RF EXPOSURE REPORT

Report No.: 16050014-FCC-H

Applicant	Quectel Wireless Solutions Co., Ltd.
Product Name	Multi-mode LTE module
Model No.	EC20
Serial No.	EC20 MiniPCIe
Test Standard	FCC 2.1091:2015
Test Date	March 17 to April 11, 2016
Issue Date	May 09, 2016
Test Result	☑ Pass ☐ Fail
Equipment complied with the specification	☑
Equipment did not comply with the specification	☐

Winnie.Zhang	David Huang	
Winnie Zhang Test Engineer	David Huang Checked By	

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Test result presented in this test report is applicable to the tested sample only

Issued by:

SIEMIC (SHENZHEN-CHINA) LABORATORIES

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Laboratories Introduction

SIEMIC, headquartered in the heart of Silicon Valley, with superior facilities in US and Asia, is one of the leading independent testing and certification facilities providing customers with one-stop shop services for Compliance Testing and Global Certifications.

In addition to testing and certification, SIEMIC provides initial design reviews and compliance management throughout a project. Our extensive experience with China, Asia Pacific, North America, European, and International compliance requirements, assures the fastest, most cost effective way to attain regulatory compliance for the global markets.

Accreditations for Conformity Assessment

Country/Region	Scope
USA	EMC, RF/Wireless, SAR, Telecom
Canada	EMC, RF/Wireless, SAR, Telecom
Taiwan	EMC, RF, Telecom, SAR, Safety
Hong Kong	RF/Wireless, SAR, Telecom
Australia	EMC, RF, Telecom, SAR, Safety
Korea	EMI, EMS, RF, SAR, Telecom, Safety
Japan	EMI, RF/Wireless, SAR, Telecom
Singapore	EMC, RF, SAR, Telecom
Europe	EMC, RF, SAR, Telecom, Safety

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1. Report Revision History

Report No.	Report Version	Description	Issue Date
16050014-FCC-H	Original	NONE	May 05, 2016
16050014-FCC-H	V1	Re-assess allowed Max. antenna gain and MPE	May 09, 2016

2. Customer information

Applicant Name	Quectel Wireless Solutions Co., Ltd.
Applicant Add	Room501,Building 13,No.99 TianZhou Road,Xuhui District,Shanghai,China
Manufacturer	Quectel Wireless Solutions Co., Ltd.
Manufacturer Add	Room501,Building 13,No.99 TianZhou Road,Xuhui District,Shanghai,China

3. Test site information

Lab performing tests	SIEMIC (Shenzhen-China) LABORATORIES
Lab Address	Zone A, Floor 1, Building 2 Wan Ye Long Technology Park South Side of Zhoushi Road, Bao' an District, Shenzhen, Guangdong China 518108
FCC Test Site No.	718246
IC Test Site No.	4842E-1
Test Software	Labview of SIEMIC version 2.0

4. Equipment under Test (EUT) Information

Description of EUT:	Multi-mode LTE module
Main Model:	EC20
Serial Model:	EC20 MiniPCIe
Equipment Category :	PCB
Antenna Gain:	GSM850: 1dBi PCS1900: 1dBi UMTS-FDD Band 5:: 1dBi UMTS-FDD Band 4: 1dBi UMTS-FDD Band 2: 1dBi LTE Band 2: 1dBi LTE Band 4: 1dBi LTE Band 5: 1dBi LTE Band 12: 1dBi LTE Band 17: 1dBi **(Note: The radio module will be sold without antenna, this antenna only used limited to ERP/EIRP or radiated spurious emission test.)**
Input Power:	Spec: DC 3.8V
Trade Name :	Quectel
Type of Modulation:	GSM / GPRS: GMSK EGPRS: GMSK,8PSK UMTS-FDD: QPSK, 16QAM, 64QAM **(Note: 16QAM and 64QAM only support UMTS downlink)** LTE Band: QPSK, 16QAM, 64QAM **(Note: LTE downlink only support 64QAM)**

RF Operating Frequency (ies):	GSM850 TX: 824.2 ~ 848.8 MHz; RX: 869.2 ~ 893.8 MHz PCS1900 TX: 1850.2 ~ 1909.8 MHz; RX: 1930.2 ~ 1989.8 MHz UMTS-FDD Band 5 TX: 826.4 ~ 846.6 MHz; RX: 871.4 ~ 891.6 MHz UMTS-FDD Band 4 TX:1712.4 ~ 1752.6 MHz; RX : 2112.4 ~ 2152.6 MHz UMTS-FDD Band 2 TX:1852.4 ~ 1907.6 MHz; RX: 1932.4 ~ 1987.6 MHz LTE Band 2 TX: 1852.5 ~ 1907.5 MHz; RX : 1932.5 ~ 1987.5 MHz LTE Band 4 TX: 1712.5 ~ 1752.5 MHz; RX : 2112.5 ~ 2152.5 MHz LTE Band 5 TX: 826.5 ~ 846.5 MHz; RX : 871.5 ~ 891.5 MHz LTE Band 12 TX:699.7 ~ 715.3 MHz; RX : 729.7~ 745.3MHz LTE Band 17 TX: 706.5 ~ 713.5 MHz; RX : 736.5 ~ 743.5 MHz
Number of Channels:	GSM 850: 124CH PCS1900: 299CH UMTS-FDD Band 5: 102CH UMTS-FDD Band 4: 202CH UMTS-FDD Band 2: 277CH
FCC ID:	XMR201603EC20

5. FCC §2.1091 - Maximum Permissible exposure (MPE)

6.1 Applicable Standard

According to §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission' s guidelines.

According to §1.1310 and §2.1091 RF exposure is calculated.

Limits for General Population/Uncontrolled Exposure

Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Averaging Time (minutes)
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*($180/f^2$)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

f = frequency in MHz

* = Plane-wave equivalent power density

6.2 Test Result

Predication of MPE limit at a given distance

$$S = \frac{PG}{4\pi R^2}$$

Where: S = power density (in appropriate units, e.g. mW/cm^2)

P = power input to the antenna (in appropriate units, e.g., mW).

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain.

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

GSM Mode:

Burst Average Power (dBm);								
Band	GSM850				PCS1900			
Channel	128	190	251	Tune up Power tolerant	512	661	810	Tune up Power tolerant
Frequency (MHz)	824.2	836.6	848.8	/	1850.2	1880	1909.8	/
GSM Voice (1 uplink),GMSK	**32.34**	32.01	32.20	31.75±0.75	**28.68**	28.40	28.42	28.75±0.75
GPRS Multi-Slot Class 8 (1 uplink),GMSK	31.99	32.33	32.15	31.75±0.75	28.41	28.38	28.67	28.75±0.75
GPRS Multi-Slot Class 10 (2 uplink) GMSK	31.98	32.05	32.02	31.75±0.75	28.21	28.20	28.45	28.75±0.75
GPRS Multi-Slot Class 12 (4 uplink) GMSK	29.85	29.78	29.85	29.75±0.75	27.84	27.96	27.89	27.75±0.75
EGPRS Multi-Slot Class 8 (1 uplink) GMSK MCS1	31.87	32.29	32.20	31.75±0.75	28.36	28.38	28.65	28.75±0.75
EGPRS Multi-Slot Class 10 (2 uplink) GMSK MCS1	31.84	32.11	32.06	31.75±0.75	28.24	28.15	28.45	28.75±0.75
EGPRS Multi-Slot Class 12 (4 uplink) GMSK MCS1	29.90	29.84	29.77	29.75±0.75	27.86	27.93	27.85	27.75±0.75
EGPRS Multi-Slot Class 8 (1 uplink) 8PSK MCS5	26.36	26.35	26.42	26.75±0.75	25.02	24.97	24.90	24.75±0.75
EGPRS Multi-Slot Class 10 (2 uplink) 8PSK MCS5	26.13	26.15	26.25	26.75±0.75	24.72	24.67	24.51	24.75±0.75
EGPRS Multi-Slot Class 12 (4 uplink) 8PSK MCS5	26.00	26.06	25.99	25.75±0.75	24.01	23.88	23.74	23.75±0.75
Remark : GPRS, CS1 coding scheme. EGPRS, MCS1 coding scheme.								

EGPRS, MCS5 coding scheme.

