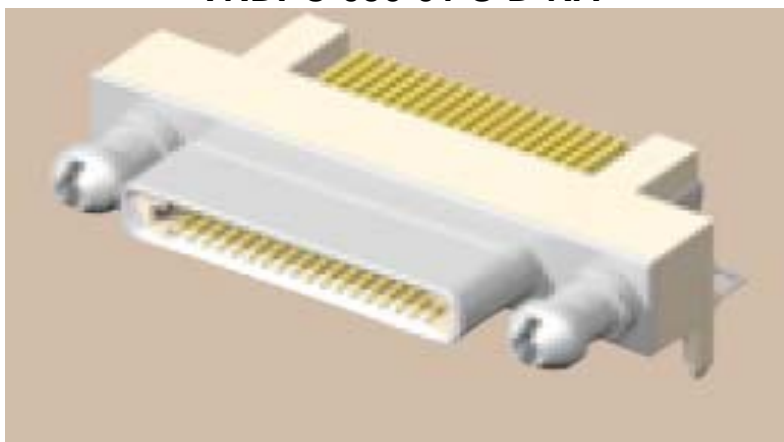




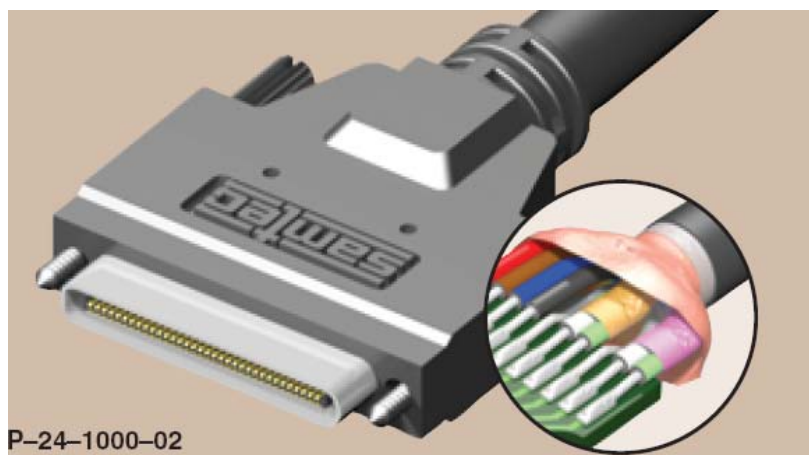
Shielding Effectiveness Report

VRDPC-050-01-S-D-RA



Mates with

VPDP/VPLSP/VPSTP



Description:
Data Rate I/O Cable Assemblies

Series: VRDPC/VPDP, VRDPC/VPLSP, VRDPC/VPSTP Data Rate I/O System

Description: Rugged External High Density I/O Cable Assemblies

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Series: VRDPC/VPDP, VRDPC/VPLSP, VRDPC/VPSTP Data Rate I/O System

