FCC RADIO TEST REPORT

FCC ID	:	**B94TNQ225HP2TK**
Equipment	:	**Notebook PC**
Brand Name	:	**HP**
Model Name	:	**TPN-Q225**
Applicant	:	**HP Inc.** **1501 Page Mill Road, Palo Alto CA 94304 USA**
Standard	:	**FCC 47 CFR Part 2, 22(H), 24(E), 27(L)**

The product was received on Jul. 10, 2020 and testing was started from Aug. 02, 2020 and completed on Aug. 14, 2020. We, SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures given in ANSI / TIA-603-E and has been in compliance with the applicable technical standards.

The test results in this partial report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

Louis Wu

Approved by: Louis Wu

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory
No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)

Table of Contents

History of this test report

Report No.	Version	Description	Issued Date
FG071106A	01	Initial issue of report	Oct. 14, 2020

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
-	§2.1046	Conducted Output Power	-	See Note
	§22.913 (a)(2)	Effective Radiated Power (WCDMA Band V)		
	§24.232 (c)	Equivalent Isotropic Radiated Power (WCDMA Band II)		
	§27.50 (d)(4)	Equivalent Isotropic Radiated Power (WCDMA Band IV)		
-	§24.232 (d)	Peak-to-Average Ratio	-	See Note
-	§2.1049 §22.917 (b) §24.238 (b) §27.53 (g)	Occupied Bandwidth (WCDMA Band V) (WCDMA Band II) (WCDMA Band IV)	-	See Note
-	§2.1051 §22.917 (a) §24.238 (a) §27.53 (g)	Band Edge Measurement (WCDMA Band V) (WCDMA Band II) (WCDMA Band IV)	-	See Note
-	§2.1051 §22.917 (a) §24.238 (a) §27.53 (g)	Conducted Emission (WCDMA Band V) (WCDMA Band II) (WCDMA Band IV)	-	See Note
-	§2.1055 §22.355 §24.235 §27.54	Frequency Stability Temperature & Voltage	-	See Note
3.4	§2.1053 §22.917 (a) §24.238 (a) §27.53 (h)	Field Strength of Spurious Radiation (WCDMA Band V) (WCDMA Band II) (WCDMA Band IV)	Pass	Under limit 34.80 dB at 7400.000 MHz

Note: The module (Model: T99W175) makes no difference after verifying output power, this report reuses test data from the module report.

Declaration of Conformity:
The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.
Comments and Explanations:
The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

Reviewed by: Wii Chang

Report Producer: Cindy Liu

1 General Description

1.1 Product Feature of Equipment Under Test

WCDMA/LTE/5G NR, Bluetooth, Wi-Fi 2.4GHz 802.11b/g/n/ax, Wi-Fi 5GHz 802.11a/n/ac/ax, and GNSS.

Product Feature	
Antenna Type	WWAN <Ant. 1>: PIFA Antenna <Ant. 2>: PIFA Antenna (Rx only) <Ant. 3>: PIFA Antenna <Ant. 4>: PIFA Antenna (Rx only) WLAN <Ant. 1>: PIFA Antenna <Ant. 2>: PIFA Antenna Bluetooth: PIFA Antenna GPS/Glonass/BDS/Galileo: PIFA Antenna

