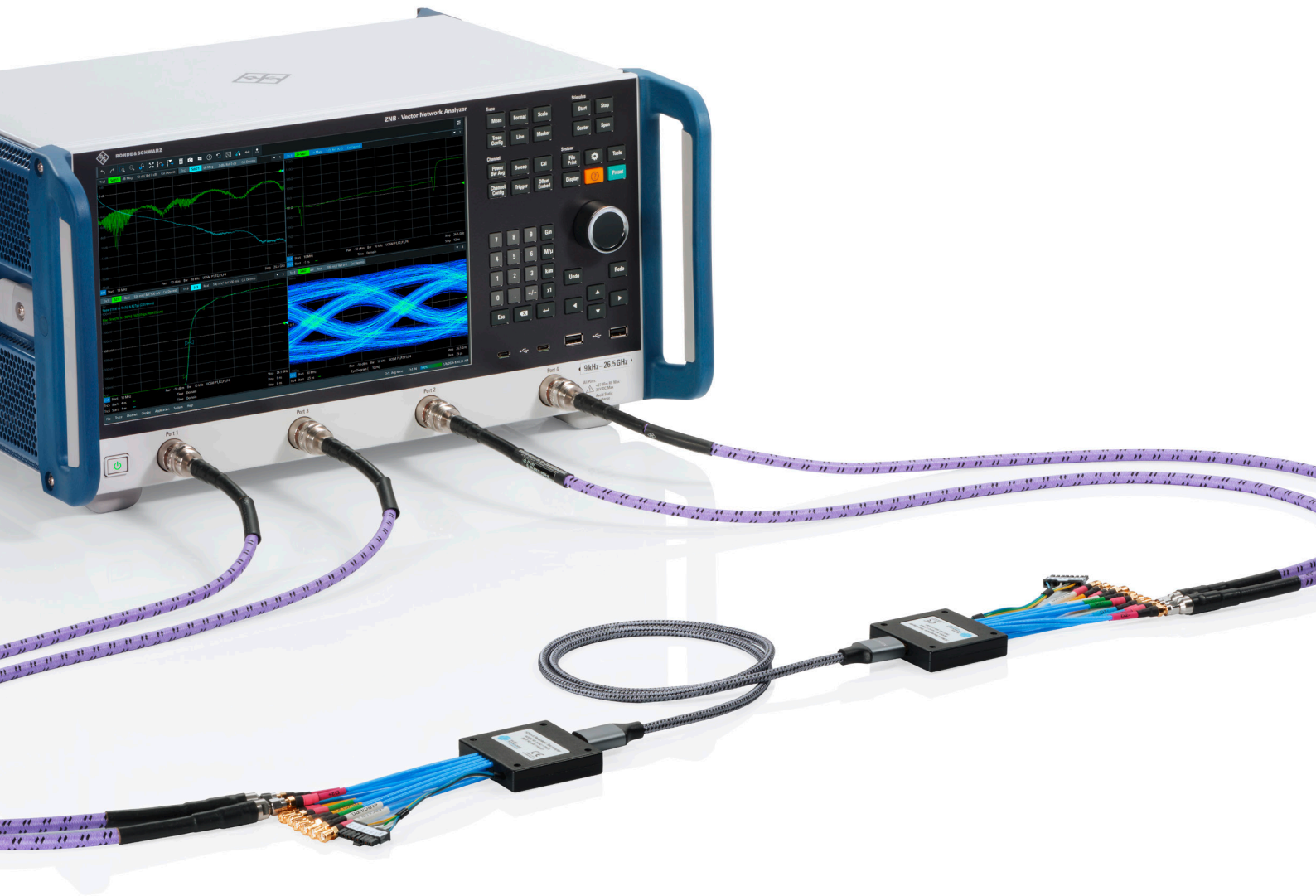


HDMI 2.2 AND HDMI 2.1 CONNECTOR AND CABLE COMPLIANCE TEST



Application Brochure
Version 02.00

ROHDE & SCHWARZ

Make ideas real



The Rohde & Schwarz HDMI 2.2 and HDMI 2.1 connector and cable test solutions have HDMI Forum approval and provide reliable and fast compliance testing for devices.

The R&S®ZNB3000 vector network analyzer with the R&S®ZNB3-K2 time domain analysis software and R&S®ZNB-K220 in-situ deembedding power the test solutions. The complete Rohde & Schwarz solutions together with the test equipment have detailed methods of implementation (MOI) for all available tests with clear instructions for compliance testing in line with the HDMI Forum generic compliance test specification (gCTS).

