ACCREDITED
Certificate # 3939.01

IC TEST REPORT

(RSS-133)

Applicant:	Particle Industries, Inc
Address:	126 Post St,4th floor, San Francisco, CA 94108 USA

Manufacturer or Supplier:	Particle Industries, Inc
Address:	126 Post St,4th floor, San Francisco, CA 94108 USA
Product:	E Series LTE
Brand Name:	Particle
Model Name:	E402, E404
IC:	8585A-2AGQN4NNN
Date of tests:	Oct. 17, 2019 ~ Dec. 05, 2019

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

☒ **RSS-132 Issue 6, Amendment 1, January, 2018**
☒ **RSS-Gen Issue 5, Amendment 1, March 2019**
☒ **ANSI C63.26-2015**

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

Remark：This test report is for internal customer use only, not as a final certification test report.

Prepared by Alex Chen Engineer / Mobile Department	Approved by Luke Lu Manager / Mobile Department
Alex Date: Dec. 23, 2020	Luke Lu Date: Dec. 23, 2020

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
IC191017W005-2	Original release, This test report is for internal customer use only, not as a final certification test report.	Dec. 06, 2019
ICP20120028-2	Based on the original product add one model name. In this report, All test data is copied from the original test report IC191017W005-2.	Dec. 23, 2020

1 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: IC RSS-133 & RSS-Gen		
STANDARD SECTION RSS-GEN	**TEST TYPE AND LIMIT**	**RESULT**
6.7	Occupied Bandwidth	Compliance
6.8	Transmit antenna	Compliance
STANDARD SECTION RSS-133	**TEST TYPE AND LIMIT**	**RESULT**
6.3	Frequency Stability AFC Freq. Error vs. Voltage AFC Freq. Error vs. Temperature	Compliance
6.4	Maximum Peak Output Power	Compliance
6.4	peak-to-average power ratio	Compliance
6.5	Band Edge Measurements	Compliance
6.5	Conducted Spurious Emissions	Compliance
6.5	Transmitter Radiated Spurious Emissions	Compliance

1.1 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in ETSI TR 100 028-1 V1.4.1(2001-12):

MEASUREMENT	UNCERTAINTY
Frequency Stability	±76.97Hz
Radiated emissions & Radiated Power (30MHz~1GMHz)	±4.98dB
Radiated emissions & Radiated Power (1GMHz ~6GMHz)	±4.70dB
Radiated emissions (6GMHz ~18GMHz)	±4.60dB
Radiated emissions (18GMHz ~40GMHz)	±4.12dB
Conducted emissions	±4.01dB
Occupied Channel Bandwidth	±43.58KHz
Conducted Output power	±2.06dB
Band Edge Measurements	±4.70dB
Peak to average ratio	±0.76dB

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

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
MXE EMI Receiver	KEYSIGHT	N9038A-544	MY54450026	Feb. 26,19	Feb. 25,20
EXA Signal Analyzer	KEYSIGHT	N9010A-526	MY54510322	Feb. 26,19	Feb. 25,20
Bilog Antenna	ETS-LINDGREN	3143B	00161965	Feb. 26,19	Feb. 25,20
Horn Antenna (1GHz-18GHz)	ETS-LINDGREN	3117	00168692	Nov. 24, 19	Nov. 23, 20
Horn Antenna (18GHz-40GHz)	N/A	QWH-SL-18-40-K-SG/QMS-00361	15433	Nov. 24, 19	Nov. 23, 20
Radio Communication Analyzer	ANRITSU	MT8820C	6201465426	Feb. 26,19	Feb. 25,20
Signal Pre-Amplifier	EMSI	EMC 9135	980249	Jul. 08,19	Jul. 09,20
Signal Pre-Amplifier	EMSI	EMC 012645B	980257	Jul. 08,19	Jul. 09,20
Signal Pre-Amplifier	EMSI	EMC 184045B	980259	Jul. 08,19	Jul. 09,20
3m Semi-anechoic Chamber	ETS-LINDGREN	9m*6m*6m	Euroshieldpn-CT0001143-1216	Feb. 26,19	Feb. 25,20
Test Software	E3	V 9.160323	N/A	N/A	N/A
Test Software	ADT	ADT_Radiated_V7.6.15.9.2	N/A	N/A	N/A
10dB Attenuator	JFW/USA	50HF-010-SMA	1505	Jul. 08,19	Jul. 09,20
Power Meter	Anritsu	ML2495A	1506002	Feb. 26,19	Feb. 25,20
Power Sensor	Anritsu	MA2411B	1339352	Feb. 26,19	Feb. 25,20
Humid & Temp Programmable Tester	Juyi	ITH-120-45-CP-AR	IAA1504-001	Jul. 08,19	Jul. 09,20
MXG Analog Microvave Signal Generator	KEYSIGHT	N5183A	MY50143024	Feb. 26,19	Feb. 25,20
Power Divider	MCLI/USA	PS2-15	24880	Jul. 09,19	Jul. 08,20

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 IC test Site Registration No. is 21771-1; The Designation No. is CN0007.

2 GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

PRODUCT	E Series LTE	
BRAND NAME	Particle	
MODEL NAME	E402, E404	
POWER SUPPLY	DC 5V	
MODULATION TYPE	**LTE:** QPSK	
FREQUENCY RANGE	**LTE Band 2 Channel Bandwidth: 1.4MHz**	1850.7MHz ~ 1909.3MHz
	LTE Band 2 Channel Bandwidth: 3MHz	1851.5MHz ~ 1908.5MHz
	LTE Band 2 Channel Bandwidth: 5MHz	1852.5MHz ~ 1907.5MHz
	LTE Band 2 Channel Bandwidth: 10MHz	1855.0MHz ~ 1905.0MHz
	LTE Band 2 Channel Bandwidth: 15MHz	1857.5MHz ~ 1902.5MHz
	LTE Band 2 Channel Bandwidth: 20MHz	1860.0MHz ~ 1900.0MHz
MAX. EIRP POWER	**LTE Band 2 Channel Bandwidth: 1.4MHz**	426mW
	LTE Band 2 Channel Bandwidth: 3MHz	429mW
	LTE Band 2 Channel Bandwidth: 5MHz	432mW
	LTE Band 2 Channel Bandwidth: 10MHz	434mW
	LTE Band 2 Channel Bandwidth: 15MHz	420mW
	LTE Band 2 Channel Bandwidth: 20MHz	442mW
EMISSION DESIGNATOR	**LTE Band 2 Channel Bandwidth: 1.4MHz**	QPSK: 1M10G7D
	LTE Band 2 Channel Bandwidth: 3MHz	QPSK: 1M27G7D
	LTE Band 2 Channel Bandwidth: 5MHz	QPSK: 1M09G7D
	LTE Band 2 Channel Bandwidth: 10MHz	QPSK: 1M10G7D
	LTE Band 2 Channel Bandwidth: 15MHz	QPSK: 1M10G7D
	LTE Band 2 Channel Bandwidth: 20MHz	QPSK: 1M10G7D

ANTENNA TYPE	Fixed External Antenna with 3.77dBi gain
HW VERSION	V1.00
SW VERSION	V1.4.0
I/O PORTS	Refer to user's manual

NOTE:

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

2. The schematic and PCB of the E404 is completely the same with E402, and these two models of HW&SW is the same. Because changing the MVNO's E-SIM card （embedded SIM card）provider from Kore to Twilio, so we plan to use different model name to sell it in market. The differences are as follows:E402 uses eSIM of Kore.E404 uses eSIM of Twilio.

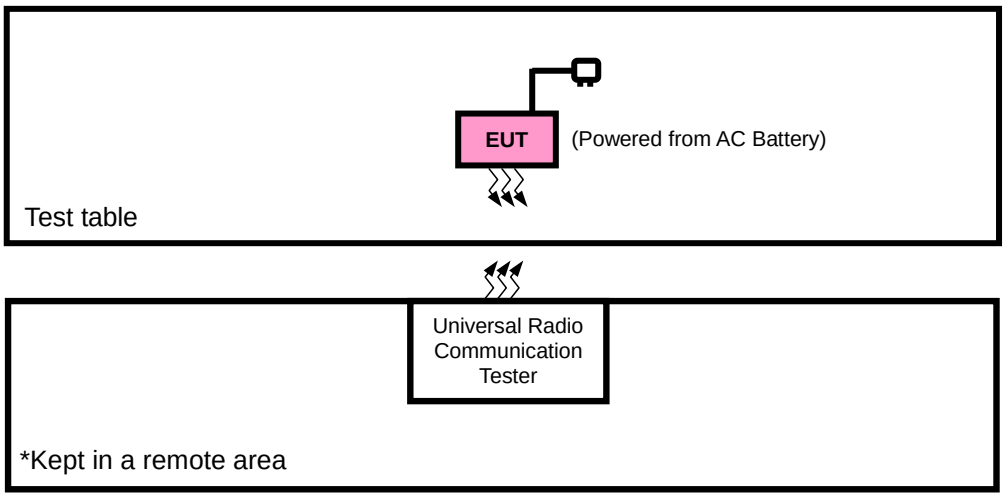
3. For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report.

4. The EUT incorporates a SISO function. Physically, the EUT provides one completed transmitter and one receiver.

MODULATION MODE	TX FUNCTION
LTE	1TX/1RX

2.2 CONFIGURATION OF SYSTEM UNDER TEST

FOR RADIATION EMISSION 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	Battery	N/A	N/A	N/A	N/A
2	DC source	LONG WEI	PS-6403D	010934269	N/A

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	N/A
2	DC Line: Unshielded, Detachable 1.0m

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 in EIRP and radiated emission was found when positioned on X-plane for LTE. Following channel(s) was (were) selected for the final test as listed below:

EUT CONFIGURE MODE	DESCRIPTION
-	**EUT + Battery with or LTE link**

LTE BAND 2

TEST ITEM	AVAILABLE CHANNEL	TESTED CHANNEL	CHANNEL BANDWIDTH	MODULATION	MODE
EIRP	18607 to 19193	18607, 18900, 19193	1.4MHz	QPSK	1 RB / 0 RB Offset
	18615 to 19185	18615, 18900, 19185	3MHz	QPSK	1 RB / 0 RB Offset
	18625 to 19175	18625, 18900, 19175	5MHz	QPSK	1 RB / 0 RB Offset
	18650 to 19150	18650, 18900, 19150	10MHz	QPSK	1 RB / 0 RB Offset
	18675 to 19125	18675, 18900, 19125	15MHz	QPSK	1 RB / 0 RB Offset
	18700 to 19100	18700, 18900, 19100	20MHz	QPSK	1 RB / 0 RB Offset
FREQUENCY STABILITY	18607 to 19193	18607, 19193	1.4MHz	QPSK	1 RB / 0 RB Offset
	18615 to 19185	18615, 19185	3MHz	QPSK	1 RB / 0 RB Offset
	18625 to 19175	18625, 19175	5MHz	QPSK	1 RB / 0 RB Offset
	18650 to 19150	18650, 19150	10MHz	QPSK	1 RB / 0 RB Offset
	18675 to 19125	18675, 19125	15MHz	QPSK	1 RB / 0 RB Offset
	18700 to 19100	18700, 19100	20MHz	QPSK	1 RB / 0 RB Offset
OCCUPIED BANDWIDTH	18607 to 19193	18607, 18900, 19193	1.4MHz	QPSK	6 RB / 0 RB Offset
	18615 to 19185	18615, 18900, 19185	3MHz	QPSK	15 RB / 0 RB Offset
	18625 to 19175	18625, 18900, 19175	5MHz	QPSK	25 RB / 0 RB Offset
	18650 to 19150	18650, 18900, 19150	10MHz	QPSK	50 RB / 0 RB Offset
	18675 to 19125	18675, 18900, 19125	15MHz	QPSK	75 RB / 0 RB Offset
	18700 to 19100	18700, 18900, 19100	20MHz	QPSK	100 RB / 0 RB Offset
PEAK TO AVERAGE RATIO	18607 to 19193	18607, 18900, 19193	1.4MHz	QPSK	1 RB / 0 RB Offset
	18615 to 19185	18615, 18900, 19185	3MHz	QPSK	1 RB / 0 RB Offset
	18625 to 19175	18625, 18900, 19175	5MHz	QPSK	1 RB / 0 RB Offset
	18650 to 19150	18650, 18900, 19150	10MHz	QPSK	1 RB / 0 RB Offset
	18675 to 19125	18675, 18900, 19125	15MHz	QPSK	1 RB / 0 RB Offset
	18700 to 19100	18700, 18900, 19100	20MHz	QPSK	1 RB / 0 RB Offset

BAND EDGE	18607 to 19193	18607	1.4MHz	QPSK	1 RB / 0 RB Offset
					6 RB / 0 RB Offset
		19193	1.4MHz	QPSK	1 RB / 5 RB Offset
					6 RB / 0 RB Offset
	18615 to 19185	18615	3MHz	QPSK	1 RB / 0 RB Offset
					15 RB / 0 RB Offset
		19185	3MHz	QPSK	1 RB / 14 RB Offset
					15 RB / 0 RB Offset
	18625 to 19175	18625	5MHz	QPSK	1 RB / 0 RB Offset
					25 RB / 0 RB Offset
		19175	5MHz	QPSK	1 RB / 24 RB Offset
					25 RB / 0 RB Offset
	18650 to 19150	18650	10MHz	QPSK	1 RB / 0 RB Offset
					50 RB / 0 RB Offset
		19150	10MHz	QPSK	1 RB / 49 RB Offset
					50 RB / 0 RB Offset
	18675 to 19125	18675	15MHz	QPSK	1 RB / 0 RB Offset
					75 RB / 0 RB Offset
		19125	15MHz	QPSK	1 RB / 74 RB Offset
					75 RB / 0 RB Offset
	18700 to 19100	18700	20MHz	QPSK	1 RB / 0 RB Offset
					100 RB / 0 RB Offset
		19100	20MHz	QPSK	1 RB / 99 RB Offset
					100 RB / 0 RB Offset
CONDCUDETED EMISSION	18607 to 19193	18607, 18900, 19193	1.4MHz	QPSK	1 RB / 0 RB Offset
	18615 to 19185	18615, 18900, 19185	3MHz	QPSK	1 RB / 0 RB Offset
	18625 to 19175	18625, 18900, 19175	5MHz	QPSK	1 RB / 0 RB Offset
	18650 to 19150	18650, 18900, 19150	10MHz	QPSK	1 RB / 0 RB Offset
	18675 to 19125	18675, 18900, 19125	15MHz	QPSK	1 RB / 0 RB Offset
	18700 to 19100	18700, 18900, 19100	20MHz	QPSK	1 RB / 0 RB Offset
RADIATED EMISSION	18607 to 19193	18607, 18900, 19193	1.4MHz	QPSK	1 RB / 0 RB Offset
	18615 to 19185	18900	3MHz	QPSK	1 RB / 0 RB Offset
	18625 to 19175	18900	5MHz	QPSK	1 RB / 0 RB Offset
	18650 to 19150	18900	10MHz	QPSK	1 RB / 0 RB Offset
	18675 to 19125	18900	15MHz	QPSK	1 RB / 0 RB Offset
	18700 to 19100	18900	20MHz	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
ERP	23deg. C, 70%RH	DC 5V	Jacky Liu
FREQUENCY STABILITY	23deg. C, 70%RH	DC 5V	Big Wang
OCCUPIED BANDWIDTH	23deg. C, 70%RH	DC 5V	Big Wang
BAND EDGE	23deg. C, 70%RH	DC 5V	Big Wang
CONDCUDETED EMISSION	23deg. C, 70%RH	DC 5V	Big Wang
PEAK TO AVERAGE RATIO	23deg. C, 70%RH	DC 5V	Big Wang
RADIATED EMISSION	23deg. C, 70%RH	DC 5V	Jacky Liu

2.5 EUT OPERATING CONDITIONS

The EUT makes a call to the communication simulator. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency

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:

Canada RSS-133, Issue 6, Amendment 1, January 2018

Canada RSS-Gen, Issue 5, Amendment 1, March 2019

ANSI C63.26 - 2015

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

2.7 TRANSMIT ANTENNA

The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.

Antenna Type	Fixed External Antenna
Antenna Gain	3.77dBi
Impedance	50 Ω

3 TEST TYPES AND RESULTS

3.1 OUTPUT POWER MEASUREMENT

3.1.1 LIMITS OF OUTPUT POWER MEASUREMENT

Mobile and portable stations are limited to 2 watts EIRP.

3.1.2 TEST PROCEDURES

EIRP MEASUREMENT:

Per KDB 971168 D01 Power Meas License Digital Systems v03r01 or subclause 5.2.5.5 of ANSI C63.26-2015, the relevant equation for determing the ERP or EIRP from the conducted RF output power measured using the guidance provided above is:

ERP or EIRP = $P_{Meas} + G_T – L_C$

Where:

ERP or EIRP = effective radiated power or equivalent isotropically radiated power, respectively

(expressed in the same units as P_{Meas}, typically dBW or dBm);

P_{Meas} = measured transmitter output power or PSD, in dBm or dBW;

G_T = gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP);

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

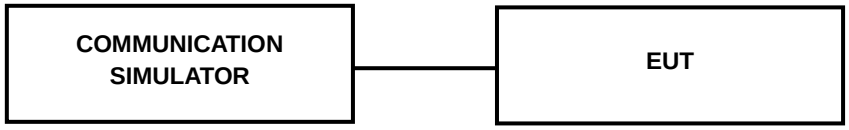
ERP=EIRP-2.15

CONDUCTED POWER MEASUREMENT:

The EUT was set up for the maximum power with WCDMA & 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

CONDUCTED POWER MEASUREMENT:



3.1.4 TEST RESULTS

CONDUCTED OUTPUT POWER (dBm)

LTE Band 2

BW	Modulation	RB Size	RB Offset	Low CH 18607	Mid CH 18900	High CH 19193	3GPP MPR (dB)
				Frequency 1850.7 MHz	Frequency 1880 MHz	Frequency 1909.3 MHz	
2/1.4	QPSK	1	0	22.30	22.39	22.45	0
		1	5	22.32	22.27	22.47	0
		3	0	22.27	22.24	22.37	0
		3	3	22.29	22.38	22.44	0
		6	0	22.31	22.26	22.46	0

BW	Modulation	RB Size	RB Offset	Low CH 18615	Mid CH 18900	High CH 19185	3GPP MPR (dB)
				Frequency 1851.5 MHz	Frequency 1880 MHz	Frequency 1908.5 MHz	
2/3	QPSK	1	0	22.33	22.42	22.48	0
		1	5	22.35	22.30	22.50	0
		3	0	22.30	22.27	22.40	0
		3	3	22.23	22.15	22.34	1
		6	0	22.31	22.32	22.43	1

BW	Modulation	RB Size	RB Offset	Low CH 18625	Mid CH 18900	High CH 19175	3GPP MPR (dB)
				Frequency 1852.5 MHz	Frequency 1880 MHz	Frequency 1907.5 MHz	
2/5	QPSK	1	0	22.36	22.45	22.51	0
		1	5	22.38	22.33	22.53	0
		3	0	22.33	22.30	22.43	0
		3	3	22.26	22.18	22.37	1
		6	0	22.34	22.35	22.46	1

BW	Modulation	RB Size	RB Offset	Low CH 18650	Mid CH 18900	High CH 19150	3GPP MPR (dB)
				Frequency 1855 MHz	Frequency 1880 MHz	Frequency 1905 MHz	
2/10	QPSK	1	0	22.38	22.47	22.53	0
		1	5	22.40	22.35	22.55	0
		3	0	22.35	22.32	22.45	0
		3	3	22.28	22.20	22.39	1
		6	0	22.36	22.37	22.48	1

BW	Modulation	RB Size	RB Offset	Low CH 18675	Mid CH 18900	High CH 19125	3GPP MPR (dB)
				Frequency 1857.5 MHz	Frequency 1880 MHz	Frequency 1902.5 MHz	
2/15	QPSK	1	0	22.41	22.50	22.56	0
		1	5	22.43	22.38	22.58	0
		3	0	22.38	22.35	22.48	0
		3	3	22.31	22.23	22.42	1
		6	0	22.39	22.40	22.51	1

BW	Modulation	RB Size	RB Offset	Low CH 18700	Mid CH 18900	High CH 19100	3GPP MPR (dB)
				Frequency 1860 MHz	Frequency 1880 MHz	Frequency 1900 MHz	
2/20	QPSK	1	0	22.46	22.55	22.61	0
		1	5	22.48	22.43	**22.63**	0
		3	0	22.43	22.40	22.53	0
		3	3	22.36	22.28	22.47	1
		6	0	22.44	22.45	22.56	1

EIRP POWER (dBm)

LTE BAND 2

CHANNEL BANDWIDTH: 1.4MHz QPSK

Channel	Frequency (MHz)	Conducted Power (dBm)	G_T-L_C (dB)	EIRP (dBm)	EIRP (mW)	Limit (W)
18607	1850.7	22.35	3.77	26.12	409.26	2
18900	1880.0	22.34	3.77	26.11	408.32	2
19193	1908.3	22.52	3.77	26.29	**425.6**	2

CHANNEL BANDWIDTH: 3MHz QPSK

Channel	Frequency (MHz)	Conducted Power (dBm)	G_T-L_C (dB)	EIRP (dBm)	EIRP (mW)	Limit (W)
18615	1851.5	22.38	3.77	26.15	412.1	2
18900	1880.0	22.38	3.77	26.15	412.1	2
19185	1908.5	22.55	3.77	26.32	**428.55**	2

CHANNEL BANDWIDTH: 5MHz QPSK

Channel	Frequency (MHz)	Conducted Power (dBm)	G_T-L_C (dB)	EIRP (dBm)	EIRP (mW)	Limit (W)
18625	1852.5	22.40	3.77	26.17	414	2
18900	1880.0	22.41	3.77	26.18	414.95	2
19175	1907.5	22.58	3.77	26.35	**431.52**	2

CHANNEL BANDWIDTH: 10MHz QPSK

Channel	Frequency (MHz)	Conducted Power (dBm)	G_T-L_C (dB)	EIRP (dBm)	EIRP (mW)	Limit (W)
18650	1855.0	22.43	3.77	26.20	416.87	2
18900	1880.0	22.42	3.77	26.19	415.91	2
19150	1905.0	22.60	3.77	26.37	**433.51**	2

CHANNEL BANDWIDTH: 15MHz QPSK

Channel	Frequency (MHz)	Conducted Power (dBm)	G_T-L_C (dB)	EIRP (dBm)	EIRP (mW)	Limit (W)
18675	1857.5	22.46	3.77	26.23	**419.76**	2
18900	1880.0	22.46	3.77	26.23	419.76	2
19125	1902.5	22.43	3.77	26.20	416.87	2

CHANNEL BANDWIDTH: 20MHz QPSK

Channel	Frequency (MHz)	Conducted Power (dBm)	G_T-L_C (dB)	EIRP (dBm)	EIRP (mW)	Limit (W)
18675	1857.5	22.51	3.77	26.28	424.62	2
18900	1880.0	22.51	3.77	26.28	424.62	2
19125	1902.5	22.68	3.77	26.45	**441.57**	2

3.2 FREQUENCY STABILITY MEASUREMENT

3.2.1 LIMITS OF FREQUENCY STABILIITY MEASUREMENT

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

3.2.2 TEST PROCEDURE

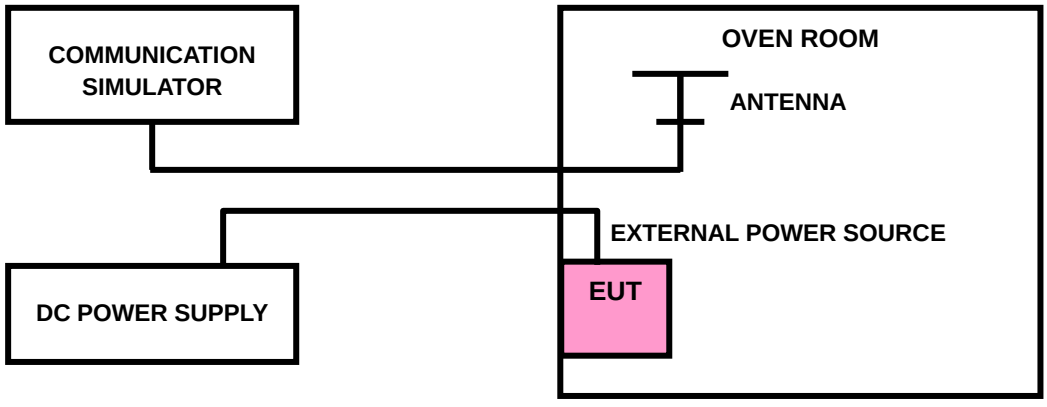
a. Device is placed at the oven room. The oven room could control the temperatures and humidity. Power warm up is at least 15 min and power applied should perform before recording frequency error.

b. EUT is connected the external power supply to control the DC input power. The test voltage range is from minimum to maximum working voltage. Each step shall be record the frequency error rate.

c. The temperature range step is 10 degrees in this test items. All temperature levels shall be hold the ±0.5℃ during the measurement testing. The each temperature step shall be at least 0.5 hours, consider the EUT could be test under the stability condition.

