CERTIFICATE #3478.01

TEST REPORT

EUT Description	**Convertible PC**
Brand Name	**HP**
Model Name	**TPN-Q250**
FCC ID	**B94TNQ250HPKVD**
Date of Test Start/End	**2021-05-06 / 2021-07-09**
Features	**WWAN (5G NR, LTE, UMTS), WLAN, BT** **(see section 5)**

Applicant	**HP Inc.**
Address	**1501 Page Mill Road, Palo Alto CA 94304 USA**
Contact Person	**Sam Lin**
Telephone/Fax/ Email	**(TEL) +886 2 37896331/ (Email) sam.lin2@hp.com**

Reference Standards	**FCC CFR Title 47 Part 2, 22, 24, 27, 90, 96** (see section 1)

Test Report identification	**210407-01.TR03**
Revision Control	**Rev. 01** **This test report revision replaces any previous test report revision** (see section 8)

The test results relate only to the samples tested.
Reference to accreditation shall be used only by full reproduction of test report.

Issued by	Reviewed by
Digitally signed by Khodor RIDA Date: 2021.07.19 14:15:13 +02'00'	Digitally signed by Ines Kharrat Date: 2021.07.19 14:48:47+02'00'
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1. Standards, reference documents and applicable test methods

FCC	1. FCC Title 47 CFR part 2 - Subpart J - Equipment Authorization Procedures. 2019-10-01 Edition 2. FCC Title 47 CFR part 22 - Subpart H - Cellular Radiotelephone Service. 2019-10-01 Edition 3. FCC Title 47 CFR part 24 – Subpart E - Broadband PCS. 2019-10-01 Edition 4. FCC Title 47 CFR part 27 – Subpart C - Technical Standards. 2019-10-01 Edition 5. FCC Title 47 CFR part 27 – Subpart L - 1695-1710, 1710-1755 MHz, 1755-1780 MHz, 2110-2155 MHz, 2155-2180 MHz, 2180-2200 MHz Bands. 2019-10-01 Edition 6. FCC Title 47 CFR Part 90 - Subpart R - Regulations governing the licensing and use of frequencies in the 763-775 and 793-805 MHz bands. 2019-10-01 Edition 7. FCC Title 47 CFR Part 90 - Subpart S - Regulations governing licensing and use of frequencies in the 806-824, 851-869, 896-901, and 935-940 MHz bands. 2019-10-01 Edition 8. FCC Title 47 CFR Part 96 - Subpart E - Technical rules. 2019-10-01 Edition 9. FCC OET KDB 971168 D01 v03r01 Measurement guidance for certification of licensed digital transmitters. 10. C63.26-2015 - IEEE/ANSI Standard for Compliance Testing of Transmitters Used in Licensed Radio Services 11. FCC TCB Workshop November 2019 – 5G NR / EN DC Compliance Test Configurations

2. General conditions, competences and guarantees

- ✓ Tests performed under FCC standards identified in section 1 are covered by A2LA accreditation.
- ✓ 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.
- ✓ 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	24.8ºC ± 2.4ºC
Humidity	48.6% ± 4.2%

4. Test samples

Sample	Control #	Description	Model	Serial #	Date of receipt	Note
#01	210407-01.S04	Convertible PC	TPN-Q250	5CD109G9JJ	12/04/2021	N/A

5. EUT Features

The herein information is provided by the customer

Brand Name	HP
Model Name	TPN-Q250
Prototype / Production	Production
Host Identification	TPN-Q250

Supported radios

The applicable frequency bands and operating modes are identified in the following table.

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)	✓	✓	✓	✓

	Bands	Modulation	Bandwidth					
			1.4	3	5	10	15	20
LTE FDD	**Band 2 (1850.0 – 1910.0 MHz)**	QPSK/16QAM/64QAM/256QAM	✓	✓	✓	✓	✓	✓
	Band 4 (1710.0 – 1755.0 MHz)	QPSK/16QAM/64QAM/256QAM	✓	✓	✓	✓	✓	✓
	Band 5 (824.0 – 849.0 MHz)	QPSK/16QAM/64QAM/256QAM	✓	✓	✓	✓		
	Band 7 (2500.0 – 2570.0 MHz)	QPSK/16QAM/64QAM/256QAM			✓	✓	✓	✓
	Band 12 (699.0 – 716.0 MHz)	QPSK/16QAM/64QAM/256QAM	✓	✓	✓	✓		
	Band 13 (777.0 – 787.0 MHz)	QPSK/16QAM/64QAM/256QAM			✓	✓		
	Band 14 (788.0 – 798.0 MHz)	QPSK/16QAM/64QAM/256QAM			✓	✓		
	Band 17 (704.0 – 716.0 MHz)	QPSK/16QAM/64QAM/256QAM			✓	✓		
	Band 25 (1850.0 – 1915 MHz)	QPSK/16QAM/64QAM/256QAM	✓	✓	✓	✓	✓	✓
	Band 26 (814.0 – 849.0 MHz)	QPSK/16QAM/64QAM/256QAM	✓	✓	✓	✓	✓	
	Band 30 (2305.0 – 2315.0 MHz)	QPSK/16QAM/64QAM/256QAM			✓	✓		
	Band 66 (1710.0 – 1780.0 MHz)	QPSK/16QAM/64QAM/256QAM	✓	✓	✓	✓	✓	✓
LTE TDD	**Band 38 (2570.0 – 2620.0 MHz)**	QPSK/16QAM/64QAM/256QAM			✓	✓	✓	✓
	Band 41 (2496.0 – 2690.0 MHz)	QPSK/16QAM/64QAM/256QAM			✓	✓	✓	✓
	Band 48 (3550.0 – 3700.0 MHz)	QPSK/16QAM/64QAM/256QAM			✓	✓	✓	✓

