

ONEADVISOR 800 WIRELESS RFoCPRI

Real-Time PIM Detection





Passive Intermodulation (PIM) is RF interference impacting wireless systems and is generated by nonlinear effects within RF hardware or infrastructure at metal junctions, corroded connectors, or dissimilar materials.

Traditional PIM isolation methods involve disconnecting a radio from its feedline and inserting a dedicated tone generator to perform PIM analysis through the operating frequency of the radio. However, these dedicated tone generators have several inconveniences due to their size and weight, frequency-dependence and the need to be placed next to the radios, which is costly and time-consuming for cell towers.

In contrast, VIAVI OneAdvisor 800 with RFoCPRI™, can perform PIM detection from the ground level, using a fiber tap between the Remote Radio Unit (RRU) and the Baseband Unit (BBU). The RFoCPRI technology decodes the RF signal between the RRU and the BBU analyzing Uplink Spectrum in real-time, automatically detecting PIM with a PASS/FAIL indicator based on the level and slope of the signal.

The connection of the fiber tap between the RRU and the BBU to the test set, and the automatic detection of cellular signals supported by the instrument only takes a few minutes, while the base station can also operate normally during the testing procedure, and with no service disruption.

Eliminate the need to hunt around for PIM using a traditional PIM Analyzer that is heavy and band specific. Simply monitor the uplink spectrum via RFoCPRI and if PIM has been detected, verify if it is internal or external to the site by analyzing the PIM presence in one or multiple antennas, and then locate external PIM sources with VIAVI RF Viewer, an augmented-reality visualization of RF emissions.

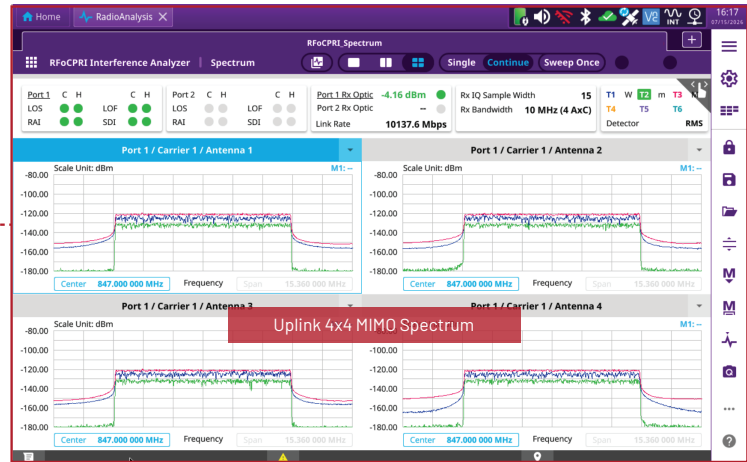
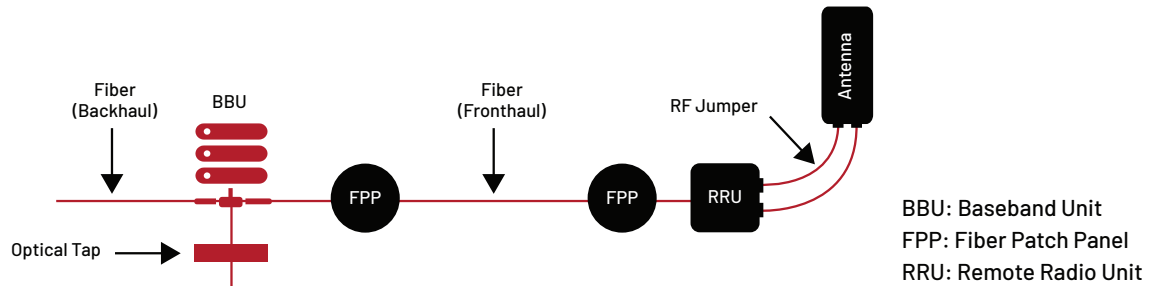
Benefits

