



## *Enabling Australia's Field Technicians to build, troubleshoot and maintain better communications networks.*



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Application Note

# Analyzing Impulse Noise with OneExpert CATV Ingress Expert

Based on powerful OneExpert CATV HyperSpectrum technology, Ingress Expert’s innovative overlapping FFT analysis means that no transient interfering signals will go undetected. This unprecedented frequency coverage in a handheld gives techs full visibility of all upstream ingress noise, from 0.5MHz up to a selectable 42, 65, 85, 110, or 204MHz. Easily configurable, Ingress Expert allows techs to toggle persistence measurement and available traces for best visibility of ingress signals.



Live upstream carriers normal spectrum analyzer type view

Use different traces to better visualize the upstream and noise below carriers

## Test Configuration

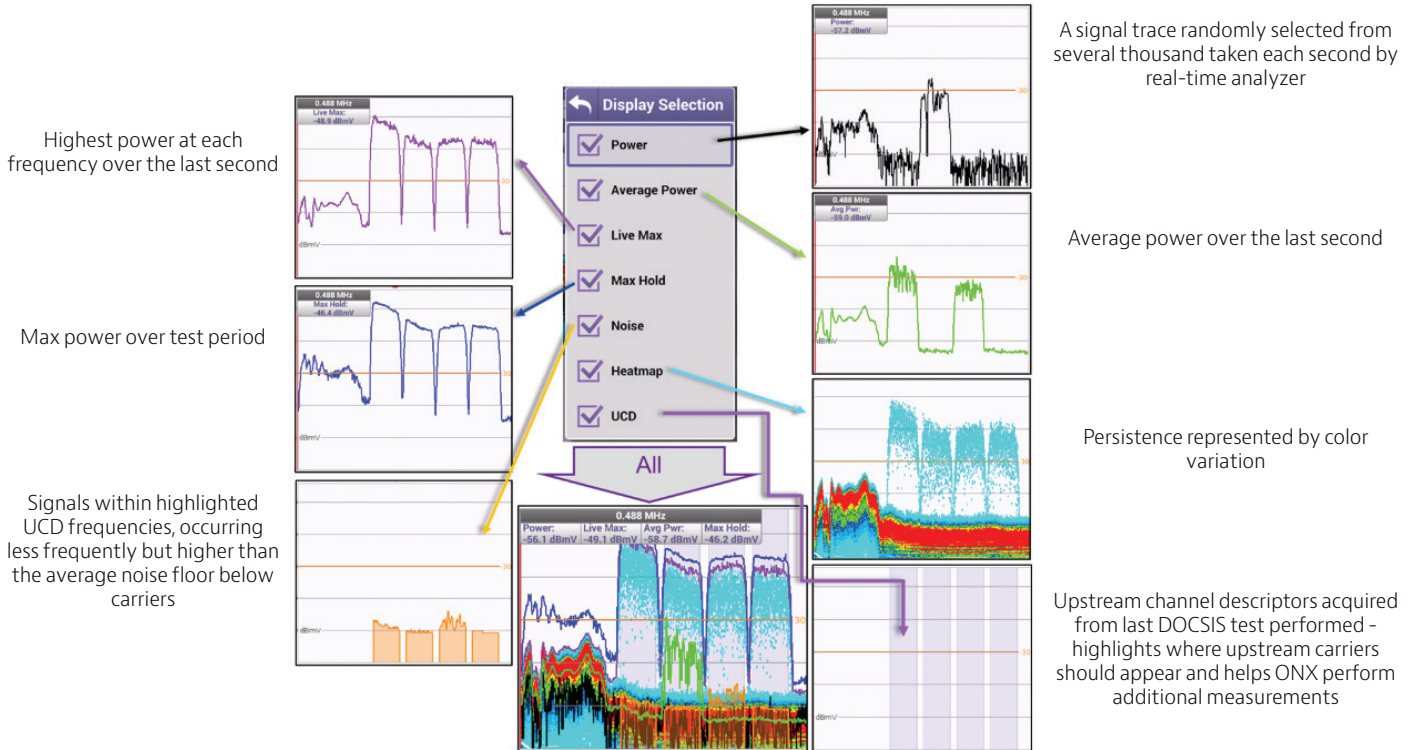
There are two RF ports on top of unit:

- Port 1 is for service testing, including video and DOCSIS®, downstream spectrum and bi-directional sweep.
- Port 2 is for upstream spectrum and ingress troubleshooting, in which the overlapping FFTs allow for gapless ingress detection.

Adjustable views allow users to select view that works best for troubleshooting situation, with a selectable upstream frequency range and heatmap persistence level.



## Display Selection Information



## Recommended Settings

To optimize testing, set the frequency span to desired test span (of return band under test) (42 / 65 / 85 / 110 / 204 ). For most scenarios Heatmap Persistence can be set at "Medium." Set traces based on preference after experience with mode. Many users find that enabling the following traces is most effective for capturing noise in the numerous ways it appears: Power, Max Live, Noise, Heatmap, and UCD.

