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MOS Equipment - Shielding Effectiveness Test Report

MIL-STD-188-125-2 Certification White Paper

Introduction

The realistic threat of an Electromagnetic Pulse (EMP) or High-Altitude Electromagnetic Pulse (HEMP) event is widespread and detrimental to government and civilian infrastructure. These effects are well recognized and understood by multiple government agencies such as the U.S. Congressional EMP Commission and the Defense Threat Reduction Agency. In response to these threats, the U.S. military established a comprehensive set of standards, MIL-STD 188-125-1 and -2, to describe the test methods and minimum requirements for HEMP hardening of command, control, communications, computer, and intelligence systems.

MOS Equipment currently offers Mission Darkness faraday bags and analysis closures which shield against HEMPS, coronal mass ejections, electrostatic discharges, and solar flares. These military grade products are specialized enclosures that provide radio frequency shielding for law enforcement and forensic investigators. Recently, MOS Equipment voluntarily sent their products to Keystone Compliance who put their products to the test by subjecting them to the MIL-STD 188-125 testing procedures to ensure product performance met military standards.

MOS Equipment and Mission Darkness

Mission Darkness, by MOS Equipment, offers a comprehensive selection of radio frequency shielding solutions primarily for law enforcement and military forensic investigators, executive travel protection, and anti-hacking/anti-tracking protection. Mission Darkness products are designed to keep wireless devices offline and shield devices ranging in size from keyfobs to large electronics such as computer towers and generators. All Mission Darkness faraday bags include at least two layers of high-shielding fabric on all sides with dual paired seam construction to block WiFi, Bluetooth, cell signals, GPS, RFID, and radio signals with 60dB-80dB average attenuation. The faraday fabric and electronic devices inside are protected by a durable water-resistant outer layer. Mission Darkness bags are used predominantly by law enforcement and military to maintain the integrity of forensic evidence during search and seizure transport, to block remote hacking and tracking, to protect information in secure facilities, to protect vehicles from theft, and to shield passports and IDs from skimming.

Keystone Compliance and Testing

Keystone Compliance is a full-service regulatory compliance laboratory that provides shielding effectiveness testing to determine the ability of material to reduce electromagnetic fields. They

are accredited to ISO/IEC 17025:2005 by the American Association for Laboratory Accreditation for both electrical and mechanical scopes. They perform product tests by applying the methods and standards of MIL-STD 188-125 for shielding effectiveness. These methods use two antennas, one placed outside the area to be tested that transmits and one inside the area being tested that receives the transmitted frequencies. The range of frequencies tested on MOS Equipment products was between 10kHz to 40GHz and was transmitted from 2 meters for the faraday fabric and 0.2 meters for the faraday bags involved in testing. Since the faraday bags use faraday fabric it's useful to know how well the fabric shields on its own. In addition, some customers use the faraday fabric by itself to make shielded rooms or other DIY shielded enclosures. Therefore, it is important to understand the individual shielding specifications of the material in different layer combinations as well as the faraday bags themselves.

Figure 1: Shows testing setup. The first picture shows the receiving antenna on one side of the testing material and the transmitting antenna on the other.

Product Testing Results

The products sent in for testing were selected because they share similarities with a majority of other products, allowing for the idea that a majority of other products with similar design and construction will pass MIL STD 188-125 testing. Faraday fabric was tested as well in different combinations of layers since most MOS Equipment products have different layer quantities based on the product. The Mission Darkness faraday bags tested consist of a ballistic nylon exterior shell with an interior that features several layers of faraday fabric to generate its signal shielding properties. There are two faraday bag design styles within the Mission Darkness product lineup. The first style is referred to as "Binded Edge Style", which means that the faraday fabric is sewn to the exterior ballistic nylon material on all sides. The second style is referred to as "Liner Style", which means there is a separate faraday fabric liner sewn to the exterior only at the top of the bag, allowing the fabric to be turned inside out if need be.

