



AFRL-RB-WP-TR-2008-3021

SONIC FATIGUE TESTING OF A FUNCTIONALLY GRADED Ti/TiB MATERIAL

Larry Byrd, Eric J. Tuegel, Jeffrey Quast, and Carl Boehlert

**Structural Mechanics Branch
Structures Division**

**JANUARY 2008
Final Report**

Approved for public release; distribution unlimited.

See additional restrictions described on inside pages

STINFO COPY

**AIR FORCE RESEARCH LABORATORY
AIR VEHICLES DIRECTORATE
WRIGHT-PATTERSON AIR FORCE BASE, OH 45433-7542
AIR FORCE MATERIEL COMMAND
UNITED STATES AIR FORCE**

NOTICE

Using Government drawings, specifications, or other data included in this document for any purpose other than Government procurement does not in any way obligate the U.S. Government. The fact that the Government formulated or supplied the drawings, specifications, or other data does not license the holder or any other person or corporation; or convey any rights or permission to manufacture, use, or sell any patented invention that may relate to them.

This report was cleared for public release by the Air Force Research Laboratory Wright-Patterson Air Force Base (WPAFB) Public Affairs Office and is available to the general public, including foreign nationals. Copies may be obtained from the Defense Technical Information Center (DTIC) (<http://www.dtic.mil>).

THIS REPORT HAS BEEN REVIEWED AND IS APPROVED FOR PUBLICATION IN ACCORDANCE WITH ASSIGNED DISTRIBUTION STATEMENT.

*/signature/

ERIC J. TUEGEL
Sr. Aerospace Engineer
Structural Mechanics Branch

//signature/

ANDREW G. SPARKS, Chief
Structural Mechanics Branch
Structures Division

//signature/

DAVID M. PRATT, Ph.D.
Technical Advisor
Structures Division
Air Vehicles Directorate

This report is published in the interest of scientific and technical information exchange and its publication does not constitute the Government's approval or disapproval of its ideas or findings.

Disseminated copies will show "/signature/" stamped or typed above the signature blocks.

REPORT DOCUMENTATION PAGE				Form Approved OMB No. 0704-0188	
The public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.					
1. REPORT DATE (DD-MM-YY) January 2008		2. REPORT TYPE Final		3. DATES COVERED (From - To) 03 April 2005 – 31 August 2007	
4. TITLE AND SUBTITLE SONIC FATIGUE TESTING OF A FUNCTIONALLY GRADED Ti/TiB MATERIAL				5a. CONTRACT NUMBER In-house	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER 0602201	
6. AUTHOR(S) Larry Byrd and Eric J. Tuegel (AFRL/RBSM) Jeffrey Quast and Carl Boehlert (Michigan State University)				5d. PROJECT NUMBER A0AM	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER 0A	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Structural Mechanics Branch (AFRL/RBSM) Structures Division Air Force Research Laboratory, Air Vehicles Directorate Wright-Patterson Air Force Base, OH 45433-7542 Air Force Materiel Command, United States Air Force				8. PERFORMING ORGANIZATION REPORT NUMBER AFRL-RB-WP-TR-2008-3021	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) Air Force Research Laboratory Air Vehicles Directorate Wright-Patterson Air Force Base, OH 45433-7542 Air Force Materiel Command United States Air Force				10. SPONSORING/MONITORING AGENCY ACRONYM(S) AFRL/RBSM	
				11. SPONSORING/MONITORING AGENCY REPORT NUMBER(S) AFRL-RB-WP-TR-2008-3021	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited.					
13. SUPPLEMENTARY NOTES PAO Case Number: WPAFB 08-0054, 14 Jan 2008. Report contains color.					
14. ABSTRACT The objective of this program was to determine how a functionally graded metal-ceramic material responds to high-frequency loading that is characteristic of sonic fatigue. This material has potential use as skins of aerodynamically heated structure and will experience fluctuating pressure that may result in sonic fatigue. Fatigue cracking starts in the brittle ceramic-rich layer. It was thought that the ductile metal-rich layers would increase the life of the specimen over a monolithic ceramic-rich specimen. This could not be confirmed nor refuted with the limited test data obtained. It was clear that a better sonic fatigue test method is needed for these types of materials. The current test method does not maintain sufficient control of the test.					
15. SUBJECT TERMS sonic fatigue, functionally graded material					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT: SAR	18. NUMBER OF PAGES 150	19a. NAME OF RESPONSIBLE PERSON (Monitor) Eric J. Tuegel 19b. TELEPHONE NUMBER (Include Area Code) 937-904-6823
a. REPORT Unclassified	b. ABSTRACT Unclassified	c. THIS PAGE Unclassified			

Table of Contents

Section	Page
List of Figures	iv
List of Tables	iv
1. Introduction.....	1
2. Material	2
3. Experimental Procedure.....	11
4. Results.....	13
5. Conclusions and Recommendations	17
6. References.....	18
Appendix A. Sonic Fatigue Test Results for 85% TiB / 15% Ti.....	20
Appendix B. Sonic Fatigue Test Results for 7-Layer Graded Material.....	84

List of Figures

Figure	Page
Figure 1. Specimen Layout in Each Plate.....	3
Figure 2. Schematic of the Microstructural Development of Three Different Alloys Systems Containing Varying Volumetric Percentages of TiB (as shown above the images).....	4
Figure 3. Backscatter SEM Images of the (a) the Longitudinal and (b) the Transverse Cross Sections of the FGM.	5
Figure 4. Backscattered SEM Images Showing the Layers of the 3-mm FGM plate.....	7
Figure 5. Higher Magnification (1000x) Backscatter SEM Images Showing the Layers of the 3-mm FGM.....	9
Figure 6. Backscattered SEM Images of the TiB-rich Sample of a 3-mm-Thick-Plate Shown in (a) Low Magnification and (b) High Magnification.	10
Figure 7. A Specimen Mounted in the Sine Clamp Attached to the Head of the Electromagnetic Shaker.....	11
Figure 8. Schematic of the Experimental Setup Showing the Control and Data Acquisition Systems.....	12
Figure 9. Sonic Fatigue Test Results	13
Figure 10. A Secondary Electron SEM Photomicrograph of a Fractured FGM Specimen.....	14
Figure 11. Collage of Higher Magnification Secondary Electron SEM Micrographs of Section A-A in Figure 10.	15
Figure 12. Secondary Electron SEM Image Showing the Cross-sectioned Fracture Surface and Crack Propagation Path (see arrows) of a 85 wt.% TiB Specimen.....	16
Figure 13. Secondary Electron SEM Image of the Inclusion Present in the Fracture Surface of a 85 wt.% TiB Specimen.....	16

List of Tables

Table	Page
Table 1. Phase Volume Ppercentages of Each Functionally Graded Layer of the 3 mm Sample .	2

1. Introduction

A functionally graded material (FGM) is characterized by a transforming composition and structure from one surface to another. FGMs have been considered to prevent cracking in ceramic-metal joints by reducing the coefficient of thermal expansion mismatch during high-temperature processing. Thus, FGMs may be used efficiently in high-temperature applications. Previous studies have shown FGMs to be beneficial in reducing thermal stresses^[1] and increasing fracture toughness^[2].

The objective of the work was to investigate how a metal-ceramic FGM responds to typical aircraft loading, in this case bending. The strain response of thick beams was investigated for quasi-static bending. The results of these experiments and the finite element modeling of the experiments are reported in reference^[3]. This report focuses on dynamic bending experiments.

Dynamic bending experiments are motivated by sonic fatigue of thin aircraft skin panels. Aerodynamic pressure fluctuations over a thin panel can excite the panel at its natural frequency causing the panel to accumulate many load cycles in a very short time and eventually crack. Sonic fatigue can be controlled by properly designing the stiffness and mass of the panel. The durability of the material expressed in terms of root mean squared (rms) strain versus cycles to failure is also important. The typical way of developing the sonic fatigue durability data for a material is from a cantilever beam subjected to constant amplitude vibration at its fundamental frequency until it fails. Since a potential application for FGMs is in skin panels, it was decided to investigate the durability a metal-ceramic FGM under sonic fatigue loading.

The potential drawback to a metal-ceramic FGM is the brittleness of the ceramic-rich layers. It is expected that cracking and subsequent fracture will originate in the ceramic-rich layer. The unknown is whether the more ductile metal-rich layers provide any life increasing support under mechanical loading. This investigation seeks to determine whether the combination of material layers with different properties provides any life improvements over the material with the worst properties, i.e., the ceramic, under high-cycle sonic fatigue loading.

2. Material

2.1 Alloy Fabrication

The metal-ceramic FGM selected for this effort was a titanium/titanium boride (Ti/TiB) system from Cercom, Inc. (now BAE Systems Advanced Ceramics, Inc.). The FGM consists of seven layers, varying from a pure titanium (Ti) surface to TiB-rich surface (targeted to be 85 wt.% TiB) with each layer from the Ti surface having increasing volume percentages of TiB, as shown in Table 1. The material is fabricated from Ti metal and TiB₂ ceramic powders. The nickel phase in the three layers with the highest percentages of Ti come from a proprietary catalyst added to aid the reaction of the Ti and TiB₂ powders to form TiB. The powders were sintered at 1578°K under a pressure of 13.8 MPa. The FGMs were fabricated as square plates, nominally 150 mm on a side by 3 mm thick. In addition, 3-mm-thick monolithic samples of Ti-85TiB were also obtained. A baseline fatigue life curve against which to compare the FGM fatigue life curve was to be generated with this material.

Table 1. Phase Volume Percentages of Each Functionally Graded Layer of the 3 mm Sample

	Ti Layer	2nd Layer	3rd Layer	4th Layer	5th Layer	6th Layer	TiB-rich Layer
Ti Phase Vol.%	88.2%	81.3%	62.4%	11.5%	8.5%	6.4%	5.7%
TiB Phase Vol.%	N/A	16.6%	33.8%	88.5%	91.5%	93.6%	94.3%
Ni Phase Vol.%	11.8%	2.1%	3.8%	--	--	--	--
Layer thickness	0.24 mm	0.35 mm	0.37 mm	0.35 mm	0.36 mm	0.61 mm	1.08 mm

Four sheets of material were obtained: two FGM sheets (996-1 and 996-2) and two uniform Ti-85TiB sheets (974-1 and 974-3). Each plate was machined into seven beams at Cercom: six with nominal dimensions 127 by 25.4 mm, and one that was 152.4 by 25.4 mm, as shown in Figure 1. One of the FGM specimens, 996-1.1, broke during machining and was replaced by a specimen from another plate, 1011-1.

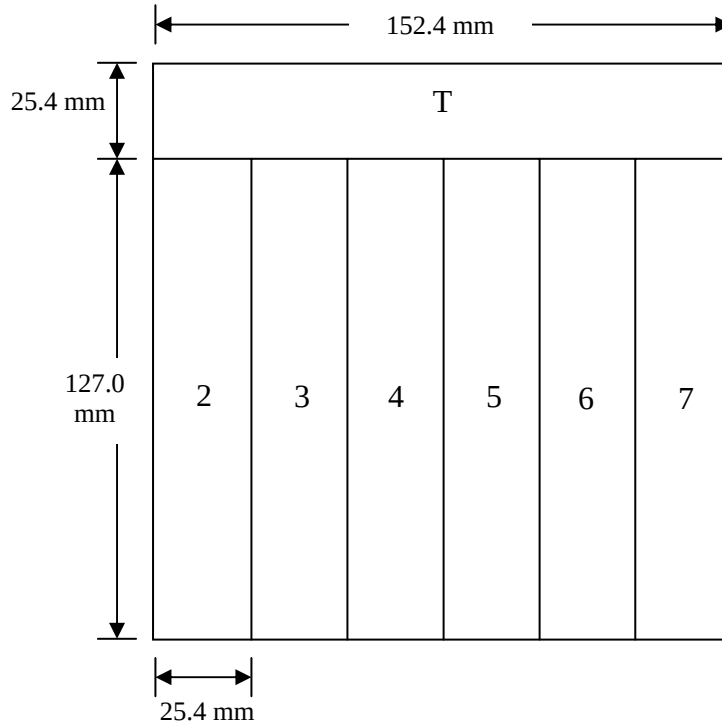
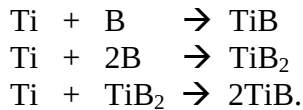


Figure 1. Specimen Layout in Each Plate

2.2 Ti/TiB Material System

Titanium-titanium boride (Ti-TiB) composites and FGMs have recently been considered for high-strength armor and ballistic applications due to the high strength and stiffness of the TiB combined with the tough and ductile Ti^[4, 5]. TiB reinforcement in Ti has an advantage over other reinforcements in that the crystallographic relationship between Ti and TiB results in a clean interface with no reactivity issues^[6]. Also, due to the similarity of thermal expansion coefficients ($8.2 \times 10^{-6}/^{\circ}\text{C}$ for Ti and $6.2 \times 10^{-6}/^{\circ}\text{C}$ for TiB), processing of these alloys is easier than other composite systems^[7]. The processing of Ti with TiB is even easier because the TiB phase can be grown in situ during solidification. Commonly, Ti-TiB composites are formed through the reaction of B or TiB₂ with Ti. The relevant reactions are as follows:



These reactions are exothermic in nature and readily occur. The TiB precipitates out as whiskers because of the faster diffusion rates of boron atoms in the [010] direction compared to other directions^[8]. Whiskers provide increased stiffness, strength, and creep resistance compared to particles. While improvements in mechanical properties of Ti alloys can be obtained through the use of TiB reinforcements^[9-16], higher volume fractions of TiB have resulted in cracking during fabrication, owing partly to the low elongation-to-failure of Ti-TiB composites^[17]. Higher TiB volume fractions can result in a change in morphology of the TiB phase as well, which reduces the effectiveness of the reinforcement.

The phase morphology of TiB is dependent on the processing conditions, which also influences the TiB volume fraction. Panda and Ravichandran^[18] have explained the dependence of morphology on the amount of direct contact between TiB₂ particles and Ti. At high TiB₂ volume fractions, a lack of contact with Ti leads to the formation of clustered TiB whiskers appearing as a monolithic TiB phase. This results from slow diffusion of Ti through TiB limiting the amount of Ti that can reach the unreacted TiB₂. This issue is alleviated with increased contact of Ti with TiB₂ through powder particle variation. Maximum powder packing in tri-modal powder mixtures is obtained when the size ratio is 1:7:49^[19], resulting in an initial packing density greater than 92 percent. Whisker-based Ti-TiB composites have been produced using similar size ratios of Ti-Beta phase stabilizer-TiB₂, respectively^[18, 20]. The TiB₂ particles fill the interstitial sites between the large Ti and medium-sized beta-stabilizing particles^[18, 20]. In microstructures containing less than 30 vol.% TiB, where the primary whiskers exhibit high aspect ratios and are isolated from each other, the mean free path for growth of the TiB is determined by the Ti particle size^[18]. At higher vol.% of TiB, there are a greater number of TiB₂ particles in the packing configuration. Such an arrangement impedes the TiB whisker growth, resulting in clusters of fine secondary TiB whiskers. At intermediate vol.% of TiB, a dual morphology of primary and secondary TiB whiskers is formed. A schematic showing the morphology of the TiB resulting from the various powder packing arrangements is shown in Figure 2^[18].

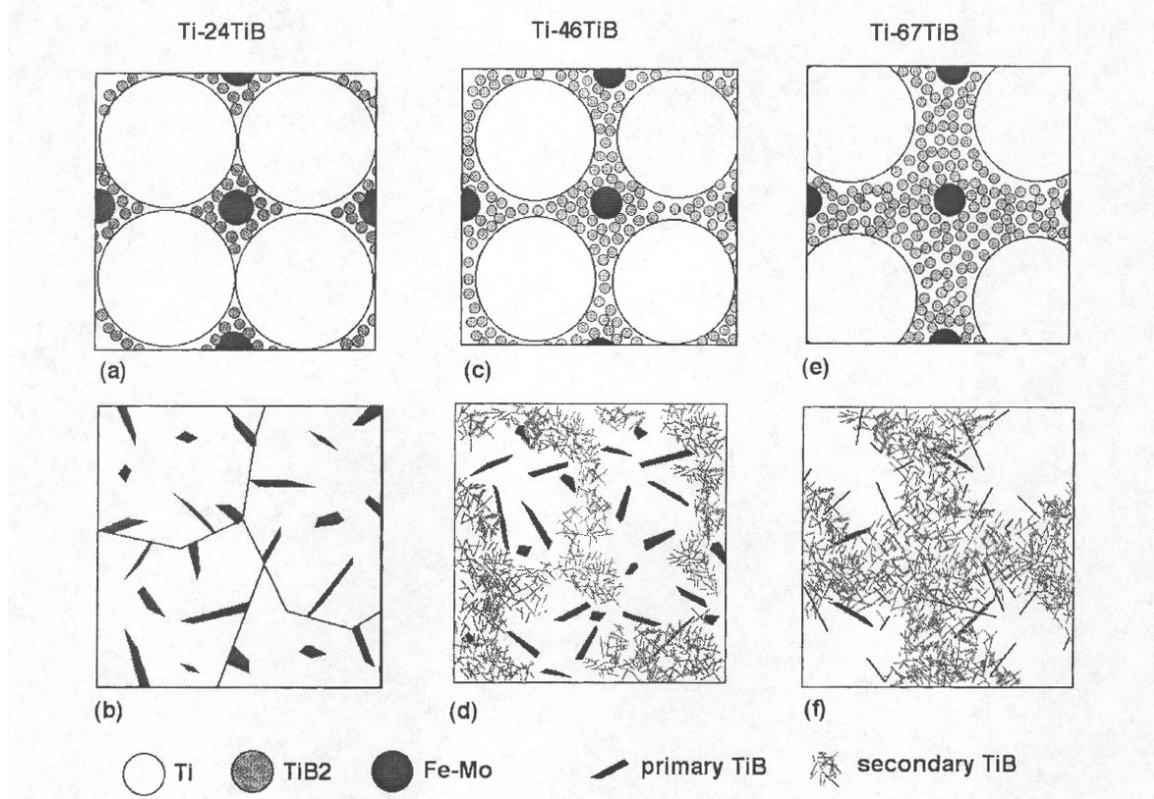


Figure 2. Schematic of the Microstructural Development of Three Different Alloy Systems Containing Varying Volumetric Percentages of TiB (as shown above the images)

Note: (a), (c), and (e) show the powder packing configuration and (b), (d), and (f) show the corresponding microstructures, respectively^[18].

In the fabrication of Ti-TiB FGMs, the volume percentage and morphology of the TiB phase both have significant impact on the mechanical properties. Though small volume percents are sufficient to significantly increase stiffness, strength, and creep resistance, practical use of such alloys for structural applications is limited by toughness and ductility^[11-16]. A 20 vol.% TiB alloy exhibits 0.5 percent room-temperature elongation-to-failure^[21], while composites with greater than 30 vol.% TiB exhibit less than 0.5 percent room-temperature elongation-to-failure and brittle failure^[22]. However, 7 vol.% TiB in Ti-6Al-4V has over 10 percent elongation-to-failure^[14, 15].

2.3 FGM Microstructure

The microstructure of the 3-mm-thick FGM and 85 wt.% TiB material were characterized to more fully understand the impact of the microstructure on the sonic fatigue performance. The specimens were cut with an abrasive saw, mounted in Konductomet (Buehler LTD.), and polished using successively finer polishing solutions through 0.06 μm colloidal silica. Backscatter and secondary electron imaging was performed with a Cambridge Stereoscan 250 Mk 2 Scanning Electron Microscope (SEM) at 20 KeV.

Figures 3 (a) and (b) show the microstructure of the 3-mm-thick FGM plate in both the longitudinal and transverse directions, respectively. Figure 4 (a) – (g) shows details of the microstructure of each layer of the FGM. The cracks visible in Figure 3 (b) were a result of either the processing or sample preparation and only occurred within the layers containing more than 30 vol.% TiB. This demonstrates the brittle nature of material with high volume fractions of TiB. The interface between the Ti-rich layers was readily apparent in the low-magnification SEM image of Figure 3. However, the interface became difficult to distinguish in the fourth layer (Ti-33TiB/Ti-88TiB) and subsequent layers. The microstructure became more homogeneous with increasing TiB phase volume fractions. Only through high-magnification SEM imaging could differences in the microstructure be distinguished. The measured thickness of each layer, determined through SEM photomicrograph measurements, is presented in Table 1.

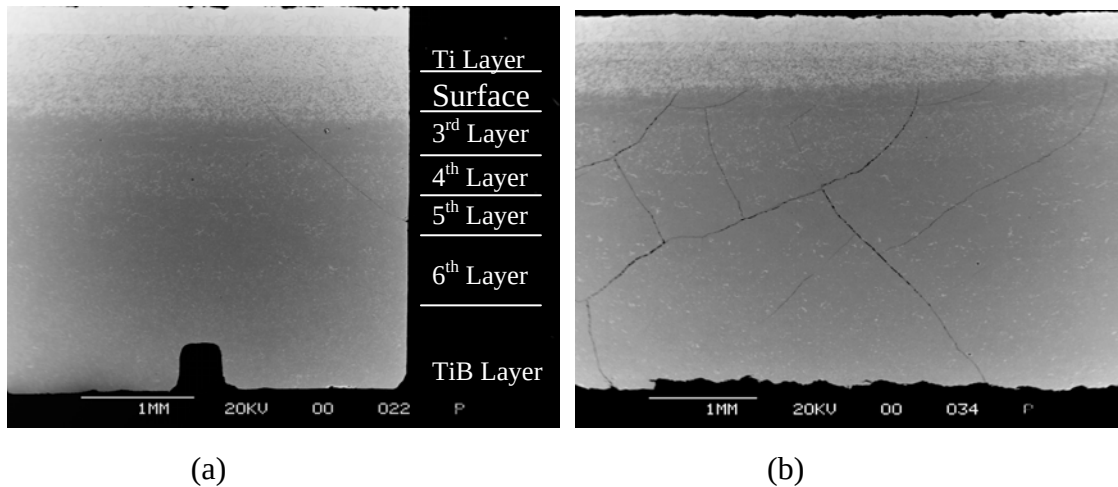


Figure 3. Backscatter SEM Images of the (a) the Longitudinal and (b) the Transverse Cross Sections of the FGM

Note the light phase is Ti, and the dark phase is the TiB, and the notch in the longitudinal sample is a cut mark.

Figure 4 (a) shows the outer layer of Ti and the interface between the Ti and Ti-16.6TiB. In the Ti layer, a semi-continuous Ni-Ti phase is seen. Ni was used as a sintering agent and phase stabilizer and remained present in the microstructure. A distinct interface is seen between where the Ti layer ends and the Ti-16.6TiB layer begins. Figure 4 (b) more clearly shows the Ti-16.6TiB layer. The TiB phase precipitated out of the Ti in the form of needles. As shown in Figure 4 (c), the Ti-16.6TiB layer is joined by the Ti-33.8TiB layer, where the needle TiB morphology coexists with a more clustered morphology. In Figure 4 (d), the Ti-88.5TiB layer, the needle TiB morphology is no longer seen and is replaced by clustered TiB appearing monolithic in form. The Ti-91.5TiB, Ti-93.6TiB, and Ti-94.3TiB layers are shown in Figure 4 (e), (f), and (g), respectively. These layers are nearly indistinguishable from one another, with a slightly larger amount of Ti present in the Ti-91.5TiB layer (see Table 1). Higher magnification images of each layer are provided in Figure 5 (a) – (g).

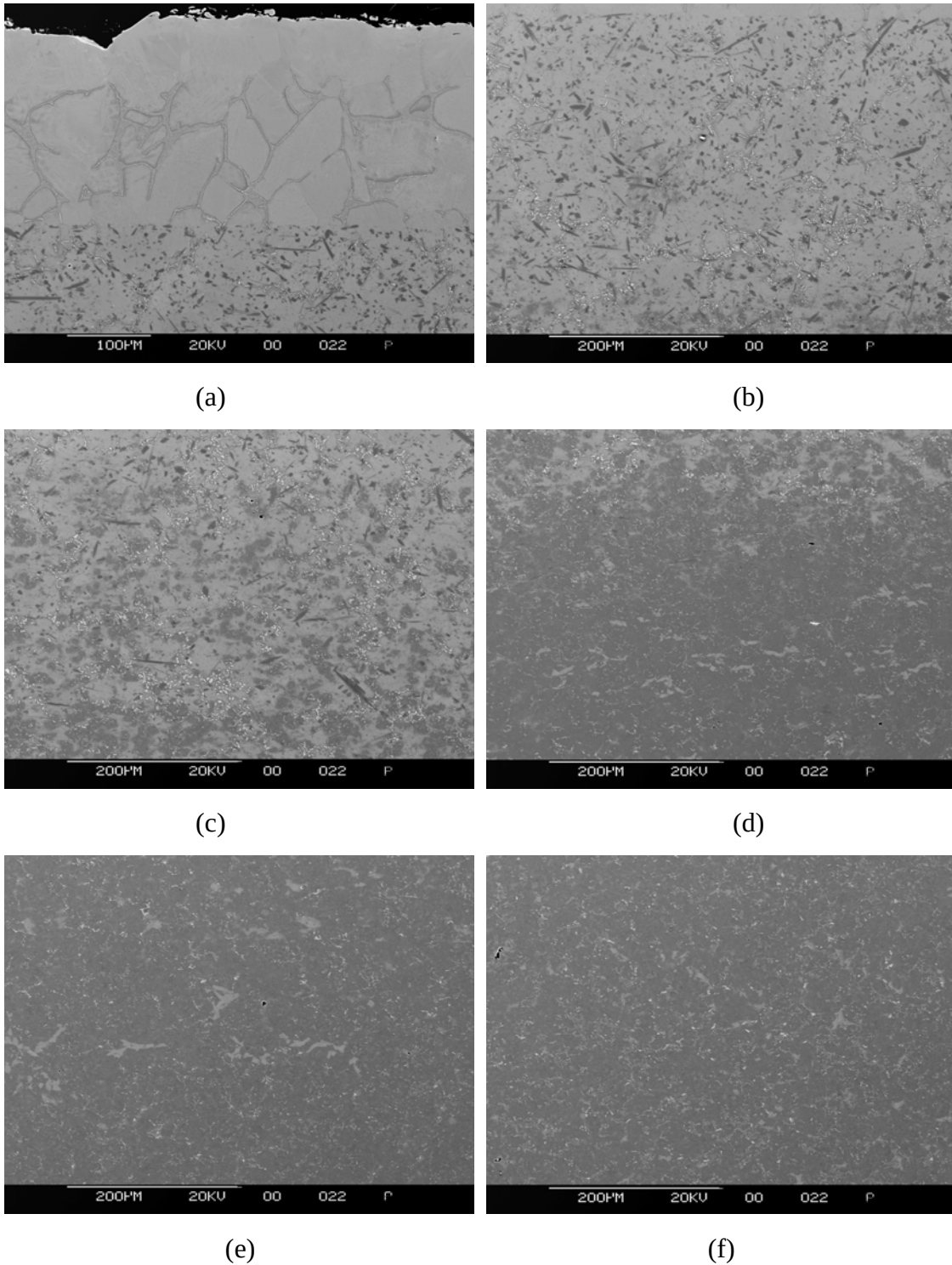
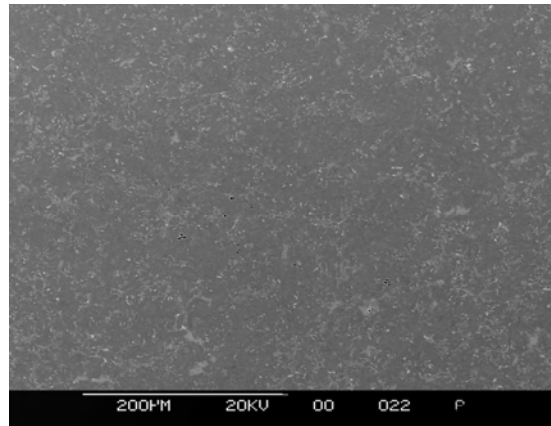


Figure 4. Backscattered SEM Images Showing the Layers of the 3-mm FGM plate

Note: (a) titanium, (b) Ti-16.6TiB, (c) Ti-33.8TiB, (d) Ti-88.5TiB, (e) Ti-91.5TiB, and (f) Ti-93.6TiB. Note the micrographs were all imaged at 200x and (a) – (d) show some overlap of neighboring layers.

(Figure continued on next page.)



(g)

Figure 4 (concluded). Backscattered SEM Images Showing the Layers of the 3-mm FGM Plate

Note: (g) Ti-94.3TiB. Note the micrographs were all imaged at 200x and (a) – (d) show some overlap of neighboring layers.

The Ti phase volume percentage decreases with each progressing layer from the Ti layer (Table 1). The nickel phase volume percentage is also provided for the first three layers. The nickel phase, while present, was indiscernible in comparison to the Ti phase in the Ti-88.5TiB, Ti-91.5TiB, Ti-93.6TiB, and Ti-94.3TiB layers. Therefore, these phase volume calculations of the Ti phase include some nickel phase as well. As confirmed by the micrographs in Figures 4 and 5, there is a dramatic change in TiB phase volume percentage between the Ti-33.8TiB and Ti-88.5TiB layers of the FGM. At such a steep change in phase volume percentage there is expected to be a higher residual stress between these two layers than between other layers with more modest changes in composition. Coincidentally, at this junction, a change in TiB morphology is seen, where the microstructure has transitioned from a needle structure to a clustered TiB morphology. From this transition on, very little gradation of TiB is present. Only a 5.8% change is observed over the last four layers (Ti-88.5TiB layer through Ti-94.3TiB layer), whereas there is a 33.8% change in TiB phase volume percentage over the first three layers of the FGM.

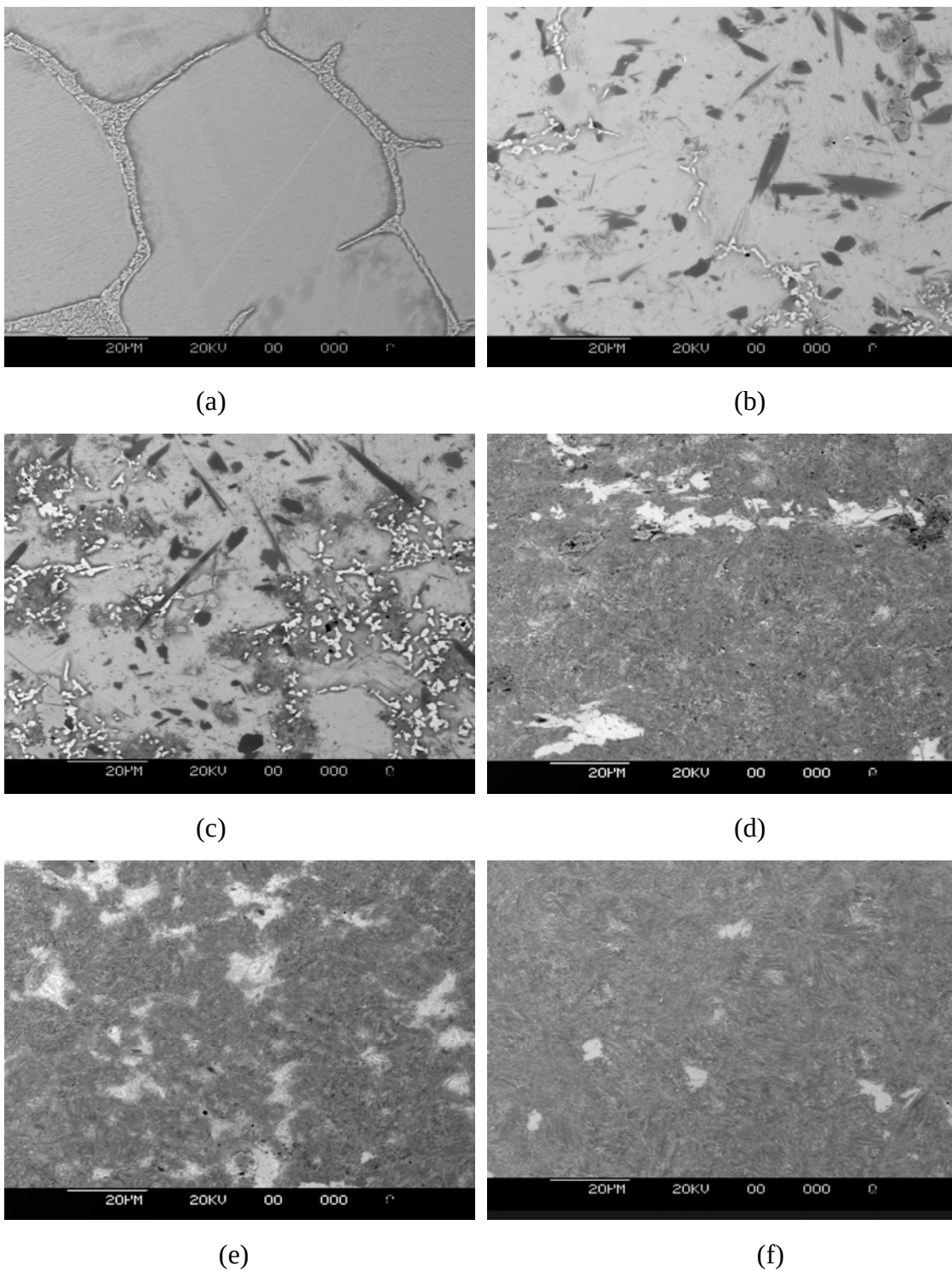
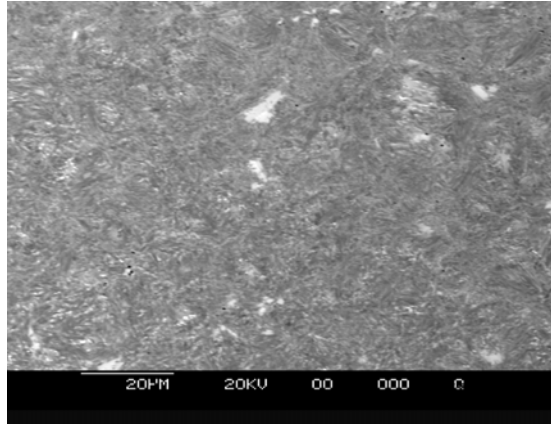


Figure 5. Higher Magnification (1000x) Backscatter SEM Images Showing the Layers of the 3-mm FGM

Note: (a) titanium, (b) Ti-16.6TiB layer, (c) Ti-33.8TiB layer, (d) Ti-88.5TiB layer, (e) Ti-91.5TiB layer, and (f) Ti-93.6TiB layer. (Figure continued on the next page.)



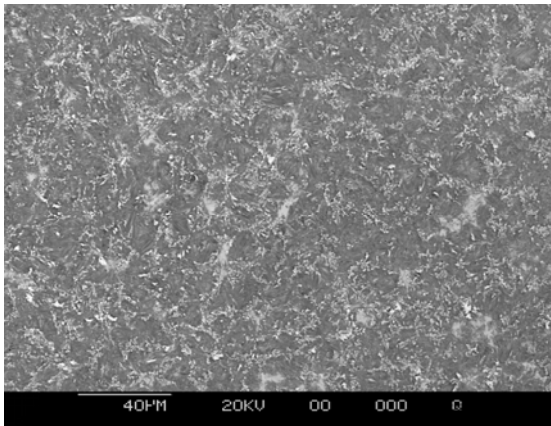
(g)

Figure 5 (continued). Higher Magnification (1000x) Backscatter SEM Images Showing the Layers of the 3-mm FGM

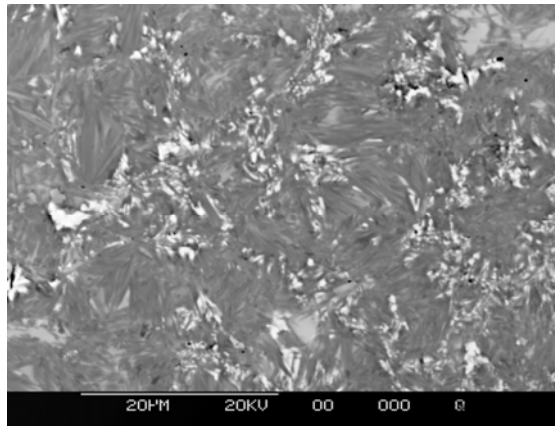
Note: (g) Ti-94.3TiB layer.

2.4 TiB-rich Samples

Microstructures of a 3 mm sample comprised entirely of TiB-rich (nominally Ti-94.3TiB) are presented in Figure 6 (a) and (b). The microstructure shows a clustered TiB phase with intermittent patches of Ti. Some Ni phase remained from the sintering process.



(a)



(b)

Figure 6. Backscattered SEM Images of the TiB-rich Sample of a 3-mm-Thick-Plate Shown in (a) Low Magnification and (b) High Magnification.

3. Experimental Procedure

The sonic fatigue tests were conducted with the test specimens mounted as cantilever beams on an electromagnetic shaker (Figure 7). The specimens are held in a sine clamp fixture mounted to the head of the shaker. The sine clamp is so named because the profile of the clamp looks like half of a sine wave. The largest strain in the specimen during testing is at the peak of the sine wave. Thus, cracks will be more likely to start in this location, making the results less sensitive to the condition of the specimen edges. The bolts holding the clamp together were torqued to between 300 and 350 in-lb.

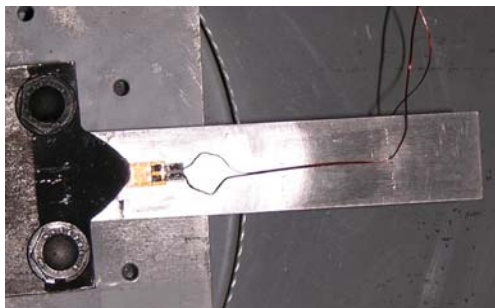


Figure 7. A Specimen Mounted in the Sine Clamp Attached to the Head of the Electromagnetic Shaker

Strain gages were mounted on both sides of the specimens at the tip of the sine clamp. The rms strain on the 85% TiB/15% Ti side of the specimen was the test parameter of interest since this material was likely to crack first being the most brittle composition. Fatigue lives in the range of 10^5 to 10^8 cycles were targeted. Testing began at a low rms strain of $500 \mu\epsilon$ since we had no data on how these materials would perform. Depending upon the lives obtained at this strain level, the rms strain would be increased or decreased to get into the target life range. The scatter in the data was so great that the decision whether to increase or decrease the rms strain on the subsequent test was just a random guess. The rms strains for all tests were between $500 \mu\epsilon$ and $700 \mu\epsilon$.

Prior to starting each test, a frequency sweep using a low-amplitude sine wave was done to determine the fundamental frequency of each beam. Next, several thousand cycles at the natural frequency were run at small and moderate shaker accelerations in order to establish the correlation between the shaker acceleration and the rms strain. This step is required because the strains reached in a given test are governed by the inertia of the particular specimen responding to the acceleration of the shaker. This correlation was used to scale up to the shaker acceleration needed to produce the desired strain in the specimen.

During each test, the specimen was excited at its fundamental frequency with a constant amplitude sine wave. The shaker was controlled using the signal from a laser vibrometer which is correlated to the strain. This provides a noncontacting method of control which can be used after the strain gage fails (Figure 8). The rms strain, vibration frequency, acceleration of the shaker head, acceleration of the fixture, rms velocity and displacement of the spot where the laser vibrometer is aimed, and the number of applied cycles were recorded during the test. This data was recorded every 5 seconds, on average, during each test. Representative data from the tests are presented in Appendices A and B.

It was noticed part way through the test program that the failure cracks in the 85% TiB specimens seemed to start on the edges of the specimen in one of a number of gouges along the edges of these specimens. The purpose of the sine clamp was to eliminate cracking at the specimen edges. Subsequently, the remaining specimens with rough edges were sent out to have the gouged edges EDM'ed off.

A number of specimens broke during the time that the shaker was ramping up to the desired test conditions. It was noted in one of these test that the test controller significantly overshoot the target strain, approximately $800\ \mu\epsilon$ when $500\ \mu\epsilon$ was the target. In subsequent tests, the amplitude of the shaker was stepped up to the target strain level along a prescribed path in order to minimize the overshoot. This seemed to reduce the occurrence of failures during ramp up but did not totally eliminate them.

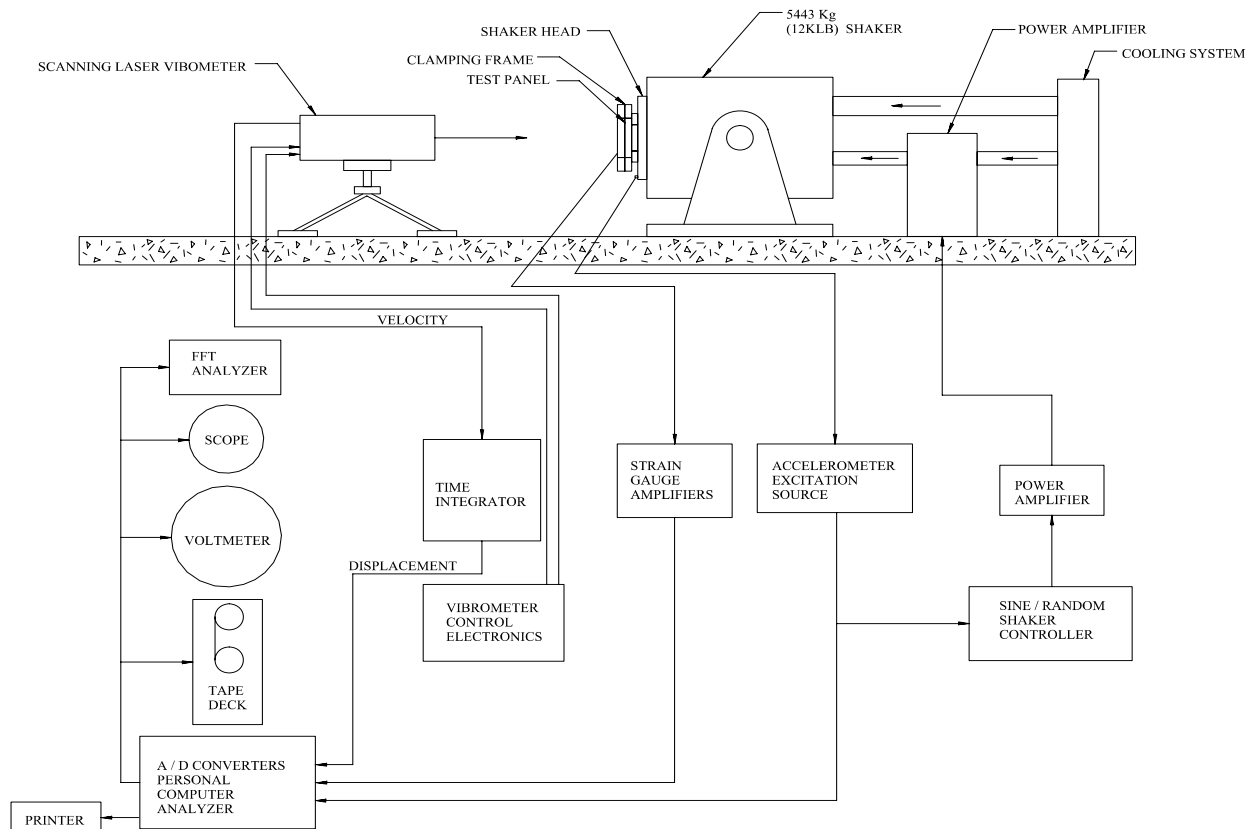


Figure 8. Schematic of the Experimental Setup Showing the Control and Data Acquisition Systems

4. Results

4.1 Sonic Fatigue Tests

The results of the fatigue tests are presented in Figure 9. In past work with metals and ceramic matrix composites, the fundamental frequency dropped as cracks developed in the specimen. Failure criteria for these materials were developed in terms of a percentage drop in the fundamental frequency^[23, 24]. In almost all cases here, when the specimen failed, it broke before there was a noticeable decrease in the fundamental frequency.

There was considerable variability in the testing—only 10 valid tests out of 26 specimens tested. The inherent variability of brittle materials such as TiB, in addition to the condition of the specimens and difficulties controlling the ramp-up of the shaker mentioned earlier, likely contributed to this. In addition, there are considerable residual stresses in both the 85 wt.% TiB and FGM materials as a result of the consolidation of the powders^[25].

The fundamental frequencies of the monolithic 85 wt.% TiB specimens were higher than the fundamental frequencies of the FGM specimens: 300 to 320 Hz versus 210 to 230 Hz. This is consistent with the 85 wt.% TiB specimens being stiffer and having a lower density than the FGM specimens. It should be noted that the fundamental frequency of the substitute FGM specimen (1011-1) was significantly lower than all the other FGM specimens, 168.8 Hz. This may indicate that the plate of material that it came from was different than the two plates that all of the other specimens came from.

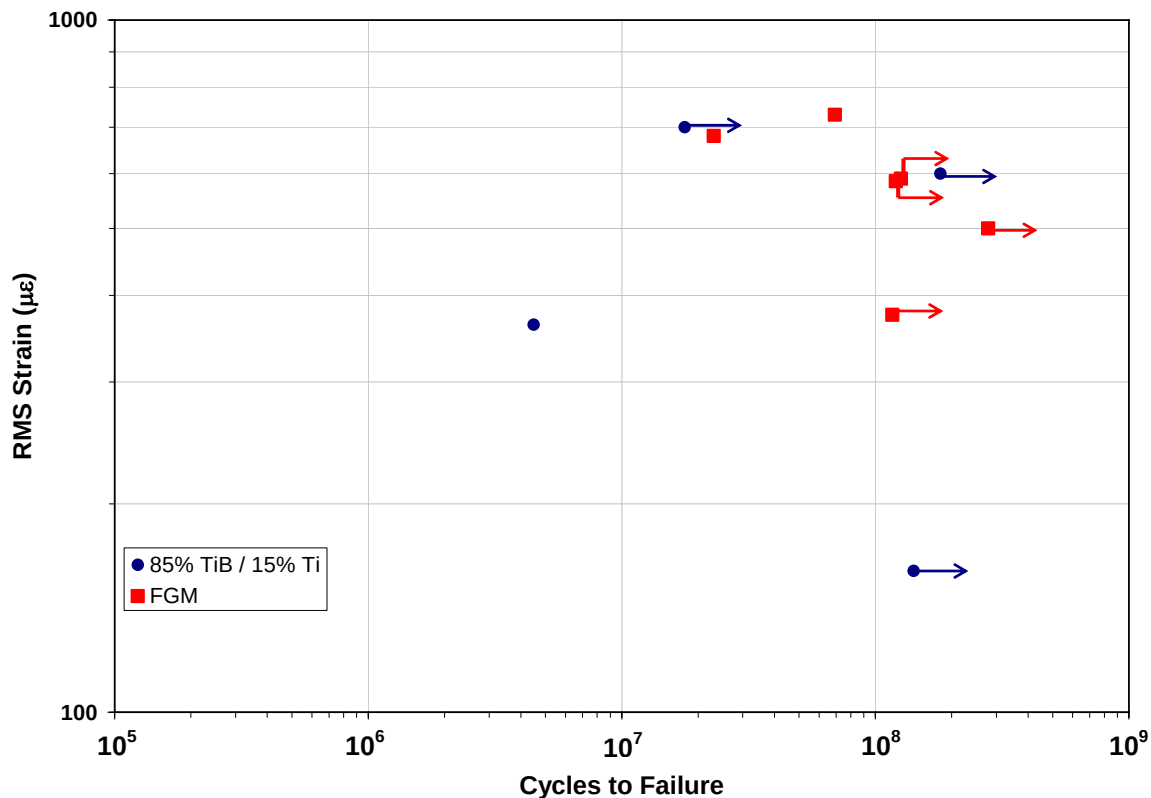


Figure 9. Sonic Fatigue Test Results

4.2 Fractography

Fractography was performed on one failed FGM specimen (996-2.1). A low magnification image of the fracture surface is shown in Figure 10 followed by a collage of higher magnification images in Figure 11. In each figure a mixed mode fracture is observed, where a ductile failure is shown in the Ti rich layers and a brittle failure is shown in the TiB rich layers. The abrupt change from ductile to brittle failure appears to occur between the Ti-33.8TiB and Ti-88.5TiB layers. As indicated by the river marks in the brittle failure regime, the failure seems to have emanated on the TiB-rich surface, propagating through the layers to the Ti rich surface. This was the expected failure mode for the FGMs.

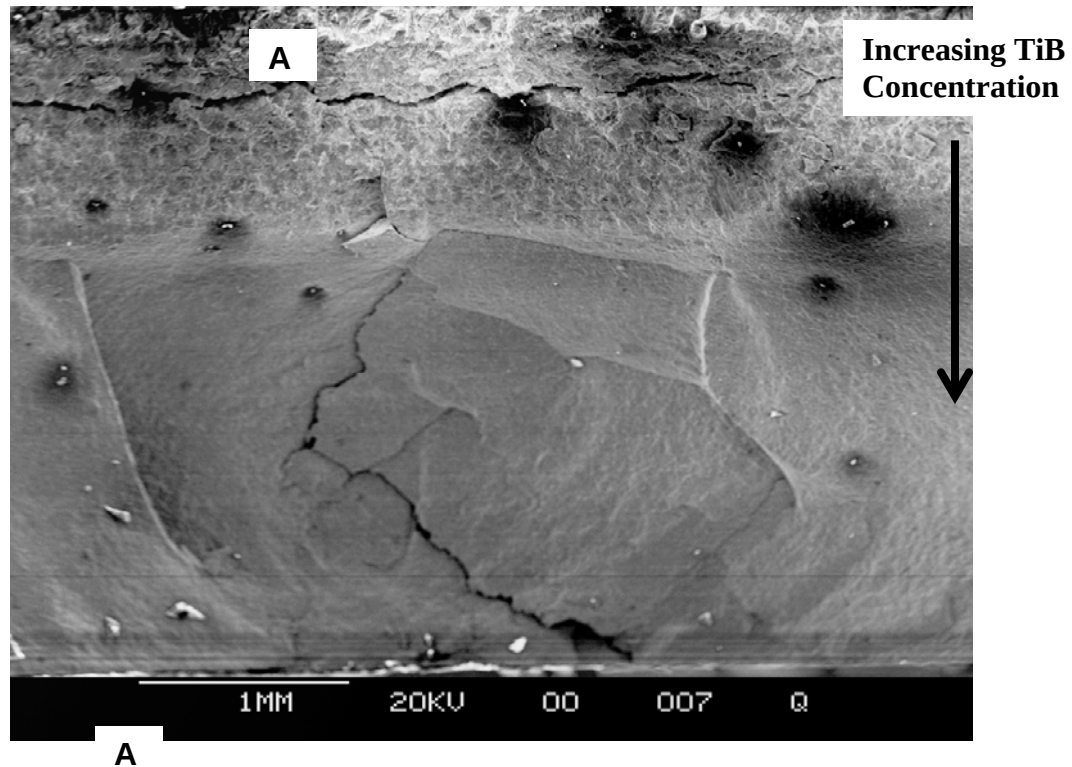


Figure 10. A Secondary Electron SEM Photomicrograph of a Fractured FGM Specimen

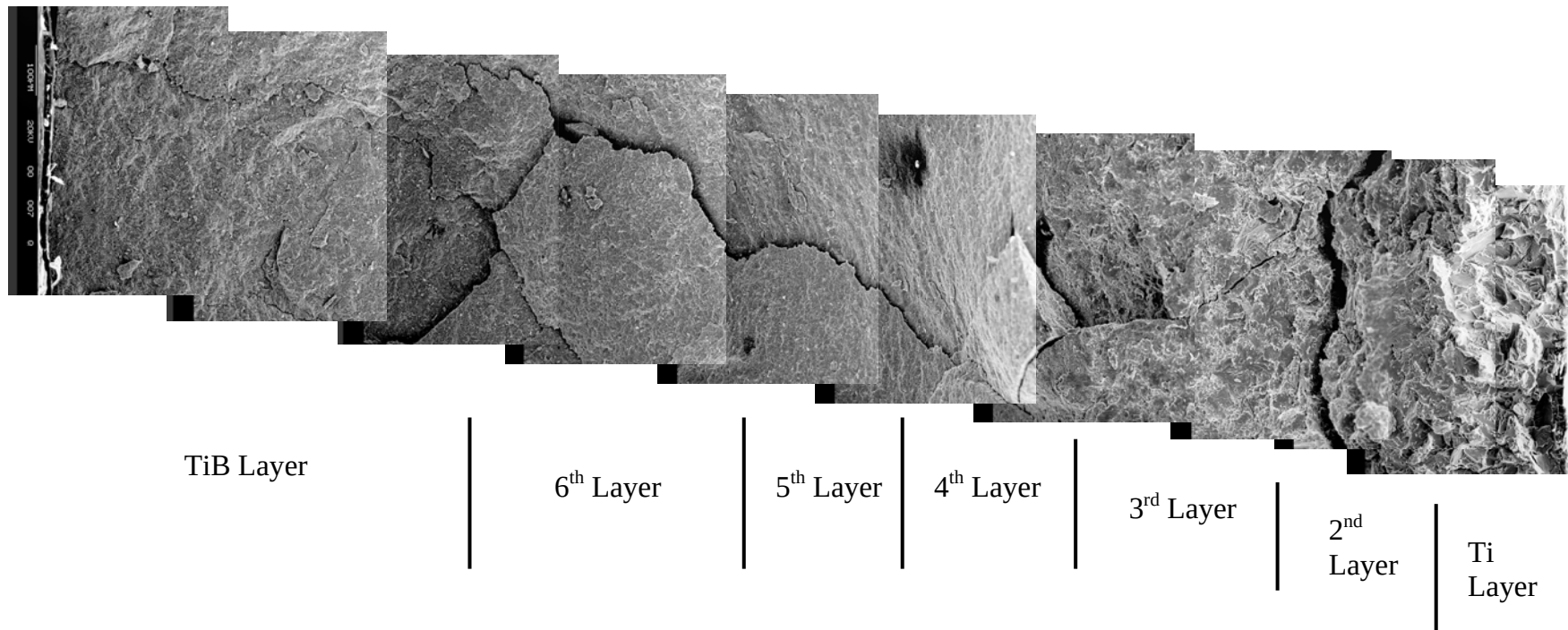


Figure 11. Collage of Higher Magnification Secondary Electron SEM Micrographs of Section A-A in Figure 10.

The fracture surface of a failed 85 wt.% TiB specimen (974-1.4) is shown in Figure 12. A relatively smooth, brittle fracture surface is shown where the crack appeared to initiate on the surface of the specimen near a large inclusion and propagated through the sample to the other surface. The inclusion, clearly displayed in Figure 13, most likely provided a stress concentration, which led to local and global failure and likely lowered the fatigue lifetime of the sample.

