



March 07, 2018

TUV SUD BABT
Octagon House, Concorde Way
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PO15 5RL

Attention: Director of Certification

RE: Analysis of RF Exposure for Portable and Mobile use per KDB 447498 D01 Mobile Portable RF Exposure v06 and RSS-102 Issue 5 March 2015.

FCC ID: YETA41-V32-100
IC: 9298A-A41V32100

1. Limits

Limits for General Population/Uncontrolled Exposure (Title 47 Subpart J §2.1091 and KDB 447498 D01 referring to limits under §1.1310)

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Electric Field Strength (H) (A/m)	Power Density (S) (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*



Limits for Devices Used by the General Public (Uncontrolled Environment (RSS-102 Issue 5 March 2015))

Frequency Range (MHz)	Electric Field Strength (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m ²)	Reference Period (minutes)
0.003 - 10 ²¹	83	90	-	Instantaneous
0.1 - 10	-	0.73/f	-	6**
1.1 - 10	87/f ^{0.5}	-	-	6**
10 - 20	27.46	0.0728	2	6
20 - 48	-58.07/f ^{0.25}	0.1540/f ^{0.25}	8.944/f ^{0.5}	6
48 - 300	22.06	0.05852	1.291	6
300 - 6000	3.142 f ^{0.3417}	0.008335 f ^{0.3417}	0.02619 f ^{0.6834}	6
6000 - 15000	61.4	0.163	10	6
15000 - 150000	61.4	0.163	10	616000/f ^{1.2}
150000 - 300000	0.158f ^{0.5}	4.21 x 10 ⁻⁴ f ^{0.5}	6.67 x 10 ⁻⁵ f	616000/f ^{1.2}

f is frequency in MHz

*Based on nerve stimulation (NS)

** Based on specific absorption rate (SAR)

2. Mobile MPE Calculation Summary using a 20cm separation distance:

Cel-Fi GO Uplink (NU)					
Mode	Output Power (dBm)*	Power Density (mW/cm ²)	Power Density (W/m ²)	FCC Limit (mW/cm ²)	ISED Limit (W/m ²)
WCDMA Band 2	22.07	0.0804878	0.804878	1	4.4803
WCDMA Band 5	19.59	0.043424	0.43424	0.551	2.581
LTE Band 2	21.55	0.0714053	0.714053	1	4.4804
LTE Band 5	22.73	0.0894809	0.894809	0.551	2.581
LTE Band 12	22.42	0.0833163	0.833163	0.468	2.307
LTE Band 13	22.74	0.0896871	0.896871	0.520	2.480
LTE Band 4	21.25	0.0666393	0.666393	1	4.246
2.4G BLE	3.43	0.0017447	0.017447	1	5.4085

*Since the EUT is a 3G/4G/LTE Cellular Antenna used with the Cel-Fi Go Smart Signal Booster which include Bluetooth LE functionality. The BT LE will work together with the Cel-Fi Go Smart Signal Booster Cellular Uplink Band.

The output power for each cellular band refers to the following reports:

- SD72121023-1016C Rev1.0 Nextivity FCC IC Part 22&24 Test Report.pdf
- SD72121023-1016D Rev 1.0 Nextivity FCC IC Part 27 B13 Test Report.pdf
- SD72121023-1016E Rev 1.0 Nextivity FCC IC Part 27 B12 Test Report.pdf
- SD72121023-1016F Rev 1.0 Nextivity FCC IC Part 27 B4 Test Report.pdf
- SD72121023-1016G Rev 1.0 Nextivity FCC IC Part 20 B2 B5 B12 B13 and B4 Test Report.pdf



The EUT is connected to Cel-Fi GO NU port with a RF cable. The cable loss is 1.2dB for Low Band below 1GHz, and 2.0dB for High Band above 1GHz.

The Maximum Cell Antenna Gain is 5.0 dB for Low Band below 1GHz, and 2.0dB for High Band above 1GHz.

To sum up the final Antenna Gain for cell bands is 3.8 dB for Low Band below 1GHz, and 4.0dB for High Band above 1GHz.

