Mission Research Corporation under contract with the US Navy Small Business Innovative Research Phase II program has fabricated and tested an innovative laser receiver system. The receiver is capable of operating in the spectral domain between 0.5 and 1.8 microns. Sensitivity design goals were 1 milliwatt per square centimeter. The unit is 100% fiber optics coupled, that is, no active components are located within the receiver head.

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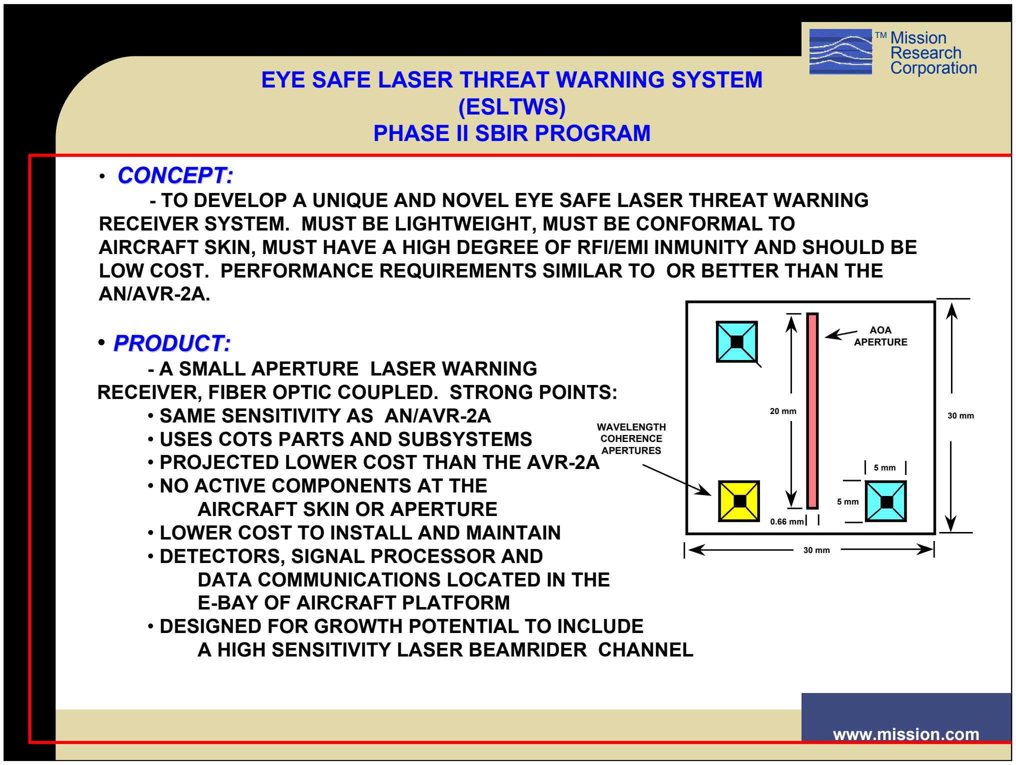
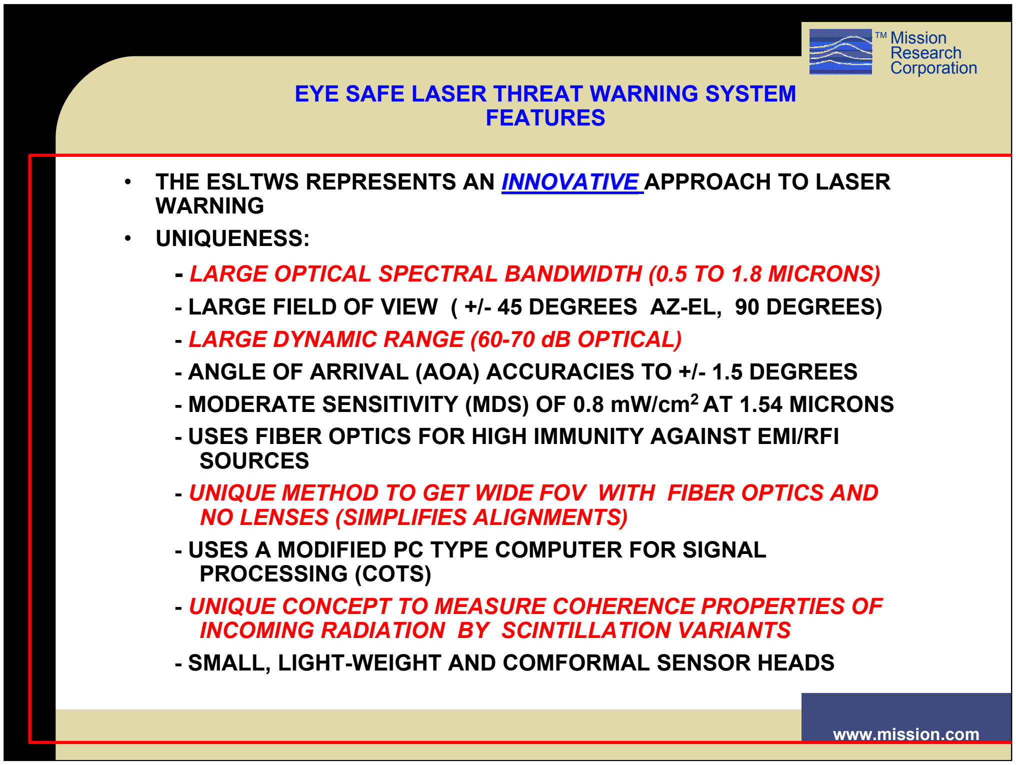
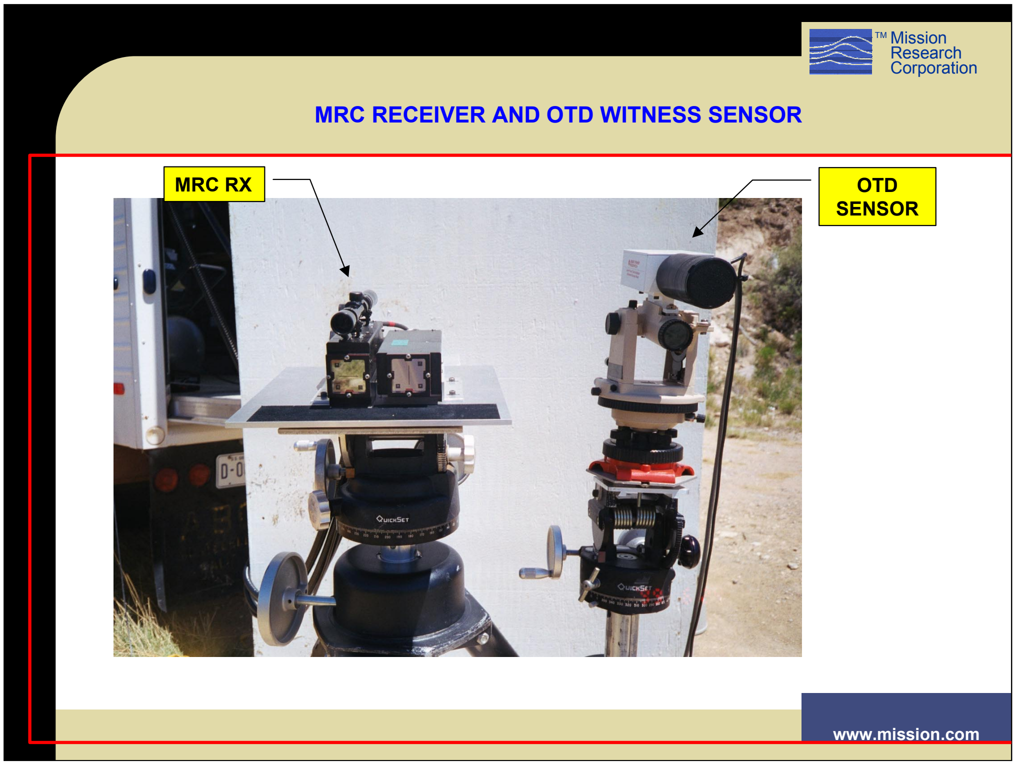


