

## **Description of each Blocks**

### **Functional Explanation of Bluetooth Module IC**

The following is the outline for design and development.

#### **a. Stabilization of Frequency**

This radio equipment applies Frequency Synthesizer Method to gain frequency stabilization and accuracy. For frequency stabilization, it uses 16MHz crystal oscillator (Crystal Oscillator X100) as a reference signal oscillator in order to control the voltage control oscillator for 1.2GHz band (U100: VCO/PLL part).

Every crystal oscillator is adjusted by electrical trimming of loading capacitance of oscillator. The crystal oscillator generates 16MHz reference clock with + - 17ppm stability.

#### **b. Suppression of Spurious Emission**

All Radio frequency circuits of this radio equipment are consisted of one IC chip. Also this radio equipment has a function to amplify RF signal. Therefore Spurious generated in the chip (U100) is canceled out and does not leak.

At first this radio equipment converts digital signals to analog signals. Then the converted analog signals pass through LPF (Low Pass Filter) and in transit Spurious (noise signal) of the signals is removed in high frequency band. Additionally since the analog signals always go through BPF (Band Pass Filter) before entering antenna, 2<sup>nd</sup> and 3<sup>rd</sup> Harmonics generated by Power Amplifier is removed.

In addition before shipment we test and check all products for out of band spurious emission during production process.

Furthermore a metal shielding case covers RF block and Modulation/Demodulation areas in order to suppress Radiation even more.

#### **c. Modulation Control**

This radio equipment applies the Frequency Hopping Method and uses 79 channels from 2402 to 2480MHz for communication.

To stabilize channel frequency at channel switch-over, signals from Power Amplifier in Transmitter is output from Antenna via Switch after frequency of output signal of +45/-45 Phase Shifter in VCO/PLL is stabilized.

Following is the procedure of Hopping Sequence.

To have homogeneous distribution of radio wave in 79 channels, we repeat sequence using 32 channels of 79 channels (between 2402 to 2480MHz, every 1MHz step) in the pseudo-random way 5 times.

In addition to have exact Hopping within the used band we control VCO/PLL in the Chip (U100) from Main Controller.

NOTE: Please refer the following information related to FCC requirements.

## **Additional information in accordance with requirements of FCC 15.247 and FCC Public Notice DA 00-705**

### **1. Hopping frequency requirements**

The number of hopping frequencies is measured in accordance with FCC Public Notice DA 00-705 and reported the compliance in the test report.

On pseudorandom frequency hopping sequence the following is an example of a 79 hopping sequence in **data transmission mode**:

47, 21, 44, 23, 42, 53, 46, 55, 33, 48, 52, 35, 50, 20, 54, 67, 56, 37, 60, 39, 58, 69, 62, 71, 64, 25, 68, 27, 66, 57, 70, 59, 72, 29, 76, 31, 74, 61, 78, 01, 63, 41, 05, 43, 03, 73, 07, 75, 09, 45, 13, 40, 11, 77, 15, 00, 16, 28, 49, 22, 34, 02, 19, 06, 17, 51, 32, 14, 36, 04, 12, 26, 18, 38, 24, 08, 30, 65, 10

Example of a hopping sequence in **inquiry mode**:

47, 08, 71, 57, 63, 02, 61, 45, 55, 10, 59, 73, 65, 69, 27, 43, 00, 77, 04, 67, 37, 06, 31, 75, 33, 39, 51, 40, 29, 14, 35, 49

Example of a hopping sequence in **paging mode**:

08, 57, 70, 68, 51, 02, 40, 42, 04, 61, 46, 44, 63, 14, 50, 48, 16, 65, 54, 52, 67, 18, 58, 56, 20, 53, 60, 62, 55, 06, 66, 64

### d. Limitation of Transmission Power

This radio equipment uses a saturated type power amplifier (PA). Additionally transmit power does not exceed the rated level in the PA block because we control the transmit power from main control block based on the configuration of Flash ROM.

Also the Stabilized Power Supply IC (U101) stabilizes supply voltage 1.8V. Moreover the stabilized 1.8V is even more stabilized in the constant voltage circuit inside of the Chip (U100) to prevent transmit power fluctuation caused by voltage fluctuation.

### e. Suppression of Radio Collaterally Radiated by Receiver

As mentioned in the above b., all high frequency circuits of this radio equipment are consisted of one chip and this radio equipment also has a function to amplify high frequency signal.

Therefore Radiation generated in the chip (U100) is canceled out and does not leak.

Additionally there are Mixer and Low Noise Amplifier between VCO and the Antenna terminal. At reception Inverse Direct Isolation of the Mixer and the Low Noise Amplifier prevents Spurious of VCO/PLL from leaking out from the Antenna terminal. Also a metal shielding case covers Modulator/Demodulator and RF block so that the Radiation decreases.