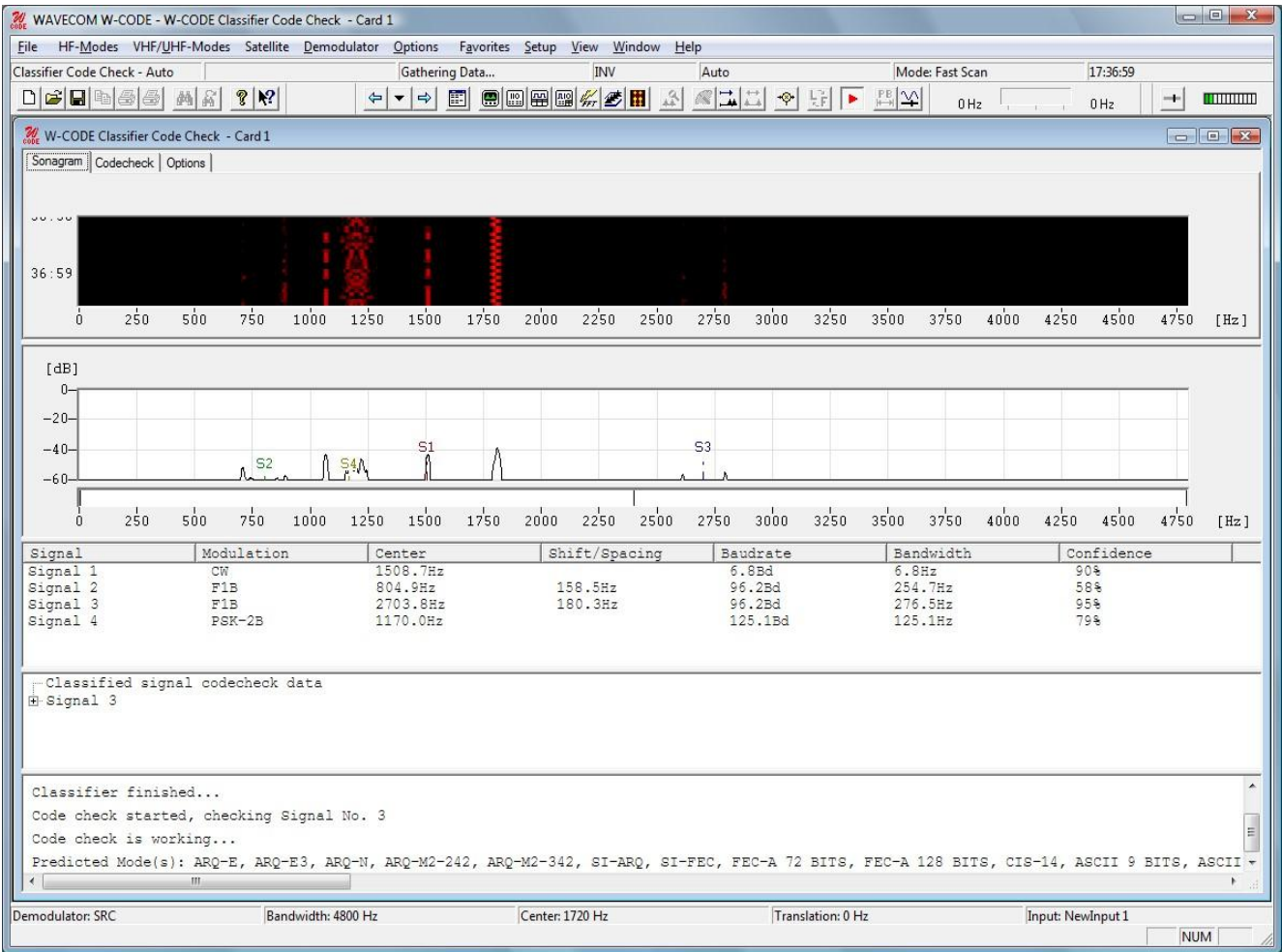
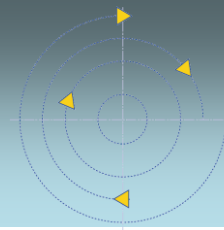


# W-CODE

Standalone Software Solution for Signal Classification, Decoding, Analysis & Processing



W-CODE with Classifier-Code-Check and multiple signals



## W-CODE Overview

The W-CODE is the first “software-only” decoder in the well known WAVECOM® line of decoders.