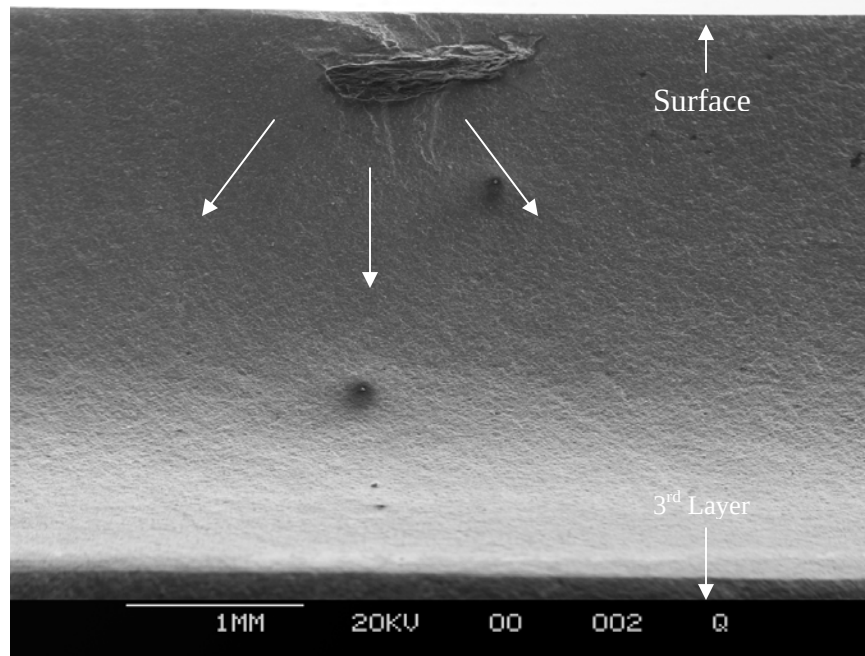


Figure 12. Secondary Electron SEM Image Showing the Cross-sectioned Fracture Surface and Crack Propagation Path (see arrows) of a 85 wt.% TiB Specimen

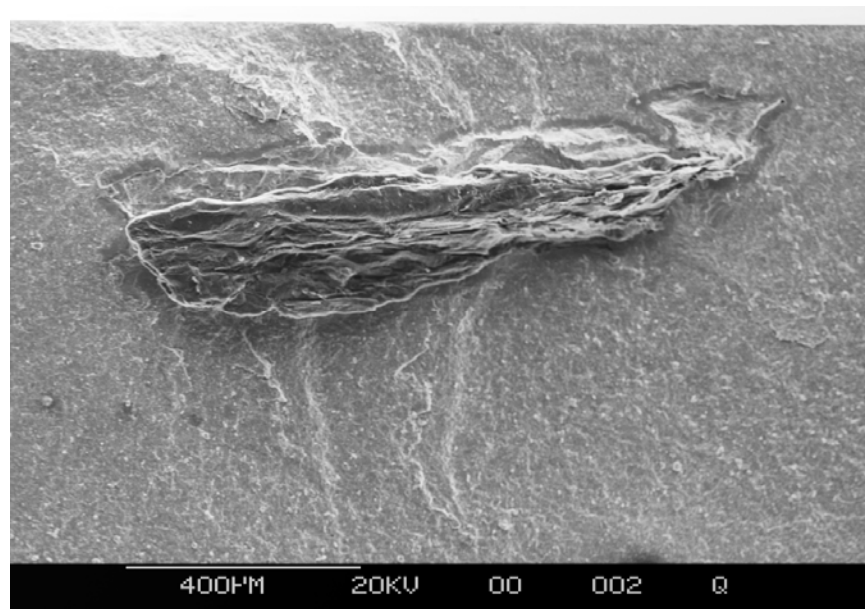


Figure 13. Secondary Electron SEM Image of the Inclusion Present in the Fracture Surface of a 85 wt.% TiB Specimen

5. Conclusions and Recommendations

The purpose of this test program was to determine if the sonic fatigue life of a metal-ceramic FGM (FGM) was governed by the life of the most brittle layer, i.e., the ceramic-rich layer. This was to be confirmed or refuted by comparing the sonic fatigue lives of Ti/TiB FGM specimens to the sonic fatigue lives of monolithic 85 wt.% TiB specimens. It was not possible to determine whether or not the FGM specimens had longer sonic fatigue lives than the 85 wt.% TiB specimens because of the sparsity of valid data from this test program.

The current practice for sonic fatigue life testing for these sorts of advanced materials is very inefficient, less than 50 percent of all the tests run yielded useful data. Even the good tests are suspect because of the extra cycles applied in order to set up the test, the stops and restarts when the laser vibrometer control signal was lost. With the advances in material testing technology, we are not limited to conducting sonic fatigue tests on electromagnetic shakers where the test parameter of interest, strain, can only be indirectly controlled.

Servohydraulic test machines capable of testing at frequencies up to 500 Hz are now available. These machines offer the potential for direct closed loop control of strain. Standard test methods for sonic fatigue using these high frequency servohydraulic test machines should be developed to improve the efficiency and quality of sonic fatigue tests, especially for advanced materials. Studies to correlate the results from these tests to those from shaker tests must be conducted to ensure the life prediction methods are still valid with data from the different test method.

6. References

1. Ravichandran, K.S., "Thermal Residual Stresses in a Functionally Graded Material System," *Materials Science and Engineering*, Vol. A201, pp.269-276, 1995.
2. Ma, J., Tan, G.E.B., and He, Z., "Fabrication and Characterization of Ti-TiB₂ Functionally Graded Material System," *Metallurgical and Materials Transactions A*, Vol. 33A, pp. 681-685, 2002.
3. Reuter, R.A., "An Exploration of Several Structural Measurement Techniques for Usage with Functionally Graded Materials," M.S. Thesis, AFIT/GAE/ENY/07-D03 (DTIC Accession ADA461271), December 2006.
4. Gooch, W.A., Burkins, M.S., Palicka, R., Rubin, J., and Ravichandran, K.S., *Proc. 5th Int. Symp. on FGMs*, Materials Science Forum, Trans Tech Publications, Uetikon-zuerich, Switzerland, Vols. 308-311, pp. 47-52, 1999.
5. Sahay, S.S., Ravichandran, K.S., Atri, R., Chen, B. and Rubin, J., "Evolution of Microstructure and Phases in In-Situ Processed Ti-TiB Composites Containing High Volume Fractions of TiB Whiskers," *Journal of Materials Research*, Vol. 14, pp. 4214-4223, 1999.
6. Li, D.X., Ping, D.H., Lu, Y.X., and Ye, H.Q., "Characterization of the Microstructure in TiB-Whiskers Reinforced Ti Alloy Matrix Composite," *Materials Letters*, Vol. 16, pp. 322-326, 1993.
7. Atri, R.R., and Ravichandran, K.S., University of Utah, Salt Lake City, UT, unpublished research, 1999.
8. Hyman, M.E., McCulloagh, C., Valencia, J.J., Levi, C.G., and Mehrabian, R., "Evolution of Boride Morphologies in TiAl-B Alloys," *Metallurgical Transactions A*, Vol. 22A, pp.1647-1662, 1991.
9. Fan, A., Midownik, P., Chandrasekaran, L., and Ward-Close, M., *Journal of Materials Science*, Vol. 29, pp. 1127-1134, 1994.
10. Saito, T., "The Automotive Application of Discontinuously Reinforced TiB-Ti Composites," *Journal of Metals*, Vol. 56, pp. 33-36, 2004.
11. Ylton, C.F., and Moll, J.H., *Titanium 1995*, Vol. 1, ed. by P.A. Blenkinsop, W.J. Evans, and H.M. Flowers, The University Press, Cambridge, pp. 2755-2762, 1996.
12. Gorsse, S., and Miracle, D.B., "Mechanical Properties of Ti-6Al-4V/TiB Composites with Randomly Oriented and Aligned TiB Reinforcements," *Acta Materialia*, Vol. 51, pp. 2427-2442, 2003.
13. K. B. Panda and K.S. Ravichandran, "First Principles Determination of Elastic Constants and Chemical Bonding of Titanium Boride (TiB) on the Basis of Density Functional Theory," *Acta Materialia*, Vol. 54, pp. 1641-1657, 2006.

14. Boehlert, C.J., Cowen, C.J., Tamirisakandala, S., McEldowney, D.J., and Miracle, D. B., "In Situ Scanning Electron Microscopy Observations of Tensile Deformation of a Boron-Modified Ti-6Al-4V Alloy," *Scripta Materialia*, Vol. 55, pp. 465-468, 2006.
15. Tamirisakandala, S., Miracle, D.B., Srinivasan, R., and Gunasekera, J.S., "Titanium Alloyed with Boron," *Advanced Materials and Processes*, December 2006, pp. 41-43.
16. Boehlert, C.J., Tamirisakandala, S., and Miracle, D.B., "The Effect of Boron on the Elevated-Temperature Creep Behavior of Cast Ti-6Al-4V(wt.%)," *Proceedings of the 11th World Conference on Titanium*, 2007.
17. Atri, R.R., Ph.D. Thesis, University of Utah, Salt Lake City, UT, 2000.
18. Panda, K.B., and Ravichandran, K.S., "Titanium-Titanium Boride (Ti-TiB) Functionally Graded Materials Through Reaction Sintering: Synthesis, Microstructure, and Properties," *Metallurgical and Materials Transactions A*, Vol. 34A, pp.1993-2003, 2003.
19. German, R.M., *Powder Packing Characteristics*, MPIF, Princeton, NJ, p. 183, 1994.
20. Panda, K.B., and Ravichandran, K.S., "Synthesis of Ductile Titanium-Titanium Boride (Ti-TiB) Composites with a Beta-titanium Matrix: The Nature of TiB Formation and Composite Properties," *Metallurgical and Materials Transactions A*, Vol. 34A, pp. 1371-1385, 2003.
21. Saito, T., Takiyama, H., and Furuta, T., *Titanium '95 Science and Technology*, P.A. Blenkinsop, W.J. Evans and H.M. Flower, eds., The Institute of Materials, London, Vol. 3, pp. 2859-2866, 1996.
22. Godfrey, T.M.T., Goodwin, P.S., and Ward-Close, C.M., *Advanced Engineering Materials*, Vol. 2, pp. 85-92, 2000.
23. L.W. Byrd, M.P. Camden, and G.E. Maddux, "Random Amplitude Fatigue Life of Electroformed Nickel Micro-channel Heat Exchanger Coupons," *Shock and Vibration*, Vol. 5, No. 2, 1998, pp. 103-110
24. H.F. Wolfe, M.P. Camden, L.W. Byrd, D.B. Paul, L.W. Simmons, and R. Kim, "Development of Failure Criteria for Dynamic High Cycle Fatigue of Ceramic Matrix Composites," 39th SDM Conference, Westin Long Beach, Long Beach, CA., 20-23 April 1988.
25. Hill, M.R., and Lin, W.-Y., "Residual Stress Measurement in a Ceramic-Metallic Graded Material," *Journal of Engineering Materials and Technology*, Vol. 124, pp. 185-191, April 2002.

Appendix A. Sonic Fatigue Test Results for 85% TiB / 15% Ti

Specimen: 974-1.2

Material: 85% TiB / 15% Ti

Thickness: 0.126 in.

Target Acceleration: 4.45 g rms (0-pk)

Target Strain: 160 microstrain

Date	Time	Frequency (Hz)	Cycles	Amplitude (mils)	Acceleration (g)	Strain (µε)	Comments
				rms	rms		
9/12/2006	10:11:42 AM	60	60	8.4	2.96	112.3	Trial to find shaker parameters
9/12/2006	10:11:47 AM	301	1,565	8.3	2.96	113.5	
9/12/2006	10:11:52 AM	301	3,070	8.3	2.96	113.8	
9/12/2006	10:11:57 AM	301	4,575	8.3	2.96	115.0	
9/12/2006	10:12:03 AM	301	6,080	8.3	2.96	114.2	
9/12/2006	10:12:07 AM	301	7,585	8.3	2.96	115.0	
9/12/2006	10:12:12 AM	301	9,090	8.3	2.96	118.9	
9/12/2006	10:12:17 AM	301	10,595	8.3	2.96	118.4	
9/12/2006	10:12:22 AM	301	12,100	8.4	2.96	123.0	
9/12/2006	10:12:28 AM	301	13,605	8.5	2.96	122.7	
9/12/2006	10:12:32 AM	301	15,110	8.4	2.96	117.4	
9/12/2006	10:12:37 AM	301	16,615	8.4	2.96	118.2	
9/12/2006	10:12:42 AM	301	18,120	8.4	2.96	115.5	
9/12/2006	10:12:47 AM	301	19,625	8.4	2.96	115.8	
9/12/2006	10:12:53 AM	301	21,130	8.6	2.96	118.6	
9/12/2006	10:12:57 AM	301	22,635	8.7	2.96	117.7	

Specimen: 974-1.2

Date	Time	Frequency (Hz)	Cycles	Amplitude (mils)	Acceleration (g)	Strain (µε)	Comments
				rms	rms		
9/12/2006	10:15:21 AM	301	301	10.5	3.98	116.1	Trial to find shaker parameters
9/12/2006	10:15:27 AM	301	1,806	10.7	3.98	111.6	
9/12/2006	10:15:32 AM	301	3,311	10.6	3.98	111.2	
9/12/2006	10:15:37 AM	301	4,816	10.5	3.98	111.4	
9/12/2006	10:15:42 AM	301	6,321	10.6	3.98	109.9	
9/12/2006	10:15:46 AM	301	7,826	10.5	3.98	108.9	
9/12/2006	10:15:52 AM	301	9,331	10.6	3.98	108.8	
9/12/2006	10:15:57 AM	301	10,836	10.5	3.98	108.4	
9/12/2006	10:16:02 AM	301	12,341	10.5	3.98	112.2	
9/12/2006	10:16:07 AM	301	13,846	10.5	3.98	112.2	
9/12/2006	10:16:11 AM	301	15,351	10.5	3.98	110.7	continued on next page

Specimen: 974-1.2

Date	Time	Frequency (Hz)	Cycles	Amplitude (mils) rms)	Acceleration (g) rms)	Strain (µε)	Comments
9/12/2006	10:16:17 AM	301	16,856	10.4	3.99	114.0	continued from previous page
9/12/2006	10:16:22 AM	301	18,361	1.3	0.04	91.7	
9/12/2006	10:16:27 AM	60	18,661	1.3	0.04	92.0	
9/12/2006	10:16:32 AM	60	18,961	1.3	0.04	90.9	
9/12/2006	10:16:36 AM	60	19,261	1.3	0.04	90.6	
9/12/2006	10:16:42 AM	60	19,561	1.3	0.04	91.7	
9/12/2006	10:16:47 AM	60	19,861	1.3	0.04	93.6	

Specimen: 974-1.2

Date	Time	Frequency (Hz)	Cycles	Amplitude (mils) rms)	Acceleration (g) rms)	Strain (µε)	Comments
9/12/2006	10:27:21 AM	60	60	9.1	2.96	2311.3	Trial to find shaker parameters
9/12/2006	10:27:31 AM	301	3,070	9.1	2.96	2304.7	
9/12/2006	10:28:01 AM	60	8,495	1.4	0.04	1744.2	
9/12/2006	10:28:32 AM	60	10,295	1.4	0.04	1744.7	
9/12/2006	10:29:01 AM	301	17,700	1.4	0.04	15.6	
9/12/2006	10:30:01 AM	60	32,155	1.4	0.04	48.5	
9/12/2006	10:31:02 AM	60	35,180	1.4	0.14	3.3	
9/12/2006	10:32:01 AM	60	38,780	1.4	0.06	20.1	
9/12/2006	10:33:01 AM	60	41,850	12.6	0.06	4181.8	
9/12/2006	10:34:01 AM	60	44,870	1.4	0.06	4194.5	
9/12/2006	10:35:01 AM	60	48,205	1.4	0.06	60.2	
9/12/2006	10:36:02 AM	60	51,540	1.4	0.06	57.3	
9/12/2006	10:37:01 AM	60	55,140	1.4	0.06	57.3	
9/12/2006	10:38:01 AM	60	58,450	1.4	0.06	95.4	
9/12/2006	10:39:01 AM	2	61,180	1.4	0.06	1177.5	
9/12/2006	10:40:01 AM	60	64,495	1.4	0.06	68.8	
9/12/2006	10:41:02 AM	7	67,830	1.4	0.06	73.3	
9/12/2006	10:42:01 AM	60	71,430	1.4	0.06	99.2	
9/12/2006	10:43:01 AM	60	75,030	1.4	0.06	95.8	
9/12/2006	10:44:01 AM	60	78,075	1.5	0.06	49.9	
9/12/2006	10:45:01 AM	60	81,385	1.5	0.06	12733.8	
9/12/2006	10:46:01 AM	60	84,405	1.5	0.06	12766.3	
9/12/2006	10:47:01 AM	60	87,715	1.5	0.06	30607.3	
9/12/2006	10:48:01 AM	60	91,315	1.5	0.06	76.0	continued on next page

Specimen: 974-1.2

Date	Time	Frequency (Hz)	Cycles	Amplitude (mils) rms	Acceleration (g) rms	Strain (µε)	Comments
9/12/2006	10:49:02 AM	60	94,915	1.5	0.06	77.2	continued from previous page
9/12/2006	10:50:01 AM	2	97,065	1.5	0.06	77.1	
9/12/2006	10:51:01 AM	60	100,665	1.5	0.06	78.2	
9/12/2006	10:52:01 AM	60	104,565	1.5	0.06	75.8	
9/12/2006	10:53:01 AM	60	108,165	1.5	0.06	75.9	
9/12/2006	10:54:02 AM	60	111,765	1.5	0.06	76.9	
9/12/2006	10:55:01 AM	60	115,365	1.5	0.06	77.8	
9/12/2006	10:56:01 AM	60	118,965	1.5	0.06	63.2	

Specimen: 974-1.2

Date	Time	Frequency (Hz)	Cycles	Amplitude (mils) rms	Acceleration (g) rms	Strain (µε)	Comments
9/12/2006	10:59:42 AM	60	60	12.4	0.05	0.0	Trial to find shaker parameters
9/12/2006	11:00:03 AM	60	1,260	1.5	0.00	7.5	
9/12/2006	11:00:17 AM	3	1,875	12.5	0.00	10.4	
9/12/2006	11:00:32 AM	60	2,490	1.5	0.06	10.1	
9/12/2006	11:00:47 AM	60	3,390	1.5	0.06	7.0	
9/12/2006	11:01:02 AM	60	4,290	1.5	0.06	6.8	
9/12/2006	11:01:18 AM	60	5,190	1.5	0.06	6.8	
9/12/2006	11:01:32 AM	60	6,090	1.5	0.06	6.9	
9/12/2006	11:01:47 AM	500	11,390	1.5	0.23	6.9	
9/12/2006	11:02:02 AM	301	14,700	4.1	0.34	68.0	
9/12/2006	11:02:17 AM	302	19,225	3.8	0.35	62.4	
9/12/2006	11:02:32 AM	60	21,330	1.5	0.06	6.9	
9/12/2006	11:02:47 AM	60	22,230	1.5	0.06	6.8	
9/12/2006	11:03:02 AM	60	23,130	1.5	0.06	6.8	
9/12/2006	11:03:18 AM	60	24,030	1.5	0.06	6.8	
9/12/2006	11:03:22 AM	60	24,330	1.5	0.06	6.8	

Specimen: 974-1.2

Date	Time	Frequency (Hz)	Cycles	Amplitude (mils) rms	Acceleration (g) rms	Strain (µε)	Comments
9/12/2006	11:04:50 AM	60	60	6.6	0.80	113.3	Trial to find shaker parameters
9/12/2006	11:04:55 AM	301	1,565	6.6	0.80	113.5	
9/12/2006	11:05:00 AM	301	3,070	6.6	0.80	113.3	continued on next page

Specimen: 974-1.2

Date	Time	Frequency (Hz)	Cycles	Amplitude (mils	Acceleration (g	Strain ($\mu\epsilon$)	Comments
				rms)	rms)		
9/12/2006	11:05:06 AM	301	4,575	6.6	0.80	113.4	continued from previous page
9/12/2006	11:05:11 AM	301	6,080	4.1	0.35	68.7	
9/12/2006	11:05:15 AM	60	6,380	1.5	0.06	6.7	
9/12/2006	11:05:20 AM	60	6,680	1.5	0.06	6.7	
9/12/2006	11:05:25 AM	60	6,980	1.5	0.06	6.7	
9/12/2006	11:05:31 AM	60	7,280	1.5	0.06	6.8	
9/12/2006	11:05:36 AM	60	7,580	1.5	0.06	6.7	
9/12/2006	11:05:40 AM	60	7,880	1.5	0.06	6.8	
9/12/2006	11:05:45 AM	60	8,180	1.5	0.06	6.8	
9/12/2006	11:05:50 AM	60	8,480	1.5	0.06	6.8	
9/12/2006	11:05:56 AM	60	8,780	1.5	0.06	7.0	
9/12/2006	11:06:01 AM	60	9,080	1.5	0.06	6.9	
9/12/2006	11:06:05 AM	60	9,380	1.5	0.06	6.9	
9/12/2006	11:06:10 AM	60	9,680	1.5	0.06	6.9	
9/12/2006	11:06:15 AM	60	9,980	1.5	0.06	6.8	
9/12/2006	11:06:21 AM	60	10,280	1.5	0.06	6.9	
9/12/2006	11:06:26 AM	60	10,580	1.5	0.06	7.0	
9/12/2006	11:06:30 AM	60	10,880	1.5	0.06	7.0	
9/12/2006	11:06:35 AM	60	11,180	1.5	0.06	6.8	

Specimen: 974-1.2

Date	Time	Frequency (Hz)	Cycles	Amplitude (mils	Acceleration (g	Strain ($\mu\epsilon$)	Comments
				rms)	rms)		
9/12/2006	11:07:06 AM	60	60	7.1	1.13	120	Trial to find shaker parameters
9/12/2006	11:07:11 AM	301	1,565	7.2	1.13	120	
9/12/2006	11:07:16 AM	301	3,070	7.2	1.13	120	

Specimen: 974-1.2

Date	Time	Frequency (Hz)	Cycles	Amplitude (mils	Acceleration (g	Strain ($\mu\epsilon$)	Comments
				rms)	rms)		
9/12/2006	11:08:44 AM	301	301	8.0	2.0	131.8	Trial to find shaker parameters
9/12/2006	11:08:49 AM	301	1,806	8.0	2.0	132.0	
9/12/2006	11:08:54 AM	301	3,311	8.0	2.0	132.0	

Specimen: 974-1.2

Date	Time	Frequency (Hz)	Cycles	Amplitude (mils) rms)	Acceleration (g) rms)	Strain (µε)	Comments
9/12/2006	11:10:08 AM	301	301	8.5	2.66	139.1	Trial to find shaker parameters
9/12/2006	11:10:13 AM	301	1,806	8.6	2.66	139.0	

Specimen: 974-1.2

Date	Time	Frequency (Hz)	Cycles	Amplitude (mils) rms)	Acceleration (g) rms)	Strain (µε)	Comments
9/12/2006	11:11:25 AM	301	301	9.6	3.98	151.0	Trial to find shaker parameters
9/12/2006	11:11:31 AM	301	1,806	9.6	3.98	151.0	

Specimen: 974-1.2

Date	Time	Frequency (Hz)	Cycles	Amplitude (mils) rms)	Acceleration (g) rms)	Strain (µε)	Comments
9/12/2006	11:12:45 AM	301	301	10.2	4.74	156.2	Start of testing
9/12/2006	11:12:50 AM	301	1,806	10.4	4.98	158.1	
9/12/2006	11:18:40 AM	301	107,156	10.3	4.98	158.9	Strain gage failed
9/12/2006	11:24:41 AM	301	215,516	10.3	4.98	160.9	
9/12/2006	11:30:41 AM	301	323,876	10.4	4.98	160.2	
9/12/2006	11:36:41 AM	301	432,236	10.5	4.98	160.3	
9/12/2006	11:42:41 AM	301	540,596	10.4	4.98	160.2	
9/12/2006	11:43:56 AM	301	563,171	10.4	4.98	160.0	
9/12/2006	11:44:00 AM	301	564,676	10.4	4.98	592.5	
9/12/2006	11:50:00 AM	301	673,036	10.4	4.98		
9/12/2006	12:02:00 PM	301	889,756	10.4	4.98		
9/12/2006	12:14:00 PM	301	1,106,476	10.3	4.98		
9/12/2006	12:20:01 PM	301	1,214,836	10.3	4.98		continued on next page
9/12/2006	12:32:00 PM	301	1,431,556	10.3	4.98		
9/12/2006	12:44:01 PM	301	1,648,276	10.3	4.98		
9/12/2006	12:50:00 PM	301	1,756,636	10.3	4.98		
9/12/2006	1:06:01 PM	301	2,045,596	10.3	4.98		
9/12/2006	1:16:01 PM	301	2,226,196	10.4	4.98		
9/12/2006	1:36:01 PM	301	2,587,396	10.6	4.98		
9/12/2006	2:06:01 PM	301	3,129,196	10.7	4.98		
9/12/2006	2:30:00 PM	301	3,562,636	10.2	4.98		
9/12/2006	3:00:00 PM	301	4,104,436	10.3	4.98		

Specimen: 974-1.2

Date	Time	Frequency (Hz)	Cycles	Amplitude (mils) rms)	Acceleration (g) rms)	Strain (µε)	Comments
9/12/2006	4:00:01 PM	301	5,188,036	9.6	4.98		continued from previous page
9/12/2006	5:00:00 PM	301	6,271,636	11.2	4.98		
9/12/2006	6:00:01 PM	301	7,355,236	11.2	4.98		
9/12/2006	7:00:00 PM	301	8,438,836	11.3	4.98		
9/12/2006	8:00:01 PM	301	9,522,436	11.5	4.98		
9/12/2006	9:00:01 PM	301	10,606,036	11.6	4.98		
9/12/2006	10:00:01 PM	301	11,689,636	11.6	4.98		
9/12/2006	11:00:01 PM	301	12,773,236	11.3	4.98		
9/13/2006	12:00:00 AM	301	13,856,836	11.5	4.98		
9/13/2006	1:00:01 AM	301	14,940,436	11.3	4.98		
9/13/2006	2:00:00 AM	301	16,024,036	11.3	4.98		
9/13/2006	3:00:01 AM	301	17,107,636	11.6	4.98		
9/13/2006	4:00:01 AM	301	18,191,236	11.6	4.98		
9/13/2006	5:00:00 AM	301	19,274,836	11.6	4.98		
9/13/2006	6:00:01 AM	301	20,358,436	11.6	4.98		
9/13/2006	7:00:00 AM	301	21,442,036	11.6	4.98		
9/13/2006	8:00:01 AM	301	22,525,636	11.5	4.98		
9/13/2006	9:00:01 AM	301	23,609,236	10.9	4.98		
9/13/2006	10:00:00 AM	301	24,692,836	10.7	4.98		
9/13/2006	11:00:00 AM	301	25,776,436	10.7	4.98		
9/13/2006	12:00:01 PM	301	26,860,036	10.4	4.98		
9/13/2006	2:00:01 PM	301	29,027,236	10.5	4.98		
9/13/2006	4:00:00 PM	301	31,194,436	10.0	4.98		
9/13/2006	6:00:01 PM	301	33,361,636	10.9	4.98		
9/13/2006	8:00:01 PM	301	35,528,836	11.1	4.98		
9/13/2006	10:00:01 PM	301	37,696,036	11.4	4.98		
9/14/2006	12:00:01 AM	301	39,863,236	11.7	4.98		
9/14/2006	2:00:00 AM	301	42,030,436	11.9	4.98		
9/14/2006	4:00:00 AM	301	44,197,636	12.0	4.98		
9/14/2006	6:00:00 AM	301	46,364,836	12.1	4.98		
9/14/2006	8:00:01 AM	301	48,532,036	10.5	4.98		
9/14/2006	10:00:01 AM	301	50,699,236	10.6	4.98		
9/14/2006	12:00:01 PM	301	52,866,436	10.8	4.98		
9/14/2006	2:00:01 PM	301	55,033,636	10.8	4.98		
9/14/2006	4:00:00 PM	301	57,200,836	10.8	4.98		continued on next page

Specimen: 974-1.2

Date	Time	Frequency (Hz)	Cycles	Amplitude (mils) rms)	Acceleration (g) rms)	Strain ($\mu\epsilon$)	Comments
9/14/2006	6:00:01 PM	301	59,368,036	10.9	4.98		continued from previous page
9/14/2006	8:00:01 PM	301	61,535,236	11.0	4.98		
9/14/2006	10:00:01 PM	301	63,702,436	11.1	4.98		
9/15/2006	12:00:01 AM	301	65,869,636	11.0	4.98		
9/15/2006	2:00:00 AM	301	68,036,832	10.9	4.98		
9/15/2006	4:00:00 AM	301	70,204,032	10.9	4.98		
9/15/2006	6:00:01 AM	301	72,371,232	10.9	4.98		
9/15/2006	8:00:01 AM	301	74,538,432	10.7	4.98		
9/15/2006	10:00:01 AM	301	76,705,632	10.7	4.98		
9/15/2006	12:00:01 PM	301	78,872,832	10.9	4.98		
9/15/2006	2:00:00 PM	301	81,040,032	10.8	4.98		
9/15/2006	4:00:01 PM	301	83,207,232	10.8	4.98		
9/15/2006	6:00:01 PM	301	85,374,432	10.9	4.98		
9/15/2006	8:00:01 PM	301	87,541,632	11.0	4.98		
9/15/2006	10:00:01 PM	301	89,708,832	11.1	4.98		
9/16/2006	12:00:00 AM	301	91,876,032	10.7	4.98		
9/16/2006	2:00:00 AM	301	94,043,232	10.6	4.98		
9/16/2006	4:00:01 AM	301	96,210,432	10.5	4.98		
9/16/2006	6:00:01 AM	301	98,377,632	10.4	4.98		
9/16/2006	8:00:01 AM	301	100,544,832	10.3	4.98		
9/16/2006	10:00:01 AM	301	102,712,032	10.4	4.98		
9/16/2006	12:00:00 PM	301	104,879,232	10.3	4.98		
9/16/2006	2:00:01 PM	301	107,046,432	10.5	4.98		
9/16/2006	4:00:00 PM	301	109,213,632	10.1	4.98		
9/16/2006	6:00:00 PM	301	111,380,832	9.9	4.98		
9/16/2006	8:00:01 PM	301	113,548,032	9.9	4.98		
9/16/2006	10:00:01 PM	301	115,715,232	9.7	4.98		
9/17/2006	12:00:01 AM	301	117,882,432	9.6	4.98		
9/17/2006	2:00:01 AM	301	120,049,632	9.6	4.98		
9/17/2006	4:00:01 AM	301	122,216,832	9.6	4.98		
9/17/2006	6:00:00 AM	301	124,384,032	9.6	4.98		
9/17/2006	8:00:00 AM	301	126,551,232	9.6	4.98		
9/17/2006	10:00:01 AM	301	128,718,432	9.5	4.98		
9/17/2006	12:00:01 PM	301	130,885,632	9.5	4.98		
9/17/2006	2:00:01 PM	301	133,052,832	9.5	4.98		continued on next page

Specimen: 974-1.2

Date	Time	Frequency (Hz)	Cycles	Amplitude (mils rms)	Acceleration (g rms)	Strain (µε)	Comments
9/17/2006	4:00:01 PM	301	135,220,032	9.4	4.98		continued from previous page
9/17/2006	6:00:01 PM	301	137,387,232	9.3	4.98		
9/17/2006	8:00:01 PM	301	139,554,432	9.6	4.98		
9/17/2006	9:57:16 PM	301	141,671,968	9.6	4.98		Test declared a run-out

Specimen: 974-1.3

Material: 85% TiB / 15% Ti

Thickness: 0.1275 in.

Target Acceleration: 23.4 g rms (0-pk)

Target Strain: 500 microstrain

Date	Time	Frequency (Hz)	Cycles	Amplitude (mils rms)	Acceleration (g rms)	Strain (µε)	Comments
9/21/2006	3:08:10 PM	14	14	83.0	15.52	245.8	Trial of shaker parameters to achieve desired strain.
9/21/2006	3:08:15 PM	306	1,544	80.7	15.51	246.8	
9/21/2006	3:08:20 PM	306	3,074	81.9	15.51	247.2	
9/21/2006	3:08:25 PM	306	4,604	79.8	11.94	225.2	

Specimen: 974-1.3

Date	Time	Frequency (Hz)	Cycles	Amplitude (mils rms)	Acceleration (g rms)	Strain (µε)	Comments
9/21/2006	3:12:22 PM	306	306	63.1	32.69	328.4	Trial of shaker parameters to achieve desired strain.
9/21/2006	3:12:27 PM	306	1,836	62.3	33.21	333.7	
9/21/2006	3:12:32 PM	306	3,366	62.6	33.22	334.3	
9/21/2006	3:12:37 PM	306	4,896	62.3	33.23	334.6	

Specimen: 974-1.3

Date	Time	Frequency (Hz)	Cycles	Amplitude (mils rms)	Acceleration (g rms)	Strain (µε)	Comments
9/21/2006	3:32:57 PM	305	305	65.5	36.71	343.9	Trial of shaker parameters to achieve desired strain.
9/21/2006	3:33:02 PM	302	1,815	1.1	0.21	3.0	
9/21/2006	3:33:07 PM	16	1,895	1.0	0.19	3.0	
9/21/2006	3:33:12 PM	120	2,495	1.0	0.20	3.3	
9/21/2006	3:33:18 PM	15	2,570	1.0	0.20	3.1	
9/21/2006	3:33:22 PM	180	3,470	1.0	0.20	3.3	
9/21/2006	3:33:27 PM	120	4,070	1.0	0.20	3.2	
9/21/2006	3:33:32 PM	357	5,855	1.0	0.21	3.2	
9/21/2006	3:33:37 PM	45	6,080	1.0	0.20	3.1	continued on next page

Specimen: 974-1.3

Date	Time	Frequency (Hz)	Cycles	Amplitude (mils	Acceleration (g	Strain (µε)	Comments
				rms)	rms)		
9/21/2006	3:33:43 PM	180	6,980	1.0	0.20	3.1	continued from previous page
9/21/2006	3:33:47 PM	302	8,490	1.0	0.20	3.2	
9/21/2006	3:33:52 PM	300	9,990	1.0	0.21	3.3	
9/21/2006	3:33:57 PM	300	11,490	1.0	0.20	3.2	
9/21/2006	3:34:02 PM	300	12,990	1.0	0.21	3.2	
9/21/2006	3:34:08 PM	300	14,490	1.0	0.20	3.1	
9/21/2006	3:34:12 PM	300	15,990	1.1	0.20	3.1	
9/21/2006	3:34:17 PM	300	17,490	1.0	0.21	3.0	
9/21/2006	3:34:22 PM	300	18,990	1.0	0.20	2.9	
9/21/2006	3:34:27 PM	300	20,490	1.1	0.21	3.2	
9/21/2006	3:34:32 PM	60	20,790	1.0	0.21	3.1	
9/21/2006	3:34:37 PM	500	23,290	1.1	0.25	3.2	
9/21/2006	3:34:42 PM	500	25,790	1.0	0.40	3.2	

Specimen: 974-1.3

Date	Time	Frequency (Hz)	Cycles	Amplitude (mils	Acceleration (g	Strain (µε)	Comments
				rms)	rms)		
9/21/2006	3:34:58 PM	500	500	49.1	58.77	437.6	Trial of shaker parameters to achieve desired strain.
9/21/2006	3:35:03 PM	918	5,090	45.8	66.27	471.1	
9/21/2006	3:35:09 PM	919	9,685	44.9	66.31	473.2	
9/21/2006	3:35:14 PM	305	11,210	2.4	0.21	5.7	
9/21/2006	3:35:19 PM	240	12,410	1.0	0.20	3.4	

Specimen: 974-1.3

Date	Time	Frequency (Hz)	Cycles	Amplitude (mils	Acceleration (g	Strain (µε)	Comments
				rms)	rms)		
9/21/2006	3:35:23 PM	300	13,910	1.0	0.20	3.1	Trial of shaker parameters to achieve desired strain.
9/21/2006	3:35:28 PM	60	14,210	1.1	0.20	3.0	
9/21/2006	3:35:34 PM	300	15,710	1.0	0.20	3.2	
9/21/2006	3:35:39 PM	300	17,210	1.1	0.20	3.2	
9/21/2006	3:35:44 PM	300	18,710	1.1	0.20	3.1	
9/21/2006	3:35:48 PM	300	20,210	1.1	0.21	3.0	
9/21/2006	3:35:53 PM	300	21,710	1.1	0.20	3.1	
9/21/2006	3:35:59 PM	300	23,210	1.1	0.20	3.1	
9/21/2006	3:36:04 PM	300	24,710	1.1	0.20	3.1	continued on next page

Specimen: 974-1.3

Date	Time	Frequency (Hz)	Cycles	Amplitude (mils rms)	Acceleration (g rms)	Strain (µε)	Comments
9/21/2006	3:36:09 PM	300	26,210	1.1	0.21	3.2	continued from previous page
9/21/2006	3:36:13 PM	300	27,710	1.1	0.21	3.1	
9/21/2006	3:36:18 PM	300	29,210	1.1	0.20	2.9	
9/21/2006	3:36:24 PM	300	30,710	1.1	0.20	3.2	

Specimen: 974-1.3

Date	Time	Frequency (Hz)	Cycles	Amplitude (mils rms)	Acceleration (g rms)	Strain (µε)	Comments
9/22/2006	8:17:10 AM	300	300	7.4	66.29	480.3	Trial of shaker parameters to achieve desired strain.
9/22/2006	8:17:16 AM	305	1,825	5.3	66.30	464.7	
9/22/2006	8:17:21 AM	301	3,330	17.0	0.17	4.2	
9/22/2006	8:17:26 AM	300	4,830	1.3	0.17	3.1	
9/22/2006	8:17:31 AM	300	6,330	1.3	0.18	2.9	
9/22/2006	8:17:36 AM	300	7,830	1.3	0.16	3.0	
9/22/2006	8:17:41 AM	300	9,330	1.3	0.16	2.8	
9/22/2006	8:17:46 AM	300	10,830	1.3	0.16	2.9	
9/22/2006	8:17:51 AM	300	12,330	0.9	0.17	2.7	
9/22/2006	8:17:56 AM	300	13,830	0.9	0.17	2.9	

Specimen: 974-1.3

Date	Time	Frequency (Hz)	Cycles	Amplitude (mils rms)	Acceleration (g rms)	Strain (µε)	Comments
9/22/2006	8:18:58 AM	300	300	43.8	66.18	493.7	Trial of shaker parameters to achieve desired strain.
9/22/2006	8:19:08 AM	300	3,300	0.9	0.19	2.8	
9/22/2006	8:19:18 AM	300	6,300	1.0	0.19	2.8	
9/22/2006	8:19:28 AM	300	9,300	0.9	0.20	2.7	
9/22/2006	8:19:38 AM	300	12,300	0.9	0.20	3.0	
9/22/2006	8:19:48 AM	300	15,300	1.0	0.20	2.9	
9/22/2006	8:19:58 AM	300	18,300	0.9	0.21	3.1	
9/22/2006	8:20:09 AM	300	21,300	0.9	0.20	2.8	
9/22/2006	8:20:18 AM	300	24,300	0.9	0.19	2.8	
9/22/2006	8:20:28 AM	300	27,300	0.9	0.20	2.6	
9/22/2006	8:20:38 AM	300	30,300	0.9	0.20	2.9	
9/22/2006	8:20:48 AM	300	33,300	0.9	0.24	2.7	

Specimen: 974-1.3

Date	Time	Frequency (Hz)	Cycles	Amplitude (mils rms)	Acceleration (g rms)	Strain (µε)	Comments
9/22/2006	8:21:13 AM	500	500	46.4	66.12	485.6	Start of test
9/22/2006	8:21:23 AM	932	9,820	35.5	66.40	547.7	Specimen failed during ramp-up to test conditions.

Specimen: 974-1.4

Material: 85% TiB / 15% Ti

Thickness: ??? in.

Target Acceleration: 40g rms (0-pk)

Target Strain: 600 microstrain

Date	Time	Frequency (Hz)	Cycles	Amplitude (mils rms)	Acceleration (g rms)	Strain (µε)	Comments
9/22/2006	8:58:08 AM	313	313	1.1	0.27	3.7	Trial

Specimen: 974-1.4

Date	Time	Frequency (Hz)	Cycles	Amplitude (mils rms)	Acceleration (g rms)	Strain (µε)	Comments
9/22/2006	9:03:46 AM	313	313	57.9	38.91	394.1	Trial of shaker parameters
9/22/2006	9:03:56 AM	926	9,573	54.7	39.84	416.1	to achieve desired strain.
9/22/2006	9:04:07 AM	926	18,833	55.8	39.83	422.1	
9/22/2006	9:04:16 AM	926	28,093	71.2	23.37	331.6	
9/22/2006	9:04:27 AM	300	31,093	1.2	0.23	4.2	
9/22/2006	9:04:36 AM	300	34,093	1.2	0.22	4.1	

Specimen: 974-1.4

Date	Time	Frequency (Hz)	Cycles	Amplitude (mils rms)	Acceleration (g rms)	Strain (µε)	Comments
9/22/2006	9:05:54 AM	300	300	47.4	28.45	371.3	Trial of shaker parameters
9/22/2006	9:06:04 AM	939	9,690	33.5	39.81	479.2	to achieve desired strain.
9/22/2006	9:06:15 AM	938	19,070	30.1	39.81	492.3	
9/22/2006	9:06:24 AM	940	28,470	30.9	39.82	511.0	
9/22/2006	9:06:35 AM	953	38,000	36.1	1.34	194.5	

Specimen: 974-1.4

Date	Time	Frequency (Hz)	Cycles	Amplitude (mils rms)	Acceleration (g rms)	Strain (µε)	Comments
9/22/2006	9:21:35 AM	300	300	82.8	14.98	234.1	Trial of shaker parameters
9/22/2006	9:21:46 AM	900	9,300	60.2	39.82	356.4	to achieve desired strain.
9/22/2006	9:21:56 AM	900	18,300	59.0	39.83	355.3	continued on next page

Specimen: 974-1.4

Date	Time	Frequency (Hz)	Cycles	Amplitude (mils) rms	Acceleration (g) rms	Strain (µε)	Comments
9/22/2006	9:22:06 AM	900	27,300	67.7	32.88	318.0	continued from previous page
9/22/2006	9:22:16 AM	300	30,300	1.2	0.23	4.2	
9/22/2006	9:22:25 AM	300	33,300	1.2	0.22	3.9	

Specimen: 974-1.4

Date	Time	Frequency (Hz)	Cycles	Amplitude (mils) rms	Acceleration (g) rms	Strain (µε)	Comments
9/22/2006	9:32:02 AM	60	60	84.1	14.61	218.4	Trial of shaker parameters to achieve desired strain.
9/22/2006	9:32:12 AM	895	9,010	63.8	39.82	341.2	
9/22/2006	9:32:23 AM	895	17,960	74.8	26.90	267.0	
9/22/2006	9:32:32 AM	300	20,960	1.2	0.22	3.9	
9/22/2006	9:32:43 AM	300	23,960	1.2	0.22	3.7	
9/22/2006	9:32:52 AM	300	26,960	1.2	0.23	3.6	
9/22/2006	9:33:02 AM	300	29,960	1.2	0.23	3.7	

Specimen: 974-1.4

Date	Time	Frequency (Hz)	Cycles	Amplitude (mils) rms	Acceleration (g) rms	Strain (µε)	Comments
9/22/2006	9:39:05 AM	300	300	63.8	39.81	339.6	Trial of shaker parameters to achieve desired strain.
9/22/2006	9:39:16 AM	895	9,250	64.6	39.80	339.5	
9/22/2006	9:39:26 AM	300	12,250	1.2	0.20	3.8	
9/22/2006	9:39:36 AM	300	15,250	1.2	0.20	4.0	

Specimen: 974-1.4

Date	Time	Frequency (Hz)	Cycles	Amplitude (mils) rms	Acceleration (g) rms	Strain (µε)	Comments
9/22/2006	9:41:37 AM	300	300	40.1	3.32	144.1	Trial of shaker parameters to achieve desired strain.
9/22/2006	9:41:47 AM	300	3,300	74.6	3.33	134.7	
9/22/2006	9:41:57 AM	300	6,300	74.5	3.32	134.4	
9/22/2006	9:42:07 AM	300	9,300	74.4	3.32	134.1	
9/22/2006	9:43:07 AM	300	27,300	72.6	3.33	130.0	
9/22/2006	9:44:07 AM	59	38,080	39.9	0.19	3.8	
9/22/2006	9:45:07 AM	60	40,160	39.7	0.20	3.8	
9/22/2006	9:46:08 AM	4	41,530	16.9	0.19	3.8	
9/22/2006	9:47:07 AM	5	41,750	9.7	0.20	4.1	

continued on next page

Specimen: 974-1.4

Date	Time	Frequency (Hz)	Cycles	Amplitude (mils rms)	Acceleration (g rms)	Strain (µε)	Comments
9/22/2006	9:48:07 AM	6	41,960	2.5	0.20	4.1	continued from previous page
9/22/2006	9:48:17 AM	6	42,020	1.6	0.19	3.7	

Specimen: 974-1.4

Date	Time	Frequency (Hz)	Cycles	Amplitude (mils rms)	Acceleration (g rms)	Strain (µε)	Comments
9/22/2006	9:50:40 AM	298	298	77.8	3.17	86.6	Trial of shaker parameters to achieve desired strain.
9/22/2006	9:50:51 AM	298	3,278	79.3	3.33	92.1	

Specimen: 974-1.4

Date	Time	Frequency (Hz)	Cycles	Amplitude (mils rms)	Acceleration (g rms)	Strain (µε)	Comments
9/22/2006	9:52:14 AM	298	298	30.0	39.79	340.3	Trial of shaker parameters to achieve desired strain.
9/22/2006	9:52:24 AM	300	3,298	34.5	39.83	344.2	
9/22/2006	9:52:34 AM	285	6,148	58.2	39.82	244.6	
9/22/2006	9:52:44 AM	270	8,848	64.5	39.84	179.1	
9/22/2006	9:52:54 AM	1269	21,538	66.9	39.81	132.8	
9/22/2006	9:53:04 AM	60	22,138	1.5	0.22	3.9	

Specimen: 974-1.4

Date	Time	Frequency (Hz)	Cycles	Amplitude (mils rms)	Acceleration (g rms)	Strain (µε)	Comments
9/22/2006	10:03:25 AM	60	60	1.3	0.50	4.3	Start test
9/22/2006	10:03:36 AM	301	3,070	33.9	24.95	291.3	
9/22/2006	10:03:46 AM	301	6,080	45.8	39.82	363.2	
9/22/2006	10:03:56 AM	301	9,090	45.9	39.84	363.7	
9/22/2006	10:04:06 AM	301	12,100	45.8	39.82	362.7	
9/22/2006	10:04:23 AM	301	15,110	45.8	39.84	362.4	
9/22/2006	10:04:26 AM	301	18,120	45.8	39.81	362.4	
9/22/2006	10:04:36 AM	301	21,130	45.9	39.82	2859.6	
9/22/2006	10:04:46 AM	301	24,140	46.1	39.83	13.3	
9/22/2006	10:04:56 AM	301	27,150	46.2	39.84	10.6	
9/22/2006	10:05:06 AM	301	30,160	46.4	39.84	10.3	strain gage failed?
9/22/2006	10:10:06 AM	301	120,460	47.4	39.84		
9/22/2006	10:15:06 AM	301	210,760	48.0	39.84		

continued on next page

Specimen: 974-1.4

Date	Time	Frequency (Hz)	Cycles	Amplitude (mils) rms	Acceleration (g) rms	Strain (µε)	Comments
9/22/2006	10:20:06 AM	301	301,060	47.4	39.84		continued from previous page
9/22/2006	10:25:06 AM	301	391,360	47.30	39.83		
9/22/2006	10:30:06 AM	301	481,660	48.10	39.84		
9/22/2006	10:35:06 AM	301	571,960	48.04	39.84		
9/22/2006	10:39:06 AM	301	644,200	45.11	39.82		
9/22/2006	10:39:16 AM	301	647,210	44.94	39.86		
9/22/2006	10:39:26 AM	311	650,320	1.40	0.19		

Specimen: 974-1.4

Date	Time	Frequency (Hz)	Cycles	Amplitude (mils) rms	Acceleration (g) rms	Strain (µε)	Comments
9/22/2006	10:47:58 AM	16	16	43.5	39.78		Restart test
9/22/2006	10:48:08 AM	301	3,026	43.4	39.82		
9/22/2006	10:48:19 AM	301	6,036	43.3	39.83		
9/22/2006	10:48:28 AM	301	9,046	43.2	39.84		
9/22/2006	10:48:38 AM	301	12,056	42.8	39.84		
9/22/2006	10:50:08 AM	301	39,146	43.0	39.82		
9/22/2006	10:51:08 AM	301	57,206	42.6	39.83		
9/22/2006	10:52:09 AM	301	75,266	42.9	39.82		
9/22/2006	10:53:08 AM	301	93,326	42.5	39.85		
9/22/2006	10:54:08 AM	301	111,386	42.20	39.84		
9/22/2006	10:55:08 AM	301	129,446	42.00	39.83		
9/22/2006	10:56:08 AM	301	147,506	41.70	39.84		
9/22/2006	10:57:09 AM	301	165,566	41.62	39.84		
9/22/2006	10:58:08 AM	301	183,626	41.51	39.84		
9/22/2006	10:59:08 AM	301	201,686	41.48	39.84		
9/22/2006	11:00:09 AM	301	219,746	41.52	39.84		
9/22/2006	11:01:08 AM	301	237,806	41.39	39.84		
9/22/2006	11:02:09 AM	301	255,866	41.35	39.87		
9/22/2006	11:03:08 AM	301	273,926	41.28	39.82		
9/22/2006	11:04:08 AM	301	291,986	41.32	39.83		
9/22/2006	11:05:08 AM	301	310,046	41.22	39.84		
9/22/2006	11:06:08 AM	301	328,106	41.3	39.83		
9/22/2006	11:07:08 AM	301	346,166	41.3	39.83		
9/22/2006	11:07:19 AM	301	349,176	41.3	39.86		continued on next page

Specimen: 974-1.4

Date	Time	Frequency (Hz)	Cycles	Amplitude (mils rms)	Acceleration (g rms)	Strain ($\mu\epsilon$)	Comments
9/22/2006	11:07:28 AM	301	352,186	41.3	39.83		continued from previous page

Specimen: 974-1.4

Date	Time	Frequency (Hz)	Cycles	Amplitude (mils rms)	Acceleration (g rms)	Strain ($\mu\epsilon$)	Comments
9/22/2006	11:12:16 AM	514	514	20.2	13.08		Restart test
9/22/2006	11:12:26 AM	301	3,524	41.1	39.82		
9/22/2006	11:12:40 AM	301	6,534	41.1	39.80		
9/22/2006	11:12:47 AM	301	9,544	41.2	39.83		
9/22/2006	11:12:56 AM	301	12,554	41.2	39.84		
9/22/2006	11:13:07 AM	301	15,564	41.2	39.82		
9/22/2006	11:14:06 AM	301	33,624	41.2	39.82		
9/22/2006	11:15:07 AM	301	51,684	41.6	39.83		
9/22/2006	11:16:07 AM	301	69,744	41.4	39.84		
9/22/2006	11:17:06 AM	301	87,804	41.3	39.83		
9/22/2006	11:18:07 AM	301	105,864	41.2	39.83		
9/22/2006	11:19:06 AM	301	123,924	41.3	39.83		
9/22/2006	11:20:07 AM	301	141,984	41.3	39.82		
9/22/2006	11:21:07 AM	301	160,044	41.3	39.84		
9/22/2006	11:22:06 AM	301	178,104	41.4	39.82		
9/22/2006	11:23:07 AM	301	196,164	41.4	39.80		
9/22/2006	11:24:06 AM	301	214,224	41.3	39.83		
9/22/2006	11:25:06 AM	301	232,284	41.4	39.81		
9/22/2006	11:26:07 AM	301	250,344	41.4	39.85		
9/22/2006	11:27:06 AM	301	268,404	41.4	39.82		
9/22/2006	11:28:07 AM	301	286,464	41.4	39.85		
9/22/2006	11:28:16 AM	301	289,474	41.5	39.83		
9/22/2006	11:28:26 AM	301	292,484	41.4	39.84		
9/22/2006	11:28:37 AM	301	295,494	17.7	15.47		

Specimen: 974-1.4

Date	Time	Frequency (Hz)	Cycles	Amplitude (mils rms)	Acceleration (g rms)	Strain ($\mu\epsilon$)	Comments
9/22/2006	11:36:27 AM	16	16	41.4	39.78		Restart
9/22/2006	11:36:38 AM	301	3,026	41.4	39.80		continued on next page

Specimen: 974-1.4

Date	Time	Frequency (Hz)	Cycles	Amplitude (mils) rms	Acceleration (g) rms	Strain (µε)	Comments
9/22/2006	11:36:48 AM	301	6,036	41.3	39.82		continued from previous page
9/22/2006	11:36:57 AM	301	9,046	41.3	39.82		
9/22/2006	11:37:08 AM	301	12,056	41.3	39.81		
9/22/2006	11:38:07 AM	301	30,116	41.3	39.83		
9/22/2006	11:39:08 AM	301	48,176	41.3	39.84		
9/22/2006	11:40:08 AM	301	66,236	41.3	39.82		
9/22/2006	11:41:07 AM	301	84,296	41.3	39.84		
9/22/2006	11:42:08 AM	301	102,356	41.3	39.81		
9/22/2006	11:43:07 AM	301	120,416	41.3	39.84		
9/22/2006	11:44:08 AM	301	138,476	41.4	39.84		
9/22/2006	11:45:08 AM	301	156,536	41.3	39.85		
9/22/2006	11:46:07 AM	301	174,596	41.3	39.82		
9/22/2006	11:47:08 AM	301	192,656	41.3	39.84		
9/22/2006	11:48:08 AM	301	210,716	41.4	39.82		
9/22/2006	11:49:08 AM	301	228,776	41.4	39.84		
9/22/2006	11:50:08 AM	301	246,836	41.4	39.82		
9/22/2006	11:51:07 AM	301	264,896	41.3	39.84		
9/22/2006	11:52:08 AM	301	282,956	41.4	39.82		
9/22/2006	11:53:08 AM	301	301,016	41.4	39.84		
9/22/2006	11:54:07 AM	301	319,076	41.5	39.83		

Specimen: 974-1.4

Date	Time	Frequency (Hz)	Cycles	Amplitude (mils) rms	Acceleration (g) rms	Strain (µε)	Comments
9/22/2006	12:37:11 PM	904	904	80.4	27.07		Restart

Specimen: 974-1.4

Date	Time	Frequency (Hz)	Total Cycles	Amplitude (mils) rms	Acceleration (g) rms	Strain (µε)	Comments
9/22/2006	12:37:51 PM	904	904	67.7	39.85		Restart
9/22/2006	12:38:02 PM	904	9,944	67.8	39.83		

Specimen: 974-1.4

Date	Time	Frequency (Hz)	Cycles	Amplitude (mils rms)	Acceleration (g rms)	Strain ($\mu\epsilon$)	Comments
9/22/2006	12:45:31 PM	15	15	24.3	18.14		Restart
9/22/2006	12:45:41 PM	301	3,025	41.8	39.82		continued on next page

Specimen: 974-1.4

Date	Time	Frequency (Hz)	Cycles	Amplitude (mils rms)	Acceleration (g rms)	Strain ($\mu\epsilon$)	Comments
9/22/2006	12:45:52 PM	301	6,035	41.8	39.82		continued from previous page
9/22/2006	12:46:01 PM	301	9,045	41.8	39.83		
9/22/2006	12:47:02 PM	301	27,105	41.8	39.84		
9/22/2006	12:48:01 PM	301	45,165	42.0	39.83		
9/22/2006	12:49:01 PM	301	63,225	41.8	39.84		
9/22/2006	12:50:02 PM	301	81,285	41.3	39.83		
9/22/2006	12:51:01 PM	301	99,345	41.1	39.83		
9/22/2006	12:52:02 PM	301	117,405	41.5	39.83		
9/22/2006	12:53:02 PM	301	135,465	41.0	39.85		
9/22/2006	12:54:01 PM	301	153,525	41.0	39.83		
9/22/2006	12:55:02 PM	301	171,585	41.0	39.83		
9/22/2006	12:56:01 PM	301	189,645	40.9	39.84		
9/22/2006	12:57:02 PM	301	207,705	40.8	39.84		
9/22/2006	12:58:02 PM	301	225,765	40.7	39.82		
9/22/2006	12:59:01 PM	301	243,825	40.7	39.83		
9/22/2006	1:00:02 PM	301	261,885	41.0	39.83		
9/22/2006	1:01:01 PM	301	279,945	40.8	39.84		
9/22/2006	1:02:02 PM	301	298,005	41.7	39.84		
9/22/2006	1:03:02 PM	301	316,065	41.0	39.84		
9/22/2006	1:04:01 PM	301	334,125	41.7	39.84		
9/22/2006	1:05:02 PM	301	352,185	41.6	39.83		
9/22/2006	1:06:01 PM	301	370,245	40.5	39.83		
9/22/2006	1:07:01 PM	301	388,305	40.6	39.83		
9/22/2006	1:08:02 PM	301	406,365	42.2	39.83		
9/22/2006	1:09:01 PM	61	410,695	1.5	0.23		
9/22/2006	1:09:12 PM	21	410,905	1.5	0.23		
9/22/2006	1:09:21 PM	16	411,065	1.5	0.22		Ran sine sweep to check 1st natural frequency.

