

# SIGNAL ANALYSIS – THE KEY IN UPDATING RADIO SIGNAL MONITORING

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Modern radio monitoring solutions prosecute complete radio frequency bands by receiving and processing hundreds of emissions simultaneously. They process the signals fully automatically; this is practically 'a must' in order to be able to process a large number of parallel signals efficiently. The operators essentially focus on evaluating the results of their predefined SOIs (Signals Of Interest).

These automatic methods are not always able to process the signals completely; poor reception quality or new, unknown radio signals are among the most common causes. This is where expertise in radio signal analysis come into the play. Based on signal recordings, experts use special software applications with in-depth analysis methods for further processing.

PROCITEC's Signal Analyzer software solution was newly developed especially for this application. The main design goal was to create an easy-to-use radio signals analysis tool that quickly produces high-quality analysis results. For example, typical analysis steps can be performed automatically, and for frequently used signal types (e.g. FSK or PSK modulation), there are predefined analysis sets with all the methods required for analysis in a measurement template.

With the new software, PROCITEC combines the knowledge of our inhouse experts with the experience of our customers. In accordance with the company's philosophy, further development is open to customer requests and feedback. Suggestions are incorporated into new software releases at six-month intervals along with functional enhancements.

## What does analysis now look like?

First, load the signal recording and select a signal section for analysis within a spectrogram display (time/energy versus frequency). It's easy, but it is an important step. As mentioned before, signal quality can vary strongly within a recording, so analyzing the signal at different times and durations can be

a key to success.

There is no real 'single procedure' for the next steps. If there is already a suspicion of a certain signal type, one changes directly to the corresponding measurement template and checks the hypothesis based on the expected results of its measurement functions.

As an example, a PSK signal (Phase Shift

Keying, frequency-modulated radio signal with digital content) shows the transmitted data bits directly in the displayed frequency graph.

This basic principle of hypothesis, verification by specialized methods for detection and measurement of technical parameters can be applied to all types of radio signals. Signal Analyzer already offers a variety of well-known methods specialized in digital radio signals (transmission of binary content) such as FSK, PSK, multichannel modulation, OFDM, etc.

## But what if I have absolutely no idea about a signal?

This is where the modulation type classifier of the Signal Analyzer helps. At the push of a single button it classifies all common signal types from analog speech, Morse, ASK, FSK, PSK, QAM, MPSK, OFDM, etc. and measures their technical parameters.

An outstanding feature is the direct classification of the used modem type (specialized on communication signals in the HF, VHF, UHF and satellite ranges).

## How can I further use the derived results optimally?

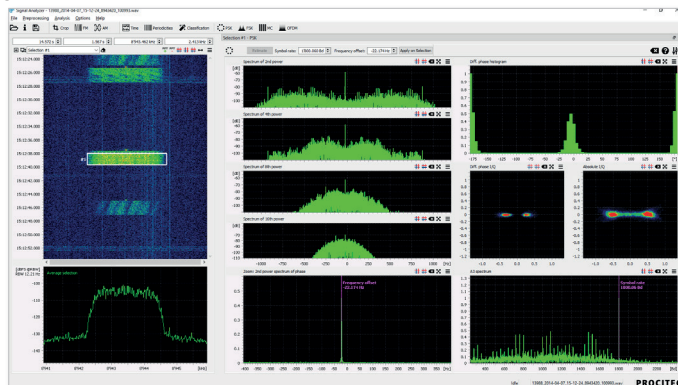
Signal Analyzer is a product from PROCITEC's go2signals product line. Monitoring solutions based on these products are compatible with each other. They are open for enhancements by the operating professionals and can thus be adapted to the constantly changing signal world.

Feeding back the results attained with Signal Analyzer extends the monitoring solution in automatic processing in the future, especially in the case of new radio signals.

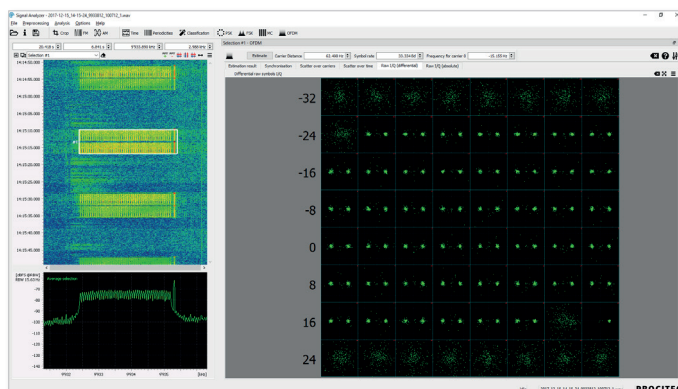
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Template for PSK signal analysis



OFDM analysis example showing multiple IQ-Display

Keying, phase-modulated radio signal with content) can thus be identified based on the displays »spectra over the multiply squared time signal«, »display of the signal in complex number space«, »frequency distributions over differential phases«, and so on.

If there is no hypothesis yet, analysis of behavior in the time domain may help. This analysis assumes a sinusoidal carrier signal. This can be modulated (changed by the data for transmission) in amplitude, frequency, phase or a combination of the parameters.

Accordingly, the three mentioned values are shown in their 'time behavior'. Depending on the signal type, typical graphs re-