

TEST REPORT

EUT Description	Notebook
Brand Name	HP
Model Name	TPN-I137
FCC ID	B94TNI137HPPD
Date of Test Start/End	2020-01-13/ 2020-01-23
Features	WWAN (LTE, UMTS), WLAN, BT (see section 5)

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Reference Standards	FCC CFR Title 47 Part 2, 22, 24, 27 (see section 1)
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Test Report identification	191210-02.TR13
Revision Control	Rev. 00 This test report revision replaces any previous test report revision (see section 8)

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1. Standards, reference documents and applicable test methods

1. FCC 47 CFR part 2 - Subpart J - Equipment Authorization Procedures.
2. FCC 47 CFR part 22 - Subpart H - Cellular Radiotelephone Service.
3. FCC 47 CFR part 24 – Subpart E - Broadband PCS.
4. FCC 47 CFR part 27 – Subpart C - Technical Standards.
5. FCC 47 CFR part 27 – Subpart L - 1695-1710, 1710-1755 MHz, 1755-1780 MHz, 2110-2155 MHz, 2155-2180 MHz, 2180-2200 MHz Bands.
6. FCC OET KDB 971168 D01 v03r01 Measurement guidance for certification of licensed digital transmitters.
7. C63.26-2015 - IEEE/ANSI Standard for Compliance Testing of Transmitters Used in Licensed Radio Services.

2. General conditions, competences and guarantees

- ✓ Intel Corporation SAS Wireless RF Lab (Intel WRF Lab) is an ISO/IEC 17025:2017 laboratory accredited by the American Association for Laboratory Accreditation (A2LA) with the certificate number 3478.01.
- ✓ Intel Corporation SAS Wireless RF Lab (Intel WRF Lab) is an Accredited Test Firm recognized by the FCC, with Designation Number FR0011.
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3. Environmental Conditions

- ✓ At the site where the measurements were performed the following limits were not exceeded during the tests:

Temperature	22°C ± 3°C
Humidity	45% ± 5%

4. Test samples

Sample	Control #	Description	Model	Serial #	Date of receipt	Note
#01	191210-02.S04	LAPTOP	HP	00094300VY	2019-12-10	N/A

5. EUT Features

Brand Name	HP							
Model Name	TPN-I137							
FCC ID	B94TNI137JPPD							
Prototype / Production	Production							
Supported Radios	The Fibocom M2 L850 GL module supports only UMTS and LTE, without carrier aggregation. The applicable frequency bands and operating modes are identified in the following table, where North America bands are shown in bold.							
	WWAN:							
	Mode	Bands	Supported Tx Mode					
			WCDMA	HSDPA	HSUPA	DC-HSDPA		
	WCDMA / HSPA+	FDD II (1850.0 – 1910.0 MHz)	✓	✓	✓	✓		
		FDD IV (1710.0 – 1755.0 MHz)	✓	✓	✓	✓		
		FDD V (824.0 – 849.0 MHz)	✓	✓	✓	✓		
		FDD VIII (880.0 – 915.0 MHz)	✓	✓	✓	✓		
	Mode	Bands	Supported Channel Bandwidth (MHz)					
			1.4	3	5	10	15	20
	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 (2500.0 – 2570.0 MHz)			✓	✓	✓	✓
		Band 12 (699.0 – 716.0 MHz)	✓	✓	✓	✓		
		Band 13 (777.0 – 787.0 MHz)			✓	✓		
		Band 17 (704.0 – 716.0 MHz)			✓	✓		
		Band 18 (815.0 – 830.0 MHz)			✓	✓	✓	
		Band 19 (830.0 – 845.0 MHz)			✓	✓	✓	
		Band 26 (814.0 – 849.0 MHz)	✓	✓	✓	✓	✓	
		Band 28 (703.0 – 748.0 MHz)		✓	✓	✓	✓	✓
		Band 30 (2305.0 – 2315.0 MHz)			✓	✓		
Band 66 (1710.0 – 1780.0 MHz)		✓	✓	✓	✓	✓	✓	
LTE TDD	Band 38 (2570.0 – 2620.0 MHz)			✓	✓	✓	✓	
	Band 40 (2300.0 – 2400.0 MHz)			✓	✓	✓	✓	
	Band 41 (2496.0 – 2690.0 MHz)			✓	✓	✓	✓	
WLAN/BT								
Mode	UL Freq Range (MHz)							
802.11b/g/n/ax	2400-2483.5							
802.11a/n/ac/ax	5150-5250							
	5250-5350							
	5475-5725							
	5725-5850							
BDR/EDR v5.0	2400-2483.5							
Bluetooth LE v5.0	2400-2483.5							
Antenna Information	INPAQ PIFA Antenna WWAN (TX1) P/N: 6036B0263901 (WA-P-LTE15-02-005)							

