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VERITAS

Test Report No.: RFP20120029-2



# FCC TEST REPORT

## (PART 24)

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	Electron
Brand Name	Particle
Model Name	ELC402, ELC404
FCC ID	XPY2AGQN4NNN
Date of tests	Oct. 17, 2019 ~ Nov. 28, 2019

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

- FCC PART 24, Subpart E     FCC PART 2  
 ANSI/TIA/EIA-603-D     ANSI/TIA/EIA-603-E     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	luke lu

Date: Dec. 23, 2020

Date: Dec. 23, 2020

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## RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF191017W004-2	Original release, This test report is for internal customer use only, not as a final certification test report.	Nov. 29, 2019
RFP20120029-2	Based on the original product add one model name, changed product name. In this report, All test data is copied from the original test report RF191017W004-2.	Dec. 23, 2020



## 1 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 24 & Part 2		
STANDARD SECTION	TEST TYPE	RESULT
2.1046 24.232	Equivalent Isotropic Radiated Power	Compliance
2.1055 24.235	Frequency Stability	Compliance
2.1049 24.238(b)	Occupied Bandwidth	Compliance
24.232(d)	Peak to average ratio	Compliance
24.238(b)	Band Edge Measurements	Compliance
2.1051 24.238	Conducted Spurious Emissions	Compliance
2.1053 24.238	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 CISPR 16-4-2:

MEASUREMENT	UNCERTAINTY
Frequency Stability	±76.97Hz
Radiated emissions & Radiated Power (30MHz~1GHz)	±4.98dB
Radiated emissions & Radiated Power (1GHz ~6GHz)	±4.70dB
Radiated emissions (6GHz ~18GHz)	±4.60dB
Radiated emissions (18GHz ~40GHz)	±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.



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## 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-00 361	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	Jun. 24,19	Jun. 23,20
Signal Pre-Amplifier	EMSI	EMC 012645B	980257	Jun. 24,19	Jun. 23,20
Signal Pre-Amplifier	EMSI	EMC 184045B	980259	Jun. 24,19	Jun. 23,20
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-SM A	1505	Jun. 24,19	Jun. 23,20
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	Jun. 24,19	Jun. 23,20
MXG Analog Microwave 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, GRRG/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 525120; The Designation No. is CN1171.



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## 2 GENERAL INFORMATION

### 2.1 GENERAL DESCRIPTION OF EUT

PRODUCT	Electron	
BRAND NAME	Particle	
MODEL NAME	ELC402, ELC404	
POWER SUPPLY	DC 5V from Host Uint or DC3.7V from Li-ion battery Vnor=3.7V,Vmin=3.145V,Vmax=4.255V	
MODULATION TYPE	LTE: QPSK	
LTE CATEGORY	M1	
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	417mW
	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: 1M11G7D
	LTE Band 2 Channel Bandwidth: 20MHz	QPSK: 1M10G7D



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<b>ANTENNA TYPE</b>	Fixed External Antenna with 3.77dBi gain
<b>HW VERSION</b>	V007
<b>SW VERSION</b>	V1.4.0
<b>I/O PORTS</b>	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 ELC404 is completely the same with ELC402, 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: ELC402 uses eSIM of Kore. ELC404 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.

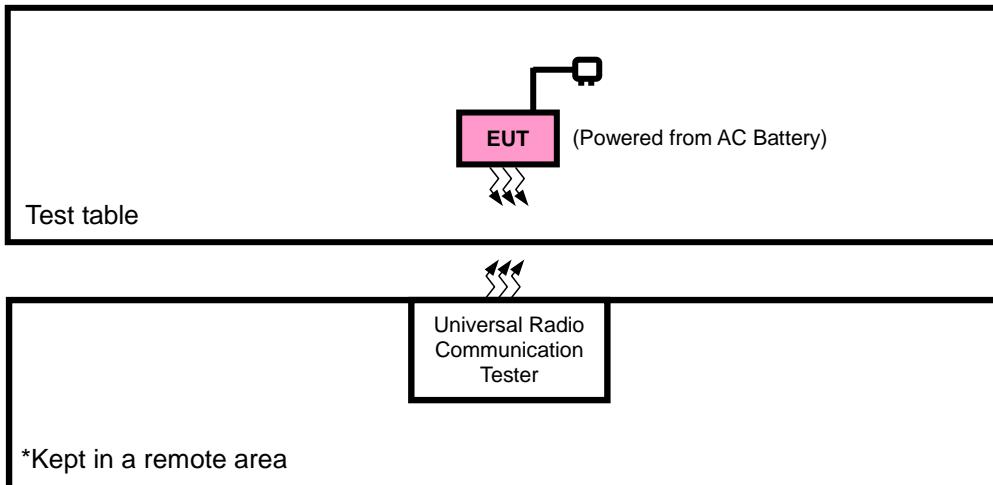
MODULATION MODE	TX FUNCTION
LTE	1TX/1RX



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## 2.2 CONFIGURATION OF SYSTEM UNDER TEST

