Introduction

This application note will outline proper setup and measurement procedure for performing dual band measurements with a Copper Mountain Technologies 4-port Cobalt VNA. This example setup features a C4409 4-port 9 GHz Analyzer and uses two ports for measurements in a low frequency band, while the other two ports are used for measurements in a separate, higher frequency band. Measurements with this dual band setup are not simultaneous but allow the user to quickly switch back and forth with the simple click of a button.

The dual band measurement setup is ideal If you have a 4-port frequency extension compatible VNA and are working in an application that deals with multiple frequency ranges. For example, some 5G applications deal in a low frequency band (below 6 GHz) as well as the mmWave frequency band.

Equipment Required

- Frequency extension compatible 4-Port Cobalt VNA (C4209, C4409, C4220, C4420)
- At least one set of frequency extenders (separate bands are required if using two sets of extenders) extender selection is determined by the DUTs being used
- 500 MHz bandpass filter (DUT #1)
- 77 GHz bandpass filter (DUT #2)

Measurement Procedure

- Connect extender set to ports 1 & 2.
- Connect test cables to ports 3 & 4.
- Calibrate at the end of the test cables on ports 1 & 2.
- Connect DUT #1 to ports 1 & 2 and complete the measurement.
- Go to: Systems>Miscellaneous Settings>Extenders>Select Extender Set (cannot measure simultaneously, this step has to be done each time you switch between frequency bands). If you're going to low frequency select: Systems>Miscellaneous Settings> Extenders> None.
- Calibrate ports 3 & 4 at the end of the extenders.
- Connect DUT #2 to port 3 & 4 to complete the measurement.

Example Measurements

In this example we are using a C4409 VNA to measure a WR12 waveguide bandpass filter with center frequency at 77 GHz and a bandpass filter with center frequency at 500 MHz. We have the CobaltFX FEV-12 extenders connected to port 1 and port 2 of the VNA. These extenders cover the 60 GHz to 90 GHz frequency range.

Figure 1: FEV-12 extenders are shown connected to ports 1 & 2, while ports 3 & 4 are connected to the 500 MHz bandpass filter

Now we can calibrate and then measure the waveguide filter by reading the port 1 and port 2 measurements.
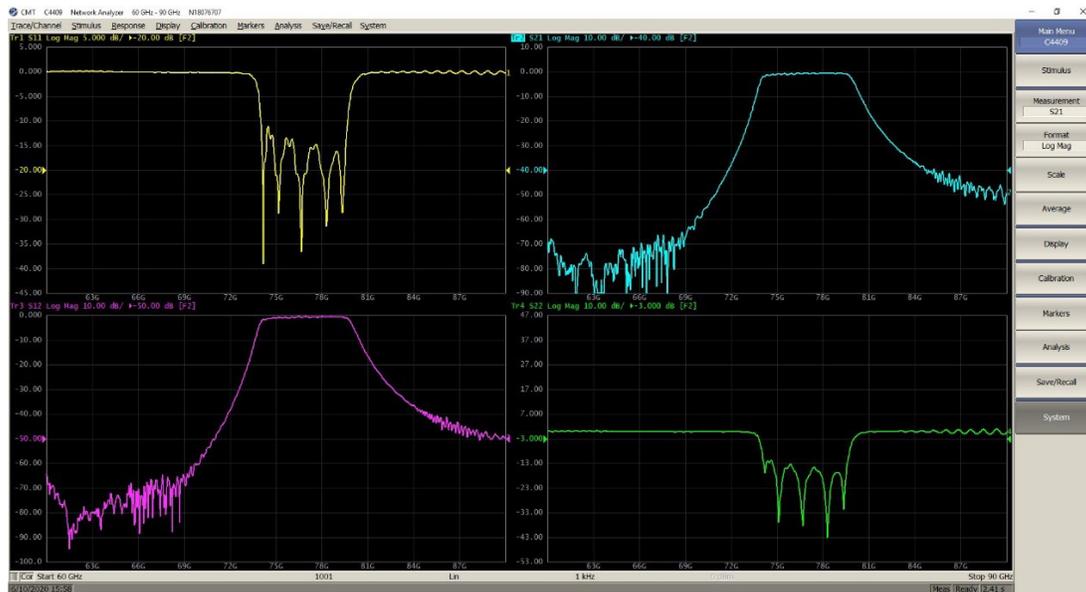

