DHAMO

Digital HF Antenna – Vertical Monopole

Main application of the digital vertical HF monopole is long-range skywave reception, for use in arrays.

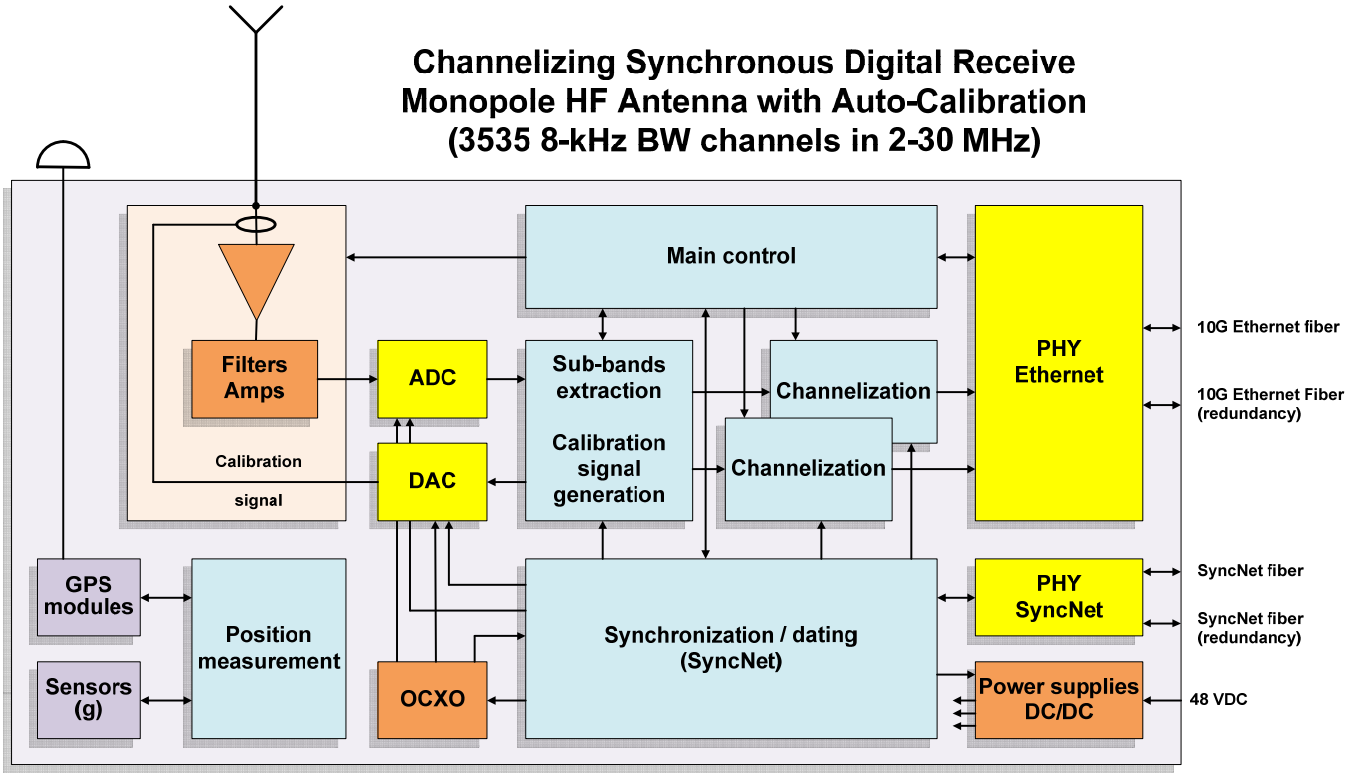
The picture shows a prototype antenna, its height is about 2.5 meters. This fully-integrated 2-30 MHz receive antenna includes integrated synchronous channelizing receiver and auto-calibration. Two GPS antenna (below radome) allow automatic relative positioning in the centimetric range when used in array, easing installation procedure. Calculations for relative positioning are done by the array controller remote computer from all antennas' preprocessed GNSS data.

The HF signal is channelized and equalized, the time-stamped output data is sent through ethernet multicast. In nominal configuration, channelization provides 3535 consecutive channels of 8 kHz bandwidth complex signals (28.28 MHz total bandwidth), each sampled at 10 kHz. If required, an efficient user-level FFT-based preprocessing stage allows higher bandwidth signal reconstruction.

Network required bare bandwidth is 80 Mbits/s per channelized MHz. Packetization overhead, due to data and network headers, consumes about 10% more. The ethernet network must be sized at least

for 100 Mbits/s per channelized MHz, ie about 3 Gbits/s per antenna. Comparatively, the bandwidth required by control messages is negligible.

The antennas' synchronization is achieved through use of FEE's SyncNet system.



A specific FEE's protocol (ADCP, Antenna Discovery and Control Protocol) relying on UDP/IP is used for configuration, management and data packets.

At least 2 optical fibers are required for use in an array configuration (SyncNet & 10G ethernet), 2 more fibers can be used for redundancy.

A minimal 48VDC and maximal 60VDC (for line losses account) power supply is required. Typical power consumption is 60-70W (temperature-dependant).

Of course, the antenna can be used alone, without SyncNet (internal timebase used then).

Features

- Auto-calibration of analog chain
- Equalized and channelized digital data broadcasted through ethernet 10G optical links
  3535 channels, 8 kHz-spaced, 10 kHz-sampled, >100 dB alias rejection
  (28.28 MHz channelized band, at least 3 Gbits/s ethernet bandwidth allocation required)
- Global channelized band positionable with a 1-channel resolution
- Wideband signal reconstruction from adjacent channels can be done on user side through efficient FFT-based preprocessing stage.
- Parametrable packetization (channels number, time samples per packet)
- Low antenna-to-user latency (packetization-dependant) : typically 10…20 ms.
- Relative positioning through integrated GPS antennas
- Data sent to two (redundancy) 10G ethernet optical links (1 fiber/link)
- Two (redundancy) SyncNet ports for synchronization (1 fiber/port)
- Power supply: 48..60VDC at receiver input
- Power consumption is temperature- dependant : 60..70W

Interfaces

- Fiber connector : 4 monomode fibers G652/G657
    - Double (redundancy) 10G ethernet optical links (1 fiber/link)
    - Two (redundancy) SyncNet ports for synchronization (1 fiber/port)
- Power supply input

Applications

- Software-Defined Radio (SDR)
- Beamforming
- Spatial diversity (long baseline arrays)
- Direction-Of-Arrival (DOA) estimation