- RFoCPRI real-time spectrum makes it simple to detect PIM on any CPRI-based radio and on any cellular band
- Non-intrusive tests avoid network disruptions, and possibly introducing a new VSWR or PIM issue
- Avoid operating costs and tower climbs by monitoring from the bottom of the tower or at the BBU Hotel in a C-RAN environment
- Easy report generation simplifies ticket close-out and reporting
- A true multiband PIM solution that can be extended for additional installation use cases with OTDRs and optical power meters

Key Features

- Auto CPRI configuration automatically discovers line rates and performs PIM analysis of multi-band cellular sites.
- Automatically compares uplink levels of radios with MIMO reception (2x or 4x)
- Supports multiple CPRI rates up to Line Rate 10
- Capable of interfacing with fiber microscopes with automated PASS/FAIL indicators of fiber connectors
- Supports optional modules for Cable and Antenna Sweep and RF Viewer and multiple capabilities for the identification and location of internal or external PIM sources

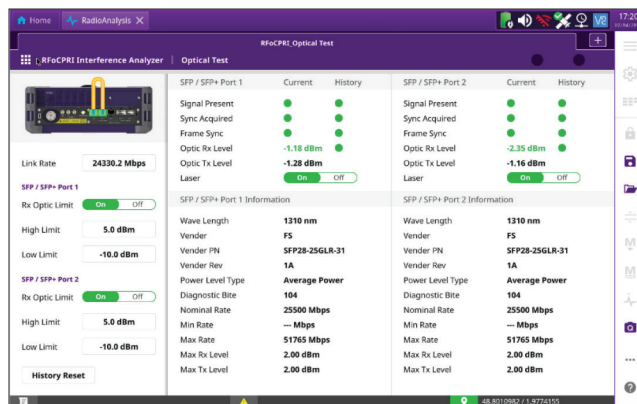




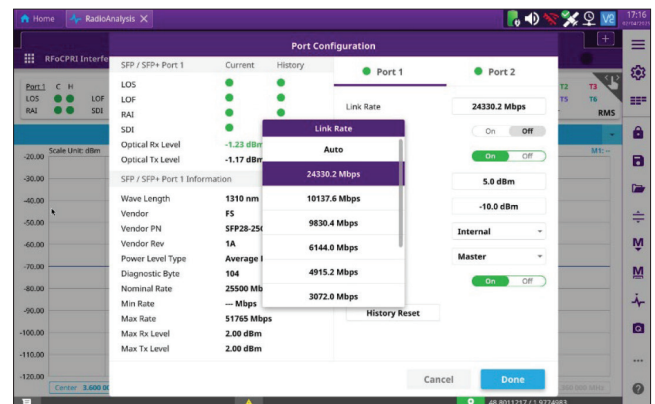
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Optical Module Verification and Full CPRI Line Rates Support

The VIAVI OneAdvisor 800 Wireless offers easy and fast validation of small formfactor pluggable (SFPs), ensuring that there is no signal loss and that the line rate supports the SFP of the base-band unit.



