



The

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... edited by Barry Mishkind – the Eclectic Engineer

Checking it Out The DEVA Broadcast DB4004 Modulation Monitor



By Richard Rudman

[January 2013] Knowing how your signal is doing on the air is more important than ever. And legacy modulation monitors are ill-suited to show you exactly what is going on with digital modulation. Here Richard Rudman takes a look at the new DB4004 from DEVA Broadcast. You will see that its modern design does a whole lot more than display modulation levels.

A Bulgarian modulation monitor? For someone accustomed to buying gear produced in North America, this was the edge of my comfort zone.

But do read on. You will see this makes sense. The DEVA DB4004 modulation monitor is well designed, well executed, cost effective – a seriously powerful test instrument.

In fact, after spending some time evaluating a DEVA DB4004, I find it incorporates so many performance features that it is impossible to list and evaluate them all in a single BDR report.

One of the DB4004s most impressive features is the receiver itself.

Not only can the DB4004 be used as an FM band scanner with an external antenna, but it can make accurate measurements at a multi-FM transmitter site, even with high power two-way VHF transmitters, without requiring a direct connection to a transmitter RF in-line sample port.

ACCURACY

Naturally, the very first question I had about the DB4004 was about its accuracy. It does not matter how good it looks, nor how many features it has, unless it is accurate in measuring station modulation.

With that in mind, I enlisted the assistance of my close friend and engineering colleague Burt Weiner – whose precision audio oscillator is referenced to a lab grade GPS standard – to verify the accuracy of both the DEVA DB4004 and my Inovonics 531.



The DEVA DB4004

There is a relatively simple and highly accurate way to check the accuracy of FM modulation monitors without sending them to the factory. As many of you know, the test is done by modulating an FM transmitter with a very precise audio sine wave of 13587.0 Hz. and observing the transmitter's RF output on a spectrum analyzer.



A precision audio oscillator with GPS reference was used for the Bessel Function test

The level of the audio sine wave is gradually increased while observing the carrier through a first carrier null until you observe a second carrier null.

At that point, Bessel Function math says that the carrier is being modulated to exactly 100% of allowed deviation which for US FM broadcast is of course +/- 75 kHz.



IFR Spectrum Analyzer showing the second Bessel carrier null

Both monitors quickly showed they were right on calibration.

A TEST IN THE FIELD

With the accuracy verified, I took the monitor to a hilltop site in Santa Barbara, California where

there are several FM transmitters, and in close proximity to an adjacent site with another FM transmitter.

The DB4004 utilizes a high-resolution OLED graphical display with an ultra-bright 60-segment LED bar graph indicator. They pack a lot of information into the front panel display while being quite readable.

Using the monitor I was able to make accurate off-air measurements of modulation percentage, pilot level, and RDS subcarrier levels not only at the site, but on the FM station on the other hill. I know the measurements were accurate because I had connected my previous (and recently calibrated) modulation monitor to RF sample ports on transmission lines segments for comparison.

NEAR AND FAR

The automatic input RF attenuator in the DEVA made testing using the external antenna a snap.



This 107.7 Stereo signal was monitored from 20 miles away. Note the low multipath.

Inputs? The DB4004 has two separate BNC antenna input connectors that can be programmed to switch between separate antennas or, with an external attenuator, direct RF inline sample ports. DEVA does caution users to not exceed a level of 100 dBuV at the antenna inputs without using an external attenuator.

The incoming RF signals are digitized at the IF level using solid (DSP) algorithms. According to DEVA, digitizing at the input gives precise measurement reproducibility over time as well as reproducibility when different DB4004s are compared.

You can even read out Bit Error Rate (BER) on RDS signals and see a real time display to let you orient the antenna for the lowest multipath percentage.

FILTERS AND DSP CONTROL

I am truly impressed with the filters DEVA uses in the 4004.

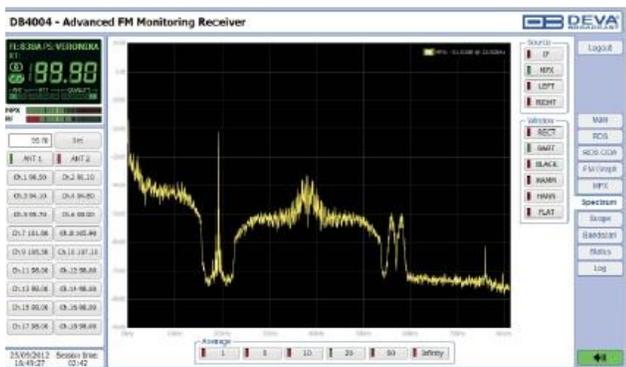
These filters, in concert with a very fast processor, allows FM multiplex signals components to be accurately reproduced from one DB4004 to another and assures that all measurements are refreshed close to instantly. This makes for detailed and informative real-time readings of various multiplex FM signal components.

You have an incredible amount of control over instrument parameters. For instance, you can set the IF bandwidth in 15 increments from 15 kHz to 157 kHz – or let the device do bandwidth selection automatically.



