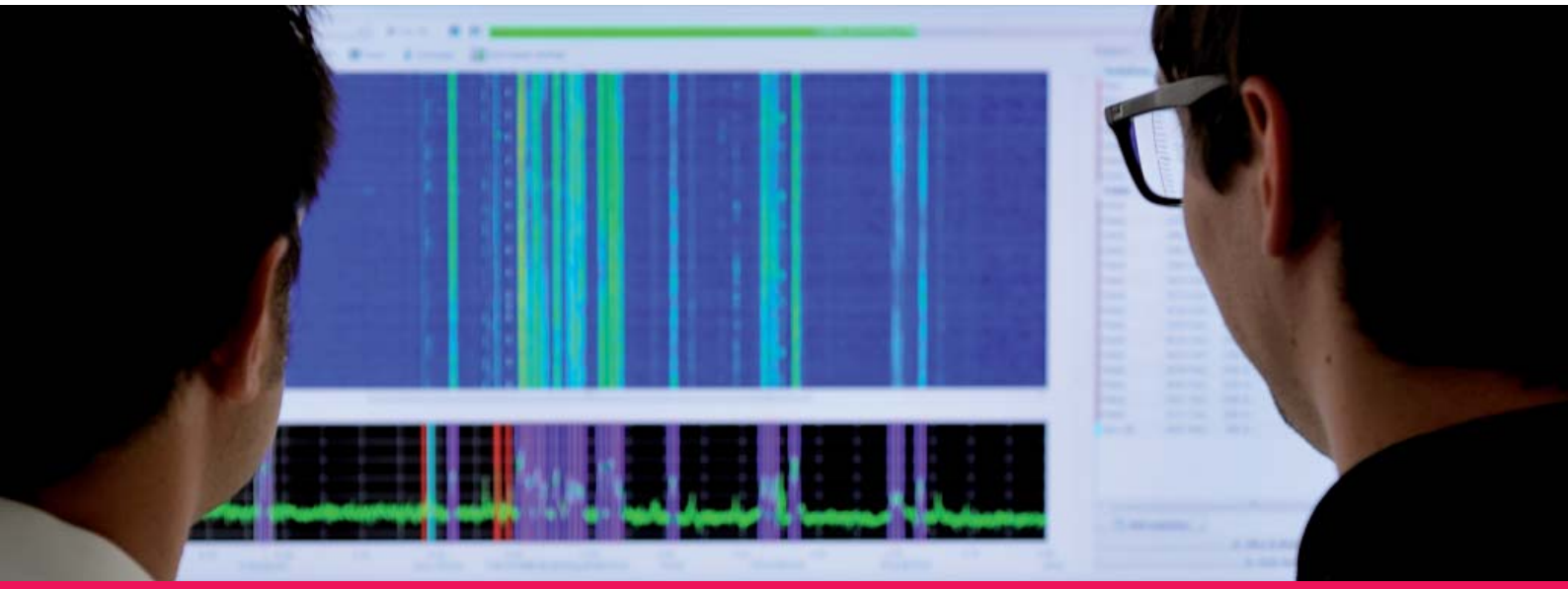
go2MONITOR

Compact Radio Signal Monitoring Solution

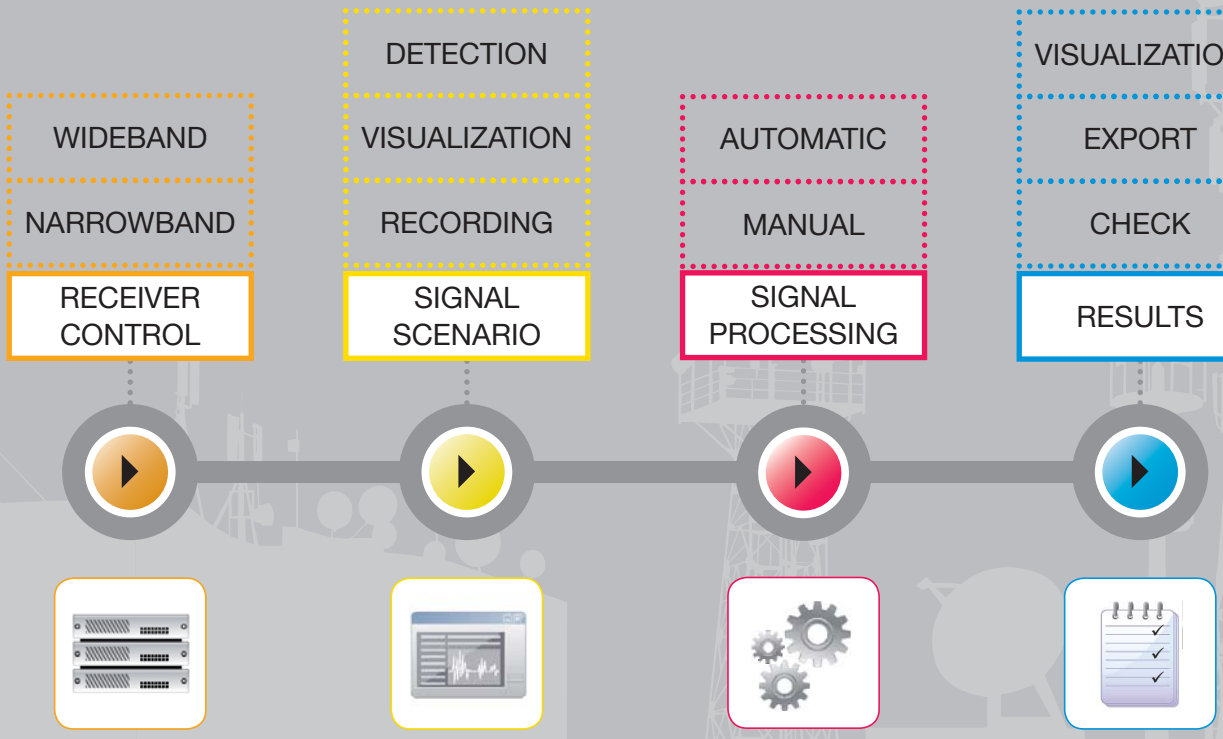


go2MONITOR is a high-performance, automatic radio monitoring solution for multichannel analysing and processing of HF and V/UHF signals.

Key facts

- Multiple wideband inputs up to 20 MHz each (spectrogram, classifier, recording, DDC)
- Modular scalability from one channel to hundreds of channels
- Automated classification and production using an extensive decoder library
- Integrated receiver control with direct Software Defined Radio (SDR) interface
- Parallel processing production channels either with buffered Digital Down Conversion (DDC) or narrowband receiver input
- User-configurable automatic signal search with task-based control for processing with defined depth of analysis and results
- User-expandable decoder-library via Decoder Description language (DDL)
- State-of-the-art GUI includes window presets, drag & drop, and integrated station list

WORKFLOW



go2MONITOR

Automatic radio monitoring, multichannel analysis and processing of radio signals

go2MONITOR consists of modular HF, V/UHF radio monitoring, classification, decoding and signal recording applications. They are based on a highly modular system architecture using standard COTS hardware.

- 2,4 MHz (HF) / 20 MHz (V/UHF) coherent, 6 GHz Scan mode
- Efficient job control by focusing on signals of interest
- Parallel and permanent classification and production of signals
- More than 250 modes for demodulating and decoding
- Use of standard hardware (COTS) and current receiver models
- Easy integration through open API‘s
- Expandable with user-defined procedures and decoders

Automatic interception workflow

go2MONITOR has a fully automatic approach for interception, classification, demodulation, decoding and recording of radio signal emissions in a wide-band signal scenario.

In combination with monitoring receivers go2MONITOR defines a full featuring workplace.