6. Remarks and comments

The tested configurations were selected based on the worst case spurious emissions per frequency band from modular type approval report.

The smallest bandwidth and RB were selected in order to guarantee the worst case in terms of power density.

7. Test Verdicts summary

The statement of conformity to applicable standards in the table below are based on the measured values, without taking into account the measurement uncertainties.

Band	FCC part	Test name	Verdict
WCDMA II	24.238, 2.1053	Radiated spurious emission	P
WCDMA IV	27.53 (h), 2.1053	Radiated spurious emission	P
WCDMA V	22.917, 2.1053	Radiated spurious emission	P
LTE 2	24.238, 2.1053	Radiated spurious emission	P
LTE 5	22.917, 2.1053	Radiated spurious emission	P
LTE 13	27.53 (g)(f), 2.1053	Radiated spurious emission	P
LTE 26	90.691, 22.917, 2.1053	Radiated spurious emission	P
LTE 30	27.53 (a)(4), 2.1053	Radiated spurious emission	P
LTE 41	27.53 (m), 2.1053	Radiated spurious emission	P

P: Pass

F: Fail

NM: Not Measured

NA: Not Applicable

8. Document Revision History

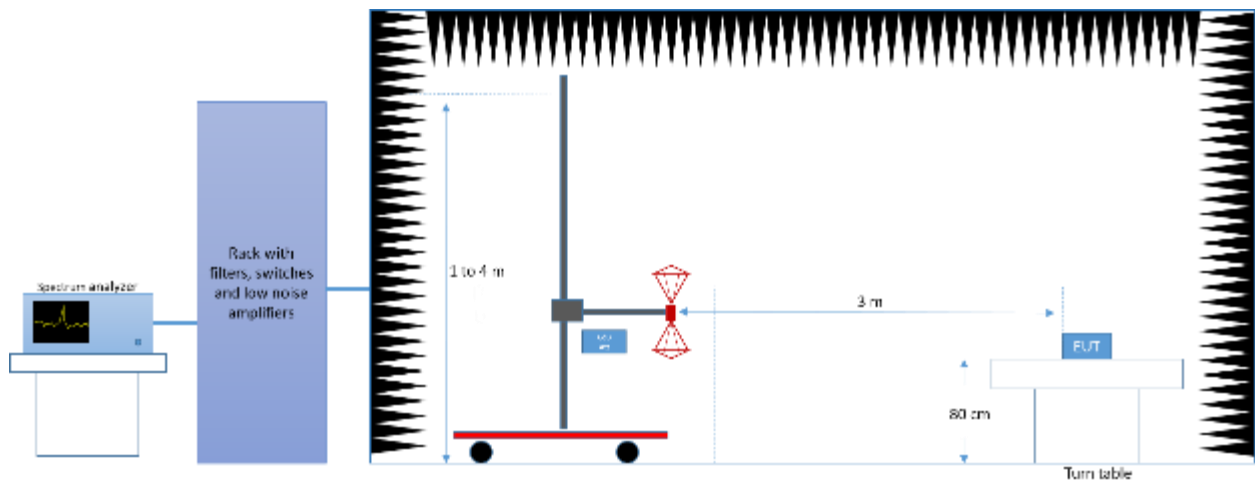
Revision #	Date	Modified by	Revision Details
Rev. 00	2020-01-23	A.LOUNES	First Issue