Description: Rugged External High Density I/O Cable Assemblies

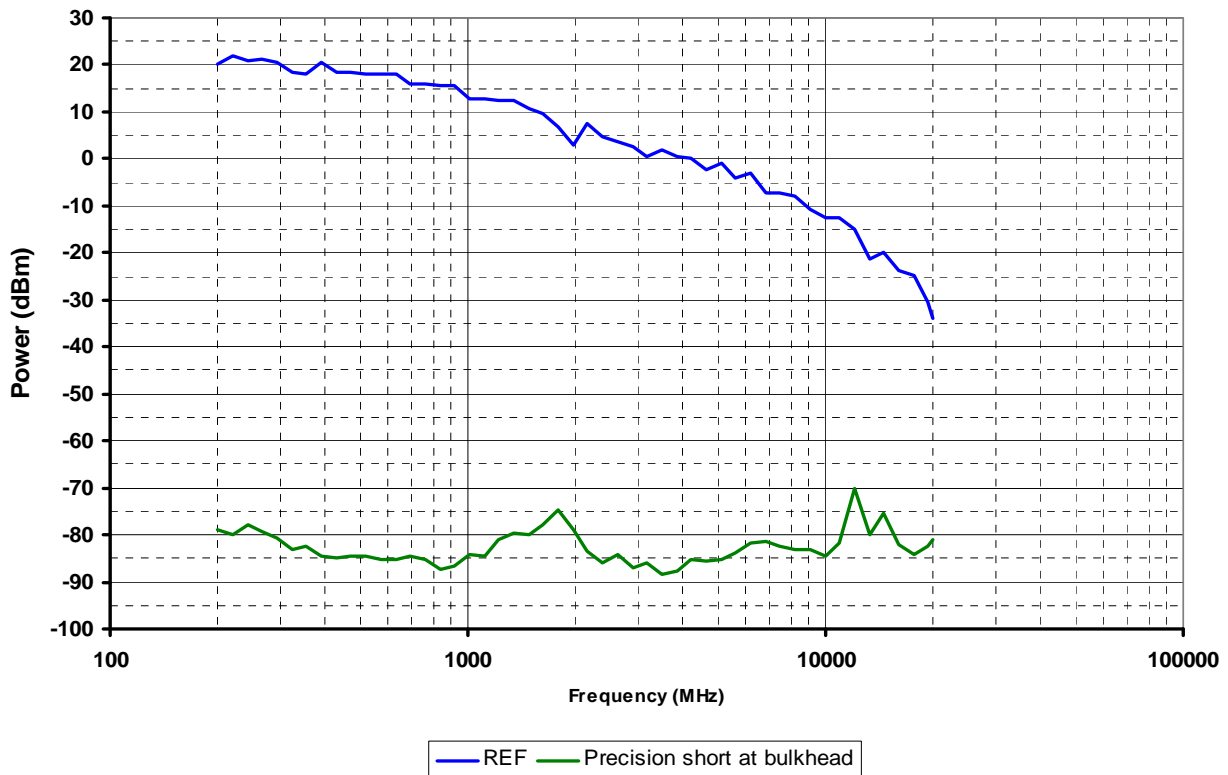
Product Overview

Samtec Data Rate I/O cable assemblies are available to support up to 24 signal pairs (8, 12, 16, and 24). These Data Rate I/O cable assemblies are available with three different cable types including 30 AWG Shielded Twisted Pair (VPSTP Series), MiniSkew 26 AWG Low Skew Pair (VPLSP Series) and 30 AWG Twinax Micro Ribbon (VPDP Series).

Shielded Room Noise Floor Verification

Prior to performing shielding effectiveness testing of a particular sample, it is important to establish the noise floor of the anechoic test chamber by measuring the shielding effectiveness of the receive line while terminated at the bulkhead connector with a precision short. The difference between this measurement and that of an "in-band" antenna (per IEC 6100-4-21) is the maximum dynamic range of the measurement system. Any sample that has a shielding effectiveness greater than the dynamic range will not be adequately characterized.

