

WAVECOM® W-SPECTRA-LAN



W-SPECTRA-LAN offers all the functions of a complete mobile wideband automatic spectrum monitoring system W-SPECTRA plus all advantages of a compact and powerful computer system. The system is implemented in a ruggedized aluminium box with fanless cooling. W-SPECTRA-LAN delivers a modern complete solution in radio monitoring with various interfaces in hardware and software.

W-SPECTRA-LAN

Complete Mobile Automatic Spectrum Monitoring System

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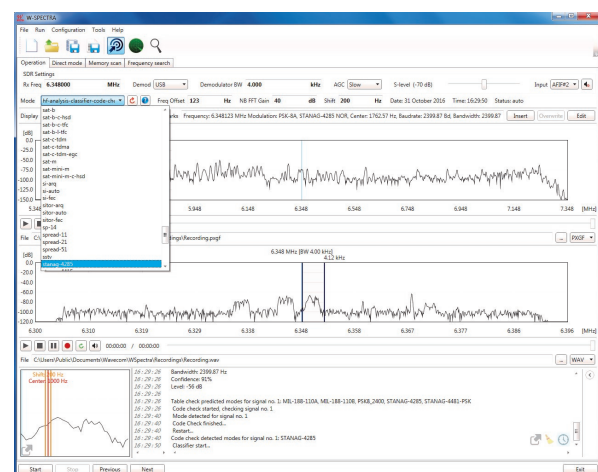
W-SPECTRA-LAN Main Features and Facts — I

W-SPECTRA-LAN system provides:

- ◆ Comprehensive real-time radio spectrum monitoring functions.
- ◆ Intuitive graphical user interface: main operation tab covers all online monitoring activities.
- ◆ Built-in bi-directional control of receivers (W-PCIe receiver and WiNRADiO G3xDDC)
- ◆ Three monitoring modes: Direct Mode, Memory Scan and Frequency Search.
- ◆ More than 220 mode decoders and protocols over ELF to SHF as in Wavecom standard decoders, e.g., W-CODE.
- ◆ Automatic demodulation and decoding to the content level (text, live voice or image etc.) of signals.
- ◆ Automatic search, signal detection, classification and code check of signals over a user-defined frequency range and search strategy.
- ◆ Automatic or manual capturing of results into a database.
- ◆ Database in XML format, providing easy processing by third-party applications.
- ◆ Wideband (2 MHz) and narrowband (96 kHz) FFT and sonagram display.
- ◆ Wideband and narrowband IQ signal recording and playback, preferably using the built-in 1 TB solid state disk (SSD).
- ◆ On-the-fly signal recording with various important side information (meta-data) such as receiver frequency and timestamp for complete investigation of the whole spectrum.
- ◆ W-SPECTRA-LAN can be connected to a PC or notebook via LAN or can operate as a stand alone system. As the W-SPECTRA-LAN operates from 9-30 V DC power sources, it is well suited for mobile use.
- ◆ Powerful host PC enables individual configuration of components for radio monitoring and decoding according to customer's requirements.
- ◆ The host computer is in a ruggedized aluminium box. The cableless construction enables an easy plug-in of extension components and cards.
- ◆ With the fanless cooling system W-SPECTRA-LAN is well suitable to work in an adverse environment.



W-SPECTRA-LAN: complete real-time radio spectrum monitoring system on a compact and powerful computer



W-SPECTRA GUI Operation tab, running more than 220 decoders manually or automatically

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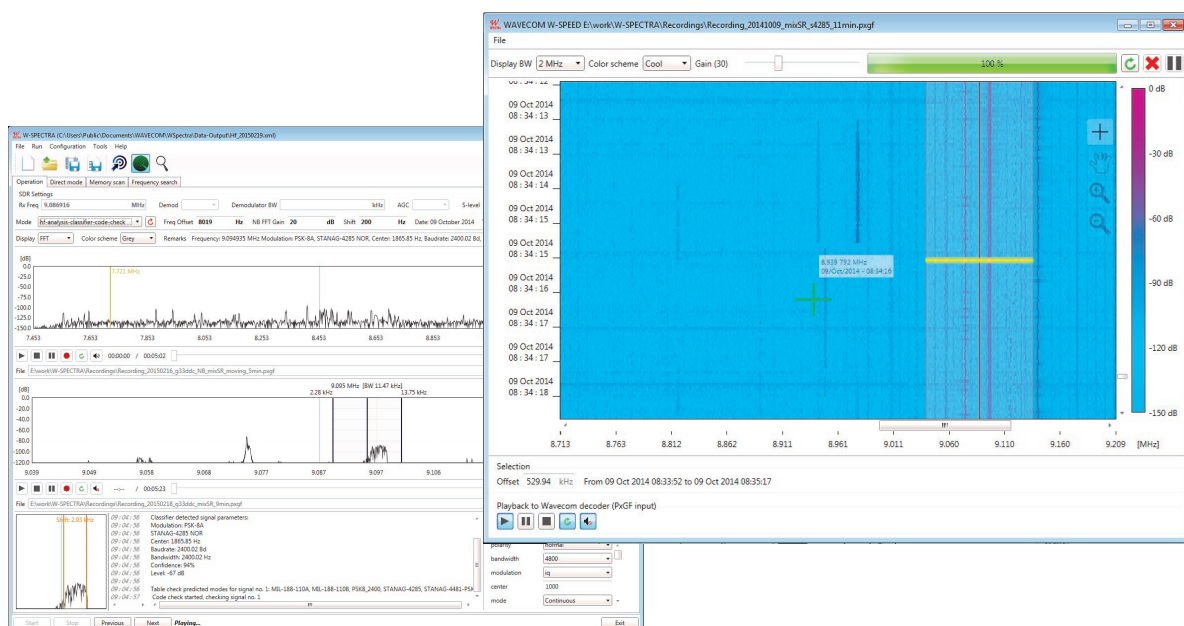
W-SPECTRA-LAN Main Features and Facts — II

W-SPECTRA-LAN system provides further:

- ◆ Instantaneous display of receiver frequency and timestamp. On-the-fly adaptation of the recording bandwidth during playback.
- ◆ Wideband spectrum editing (W-SPEED): sonagram display of a recording, free navigation over the whole sonagram with spot display of spectrum information: absolute receiver frequency and recording timestamp.
- ◆ Detail investigation of a recording: Zoom view into a sonagram. Select a signal anywhere (in time and frequency domains) from a recording for classification and decoding in W-SPECTRA and other Wavecom decoders.
- ◆ A file splitter to divide a big recording into consecutive files with reasonable size
- ◆ A recording converter to convert a WAV file into PXGF format with on-the-fly meta-data.

