go2MONITOR

Automatic Signals Search Monitoring and Decoding
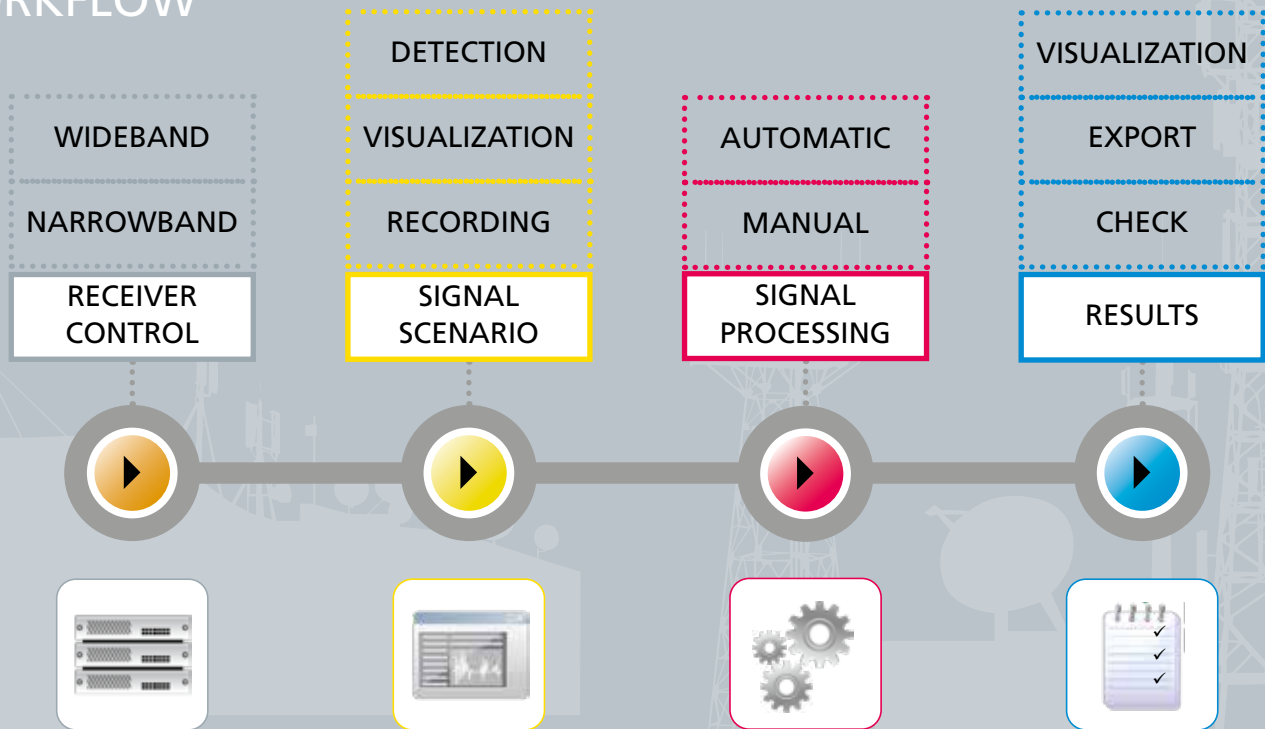
Key Facts

go2MONITOR is a search, Wideband Multichannel Analysis & Decoding tool for HF / VHF/ UHF / SHF Signals in Tactical & Strategic Environments

- Multiple wideband inputs (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 production channels either with buffered Digital Down Conversion (DDC) or narrowband receiver input
- User-configurable automatic signal search with task-based control for processing, analysis and results
- User-expandable decoder library via Decoder Description Language (DDL/pyDDL)
- State-of-the-art GUI includes preset windows, drag & drop, and integrated station list
- For civil, tactical and strategic applications

WORKFLOW

	DETECTION		VISUALIZATION
WIDEBAND	VISUALIZATION	AUTOMATIC	EXPORT
NARROWBAND	RECORDING	MANUAL	CHECK
RECEIVER CONTROL	**SIGNAL SCENARIO**	**SIGNAL PROCESSING**	**RESULTS**

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/U/SHF) coherent input (scalable), 6 GHz scan mode

- Efficient tasking control by focusing on Signals Of Interest

- Parallel and continuous classification and production (collection) of signals

- More than 250 demodulation and decoding modes

- Use of standard COTS hardware and current receiver models

- Easy integration through open APIs

- Expandable with user-defined procedures, modems and decoders

Automatic Intercept Workflow

go2MONITOR has a fully automatic approach for intercept, classification, demodulation, decoding and recording of radio signal emissions in a wideband spectrum environment.

In combination with monitoring receivers, go2MONITOR delivers a full-feature capability.

A wideband frequency range is intercepted and monitored automatically. Detected signal activations are classified and technical parameters of the signals are determined. Known signals are automatically recorded and demodulated to live audio and decoding. Collected results are stored in a database.

New and unknown signals can be recorded for more in depth manual analysis, enabling the operator to concentrate on priority Signals Of Interest. The new and unknown signals are analysed and related decoders created by the customer to maintain operational currency.

