



# APPENDIX I RADIO FREQUENCY EXPOSURE

## LIMIT

According to §Part22, Part 24 and Part 27 of the FCC rules are subject to routine environmental evaluation for RF exposure prior to equipment authorization.

## EUT Specification

<b>EUT</b>	Module																	
<b>Model</b>	HL7548																	
<b>Frequency band (Operating)</b>	<input checked="" type="checkbox"/> LTE Band II: 1850.0MHz ~ 1910.0MHz <input checked="" type="checkbox"/> LTE Band IV: 1710.0MHz ~ 1755.0MHz <input checked="" type="checkbox"/> LTE Band V: 824.0MHz ~ 849.0MHz <input checked="" type="checkbox"/> LTE Band XVII: 704.0MHz ~ 716.0MHz <input type="checkbox"/> Others																	
<b>Device category</b>	<input type="checkbox"/> Portable (<20cm separation) <input checked="" type="checkbox"/> Mobile (>20cm separation) <input type="checkbox"/> Others																	
<b>Exposure classification</b>	<input type="checkbox"/> Occupational/Controlled exposure (S = 5mW/cm <sup>2</sup> ) <input checked="" type="checkbox"/> General Population/Uncontrolled exposure (S=1mW/cm <sup>2</sup> )																	
<b>Measurement Average output power</b>	<table border="1"> <thead> <tr> <th>System</th> <th>Power</th> <th></th> </tr> </thead> <tbody> <tr> <td>LTE Band II</td> <td>23.31 dBm</td> <td>(214.29 mW)</td> </tr> <tr> <td>LTE Band IV</td> <td>23.03 dBm</td> <td>(200.91 mW)</td> </tr> <tr> <td>LTE Band V</td> <td>22.54 dBm</td> <td>(179.47 mW)</td> </tr> <tr> <td>LTE Band XVII</td> <td>22.78 dBm</td> <td>(189.67 mW)</td> </tr> </tbody> </table>			System	Power		LTE Band II	23.31 dBm	(214.29 mW)	LTE Band IV	23.03 dBm	(200.91 mW)	LTE Band V	22.54 dBm	(179.47 mW)	LTE Band XVII	22.78 dBm	(189.67 mW)
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<b>Max tune up Power / Max time Average Power GPRS/EGPRS 1 slot: -9dB 2 slot: -6dB 3 slot: -4dB 4 slot: -3dB</b>	<b>System</b>	<b>Max Tune up Power</b>	<b>Time Average Power</b>
	LTE Band II	24.0dBm (251.189mW)	24.0dBm (251.189mW)
	LTE Band IV	24.0dBm (251.189mW)	24.0dBm (251.189mW)
	LTE Band V	24.0dBm (251.189mW)	24.0dBm (251.189mW)
	LTE Band XVII	24.0dBm (251.189mW)	24.0dBm (251.189mW)
<b>Evaluation applied</b>	<input checked="" type="checkbox"/> MPE Evaluation* <input type="checkbox"/> SAR Evaluation <input type="checkbox"/> N/A		



### **Revision History**

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	2015/01/28	Initial Issue	ALL	Doris Chu



## **TEST RESULTS**

**No non-compliance noted.**

### **Calculation**

Given  $E = \frac{\sqrt{30 \times P \times G}}{d}$  &  $S = \frac{E^2}{377}$

Where  $E$  = Field strength in Volts / meter

$P$  = Power in Watts

$G$  = Numeric antenna gain

$d$  = Distance in meters

$S$  = Power density in milliwatts / square centimeter

Combining equations and re-arranging the terms to express the distance as a function of the remaining variables yields:

$$S = \frac{30 \times P \times G}{377d^2}$$

Changing to units of mW and cm, using:

$$P \text{ (mW)} = P \text{ (W)} / 1000 \text{ and}$$

$$d \text{ (cm)} = d \text{ (m)} / 100$$

Yields

$$S = \frac{30 \times (P/1000) \times G}{377 \times (d/100)^2} = 0.0796 \times \frac{P \times G}{d^2} \quad \text{Equation 1}$$

Where  $d$  = Distance in cm

$P$  = Power in mW

$G$  = Numeric antenna gain

$S$  = Power density in mW / cm<sup>2</sup>



**Maximum Permissible Exposure**

Substituting the MPE safe distance using d = 20 cm into Equation 1:

$$S = 0.000199 \times P \times G$$

Where *P* = Power in mW

*G* = Numeric antenna gain

*S* = Power density in mW / cm<sup>2</sup>

**LTE Band II mode:**

Ch.	Frq.(MHz)	P (mW)	D (cm)	MPE Limit (mW/cm <sup>2</sup> )	ERP/EIRP Limit (W/cm <sup>2</sup> )	Gain (num.)	Antenna Gain (dBi)	Max Ant. Gain to comply MPE and ERP/EIRP limits
19150	1905.0	251.189	20	1.00		20.01	13.01	9.01 dBi
19150	1905.0	251.189	20		2.0	7.96	9.01	

**LTE Band IV mode:**

Ch.	Frq.(MHz)	P (mW)	D (cm)	MPE Limit (mW/cm <sup>2</sup> )	ERP/EIRP Limit (W/cm <sup>2</sup> )	Gain (num.)	Antenna Gain (dBi)	Max Ant. Gain to comply MPE and ERP/EIRP limits
20300	1745.0	251.189	20	1.00		20.01	13.01	6.00 dBi
20300	1745.0	251.189	20		1.0	3.98	6.00	

**LTE Band V mode:**

Ch.	Frq.(MHz)	P (mW)	D (cm)	MPE Limit (mW/cm <sup>2</sup> )	ERP/EIRP Limit (W/cm <sup>2</sup> )	Gain (num.)	Antenna Gain (dBi)	Max Ant. Gain to comply MPE and ERP/EIRP limits
20450	829.0	251.189	20	0.55		11.00	10.42	10.42 dBi
20450	829.0	251.189	20		7.0	45.70	16.60	

**LTE Band XVII mode:**

Ch.	Frq.(MHz)	P (mW)	D (cm)	MPE Limit (mW/cm <sup>2</sup> )	ERP/EIRP Limit (W/cm <sup>2</sup> )	Gain (num.)	Antenna Gain (dBi)	Max Ant. Gain to comply MPE and ERP/EIRP limits
23790	710.0	251.189	20	0.47		9.40	9.73	9.73 dBi
23790	710.0	251.189	20		3.0	19.59	12.92	