



December 10, 2019

TUV SUD BAPT
Octagon House, Concorde Way
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: PKRISGMD8800
IC Number: 3229A-MD8800

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*



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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:

Mode	Output Power (dBm/mW)	FCC Power Density Limit (mW/cm ²)	ISED Power Density Limit (W/m ²)	FCC Maximum Allowed Antenna Gain (dBi)	ISED Maximum Allowed Antenna Gain (dBi)
WCDMA Band 2	24.0 / 251.19	1.0	4.4803	13.01	9.52
LTE Band 2	24.0 / 251.19	1.0	4.4775	13.01	9.52
LTE Band 4	24.0 / 251.19	1.0	4.243	13.01	9.28
WCDMA Band 5	24.0 / 251.19	0.551	2.5807	10.42	7.13
LTE Band 5	24.0 / 251.19	0.55	2.577	10.41	7.12
LTE Band 7	24.0 / 251.19	1.0	5.5028	13.01	10.41
LTE Band 13	24.0 / 251.19	0.52	2.4797	10.16	6.95
LTE Band 14	24.0 / 251.19	0.527	2.5036	10.23	6.99
LTE Band 42	24.0 / 251.19	1.0	7.0217	13.01	11.47
LTE Band 48	24.0 / 251.19	1.0	6.9915	13.01	11.45
LTE Band 66	24.0 / 251.19	1.0	4.243	13.01	9.28

For WCDMA/LTE Band 2, WCDMA/LTE Band 5, LTE Band 4, 13, 14 and 66 which share the same antenna, FCC Maximum Allowed Antenna Gain is 10.16 dBi, and ISED Maximum Allowed Antenna Gain is 6.95 dBi.

For LTE Band 7, FCC Maximum Allowed Antenna Gain is 13.01 dBi, and ISED Maximum Allowed Antenna Gain is 10.41 dBi.

For LTE Band 42 and 48 which share the same antenna, FCC Maximum Allowed Antenna Gain is 13.01 dBi, and ISED Maximum Allowed Antenna Gain is 11.45 dBi.



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3. Mobile MPE Calculation using a 20cm separation distance (WCDMA Band 2):

Maximum peak output power at antenna input terminal:	24.0	(dBm)
Maximum peak output power at antenna input terminal:	251.19	(mW)
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:	1.0	(mW/cm ²)
ISED MPE limit for uncontrolled exposure at prediction frequency:	4.4803	(W/m ²)
FCC Maximum Antenna gain:	13.01	(dBi)
ISED Maximum Antenna gain:	9.52	(dBi)

4. Mobile MPE Calculation using a 20cm separation distance (LTE Band 2):

Maximum peak output power at antenna input terminal:	24.0	(dBm)
Maximum peak output power at antenna input terminal:	251.19	(mW)
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:	1.0	(mW/cm ²)
ISED MPE limit for uncontrolled exposure at prediction frequency:	4.4775	(W/m ²)
FCC Maximum Antenna gain:	13.01	(dBi)
ISED Maximum Antenna gain:	9.52	(dBi)



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5. Mobile MPE Calculation using a 20cm separation distance (LTE Band 4):

Maximum peak output power at antenna input terminal:	24.0	(dBm)
Maximum peak output power at antenna input terminal:	251.19	(mW)
Prediction distance:	20	(cm)
Source Based Time Average Duty Cycle:	100	(%)
Prediction frequency:	1710.7	(MHz)
FCC MPE limit for uncontrolled exposure at prediction frequency:	1.0	(mW/cm ²)
ISED MPE limit for uncontrolled exposure at prediction frequency:	4.243	(W/m ²)
FCC Maximum Antenna gain:	13.01	(dBi)
ISED Maximum Antenna gain:	9.28	(dBi)

6. Mobile MPE Calculation using a 20cm separation distance (WCDMA Band 5):

Maximum peak output power at antenna input terminal:	24.0	(dBm)
Maximum peak output power at antenna input terminal:	251.19	(mW)
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:	0.5509	(mW/cm ²)
ISED MPE limit for uncontrolled exposure at prediction frequency:	2.5807	(W/m ²)
FCC Maximum Antenna gain:	10.42	(dBi)
ISED Maximum Antenna gain:	7.13	(dBi)



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7. Mobile MPE Calculation using a 20cm separation distance (LTE Band 5):

