SPEC SHEET

5GPro Spectrum Analyzer

RF SPECTRUM ANALYZER

- Simple to use, accurate, built specifically for field techs. EXFO's portable RF spectrum analyzer provides visibility into 4G LTE and 5G RF environments with the industry's only modular RF testing solution.

KEY FEATURES

- FR1 (450 MHz – 6 GHz)
- FR2 (24.25 GHz – 40 GHz)
- Real-time spectrum and signal analysis bandwidth up to 100 MHz
- 5G NR signal and beam analysis
- LTE signal analysis
- RF channel power measurements
- Multi-PCI analysis (up to 12 PCI)
- Coverage mapping for channel power
- Audible tone for RF interference hunting
- 5G secondary synchronization block (SSB) blind scanner (frequency, GSCN, ARFCN, 3GPP bands)
- Gated sweep and patent-pending TDD sync
- OTDR, RF over CPRI, CPRI/eCPRI, timing and synchronization, Ethernet up to 100G

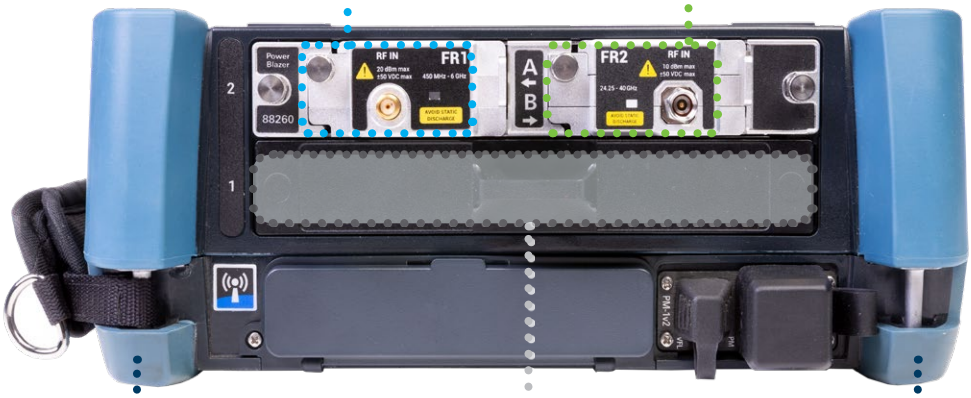
RF MODULES AND PLATFORM

The 5GPro Spectrum Analyzer provides visibility into 4G LTE and 5G RF environments through an easy-to-use, compact and portable solution. Ready to adapt as your network transforms, this flexible, modular and field-upgradeable solution lets field technicians analyze FR1 (450 MHz – 6 GHz) or FR2 (24.25 GHz – 40 GHz) bands with the same device.

FTBx-88260 MODULE INCLUDING FR1 AND FR2

FR1	
Frequency range	450 MHz to 6 GHz
Connector	SMA (female)
Max safe level input	30 dBm

FR2	
Frequency range	24.25 GHz to 40 GHz
Connector	2.92 mm (K-male)
Max safe level input	20 dBm



Supported on the FTB-1 Pro dual-carrier and FTB-1 Pro high-power, dual-carrier configurations

Additional empty slot for other EXFO testing modules and capabilities, as needed

Windows-based architecture supporting cloud connectivity and third-party software tools

APPLICATIONS

Real-time spectrum analysis

The 5GPro Spectrum Analyzer is a real-time spectrum analyzer (RTSA) that provides continuous acquisition of RF signals with 100 MHz of analysis bandwidth. Quick characterization of wireless signals and detection of intermittent interference is now possible through the combination of RTSA persistence and spectrogram views.

Snap-to-Peak, the new patent-pending feature is an innovation in RF testing. By using the touchscreen, field technicians can identify interferers through a movable window which allows them to search for the highest amplitude interferer and attach a marker.

The audible-tone feature allows for customizable thresholds to help pinpoint interferers and external PIM. This feature can be used to operate the instrument hands-free when the user is busy holding a directional antenna.

