

FCC TEST REPORT

(PART 27)

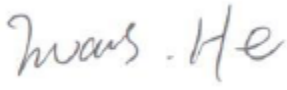
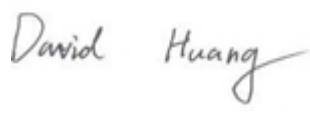
Applicant:	PUNDI X LABS PTE. LTD.
Address:	6 Raffles Boulevard,#03-308 Marina Square Singapore, 039594

Manufacturer or Supplier	PUNDI X LABS PTE. LTD.
Address	6 Raffles Boulevard,#03-308 Marina Square Singapore, 039594
Product	XPOS
Brand Name	Pundi X
Model Name	X2
FCC ID:	2ASTH-X2
Date of tests	Dec. 19, 2018 ~ Mar. 16, 2019

The tests have been carried out according to the requirements of the following standard:

- ☒ **FCC Part 27, Subpart C**
☒ **ANSI/TIA/EIA-603- D**
☒ **FCC Part 2**
☒ **ANSI/TIA/EIA-603-E**
☒ **ANSI C63.26-2015**

CONCLUSION: The submitted sample was found to COMPLY with the test requirement

Issued by Evans He Engineer / Mobile Department	Approved by David Huang Manager / Mobile Department
	
Date: Mar. 07, 2019	Date: Mar. 17, 2019

This report is governed by, and incorporates by reference, CPS Conditions of Service as posted at the date of issuance of this report at <http://www.bureauveritas.com/home/about-us/our-business/cps/about-us/terms-conditions/> and is intended for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. Measurement uncertainty is only provided upon request for accredited tests. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence or if you require measurement uncertainty; provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents.



TABLE OF CONTENTS

RELEASE CONTROL RECORD	4
1 SUMMARY OF TEST RESULTS.....	5
1.1 MEASUREMENT UNCERTAINTY	5
1.2 TEST SITE AND INSTRUMENTS	6
2 GENERAL INFORMATION	7
2.1 GENERAL DESCRIPTION OF EUT	7
2.2 CONFIGURATION OF SYSTEM UNDER TEST	8
2.3 DESCRIPTION OF SUPPORT UNITS	9
2.4 TEST ITEM AND TEST CONFIGURATION.....	9
2.5 DUTY CYCLE OF TEST SIGNAL.....	11
2.6 GENERAL DESCRIPTION OF APPLIED STANDARDS	12
3 TEST TYPES AND RESULTS	13
3.1 OUTPUT POWER MEASUREMENT	13
3.1.1 LIMITS OF OUTPUT POWER MEASUREMENT	13
3.1.2 TEST PROCEDURES	13
3.1.3 TEST SETUP	14
3.1.4 TEST RESULTS	15
3.2 FREQUENCY STABILITY MEASUREMENT	19
3.2.1 LIMITS OF FREQUENCY STABILITY MEASUREMENT	19
3.2.2 TEST PROCEDURE	19
3.2.3 TEST SETUP	19
3.2.4 TEST RESULTS	20
3.3 OCCUPIED BANDWIDTH MEASUREMENT	22
3.3.1 LIMITS OF OCCUPIED BANDWIDTH MEASUREMENT	22
3.3.2 TEST SETUP	22
3.3.3 TEST PROCEDURES	22
3.3.4 TEST RESULTS	23
3.4 PEAK TO AVERAGE RATIO.....	25
3.4.1 LIMITS OF peak to average ratio MEASUREMENT	25
3.4.2 TEST SETUP	25
3.4.3 TEST PROCEDURES	25
3.4.4 TEST RESULTS	26
3.5 BAND EDGE MEASUREMENT	28
3.5.1 LIMITS OF BAND EDGE MEASUREMENT	28
3.5.2 TEST SETUP	28
3.5.3 TEST PROCEDURES	29
3.5.4 TEST RESULTS	30
3.6 CONDUCTED SPURIOUS EMISSIONS	32
3.6.1 LIMITS OF CONDUCTED SPURIOUS EMISSIONS MEASUREMENT.....	32
3.6.2 TEST PROCEDURE	32
3.6.3 TEST SETUP	32
3.6.4 TEST RESULTS	33
3.7 RADIATED EMISSION MEASUREMENT	35
3.7.1 LIMITS OF RADIATED EMISSION MEASUREMENT	35
3.7.2 TEST PROCEDURES	35
3.7.3 DEVIATION FROM TEST STANDARD	35
3.7.4 TEST SETUP	36



Test Report No.: RF181102N040-10_R1

3.7.5 TEST RESULTS	38
4 PHOTOGRAPHS OF THE TEST CONFIGURATION	42
5 APPENDIX A – MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB	43

RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF181102N040-10	Original release	Mar. 17, 2019
RF181102N040-10_R1	Updated the applicant and manufacturer address from "99 DUXTON ROAD 089543, Singapor" to "6 Raffles Boulevard,#03-308 Marina Square Singapore, 039594"	Apr. 24, 2019

1 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 27 & Part 2			
STANDARD SECTION	TEST TYPE AND LIMIT	RESULT	REMARK
2.1046 27.50(a)(3)	Equivalent Isotropically Radiated Power	PASS	Meet the requirement of limit.
2.1055 27.54	Frequency Stability	PASS	Meet the requirement of limit.
2.1049	Occupied Bandwidth	PASS	Meet the requirement of limit.
--	Peak to average ratio	PASS	Meet the requirement of limit.
2.1051 27.53(a)(4)	Band Edge Measurements	PASS	Meet the requirement of limit.
2.1051 27.53(a)(4)	Conducted Spurious Emissions	PASS	Meet the requirement of limit.
2.1053 27.53(a)(4)	Radiated Spurious Emissions	PASS	Meet the requirement of limit. Minimum passing margin is -20.14dB at 785.3MHz.

NOTE : Test Lab Information:

Lab: Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch

Test Lab Address: Zone A, Floor 1, Building 2 Wan Ye Long Technology Park

South Side of Zhoushi Road, Bao'an District Shenzhen, Guangdong, 518108, People's Republic of China.

1.1 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

MEASUREMENT	FREQUENCY	UNCERTAINTY
Conducted emissions	150 kHz ~ 30 MHz	3.11dB
Radiated emissions	30 MHz ~ 200 MHz	3.11dB
	200 MHz ~1000 MHz	5.12dB
	1 GHz ~ 18 GHz	5.34dB
	18 GHz ~ 40 GHz	5.02dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

1.2 TEST SITE AND INSTRUMENTS

Instrument	Model	Serial #	Cal Date	Cal Due
EMI test receiver	ESL6	100262	Jan. 04, 19	Jan. 03, 20
Active Antenna	AL-130	121031	Feb. 07, 19	Feb. 06, 20
3m Semi-anechoic Chamber	9m*6m*6m	N/A	Oct. 18, 18	Oct. 17, 19
Signal Amplifier	8447E	443008	Jan. 24, 19	Jan. 23, 20
MXA signal analyzer	N9020A	MY49100060	Jan. 04, 19	Jan. 03, 20
Horn Antenna	HAH-118	71259	Jan. 25, 19	Jan. 24, 20
Horn Antenna	HAH-118	71283	Feb. 01, 19	Jan. 31, 20
AMPLIFIER	EM01G26G	60613	Jan. 24, 19	Jan. 23, 20
AMPLIFIER	Emc012645	980077	Jan. 04, 19	Jan. 03, 20
Bilog Antenna (30MHz~6GHz)	JB6	A110712	Feb. 07, 19	Feb. 06, 20
DC Power Supply	E3640A	MY40004013	Jan. 04, 19	Jan. 03, 20
MXA Signal Analyzer	N9020A	MY49100060	Jan. 04, 19	Jan. 03, 20
MXG Vector Signal Generator	N5182A	MY50140530	Jan. 04, 19	Jan. 03, 20
Series Signal Generator	E4421B	US40051152	May. 12, 18	May. 11, 19
RF control unit	JS0806-0806-2	188060112	Apr. 25, 18	Apr. 24, 19
Wireless Connectivity Tester	CMW270	1201.0002K75-101 601-PE	Apr. 25, 18	Apr. 24, 19
Universal Radio Communication Tester	CMU200	121393	Jan. 04, 19	Jan. 03, 20
Programmable Temperature & Humidity Chamber	HYL-TH-225D H	DG-180746	Jul. 15, 18	Jul. 14, 19
Test Software	EZ-EMC	ver.lcp-03A1	N/A	N/A

- NOTE:**
1. The calibration interval of the above test instruments is 12 months or 24 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.
 2. The test was performed in 3m Semi-anechoic Chamber and RF Oven Room.
 3. The horn antenna is used only for the measurement of emission frequency above 1GHz if tested.
 4. The FCC Site Registration No. is 749762.

