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ABSTRACT

This is a final report covering all measurements made on the performance of TS-299/UP, Standing Wave Indicator. The measurements herein reported indicate that the TS-299/UP will be a satisfactory piece of test equipment when the minor changes recommended herein are incorporated.

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RESULTS OF TESTS

1. Unless otherwise specified, all radio frequency measurements were made employing a reflex klystron, 2K33-B, oscillator as a source of energy.
2. The voltage standing wave ratios of the bi-directional coupler were measured looking into three of the connections; (a) Input to the main guide, (b) direct coupler output, (c) reflected coupler output. These measurements were made as a function of frequency, and the results are shown in Table I.
3. The coupling loss between the main wave guide and the two output connections was determined by means of an accurate calibrated attenuator. The values obtained as a function of frequency are shown in Table 2. The magnitude of the coupling loss is not indicated on the coupler, as required by Paragraph E-6c of Reference (b).
4. The directivity of the two couplers was determined at the mid-band frequency, 24,042 megacycles. The reflected coupler directivity was found to be 27.6 decibels; that of the direct coupler 29.0 decibels.
5. The accuracy of TS-299/UP was determined by comparison with slotted line indications. A measurement system was devised that provided series operation of the slotted line and the equipment under test. The variable tuning stub was attached to the output of the connected units. The magnitude of the standing waves in the main wave guide were altered by the adjustment of the stub tuner, and simultaneous readings of standing wave ratios were taken from both the line and the unit under test. The results of these measurements are shown in Plate 1. Throughout the ratio range required by Reference (b), the TS-299/UP was found to be within the accuracy tolerance set forth in Paragraph E-10b of the same reference.
6. The decibel calibration of the variable attenuator on the TS-299/UP was compared with a known attenuator. Graphs showing the results of these measurements are presented on Plate 2.
7. The maximum available k band power, 32 kilowatts peak, was transmitted through the TS-299/UP main guide by employing a 3J31 magnetron as a power source. Standing wave measurements were made satisfactorily under the above power condition without any indication of breakdown or arcing.

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8. All necessary controls, labeling, and accessories have been provided on or with the subject test set with a single exception mentioned in Paragraph 5.
9. The subject test set was placed in a controlled atmosphere chamber and subjected to an atmosphere condition of 185°F, 95% relative humidity, for a period of 44 hours. At the end of this time, a standing wave ratio calibration was made as set forth in Paragraph 7. The results of these measurements made at 24,020 megacycles, are shown in Plate 3, the curve being labeled "Humidity".
10. Following the above test, time was allowed for the subject test set to become thoroughly dry. The temperature in the test chamber was then lowered to -67°F, and the unit was maintained at this temperature for an eight hour period. Following this period of time the temperature was raised to +140°F for a period of five hours. After these temperature variations, the accuracy of the unit was again determined. The curve marked "Temperature" (Plate 3), shows the result of this test.
11. The weight of the complete TS-299/UP is 17.0 pounds. The overall dimensions of the carrying case are 9½ inches by 11 inches by 13½ inches.

COMMENTS

12. The standing wave ratios of the bi-directional coupler which are shown in Table 1 do, in some cases, exceed the limitation set forth in Reference (b). However, the deviation is slight and is not considered detrimental to the operation and use of the subject test equipment.
13. It is required by Reference (b) that the directivity of the reflected power uni-directional coupler be 32 decibels. As shown in Paragraph 6, the directivity is only 27.6 decibels. Again it is felt that correction is not necessary as the error so incurred will be negligible.
14. The coupling loss of the bi-directional coupler is not indicated on the coupler as directed by Paragraph E-6c of Reference (b).
15. Immediately following the humidity test the accuracy of the TS-299/UP unit was sufficiently below standard to make its indications useless. This condition corrected itself, however, after allowing a reasonable drying time.

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16. Inspection following the atmospheric tests showed a small amount of corrosion of the legs of the supporting stand.
17. Removal of the accessory box from the carrying case is unnecessarily difficult.

RECOMMENDATIONS

18. The two coupling losses of the bi-directional coupler should be plainly engraved on this unit.
19. To preserve the system accuracy, the units should be placed in the moisture-proof carrying case when they are not in use. This point should be stressed in the operating manual.
20. Corrosion of the supporting stand should be eliminated by the use of proper surface finishes.
21. A handle should be fastened to the accessory box to facilitate its removal from the carrying case. This handle could also take the place of the holding bar within the carrying case lid.