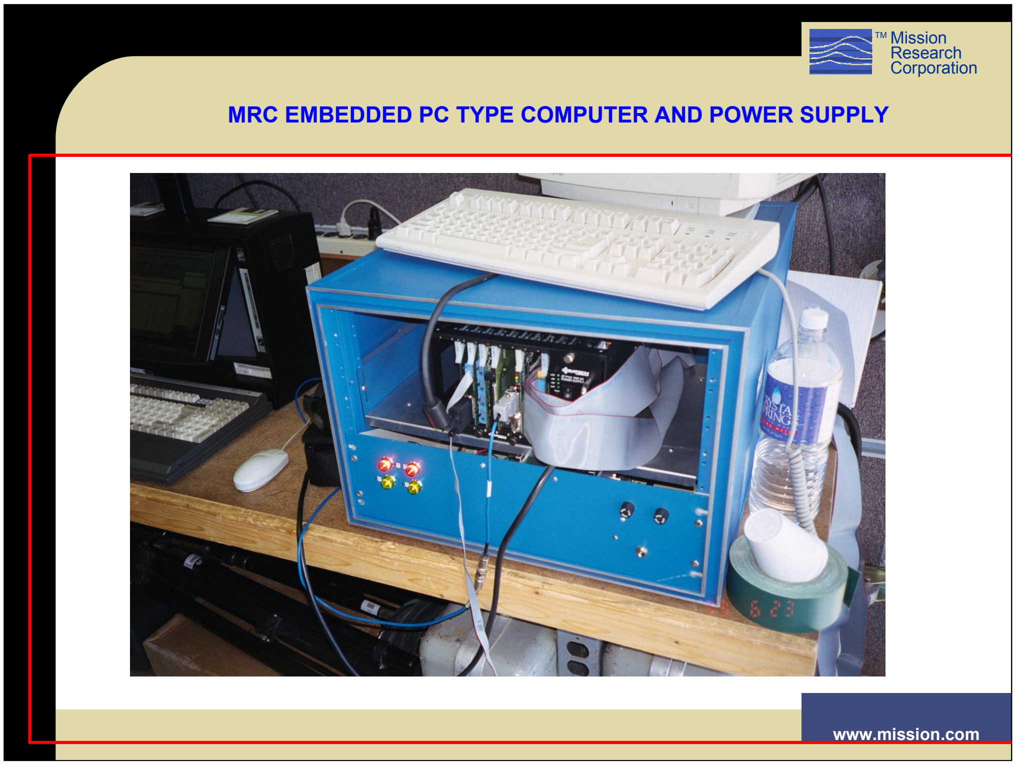
The receiver is a very low profile unit which is conformal to the aircraft skin. It basically has two 5 mm coherency discrimination ports, one 5 mm optical port for wavelength discrimination and a narrow slit used for angle of arrival information.



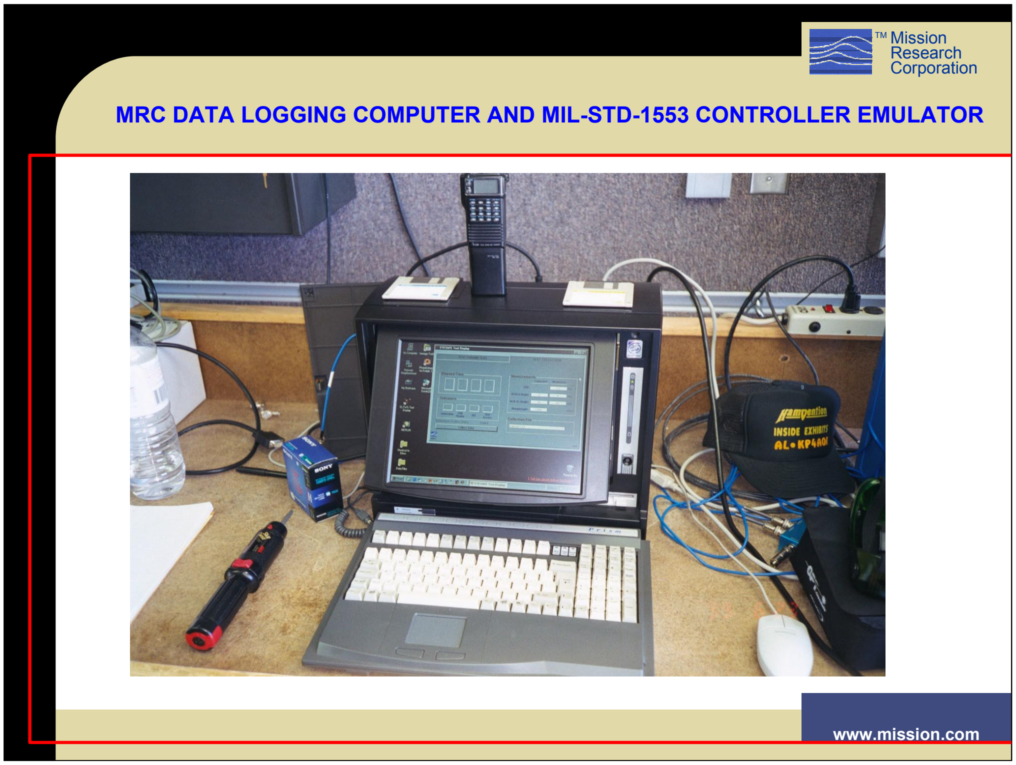
Some of the unique and innovative properties of the receiver system.



