Frequency Hopping Spread Spectrum

1. Bluetooth system

The Equipment Under Test (EUT) is the Digital Video Camera Recorder, witch has a ***Bluetooth*** communication module internally. ***Bluetooth*** is the one of the short-range wireless communication system with frequency hopping spread spectrum (FHSS). ***Bluetooth Specification*** is standardized by and published by ***Bluetooth Special Interest Group (SIG)***. This EUT is completely applied to ***The Bluetooth Specification ver. 1.1*** released in February 22nd, 2001.

2. Hopping Frequency

The frequency range is 2402 MHz to 2480 MHz with spanning 79MHz. Hopping frequencies (channels) are separated by 1MHz within 20 dB bandwidth. Therefore there are 79 hopping frequencies. These hopping frequencies are selected by pseudo random sequence so that each frequency must be used equally on the average. The slot length of ***Bluetooth*** is separated by 625 microsecond and ***Bluetooth*** specifications allow a multi slots packet using these slots, up to five slots without an interval. A hopping frequency occupies over this multi slots packet and the longest occupancy is 3.125 millisecond, in case of a five-slot packet.

3. Hopping Sequence

The hopping frequencies are selected derived from the ***Bluetooth*** clock and the ***Bluetooth BD_Address***, which is a unique ID for unit by unit.

Hopping frequencies are grouped into several segments. Each segment consists of 32 hop frequencies spanning about 64MHz. The hopping frequency selection scheme chooses a segment and visits these hops once in a random order. In case of connection mode, the selected 32-hop segment is changed by pseudo random sequence one after another. And cycling time is so long, because the code length is 2^27-1.

4. Creating connection

Short-range wireless communication network of ***Bluetooth***, called piconet, is established as following. One "Master" unit searches for other "Slave" units in surrounding area, which is called "Inquiry". If at least one "Slave" is found, "Master" can try to create connection with it, which is called "Page". After the connection is established, "Master" unit controls the hopping sequence in the piconet. In this case, "Master" unit's BD_Address is used to generate hopping sequence.