



March 30, 2016

TUV SUD BABT
Octagon House, Concorde Way
Segensworth Rd N, Fareham
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Attention: Director of Certification

RE: Analysis of RF Exposure for Portable and Mobile use per KDB 447498 D01 Mobile Portable RF Exposure v05r02 and RSS-102 Issue 5 March 2015.

FCC ID: SGWIPS2015SC
IC: 11583A-IPS2015SC

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	-	6**
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:

Mode (Worst Case)	Output Power	Power Density (mW/cm ²)
Cellular CDMA	0.292 watt	0.189
PCS CDMA	0.278 watt	0.226
BLE	0.00113 watt	0.0003
RFID	0.008 watt	0.0000000015

3. Simultaneous Transmission MPE:

Transmitter type	MPE (mW/cm ²)	FCC Limit (mW/cm ²)	FCC MPE ratio (MPE/Limit)
Cellular CDMA	0.189	0.979	0.193
Sum of the ratios (should be <1.0)			0.193

Transmitter type	MPE (mW/cm ²)	FCC Limit (mW/cm ²)	FCC MPE ratio (MPE/Limit)
PCS CDMA	0.226	1	0.226
Sum of the ratios (should be <1.0)			0.226

Transmitter type	MPE (mW/cm ²)	FCC Limit (mW/cm ²)	FCC MPE ratio (MPE/Limit)
BLE	0.0003	1	0.0003
Sum of the ratios (should be <1.0)			0.0003



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Transmitter type	MPE (mW/cm ²)	FCC Limit (mW/cm ²)	FCC MPE ratio (MPE/Limit)
RFID	0.0000000015	0.979	0.00000000153
Sum of the ratios (should be <1.0)			0.00000000153

Transmitter type	MPE (W/m ²)	ISED Limit (W/m ²)	Margin (dB)
Cellular CDMA	1.889	2.628	-1.44
Sum of MPE (Should be <2.628)	1.889	2.628	-1.44

Transmitter type	MPE (W/m ²)	ISED Limit (W/m ²)	Margin (dB)
PCS CDMA	2.263	4.573	-3.05
Sum of MPE (Should be <4.573)	2.263	4.573	-3.05

Transmitter type	MPE (W/m ²)	ISED Limit (W/m ²)	Margin (dB)
BLE	0.00253	5.351	-33.26
Sum of MPE (Should be <5.351)	0.00253	5.351	-33.26

Transmitter type	MPE (W/m ²)	ISED Limit (W/m ²)	Margin (dB)
RFID	0.0000000015	2	-81.20
Sum of MPE (Should be <2)	0.0000000015	2	-81.20



4. Mobile MPE Calculation using a 20cm separation distance (Cellular CDMA):

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

Maximum peak output power at antenna input terminal:	24.65	(dBm)
Maximum peak output power at antenna input terminal:	291.74	(mW)
Antenna gain(typical):	5.12	(dBi)
Maximum antenna gain:	3.251	(numeric)
Prediction distance:	20	(cm)
Source Based Time Average Duty Cycle:	100	(%)
Prediction frequency:	824.7	(MHz)
FCC MPE limit for uncontrolled exposure at prediction frequency:	0.979	(mW/cm ²)
ISED MPE limit for uncontrolled exposure at prediction frequency:	2.628	(W/m ²)
Power density at prediction frequency:	0.1886819	(mW/cm ²)
Power density at prediction frequency:	1.886819	(W/m ²)
FCC Margin of Compliance:	-7.15	(dB)
ISED Margin of Compliance:	-1.44	(dB)



5. Mobile MPE Calculation using a 20cm separation distance (PCS CDMA):

Maximum peak output power at antenna input terminal:	24.44	(dBm)
Maximum peak output power at antenna input terminal:	277.97	(mW)
Antenna gain(typical):	6.12	(dBi)
Maximum antenna gain:	4.093	(numeric)
Prediction distance:	20	(cm)
Source Based Time Average Duty Cycle:	100	(%)
Prediction frequency:	1908.75	(MHz)
FCC MPE limit for uncontrolled exposure at prediction frequency:	1.000	(mW/cm ²)
ISED MPE limit for uncontrolled exposure at prediction frequency:	4.573	(W/m ²)
Power density at prediction frequency:	0.2263238	(mW/cm ²)
Power density at prediction frequency:	2.263238	(W/m ²)
FCC Margin of Compliance:	-6.45	(dB)
ISED Margin of Compliance:	-3.05	(dB)

6. Mobile MPE Calculation using a 20cm separation distance (BLE):

Maximum peak output power at antenna input terminal:	0.54	(dBm)
Maximum peak output power at antenna input terminal:	1.13	(mW)
Antenna gain(typical):	0.5	(dBi)
Maximum antenna gain:	1.122	(numeric)
Prediction distance:	20	(cm)
Source Based Time Average Duty Cycle:	100	(%)
Prediction frequency:	2402	(MHz)
FCC MPE limit for uncontrolled exposure at prediction frequency:	1.000	(mW/cm ²)
ISED MPE limit for uncontrolled exposure at prediction frequency:	5.351	(mW/cm ²)
FCC Power density at prediction frequency:	0.0002528	(mW/cm ²)
ISED Power density at prediction frequency:	0.002528	(W/m ²)
FCC Margin of Compliance:	-35.97	(dB)
ISED Margin of Compliance:	-33.26	(dB)



7. Mobile MPE Calculation using a 20cm separation distance (RFID):

Measured Field Strength --Radiated:	46.2	(dBuV/m)
Maximum peak output power --Radiated:	0.000008	(mW)
Antenna gain(typical):	0	(dBi)
Maximum antenna gain:	1.000	(numeric)
Prediction distance:	20	(cm)
Source Based Time Average Duty Cycle	100	(%)
Prediction frequency:	13.56	(mW/cm ²)
FCC Limit at prediction frequency:	0.979	(mW/cm ²)
ISED Limit at prediction frequency	2.000	W/ m ²
Power density at prediction frequency:	0.000000015	(mW/cm ²)
Power density at prediction frequency:	0.000000015	(W/m ²)
FCC Margin of Compliance:	-88.10	(dB)
ISED Margin of Compliance:	-81.20	(dB)

Sincerely,


Alex Chang

Name

Authorized Signatory

Title: Senior EMC/Wireless Test Engineer