

TEST REPORT

EUT Description	Notebook/Tablet
Brand Name	HP
Model Name	HSN-Q225
FCC ID	B94HNC04PKCP2
Date of Test Start/End	2019-07-29 / 2019-08-21
Features	WWAN (LTE, UMTS), WLAN, BT (see section 1)

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Reference Standards	FCC CFR Title 47 Part 2, 22, 24, 27,90 (see section 1)
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Test Report identification	190617-01.TR01
Revision Control	Rev. 00 This test report revision replaces any previous test report revision (see section 8)

The test results relate only to the samples tested.
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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 47 CFR part 27 – Subpart R - Regulations Governing the Licensing and Use of Frequencies in the 763-775 and 793-805 MHz Bands
7. FCC 47 CFR part 27 – Subpart S - Regulations Governing Licensing and Use of Frequencies in the 806-824, 851-869, 896-901, and 935-940 MHz Bands
8. FCC OET KDB 971168 D01 v03r01 Measurement guidance for certification of licensed digital transmitters.
9. ANSI 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 17025:2005 testing 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.
- ✓ Intel Corporation SAS Wireless RF Lab (Intel WRF Lab) is a Registered Test Site listed by IC, with IC Assigned Code 1000Y.
- ✓ Intel WRF Lab declines any responsibility with respect to the identified information provided by the customer and that may affect the validity of results.
- ✓ 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.

3. Environmental Conditions

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

Temperature	25°C ± 2°C
Humidity	57% ± 3%

4. Test samples

Sample	Control #	Description	Model	Serial #	Date of receipt	Note
#01	190617-01.S02	PC	HSN-Q225	A5CD91788S65Q	19/06/2019	

5. EUT Features

Brand Name	HP							
Model Name	HSN-Q225							
FCC/IC ID	B94HNC04PKCP2							
Prototype / Production	Production							
Supported Radios	The Fibocom M2 L860 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 14 (788.0 – 798.0 MHz)			✓	✓		
		Band 17 (704.0 – 716.0 MHz)			✓	✓		
		Band 18 (815.0 – 830.0 MHz)			✓	✓	✓	
		Band 19 (830.0 – 845.0 MHz)			✓	✓	✓	
		Band 25 (1850.0 – 1915.0 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)			✓	✓	✓	✓

Supported Radios	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

6. Remarks and comments

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

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 4	27.53(h), 2.1053	Radiated spurious emission	P
LTE 14	90.543(c),(f), 2.1053	Radiated spurious emission	P
LTE 25	24.238, 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

P: Pass

F: Fail

NM: Not Measured

NA: Not Applicable

8. Document Revision History

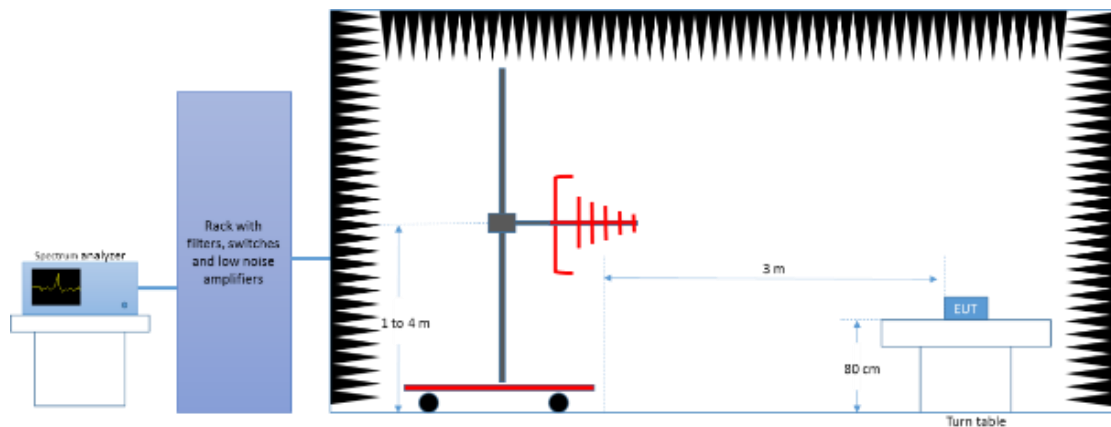
Revision #	Date	Modified by	Revision Details
Rev. 00	2019-08-21	I.KHARRAT	First Issue