Multi-Slot Class 8 , Support Max 4 downlink, 1 uplink , 5 working link

Multi-Slot Class 10 , Support Max 4 downlink, 2 uplink , 5 working link

Multi-Slot Class 12 , Support Max 4 downlink, 4 uplink , 5 working link

	Source Based time Average Power (dBm)									
Band	GSM850					PCS1900				
Channel	128	190	251	Time Average factor	Tune up Power tolerant	512	661	810	Time Average factor	Tune up Power tolerant
Frequency (MHz)	824.2	836.6	848.8	/	/	1850.2	1880	1909.8	/	/
GSM Voice (1 uplink),GMSK	23.31	22.98	23.17	-9.03	22.75±0.75	19.65	19.37	19.39	-9.03	19.75±0.75
GPRS Multi-Slot Class 8 (1 uplink),GMSK	22.96	23.3	23.12	-9.03	22.75±0.75	19.38	19.35	19.64	-9.03	19.75±0.75
GPRS Multi-Slot Class 10 (2 uplink) GMSK	25.96	26.03	26.00	-6.02	25.75±0.75	22.19	22.18	22.43	-6.02	22.75±0.75
GPRS Multi-Slot Class 12 (4 uplink) GMSK	26.84	26.77	26.84	-3.01	26.75±0.75	24.83	24.95	24.88	-3.01	24.75±0.75
EGPRS Multi-Slot Class 8 (1 uplink) GMSK MCS1	22.84	23.26	23.17	-9.03	22.75±0.75	19.33	19.35	19.62	-9.03	19.75±0.75
EGPRS Multi-Slot Class 10 (2 uplink) GMSK MCS1	25.82	26.09	26.04	-6.02	25.75±0.75	22.22	22.13	22.43	-6.02	22.75±0.75
EGPRS Multi-Slot Class 12 (4 uplink) GMSK MCS1	26.89	26.83	26.76	-3.01	26.75±0.75	24.85	24.92	24.84	-3.01	24.75±0.75

EGPRS Multi-Slot Class 8 (1 uplink) 8PSK MCS5	17.33	17.32	17.39	-9.03	17.75±0.75	15.99	15.94	15.87	-9.03	15.75±0.75
EGPRS Multi-Slot Class 10 (2 uplink) 8PSK MCS5	20.11	20.13	20.23	-6.02	20.75±0.75	18.70	18.65	18.49	-6.02	18.75±0.75
EGPRS Multi-Slot Class 12 (4 uplink) 8PSK MCS5	22.99	23.05	22.98	-3.01	22.75±0.75	21.00	20.87	20.73	-3.01	20.75±0.75

Remark :

GPRS, CS1 coding scheme.

EGPRS, MCS1 coding scheme.

EGPRS, MCS5 coding scheme.

Multi-Slot Class 8 , Support Max 4 downlink, 1 uplink , 5 working link

Multi-Slot Class 10 , Support Max 4 downlink, 2 uplink , 5 working link

Multi-Slot Class 12 , Support Max 4 downlink, 4 uplink , 5 working link

UMTS Mode:

UMTS-FDD Band 5

Band/ Time Slot configuration	Channel	Frequency	Average power (dBm)	Tune up Power tolerant
RMC 12.2kbps	4132	826.4	**23.21**	22.5±1
	4175	835	23.00	22.5±1
	4233	846.6	22.95	22.5±1
HSDPA Subtest1	4132	826.4	22.36	22.5±1
	4175	835	22.58	22.5±1
	4233	846.6	22.45	22.5±1
HSDPA Subtest2	4132	826.4	22.15	22.5±1
	4175	835	22.16	22.5±1
	4233	846.6	22.37	22.5±1
HSDPA Subtest3	4132	826.4	22.15	22.5±1
	4175	835	22.14	22.5±1
	4233	846.6	22.25	22.5±1
HSDPA Subtest4	4132	826.4	22.35	22.5±1
	4175	835	22.31	22.5±1
	4233	846.6	22.26	22.5±1
HSUPA Subtest1	4132	826.4	21.86	22±1
	4175	835	22.53	22±1
	4233	846.6	21.42	22±1
HSUPA Subtest2	4132	826.4	22.27	22±1
	4175	835	21.55	22±1
	4233	846.6	21.43	22±1
HSUPA Subtest3	4132	826.4	22.44	22.5±1
	4175	835	21.88	22.5±1
	4233	846.6	21.56	22.5±1
HSUPA Subtest4	4132	826.4	21.54	22.5±1
	4175	835	21.88	22.5±1
	4233	846.6	22.34	22.5±1
HSUPA Subtest5	4132	826.4	22.36	22±1
	4175	835	21.45	22±1
	4233	846.6	22.44	22±1

UMTS-FDD Band 2

Band/ Time Slot configuration	Channel	Frequency	Average power (dBm)	Tune up Power tolerant
RMC 12.2kbps	9262	1852.4	**22.26**	22.5±1
	9400	1880	22.07	22.5±1
	9538	1907.6	21.93	22.5±1
HSDPA Subtest1	9262	1852.4	22.36	22±1
	9400	1880	21.53	22±1
	9538	1907.6	21.46	22±1
HSDPA Subtest2	9262	1852.4	21.55	22±1
	9400	1880	21.59	22±1
	9538	1907.6	21.58	22±1
HSDPA Subtest3	9262	1852.4	21.56	22±1
	9400	1880	21.46	22±1
	9538	1907.6	21.43	22±1
HSDPA Subtest4	9262	1852.4	21.38	22±1
	9400	1880	21.57	22±1
	9538	1907.6	21.24	22±1
HSUPA Subtest1	9262	1852.4	21.28	22±1
	9400	1880	21.80	22±1
	9538	1907.6	21.23	22±1
HSUPA Subtest2	9262	1852.4	21.34	22±1
	9400	1880	21.55	22±1
	9538	1907.6	21.64	22±1
HSUPA Subtest3	9262	1852.4	21.46	22±1
	9400	1880	21.47	22±1
	9538	1907.6	21.41	22±1
HSUPA Subtest4	9262	1852.4	21.24	22±1
	9400	1880	21.33	22±1
	9538	1907.6	21.53	22±1
HSUPA Subtest5	9262	1852.4	21.26	22±1
	9400	1880	21.29	22±1
	9538	1907.6	21.58	22±1

UMTS-FDD Band 4

Band/ Time Slot configuration	Channel	Frequency	Average power (dBm)	Tune up Power tolerant
RMC 12.2kbps	1313	1712.6	21.86	22.5±1
	1413	1732.6	**22.30**	22.5±1
	1512	1752.4	21.77	22.5±1
HSDPA Subtest1	1313	1712.6	21.65	22.5±1
	1413	1732.6	21.53	22.5±1
	1512	1752.4	21.54	22.5±1
HSDPA Subtest2	1313	1712.6	21.59	22.5±1
	1413	1732.6	21.56	22.5±1
	1512	1752.4	21.57	22.5±1
HSDPA Subtest3	1313	1712.6	21.55	22±1
	1413	1732.6	21.36	22±1
	1512	1752.4	21.39	22±1
HSDPA Subtest4	1313	1712.6	21.48	22±1
	1413	1732.6	21.57	22±1
	1512	1752.4	21.53	22±1
HSUPA Subtest1	1313	1712.6	21.43	22±1
	1413	1732.6	21.65	22±1
	1512	1752.4	21.43	22±1
HSUPA Subtest2	1313	1712.6	21.23	22±1
	1413	1732.6	21.48	22±1
	1512	1752.4	21.66	22±1
HSUPA Subtest3	1313	1712.6	21.45	22±1
	1413	1732.6	21.61	22±1
	1512	1752.4	21.47	22±1
HSUPA Subtest4	1313	1712.6	21.35	22±1
	1413	1732.6	21.52	22±1
	1512	1752.4	21.44	22±1
HSUPA Subtest5	1313	1712.6	21.56	22±1
	1413	1732.6	21.58	22±1
	1512	1752.4	21.43	22±1

LTE Band 2:

BW (MHz)	Ch	Freq. (MHz)	Mode	UL RB Allocation	UL RB Offset	MPR	Average power (dBm)	Tune up Power tolerant
20MHz	18700	1860.0	QPSK	1	0	0	21.98	22.5±1
				1	49	0	22.00	22.5±1
				1	99	0	22.05	22.5±1
				50	0	1	20.91	21.5±1
				50	24	1	20.94	21.5±1
				50	49	1	20.93	21.5±1
				100	0	1	20.88	21.5±1
			16QAM	1	0	1	20.76	21.5±1
				1	49	1	20.85	21.5±1
				1	99	1	20.86	21.5±1
				50	0	2	20.56	21.5±1
				50	24	2	20.59	21.5±1
				50	49	2	20.56	21.5±1
				100	0	2	20.89	21.5±1
	18900	1880.0	QPSK	1	0	0	22.00	21.5±1
				1	49	0	22.06	21.5±1
				1	99	0	**22.10**	21.5±1
				50	0	1	20.89	21.5±1
				50	24	1	20.88	21.5±1
				50	49	1	21.02	21.5±1
				100	0	1	20.87	21.5±1
			16QAM	1	0	1	21.46	21.5±1
				1	49	1	21.45	21.5±1
				1	99	1	21.52	21.5±1
				50	0	2	20.69	21.5±1
				50	24	2	20.86	21.5±1
				50	49	2	20.87	21.5±1
				100	0	2	21.91	21.5±1
	19100	1900.0	QPSK	1	0	0	22.06	21.5±1
				1	49	0	22.00	21.5±1
				1	99	0	21.75	21.5±1
				50	0	1	20.86	21.5±1
				50	24	1	20.85	21.5±1
				50	49	1	20.88	21.5±1
				100	0	1	20.85	21.5±1
			16QAM	1	0	1	21.28	21.5±1
				1	49	1	21.15	21.5±1
				1	99	1	21.04	21.5±1
				50	0	2	20.98	21.5±1
				50	24	2	20.95	21.5±1
				50	49	2	20.89	21.5±1
				100	0	2	20.63	21.5±1

