

# Application Note

## Channel Power Measurements with the iVA Cable & Antenna Analyzer

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## Introduction

Modern cellular radio signals are characterized by wide bandwidths and high peak-to-average power ratios. In the 4G world, as carrier aggregation becomes more pervasive, signals increasingly comprise several component carriers distributed across the operator's frequency band. To complicate matters further, it is not uncommon for two or more operators to share parts of the same RF infrastructure at some cell sites, so that signals from several radio systems travel through the same physical cables and antennas.

In such a crowded spectral environment, measurement of the RF power of a given signal cannot be performed with a conventional wideband RF power meter. Instead, it is necessary to first measure the signal's *spectrum*, and then sum up the total power of the spectral components that lie within the band of interest.

In order to streamline this measurement process, Kaelus has developed "Channel Power" mode for the iVA. Channel Power mode allows the user to determine the total RF power between any two frequencies in a Spectrum Monitor trace. Measurement bandwidths of up to 75 MHz are allowed, for signal levels ranging from +15 dBm to -100 dBm. Both modulated and continuous wave (CW) signals are supported.

A typical use case for Channel Power mode is depicted in Figure 1. An iVA is connected to the output of a base station transmitter. Next, a Bluetooth connection is established between the user device (tablet or laptop) and the iVA. The base station transmitter is then turned on, and the user initiates a measurement sweep in Spectrum Monitor mode. Upon completion of the sweep, the channel power is computed and displayed on screen.

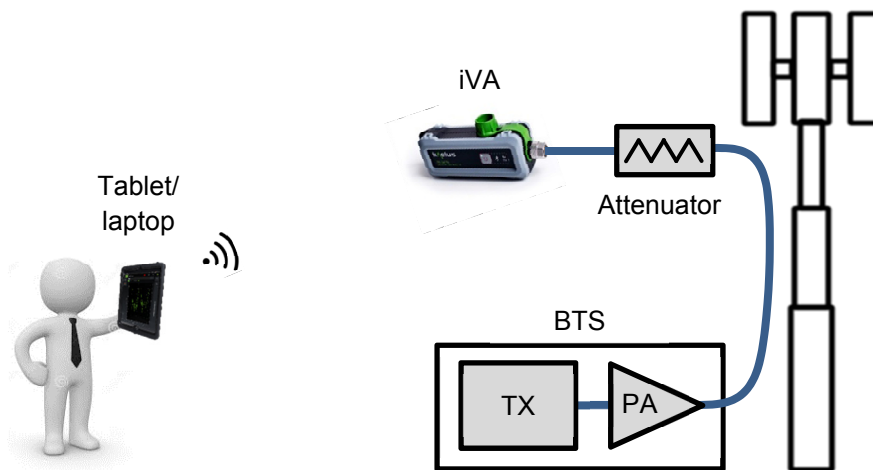


Figure 1. Typical equipment setup for a channel power measurement with the iVA.

## Preparing for a Channel Power Measurement

The first step in preparing for a Channel Power measurement is to establish a Bluetooth connection between the tablet and the iVA.

The second step is to perform a Channel Power calibration. This is a simple procedure that only needs to be performed when using Channel Power mode for the very first time. This function can be accessed on the “Calibrate” screen, under the heading “Channel Power Calibration”.

The third step is to go to the Spectrum Monitor screen and specify the frequency sweep settings.

The final step is to specify the Channel Power settings, which include the frequency range over which the channel power is to be measured, and the type of signal being measured (i.e. Modulated or CW). These settings can be accessed near the bottom of the “Traces” menu.

You are now ready to perform Channel Power measurement.

## Measure Channel Power

Connect the iVA to the output port of the signal source. If the composite power of the signal under test is expected to be greater than +20 dBm, an attenuator must be inserted between the iVA and the signal source as per Figure 1, in order to avoid causing damage to the iVA. Turn on the signal source and trigger a measurement sweep in Spectrum Monitor mode. After a short delay a plot of signal amplitude vs frequency will appear on the screen. The band of frequencies in which channel power is measured is shown as a shaded blue region. The channel power result is printed in a blue text box above the plot.

## Modulated Signal Measurement Example

The results of a channel power measurement on a modulated signal are shown in Figure 2. In this example the signal under test was an LTE-Advanced FDD downlink signal with 4 component carriers and a composite power of  $-30$  dBm. The channel power of the third component carrier was measured and found to be  $-35.8$  dBm. This equates to approximately one-quarter of the composite signal power, as we would expect.

Note that due to the wideband nature of this signal, the “Signal Type” setting in the Channel Power menu had to be set to “Modulated”. This is very important, as the iVA measures modulated signals differently to CW signals.



Figure 2. Measurement of RF power of third component carrier in an LTE-Advanced FDD downlink signal with 4 component carriers.

## CW Signal Measurement Example

The results of a channel power measurement on a CW signal are shown in Figure 3. In this example the signal under test was a multitone CW signal comprising 10 carriers and a composite power of  $-30$  dBm. The power of the seventh carrier was measured and found to be  $-40$  dBm. This equates to one-tenth of the composite signal power, as we would expect.

Note that due to the narrowband nature of the spectral components in this signal, the “Signal Type” setting in the Channel Power menu had to be set to “CW”. As mentioned previously, this is very important, as the iVA measures CW signals differently to modulated signals.

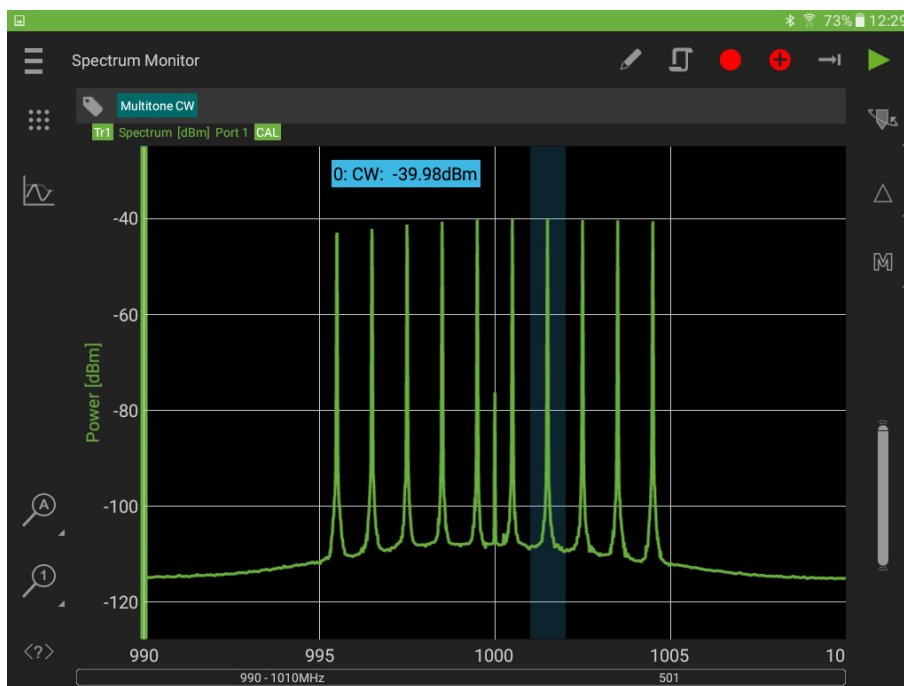


Figure 3. Measurement of RF power of one carrier in a multitone CW signal.

## Capabilities to be Further Expanded in Future Releases

Future releases of Kaelus Unify will expand the measurement capabilities of Channel Power mode to include Occupied Bandwidth, Adjacent Channel Power Ratio and multi-channel power measurements.