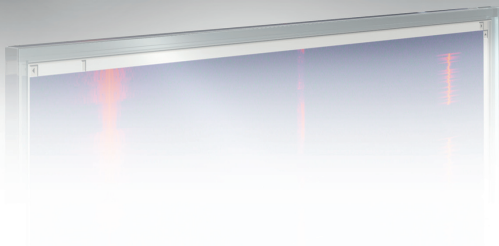
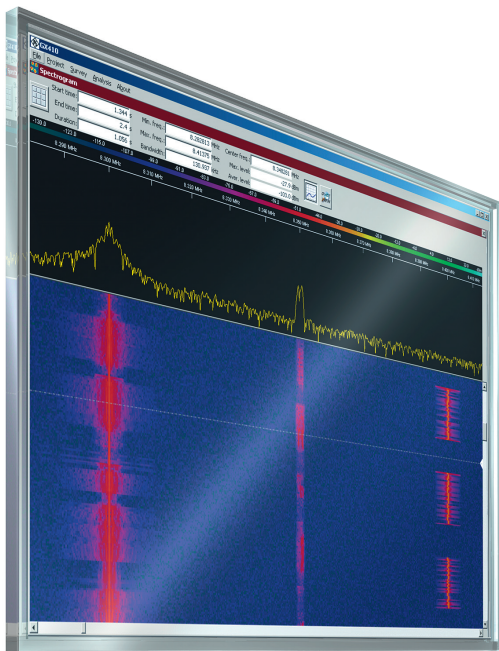


R&S® AMMOS® GX410 System for Technical Signal Analysis

Analysis of unknown or complex signal scenarios



R&S®AMMOS® GX410 System for Technical Signal Analysis At a glance

The R&S®GX410 is a system for the technical analysis of unknown or complex signal scenarios. It provides solutions for conventional fixed-frequency emissions as well as for the investigation of burst transmissions and frequency-hopping (FH) radios.

The R&S®GX410 offers the following:

- Digital IF (complex baseband) signal snapshot processing in connection with the R&S®AMMOS®GX400 sensor group, delivering a bandwidth of up to 20 MHz (HF and VHF/UHF) and unlimited bandwidth from other sources (e.g. R&S®GX420 AMREC or WAV format)
- Signal extraction from the wideband signal record using digital downconversion (DDC)
- Time and frequency domain signal analysis for determining technical parameters
- Automatic recognition of modulation parameters including bit stream classification
- Comprehensive library of demodulators and decoders
- Bit stream analysis
- Analog IF output

The R&S®GX410 consists of an R&S®GX410 AMLAB workstation with software for online monitoring, signal acquisition (e.g. with the R&S®AMMOS®GX400 sensor group), and offline signal analysis.

R&S®GX410 with
recommended R&S®AMLAB
workstation



R&S®AMMOS® GX410 System for Technical Signal Analysis

Benefits and key features

Graphical user interface provides control of all analysis functions

- ▮ Spectrogram showing an overview of the complete signal sample
- ▮ Time domain analysis for selected emissions
- ▮ Case-sensitive controls for the R&S®GX410 AMLAB processing steps (signal acquisition, detectors, demodulators, decoders, etc.)
- ▮ Navigation center showing all signal samples and calculated analysis results

Signal acquisition

- ▮ Digital IF data in R&S®AMMOS® IF format provided by various Rohde&Schwarz receivers and direction finders, or by the R&S®GX420 AMREC recording/replay system
- ▮ Digital IF data from non-Rohde&Schwarz receivers
- ▮ WAV files imported from a file server, for example
- ▮ Online (snapshot) IF wideband data provided by the R&S®AMMOS®GX400 sensor group, for example

Spectrogram representation

- ▮ Wide range of different resolutions and window functions
- ▮ Selection of emissions of interest

Automatic signal detection

- ▮ Speeding up the wideband signal sample investigation
- ▮ Detected emissions listed in a table and highlighted in the spectrogram

Automatic measurement/classification of fixed-frequency signals

- ▮ Powerful R&S®AMMOS® classification unit included
- ▮ Segmentation and modulation analysis
- ▮ Comprehensive library of demodulators and decoders

Manual modulation analysis

- ▮ In-depth modulation analysis with measurement cursors in zoomable spectrogram
- ▮ Automatic and manual measurement

Analysis of short-time signals

- ▮ Automatic detection algorithm
- ▮ Finding out different kinds of emitters within a complex scenario

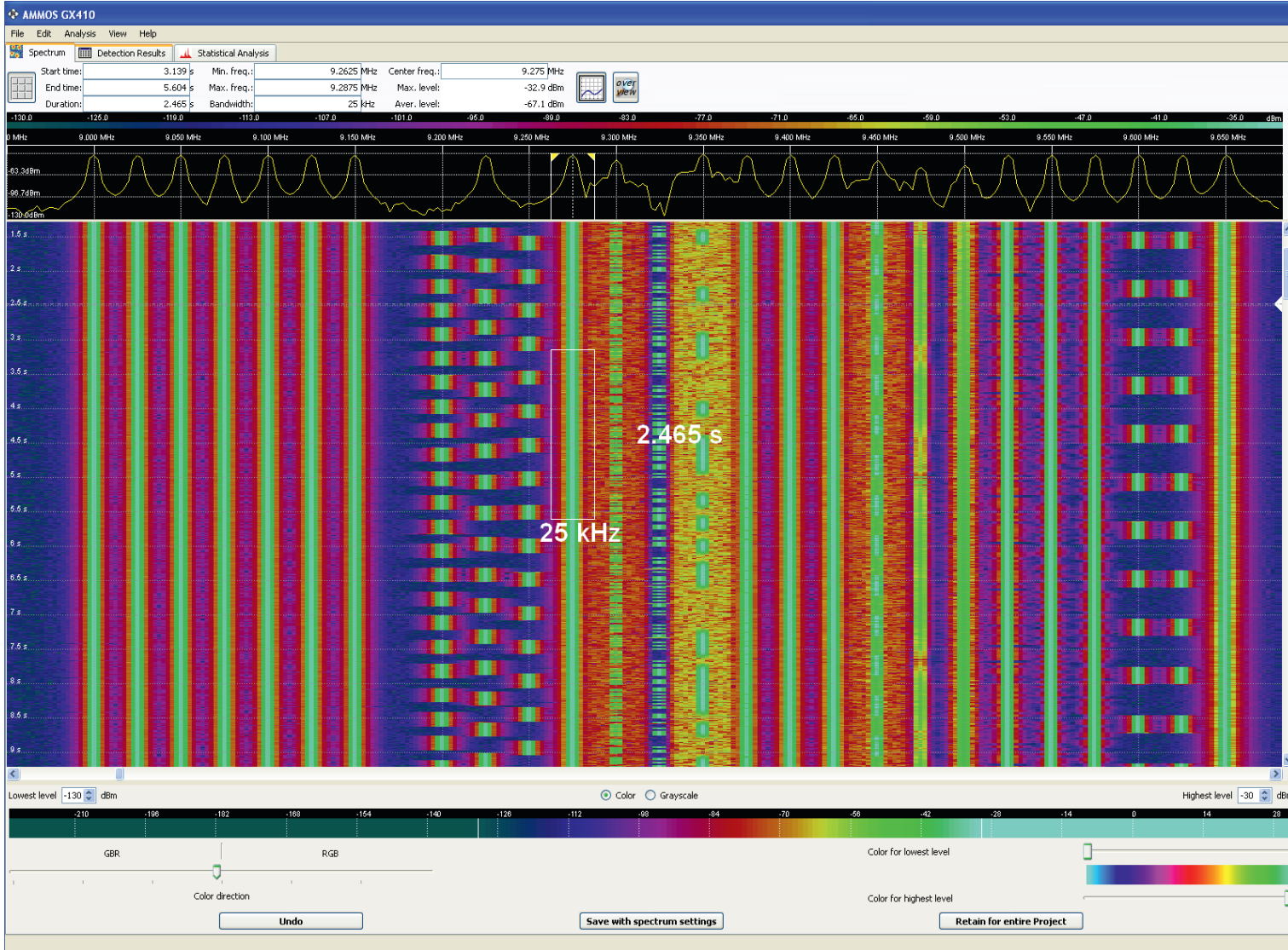
Bit stream analysis

- ▮ Bit stream is displayed in different representations
- ▮ Large set of bit stream analysis functions
- ▮ Bit, channel, and source coding
- ▮ Powerful tool in the field of code identification

System configuration

- ▮ Use as standalone system
- ▮ Use with R&S®AMMOS automatic production system
- ▮ Optional D/A converter board
- ▮ Analog IF output interface

1



The R&S®GX410 graphical user interface provides control of all analysis functions. Gathered signal samples and all processing results of the offline analysis are organized in a project (file tree) structure that is used for navigation and to start the following processing steps. All relevant data is stored in an SQL database.

