

Troubleshooting Embedded RF Modules

Your Challenges:

Using a certified off-the-shelf RF module does not guarantee it will work when embedded in a design. Unpredictable interactions between control buses, power supply issues and antenna mismatch can all cause troubleshooting challenges.

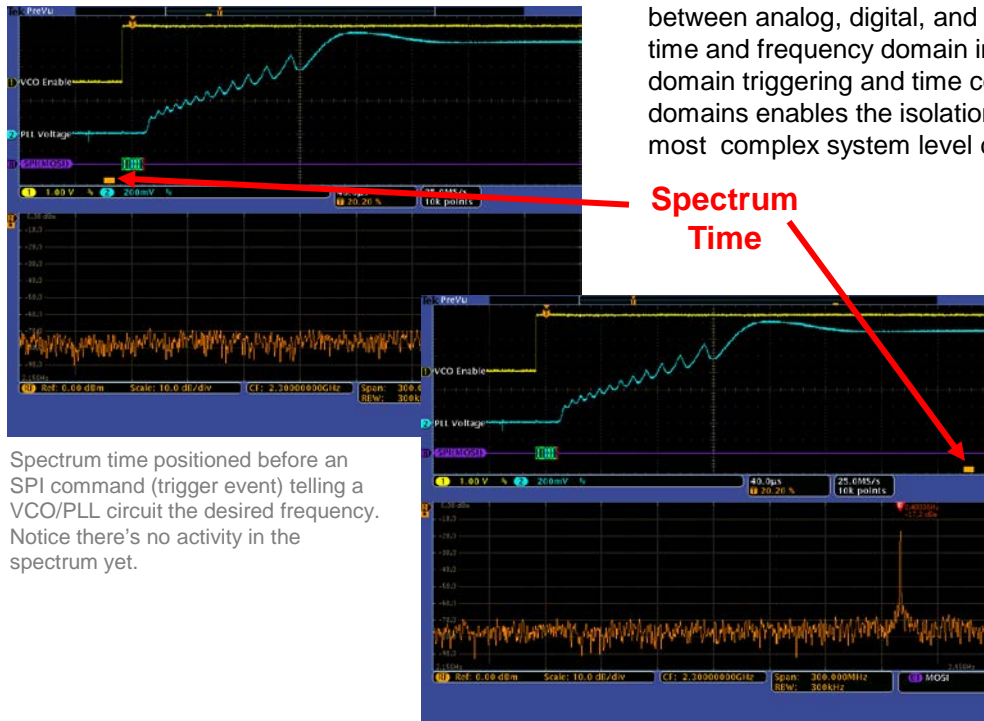
A common challenge in embedded RF applications is determining if the RF is on frequency and not interfering with other devices.

Tektronix Advantage:

The MDO4000B is a versatile tool for developing and debugging embedded systems with RF modules. For the first time ever, you can easily measure the relationship between analog, digital, and RF signals. See both the time and frequency domain in a single glance. Cross domain triggering and time correlated viewing of both domains enables the isolation and diagnosis of even the most complex system level design issues.

Unique Benefits of Tektronix Solutions:

- The MDO4000B is the only instrument that incorporates a spectrum analyzer, oscilloscope, and logic analyzer in a single compact package.
- The entry-level MDO4000B provides more measurement capability at a lower price than a stand-alone spectrum analyzer with comparable performance.
- In addition to being three instruments in one, the MDO4000B correlates frequency and time domain events to drastically reduce troubleshooting time.
- The MDO4000B spectrum analyzer has the widest capture bandwidth available of any spectrum analyzer. See the whole spectrum of interest at any point in time with the up to 3 GHz capture bandwidth.
- When paired with SignalVu-PC vector signal analysis software, the MDO4000B becomes the industry's widest bandwidth VSA with up to 1 GHz capture bandwidth. 802.11 transmitter test options further assist in understanding device performance and troubleshooting design issues



Spectrum time positioned before an SPI command (trigger event) telling a VCO/PLL circuit the desired frequency. Notice there's no activity in the spectrum yet.

Spectrum time positioned ~300µs after the SPI command. Notice the circuit has now tuned to the desired 2.4 GHz frequency.

