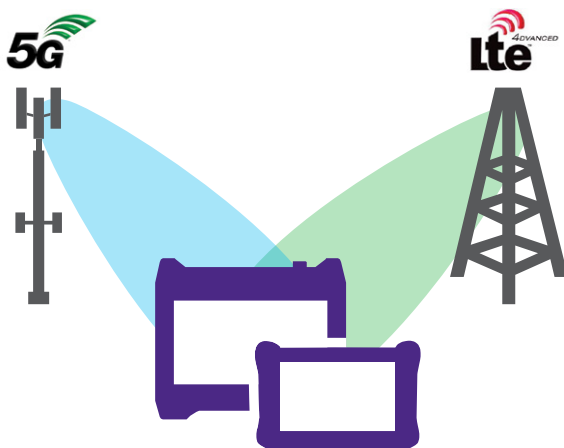


# VIAVI Radio Access Network Coverage

VIAVI field test solutions for radio access networks (RAN), CellAdvisor 5G and OneAdvisor-800, have been designed for the installation, maintenance and optimization of cell sites, including spectrum and interference analysis, validation of 4G-LTE and 5G-NR technologies, as well as concurrent analysis of signals transmitted over Dynamic Spectrum Sharing (DSS) and in Non-Standalone (NSA).



CellAdvisor 5G | OneAdvisor

VIAVI RAN analyzers are all-in-one solutions for cell technicians and RF engineers to effectively verify RF conditions, including signal analysis route mapping.

There are two main applications of signal analysis route mapping:

- Outdoor coverage, performing signal analysis route mapping through drive testing.
- Indoor coverage, performing signal analysis route mapping through walk testing.

## Key Benefits

- 5G signal analysis including carrier aggregation, beamform analysis and signal quality assessment.
- LTE signal analysis including MIMO verification and signal quality.
- DSS analysis performing concurrent analysis of LTE and 5G carriers to quickly identify signal availability and performance issues.
- Interference analysis, detecting interference impairments which may affect coverage and service quality.
- Remote control and cloud services allowing remote assistance.
- Real-time spectrum analysis for better representation of LTE and 5G TDD carriers.



CellAdvisor 5G | OneAdvisor-800

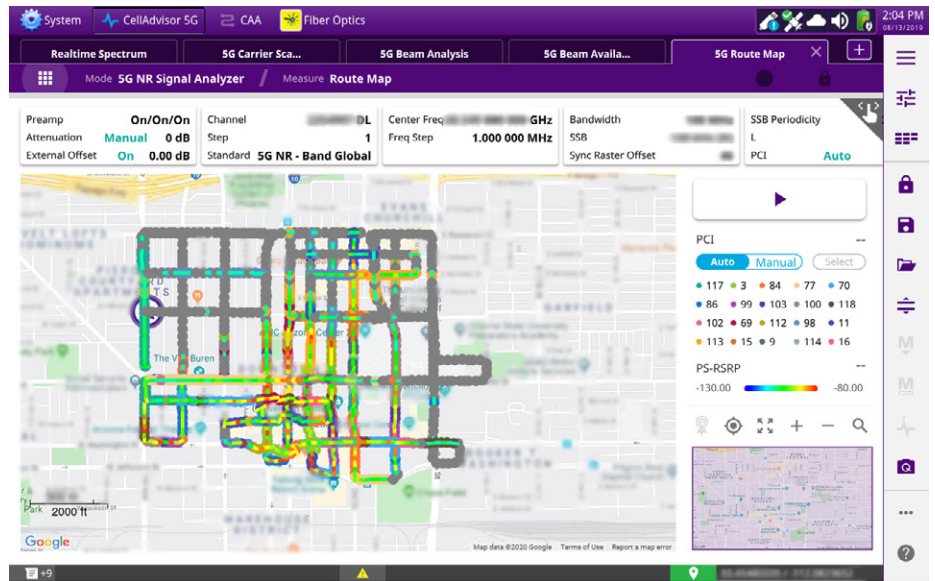
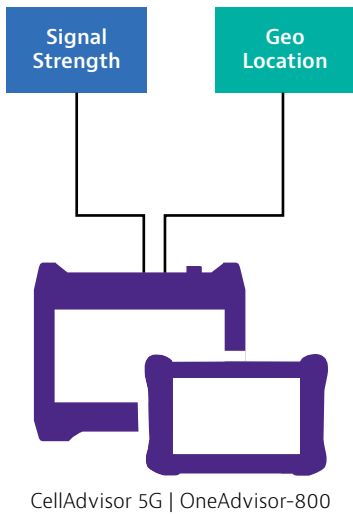
All-in-one 5G-NR and 4G-LTE test solutions offering the best total cost of ownership

## Radio Access Outdoor Coverage

Outdoor coverage can be affected by shadowing in the case of mm-wave signals that experience high penetration loss through materials such as concrete, steel or reflective glass; as well as the effects from interfering signals that collide with the radio's transmission or reception bands, which in cases despite of acceptable signal levels the throughput is limited or might even cause call drops.

