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1. Standards, reference documents and applicable test methods

1. FCC CFR Title 47 Part 1.1310 – Radiofrequency radiation exposure limits.
2. FCC CFR Title 47 Part 2.1091 – Radiofrequency radiation exposure evaluation: mobile devices.
3. RSS-102 Issue 5 — Radio Frequency (RF) Exposure Compliance of Radio communication Apparatus

2. General conditions, competences and guarantees

- ✓ Intel Mobile Communications Wireless RF Lab (Intel WRF Lab) is a laboratory competent to perform this evaluation.
- ✓ Intel WRF Lab only provides testing services and is committed to providing reliable, unbiased test results and interpretations.
- ✓ Intel WRF Lab is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.
- ✓ Intel WRF Lab has developed calibration and proficiency programs for its measurement equipment to ensure correlated and reliable results to its customers.
- ✓ This report is only referred to the item that has undergone the test.
- ✓ This report does not imply an approval of the product by the Certification Bodies or competent Authorities.
- ✓ Complete or partial reproduction of the report cannot be made without written permission of Intel WRF Lab.

3. EUT features

These are the detailed bands and modes supported by the Equipment Under Test:

GSM / GPRS / EDGE	GSM 850 (824.0 – 849.0 MHz) PCS 1900 (1850.0 – 1910.0 MHz)
WCDMA / HSPA+	FDD II (1850.0 – 1910.0 MHz) FDD IV (1710.0 – 1755.0 MHz) FDD V (824.0 – 849.0 MHz)
LTE FDD	Band 2 (1850.0 – 1910.0 MHz) Band 4 (1710.0 – 1755.0 MHz) Band 5 (824.0 – 849.0 MHz) Band 7 (2500 – 2570 MHz) Band 12 (699 – 716 MHz) Band 13 (777 – 787 MHz) Band 17 (704.0 – 716.0 MHz) Band 26 (814 – 849 MHz) Band 30 (2305 – 2315 MHz)

4. Remarks and comments

- The conducted output power values presented in this report are the corresponding maximum per band and they are taken from reports 15070102.TR01 and 15070102.TR02

5. Evaluation Verdicts summary

Mode	Band	FCC		IC		Verdict
		Highest Power Density @ 20cm (mW/cm ²)	Limit (mW/cm ²)	Highest Power Density @ 20cm (W/m ²)	Limit (W/m ²)	
GSM/GPRS/EDGE	GSM 850	0.162	0.558	1.620	2.60	P
	PCS 1900	0.100	1.000	1.000	4.48	P
WCDMA/HSPA+	FDD II	0.079	1.000	0.790	4.48	P
	FDD IV	0.078	1.000	0.780	4.28	P
	FDD V	0.075	0.557	0.750	2.60	P
LTE FDD	Band 2	0.072	1.000	0.720	4.53	P
	Band 4	0.057	1.000	0.570	4.28	P
	Band 5	0.056	0.558	0.560	2.60	P
	Band 17	0.056	0.473	0.560	2.32	P
	Band 7	0.074	1.000	0.740	5.51	P
	Band 12	0.065	0.467	0.650	2.31	P
	Band 13	0.072	0.521	0.720	2.49	P
	Band 26	0.063	0.543	0.630	2.56	P
	Band 30	0.068	1.000	0.680	5.21	P

P: Pass
 F: Fail
 NM: Not Measured
 NA: Not Applicable

6. Document Revision History

Revision #	Date	Modified by	Details
Rev. 00	2015-07-13	O. Fargant	First Issue
Rev. 01	2015-08-27	Jose M. Fortes	Typo in the declared antenna gain. Updated values in A.4.9 according to the actual declared antenna gain for LTE Band 30.