Bands	Modulation	SCS (KHz)	Bandwidth												
			5	10	15	20	25	30	40	50	60	70	80	90	100
N2 FDD (1850.0 – 1910.0 MHz)	Pl/2 BPSK QPSK 16QAM 64QAM 256QAM	15 30 60	✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓									
N5 FDD (824.0 – 849.0 MHz)	PV2 BPSK QPSK 16QAM 64QAM 256QAM	15 30 60	✓	✓ ✓	✓ ✓	✓ ✓									
N7 FDD (2500.0 – 2570.0 MHz)	PV2 BPSK QPSK 16QAM 64QAM 256QAM	15 30 60	✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓									
N25 FDD (1850.0 – 1915 MHz)	PV2 BPSK QPSK 16QAM 64QAM 256QAM	15 30 60	✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓									
N30 FDD (2305.0 – 2315.0 MHz)	PV2 BPSK QPSK 16QAM 64QAM 256QAM	15 30 60	✓	✓ ✓											
N38 TDD (2570.0 – 2620.0 MHz)	PV2 BPSK QPSK 16QAM 64QAM 256QAM	15 30 60	✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓						
N41 TDD (2496.0 – 2690.0 MHz)	PV2 BPSK QPSK 16QAM 64QAM 256QAM	15 30 60				✓ ✓ ✓			✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓
N66 FDD (1710.0 – 1780.0 MHz)	PV2 BPSK QPSK 16QAM 64QAM 256QAM	15 30 60	✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓						
N77 TDD* (3700.0 – 3980.0 MHz)	PV2 BPSK QPSK 16QAM 64QAM 256QAM	15 30 60		✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓
N78 TDD (3700.0 – 3800.0 MHz)**	PV2 BPSK QPSK 16QAM 64QAM 256QAM	15 30 60		✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓

*FCC limits 5G NR B77 to 3700-3980MHz
** FCC limits 5G NR B78 to 3700-3800MHz

UL carrier aggregation LTE (Inter-Band)	UL carrier aggregation LTE (Intra-band)
2A - 5A	FDD Band 5B
2A – 12A	FDD Band 7C
2A – 13A	FDD Band 41C
2A – 14A	FDD Band 66
2A – 48A	
4A – 5A	
4A – 12A	
4A – 13A	
5A – 7A	
5A – 30A	
5A – 48A	
5A – 66A	
12A – 30A	
12A – 66A	
13A – 48A	
13A – 66A	
14A – 30A	
14A – 66A	
25A – 26A	
48A – 66A	

EN/DC possible combinations	
NR 5G Band	Associated LTE Bands
N2A	LTE Band 5, 12, 13
N5A	LTE Band 2, 30, 66, 48
N66A	LTE Band 5, 12, 13, 48
N41A	LTE Band 40, 41
N77A	LTE Band 41A, 41C
N78A	LTE Band 2, 5, 38

UL carrier aggregation 5G FR1
n2A - n5A
n5A - n66A

WLAN

Intel Wi-Fi 6 Intel® AX201 supports (IEEE802.11ax compliant) Wi-Fi and Bluetooth (BT)

Mode	UL Freq Range
802.11b/g/n/ax	2.4GHz (2400.0 – 2483.5 MHz)
802.11a/n/ac/ax	5.2GHz (5150.0 – 5250.0 MHz) 5.3GHz (5250.0 – 5350.0 MHz) 5.6GHz (5470.0 – 5725.0 MHz) 5.8GHz (5725.0 – 5825.0 MHz)
Bluetooth & BLE v5.0	2.4GHz (2400.0 – 2483.5 MHz)

Antenna information

Transmitter	Main (Antenna 5)	Aux (Antenna 8)
Manufacturer	INPAQ	INPAQ
Antenna type	PIFA antenna	PIFA antenna
Part number	DQ6PS6G1S01 (WA-P-S6G1S6G1S6G2S6G2-02-001)	DQ6PS6G1S01 (WA-P-S6G1S6G1S6G2S6G2-02-001)
Maximum Peak Gain (dBi)	1.42	1.42

6. Remarks and comments

1. For SA and ENDC modes, only worst-case configuration is tested among low, middle and high channels per band selected from modular type approval report.
2. For 4G ULCA, the tested configurations were selected based on the worst-case spurious emission 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	Verdict
WCDMA	WCDMA II	24.238, 2.1053	PASS
	WCDMA IV	27.53 (h), 2.1053	PASS
	WCDMA V	22.917, 2.1053	PASS
LTE	LTE 7	27.53(m)(4), 2.1053	PASS
	LTE12	27.53 (g), 2.1053	PASS
	LTE 13	27.53 (g)(f), 2.1053	PASS
	LTE14	90.543 (f), 2.1053	PASS
	LTE 25	24.238, 2.1053	PASS
	LTE 26	90.691, 22.917, 2.1053	PASS
	LTE 30	27.53 (a)(4), 2.1053	PASS
	LTE 41	27.53 (m), 2.1053	PASS
	LTE 48	96.41(e), 2.1053	PASS
	LTE 66	27.53(h), 2.1053	PASS
LTE ULCA	14A - 30A	90.543 (f), 27.53 (a)(4), 2.1053	PASS
	14A - 66A	90.543 (f), 27.53(h), 2.1053	PASS
	48A - 66A	96.41(e), 27.53(h), 2.1053	PASS
	13A - 48A	27.53 (g)(f), 96.41(e), 2.1053	PASS
5G NR FR1	N 2	22.917(a), 2.1053	PASS
	N 5	24.238(a), 2.1053	PASS
	N 7	27.53(m)(4), 2.1053	PASS
	N 30	27.53 (a)(4), 2.1053	PASS
	N 41	27.53(m)(4), 2.1053	PASS
	N 48	96.41(e), 2.1053	PASS
	N 66	27.53(h), 2.1053	PASS
	N 77	27.53(g), 2.1053	PASS
5G NR FR1 ULCA	N 2A - N 5A	22.917(a), 24.238(a), 2.1053	PASS
	N 5A - N 66A	24.238(a), 27.53(h), 2.1053	PASS
5G NR EN-DC	48 A - N 66A	96.41(e), 27.53(h), 2.1053	PASS
	2A – N 78A	22.917(a), §27.53 (g), 2.1053	PASS
	5A – N 2A	24.238(a), 22.917(a), 2.1053	PASS
	41A – N 41A	27.53 (m), 2.1053	PASS
	2A – N 77A	22.917(a), 27.53(g), 2.1053	PASS

