

# TEMPEST Performance Testing of Optical Fiber Cables

## AEN099, Revision 2

TEMPEST relates to the requirements for shielding communications equipment and environments to prevent data related electromagnetic interference (EMI) or radio frequency interference (RFI) from propagating beyond specific boundaries. TEMPEST security is a function of the TEMPEST characteristics of the processing equipment, the way the equipment is installed, the electromagnetic and physical characteristics of the facility, and the geographical environment where the facility is located.

Communications cables are just one part of the overall TEMPEST system. The key area of concern is the point where the cable enters/exits the TEMPEST secure environment. Cables typically pass through a waveguide attenuator, which is a metal pipe of a defined size and length, when transitioning from a secure to a non-secure area. The dielectric constant of the air in the waveguide attenuator causes signals generated inside the secure environment to attenuate and prohibits them from being transmitted along the cable. Cables placed in the waveguide attenuator alter the dielectric constant inside the waveguide attenuator and degrade its attenuation performance. Cables penetrating the waveguide attenuator are susceptible to fortuitous conduction. Fortuitous conduction is the phenomenon in which a cable acts as an antenna, picking up a radiated signal, conducting it for some distance, and then re-radiating it. Therefore, the waveguide attenuator must attenuate the conducted signal sufficiently to ensure the security of the environment. The performance of the waveguide attenuator is known as shielding effectiveness. One of the advantages of optical fiber cables is that they can be designed to be all dielectric. By eliminating any copper or conductive metals (twisted pair, coax, or armor), the cables are less likely to conduct and re-radiate signals through the waveguide attenuator.

Corning Optical Communications collaborated with a recognized, independent TEMPEST testing facility to ensure that Corning Optical Communications dielectric optical fiber cables would not degrade the shielding effectiveness of a typical waveguide attenuator in a TEMPEST system. The independent test lab conducted testing using the methods of MIL-STD 285 as recommended by NSTISSAM TEMPEST 2-95, "RED/BLACK Installation Guidance". The lab placed a signal generator operating at 400 MHz and 1 GHz inside a shielded chamber. Antennas, specifically designed for shielding effectiveness testing, were used to radiate the signals inside the chamber and to measure the signals that were conducted outside of the chamber.

The testing lab routed each of the cables from inside the shielded chamber to the outside through a typical waveguide attenuator. The lab then generated a signal at the two frequencies and measured the signal conducted to the outside of the chamber. No measurable decrease in the shielding effectiveness of the waveguide attenuator was

recorded at either frequency for all of the cables tested. Corning Optical Communications is able to provide a detailed testing report from the independent testing facility upon request. Table 1 lists the 15 cables that were tested.

<b>Fiber Count and Cable Type</b>
12 F MIC <sup>®</sup> Plenum cable
24 F MIC Plenum cable
6 F MIC Plenum cable
2 F MIC Plenum cable
4 F MIC Plenum cable
24 F MIC Riser cable
12 F MIC Riser cable
6 F MIC Riser cable
12 F Riser Ribbon Interconnect cable
Zipcord Riser cable
48 F Ribbon Plenum cable
24 F Ribbon Plenum cable
72 F Ribbon Plenum cable
12 F Plenum Fan Out cable (2.9 mm)
6 F Plenum Fan Out cable (2.9 mm)

Table 1. Optical Fiber Cables Tested

Based on the testing, the cables are suitable for preserving the isolation requirements of NSTISSAM TEMPEST 2-95, "RED/BLACK Installation Guidance," at frequencies up to 1 GHz. Certified TEMPEST Technical Authorities (CTTA) use the "RED/BLACK Installation Guidance" (NSTISSAM TEMPEST/2-95) to determine the requirements to achieve TEMPEST security.