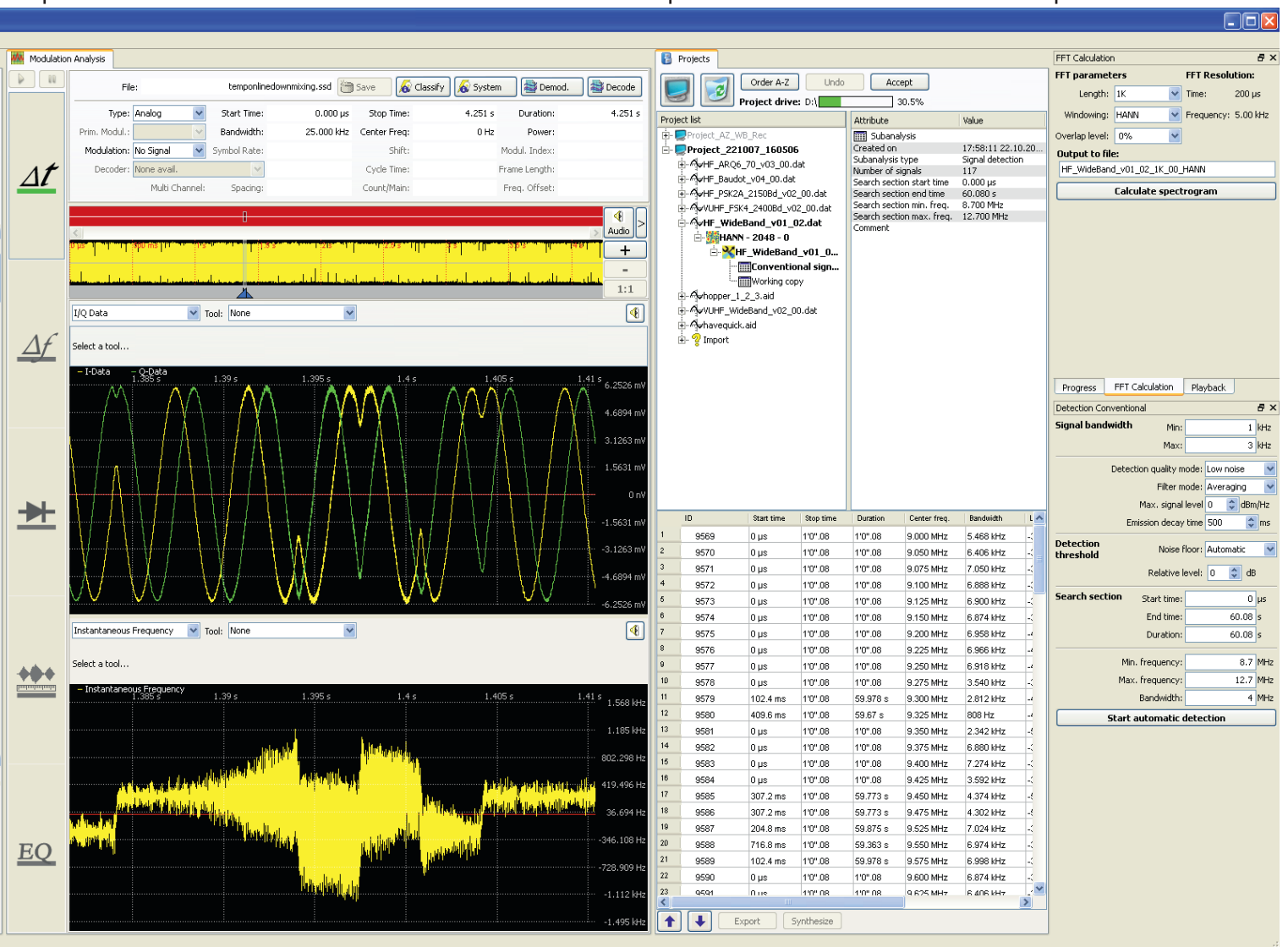
Main overview:

- (1) Spectrogram showing the overview of the complete signal sample
- (2) Time domain analysis for selected emissions
- (3) Navigation center showing all signal samples and calculated analysis results
- (4) Case-sensitive controls for the R&S®GX420 AMLAB processing steps (signal acquisition, detectors, demodulators, decoders, etc.)

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3

4



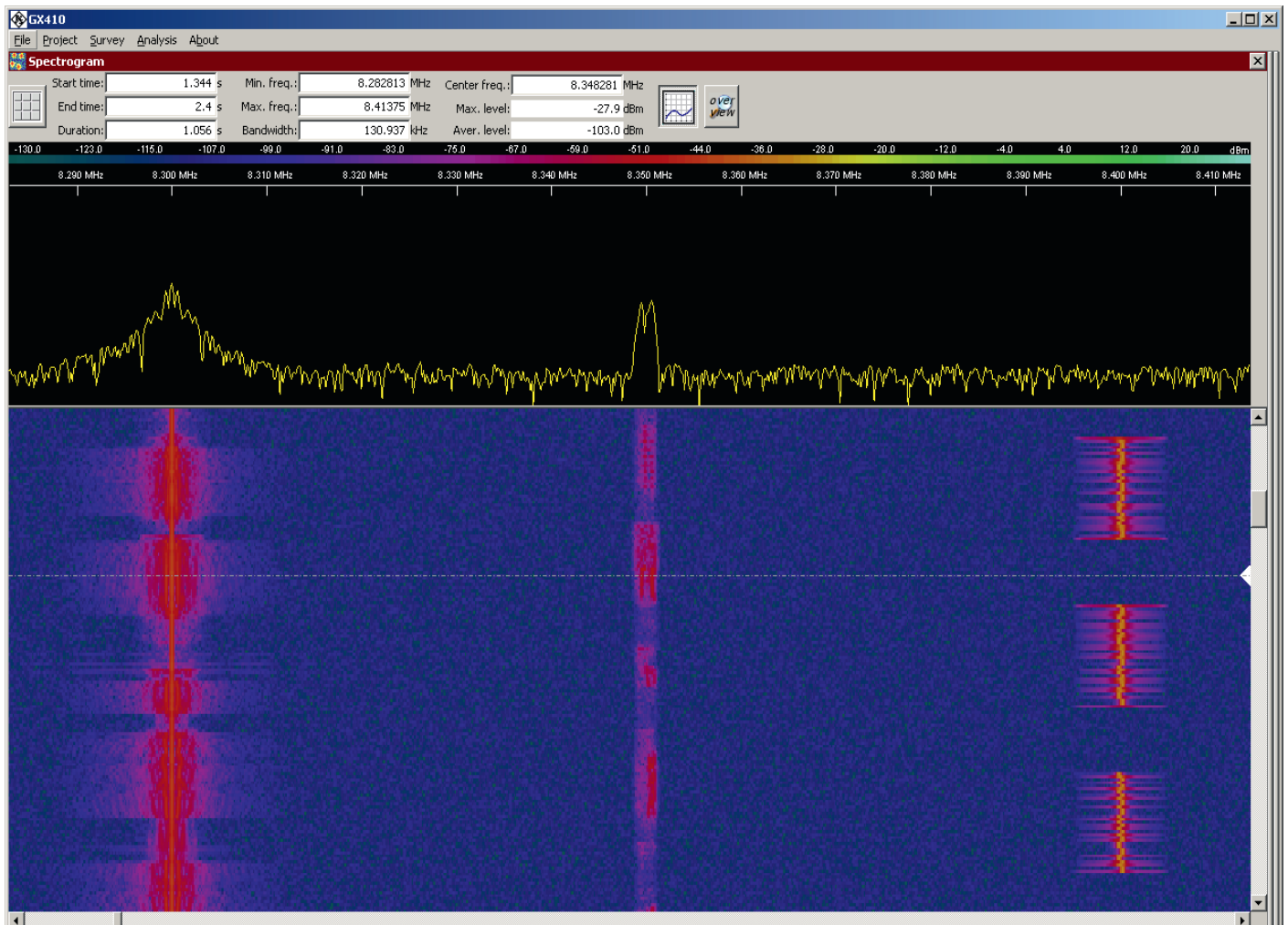
The R&S®GX410 processes recorded digital signal data

- Digital IF data in R&S®AMMOS® IF format provided by various Rohde&Schwarz receivers and direction finders; this data may be imported from a file server, for example, or from the R&S®GX420 AMREC recording/replay system
- Digital IF data from non-Rohde&Schwarz receivers (after conversion to the R&S®AMMOS® IF format; the structure of the R&S®AMMOS® IF format is public); this data may be imported from a file server, for example
- WAV files imported from a file server, for example

Online (snapshot) IF wideband data provided by the R&S®AMMOS®GX400 sensor group, for example

Online HF and VHF/UHF wideband signals are received by the R&S®AMMOS® sensor group. The frequency range is presented using a realtime waterfall with a resolution (FFT) of 2048 points and waterfall speed up to 200 lines/s.