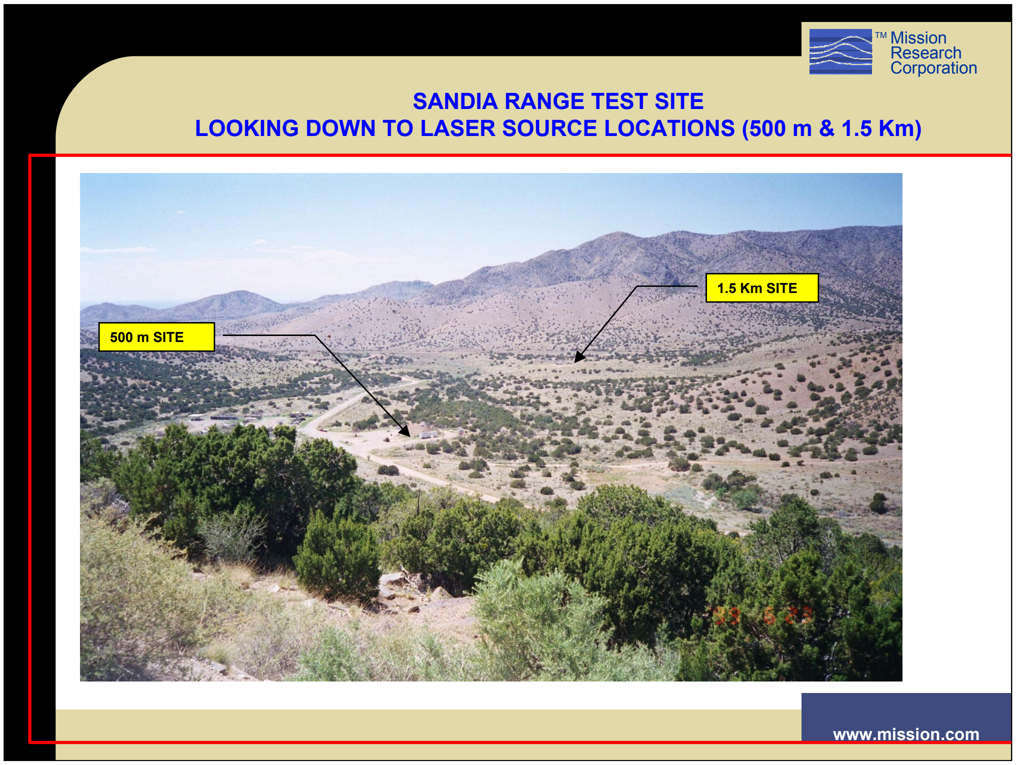
The ESLTWS is mounted on a tripod with a pointing scope on top. The two heads are identical in configuration and performance. One head is rotated 90 degrees to provide AOA in the elevation plane while the other provides AOA in the azimuth plane. Adjacent to the receiver head is the Office of the Test Director (OTD) ground truth/ witness sensor (radiometer). The OTD witness sensor aperture is not much larger than the ESLTWS aperture thus is also very susceptible to scintillation variations.



MRC ESLTWS processing and embedded computer with a power supply in the lower part of the 19 inch rack. The computer used for demonstrating the performance of the unit was fabricated by Ziatec.



