



FCC RADIO TEST REPORT

FCC ID : RI7FN980M
Equipment : 5G/ LTE M.2 Data Card
Brand Name : Telit
Model Name : FN980m
Marketing Name : FN980m
Applicant : TELIT COMMUNICATIONS S.P.A.
VIA STAZIONE DI PROSECCO 5B - SGONICO
-TRIESTE - ITALY
Manufacturer : TELIT COMMUNICATIONS S.P.A.
VIA STAZIONE DI PROSECCO 5B - SGONICO
-TRIESTE - ITALY
Standard : FCC 47 CFR Part 2, Part 27(D)

The product was received on Aug. 11, 2021 and testing was started from Aug. 30, 2021 and completed on Sep. 16, 2021. 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 variant 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.

Approved by: Louis Wu

Sportun International Inc. EMC & Wireless Communications Laboratory

No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)



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History of this test report



Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.2	§2.1046	Conducted Output Power and Effective Isotropic Radiated Power	Pass	-
-	-	Peak-to-Average Ratio	Not Required	-
-	§27.50 (a)(3)	EIRP Power Density	Not Required	-
-	§2.1049	Occupied Bandwidth	Not Required	-
-	§2.1051 §27.53 (a)(4)	Conducted Band Edge Measurement	Not Required	-
-	§2.1051 §27.53 (a)(4)	Conducted Spurious Emission	Not Required	-
-	§2.1055 §27.54	Frequency Stability Temperature & Voltage	Not Required	-
4.2	§2.1053 §27.53 (a)(4)	Radiated Spurious Emission	Pass	Under limit 8.88 dB at 9234.000 MHz

Note:

1. Not required means after assessing, test items are not necessary to carry out.
2. This is a variant report which can be referred Product Equality Declaration. All the test cases were performed on original report which can be referred to Sporton Report Number FG031715-01D. Based on the original report, the conducted output power and radiated spurious emission test cases were verified.

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: Avis Chuang

Report Producer: Amy Chen



1 General Description

1.1 Product Feature of Equipment Under Test

WCDMA/LTE/5G NR and GNSS.

Product Specification subjective to this standard	
Antenna Type	<p>WWAN: <Ant. 0> Dipole Antenna <Ant. 1> Dipole Antenna <Ant. 2> Dipole Antenna <Ant. 3> Dipole Antenna</p> <p>GNSS : <1559 MHz ~ 1610 MHz>: <Ant. 3> Dipole Antenna <Ant. 4> Dipole Antenna <1164 MHz ~ 1215 MHz>: <Ant. 2> Dipole Antenna</p>

Remark: The above EUT's information was declared by manufacturer. Please refer to Comments and Explanations in report summary.

1.2 Modification of EUT

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



1.3 Testing Site

Test Site	Sportun International Inc. EMC & Wireless Communications Laboratory	
Test Site Location	No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978	
Test Site No.	Sportun Site No.	
	TH03-HY	03CH07-HY
Test Engineer	Bryant Liu Jesse Wang and Stan Hsieh	
Temperature	23~25 °C 24.2~25.5°C	
Relative Humidity	54~56 % 53.9~55.7%	

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

FCC Designation No.: TW1190

1.4 Applied Standards

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

- ♦ ANSI C63.26-2015
- ♦ FCC 47 CFR Part 2, Part 27(D)
- ♦ ANSI / TIA-603-E
- ♦ FCC KDB 971168 Power Meas License Digital Systems D01 v03r01
- ♦ FCC KDB 412172 D01 Determining ERP and EIRP v01r01
- ♦ 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. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.
3. The TAF code is not including all the FCC KDB listed without accreditation.