WWAN Antenna Information			
Antenna Part Number	**Manufacture**	**Antenna Type**	**Peak Gain (dBi)**
DQ6PS6G1S00 (WA-P-S6G1S6G1S6G2S6G2-02-002) Main	INPAQ	PIFA	824-849MHz 0.79 dBi (peak) 880-915MHz -0.37 dBi (peak) 1710-1785MHz 0.85 dBi (peak) 1850-1910MHz -1.24 dBi (peak) 1920-1980MHz -1.92 dBi (peak) 704-716MHz -2.74 dBi (peak) 777-787MHz 1.06 dBi (peak) 832-862MHz 0.6 dBi (peak) 1710-1755MHz 0.85 dBi (peak) 2500-2570MHz -0.36 dBi (peak) 2305-2315MHz 0.46 dBi (peak) 788-798MHz 1.15 dBi (peak) 814-849MHz 1.26 dBi (peak) 3300-4200MHz -1.81 dBi (peak) 3300-3800MHz -1.81 dBi (peak) 4400-5000MHz -1.54 dBi (peak)
DQ6PS6G1S00 (WA-P-S6G1S6G1S6G2S6G2-02-002) Aux 1	INPAQ	PIFA	869-894MHz -1.69 dBi (peak) 925-960MHz -2.46 dBi (peak) 1805-1880MHz -0.51 dBi (peak) 1930-1990MHz -1.9 dBi (peak) 746-756MHz -0.28 dBi (peak) 791-821MHz 0.1 dBi (peak) 2620-2690MHz -1.92 dBi (peak) 3300-4200MHz 0.17 dBi (peak) 3300-3800MHz 0.17 dBi (peak) 4400-5000MHz -1.69 dBi (peak)
DQ6PS6G1S00 (WA-P-S6G1S6G1S6G2S6G2-02-002) Aux 2	INPAQ	PIFA	1805-1880MHz 1.02 dBi (peak) 1930-1990MHz -0.4 dBi (peak) 2620-2690MHz -2.08 dBi (peak) 2496-2593MHz -2.13 dBi (peak) 3300-4200MHz 0.5 dBi (peak) 3300-3800MHz -0.35 dBi (peak) 4400-5000MHz 0.33 dBi (peak)
DQ6PS6G1S00 (WA-P-S6G1S6G1S6G2S6G2-02-002) Aux 3	INPAQ	PIFA	1710-1785MHz 2.58 dBi (peak) 1850-1910MHz 2.75 dBi (peak) 1920-1980MHz 0.56 dBi (peak) 1710-1755MHz 2.55 dBi (peak) 2500-2570MHz -1.36 dBi (peak) 2305-2315MHz -0.93 dBi (peak) 3300-4200MHz 0.2 dBi (peak) 3300-3800MHz 0.2 dBi (peak) 4400-5000MHz 1.26 dBi (peak)

1.2 Modification of EUT

No modifications are made to the EUT during all test items.

1.3 Testing Location

Test Site	SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory
Test Site Location	No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855
Test Site No.	**Sporton Site No.**
	03CH12-HY
Test Engineer	Jack Cheng, Lance Chiang and Chuan Chu
Temperature	22.8~26.2℃
Relative Humidity	56.5~68.6%

Note: The test site complies with ANSI C63.4 2014 requirement.

FCC Designation No.: TW0007

1.4 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ANSI C63.26-2015
- ANSI / TIA-603-E
- FCC 47 CFR Part 2, 22(H), 24(E), 27(L)
- FCC KDB 971168 D01 Power Meas. License Digital Systems v03r01
- FCC KDB 414788 D01 Radiated Test Site v01r01

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. The TAF code is not including all the FCC KDB listed without accreditation.

2 Test Configuration of Equipment Under Test

2.1 Test Mode

Antenna port conducted and radiated test items were performed according to KDB 971168 D01 Power Meas. License Digital Systems v03r01 with maximum output power.

For radiated measurement, in Tablet type (three orthogonal panels, X, Y, Z) and Notebook type. The worst cases (Y plane) were recorded in this report.

Radiated emissions were investigated as following frequency range:

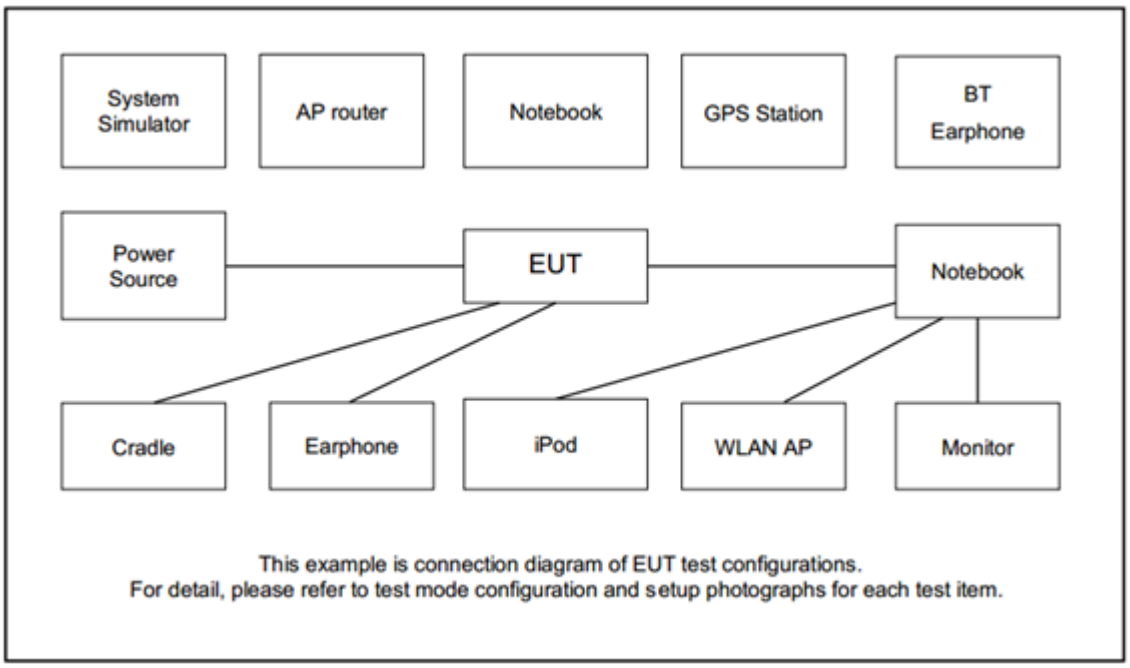
1. 1000 MHz to 19100 MHz for WCDMA Band II

All modes and data rates and positions were investigated.

Test modes are chosen to be reported as the worst case configuration below:

Test Modes	
Band	**Radiated TCs**
WCDMA Band II	■ RMC 12.2Kbps Link

2.2 Connection Diagram of Test System



2.3 Support Unit used in test configuration

Item	Equipment	Brand Name	Model No.	FCC ID	Data Cable	Power Cord
1.	System Simulator	R&S	CMU 200	N/A	N/A	Unshielded, 1.8 m
2.	iPod Earphone	Apple	N/A	Verification	Unshielded, 1.0 m	N/A

2.4 Frequency List of Low/Middle/High Channels

Frequency List				
Band	**Channel/Frequency(MHz)**	**Lowest**	**Middle**	**Highest**
WCDMA Band II	Channel	9262	9400	9538
	Frequency	1852.4	1880.0	1907.6