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

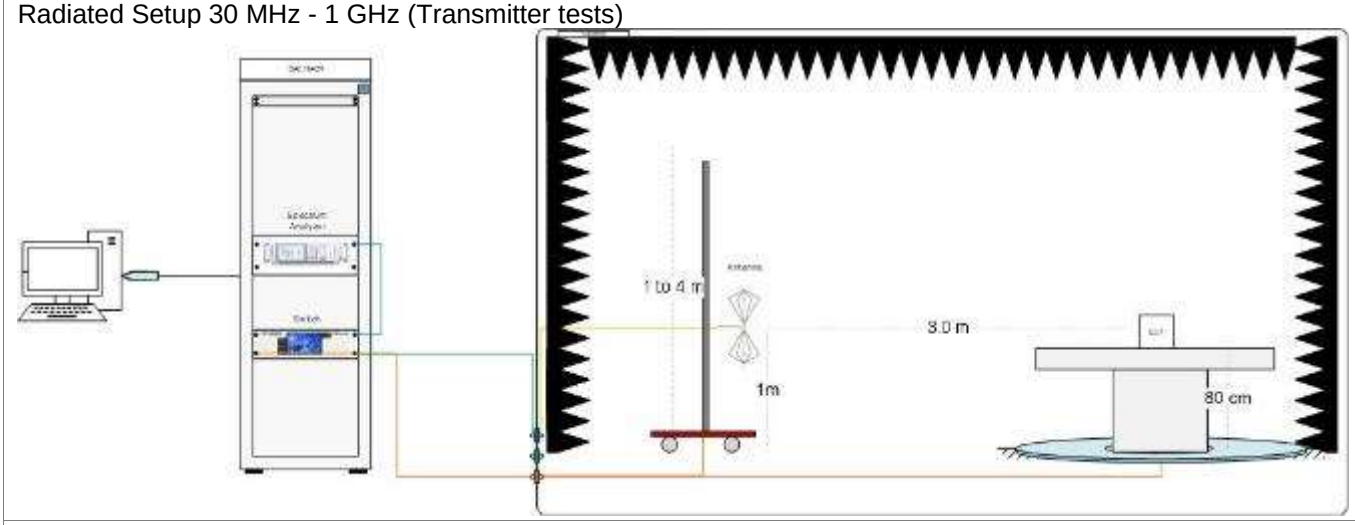
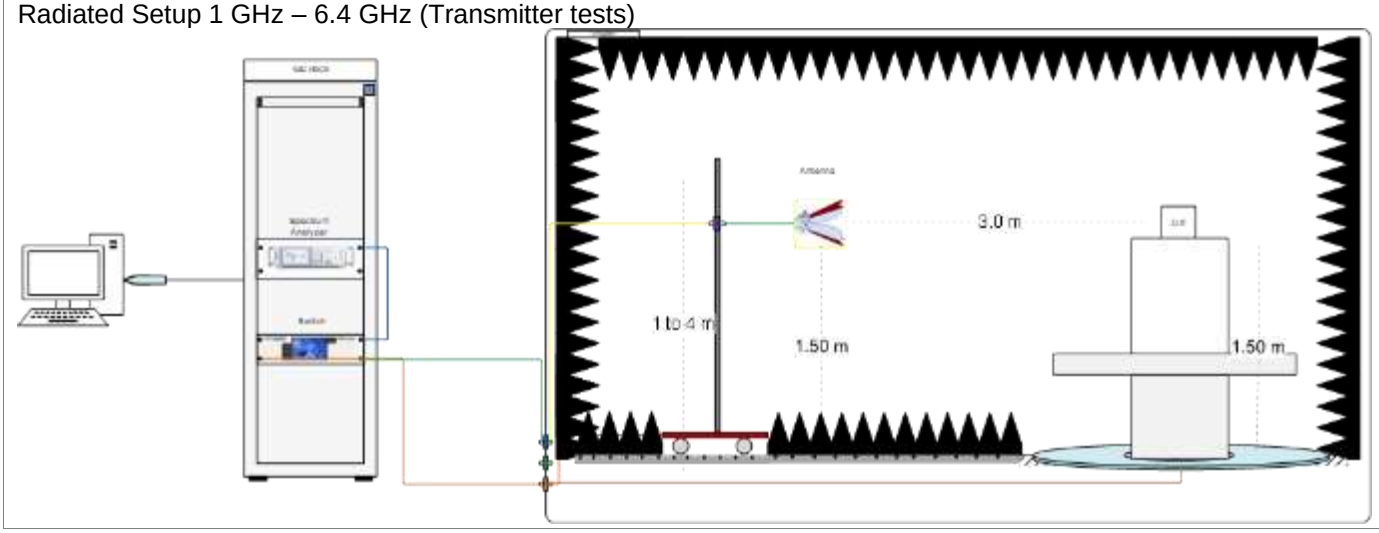
8. Document Revision History

Revision #	Modified by	Revision Details
Rev. 00	N. BUI	First Issue
Rev. 01	K. RIDA	Update the duplex mode of 5G NR N38 band