KEY FACTS

- ▶ Approved solutions for HDMI 2.2 and HDMI 2.1 by HDMI Forum
- ▶ Ultrafast sweep cycle time for testing HDMI connector and cable compliance
- ▶ Versatile vector network analyzer (VNA) firmware for enhanced flexibility when testing connector and cable compliance

COVERED TESTS

HDMI 2.2 (CAT4)

Connector tests

- ▶ HFB6-1: Mated connector differential impedance
- ▶ HFB6-2: Mated connector attenuation (differential insertion loss)
- ▶ HFB6-3: Mated connector attenuation to far-end crosstalk ratio

Cable tests

- ▶ HFB7-2: Differential insertion loss (informative)
- ▶ HFB7-3: Differential impedance of fixed rate link (FRL) lane
- ▶ HFB7-4: Attenuation to crosstalk ratio (informative)
- ▶ HFB7-5: Intra-pair skew (informative)
- ▶ HFB7-6: Inter-pair skew
- ▶ HFB7-7: Mode conversion

HDMI 2.1 (CAT3)

Connector tests

- ▶ HFR6-1: Mated connector differential impedance
- ▶ HFR6-2: Mated connector attenuation (differential insertion loss)
- ▶ HFR6-3: Mated connector attenuation to far-end crosstalk ratio

Cable tests

- ▶ HFR7-2: Differential insertion loss
- ▶ HFR7-3: Differential impedance of FRL lane
- ▶ HFR7-4: Attenuation to crosstalk ratio
- ▶ HFR7-5: Intra-pair skew
- ▶ HFR7-6: Inter-pair skew
- ▶ HFR7-7: Mode conversion
- ▶ HFR7-12: eARC differential insertion loss
- ▶ HFR7-13: eARC lane differential impedance
- ▶ HFR7-14: eARC common mode impedance
- ▶ HFR7-15: eARC intra-pair skew

Overview of HDMI connector and cable testing

Testing HDMI connectors or cables is made easy with Rohde&Schwarz by following three steps:

Step 1

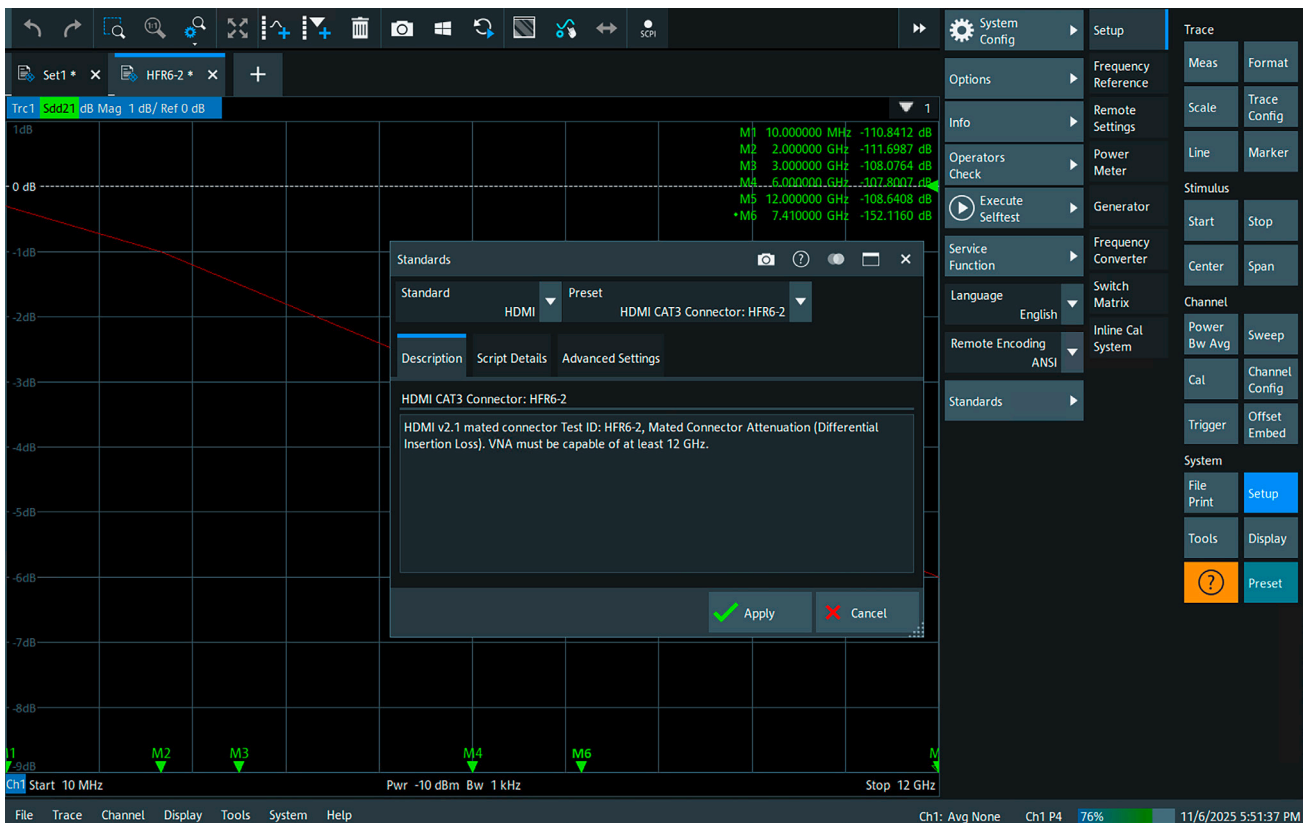
Review the MOI for the desired test and follow steps outlined therein. All MOIs are available in the HDMI extranet adapter, the MOI from Rohde&Schwarz outlines how the R&S®ZNB3000 can help make the measurement.