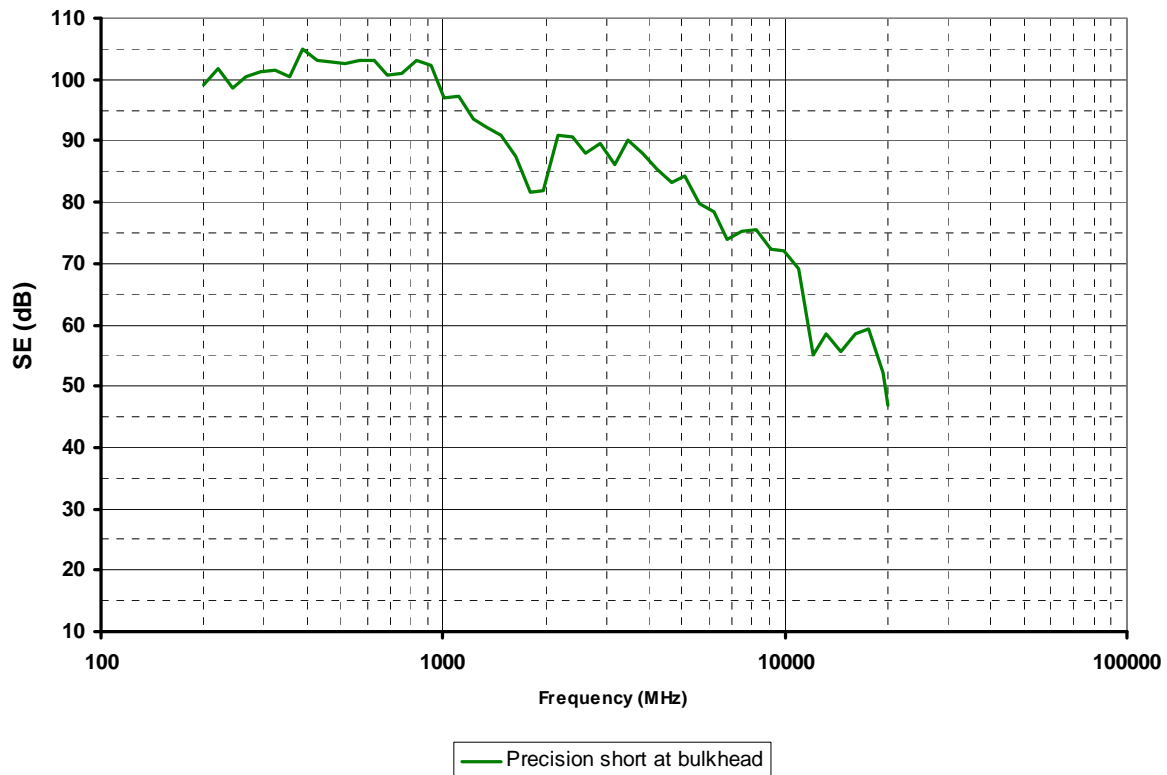
Received Power - Baseline, precision short at bulkhead



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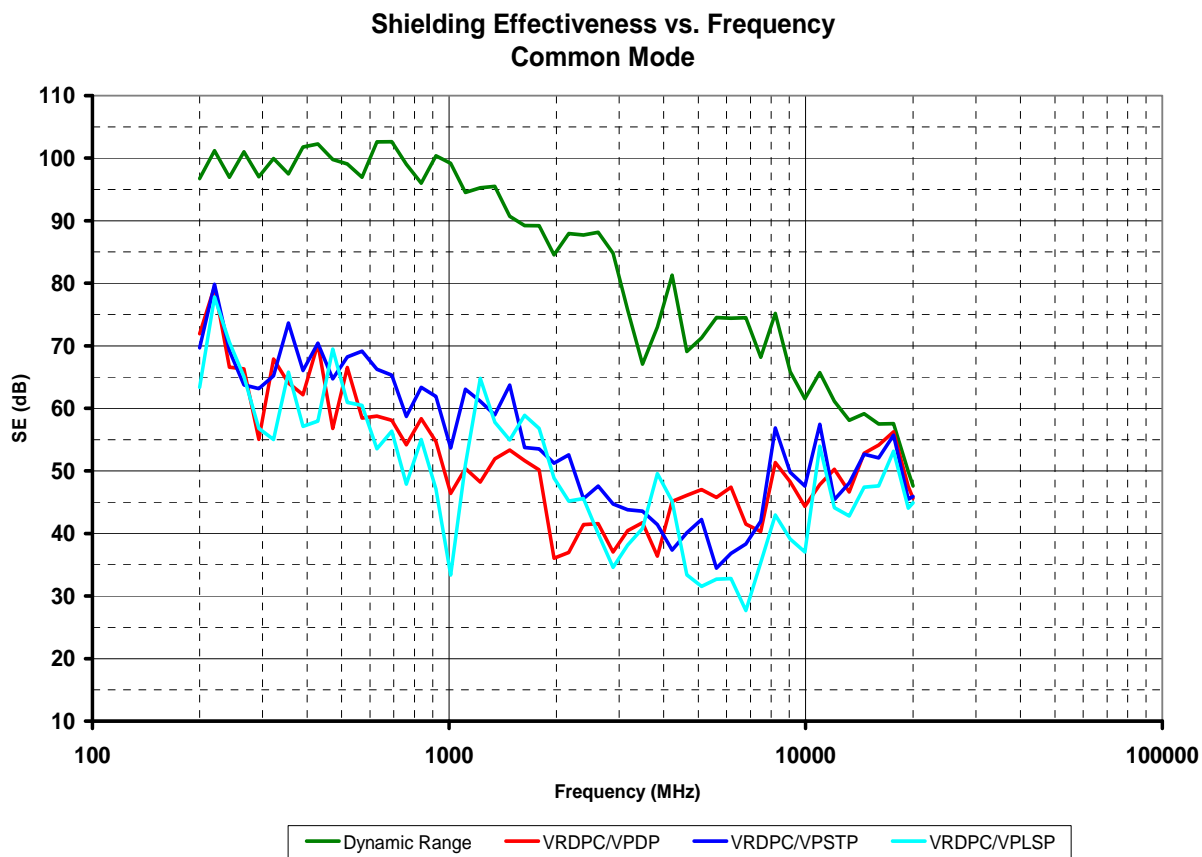
Shielding Effectiveness - Maximum Dynamic Range