Annex A. Test & System Description

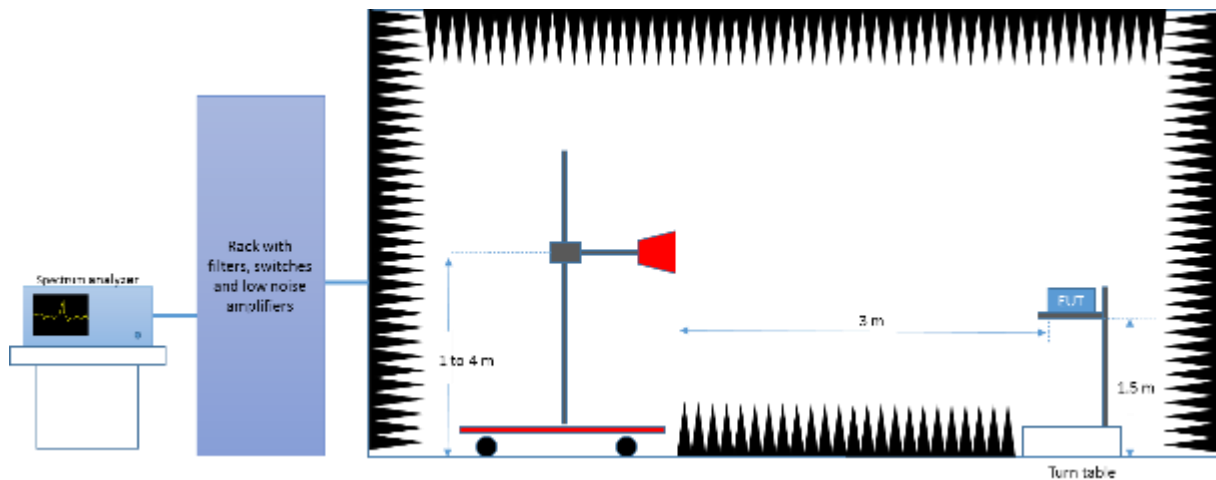
A.1 Measurement System

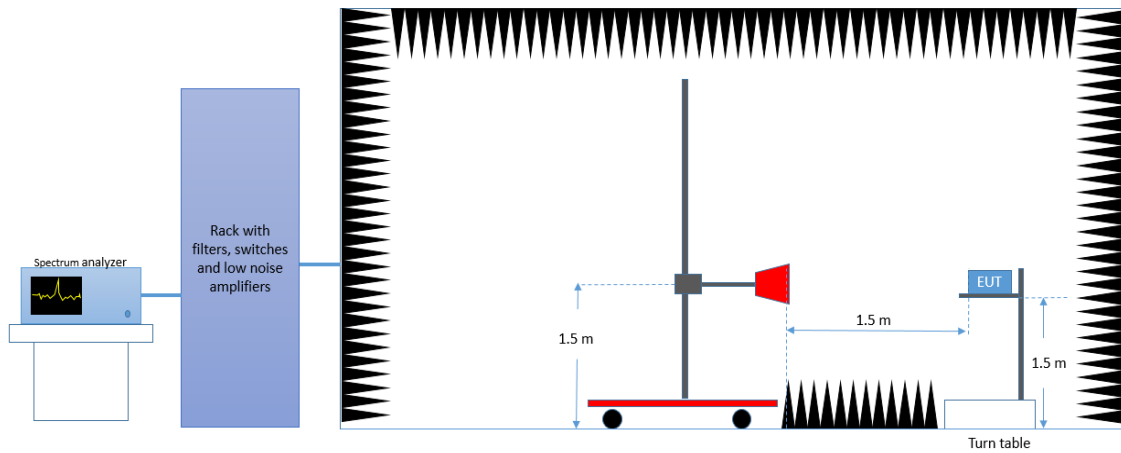
Measurements were performed using the following setups. A communication tester was used to establish a communication link with the EUT, and the communication tester parameters were set to get the maximum output power from the EUT.

