

VIAVI

Verifying Wireless Fronthaul Networks

CPRI and eCPRI test options for T-BERD/MTS-5800,
T-BERD/MTS-5800–100G, and MAP-2100

Fronthaul test options enable users to verify various transport parameters with measurements on CPRI and eCPRI fronthaul links. The transport parameters consist of bit error rate, packet throughput and delay metrics. Beyond transport test, fronthaul links also allow users to detect Passive Intermodulation (PIM) or external interference issues present at the connected radios.

Value Proposition

Introduction of Centralized Radio Access Networks (CRAN) and 5G has driven a massive deployment of fronthaul networks in access networks. The prominent fronthaul network protocol is Common Public Radio Interface (CPRI) which is a simple light protocol for controlling Remote Radio Heads (RRH) from the Baseband Unit (BBU). While simple, it is inefficient for large amount of fronthaul traffic that are necessary with deployments of 5G enhanced Mobile Broadband (eMBB) applications. This problem led to the development of enhanced CPRI (eCPRI) which is a packet-based transport protocol. Since mainstream operator networks will need to support both 5G and 4G services, fronthaul transport networks need to support both protocols. Rather than supporting two protocols in fronthaul, operators are planning to deploy Fronthaul Gateways (FHGW) that convert CPRI protocols to Ethernet with Radio over Ethernet (RoE), and thus create a single packet-based transport network in fronthaul.

Benefits

- Validate the health of fronthaul transport networks with CPRI BERT/delay and eCPRI packet throughput and delay measurements
- Verify the proper operation of Radio over Ethernet (RoE) transport functions with CPRI control word and user plane (AxC) transparency test
- Detect the presence of any PIM or external interferers with RFoCPRI™

Intended audience

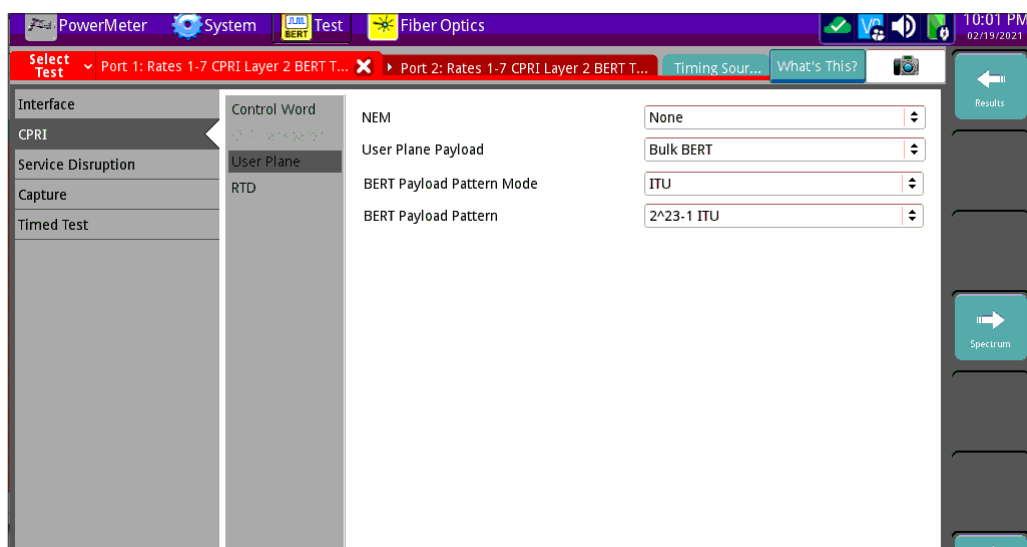
- Wireless technicians who install, turn up, or troubleshoot radio access networks
- Engineers who design, maintain, or troubleshoot synchronization equipment in the lab or field

Verifying the proper function of the fronthaul transport networks is essential for proper operation of radio networks. CPRI links can be simply checked by performing Bit Error Rate Test (BERT) in CPRI signals. eCPRI verification can be done by performing packet loss and throughput measurements. These BERT and packet measurements characterize the health of the transport network for fronthaul traffic. One additional parameter critical for the operation of radio units is the delay between the radio and the baseband unit. Delay measurements are therefore critical for proper network qualification. Testing FHGW necessitates adequate validation of the RoE mapping function. This can be accomplished by checking the transparency of CPRI control words and the embedded Antenna Carrier Channels (AxC).