Zoom emissions of interest



Signal attributes can be measured using time and frequency axis cursors. In the case of online control of a wideband receiver, an online waterfall provides a panorama overview of the signal scenario. By activating the recording, a wideband signal sample is stored for offline analysis purposes as a snapshot on the R&S®GX410 or as a continuous recording on the R&S®GX420 AMREC.

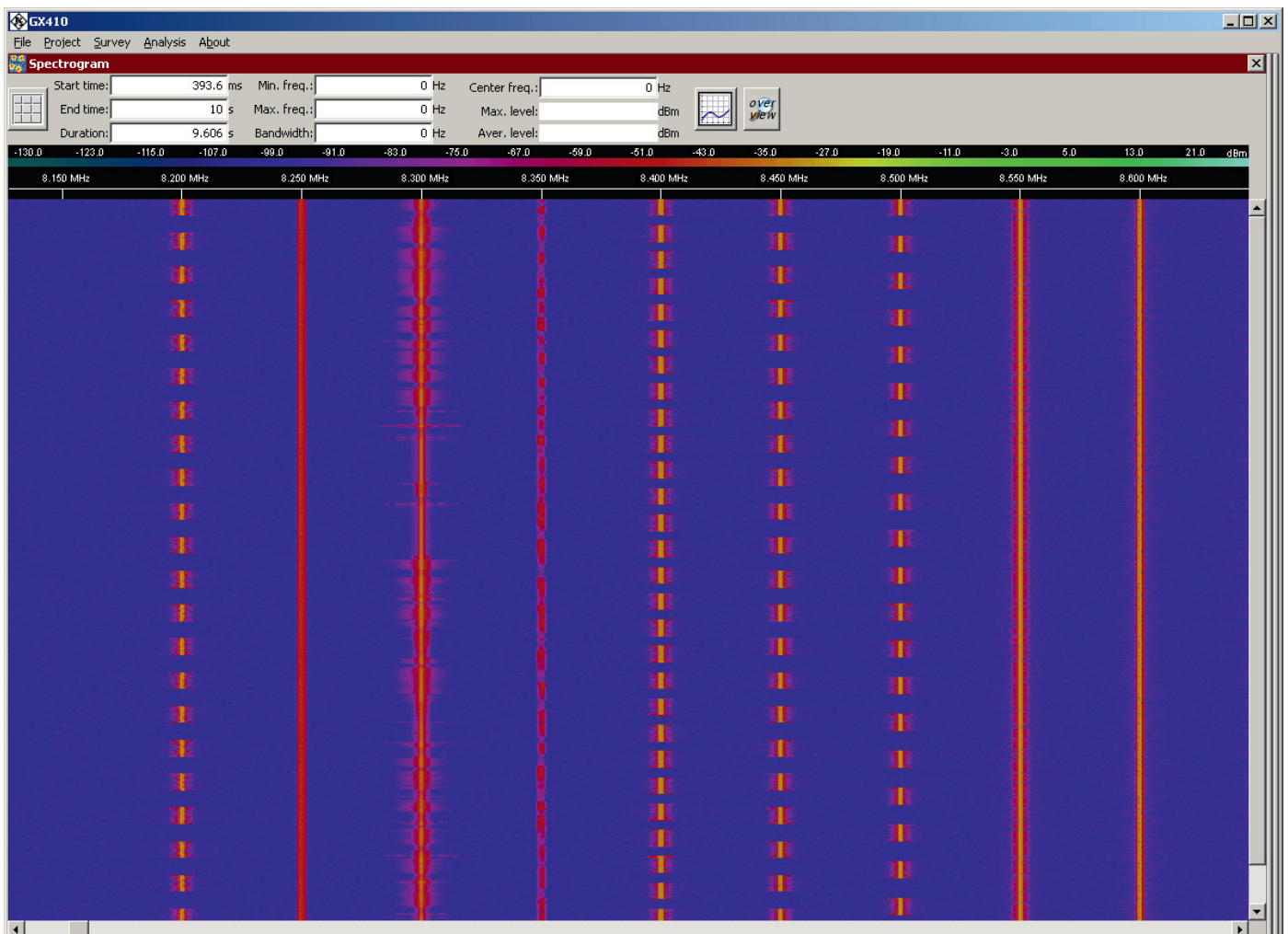
Calculation signal-adapted spectrograms

Using the signal sample, a spectrogram is calculated. The operator can calculate several spectrograms (with different FFT lengths, for example, window types and overlap factors may be used according to special emission types). The spectrogram is presented in a zoomable and scrollable window. Additionally, a spectrum can be activated.

Selection of emissions of interest

The operator selects emissions of interest and investigates them with an automatic classification algorithm or by manual measurement.

Calculation of several spectrograms



Automatic signal detection

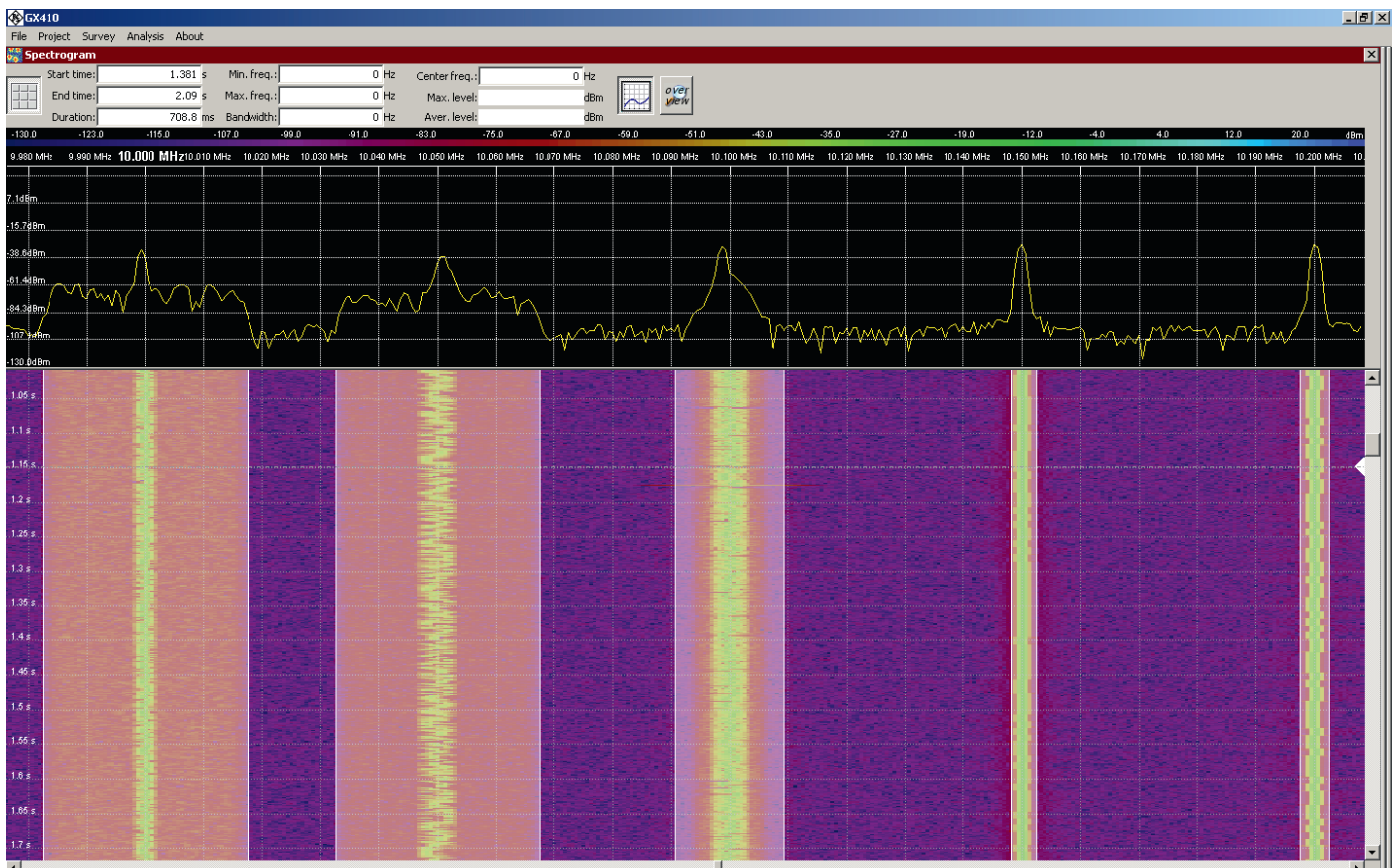
Speeding up the wideband signal sample investigation