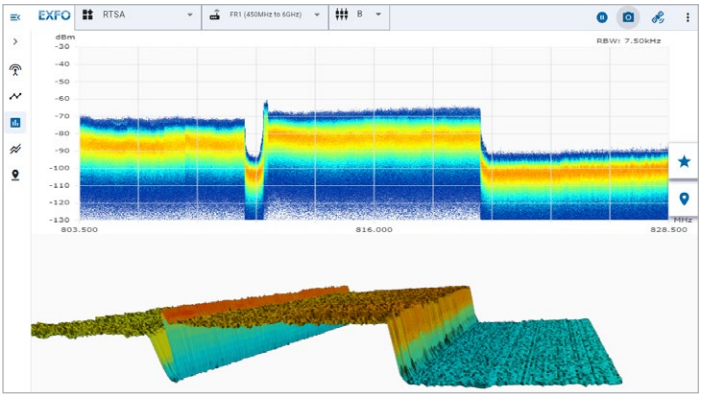


Figure 1. Real-time persistence spectrum with 3D view.

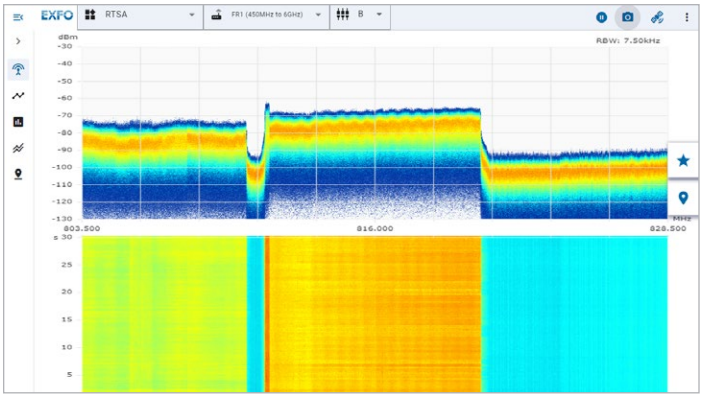


Figure 2. Real-time persistence spectrum with waterfall diagram.

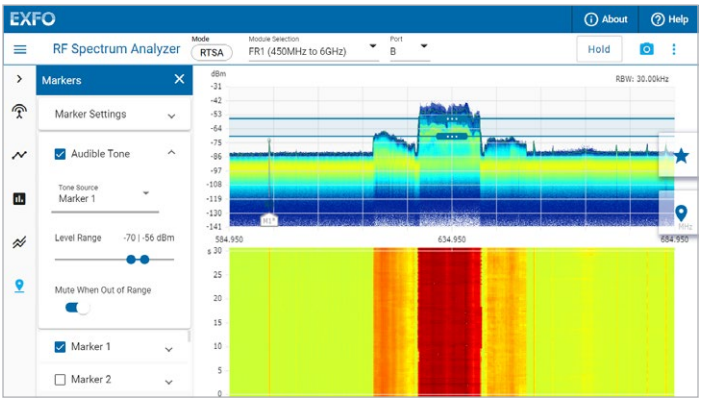


Figure 3. Audible tone with customizable thresholds.

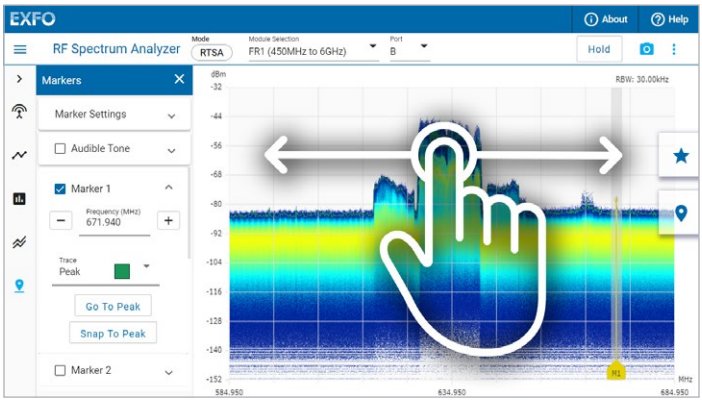


Figure 4. Patent-pending Snap-to-Peak feature.

5G SSB blind scanner

The 5GPro Spectrum Analyzer provides an automated 5G blind scanner within the 5GNR signal analyzer application. This scanner allows the user to scan for 5G frequencies, GSCN values and PCIs without any manual configuration. Scanning can be done for bands, current span or a specific customizable frequency range.