VIAVI RAN analyzers are equipped with route map test functions that performs coverage testing in real-time, by plotting signal strength, with different color scheme based on the received power level, in a geographical map obtaining location from GPS. The resulting route map shows coverage levels and dead-zones or areas with no coverage which might cause service impairments such as call drops.

Coverage test data can be saved as a mapping test result allowing post-analyze with the RAN analyzer displaying signal analysis parameters for each data point including originating physical cell identification or PCI, as well as beamforming profile including beam index and beam power level. In addition, coverage test data can also be saved as comma separated files for post-processing analysis.



RAN analyzer – 5G Signal Analysis Route Mapping

## Radio Access Indoor Coverage

Indoor coverage can be affected by many factors, including reflections and attenuation caused by building materials including concrete walls, steel, and reflective windows, as well as for potential interfering signals that collide with signals of small cells or customer premise equipment.

Therefore, it is essential in the deployment of indoor networks to verify the spectrum is clear, verifying no other signals are present, avoiding service quality impairments; and subsequently the network is not causing interference to other networks.

VIAVI RAN analyzers can perform indoor coverage mapping in two different modes to obtain location and overcoming the lack of GPS information availability for indoor networks:

- Manual geo-location, assisted by user intervention selecting the physical location.
- Automatic geo-location, assisted by NEON Tracker and NEON Signal Mapper.

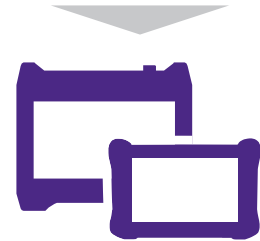
## Indoor Coverage with Manual Geo-Location

Indoor coverage mapping with manual geo-location is achieved by a simple test process:

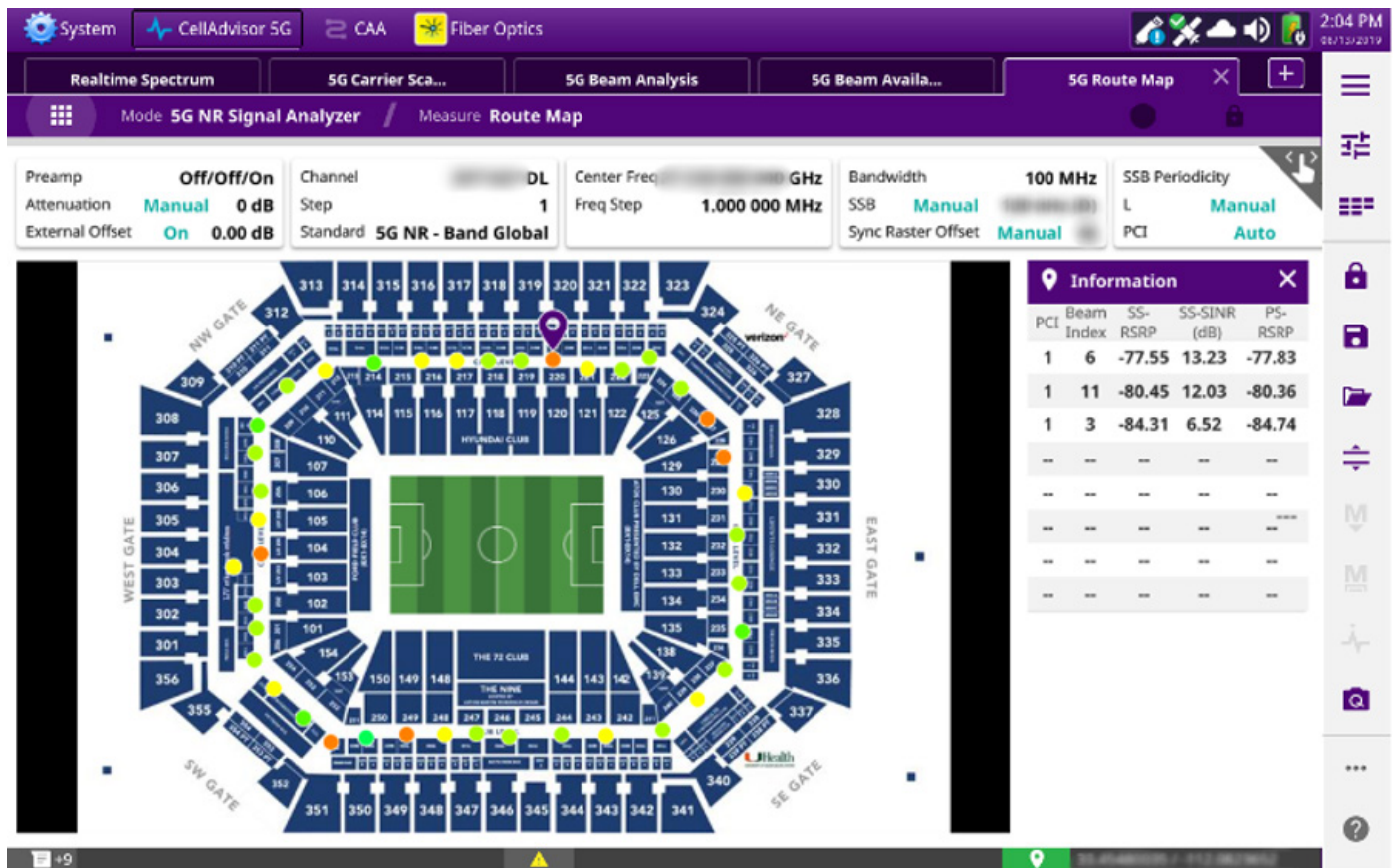
1. Indoor map creation, with VIAVI JMapCreator software that converts picture files of indoor layouts or floor plans into a file format readable by the RAN analyzer.
2. Perform signal analysis route mapping with the RAN analyzer and setting map configuration plot point by time or position.
3. Manually select the location on the map displayed in the RAN analyzer



JMapCreator



CellAdvisor 5G | OneAdvisor-800



RAN analyzer – Signal Analysis Route Map 5G-NR



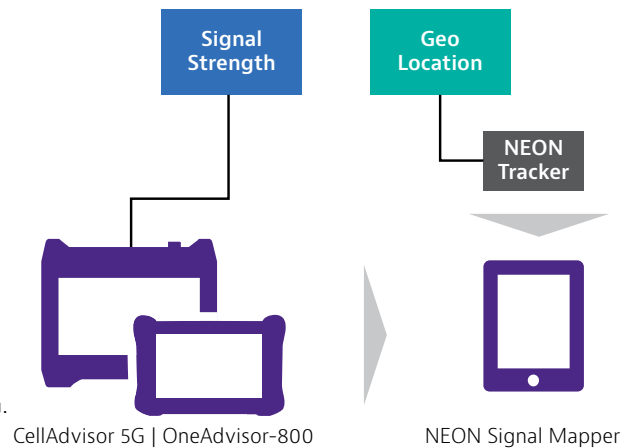
RAN analyzer – Signal Analysis Route Map 5G-NR Beam Profile