BW (MHz)	Ch	Freq. (MHz)	Mode	UL RB Allocation	UL RB Offset	MPR	Average power (dBm)	Tune up Power tolerant
15MHz	18675	1857.5	QPSK	1	0	0	21.75	22.5±1
				1	37	0	21.76	22.5±1
				1	74	0	21.79	22.5±1
				36	0	1	20.77	21.5±1
				36	16	1	20.75	21.5±1
				36	35	1	20.76	21.5±1
				75	0	1	20.64	21.5±1
			16QAM	1	0	1	21.42	21.3±1
				1	37	1	21.45	21.3±1
				1	74	1	21.50	21.3±1
				36	0	2	20.87	21.3±1
				36	16	2	20.86	21.3±1
				36	35	2	20.89	21.3±1
				75	0	2	20.68	21.3±1
	18900	1880.0	QPSK	1	0	0	21.64	21.3±1
				1	37	0	21.70	21.3±1
				1	74	0	21.73	21.3±1
				36	0	1	20.80	21.3±1
				36	16	1	20.79	21.3±1
				36	35	1	20.81	21.3±1
				75	0	1	20.65	21.3±1
			16QAM	1	0	1	21.36	21.3±1
				1	37	1	21.31	21.3±1
				1	74	1	21.27	21.3±1
				36	0	2	20.86	21.3±1
				36	16	2	20.89	21.3±1
				36	35	2	20.89	21.3±1
				75	0	2	20.77	21.3±1
	19125	1902.5	QPSK	1	0	0	21.76	21.3±1
				1	37	0	21.71	21.3±1
				1	74	0	21.62	21.3±1
				36	0	1	20.85	21.3±1
				36	16	1	20.87	21.3±1
				36	35	1	20.88	21.3±1
				75	0	1	20.83	21.3±1
			16QAM	1	0	1	20.76	20.3±1
				1	37	1	20.65	20.3±1
				1	74	1	20.48	20.3±1
				36	0	2	20.16	20.3±1
				36	16	2	20.18	20.3±1
				36	35	2	20.15	20.3±1
				75	0	2	20.82	20.3±1

BW (MHz)	Ch	Freq. (MHz)	Mode	UL RB Allocation	UL RB Offset	MPR	Average power (dBm)	Tune up Power tolerant
10MHz	18650	1855	QPSK	1	0	0	21.95	22.5±1
				1	24	0	21.99	22.5±1
				1	49	0	22.02	22.5±1
				25	0	1	20.92	21.3±1
				25	12	1	20.95	21.3±1
				25	24	1	20.93	21.3±1
				50	0	1	20.81	21.3±1
			16QAM	1	0	1	20.54	21.3±1
				1	24	1	20.56	21.3±1
				1	49	1	20.66	21.3±1
				25	0	2	20.46	21.3±1
				25	12	2	20.43	21.3±1
				25	24	2	20.48	21.3±1
				50	0	2	20.88	21.3±1
	18900	1880.0	QPSK	1	0	0	21.79	21.3±1
				1	24	0	21.93	21.3±1
				1	49	0	21.93	21.3±1
				25	0	1	20.89	21.3±1
				25	12	1	20.88	21.3±1
				25	24	1	21.01	21.3±1
				50	0	1	20.81	21.3±1
			16QAM	1	0	1	20.58	20.3±1
				1	24	1	20.60	20.3±1
				1	49	1	20.64	20.3±1
				25	0	2	20.15	20.3±1
				25	12	2	20.19	20.3±1
				25	24	2	20.27	20.3±1
				50	0	2	20.86	20.3±1
	19150	1905	QPSK	1	0	0	21.99	21.3±1
				1	24	0	21.86	21.3±1
				1	49	0	21.61	21.3±1
				25	0	1	20.95	21.3±1
				25	12	1	20.96	21.3±1
				25	24	1	20.96	21.3±1
				50	0	1	20.76	21.3±1
			16QAM	1	0	1	21.64	21.3±1
				1	24	1	21.35	21.3±1
				1	49	1	21.16	21.3±1
				25	0	2	20.54	21.3±1
				25	12	2	20.65	21.3±1
				25	24	2	20.45	21.3±1
				50	0	2	20.87	21.3±1

BW (MHz)	Ch	Freq. (MHz)	Mode	UL RB Allocation	UL RB Offset	MPR	Average power (dBm)	Tune up Power tolerant
5MHz	18625	1852.5	QPSK	1	0	0	21.98	22.5±1
				1	12	0	21.99	22.5±1
				1	24	0	22.10	22.5±1
				12	0	1	20.94	21.3±1
				12	6	1	20.95	21.3±1
				12	11	1	20.93	21.3±1
				25	0	1	20.93	21.3±1
			16QAM	1	0	1	20.98	21.3±1
				1	12	1	21.03	21.3±1
				1	24	1	21.06	21.3±1
				12	0	2	20.78	21.3±1
				12	6	2	20.76	21.3±1
				12	11	2	20.78	21.3±1
				25	0	2	20.82	21.3±1
	18900	1880.0	QPSK	1	0	0	21.64	21.3±1
				1	12	0	21.68	21.3±1
				1	24	0	21.80	21.3±1
				12	0	1	20.94	21.3±1
				12	6	1	20.96	21.3±1
				12	11	1	20.93	21.3±1
				25	0	1	20.88	21.3±1
			16QAM	1	0	1	20.91	21.3±1
				1	12	1	20.99	21.3±1
				1	24	1	21.00	21.3±1
				12	0	2	20.56	21.3±1
				12	6	2	20.59	21.3±1
				12	11	2	20.58	21.3±1
				25	0	2	20.94	21.3±1
	19175	1907.5	QPSK	1	0	0	21.91	21.3±1
				1	12	0	21.84	21.3±1
				1	24	0	21.66	21.3±1
				12	0	1	20.97	21.3±1
				12	6	1	20.96	21.3±1
				12	11	1	20.93	21.3±1
				25	0	1	20.88	21.3±1
			16QAM	1	0	1	20.52	21.3±1
				1	12	1	20.46	21.3±1
				1	24	1	20.44	21.3±1
				12	0	2	20.75	21.3±1
				12	6	2	20.56	21.3±1
				12	11	2	20.69	21.3±1
				25	0	2	20.40	21.3±1

BW (MHz)	Ch	Freq. (MHz)	Mode	UL RB Allocation	UL RB Offset	MPR	Average power (dBm)	Tune up Power tolerant
3MHz	18625	1852.5	QPSK	1	0	0	21.93	22.5±1
				1	7	0	21.96	22.5±1
				1	14	0	21.90	22.5±1
				8	0	1	20.98	21.3±1
				8	4	1	20.95	21.3±1
				8	7	1	20.96	21.3±1
				15	0	1	20.91	21.3±1
			16QAM	1	0	1	20.51	21.3±1
				1	7	1	20.53	21.3±1
				1	14	1	20.56	21.3±1
				8	0	2	20.87	21.3±1
				8	4	2	20.53	21.3±1
				8	7	2	20.72	21.3±1
				15	0	2	20.93	21.3±1
	18900	1880.0	QPSK	1	0	0	21.88	21.3±1
				1	7	0	21.89	21.3±1
				1	14	0	21.88	21.3±1
				8	0	1	20.92	21.3±1
				8	4	1	20.96	21.3±1
				8	7	1	20.95	21.3±1
				15	0	1	21.01	21.3±1
			16QAM	1	0	1	20.60	21.3±1
				1	7	1	20.50	21.3±1
				1	14	1	20.40	21.3±1
				8	0	2	20.88	21.3±1
				8	4	2	20.98	21.3±1
				8	7	2	20.54	21.3±1
				15	0	2	20.47	21.3±1
	19175	1907.5	QPSK	1	0	0	21.78	21.3±1
				1	7	0	21.65	21.3±1
				1	14	0	21.55	21.3±1
				8	0	1	20.84	21.3±1
				8	4	1	20.83	21.3±1
				8	7	1	20.82	21.3±1
				15	0	1	20.87	21.3±1
			16QAM	1	0	1	21.18	21.3±1
				1	7	1	21.11	21.3±1
				1	14	1	21.16	21.3±1
				8	0	2	20.86	21.3±1
				8	4	2	20.88	21.3±1
				8	7	2	20.83	21.3±1
				15	0	2	20.48	21.3±1

