



5G Sync and Timing Test Guide

OneAdvisor 800

Table of Contents

- 1. Scope 2
- 2. Equipment Required..... 3
 - 2.1 5G Over-the-Air Sync and Timing Analysis 4
 - 2.1.1 5G Over-the-Air Time and Frequency Variation 4
 - 2.1.2 5G Over-the-Air Cell Phase Synchronization..... 6
- 3. Annex..... 9
 - 3.1 Save Measurement Results..... 9
- 4. Technical Support..... 10



1. Scope

Radio frequency (RF) interference can be defined as the effect of unwanted energy due to emissions, radiation, conduction, or induction (or a combination thereof) on reception in a radio communication system. RF interference results in performance degradation, misinterpretation, or loss of information.

Mobile users near the interference source will experience degraded call success rates, increased dropped calls, decreased battery life, poor voice quality, and reduced data throughput. Detecting, locating, and finally eliminating the sources of RF interference are critical to maintaining good user experience throughout the network.

Typical sources of RF interferences are the following:

- Passive Intermodulation (PIM), caused internally in the cell site by improper conductivity of cabling and antenna systems, or created externally by reflections of nearby metal elements.
- External RF sources that are illegal or malfunctioning and generate RF interference in licensed spectrum, including video cameras and broadband amplifiers, among others.
- Synchronization and timing issues time division networks (TDD) where an out-of-sync radio cause and are affected by downlink timeslots interfering with uplink timeslots.

OneAdvisor-800 Interference Analyzer functions provides the most comprehensive measurement techniques to effectively identify, characterize and locate interfering signals.



Key interference analysis measurement functions:

- RFoCPRI interference analysis
- Over-The-Air interference analysis
- 5G Over-the-Air Sync and Timing Analysis
- Interference Finder

This document describes the process to test Over-the-Air Sync and Timing Analysis on 5G mobile networks, with OneAdvisor-800.

2. Equipment Required

The required products and parts to complete this procedure are as follows:

Description	Diagram
<p>OneAdvisor-800 with the following functions:</p> <ul style="list-style-type: none"> - OneAdvisor-800 platform equipped with the following modules and options: <ul style="list-style-type: none"> o Any radio analysis module with optical hardware: <ul style="list-style-type: none"> ▪ SPA06MA-O: Spectrum up to 6 GHz and Optical HW ▪ RA09MA-O: Spectrum up to 9 GHz and Optical HW ▪ RA18MA-O: Spectrum up to 18 GHz and Optical HW ▪ RA32MA-O: Spectrum up to 32 GHz and Optical HW ▪ RA44MA-O: Spectrum up to 44 GHz and Optical HW o ONA-SP-GNSS: GNSS Connectivity with Antenna o ONA-SP-5GOTA: 5G NR Beamforming Analysis and ONA-SP-CPS: 5G NR Cell Phase Synchronization 	 <p style="text-align: center;">OneAdvisor-800</p>
<p>RF accessories</p> <ul style="list-style-type: none"> - Any RF Filter based on uplink frequency ranges: <ul style="list-style-type: none"> o G7000506xx, where xx: {01 to 16, 40} - JD70050007: AntennaAdvisor Handle - G700050367: RF Log Periodic Antenna SMA-f 650 to 6000 MHz 2.85 dBd - G700050345: Mag Mount RF Omni Antenna 617-960/1700-6000 MHz 8 ft. LL-195 with N-plug 	 <p style="display: flex; justify-content: space-around;"> RF Filter Antenna Handle and Log periodic antenna </p> <p style="text-align: center;">Mag-mount Omni-Antenna</p>