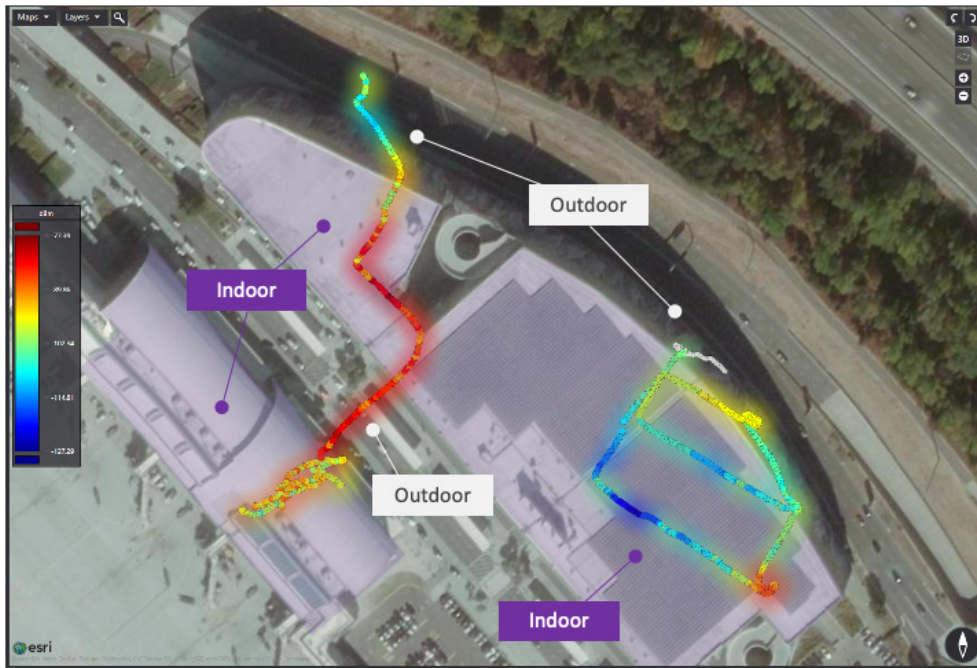
## Indoor Coverage with Automatic Geo-Location

Indoor coverage mapping with automatic geo-location is assisted by NEON tracker to obtain a geographical reference position, and NEON Signal Mapper that correlates this position with signal analysis measurements from VIAVI's RAN analyzer, resulting in an accurate indoor network coverage map.

The test process is as follows:

1. VIAVI RAN analyzer: setup the corresponding RF antenna and configure the signal analysis test function to test the signal of interest and establish Wi-Fi connectivity with the device running NEON signal mapper.
2. Personnel tracker, initialize the tracker and establish Bluetooth connectivity with the device running NEON Signal Mapper
3. NEON Signal Mapper, launch the application and configure connectivity with the tracker and RAN analyzer; then select the type of signal coverage test to be performed, LTE or 5G.





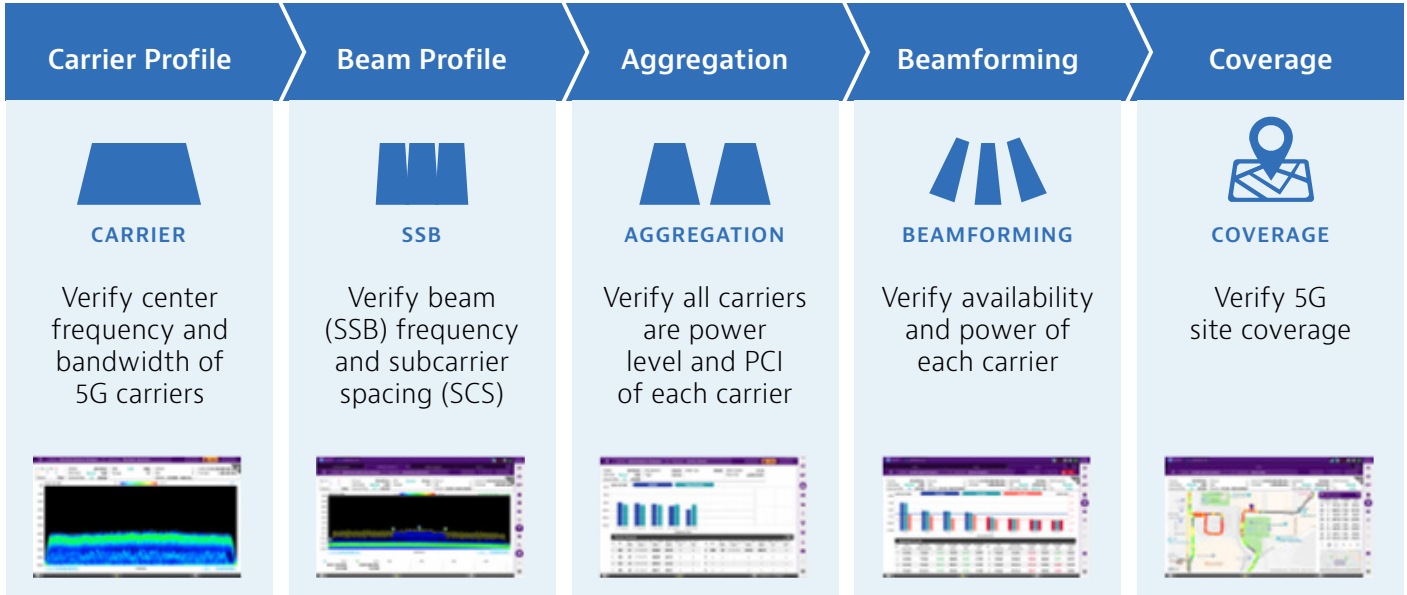
NEON Signal Mapper – Indoor & Outdoor 5G Coverage