The W-CODE software is designed to work with your existing equipment - no proprietary hardware required. It allows seamless integration with SDR (Software Defined Radio) receivers with IQ data or digital audio outputs, TCP/IP streams and sound cards.

One client license is provided with each software package (multiple licenses on request). W-CODE provides all functions required to analyze, decode and process radio data communications throughout the spectrum (HF, VHF, UHF, and SHF).

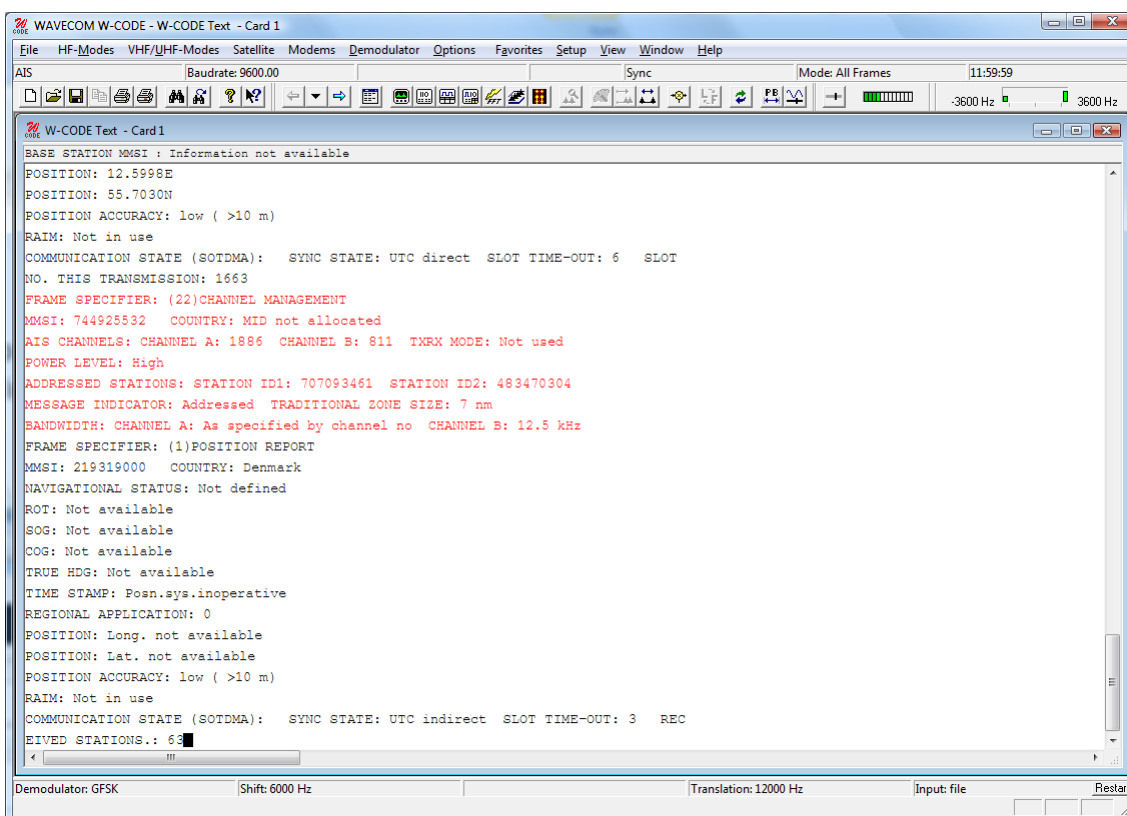
**The W-CODE provides:**

- An signal overview using real-time spectrum and waterfall display

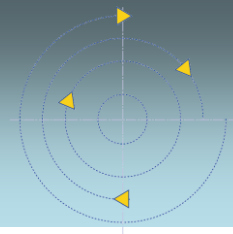
- Demodulation, decoding to content level of known signals. Decoded output can be saved to files or picked up from the remote control interface
- Manual signal measurement
- Automatic classification and CodeCheck of unknown signals
- A versatile XML Remote Control Interface with the same command set used by the W51PC and the W61PC.

**The COMINT Solution for:**

- Government agencies
- Homeland and government security agencies, defense contractors
- Telecommunications authorities
- Defense signal corps