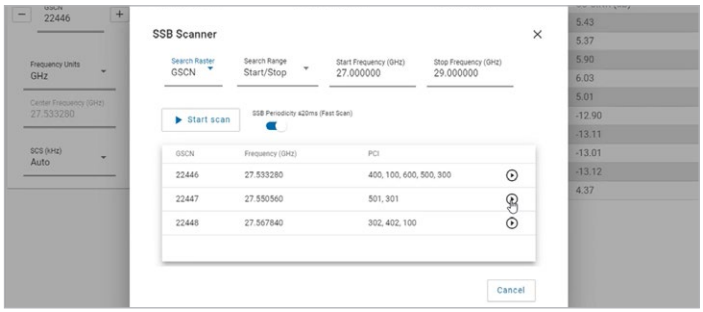


Figure 5. 5G SSB blind scanner.

5GNR signal analyzer

A 5GNR signal analyzer supports the demodulation of 5GNR signals validating over-the-air (OTA) performance of cell sites and ensures smooth communication with user equipment. Analyzing up to 64 beams and displaying the 12 strongest beams with the corresponding power measurements, the 5GNR signal analyzer provides several beamforming metrics.

- Physical Cell ID (PCI), Beam ID and SSB periodicity.
- Auto-detection of subcarrier spacing (SCS).
- Secondary synchronization – reference signal received power (SS-RSRP): linear average received power of each secondary synchronization signal (SSS) resource element.
- Secondary synchronization – reference signal received quality (SS-RSRQ): ratio of SSS power over the total power of a given number of resource blocks.
- Secondary synchronization – signal to interference and noise ratio (SS-SINR): ratio of SSS over all noise sources, including interferers.
- Multi-PCI – filter by strongest and specific PCIs (up to 12 PCIs)

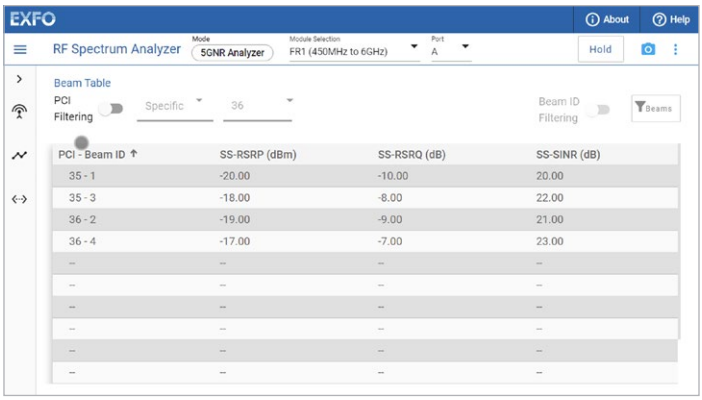


Figure 6. 5GNR beam analysis.

Spectrum analysis (TDD gated sweep)

Time division duplexing (TDD) is a transmission technique whereby uplink and downlink signals are transmitted on the same frequency using synchronized timed intervals. Both spectrum analysis and interference analysis for TDD require the use of a measurement technique called gated sweep. This technique facilitates the visualization of uplink or downlink spectrum by displaying that data within a specified range of timeslots.

This technique allows the visualization of the symbol and slots in a frame, within a power vs. time graph, and the selection of uplink or downlink timeframes to further facilitate the visualization of uplink or downlink spectrum. EXFO's patent-pending TDD Sync, synchronizes with the 5G or LTE frame and prevents from the use of external GNSS references to avoid synchronization errors between the gating and the frame.

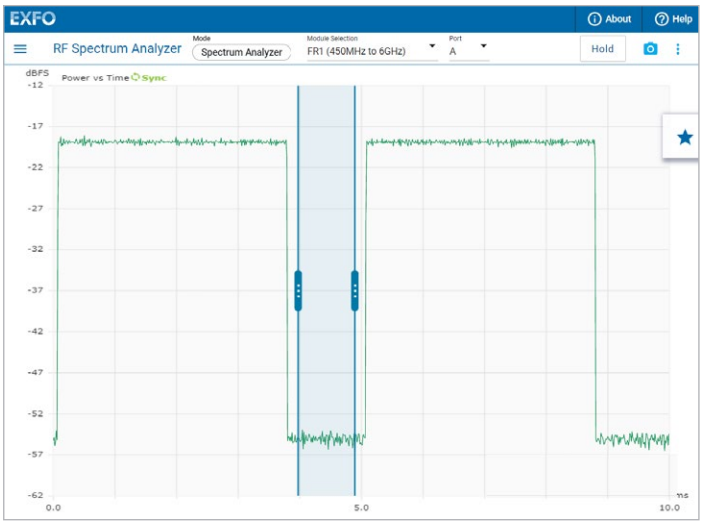


Figure 7. TDD gated sweep.