BW (MHz)	Ch	Freq. (MHz)	Mode	UL RB Allocation	UL RB Offset	MPR	Average power (dBm)	Tune up Power tolerant
1.4MHz	18607	1850.7	QPSK	1	0	0	21.85	22.5±1
				1	2	0	21.88	22.5±1
				1	5	0	21.89	22.5±1
				3	0	0	21.99	21.3±1
				3	1	0	21.95	21.3±1
				3	2	0	21.96	21.3±1
				6	0	1	20.89	21.3±1
			16QAM	1	0	1	20.35	21.3±1
				1	2	1	20.34	21.3±1
				1	5	1	20.36	21.3±1
				3	0	1	20.86	21.3±1
				3	1	1	20.58	21.3±1
				3	2	1	20.49	21.3±1
				6	0	2	20.89	21.3±1
	18900	1880.0	QPSK	1	0	0	21.97	21.3±1
				1	2	0	21.96	21.3±1
				1	5	0	21.91	21.3±1
				3	0	0	22.07	21.3±1
				3	1	0	22.03	21.3±1
				3	2	0	22.08	21.3±1
				6	0	1	21.00	21.3±1
			16QAM	1	0	1	20.57	21.3±1
				1	2	1	20.56	21.3±1
				1	5	1	20.59	21.3±1
				3	0	1	20.74	21.3±1
				3	1	1	20.88	21.3±1
				3	2	1	20.56	21.3±1
				6	0	2	20.85	21.3±1
	19193	1909.3	QPSK	1	0	0	21.76	21.3±1
				1	2	0	21.73	21.3±1
				1	5	0	21.78	21.3±1
				3	0	0	21.73	21.3±1
				3	1	0	21.76	21.3±1
				3	2	0	21.74	21.3±1
				6	0	1	20.86	21.3±1
			16QAM	1	0	1	20.58	21.3±1
				1	2	1	20.56	21.3±1
				1	5	1	20.54	21.3±1
				3	0	1	20.35	21.3±1
				3	1	1	20.39	21.3±1
				3	2	1	20.34	21.3±1
				6	0	2	20.81	21.3±1

LTE Band 4:

BW (MHz)	Ch	Freq. (MHz)	Mode	UL RB Allocation	UL RB Offset	MPR	Average power (dBm)	Tune up Power tolerant
20MHz	20050	1720.0	QPSK	1	0	0	21.55	21.3±1
				1	49	0	21.68	21.3±1
				1	99	0	21.89	21.3±1
				50	0	1	20.68	21.3±1
				50	24	1	20.79	21.3±1
				50	49	1	20.56	21.3±1
				100	0	1	20.31	21.3±1
			16QAM	1	0	1	20.35	21.3±1
				1	49	1	20.49	21.3±1
				1	99	1	20.86	21.3±1
				50	0	2	20.74	21.3±1
				50	24	2	20.58	21.3±1
				50	49	2	20.49	21.3±1
				100	0	2	20.36	21.3±1
	20175	1732.5	QPSK	1	0	0	21.55	21.3±1
				1	49	0	21.69	21.3±1
				1	99	0	21.81	21.3±1
				50	0	1	20.73	21.3±1
				50	24	1	20.75	21.3±1
				50	49	1	20.74	21.3±1
				100	0	1	20.73	21.3±1
			16QAM	1	0	1	20.88	21.3±1
				1	49	1	20.96	21.3±1
				1	99	1	21.09	21.3±1
				50	0	2	20.68	21.3±1
				50	24	2	20.86	21.3±1
				50	49	2	20.87	21.3±1
				100	0	2	20.76	21.3±1
	20300	1745.0	QPSK	1	0	0	21.94	21.3±1
				1	49	0	21.88	21.3±1
				1	99	0	21.62	21.3±1
				50	0	1	20.33	21.3±1
				50	24	1	20.43	21.3±1
				50	49	1	20.36	21.3±1
				100	0	1	20.39	21.3±1
			16QAM	1	0	1	21.31	21.3±1
				1	49	1	21.15	21.3±1
				1	99	1	20.89	21.3±1
				50	0	2	20.87	21.3±1
				50	24	2	20.86	21.3±1
				50	49	2	20.84	21.3±1
				100	0	2	20.51	21.3±1

BW (MHz)	Ch	Freq. (MHz)	Mode	UL RB Allocation	UL RB Offset	MPR	Average power (dBm)	Tune up Power tolerant
15MHz	20025	1717.5	QPSK	1	0	0	21.55	21.3±1
				1	37	0	21.56	21.3±1
				1	74	0	21.76	21.3±1
				36	0	1	20.37	21.3±1
				36	16	1	20.36	21.3±1
				36	35	1	20.39	21.3±1
				75	0	1	20.87	21.3±1
			16QAM	1	0	1	20.76	21.3±1
				1	37	1	20.55	21.3±1
				1	74	1	20.42	21.3±1
				36	0	2	20.56	21.3±1
				36	16	2	20.78	21.3±1
				36	35	2	20.59	21.3±1
				75	0	2	20.45	21.3±1
	20175	1732.5	QPSK	1	0	0	21.68	21.3±1
				1	37	0	21.78	21.3±1
				1	74	0	21.95	21.3±1
				36	0	1	20.67	21.3±1
				36	16	1	20.65	21.3±1
				36	35	1	20.68	21.3±1
				75	0	1	20.75	21.3±1
			16QAM	1	0	1	20.66	21.3±1
				1	37	1	20.74	21.3±1
				1	74	1	21.05	21.3±1
				36	0	2	20.46	21.3±1
				36	16	2	20.49	21.3±1
				36	35	2	20.48	21.3±1
				75	0	2	20.73	21.3±1
	20325	1747.5	QPSK	1	0	0	21.78	21.3±1
				1	37	0	21.64	21.3±1
				1	74	0	21.59	21.3±1
				36	0	1	20.50	21.3±1
				36	16	1	20.53	21.3±1
				36	35	1	20.54	21.3±1
				75	0	1	20.42	21.3±1
			16QAM	1	0	1	21.44	21.3±1
				1	37	1	21.36	21.3±1
				1	74	1	21.15	21.3±1
				36	0	2	20.98	21.3±1
				36	16	2	20.92	21.3±1
				36	35	2	20.95	21.3±1
				75	0	2	20.48	21.3±1

BW (MHz)	Ch	Freq. (MHz)	Mode	UL RB Allocation	UL RB Offset	MPR	Average power (dBm)	Tune up Power tolerant
10MHz	20000	1715.0	QPSK	1	0	0	21.59	21.3±1
				1	24	0	21.50	21.3±1
				1	49	0	21.42	21.3±1
				25	0	1	20.42	21.3±1
				25	12	1	20.45	21.3±1
				25	24	1	20.43	21.3±1
				50	0	1	20.55	21.3±1
			16QAM	1	0	1	20.71	21.3±1
				1	24	1	20.46	21.3±1
				1	49	1	20.88	21.3±1
				25	0	2	20.66	21.3±1
				25	12	2	20.45	21.3±1
				25	24	2	20.63	21.3±1
				50	0	2	20.50	21.3±1
	20175	1732.5	QPSK	1	0	0	21.87	21.3±1
				1	24	0	21.94	21.3±1
				1	49	0	21.88	21.3±1
				25	0	1	20.95	21.3±1
				25	12	1	20.96	21.3±1
				25	24	1	20.93	21.3±1
				50	0	1	20.82	21.3±1
			16QAM	1	0	1	20.57	20.3±1
				1	24	1	20.66	20.3±1
				1	49	1	20.75	20.3±1
				25	0	2	20.16	20.3±1
				25	12	2	20.13	20.3±1
				25	24	2	20.11	20.3±1
				50	0	2	20.93	20.3±1
	20350	1750.0	QPSK	1	0	0	21.42	21.3±1
				1	24	0	21.55	21.3±1
				1	49	0	21.68	21.3±1
				25	0	1	20.55	21.3±1
				25	12	1	20.56	21.3±1
				25	24	1	20.58	21.3±1
				50	0	1	20.42	21.3±1
			16QAM	1	0	1	21.14	21.3±1
				1	24	1	21.16	21.3±1
				1	49	1	21.20	21.3±1
				25	0	2	20.98	21.3±1
				25	12	2	20.95	21.3±1
				25	24	2	20.93	21.3±1
				50	0	2	20.51	21.3±1