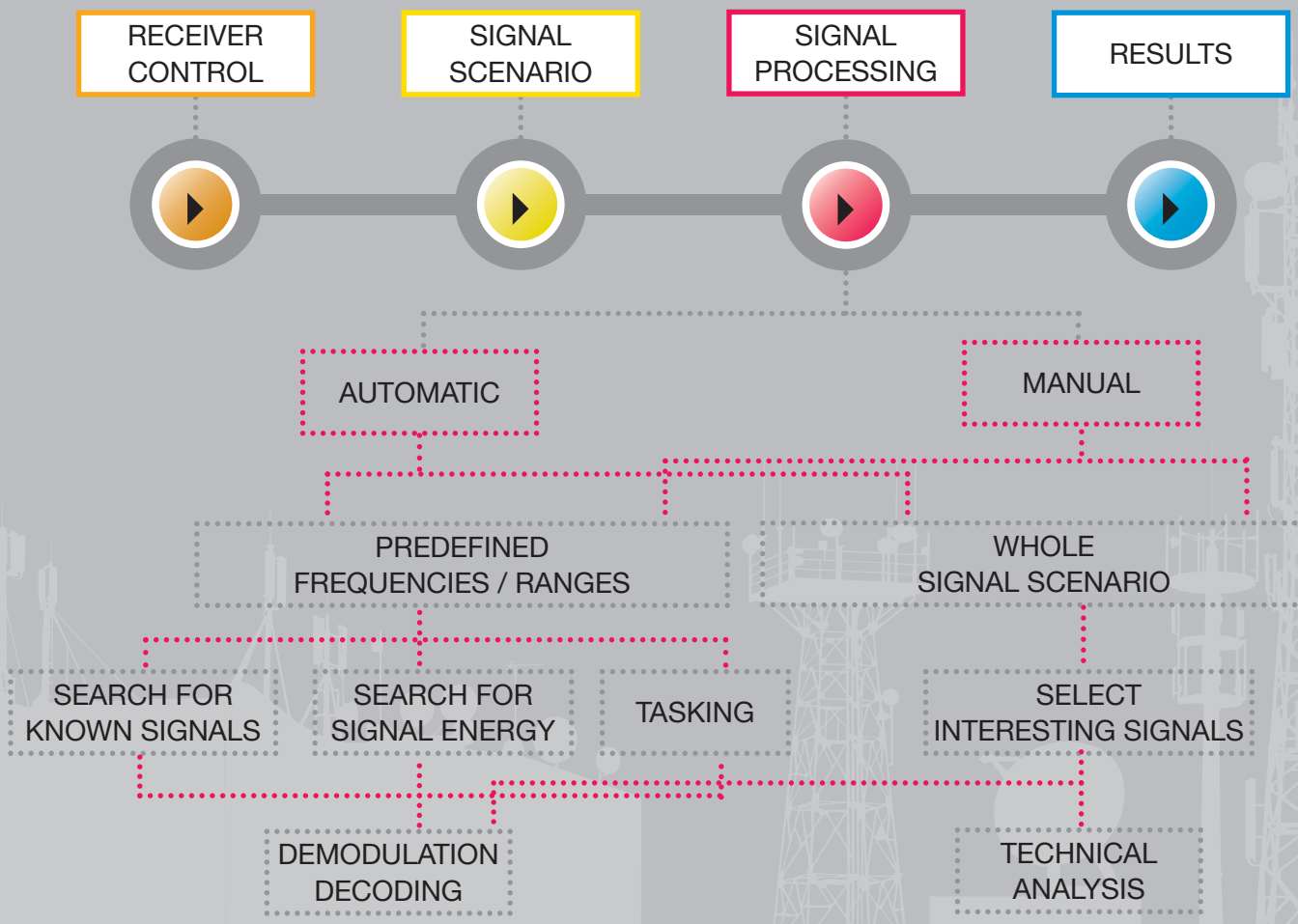
A frequency range is intercepted and its signal scenario monitored fully automatic. Detected activities are classified and technical parameters of the signals are determined. Known signals are automatically recorded, demodulated to listen in or passed to decoding, gathered results are stored into a database.

Unkown signals can be recorded for more in depth manual analysis. This enables the operator to concentrate on signals of interest for his daily work. Analysing new unkown signals to expand the software with own decoders keeps it up to date with the signal scenario.

The entire functionality is available for manual, and automatic operation: From manual signal processing and quick analysis of an individual signal up to fully automatic signal search, interception and processing.

MODULAR SCALABILITY

The modular and scalable design enables several different component combinations to create customised product setups perfectly suited for specific applications: From a manually operated wideband signal workstation over a fully automatic working radio monitoring solution to a signal processing component integrated in a larger system.



Use Cases

Automatic search and production of known signal types

The user is able to search in predefined frequency ranges for well-known signal types. This feature includes the search for analogue transmissions (voice / morse) and for all signals matching a list of digital transmission methods of interest. The system will run in automatic mode, search for all signals using one of these transmission methods in the defined frequency range, extract and store these signals in a storage server. Results like decoded text or demodulated audio signals are stored in the storage server for further evaluation and export.

Automatic determination of frequency allocation

A main use case of automated systems is to provide an overall survey of the signal scenario without having any preknowledge about the frequency allocation. In this use case the system searchs for energy in a predefined frequency range and determines if the energy could be a signal. The detected energy is processed up to the level of information that is parameterised for this task: signal detection, specific signal parameters (e.g. SNR, bandwidth), modulation type or transmission method.

Automatic frequency monitoring with production

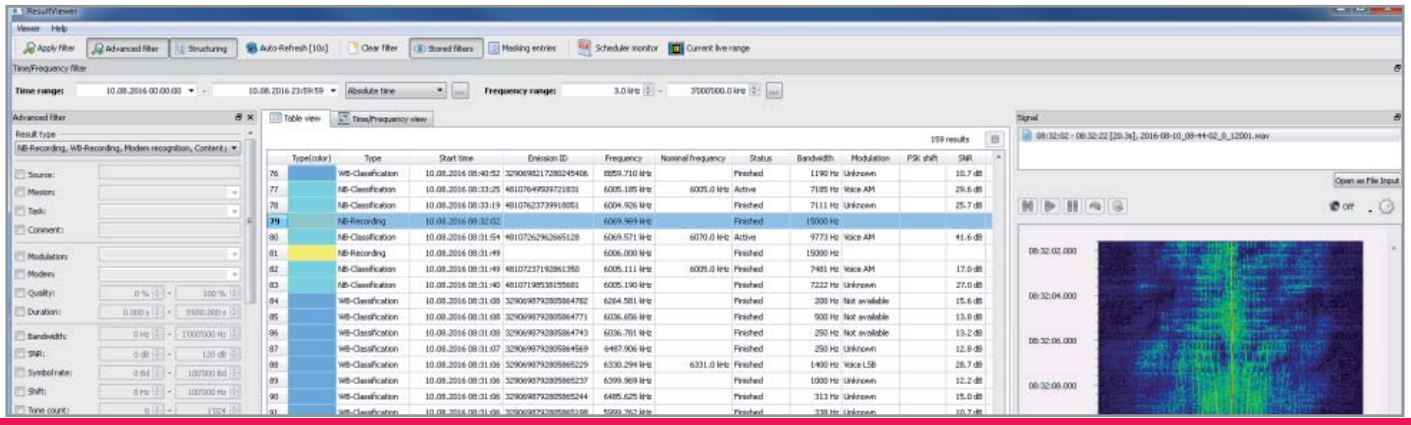
For some operations it is necessary to monitor specific frequencies. After starting a frequency monitoring task, the defined frequencies are constantly checked for signal activity. In case of activity the signal is processed without delay. If the type of the active signal matches the list of interesting transmission methods the signal is recorded, demodulated and decoded.