LTE analysis

LTE analyzer supports the demodulation of 4G/LTE signals validating OTA performance of cell sites and providing key metrics including:

- Sector and group ID
- Physical cell ID (PCI)
- Duplexing mode (FDD or TDD)
- RSRP (dBm)
- RSRQ (dB)
- RSSI (dBm)
- Multi-PCI – filter by strongest and specific PCIs

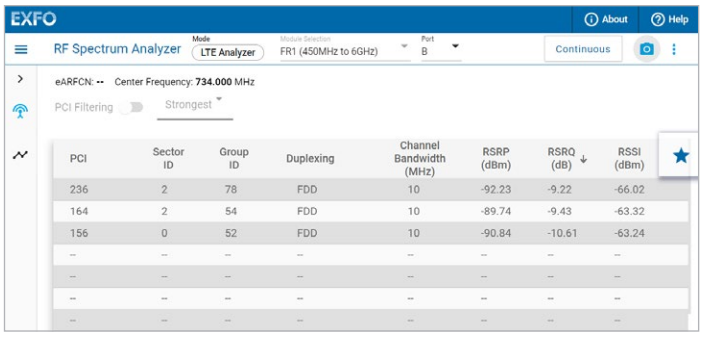


Figure 8. LTE analysis.

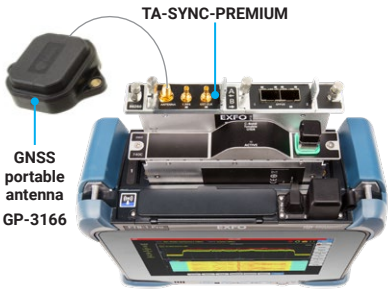
OTA RF measurements

Absolute time error (TE)

Absolute time error (TE) measurements can be made with the 5GPro Spectrum Analyzer by demodulating the radio signal and locating the position of the primary sync sequence (PSS) within the SSB. The absolute time position of the PSS is determined using EXFO's existing SYNC module that can be inserted into EXFO's FTBx-88260 module. By doing so, it is possible to determine the absolute TE of the base station.

The GNSS receiver used for OTA TE measurements supports 5 GNSS constellations providing worldwide coverage:

- GPS (USA)
- Galileo (Europe)
- GLONASS (Russia)
- BeiDou (China)
- QZSS (Japan)



TA-SYNC-PREMIUM

Integrate new best-in-class, very high accuracy GNSS receiver

±5 ns accuracy in under 20 minutes

90% quicker than any other tester in the industry

Stratum 3E oven-controlled oscillator (OCXO) for holdover

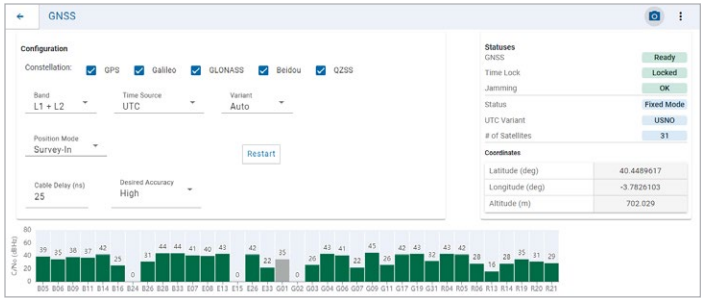


Figure 9. GNSS supported satellites.

OTA TE measurements can be performed on FR1 or FR2 bands using the TA-FR1 and TA-FR2 modules, respectively. The measurement results are presented in a tabular format, with data displayed for each PCI/Beam ID along with SS-RSRP, SS-RSRQ, and SS-SINR values.