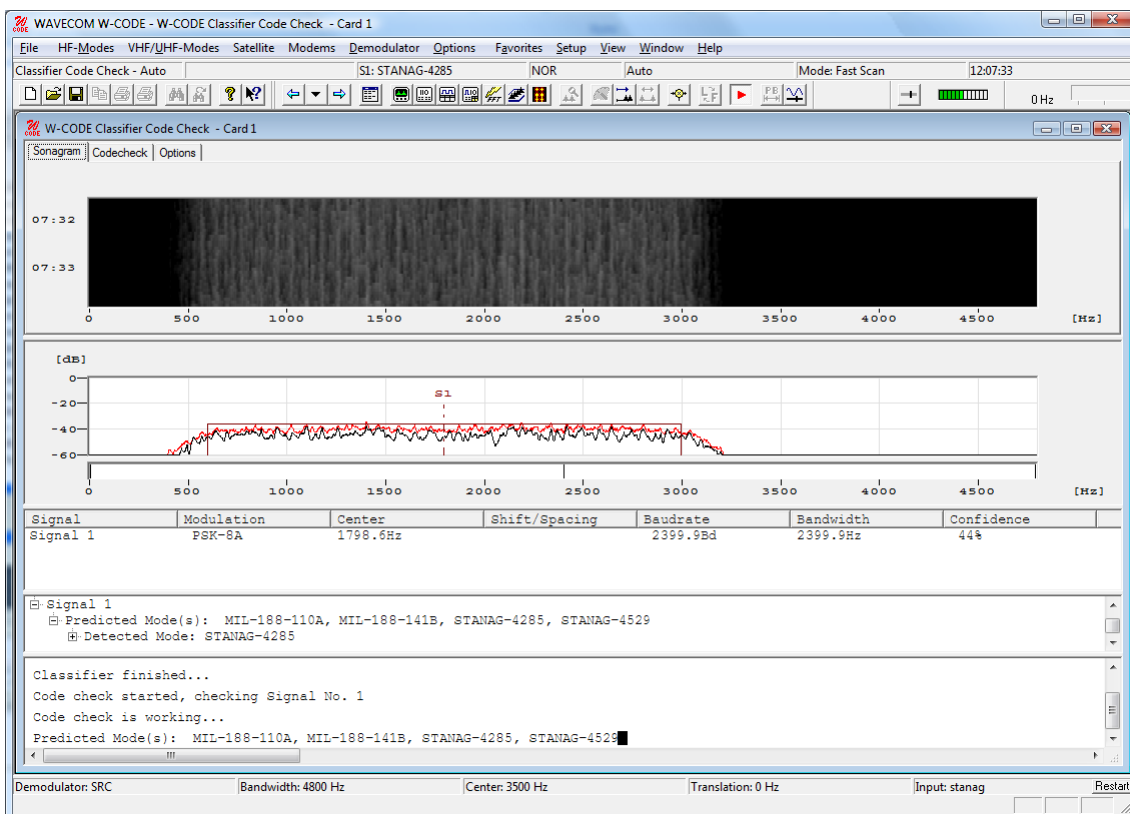


*Decoding AIS from a 12 kHz IF file*



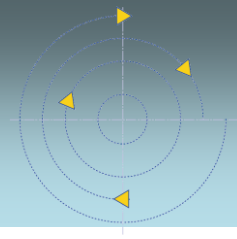
## Features

- TCP/IP data input (LAN) for IQ or PCM coded data. Data conversion to the WAVECOM format is done by a separate, external application. Source code available on request
- Media Player for recording and playback
- Decoding from PC soundcard with sampling rates up to 192 kHz
- Internal sampling rate converter
- Direct decoding from audio files
- Virtual Audio Cable (VAC) support
- Impressive list of currently implemented modes (see specifications), including:
  - ✓ INMARSAT
  - ✓ Modem and FAX modes
  - ✓ Robust-Packet
  - ✓ CLOVER-2
  - ✓ CLOVER-2000
  - ✓ PACTOR-3
- ✓ CODAN-9001
- Powerful 48 and 96 kHz wideband FFT
- Adaptive Equalizer for high-speed PSK protocols
- Tested with a number of Software Defined Radios e.g. WINRADI0, Perseus, SDR14/SDRIQ, AOR AR-ALPHA, R&S receivers (using AllAudio and VAC), IZT
- W-CONV, optional, external input device with two channels AF/IF (0.x-30) MHz and 70 MHz (52.5-87.5 MHz)
- XML Remote Control Interface with the same command set as the W51PC and W61PC
- Optional software classifier plug-in with 4 and 8 kHz bandwidth and FSK, MFSK, PKS, and OFDM support
- Pass band filters to mitigate poor propagation conditions or process wideband receiver input
- Worldwide support



*Classified STANAG 4285 signal*

# W-CODE



# Functions

## General

The easy-to-use graphical user interface (GUI) with well structured pull-down menus allows an operator to become familiar with the W-CODE in a short time. A high degree of operator proficiency can quickly be achieved.

The decoder can be used in a number of configurations:

- Local use as a PC application
- Remote use via a LAN with standard W-CODE application instances in a client-server mode
- Remote control from other applications using third party software (using TCP/IP and XML)

These features allow the system to be adapted to the client's requirements and applications.

The implementation of complex systems for monitoring on a large scale is only limited by the num-

ber of decoders and the performance of the hardware and software.

The configuration of the system components can be completely adapted to the requirements of the customer.

A wide range of system default settings can be configured, e.g., input signal level, measuring interval, centre frequency and demodulator type.

A W-CODE decoder may be controlled from everywhere in the network and its output may be sent to one or more applications on the network.

In order to process the data output, control the decoder and the code parameters, an integrated remote control interface allows easy control of the W-CODE from a customer application.