Specimen: 974-1.4

Date	Time	Frequency (Hz)	Cycles	Amplitude (mils) rms	Acceleration (g) rms	Strain ($\mu\epsilon$)	Comments
9/25/2006	1:11:50 PM	60	60	41.5	39.74	Restart	
9/25/2006	1:12:00 PM	309	3,150	43.0	39.81		
9/25/2006	1:13:01 PM	309	21,690	44.0	39.84		
9/25/2006	1:14:01 PM	309	40,230	45.6	39.85		
9/25/2006	1:15:00 PM	309	58,770	43.7	39.84		
9/25/2006	1:16:01 PM	309	77,310	44.4	39.84		
9/25/2006	1:17:00 PM	309	95,850	44.7	39.85		
9/25/2006	1:18:01 PM	309	114,390	43.7	39.85		
9/25/2006	1:19:01 PM	309	132,930	44.2	39.84		
9/25/2006	1:20:00 PM	309	151,470	43.6	39.85		
9/25/2006	1:21:01 PM	309	170,010	43.5	39.83		
9/25/2006	1:22:00 PM	309	188,550	43.6	39.82		
9/25/2006	1:23:00 PM	309	207,090	43.5	39.85		
9/25/2006	1:24:01 PM	309	225,630	43.2	39.85		
9/25/2006	1:25:00 PM	309	244,170	43.0	39.84		
9/25/2006	1:26:01 PM	309	262,710	43.3	39.83		
9/25/2006	1:27:00 PM	309	281,250	43.0	39.85		
9/25/2006	1:28:00 PM	309	299,790	43.0	39.83		
9/25/2006	1:29:01 PM	309	318,330	42.4	39.84		
9/25/2006	1:30:00 PM	309	336,870	42.9	39.84		
9/25/2006	1:31:01 PM	309	355,410	42.9	39.84		
9/25/2006	1:32:01 PM	309	373,950	43.0	39.83		
9/25/2006	1:33:00 PM	309	392,490	43.3	39.83		
9/25/2006	1:34:01 PM	309	411,030	43.1	39.84		
9/25/2006	1:35:00 PM	309	429,570	43.9	39.86		
9/25/2006	1:36:01 PM	309	448,110	43.2	39.84		
9/25/2006	1:37:01 PM	309	466,650	43.0	39.85		
9/25/2006	1:38:00 PM	309	485,190	43.4	39.83		
9/25/2006	1:39:01 PM	309	503,730	42.8	39.83		
9/25/2006	1:40:00 PM	309	522,270	42.0	39.86		
9/25/2006	1:40:30 PM	309	531,540	42.4	39.61		Test interrupted.

Specimen: 974-1.4

Date	Time	Frequency (Hz)	Cycles	Amplitude (mils rms)	Acceleration (g rms)	Strain ($\mu\epsilon$)	Comments
9/25/2006	4:27:02 PM	16	16	38.5	33.43		Restart
9/25/2006	4:28:02 PM	309	18,556	43.6	39.84		
9/25/2006	4:29:03 PM	309	37,096	43.7	39.83		
9/25/2006	4:30:02 PM	309	55,636	43.7	39.85		
9/25/2006	4:31:03 PM	309	74,176	43.7	39.84		
9/25/2006	4:32:02 PM	309	92,716	43.5	39.84		
9/25/2006	4:33:02 PM	309	111,256	43.5	39.84		
9/25/2006	4:34:03 PM	309	129,796	43.4	39.85		
9/25/2006	4:35:02 PM	309	148,336	43.3	39.84		
9/25/2006	4:36:03 PM	309	166,876	43.3	39.82		
9/25/2006	4:37:03 PM	309	185,416	43.3	39.84		
9/25/2006	4:38:02 PM	309	203,956	43.2	39.85		
9/25/2006	4:39:03 PM	309	222,496	43.2	39.84		
9/25/2006	4:40:02 PM	309	241,036	43.1	39.85		
9/25/2006	4:41:02 PM	309	259,576	43.0	39.84		
9/25/2006	4:42:03 PM	309	278,116	43.0	39.84		
9/25/2006	4:43:02 PM	309	296,656	43.0	39.85		
9/25/2006	4:44:03 PM	309	315,196	42.9	39.84		
9/25/2006	4:45:02 PM	309	333,736	42.9	39.82		
9/25/2006	4:46:02 PM	309	352,276	42.8	39.84		
9/25/2006	4:47:03 PM	309	370,816	42.8	39.85		
9/25/2006	4:48:02 PM	309	389,356	42.8	39.85		
9/25/2006	4:49:03 PM	309	407,896	42.8	39.82		
9/25/2006	4:50:02 PM	309	426,436	42.7	39.84		
9/25/2006	4:51:02 PM	309	444,976	42.6	39.85		
9/25/2006	4:52:03 PM	309	463,516	42.6	39.83		
9/25/2006	4:53:02 PM	309	482,056	42.6	39.85		
9/25/2006	4:54:03 PM	309	500,596	42.6	39.84		
9/25/2006	4:55:02 PM	309	519,136	42.6	39.8		
9/25/2006	4:56:02 PM	309	537,676	42.6	39.8		
9/25/2006	4:57:03 PM	309	556,216	42.5	39.8		
9/25/2006	4:58:02 PM	309	574,756	42.5	39.8		
9/25/2006	4:59:03 PM	309	593,296	42.4	39.8		
9/25/2006	5:00:03 PM	309	611,836	42.4	39.8		
9/25/2006	5:01:02 PM	309	630,376	42.5	39.8		continued on next page

Specimen: 974-1.4

Date	Time	Frequency (Hz)	Cycles	Amplitude (mils) rms	Acceleration (g) rms	Strain (µε)	Comments
9/25/2006	5:02:03 PM	309	648,916	42.4	39.8		continued from previous page
9/25/2006	5:03:02 PM	309	667,456	42.3	39.8		
9/25/2006	5:04:02 PM	309	685,996	42.4	39.9		

Specimen: 974-1.4

Date	Time	Frequency (Hz)	Cycles	Amplitude (mils) rms	Acceleration (g) rms	Strain (µε)	Comments
9/25/2006	5:10:09 PM	17	17	19.7	12.30		Restart
9/25/2006	5:11:09 PM	309	18,557	42.8	39.84		
9/25/2006	5:12:10 PM	309	37,097	42.8	39.84		
9/25/2006	5:13:00 PM	309	52,547	42.7	39.83		
9/25/2006	5:13:59 PM	309	71,087	42.8	39.85		
9/25/2006	5:14:59 PM	309	89,627	42.8	39.85		
9/25/2006	5:15:59 PM	309	108,167	42.8	39.83		
9/25/2006	5:16:59 PM	309	126,707	42.7	39.84		
9/25/2006	5:18:00 PM	309	145,247	42.8	39.85		
9/25/2006	5:18:59 PM	309	163,787	42.8	39.84		
9/25/2006	5:19:59 PM	309	182,327	42.6	39.83		
9/25/2006	5:21:00 PM	309	200,867	42.6	39.84		
9/25/2006	5:21:59 PM	309	219,407	42.7	39.84		
9/25/2006	5:23:00 PM	309	237,947	42.6	39.83		
9/25/2006	5:23:59 PM	309	256,487	42.7	39.85		
9/25/2006	5:24:59 PM	309	275,027	42.6	39.84		
9/25/2006	5:26:00 PM	309	293,567	42.5	39.83		
9/25/2006	5:26:59 PM	309	312,107	42.0	39.82		
9/25/2006	5:27:59 PM	309	330,647	42.0	39.83		
9/25/2006	5:28:59 PM	309	349,187	42.0	39.86		
9/25/2006	5:29:59 PM	309	367,727	42.1	39.83		
9/25/2006	5:31:00 PM	309	386,267	42.2	39.84		
9/25/2006	5:31:59 PM	309	404,807	42.3	39.85		
9/25/2006	5:32:59 PM	309	423,347	42.4	39.84		
9/25/2006	5:33:39 PM	309	435,707	42.5	39.85		

Specimen: 974-1.4

Date	Time	Frequency (Hz)	Cycles	Amplitude (mils rms)	Acceleration (g rms)	Strain ($\mu\epsilon$)	Comments
9/26/2006	12:59:50 PM	16	16	31.4	15.14		Restart; Sine sweep of frequencies to check 1st natural frequency prior to restart.
9/26/2006	1:00:00 PM	326	3,276	51.5	39.82		
9/26/2006	1:05:00 PM	326	101,076	18.7	39.85		
9/26/2006	1:10:00 PM	326	198,876	8.6	39.83		
9/26/2006	1:15:00 PM	326	296,676	8.7	39.83		
9/26/2006	1:20:00 PM	326	394,476	8.8	39.83		
9/26/2006	1:25:00 PM	326	492,276	8.6	39.84		
9/26/2006	1:30:00 PM	326	590,076	8.6	39.83		
9/26/2006	1:35:00 PM	326	687,876	7.7	39.82		
9/26/2006	1:40:00 PM	326	785,676	7.5	39.83		
9/26/2006	1:41:00 PM	327	805,246	7.7	39.83		specimen failed

Cycles to Failure = 4,492,778

Specimen: 974-1.5 **Material:** 85% TiB / 15% Ti **Thickness:** 0.126 in.

Target Acceleration: **Target Strain:**

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
1/29/2007		318			10				Failed during ramp up to test conditions.

Specimen: 974-1.6 **Material:** 85% TiB / 15% Ti **Thickness:** 0.128 in.

Target Acceleration: 60g rms (0-pk) **Target Strain:** 420 µε

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
10/3/2006	4:09:50 PM	60	60		33.09		58.0		
10/3/2006	4:10:01 PM	325	3,310		0.02		4.4		Failed during ramp-up to test conditions.

Specimen: 974-3.1 **Material:** 85% TiB / 15% Ti **Thickness:** 0.125 in.

Target Acceleration: **Target Strain:** 730 µε

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/22/2007	10:16:07 AM	240	240	1.3	1.09	1.17	4.2	17,053.4	Trial to determine shaker settings.
8/22/2007	10:16:12 AM	26	370	1.3	1.11	1.20	4.3	17,057.3	
8/22/2007	10:16:18 AM	29	515	1.3	1.10	1.19	4.2	17,055.4	
8/22/2007	10:16:23 AM	33	680	1.4	1.11	1.20	4.3	17,054.7	
8/22/2007	10:16:28 AM	35	820	1.6	1.10	1.19	4.4	17,052.9	
8/22/2007	10:16:33 AM	35	960	1.8	1.10	1.18	4.4	17,051.2	
8/22/2007	10:16:38 AM	35	1,205	2.3	1.10	1.19	4.3	17,050.4	
8/22/2007	10:16:43 AM	53	1,507	3.1	1.10	1.19	4.5	17,050.2	
8/22/2007	10:16:48 AM	58	1,733	4.0	1.10	1.19	4.9	17,049.1	
8/22/2007	10:16:50 AM	61	1,855	4.6	1.10	1.18	4.4	17,048.7	
8/22/2007	10:16:52 AM	64	1,983	5.3	1.10	1.18	4.2	17,047.9	
8/22/2007	10:16:54 AM	67	2,117	6.0	1.10	1.18	4.5	16,292.3	
8/22/2007	10:16:56 AM	71	2,259	6.9	1.10	1.18	4.4	75.7	
8/22/2007	10:17:01 AM	80	2,713	9.4	1.10	1.18	4.2	68.4	
8/22/2007	10:18:02 AM	325	13,530	219.4	1.09	1.39	54.2	119.5	
8/22/2007	10:19:01 AM	300	34,164	1.2	0.28	0.04	4.0	56.9	continued on next page

Specimen: 974-3.1

Material: 85% TiB / 15% Ti

Thickness: 0.125 in.

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain ($\mu\epsilon$)	Amplitude (mils rms)	Comments
8/22/2007	10:20:01 AM	360	52,596	1.2	0.28	0.04	4.5	58.9	continued from previous page
8/22/2007	10:21:02 AM	300	71,106	1.2	0.28	0.04	4.5	61.8	
8/22/2007	10:22:01 AM	300	89,364	5.3	0.32	0.18	4.5	64.1	
8/22/2007	10:23:02 AM	326	108,612	11.2	0.28	0.05	5.2	13.1	
8/22/2007	10:24:02 AM	329	126,957	1.2	0.28	0.04	4.8	13.9	
8/22/2007	10:25:01 AM	300	144,957	7.3	0.36	0.25	4.7	16.3	
8/22/2007	10:26:02 AM	300	163,731	1.2	0.28	0.04	4.7	145.5	
8/22/2007	10:26:38 AM	325	174,756	2.7	0.27	0.04	4.9	285.7	
8/22/2007	10:26:40 AM	326	175,734	1.2	0.27	0.04	4.5	554.9	
8/22/2007	10:26:43 AM	300	176,634	32.6	0.27	0.04	4.5	2,231.8	
8/22/2007	10:26:46 AM	325	177,609	1.2	0.28	0.04	4.7	17,771.5	
8/22/2007	10:26:50 AM	300	178,509	1.2	0.27	0.04	4.5	17,772.1	
8/22/2007	10:26:53 AM	101	178,812	1.2	0.27	0.04	4.7	4,586.8	
8/22/2007	10:26:56 AM	300	179,712	1.2	0.27	0.04	4.3	4,586.5	

Specimen: 974-3.1

Material: 85% TiB / 15% Ti

Thickness: 0.125 in.

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain ($\mu\epsilon$)	Amplitude (mils rms)	Comments
8/22/2007	10:53:26 AM	300	300	2.1	0.29	0.10	4.6	14,989.2	Trial to determine shaker settings.
8/22/2007	10:54:02 AM	324	11,388	813.1	1.58	1.14	178.0	15,004.1	
8/22/2007	10:55:03 AM	300	30,024	1.2	0.28	0.07	4.7	15,004.6	
8/22/2007	10:56:02 AM	300	48,636	1.2	0.28	0.07	4.8	15,004.3	
8/22/2007	10:57:00 AM	324	66,579	704.3	1.33	0.89	153.4	15,005.3	
8/22/2007	10:58:02 AM	323	86,955	721.0	1.14	0.76	157.7	15,252.2	
8/22/2007	10:59:00 AM	323	105,348	739.5	1.35	0.92	161.9	15,515.4	
8/22/2007	11:00:02 AM	323	125,673	754.1	1.34	0.89	165.9	15,891.7	
8/22/2007	11:01:00 AM	323	144,054	674.1	1.28	0.83	148.0	15,833.7	
8/22/2007	11:02:02 AM	145	159,531	63.7	0.28	0.08	4.7	7,352.6	
8/22/2007	11:03:02 AM	300	175,641	1.2	0.28	0.08	4.9	2,969.1	
8/22/2007	11:04:00 AM	195	189,282	29.0	0.28	0.08	4.9	9,607.6	
8/22/2007	11:05:02 AM	240	203,214	1.2	0.28	0.08	36.5	18,855.0	
8/22/2007	11:06:00 AM	240	216,513	1.2	0.28	0.08	5.0	14,453.9	
8/22/2007	11:08:00 AM	35	244,902	1.5	0.99	1.07	5.1	14,455.3	continued on next page

Specimen: 974-3.1

Material: 85% TiB / 15% Ti

Thickness: 0.125 in.

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain ($\mu\epsilon$)	Amplitude (mils rms)	Comments
8/22/2007	11:09:02 AM	150	250,032	11.5	0.98	1.06	5.3	14,433.0	continued from previous page
8/22/2007	11:10:00 AM	240	266,517	1.2	0.28	0.08	4.9	14,413.2	
8/22/2007	11:11:02 AM	240	281,637	1.24	0.28	0.08	4.9	14,411.8	
8/22/2007	11:12:00 AM	300	297,477	4.50	0.36	0.26	5.2	14,410.8	
8/22/2007	11:13:02 AM	326	317,778	134.52	0.40	0.39	54.7	14,432.7	
8/22/2007	11:14:02 AM	300	333,948	0.19	0.28	0.07	4.8	14,436.9	
8/22/2007	11:15:03 AM	300	352,308	1.1	0.29	0.10	5.1	14,438.0	
8/22/2007	11:16:02 AM	329	370,551	0.4	1.02	1.09	5.1	14,512.9	
8/22/2007	11:17:00 AM	53	376,044	2.6	0.99	1.06	5.4	14,453.5	
8/22/2007	11:18:02 AM	226	383,841	10.1	0.99	1.06	5.4	14,451.9	
8/22/2007	11:19:00 AM	300	402,771	0.2	0.28	0.08	5.1	14,450.2	
8/22/2007	11:20:02 AM	300	421,131	0.5	0.28	0.08	5.0	14,450.7	
8/22/2007	11:21:00 AM	326	439,011	141.1	0.63	0.40	57.1	14,450.3	
8/22/2007	11:22:03 AM	300	457,068	0.2	0.28	0.08	5.0	14,445.9	
8/22/2007	11:23:02 AM	240	472,008	1.3	0.28	0.08	5.3	14,444.3	
8/22/2007	11:24:00 AM	300	488,748	14.3	0.83	0.85	7.2	14,444.7	
8/22/2007	11:25:02 AM	240	506,370	1.2	0.28	0.07	5.0	14,431.5	
8/22/2007	11:25:29 AM	240	512,850	1.2	0.28	0.08	5.1	14,431.6	

Specimen: 974-3.1

Material: 85% TiB / 15% Ti

Thickness: 0.125 in.

Target: Velocity 2250 mm/s peak

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain ($\mu\epsilon$)	Amplitude (mils rms)	Comments
8/22/2007	11:31:06 AM	240	240	7.8	0.33	0.12	6.2	11,929.1	Trial to determine shaker settings.
8/22/2007	11:31:09 AM	326	1,218	1275.9	5.90	4.19	573.2	11,863.4	
8/22/2007	11:31:30 AM	326	8,064	1607.9	8.76	6.53	747.7	8,515.3	
8/22/2007	11:32:00 AM	324	17,817	1565.0	8.46	6.22	720.2	19,251.9	
8/22/2007	11:32:30 AM	324	27,537	1588.3	10.28	8.12	721.0	18,884.1	
8/22/2007	11:33:00 AM	324	37,257	1596.7	7.72	5.40	734.0	16,996.2	
8/22/2007	11:33:30 AM	300	46,611	40.9	0.32	0.08	5.6	14,789.6	
8/22/2007	11:34:00 AM	300	55,611	0.9	0.32	0.08	5.2	17,271.5	
8/22/2007	11:34:24 AM	300	62,811	0.9	0.32	0.08	5.4	17,273.1	

Specimen: 974-3.1 **Material:** 85% TiB / 15% Ti **Thickness:** 0.125 in.
Target: Velocity 2250 mm/s peak

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/22/2007	11:35:52 AM	300	300	45.9	1.58	1.84	23.1	19,953.1	Trial to determine shaker settings.
8/22/2007	11:35:55 AM	326	1,278	293.7	58.15	64.87	21.1	3,831.8	
8/22/2007	11:35:58 AM	240	1,998	1.2	0.28	0.09	5.1	3,950.7	
8/22/2007	11:36:02 AM	240	2,718	1.2	0.28	0.08	5.3	4,010.7	
8/22/2007	11:36:16 AM	240	6,318	1.2	0.28	0.07	5.2	4,153.8	
8/22/2007	11:36:31 AM	240	9,918	1.2	0.28	0.07	5.1	18,024.8	
8/22/2007	11:36:46 AM	240	13,518	1.2	0.28	0.07	5.2	10,693.9	
8/22/2007	11:36:49 AM	240	14,238	1.2	0.28	0.07	5.2	10,693.1	
8/22/2007	11:36:53 AM	240	14,958	1.2	0.28	0.07	5.0	10,695.5	

Specimen: 974-3.1 **Material:** 85% TiB / 15% Ti **Thickness:** 0.125 in.
Target: Velocity 2250 mm/s peak

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/22/2007		325.9					730		Start test. Failed during ramp up to test conditions.

Specimen: 974-3.2 **Material:** 85% TiB / 15% Ti **Thickness:** 0.12586 in.
Target Acceleration: **Target Strain:** 635 µε

Date	Time	Frequenc y (Hz)	Cycles	Velocity (mm/s rms)	Head Acceleration (g rms)	Fixture Acceleration (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/20/2007	10:23:09 AM	Infinity	300	0.44	0.44	0.05	13.2	4,182.5	Trial to determine shaker settings.
8/20/2007	10:23:14 AM	300	1,800	0.41	0.44	0.05	10.7	4,181.9	
8/20/2007	10:24:04 AM	300	16,800	0.41	0.43	0.05	6.5	4,183.0	
8/20/2007	10:25:04 AM	300	34,800	0.43	0.43	0.05	8.9	4,182.9	
8/20/2007	10:26:04 AM	300	52,800	0.48	0.43	0.10	6.3	4,187.7	
8/20/2007	10:27:00 AM	300	69,300	0.44	0.27	0.10	5.2	3.5	
8/20/2007	10:30:04 AM	300	124,815	0.43	0.27	0.10	5.9	4.0	
8/20/2007	10:35:04 AM	300	214,815	0.46	0.27	0.10	3.8	5.6	
8/20/2007	10:40:05 AM	300	304,815	1.07	0.27	0.10	2.2	39.0	continued on next page

Specimen: 974-3.2

Material: 85% TiB / 15% Ti

Thickness: 0.12586 in.

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain ($\mu\epsilon$)	Amplitude (mils rms)	Comments
8/20/2007	10:41:04 AM	300	322,815	954.19	7.38	7.08	1189.1	749.6	continued from previous page
8/20/2007	10:41:10 AM	300	324,315	7.83	0.27	0.10	11.5	688.4	
8/20/2007	10:41:14 AM	300	325,815	0.70	0.27	0.10	3.2	688.3	
8/20/2007	10:41:19 AM	300	327,315	0.66	0.27	0.10	3.1	689.4	

Specimen: 974-3.2

Material: 85% TiB / 15% Ti

Thickness: 0.12586 in.

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain ($\mu\epsilon$)	Amplitude (mils rms)	Comments
8/20/2007	10:44:41 AM	300	300	0.7	0.83	0.87	11.4	689.4	Trial to determine shaker settings.
8/20/2007	10:45:02 AM	300	6,300	0.7	0.27	0.06	6.9	688.2	
8/20/2007	10:46:02 AM	300	24,300	0.7	0.27	0.06	12.2	687.6	
8/20/2007	10:47:02 AM	300	42,300	0.8	0.27	0.06	14.5	686.4	
8/20/2007	10:48:02 AM	300	60,300	0.8	0.27	0.06	6.0	688.1	
8/20/2007	10:49:02 AM	300	78,300	0.8	0.27	0.06	7.2	688.3	
8/20/2007	10:50:02 AM	300	96,300	0.8	0.27	0.06	7.3	688.4	
8/20/2007	10:51:02 AM	300	114,300	0.8	0.27	0.06	5.1	688.4	
8/20/2007	10:52:02 AM	300	132,300	0.8	0.27	0.06	6.1	688.3	
8/20/2007	10:53:02 AM	300	150,300	0.8	0.27	0.06	11.2	688.3	
8/20/2007	10:54:01 AM	296	168,140	158.0	1.14	1.06	193.9	679.4	
8/20/2007	10:54:52 AM	300	182,960	0.7	0.27	0.07	7.5	670.0	

Specimen: 974-3.2

Material: 85% TiB / 15% Ti

Thickness: 0.12586 in.

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain ($\mu\epsilon$)	Amplitude (mils rms)	Comments
8/20/2007	11:03:52 AM	300	300	0.7	0.31	0.11	5.8	4,536.8	Trial to determine shaker settings.
8/20/2007	11:04:03 AM	300	3,300	0.7	1.78	1.94	8.8	4,536.7	
8/20/2007	11:05:02 AM	300	21,300	0.6	0.30	0.09	3.9	4,536.8	
8/20/2007	11:06:03 AM	300	39,300	0.7	0.31	0.09	6.8	4,536.8	
8/20/2007	11:07:03 AM	300	57,300	0.7	0.30	0.09	5.6	4,536.9	
8/20/2007	11:08:03 AM	300	73,810	0.6	0.30	0.09	4.5	7,905.1	
8/20/2007	11:09:03 AM	300	91,810	0.7	0.31	0.10	2.6	7,903.9	
8/20/2007	11:10:03 AM	300	109,810	0.6	0.31	0.09	4.9	7,904.5	continued on next page

Specimen: 974-3.2

Material: 85% TiB / 15% Ti

Thickness: 0.12586 in.

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain ($\mu\epsilon$)	Amplitude (mils rms)	Comments
8/20/2007	11:11:03 AM	300	127,810	0.7	0.30	0.09	4.3	7,903.5	continued from previous page
8/20/2007	11:12:02 AM	300	145,810	0.7	0.30	0.09	2.0	7,905.0	
8/20/2007	11:13:03 AM	302	163,835	14.2	0.31	0.11	19.0	7,904.1	
8/20/2007	11:14:02 AM	300	181,875	0.7	0.30	0.09	5.6	7,904.0	
8/20/2007	11:15:03 AM	300	199,875	0.6	0.31	0.09	4.9	3.7	
8/20/2007	11:16:02 AM	300	217,875	0.7	0.31	0.09	5.6	4.0	
8/20/2007	11:17:03 AM	300	235,875	0.6	0.31	0.09	6.2	3.9	
8/20/2007	11:18:02 AM	300	253,875	0.7	0.31	0.09	4.1	2.4	
8/20/2007	11:19:03 AM	300	271,875	1.0	0.31	0.09	4.1	3.7	
8/20/2007	11:20:02 AM	300	289,875	1.0	0.30	0.09	7.2	2.5	
8/20/2007	11:20:43 AM	300	300,675	6.5	0.30	0.09	7.5	4.6	

Specimen: 974-3.2

Material: 85% TiB / 15% Ti

Thickness: 0.12586 in.

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain ($\mu\epsilon$)	Amplitude (mils rms)	Comments
8/20/2007	11:22:26 AM	300	300	121.4	0.35	0.41	154.7	63.9	Start test.
8/20/2007	11:23:02 AM	301	10,835	585.1	1.90	2.78	743.3	519.6	
8/20/2007	11:24:01 AM	303	28,920	359.0	3.00	3.76	464.4	547.9	
8/20/2007	11:25:02 AM	300	46,980	1.2	0.27	0.09	2.3	765.2	
8/20/2007	11:30:01 AM	300	135,850	1.2	0.27	0.09	4.5	773.3	
8/20/2007	12:00:01 PM	300	675,850	1.1	0.27	0.09	3.7	745.7	
8/20/2007	12:30:01 PM	300	1,215,850	1.1	0.27	0.08	6.4	713.6	
8/20/2007	1:00:01 PM	300	1,749,950	1.2	0.28	0.08	3.0	1,022.9	
8/20/2007	1:30:02 PM	300	2,289,950	1.1	0.27	0.08	3.5	1,022.5	
8/20/2007	2:00:02 PM	300	2,829,950	1.1	0.28	0.08	8.2	1,024.3	
8/20/2007	2:30:02 PM	300	3,369,950	1.1	0.28	0.08	6.1	1,020.7	
8/20/2007	3:00:02 PM	300	3,909,950	1.1	0.27	0.08	3.9	1,021.7	
8/20/2007	3:30:01 PM	300	4,449,950	1.2	0.27	0.08	7.4	1,022.3	
8/20/2007	4:00:01 PM	300	4,989,955	1.2	0.27	0.08	3.8	1,022.1	
8/20/2007	4:30:01 PM	300	5,529,955	1.1	0.27	0.08	7.0	1,015.7	
8/20/2007	5:00:01 PM	300	6,067,040	1.1	0.28	0.08	6.5	3,340.2	Test interrupted: test conditions not met.
8/20/2007	5:13:31 PM	300	6,274,890	0.8	0.28	0.08	7.3	26.9	

Specimen: 974-3.2
Target: Velocity 500 mm/s peak

Material: 85% TiB / 15% Ti

Thickness: 0.12586 in.
Target Strain: 750 microstrain

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/20/2007	5:14:09 PM	300	300	255.3	0.50	0.83	460.9	143.3	Restart test.
8/20/2007	5:15:01 PM	300	13,800	353.4	0.68	1.21	636.6	874.2	
8/20/2007	5:30:00 PM	300	285,295	345.3	0.93	1.45	623.7	8,094.6	
8/20/2007	5:45:00 PM	300	555,215	325.2	1.03	1.59	588.3	16,906.1	
8/20/2007	6:00:00 PM	300	825,015	341.3	0.91	1.42	615.8	17,106.2	
8/20/2007	6:15:00 PM	300	1,094,505	424.3	0.75	1.27	762.9	15,058.2	
8/20/2007	6:30:00 PM	299	1,363,990	321.6	0.89	1.40	579.7	11,728.3	
8/20/2007	6:45:00 PM	299	1,633,495	432.8	0.81	1.34	777.0	5,830.5	
8/20/2007	7:00:00 PM	300	1,902,875	371.0	0.69	1.12	664.9	2,184.2	
8/20/2007	8:00:00 PM	299	2,979,895	358.9	0.78	1.18	643.4	17,171.6	
8/20/2007	9:00:00 PM	298	4,056,300	410.5	0.73	1.25	734.9	9,773.2	
8/20/2007	10:00:00 PM	299	5,132,475	307.9	0.85	1.31	552.0	2,328.0	
8/20/2007	11:00:00 PM	299	6,208,700	402.2	0.78	1.21	717.1	2,297.5	
8/21/2007	12:00:05 AM	299	7,286,545	355.0	0.78	1.16	634.1	15,821.5	
8/21/2007	1:00:00 AM	299	8,361,220	300.5	0.79	1.23	538.4	3,124.8	
8/21/2007	2:00:00 AM	299	9,437,425	425.2	0.74	1.22	759.2	15,096.2	
8/21/2007	3:00:00 AM	299	10,513,655	427.9	0.75	1.25	764.4	4,273.2	
8/21/2007	4:00:00 AM	299	11,589,960	382.9	0.75	1.13	683.6	8,196.1	
8/21/2007	5:00:05 AM	299	12,667,805	407.2	0.72	1.14	727.1	16,698.3	
8/21/2007	6:00:00 AM	299	13,742,490	435.1	0.68	1.16	776.5	7,399.2	
8/21/2007	7:00:00 AM	299	14,818,780	416.4	0.77	1.22	744.0	18,602.8	
8/21/2007	8:00:00 AM	299	15,894,980	416.4	0.63	1.07	741.4	16,893.3	
8/21/2007	9:00:00 AM	300	16,971,420	437.6	0.70	1.24	779.9	402.9	
8/21/2007	9:15:00 AM	299	17,240,484	397.0	0.75	1.18	709.6	7,602.3	
8/21/2007	9:30:00 AM	300	17,509,804	432.7	0.67	1.13	772.9	15,170.0	
8/21/2007	9:34:44 AM	300	17,595,110	1.2	0.29	0.03	3.9	17,325.4	

Specimen: 974-3.2
Target: Velocity 500 mm/s peak

Material: 85% TiB / 15% Ti

Thickness: 0.12586 in.
Target Strain: 635 microstrain

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/21/2007	9:36:40 AM	300	300	288.2	0.98	1.51	521.3	17,350.8	Restart test. (cont'd on next page)

Specimen: 974-3.2
Target: Velocity 500 mm/s peak

Material: 85% TiB / 15% Ti

Thickness: 0.12586 in.
Target Strain: 635 microstrain

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/21/2007	9:36:45 AM	300	1,800	371.1	1.14	1.84	668.0	17,364.8	continued from previous page
8/21/2007	9:36:50 AM	302	3,310	513.0	1.95	2.55	928.7	17,451.5	
8/21/2007	9:36:56 AM	301	4,815	425.5	1.87	2.76	771.8	17,570.0	
8/21/2007	9:37:00 AM	301	6,320	426.8	0.82	1.21	766.7	17,630.8	
8/21/2007	9:37:05 AM	300	7,820	255.9	1.82	2.41	468.8	17,722.4	
8/21/2007	9:37:10 AM	301	9,325	287.4	1.24	1.75	519.9	17,912.9	
8/21/2007	9:37:15 AM	302	10,835	465.9	2.01	2.87	846.4	17,956.5	
8/21/2007	9:37:20 AM	300	12,335	463.0	0.93	1.29	829.8	18,049.4	
8/21/2007	9:37:25 AM	301	13,840	31.4	0.35	0.22	57.5	18,092.7	Front strain gage (control gage) failed.
8/21/2007	9:37:30 AM	300	15,340	1.3	0.32	0.04	4.2	18,092.1	
8/21/2007	9:37:35 AM	300	16,840	1.7	0.32	0.03	5.1	18,092.8	
8/21/2007	9:37:40 AM	300	18,340	0.3	0.32	0.04	5.4	18,093.9	

Specimen: 974-3.2
Target: Velocity 500 mm/s peak

Material: 85% TiB / 15% Ti

Thickness: 0.12586 in.
Target Strain: 635 microstrain

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/21/2007	9:47:08 AM	300	300	473.7	6.03	6.68	900.3	8,262.4	Restart test.
8/21/2007	9:48:03 AM	12	4,295	681.3	0.29	0.04	9.2	10,656.9	
8/21/2007	9:49:03 AM	4	6,260	451.0	0.29	0.04	6.9	12,264.4	
8/21/2007	9:50:03 AM	2	7,450	40.5	0.29	0.04	8.2	15,450.1	
8/21/2007	9:55:03 AM	60	27,050	3.5	0.29	0.04	4.4	14,946.9	
8/21/2007	10:00:03 AM	60	45,050	0.2	0.29	0.04	4.7	14,411.8	
8/21/2007	10:05:03 AM	60	62,760	1.6	0.28	0.04	8.3	7,437.1	
8/21/2007	10:10:03 AM	2	76,630	21.8	0.28	0.04	9.0	18,615.4	
8/21/2007	10:15:03 AM	60	87,525	1.0	0.28	0.03	7.3	940.6	
8/21/2007	10:16:03 AM	60	90,865	0.9	0.29	0.03	9.2	4,482.0	
8/21/2007	10:17:03 AM	60	94,185	5.2	0.29	0.03	11.4	10,410.8	
8/21/2007	10:18:03 AM	60	96,935	1.6	0.28	0.03	8.7	153.9	
8/21/2007	10:18:38 AM	300	101,145	0.2	0.28	0.03	7.1	1,045.5	Test stopped without a failure. Unable to control test with vibrometer.
Applied Load Cycles =			17,714,595						

Specimen: 974-3.3 **Material:** 85% TiB / 15% Ti **Thickness:** 0.125 in.

Target Acceleration: **Target Strain:** 700 $\mu\epsilon$

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain ($\mu\epsilon$)	Amplitude (mils rms)	Comments
8/21/2007	10:28:02 AM	300	300	0.4	0.29	0.08	3.4	13,391.3	Trial to define shaker parameters.
8/21/2007	10:28:33 AM	323	9,645	8.8	0.36	0.18	17.2	13,392.7	
8/21/2007	10:29:02 AM	326	19,350	0.2	0.28	0.04	3.3	13,391.0	
8/21/2007	10:29:32 AM	300	28,350	1.6	0.28	0.04	3.3	13,389.1	
8/21/2007	10:30:02 AM	326	37,610	1.6	0.28	0.03	3.3	3,862.8	
8/21/2007	10:30:32 AM	300	46,610	1.7	0.28	0.04	3.3	3,907.9	
8/21/2007	10:31:03 AM	300	55,610	7.7	0.35	0.23	3.7	3,920.5	
8/21/2007	10:31:32 AM	323	65,300	702.5	1.11	1.84	187.1	3,839.0	
8/21/2007	10:32:08 AM	300	75,080	1.6	0.28	0.03	3.3	2,403.8	
8/21/2007	10:33:02 AM	300	91,580	1.6	0.28	0.03	3.3	4,891.5	
8/21/2007	10:34:02 AM	300	109,580	1.6	0.29	0.03	3.4	4,888.6	
8/21/2007	10:34:32 AM	300	118,580	1.6	0.29	0.03	3.4	4,884.9	
8/21/2007	10:34:52 AM	300	124,580	1.6	0.29	0.03	3.4	4,885.1	

Specimen: 974-3.3 **Material:** 85% TiB / 15% Ti **Thickness:** 0.125 in.

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain ($\mu\epsilon$)	Amplitude (mils rms)	Comments
8/21/2007	10:38:47 AM	300	300	238.1	1.12	0.98	68.4	4,881.0	Start of test.
8/21/2007	10:38:52 AM	323	1,915	2.9	0.60	0.59	63.1	10,700.4	
8/21/2007	10:38:58 AM	240	3,115	1.2	0.28	0.03	33.0	10,702.1	
8/21/2007	10:39:03 AM	240	4,315	1.2	0.28	0.04	24.8	10,702.3	
8/21/2007	10:39:07 AM	240	5,515	1.2	0.28	0.04	23.4	10,702.5	
8/21/2007	10:39:12 AM	240	6,715	1.2	0.29	0.04	21.1	10,702.5	
8/21/2007	10:39:18 AM	240	7,915	1.2	0.28	0.03	20.9	10,702.5	
8/21/2007	10:39:22 AM	240	9,115	1.3	0.28	0.04	18.6	10,702.8	
8/21/2007	10:39:27 AM	240	10,315	1.2	0.29	0.04	17.5	10,702.6	
8/21/2007	10:39:33 AM	240	11,515	1.3	0.28	0.04	18.5	10,702.7	
8/21/2007	10:39:37 AM	240	12,715	1.2	0.29	0.03	18.1	10,703.9	
8/21/2007	10:39:42 AM	240	13,915	1.3	0.28	0.03	17.2	10,704.1	Specimen failed during ramp-up to test conditions.

Specimen: 974-3.4 **Material:** 85% TiB / 15% Ti **Thickness:** 0.12925 in. to 0.1261 in.

Target : Velocity = 141.44 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/6/2007	2:36:55 PM	60	60	1552.1	49.17	43.90	537.5	833.6	Trial to determine shaker parameters.
8/6/2007	2:36:56 PM	60	120	1111.2	38.84	34.82	375.1	1,886.9	
8/6/2007	2:36:57 PM	60	180	5.0	0.01	0.02	2.0	2,152.7	
8/6/2007	2:37:00 PM	60	360	0.6	0.01	0.02	0.8	2,331.9	
8/6/2007	2:37:05 PM	60	600	0.6	0.01	0.02	0.8	2,496.2	
8/6/2007	2:37:10 PM	60	900	0.6	0.01	0.02	0.8	2,581.7	
8/6/2007	2:37:15 PM	60	1,200	0.6	0.01	0.02	0.8	2,621.5	
8/6/2007	2:37:16 PM	60	1,260	0.6	0.01	0.02	0.8	2,627.5	

Specimen: 974-3.4 **Material:** 85% TiB / 15% Ti **Thickness:** 0.12925 in. to 0.1261 in.

Target : Velocity = 141.44 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/6/2007	2:41:30 PM	60	60	83.6	0.34	0.53	29.2	55.2	Start of test
8/6/2007	2:41:45 PM	297	2,085	99.9	0.44	0.67	35.5	62.7	
8/6/2007	2:41:59 PM	297	6,540	99.9	0.43	0.67	35.5	54.3	
8/6/2007	2:42:14 PM	297	10,995	6.0	0.07	0.07	2.3	38.3	
8/6/2007	2:42:29 PM	60	11,895	1.6	0.07	0.06	0.9	31.4	
8/6/2007	2:42:44 PM	60	12,795	1.6	0.07	0.06	0.9	4.9	
8/6/2007	2:42:59 PM	60	13,695	1.6	0.07	0.06	0.9	760.7	
8/6/2007	2:43:14 PM	60	14,595	1.6	0.07	0.06	0.9	11.8	

Specimen: 974-3.4 **Material:** 85% TiB / 15% Ti **Thickness:** 0.12925 in. to 0.1261 in.

Target : Velocity = 141.44 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/6/2007	2:44:52 PM	60	60	139.8	0.62	0.94	49.5	74.1	Restart
8/6/2007	2:44:55 PM	60	240	195.9	0.97	1.44	70.0	106.6	
8/6/2007	2:45:00 PM	60	480	199.5	1.00	1.49	71.6	107.1	continued on next page

Specimen: 974-3.4 **Material:** 85% TiB / 15% Ti **Thickness:** 0.12925 in. to 0.1261 in.
Target : Velocity = 141.44 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/6/2007	2:45:13 PM	297	3,216	199.6	1.01	1.49	71.6	106.4	continued from previous page
8/6/2007	2:45:28 PM	297	7,671	199.9	1.01	1.49	71.8	106.4	
8/6/2007	2:45:43 PM	297	12,126	199.7	1.00	1.49	71.9	106.2	
8/6/2007	2:45:59 PM	297	16,581	16.0	0.09	0.12	5.8	10.4	
8/6/2007	2:46:03 PM	60	16,881	1.6	0.07	0.08	0.9	4.6	

Specimen: 974-3.4 **Material:** 85% TiB / 15% Ti **Thickness:** 0.12925 in. to 0.1261 in.
Target : Velocity = 2142.9 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/6/2007	2:52:57 PM	60	60	1.6	0.07	0.06	1.0	14.6	Restart
8/6/2007	2:53:00 PM	60	240	1.6	0.07	0.06	1.0	36.2	
8/6/2007	2:53:05 PM	60	540	1.7	0.07	0.06	1.0	27.2	
8/6/2007	2:53:10 PM	60	780	1.7	0.07	0.06	1.0	5.9	
8/6/2007	2:53:15 PM	60	1,080	1.6	0.07	0.06	1.0	18.1	
8/6/2007	2:53:20 PM	60	1,380	1.6	0.07	0.06	1.0	12.5	
8/6/2007	2:53:25 PM	60	1,680	1.6	0.07	0.06	1.0	12.3	
8/6/2007	2:53:26 PM	60	1,740	1.6	0.07	0.06	0.9	17.9	

Specimen: 974-3.4 **Material:** 85% TiB / 15% Ti **Thickness:** 0.12925 in. to 0.1261 in.
Target : Velocity = 2142.9 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/6/2007	2:55:20 PM	60	60	76.6	0.34	0.50	27.2	41.8	Restart
8/6/2007	2:55:25 PM	60	360	1219.9	28.70	24.83	415.7	656.6	
8/6/2007	2:55:30 PM	60	600	25.1	0.04	0.08	8.9	2,193.8	
8/6/2007	2:55:35 PM	60	900	0.9	0.04	0.02	0.8	2,475.2	
8/6/2007	2:55:40 PM	60	1,200	0.9	0.04	0.02	0.8	2,593.4	
8/6/2007	2:55:44 PM	60	1,440	0.9	0.04	0.02	0.8	2,634.9	

Specimen: 974-3.4

Material: 85% TiB / 15% Ti

Thickness: 0.12925 in. to 0.1261 in.

Target : Velocity = 2331 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain ($\mu\epsilon$)	Amplitude (mils rms)	Comments
8/6/2007	3:01:51 PM	60	60	412.4	1.95	2.95	151.5	257.0	Restart
8/6/2007	3:02:01 PM	60	600	1613.1	52.64	47.18	550.9	869.5	
8/6/2007	3:02:09 PM	297	2,325	1640.5	54.44	48.87	559.5	896.2	
8/6/2007	3:15:05 PM	297	232,500	1642.3	54.15	48.53	553.7	14,752.2	
8/6/2007	3:25:00 PM	14	407,800	0.4	0.03	0.02	0.8	26,480.3	Test conditions not met - amplifier overheating?
8/6/2007	3:30:05 PM	120	447,400	0.6	0.03	0.02	0.8	27,063.8	
8/6/2007	3:45:05 PM	120	562,000	0.6	0.03	0.02	0.8	27,191.8	
8/6/2007	4:00:04 PM	240	674,200	0.6	0.03	0.02	0.8	27,247.0	
8/6/2007	5:00:04 PM	120	1,147,000	0.5	0.04	0.02	0.8	27,317.0	
8/6/2007	6:00:00 PM	120	1,607,010	0.5	0.04	0.02	0.8	27,321.2	
8/6/2007	7:00:00 PM	120	2,165,010	0.6	0.04	0.02	0.8	27,319.5	
8/6/2007	8:00:05 PM	120	2,616,210	0.6	0.04	0.02	0.8	27,310.2	
8/6/2007	9:00:04 PM	120	3,069,810	0.6	0.04	0.02	0.8	27,300.3	
8/6/2007	10:00:04 PM	120	3,518,610	0.6	0.04	0.01	0.8	27,294.5	
8/6/2007	11:00:00 PM	120	3,968,610	0.6	0.04	0.01	0.8	27,278.9	
8/7/2007	12:00:05 AM	120	4,423,410	0.6	0.04	0.01	0.8	27,267.2	
8/7/2007	1:00:04 AM	120	4,869,210	0.6	0.04	0.01	0.8	27,258.0	
8/7/2007	2:00:04 AM	120	5,322,810	0.7	0.04	0.01	0.8	27,237.3	
8/7/2007	3:00:00 AM	120	5,787,210	0.7	0.04	0.01	0.8	27,257.6	
8/7/2007	4:00:00 AM	120	6,241,410	0.6	0.04	0.01	0.8	27,267.5	
8/7/2007	5:00:05 AM	120	6,695,010	0.7	0.04	0.01	0.8	27,267.5	
8/7/2007	6:00:04 AM	240	7,148,010	0.6	0.04	0.01	0.8	27,272.3	
8/7/2007	7:00:00 AM	120	7,598,010	0.7	0.04	0.01	0.8	27,287.5	
8/7/2007	8:00:00 AM	120	8,061,810	0.7	0.04	0.01	0.8	27,338.4	
8/7/2007	9:00:05 AM	120	8,514,210	0.6	0.04	0.01	0.8	27,338.2	
8/7/2007	9:08:14 AM	240	8,574,810	0.7	0.04	0.01	0.8	27,338.3	strain gage wire interfered with laser vibrometer. Test stopped.

Specimen: 974-3.4

Material: 85% TiB / 15% Ti

Thickness: 0.12925 in. to 0.1261 in.

Target : Velocity = 2331 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/7/2007	9:18:36 AM	120	120	174.0	0.51	0.91	65.4	150.1	Restart
8/7/2007	9:18:40 AM	120	600	862.7	8.15	5.72	312.5	514.0	
8/7/2007	9:18:45 AM	120	1,200	1544.8	49.23	43.99	538.2	899.1	
8/7/2007	9:18:50 AM	120	1,680	1631.7	55.62	49.99	564.0	974.5	
8/7/2007	9:18:55 AM	120	2,400	1640.5	56.27	50.59	566.5	988.6	
8/7/2007	9:19:00 AM	297	3,885	1640.5	56.29	50.61	566.4	983.0	
8/7/2007	9:30:00 AM	297	199,905	1642.5	55.74	49.98	565.8	897.7	
8/7/2007	9:45:00 AM	14	464,375	0.5	0.01	0.02	0.8	8,504.0	Strain gage failed. Strain gage wire interfered with laser vibrometer.
8/7/2007	9:48:55 AM	120	493,775	0.6	0.01	0.02	0.8	8,897.8	

Specimen: 974-3.4

Material: 85% TiB / 15% Ti

Thickness: 0.12925 in. to 0.1261 in.

Target : Velocity = 2331 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/7/2007	9:53:00 AM	120	120	279.2	1.23	1.95		169.1	Restart
8/7/2007	9:53:10 AM	120	1,200	1573.1	50.08	44.69		844.9	
8/7/2007	9:53:18 AM	297	3,696	1640.1	55.30	49.59		880.2	
8/7/2007	9:53:29 AM	297	6,666	1641.4	55.38	49.66		899.7	
8/7/2007	9:53:38 AM	297	9,636	1641.5	55.37	49.66		922.4	
8/7/2007	9:53:49 AM	297	12,606	1642.0	55.41	49.69		955.4	
8/7/2007	9:53:59 AM	297	15,576	1642.2	55.39	49.67		986.5	
8/7/2007	9:54:04 AM	297	17,061	1642.3	55.41	49.69		1,002.5	
8/7/2007	9:55:03 AM	297	34,881	1641.4	55.42	49.69		1,234.8	
8/7/2007	9:56:04 AM	297	52,701	1642.8	55.35	49.61		1,513.4	
8/7/2007	9:57:04 AM	297	70,521	1642.7	55.32	49.58		1,721.9	
8/7/2007	9:58:04 AM	297	88,341	1641.8	55.33	49.58		2,024.9	
8/7/2007	9:59:04 AM	297	106,161	1642.1	55.32	49.57		2,392.5	
8/7/2007	10:00:04 AM	297	123,981	1641.6	55.24	49.49		2,985.5	
8/7/2007	10:01:04 AM	297	141,801	1641.8	55.24	49.48		3,606.5	
8/7/2007	10:02:03 AM	297	159,621	1641.8	55.22	49.46		4,192.6	
8/7/2007	10:03:04 AM	297	177,441	1642.8	55.17	49.42		4,838.1	continued on next page

Specimen: 974-3.4

Material: 85% TiB / 15% Ti

Thickness: 0.12925 in. to 0.1261 in.

Target : Velocity = 2331 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/7/2007	10:04:03 AM	297	195,261	1642.7	55.15	49.39		5,414.9	continued from previous page
8/7/2007	10:05:04 AM	297	213,081	1642.0	55.14	49.37		6,187.1	
8/7/2007	10:06:03 AM	297	230,901	1642.2	55.09	49.33		6,925.1	
8/7/2007	10:07:04 AM	297	248,721	1641.9	55.13	49.36		7,479.0	
8/7/2007	10:08:03 AM	297	266,541	1642.3	55.08	49.31		8,149.8	
									Maximum drive reached - amplifier
8/7/2007	10:09:04 AM	296	284,356	2.5	0.04	0.02		11,240.0	overheated.
8/7/2007	10:10:03 AM	120	292,236	1.1	0.04	0.02		11,816.9	
8/7/2007	10:10:44 AM	120	295,856	1.6	0.04	0.02		24,106.8	Test stopped.

Specimen: 974-3.4

Material: 85% TiB / 15% Ti

Thickness: 0.12925 in. to 0.1261 in.

Target : Velocity = 2331 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/7/2007	10:17:10 AM	120	120	602.7	2.39	3.39		3,150.9	Restart
8/7/2007	10:18:00 AM	297	11,430	1641.3	56.54	50.72		3,342.4	
8/7/2007	10:19:01 AM	297	29,250	1642.3	56.53	50.71		3,408.9	
8/7/2007	10:20:00 AM	297	47,070	1642.3	56.51	50.68		3,384.0	
8/7/2007	10:21:01 AM	297	64,890	1642.8	56.47	50.64		3,404.2	
8/7/2007	10:22:00 AM	297	82,710	1642.9	56.44	50.60		3,542.8	
8/7/2007	10:23:01 AM	297	100,530	1642.0	56.46	50.62		3,513.2	
8/7/2007	10:24:00 AM	297	118,350	1642.1	56.43	50.58		3,588.5	
8/7/2007	10:25:01 AM	297	136,170	1642.3	56.38	50.53		3,582.6	
8/7/2007	10:26:01 AM	297	153,990	1642.0	56.37	50.52		3,437.3	
8/7/2007	10:27:01 AM	297	171,810	1642.7	56.38	50.53		3,388.9	
8/7/2007	10:28:01 AM	297	189,630	1642.5	56.36	50.50		3,106.2	
8/7/2007	10:29:01 AM	297	207,450	1642.7	56.37	50.51		2,783.0	
8/7/2007	10:30:01 AM	297	225,270	1642.7	56.35	50.49		2,330.7	
8/7/2007	10:31:01 AM	297	243,090	1641.9	56.36	50.50		1,703.0	
									Maximum drive reached - amplifier
8/7/2007	10:32:01 AM	120	257,740	0.9	0.04	0.02		2,039.3	overheated.
8/7/2007	10:33:01 AM	120	266,140	1.0	0.04	0.02		2,215.7	continued on next page

Specimen: 974-3.4 **Material:** 85% TiB / 15% Ti **Thickness:** 0.12925 in. to 0.1261 in.
Target : Velocity = 2331 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/7/2007	10:34:01 AM	120	273,340	1.0	0.04	0.02		2,275.3	continued from previous page
8/7/2007	10:34:21 AM	120	275,740	1.0	0.04	0.02		2,285.3	Test stopped.