Frequency	Mode	Offset	Shift	Remarks	Date & Time	Baudrate	Modulation	Operator	Callign	Location	Frame
16.120000 MHz	HF-analysis-classifier-code-check 0 Hz	849 Hz		Modulation: F1B, Center: 2086.33 Hz... Signal #1: predicted model(s)...	10 Nov 2014 13:11:52	50 Bd	F1B				
16.204000 MHz	HF-analysis-classifier-code-check 0 Hz	201 Hz		Modulation: F1B, Center: 2086.83 Hz... Signal #1: predicted model(s)...	10 Nov 2014 13:13:45	50 Bd	F1B				
16.236000 MHz	HF-analysis-classifier-code-check 0 Hz	196 Hz		Modulation: F1B, Center: 2086.89 Hz... Signal #1: predicted model(s)...	10 Nov 2014 13:17:07	50 Bd	F1B				
16.328000 MHz	HF-analysis-classifier-code-check 0 Hz			Modulation: CW, auto, Center: 2086.82 Hz... Signal #1: predicted model(s)...	10 Nov 2014 13:21:18	7 Bd	CW, auto				
16.332000 MHz	HF-analysis-classifier-code-check 0 Hz			Modulation: CW, man, Center: 2086.56 Hz... Signal #1: predicted model(s)...	10 Nov 2014 13:21:28	6 Bd	CW, man				
16.804000 MHz	HF-analysis-classifier-code-check 0 Hz	199 Hz		Modulation: F1B, Center: 3999.42 Hz... Signal #1: predicted model(s)...	10 Nov 2014 13:41:10	75 Bd	F1B				
12.564029 MHz	HF-analysis-classifier-code-check 3883 Hz			Rx freq 12.564029 MHz Modulation: PSK-BA... Table check predicted modes for signal no. 1...	11 Nov 2014 14:48:53	2400 Bd	PSK-BA, STANAG-4285 NOR				
12.039082 MHz	HF-analysis-classifier	-4115 Hz		Rx freq 12.039082 MHz Modulation: AM... Modulation: AM, Center: 11.84 Hz... Modulation: VQCE AM (AM Subcarrier: 0.00... Modulation: VQCE USB (USB)...	11 Nov 2014 14:49:50	2400 Bd	AM				
10.501113 MHz	HF-analysis-classifier	-209 Hz	103 Hz	Rx freq 10.501113 MHz Modulation: PSK-BA... Modulation: PSK-BA, Center: 11.84 Hz...	11 Nov 2014 14:53:43	120 Bd	PSK-BA, CFS-12 NOR (USB)				
10.501113 MHz	HF-analysis-classifier	788 Hz	103 Hz	Rx freq 10.501113 MHz Modulation: PSK-BA... Modulation: PSK-BA, Center: 11.84 Hz...	11 Nov 2014 14:53:47	120 Bd	PSK-BA, CFS-12 NOR (USB)				
10.501113 MHz	HF-analysis-classifier	788 Hz	103 Hz	Rx freq 10.501113 MHz Modulation: PSK-BA... Modulation: PSK-BA, Center: 11.84 Hz...	11 Nov 2014 14:54:17	2400 Bd	PSK-BA, STANAG-4285 NOR (USB)				
10.090000 MHz	HF-analysis-classifier	289 Hz	448 Hz	Rx freq 10.090000 MHz Modulation: F1B... Modulation: F1B, Center: 11.84 Hz...	08 Oct 2014 11:09:28	50 Bd	F1B				

Automatic insertion of results into a database



Zoom-in sonagram display of a recording with W-SPEED. Spot display of receiver frequency and recording timestamp. Select a signal and classification in W-SPECTRA

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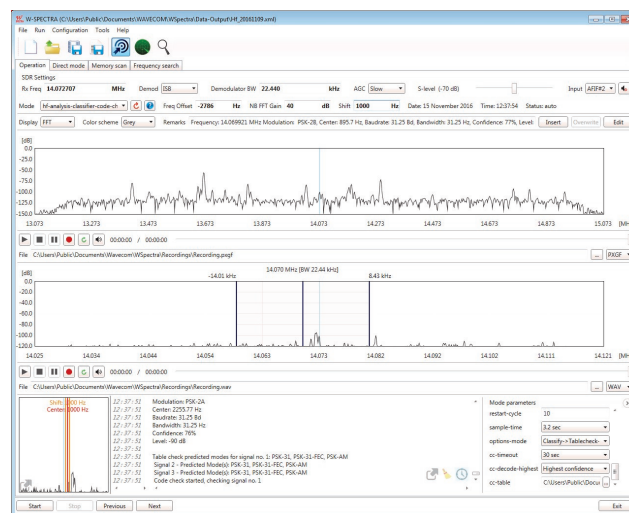
Typical Configuration

W-SPECTRA connects to Wavecom native W-PCle receiver or a third-party Software Defined Radio (SDR) and takes over its full control.

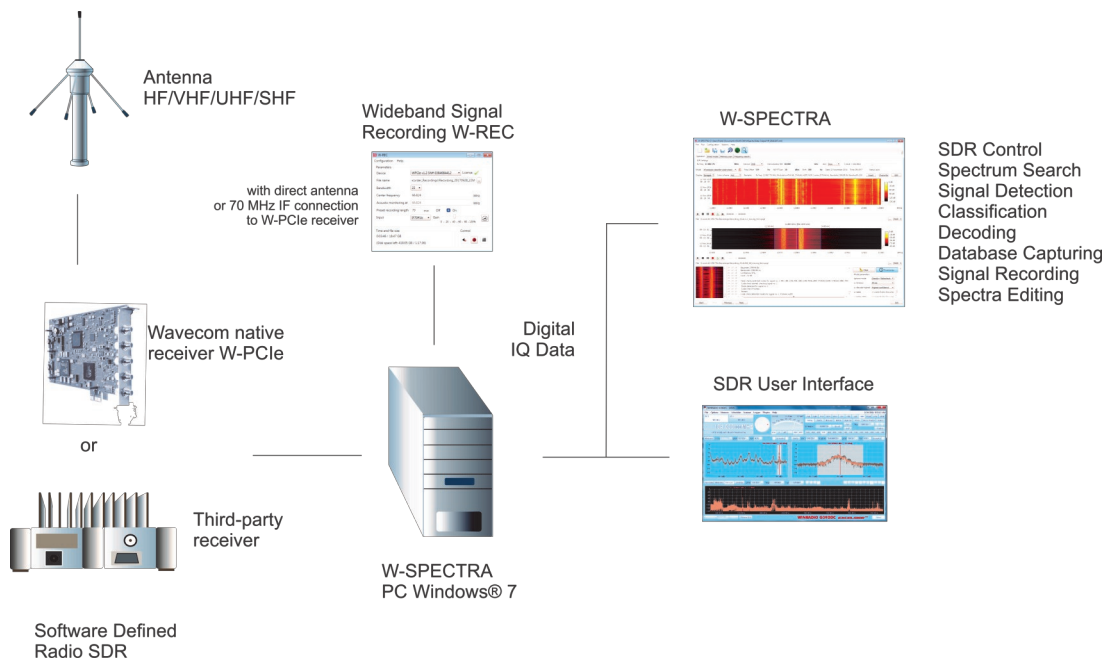
A built-in mass storage device (e.g., an SSD) can be used by W-SPECTRA for wideband IQ signal recording.

The "Operation" tab in the W-SPECTRA GUI contains *four* parts. All the monitoring activities are covered in this tab.

- ◆ Receiver control: allows the setting of receiver frequency, demodulator and bandwidth etc.
 - ◆ Wideband spectrum display (2 MHz) with IQ signal recording and playback.
 - ◆ Narrowband spectrum display (96 kHz) with IQ signal recording and playback.
 - ◆ Classification and decoding result display
- W-SPECTRA can work in three modes: *Direct Mode*, *Memory Scan* and *Frequency Search*.



W-SPECTRA Operation GUI contains four parts



Example setup of a monitoring system with W-SPECTRA-LAN

Direct (Built-in) Receiver Control

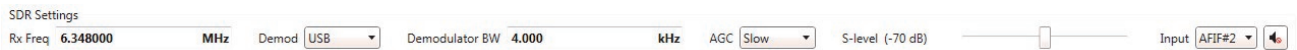
At start-up W-SPECTRA connects to the Wavecom native W-PCIe receiver and a third-party receiver (e.g., WiNRADiO G3xDDC) and assumes full control.

The connection is bi-directional. Users may set the receiver frequency, demodulator, demodulator bandwidth, AGC, squelch level and antenna input directly in the W-SPECTRA GUI. This will

then reflect to the SDR GUI and vice-versa.

With the speaker button the user can output the demodulated signal to the speaker for acoustic monitoring purpose.

The Demodulator BW determines the bandwidth of the narrowband spectrum display.



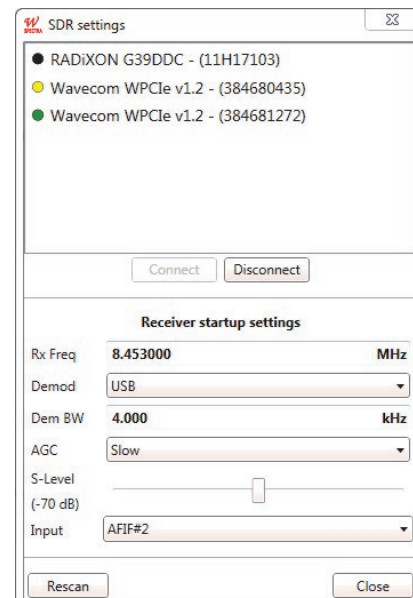
Bi-directional receiver (SDR) control

With the “SDR settings” GUI W-SPECTRA can

- ◆ configure the connection behavior to a receiver at start: preset the receiver frequency, demodulator bandwidth, AGC and squelch level
- ◆ recheck if a receiver is still online by Rescan and
- ◆ connect and disconnect a receiver during running.

