



April 27, 2017

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 General RF Exposure Guidance v06 and RSS-102 Issue 5 March 2015.

FCC ID: 2ADLNXYGPS-01
IC: 12506A-XYGPS01

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 44cm separation distance per FCC 2.1091::

Mode (Worst Case)	Output Power (dBm)	Power Density (mW/cm ²)
Bluetooth	-3.45	0.0001
GSM 850	26.51	0.1445
GSM 1900	25.02	0.1320
GPRS 850	26.62	0.1482
GPRS 1900	25.01	0.1317

3. Mobile MPE Calculation Summary using a 20cm separation distance per RSS-102 Issue 5:

Mode (Worst Case)	Output Power (dBm)	Power Density (W/cm ²)
Bluetooth	-3.45	0.001
GSM 850	26.51	1.445
GSM 1900	25.02	1.320
GPRS 850	26.62	1.482
GPRS 1900	25.01	1.317

4. Co-Located Transmitters transmission table:

Transmitter type	Transmitter type that can transmit at the same time
Bluetooth	GSM



5. Simultaneous Transmission MPE:

Transmitter type	MPE (mw/cm ²)	FCC Limit (mW/cm ²)	FCC MPE ratio (MPE/Limit)
Bluetooth	0.0001	1.0000	0.0001
GPRS 850	0.1482	1.0000	0.1482
Sum of the ratios (should be <1.0)			0.1483

Transmitter type	MPE (W/m ²)	ISED Limit (W/m ²)	Margin (dB)
Bluetooth	0.001	5.409	-38.79
GPRS 850	1.482	2.602	-2.45
Sum of MPE (Should be <min. limit)	1.483	2.602	-1.119

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

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:	-3.45	(dBm)
Maximum peak output power at antenna input terminal:	0.45	(mW)
Antenna gain(typical):	-1	(dBi)
Maximum antenna gain:	0.794	(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:	1.000	(mW/cm ²)
ISED MPE limit for uncontrolled exposure at prediction frequency:	5.409	(W/m ²)
Power density at prediction frequency:	0.001	(mW/cm ²)
Power density at prediction frequency:	0.01	(W/m ²)
FCC Margin of Compliance:	-41.46	(dB)
ISED Margin of Compliance:	-38.79	(dB)



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7. Mobile MPE Calculation using a 44cm separation distance (GPRS 850):

Maximum peak output power at antenna input terminal:	26.622	(dBm)
Maximum peak output power at antenna input terminal:	459.20	(mW)
Antenna gain(typical):	2.1	(dBi)
Maximum antenna gain:	1.622	(numeric)
Prediction distance:	20	(cm)
Source Based Time Average Duty Cycle:	100	(%)
Prediction frequency:	836.6	(MHz)
FCC MPE limit for uncontrolled exposure at prediction frequency:	1.000	(mW/cm ²)
ISED MPE limit for uncontrolled exposure at prediction frequency:	2.602	(W/m ²)
Power density at prediction frequency:	0.1482	(mW/cm ²)
Power density at prediction frequency:	1.482	(W/m ²)
FCC Margin of Compliance:	-5.76	(dB)
ISED Margin of Compliance:	-2.45	(dB)

Sincerely,

A handwritten signature in blue ink that reads 'Alex Chang'.

Alex Chang

Name

Authorized Signatory

Title: EMC/Wireless Test Engineer