### FOR RADIATION EMISSION TEST





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## 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 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



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## 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	6 RB / 0 RB Offset
	18625 to 19175	18625, 18900, 19175	5MHz	QPSK	6 RB / 0 RB Offset
	18650 to 19150	18650, 18900, 19150	10MHz	QPSK	6 RB / 0 RB Offset
	18675 to 19125	18675, 18900, 19125	15MHz	QPSK	6 RB / 0 RB Offset
	18700 to 19100	18700, 18900, 19100	20MHz	QPSK	6 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



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BAND EDGE	18607 to 19193	18607	1.4MHz	QPSK	1 RB / 0 RB Offset
		19193	1.4MHz		6 RB / 0 RB Offset
	18615 to 19185	18615	3MHz	QPSK	1 RB / 5 RB Offset
		19185	3MHz		6 RB / 0 RB Offset
	18625 to 19175	18625	5MHz	QPSK	1 RB / 0 RB Offset
		19175	5MHz		6 RB / 0 RB Offset
		18650	10MHz	QPSK	1 RB / 5 RB Offset
		19150	10MHz		6 RB / 0 RB Offset
	18675 to 19125	18675	15MHz	QPSK	1 RB / 0 RB Offset
		19125	15MHz		6 RB / 0 RB Offset
		18700	20MHz	QPSK	1 RB / 5 RB Offset
		19100	20MHz		6 RB / 0 RB Offset
CONDUCED 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	18900	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	18650, 18900, 19150	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 3.7V by battery	Star Le
FREQUENCY STABILITY	23deg. C, 70%RH	DC 3.7V/3.145/4.255 by DC source	Big Wang
OCCUPIED BANDWIDTH	23deg. C, 70%RH	DC 3.7V by battery	Big Wang
BAND EDGE	23deg. C, 70%RH	DC 3.7V by battery	Big Wang
CONCUDETED EMISSION	23deg. C, 70%RH	DC 3.7V by battery	Big Wang
PEAK TO AVERAGE RATIO	23deg. C, 70%RH	DC 3.7V by battery	Big Wang
RADIATED EMISSION	23deg. C, 70%RH	DC 3.7V by battery	Star Le

**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:

**FCC 47 CFR Part 2**

**FCC 47 CFR Part 24**

**KDB 971168 D01 Power Meas License Digital Systems v03r01**

**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 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 determining the ERP or EIRP from the conducted RF output power measured using the guidance provided above is:

$$\text{ERP or EIRP} = P_{\text{Meas}} + G_T - L_c$$

Where:

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

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

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

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

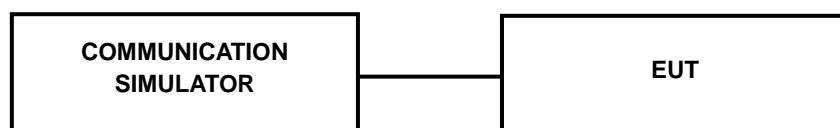
$L_c$  = signal attenuation in the connecting cable between the transmitter and antenna, in dB.

##### CONDUCTED POWER MEASUREMENT:

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





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### 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	22.28	22.34	22.48	0
		1	5	22.27	22.29	22.52	0
		3	0	22.35	22.33	22.41	0
		3	3	22.27	22.33	22.47	0
		6	0	22.26	22.28	22.51	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	22.31	22.37	22.51	0
		1	5	22.30	22.32	22.55	0
		3	0	22.38	22.36	22.44	0
		3	3	22.34	22.35	22.47	1
		6	0	22.37	22.38	22.41	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	22.34	22.40	22.54	0
		1	5	22.33	22.35	22.58	0
		3	0	22.41	22.39	22.47	0
		3	3	22.37	22.38	22.50	1
		6	0	22.40	22.41	22.44	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	22.36	22.42	22.56	0
		1	5	22.35	22.37	22.60	0
		3	0	22.43	22.41	22.49	0
		3	3	22.39	22.40	22.52	1
		6	0	22.42	22.43	22.46	1



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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	22.39	22.45	22.59	0
		1	5	22.38	22.40	22.63	0
		3	0	22.46	22.44	22.52	0
		3	3	22.42	22.43	22.55	1
		6	0	22.45	22.46	22.49	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	22.44	22.50	22.64	0
		1	5	22.43	22.45	<b>22.68</b>	0
		3	0	22.51	22.49	22.57	0
		3	3	22.47	22.48	22.60	1
		6	0	22.50	22.51	22.54	1