Series: VRDPC/VPDP, VRDPC/VPLSP, VRDPC/VPSTP Data Rate I/O System

Description: Rugged External High Density I/O Cable Assemblies

Shielding Effectiveness Summary Data



Series: VRDPC/VPDP, VRDPC/VPLSP, VRDPC/VPSTP Data Rate I/O System

Description: Rugged External High Density I/O Cable Assemblies

Characterization Details

This report presents data that characterizes the shielding effectiveness of a cable assembly in a controlled printed circuit board (PCB) environment. All efforts are made in order to reveal typical responses inherent to the system under test (SUT).

In this report, the SUT includes the cable assembly and mating connectors. The mating connectors are attached to test boards constructed with Samtec recommended footprints and routing practices. The mating connector to chassis panel interface is critical to shielding performance, and every attempt was made to mimic typical installation practices. Where available, recommended chassis panel cutout dimensions were used, and the mating connector typically penetrates this panel cutout. Connection between the panel and the mating connector relies on mating connector features such as flanges or EMI gaskets when specified on the mating connector drawing.

Common Mode Signals

IEC 61000-4-21 does not specifically address fixturing aspects of high speed differential cable assemblies. For this test, a power divider was used to combine the received signal from each wire of a single differential pair in the cable assembly. This is referred to as the common mode response or common mode shielding effectiveness.

Product and Test System Descriptions

Product Description

Product test samples were one-meter long VPSTP Series, VPSTP Series, and VPDP Series cable assemblies. The cable within each completed assembly is terminated by soldering a small transition PCB (termination board) at each end. Each termination board has a connector soldered to it. Each cable assembly was tested by mating it to a VRDPC Series test board connector. The actual part numbers that were tested are shown in Table 1, which also identifies End 1 and End 2 of the assembly.

Length	Part Number	End 1	End 2
1000mm	VPSTP-016-1000-01	DS-1	DS-1
1000mm	VPLSP-016-1000-01	DS-1	DS-1
1000mm	VPDP-016-1000-01	DS-1 (metal)	DS-1 (metal)

Series: VRDPC/VPDP, VRDPC/VPLSP, VRDPC/VPSTP Data Rate I/O System

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Test System Description

All measurements were performed using the test boards. The test boards have trace lengths of 3.00 inches and provide for the interconnection to the cable assemblies by use of replaceable SMA connectors. Each test board had a pair of THRU reference traces.