NEON Command – 4G & 5G Signal Profile

## Solving Network Coverage Issues

VIAMI RAN analyzers solve network coverage and improve user experience through the following cell site deployment best practices:

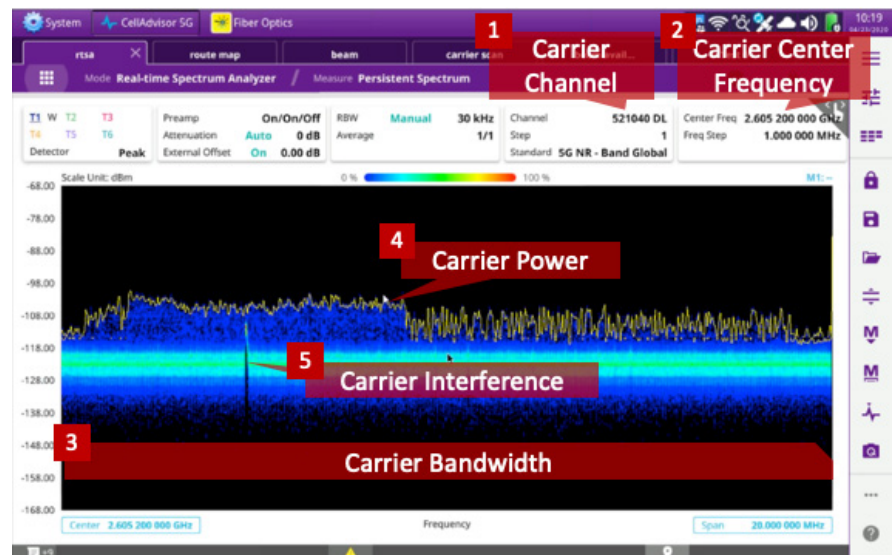


RAN Troubleshooting Best Practices

### Carrier Profile

5G carrier profile verification is needed to validate over-the-air characteristics including spectrum clearance.

1. Carrier Channel: compliant with 3GPP ARFCN.
2. Carrier Center Frequency: verify the channel frequency corresponds to the center frequency of the transmitted signal.
3. Carrier bandwidth: verify the signal bandwidth correspond to the defined carrier bandwidth.
4. Carrier Power: verify the transmitted signal has proper signal strength (e.g. level  $\geq -90$ dBm).
5. Carrier Interference: verify the signal transmitted is not affected by any interfering signal.

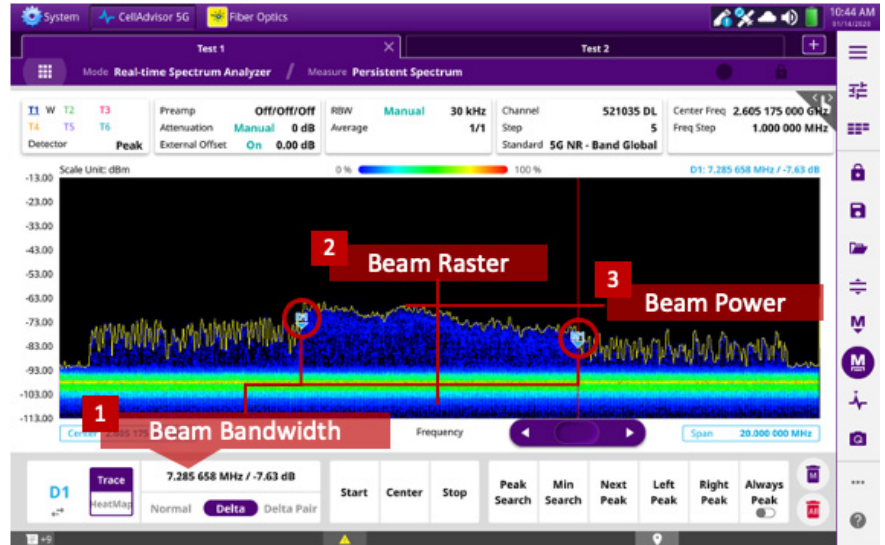


RAN analyzer – Carrier Profile

## Beam Profile

5G beam profile verification is needed to validate over-the-air characteristics and radio configuration of the beam numerology.

