



March 07, 2018

TUV SUD BABT  
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Segensworth Rd N, Fareham  
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: 2AO3P-GGBUD001  
IC: 23668-GGBUD001

## 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 <sup>2</sup> )	Averaging Time (minutes)
0.3 - 1.34	614	1.63	*(100)	30
1.34 - 30	824/f	2.19/f	*(180/f <sup>2</sup> )	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 <sup>2</sup> )	Reference Period (minutes)
0.003 - 10 <sup>21</sup>	83	90	-	Instantaneous
0.1 - 10	-	0.73/f	-	6**
1.1 - 10	87/f <sup>0.5</sup>	-	-	6**
10 - 20	27.46	0.0728	2	6
20 - 48	-58.07/f <sup>0.25</sup>	0.1540/f <sup>0.25</sup>	8.944/f <sup>0.5</sup>	6
48 - 300	22.06	0.05852	1.291	6
300 - 6000	3.142 f <sup>0.3417</sup>	0.008335 f <sup>0.3417</sup>	0.02619 f <sup>0.6834</sup>	6
6000 - 15000	61.4	0.163	10	6
15000 - 150000	61.4	0.163	10	616000/f <sup>1.2</sup>
150000 - 300000	0.158f <sup>0.5</sup>	4.21 x 10 <sup>-4</sup> f <sup>0.5</sup>	6.67 x 10 <sup>-5</sup> f	616000/f <sup>1.2</sup>

*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	Output Power (dBm)	Power Density (mW/cm <sup>2</sup> )	Power Density (W/m <sup>2</sup> )	FCC Limit (mW/cm <sup>2</sup> )	ISED Limit (W/m <sup>2</sup> )
902 – 928 MHz Lora	18.89	0.0244191	0.244191	0.602	2.741906



### 3. 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

#### 902 – 928 MHz Lora:

Maximum peak output power at antenna input terminal:	<b>18.89</b>	(dBm)
Maximum peak output power at antenna input terminal:	<b>77.45</b>	(mW)
Antenna gain(typical):	<b>2</b>	(dBi)
Maximum antenna gain:	<b>1.585</b>	(numeric)
Prediction distance:	<b>20</b>	(cm)
Source Based Time Average Duty Cycle:	<b>100</b>	(%)
Prediction frequency:	<b>903</b>	(MHz)
FCC MPE limit for uncontrolled exposure at prediction frequency:	<b>0.602</b>	(mW/cm <sup>2</sup> )
ISED MPE limit for uncontrolled exposure at prediction frequency:	<b>2.741906</b>	(W/m <sup>2</sup> )
Power density at prediction frequency:	<b>0.0244191</b>	(mW/cm <sup>2</sup> )
Power density at prediction frequency:	<b>0.244191</b>	(W/m <sup>2</sup> )
FCC Margin of Compliance:	<b>-13.92</b>	(dB)
IC Margin of Compliance:	<b>-10.59</b>	(dB)

Sincerely,

Xiaoying Zhang

Name

Authorized Signatory

Title: EMC/Wireless Test Engineer