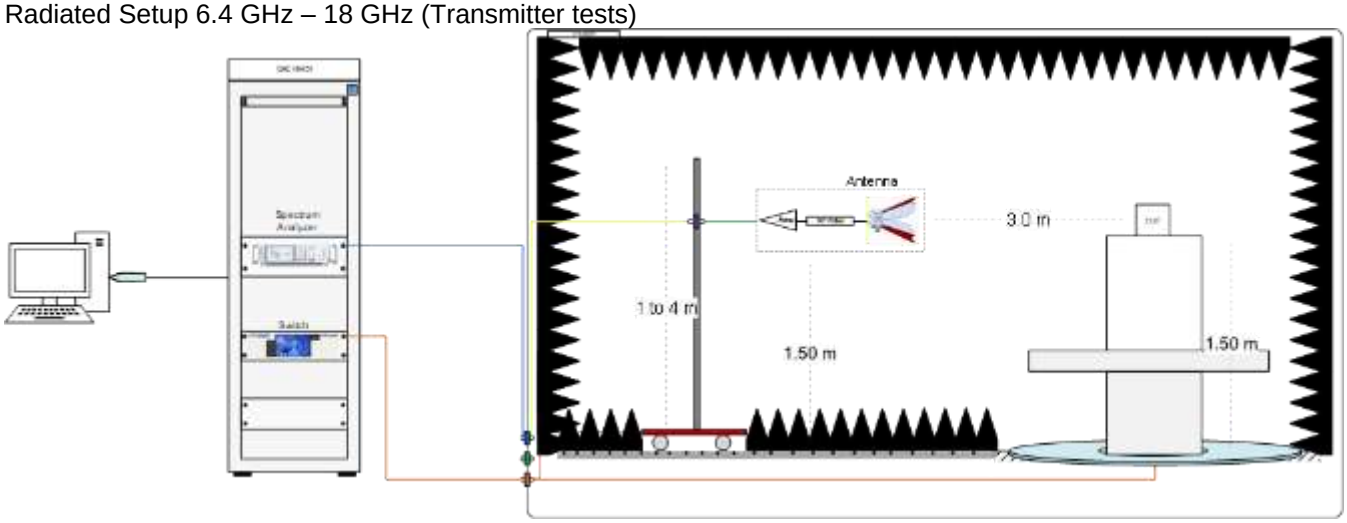
Annex A. Test & System Description

A.1 Measurement System

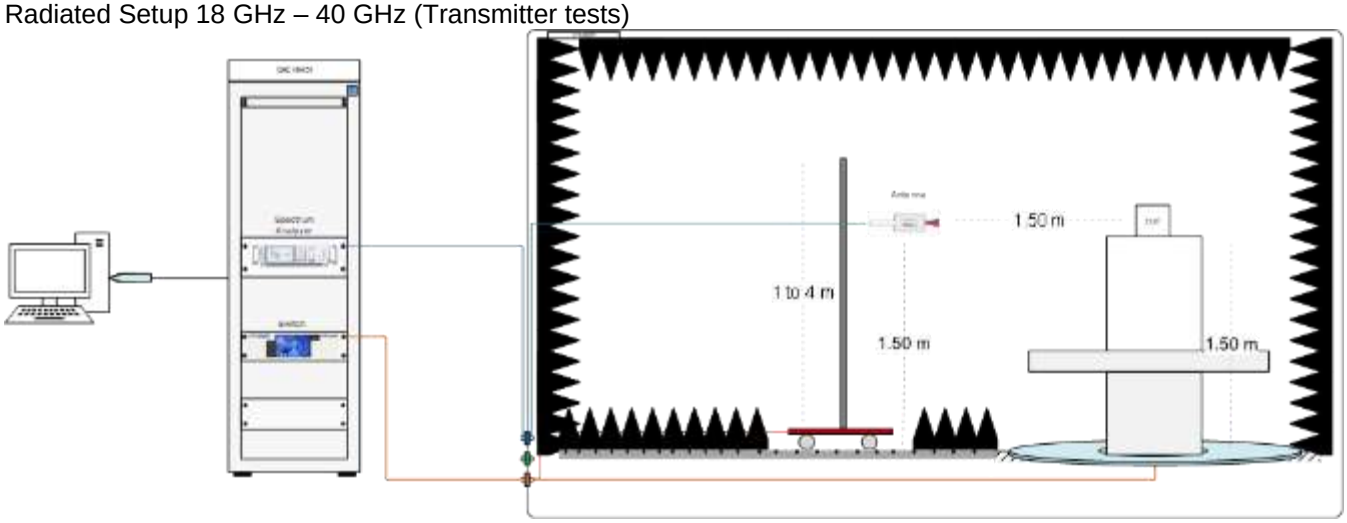
Measurements were performed using the following setups.
For WCDMA and LTE, a communication tester was used to establish a communication link with the EUT, and the communication tester parameters were set to get the maximum output power from the EUT.
For 5G NR, a factory test mode software provided by the applicant is used to establish the connection at the maximum output power.