Annex A. Evaluation Description

A.1.1 RF Exposure Limit

The EUT has been evaluated against the requirement of human Maximum Permissible Exposure (MPE) according to the standards and documents detailed in 1. *Standards, reference documents and applicable test methods.*

As per FCC CFR Title 47 Part 2.1091, a mobile device (i.e. transmitting device designed to be used in such way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons) operating in the services covered by Parts 22, 24, 27 and 90 are subject to RF Exposure evaluation according to the limits defined in FCC CFR Title 47 Part 1.1310, Table 1:

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	*100	6
3.0-30	1842/f	4.89/f	*900/f ²	6
30-300	61.4	0.163	1.0	6
300-1,500			f/300	6
1,500-100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
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
300-1,500			f/1500	30
1,500-100,000			1.0	30

f = frequency in MHz * = Plane-wave equivalent power density

As per RSS 102 Issue 5, devices that have a radiating element normally operating at or below 6 GHz, with a separation distance greater than 20 cm between the user and/or bystander and the device shall undergo an RF exposure evaluation:

Table 4: RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)				
Frequency Range (MHz)	Electric Field (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/ <i>f</i>	-	6**
1.1-10	87/ <i>f</i> 0.5	-	-	6**
10-20	27.46	0.0728	-2	6
20-48	58.07/ <i>f</i> ^{0.25}	0.1540/ <i>f</i> ^{0.25}	8.944/ <i>f</i> ^{0.5}	6
48-300	22.06	0.05852	1.291	6
300-6000	3.142 <i>f</i> 0.3417	0.008335 <i>f</i> 0.3417	0.02619 <i>f</i> 0.6834	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	616000/ <i>f</i> 1.2
150000-300000	0.158 <i>f</i> 0.5	4.21 × 10 ⁻⁴ <i>f</i> 0.5	6.67 × 10 ⁻⁵ <i>f</i>	616000/ <i>f</i> 1.2

Note: *f* is frequency in MHz.
 * Based on nerve stimulation (NS).
 ** Based on specific absorption rate (SAR).

For the purpose of this evaluation, a minimum distance of 20cm was used to calculate the equivalent plan wave power density, to be compared with the power density limit, according to Friis transmission formula:

$$S_{eq} = \frac{P_{avg} \cdot G}{4 \cdot \pi \cdot R^2}$$

Where:

S_{eq} = Equivalent Plane Wave Power Density

P_{avg} = Source-Based Average Power at antenna terminals

G = Gain of the Transmitting Antenna

R = Distance from the Transmitting Antenna

Results of RF Exposure Evaluation

A.2 GSM/GPRS/EDGE

A.2.1 GSM 850

Antenna Peak Gain = 2dBi

Mod.	#UL Slots	CH #	Freq [MHz]	Burst Avg Power [dBm]	Frame Avg Power [dBm]	ERP/EIRP Avg [dBm]	ERP/EIRP Avg [mW]
GMSK	1	128	824.2	32.55	23.52	25.52	356.38
		190	836.6	32.60	23.57	25.57	360.50
		251	848.8	32.57	23.54	25.54	358.02
	2	128	824.2	32.45	26.43	28.43	696.53
		190	836.6	31.77	25.75	27.75	595.58
		251	848.8	31.68	25.66	27.66	583.36
	3	128	824.2	31.77	27.51	29.51	893.37
		190	836.6	31.21	26.95	28.95	785.29
		251	848.8	31.19	26.93	28.93	781.68
	4	128	824.2	30.11	27.10	29.10	812.77
		190	836.6	30.12	27.11	29.11	814.65
		251	848.8	29.99	26.98	28.98	790.62
QPSK	1	128	824.2	26.39	17.36	19.36	86.28
		190	836.6	26.98	17.95	19.95	98.83
		251	848.8	27.03	18.00	20.00	99.98
	2	128	824.2	27.02	21.00	23.00	199.50
		190	836.6	27.04	21.02	23.02	200.42
		251	848.8	27.07	21.05	23.05	201.81
	3	128	824.2	26.22	21.96	23.96	248.90
		190	836.6	26.36	22.10	24.10	257.06
		251	848.8	26.28	22.02	24.02	252.37
	4	128	824.2	24.95	21.94	23.94	247.73
		190	836.6	25.34	22.33	24.33	271.00
		251	848.8	25.20	22.19	24.19	262.40

$$\text{Frame Average Power} = \text{Burst Average Power} - 10 \cdot \log\left(\frac{1}{\#\text{UL Slots}/8}\right)$$