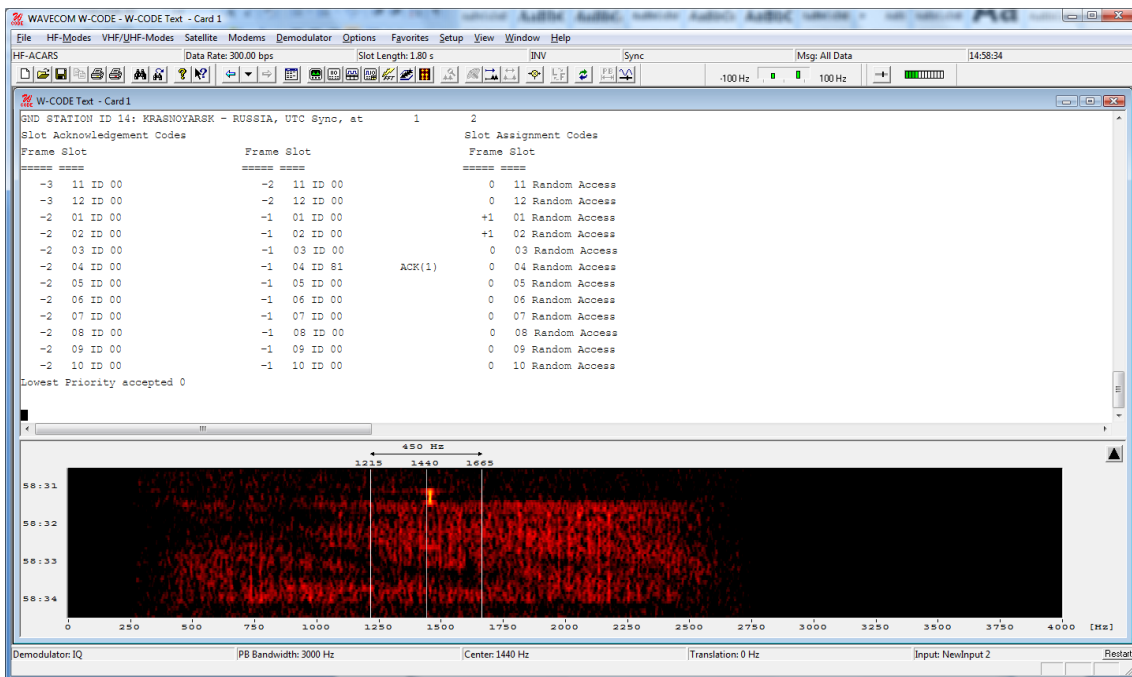


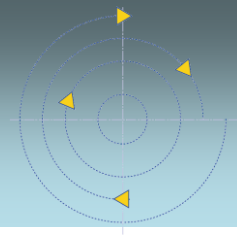
Figure 1 HF-DL/ARINC 635decoding

## Analysis

The determination of signal characteristics is assisted by a large number of analysis and mea-

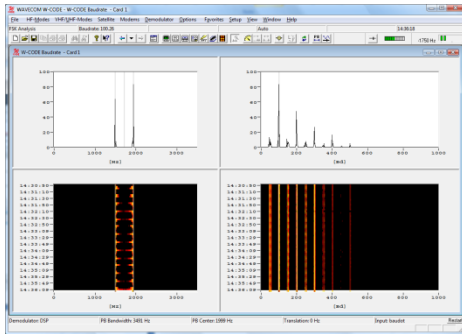
surement functions operating over a wide range of signal parameters.

# W-CODE

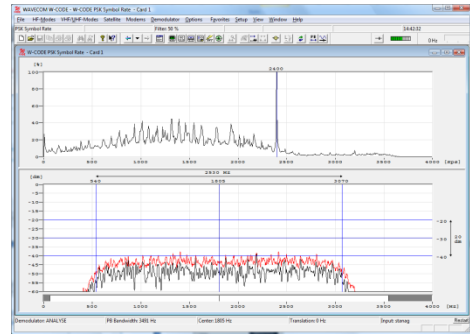


All of the integrated analysis tools contain many different methods and viewing options. The GUI assists the operator in analyzing the important signal parameters. Exact measurements are easily made using adjustable cursors with associated

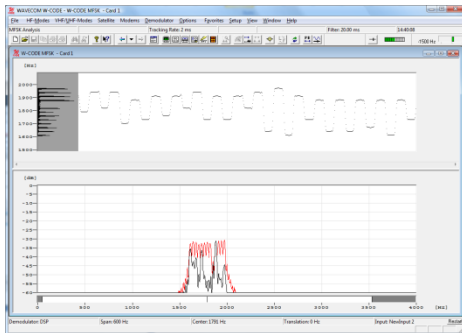
numerical displays. Dynamic zoom functions allow magnification of details in any selected window. The scroll buffering feature makes it possible to move back and forward in signal history.



