

AXONN PHYSICAL ON AIR PROTOCOL, BENEFITS:

DATA RELIABILITY

63 chip code, supports 18dB process gain

Chip rate 1.22 Mc/s

- Fast enough to reduce multipath fading by 12 dB (outdoors)

- Slow enough to allow eight 3 MHz channels to operate in the 902 to 928 MHz band

Antenna diversity, preamble supports methods to reduce fading by an additional 12 dB

Preamble provides for automatic message routing through repeaters

Extended range supports overlapping receiver coverage, increases reliability against:
interference, collisions, multipath, obstructions

Impulse noise rejection; high impulse noise rejection prevents waiting entire message time until CRC fails

Hopping receivers susceptible to MDS level impulse noise on all 25/50/75 channels

Redundancy: repeated message with time randomization (automatic retry on 2-way applications)

Out-of-channel rejection; 65 dB to 90 dB@ 3 MHz (one channel spacing), depending on receiver impl.

Frequency Agile

- Transceivers hunt to new frequencies if jammed (under application layer control)

- Transmission devices, optionally transmit all messages on 3 frequency channels

Selectable 16 or 32 bit CRC + 1 bit ECC

Data rate promotes reliability

- High enough for short message duration 10-25 ms: reduces data collisions

- Low enough for 1-mile line-of-sight range: promotes overlapping receiver architecture

- Message retransmission scheme overcomes slow hoppers

915 MHz operation

- Significantly less multipath than at 2.4 GHz

- 8 dB better propagation than at 2.4 GHz

Payload can be encrypted (0-256 bytes specified; 0-31 typical implementation), at application layer

Property code/customer code can logically isolate installations and sensor type code

4 bit sequence # can detect missed messages and intentional message tampering

PHYSICALLY RELIABLE

Industrial temp range -40 to +85C

Manufacturable, over 11 million fielded in different industrial applications

LONG BATTERY LIFE

Data rate + chip rate + protocol support message duration: short 10-25 ms

Combined with efficient transmitter and 3 minute xmit rate yields 5-10 yr battery Life

DSSS and 1.22 Mc/s rate allows for very fast signal acquisition

- Frequency hoppers must acquire a narrow band signal that take much longer to settle or fill DSP filter

- Multi-transmitter ALOHA system can't remain hop synchronized

- Hopping receiver in transmit-only configurations must search all 25/50/75 frequency channels

LOW MANUFACTURING COST

BPSK DSSS, low cost demodulation by DSP or synchronized mixer

ASK Data, low cost modulation and demodulation

- Tolerant to close proximity antennas on same PCB

- Doppler tolerant

- Phase noise tolerant

- (BPSK future option, ASK back compatible)

Low cost crystals, receiver can rapidly detect and correct frequency errors during preamble time

- Supports 40 PPM crystals (initial accuracy, temperature drift and aging)

The transmitter system requirements are supported by low cost CMOS