OneExpert CATV 630

Extended Quick Start Guide v4

August 2019

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Support Links

Viavi Customer Care:
For questions about warranty information, repair and calibration, Return Material Authorization (RMA) request, services quotation, order status.
T: 1-844 GO VIAVI (+1-844-468-4284)
E: NAM.CustomerCare@viavisolutions.com

https://www.viavisolutions.com/en-us/services-and-support/support-center/customer-care

Customer Care Portal Login
https://www.viavisolutions.com/en-us/services-and-support/support-center/customer-care/customer-portal-login

RMA Request Form:
http://www.viavisolutions.com/en-us/services-and-support/return-material-authorization-rma-request

Viavi Technical Support:
Will assist you in using/configuring products or address issues regarding product performance.
T: +1-844 GO VIAVI (+1-844-468-4284)
E: catvsupport@viavisolutions.com

For access to online technical and product support:
http://support.viavisolutions.com

Quick Tip Videos (including ONX):
https://www.viavisolutions.com/en-us/support/quick-references/quick-tip-videos

Product Focused YouTube Channel:
ViaviSolutions CIVT

ONX CATV - Overview

ONX Control keys

Network Indicator **LEDs**

High Sensitivity **Touch Screen**

Shortcut Buttons

Short Cut Hard keys – **Functions keys**

Navigation Directional Buttons

Back, Home Screen, and Utility Buttons

Power On/Off Button

ONX Interfaces

Port 2 – RF Ingress Port
Connect to upstream from house for Ingress Scan

Port 1 – RF US/DS Analysis
DOCSIS, QAM

D-Ring

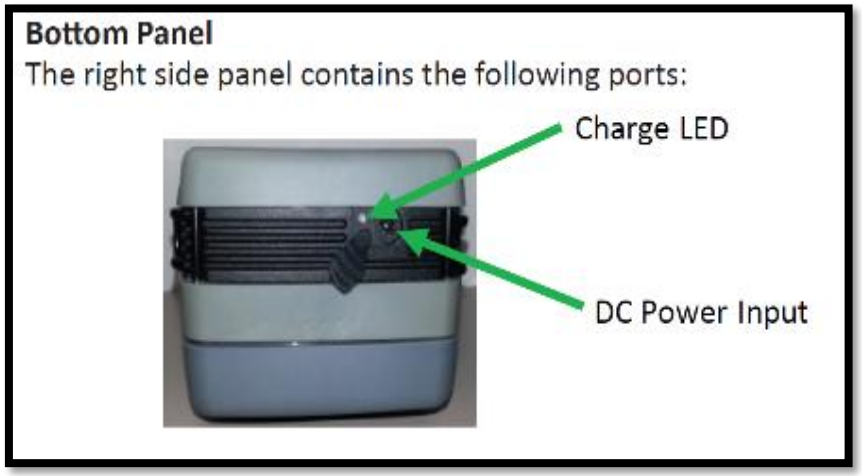
Dual 10/100/1000 RJ45 Ports

Dual USB 2.0 Ports

D-Ring

Battery Charger Port (under flap)

Power LED and Systems Keys



- The DC Power Input, located on the bottom of the instrument, is used to connect the AC adapter.
- The Charge LED located next to the power input indicates that the adapter is connected.
- Solid green indicates that charging is complete.
- Slow flashing red indicates that the battery charge is critically low, and less than 10%.
- Fast flashing red indicates that the charging was suspended due to a fault and user intervention is necessary (for example, an incorrect charger is attached).
- Solid red indicates that the charging was suspended due to overheating. The unit can continue to run, and no user intervention necessary.
- Solid amber indicates that the battery is charging.

LED's

Sync – Reports the status of modem synchronization.

- Blinking green indicates that the modem is ranging.
- Solid green indicates that the modem has successfully ranged.

Network – Indicates the status of network connectivity.

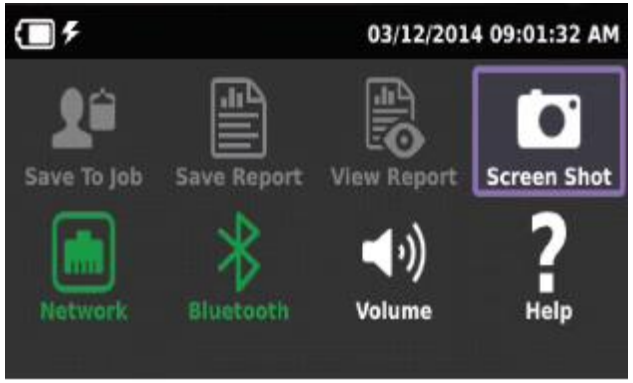
- Blinking green indicates that the unit is acquiring an IP address.
- Solid green indicates that an IP address has been acquired.
- Blinking amber indicates a timeout – the unit was unable to acquire an IP address.
- If the LED is not illuminated, the network is not active – either the unit is not connected or it is logged off.

Batt – A multi-color LED that indicates the battery status.

- Solid green indicates that either the battery charge is higher than 30%, or that an external source is powering the unit.
- Solid red indicates that the battery charge is critically low, and less than 10%.
- Solid amber indicates that the battery is getting low, and the charge is between 10% and 30%.

Error – Solid red indicates error and alarm conditions. The type of error varies and depends on the application.

Tray Menu



USING THE TRAY MENU

The tray menu allows access to commonly used functions. It can be accessed either by pressing the Tray system key or by swiping downward from the top of the LCD.

Hint:

A long push on TRAY key will automatically start a screen capture. It is useful when a short Tray key push doesn't open the Tray menu (when for example a function key menu is open)

SAVE TO JOB – Saves the results to job ticket.

SAVE TO REPORT – Saves the results to a report. Formats available: XML, PDF, or HTML.

VIEW REPORT – Views a saved report. Select View Report and then select the saved report to view. If there are no saved reports, the text will be grayed out.

SCREENSHOT – Takes a screen capture of the current menu (the screen you were viewing when you launched the tray menu).

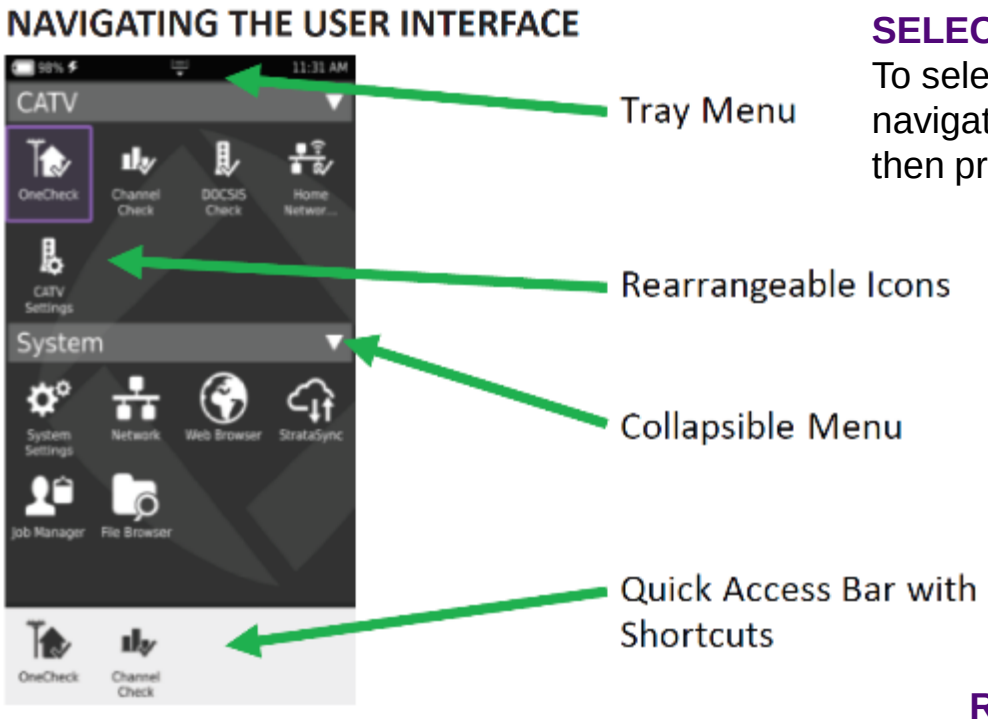
NETWORK – Enables or disables the home/Ethernet network.

BLUETOOTH – Enables or disables Bluetooth.

VOLUME – Control the device volume.

HELP – Provides TAC phone numbers.

User interface



SELECTING A MENU

To select a menu, either touch the item or use the arrow navigation keys to highlight the desired menu item and then press the OK key.

COLLAPSIBLE MENUS

Each main item is a collapsible menu. Touch the triangle on the right (the triangle rotates from pointing left to pointing down) or use the arrow keys to highlight the menu item and then press the OK key.

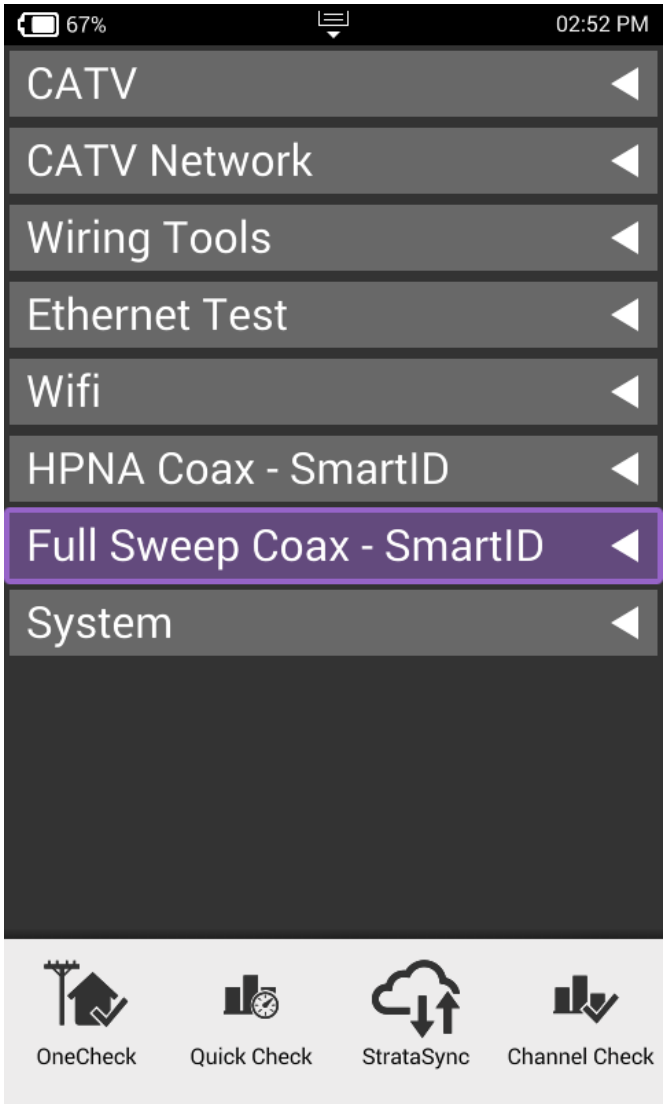
SHORTCUTS

- If you have a test or function that you use frequently you can make it a shortcut.
- Touch and hold the icon for the function and then drag it to the bottom of the screen to create a shortcut.
- You can create up to four shortcuts.
- To remove the shortcut, drag it off the shortcut bar.

REARRANGING ICONS

- You can rearrange icons within a menu for tests or functions you use frequently.
- To rearrange icons inside a menu, touch and hold the icon and then drag it to the new location.

Home Screen



Home Screen is default when ONX is turned on

- It can be reached by selecting the Home Screen button above the On/Off Button
- Back Button also returns the user to the Home Screen

Each **Menu option** is labeled and can be opened or collapsed by the triangle buttons to the right

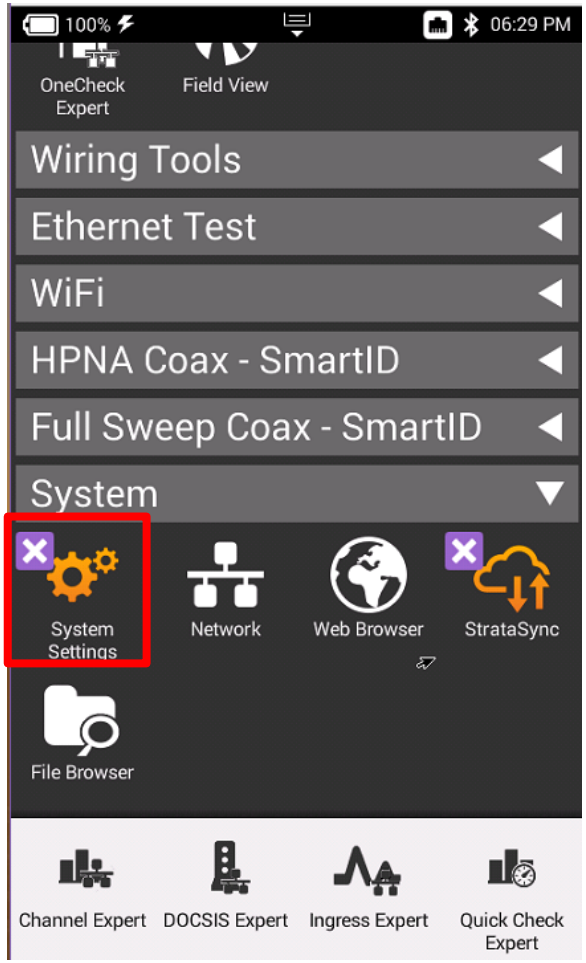
Shortcuts are located across the bottom and can be customized by selecting an icon and dragging it to the shortcut bar

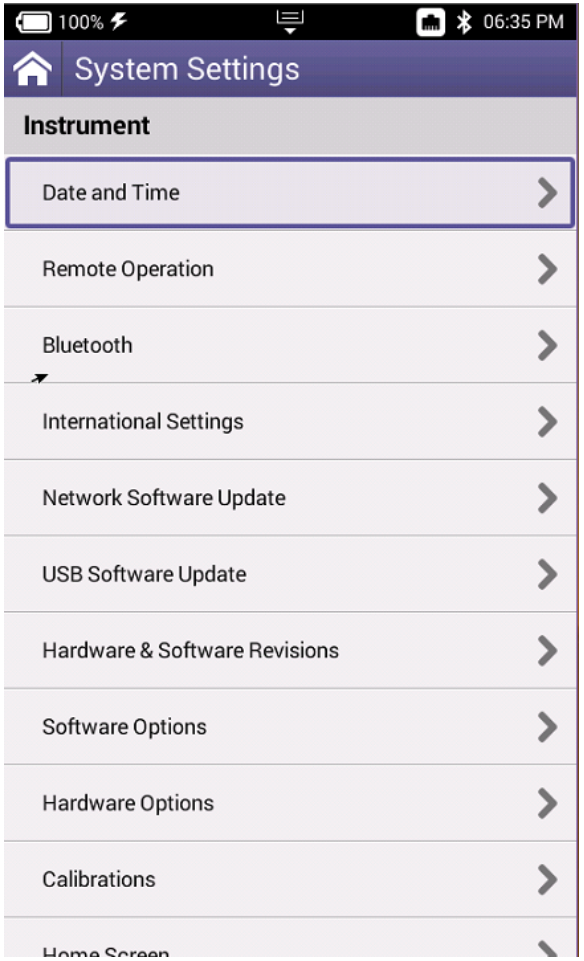
System Settings

Navigate from the Home Screen down to the bottom, using the D PAD to swiping with a finger

Select System Settings

From System Settings, the user can set up the meter a variety of ways

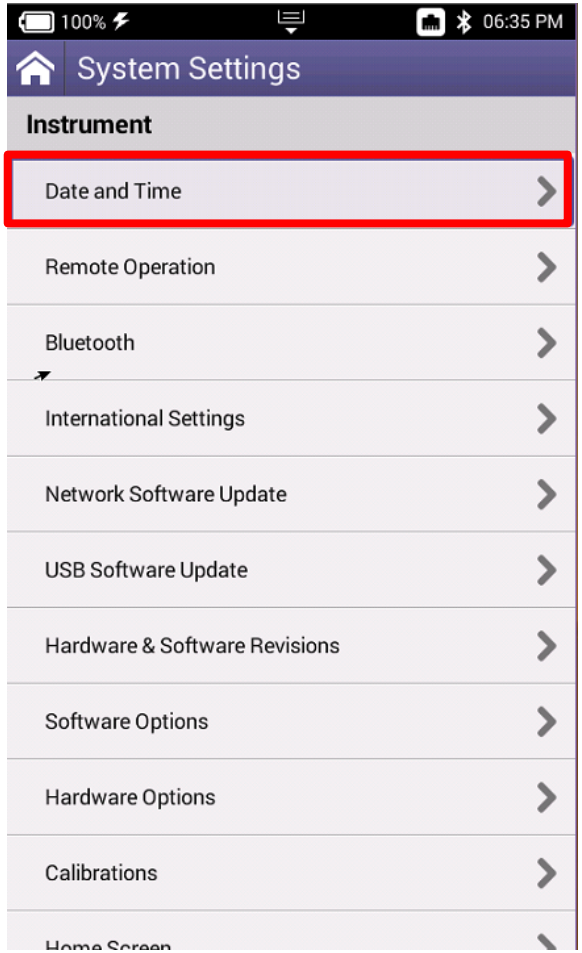


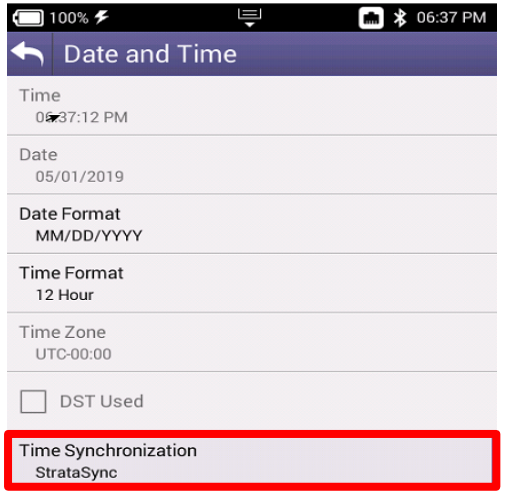


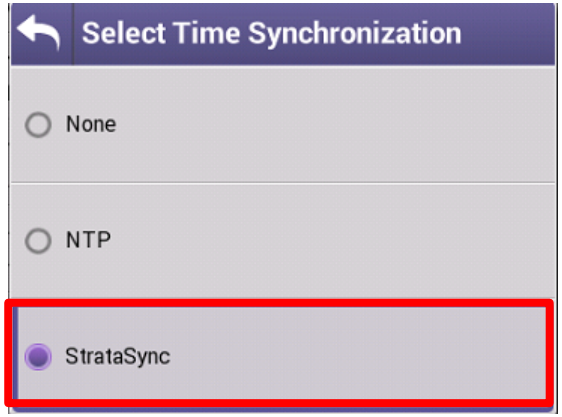
Date and Time

Select Date and Time and make sure that Time Synchronization is set to StrataSync

This is important because test data will need to be time stamped with the correct date and time



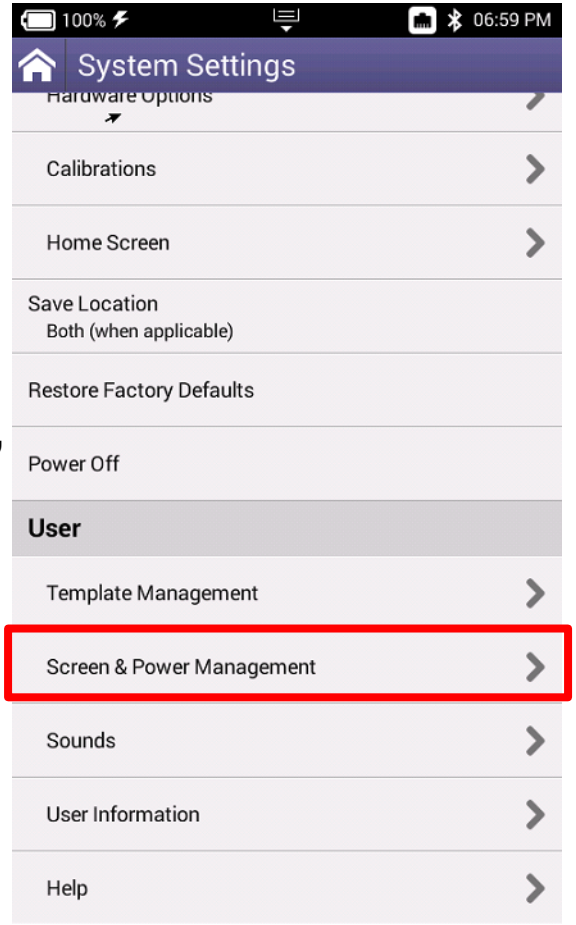


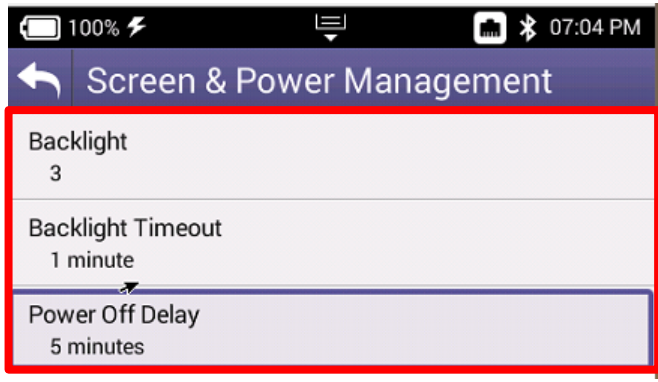


Screen and Power Management

Select Screen and Power Management to better conserve the ONX battery life

Recommended values are shown to the right. However, if Power off Delay needs to be set higher in order to accommodate technician's pace, select appropriate time



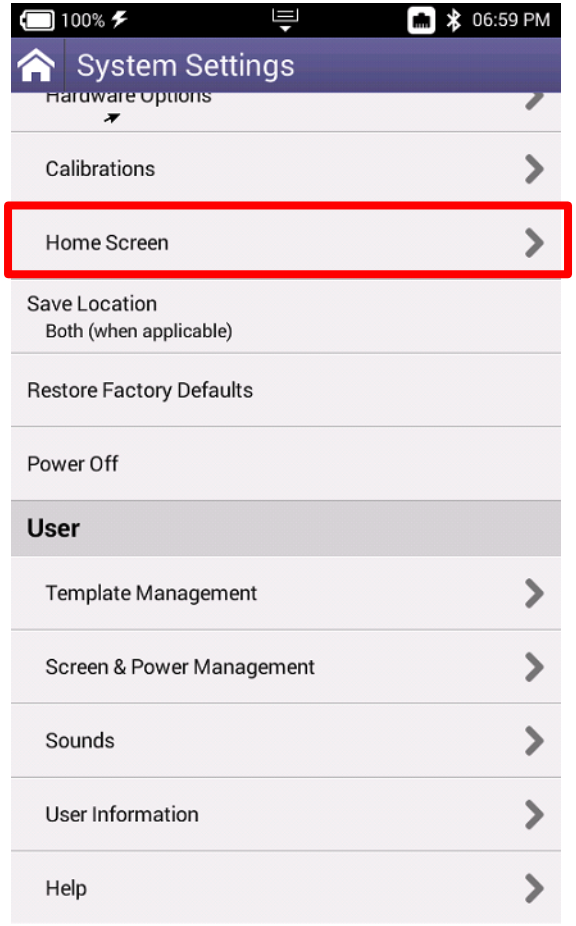


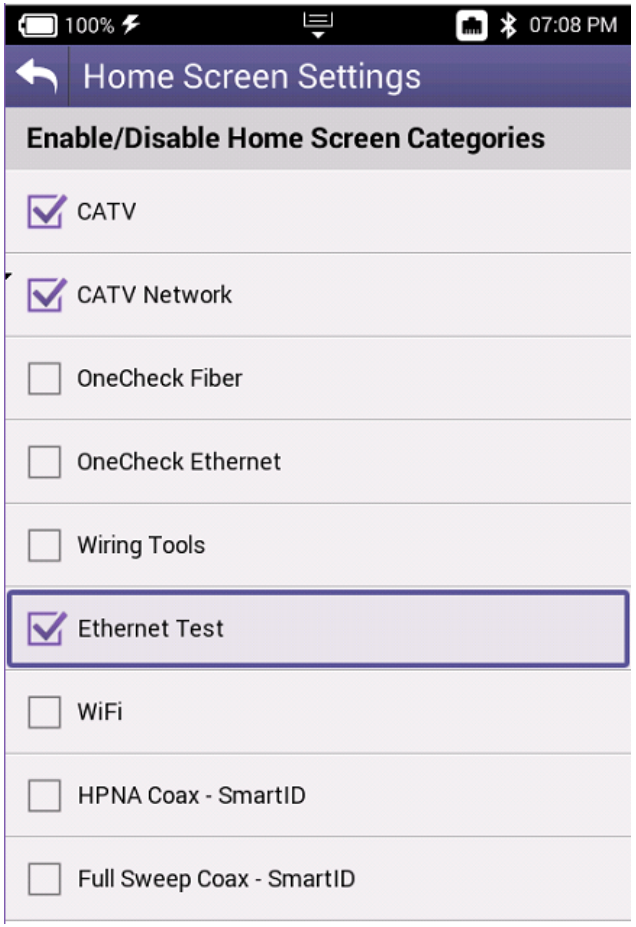
Customizing the Home Screen

Select Home Screen to customize which measurement bundles are available on the Home Screen of the ONX630

For the Network Technician, CATV, CATV Network and Ethernet Test are the only truly applicable test bundles

Technicians are invited to customized as needed

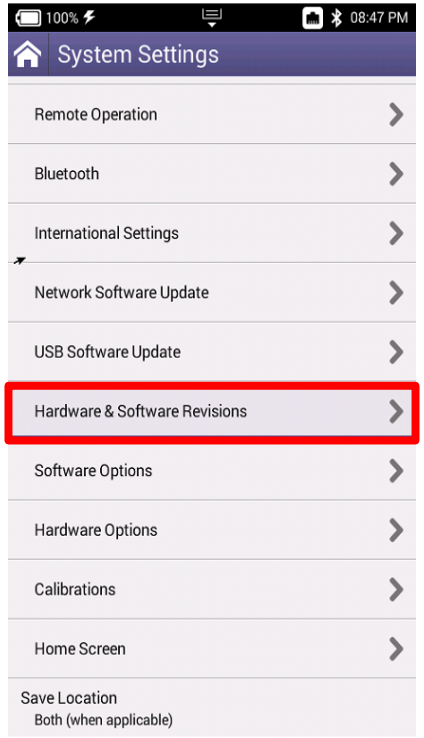


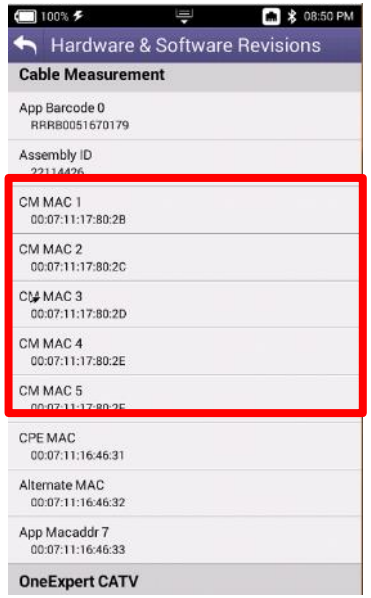


Hardware and Software Revisions

Select Hardware & Software Revisions to verify the most up to date Firmware is installed

Additionally, ONX630 Serial Number (listed as Unit ID) and CM MAC Addresses (used in provisioning of the onboard Cable Modem)

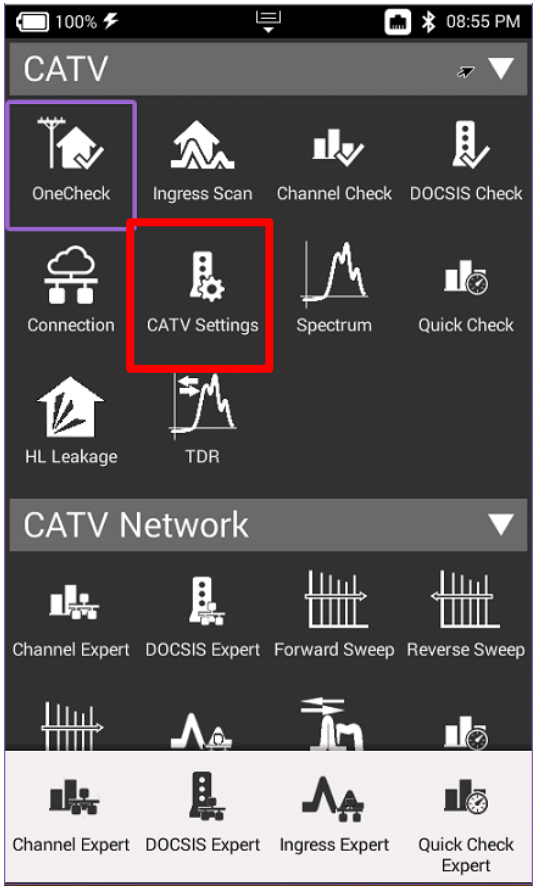


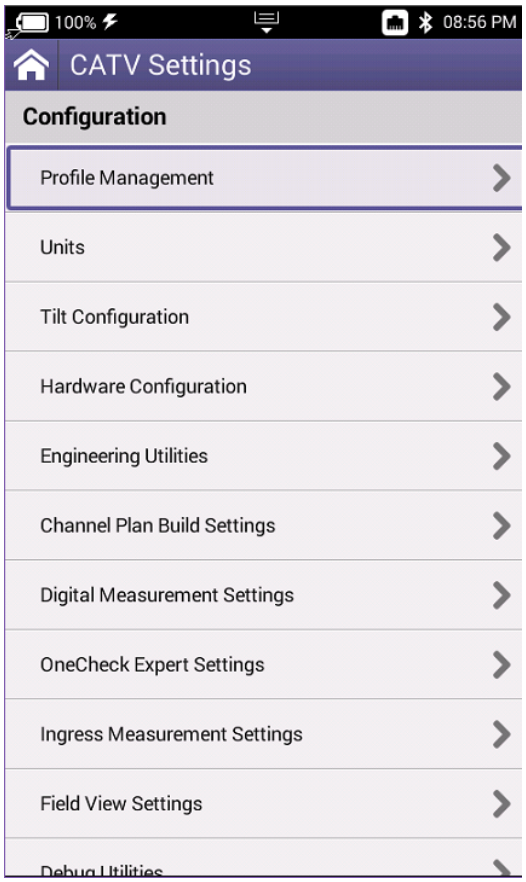


CATV Settings

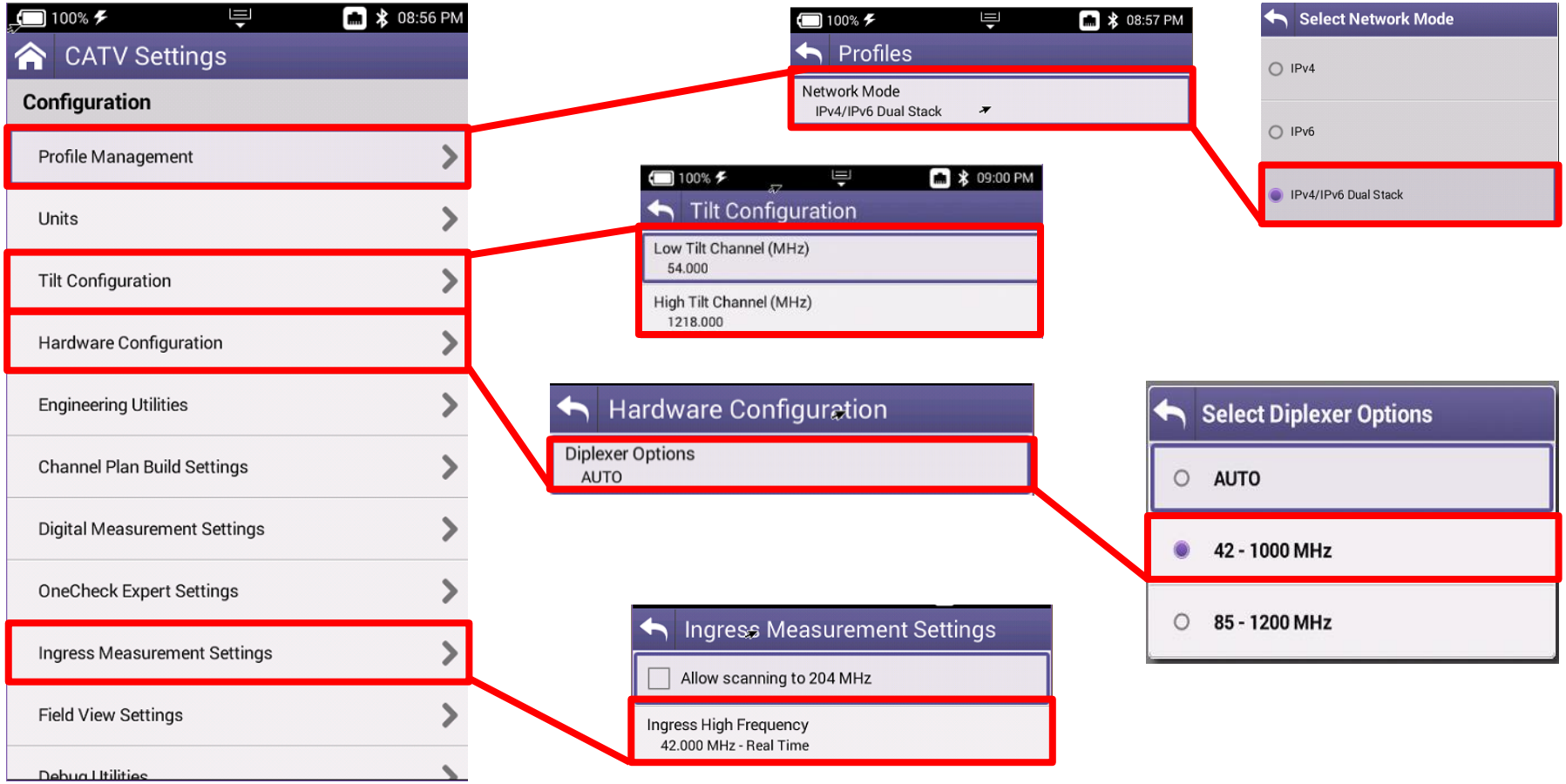
Navigate from the Home Screen to CATV Settings

- Here the tech can validate IPv4 or IPv6
- Tilt
- Sweep
- Diplex
- Digital Measurement
- Channel Plan Build Settings

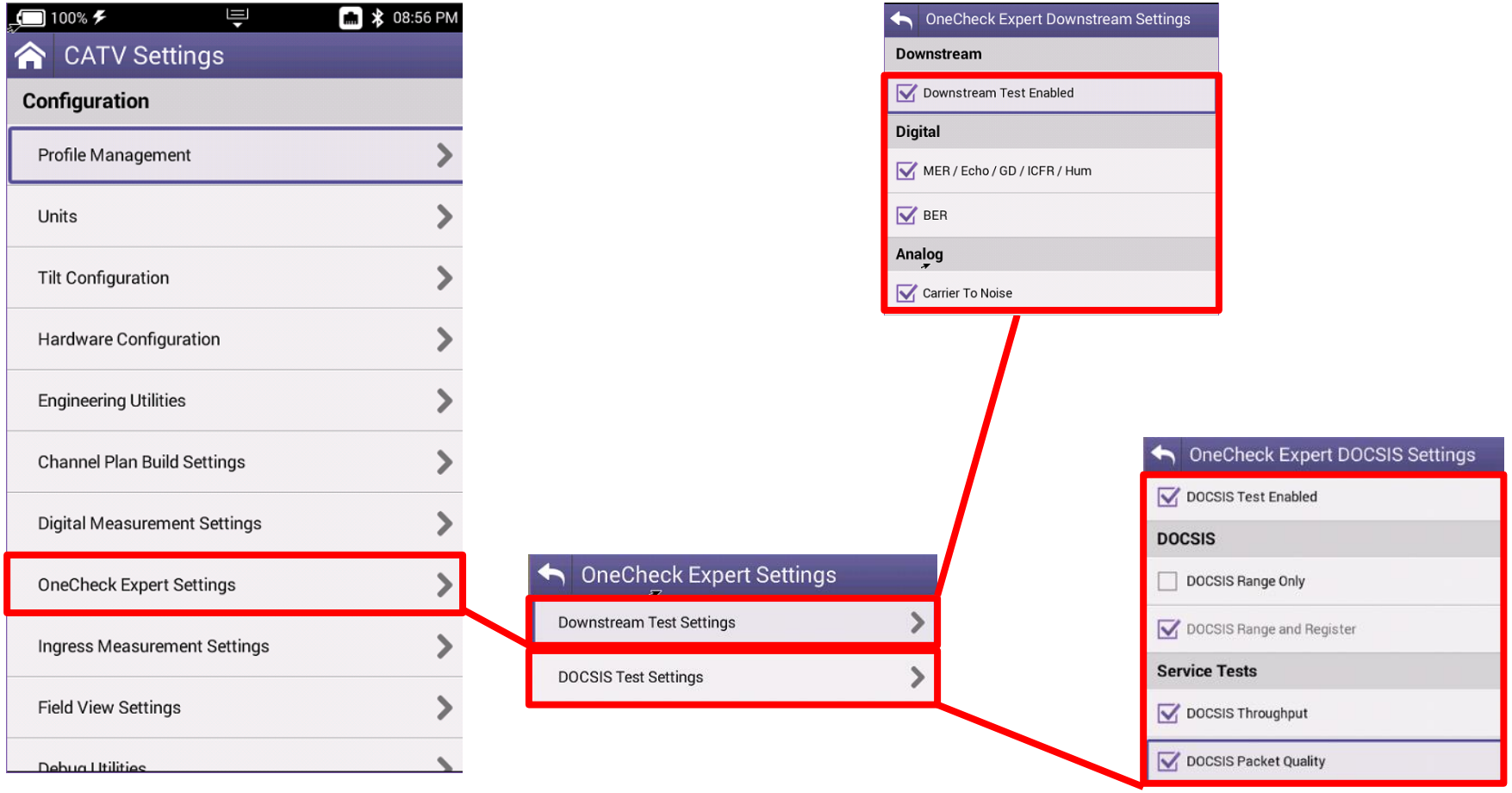




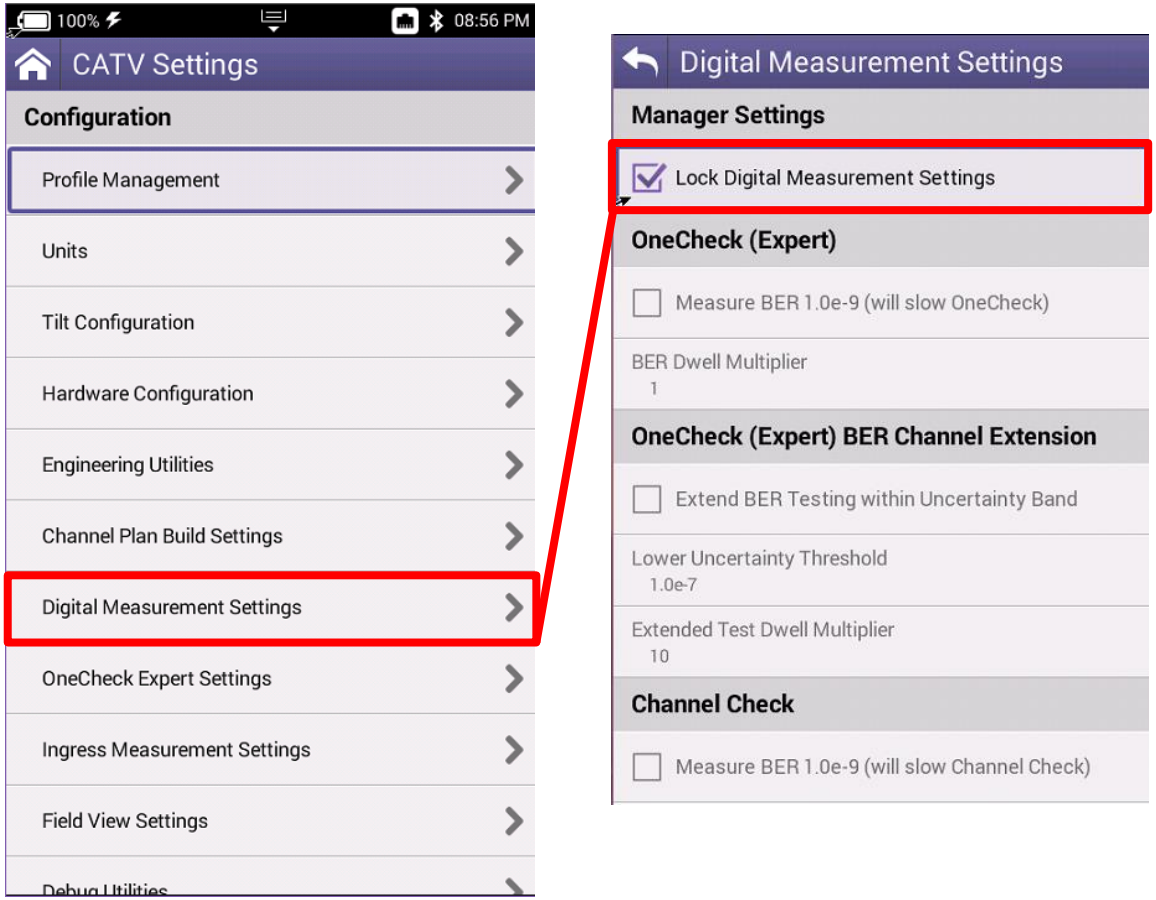
Advanced CATV Settings



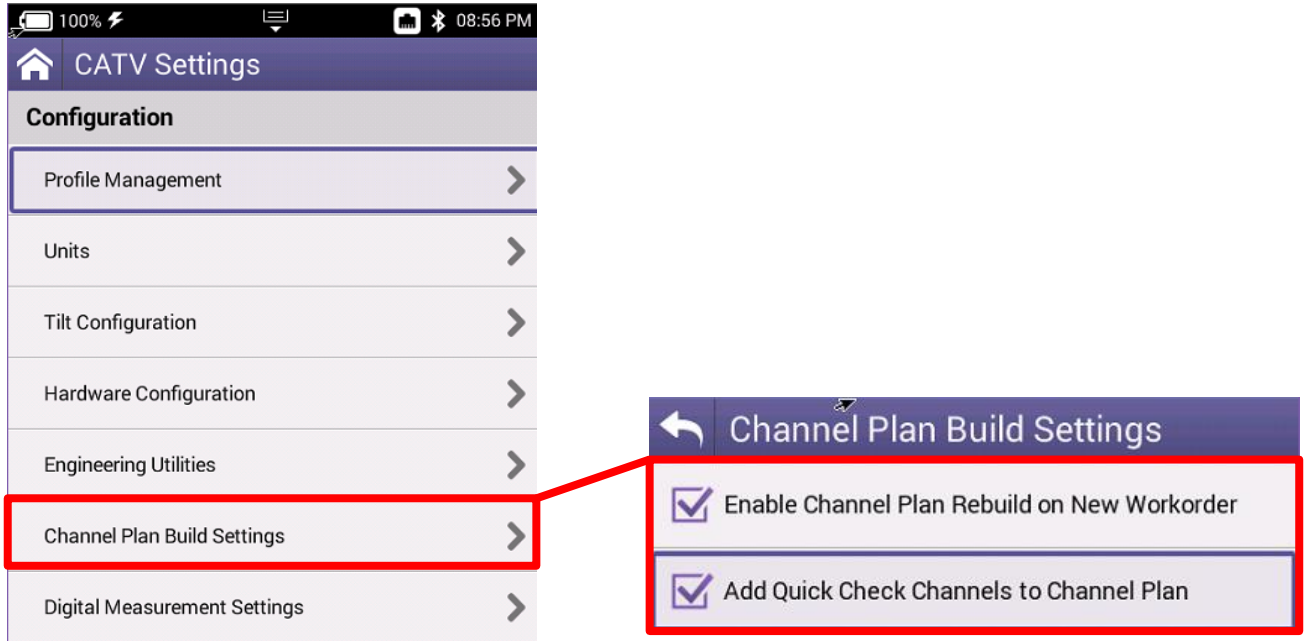
Advanced CATV Settings



Advanced CATV Settings



Advanced CATV Settings

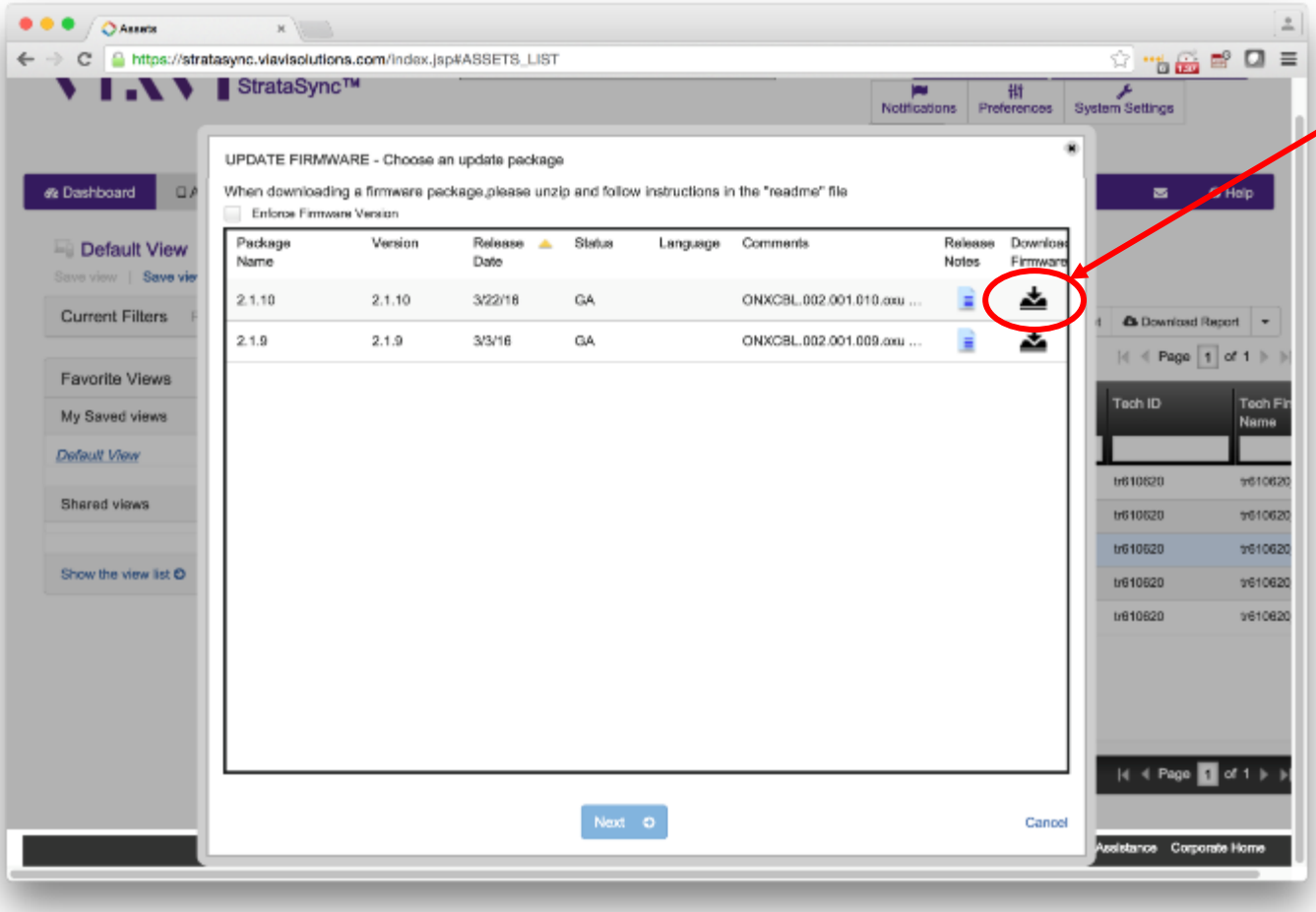


ONX CATV - SW Upgrade and Data Synchronization

ONX Software / Firmware Upgrades

- Software (SW) and Firmware (FW) releases are the best way to ensure your VIAVI OneExpert ONX is functioning at its best.
- VIAVI delivers SW and FW easily via **StrataSync** and **USB Stick**
- All ONX units should be upgraded to the latest production software release – available through StrataSync (or your Viavi representative)
- New SW Version offer substantial operational improvements and enhancements over earlier software releases including the version that shipped with the units initially.
- The software will be deployed to the units by the StrataSync Administrator, but each unit needs to be configured to connect with StrataSync.
- Follow these steps to ensure your meter is configured correctly and you can connect to StrataSync to receive the latest updates.

USB Upgrade Process

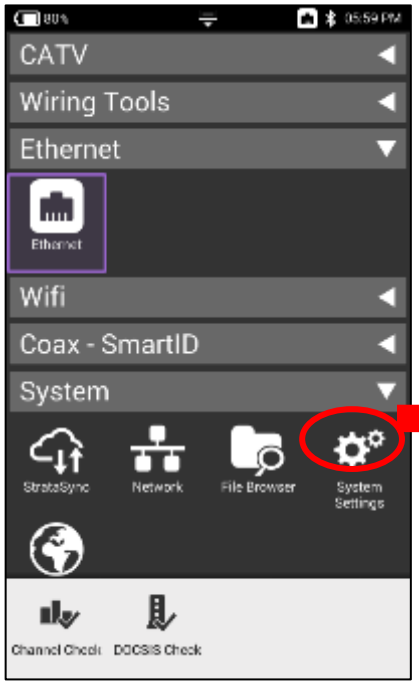


- Click here to download the newest firmware
- Copy the downloaded file ONXCBL.xxx.xxx.xxx.oxu to the root directory of a USB thumb drive.
- Press Cancel once the download has completed and you have placed the file on the USB thumb drive.

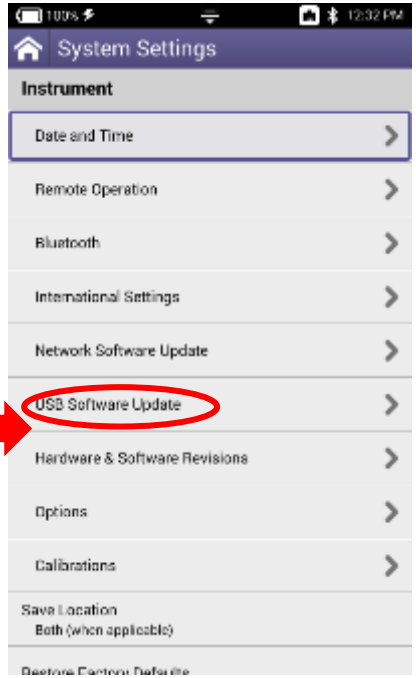
Note: Firmware must be downloaded from StrataSync first

USB Upgrade Process

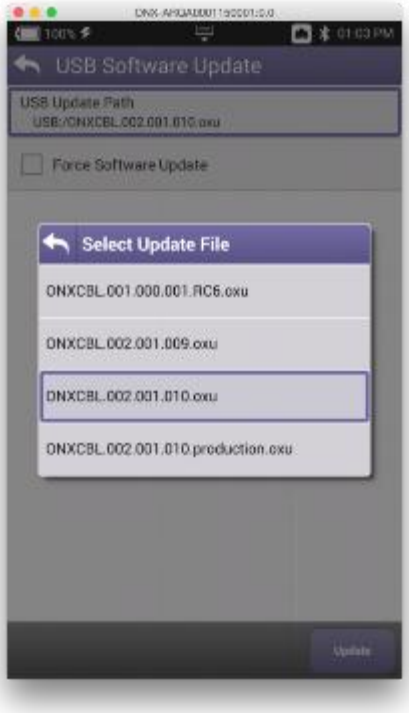
1) Insert the thumb drive into either USB port on the side of the ONX. Then start System Settings



2) Select USB Software Update

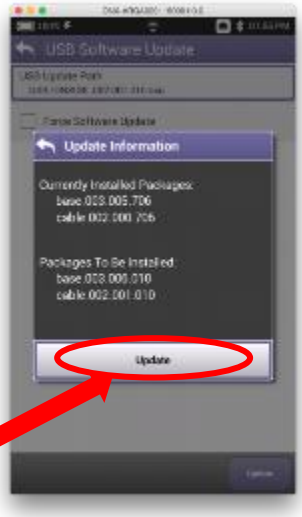


3) At the popup, select the firmware image you wish to select for upgrade.