BW (MHz)	Ch	Freq. (MHz)	Mode	UL RB Allocation	UL RB Offset	MPR	Average power (dBm)	Tune up Power tolerant
5MHz	20000	1715.0	QPSK	1	0	0	21.72	21.3±1
				1	12	0	21.68	21.3±1
				1	24	0	21.60	21.3±1
				12	0	1	20.60	21.3±1
				12	6	1	20.63	21.3±1
				12	11	1	20.65	21.3±1
				25	0	1	20.52	21.3±1
			16QAM	1	0	1	20.73	21.3±1
				1	12	1	20.64	21.3±1
				1	24	1	20.55	21.3±1
				12	0	2	20.35	21.3±1
				12	6	2	20.36	21.3±1
				12	11	2	20.38	21.3±1
				25	0	2	20.59	21.3±1
	20175	1732.5	QPSK	1	0	0	21.99	21.3±1
				1	12	0	21.99	21.3±1
				1	24	0	22.03	21.3±1
				12	0	1	21.07	21.3±1
				12	6	1	21.03	21.3±1
				12	11	1	20.55	21.3±1
				25	0	1	20.93	21.3±1
			16QAM	1	0	1	20.61	21.3±1
				1	12	1	20.70	21.3±1
				1	24	1	20.77	21.3±1
				12	0	2	20.45	21.3±1
				12	6	2	20.48	21.3±1
				12	11	2	20.43	21.3±1
				25	0	2	20.83	21.3±1
	20350	1750.0	QPSK	1	0	0	21.40	21.3±1
				1	12	0	21.56	21.3±1
				1	24	0	21.74	21.3±1
				12	0	1	20.57	21.3±1
				12	6	1	20.56	21.3±1
				12	11	1	20.58	21.3±1
				25	0	1	20.59	21.3±1
			16QAM	1	0	1	20.66	21.3±1
				1	12	1	20.78	21.3±1
				1	24	1	20.91	21.3±1
				12	0	2	20.76	21.3±1
				12	6	2	20.75	21.3±1
				12	11	2	20.77	21.3±1
				25	0	2	20.56	21.3±1

BW (MHz)	Ch	Freq. (MHz)	Mode	UL RB Allocation	UL RB Offset	MPR	Average power (dBm)	Tune up Power tolerant
3MHz	19965	1711.5	QPSK	1	0	0	21.64	21.3±1
				1	7	0	21.53	21.3±1
				1	14	0	21.48	21.3±1
				8	0	1	20.57	21.3±1
				8	4	1	20.53	21.3±1
				8	7	1	20.58	21.3±1
				15	0	1	20.53	21.3±1
			16QAM	1	0	1	20.77	21.3±1
				1	7	1	20.56	21.3±1
				1	14	1	20.42	21.3±1
				8	0	2	20.48	21.3±1
				8	4	2	20.46	21.3±1
				8	7	2	20.44	21.3±1
				15	0	2	20.53	21.3±1
	20175	1732.5	QPSK	1	0	0	22.07	21.3±1
				1	7	0	22.05	21.3±1
				1	14	0	22.02	21.3±1
				8	0	1	21.03	21.3±1
				8	4	1	21.01	21.3±1
				8	7	1	20.98	21.3±1
				15	0	1	21.02	21.3±1
			16QAM	1	0	1	20.74	21.3±1
				1	7	1	20.73	21.3±1
				1	14	1	20.72	21.3±1
				8	0	2	20.93	21.3±1
				8	4	2	20.96	21.3±1
				8	7	2	20.95	21.3±1
				15	0	2	20.52	21.3±1
	20385	1753.5	QPSK	1	0	0	21.46	21.3±1
				1	7	0	21.55	21.3±1
				1	14	0	21.66	21.3±1
				8	0	1	20.60	21.3±1
				8	4	1	20.64	21.3±1
				8	7	1	20.63	21.3±1
				15	0	1	20.64	21.3±1
			16QAM	1	0	1	21.06	21.3±1
				1	7	1	21.11	21.3±1
				1	14	1	21.19	21.3±1
				8	0	2	20.60	21.3±1
				8	4	2	20.64	21.3±1
				8	7	2	20.63	21.3±1
				15	0	2	20.83	21.3±1

BW (MHz)	Ch	Freq. (MHz)	Mode	UL RB Allocation	UL RB Offset	MPR	Average power (dBm)	Tune up Power tolerant
1.4MHz	19957	1710.7	QPSK	1	0	0	21.67	21.3±1
				1	2	0	21.65	21.3±1
				1	5	0	21.63	21.3±1
				3	0	0	21.69	21.3±1
				3	1	0	21.65	21.3±1
				3	2	0	21.63	21.3±1
				6	0	1	20.69	21.3±1
			16QAM	1	0	1	21.24	21.3±1
				1	2	1	21.26	21.3±1
				1	5	1	21.28	21.3±1
				3	0	1	21.15	21.3±1
				3	1	1	20.46	21.3±1
				3	2	1	20.58	21.3±1
				6	0	2	20.62	21.3±1
	20175	1732.5	QPSK	1	0	0	**22.21**	21.3±1
				1	2	0	22.15	21.3±1
				1	5	0	22.02	21.3±1
				3	0	0	21.94	21.3±1
				3	1	0	21.93	21.3±1
				3	2	0	21.96	21.3±1
				6	0	1	21.12	21.3±1
			16QAM	1	0	1	20.78	21.3±1
				1	2	1	20.77	21.3±1
				1	5	1	20.74	21.3±1
				3	0	1	20.56	21.3±1
				3	1	1	20.59	21.3±1
				3	2	1	20.54	21.3±1
				6	0	2	20.68	21.3±1
	20393	1754.3	QPSK	1	0	0	21.58	21.3±1
				1	2	0	21.68	21.3±1
				1	5	0	21.80	21.3±1
				3	0	0	21.62	21.3±1
				3	1	0	21.64	21.3±1
				3	2	0	21.65	21.3±1
				6	0	1	20.76	21.3±1
			16QAM	1	0	1	20.61	21.3±1
				1	2	1	20.76	21.3±1
				1	5	1	20.44	21.3±1
				3	0	1	20.75	21.3±1
				3	1	1	20.59	21.3±1
				3	2	1	20.89	21.3±1
				6	0	2	20.74	21.3±1

LTE Band 5:

BW (MHz)	Ch	Freq. (MHz)	Mode	UL RB Allocation	UL RB Offset	MPR	Average power (dBm)	Tune up Power tolerant
10MHz	20450	829	QPSK	1	0	0	22.78	22±1
				1	24	0	22.65	22±1
				1	49	0	22.48	22±1
				25	0	1	21.62	22±1
				25	12	1	21.63	22±1
				25	24	1	21.64	22±1
				50	0	1	21.26	22±1
			16QAM	1	0	1	21.34	21.3±1
				1	24	1	21.25	21.3±1
				1	49	1	21.02	21.3±1
				25	0	2	20.76	21.3±1
				25	12	2	20.72	21.3±1
				25	24	2	20.73	21.3±1
				50	0	2	20.35	21.3±1
	20525	836.5	QPSK	1	0	0	22.36	22±1
				1	24	0	22.46	22±1
				1	49	0	22.71	22±1
				25	0	1	21.29	22±1
				25	12	1	21.25	22±1
				25	24	1	21.26	22±1
				50	0	1	21.30	22±1
			16QAM	1	0	1	21.02	21.3±1
				1	24	1	21.15	21.3±1
				1	49	1	21.36	21.3±1
				25	0	2	20.68	21.3±1
				25	12	2	20.69	21.3±1
				25	24	2	20.65	21.3±1
				50	0	2	20.38	21.3±1
	20600	844	QPSK	1	0	0	22.47	22±1
				1	24	0	22.36	22±1
				1	49	0	22.27	22±1
				25	0	1	21.53	22±1
				25	12	1	21.56	22±1
				25	24	1	21.54	22±1
				50	0	1	21.39	22±1
			16QAM	1	0	1	22.08	21.3±1
				1	24	1	21.99	21.3±1
				1	49	1	21.92	21.3±1
				25	0	2	20.85	21.3±1
				25	12	2	20.83	21.3±1
				25	24	2	20.81	21.3±1
				50	0	2	20.43	21.3±1