Three color indicators mean

- ◆ Yellow: the receiver is running properly and ready for connection to W-SPECTRA.
- ◆ Green: the receiver is now connected to W-SPECTRA and works properly or
- ◆ Black: the receiver is not running (offline).



SDR settings GUI

Wideband (WB) and Narrowband (NB) Spectrum Display and Media Player/Recorder

There are two spectrum displays in W-SPECTRA: wideband and narrowband. They have the following characteristics and capabilities:

- ◆ The wideband display is 2 MHz wide. It corresponds to the DDC1 of the receiver.
- ◆ A wideband recording of the DDC1 IQ signal in PXGF format with on-the-fly side information such as receiver frequency, bandwidth and timestamp.
- ◆ The narrowband spectrum display corresponds to the DDC2 of the receiver. Its bandwidth can be 24, 48 or 96 kHz and is coupled with the SDR demodulator BW.
- ◆ The narrowband spectrum display contains a Spectrum Analysis (W-SA) function, which will detect and mark all signals in the display band.
- ◆ A narrowband recording of the DDC2 IQ signal (96 kHz) in PXGF or .wav format.
- ◆ Playback of a recording in both Media Players. The signal is classified or decoded in W-SPECTRA.
- ◆ The wideband display enables the selection of any 96 kHz band from a WB recording for classification and decoding.
- ◆ Playback is running in real-time.
- ◆ The recorded side information (Rx Freq and timestamp) is displayed instantaneously in the main GUI Operation tab.
- ◆ The playback progress cursor can be moved to any position of the recording, providing forward and backward traversing of the signal.
- ◆ The signal can be output to the speaker for sound monitoring purpose.



Wideband (2 MHz) and narrowband (96 kHz) spectrum and media player/recorder. Spectrum Analysis (W-SA) detects and marks all signals in the narrowband spectrum and display the signal details in the text output window below.



Only make recordings on a built-in storage medium (e.g., built-in harddisk or SSD). Don't use external USB harddisk, nor over the network, because the max. speed of external devices may be insufficient for the wideband recording.

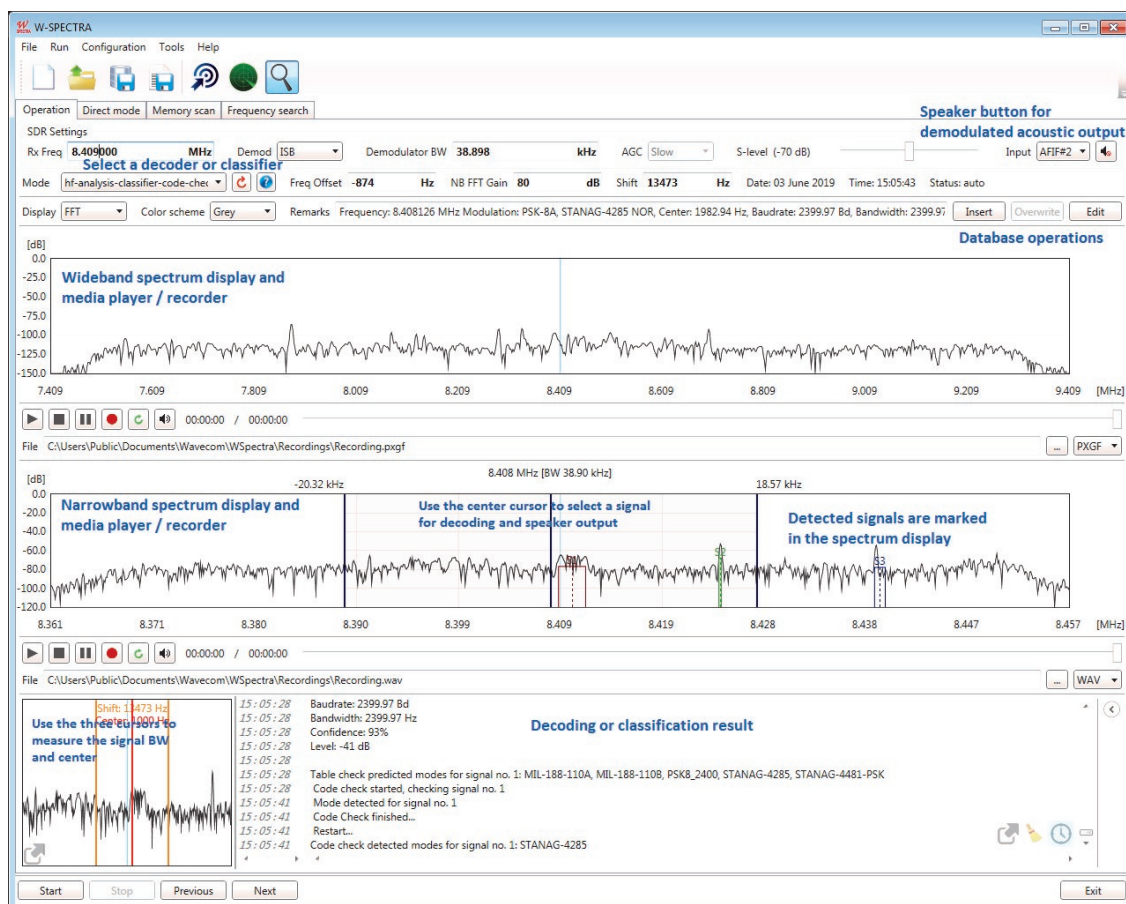
Three Operation Modes: Direct Mode, Memory Scan and Frequency Search

W-SPECTRA works in three operation modes: Direct Mode, Memory Scan and Frequency Search.

- ◆ A decoder or classifier can be set manually or automatically to process the signal selected by the middle cursor of the NB spectrum display. Results are displayed in the lower part of the GUI.
- ◆ All the three modes can work in a manual or

automatic way. Four buttons (Start, Stop, Previous and Next) control the work flow.

- ◆ In each mode W-SPECTRA opens a database with a user defined template to record classification and decoding results.
- ◆ A small tuning FFT at the lower left corner can be used to measure the signal width.



W-SPECTRA GUI Operation tab (with comment)

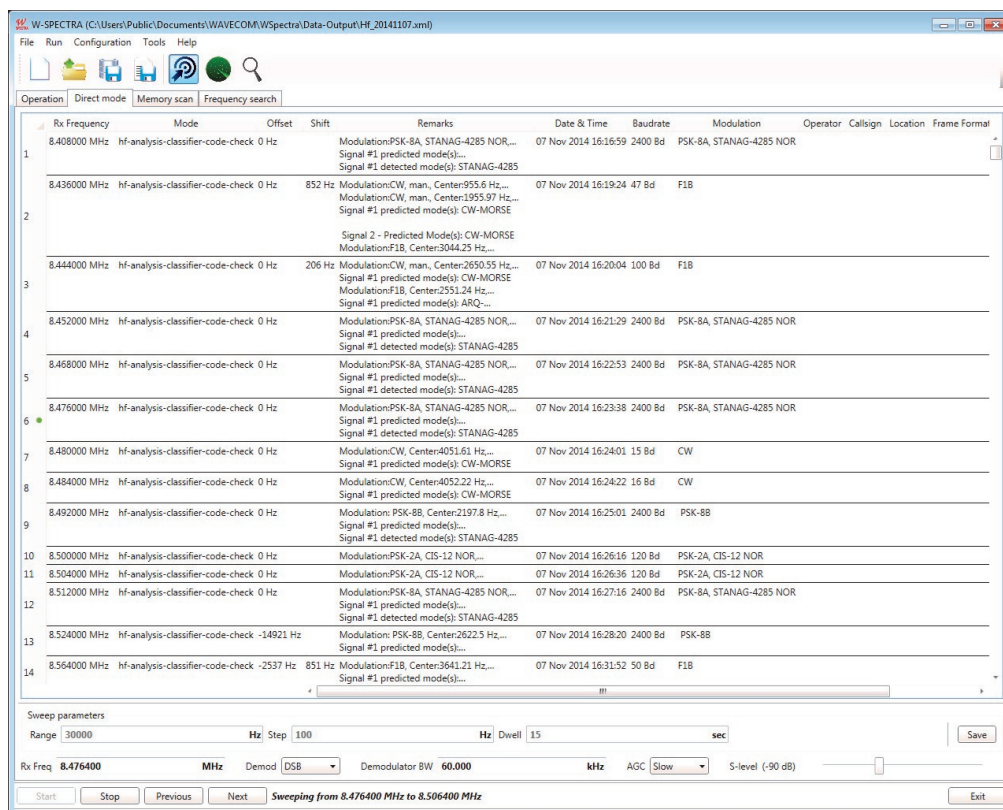
Direct Mode: First Things First to Begin Spectrum Monitoring

W-SPECTRA Direct Mode is designed for a user to begin the spectrum monitoring in a manual way.