Printed Circuit Board Fixture Identification

PCB-100473-TST-01,	mates	SUT
BOARD 1 (receive end)	with	
PCB-100473-TST-01,	mates	SUT
BOARD 2 (termination end)	with	

The cable terminations had a pre-determined signal-to-ground configuration. The respective signal line numbers are shown in Table 2 below (there are a total of 25 positions per row).

G	2	3	G	5	6	G	8	9	G	G	G	G	G	G	G	17	18	G	20	21	G	23	24	G
G	G	G	G	30	31	G	33	34	G	36	37	G	39	40	G	42	43	G	45	46	G	G	G	G

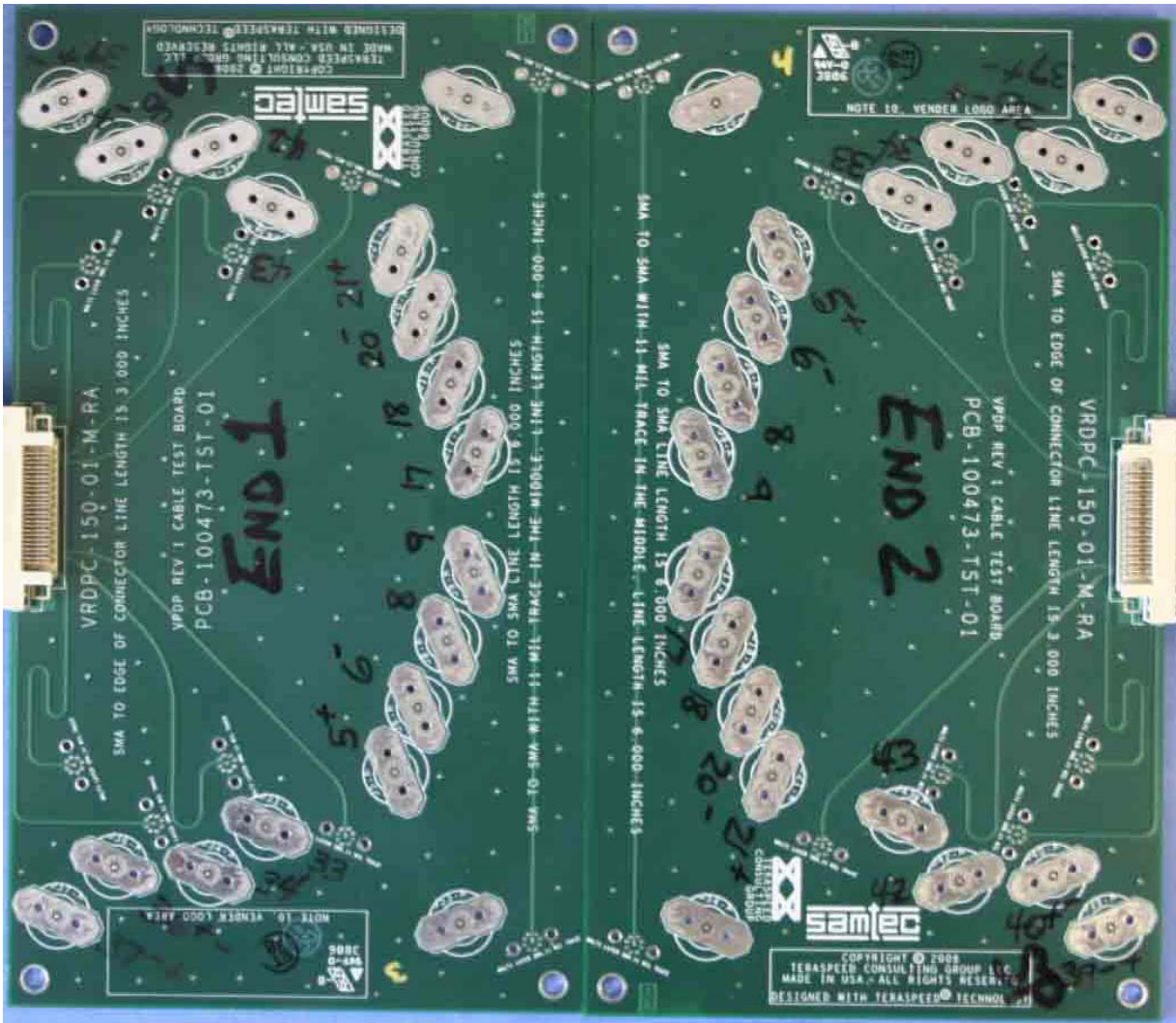
Table 2: Grounding scheme and respective signal line numbers