2.1 5G Over-the-Air Sync and Timing Analysis

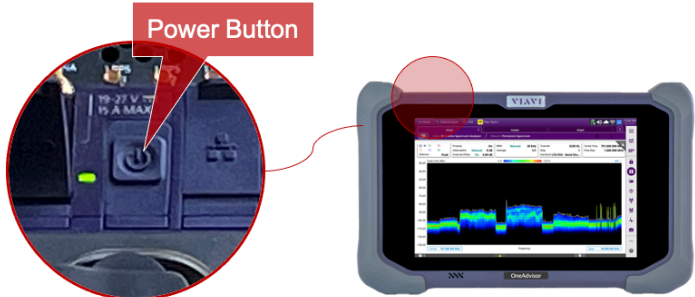

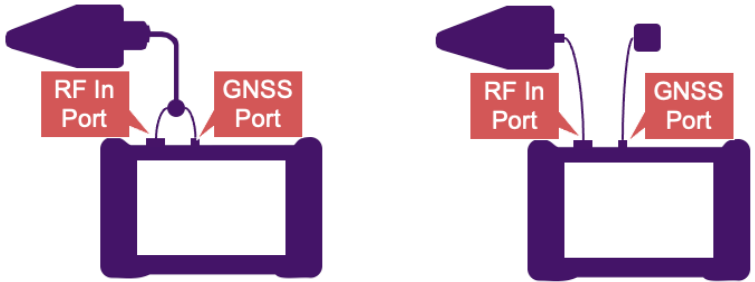
The following procedure describes the steps to perform OTA Sync and Timing Analysis with the OneAdvisor 800.

The following information is required to complete these tests:

- Downlink center frequency or channel number
- Downlink channel bandwidth

2.1.1 5G Over-the-Air Time and Frequency Variation

The following procedure describes the test setup for 5G Over-the-Air Time and Frequency variation analysis, including turn-up, connectivity, and configuration.

Step	Action	Description
1	Power ON OneAdvisor 800	<p>Press and hold the ON/OFF button for 3 seconds</p>  <p>OneAdvisor 800 - Power ON</p>
2	<ul style="list-style-type: none"> - Connect the GPS antenna into the OneAdvisor 800 GNSS port. - Connect the directional antenna into the Spectrum Analyzer RF In port. 	 <p>OneAdvisor 800 - RF In Port and GNSS Port</p>
		 <p>OneAdvisor 800 with Antenna Advisor (Directional antenna and GPS antenna)</p> <p>OneAdvisor with directional antenna and GPS antenna</p>

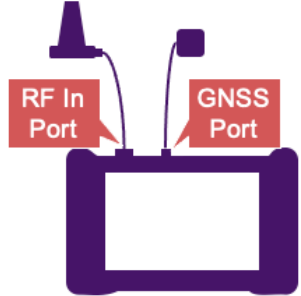
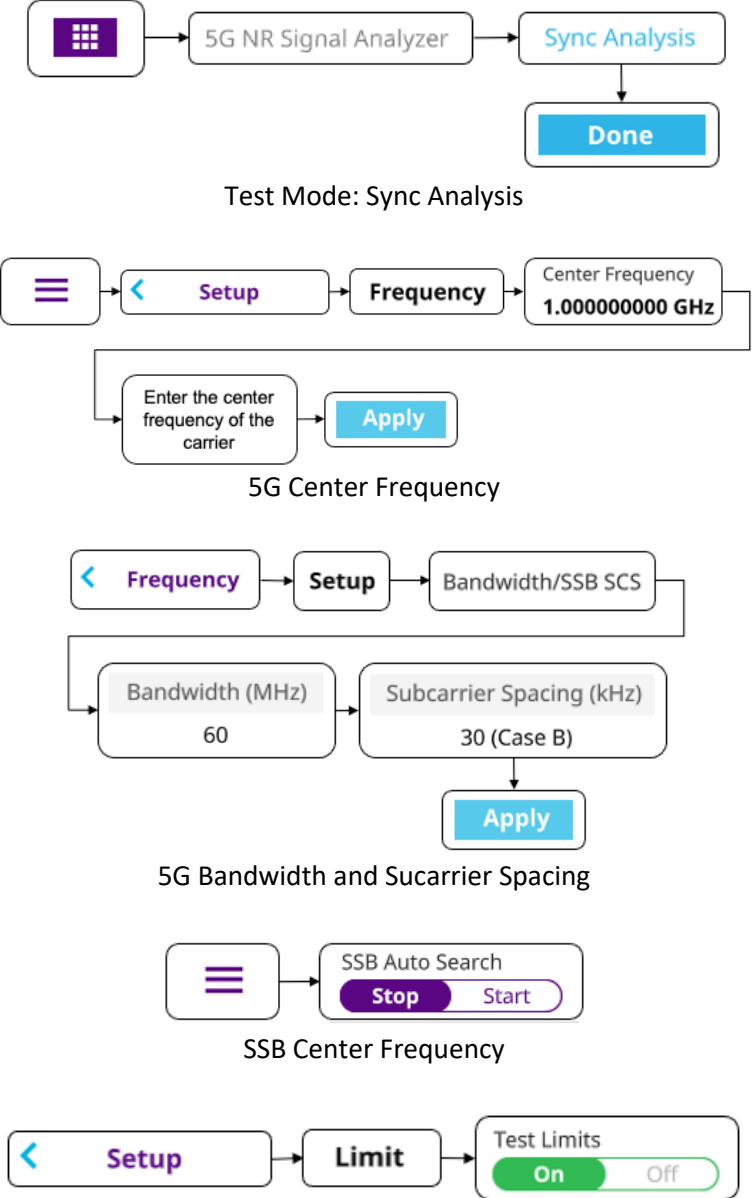
Step	Action	Description
3	<p>To perform Time and Frequency Variation select:</p> <ul style="list-style-type: none"> - Measurement Menu - 5G NR Analyzer - Freq / Time / Power Variation - Done <p>To set the frequency of the carrier under test select:</p> <ul style="list-style-type: none"> - Settings - Setup - Frequency - Center Frequency - Enter the center frequency of the carriers - Apply <p>Set the carrier bandwidth and subcarrier spacing by selecting:</p> <ul style="list-style-type: none"> - Frequency - Setup - Bandwidth / SSB SCS - In the Bandwidth (MHz) list select the corresponding bandwidth of the carrier - In the Subcarrier Spacing (KHz) list select the corresponding subcarrier spacing - Apply <p>Set the SSB center frequency by selecting</p> <ul style="list-style-type: none"> - Settings - SSB Auto Search : Start <p>Set the trigger and frequency reference to GPS by selecting:</p> <ul style="list-style-type: none"> - Setup - Trigger - Trigger - GPS - Frequency Reference - GPS <p>Adjust the amplitude by selecting:</p>	<p>5G NR Signal Analyzer</p> <p>Freq / Time / Power Variation</p> <p>Done</p> <p>Test Mode: Freq / Time / Power Variation</p> <p>Settings</p> <p>Setup</p> <p>Frequency</p> <p>Center Frequency 1.00000000 GHz</p> <p>Apply</p> <p>Enter the center frequency of the carrier</p> <p>Apply</p> <p>5G Center Frequency</p> <p>Frequency</p> <p>Setup</p> <p>Bandwidth/SSB SCS</p> <p>Apply</p> <p>Bandwidth (MHz) 60</p> <p>Subcarrier Spacing (kHz) 30 (Case B)</p> <p>Apply</p> <p>5G Bandwidth and Subcarrier Spacing</p> <p>Settings</p> <p>SSB Auto Search</p> <p>Stop Start</p> <p>SSB Center Frequency</p> <p>Setup</p> <p>Trigger</p> <p>Trigger Internal</p> <p>GPS</p> <p>Frequency Reference Internal</p> <p>GPS</p> <p>Trigger and Frequency Reference to GPS</p> <p>Amplitude Auto Scale</p>