- ♦ The user can set the receiver frequency manually and turn on the classifier or a decoder to monitor and decode a signal.
- ♦ The user can open a database in the “Direct Mode” tab and manually insert results.
- ♦ Direct Mode can also run automatically to sweep the spectrum in a small range so that a signal can be fine tuned to the spectrum middle.

There are four buttons in the last line of the GUI which have the following function:

- ♦ Start button: starts the sweep function. The receiver will jump to the next frequency according to the Step size and Dwell period.
- ♦ Stop button: stops the sweep function.
- ♦ Previous and Next buttons: jump manually to the previous and next frequency respectively according to the Step size.



Direct Mode tab with database and sweep parameters setting

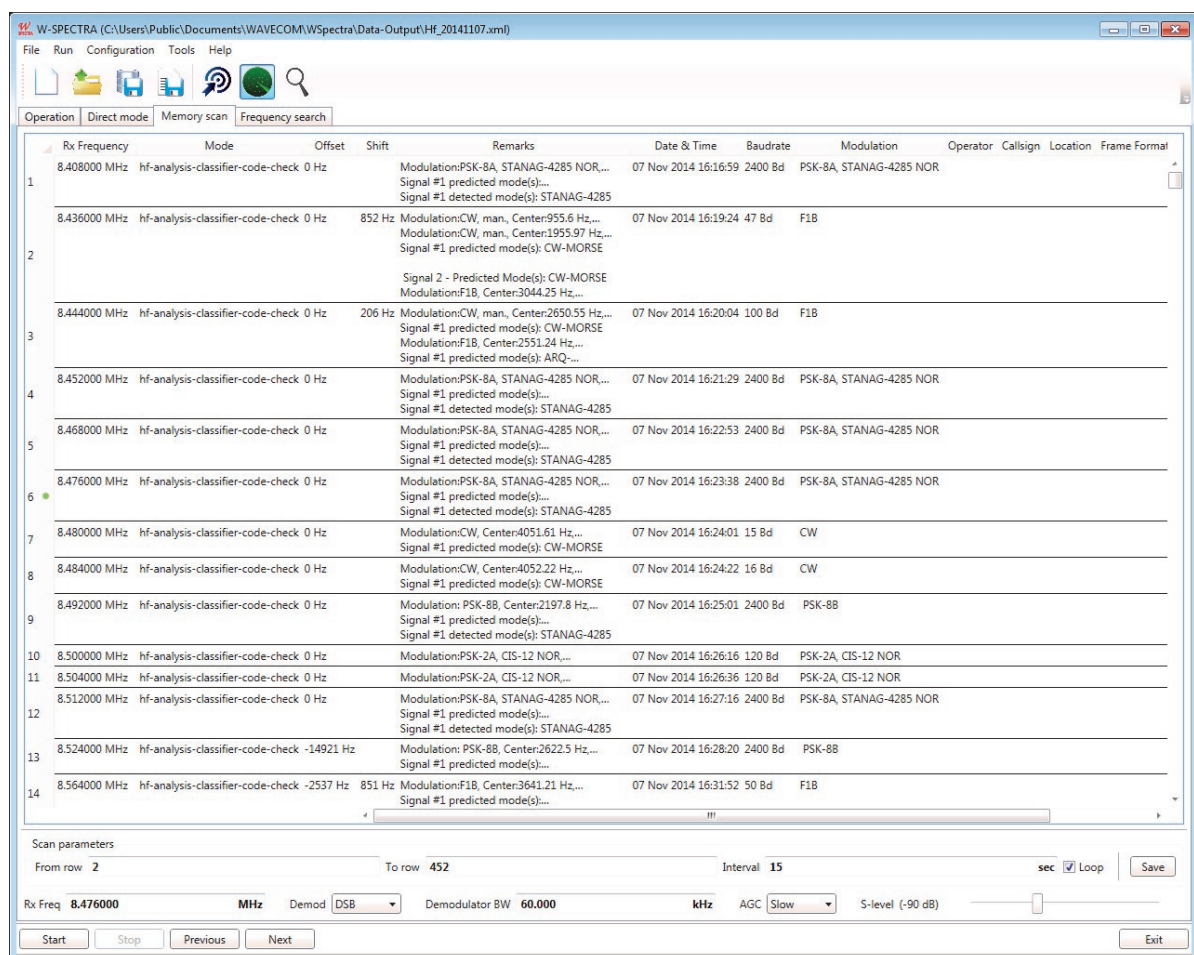
Memory Scan: Spectrum Monitoring and Verification

W-SPECTRA runs in Memory Scan mode over an existing database. Each database entry sets the receiver (SDR) and the decoder or classifier accordingly. In this way the spectrum is revisited and verified. The user may insert a new entry into the database or just overwrite the old one.

The four buttons in the last line of the GUI have

the following functions:

- ◆ Start button: starts the memory scan from the first database entry and jump to the next one after an Interval period.
- ◆ Stop button: stops the memory scan function.
- ◆ Previous and Next buttons: manually jump to the previous and next database entry respectively.



Memory Scan mode with a database and scan parameters setting

Frequency Search: Automatic Spectrum Monitoring and Database Capturing

With the Frequency Search mode W-SPECTRA can scan over an entire frequency band, e.g., the HF band (3 — 30 MHz), run a classifier and code check (with different search strategies), search for signals and record the classification results into the database automatically.

The four buttons in the last line of the GUI have the following function:

- ◆ Start button: starts the frequency search from

the first frequency defined and jump to the next frequency (+ Step) after an Interval period.

- ◆ Stop button: stops the frequency search function.
- ◆ Previous and Next buttons: manually jump to the previous and next frequency respectively according to the Step size.

The screenshot shows the W-SPECTRA software interface in Frequency Search mode. The main window displays a table of search results with columns: Rx Frequency, Mode, Offset, Shift, Remarks, Date & Time, Baudrate, Modulation, Operator, Callsign, Location, and Frame. The table lists various signals detected, including PSK-8A, PSK-2A, and PSK-8B. Below the table, the 'Search parameters' section is visible, showing settings for frequency range (6.000000 to 20.000000 MHz), step (1000.000 Hz), interval (15 Hz), and search strategy (hf-analysis-classifier-code-check [Classify]). The 'Start' button is highlighted.

Frequency Search mode with a database and search parameters setting



Recommended configuration and typical search results on page 21.

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Scan Delay in Automatic Modes

ered. In this way W-SPECTRA delivers more precise, stable and reliable monitoring results. This method applies to all three operation modes: Direct Mode, Memory Scan and Frequency Search.

Powerful spectrum analysis and classification unit — The brain of W-SPECTRA

W-Spectrum Analysis (W-SA) W-Classifier (W-CL) detects and measures the following signal

- ◆ Modulation type
- ◆ Baud rate or symbol rate, up to 60 kBd
- ◆ Signal center frequency
- ◆ Number of carriers



Automatic Signal Detection, Classification and Decoding

- ◆ Frequency shift or signal bandwidth
- ◆ Carrier spacing or distance
- ◆ CW-Morse detection
- ◆ Voice detection AM, FM, USB and LSB

All signals within the classifier bandwidth (up to 96 kHz) are detected and analyzed in one shot — multiple signal classification.