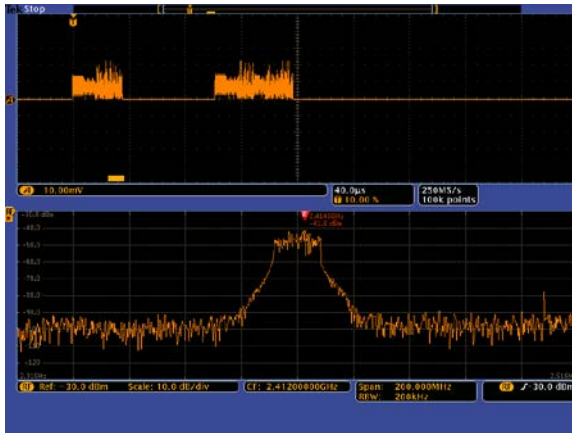
Spectrum Time

The upper half of the MDO4000B Series display shows a Time Domain view of all analog and digital channels, while the lower half shows the Frequency Domain view of the spectrum analyzer. Spectrum Time (indicated by the orange bar in the time domain view) indicates the period of time the spectrum shown in the frequency domain correlates to.

Easily correlate frequency domain events with changes in time domain signals. Characterize complex interactions between digital control signals and serial buses with changes in your RF signal.

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Emerging wireless standards continue to employ frequency hopping and wide information bandwidths. Traditional spectrum analyzers are limited in the information they can provide given their swept-tuned architecture. The MDO4000B is the most versatile tool available to engineers and technicians developing embedded designs with RF modules.



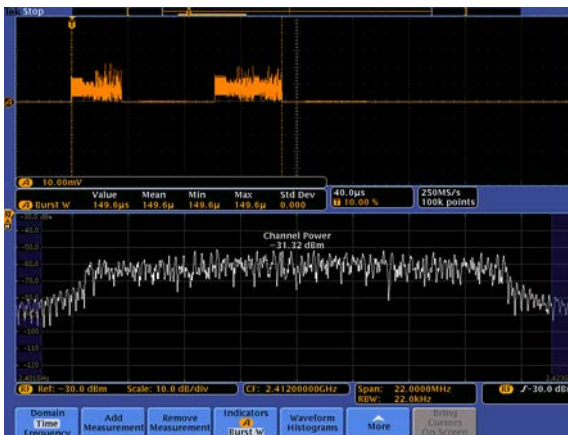
RF Power level used to trigger instrument to capture Wi-Fi transmission



Automated channel power measurement of first burst in Wi-Fi transmission

The upper half of the MDO4000B Series display shows the Time Domain view of the RF Amplitude versus time trace, while the lower half shows the Frequency Domain view of the spectrum analyzer input. The orange bar - Spectrum Time - shows the period of time used to measure the RF spectrum.

The MDO4000B's ultra wide capture bandwidth enables capture of the entire 802.11 band in a single acquisition while also offering the ability to see how the RF signal changes over time.



Automated burst width measurement of RF Amplitude versus Time trace from the captured Wi-Fi transmission

More Information

Datasheet:

- MDO4000B Series

Videos:

- MDO4000B Series Virtual Tour
- Mixed Domain Analysis
- Time Correlation of Analog + Digital and RF
- Complete Analysis of Wide Bandwidth Systems
- Advanced RF and Cross Domain Triggering
- Amplitude + Frequency and Phase vs. Time Traces
- Spectral Analysis and Spectrograms
- Automated Peak Markers
- MDO4000B Spectrum Analyzer vs. Scope FFT
- Debug of WLAN Power Amplifier
- Integrating Zigbee Radio Implementation and Testing
- www.youtube.com/user/w2aew
- and more at www.tek.com/mdo4000b

Literature:

- Fundamentals of the MDO4000B Series (application note)
- Secrets Behind MDO4000B Spectrum Analyzer Dynamic Range (application note)
- MDO4000B Series vs. Traditional Scope FFT (fact sheet)
- Hunting Noise Sources in Wireless Embedded Systems (application note)
- Integrated Zigbee Radio Implementation and Testing (application note)
- and more at www.tek.com/mdo4000b

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