NOTE: The frequency error was recorded frequency error from the communication simulator.

3.2.3 TEST SETUP



3.2.4 TEST RESULTS

LTE BAND 2

FREQUENCY ERROR VS. VOLTAGE

VOLTAGE (Volts)	1.4MHz		LIMIT (ppm)
	FREQUENCY ERROR (ppm)		
	Low Channel	High Channel	
V_{nor}	0.0022	0.0025	2.5
V_{min}	-0.0031	-0.0030	2.5
V_{max}	0.0021	0.0020	2.5

NOTE: The applicant defined the normal working voltage of the battery is V_{min} to V_{max}.

FREQUENCY ERROR vs. TEMPERATURE.

TEMP. (℃)	1.4MHz		LIMIT (ppm)
	FREQUENCY ERROR (ppm)		
	Low Channel	High Channel	
-30	-0.0120	-0.0118	2.5
-20	-0.0100	-0.0100	2.5
-10	-0.0085	-0.0080	2.5
0	-0.0074	-0.0075	2.5
10	-0.0055	-0.0045	2.5
20	-0.0041	-0.0041	2.5
30	-0.0036	-0.0040	2.5
40	-0.0018	-0.0017	2.5
50	-0.0003	-0.0002	2.5

FREQUENCY ERROR VS. VOLTAGE

VOLTAGE (Volts)	3MHz		LIMIT (ppm)
	FREQUENCY ERROR (ppm)		
	Low Channel	High Channel	
V_{nor}	0.0021	0.0021	2.5
V_{min}	-0.0021	-0.0025	2.5
V_{max}	0.0018	0.0018	2.5

NOTE: The applicant defined the normal working voltage of the battery is V_{min} to V_{max}.

FREQUENCY ERROR vs. TEMPERATURE.

TEMP. (℃)	3MHz		LIMIT (ppm)
	FREQUENCY ERROR (ppm)		
	Low Channel	High Channel	
-30	-0.0117	-0.0115	2.5
-20	-0.0111	-0.0104	2.5
-10	-0.0083	-0.0080	2.5
0	-0.0073	-0.0073	2.5
10	-0.0048	-0.0045	2.5
20	-0.0040	-0.0042	2.5
30	-0.0024	-0.0041	2.5
40	-0.0017	-0.0017	2.5
50	-0.0005	-0.0004	2.5

FREQUENCY ERROR VS. VOLTAGE

VOLTAGE (Volts)	5MHz		LIMIT (ppm)
	FREQUENCY ERROR (ppm)		
	Low Channel	High Channel	
V_{nor}	0.0021	0.0024	2.5
V_{min}	-0.0023	-0.0030	2.5
V_{max}	0.0022	0.0020	2.5

NOTE: The applicant defined the normal working voltage of the battery is V_{min} to V_{max}.

FREQUENCY ERROR vs. TEMPERATURE.

TEMP. (℃)	5MHz		LIMIT (ppm)
	FREQUENCY ERROR (ppm)		
	Low Channel	High Channel	
-30	-0.0119	-0.0111	2.5
-20	-0.0113	-0.0104	2.5
-10	-0.0086	-0.0082	2.5
0	-0.0076	-0.0073	2.5
10	-0.0056	-0.0046	2.5
20	-0.0043	-0.0037	2.5
30	-0.0034	-0.0024	2.5
40	-0.0018	-0.0021	2.5
50	-0.0005	-0.0005	2.5

FREQUENCY ERROR VS. VOLTAGE

VOLTAGE (Volts)	10MHz		LIMIT (ppm)
	FREQUENCY ERROR (ppm)		
	Low Channel	High Channel	
V_{nor}	0.0024	0.0024	2.5
V_{min}	-0.0031	-0.0030	2.5
V_{max}	0.0025	0.0026	2.5

NOTE: The applicant defined the normal working voltage of the battery is V_{min} to V_{max}.

FREQUENCY ERROR vs. TEMPERATURE.

TEMP. (℃)	10MHz		LIMIT (ppm)
	FREQUENCY ERROR (ppm)		
	Low Channel	High Channel	
-30	-0.0117	-0.0113	2.5
-20	-0.0109	-0.0097	2.5
-10	-0.0083	-0.0081	2.5
0	-0.0073	-0.0073	2.5
10	-0.0052	-0.0055	2.5
20	-0.0044	-0.0041	2.5
30	-0.0031	-0.0025	2.5
40	-0.0015	-0.0015	2.5
50	-0.0004	-0.0003	2.5

FREQUENCY ERROR VS. VOLTAGE

VOLTAGE (Volts)	15MHz		LIMIT (ppm)
	FREQUENCY ERROR (ppm)		
	Low Channel	High Channel	
V_{nor}	0.0027	0.0024	2.5
V_{min}	-0.0031	-0.0030	2.5
V_{max}	0.0025	0.0024	2.5

NOTE: The applicant defined the normal working voltage of the battery is V_{min} to V_{max}.

FREQUENCY ERROR vs. TEMPERATURE.

TEMP. (℃)	15MHz		LIMIT (ppm)
	FREQUENCY ERROR (ppm)		
	Low Channel	High Channel	
-30	-0.0116	-0.0111	2.5
-20	-0.0109	-0.0108	2.5
-10	-0.0085	-0.0081	2.5
0	-0.0076	-0.0074	2.5
10	-0.0050	-0.0053	2.5
20	-0.0042	-0.0043	2.5
30	-0.0032	-0.0029	2.5
40	-0.0015	-0.0015	2.5
50	-0.0005	-0.0002	2.5

FREQUENCY ERROR VS. VOLTAGE

VOLTAGE (Volts)	20MHz		LIMIT (ppm)
	FREQUENCY ERROR (ppm)		
	Low Channel	High Channel	
V_{nor}	0.0024	0.0026	2.5
V_{min}	-0.0031	-0.0030	2.5
V_{max}	0.0026	0.0025	2.5

NOTE: The applicant defined the normal working voltage of the battery is V_{min} to V_{max}.

FREQUENCY ERROR vs. TEMPERATURE.

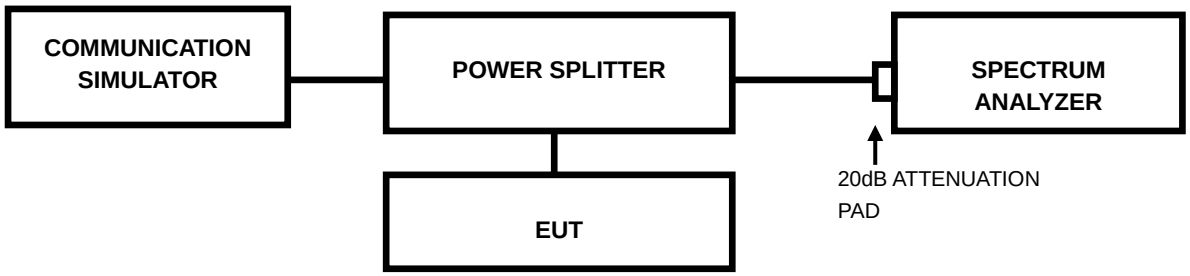
TEMP. (℃)	20MHz		LIMIT (ppm)
	FREQUENCY ERROR (ppm)		
	Low Channel	High Channel	
-30	-0.0113	-0.0119	2.5
-20	-0.0110	-0.0101	2.5
-10	-0.0086	-0.0081	2.5
0	-0.0076	-0.0076	2.5
10	-0.0050	-0.0047	2.5
20	-0.0043	-0.0038	2.5
30	-0.0027	-0.0034	2.5
40	-0.0022	-0.0015	2.5
50	-0.0004	-0.0006	2.5

3.3 OCCUPIED BANDWIDTH MEASUREMENT

3.3.1 TEST PROCEDURES

The EUT makes a call to the communication simulator. All measurements were done at low, middle and high operational frequency range. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency. Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth.

3.3.2 TEST SETUP



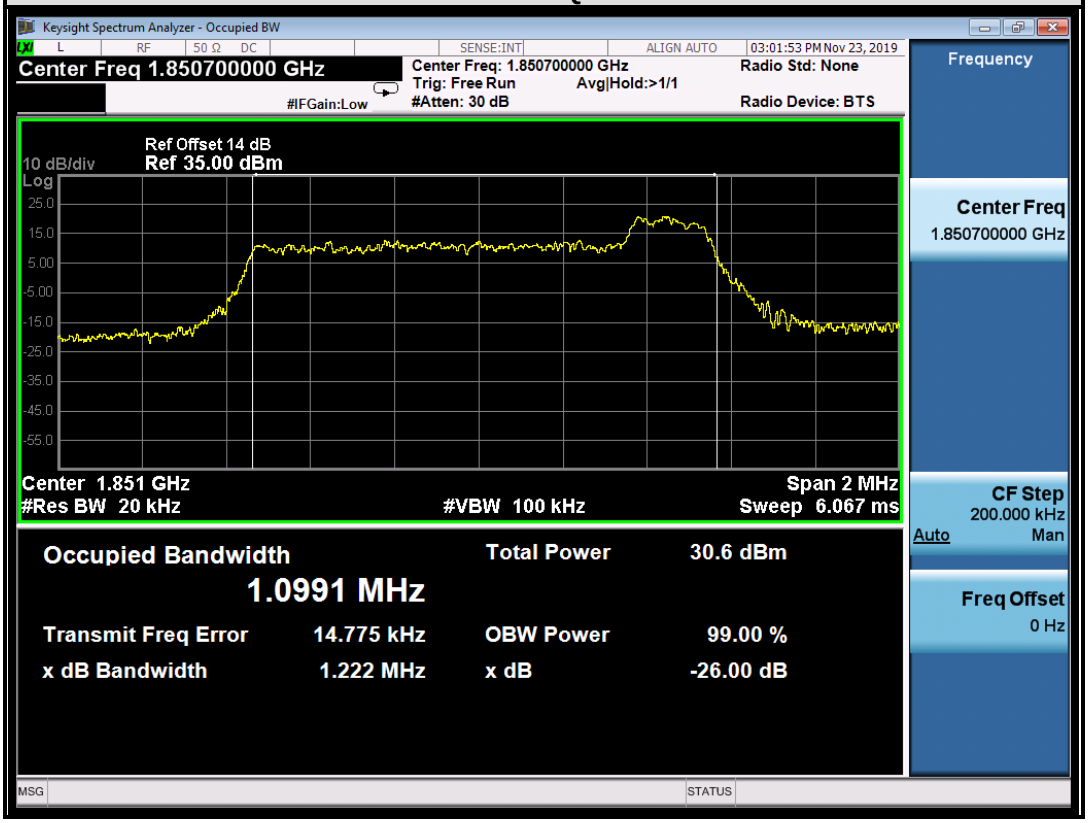
3.3.3 TEST RESULTS

LTE BAND 2

CHANNEL BANDWIDTH:1.4MHz			
CHANNEL	Frequency (MHz)	99% OCCUPIED Bandwidth (MHz)	26 dB bandwidth (MHz)
		QPSK	QPSK
18607	1850.7	1.10	1.22
18900	1880	1.10	1.23
19193	1909.3	1.10	1.21

SPECTRUM PLOT OF WORST VALUE of 99% Occupied Bandwidth/ 26 dB Occupied Bandwidth

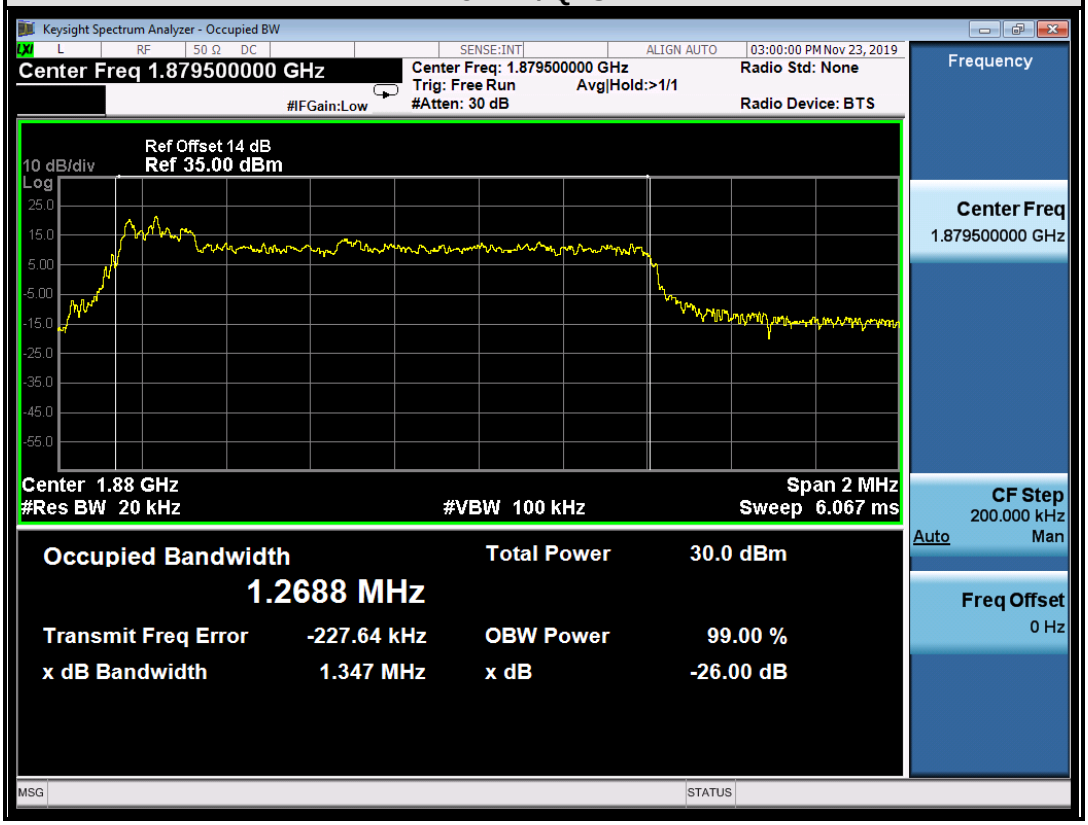
1.4MHz / QPSK



CHANNEL BANDWIDTH:3MHz			
CHANNEL	Frequency (MHz)	99% OCCUPIED Bandwidth (MHz)	26 dB bandwidth (MHz)
		QPSK	QPSK
18615	1851.5	1.26	1.43
18900	1880	1.27	1.35
19185	1908.5	1.27	1.41

SPECTRUM PLOT OF WORST VALUE of 99% Occupied Bandwidth/ 26 dB Occupied Bandwidth

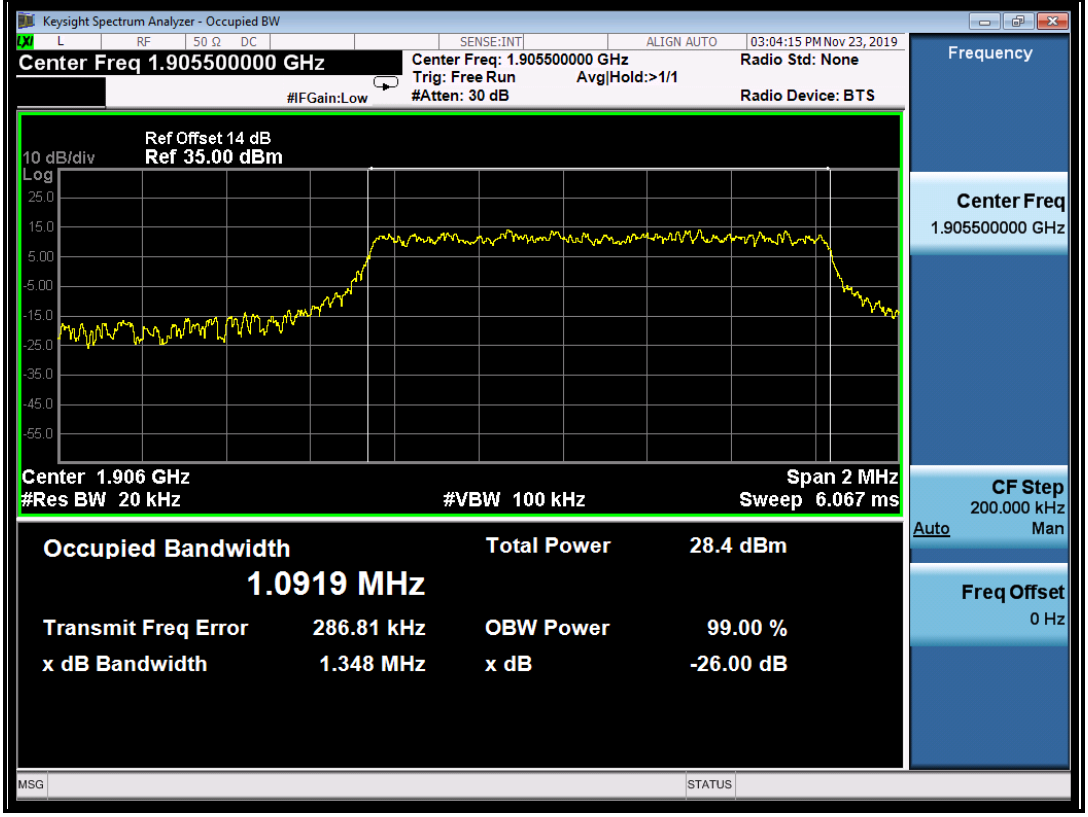
3MHz / QPSK



CHANNEL BANDWIDTH:5MHz			
CHANNEL	Frequency (MHz)	99% OCCUPIED Bandwidth (MHz)	26 dB bandwidth (MHz)
		QPSK	QPSK
18625	1852.5	1.09	1.36
18900	1880	1.09	1.29
19175	1907.5	1.09	1.35

