Introduction

The MU203 Wireless Module developed independently by HUAWEI based on the 6240 chipset produced by QUALCOMM Incorporated. It supports GSM/GPRS/EDGE frequency bands.It is designed in compliance with the FCC Rules and Regulations **Part 24 and Part22.**

Intended use statements

MU203 is a Wireless Module. It can only be work in the networks which it supports the EDGE/GPRS/GSM technique. If there are no corresponding networks, the RF module of MU203 will not work and no any unwanted emission will be produced.

Types of Emissions

For this Wireless module, the emission designator is **300KGXW**

Frequency Range

GSM/GPRS/EDGE 850MHz: 824～849MHz

GSM/GPRS/EDGE 1900MHz:1850~1910MHz

Range of Operating Power

The peak output power of a this handset may not exceed 2 Watts EIRP for 1900M as defined in Part 24

The peak output power of a this handset may not exceed 7 Watts ERP for 850M as defined in Part 22

Maximum Power Limits

850MHz:

GSM/GPRS: 33dBm [+/-2dB]

EDGE: 27 dBm [+/-3dB]

1900MHz:

GSM/GPRS: 30dBm [+/-2dB]

EDGE: 26 dBm [+/-3dB]

Antenna description

Technical parameters of the Huawei MU203 Wireless Module antenna:

Item	Description
Frequency	850MHz/1900 MHz
Input impedance	50 Ohm
VSWR	≤ 3
Peak gain	850M:<4.28dBi 1900M:<2.1dBi
Rated power	4 W
Polarization	Linear

Applied voltages

Normal Voltage: 3.8V

Low Voltage: 3.3V

High Voltage: 4.2V

Complete bill of material

Attachment

Complete Circuit Diagrams

Attachment

Instruction/Installation Manual

Attachment

Means for Frequency Stabilization

The QSC6240 is mainly responsible for the frequency stabilization. The QSC6240 receives the BS signal and demodulates it and then generates the local clock to provide the system with various clock signals.

Means for Limiting Modulation

In a GSM system, the input signal (voice for example) is sampled and coded in a vocoder, after channel coding, The digital signal is modulated onto the analog carrier frequency using Gaussian-filtered Minimum Shift Keying (GMSK). The modulation scheme is gaussian MSK (GMSK) with BT=0.3. The modulation rate is 1625/6 kbit/s (270,83kbit/s). GMSK was selected over other modulation schemes as a compromise between spectral efficiency, complexity of the transmitter, and limited spurious emissions.

The modulation standard selected for EDGE is 8-phase shift keying (8PSK). 8PSK was selected over other modulation schemes as a compromise between spectral efficiency, complexity of the transmitter, and limited spurious emissions.

Description of Digital Modulation Techniques

GSM is a digital system, so speech which is inherently analog, has to be digitized. The method employed by ISDN, and by current telephone systems for multiplexing voice lines over high speed trunks and optical fiber lines, is Pulse Coded Modulation (PCM). The output stream from PCM is 64 kbps, too high a rate to be feasible over a radio link. The 64 kbps signal, although simple to implement, contains much redundancy. The GSM group studied several speech coding algorithms on the basis of subjective speech quality and complexity (which is related to cost, processing delay, and power consumption once implemented) before arriving at the choice of a Regular Pulse Excited -- Linear Predictive Coder (RPE--LPC) with a Long Term Predictor loop. Basically, information from previous samples, which does not change very quickly, is used to predict the current sample. The coefficients of the linear combination of the previous samples, plus an encoded form of the residual, the difference between the predicted and actual sample, represent the signal. Speech is divided into 20 millisecond samples, each of which is encoded as 260 bits, giving a total bit rate of 13 kbps. This is the so-called Full-Rate speech coding. Recently, an Enhanced Full-Rate (EFR) speech coding algorithm has been implemented by some North American GSM1900 operators. This is said to provide improved speech quality using the existing 13 kbps bit rate.

Because of natural and man-made electromagnetic interference, the encoded speech or data signal transmitted over the radio interface must be protected from errors. GSM uses convolutional encoding and block interleaving to achieve this protection. The exact algorithms used differ for speech and for different data rates. The method used for speech blocks will be described below.

Recall that the speech codec produces a 260 bit block for every 20 ms speech sample. From subjective testing, it was found that some bits of this block were more important for perceived speech quality than others. The bits are thus divided into three classes:

Class Ia 50 bits - most sensitive to bit errors

Class Ib 132 bits - moderately sensitive to bit errors

Class II 78 bits - least sensitive to bit errors

Class Ia bits have a 3 bit Cyclic Redundancy Code added for error detection. If an error is detected, the frame is judged too damaged to be comprehensible and it is discarded. It is replaced by a slightly attenuated version of the previous correctly received frame. These 53 bits, together with the 132 Class Ib bits and a 4 bit tail sequence (a total of 189 bits), are input into a 1/2 rate convolutional encoder of constraint length 4. Each input bit is encoded as two output bits, based on a combination of the previous 4 input bits. The convolutional encoder thus outputs 378 bits, to which are added the 78 remaining Class II bits, which are unprotected. Thus every 20 ms speech sample is encoded as 456 bits, giving a bit rate of 22.8 kbps.

To further protect against the burst errors common to the radio interface, each sample is interleaved. The 456 bits output by the convolutional encoder are divided into 8 blocks of 57 bits, and these blocks are transmitted in eight consecutive time-slot bursts. Since each time-slot burst can carry two 57 bit blocks, each burst carries traffic from two different speech samples.

Recall that each time-slot burst is transmitted at a gross bit rate of 270.833 kbps. This digital signal is modulated onto the analog carrier frequency using Gaussian-filtered Minimum Shift Keying (GMSK). GMSK was selected over other modulation schemes as a compromise between spectral efficiency, complexity of the transmitter, and limited spurious emissions. The complexity of the transmitter is related to power consumption, which should be minimized for the mobile station. The spurious radio emissions, outside of the allotted bandwidth, must be strictly controlled so as to limit adjacent channel interference.

8PSK modulation has the same qualities in terms of generating interference on adjacent channels as GMSK. This makes it possible to integrate EDGE channels into an existing frequency plan and to assign new EDGE channels in the same way as standard GSM channels.

The 8PSK modulation method is a linear method in which three consecutive bits are mapped onto one symbol in the I/Q plane. The symbol rate, or the number of symbols sent within a certain period of time, remains the same as for GMSK, but each symbol now represents three bits instead of one. The total data rate is therefore increased by a factor of three.

The data rate used by a terminal depends on spreading factor assigned to this particular terminal. If several terminals use the same spreading factor, the signals are distinguished through different code channels. At present the maximum data rate is 384 kbps. In the future it will be possible to combine several code channels to a multi-code link, allowing data rates up to 2 Mbps. However, when this is used the capacity of this frequency channel is used up, i.e. no other terminal can operate on this frequency channel. The reason for this is that there is no more "SNR" left for additional connections. This is the capacity issue indicated above.