2 GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

PRODUCT	XPOS	
MODEL NAME	X2	
POWER SUPPLY	5.0Vdc (adapter or host equipment) 3.8Vdc (Li-ion, ion battery)	
MODULATION TECHNOLOGY	LTE	QPSK, 16QAM
FREQUENCY RANGE	LTE Band 40 Channel Bandwidth: 5MHz	2307.5 MHz ~ 2312.5 MHz
	LTE Band 40 Channel Bandwidth: 10MHz	2310 MHz
EMISSION DESIGNATOR	LTE Band 40 Channel Bandwidth: 5MHz	QPSK: 4M47G7D
		16QAM: 4M47W7D
	LTE Band 40 Channel Bandwidth: 10MHz	QPSK: 8M94G7D
		16QAM: 8M94W7D
MAX. EIRP POWER	LTE Band 40 Channel Bandwidth: 5MHz	193.64mW
	LTE Band 40 Channel Bandwidth: 10MHz	191.87mW
ANTENNA TYPE	LTE Band 40	FPC Antenna with 1.7dBi
HW VERSION	JP800_MB_V1.1	
SW VERSION	JP800_MB_V1.1	
I/O PORTS	Refer to user's manual	
DATA CABLE	Power cable: non-shielded, detachable, 1.4m	

NOTE:

- For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.

- The EUT was powered by the following adapter:

ADAPTER	
INPUT:	AC 100-240V~50/60Hz
OUTPUT:	DC 5V,2.0A

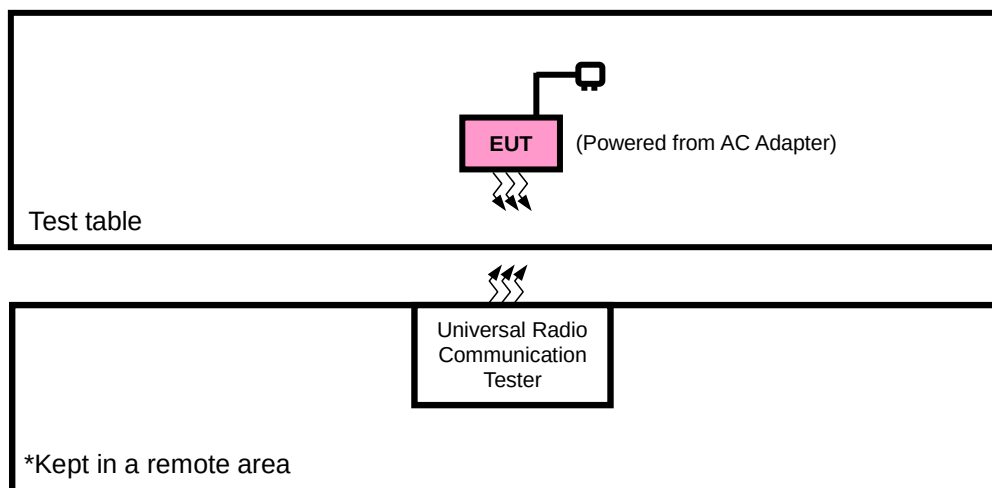
- The EUT matched the following USB cables:

USB CABLE	
BRAND:	N/A
MODEL:	N/A
SIGNAL LINE:	1.4 METER

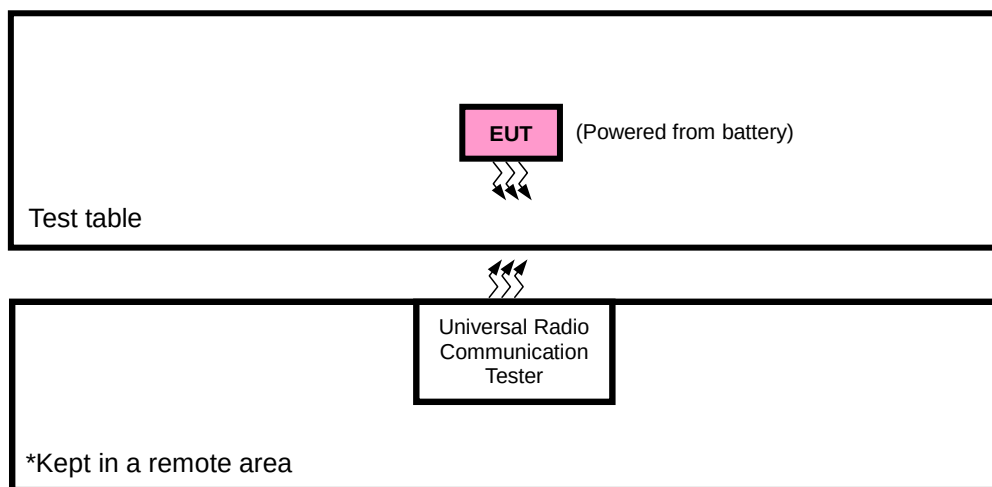
- For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report.

2.2 CONFIGURATION OF SYSTEM UNDER TEST

FOR RADIATION EMISSION TEST



FOR CONDUCTED & E.I.R.P TEST



2.3 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	N/A	N/A	N/A	N/A	N/A
2	N/A	N/A	N/A	N/A	N/A

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	N/A
2	N/A

2.4 TEST ITEM AND TEST CONFIGURATION

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and antenna ports. The worst case was found when positioned on Y-plane for EIRP and X-axis for radiated emission. Following channel(s) was (were) selected for the final test as listed below:

EUT CONFIGURE MODE	DESCRIPTION
A	EUT + Adapter with LTE link
B	EUT + Battery with LTE link

LTE BAND 40

EUT CONFIGURE MODE	TEST ITEM	AVAILABLE CHANNEL	TESTED CHANNEL	CHANNEL BANDWIDTH	MODULATION	MODE
B	EIRP	38725 to 38775	38725, 38750, 38775	5MHz	QPSK, 16QAM, 64QAM	1 RB / 0 RB Offset
		38750	38750	10MHz	QPSK, 16QAM, 64QAM	1 RB / 0 RB Offset
B	FREQUENCY STABILITY	38725 to 38775	38725, 38775	5MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		38750	38750	10MHz	QPSK, 16QAM	1 RB / 0 RB Offset
B	OCCUPIED BANDWIDTH	38725 to 38775	38725, 38750, 38775	5MHz	QPSK, 16QAM, 64QAM	25 RB / 0 RB Offset
		38750	38750	10MHz	QPSK, 16QAM, 64QAM	50 RB / 0 RB Offset
B	PEAK TO AVERAGE RATIO	38725 to 38775	38725, 38750, 38775	5MHz	QPSK, 16QAM, 64QAM	1 RB / 0 RB Offset
		38750	38750	10MHz	QPSK, 16QAM, 64QAM	1 RB / 0 RB Offset
B	BAND EDGE	38725 to 38775	38725	5MHz	QPSK, 16QAM	25 RB / 0 RB Offset
			38750	5MHz	QPSK, 16QAM	25 RB / 0 RB Offset
			38775	5MHz	QPSK, 16QAM	25 RB / 0 RB Offset
		38750	38750	10MHz	QPSK, 16QAM	50 RB / 0 RB Offset
			38750	10MHz	QPSK, 16QAM	50 RB / 0 RB Offset
			38750	10MHz	QPSK, 16QAM	50 RB / 0 RB Offset
B	CONDCUDED EMISSION	38725 to 38775	38725, 38750, 38775	5MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		38750	38750	10MHz	QPSK, 16QAM	1 RB / 0 RB Offset
A	RADIATED EMISSION	38725 to 38775	38750	5MHz	QPSK	1 RB / 0 RB Offset
		38750	38750	10MHz	QPSK	1 RB / 0 RB Offset

Note: This device was tested under all bandwidths, RB configurations and modulations. The worst case was found in QPSK modulation.

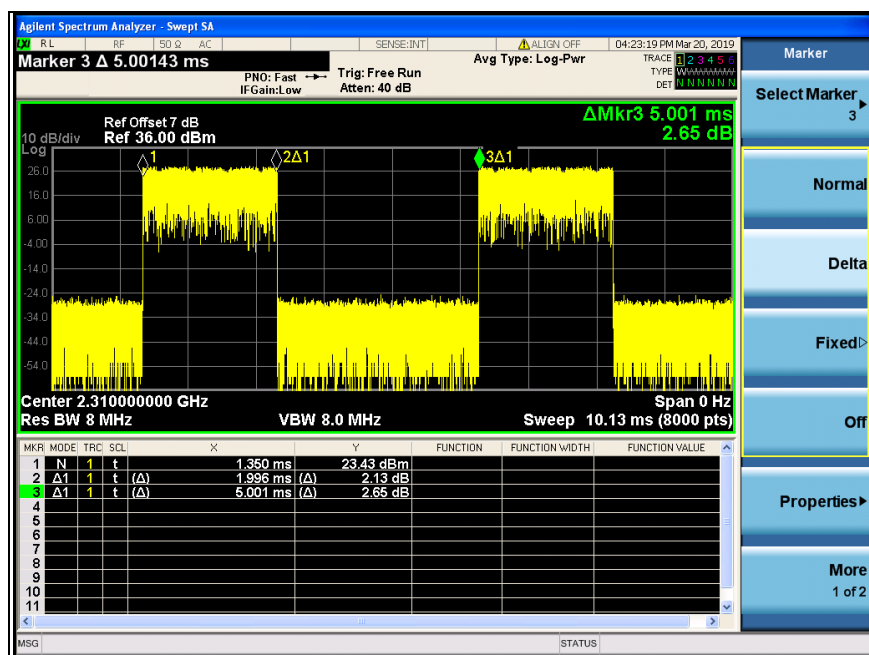
TEST CONDITION:

TEST ITEM	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
EIRP	24deg. C, 57%RH	3.8Vdc from Battery	Evans He
FREQUENCY STABILITY	24deg. C, 57%RH	DC 3.3V/3.8V/4.3V	Aaron Liang
OCCUPIED BANDWIDTH	24deg. C, 57%RH	3.8Vdc from Battery	Aaron Liang
PEAK TO AVERAGE RATIO	24deg. C, 57%RH	3.8Vdc from Battery	Aaron Liang
BAND EDGE	24deg. C, 57%RH	3.8Vdc from Battery	Aaron Liang
CONDCUDED EMISSION	24deg. C, 57%RH	3.8Vdc from Battery	Evans He
RADIATED EMISSION	23deg. C, 59%RH	5Vdc from adapter	Evans He

2.5 Duty Cycle of Test Signal

TDD Band 40

Duty cycle = $1.996/5.001 = 0.40 < 38\%$,





Test Report No.: RF181102N040-10_R1

2.6 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a RF product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC 47 CFR Part 2

FCC 47 CFR Part 27

KDB 971168 D01 Power Meas License Digital Systems v03

ANSI/TIA/EIA-603-D

ANSI/TIA/EIA-603-E

ANSI C63.26-2015

NOTE: All test items have been performed and recorded as per the above standards.

3 TEST TYPES AND RESULTS

3.1 OUTPUT POWER MEASUREMENT

3.1.1 LIMITS OF OUTPUT POWER MEASUREMENT

Mobile and portable stations. (i) For mobile and portable stations transmitting in the 2305-2315 MHz band or the 2350-2360 MHz band, the average EIRP must not exceed 50 milliwatts within any 1 megahertz of authorized bandwidth, except that for mobile and portable stations compliant with 3GPP LTE standards or another advanced mobile broadband protocol that avoids concentrating energy at the edge of the operating band the average EIRP must not exceed 250 milliwatts within any 5 megahertz of authorized bandwidth but may exceed 50 milliwatts within any 1 megahertz of authorized bandwidth. For mobile and portable stations using time division duplexing (TDD) technology, the duty cycle must not exceed 38 percent in the 2305-2315 MHz and 2350-2360 MHz bands. Mobile and portable stations using FDD technology are restricted to transmitting in the 2305-2315 MHz band. Power averaging shall not include intervals in which the transmitter is off.

3.1.2 TEST PROCEDURES

EIRP MEASUREMENT:

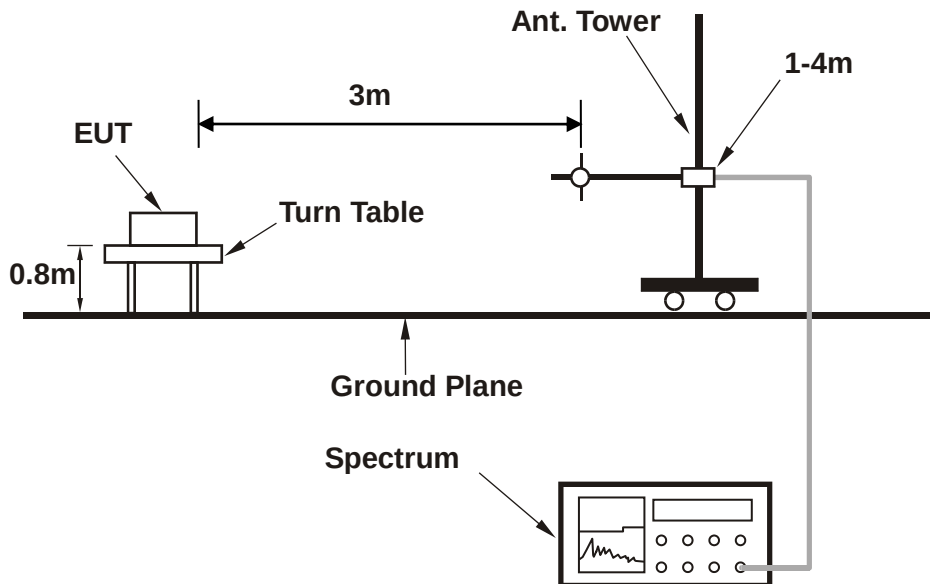
- All measurements were done at low, middle and high operational frequency range. RBW and VBW is 10MHz for LTE mode.
- Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8m height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum polar radiated power. The "Read Value" is the spectrum reading the maximum power value.
- The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a tx cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to "Read Value" of step b. Record the power level of S.G.
- $EIRP = \text{Output power level of S.G} - \text{TX cable loss} + \text{Antenna gain of substitution horn}.$

CONDUCTED POWER MEASUREMENT:

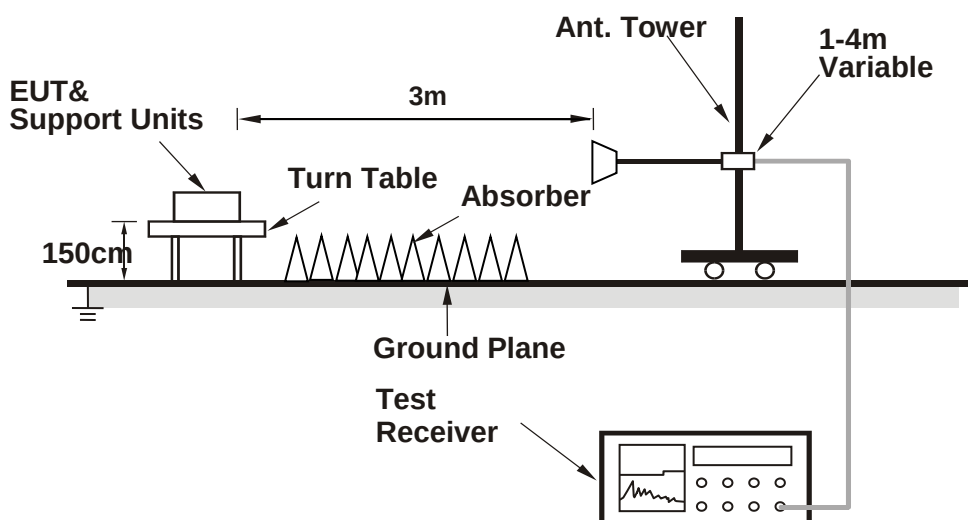
- The EUT was set up for the maximum power with LTE link data modulation and link up with simulator.
- Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator.

3.1.3 TEST SETUP

ERP MEASUREMENT:

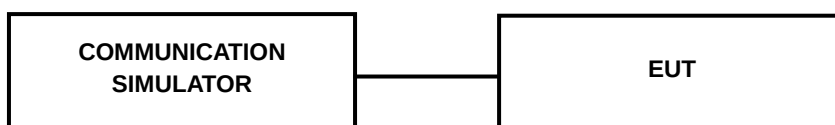


EIRP MEASUREMENT:



For the actual test configuration, please refer to the attached file (Test Setup Photo).

CONDUCTED POWER MEASUREMENT:



For the actual test configuration, please refer to the attached file (Test Setup Photo).

3.1.4 TEST RESULTS

AVERAGE CONDUCTED OUTPUT POWER (dBm)

LTE Band 40							
BW	Modulation	RB Size	RB Offset	Low CH 38725	Mid CH 38750	High CH 38775	MPR
				Frequency 2307.5 MHz	Frequency 2310 MHz	Frequency 2312.5 MHz	
5 MHz	QPSK	1	0	23.59	23.65	23.60	0
		1	12	23.39	23.45	23.40	0
		1	24	23.36	23.42	23.37	0
		12	0	22.62	22.68	22.63	1
		12	6	22.53	22.59	22.54	1
		12	13	22.49	22.55	22.50	1
		25	0	22.51	22.57	22.52	1
	16QAM	1	0	22.60	22.66	22.61	1
		1	12	22.40	22.46	22.41	1
		1	24	22.36	22.42	22.37	1
		12	0	21.64	21.70	21.65	2
		12	6	21.51	21.57	21.52	2
		12	13	21.47	21.53	21.48	2
		25	0	21.62	21.68	21.63	2

LTE Band 40							
BW	Modulation	RB Size	RB Offset	CH	CH 38750	CH	MPR
				Frequency MHz	Frequency 2310 MHz	Frequency MHz	
10 MHz	QPSK	1	0	-	23.71	-	0
		1	24	-	23.51	-	0
		1	49	-	23.48	-	0
		25	0	-	22.74	-	1
		25	12	-	22.65	-	1
		25	25	-	22.61	-	1
		50	0	-	22.63	-	1
	16QAM	1	0	-	22.72	-	1
		1	24	-	22.52	-	1
		1	49	-	22.48	-	1
		25	0	-	21.76	-	2
		25	12	-	21.63	-	2
		25	25	-	21.59	-	2
		50	0	-	21.74	-	2