Annex A. Test & System Description

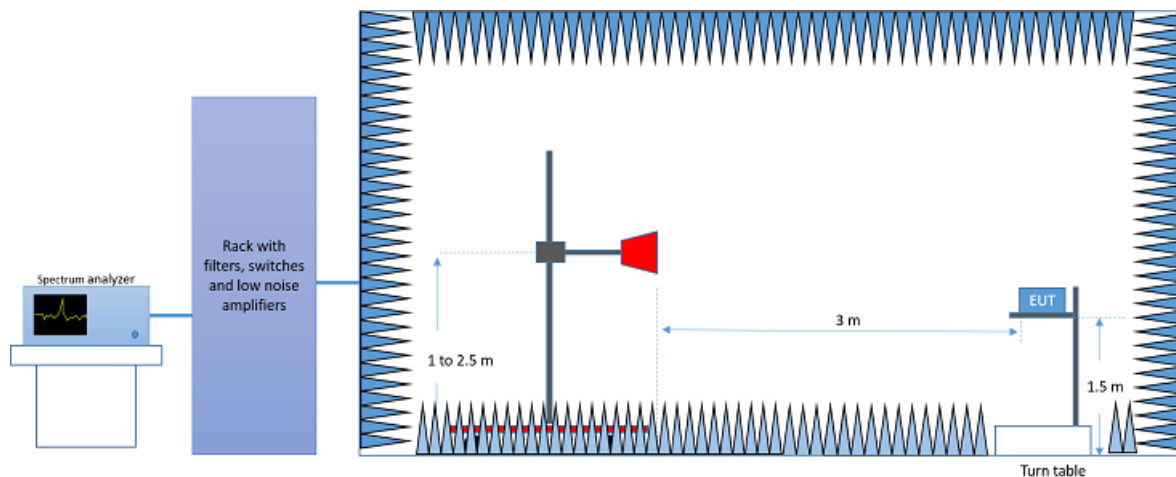
A.1 Measurement System

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.