Radiated test setup
Radiated Setup 30 MHz - 1 GHz (Transmitter tests)

Radiated Setup 1 GHz – 6.4 GHz (Transmitter tests)


Radiated Setup 6.4 GHz – 18 GHz (Transmitter tests)



Radiated Setup 18 GHz – 40 GHz (Transmitter tests)



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 (dB) = Free Space Attenuation (dB) + Cable losses (dB) – Amplifiers Gain (dB) - Rx Antenna Gain (dBi)
EIRP (dBm) = P(dBm) + F (dB)

A.2 Test Equipment List

A.2.1 Radiated Setup

ID#	Device	Type/Model	Serial #	Manufacturer	Cal. Date	Cal. Due Date
006-008	Measurement Software v10.40.10	EMC32	100623	Rohde & Schwarz	N/A	N/A
147-000	Spectrum analyzer	FSW43	101847	Rohde & Schwarz	2020-11-02	2022-11-02
006-000	Anechoic chamber	FACT 3	5720	ETS Lindgren	2020-07-01	2022-07-01
006-002	Switch & Positioning	EMC center	00159757	ETS Lindgren	N/A	N/A
006-011	Boresight antenna mast	BAM4.0-P	P/278/2890.01	Maturo	N/A	N/A
006-003	Multi axis Positioning	2116CR-5905	00153265	ETS Lindgren	N/A	N/A
056-000	Double Ridged Horn Antenna 1 GHz – 18 GHz	3117	00157736	ETS Lindgren	2020-04-01	2022-04-01
007-008	Double Horn Ridged antenna	3116C-PA	00169308bis + 00196308	ETS-Lindgren	2019-07-24	2021-07-24
006-024	Horn Antenna 18 GHz – 26.5 GHz	114514	00167100	ETS-Lindgren	2020-03-18	2022-03-18
006-025	Horn Antenna 26.5 GHz – 40 GHz	120722	00169638	ETS-Lindgren	2020-04-05	2022-04-05
006-023	Conical log spiral antenna	3102	00154400	ETS Lindgren	NA	NA
006-019	BiConical antenna 25 MHz – 1 GHz	UBAA9115+BBVU9135+DGA9552N	0286+CH 9044	Schwarzbeck	2019-11-22	2021-11-22
006-020	Double Ridged Horn Antenna 1 GHz – 18 GHz	3117	00157734	ETS Lindgren	2019-08-12	2021-08-12
006-052	RF Cable 7.5m	0501051057000GX	19.35.850	Radiall	2021-02-24	2021-08-24
006-051	RF Cable 1.0m	CBL-1.5M-SMSM+	202879	Mini-Circuits	2021-02-25	2021-08-25
006-030	RF Cable 1.2m	UFA147A-0-0480-200200	MFR 64639223720-003	Micro-coax	2021-02-15	2021-08-15
006-033	RF Cable 2.5m	UFA147A-0-1380-50U200	MFR 64639223219-001	Micro-coax	2021-02-24	2021-08-24
006-034	RF Cable 1.0m	UFA147A	-	Utilflex	2021-02-19	2021-08-19
006-036	RF Cable 1.0m	UFB311A-0-0590-50U50U	MFR 64639 223230-001	Micro-coax	2021-02-24	2021-08-24
006-038	RF Cable 7.0m	R286304009	-	Radiall	2021-02-15	2021-08-15
006-039	RF Cable 2.5m	0500990992500KE	19.23.395	Radiall	2021-02-24	2021-08-24
363-000*	Temperature & Humidity logger	RA12E-TH1-RAS	RA12-B89702	Avtech	2019-07-04	2021-07-04
365-000	Temperature & Humidity logger	RA12E-TH1-RAS	00-80-A3-E1-6E-55	Avtech	2021-03-08	2023-03-08
295-000	Communication tester	CMW500	147712	Rohde & Schwarz	N/A	N/A
179-000	Communication tester	CMW500	163104	Rohde & Schwarz	N/A	N/A

*Item not used during out of calibration period

A.3 Measurement Uncertainty Evaluation

The system uncertainty evaluation is shown in the table below with a coverage factor of k = 2 to indicate a 95% level of confidence:

Measurement type	Uncertainty	Unit
Tx Radiated test < 1GHz	± 5.26	dB
Tx Radiated test 1GHz - 40 GHz	± 5.19	dB

Annex B. Test Results

The herein test results were performed by:

Test case measurement	Test Personnel
Radiated spurious emission	A.Lounes, N.Bui

B.1 Radiated spurious emission

B.1.1 Standard references

Band	FCC part	FCC Limit
WCDMA II LTE 2 LTE 25 N 2 N 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
WCDMA IV LTE 4 LTE 66 N 66	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 LTE 5 N 5 LTE 26	22.917, 2.1053 90.691, 22.91, 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 12 LTE 13 LTE 17 NR 77 NR 78	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 14	90.543(c)	(e) For operations in the 758-768 MHz and the 788-798 MHz bands, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following: (1) On all frequencies between 769-775 MHz and 799-805 MHz, by a factor not less than 76 + 10 log (P) dB in a 6.25 kHz band segment, for base and fixed stations. (2) On all frequencies between 769-775 MHz and 799-805 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations. (3) On any frequency between 775-788 MHz, above 805 MHz, and below 758 MHz, by at least 43 + 10 log (P) dB. (4) Compliance with the provisions of paragraphs (e)(1) and (2) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment. (5) Compliance with the provisions of paragraph (e)(3) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of 30 kHz may be employed.
LTE 30 N 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.
LTE 7 LTE 38 LTE 41 N 7 N 38 N 41	27.53 (m), 2.1053	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 that 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.

LTE 48 N 48	96.41(e)	(ii) Except as otherwise specified in paragraph (e)(2) of this section, for channel and frequency assignments made by a CBSD to End User Devices, the conducted power of any End User Device emission outside the fundamental emission (whether in or outside of the authorized band) shall not exceed −13 dBm/MHz within 0 to B megahertz (where B is the bandwidth in megahertz of the assigned channel or multiple contiguous channels of the End User Device) above the upper CBSD-assigned channel edge and within 0 to B megahertz below the lower CBSD-assigned channel edge. At all frequencies greater than B megahertz above the upper CBSD assigned channel edge and less than B megahertz below the lower CBSD-assigned channel edge, the conducted power of any End User Device emission shall not exceed −25 dBm/MHz. Notwithstanding the emission limits in this paragraph, the Adjacent Channel Leakage Ratio for End User Devices shall be at least 30 dB. (2) Additional protection levels. Notwithstanding paragraph (e)(1) of this section, for CBSDs and End User Devices, the conducted power of emissions below 3540 MHz or above 3710 MHz shall not exceed −25 dBm/MHz, and the conducted power of emissions below 3530 MHz or above 3720 MHz shall not exceed −40dBm/MHz

B.1.2 Test procedure

The setup described in Test & System Description section was used to measure the radiated spurious emissions. 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 360º and for both Vertical and Horizontal polarizations.