3. Co-Located Transmitters transmission table:

Uplink	
Transmitter type	Transmitter type that can transmit at the same time
WCDMA B2 Uplink	2.4G BLE
WCDMA B5 Uplink	2.4G BLE
LTE B2 Uplink	2.4G BLE
LTE B5 Uplink	2.4G BLE
LTE B12 Uplink	2.4G BLE
LTE B13 Uplink	2.4G BLE
LTE B4 Uplink	2.4G BLE
2.4G BLE	WCDMA B2/B5 or LTE B2/5/12/13/B4 Uplink

4. Simultaneous Transmission MPE:

Transmitter type	MPE (mw/cm ²)	FCC Limit (mW/cm ²)	IC Limit (W/m ²)	FCC MPE ratio (MPE/Limit)	ISED MPE ratio (MPE/Limit)
LTE Band 12	0.0833163	0.468	2.307	0.178026	0.361146
2.4G BLE	0.0017447	1	5.4085	0.0017447	0.032258
Sum of the ratios (should be <1.0)				0.179771	0.393404

*Since the IC limit is related to the frequency, so Band 12 was selcted as the worst case.



5. Mobile MPE Calculation using a 20cm separation distance

Using Power Density formula:

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

where: S = power density

P = power input to the antenna

G = power gain of the antenna in the direction of interest relative to isotropic

R = distance to the center of radiation of the antenna

WCDMA Band 2 Uplink:

Maximum peak output power at antenna input terminal:	22.07	(dBm)
Maximum peak output power at antenna input terminal:	161.06	(mW)
Antenna gain(typical):	4	(dBi)
Maximum antenna gain:	2.512	(numeric)
Prediction distance:	20	(cm)
Source Based Time Average Duty Cycle:	100	(%)
Prediction frequency:	1852.4	(MHz)
FCC MPE limit for uncontrolled exposure at prediction frequency:	1.00	(mW/cm ²)
ISED MPE limit for uncontrolled exposure at prediction frequency:	4.4803	(W/m ²)
Power density at prediction frequency:	0.0804878	(mW/cm ²)
Power density at prediction frequency:	0.804878	(W/m ²)
FCC Margin of Compliance:	-10.94	(dB)
IC Margin of Compliance:	-7.46	(dB)

WCDMA Band 5 Uplink:

Maximum peak output power at antenna input terminal:	19.59	(dBm)
Maximum peak output power at antenna input terminal:	90.99	(mW)
Antenna gain(typical):	3.8	(dBi)
Maximum antenna gain:	2.399	(numeric)
Prediction distance:	20	(cm)
Source Based Time Average Duty Cycle:	100	(%)
Prediction frequency:	826.4	(MHz)
FCC MPE limit for uncontrolled exposure at prediction frequency:	0.551	(mW/cm ²)
ISED MPE limit for uncontrolled exposure at prediction frequency:	2.581	(W/m ²)
Power density at prediction frequency:	0.043424	(mW/cm ²)
Power density at prediction frequency:	0.43424	(W/m ²)
FCC Margin of Compliance:	-11.03	(dB)
IC Margin of Compliance:	-7.74	(dB)



LTE Band 2 Uplink:

Maximum peak output power at antenna input terminal:	21.55	(dBm)
Maximum peak output power at antenna input terminal:	142.89	(mW)
Antenna gain(typical):	4	(dBi)
Maximum antenna gain:	2.512	(numeric)
Prediction distance:	20	(cm)
Source Based Time Average Duty Cycle:	100	(%)
Prediction frequency:	1852.5	(MHz)
FCC MPE limit for uncontrolled exposure at prediction frequency:	1.00	(mW/cm ²)
ISED MPE limit for uncontrolled exposure at prediction frequency:	4.4804	(W/m ²)
Power density at prediction frequency:	0.0714053	(mW/cm ²)
Power density at prediction frequency:	0.714053	(W/m ²)
FCC Margin of Compliance:	-11.46	(dB)
IC Margin of Compliance:	-7.98	(dB)

LTE Band 5 Uplink:

Maximum peak output power at antenna input terminal:	22.73	(dBm)
Maximum peak output power at antenna input terminal:	187.5	(mW)
Antenna gain(typical):	3.8	(dBi)
Maximum antenna gain:	2.399	(numeric)
Prediction distance:	20	(cm)
Source Based Time Average Duty Cycle:	100	(%)
Prediction frequency:	826.5	(MHz)
FCC MPE limit for uncontrolled exposure at prediction frequency:	0.551	(mW/cm ²)
ISED MPE limit for uncontrolled exposure at prediction frequency:	2.581	(W/m ²)
Power density at prediction frequency:	0.0894809	(mW/cm ²)
Power density at prediction frequency:	0.894809	(W/m ²)
FCC Margin of Compliance:	-7.89	(dB)
IC Margin of Compliance:	-4.6	(dB)



LTE Band 12 Uplink:

Maximum peak output power at antenna input terminal:	22.42	(dBm)
Maximum peak output power at antenna input terminal:	174.58	(mW)
Antenna gain(typical):	3.8	(dBi)
Maximum antenna gain:	2.399	(numeric)
Prediction distance:	20	(cm)
Source Based Time Average Duty Cycle:	100	(%)
Prediction frequency:	701.5	(MHz)
FCC MPE limit for uncontrolled exposure at prediction frequency:	0.468	(mW/cm ²)
ISED MPE limit for uncontrolled exposure at prediction frequency:	2.307336	(W/m ²)
Power density at prediction frequency:	0.0833163	(mW/cm ²)
Power density at prediction frequency:	0.833163	(W/m ²)
FCC Margin of Compliance:	-7.49	(dB)
IC Margin of Compliance:	-4.42	(dB)

LTE Band 13 Uplink:

Maximum peak output power at antenna input terminal:	22.74	(dBm)
Maximum peak output power at antenna input terminal:	187.93	(mW)
Antenna gain(typical):	3.8	(dBi)
Maximum antenna gain:	2.399	(numeric)
Prediction distance:	20	(cm)
Source Based Time Average Duty Cycle:	100	(%)
Prediction frequency:	779.5	(MHz)
FCC MPE limit for uncontrolled exposure at prediction frequency:	0.520	(mW/cm ²)
ISED MPE limit for uncontrolled exposure at prediction frequency:	2.47972	(W/m ²)
Power density at prediction frequency:	0.0896871	(mW/cm ²)
Power density at prediction frequency:	0.896871	(W/m ²)
FCC Margin of Compliance:	-7.63	(dB)
IC Margin of Compliance:	-4.42	(dB)

**LTE Band 4 Uplink:**

Maximum peak output power at antenna input terminal:	21.25	(dBm)
Maximum peak output power at antenna input terminal:	133.35	(mW)
Antenna gain(typical):	4	(dBi)
Maximum antenna gain:	2.512	(numeric)
Prediction distance:	20	(cm)
Source Based Time Average Duty Cycle:	100	(%)
Prediction frequency:	1712.5	(MHz)
FCC MPE limit for uncontrolled exposure at prediction frequency:	1	(mW/cm ²)
ISED MPE limit for uncontrolled exposure at prediction frequency:	4.246	(W/m ²)
Power density at prediction frequency:	0.0666393	(mW/cm ²)
Power density at prediction frequency:	0.666393	(W/m ²)
FCC Margin of Compliance:	-11.76	(dB)
IC Margin of Compliance:	-8.04	(dB)

2.4GHz BLE:

Maximum peak output power at antenna input terminal:	3.43	(dBm)
Maximum peak output power at antenna input terminal:	2.2	(mW)
Antenna gain(typical):	6	(dBi)
Maximum antenna gain:	3.981	(numeric)
Prediction distance:	20	(cm)
Source Based Time Average Duty Cycle:	100	(%)
Prediction frequency:	2440	(MHz)
FCC MPE limit for uncontrolled exposure at prediction frequency:	1	(mW/cm ²)
ISED MPE limit for uncontrolled exposure at prediction frequency:	5.4085	(W/m ²)
Power density at prediction frequency:	0.0017447	(mW/cm ²)
Power density at prediction frequency:	0.017447	(W/m ²)
FCC Margin of Compliance:	-27.58	(dB)
IC Margin of Compliance:	-24.91	(dB)

Sincerely,

Xiaoying Zhang

Name

Authorized Signatory

Title: EMC/Wireless Test Engineer