Radiated Setup 30MHz- 1GHz



Radiated Setup Frequency range 1 GHz to 18 GHz



Radiated Setup Frequency range 18 GHz to 26.5 GHzSample Calculation

The spurious received power P at the spectrum Analyzer is converted to EIRP the equivalent isotropically radiated power, in dBm using the transducer factor F corresponding to the Rx path Loss:

$$F \text{ (dB)} = \text{Free Space Attenuation (dB)} + \text{Cable losses (dB)} - \text{Amplifiers Gain (dB)} - \text{Rx Antenna Gain (dBi)}$$
$$\text{EIRP (dBm)} = P(\text{dBm}) + F \text{ (dB)}$$

A.2 Test Equipment List

A.2.1 Radiated Setup #1

ID#	Device	Type/Model	Serial #	Manufacturer	Cal. Date	Cal. Due Date
0420	Spectrum analyzer	FSV40	101556	Rohde & Schwarz	2018-05-17	2020-05-17
0993	BiConical antenna 25 MHz – 1 GHz	UBAA9115+BBVU9135+ DGA9552N	0286+CH 9044	Schwarzbeck	2019-11-22	2021-11-21
0141	Double Ridged Horn Antenna 1 GHz – 18 GHz	3117	00157736	ETS Lindgren	2018-05-11	2020-05-11
0325	Double Ridged Horn Antenna 1 GHz – 18 GHz	3117	00157734	ETS Lindgren	2019-08-12	2021-08-12
0139	Horn Antenna 3116+ Amplifier 18GHz – 26.5GHz	3116	00167100	ETS Lindgren	2018-04-06	2020-04-06
0135	Semi Anechoic chamber	FACT 3	5720	ETS Lindgren	2018-04-18	2020-04-18
0329	Measurement Software	EMC32 V10.40.10	100401	Rohde & Schwarz	N/A	N/A
0421	Communication tester	CMW500	158429	Rohde & Schwarz	2019-04-13	2020-04-13
0577	Temperature & Humidity logger	RA12E-TH1-RAS	RA12-B89702	AVTECH	2018-03-01	2020-03-01

A.3 Measurement Uncertainty Evaluation

The system uncertainty evaluation is shown in the below table:

Measurement type	Uncertainty [\pm dB]
Radiated test < 1GHz	± 3.0
Radiated test 1GHz – 26.5 GHz	± 4.3

Annex B. Test Results

B.1 Radiated spurious emission

B.1.1 Standard references

BAND	FCC part	Limits
WCDMA II	24.238, 2.1053	The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB
WCDMA IV	27.53 (h), 2.1053	The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB
WCDMA V	22.917, 2.1053	The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB
LTE 2	24.238, 2.1053	The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB
LTE 5	22.917, 2.1053	The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB
LTE 13	27.53 (g)(f), 2.1053	The power of any emission outside a licensee's frequency block shall be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB. For operations in the 746-758 MHz, 775-788 MHz, and 805-806 MHz bands, emissions in the band 1559-1610 MHz shall be limited to -70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth.
LTE 26	90.691, 22.917, 2.1053	The power of any emission outside a licensee's frequency block shall be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB
LTE 30	27.53 (a)(4), 2.1053	By a factor of not less than: $43 + 10 \log(P)$ dB on all frequencies between 2305 and 2320 MHz and on all frequencies between 2345 and 2360 MHz that are outside the licensed band(s) of operation, not less than $55 + 10 \log(P)$ dB on all frequencies between 2320 and 2324 MHz and on all frequencies between 2341 and 2345