EIRP

LTE BAND 40

CHANNEL BANDWIDTH: 5MHz QPSK

Channel	Frequency (MHz)	SPA LVL (dBm)	Correction Factor(dB)	EIRP(dBm)	EIRP(mW)	Polarization (H/V)
38725	2302.5	-24.45	44.58	20.13	103.04	H
38750	2350	-24.52	44.54	20.02	100.46	H
38775	2397.5	-24.08	44.52	20.44	110.66	H
38725	2302.5	-22.73	44.58	21.85	153.11	V
38750	2350	-22.36	44.54	22.18	165.2	V
38775	2397.5	-21.75	44.52	22.77	189.23	V

CHANNEL BANDWIDTH: 5MHz 16QAM

Channel	Frequency (MHz)	SPA LVL (dBm)	Correction Factor(dB)	EIRP(dBm)	EIRP(mW)	Polarization (H/V)
38725	2302.5	-24.54	44.58	20.04	100.93	H
38750	2350	-24.4	44.54	20.14	103.28	H
38775	2397.5	-24.32	44.52	20.2	104.71	H
38725	2302.5	-22.53	44.58	22.05	160.32	V
38750	2350	-21.67	44.54	22.87	193.64	V
38775	2397.5	-22.27	44.52	22.25	167.88	V

LTE BAND 40

CHANNEL BANDWIDTH: 10MHz QPSK

Channel	Frequency (MHz)	SPA LVL (dBm)	Correction Factor(dB)	EIRP(dBm)	EIRP(mW)	Polarization (H/V)
38750	2305	-23.97	44.81	20.84	121.34	H
38750	2395	-21.98	44.81	22.83	191.87	V

CHANNEL BANDWIDTH: 10MHz 16QAM

Channel	Frequency (MHz)	SPA LVL (dBm)	Correction Factor(dB)	EIRP(dBm)	EIRP(mW)	Polarization (H/V)
38750	2305	-23.88	44.81	20.93	123.88	H
38750	2395	-22.35	44.81	22.46	176.2	V

REMARKS: 1. EIRP Output Power (dBm) = SPA LVL (dBm) + Correction Factor (dB).
2. Correction factor (dB) = Free Space Loss + Antenna Factor + Cable Loss



3.2.4 TEST RESULTS

LTE BAND 40

FREQUENCY ERROR VS. VOLTAGE

VOLTAGE (Volts)	5MHz		LIMIT (ppm)
	FREQUENCY ERROR (ppm)		
	Low Channel	High Channel	
3.8	0.0005	-0.0019	2.5
3.3	-0.0049	0.0002	2.5
4.3	0.0048	-0.0007	2.5

NOTE: The applicant defined the normal working voltage of the battery is from 3.3Vdc to 4.3Vdc.

FREQUENCY ERROR vs. TEMPERATURE.

TEMP. (°C)	5MHz		LIMIT (ppm)
	FREQUENCY ERROR (ppm)		
	Low Channel	High Channel	
-30	0.0002	-0.0033	2.5
-20	0.0050	-0.0004	2.5
-10	0.0070	-0.0053	2.5
0	0.0015	-0.0033	2.5
10	0.0025	0.0015	2.5
20	0.0056	0.0053	2.5
30	0.0037	-0.0021	2.5
40	-0.0043	-0.0039	2.5
50	0.0071	0.0022	2.5

FREQUENCY ERROR VS. VOLTAGE

VOLTAGE (Volts)	10MHz	LIMIT (ppm)
	FREQUENCY ERROR (ppm)	
	Channel 38750	
3.8	-0.0028	2.5
3.3	0.0055	2.5
4.3	0.0037	2.5

NOTE: The applicant defined the normal working voltage of the battery is from 3.3Vdc to 4.3Vdc.

FREQUENCY ERROR vs. TEMPERATURE.

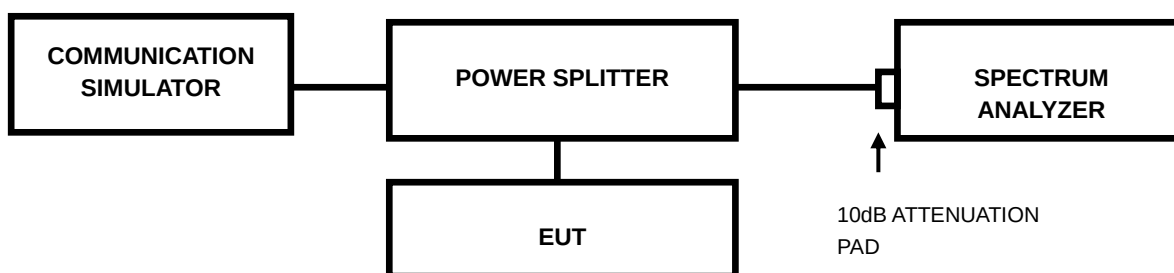
TEMP. (°C)	10MHz	LIMIT (ppm)
	FREQUENCY ERROR (ppm)	
	Channel 38750	
-30	0.0039	2.5
-20	-0.0047	2.5
-10	0.0083	2.5
0	0.0051	2.5
10	0.0033	2.5
20	0.0048	2.5
30	0.0038	2.5
40	-0.0037	2.5
50	0.0022	2.5
60	0.0072	2.5

3.3 OCCUPIED BANDWIDTH MEASUREMENT

3.3.1 LIMITS OF OCCUPIED BANDWIDTH MEASUREMENT

The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5 % of the total mean power of a given emission.

3.3.2 TEST SETUP



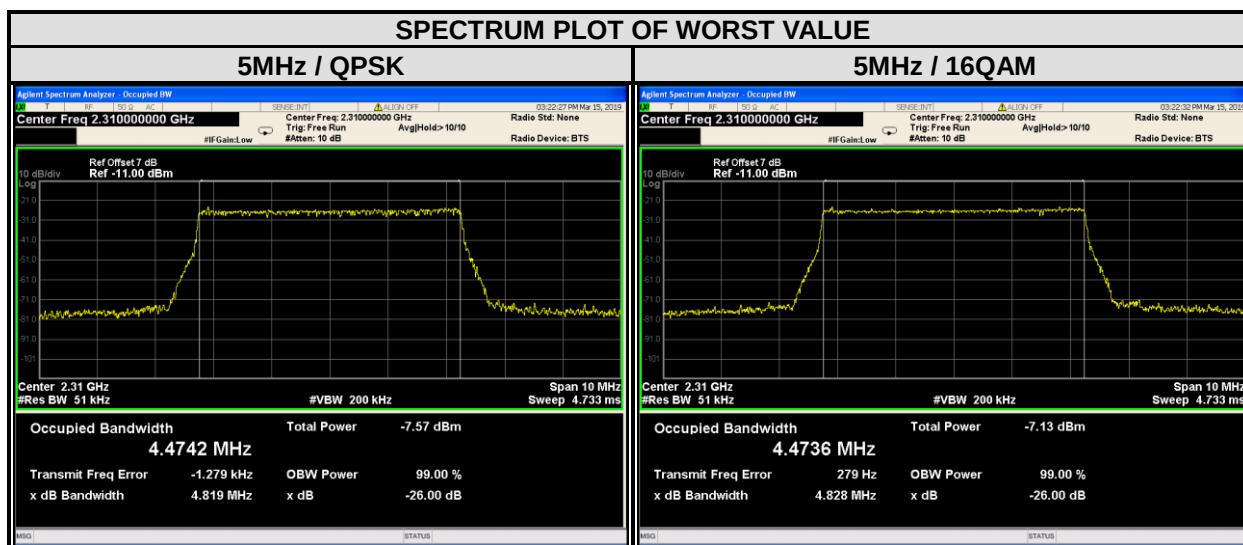
3.3.3 TEST PROCEDURES

- The conducted occupied bandwidth used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.
- Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth.

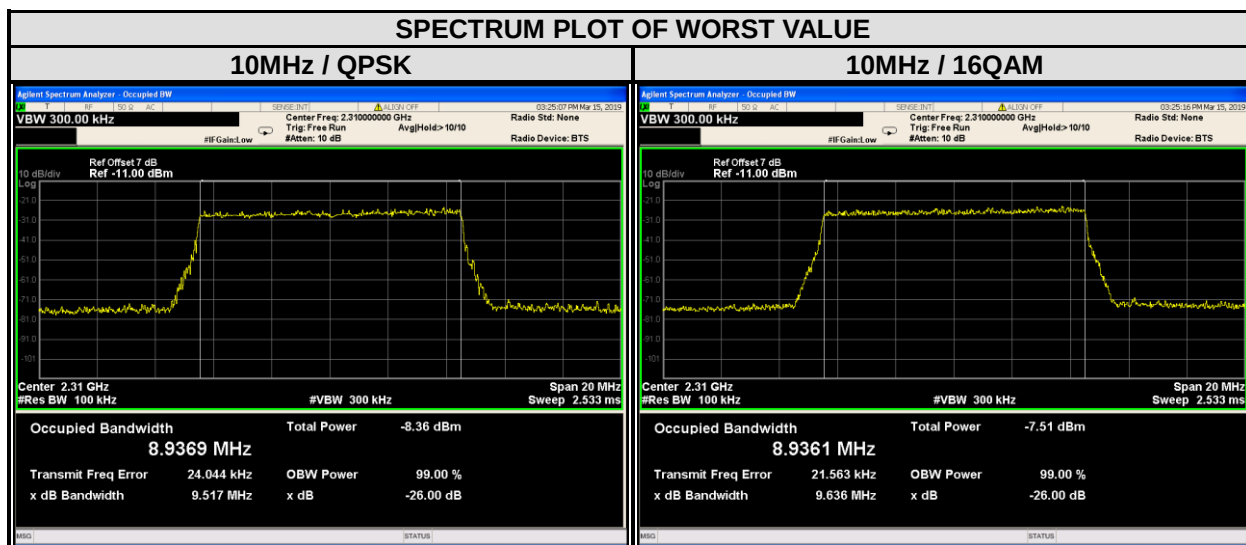


LTE BAND 40

CHANNEL BANDWIDTH: 5MHz			
CHANNEL	FREQUENCY (MHz)	99% OCCUPIED Bandwidth (MHz)	
		QPSK	16QAM
38725	2307.5	4.4686	4.4689
38750	2310.0	4.4742	4.4736
38775	2312.5	4.4641	4.4654



