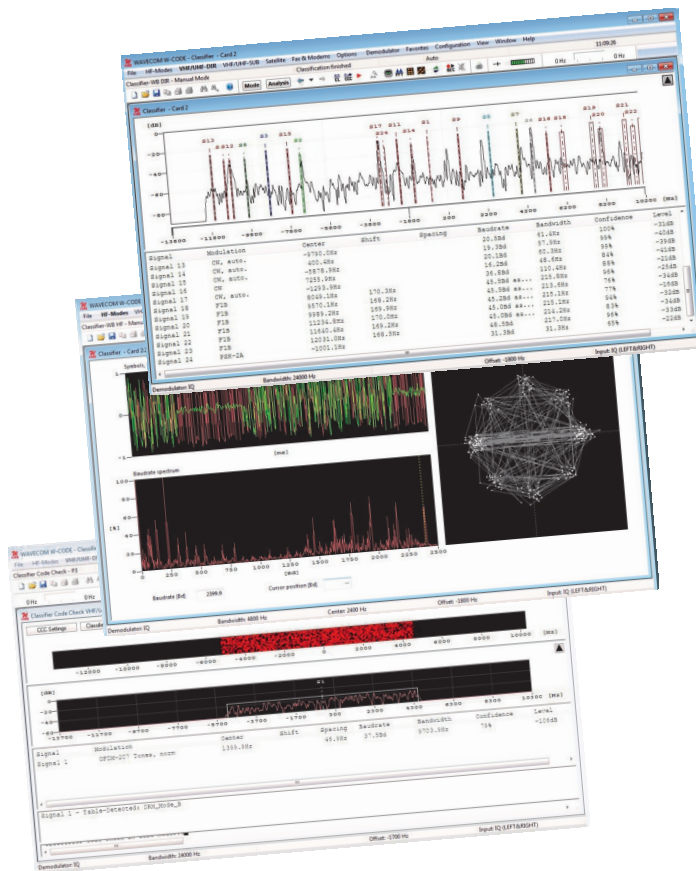


WAVECOM® W-Classifier



The ability to rapidly identify unknown signals has become an essential requirement in signal analysis. The W-CLASSIFIER provides all functions required to automatically classify multiple signals throughout the full radio spectrum from HF to SHF.



W-CLASSIFIER Overview

The automation of the signal classification process relieves the operator from manual evaluation, which otherwise requires considerable skill and experience.

W-Classifier supports these functions

- ◆ Modulation type
- ◆ Baud rate or symbol rate
- ◆ Signal center frequency
- ◆ Number of carriers
- ◆ Frequency shift
- ◆ Carrier spacing or distance
- ◆ CW-Morse detection
- ◆ 8 kHz bandwidth for the Narrowband Classifier (W-Classifier-NB, WCL61PC)
- ◆ All signals within the classifier bandwidth are processed

Additional functions for Wideband (W-Classifier-WB)

- ◆ 96 kHz bandwidth for the Wideband Classifier
- ◆ Voice detection AM, FM, USB and LSB
- ◆ Baud rate up to 60 kBd

Application

The classifier can be used in a number of configurations

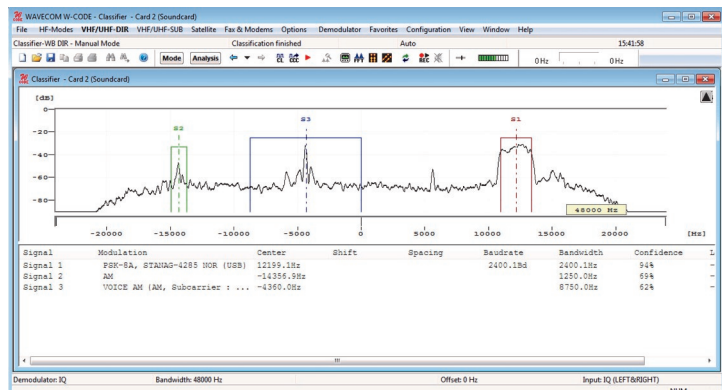
- ◆ Local use as a PC application
- ◆ Remote control via W-CLOUD client-server mode
- ◆ Remote use via LAN with standard W-CODE

application instances in client-server mode

- ◆ Remote control from other applications using third party software (using TCP/IP and XML)
- ◆ Remote control via Microsoft Remote Desktop Protocol