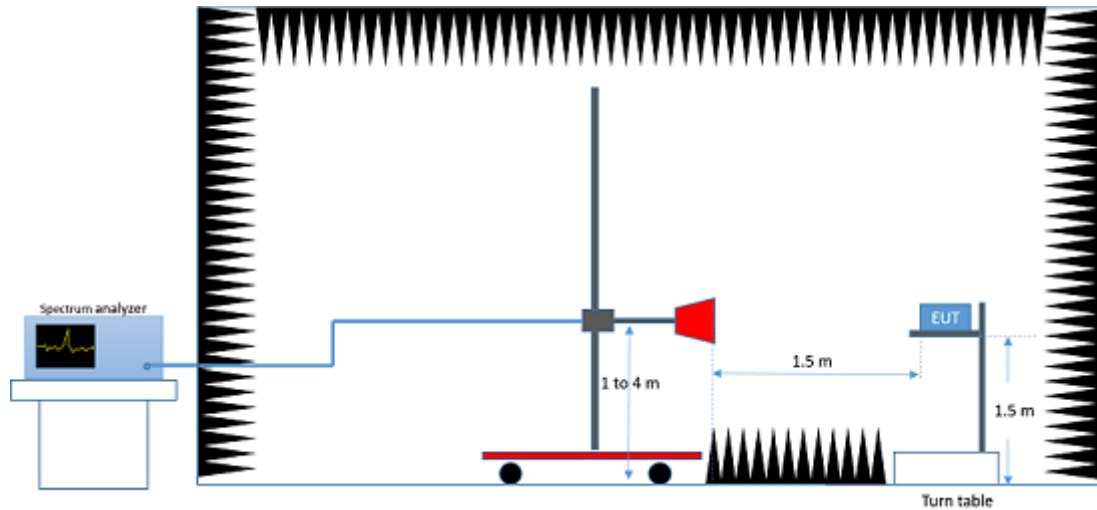
Radiated Setup 30MHz- 1GHz



Radiated Setup Frequency range 1 GHz to 18 GHz



Radiated Setup Frequency range 18 GHz to 26 GHz



Sample 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
0245	Biconical Antenna 30 - 300 MHz	3110C	00161549	ETS Lindgren	2018-10-29	2020-10-29
0247	Log Periodic Dipole Array Antenna 200 MHz- 1 GHz	3148B	00166194	ETS Lindgren	2018-05-10	2020-05-10
0139	Horn Antenna w/Preamp 18GHz – 26.5GHz	114514	00167100	ETS Lindgren	2018-04-06	2020-04-06
0135	Anechoic chamber	FACT 3	5720	ETS Lindgren	2018-04-18	2020-04-18
0530	Measurement Software	EMC32	100623	Rohde & Schwarz	N/A	N/A
0210	Communication tester	CMW500	147712	Rohde & Schwarz	N/A	N/A

A.2.2 Radiated Setup #2

ID#	Device	Type/Model	Serial #	Manufacturer	Cal. Date	Cal. Due Date
0133	Spectrum analyzer	FSV40	101358	Rohde & Schwarz	2018-05-17	2020-05-17
0141	Double Ridged Horn Antenna 1 GHz – 18 GHz	3117	00157736	ETS Lindgren	2018-05-11	2020-05-11
0138	Double Ridged Horn Antenna 1 GHz – 18 GHz	3117	00152266	ETS Lindgren	2018-03-29	2020-03-29
0337	Full Anechoic chamber	RFD_FA_100	5996	ETS Lindgren	2018-04-17	2020-04-17
0329	Measurement Software	EMC32	100401	Rohde & Schwarz	N/A	N/A
0311	Communication tester	CMW500	152720	Rohde & Schwarz	N/A	N/A

N/A: Not Applicable

A.3 Measurement Uncertainty Evaluation

The system uncertainty evaluation is shown in the below table:

Measurement type	Uncertainty [$\pm$ dB]
Radiated test < 1GHz	± 3.8
Radiated test 1GHz – 26 GHz	± 4.7

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 4	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
LTE 14	90.543(c),(f), 2.1053	the power of any emission must be reduced below the mean output power (P) by at least $43 + 10 \log(P)$ dB measured in a 100 kHz bandwidth for frequencies less than 1 GHz, and in a 1 MHz bandwidth for frequencies greater than 1 GHz For operations in the 758-775 MHz and 788-805 MHz bands, all emissions including harmonics 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 25	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 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

BAND	FCC part	Limits
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 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; (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; (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.