CHANNEL BANDWIDTH: 10MHz			
CHANNEL	FREQUENCY (MHz)	99% OCCUPIED Bandwidth (MHz)	
		QPSK	16QAM
-	-	-	-
38750	2310.0	8.9369	8.9361
-	-	-	-

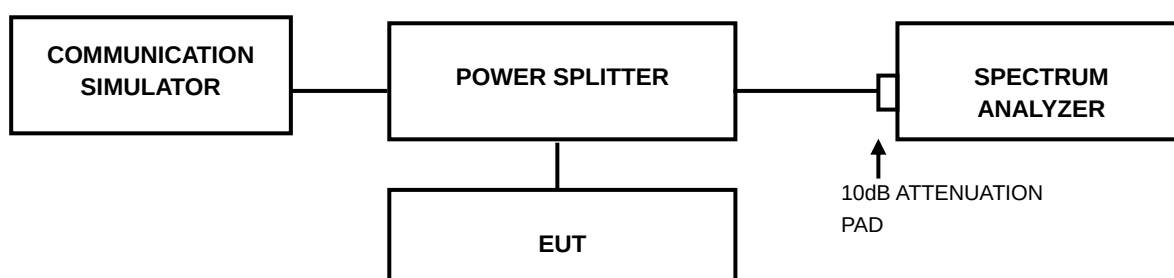


3.4 PEAK TO AVERAGE RATIO

3.4.1 LIMITS OF PEAK TO AVERAGE RATIO MEASUREMENT

In measuring transmissions in this band using an average power technique, the peak to-average ratio (PAR) of the transmission may not exceed 13 dB.

3.4.2 TEST SETUP



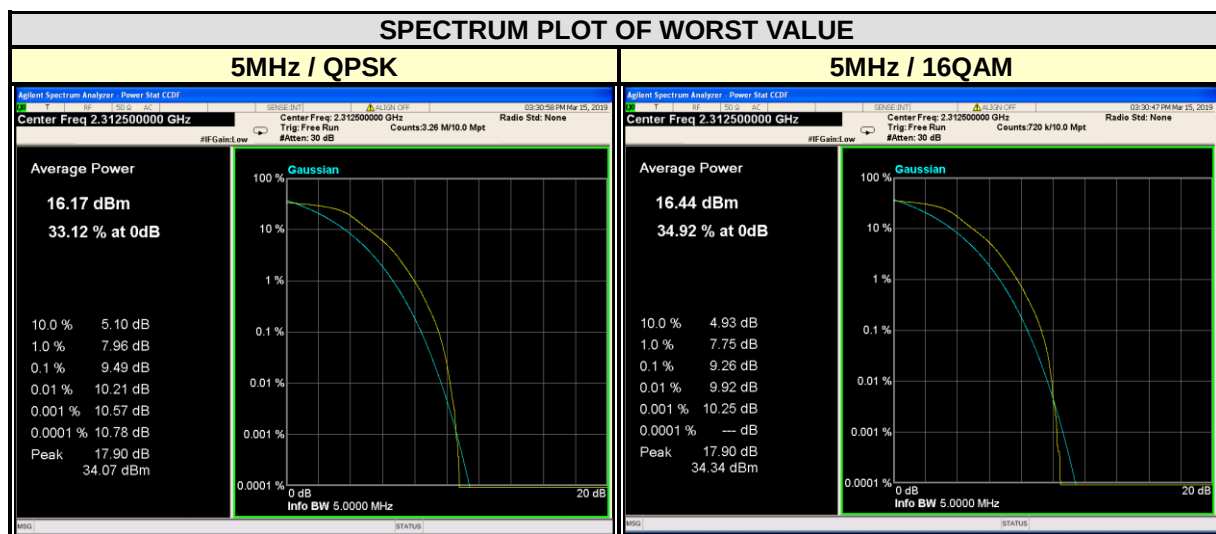
3.4.3 TEST PROCEDURES

1. Set resolution/measurement bandwidth $\geq$ signal's occupied bandwidth;
2. Set the number of counts to a value that stabilizes the measured CCDF curve;
3. Record the maximum PAPR level associated with a probability of 0.1%.

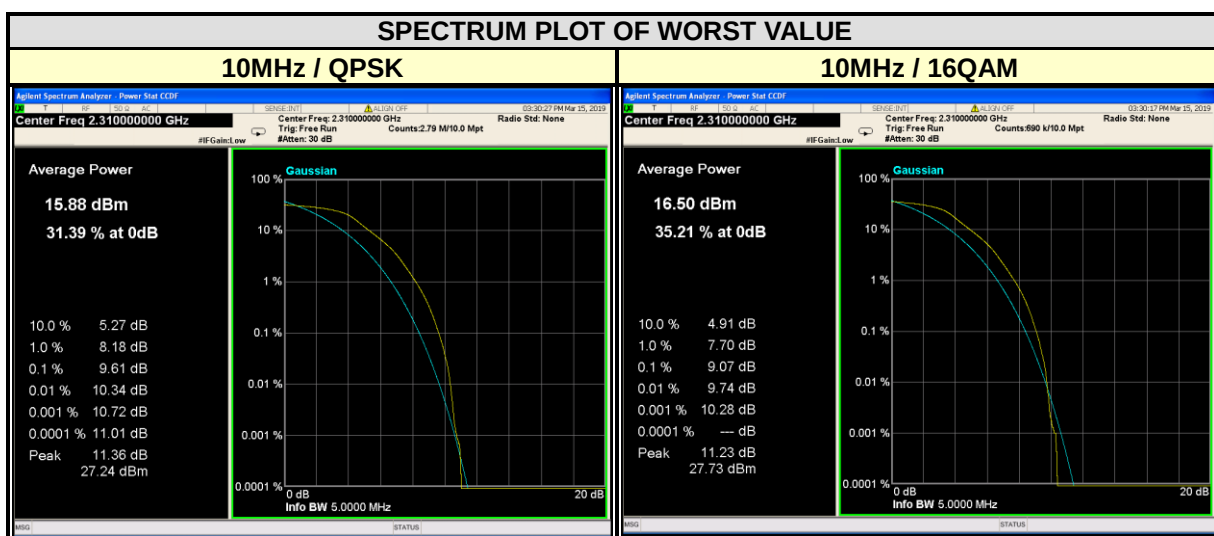
3.4.4 TEST RESULTS

LTE BAND 40

CHANNEL BANDWIDTH: 5MHz			
CHANNEL	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)	
		QPSK	16QAM
38725	2307.5	8.29	8.77
38750	2310.0	8.53	8.84
38775	2312.5	9.49	9.26



CHANNEL BANDWIDTH: 10MHz			
CHANNEL	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)	
		QPSK	16QAM
-	-	-	-
38750	2310.0	9.61	9.07
-	-	-	-



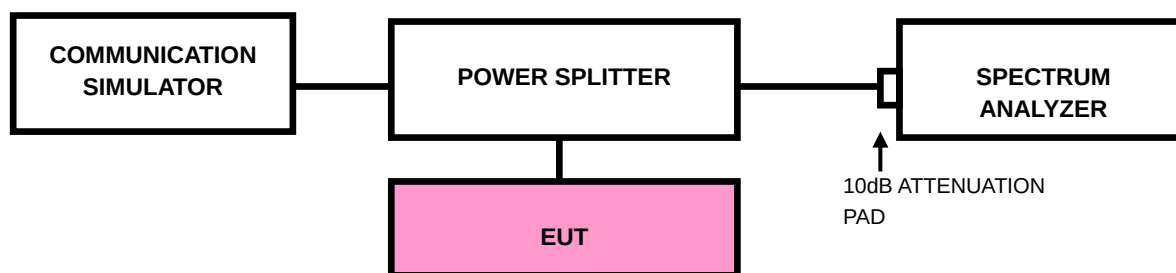
3.5 BAND EDGE MEASUREMENT

3.5.1 LIMITS OF BAND EDGE MEASUREMENT

According to FCC 27.53(m) For mobile and portable stations operating in the 2305-2315 MHz and 2350-2360 MHz bands:

- (i) 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.