B.1.3 Test Results

B.1.3.1 WCDMA

WCDMA II

30 MHz to 26.5 GHz - Radiated Spurious
WCDMA II - Low channel

Frequency	RMS	Limit	Margin
MHz	dBm	dBm	dB
952.4	-54.8	-13.0	41.8
2956.5	-46.0	-13.0	33.0
16024.1	-53.6	-13.0	40.6
16315.6	-52.5	-13.0	39.5
16822.1	-51.4	-13.0	38.4
18317.8	-58.1	-13.0	45.1

WCDMA IV

30 MHz to 18GHz - Radiated Spurious
WCDMA IV - High channel

Frequency	RMS	Limit	Margin
MHz	dBm	dBm	dB
959.6	-54.6	-13.0	41.6
2943.5	-46.5	-13.0	33.5
16822.6	-51.2	-13.0	38.2
16869.0	-51.4	-13.0	38.4
17006.8	-51.3	-13.0	38.3
17193.3	-51.9	-13.0	38.9

WCDMA V

30 MHz to 9.5 GHz - Radiated Spurious
WCDMA V- Low channel

Frequency	RMS	Limit	Margin
MHz	dBm	dBm	dB
960.8	-39.6	-13.0	26.6
8195.3	-46.7	-13.0	33.7
8405.9	-47.0	-13.0	34.0
8610.3	-46.7	-13.0	33.7
8846.0	-46.1	-13.0	33.1
8985.3	-45.8	-13.0	32.8

B.1.3.2 LTE

LTE 7

30MHz to 26.5GHz - Radiated Spurious
LTE 7- QPSK - BW 20MHz - High channel

Frequency	RMS	Limit	Margin
MHz	dBm	dBm	dB
991.7	-53.5	-25.0	28.5
2986.5	-46.3	-25.0	21.3
16846.3	-50.4	-25.0	25.4
17019.8	-50.8	-25.0	25.8
17173.0	-50.6	-25.0	25.6
22569.7	-55.4	-25.0	30.4

LTE 12

30MHz to 9.5GHz - Radiated Spurious
LTE 12- QPSK - BW 10MHz - Low channel

Frequency	RMS	Limit	Margin
MHz	dBm	dBm	dB
960.4	-39.4	-13.0	26.4
9035.3	-46.1	-13.0	33.1
8315.2	-47.3	-13.0	34.3
8509.8	-46.7	-13.0	33.7
8671.3	-46.7	-13.0	33.7
8849.3	-46.7	-13.0	33.7

LTE 13

30MHz to 9.5GHz - Radiated Spurious
LTE 13 - QPSK - BW 5MHz - High channel

Frequency	RMS	Limit	Margin
MHz	dBm	dBm	dB
951.3	-40.1	-13.0	27.1
8220.8	-46.7	-13.0	33.7
8419.6	-47.3	-13.0	34.3
8671.3	-46.7	-13.0	33.7
8835.1	-46.7	-13.0	33.7
9075.0	-47.1	-13.0	34.1

LTE 14

30MHz to 9.5GHz - Radiated Spurious
LTE 14 - QPSK - BW 5MHz - Mid channel

Frequency	RMS	Limit	Margin
MHz	dBm	dBm	dB
959.2	-40.1	-13.0	27.1
1557.7	-53.3	-13.0	40.3
1565.7	-54.8	-40.0	14.8
1573.8	-55.4	-40.0	15.4
1576.1	-55.7	-40.0	15.7
1583.2	-55.9	-40.0	15.9

LTE 25

30MHz to 26.5GHz - Radiated Spurious
LTE 25 - QPSK - BW 20MHz - Low channel

Frequency	RMS	Limit	Margin
MHz	dBm	dBm	dB
959.3	-54.9	-13.0	41.9
2972.5	-46.3	-13.0	33.3
2982.5	-46.3	-13.0	33.3
2992.5	-46.0	-13.0	33.0
9996.5	-55.7	-13.0	42.7
18370.2	-58.2	-13.0	45.2

LTE 26

30MHz to 9.5GHz - Radiated Spurious
LTE 26 – QPSK - BW 15MHz - Low channel

Frequency	RMS	Limit	Margin
MHz	dBm	dBm	dB
984.3	-39.4	-13.0	26.4
8832.3	-46.5	-13.0	33.5
8956.9	-46.2	-13.0	33.2
9055.2	-46.2	-13.0	33.2
9213.4	-46.0	-13.0	33.0
9343.7	-46.2	-13.0	33.2

LTE 30

30MHz to 26.5GHz - Radiated Spurious
LTE 30 - QPSK - BW 10MHz - Mid channel

Frequency	RMS	Limit	Margin
MHz	dBm	dBm	dB
948.6	-54.2	-40.0	14.2
2978.5	-46.4	-40.0	6.4
9979.6	-55.8	-40.0	15.8
16353.3	-52.4	-40.0	12.4
16821.6	-50.7	-40.0	10.7
18297.0	-57.8	-40.0	17.8

LTE 41

30MHz to 40GHz - Radiated Spurious
LTE 41 – QPSK - BW 20MHz - High channel

Frequency	RMS	Limit	Margin
MHz	dBm	dBm	dB
968.8	-58.5	-25.0	33.5
5371.0	-50.8	-25.0	25.8
7772.0	-58.4	-25.0	33.4
10363.7	-56.0	-25.0	31.0
12954.0	-53.7	-25.0	28.7
15545.0	-53.0	-25.0	28.0
27272.0	-55.2	-25.0	30.2