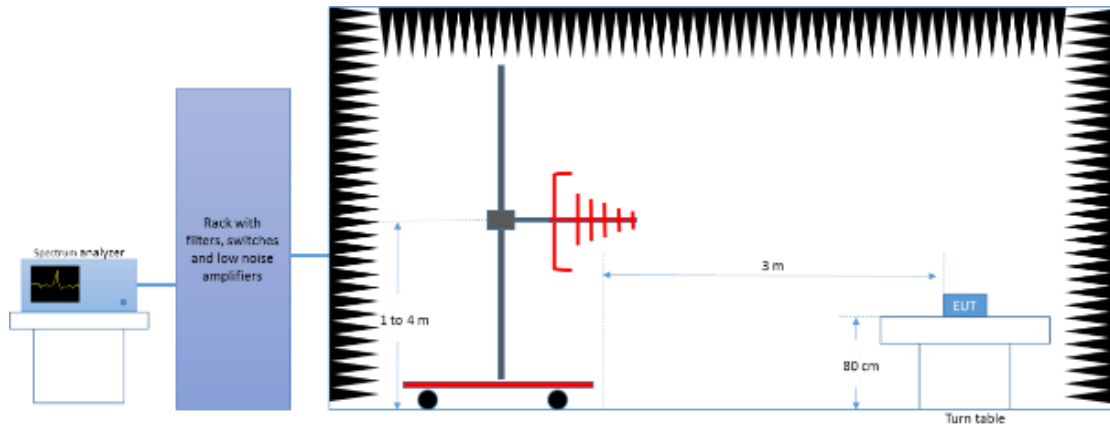
B.1.2 Test procedure

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

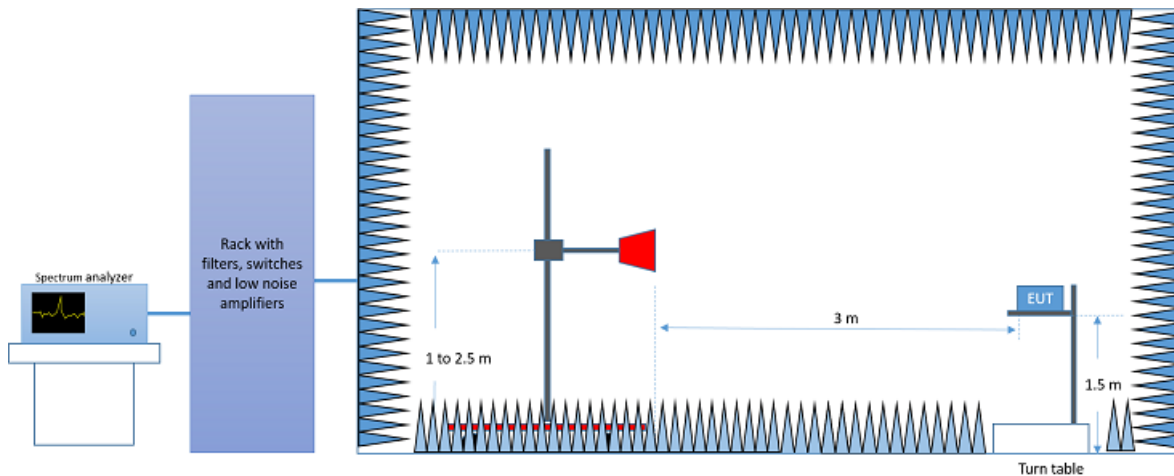
Depending of the frequency range and bands being tested, different antennas and filters were used.