3.5.2 TEST SETUP

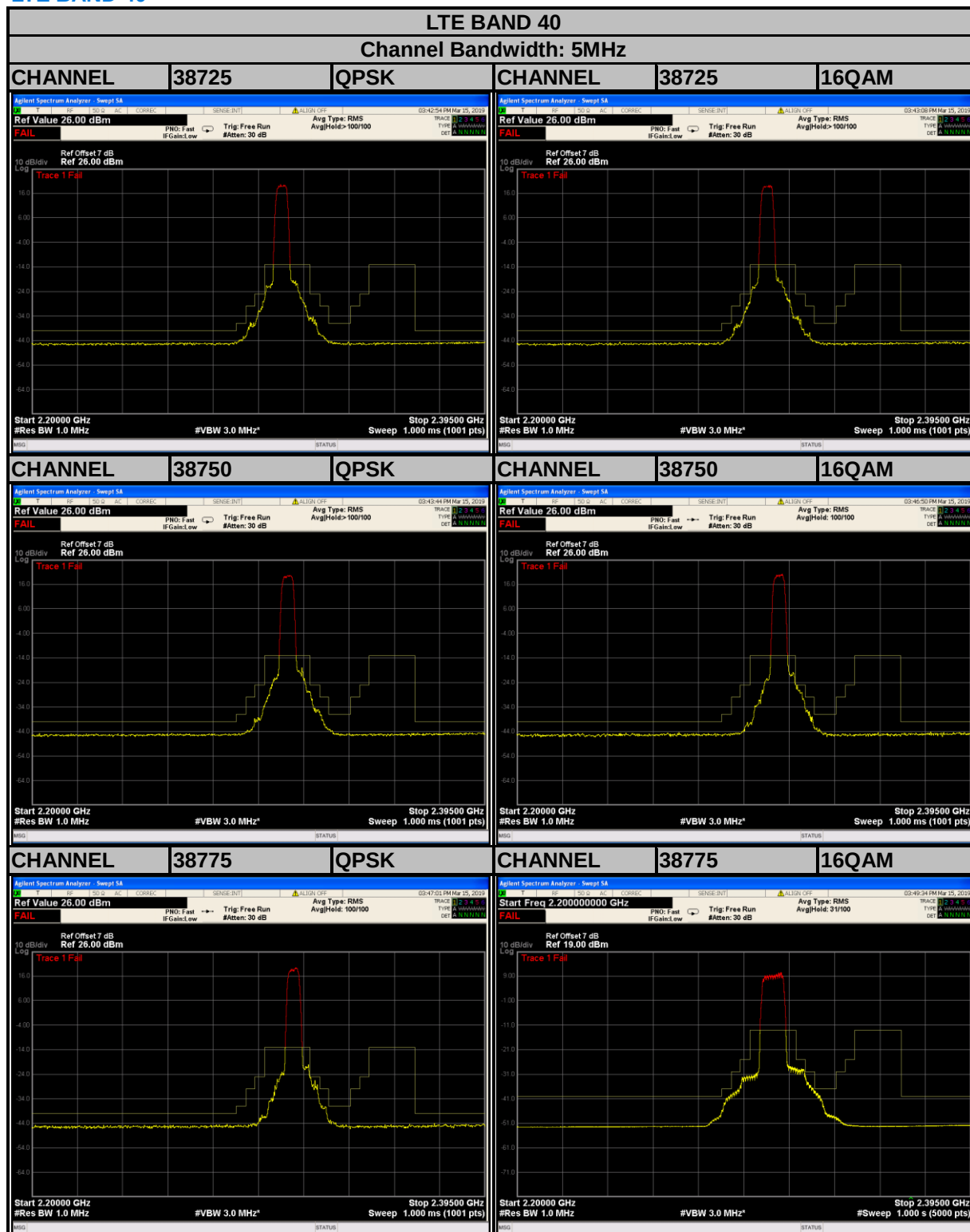


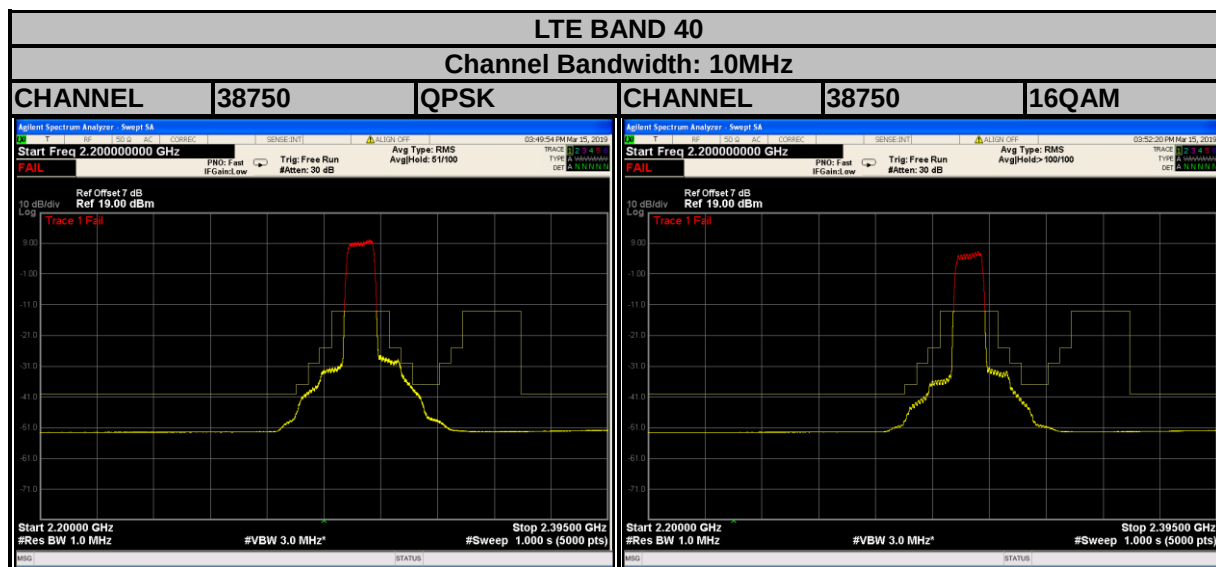
3.5.3 TEST PROCEDURES

- a. The EUT was set up for the maximum peak power with LTE link data modulation. The power was measured with R&S Spectrum Analyzer. All measurements were done at 2 channels (low and high operational frequency range.).
- b. The band edge measurement used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.
- c. Measuring frequency range is from 2305 MHz to 2315 MHz for LTE Band 30 & LTE Band 40. 10 dB attenuation pad is connected with spectrum.
RBW=1MHz and VBW=3MHz are used for conducted emission measurement.
- d. Record the max trace plot into the test report.

3.5.4 TEST RESULTS

LTE BAND 40





NOTE: Since there is no limit on Fundamental frequency, all frequency are connected together to test, so “Fail” doesn’t mean test result!

3.6 CONDUCTED SPURIOUS EMISSIONS

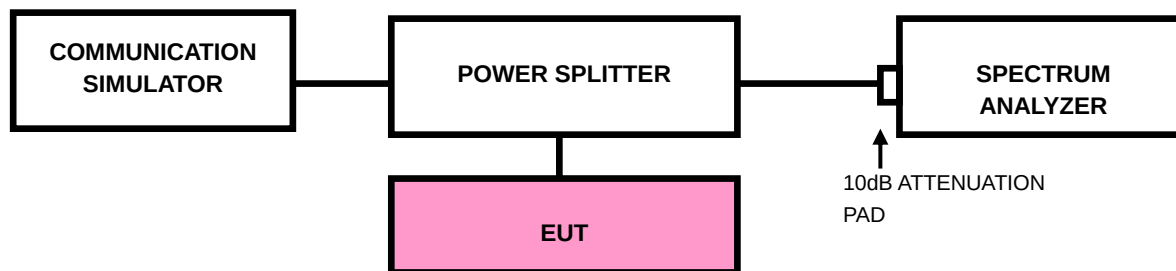
3.6.1 LIMITS OF CONDUCTED SPURIOUS EMISSIONS MEASUREMENT

The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least $70 + 10 \log_{10}(P)$ dB. The limit of emission is equal to -40dBm.