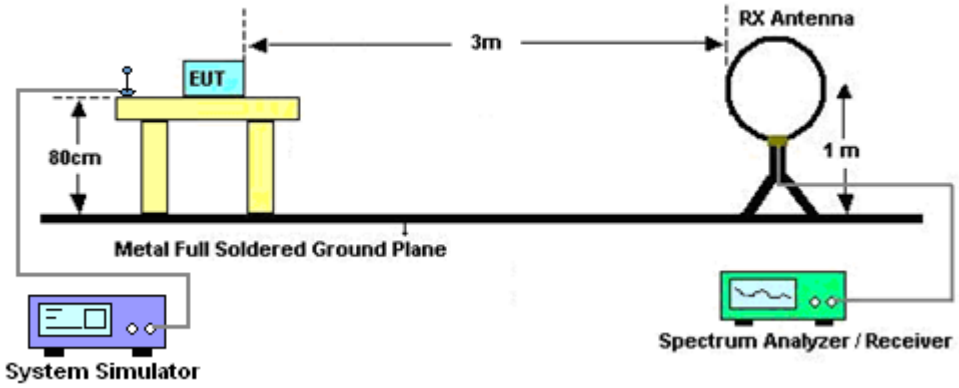
3 Radiated Test Items

3.1 Measuring Instruments

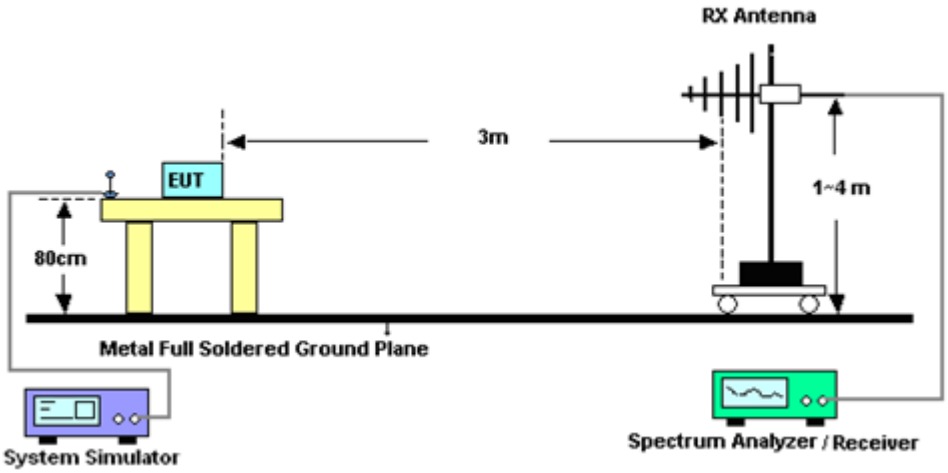
See list of measuring instruments of this test report.