Spectrum Display

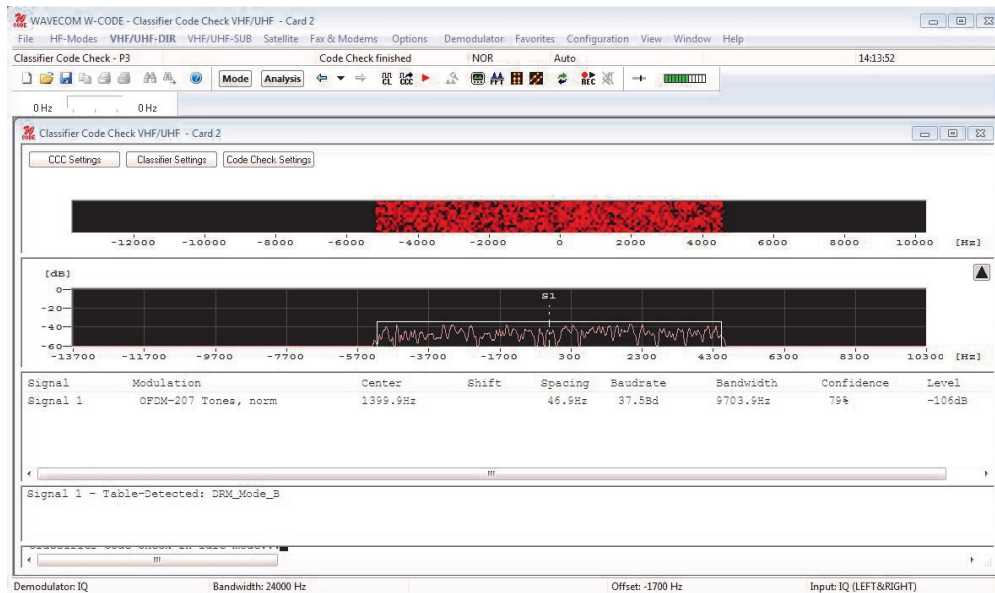
The monitored frequency band is displayed in a spectrum pane. After classification has completed, the classified signals are listed below the spectrum display.



CLASSIFIER-CODE-CHECK (CCC)

The Classifier-Code-Check is a versatile analysis tool for the classification of known and unknown signals and the determination of the mode (protocol) in use. The CCC will attempt to process all signals within the bandwidth of the narrowband or wideband 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 an XML-formatted mode list. The code check will attempt to synchronise against classified modes. Finally the signal may be forwarded to a decoder for output.



Classifier-Code-Check (CCC) with table detected DRM Mode B (OFDM)

Classifier-Code Check process levels

Process Level	P1	P2	P3	P4	P5
	Classification is performed, but no decoding	Classification and table check are performed, but no decoding	Classification, table check and code check are performed, but no decoding	Classification and table check are performed and finally the signal is decoded if a mode with an associated, valid detector was found	Classification, table check and code check are performed and finally the signal is decoded if a mode with an associated, valid detector was found

CLASSIFIER-CODE-CHECK (CCC) EDITOR

An XML table editor allows extending, modifying or deleting records in the XML table used for mode look up. An input template containing all important parameters is available for each modulation type. All parameters, record name and file name is user selectable.

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_819_145	no-mode	FSK		81.9	136	*	2				
FSK_819_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
HIC-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

User defined list of modes for automatic recognition

Signal Parameters Editor

Edit Signal: FSK MFSK PSK OFDM CW

Name: Subcarrier:

Decoder: Symbol Rate: Bd

Modulation: No. of Carriers:

Codecheck Count: Minimum No. of Carriers:

Recognition disabled Bandwidth: Hz

ITU Designator: Spacing: Hz

Comments: Pilot Frequency: Hz

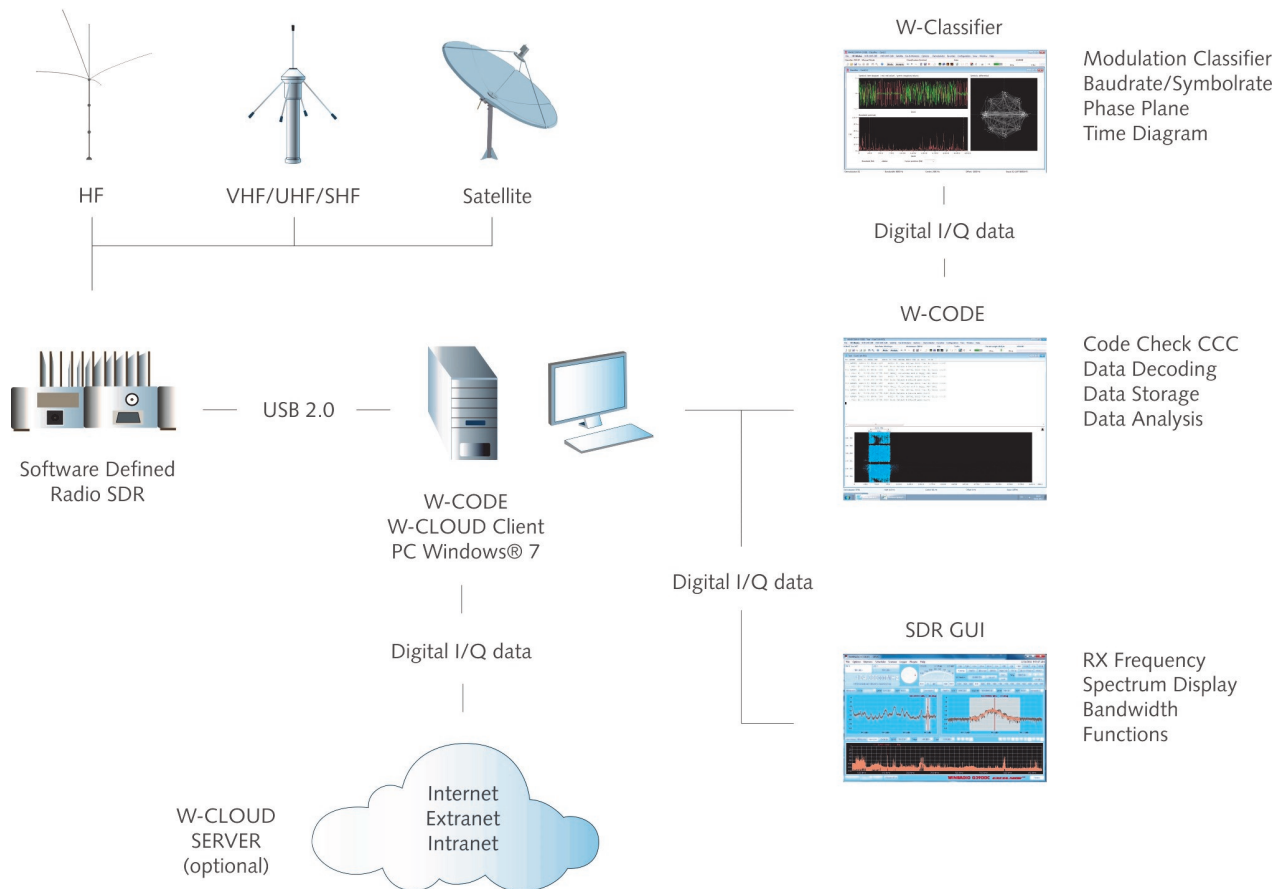
OK Cancel

An unlimited number of XML tables may be set up. Any table may be loaded from the "Code-Check-Settings" menu.

- CCC Table HF 2012.04.29 XML-Dokument
- CCC Table VHFUHF 2012.02.25 XML-Dokument
- CCC Table VHFUHF-DIR 2012.02.25 XML-Dokument
- CCC Table VHFUHF-SUB 2012.02.25 XML-Dokument

Classifier-Code-Check Editor input template

W-CLASSIFIER Application in Conjunction with a Modern SDR



W-CODE and W-CLASSIFIER provides all functions required to analyze, decode and process radio data communications throughout the radio spectrum from HF, VHF, UHF to SHF. W-CLASSIFIER accepts input from the host built-in sound card, a number of SDRs, analog or digital audio outputs, WAV files, I/Q data or TCP/IP streams.

W-Classifier-NB Technical Data

Bandwidth HF	4 kHz or 8 kHz (complex: 9.6 kHz)
Sampling interval (Ts)	1.6 sec or 3.2 sec
FSK	30 to 3000 Bd, Shift \leq 3500 Hz Modulation index: 0.5-20 Signal must be continuously present during sampling interval
FSK-4 (F7B)	30 to 300 Bd, Shift \leq 3500 Hz
MFSK	4-36 tones
PSK 2/4 Variant A/B	30 to 3000 Bd
PSK 8/16 Variant A/B	30 to 3000 Bd
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	No
Operation	FFT display of classified signals Continuous and single-pass mode Classifier Code Check with look-up table

W-Classifier-NB 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-NB Accuracy of Measured Parameters

FSK	baud rate center frequency	0.3 % 2 % of baud rate
PSK	baud rate center frequency	0.2 % 0.15 % of baud rate
CW-Morse	baud rate	5 %

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 ≤ 30 kHz Modulation index: m = 0.5-20 Signal must be continuously present during sampling interval
4-FSK (F7B)	30 to 300 Bd, Shift ≤ 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 Tg/Tu = 1/1 to 1/8 ≥ 25 Bd
OQPSK	25 Bd to 30 kBd
CW-Morse	Ts = 1.6 s: 6 to 60 Bd Ts = 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 ≥ 2: 100-2400 Bd m ≥ 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 %

W-Classifier

Automatic Signal Classification

WAVECOM[®]
NACHRICHTENTECHNIK

Since 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/decoder-online-help/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

System Requirements

	<i>Minimum</i>	<i>Recommended</i>
CPU	P4 Dual-Core 2.4 GHz	Core i5 or Core i7 2.8 GHz
Memory	2 GB RAM	4 - 8 GB RAM
OS	Windows XP	Windows 7 32-bit or Windows 7 64-bit

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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