3.6.2 TEST PROCEDURE

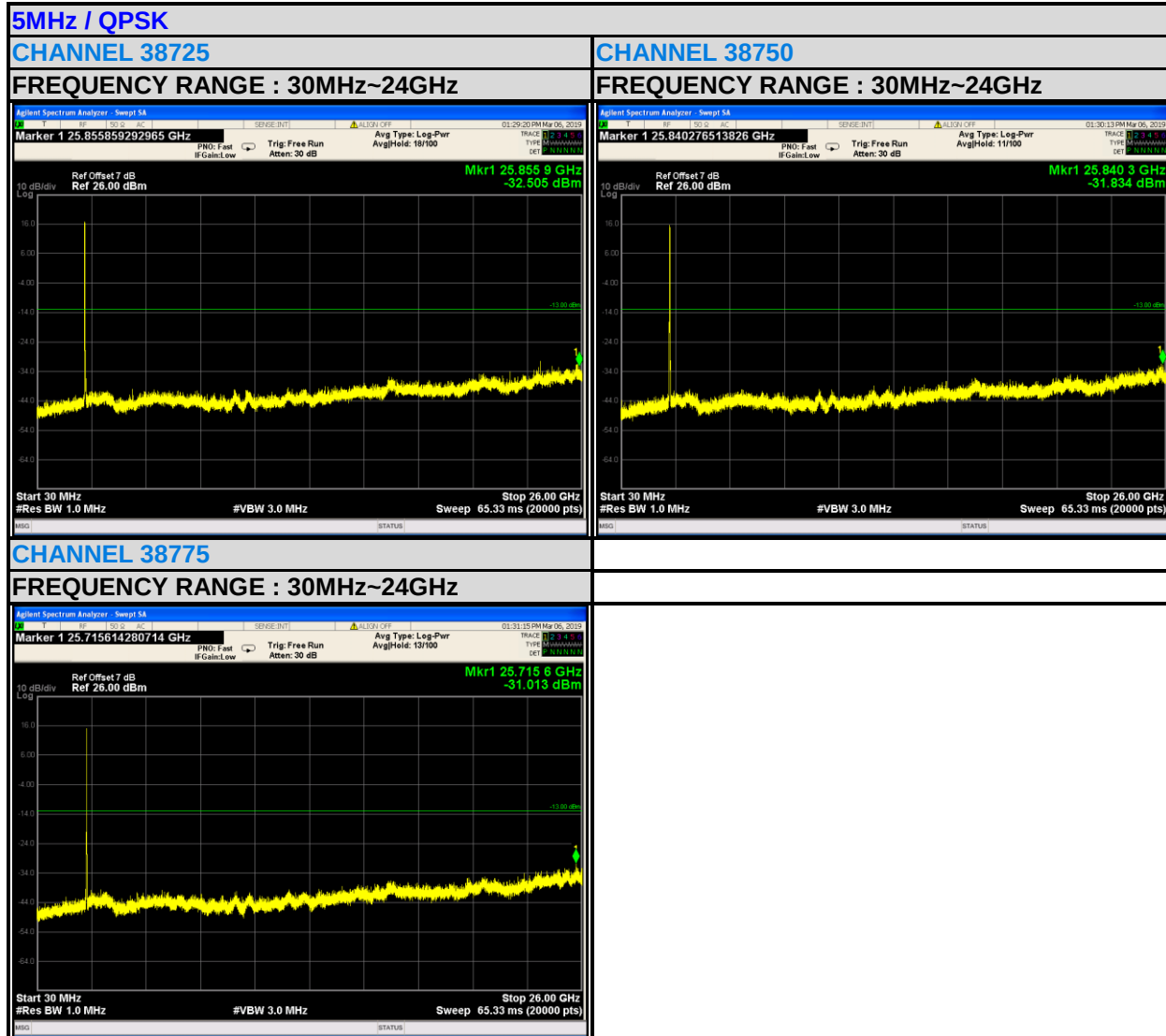
- a. The EUT makes a phone call to the communication simulator. All measurements were done at low, middle and high operational frequency range.
- b. Measuring frequency range is from 30 MHz to 24GHz for LTE Band 30 & LTE Band 40. 10dB attenuation pad is connected with spectrum. RBW=1MHz and VBW=3MHz are used for conducted emission measurement.

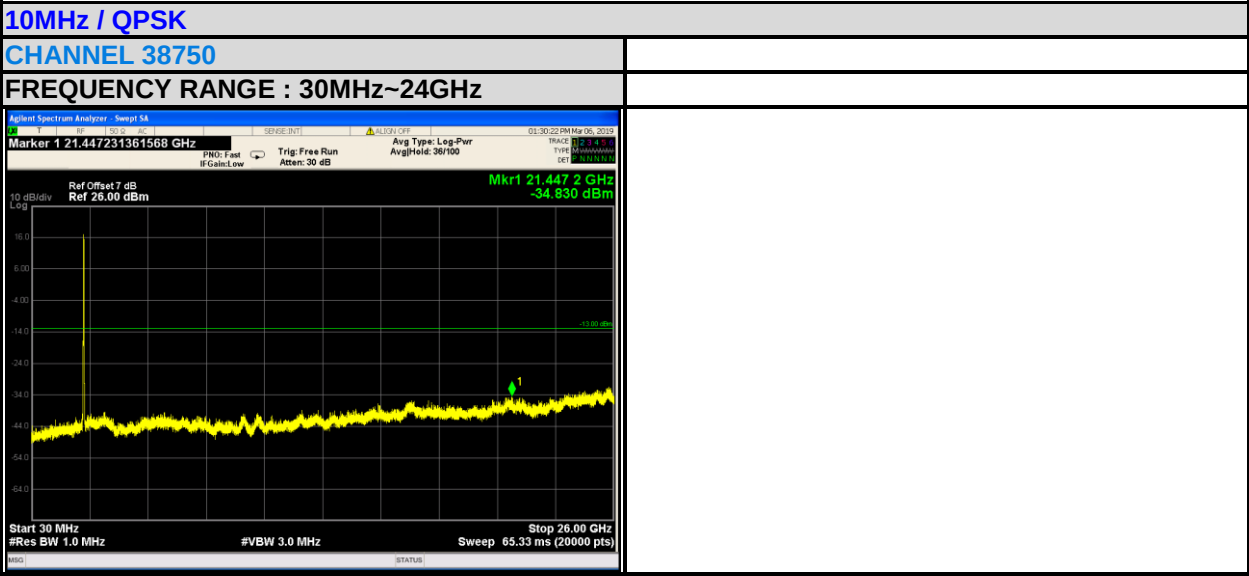
3.6.3 TEST SETUP



3.6.4 TEST RESULTS

LTE BAND 40





3.7 RADIATED EMISSION MEASUREMENT

3.7.1 LIMITS OF RADIATED EMISSION MEASUREMENT

The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least $70 + 10 \log_{10}(P)$ dB. The limit of emission is equal to -40dBm.

3.7.2 TEST PROCEDURES

- a. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8m height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum polar radiated power. The "Read Value" is the spectrum reading the maximum power value.
- b. The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a TX cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to "Read Value " of step a. Record the power level of S.G.
- c. $EIRP = \text{Output power level of S.G} - \text{TX cable loss} + \text{Antenna gain of substitution horn}.$
- d. E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole,
 $E.R.P \text{ power} = E.I.P.R \text{ power} - 2.15\text{dBi}.$

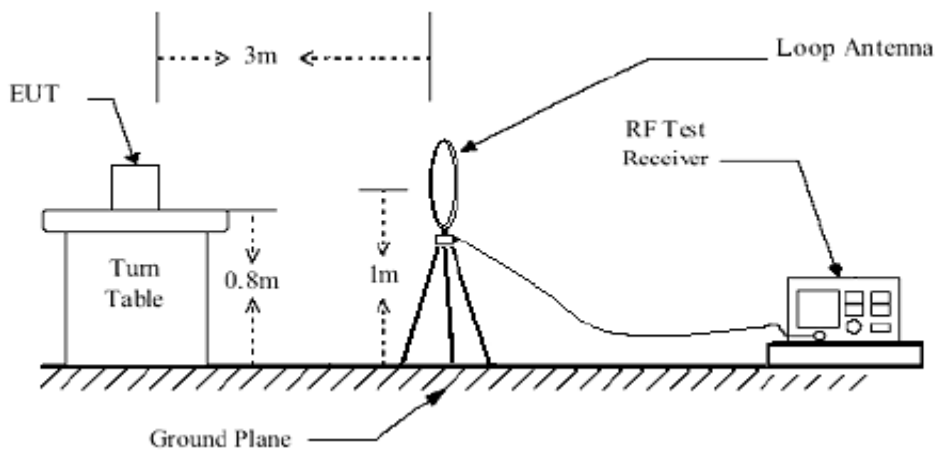
NOTE: The resolution bandwidth of spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz.