BW (MHz)	Ch	Freq. (MHz)	Mode	UL RB Allocation	UL RB Offset	MPR	Average power (dBm)	Tune up Power tolerant
5MHz	20425	826.5	QPSK	1	0	0	**22.91**	22±1
				1	12	0	22.85	22±1
				1	24	0	22.70	22±1
				12	0	1	21.74	22±1
				12	6	1	21.76	22±1
				12	11	1	21.72	22±1
				25	0	1	21.68	22±1
			16QAM	1	0	1	21.78	21.3±1
				1	12	1	21.75	21.3±1
				1	24	1	21.68	21.3±1
				12	0	2	20.84	21.3±1
				12	6	2	20.82	21.3±1
				12	11	2	20.83	21.3±1
				25	0	2	20.70	21.3±1
	20525	836.5	QPSK	1	0	0	22.39	22±1
				1	12	0	22.42	22±1
				1	24	0	22.57	22±1
				12	0	1	21.46	22±1
				12	6	1	21.45	22±1
				12	11	1	21.48	22±1
				25	0	1	21.34	22±1
			16QAM	1	0	1	21.59	21.3±1
				1	12	1	21.65	21.3±1
				1	24	1	21.70	21.3±1
				12	0	2	20.76	21.3±1
				12	6	2	20.72	21.3±1
				12	11	2	20.75	21.3±1
				25	0	2	20.38	21.3±1
	20625	846.5	QPSK	1	0	0	22.69	22±1
				1	12	0	22.59	22±1
				1	24	0	22.22	22±1
				12	0	1	21.74	22±1
				12	6	1	21.75	22±1
				12	11	1	21.76	22±1
				25	0	1	21.45	22±1
			16QAM	1	0	1	21.38	21.3±1
				1	12	1	21.25	21.3±1
				1	24	1	21.18	21.3±1
				12	0	2	20.78	21.3±1
				12	6	2	20.85	21.3±1
				12	11	2	20.83	21.3±1
				25	0	2	20.62	21.3±1

BW (MHz)	Ch	Freq. (MHz)	Mode	UL RB Allocation	UL RB Offset	MPR	Average power (dBm)	Tune up Power tolerant
3MHz	20415	825.5	QPSK	1	0	0	22.79	22±1
				1	7	0	22.78	22±1
				1	14	0	22.70	22±1
				8	0	1	21.73	22±1
				8	4	1	21.74	22±1
				8	7	1	21.71	22±1
				15	0	1	21.70	22±1
			16QAM	1	0	1	21.36	21.3±1
				1	7	1	21.30	21.3±1
				1	14	1	20.98	21.3±1
				8	0	2	20.62	21.3±1
				8	4	2	20.65	21.3±1
				8	7	2	20.63	21.3±1
				15	0	2	20.71	21.3±1
	20525	836.5	QPSK	1	0	0	22.39	22±1
				1	7	0	22.45	22±1
				1	14	0	22.45	22±1
				8	0	1	21.40	22±1
				8	4	1	21.43	22±1
				8	7	1	21.45	22±1
				15	0	1	21.33	22±1
			16QAM	1	0	1	21.09	21.3±1
				1	7	1	21.10	21.3±1
				1	14	1	21.14	21.3±1
				8	0	2	20.27	20.3±1
				8	4	2	20.23	20.3±1
				8	7	2	20.25	20.3±1
				15	0	2	20.39	20.3±1
	20635	847.5	QPSK	1	0	0	22.32	22±1
				1	7	0	22.26	22±1
				1	14	0	22.16	22±1
				8	0	1	21.62	22±1
				8	4	1	21.65	22±1
				8	7	1	21.65	22±1
				15	0	1	21.49	22±1
			16QAM	1	0	1	22.07	21.3±1
				1	7	1	21.98	21.3±1
				1	14	1	21.82	21.3±1
				8	0	2	20.58	21.3±1
				8	4	2	20.56	21.3±1
				8	7	2	20.59	21.3±1
				15	0	2	20.63	21.3±1

BW (MHz)	Ch	Freq. (MHz)	Mode	UL RB Allocation	UL RB Offset	MPR	Average power (dBm)	Tune up Power tolerant
1.4MHz	20407	824.7	QPSK	1	0	0	22.72	22±1
				1	2	0	22.70	22±1
				1	5	0	22.66	22±1
				3	0	0	22.85	22±1
				3	1	0	22.84	22±1
				3	2	0	22.82	22±1
				6	0	1	21.78	22±1
			16QAM	1	0	1	21.17	21.3±1
				1	2	1	21.16	21.3±1
				1	5	1	21.12	21.3±1
				3	0	1	20.88	21.3±1
				3	1	1	20.89	21.3±1
				3	2	1	20.86	21.3±1
				6	0	2	20.72	21.3±1
	20525	836.5	QPSK	1	0	0	22.48	22±1
				1	2	0	22.49	22±1
				1	5	0	22.52	22±1
				3	0	0	22.54	22±1
				3	1	0	22.56	22±1
				3	2	0	22.53	22±1
				6	0	1	21.47	22±1
			16QAM	1	0	1	21.12	21.3±1
				1	2	1	21.11	21.3±1
				1	5	1	21.10	21.3±1
				3	0	1	20.88	21.3±1
				3	1	1	20.89	21.3±1
				3	2	1	20.85	21.3±1
				6	0	2	20.36	21.3±1
	20643	848.3	QPSK	1	0	0	22.39	22±1
				1	2	0	22.30	22±1
				1	5	0	22.28	22±1
				3	0	0	22.41	22±1
				3	1	0	22.45	22±1
				3	2	0	22.43	22±1
				6	0	1	21.38	22±1
			16QAM	1	0	1	21.05	21.3±1
				1	2	1	21.04	21.3±1
				1	5	1	21.03	21.3±1
				3	0	1	20.87	21.3±1
				3	1	1	20.84	21.3±1
				3	2	1	20.82	21.3±1
				6	0	2	20.33	21.3±1

LTE Band 12:

BW (MHz)	Ch	Freq. (MHz)	Mode	UL RB Allocation	UL RB Offset	MPR	Average power (dBm)	Tune up Power tolerant
10MHz	23060	704	QPSK	1	0	0	22.57	22±1
				1	24	0	22.46	22±1
				1	49	0	22.29	22±1
				25	0	1	21.35	22±1
				25	12	1	21.34	22±1
				25	24	1	21.39	22±1
				50	0	1	21.22	22±1
			16QAM	1	0	1	21.05	20.3±1
				1	24	1	20.98	20.3±1
				1	49	1	20.88	20.3±1
				25	0	2	20.65	20.3±1
				25	12	2	20.64	20.3±1
				25	24	2	20.63	20.3±1
				50	0	2	20.27	20.3±1
	23095	707.5	QPSK	1	0	0	22.29	22±1
				1	24	0	22.30	22±1
				1	49	0	22.38	22±1
				25	0	1	21.21	22±1
				25	12	1	21.19	22±1
				25	24	1	21.10	22±1
				50	0	1	21.07	22±1
			16QAM	1	0	1	20.93	21.3±1
				1	24	1	21.02	21.3±1
				1	49	1	21.09	21.3±1
				25	0	2	20.65	21.3±1
				25	12	2	20.63	21.3±1
				25	24	2	20.68	21.3±1
				50	0	2	20.42	21.3±1
	23130	711	QPSK	1	0	0	22.04	21.3±1
				1	24	0	21.85	21.3±1
				1	49	0	21.65	21.3±1
				25	0	1	21.30	21.3±1
				25	12	1	21.36	21.3±1
				25	24	1	21.42	21.3±1
				50	0	1	21.01	21.3±1
			16QAM	1	0	1	21.65	21.3±1
				1	24	1	21.47	21.3±1
				1	49	1	21.25	21.3±1
				25	0	2	20.77	21.3±1
				25	12	2	20.74	21.3±1
				25	24	2	20.73	21.3±1
				50	0	2	20.82	21.3±1