4) Press Update to start the upgrade

5) Press Update to confirm and start the upgrade. The meter will power off when the update is complete.



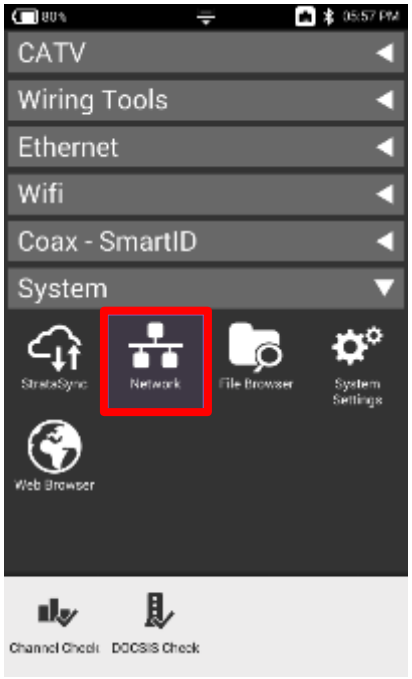
Note: Make sure you do not have an Ethernet cable plugged in when upgrading by USB

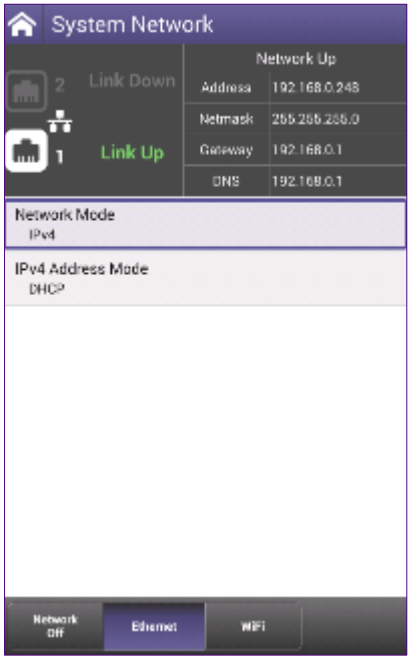
StrataSync Synchronization - ETHERNET

Note - You can synchronize to StrataSync via RF or WiFi, but this is ONLY for sending test files, receiving configuration information like limit plans, etc. - not for SW/FW upgrades

1) Connect an Ethernet cable from an active internet connection (Cable Modem or router/gateway) to Port 1 on the ONX

2) From the ONX home screen navigate to ***System Menu*** and select ***Network*** **-** Verify the ONX has a valid IP address*



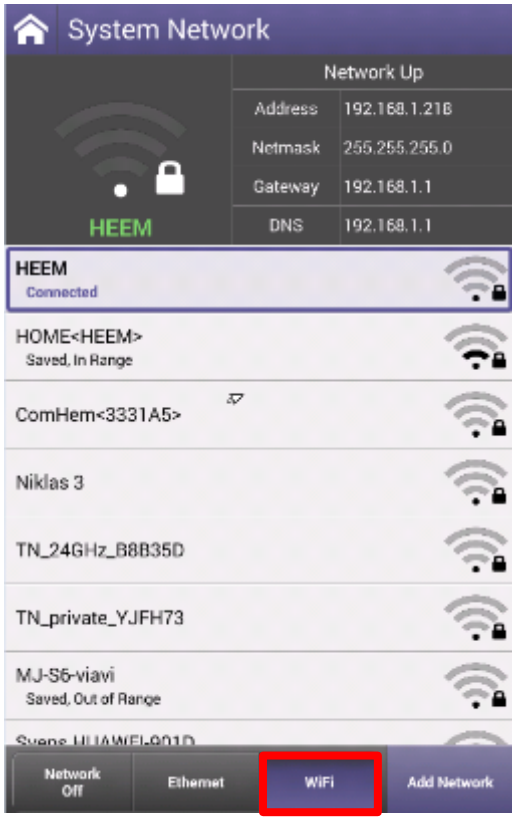


StrataSync Synchronization - WIFI

- Note - **Sync via WiFi** is now supported. Use Network Settings app to configure and join a WiFi network prior to performing sync. You can synchronize to StrataSync via WiFi, but this is ONLY for sending test files, receiving configuration information like limit plans, etc.

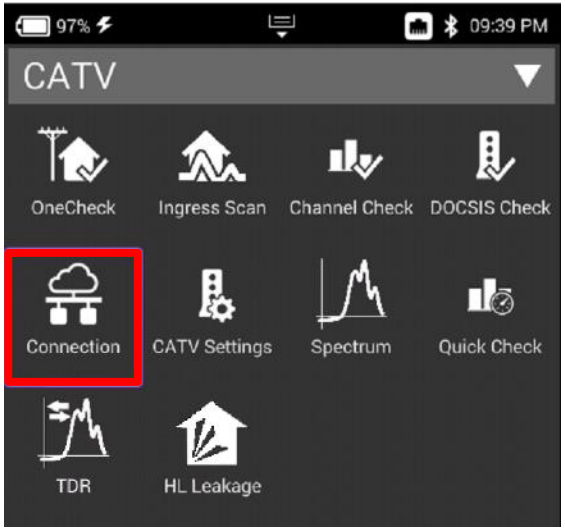
1) Connect with WiFi from an active internet connection (Cable Modem or router/gateway)

2) From the ONX home screen navigate to **System Network / WiFi-** Verify the ONX has a valid IP address

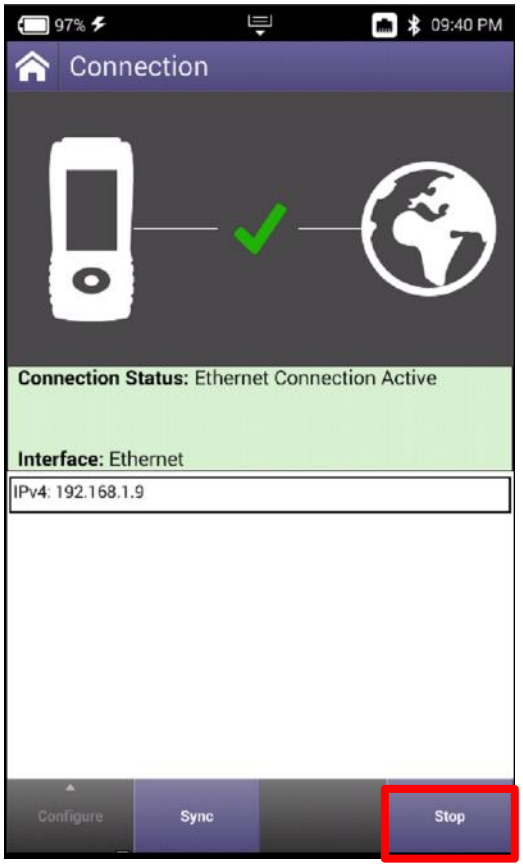


StrataSync Synchronization - RF

1) Make sure that CM MAC 1 is provisioned in the billing system
2) Select the CONNECTION APP from CATV



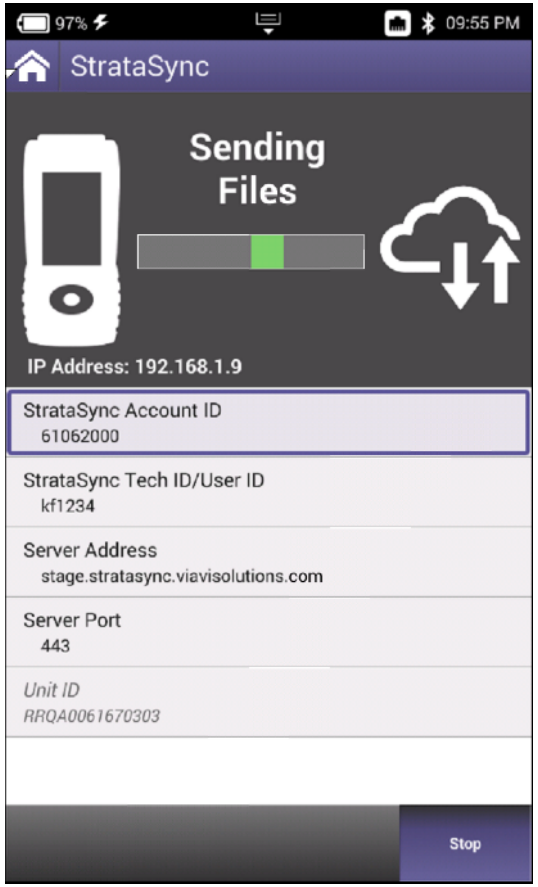
3) Once CONNECTION STATUS reports a GREN Check mark and INTERFACE: RF; IP ADDRESS is shown



StrataSync Synchronization – ETHERNET, WIFI and RF

1) After IP Address verification, navigate to the ***System*** Menu and select ***StrataSync***

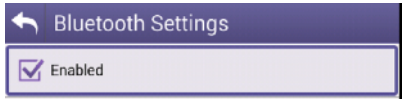
2) StrataSync Account ID = xxxxxxxxx
Server Address = stratasync.jdsu.com
(*stratasync.viavisolutions.com* also works)
Server Port = 443



StrataSync Synchronization – Mobile Tech App

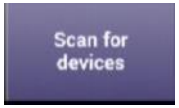
- Download VIAVI MOBILE TECH v2 app

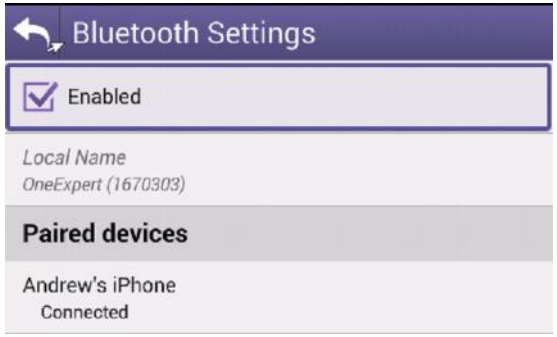
- On ONX620 or 630, enable BLUETOOTH by going to SYSTEM SETTINGS->BLUETOOTH SETTINGS



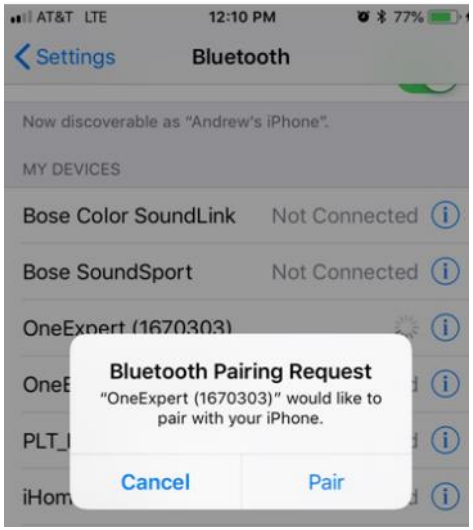
StrataSync Synchronization – Mobile Tech App

- Select SCAN FOR DEVICES, select mobile phone and PAIR mobile phone to ONX





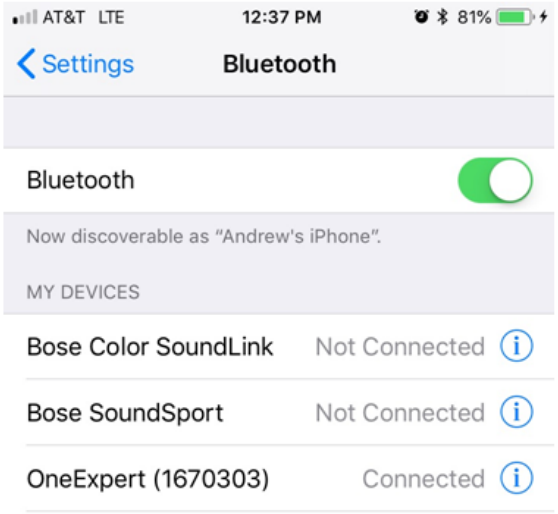
- Accept the PAIR request on the mobile phone



StrataSync Synchronization – Mobile Tech App

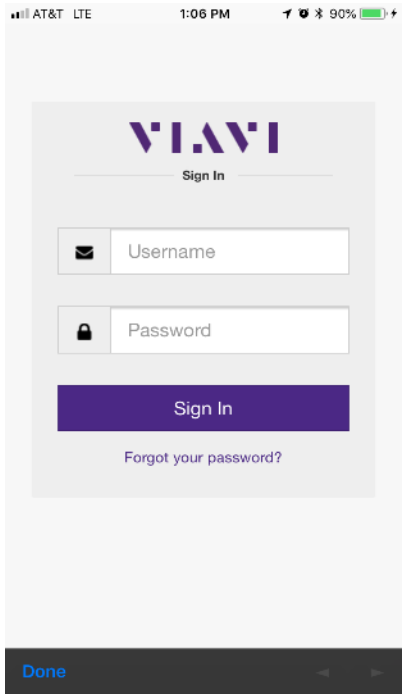
- Open VIAVI Mobile Tech app

- Connect to ONX now identified in BLUETOOTH SETTINGS on mobile phone



StrataSync Synchronization – Mobile Tech App

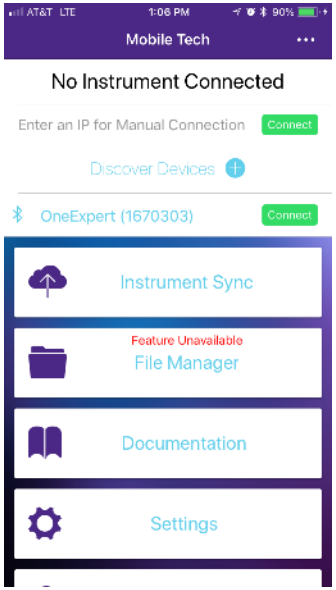
- LOGIN using STRATASYNC LOGIN and PASSWORD credentials. If user doesn't have login credentials – please reach out to local STRATASYNC ADMINISTRATOR

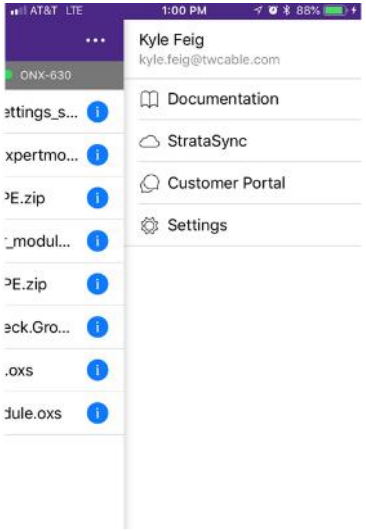


StrataSync Synchronization – Mobile Tech App

- Select the *** in the upper right-hand corner for SETTINGS

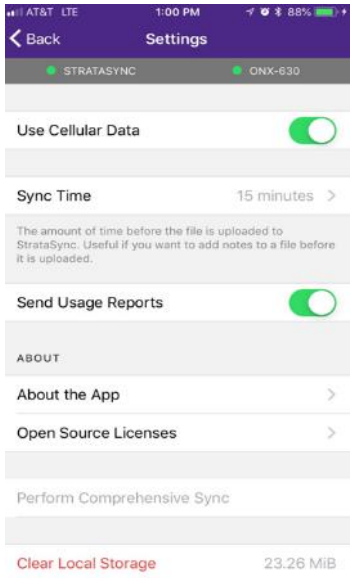
- If ONX is not connected, choose CONNECT



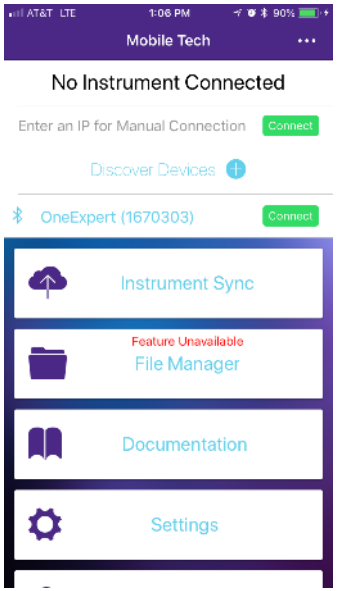


StrataSync Synchronization – Mobile Tech App

- In SETTINGS, users can select the number of minutes between automatic SYNCRONIZATION of test data

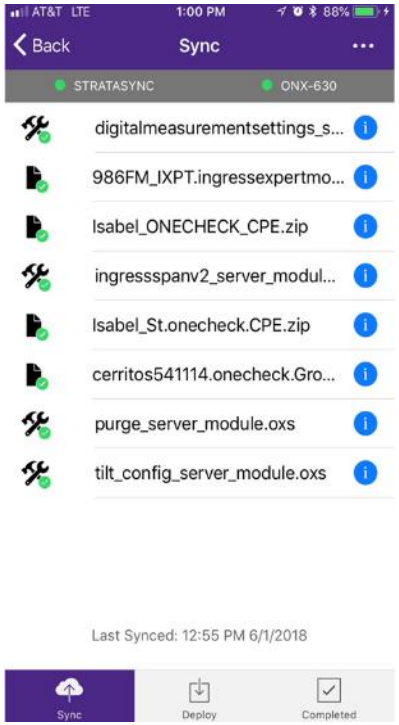


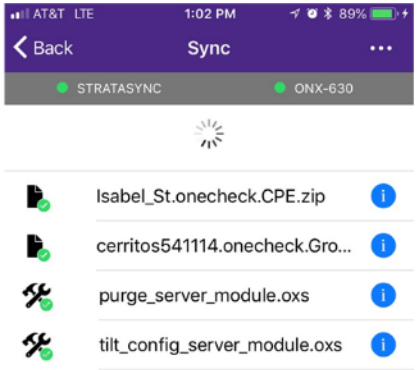
- Return to the main screen and select INSTRUMENT SYNC



StrataSync Synchronization – Mobile Tech App

- Once saved on ONX, the test data will appear in the SYNC folder and will automatically sync to STRATASYNC at the chosen time interval. The sync from MOBILE TECH to STRATASYNC will occur regardless of whether the tech views this screen
- Test data will appear in STRATASYNC after a few minutes (3-5 minutes based on the number of files)



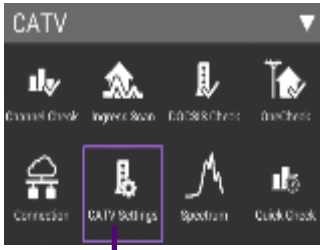


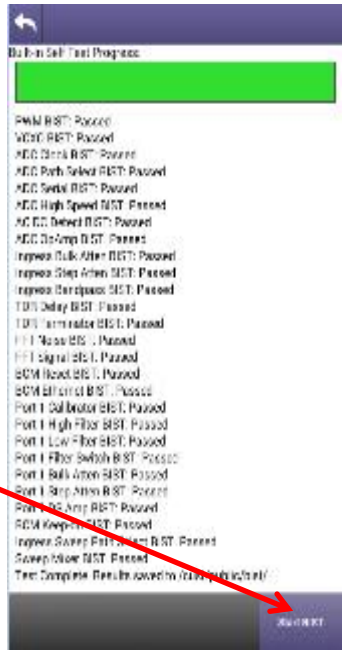
ONX CATV - Engineering Mode

ONX Engineering Mode and Build-in Self Test (BIST)

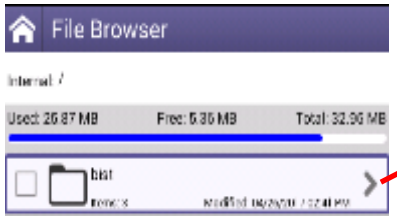
Enable Engineering mode and run a BIST:
Enable Demo mode:

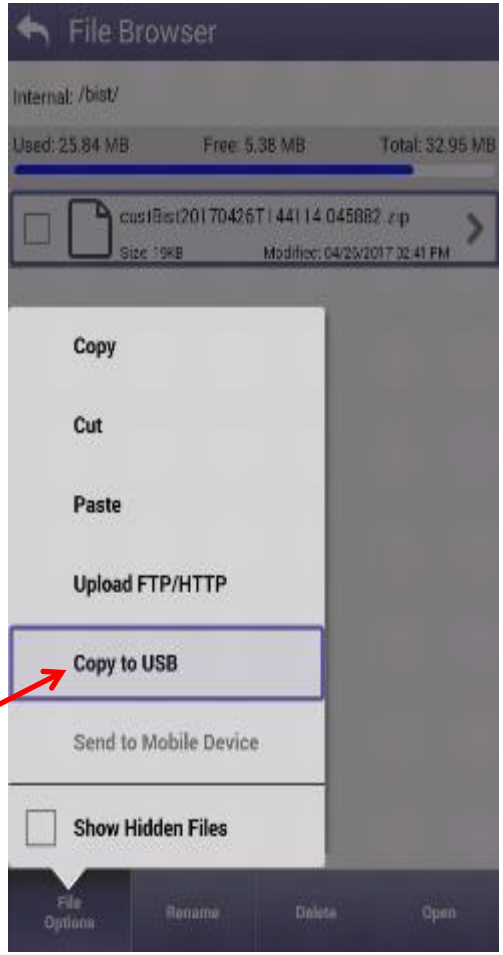
1. Turn the unit off
2. Press and hold the Tray key
3. Press and release the Power On key
4. Hold the Tray key until the top four LEDs are orange (takes about 3 secs)
5. Release the Tray key
6. In CATV settings select Engineering Utilities
7. Select “Built-in Self Test” and Start BIST :





8. Go to File Browser and copy the custBist*.zip file to a plugged USB memory stick :

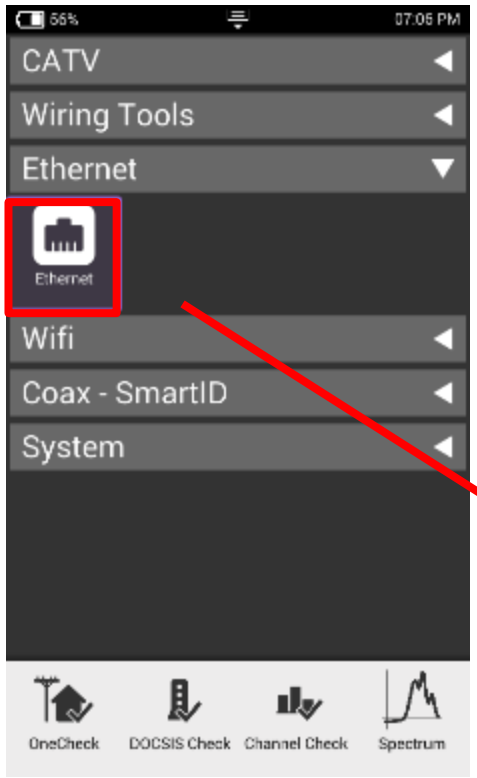


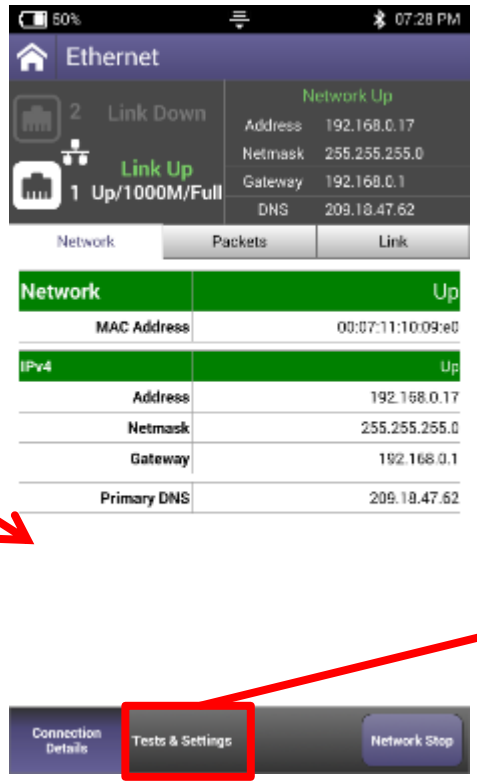


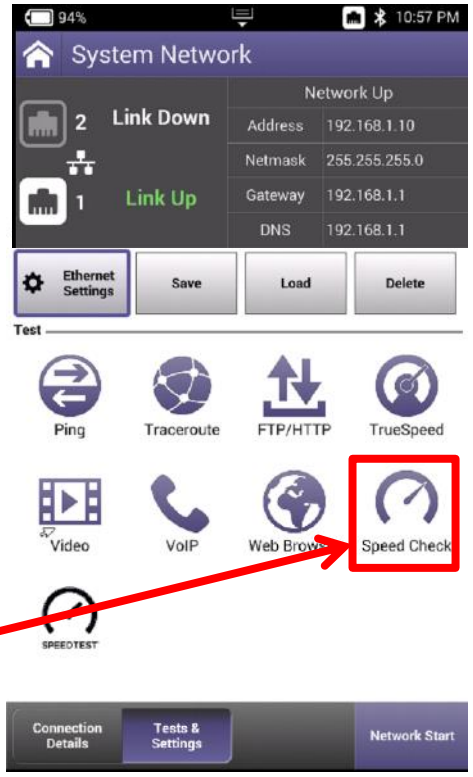
Ethernet Testing

Ethernet – Tests and Settings

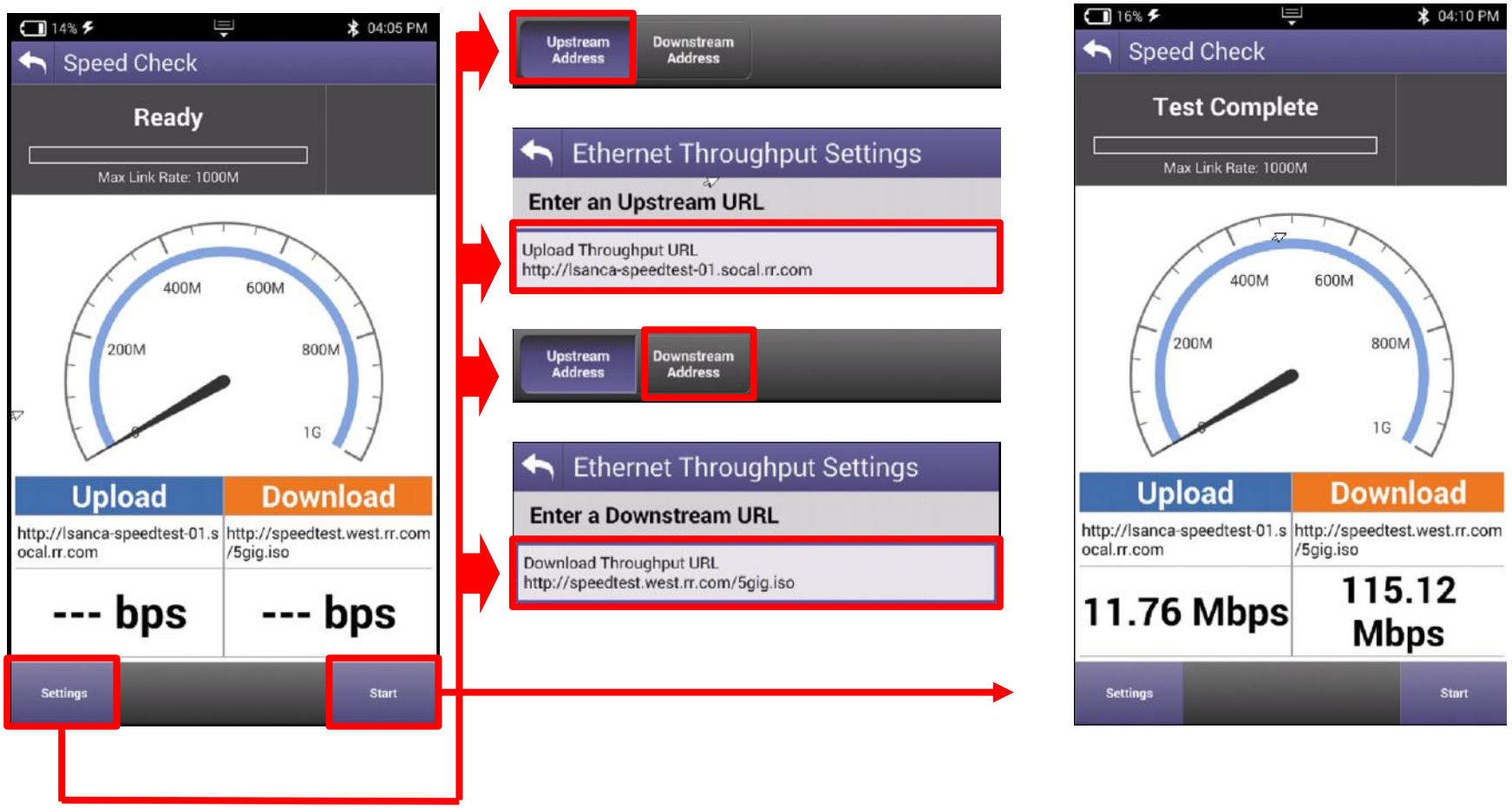
- From Home Screen, select Ethernet
- Once Network Up is indicated with green, select Test and Settings





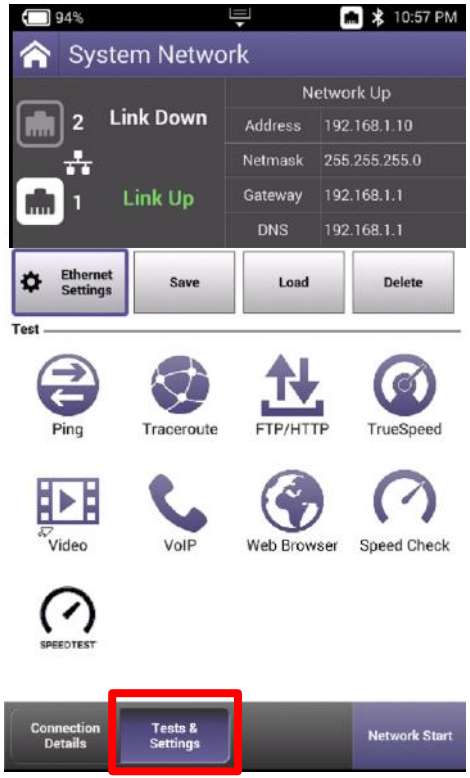


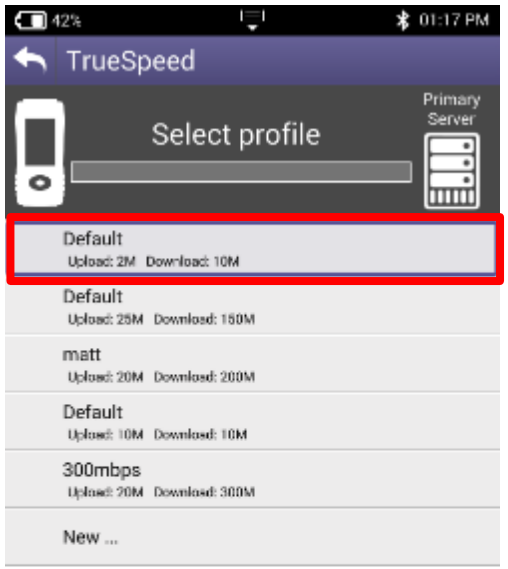
Ethernet – Speed Check

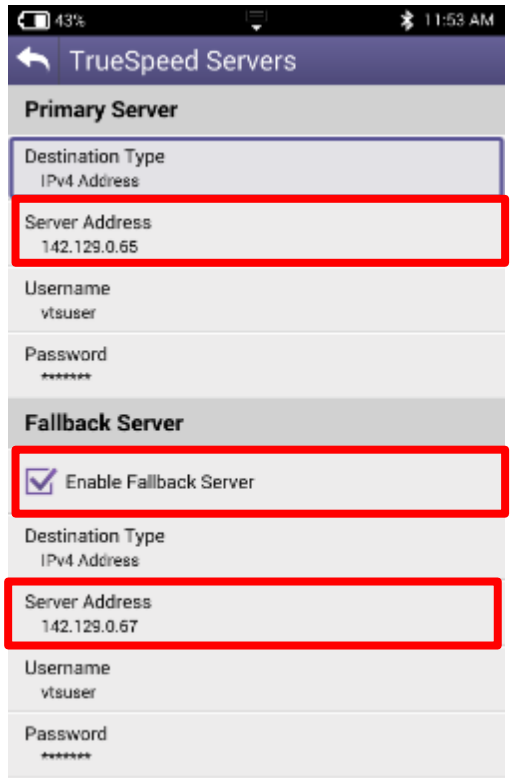


- CATV Ethernet's throughput IP Address/URL is configured in the mode under Settings.
- Default value are for both Downstream/Upstream the same: http://CATVSpeedTest.viavisolutions.com/bigfile.zip
- If the upstream URL changes, the file name need to be the same: bigfile.zip

ETHERNET - TrueSpeed Setup



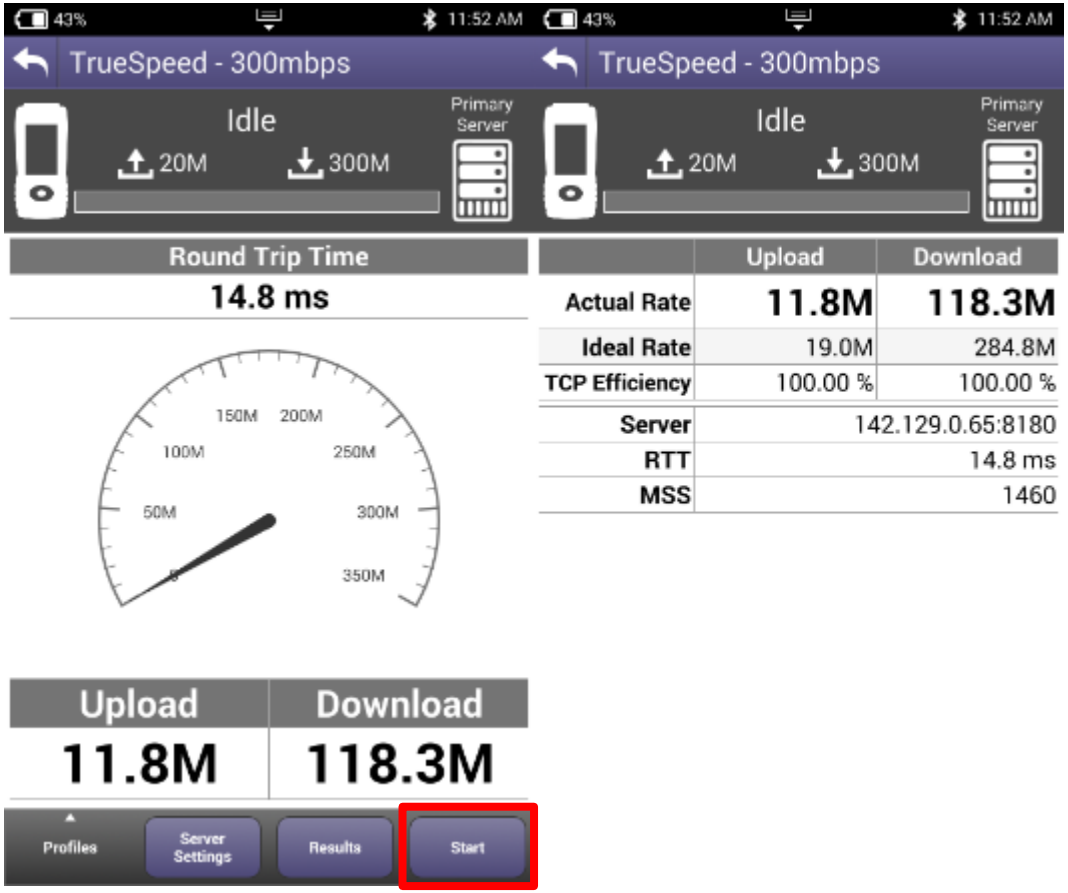




- Select Profile or create a new one
- The test will start automatically after Profile is selected.
- Stop Test and choose Server Settings on the bottom and enter the Server IP address and then resume. (Only applicable for first test setup)
- Fallback Server is for second TrueSpeed VNF and can help alleviate queue

ETHERNET - TrueSpeed Results

- After test completes, Results are displayed as either the Speedometer or a simple list



CATV Measurements

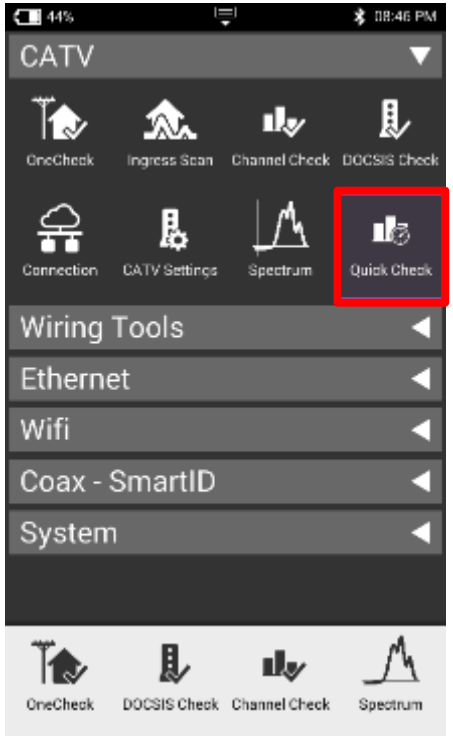
- QuickCheck
- Ingress Scan
- Spectrum
- TDR
- HL Leakage
- OneCHECK

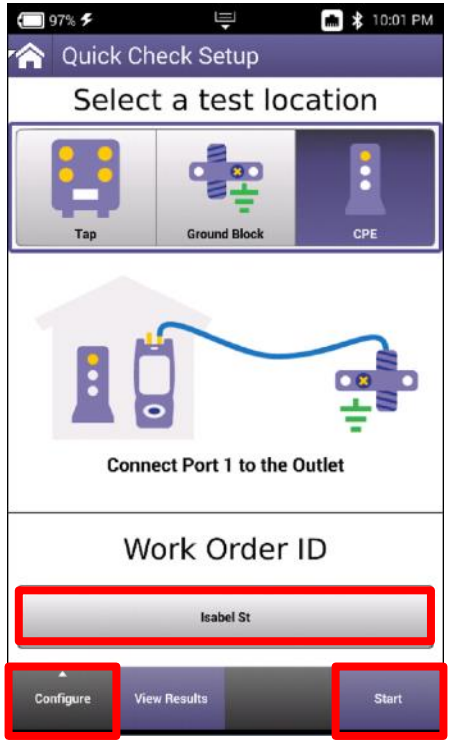
CATV Measurements – QuickCHECK

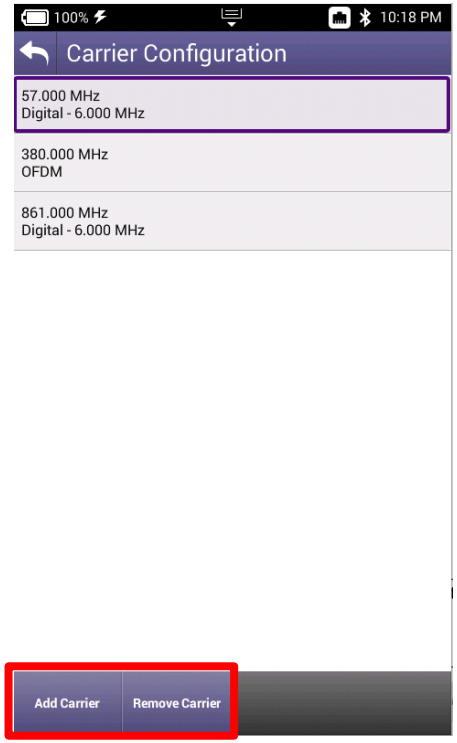
QuickCHECK Setup

Use **QUICKCHECK** to see a small number of manually added channels and quickly determine if signal is present as well as SYSTEM TILT

- Enter WORK ORDER ID and choose demarcation point and press Start
- Navigate the Results Screen (shown to the right) using touchscreen or Directional Buttons

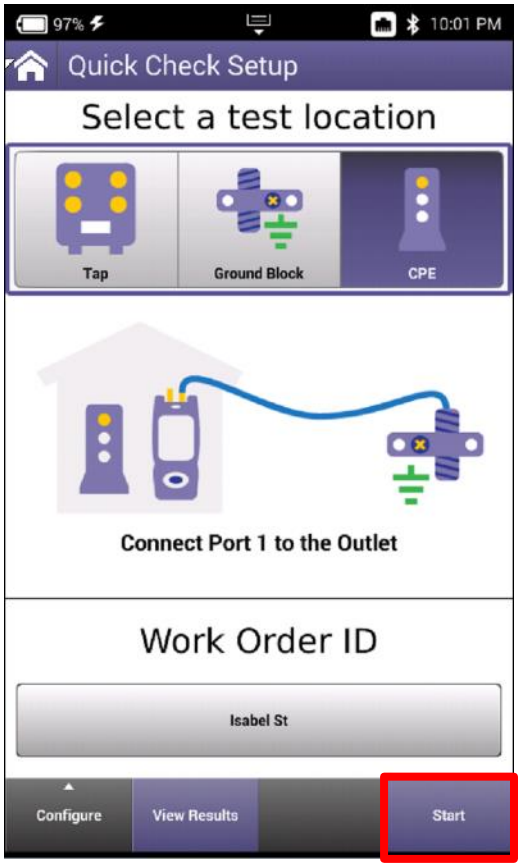


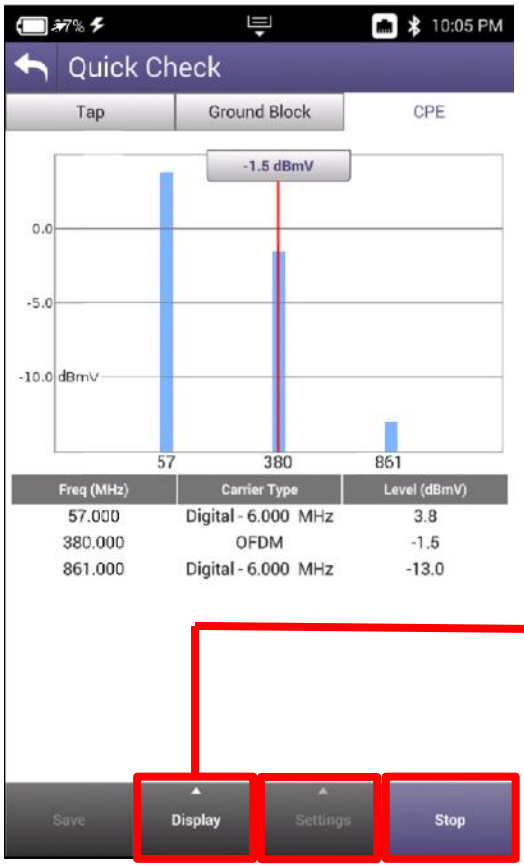


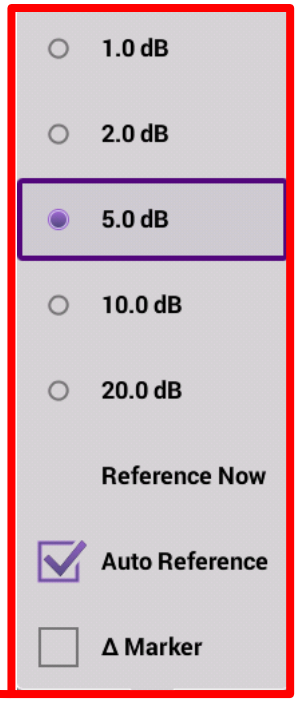


- Add/remove frequency and type of carrier

QuickCHECK Results and Settings





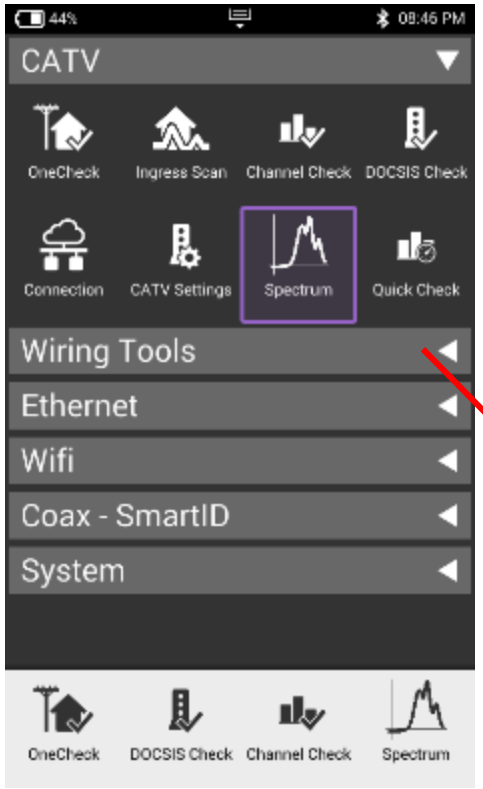


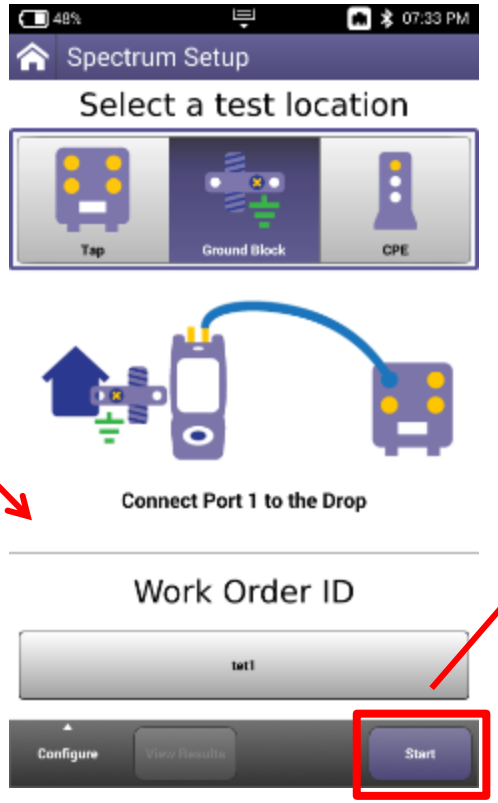
- Select REFERENCE NOW for auto reference based on level and AUTO REFERENCE to rely on AGC for adjustment when removing or plugging in test jumper to power

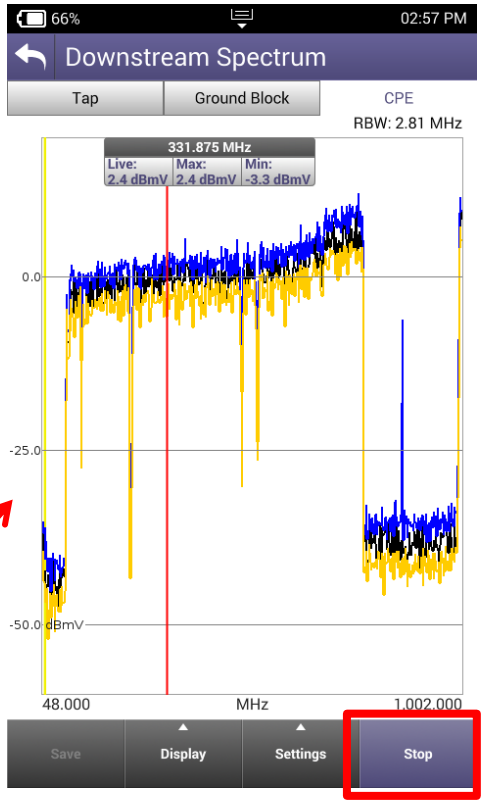
CATV Measurements - Spectrum

Spectrum Setup

- Enter Work Order ID and choose proper demarcation point
- Navigate the Results Screen (shown to the right) using touchscreen or Directional Buttons

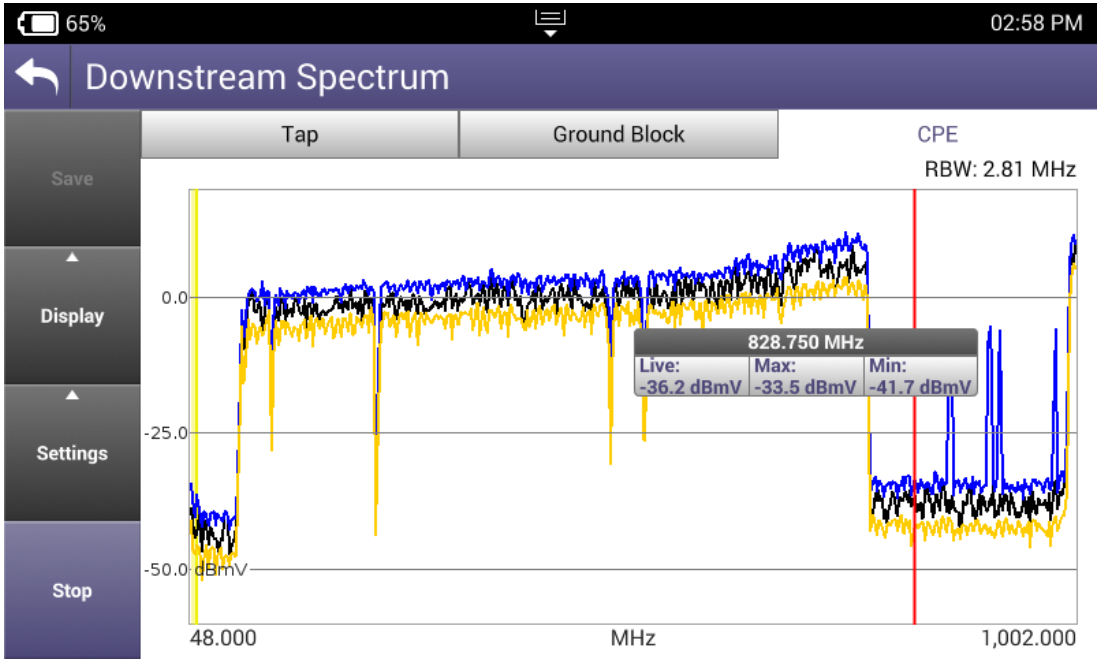






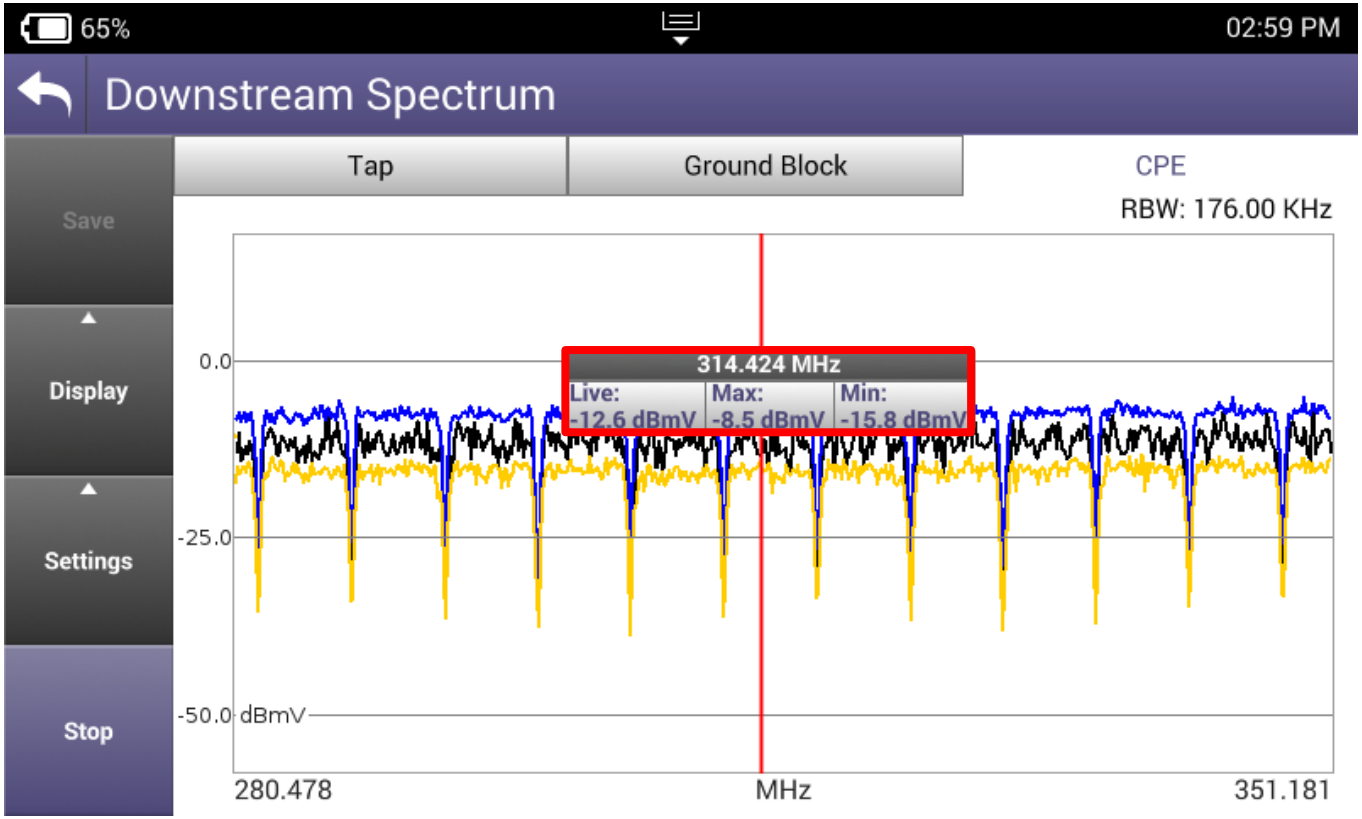
Spectrum Results

- Navigate the Results Screen (shown to the right) using touchscreen (pinch and pull like tablet or smart phone) or Directional Buttons
- Choose Display to change to landscape view or manually change graph division size, span and toggle Live/Max and Min traces
- Choose Settings to change RBW and AGC settings