REFERENCES:

- (a) BuShips ltr. to NRL, Sec:944DA Ser. 3863/944ZA dated 7 March 1946.
- (b) BuShips Specification 16 M 15(RE) dated 15 May 1945.

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TABLE 1

Standing Wave Ratio of Bi-Directional Coupler

Frequency Mc	Voltage Standing Wave Ratio		
	At input	At D	At R
23,510	1.08	1.16	1.11
23,751	1.11	1.10	1.04
24,004	1.07	1.06	1.04
24,244	1.09	1.12	1.13
24,487	1.09	1.20	1.10

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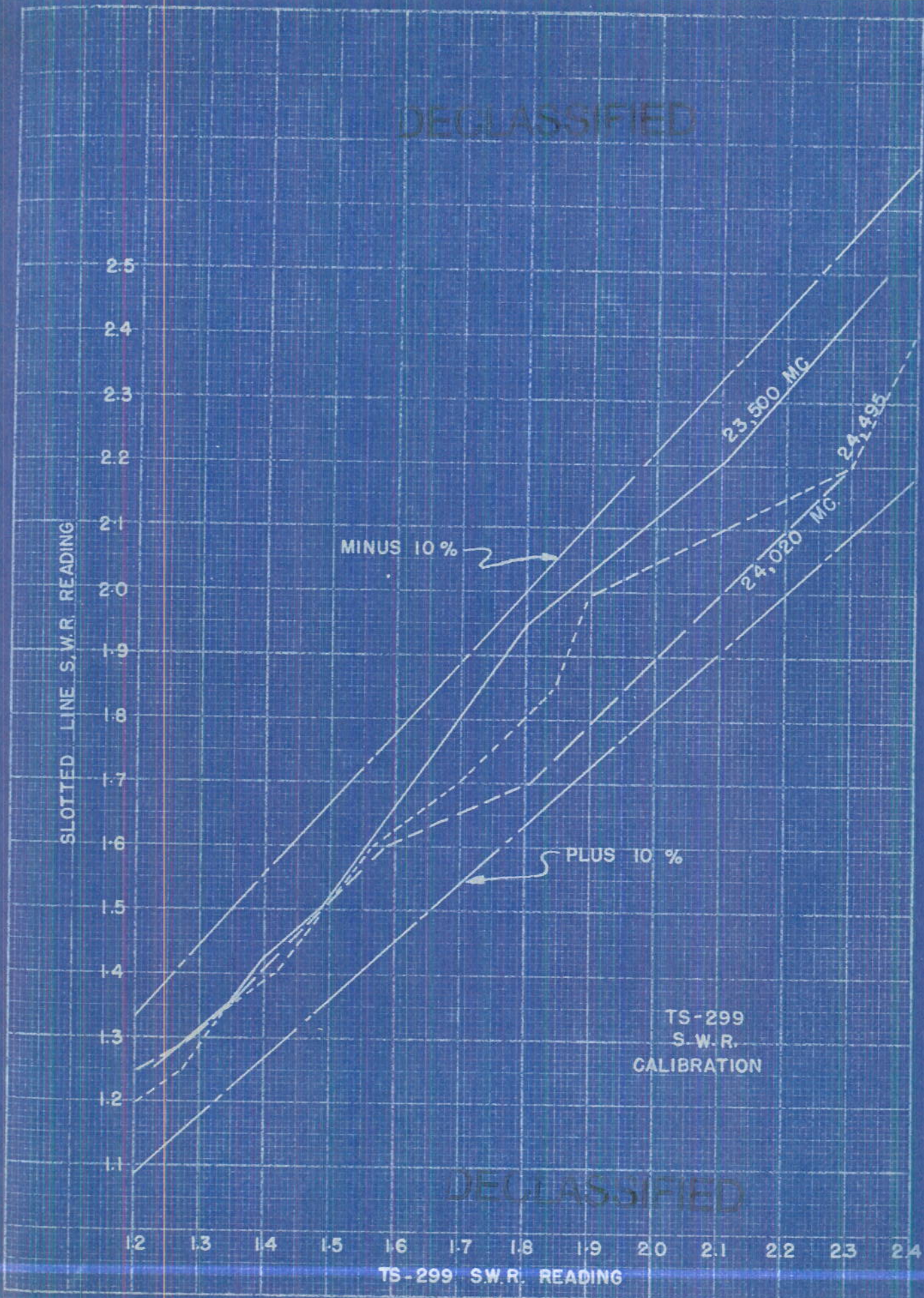
TABLE 2