BW (MHz)	Ch	Freq. (MHz)	Mode	UL RB Allocation	UL RB Offset	MPR	Average power (dBm)	Tune up Power tolerant
5MHz	23035	701.5	QPSK	1	0	0	22.47	22±1
				1	12	0	22.45	22±1
				1	24	0	22.41	22±1
				12	0	1	21.61	22±1
				12	6	1	21.53	22±1
				12	11	1	21.64	22±1
				25	0	1	21.32	22±1
			16QAM	1	0	1	21.41	21.3±1
				1	12	1	21.35	21.3±1
				1	24	1	21.30	21.3±1
				12	0	2	20.76	21.3±1
				12	6	2	20.75	21.3±1
				12	11	2	20.74	21.3±1
				25	0	2	20.34	21.3±1
	23095	707.5	QPSK	1	0	0	22.21	22±1
				1	12	0	22.26	22±1
				1	24	0	22.31	22±1
				12	0	1	21.16	22±1
				12	6	1	21.19	22±1
				12	11	1	21.15	22±1
				25	0	1	21.23	22±1
			16QAM	1	0	1	21.39	21.3±1
				1	12	1	21.46	21.3±1
				1	24	1	21.50	21.3±1
				12	0	2	20.85	21.3±1
				12	6	2	20.83	21.3±1
				12	11	2	20.81	21.3±1
				25	0	2	20.67	21.3±1
	23155	713.5	QPSK	1	0	0	22.43	22±1
				1	12	0	22.06	22±1
				1	24	0	21.81	22±1
				12	0	1	21.37	22±1
				12	6	1	21.56	22±1
				12	11	1	21.39	22±1
				25	0	1	21.13	22±1
			16QAM	1	0	1	21.03	21.3±1
				1	12	1	20.88	21.3±1
				1	24	1	20.51	21.3±1
				12	0	2	20.53	21.3±1
				12	6	2	20.62	21.3±1
				12	11	2	20.64	21.3±1
				25	0	2	20.56	21.3±1

BW (MHz)	Ch	Freq. (MHz)	Mode	UL RB Allocation	UL RB Offset	MPR	Average power (dBm)	Tune up Power tolerant
3MHz	23025	700.5	QPSK	1	0	0	22.46	22±1
				1	7	0	22.50	22±1
				1	14	0	22.51	22±1
				8	0	1	21.57	22±1
				8	4	1	21.56	22±1
				8	7	1	21.53	22±1
				15	0	1	21.47	22±1
			16QAM	1	0	1	21.12	21.3±1
				1	7	1	21.06	21.3±1
				1	14	1	21.06	21.3±1
				8	0	2	20.46	21.3±1
				8	4	2	20.45	21.3±1
				8	7	2	20.43	21.3±1
				15	0	2	20.54	21.3±1
	23095	707.5	QPSK	1	0	0	22.19	22±1
				1	7	0	22.20	22±1
				1	14	0	22.30	22±1
				8	0	1	21.31	22±1
				8	4	1	21.35	22±1
				8	7	1	21.36	22±1
				15	0	1	21.26	22±1
			16QAM	1	0	1	20.84	20.3±1
				1	7	1	20.88	20.3±1
				1	14	1	20.95	20.3±1
				8	0	2	20.24	20.3±1
				8	4	2	20.23	20.3±1
				8	7	2	20.25	20.3±1
				15	0	2	20.29	20.3±1
	23025	714.5	QPSK	1	0	0	22.06	21.3±1
				1	7	0	22.00	21.3±1
				1	14	0	21.60	21.3±1
				8	0	1	20.98	21.3±1
				8	4	1	20.95	21.3±1
				8	7	1	20.93	21.3±1
				15	0	1	20.98	21.3±1
			16QAM	1	0	1	21.72	21.3±1
				1	7	1	21.70	21.3±1
				1	14	1	21.26	21.3±1
				8	0	2	20.92	21.3±1
				8	4	2	20.96	21.3±1
				8	7	2	20.95	21.3±1
				15	0	2	20.79	21.3±1

BW (MHz)	Ch	Freq. (MHz)	Mode	UL RB Allocation	UL RB Offset	MPR	Average power (dBm)	Tune up Power tolerant
1.4MHz	23017	699.7	QPSK	1	0	0	22.47	22±1
				1	2	0	22.46	22±1
				1	5	0	22.00	22±1
				3	0	0	22.54	22±1
				3	1	0	**22.59**	22±1
				3	2	0	22.53	22±1
				6	0	1	21.65	22±1
			16QAM	1	0	1	20.98	21.3±1
				1	2	1	21.16	21.3±1
				1	5	1	21.12	21.3±1
				3	0	1	20.75	21.3±1
				3	1	1	20.73	21.3±1
				3	2	1	20.78	21.3±1
				6	0	2	20.46	21.3±1
	23095	707.5	QPSK	1	0	0	22.10	21.3±1
				1	2	0	22.05	21.3±1
				1	5	0	22.03	21.3±1
				3	0	0	22.11	21.3±1
				3	1	0	22.15	21.3±1
				3	2	0	22.13	21.3±1
				6	0	1	21.18	21.3±1
			16QAM	1	0	1	20.79	21.3±1
				1	2	1	20.76	21.3±1
				1	5	1	20.78	21.3±1
				3	0	1	20.78	21.3±1
				3	1	1	20.79	21.3±1
				3	2	1	20.76	21.3±1
				6	0	2	20.57	21.3±1
	23173	715.3	QPSK	1	0	0	21.84	21.3±1
				1	2	0	21.79	21.3±1
				1	5	0	21.74	21.3±1
				3	0	0	21.91	21.3±1
				3	1	0	21.93	21.3±1
				3	2	0	21.86	21.3±1
				6	0	1	20.91	21.3±1
			16QAM	1	0	1	20.32	21.3±1
				1	2	1	21.24	21.3±1
				1	5	1	21.19	21.3±1
				3	0	1	20.52	21.3±1
				3	1	1	21.13	21.3±1
				3	2	1	21.13	21.3±1
				6	0	2	20.92	21.3±1

LTE Band 17:

BW (MHz)	Ch	Freq. (MHz)	Mode	UL RB Allocation	UL RB Offset	MPR	Average power (dBm)	Tune up Power tolerant
10MHz	23780	709.0	QPSK	1	0	0	22.27	22±1
				1	24	0	22.25	22±1
				1	49	0	22.25	22±1
				25	0	1	21.06	22±1
				25	12	1	21.05	22±1
				25	24	1	21.03	22±1
				50	0	1	21.05	22±1
			16QAM	1	0	1	20.77	21.3±1
				1	24	1	20.77	21.3±1
				1	49	1	20.78	21.3±1
				25	0	2	20.46	21.3±1
				25	12	2	20.48	21.3±1
				25	24	2	20.43	21.3±1
				50	0	2	21.07	21.3±1
	23790	701.0	QPSK	1	0	0	22.05	21.3±1
				1	24	0	22.09	21.3±1
				1	49	0	22.11	21.3±1
				25	0	1	21.21	21.3±1
				25	12	1	21.22	21.3±1
				25	24	1	21.23	21.3±1
				50	0	1	21.10	21.3±1
			16QAM	1	0	1	20.64	21.3±1
				1	24	1	20.66	21.3±1
				1	49	1	20.73	21.3±1
				25	0	2	20.48	21.3±1
				25	12	2	20.48	21.3±1
				25	24	2	20.41	21.3±1
				50	0	2	21.19	21.3±1
	23800	711.0	QPSK	1	0	0	22.10	21.3±1
				1	24	0	21.96	21.3±1
				1	49	0	21.68	21.3±1
				25	0	1	21.10	21.3±1
				25	12	1	21.14	21.3±1
				25	24	1	21.45	21.3±1
				50	0	1	20.98	21.3±1
			16QAM	1	0	1	21.71	21.3±1
				1	24	1	21.56	21.3±1
				1	49	1	21.30	21.3±1
				25	0	2	20.59	21.3±1
				25	12	2	20.56	21.3±1
				25	24	2	20.51	21.3±1
				50	0	2	21.14	21.3±1

BW (MHz)	Ch	Freq. (MHz)	Mode	UL RB Allocation	UL RB Offset	MPR	Average power (dBm)	Tune up Power tolerant
5MHz	23755	706.5	QPSK	1	0	0	22.36	22±1
				1	12	0	22.35	22±1
				1	24	0	22.35	22±1
				12	0	1	21.13	22±1
				12	6	1	21.15	22±1
				12	11	1	21.14	22±1
				25	0	1	21.06	22±1
			16QAM	1	0	1	21.28	21.3±1
				1	12	1	21.26	21.3±1
				1	24	1	21.27	21.3±1
				12	0	2	20.58	21.3±1
				12	6	2	20.56	21.3±1
				12	11	2	20.57	21.3±1
				25	0	2	21.11	21.3±1
	23790	710.0	QPSK	1	0	0	22.11	21.3±1
				1	12	0	22.16	21.3±1
				1	24	0	22.30	21.3±1
				12	0	1	21.21	21.3±1
				12	6	1	21.23	21.3±1
				12	11	1	21.24	21.3±1
				25	0	1	21.32	21.3±1
			16QAM	1	0	1	21.76	21.3±1
				1	12	1	21.65	21.3±1
				1	24	1	21.55	21.3±1
				12	0	2	20.56	21.3±1
				12	6	2	20.53	21.3±1
				12	11	2	20.54	21.3±1
				25	0	2	21.31	21.3±1
	23825	713.5	QPSK	1	0	0	**22.46**	21.3±1
				1	12	0	22.26	21.3±1
				1	24	0	21.73	21.3±1
				12	0	1	21.32	21.3±1
				12	6	1	21.35	21.3±1
				12	11	1	21.36	21.3±1
				25	0	1	21.07	21.3±1
			16QAM	1	0	1	21.03	21.3±1
				1	12	1	20.78	21.3±1
				1	24	1	20.49	21.3±1
				12	0	2	20.45	21.3±1
				12	6	2	20.48	21.3±1
				12	11	2	20.43	21.3±1
				25	0	2	21.20	21.3±1