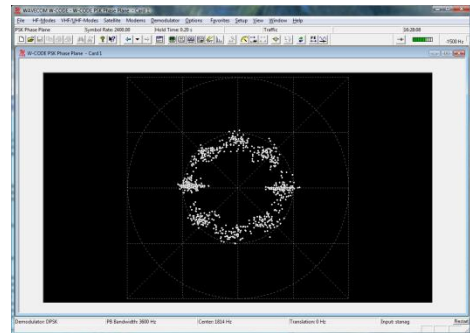
FSK-Analysis



PSK-Symbolrate-Analysis



MFSK-Analysis



PSK-Phaseplane-Analysis

### Demodulation and Decoding

If a decoder for a protocol is selected, then the demodulator can be tuned by the following ways:

- Automatically (for FSK)

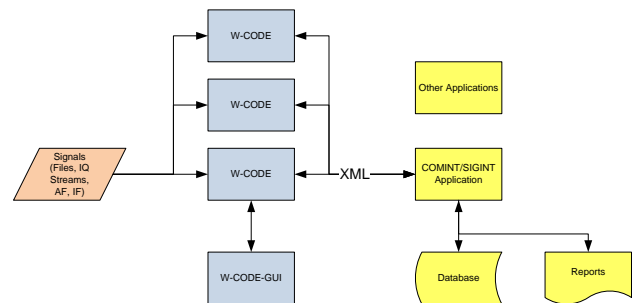
- Manually
- Using the results from the classifier

## Applications

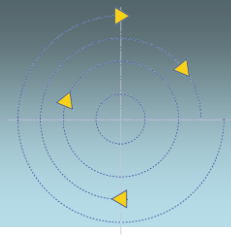
Typical fields of applications for the WAVECOM decoders include:

- Manual or automated monitoring of radio data communications in the HF/VHF/UHF/SHF (satellite) bands
- Signal intelligence
- Signal analysis and classification

For government agencies, and telecommunications authorities, the applications range from stationary monitoring of one transmission with a single system to fully automated broadband monitoring employing many systems.



Decoding system with external control application

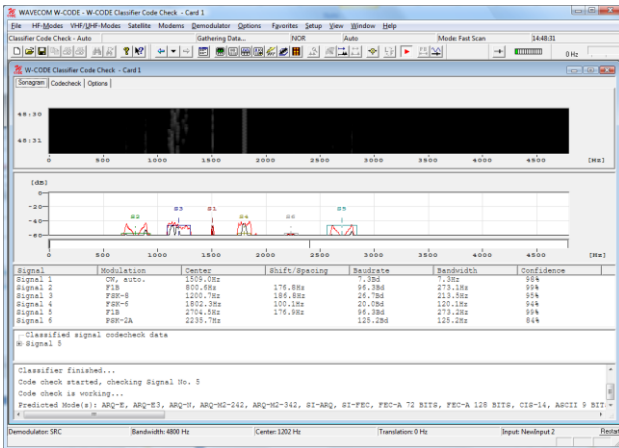


Decoded data can be imported from third-party applications running on the same or another computer in the network.

Software generated time stamps may be automatically added to each line of decoded data to ensure precise backtracking of any signal.

## Classification (Option)

The ability to rapidly identify unknown signals has become an essential requirement in signal analysis.



*Spectrum, Classifier and Code-Check Windows*

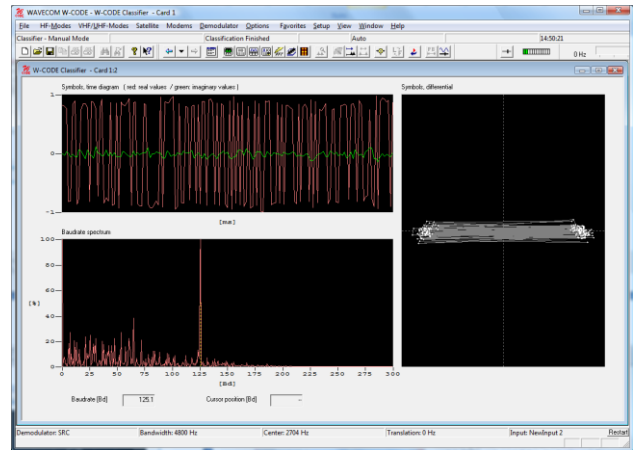
The automation of the signal classification process relieves the operator from manual evaluation, which otherwise requires considerable skills and experience. The combination of a classifier and a decoder thus satisfies the requirement for an automatic system that is able to rapidly and reliably determine the characteristics of radio data transmissions within the signal spectrum being monitored.

