

ROBUST-PACKET (RPR)

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 carrier 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%. The WAVECOM decoder automatically detects the user data rate and the size of the transmitted packet and displays the result.

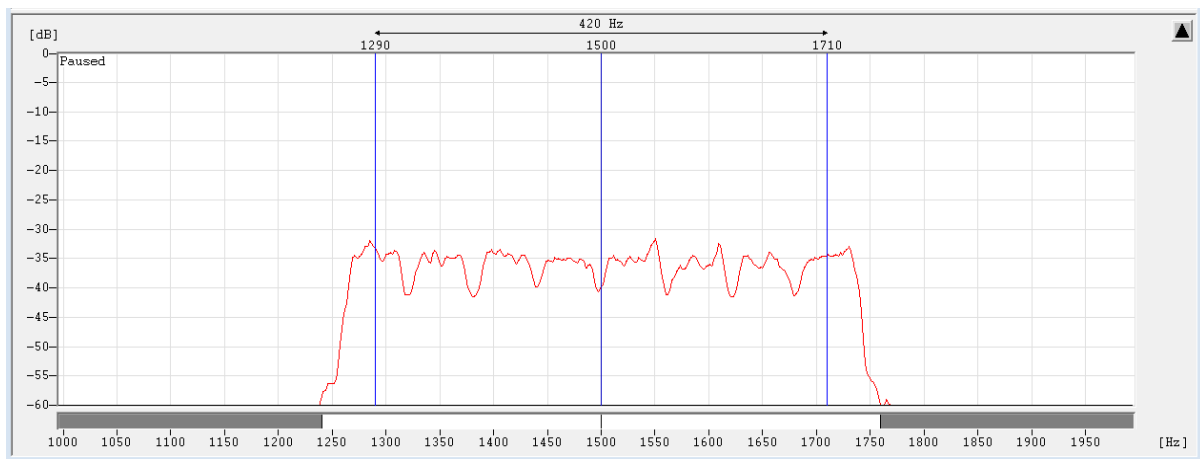
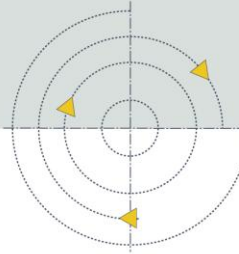


Fig. 1 Robust-Packet spectrum

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.



Detailed description of the signaling information can be found in the documentation for AX.25 Link

Access Protocol for Amateur Packet Radio.

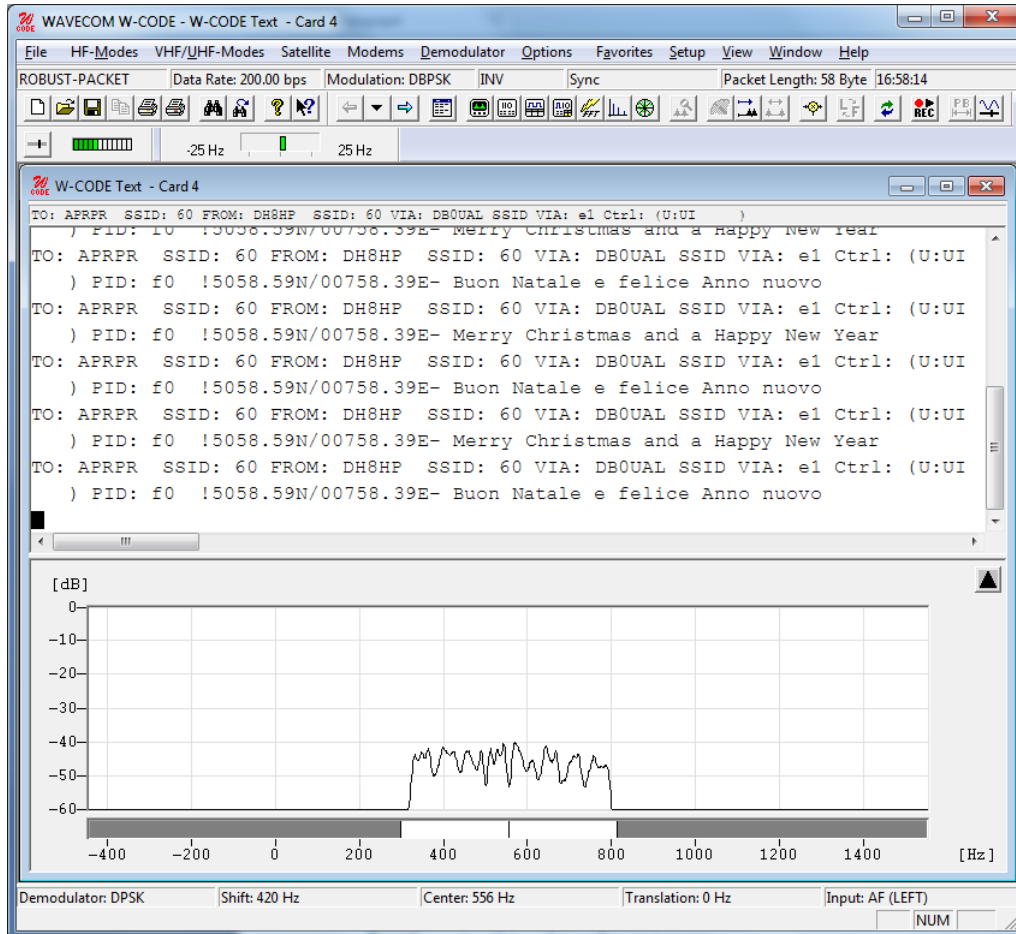


Fig. 2 Robust-Packet decoded