To speed up the investigation of a wideband signal sample that may contain a large number of different emissions, an automatic detection function is provided. The algorithm operates on a selected sample portion and delivers the time/frequency segments of all emissions matching the search criteria (such as frequency range of interest, emission power, and bandwidth). The emission list is stored in the database and serves as a starting point for the modulation analysis.

Detected emissions listed in a table and highlighted in the spectrogram

The operator can refine the detection process and edit the emission list in order to obtain a data set containing all emissions of interest. This function may also enable a user to reproduce online detection results delivered by a R&S®AMMOS®GX400 automatic production system (for further information, refer to the R&S®GX403DT product brochure) and adapt the detection parameters for difficult online search operations using R&S®GX403DT.

Detected emissions are highlighted in the spectrogram



Automatic measurement/ classification of fixed-frequency signals, demodulation, and decoding

Powerful R&S®AMMOS classification unit included

The R&S®GX410 contains the powerful R&S®AMMOS classification unit for the HF and VHF/UHF frequency range and can recognize the modulation type and transmission system of a huge variety of analog and digital signals. Information about supported modulation types included in the R&S®AMMOS® classification unit is provided in the "Specifications" section at the end of this document. This library will be continuously expanded.

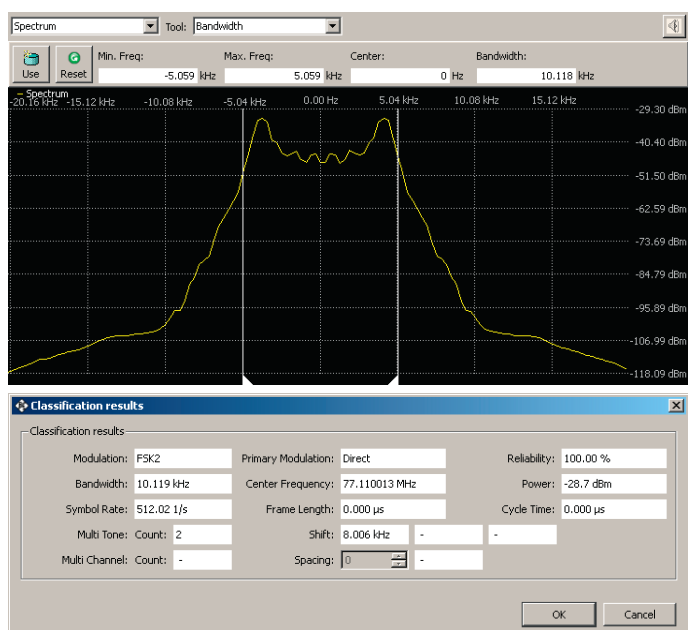
Segmentation and modulation analysis

The classification algorithm provides a segmentation and modulation analysis result for every signal previously selected in the emission list. The segmentation process determines the accurate center frequency and bandwidth of the signal. The modulation analysis determines the modulation type as well as all relevant modulation parameters (symbol rate, frequency shift, etc.).

Comprehensive library of demodulators and decoders

The classifier results can be used to parameterize a demodulator from the R&S®AMMOS® demodulation library in order to demodulate a sample of the signal. The resulting symbol/bit stream can be analyzed by using the bit stream analysis tool or can be decoded by using the decoders of the R&S®AMMOS® decoding library. In addition, the data stream can be exported to other customer-specific tools. Information about demodulators and decoders included in R&S®AMLAB is provided in the "Specifications" section at the end of this document. This library will be continuously expanded.

Automatic measurement/ classification of fixed-frequency signals



Manual modulation analysis

Emissions are analyzed in detail with the high-precision time domain analysis part of the R&S®GX410. Zoomable level, envelope, frequency, phase, and spectrum plots make high-precision measurements possible, e.g. of start/end time of an emission, level range, frequency shift, and symbol rate.

In-depth modulation analysis with measurement cursors in zoomable spectrogram

Manual measurements of emission characteristics (bandwidth, duration, S/N ratio) can be performed with measurement cursors in the zoomable spectrogram.

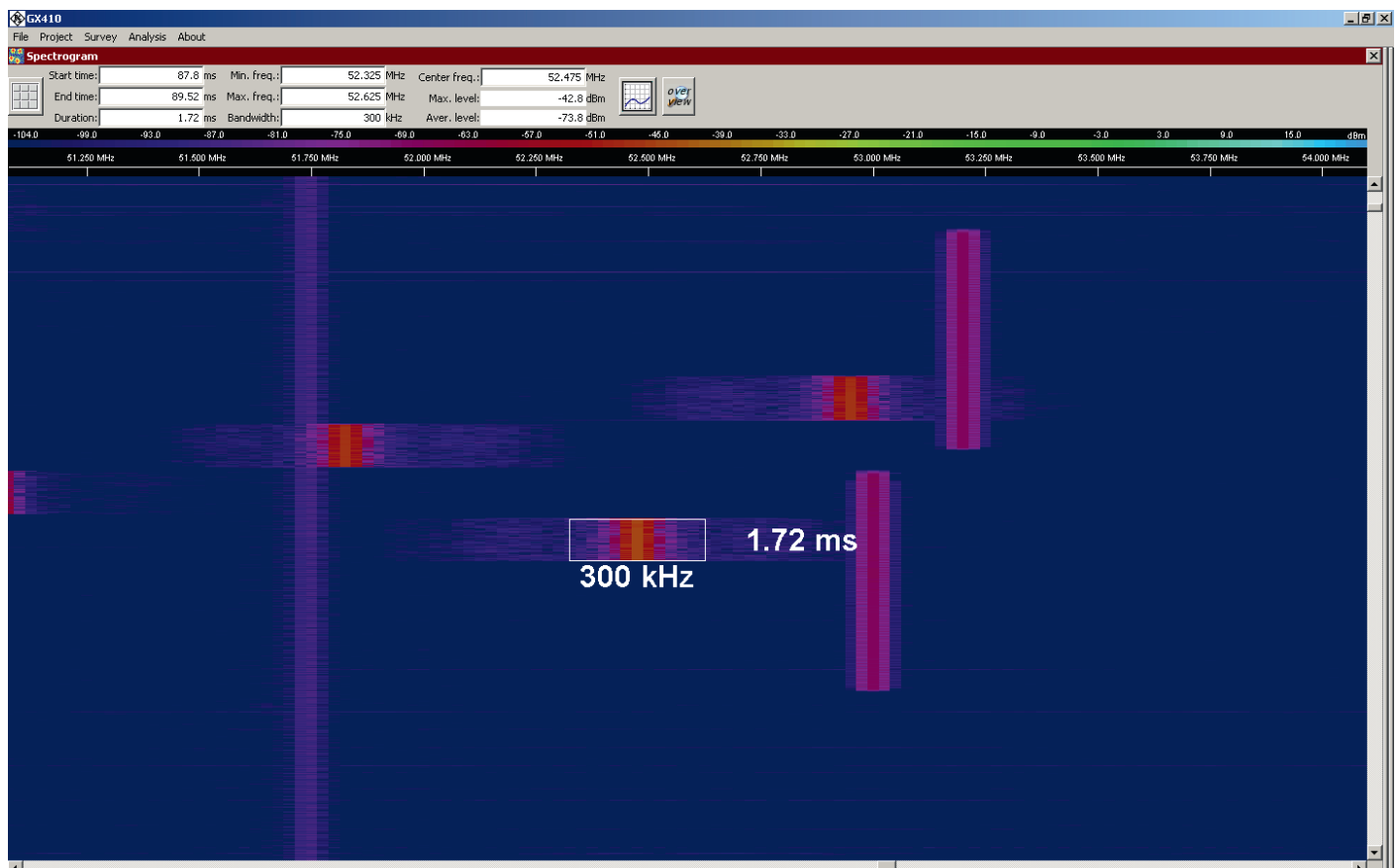
For in-depth measurements, the selected emission is transferred (via DDC) to high-resolution modulation analysis. The filter bandwidth is automatically adapted to filter out all disturbing out-of-band emissions and noise.