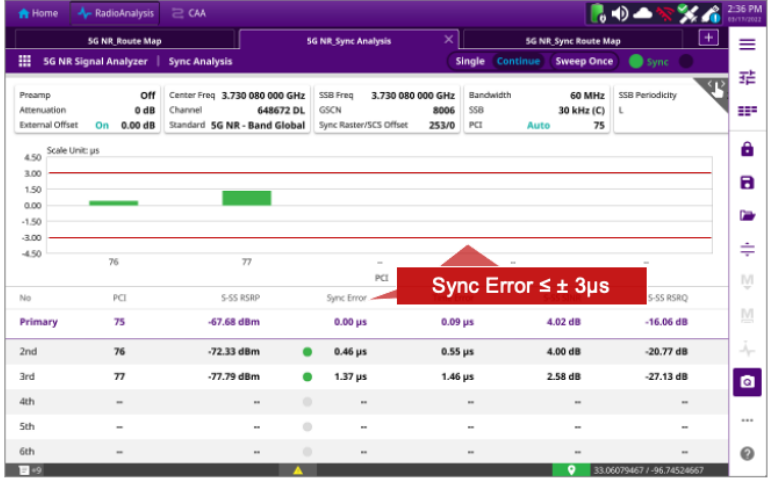

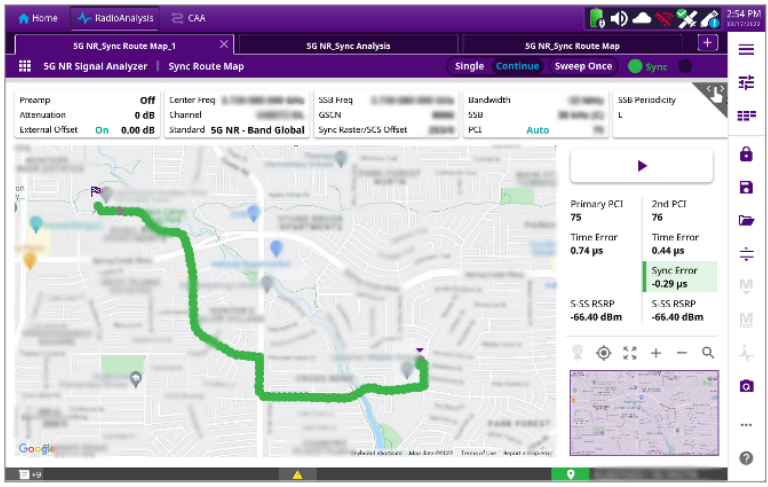
Step	Action	Description
	<ul style="list-style-type: none"> - AutoScale <p>Measurement Result: Ensure the Time Error is lower or equal than $\pm 1.5\mu\text{s}$</p>	<p>Time Error Measurement Result</p>

2.1.2 5G Over-the-Air Cell Phase Synchronization

The following procedure describes the test setup for 5G Over-the-Air Cell Phase Synchronization including turn-up, connectivity, and configuration.

Step	Action	Description
1	Power ON OneAdvisor 800	<p>Press and hold the ON/OFF button for 3 seconds</p> <p>OneAdvisor 800 - Power ON</p>
2	<ul style="list-style-type: none"> - Connect the GPS antenna into the OneAdvisor 800 GNSS port. - Connect the omnidirectional antenna into the Spectrum Analyzer RF In port. 	<p>OneAdvisor 800 - RF In Port and GNSS Port</p>

Step	Action	Description
		 <p>OneAdvisor 800 with Omnidirectional Antenna and GPS antenna</p>
3	<p>To perform Cell Phase Synchronization test, select:</p> <ul style="list-style-type: none"> - Measurement Menu - 5G NR Analyzer - Sync Analysis - Done <p>Set the carrier bandwidth and subcarrier spacing by selecting:</p> <ul style="list-style-type: none"> - Frequency - Setup - Bandwidth / SSB SCS - In the Bandwidth (MHz) list select the corresponding bandwidth of the carrier - In the Subcarrier Spacing (KHz) list select the corresponding subcarrier spacing - Apply <p>Set the SSB center frequency by selecting</p> <ul style="list-style-type: none"> - Settings - SSB Auto Search : Start <p>Enable the Cell Phase Synchronization limit of $\pm 3\mu\text{s}$ by selecting:</p> <ul style="list-style-type: none"> - Setup - Limit - Toggle the Test Limit to ON <p>Measurement Result: Ensure the Sync Error is lower or equal than $\pm 3\mu\text{s}$</p>	 <p>Test Mode: Sync Analysis</p> <p>5G Center Frequency</p> <p>5G Bandwidth and Subcarrier Spacing</p> <p>SSB Center Frequency</p>

Step	Action	Description
		 <p style="text-align: center;">Sync Error Measurement Result</p>
4	<p>To perform Sync Error verification of the Radio Access Network, set the OneAdvisor 800 and antennas for drive test, and then select:</p> <ul style="list-style-type: none"> - Setup - 5G NR Signal Analyzer - Sync Route Map - Done 	 <p style="text-align: center;">Test Mode: Sync Error Route Map</p>  <p style="text-align: center;">Sync Error Route Map Measurement Result</p>

3. Annex

3.1 Save Measurement Results

The following procedure describes the steps to save measurement results with OneAdvisor-800

Step	Action	Description
1	<p>Saving measurements</p> <ul style="list-style-type: none"> - Select the save icon and enter file name - Select the type of file to save: <ul style="list-style-type: none"> o Result (to be replayed or post-processed by the CellAdvisor 5G) o Result as CSV, to be post-processed by a PC application o Screen, as a picture - Select the destination to save the file - Select "Save" 	<p>Save and File Name Sequence</p> <p>File Type as Result, Result as CSV or Screen</p> <p>Select the destination either Internal or USB</p> <p>Select Save</p>



4. Technical Support

Technical support is provided by:

- Phone: 1-844-GO-VIAVI (1-844-468-4284) options 3-2-3
- Email: diagnostics.tac@viavisolutions.com

Regularly new firmware updates for the OneAdvisor-800 are released and it is recommended to keep the instrument in the latest firmware to provide all the enhancements and bug fixes.

- For additional information of cell site test go to:
<http://www.viavisolutions.com/en/products/network-test-and-certification/cell-site-test>