Mod.	#UL Slots	CH #	Freq [MHz]	FCC		IC	
				Power density @ 20cm [mW/cm ²]	Limit [mW/cm ²]	Power density @ 20cm [W/m ²]	Limit [W/m ²]
GMSK	1	128	824.2	0.071	0.549	0.71	2.58
		190	836.6	0.072	0.558	0.72	2.60
		251	848.8	0.071	0.566	0.71	2.63
	2	128	824.2	0.139	0.549	1.39	2.58
		190	836.6	0.118	0.558	1.18	2.60
		251	848.8	0.116	0.566	1.16	2.63
	3	128	824.2	0.178	0.549	1.78	2.58
		190	836.6	0.156	0.558	1.56	2.60
		251	848.8	0.156	0.566	1.56	2.63
	4	128	824.2	0.162	0.549	1.62	2.58
		190	836.6	0.162	0.558	1.62	2.60
		251	848.8	0.157	0.566	1.57	2.63
8PSK	1	128	824.2	0.017	0.549	0.17	2.58
		190	836.6	0.020	0.558	0.20	2.60
		251	848.8	0.020	0.566	0.20	2.63
	2	128	824.2	0.040	0.549	0.40	2.58
		190	836.6	0.040	0.558	0.40	2.60
		251	848.8	0.040	0.566	0.40	2.63
	3	128	824.2	0.050	0.549	0.50	2.58
		190	836.6	0.051	0.558	0.51	2.60
		251	848.8	0.050	0.566	0.50	2.63
	4	128	824.2	0.049	0.549	0.49	2.58
		190	836.6	0.054	0.558	0.54	2.60
		251	848.8	0.052	0.566	0.52	2.63

A.2.2 PCS 1900

Antenna Peak Gain = 2dBi

Mod.	#UL Slots	CH #	Freq [MHz]	Burst Avg Power [dBm]	Frame Avg Power [dBm]	ERP/EIRP Avg [dBm]	ERP/EIRP Avg [mW]
GMSK	1	512	1850.2	29.59	20.56	22.56	180.26
		661	1880.0	29.34	20.31	22.31	170.18
		810	1909.8	29.37	20.34	22.34	171.36
	2	512	1850.2	29.57	23.55	25.55	358.87
		661	1880.0	29.30	23.28	25.28	337.24
		810	1909.8	29.20	23.18	25.18	329.56
	3	512	1850.2	29.06	24.80	26.80	478.66
		661	1880.0	28.84	24.58	26.58	455.02
		810	1909.8	28.83	24.57	26.57	453.97
	4	512	1850.2	28.01	25.00	27.00	501.15
		661	1880.0	27.80	24.79	26.79	477.50
		810	1909.8	27.95	24.94	26.94	494.28
8PSK	1	512	1850.2	25.98	16.95	18.95	78.51
		661	1880.0	25.75	16.72	18.72	74.46
		810	1909.8	25.75	16.72	18.72	74.46
	2	512	1850.2	26.72	20.70	22.70	186.18
		661	1880.0	26.55	20.53	22.53	179.04
		810	1909.8	26.42	20.40	22.40	173.76
	3	512	1850.2	25.88	21.62	23.62	230.16
		661	1880.0	25.72	21.46	23.46	221.84
		810	1909.8	25.63	21.37	23.37	217.29
	4	512	1850.2	24.75	21.74	23.74	236.58
		661	1880.0	24.50	21.49	23.49	223.34
		810	1909.8	24.45	21.44	23.44	220.79

$$Frame\ Average\ Power = Burst\ Average\ Power - 10 \cdot \log\left(\frac{1}{\#UL\ Slots/8}\right)$$