The entire capability is available for manual and automatic operation: From manual signal processing and rapid analysis of an individual signal up to fully automatic signal search, intercept and processing.
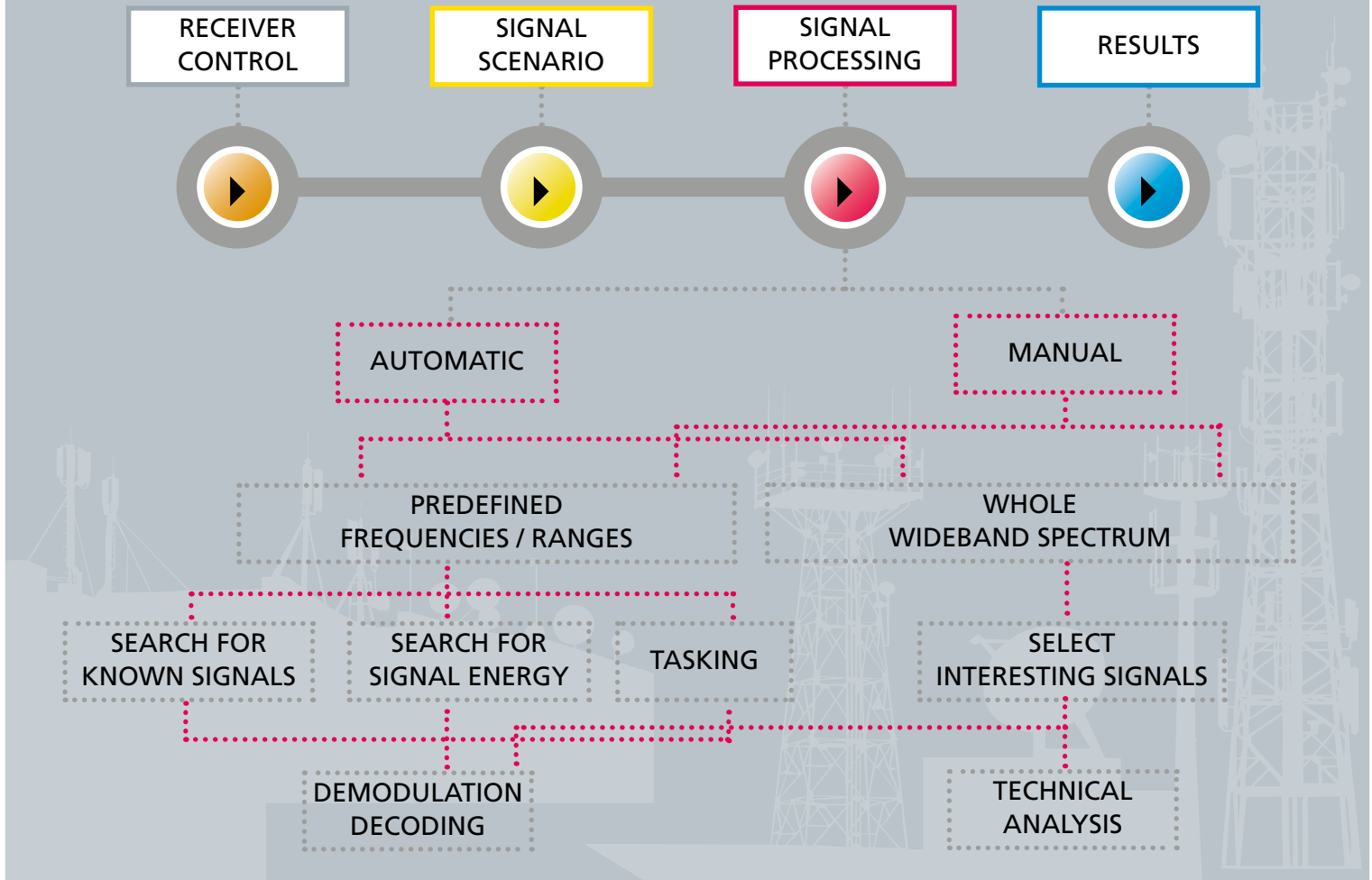
MODULAR SCALABILITY

The modular and scalable design enables many different go2MONITOR component combinations to create customised manual or fully automatic setups tailored to the user's needs:
- as a signal processing component in integrated systems
- tactical deployment configurations
- strategic monitoring capabilities

USE CASES

| RECEIVER CONTROL | SIGNAL SCENARIO | SIGNAL PROCESSING | RESULTS |

AUTOMATIC

MANUAL

PREDEFINED FREQUENCIES / RANGES

WHOLE WIDEBAND SPECTRUM

SEARCH FOR KNOWN SIGNALS

SEARCH FOR SIGNAL ENERGY

TASKING

SELECT INTERESTING SIGNALS

DEMODULATION DECODING

TECHNICAL ANALYSIS

Use Cases

Automatic Search and Production of Known Signal Types

The user is able to search in predefined frequency ranges for known signal types. This feature includes the search for analogue transmissions (e.g. voice) and for all signals matching a list of digital transmission modes of interest. The system will run in automatic mode, search for all signals using these transmission modes in the defined frequency range, extracting and storing these signals on a storage server. Results such as decoded text or demodulated audio are stored on the storage server for further analysis and reporting.

Automatic Determination of Frequency Allocation

A main use case of automated systems is to provide an overall survey of the RF environment without preknowledge of the frequency allocations. In this use case, the system searches for energy in a predefined frequency range and determines if the energy could be a Signal Of Interest. The detected energy is processed up to the level of information that is parametrized for this task: signal detection, specific signal parameters (e.g. SNR, bandwidth), modulation type or transmission mode.

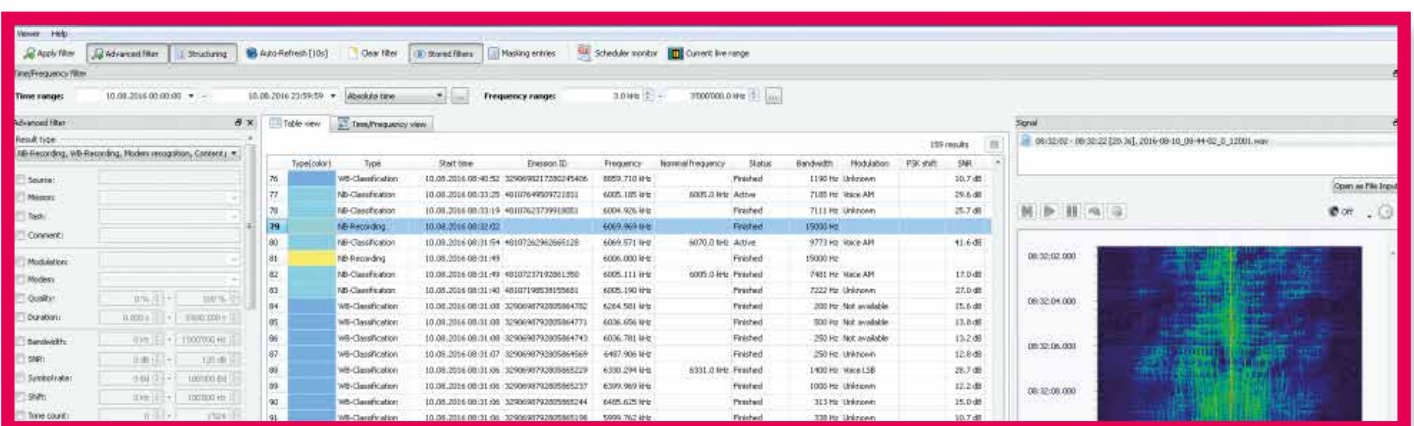## Automatic Frequency Monitoring with Production (Collection)

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 immediately. If the type of active signal matches the list of tasked transmission modes, the signal is recorded, demodulated and decoded