		<p>MHz, not less than $61 + 10 \log (P)$ dB on all frequencies between 2324 and 2328 MHz and on all frequencies between 2337 and 2341 MHz, and not less than $67 + 10 \log (P)$ dB on all frequencies between 2328 and 2337 MHz;</p> <p>(ii) By a factor of not less than $43 + 10 \log (P)$ dB on all frequencies between 2300 and 2305 MHz, $55 + 10 \log (P)$ dB on all frequencies between 2296 and 2300 MHz, $61 + 10 \log (P)$ dB on all frequencies between 2292 and 2296 MHz, $67 + 10 \log (P)$ dB on all frequencies between 2288 and 2292 MHz, and $70 + 10 \log (P)$ dB below 2288 MHz;</p> <p>(iii) By a factor of not less than $43 + 10 \log (P)$ dB on all frequencies between 2360 and 2365 MHz, and not less than $70 + 10 \log (P)$ dB above 2365 MHz.</p>
<p>LTE 41</p>	<p>27.53 (m), 2.1053</p>	<p>For mobile digital stations, the attenuation factor shall be not less than $40 + 10 \log (P)$ dB on all frequencies between the channel edge and 5 megahertz from the channel edge, $43 + 10 \log (P)$ dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and $55 + 10 \log (P)$ dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less than $43 + 10 \log (P)$ dB on all frequencies between 2490.5 MHz and 2496 MHz and $55 + 10 \log (P)$ dB at or below 2490.5 MHz.</p>

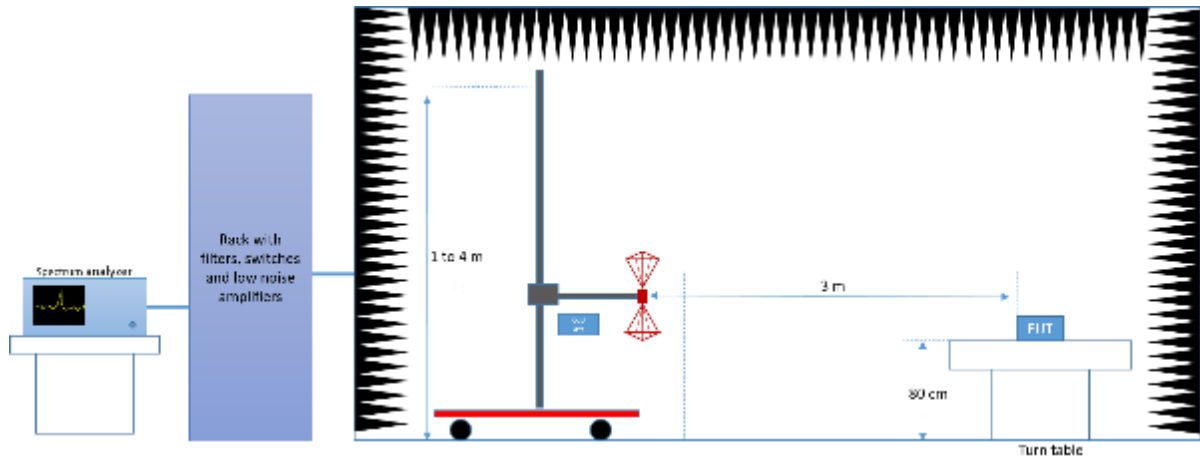
B.1.2 Test procedure

The setup below was used to measure the radiated spurious emissions. The test was done following the FCC OET KDB 971168 D01 v03r01.

