Introduction

HUAWEI LTE Wireless Gateway–B890-66 is subscriber equipment in the WCDMA/LTE system, also supports wireless Internet accessing function, routing function, network address translation (NAT) function.

Intended use statements

HUAWEI LTE Wireless Gateway–B890-66 is subscriber equipment in the WCDMA/LTE system, also supports wireless Internet accessing function, routing function, network address translation (NAT) function. The HSPA+/WCDMA frequency band is Band 2/4/5. The LTE frequency band includes Band 2/4/5/7/12/13/17. And the TX/RX band is 2400MHz~2483MHz for WLAN. B890-66 implements such functions as RF signal receiving/sending, WCDMA and LTE protocol processing, voice and data service etc. Externally it provides USB port interface, SIM card interface, four auto-sensing Ethernet interfaces and external antenna interface.

Types of Emissions

Band 2:

UMTS system: 4M19F9W

LTE system: 1M09G7D (1.4MHz ,QPSK modulation),
1M09W7D (1.4 MHz ,16QAM modulation),
2M69G7D (3MHz ,QPSK modulation),
2M68W7D (3 MHz ,16QAM modulation),
4M47G7D (5MHz ,QPSK modulation),
4M48W7D (5 MHz ,16QAM modulation),
8M97G7D (10 MHz QPSK modulation),
8M95W7D (10 MHz 16QAM modulation),
13M4G7D (15 MHz QPSK modulation),
13M4W7D (15 MHz 16QAM modulation),
17M9G7D (20 MHz QPSK modulation),
17M9W7D (20 MHz 16QAM modulation),

Band 4:

UMTS system: 4M17F9W

LTE system: 1M09G7D (1.4MHz ,QPSK modulation),
1M08W7D (1.4 MHz ,16QAM modulation),
2M69G7D (3MHz ,QPSK modulation),
2M68W7D (3 MHz ,16QAM modulation),
4M48G7D (5MHz ,QPSK modulation),
4M48W7D (5 MHz ,16QAM modulation),
8M95G7D (10 MHz QPSK modulation),
8M94W7D (10 MHz 16QAM modulation),
13M5G7D (15 MHz QPSK modulation),
13M5W7D (15 MHz 16QAM modulation),
17M9G7D (20 MHz QPSK modulation),
17M9W7D (20 MHz 16QAM modulation),

Band 5

UMTS system: 4M17F6W

LTE system: 1M09G7D (1.4MHz ,QPSK modulation),
1M08W7D (1.4 MHz ,16QAM modulation),
2M69G7D (3MHz ,QPSK modulation),
2M69W7D (3 MHz ,16QAM modulation),
4M48G7D (5MHz ,QPSK modulation),
4M48W7D (5 MHz ,16QAM modulation),
8M96G7D (10 MHz QPSK modulation),
8M94W7D (10 MHz 16QAM modulation),

Band 7:

LTE system: 4M48G7D (5 MHz ,QPSK modulation),
4M48W7D (5 MHz ,16QAM modulation),
8M96G7D (10 MHz QPSK modulation),
8M95W7D (10 MHz 16QAM modulation),
13M44G7D (15MHz QPSK modulation),
13M43W7D (15MHz 16QAM modulation),
17M88G7D (20 MHz QPSK modulation),
17M89W7D (20 MHz 16QAM modulation)

Band 12

LTE system: 1M09G7D (1.4 MHz ,QPSK modulation),
1M09W7D (1.4 MHz ,16QAM modulation),
2M69G7D (3 MHz QPSK modulation),
2M68W7D (3 MHz 16QAM modulation),
4M48G7D (5MHz QPSK modulation),
4M48W7D (5MHz 16QAM modulation),
8M95G7D (10 MHz QPSK modulation),
8M96W7D (10 MHz 16QAM modulation),

Band 13

LTE system: 4M48G7D (5 MHz ,QPSK modulation),
4M48W7D (5 MHz ,16QAM modulation),
8M95G7D (10 MHz QPSK modulation),
8M94W7D (10 MHz 16QAM modulation),

