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## **Low Cost Power Lead Extended Pre-Compliance Conducted EMI Measurement Setup and Diagnostics with Compact LISN**

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### **Abstract**

An extended pre-compliance measurement setup has been created in the development laboratory to measure and diagnose conducted EMI up to 100 MHz without the use of a spectrum analyser. A dual compact Line Impedance Stabilisation Network (LISN) had been designed, assembled and validated in an accredited EMC laboratory. It was designed for high density military DC-DC power converters with input voltages up to 300 VDC and a steady state current of up to 10 A. The test requirement of concern was as described in MIL-STD-461-F, but the same LISN can cover the FCC and CISPR conducted frequency range; in which case the only difference will be the bench setup, as the MIL specification requires a conductive test surface while the FCC and CISPR a wooden surface. The LISN ports noise signals were digitally recorded with an oscilloscope and the data processed on a Pc. The validation of the digital measurement technique was done in conjunction with an accredited Electromagnetic Compatibility (EMC) test facility. An added advantage of the simultaneous digitising of the conducted noise measurement from both channels of the oscilloscope is that diagnostic calculations can be performed from the recorded signals. For instance, the common mode and differential mode noise components can be extracted, up to a frequency of 100 MHz assisting in characterising the noise mechanisms to identify problem areas in the converter design as well as assisting in an optimised filter design. The validity of the digital extraction of common mode and differential mode noise was verified with the aid of an EMC ETS-Lindgren current probe. Furthermore, the power converter has to be designed to be stable with the LISN inline with the input power, a concern in especially DC-DC Step Down converters, stabilizing the loop with a highly inductive source. The bench setup can be used to verify this aspect. The pre-compliance test bench will build confidence in the conducted EMC design and test methodology and will eventually save time and cost in the power converter qualification process.