All data are results from the PCB-100473-TST-01, BOARD 1 (receive end). Electrical continuity exists between labeled test points if mated as designated. The test boards are pictured below.

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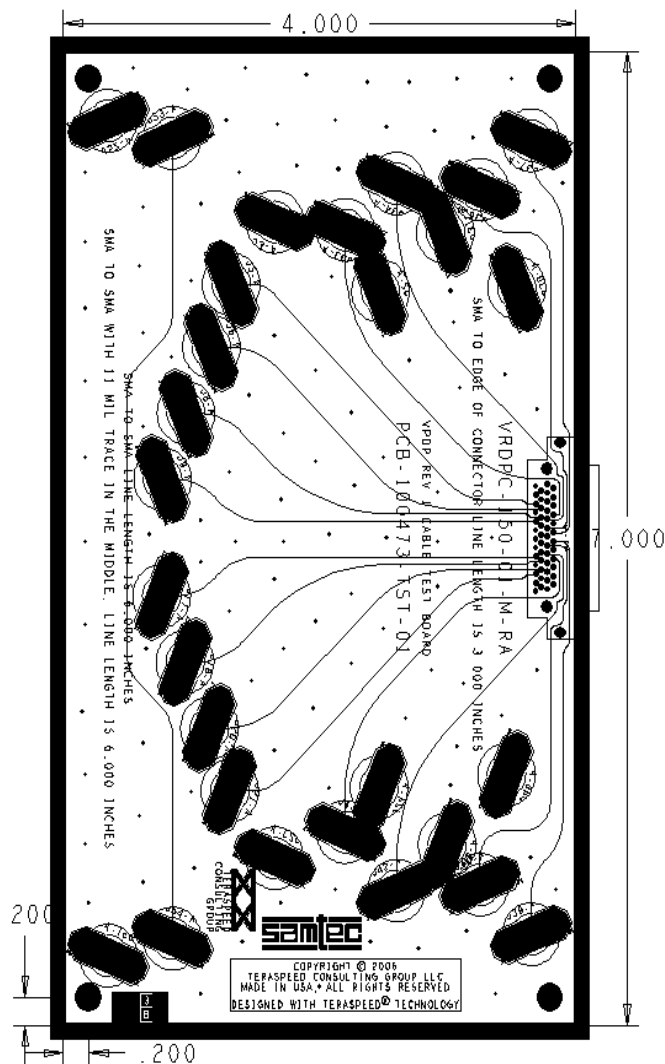
PCB-100473-TST-01 Cable Test Board End 1 and 2



Series: VRDPC/VPDP, VRDPC/VPLSP, VRDPC/VPSTP Data Rate I/O System

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PCB-100473-TST-01 Cable Test Board Design



Series: VRDPC/VPDP, VRDPC/VPLSP, VRDPC/VPSTP Data Rate I/O System

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Appendix A– Test and Measurement Setup

The Mode Stirred Chamber Method, documented in IEC 61000-4-21, was used in this testing. This method relies on exposing a device to electromagnetic energy in a large resonant cavity (shielded room). An electrically large tuner perturbs the boundary conditions of the cavity resulting in different standing wave patterns and a randomized excitation of the device. Multiple device measurements are made at different tuner positions, and the results are averaged.