Coupling Loss of Bi-directional Coupler

Frequency Mc	Coupling Loss	
	Direct Coupler	Reflected Coupler
23,510	19.4 db	20.1 db
24,042	19.4 db	21.0 db
24,491	20.7 db	19.9 db

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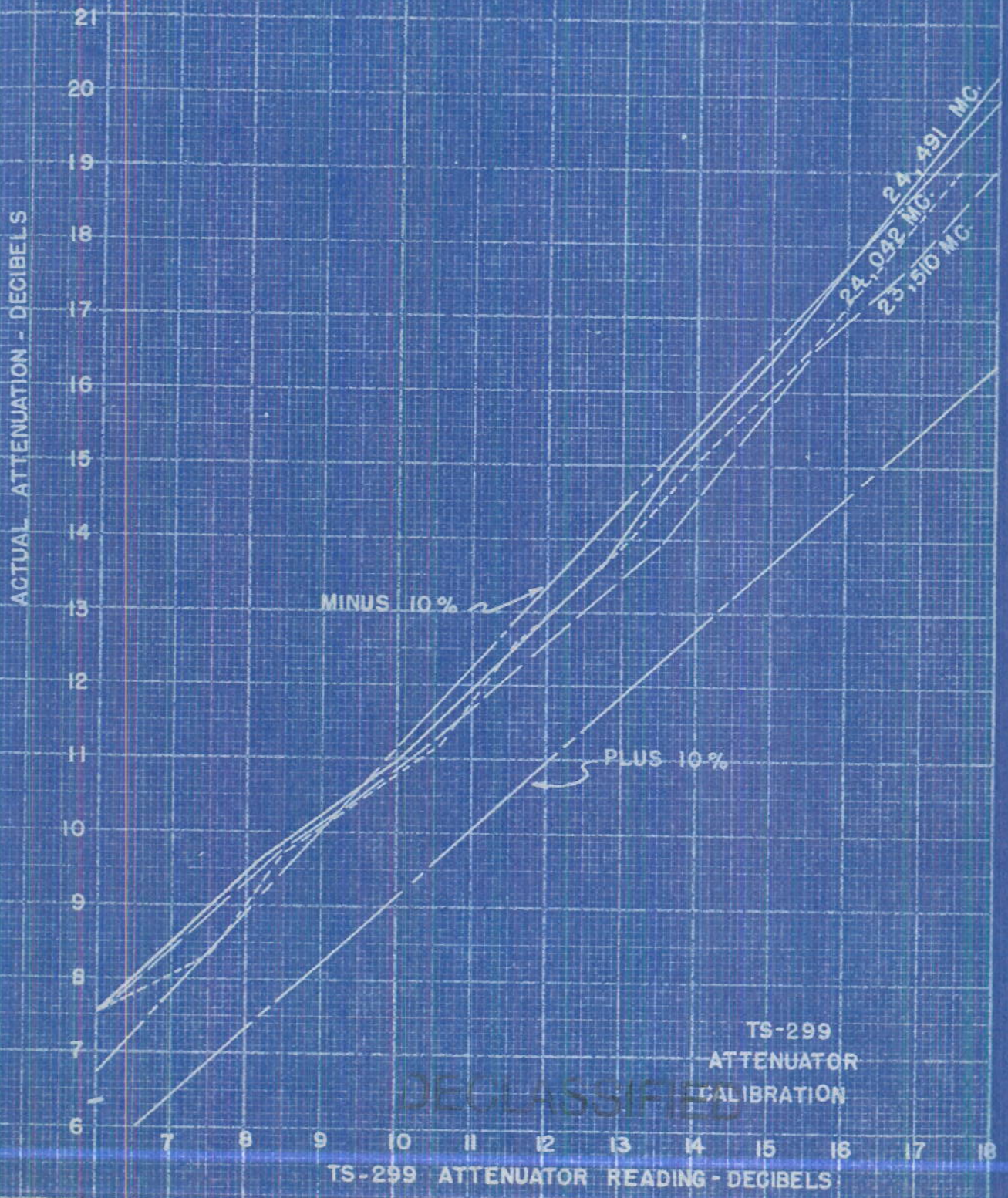