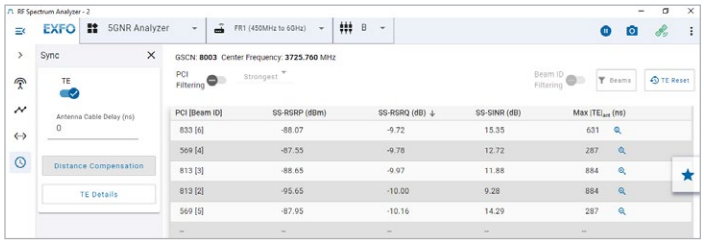


Figure 10. OTA TE measurements.

Additionally, statistical information is provided for minimum, maximum, and absolute TE values, all in nanoseconds (ns) and in a graphical format, showing its evolution over time.

Figure 11. OTA TE chart.

Channel power

The Spectrum Analyzer efficiently gives a clear view on the spectrum and measures the channel power on a specified integration bandwidth range.

To perform channel power measurements, the root mean square (RMS trace detector) is used to average the power level for accurate readings. The Spectrum Analyzer simplifies channel power measurements for technicians on cell sites.

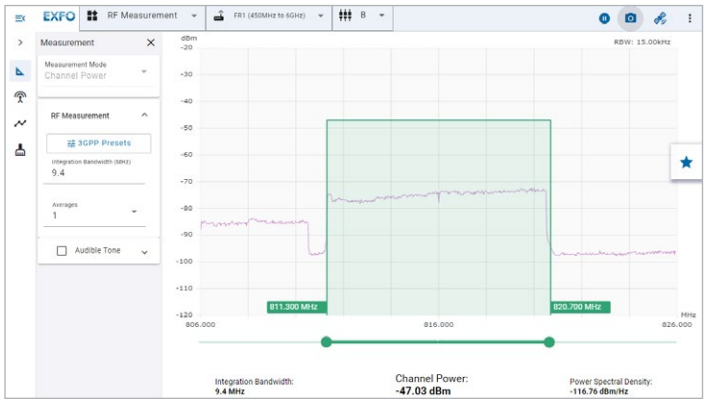


Figure 12. Channel power measurements.

Coverage mapping for channel power

Coverage mapping of channel power on RF spectrum analyzer offers an efficient and easy way to continuously measure and visualize channel power and power spectral density (PSD) on a map.

By understanding the interference situation in the field using the coverage mapping for channel power feature, network operators can easily pinpoint problem areas on a map reducing the need for extensive field testing and empowering proactive network maintenance and troubleshooting.

Then, they can use directional antennas to pinpoint and hunt the exact direction or location of the interference.

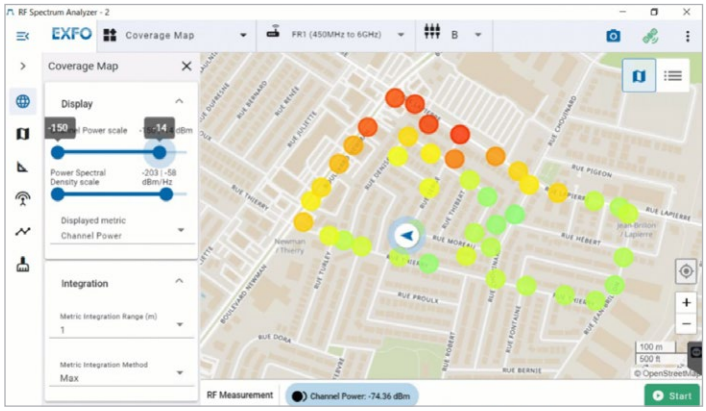


Figure 13. Coverage mapping for channel power.