Shielding effectiveness is defined to be relative to an in-band reference antenna for IEC 61000-4-21. If the shielding effectiveness is 20 dB, it means that the received power with the sample in place is 20 dB lower than the received power when a reference antenna is in place. A log periodic antenna serves as the reference from 200 MHz to 2 GHz, and a double-ridge guide horn antenna is the reference from 2 GHz to 20 GHz. This method has a practical high frequency limit determined by the instrumentation used, in this case 20 GHz. The low frequency limit is determined by the size of the chamber, which in this case is 200 MHz. The system used for this testing is a SMART 200 system by ETS-Lindgren and is shown in Figure 1.

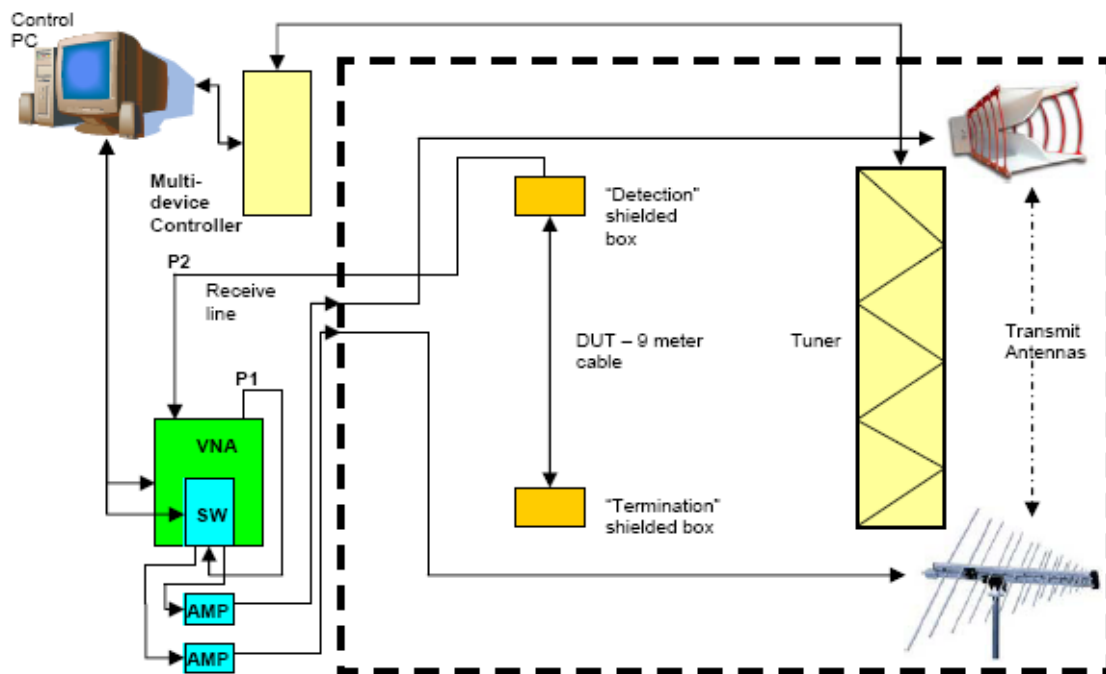


Figure 1: Mode Stirred Chamber Method

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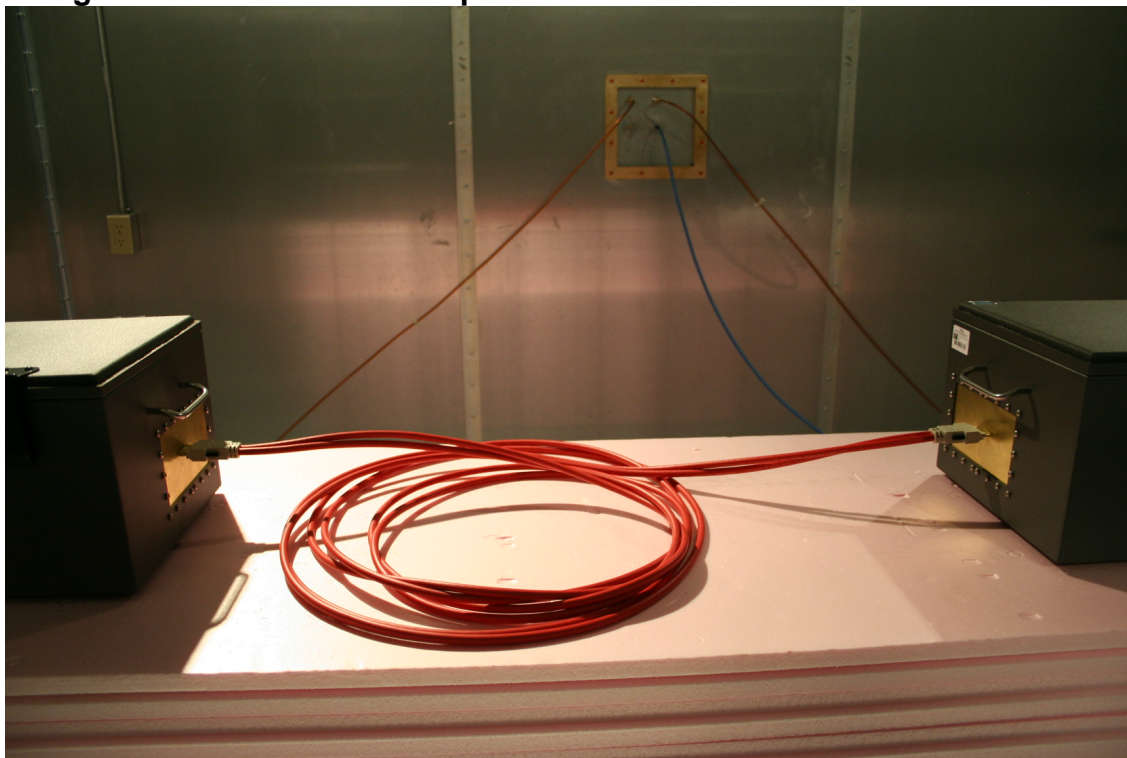
ETS/Lindgren 2090 Multi-Device Controller and HP Vector Network Analyzer