1. Beam Bandwidth: validate the radio's 5G beam numerology ( $\mu$ ) of sub-carrier spacing ( $\Delta f$ ): 15KHz to 240KHz.
2. Beam Raster: verify the 5G beam (SSB) frequency offset relative to the 5G channel.
3. Beam Power: verify the 5G beam (SSB) transmitted power level (e.g. level  $\geq -90$ dBm).

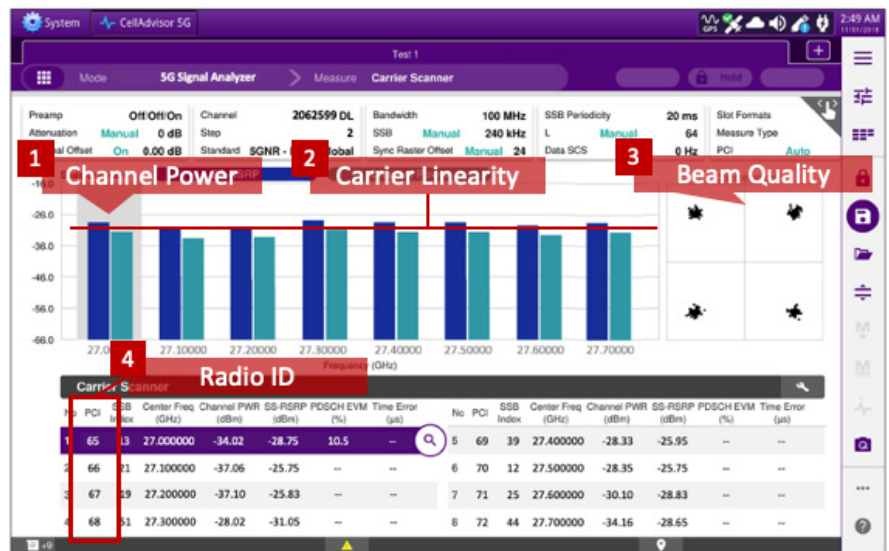


RAN analyzer – Beam Profile Verification

## Carrier Aggregation

5G carrier aggregation verification is needed to validate power level, linearity and quality of the 5G radio.

1. Channel Power: verify signal strength of the transmitted carrier.
2. Carrier Linearity: verify the carriers transmitted by the radio have the same power level.
3. Beam Quality: verify 5G beam quality (constellation) performance.
4. 5G Radio ID: verify the radio ID (PCI).

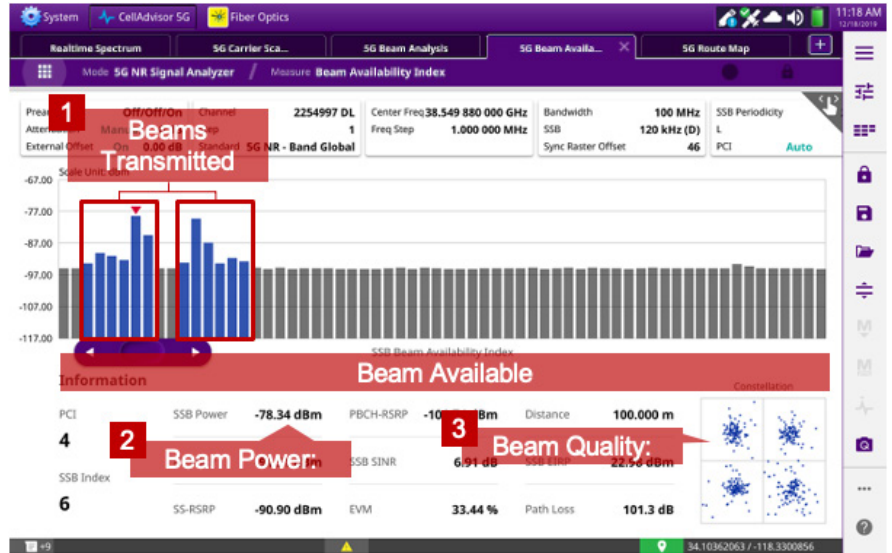


RAN analyzer – Carrier Aggregation

## Beamforming

5G beamforming verification is needed to validate beams transmitted by the radio, beam power, and quality.