Spectrum Results

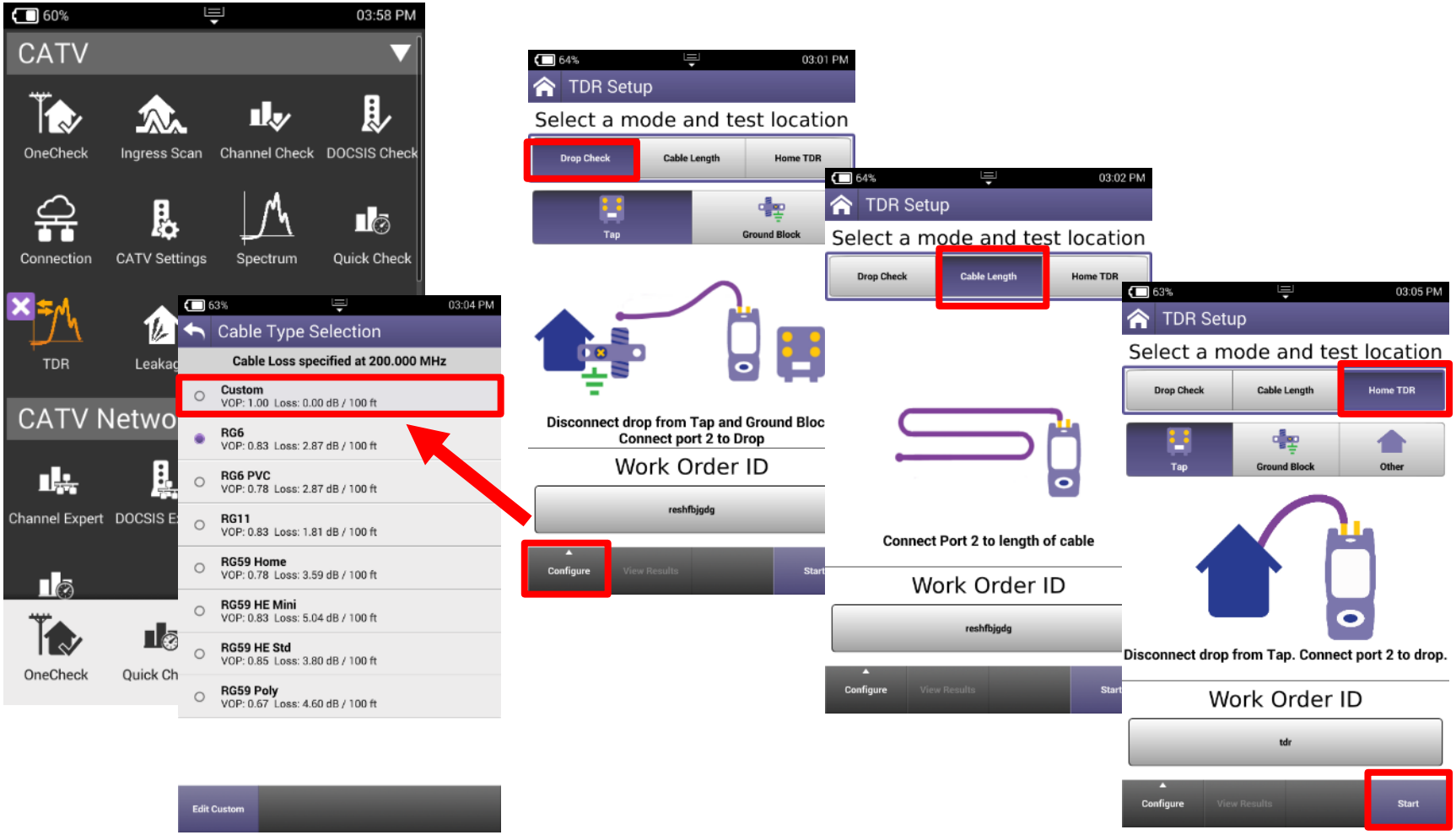
- Drag or use Directional buttons to move marker
- Double tap on the marker to display Delta between second marker which will appear



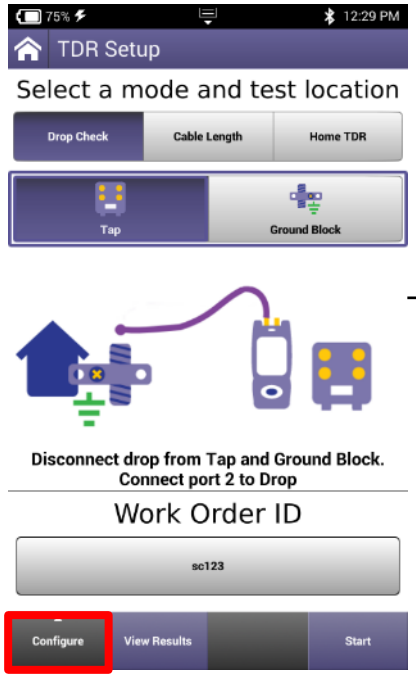
CATV Measurements - TDR

TDR

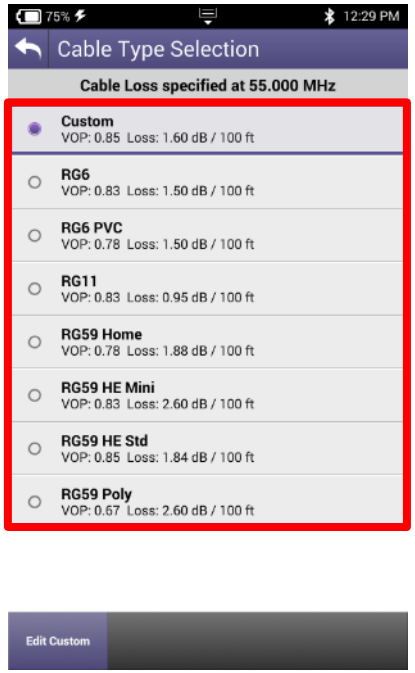
- TDR function will allow users to set the Velocity of Propagation (VoP) in various cable types
- Connect to PORT 2 to take TDR traces, selecting the proper demarcation point



HOME TDR



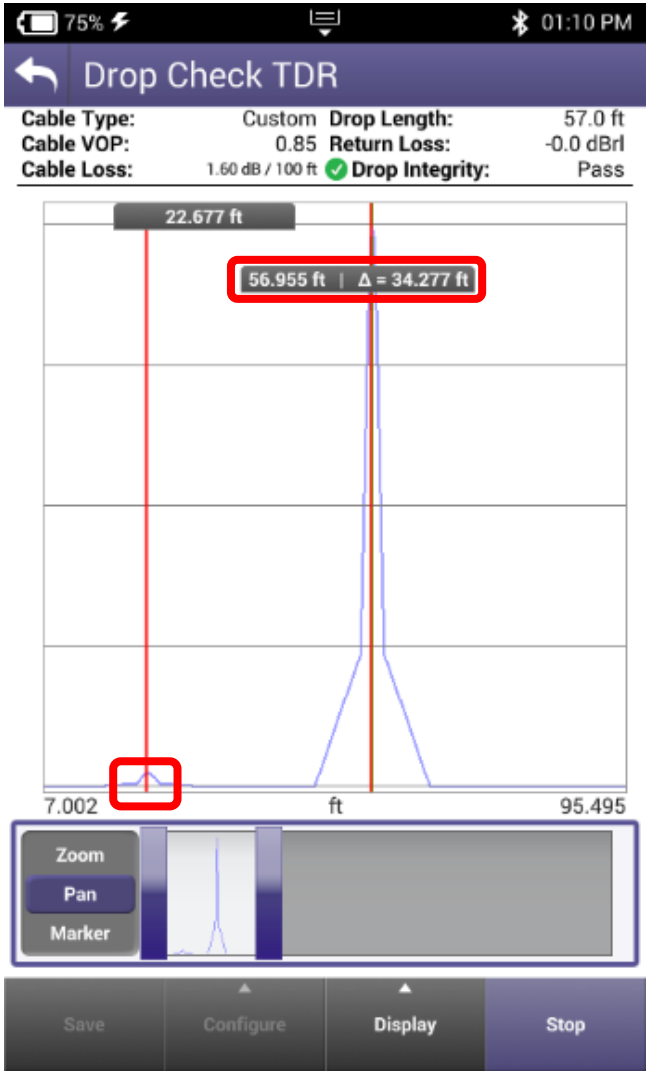
TDR Setup



VoP Configuration

- A TDR measures reflections based on time. Therefore the correct Velocity of Propagation for the cable to be tested must be chosen first.
- VoP is essential for accurate distance measurements

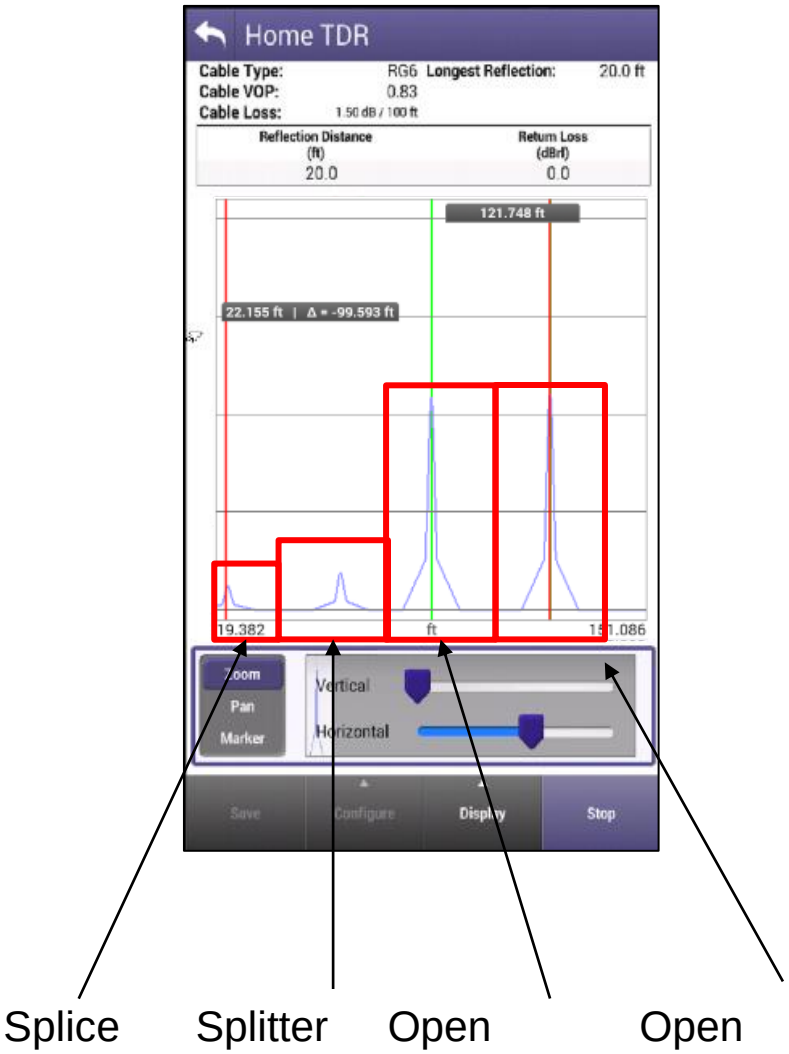
TDR – DROP CHECK and CABLE LENGTH



Splice

- DROP CHECK and CABLE LENGTH tabs are identical tests. The DROP CHECK simply reminds the user to disconnect the other end of the drop.
- Displayed is a 57’ cable with a splice.
- The splice is a small reflection at 22’ while the open end of the cable is a larger reflection at 57’.

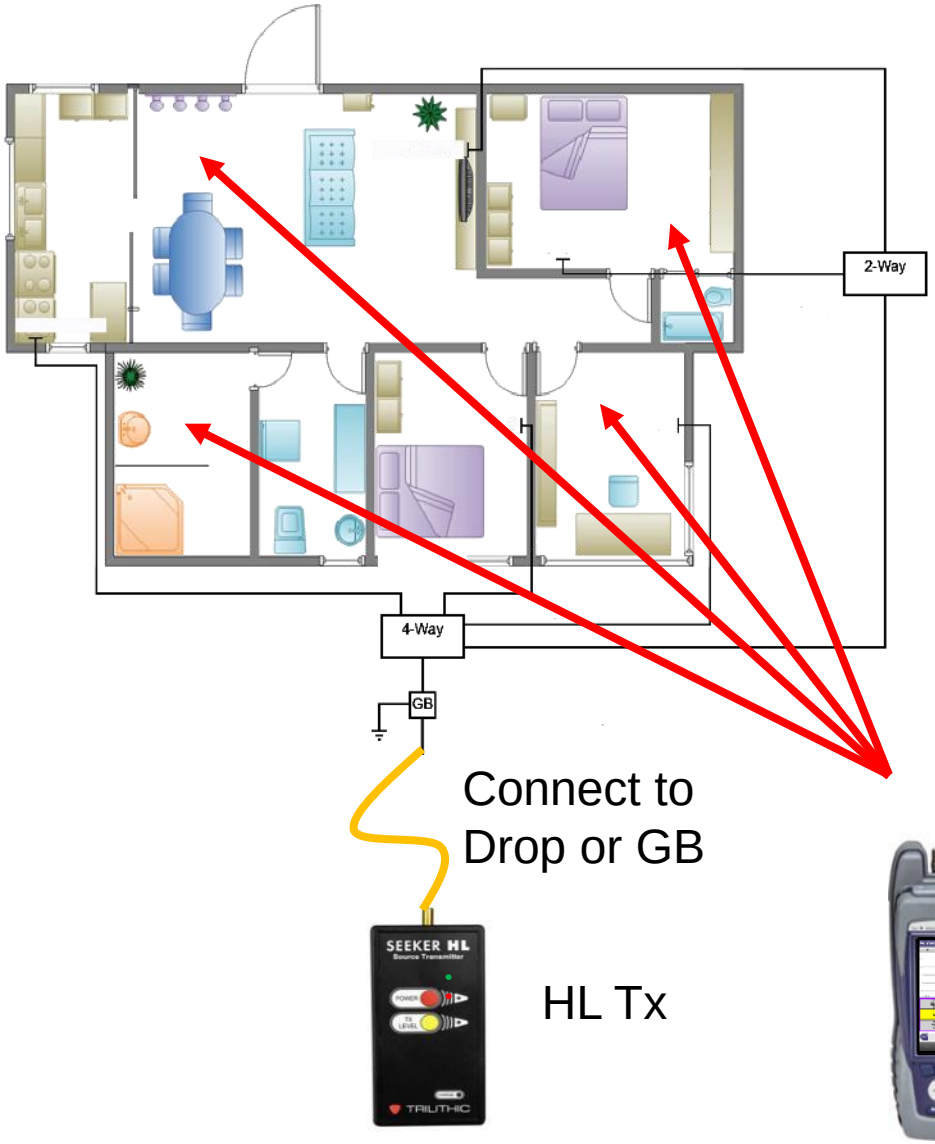
TDR - HOME TDR



- HOME TDR test is designed to display splices, splits and cable lengths.
- Example to the left still shows the splice at 22’ with a splitter at 57’and 2 cables connected to the splitter with open ends.
- HOME TDR displays all 4 events.
- Markers can be added for relative distances under from the display button.
- Horizontal Zoom and Pan functions are at the bottom of the display

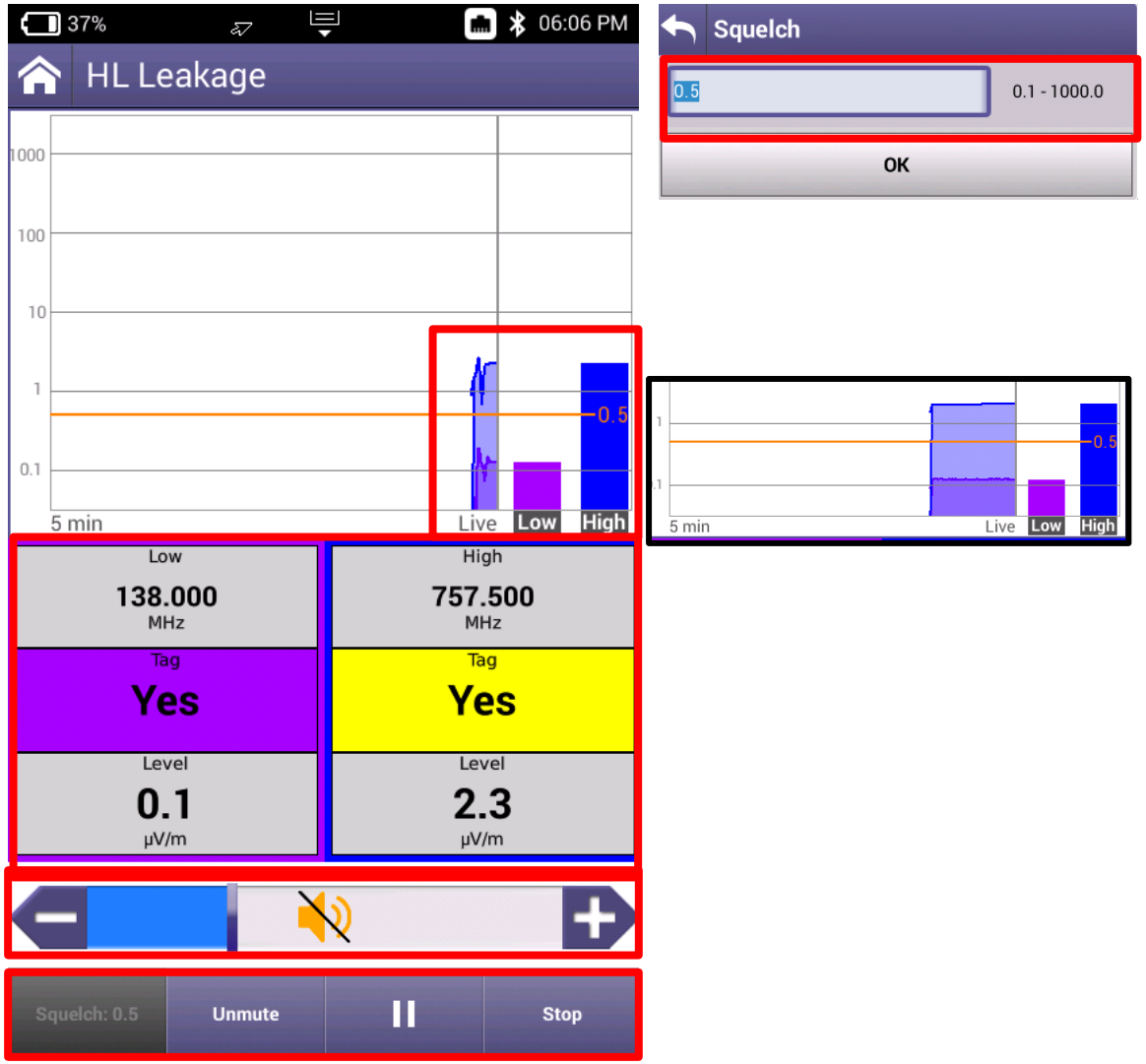
CATV Measurements - HL Leakage with Transmitter

HL LEAKAGE Option with Transmitter



- Connect HL TRANSMITTER to GB or DROP and turn unit on.
- Proceed to attach ANTENNA to ONX Port 1 and walk around the home or business
- Required Equipment Includes:
  - ONX-620 or ONX-630 with DOCSIS 3.1 hardware
  - HL Leakage software option must be present on the ONX
  - HL Leakage Transmitter (60dBmv output [RED LIGHT] and 40dBmv output [GREEN LIGHT])
  - HL Leakage Antennas
    - 4a) Dual band rubber duck antenna
    - 4b) Near-Field Probe antenna
    - Used for detecting leaks when attached to ONX
    - Tuned for 138MHz and 757.5MHz

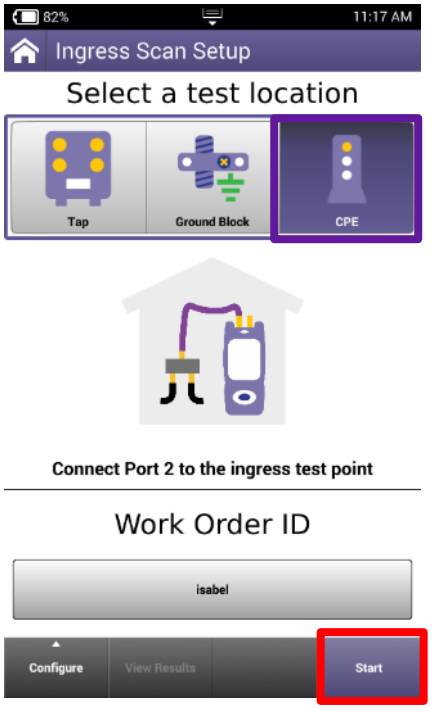
HL Leakage Option with Transmitter

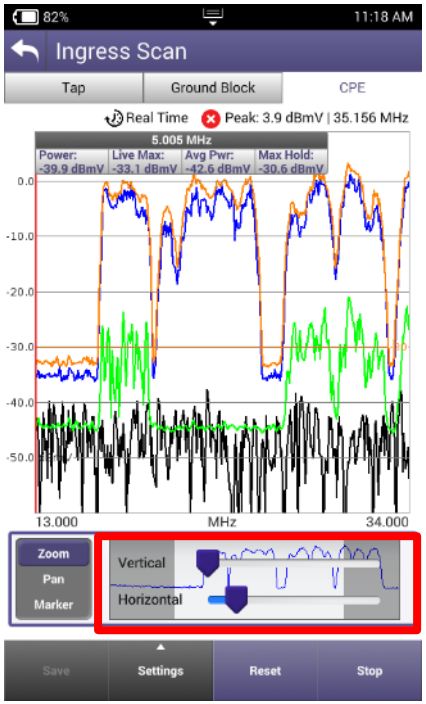


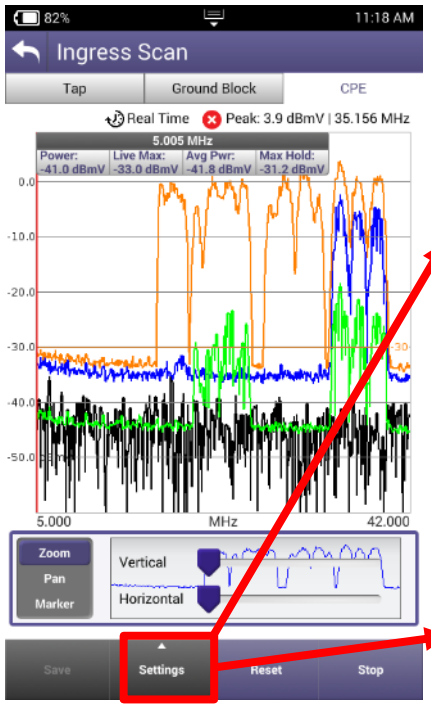
- Leaks will be shown over time on the HL LEAKAGE display, while also emitting a siren that will signal proximity to leak
- MUTE or UNMUTE and VOLUME controls as well as PAUSE and STOP/RETEST will be displayed across the bottom
- Since HL Leakage is LIVE, select STOP before adjusting the SQUELCH limit
- Test will run for 5 mins before restarting

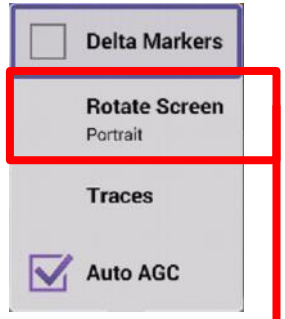
CATV Measurements – Ingress Scan

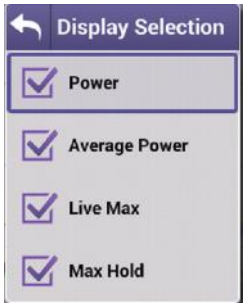
Ingress Scan

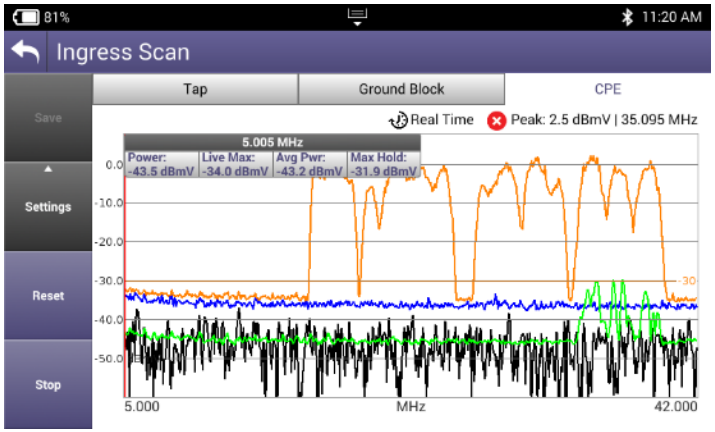










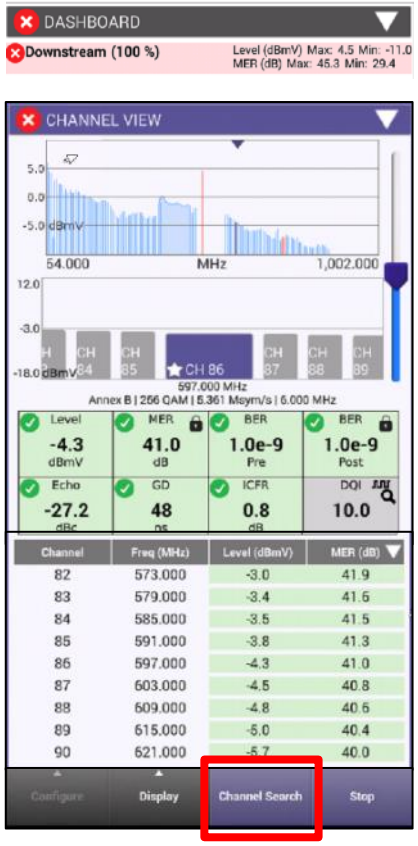


CATV Measurements – Channel CHECK

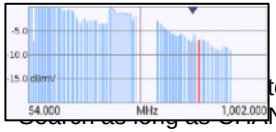
Channel CHECK - DASHBOARD

- Dashboard gives an overall status on the test. Because Channel Check is LIVE, measurements will continue to update once the dashboard
- Max and Mins are displayed for MER(dB) and Level (dBmV)

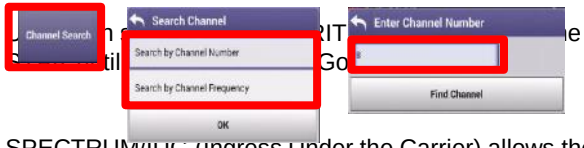
Channel CHECK – CHANNEL VIEW and INGRESS UNDER THE CARRIER



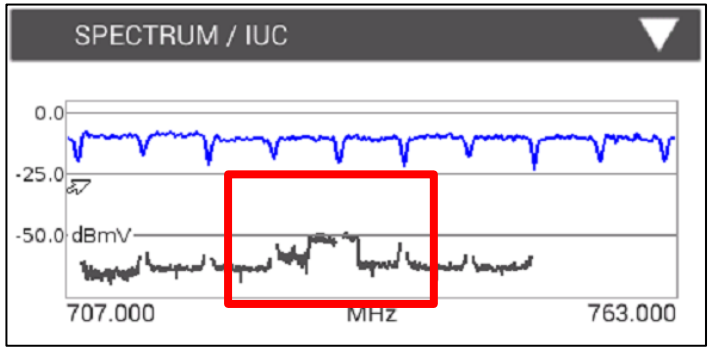
- CHANNEL VIEW allows the user to view the Fullscan, with any measurements failing the threshold represented in RED and all measurements passing the thresholds represented in GREEN

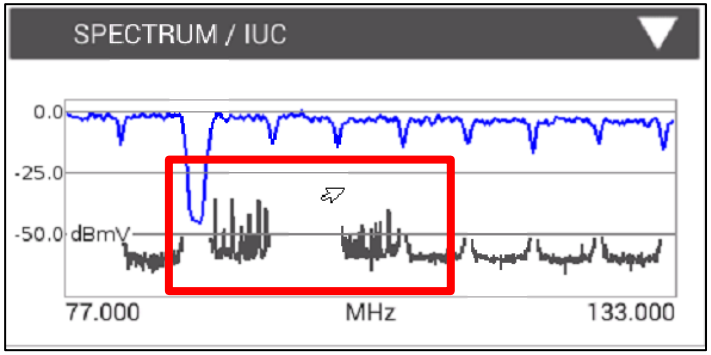


- touchs el
  NNEL VIEW is selected in BLUE

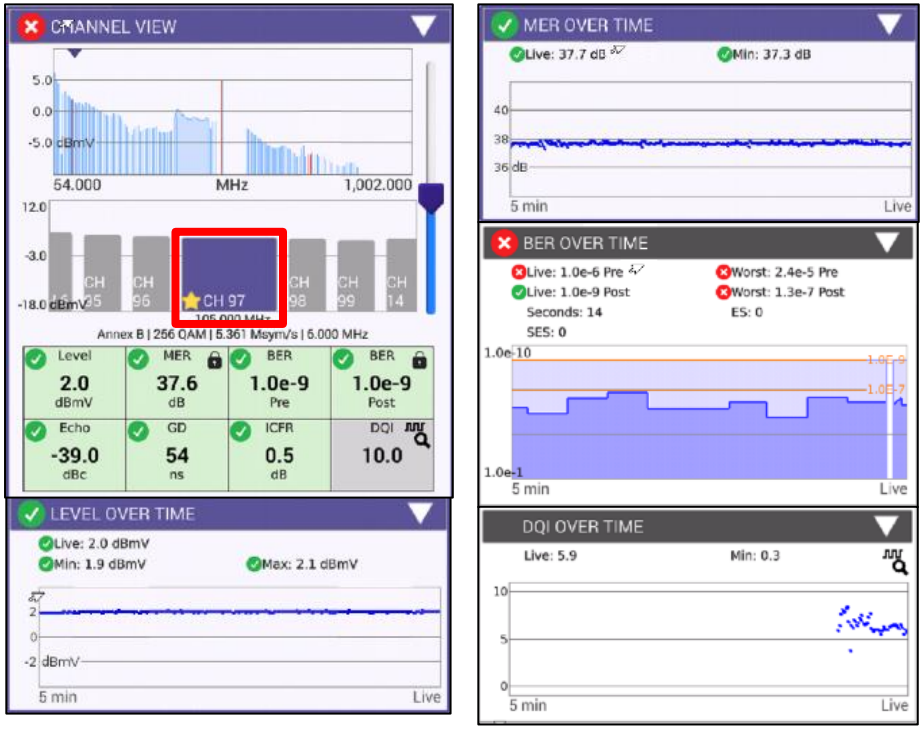


- SPECTRUM/IUC (Ingress Under the Carrier) allows the user to view ingress under the selected and adjacent QAM carriers.
- s below are real world LTE Ingress and FM

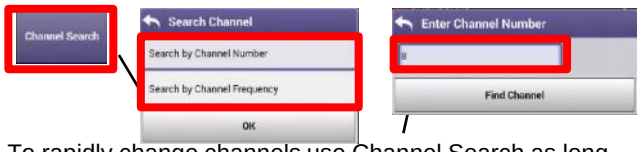




Channel CHECK – OVER TIME MEASUREMENTS

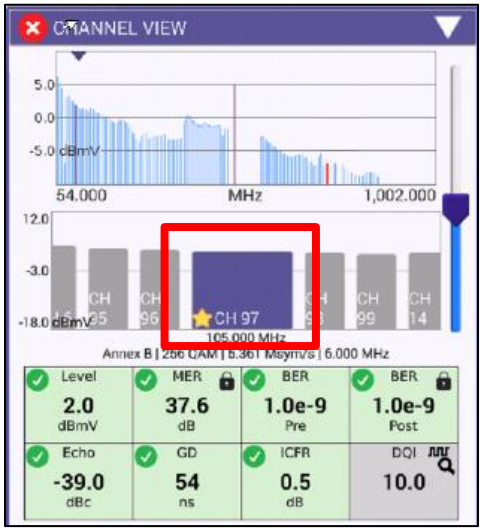


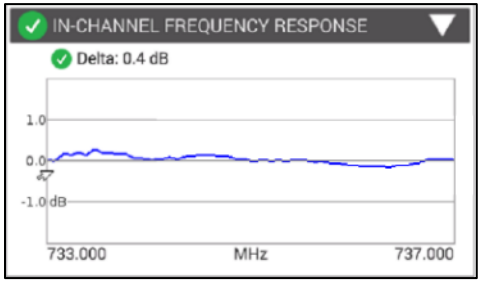
- Level OVER TIME, MER OVER TIME, BER OVER TIME on all channels in the background and DQI OVER TIME measured on the channel selected in CHANNEL VIEW. These measurements will continue until and be displayed over the last 5 minutes until the measurement is stopped



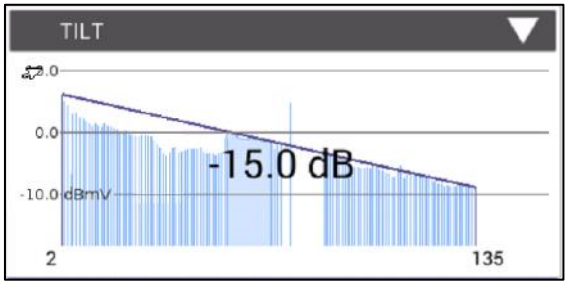
- To rapidly change channels use Channel Search as long as CHANNEL VIEW is selected in BLUE

Channel CHECK – ICFR, TILT and SMARTSCAN

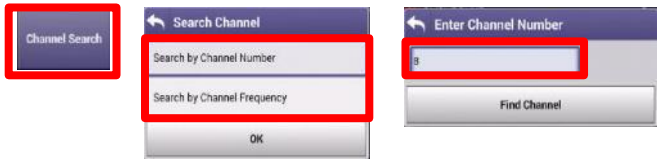


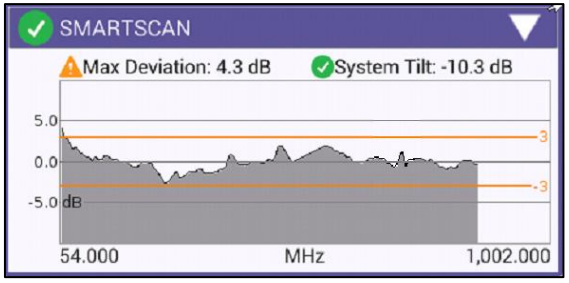


- IN-CHANNEL FRQEUENCY RESPONSE of the specific carrier selected in CHANNEL VIEW and will continue until stopped
- TILT of the Fullscan, TILT channels can be toggled in CATV SETTINGS
- SMARTSCAN offers a raw frequency domain response of the Fullscan and measures against a defined thresholds for deviation and tilt



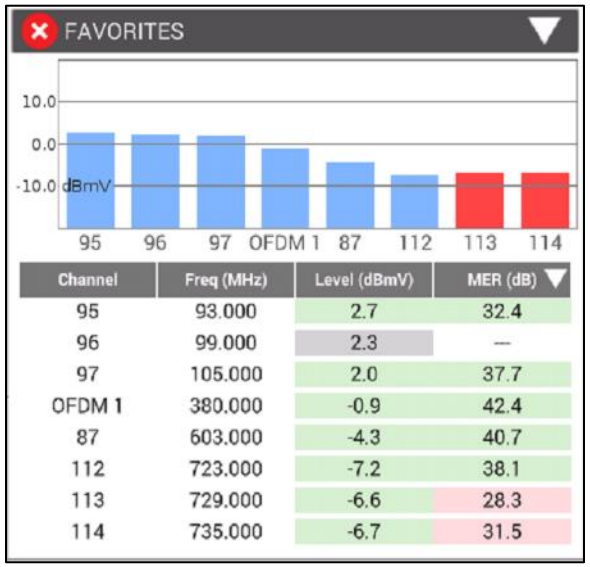
- To rapidly change channels use Channel Search as long as CHANNEL VIEW is selected in BLUE



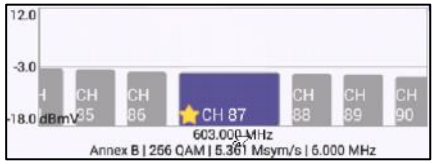


Channel CHECK - FAVORITES

- FAVORITES is a user defined MINISCAN
- Select favorites channels by highlighting the Gold Star on desired channels in CHANNEL VIEW

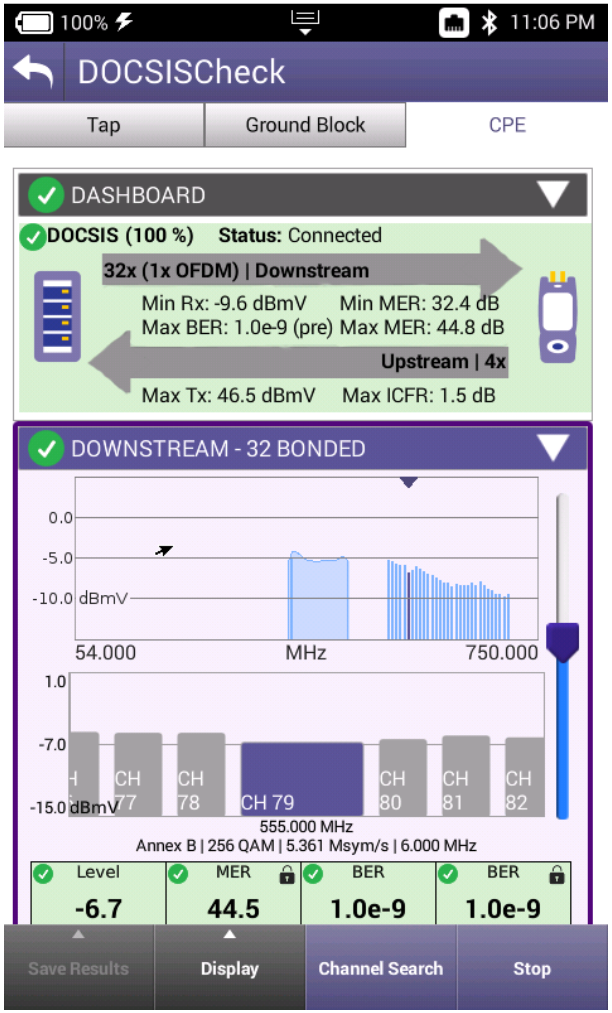


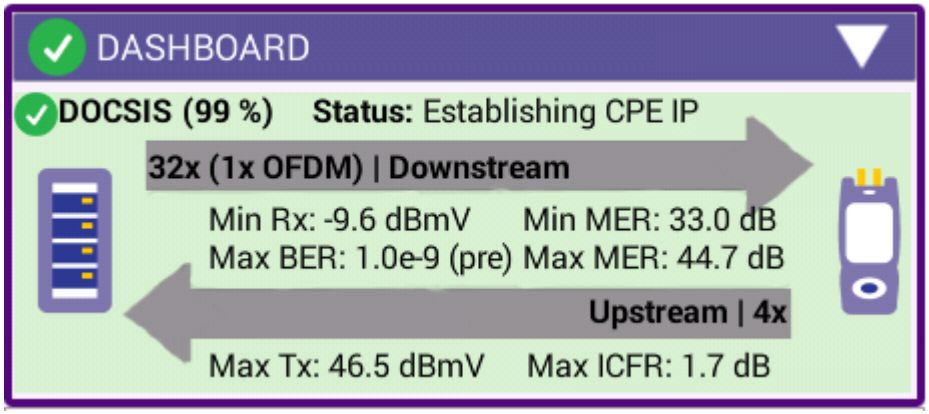
Channel	Freq (MHz)	Level (dBmV)	MER (dB)
95	93.000	2.7	32.4
96	99.000	2.3	---
97	105.000	2.0	37.7
OFDM 1	380.000	-0.9	42.4
87	603.000	-4.3	40.7
112	723.000	-7.2	38.1
113	729.000	-6.6	28.3
114	735.000	-6.7	31.5



CATV Measurements – DOCSIS CHECK

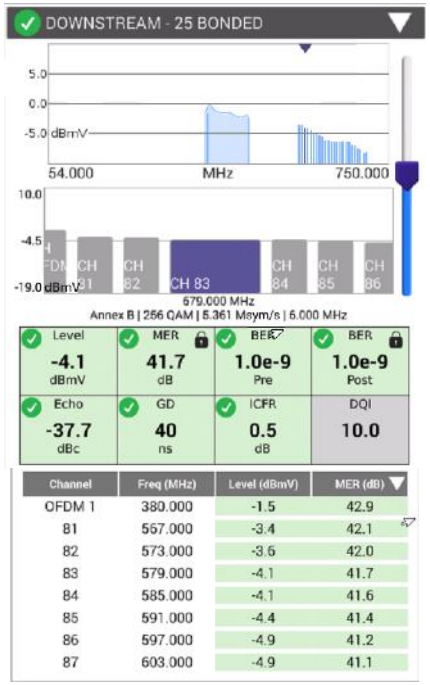
DOCSIS CHECK- DASHBOARD



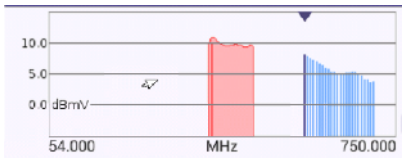


- Dashboard gives an overall status on the test. Because DOCSIS CHECK is LIVE, measurements will continue to update once the dashboard indicates 100%
- Downstream measurements displayed include Max and Mins for MER(dB) and Level (dBmV) and MAX Rx
- Upstream measurements displayed include MAX Tx and MAX ICFR

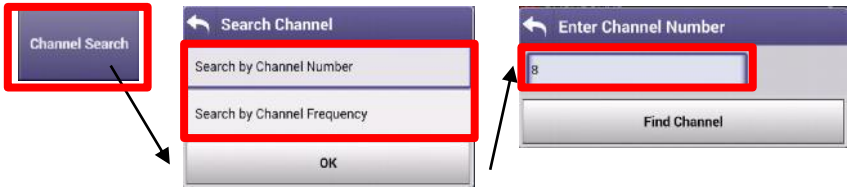
DOCSIS CHECK – DOWNSTREAM



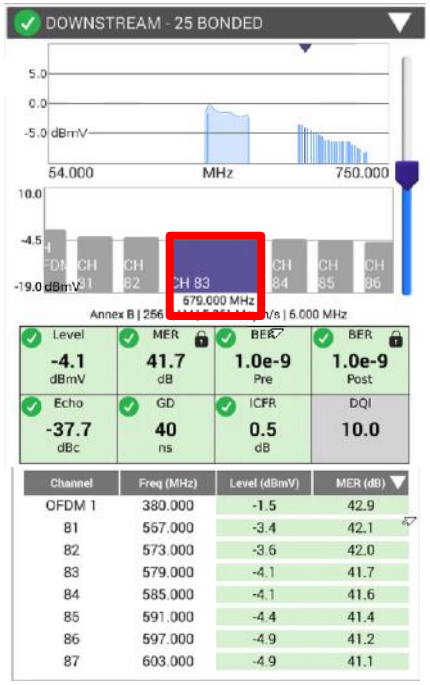
- DOWNSTREAM allows the user to view the DOWNSTREAM DOCSIS CHANNELS, with any measurements failing the threshold represented in RED and all measurements passing the thresholds represented in GREEN

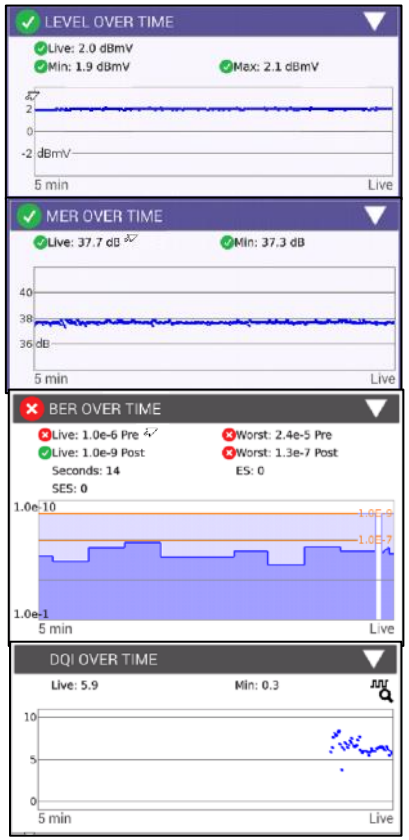


- Users can navigate via touchscreen, D-Pad or Channel Search as long as CHANNEL VIEW is selected



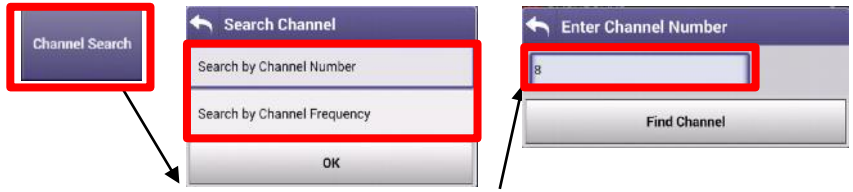
DOCSIS CHECK – OVER TIME MEASUREMENTS



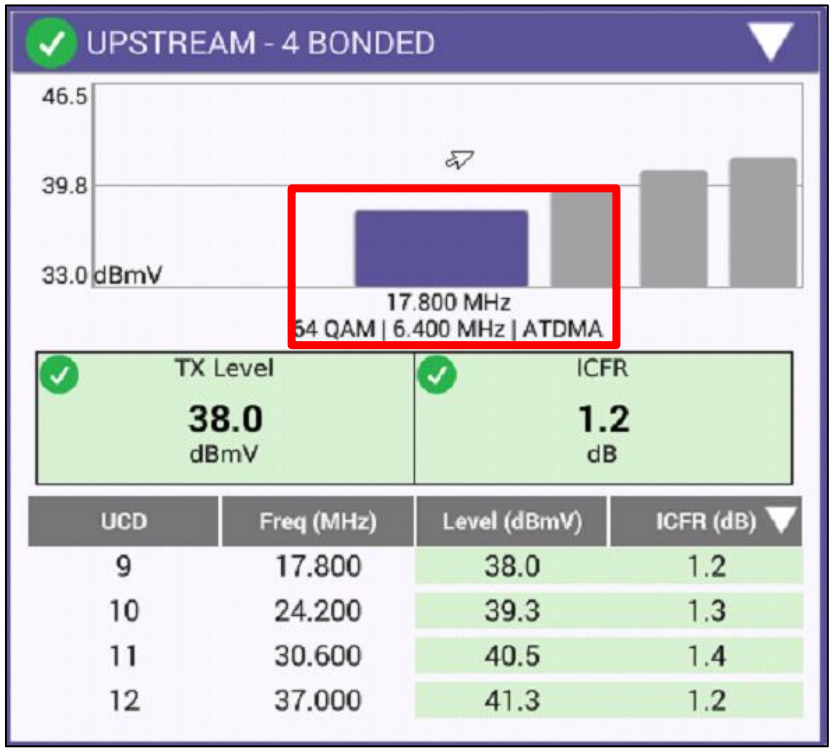


- Level OVER TIME, MER OVER TIME, BER OVER TIME and DQI OVER TIME measure the channel that is selected in CHANNEL VIEW and will continue until stopped

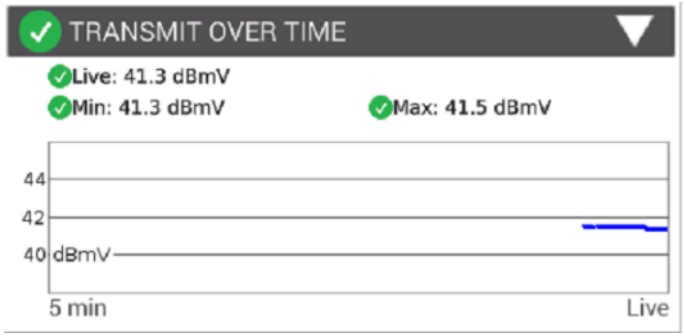
- To rapidly change channels use Channel Search as long as CHANNEL VIEW is selected



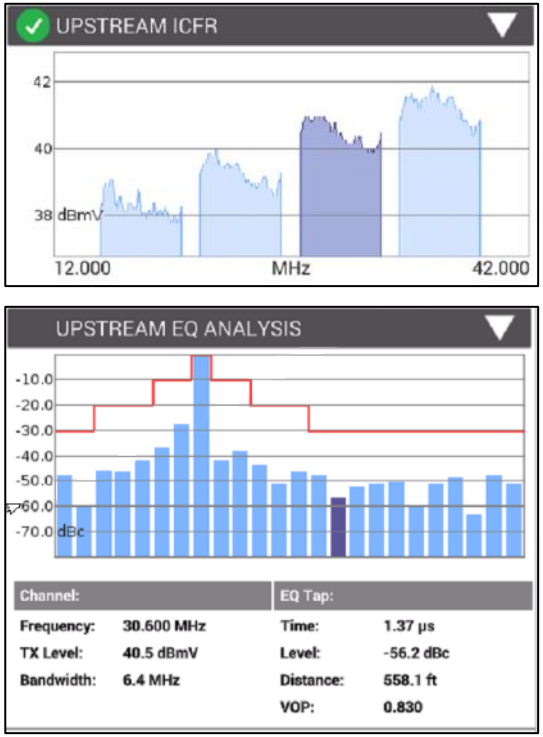
DOCSIS CHECK – UPSTREAM/TRANSMIT OVER TIME



- UPSTREAM provides the user with verification of the number of upstream carriers; the Upstream Transmit Level (TX) and In-Channel Frequency Response (ICFR)
- TRANSMIT OVER TIME corresponds to the locked upstream carrier (highlighted in blue to the left). To shift upstream carrier, select a different one from the UPSTREAM window (D-PAD or TOUCH to toggle) and the TRANSMIT OVER TIME will update



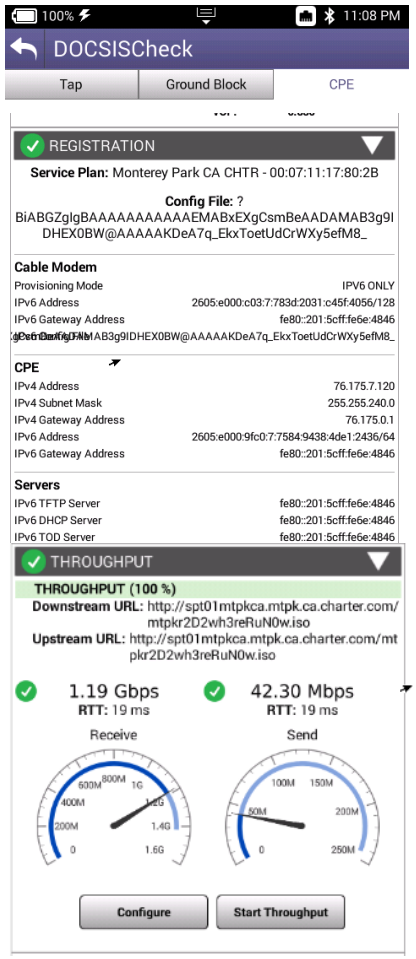
DOCSIS CHECK – UPSTREAM ICFR and UPSTREAM EQ ANALYSIS

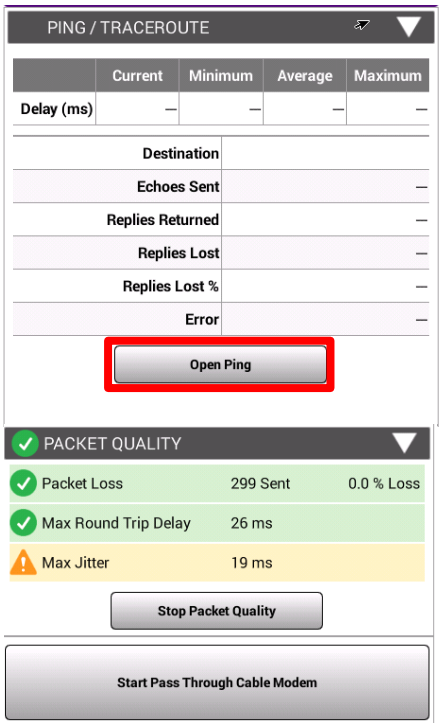


- UPSTREAM ICFR displays each upstream carrier, the darkened carrier is the locked carrier. To toggle, scroll to UPSTREAM and choose a different carrier, UPSTREAM ICFR and UPSTREAM EQ ANALYSIS will update

- UPSTREAM EQ ANALYSIS displays the equalizer graph for 16 QAM and 64 QAM upstream carriers. By highlighting a specific tap, that will indicate the distance to a reflection point in the upstream. This is usually the distance from an amplifier to a reflection caused by an impedance mismatch.