Figure 2: Measurement of 77 GHz bandpass filter on ports 1 & 2

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When we want to start measuring the 500 MHz bandpass filter, we simply need to go to Systems>miscellaneous settings> extenders> select "none". The VNA software at this point will relaunch itself and the frequency range will go back to 100 MHz to 9 GHz. To read the measurements of the 500 MHz filter we need to read measurements on port 3 and port 4.
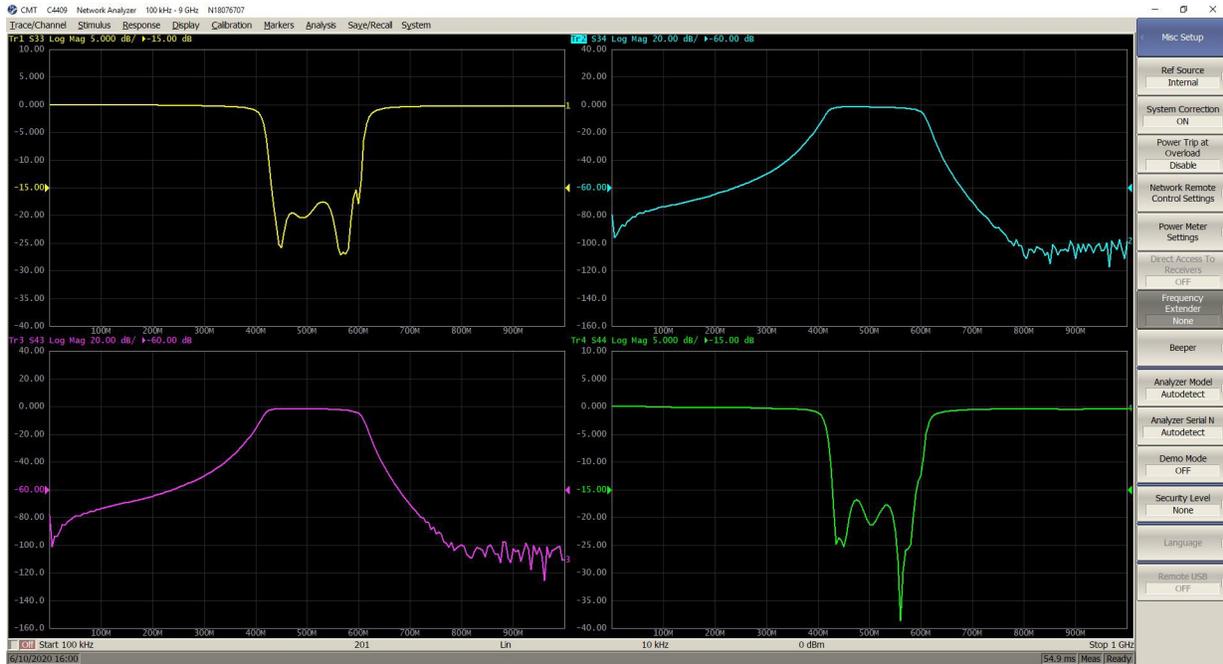

Figure 3: Measurement of 500 MHz bandpass filter on ports 3 & 4

Conclusion

As you can see this is a fairly simple measurement process, which allows you to quickly make measurements in multiple frequency ranges through the use of a single measurement setup. If you need further clarification on this application note or any assistance with your specific application, please contact: support@coppermountaintech.com.

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