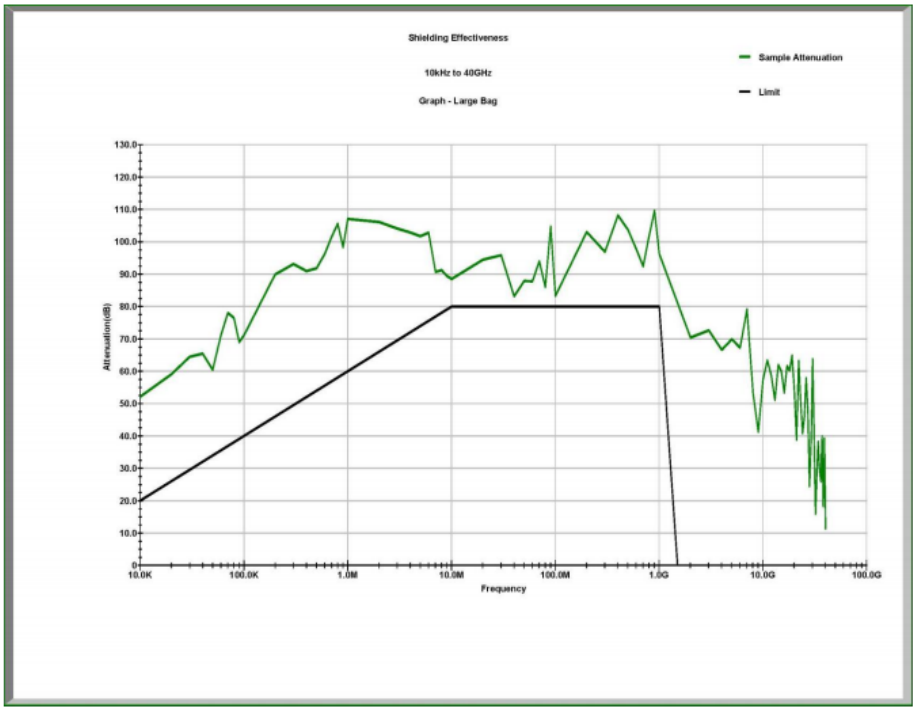
Product Tested and Passed	Products that Share a Similar Design Style to Products that have Passed	Products Outside Scope of Test
Non-window Faraday Bag for Laptops	Non-window Faraday Bag for Phones	BlockBox Lab
Revelation EMP Shield for Generators*	Non-window Faraday Bag for Tablets	BlockBox Lab – RJ45
T10 Faraday Bag for Computer Towers*	Neolok – Phone Size	Window – Faraday Bag for Phones
Single Layer of TitanRF Fabric	Neolok – Tablet Size	Window – Faraday Bag for Tablets
Double Layer of Titan RF Fabric	Neolok Charging Kit – 10,000mAh	Window – Faraday Bag for Laptops
Triple Layer of TitanRF Fabric	Neolok Charging Kit – 20,000mAh	
	Neolok – Tablet Size w/USB Filter	
	BlockBox Touch	
	BlockBox Touch – USB	
	BlockBox Touch – Multiport	
	Faraday Bag for Keyfolds*	
	Mojave Faraday Bag for Phones	
	BlokStart Keyfob Shield	
	Dry Shiled 15L Tote	
	Dry Shiled 40L Backpack	
	Dry Shield MILLE Faraday Pouch	
	X2 Duffel Faraday Bag	
	Padded Utility Faraday Bag	
	MOLLE Faraday Pouch	

Table 1: Comparison of products tested versus products not tested but similar and products outside of the scope. The blue highlighted products are in the "Binded Edge Style" category and the green highlighted products are the "Liner Style" category. * Product contains 3 layers of fabric. All others have 2 layers.