3.2 Test Setup

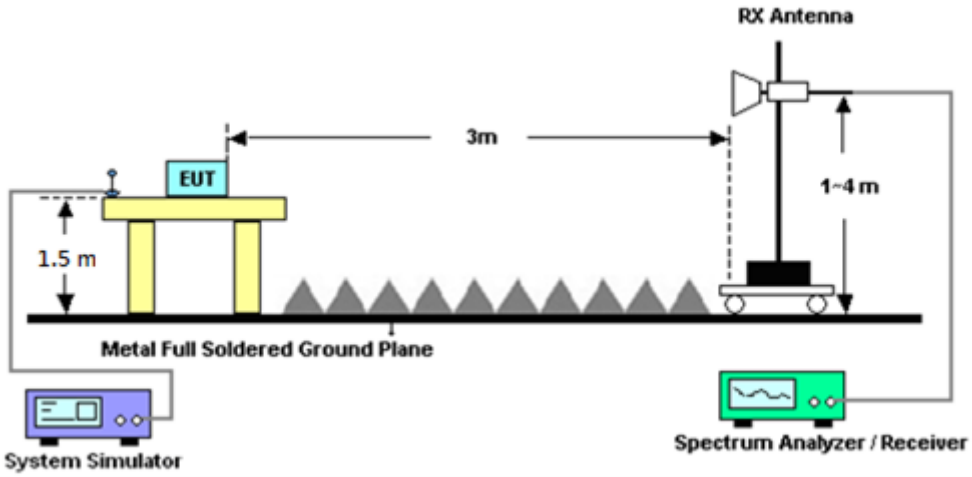
For radiated emissions below 30MHz



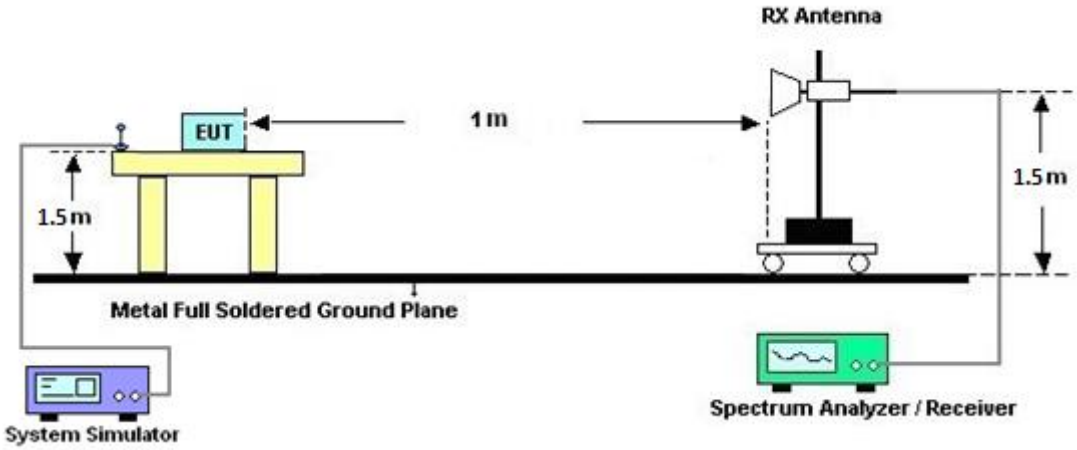
For radiated test from 30MHz to 1GHz



For radiated test from 1GHz to 18GHz



For radiated emissions above 18GHz



3.3 Test Result of Radiated Test

Please refer to Appendix A.

Note:

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

There is a comparison data of both open-field test site and alternative test site - semi-Anechoic chamber according to 414788 D01 Radiated Test Site v01r01, and the result came out very similar.

3.4 Field Strength of Spurious Radiation Measurement

3.4.1 Description of Field Strength of Spurious Radiated Measurement

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitter power (P) by a factor of at least 43 + 10 log (P) dB. The spectrum is scanned from 30 MHz up to a frequency including its 10th harmonic.

3.4.2 Test Procedures

The testing follows FCC KDB 971168 D01 v03r01 Section 7 and ANSI / TIA-603-E Section 2.2.12.

1. The EUT was placed on a rotatable wooden table 0.8 meters for frequency below 1GHz and 1.5 meter for frequency above 1GHz above the ground.
2. The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest spurious emission.
4. The height of the receiving antenna is varied between one meter and four meters to search for the maximum spurious emission for both horizontal and vertical polarizations.
5. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz, taking record of maximum spurious emission.
6. A horn antenna was substituted in place of the EUT and was driven by a signal generator.
7. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.
8. Taking the record of output power at antenna port.
9. Repeat step 7 to step 8 for another polarization.
10. EIRP (dBm) = S.G. Power – Tx Cable Loss + Tx Antenna Gain
11. ERP (dBm) = EIRP - 2.15
12. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
13. The limit line is derived from 43 + 10log(P) dB below the transmitter power P(Watts)

4 List of Measuring Equipment

Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100315	9 kHz~30 MHz	Dec. 26, 2019	Aug. 02, 2020~ Aug. 14, 2020	Dec. 25, 2020	Radiation (03CH12-HY)
Bilog Antenna	TESEQ	CBL 6111D & 00800N1D01 N-06	37059 & 01	30MHz~1GHz	Oct. 12, 2019	Aug. 02, 2020~ Aug. 14, 2020	Oct. 11, 2020	Radiation (03CH12-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1328	1GHz~18GHz	Nov. 14, 2019	Aug. 02, 2020~ Aug. 14, 2020	Nov. 13, 2020	Radiation (03CH12-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170584	18GHz~40GHz	Dec. 10, 2019	Aug. 02, 2020~ Aug. 14, 2020	Dec. 09, 2020	Radiation (03CH12-HY)
Preamplifier	COM-POWER	PA-103	161075	10MHz~1GHz	Mar. 25, 2020	Aug. 02, 2020~ Aug. 14, 2020	Mar. 24, 2021	Radiation (03CH12-HY)
Preamplifier	Agilent	8449B	3008A02375	1GHz~26.5GHz	Mar. 26, 2020	Aug. 02, 2020~ Aug. 14, 2020	Mar. 25, 2021	Radiation (03CH12-HY)
Preamplifier	Jet-Power	JPA0118-55-303K	1710001800054002	1GHz~18GHz	Feb. 07, 2020	Aug. 02, 2020~ Aug. 14, 2020	Feb. 06, 2021	Radiation (03CH12-HY)
Preamplifier	EMEC	EM18G40G	060715	18GHz~40GHz	Dec. 13, 2019	Aug. 02, 2020~ Aug. 14, 2020	Dec. 12, 2020	Radiation (03CH12-HY)
Spectrum Analyzer	Rohde & Schwarz	FSV3044	101048	10Hz~44GHz	Apr. 29, 2020	Aug. 02, 2020~ Aug. 14, 2020	Apr. 28, 2021	Radiation (03CH12-HY)
Signal Generator	Rohde & Schwarz	SMB100A	101107	100kHz~40GHz	Aug. 27, 2019	Aug. 02, 2020~ Aug. 14, 2020	Aug. 26, 2020	Radiation (03CH12-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 126E	0058/126E	30MHz~18GHz	Dec. 12, 2019	Aug. 02, 2020~ Aug. 14, 2020	Dec. 11, 2020	Radiation (03CH12-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	505134/2	30MHz~40GHz	Feb. 25, 2020	Aug. 02, 2020~ Aug. 14, 2020	Feb. 24, 2021	Radiation (03CH12-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	800740/2	30MHz~40GHz	Feb. 25, 2020	Aug. 02, 2020~ Aug. 14, 2020	Feb. 24, 2021	Radiation (03CH12-HY)
Controller	EMEC	EM1000	N/A	Control Turn table & Ant Mast	N/A	Aug. 02, 2020~ Aug. 14, 2020	N/A	Radiation (03CH12-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1m~4m	N/A	Aug. 02, 2020~ Aug. 14, 2020	N/A	Radiation (03CH12-HY)
Turn Table	EMEC	TT2000	N/A	0~360 Degree	N/A	Aug. 02, 2020~ Aug. 14, 2020	N/A	Radiation (03CH12-HY)
Software	Audix	E3 6.2009-8-24	RK-000989	N/A	N/A	Aug. 02, 2020~ Aug. 14, 2020	N/A	Radiation (03CH12-HY)