Band 17

LTE system: 4M47G7D (5 MHz ,QPSK modulation),
4M49W7D (5 MHz ,16QAM modulation),
8M96G7D (10 MHz QPSK modulation),
8M96W7D (10 MHz 16QAM modulation),

WLAN:

10M44D2D (802.11b with data rate of 11 Mbps)
16M60D2D (802.11g with data rate of 54 Mbps)
17M71D2D (802.11n with 20 MHz bandwidth)
36M00D2D (802.11n with 40 MHz bandwidth)

Frequency Range

Mode		Work Frequency	
		Transmitt Frequency （MHz）	Receive Frequency （MHz）
HSPA+/WCDMA	WCDMA1900	1850-1910	1930-1990
	AWS	1712-1753	2122-2183
	WCDMA850	824-849	869-894
LTE	Band 2	1850 – 1910	1930 – 1990
	Band 4	1710 – 1755	2110– 2155
	Band 5	824 – 849	869 – 894
	Band 7	2500 – 2570	2620 – 2690
	Band 12	699 – 716	729 – 746
	Band 13	777– 787	746 – 756
	Band 17	704 - 716	734 - 746
WLAN	WLAN	2400~2483	2400~2483

Range of Operating Power

$BW_{Channel}$ [MHz]	**1.4**	**3**	**5**	**10**	**15**	**20**
1RB	1	1	1	1	1	1
Partial RB	5	4	8	12	16	18
Full RB	6	15	25	50	75	100

LTE Band	Class 3 (dBm)	QPSK partial RB allocation Tol.(dB)	QPSK full RB allocation Tol.(dB)	QPSK partial RB allocation Tol.(dB)	QPSK full RB allocation Tol.(dB)
Band 2	23	+2.7/-2.7	+2.7/-3.7	+2.7/-3.7	+2.7/-4.7
Band 4	23	+2.7/-2.7	+2.7/-3.7	+2.7/-3.7	+2.7/-4.7
Band 5	23	+2.7/-2.7	+2.7/-3.7	+2.7/-3.7	+2.7/-4.7
Band 7	23	+2.7/-2.7	+2.7/-3.7	+2.7/-3.7	+2.7/-4.7
Band 12	23	+2.7/-2.7	+2.7/-3.7	+2.7/-3.7	+2.7/-4.7
Band 13	23	+2.7/-2.7	+2.7/-3.7	+2.7/-3.7	+2.7/-4.7
Band 17	23	+2.7/-2.7	+2.7/-3.7	+2.7/-3.7	+2.7/-4.7

WCDMA Band 2/4/5: 24 +2/-2 dBm

WLAN: 802.11b：17dbm（+2/-2）
802.11g：15dbm（+2/-2）
802.11n：15dbm（+2/-2）

Maximum Power Limits

$BW_{Channel}$ [MHz]	1.4	3	5	10	15	20
1RB	1	1	1	1	1	1
Partial RB	5	4	8	12	16	18
Full RB	6	15	25	50	75	100

LTE Band	Class 3 (dBm)	QPSK partial RB allocation Tol.(dB)	QPSK full RB allocation Tol.(dB)	QPSK partial RB allocation Tol.(dB)	QPSK full RB allocation Tol.(dB)
Band 2	23	+2.7/-2.7	+2.7/-3.7	+2.7/-3.7	+2.7/-4.7
Band 4	23	+2.7/-2.7	+2.7/-3.7	+2.7/-3.7	+2.7/-4.7
Band 5	23	+2.7/-2.7	+2.7/-3.7	+2.7/-3.7	+2.7/-4.7
Band 7	23	+2.7/-2.7	+2.7/-3.7	+2.7/-3.7	+2.7/-4.7
Band 12	23	+2.7/-2.7	+2.7/-3.7	+2.7/-3.7	+2.7/-4.7
Band 13	23	+2.7/-2.7	+2.7/-3.7	+2.7/-3.7	+2.7/-4.7
Band 17	23	+2.7/-2.7	+2.7/-3.7	+2.7/-3.7	+2.7/-4.7