2 Test Configuration of Equipment Under Test

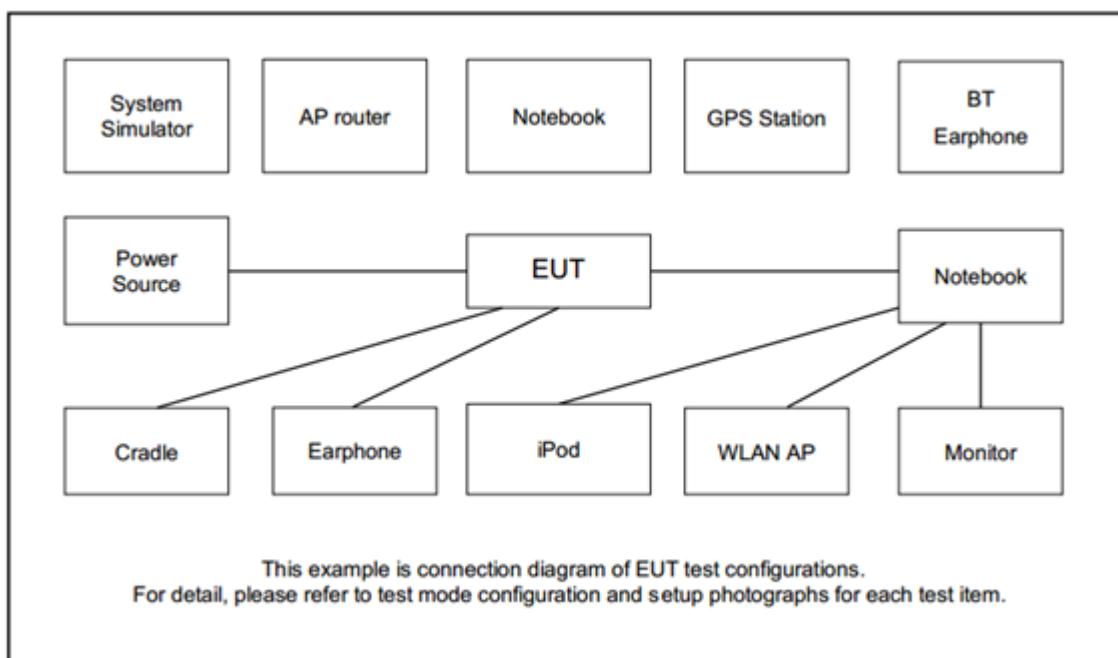
2.1 Test Mode

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

The measured emission level of the EUT was maximized by rotating the EUT on a turntable, adjusting the orientation of the EUT and EUT antenna in two config (Horizontal and Vertical), and adjusting the measurement antenna orientation, following C63.26 exploratory test procedures and find Ant. Vertical as worst plane.

Test Items	Band	Bandwidth (MHz)						Modulation			RB #			Test Channel		
		1.4	3	5	10	15	20	QPSK	16QAM	64QAM	1	Half	Full	L	M	H
Max. Output Power	30	-	-	v	v	-	-	v	v	v	v	v	v	v	v	v
E.I.R.P	30	-	-	v	v	-	-	v	v	v	Max. Power					
Radiated Spurious Emission	30	-	-	v		-	-	v			v					v
Remark		1. The mark "v" means that this configuration is chosen for testing 2. The mark "-" means that this bandwidth is not supported. 3. The device is investigated from 30MHz to 10 times of fundamental signal for radiated spurious emission test under different RB size/offset and modulations in exploratory test. Subsequently, only the worst case emissions are reported.														

2.2 Connection Diagram of Test System





2.3 Support Unit used in test configuration and system

Item	Equipment	Brand Name	Model No.	FCC ID	Data Cable	Power Cord
1.	DC power Supply	Agilent	E3610A	N/A	N/A	N/A
2.	System Simulator	Anritsu	MT8821C	N/A	N/A	Unshielded, 1.8 m

2.4 Frequency List of Low/Middle/High Channels

LTE Band 30 Channel and Frequency List				
BW [MHz]	Channel/Frequency(MHz)	Lowest	Middle	Highest
10	Channel	-	27710	-
	Frequency	-	2310	-
5	Channel	27685	27710	27735
	Frequency	2307.5	2310	2312.5

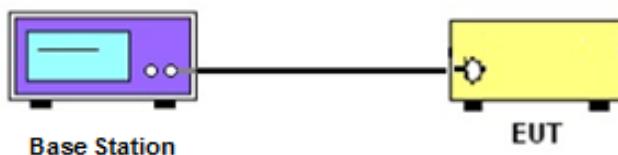
3 Conducted Test Items

3.1 Measuring Instruments

See list of measuring instruments of this test report.