SFP Optical Module Verification



RfocPRI Line Rate and Port Configuration

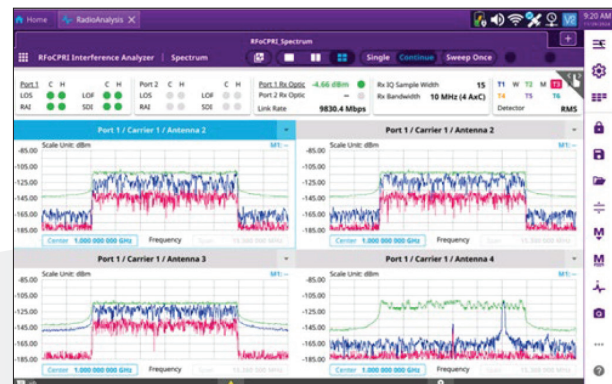
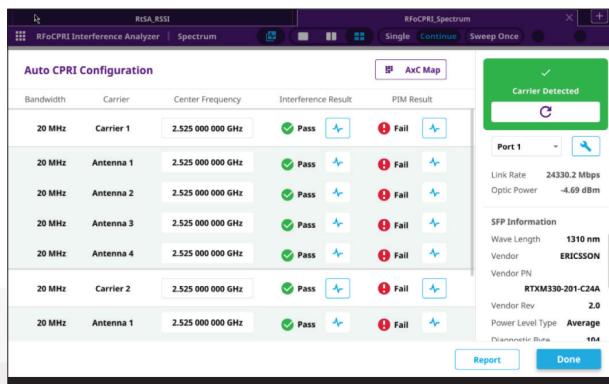
The CPRI Port Configuration supports all CPRI line rates (1 to 10) up to 25 Gbps and provides a quick and effective validation of the optical link and SFP information, as well as quality indicators like LOS (Loss of Signal) or LOF (Loss of Frame), and Layer 1 in-band alarms like RAI (Remote Alarm Indication) or SDI (Service Defect Indication).

CPRI Configuration

VIavi RfCPRI technology verifies the CPRI control signals and extracts the RF (IQ) data transmitted between the Remote Radio Unit (RRU) and the Baseband Unit (BBU), permitting the monitoring and analysis of interference in the uplink (mobile Tx) for each of the radio's receiving antennas (using MIMO).

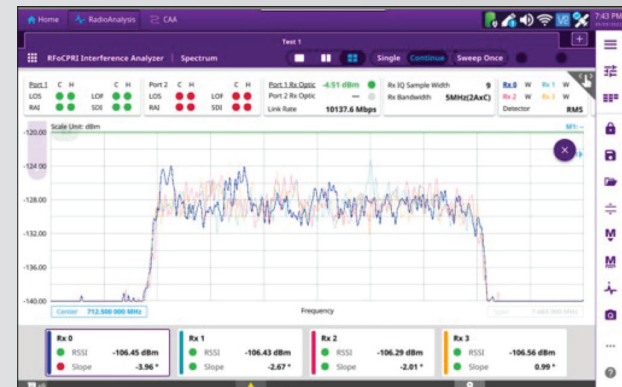
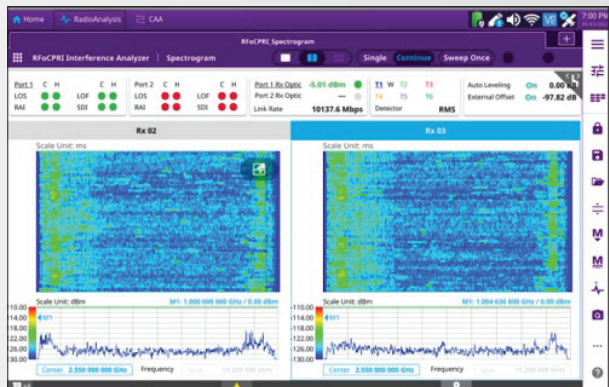
The CPRI protocol enables communication between the BBU and the RRU, by transmitting baseband data over CPRI containers that can have different configurations of sampling, stuffing, mapping and grouping, allowing different configurations on different radios.

VIavi Auto CPRI Configuration applies machine learning to automatically identify the line rate, mapping configuration, and distribution of the RF data in the CPRI structure, performing uplink spectrum analysis for all antenna paths (when using MIMO 2x2, 4x4, etc.).



