

# Robust Packet Radio (RPR)

Advanced Protocols

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## ROBUST-PACKET Overview

Ordinary amateur radio Packet Radio is not well adapted to the characteristics of the HF range. A new, robust variant of this mode has features, which attempt to mitigate these characteristics. Robust-Packet is a data transmission mode designed by Special Communications Systems. It is optimized for deployment in the short wave band. To accommodate the characteristics of this frequency range, for example fading and multipath propagation (intersymbol interference), eight-carrier, pulse-shaped OFDM (Orthogonal Frequency Division Multiplex) is used. The AF center frequency is 1500Hz and the carrier center spacing is 60 Hz. Dependent on the user data rate (200 or 600 bps before AX.25 protocol overhead) each car-

rier is DBPSK or DQPSK modulated at a constant rate of 50 Baud. The modulation type is automatically adapted to the propagation conditions.

Just like ordinary PACKET-RADIO the AX.25 protocol is utilized as the Layer 2 protocol. The payload of a packet can be up to 256 Bytes, but the actual length depends on the amount of data to be sent and of which one of the 25 different packet types is used. One type is used for connect-disconnect and another 12 variable length types for each of the two user data rates.

Individual AX.25 packets are consolidated into multi-frames, which contain only one CRC field and one call sign field. This feature enhances throughput with approx. 30%.

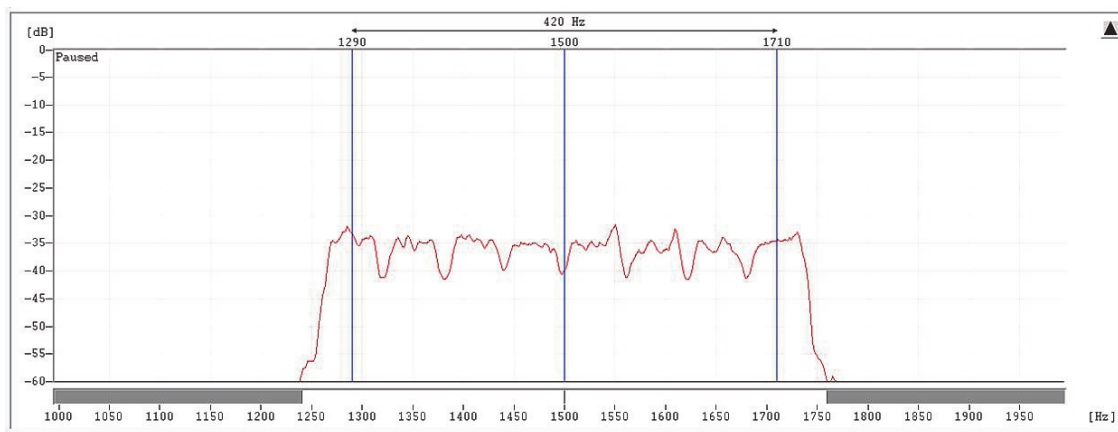


Fig. 1 Robust-Packet spectrum

## ROBUST-PACKET Features

- ◆ 500Hz Bandwidth
- ◆ OFDM with 8 Carriers
- ◆ Convolution Code with FEC
- ◆ AX-25 frame protocol
- ◆ 200 Baud or 600 Baud net
- ◆ Error correction and CRC
- ◆ Speedlevel1: DBPSK, convolution code R=1/2
- ◆ Speedlevel2: DQPSK, convolution code R=3/4
- ◆ Signal-to-noise ratio typ. 7 to 10 dB with AWGN-channel (3 Khz bandwidth)

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To make the transmission as robust as possible, several modifications have been applied to the AX.25-formatted data stream before transmission: The call signs are compressed with a special algorithm, the data stream is scrambled, redundancy in the form of convolutional coding with constraint length  $k = 9$  at code rates  $R = \frac{1}{2}$  (DBPSK) or  $R = \frac{3}{4}$  (DQPSK) is added and the stream is interleaved over the full frame length using a robust, pseudo-random algorithm. The

packets are additionally protected by CRC. To ensure synchronization each packet is lead in with a 160 ms preamble of 64 DPSK symbols distributed across all eight carriers. The decoder output is divided into data and signaling information (call signs with SSID (Secondary Station ID), package identifier (PID) and AX.25 control word). Data may be displayed as US ITA5 or HEX. The PID specifies the Layer 3 protocol used.