Manual Online Monitoring of Frequencies

An online spectrogram is provided to enable realtime visualisation of the electro-magnetic spectrum. The operator observes the wideband spectrum in the spectrogram display. Zoom and cursor functionalities provide a rough estimation of signals' characteristics. The operator selects Signals Of Interest directly in the online spectrogram for live decoding and audio monitoring, or recording for classification and technical analysis with the related narrowband analysis software.
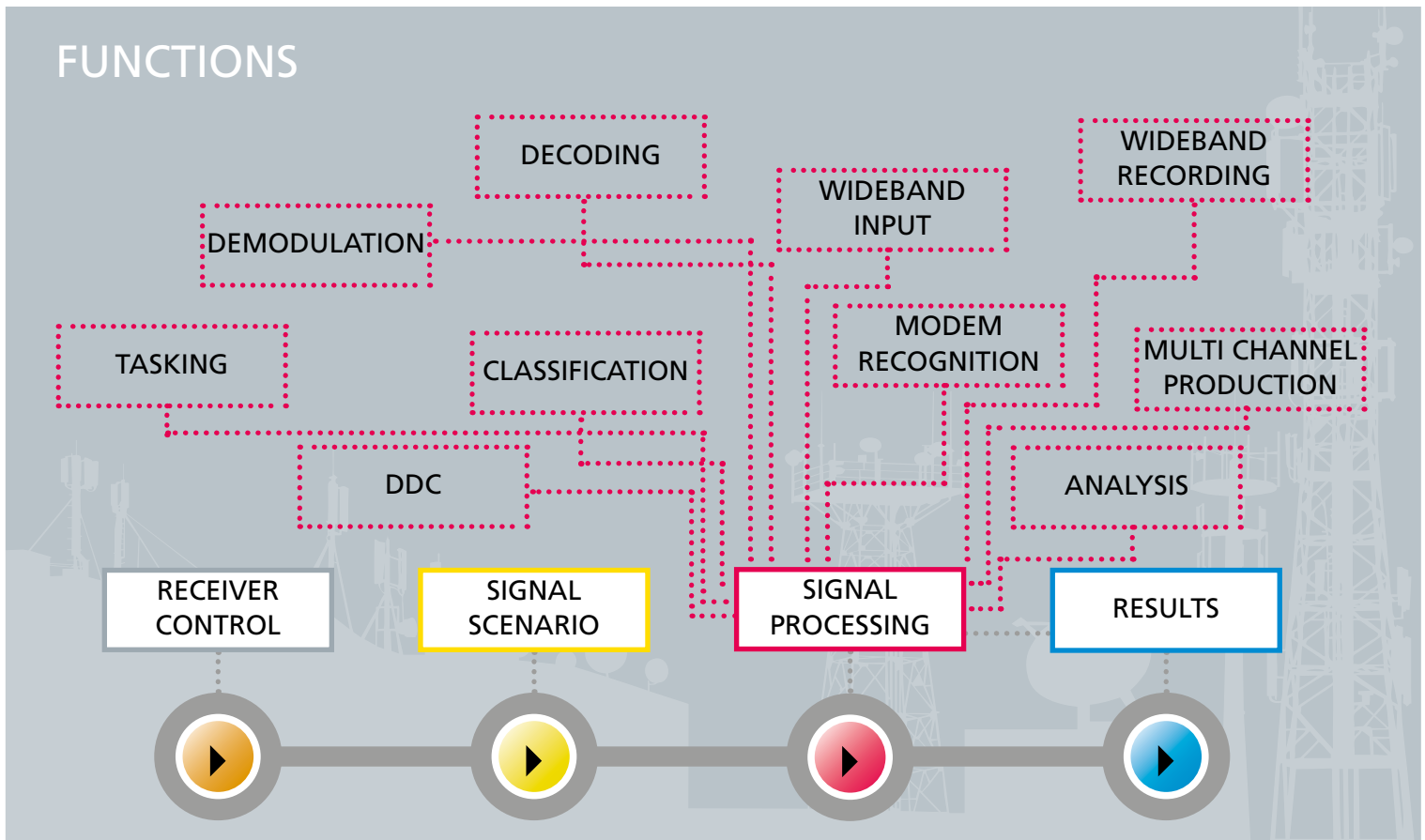
Recording and Offline Analysis of Frequency Ranges and Sub-Bands

Recording of frequency ranges can be triggered by system events, parametrized as time based tasks or started manually by an operator. For evaluation, the operator uses an offline spectrogram for rapid overview and navigation within the recorded spectrum bandwidth. Specific emissions can be easily selected and highlighted and a description and text annotation can be added. Selected signals can be exported to files or processed as signal input to external signal analysis tools.

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

DECODING

DEMODULATION

WIDEBAND
INPUT

WIDEBAND
RECORDING

TASKING

CLASSIFICATION

MODEM
RECOGNITION

MULTI CHANNEL
PRODUCTION

DDC

ANALYSIS

RECEIVER CONTROL	SIGNAL SCENARIO	SIGNAL PROCESSING	RESULTS

Functions

Signal Selection from a Wideband Input

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

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

The output of the DDC is assigned to a production channel; the DDC's user interface is updated 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 selected wideband frequency range.

Narrowband Channel Processing

Signals Of Interest can be assigned from the wideband spectrum to a production channel by drag and drop. All production channels can be reviewed in parallel and configured individually.

A production channel shows a detailed display of the selected signal. Spectrograms and spectrum displays are easily configurable.

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

Operating modes of the production channels:

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/ modem list.

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 and recognition result.
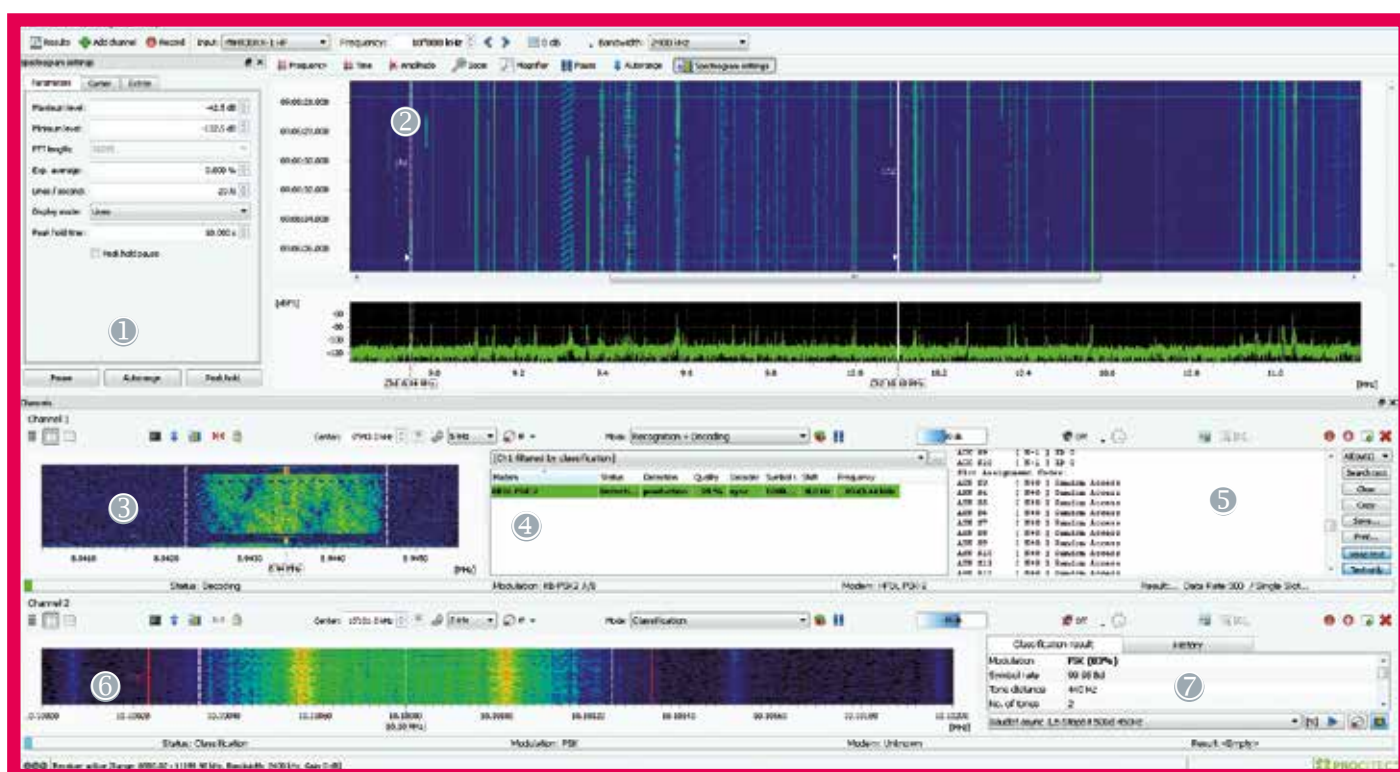
Automatic Recognition and Decoding