The Classifier-Code-Check (CCC) is a versatile analysis tool for the classification of known and unknown signals and the determination of the mode in use. The CCC attempts to process all signals within the bandwidth of the classifier. The classifier attempts to classify the input signals according to their modulation formats. The table

check will check the signal against the entries of the selected mode list. The code check attempts to synchronize against classified modes, finally the signal will be forwarded to a decoder for output.

A CCC Table Editor (under the menu Addons) allows extending, modifying or deleting records in the table used for mode look-up. An input template containing all important parameters is

available for each modulation type. All parameters, the record name and the file name are user selectable.

CCC Table HF 2012.02.25 - CCC Editor

Name	Decoder	Modulation	Subcarrier	Baud / Symbol...	Shift	Bandwidth	No. of Tones	No. of Carriers	Spacing	Pilot Frequency	Code
FSK_800_500	no-mode	FSK		800	500	*	2				
FSK_81.9_145	no-mode	FSK		81.9	136	*	2				
FSK_81.9_145	no-mode	FSK		81.9	145	*	2				
G-TOR	g-tor	FSK		100	170	*	2				2
G-TOR	g-tor	FSK		100	200	*	2				2
G-TOR	g-tor	FSK		200	170	*	2				2
G-TOR	g-tor	FSK		200	200	*	2				2
G-TOR	g-tor	FSK		300	200	*	2				2
G-TOR	g-tor	FSK		300	170	*	2				2
GMDSS/DSC-HF	dsc-hf	FSK		100	170	*	2				1
GW-FSK	gw-fsk	FSK		100	200	*	2				5
GW-FSK	gw-fsk	FSK		200	200	*	2				5
GW-OFDM	gw-ofdm	OFDM	PSK-4	62.5				12 (min.11)	62.5		5
GW-OFDM	gw-ofdm	OFDM	PSK-4	62.5				14 (min.13)	62.5		5
GW-OFDM	gw-ofdm	OFDM	PSK-4	62.5				16 (min.15)	62.5		5
GW-OFDM	gw-ofdm	OFDM	PSK-4	62.5				18 (min.17)	62.5		5
GW-OFDM	gw-ofdm	OFDM	PSK-4	62.5				20 (min.19)	62.5		5
GW-OFDM	gw-ofdm	OFDM	PSK-4	62.5				22 (min.21)	62.5		5
GW-OFDM	gw-ofdm	OFDM	PSK-4	62.5				24 (min.23)	62.5		5
GW-OFDM	gw-ofdm	OFDM	PSK-4	62.5				26 (min.25)	62.5		5
GW-OFDM	gw-ofdm	OFDM	PSK-4	62.5				28 (min.27)	62.5		5
GW-OFDM	gw-ofdm	OFDM	PSK-4	62.5				30 (min.29)	62.5		5
GW-OFDM	gw-ofdm	OFDM	PSK-4	62.5				32 (min.31)	62.5		5
GW-PSK	gw-psk	PSK-4		200							5
GW-PSK	gw-psk	PSK-8		200							5
HC-ARQ	hc-arq	FSK		240	200	*	2				5
HELL-80	fm-hell	FSK		245	490	*	2				1
HF-ACARS	hf-acars	PSK-2		1800							2
HF-ACARS	hf-acars	PSK-4		1800							2
HF-ACARS	hf-acars	PSK-8		1800							2

Classifier Code Check table editor

Database Define and Check

W-SPECTRA records classification and decoding results into a database. The database is in XML format, which allows easy access by a third-party program. The user can define a database template according to his needs. Each database template contains 8 mandatory fields:

- ♦ Rx Frequency
- ♦ Mode: decoder, classifier or code check running in W-SPECTRA
- ♦ Offset: offset of the middle cursor in the NB spectrum display, used to place a signal in the bandwidth
- ♦ Center: center of a signal, relative to the center of the narrowband spectrum display
- ♦ Bandwidth: bandwidth of a signal
- ♦ Shift: shift of a signal, equals to bandwidth

in most case

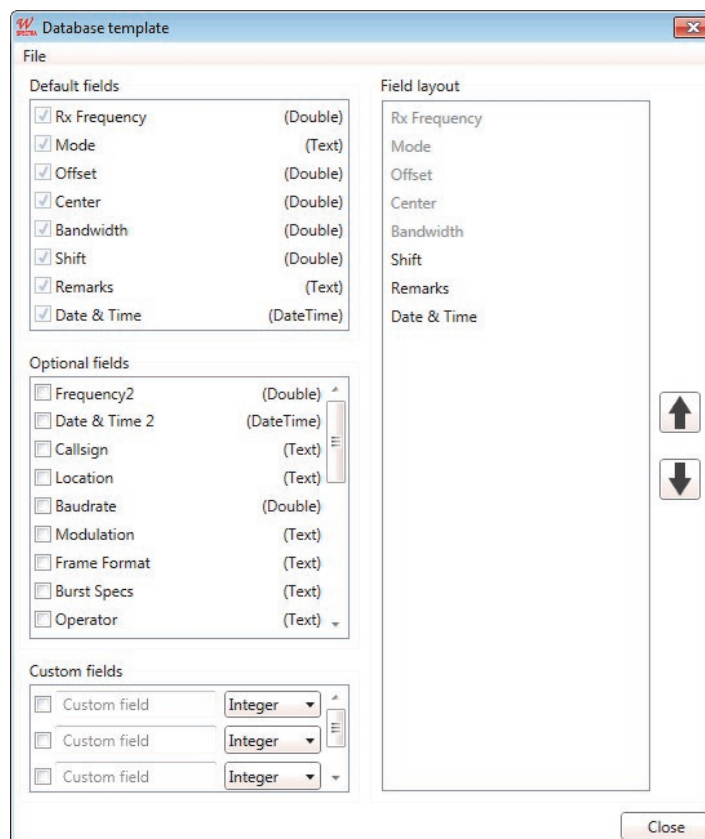
- ♦ Remarks: classification code check result automatically filled or free text manually editable
- ♦ Date & Time: date and time when the record is inserted into the database

All the mandatory fields are accessible in the main GUI "Operation" tab.

The user can extend the template by choosing up to 23 predefined optional fields and defining up to 3 custom fields.

W-SPECTRA can verify the database integrity by

- ♦ removing empty entries and
- ♦ removing duplicate entries when all data fields have the identical content.



Customize a database template

Spectra Editing (W-SPEED) — I

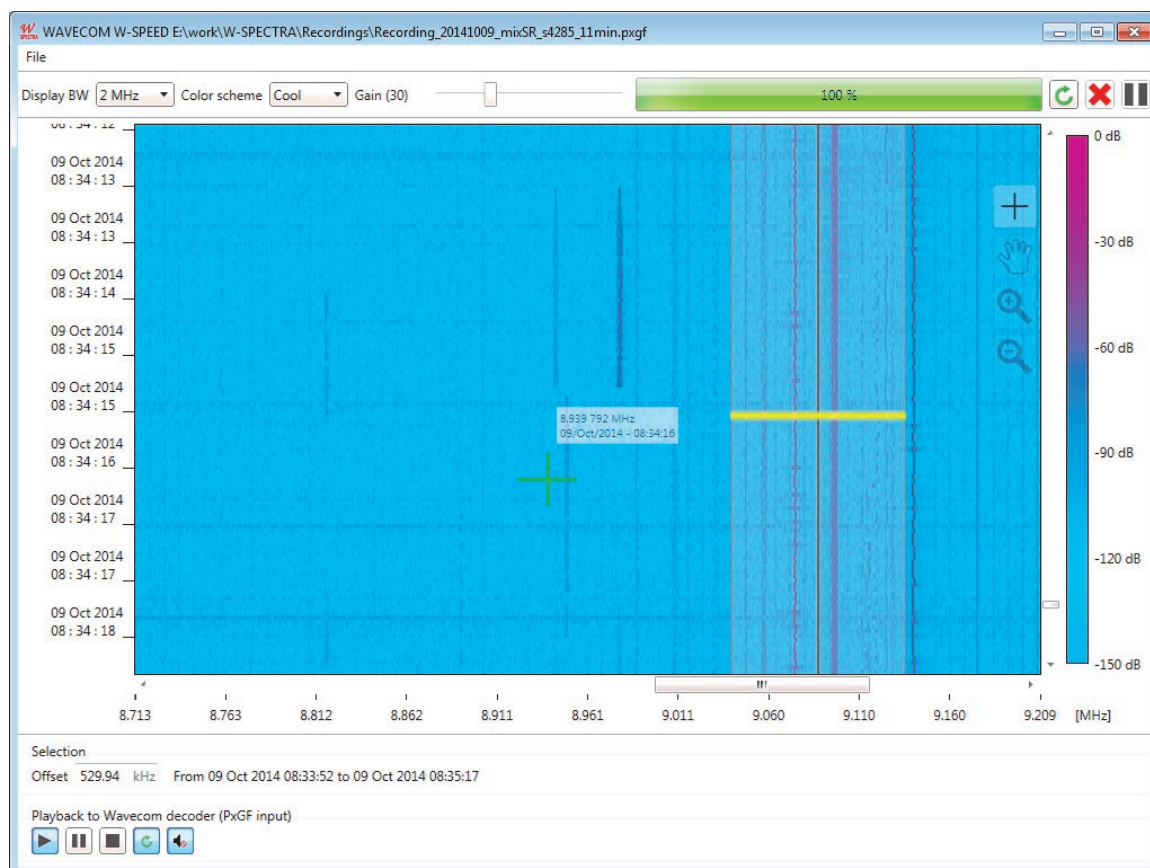
W-SPECTRA performs online monitoring of signals within a 96 kHz bandwidth of the receiver frequency. For spectrum outside this bandwidth the user can make a wideband (2 MHz) IQ signal recording with various side information. The recording is made in PXGF format.