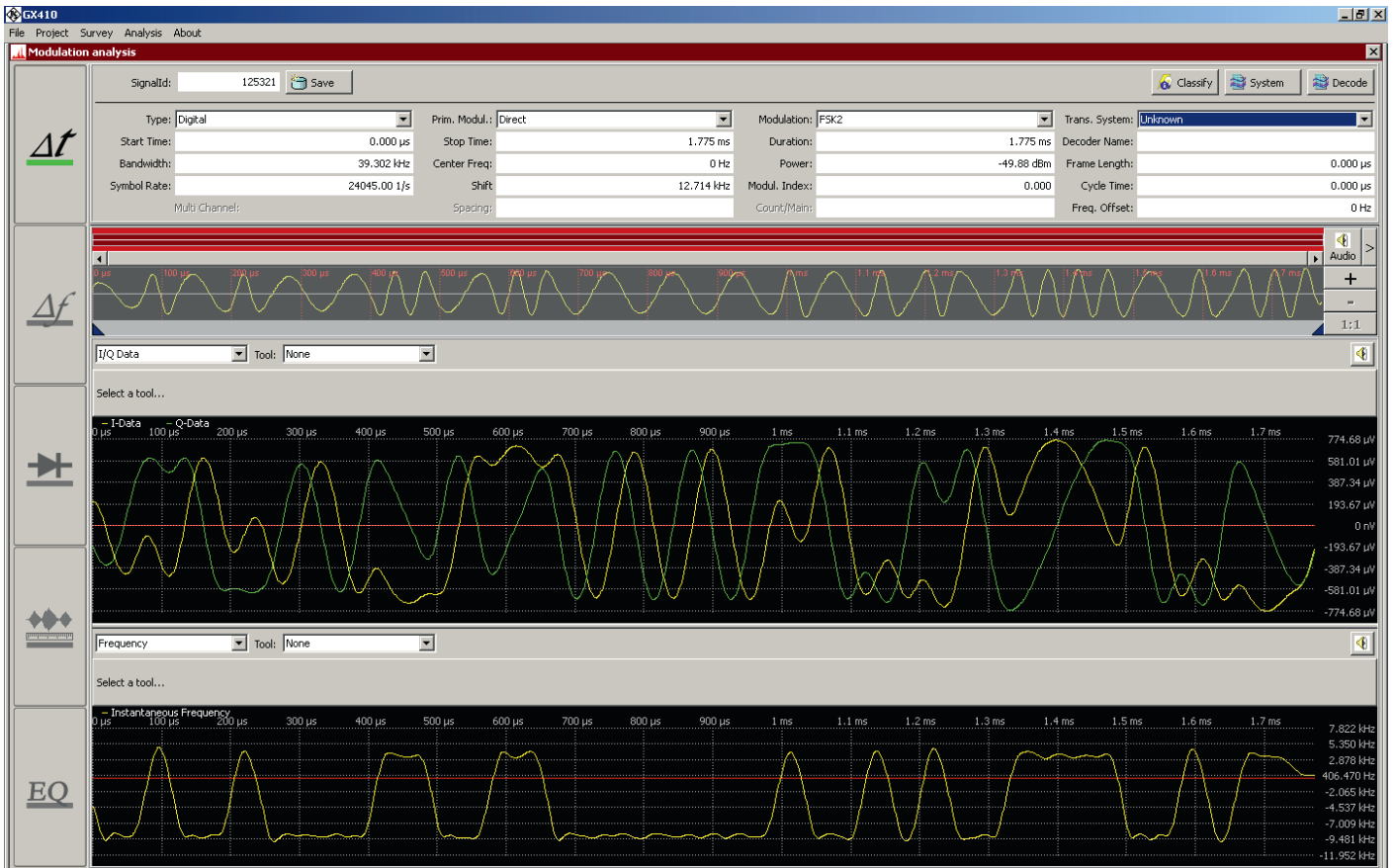
Using automatic and manual measurement together

The system's interactive modulation analysis feature is the most powerful way to quickly achieve reliable modulation analysis. The automatic classification algorithm displays all its results in a wizard, giving the operator access to all relevant intermediate results (including time and frequency segmentation, primary demodulation, symbol rate estimation, equalization, harmonic analysis, and sampling).

The operator can verify the output of the automatic classification process one step at a time and concentrate on analysis steps where the algorithmic output might need manual refinement. A new classification process can then be started, taking into account the expert settings.

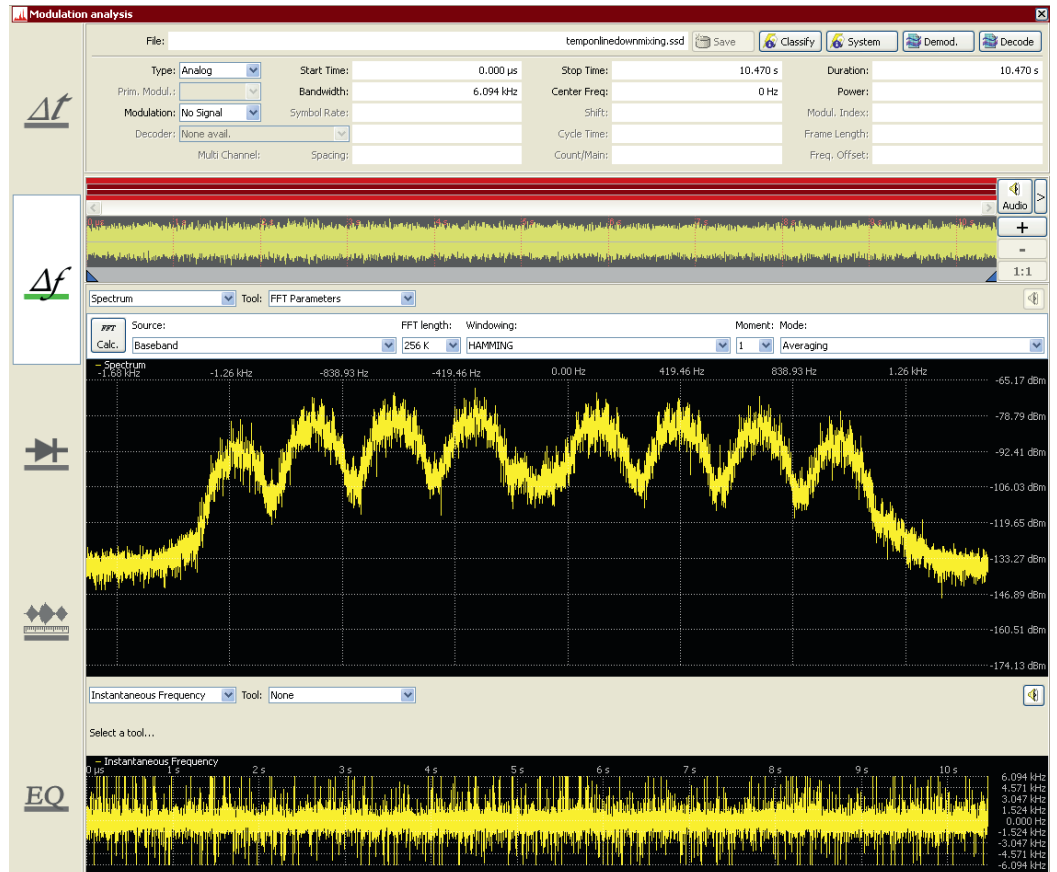
Emission selection for in-depth analysis





Detailed high-precision time domain analysis

Spectra can be calculated with an FFT length of up to 256k points (irrespective of the signal bandwidth)



Analysis of short time signals

Automatic detection algorithm

The R&S®GX410 provides an automatic detection algorithm for short-time emissions. By manual or automatic measurement of some of the emissions (duration, bandwidth, S/N ratio), the operator can set up a search pattern for the detection algorithm. The algorithm will scan the signal sample to detect all emissions that fit the defined pattern.