3.1.1 Test Setup

3.1.2 Conducted Output Power



3.1.3 Test Result of Conducted Test

Please refer to Appendix A.



3.2 Conducted Output Power Measurement and EIRP Measurement

3.2.1 Description of the Conducted Output Power Measurement and EIRP Measurement

A base station simulator was used to establish communication with the EUT. Its parameters were set to transmit the maximum power on the EUT. The measured power in the radio frequency on the transmitter output terminals shall be reported.

According to KDB 412172 D01 Power Approach,

$$\text{EIRP} = P_T + G_T - L_C, \text{ where}$$

P_T = transmitter output power in dBm

G_T = gain of the transmitting antenna in dBi

L_C = signal attenuation in the connecting cable between the transmitter and antenna in dB

3.2.2 Test Procedures

1. The transmitter output port was connected to the system simulator.
2. Set EUT at maximum power through the system simulator.
3. Select lowest, middle, and highest channels for each band and different modulation.
4. Measure and record the power level from the system simulator.

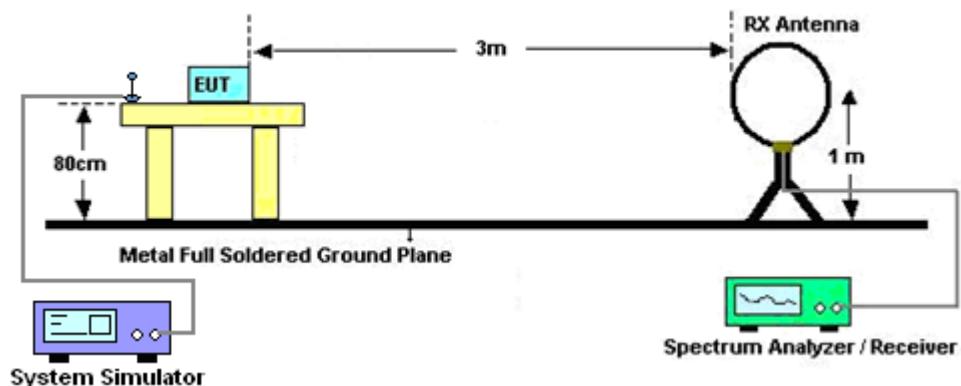
4 Radiated Test Items

4.1 Measuring Instruments

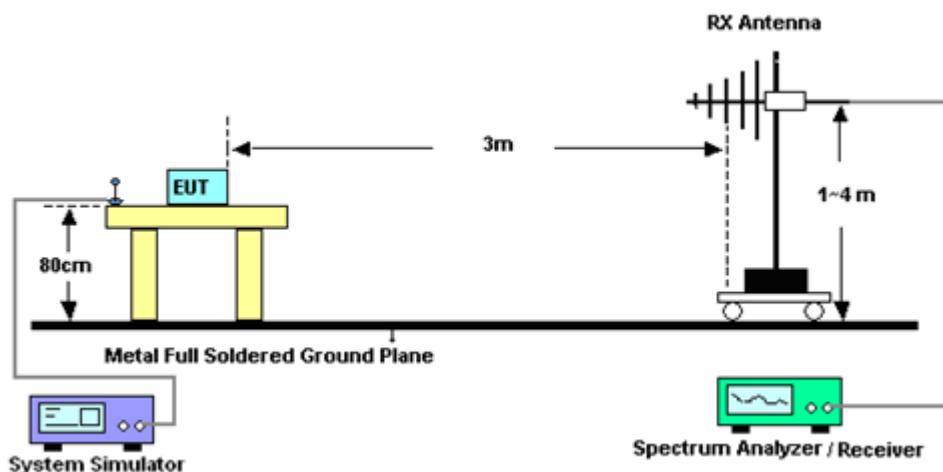
See list of measuring instruments of this test report.