The entire recorded spectrum can be displayed as a sonagram and analysed (classified and decoded) using the wideband Spectra Editing (W-SPEED) tool. The main features of W-SPEED are:

- ◆ It displays an IQ recording in a 2-dimensional sonagram (frequency and time domains) with selectable display bandwidths from 250 kHz to 30 MHz, with 2 MHz as default. The X-axis

is labeled with the absolute receiver frequency when it is not changed through the whole recording; otherwise it is labeled with the relative frequency of \pm half of the display bandwidth. The Y-axis is labeled with the recording timestamp.

- ◆ A spot display (a cross cursor) shows the absolute receiver frequency and the recording timestamp anywhere in the sonagram.
- ◆ Zoom-in (max. 32 times) displays the sonagram with the max. resolution of 60 Hz each FFT point (pixel).



Display a recording in the Spectra Editing Tool (W-SPEED). The X and Y-axis are labeled with the absolute Rx frequency and the recording timestamp, respectively. Spot display, zoom-in function and free navigation of the entire sonagram

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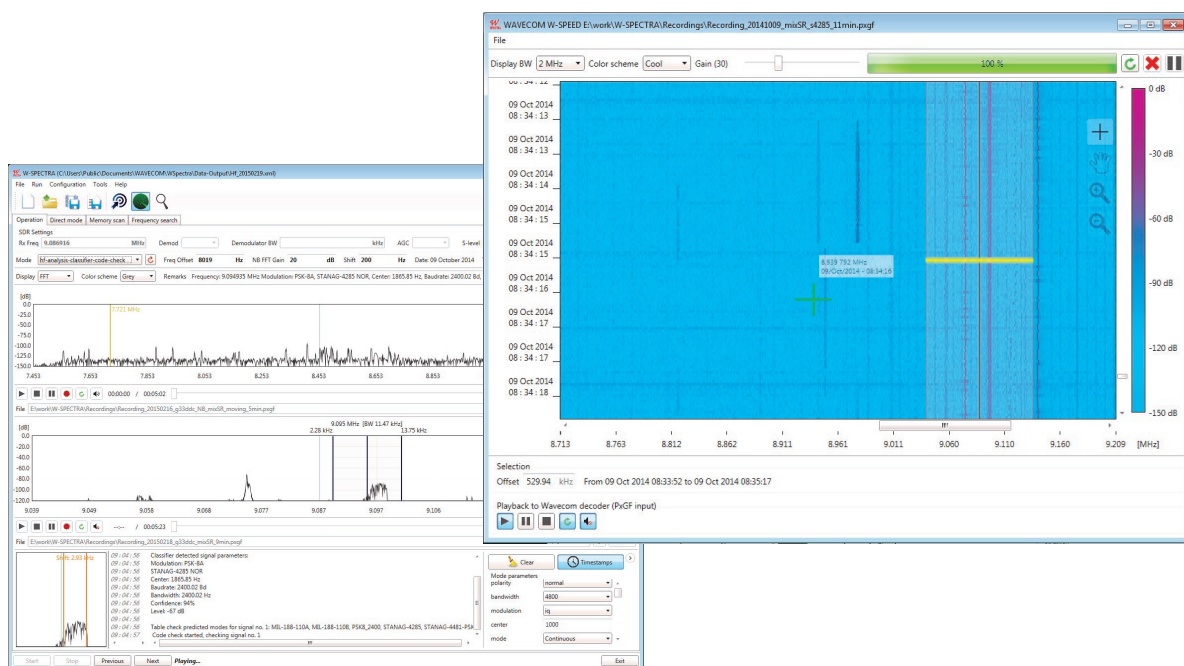
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Spectra Editing (W-SPEED) — II

With W-SPEED the user can perform detail analysis and investigation on interesting signals.

- ◆ Two dimensional free navigation and positioning over the entire sonagram.
- ◆ The user can choose an interesting signal by marking it with a rectangular stripe (width 96 kHz) in time and frequency domains.
- ◆ The user can playback the selected signal to W-SPECTRA or other Wavecom decoders for afterwards classification and decoding.
- ◆ The playback displays the instantaneous side information (receiver frequency and recording timestamp) in the W-SPECTRA main GUI “Operation” tab.
- ◆ During the playback W-SPEED outputs the signal to the speaker for acoustic monitoring purpose.



Use W-SPEED to cut out an interesting signal for detail processing in W-SPECTRA

Technical Data and Overall Software Characteristics

Receiver Control

- ◆ Support Wavecom W-PCIe receiver and WiNRADiO G3xDDC (e.g., G33DDC and G39DDC)
- ◆ Bi-directional control of the receiver
- ◆ Spectrum display wideband (up to 2 MHz) and narrowband (96 kHz) signals and process of them

W-SPECTRA Operation Modes

	Direct Mode	Memory Scan	Frequency Search
Description	Classify and decode a signal by setting a receiver frequency manually. Use „Sweep“ mode to catch a signal in a small range	Rescan and verify signals according to database entries. New result can be inserted into the database	Automatic search signals (detect, classify and code check) over a predefined frequency band according to a search strategy. Results automatically inserted into a database
Start button	Start to sweep over a defined frequency range	Start to rescan the spectrum according to the database entries	Start to search signals in a wide range of frequency
Stop button	Stop sweeping	Stop rescan	Stop searching signals
Previous button	Jump to the previous frequency according to the step size	Jump to the previous database entry	Jump to the previous frequency according to the step size
Next button	Jump to the next frequency according to the step size	Jump to the next database entry	Jump to the next frequency according to the step size
Default (recommended) values	Sweep range: 3000 Hz Step size: 100 Hz Dwell period: 1 sec	Time interval: 15 sec	Step size: 1000 Hz Time interval: 15 sec

Decoder Modes in W-SPECTRA

All HF, VHF/UHF, SHF and SATELLITE modes as in Wavecom decoders (see modes list on pages 20 and 21).