**Select Span High Frequency**

42.000 MHz  
Real Time

65.000 MHz  
Real Time

85.000 MHz  
Real Time

110.000 MHz  
Real Time

204.000 MHz

**Select Heatmap Persistence**

Low

Medium

High

**Display Selection**

Power

Average Power

Live Max

Max Hold

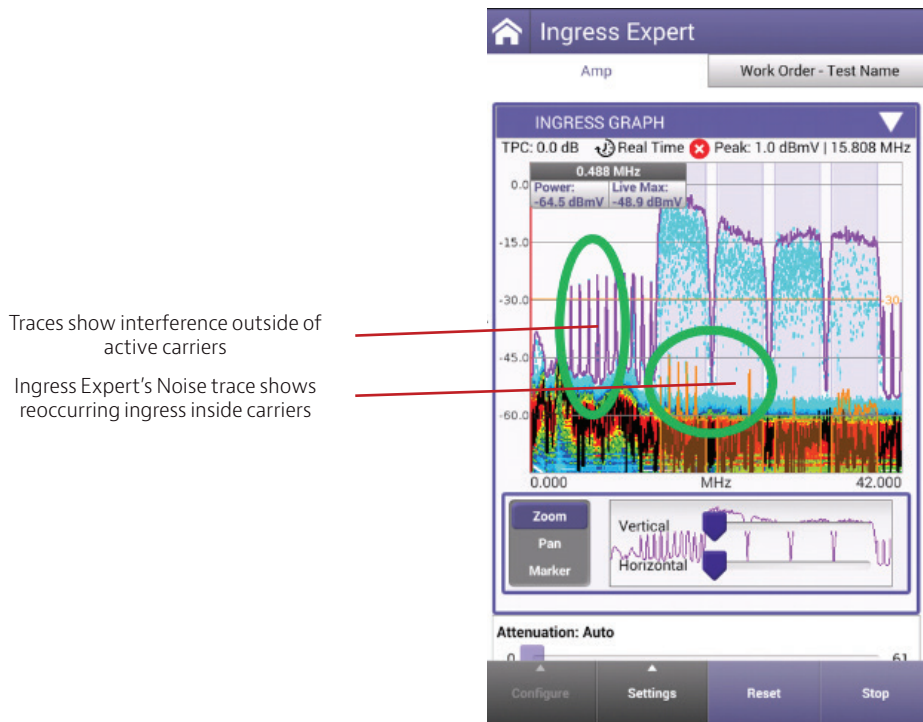
Noise

Heatmap

UCD

## Troubleshooting Intermittent Noise

One of a technician's toughest tasks is to find and fix impulse noise impairments because fast transient noise is difficult to identify and measure. HyperSpectrum easily catches these quick transient impulses, even when below active upstream carriers, as the various traces make these impairments visible. The "Noise" trace shows reoccurring impulse ingress under active carriers.