DOCSIS CHECK – REGISTRATION, THROUGHPUT, PING/TRACEROUTE and PACKET QUALITY

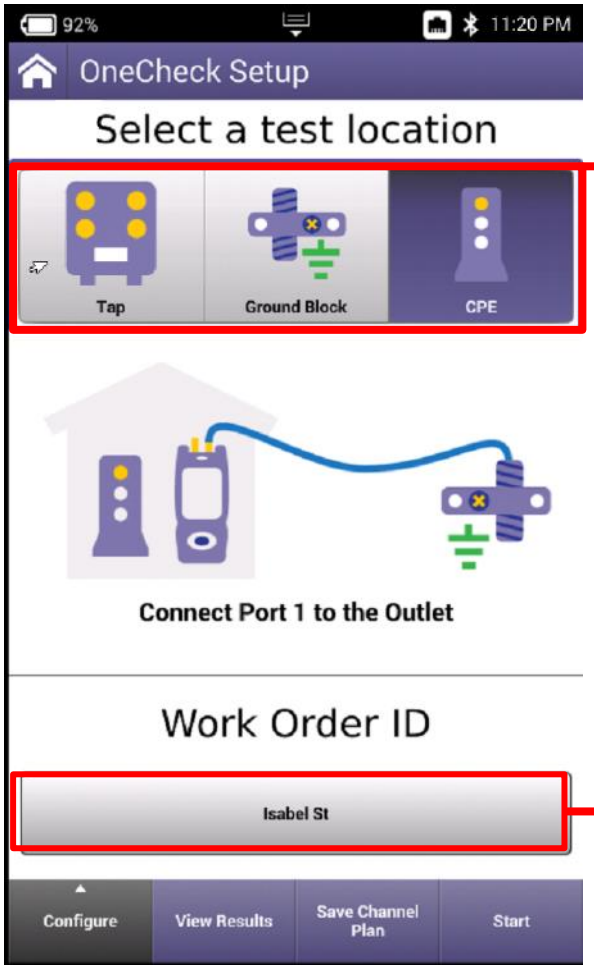


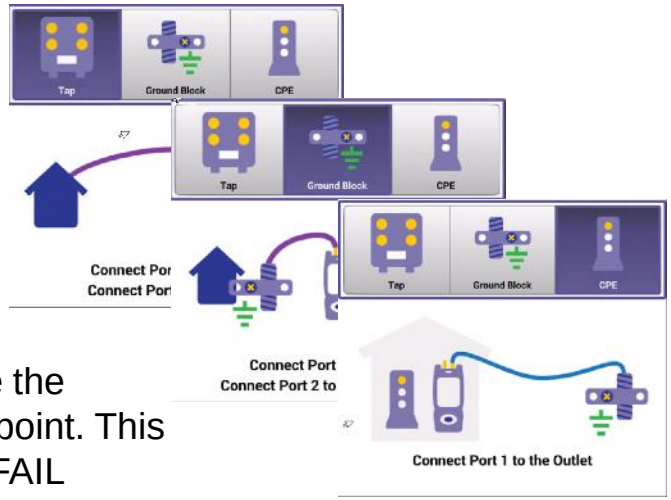


- REGISTRATION will display the configuration file if the CM MAC has been provisioned.
- The THROUGHPUT, PING/TRACEROUTE and PACKET QUALITY functions will be greyed out if the CM MAC is not provisioned. Or if an un-provisioned MAC address is selected in CONFIGURE-> SELECT DOCSIS SERVICE PLAN.
- The throughput test sends a file upstream to a server. The server then sends the file back to the meter. Since the file size is known and the time it takes to download the file is known, the meter can then calculate the downstream speed. The same is done for the upstream.
- The PING/TRACEROUTE function can be configured to send configurable ping packets to a destination. A TRACEROUTE test can also be done to configurable destinations.
- The packet quality test sends ping packets to the CMTS and the meter counts any lost packets, measures latency, (round trip time) and measures maximum jitter. (variations in latency)

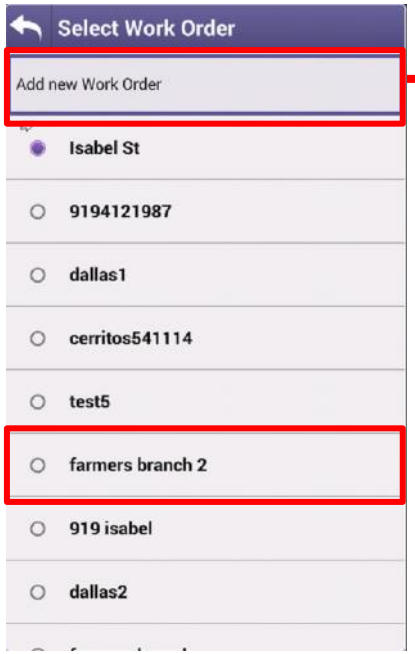
CATV Measurements - OneCHECK

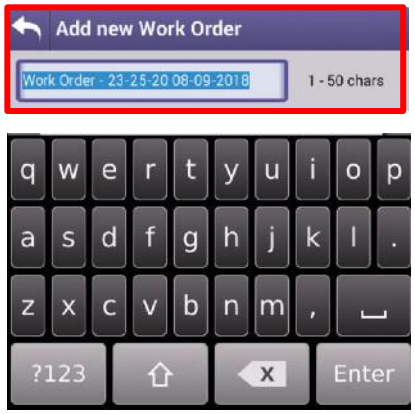
OneCHECK – SETUP





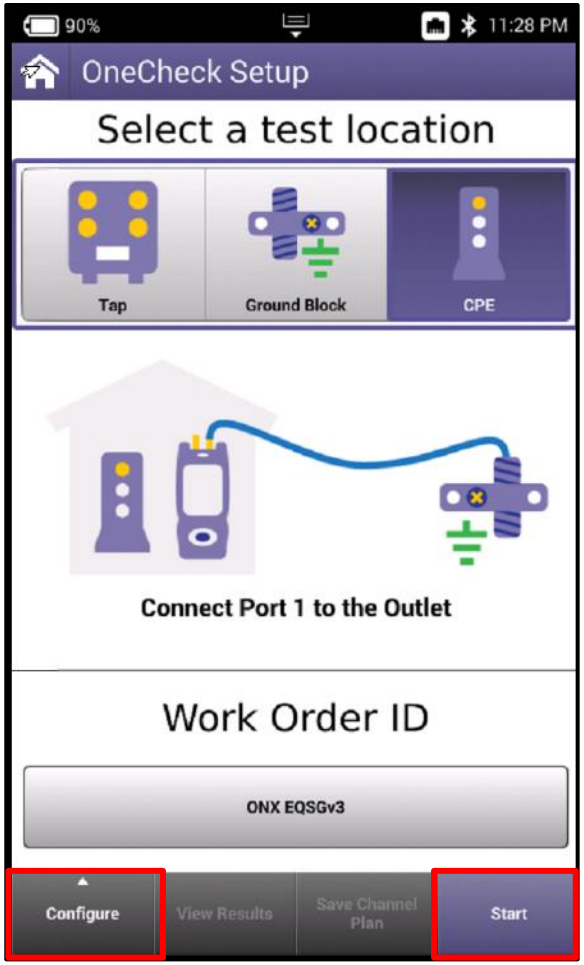
- Users should choose the correct demarcation point. This will guide the PASS/FAIL criteria of the measurements

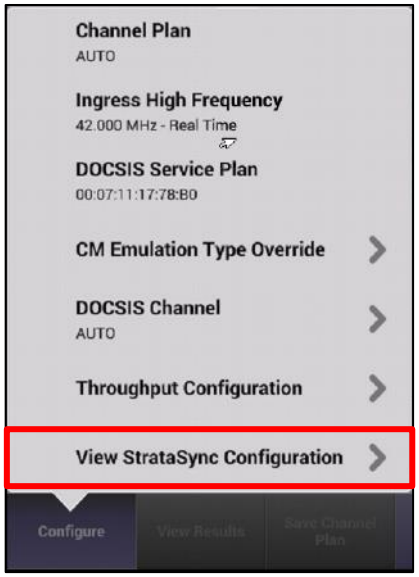




- Users choose or enter a NEW WORK ORDER ID at the beginning of every new job

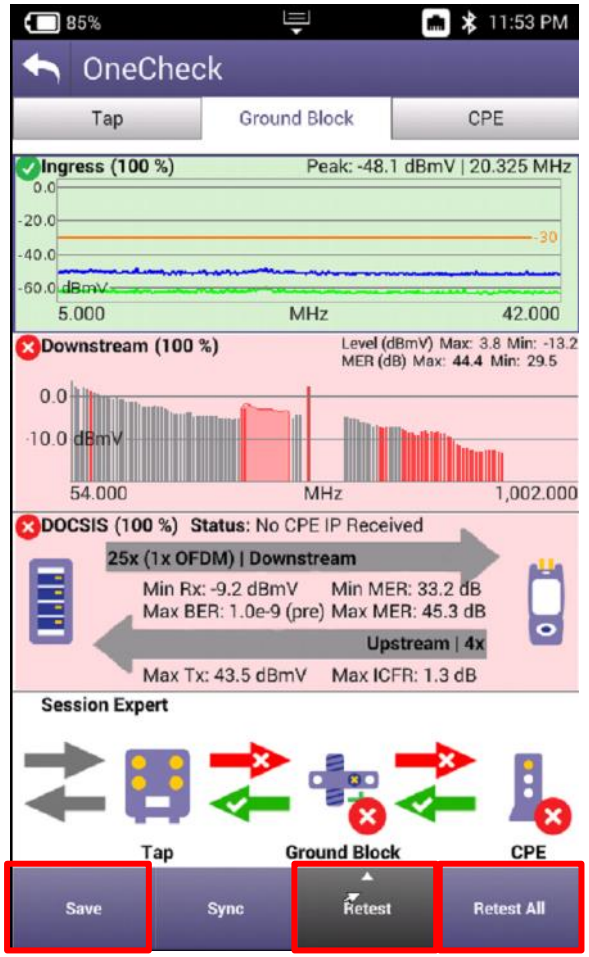
OneCHECK - CONFIGURE





- User can verify that configurations are correct and up to date by selecting VIEW STRASYNC CONFIGURATION and verifying most recent config files
- Select START to begin the test

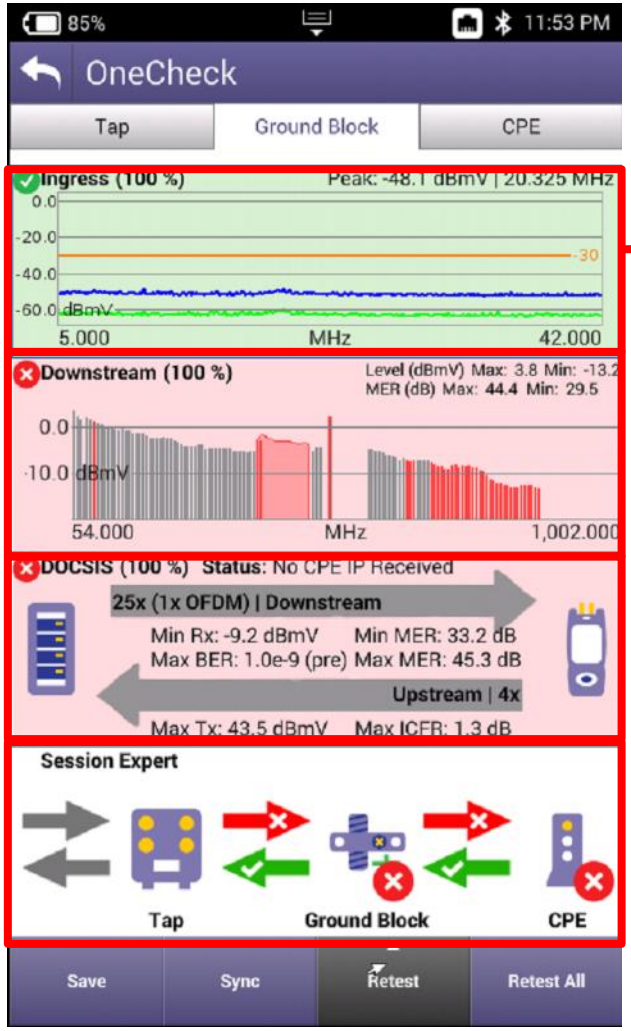
OneCHECK- RESULTS Dashboard



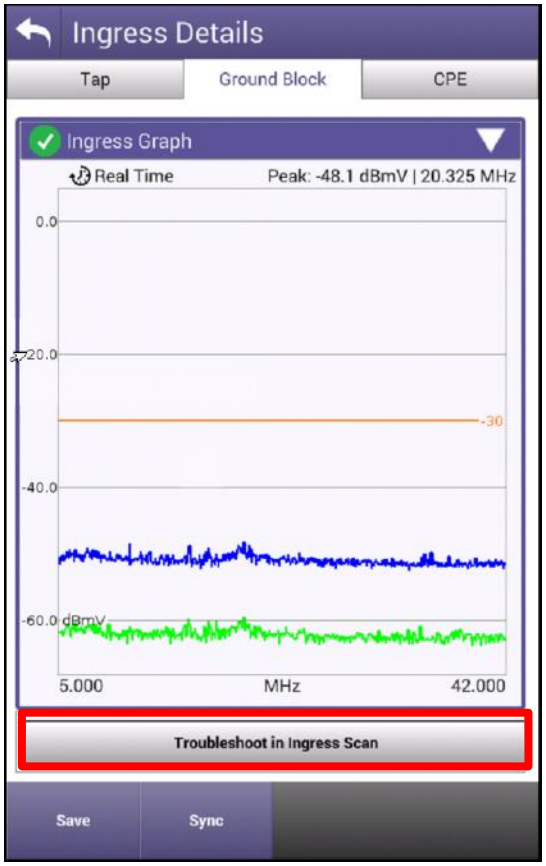
- The completed RESULTS screen gives an overall status on the OneCHECK test, broken out in to four categories:
  - Ingress
  - Downstream
  - Upstream
  - Session Expert
- OneCHECK is a snap shot so measurements will not fluctuate like they will in CHANNEL CHECK or DOCSIS CHECK.
- Max and Mins are displayed for MER(dB) and Level (dBmV)
- Users can choose RETEST ALL to restart the whole test or chose RETEST and chose the appropriate category to better determine if a failure was intermittent

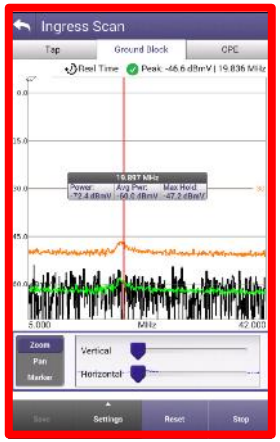
- Users can SAVE from this screen, all files saved will have the WORK ORDER ID attached to them for reporting via StrataSync

OneCHECK – RESULTS Dashboard

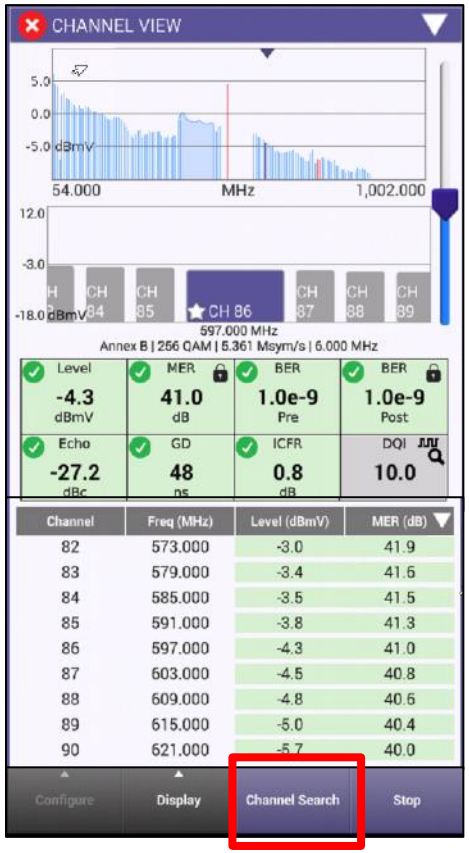


- Users can double-tap each of the 4 measurements categories to access additional information and deeper analysis
- Users can also select the TROUBLESHOOT… button to switch to LIVE INGRESS SCAN, CHANNEL CHECK and DOCSIS CHECK

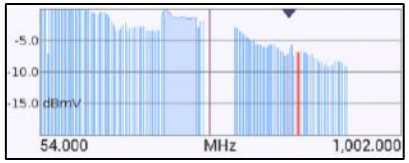




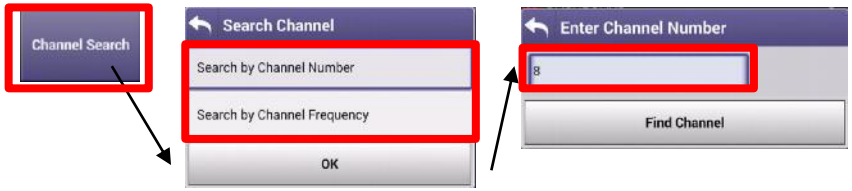
OneCHECK – Downstream Details – CHANNEL VIEW



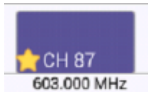
- CHANNEL VIEW allows the user to view the Fullscan, with any measurements failing the threshold represented in RED and all measurements passing the thresholds represented in GREEN



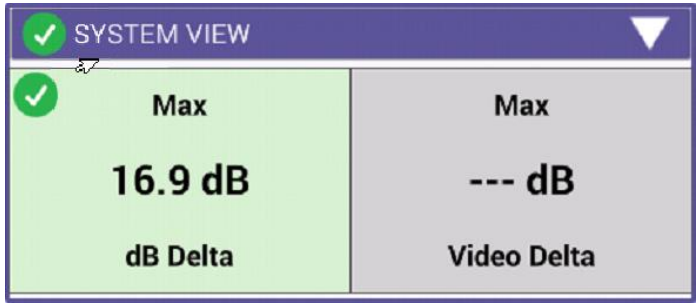
- Users can navigate via touchscreen, D-Pad or Channel Search

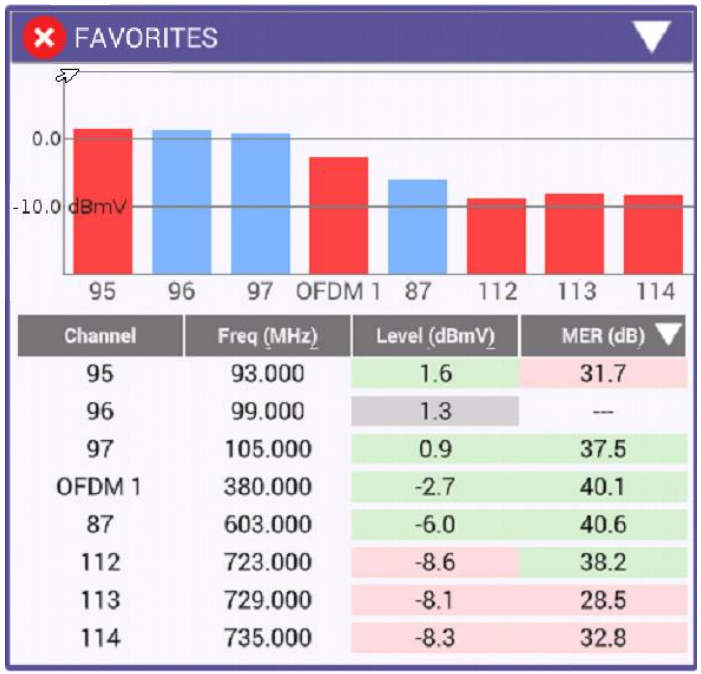


- Users can select their FAVORITES by pressing on the STAR until it is highlighted in Gold



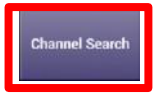
OneCHECK – Downstream Details – SYSTEM VIEW and FAVORITES

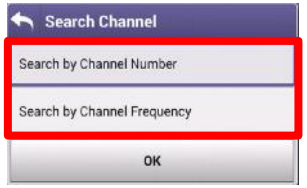




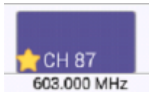
Channel	Freq (MHz)	Level (dBmV)	MER (dB)
95	93.000	1.6	31.7
96	99.000	1.3	---
97	105.000	0.9	37.5
OFDM 1	380.000	-2.7	40.1
87	603.000	-6.0	40.6
112	723.000	-8.6	38.2
113	729.000	-8.1	28.5
114	735.000	-8.3	32.8

- SYSTEM VIEW provides the maximum dB Delta between digital carriers and the maximum Video Delta between analog carriers
- To rapidly change channels use Channel Search

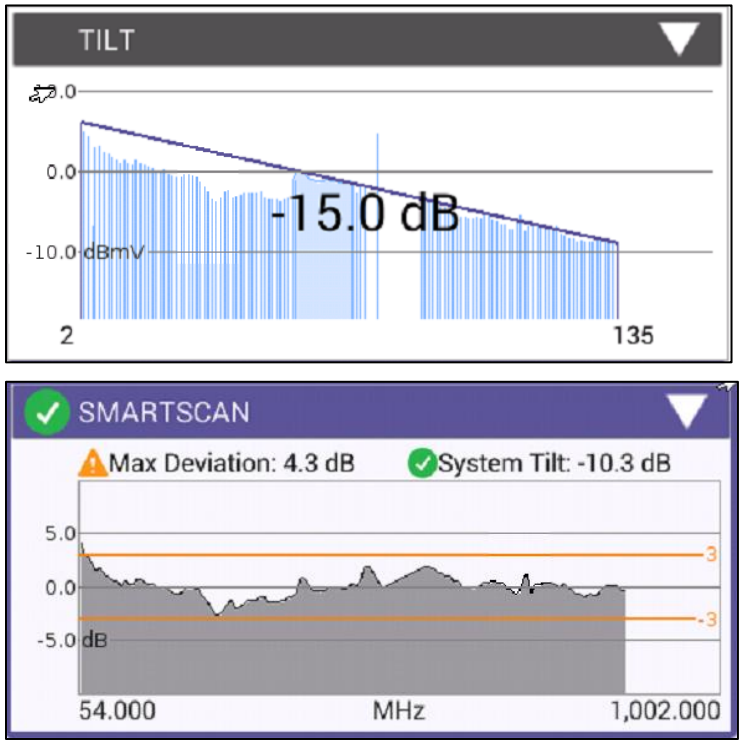




- FAVORITES is a user defined Miniscan
- FAVORITES can be configured by pressing on the given channel until a gold star is highlighted. Channels will not populate this measurements window

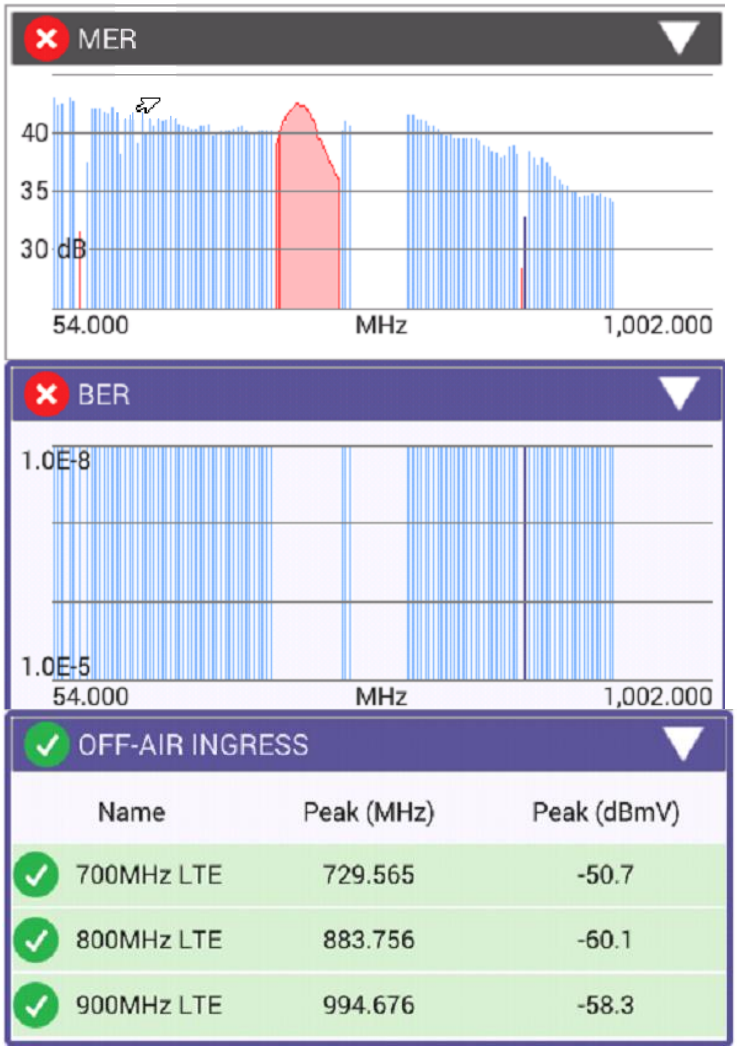


OneCHECK – Downstream Details – TILT and SMARTSCAN



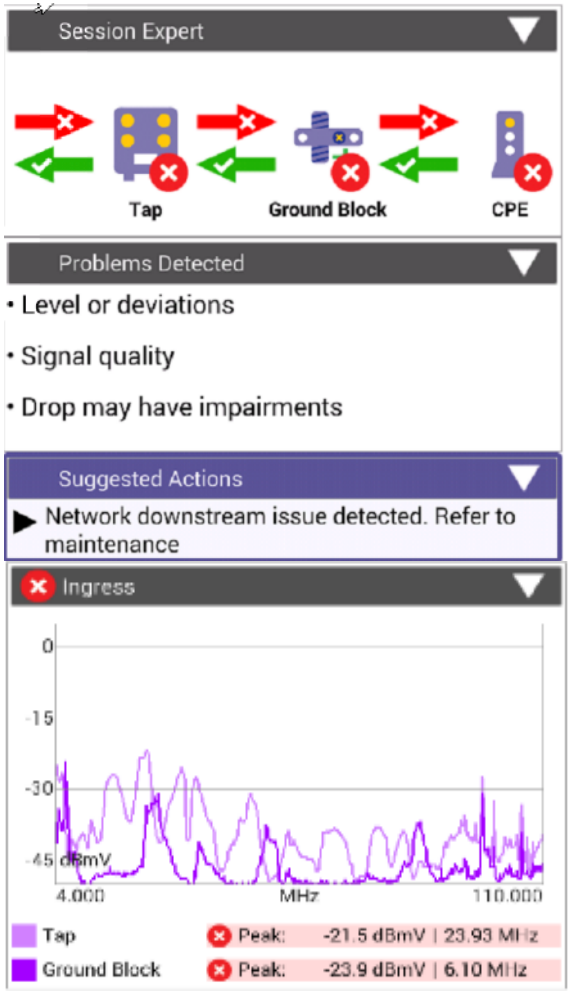
- TILT of the Fullscan, TILT channels can be toggled in CATV SETTINGS
- SMARTSCAN offers a raw frequency domain response of the Fullscan and measures against a defined thresholds for deviation and tilt

OneCHECK – Downstream Details – MER and BER and OFF-AIR Ingress



- MER plots each digital carrier against its MER measurements. D3.1 OFDM carriers will appear with more granularity because of the measurement of all the subcarriers
- BER plots each digital carrier against its BER measurements with the maximum of 1.0E-9 available to the user in settings. Default is 1.0E-8.
- OFF-AIR INGRESS can be configured in STRATASYNC and is a measurement of the noise floor at the defined frequencies. This measurement is specifically focused on LTE ingress.

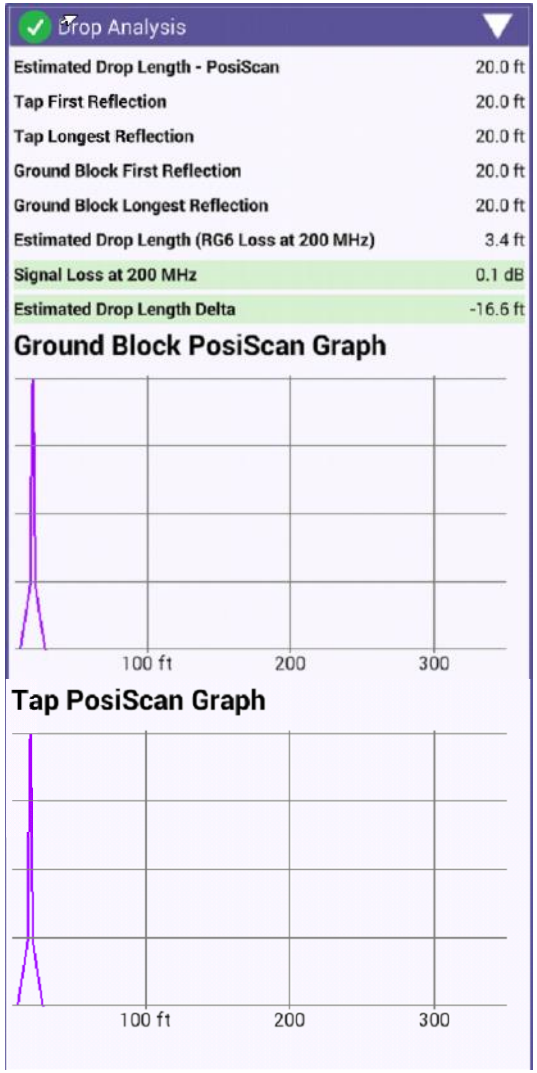
OneCHECK – SESSION EXPERT



- SESSION EXPERT seeks to educate the user about the next logical demarcation point where network impairments may be located. It also offers suggestions based on the observed impairments

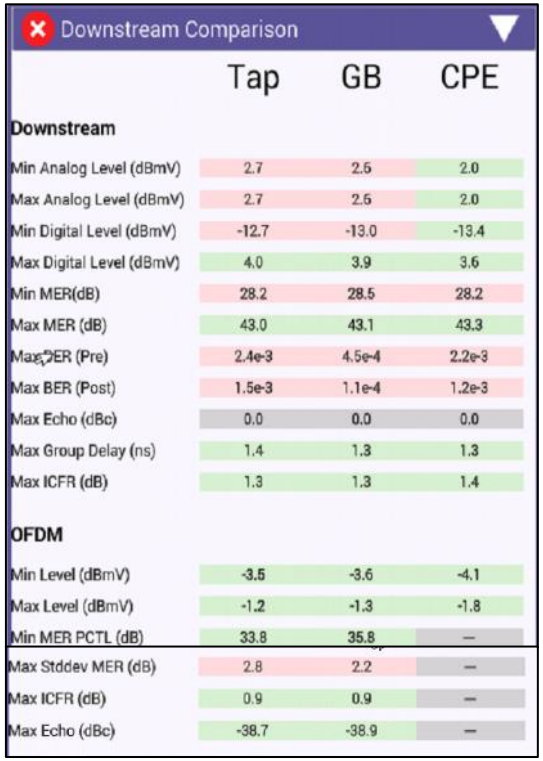
- INGRESS overlays comparisons of Ingress Scans between the TAP and GB help highlight where ingress is getting in

OneCHECK – Session Expert – DROP ANALYSIS



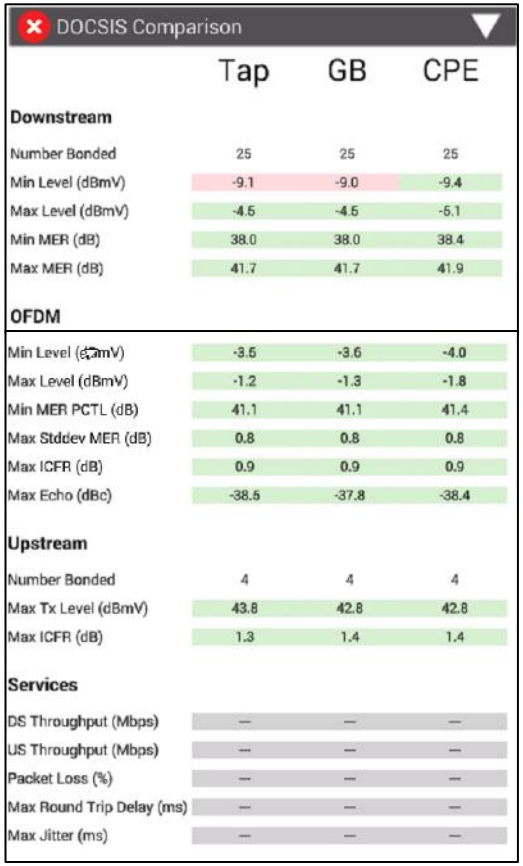
- SESSION EXPERT utilizes a TDR to automatically analyze the Drop. This helps the user identify if there is a problem in the Drop between the TAP and Ground Block
- Additionally, the user can switch to the standalone TDR measurement to conduct a thorough Drop analysis
- DOWNSTREAM COMPARISON offers a side by side comparison measurements between TAP, GB, and CPE which speeds up user analysis time

OneCHECK – Session Expert – COMPARISON



Downstream Comparison

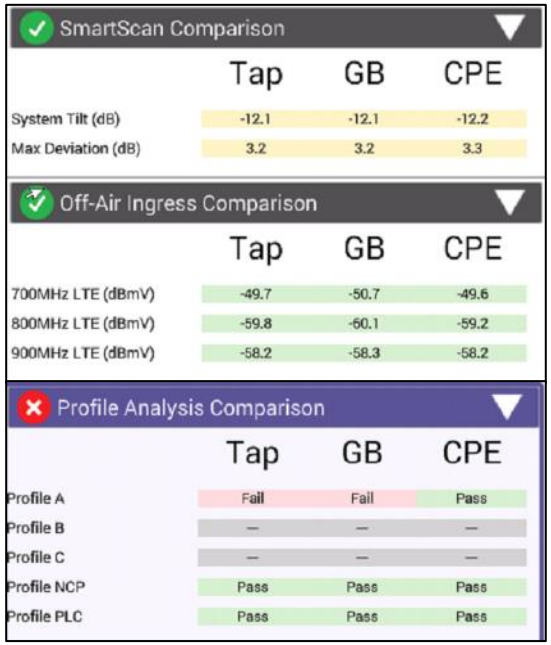
	Tap	GB	CPE
Downstream			
Min Analog Level (dBmV)	2.7	2.5	2.0
Max Analog Level (dBmV)	2.7	2.5	2.0
Min Digital Level (dBmV)	-12.7	-13.0	-13.4
Max Digital Level (dBmV)	4.0	3.9	3.6
Min MER(dB)	28.2	28.5	28.2
Max MER (dB)	43.0	43.1	43.3
Max BER (Pre)	2.4e-3	4.5e-4	2.2e-3
Max BER (Post)	1.5e-3	1.1e-4	1.2e-3
Max Echo (dBc)	0.0	0.0	0.0
Max Group Delay (ns)	1.4	1.3	1.3
Max ICFR (dB)	1.3	1.3	1.4
OFDM			
Min Level (dBmV)	-3.5	-3.6	-4.1
Max Level (dBmV)	-1.2	-1.3	-1.8
Min MER PCTL (dB)	33.8	35.8	—
Max Stddev MER (dB)	2.8	2.2	—
Max ICFR (dB)	0.9	0.9	—
Max Echo (dBc)	-38.7	-38.9	—



DOCSIS Comparison

	Tap	GB	CPE
Downstream			
Number Bonded	25	25	25
Min Level (dBmV)	-9.1	-9.0	-9.4
Max Level (dBmV)	-4.5	-4.5	-5.1
Min MER (dB)	38.0	38.0	38.4
Max MER (dB)	41.7	41.7	41.9
OFDM			
Min Level (dBmV)	-3.5	-3.6	-4.0
Max Level (dBmV)	-1.2	-1.3	-1.8
Min MER PCTL (dB)	41.1	41.1	41.4
Max Stddev MER (dB)	0.8	0.8	0.8
Max ICFR (dB)	0.9	0.9	0.9
Max Echo (dBc)	-38.5	-37.8	-38.4
Upstream			
Number Bonded	4	4	4
Max Tx Level (dBmV)	43.8	42.8	42.8
Max ICFR (dB)	1.3	1.4	1.4
Services			
DS Throughput (Mbps)	—	—	—
US Throughput (Mbps)	—	—	—
Packet Loss (%)	—	—	—
Max Round Trip Delay (ms)	—	—	—
Max Jitter (ms)	—	—	—

- COMPARISON windows offer a side by side comparison measurements between TAP, GB, and CPE which speeds up user analysis time
- Type of COMPARISON measurements in SESSION EXPERT include:
  - DOWNSTREAM
  - DOCSIS
  - PROFILE (for OFDM Carriers)
  - SMARTSCAN
  - OFF-AIR INGRESS



SmartScan Comparison

	Tap	GB	CPE
System Tilt (dB)	-12.1	-12.1	-12.2
Max Deviation (dB)	3.2	3.2	3.3

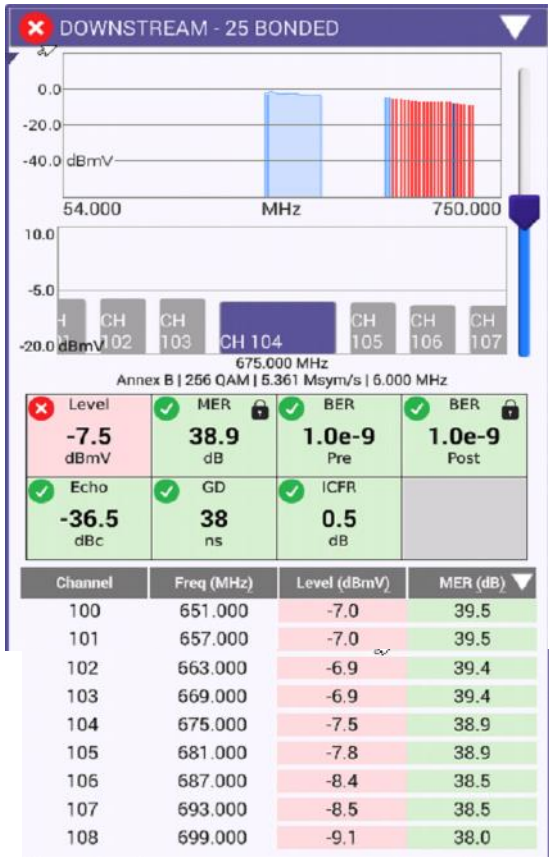
Off-Air Ingress Comparison

	Tap	GB	CPE
700MHz LTE (dBmV)	-49.7	-50.7	-49.6
800MHz LTE (dBmV)	-59.8	-60.1	-59.2
900MHz LTE (dBmV)	-58.2	-58.3	-58.2

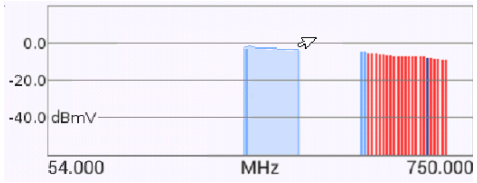
Profile Analysis Comparison

	Tap	GB	CPE
Profile A	Fail	Fail	Pass
Profile B	—	—	—
Profile C	—	—	—
Profile NCP	Pass	Pass	Pass
Profile PLC	Pass	Pass	Pass

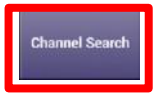
OneCHECK – DOCSIS Details - DOWNSTREAM

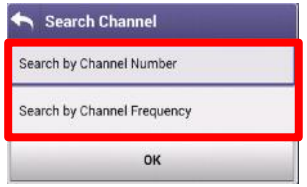


- DOWNSTREAM allows the user to view all identified DOCSIS downstream carriers as a Fullscan, with any measurements failing the threshold represented in RED and all measurements passing the thresholds represented in GREEN

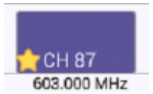


- Users can navigate via touchscreen, D-Pad or Channel Search

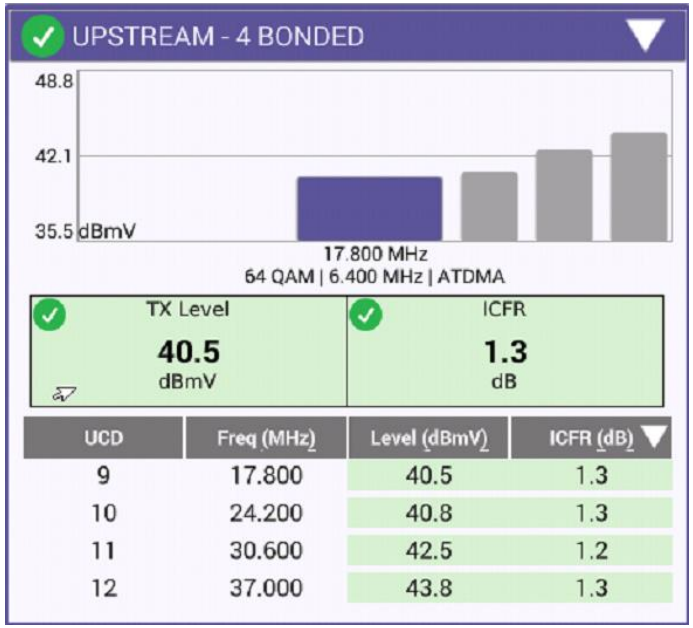




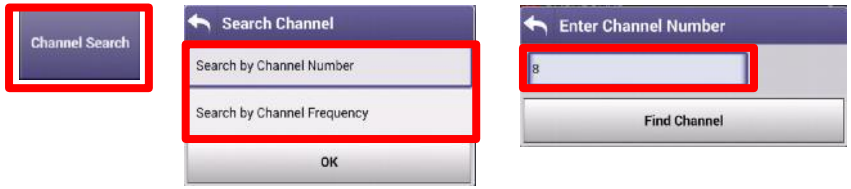
- Users can select their FAVORITES by pressing on the STAR until it is highlighted in Gold



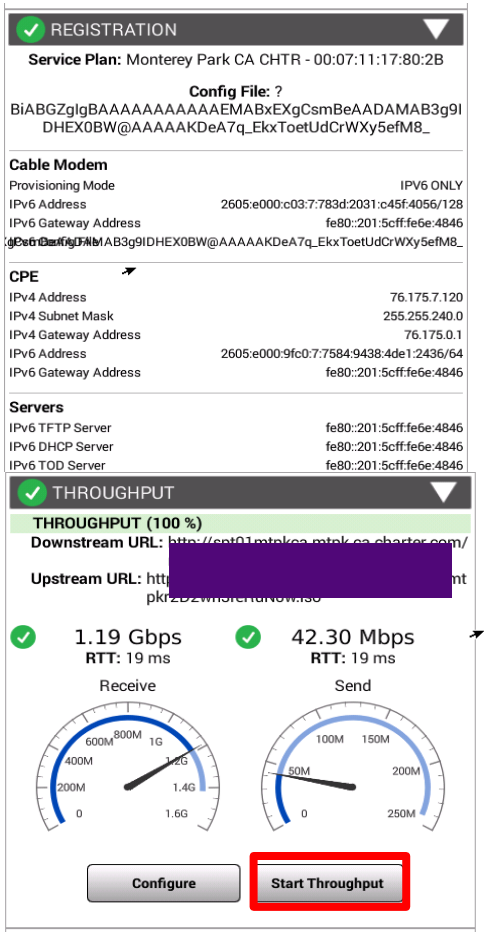
OneCHECK – DOCSIS Details - UPSTREAM

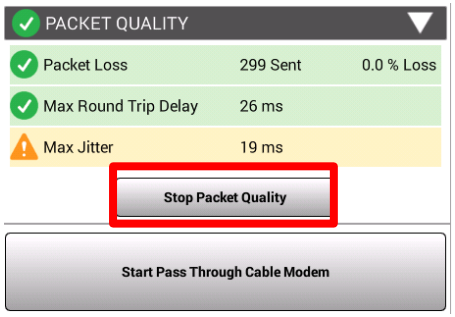


- Upstream allows the user to view all identified DOCSIS Upstream carriers, with any measurements failing the threshold represented in RED and all measurements passing the thresholds represented in GREEN
- UPSTREAM provides the user with verification of the number of upstream carriers; the Upstream Transmit Level (TX) and In-Channel Frequency Response (ICFR)
- Users can navigate via touchscreen, D-Pad or Channel Search



OneCHECK - DOCSIS Details – REGISTRATION and THROUGHPUT

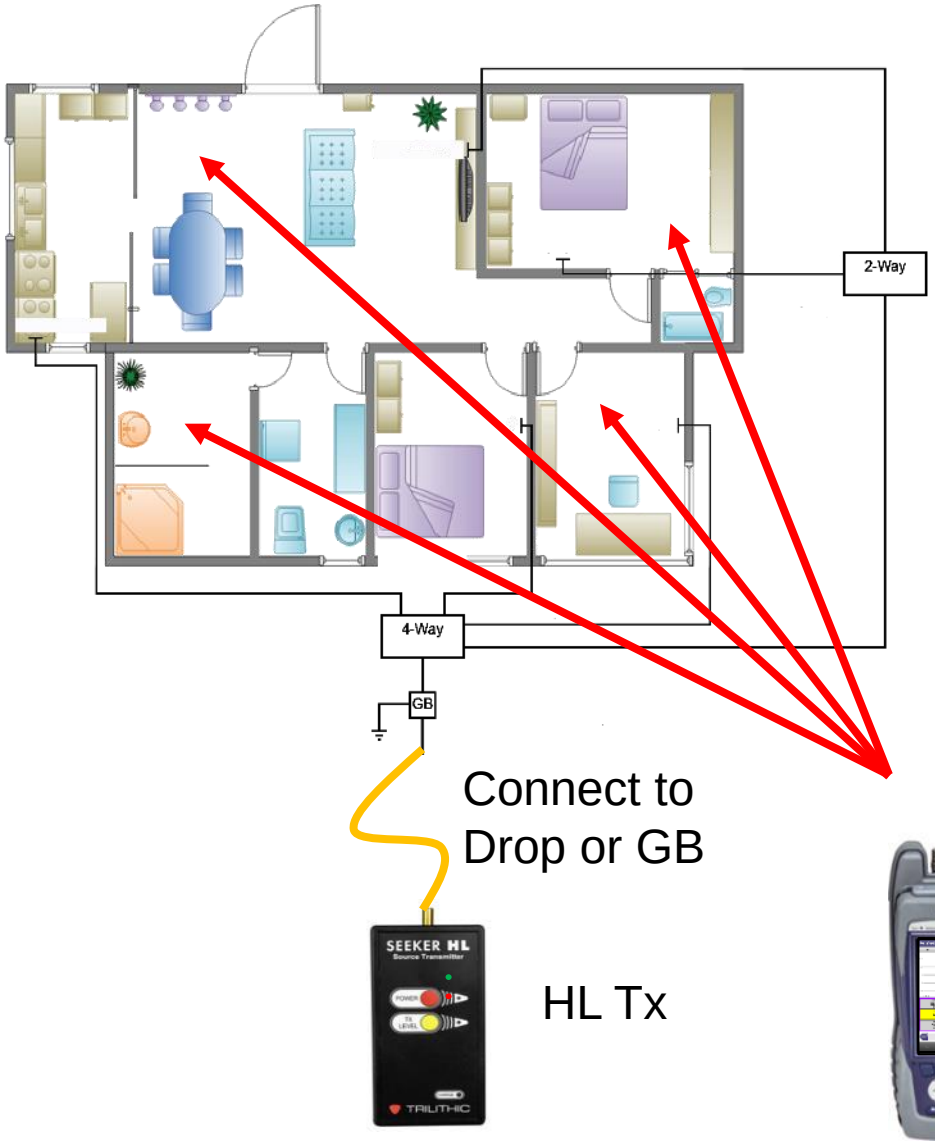




- REGISTRATION identifies the internal modems status and helps identify if there are server issues, config file issues with customer CPE or verifies the ONX is provisioned appropriately
- Throughput testing is available over the DOCSIS connection to test. ONX should have at least CM MAC 1 provisioned as a cable modem and DOCSIS SERVICE PLAN should be configured with UPSTREAM AND DOWNSTREAM IP ADDRESSES before THROUGHPUT will display accurate measurements
- Packet Quality identifies if there is packet loss present in the normal course of DOCSIS communication

CATV Measurements - OneCHECK with HL Leakage

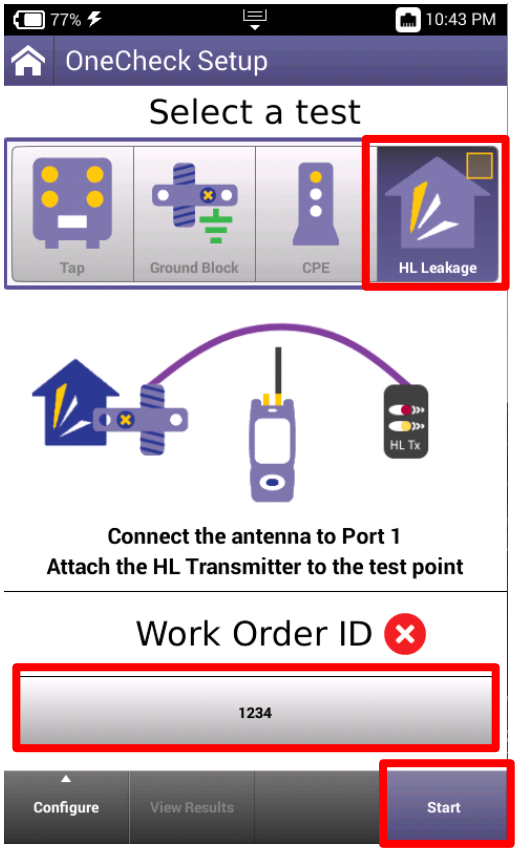
HL LEAKAGE Option with Transmitter

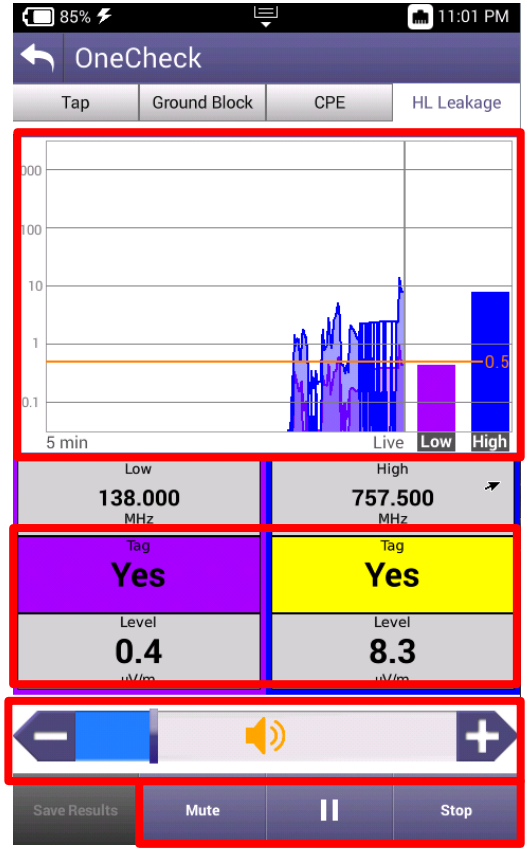


- Connect HL TRANSMITTER to GB or DROP and turn unit on.
- Proceed to attach ANTENNA to ONX Port 1 and walk around the home or business.
- Required Equipment Includes:
  - ONX-620 or ONX-630 with DOCSIS 3.1 hardware
  - HL Leakage software option must be present on the ONX
  - HL Leakage Transmitter (60dBmv output [RED LIGHT] and 40dBmv output [GREEN LIGHT])
  - HL Leakage Antennas
    - 4a) Dual band rubber duck antenna
    - 4b) Near-Field Probe antenna
    - Used for detecting leaks when attached to ONX
    - Tuned for 138MHz and 757.5MHz