Specimen: 974-3.4 **Material:** 85% TiB / 15% Ti **Thickness:** 0.12925 in. to 0.1261 in.
Target : Velocity = 2331 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/7/2007	10:37:03 AM	120	120	308.5	1.42	2.24		999.6	Restart
8/7/2007	10:38:01 AM	297	14,040	1642.6	56.32	50.49		1,291.3	
8/7/2007	10:39:01 AM	297	31,860	1642.2	56.31	50.47		909.2	
8/7/2007	10:40:01 AM	297	49,680	1642.6	56.24	50.39		1,069.2	
8/7/2007	10:41:00 AM	297	67,500	1642.6	56.23	50.38		1,683.6	
8/7/2007	10:42:01 AM	297	85,320	1641.9	56.27	50.41		2,454.3	
8/7/2007	10:43:00 AM	297	103,140	1641.9	56.27	50.41		3,259.2	
8/7/2007	10:44:01 AM	297	120,960	1642.3	56.23	50.37		4,176.4	
8/7/2007	10:45:00 AM	297	138,780	1641.7	56.24	50.37		4,990.9	
8/7/2007	10:46:01 AM	297	156,600	1642.8	56.23	50.35		5,707.4	
8/7/2007	10:47:00 AM	297	174,420	1642.6	56.20	50.32		6,364.8	
8/7/2007	10:48:01 AM	297	192,240	1642.7	56.15	50.28		6,997.3	
8/7/2007	10:49:00 AM	297	210,060	1642.9	56.16	50.28		7,762.7	
8/7/2007	10:50:01 AM	120	217,615	0.6	0.01	0.02		11,103.3	Maximum drive reached - amplifier overheated.
8/7/2007	10:51:00 AM	120	224,815	0.6	0.01	0.02		11,179.3	
8/7/2007	10:52:01 AM	120	232,905	0.6	0.01	0.02		11,224.8	
8/7/2007	10:52:20 AM	120	235,305	0.7	0.01	0.02		11,235.1	Test stopped.

Specimen: 974-3.4 **Material:** 85% TiB / 15% Ti **Thickness:** 0.12925 in. to 0.1261 in.
Target : Velocity = 2331 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/7/2007	11:05:57 AM	120	120	1500.0	48.69	43.57		7,982.3	Restart
8/7/2007	11:06:01 AM	120	600	1625.0	58.70	53.01		8,075.1	continued on next page

Specimen: 974-3.4

Material: 85% TiB / 15% Ti

Thickness: 0.12925 in. to 0.1261 in.

Target : Velocity = 2331 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/7/2007	11:10:02 AM	295	70,645	1642.7	59.57	53.78		15,804.8	continued from previous page
8/7/2007	11:15:02 AM	295	159,145	1642.8	59.38	53.56		23,941.1	
8/7/2007	11:20:03 AM	295	247,645	1642.5	59.31	53.49		29,010.1	
8/7/2007	11:21:02 AM	120	258,435	0.6	0.03	0.02		32,347.9	Maximum drive reached - amplifier overheated.
8/7/2007	11:25:02 AM	120	288,435	0.7	0.03	0.02		32,543.6	
8/7/2007	11:30:02 AM	120	326,235	0.7	0.03	0.02		32,614.4	
8/7/2007	11:35:03 AM	120	364,635	0.6	0.03	0.02		32,653.4	
8/7/2007	11:40:02 AM	120	401,835	0.6	0.04	0.02		32,683.4	
8/7/2007	11:43:27 AM	300	435,435	0.8	0.04	0.03		29,701.4	Test stopped.

Specimen: 974-3.4

Material: 85% TiB / 15% Ti

Thickness: 0.12925 in. to 0.1261 in.

Target : Velocity = 2331 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/7/2007	11:46:39 AM	300	300	639.0	1.28	1.49		364.3	Restart
8/7/2007	11:47:02 AM	295	6,850	1641.0	59.09	53.50		887.1	
8/7/2007	11:48:02 AM	295	24,550	1642.4	59.09	53.46		1,145.7	
8/7/2007	11:49:02 AM	295	42,250	1643.0	59.06	53.40		1,318.5	
8/7/2007	11:50:02 AM	295	59,950	1642.4	59.07	53.39		1,524.6	
8/7/2007	11:51:02 AM	295	77,650	1642.8	59.05	53.34		1,663.6	
8/7/2007	11:52:01 AM	295	95,350	1642.7	59.01	53.29		1,843.1	
8/7/2007	11:53:02 AM	295	113,050	1643.0	59.01	53.27		2,067.4	
8/7/2007	11:54:01 AM	295	130,750	1643.4	59.05	53.29		2,291.7	
8/7/2007	11:55:02 AM	295	148,450	1642.7	58.93	53.17		2,473.3	
8/7/2007	11:56:01 AM	295	166,150	1642.9	58.97	53.19		2,673.9	
8/7/2007	11:57:02 AM	295	183,850	1642.6	58.96	53.18		2,851.8	
8/7/2007	11:58:02 AM	295	201,550	1642.9	58.95	53.17		2,955.2	
8/7/2007	11:59:02 AM	295	219,250	1642.6	58.96	53.16		2,985.1	
8/7/2007	12:00:02 PM	295	236,950	1642.7	58.95	53.14		3,078.3	
8/7/2007	12:01:02 PM	295	254,650	1642.5	58.93	53.12		3,094.8	continued on next page

Specimen: 974-3.4 **Material:** 85% TiB / 15% Ti **Thickness:** 0.12925 in. to 0.1261 in.
Target : Velocity = 2331 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/7/2007	12:02:02 PM	120	268,340	0.3	0.03	0.02		6,250.4	Maximum drive reached: amplifier overheated. (cont'd from previous page)
8/7/2007	12:07:17 PM	120	307,340	0.3	0.03	0.02		6,520.7	Test stopped.

Specimen: 974-3.4 **Material:** 85% TiB / 15% Ti **Thickness:** 0.12925 in. to 0.1261 in.
Target : Velocity = 2331 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/7/2007	12:16:52 PM	120	120	819.2	5.51	3.29		3,430.7	Restart
8/7/2007	12:17:00 PM	120	960	1542.9	51.09	45.89		3,434.6	
8/7/2007	12:18:04 PM	295	18,265	1594.5	55.01	49.56		3,883.7	
8/7/2007	12:19:04 PM	295	35,965	1593.8	54.98	49.50		4,158.9	
8/7/2007	12:20:04 PM	295	53,665	1594.4	54.99	49.49		4,451.3	
8/7/2007	12:25:04 PM	295	142,165	1593.9	54.96	49.39		6,414.3	
8/7/2007	12:30:04 PM	295	230,665	1593.9	54.97	49.37		8,626.6	
8/7/2007	12:35:04 PM	120	291,530	1.0	0.03	0.02		12,943.6	Maximum drive reached - amplifier overheated.
8/7/2007	12:40:04 PM	120	328,130	1.0	0.03	0.02		13,039.4	
8/7/2007	12:45:04 PM	120	364,730	1.0	0.03	0.02		13,079.9	
8/7/2007	12:50:04 PM	120	401,330	1.0	0.03	0.02		13,105.2	
8/7/2007	12:54:19 PM	120	435,530	1.0	0.03	0.02		13,125.3	Test stopped.

Specimen: 974-3.4 **Material:** 85% TiB / 15% Ti **Thickness:** 0.12925 in. to 0.1261 in.
Target : Velocity = 2331 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/7/2007	12:59:31 PM	120	120	735.5	2.10	1.11		10,038.8	Restart
8/7/2007	1:00:02 PM	295	7,340	1593.4	54.90	49.49		871.1	
8/7/2007	1:05:02 PM	295	95,840	1594.2	54.93	49.39		3,013.4	
8/7/2007	1:10:02 PM	295	184,340	1594.6	54.84	49.25		7,163.2	
8/7/2007	1:15:02 PM	295	272,840	1594.8	54.81	49.20		10,942.9	continued on next page

Specimen: 974-3.4 **Material:** 85% TiB / 15% Ti **Thickness:** 0.12925 in. to 0.1261 in.
Target : Velocity = 2331 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/7/2007	1:20:02 PM	240	339,845	0.6	0.03	0.06		15,879.7	Maximum drive reached: amplifier overheated. (cont'd from previous page)
8/7/2007	1:23:32 PM	60	398,045	0.8	0.04	0.06		12,560.6	Test stopped.

Specimen: 974-3.4 **Material:** 85% TiB / 15% Ti **Thickness:** 0.12925 in. to 0.1261 in.
Target : Velocity = 2331 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/7/2007	1:28:52 PM	60	60	770.8	3.18	1.38		12,543.5	Restart
8/7/2007	1:29:00 PM	60	540	1546.2	51.27	45.91		12,518.4	
8/7/2007	1:30:01 PM	295	18,300	1594.0	54.93	49.32		12,997.2	
8/7/2007	1:35:01 PM	295	106,800	1594.5	54.79	49.15		16,787.4	
8/7/2007	1:40:01 PM	295	195,300	1593.9	54.73	49.09		18,375.5	
8/7/2007	1:45:01 PM	296	269,955	0.6	0.07	0.03		21,485.5	
8/7/2007	1:47:51 PM	300	320,935	0.7	0.07	0.03		18,425.8	Maximum drive reached - amplifier overheated.

Specimen: 974-3.4 **Material:** 85% TiB / 15% Ti **Thickness:** 0.12925 in. to 0.1261 in.
Target : Velocity = 2331 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/7/2007	2:17:07 PM	300	300	757.8	3.03	1.25		18,549.9	Restart
8/7/2007	2:20:03 PM	295	52,300	1594.6	55.09	49.45		17,700.6	
8/7/2007	2:25:03 PM	295	140,800	1594.7	54.92	49.28		15,573.6	
8/7/2007	2:30:04 PM	295	229,300	1594.4	54.85	49.21		15,117.2	
8/7/2007	2:35:03 PM	295	317,800	1594.4	54.78	49.15		15,454.1	
8/7/2007	2:39:04 PM	295	388,600	1594.3	54.73	49.10		16,798.5	
8/7/2007	2:40:03 PM	120	401,930	0.7	0.03	0.03		20,802.7	Maximum drive reached - amplifier overheated.
8/7/2007	2:45:04 PM	297	445,125	0.6	0.03	0.03		17,391.8	
8/7/2007	2:46:13 PM	300	467,980	0.7	0.04	0.03		17,162.0	Test stopped.

Specimen: 974-3.4 **Material:** 85% TiB / 15% Ti **Thickness:** 0.12925 in. to 0.1261 in.
Target : Velocity = 2331 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/7/2007	2:54:18 PM	300	300	837.3	5.69	3.38		17,460.8	Restart
8/7/2007	2:55:04 PM	295	13,575	1592.8	54.79	49.21		17,811.8	
8/7/2007	3:00:03 PM	295	102,075	1593.8	54.69	49.06		20,216.4	
8/7/2007	3:05:03 PM	295	190,575	1594.7	54.61	48.98		22,266.1	
8/7/2007	3:10:04 PM	295	279,075	1594.8	54.52	48.89		23,039.6	
8/7/2007	3:12:08 PM	120	302,625	1.0	0.03	0.03		26,735.7	Maximum drive reached - amplifier overheated.

Specimen: 974-3.4 **Material:** 85% TiB / 15% Ti **Thickness:** 0.12925 in. to 0.1261 in.
Target : Velocity = 2331 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/7/2007	3:22:02 PM	120	120	744.3	1.82	1.33		22,834.1	Restart
8/7/2007	3:25:02 PM	295	53,220	1594.1	54.48	48.91		28,288.1	
8/7/2007	3:30:02 PM	295	141,720	1594.2	54.42	48.81		34,467.6	
8/7/2007	3:35:03 PM	295	230,220	1593.7	54.32	48.69		39,182.9	
8/7/2007	3:40:02 PM	295	318,720	1594.9	54.29	48.65		8,569.1	
8/7/2007	3:45:02 PM	295	407,220	1594.5	54.22	48.57		19,135.2	
8/7/2007	3:50:03 PM	295	495,720	1594.7	54.17	48.53		27,760.7	
8/7/2007	3:55:02 PM	295	584,220	1594.1	54.16	48.52		30,645.7	
8/7/2007	4:00:02 PM	295	672,720	1594.1	54.10	48.45		26,369.0	
8/7/2007	4:05:03 PM	295	761,220	1593.7	54.02	48.38		24,094.2	
8/7/2007	4:10:02 PM	295	849,720	1594.5	53.94	48.30		20,157.3	
8/7/2007	4:15:07 PM	295	939,695	1594.4	53.84	48.19		17,422.6	
8/7/2007	4:20:03 PM	295	1,026,720	1594.1	53.86	48.20		17,415.4	
8/7/2007	4:25:02 PM	295	1,115,220	1594.5	53.80	48.14		13,036.8	
8/7/2007	4:30:02 PM	295	1,203,720	1594.6	53.66	48.00		2,461.1	
8/7/2007	4:35:03 PM	295	1,292,220	1593.9	53.66	48.00		20,251.8	
8/7/2007	4:40:02 PM	120	1,342,275	1.0	0.03	0.03		21,158.7	Maximum drive reached - amplifier overheated.
8/7/2007	4:55:02 PM	120	1,453,875	1.0	0.03	0.03		20,976.0	continued on next page

Specimen: 974-3.4 **Material:** 85% TiB / 15% Ti **Thickness:** 0.12925 in. to 0.1261 in.
Target : Velocity = 2331 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/7/2007	5:10:02 PM	120	1,565,475	1.0	0.03	0.03		20,905.4	continued from previous page
8/7/2007	5:23:27 PM	120	1,672,875	1.0	0.03	0.03		20,870.0	Test stopped.

Specimen: 974-3.4 **Material:** 85% TiB / 15% Ti **Thickness:** 0.12925 in. to 0.1261 in.
Target : Velocity = 2331 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/7/2007	5:29:00 PM	120	120	753.2	1.86	1.07		24,870.9	Restart
8/7/2007	5:30:01 PM	295	17,820	1594.2	53.70	48.26		26,318.7	
8/7/2007	5:45:01 PM	295	283,320	1594.1	53.71	47.99		30,639.6	Maximum drive reached - amplifier overheated.
8/7/2007	6:00:01 PM	295	548,820	1594.2	53.46	47.71		3,412.2	Test continued to run overnight at less than the desired strains.
8/7/2007	6:15:01 PM	120	703,630	1.0	0.03	0.03		5,497.0	
8/7/2007	7:00:01 PM	120	1,050,430	0.9	0.03	0.02		5,647.7	
8/7/2007	8:00:02 PM	120	1,501,630	1.0	0.03	0.02		5,677.3	
8/7/2007	9:00:01 PM	120	1,951,630	1.0	0.03	0.02		5,656.9	
8/7/2007	10:00:01 PM	120	2,403,430	1.0	0.03	0.02		5,636.3	
8/7/2007	11:00:01 PM	120	2,846,830	1.0	0.03	0.02		5,625.3	
8/8/2007	12:00:00 AM	120	3,296,230	1.0	0.03	0.02		5,615.7	
8/8/2007	1:00:01 AM	120	3,820,630	1.0	0.03	0.02		5,610.4	
8/8/2007	2:00:01 AM	120	4,268,230	1.0	0.04	0.02		5,600.0	
8/8/2007	3:00:01 AM	120	4,715,230	1.0	0.04	0.02		5,595.0	
8/8/2007	4:00:01 AM	120	5,162,230	1.0	0.04	0.02		5,589.7	
8/8/2007	5:00:01 AM	120	5,613,430	1.0	0.04	0.02		5,584.6	
8/8/2007	6:00:01 AM	120	6,062,230	1.0	0.04	0.02		5,579.5	
8/8/2007	7:00:01 AM	120	6,509,830	1.0	0.04	0.02		5,574.4	
8/8/2007	8:00:01 AM	300	7,550,625	1.0	0.04	0.03		1,300.5	
8/8/2007	8:30:01 AM	300	8,090,625	1.1	0.04	0.03		1,320.2	
8/8/2007	8:38:21 AM	300	8,240,625	1.1	0.04	0.03		1,314.0	Test stopped when technician arrived in morning.

Specimen: 974-3.4

Material: 85% TiB / 15% Ti

Thickness: 0.12925 in. to 0.1261 in.

Target : Velocity = 2331 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain ($\mu\epsilon$)	Amplitude (mils rms)	Comments
8/8/2007	8:43:49 AM	300	300	698.2	1.47	1.10		1,412.1	Restart
8/8/2007	8:45:00 AM	295	20,950	1593.8	54.38	48.69		2,083.9	
8/8/2007	8:50:00 AM	295	109,450	1593.9	54.23	48.51		1,520.0	
8/8/2007	8:55:00 AM	295	197,950	1594.1	54.04	48.31		1,096.0	
8/8/2007	9:00:00 AM	295	286,450	1594.5	53.94	48.21		3,554.2	
8/8/2007	9:05:00 AM	295	374,950	1594.2	53.87	48.14		3,007.2	
8/8/2007	9:10:00 AM	120	453,640	0.7	0.01	0.02		5,400.4	
8/8/2007	9:15:05 AM	120	494,440	0.7	0.01	0.02		5,612.1	
8/8/2007	9:20:00 AM	120	531,040	0.7	0.01	0.02		5,677.8	
8/8/2007	9:23:35 AM	120	559,240	0.7	0.01	0.02		5,708.0	Maximum drive reached - amplifier overheated.

Specimen: 974-3.4

Material: 85% TiB / 15% Ti

Thickness: 0.12925 in. to 0.1261 in.

Target : Velocity = 2331 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain ($\mu\epsilon$)	Amplitude (mils rms)	Comments
8/8/2007	9:40:04 AM	120	120	736.3	1.80	1.09		2,146.2	Restart
8/8/2007	9:45:05 AM	295	88,620	1594.2	53.75	48.13		5,127.7	
8/8/2007	9:50:04 AM	295	177,120	1594.1	53.70	48.01		9,039.9	
8/8/2007	9:55:00 AM	295	264,145	1594.1	53.64	47.91		11,120.6	
8/8/2007	10:00:04 AM	295	354,120	1594.5	53.58	47.83		16,984.9	
8/8/2007	10:05:04 AM	295	442,620	1594.7	53.52	47.77		23,695.4	
8/8/2007	10:10:05 AM	295	531,120	1594.7	53.51	47.75		27,330.3	
8/8/2007	10:15:04 AM	295	619,620	1594.3	53.43	47.65		31,831.4	
8/8/2007	10:20:00 AM	295	706,645	1594.6	53.25	47.47		37,424.8	
8/8/2007	10:25:05 AM	295	796,620	1594.9	53.24	47.46		5,498.7	
8/8/2007	10:27:39 AM	120	828,150	1.0	0.07	0.03		10,703.6	Maximum drive reached - amplifier overheated.

Specimen: 974-3.4

Material: 85% TiB / 15% Ti

Thickness: 0.12925 in. to 0.1261 in.

Target : Velocity = 2331 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/8/2007	10:55:44 AM	120	120	794.9	3.12	1.23		7,126.7	Restart
8/8/2007	11:00:04 AM	295	76,820	1594.1	53.23	47.65		6,781.7	
8/8/2007	11:05:00 AM	295	163,845	1594.4	53.19	47.52		2,619.6	
8/8/2007	11:10:00 AM	295	252,345	1594.8	53.13	47.40		2,083.4	
8/8/2007	11:15:04 AM	295	342,320	1594.4	53.15	47.39		7,644.6	
8/8/2007	11:20:00 AM	295	429,345	1593.8	53.15	47.37		10,484.3	
8/8/2007	11:25:05 AM	295	519,320	1594.5	53.10	47.30		8,688.8	
8/8/2007	11:30:00 AM	295	606,345	1594.9	53.06	47.26		3,824.0	
8/8/2007	11:35:00 AM	295	694,845	1594.7	52.97	47.17		1,439.5	
8/8/2007	11:40:05 AM	295	784,820	1594.7	52.88	47.08		5,206.7	
8/8/2007	11:45:00 AM	295	871,845	1594.2	52.90	47.10		10,274.9	
8/8/2007	11:50:00 AM	295	960,345	1594.6	52.86	47.06		13,478.9	
8/8/2007	11:54:30 AM	120	1,032,480	0.7	0.03	0.01		11,032.7	Maximum drive reached - amplifier overheated.

Specimen: 974-3.4

Material: 85% TiB / 15% Ti

Thickness: 0.12925 in. to 0.1261 in.

Target : Velocity = 2331 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/8/2007	1:14:04 PM	240	240	972.4	11.28	8.32		14,324.9	Restart
8/8/2007	1:15:05 PM	295	17,940	1593.5	53.41	47.66		13,677.2	
8/8/2007	1:20:00 PM	295	104,965	1594.3	52.76	47.02		9,059.1	
8/8/2007	1:25:00 PM	295	193,465	1594.4	52.58	46.84		14,221.9	
8/8/2007	1:30:05 PM	295	283,440	1594.5	52.48	46.74		19,986.9	
8/8/2007	1:35:00 PM	295	370,465	1594.2	52.44	46.69		23,460.9	
8/8/2007	1:38:20 PM	120	420,180	0.7	0.03	0.01		22,514.2	Maximum drive reached - amplifier overheated.

Specimen: 974-3.4 **Material:** 85% TiB / 15% Ti **Thickness:** 0.12925 in. to 0.1261 in.
Target : Velocity = 2331 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/8/2007	1:59:18 PM	240	240	763.1	2.09	1.06		21,764.8	Restart
8/8/2007	2:00:04 PM	295	13,515	1593.6	52.27	46.73		22,187.6	
8/8/2007	2:05:04 PM	295	102,015	1594.8	52.24	46.60		20,116.0	
8/8/2007	2:10:03 PM	295	190,515	1594.2	52.35	46.65		20,254.0	
8/8/2007	2:15:04 PM	295	279,015	1594.4	52.37	46.63		26,148.5	
8/8/2007	2:20:03 PM	295	367,515	1594.6	52.35	46.58		29,931.7	
8/8/2007	2:25:04 PM	295	456,015	1594.8	52.30	46.52		26,695.3	
8/8/2007	2:28:04 PM	120	501,945	0.7	0.03	0.01		24,054.6	Maximum drive reached - amplifier overheated.

Specimen: 974-3.4 **Material:** 85% TiB / 15% Ti **Thickness:** 0.12925 in. to 0.1261 in.
Target : Velocity = 2331 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/8/2007	2:45:34 PM	120	120	772.4	2.10	1.10		23,406.0	Restart
8/8/2007	2:50:00 PM	295	78,295	1594.9	52.25	46.49		23,778.4	
8/8/2007	2:55:00 PM	295	166,795	1594.2	52.08	46.32		19,435.6	
8/8/2007	3:00:00 PM	295	255,295	1594.2	52.01	46.24		14,072.7	
8/8/2007	3:05:00 PM	295	343,795	1594.5	51.92	46.14		8,440.5	
8/8/2007	3:10:05 PM	120	426,860	0.9	0.03	0.03		9,912.7	
8/8/2007	3:10:55 PM	120	434,060	1.0	0.03	0.03		9,907.7	Maximum drive reached - amplifier overheated.

Specimen: 974-3.4 **Material:** 85% TiB / 15% Ti **Thickness:** 0.12925 in. to 0.1261 in.
Target : Velocity = 2331 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/8/2007	3:40:26 PM	120	120	786.7	2.36	1.04		9,302.9	Maximum drive reached - amplifier overheated.

Specimen: 974-3.4

Material: 85% TiB / 15% Ti

Thickness: 0.12925 in. to 0.1261 in.

Target : Velocity = 2331 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain ($\mu\epsilon$)	Amplitude (mils rms)	Comments
8/8/2007	6:00:35 PM	120	120	1078.2	15.19	11.89		10,897.4	Restart
8/8/2007	6:15:01 PM	295	255,295	1594.2	51.41	45.63		39,314.5	
8/8/2007	6:30:01 PM	295	520,795	1594.3	51.46	45.63		13,723.7	Maximum drive reached - amplifier overheated.
8/8/2007	6:45:01 PM	120	635,960	1.0	0.03	0.03		14,201.3	Test continued to run overnight at less than the desired strains.
8/8/2007	7:00:01 PM	120	754,160	1.0	0.03	0.03		14,196.4	
8/8/2007	8:00:00 PM	120	1,219,160	1.0	0.03	0.02		14,171.4	
8/8/2007	9:00:00 PM	120	1,681,760	1.0	0.03	0.02		14,182.1	
8/8/2007	10:00:00 PM	120	2,147,360	1.0	0.03	0.02		14,197.4	
8/8/2007	11:00:01 PM	120	2,611,160	1.0	0.03	0.02		14,212.8	
8/9/2007	12:00:00 AM	120	3,068,360	1.0	0.03	0.02		14,230.4	
8/9/2007	1:00:00 AM	120	3,520,160	1.0	0.03	0.02		14,240.7	
8/9/2007	2:00:00 AM	120	4,064,360	1.0	0.04	0.02		14,251.2	
8/9/2007	3:00:01 AM	120	4,587,560	1.0	0.03	0.02		14,261.4	
8/9/2007	4:00:01 AM	240	5,032,760	1.0	0.04	0.02		14,266.5	
8/9/2007	5:00:00 AM	120	5,480,960	0.9	0.04	0.02		14,271.7	
8/9/2007	6:00:00 AM	120	5,938,160	1.0	0.04	0.02		14,276.9	
8/9/2007	7:00:00 AM	120	6,388,760	1.1	0.04	0.02		14,282.0	
8/9/2007	8:00:01 AM	300	7,430,655	1.4	0.04	0.03		13,225.2	
8/9/2007	8:30:40 AM	300	7,982,655	1.5	0.04	0.03		13,222.1	Test stopped when technician arrived in morning.

Specimen: 974-3.4

Material: 85% TiB / 15% Ti

Thickness: 0.12925 in. to 0.1261 in.

Target : Velocity = 2331 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain ($\mu\epsilon$)	Amplitude (mils rms)	Comments
8/9/2007	8:35:03 AM	300	300	757.0	2.34	0.85		13,247.1	Restart
8/9/2007	8:40:04 AM	295	88,800	1594.4	52.15	46.36		13,200.7	
8/9/2007	8:45:03 AM	295	177,300	1594.1	51.97	46.18		14,204.7	
8/9/2007	8:50:03 AM	295	265,800	1594.0	51.86	46.06		16,939.5	
8/9/2007	8:55:04 AM	295	354,300	1594.4	51.78	45.99		12,076.3	
8/9/2007	9:00:03 AM	295	442,800	1594.4	51.65	45.85		911.6	continued on next page

Specimen: 974-3.4 **Material:** 85% TiB / 15% Ti **Thickness:** 0.12925 in. to 0.1261 in.
Target : Velocity = 2331 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/9/2007	9:05:03 AM	120	527,280	0.9	0.03	0.02		4,914.8	continued from previous page
8/9/2007	9:06:44 AM	300	554,440	1.2	0.03	0.03		5,409.1	Maximum drive reached - amplifier overheated.

Specimen: 974-3.4 **Material:** 85% TiB / 15% Ti **Thickness:** 0.12925 in. to 0.1261 in.
Target : Velocity = 2331 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/9/2007	9:24:55 AM	300	300	936.4	8.17	5.35		39,633.3	Restart
8/9/2007	9:25:01 AM	295	1,775	1478.2	42.66	37.44		39,204.4	
8/9/2007	9:30:00 AM	295	90,275	1594.3	51.49	45.70		39,169.2	
8/9/2007	9:35:01 AM	295	178,775	1594.5	51.63	45.82		1,350.7	
8/9/2007	9:40:00 AM	295	267,275	1594.8	51.58	45.77		943.1	
8/9/2007	9:45:01 AM	295	355,775	1595.0	51.56	45.75		4,664.8	
8/9/2007	9:50:01 AM	295	444,275	1594.1	51.53	45.71		13,303.2	
8/9/2007	9:55:00 AM	295	532,775	33.0	0.04	0.11		16,817.1	
8/9/2007	9:55:46 AM	240	538,270	0.7	0.03	0.03		16,965.9	Maximum drive reached - amplifier overheated.

Specimen: 974-3.4 **Material:** 85% TiB / 15% Ti **Thickness:** 0.12925 in. to 0.1261 in.
Target : Velocity = 2331 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/9/2007	10:15:30 AM	120	120	838.2	3.92	1.68		17,633.3	Restart
8/9/2007	10:20:00 AM	295	79,770	1594.5	51.70	45.89		17,055.6	
8/9/2007	10:25:00 AM	295	168,270	1594.4	51.59	45.78		14,345.4	
8/9/2007	10:30:00 AM	295	256,770	1594.8	51.49	45.69		9,688.5	
8/9/2007	10:35:00 AM	295	345,270	1594.5	51.38	45.57		5,102.4	
8/9/2007	10:40:00 AM	295	433,770	1594.0	51.33	45.52		4,736.9	
8/9/2007	10:42:39 AM	120	470,825	0.7	0.03	0.03		4,978.5	Max. drive reached: amplifier overheated. (cont'd from previous page)

Specimen: 974-3.4 **Material:** 85% TiB / 15% Ti **Thickness:** 0.12925 in. to 0.1261 in.
Target : Velocity = 1600 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/9/2007	3:56:06 PM	10	10	203.4	2.01	2.95		6,994.0	Switched to 12K shaker.
8/9/2007	3:56:10 PM	10	50	338.7	37.85	49.00		6,799.2	
8/9/2007	3:56:11 PM	10	60	1067.8	70.15	75.16		25,780.7	
8/9/2007	3:56:16 PM	10	100	12.7	0.47	0.06		28,934.8	
8/9/2007	3:56:20 PM	10	140	10.4	0.47	0.03		28,851.1	
8/9/2007	3:56:25 PM	10	190	8.1	0.47	0.03		28,795.2	Specimen failed on ramp up to test conditions.

Specimen: 974-3.5 **Material:** 85% TiB / 15% Ti **Thickness:** 0.126 in.
Target: Velocity = 141.44 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/10/2007	10:16:20 AM	10	10	37.7	0.49	0.13	49.4	13,411.2	Trial to determine shaker settings.
8/10/2007	10:16:30 AM	10	100	106.6	0.53	0.32	139.5	13,411.0	
8/10/2007	10:16:37 AM	10	170	98.1	0.53	0.34	128.9	13,411.8	
8/10/2007	10:16:42 AM	302	1,680	98.0	0.52	0.29	128.6	13,411.7	
8/10/2007	10:16:52 AM	301	4,690	106.2	0.53	0.31	139.1	13,411.7	
8/10/2007	10:17:02 AM	301	7,700	107.7	0.53	0.32	141.0	13,412.0	
8/10/2007	10:17:11 AM	301	10,715	106.4	0.53	0.31	139.4	13,412.0	
8/10/2007	10:17:22 AM	301	13,730	98.7	0.54	0.35	129.9	13,411.5	
8/10/2007	10:17:32 AM	301	16,745	98.9	0.54	0.36	129.9	13,411.2	
8/10/2007	10:17:42 AM	300	19,750	1.2	0.48	0.05	5.1	13,413.0	

Specimen: 974-3.5 **Material:** 85% TiB / 15% Ti **Thickness:** 0.126 in.
Target: Velocity = 282.88 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/10/2007	10:20:26 AM	300	300	59.8	0.50	0.21	78.6	13,414.3	Trial to determine shaker settings.
8/10/2007	10:20:30 AM	300	1,500	196.8	0.73	0.79	258.4	13,414.2	
8/10/2007	10:20:35 AM	300	3,000	198.9	0.74	0.82	261.1	13,413.6	continued on next page

Specimen: 974-3.5 **Material:** 85% TiB / 15% Ti **Thickness:** 0.126 in.
Target: Velocity = 282.88 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/10/2007	10:20:42 AM	302	5,110	199.5	0.75	0.84	262.0	13,414.6	continued from previous page
8/10/2007	10:20:47 AM	301	6,615	203.4	0.74	0.81	266.5	13,416.7	
8/10/2007	10:20:52 AM	301	8,120	199.1	0.71	0.77	260.8	13,416.6	
8/10/2007	10:20:58 AM	301	9,625	198.9	0.71	0.77	260.5	13,417.8	
8/10/2007	10:21:02 AM	301	11,130	199.2	0.71	0.78	261.6	13,416.3	
8/10/2007	10:21:07 AM	301	12,635	198.9	0.71	0.78	261.3	13,417.9	
8/10/2007	10:21:12 AM	301	14,140	185.3	0.67	0.71	242.9	13,418.1	
8/10/2007	10:21:17 AM	300	15,640	0.8	0.48	0.05	8.1	13,416.5	

Specimen: 974-3.5 **Material:** 85% TiB / 15% Ti **Thickness:** 0.126 in.
Target: Velocity = 467.11 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/10/2007	10:27:03 AM	300	300	518.5	2.39	3.03	679.9	13,422.5	Start of test.
8/10/2007	10:28:03 AM	300	18,005	1.5	0.52	0.04	4.6	13,335.8	
8/10/2007	10:29:02 AM	300	36,005	0.9	0.52	0.04	6.7	13,335.1	
8/10/2007	10:30:03 AM	300	54,005	0.8	0.52	0.04	7.4	13,335.1	
8/10/2007	10:31:02 AM	300	72,005	0.8	0.52	0.04	4.8	13,345.0	
8/10/2007	10:32:03 AM	300	90,005	0.8	0.52	0.04	3.3	13,334.9	
8/10/2007	10:33:02 AM	300	108,005	0.8	0.52	0.04	4.7	13,340.0	
8/10/2007	10:34:03 AM	300	126,005	0.9	0.52	0.04	5.6	13,340.1	
8/10/2007	10:34:58 AM	400	144,805	0.8	0.52	0.04	7.4	13,345.1	Test stopped: Vrms not controlling steady.

Specimen: 974-3.5 **Material:** 85% TiB / 15% Ti **Thickness:** 0.126 in.
Target: Velocity = 467.11 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/10/2007	10:35:05 AM	400	400	182.6	1.69	1.92	241.5	13,349.0	Restart test.
8/10/2007	10:35:06 AM	400	800	330.7	3.09	3.58	436.4	13,350.3	
8/10/2007	10:35:07 AM	400	1,200	453.3	4.02	4.73	597.8	13,349.9	
8/10/2007	10:35:08 AM	400	1,600	464.2	4.10	4.82	611.6	13,350.4	continued on next page

Specimen: 974-3.5 **Material:** 85% TiB / 15% Ti **Thickness:** 0.126 in.
Target: Velocity = 467.11 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/10/2007	10:40:00 AM	302	90,420	464.5	3.95	4.67	609.0	13,156.1	continued from previous page
8/10/2007	10:45:00 AM	302	180,985	466.0	4.05	4.77	612.0	12,921.3	
8/10/2007	10:50:00 AM	302	271,530	465.1	4.17	4.89	612.4	11,857.9	
8/10/2007	10:55:00 AM	302	362,075	464.7	4.28	5.00	611.5	10,751.4	
8/10/2007	11:00:00 AM	302	452,620	466.1	4.21	4.94	612.4	10,271.7	
8/10/2007	11:05:00 AM	302	543,090	471.3	4.35	5.08	621.3	9,997.8	
8/10/2007	11:10:00 AM	301	633,565	471.6	4.50	5.24	621.5	9,619.7	
8/10/2007	11:15:00 AM	302	724,045	462.2	4.56	5.29	608.7	9,375.8	
8/10/2007	11:20:00 AM	302	814,520	461.3	4.64	5.37	607.8	9,126.4	
8/10/2007	11:25:00 AM	302	904,995	464.0	4.69	5.43	613.1	8,851.6	
8/10/2007	11:30:00 AM	301	995,415	491.9	2.52	3.25	637.5	8,582.7	
8/10/2007	11:35:00 AM	301	1,085,585	468.2	2.46	3.16	606.6	8,094.5	
8/10/2007	11:40:00 AM	300	1,175,710	350.2	2.48	3.00	456.1	7,689.4	
8/10/2007	11:45:00 AM	300	1,265,745	469.5	2.48	3.18	607.4	7,363.7	
8/10/2007	11:47:20 AM	300	1,307,745	1.3	0.48	0.08	7.2	7,336.2	Test stopped: strain gage wire interfered with laser vibrometer measurement.

Specimen: 974-3.5 **Material:** 85% TiB / 15% Ti **Thickness:** 0.126 in.
Target: Velocity = 467.11 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/10/2007	11:49:02 AM	300	300	31.9	0.50	0.19	42.3	17.0	Restart test.
8/10/2007	11:49:03 AM	300	600	83.8	0.62	0.53	108.5	44.0	
8/10/2007	11:49:04 AM	300	900	135.8	0.88	0.96	176.6	71.5	
8/10/2007	11:49:05 AM	300	1,200	224.9	1.48	1.77	292.6	118.4	
8/10/2007	11:49:06 AM	300	1,500	377.0	2.55	3.12	492.3	199.1	
8/10/2007	11:49:07 AM	300	1,800	463.0	2.99	3.71	604.3	244.6	
8/10/2007	11:50:02 AM	302	18,395	477.7	3.22	3.97	623.7	419.1	
8/10/2007	11:55:02 AM	300	108,985	1.2	0.49	0.07	4.5	1,346.6	
8/10/2007	12:00:02 PM	300	198,985	1.1	0.49	0.07	10.6	1,345.7	
8/10/2007	12:05:02 PM	300	288,985	1.0	0.49	0.07	4.7	1,341.8	
									continued on next page

Specimen: 974-3.5 **Material:** 85% TiB / 15% Ti **Thickness:** 0.126 in.
Target: Velocity = 467.11 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/10/2007	12:09:17 PM	300	365,485	0.9	0.48	0.07	6.8	4.4	Test stopped: positive dwell exceeded. (cont'd from previous page)

Specimen: 974-3.5 **Material:** 85% TiB / 15% Ti **Thickness:** 0.126 in.
Target: Velocity = 467.11 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/10/2007	12:15:20 PM	300	300	18.4	0.49	0.12	24.4	35.4	Test stopped: control channel jumping.

Specimen: 974-3.5 **Material:** 85% TiB / 15% Ti **Thickness:** 0.126 in.
Target: Velocity = 467.11 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/10/2007	12:15:59 PM	300	300	465.6	3.82	4.57	611.5	248.9	Test stopped: control channel jumping.

Specimen: 974-3.5 **Material:** 85% TiB / 15% Ti **Thickness:** 0.126 in.
Target: Velocity = 467.11 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/10/2007	12:16:16 PM	300	300	465.3	3.80	4.55	610.9	251.2	Restart test.
8/10/2007	12:20:01 PM	300	68,080	1.4	0.58	0.32	6.0	44.4	
8/10/2007	12:25:02 PM	300	143,345	1.2	0.49	0.07	10.0	43.6	
8/10/2007	12:27:01 PM	300	179,345	1.1	0.49	0.08	5.8	44.2	Test stopped: control channel jumping.

Specimen: 974-3.5 **Material:** 85% TiB / 15% Ti **Thickness:** 0.126 in.
Target: Velocity = 467.11 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/10/2007	12:27:50 PM	300	300	83.2	0.53	0.18	106.1	56.4	Restart test.
8/10/2007	12:30:00 PM	298	38,855	509.1	1.00	1.17	648.1	272.5	continued on next page

Specimen: 974-3.5 **Material:** 85% TiB / 15% Ti **Thickness:** 0.126 in.
Target: Velocity = 467.11 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/10/2007	12:33:40 PM	300	104,540	1.7	0.48	0.09	6.7	24.8	Test stopped: control channel jumping. (cont'd from previous page)

Specimen: 974-3.5 **Material:** 85% TiB / 15% Ti **Thickness:** 0.126 in.
Target: Velocity = 467.11 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/10/2007	1:02:21 PM	300	300	99.8	0.53	0.38	130.4	122.8	Restart test
8/10/2007	1:03:03 PM	300	12,930	0.9	0.48	0.07	7.3	98.3	
8/10/2007	1:04:03 PM	300	30,930	0.9	0.48	0.06	7.0	97.8	
8/10/2007	1:04:58 PM	300	47,430	1.0	0.52	0.22	3.6	94.2	Test stopped: control channel jumping.

Specimen: 974-3.5 **Material:** 85% TiB / 15% Ti **Thickness:** 0.126 in.
Target: Velocity = 467.11 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/10/2007	1:05:37 PM	300	300	205.7	1.50	1.78	271.0	228.3	Restart test
8/10/2007	1:06:01 PM	303	7,560	352.0	2.70	3.26	464.9	295.6	
8/10/2007	1:07:01 PM	303	25,740	352.0	2.67	3.23	464.9	331.6	
8/10/2007	1:08:01 PM	300	43,905	0.9	0.45	0.06	4.3	334.3	
8/10/2007	1:09:01 PM	300	61,905	0.9	0.44	0.06	8.7	337.9	
8/10/2007	1:10:02 PM	300	79,905	0.9	0.44	0.06	5.0	334.3	
8/10/2007	1:10:22 PM	300	85,905	0.9	0.45	0.06	7.0	334.3	Test stopped: control channel jumping.

Specimen: 974-3.5 **Material:** 85% TiB / 15% Ti **Thickness:** 0.126 in.
Target: Velocity = 467.11 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/10/2007	1:13:04 PM	300	300	115.7	0.83	0.89	152.0	383.9	Restart test
8/10/2007	1:15:04 PM	303	36,660	465.5	3.58	4.34	615.0	619.4	
8/10/2007	1:20:04 PM	303	127,560	465.1	3.67	4.44	614.9	1,016.8	continued on next page

Specimen: 974-3.5 **Material:** 85% TiB / 15% Ti **Thickness:** 0.126 in.
Target: Velocity = 467.11 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/10/2007	1:25:04 PM	303	218,460	465.2	3.73	4.49	615.0	1,506.2	continued from previous page
8/10/2007	1:30:04 PM	303	309,360	465.3	3.74	4.50	614.8	2,070.2	
8/10/2007	1:35:04 PM	303	400,260	464.7	3.75	4.51	614.7	2,662.1	
8/10/2007	1:40:04 PM	303	491,160	462.5	3.78	4.54	612.4	3,901.5	
8/10/2007	1:45:04 PM	303	582,060	466.9	3.87	4.64	618.5	4,625.6	
8/10/2007	1:50:04 PM	303	672,960	464.3	3.93	4.69	615.0	4,382.2	
8/10/2007	1:55:04 PM	303	763,860	467.2	3.95	4.72	618.6	4,477.9	
8/10/2007	2:00:00 PM	303	853,245	465.7	3.97	4.74	617.3	4,931.9	
8/10/2007	2:05:04 PM	303	945,660	464.6	4.00	4.77	615.7	5,411.6	
8/10/2007	2:10:04 PM	303	1,036,560	466.5	4.07	4.85	618.2	4,967.6	
8/10/2007	2:15:04 PM	303	1,127,460	464.9	4.12	4.89	615.9	4,350.2	
8/10/2007	2:20:04 PM	303	1,218,360	468.3	4.13	4.91	620.5	3,549.9	
8/10/2007	2:25:04 PM	303	1,309,260	465.3	4.14	4.91	614.4	3,428.1	
8/10/2007	2:30:04 PM	303	1,400,160	466.5	4.14	4.91	615.5	3,948.1	
8/10/2007	2:35:04 PM	303	1,491,060	465.4	4.16	4.93	614.5	4,334.6	
8/10/2007	2:40:04 PM	303	1,581,960	465.0	4.15	4.92	614.4	5,378.1	
8/10/2007	2:45:00 PM	303	1,671,345	465.1	4.13	4.90	613.7	5,653.7	
8/10/2007	2:50:05 PM	303	1,763,760	464.3	4.16	4.92	612.7	5,353.1	
8/10/2007	2:55:04 PM	303	1,854,660	467.5	4.14	4.91	616.9	5,450.9	
8/10/2007	2:56:09 PM	300	1,874,335	1.0	0.45	0.04	3.2	5,512.2	Test stopped: control channel jumping.

Specimen: 974-3.5 **Material:** 85% TiB / 15% Ti **Thickness:** 0.126 in.
Target: Velocity = 282.88mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/10/2007	3:53:05 PM	300	300	133.6	0.71	0.63	172.4	143.5	Test stopped: control channel jumping.

Specimen: 974-3.5 **Material:** 85% TiB / 15% Ti **Thickness:** 0.126 in.
Target: Velocity = 282.88mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/10/2007	3:53:17 PM	300	300	197.8	1.60	1.79	257.5	147.2	Test stopped: control channel jumping.

Specimen: 974-3.5 **Material:** 85% TiB / 15% Ti **Thickness:** 0.126 in.
Target: Velocity = 282.88mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/10/2007	3:53:30 PM	300	300	198.8	1.57	1.77	258.1	141.0	Test stopped: control channel jumping.

Specimen: 974-3.5 **Material:** 85% TiB / 15% Ti **Thickness:** 0.126 in.
Target: Velocity = 282.88mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/10/2007	3:53:51 PM	300	300	205.0	1.53	1.73	265.7	113.8	Restart test.
8/10/2007	3:53:57 PM	291	1,755	198.8	1.51	1.70	257.6	109.1	
8/10/2007	3:54:02 PM	291	3,210	198.8	1.51	1.71	257.5	110.0	
8/10/2007	3:54:06 PM	291	4,665	199.0	1.52	1.71	257.6	114.0	
8/10/2007	3:54:11 PM	291	6,120	199.1	1.52	1.72	257.6	115.1	
8/10/2007	3:54:17 PM	291	7,575	199.1	1.53	1.72	257.7	112.5	
8/10/2007	3:54:22 PM	291	9,030	199.1	1.53	1.72	257.7	112.8	
8/10/2007	3:54:26 PM	291	10,485	198.9	1.53	1.73	257.7	112.4	
8/10/2007	3:54:32 PM	291	11,940	198.8	1.54	1.73	257.4	114.0	
8/10/2007	3:54:37 PM	291	13,395	1.1	0.49	0.03	3.1	33.3	Test stopped: control channel jumping.

Specimen: 974-3.5 **Material:** 85% TiB / 15% Ti **Thickness:** 0.126 in.
Target: Velocity = 467.11 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/10/2007	3:58:27 PM	60	60	569.2	2.30	2.38	730.1	311.0	Restart test.
8/10/2007	4:00:03 PM	284	27,045	465.0	1.82	1.50	574.0	344.6	
8/10/2007	5:00:02 PM	284	1,049,445	465.2	1.76	1.46	572.5	9,438.7	
8/10/2007	6:00:02 PM	284	2,071,845	465.8	1.83	1.50	568.4	15,377.2	continued on next page

Specimen: 974-3.5

Material: 85% TiB / 15% Ti

Thickness: 0.126 in.

Target: Velocity = 467.11 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain ($\mu\epsilon$)	Amplitude (mils rms)	Comments
8/10/2007	7:00:03 PM	283	3,091,710	465.3	2.10	1.74	567.1	25,752.7	continued from previous page
8/10/2007	8:00:03 PM	283	4,110,510	465.1	2.04	1.73	564.6	35,810.9	
8/10/2007	9:00:03 PM	283	5,129,310	465.2	2.05	1.76	563.9	6,970.3	
8/10/2007	10:00:02 PM	283	6,148,110	465.0	2.15	1.83	565.2	37,497.3	
8/10/2007	11:00:02 PM	283	7,166,910	465.2	2.16	1.85	566.3	10,843.2	
8/11/2007	12:00:03 AM	283	8,185,710	465.3	2.18	1.88	565.6	1,614.1	
8/11/2007	1:00:03 AM	283	9,204,510	464.9	2.18	1.88	564.0	5,002.2	
8/11/2007	2:00:02 AM	283	10,223,310	465.2	2.20	1.89	566.0	9,146.4	
8/11/2007	3:00:02 AM	283	11,242,110	465.1	2.18	1.89	565.5	8,746.1	
8/11/2007	4:00:03 AM	283	12,260,910	465.2	2.23	1.94	563.7	939.8	
8/11/2007	5:00:03 AM	283	13,279,710	465.2	2.24	1.95	563.6	14,403.8	
8/11/2007	6:00:03 AM	283	14,298,510	465.2	2.26	1.96	564.1	23,283.1	
8/11/2007	7:00:02 AM	283	15,317,310	464.8	2.26	1.97	564.5	31,573.5	
8/11/2007	8:00:02 AM	283	16,336,110	465.3	2.24	1.95	559.6	37,216.7	
8/11/2007	9:00:03 AM	283	17,354,910	465.3	1.97	1.65	570.1	20,766.3	
8/11/2007	10:00:03 AM	283	18,373,710	465.2	2.02	1.73	567.5	6,798.4	
8/11/2007	11:00:02 AM	283	19,392,510	465.0	2.06	1.78	567.5	5,426.5	
8/11/2007	12:00:02 PM	283	20,411,310	465.2	2.05	1.78	566.3	15,641.3	
8/11/2007	1:00:03 PM	283	21,430,110	464.9	2.13	1.83	567.2	24,693.7	
8/11/2007	2:00:03 PM	283	22,448,910	464.8	2.15	1.84	566.0	32,645.3	
8/11/2007	3:00:02 PM	283	23,467,710	465.1	2.12	1.83	565.8	39,895.8	
8/11/2007	4:00:02 PM	283	24,486,510	465.2	2.13	1.84	564.2	31,388.2	
8/11/2007	5:00:02 PM	283	25,505,310	465.0	2.12	1.84	565.0	11,598.6	
8/11/2007	6:00:03 PM	283	26,524,110	465.0	2.13	1.85	565.3	11,513.4	
8/11/2007	7:00:03 PM	283	27,542,910	465.0	2.16	1.88	565.1	32,560.1	
8/11/2007	8:00:02 PM	282	28,560,450	465.1	2.25	1.94	565.4	27,595.8	
8/11/2007	9:00:02 PM	282	29,575,650	465.2	2.28	1.97	565.7	5,936.9	
8/11/2007	10:00:03 PM	282	30,590,850	465.2	2.28	1.98	565.5	16,565.7	
8/11/2007	11:00:03 PM	282	31,606,050	465.1	2.31	2.00	565.6	32,834.8	
8/12/2007	12:00:02 AM	282	32,621,250	465.1	2.33	2.02	566.0	39,214.5	
8/12/2007	1:00:02 AM	282	33,636,448	465.1	2.36	2.04	568.0	36,135.7	
8/12/2007	2:00:03 AM	282	34,651,648	465.2	2.36	2.04	567.6	25,078.5	
8/12/2007	3:00:03 AM	282	35,666,848	465.2	2.37	2.06	566.9	13,544.2	continued on next page

Specimen: 974-3.5

Material: 85% TiB / 15% Ti

Thickness: 0.126 in.

Target: Velocity = 467.11 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain ($\mu\epsilon$)	Amplitude (mils rms)	Comments
8/12/2007	4:00:03 AM	282	36,682,048	465.2	2.39	2.08	568.4	1,333.6	continued from previous page
8/12/2007	5:00:02 AM	282	37,697,248	465.1	2.39	2.09	567.6	14,851.3	
8/12/2007	6:00:02 AM	282	38,712,448	465.2	2.40	2.10	568.4	38,932.4	
8/12/2007	7:00:03 AM	282	39,727,648	465.3	2.42	2.12	569.4	15,687.3	
8/12/2007	8:00:03 AM	282	40,742,848	465.1	2.42	2.13	568.4	15,123.8	
8/12/2007	9:00:02 AM	282	41,758,048	465.2	2.44	2.15	567.4	39,737.9	
8/12/2007	10:00:02 AM	282	42,773,248	465.2	2.45	2.15	570.5	14,824.7	
8/12/2007	11:00:03 AM	282	43,788,448	465.1	2.45	2.16	569.7	6,815.5	
8/12/2007	12:00:03 PM	282	44,803,648	465.1	2.48	2.19	571.4	28,309.9	
8/12/2007	1:00:03 PM	282	45,818,848	465.1	2.51	2.23	573.0	28,397.6	
8/12/2007	2:00:02 PM	282	46,834,048	465.3	2.67	2.37	571.9	590.5	
8/12/2007	3:00:02 PM	282	47,849,248	465.3	2.85	2.55	570.4	29,961.9	
8/12/2007	4:00:03 PM	282	48,864,448	465.1	2.97	2.67	568.5	24,332.9	
8/12/2007	5:00:03 PM	282	49,879,648	465.0	3.09	2.78	567.4	2,810.4	
8/12/2007	6:00:02 PM	282	50,894,848	465.0	3.14	2.83	570.1	27,630.1	
8/12/2007	7:00:02 PM	282	51,910,048	465.2	3.21	2.88	567.1	27,065.9	
8/12/2007	8:00:03 PM	282	52,925,248	465.1	3.29	2.97	572.7	4,153.8	
8/12/2007	9:00:03 PM	282	53,940,448	465.0	3.37	3.06	568.9	30,696.1	
8/12/2007	10:00:02 PM	282	54,955,648	465.2	3.39	3.08	572.3	20,661.0	
8/12/2007	11:00:02 PM	282	55,970,848	465.2	3.49	3.19	578.1	13,137.4	
8/13/2007	12:00:03 AM	282	56,986,048	465.1	3.61	3.31	571.3	31,138.3	
8/13/2007	1:00:03 AM	282	58,001,248	465.1	3.62	3.34	577.3	16,883.5	
8/13/2007	2:00:03 AM	282	59,016,448	465.1	3.94	3.66	557.1	9,687.8	
8/13/2007	3:00:02 AM	282	60,031,648	465.3	4.20	3.94	1,907.8	37,514.9	
8/13/2007	4:00:02 AM	282	61,046,848	464.9	4.56	4.30	1,251.5	25,891.1	
8/13/2007	5:00:03 AM	282	62,062,048	464.1	4.67	4.40	3,917.5	19,769.2	
8/13/2007	6:00:03 AM	282	63,077,248	465.4	4.68	4.41	9,101.9	28,256.6	
8/13/2007	7:00:02 AM	282	64,092,448	465.1	4.74	4.48	7,845.0	34,124.9	
8/13/2007	8:00:02 AM	282	65,107,648	465.0	4.78	4.52	9,282.4	15,568.9	
8/13/2007	8:48:27 AM	60	65,910,288	0.8	0.48	0.02	8.9	30,801.0	

Specimen: 974-3.5 **Material:** 85% TiB / 15% Ti **Thickness:** 0.126 in.
Target: Velocity = 467.11 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/13/2007	9:06:43 AM	60	60	3.1	0.52	0.07		30,738.2	Restart - strain gage failed.
8/13/2007	9:10:02 AM	284	56,343	465.1	2.64	2.10		31,218.6	
8/13/2007	9:15:02 AM	284	141,543	465.2	2.60	2.06		31,841.9	
8/13/2007	9:20:01 AM	284	226,743	464.2	2.60	2.06		32,494.7	
8/13/2007	9:25:02 AM	284	311,943	465.8	2.58	2.03		32,068.6	
8/13/2007	9:30:02 AM	284	397,143	465.1	2.27	1.73		32,656.7	
8/13/2007	9:34:31 AM	60	471,135	1.1	0.52	0.02		32,397.9	Test stopped to remove strain gage wires.