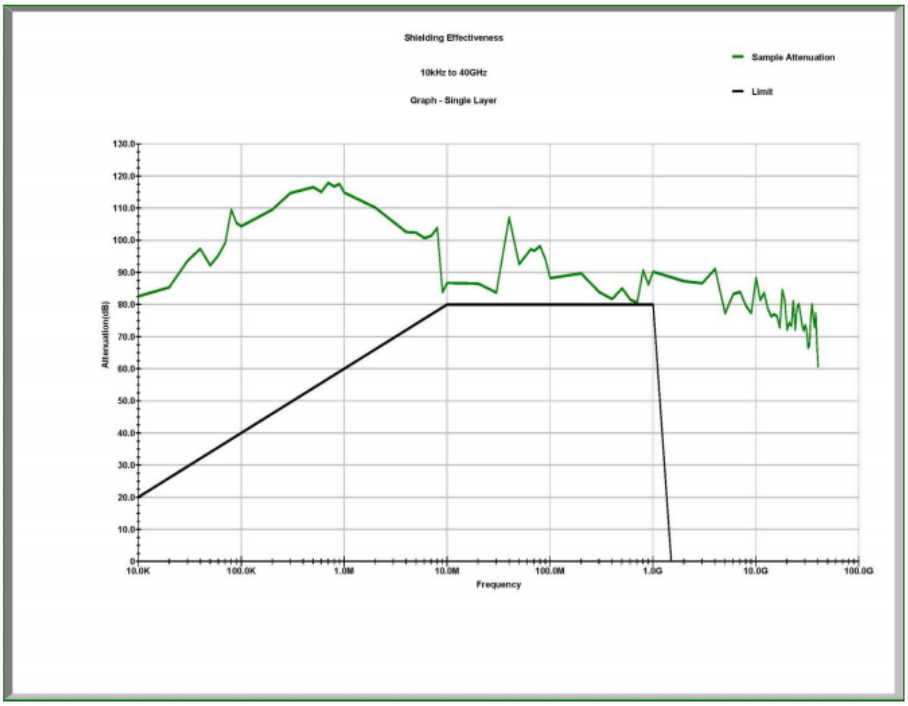
Table 1 shows the products that were tested, the products not tested with similar design styles to tested products, and products outside of the scope of testing. The products tested are similar in design style, construction and fabric lining to other products not tested in the Mission Darkness product lineup and, because of this, the same results and shielding specifications are expected for these related products.

The five products tested were a Mission Darkness Non-Window Faraday Bag for Laptops (noted as small faraday bag), a Mission Darkness Revelation EMP Shield for Generators (noted as large faraday bag), and single, double, and triple layered faraday fabric. The graphs below provide the results of testing these five product types. The green line is the sample attenuation, or the reduction of force of the electromagnetic field being applied and the limit line represents the pass/fail limitation set by the standard. The results show all five types of faraday products tested comply with the MIL-STD 188-125 standard.