4.1.1 Test Setup

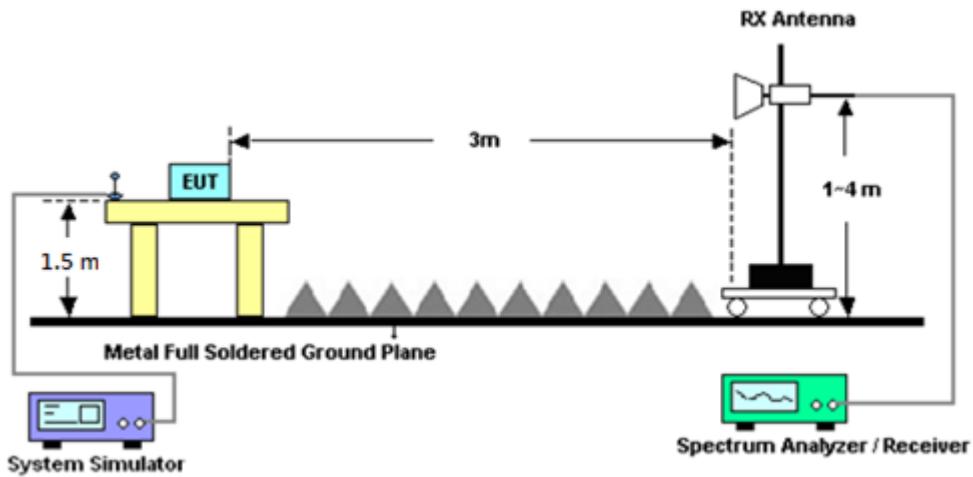
For radiated test below 30MHz



For radiated test from 30MHz to 1GHz



For radiated test above 1GHz



4.1.2 Test Result of Radiated Test

Please refer to Appendix B.

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 adequate comparison measurement 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.



4.2 Radiated Spurious Emission Measurement

4.2.1 Description of Radiated Spurious Emission Measurement

The radiated spurious emission was measured by substitution method according to ANSI / TIA-603-E

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 $70 + 10 \log(P)$ dB.

The spectrum is scanned from 30 MHz up to a frequency including its 10th harmonic.

4.2.2 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 turntable with 0.8 meter height for frequency below 1GHz and 1.5 meter height for frequency above 1GHz respectively above ground.
2. The EUT was set 3 meters from the receiving antenna 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 1m to 4m to search the maximum spurious emission for both horizontal and vertical polarizations.
5. During the measurement, the system simulator parameters were set to force the EUT transmitting at maximum output power.
6. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz, taking the record of maximum spurious emission.
7. A horn antenna was substituted in place of the EUT and was driven by a signal generator.
8. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.

$EIRP \text{ (dBm)} = S.G. \text{ Power} - \text{Tx Cable Loss} + \text{Tx Antenna Gain}$

$ERP \text{ (dBm)} = EIRP - 2.15$

9. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

The limit line is derived from $70 + 10\log(P)$ dB below the transmitter power P(Watts)