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### EIRP POWER (dBm)

#### LTE BAND 2

##### CHANNEL BANDWIDTH: 1.4MHz QPSK

Channel	Frequency (MHz)	Conducted Power (dBm)	G <sub>T</sub> -L <sub>c</sub> (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	<b>425.60</b>	2

##### CHANNEL BANDWIDTH: 3MHz QPSK

Channel	Frequency (MHz)	Conducted Power (dBm)	G <sub>T</sub> -L <sub>c</sub> (dB)	EIRP (dBm)	EIRP (mW)	Limit (W)
18615	1851.5	22.38	3.77	26.15	412.10	2
18900	1880.0	22.38	3.77	26.15	412.10	2
19185	1908.5	22.55	3.77	26.32	<b>428.55</b>	2

##### CHANNEL BANDWIDTH: 5MHz QPSK

Channel	Frequency (MHz)	Conducted Power (dBm)	G <sub>T</sub> -L <sub>c</sub> (dB)	EIRP (dBm)	EIRP (mW)	Limit (W)
18625	1852.5	22.41	3.77	26.18	414.95	2
18900	1880.0	22.41	3.77	26.18	414.95	2
19175	1907.5	22.58	3.77	26.35	<b>431.52</b>	2

##### CHANNEL BANDWIDTH: 10MHz QPSK

Channel	Frequency (MHz)	Conducted Power (dBm)	G <sub>T</sub> -L <sub>c</sub> (dB)	EIRP (dBm)	EIRP (mW)	Limit (W)
18650	1855.0	22.43	3.77	26.20	<b>416.87</b>	2
18900	1880.0	22.43	3.77	26.20	416.87	2
19150	1905.0	22.60	3.77	26.37	433.51	2



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**CHANNEL BANDWIDTH: 15MHz QPSK**

Channel	Frequency (MHz)	Conducted Power (dBm)	G <sub>T</sub> -L <sub>C</sub> (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 <sub>T</sub> -L <sub>C</sub> (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	<b>441.57</b>	2



### 3.2 FREQUENCY STABILITY MEASUREMENT

#### 3.2.1 LIMITS OF FREQUENCY STABILITY MEASUREMENT

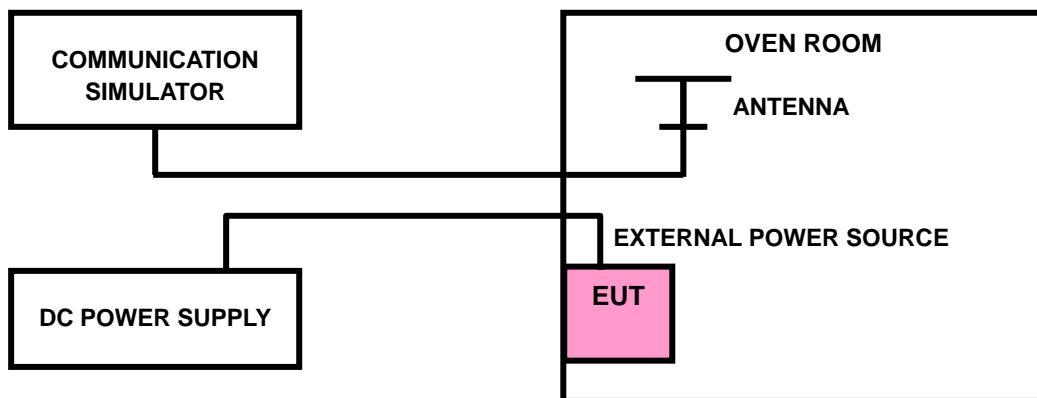
The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

#### 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  $\pm 0.5^{\circ}\text{C}$  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





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### 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 <sub>nor</sub>	0.0021	0.0026	2.5	
V <sub>min</sub>	-0.0031	-0.0030	2.5	
V <sub>max</sub>	0.0021	0.0021	2.5	

**NOTE:** The applicant defined the normal working voltage of the battery is V<sub>min</sub> to V<sub>max</sub>.

##### FREQUENCY ERROR vs. TEMPERATURE.

TEMP. (°C)	1.4MHz		LIMIT (ppm)	
	FREQUENCY ERROR (ppm)			
	Low Channel	High Channel		
-30	-0.0118	-0.0118	2.5	
-20	-0.0099	-0.0104	2.5	
-10	-0.0083	-0.0080	2.5	
0	-0.0078	-0.0073	2.5	
10	-0.0054	-0.0047	2.5	
20	-0.0044	-0.0042	2.5	
30	-0.0035	-0.0027	2.5	
40	-0.0019	-0.0017	2.5	
50	-0.0003	-0.0002	2.5	