Mod.	#UL Slots	CH #	Freq [MHz]	FCC		IC	
				Power density @ 20cm [mW/cm ²]	Limit [mW/cm ²]	Power density @ 20cm [W/m ²]	Limit [W/m ²]
GMSK	1	512	1850.2	0.036	1.000	0.36	4.48
		661	1880.0	0.034	1.000	0.34	4.53
		810	1909.8	0.034	1.000	0.34	4.57
	2	512	1850.2	0.071	1.000	0.71	4.48
		661	1880.0	0.067	1.000	0.67	4.53
		810	1909.8	0.066	1.000	0.66	4.57
	3	512	1850.2	0.095	1.000	0.95	4.48
		661	1880.0	0.091	1.000	0.91	4.53
		810	1909.8	0.090	1.000	0.90	4.57
	4	512	1850.2	0.100	1.000	1.00	4.48
		661	1880.0	0.095	1.000	0.95	4.53
		810	1909.8	0.098	1.000	0.98	4.57
8PSK	1	512	1850.2	0.016	1.000	0.16	4.48
		661	1880.0	0.015	1.000	0.15	4.53
		810	1909.8	0.015	1.000	0.15	4.57
	2	512	1850.2	0.037	1.000	0.37	4.48
		661	1880.0	0.036	1.000	0.36	4.53
		810	1909.8	0.035	1.000	0.35	4.57
	3	512	1850.2	0.046	1.000	0.46	4.48
		661	1880.0	0.044	1.000	0.44	4.53
		810	1909.8	0.043	1.000	0.43	4.57
	4	512	1850.2	0.047	1.000	0.47	4.48
		661	1880.0	0.044	1.000	0.44	4.53
		810	1909.8	0.044	1.000	0.44	4.57

A.3 WCDMA/HSPA+

A.3.1 FDD II

Antenna Peak Gain = 2dBi

Mode	CH #	Freq [MHz]	Avg Power [dBm]	ERP/EIRP Avg [dBm]	ERP/EIRP Avg [mW]	FCC		IC	
						Power density @ 20cm [mW/cm ²]	Limit [mW/cm ²]	Power density @ 20cm [W/m ²]	Limit [W/m ²]
RMC	9262	1852.4	24.01	26.01	399.02	0.079	1.000	0.79	4.48
	9400	1880.0	23.86	25.86	385.48	0.077	1.000	0.77	4.53
	9538	1907.6	23.87	25.87	386.37	0.077	1.000	0.77	4.57

A.3.2 FDD IV

Antenna Peak Gain = 2dBi

Mode	CH #	Freq [MHz]	Avg Power [dBm]	ERP/EIRP Avg [dBm]	ERP/EIRP Avg [mW]	FCC		IC	
						Power density @ 20cm [mW/cm ²]	Limit [mW/cm ²]	Power density @ 20cm [W/m ²]	Limit [W/m ²]
RMC	1312	1712.4	23.59	25.59	362.24	0.072	1.00	0.72	2.58
	1413	1732.6	23.96	25.96	394.46	0.078	1.00	0.78	2.60
	1513	1752.6	23.85	25.85	384.59	0.077	1.00	0.77	2.62

A.3.3 FDD V

Antenna Peak Gain = 2dBi

Mode	CH #	Freq [MHz]	Avg Power [dBm]	ERP/EIRP Avg [dBm]	ERP/EIRP Avg [mW]	FCC		IC	
						Power density @ 20cm [mW/cm ²]	Limit [mW/cm ²]	Power density @ 20cm [W/m ²]	Limit [W/m ²]
RMC	4132	826.4	23.66	25.66	368.13	0.073	0.551	0.73	5.51
	4180	836	23.74	25.74	374.97	0.075	0.557	0.75	5.57
	4230	846	23.63	25.63	365.59	0.073	0.564	0.73	5.64