The classification algorithm determines the accurate center frequency, speed (symbol rate), shift, bandwidth and modulation.

The detection and classification results are displayed in a list together with all parameters and are fully integrated into the WAVECOM® user interface.

### Classifier-Code-Check (CCC)

An FSK/PSK or MFSK code check of the classified signal is started to further determine the protocol of the signal. After the code check has completed, the classifier and code-check results are used to automatically parameterize the code and start decoding.



*Classifier data analysis*

### Spectrum display

In this pane the monitored frequency spectrum is displayed. After classification has completed the classified signals are indicated in the spectrum display.

### Classification

The results of the classification are shown as a list in a second pane. The following parameters are provided for each classified signal:

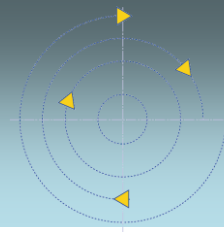
- Modulation type
- Center frequency of the signal
- Number of carriers in the case of multi-carrier FSK
- Baud rate in the case of FSK or PSK signal
- Frequency shift in the case of FSK signal
- Bandwidth

### Additional information

Additional graphical FSK, MFSK and PSK information on symbol timing and constellation, baud rate and frequency vs. time is displayed in a separate window when a classified signal is selected from the list.

### Classified signals

For a list of classified signals, please see the section "Specification".



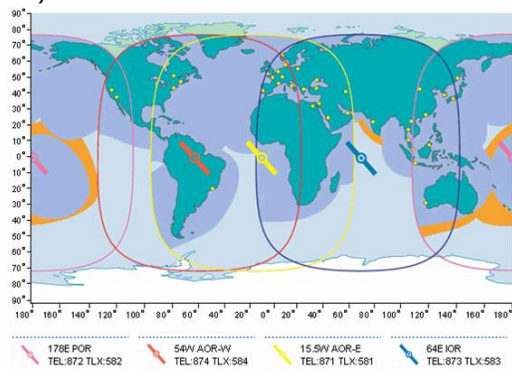
## W-CODE-SAT (INMARSAT Option)

The W-CODE-SAT, together with the W-CONV hardware is the first choice to build a cost efficient satellite monitoring system for INMARSAT.

The user interface of the WAVECOM satellite modes is fully integrated as a software module in the existing hardware and professional software.

Additional functions are:

- Remote Control, to enable the customer to build his own customized system.
- INMARSAT B/M/mM, L-Band only, forward channel monitoring (does not require a large C-Band antenna).



Satellite locations

### INMARSAT B/M/mM

These modes offer video, data and fax service at different speeds.

The software monitors the control channel, and upon initiation of a new session with a mobile terminal, automatically switches to the assigned traffic channel for monitoring.

To limit the volume of monitored traffic, a watch list may be created containing target MES IDs.

Monitored fax and data sessions are stored in files. A fax viewer is included in the software. INMARSAT B and M Voice are supported (mM on request).