Beyond transport network validation, fronthaul CPRI links provide a unique access point to detect the presence of any Passive Intermodulation (PIM) or external interferers on feeder lines attached to the radio units. VIAVI Solutions first introduced the RFoCPRI test applications that decode the In-Phase Quadrature (IQ) data of the uplink base band signal and display it as a spectrum or spectrogram.

CPRI BERT

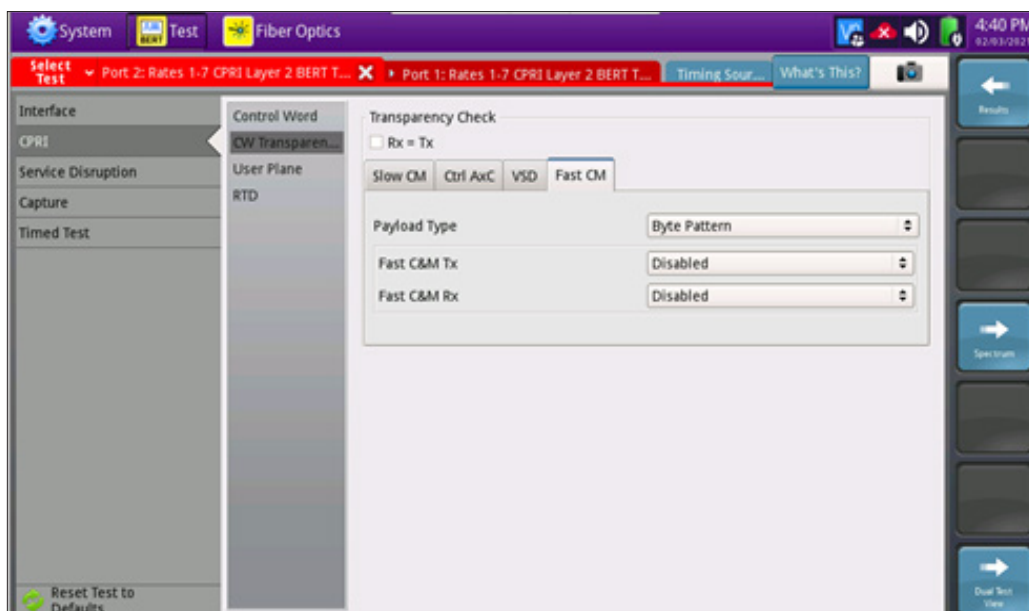
CPRI signal is a simple Time Domain Multiplexed (TDM) structure with dedicated bytes for control words and remaining bytes assigned to time domain IQ data. Checking proper operation of CPRI transport networks should be started by performing a BERT test that populates the IQ data bytes with common Pseudo Random Bit Sequence (PRBS) patterns and conducting a bit error rate measurement at the remote site.