Manual online monitoring of frequencies

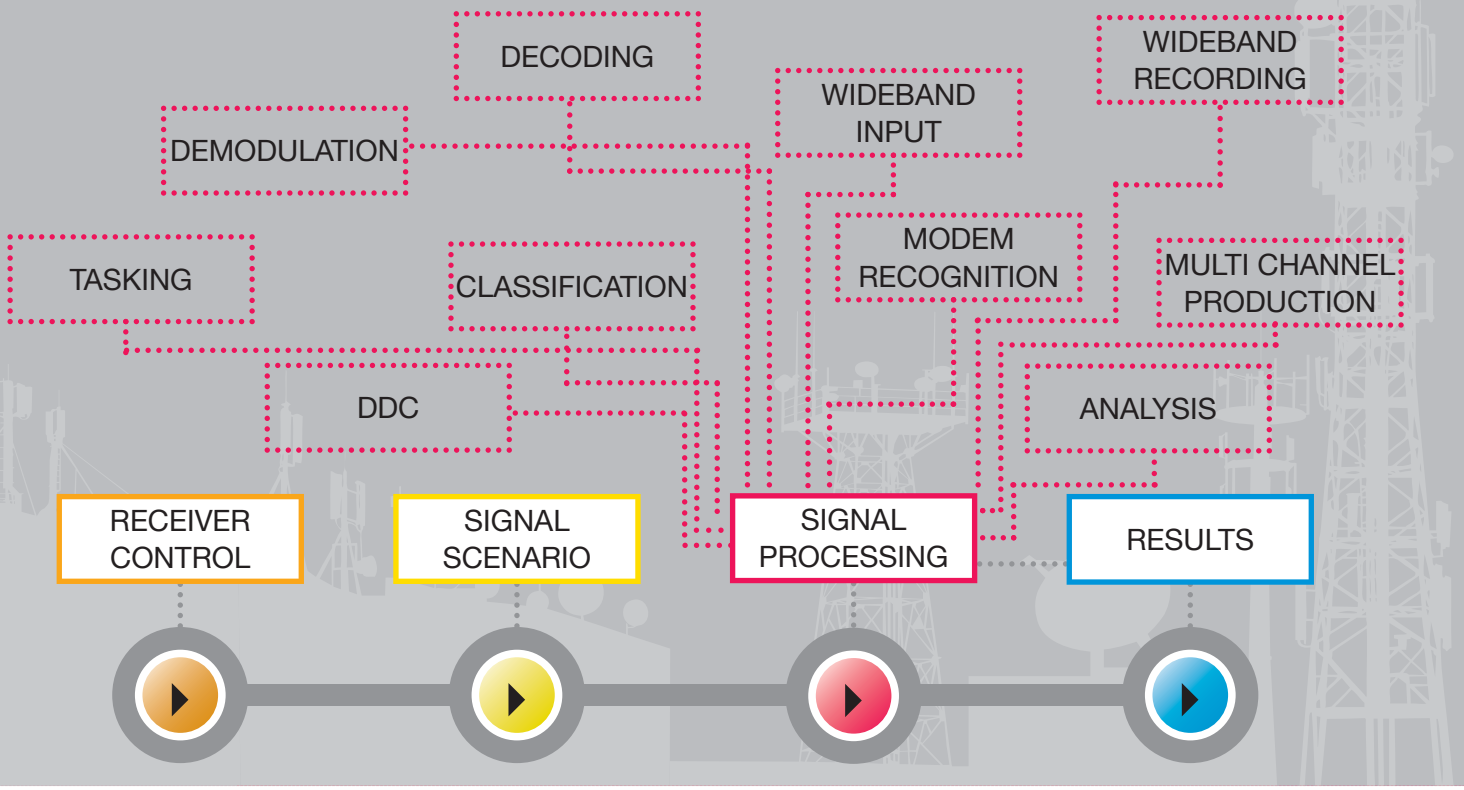
For visual real-time monitoring of the electromagnetic spectrum an online spectrogram is provided. The operator observes the current signal scenario in a spectrogram display. Zoom and cursor functionality allow for rough estimation of signals. The operator selects signals of interest directly in the online spectrogram for decoding and listening or to pass them to narrowband analysis software for technical analysis.

Recording and offline analysis of frequency ranges

The recording of frequency ranges can be triggered by system events, is parameterised as a time based task or is started manually by an operator observing a frequency range. For evaluation the operator uses an offline spectrogram for a quick overview and navigation within the recorded signal scenario. Specific emissions can easily be selected and highlighted and a description and text annotation can be added. Selected signals can be exported to files or streamed to arbitrary external signal analysis tools.



ResultViewer:
Result post processing with filtering, pre-view, editing and export



Functions

Signal selection in wideband input

go2MONITOR displays an overview of the signal scenario utilising a spectrogram and a spectrum FFT. Various display settings, cursors and a dynamic zoom are available.

Using the wideband view the operator is able to select signals to be extracted by Digital Down Conversion (DDC) simply by selecting them in the display.

The output of the DDC is assigned to a production channel, the user interface is enhanced to show the results.

Alternatively, the wideband classification results can be used to select signals of interest. Modulation, bandwidth, symbol rate, shift and other parameters are shown for all classified signals within the wideband frequency range.

Narrowband channel processing

Signals of interest can be selected from the wideband spectrum to a production channel by drag and drop. All production channels can be reviewed at a time and can be configured individually.

A production channel shows a detailed display of the selected signal. Spectrograms, FFT displays and the wideband view are easily configurable.

Up to eight production channels can be set up in parallel in manual mode, up to hundreds of channels in automatic mode.

Operating modes of the production channel:

- Classification mode: detailed determination of frequency allocation and classification of modulation type.
- Decoding mode: the channel works as a decoder. The suitable decoder/ modem is manually selected from a decoder-/ modemlist.
- Recognition and decoding mode: an assigned signal will be decoded automatically.
- Classification, recognition and decoding mode: suitable decoders/ modems will be automatically selected depending on the classification result.

Automatic recognition and decoding

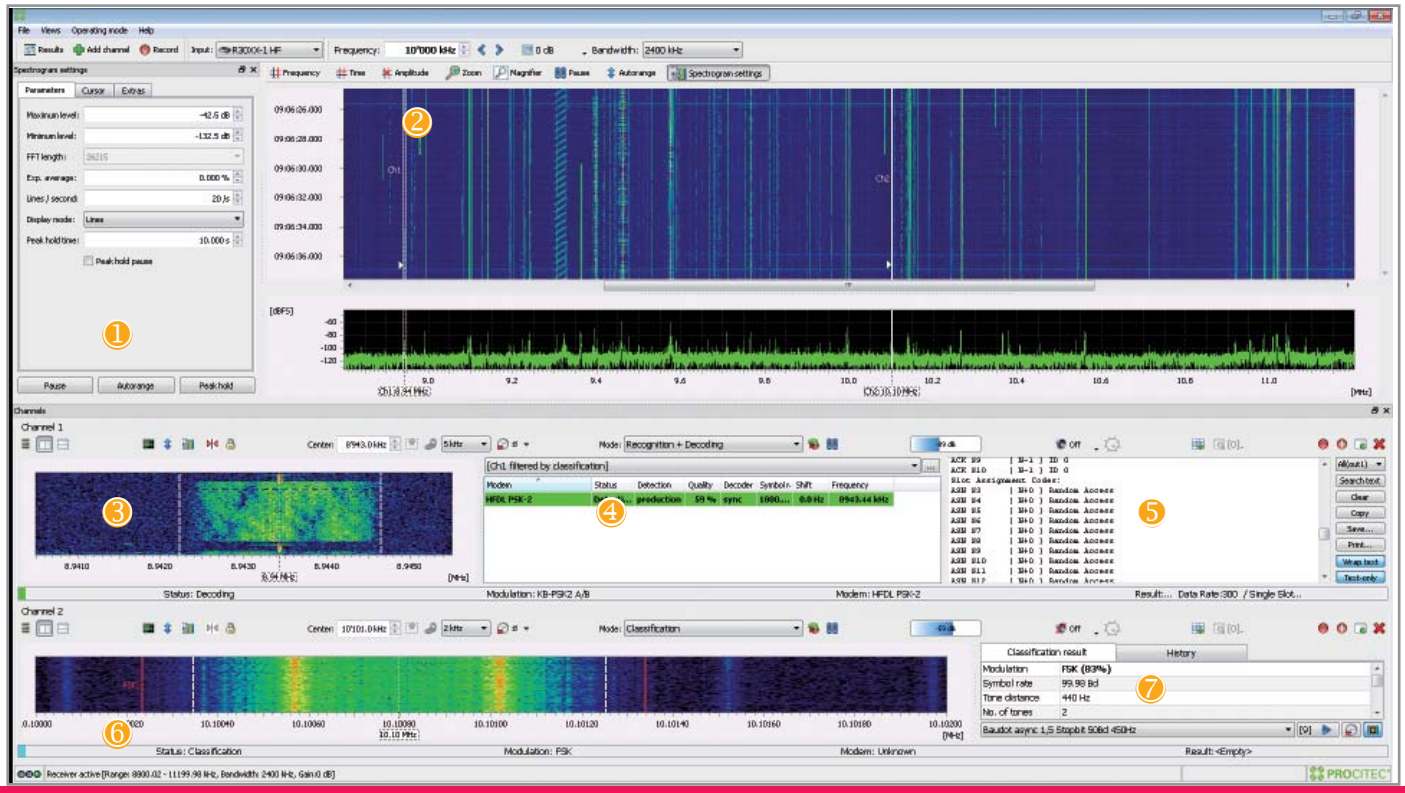
A production channel uses a configurable list of decoders/modems and checks which of them matches the signal.