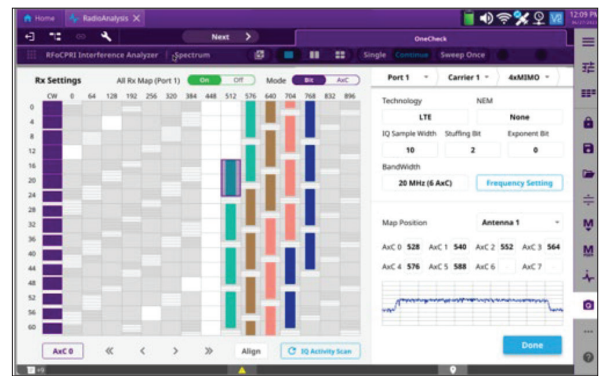
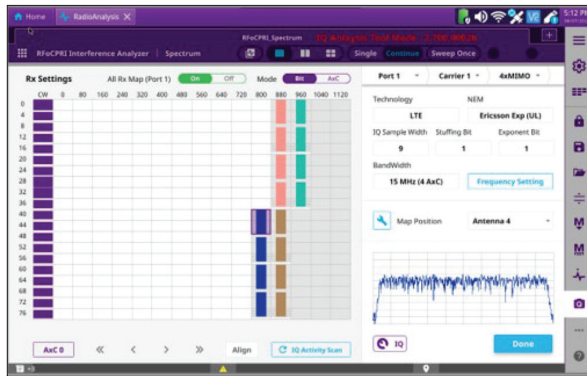
Auto CPRI Configuration automatically detects line rates and RF data configuration in CPRI

The Auto CPRI Configuration function identifies the number of carriers associated with their respective bandwidths and detects the presence of external interference or PIM. These carriers can be further analyzed using spectrum analysis, including spectrogram and overlay spectrum for MIMO configurations.



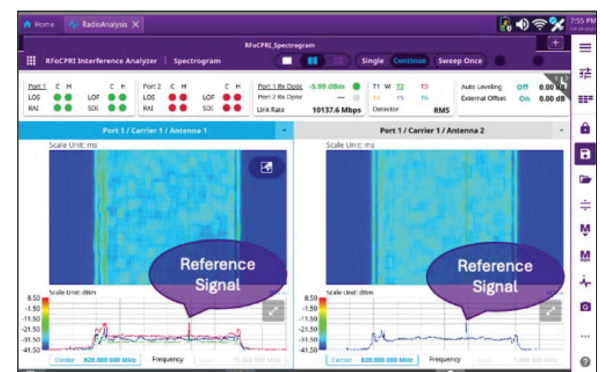
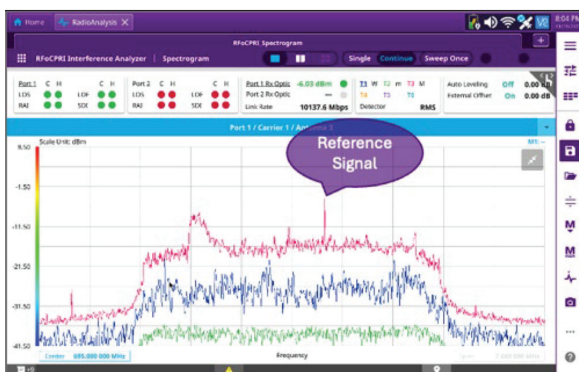
RfCPRI Spectrogram and Overlay Spectrum

In those situations where radios may be configured with an uncommon CPRI configuration, the instrument Rx Settings will provide visibility over the RF data activity and distribution in the CPRI link, allowing the analysis of any carrier regardless of the frequency band, channel bandwidth, or radio manufacturer or type.



RFoCPRI Rx Settings RF Data Activity

In cases where radios are transmitting multiple carriers over the same CPRI link, and those carriers have the same bandwidth, it may be challenging to differentiate their band of operation or center frequency, since the CPRI RF data is in baseband, and the carrier configuration information therefore not available. For those cases, the VIAVI OneAdvisor 800 can also be equipped with a Cable and Antenna Analysis (CAA) compact module. This option supports a configurable RF Source that can generate a Reference Signal, which is then received by the radio in the uplink and immediately visible in RFoCPRI Spectrum Analysis, like showing in the following examples:



RFoCPRI Spectrum and Reference Signals

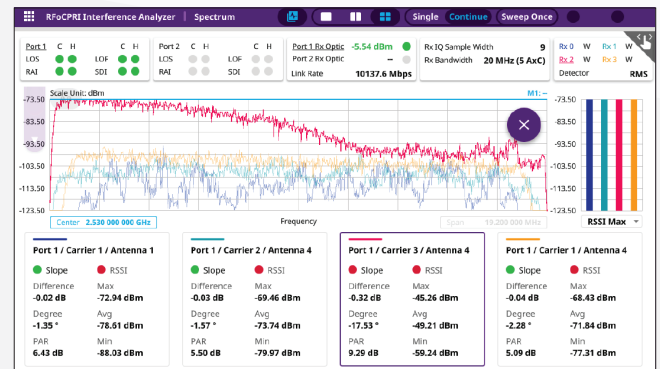
RFoCPRI Technology for PIM Detection

VIAVI RFoCPRI technology in the OneAdvisor 800 verifies CPRI control signals and extracts the RF data transmitted between the RRU and BBU, allowing for monitoring the uplink spectrum, and performing interference analysis of external or internal sources of Passive Intermodulation (PIM).

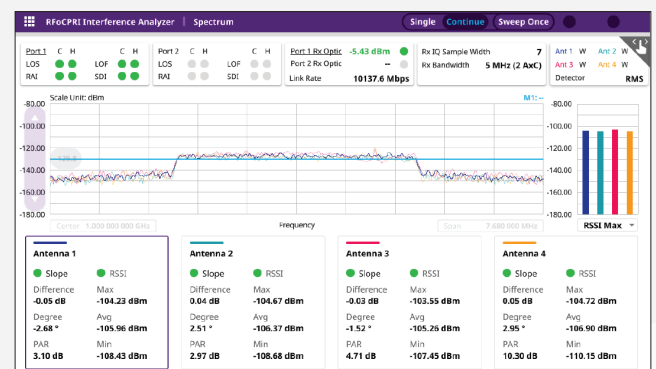
- OneAdvisor 800 supports simultaneous RF Source and RFoCPRI Analysis to accurately identify in real-time the uplink frequency of CPRI multi-carrier containers
- RFoCPRI PIM detection compares in real-time, RF uplink signals of a MIMO system, providing additional characterization of the PIM source by antenna port
- Auto CPRI Configuration automatically identifies the number and type of channel carriers in a CPRI link
- Use RF Viewer for easy location of external PIM sources in rooftops and other environments

Key Benefits

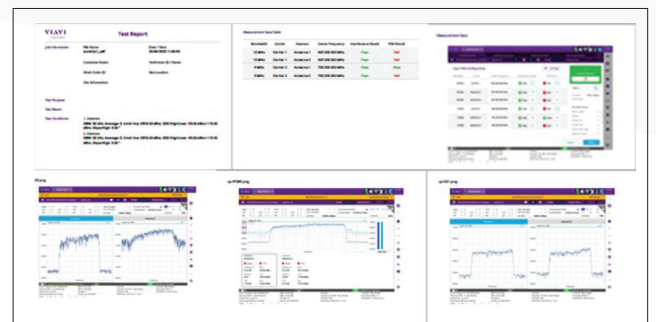
- Simplifies PIM detection for any CPRI-based radio of any frequency band or radio manufacturer
- Non-intrusive – does not require opening a coaxial connection and possibly introducing a new VSWR or PIM issue
- Reduces tower climbs – monitors from the bottom of a tower or at a BBU Hotel in C-RAN
- Supports CPRI rates 1 to 10 up to 25 Gbps
- Overlay spectrum traces for 2x2 and 4x4 MIMO
- Automatic PASS/FAIL detection of PIM presence
- Easy closeout report generation from instrument



VIAVI OneAdvisor 800 Wireless
detecting the presence of PIM



VIAVI OneAdvisor 800 Wireless
showing no PIM present



VIAVI OneAdvisor PIM Detection
automatic generated report



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