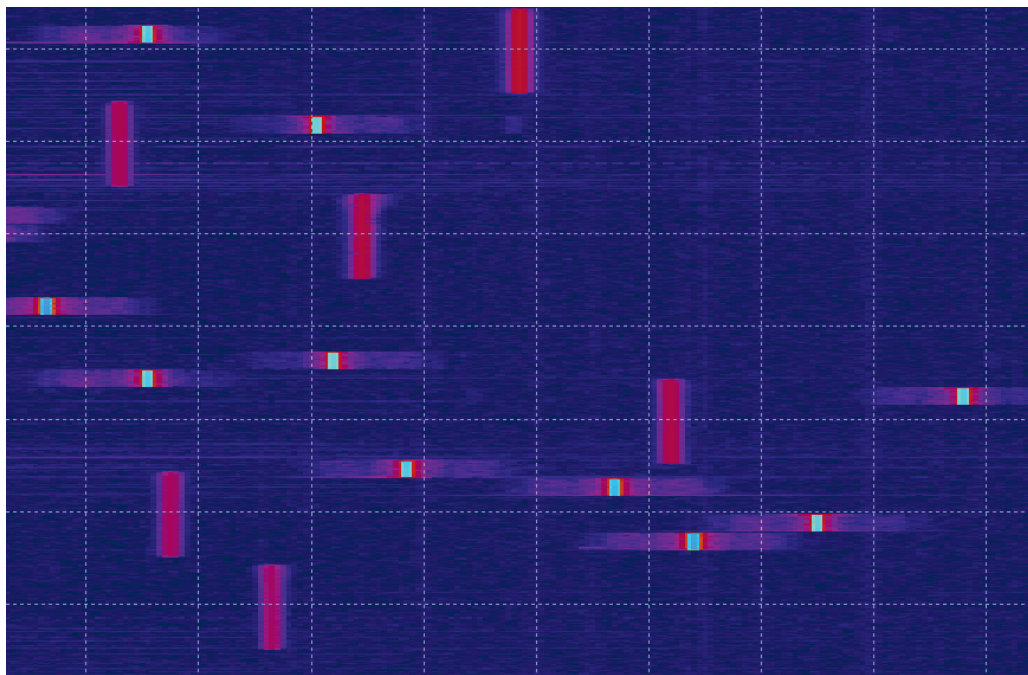
Finding out different kinds of emitters within a complex scenario

All detected emissions are graphically marked in the spectrogram and stored in an emission result list where they can be sorted, evaluated, and selected for the next processing steps.

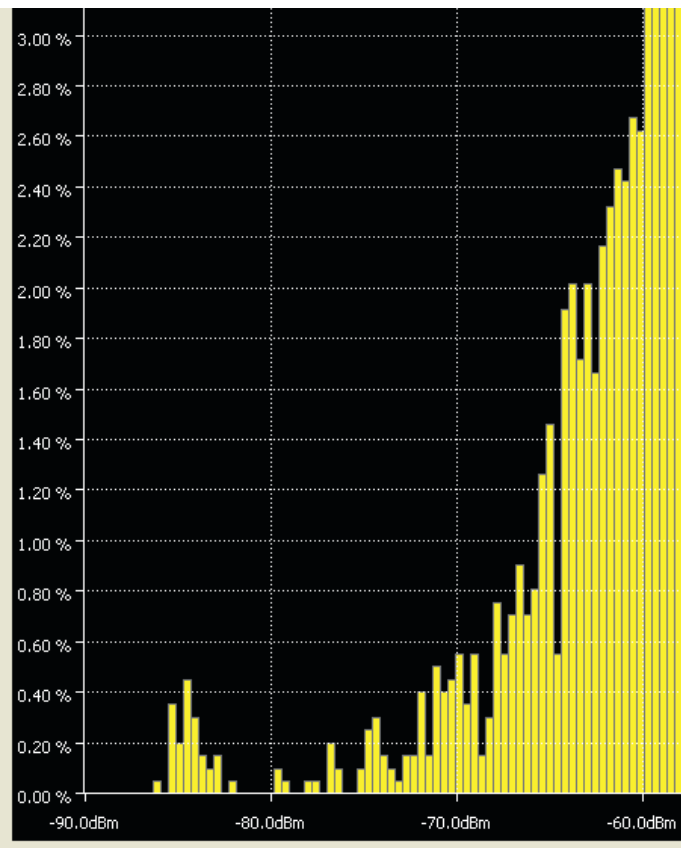
A special toolset enables the operator to distinguish between different kinds of emitters within a complex scenario and to create an emission list for each detected emitter. These emission lists are the basis for in-depth transmission system analysis and a successful recombination process.

List of detected bursts

ID	Start time	Stop time	Duration	Center freq.	Bandwidth	Level	Symbol rate	F
5800	277.467 ms	279.24 ms	1.773 ms	54.025 MHz	25.310 kHz	-50.5 dBm		
140	5801	279.422 ms	281.195 ms	1.773 ms	44.500 MHz	25.310 kHz	-62.4 dBm	
141	5802	281.377 ms	283.15 ms	1.773 ms	51.250 MHz	25.310 kHz	-64.9 dBm	
142	5803	283.332 ms	285.105 ms	1.773 ms	50.550 MHz	25.310 kHz	-57.8 dBm	
143	5804	285.287 ms	287.06 ms	1.773 ms	58.150 MHz	25.310 kHz	-56.4 dBm	
144	5805	287.242 ms	289.015 ms	1.773 ms	52.400 MHz	25.310 kHz	-52.3 dBm	
145	5806	289.197 ms	290.97 ms	1.773 ms	52.300 MHz	25.310 kHz	-52.7 dBm	
146	5807	291.152 ms	292.925 ms	1.773 ms	40.350 MHz	25.310 kHz	-63.8 dBm	
147	5808	293.107 ms	294.88 ms	1.773 ms	58.525 MHz	25.310 kHz	-53.9 dBm	
148	5809	295.062 ms	296.835 ms	1.773 ms	41.000 MHz	25.310 kHz	-59.3 dBm	
149	5810	297.017 ms	298.79 ms	1.773 ms	52.825 MHz	25.310 kHz	-53.0 dBm	
150	5811	298.972 ms	300.745 ms	1.773 ms	43.775 MHz	25.310 kHz	-70.2 dBm	
151	5812	300.927 ms	302.7 ms	1.773 ms	45.975 MHz	25.310 kHz	-60.5 dBm	
152	5813	302.882 ms	304.655 ms	1.773 ms	54.100 MHz	25.310 kHz	-60.8 dBm	
153	5814	304.837 ms	306.61 ms	1.773 ms	53.275 MHz	25.310 kHz	-58.5 dBm	
154	5815	306.792 ms	308.565 ms	1.773 ms	56.900 MHz	25.310 kHz	-59.4 dBm	
155	5816	308.747 ms	310.52 ms	1.773 ms	42.975 MHz	25.310 kHz	-65.6 dBm	
156	5817	310.702 ms	312.475 ms	1.773 ms	46.000 MHz	25.310 kHz	-60.4 dBm	
157	5818	312.657 ms	314.43 ms	1.773 ms	51.300 MHz	25.310 kHz	-65.8 dBm	
158	5819	314.612 ms	316.385 ms	1.773 ms	54.425 MHz	25.310 kHz	-58.1 dBm	
159	5820	316.567 ms	318.34 ms	1.773 ms	55.350 MHz	25.310 kHz	-55.4 dBm	
160	5821	318.522 ms	320.295 ms	1.773 ms	41.050 MHz	25.310 kHz	-60.1 dBm	
161	5822	320.477 ms	322.25 ms	1.773 ms	56.250 MHz	25.310 kHz	-55.2 dBm	
162	5823	322.432 ms	324.205 ms	1.773 ms	55.700 MHz	25.310 kHz	-48.8 dBm	



Detected bursts



Evaluation of detected emissions for short-time signals

The R&S®GX410 provides several statistical evaluation algorithms for the detected list of emissions.

The emission list data can be exported to a standard spreadsheet (not included in the R&S®GX410), where R&S®AMLAB operators can use their own macro library with self-developed macros to perform special evaluation operations on the selected emissions.

The evaluated emission result list can be used, for example, for the recombination of selected baseband emissions to build a continuous narrowband digital IF signal for further analysis (e.g. classification or demodulation).

Histogram of signal power

Recombined digital IF signal



Bit stream analysis

Bit, channel, and source coding

The bit stream can also be manipulated by using a toolset covering most of the operations used for bit, channel, and source coding, for example:

- Differential to absolute coding
- Line codes transformations
- Multiplexing/demultiplexing
- Alphabet conversions
- Preamble extraction

A direct feedback function allows the operator to verify analysis steps and progress in the clearance process of the signal of interest.