Specimen: 974-3.5 **Material:** 85% TiB / 15% Ti **Thickness:** 0.126 in.
Target: Velocity = 467.11 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/13/2007	9:37:31 AM	60	60	162.2	2.52	2.72		2,014.9	Restart test.
8/13/2007	9:37:32 AM	60	120	405.4	4.40	4.78		2,017.9	
8/13/2007	9:37:33 AM	60	180	693.4	3.59	2.81		2,054.6	
8/13/2007	9:45:02 AM	284	127,203	465.3	3.04	2.48		424.4	
8/13/2007	10:00:02 AM	284	382,803	465.1	3.04	2.49		9,905.2	
8/13/2007	10:30:01 AM	284	893,719	465.1	3.06	2.51		18,905.0	
8/13/2007	11:00:01 AM	284	1,404,919	464.8	3.01	2.46		31,146.6	
8/13/2007	11:30:00 AM	284	1,916,119	464.9	2.99	2.44		26,791.3	
8/13/2007	12:00:00 PM	284	2,427,319	465.3	2.96	2.41		261.9	
8/13/2007	12:30:00 PM	284	2,938,519	465.1	2.97	2.41		25,973.1	
8/13/2007	1:00:00 PM	284	3,449,719	465.4	2.96	2.41		34,619.3	
8/13/2007	1:30:01 PM	284	3,960,919	465.1	2.95	2.39		13,643.3	
8/13/2007	1:31:50 PM	60	3,996,424	0.8	0.52	0.05		16,563.1	Washer on fixture failed. Repaired.

Specimen: 974-3.5 **Material:** 85% TiB / 15% Ti **Thickness:** 0.126 in.
Target: Velocity = 467.11 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
8/13/2007	1:59:46 PM	60	60	45.9	0.50	0.20		6,629.0	Restart test. (cont'd on next page)

Specimen: 974-3.5

Material: 85% TiB / 15% Ti

Thickness: 0.126 in.

Target: Velocity = 467.11 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain ($\mu\epsilon$)	Amplitude (mils rms)	Comments
8/13/2007	1:59:50 PM	60	300	369.8	1.98	2.49		6,634.5	continued from previous page
8/13/2007	1:59:55 PM	60	600	10.9	0.51	0.18		6,551.5	Trouble controlling Vrms.
8/13/2007	2:00:02 PM	300	2,220	1.3	0.48	0.05		6,552.1	
8/13/2007	2:00:07 PM	300	3,720	1.4	0.49	0.05		6,552.0	
8/13/2007	2:00:12 PM	300	5,220	1.4	0.48	0.05		6,552.1	
8/13/2007	2:00:18 PM	300	6,720	1.4	0.48	0.05		6,551.8	
8/13/2007	2:00:22 PM	300	8,220	1.4	0.48	0.05		6,551.9	
8/13/2007	2:00:27 PM	300	9,720	1.4	0.49	0.05		6,552.1	
8/13/2007	2:00:33 PM	300	11,220	1.4	0.49	0.05		6,552.1	
8/13/2007	2:00:37 PM	300	12,720	1.4	0.48	0.05		6,551.5	
8/13/2007	2:00:42 PM	300	14,220	1.4	0.49	0.05		6,552.0	
8/13/2007	2:00:47 PM	300	15,720	1.4	0.48	0.05		6,551.7	
8/13/2007	2:00:53 PM	300	17,220	1.5	0.48	0.05		6,552.2	
8/13/2007	2:00:57 PM	300	18,720	1.5	0.48	0.04		6,551.9	
8/13/2007	2:01:02 PM	300	20,220	1.5	0.48	0.05		6,552.1	
8/13/2007	2:01:08 PM	300	21,720	1.5	0.49	0.06		4.7	Test stopped.

Specimen: 974-3.5

Material: 85% TiB / 15% Ti

Thickness: 0.126 in.

Target: Velocity = 467.11 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain ($\mu\epsilon$)	Amplitude (mils rms)	Comments
8/13/2007	2:01:59 PM	300.075	300	20.4	0.50	0.16		10.9	Restart test.
8/13/2007	2:02:04 PM	302	1,810	670.0	2.54	2.80		352.7	
8/13/2007	2:02:10 PM	297	3,295	499.9	1.07	0.62		272.4	
8/13/2007	2:02:15 PM	297	4,780	474.3	1.09	0.58		265.2	
8/13/2007	2:02:19 PM	297	6,265	467.5	1.05	0.55		280.3	
8/13/2007	3:00:00 PM	297	1,033,885	465.3	0.88	0.40		10,901.3	
8/13/2007	4:00:05 PM	297	2,104,570	465.1	0.73	0.42		16,177.3	
8/13/2007	5:00:04 PM	297	3,173,770	465.3	0.74	0.39		25,357.4	
8/13/2007	6:00:04 PM	297	4,242,970	465.1	0.75	0.38		35,486.0	
8/13/2007	7:00:00 PM	297	5,310,685	465.0	0.76	0.37		39,245.6	
8/13/2007	8:00:00 PM	297	6,379,885	465.2	0.78	0.37		33,075.0	continued on next page

Specimen: 974-3.5

Material: 85% TiB / 15% Ti

Thickness: 0.126 in.

Target: Velocity = 467.11 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain ($\mu\epsilon$)	Amplitude (mils rms)	Comments
8/13/2007	9:00:05 PM	297	7,450,570	465.3	0.77	0.38		28,637.7	continued from previous page
8/13/2007	10:00:04 PM	297	8,519,770	465.3	0.76	0.39		19,777.1	
8/13/2007	11:00:04 PM	297	9,588,970	464.9	0.75	0.40		8,450.2	
8/14/2007	12:00:00 AM	297	10,656,685	464.9	0.75	0.40		4,456.8	
8/14/2007	1:00:05 AM	297	11,727,370	465.0	0.75	0.40		5,768.5	
8/14/2007	2:00:04 AM	297	12,796,570	465.1	0.73	0.41		10,196.7	
8/14/2007	3:00:04 AM	297	13,865,770	465.2	0.73	0.42		11,176.8	
8/14/2007	4:00:00 AM	297	14,933,485	465.4	0.72	0.43		5,040.8	
8/14/2007	5:00:05 AM	297	16,004,170	465.2	0.71	0.43		2,806.0	
8/14/2007	6:00:04 AM	297	17,073,370	465.2	0.73	0.43		9,387.9	
8/14/2007	7:00:04 AM	297	18,142,570	464.8	0.73	0.42		12,346.0	
8/14/2007	8:00:00 AM	297	19,210,284	465.0	0.72	0.43		17,271.4	
8/14/2007	9:00:00 AM	297	20,279,484	465.1	0.73	0.42		22,025.8	
8/14/2007	10:00:05 AM	297	21,350,164	465.2	0.72	0.42		6,466.9	
8/14/2007	11:00:04 AM	297	22,419,364	465.1	0.71	0.43		17,390.2	
8/14/2007	12:00:00 PM	297	23,487,080	465.2	0.78	0.36		21,388.8	
8/14/2007	1:00:00 PM	297	24,556,280	465.1	0.77	0.37		19,010.6	
8/14/2007	2:00:05 PM	297	25,626,964	464.8	0.77	0.37		14,158.6	
8/14/2007	3:00:04 PM	297	26,696,164	465.0	0.76	0.37		10,350.5	
8/14/2007	4:00:04 PM	297	27,765,364	465.2	0.76	0.37		6,796.0	
8/14/2007	5:00:00 PM	297	28,833,080	465.2	0.75	0.38		4,098.4	
8/14/2007	6:00:05 PM	297	29,903,764	465.0	0.76	0.37		812.4	
8/14/2007	7:00:04 PM	297	30,972,944	465.2	0.75	0.37		3,164.8	
8/14/2007	8:00:04 PM	297	32,042,140	465.1	0.72	0.39		7,062.0	
8/14/2007	9:00:00 PM	297	33,109,856	465.1	0.72	0.40		7,758.6	
8/14/2007	10:00:05 PM	297	34,180,540	465.0	0.73	0.41		4,893.3	
8/14/2007	11:00:04 PM	297	35,249,740	465.2	0.72	0.42		2,318.1	
8/15/2007	12:00:04 AM	297	36,318,940	465.0	0.72	0.42		10,926.8	
8/15/2007	1:00:00 AM	297	37,386,656	465.2	0.72	0.43		13,063.2	
8/15/2007	2:00:00 AM	297	38,455,856	465.2	0.72	0.43		20,210.4	
8/15/2007	3:00:05 AM	297	39,526,540	465.1	0.72	0.44		24,983.7	
8/15/2007	4:00:04 AM	297	40,595,736	473.3	0.81	0.38		28,387.3	
8/15/2007	5:00:00 AM	297	41,663,448	465.3	0.73	0.43		31,166.8	continued on next page

Specimen: 974-3.5

Material: 85% TiB / 15% Ti

Thickness: 0.126 in.

Target: Velocity = 467.11 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain ($\mu\epsilon$)	Amplitude (mils rms)	Comments
8/15/2007	6:00:00 AM	296	42,731,296	465.0	0.81	0.39		30,565.1	continued from previous page
8/15/2007	7:00:05 AM	296	43,798,376	465.1	0.79	0.40		30,341.5	
8/15/2007	8:00:04 AM	296	44,863,976	464.8	0.77	0.41		30,806.1	
8/15/2007	9:00:04 AM	296	45,929,576	465.0	0.77	0.42		34,113.4	
8/15/2007	10:00:00 AM	296	46,993,696	465.1	0.76	0.43		39,446.4	
8/15/2007	11:00:00 AM	296	48,059,296	465.0	0.77	0.44		351.3	
8/15/2007	12:00:05 PM	296	49,126,380	465.2	0.86	0.40		2,730.2	
8/15/2007	1:00:04 PM	296	50,191,980	465.2	0.85	0.41		1,945.0	
8/15/2007	2:00:04 PM	296	51,257,592	465.1	0.83	0.43		2,297.6	
8/15/2007	3:00:00 PM	296	52,321,712	465.1	0.78	0.44		557.0	
8/15/2007	4:00:05 PM	296	53,388,800	464.9	0.86	0.41		294.6	
8/15/2007	5:00:05 PM	296	54,454,400	465.2	0.87	0.41		12,577.3	
8/15/2007	6:00:04 PM	296	55,520,000	465.1	0.88	0.41		294.0	
8/15/2007	7:00:00 PM	296	56,584,140	464.9	0.88	0.42		1,527.3	
8/15/2007	8:00:00 PM	296	57,649,740	465.0	0.89	0.42		5,488.5	
8/15/2007	9:00:05 PM	297	58,718,560	465.0	0.90	0.46		14,535.5	
8/15/2007	10:00:04 PM	297	59,788,360	465.0	1.02	0.50		30,654.6	
8/15/2007	11:00:04 PM	297	60,857,560	464.9	0.89	0.46		39,248.7	
8/16/2007	12:00:00 AM	297	61,925,276	466.1	0.86	0.46		40,504.7	
8/16/2007	1:00:05 AM	297	62,995,960	465.1	0.92	0.45		38,071.4	
8/16/2007	2:00:04 AM	297	64,065,160	465.1	0.87	0.45		39,712.8	
8/16/2007	3:00:04 AM	297	65,134,360	465.7	0.84	0.46		40,784.4	
8/16/2007	4:00:00 AM	297	66,202,076	465.2	0.95	0.44		37,289.2	
8/16/2007	5:00:05 AM	297	67,272,760	465.6	0.92	0.44		29,749.7	
8/16/2007	6:00:04 AM	297	68,341,960	465.2	0.90	0.45		20,576.8	
8/16/2007	7:00:04 AM	297	69,411,160	465.0	0.83	0.46		10,814.5	
8/16/2007	8:00:00 AM	297	70,478,872	465.1	0.83	0.47		1,954.8	
8/16/2007	9:00:00 AM	297	71,548,072	465.4	0.86	0.46		5,569.2	
8/16/2007	10:00:05 AM	297	72,618,760	465.3	0.84	0.46		6,626.1	
8/16/2007	11:00:04 AM	296	73,687,312	465.7	1.00	0.48		2,730.9	
8/16/2007	12:00:04 PM	295	74,752,208	465.1	0.87	0.47		10,792.0	
8/16/2007	1:00:00 PM	295	75,812,736	465.2	0.95	0.48		22,487.9	
8/16/2007	2:00:05 PM	295	76,876,208	465.2	0.95	0.47		24,433.3	continued on next page

Specimen: 974-3.5

Material: 85% TiB / 15% Ti

Thickness: 0.126 in.

Target: Velocity = 467.11 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain ($\mu\epsilon$)	Amplitude (mils rms)	Comments
8/16/2007	3:00:04 PM	295	77,938,208	465.2	0.90	0.48		29,993.1	continued from previous page
8/16/2007	4:00:04 PM	295	79,000,208	465.0	0.98	0.48		39,307.3	
8/16/2007	5:00:00 PM	295	80,060,736	465.3	0.84	0.47		40,402.4	
8/16/2007	6:00:05 PM	295	81,124,208	465.0	0.90	0.46		37,975.8	
8/16/2007	7:00:04 PM	295	82,186,208	465.2	0.92	0.46		29,790.1	
8/16/2007	8:00:04 PM	295	83,248,208	465.1	0.96	0.46		6,474.2	
8/16/2007	9:00:00 PM	295	84,308,736	465.2	0.87	0.48		257.2	
8/16/2007	10:00:00 PM	295	85,370,736	465.2	0.91	0.50		1,811.2	
8/16/2007	11:00:05 PM	295	86,434,208	465.4	0.99	0.50		5,067.8	
8/17/2007	12:00:04 AM	295	87,496,208	465.0	0.99	0.51		5,228.6	
8/17/2007	1:00:00 AM	295	88,556,736	465.0	0.99	0.50		3,604.2	
8/17/2007	2:00:00 AM	295	89,618,736	465.0	0.92	0.49		2,886.7	
8/17/2007	3:00:05 AM	294	90,681,968	465.2	1.01	0.50		4,303.8	
8/17/2007	4:00:04 AM	294	91,740,368	465.1	1.02	0.51		10,744.5	
8/17/2007	5:00:04 AM	294	92,799,112	465.1	1.02	0.52		14,265.1	
8/17/2007	6:00:00 AM	294	93,856,040	465.1	0.95	0.51		13,996.0	
8/17/2007	7:00:05 AM	294	94,915,912	464.8	0.96	0.51		14,929.4	
8/17/2007	8:00:04 AM	294	95,974,312	465.2	0.99	0.52		14,859.8	
8/17/2007	9:00:04 AM	294	97,032,712	465.8	1.01	0.52		18,407.8	
8/17/2007	10:00:00 AM	294	98,089,640	465.3	0.98	0.49		23,450.1	
8/17/2007	11:00:00 AM	294	99,148,040	465.2	0.98	0.47		30,377.5	
8/17/2007	12:00:05 PM	294	100,207,912	465.7	0.84	0.47		33,886.7	
8/17/2007	1:00:04 PM	294	101,266,312	465.0	0.93	0.47		30,891.4	
8/17/2007	2:00:04 PM	294	102,324,712	465.2	0.91	0.45		31,834.3	
8/17/2007	3:00:00 PM	294	103,381,640	465.3	0.90	0.46		31,542.8	
8/17/2007	4:00:05 PM	294	104,441,512	464.8	0.89	0.45		12,181.5	
8/17/2007	5:00:04 PM	294	105,499,912	465.6	0.91	0.45		12,826.4	
8/17/2007	5:56:09 PM	120	106,476,632	0.8	0.48	0.03		33,162.0	Test stopped

Cycles to Failure

180,628,504 Run-out

Specimen: 974-3.6 **Material:** 85% TiB / 15% Ti **Thickness:** 0.125 in.
Target Acceleration: **Target Strain:** 625 $\mu\epsilon$

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain ($\mu\epsilon$)	Amplitude (mils rms)	Comments
8/22/2007									Failed during ramp-up at 211 $\mu\epsilon$.

Specimen: 974-3.7 **Material:** 85% TiB / 15% Ti **Thickness:** 0.127 in.
Target: Velocity = 100 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain ($\mu\epsilon$)	Amplitude (mils rms)	Comments
4/9/2007	11:25:12 AM	10	10	0.0	0.02	0.71	12.5	5,964.6	Trial to set shaker parameters.
4/9/2007	11:25:33 AM	60	1,210	0.0	0.02	0.71	12.4	6,233.2	
4/9/2007	11:26:02 AM	60	3,010	0.0	0.02	1.52	12.3	5,290.3	
4/9/2007	11:26:33 AM	60	4,810	0.0	0.02	0.71	6.7	2,265.1	
4/9/2007	11:27:03 AM	60	6,610	0.0	0.02	0.73	1.5	2,275.9	
4/9/2007	11:27:33 AM	60	8,410	0.0	0.02	0.73	9.4	6,272.7	
4/9/2007	11:28:03 AM	60	10,210	0.0	0.02	0.72	0.2	6,473.4	
4/9/2007	11:28:32 AM	60	12,010	0.0	0.02	0.71	57.4	3,721.8	
4/9/2007	11:29:03 AM	60	13,810	0.0	0.01	0.70	35.0	8,116.8	
4/9/2007	11:29:33 AM	60	15,610	0.0	0.02	0.70	7.2	8,122.2	
4/9/2007	11:30:03 AM	60	17,410	0.0	0.02	0.71	3.3	8,538.6	
4/9/2007	11:30:28 AM	60	18,910	0.0	0.02	0.71	1.0	8,527.2	

Specimen: 974-3.7 **Material:** 85% TiB / 15% Ti **Thickness:** 0.127 in.
Target: Velocity = 100 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain ($\mu\epsilon$)	Amplitude (mils rms)	Comments
4/9/2007	11:35:24 AM	60	60	0.0	0.04	0.78	0.2	8,535.3	
4/9/2007	11:35:29 AM	60	360	0.0	0.04	0.78	0.2	8,534.4	
4/9/2007	11:35:34 AM	60	660	0.0	0.04	0.79	0.2	8,517.0	
4/9/2007	11:35:39 AM	60	960	0.0	0.04	0.78	0.2	8,514.8	
4/9/2007	11:35:44 AM	60	1,260	0.0	0.04	0.78	0.2	8,520.5	
4/9/2007	11:35:49 AM	60	1,560	0.0	0.04	0.79	0.2	8,524.8	

Specimen: 974-3.7

Material: 85% TiB / 15% Ti

Thickness: 0.127 in.

Target: Velocity = 100 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain ($\mu\epsilon$)	Amplitude (mils rms)	Comments
4/9/2007	11:42:33 AM	60	60	1.0	0.82	41.14	66.3	6,331.3	
4/9/2007	11:42:38 AM	320	1,660	1.0	0.82	39.78	64.0	6,343.0	
4/9/2007	11:42:43 AM	320	3,260	1.0	0.82	38.89	62.6	6,335.9	
4/9/2007	11:42:48 AM	320	4,860	0.6	0.48	24.58	39.6	6,325.3	
4/9/2007	11:42:53 AM	1860	14,160	0.0	0.05	0.98	0.2	6,331.4	
4/9/2007	11:42:58 AM	1860	23,460	0.0	0.05	0.97	0.2	6,333.0	
4/9/2007	11:43:03 AM	1800	32,460	0.0	0.05	0.97	0.2	6,334.9	
4/9/2007	11:43:08 AM	1800	41,460	0.0	0.05	0.97	0.2	6,334.9	
4/9/2007	11:43:13 AM	1800	50,460	0.0	0.05	0.97	0.2	6,328.6	
4/9/2007	11:43:18 AM	1800	59,460	0.0	0.05	0.98	0.2	6,322.5	
4/9/2007	11:43:23 AM	1800	68,460	0.0	0.05	0.98	0.2	6,315.6	
4/9/2007	11:43:28 AM	1800	77,460	0.0	0.05	0.97	0.2	6,336.3	

Specimen: 974-3.7

Material: 85% TiB / 15% Ti

Thickness: 0.127 in.

Target: Velocity = 600 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain ($\mu\epsilon$)	Amplitude (mils rms)	Comments
4/9/2007	11:49:39 AM	1800	1,800	1.0	0.81	37.94	61.1	6,379.8	
4/9/2007	11:49:45 AM	320	3,400	1.0	0.81	36.88	59.3	6,389.3	
4/9/2007	11:50:00 AM	320	8,200	1.0	0.81	35.23	56.5	6,394.4	
4/9/2007	11:50:15 AM	1800	27,800	0.0	0.02	0.80	0.2	6,391.7	
4/9/2007	11:50:29 AM	1800	54,800	0.0	0.02	0.79	0.2	6,354.8	
4/9/2007	11:50:45 AM	734	71,170	0.0	0.02	0.98	1.0	6,355.9	
4/9/2007	11:51:00 AM	320	83,370	1.0	0.81	35.38	56.7	6,361.8	
4/9/2007	11:51:15 AM	1800	95,570	0.0	0.02	0.78	0.2	6,355.8	
4/9/2007	11:51:30 AM	1800	122,570	0.0	0.02	0.78	0.2	6,389.2	
4/9/2007	11:51:44 AM	1800	149,570	0.0	0.02	0.79	0.2	6,370.6	
4/9/2007	11:52:00 AM	1800	176,570	0.0	0.02	0.80	0.2	6,365.0	
4/9/2007	11:52:15 AM	1800	203,570	0.0	0.02	0.79	0.2	6,397.0	
4/9/2007	11:52:30 AM	1800	230,570	0.0	0.02	0.79	0.2	6,368.3	
4/9/2007	11:52:45 AM	1799	257,565	0.0	0.02	0.78	0.2	6,391.8	
4/9/2007	11:52:55 AM	734	270,235	0.1	0.13	1.85	2.8	6,386.1	

Specimen: 974-3.7 **Material:** 85% TiB / 15% Ti **Thickness:** 0.127 in.
Target: Velocity = 600 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
4/9/2007	11:53:18 AM	733	733	2.9	2.65	59.63	93.3	6,379.5	
4/9/2007	11:53:33 AM	320	5,533	2.9	2.65	56.51	87.9	6,372.6	
4/9/2007	11:53:48 AM	320	10,333	2.9	2.65	55.26	85.8	6,366.5	
4/9/2007	11:54:03 AM	320	15,133	2.9	2.65	54.34	84.1	6,372.1	
4/9/2007	11:54:18 AM	320	19,933	2.9	2.65	53.73	83.1	6,376.4	
4/9/2007	11:54:33 AM	320	24,733	2.9	2.65	53.24	82.2	6,366.7	
4/9/2007	11:54:48 AM	1800	36,933	0.0	0.02	0.79	0.2	6,382.4	
4/9/2007	11:55:03 AM	1800	63,933	0.0	0.02	0.78	0.2	6,386.6	
4/9/2007	11:55:18 AM	1800	90,933	0.0	0.02	0.77	0.2	6,390.9	
4/9/2007	11:55:23 AM	1800	99,933	0.0	0.02	0.78	0.2	6,391.2	

Specimen: 974-3.7 **Material:** 85% TiB / 15% Ti **Thickness:** 0.127 in.
Target: Velocity = 600 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
4/9/2007	11:58:43 AM	1800	1,800	3.2	2.93	64.54	100.9	6,363.3	
4/9/2007	11:58:58 AM	320	6,600	3.2	2.93	60.57	94.0	6,376.0	
4/9/2007	11:59:18 AM	1860	20,700	0.0	0.02	0.78	0.2	6,413.6	
4/9/2007	11:59:33 AM	1980	49,800	0.0	0.02	0.78	0.2	6,378.8	
4/9/2007	11:59:48 AM	1860	78,300	0.0	0.02	0.78	0.2	6,344.5	
4/9/2007	11:59:58 AM	1860	96,900	0.0	0.02	0.78	0.2	6,344.7	

Specimen: 974-3.7 **Material:** 85% TiB / 15% Ti **Thickness:** 0.127 in.
Target: Velocity = 600 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain (µε)	Amplitude (mils rms)	Comments
4/9/2007	2:14:35 PM	1860	1,860	0.0	26.28	2.40	124.5	1,726.5	
4/9/2007	2:14:41 PM	180	2,760	0.0	26.23	2.74	124.3	1,746.4	
4/9/2007	2:14:46 PM	180	3,660	0.0	0.05	0.71	1.0	1,674.4	
4/9/2007	2:14:51 PM	180	4,560	0.0	0.04	0.70	3.0	1,266.1	continued on next page

Specimen: 974-3.7

Material: 85% TiB / 15% Ti

Thickness: 0.127 in.

Target: Velocity = 600 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Strain ($\mu\epsilon$)	Amplitude (mils rms)	Comments
4/9/2007	2:14:56 PM	180	5,460	0.0	0.05	0.70	2.3	1,285.7	continued from previous page
4/9/2007	2:15:00 PM	180	6,360	0.0	0.05	0.71	1.9	1,282.7	
4/9/2007	2:15:06 PM	180	7,260	0.0	0.05	0.84	1.5	1,302.7	
4/9/2007	2:15:11 PM	2	7,270	0.0	0.05	0.64	1.1	1,285.2	
4/9/2007	2:15:16 PM	60	7,570	0.0	0.05	0.65	178.9	3,060.9	
4/9/2007	2:15:21 PM	60	7,870	0.0	0.05	0.76	2.1	3,727.0	
4/9/2007	2:15:25 PM	60	8,170	0.0	0.04	0.75	1.7	3,739.9	
4/9/2007	2:15:31 PM	60	8,470	0.0	0.05	0.75	1.3	3,715.2	
4/9/2007	2:15:36 PM	60	8,770	0.0	0.05	0.76	1.1	3,617.9	
4/9/2007	2:15:41 PM	60	9,070	0.0	0.05	0.76	0.8	3,610.1	
4/9/2007	2:15:46 PM	60	9,370	0.0	0.05	0.76	2.7	4,790.5	
4/9/2007	2:15:50 PM	60	9,670	0.0	0.05	0.75	2.2	5,431.8	
4/9/2007	2:15:56 PM	60	9,970	0.0	0.05	0.75	1.7	5,435.7	specimen broke.

Appendix B. Sonic Fatigue Test Results for 7-Layer Graded Material

Specimen: 996-1.2

Material: FGM

Thickness: 0.126 in.

Target: Velocity = 141.44 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain ($\mu\epsilon$)	TiB-side Strain ($\mu\epsilon$)	Amplitude (mils rms)	Comments
7/17/2007	11:00:06 AM	16	16	88.7	0.25	0.31	52.5	39.0	1,789.6	
7/17/2007	11:00:12 AM	227	1,151	99.4	0.28	0.36	58.8	43.7	1,779.9	
7/17/2007	11:00:17 AM	227	2,286	99.4	0.28	0.36	58.8	43.6	1,790.4	
7/17/2007	11:00:22 AM	227	3,421	99.6	0.29	0.36	58.9	43.6	1,796.6	
7/17/2007	11:00:26 AM	227	4,556	99.5	0.28	0.36	58.8	43.6	1,788.3	
7/17/2007	11:00:32 AM	227	5,691	98.9	0.29	0.36	58.6	43.3	1,791.3	
7/17/2007	11:00:37 AM	227	6,826	99.7	0.27	0.34	59.0	43.6	1,792.9	
7/17/2007	11:00:41 AM	227	7,961	99.5	0.27	0.34	58.9	43.5	1,778.7	
7/17/2007	11:00:47 AM	227	9,096	99.5	0.27	0.34	58.9	43.5	1,774.4	
7/17/2007	11:00:52 AM	227	10,231	99.5	0.27	0.34	58.9	43.5	1,777.3	
7/17/2007	11:00:56 AM	227	11,366	99.6	0.27	0.34	59.0	43.5	1,769.5	
7/17/2007	11:01:01 AM	227	12,501	99.5	0.27	0.34	58.9	43.4	1,774.3	
7/17/2007	11:01:07 AM	227	13,636	99.6	0.27	0.34	59.0	43.5	1,791.0	
7/17/2007	11:01:12 AM	227	14,771	99.6	0.27	0.34	58.9	43.4	1,784.7	
7/17/2007	11:01:16 AM	228	15,911	83.6	0.45	0.51	50.1	36.5	1,805.1	
7/17/2007	11:01:22 AM	228	17,051	99.6	0.54	0.61	59.8	43.6	1,801.8	
7/17/2007	11:01:27 AM	228	18,191	99.0	0.54	0.61	59.5	43.3	1,812.5	
7/17/2007	11:01:31 AM	228	19,331	99.5	0.54	0.61	59.8	43.6	1,818.4	
7/17/2007	11:01:37 AM	228	20,471	99.5	0.54	0.61	59.8	43.5	1,817.9	
7/17/2007	11:01:42 AM	228	21,611	99.5	0.54	0.61	59.8	43.5	1,817.3	
7/17/2007	11:01:47 AM	228	22,751	99.7	0.54	0.61	59.7	43.5	1,815.8	
7/17/2007	11:01:51 AM	226	23,881	0.9	0.04	0.03	1.4	0.9	1,816.1	
7/17/2007	11:01:57 AM	60	24,181	0.8	0.04	0.03	1.4	0.8	1,817.4	
7/17/2007	11:02:02 AM	60	24,481	0.9	0.04	0.03	1.4	0.9	1,821.2	
7/17/2007	11:03:02 AM	60	28,081	0.8	0.04	0.03	1.4	0.9	1,808.6	
7/17/2007	11:04:02 AM	60	31,681	0.9	0.04	0.03	1.4	0.8	1,810.9	
7/17/2007	11:05:02 AM	60	35,281	0.9	0.04	0.03	1.4	0.8	1,826.9	
7/17/2007	11:06:01 AM	60	38,881	0.9	0.03	0.03	1.4	0.9	1,798.4	
7/17/2007	11:06:06 AM	60	39,181	0.9	0.03	0.03	1.4	0.9	1,815.0	
7/17/2007	11:06:12 AM	60	39,481	0.9	0.03	0.03	1.4	0.9	1,822.8	

Specimen: 996-1.2

Material: FGM

Thickness: 0.126 in.

Target: Velocity = 2486.9 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/17/2007	11:11:32 AM	60	60	1240.2	6.03	6.96	739.3	523.7	2,060.7	Restart test
7/17/2007	11:11:38 AM	227	1,195	0.9	0.03	0.02	9.4	6.5	1,999.9	
7/17/2007	11:11:43 AM	16	1,275	0.7	0.03	0.02	1.4	0.7	2,276.9	
7/17/2007	11:11:48 AM	120	1,875	0.8	0.03	0.02	1.5	0.7	2,400.8	
7/17/2007	11:11:53 AM	120	2,475	0.8	0.03	0.02	1.5	0.7	2,444.5	
7/17/2007	11:11:58 AM	240	3,675	562.8	0.03	0.02	1.5	0.7	24,449.5	
7/17/2007	11:12:03 AM	120	4,275	1.9	0.03	0.02	1.7	0.7	30,809.2	
7/17/2007	11:12:08 AM	120	4,875	1.7	0.03	0.02	1.7	0.7	30,825.9	
7/17/2007	11:12:13 AM	120	5,475	1.5	0.03	0.02	1.6	0.7	30,843.6	
7/17/2007	11:12:18 AM	120	6,075	1.3	0.03	0.02	1.6	0.7	30,857.8	
7/17/2007	11:12:22 AM	240	7,275	1.2	0.03	0.02	1.6	0.7	30,863.8	
7/17/2007	11:12:28 AM	2	7,285	558.3	0.03	0.02	1.3	0.8	20,503.1	
7/17/2007	11:12:33 AM	9	7,330	651.1	0.03	0.02	1.3	0.8	26,612.0	
7/17/2007	11:12:38 AM	14	7,400	247.3	0.03	0.02	1.3	0.8	22,573.7	
7/17/2007	11:12:43 AM	14	7,470	1245.7	0.03	0.02	1.3	0.8	14,460.4	
7/17/2007	11:12:48 AM	15	7,545	513.5	0.03	0.02	1.4	0.8	10,551.5	
7/17/2007	11:12:53 AM	13	7,610	867.9	0.03	0.02	1.4	0.8	16,254.1	Specimen failed on ramp-up to test conditions.
7/17/2007	11:12:58 AM	16	7,690	1291.7	0.03	0.02	1.3	0.8	29,461.5	

Specimen: 996-1.3

Material: FGM

Thickness: 0.126 in.

Target: Velocity = 141.44 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/17/2007	2:15:51 PM	60	60	100.3	0.34	0.43	56.3	43.6	68.3	Condition 1
7/17/2007	2:15:56 PM	237	1,245	100.1	0.34	0.43	56.2	43.6	70.7	
7/17/2007	2:16:02 PM	237	2,430	99.5	0.34	0.43	55.8	43.3	71.9	
7/17/2007	2:16:07 PM	237	3,615	100.1	0.34	0.43	56.1	43.5	79.1	
7/17/2007	2:16:11 PM	237	4,800	100.1	0.34	0.43	56.1	43.6	81.5	
7/17/2007	2:16:17 PM	237	5,985	100.2	0.34	0.43	56.1	43.7	85.4	
7/17/2007	2:16:22 PM	237	7,170	99.8	0.34	0.43	56.0	43.5	96.0	
7/17/2007	2:16:26 PM	237	8,355	99.7	0.34	0.43	55.9	43.4	84.5	
7/17/2007	2:16:31 PM	237	9,540	99.9	0.34	0.43	56.0	43.5	85.0	
										continued on next page

Specimen: 996-1.3		Material: FGM		Thickness: 0.126 in.		Target: Velocity = 141.44 mm/s				
Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/17/2007	2:16:37 PM	237	10,725	99.6	0.34	0.43	55.8	43.3	74.0	continued from previous page
7/17/2007	2:16:41 PM	237	11,910	99.8	0.34	0.43	55.9	43.5	68.5	
7/17/2007	2:16:46 PM	237	13,095	100.0	0.34	0.43	56.0	43.5	75.6	
7/17/2007	2:16:52 PM	237	14,280	52.4	0.16	0.20	29.3	22.8	61.2	
7/17/2007	2:16:57 PM	60	14,580	0.8	0.03	0.03	1.1	1.0	52.8	
7/17/2007	2:17:01 PM	60	14,880	0.8	0.03	0.03	1.1	1.0	57.5	
7/17/2007	2:17:06 PM	60	15,180	0.8	0.03	0.03	1.1	1.0	55.6	
7/17/2007	2:17:12 PM	236	16,360	1.1	0.03	0.03	1.2	1.1	33.8	
7/17/2007	2:17:16 PM	60	16,660	0.9	0.03	0.03	1.1	1.0	23.0	
7/17/2007	2:17:21 PM	60	16,960	0.8	0.03	0.03	1.1	1.0	21.1	
7/17/2007	2:17:27 PM	60	17,260	0.9	0.03	0.03	1.1	1.0	20.7	
7/17/2007	2:17:31 PM	60	17,560	0.8	0.03	0.03	1.1	1.0	15.9	
7/17/2007	2:18:32 PM	60	21,160	0.9	0.03	0.03	1.1	1.0	2.5	
7/17/2007	2:19:31 PM	60	24,760	0.9	0.03	0.03	1.1	1.0	7.6	
7/17/2007	2:20:32 PM	60	28,360	0.8	0.03	0.03	1.1	1.0	12.7	
7/17/2007	2:21:16 PM	60	31,940	0.9	0.03	0.03	1.1	1.0	3.4	
Specimen: 996-1.3		Material: FGM		Thickness: 0.126 in.		Target: Velocity = 141.44 mm/s				
Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/17/2007	2:25:58 PM	60	60	662.0	2.69	3.27	373.2	289.0	443.2	Start of Test
7/17/2007	2:26:03 PM	235	1,235	2.5	0.07	0.03	1.7	1.3	21.3	
7/17/2007	2:26:08 PM	60	1,535	0.8	0.07	0.03	1.1	0.9	19.3	
Specimen: 996-1.3		Material: FGM		Thickness: 0.126 in.		Target: Velocity = 141.44 mm/s				
Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/17/2007	2:28:14 PM	60	60	368.5	2.13	2.45	208.7	161.5	246.2	
7/17/2007	2:28:20 PM	237	1,245	1545.3	2.81	2.34	852.0	657.2	1,039.1	
7/17/2007	2:28:25 PM	234	2,415	0.9	0.03	0.03	1.1	0.8	90.0	
7/17/2007	2:28:30 PM	60	2,715	0.8	0.03	0.03	1.2	0.9	81.6	

Specimen: 996-1.3

Material: FGM

Thickness: 0.126 in.

Target: Velocity = 141.44 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/17/2007	2:41:19 PM	60	60	558.0	1.51	2.00	310.9	238.6	383.6	
7/17/2007	2:42:00 PM	60	2,520	1376.4	2.30	1.34	748.6	580.1	938.2	
7/17/2007	2:45:00 PM	234	44,640	1381.1	2.19	1.29	762.9	590.2	948.9	
7/17/2007	3:00:01 PM	234	255,245	1365.1	2.17	1.24		584.0	3,109.7	Ti-side strain gage failed
7/17/2007	3:15:01 PM	234	465,845	1375.9	2.13	1.37		584.9	6,090.4	
7/17/2007	3:30:01 PM	234	676,445	1376.3	2.15	1.42		586.3	11,757.2	
7/17/2007	3:34:10 PM	234	734,945	1375.5	2.13	1.43		586.7	16,565.7	
7/17/2007	3:34:16 PM	234	736,115	1375.9	2.14	1.43		3.0	16,679.7	85% TiB-side strain gage failed
7/17/2007	3:34:21 PM	234	737,285	1376.3	2.14	1.43		3.0	16,759.7	
7/17/2007	4:00:01 PM	234	1,097,645	1375.7	2.19	1.45			34,790.8	
7/17/2007	5:00:00 PM	234	1,940,210	1375.6	2.02	1.40			36,169.1	
7/17/2007	6:00:00 PM	235	2,784,150	1376.2	2.02	1.41			35,995.7	
7/17/2007	7:00:01 PM	235	3,630,060	1375.9	1.95	1.38			24,498.0	
7/17/2007	8:00:01 PM	235	4,476,000	1375.2	1.90	1.38			21,201.4	
7/17/2007	9:00:00 PM	235	5,322,000	1375.8	1.98	1.42			32,978.4	
7/17/2007	10:00:00 PM	235	6,167,995	1375.5	1.94	1.42			29,548.2	
7/17/2007	11:00:01 PM	235	7,013,995	1375.2	1.95	1.44			16,878.9	
7/18/2007	12:00:01 AM	235	7,859,995	1373.0	1.88	1.39			3,215.2	
7/18/2007	1:00:00 AM	235	8,705,995	1376.0	1.89	1.43			27,550.7	
7/18/2007	2:00:00 AM	235	9,551,995	1375.9	1.92	1.45			32,766.3	
7/18/2007	3:00:01 AM	235	10,397,995	1374.9	1.95	1.47			14,985.0	
7/18/2007	4:00:01 AM	235	11,243,995	1375.7	1.97	1.49			7,308.7	
7/18/2007	5:00:00 AM	235	12,089,995	1375.7	1.92	1.47			1,032.1	
7/18/2007	6:00:00 AM	235	12,935,995	1375.5	1.94	1.49			8,043.3	
7/18/2007	7:00:00 AM	235	13,781,995	1374.4	1.94	1.49			16,345.8	
7/18/2007	8:00:01 AM	234	14,627,160	1375.9	2.03	1.58			1,241.3	
7/18/2007	9:00:01 AM	234	15,469,560	1381.7	1.90	1.71			8,322.8	
7/18/2007	10:00:00 AM	234	16,311,980	1375.1	1.96	1.68			30,926.8	
7/18/2007	11:00:00 AM	235	17,154,460	1370.3	1.85	1.59			27,990.8	
7/18/2007	12:00:01 PM	234	17,996,876	1376.1	2.02	1.72			28,418.3	
7/18/2007	1:00:01 PM	234	18,839,944	1371.8	2.00	1.62			18,617.0	
7/18/2007	2:00:00 PM	234	19,682,344	1375.8	1.97	1.66			31,808.4	
7/18/2007	3:00:00 PM	234	20,524,744	1378.5	1.89	1.65			9,956.4	
7/18/2007	4:00:00 PM	234	21,367,144	1379.2	1.92	1.66			17,537.8	continued on next page

Specimen: 996-1.3

Material: FGM

Thickness: 0.126 in.

Target: Velocity = 141.44 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/18/2007	5:00:01 PM	234	22,209,596	1376.1	1.94	1.67			27,124.5	continued from previous page
7/18/2007	6:00:01 PM	234	23,052,000	1376.0	1.97	1.67			35,619.6	
7/18/2007	7:00:00 PM	234	23,894,424	1376.7	1.95	1.68			7,803.2	
7/18/2007	8:00:00 PM	234	24,736,836	1376.0	1.98	1.69			38,846.7	
7/18/2007	9:00:01 PM	234	25,579,270	1375.9	1.94	1.67			18,829.5	
7/18/2007	10:00:01 PM	234	26,421,670	1375.6	1.97	1.68			20,243.2	
7/18/2007	11:00:01 PM	234	27,264,070	1376.3	1.96	1.67			30,329.4	
7/19/2007	12:00:00 AM	234	28,106,476	1375.5	1.96	1.66			4,946.9	
7/19/2007	1:00:00 AM	234	28,948,876	1375.8	1.95	1.67			28,875.1	
7/19/2007	2:00:01 AM	234	29,791,276	1376.4	1.96	1.68			1,202.6	
7/19/2007	3:00:01 AM	234	30,633,676	1376.3	1.98	1.70			30,307.2	
7/19/2007	4:00:00 AM	234	31,476,076	1375.6	1.98	1.70			23,740.1	
7/19/2007	5:00:00 AM	235	32,321,476	1376.3	1.96	1.69			6,466.6	
7/19/2007	6:00:00 AM	235	33,167,464	1376.0	1.96	1.69			25,672.6	
7/19/2007	7:00:01 AM	235	34,013,456	1376.1	1.96	1.69			16,555.0	
7/19/2007	8:00:01 AM	234	34,857,604	1377.0	1.94	1.61			28,902.6	
7/19/2007	9:00:00 AM	234	35,700,004	1375.8	1.88	1.59			39,298.3	
7/19/2007	10:00:00 AM	234	36,542,416	1376.4	1.93	1.68			24,669.9	
7/19/2007	11:00:01 AM	234	37,385,404	1376.6	1.90	1.66			30,566.8	
7/19/2007	12:00:01 PM	234	38,227,804	1376.3	1.94	1.69			25,397.8	
7/19/2007	1:00:00 PM	234	39,070,204	1376.5	1.92	1.68			5,593.5	
7/19/2007	2:00:00 PM	234	39,912,656	1375.9	1.85	1.62			32,745.8	
7/19/2007	3:00:00 PM	234	40,755,056	1373.2	1.91	1.53			36,442.6	
7/19/2007	4:00:01 PM	234	41,597,456	1375.4	1.83	1.51			38,230.2	
7/19/2007	5:00:01 PM	234	42,439,860	1371.9	1.84	1.53			32,790.6	
7/19/2007	6:00:00 PM	234	43,282,284	1377.0	1.89	1.60			5,424.0	
7/19/2007	7:00:00 PM	234	44,124,684	1376.1	1.91	1.61			26,334.6	
7/19/2007	8:00:00 PM	234	44,967,200	1380.5	1.94	1.65			13,686.6	
7/19/2007	9:00:01 PM	234	45,809,656	1375.8	1.86	1.60			7,686.2	
7/19/2007	10:00:01 PM	234	46,652,056	1376.1	1.89	1.62			18,279.5	
7/19/2007	11:00:00 PM	234	47,494,456	1375.9	1.90	1.63			25,451.5	
7/20/2007	12:00:00 AM	234	48,336,860	1376.1	1.87	1.63			16,188.7	
7/20/2007	1:00:00 AM	234	49,179,260	1376.0	1.91	1.66			6,366.1	
7/20/2007	2:00:01 AM	234	50,021,664	1372.6	1.82	1.59			31,196.2	continued on next page

Specimen: 996-1.3

Material: FGM

Thickness: 0.126 in.

Target: Velocity = 141.44 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/20/2007	3:00:01 AM	234	50,864,112	1376.0	1.90	1.66			28,298.7	continued from previous page
7/20/2007	4:00:00 AM	234	51,706,512	1376.0	1.93	1.68			10,722.1	
7/20/2007	5:00:00 AM	235	52,550,644	1376.5	1.91	1.68			950.5	
7/20/2007	6:00:01 AM	235	53,396,616	1376.7	1.92	1.69			24,393.8	
7/20/2007	7:00:01 AM	235	54,242,600	1376.6	1.89	1.68			38,980.2	
7/20/2007	8:00:00 AM	235	55,087,120	1376.1	1.87	1.63			29,355.2	
7/20/2007	9:00:00 AM	235	55,933,120	1376.3	1.89	1.67			30,377.4	
7/20/2007	10:00:00 AM	235	56,779,112	1375.4	1.91	1.67			37,882.4	
7/20/2007	11:00:01 AM	235	57,625,096	1375.5	1.92	1.66			39,109.0	
7/20/2007	12:00:01 PM	235	58,471,096	1375.1	1.91	1.67			39,521.8	
7/20/2007	1:00:00 PM	235	59,316,940	1375.7	1.87	1.66			29,208.4	
7/20/2007	2:00:00 PM	235	60,162,940	1375.9	1.86	1.66			22,702.9	
7/20/2007	3:00:01 PM	235	61,008,940	1375.9	1.90	1.67			16,888.6	
7/20/2007	4:00:01 PM	235	61,854,936	1374.9	1.86	1.62			10,093.5	
7/20/2007	5:00:01 PM	235	62,700,928	1375.1	1.92	1.65			28,372.5	
7/20/2007	6:00:00 PM	235	63,546,916	1375.7	1.89	1.66			25,567.8	
7/20/2007	7:00:00 PM	235	64,392,912	1375.8	1.86	1.63			3,367.7	
7/20/2007	8:00:01 PM	235	65,238,912	1375.2	1.88	1.66			32,772.6	
7/20/2007	9:00:01 PM	235	66,084,900	1376.1	1.89	1.66			39,461.4	
7/20/2007	10:00:00 PM	235	66,930,884	1375.7	1.92	1.67			20,007.7	
7/20/2007	11:00:00 PM	235	67,776,888	1376.2	1.93	1.68			11,096.4	
7/21/2007	12:00:00 AM	235	68,622,488	1375.2	1.93	1.67			4,234.9	
7/21/2007	1:00:01 AM	235	69,468,488	1374.8	1.89	1.67			23,348.8	
7/21/2007	2:00:01 AM	235	70,314,488	1375.4	1.91	1.67			32,904.0	
7/21/2007	3:00:00 AM	235	71,160,488	1376.0	1.92	1.67			1,866.7	
7/21/2007	4:00:00 AM	235	72,006,368	1375.4	1.88	1.68			29,424.5	
7/21/2007	5:00:00 AM	235	72,852,368	1376.2	1.93	1.71			32,097.4	
7/21/2007	6:00:01 AM	235	73,698,368	1375.5	1.88	1.71			29,775.9	
7/21/2007	7:00:01 AM	235	74,544,368	1375.1	1.91	1.72			38,432.2	
7/21/2007	8:00:00 AM	235	75,390,368	1375.9	1.93	1.74			4,037.8	
7/21/2007	9:00:00 AM	235	76,236,368	1375.5	1.94	1.73			31,041.2	
7/21/2007	10:00:00 AM	235	77,082,368	1376.4	1.90	1.69			1,199.4	
7/21/2007	11:00:01 AM	235	77,928,368	1376.1	1.89	1.70			6,703.6	
7/21/2007	12:00:01 PM	235	78,774,368	1376.5	1.90	1.70			4,134.7	continued on next page

Specimen: 996-1.3

Material: FGM

Thickness: 0.126 in.

Target: Velocity = 141.44 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/21/2007	1:00:00 PM	235	79,620,368	1375.2	1.87	1.68			1,040.7	continued from previous page
7/21/2007	2:00:00 PM	235	80,466,368	1375.8	1.88	1.69			9,995.2	
7/21/2007	3:00:01 PM	235	81,312,368	1376.7	1.88	1.70			15,637.4	
7/21/2007	4:00:01 PM	235	82,158,368	1375.9	1.88	1.71			15,740.1	
7/21/2007	5:00:01 PM	235	83,004,368	1376.1	1.87	1.70			9,537.7	
7/21/2007	6:00:00 PM	235	83,850,368	1375.6	1.86	1.70			8,134.8	
7/21/2007	7:00:00 PM	235	84,696,368	1376.3	1.87	1.70			11,701.3	
7/21/2007	8:00:01 PM	235	85,542,368	1377.0	1.86	1.69			13,149.5	
7/21/2007	9:00:01 PM	235	86,388,368	1375.8	1.86	1.69			14,181.3	
7/21/2007	10:00:00 PM	235	87,234,368	1376.4	1.87	1.69			21,399.0	
7/21/2007	11:00:00 PM	235	88,080,368	1376.3	1.88	1.70			24,791.1	
7/22/2007	12:00:01 AM	235	88,926,368	1375.5	1.89	1.71			19,249.1	
7/22/2007	1:00:01 AM	235	89,772,368	1376.0	1.90	1.71			7,483.1	
7/22/2007	2:00:01 AM	235	90,618,368	1375.9	1.92	1.73			4,257.2	
7/22/2007	3:00:00 AM	235	91,464,368	1376.4	1.96	1.75			36,579.1	
7/22/2007	4:00:00 AM	235	92,310,368	1376.6	1.96	1.76			5,793.0	
7/22/2007	5:00:01 AM	235	93,156,368	1376.2	1.94	1.77			29,015.9	
7/22/2007	6:00:01 AM	235	94,002,368	1374.8	1.93	1.75			31,802.3	
7/22/2007	7:00:00 AM	235	94,848,368	1375.6	1.92	1.73			34,809.9	
7/22/2007	8:00:00 AM	235	95,694,368	1375.7	1.91	1.71			9,403.0	
7/22/2007	9:00:00 AM	235	96,540,368	1375.2	1.93	1.72			21,444.4	
7/22/2007	10:00:01 AM	235	97,386,368	1375.6	1.92	1.71			39,976.8	
7/22/2007	11:00:01 AM	235	98,232,368	1375.6	1.89	1.69			10,727.8	
7/22/2007	12:00:00 PM	235	99,078,368	1376.4	1.86	1.69			27,039.3	
7/22/2007	1:00:00 PM	235	99,924,352	1372.7	1.99	1.70			27,391.8	
7/22/2007	2:00:01 PM	235	100,770,328	1376.4	1.90	1.70			33,925.5	
7/22/2007	3:00:01 PM	235	101,616,328	1375.8	1.84	1.66			37,641.5	
7/22/2007	4:00:00 PM	235	102,462,304	1375.1	1.83	1.63			12,831.2	
7/22/2007	5:00:00 PM	235	103,308,216	1375.5	1.92	1.67			21,739.3	
7/22/2007	6:00:00 PM	235	104,154,216	1374.5	1.85	1.64			28,890.6	
7/22/2007	7:00:01 PM	235	105,000,088	1376.1	1.91	1.67			1,937.2	
7/22/2007	8:00:01 PM	235	105,846,088	1375.2	1.88	1.65			18,022.5	
7/22/2007	9:00:00 PM	235	106,692,088	1375.8	1.89	1.64			1,633.9	
7/22/2007	10:00:00 PM	235	107,538,088	1376.0	1.92	1.65			26,886.8	continued on next page

Specimen: 996-1.3

Material: FGM

Thickness: 0.126 in.

Target: Velocity = 141.44 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments	
7/22/2007	11:00:01 PM	235	108,384,088	1375.7	1.95	1.66			28,801.8	continued from previous page	
7/23/2007	12:00:01 AM	235	109,230,088	1375.6	1.96	1.65			12,941.0		
7/23/2007	1:00:00 AM	235	110,076,088	1376.1	1.89	1.61			11,231.4		
7/23/2007	2:00:00 AM	235	110,922,088	1375.5	1.90	1.62			15,673.3		
7/23/2007	3:00:01 AM	235	111,768,088	1375.7	1.91	1.62			16,629.6		
7/23/2007	4:00:01 AM	235	112,614,088	1375.8	1.94	1.65			14,194.8		
7/23/2007	5:00:00 AM	235	113,460,088	1375.3	1.93	1.63			20,008.4		
7/23/2007	6:00:00 AM	235	114,306,088	1374.3	1.89	1.66			21,011.1		
7/23/2007	7:00:00 AM	235	115,152,088	1376.0	1.94	1.70			1,585.9		
7/23/2007	8:00:01 AM	235	115,998,056	1375.9	1.91	1.66			23,739.6		
7/23/2007	9:00:01 AM	235	116,843,776	1375.6	1.83	1.59			13,726.6		
7/23/2007	10:00:00 AM	234	117,687,488	1375.9	1.89	1.61			12,188.3		
7/23/2007	11:00:01 AM	234	118,530,040	1376.2	1.81	1.56			12,911.4		
7/23/2007	12:00:01 PM	234	119,372,560	1369.3	1.88	1.49			18,765.7		
7/23/2007	1:00:00 PM	234	120,215,056	1375.5	1.80	1.52			32,238.1		
7/23/2007	1:20:16 PM	60	120,481,096	0.9	0.03	0.06			20,708.2		Test stopped - run-out
Applied Load Cycles =			120,481,096	Run-out							

Specimen: 996-1.5

Material: FGM

Thickness: 0.126 in.

