

FCC ID : 2BAVH-QCELLS4GV1

1. RF EXPOSURE EVALUATION

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) Radiation as specified in §1.1307(b).

Limits for Maximum Permissible Exposure (MPE).

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density(mW/cm²)	Average Time
(A) Limits for Occupational/Control Exposures				
300-1500	--	--	F/300	6
1500-100000	--	--	5	6
(B) Limits for General Population/Uncontrol Exposures				
300-1500	--	--	F/1500	6
1500-100000	--	--	1	30

Friis transmission formula: $P_d = (P_{out} \cdot G) / (4 \cdot \pi \cdot R^2)$

Where

P_d = Power density in mW/cm².

P_{out} =output power to antenna in mW.

G = Numeric gain of the antenna relative to isotropic antenna.

π =3.1416.

R = distance between observation point and center of the radiator in 20cm.

P_d the limit of MPE, 1mW/cm². If we know the maximum gain of the nd total.

power input to the antenna, through the calculation, we will know the distance where the MPE limit is reached.

2. EUT TECHNICAL DESCRIPTION

Characteristics	Description
Product	Q.HOME CORE Cellular
Model Number	Q.HOME CORE Cellular
Power Supply	DC 5V
Temperature Range	-35°C ~ 60°C

IEEE 802.11 WLAN Mode Supported	☒ 802.11b ☒ 802.11g ☒ 802.11n(20MHz channel bandwidth) ☒ 802.11n(40MHz channel bandwidth)
Modulation	DSSS with DBPSK/DQPSK/CCK for 802.11b OFDM with BPSK/QPSK/16QAM/64QAM for 802.11g/n
Operating Frequency Range	2412-2462MHz for 802.11b/g/n(HT20) 2422-2452MHz for 802.11b/g/n(HT40)
Number of Channels	11 channels for 802.11b/g/n(HT20) 7 Channels for 802.11n(HT40)
Antenna Type	PCB Antenna
Antenna Gain	3.26dBi

Operation Band:	LTE B2/B4/B5/B12/B13/B25/B26/B66/B85 NB-IOT B2/B4/B5/B12/B13/B25/B66/B71/B85
Modulation:	QPSK/16QAM for LTE BPSK, QPSK for NB-IOT
Operating Frequency Range(s):	LTE Band 2: Tx: 1850-1910MHz, Rx: 1930-1990MHz LTE Band 4: Tx: 1710-1755MHz, Rx: 2110-2155MHz LTE Band 5: Tx: 824-849MHz, Rx: 875-885MHz LTE Band 12: Tx: 699-716MHz, Rx: 729-746MHz LTE Band 13: Tx: 777-787MHz, Rx: 746-756MHz LTE Band 25: Tx: 1850-1915MHz, Rx: 1930-1995MHz LTE Band 26: Tx: 814-849MHz, Rx: 859-894MHz LTE Band 66: Tx/Rx: 1710-1780MHz LTE Band 85: Tx: 698-716MHz, Rx: 728-746MHz NB-IOT Band 2: Tx: 1850-1910MHz, Rx: 1930-1990MHz NB-IOT Band 4: Tx: 1710-1755MHz, Rx: 2110-2155MHz NB-IOT Band 5: Tx: 824-849MHz, Rx: 875-885MHz NB-IOT Band 12: Tx: 699-716MHz, Rx: 729-746MHz NB-IOT Band 13: Tx: 777-787MHz, Rx: 746-756MHz NB-IOT Band 25: Tx: 1850-1915MHz, Rx: 1930-1995MHz NB-IOT Band 66: Tx/Rx: 1710-1780MHz NB-IOT Band 71: Tx/Rx: 663-698MHz NB-IOT Band 85: Tx: 698-716MHz, Rx: 728-746MHz
Antenna Type:	External Antenna
Antenna Gain:	LTE Band 2: 1.49dBi LTE Band 4: 1.28dBi

	LTE Band 5: 1.16dBi LTE Band 12: 2.87dBi LTE Band 13: 1.95dBi LTE Band 25: 1.49dBi LTE Band 26: 1.26dBi LTE Band 66: 1.28dBi LTE Band 85: 2.87dBi NB-IOT Band 2: 1.49dBi NB-IOT Band 4: 1.28dBi NB-IOT Band 5: 1.16dBi NB-IOT Band 12: 2.87dBi NB-IOT Band 13: 1.95dBi NB-IOT Band 25: 1.49dBi NB-IOT Band 66: 1.28dBi NB-IOT Band 71: 2.87dBi NB-IOT Band 85: 2.87dBi
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3. Measurement Result

Mode	PG (mW)	Antenna gain (dBi)	Antenna Gain Numeric	R (cm)	Evaluation result (mW/cm ²)	Power density Limits (mW/cm ²)
2.4G WIFI	93.3254	3.26	2.12	20	0.0186	1.0000
LTE B2	153.6125	1.49	1.41	20	0.0306	1.0000
LTE B4	150.3897	1.28	1.34	20	0.0299	1.0000
LTE B5	150.2097	1.16	1.31	20	0.0299	0.5498
LTE B12	214.9428	2.87	1.94	20	0.0428	0.4665
LTE B13	173.9094	1.95	1.57	20	0.0346	0.5197
LTE B25	156.4311	1.49	1.41	20	0.0311	0.5270
LTE B26	149.6987	1.26	1.34	20	0.0298	1.0000
LTE B66	139.6476	1.28	1.34	20	0.0278	1.0000
LTE B85	261.4170	2.87	1.94	20	0.0520	0.4770
NB-IOT B2	160.6589	1.49	1.41	20	0.0320	1.0000
NB-IOT B4	139.6476	1.28	1.34	20	0.0278	1.0000
NB-IOT B5	155.4343	1.16	1.31	20	0.0309	0.5498
NB-IOT B12	224.6249	2.87	1.94	20	0.0447	0.4665
NB-IOT B13	178.6096	1.95	1.57	20	0.0355	0.5197
NB-IOT B25	140.9289	1.49	1.41	20	0.0280	0.5270
NB-IOT B66	136.9620	1.28	1.34	20	0.0272	1.0000
NB-IOT B71	218.8157	2.87	1.94	20	0.0435	0.4437
NB-IOT B85	234.3071	2.87	1.94	20	0.0466	0.4770

Note: All the modes are tested, only the worst data are described in the table.

Conclusion of simultaneous transmitter:

Both of the module 1 and module 2 can transmit simultaneously, the formula of calculated the MPE is:

$$CPD1/LPD1 + CPD2/LPD2 + \dots \text{etc.} < 1$$

CPD = Calculation power density

LPD = Limit of power density

Therefore the worst-case situation is $0.0186/1 + 0.0520/0.4770 = 0.1276$, which is less than 1, this confirmed that the device comply with FCC 1.1310 MPE limit.

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