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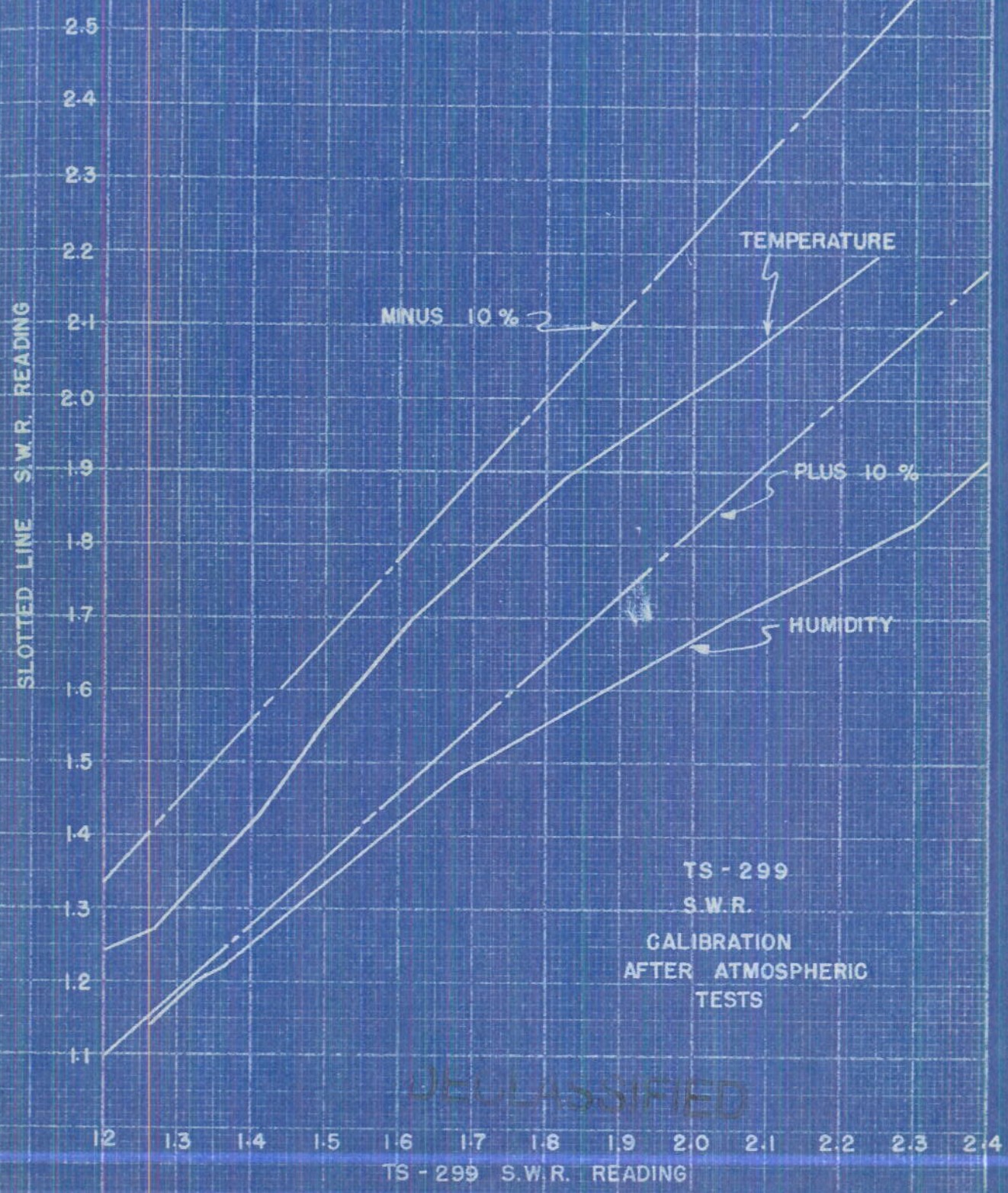


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TS-299 ATTENUATOR READING - DECIBELS

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