



NASA SBIR 2011 Phase I Solicitation

A1.07 Avionics Health State Assessment and Management

Lead Center: ARC

Participating Center(s): LaRC

Shielded twisted-pair cables are already in common use on-board aircraft and spacecraft, and are destined to be ubiquitous in the all-electric aircraft designs of the future. At present, however, easy to use commercially available connector interfaces between this type of cable and electrical test equipment (such as oscilloscopes, network analyzers, or handheld diagnostic units) are not readily available, and custom-built test fixtures are the norm. Given the widespread use of this cable type in other commercial wiring applications such as DSL, NASA is investing in the research and development of a commercial-grade product to address this need. Proposals are therefore sought for the design of a novel electrical connector system (or small portable interface board) that can interface the coaxial SMA (or 2.9 mm) ports of typical high-end electrical test equipment with a shielded twisted-pair (STP) cable (2 inner conductors surrounded by a shield). The design should provide two 50 ohm coaxial SMA (or 2.9 mm) inputs, each used to individually excite the common and differential modes of the cable, and one output connection to the STP cable itself. In addition, the design should minimize the mode cross coupling caused by the connector in the frequency range of interest (0-10 GHz). Finally, a critical part of the design must include a calibration method and set of calibration standards for obtaining a high-quality Vector Network Analyzer (VNA) based measurement (using a standard VNA) of the 4 port 4x4 S-parameter matrix covering the differential and common mode ports on each end of the TSP cable from 0-10 GHz.

Proposals should address the design and the numerical verification of the connector and calibration standards in Phase I, with the experimental validation and the prototype construction reserved for Phase II. Use of a commercial electromagnetics simulator such as COMSOL is strongly encouraged. While the design does not need to be compact or inexpensive at this stage, any obvious impediments to its subsequent miniaturization or commercialization will be considered a serious weakness.