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Signal Recording and Playback

Media Player / Recorder	Wideband	Narrowband
Recording format	IQ PXGF	IQ PXGF and WAV
Bandwidth	Up to 2 MHz	96 kHz
Bits per sample	16 bits each I and Q	32 bits each I and Q
On the fly side information	Receiver frequency (Rx Freq), recording bandwidth and timestamp	Receiver frequency (Rx Freq), recording bandwidth and timestamp in PXGF format
Playback	<ul style="list-style-type: none"> ◆ WB spectrum display with side information ◆ A selected 96 kHz band displayed in NB spectrum and processed by the classifier or decoder ◆ Signal output to speaker for acoustic monitoring 	<ul style="list-style-type: none"> ◆ Signal displayed in NB spectrum with side information ◆ Selected signal processed by the classifier or decoder ◆ Signal output to speaker for acoustic monitoring
Typical recording size	<ul style="list-style-type: none"> ◆ 0.5 Gigabytes for 1 minute ◆ 30 Gigabytes for 1 hour ◆ 720 Gigabytes for 1 day (24 hours) 	<ul style="list-style-type: none"> ◆ 46 MB for 1 minute ◆ 2.7 Gigabytes for 1 hour ◆ 66 Gigabytes for 1 day (24 hours)

Spectra Editing Tool (W-SPEED)

Sonagram bandwidth	250 kHz, 500 kHz, 1 MHz, 1.5 MHz, 2 MHz, 4 MHz, 8 MHz, 10 MHz, 12 MHz, 16 MHz, 24 MHz or 30 MHz. Default 2 MHz
Axis label	X-axis labeled as the absolute receiver (Rx) frequency when it is not changed in the whole recording, otherwise it is labeled as the relative frequency +/- half of the display bandwidth Y-axis labeled with the recording timestamp
Spot display	Instantaneous display of the Rx frequency and recording timestamp when a cross cursor is moved over the entire sonagram
Zoom-in	Maximum zoom-in of 32 times makes the max. visible frequency resolution of 60 Hz.
Free navigation	Two-dimensional free navigation and positioning over the entire sonagram
Select a signal and process	Mark a 96 kHz wide stripe over an interesting signal and send it to W-SPECTRA or other Wavecom decoders for detail processing

Recording Splitter Tool

- ◆ Split a PXGF recording into max. 10 equal size recording files
- ◆ The minimum size of recordings after split is 1 GB
- ◆ The minimum size of a recording which can be split is 2 GB

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W-Classifier-WB Technical Data

Bandwidth HF/VHF/UHF/SHF	500 Hz to 96 kHz (complex: 160 kHz)
Sampling interval (Ts)	1.6 sec or 3.2 sec
FSK	30 Bd to 60 kBd, Shift \leq 30 kHz Modulation index: $m = 0.5-20$ Signal must be continuously present during sampling interval
4-FSK (F7B)	30 to 300 Bd, Shift \leq 3500 Hz
MFSK	4-36 tones
PSK 2/4 Variant A/B	30 Bd to 60 kBd
PSK 8/16 Variant A/B	30 Bd to 60 kBd
MIL/STANAG	Classified to protocol
CIS-12	120 Bd, classified as one signal
OFDM	25 - 512 carriers $T_g/T_u = 1/1$ to $1/8$ ≥ 25 Bd
OQPSK	25 Bd to 30 kBd
CW-Morse	$T_s = 1.6$ s: 6 to 60 Bd $T_s = 3.2$ s: 3 to 60 Bd
Voice	AM, FM, USB, LSB
Operation	FFT display of classified signals Continuous and single-pass mode Classifier Code Check with look-up table

W-Classifier-WB Quality of Modulation Classification

FSK	$m = 0.8$: 100-2400 Bd $m = 0.8$: 50 Bd $m \geq 2$: 100-2400 Bd $m \geq 2$: 50 Bd	12 dB (Eb/N0) 15 dB (Eb/N0) 14 dB (Eb/N0) 16 dB (Eb/N0)
PSK 2/4 Variant A/B	100-2400 Bd	14 dB (Eb/N0)
PSK 8/16 Variant A/B	100-2400 Bd	16 dB (Eb/N0)
CW-Morse	8-50 Bd	18 dB (Eb/N0)

W-Classifier-WB Accuracy of Measured Parameters

FSK 100 - 60 kBd	baud rate center frequency	0.3 % 2 % of baud rate
PSK 100 - 60 kBd	baud rate center frequency	0.2 % 0.15 % of baud rate
CW-Morse 6 - 50 Bd	baud rate	5 %

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Classifier Code Check (CCC) with look-up table and XML-editor for all modulation variants

Process steps	P0	Spectrum analysis is running, no detail classification
	P1	Signal classification is performed, but no decoding
	P2	Classification and table check are performed, but no decoding
	P3	Classification, table check and code check are performed, but no decoding
	P4	Classification and table check are performed and finally the signal is decoded if a mode with an associated, valid detector was found
	P5	Classification, table check and code check are performed and finally the signal is decoded if a mode with an associated, valid detector was found
Scan Delay		When CCC gets the first result, the automatic scan will hold on until the entire result is delivered.

User Configurable Database

Database in XML format	Date & Time 2	Antenna
Eight mandatory fields	Callsign	Elevation
Rx Frequency (receiver frequency)	Location	ITU Designator
Mode (decode or classifier running)	Baudrate	Remote Name
Offset (middle cursor of the NB spectrum display)	Modulation	Polarisation
Center	Frame Format	Satellite Name
Bandwidth	Burst Specs	Satellite Position
Shift	Operator	Links to Templates
Remarks	Direction	Links to Files
Date & Time	Longitude	Links to Internet
23 optional fields	Latitude	Three custom fields free editable
Frequency 2	SNR	

Recommended Configuration for Automatic Frequency Search and Typical Result

From ... to	4 MHz to 20 MHz (for HF band)
Step	1000 Hz
Interval	15 seconds
Search strategy	HF Classifier Code Check (Classify — Tablecheck — Codecheck)
Typical result	Round 250 automatically captured results (database entries) per day (24 hours)

HF - Protocols

ALE-400
ALF-RDS
ALIS
ALIS-2
ARQ6-90
ARQ6-98
ARQ-E
ARQ-E3
ARQ-M2-242
ARQ-M2-342
ARQ-M4-242
ARQ-M4-342
ARQ-N
ASCII
AUM-13
AUTOSPEC
BAUDOT
BR-6028 (ITA-2 and ITA-5)
BULG-ASCII
CHN 4+4
CHU
CIS-11
CIS-12 (HEX output)
CIS-14
CIS-36
CIS-36-50
CIS-50-50
CLOVER-2 (ARQ, all CRCs)
CLOVER-2000 (ARQ, all CRCs)
CLOVER-2500 (ARQ, all CRCs)
CODAN-CHIRP
CODAN-SELCAL
CODAN-3212
CODAN-9001
COQUELET-8
COQUELET-13
COQUELET-80
CV-786
CW-MORSE
DCS SELCAL
DGPS
DUP-ARQ
DUP-ARQ-2
DUP-FEC-2

EFR
FEC-A
FELDHILL
FM-HELL
GMDSS/DSC-HF
G-TOR
GW-FSK
GW-OFDM
GW-PSK
HC-ARQ
HF-ACARS (HF-DL)
HNG-FEC
ICAO-SELCAL (ANNEX 10)
LINK-11 (CLEW)
MD-674
MFSK-16
MFSK-20
MFSK-8
MIL-188-110-16TONE (-110A/B App. A)
MIL-188-110-39TONE (-110A/B App. B)
MIL-188-110A Serial Tones, 75-4800 bps
MIL-188-110A-MOD
MIL-188-110B (App. C) STANAG 4539
MIL-188-110B 3200-12800 bps
MIL-188-141A (ALE)
MIL-188-141B (BW0, BW1, BW4 data)
MIL-188-141B (BW2, BW3 ID)
MIL-M-55529 NB/WB
OLIVIA
PACKET-300/600
PACTOR (all CRCs)
PACTOR-4
PACTOR-FEC (all CRCs)
PACTOR-II (all CRCs)
PACTOR-II-AUTO (all CRCs)
PACTOR-II-FEC (all CRCs)
PACTOR-III (all CRCs)
PICCOLO-MK12
PICCOLO-MK6

POL-ARQ
PRESS-FAX
PSK-10
PSK-125 (BPSK, QPSK) with FLARC
PSK-125F
PSK-220F
PSK-250 (BPSK, QPSK) with FLARC
PSK-31 (BPSK, QPSK)
PSK-31-FEC
PSK-63 (BPSK, QPSK) with FLARC
PSK-63F
PSK-AM
ROBUST-PACKET
RUM-FEC
SI-ARQ
SI-AUTO
SI-FEC
SITOR-ARQ
SITOR-AUTO
SITOR-FEC
SP-14
SPREAD-11, 21, 51
SSTV Automatic
SSTV Martin 1, 2, 3, 4
SSTV Robot 8s, 12s, 24s, 36s
SSTV SC-1 16, 32s
SSTV SC-1 8s, 16s, 32s
SSTV Scottie 1, 2, 3, 4
SSTV Wraase SC-1 24s - 96s
SSTV Wraase SC-2 20s - 180s
STANAG 4285 75-3600 bps
STANAG 4415 75 bps (NATO ROBUST)
STANAG 4481-FSK (KG-84)
STANAG 4481-PSK
STANAG 4529 75-1800 bps
STANAG 4539 3200-12800 bps
STANAG 5065-FSK
SWED-ARQ
THROB
THROBX
TWINPLEX
VISEL
WEATHER-FAX