Powerful tool in the field of code identification

Bit stream analysis is a powerful tool in the field of code identification, content analysis, and the development of custom decoder modules. For further information about R&S®AMMOS® decoder development, refer to the R&S®AMMOS®GX400ID data sheet.

Large set of bit stream analysis functions

A large set of bit stream analysis functions supports the operator in analyzing block codes and in searching for preambles, synchronization frames, convolutional coders, and scrambler polynomials. The R&S®GX410 provides the following algorithms for this purpose:

- Auto- and cross-correlation
- Tsallis, Maurer, and Chi-square test
- Berlekamp-Massey algorithm
- Convolutional code and scrambler search

Bit stream analysis

The screenshot displays the AMMOS GX4138A software interface. The main window is titled "AMMOS GX4138A" and contains a menu bar (File, View, Language, Help) and a toolbar. The interface is divided into several panes:

- Visualisation Toolbox:** Contains buttons for "Create Bitview" and "Show Sequence". It has checkboxes for "Show Grid", "Show Header", and "Show Quality" (checked). A "Quality Threshold" is set to 0. There is a "Merge Colors" checkbox and a "Remove all colors" button. Below these are radio buttons for "Decimal Visualisation" (selected), "X/- Visualisation", and "Graphical Visualisation".
- Table View #0:** Displays a grid of bit stream data. The grid is color-coded from yellow to green. Below the grid is an "Autocorrelation" plot showing a series of vertical bars with a peak at 15 symbols. The plot has x-axis markers at 250, 500, 750, and 1000. The y-axis values range from 0.200 to 0.347.
- Analysis Toolbox:** Contains a "Run" button and a list of analysis functions: "Autocorrelation", "Crosscorrelation", "Tsallis Entropy Test", "Maurer Test", "Chi-Square Test", "Berlekamp Massey Test", "Scrambler Lookup-Table Test", and "Convolution Code Lookup-Table Test".
- File Properties:** Shows "Number of Symbols: 28058", "Decimal Symbol Valency: 2", and "Number of Bits: 28058".
- Table Settings:** Located at the bottom, it includes fields for "Start Index" (0), "Cycle Length" (40), "Shown Items" (100000), "Cell Size" (17), and "Cell Size Ratio" (6).

System integration

In addition to its technical analysis capabilities, the R&S®GX410 provides the optimal starting point for the following tasks:

- Using the complete R&S®AMMOS® based HF and VHF/UHF communications intelligence (R&S®GX400) for manual and automatic detection, classification, demodulation, decoding
- Teaching operators the basics of modern digital modulation/transmission methods and low probability of intercept (LPI) signals

R&S®GX400 sensor group



Use as standalone system

The R&S®GX410 can be used as a standalone system for HF and VHF/UHF technical analysis. Signal samples may be archived by using the built-in DVD/CD writer. An optionally attached R&S®AMMOS®GX420 AMREC recording unit allows the recording of digital wideband and narrowband IF data streams (from the R&S®AMMOS®GX400 sensor group).

Use with R&S®AMMOS® automatic production system

Similarly, recordings made with the R&S®AMMOS®GX400 sensor group on the R&S®GX420 AMREC may be imported to the R&S®GX410 for technical analysis.

Optional D/A converter board

By using the optional D/A converter board, any detected, extracted, or recombined signal can be replayed as analog IF for further processing in customer-specific analysis equipment (not included in the R&S®GX410).

R&S®GX420 AMREC recording unit



R&S®AMREC controller for recording unit



R&S®GX410 with recommended R&S®AMLAB workstation



Specifications

Data acquisition

Digital IF (complex baseband I/Q)	R&S®AMMOS® IF format or WAV file format (using left and right channel with 16 bit)
Maximal bandwidth of imported IF data	unlimited
Digital AF	binary raw data or WAV format with 16 bit
Frequency range (if used with R&S®AMMOS®GX400 sensor group)	
HF	100 kHz to 30 MHz
VHF/UHF	20 MHz to 3.6 GHz
Bandwidth for wideband reception (if used with R&S®AMMOS®GX400 sensor group)	
HF	1 MHz, 4 MHz, 10 MHz, 20 MHz
VHF/UHF	5 MHz, 10 MHz, 20 MHz
Maximum wideband signal sample length (if used with R&S®AMMOS®GX400 sensor group)	
HF	20 MHz: up to 8 s (2.5 h with R&S®AMREC) 1 MHz: up to 160 s (50 h with R&S®AMREC)
VHF/UHF	20 MHz: up to 8 s (2.5 h with R&S®AMREC) 5 MHz: up to 32 s (10 h with R&S®AMREC)
Resolution for realtime waterfall (if used with R&S®AMMOS®GX400 sensor group)	2048 points, 30, 60, 100, 200 lines/s

Measurement capabilities

FFT resolution for offline spectrogram	256 points to 32k points
FFT resolution for modulation analysis spectrum	64 points to 256k points
Minimum signal duration length for reliable detection of short-time signals (R&S®GX410DS option)	
HF	5 ms
VHF/UHF	0.5 ms
Quality of detection algorithm (R&S®GX410DS): minimum SNR for detecting	>90% of all emissions
HF	6 dB at emission length × bandwidth = 50
VHF/UHF	6 dB at emission length × bandwidth = 50

Analog output (R&S®GX410DA option)

Carrier frequency for analog IF output	1 kHz to 1 MHz
Maximal bandwidth for analog IF output	1 MHz

Data export

Digital IF	R&S®AMMOS® IF format (complex baseband I/Q) and WAV format
Digital AF	WAV format, 16 bit
Demodulated audio	WAV format, 16 bit
Emission lists	CSV file format (comma-separated values as ASCII text)
Symbol data	R&S®AMMOS® symbol data format
Decoded text	ASCII file format
Reports	XML file format (R&S®AMMOS® IT-compatible)

Environment (R&S®GX410 AMLAB PC workstation)

Operating temperature range	5 °C to 30 °C
Power consumption	max. 700 W
Graphics card	Open GL 1.4 is mandatory

R&S® GX413MA: recognized HF and VHF/UHF modulation types (unlimited bandwidth)

HF			VHF/UHF		
Analog modulation	Digital modulation		Analog modulation	Digital modulation	
CW	ASK2	unlimited baud rate range	CW	ASK2	unlimited baud rate range
AM DSB-TC	FSK2	unlimited baud rate range	AM DSB-TC	FSK2	unlimited baud rate range
AM DSB-SC	FSK4	unlimited baud rate range	AM DSB-SC	FSK4	unlimited baud rate range
AM SSB-LSB	MSK/GMSK	unlimited baud rate range	FM	MSK/GMSK	unlimited baud rate range
AM SSB-USB	PSK2 A/B	unlimited baud rate range		PSK2 A/B	unlimited baud rate range
FM	PSK4 A/B	unlimited baud rate range		PSK4 A/B	unlimited baud rate range
	PSK8 A/B	unlimited baud rate range		PSK8 A/B	unlimited baud rate range
	OQPSK	unlimited baud rate range		OQPSK	unlimited baud rate range
	QAM16	unlimited baud rate range		QAM16	unlimited baud rate range
	multitone	6 to 64 tones, unlimited baud rate range		multitone	6 to 64 tones, unlimited baud rate range
	multichannel	2 to 20 channels, unlimited baud rate range, channel spacing $\geq 1.5 \times$ baud rate		AM-FSK	unlimited baud rate range
				FM-FSK	unlimited baud rate range

R&S® GX413DM: processed HF and VHF/UHF modulation types (unlimited bandwidth)

HF		VHF/UHF	
ASK2	unlimited baud rate range	ASK2	unlimited baud rate range
FSK2		FSK2	
Discriminator	unlimited baud rate range	Discriminator	unlimited baud rate range
Matched filter	unlimited baud rate range	Matched filter	unlimited baud rate range
FSK4		FSK4	
Discriminator	unlimited baud rate range	Discriminator	unlimited baud rate range
Matched filter	unlimited baud rate range	Matched filter	unlimited baud rate range
(G)MSK	unlimited baud rate range	(G)MSK	unlimited baud rate range
PSK2 A/B	unlimited baud rate range	PSK2 A/B	unlimited baud rate range
PSK4 A/B	unlimited baud rate range	PSK4 A/B	unlimited baud rate range
PSK8 A/B	unlimited baud rate range	PSK8 A/B	unlimited baud rate range
Multichannel modulation types		OQPSK ¹⁾	unlimited baud rate range
FSK2: 2 to 64 channels	unlimited baud rate range	AM-FSK	unlimited baud rate range
PSK2/4 A/B: 2 to 64 channels	unlimited baud rate range	FM-FSK	unlimited baud rate range
Multitone		Multitone	
Number of tones	6 to 64	Number of tones	6 to 64
Transmission rate	unlimited baud rate range	Transmission rate	unlimited baud rate range