OneCHECK with HL Leakage

- If HL LEAKAGE is enabled as a part of OneCHECK the technician will be compelled to enter unique WORK ORDER ID and then perform a HL LEAKAGE Test prior to being able to resume testing at the CPE, GB and Tap

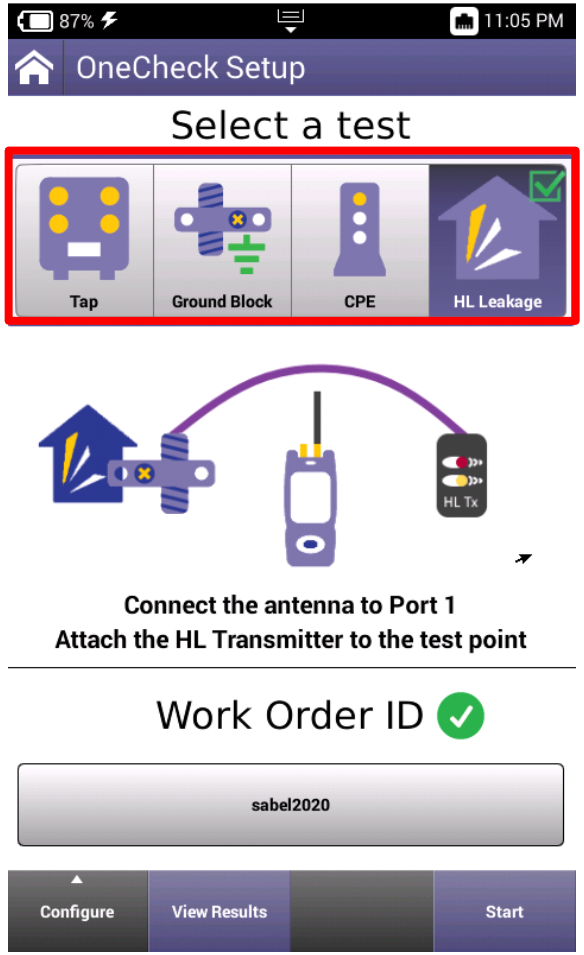




- Leaks will be shown over time on the HL LEAKAGE display, while also emitting a siren that will signal proximity to leak
- MUTE or UNMUTE and VOLUME controls as well as PAUSE and STOP/RETEST will be displayed across the bottom

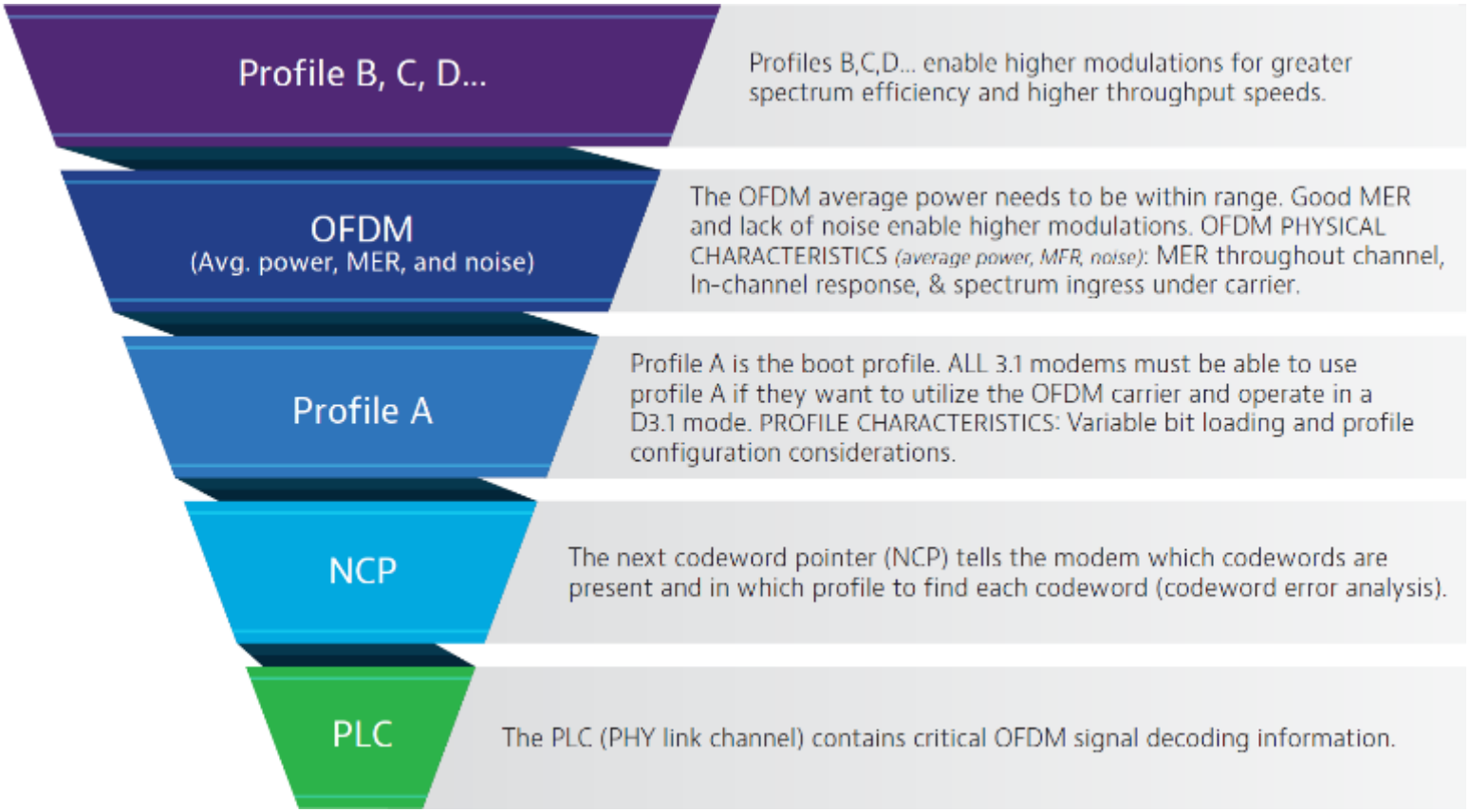
OneCHECK with HL Leakage

- After HL LEAKAGE test is completed and technician deems the home or business coax network sufficiently free from leakage returning to the OneCHECK SETUP screen will display HL LEAKAGE requirement complete
- Technician can now resume normal OneCHECK testing at CPE, GB and TAP

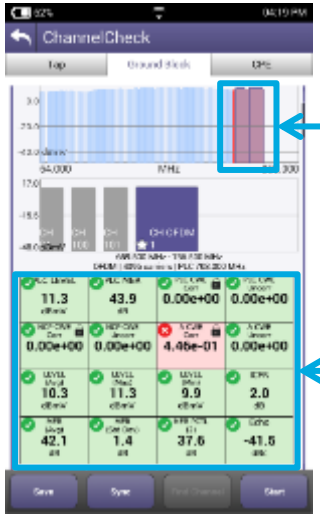


ONX DOCSIS 3.1 Measurements

Testing OFDM

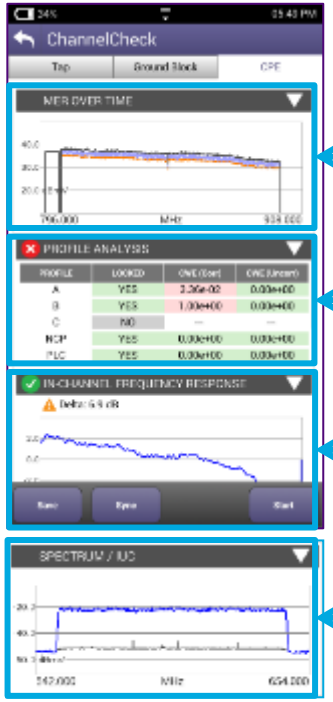


OneExpert CATV DOCSIS 3.1 measurements



Identify OFDM carrier in the lineup: Downstream scan measurement requires no learning curve, same as D3.0 scan, but shows OFDM signal

Overall OFDM carrier performance metrics including best and worst case; simple pass/fail indications



MER over entire OFDM channel provides insight into why higher tier profiles are failing

Analysis of different profiles available and which profiles can be supported at test location

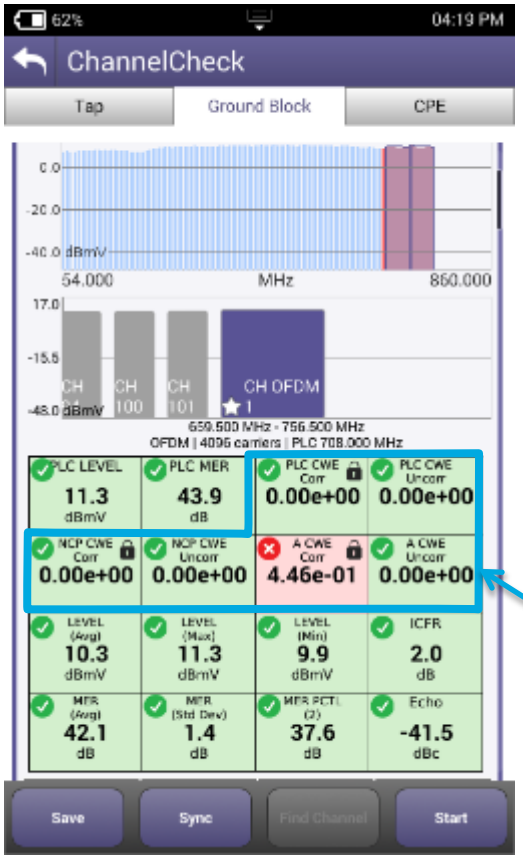
In-Channel Response identifies roll-off and excessive ripple

Spectrum and noise identify portions of carrier where degradation may occur

OneExpert CATV with DOCSIS 3.1

- OFDM demodulation with D3.1 Profile Analysis
- **Full DOCSIS service testing including 32 Bonded + D3.1 OFDM carrier**
- Upstream **DOCSIS 3.1 OFDM-A capable**

DOCSIS 3.1 Codeword Errors (CWE)

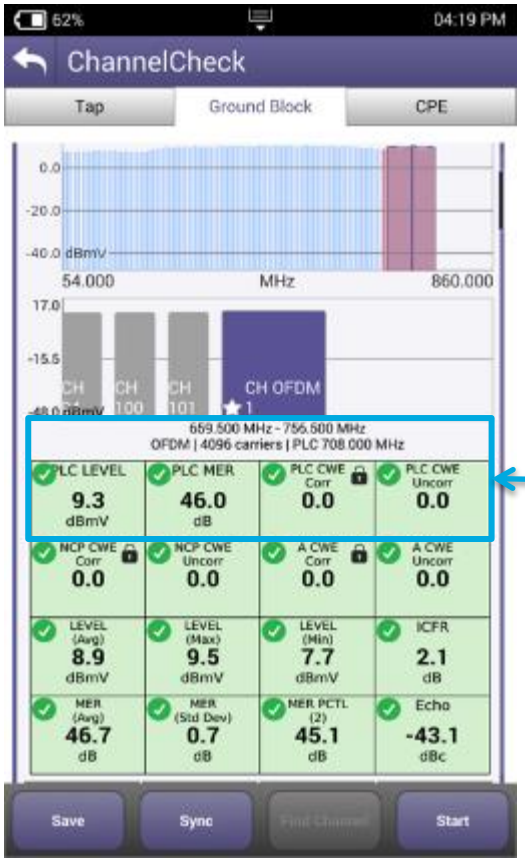


- **Codeword (CW):** a data bucket within a DOCSIS packet
- **CW Error (CWE)**: a byte-level data packet corruption resulting from QAM symbol displacement across constellation decision boundaries
- Correctable vs. Uncorrectable determined by number of corrupted symbols relative to CMTS forward error correction level settings
- If you are having CWEs, you may be losing data
- **Uncorrectable CWEs** indicate dropped packets (think post-FEC BER)
- Retransmit is required for recovery
- There is no recovery from dropped packets for real-time apps like VoIP!
- **Correctable CWEs** are an early warning that the uncorrectable threshold may be near! (think pre-FEC BER)

THINGS TO CHECK:

To make sure there are **no uncorrectable CWE**

Testing PLC – PHY Link Channel



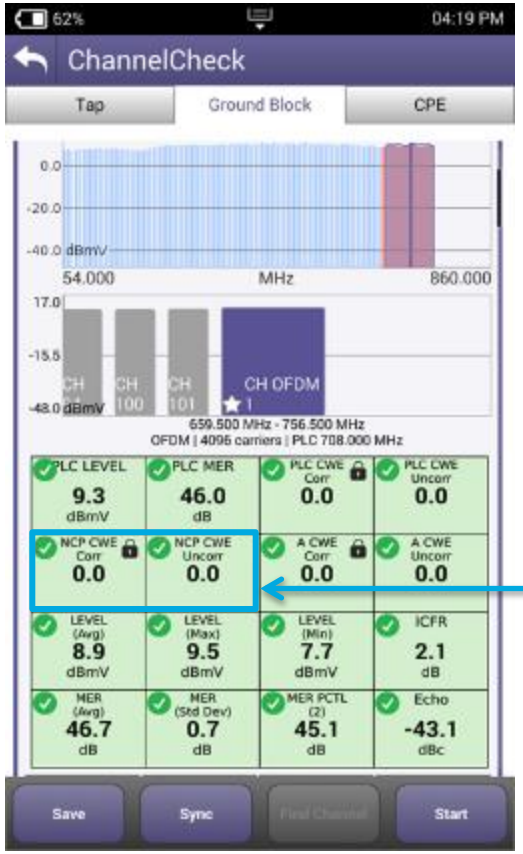
PLC

PLC contains CRITICAL OFDM signal decoding information

THINGS TO CHECK:

Level: >-15 dBmV (6 MHz)
MER: >15 dB (min)
Lock status: locked
Uncorrectable CWE: none
Other info: PLC center frequency

Testing Next Codeword Pointer (NCP)



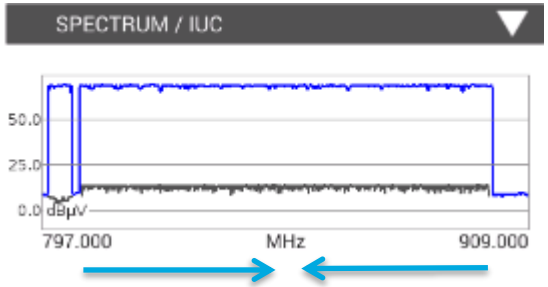
NCP

The **NCP** tells the modem which CW are present and in which profile to find each CW (CWE analysis), it is CRITICAL for proper data communication

- Don't disregard OFDM performance at high end or low end. Roll off of either could impair a CM's ability to correctly receive NCP or CWs.

THINGS TO CHECK:

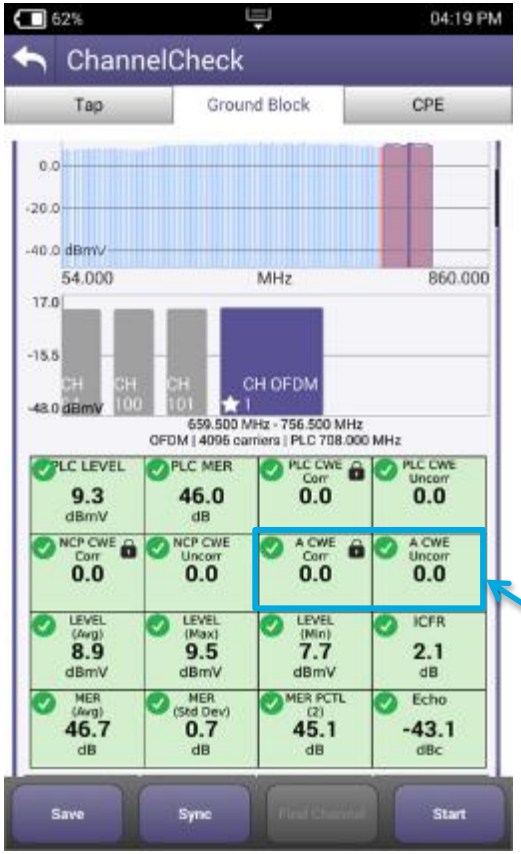
Lock status: locked
Uncorrectable CWE: none



Codewords start at LOW frequencies and populate UP

NCP's start at HIGH frequencies and populate down

Testing Profile A



Profile A

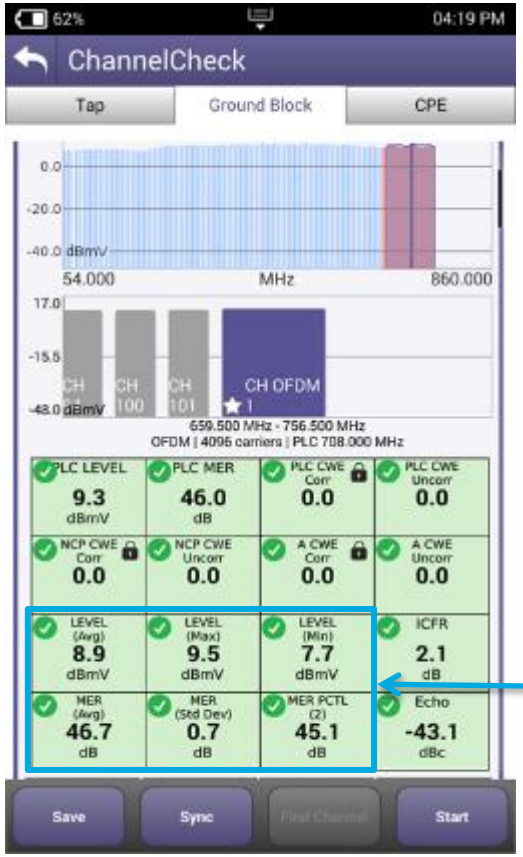
Profile A is boot profile; ALL 3.1 modems must be able to use profile A

- Profile A is key to D3.1 modem communication via an OFDM carrier. This is where command and control, range, and registration occurs.
- In practice, profile A may be assigned lower mixed modulations, like QAM 64/16, so every D3.1 modem can communicate. Lower modulation profiles can operate at lower MER/CNR and power levels.
- If profile A isn't locked or has uncorrectable CWE, a modem may roll back and use only SC QAMs in 3.0 mode.

THINGS TO CHECK:

Lock status: locked
Uncorrectable CWE: none

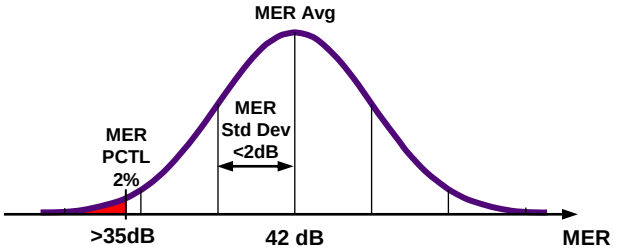
Physical Measurements (Level, MER)



OFDM
(Avg. power, MER, and noise)

OFDM Avg power must be within range. Good MER and low noise enable higher modulations.

- **MER 2 percentile** shows how well 98% of the subcarriers are working and filters out underperforming ones that LDPC error correction will likely clear up.

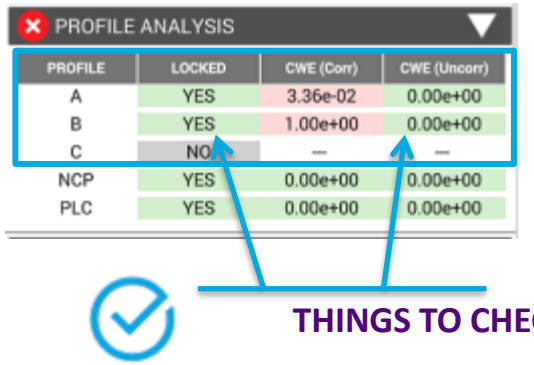


THINGS TO CHECK:

Avg level, variable: >-6 dBmV recommended
Avg MER, variable: >36 dB recommended
MER at 2 percentile: >35 dB recommended
MER standard deviation: <2 dB recommended

CM Minimum CNR/MER Performance in AWGN		
Channel Modulation	Up to 1 GHz CNR(dB)	Min P_{6AVG} dBmV
4096	41.0	-6
2048	37.0	-9
1024	34.0	-12
512	30.5	-12
256	27.0	-15
128	24.0	-15
64	21.0	-15
16	15.0	-15

Testing Higher Profiles



THINGS TO CHECK:

Lock status: locked

Uncorrectable CWE: none

Profile B, C, D…

Profiles B,C,D… enable higher modulations for greater efficiency

- Higher profiles improve network efficiency. Optimally, more CM run on higher profiles for overall network efficiency and improved customer QoE.
- Profiles enable tiers of service, and allow best case service when consistent network constraints inhibit maximum performance
- Testing viability of all profiles provides quick assessment of network performance to any given test point (service outlet)
- Tech must be able to troubleshoot failing profiles and identify degradations
- Profile changes highlight drop or home wiring problems:

	TAP		Ground Block		Outlet/CPE	
	Profile Locked?	Uncorrectable CWE	Profile Locked?	Uncorrectable CWE	Profile Locked	Uncorrectable CWE
Profile A	YES	NO	YES	NO	YES	NO
Profile B	YES	NO	YES	NO	NO	YES
Profile C	YES	NO	YES	YES	NO	YES
Profile D	YES	NO	NO	YES	NO	YES

OFDM is DYNAMIC with varying subcarriers and LDPC
MER and Level alone don't tell the whole story

- Profiles and CWE analysis are important

Component	Tasks	Importance	CWE expectations and impact
PLC PHY Link Channel	Contains CRITICAL OFDM signal decoding information	Critical	Should have 0 Uncorrectable-CWE otherwise OFDM may not work
NCP Next CW Pointer	Tells modem which CW are present and in which profile to find each CW	Critical	Should have 0 U-CWE otherwise OFDM may not work
Profile A	Boot profile. ALL 3.1 modems must be able to use profile A	Critical	U-CWE will cause poor QOE and possibly make OFDM carrier unusable, forcing data to standard QAM carriers instead of OFDM
Profile B,C,D	Enable higher modulations for greater efficiency	High	U-CWE will affect bandwidth and overall QOE

THINGS TO CHECK:

1. PLC is working well
2. NCP is working well
3. Profile A is working well with some correctible (in this case running 256 QAM)
4. Profile B (running 1024 QAM in this case) is on the edge: 100% correctable CWE but LDPC is correcting them all!
5. This makes sense, 1024 QAM level should be ≥12dBmV and MER > 34 dB

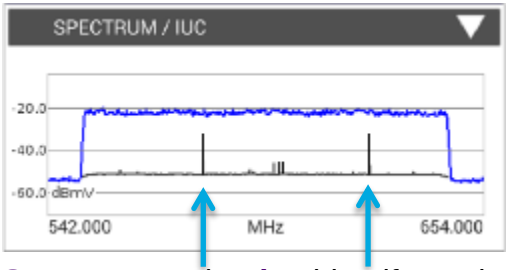
PROFILE ANALYSIS

PROFILE	LOCKED	CWE (Corr)	CWE (Uncorr)
A	YES	9.20e-01	0.00e+00
B	YES	4 1.00e+00	0.00e+00
NCP	YES	0.00e+00	0.00e+00
PLC	YES	0.00e+00	0.00e+00

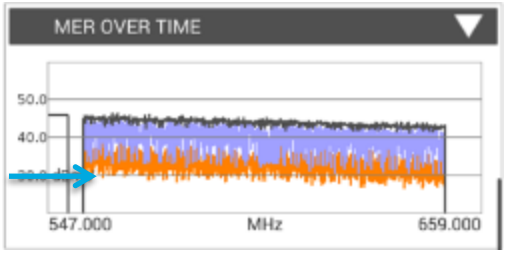
CM Minimum CNR/MER Performance in AWGN		
QAM Modulation	Up to 1 GHz CNR(dB)	Min P_{6AVG} dBmV
4096	41.0	-6
2048	37.0	-9
5 1024	34.0	-12
512	30.5	-12
256	27.0	-15
128	24.0	-15
64	21.0	-15
16	15.0	-15

DOCSIS 3.1 Signal Testing and Troubleshooting

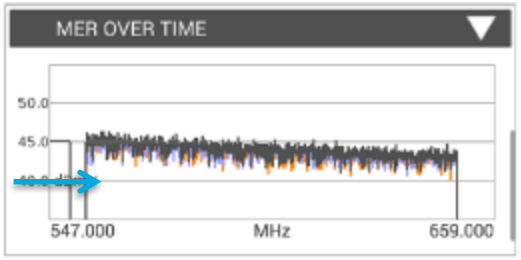
Measuring MER across entire subcarrier list enables identifying potential impairments with impact on higher level profiles



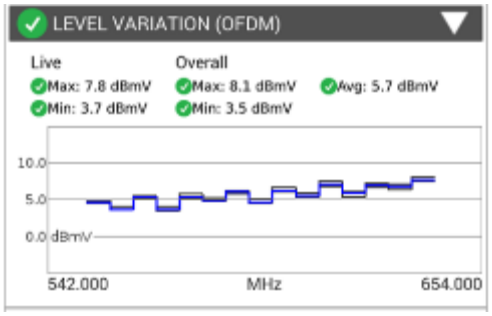
Spectrum and **noise** identify portions of a carrier where degradation may occur and require possible profile adjustment.



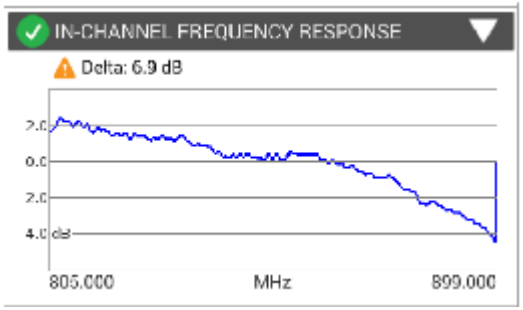
Unstable MER with drops below 30dB means only profiles running 256 QAM or lower will work.



Stable **MER better than 40 dB** means QAM 2048 and 4096 will work.



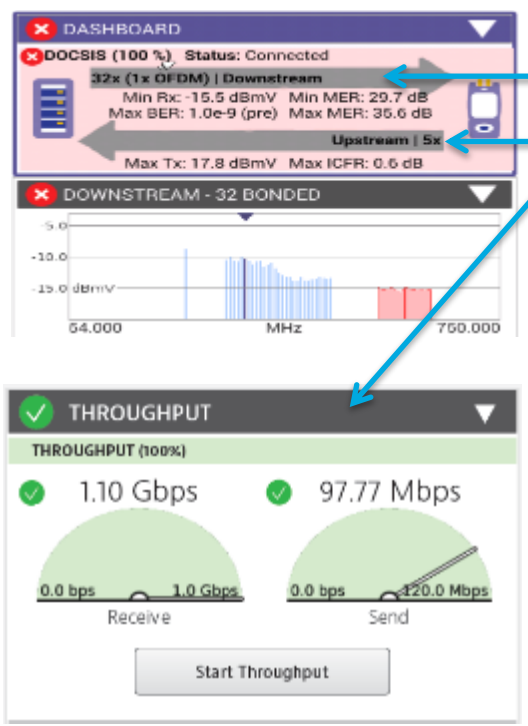
Level variation within the OFDM channel band provides insight into frequency-response related issues.



In-Channel Response identifies roll-off and excessive ripple

DOCSIS Service Level Testing

DOCSIS 3.1 is backwards compatible – can utilize just 3.0 QAM carriers. Verify bonding with OFDM carriers to ensure that high-tier data traffic is on more efficient OFDM carriers and is not impacting other customers.

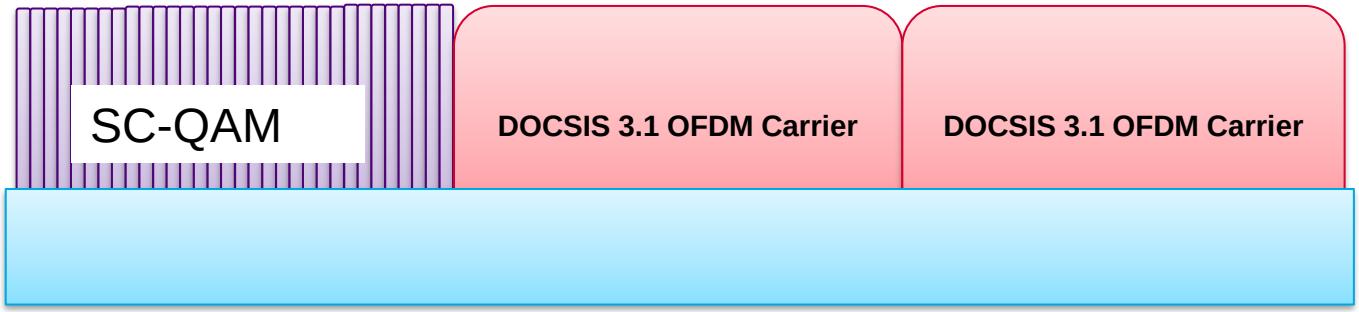


THINGS TO CHECK:

Bonding with OFDM, Upstream bonding and Throughput

- DOCSIS 3.1 systems can provide over 1 Gbps throughput
- Validating operation at subscribed rates is important to verify customer experience.
- Testing at DOCSIS physical layer identifies RF related impacts on overall service performance.
- Testing both DOCSIS service and Ethernet helps ensure top customer QoE.
- Consumer-grade PC HW limitations can prevent testing up to 1 Gbps.
  → Testing both DOCSIS and Ethernet layer to 1 Gbps helps distinguish
- between service problems and equipment problems.

How to set the level of a D3.1 OFDM carrier



DOCSIS 3.1 OFDM carrier power levels should be measured and referenced in comparison to the power in a 6MHz carrier.

In a flat system, the average power of the OFDM, referenced to a 6MHz carrier should be set to the same power level as the adjacent 6MHz QAM 256 carriers.

NOTE: The TOTAL power of the 96 or 192 MHz OFDM carrier is greatly different than the average power in a 6MHz bandwidth.
Total power of 96/192MHz wide carrier: This is not referenced to a 6MHz carrier

Total Power = Total Power PER Channel (6MHz) + $10\log_{10}$(Channel Bandwidth).

Where Channel Bandwidth would be overall OFDM Bandwidth/6MHz channel bandwidth = # of 6MHz Channels :

- ➔ for a 96MHz wide OFDM carrier the TOTAL power will be 12.04dB higher
- ➔ for a 192 MHz wide OFDM carrier the TOTAL power will be 15.05dB higher

NOTE: DON'T USE THE TOTAL OFDM POWER to ADJUST CMTS OUTPUT POWER
(This would be like using the total integrated power of 32 DOCSIS QAM carriers to set the level)

Example: Single 6MHz channel power = 5 dBmV
➔ *Total Power(96MHz channel) = 5dBmV + $10\log_{10}(16)$ = 5 + 12.04 = 17.04dBmV ➔ This is what some spectrum analyzers (like R&S FSW) show*

DOCSIS 3.1 OFDM Carrier Level Measurements

Select OFDM carrier in scan

Look at OFDM carrier average level

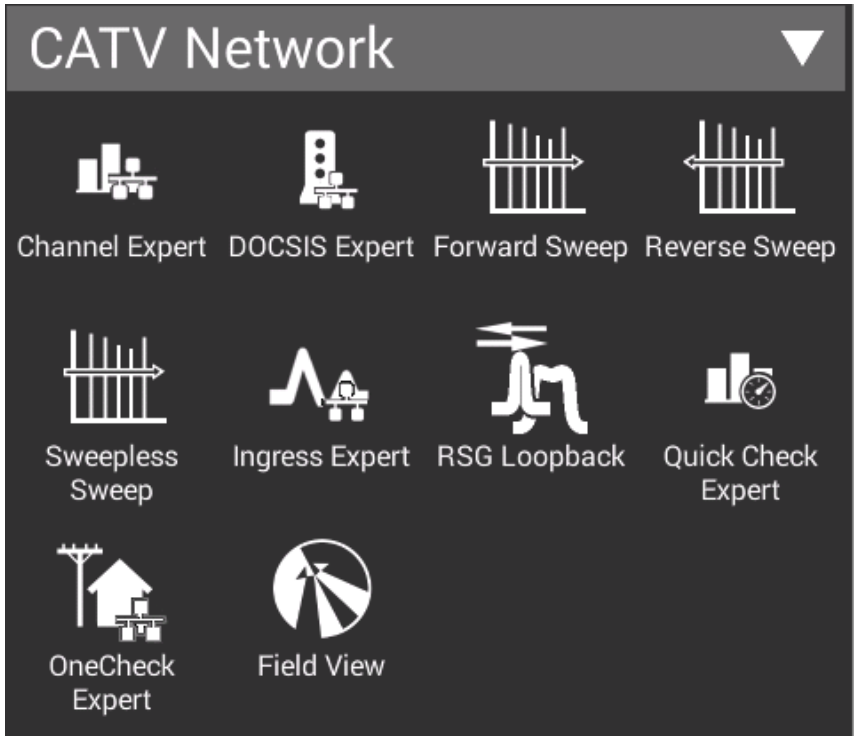
Level approximates 6MHz QAM power, for example, all at 10dBmV

- Measure and reference OFDM carriers in comparison to power in a 6 MHz bandwidth (CableLabs® recommendation).
- With 8 MHz QAM in Europe → Set the OFDM level (ref. 6 MHz) **1.2 dB below the 8 MHz QAM 256** to maintain the same power/Hz.
- PLC carrier average power will be approximately 0.8dB higher than other carriers due to additional pilots and data patterns
- Total OFDM carrier (up to 192MHz) power is greatly different than average power in a 6 MHz bandwidth:
  - For a 96 MHz wide OFDM carrier, the total power will be 12.04 dB higher.
  - For a 192 MHz wide OFDM carrier, the total power will be 15.05 dB higher
- Do not use the total OFDM power to adjust CMTS output power: this would be like using total integrated power of 32 DOCSIS QAM carriers to set level.

ONX CATV NETWORK Testing

- Configure Screens
- QuickCheck EXPERT
- Channel EXPERT
- DOCSIS EXPERT
- Ingress Expert
- Return Signal Generator (RSG) w/ Loopback

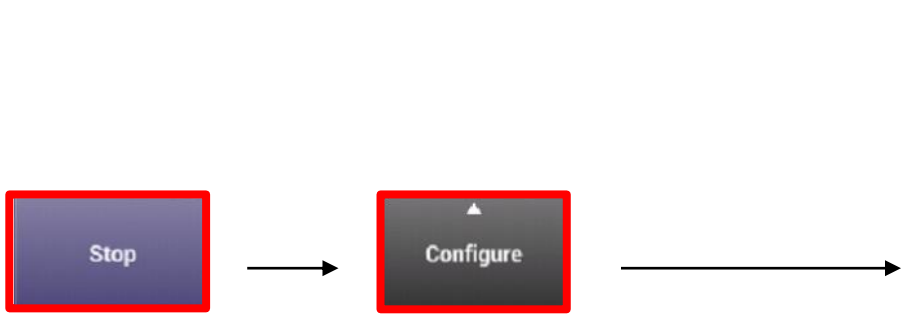
CATV NETWORK

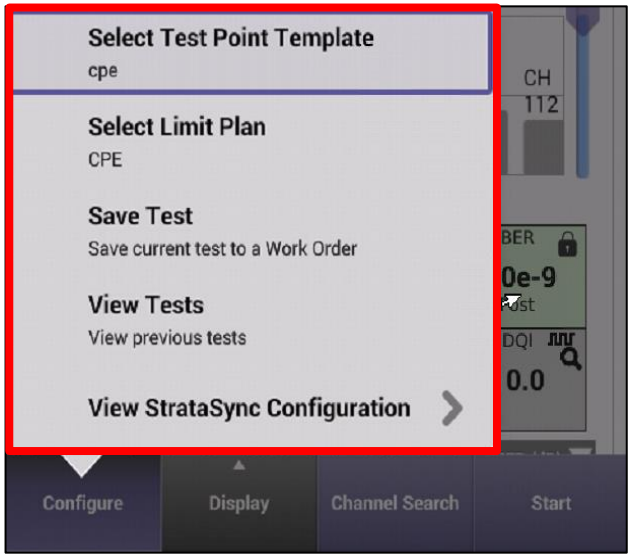


- CATV NETWORK offers 8 test functions
- Channel Expert
- DOCSIS Expert
- Forward Sweep (Active)
- Reverse Sweep (Active)
- Sweepless Sweep (Downstream)
- Ingress Expert
- Return Signal Generator w/ Loopback
- Quick Check Expert
- OneCheck Expert
- Field View (with Return Signal Generator)

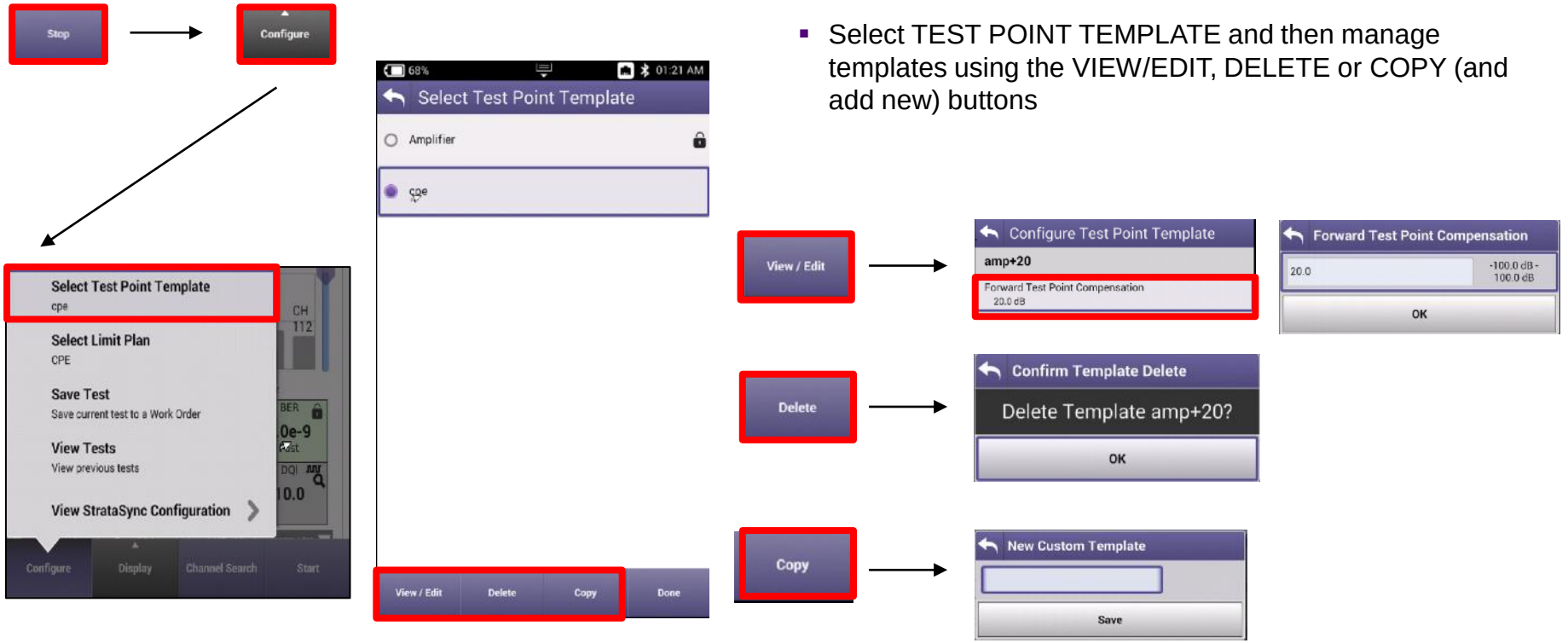
CONFIGURE

- All EXPERT test functions will feature a CONFIGURE button when the STOP function is pressed
- All new test functions are LIVE tests so to access CONFIGURE, test must be stopped first





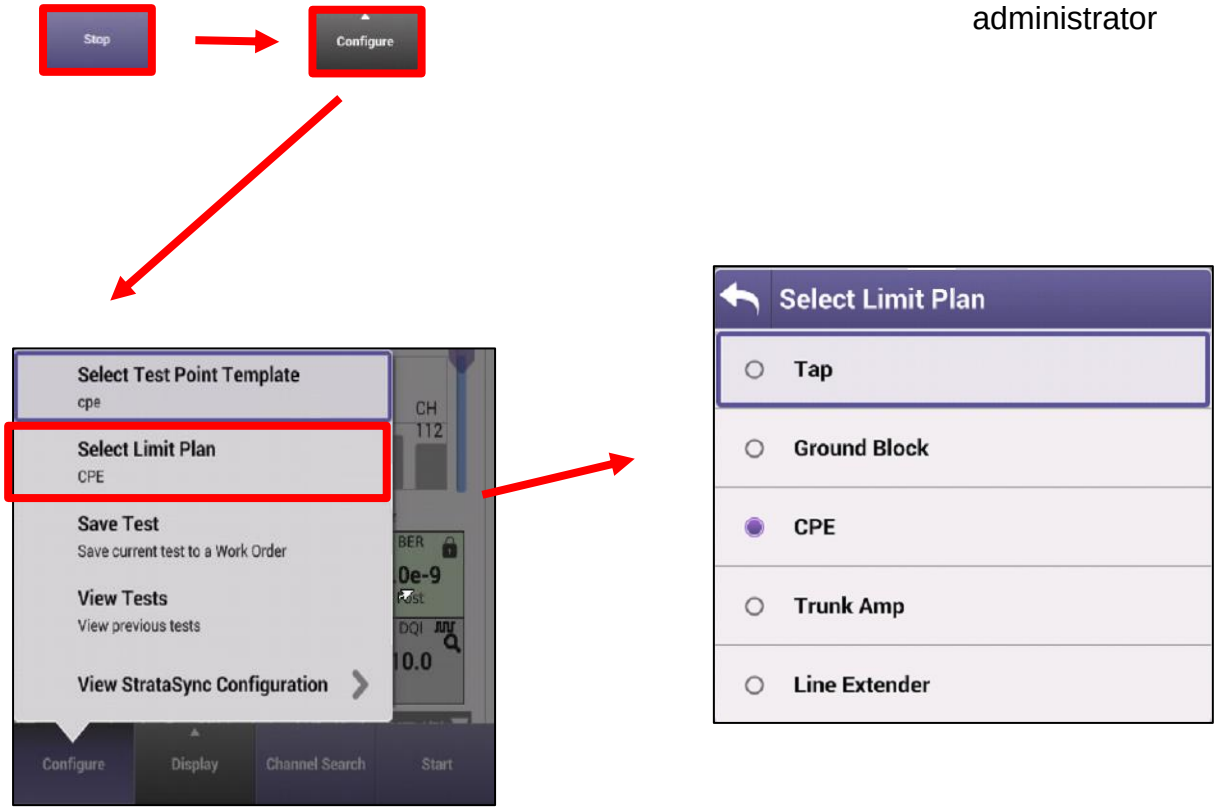
CONFIGURE – TEST POINT TEMPLATE



- Select TEST POINT TEMPLATE and then manage templates using the VIEW/EDIT, DELETE or COPY (and add new) buttons

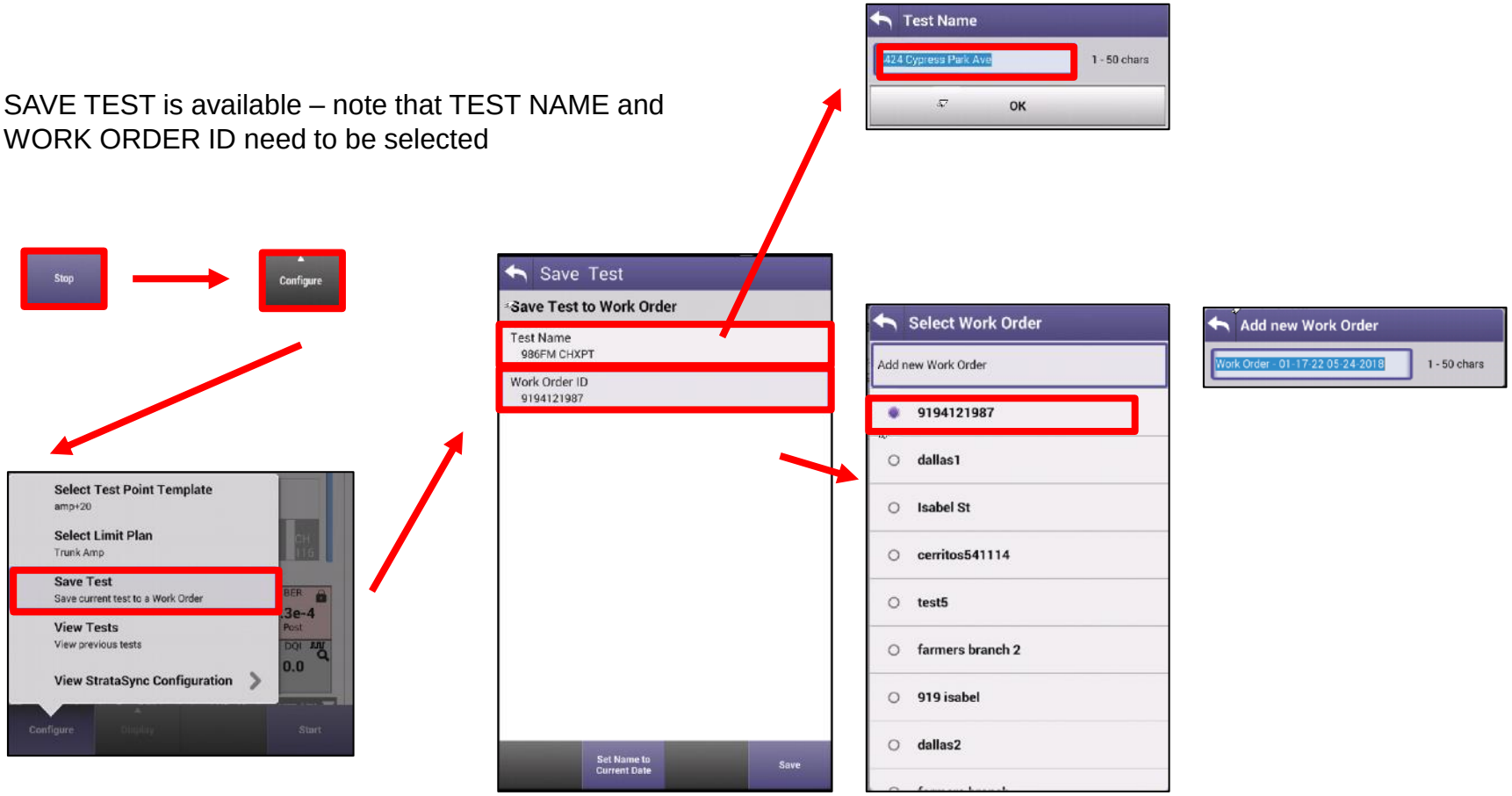
CONFIGURE – LIMIT PLAN

- LIMIT PLANS are set up in STRATASYNC – for help setting up custom LIMIT PLANS see system administrator



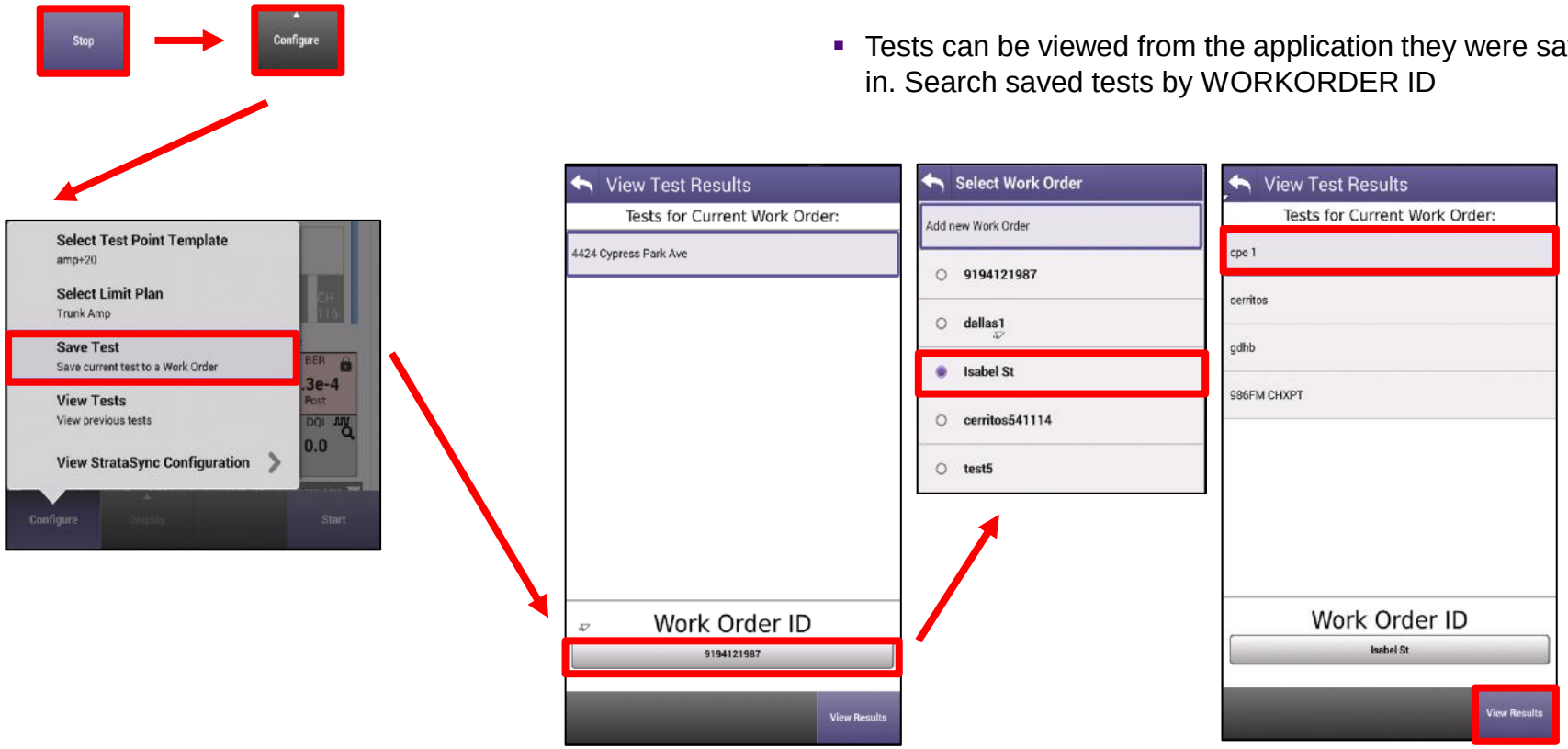
CONFIGURE – SAVE TEST

- SAVE TEST is available – note that TEST NAME and WORK ORDER ID need to be selected

