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Bluetooth How Does It Work?

Normally operating at 2.4 GHz in the license-free, globally available ISM radio band are Bluetooth devices. Worldwide availability and compatibility is considered as an advantage to this band. But the devices must share this band with other RF emitters and that would be a disadvantage. This would include other wireless devices, and other noise sources, such as microwaves as well as automobile security systems.

Bluetooth employs a fast frequency hopping scheme in order to overcome this challenge and so shorter packets than other standards within the ISM band will be used. Because of this scheme, Bluetooth communication becomes more secure and more robust.

Learn about frequency hopping

Frequency hopping is basically jumping from frequency to frequency within the ISM radio band. The device or devices that it is communicating with can hop to another frequency before the next packet is sent after a Bluetooth device sends or receives a packet.

There are three advantages offered here:

While it never transmits from a fixed frequency for more than a short period of time, it does allow Bluetooth devices to use the entirety of the available ISM band. This is the reason why Bluetooth conforms to the ISM restrictions on the transmission quantity per frequency.

Making sure that any interference won't last long is another thing that it does. Any packet that doesn't arrive safely to its destination can be resent to the next frequency.

A base level of security is also provided because it's very hard for an eavesdropping device to predict which frequency the Bluetooth devices will use next.

However, the connected devices must agree upon the frequency they will use next. When it comes to the specification in Bluetooth, this can be ensured in two ways. The first thing it does is define a master and slave type relationship between Bluetooth devices. Next, it specifies an algorithm that uses device specific information when calculating the frequency of hop sequences.

A Bluetooth device that operates in master mode can communicate with up to seven devices that are set in slave mode. The master Bluetooth device will send its own unique address to each of the slaves as well as the value of its own internal clock. To calculate the frequency hop sequences, the information sent will then be used.

The same algorithm with the same initial input is used by the master device and each of the slave devices which is why the connected devices will arrive together at the same frequency that they have agreed on.

A range of around 5-10 meters is what Bluetooth devices usually have. This range is far enough for wireless communication but close enough to avoid drawing too much power from the power source of the device.

With Bluetooth, devices are able to communicate with each other such as laptops and hands-free car kits.

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