SPECIFICATIONS

RF AND GENERAL			
		TA-FR1	**TA-FR2**
Frequency range		450 MHz to 6 GHz	24.25 GHz to 40 GHz
Analysis bandwidth (MHz)		100	100
RF max safe level input		30 dBm peak typical, ±50 VDC (≥ 10 dB attenuation)	20 dBm peak typical, ±50 VDC (≥ 10 dB attenuation)
Preamplifier		Yes	Yes
Attenuator (auto/manual)		0 to 30 dB, 10 dB steps	0 to 30 dB, 10 dB steps
Connector		RF IN SMA female connector	RF IN 2.92 mm (K) male connector
Platform		Interfaces: RJ45 LAN 10/100/1000 Mbit/s WiFi connectivity USB 2.0 ports (2) USB 3.0 port (1) MicroSD card slot 3.5 mm headset/microphone port	
Battery autonomy	Dual carrier (FTB-1v2 Pro) High-power dual carrier (FTB-1v2 Pro)	> 2h > 4h	
Certification		MIL-PRF-28800F – Class 2 (shock, vibration and drop)	
Mainframe and storage		Quad-core processor / 4 GB RAM / Windows 10 with 128 GB internal flash memory MicroSD slot for external storage	
Screen		Touchscreen, color, 1280 × 800 TFT 203 mm (8 in)	
Temperature	Operating Storage	0 °C to 50 °C (32 °F to 122 °F) −40 °C to 70 °C (−40 °F to 158 °F)	
Size (H × W × D)	Double-depth module back / Dual carrier High-power dual carrier	210 mm × 254 mm × 96 mm (8 ¼ in × 10 in × 3 ⅞ in) 210 mm × 254 mm × 122 mm (8 ¼ in × 10 in × 4 ¾ in)	
Weight	Dual carrier High-power dual carrier	2.9 kg (6.4 lb) 3.7 kg (8.2 lb)	

SPECTRUM ANALYZER

	TA-FR1	TA-FR2
Traces	Max, Sample, Max Hold, Min Hold Displays all traces at the same time	
Frequency	450 MHz to 6 GHz	24.25 GHz to 40 GHz
Frequency reference (accuracy)	±0.35 ppm (including aging for 2.5 years)	
Markers	Display 12 markers Apply on Max, Sample, Max Hold, Min Hold traces Go to Peak, Snap to Peak (patent-pending)	
Audible tone	Audible tone linked to each marker for interference hunting (configurable level-limit lines)	
Persistence spectrogram	Apply on Max, Sample, Max Hold, Min Hold traces 30 seconds, amplitude scale user selectable, 2D and 3D	
RBW/VBW	58 Hz to 120 kHz / 1:1, 3:1, 10:1, 30:1, 100:1	
Gated sweep	Zero span and gate configuration to visualize TDD signals Patent-pending synchronization with 5GNR and LTE frames SSB scanner to scan, detect and sync onto 5G signals	
Spectral purity	Offset / SSB phase noise at 1 GHz 10 KHz / −98 dBc/Hz 100 KHz / −105 dBc/Hz 1 MHz / −125 dBc/Hz 10 MHz / −137 dBc/Hz	Offset / SSB phase noise at 25 GHz 10 KHz / −85 dBc/Hz 100 KHz / −93 dBc/Hz 1 MHz / −104 dBc/Hz 10 MHz / −127 dBc/Hz
Spurs (typical values)	Residuals < −100 dBm (50 ohms termination, 0 dB attenuation, preamp off) [a]	Contact factory for more details
Third-order intercept (TOI) (typical values)	450 MHz to 3 GHz: 10.1 dBm 3 GHz to 6 GHz: 7.2 dBm	24.5 GHz to 30 GHz: 13.82 dBm 30.5 GHz to 39.5 GHz: 14.44 dBm
Amplitude ranges (1 GHz)	DR: 2/3* (TOI-DANL at 1 Hz RBW): > 104 dB Measurement range: DANL to 30 dBm	DR: 2/3* (TOI-DANL at 1 Hz RBW): > 105 dB Measurement range: DANL to 20 dBm
Displayed average noise level (DANL typical values)	Preamp ON / Preamp OFF 1 GHz / −167 dBm/Hz / −151 dBm/Hz 2-3 GHz / −167 dBm/Hz / −149 dBm/Hz 4-6 GHz / −166 dBm/Hz / −151 dBm/Hz	Preamp ON / Preamp OFF 24.5-36.5 GHz / −160 dBm / −142 dBm 37-40 GHz / −161 dBm / −143 dBm
Input VSWR	1.3:1 (nominal)	2.3:1 (nominal)
Channel power (typical amplitude uncertainty) (dBm)	2	2

REAL-TIME SPECTRUM ANALYZER (RTSA)