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, specific decoders/modems to be used are defined according to the user's mission priorities and tasking; existing classification results enhance production. go2DECODE can be used for analysis and creation of customer specific decoders by using the DDL/pyDDL programming language; these customer- derived decoders can be used directly in go2MONITOR.

Results Processing and Export

The ResultViewer shows all collected results in tabular or graphical representation. Results can be filtered, sorted, grouped, marked, audio-monitored, viewed, edited and exported. All results are stored in a database for post-processing, analysis and reporting.

① Configuration of wideband spectrogram
② Wideband input 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: Identified 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 input 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 by drag and drop to a production channel to start production of the signal
④ List of mission/task-specific decoders/modems for automatic modem recognition
⑤ After automatic 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 operates in manual mode with wideband and narrowband classifiers, automatic decoder/modem recognition and content decoding.

1. Monitoring of a wideband input requires the processing of many signals at the same time. The Wideband Classifier function assists automatic detection and classification of all signals. The resulting emission list provides a quick and easy overview to the operator.

2. The operator simply selects a signal in the emission list to start further signal processing. Narrowband Classification helps to track signal parameters in detail.

3. With the classification result, the operator gets a list of possible decoder/modem types matching the modulation type.

4. If modulation parameters are unique, the specific 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 for the signal and automatically starts the decoding of the signal content. Internal signal buffers and processing faster than realtime assure that no bit is lost (decoding of the first bit) even during tracking of signal changes.

Automatic Mode with Tasking

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

Automatic monitoring and tasking option 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 in 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, if GPS location is available)
- Signal energy found
- Modulation type recognized
- Modulation parameters
- Modem recognized

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

- Alert (send network notification to an external system)
- Record signal (Narrowband or wideband)
- 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
- 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 ensures that go2MONITOR can interface to third-party software without modification.
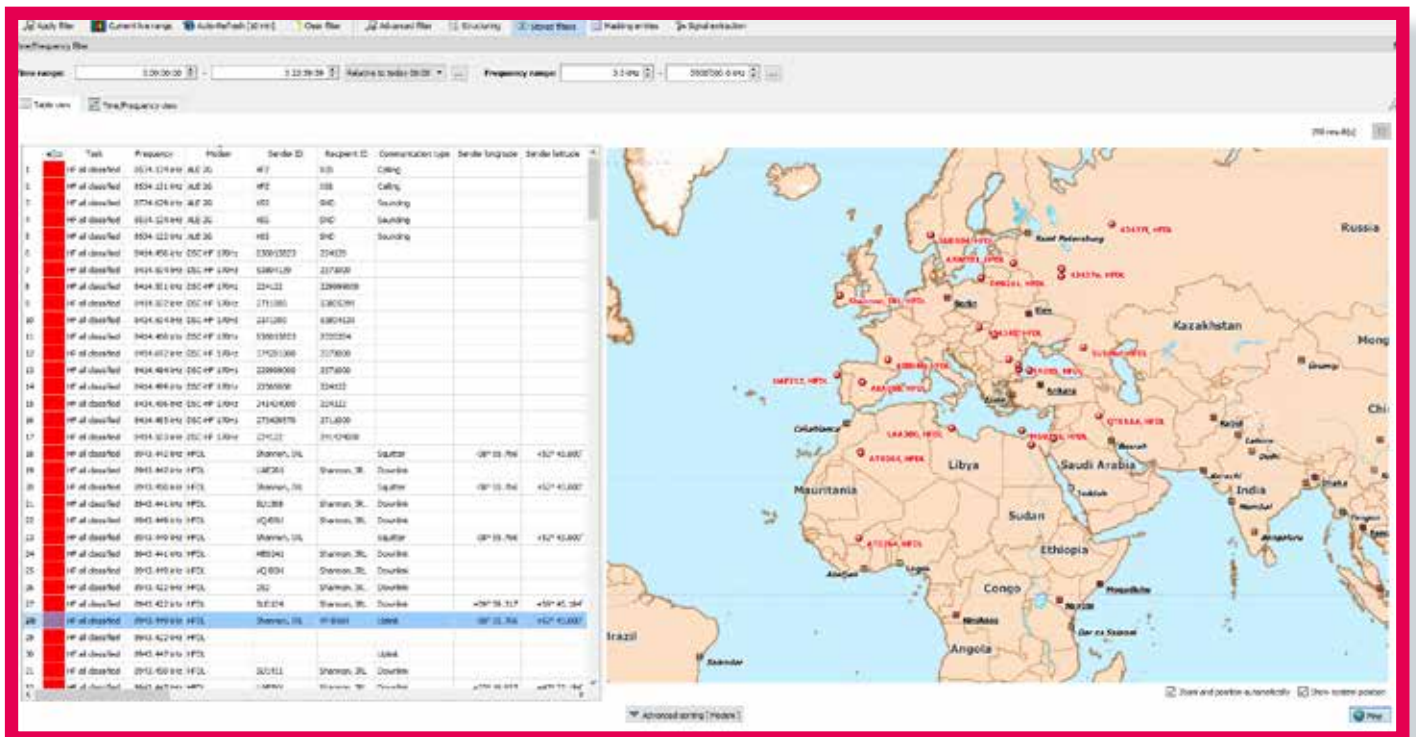
ResultViewer showing metadata extracted and decoded transmission locations plotted to map
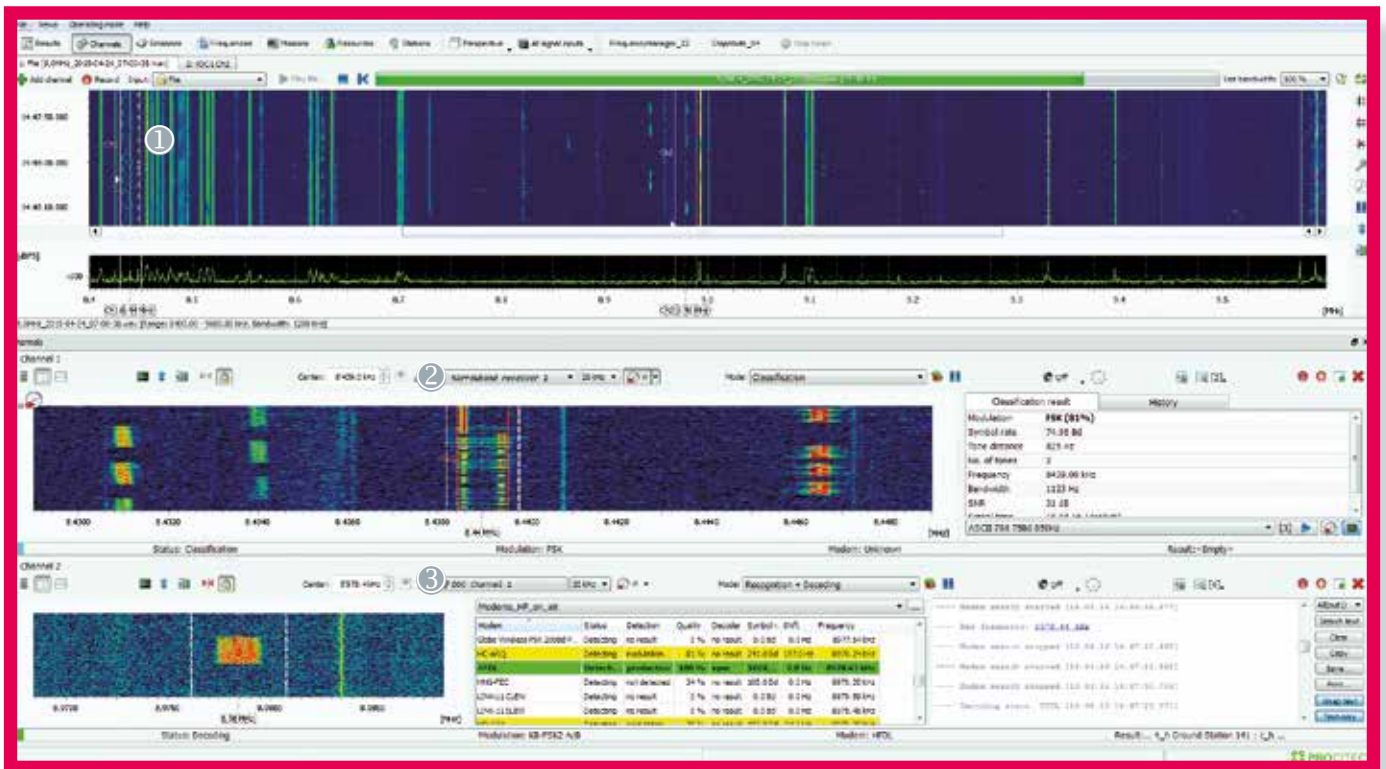
Seamless usage of DDC channels and narrowband receivers:

① Wideband input 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 use 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 hand-off function. The bandwidth 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 narrowband 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. In addition to the recording of 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. From the wideband recordings narrowband signals can be selected and extracted.

Extracted signals can be used as new inputs to go2MONITOR or for further signals development, e.g. analysis with go2DECODE.

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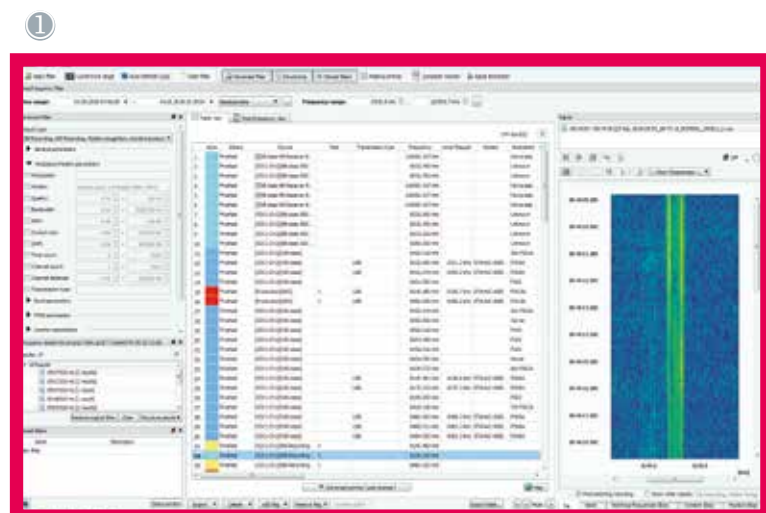
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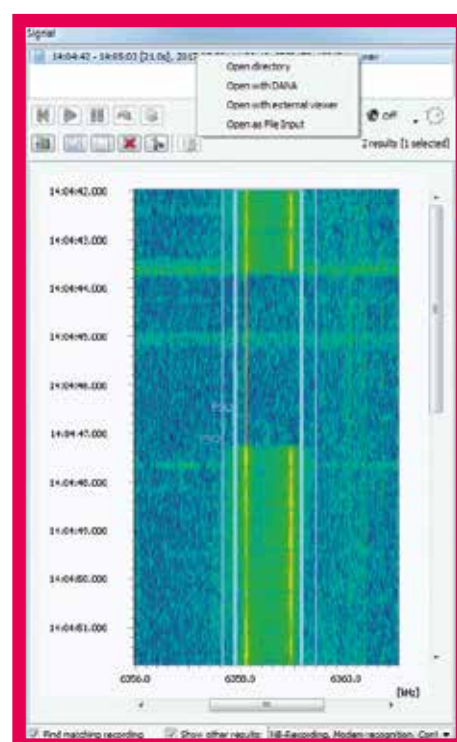
① ResultViewer - Main Window: All views are implemented as docking windows and can be freely positioned or dragged out of the ResultViewer as floating windows. Configuration of views will be stored and reused in the next session.
② ResultViewer - Signal View: Clicking on a file will show it in the spectrogram preview.