The logging computer and the 1553 bus controller was implemented with the use of a luggable computer. Communications with the embedded computer was done with the use of a 1553 bus network to provide a realistic aircraft representation.



Picture of the two laser sites, one at 500 meters and the other at 1500 meters. The NRL scintillometer was located at the 500 meters site. Elevation between the sites was approximately 300 feet.

Mission Research Corporation

FIELD TEST RESULTS

- COHERENCE DISCRIMINATION LEVELS OF 24 COUNTS WERE SUFFICIENT TO PREVENT LASER DETECTION FROM RADIO SIGNALS, XENON STROBES (SHORT RANGE) AND LONG RANGE POWERFUL STROBES (MIR). ESSENTIALLY, NO FALSE SIGNALS TRIGGERED THE SYSTEM WHEN COHERENCY VALUE WAS AT THIS LEVEL.
- SCINTILLATION MEASUREMENTS DONE WITH NRL SCINTILLOMETER; SCINTILLATION MEASURED ON THE AVERAGE AT 9×10^{-13} OVER A 500 METER PATH AT A WAVELENGTH OF 0.9 MICROMETERS
- ANGULAR MEASUREMENTS WERE MADE TO DETERMINE FIELD OF VIEW OF THE SYSTEM. ANGULAR FIELD DATA MATCHES THEORETICAL RESULTS (+/- 45 DEGREES IN BOTH PLANES)
- ATMOSPHERIC SCINTILLATION AS A COHERENCY DISCRIMINATOR DETERMINED TO BE A RELIABLE METHOD. MORE FIELD DATA IS NEEDED TO PROPERLY VALIDATE THE ALGORITHMS USED.

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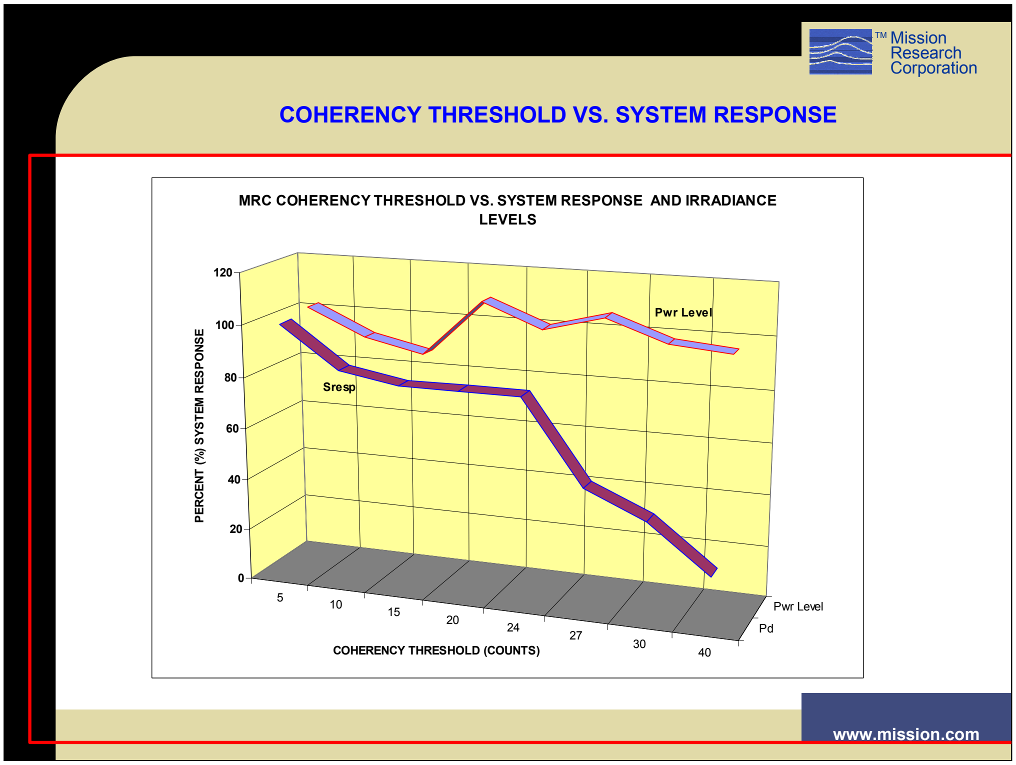
Self explanatory.



