Handheld Spectrum Analyzer R&S®FSH 3

# Code domain power measurement on 3GPP base stations

For more than three years, the Handheld Spectrum Analyzer R&S®FSH 3 has been used to perform a variety of T&M tasks that are instrumental in installing and maintaining mobile radio base stations. The new R&S®FSH-K 4 software option now also provides code domain power analysis for 3G base stations, including EVM and scrambling code determination.

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FIG 1 The versatile measurement functions of the R&S®FSH 3 offer a broad scope of applications, including the installation and maintenance of a mobile radio base station, on-site analyses of faults in RF cables and applications in development and service.
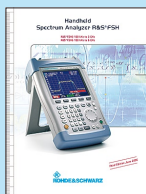
Measuring the code domain power in the field

So far, only high-end spectrum analyzers have been able to analyze the code domain power of 3G base stations. However, due to their size and weight, they are suitable for field applications only to a limited extent. The R&S®FSH 3 (FIG 1), however, was specially designed for on-site operation: This compact, lightweight tool can even be operated without AC supply.

To perform code domain analysis, the R&S®FSH 3 has now been enhanced by an additional memory for I/Q data. The analyzer can thus record a signal section with a length of approx. 1.2 ms, which is sufficient to detect the code channels

required for code domain analysis and determine their power as well as other characteristics.

In addition to the overall power of the 3G signal, the R&S®FSH3 also outputs the power values of the following code channels:
◆ Common pilot channel (CPICH)
◆ Primary common control physical channel (P-CCPCH)
◆ Primary synchronization channel (P-SCH)
◆ Secondary synchronization channel (S-SCH)

But analyzing the signal quality is even more beneficial: If required, the analyzer additionally determines the error vector magnitude (EVM) of the CPICH and the P-CCPCH. The signal-to-noise ratio also considerably affects signal quality. In a WCDMA system, the E_c/I_0 value, i.e. the ratio of the chip energy (E_c) to the power density of the interference signal (I_0), is decisive. Naturally, the R&S®FSH3 also supports this measurement (FIG 2). Last but not least, the carrier frequency error is measured and displayed. By directly feeding the base station reference frequency into the R&S®FSH3, measurement accuracy can be enhanced.

Indispensable: Level Adjust and scrambling code search

What's the base station's transmit power? Which scrambling code has been used for the code channels? These are key questions posed prior to starting measurements on a base station, and the R&S®FSH3 automatically gives the answers. Simply press the Level Adjust function button, and the analyzer will search for the optimum level setting for the applied power. Another press of a button, and the R&S®FSH3 determines the scrambling code of the base station and automatically uses it for decoding the code channels. You can also get a

quick overview of adjacent base stations. If required, up to eight scrambling codes and their CPICH power are displayed in a list. The list is automatically sorted according to the magnitude of the power values (FIG 3).

In practice, only four operating steps are required to display the measured code domain values:
◆ Select the 3GPP CDP function
◆ Enter the center frequency
◆ Use "Level Adjust" to optimize the level setting
◆ Start the scrambling code search

For base stations with two antennas, you can additionally select the antenna the R&S®FSH3 should synchronize to (antenna diversity).

Summary

Installing and maintaining a base station without the aid of the R&S®FSH3 is almost inconceivable. Equipped with a vector transmission and reflection measurement option (R&S®FSH-K2), a distance-to-fault option (R&S®FSH-B2) and the new code domain power analysis option (R&S®FSH-K4), the R&S®FSH3 provides in a compact and lightweight box all the features that make an engineer's heart swell.

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