WCDMA Band 2/4/5: 24 +2/-2 dBm

WLAN: 802.11b：17dbm（+2/-2）
802.11g：15dbm（+2/-2）
802.11n：15dbm（+2/-2）

Antenna description

Technical parameters of theB890-66 antenna specifications

Item	Description
Frequency range	LTE:1900/AWS/850/2600/NA700MHz WCDMA:1900/AWS/850MHz
Input impedance	50 Ohm
VSWR	<3.
Gain	≥1dBi (horizontal level peak value)
Max. power	25W
Polarization Type	Linear polarization

Applied voltages:

AC: 100V-240V DC: 12V, 2 A

Complete bill of material

Attachment

Complete Circuit Diagrams
Attachment

Instruction/Installation Manual
Attachment

Equipment label with CE identification
Attachment
Means for Frequency Stabilization
The Voltage Controlled Temperature Compensated Crystal Oscillator (VCTCXO) provides the reference frequency for all RFIC synthesizers as well as clock generation functions within the MDM9215. The oscillator frequency is controlled by the MDM9215's pulse density modulated signal.

Means for Limiting Modulation
The modulation standard selected for WCDMA is QPSK. QPSK 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 HSPA is 16QAM. HSDPA is just the technology for the downlink. The downlink channel HS-DSCH is modulated by the 16QAM. The uplink modulation is the same with the WCDMA.The modulation standard selected for HSUPA is QPSK.
The LTE downlink channel is modulated by the QPSK, 16QAM, 64QAM. The uplink modulation is the QPSK and 16QAM.

Description of Digital Modulation Techniques
WCDMA or UMTS – as it is called throughout Europe – is a standard which has been developed to accommodate higher data rates to allow features like internet surfing, video telephony or video download. Even though WCDMA is focusing on high data rates it still supports simple features like a plain voice call or sending of SMS.
WCDMA is a CDMA system. CDMA stands for code division multiple access. This means that the available frequency channel is broken down by different code sequences that are multiplied by the user signals of the individual subscribers. All subscribers transmit on the same frequency and at the same time.
For WCDMA different base stations are distinguished by a different scrambling code, which makes cell planning a lot easier, since neighboring cells can re-use the same frequency! (However, the occupied "SNR" – or Signal to Noise Ratio is the limiting factor and characteristic for CDMA)
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.

In order to address higher data rates high speed downlink packet access (HSPA) has been introduced into Release 5 of the WCDMA (3GPP) standard. HSPA allows data rates of up to 10 Mbps (and 20 Mbps for Multiple Input Multiple Output (MIMO) systems) and is based on 16-QAM modulation. As the name suggests HSPA is only available in the downlink direction, i.e. ideal for loading large Emails, surf the web or download videos LTE, known as Long-Term Evolution, targets more complex spectrum situations and has fewer restrictions on backwards compatibility. The radio interface is purely optimized for IP transmissions not having to support ISDN traffic: that is, there is no requirement for support of GSM circuit-switch services, a requirement that WCDMA had. For spectrum flexibility, LTE is therefore targeted to operate in spectrum allocations from roughly 1 to 20MHz. Furthermore, when going to the data rates that LTE is targeting, achieving low delay and high data rates at the cell edges are more important requirements than the peak data rate.

The multiple access scheme for the LTE physical layer is based on Orthogonal Frequency Division Multiplexing (OFDM) with a cyclic prefix (CP) in the downlink, and on Single-Carrier Frequency Division Multiple Access (SC-FDMA) with a cyclic prefix in the uplink.

The Layer 1 is defined in a bandwidth agnostic way based on resource blocks, allowing the LTE Layer 1 to adapt to various spectrum allocations. A resource block spans either 12 sub-carriers with a sub-carrier bandwidth of 15kHz or 24 sub-carriers with a sub-carrier bandwidth of 7.5kHz each over a slot duration of 0.5ms.

The radio frame structure type 1 is used for FDD (for both full duplex and half duplex operation) and has a duration of 10ms and consists of 20 slots with a slot duration of 0.5ms. Two adjacent slots form one sub-frame of length 1ms.