SPECTRUM PLOT OF WORST VALUE of 99% Occupied Bandwidth/ 26 dB Occupied Bandwidth

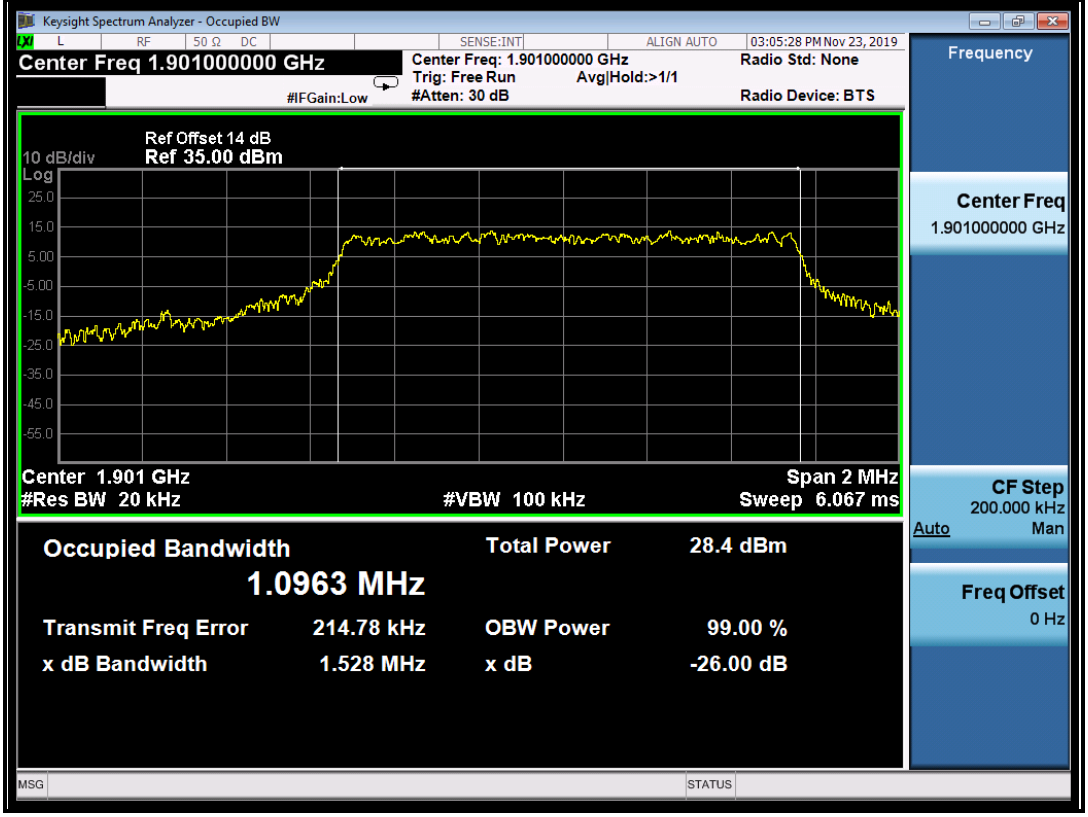
5MHz / QPSK



CHANNEL BANDWIDTH:10MHz			
CHANNEL	Frequency (MHz)	99% OCCUPIED Bandwidth (MHz)	26 dB bandwidth (MHz)
		QPSK	QPSK
18650	1855	1.09	1.41
18900	1880	1.09	1.41
19150	1905	1.10	1.53

SPECTRUM PLOT OF WORST VALUE of 99% Occupied Bandwidth/ 26 dB Occupied Bandwidth

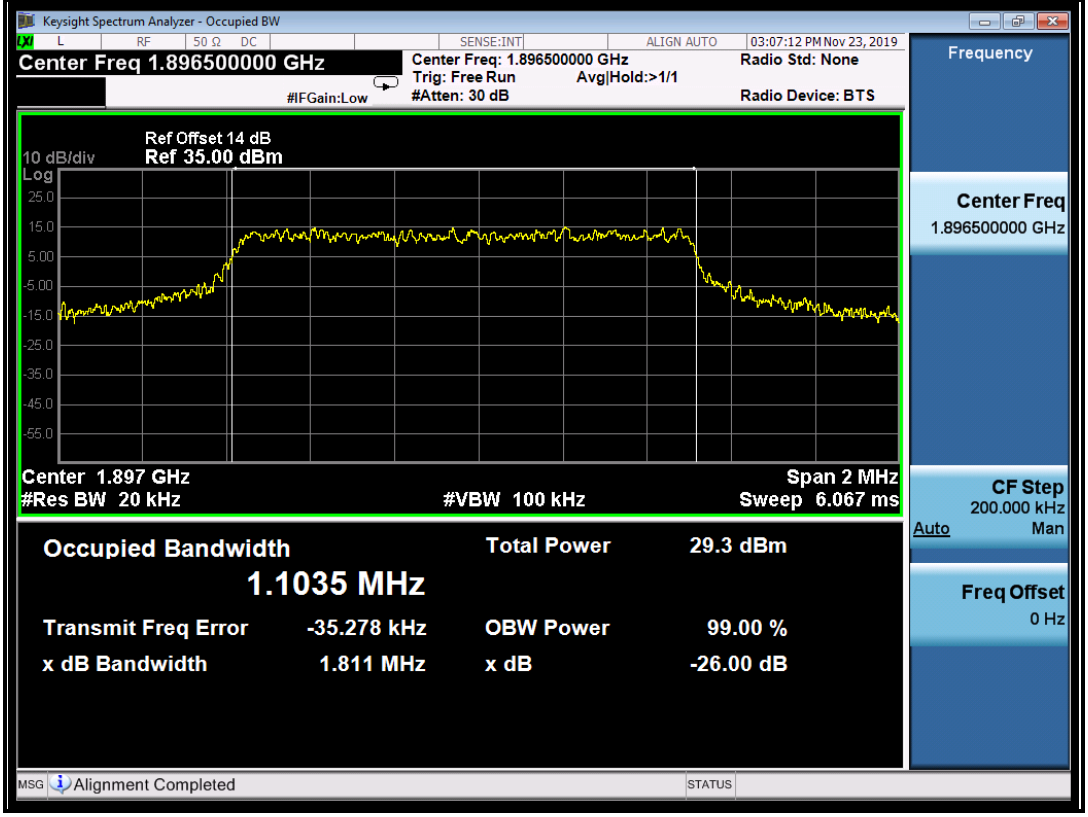
10MHz / QPSK



CHANNEL BANDWIDTH:15MHz			
CHANNEL	Frequency (MHz)	99% OCCUPIED Bandwidth (MHz)	26 dB bandwidth (MHz)
		QPSK	QPSK
18675	1857.5	1.10	1.49
18900	1880	1.10	1.57
19125	1902.5	1.10	1.81

SPECTRUM PLOT OF WORST VALUE of 99% Occupied Bandwidth/ 26 dB Occupied Bandwidth

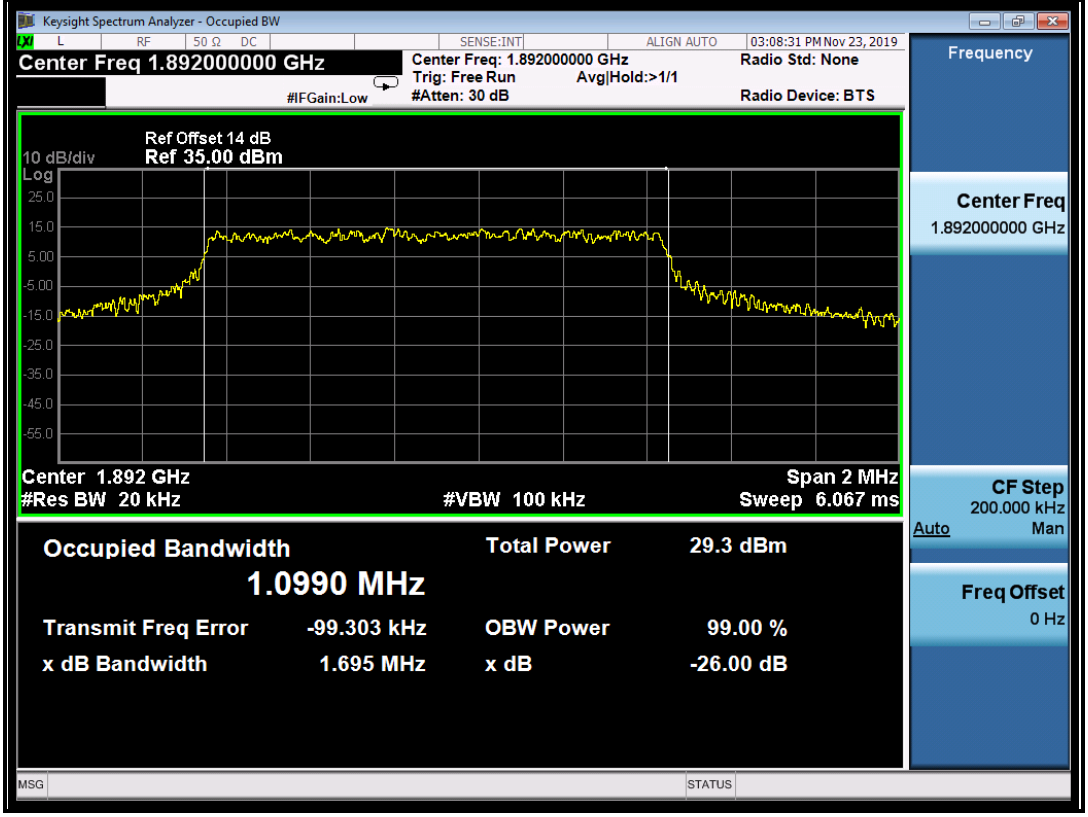
15MHz / QPSK



CHANNEL BANDWIDTH:20MHz			
CHANNEL	Frequency (MHz)	99% OCCUPIED Bandwidth (MHz)	26 dB bandwidth (MHz)
		QPSK	QPSK
18700	1860	1.09	1.58
18900	1880	1.10	1.48
19100	1900	1.10	1.70

SPECTRUM PLOT OF WORST VALUE of 99% Occupied Bandwidth/ 26 dB Occupied Bandwidth

20MHz / QPSK

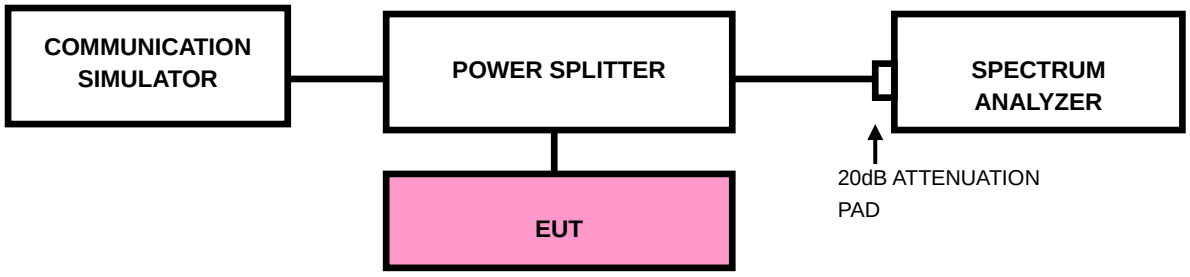


3.4 BAND EDGE MEASUREMENT

3.4.1 LIMITS OF BAND EDGE MEASUREMENT

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. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

3.4.2 TEST SETUP



3.4.3 TEST PROCEDURES

a. All measurements were done at low and high operational frequency range.

b. The center frequency of spectrum is the band edge frequency and span is 1~5 MHz. RBW of the spectrum is 20kHz and VBW of the spectrum is 100 kHz. (LTE bandwidth 1.4MHz)

c. The center frequency of spectrum is the band edge frequency and span is 1~5 MHz. RBW of the spectrum is 30kHz and VBW of the spectrum is 100kHz. (LTE bandwidth 3MHz)

d. The center frequency of spectrum is the band edge frequency and span is 1~5 MHz. RBW of the spectrum is 50kHz and VBW of the spectrum is 200kHz. (LTE bandwidth 5MHz)

e. The center frequency of spectrum is the band edge frequency and span is 1~5 MHz. RBW of the spectrum is 100kHz and VBW of the spectrum is 300kHz. (LTE bandwidth 10MHz)

f. The center frequency of spectrum is the band edge frequency and span is 1~5 MHz. RBW of the spectrum is 200kHz and VBW of the spectrum is 1MHz. (LTE bandwidth 15MHz)

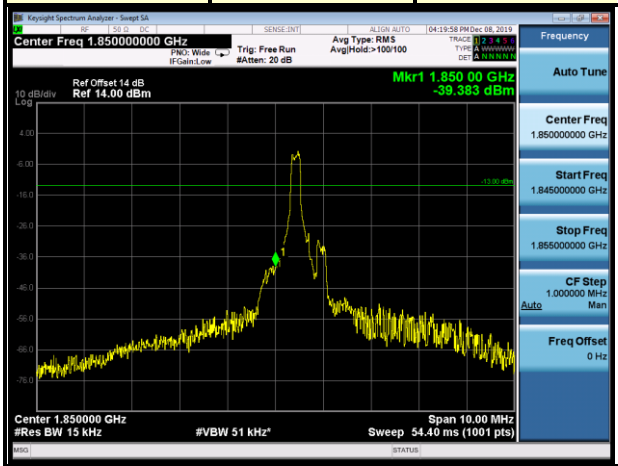
g. he center frequency of spectrum is the band edge frequency and span is 1~5 MHz. RBW of the spectrum is 200kHz and VBW of the spectrum is 1MHz. (LTE bandwidth 20MHz)

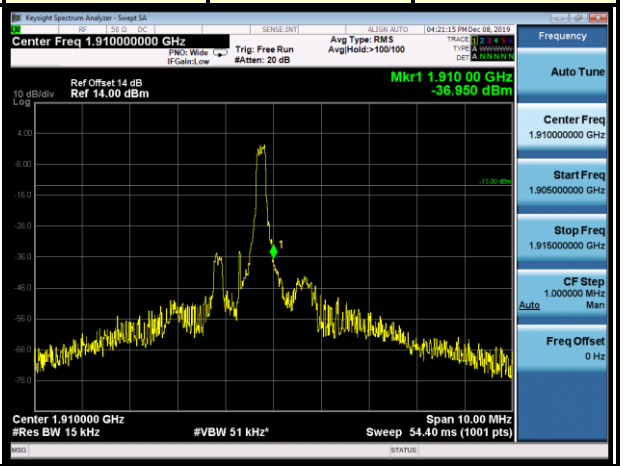
h. Record the max trace plot into the test report.

3.4.4 TEST RESULTS

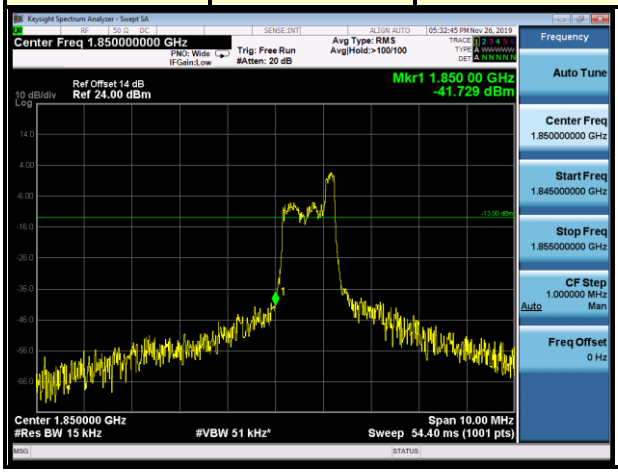
LTE BAND 2

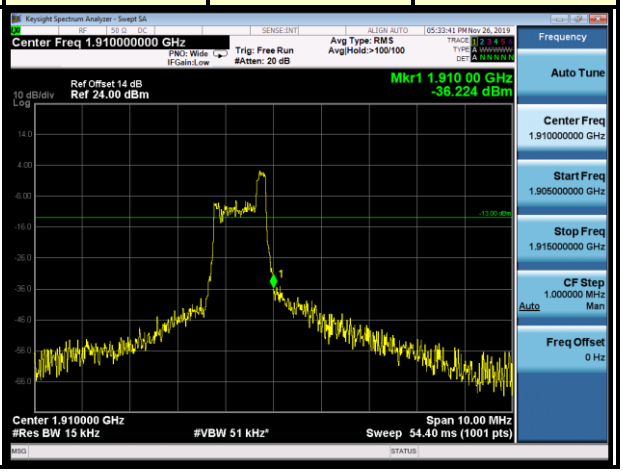
Channel Bandwidth: 1.4MHz QPSK					
CHANNEL	18607	1 RB	CHANNEL	19193	1 RB

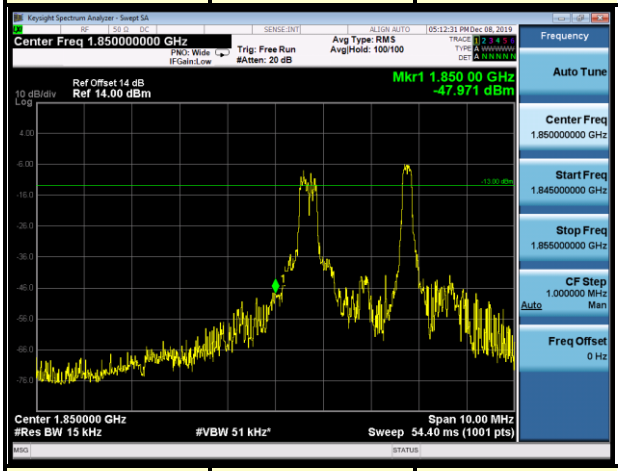
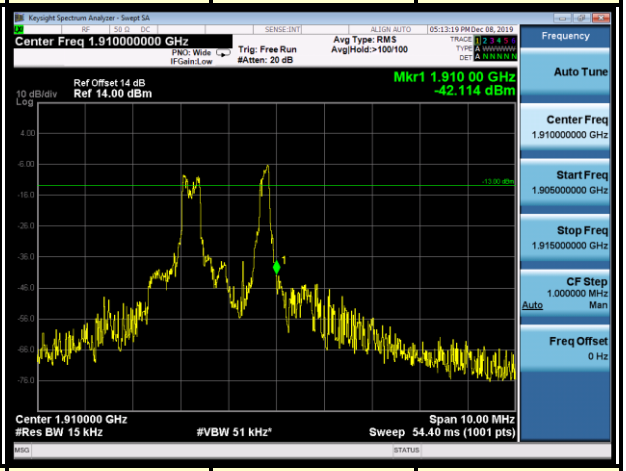
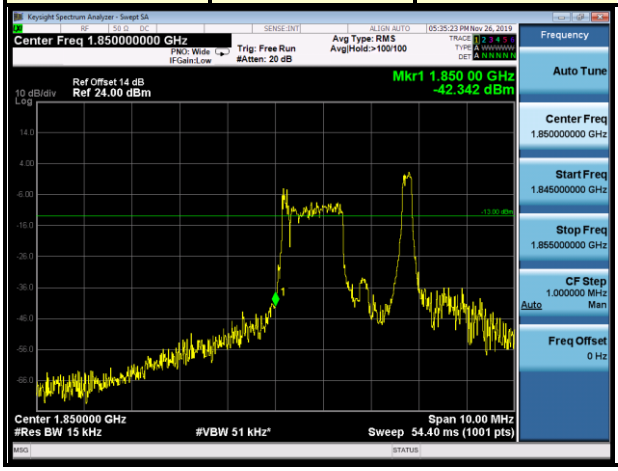
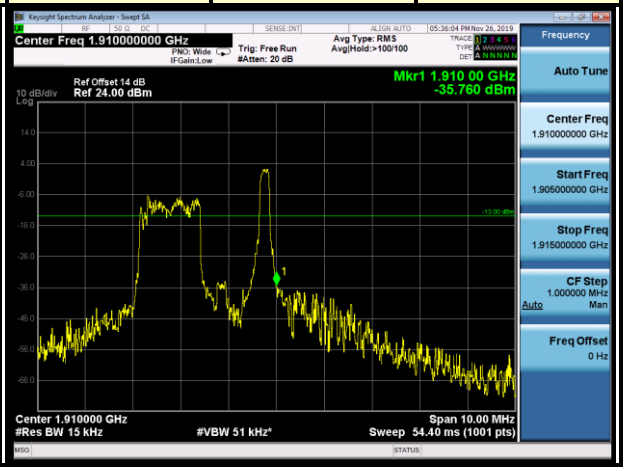




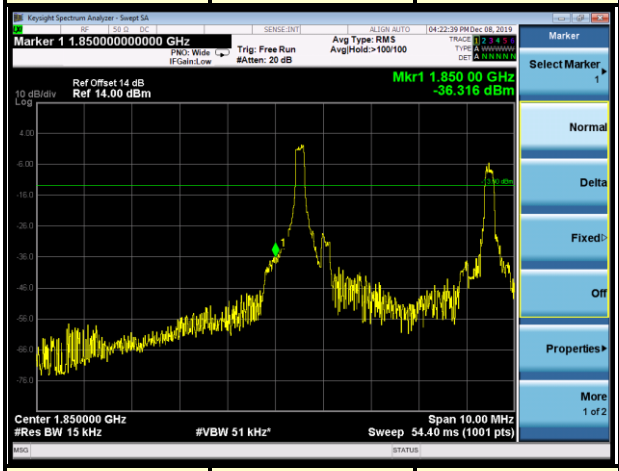
CHANNEL	18607	Full RB	CHANNEL	19193	Full RB

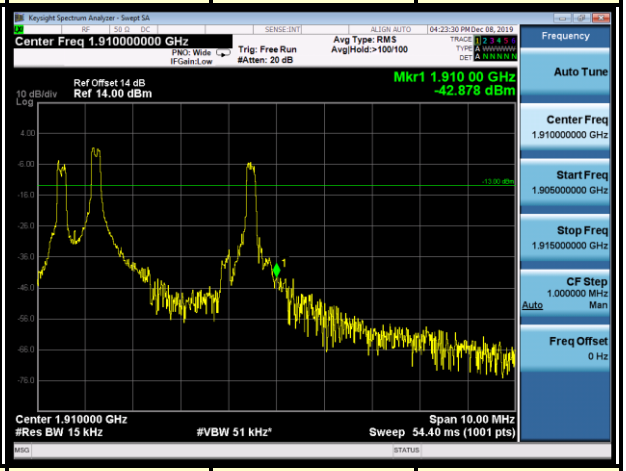




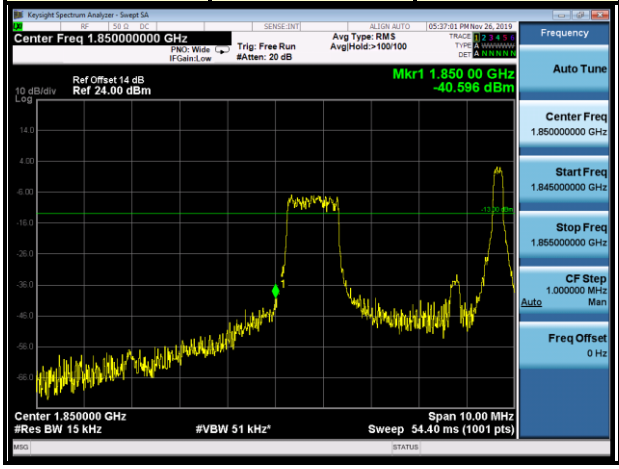
Channel Bandwidth: 3MHz QPSK					
CHANNEL	18615	1 RB	CHANNEL	19185	1 RB
					