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

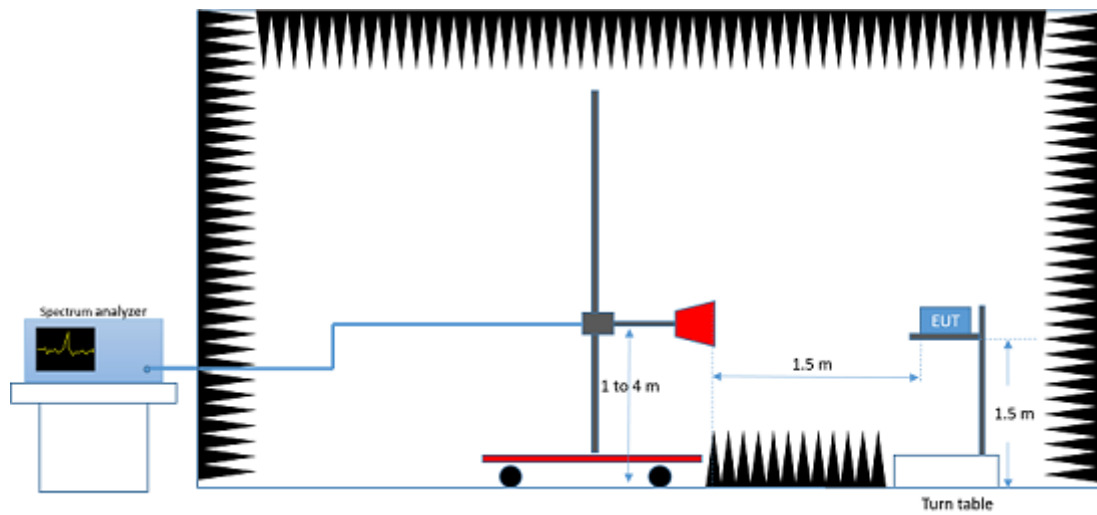
Radiated Setup 30MHz- 1GHz



Radiated Setup Frequency range 1 GHz to 18 GHz



Radiated Setup Frequency range 18 GHz to 26 GHz



B.1.3 Test Results

WCDMA 2

30MHz to 26GHz - Radiated Spurious WCDMA 2 - QPSK - Mid channel 9400				
Frequency	RMS	Limit	Margin	Polarization
MHz	dBm	dBm	dB	
297.0	-53.4	-13.0	40.4	H
859.0	-78.2	-13.0	65.2	H
4989.5	-55.5	-13.0	42.5	H
24575.7	-61.4	-13.0	48.4	V

WCDMA 4

30MHz to 18GHz - Radiated Spurious WCDMA 4 - QPSK - Mid channel 1413				
Frequency	RMS	Limit	Margin	Polarization
MHz	dBm	dBm	dB	
296.2	-53.1	-13.0	40.1	V
955.4	-77.0	-13.0	64.0	V
2134.0	-28.5	-13.0	15.5	H
17390.2	-42.3	-13.0	29.3	V

WCDMA 5

30MHz to 18GHz - Radiated Spurious WCDMA 5 - QPSK - Mid channel 4183				
Frequency	RMS	Limit	Margin	Polarization
MHz	dBm	dBm	dB	
295.4	-53.1	-13.0	40.1	V
905.5	-57.5	-13.0	44.5	V
1187.5	-58.5	-13.0	45.5	H
16656.0	-41.8	-13.0	28.8	V

LTE 4

30MHz to 18GHz - Radiated Spurious LTE 4 - QPSK - Low channel 19957 BW 20MHz – RB 1

Frequency	RMS	Limit	Margin	Polarization
MHz	dBm	dBm	dB	
297.3	-53.0	-13.0	40.0	V
709.4	-75.7	-13.0	62.7	H
3447.2	-57.7	-13.0	44.7	V
4750.0	-55.5	-13.0	42.5	V
5170.5	-54.1	-13.0	41.1	V

LTE 14

30MHz to 18GHz - Radiated Spurious LTE 14 - QPSK - Mid channel 23330 BW 10MHz – RB 1

Frequency	RMS	Limit	Margin	Polarization
MHz	dBm	dBm	dB	
885.3	-57.1	-13.0	44.1	H
6528.5	-62.3	-13.0	49.3	H
16798.5	-56.7	-13.0	43.7	V

LTE 25

30MHz to 26GHz - Radiated Spurious LTE 25 - QPSK - High channel 26683 BW 20MHz – RB 1

Frequency	RMS	Limit	Margin	Polarization
MHz	dBm	dBm	dB	
287.3	-68.9	-13.0	55.9	V
393.8	-75.8	-13.0	62.8	H
3255.5	-26.6	-13.0	13.6	V
17190.2	-43.1	-13.0	30.1	H
24538.4	-62.5	-13.0	49.5	V

LTE 26

**30MHz to 18GHz - Radiated Spurious
LTE 26 - QPSK - Mid channel 26865
BW 10MHz – RB 1**

Frequency	RMS	Limit	Margin	Polarization
MHz	dBm	dBm	dB	
291.8	-53.2	-13.0	40.2	V
933.7	-57.0	-13.0	44.0	V
6858.0	-61.7	-13.0	48.7	H
17106.0	-56.8	-13.0	43.8	H