Target: 580 µε 85% TiB side

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
10/10/2006	12:39:19 PM	60	60		16.3		545.615	371.6		
10/10/2006	12:39:29 PM	230	2,360		23.2		619.663	420.7		
10/10/2006	12:40:30 PM	230	16,160		23.2		623.482	423.2		
10/10/2006	12:41:29 PM	230	29,960		23.2		623.12	422.4		
10/10/2006	12:42:29 PM	230	43,760		23.2		689.986	421.9		
10/10/2006	12:42:39 PM	230	46,060		23.2		521.606	416.1		
10/10/2006	12:42:49 PM	229	48,350		23.2		3489.552	413.1		

Specimen: 996-1.5

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
10/10/2006	12:45:04 PM	60	60		8.3		5318.06	329.3		Strain gages failed during previous cycling.
10/10/2006	12:45:14 PM	234	2,400		23.2		4297.003	485.5		
10/10/2006	12:45:24 PM	238	4,780		23.2		1569.714	380.2		
10/10/2006	12:45:34 PM	241	7,190		0.0		875.105	347.9		

Specimen: 996-1.5

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
11/3/2006	12:59:58 PM	10	10	0.1	0.0		0.023	0.3	0.0	Strain gages repaired
11/3/2006	1:00:06 PM	625	3,135	0.1	0.0		0.021	0.3	0.0	

Specimen: 996-1.5

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
11/3/2006	1:01:17 PM	625	625	30.8	0.0		1.072	2.2	2,179.3	

Specimen: 996-1.5

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
11/3/2006	1:01:37 PM	180	180	29.2	0.0		1.166	2.0	2,179.2	
11/3/2006	1:01:42 PM	180	1,080	29.4	0.0		1.166	2.0	2,179.2	

Specimen: 996-1.5

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
11/3/2006	1:02:06 PM	180	180	32.2	0.0		1.009	2.0	2,179.0	

Specimen: 996-1.5

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
11/3/2006	1:02:27 PM	180	180	31.7	0.0		1.061	2.0	2,179.3	
11/3/2006	1:03:03 PM	231	6,735	49.8	0.0		8.802	6.3	2,178.5	
11/3/2006	1:03:33 PM	180	12,135	31.2	0.0		0.941	2.1	2,180.3	
11/3/2006	1:04:03 PM	180	17,535	31.0	0.0		1.16	2.2	2,181.1	
11/3/2006	1:04:07 PM	180	18,435	30.8	0.0		1.088	2.0	2,180.4	

Specimen: 996-1.5

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
11/3/2006	1:14:14 PM	180	180	2174.1	7.6		501.4	341.1	1,174.9	
11/3/2006	1:14:24 PM	234	2,520	2844.9	23.2		743.4	448.2	1,539.6	
11/3/2006	1:14:34 PM	234	4,860	2848.3	23.2		744.4	448.7	966.2	
11/3/2006	1:14:44 PM	234	7,200	2850.6	23.2		942.2	449.4	1,426.6	
11/3/2006	1:14:49 PM	237	8385	2757.6	14.90		9338.0	452.7	1,308.9	Ti-side strain gage failed.
11/3/2006	1:14:54 PM	60	8,685	40.3	0.0		539.4	2.5	1,105.8	

Specimen: 996-1.5

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
11/3/2006	1:19:25 PM	60	60	2184.4	6.9			343.7	1,259.4	
11/3/2006	1:19:30 PM	234	1230	2889.4	23.01			456.0	1,505.5	
11/3/2006	1:19:35 PM	234	2400	2734.8	23.18			429.3	1,197.7	
11/3/2006	1:19:40 PM	230	3550	174.8	0.10			26.1	1,510.0	
11/3/2006	1:19:46 PM	60	3850	40.6	0.01			2.7	1,511.7	
11/3/2006	1:19:50 PM	60	4150	40.5	0.01			2.5	1,540.7	
11/3/2006	1:19:55 PM	60	4450	40.5	0.01			2.7	1,528.2	
11/3/2006	1:20:00 PM	60	4,750	40.6	0.0			2.7	1,522.0	
11/3/2006	1:21:01 PM	60	8,350	38.8	0.0			2.5	1,466.8	
11/3/2006	1:22:00 PM	233	23,765	2815.0	23.2			442.6	1,368.9	
11/3/2006	1:23:00 PM	227	37,515	2252.0	23.2			346.9	1,086.9	
11/3/2006	1:23:06 PM	225	38,640	2183.3	23.2			335.2	1,116.0	
11/3/2006	1:23:20 PM	220	41,995	951.8	8.2			142.6	1,700.7	continued on next page

Specimen: 996-1.5

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
11/3/2006	1:23:25 PM	60	42,295	40.6	0.0			2.5	1,753.6	continued from previous page
11/3/2006	1:23:50 PM	60	43,795	39.9	0.0			2.4	1,763.3	

Specimen: 996-1.5

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
11/3/2006	1:36:45 PM	60	60	307.4	14.4			458.6	2,125.2	
11/3/2006	1:36:51 PM	238	1,250	382.8	23.1			522.4	2,066.6	
11/3/2006	1:36:56 PM	238	2,440	383.5	23.2			522.7	2,052.7	
11/3/2006	1:37:04 PM	238	3,630	374.4	23.2			489.0	1,998.7	
11/3/2006	1:37:06 PM	235	4,805	363.6	23.2			444.6	1,996.2	
11/3/2006	1:37:11 PM	228	5,945	334.6	23.2			358.7	1,762.3	
11/3/2006	1:37:16 PM	222	7,055	318.6	23.2			303.9	1,688.8	
11/3/2006	1:37:21 PM	60	7,355	36.4	0.0			6.7	1,617.8	
11/3/2006	1:38:11 PM	60	10,355	35.2	0.0			6.8	132.1	
11/3/2006	1:38:16 PM	500	12,855	35.0	0.1			6.9	137.2	
11/3/2006	1:38:21 PM	500	15,355	34.7	0.1			6.8	137.0	
11/3/2006	1:38:26 PM	500	17,855	34.5	0.2			6.8	124.4	
11/3/2006	1:38:31 PM	60	18,155	34.3	0.0			6.5	123.2	
11/3/2006	1:38:36 PM	10	18,205	68.9	0.2			6.7	951.0	
11/3/2006	1:39:36 PM	34	19,380	45.3	0.7			6.8	187.4	
11/3/2006	1:40:26 PM	109	22,780	33.8	0.7			6.7	176.7	
11/3/2006	1:40:30 PM	121	23,385	33.8	0.7			6.8	173.6	
11/3/2006	1:40:36 PM	136	24,065	33.9	0.7			6.7	141.7	
11/3/2006	1:40:41 PM	153	24,830	34.1	0.7			7.1	159.8	
11/3/2006	1:40:46 PM	173	25,695	33.8	0.7			7.3	157.1	
11/3/2006	1:40:51 PM	195	26,670	33.7	0.7			8.2	168.0	
11/3/2006	1:40:55 PM	214	27,740	35.6	0.7			17.4	171.4	
11/3/2006	1:41:01 PM	243	28,955	33.0	0.7			9.8	122.5	
11/3/2006	1:41:06 PM	275	30,330	32.9	0.7			6.9	111.6	
11/3/2006	1:41:11 PM	310	31,880	32.8	0.7			6.7	111.1	
11/3/2006	1:41:16 PM	346	33,610	33.2	0.7			6.8	100.7	
11/3/2006	1:41:20 PM	381	35,515	33.2	0.7			6.8	109.8	continued on next page

Specimen: 996-1.5

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
11/3/2006	1:41:26 PM	430	37,665	32.9	0.7			6.8	107.3	continued from previous page
11/3/2006	1:41:31 PM	485	40,090	32.9	0.7			6.8	113.5	
11/3/2006	1:41:36 PM	547	42,825	32.7	0.7			6.6	126.3	
11/3/2006	1:41:41 PM	616	45,905	32.7	0.7			6.8	121.6	
11/3/2006	1:41:45 PM	679	49,300	33.3	0.7			6.9	114.0	
11/3/2006	1:41:51 PM	765	53,125	32.7	0.7			6.8	127.1	
11/3/2006	1:41:56 PM	863	57,440	32.6	0.7			6.6	126.0	
11/3/2006	1:42:01 PM	973	62,305	32.6	0.5			6.7	121.8	
11/3/2006	1:42:06 PM	60	62,605	32.6	0.0			6.8	114.7	
11/3/2006	1:43:00 PM	60	65,905	32.0	0.0			6.7	94.3	
11/3/2006	1:44:01 PM	60	69,505	33.1	0.0			6.5	1,686.2	
11/3/2006	1:45:01 PM	60	73,105	32.2	0.0			6.7	1,661.5	
11/3/2006	1:46:01 PM	60	76,705	33.5	0.0			6.5	1,686.2	
11/3/2006	1:46:51 PM	60	79,705	33.3	0.0			6.5	1,681.7	

Specimen: 996-1.5

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
11/3/2006	1:47:54 PM	60	60	375.3	23.1			497.4	1,623.1	
11/3/2006	1:47:59 PM	237	1,245	376.6	23.2			497.7	1,660.7	
11/3/2006	1:48:05 PM	237	2,430	376.8	23.2			498.0	1,738.7	
11/3/2006	1:49:00 PM	237	15,465	377.1	23.2			498.6	1,954.3	
11/3/2006	1:50:00 PM	237	29,685	377.5	23.2			494.3	2,002.5	
11/3/2006	1:51:05 PM	237	45,090	377.4	23.2			496.3	1,992.6	
11/3/2006	1:52:00 PM	237	58,125	378.0	23.2			495.7	1,994.6	
11/3/2006	1:53:04 PM	237	73,530	378.3	23.2			495.5	1,950.3	
11/3/2006	1:54:00 PM	237	86,565	378.4	23.2			495.5	1,571.7	
11/3/2006	1:55:00 PM	237	100,785	378.9	23.2			495.4	1,192.9	
11/3/2006	1:56:05 PM	237	116,190	379.0	23.2			495.4	846.2	
11/3/2006	1:57:00 PM	237	129,225	379.0	23.2			495.2	689.0	
11/3/2006	1:58:04 PM	237	144,630	379.2	23.2			495.4	328.6	
11/3/2006	1:59:00 PM	237	157,665	379.1	23.2			495.8	308.1	
11/3/2006	2:00:00 PM	237	171,885	379.7	23.2			495.4	708.0	

continued on next page

Specimen: 996-1.5

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
11/3/2006	2:15:00 PM	237	385,185	380.7	23.2			497.9	16,732.4	continued from previous page
11/3/2006	2:30:05 PM	238	599,705	385.8	23.2			516.1	20,058.6	
11/3/2006	2:42:20 PM	239	774,640	402.0	23.0			574.8	36,840.5	

Specimen: 996-1.5

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
11/3/2006	3:21:00 PM	60	60	232.0	7.5			332.7	22,573.8	
11/3/2006	3:21:05 PM	232	1,220	371.4	23.0			429.3	22,405.0	
11/3/2006	3:21:10 PM	232	2,380	373.6	23.2			431.0	22,278.0	
11/3/2006	3:21:16 PM	232	3,540	373.5	23.2			431.7	22,117.6	
11/3/2006	3:21:21 PM	232	4,700	373.9	23.2			433.1	21,835.6	
11/3/2006	3:21:25 PM	232	5,860	373.8	23.2			435.2	21,591.8	
11/3/2006	3:21:30 PM	232	7,020	373.7	23.2			436.5	21,241.8	
11/3/2006	3:21:35 PM	232	8,180	373.9	23.2			436.6	20,906.8	
11/3/2006	3:21:41 PM	232	9,340	373.8	23.2			436.2	20,571.3	
11/3/2006	3:21:46 PM	232	10,500	374.1	23.2			435.5	20,252.7	
11/3/2006	3:21:50 PM	232	11,660	374.0	23.2			435.0	20,017.6	
11/3/2006	3:21:55 PM	232	12,820	374.0	23.2			434.2	19,827.0	
11/3/2006	3:22:00 PM	232	13,980	373.9	23.2			434.0	19,729.5	
11/3/2006	3:22:06 PM	232	15,140	374.1	23.2			433.6	19,689.2	
11/3/2006	3:22:11 PM	232	16,300	374.0	23.2			434.0	19,785.3	
11/3/2006	3:22:15 PM	232	17,460	374.0	23.2			433.6	19,845.6	
11/3/2006	3:22:20 PM	232	18,620	373.9	23.2			107.8	19,971.4	85% TiB-side strain gage failed.
11/3/2006	3:22:25 PM	232	19,780	374.0	23.2				20,092.5	
11/3/2006	3:22:31 PM	232	20,940	373.9	23.2				20,229.7	
11/3/2006	3:25:01 PM	232	55,740	376.3	23.2				14,069.8	
11/3/2006	3:30:01 PM	232	125,340	377.4	23.2				3,869.6	
11/3/2006	3:35:00 PM	232	194,940	377.8	23.2				7,014.2	
11/3/2006	3:40:00 PM	232	264,540	378.1	23.2				29,498.0	
11/3/2006	3:42:00 PM	235	292,395	60.1	0.0				37,332.7	

Specimen: 996-1.5

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
11/3/2006	3:44:52 PM	60	60	271.1	11.2				37,375.8	
11/3/2006	3:44:57 PM	232	1,220	374.4	23.1				37,179.5	
11/3/2006	3:45:02 PM	232	2,380	374.3	23.2				38,093.6	
11/3/2006	3:45:07 PM	227	3,515	112.7	0.8				38,245.8	

Specimen: 996-1.5

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
11/3/2006	3:48:13 PM	60	60	241.5	9.9				2,745.4	
11/3/2006	3:48:19 PM	232	1,220	354.5	23.1				2,691.8	
11/3/2006	3:49:03 PM	232	11,660	355.8	23.2				3,032.5	
11/3/2006	3:50:04 PM	232	25,580	355.9	23.2				3,606.7	
11/3/2006	3:51:04 PM	232	39,500	355.8	23.2				5,452.6	
11/3/2006	3:52:04 PM	232	53,420	356.5	23.2				7,580.4	
11/3/2006	3:52:48 PM	234	63,870	367.1	23.2				9,131.2	

Specimen: 996-1.5

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
11/3/2006	3:54:57 PM	60	60	280.5	14.0				9,189.6	
11/3/2006	3:55:02 PM	232	1,220	357.4	23.1				9,047.6	
11/3/2006	3:55:07 PM	229	2,365	340.1	23.2				8,842.4	

Specimen: 996-1.5

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
11/3/2006	3:56:53 PM	60	60	190.7	7.0				8,730.2	
11/3/2006	3:56:59 PM	232	1,220	354.8	22.9				8,565.8	
11/3/2006	3:58:04 PM	232	16,300	357.7	23.2				3,941.4	
11/3/2006	3:59:04 PM	232	30,220	357.4	23.2				704.8	
11/3/2006	4:00:04 PM	232	44,140	356.9	23.2				2,962.2	
11/3/2006	4:01:03 PM	232	58,060	357.0	23.2				4,711.8	continued on next page

Specimen: 996-1.5

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
11/3/2006	4:02:01 PM	232	71,284	356.7	23.2				5,694.6	continued from previous page
11/3/2006	4:03:01 PM	232	85,204	356.5	23.2				5,535.2	
11/3/2006	4:04:00 PM	232	99,124	356.5	23.2				4,718.9	
11/3/2006	4:05:01 PM	232	113,044	356.2	23.2				3,114.2	
11/3/2006	4:06:01 PM	232	126,964	356.1	23.2				1,036.6	
11/3/2006	4:07:01 PM	232	140,884	356.0	23.2				1,200.7	
11/3/2006	4:08:01 PM	232	154,804	356.2	23.2				3,033.8	
11/3/2006	4:09:00 PM	232	168,724	355.9	23.2				3,894.1	
11/3/2006	4:10:01 PM	232	182,644	356.2	23.2				4,572.1	
11/3/2006	4:11:01 PM	232	196,564	356.2	23.2				5,137.9	
11/3/2006	4:12:01 PM	232	210,484	356.0	23.2				5,577.4	
11/3/2006	4:13:01 PM	232	224,404	356.2	23.2				5,891.0	
11/3/2006	4:14:00 PM	232	238,324	356.1	23.2				6,358.2	
11/3/2006	4:15:01 PM	232	252,244	356.2	23.2				6,499.8	
11/3/2006	4:16:01 PM	232	266,164	356.0	23.2				6,422.2	
11/3/2006	4:17:00 PM	232	280,084	356.1	23.2				6,818.9	
11/3/2006	4:18:01 PM	232	294,004	356.1	23.2				6,786.2	
11/3/2006	4:19:00 PM	232	307,924	356.0	23.2				7,228.9	
11/3/2006	4:20:01 PM	232	321,844	355.8	23.2				7,694.3	
11/3/2006	4:21:01 PM	232	335,764	355.8	23.2				7,548.6	
11/3/2006	4:22:00 PM	232	349,684	355.9	23.2				8,082.6	
11/3/2006	4:23:01 PM	232	363,604	355.9	23.2				9,054.9	
11/3/2006	4:23:06 PM	232	364,764	360.3	23.2				8,920.4	
11/3/2006	4:23:11 PM	236	365,944	36.0	0.0				9,059.8	

Specimen: 996-1.5

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
11/3/2006	4:30:50 PM	60	60	233.4	9.4				8,925.3	
11/3/2006	4:30:56 PM	232	1,220	351.4	23.1				8,553.5	
11/3/2006	4:31:01 PM	232	2,380	352.6	23.2				8,093.9	
11/3/2006	4:31:36 PM	232	10,500	352.6	23.2				4,398.1	
11/3/2006	4:32:01 PM	232	16,300	352.9	23.2				1,679.8	

continued on next page

Specimen: 996-1.5

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
11/3/2006	4:32:30 PM	232	23,260	353.1	23.2				1,216.8	continued from previous page
11/3/2006	4:32:46 PM	232	26,740	353.4	23.2				2,617.5	

Specimen: 996-1.5

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
11/3/2006	4:37:02 PM	60	60	278.0	14.4				9,059.4	continued on next page
11/3/2006	4:37:07 PM	232	1,220	352.7	23.1				9,034.2	
11/3/2006	4:38:02 PM	232	13,980	353.4	23.2				7,130.4	
11/3/2006	4:39:03 PM	232	27,900	353.6	23.2				6,036.0	
11/3/2006	4:40:02 PM	232	41,820	353.9	23.2				5,119.6	
11/3/2006	4:41:02 PM	232	55,740	354.1	23.2				4,476.9	

Specimen: 996-1.5

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
11/3/2006	4:42:02 PM	232	69,660	354.3	23.2				3,295.8	continued from previous page
11/3/2006	4:43:02 PM	232	83,580	354.3	23.2				2,743.0	
11/3/2006	4:44:03 PM	232	97,500	354.2	23.2				1,424.9	
11/3/2006	4:45:02 PM	232	111,420	354.4	23.2				2,331.8	
11/3/2006	5:00:02 PM	232	320,220	354.8	23.2				2,502.9	
11/3/2006	5:30:07 PM	232	738,980	354.4	23.2				522.8	
11/3/2006	6:00:07 PM	232	1,156,580	358.5	23.2				1,571.4	
11/3/2006	6:30:08 PM	232	1,574,180	359.0	23.2				3,409.7	
11/3/2006	7:00:07 PM	232	1,991,780	359.1	23.2				1,507.8	
11/3/2006	7:30:07 PM	232	2,409,380	359.3	23.2				3,354.8	
11/3/2006	8:00:08 PM	232	2,826,980	358.8	23.2				6,564.6	
11/3/2006	9:00:07 PM	232	3,662,180	359.4	23.2				7,376.2	
11/3/2006	10:00:07 PM	232	4,497,380	359.5	23.2				4,605.3	
11/3/2006	11:00:07 PM	232	5,332,580	359.8	23.2				4,699.7	
11/4/2006	12:00:07 AM	232	6,167,780	359.4	23.2				581.6	
11/4/2006	1:00:08 AM	232	7,002,980	359.5	23.2				6,832.0	
11/4/2006	2:00:07 AM	232	7,838,180	359.0	23.2				8,964.0	continued on next page

Specimen: 996-1.5

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
11/4/2006	3:00:08 AM	231	8,671,780	357.3	23.2				4,617.6	continued from previous page
11/4/2006	4:00:07 AM	231	9,503,380	357.2	23.2				283.5	
11/4/2006	4:01:07 AM	231	9,517,240	357.3	23.2				4,636.6	
11/4/2006	4:02:08 AM	231	9,531,100	357.8	23.2				8,926.6	
11/4/2006	4:03:07 AM	231	9,544,960	357.5	23.2				5,924.7	
11/4/2006	4:04:08 AM	231	9,558,820	357.4	23.2				1,331.7	
11/4/2006	4:05:07 AM	231	9,572,680	357.6	23.2				3,278.1	
11/4/2006	4:05:57 AM	231	9,584,230	357.6	23.2				6,998.1	

Specimen: 996-1.5

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
11/6/2006	9:12:43 AM	50	50	189.0	6.2				4,074.4	
11/6/2006	9:12:54 AM	232	2,370	344.2	23.2				4,736.8	
11/6/2006	9:13:09 AM	232	4,690	344.8	23.2				5,838.2	
11/6/2006	9:15:03 AM	232	32,530	345.9	23.2				3,995.3	
11/6/2006	9:30:03 AM	232	241,330	348.2	23.2				5,591.9	
11/6/2006	9:45:04 AM	229	448,130	339.4	23.2				3,314.3	
11/6/2006	10:00:04 AM	229	654,230	342.0	23.2				4,162.3	
11/6/2006	11:00:03 AM	229	1,478,630	345.3	23.2				7,678.6	
11/6/2006	12:00:04 PM	229	2,303,030	348.6	23.2				9,056.8	
11/6/2006	1:00:04 PM	229	3,127,430	349.8	23.2				4,116.6	
11/6/2006	2:00:04 PM	229	3,951,830	350.0	23.2				4,726.1	
11/6/2006	3:00:03 PM	229	4,776,230	349.8	23.2				6,365.7	
11/6/2006	4:00:04 PM	229	5,600,630	350.8	23.2				7,582.5	
11/6/2006	5:00:04 PM	229	6,425,030	350.3	23.2				2,955.4	
11/6/2006	6:00:03 PM	229	7,249,430	350.7	23.2				8,969.5	
11/6/2006	7:00:04 PM	229	8,073,830	350.9	23.2				1,861.6	
11/6/2006	8:00:03 PM	229	8,898,230	351.3	23.2				8,658.9	
11/6/2006	9:00:04 PM	229	9,722,630	350.7	23.2				5,327.1	
11/6/2006	10:00:04 PM	229	10,547,030	350.8	23.2				2,709.3	
11/6/2006	11:00:04 PM	229	11,371,430	350.8	23.2				6,870.0	
11/7/2006	12:00:04 AM	229	12,195,830	350.6	23.2				4,125.5	continued on next page

Specimen: 996-1.5

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
11/7/2006	1:00:03 AM	229	13,020,230	350.8	23.2				6,993.9	continued from previous page
11/7/2006	2:00:04 AM	229	13,844,630	350.3	23.2				4,026.2	
11/7/2006	3:00:04 AM	229	14,669,030	350.9	23.2				2,317.8	
11/7/2006	4:00:04 AM	229	15,493,430	349.9	23.2				6,148.2	
11/7/2006	5:00:04 AM	229	16,317,830	350.7	23.2				8,094.4	
11/7/2006	6:00:04 AM	229	17,142,230	350.0	23.2				5,606.8	
11/7/2006	7:00:04 AM	229	17,966,630	349.9	23.2				6,154.8	
11/7/2006	8:00:03 AM	229	18,791,030	349.9	23.2				4,445.8	
11/7/2006	9:00:04 AM	229	19,615,430	349.5	23.2				5,717.5	
11/7/2006	10:00:03 AM	229	20,439,830	350.5	23.2				5,143.4	
11/7/2006	11:00:04 AM	229	21,264,230	350.8	23.2				6,707.0	
11/7/2006	12:00:03 PM	229	22,088,630	349.4	23.2				1,113.6	
11/7/2006	1:00:04 PM	229	22,913,030	350.4	23.2				8,986.0	
11/7/2006	2:00:04 PM	229	23,737,430	349.3	23.2				9,040.2	
11/7/2006	3:00:04 PM	229	24,561,830	349.1	23.2				8,176.3	
11/7/2006	4:00:04 PM	229	25,386,230	348.4	23.2				7,597.7	
11/7/2006	5:00:03 PM	229	26,210,630	347.7	23.2				9,057.2	
11/7/2006	6:00:04 PM	229	27,035,030	347.9	23.2				6,092.7	
11/7/2006	7:00:04 PM	229	27,859,430	347.8	23.2				1,883.6	
11/7/2006	8:00:04 PM	229	28,683,830	346.9	23.2				1,843.5	
11/7/2006	9:00:04 PM	229	29,508,230	347.1	23.2				5,323.5	
11/7/2006	10:00:04 PM	229	30,332,630	347.5	23.2				237.8	
11/7/2006	11:00:04 PM	229	31,157,030	348.2	23.2				8,430.2	
11/8/2006	12:00:03 AM	229	31,981,430	347.8	23.2				2,646.9	
11/8/2006	1:00:04 AM	229	32,805,830	348.0	23.2				4,251.9	
11/8/2006	2:00:03 AM	229	33,630,232	347.7	23.2				5,602.1	
11/8/2006	3:00:04 AM	229	34,454,632	348.4	23.2				805.6	
11/8/2006	4:00:04 AM	229	35,279,032	348.8	23.2				7,416.8	
11/8/2006	5:00:04 AM	229	36,103,432	348.3	23.2				1,947.0	
11/8/2006	6:00:04 AM	229	36,927,832	348.9	23.2				5,557.0	
11/8/2006	7:00:03 AM	229	37,752,232	348.9	23.2				9,310.4	
11/8/2006	8:00:04 AM	229	38,576,632	348.6	23.2				9,057.2	
11/8/2006	9:00:04 AM	229	39,401,032	348.3	23.2				7,428.8	
11/8/2006	10:00:04 AM	229	40,225,432	349.1	23.2				7,575.5	continued on next page

Specimen: 996-1.5

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
11/8/2006	11:00:04 AM	229	41,049,832	349.8	23.2				8,944.0	continued from previous page
11/8/2006	12:00:04 PM	229	41,874,232	350.4	23.2				5,207.1	
11/8/2006	1:00:04 PM	229	42,698,632	350.6	23.2				6,751.0	
11/8/2006	2:00:04 PM	229	43,523,032	349.7	23.2				2,283.0	
11/8/2006	3:00:04 PM	229	44,347,432	350.4	23.2				410.8	
11/8/2006	4:00:04 PM	229	45,171,832	350.7	23.2				3,529.2	
11/8/2006	5:00:04 PM	229	45,996,232	350.4	23.2				4,351.2	
11/8/2006	6:00:03 PM	229	46,820,632	350.7	23.2				2,433.6	
11/8/2006	7:00:04 PM	229	47,645,032	351.1	23.2				6,835.6	
11/8/2006	8:00:04 PM	229	48,469,432	351.6	23.2				3,755.8	
11/8/2006	9:00:04 PM	229	49,293,832	350.4	23.2				6,052.9	
11/8/2006	10:00:04 PM	229	50,118,232	351.2	23.2				4,465.9	
11/8/2006	11:00:04 PM	229	50,942,632	350.7	23.2				6,482.9	
11/9/2006	12:00:04 AM	229	51,767,032	351.2	23.2				4,567.7	
11/9/2006	1:00:03 AM	229	52,591,432	351.1	23.2				4,554.9	
11/9/2006	2:00:04 AM	229	53,415,832	351.7	23.2				4,953.2	
11/9/2006	3:00:04 AM	229	54,240,232	352.1	23.2				783.0	
11/9/2006	4:00:04 AM	229	55,064,632	351.3	23.2				6,098.0	
11/9/2006	5:00:04 AM	229	55,889,032	352.3	23.2				7,066.3	
11/9/2006	6:00:04 AM	229	56,713,432	352.1	23.2				1,039.0	
11/9/2006	7:00:04 AM	229	57,537,832	352.6	23.2				4,559.2	
11/9/2006	8:00:03 AM	229	58,362,232	353.4	23.2				3,924.4	
11/9/2006	9:00:04 AM	229	59,186,632	350.1	23.2				8,912.4	
11/9/2006	10:00:04 AM	229	60,011,032	354.4	23.2				9,335.1	
11/9/2006	11:00:04 AM	229	60,835,432	353.2	23.2				3,244.3	
11/9/2006	12:00:04 PM	229	61,659,832	352.5	23.2				843.8	
11/9/2006	1:00:04 PM	229	62,484,232	353.0	23.2				4,946.6	
11/9/2006	2:00:03 PM	229	63,308,632	352.4	23.2				6,985.5	
11/9/2006	3:00:04 PM	229	64,133,032	353.6	23.2				7,477.4	
11/9/2006	4:00:03 PM	229	64,957,432	352.8	23.2				7,185.5	
11/9/2006	5:00:04 PM	229	65,781,832	353.3	23.2				1,172.9	
11/9/2006	6:00:04 PM	229	66,606,232	353.3	23.2				8,486.3	
11/9/2006	7:00:04 PM	229	67,430,632	352.9	23.2				7,335.6	
11/9/2006	8:00:04 PM	229	68,255,032	353.3	23.2				251.0	continued on next page

Specimen: 996-1.5

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
11/9/2006	9:00:03 PM	229	69,079,432	352.3	23.2				5,429.0	continued from previous page
11/9/2006	10:00:04 PM	229	69,903,832	352.9	23.2				7,047.3	
11/9/2006	11:00:03 PM	229	70,728,232	352.0	23.2				2,908.2	
11/10/2006	12:00:04 AM	229	71,552,632	352.3	23.2				9,152.9	
11/10/2006	1:00:04 AM	229	72,377,032	352.1	23.2				5,342.6	
11/10/2006	2:00:04 AM	229	73,201,432	352.2	23.2				2,341.1	
11/10/2006	3:00:04 AM	229	74,025,832	353.0	23.2				6,970.8	
11/10/2006	4:00:03 AM	229	74,850,232	352.6	23.2				2,461.1	
11/10/2006	5:00:04 AM	229	75,674,632	352.1	23.2				1,851.1	
11/10/2006	6:00:04 AM	229	76,499,032	352.7	23.2				2,422.4	
11/10/2006	7:00:04 AM	229	77,323,432	352.3	23.2				4,180.3	
11/10/2006	8:00:04 AM	229	78,147,832	353.6	23.2				6,731.7	
11/10/2006	9:00:04 AM	229	78,972,232	352.6	23.2				2,586.5	
11/10/2006	10:00:04 AM	229	79,796,632	353.9	23.2				5,666.6	
11/10/2006	11:00:03 AM	229	80,621,032	355.0	23.2				4,724.3	
11/10/2006	12:00:04 PM	229	81,445,432	356.0	23.2				751.2	
11/10/2006	1:00:04 PM	229	82,269,832	354.8	23.2				1,933.0	
11/10/2006	2:00:04 PM	229	83,094,232	355.0	23.2				758.2	
11/10/2006	3:00:03 PM	229	83,918,632	355.6	23.2				8,979.9	
11/10/2006	4:00:04 PM	229	84,743,032	355.4	23.2				8,914.3	
11/10/2006	5:00:04 PM	229	85,567,432	355.9	23.2				1,151.6	
11/10/2006	6:00:04 PM	229	86,391,832	354.9	23.2				3,543.7	
11/10/2006	7:00:04 PM	229	87,216,232	355.7	23.2				2,328.3	
11/10/2006	8:00:04 PM	229	88,040,632	355.5	23.2				4,736.9	
11/10/2006	9:00:04 PM	229	88,865,032	355.4	23.2				1,427.7	
11/10/2006	10:00:03 PM	229	89,689,432	354.7	23.2				4,526.1	
11/10/2006	11:00:04 PM	229	90,513,832	356.0	23.2				7,923.9	
11/11/2006	12:00:04 AM	229	91,338,232	355.8	23.2				2,054.7	
11/11/2006	1:00:04 AM	229	92,162,632	356.2	23.2				1,857.4	
11/11/2006	2:00:04 AM	229	92,987,032	355.5	23.2				3,725.9	
11/11/2006	3:00:03 AM	229	93,811,432	356.3	23.2				1,167.0	
11/11/2006	4:00:04 AM	229	94,635,832	356.8	23.2				8,475.3	
11/11/2006	5:00:04 AM	229	95,460,232	355.8	23.2				7,382.7	
11/11/2006	6:00:04 AM	229	96,284,632	355.8	23.2				4,182.3	continued on next page

Specimen: 996-1.5

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
11/11/2006	7:00:04 AM	229	97,109,032	355.5	23.2				9,155.9	continued from previous page
11/11/2006	8:00:04 AM	229	97,933,432	354.4	23.2				9,219.8	
11/11/2006	9:00:04 AM	229	98,757,832	354.4	23.2				2,330.5	
11/11/2006	10:00:03 AM	229	99,582,232	355.2	23.2				3,962.7	
11/11/2006	11:00:04 AM	229	100,406,632	355.6	23.2				6,040.1	
11/11/2006	12:00:04 PM	229	101,231,032	355.2	23.2				5,070.0	
11/11/2006	1:00:04 PM	229	102,055,432	354.4	23.2				7,556.2	
11/11/2006	2:00:03 PM	229	102,879,832	355.0	23.2				1,769.3	
11/11/2006	3:00:04 PM	229	103,704,232	354.8	23.2				1,692.4	
11/11/2006	4:00:04 PM	229	104,528,632	354.5	23.2				5,199.1	
11/11/2006	5:00:04 PM	229	105,353,032	355.2	23.2				2,752.5	
11/11/2006	6:00:04 PM	229	106,177,432	354.8	23.2				8,282.0	
11/11/2006	7:00:03 PM	229	107,001,832	355.3	23.2				3,453.9	
11/11/2006	8:00:04 PM	229	107,826,232	355.1	23.2				6,966.4	
11/11/2006	9:00:04 PM	229	108,650,632	354.1	23.2				1,428.2	
11/11/2006	10:00:04 PM	229	109,475,032	354.2	23.2				4,800.6	
11/11/2006	11:00:04 PM	229	110,299,432	353.9	23.2				453.7	
11/12/2006	12:00:04 AM	229	111,123,832	353.6	23.2				1,623.4	
11/12/2006	1:00:04 AM	229	111,948,232	354.0	23.2				3,281.4	
11/12/2006	2:00:03 AM	229	112,772,632	354.1	23.2				9,085.3	
11/12/2006	3:00:04 AM	229	113,597,032	354.7	23.2				7,891.4	
11/12/2006	4:00:04 AM	229	114,421,432	353.5	23.2				4,844.6	
11/12/2006	5:00:04 AM	229	115,245,832	352.7	23.2				5,835.0	
11/12/2006	6:00:04 AM	229	116,070,232	354.3	23.2				7,735.2	
11/12/2006	7:00:04 AM	228	116,892,568	349.7	23.2				7,801.8	
11/12/2006	8:00:04 AM	228	117,713,368	349.2	23.2				5,726.6	
11/12/2006	9:00:03 AM	228	118,534,168	348.2	23.2				8,856.7	
11/12/2006	10:00:04 AM	228	119,354,968	350.1	23.2				5,675.4	
11/12/2006	11:00:04 AM	228	120,175,768	350.0	23.2				5,936.7	
11/12/2006	12:00:04 PM	228	120,996,568	348.7	23.2				5,629.7	
11/12/2006	1:00:04 PM	228	121,817,368	347.9	23.2				5,268.8	
11/12/2006	2:00:04 PM	228	122,638,168	346.9	23.2				245.5	
11/12/2006	3:00:03 PM	228	123,458,968	347.7	23.2				1,308.5	
11/12/2006	4:00:04 PM	228	124,279,768	347.5	23.2				1,645.2	

continued on next page

Specimen: 996-1.5

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
11/12/2006	5:00:04 PM	227	125,099,640	344.2	23.2				8,427.4	continued from previous page
11/12/2006	6:00:04 PM	226	125,915,480	342.5	23.2				2,382.0	
11/12/2006	7:00:04 PM	226	126,729,080	342.8	23.2				2,508.5	
11/12/2006	8:00:04 PM	226	127,542,680	343.1	23.2				5,538.3	
11/12/2006	9:00:04 PM	226	128,356,280	342.7	23.2				2,311.6	
11/12/2006	10:00:03 PM	226	129,169,880	343.6	23.2				7,375.2	
11/12/2006	11:00:04 PM	226	129,983,480	343.6	23.2				2,034.5	
11/13/2006	12:00:04 AM	226	130,797,080	344.9	23.2				8,536.1	
11/13/2006	1:00:04 AM	226	131,610,680	345.5	23.2				9,297.6	
11/13/2006	2:00:04 AM	226	132,424,280	345.3	23.2				722.5	
11/13/2006	3:00:04 AM	226	133,237,880	345.6	23.2				7,523.7	
11/13/2006	4:00:04 AM	226	134,051,480	346.3	23.2				5,616.1	
11/13/2006	5:00:03 AM	226	134,865,088	346.4	23.2				969.9	
11/13/2006	6:00:04 AM	226	135,678,688	346.3	23.2				6,949.6	
11/13/2006	7:00:04 AM	226	136,492,288	346.9	23.2				5,205.4	
11/13/2006	8:00:04 AM	226	137,305,888	346.5	23.2				5,931.9	
11/13/2006	9:00:04 AM	226	138,119,488	348.3	23.2				3,614.2	
11/13/2006	10:00:04 AM	226	138,933,088	348.4	23.2				2,909.1	
11/13/2006	11:00:04 AM	226	139,746,688	349.4	23.2				8,319.0	
11/13/2006	12:00:04 PM	226	140,560,288	349.5	23.2				5,565.1	
11/13/2006	1:00:03 PM	226	141,373,888	349.3	23.2				8,085.3	
11/13/2006	2:00:04 PM	226	142,187,488	348.8	23.2				6,265.7	
11/13/2006	3:00:04 PM	226	143,001,088	349.4	23.2				3,988.5	
11/13/2006	4:00:04 PM	226	143,814,688	349.4	23.2				6,697.4	
11/13/2006	5:00:03 PM	226	144,628,288	348.0	23.2				6,185.9	
11/13/2006	6:00:04 PM	226	145,441,888	347.4	23.2				6,743.5	
11/13/2006	7:00:04 PM	226	146,255,488	347.6	23.2				666.8	
11/13/2006	8:00:04 PM	226	147,069,088	347.4	23.2				9,124.7	
11/13/2006	9:00:04 PM	226	147,882,688	347.2	23.2				6,959.8	
11/13/2006	10:00:04 PM	226	148,696,288	347.6	23.2				5,427.4	
11/13/2006	11:00:04 PM	226	149,509,888	348.1	23.2				328.5	
11/14/2006	12:00:03 AM	226	150,323,488	348.8	23.2				4,002.2	
11/14/2006	1:00:04 AM	226	151,137,088	348.0	23.2				3,645.9	
11/14/2006	2:00:04 AM	226	151,950,688	348.6	23.2				4,293.9	continued on next page

Specimen: 996-1.5

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
11/14/2006	3:00:04 AM	226	152,764,288	349.6	23.2				4,384.5	continued from previous page
11/14/2006	4:00:04 AM	226	153,577,888	350.0	23.2				3,915.4	
11/14/2006	5:00:04 AM	226	154,391,488	349.9	23.2				4,025.1	
11/14/2006	6:00:04 AM	226	155,205,088	349.7	23.2				6,445.4	
11/14/2006	7:00:03 AM	226	156,018,688	348.4	23.2				4,669.2	
11/14/2006	8:00:04 AM	226	156,832,288	348.3	23.2				9,155.9	
11/14/2006	9:00:04 AM	226	157,645,888	348.9	23.2				6,706.4	
11/14/2006	10:00:04 AM	226	158,459,488	348.3	23.2				3,001.1	
11/14/2006	11:00:04 AM	226	159,273,088	348.8	23.2				8,414.3	
11/14/2006	12:00:04 PM	226	160,086,688	349.9	23.2				1,859.2	
11/14/2006	1:00:03 PM	226	160,900,288	350.1	23.2				7,233.6	
11/14/2006	2:00:04 PM	226	161,713,888	351.8	23.2				3,710.6	
11/14/2006	3:00:04 PM	226	162,527,488	351.8	23.2				2,045.1	
11/14/2006	4:00:04 PM	226	163,341,088	352.6	23.2				4,736.4	
11/14/2006	5:00:04 PM	226	164,154,688	352.3	23.2				4,699.4	
11/14/2006	5:59:54 PM	226	164,966,016	353.0	23.2				2,951.5	
11/14/2006	7:00:04 PM	226	165,781,888	352.4	23.2				4,096.8	
11/14/2006	8:00:03 PM	226	166,595,488	352.9	23.2				6,913.2	
11/14/2006	9:00:04 PM	226	167,409,088	353.1	23.2				3,127.5	
11/14/2006	10:00:04 PM	226	168,222,688	353.1	23.2				2,472.6	
11/14/2006	11:00:04 PM	226	169,036,288	352.6	23.2				9,220.1	
11/15/2006	12:00:04 AM	226	169,849,888	353.1	23.2				8,599.5	
11/15/2006	1:00:03 AM	226	170,663,488	352.7	23.2				9,132.5	
11/15/2006	2:00:04 AM	226	171,477,088	353.4	23.2				6,123.4	
11/15/2006	3:00:03 AM	226	172,290,688	353.7	23.2				5,013.5	
11/15/2006	4:00:04 AM	226	173,104,288	354.1	23.2				6,870.3	
11/15/2006	5:00:04 AM	226	173,917,888	354.0	23.2				1,077.8	
11/15/2006	6:00:04 AM	226	174,731,488	353.7	23.2				5,279.8	
11/15/2006	7:00:04 AM	226	175,545,088	353.8	23.2				3,261.9	
11/15/2006	8:00:04 AM	226	176,358,688	353.2	23.2				7,337.0	
11/15/2006	9:00:04 AM	226	177,172,288	354.2	23.2				8,989.4	
11/15/2006	10:00:03 AM	226	177,985,888	353.8	23.2				9,124.8	
11/15/2006	11:00:04 AM	226	178,799,488	355.1	23.2				759.2	
11/15/2006	12:00:04 PM	226	179,613,088	355.1	23.2				4,174.0	continued on next page

Specimen: 996-1.5

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
11/15/2006	1:00:04 PM	226	180,426,688	355.0	23.2				3,150.5	continued from previous page
11/15/2006	2:00:03 PM	226	181,240,288	354.8	23.2				5,269.5	
11/15/2006	3:00:04 PM	226	182,053,888	355.4	23.2				5,650.9	
11/15/2006	4:00:03 PM	226	182,867,488	355.2	23.2				6,431.5	
11/15/2006	5:00:04 PM	226	183,681,088	355.4	23.2				7,897.6	
11/15/2006	6:00:04 PM	226	184,494,688	355.0	23.2				7,468.0	
11/15/2006	7:00:04 PM	226	185,308,288	355.3	23.2				574.0	
11/15/2006	8:00:03 PM	226	186,121,888	354.5	23.2				1,312.0	
11/15/2006	9:00:04 PM	226	186,935,488	354.9	23.2				5,962.3	
11/15/2006	10:00:04 PM	226	187,749,088	355.2	23.2				8,857.7	
11/15/2006	11:00:04 PM	226	188,562,688	355.2	23.2				4,410.4	
11/16/2006	12:00:04 AM	226	189,376,288	353.9	23.2				6,392.0	
11/16/2006	1:00:03 AM	226	190,189,888	355.3	23.2				3,035.0	
11/16/2006	2:00:04 AM	226	191,003,488	355.0	23.2				4,686.9	
11/16/2006	3:00:04 AM	226	191,817,088	354.5	23.2				6,639.2	
11/16/2006	4:00:04 AM	226	192,630,688	354.2	23.2				9,009.1	
11/16/2006	5:00:04 AM	226	193,444,288	354.0	23.2				8,289.8	
11/16/2006	6:00:04 AM	226	194,257,888	353.2	23.2				8,442.8	
11/16/2006	7:00:04 AM	226	195,071,488	353.2	23.2				3,723.6	
11/16/2006	8:00:03 AM	226	195,885,088	352.8	23.2				985.2	
11/16/2006	9:00:04 AM	226	196,698,688	353.8	23.2				2,782.0	
11/16/2006	10:00:03 AM	226	197,512,288	354.4	23.2				7,230.7	
11/16/2006	11:00:04 AM	226	198,325,888	354.0	23.2				7,626.3	
11/16/2006	12:00:04 PM	226	199,139,488	353.6	23.2				8,041.5	
11/16/2006	1:00:04 PM	226	199,953,088	353.5	23.2				7,712.6	
11/16/2006	2:00:04 PM	226	200,766,688	353.3	23.2				2,066.7	
11/16/2006	3:00:04 PM	226	201,580,288	354.7	23.2				3,070.8	
11/16/2006	4:00:03 PM	226	202,393,888	356.2	23.2				1,665.3	
11/16/2006	5:00:04 PM	226	203,207,488	355.5	23.2				3,701.0	
11/16/2006	6:00:04 PM	226	204,021,088	352.6	23.2				8,251.0	
11/16/2006	7:00:04 PM	226	204,834,688	355.3	23.2				279.0	
11/16/2006	8:00:04 PM	226	205,648,288	352.4	23.2				4,268.2	
11/16/2006	9:00:03 PM	226	206,461,888	355.3	23.2				1,222.7	
11/16/2006	10:00:04 PM	226	207,275,488	354.8	23.2				9,144.3	continued on next page

Specimen: 996-1.5

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
11/16/2006	11:00:04 PM	226	208,089,088	355.6	23.2				8,451.9	continued from previous page
11/17/2006	12:00:04 AM	226	208,902,688	355.1	23.2				4,730.7	
11/17/2006	1:00:04 AM	226	209,716,288	356.0	23.2				6,799.9	
11/17/2006	2:00:04 AM	226	210,529,888	356.6	23.2				6,463.3	
11/17/2006	3:00:04 AM	226	211,343,488	357.2	23.2				1,228.4	
11/17/2006	4:00:03 AM	226	212,157,088	357.5	23.2				2,072.6	
11/17/2006	5:00:04 AM	226	212,970,688	357.4	23.2				8,686.8	
11/17/2006	6:00:04 AM	226	213,784,288	357.6	23.2				1,528.8	
11/17/2006	7:00:04 AM	226	214,597,888	357.8	23.2				6,589.8	
11/17/2006	8:00:04 AM	226	215,411,488	358.1	23.2				4,245.7	
11/17/2006	9:00:04 AM	226	216,225,088	359.5	23.2				5,361.6	
11/17/2006	10:00:04 AM	226	217,038,688	360.1	23.2				292.6	
11/17/2006	11:00:04 AM	226	217,852,288	358.7	23.2				3,579.0	
11/17/2006	12:00:03 PM	226	218,665,888	360.3	23.2				6,967.4	
11/17/2006	12:00:14 PM	226	218,668,144	360.1	23.2				6,477.4	
11/17/2006	1:00:04 PM	226	219,479,488	359.7	23.2				9,049.6	
11/17/2006	2:00:04 PM	226	220,293,088	359.8	23.2				8,637.9	
11/17/2006	3:00:04 PM	226	221,106,688	359.6	23.2				8,915.9	
11/17/2006	4:00:04 PM	226	221,920,288	360.3	23.2				4,863.4	
11/17/2006	5:00:04 PM	226	222,733,888	359.6	23.2				472.0	
11/17/2006	6:00:04 PM	226	223,547,488	359.2	23.2				4,803.8	
11/17/2006	7:00:03 PM	226	224,361,088	359.9	23.2				3,441.4	
11/17/2006	8:00:04 PM	226	225,174,688	359.8	23.2				3,695.7	
11/17/2006	8:35:54 PM	224	225,660,560	72.9	0.0				8,094.5	

Specimen: 996-1.5

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
11/28/2006	1:56:57 PM	45	45	227.4	12.6				8,690.5	
11/28/2006	1:57:07 PM	218	2,225	338.4	23.2				8,732.6	
11/28/2006	2:00:07 PM	218	41,465	342.2	23.2				7,813.2	
11/28/2006	3:00:07 PM	218	826,265	347.8	23.2				2,947.6	
11/28/2006	4:00:07 PM	218	1,611,065	349.6	23.2				2,936.9	

continued on next page

Specimen: 996-1.5

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
11/28/2006	5:00:07 PM	218	2,395,865	351.5	23.2				4,901.0	continued from previous page
11/28/2006	6:00:08 PM	218	3,180,665	351.8	23.2				2,198.6	
11/28/2006	7:00:07 PM	218	3,965,465	350.3	23.2				4,409.6	
11/28/2006	8:00:07 PM	218	4,750,265	349.4	23.2				2,767.9	
11/28/2006	9:00:07 PM	218	5,535,065	347.5	23.2				3,449.2	
11/28/2006	10:00:07 PM	218	6,319,865	347.2	23.2				646.2	
11/28/2006	11:00:07 PM	218	7,104,665	346.5	23.2				2,051.1	
11/29/2006	12:00:07 AM	218	7,889,465	346.6	23.2				6,475.2	
11/29/2006	1:00:07 AM	218	8,674,265	347.6	23.2				6,815.0	
11/29/2006	2:00:07 AM	218	9,459,065	348.2	23.2				6,917.6	
11/29/2006	3:00:07 AM	218	10,243,865	347.9	23.2				4,348.6	
11/29/2006	4:00:07 AM	218	11,028,665	348.7	23.2				5,159.2	
11/29/2006	5:00:07 AM	218	11,813,465	348.4	23.2				6,124.9	
11/29/2006	6:00:07 AM	218	12,598,265	349.0	23.2				7,670.0	
11/29/2006	7:00:07 AM	218	13,383,065	351.1	23.2				3,743.7	
11/29/2006	8:00:07 AM	218	14,167,865	352.4	23.2				1,290.2	
11/29/2006	9:00:07 AM	218	14,952,665	351.9	23.2				5,443.5	
11/29/2006	10:00:08 AM	218	15,737,465	352.4	23.2				5,905.1	
11/29/2006	11:00:07 AM	218	16,522,265	352.5	23.2				8,533.3	
11/29/2006	12:00:07 PM	218	17,307,064	352.2	23.2				345.0	
11/29/2006	1:00:07 PM	218	18,091,864	352.9	23.2				1,364.8	
11/29/2006	2:00:07 PM	218	18,876,664	353.1	23.2				4,490.7	
11/29/2006	3:00:08 PM	218	19,661,464	353.2	23.2				7,471.0	
11/29/2006	3:43:47 PM	218	20,232,624	353.8	23.2				2,670.1	

Specimen: 996-1.5

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
11/30/2006	9:12:12 AM	54	54	228.7	11.2				2,289.7	
11/30/2006	9:12:22 AM	221	2,264	349.9	23.2				2,119.2	
11/30/2006	10:00:03 AM	221	621,064	352.5	23.2				6,920.9	
11/30/2006	11:00:03 AM	221	1,416,664	353.5	23.2				4,630.2	
11/30/2006	12:00:04 PM	221	2,212,264	354.2	23.2				940.9	
										continued on next page

Specimen: 996-1.5

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments	
11/30/2006	1:00:03 PM	221	3,007,864	354.9	23.2				3,716.2	continued from previous page	
11/30/2006	2:00:03 PM	221	3,803,464	355.5	23.2				9,234.3		
11/30/2006	3:00:03 PM	221	4,599,064	356.0	23.2				4,083.7		
11/30/2006	4:00:03 PM	221	5,394,664	356.1	23.2				4,096.0		
11/30/2006	5:00:03 PM	221	6,190,264	356.5	23.2				4,090.4		
11/30/2006	6:00:03 PM	221	6,985,864	356.4	23.2				1,262.6		
11/30/2006	7:00:03 PM	221	7,781,464	356.0	23.2				2,982.1		
11/30/2006	8:00:03 PM	221	8,577,064	355.8	23.2				1,608.4		
11/30/2006	9:00:03 PM	221	9,372,664	356.1	23.2				1,546.2		
11/30/2006	10:00:03 PM	221	10,168,264	356.3	23.2				1,487.4		
11/30/2006	11:00:03 PM	221	10,963,864	356.4	23.2				1,496.6		
12/1/2006	12:00:03 AM	221	11,759,464	356.4	23.2				1,104.1		
12/1/2006	1:00:03 AM	221	12,555,064	356.7	23.2				1,066.3		
12/1/2006	2:00:03 AM	221	13,350,664	356.6	23.2				2,118.8		
12/1/2006	3:00:03 AM	221	14,146,264	356.6	23.2				4,591.3		
12/1/2006	4:00:03 AM	221	14,941,864	356.8	23.2				5,652.5		
12/1/2006	5:00:03 AM	221	15,737,464	356.6	23.2				9,149.2		
12/1/2006	6:00:03 AM	221	16,533,064	356.7	23.2				7,986.6		
12/1/2006	7:00:03 AM	221	17,328,664	356.9	23.2				6,445.1		
12/1/2006	8:00:03 AM	221	18,124,264	357.3	23.2				6,536.3		
12/1/2006	9:00:03 AM	221	18,919,864	357.2	23.2				8,122.7		
12/1/2006	10:00:03 AM	221	19,715,464	357.4	23.2				1,992.1		
12/1/2006	11:00:03 AM	221	20,511,064	357.7	23.2				8,582.0		
12/1/2006	12:00:03 PM	221	21,306,664	357.5	23.2				2,849.2		
12/1/2006	12:17:33 PM	221	21,538,714	357.2	23.2				1,415.7		run-out
Applied Load Cycles =			278,552,652	Run-out							

Specimen: 996-2.1 **Material:** FGM **Thickness:** 0.125 in. **Target:** Velocity = 141.44 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/23/2007	4:01:09 PM	120	120	26.8	0.07	0.08	15.6	11.3	18724.1	
7/23/2007	4:01:14 PM	120	720	99.9	0.19	0.20	57.7	41.5	18711.4	
7/23/2007	4:01:19 PM	226	1,518	99.8	0.19	0.20	57.6	41.4	18703.5	
7/23/2007	4:01:24 PM	226	2,648	99.8	0.19	0.20	57.6	41.4	18704.5	
7/23/2007	4:01:28 PM	226	3,778	99.9	0.19	0.20	57.6	41.4	18698.5	
7/23/2007	4:01:34 PM	226	4,908	99.8	0.19	0.20	57.6	41.4	18710.4	
7/23/2007	4:01:39 PM	226	6,038	99.9	0.19	0.20	57.7	41.5	18693.9	