CHANNEL	18615	Full RB	CHANNEL	19185	Full RB
					

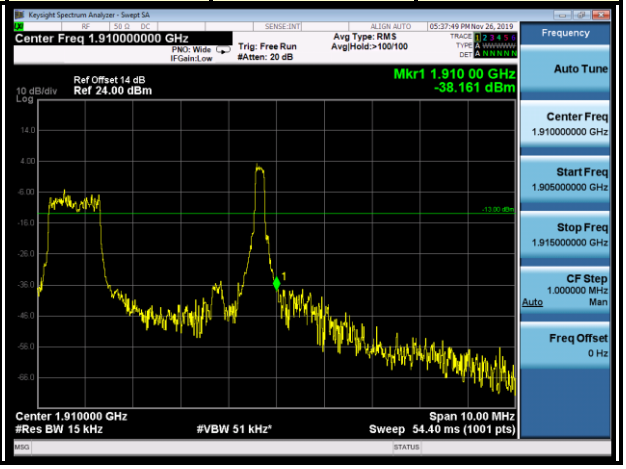
Channel Bandwidth: 5MHz QPSK					
CHANNEL	18625	1 RB	CHANNEL	19175	1 RB

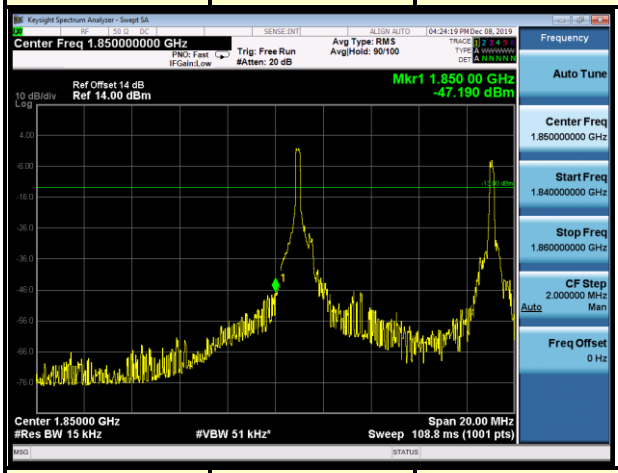
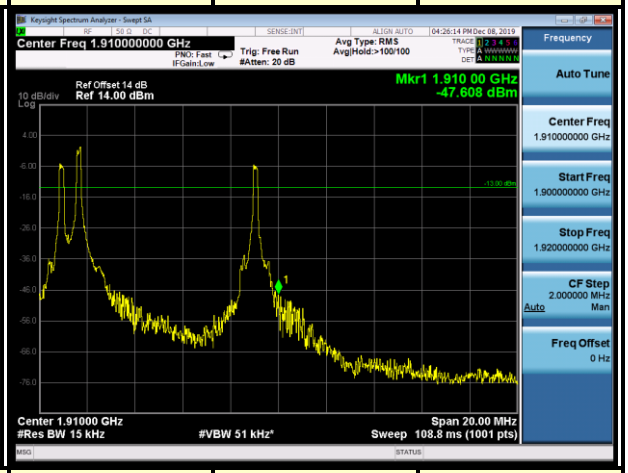
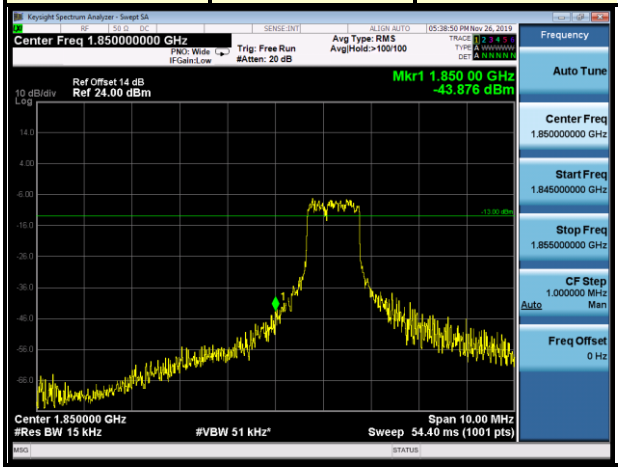
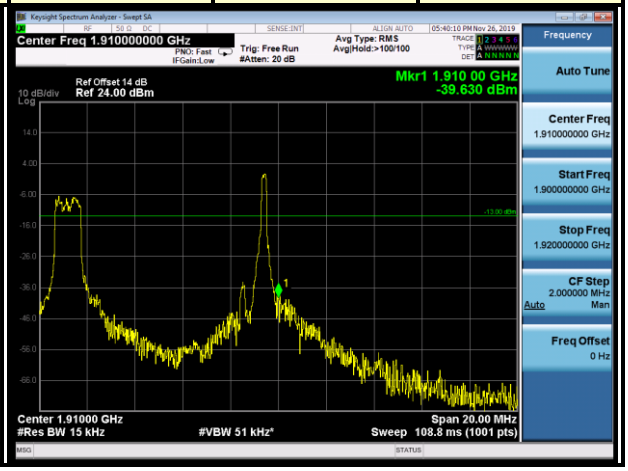


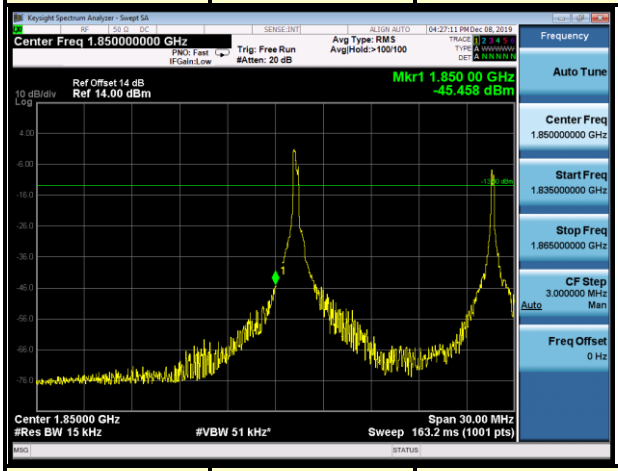
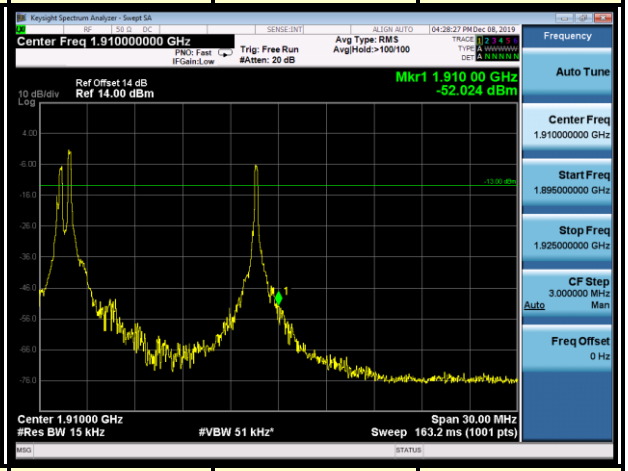
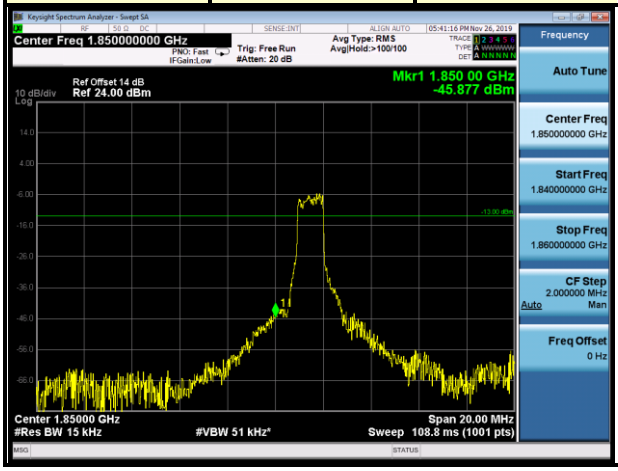
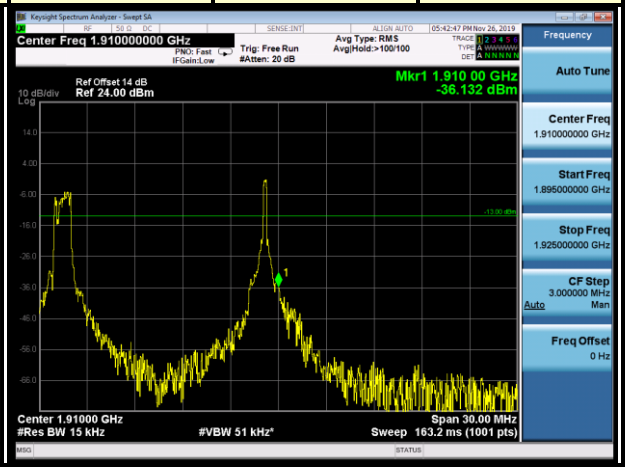


CHANNEL	18625	Full RB	CHANNEL	19175	Full RB

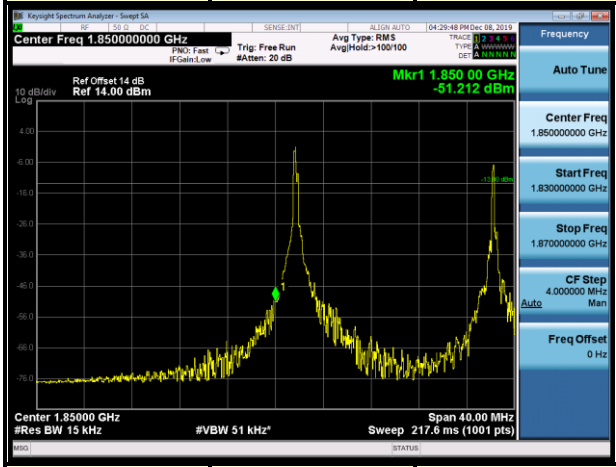


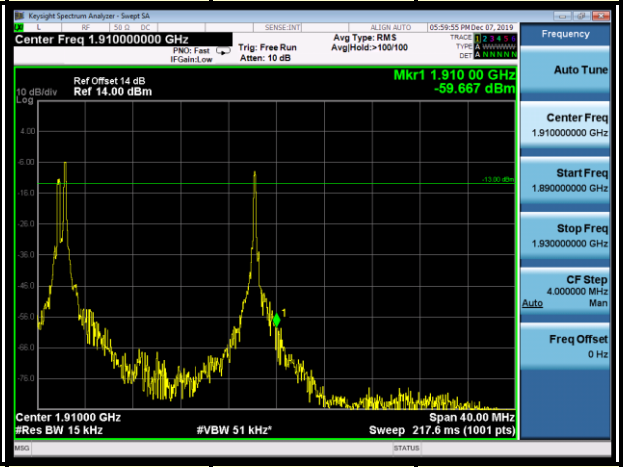


Channel Bandwidth: 10MHz QPSK					
CHANNEL	18650	1 RB	CHANNEL	19150	1 RB
					
CHANNEL	18650	Full RB	CHANNEL	19150	Full RB
					

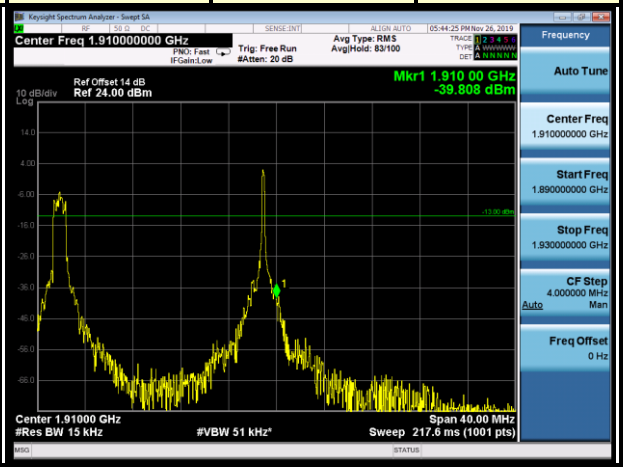
Channel Bandwidth: 15MHz QPSK					
CHANNEL	18675	1 RB	CHANNEL	19125	1 RB
					
CHANNEL	18675	Full RB	CHANNEL	19125	Full RB
					

Channel Bandwidth: 20MHz QPSK					
CHANNEL	18700	Full RB	CHANNEL	19100	Full RB





CHANNEL	18700	Full RB	CHANNEL	19100	Full RB



3.5 CONDUCTED SPURIOUS EMISSIONS

3.5.1 LIMITS OF CONDUCTED SPURIOUS EMISSIONS MEASUREMENT

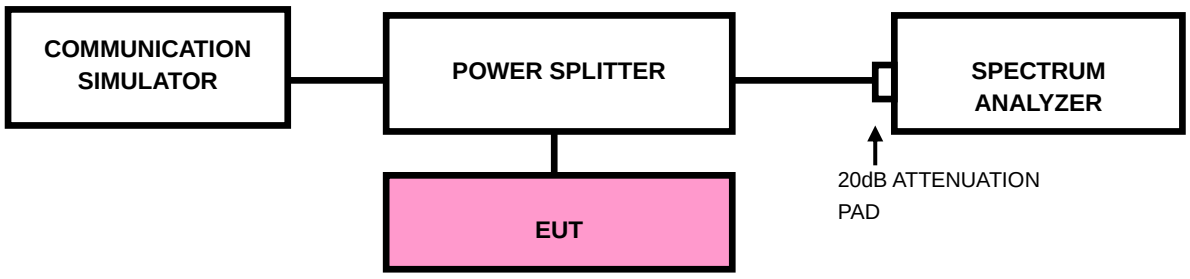
The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB. The emission limit equal to –13dBm.

3.5.2 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 9 kHz to 19.1GHz. 20dB attenuation pad is connected with spectrum. RBW=1MHz and VBW=3MHz is used for conducted emission measurement.

3.5.3 TEST SETUP



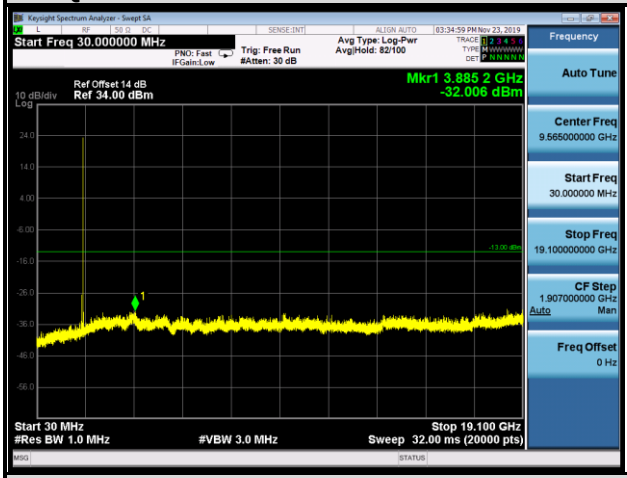
3.5.4 TEST RESULTS

LTE BAND 2

1.4MHz / QPSK

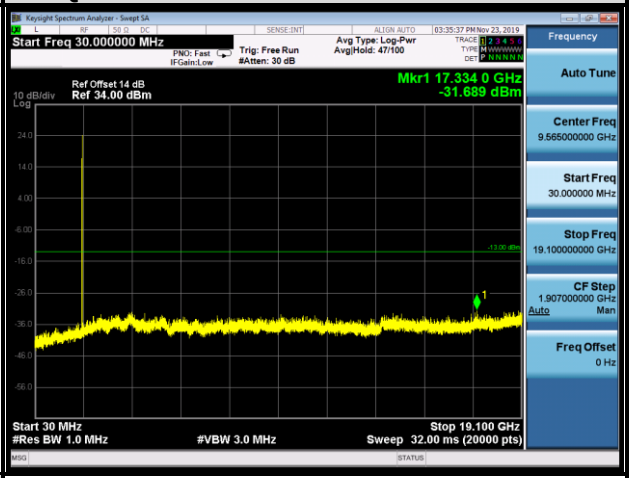
CHANNEL 18607

FREQUENCY RANGE : 30MHz~19.1GHz



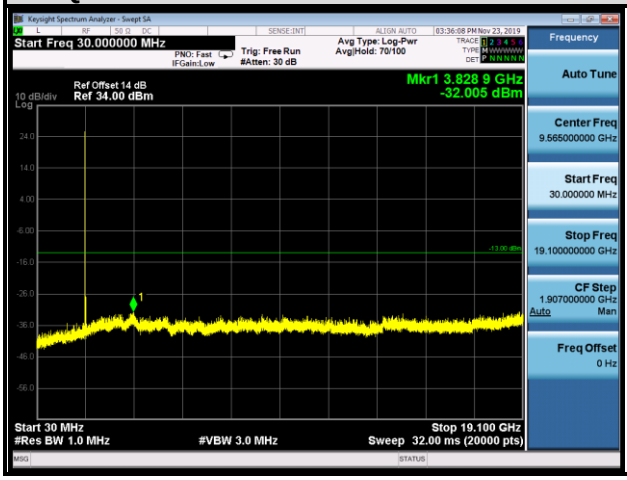
CHANNEL 18900

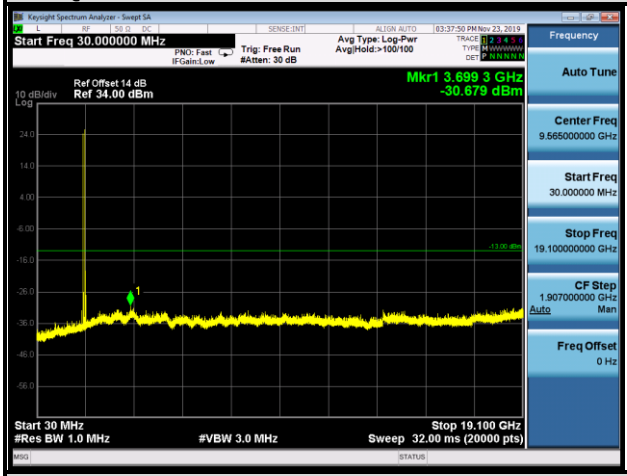
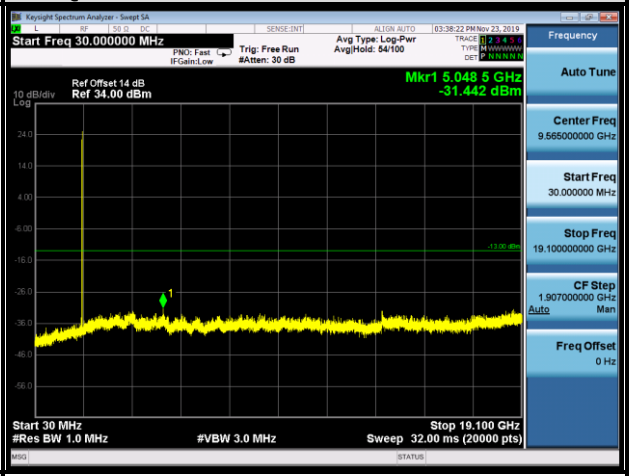
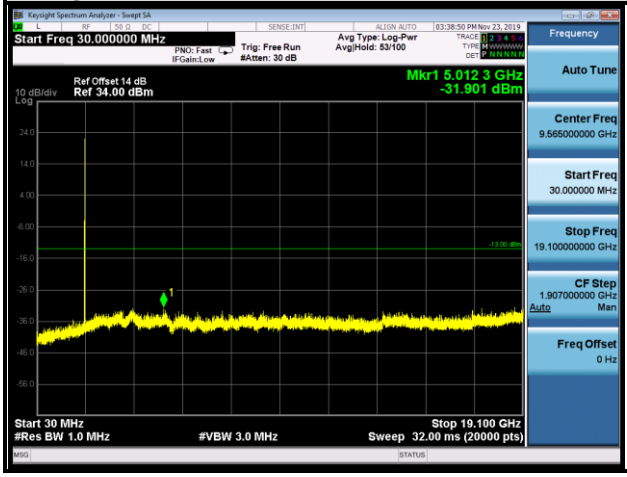
FREQUENCY RANGE : 30MHz~19.1GHz

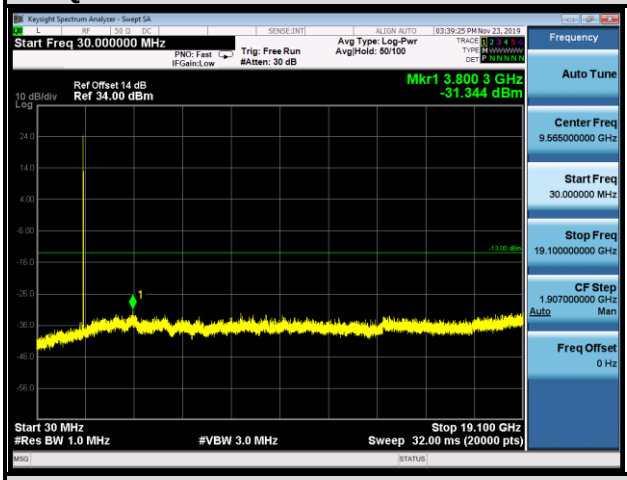
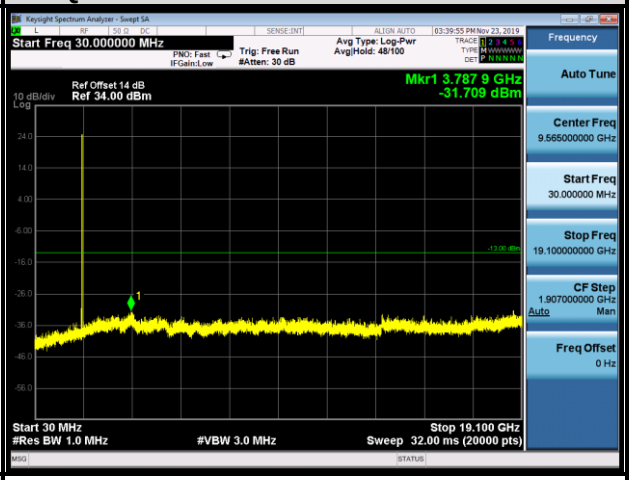
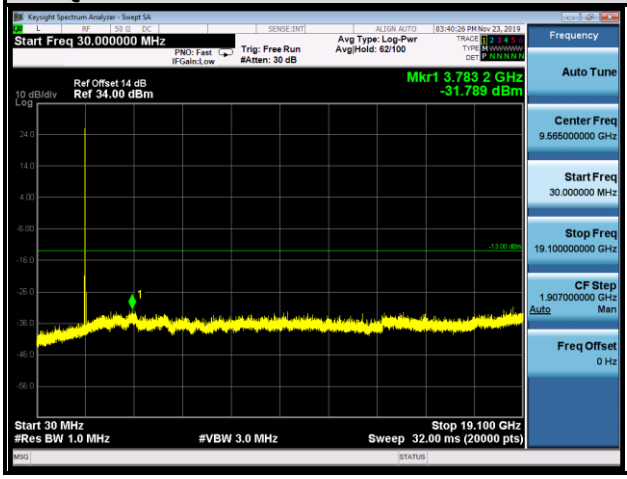