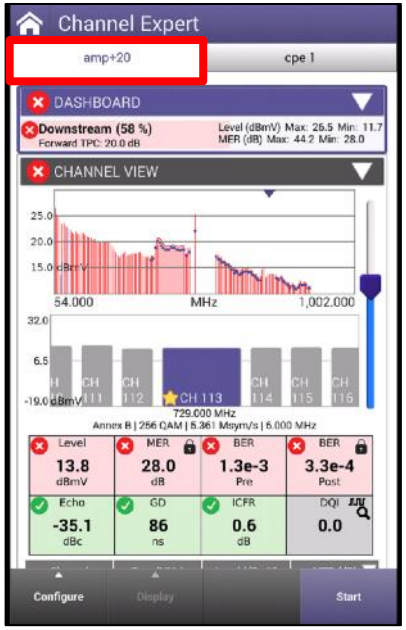


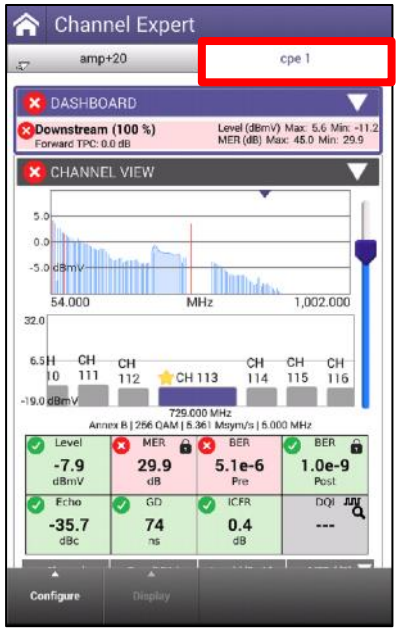
CONFIGURE – VIEW TEST

- Tests can be viewed from the application they were saved in. Search saved tests by WORKORDER ID

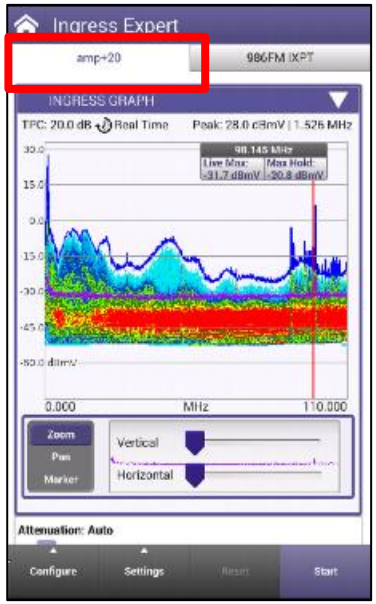


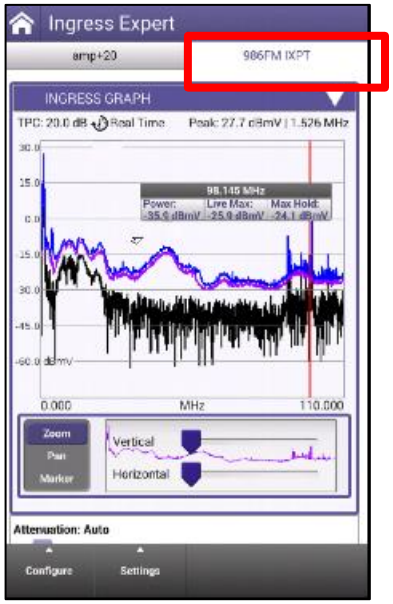
CONFIGURE – VIEW TEST – DELTA TAB





- After loading a saved test file it will appear in the RIGHT HAND TAB
- Users can cycle back and forth between live measurements and the saved test file by selecting the appropriate tab
- Note because the saved test in the RIGHT HAND TAB is not live, there are no START or STOP buttons

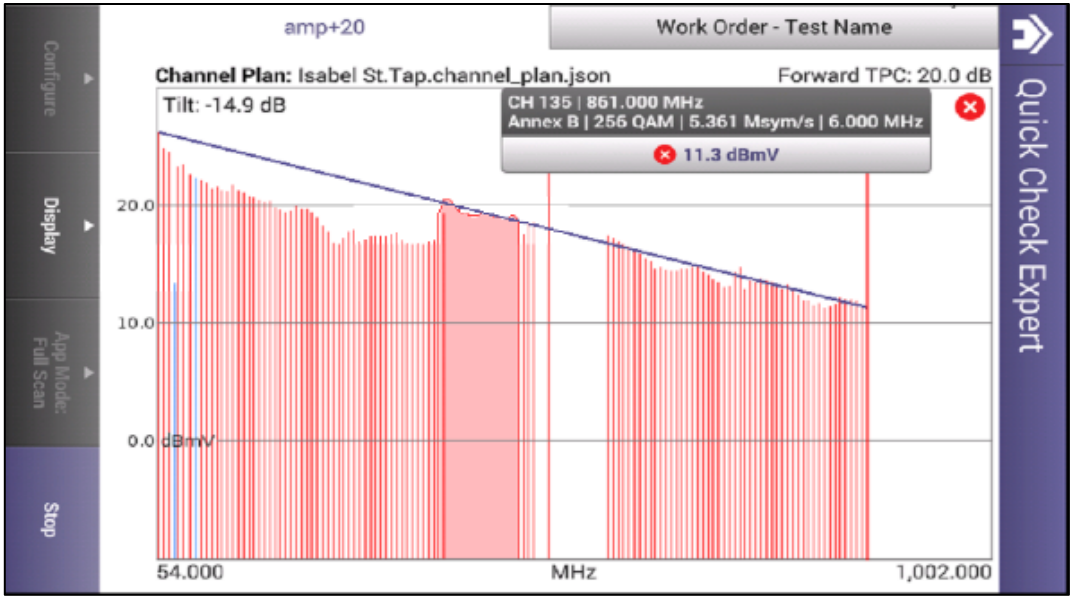


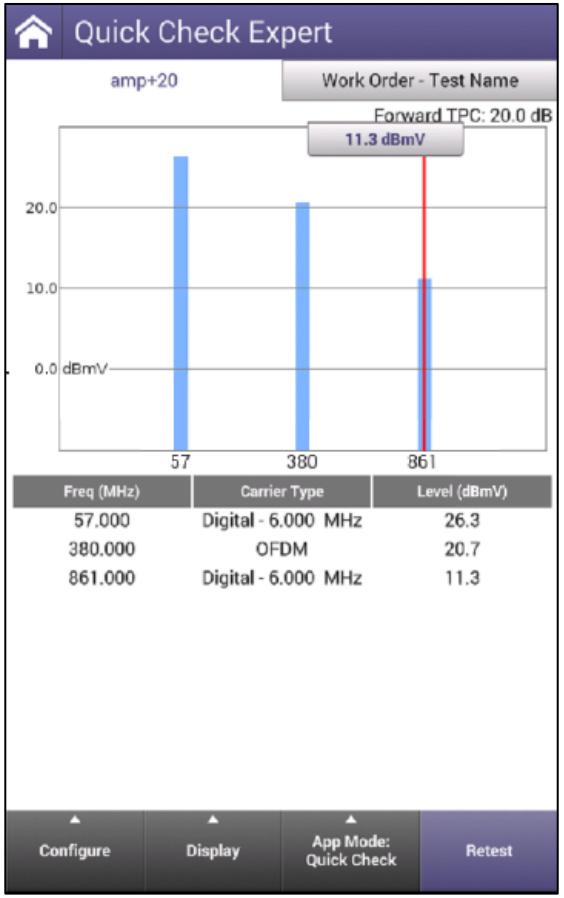


QuickCheck EXPERT

QuickCheck EXPERT

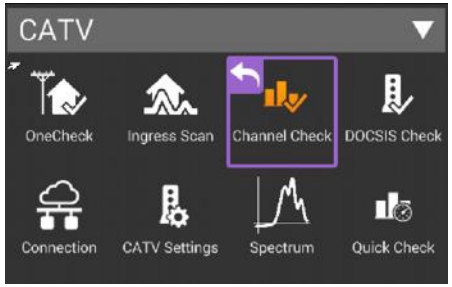
- QuickCheck Expert can be run in two modes
  - Quick Check
  - Full Scan
- To populate the FULL SCAN, user must first save a channel plan in ChannelCheck before loading it in QuickCheck Expert
- To populate the QuickCheck mode with channels, user must add them manually





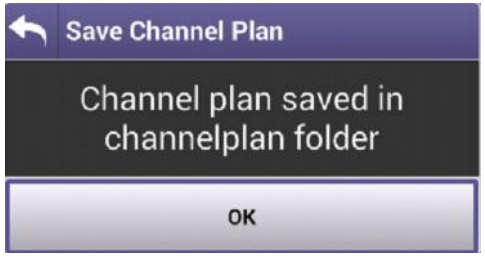
QuickCheck EXPERT – SAVING CHANNEL PLANS

- To save a Channel Plan, run the CHANNELCHECK test under CATV



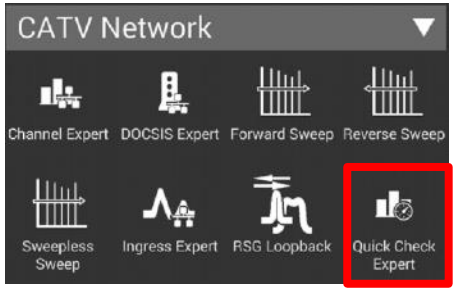
- After test completes, use the BACK button to return to CHANNELCHECK SETUP

- Select SAVE CHANNEL PLAN. A message will display indicating the Channel Plan has ben saved. The Channel plan will be named after the WORK ORDER ID

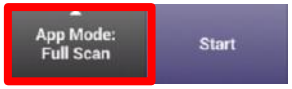


QuickCheck EXPERT – LOADING CHANNEL PLANS

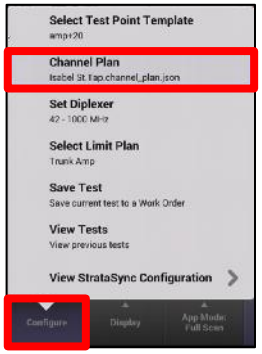
- Return to QUICKCHECK EXPERT under CATV NETWORK



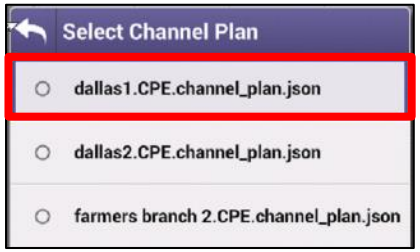
- Test will automatically run, STOP test and change APP MODE to FULL SCAN



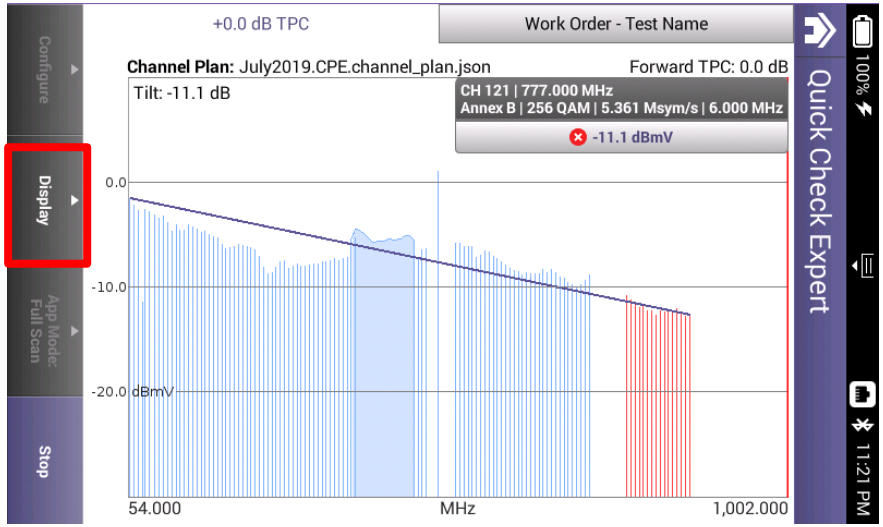
- Select CONFIGURE and select CHANNEL PLAN



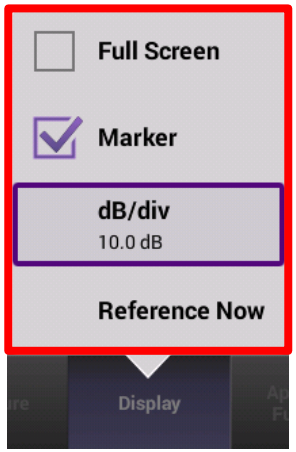
- Select the appropriate saved CHANNEL PLAN



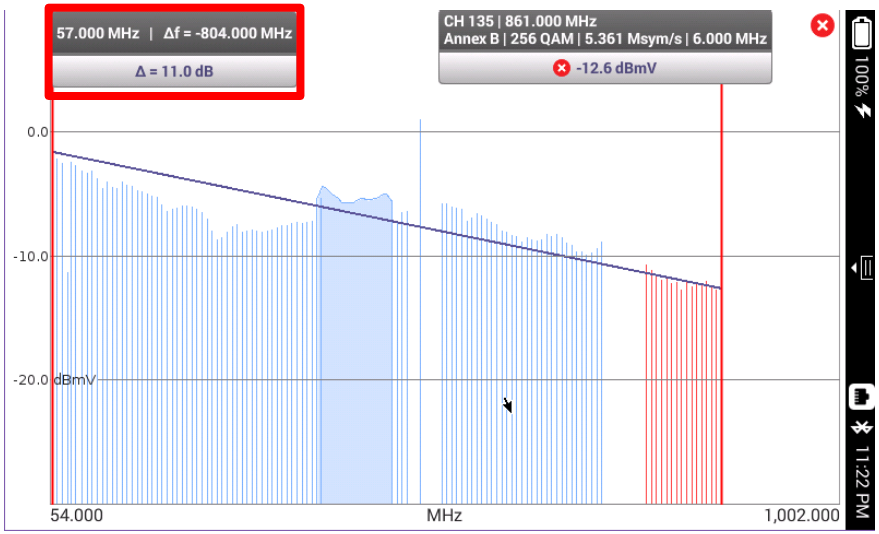
QuickCheck EXPERT – FULL SCAN MODE



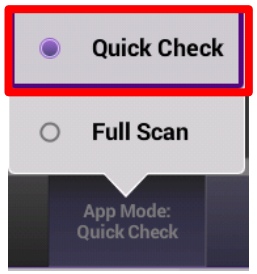
- DISPLAY allows the user customize the following

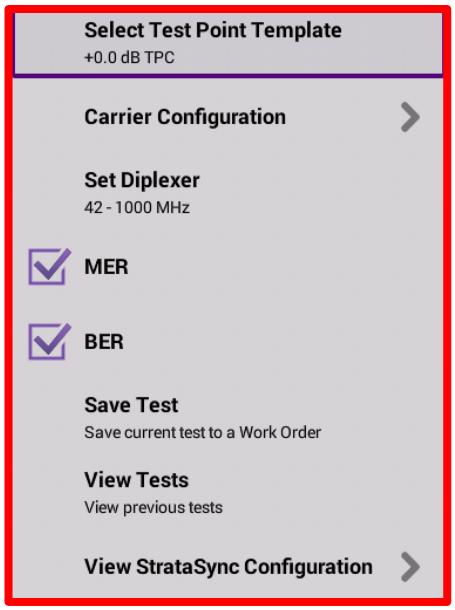


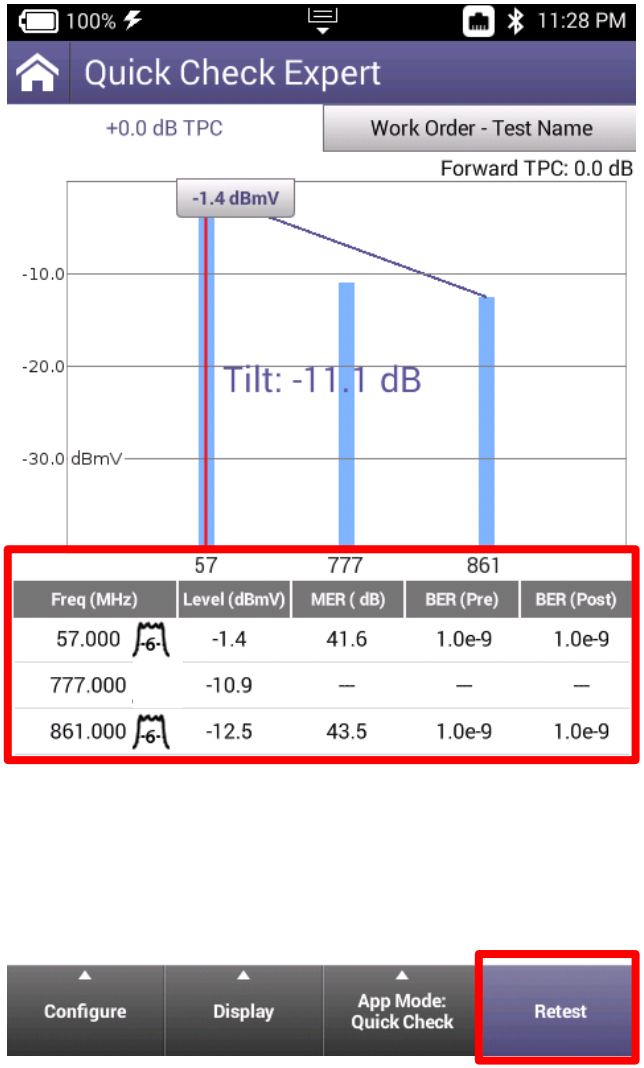
- To EXIT FULLSCREEN, double tap finger on the FULL SCAN



QuickCheck EXPERT – QUICK CHECK MODE

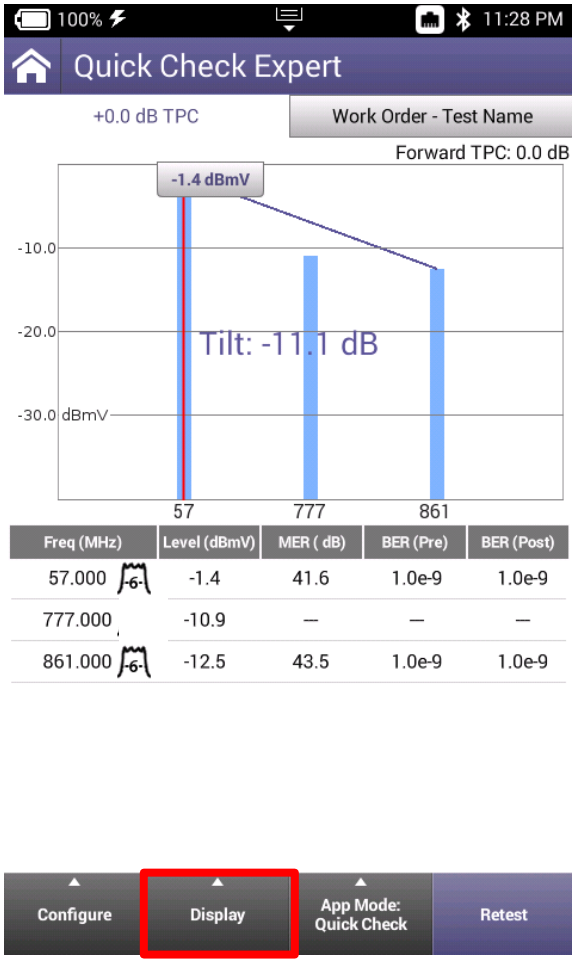


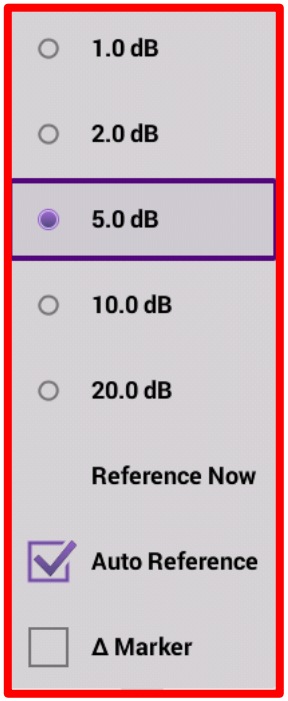




- Select the QUICK CHECK MODE for a more responsive LEVEL/MINISCAN mode
- While test is STOPPED, select CONFIGURE and select display of MER and BER and CARRIER CONFIGURATION
- Select CARRIER CONFIGURATION and then choose ADD CARRIER or REMOVE CARRIER to customize

QuickCheck EXPERT – QUICK CHECK MODE



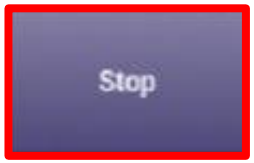


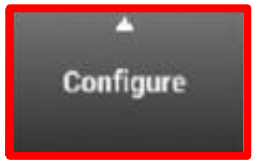
- DISPLAY allows the user to change dB/div and also select AUTO REFERENCE or REFERENCE NOW

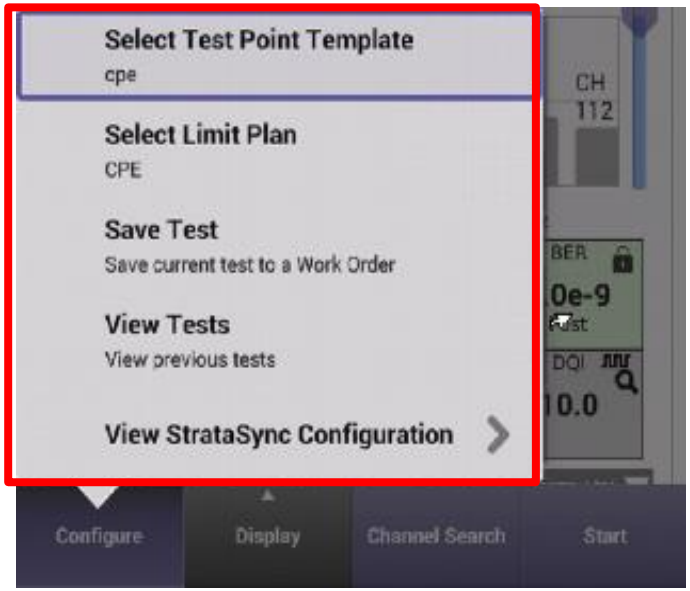
Channel EXPERT

Channel EXPERT - DASHBOARD

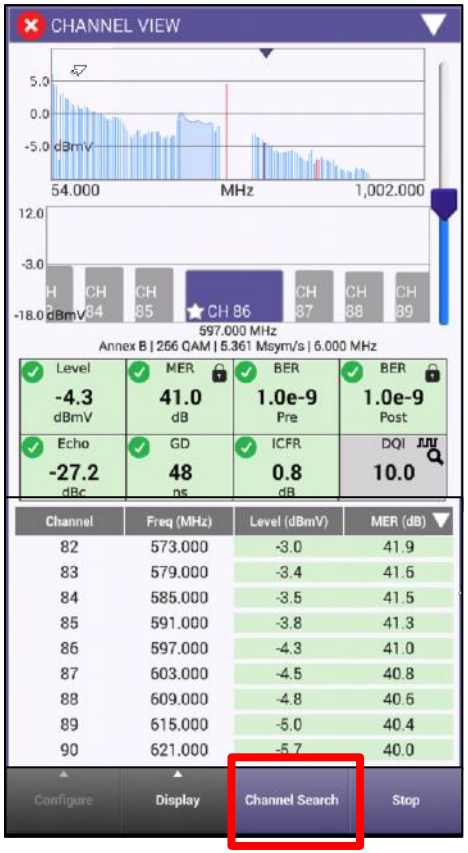
- Dashboard gives an overall status on the test. Because Channel Expert is LIVE, measurements will continue to update once the dashboard indicates 100%
- Test Point Compensation (TPC) is shown and can be toggled after users select STOP and CONFIGURE (See Section on TPC Setup)
- Max and Mins are displayed for MER(dB) and Level (dBmV)



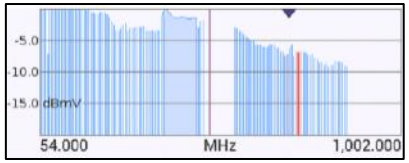




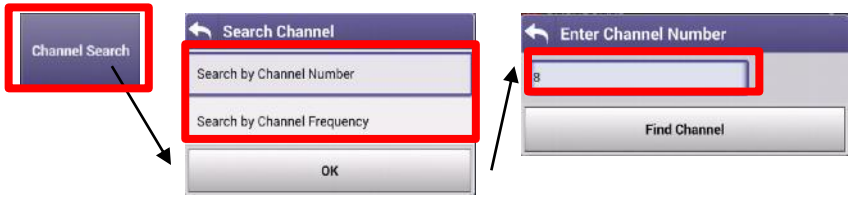
Channel EXPERT – CHANNEL VIEW



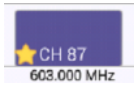
- CHANNEL VIEW allows the user to view the Fullscan, with any measurements failing the threshold represented in RED and all measurements passing the thresholds represented in GREEN



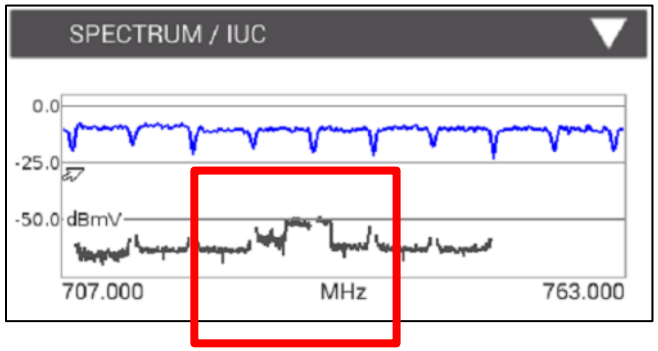
- Users can navigate via touchscreen, D-Pad or Channel Search as long as CHANNEL VIEW is selected in BLUE



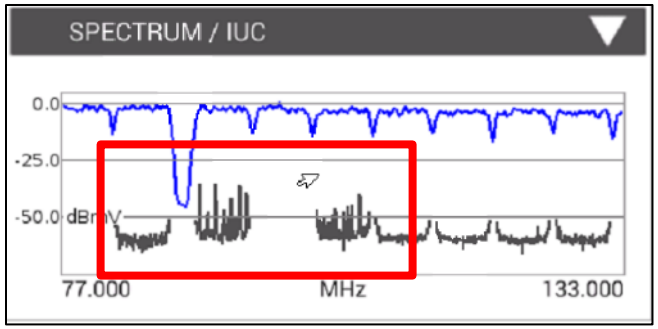
- Users can select their FAVORITES by pressing on the STAR until it is highlighted in Gold



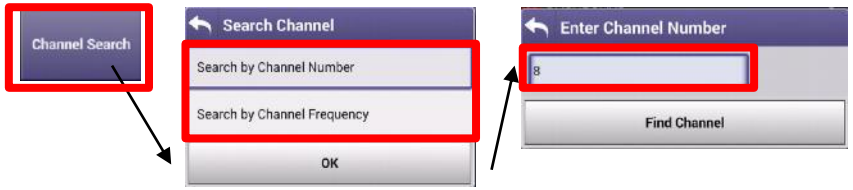
Channel EXPERT – SPECTRUM/ IUC



- SPECTRUM/IUC (Ingress Under the Carrier) allows the user to view ingress under the selected and adjacent QAM carriers.
- Examples below are real world LTE Ingress and FM Ingress



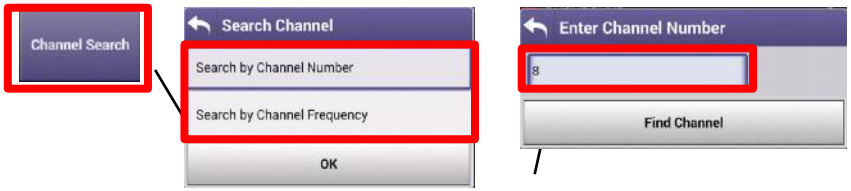
- To rapidly change channels use Channel Search as long as CHANNEL VIEW is selected in BLUE



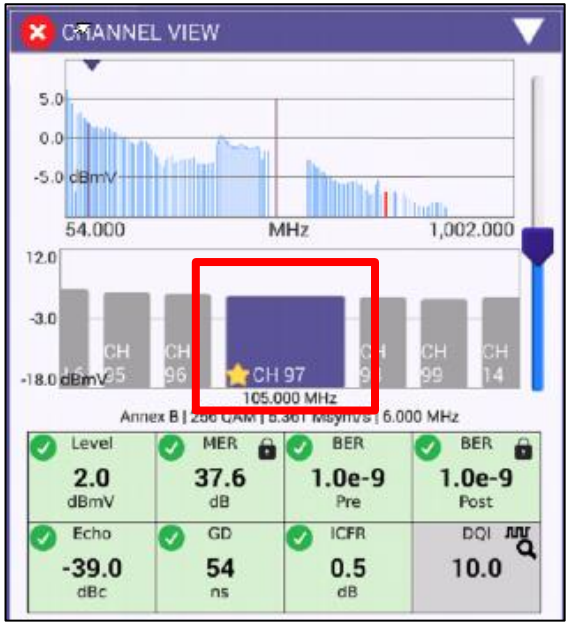
Channel EXPERT – OVER TIME MEASUREMENTS

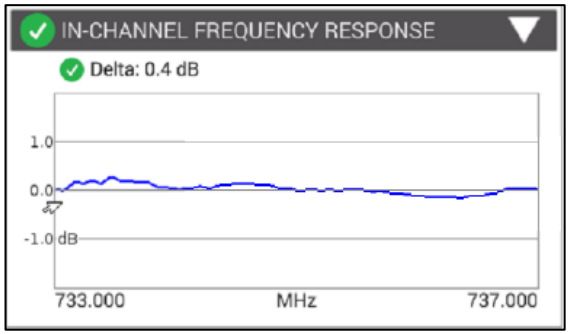
- Level OVER TIME, MER OVER TIME, BER OVER TIME on all channels in the background and DQI OVER TIME measured on the channel selected in CHANNEL VIEW. These measurements will continue until and be displayed over the last 5 minutes until the measurement is stopped

- To rapidly change channels use Channel Search as long as CHANNEL VIEW is selected in BLUE



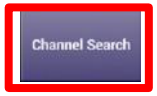
Channel EXPERT – ICFR (In-Channel Frequency Response)

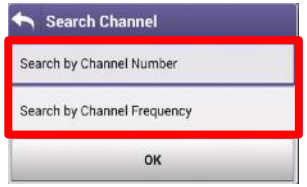




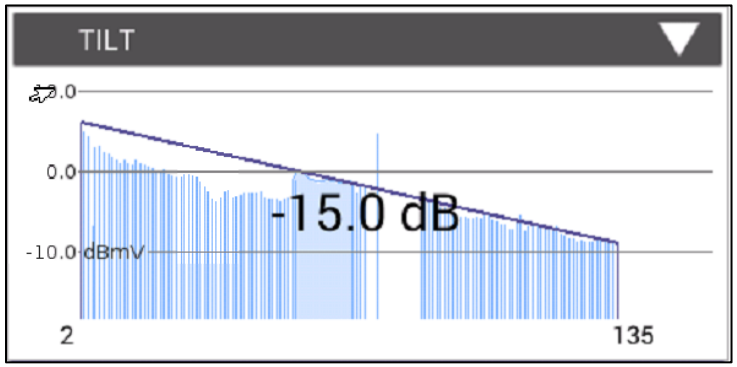
- In-Channel Frequency Response of the specific carrier selected in CHANNEL VIEW and will continue until stopped

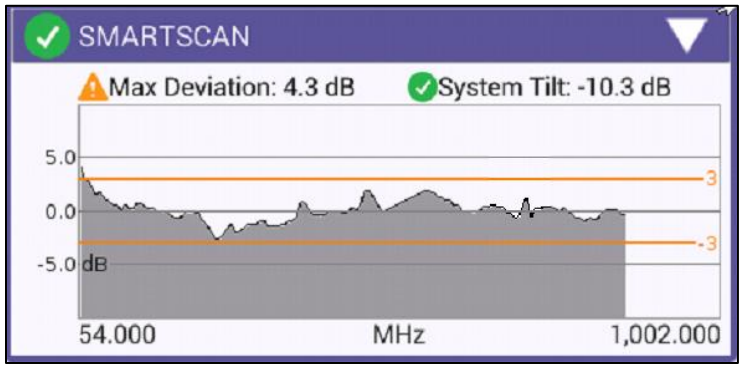
- To rapidly change channels use Channel Search as long as CHANNEL VIEW is selected





Channel EXPERT – TILT and SMARTSCAN

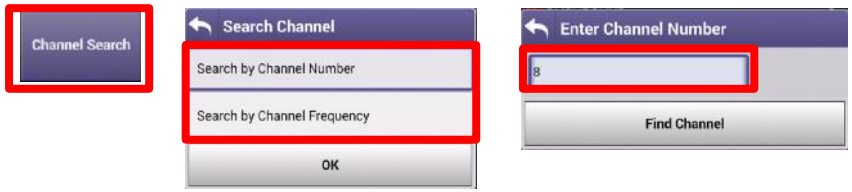




- TILT of the Fullscan, TILT channels can be toggled in CATV SETTINGS

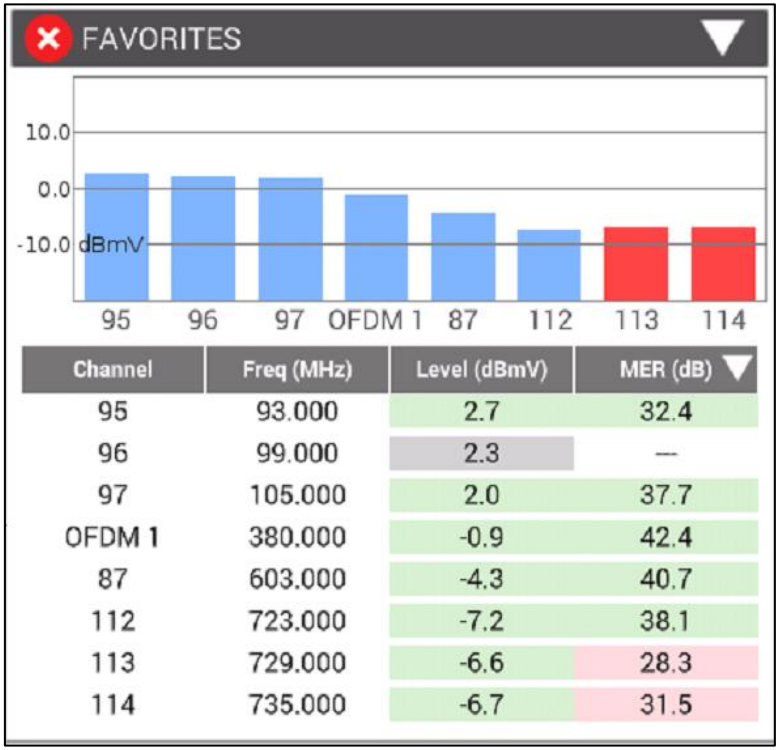
- SMARTSCAN offers a raw frequency domain response of the Fullscan and measures against a defined thresholds for deviation and tilt

- To rapidly change channels use Channel Search has long as CHANNEL VIEW is selected in BLUE

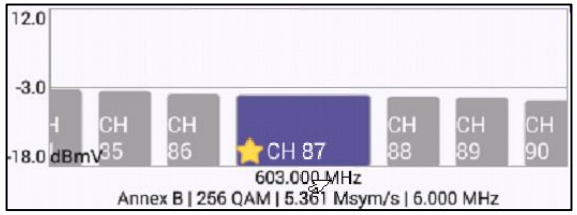


Channel EXPERT - FAVORITES

- FAVORITES is a user defined Miniscan
- Select favorites channels by highlighting the Gold Star on desired channels in CHANNEL VIEW

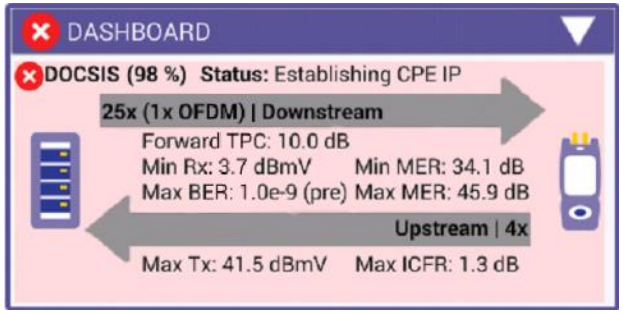


Channel	Freq (MHz)	Level (dBmV)	MER (dB)
95	93.000	2.7	32.4
96	99.000	2.3	---
97	105.000	2.0	37.7
OFDM 1	380.000	-0.9	42.4
87	603.000	-4.3	40.7
112	723.000	-7.2	38.1
113	729.000	-6.6	28.3
114	735.000	-6.7	31.5



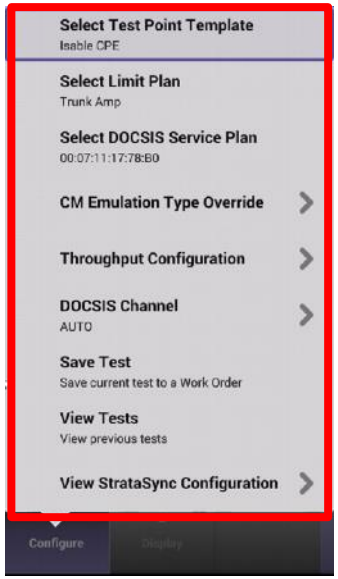
DOCSIS EXPERT

DOCSIS EXPERT - DASHBOARD



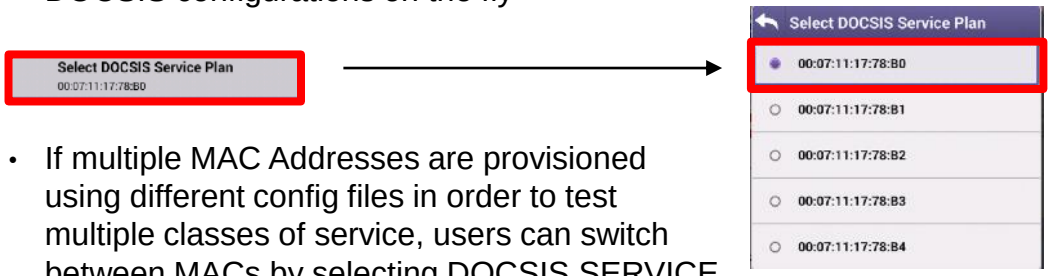
- Dashboard gives an overall status on the test. Because DOCSIS Expert is LIVE, measurements will continue to update once the dashboard indicates 100%
- Test Point Compensation (TPC) is shown and can be toggled after users select STOP and CONFIGURE (See Section on TPC Setup)

- Downstream measurements displayed include Max and Mins for MER(dB) and Level (dBmV) and MAX Rx
- Upstream measurements displayed include MAX Tx and MAX ICFR

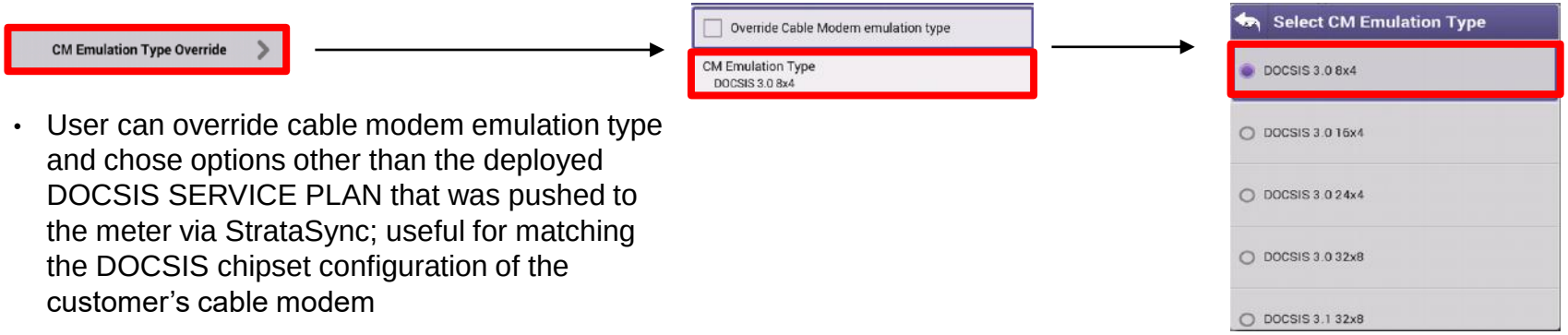


DOCSIS EXPERT - CONFIGURE

- CONFIGURE offers the user the ability to customize DOCSIS configurations on the fly

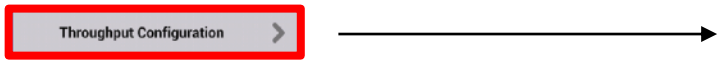


- If multiple MAC Addresses are provisioned using different config files in order to test multiple classes of service, users can switch between MACs by selecting DOCSIS SERVICE PLAN

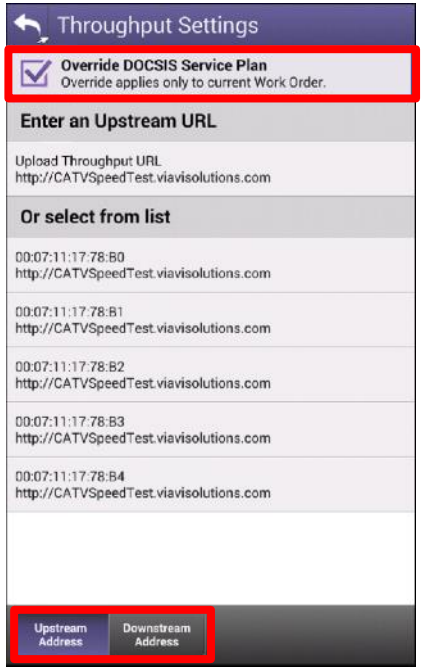


- User can override cable modem emulation type and chose options other than the deployed DOCSIS SERVICE PLAN that was pushed to the meter via StrataSync; useful for matching the DOCSIS chipset configuration of the customer's cable modem

DOCSIS EXPERT - CONFIGURE

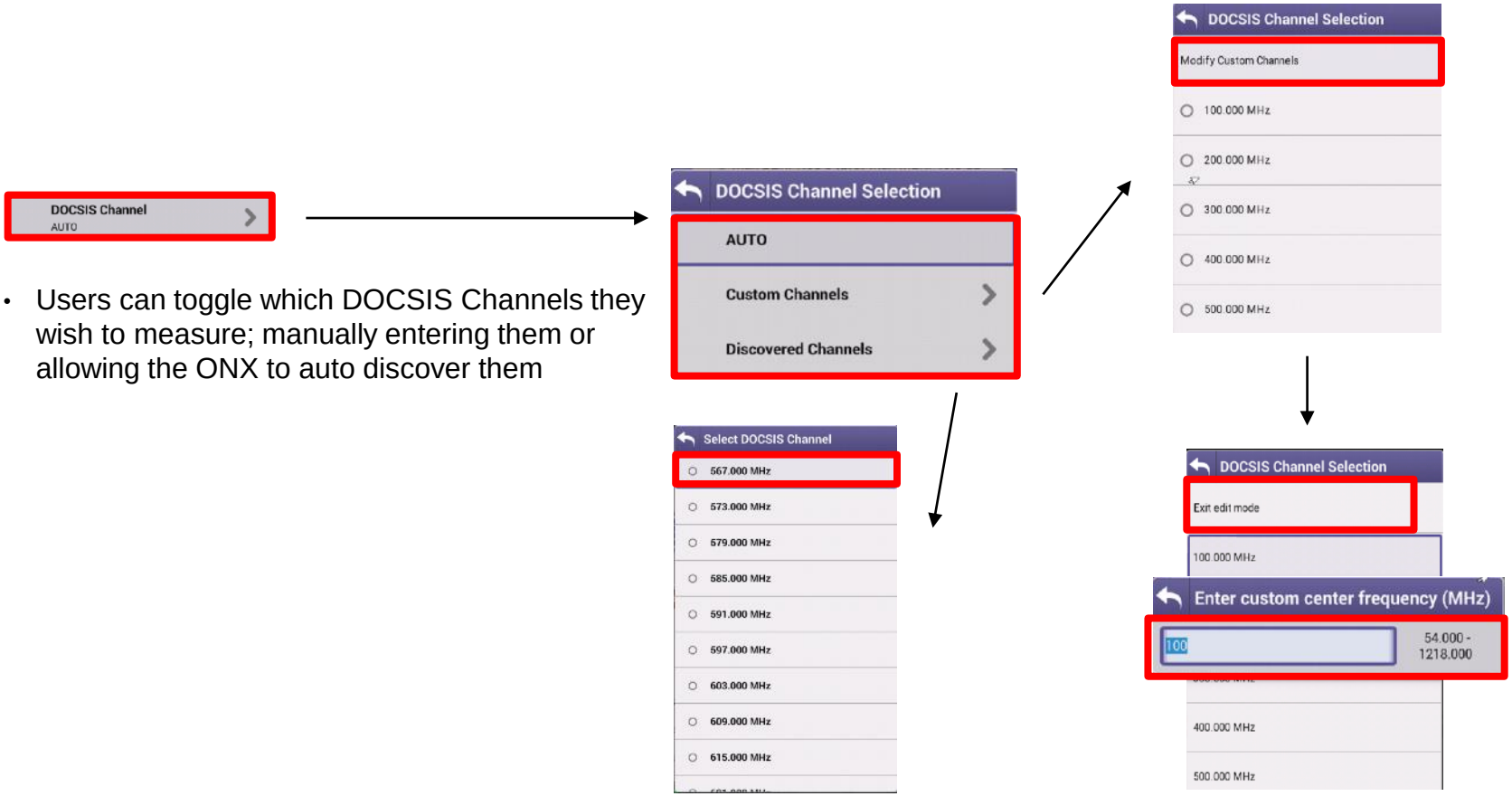


- Users can toggle THROUGHPUT CONFIGURATIONS; useful when there are multiple throughput servers to test to at any given time
- Select Override DOCSIS SERVICE PLAN and then choose UPSTREAM or DOWNSTREAM ADDRESS to customize or update

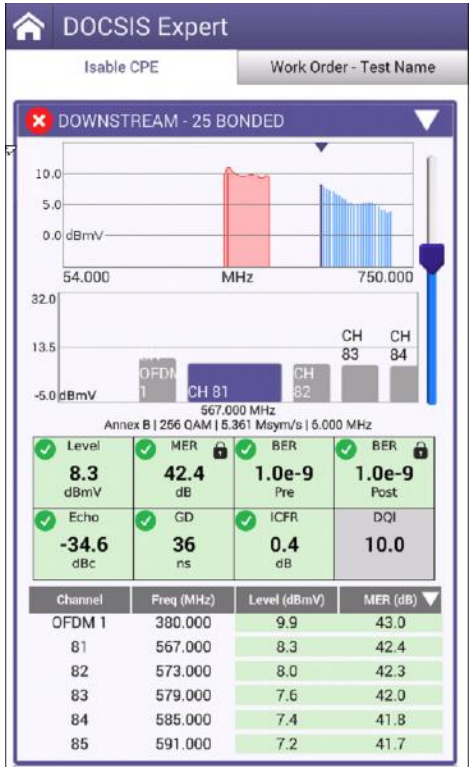


DOCSIS EXPERT - CONFIGURE

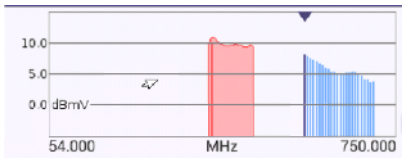
- Users can toggle which DOCSIS Channels they wish to measure; manually entering them or allowing the ONX to auto discover them



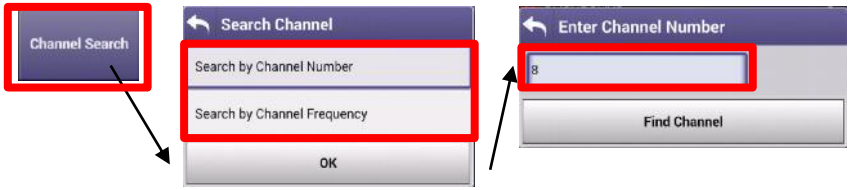
DOCSIS EXPERT – DOWNSTREAM



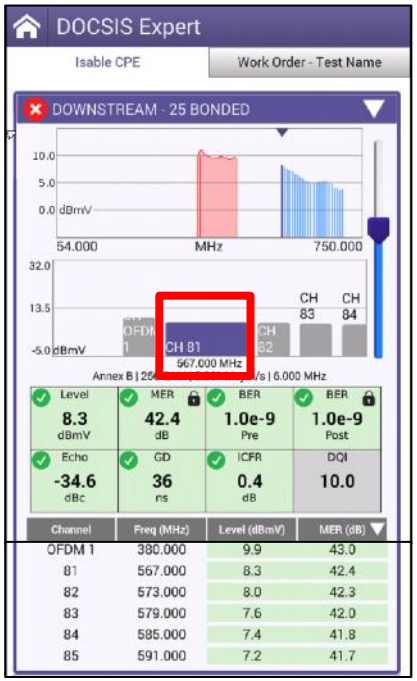
- DOWNSTREAM allows the user to view the DOWNSTREAM DOCSIS CHANNELS, with any measurements failing the threshold represented in RED and all measurements passing the thresholds represented in GREEN

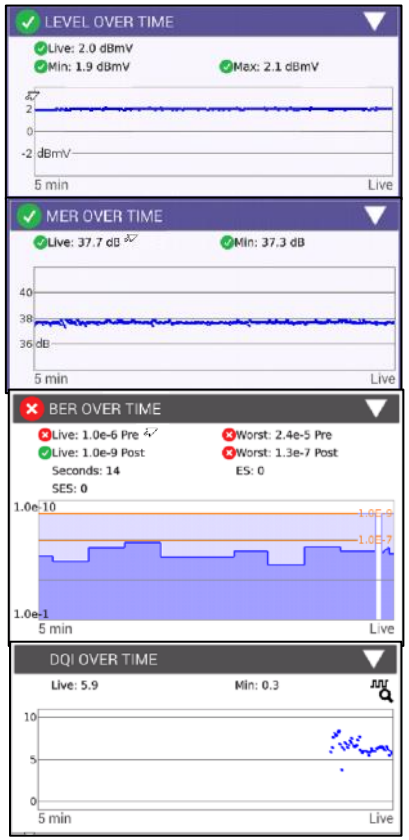


- Users can navigate via touchscreen, D-Pad or Channel Search as long as CHANNEL VIEW is selected



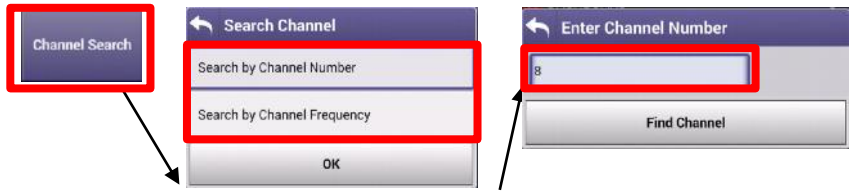
DOCSIS EXPERT – OVER TIME MEASUREMENTS



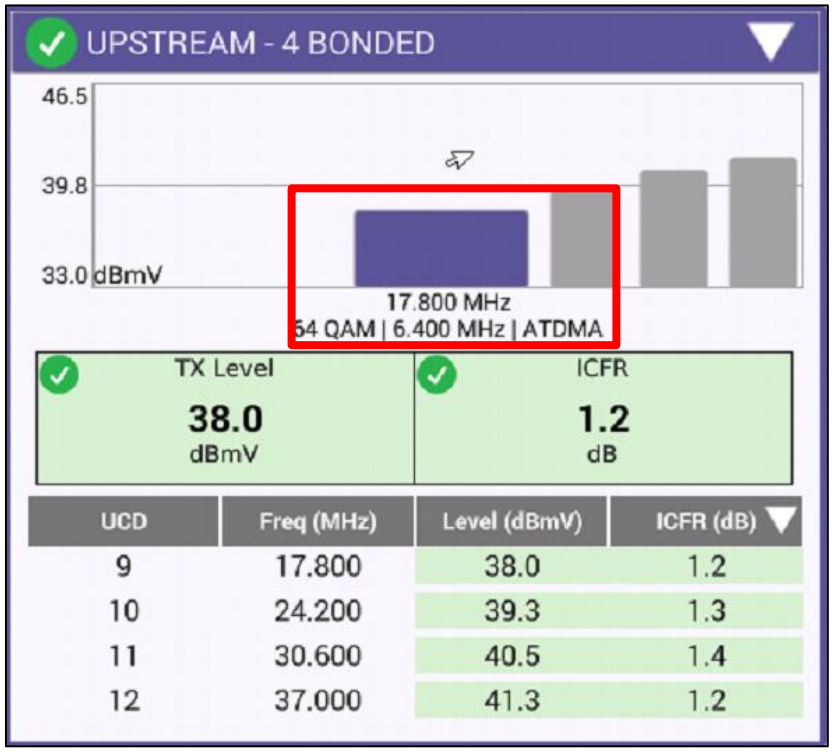


- Level OVER TIME, MER OVER TIME, BER OVER TIME and DQI OVER TIME measure the channel that is selected in CHANNEL VIEW and will continue until stopped

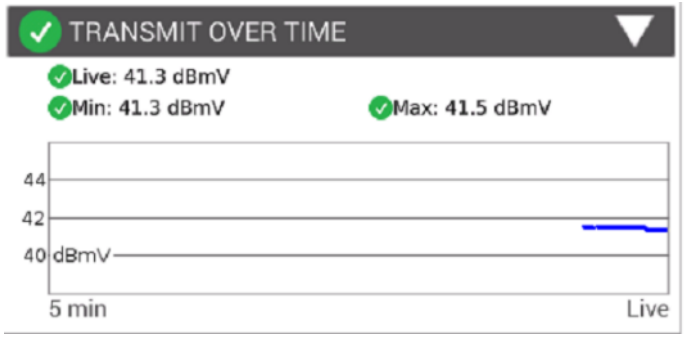
- To rapidly change channels use Channel Search as long as CHANNEL VIEW is selected



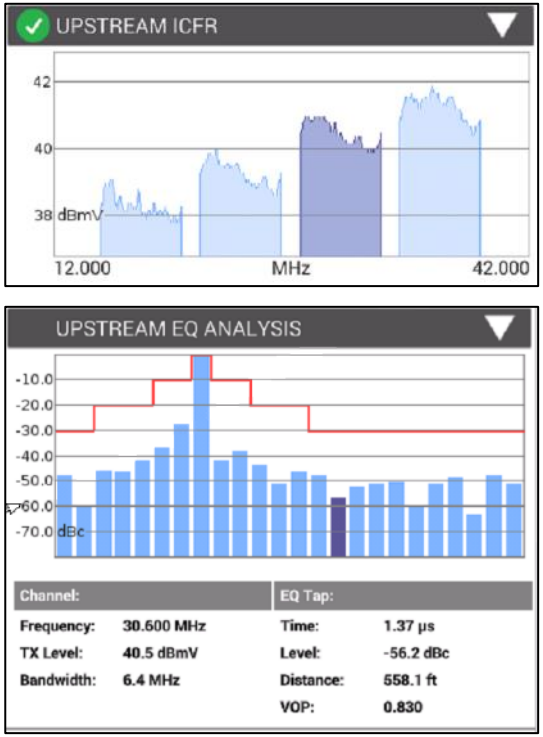
DOCSIS EXPERT – UPSTREAM/TRANSMIT OVER TIME



- UPSTREAM provides the user with verification of the number of upstream carriers; the Upstream Transmit Level (TX) and In-Channel Frequency Response (ICFR)
- TRANSMIT OVER TIME corresponds to the locked upstream carrier (highlighted in blue to the left). To shift upstream carrier, select a different one from the UPSTREAM window (D-PAD or TOUCH to toggle) and the TRANSMIT OVER TIME will update



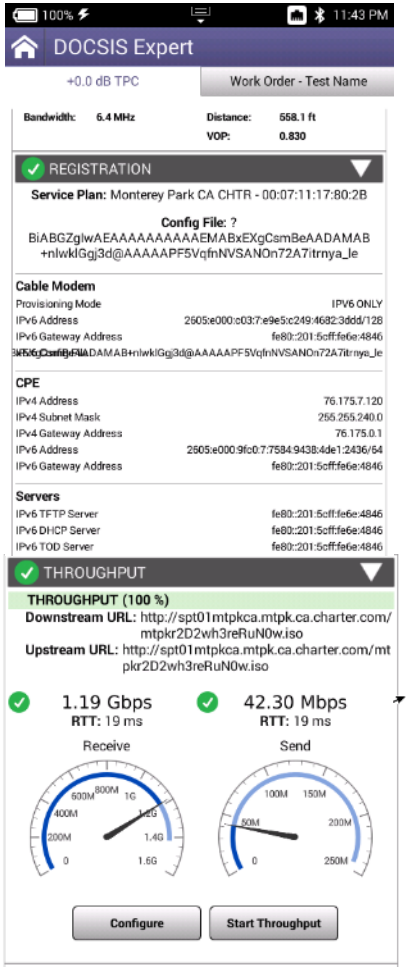
DOCSIS EXPERT – UPSTREAM ICFR and UPSTREAM EQ ANALYSIS

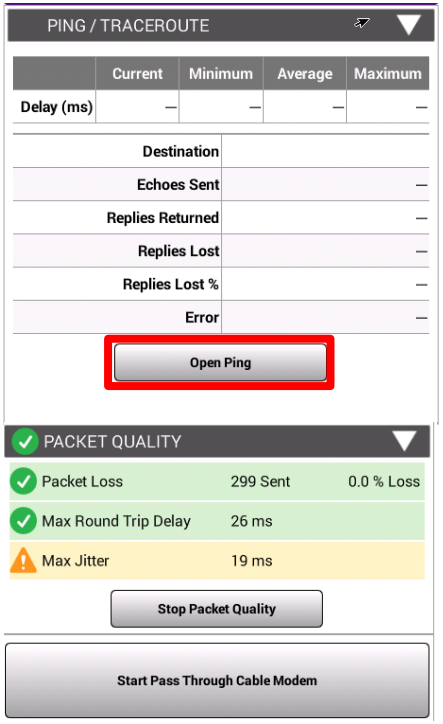


- UPSTREAM ICFR displays each upstream carrier, the darkened carrier is the locked carrier. To toggle, scroll to UPSTREAM and choose a different carrier, UPSTREAM ICFR and UPSTREAM EQ ANALYSIS will update

- UPSTREAM EQ ANALYSIS displays the equalizer graph for 16 QAM and 64 QAM upstream carriers. By highlighting a specific tap, that will indicate the distance to a reflection point in the upstream. This is usually the distance from an amplifier to a reflection caused by an impedance mismatch.