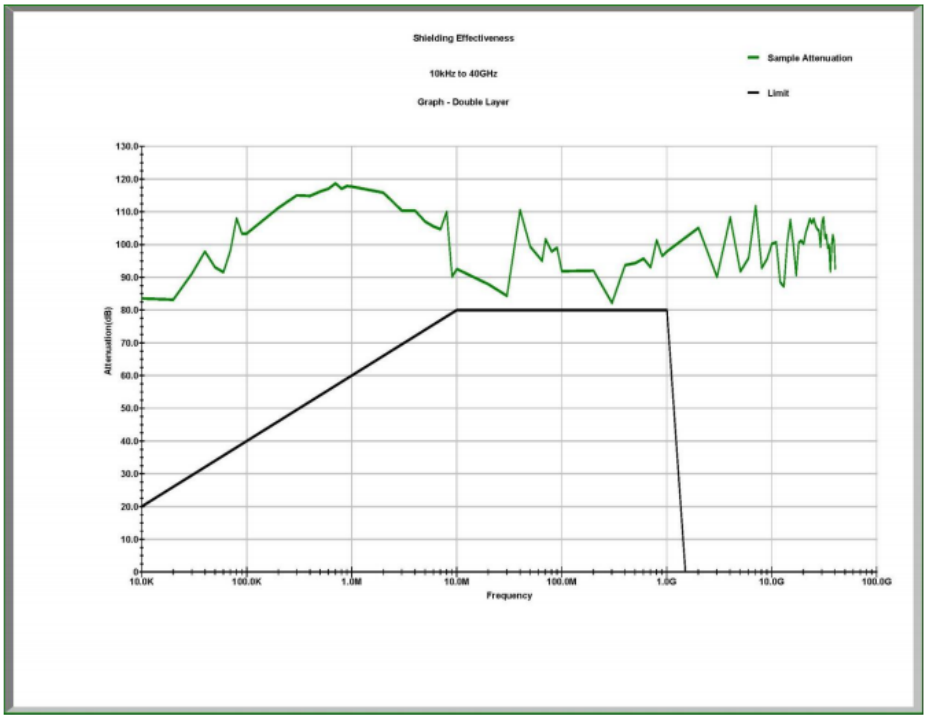
Graph 1: Small faraday bag attenuation



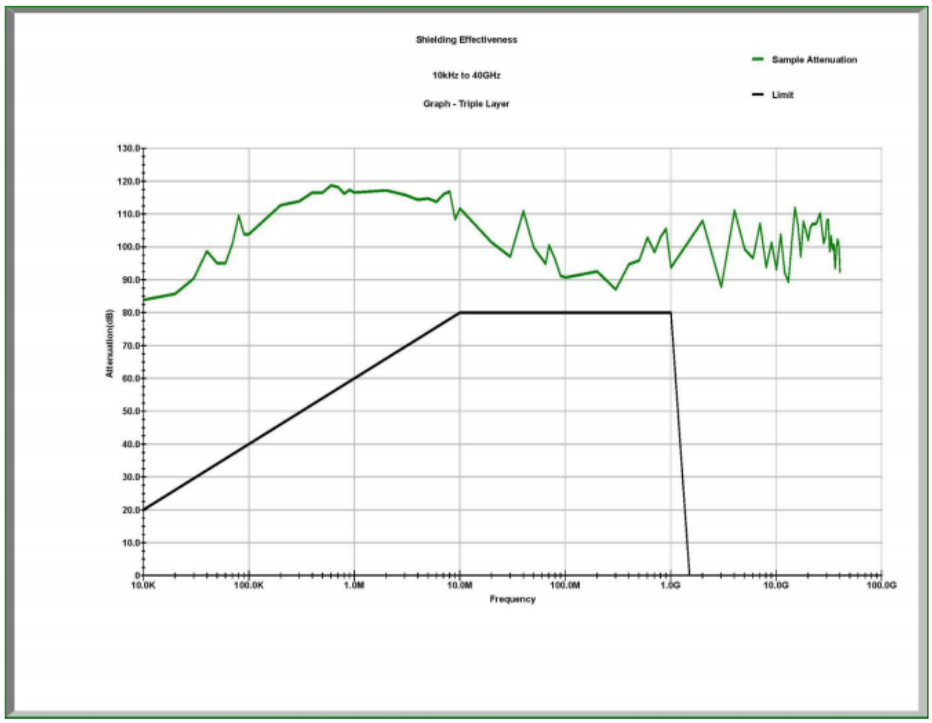
Graph 2: Large faraday bag attenuation



Graph 3: Single layer faraday fabric attenuation



Graph 4: Double layer faraday fabric attenuation



Graph 5: Triple layer faraday fabric attenuation

Conclusion

The results of Keystone Compliance's testing show MOS Equipment products are compliant with the strictest military standards for protection against HEMP events. All five products tested using MIL-STD 188-125 passed and are compliant for shielding effectiveness. The results of testing actual finished products, as well as the faraday fabric in different layer combinations, can be used to formulate a fairly reasonable idea of whether or not other products offered by MOS Equipment will pass MIL STD 188-125 and what those shielding results might be like. This is because shielding products, like faraday bags, experience differences in shielding capability from bag to bag even if they are of the same model and design. There can be up to 15dB in variance between same model bags due to manufacturing inconsistencies, which is a real-world variable that is inescapable and experienced by every textile manufacturer in the world. The effectiveness of shielding products is so heavily tied to the quality of manufacturing that the demands for quality control are much higher. For this reason, MOS Equipment maintains high quality manufacturing standards and high-quality control checks after manufacturing. When MOS Equipment combines compliant testing specs based on common product configurations with high quality control, there's a reasonable assurance their broad product line will offer similar shielding specifications to the products tested by Keystone Compliance.

Link to Shielding Effectiveness Test Report offered by Keystone Compliance

References

Hendricks, M. (2012). Technical Note :Mil-STD 188-125. Referencing MIL-STD for Commercial Applications. Infinit.

MIL-STD 188-125 Appendix A