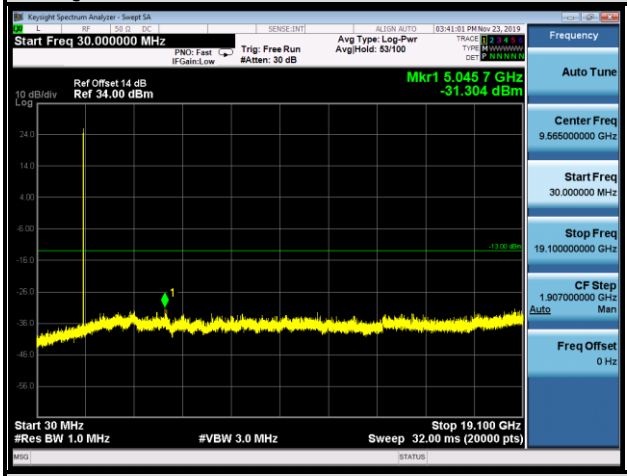
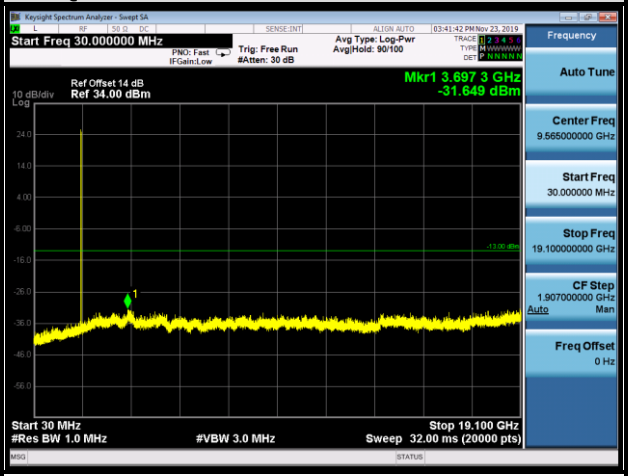
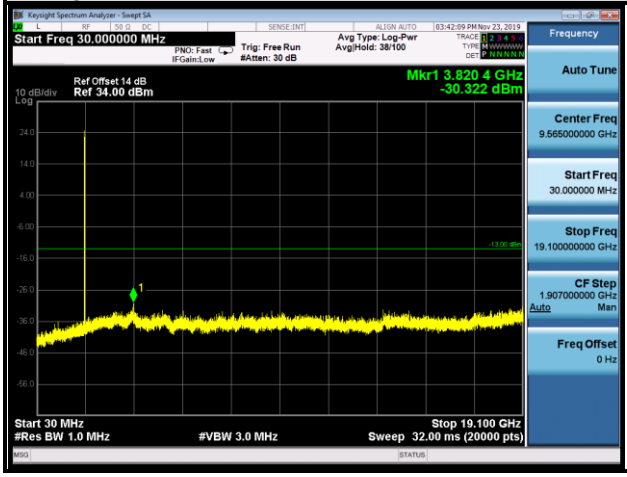
CHANNEL 19193

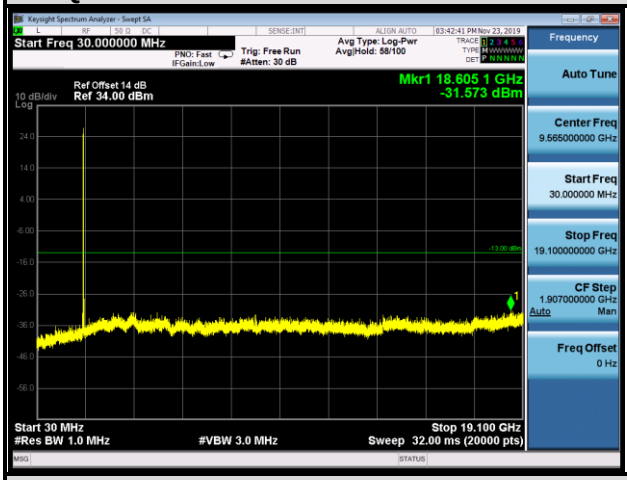
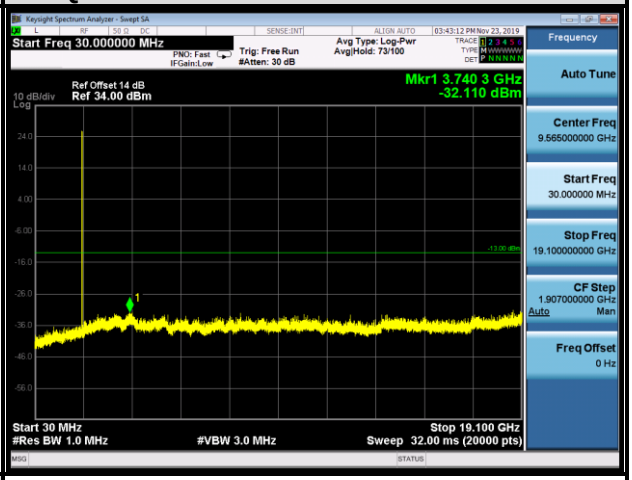
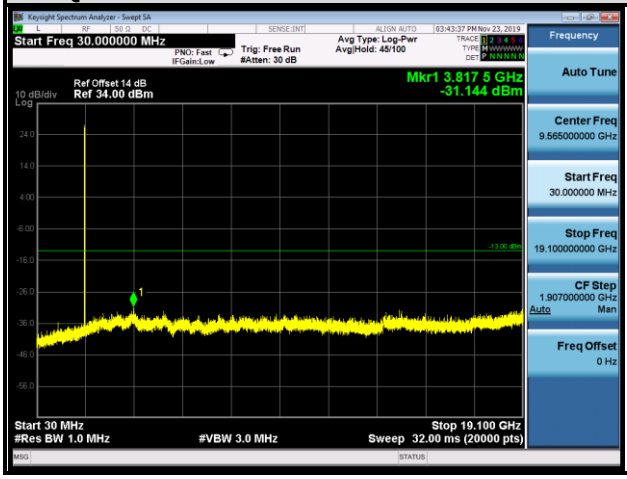
FREQUENCY RANGE : 30MHz~19.1GHz



3MHz / QPSK	
CHANNEL 18615	CHANNEL 18900
FREQUENCY RANGE : 30MHz~19.1GHz	FREQUENCY RANGE : 30MHz~19.1GHz
	
CHANNEL 19185	
FREQUENCY RANGE : 30MHz~19.1GHz	
	

5MHz / QPSK	
CHANNEL 18625	CHANNEL 18900
FREQUENCY RANGE : 30MHz~19.1GHz	FREQUENCY RANGE : 30MHz~19.1GHz
	
CHANNEL 19175	
FREQUENCY RANGE : 30MHz~19.1GHz	
	

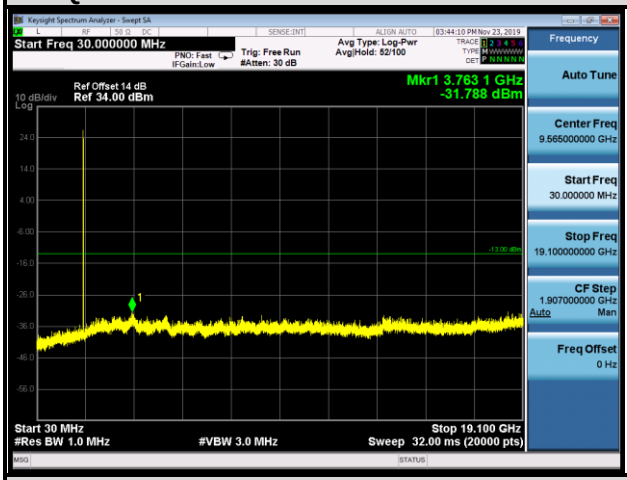
10MHz / QPSK	
CHANNEL 18650	CHANNEL 18900
FREQUENCY RANGE : 30MHz~19.1GHz	FREQUENCY RANGE : 30MHz~19.1GHz
	
CHANNEL 19150	
FREQUENCY RANGE : 30MHz~19.1GHz	
	

15MHz / QPSK	
CHANNEL 18675	CHANNEL 18900
FREQUENCY RANGE : 30MHz~19.1GHz	FREQUENCY RANGE : 30MHz~19.1GHz
	
CHANNEL 19125	
FREQUENCY RANGE : 30MHz~19.1GHz	
	

20MHz / QPSK

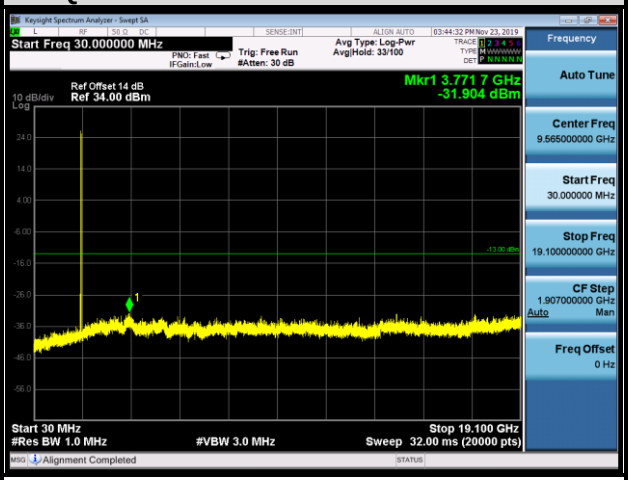
CHANNEL 18700

FREQUENCY RANGE : 30MHz~19.1GHz



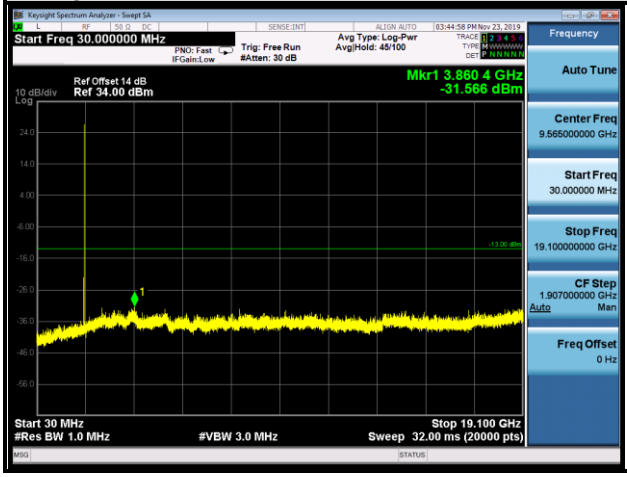
CHANNEL 18900

FREQUENCY RANGE : 30MHz~19.1GHz



CHANNEL 19100

FREQUENCY RANGE : 30MHz~19.1GHz



3.6 RADIATED EMISSION MEASUREMENT

3.6.1 LIMITS OF RADIATED EMISSION MEASUREMENT

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. The emission limit equal to –13dBm.

3.6.2 TEST PROCEDURES

a. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8m/1.5m 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 = Output power level of S.G – TX cable loss + Antenna gain of substitution horn.

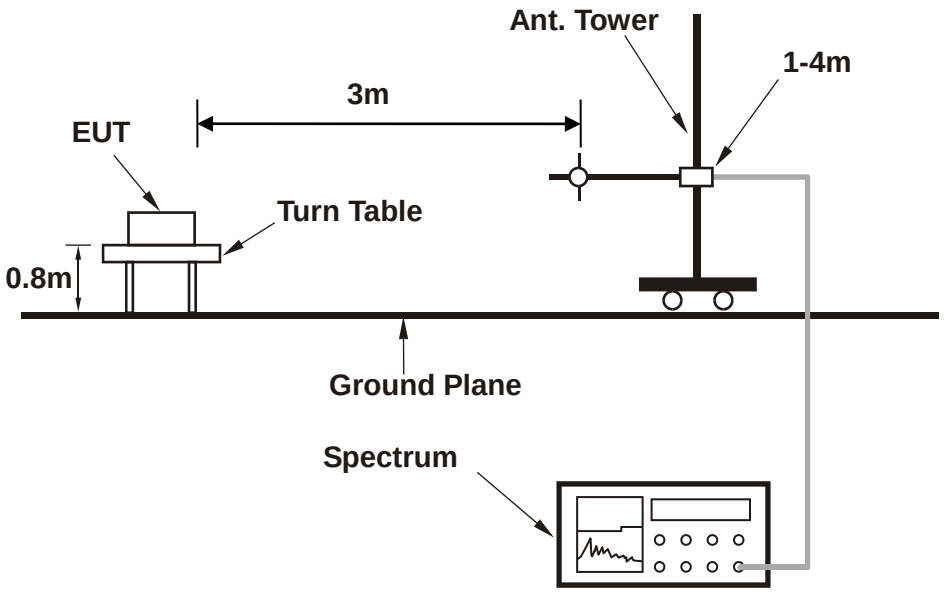
NOTE: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1MHz/3MHz.

3.6.3 DEVIATION FROM TEST STANDARD

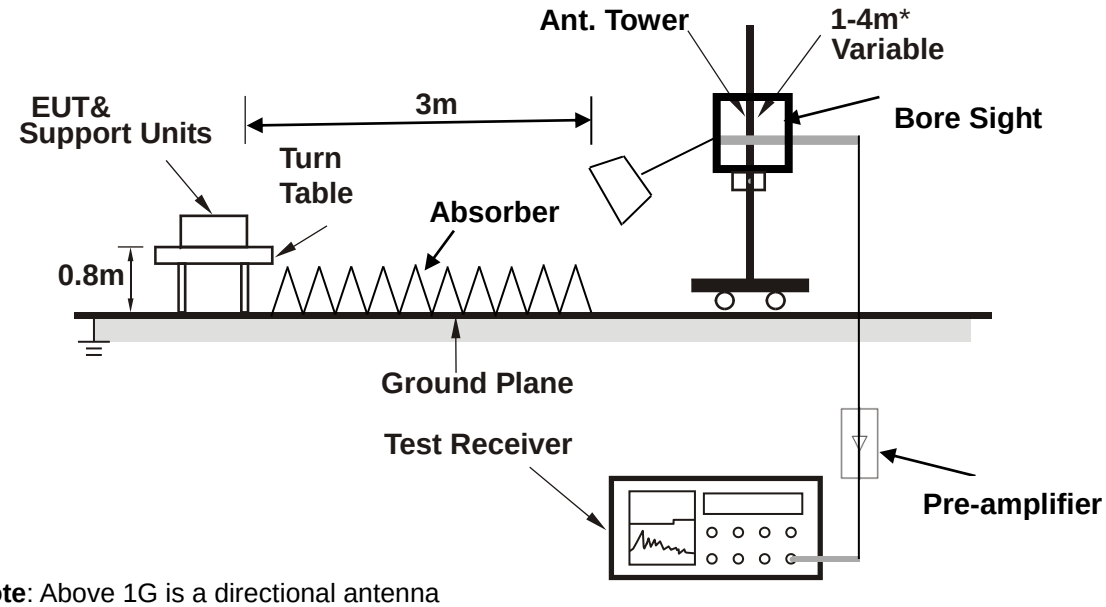
No deviation

3.6.4 TEST SETUP

< Frequency Range 30MHz~1GHz >



<Frequency Range above 1GHz>



Note: Above 1G is a directional antenna

depends on the EUT height and the antenna 3dB beamwidth both, refer to section 7.3 of CISPR 16-2-3.

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

3.6.5 TEST RESULTS

BELOW 1GHz WORST-CASE DATA

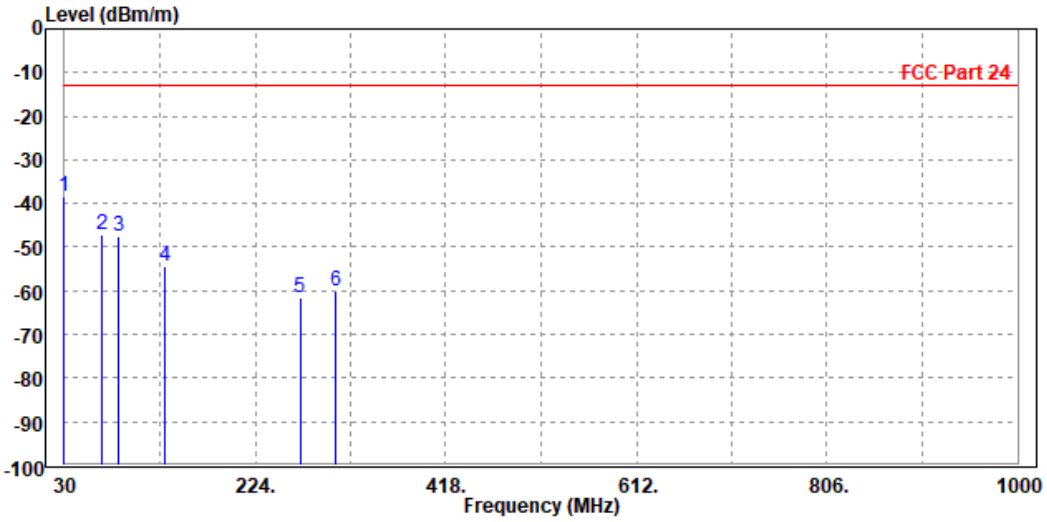
30 MHz – 1GHz data:

LTE Band 2

CHANNEL BANDWIDTH: 1.4MHz / QPSK

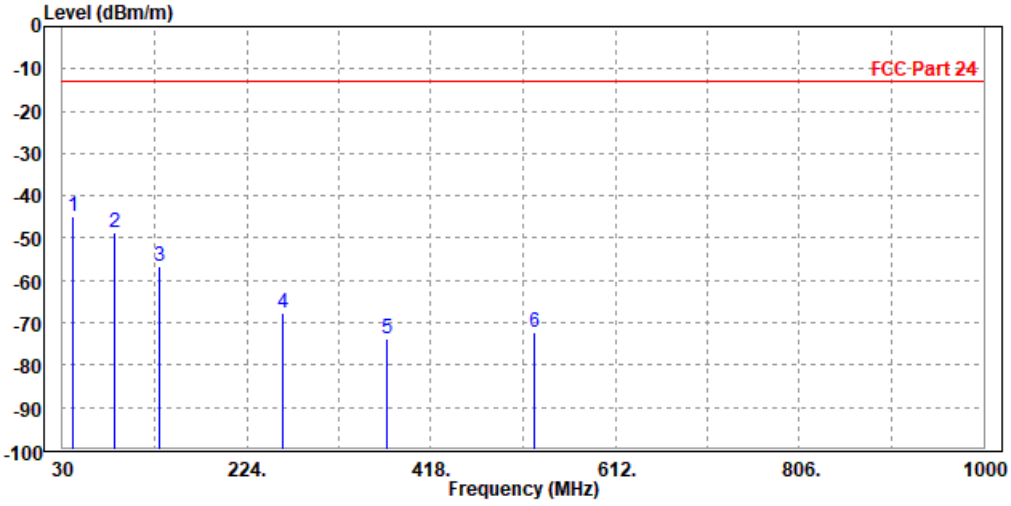
MODE	TX channel 18900	FREQUENCY RANGE	Below 1000MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70%RH	INPUT POWER	DC 5V
TESTED BY	Jacky Liu		
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M			

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark	Pol/Phase
	MHz	dBm/m	dBm	dBm/m	dB	dB/m		
1 PP	30.000	-38.50	-57.84	-13.00	-25.50	19.34	Peak	Horizontal
2	67.830	-47.33	-36.09	-13.00	-34.33	-11.24	Peak	Horizontal
3	85.290	-47.72	-39.34	-13.00	-34.72	-8.38	Peak	Horizontal
4	131.850	-54.23	-37.40	-13.00	-41.23	-16.83	Peak	Horizontal
5	269.590	-61.57	-46.26	-13.00	-48.57	-15.31	Peak	Horizontal
6	305.480	-60.13	-46.51	-13.00	-47.13	-13.62	Peak	Horizontal



MODE	TX channel 18900	FREQUENCY RANGE	Below 1000MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70%RH	INPUT POWER	DC 5V
TESTED BY	Jacky Liu		
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M			

		Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark	Pol/Phase
		MHz	dBm/m	dBm	dBm/m	dB	dB/m		
1	PP	40.670	-44.99	-43.46	-13.00	-31.99	-1.53	Peak	Vertical
2		85.290	-48.69	-38.29	-13.00	-35.69	-10.40	Peak	Vertical
3		132.820	-56.61	-44.12	-13.00	-43.61	-12.49	Peak	Vertical
4		261.830	-67.82	-56.35	-13.00	-54.82	-11.47	Peak	Vertical
5		371.440	-73.88	-62.84	-13.00	-60.88	-11.04	Peak	Vertical
6		526.640	-72.14	-64.87	-13.00	-59.14	-7.27	Peak	Vertical



