Theory and Terminology Note

Frequency Hop Spread Spectrum vs. Direct Sequence Spread Spectrum

Definition

Frequency Hopping Spread Spectrum (FHSS): When using FHSS, the frequency spectrum is divided into channels. Data packets are split up and transmitted on these channels in a random pattern known only to the transmitter and receiver. Because collocated networks follow different random patterns, or hop code tables, multiple networks can operate in close proximity without interfering.

If interference is present on one channel, data transmission is blocked. The transmitter and receiver 'hop' to the next channel in the hop table and the transmitter resends the data packet.

Frequency hopping technology works best for small data packets in high interference environments.

Direct Sequence Spread Spectrum (DSSS): The DSSS encoder spreads the data across a broad range of frequencies using a mathematical key. The receiver uses the same key to decode the data.

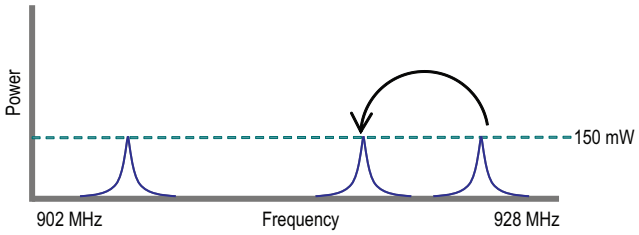
While narrowband and DSSS transmissions use the same total power to send data, DSSS uses a lower power density (power/frequency), making it harder to detect. DSSS also sends redundant copies of the encoded data to ensure reception.

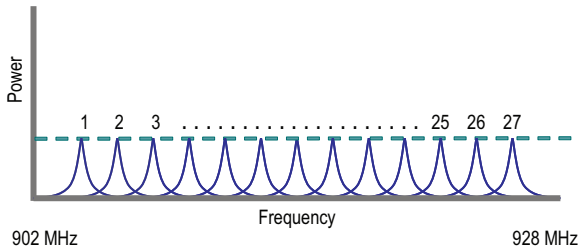
Narrowband interference appears to the receiver as another narrowband transmission. When the total received signal is decoded, the wider band transmission (DSSS encoded data) is decoded back to its original narrowband format while the interference is decoded to a lower power density signal, thereby reducing its effects.

When broadband interference is present, however, the resulting decoded broadband interference can give a much higher noise floor, almost as high as the decoded signal.

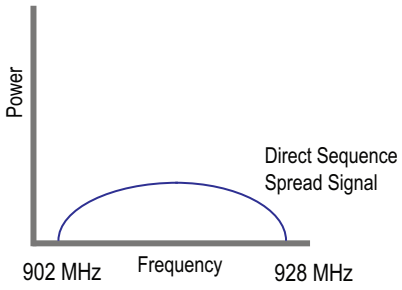
For this reason, DSSS works best for large data packets in a low to medium interference environment, but not as well in higher interference industrial applications.

As a general rule, FHSS can resist interference from spurious RF signals ten times better than DSSS.



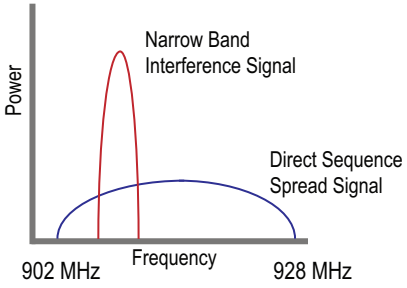


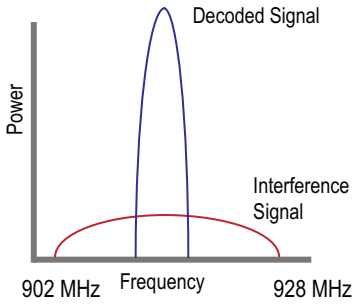
The frequency range is divided into channels. The data is transmitted on these randomly ordered channels.



The narrowband signal is converted into this DSSS signal for transmission.

The DSSS signal uses a much lower power density than narrowband inference.





When the DSSS signal is decoded back to its original narrowband state, the narrowband inference picked up during transmission is decoded to a lower power density signal and is ignored by the receiver.

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