RESULT VIEWER

Recordings can be extracted in the spectrogram of the signal view for selected time/frequency ranges and for results. The time/frequency ranges of mouse selection areas and of results are extracted into a new narrowband recording, with either the wideband- or narrowband recording being used as the source of extraction. The extracted recordings will be added to the database as new results. After completion of the extraction the new results can be viewed in the Signal view spectrogram as well as in the Table view of the ResultViewer.
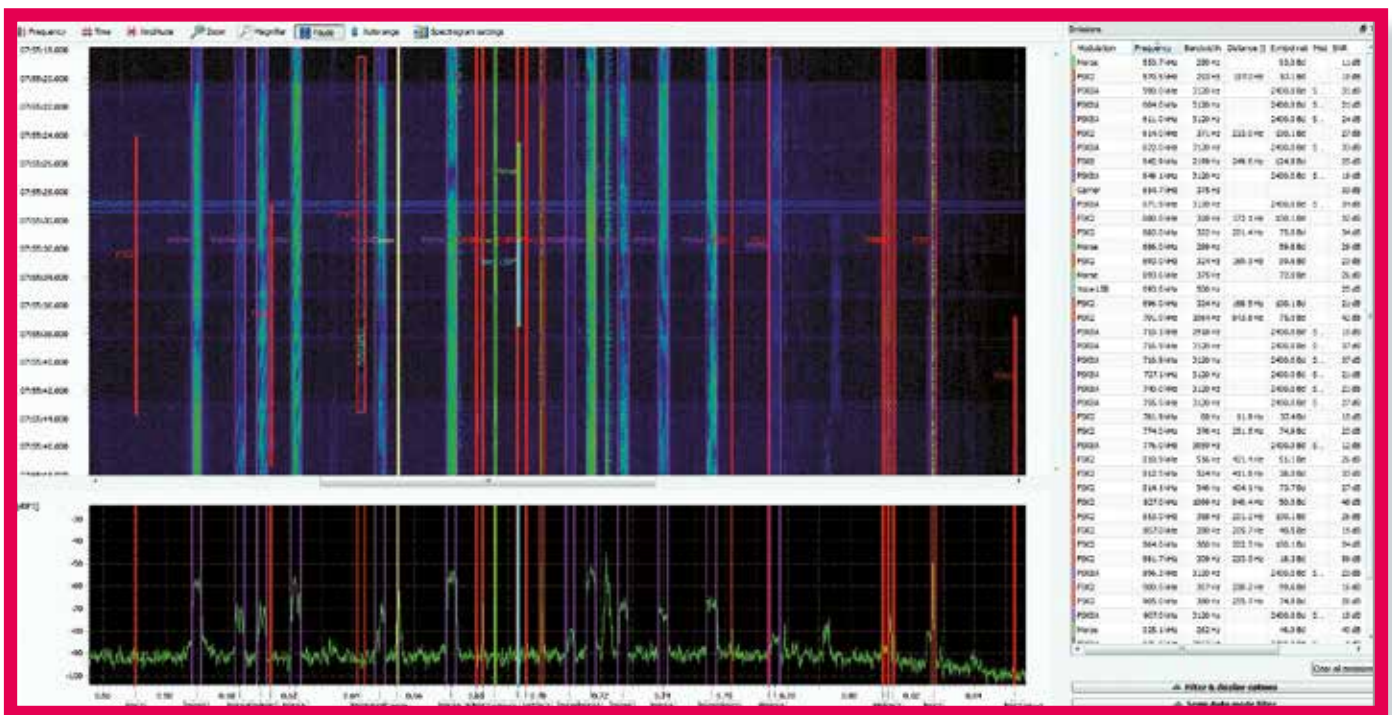
Wideband classifier

Wideband Analysis Functions

Wideband Modulation Classification

The option "Wideband input 20 MHz" extends the signal input bandwidth for the continuous and snapshot classification up to 2.4 MHz in HF or 20 MHz in V/UHF. It is possible to automatically detect, measure and determine RF parameters for all signals in the selected 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. Therefore, 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 this 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 first recorded to a signal file and then processed with the Automatic Production Channel (APC). Advantages of this technique are:
- Increase of overall system throughput
- Automatic storage of the I&Q for each signal
- Reduction in the number of production channel licenses needed

Multiple Wideband Signal Input

Control multiple wideband receivers using the same GUI

go2MONITOR can control multiple wideband receivers (including those manufactured by different manufacturers) using the same go2MONITOR user interface. The user no longer needs to alternate between different receiver GUIs, but can use 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 Power Spectral Density (PSD) data) from modern digital receivers are now available within go2MONITOR.

Wideband input overview display shows
① Wideband spectrum 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 coherent (1 MHz in basic version) Digital AF recordings (complex WAV 8, 16, 32 Bit) 2 wideband inputs in parallel. Other configurations on request
Localization	English or German; Others on request
Documentation	PDF Online-Help
Recommended PC hardware	Min. Intel i5 4 Core, 2 GHz, 8 GB RAM for 4 channels version Min. Intel i7 8 Core, 2 GHz, 16 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 SP1 (with Microsoft Windows patch KB2999226) / 10 de/en, 64 bit, Linux (CentOS 7.5) 64 bit
ISO 9001:2015	Company is certified
License	USB-Dongle (CodeMeter) License sharing with license server The AMBE+2™ voice coding Technology embodied in this product is protected by intellectual property rights including patent rights, copyrights and trade secrets of Digital Voice Systems, Inc. This voice coding Technology is licensed solely for use within this Licensed Product. The user of this Technology is explicitly prohibited from attempting to extract, remove, decompile, reverse engineer, or disassemble the object code, or in any other way convert the Object Code into a human-readable form. US Patent Nos. #8,595,002, #8,359,197, #8,315,860, #8,200,497, #7,970,606, #6,912,495 B2, #6,199,037.

Features

Software Feature	Remarks
Alphabets	Can be added to the decoder, freely configurable Requires go2DECODE
Classifier	1 MHz bandwidth (up to 2.4 HF/ 20 MHz V/U/SHF with option WCL) Manually triggered or repetitive snapshots (at 10, 20,… . sec intervals) or continuous (with option AMT)
Channels/ 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 (first bit) No loss of data during analyzing and protocol changes Python language based Decoder Description Language (DDL/pyDDL) 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 Supports multiple monitors Drag-and-drop of frequencies, classifier results, stations Receiver control Wideband input spectrogram and spectrum Manual channel control Resultviewer 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/IF (WAV 8, 16, 32 Bit and TCI cap format)
Input TCP/IP Streaming	Generic PROCITEC/PLATH format VITA 49 PXGF

The performance of our software products depends on the hardware used. Technical parameters can differ under real operational conditions. The parameters specified are limit values that cannot be guaranteed in all combinations. Specifications subject to change.

Features

Software Feature	Remarks
Option *: AMT Automatic Monitoring and Tasking	Full automatic task 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 5 / 10 or 20 MHz	Continuous classifier emission tracking (only if AMT option available) Wideband spectrogram display (HF / V/ U/ SHF): 1 / 5 MHz or 1 / 10 MHz or 2.4 / 20 MHz Wideband classification (HF / V/ U/ SHF): 1 / 5 MHz or 1 / 10 MHz or 2.4 / 20 MHz Delivered as a complete package with server and receiver
Option *: WMPC Wideband Multi Production Channels 16 or 32	Extends the number of channels in steps of 16 or 32 Each channel supports DDC, demodulation, decoding, narrowband classifier and narrowband recording functionality Easy overview over decoded, classified or recorded signals
Option* : WBR Wideband Recording 5 / 10 or 20 MHz	Lossless recording of up to 5 / 10 or 20 MHz 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 AMT) Delivered as a complete package with server and receiver
Option*: Hopper Detection	Recognition and recording of hopper signals in 20 MHz (option WCL-20 and WBR-20 are required) input bandwidth V/UHF (2.4 MHz HF) frequency range.
Option*: NCL Narrowband Classifier	Additional automatic narrowband classifiers with command line control and result interface. Each narrowband classifier (number set with license) classifies a signal in a recording parallel; the processing is performed „faster than real-time". Useful for backend integration
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
Metadata extraction	Automatic decoder output post processing with metadata extraction (sender ID, recipient ID, position, ...)
Recording	Wideband (1 MHz up to 20 MHz with option WCL and WBR) 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

* The products are configurable. The software delivered will be configured as stated in the order confirmation.