List of processed modulation types will be expanded in the future

R&S®GX413SR: recognized HF codes and VHF/UHF transmission systems

HF				VHF/UHF
ACARS ¹⁾	CIS-11	DUP-ARQ	PSK-31	SELCAL analog: CCIR-1, CCIR-2, CCITT, DTMF, EEA, EIA, EURO, NATEL, VDEW, ZVEI-1, ZVEI-2
ARQ-E3	TORG 10/11	ARQ duplex DUP-ARQ-2	BPSK31	
ARQ-E	CIS-12	DUP-FEC-2	QPSK31	
ARQ1000D	FIRE	FARCOS	PSK-63	
ARQ-M2 242	CIS-14	FEC-A	BPSK63	
ARQ TDM 242	PARITY 14	FEC100A	QPSK63	
ARQ-M2 342	CIS 96	FEC-S	RUM-FEC	
ARQ TDM 342	AMOR	FEC1000S	ROU FEC	
ARQ-M4 242	AMOR 96	SI-FEC	SI-ARQ	
ARQ-M4 342	TORG 14	G-TOR	ARQ-S	
ARQ-N	CIS-36	HF-FAX (FM)	ARQ1000S	
ARQ1000	CROWD 36	HNG-FEC	SITOR-A	
ARQ 6-70	Russian Piccolo	MIL-STD-188-110A serial	SITOR-ARQ	
ARQ 6-90	URS multitone	MIL-STD-188-110B	SITOR-B	
ARQ 6-98	CIS 10-11-11 MFSK	MIL-STD-188-141A (ALE)	SITOR-FEC	
ASCII	CLOVER	MORSE	SKYFAX	
RTTY7	CODAN (16 channels)	PACTOR	SPREAD11	
IRA-ARQ	COQUELET 8	PACTOR II	SPREAD21	
AUTOSPEC	Mk 2	PACTOR III	SPREAD51	
BAUDOT	COQUELET 13	PACKET RADIO	STANAG 4285	
RTTY5	Mk 1	PICCOLO MK6	STANAG 4415	
BULG-ASCII	COQUELET 80	PICCOLO MK12	STANAG 4529	
CH4+4 modem	Coquelet 8 FEC	POL-ARQ	SWED-ARQ	
			ARQ-SWE	
			TWINPLEX ARQ (F7B)	

List of recognized codes and transmission systems will be expanded in the future.

R&S®GX413DC: decoding HF and VHF/UHF

HF				VHF/UHF
ACARS ¹⁾	CIS-14	HF-FAX	SSTV	SELCAL analog: CCIR-1, CCIR-2, CCITT, DTMF, EEA, EIA, EURO, NATEL, VDEW, ZVEI-1, ZVEI-2
ARQ-E3	PARITY 14	AM FAX	SSTV Auto	
ARQ-E	CIS 96	FM FAX	SSTV Acorn PD 180 YUV	
ARQ1000D	AMOR	MORSE	SSTV Acorn PD 290 YUV	
ARQ-M2 242	AMOR 96	PACTOR I	SSTV Martin 1 and 3	
ARQ TDM 242	TORG 14	PACKET RADIO 300	SSTV Martin 2 and 4	
ARQ-M2 342	CIS-36	PICCOLO MK6	SSTV Pasokon TV 3	
ARQ TDM 342	CROWD 36	PICCOLO MK12	SSTV Pasokon TV 5	
ARQ-M4 242	Russian Piccolo	POL-ARQ	SSTV Pasokon TV 7	
ARQ-M4 342	URS multitone	PRESSFAX	SSTV Robot 8 BW	
ARQ-N	CIS 10-11-11 MFSK	PSK-31	SSTV Robot 12BW	
ARQ-1000	COQUELET 8	BPSK31	SSTV Robot 24BW	
ARQ-S	Mk 2	QPSK31	SSTV Robot 36BW	
ARQ1000S	COQUELET 13	PSK-63	SSTV Robot 43BW	
ARQ 6-70	Mk 1	BPSK63	SSTV Robot 12YUV	
ARQ 6-90	COQUELET-80	QPSK63	SSTV Robot 24YUV	
ARQ 6-98	Coquelet 8 FEC	RUM-FEC	SSTV Robot 36YUV	
ASCII	DUP-ARQ	ROU FEC	SSTV Robot 72YUV	
RTTY7	ARQ duplex	SI-ARQ	SSTV Robot 8 and 3	
IRA-ARQ	DUP-ARQ-2	SITOR-A	SSTV Scottie 1 and 4	
AUTOSPEC	DUP-FEC-2	SITOR-ARQ	SSTV Scottie DX	
BAUDOT	FEC-A	SITOR-B	SSTV Scottie DX2	
RTTY5	FEC100	SITOR-FEC	SSTV Wraase SC-1 8 and 16 BW	
BULG-ASCII	FEC100A	SPREAD11	SSTV Wraase SC-1 16 and 32 BW	
CIS-11	FEC-S	SPREAD21	SSTV Wraase SC-1 24 BW	
TORG 10/11	FEC1000S	SPREAD51	SSTV Wraase SC-1 24 and 48	
	SI-FEC		SSTV Wraase SC-1 48 and 96	
	G-TOR		SSTV Wraase SC-2 20 and 60	
	HNG-FEC		SSTV Wraase SC-2 120	
	HELLSCHREIBER		SSTV Wraase SC-2 180	
			SWED-ARQ	
			ARQ-SWE	
			TWINPLEX ARQ (F7B)	

List of processed codes and transmission systems will be expanded in the future.

R&S®GX413DC-E: expanded HF decoding

HF			
PACTOR II			
PACTOR III			
CLOVER-2			
CLOVER-2000			

¹⁾ Currently being developed.

Ordering information

Type	Designation
Base components	
R&S®GX410	R&S®AMLAB signal analysis software (R&S®GX410 application base software, including signal import, manual measurement of modulation parameters, and analog demodulation); requires R&S®GX410WS
R&S®GX410WS	R&S®AMLAB workstation (mandatory for R&S®GX410)
Options	
R&S®GX410HF	Control for HF VXI wideband receivers (requires R&S®AMMOS®GX400 sensor group and R&S®AMMOS®GX410FP)
R&S®GX410VU	Control for VHF/UHF VXI wideband receivers (requires R&S®AMMOS®GX400 sensor group and R&S®AMMOS®GX410FP)
R&S®GX410FP	FPDP card to connect wideband receivers directly to the R&S®AMLAB workstation for snapshot recording
R&S®GX410AR	R&S®AMREC control to record continuous IF on R&S®AMREC and import from R&S®AMREC (requires R&S®AMMOS®GX420)
R&S®GX410DA	D/A converter board and control software
R&S®GX410DS	Technical and statistical analysis of short-time signals
R&S®GX413MA	Automatic modulation analysis HF and VHF/UHF
R&S®GX413SR	System and code recognition (bit stream classification) HF and VHF/UHF (requires R&S®AMMOS®GX413MA)
R&S®GX413DM	Demodulation HF and VHF/UHF
R&S®GX413DC	Decoding HF and VHF/UHF (requires R&S®AMMOS®GX413DM)
R&S®GX413DC-E	Expanded capability for decoding HF and VHF/UHF (requires R&S®GX413DC)
R&S®GX413BA	Bit stream analysis (requires R&S®AMMOS®GX413DM)

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Rohde & Schwarz is an independent group of companies specializing in electronics. It is a leading supplier of solutions in the fields of test and measurement, broadcasting, radiomonitoring and radiolocation, as well as secure communications. Established 75 years ago, Rohde & Schwarz has a global presence and a dedicated service network in over 70 countries. Company headquarters are in Munich, Germany.

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With 24-hour support worldwide and personal service contacts in over 70 countries, Rohde & Schwarz is present around the globe. The company stands for high quality, preventive service, and compliance with delivery schedules – no matter whether the task at hand is calibration or application support.

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For data sheet, see
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(search term: GX410)

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