RTSA bandwidth (MHz)	6.25, 12.5, 25, 50, 100
Traces	Persistent real-time spectrum with variable decay (0-10 seconds) and infinite decay Max, Sample, Average, Max Hold, Min Hold Displays all traces at the same time
Markers	Display 12 markers Apply on Max, Sample, Average, Max Hold, Min Hold traces Go to Peak, Snap to Peak
Audible tone	Audible tone linked to each marker for interference hunting (configurable level limit lines)
Persistence spectrogram	Apply on Max, Sample, Average, Max Hold, Min Hold traces 30 seconds, amplitude scale user selectable, 2D and 3D
POI (probability of intercept)	50 µs (100 MHz bandwidth)
FFT rate (FFT/s)	60 000

a. Three exceptions:
Spur at 2Fc-4315.53 for central frequency (FC) in (4265.53-4365.53) with a level of −94 dBm
Spur at 2Fc-1975.53 for FC in (1925.53-2025.53) with a level of −100 dBm
Spur at 2Fc-2458.48 for FC in (2458.48-2491.53) with a level of −100 dBm

5G SIGNAL ANALYZER	
Frequency range	450 MHz to 6 GHz (FR1) and 24.25 GHz to 40 GHz (FR2)
Analysis bandwidth (MHz)	Up to 100
Band configuration	Manual or selectable band number, absolute radio frequency channel number (ARFCN), auto subcarrier spacing (SCS)
Multi-beam view	Physical-layer cell ID, beam index, SCS, SSB periodicity (auto-detected), SS-RSRP (dBm), SS-RSRQ (dB), SS-SINR (dB)
SSB blind scanner	Scan and detect 5G NR signals by searching through GSCN and ARFCN. Predefined search in SPAN, frequency range and 3GPP band.
Amplitude	Auto range, reference level offset, attenuation level (auto/manual), preamp
Multi-PCI	Filter by strongest and specific PCI (display up to 12 PCI)

LTE SIGNAL ANALYZER	
Frequency range	450 MHz to 6 GHz (FR1)
Analysis bandwidth (MHz)	Auto, 1.4, 3, 5, 10, 15, 20
Band configuration	Manual or selectable band number, absolute radio frequency channel number (ARFCN)
Cell view	Physical cell ID (PCI), SectorID, GroupID, duplexing, RSRP (dBm), RSRQ (dB), RSSI (dBm)
Amplitude	Auto range, reference level offset, attenuation level (auto/manual), preamp
Multi-PCI	Filter by strongest and specific PCI (display up to 8 PCI)

DISCOVER THE FTB 5GPRO: NOW WITH RF SPECTRUM ANALYSIS

The fully featured FTB 5GPro now also includes RF spectrum analysis, making it the ultimate all-in-one solution for validating coexisting 4G and 5G networks.

Leveraging the powerful and intelligent FTB-1 Pro handheld test platform, the FTB 5GPro is a complete and future-proof solution that removes any guesswork from test set-up, execution and analysis.

The FTB 5GPro is designed to boost the efficiency of field tests in view of delivering high-quality 5G and 4G/LTE networks, on time. It achieves this by:

- Following standardized, field-proven test procedures.
- Enabling technicians of any skill level to instantly interpret results and accelerate outcomes.
- Addressing any potential issues when installing, activating and maintaining mobile networks.

RF SPECTRUM ANALYSIS ON THE FTB 5GPRO

With the addition of real-time RF spectrum analysis with OTA measurements, EXFO's modular FTB 5GPro becomes the industry's only complete, fully integrated solution for 5G RAN validation: Ethernet testing up to 100G, timing and synchronization, eCPRI and CPRI protocol testing, intelligent RF spectrum analysis over CPRI (iORF) and optical transceiver validation (iOptics).

Portable tool

With the FTB 5GPro, field technicians no longer need to carry 3 or 4 heavy test sets.

FLEXIBLE DESIGN READY FOR NOW AND FOR WHAT COMES NEXT

FTB 5GPro test solution
Complete, all-in-one 4G and 5G test solution

5GPro Spectrum Analyzer
Analyze FR1(low and mid-band) or FR2 (mmWave) bands

OTDR/iOLM module
Automated fiber characterization and expert-level fault-finding capabilities

FTBx-88260 1G-100G network test module
Validate Ethernet up to 100G, CPRI, OBSAI and eCPRI transport links. Also check wander, SyncE, 1588-PTP

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