$= P(W) - [70 + 10\log(P)] \text{ (dB)}$

$= [30 + 10\log(P)] \text{ (dBm)} - [70 + 10\log(P)] \text{ (dB)}$

$= -40 \text{ dBm.}$



5 List of Measuring Equipment

Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Bilog Antenna	TESEQ	CBL 6111D & 00800N1D01N-06	35419 & 03	30MHz~1GHz	Apr. 28, 2021	Aug. 30, 2021~Sep. 01, 2021	Apr. 27, 2022	Radiation (03CH07-HY)
Double Ridge Horn Antenna	ESCO	3117	00075962	1GHz ~ 18GHz	Dec. 01, 2020	Aug. 30, 2021~Sep. 01, 2021	Nov. 30, 2021	Radiation (03CH07-HY)
Preamplifier	MITEQ	AMF-7D-00101 800-30-10P	1590075	1GHz~18GHz	Apr. 22, 2021	Aug. 30, 2021~Sep. 01, 2021	Apr. 21, 2022	Radiation (03CH07-HY)
Preamplifier	COM-POWER	PA-103A	161241	10MHz~1GHz	May 18, 2021	Aug. 30, 2021~Sep. 01, 2021	May 17, 2022	Radiation (03CH07-HY)
Preamplifier	Agilent	8449B	3008A02362	1GHz~26.5GHz	Oct. 31, 2020	Aug. 30, 2021~Sep. 01, 2021	Oct. 30, 2021	Radiation (03CH07-HY)
Preamplifier	EMEC	EM18G40G	0600789	18-40GHz	Jul. 23, 2021	Aug. 30, 2021~Sep. 01, 2021	Jul. 22, 2022	Radiation (03CH07-HY)
Spectrum Analyzer	Agilent	N9030A	MY52350276	3Hz~44GHz	Jul. 22, 2021	Aug. 30, 2021~Sep. 01, 2021	Jul. 21, 2022	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY15682-4	30MHz to 18GHz	Feb. 24, 2021	Aug. 30, 2021~Sep. 01, 2021	Feb. 23, 2022	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY24971-4	9kHz to 18GHz	Feb. 24, 2021	Aug. 30, 2021~Sep. 01, 2021	Feb. 23, 2022	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY28655-4	9kHz to 18GHz	Feb. 24, 2021	Aug. 30, 2021~Sep. 01, 2021	Feb. 23, 2022	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	MY2858/2,801 606/2	18GHz~40GHz	Feb. 24, 2021	Aug. 30, 2021~Sep. 01, 2021	Feb. 23, 2022	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 126	532078/126E	30MHz~18GHz	Sep. 18, 2020	Aug. 30, 2021~Sep. 01, 2021	Sep. 17, 2021	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	801606/2	9KHz ~ 40GHz	Apr. 03, 2021	Aug. 30, 2021~Sep. 01, 2021	Apr. 02, 2022	Radiation (03CH07-HY)
Controller	EMEC	EM1000	N/A	Control Ant Mast	Apr. 28, 2021	Aug. 30, 2021~Sep. 01, 2021	Apr. 27, 2022	Radiation (03CH07-HY)
Controller	MF	MF-7802	N/A	Control Turn table	N/A	Aug. 30, 2021~Sep. 01, 2021	N/A	Radiation (03CH07-HY)
Antenna Mast	EMEC	AM-BS-4500E	N/A	Boresight mast 1M~4M	Apr. 28, 2021	Aug. 30, 2021~Sep. 01, 2021	Apr. 27, 2022	Radiation (03CH07-HY)
Turn Table	ChainTek	Chaintek 3000	N/A	0~360 Degree	N/A	Aug. 30, 2021~Sep. 01, 2021	N/A	Radiation (03CH07-HY)
Software	Audix	E3 6.2009-8-24	N/A	N/A	N/A	Aug. 30, 2021~Sep. 01, 2021	N/A	Radiation (03CH07-HY)
USB Data Logger	TECPEL	TR-32	HE17XB2495	N/A	Mar. 09, 2021	Aug. 30, 2021~Sep. 01, 2021	Mar. 08, 2022	Radiation (03CH07-HY)
Horn Antenna	EMCO	3117	00143261	1GHz~18GHz	Jan. 26, 2021	Aug. 30, 2021~Sep. 01, 2021	Jan. 25, 2022	Radiation (03CH07-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170251	18GHz~40GHz	Dec. 02, 2020	Aug. 30, 2021~Sep. 01, 2021	Dec. 01, 2021	Radiation (03CH07-HY)
Signal Generator	Rohde & Schwarz	SMF100A	101107	100KHz~40GHz	Dec. 04, 2020	Aug. 30, 2021~Sep. 01, 2021	Dec. 03, 2021	Radiation (03CH07-HY)
Radio Communication Analyzer	Anritsu	MT8821C	6262025341	LTE FDD/TDD LTE-2CC ULCA/DLCA	Oct. 06, 2020	Aug. 30, 2021~Sep. 16, 2021	Oct. 05, 2021	Conducted (TH03-HY)
Programmable Power Supply	GW Instek	PSS-2005	EL890001	1V~20V 0.5A~5A	Oct. 11, 2020	Aug. 30, 2021~Sep. 16, 2021	Oct. 10, 2021	Conducted (TH03-HY)
Coupler	Warison	20dB 25W SMA Directional Coupler	#B	1-18GHz	Jan. 09, 2021	Aug. 30, 2021~Sep. 16, 2021	Jan. 08, 2022	Conducted (TH03-HY)