The signal is demodulated, decoded and the results are displayed in the result view. The decoder/modem lists can be configured, loaded and saved.

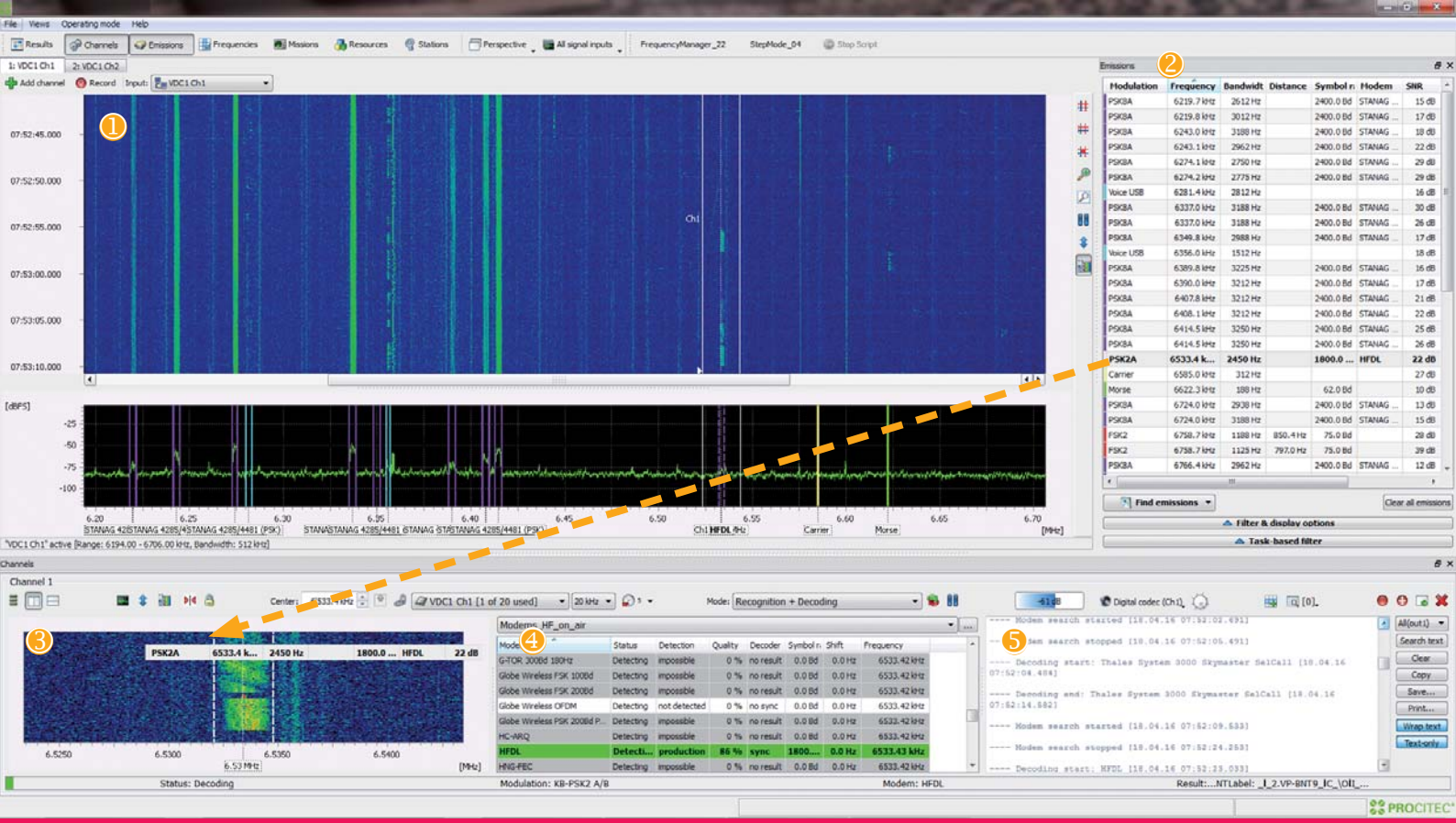
This way the operator defines specific decoders/modems to be used according to his monitoring task. A previous classification enhances the production. go2DECODE (go2SIGNALS product for analysis recognition, demodulation and decoding) can be used for analysis and creation of customer specific decoders (using DDL programming language), which can be used directly in go2MONITOR.

Result processing and export

The ResultViewer shows all collected results in detail as tabular or graphical representation. Results can be filtered, sorted, grouped, marked, listen to, viewed, edited and exported. All results are stored in a database up to several weeks for later post-processing and result history.



① Configuration of wideband spectrogram
② Wideband signal scenario displayed in a spectrogram and a spectrum FFT
③ Production of a selected narrowband signal in production channel 1, operation mode: recognition and decoding
④ Recognition results: found decoder / modem
⑤ Decoding results: decoded text
⑥ Production of a second selected narrowband signal in production channel 2, operation mode: classification
⑦ Classification results: detected modulation type and parameters



① Wideband signal scenario displayed in a spectrogram and a spectrum FFT
② Emission list with classified signals
③ Select a signal in the emission list, import the signal per drag and drop to a production channel and start production of the signal
④ List of possible decoders/modems for automatic modem recognition
⑤ After automatic decoder/modem recognition the system starts to decode the signal content

Modes

Interactive manual mode

Using classification and decoder/modem recognition, monitoring of wideband input

go2MONITOR features the operator in manual mode with two types of classifiers and an automatic decoder/modem recognition and content decoding mode.

1. Monitoring of a wideband input band means a lot of signals to process. The Wideband Classifier function helps you by automatic detecting and classifying all signals. With the emission list the operator gets a quick and easy overview.

2. Simply select a signal in the emission list to start further signal operation. Narrowband Classification helps to track parameters in detail.

3. With the classification result, the operator gets a list of possible decoders/modems types matching to the modulation type.

4. If modulation parameters are unique, even the decoder/modem is detected. If not, a matched list of decoders/modems is generated ready to use with the decoder/modem recognition function.

5. The automatic decoder/modem recognition evaluates the correct decoder of the signal and changes into the decoding of the signal content. Internal signal buffers and processing faster than realtime take care that no bit is lost (decoding of the first bit) even during tracking of signal changes.

IMPORT OF SIGNALS PER DRAG & DROP

Signals of interest can easily be added from the emission list or directly from the spectrogram view per drag and drop to a production channel.

Automatic mode with tasking

Fully automatic signal detection with configurable, loss-free automatic processing

The option automatic monitoring and tasking turns go2MONITOR into a fully automated signal search and processing system. To use automatic processing features, the operator creates tasks and missions. The results are stored into a database for further evaluation. An advanced ResultViewer shows a tabular or graphical representation of the stored data. The operator can define various tasks which are automatically processed. Task definition consists of three parts.