LTE 48

30MHz to 40GHz – Tx Radiated Spurious
LTE 48 - QPSK - BW 20MHz - Mid channel

Frequency	RMS	Limit	Margin
MHz	dBm	dBm	dB
956.9	-58.6	-40.0	18.6
2972.0	-46.0	-40.0	6.0
2980.0	-46.2	-40.0	6.2
7245.6	-57.2	-40.0	17.2
10868.8	-46.6	-40.0	6.6
18114.0	-58.8	-40.0	18.8

LTE 66

30MHz to 18 GHz – Tx Radiated Spurious
LTE 66 - QPSK - BW 20MHz - High channel

Frequency	RMS	Limit	Margin
MHz	dBm	dBm	dB
961.5	-54.2	-13.0	41.2
2991.5	-46.4	-13.0	33.4
9994.1	-55.9	-13.0	42.9
16874.3	-51.4	-13.0	38.4
17118.9	-51.9	-13.0	38.9
17366.8	-51.3	-13.0	38.3

B.1.3.3 LTE UL CA

LTE 14 – LTE 30

30MHz to 40 GHz – Tx Radiated Spurious
LTE 14 - QPSK - BW 10MHz / LTE 30 - QPSK - BW 10MHz
Mid channel

Frequency	RMS	Limit	Margin
MHz	dBm	dBm	dB
961.6	-50.8	-40.0	10.8
4978.6	-51.2	-40.0	11.2
16875.8	-50.2	-40.0	10.2
19999.9	-59.0	-40.0	19.0
25345.9	-61.0	-40.0	21.0

LTE 14 – LTE 66

30MHz to 40 GHz – Tx Radiated Spurious
LTE 14 - QPSK - BW 10MHz / LTE 66 - QPSK - BW 20MHz
Mid channel

Frequency	RMS	Limit	Margin
MHz	dBm	dBm	dB
953.4	-48.5	-13.0	35.5
3123.1	-50.0	-13.0	37.0
4983.7	-50.6	-13.0	37.6
16875.3	-50.3	-13.0	37.3

LTE 48 – LTE 66

30MHz to 40 GHz – Tx Radiated Spurious
LTE 48 - QPSK - BW 20MHz / LTE 66 - QPSK - BW 20MHz
Mid channel

Frequency	RMS	Limit	Margin
MHz	dBm	dBm	dB
956.8	-58.7	-40.0	18.7
1879.5	-47.9	-40.0	7.9
6269.3	-49.6	-40.0	9.6
10876.6	-50.3	-40.0	10.3
15000.0	-52.1	-40.0	12.1
20000.0	-59.6	-40.0	19.6

LTE 13 – LTE 48

30MHz to 40 GHz – Tx Radiated Spurious
LTE 13 - QPSK - BW 10MHz / LTE 48 - QPSK - BW 20MHz
Mid channel

Frequency	RMS	Limit	Margin
MHz	dBm	dBm	dB
958.6	-53.7	-40.0	13.7
1564.2	-51.0	-13.0	38.0
6274.0	-49.8	-40.0	9.8
10875.5	-51.7	-40.0	11.7
15000.0	-51.8	-40.0	11.8
20000.0	-59.6	-40.0	19.6

B.1.3.4 5G NR FR1

N 2

30MHz to 26.5 GHz – Tx Radiated Spurious
N 2 - QPSK DFT-s-OFDM - BW 20MHz - Mid channel

Frequency	RMS	Limit	Margin
MHz	dBm	dBm	dB
953.1	-55.5	-13.0	42.5
2995.5	-46.2	-13.0	33.2
16236.3	-52.6	-13.0	39.6
16494.9	-52.1	-13.0	39.1
16860.3	-49.9	-13.0	36.9
25886.6	-55.5	-13.0	42.5

N 5

30MHz to 9.5 GHz – Tx Radiated Spurious
N 5 - QPSK DFT-s-OFDM - BW 20MHz - Low channel

Frequency	RMS	Limit	Margin
MHz	dBm	dBm	dB
954.2	-39.6	-13.0	26.6
7462.4	-48.4	-13.0	35.4
7780.6	-47.9	-13.0	34.9
8002.6	-47.1	-13.0	34.1
8222.6	-46.6	-13.0	33.6
8945.1	-46.1	-13.0	33.1

N 7

30MHz to 26.5 GHz – Tx Radiated Spurious N 7 - QPSK DFT-s-OFDM - BW 20MHz - Low channel			
Frequency	RMS	Limit	Margin
MHz	dBm	dBm	dB
957.6	-55.1	-25.0	30.1
2960.0	-46.2	-25.0	21.2
16345.6	-51.4	-25.0	26.4
16483.8	-51.4	-25.0	26.4
16871.4	-50.1	-25.0	25.1
25885.6	-55.6	-25.0	30.6

N 30

30MHz to 26.5 GHz – Tx Radiated Spurious N 30 - QPSK DFT-s-OFDM - BW 10MHz - Mid channel			
Frequency	RMS	Limit	Margin
MHz	dBm	dBm	dB
966.2	-56.8	-40.0	16.8
2982.0	-46.3	-40.0	6.3
16466.9	-51.9	-40.0	11.9
16667.0	-51.2	-40.0	11.2
16861.3	-50.1	-40.0	10.1
25931.0	-56.4	-40.0	16.4

N 41

30MHz to 40 GHz – Tx Radiated Spurious N 41 - QPSK DFT-s-OFDM - BW 80MHz - High channel			
Frequency	RMS	Limit	Margin
MHz	dBm	dBm	dB
968.9	-58.7	-25.0	33.7
3000.0	-46.0	-25.0	21.0
16375.0	-53.2	-25.0	28.2
16565.0	-52.6	-25.0	27.6
16864.5	-51.9	-25.0	26.9
26407.5	-56.5	-25.0	31.5