5 Uncertainty of Evaluation

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**3.07**

Uncertainty of Radiated Emission Measurement (1 GHz ~ 18 GHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**3.21**

Uncertainty of Radiated Emission Measurement (18 GHz ~ 40 GHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**3.80**

Appendix A. Test Results of Radiated Test

WCDMA 1900

WCDMA 1900									
Channel	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)
Lowest	3700	-54.78	-13	-41.78	-72.74	-65.99	1.41	12.62	H
	5550	-50.93	-13	-37.93	-74.17	-62.49	1.74	13.30	H
	7400	-47.80	-13	-34.80	-74.69	-57.12	1.94	11.26	H
									H
									H
									H
	3700	-54.92	-13	-41.92	-73.02	-66.13	1.41	12.62	V
	5550	-51.43	-13	-38.43	-74.19	-62.99	1.74	13.30	V
	7400	-47.93	-13	-34.93	-74.66	-57.25	1.94	11.26	V
									V
									V
									V
Middle	3760	-54.86	-13	-41.86	-73.05	-66.09	1.43	12.66	H
	5640	-51.06	-13	-38.06	-74.32	-62.63	1.73	13.30	H
	7520	-48.58	-13	-35.58	-74.89	-57.69	1.99	11.10	H
									H
									H
									H
	3760	-54.83	-13	-41.83	-73.24	-66.06	1.43	12.66	V
	5640	-50.88	-13	-37.88	-73.73	-62.45	1.73	13.30	V
	7520	-49.13	-13	-36.13	-75.4	-58.24	1.99	11.10	V
									V
									V
									V

WCDMA 1900									
Channel	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)
Highest	3820	-54.98	-13	-41.98	-73.37	-66.23	1.44	12.69	H
	5730	-50.32	-13	-37.32	-73.99	-61.89	1.73	13.30	H
	7640	-48.86	-13	-35.86	-74.73	-57.98	2.01	11.13	H
									H
									H
									H
									H
	3820	-54.91	-13	-41.91	-73.53	-66.16	1.44	12.69	V
	5730	-51.42	-13	-38.42	-74.45	-62.99	1.73	13.30	V
	7640	-49.04	-13	-36.04	-74.81	-58.16	2.01	11.13	V
									V
									V
									V
									V

Remark: Spurious emissions within 30-1000MHz were found more than 20dB below limit line.