Trigger = Select signal types the system should search for. Parameters are:

- Time ranges (from-to)
- Frequency ranges (from-to)
- Geographical areas (activate signal trigger at specific site)
- Signal energy found
- Modulation type recognized
- Modulation parameters

Action = Defines the action to be executed when the signal or event defined in the trigger was detected. Possible actions are (actions could be combined):

- Alert (send network notification to an external system)
- Record signal
- Classify modulation type
- Demodulate/decode signal (with predefined decoder/modem)
- Detect decoder/modem demodulate/decode (with search decoder/modem list)

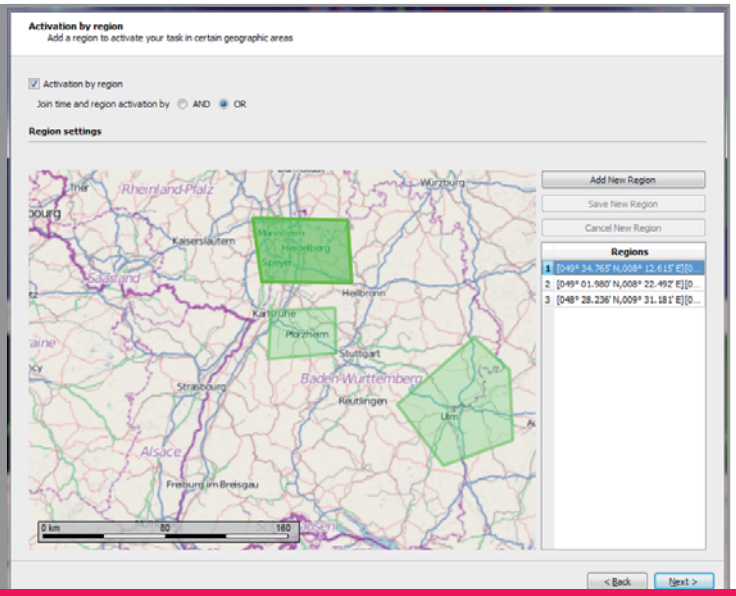
Stop criteria = Defines, when the task is finished. Stop if:

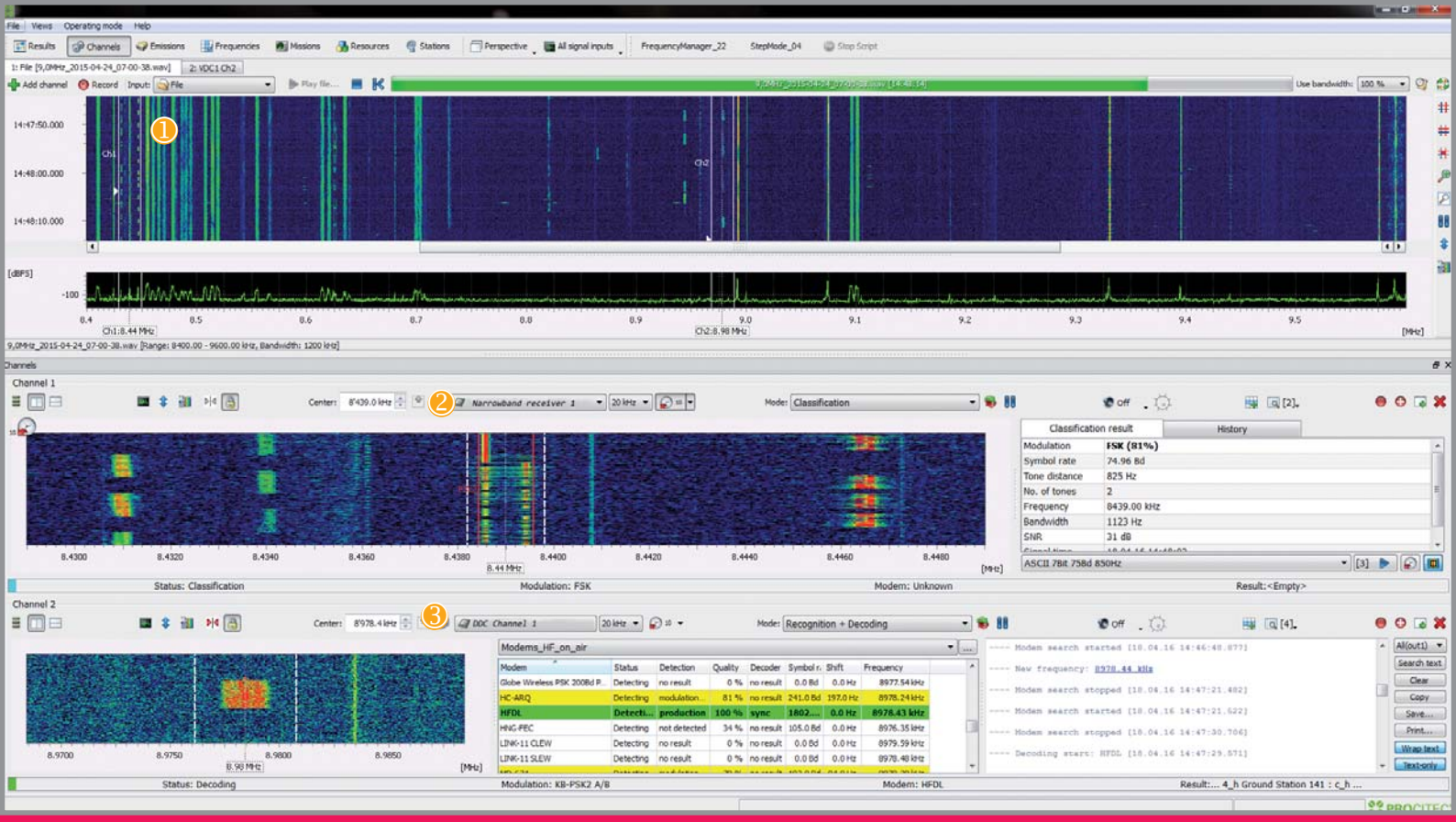
- Signal energy lost (incl. dwell time)
- Signal lost during decoding
- Maximum duration

Alert actions can be defined by the operator by specifying an external application which will be started in the case of an alert. This interface makes it possible that go2MONITOR can work with other software without modification.

TASKING BY GEOGRAPHICAL POSITION

Define the geographical locations where the task should be active. They are defined as a list of map-based polygons. A graphical map display is provided for the operator to define these polygons. Additionally, it can be defined whether time and position activations will be combined by using the “AND” or “OR” operator.





Seamless usage of DDC channels and narrowband receivers:

① Wideband signal scenario displayed in a spectrogram and a spectrum FFT
② Production channel 1 classifies the selected signal using a hand-off narrowband receiver
③ Production channel 2 is recognising and decoding the selected signal using a DDC channel

Special Functions

Using hand-off narrowband receivers

Continuous searching for new emissions in a wide frequency range with additional narrowband receivers

Software DDC-channels are used as signal input for the processing channels. This limits the input band to the bandwidth of the wideband receiver and pauses the processing during receiver scan mode.

The option “Narrowband receiver control“ allows the usage of additional narrowband receivers as a signal input for processing channels. The operator can choose the emission/ frequency in the GUI and decide if it should be extracted from the wideband input by using a DDC-channel or by using external narrowband-receivers. All receiver types supported for the wideband input can also be used for this. The bandwith of a channel using a narrowband receiver can be up to 500 kHz.

The advantage of a narrowband receiver based channel against a software DDC channel is the independency from the input frequency range of the wideband receiver. Also in many cases a better receiver sensitivity is available.

Frequency ranges of narrowband channels are marked in the wideband spectrogram. An interactive interface for processing and fine-tuning the narrow-band signal is available in the GUI. This interface can also display a zoomed-in spectrogram of the single channel with much higher spectrum resolution than in the wideband spectrogram.

The required frequency of the channel can be selected directly in the wideband spectrogram by using the mouse or by entering numerical values directly in the channel fine-tuning interface.

Fast navigation and signal extraction in 20 MHz recordings

The option “Wideband Recording 20 MHz“ extends the recording bandwidth up to 20 MHz. To achieve this, a separate wideband recording component is used. Additionally to recording the signal input, the Wideband Recording option will calculate the FFT of the input signal and store it along with the wideband IF-signal files to enable fast spectrum display and navigation. Operation modes are sequential recording and recording scheduler.
From the wideband recordings narrowband signals can be reviewed, edited, filtered and extracted.

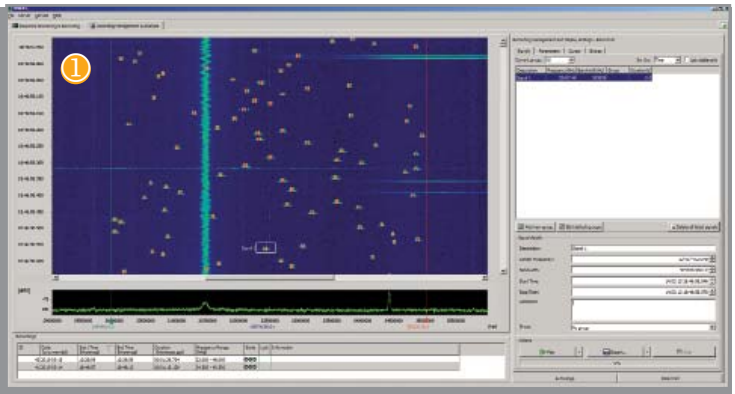
Extracted signals can be used as new input in go2MONITOR or for further signal operation.