Specimen: 996-2.1 **Material:** FGM **Thickness:** 0.125 in. **Target:** Velocity = 282.88 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/23/2007	4:03:16 PM	226	226	9.3	0.04	0.04	5.6	4.0	18674.5	
7/23/2007	4:03:21 PM	226	1,356	199.3	0.35	0.40	114.4	83.4	18680.1	
7/23/2007	4:03:28 PM	225	2,709	198.2	0.36	0.42	113.6	82.9	18674.1	
7/23/2007	4:03:32 PM	226	3,839	201.8	0.37	0.38	115.4	84.1	18669.1	
7/23/2007	4:03:37 PM	225	4,964	196.7	0.39	0.48	112.8	82.4	18670.2	
7/23/2007	4:03:43 PM	226	6,094	204.6	0.38	0.39	116.6	85.2	18678.0	
7/23/2007	4:03:48 PM	225	7,219	194.6	0.39	0.48	111.5	81.5	18660.9	
7/23/2007	4:03:52 PM	225	8,344	192.5	0.39	0.48	110.4	80.7	18684.2	
7/23/2007	4:03:58 PM	226	9,474	209.4	0.38	0.41	119.6	87.4	18675.3	
7/23/2007	4:04:03 PM	225	10,599	191.3	0.39	0.48	109.8	80.2	18665.5	
7/23/2007	4:04:07 PM	225	11,724	192.4	0.39	0.48	110.3	80.7	18652.5	
7/23/2007	4:04:12 PM	226	12,854	199.5	0.36	0.38	113.7	83.1	18648.9	
7/23/2007	4:04:18 PM	225	13,979	205.4	0.38	0.45	117.6	85.9	18644.4	
7/23/2007	4:04:23 PM	225	15,104	195.9	0.35	0.36	111.7	81.6	18635.1	
7/23/2007	4:04:27 PM	225	16,229	195.2	0.35	0.36	111.4	81.4	18626.5	
7/23/2007	4:04:33 PM	225	17,354	205.9	0.38	0.44	117.7	86.0	18654.3	

Specimen: 996-2.1 **Material:** FGM **Thickness:** 0.125 in. **Target:** Velocity = 282.88 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/24/2007	9:20:29 AM	225	225	55.8	0.12	0.13	32.3	23.9	750.6	continued on next page

Specimen: 996-2.1 **Material:** FGM **Thickness:** 0.125 in. **Target:** Velocity = 282.88 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/24/2007	9:20:34 AM	225	1,350	199.3	0.39	0.40	115.7	83.3	762.7	continued from previous page
7/24/2007	9:21:01 AM	226	7,677	199.7	0.38	0.40	115.8	83.2	804.5	
7/24/2007	9:22:02 AM	60	15,427	1.1	0.04	0.03	1.4	0.9	832.3	
7/24/2007	9:23:00 AM	60	18,907	1.2	0.04	0.03	1.4	0.9	889.4	
7/24/2007	9:24:00 AM	60	22,267	1.1	0.04	0.03	1.4	0.9	928.9	
7/24/2007	9:25:00 AM	60	25,627	1.1	0.04	0.03	1.4	0.9	964.5	
7/24/2007	9:25:38 AM	60	27,787	1.1	0.04	0.03	1.4	0.8	996.4	

Specimen: 996-2.1 **Material:** FGM **Thickness:** 0.125 in. **Target:** Velocity = 2380.0 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/24/2007	9:27:39 AM	60	60	4.5	0.04	0.03	2.9	2.0	1,103.0	Strain gages failed.
7/24/2007	9:27:45 AM	60	360	1049.5	2.77	3.35	605.8	435.7	1,315.7	
7/24/2007	9:27:57 AM	60	1,140	1724.8	3.40	4.05	993.0	707.7	1,549.4	
7/24/2007	9:28:03 AM	225	2,265	1687.5	3.09	3.23	966.0	688.3	1,504.8	
7/24/2007	9:29:03 AM	224	15,725	1676.5	2.97	3.10	957.9	684.9	1,343.6	
7/24/2007	9:30:03 AM	224	29,165	1676.6	2.91	3.12	957.6	684.6	1,195.7	
7/24/2007	9:49:53 AM	224	295,725	1726.5	2.76	3.17	1006.0	693.8	1,362.9	
7/24/2007	9:49:58 AM	225	296,850	1665.9	2.68	2.82	968.8	666.8	1,328.1	
7/24/2007	10:00:03 AM	224	432,370	1676.7	2.59	2.77	822.5	377.3	6,896.0	
7/24/2007	11:00:02 AM	224	1,238,770	1676.7	2.51	2.82	43.6	2.1	3,198.0	
7/24/2007	12:00:03 PM	224	2,045,170	1676.8	2.35	2.59	673.2	666.1	5,753.5	
7/24/2007	1:00:03 PM	224	2,851,570	1676.7	2.32	2.53	707.1	4178.4	12,733.9	
7/24/2007	2:00:03 PM	224	3,657,970	1676.2	2.44	2.50			33,077.2	
7/24/2007	3:00:02 PM	224	4,464,370	1677.2	2.13	2.32			36,432.0	
7/24/2007	4:00:03 PM	224	5,270,770	1676.4	2.21	2.24			26,942.1	
7/24/2007	5:00:03 PM	224	6,077,170	1676.7	2.17	2.35			10,176.4	
7/24/2007	6:00:03 PM	224	6,883,570	1676.7	2.13	2.34			13,639.8	
7/24/2007	7:00:03 PM	224	7,689,970	1676.9	2.10	2.31			24,614.2	
7/24/2007	8:00:02 PM	224	8,496,370	1677.1	2.05	2.24			26,085.2	
7/24/2007	9:00:03 PM	224	9,302,770	1676.5	2.07	2.28			33,652.1	
7/24/2007	10:00:03 PM	224	10,109,170	1675.7	2.04	2.26			15,049.9	
7/24/2007	11:00:03 PM	224	10,915,570	1676.1	2.01	2.22			10,478.4	continued on next page

Specimen: 996-2.1**Material:** FGM**Thickness:** 0.125 in.**Target:** Velocity = 2380.0 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/25/2007	12:00:02 AM	224	11,721,970	1676.2	1.98	2.17			12,899.0	continued from previous page
7/25/2007	1:00:03 AM	224	12,528,370	1676.0	1.98	2.14			11,594.5	
7/25/2007	2:00:03 AM	224	13,334,770	1676.2	1.98	2.13			39,311.7	
7/25/2007	3:00:03 AM	224	14,141,170	1675.6	1.98	2.12			34,953.3	
7/25/2007	4:00:02 AM	224	14,947,570	1677.1	1.98	2.09			25,664.3	
7/25/2007	5:00:03 AM	224	15,753,970	1676.0	1.98	2.09			22,572.4	
7/25/2007	6:00:03 AM	224	16,560,370	1676.0	1.98	2.08			21,868.6	
7/25/2007	7:00:03 AM	224	17,366,770	1676.9	1.98	2.08			18,748.8	
7/25/2007	8:00:02 AM	224	18,173,144	1676.5	2.09	2.29			14,304.1	
7/25/2007	9:00:03 AM	224	18,979,544	1676.0	2.10	2.10			1,216.5	
7/25/2007	9:32:22 AM	224	19,414,104	1675.4	2.10	2.13			20,535.9	Lost heartbeat event - test stopped.
7/25/2007	9:32:28 AM	224	19,415,224	765.4	0.51	0.94			20,481.1	
7/25/2007	9:32:33 AM	60	19,415,524	0.7	0.04	0.02			20,456.2	
7/25/2007	9:32:38 AM	60	19,415,824	0.7	0.04	0.02			20,445.9	
7/25/2007	9:33:12 AM	60	19,417,924	0.9	0.04	0.02			20,466.2	

Specimen: 996-2.1**Material:** FGM**Thickness:** 0.125 in.**Target:** Velocity = 2380.0 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/25/2007	9:38:09 AM	60	60	6.6	0.04	0.04			19,476.4	
7/25/2007	9:38:10 AM	60	120	17.7	0.06	0.06			19,470.8	
7/25/2007	9:38:11 AM	60	180	142.2	0.38	0.49			19,459.9	
7/25/2007	9:38:12 AM	60	240	383.4	1.03	1.34			19,445.3	
7/25/2007	9:38:13 AM	60	300	602.6	1.67	2.16			19,445.4	
7/25/2007	9:38:14 AM	60	360	1018.9	2.70	3.52			19,435.6	
7/25/2007	9:38:15 AM	60	420	1785.2	2.94	3.75			19,427.7	
7/25/2007	9:38:16 AM	60	480	1911.0	2.27	1.36			19,404.4	
7/25/2007	9:38:17 AM	60	540	1906.7	1.69	1.27			19,391.4	
7/25/2007	9:38:18 AM	60	600	1619.3	1.56	0.50			19,373.1	
7/25/2007	9:38:19 AM	60	660	1520.6	2.20	1.09			19,357.8	
7/25/2007	9:38:20 AM	60	720	1840.6	1.89	0.84			19,356.0	
7/25/2007	9:38:21 AM	60	780	1682.4	1.73	0.64			19,347.6	
7/25/2007	9:38:22 AM	60	840	1629.6	1.80	0.62			19,347.1	
										continued on next page

Specimen: 996-2.1**Material:** FGM**Thickness:** 0.125 in.**Target:** Velocity = 2380.0 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/25/2007	9:38:27 AM	225	1,965	1690.7	1.81	0.63			19,319.6	continued from previous page
7/25/2007	9:38:32 AM	225	3,090	1657.9	1.85	0.69			19,247.6	
7/25/2007	9:38:37 AM	225	4,215	1669.9	1.81	0.69			19,207.8	
7/25/2007	9:38:42 AM	225	5,340	1737.4	1.74	0.58			19,167.2	
7/25/2007	9:38:47 AM	225	6,465	1716.6	1.83	0.70			19,116.7	
7/25/2007	9:38:52 AM	225	7,590	1627.3	1.84	0.63			19,044.4	
7/25/2007	9:38:57 AM	224	8,710	1702.8	1.82	0.59			18,819.1	
7/25/2007	9:39:02 AM	225	9,835	1682.8	1.82	0.74			18,985.7	
7/25/2007	9:39:07 AM	224	10,955	1796.0	1.91	0.74			18,892.0	
7/25/2007	9:39:12 AM	225	12,080	1605.4	1.83	0.63			18,818.3	
7/25/2007	9:39:17 AM	225	13,205	1617.3	1.91	0.75			18,779.6	
7/25/2007	9:39:22 AM	224	14,325	1798.1	1.88	0.75			18,718.5	
7/25/2007	9:39:27 AM	225	15,450	1662.6	1.81	0.63			18,677.2	
7/25/2007	9:39:32 AM	225	16,575	1671.3	1.85	0.64			18,605.9	
7/25/2007	9:39:37 AM	225	17,700	1673.6	1.87	0.65			18,555.2	
7/25/2007	9:39:42 AM	225	18,825	1600.9	1.83	0.65			18,465.5	
7/25/2007	9:39:47 AM	225	19,950	1613.5	1.82	0.63			18,389.6	
7/25/2007	9:39:52 AM	225	21,075	1591.2	1.81	0.63			18,342.9	
7/25/2007	9:39:57 AM	224	22,195	1734.7	1.95	0.70			18,283.5	
7/25/2007	9:40:02 AM	225	23,320	1516.3	1.85	0.69			18,228.5	
7/25/2007	9:40:06 AM	225	24,445	1698.3	1.847	0.68			18,185.3	
7/25/2007	9:40:12 AM	225	25,570	1660.9	1.62	0.61			18,116.1	stopped.
7/25/2007	9:40:17 AM	225	26,695	3.3	0.04	0.04			18,115.8	
7/25/2007	9:40:22 AM	60	26,995	1.1	0.04	0.03			18,122.3	
7/25/2007	9:40:27 AM	60	27,295	1.1	0.04	0.04			18,110.9	

Specimen: 996-2.1**Material:** FGM**Thickness:** 0.125 in.**Target:** Velocity = 2380.0 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/25/2007	9:49:16 AM	60	60	11.6	0.05	0.04			18,162.7	continued on next page
7/25/2007	9:49:33 AM	60	1,080	1808.1	1.82	0.73			17,882.3	
7/25/2007	9:49:39 AM	225	2,205	1542.9	1.84	0.73			17,786.4	
7/25/2007	9:50:04 AM	225	7,820	1579.8	1.81	0.64			17,351.4	

Specimen: 996-2.1		Material: FGM		Thickness: 0.125 in.		Target: Velocity = 2380.0 mm/s				
Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/25/2007	10:00:04 AM	225	142,780	1676.3	1.82	0.63			9,154.4	continued from previous page
7/25/2007	10:30:03 AM	225	547,705	1680.6	1.80	0.61			8,838.5	
7/25/2007	11:00:04 AM	224	951,100	1676.7	1.91	0.74			33,295.4	
7/25/2007	11:30:04 AM	224	1,354,320	1676.8	1.83	0.71			19,677.0	
7/25/2007	12:00:04 PM	224	1,757,540	1723.4	1.78	0.72			3,837.7	
7/25/2007	12:30:04 PM	224	2,160,745	1676.1	1.80	0.66			29,567.3	
7/25/2007	1:00:04 PM	224	2,563,945	1675.7	1.80	0.64			29,566.2	
7/25/2007	1:30:04 PM	224	2,967,145	1676.3	1.77	0.63			5,771.5	
7/25/2007	2:00:04 PM	224	3,370,365	1675.4	1.80	0.65			16,221.3	
7/25/2007	2:16:59 PM	224	3,597,725	1680.0	1.81	0.69			29,342.3	
7/25/2007	2:17:04 PM	224	3,598,845	1653.2	1.90	0.79			29,400.2	Positive dwell limit exceeded. Test stopped.
7/25/2007	2:17:09 PM	224	3,599,965	1710.4	1.84	0.77			29,461.1	
7/25/2007	2:17:14 PM	113	3,600,530	6.8	3.59	3.53			29,520.9	
7/25/2007	2:17:18 PM	120	3,601,130	2.2	0.03	0.03			29,522.0	
7/25/2007	2:17:24 PM	120	3,601,730	2.4	0.03	0.03			29534.33	
7/25/2007	2:19:54 PM	120	3,619,730	2.7	0.03	0.03			29,515.5	
Specimen: 996-2.1		Material: FGM		Thickness: 0.125 in.		Target: Velocity = 2380.0 mm/s				
Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/25/2007	2:46:21 PM	120	120	0.9	0.33	0.32			22,013	Restart test, but never reach test conditions.
7/25/2007	2:46:22 PM	120	240	28.5	3.10	3.04			22,012	
7/25/2007	2:46:23 PM	120	360	145.6	28.09	28.09			21,869	
7/25/2007	2:46:24 PM	120	480	255.9	42.21	42.97			23,428	
7/25/2007	2:46:25 PM	120	600	1.1	0.03	0.02			24,444	
7/25/2007	2:46:26 PM	120	720	0.8	0.03	0.02			24,464	
7/25/2007	2:46:28 PM	120	840	0.8	0.03	0.02			24,549	
7/25/2007	2:46:29 PM	120	960	0.8	0.03	0.02			24,621	
7/25/2007	2:46:30 PM	120	1,080	0.8	0.03	0.02			24,687	
7/25/2007	2:46:31 PM	120	1,200	0.8	0.03	0.02			24,733	
7/25/2007	2:46:32 PM	120	1,320	0.8	0.03	0.02			24,768	continued on next page

Specimen: 996-2.1 **Material:** FGM **Thickness:** 0.125 in. **Target:** Velocity = 2380.0 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/25/2007	2:46:33 PM	120	1,440	0.8	0.03	0.02			24,796	continued from previous page
7/25/2007	2:46:34 PM	120	1,560	0.8	0.03	0.02			24,819	
7/25/2007	2:46:35 PM	120	1,680	0.8	0.03	0.02			24,840	
7/25/2007	2:46:36 PM	120	1,800	0.8	0.03	0.02			24,857	
7/25/2007	2:46:37 PM	120	1,920	0.8	0.03	0.02			24,873	
7/25/2007	2:46:38 PM	120	2,040	0.8	0.03	0.02			24,883	

Cycles to Failure = 23,059,404

Specimen: 996-2.2 **Material:** FGM **Thickness:** 0.124 in. to 0.128 in. **Target:** Velocity = 141.44 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/23/2007	3:00:08 PM	4	4	97.4	0.36	0.34	55.3	39.1	701.2	
7/23/2007	3:00:13 PM	4	24	99.9	0.37	0.35	56.8	40.2	688.1	
7/23/2007	3:00:18 PM	4	44	99.9	0.36	0.35	56.8	40.2	707.3	
7/23/2007	3:00:23 PM	4	60	99.9	0.36	0.35	56.7	40.1	690.0	
7/23/2007	3:00:29 PM	4	84	99.9	0.37	0.35	56.9	40.2	691.1	

Specimen: 996-2.2 **Material:** FGM **Thickness:** 0.124 in. to 0.128 in. **Target:** Velocity = 141.44 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/23/2007	3:00:35 PM	4	4	99.9	0.37	0.35	56.8	40.1	695.1	
7/23/2007	3:00:43 PM	210	1,062	100.0	0.36	0.35	56.9	40.1	714.3	
7/23/2007	3:00:48 PM	210	2,112	99.8	0.36	0.35	56.8	40.1	702.0	
7/23/2007	3:00:52 PM	210	3,162	100.1	0.37	0.35	57.0	40.2	692.0	
7/23/2007	3:00:58 PM	210	4,212	100.2	0.36	0.35	57.1	40.2	699.7	
7/23/2007	3:01:03 PM	210	5,262	99.9	0.36	0.35	56.9	40.1	716.3	
7/23/2007	3:01:08 PM	210	6,312	99.8	0.36	0.35	56.9	40.1	717.3	
7/23/2007	3:01:13 PM	210	7,362	99.8	0.36	0.35	56.8	40.0	709.2	
7/23/2007	3:01:18 PM	210	8,412	99.9	0.36	0.35	56.9	40.0	699.0	

Specimen: 996-2.2 **Material:** FGM **Thickness:** 0.124 in. to 0.128 in. **Target:** Velocity = 282.88 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/23/2007	3:04:49 PM	210	210	33.235	0.14	0.14	18.9	13.4	705.6	
7/23/2007	3:04:55 PM	210	1,260	190.7	0.73	0.69	108.4	77.5	725.1	
7/23/2007	3:05:00 PM	210	2,310	199.6	0.77	0.74	113.5	81.2	737.8	
7/23/2007	3:05:15 PM	210	5,460	199.8	0.79	0.75	113.6	81.2	747.2	
7/23/2007	3:05:30 PM	210	8,610	199.8	0.79	0.76	113.4	80.9	735.8	
7/23/2007	3:05:45 PM	210	11,760	199.8	0.79	0.77	113.4	80.9	737.9	
7/23/2007	3:06:00 PM	210	14,910	199.7	0.81	0.78	112.5	80.7	748.8	
7/23/2007	3:06:14 PM	210	18,060	0.9	0.03	0.03	1.0	0.9	734.1	
7/23/2007	3:06:20 PM	60	18,360	0.8	0.03	0.03	1.0	0.9	744.3	

Specimen: 996-2.2 **Material:** FGM **Thickness:** 0.124 in. to 0.128 in. **Target:** Velocity = 2444.7 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/23/2007	3:12:02 PM	60	60	6.5	0.03	0.04	3.8	2.8	797.3	

Specimen: 996-2.2 **Material:** FGM **Thickness:** 0.124 in. to 0.128 in. **Target:** Velocity = 2444.7 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/23/2007	3:12:52 PM	60	60	1756.7	21.93	20.54	926.9		4,837.1	85% TiB-side strain gage failed.
7/23/2007	3:12:58 PM	210	1,110	1864.9	21.94	20.55	926.5		12,236.4	Est. 85% TiB-side strain to be
7/23/2007	3:13:03 PM	210	2,160	1997.9	22.75	21.34	935.6		9,341.5	about 665 µε.
7/23/2007	3:13:08 PM	210	3,210	1795.2	23.21	21.78	940.8		31,327.9	
7/23/2007	3:13:13 PM	210	4,260	1872.1	23.04	21.61	939.9		19,238.7	velocity over-range recorded - test stopped.
7/23/2007	3:13:18 PM	3	4,275	164.3	0.61	0.49	86.9		32,806.7	
7/23/2007	3:13:22 PM	60	4,575	21.3	0.03	0.03	1.1		32,800.6	
7/23/2007	3:13:28 PM	60	4,875	16.3	0.03	0.03	1.1		32,799.6	
7/23/2007	3:13:33 PM	60	5,175	12.5	0.03	0.03	1.1		32,800.0	
7/23/2007	3:13:37 PM	60	5,475	10.2	0.03	0.03	1.1		32,795.9	
7/23/2007	3:13:43 PM	60	5,775	7.9	0.03	0.03	1.1		32,812.5	
7/23/2007	3:13:48 PM	60	6,075	6.1	0.03	0.03	1.1		32,796.9	

Specimen: 996-2.2 **Material:** FGM **Thickness:** 0.124 in. to 0.128 in. **Target:** Velocity = 2444.7 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/23/2007	3:17:50 PM	60	60	3.8	0.04	0.03	2.3		10.6	
7/23/2007	3:17:55 PM	60	360	1126.3	4.48	3.71	619.7		853.5	
7/23/2007	3:18:00 PM	60	660	4535.0	30.28	28.55	1019.0		24,535.6	
										strain gage wire interfered with laser vibrometer - Ti-side strain gage recorded peak of 1080 µε - test stopped to remove wire.
7/23/2007	3:18:05 PM	60	960	1828.6	3.50	2.92	453.0		14,435.4	
7/23/2007	3:18:10 PM	60	1,260	23.2	0.03	0.02	1.1		6,246.1	
7/23/2007	3:18:15 PM	60	1,560	25.3	0.03	0.02	1.1		6,426.3	

Specimen: 996-2.2 **Material:** FGM **Thickness:** 0.124 in. to 0.128 in. **Target:** Velocity = 2444.7 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/23/2007	3:23:55 PM	60	60	3.0	0.04	0.04	2.0		2,501.5	Restart test.
7/23/2007	3:24:00 PM	60	360	1100.3	4.34	3.59	605.8		2,659.6	
7/23/2007	3:25:01 PM	210	9,960	1756.2	21.39	19.98	927.1		1,339.7	
7/23/2007	3:26:00 PM	210	22,560	1754.6	21.35	19.94	928.3		4,177.2	
7/23/2007	3:27:01 PM	210	35,160	1754.4	21.33	19.92	926.9		6,497.2	
7/23/2007	3:28:00 PM	210	47,760	1756.1	21.28	19.87	924.4		8,131.2	
7/23/2007	3:29:00 PM	210	60,360	1754.5	21.27	19.86	924.5		8,923.7	
7/23/2007	3:30:00 PM	210	72,960	1754.9	21.25	19.83	924.6		10,764.0	
7/23/2007	3:31:00 PM	210	85,560	1760.4	19.73	18.33	930.7		15,019.5	specimen failed.
7/23/2007	3:32:00 PM	120	91,750	0.8	0.03	0.03	1.2		639.3	
7/23/2007	3:33:00 PM	120	99,550	0.3	0.03	0.03	1.2		548.1	

Cycles to Failure = 90,780

Specimen: 996-2.3 **Material:** FGM **Thickness:** 0.125 in. **Target:** Velocity = 141.44 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/23/2007	1:55:29 PM	60	60	99.1	0.26	0.25	68.1	48.1	99.2	
7/23/2007	1:55:35 PM	226	1,190	99.5	0.26	0.25	68.4	48.3	105.0	continued on next page

Specimen: 996-2.3		Material: FGM		Thickness: 0.125 in.		Target: Velocity = 141.44 mm/s				
Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/23/2007	1:56:00 PM	226	6,840	99.8	0.27	0.26	68.6	48.5	104.8	continued from previous page
7/23/2007	1:57:00 PM	226	20,400	99.8	0.27	0.26	68.6	48.5	113.8	
7/23/2007	1:58:00 PM	60	24,000	0.8	0.03	0.03	1.2	0.9	64.5	
7/23/2007	1:59:00 PM	60	27,600	0.8	0.03	0.03	1.2	0.9	55.7	
7/23/2007	2:00:00 PM	60	31,200	0.9	0.03	0.03	1.2	0.9	39.4	
7/23/2007	2:01:00 PM	60	34,800	0.9	0.03	0.03	1.2	0.9	67.0	
7/23/2007	2:01:05 PM	60	35,100	0.8	0.03	0.03	1.2	0.9	68.3	

Specimen: 996-2.3		Material: FGM		Thickness: 0.125 in.		Target: Velocity = 282.88 mm/s				
Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/23/2007	2:02:24 PM	60	60	99.8	0.27	0.26	68.4	48.4	79.3	
7/23/2007	2:02:30 PM	226	1,190	99.9	0.27	0.26	68.6	48.6	86.4	
7/23/2007	2:02:44 PM	226	4,580	99.9	0.27	0.26	68.6	48.5	87.4	
7/23/2007	2:02:59 PM	226	7,970	99.8	0.27	0.26	68.5	48.5	88.8	
7/23/2007	2:03:14 PM	226	11,360	99.9	0.27	0.26	68.6	48.5	91.8	
7/23/2007	2:03:30 PM	226	14,750	99.8	0.27	0.26	68.6	48.5	76.9	
7/23/2007	2:03:45 PM	226	18,140	99.9	0.27	0.26	68.5	48.5	78.6	
7/23/2007	2:04:00 PM	226	21,530	99.7	0.28	0.26	68.5	48.5	81.6	
7/23/2007	2:04:15 PM	60	24,090	0.8	0.03	0.03	1.2	0.9	50.1	
7/23/2007	2:04:20 PM	60	24,390	0.8	0.03	0.03	1.2	0.9	61.8	

Specimen: 996-2.3		Material: FGM		Thickness: 0.125 in.		Target: Velocity =2041.44 mm/s				
Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/23/2007	2:12:41 PM	60	60	3.9	0.04	0.04	2.94	2.08	19.3	
7/23/2007	2:12:46 PM	226	1,190	672.5	4.62	5.07	470.65	328.54	475.0	
7/23/2007	2:12:52 PM	226	2,320	104.1	14.98	14.68	9.18	1.18	16246.4	
7/23/2007	2:12:56 PM	14	2,390	11.8	0.03	0.03	7.82	0.91	15804.3	
7/23/2007	2:13:01 PM	2	2,400	9.1	0.03	0.03	7.70	0.84	15617.0	
7/23/2007	2:13:07 PM	2	2,410	7.1	0.03	0.03	7.66	0.82	15544.1	
7/23/2007	2:13:12 PM	2	2,420	5.6	0.03	0.03	7.62	0.81	15505.0	

continued on next page

Specimen: 996-2.3		Material: FGM		Thickness: 0.125 in.		Target: Velocity =2041.44 mm/s				
Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/23/2007	2:13:16 PM	13	2,485	4.7	0.03	0.03	7.58	0.81	15491.5	continued from previous page Specimen failed on ramp up to test conditions.
7/23/2007	2:13:22 PM	6	2,515	10.4	0.03	0.04	7.54	0.80	27485.0	

Specimen: 996-2.4		Material: FGM		Thickness: 0.122 in. to 0.125 in.		Target: Velocity = 141.44 mm/s & 282.88 mm/s				
Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/26/2007	2:07:02 PM	120	120	4.9	0.05	0.03	3.7	2.1	688.3	
7/26/2007	2:07:03 PM	120	240	17.9	0.06	0.05	10.5	7.2	688.1	
7/26/2007	2:07:15 PM	120	1,680	99.7	0.25	0.32	57.2	40.1	707.1	
7/26/2007	2:07:30 PM	223	4,510	99.8	0.25	0.32	57.3	40.1	692.0	
7/26/2007	2:07:45 PM	223	7,855	99.8	0.25	0.32	57.2	40.1	699.5	
7/26/2007	2:08:00 PM	223	10,977	99.9	0.25	0.32	57.3	40.1	732.0	
7/26/2007	2:08:15 PM	223	14,099	100.0	0.25	0.32	57.3	40.1	724.0	
7/26/2007	2:08:30 PM	223	17,890	99.8	0.25	0.32	57.2	40.0	718.3	
7/26/2007	2:08:45 PM	223	21,235	99.8	0.25	0.32	57.2	40.1	707.3	
7/26/2007	2:08:59 PM	223	24,580	99.9	0.25	0.32	57.2	40.1	718.2	
7/26/2007	2:09:15 PM	223	27,925	99.8	0.25	0.32	57.3	40.1	724.0	
7/26/2007	2:09:30 PM	223	31,047	99.6	0.25	0.32	57.2	40.0	729.6	
7/26/2007	2:09:45 PM	223	34,169	49.9	0.13	0.15	28.7	20.1	719.9	
7/26/2007	2:09:50 PM	223	35,284	146.7	0.38	0.48	84.1	59.0	735.0	
7/26/2007	2:09:55 PM	223	36,176	149.1	0.39	0.49	85.3	59.8	748.9	
7/26/2007	2:10:00 PM	223	37,291	149.3	0.39	0.49	85.5	60.0	761.3	
7/26/2007	2:10:15 PM	223	40,413	149.5	0.39	0.50	85.6	60.0	766.1	
7/26/2007	2:10:30 PM	223	43,535	159.8	0.42	0.53	91.5	64.2	746.5	
7/26/2007	2:10:45 PM	223	46,657	199.4	0.54	0.68	114.4	80.3	781.8	
7/26/2007	2:11:00 PM	223	50,225	199.5	0.54	0.69	114.4	80.3	776.1	
7/26/2007	2:11:15 PM	223	54,685	199.6	0.54	0.69	114.4	80.3	790.1	
7/26/2007	2:11:30 PM	223	58,030	199.7	0.54	0.69	114.5	80.4	807.2	
7/26/2007	2:11:45 PM	222	61,370	1.1	0.04	0.02	2.4	0.9	793.7	

Specimen: 996-2.4		Material: FGM		Thickness: 0.122 in. to 0.125 in.		Target: Velocity = 2642 mm/s				
Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/26/2007	2:18:50 PM	60	60	14.3	0.06	0.05	8.5	5.7	878.1	
7/26/2007	2:18:54 PM	60	300	764.9	2.74	3.31	439.7	308.5	1,077.5	
7/26/2007	2:19:00 PM	60	600	2180.9	4.01	4.48	1236.7	864.9	1,859.6	
7/26/2007	2:19:05 PM	60	900	26.0	0.05	0.03	14.8	10.3	1,065.7	
7/26/2007	2:19:10 PM	60	1,200	1.1	0.04	0.02	2.3	0.8	1,073.9	
7/26/2007	2:19:18 PM	60	1,680	1.1	0.04	0.02	2.3	0.8	1,066.8	Exceed negative dwell limit - test stopped.

Specimen: 996-2.4		Material: FGM		Thickness: 0.122 in. to 0.125 in.		Target: Velocity = 2642 mm/s				
Date	Time	Freq. (Hz)	Cycles	Velocity	Head Accel.	Fixture	Ti-side	TiB-side	Amplitude	
				(mm/s rms)	(g rms)	Accel. (g rms)				
7/26/2007	2:21:32 PM	60	60	2.7	0.04	0.02	2.7	1.3	1,040.3	
7/26/2007	2:21:33 PM	60	120	2.9	0.04	0.02	2.8	1.4	1,037.2	
7/26/2007	2:21:34 PM	60	180	3.0	0.05	0.02	2.8	1.4	1,029.7	
7/26/2007	2:21:35 PM	60	240	11.1	0.06	0.05	6.7	4.5	1,034.5	
7/26/2007	2:21:36 PM	60	300	94.8	0.37	0.44	54.6	38.3	1,042.8	
7/26/2007	2:21:37 PM	60	360	343.9	1.41	1.67	197.5	138.8	1,094.7	
7/26/2007	2:21:38 PM	60	420	529.2	2.29	2.69	304.5	214.0	1,148.5	
7/26/2007	2:21:39 PM	60	480	830.4	3.70	4.34	479.1	336.5	1,254.4	
7/26/2007	2:21:40 PM	60	540	1,314.7	5.77	6.82	757.5	531.2	1,459.9	
7/26/2007	2:21:41 PM	60	600	1,688.7	7.17	8.57	974.1	682.3	1,654.8	
7/26/2007	2:21:43 PM	60	660	2,289.3	6.10	6.11	1302.2	910.0	1,997.4	
7/26/2007	2:21:44 PM	60	720	2,243.1	4.88	4.97	1272.3	889.3	2,064.6	
7/26/2007	2:21:45 PM	60	780	2,097.1	3.76	3.45	1184.4	828.3	2,066.8	
7/26/2007	2:21:46 PM	60	840	1,882.4	3.28	2.12	1054.5	738.1	1,996.9	
7/26/2007	2:21:47 PM	60	900	1,834.1	3.52	2.28	1026.1	718.3	1,984.4	
7/26/2007	2:21:48 PM	60	960	1,877.5	3.45	2.17	1050.4	735.3	2,008.7	
7/26/2007	2:21:49 PM	60	1,020	1,870.2	3.43	2.15	1046.0	732.2	1,999.5	
7/26/2007	2:21:50 PM	60	1,080	1,868.3	3.42	2.13	1045.6	731.9	2,001.2	
7/26/2007	2:22:02 PM	220	3,400	1,862.0	3.36	2.06	1041.6	729.1	2,090.7	
7/26/2007	2:25:01 PM	221	43,035	1,885.2	3.33	1.98	1059.1	741.0	4,783.2	
7/26/2007	2:30:01 PM	220	109,165	1,857.0	3.24	1.92	1042.3	729.2	10,660.3	
7/26/2007	3:00:02 PM	220	505,165	1,862.8	3.26	1.94	213.8	731.5	16,743.5	Ti-side gage failed. (cont'd on next page)

Specimen: 996-2.4

Material: FGM

Thickness: 0.122 in. to 0.125 in.

Target: Velocity = 2642 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/26/2007	4:00:02 PM	220	1,297,165	1,864.1	3.41	2.09	28.7	731.2	13,896.7	continued from previous page
7/26/2007	5:00:01 PM	220	2,089,320	1,863.8	3.49	2.22	120.8	731.5	21,555.6	
7/26/2007	6:00:01 PM	220	2,881,480	1,863.0	3.56	2.30	156.4	4326.5	35,426.0	85% TiB-side strain gage failed.
7/26/2007	7:00:01 PM	220	3,673,925	1,861.8	3.47	2.17	146.6	9768.4	10,895.5	
7/26/2007	8:00:02 PM	221	4,469,205	1,863.1	3.15	1.94	369.8	9899.7	32,520.2	
7/26/2007	9:00:01 PM	221	5,264,805	1,863.3	3.27	2.02		8764.0	1,965.1	
7/26/2007	10:00:01 PM	221	6,060,395	1,863.1	3.24	1.98		8585.9	20,996.2	
7/26/2007	11:00:01 PM	221	6,855,225	1,878.1	3.49	2.22		10082.1	38,498.9	
7/27/2007	12:00:02 AM	221	7,650,575	1,863.0	3.15	1.95		9654.7	30,139.3	
7/27/2007	1:00:01 AM	221	8,446,175	1,863.3	3.15	1.96		1.0	19,032.1	
7/27/2007	2:00:01 AM	221	9,241,775	1,863.9	3.06	1.95			37,551.2	
7/27/2007	3:00:01 AM	221	10,036,930	1,863.0	3.05	2.01			3,384.7	
7/27/2007	4:00:02 AM	221	10,832,515	1,863.7	3.11	2.44			29,180.6	
7/27/2007	5:00:02 AM	221	11,628,025	1,864.1	3.11	2.83			2,909.7	
7/27/2007	6:00:01 AM	221	12,423,510	1,863.0	3.14	3.00			39,334.6	
7/27/2007	7:00:01 AM	221	13,219,005	1,863.1	3.13	3.02			26,769.6	
7/27/2007	8:00:02 AM	220	14,011,560	1,863.0	3.19	3.13			1,517.7	
7/27/2007	9:00:02 AM	220	14,803,600	1,863.8	3.30	3.08			36,730.3	
7/27/2007	10:00:01 AM	220	15,595,600	1,863.7	3.26	2.98			13,389.3	
7/27/2007	11:00:01 AM	220	16,387,600	1,873.8	3.31	2.82			36,434.3	
7/27/2007	12:00:01 PM	220	17,179,600	1,863.9	3.44	2.69			2,959.3	
7/27/2007	1:00:01 PM	220	17,971,600	1,863.6	3.41	2.49			7,383.7	
7/27/2007	2:00:01 PM	220	18,763,600	1,862.5	3.35	2.35			31,387.6	
7/27/2007	3:00:02 PM	220	19,555,600	1,863.1	3.58	2.39			19,087.0	
7/27/2007	4:00:02 PM	220	20,347,600	1,864.1	3.36	2.20			21,681.5	
7/27/2007	5:00:01 PM	220	21,139,600	1,864.1	3.43	2.06			23,398.9	
7/27/2007	6:00:01 PM	220	21,931,600	1,863.6	3.46	2.00			14,946.0	
7/27/2007	7:00:01 PM	220	22,723,600	1,863.2	3.43	1.96			13,496.7	
7/27/2007	8:00:02 PM	220	23,515,600	1,863.9	3.35	1.87			17,238.0	
7/27/2007	9:00:01 PM	220	24,307,600	1,863.5	3.33	1.84			21,170.8	
7/27/2007	10:00:01 PM	220	25,099,600	1,863.1	3.29	1.80			39,347.3	
7/27/2007	11:00:01 PM	220	25,891,600	1,863.5	3.69	2.11			39,023.6	
7/28/2007	12:00:02 AM	220	26,683,600	1,863.7	3.68	2.08			28,533.5	
7/28/2007	1:00:01 AM	220	27,475,600	1,863.7	3.65	2.07			9,117.0	continued on next page

Specimen: 996-2.4

Material: FGM

Thickness: 0.122 in. to 0.125 in.

Target: Velocity = 2642 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/28/2007	2:00:01 AM	220	28,267,600	1,863.4	3.64	2.08			1,727.1	continued from previous page
7/28/2007	3:00:01 AM	220	29,059,600	1,863.3	3.60	2.05			10,394.6	
7/28/2007	4:00:02 AM	220	29,851,600	1,863.3	3.56	2.06			24,277.2	
7/28/2007	5:00:02 AM	220	30,643,600	1,863.2	3.54	2.09			28,159.6	
7/28/2007	6:00:01 AM	220	31,435,600	1,863.1	3.46	2.04			7,909.6	
7/28/2007	7:00:01 AM	220	32,227,600	1,863.5	3.43	2.07			38,922.7	
7/28/2007	8:00:02 AM	220	33,019,600	1,862.8	3.37	2.13			6,338.3	
7/28/2007	9:00:02 AM	220	33,811,600	1,862.7	3.41	2.25			28,849.5	
7/28/2007	10:00:01 AM	220	34,603,600	1,863.1	3.82	2.62			9,394.6	
7/28/2007	11:00:01 AM	220	35,395,600	1,864.9	3.78	2.65			38,961.1	
7/28/2007	12:00:01 PM	220	36,187,600	1,862.7	3.74	2.73			12,705.8	
7/28/2007	1:00:02 PM	220	36,979,600	1,863.5	3.69	2.75			21,281.3	
7/28/2007	2:00:01 PM	220	37,771,600	1,863.3	3.65	2.76			29,016.6	
7/28/2007	3:00:01 PM	220	38,563,600	1,863.7	3.57	2.87			6,685.9	
7/28/2007	4:00:01 PM	220	39,355,600	1,859.3	4.01	3.19			14,774.2	specimen failed
7/28/2007	5:00:02 PM	220	40,147,600	1,863.6	3.61	3.13			10,749.4	
7/28/2007	6:00:01 PM	220	40,939,600	1,863.3	4.06	3.46			38,387.1	
7/28/2007	7:00:01 PM	220	41,731,600	1,863.9	3.84	3.83			7,174.3	
7/28/2007	8:00:01 PM	220	42,523,464	1,863.7	3.81	4.19			19,004.3	
7/28/2007	9:00:02 PM	219	43,313,196	1,863.5	4.16	4.66			34,209.8	
7/28/2007	10:00:02 PM	219	44,101,596	1,862.5	4.51	5.26			3,135.5	
7/28/2007	11:00:01 PM	219	44,889,996	1,863.0	4.20	5.48			19,929.0	
7/29/2007	12:00:01 AM	219	45,678,396	1,862.5	4.72	5.96			11,119.3	
7/29/2007	1:00:02 AM	219	46,466,796	1,863.1	5.11	6.54			9,732.9	
7/29/2007	2:00:02 AM	219	47,255,196	1,862.6	5.20	6.96			29,376.9	
7/29/2007	3:00:01 AM	218	48,041,676	1,861.8	5.57	7.95			32,596.9	
7/29/2007	4:00:01 AM	218	48,826,476	1,861.9	5.94	8.69			35,841.5	
7/29/2007	5:00:01 AM	217	49,609,676	1,863.0	6.68	10.11			7,933.9	
7/29/2007	6:00:02 AM	216	50,390,312	1,861.0	7.81	10.72			9,631.6	
7/29/2007	7:00:01 AM	214	51,163,224	1,860.7	13.53	13.61			4,719.4	
7/29/2007	7:17:51 AM	213	51,392,856	1,862.5	16.23	16.12			3,723.0	
7/29/2007	7:17:57 AM	213	51,393,920	490.7	68.70	69.96			33,050.0	continued on next page
7/29/2007	7:18:01 AM	218	51,395,008	501.8	71.74	70.16			33,194.3	
7/29/2007	7:18:06 AM	222	51,396,120	8.2	0.06	0.06			33,220.7	

Specimen: 996-2.4 **Material:** FGM **Thickness:** 0.122 in. to 0.125 in. **Target:** Velocity = 2642 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/29/2007	7:18:12 AM	60	51,396,420	6.1	0.04	0.03			33,193.3	continued from previous page
7/29/2007	8:00:01 AM	60	51,547,020	0.9	0.04	0.03			30,216.6	
Cycles to Failure =			69,364,456							

Specimen: 996-2.5 **Material:** FGM **Thickness:** 0.120 in. to 0.125 in. **Target:** Velocity = 80 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/3/2007	3:55:53 PM	60	60	34.6	0.14	0.14	22.1	15.5	33,692.2	

Specimen: 996-2.5 **Material:** FGM **Thickness:** 0.120 in. to 0.125 in. **Target:** Velocity = 80 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/3/2007	3:56:01 PM	210	210	79.7	0.28	0.27	51.4	35.6	33,680.0	
7/3/2007	3:56:07 PM	210	1,260	80.1	0.28	0.27	51.6	35.7	33,672.9	
7/3/2007	3:56:12 PM	210	2,310	79.9	0.28	0.27	51.6	35.7	33,662.7	
7/3/2007	3:56:16 PM	210	3,360	79.8	0.28	0.27	51.5	35.6	33,684.1	
7/3/2007	3:56:22 PM	210	4,410	79.8	0.28	0.27	51.5	35.6	33,680.2	
7/3/2007	3:56:27 PM	210	5,460	79.7	0.28	0.27	51.4	35.5	33,672.4	
7/3/2007	3:56:32 PM	210	6,510	79.9	0.28	0.27	51.6	35.6	33,663.3	
7/3/2007	3:56:37 PM	210	7,560	51.6	0.16	0.15	33.3	23.0	33,666.1	
7/3/2007	3:56:42 PM	60	7,860	0.4	0.02	0.03	1.4	0.9	33,678.1	

Specimen: 996-2.5 **Material:** FGM **Thickness:** 0.120 in. to 0.125 in. **Target:** Velocity = 80 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/3/2007	4:11:48 PM	60	60	0.8	0.02	0.03	1.4	0.9	5.3	
7/3/2007	4:12:04 PM	60	960	0.8	0.02	0.03	1.5	0.9	4.5	
7/3/2007	4:12:34 PM	60	2,760	0.7	0.02	0.03	1.4	0.9	17.0	
7/3/2007	4:13:04 PM	60	4,560	0.7	0.08	0.08	1.5	0.9	10.1	
7/3/2007	4:13:34 PM	400	13,160	5.1	3.88	3.80	4.3	3.2	92.7	continued on next page

Specimen: 996-2.5		Material: FGM		Thickness: 0.120 in. to 0.125 in.		Target: Velocity = 80 mm/s				
Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/3/2007	4:14:03 PM	60	19,660	0.8	0.02	0.03	1.4	0.9	9.2	continued from previous page
7/3/2007	4:14:14 PM	60	20,260	0.8	0.02	0.03	1.5	0.9	2.3	
Specimen: 996-2.5		Material: FGM		Thickness: 0.120 in. to 0.125 in.		Target: Velocity = 914 mm/s				
Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/3/2007	4:16:37 PM	60	60	159.79	0.68	0.67	103.1	71.2	120.9	85% TiB-side strain gage failed.
7/3/2007	4:16:42 PM	210	1,110	950.3	4.27	3.78	605.9	410.7	16,302.1	
7/3/2007	4:16:48 PM	209	2,155	900.0	4.03	3.56	572.1	383.9	16,344.3	
7/3/2007	4:17:02 PM	209	5,290	911.6	4.28	3.79	581.2	384.1	16405.4	
7/3/2007	4:18:03 PM	209	17,830	910.5	4.32	3.83	582.6	378.9	16929.0	
7/3/2007	4:19:02 PM	209	30,370	911.6	4.33	3.85	584.4	379.0	1145.7	
7/3/2007	4:20:03 PM	209	42,910	912.0	4.36	3.88	585.8	378.1	1,009.5	
7/3/2007	4:21:02 PM	209	55,450	910.3	4.38	3.90	585.5	377.9	889.4	
7/3/2007	4:22:03 PM	209	67,990	911.5	4.40	3.92	586.2	376.8	816.3	
7/3/2007	4:23:02 PM	209	80,530	911.8	4.40	3.92	587.2	376.2	717.6	
7/3/2007	4:24:06 PM	209	93,070	911.8	4.39	3.91	586.9	374.7	696.3	
7/3/2007	4:24:42 PM	209	101,430	911.3	4.39	3.91	586.6	373.9	741.7	
7/3/2007	4:24:47 PM	209	102,475	912.0	4.39	3.92	586.7	3511.4	751.2	
7/3/2007	4:24:53 PM	209	103,520	912.2	4.39	3.91	587.2	2674.3	772.0	
7/3/2007	4:25:02 PM	209	105,610	911.9	4.39	3.91	586.5	3056.9	843.2	
7/3/2007	4:30:03 PM	210	168,530	912.0	3.27	2.80	586.2	1783.5	1,274.0	
7/3/2007	4:35:02 PM	210	231,530	912.0	3.28	2.80	584.7		1,313.1	
7/3/2007	4:40:02 PM	210	294,530	911.7	3.22	2.76	584.9		1,364.2	
7/3/2007	4:45:03 PM	210	357,530	911.9	3.17	2.71	584.7		1,407.0	
7/3/2007	4:50:02 PM	60	385,250	1.0	0.02	0.03	1.5		16,343.5	No longer at test conditions. Ignore rest of cycles until test is restarted.
7/3/2007	4:52:08 PM	60	392,750	1.0	0.02	0.03	1.5		16,348.3	
Specimen: 996-2.5		Material: FGM		Thickness: 0.120 in. to 0.125 in.		Target: Velocity = 914 mm/s				
Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/3/2007	4:55:50 PM	60	60	17.4	0.05	0.04	11.0		10,767.5	Restart test (cont'd on next page)

Specimen: 996-2.5

Material: FGM

Thickness: 0.120 in. to 0.125 in.

Target: Velocity = 914 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain ($\mu\epsilon$)	TiB-side Strain ($\mu\epsilon$)	Amplitude (mils rms)	Comments
7/3/2007	4:56:00 PM	210	2,160	865.7	2.04	1.57	555.9		10,708.9	continued from previous page
7/3/2007	5:00:05 PM	210	53,610	909.5	2.20	1.68	582.5		898.3	
7/3/2007	6:00:00 PM	210	808,560	922.1	2.23	1.72	588.8		19,517.7	
7/3/2007	7:00:00 PM	210	1,564,560	911.2	2.21	1.71	579.7		22,833.8	
7/3/2007	8:00:00 PM	210	2,320,560	911.4	2.17	1.68	581.1		20,914.6	
7/3/2007	9:00:00 PM	210	3,076,560	910.9	2.13	1.65	582.1		21,358.9	
7/3/2007	10:00:05 PM	210	3,833,610	911.3	2.35	1.83	580.9		16,959.5	
7/3/2007	11:00:00 PM	210	4,588,560	910.9	2.34	1.82	581.3		31,826.4	
7/4/2007	12:00:00 AM	210	5,344,560	911.3	2.32	1.81	581.4		6,155.0	
7/4/2007	1:00:00 AM	210	6,100,560	911.3	2.31	1.81	579.8		21,760.1	Ti-side strain gage failed?
7/4/2007	2:00:00 AM	210	6,856,560	911.1	2.29	1.79	580.0		33,616.1	
7/4/2007	3:00:00 AM	210	7,612,560	910.9	2.29	1.79	579.2		37,167.5	
7/4/2007	4:00:00 AM	210	8,368,560	910.8	2.26	1.77	579.0		16,244.7	
7/4/2007	5:00:00 AM	210	9,124,560	911.2	2.26	1.77	579.1		2,836.9	
7/4/2007	6:00:00 AM	210	9,880,560	911.5	2.24	1.76	579.8		8,210.3	
7/4/2007	7:00:00 AM	210	10,636,560	911.8	2.22	1.74	578.7		7,377.9	
7/4/2007	8:00:00 AM	210	11,392,560	910.7	2.19	1.72	578.6		2,529.4	
7/4/2007	9:00:00 AM	210	12,148,560	911.3	2.20	1.72	577.2		21,007.8	
7/4/2007	10:00:00 AM	210	12,904,560	910.9	2.44	1.92	574.5		33,988.9	
7/4/2007	11:00:00 AM	210	13,660,560	911.2	2.11	1.64	122.2		26,915.0	
7/4/2007	12:00:00 PM	210	14,416,560	911.2	2.34	1.85	263.8		16,746.9	
7/4/2007	1:00:00 PM	210	15,172,560	910.9	2.38	1.88	324.0		697.3	
7/4/2007	2:00:00 PM	210	15,928,560	910.9	2.35	1.86	337.5		15,930.9	
7/4/2007	3:00:00 PM	210	16,684,560	911.0	2.35	1.86	326.8		28,889.3	
7/4/2007	4:00:00 PM	210	17,440,560	911.0	2.37	1.87	330.2		39,571.3	
7/4/2007	5:00:00 PM	210	18,196,560	905.9	2.35	1.85	325.7		34,459.4	
7/4/2007	6:00:00 PM	210	18,952,560	911.3	2.30	1.82	336.7		38,757.2	
7/4/2007	7:00:00 PM	210	19,708,560	910.8	2.27	1.79	344.7		29,625.8	
7/4/2007	8:00:00 PM	210	20,464,560	911.0	2.27	1.79	349.4		34,703.4	
7/4/2007	9:00:05 PM	210	21,221,610	910.9	2.25	1.78	333.1		732.8	
7/4/2007	10:00:00 PM	210	21,976,560	911.0	2.25	1.77	348.2		36,896.9	
7/4/2007	11:00:00 PM	210	22,732,560	910.9	2.25	1.78	342.2		15,151.0	
7/5/2007	12:00:00 AM	210	23,488,560	911.5	2.23	1.76	363.3		13,620.8	
7/5/2007	1:00:00 AM	210	24,244,560	911.2	2.21	1.74	359.9		13,006.3	continued on next page

Specimen: 996-2.5

Material: FGM

Thickness: 0.120 in. to 0.125 in.