A.4 LTE

A.4.1 Band 2

Antenna Peak Gain = 2dBi

Mod.	CH #	Freq [MHz]	Avg Power [dBm]	ERP/EIRP Avg [dBm]	ERP/EIRP Avg [mW]	FCC		IC	
						Power density @ 20cm [mW/cm ²]	Limit [mW/cm ²]	Power density @ 20cm [W/m ²]	Limit [W/m ²]
QPSK	18615	1851.5	23.45	25.45	350.75	0.070	1.000	0.70	4.48
	18900	1880.0	23.58	25.58	361.41	0.072	1.000	0.72	4.53
	19150	1905.0	23.41	25.41	347.54	0.069	1.000	0.69	4.57
16QAM	18615	1851.5	22.57	24.57	286.42	0.057	1.000	0.57	4.48
	18900	1880.0	22.59	24.59	287.74	0.057	1.000	0.57	4.53
	19185	1908.5	22.47	24.47	279.90	0.056	1.000	0.56	4.57

A.4.2 Band 4

Antenna Peak Gain = 2dBi

Mod.	CH #	Freq [MHz]	Avg Power [dBm]	ERP/EIRP Avg [dBm]	ERP/EIRP Avg [mW]	FCC		IC	
						Power density @ 20cm [mW/cm ²]	Limit [mW/cm ²]	Power density @ 20cm [W/m ²]	Limit [W/m ²]
QPSK	19957	1710.7	22.46	24.46	279.25	0.056	1.00	0.56	4.24
	20175	1732.5	22.55	24.55	285.1	0.057	1.00	0.57	4.28
	20385	1753.5	22.54	24.54	284.45	0.057	1.00	0.57	4.32
16QAM	19965	1711.5	21.68	23.68	233.35	0.046	1.00	0.46	4.24
	20175	1732.5	21.77	23.77	238.23	0.047	1.00	0.47	4.28
	20385	1753.5	21.81	23.81	240.44	0.048	1.00	0.48	4.32

A.4.3 Band 5

Antenna Peak Gain = 2dBi

Mod.	CH #	Freq [MHz]	Avg Power [dBm]	ERP/EIRP Avg [dBm]	ERP/EIRP Avg [mW]	FCC		IC	
						Power density @ 20cm [mW/cm ²]	Limit [mW/cm ²]	Power density @ 20cm [W/m ²]	Limit [W/m ²]
QPSK	20407	824.7	22.41	24.41	276.06	0.055	0.55	0.55	2.58
	20525	836.5	22.47	24.47	279.9	0.056	0.558	0.56	2.60
	20600	844	22.35	24.35	272.27	0.054	0.563	0.54	2.62
16QAM	20407	824.7	21.68	23.68	233.35	0.046	0.55	0.46	2.58
	20525	836.5	21.61	23.61	229.61	0.046	0.558	0.46	2.60
	20635	847.5	21.45	23.45	221.31	0.044	0.565	0.44	2.63

A.4.4 Band 17

Antenna Peak Gain = 2dBi

Mod.	CH #	Freq [MHz]	Avg Power [dBm]	ERP/EIRP Avg [dBm]	ERP/EIRP Avg [mW]	FCC		IC	
						Power density @ 20cm [mW/cm ²]	Limit [mW/cm ²]	Power density @ 20cm [W/m ²]	Limit [W/m ²]
QPSK	23780	709	22.52	24.52	283.14	0.056	0.473	0.56	2.32
	23790	710	22.52	24.52	283.14	0.056	0.473	0.56	2.33
	23800	711	22.5	24.5	281.84	0.056	0.474	0.56	2.33
16QAM	23780	709	21.72	23.72	235.5	0.047	0.473	0.47	2.32
	23790	710	21.69	23.69	233.88	0.047	0.473	0.47	2.33
	23800	711	21.67	23.67	232.81	0.046	0.474	0.46	2.33

A.4.5 Band 7

Antenna Peak Gain = 2dBi

Mod.	CH #	Freq [MHz]	Avg Power [dBm]	ERP/EIRP Avg [dBm]	ERP/EIRP Avg [mW]	FCC		IC	
						Power density @ 20cm [mW/cm ²]	Limit [mW/cm ²]	Power density @ 20cm [W/m ²]	Limit [W/m ²]
QPSK	20800	2505	23.69	25.69	370.68	0.074	1.00	0.74	5.51
	21100	2535	23.63	25.63	365.59	0.073	1.00	0.73	5.55
	21400	2565	23.45	25.45	350.75	0.07	1.00	0.70	5.60
16QAM	20775	2502.5	22.84	24.84	304.79	0.061	1.00	0.61	5.50
	21100	2535	22.88	24.88	307.61	0.061	1.00	0.61	5.55
	21400	2565	22.79	24.79	301.3	0.060	1.00	0.60	5.60