This chart shows the experimental curve obtained from the Sandia Field Test data reduction. It shows that for a constant power of about 100 milliwatts per square centimeter, by adjusting the coherence threshold, the percent of system response to coherent sources can be reduced accordingly. It also implies that only severe scintillation will get through the signal processor.

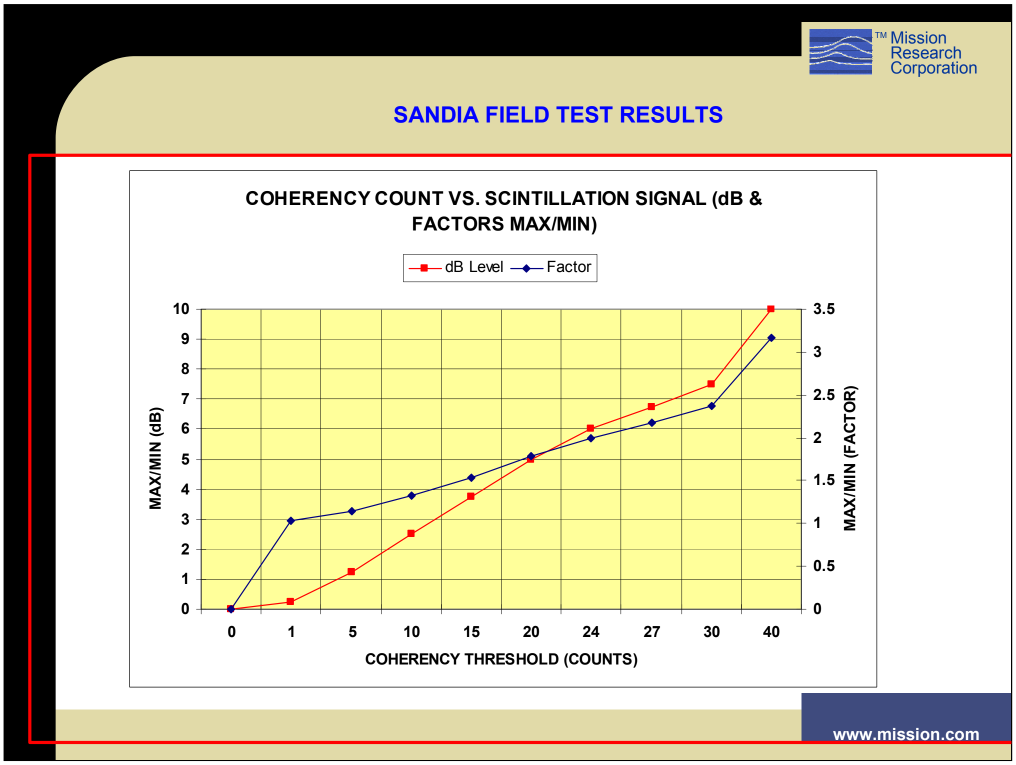
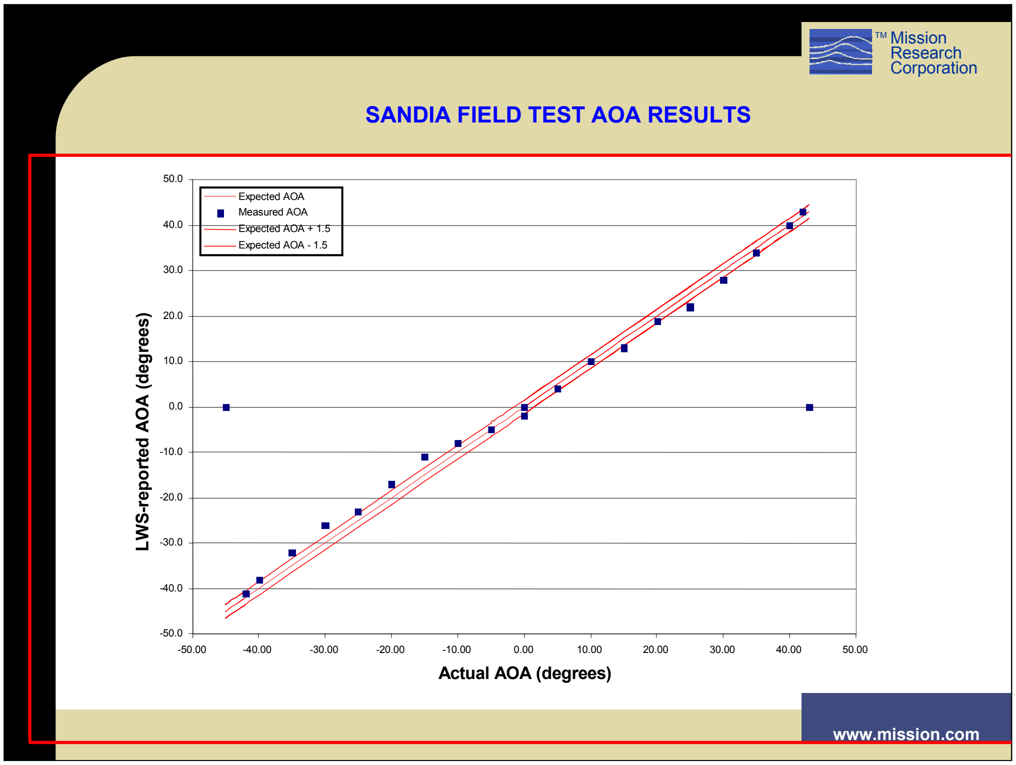