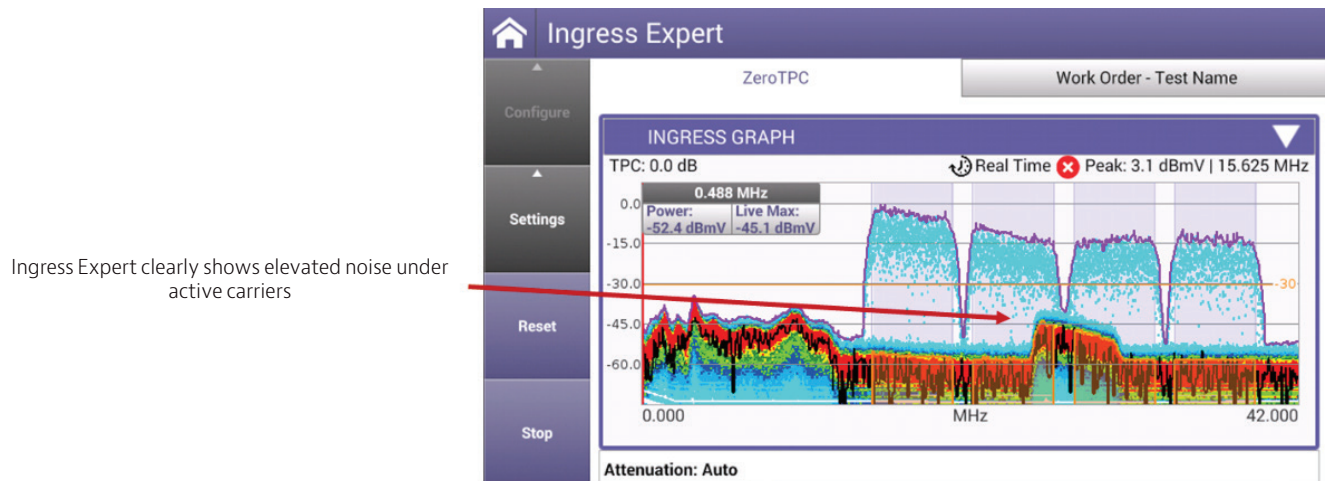


Traces show interference outside of active carriers

Ingress Expert's Noise trace shows reoccurring ingress inside carriers

## Troubleshooting Consistent Noise

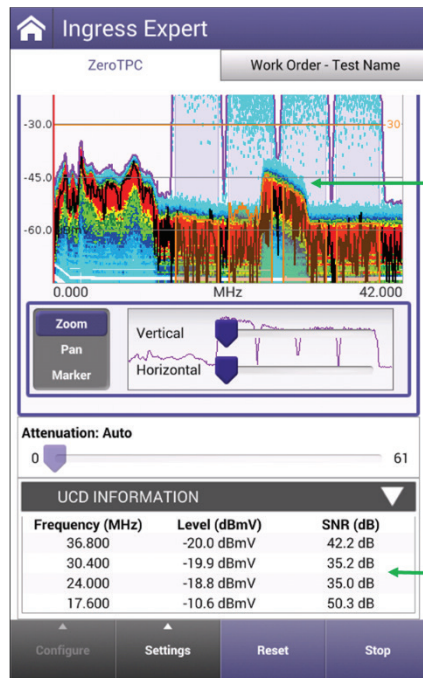
Consistent ingress/noise sources have traditionally been easier to troubleshoot, however as vacant upstream spectrum becomes scarce, the ability to find and fix noise under active QAM carriers is more important than ever. Ingress Expert mode's persistence measurement catches and displays noise even under active upstream carriers.



Ingress Expert clearly shows elevated noise under active carriers

## UCD Identification and Table

The Ingress Expert mode identifies upstream carrier frequencies and populates a UCD table below the Ingress Expert graph based on the last successful DOCSIS range test performed. Knowing exactly where to anticipate the upstream carriers enables additional measurements to be displayed: carrier frequency, upstream carrier level as measured at the test point, and signal-to-noise ratio (SNR) as measured for level and noise at the test point.



The impact of the noise floor can be clearly seen in the SNR calculated for the 24 and 30.4MHz carriers

## Impulse Noise – Scanning vs. Real-Time Analysis

Ingress Expert uses a full-band spectrum capture technology that overlaps FFT (fast Fourier transform) analysis and result presentation. It captures a complete upstream spectrum in one "shot" and takes thousands of full-band shots per second. While one measurement is being captured the previous measurement is simultaneously being processed for display, which effectively turns the meter into a near real-time spectrum analyzer. Because the meter is continuously capturing the whole upstream band, any transient impulse noise is detected and displayed.

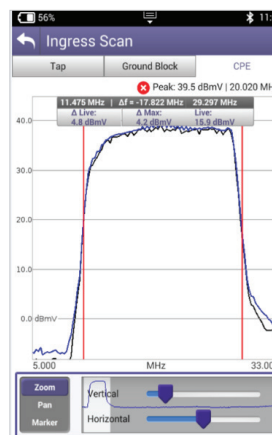
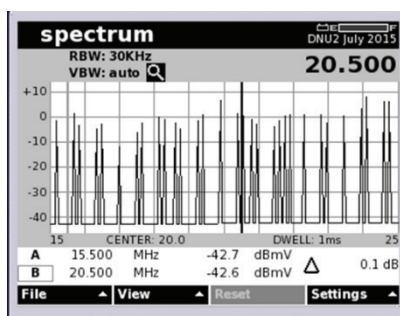
This technology offers a true view of upstream spectrum, much more quickly than more traditional swept spectrum analyzers. Swept spectrum analyzers scan, tuning to one frequency at a time taking measurements within the RBW (resolution bandwidth) then moving to the next frequency. This continues until it reaches the highest measurement frequency and then starts over at the beginning. If the analyzer scan is not already tuned to the frequency at the instant of a noise signal, then that noise may not be detected or measured. Detection depends on the duration of the noise signal and whether the analyzer scan is at the noise frequency so the noise is within the detection RBW. These noise signals appear as spikes on swept spectrum analyzers, but appear as larger continuous mounds in the Ingress Expert mode, which is the true broadband noise characteristic.

One easily replicated example that shows the difference between scanning and real-time analysis is the display of upstream cable modem signals. Like intermittent noise, cable modem traffic bursts in its 6.4 MHz wide carrier band for a brief period and then disappears until the modem is active again. A swept spectrum analyzer may require several passes with peak hold active to display the complete 6.4MHz wide carrier. This is because the modem carrier might not be active until the swept spectrum analyzer scanning has moved on to the next frequency. Therefore, modem traffic often looks like spikes rather than a haystack on a scanning analyzer. With Ingress Expert mode, when the 6.4MHz wide carrier is active the full 6.4MHz carrier is visible immediately. Another example, HPNA interference is shown below.

### HPNA Interference Example

The DSAM scanning analyzer catches samples within its resolution bandwidth as it scans spectrum. Max Hold is needed to capture complete noise “envelope” over time.

The Ingress Expert FFT captures the whole noise envelope at once, and there’s no need to wait for multiple scans to see complete interference impact, or recognize the signature of the interfering signal.



The Ingress Expert FFT display shows a more complete representation of the actual noise signature at any given moment, and with its “Live Max” mode the captured signal remains on the display longer, making it easier for the troubleshooting tech to notice its presence, and perhaps to identify by signature the likely source (in the case above, the characteristic “haystack” of an HPNA signal).

\*DOCSIS is a trademark of CableLabs