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VHF/UHF - Protocols

ACARS
AIS
APCO-25 (P25, with live voice)
ASCII
ATIS (Selcal digital)
BIIS
CCIR-1 (Selcal analog)
CCIR-2 (Selcal analog)
CCIR-7 (Selcal analog)
CCITT (Selcal analog)
CTCSS
DCS-SELCAL
DGPS
DMR (decryption and live voice)
dPMR (with live voice)
DTMF (Selcal analog)
DZVEI (Selcal analog)

EEA (Selcal analog)
EIA (Selcal analog)
ERMES
EURO (Selcal analog)
FLEX
FMS-BOS (Selcal digital)
GMDSS/DSC-VHF
GOLAY/GSC
MOBITEX-1200 (with OVLS)
MOBITEX-8000
MODAT (Selcal analog)
MPT-1327 (with ITA-5)
NATEL (Selcal analog)
NMT-450
NWR-SAME
NXDN (decryption and live voice)
PACKET-1200

PACKET-9600
PCCIR (Selcal analog)
PDZVEI (Selcal analog)
POCSAG
PZVEI (Selcal analog)
SKYPER (POCSAG)
TETRA (with live voice)
TETRAPOL (with live voice)
VDEW (Selcal analog)
VDL-M2
X.25
ZVEI-1 (Selcal analog)
ZVEI-2 (Selcal analog)
ZVEI-3 (Selcal analog)
ZVEI-VDEW (Selcal digital)

SATELLITE - Protocols

AMSAT-P3-D
INMARSAT-AERO-P, C, R and T
INMARSAT-B-C-TFC (return)
INMARSAT-B-Data (forward)
INMARSAT-B-FAX (forward)
INMARSAT-B-HSD (forward, high speed data)
INMARSAT-B-TEL (forward, with live voice)
INMARSAT-B-TELEX-MM (forward)

INMARSAT-B-TELEX-SM (forward)
INMARSAT-C-EGC (Enhanced Group Call)
INMARSAT-C-TDM
INMARSAT-C-TDM-EGC
INMARSAT-C-TDMA
INMARSAT-M-Data (forward)
INMARSAT-M-FAX (forward)
INMARSAT-M-TEL (forward, with live voice)

INMARSAT-mM-DATA (forward)
INMARSAT-mM-FAX (forward)
INMARSAT-mM-TEL (forward)
INMARSAT-mM-HSD (High Speed Data)
INMARSAT-mM-C-HSD (C band High Speed Data)
NOAA-GEO SAT
ORBCOMM

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W-SPECTRA-LAN Computer Specifications and Technical Data *

Dimensions (L x H x W)	227 x 126 x 216 mm
Weight	7.0 kg
DC power requirement (typical values)	9—48 V DC, 120 W, 24 V / 5 A
AC power requirement (typical values)	100—240 V, 50-60 Hz, 1.4 A
Operating temperature	-40 °C to 70 °C (According to IEC60068-2-1, IEC60068-2-2, IEC60068-2-14) Typically 55 °C at full decoding and monitoring operation
Case temperature range	-40 °C to 70 °C
Storage temperature range	-40 °C to 85 °C
Relative humidity	10 to 90 % (non-condensing)
Operating system (OS)	Windows 7 Professional, 64-bit, English
CPU	Intel® Core™ i7-6700TE, 8MB cache, Quad-core
CPU Clock	2.4 GHz
Controller	Desktop Intel® Q170 Platform Controller Hub
Memory	8 GB DDR4-RAM, PC2133, 260-pin memory DIMM
Hard disk (HDD) for operating system	250 GB, 7200, 64MB cache, 24h/7d
Solid state disk (SSD) for data storage	1000 GB, 540 MB/s, 1 GB cache
W-SPECTRA-LAN	1 slot PCIe x 16 for W-PCIe receiver card (optional) 1 PCI slot free
Ethernet / LAN	2 x 10MB/100MB/1GB
USB	2 x USB 3.0 (front), 4 x USB 3.0 (rear)
Serial ports	2 x RS232/422/485 (rear)
Audio	1 x Mic-in 1 x Line-out
Video	1 x DVI-I port, 2 x Display Ports (1 x front, 1 x rear) Intel® HD Graphics 530
Keyboard/Mouse	1 x PS/2 or USB
Conformity	   

(*) Technical data in the table is reference value. Product photo on the cover may change.





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W-PCIe Receiver Card Specifications and Technical Data

Inputs	AFIF#1 and AFIF#2	IF70#1a, IF70#1b and IF70#2
Connector	SMA female	SMA female
Frequency range	50 Hz to 25 MHz	52.5 MHz to 87.5 MHz (SAW filter)
Bandwidth	5 kHz to 500 kHz	5 kHz to 500 kHz
Frequency raster DDC	1.0 Hz	1.0 Hz
Signal level	2 mVrms to 0.5 Vrms 20 mVrms to 2.5 Vrms with 20 dB attenuator (jumped)	20 mVrms to 2.5 Vrms
Input impedance	> 1 kOhm	50 Ohm
Input max sampling rate	92.16 MHz	92.16 MHz
Input sampling rate jitter	1 ps (RMS 12 kHz to 20 MHz)	1 ps (RMS 12 kHz to 20 MHz)

Card type	Half-size PCIe card (PCI Express)
Number of concurrent, independent inputs	2 AFIF#1 or IF70#1a or IF70#1b -with- AFIF#2 or IF70#2
Dimensions (L x W x H)	168 x 106 x 22 mm
Weight	0.15 kg
Power requirement (typical values)	+3.3V max. 1.0 A +12V max. 0.5 A
Bus interface	PCIe x1 Link 2 Gbit/s
Operating temperature range	0 °C to 50 °C
Case temperature range	0 °C to 55 °C
Storage temperature range	0 °C to 70 °C
Relative humidity	10 to 90 % (non-condensing)
A/D converter	AD9268 dual 16 bit ADC
Dynamic range	> 60 dB
Digital down converter DDC	FPGA Cyclone IV 55K
DSP	TI DSP320C6454
Watchdog for on-board generated voltages	Yes
Conformity	   

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Since more than thirty years Wavecom Elektronik AG has developed, manufactured and distributed high quality devices and software for the decoding and retrieval of information from wireless data communication in all frequency bands. The nature

of the data communication may be arbitrary, but commonly contains text, images and voice. The company is internationally established within this industry and maintains a longstanding, world-wide network of distributors and business partners.

Product Information

Products	http://www.wavecom.ch/product-summary.php
Datasheets	http://www.wavecom.ch/brochures.php
Specifications	http://www.wavecom.ch/product-specifications.php
Documentation	http://www.wavecom.ch/manuals.php
Online help	http://www.wavecom.ch/content/ext/MonitoringSystemOnlineHelp/default.htm
Software warranty	One year free releases and bug fixes, update by DVD
Hardware warranty	Two years hardware warranty
Prices	http://www.wavecom.ch/contact-us.php

Ordering Information

Product Code	Description
WSPLAN	Robust aluminium box PC, with a complete wideband spectrum monitoring system W-SPECTRA. Receiving device not included. Option: W-LV (Live Voice), W-CPT (Decipher), W-SA (Spectrum Analysis), W-Classifer-WB
WSPLANRX	Robust aluminium box PC, with a complete wideband spectrum monitoring system W-SPECTRA and a native Wavecom W-PCle receiver. Option: W-LV (Live Voice), W-CPT (Decipher), W-SA (Spectrum Analysis), W-Classifer-WB

Distributors and Regional Contacts

You will find a list of distributors and regional contacts at <http://www.wavecom.ch/distributors.php>

WAVECOM
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