DEVA DB4004 Menu Screen

The Fast Fourier Transform (FFT) internal spectrum analyzer mode is especially impressive when viewed using the built-in web interface.



The DB4004 FFT WEB interface spectrum analyzer display

Both the front panel display and the web display let you view MPX Power and all other level measurements

The DB4004 has very fast built-in front panel and web interface oscilloscope displays. Not only can you view all FM demodulated waveforms, but the monitor even has an X-Y mode that shows stereo phasing.



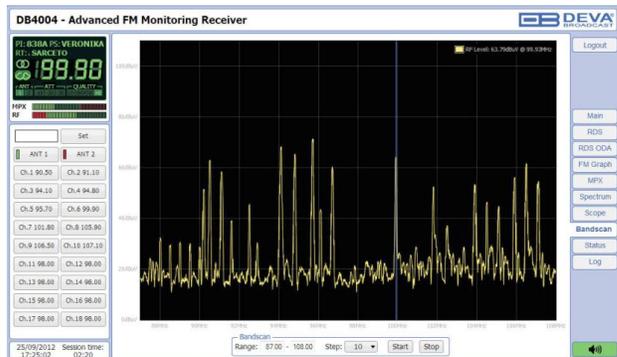
DB4004 X-Y Stereo Display

All RDS information contained in the processed MPX signal is there not only for you to check, but the DB4004 decodes the embedded information on the front panel OLED screen.

BAND SCAN

The band scan mode is another outstanding feature. All you have to do is locate a DB4004 so it can pick up your market's stations and you easily can survey all your competition.

While the band scan display does not pop up call letters next to carriers, an easy to used cursor screen marker lets you find out what the frequency is for any observed signal. Or, enter a frequency of interest and you can see the details.



Web-based band scan display. Note the marker and corresponding frequency read-out on the upper-left

The frosting on the cake with the web view is being able to not only remote view what the DB4004 is telling you, but it gives you better and faster control of all features than the front panel.

If you locate the DB4004 at your site, there is a rear panel alarm terminal to tie into your remote control and telemetry. The DB4004 can support USB in addition to LAN/WAN connections, allowing great flexibility in remote control and remote monitoring.

MORE FEATURES

There is more – much more than I have had time to test as yet.

For example, the DB4004 has what they call an Interactive Software-based Log Viewer tool. This allows detailed analysis of any station from channels being monitored. The Band Analyzer function in the DB4004 presents an overview of all FM signals available, plus the RF signal strength of these stations.

Scans can be set up within any section of the band using three different modes. Band scans can be programmed to watch for FM pirates or other types of sporadic band interference.

Want the DB4004 to keep watch on your system? If you set the frequency to your station, you can program the DEVA to tell you if there has been a transmission failure using E-mail, SNMP, or SMS. With the built-in audio stream server you can listen to, skim, and record the audio from your station, or the competition.

Then there is data handling. All channel measurements and logs can be saved in the internal device memory. A built-in FTP capability can be set up to manage the log files according to an assigned schedule. All the collected information is saved in a database that can be revised, played back, and sent automatically to another location as needed.

And there are still more features to explore.

MAKING THE DECISION TO BUY

Perhaps, as you read this review, you may wonder whether you should consider purchasing a modulation monitor from a European manufacturer? I think you should keep an open mind for the following reasons:

1. The DB4004's design team is solid and experienced, having designed a number of analog and digital products, including some well-known RDS products.
2. DEVA has a relationship at this writing with established U.S. distributors, including SCMS.
3. The U.S. distributors have promised to support the DB4004 post-sale, including any warranty work. You will not have to worry about any international shipping hassles.
4. The DB4004 has an incredible feature set that belies its low price point.

You can download all specs and the user manual from the DEVA site. It is worth a click or two to see the details for yourself at:

<http://www.devabroadcast.com>

Is there room for improvement and refinement? Yes. For instance, the current version cannot tell you much more about an HD FM signal than to display the RF envelope right now. While for most markets and most stations, this will not be a problem, I suspect this will change in the future.

After a series of emails and a phone conversations with the developer, future enhancements (or bug fixes) are underway and can be sent to the device using FTP.

BOTTOM LINE

DEVA claims that the DB4004 is the most cost effective way for regular monitoring of the quality and continuity of a single station – and up to 50 other FM Radio Stations on the band. Looking at a band scan of the Los Angeles FM envi-

ronment, I think DEVA is on safe ground with this statement.

It is also impossible for me to think of another broadcast engineering tool that brings such a great number of revolutionary and evolutionary user-enticing features to a product category at a super-reasonable price point.

Am I going to buy one?

Absolutely.

You can get more information on the DEVA Broadcast [web site](#) or call 855-428-7272.

A broadcast engineer with experience from small to major markets, Richard Rudman is a regular contributor to the BDR and is the owner of Remote Possibilities in Santa Paula, CA.

Contact him at rar01@mac.com

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