ABOVE 1GHz DATA

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

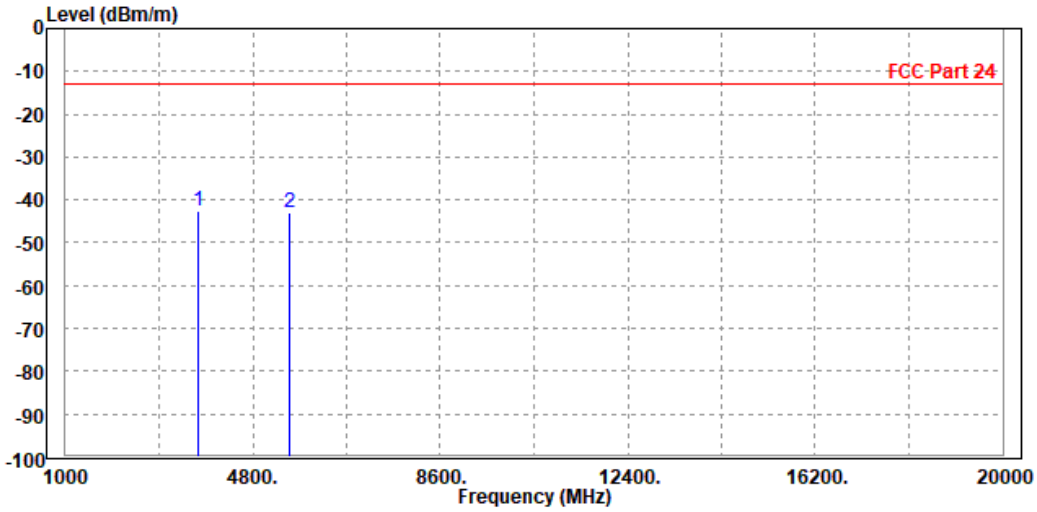
LTE Band 2

CHANNEL BANDWIDTH: 1.4MHz / QPSK

CH 18607

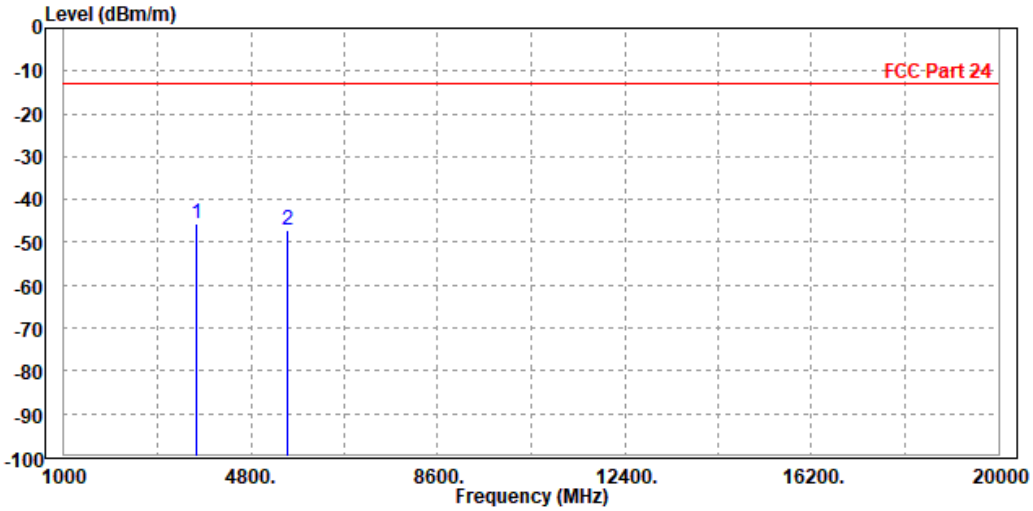
MODE	TX channel 18607	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70%RH	INPUT POWER	DC 5V
TESTED BY	Jacky Liu		
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M			

		Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark	Pol/Phase
		MHz	dBm/m	dBm	dBm/m	dB	dB/m		
1	PP	3698.000	-42.67	-51.45	-13.00	-29.67	8.78	Peak	Horizontal
2		5552.100	-43.03	-53.22	-13.00	-30.03	10.19	Peak	Horizontal



MODE	TX channel 18607	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70%RH	INPUT POWER	DC 5V
TESTED BY	Jacky Liu		
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M			

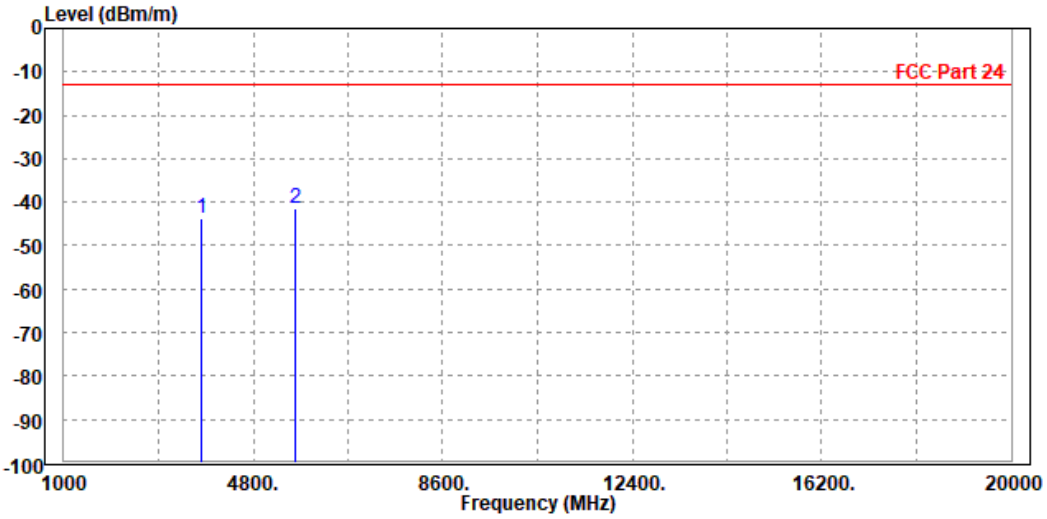
	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark	Pol/Phase
	MHz	dBm/m	dBm	dBm/m	dB	dB/m		
1 PP	3698.000	-45.65	-54.90	-13.00	-32.65	9.25	Peak	Vertical
2	5552.100	-46.97	-56.88	-13.00	-33.97	9.91	Peak	Vertical



CH 18900

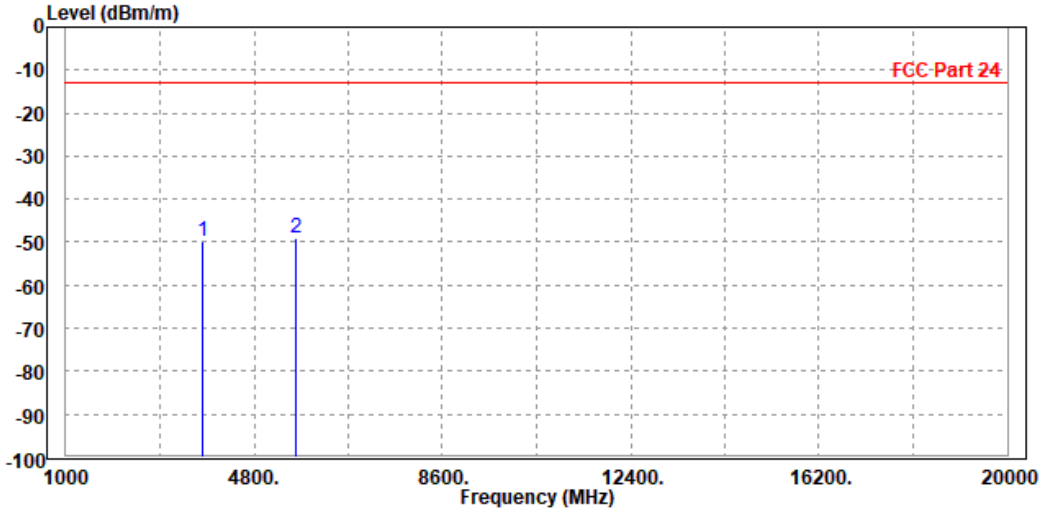
MODE	TX channel 18900	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70%RH	INPUT POWER	DC 5V
TESTED BY	Jacky Liu		
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M			

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark	Pol/Phase
	MHz	dBm/m	dBm	dBm/m	dB	dB/m		
1	3755.000	-43.60	-52.45	-13.00	-30.60	8.85	Peak	Horizontal
2 PP	5640.000	-41.37	-51.85	-13.00	-28.37	10.48	Peak	Horizontal



MODE	TX channel 18900	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70%RH	INPUT POWER	DC 5V
TESTED BY	Jacky Liu		
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M			

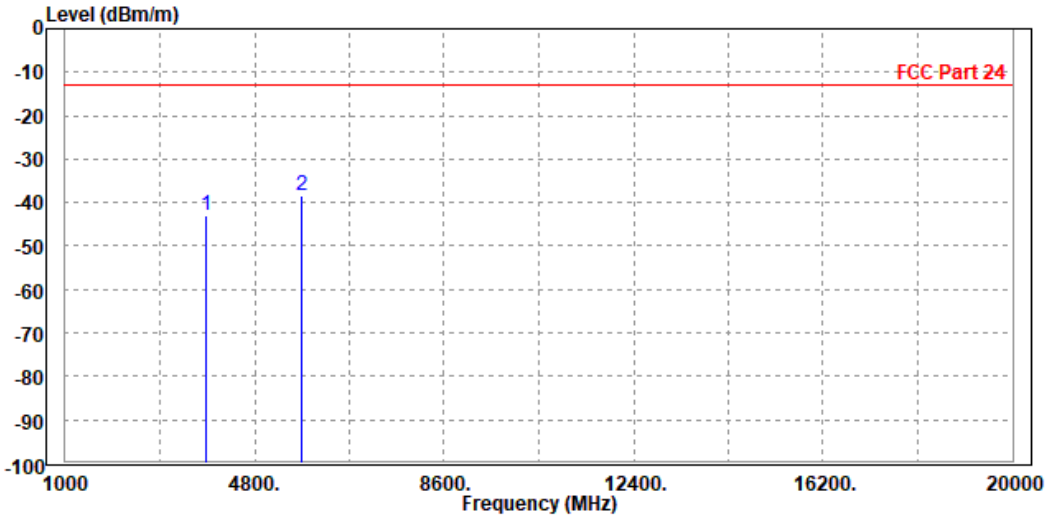
	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark	Pol/Phase
	MHz	dBm/m	dBm	dBm/m	dB	dB/m		
1	3755.000	-49.81	-59.08	-13.00	-36.81	9.27	Peak	Vertical
2 PP	5640.000	-49.02	-59.27	-13.00	-36.02	10.25	Peak	Vertical



CH 19193

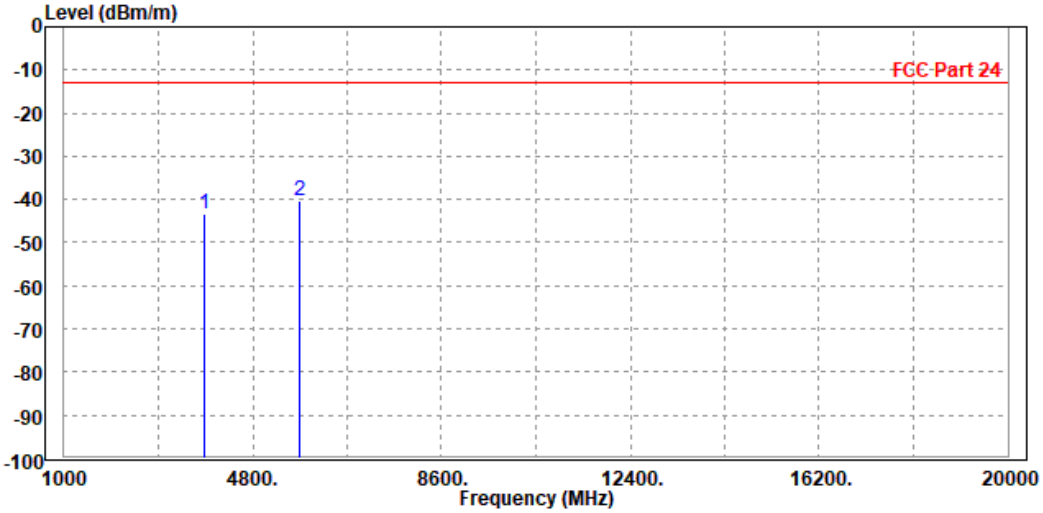
MODE	TX channel 19193	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70%RH	INPUT POWER	DC 5V
TESTED BY	Jacky Liu		
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M			

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark	Pol/Phase
	MHz	dBm/m	dBm	dBm/m	dB	dB/m		
1	3812.000	-42.82	-51.73	-13.00	-29.82	8.91	Peak	Horizontal
2 PP	5727.900	-38.56	-49.33	-13.00	-25.56	10.77	Peak	Horizontal



MODE	TX channel 19193	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70%RH	INPUT POWER	DC 5V
TESTED BY	Jacky Liu		
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M			

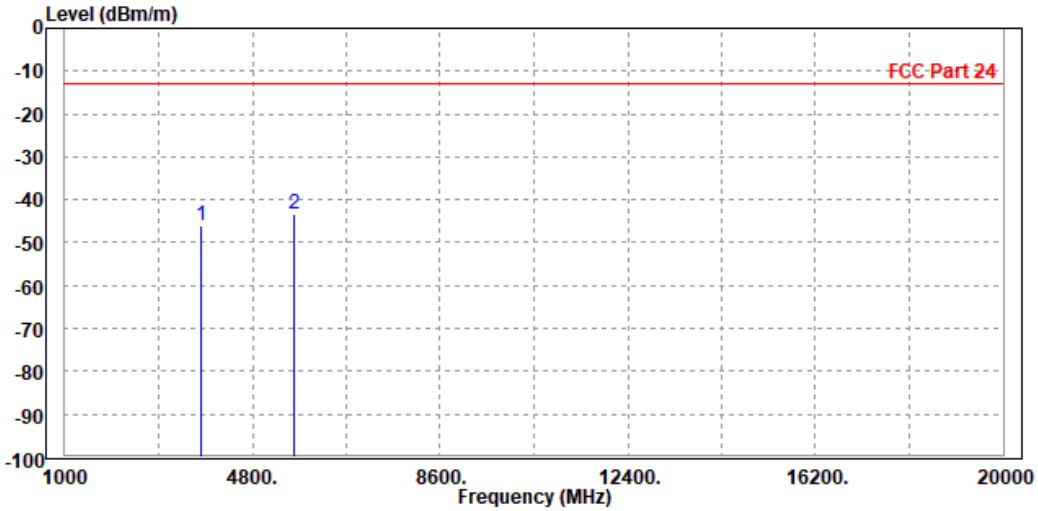
	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark	Pol/Phase
	MHz	dBm/m	dBm	dBm/m	dB	dB/m		
1	3812.000	-43.44	-52.73	-13.00	-30.44	9.29	Peak	Vertical
2 PP	5727.900	-40.49	-51.08	-13.00	-27.49	10.59	Peak	Vertical



CHANNEL BANDWIDTH: 3MHz / QPSK

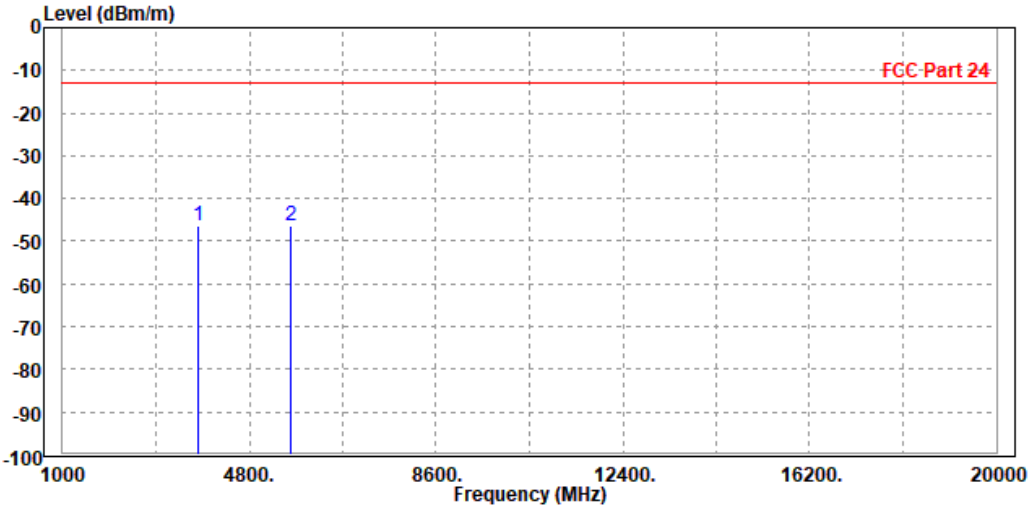
MODE	TX channel 18900	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70%RH	INPUT POWER	DC 5V
TESTED BY	Jacky Liu		
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M			

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark	Pol/Phase
	MHz	dBm/m	dBm	dBm/m	dB	dB/m		
1	3755.000	-46.08	-54.93	-13.00	-33.08	8.85	Peak	Horizontal
2 PP	5640.000	-43.33	-53.81	-13.00	-30.33	10.48	Peak	Horizontal



MODE	TX channel 18900	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70%RH	INPUT POWER	DC 5V
TESTED BY	Jacky Liu		
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M			

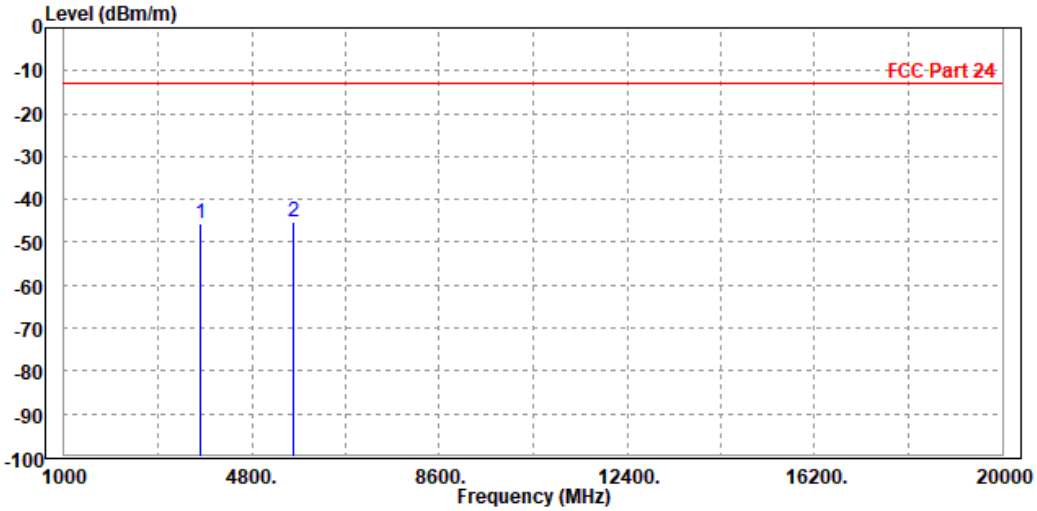
	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark	Pol/Phase
	MHz	dBm/m	dBm	dBm/m	dB	dB/m		
1	3755.000	-46.44	-55.71	-13.00	-33.44	9.27	Peak	Vertical
2 PP	5640.000	-46.22	-56.47	-13.00	-33.22	10.25	Peak	Vertical



CHANNEL BANDWIDTH: 5MHz / QPSK

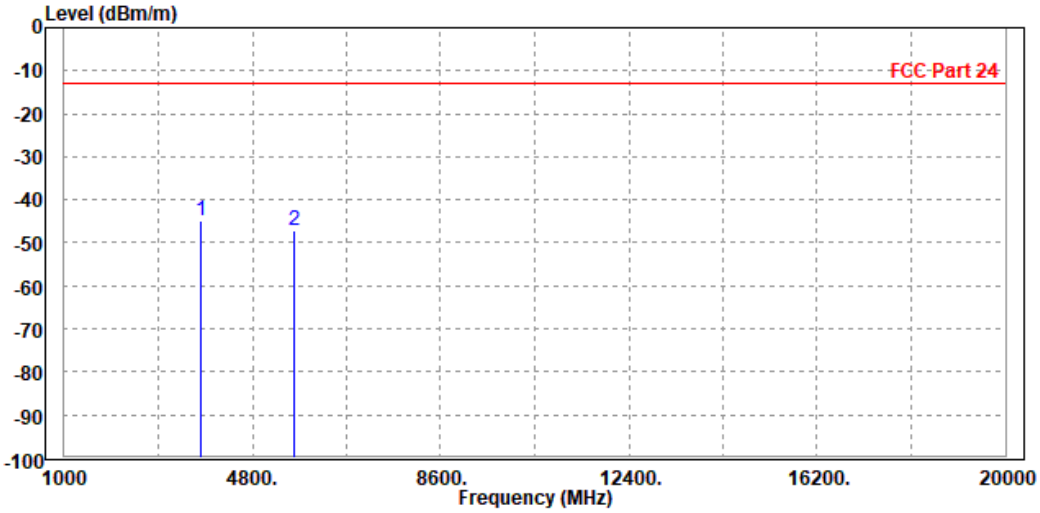
MODE	TX channel 18900	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70%RH	INPUT POWER	DC 5V
TESTED BY	Jacky Liu		
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M			

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark	Pol/Phase
	MHz	dBm/m	dBm	dBm/m	dB	dB/m		
1	3755.000	-45.81	-54.66	-13.00	-32.81	8.85	Peak	Horizontal
2 PP	5640.000	-45.11	-55.59	-13.00	-32.11	10.48	Peak	Horizontal



MODE	TX channel 18900	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70%RH	INPUT POWER	DC 5V
TESTED BY	Jacky Liu		
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M			