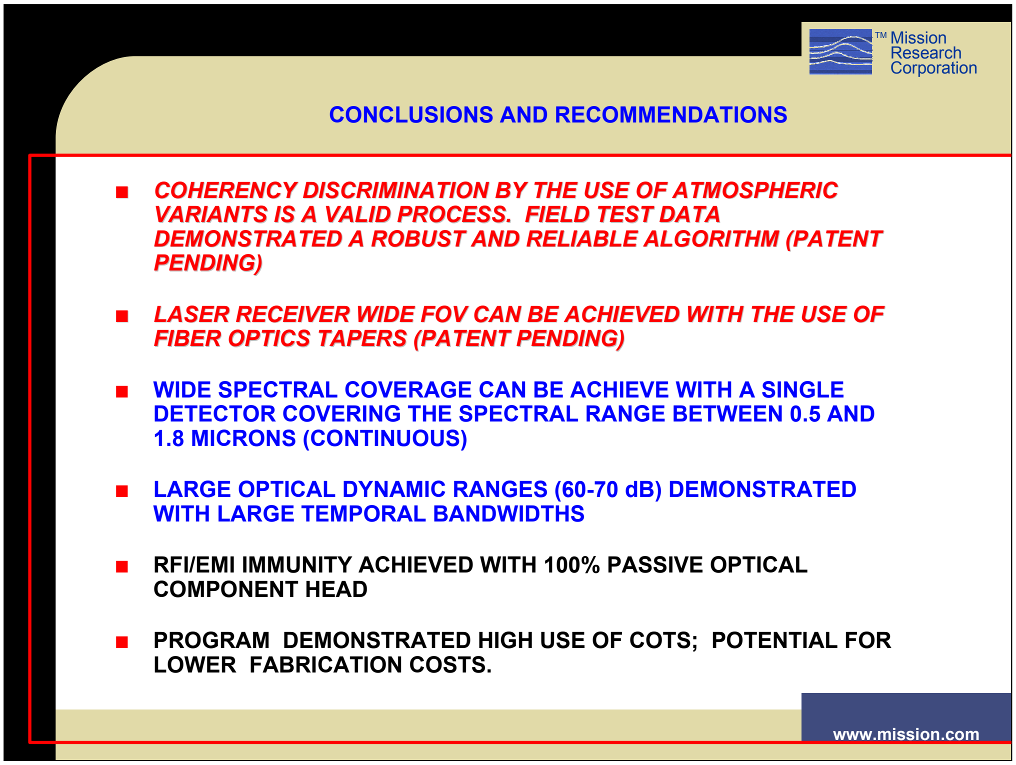


Chart shows the relationship of coherency threshold counts versus the number of decibels between a maxima and minimum among the coherence channel. It also shows the ratio of the between the peaks and the valleys generated by atmospheric scintillation.



This chart shows the excellent AOA response of the system between -45 degrees and + 45 degrees for both azimuth and elevation.



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