3.7.3 DEVIATION FROM TEST STANDARD

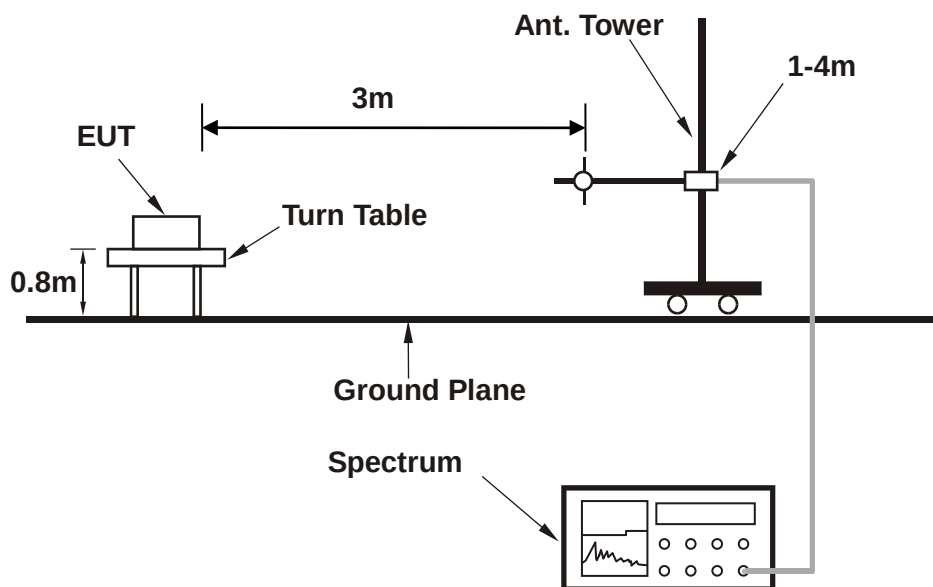
No deviation

3.7.4 TEST SETUP

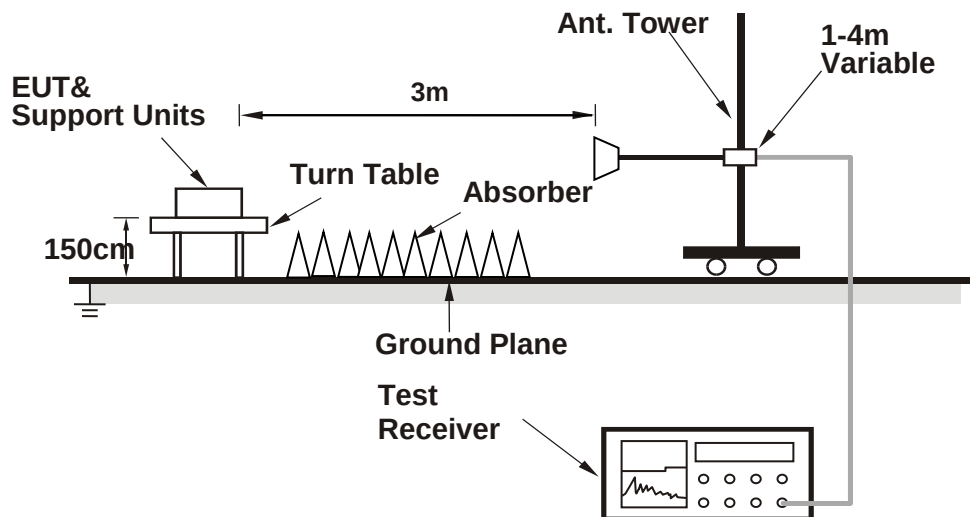
<Below 30MHz>



< Frequency Range 30MHz~1GHz >



< Frequency Range above 1GHz >



For the actual test configuration, please refer to the attached file (Test Setup Photo).

3.7.5 TEST RESULTS

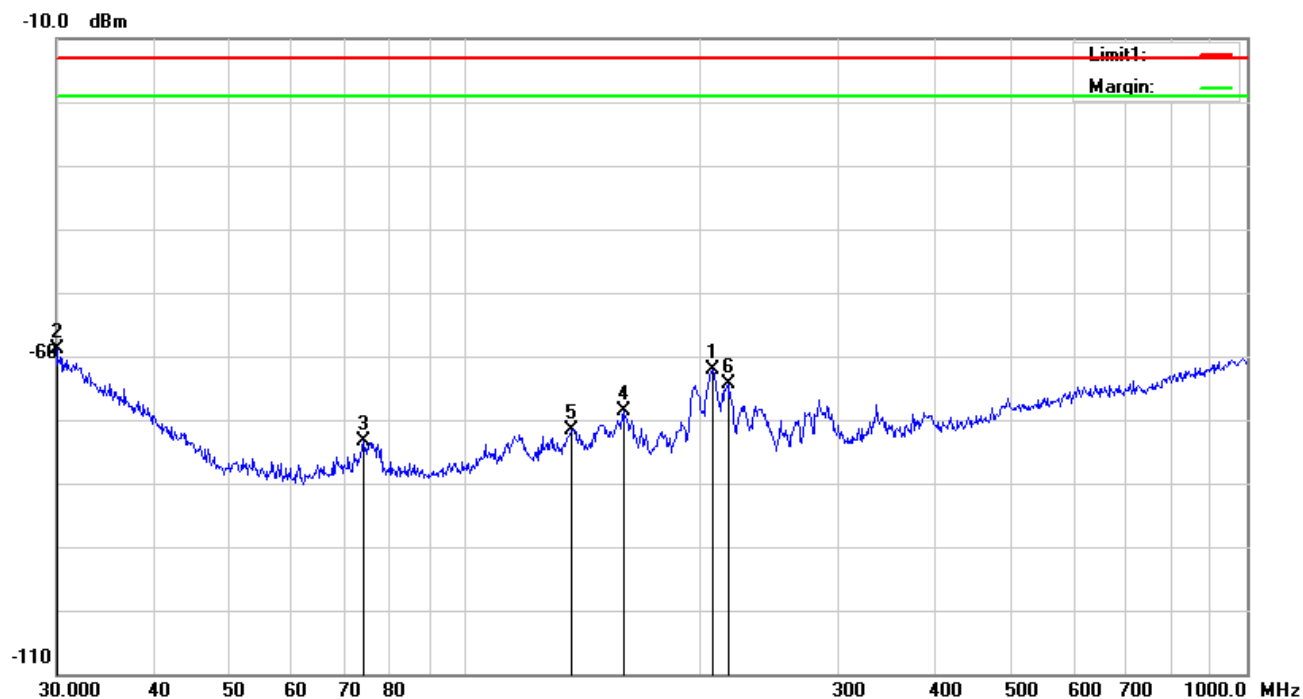
BELOW 1GHz WORST-CASE DATA

9 KHz – 30 KHz data: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required in the report.

30 MHz – 1GHz data:

LTE Band 41:

MODE	TX channel 40740	FREQUENCY RANGE	Below 1000MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 58%RH	INPUT POWER	DC 5V from adapter
TESTED BY	Simon Lin		
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M			



No.	Frequency (MHz)	Reading (dBm)	Result (dBm)	Limit (dBm)	Margin (dB)
1	207.1226	-62.34	-62.03	-13.00	-49.03
2	30.0000	-73.06	-58.94	-13.00	-45.94
3	74.1351	-70.74	-73.42	-13.00	-60.42
4	159.2251	-69.22	-68.66	-13.00	-55.66
5	136.4598	-71.47	-71.56	-13.00	-58.56
6	216.7828	-64.82	-64.37	-13.00	-51.37

MODE	TX channel 40740	FREQUENCY RANGE	Below 1000MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 58%RH	INPUT POWER	DC 5V from adapter
TESTED BY	Simon Lin		
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M			



No.	Frequency (MHz)	Reading (dBm)	Result (dBm)	Limit (dBm)	Margin (dB)
1	207.8501	-61.04	-57.94	-13.00	-44.94
2	117.3603	-66.24	-60.95	-13.00	-47.95
3	58.2030	-61.55	-65.11	-13.00	-52.11
4	67.2022	-63.92	-65.80	-13.00	-52.80
5	137.4202	-67.66	-62.61	-13.00	-49.61
6	747.4826	-72.77	-60.37	-13.00	-47.37

ABOVE 1GHz DATA

Note: For higher frequency, the emission is too low to be detected.

LTE Band 41:

5M QPSK

Middle channel

Frequency (MHz)	Antenna Polarization (H/V)	-36.51 -36.94	Limit (dBm)	Margin (dB)
792.7	V	-42.21	-13	-29.21
377.4	H	-34.98	-13	-21.98
347.3	V	-34.87	-13	-21.87
889.7	H	-34.79	-13	-21.79

10M QPSK

Middle channel

Frequency (MHz)	Antenna Polarization (H/V)	-36.51 -36.94	Limit (dBm)	Margin (dB)
655.1	V	-35.96	-13	-22.96
698.5	H	-33.85	-13	-20.85
483.6	V	-33.15	-13	-20.15
656.3	H	-35.37	-13	-22.37

15M QPSK

Middle channel

Frequency (MHz)	Antenna Polarization (H/V)	-36.51 -36.94	Limit (dBm)	Margin (dB)
400.2	V	-39.17	-13	-26.17
154.9	H	-33.18	-13	-20.18
855	V	-33.22	-13	-20.22
238.2	H	-36.63	-13	-23.63

20M QPSK

Middle channel

Frequency (MHz)	Antenna Polarization (H/V)	-36.51 -36.94	Limit (dBm)	Margin (dB)
913.1	V	-36.71	-13	-23.71
785.3	H	-33.14	-13	-20.14
967.1	V	-40.72	-13	-27.72
588.3	H	-41.71	-13	-28.71

Note:

- 1, The testing has been conformed to $10 \times 2687.5\text{MHz} = 26,875\text{MHz}$
- 2, All other emissions more than 30 dB below the limit
- 3, X-Axis, Y-Axis and Z-Axis were investigated. The results above show only the worst case.
- 4, The radiated spurious test above 18GHz is subcontracted to Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch Laboratories and found 30dB below the limit at least.



Test Report No.: RF181102N040-10_R1

4 PHOTOGRAPHS OF THE TEST CONFIGURATION

Please refer to the attached file (Test Setup Photo).



Test Report No.: RF181102N040-10_R1

5 APPENDIX A – MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No any modifications are made to the EUT by the lab during the test.

---END---