CPRI Transparency (RoE) test

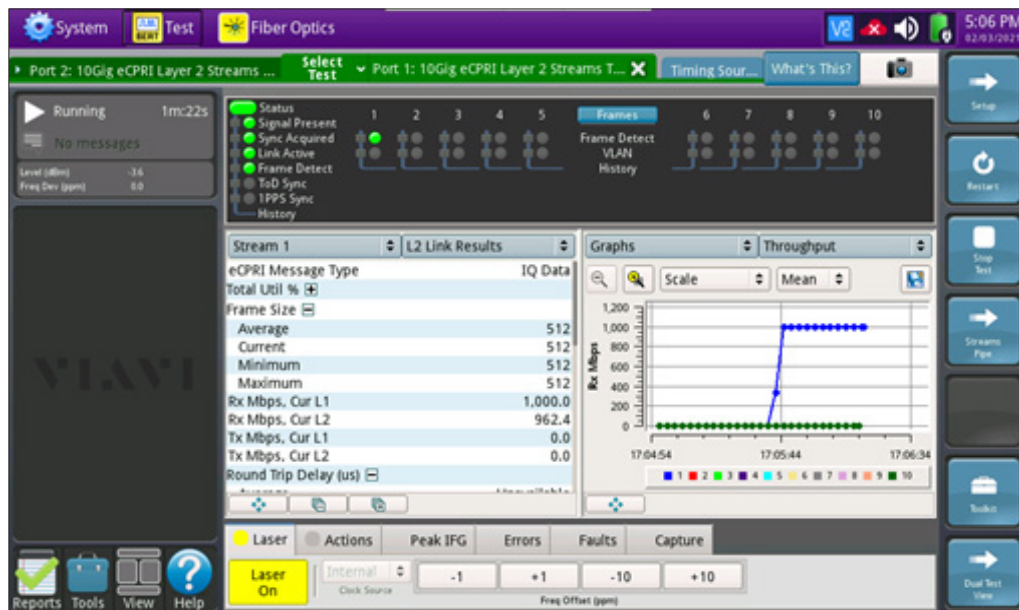
Radio over Ethernet (RoE) mappers convert CPRI signals to Ethernet frames at the client ports of a FHGW, and demap them back to CPRI at the remote FHGW. The simplest method to verify the function of a FHGW is a CPRI BERT as described above. A CPRI BERT is useful when a structure agnostic mode of RoE is used. In this mode, the RoE mapper maps the entire CPRI frame (including the 8/10b or 64/66bit encoding) into Ethernet frames. This is a simple, but not efficient RoE method.

In structure aware RoE mode, the mapper is aware of the structure of the CPRI signal; more specifically it is aware of equipped AxC(s) inside of the CPRI IQ block, and only maps those used parts of the IQ block. In this mode, the AxC channels and the control words are separated and transported in dedicated Ethernet frames. Testing the structure aware mode is best accomplished if one tests the control words and individual AxC separately. T-BERD/MTS-5800 CPRI PROOF and AXC PROOF test options perform these tests. Control words include Fast C&M, Slow C&M, Ctrl AxC, and VSD channels.



eCPRI Transport Test

eCPRI protocol is a packet-based network protocol. It resembles the Ethernet protocol, but it has a different Ethertype. eCPRI provides message types for different types of fronthaul data. They include IQ, Control Data, and One-Way Delay message types. Testing eCPRI transport networks should include a basic eCPRI packet throughput measurement as a minimum. eCPRI One Way delay measurement is a useful measurement that validates the maximum One-Way Frame latency between two test points. This measurement can be done by either using two book-ended testers or by performing a test against an eCPRI Radio that supports this message type.



RFoCPRI Test

CPRI links provide an invaluable test access point for verifying the presence of any internal PIM or external interferers at the radio. The RFoCPRI test application performs a baseband analysis of the CPRI signal. The IQ data in embedded AxCs is decoded and displayed as a spectrum diagram. The spectrum diagram indicates presence of PIM or external interferers. Spectrogram diagrams are also available, and useful for detecting intermittent problems.



Ordering Information

Description	Part Number
T-BERD/MTS-5811 and T-BERD/MTS-5822 T-BERD/MTS-5882 T-BERD/MTS-5800-100G MAP-2100	Various packages are available. Please contact your sales representative for a free initial consultation
CPRI Rates 1-7	C5CPRI1-7
CPRI Rates 8-9	C510GCPRI; C5122GCPRI
CPRI Rate 10	C5243GCPRI
eCPRI 10G	C5eCPRI
eCPRI 25G	C5eCPRI
CPRI PROOF	C5CPRIPROOF
AXC PROOF	C5AXCPROOF
RFOCPRI	C5RFOCPRI