DOCSIS EXPERT – REGISTRATION, THROUGHPUT, PING/TRACEROUTE and PACKET QUALITY



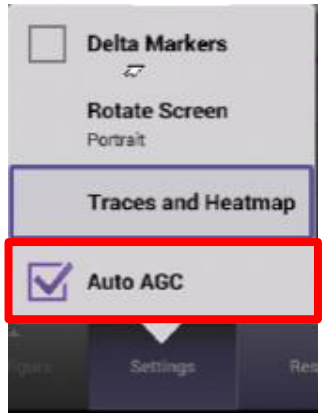


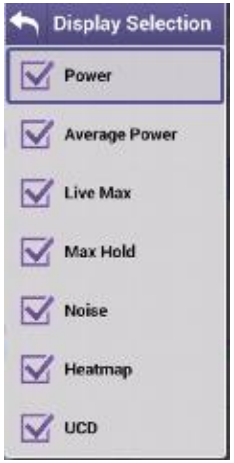
- REGISTRATION will display the configuration file if the CM MAC has been provisioned.
- The THROUGHPUT, PING/TRACEROUTE and PACKET QUALITY functions will be greyed out if the CM MAC is not provisioned. Or if an un-provisioned MAC address is selected in CONFIGURE-> SELECT DOCSIS SERVICE PLAN.
- The throughput test sends a file upstream to a server. The server then sends the file back to the meter. Since the file size is known and the time it takes to download the file is known, the meter can then calculate the downstream speed. The same is done for the upstream.
- The PING/TRACEROUTE function can be configured to send configurable ping packets to a destination. A TRACEROUTE test can also be done to configurable destinations.
- The packet quality test sends ping packets to the CMTS and the meter counts any lost packets, measures latency, (round trip time) and measures maximum jitter. (variations in latency)

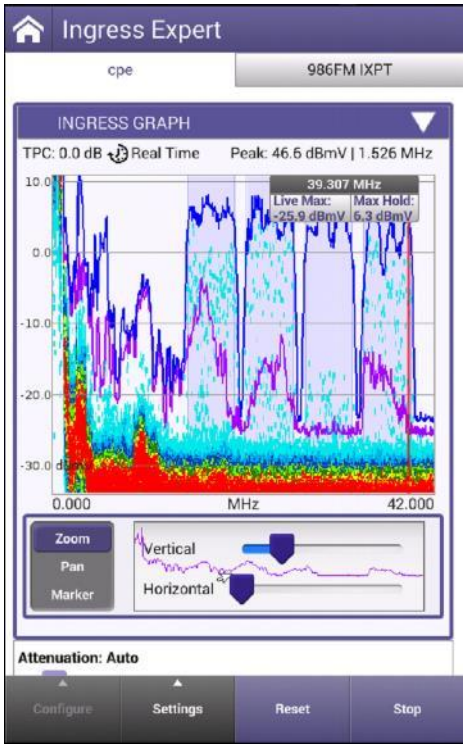
Ingress EXPERT

INGRESS EXPERT

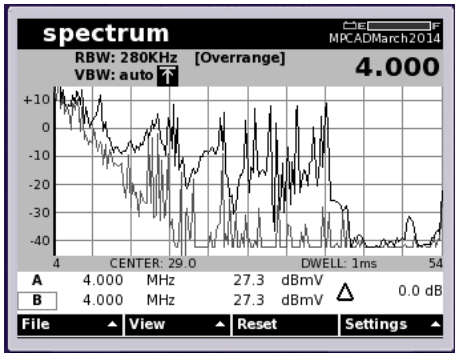
- INGRESS EPXERT is based on powerful OneExpert CATV HyperSpectrum technology (Real Time Spectrum Analyzer)
  - Innovative overlapping FFT (Fast Faurier transform) measures all transient interfering signals
- INGRESS EXPERT is different from Swept Spectrum Analyzers (DSAM and Pathtrak) – its more accurate and has thousands of samples a second
- Overlapping options provide additional detail







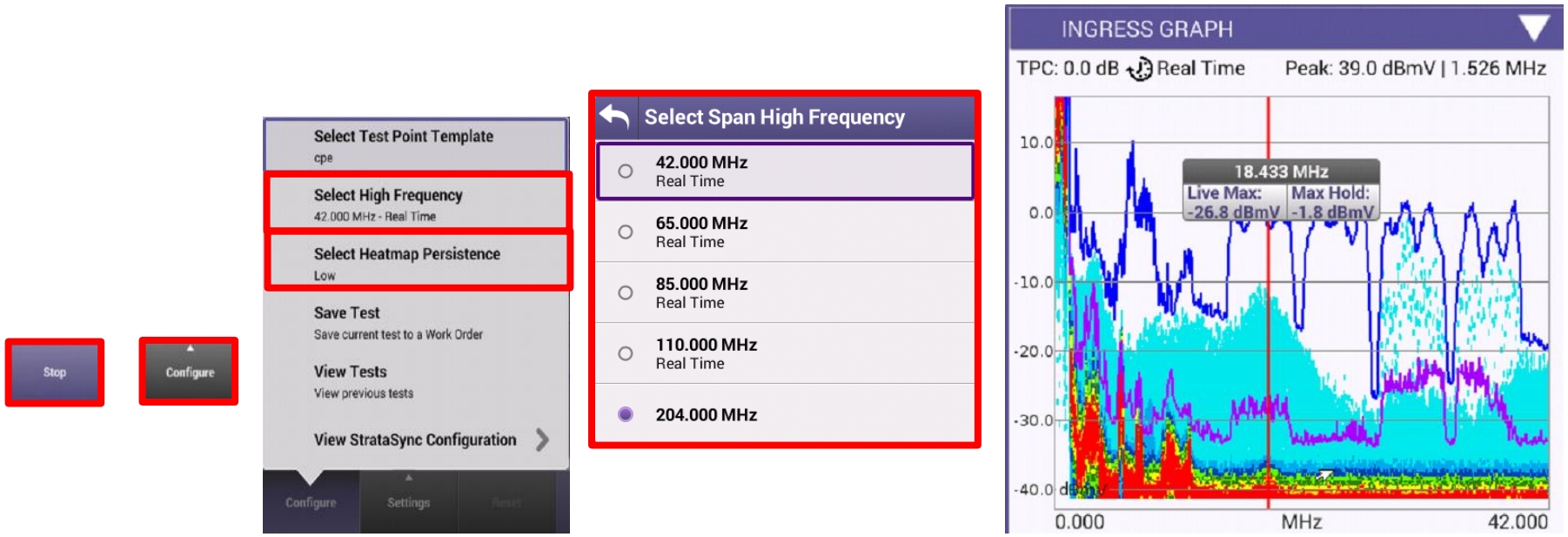
ONX630



DSAM6300

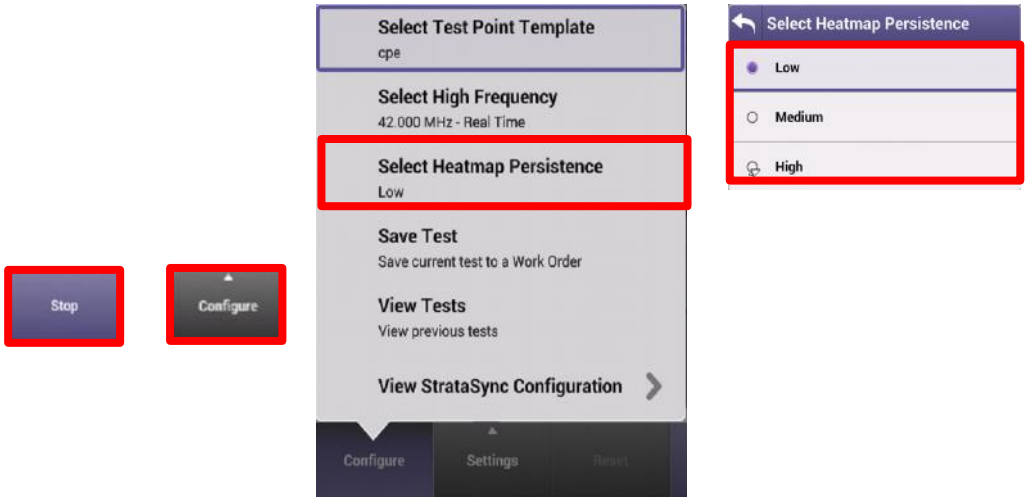
INGRESS EXPERT - CONFIGURE

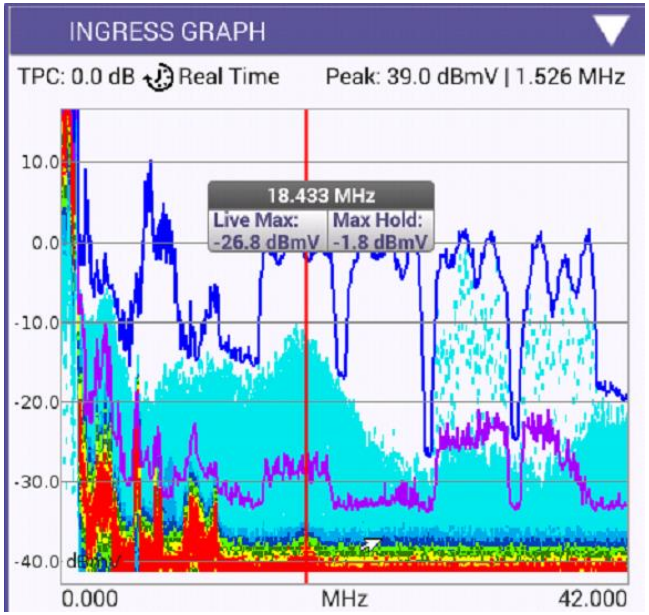
- Select CONFIGURE and choose SELECT HIGH FREQUENCY to change SPAN
- Some models may have 204MHz as an option



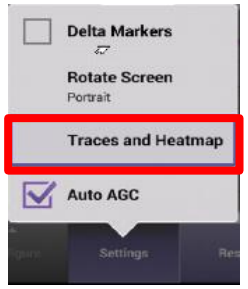
INGRESS EXPERT - CONFIGURE

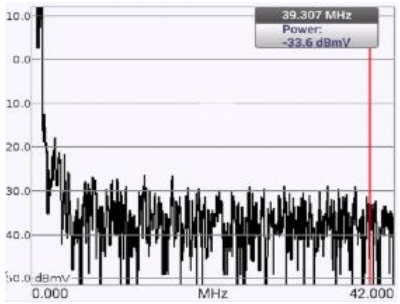
- Select HEATMAP PERSISTENCE to change dwell time of the HEATMAP
  - LOW is best for constant noise
  - MEDIUM is best for transient and constant noise
  - HIGH is best for transient only



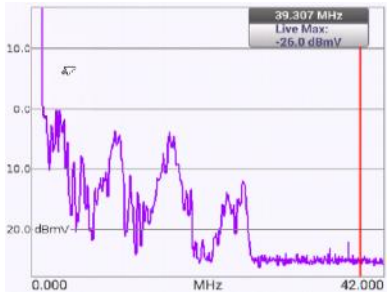


INGRESS EXPERT – HEATMAP OVERLAYS

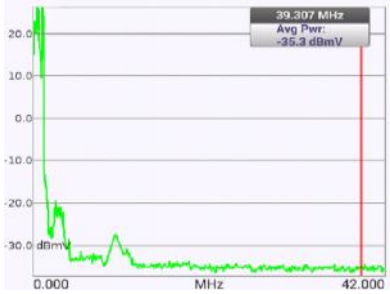




Power

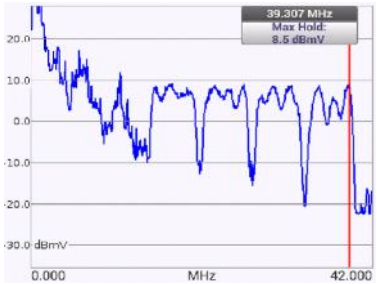


Live Max

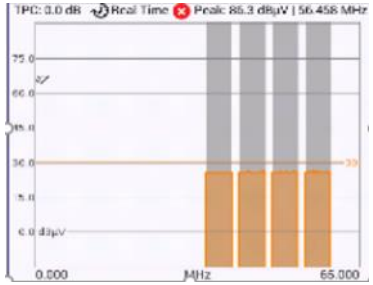


Average Power

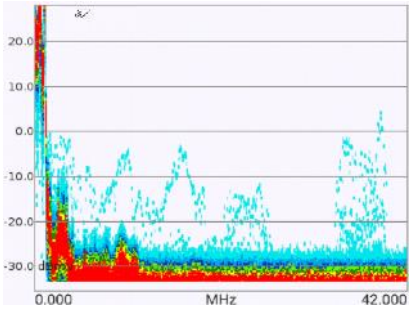
UCD



Max Hold

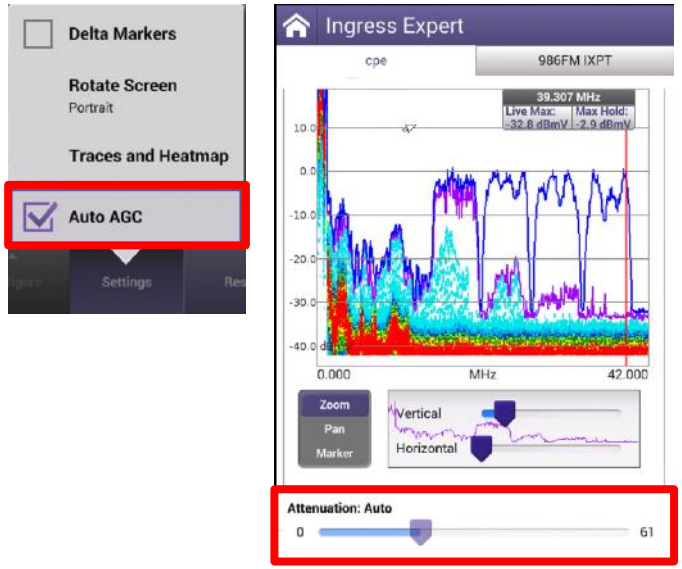


Noise



Heatmap

INGRESS EXPERT – AUTO-ACG

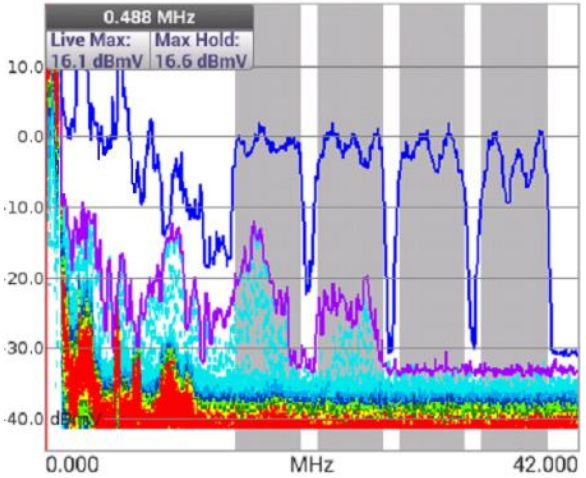


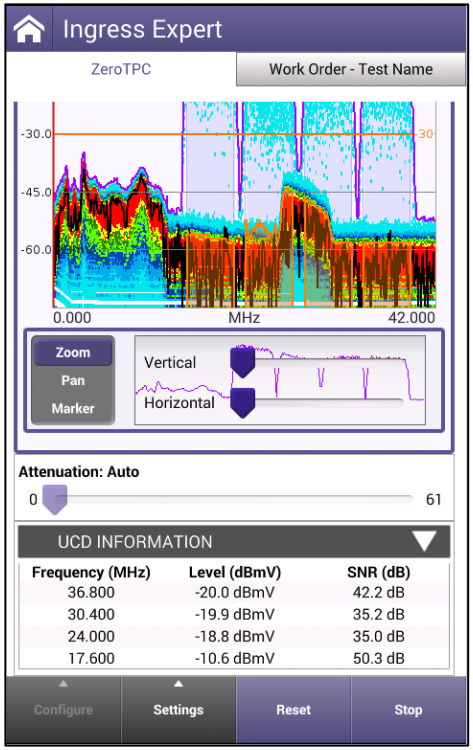
- AUTO AGC will attempt keep spectrum view references, up to 60dB dynamic range

- DISABLING AUTO AGC requires the user manually attenuates the signal to prevent OVERRANGE

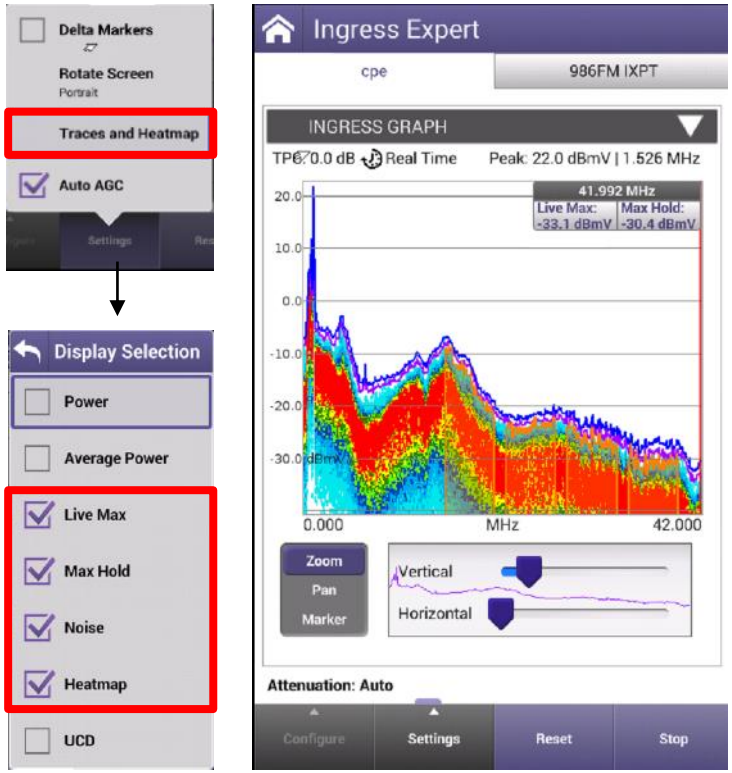
INGRESS EXPERT – SNR and NOISE

- The NOISE setting will allow users to see the noise floor under the upstream carriers
- If the user performs a DOCSIS EXPERT test before INGRESS EXPERT, UCDs will match that of the network and give clear indication of the carriers width and location
- Additionally, UCDs will be demodulated with FREQUENCY, LEVEL and SNR calculated and displayed

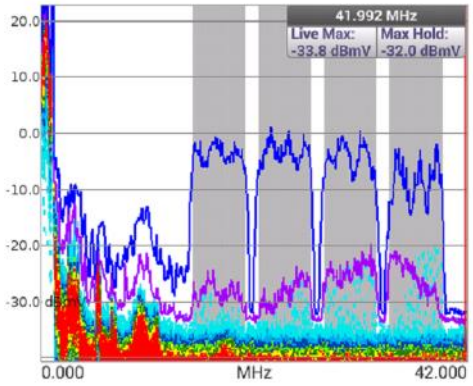


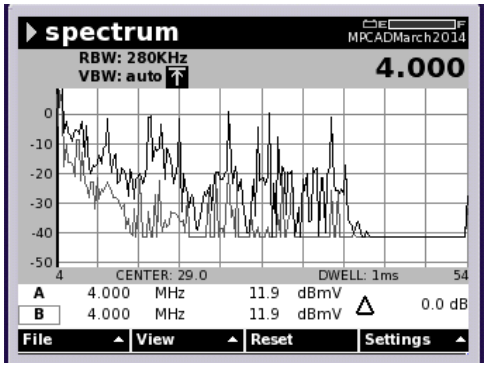


INGRESS EXPERT – RECOMMENDED SETTINGS

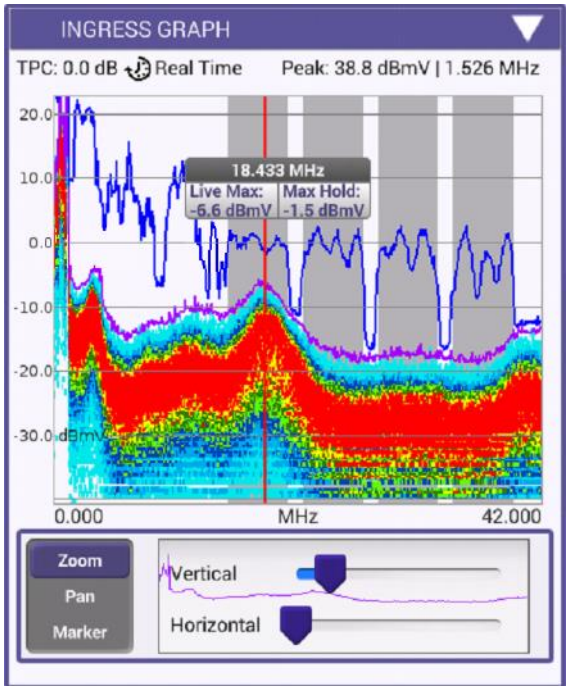


- The live display shows energy changing from constant (Red, Orange) to transient (Yellow, Green, Blue, Light Blue)
- Turning on UCD can lend assistance when noise is obscuring the carrier (see DSAM by comparison)

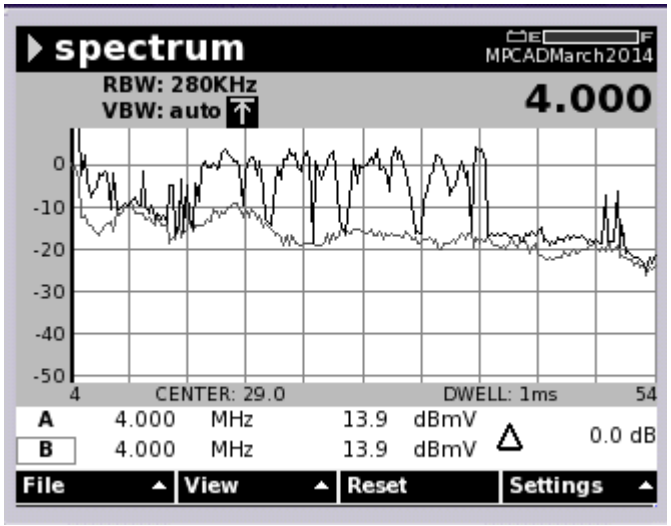




INGRESS EXPERT VS DSAM



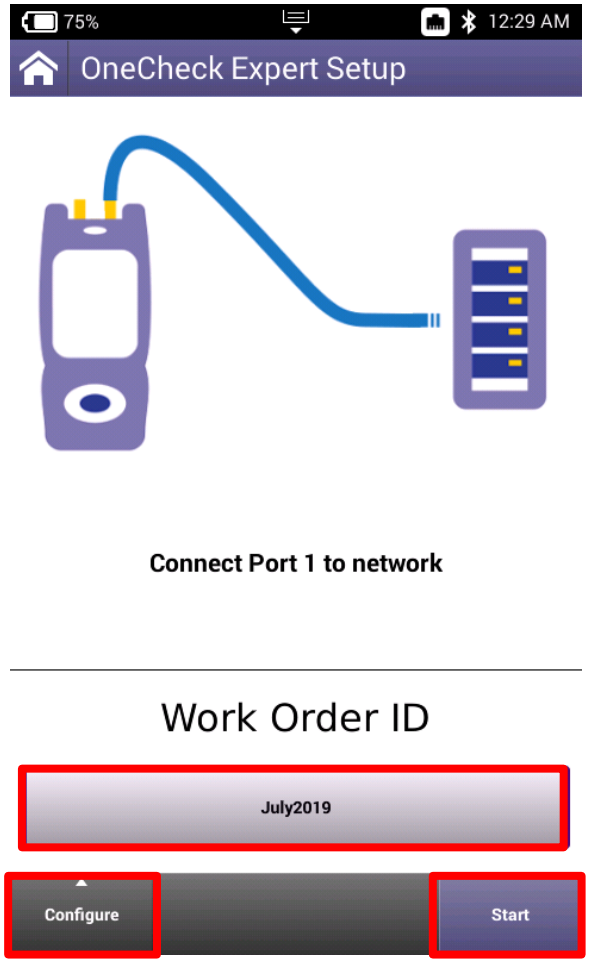
- Tracking Impulse Noise on ONX630



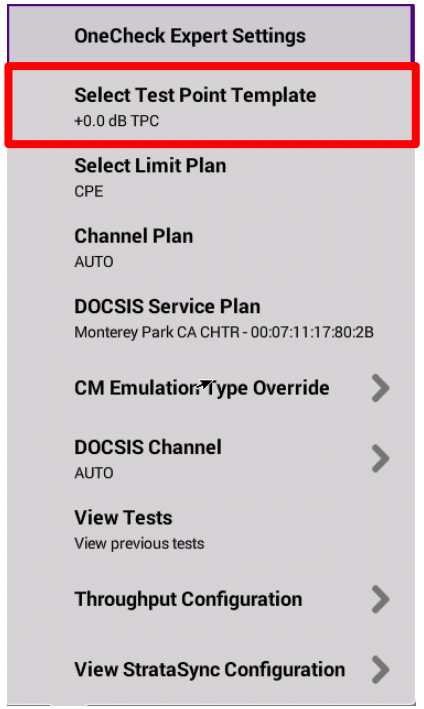
- Tracking Impulse Noise on DSAM

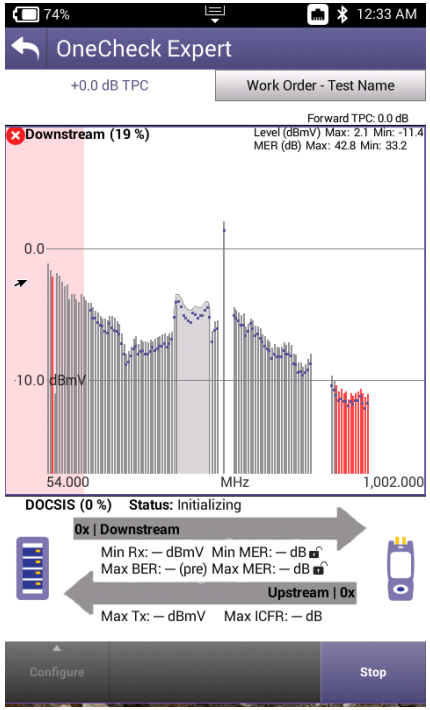
ONECHECK EXPERT

ONECHECK EXPERT

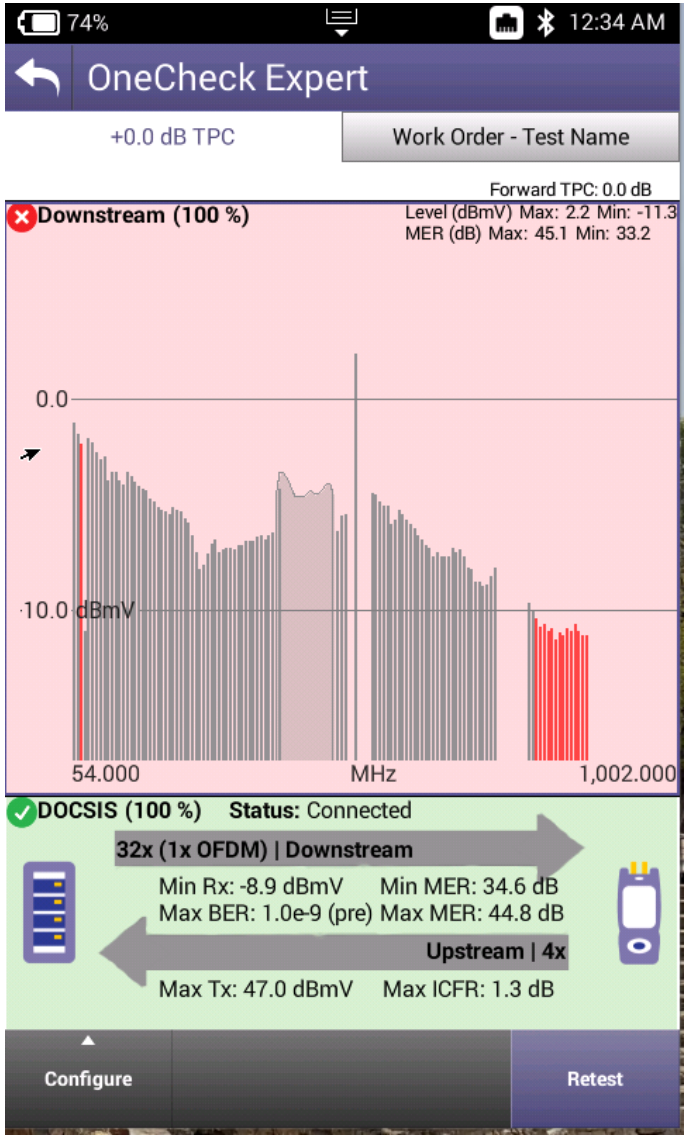


- Like ONECHECK, technicians must enter a unique WORKORDER ID and then connect PORT 1 to the desired test point, be it at a node, amplifiers, tap or even at the Ground Block or CPE.
- Technician should adjust Test Point Compensation based on the demarcation point

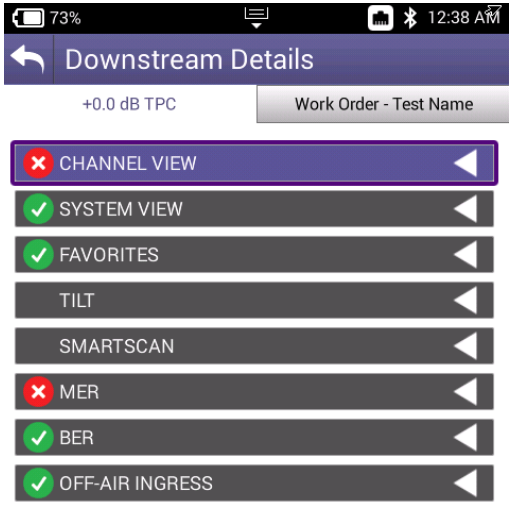


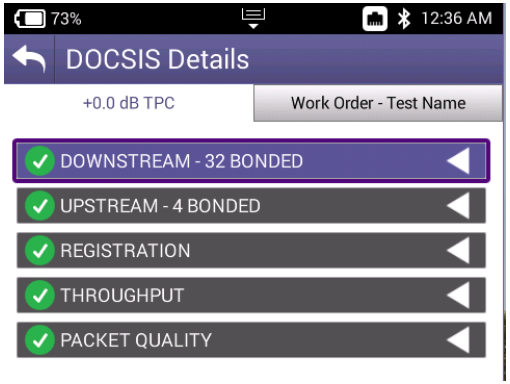


ONECHECK EXPERT



- As with ONECHECK, the ONCECHECK EXPERT will allow technicians to double tap on the downstream or upstream results
- This test is limited to the testing done in ONCECHECK for better correlation, to troubleshoot and for great testing functionality select CHANNEL EXPERT, DOCSIS EXPERT or INGRESS EXPERT
- Below, a complete list of tests displayed in ONECHECK EXPERT

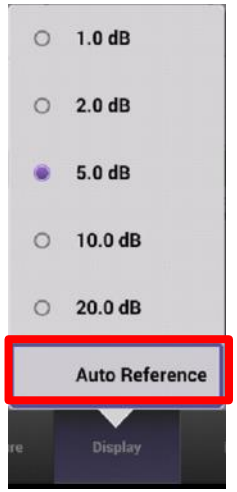


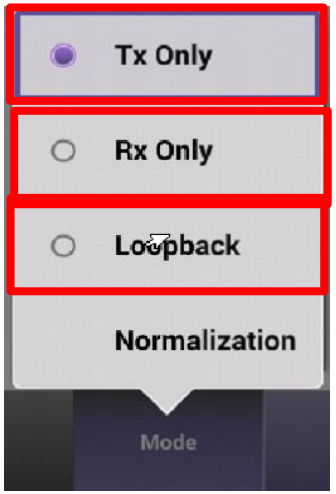


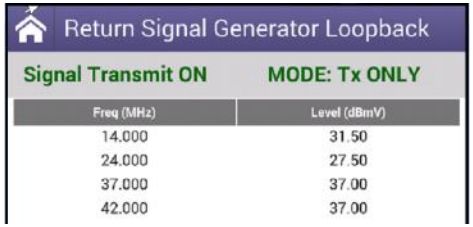
Return Signal Generator

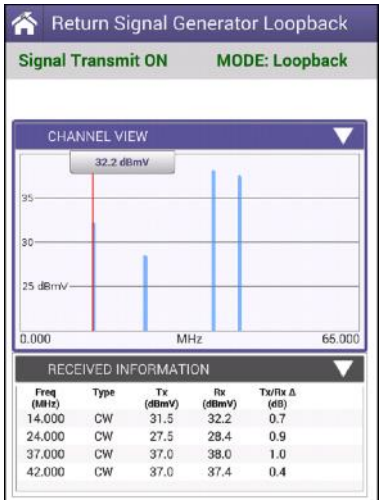
RETURN SIGNAL GENERATOR

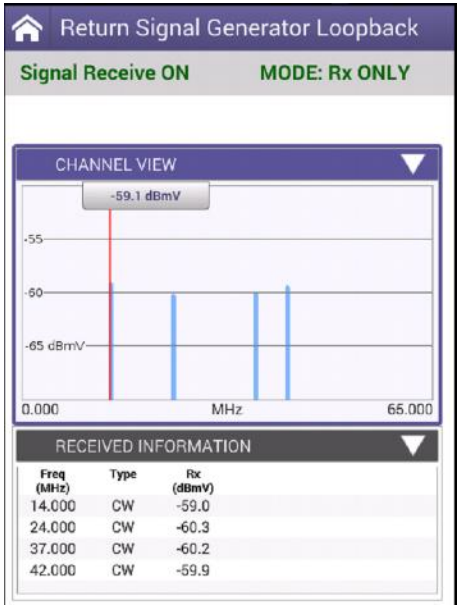
- ONX is capable of generating up to 8 return signals (CW or QAM) at a time, each with up to 12dBmV delta between carriers



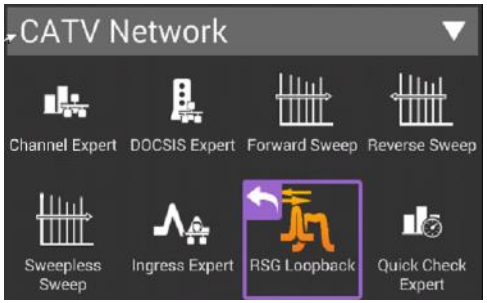


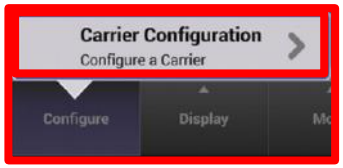


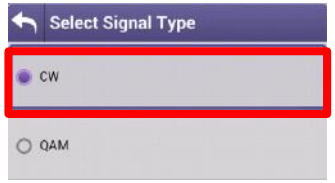


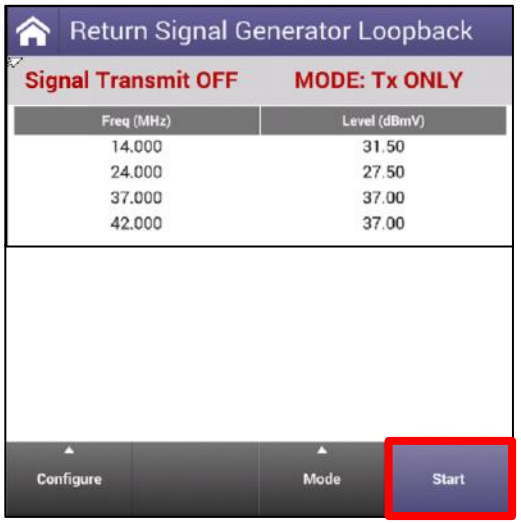


RETURN SIGNAL GENERATOR – CONFIGURATION



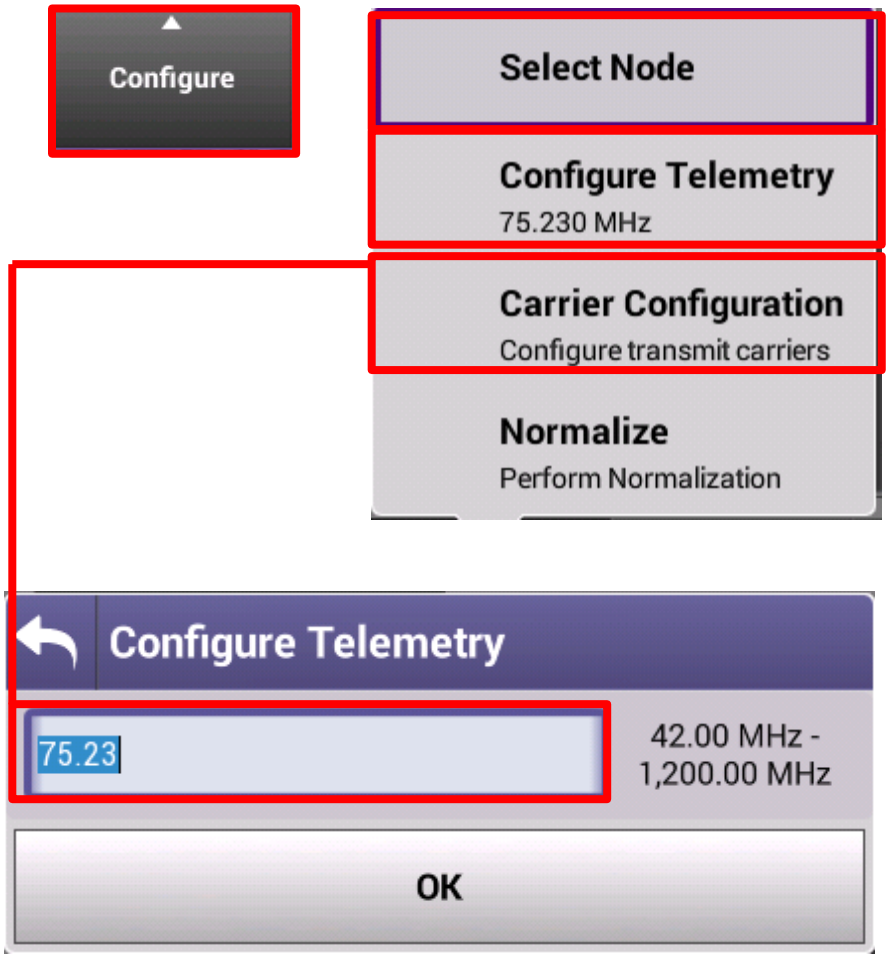






Field View with Return Signal Generator

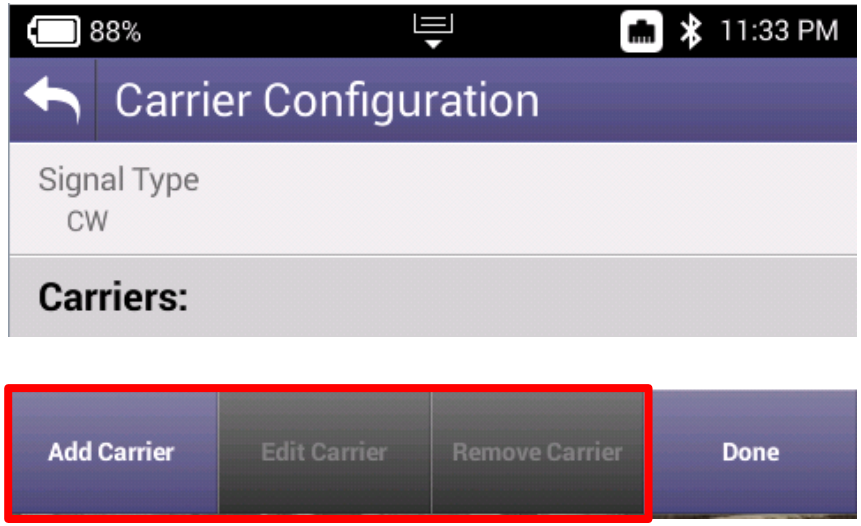
FIELD VIEW with Return Signal Generation (RSG)

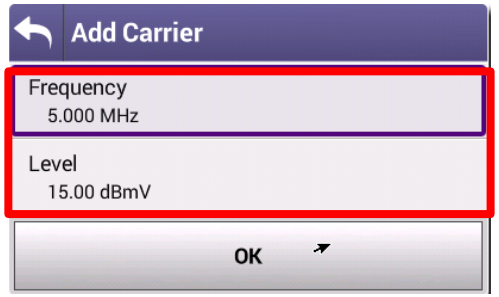


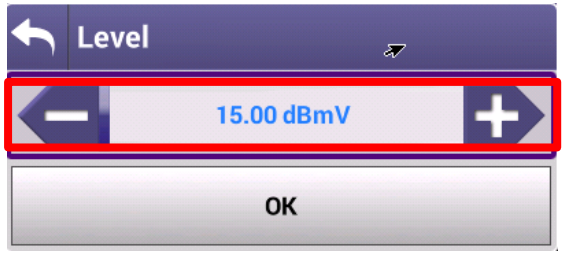
- To configure FIELD VIEW, select the CONFIGURE button
- Select CONFIGURE TELEMETRY to enter the precise frequency of the FIELD VIEW TELEMETRY (if this is not known reach out to local HE resources for information)
- SELECT NODE will take the technician to a screen displaying all the Pathtrak Nodes currently in broadcast – ***NOTE: when changing nodes in FIELD VIEW be sure that node matches physical location***

FIELD VIEW with RSG – Carrier Configuration

- CARRIER CONFIGURATION will allow technician to turn on user created carriers while simultaneously viewing the return from the HE mounted Pathtrak Return Path Monitoring Ports; this will allow a single technician the ability to optimize a node from the field
- Select ADD CARRIER for screen showing configuration
- EDIT or REMOVE also available

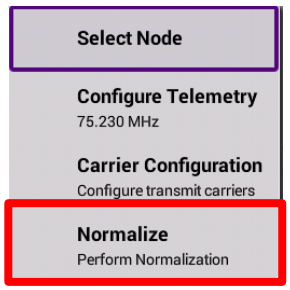


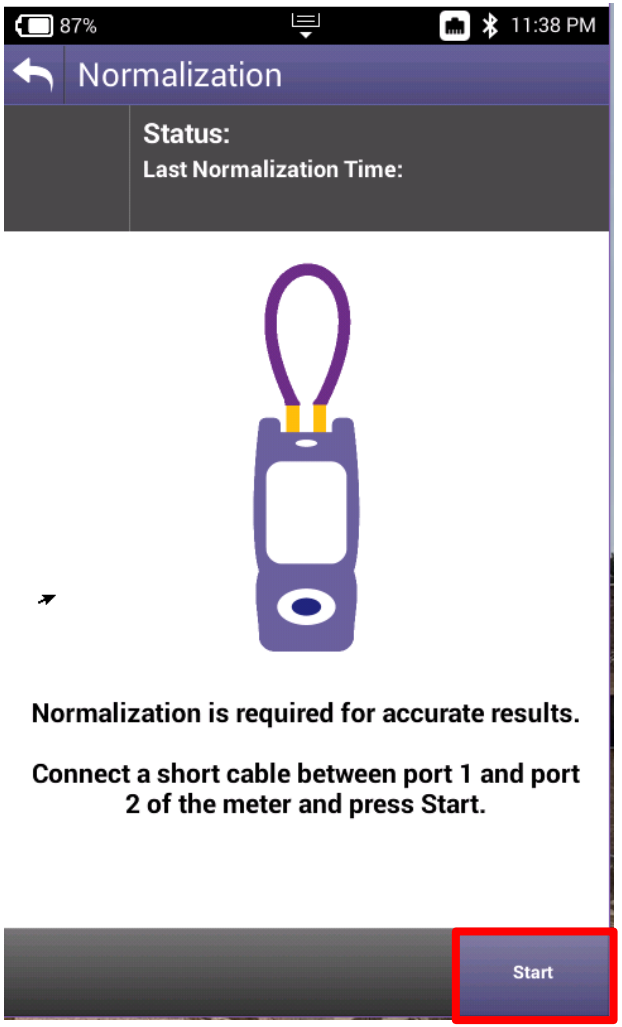


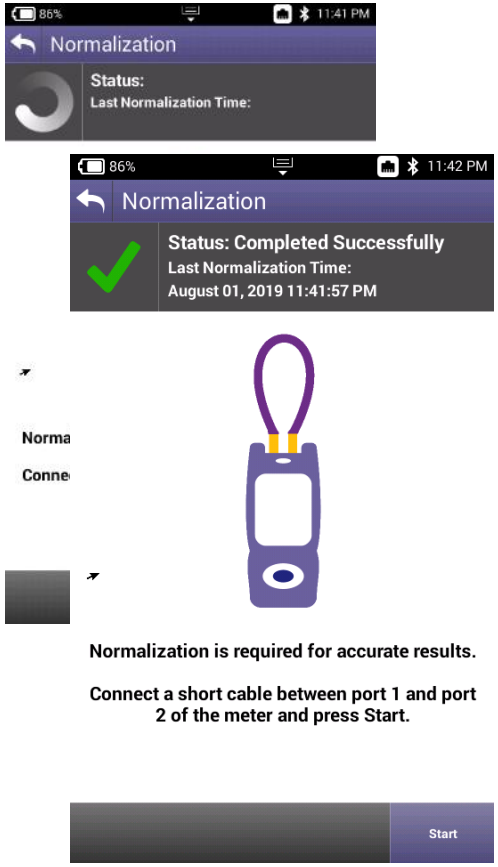


FIELD VIEW with RSG - Normalization

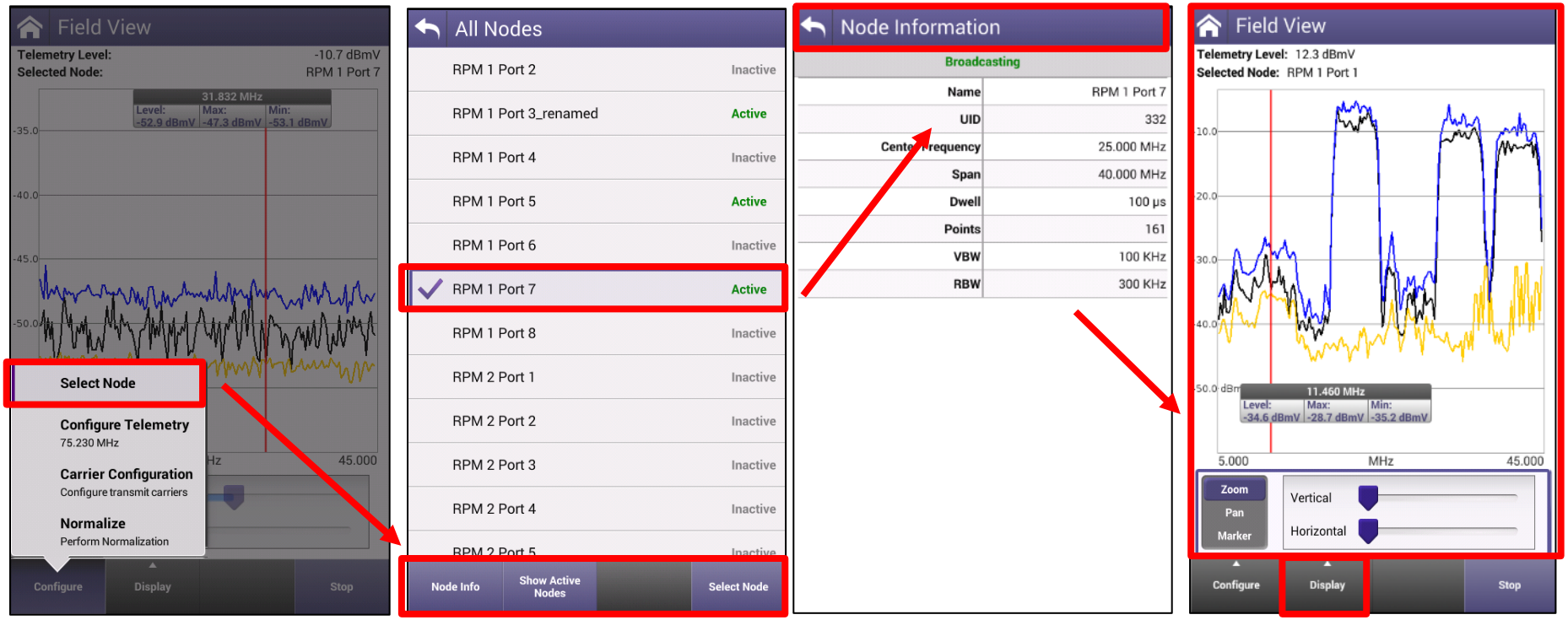
- NORMALIZATION is a process by which the ONX will transmit through Port 1 and receive through Port 2, cancelling out the loss associated with the cable and ensuring accurate transmit back to the Hub
- Before FIELD VIEW w/ RSG is used, the normalization process should be done to ensure accuracy