Step 2

Next load in the test state, which can be done in two ways:

Download the recall state file from Rohde&Schwarz. The files can be found on the Rohde&Schwarz website.

The other option is to go through the menus on the R&S®ZNB3000 and find the “standard” button:
System → Setup → Standards → HDMI.



Step 3

Sweep the DUT to make the measurement. Once the sweep is finished the R&S®ZNB3000 will clearly show pass or fail results.



Connectivity

Luxshare-ICT and Wilder Technologies provide two approved test point adapters (TPA) for HDMI connector and cable testing. The companies both make plug and socket (receptacle) test fixtures that let the VNA measure the device under test (DUT) by breaking out the desired signals. Generally, such TPAs are deembedded for measurements and the TPA vendor provides deembedding files or Rohde&Schwarz deembedding tools can generate such files. All unused lanes on the TPA in the test must use 50 Ω terminators, so test setups require 16 × 50 Ω terminators as well as the TPAs.

Debugging methods and options

The R&S®ZNB3-K20 extended time domain analysis option lets the R&S®ZNB3000 implement a virtual signal generator for multilevel pulse amplitude modulation (PAM) signals such as NRZ, PAM-4, PAM-8 and PAM-16, as well as simulated lowpass behavior. The eye diagram calculated from the DUT S-parameters provides an extensive overview of system signal integrity. Further building blocks for pre-emphasis, jitter, noise and equalization can be used to synthesize transmission system transmitter and receiver parts.

Cable test reference configuration

HDMI 2.2 (CAT4)

Designation	Type	Quantity	Remark
Required			
VNA	R&S®ZNB3020	1	4-port option, at least 24 GHz of bandwidth is required
RF cable	R&S®ZV-Z193, model .60	4	50 Ω, DC to 26.5 GHz, 3.5 mm (f) to 3.5 mm (m), flexible, phase stable
Calibration unit	R&S®ZN-Z52, model .30	1	automatic calibration unit, 100 kHz to 26.5 GHz, 4 ports, 3.5 mm (f)
Time domain analysis	R&S®ZNB3-K2	1	software license
In-situ deembedding (ISD)	R&S®ZNB-K220	1	software license, ISD preferred because no 2 × Through to make coupon
50 Ω terminator	2003-6110-00	16	made by Amphenol but other 50 Ω terminators can work, make sure they operate up to at least 18 GHz
Optional (only applicable fixtures for user cable or connector should be purchased)			
TPA receptacle	HDMI 2.2 Type-A Receptacle	2	HDMI 2.2 type A receptacle test fixture, made by Luxshare-ICT
	HDMIA2.2-TPA-R	2	HDMI 2.2 type A receptacle test fixture, made by Wilder Technologies
TPA plug	HDMI 2.2 Type-A Plug	1	HDMI 2.2 type A plug test fixture, made by Luxshare-ICT
	HDMIA2.2-TPA-P	1	HDMI 2.2 type A plug test fixture, made by Wilder Technologies

HDMI 2.1 (CAT3)

Designation	Type	Quantity	Remark
Required			
VNA	R&S®ZNB3020	1	4-port option, at least 12 GHz of bandwidth is required
RF cable	R&S®ZV-Z193, model .60	4	50 Ω, DC to 26.5 GHz, 3.5 mm (f) to 3.5 mm (m), flexible, phase stable
Calibration unit	R&S®ZN-Z52, model .30	1	electronic cal unit, 100 kHz to 26.5 GHz, 4 ports, 3.5 mm(f)
Time domain analysis	R&S®ZNB3-K2	1	software license
In-situ deembedding (ISD)	R&S®ZNB-K220	1	software license, ISD preferred because no 2 × Through to make coupon
50 Ω terminator	XMA 2003-6110-00	12	made by Amphenol but other 50 Ω terminators can work, make sure they operate up to at least 18 GHz
Optional (only applicable fixtures for user cable or connector should be purchased)			
TPA receptacle	TFH-08P1U	2	HDMI 2.1 type A receptacle test fixture, made by Luxshare-ICT
	600-1146-000	2	HDMI 2.1 type A receptacle test fixture, made by Wilder Technologies
TPA plug	TFH-08P1U	1	HDMI 2.1 type A plug test fixture, made by Luxshare-ICT
	640-0860-000	1	HDMI 2.1 type A plug test fixture, made by Wilder Technologies

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