Technical Specifications

Modulation Type Classifier *				
Modulation	**Spec. general**	**Spec. HF**	**Spec. V/UHF**	**Recognition quality (Eb/No) for a detection rate > 90% and false alarms < 1%**
Max. signal bandwidth		50 kHz	50 - 300 kHz (depending on modulation type)	
Signal energy detection min. SNR		6 dB	6 dB	
Analogue modulation types		USB J3E LSB J3E AM A3E DSB-SC (optional)	USB J3E LSB J3E AM A3E NFM F3E (Radio frequency >= 25 MHz) DSB-SC (optional)	
MORSE		30 - 250 CPM	30 - 250 CPM	
FSK 2	m = 1 - 10	25 - 4800 Bd	1.2 - 25 kBd	11 - 15 dB
FSK 2	m = 0.75 - 1.5		25 - 75 kBd	>= 25 dB
FSK 4		25 - 4800 Bd	1.2 - 25 kBd	11 - 15 dB
MSK	m = 0.5	100 - 4800 Bd	1.2 - 125 kBd	14 - 16 dB
GMSK	m = 0.5	300 - 4800 Bd	1.2 - 125 kBd	14 - 16 dB
Multitone FSKn	5 - 64 tones (shift > sr)	3 - 200 ms (5 - 330 Bd)	3 - 200 ms (5 - 330 Bd)	14 - 16 dB
(D)PSK 2 A/B		31.25 - 4800 Bd	1.2 - 125 kBd	7 - 10 dB, A/B Decision: 8 - 15 dB
(D)PSK 4 A/B		31.25 - 4800 Bd	1.2 - 125 kBd	8 - 12 dB, A/B Decision: 10 - 15 dB
(D)PSK 8 A/B		31.25 - 4800 Bd	1.2 - 125 kBd	HF: 8 - 12 dB, A/B Decision: 10 - 15 dB V/UHF: 10 - 14 dB, A/B Decision: 12 - 15 dB
PSK 16		300 - 4800 Bd	1.2 - 125 kBd	14 - 16 dB
Multichannel (D)PSK 2, 4 A/B	max. 10 kHz signal bandwidth; 2 - 64 channels	50 - 300 Hz channel spacing	50 - 300 Hz channel spacing	13 - 15 dB
OFDM	25 - 512 channels	25 - 200 Bd 30 - 250 Hz channel spacing	25 - 200 Bd 30 - 250 Hz channel spacing	14 - 18 dB
QAM	Order: 16, 32, 64	1600 - 4800Bd	1.6 - 25 kBd	22 dB
ASK 2/4			1.2 - 25 kBd Radio frequency: >= 300 MHz	20 dB
MCFSK2	Modulation index ≥ 1; 2 - 64 channels	40 - 250 Bd 120 - 1000 Hz channel spacing	40 - 250 Bd 120 - 1000 Hz channel spacing	17 dB
WFM (FM Broadcast only)			Radio frequency: 65 MHz - 108 MHz Bandwidth 50 kHz - 300 kHz	
OTH Radar		Detection only		FM-CW variants only
* Measurement interval 4 sec				

Modem Classifier

HF/VUHF	PMR	MIL (Decoder Option MIL needed)
ACARS-VHF	APCO-25	ALE 3G
CODAN 3212 16 Channel PSK	APCO-25 Phase 2 Downlink	CHN 4+4
CODAN 3012 16 Channel PSK	DMR	CHN hybrid
HFDL	DMR Continuous	CIS-45 (33 / 45 Bd)
PACTOR (I, II, II FEC, III, 4)	dPMR	CIS-60
VDL2	D-STAR	CIS-93
	GSM (<3G)	CIS-112
	Inmarsat Satphone Uplink	CIS-128
	Iridium Satphone Uplink	LINK11 (CLEW)
	MPT1327 1200Bd MSK	LINK 11 (SLEW)
	NXDN 2400 Bd	MIL-STD-188-110A Serial (single-tone) mode (a.k.a. STANAG 4539)
	NXDN 4800 Bd	MIL-STD-188-110B/C App. C (a.k.a. STANAG 4539 HDR)
	TETRA Downlink	STANAG 4285/4481 (PSK)
	TETRA Uplink	STANAG 4529
	TETRAPOL	STANAG 4539
	Thuraya Satphone Uplink	
	Yaesu System Fusion	

Measured Modulation Type Parameters

Parameter	Description	OFDM	Carrier	FSK	MFSK	MSK	CW	PSK	MCPSK	QAM	ASK	MCFSK	Voice	FM Broadcast	Unknown
Modulation	The type of modulation and its quality	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	The number of phase shifts / levels							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
Number of tones				x	x										
Number of channels									x			x			

Technical Specifications

Supported Receivers

Receiver	Max. Rx band-width*	Spectrum overview	Scan	Windows	LINUX	Remark
AirSpy	8 MHz			X		Experimental support
CommsAudit CA7851	5 MHz			X	X	VITA 49
CommsAudit CA7852	40 MHz			X	X	VITA 49
Grintek GRX Lan	1 MHz			X		
IZT R3xxx series	20 MHz	X	X	X	X	Up to 3 channels + spectrum
IZT R4000 (SignalSuite)	1 MHz			X	X	1 channel only
Microtelecom PERSEUS	800 kHz			X		Limited USB 3.0 compatibility
narda® NRA-3000 RX	320 kHz			X	X	
narda® NRA-6000 RX	320 kHz			X	X	
narda® IDA 2	320 kHz			X	X	
narda® SignalShark® 3310	20 MHz			X	X	VITA 49
PLATH SIR 2110	20 MHz			X	X	LINUX recommended. External receiver control only
PLATH SIR 2115	4x20 MHz			X	X	External receiver control only
PLATH SIR 5110	12 MHz			X	X	16x768 kHz subbands External receiver control only
PLATH SIR 5115	Full HF			X	X	40x768 kHz subbands External receiver control only
R&S EB 500	5 MHz	X		X	X	
R&S EB 510	5 MHz			X	X	
R&S EM100 / PR100	500 kHz	X	X	X	X	
R&S ESMD	15 MHz			X	X	External receiver control only
RFSPACE NetSDR	2 MHz			X	X	
RFSPACE SDR-14	190 kHz			X		
RTLSDR/Noxon USB-sticks	3.2 MHz			X		Experimental support. Continuous signal up to 2.4 MHz
SDRplay RSP1 & RSP2	6 MHz			X		Experimental support
SignalHound BB60C	27 MHz		X	X	X	
ThinkRF R5500-408	6.25 MHz			X	X	VITA 49
ThinkRF R5500-427	6.25 MHz			X	X	VITA 49
ThinkRF WSA5000-408	780 kHz			X	X	VITA 49
ThinkRF WSA5000-427	780 kHz			X	X	VITA 49
USRP X310	20 MHz			X	X	
WiNRADiO G31DDC	800 kHz			X		
WiNRADiO G33DDC	4 MHz	X		X		
WiNRADiO G35DDC	4 MHz	X		X		
WiNRADiO G39DDC	4 MHz	X		X		Up to 2 channels + spectrum
Generic VITA 49 receiver support	Max. receiver bandwidth	X		X	X	Can be configured in a wide range for different receiver types
Other generic „Winrad ExtIO" supported receivers	Max. receiver bandwidth			X		Experimental support

* The bandwidth of the product is limited by its license/options and the maximum IQ streaming bandwidth of the receiver.