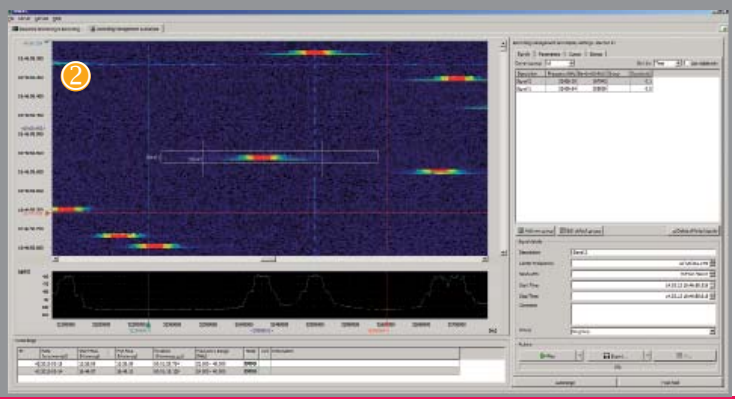
Even manual dehopping is possible by exporting a signal group to the same frequency merged in one file.

MANUAL DEHOPPING

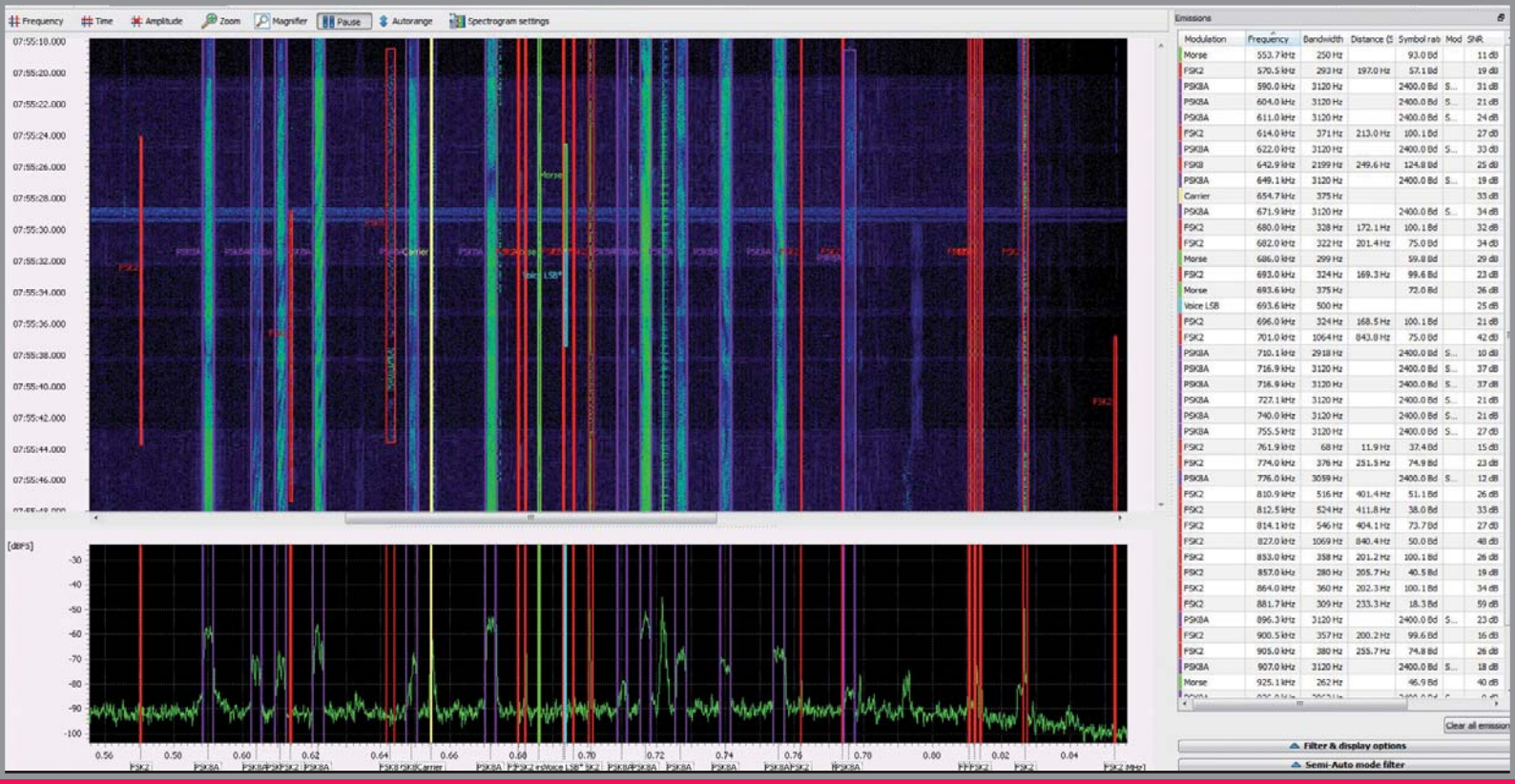
Select and mark all single hopper bursts in the go2MONITOR wideband recording, save them as playlist and open them as playlist in go2DECODE (go2SIGNALS product for analysis, recognition, demodulation and decoding) for further signal analysis and fingerprinting. Demodulation and decoding on the stitched/ de-hopped signal is possible – whereas a content production most likely will fail, since frequency-hopped (military) communication usually is encrypted.

The following screenshots show the recording and analysis of a newest generation Harris V-/ UHF hopper (captured at a hop rate of 125 Hops per second – insofar applicable even for higher hop-rates than can be found for HF hoppers).





① go2MONITOR - recorded V-/UHF Harris Hopper with a hop-rate of 125 hops per second
② go2MONITOR - marked hopper bursts can be exported directly to the go2DECODE signal analysis software for further processing



Wideband classifier

Scenario Analysis Functions

Wideband modulation classification

The feature “Wideband input 20 MHz“ extends the signal input bandwidth and the continuous, real time wideband classifier and signal tracking up to 2.4 MHz in HF or 20 MHz in V/UHF. It offers also a snapshot classification. It is possible to automatically detect, measure and determine RF parameters for all signals in the available frequency range. The results are displayed in the GUI and can be used as an input for further processing.

Multichannel production

To handle wideband signal input bands, automatic processing of many signals of interest at the same time may be necessary. Therefor, the number of processing channels can be increased by the feature “Multi channel production“. The number of processing channels and software-DDCs for automated processing is extendable in steps of 32. The software can be increased to hundreds of channels installing the option multiple times.

Additional “Offline processing“ will be included into the processing channels. This separates the realtime part (recording) from the processing (narrowband classifying and decoding) part, and enables processing faster than realtime.

PROCESSING OF SIGNALS FASTER THAN REALTIME

The signal is recorded to a signal file first and then processed with the APC (automatic production channel).
Advantages of this strategy are:
- Increase of the overall system throughput
- Automatic storage of the IF for each signal
- Reduction of the number of production channel licenses needed

Multiple wideband signal input

Control multiple wideband receivers using the same GUI

go2MONITOR provides the opportunity to control multiple wideband receivers (even ones made by different manufacturers) using one and the same user interface. The user now no longer needs to alternate between different operation applications, but can use in parallel the same user-friendly control interface for all receivers connected to the system.

Highlight: Multiple receivers can be used in parallel, this makes the simultaneous processing of different frequency bands using the same software possible.

Wideband input overview display

With the overview display the features (fast scan mode, overview PSD data) from modern digital receivers are now available within go2MONITOR.