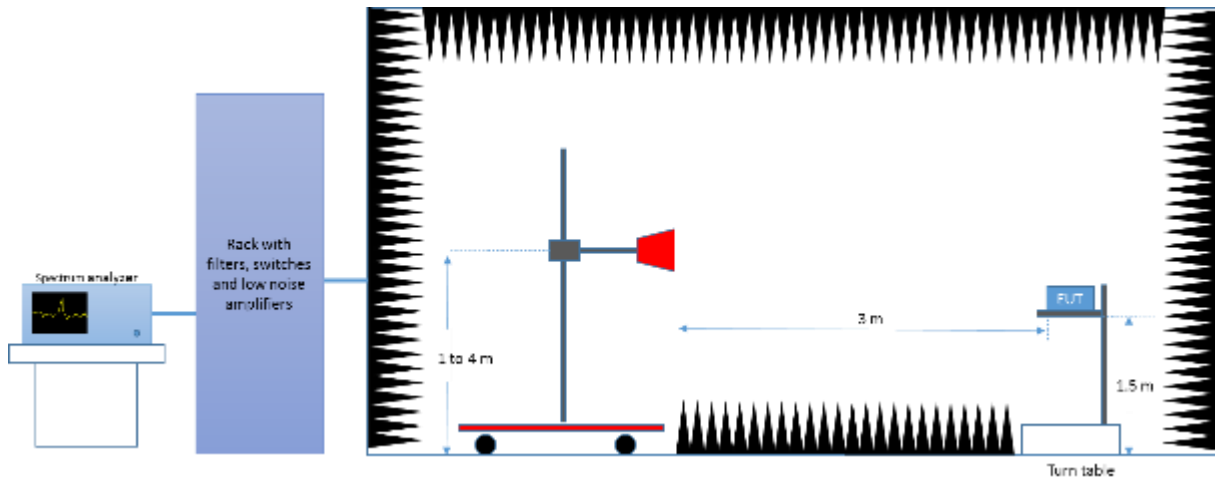
Depending of the frequency range and bands being tested, different antennas and filters were used.

The final measurement is done by varying the antenna height from 1 to 4 meters, the EUT azimuth over 360° and for both Vertical and Horizontal polarizations.

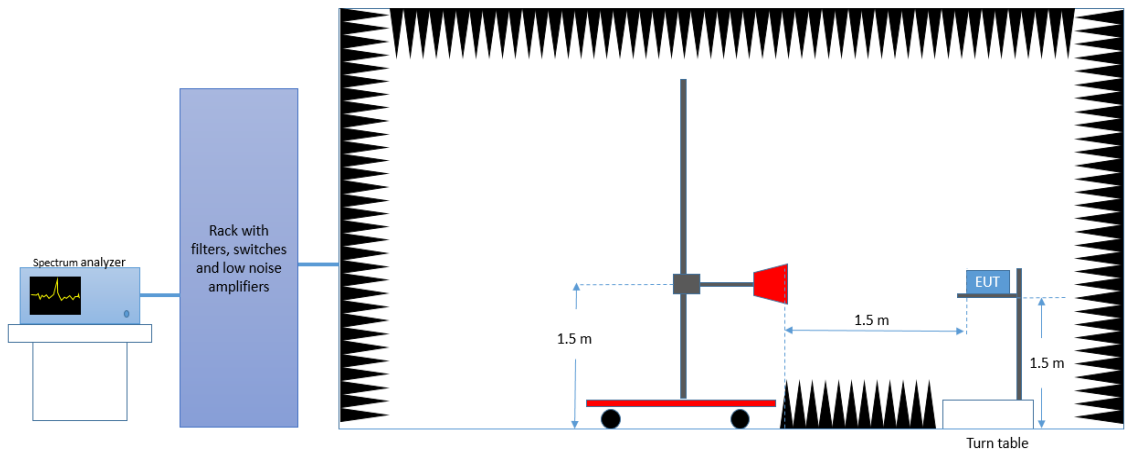
Radiated Setup 30MHz- 1GHz



Radiated Setup Frequency range 1 GHz to 18 GHz



Radiated Setup Frequency range 18 GHz to 26.5 GHz



B.1.3 Test Results

WCDMA 2

30 MHz to 26.5 GHz - Radiated Spurious WCDMA 2- QPSK - Low channel – 1850 MHz BW 5 MHz			
Frequency	RMS	Limit	Margin
MHz	dBm	dBm	dB
821.8	-59.1	-13.0	46.1
876.5	-58.2	-13.0	45.2
951.5	-55.4	-13.0	42.4
2998.5	-48.5	-13.0	35.5
16395.6	-56.8	-13.0	43.8
24607.8	-61.7	-13.0	48.7

WCDMA 4

30 MHz to 18GHz - Radiated Spurious WCDMA 4- QPSK - Mid channel – 1732.5 MHz BW 5 MHz			
Frequency	RMS	Limit	Margin
MHz	dBm	dBm	dB
650.0	-63.9	-13.0	50.9
704.1	-62.6	-13.0	49.6
817.5	-59.0	-13.0	46.0
960.4	-55.2	-13.0	42.2
2998.5	-48.0	-13.0	35.0
16353.5	-56.5	-13.0	43.5