A.4.6 Band 12

Antenna Peak Gain = 2dBi

Mod.	CH #	Freq [MHz]	Avg Power [dBm]	ERP/EIRP Avg [dBm]	ERP/EIRP Avg [mW]	FCC		IC	
						Power density @ 20cm [mW/cm ²]	Limit [mW/cm ²]	Power density @ 20cm [W/m ²]	Limit [W/m ²]
QPSK	23025	700.5	23.11	25.11	324.34	0.065	0.467	0.65	2.31
	23095	707.5	23.11	25.11	324.34	0.065	0.472	0.65	2.32
	23165	714.5	23.00	25.00	316.23	0.063	0.476	0.63	2.34
16QAM	23017	699.7	22.18	24.18	261.82	0.052	0.466	0.52	2.30
	23095	707.5	22.21	24.21	263.63	0.052	0.472	0.52	2.32
	23165	714.5	22.21	24.21	263.63	0.052	0.476	0.52	2.34

A.4.7 Band 13

Antenna Peak Gain = 2dBi

Mod.	CH #	Freq [MHz]	Avg Power [dBm]	ERP/EIRP Avg [dBm]	ERP/EIRP Avg [mW]	FCC		IC	
						Power density @ 20cm [mW/cm ²]	Limit [mW/cm ²]	Power density @ 20cm [W/m ²]	Limit [W/m ²]
QPSK	23205	779.5	23.17	25.17	328.85	0.065	0.52	0.65	2.48
	23230	782	23.61	25.61	363.92	0.072	0.521	0.72	2.49
	23255	784.5	23.04	25.04	319.15	0.063	0.523	0.63	2.49
16QAM	23205	779.5	22.39	24.39	274.79	0.055	0.52	0.55	2.48
	23230	782	22.82	24.82	303.39	0.060	0.521	0.60	2.49
	23255	784.5	22.10	24.10	257.04	0.051	0.523	0.51	2.49

A.4.8 Band 26

Antenna Peak Gain = 2dBi

Mod.	CH #	Freq [MHz]	Avg Power [dBm]	ERP/EIRP Avg [dBm]	ERP/EIRP Avg [mW]	FCC		IC	
						Power density @ 20cm [mW/cm ²]	Limit [mW/cm ²]	Power density @ 20cm [W/m ²]	Limit [W/m ²]
QPSK	26697	814.7	23.02	25.02	317.69	0.063	0.543	0.63	2.56
	26865	831.5	23.00	25.00	316.23	0.063	0.554	0.63	2.59
	26990	844.0	22.65	24.65	291.74	0.058	0.563	0.58	2.62
16QAM	26697	814.7	22.03	24.03	252.93	0.05	0.543	0.50	2.56
	26865	831.5	22.02	24.02	252.35	0.05	0.554	0.50	2.59
	27025	847.5	21.82	23.82	240.99	0.048	0.565	0.48	2.63

A.4.9 Band 30

Antenna Peak Gain = 0dBi

Mod.	CH #	Freq [MHz]	Avg Power [dBm]	ERP/EIRP Avg [dBm]	ERP/EIRP Avg [mW]	FCC		IC	
						Power density @ 20cm [mW/cm ²]	Limit [mW/cm ²]	Power density @ 20cm [W/m ²]	Limit [W/m ²]
QPSK	27710	2310	23.33	23.33	215.278	0.043	1.00	0.43	5.21
	27735	2312.5	23.25	23.25	211.349	0.042	1.00	0.42	5.21
16QAM	27710	2310	22.68	22.68	185.353	0.037	1.00	0.37	5.21