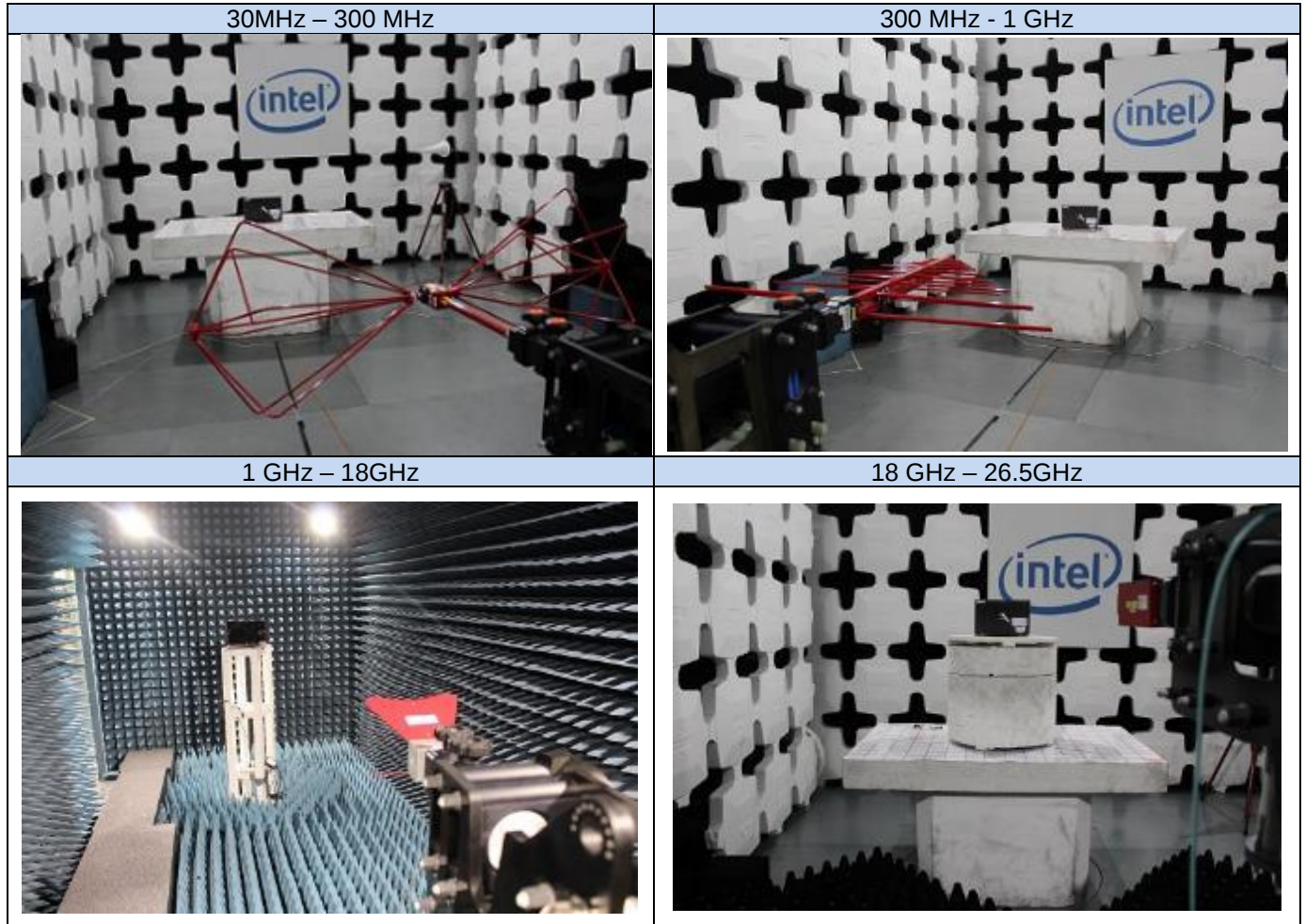
LTE 30

**30MHz to 26GHz - Radiated Spurious
LTE 30 - QPSK - Mid channel 27710
BW 10MHz – RB 1**

Frequency	RMS	Limit	Margin	Polarization
MHz	dBm	dBm	dB	
295.8	-52.9	-40.0	12.9	V
802.3	-77.3	-40.0	37.3	H
8967.6	-52.7	-40.0	12.7	H
17230.5	-48.5	-40.0	8.5	V
24548.8	-61.0	-40.0	21.0	H

Annex C. Photographs

C.1 Radiated Test Setup



C.2 Test Sample

Sample #01

Front view



Bottom view



END of report