6 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	3.16 dB
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Uncertainty of Radiated Emission Measurement (1 GHz ~ 18 GHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	3.71 dB
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Uncertainty of Radiated Emission Measurement (18 GHz ~ 40 GHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	4.16 dB
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Appendix A. Test Results of Conducted Test

Conducted Output Power(Average power & EIRP)

LTE Band 30 Maximum Average Power [dBm] (GT - LC = 0.5 dB)								
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest	EIRP (dBm)	EIRP (W)
10	1	0	QPSK	22.12	-	22.68	0.1854	
10	1	25		22.18				
10	1	49		22.04				
10	25	0		21.32				
10	25	12		21.23				
10	25	25		21.24				
10	50	0		21.24				
10	1	0	16-QAM	21.50	-	22.01	0.1589	
10	1	25		21.51				
10	1	49		21.45				
10	25	0		20.40				
10	25	12		20.26				
10	25	25		20.32				
10	50	0		20.32				
10	1	0	64-QAM	20.27	-	20.91	0.1233	
10	1	25		20.41				
10	1	49		20.34				
10	25	0		19.34				
10	25	12		19.37				
10	25	25		19.33				
10	50	0		19.37				
Limit	EIRP < 250W/5MHz			Result			Pass	



LTE Band 30 Maximum Average Power [dBm] (GT - LC = 0.5 dB)								
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest	EIRP (dBm)	EIRP (W)
5	1	0	QPSK	22.11	22.18	22.31	22.81	0.1910
	1	12		22.15	22.28	22.22		
	1	24		22.26	22.24	22.27		
	12	0		21.23	21.37	21.38		
	12	7		21.38	21.40	21.41		
	12	13		21.33	21.37	21.33		
	25	0		21.31	21.40	21.40		
5	1	0	16-QAM	21.44	21.61	21.59	22.16	0.1644
	1	12		21.57	21.61	21.57		
	1	24		21.66	21.62	21.54		
	12	0		20.30	20.41	20.39		
	12	7		20.35	20.41	20.43		
	12	13		20.36	20.39	20.32		
	25	0		20.35	20.42	20.41		
5	1	0	64-QAM	20.43	20.46	20.51	21.07	0.1279
	1	12		20.44	20.51	20.51		
	1	24		20.57	20.50	20.49		
	12	0		19.31	19.45	19.42		
	12	7		19.45	19.42	19.45		
	12	13		19.43	19.45	19.41		
	25	0		19.42	19.42	19.39		
Limit	EIRP < 250W/5MHz			Result			Pass	



Appendix B. Test Results of Radiated Test

LTE Band 30

LTE Band 30 / 5MHz / QPSK									
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	4620	-55.87	-40	-15.87	-79.16	-62.69	2.12	8.94	H
	6930	-52.66	-40	-12.66	-80.23	-60.76	2.61	10.72	H
	9234	-49.72	-40	-9.72	-80.39	-59.79	2.53	12.61	H
									H
									H
									H
									H
	4620	-55.71	-40	-15.71	-79	-62.53	2.12	8.94	V
	6930	-50.61	-40	-10.61	-78.18	-58.71	2.61	10.72	V
	9234	-48.88	-40	-8.88	-79.96	-58.95	2.53	12.61	V
									V
									V
									V
									V

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