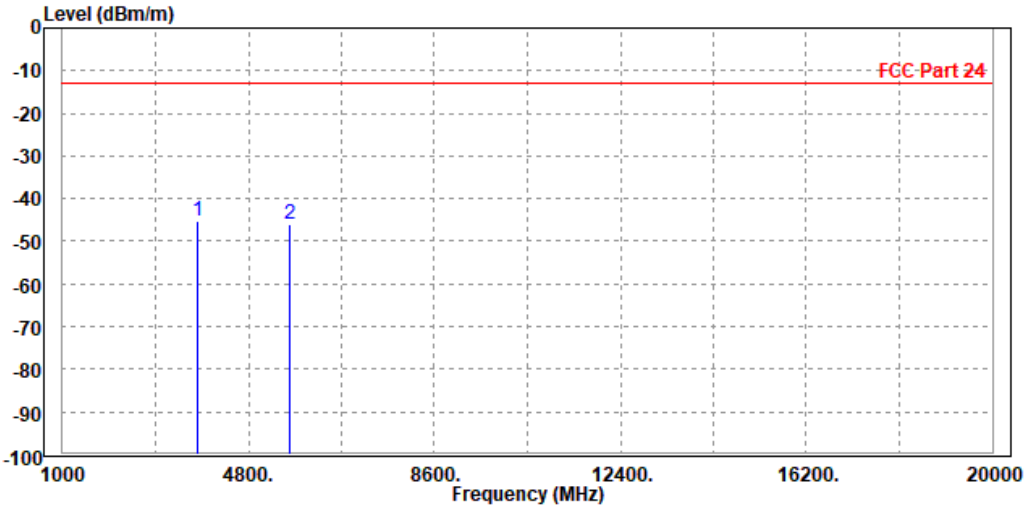
		Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark	Pol/Phase
		MHz	dBm/m	dBm	dBm/m	dB	dB/m		
1	PP	3755.000	-44.72	-53.99	-13.00	-31.72	9.27	Peak	Vertical
2		5640.000	-47.17	-57.42	-13.00	-34.17	10.25	Peak	Vertical



CHANNEL BANDWIDTH: 10MHz / QPSK

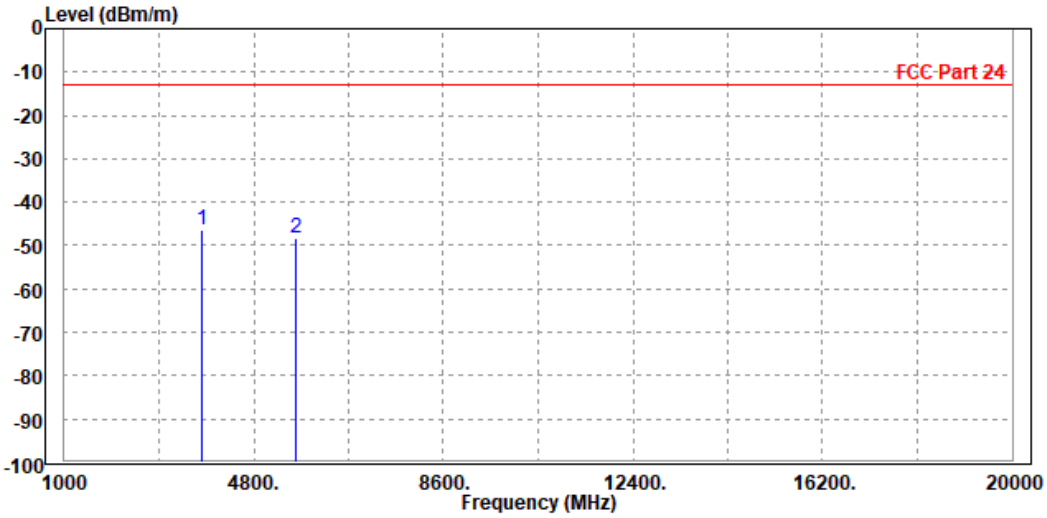
MODE	TX channel 18900	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70%RH	INPUT POWER	DC 5V
TESTED BY	Jacky Liu		
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M			

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark	Pol/Phase
	MHz	dBm/m	dBm	dBm/m	dB	dB/m		
1	PP 3755.000	-45.34	-54.19	-13.00	-32.34	8.85	Peak	Horizontal
2	5640.000	-45.84	-56.32	-13.00	-32.84	10.48	Peak	Horizontal



MODE	TX channel 18900	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70%RH	INPUT POWER	DC 5V
TESTED BY	Jacky Liu		
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M			

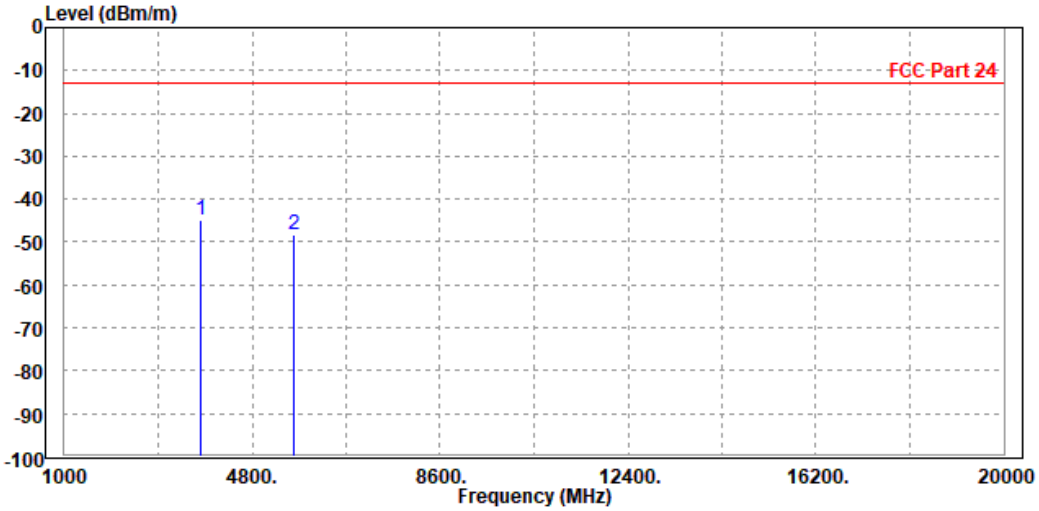
	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark	Pol/Phase
	MHz	dBm/m	dBm	dBm/m	dB	dB/m		
1 PP	3755.000	-46.29	-55.56	-13.00	-33.29	9.27	Peak	Vertical
2	5640.000	-48.30	-58.55	-13.00	-35.30	10.25	Peak	Vertical



CHANNEL BANDWIDTH: 15MHz / QPSK

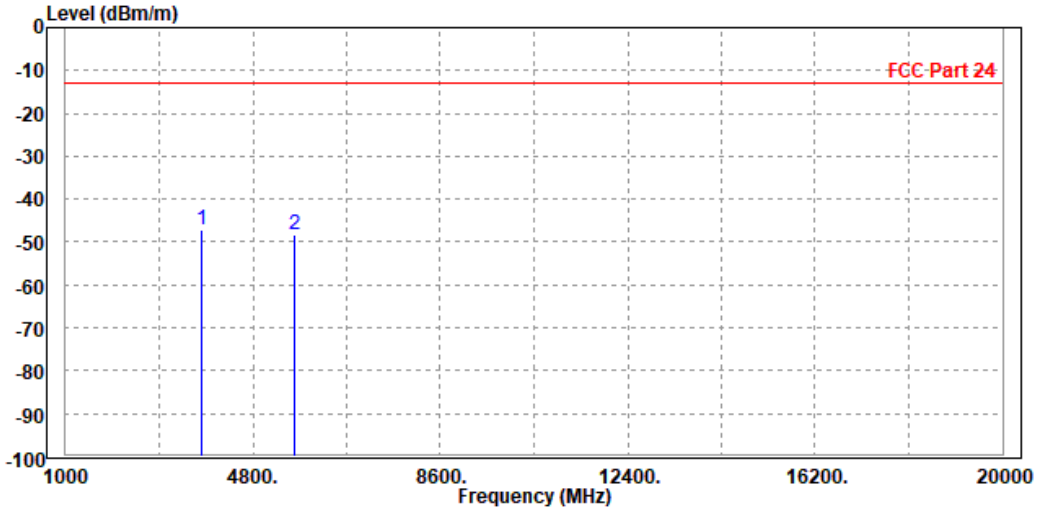
MODE	TX channel 18900	**FREQUENCY RANGE**	Above 1000MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70%RH	**INPUT POWER**	DC 5V
TESTED BY	Jacky Liu		
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M			

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark	Pol/Phase
	MHz	dBm/m	dBm	dBm/m	dB	dB/m		
1 PP	3755.000	-44.94	-53.79	-13.00	-31.94	8.85	Peak	Horizontal
2	5640.000	-48.11	-58.59	-13.00	-35.11	10.48	Peak	Horizontal



MODE	TX channel 18900	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70%RH	INPUT POWER	DC 5V
TESTED BY	Jacky Liu		
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M			

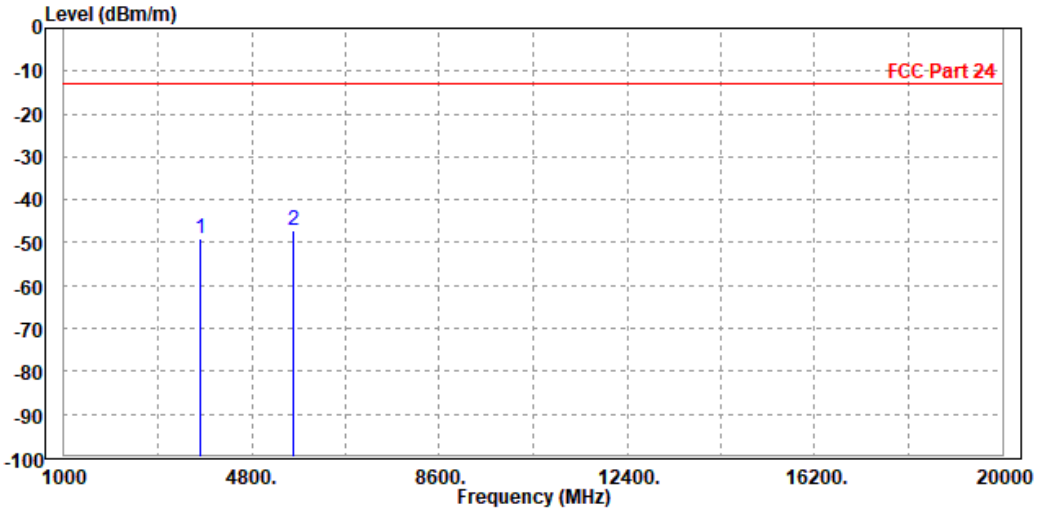
		Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark	Pol/Phase
		MHz	dBm/m	dBm	dBm/m	dB	dB/m		
1	PP	3755.000	-46.99	-56.26	-13.00	-33.99	9.27	Peak	Vertical
2		5640.000	-48.21	-58.46	-13.00	-35.21	10.25	Peak	Vertical



CHANNEL BANDWIDTH: 20MHz / QPSK

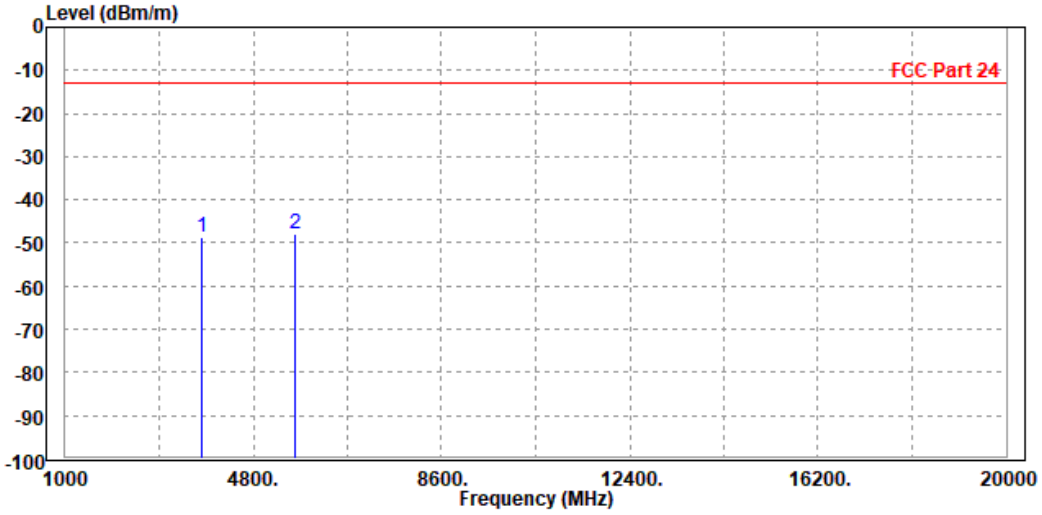
MODE	TX channel 18900	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70%RH	INPUT POWER	DC 5V
TESTED BY	Jacky Liu		
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M			

		Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark	Pol/Phase
		MHz	dBm/m	dBm	dBm/m	dB	dB/m		
1		3755.000	-48.90	-57.75	-13.00	-35.90	8.85	Peak	Horizontal
2	PP	5640.000	-47.26	-57.74	-13.00	-34.26	10.48	Peak	Horizontal



MODE	TX channel 18900	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70%RH	INPUT POWER	DC 5V
TESTED BY	Jacky Liu		
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M			

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark	Pol/Phase
	MHz	dBm/m	dBm	dBm/m	dB	dB/m		
1	3755.000	-48.82	-58.09	-13.00	-35.82	9.27	Peak	Vertical
2 PP	5640.000	-48.00	-58.25	-13.00	-35.00	10.25	Peak	Vertical



3.7 RECEIVER SPURIOUS EMISSIONS

3.7.1 LIMITS OF RADIATED EMISSION MEASUREMENT

Spurious emissions from receivers shall not exceed the radiated emission limits shown in follow table

Frequency(MHz)	Field strength(Uv/m at 3 metres)
30~88	100
88~216	150
216~960	200
Above 960	500

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).

3.7.2 TEST PROCEDURES

a. The EUT was placed on the top of a rotating table 0.8 meters (for below 1GHz) / 1.5 meters (for above 1GHz) above the ground at a 3 meter chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, For battery operated equipment, the equipment tests shall be perform using fresh batteries. The turntable was rotated to maximize the emission level.

NOTE:

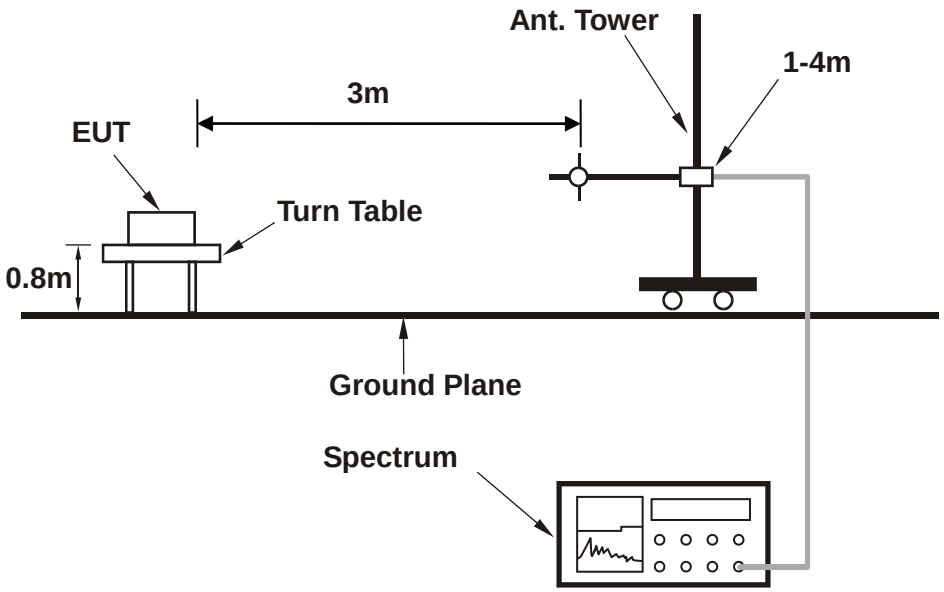
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz for Average detection (AV) at frequency above 1GHz.
4. If the dwell time per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a “duty cycle correction factor”, derived from 20log(dwell time/100 ms), in an effort to demonstrate compliance with the 15.209 limit.
5. All modes of operation were investigated and the worst-case emissions are reported.

3.7.3 DEVIATION FROM TEST STANDARD

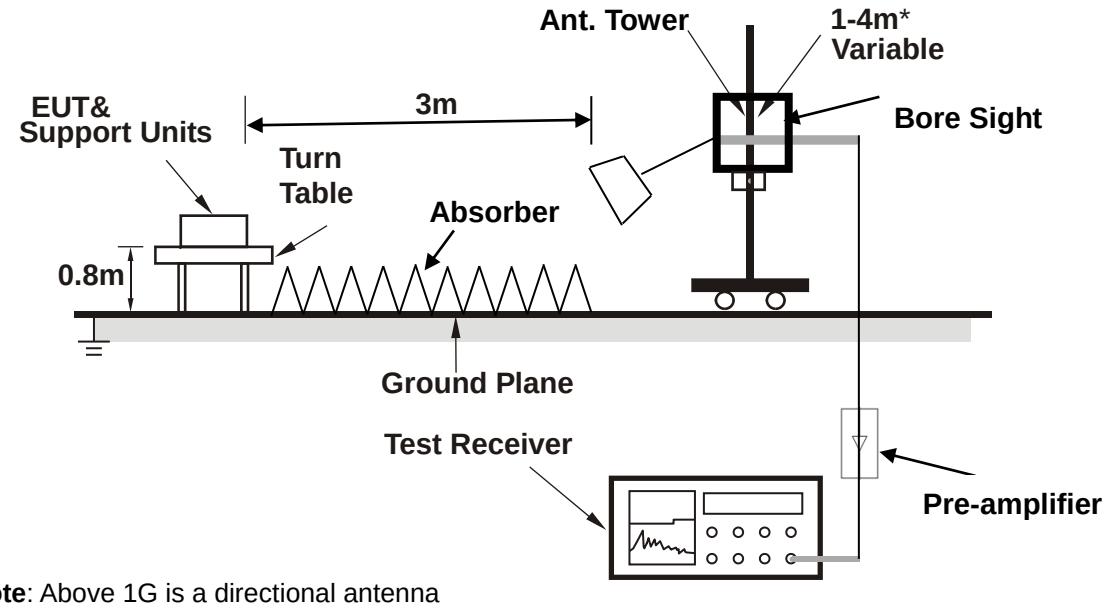
No deviation

3.7.4 TEST SETUP

< Frequency Range 30MHz~1GHz >



<Frequency Range above 1GHz>



Note: Above 1G is a directional antenna

depends on the EUT height and the antenna 3dB beamwidth both, refer to section 7.3 of CISPR 16-2-3.

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

3.7.5 TEST RESULT

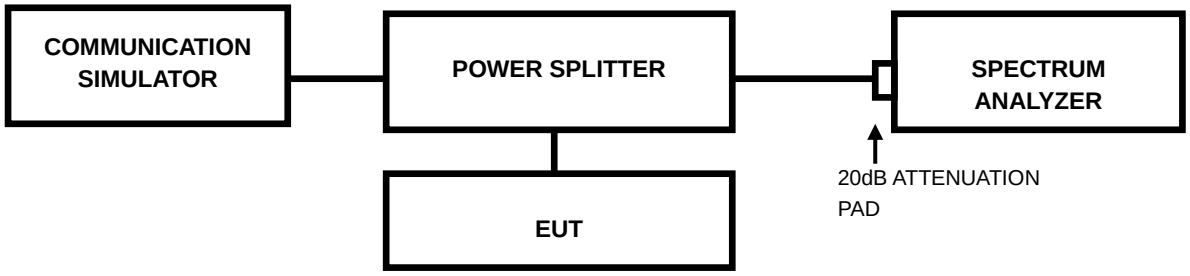
The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required in the report.

3.8 PEAK TO AVERAGE RATIO

3.8.1 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

3.8.2 TEST SETUP



3.8.3 TEST PROCEDURES

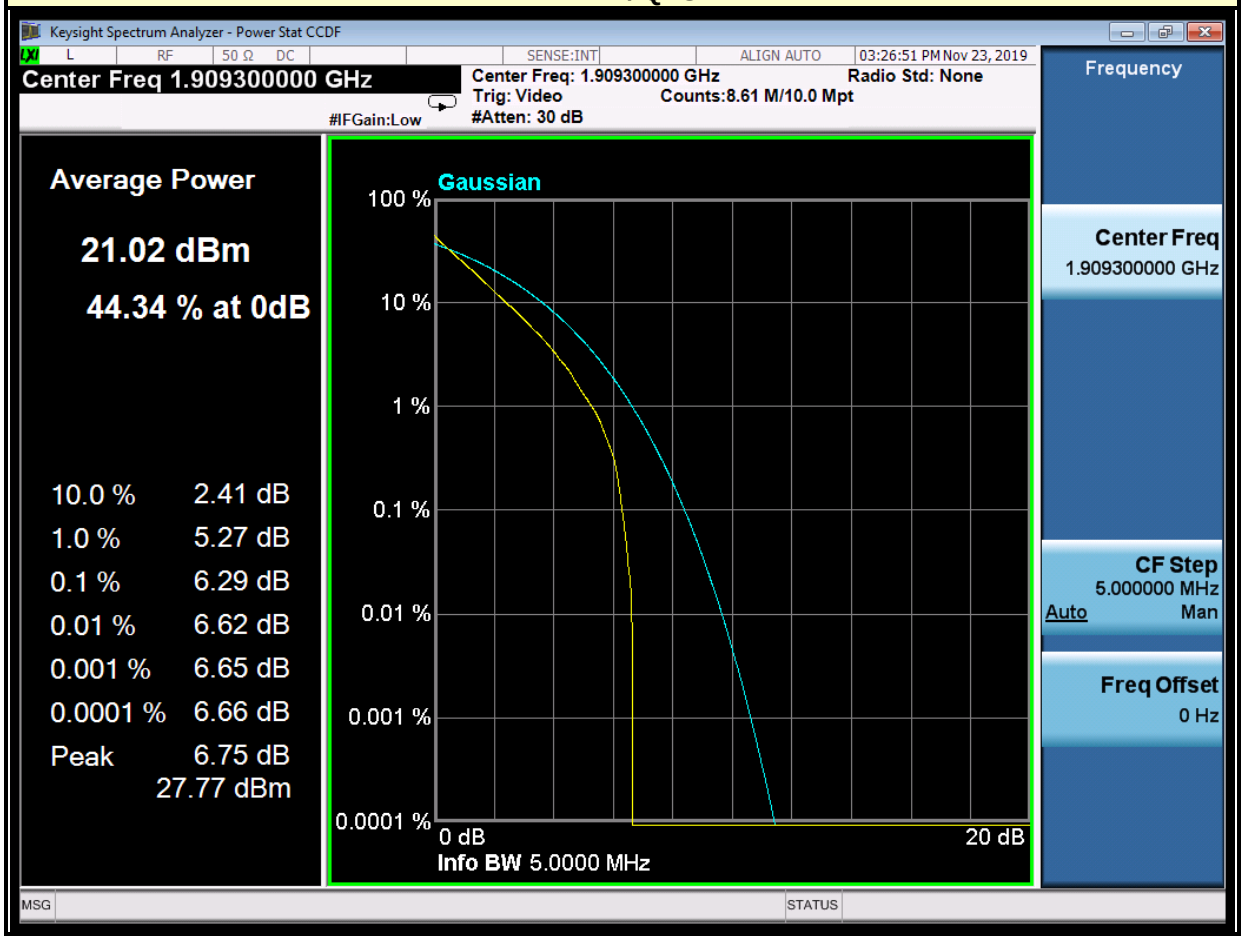
1. Set resolution/measurement bandwidth ≥ signal's occupied bandwidth;
2. Set the number of counts to a value that stabilizes the measured CCDF curve;
3. Record the maximum PAPR level associated with a probability of 0.1%.