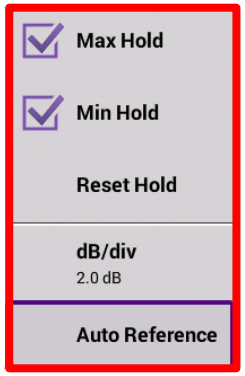




FIELD VIEW with RSG



- Select NODE and choose either, SHOW ACTIVE NODES
- From the list of ACTIVE NODES, chose SELECT NODE
- NODE INFO is available
- DISPLAY allows technician to change the spectrum dB/div, AUTO REFERENCE or toggle MAX and MIN HOLD



ONX CATV - Fiber Testing
- P5000i Probe Microscope
- MPx0 Power Meters

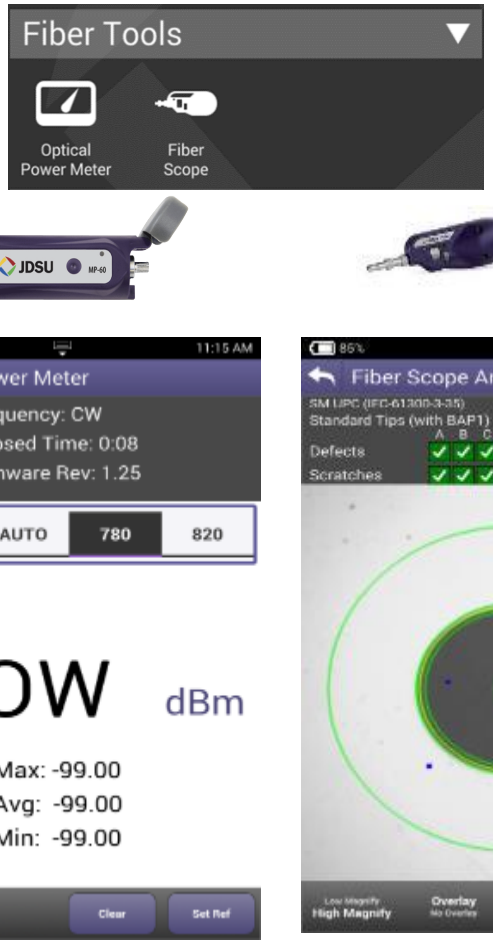
OneExpert CATV Fiber Optics Integration

Fiber Inspection Scope

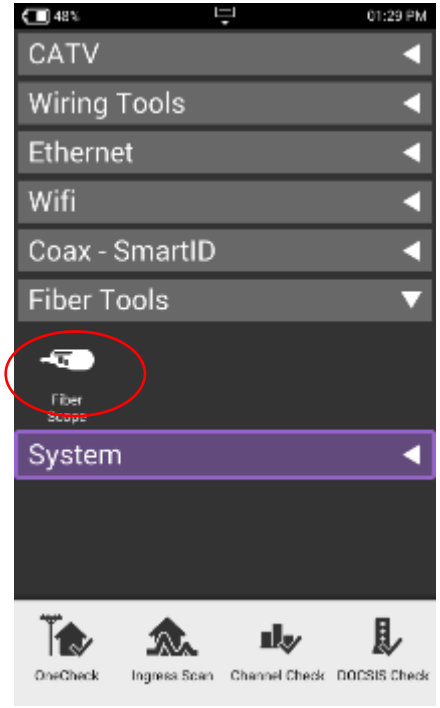
- P5000i via USB
- Auto pass/fail analysis

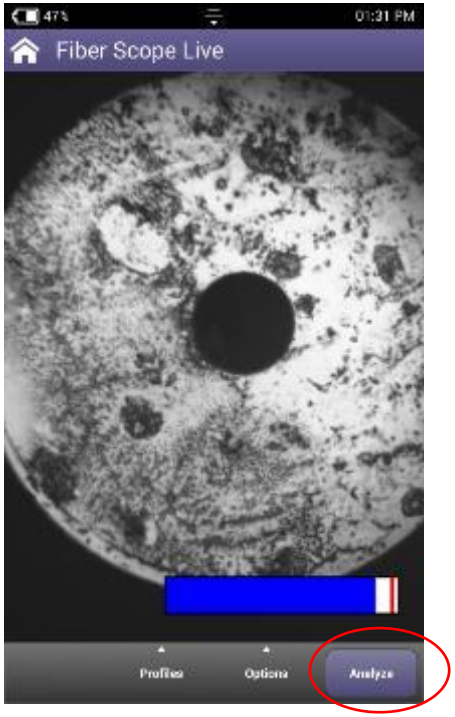
Optical Power Measurement

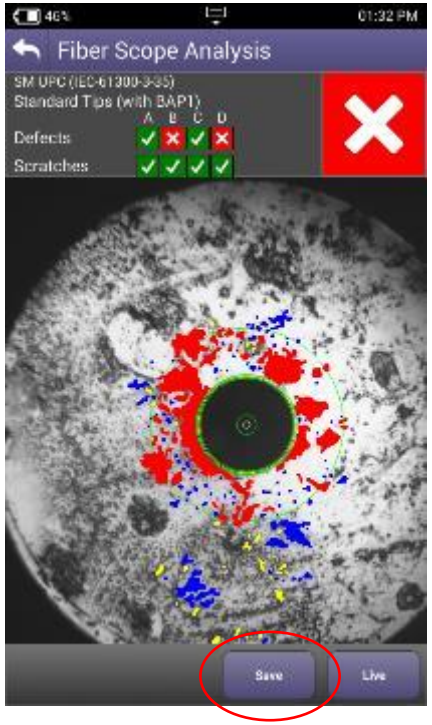
- **MP-60/80** Optical Broadband Power Meter



Optical Accessories – P5000i Probe Microscope







When **P5000i Probe Microscope** is attached to ONX through USB, Fiber Tools menu automatically appears

- After plugging in patch cord or inserted probe into bulkhead, fiber end face will appear and can be focused or auto centered using controls on P5000i.
- Autotest can be conducted and results saved from results screen

Forward and Return Sweep

Sweep settings examples:

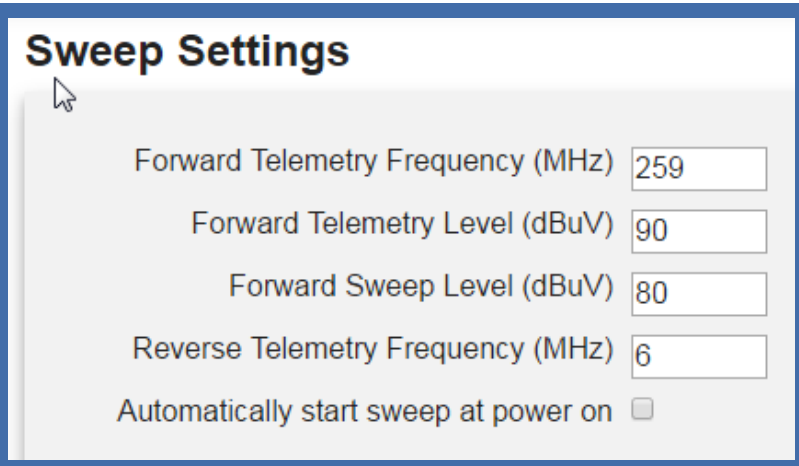
Settings in ONX should match settings in Sweep Control Units

SCU-1800 sweep settings

Forward Telemetry
- Frequency= 259 MHz
- Level = 90 dBµV (80-110)

Forward Sweep
- Level = 80 dBµV (80-110)

Reverse Telemetry
- Frequency= 6 MHz



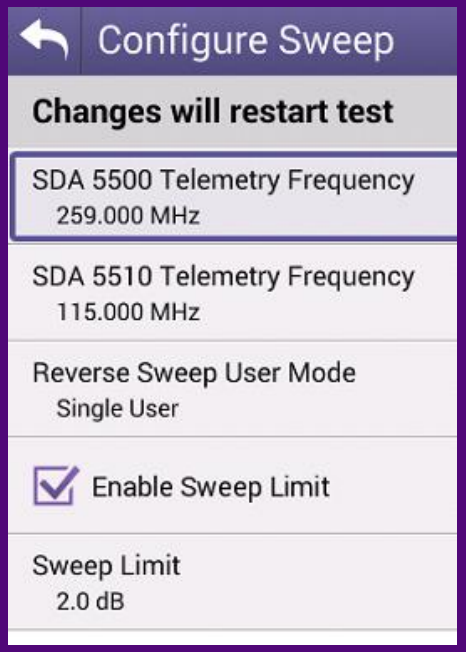
ONX sweep settings

SDA5500 Telemetry = Forward Telemetry
- Frequency= 259 MHz

SDA5510 Telemetry = Forward Telemetry
- Frequency= 259 MHz

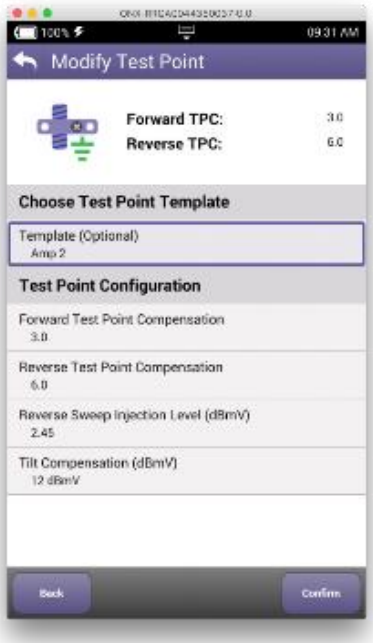
Reverse sweep User mode
- Single user (SDA5500)
- Multiple user (SDA5510)

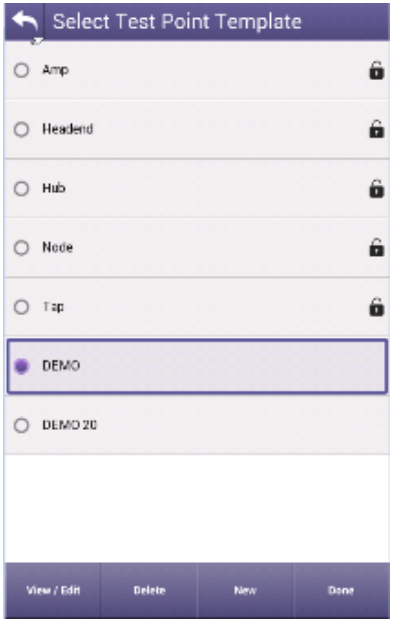
Sweep limits (0-20dB)



ONX: Templates for Test Point Locations

- Configure Test Points for loss and sweep settings
- Easily switch between Test Points at any test
- Multiple test point locations can be customized and stored



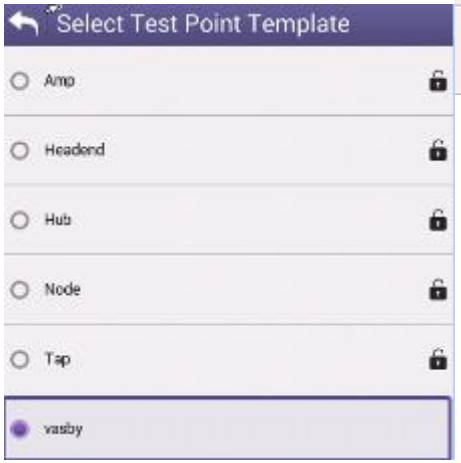


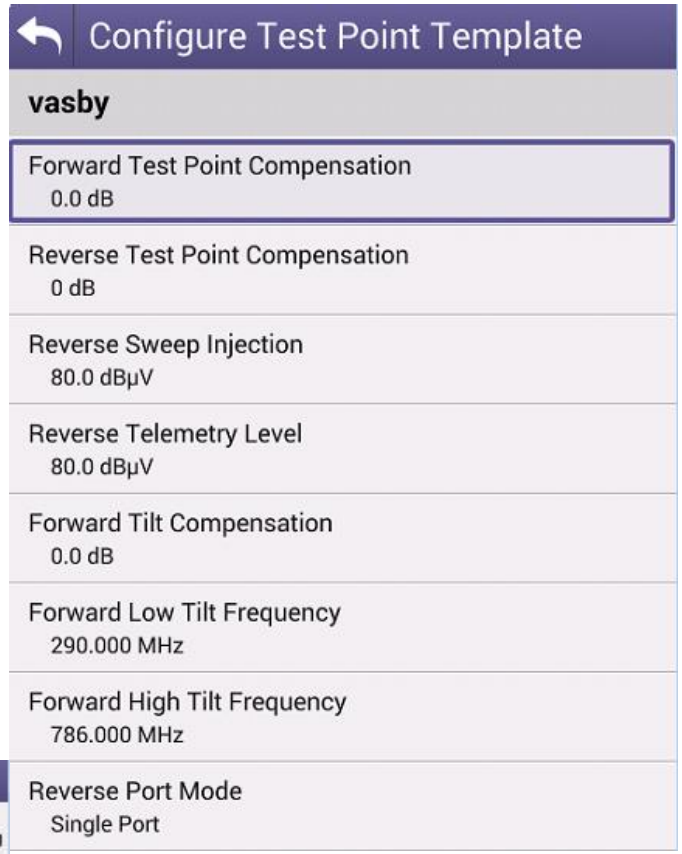
ONX: Test Point Template settings

- **Forward TPC** Test Point Compensation (-100, +100 dB)
- **Reverse TPC** Test Point Compensation (-100, +100 dB)
- **Reverse Sweep injection** (68-113 dBµV)
- **Reverse Telemetry Level** (68-113 dBµV)

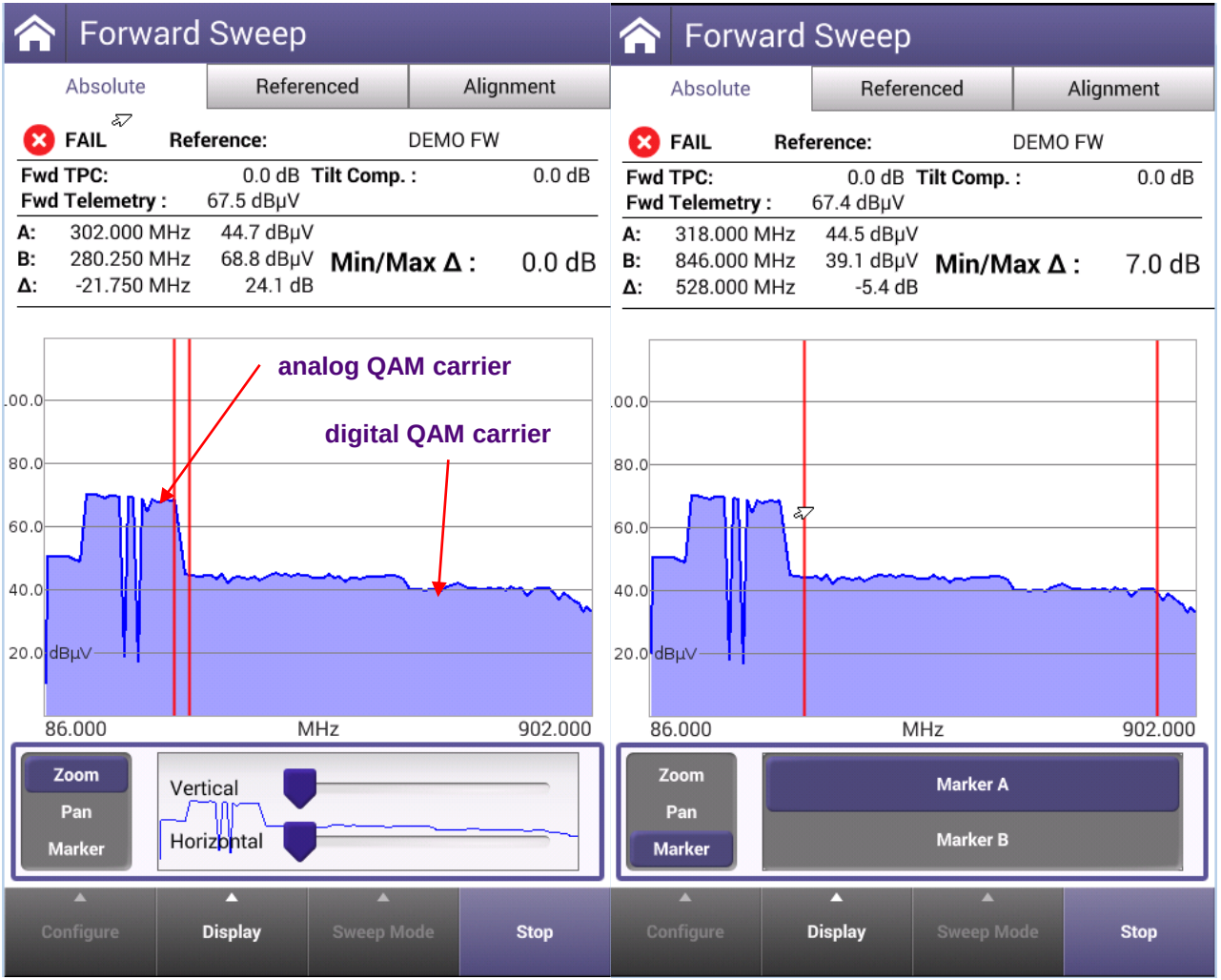
- **Forward Sweep Tilt Compensation** (-100, +100 dB)
- **Forward sweep Low Tilt Frequency**
- **Forward sweep High Tilt Frequency**

- **Reverse Port mode**
  - Single port (port 1 – ONX)
  - Dual port (port 1=FW, port 2=RV)

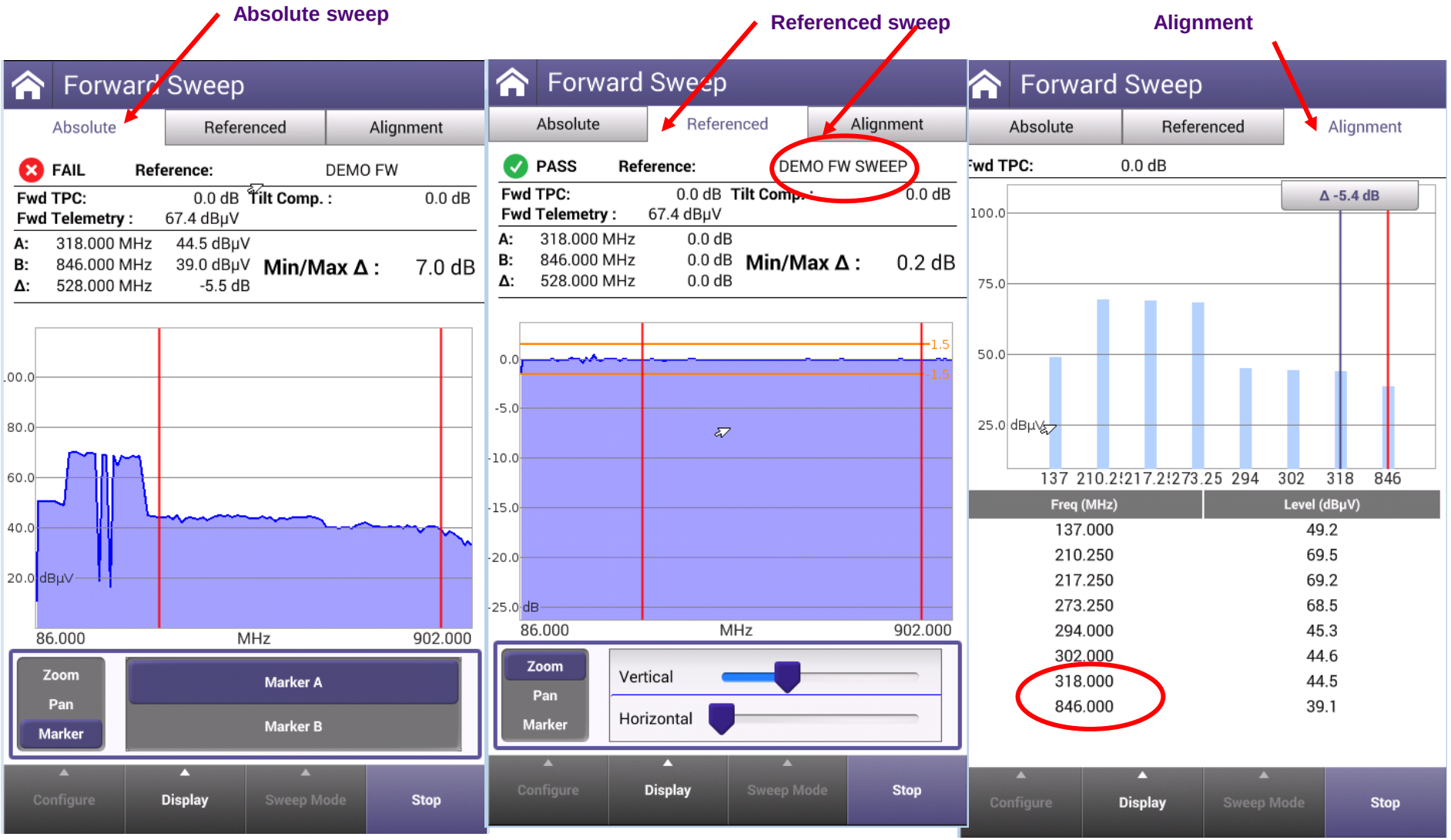




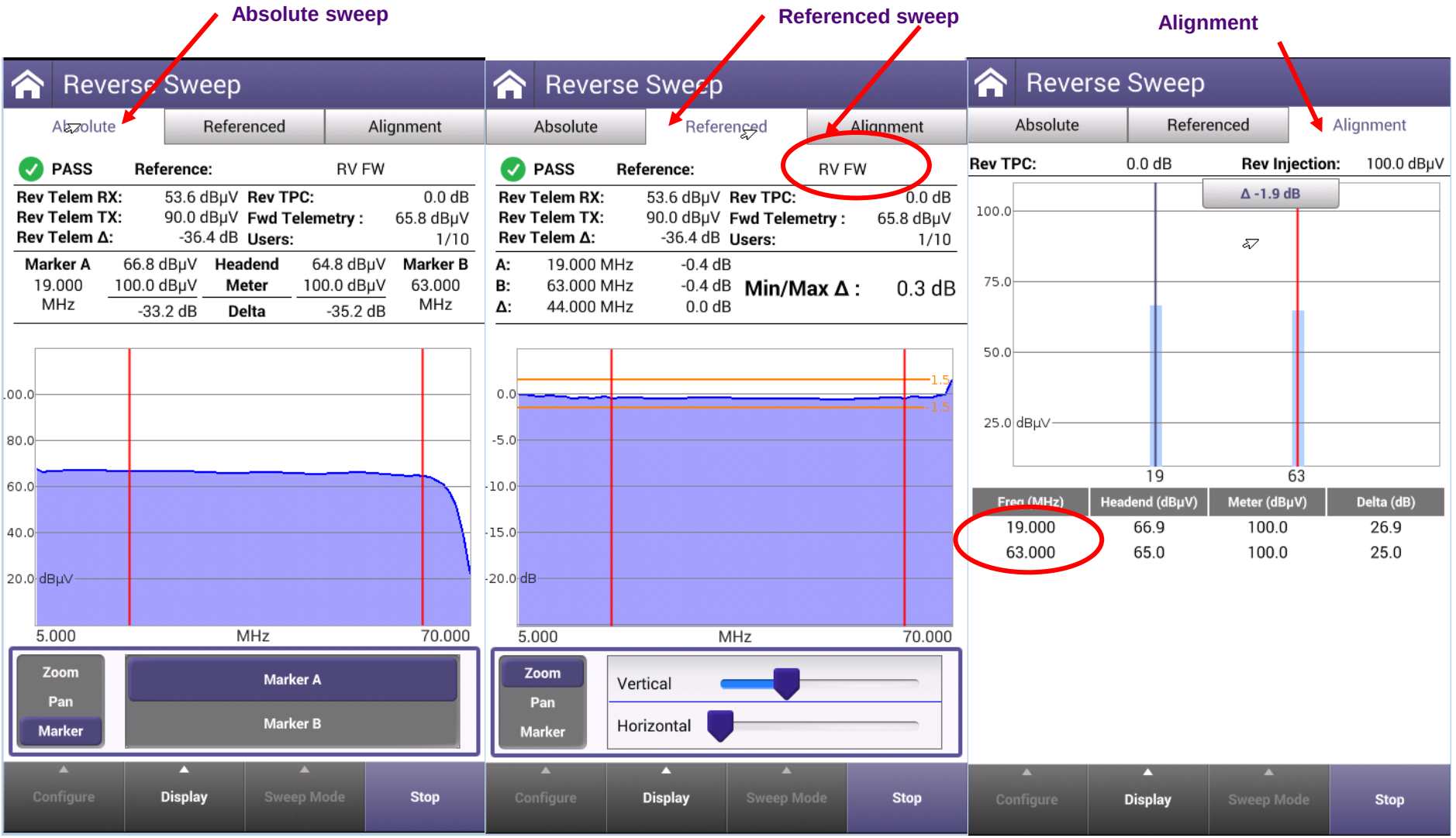
Forward Sweep Example



Forward Sweep Example



Reverse Sweep Example



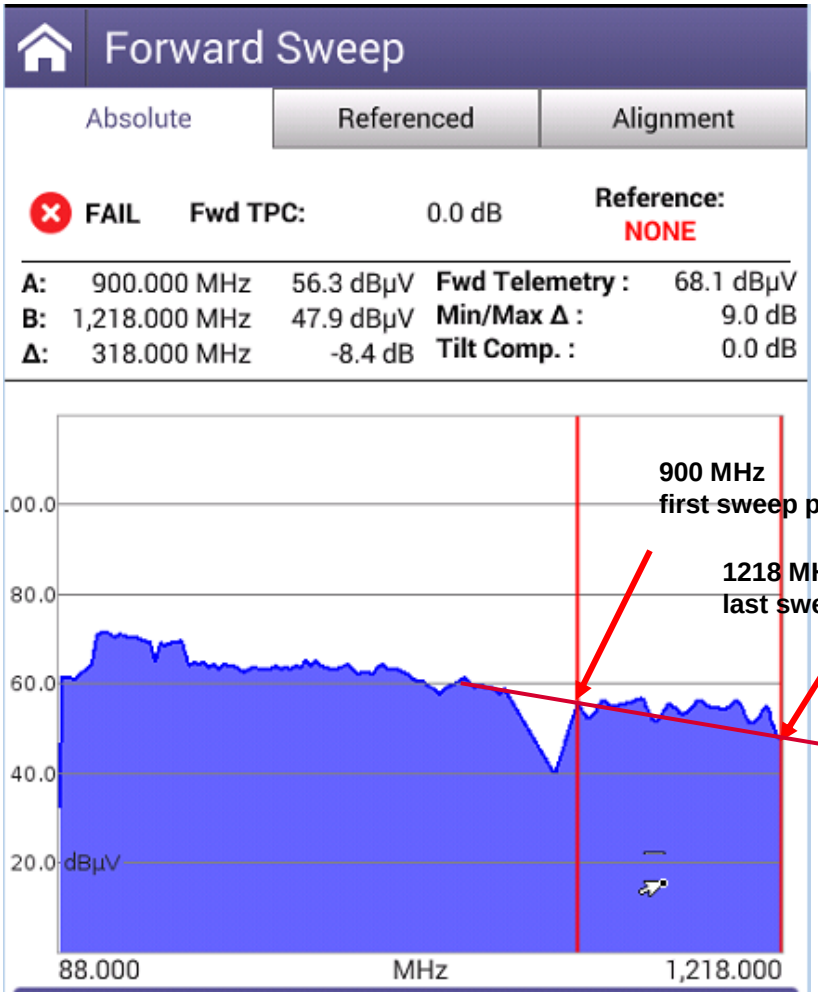
Forward Tilt Compensation

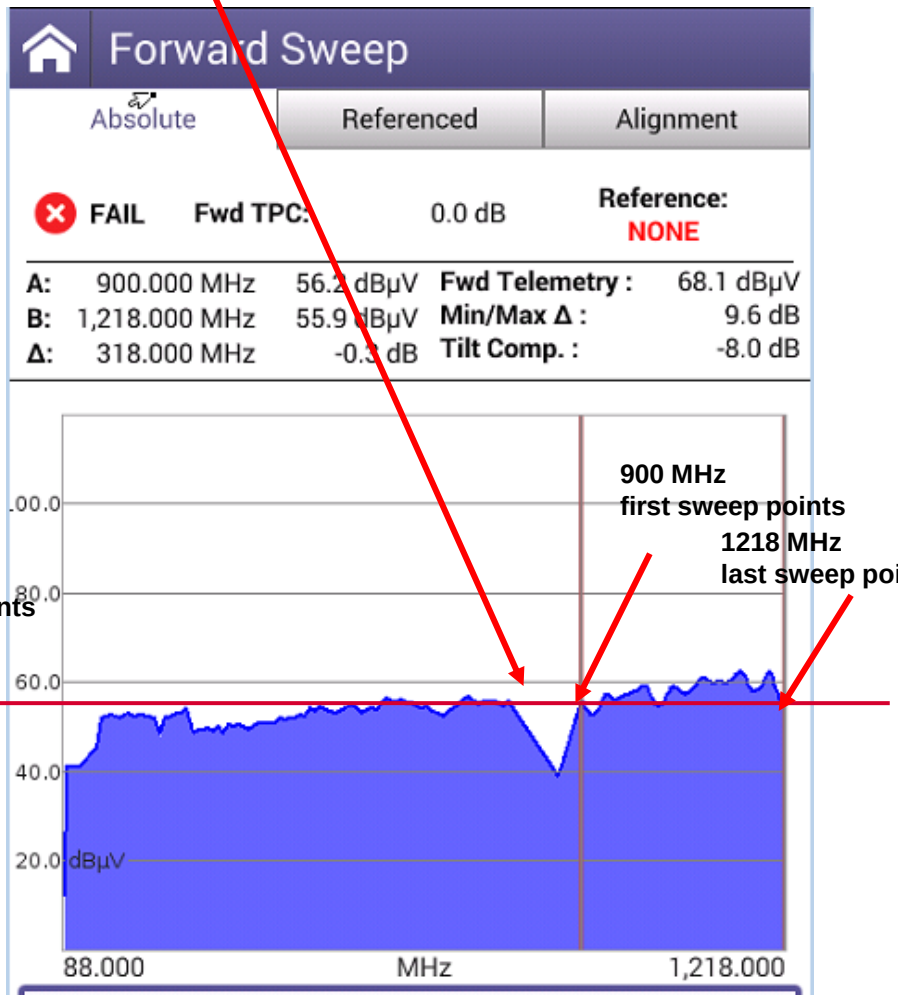
Forward Tilt Compensation
-8.0 dB

Forward Low Tilt Frequency
900.000 MHz

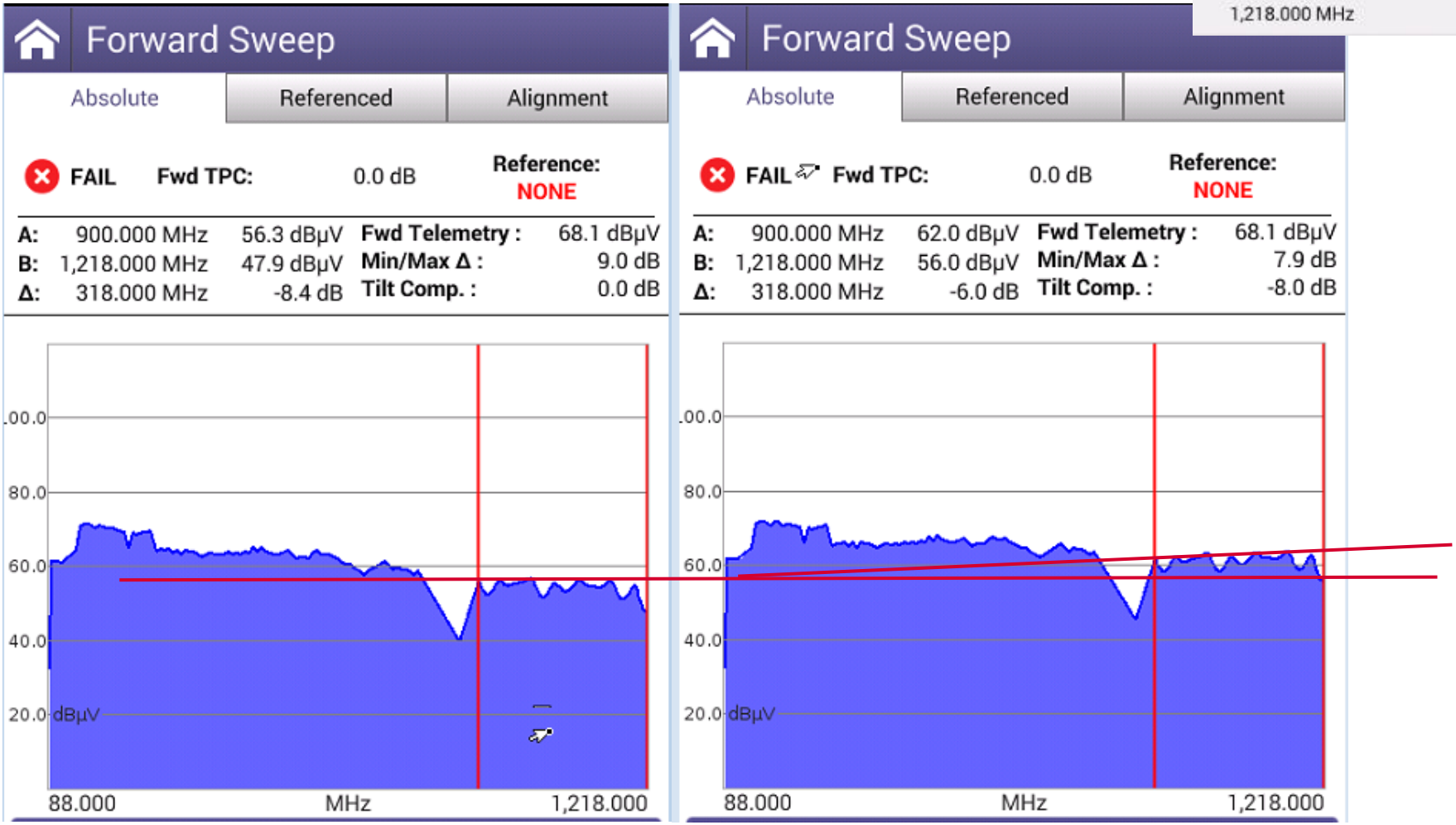
Forward High Tilt Frequency
1,218.000 MHz

Apply sweep tilt compensation

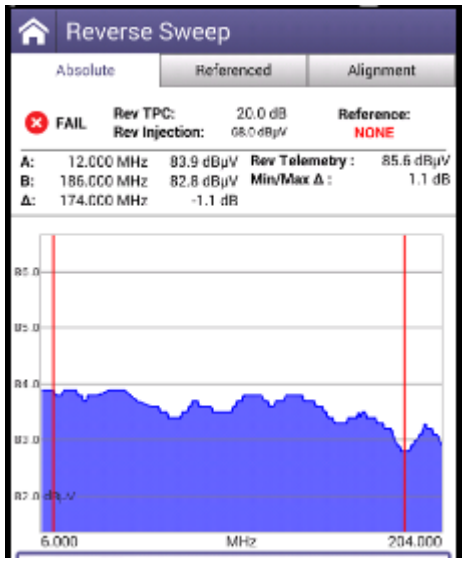


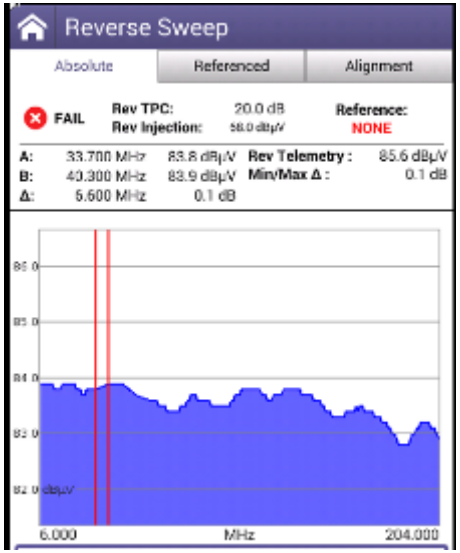


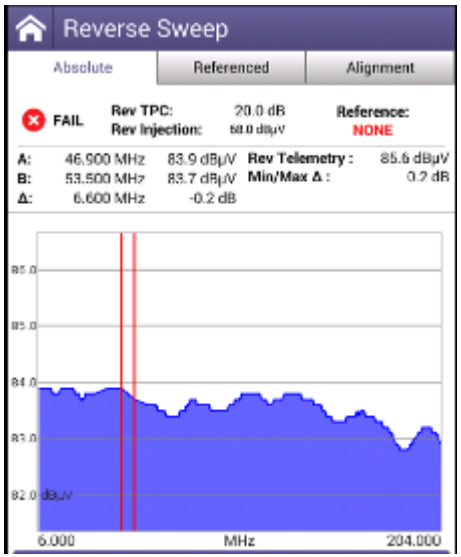
Forward Tilt Compensation

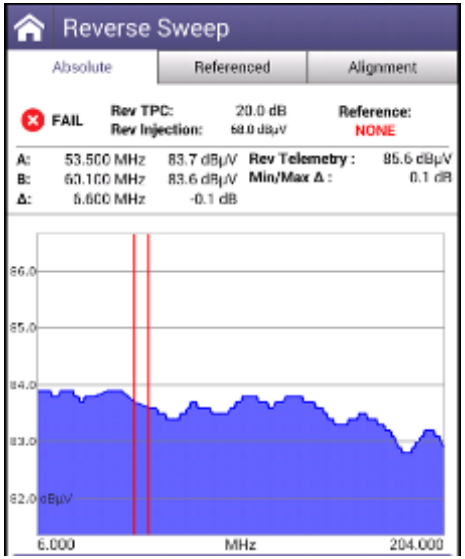


Reverse Sweep example





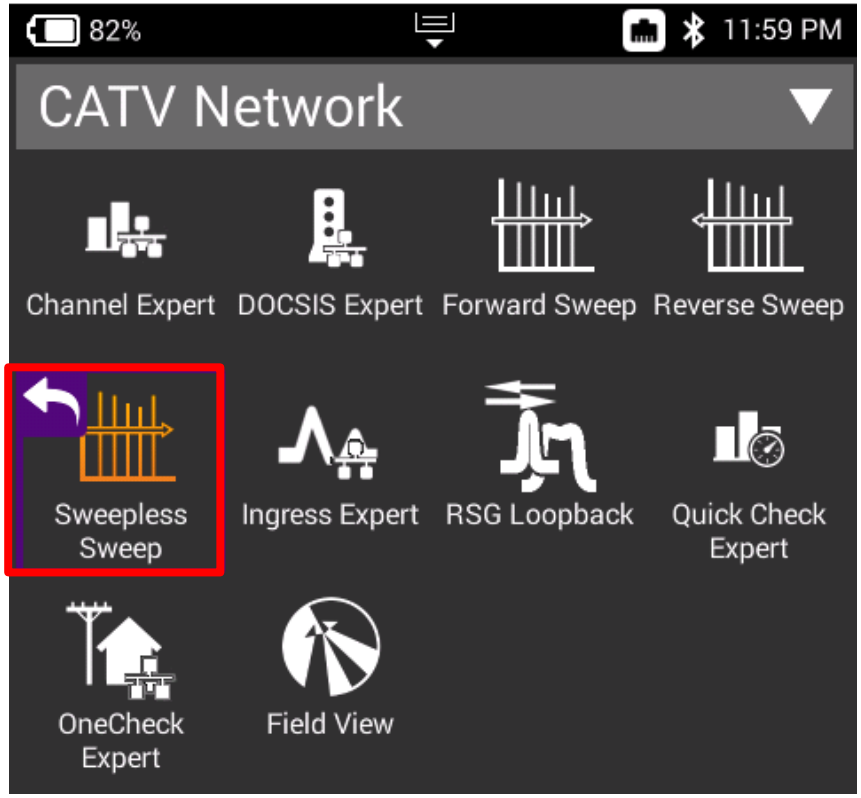




Sweepless Sweep

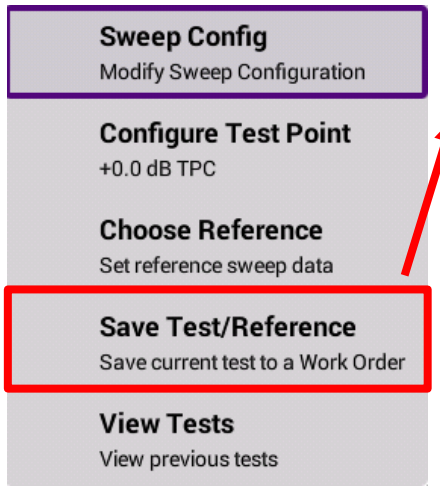
SWEEPLESS SWEEP

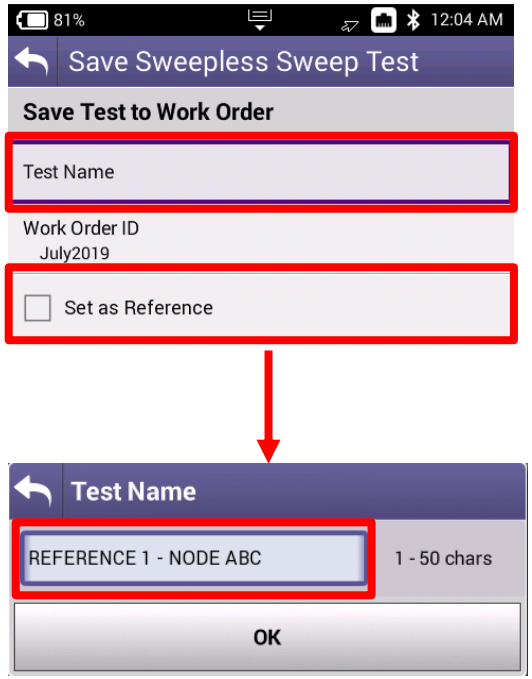
- SWEEPLESS SWEEP utilizes the downstream carriers to create a known reference
- Technicians use this known reference, usually taken at the node, so sweep and balance the remaining amplifiers out to the end of the line
- To perform sweepless sweep, technicians should select the icon from the Home Screen



SWEEPLESS SWEEP

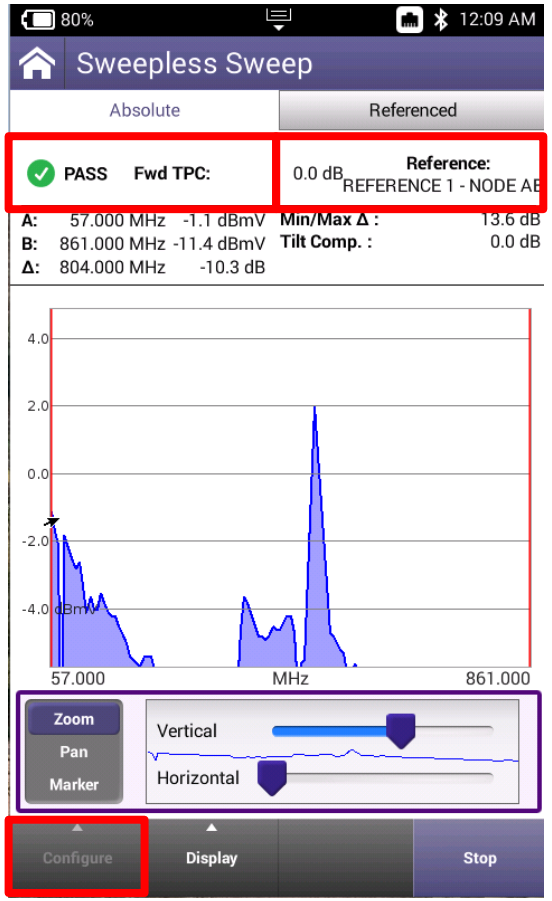
- The first response is called the ABSOLUTE response
- To save a REFERENCED response; select STOP and then CONFIGURE->SAVE TEST/REFERENCE

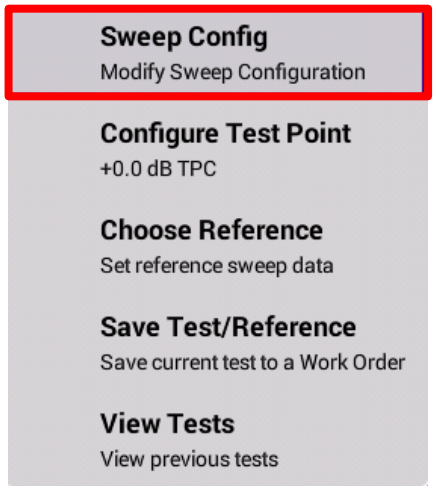


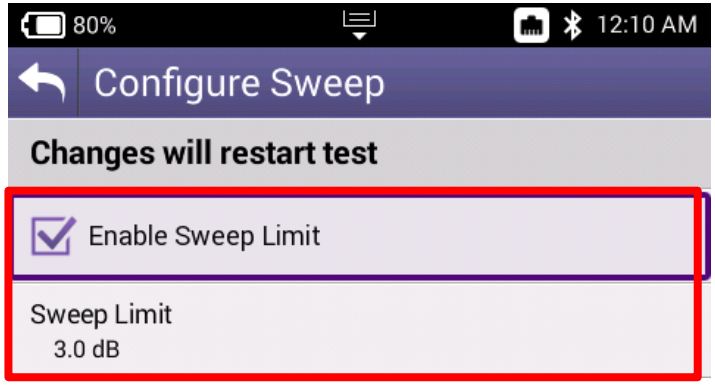


SWEEPLESS SWEEP

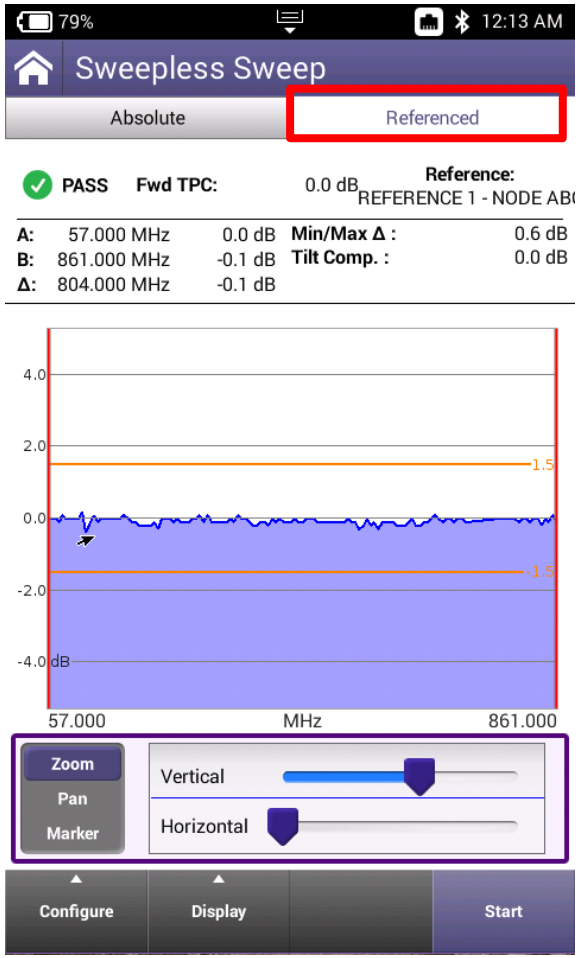
- After saving REFERENCE, technician can now see the name of the reference for verification
- The SWEEP LIMIT (often set to 2 or 3dBmv) can be edited
- Technicians can now select REFERENCED to see the referenced response, which will appear flat
- As technicians move down the cascade, they will now be seeing variations from the originally captures referenced location

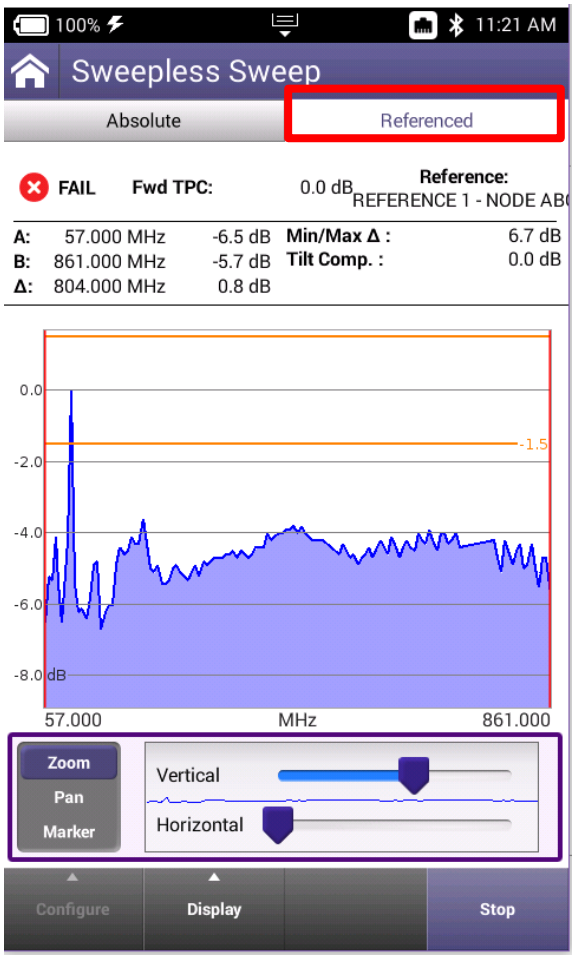






SWEEPLESS SWEEP





VIAVI