Target: Velocity = 914 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain ($\mu\epsilon$)	TiB-side Strain ($\mu\epsilon$)	Amplitude (mils rms)	Comments
7/5/2007	2:00:00 AM	210	25,000,560	910.9	2.20	1.73	364.2		6,438.7	continued from previous page
7/5/2007	3:00:00 AM	209	25,753,910	910.7	2.46	1.94	365.9		5,830.9	
7/5/2007	4:00:00 AM	209	26,506,310	911.2	2.44	1.93	363.5		10,150.3	
7/5/2007	5:00:00 AM	209	27,258,710	911.0	2.43	1.92	377.7		6,246.5	
7/5/2007	6:00:05 AM	209	28,012,156	911.0	2.42	1.91	366.9		2,796.5	
7/5/2007	7:00:00 AM	209	28,763,510	910.9	2.41	1.90	360.8		4,846.6	
7/5/2007	8:00:00 AM	210	29,518,850	910.7	2.15	1.67	311.7		13,284.9	
7/5/2007	9:00:00 AM	209	30,274,340	911.4	2.29	1.80	338.8		25,659.6	
7/5/2007	10:00:00 AM	209	31,026,740	911.0	2.24	1.74	334.4		31,708.7	
7/5/2007	11:00:00 AM	209	31,779,140	911.3	2.07	1.60	344.8		39,850.6	
7/5/2007	12:00:00 PM	209	32,531,540	910.6	2.24	1.76	343.0		3,172.0	
7/5/2007	1:00:00 PM	209	33,283,940	911.0	2.43	1.92	363.8		19,978.7	
7/5/2007	2:00:00 PM	209	34,036,340	910.9	2.40	1.89	404.6		29,914.3	
7/5/2007	3:00:00 PM	209	34,788,740	911.1	2.39	1.88	387.1		33,586.2	
7/5/2007	4:00:00 PM	209	35,541,140	911.2	2.18	1.70	402.4		22,128.2	
7/5/2007	5:00:00 PM	209	36,293,540	911.5	2.20	1.72	404.9		7,435.7	
7/5/2007	6:00:00 PM	209	37,045,940	910.4	2.18	1.69	400.2		31,762.8	
7/5/2007	7:00:00 PM	209	37,798,340	911.4	2.21	1.72	387.6		37,586.5	
7/5/2007	8:00:00 PM	209	38,550,740	911.3	2.22	1.72	410.4		5,613.9	
7/5/2007	9:00:00 PM	209	39,303,140	911.1	2.22	1.72	395.5		28,122.7	
7/5/2007	10:00:00 PM	209	40,055,540	911.0	2.23	1.73	381.0		25,522.2	
7/5/2007	11:00:05 PM	209	40,808,984	910.7	2.21	1.72	390.3		2,862.8	
7/6/2007	12:00:00 AM	209	41,560,340	910.9	2.20	1.70	386.2		9,988.7	
7/6/2007	1:00:00 AM	209	42,312,740	910.8	2.18	1.69	401.5		12,923.3	
7/6/2007	2:00:00 AM	209	43,065,140	910.9	2.19	1.70	399.2		17,679.3	
7/6/2007	3:00:00 AM	209	43,817,540	911.2	2.18	1.69	402.2		17,407.3	
7/6/2007	4:00:00 AM	209	44,569,940	911.0	2.17	1.68	388.7		15,154.1	
7/6/2007	5:00:00 AM	209	45,322,340	911.0	2.18	1.69	392.4		14,626.2	
7/6/2007	6:00:00 AM	209	46,074,740	911.1	2.17	1.68	395.0		19,524.1	
7/6/2007	7:00:00 AM	209	46,827,140	911.4	2.18	1.69	364.0		21,051.1	
7/6/2007	8:00:00 AM	209	47,579,540	910.7	2.19	1.69	385.3		21,870.9	
7/6/2007	9:00:00 AM	209	48,331,940	910.3	2.11	1.64	371.8		1,757.5	
7/6/2007	10:00:00 AM	209	49,084,340	911.4	2.21	1.72	392.9		7,515.1	
7/6/2007	11:00:00 AM	209	49,836,740	911.0	2.24	1.73	395.9		8,379.8	continued on next page

Specimen: 996-2.5 **Material:** FGM **Thickness:** 0.120 in. to 0.125 in. **Target:** Velocity = 914 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/6/2007	12:52:59 PM	209	50,069,776	911.0	2.32	1.80	427.9		1,485.1	continued from previous page

Specimen: 996-2.5 **Material:** FGM **Thickness:** 0.120 in. to 0.125 in. **Target:** Velocity = 914 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/6/2007	12:53:04 PM	209	209	911.0	2.32	1.81	432.4		1,448.6	Restart test
7/6/2007	12:54:04 PM	209	12,749	914.3	2.13	1.65	411.3		1,241.4	
7/6/2007	12:55:04 PM	209	25,289	911.0	2.06	1.60	418.2		1,046.0	
7/6/2007	12:56:04 PM	209	37,829	911.2	2.06	1.60	422.1		878.1	
7/6/2007	12:57:04 PM	209	50,369	911.0	2.07	1.60	422.2		727.9	
7/6/2007	12:58:04 PM	209	62,909	911.1	2.08	1.61	422.7		705.3	
7/6/2007	12:59:04 PM	209	75,449	910.7	2.11	1.63	408.7		697.3	
7/6/2007	1:00:04 PM	209	87,989	911.2	2.13	1.65	416.5		711.5	
7/6/2007	2:00:04 PM	209	840,389	911.3	2.17	1.68	394.9		2,441.9	
7/6/2007	3:00:04 PM	209	1,592,789	911.3	2.19	1.70	388.1		2,978.1	
7/6/2007	4:00:04 PM	209	2,345,189	910.8	2.22	1.72	379.5		13,050.9	
7/6/2007	5:00:04 PM	209	3,097,589	911.6	2.23	1.73	379.2		8,048.3	
7/6/2007	6:00:04 PM	209	3,849,989	911.4	2.22	1.72	371.3		4,368.8	
7/6/2007	7:00:04 PM	209	4,602,389	911.1	2.15	1.67	368.8		692.1	
7/6/2007	8:00:04 PM	209	5,354,789	911.1	2.14	1.66	364.4		7,476.4	
7/6/2007	9:00:04 PM	209	6,107,189	910.9	2.16	1.67	367.7		9,824.6	
7/6/2007	10:00:04 PM	209	6,859,589	911.3	2.14	1.66	364.6		29,946.1	
7/6/2007	11:00:04 PM	209	7,611,989	910.6	2.14	1.65	357.4		31,253.8	
7/7/2007	12:00:04 AM	209	8,364,389	910.5	2.14	1.65	362.7		10,985.9	
7/7/2007	1:00:04 AM	209	9,116,789	911.2	2.13	1.65	368.5		6,405.0	
7/7/2007	2:00:04 AM	209	9,869,189	910.9	2.11	1.63	368.9		13,168.6	
7/7/2007	3:00:04 AM	209	10,621,589	911.3	2.11	1.63	370.4		8,865.0	
7/7/2007	4:00:03 AM	209	11,373,989	911.1	2.12	1.64	377.1		5,328.5	
7/7/2007	5:00:04 AM	209	12,126,389	911.0	2.13	1.65	384.3		2,373.7	
7/7/2007	6:00:04 AM	209	12,878,789	911.2	2.15	1.66	377.9		4,912.0	
7/7/2007	7:00:04 AM	209	13,631,189	911.5	2.17	1.67	381.7		11,490.2	
7/7/2007	8:00:04 AM	209	14,383,589	911.0	2.16	1.67	381.4		5,666.3	
7/7/2007	9:00:04 AM	209	15,135,989	911.6	2.13	1.65	370.0		3,411.6	continued on next page

Specimen: 996-2.5

Material: FGM

Thickness: 0.120 in. to 0.125 in.

Target: Velocity = 914 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain ($\mu\epsilon$)	TiB-side Strain ($\mu\epsilon$)	Amplitude (mils rms)	Comments
7/7/2007	10:00:04 AM	209	15,888,389	911.3	2.11	1.63	375.3		9,740.8	continued from previous page
7/7/2007	11:00:04 AM	209	16,640,789	911.0	2.09	1.61	378.8		17,095.8	
7/7/2007	12:00:04 PM	209	17,393,188	911.1	2.08	1.60	373.2		16,634.9	
7/7/2007	1:00:04 PM	209	18,145,588	910.8	2.07	1.60	370.4		15,639.6	
7/7/2007	2:00:04 PM	209	18,897,988	911.2	2.07	1.59	382.7		14,130.2	
7/7/2007	3:00:04 PM	209	19,650,388	911.3	2.12	1.63	361.7		13,153.2	
7/7/2007	4:00:00 PM	209	20,401,744	911.7	2.13	1.63	362.7		12,402.7	
7/7/2007	5:00:04 PM	209	21,155,188	911.2	2.13	1.63	367.8		11,107.7	
7/7/2007	6:00:04 PM	209	21,907,588	911.8	2.13	1.64	358.2		9,629.3	
7/7/2007	7:00:04 PM	209	22,659,988	910.9	2.13	1.63	357.3		7,934.3	
7/7/2007	8:00:04 PM	209	23,412,388	911.5	2.13	1.64	371.9		5,413.0	
7/7/2007	9:00:04 PM	209	24,164,788	910.7	2.13	1.63	364.9		8,566.2	
7/7/2007	10:00:04 PM	209	24,917,188	911.2	2.11	1.62	369.6		12,358.0	
7/7/2007	11:00:04 PM	209	25,669,588	911.5	2.12	1.63	363.6		15,279.0	
7/8/2007	12:00:04 AM	209	26,421,988	911.8	2.12	1.62	363.8		22,780.8	
7/8/2007	1:00:04 AM	209	27,174,388	911.0	2.12	1.63	373.3		27,276.1	
7/8/2007	2:00:04 AM	209	27,926,788	911.4	2.12	1.63	367.6		24,692.9	
7/8/2007	3:00:04 AM	209	28,679,188	911.0	2.12	1.63	387.3		22,294.4	
7/8/2007	4:00:04 AM	209	29,431,588	911.1	2.12	1.63	388.2		24,337.3	
7/8/2007	5:00:04 AM	209	30,183,988	911.6	2.12	1.63	401.2		25,448.3	
7/8/2007	6:00:04 AM	209	30,936,388	910.9	2.13	1.63	392.0		25,251.3	
7/8/2007	7:00:04 AM	209	31,688,788	911.1	2.13	1.64	384.3		29,159.4	
7/8/2007	8:00:04 AM	209	32,441,188	911.3	2.12	1.63	390.6		39,828.2	
7/8/2007	9:00:04 AM	209	33,193,588	911.3	2.11	1.62	372.8		23,608.1	
7/8/2007	10:00:04 AM	209	33,945,988	911.6	2.09	1.60	360.7		14,115.8	
7/8/2007	11:00:04 AM	209	34,698,388	911.5	2.08	1.59	357.7		5,126.5	
7/8/2007	12:00:04 PM	209	35,450,788	911.0	2.07	1.59	362.0		4,781.1	
7/8/2007	1:00:04 PM	209	36,203,188	911.5	2.06	1.58	360.6		13,643.6	
7/8/2007	2:00:04 PM	209	36,955,588	911.5	2.06	1.58	389.1		14,303.2	
7/8/2007	3:00:04 PM	209	37,707,988	911.8	2.05	1.57	366.2		12,500.7	
7/8/2007	4:00:04 PM	209	38,460,388	911.5	2.05	1.57	362.9		11,480.7	
7/8/2007	5:00:04 PM	209	39,212,788	910.9	2.05	1.57	368.7		14,034.6	
7/8/2007	6:00:04 PM	209	39,965,188	911.1	2.03	1.56	353.4		13,019.7	
7/8/2007	7:00:04 PM	209	40,717,588	911.5	2.03	1.56	364.4		9,723.6	continued on next page

Specimen: 996-2.5 **Material:** FGM **Thickness:** 0.120 in. to 0.125 in. **Target:** Velocity = 914 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/8/2007	8:00:04 PM	209	41,469,988	911.1	2.02	1.55	351.5		9,353.3	continued from previous page
7/8/2007	9:00:04 PM	209	42,222,388	911.1	2.01	1.54	368.4		10,294.2	
7/8/2007	10:00:00 PM	209	42,973,744	911.2	2.03	1.55	369.0		10,343.0	
7/8/2007	11:00:04 PM	209	43,727,188	911.1	2.03	1.55	358.7		9,869.9	
7/9/2007	12:00:04 AM	209	44,479,588	910.4	2.03	1.56	347.7		9,499.4	
7/9/2007	1:00:04 AM	209	45,231,988	911.3	2.03	1.56	353.8		18,763.4	
7/9/2007	2:00:04 AM	209	45,984,388	911.5	2.03	1.56	366.9		26,017.3	
7/9/2007	3:00:04 AM	209	46,736,788	911.4	2.03	1.56	368.6		33,239.9	
7/9/2007	4:00:04 AM	209	47,489,188	911.5	2.04	1.57	368.0		39,776.8	
7/9/2007	5:00:04 AM	209	48,241,588	910.9	2.04	1.56	362.4		31,268.7	
7/9/2007	5:37:49 AM	209	48,714,976	911.5	2.04	1.57	376.9		20,204.0	No longer at test conditions. Ignore rest of cycles until test is restarted.
7/9/2007	5:37:54 AM	209	48,716,020	134.4	0.16	0.25	401.0		20,172.9	
7/9/2007	5:37:59 AM	60	48,716,320	0.8	0.04	0.03	391.5		20,138.6	
7/9/2007	5:38:04 AM	60	48,716,620	0.8	0.03	0.03	391.6		20,127.0	
7/9/2007	6:00:04 AM	60	48,795,820	0.8	0.04	0.03	7.2		20,116.6	
7/9/2007	7:00:04 AM	60	49,011,820	0.8	0.04	0.03	7.0		5,771.4	
7/9/2007	8:00:04 AM	60	49,234,284	0.8	0.03	0.03	7.2		5,877.7	
7/9/2007	9:00:04 AM	60	49,482,600	0.8	0.03	0.03	7.6		5,753.4	
7/9/2007	9:30:04 AM	60	49,590,600	0.8	0.03	0.04	7.8		5,641.4	

Specimen: 996-2.5 **Material:** FGM **Thickness:** 0.120 in. to 0.125 in. **Target:** Velocity = 914 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/9/2007	9:33:18 AM	60	60	583.3	2.29	2.62	279.1		5,706.1	Test restarted.
7/9/2007	9:33:24 AM	209	1,105	919.9	1.94	1.48	319.7		5,704.7	
7/9/2007	9:34:04 AM	208	9,425	911.8	2.00	1.54	334.1		5,468.6	
7/9/2007	9:35:04 AM	208	21,905	911.7	2.01	1.55	334.0		5,132.6	
7/9/2007	9:40:04 AM	208	84,305	911.7	1.97	1.52	339.4		3,775.4	
7/9/2007	9:45:04 AM	208	146,705	909.7	2.22	1.72	354.0		3,945.1	
7/9/2007	10:00:04 AM	208	333,905	911.6	1.99	1.53	393.1		6,764.7	
7/9/2007	11:00:04 AM	208	1,082,705	911.1	2.15	1.68	520.9		12,178.1	
7/9/2007	12:00:03 PM	209	1,834,075	911.6	2.11	1.64	460.9		25,402.9	
7/9/2007	1:00:04 PM	209	2,586,475	911.6	2.25	1.75	436.4		36,127.9	continued on next page

Specimen: 996-2.5

Material: FGM

Thickness: 0.120 in. to 0.125 in.

Target: Velocity = 914 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain ($\mu\epsilon$)	TiB-side Strain ($\mu\epsilon$)	Amplitude (mils rms)	Comments
7/9/2007	2:00:04 PM	209	3,338,875	911.6	2.28	1.77	444.4		38,749.0	continued from previous page
7/9/2007	3:00:04 PM	209	4,091,275	911.3	2.27	1.76	467.9		39,043.0	
7/9/2007	4:00:03 PM	209	4,843,675	911.4	2.05	1.58	383.1		32,664.4	
7/9/2007	5:00:04 PM	209	5,596,075	911.2	2.11	1.63	392.8		34,253.1	
7/9/2007	6:00:04 PM	209	6,348,475	911.8	2.12	1.63	428.6		31,406.9	
7/9/2007	7:00:04 PM	209	7,100,875	911.4	2.13	1.64	413.6		36,423.7	
7/9/2007	8:00:03 PM	209	7,853,275	911.5	2.15	1.66	402.4		31,100.0	
7/9/2007	9:00:04 PM	209	8,605,675	911.6	2.15	1.65	383.2		8,345.6	
7/9/2007	10:00:04 PM	209	9,358,075	911.3	2.16	1.66	325.0		14,013.2	
7/9/2007	11:00:04 PM	209	10,110,475	911.3	2.17	1.67	374.2		33,734.2	
7/10/2007	12:00:04 AM	209	10,862,875	911.4	2.18	1.68	380.2		29,507.0	No longer at test conditions. Ignore rest of cycles. continued from previous page
7/10/2007	1:00:03 AM	209	11,615,275	911.3	2.18	1.68	363.9		12,034.4	
7/10/2007	2:00:04 AM	209	12,367,675	911.5	2.19	1.68	390.7		5,548.9	
7/10/2007	3:00:04 AM	209	13,120,075	911.4	2.20	1.69	363.7		22,454.8	
7/10/2007	4:00:04 AM	209	13,872,475	911.6	2.21	1.70	377.8		36,788.2	
7/10/2007	5:00:03 AM	209	14,624,875	911.4	2.21	1.70	376.6		20,591.8	
7/10/2007	6:00:04 AM	209	15,377,275	911.1	2.20	1.69	363.2		8,333.9	
7/10/2007	7:00:04 AM	209	16,129,675	911.4	2.20	1.69	378.6		6,234.8	
7/10/2007	8:00:04 AM	209	16,882,076	911.9	2.04	1.57	458.8		11,006.8	
7/10/2007	9:00:03 AM	208	17,631,770	911.6	2.10	1.63	373.8		4,773.2	
7/10/2007	9:29:29 AM	208	17,998,890	1.0	0.06	0.02	438.1		2,602.6	continued from previous page
7/10/2007	9:29:34 AM	60	17,999,190	1.0	0.06	0.02	438.1		2,593.8	
7/10/2007	9:29:44 AM	60	17,999,790	1.1	0.06	0.02	438.1		2,617.4	
7/10/2007	9:29:54 AM	60	18,000,390	1.0	0.06	0.02	438.2		2,609.0	
7/10/2007	9:30:03 AM	60	18,000,990	1.0	0.06	0.02	438.4		2,593.4	
7/10/2007	9:31:04 AM	3	18,004,304	638.6	0.06	0.02	438.6		24,713.2	
7/10/2007	9:32:04 AM	23	18,011,460	26.5	0.06	0.03	442.3		25,760.9	
7/10/2007	9:33:03 AM	14	18,012,424	1147.1	0.06	0.03	442.6		28,442.1	
7/10/2007	9:34:04 AM	15	18,013,370	1335.4	0.06	0.03	442.8		28,405.2	
7/10/2007	9:35:04 AM	15	18,014,250	1472.6	0.06	0.02	220.6		30,514.5	
7/10/2007	9:36:04 AM	15	18,015,144	1436.1	0.06	0.02	2.0		23,380.5	continued from previous page
7/10/2007	9:36:19 AM	15	18,015,370	1160.5	0.06	0.02	1.9		11,934.2	

Applied Load Cycles = 116,774,052 Run-out

Specimen: 996-2.6**Material:** FGM**Thickness:** 0.124 in.**Target:** Velocity = 113 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/10/2007	9:52:29 AM	16	16	79.5	0.18	0.21	50.7	35.4	22,402.5	
7/10/2007	9:52:34 AM	219	1,111	79.6	0.18	0.21	50.7	35.5	22,402.1	
7/10/2007	9:52:39 AM	219	2,206	79.6	0.18	0.21	50.8	35.5	22,416.6	
7/10/2007	9:52:45 AM	219	3,301	79.7	0.18	0.21	50.8	35.5	22,414.1	
7/10/2007	9:52:49 AM	219	4,396	79.6	0.18	0.21	50.8	35.5	22,426.0	
7/10/2007	9:52:54 AM	219	5,491	79.7	0.18	0.21	50.8	35.5	22,411.3	
7/10/2007	9:53:00 AM	219	6,586	79.7	0.18	0.21	50.8	35.5	22,413.4	
7/10/2007	9:53:04 AM	219	7,681	79.6	0.18	0.21	50.8	35.5	22,411.7	
7/10/2007	9:53:09 AM	219	8,776	79.7	0.18	0.21	50.8	35.5	22,417.4	
7/10/2007	9:53:15 AM	219	9,871	79.7	0.18	0.21	50.9	35.5	22,414.9	
7/10/2007	9:53:19 AM	219	10,966	79.6	0.18	0.21	50.9	35.5	22,413.7	
7/10/2007	9:53:24 AM	219	12,061	79.6	0.18	0.21	50.9	35.5	22,441.4	
7/10/2007	9:53:29 AM	60	12,361	0.8	0.03	0.04	0.9	1.1	22,427.9	
7/10/2007	9:53:35 AM	60	12,661	0.8	0.03	0.04	0.9	1.1	22,420.3	

Specimen: 996-2.6**Material:** FGM**Thickness:** 0.124 in.**Target:** Velocity = 282.9 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/10/2007	10:08:15 AM	60	60	194.3	0.45	0.51	122.9	85.7	22,401.9	
7/10/2007	10:08:21 AM	219	1,155	199.5	0.46	0.52	126.0	88.0	22,403.8	
7/10/2007	10:08:26 AM	219	2,250	199.5	0.46	0.52	126.0	88.1	22,402.6	
7/10/2007	10:08:31 AM	219	3,345	199.4	0.45	0.51	125.9	88.0	22,389.1	
7/10/2007	10:08:36 AM	219	4,440	199.2	0.45	0.51	125.7	87.9	22,382.2	
7/10/2007	10:08:41 AM	219	5,535	199.1	0.45	0.51	125.7	87.8	22,377.3	
7/10/2007	10:08:46 AM	219	6,630	199.2	0.45	0.51	125.8	87.9	22,359.7	
7/10/2007	10:08:51 AM	219	7,725	199.4	0.45	0.51	125.9	87.9	22,362.1	
7/10/2007	10:08:56 AM	219	8,820	199.2	0.45	0.51	125.8	87.8	22,361.8	
7/10/2007	10:09:01 AM	219	9,915	199.1	0.45	0.51	125.7	87.8	22,363.4	
7/10/2007	10:09:05 AM	219	11,010	1.1	0.03	0.04	0.6	0.9	22,369.9	

Specimen: 996-2.6

Material: FGM

Thickness: 0.124 in.

Target: Velocity = 1932.1 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/10/2007	10:18:14 AM	60	60	733.4	2.62	2.85	465.3	322.8	22,450.6	Start test
7/10/2007	10:18:19 AM	219	1,155	1225.0	8.66	7.69	754.4	522.3	22,396.0	
7/10/2007	10:18:24 AM	219	2,250	1341.6	11.14	10.02	822.3	570.0	22,402.0	
7/10/2007	10:18:30 AM	220	3,350	1412.3	10.68	9.50	868.5	607.4	22,390.8	
7/10/2007	10:19:04 AM	220	11,050	1368.9	8.48	7.40	846.5	586.0	22,288.9	
7/10/2007	10:20:04 AM	220	24,250	1363.0	7.99	6.93	843.9	586.2	22,188.2	
7/10/2007	10:21:00 AM	220	36,350	1363.2	7.79	6.74	845.4	586.9	1,021.4	
7/10/2007	10:22:04 AM	220	50,650	1362.5	7.60	6.55	846.1	587.5	984.6	
7/10/2007	10:23:00 AM	220	62,750	1361.7	7.47	6.42	846.3	587.9	984.6	
7/10/2007	10:24:04 AM	220	77,050	1362.8	7.34	6.30	846.4	588.8	995.3	
7/10/2007	10:25:00 AM	220	89,150	1362.3	7.25	6.21	847.1	589.4	1,029.9	85% TiB-side strain gage failed.
7/10/2007	10:26:04 AM	220	103,450	1362.3	7.17	6.13	847.1	589.8	1,011.4	
7/10/2007	10:27:04 AM	220	116,650	1362.4	7.11	6.08	847.7	590.3	1,015.5	
7/10/2007	10:28:04 AM	220	129,850	1362.0	7.04	6.01	847.8	590.2	1,018.1	
7/10/2007	10:29:00 AM	220	141,950	1362.4	7.00	5.97	848.2	590.3	1,006.7	
7/10/2007	10:30:04 AM	220	156,250	1362.0	6.94	5.91	848.6	590.5	1,004.6	
7/10/2007	10:35:00 AM	220	221,150	1361.8	6.74	5.73	849.7	592.4	1,183.8	
7/10/2007	10:40:05 AM	220	288,250	1362.0	6.63	5.62	849.3	593.2	1,014.0	
7/10/2007	10:45:04 AM	220	354,250	1362.1	6.55	5.55	847.4	593.4	1,302.5	
7/10/2007	10:48:14 AM	219	396,045	1353.7	6.76	5.74	840.6	589.5	1,276.9	Ti-side strain gage failed.
7/10/2007	10:48:19 AM	219	397,140	1357.1	6.89	5.86	842.9	591.1	1,258.6	
7/10/2007	10:48:24 AM	219	398,235	1327.2	7.05	6.05	821.5	1582.8	1,251.7	
7/10/2007	10:48:29 AM	218	399,325	1328.4	8.74	7.67	815.7	1.0	1,266.6	
7/10/2007	10:48:35 AM	218	400,415	1349.8	9.43	8.33	827.2	0.8	1,276.3	
7/10/2007	11:00:04 AM	218	550,835	1361.9	10.22	9.08	826.6	0.8	992.4	
7/10/2007	12:00:00 PM	219	1,337,925	1362.3	9.65	8.51	831.1	0.8	3,052.6	
7/10/2007	1:00:04 PM	219	2,127,420	1362.9	9.66	8.53	1745.1	0.8	1,528.3	
7/10/2007	2:00:04 PM	219	2,915,820	1362.7	9.64	8.51	3172.7		3,044.5	
7/10/2007	3:00:04 PM	219	3,704,220	1363.9	7.62	6.58			4,741.1	
7/10/2007	4:00:04 PM	219	4,492,620	1362.2	7.99	6.92			20,591.1	continued on next page
7/10/2007	5:00:00 PM	219	5,279,925	1363.7	8.05	6.98			22,596.2	
7/10/2007	6:00:05 PM	219	6,069,420	1362.3	8.05	6.98			28,919.8	
7/10/2007	7:00:04 PM	219	6,857,820	1362.0	7.98	6.92			32,167.5	
7/10/2007	8:00:04 PM	219	7,646,220	1362.6	7.90	6.83			8,797.3	

Specimen: 996-2.6

Material: FGM

Thickness: 0.124 in.

Target: Velocity = 1932.1 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/10/2007	9:00:00 PM	219	8,433,525	1363.3	7.83	6.77			5,715.7	continued from previous page
7/10/2007	10:00:05 PM	219	9,223,020	1362.2	7.75	6.69			6,681.1	
7/10/2007	11:00:04 PM	219	10,011,420	1363.9	7.69	6.64			992.6	
7/11/2007	12:00:04 AM	219	10,799,820	1361.9	7.65	6.59			14,711.1	
7/11/2007	1:00:00 AM	219	11,587,125	1363.1	7.63	6.58			31,997.1	
7/11/2007	2:00:05 AM	219	12,376,620	1362.7	7.59	6.54			35,006.2	
7/11/2007	3:00:04 AM	219	13,165,020	1362.8	7.55	6.51			28,820.4	
7/11/2007	4:00:04 AM	219	13,953,420	1363.2	7.51	6.47			25,029.1	
7/11/2007	5:00:00 AM	219	14,740,725	1362.5	7.47	6.42			25,172.6	
7/11/2007	6:00:04 AM	219	15,530,220	1363.8	7.45	6.41			32,070.3	
7/11/2007	7:00:04 AM	219	16,318,620	1363.3	7.42	6.37			25,439.0	
7/11/2007	8:00:04 AM	219	17,107,020	1363.3	6.12	5.16			4,089.9	
7/11/2007	9:00:04 AM	219	17,895,420	1363.1	7.38	6.33			6,006.0	
7/11/2007	10:00:00 AM	219	18,682,724	1363.1	7.70	6.65			22,563.7	
7/11/2007	11:00:05 AM	219	19,472,220	1362.9	7.79	6.73			37,780.5	
7/11/2007	12:00:04 PM	219	20,260,620	1362.9	7.80	6.73			32,767.9	
7/11/2007	1:00:04 PM	219	21,049,020	1363.0	7.81	6.75			20,216.4	
7/11/2007	2:00:04 PM	219	21,837,420	1363.7	7.78	6.72			2,270.4	
7/11/2007	3:00:05 PM	219	22,625,820	1363.3	7.83	6.77			28,485.1	
7/11/2007	4:00:04 PM	219	23,414,220	1363.2	7.84	6.78			7,101.9	
7/11/2007	5:00:04 PM	219	24,202,620	1363.0	7.85	6.79			35,803.9	
7/11/2007	6:00:00 PM	219	24,989,924	1363.2	7.89	6.82			14,711.8	
7/11/2007	7:00:05 PM	219	25,779,420	1362.5	7.89	6.82			27,862.2	
7/11/2007	8:00:04 PM	219	26,567,820	1363.4	7.90	6.84			14,666.2	
7/11/2007	9:00:04 PM	219	27,356,220	1362.9	7.91	6.85			21,746.9	
7/11/2007	10:00:00 PM	219	28,143,524	1362.9	7.92	6.85			33,245.3	
7/11/2007	11:00:04 PM	219	28,933,020	1362.3	7.92	6.85			10,296.7	
7/12/2007	12:00:04 AM	219	29,721,420	1363.5	7.91	6.85			8,678.4	
7/12/2007	1:00:04 AM	219	30,509,820	1362.8	7.97	6.90			27,544.8	
7/12/2007	2:00:04 AM	219	31,298,220	1363.1	7.97	6.90			33,423.6	
7/12/2007	3:00:00 AM	219	32,085,524	1362.8	8.01	6.94			7,314.7	
7/12/2007	4:00:05 AM	219	32,875,020	1363.1	8.02	6.95			16,107.0	
7/12/2007	5:00:04 AM	219	33,663,420	1363.0	8.02	6.95			39,373.7	
7/12/2007	6:00:04 AM	219	34,451,820	1362.9	7.83	6.77			5,715.8	continued on next page

Specimen: 996-2.6

Material: FGM

Thickness: 0.124 in.

Target: Velocity = 1932.1 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/12/2007	7:00:00 AM	219	35,239,124	1363.1	7.81	6.75			26,603.1	continued from previous page
7/12/2007	8:00:05 AM	219	36,028,620	1363.1	7.87	6.80			25,314.2	
7/12/2007	9:00:04 AM	219	36,817,020	1362.8	7.84	6.77			3,042.9	
7/12/2007	10:00:04 AM	219	37,605,420	1363.0	7.73	6.67			39,449.6	
7/12/2007	11:00:00 AM	219	38,392,724	1362.8	7.69	6.63			11,682.1	
7/12/2007	12:00:05 PM	219	39,182,220	1363.0	7.68	6.62			24,086.3	
7/12/2007	1:00:04 PM	219	39,970,620	1362.7	7.73	6.67			13,676.6	
7/12/2007	2:00:04 PM	219	40,759,020	1362.9	7.73	6.66			28,683.8	
7/12/2007	3:00:00 PM	219	41,546,324	1362.9	7.68	6.61			3,104.5	
7/12/2007	4:00:04 PM	219	42,335,820	1362.9	7.67	6.61			35,359.3	
7/12/2007	5:00:04 PM	219	43,124,220	1362.9	7.66	6.60			7,046.4	
7/12/2007	6:00:04 PM	219	43,912,620	1362.8	7.66	6.60			28,161.7	
7/12/2007	7:00:04 PM	219	44,701,020	1362.7	7.70	6.63			37,055.2	
7/12/2007	8:00:00 PM	219	45,488,324	1362.8	7.70	6.64			26,005.2	No longer at test conditions. Ignore rest of cycles until test restarted. (cont'd on next page)
7/12/2007	9:00:05 PM	219	46,277,820	1363.3	7.68	6.61			15,953.6	
7/12/2007	10:00:04 PM	219	47,066,220	1363.4	7.71	6.64			1,272.6	
7/12/2007	11:00:04 PM	219	47,854,620	1363.1	7.72	6.65			20,919.4	
7/13/2007	12:00:00 AM	219	48,641,924	1363.1	7.71	6.64			35,115.2	
7/13/2007	1:00:05 AM	219	49,431,420	1362.8	7.68	6.62			29,573.9	
7/13/2007	2:00:04 AM	219	50,219,820	1363.0	7.67	6.61			25,917.7	
7/13/2007	3:00:04 AM	219	51,008,220	1363.4	7.71	6.64			23,673.1	
7/13/2007	4:00:00 AM	219	51,795,524	1362.8	7.73	6.66			18,889.3	
7/13/2007	5:00:05 AM	219	52,585,020	1362.6	7.69	6.63			1,031.4	
7/13/2007	6:00:04 AM	219	53,373,420	1362.5	7.67	6.60			24,558.2	
7/13/2007	7:00:04 AM	219	54,161,820	1362.9	7.66	6.60			38,845.5	
7/13/2007	8:00:00 AM	219	54,949,124	1362.9	7.10	6.07			4,859.5	
7/13/2007	9:00:04 AM	219	55,738,620	1363.3	7.17	6.13			16,678.3	No longer at test conditions. Ignore rest of cycles until test restarted. (cont'd on next page)
7/13/2007	10:00:04 AM	219	56,527,020	1362.9	7.51	6.46			18,158.1	
7/13/2007	11:00:04 AM	219	57,315,420	1362.8	7.51	6.46			17,646.6	
7/13/2007	12:00:04 PM	219	58,103,820	1362.8	7.48	6.43			16,212.6	
7/13/2007	1:00:00 PM	219	58,891,124	1362.6	6.40	5.41			29,742.3	
7/13/2007	1:29:49 PM	219	59,283,136	2847.5	6.95	5.92			19,383.3	
7/13/2007	1:29:54 PM	2	59,283,144	114.6	0.03	0.03			38,988.6	

Specimen: 996-2.6		Material: FGM		Thickness: 0.124 in.		Target: Velocity = 1932.1 mm/s				
Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/13/2007	1:30:04 PM	2	59,283,164	69.4	0.03	0.03			38,999.6	continued from previous page
7/13/2007	1:30:14 PM	60	59,283,764	39.7	0.03	0.03			38,994.9	
7/13/2007	1:30:24 PM	60	59,284,364	23.9	0.03	0.03			38,990.1	
7/13/2007	1:30:35 PM	60	59,284,964	13.5	0.03	0.03			38,962.7	
7/13/2007	1:30:44 PM	60	59,285,564	7.9	0.03	0.03			38,971.8	
7/13/2007	1:30:54 PM	60	59,286,164	4.6	0.03	0.03			38,970.9	
Specimen: 996-2.6		Material: FGM		Thickness: 0.124 in.		Target: Velocity = 1360 mm/s				
Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/13/2007	2:16:29 PM	10	10	549.4	0.77	1.06			2,303.8	Restart test.
7/13/2007	2:16:35 PM	216	1,090	935.1	1.22	0.98			2,358.4	
7/13/2007	2:17:04 PM	217	7,590	949.7	1.18	0.96			2,325.2	
7/13/2007	2:18:00 PM	217	19,525	961.4	1.20	0.94			2,264.2	
7/13/2007	2:19:04 PM	217	33,630	961.8	1.21	0.95			2,248.3	
7/13/2007	2:20:00 PM	217	45,565	961.9	1.20	0.94			2,205.4	
7/13/2007	2:21:04 PM	217	59,670	961.6	1.20	0.94			2,088.7	No longer at test conditions. Ignore rest of cycles until test restarted.
7/13/2007	2:21:25 PM	217	64,010	903.7	1.00	0.83			2,069.8	
7/13/2007	2:21:30 PM	60	64,310	1.0	0.07	0.03			1,983.2	
7/13/2007	2:21:40 PM	60	64,910	1.1	0.07	0.03			1,968.0	
7/13/2007	2:21:49 PM	60	65,510	1.1	0.07	0.03			1,980.5	
7/13/2007	2:22:00 PM	60	66,110	1.1	0.07	0.03			1,975.2	
7/13/2007	2:23:04 PM	60	70,010	1.2	0.07	0.03			1,976.9	
Specimen: 996-2.6		Material: FGM		Thickness: 0.124 in.		Target: Velocity = 1360 mm/s				
Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/13/2007	2:50:21 PM	60	60	511.5	0.85	1.17			378.0	Restart test.
7/13/2007	2:50:27 PM	216	1,140	1099.9	3.54	2.73			808.1	
7/13/2007	2:50:32 PM	216	2,220	1224.6	7.87	6.86			901.3	
7/13/2007	2:50:37 PM	216	3,300	1308.7	11.03	9.92			962.6	
7/13/2007	2:50:42 PM	216	4,380	1340.4	12.22	11.08			985.9	
										continued on next page

Specimen: 996-2.6

Material: FGM

Thickness: 0.124 in.

Target: Velocity = 1360 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain ($\mu\epsilon$)	TiB-side Strain ($\mu\epsilon$)	Amplitude (mils rms)	Comments
7/13/2007	2:50:47 PM	216	5,460	1356.0	12.80	11.64			1,001.2	continued from previous page
7/13/2007	2:50:52 PM	216	6,540	1361.1	12.98	11.81			1,004.6	
7/13/2007	2:50:56 PM	216	7,620	1362.2	13.02	11.84			1,011.3	
7/13/2007	2:51:02 PM	216	8,700	1362.8	13.02	11.85			1,018.1	
7/13/2007	2:55:02 PM	216	60,540	1362.9	12.88	11.71			2,596.2	
7/13/2007	3:00:01 PM	216	125,340	1362.8	12.77	11.60			5,409.4	
7/13/2007	4:00:01 PM	216	902,940	1363.1	13.42	12.20			23,146.7	
7/13/2007	5:00:02 PM	216	1,680,540	1363.1	13.75	12.52			10,270.9	
7/13/2007	6:00:02 PM	216	2,458,140	1363.0	13.83	12.60			13,626.9	
7/13/2007	7:00:02 PM	216	3,235,740	1363.0	13.84	12.61			32,180.2	
7/13/2007	8:00:02 PM	216	4,013,340	1363.1	13.82	12.60			36,779.9	
7/13/2007	9:00:02 PM	216	4,790,940	1362.7	13.86	12.63			39,145.5	
7/13/2007	10:00:02 PM	216	5,568,540	1362.9	13.86	12.64			23,649.3	
7/13/2007	11:00:01 PM	216	6,346,140	1363.1	13.90	12.68			21,317.6	
7/14/2007	12:00:01 AM	216	7,123,740	1363.3	13.92	12.70			20,043.3	
7/14/2007	1:00:02 AM	216	7,901,340	1362.8	13.93	12.70			27,736.0	
7/14/2007	2:00:02 AM	216	8,678,940	1363.2	13.97	12.74			31,052.5	
7/14/2007	3:00:02 AM	216	9,456,540	1362.9	14.00	12.77			32,890.3	
7/14/2007	4:00:02 AM	216	10,234,140	1362.8	13.98	12.75			33,749.7	
7/14/2007	5:00:02 AM	216	11,011,740	1362.9	14.01	12.78			30,524.5	
7/14/2007	6:00:02 AM	216	11,789,340	1362.9	14.02	12.79			15,319.8	
7/14/2007	7:00:02 AM	216	12,566,940	1362.5	14.06	12.83			13,571.2	
7/14/2007	8:00:01 AM	216	13,344,540	1362.9	14.08	12.85			32,770.6	
7/14/2007	9:00:02 AM	216	14,122,140	1363.1	13.99	12.77			1,460.2	
7/14/2007	10:00:02 AM	216	14,899,740	1362.6	13.94	12.72			29,899.6	
7/14/2007	11:00:02 AM	216	15,677,340	1362.8	13.91	12.69			38,249.6	
7/14/2007	12:00:02 PM	216	16,454,940	1362.9	13.90	12.68			37,279.9	
7/14/2007	1:00:02 PM	216	17,232,540	1362.8	13.88	12.65			28,962.3	
7/14/2007	2:00:01 PM	216	18,010,140	1363.2	13.87	12.65			23,078.2	
7/14/2007	3:00:02 PM	216	18,787,740	1362.6	13.85	12.62			15,756.7	
7/14/2007	4:00:02 PM	216	19,565,340	1363.0	13.84	12.62			9,746.8	
7/14/2007	5:00:02 PM	216	20,342,940	1363.2	13.82	12.60			3,611.2	
7/14/2007	6:00:02 PM	216	21,120,540	1362.9	13.81	12.59			1,872.0	
7/14/2007	7:00:02 PM	216	21,898,140	1363.1	13.81	12.59			7,686.6	continued on next page

Specimen: 996-2.6

Material: FGM

Thickness: 0.124 in.

Target: Velocity = 1360 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain ($\mu\epsilon$)	TiB-side Strain ($\mu\epsilon$)	Amplitude (mils rms)	Comments
7/14/2007	8:00:02 PM	216	22,675,740	1363.2	13.80	12.58			13,460.1	continued from previous page
7/14/2007	9:00:02 PM	216	23,453,340	1362.8	13.78	12.56			22,737.3	
7/14/2007	10:00:01 PM	216	24,230,940	1363.1	13.76	12.54			27,115.9	
7/14/2007	11:00:01 PM	216	25,008,540	1363.2	13.74	12.52			31,954.0	
7/15/2007	12:00:02 AM	216	25,786,140	1363.1	13.75	12.53			34,343.8	
7/15/2007	1:00:02 AM	216	26,563,740	1362.9	13.76	12.54			31,440.4	
7/15/2007	2:00:02 AM	216	27,341,340	1363.1	13.74	12.52			22,786.6	
7/15/2007	3:00:02 AM	216	28,118,940	1363.0	13.74	12.52			20,993.9	
7/15/2007	4:00:01 AM	216	28,896,540	1362.8	13.74	12.52			3,216.0	
7/15/2007	5:00:01 AM	216	29,674,140	1363.3	13.74	12.52			9,201.9	
7/15/2007	6:00:02 AM	216	30,451,740	1362.8	13.74	12.52			23,090.1	
7/15/2007	7:00:02 AM	216	31,229,340	1362.8	13.75	12.53			39,477.4	
7/15/2007	8:00:02 AM	216	32,006,940	1363.2	13.74	12.52			28,496.1	
7/15/2007	9:00:02 AM	216	32,784,540	1362.9	13.74	12.52			17,515.1	
7/15/2007	10:00:02 AM	216	33,562,140	1363.1	13.73	12.51			12,660.6	
7/15/2007	11:00:01 AM	216	34,339,740	1363.1	13.71	12.49			5,836.7	
7/15/2007	12:00:02 PM	216	35,117,340	1362.9	13.69	12.48			6,116.1	
7/15/2007	1:00:02 PM	216	35,894,940	1362.8	13.67	12.45			19,339.4	
7/15/2007	2:00:02 PM	216	36,672,540	1362.8	13.65	12.44			34,927.3	
7/15/2007	3:00:02 PM	216	37,450,140	1362.8	13.65	12.43			19,136.7	
7/15/2007	4:00:02 PM	216	38,227,740	1362.9	13.63	12.41			8,554.2	
7/15/2007	5:00:02 PM	216	39,005,340	1363.0	13.62	12.40			37,554.2	
7/15/2007	6:00:02 PM	216	39,782,940	1363.0	13.65	12.44			19,277.3	
7/15/2007	7:00:01 PM	216	40,560,540	1362.9	13.67	12.46			12,314.1	
7/15/2007	8:00:02 PM	216	41,338,140	1362.9	13.67	12.46			39,232.2	
7/15/2007	9:00:02 PM	216	42,115,740	1362.7	13.68	12.46			9,755.4	
7/15/2007	10:00:02 PM	216	42,893,340	1362.9	13.69	12.47			16,004.0	
7/15/2007	11:00:02 PM	216	43,670,940	1362.9	13.71	12.49			35,585.3	
7/16/2007	12:00:02 AM	186	44,419,976	1390.0	20.68	20.06			29,638.0	Natural frequency dropped.
7/16/2007	1:00:02 AM	185	45,089,416	1417.8	17.96	17.40			21,712.5	
7/16/2007	2:00:01 AM	185	45,755,416	1404.9	17.47	17.00			39,470.7	continued on next page
7/16/2007	3:00:01 AM	185	46,421,416	1405.9	17.17	17.05			8,780.4	
7/16/2007	4:00:02 AM	185	47,087,416	1406.5	16.99	16.57			2,987.2	
7/16/2007	5:00:02 AM	185	47,753,416	1406.5	17.11	16.80			21,024.6	

Specimen: 996-2.6

Material: FGM

Thickness: 0.124 in.

Target: Velocity = 1360 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain ($\mu\epsilon$)	TiB-side Strain ($\mu\epsilon$)	Amplitude (mils rms)	Comments
7/16/2007	6:00:02 AM	185	48,419,416	1407.4	16.93	16.69			39,102.7	continued from previous page
7/16/2007	7:00:02 AM	185	49,085,416	1406.6	16.83	16.43			3,839.3	
7/16/2007	8:00:02 AM	185	49,751,416	1408.1	16.47	16.44			7,985.2	
7/16/2007	9:00:01 AM	185	50,417,416	1412.3	15.40	15.35			29,734.7	
7/16/2007	10:00:01 AM	185	51,083,408	1413.7	14.86	14.20			7,797.2	
7/16/2007	11:00:01 AM	184	51,747,176	1413.6	14.71	14.10			15,600.0	
7/16/2007	12:00:02 PM	184	52,409,576	1413.6	14.52	13.92			12,630.2	
7/16/2007	1:00:02 PM	184	53,071,976	1415.2	14.54	13.84			11,764.6	
7/16/2007	2:00:02 PM	183	53,731,312	1406.4	16.21	16.75			28,129.2	
7/16/2007	3:00:02 PM	182	54,388,980	1405.0	16.83	17.46			24,996.7	
7/16/2007	4:00:02 PM	182	55,044,180	1404.5	17.04	17.07			8,044.1	
7/16/2007	5:00:01 PM	182	55,699,380	1405.1	16.97	16.63			21,707.9	
7/16/2007	6:00:01 PM	182	56,354,580	1404.1	16.74	16.43			25,490.8	
7/16/2007	7:00:02 PM	182	57,009,780	1402.9	17.35	17.13			11,307.0	
7/16/2007	8:00:01 PM	182	57,664,980	1403.1	17.33	17.03			26,530.8	
7/16/2007	9:00:02 PM	182	58,320,180	1401.7	17.18	17.08			23,522.8	No longer at test conditions. Ignore rest of cycles.
7/16/2007	10:00:02 PM	182	58,975,380	1403.9	17.04	16.94			39,247.2	
7/16/2007	11:00:02 PM	182	59,630,580	1403.1	17.00	16.79			35,584.6	
7/17/2007	12:00:01 AM	182	60,285,780	1402.4	16.84	16.67			18,606.2	
7/17/2007	1:00:02 AM	182	60,940,980	1403.9	16.74	16.51			2,864.7	
7/17/2007	2:00:02 AM	182	61,596,180	1404.3	16.58	16.13			39,348.9	
7/17/2007	3:00:02 AM	182	62,251,380	1404.1	16.62	16.09			15,233.9	
7/17/2007	4:00:02 AM	182	62,906,580	1403.8	16.43	16.29			18,078.5	
7/17/2007	5:00:01 AM	182	63,561,780	1403.7	16.34	16.02			34,627.1	
7/17/2007	6:00:02 AM	182	64,216,980	1403.9	16.22	15.64			32,845.0	
7/17/2007	7:00:02 AM	182	64,872,180	1403.6	16.22	16.08			25,101.2	
7/17/2007	8:00:02 AM	182	65,527,380	1400.6	16.06	16.50			30,470.1	
7/17/2007	9:00:01 AM	182	66,182,580	1399.7	15.90	15.88			36,264.0	
7/17/2007	10:00:02 AM	182	66,837,780	1399.9	15.95	16.13			30,225.7	
7/17/2007	10:07:46 AM	182	66,922,408	1401.0	15.92	16.00			33,603.0	continued on next page
7/17/2007	10:07:52 AM	60	66,922,712	0.9	0.03	0.03			33,094.8	
7/17/2007	10:07:57 AM	60	66,923,008	0.9	0.03	0.03			33,095.2	
7/17/2007	10:08:01 AM	60	66,923,312	0.9	0.03	0.03			33,102.6	
7/17/2007	10:09:02 AM	60	66,926,660	1.1	0.03	0.03			33,118.7	

Specimen: 996-2.6 **Material:** FGM **Thickness:** 0.124 in. **Target:** Velocity = 1360 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
7/17/2007	10:10:01 AM	60	66,930,000	1.1	0.03	0.03			33,106.2	continued from previous page
7/17/2007	10:11:02 AM	60	66,932,800	1.1	0.03	0.03			33,104.7	
7/17/2007	10:12:01 AM	15	66,937,272	1620.9	0.03	0.03			26,240.7	
7/17/2007	10:12:27 AM	15	66,937,648	1670.3	0.03	0.03			21,088.6	

Applied Load Cycles = 126,269,554

Specimen: 1011-1 **Material:** FGM **Thickness:** 0.128 in. to 0.131 in. **Target:** Velocity = 141.44 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
8/6/2007	1:12:06 PM	300	300	38.3	0.25	0.26	28.8	24.2	12,197.7	
8/6/2007	1:12:10 PM	300	1,500	97.7	0.52	0.52	70.9	59.5	12,206.4	
8/6/2007	1:12:15 PM	300	3,000	99.0	0.54	0.56	72.6	61.0	12,214.1	
8/6/2007	1:12:20 PM	300	4,500	100.4	0.48	0.48	73.0	61.1	12,205.0	
8/6/2007	1:12:25 PM	300	5,700	104.1	0.50	0.53	77.1	64.5	12,195.3	
8/6/2007	1:12:29 PM	300	7,200	102.3	0.41	0.41	74.8	62.7	12,200.4	
8/6/2007	1:12:39 PM	168	8,880	100.5	0.43	0.41	72.9	61.2	12,202.5	
8/6/2007	1:12:49 PM	169	10,570	101.6	0.45	0.44	73.9	61.9	12,208.5	
8/6/2007	1:12:59 PM	168	12,255	100.1	0.45	0.45	73.1	61.3	12,225.5	
8/6/2007	1:13:09 PM	169	13,945	102.3	0.46	0.45	74.2	62.3	12,234.4	
8/6/2007	1:13:19 PM	168	15,625	93.4	0.42	0.42	68.4	57.4	12,216.7	
8/6/2007	1:13:30 PM	60	16,225	2.7	0.10	0.09	1.4	1.0	12,216.8	
8/6/2007	1:13:34 PM	60	16,525	2.7	0.10	0.09	1.4	1.0	12,205.1	

Specimen: 1011-1 **Material:** FGM **Thickness:** 0.128 in. to 0.131 in. **Target:** Velocity = 282.88 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
8/6/2007	1:18:04 PM	60	60	54.1	0.32	0.34	40.5	34.0	12,136.0	
8/6/2007	1:18:05 PM	60	120	87.1	0.45	0.47	64.6	54.1	12,133.3	
8/6/2007	1:18:10 PM	60	420	199.7	0.78	0.86	146.6	123.5	12,146.7	
8/6/2007	1:18:15 PM	60	720	199.3	0.78	0.86	146.4	123.3	12,139.2	continued on next page

Specimen: 1011-1 **Material:** FGM **Thickness:** 0.128 in. to 0.131 in. **Target:** Velocity = 282.88 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
8/6/2007	1:18:20 PM	60	1,020	199.2	0.77	0.85	146.4	123.3	12,081.2	continued from previous page
8/6/2007	1:18:25 PM	60	1,260	198.6	0.77	0.86	146.0	122.9	12,052.3	
8/6/2007	1:18:30 PM	60	1,560	200.1	0.76	0.85	146.9	123.8	12,011.9	
8/6/2007	1:18:39 PM	169	3,250	199.9	0.76	0.84	146.8	123.7	11,957.3	
8/6/2007	1:18:49 PM	169	4,940	199.9	0.76	0.84	146.8	123.6	11,866.3	
8/6/2007	1:18:59 PM	169	6,630	199.6	0.76	0.84	146.4	123.3	11,705.9	
8/6/2007	1:19:09 PM	169	8,320	199.7	0.76	0.85	146.5	123.4	11,620.7	
8/6/2007	1:19:19 PM	169	10,010	188.9	0.75	0.85	139.4	117.4	11,472.0	
8/6/2007	1:19:28 PM	168	11,690	3.3	0.10	0.09	2.1	1.6	11,459.3	
8/6/2007	1:19:34 PM	60	11,990	2.6	0.10	0.09	1.4	1.0	11,452.2	

Specimen: 1011-1 **Material:** FGM **Thickness:** 0.128 in. to 0.131 in. **Target:** Velocity =1569.1 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
8/6/2007	1:28:39 PM	60	60	11.5	0.10	0.10	8.5	7.1	94.7	85% TiB-side strain gage failed. Strain gage wire interfered with vibrometer reading. Test stopped.
8/6/2007	1:28:40 PM	60	120	40.9	0.24	0.25	30.5	25.6	94.6	
8/6/2007	1:28:45 PM	60	420	826.8	3.24	3.57	608.3	508.5	777.7	
8/6/2007	1:28:50 PM	60	720	1071.7	4.17	3.58	771.3	642.9	1,051.0	
8/6/2007	1:28:54 PM	169	1,347	1106.7	4.36	3.73	795.1	664.3	1,069.0	
8/6/2007	1:29:00 PM	169	2,192	1104.3	4.36	3.76	793.5	663.5	1,041.0	
8/6/2007	1:29:10 PM	169	3,882	1106.7	4.38	3.79	792.8	664.1	1,139.5	
8/6/2007	1:29:20 PM	169	5,572	1106.7	4.40	3.80	791.9	664.0	1,266.3	
8/6/2007	1:29:30 PM	169	7,262	1107.0	4.41	3.81	791.1	664.0	1,569.6	
8/6/2007	1:29:40 PM	169	8,952	1105.7	4.48	3.87	789.2		1,514.7	
8/6/2007	1:29:50 PM	169	10,642	1107.5	4.49	3.87	790.5		1,400.1	
8/6/2007	1:30:00 PM	60	11,787	8.4	0.09	0.09	1.5		37,274.2	
8/6/2007	1:30:10 PM	169	12,642	5.8	0.09	0.09	1.7		40,854.8	
8/6/2007	1:30:15 PM	60	12,942	4.5	0.09	0.09	1.4		40,851.8	

Specimen: 1011-1

Material: FGM

Thickness: 0.128 in. to 0.131 in.

Target: Velocity =1681.2 mm/s

Date	Time	Freq. (Hz)	Cycles	Velocity (mm/s rms)	Head Accel. (g rms)	Fixture Accel. (g rms)	Ti-side Strain (µε)	TiB-side Strain (µε)	Amplitude (mils rms)	Comments
8/6/2007	1:38:03 PM	60	60	79.0	0.18	0.21	57.1		40,860.3	Restart test.
8/6/2007	1:38:04 PM	60	120	220.2	0.55	0.67	160.9		40,869.7	
8/6/2007	1:38:05 PM	60	180	322.6	0.80	0.97	236.6		40,729.3	
8/6/2007	1:38:10 PM	60	420	957.2	2.39	1.90	686.2		39,702.4	
8/6/2007	1:38:14 PM	60	660	1038.3	4.22	3.42	735.8		39,722.0	
8/6/2007	1:38:19 PM	169	1,505	1114.0	6.18	5.22	778.5		39,621.9	
8/6/2007	1:38:23 PM	169	2,350	1148.8	7.11	6.10	798.8		39,623.3	
8/6/2007	1:38:29 PM	169	3,195	1170.6	7.70	6.66	812.1		39,633.6	
8/6/2007	1:38:44 PM	169	5,730	1185.4	8.05	6.99	820.2		39,577.0	
8/6/2007	1:39:04 PM	169	9,110	1187.0	8.02	6.96	819.8		39,609.8	
8/6/2007	1:40:03 PM	169	19,250	1185.7	7.93	6.86	820.3		39,547.9	Ti-side strain gage failed.
8/6/2007	1:41:04 PM	169	29,390	1185.6	7.88	6.82	821.0		39,345.1	
8/6/2007	1:42:03 PM	169	39,530	1186.2	7.84	6.77	821.6		39,771.1	
8/6/2007	1:43:04 PM	169	49,670	1186.3	7.79	6.73	822.1		39,540.3	
8/6/2007	1:44:03 PM	169	59,810	1186.0	7.78	6.71			38,171.2	
8/6/2007	1:45:04 PM	169	69,950	1185.9	7.77	6.70			34,950.1	
8/6/2007	1:46:03 PM	169	80,090	1185.7	7.75	6.68			32,607.3	
8/6/2007	1:47:04 PM	169	90,230	1186.4	7.72	6.66			30,643.7	
8/6/2007	1:48:03 PM	169	100,370	1186.8	7.69	6.63			28,763.9	
8/6/2007	1:49:04 PM	169	110,510	1186.6	7.66	6.60			27,493.1	
8/6/2007	1:50:04 PM	169	120,650	1185.8	7.65	6.59			26,175.7	Specimen failed.
8/6/2007	1:51:04 PM	169	130,790	1186.2	7.63	6.56			24,906.9	
8/6/2007	1:52:04 PM	169	140,930	1187.1	7.59	6.53			24,201.6	
8/6/2007	1:53:03 PM	169	151,070	1186.4	7.59	6.52			23,481.3	
8/6/2007	1:53:58 PM	169	160,365	1186.3	7.56	6.50			22,372.0	

Cycles to Failure = 171,007