N 48

30MHz to 40 GHz – Tx Radiated Spurious
N 48 - QPSK DFT-s-OFDM - BW 20MHz - Mid channel

Frequency	RMS	Limit	Margin
MHz	dBm	dBm	dB
960.9	-59.0	-40.0	19.0
2998.5	-46.0	-40.0	6.0
10875.5	-50.4	-40.0	10.4
15000.0	-53.2	-40.0	13.2
16859.5	-52.3	-40.0	12.3
35520.0	-54.0	-40.0	14.0

N 66

30MHz to 18 GHz – Tx Radiated Spurious
N 66 - QPSK DFT-s-OFDM - BW 40MHz - High channel

Frequency	RMS	Limit	Margin
MHz	dBm	dBm	dB
943.5	-54.8	-13.0	41.8
2996.0	-46.4	-13.0	33.4
16338.8	-51.4	-13.0	38.4
16492.0	-51.2	-13.0	38.2
16663.1	-51.3	-13.0	38.3
16899.0	-50.3	-13.0	37.3

N 77

30MHz to 40 GHz – Tx Radiated Spurious
N 77 - QPSK DFT-s-OFDM - BW 100MHz - Low channel

Frequency	RMS	Limit	Margin
MHz	dBm	dBm	dB
962.2	-58.3	-13.0	45.3
3000.0	-46.0	-13.0	39.4
16264.0	-53.8	-13.0	40.8
16479.5	-53.2	-13.0	40.2
16835.5	-52.4	-13.0	39.4
33777.5	-54.7	-13.0	41.7

B.1.3.5 5G - ULCA

N 2 – N 5

30MHz to 40 GHz – Tx Radiated Spurious
N 2 - QPSK DFT-s-OFDM - BW 5MHz / N 5 – QPSK DFT-s-OFDM - BW 5MHz
Mid channel

Frequency	RMS	Limit	Margin
MHz	dBm	dBm	dB
959.3	-41.1	-13.0	28.1
3173.2	-49.3	-13.0	36.3
4985.6	-51.0	-13.0	38.0
16876.3	-50.7	-13.0	37.7
19999.9	-60.6	-13.0	47.6

N 5 – N 66

30MHz to 40 GHz – Tx Radiated Spurious
N 5 - QPSK DFT-s-OFDM - BW 5MHz / N 66 – QPSK DFT-s-OFDM - BW 5MHz
Mid channel

Frequency	RMS	Limit	Margin
MHz	dBm	dBm	dB
963.9	-40.0	-13.0	27.0
3171.9	-49.9	-13.0	36.9
4980.0	-50.8	-13.0	37.8
15000.0	-51.1	-13.0	38.1
15398.7	-52.4	-13.0	39.4

B.1.3.6 5G FR1- EN-DC

LTE 2 – N 77

30MHz to 40 GHz – Tx Radiated Spurious
LTE 2 - QPSK - BW 20MHz / N 77 - QPSK DFT-s-OFDM - BW 100MHz
Mid channel

Frequency	RMS	Limit	Margin
MHz	dBm	dBm	dB
868.2	-61.2	-13.0	48.2
2949.0	-45.8	-13.0	32.8
4989.5	-51.1	-13.0	38.1
10000.8	-56.5	-13.0	43.5
14999.5	-52.0	-13.0	39.0
20000.0	-60.2	-13.0	47.2

LTE 2 - N 78

30MHz to 40 GHz – Tx Radiated Spurious
LTE 2 - QPSK - BW 20MHz / N 78 – QPSK DFT-s-OFDM - BW 50MHz
Mid channel

Frequency	RMS	Limit	Margin
MHz	dBm	dBm	dB
955.2	-58.8	-13.0	45.8
2957.0	-45.7	-13.0	32.7
5311.0	-51.8	-13.0	38.8
9999.7	-55.8	-13.0	42.8
14999.5	-51.8	-13.0	38.8
20000.0	-60.0	-40.0	20.0

LTE 5 – N 2

30MHz to 40 GHz – Tx Radiated Spurious
LTE 5 - QPSK - BW 10MHz / N 2 – QPSK DFT-s-OFDM - BW 20MHz
Mid channel

Frequency	RMS	Limit	Margin
MHz	dBm	dBm	dB
963.9	-40.0	-13.0	27.0
3177.5	-49.8	-13.0	36.8
4984.1	-50.7	-13.0	37.7
15000.0	-51.3	-13.0	38.3
19999.9	-59.7	-13.0	46.7

LTE41 - NR41

30MHz to 40 GHz – Tx Radiated Spurious
LTE 41 - QPSK - BW 20MHz / N 41 – QPSK DFT-s-OFDM - BW 50MHz
Mid channel

Frequency	RMS	Limit	Margin
MHz	dBm	dBm	dB
952.5	-58.8	-25.0	33.8
2953.0	-45.9	-25.0	20.9
5304.5	-51.8	-25.0	26.8
6352.1	-50.0	-25.0	25.0
15000.0	-51.9	-25.0	26.9
20000.0	-59.5	-25.0	34.5

LTE 48 – N 66

30MHz to 40 GHz – Tx Radiated Spurious
LTE 48 - QPSK - BW 20MHz / N 66 – QPSK DFT-s-OFDM - BW 40MHz
Mid channel

Frequency	RMS	Limit	Margin
MHz	dBm	dBm	dB
956.2	-58.8	-40.0	18.8
2723.0	-47.9	-40.0	7.9
4989.5	-51.1	-40.0	11.1
10877.8	-52.2	-40.0	12.2
15000.0	-51.7	-40.0	11.7
20000.0	-59.2	-40.0	19.2