Series: VRDPC/VPDP, VRDPC/VPLSP, VRDPC/VPSTP Data Rate I/O System

Description: Rugged External High Density I/O Cable Assemblies

Shielding Effectiveness Test Setup



Test Instruments

<u>QTY</u>	<u>Description</u>
1	ETS/Lindgren Smart200 Reverberation Chamber
1	ETS/Lindgren 2090 Multi-Device Controller w/ Smart IMM Software
1	HP8720ES 50 MHz – 20 GHz Vector Network Analyzer

Measurement Station Accessories

<u>QTY</u>	<u>Description</u>
1	Agilent 3499B Switch Controller
1	Agilent 8762C Coaxial Switch (DC – 26.5 GHz)
1	Mini-Circuits ZHL – 42W Coaxial Amplifier (10 MHz – 4.2 GHz, +30 dB gain)
1	Microwave Power L0218-30 Wideband Amplifier (2–18 GHz, +30 dB gain)
1	Weinschel Model 1515-1 Broadband Resistive Power Divider (DC-18 GHz)

Test Cables & Adapters

<u>QTY</u>	<u>Description</u>
1	Pasternack Enterprises 2.9mm Semi-Rigid (.141) 8" Cable Assemblies (4)
1	Tektronix 1 Meter Module Extenders (2)