3.8.4 TEST RESULTS

LTE BAND 2

CHANNEL BANDWIDTH: 1.4MHz		
CHANNEL	Frequency (MHz)	PEAK TO AVERAGE RATIO (dB)
		QPSK
18607	1850.7	4.15
18900	1880	6.06
19193	1909.3	6.29

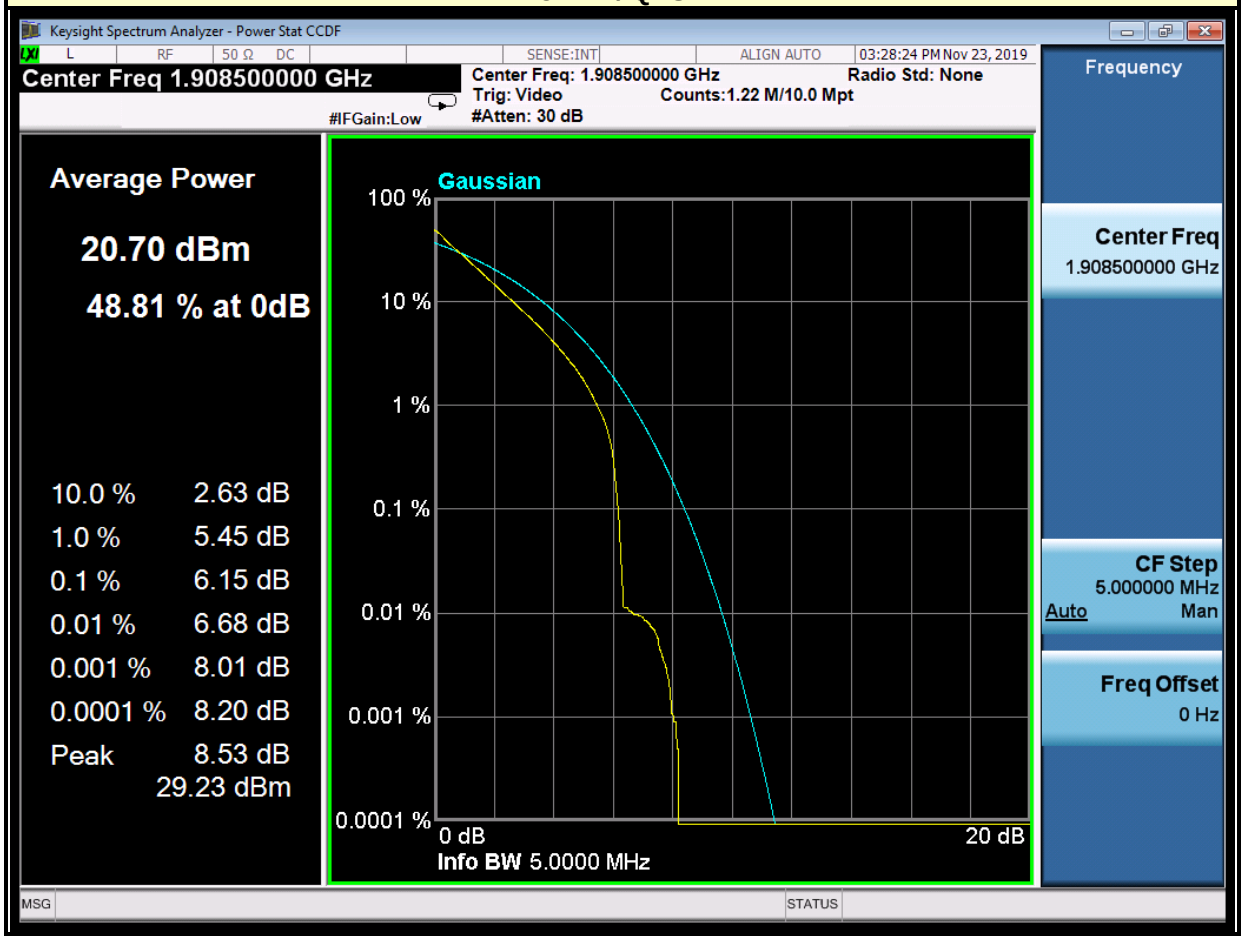
SPECTRUM PLOT OF WORST VALUE
1.4MHz / QPSK



CHANNEL BANDWIDTH: 3MHz		
CHANNEL	Frequency (MHz)	PEAK TO AVERAGE RATIO (dB)
		QPSK
18615	1851.5	5.49
18900	1880	5.73
19185	1908.5	6.15

SPECTRUM PLOT OF WORST VALUE

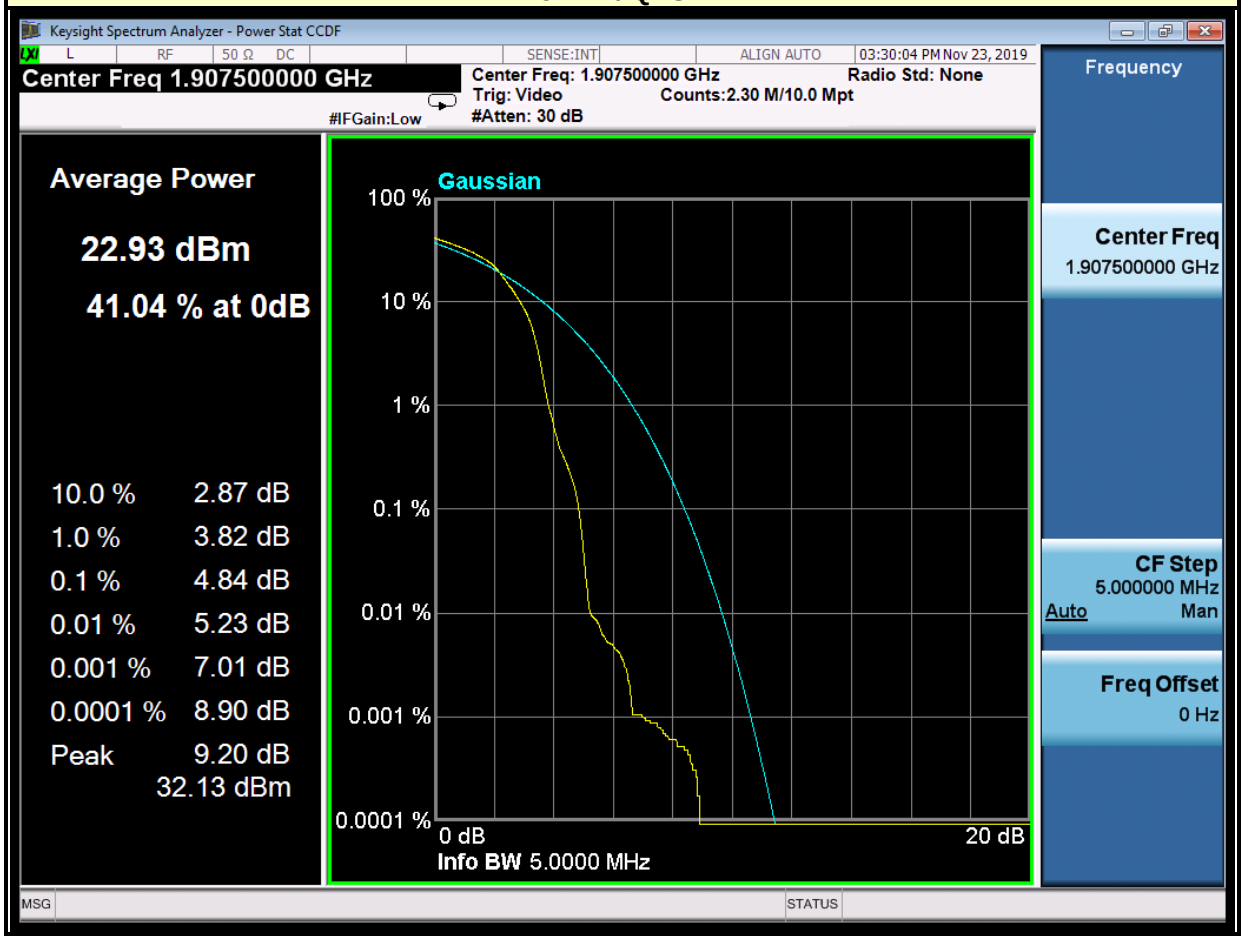
3MHz / QPSK



CHANNEL BANDWIDTH: 5MHz		
CHANNEL	Frequency (MHz)	PEAK TO AVERAGE RATIO (dB)
		QPSK
18625	1852.5	4.63
18900	1880	4.63
19175	1907.5	4.84

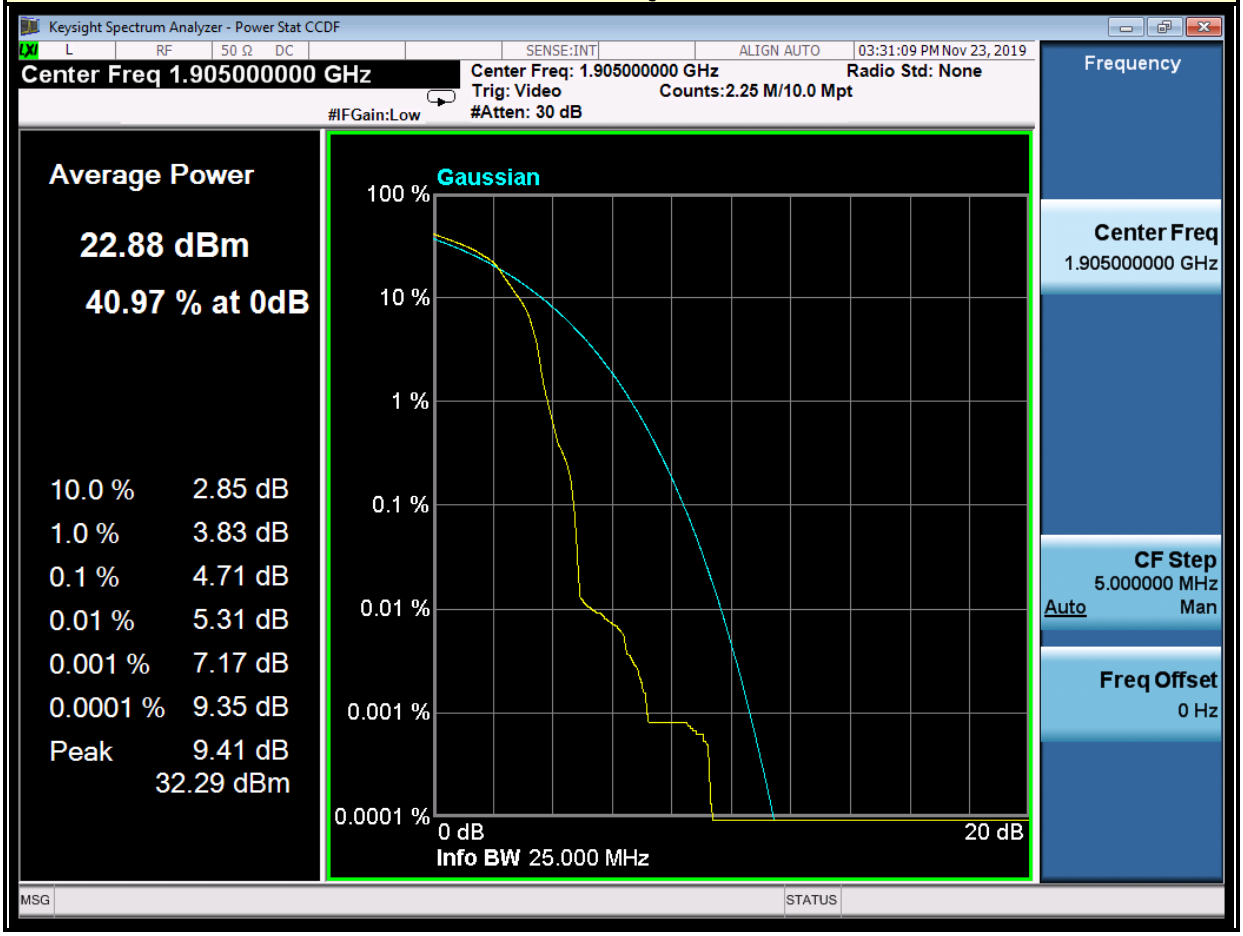
SPECTRUM PLOT OF WORST VALUE

5MHz / QPSK



CHANNEL BANDWIDTH: 10MHz		
CHANNEL	Frequency (MHz)	PEAK TO AVERAGE RATIO (dB)
		QPSK
18650	1855	4.52
18900	1880	4.67
19150	1905	4.71

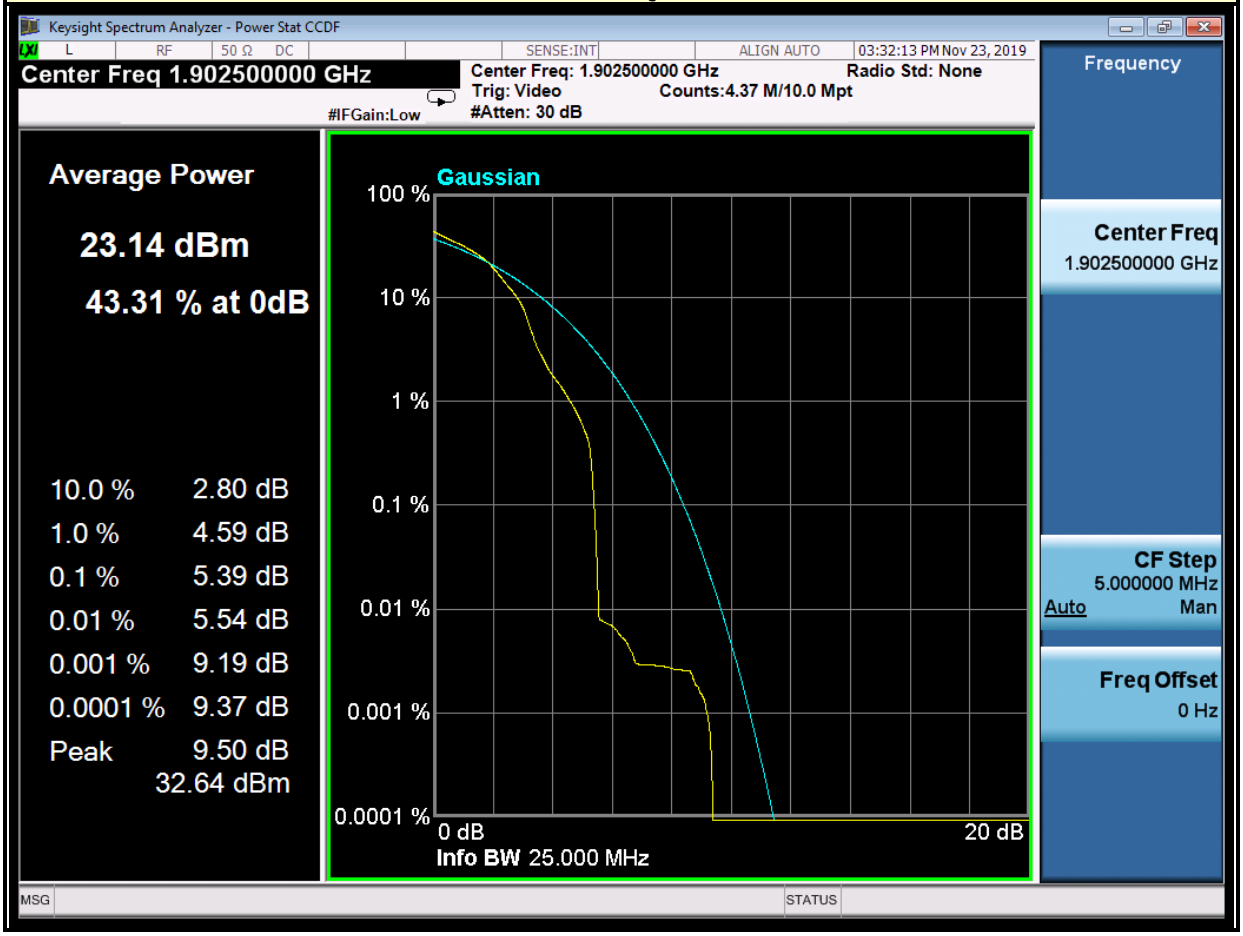
SPECTRUM PLOT OF WORST VALUE
10MHz / QPSK



CHANNEL BANDWIDTH: 15MHz		
CHANNEL	Frequency (MHz)	PEAK TO AVERAGE RATIO (dB)
		QPSK
18675	1857.5	5.30
18900	1880	5.39
19125	1902.5	5.39

SPECTRUM PLOT OF WORST VALUE

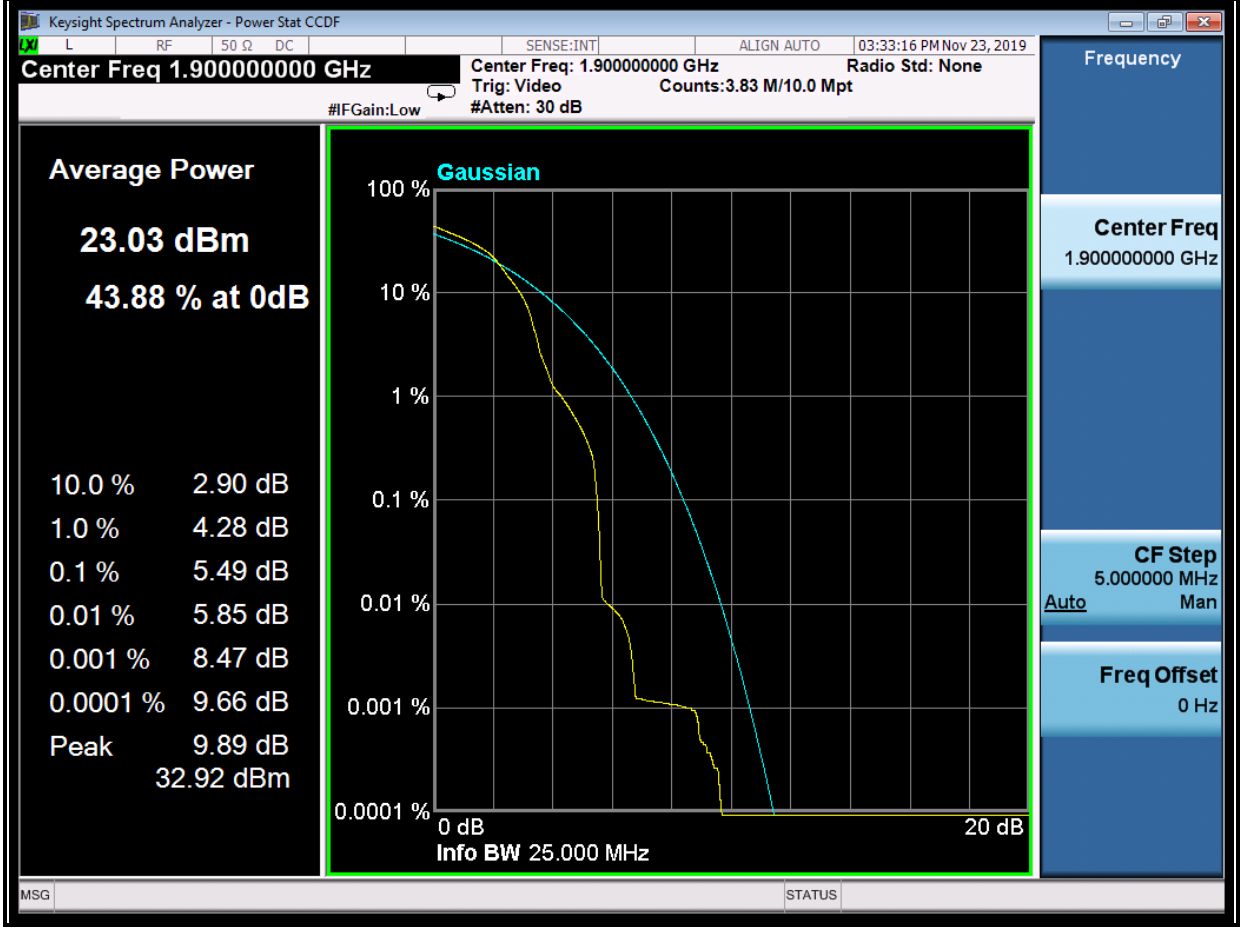
15MHz / QPSK



CHANNEL BANDWIDTH: 20MHz		
CHANNEL	Frequency (MHz)	PEAK TO AVERAGE RATIO (dB)
		QPSK
18700	1860	4.98
18900	1880	5.24
19100	1900	5.49

SPECTRUM PLOT OF WORST VALUE

20MHz / QPSK



4 INFORMATION ON THE TESTING LABORATORIES

We, BV 7Layers Communications Technology (Shenzhen) Co. Ltd, were founded in 2015 to provide our best service in EMC, Radio, and Telecom. Our laboratories are accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

Shenzhen EMC/RF Lab:
Tel: +86 755 8869 6566
Fax: +86 755 8869 6577

Email: customerservice.dg@cn.bureauveritas.com
Web Site: www.adt.com.tw

The address and road map of all our labs can be found in our web site also.

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---