For Max allowed antenna calculate

Step 1 ERP/EIRP calculate:

Bands	Max Turn-up Conducted power (dBm)	ERP/EIRP Limit (dBm)	Margin (dB)
GSM 850	32.5	38.45	5.95
PCS 1900	29.5	33.00	3.5
WCDMA band 5	23.5	38.45	14.95
WCDMA band 2	23.5	33.00	9.5
WCDMA band 4	23.5	30.00	6.5
LTE Band 2	22.5	33.00	10.5
LTE Band 4	22.3	30.00	7.7
LTE Band 5	23.0	38.45	15.45
LTE Band 12	23.0	34.77	11.77
LTE Band 17	22.3	34.77	12.47

Step 2 MPE calculate:

Bands	Max Turn-up Conducted Source Based time Average Power (dBm)	Max Turn-up Conducted Source Based time Average Power (mw)	Distance (cm)	Power Density Limit (mW/cm2)	Max allow antenna gain (dBi)
GSM 850	27.5	562.34	20	0.549	6.91
PCS 1900	25.5	354.81	20	1	11.51
WCDMA band 5	23.5	223.87	20	0.551	10.92
WCDMA band 2	23.5	223.87	20	1	13.51
WCDMA band 4	23.5	223.87	20	1	13.51
LTE Band 2	22.5	177.828	20	1	14.51
LTE Band 4	22.3	169.824	20	1	14.71
LTE Band 5	23.0	199.526	20	0.550	11.41
LTE Band 12	23.0	199.526	20	0.466	10.69
LTE Band 17	22.3	169.824	20	0.471	11.44

Step 3:
If meet above step 1 and 2, the Max allows antenna gain of different bands and different modes show is below:

Bands	Max allow antenna gain (dBi)
GSM 850	5.95
PCS 1900	3.5
WCDMA band 5	10.92
WCDMA band 2	9.5
WCDMA band 4	6.5
LTE Band 2	10.5
LTE Band 4	7.7
LTE Band 5	11.41
LTE Band 12	10.69
LTE Band 17	11.44

Step 4:
If meet above step 1, 2 and 3, the Max allows antenna gain show is below:

Uplink Frequency (MHz)	Band	Max allow antenna gain of each band and each mode (dBi)	Max allow antenna gain of each band (dBi)
824-849	GSM 850	5.95	5.95
	WCDMA band 5	10.92	
	LTE Band 5	11.41	
1850-1910	PCS 1900	3.5	3.5
	WCDMA band 2	9.5	
	LTE Band 2	10.5	
1710-1755	WCDMA band 4	6.5	6.5
	LTE Band 4	7.7	
699-716	LTE Band 12	10.69	10.69
	LTE Band 17	11.44	

Note:

Single Modular Approval.

Output power is conducted. This device is to be used in mobile or fixed applications only. Antenna gain including cable loss must not exceed 10.69 dBi of frequency band 699-716MHz, 5.95 dBi of frequency band 824-849MHz, 6.5 dBi of frequency band 1710-1755MHz, 3.5 dBi of frequency band 1850-1910MHz,for the purpose of satisfying the requirements of 2.1043 and 2.1091. The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20cm from all persons and must not be co-located or operated in conjunction with any antenna or transmitter not described under this FCC ID. The final product operating with this transmitter must include operating instructions and antenna installation instructions, for end-users and installers to satisfy RF exposure compliance requirements. Compliance of this device in all final product configurations is the responsibility of the Grantee. Installation of this device into specific final products may require the submission of a Class II permissive change application containing data pertinent to RF Exposure, spurious emissions, ERP/EIRP, and host/module authentication, or new application if appropriate. Installation of this device into specific final products may require the submission of a Class II permissive change application containing data pertinent to RF Exposure, spurious emissions, ERP/EIRP, and host/module authentication, or new application if appropriate.

MPE:

Frequency bands	Max. Turn-up Conducted power (dBm)	Max. allow antenna gain (dBi)	Max. ERP/EIRP	Exemption Limit of RF Exposure Evaluation	Result(if Exemption or not)
GSM 850	32.5	5.95	38.45	31.76	NO
PCS 1900	29.5	3.5	33	34.77	Yes
WCDMA band Ⅴ	23.5	5.95	29.45	31.76	Yes
WCDMA band Ⅱ	23.5	3.5	27	34.77	Yes
WCDMA band Ⅳ	23.5	6.5	30	34.77	Yes
LTE Band 2	22.5	3.5	26	34.77	Yes
LTE Band 4	22.3	6.5	28.8	34.77	Yes
LTE Band 5	23.0	5.95	28.95	31.76	Yes
LTE Band 12	23.0	10.69	33.69	31.76	NO
LTE Band 17	22.3	10.69	32.99	31.76	NO

Note:

FCC Part2.1091 Radiofrequency radiation exposure evaluation: mobile devices.

(c)(1) Mobile devices that operate in the Commercial Mobile Radio Services pursuant to part 20 of this chapter; the Cellular Radiotelephone Service pursuant to part 22 of this chapter; the Personal Communications Services pursuant to part 24 of this chapter; the Satellite Communications Services pursuant to part 25 of this chapter; the Miscellaneous Wireless Communications Services pursuant to part 27 of this chapter; the Maritime Services (ship earth station devices only) pursuant to part 80 of this chapter; the Specialized Mobile Radio Service, and the 3650 MHz Wireless Broadband Service pursuant to part 90 of this chapter; and the Citizens Broadband Radio Service pursuant to part 96 of this chapter are subject to routine environmental evaluation for RF exposure prior to equipment authorization or use if:

(i) They operate at frequencies of 1.5 GHz or below and their effective radiated power (ERP) is 1.5 watts or more, or

(ii) They operate at frequencies above 1.5 GHz and their ERP is 3 watts or more

GSM850

For the antenna manufacturer provide only used limited to ERP/EIRP or radiated spurious emission test. The MPE evaluation as below:

Maximum output power at antenna input terminal: 27.5 (dBm)
Maximum output power at antenna input terminal: 562.34(mW)
Prediction distance: >20 (cm)
Predication frequency: 824.2(MHz) Low frequency
Antenna Gain (typical): 5.95 (dBi)
Antenna Gain (typical): 3.936 (numeric)
The worst case is power density at predication frequency at 20 cm: 0.44(mW/cm^2)

MPE limit for general population exposure at prediction frequency: 0.55(mW/cm^2)

0.44(mW/cm^2) < 0.55 (mW/cm^2)

Result: Pass

LTE Band 12

For the antenna manufacturer provide only used limited to ERP/EIRP or radiated spurious emission test. The MPE evaluation as below:

Maximum output power at antenna input terminal: 23.0 (dBm)
Maximum output power at antenna input terminal: 199.53(mW)
Prediction distance: >20 (cm)
Predication frequency: 699.7 (MHz)
Antenna Gain (typical): 10.69 (dBi)
Antenna Gain (typical): 11.72 (numeric)
The worst case is power density at predication frequency at 20 cm: 0.465 (mW/cm^2)

MPE limit for general population exposure at prediction frequency: 0.466 (mW/cm^2)

0.465(mW/cm^2) < 0.466 (mW/cm^2)

Result: Pass

LTE Band 17

For the antenna manufacturer provide only used limited to ERP/EIRP or radiated spurious emission test. The MPE evaluation as below:

Maximum output power at antenna input terminal: 22.3 (dBm)

Maximum output power at antenna input terminal: 169.82(mW)

Prediction distance: >20 (cm)

Predication frequency: 706.5 (MHz)

Antenna Gain (typical): 11.44 (dBi)

Antenna Gain (typical): 13.93 (numeric)

The worst case is power density at predication frequency at 20 cm: 0.471 (mW/cm^2)

MPE limit for general population exposure at prediction frequency: 0.471 (mW/cm^2)

0.471(mW/cm^2) = 0.471 (mW/cm^2)

Result: Pass