Wideband input overview display shows

① Signal scenario overview
② Wideband input selection
③ Channel setting
④ Zoom spectrogram for easy signal selection

Technical specifications

Specifications overview	
Data acquisition	Digital IF (complex I/Q), bandwidth up to 20 MHz (1 MHz in basic version) Digital AF (complex WAV 8, 16, 32 Bit) Multiple signal inputs simultaneously possible, depending on configuration Others on request
Localization	English or German; Others on request
Documentation	PDF Online-Help
Recommended PC hardware	Min. Intel i5 4 Core, 2 GHz, 4 GB RAM for 4 channels version Min. Intel i7 8 Core, 2 GHz, 8 GB RAM for 8 channels version HDD: min. 500 GB recommended (depends on recordings) Screen Resolution: min. 1920 x 1080 pixel or two displays 1280 x 1024 pixels (multiple monitors recommended) Fast Ethernet for digital IF input
OS	Windows 7 / 10 64 bit, Linux (CentOS/Redhat 6/7) 64 bit

Features	
Software Feature	**Remarks**
Alphabets	Can be added to the decoder, freely configurable Requires go2DECODE
Classifier	1 MHz bandwidth, (2.4 / 20 MHz with option WCL) Manually triggered or repetitive snapshots (at 10, 20,… . sec intervals) or continuous (with option AMT)
Decoders	1, 2, 4 or 8 channels or more in steps of 32 (with options WMPC) Automatic change of decoder if signals change in „Recognition + Decoding“ mode Customizable decoder lists for automatic decoding Buffering for lossless decoding No loss of data during analyzing and protocol changes Proprietary Decoder Description Language (DDL) Custom extendable decoder list (with go2DECODE)
Demodulators	Universal demodulators with AGC and AFC Automatic baud rate synchronization (less problems with playback of files recorded on other inaccurate devices) For types and parameter details please refer to the go2DECODE datasheet
GUI	Simple and intuitive to operate user interface Supports multiple monitors Drag-and-drop of frequencies, classifier results, stations Receiver control Wideband input spectrogram and spectrum Manual channel control Result database view Simultaneous working with multiple receivers and with multiple narrowband channels
Input Files	Digital IF (complex baseband I/Q 32bit), Bandwidth <= 1 MHz (standard) or up to 20 MHz (with option WCL) Playback of standard wav files Digital AF (WAV 8, 16, 32 Bit) File processing faster than real time
Input TCP/IP Streaming	Generic PROCITEC/PLATH format VITA 49 (on request) PXGF (on request)
ISO 9001:2015	Company is certified (not only hardware)
License	USB-Dongle (WIBU-KEY/CodeMeter) License sharing witch license server

Features

Software Feature	Remarks
Option: AMT Automatic Monitoring and Tasking	Full automatic job based monitoring (decoding, recording, classification) Continuous classification Missions and Tasks based on time, frequencies (ranges), RX location, modulation, modulation parameters, modems, … Powerful filtering functions Easy overview over decoded, classified or recorded signals ResultViewer with continuous updates
Option: NRC Narrowband Receiver Control	Frequency independent production on all 1/2/4 or 8 production channels Monitor signals in different frequency ranges Narrowband receivers offer a better sensitivity compared to wideband receivers Narrowband receivers consume less resources, as no DDC is required Possibility to add „virtual“ receivers using ExtIO, which can connect to third party DDCs or streams
Option: WCL Wideband Input, Classification 20 MHz	Continuous Mode (only if AMT option available) Snapshot Mode Wideband spectrogram display 2.4 MHz (HF) / 20 MHz (VUHF) Wideband classification 2.4 MHz (HF) / 20 MHz (VUHF) Delivered as a complete package with server and receiver
Option: WMPC Wideband Multi Production Channels	Extends the number of channels in steps of 32 Each channel supports DDC, demodulation, decoding, narrowband classifier and narrowband recording functionality Easy overview over decoded, classified or recorded signals
Option: WRC Wideband Recording 20 MHz	Lossless recording of up to 20MHz digital IF IQ data in standard WAV files Parallel storage of spectrum data for fast preview Recording replay and signal extraction Recording scheduler (with option ATM) Delivered as a complete package with server and receiver
Output	Visual decoder result output, configurable using XSLT All results are continuously saved in files and SQL data base Protocol detection and production down to the content (text, audio, binaries) Various export functions
Recording	Wideband (1 MHz, 20 MHz with option WCL) Narrowband up to 300 kHz for each DDC IQ channel Bitstream (demodulated bits)
ResultViewer	Display, filter and export result data Display of: Decoder output, demodulated audio files (CW, TETRA etc.), text output (ALE, HFDL, etc.), binary files Audio demodulation and playback Recognized modems (protocols) Wide-/Narrowband classification results Recorded wide-/narrowband IF-signals, Advanced filter, Result detail and Time/frequency filter are implemented as docking/floating windows and can be freely positioned Table and graphical (time-frequency plane) result display Filter data using GUI, SQL or scripting
Third party decoder	Interface to the DDC channel output Interface to the audio output
Training	Very short training period Same technology as in large decoding systems

Technical specifications

Classifier Modulations		
Modulation	**Specification**	**Recognition quality (Eb/No) for a detection rate > 90% and false alarms < 1%**
Max. signal bandwidth	HF 20 kHz, V/UHF 50 kHz/300kHz	
Signal detection min. carrier to noise ratio	6 dB	
Analog modulation types	J3E USB, J3E LSB, A3E AM, F3E NFM/WFM, DSB-SC (optional)	
MORSE	30 - 250 CPM	
FSK 2	HF: 25 - 4800 Bd V/UHF: 1,2 - 25 kBd m = 1 - 10	11 - 15 dB
FSK 4	HF: 25 - 4800 Bd V/UHF: 1,2 - 25 kBd	11 - 15 dB
MSK	HF: 100 - 4800 Bd V/UHF: 1,2 - 25 kBd	14 - 16 dB
Multitone FSKn	3 - 200 ms (5 - 330 Bd) 5 - 64 tones	11 - 15 dB
(D)PSK 2 A/B	HF: 31,25 - 4800 Bd V/UHF: 1,2 - 25 kBd	7 - 10 dB, A/B Decision: 8 - 10 dB
(D)PSK 4 A/B	HF: 31,25 - 4800 Bd V/UHF: 1,2 - 25 kBd	8 - 12 dB, A/B Decision: 10 - 12 dB
(D)PSK 8 A/B	HF: 31,25 - 4800 Bd V/UHF: 1,2 - 25 kBd	HF: 8 - 12 dB, A/B Decision: 10 - 14 dB
PSK 16	HF: 300 - 4800 Bd V/UHF: 1,2 - 25 kBd	14 - 16 dB
Multichannel (D)PSK 2, 4 A/B	max. 10kHz signal bandwidth 50 - 300 Hz channel spacing 2 - 64 channels	13 - 15 dB
OFDM	25-200 Bd 30-250 Hz channel spacing 25-512 channels	14 - 18 dB
QAM	HF: 1600-4800Bd V/UHF: 1,6 - 25 kBd Order: 16, 32, 64	22 dB
ASK 2/4	V/UHF: 1,2-25 kBd	20 dB
MCFSK2 (optional)	40-250 Bd Modulation index >=1 120-1000 Hz channel spacing 2-64 channels	17 dB
FM Broadcast	Freq: 65 MHz - 108 MHz Bandwidth 50 kHz - 350 kHz	
OTH Radar	detection only	

Classifier Modem-Classifications		
APCO-25	LINK 11 (CLEW)	PACTOR-4
CODAN 3212 16 Channel PSK	LINK 11 (SLEW)	STANAG 4285/4481 (PSK)
CODAN 3012 16 Channel PSK	MIL-STD-188-110A Serial (single-tone) mode (a.k.a. STANAG 4539)	STANAG 4529
DMR	MIL-STD-188-110B/C App. C (a.k.a. STANAG 4539 HDR)	TETRA Downlink
DMR Continuous	MPT1327 1200Bd MSK	TETRA Uplink
dPMR	NXDN 2400 Bd	TETRAPOL
D-STAR	NXDN 4800 Bd	
HFDL	PACTOR II FEC	

Measured modulation type parameters															
Parameter	**Description**	OFDM	Carrier	FSK	FSKn	MSK	CW	PSK	MCPSK	QAM	ASK	MCFSK	Voice	FM Broadcast	Unknown
Modulation	The type of modulation and its probability	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Pitch	Pitch of the modulated voice												x		
Type	Type of voice like LSB, USB, AM, FM												x		
Symbol rate	The symbol rate in Bd	x		x	x	x		x	x	x	x	x			
Order	Modulation order, number of symbol states			x	x			x	x		x	x			
Version	Version of PSK A or B							x	x						
CPM	Transmitted character per minute						x								
Dash Dot Ratio	The ratio between the length of dashes and dots						x								
Shift	The measured shift			x	x	x						x			
Channel spacing	The measured distance between channel in Hz	x							x			x			
Frequency	The center frequency of the signal	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Bandwidth	The overall bandwidth of the signal	x	x	x	x	x	x	x	x	x	x	x	x	x	x
SNR	The signal to noise ratio in dB	x	x	x	x	x	X	x	x	x	x	x	x	x	x
Signal time	Time of measurement	x	x	x	x	x	x	x	x	x	x	x	x	x	x