### INMARSAT B-C-TFC

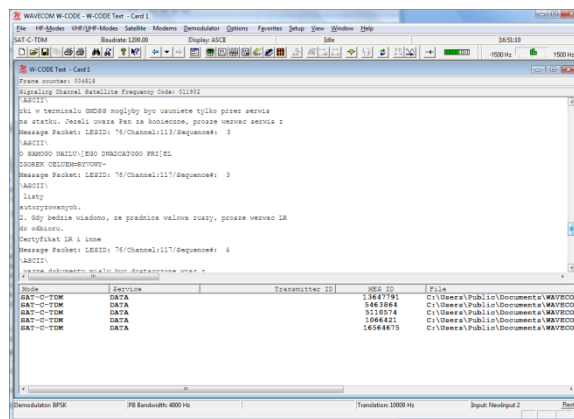
SAT-B-C-TFC is used to monitor the return signal of SAT-B. This signal can be the uplink L-Band signal, or the downlink C-Band signal.

### INMARSAT B-HSD

HSD (High Speed Data) Service using Inmarsat-B enables high-speed data communications between an INMARSAT terminal and a land-side ISDN terminal or between two Inmarsat terminals via 64 (56) kbps or 128 (112) kbps circuit.

### INMARSAT C-TDM

INMARSAT C is a store-and-forward, low speed message transmission system. Currently it is one of the most reliable and most used systems for today's communication.



INMARSAT C-TDM traffic

This is traffic going to the MES. Data output is in ASCII, HEX or Baudot.

### INMARSAT-C-TDM-EGC

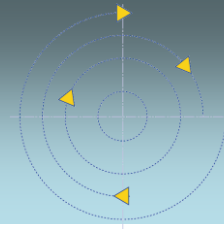
The INMARSAT C maritime mobile satellite system has an inherent capability, known as Enhanced Group Call (EGC), which allows broadcast messages to be made to selected groups of ship stations located anywhere within a satellite's coverage. Four geostationary satellites provide worldwide coverage for these types of broadcasts. Two types of EGC services are available: Safety NET and Fleet NET.

### INMARSAT-C-TDMA

INMARSAT-C return channel traffic to the LES.

### INMARSAT-AERO

The SAT-AERO system carries different services between aeronautical Ground Earth Stations (GES)

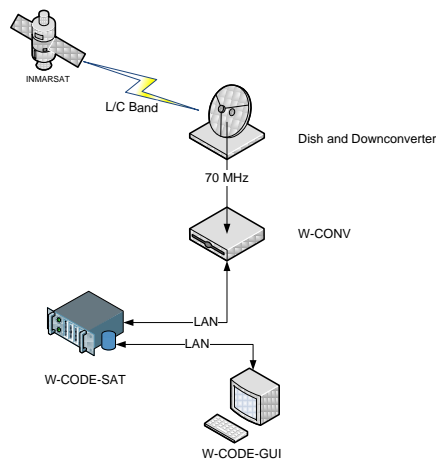


and Aircraft Earth Stations (AES). At the moment only the P channel can be decoded.

### System Requirements

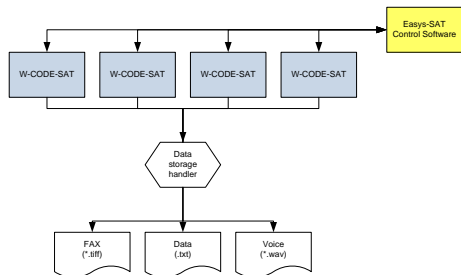
The following items are required to monitor INMARSAT traffic:

- Antenna (L- or C-Band)
- LNA or LNB
- Standard Down Converter to 70 MHz
- Computer(s)
- W-CONV interface(s) and W-CODE decoder(s) with W-CODE-SAT option



INMARSAT system

### Easy-SAT-Control Software



Easy-SAT-Control

As part of the INMARSAT software the Easy-SAT-Control software is included. It contains a small control application that allows multi-channel monitoring of INMARSAT B/M/mM.

### Detailed specifications: See separate document (also published on [www.wavecom.ch](http://www.wavecom.ch))

For authorized government agencies WAVECOM is able to provide:

- Additional customer specific modes
- Software source code and a complete development environment
- Training

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# W-CODE