WCDMA 5

**30 MHz to 18 GHz - Radiated Spurious
WCDMA 5- QPSK - Mid channel – 836.5 MHz
BW 5 MHz**

Frequency	RMS	Limit	Margin
MHz	dBm	dBm	dB
658.8	-44.7	-13.0	31.7
688.0	-43.6	-13.0	30.6
958.9	-35.3	-13.0	22.3
991.4	-35.8	-13.0	22.8
6998.6	-37.1	-13.0	24.1
16399.5	-56.2	-13.0	43.2

LTE 2

**30MHz to 26.5GHz - Radiated Spurious
LTE 2- QPSK – High channel – 1910 MHz
BW 1.4 MHz– RB 1**

Frequency	RMS	Limit	Margin
MHz	dBm	dBm	dB
841.8	-59.3	-13.0	46.3
895.2	-57.8	-13.0	44.8
968.1	-55.8	-13.0	42.8
2997.5	-48.7	-13.0	35.7
16747.7	-53.6	-13.0	40.6
24570.0	-61.7	-13.0	48.7

LTE 5**30MHz to 18GHz - Radiated Spurious
LTE 5 - QPSK - Mid channel – 836.5 MHz
BW 1.4 MHz– RB 1**

Frequency	RMS	Limit	Margin
MHz	dBm	dBm	dB
715.5	-42.9	-13.0	29.9
754.0	-42.9	-13.0	29.9
933.5	-37.5	-13.0	24.5
965.0	-36.2	-13.0	23.2
991.1	-35.9	-13.0	22.9
6999.1	-36.6	-13.0	23.6

LTE 13**30MHz to 18GHz - Radiated Spurious
LTE 13 - QPSK - Mid channel – 782 MHz
BW 5 MHz– RB 1**

Frequency	RMS	Limit	Margin
MHz	dBm	dBm	dB
642.5	-44.9	-13.0	31.9
657.0	-44.0	-13.0	31.0
907.5	-36.4	-13.0	23.4
957.9	-35.9	-13.0	22.9
976.0	-36.8	-13.0	23.8
1585.6	-58.5	-40.0	18.5

LTE 26

30MHz to 18GHz - Radiated Spurious LTE 26 - QPSK - Mid channel - 831.5 MHz BW 1.4 MHz– RB 1			
Frequency	RMS	Limit	Margin
MHz	dBm	dBm	dB
710.8	-41.5	-13.0	28.5
741.2	-42.5	-13.0	29.5
955.1	-37.4	-13.0	24.4
967.8	-36.5	-13.0	23.5
986.4	-36.4	-13.0	23.4
6989.2	-37.6	-13.0	24.6

LTE 30

30MHz to 26.5GHz - Radiated Spurious LTE 30 - QPSK - Mid channel - 2310 MHz BW 5 MHz– RB 1			
Frequency	RMS	Limit	Margin
MHz	dBm	dBm	dB
852.7	-58.4	-40.0	18.4
898.6	-57.3	-40.0	17.3
958.0	-54.8	-40.0	14.8
2985.5	-49.0	-40.0	9.0
16720.8	-54.4	-40.0	14.4
24960.1	-61.5	-40.0	21.5

LTE 41**30MHz to 26.5GHz – Radiated Spurious
LTE 41 – QPSK – High channel 2690
BW 5 MHz– RB 1**

Frequency	RMS	Limit	Margin
MHz	dBm	dBm	dB
803.4	-64.8	-25.0	39.8
936.3	-60.5	-25.0	35.5
963.9	-59.5	-25.0	34.5
2995.0	-39.3	-25.0	14.3
11938.0	-58.0	-25.0	33.0
24993.0	-63.1	-25.0	38.1

Annex C. Photographs

C.1 Radiated Test Setup



C.2 Test Sample

Sample #1

Sample Front



Sample Back



Laptop Mode



END