Demodulators

|				
AM / A3E	Clover 2500	FSK 2,3 auto shift	MT63	QAM 16, 32, 64, 128, 256
Analogue Selcal	Coquelet	MSK / GMSK	MultiModem	TFM3
ASK 2, 4	DPSK 2, 4, 8, 16 A/B	J3E (USB, LSB)	MultiTone (FSKn)	THROB / THROBX
ASK2PSK8	F1A	LINK11	OFDM	
ASK4PSK8	FM / F3E	MDPSK 2, 4, 8, 16 A/B	OQPSK	
Chirp	F6/F7B	MFSK 2	Pactor II, III, IV	
Clover II	FSK 2 matched	Morse	PSK 2, 4, 8, 16 A/B	
Clover 2000	FSK 2, 3, 4 disc.	MPSK 2, 4, 8, 16 A/B	PSK data aided	

Decoders

Our list of standard, military and PMR decoders is subject to continuous development.

See the current list of available decoders on our website: www.procitec.de.

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

The performance of our software products depends on the hardware used. Technical parameters can differ under real operational conditions. The parameters specified are limit values that cannot be guaranteed in all combinations. Specifications subject to change.
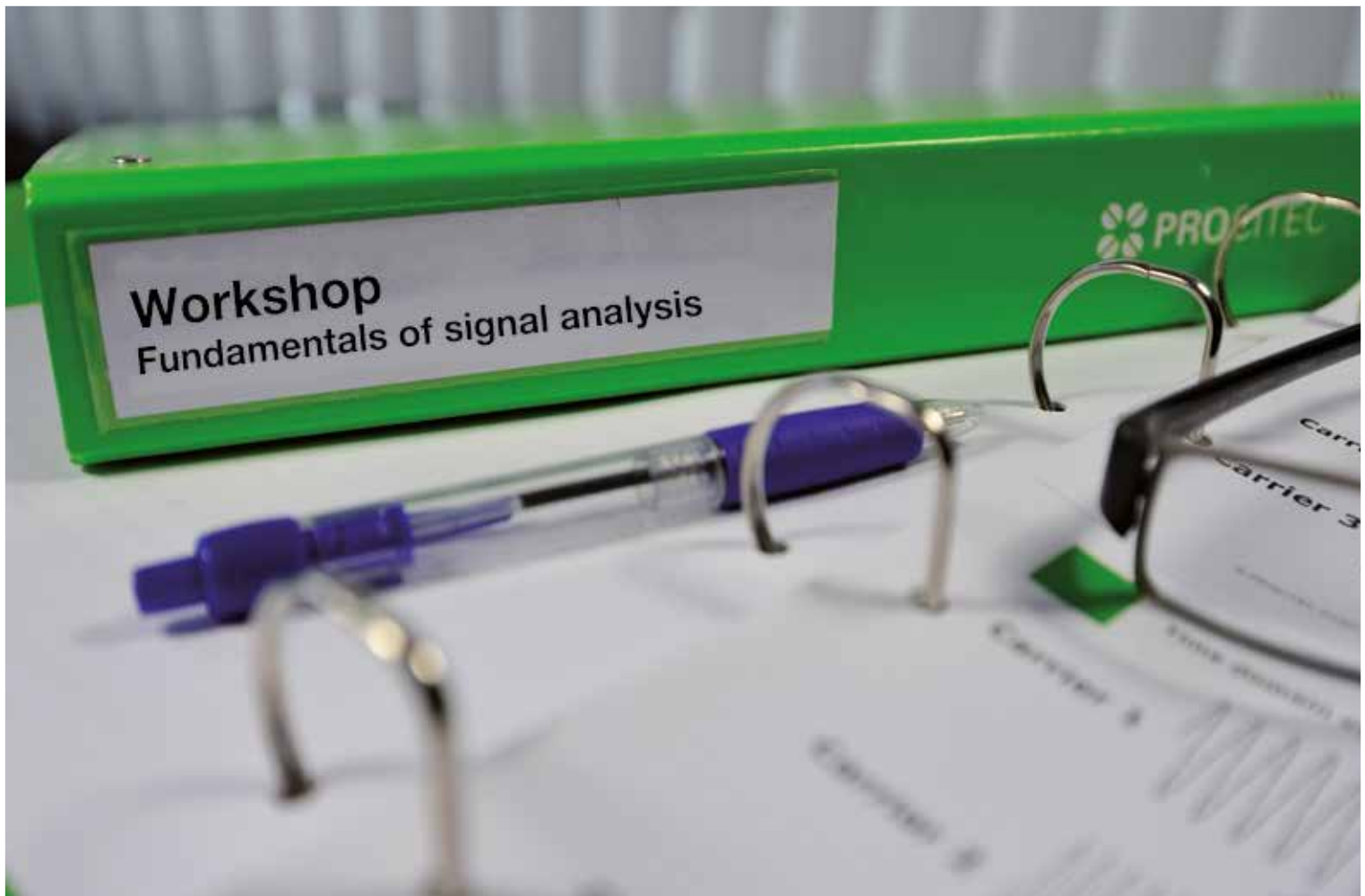
go2MONITOR Standard Operator Training

**Automatic Detection, Classification, Recognition, Decoding and Reporting
of Communications Signals using Wideband Multichannel techniques**

Our go2MONITOR Standard Operator Training Course captures the go2MONITOR host-system's complete signal flow from connected receiver or sensor to the content of the processed radio signals. We place particular emphasis on the efficient and task-orientated application of the available go2MONITOR features and resources to ensure rapid assimilation of information and successful application of the presented instructions by the Students.

Course content:
 -Introduction to go2MONITOR operational usage
 -Host Receiver or Sensor control
 -Wideband spectrum analysis and classification of signals
  within the RF spectrum
 -Narrowband multichannel signal processing (auto-
  processing signals, classification, demodulation, decoding)
 -Display of results (temporal, spectral, merger of raw data
  and content output)
 -Transfer from manual to automatic mode, creation of
  automated tasks (where applicable)
 -Lectures and practical exercises

Target Audience:
Spectrum Monitoring and Policing Operatives, and Communications Surveillance and Intelligence System Operators

 For further information please contact our sales team sales@procitec.com.

go2**SIGNALS**

PROCITEC® SOFTWARE

go2DECODE

go2MONITOR

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Software
Bundesverband
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100%
Service
Quality
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TÜV
SÜD
ISO 9001

Management System
ISO 9001:2015