Technical specifications

Supported receivers*

Receiver	Max. Rx bandwidth	Spectrum overview	Scan	Remark
AirSpy	8 MHz			
CommsAudit CA7851	5 MHz			VITA 49
Grintek GRX Lan	1 MHz			
IZT R3xxx series	20 MHz	X	X	Up to 3 channels spectrum
IZT R4000 (SignalSuite)	1 MHz			1 channel only
Microtelecom PERSEUS	800 kHz			Limited USB 3.0 compatibility
NARDA NRA-3000 RX	320 kHz			
NARDA NRA-6000 RX	320 kHz			
NARDA IDA 2	320 kHz			
PLATH SIR 2110	20 MHz			
PLATH SIR 2115	4x20 MHz			Preliminary support only
PLATH SIR 5110	12 MHz			16x768 kHz subbands
PLATH SIR 5115	Full HF			40x768 kHz subbands
R&S EM100 / PR100	500 kHz	X	X	
RFSPACE SDR-14	190 kHz			
RTLSDR/Noxon USB-sticks	3.2 MHz			
SDRplay RSP1 & RSP2	6 MHz			
ThinkRF WSA5000-427	780 kHz			VITA 49
WiNRADiO G31DDC	800 kHz			
WiNRADiO G33DDC	4 MHz	X		
WiNRADiO G39DDC	4 MHz	X		Up to 2 channels + spectrum
Generic VITA 49 receiver support	Max. receiver bandwidth			Can be configured in a wide range for different receiver types
Other generic „Winrad ExtIO“ supported receivers	Max. receiver bandwidth			Experimental support

Not all listed receivers are supported with Linux operation systems.

Demodulators

AM / A3E	Clover 2000	FSK 2, 3, 4 disc.	MPSK 2, 4, 8, 16 A/B	PSK 2, 4, 8, 16 A/B
Analogue Selcal	Clover 2500	FSK 2,3 auto shift	MT63	PSK data aided
ASK 2, 4	Coquelet	MSK / GMSK	MultiModem	QAM 16, 32, 64, 128, 256
ASK2PSK4	DPSK 2, 4, 8, 16 A/B	J3E (USB, LSB)	MultiTone (FSKn)	TFM3
ASK2PSK8	FM / F3E	MDPSK 2, 4, 8, 16 A/B	OFDM	THROB / THROBX
ASK4PSK8	F6/F7B	MFSK 2	OQPSK	
Clover II	FSK 2 matched	Morse	Pactor II, III, IV	

Decoders and Demodulators

1. MIL and PMR decoders may need an End-User-Certificate (depending on the country of the user)
2. Automatic sideband detection can be achieved via two modems set to inverse sidebands.
3. A gap between message bursts and acknowledge burst must be detectable.
4. Separation of slow selcall types cannot be guaranteed.
5. Slow multitone modems are recommended to operate with fixed nominal frequency

Our set of standard, military, SAT and PMR decoders is subject to continuous development. Please download the current list of available decoders on our website www.go2signals.de.

Subject to modifications, available from software version 17.2.

go2MONITOR TRAINING

go2MONITOR training comprises the complete signal flow from connected receiver to content output of a radio signal. We place particular emphasis on the efficient and task oriented application of the comprehensive operating possibilities.

The aims of our training courses are therefore, in particular, rapid assimilation of information as well as sucessful application of the presented instructions. Training on the semi and fully automatic operation of go2MONITOR can be organised on request.

Training content:

- Introduction to operation
- Receiver control
- Scenario analysis (overview of numerous simultaneous emissions)
- Signal processing (processing a concrete signal, classification, demodulation, decoding)
- Display of results (temporal, spectral, merger of raw data and content output)
- Optional: Transfer from manual to automatic mode, creation of automated tasks
- Practical exercises

go2SIGNALS

... monitoring a connected world

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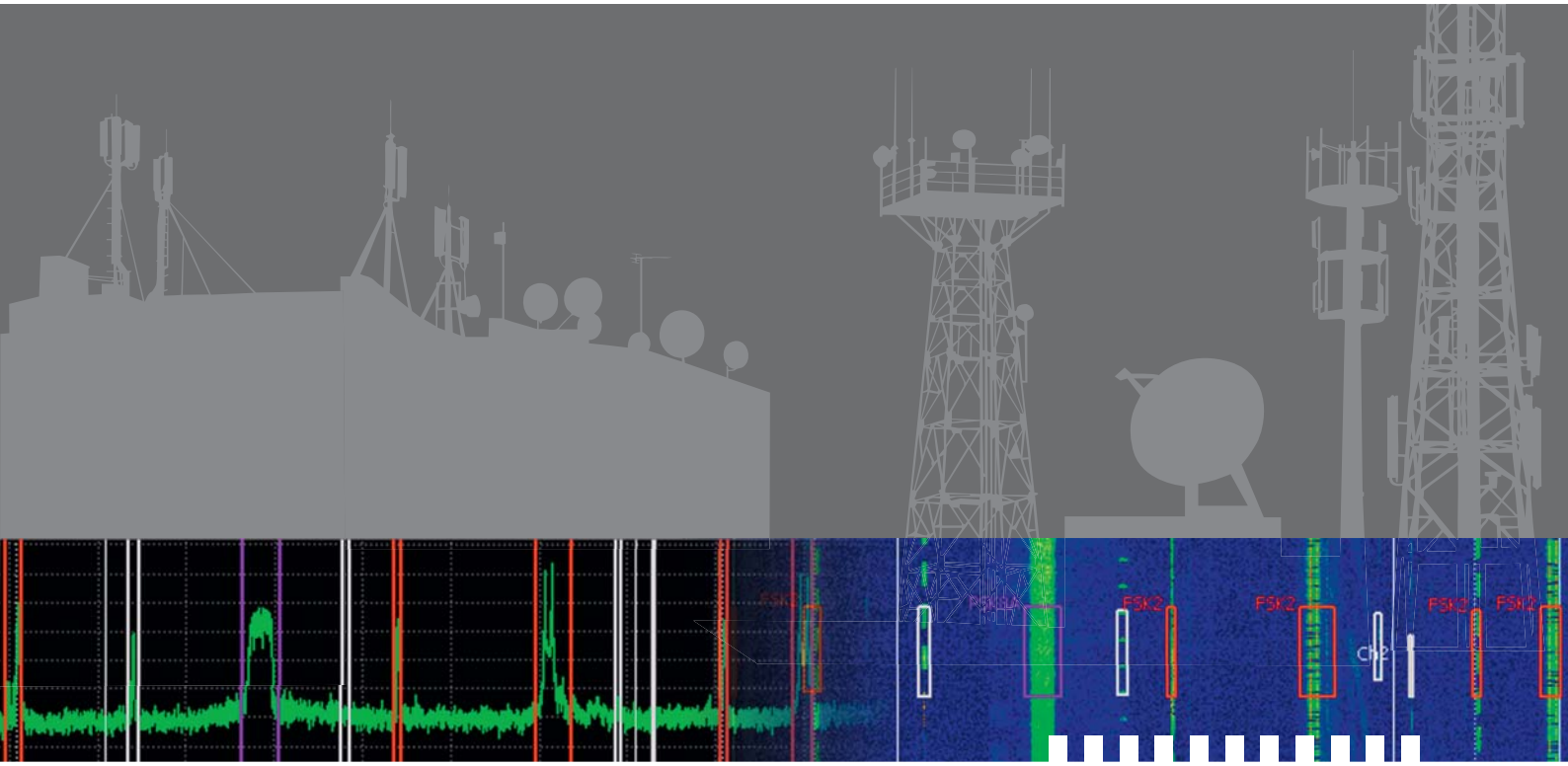
go2DECODE

go2MONITOR

go2ANALYSE



Management System
ISO 9001:2015

17.2 01/2018 (Subject to modification)