Operation Description

DV5MB is operating in the ISM band (2402-2480 MHz). The channel is represented by a pseudo-random hopping sequence hopping through the 79 RF channels. The unique hopping sequence is determined by the Bluetooth device address of the master; the phase in the hopping sequence is determined by the Bluetooth clock of the master. The channel is divided into time slots where each slot corresponds to an RF hop frequency. Consecutive hops correspond to different RF hop frequencies. The nominal hop rate is 1600 hops/s and the 1MHz symbol rate as defined for the basic data rate.

All Bluetooth units participating in a piconet are time- and hop-synchronized to the channel.
The channel is divided into time slots, each 625 μs in length. In the time slots, master and slave can transmit packets. A TDD scheme is used where master and slave alternatively transmit. The RF hop frequency shall remain fixed for the duration of the packet. For a single packet, the RF hop frequency to be used is derived from the current Bluetooth clock value. For a multi-slot packet, the RF hop frequency to be used for the entire packet is derived from the Bluetooth clock value in the first slot of the packet. The RF hop frequency in the first slot after a multi-slot packet shall use the frequency as determined by the current Bluetooth clock value. If a packet occupies more than one time slot, the hop frequency applied shall be the hop frequency as applied in the time slot where the packet transmission was started.

5 types of hopping sequences are defined:
- A page hopping sequence with 32 unique wake-up frequencies distributed equally over the 79MHz, with a period length of 32.
- A page response sequence covering 32 unique response frequencies that all are in an one-to-one correspondence to the current page hopping sequence.
- An inquiry sequence with 32 unique wake-up frequencies distributed equally over the 79MHz, with a period length of 32. (Note: The headset does never use this sequence)
- A inquiry response sequence covering 32 unique response frequencies that all are in an one-to-one correspondence to the current inquiry hopping sequence.
- A channel hopping sequence which has a very long period length, which does not show repetitive patterns over a short time interval, but which distributes the hop frequencies equally over the 79MHz during a short time interval.

Hopping information:
In this application note, we will only consider the frequency hopping form of spread spectrum, as this technique is more suited to relatively low-data rate, low-power systems. Frequency hopping, as implied by the name, is performed by changing carrier frequencies while communicating. In a typical system, the frequency hopping will be of the so-called slow variety, which means that several data symbols (bits) are transmitted during each hop. A rate between 50 and several hundred hops per second is practical. The lock time of the PLL when changing frequencies is 100us-200us (depending on the loop filter), while the time required to reprogram the needed registers using a 1 MHz clock is on the order of 50-60us. The time during a hop when data cannot be received or transmitted is termed the blanking interval. The dwell time is the time spent in

each channel.

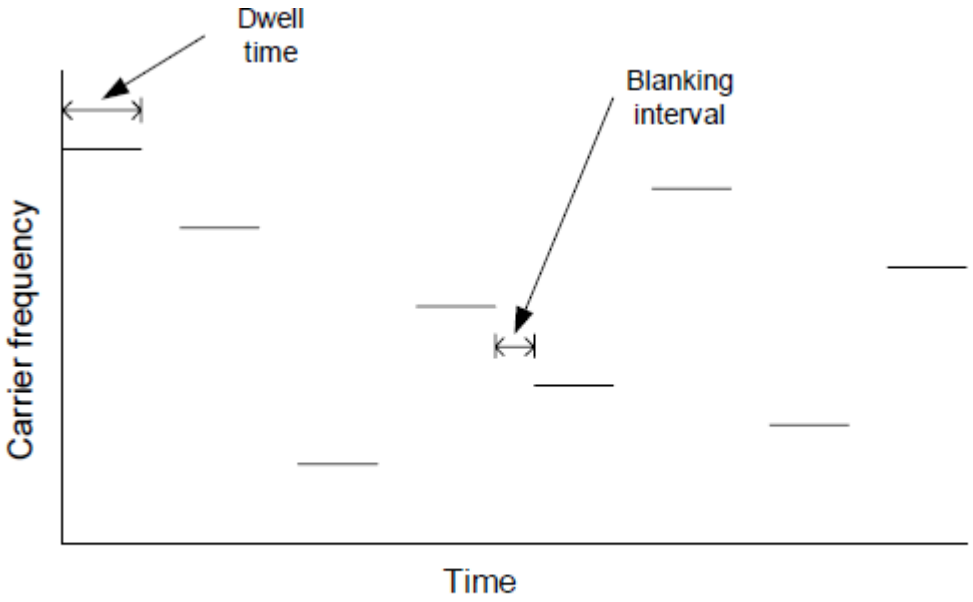

Figure 1 Frequency hopping terminology

Since spread-spectrum technology has its roots in military applications, much of the terminology refers to enemy “jammers” of varying complexity. In commercial systems, intelligent jamming is not a primary threat. Most of the time, the “jamming” signal will merely be another device trying to utilise the same frequency band for communicating. These devices will typically not be as devious as intelligent enemy jammers might be, so the security requirements can be eased a bit compared to military applications. The so-called “narrowband jammer” is probably the most representative threat seen in civilian applications. Interference from multi-path reflections is also a serious threat. These reflections can cause large frequency- and location-dependent drops in signal strength. Frequency hopping combats multi-path reflections by ensuring frequency diversity.

BT Antenna: PCB Antenna
BT Version: EDR+2.1
BT Modulation type: FHSS: (GFSK (1Mbps), Π/4-DQPSK (EDR 2Mbps), 8-DPSK (EDR 3Mbps)
BT Frequency range: 2.402GHz-2.480GHz
Bluetooth max. output power: 0.682dBm