Fig. 2 Robust-Packet tracking-mode

## ROBUST-PACKET Application

- ◆ Sailing vessel, sailing yacht
- ◆ 4WD Wilderness-Camping tours
- ◆ determination of the position
- ◆ Telemetrie for temperatur or SWR
- ◆ Telemetrie vor battery voltage
- ◆ Mailbox, PMBX, remote beacon
- ◆ Keyboard to keyboard
- ◆ Amateurradio

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## ROBUST-PACKET Implementation

The Wavecom implementation of the ROBUST-PACKET decoder consists of an OFDM demodulator with frequency tracking and automatic synchronization. Decoded traffic is displayed in the decoded data window as well as saved to a file, which can be retrieved for later in-depth analysis. The decoder will display status information on call signs.

The W-CODE decoder automatically detects the user data rate and the size of the transmitted packet and displays the result.

Detailed description of the signaling information can be found in the documentation for AX.25 Link Access Protocol for Amateur Packet Radio.

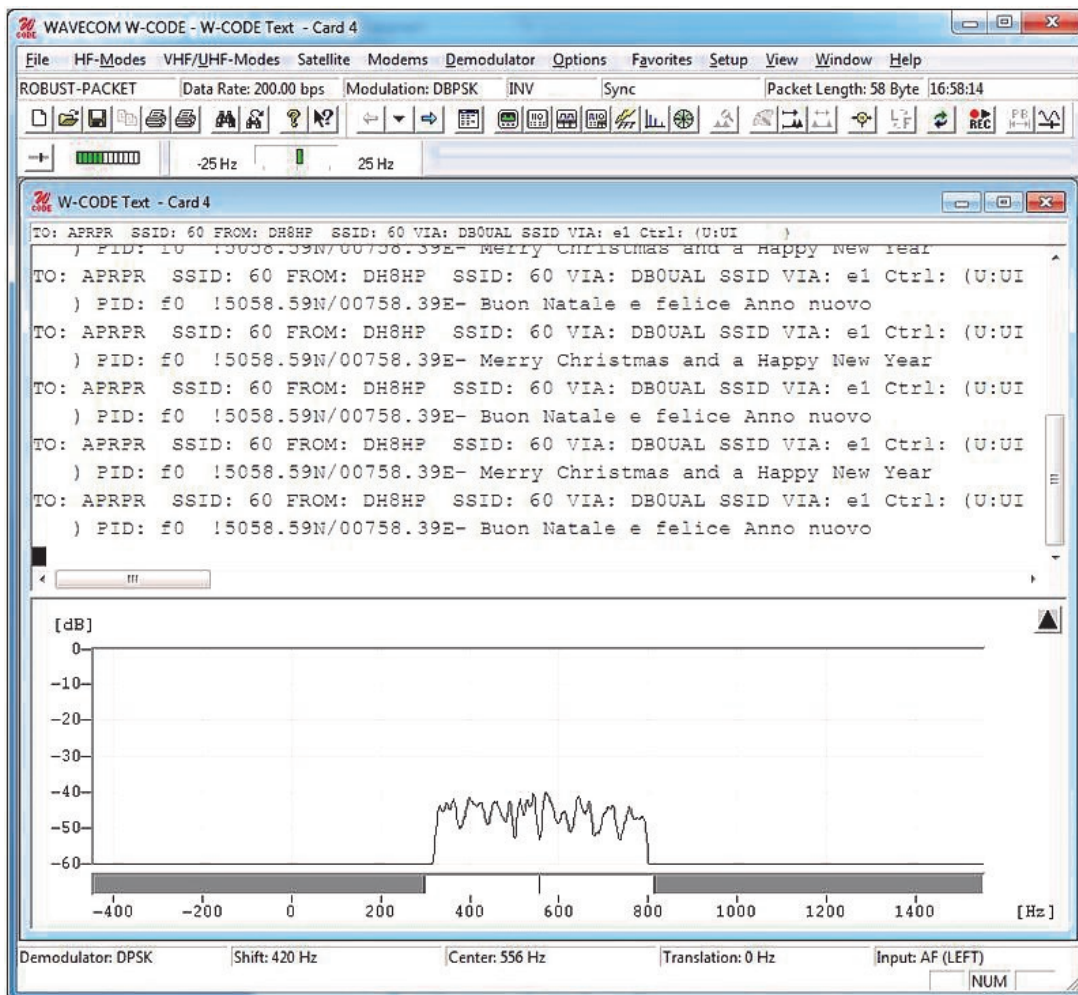


Fig. 3 W-CODE Screenshot

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

## System Requirements

	<i>Minimum</i>	<i>Recommended</i>
CPU	Core i5 or Core i7 2.8 GHz	Core i7-6700 3.4 GHz
Memory	4 - 8 GB RAM	16 - 32 GB RAM
OS	Windows 7	Windows 10 32-bit or 64-bit

## Distributors and Regional Contacts

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

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