Maximum peak output power at antenna input terminal:	24.0	(dBm)
Maximum peak output power at antenna input terminal:	251.19	(mW)
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:	0.5498	(mW/cm ²)
ISED MPE limit for uncontrolled exposure at prediction frequency:	2.5771	(W/m ²)
FCC Maximum Antenna gain:	10.41	(dBi)
ISED Maximum Antenna gain:	7.12	(dBi)

8. Mobile MPE Calculation using a 20cm separation distance (LTE Band 7):

Maximum peak output power at antenna input terminal:	24.0	(dBm)
Maximum peak output power at antenna input terminal:	251.19	(mW)
Prediction distance:	20	(cm)
Source Based Time Average Duty Cycle:	100	(%)
Prediction frequency:	2502.5	(MHz)
FCC MPE limit for uncontrolled exposure at prediction frequency:	1.0	(mW/cm ²)
ISED MPE limit for uncontrolled exposure at prediction frequency:	5.5028	(W/m ²)
FCC Maximum Antenna gain:	13.01	(dBi)
ISED Maximum Antenna gain:	10.41	(dBi)



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9. Mobile MPE Calculation using a 20cm separation distance (LTE Band 13):

Maximum peak output power at antenna input terminal:	24.0	(dBm)
Maximum peak output power at antenna input terminal:	251.19	(mW)
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:	0.5197	(mW/cm ²)
ISED MPE limit for uncontrolled exposure at prediction frequency:	2.4797	(W/m ²)
FCC Maximum Antenna gain:	10.16	(dBi)
ISED Maximum Antenna gain:	6.95	(dBi)

10. Mobile MPE Calculation using a 20cm separation distance (LTE Band 14):

Maximum peak output power at antenna input terminal:	24.0	(dBm)
Maximum peak output power at antenna input terminal:	251.19	(mW)
Prediction distance:	20	(cm)
Source Based Time Average Duty Cycle:	100	(%)
Prediction frequency:	790.5	(MHz)
FCC MPE limit for uncontrolled exposure at prediction frequency:	0.527	(mW/cm ²)
ISED MPE limit for uncontrolled exposure at prediction frequency:	2.5036	(W/m ²)
FCC Maximum Antenna gain:	10.23	(dBi)
ISED Maximum Antenna gain:	6.99	(dBi)



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11. Mobile MPE Calculation using a 20cm separation distance (LTE Band 42):

Maximum peak output power at antenna input terminal:	24.0	(dBm)
Maximum peak output power at antenna input terminal:	251.19	(mW)
Prediction distance:	20	(cm)
Source Based Time Average Duty Cycle:	100	(%)
Prediction frequency:	3575	(MHz)
FCC MPE limit for uncontrolled exposure at prediction frequency:	1.0	(mW/cm ²)
ISED MPE limit for uncontrolled exposure at prediction frequency:	7.0217	(W/m ²)
FCC Maximum Antenna gain:	13.01	(dBi)
ISED Maximum Antenna gain:	11.47	(dBi)

12. Mobile MPE Calculation using a 20cm separation distance (LTE Band 48):

Maximum peak output power at antenna input terminal:	24.0	(dBm)
Maximum peak output power at antenna input terminal:	251.19	(mW)
Prediction distance:	20	(cm)
Source Based Time Average Duty Cycle:	100	(%)
Prediction frequency:	3552.5	(MHz)
FCC MPE limit for uncontrolled exposure at prediction frequency:	1.0	(mW/cm ²)
ISED MPE limit for uncontrolled exposure at prediction frequency:	6.9915	(W/m ²)
FCC Maximum Antenna gain:	13.01	(dBi)
ISED Maximum Antenna gain:	11.45	(dBi)



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13. Mobile MPE Calculation using a 20cm separation distance (LTE Band 66):

Maximum peak output power at antenna input terminal:	24.0	(dBm)
Maximum peak output power at antenna input terminal:	251.19	(mW)
Prediction distance:	20	(cm)
Source Based Time Average Duty Cycle:	100	(%)
Prediction frequency:	1710.7	(MHz)
FCC MPE limit for uncontrolled exposure at prediction frequency:	1.0	(mW/cm ²)
ISED MPE limit for uncontrolled exposure at prediction frequency:	4.2431	(W/m ²)
FCC Maximum Antenna gain:	13.01	(dBi)
ISED Maximum Antenna gain:	9.28	(dBi)

Sincerely,


Alex Chang

Name

Authorized Signatory

Title: Senior EMC/RF Wireless Test Engineer