1. Beams Transmitted: verify the individual beams transmitted.
2. Beam Power: verify the power level of the individual beams.
3. Beam Quality: verify 5G beam quality performance (constellation and error vector magnitude).



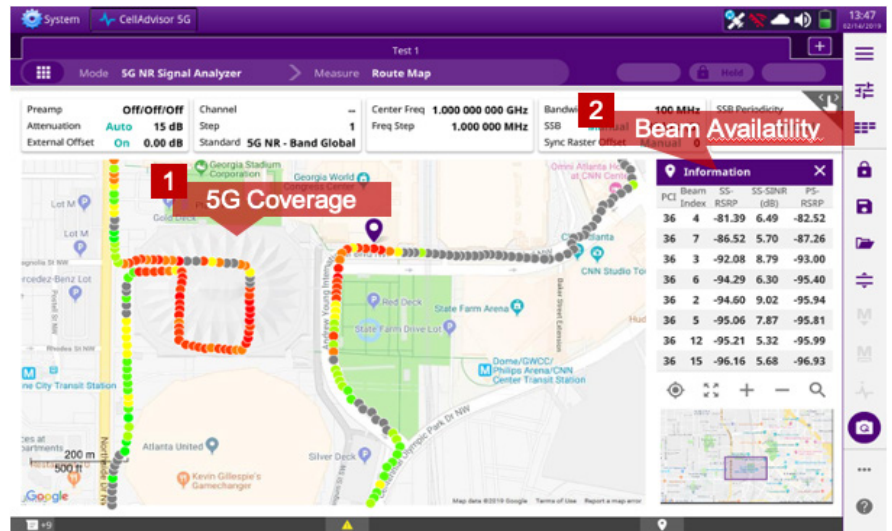
RAN analyzer - Beamforming

## Signal Coverage

5G coverage verification is needed to validate proper power levels in different location suitable for 5G service.

1. 5G coverage: Assess signal strength by geo-location.
2. Beam availability: verify the availability of multiple beams by geo-location.

5G Coverage data done in real-time and available for post-processing



RAN analyzer – Signal Coverage

## Summary

VIAVI RAN analyzers, CellAdvisor 5G and OneAdvisor, are the ideal all-in-one test solutions for radio access networks, their portability allows conducting field tests in the front-haul, and over-the-air, including spectrum and interference analysis, as well as LTE and 5G signal analysis and coverage testing for indoors and outdoors.





## Ordering Information

### CellAdvisor 5G

Part Number	Description
CA5000-F001	CellAdvisor 5G, Frequency for 5G NR FR1 up to 6 GHz
CA5000-F018	CellAdvisor 5G, Frequency up to 18 GHz
CA5000-F002N	CellAdvisor 5G, Frequency for 5G NR FR1 6 GHz and FR2 40 GHz with two RF ports
CA5000-S032	CellAdvisor 5G option, LTE/LTE-Adv FDD signal analysis
CA5000-S033	CellAdvisor 5G option, LTE/LTE-Adv TDD signal analysis
CA5000-S041	CellAdvisor 5G option, 5G NR beamforming analyzer
CA5000-S043	CellAdvisor 5G option, NSA analyzer

### OneAdvisor

Part Number	Description
ONA800A-SPO	OneAdvisor-800, Frequency for 5G NR FR1 up to 6 GHz
ONA-SP-LTEFDOTA	OneAdvisor-800 option, LTE/LTE-Adv FDD signal analysis
ONA-SP-LTETDOTA	OneAdvisor-800 option, LTE/LTE-Adv TDD signal analysis
ONA-SP-5GOTA	OneAdvisor-800 option, 5G NR beamforming analyzer

### NEON Tracker and Signal Mapper

Part Number	Description
140742	NEON Tracking Unit w/belt clip
140747	NEON Signal Mapper Package - Tracking Unit; Software; and 1 Year License
140748	NEON Signal Mapper Package-Tracking Unit; Software; and 2 Year License
140749	NEON Signal Mapper Package - Tracking Unit; Software; and 3 Year License
141586	NEON Signal Mapper Package - Tracking Unit; Software; and 5 Year License
142944	NEON Signal Mapper License Renewal; 1 Year
142945	NEON Signal Mapper License Renewal; 2 Year
142946	NEON Signal Mapper License Renewal; 3 Year



Contact Us **+1 844 GO VIAVI**  
(+1 844 468 4284)

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