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#### FREQUENCY ERROR VS. VOLTAGE

VOLTAGE (Volts)	3MHz		LIMIT (ppm)	
	FREQUENCY ERROR (ppm)			
	Low Channel	High Channel		
V <sub>nor</sub>	0.0021	0.0021	2.5	
V <sub>min</sub>	-0.0021	-0.0025	2.5	
V <sub>max</sub>	0.0018	0.0018	2.5	

**NOTE:** The applicant defined the normal working voltage of the battery is V<sub>min</sub> to V<sub>max</sub>.

#### FREQUENCY ERROR vs. TEMPERATURE.

TEMP. (°C)	3MHz		LIMIT (ppm)	
	FREQUENCY ERROR (ppm)			
	Low Channel	High Channel		
-30	-0.0119	-0.0114	2.5	
-20	-0.0100	-0.0109	2.5	
-10	-0.0086	-0.0080	2.5	
0	-0.0078	-0.0074	2.5	
10	-0.0054	-0.0052	2.5	
20	-0.0043	-0.0039	2.5	
30	-0.0040	-0.0033	2.5	
40	-0.0015	-0.0015	2.5	
50	-0.0005	-0.0004	2.5	



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#### FREQUENCY ERROR VS. VOLTAGE

VOLTAGE (Volts)	5MHz		LIMIT (ppm)	
	FREQUENCY ERROR (ppm)			
	Low Channel	High Channel		
V <sub>nor</sub>	0.0021	0.0025	2.5	
V <sub>min</sub>	-0.0023	-0.0030	2.5	
V <sub>max</sub>	0.0021	0.0021	2.5	

**NOTE:** The applicant defined the normal working voltage of the battery is V<sub>min</sub> to V<sub>max</sub>.

#### FREQUENCY ERROR vs. TEMPERATURE.

TEMP. (°C)	5MHz		LIMIT (ppm)	
	FREQUENCY ERROR (ppm)			
	Low Channel	High Channel		
-30	-0.0115	-0.0113	2.5	
-20	-0.0111	-0.0106	2.5	
-10	-0.0082	-0.0083	2.5	
0	-0.0074	-0.0072	2.5	
10	-0.0053	-0.0047	2.5	
20	-0.0040	-0.0041	2.5	
30	-0.0036	-0.0032	2.5	
40	-0.0023	-0.0015	2.5	
50	-0.0002	-0.0004	2.5	



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#### FREQUENCY ERROR VS. VOLTAGE

VOLTAGE (Volts)	10MHz		LIMIT (ppm)	
	FREQUENCY ERROR (ppm)			
	Low Channel	High Channel		
V <sub>nor</sub>	0.0024	0.0025	2.5	
V <sub>min</sub>	-0.0031	-0.0030	2.5	
V <sub>max</sub>	0.0026	0.0026	2.5	

**NOTE:** The applicant defined the normal working voltage of the battery is V<sub>min</sub> to V<sub>max</sub>.

#### FREQUENCY ERROR vs. TEMPERATURE.

TEMP. (°C)	10MHz		LIMIT (ppm)	
	FREQUENCY ERROR (ppm)			
	Low Channel	High Channel		
-30	-0.0113	-0.0115	2.5	
-20	-0.0104	-0.0103	2.5	
-10	-0.0082	-0.0079	2.5	
0	-0.0077	-0.0074	2.5	
10	-0.0052	-0.0055	2.5	
20	-0.0044	-0.0040	2.5	
30	-0.0039	-0.0038	2.5	
40	-0.0018	-0.0017	2.5	
50	-0.0003	-0.0003	2.5	



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#### FREQUENCY ERROR VS. VOLTAGE

VOLTAGE (Volts)	15MHz		LIMIT (ppm)	
	FREQUENCY ERROR (ppm)			
	Low Channel	High Channel		
V <sub>nor</sub>	0.0026	0.0025	2.5	
V <sub>min</sub>	-0.0031	-0.0031	2.5	
V <sub>max</sub>	0.0026	0.0024	2.5	

**NOTE:** The applicant defined the normal working voltage of the battery is V<sub>min</sub> to V<sub>max</sub>.

#### FREQUENCY ERROR vs. TEMPERATURE.

TEMP. (°C)	15MHz		LIMIT (ppm)	
	FREQUENCY ERROR (ppm)			
	Low Channel	High Channel		
-30	-0.0117	-0.0113	2.5	
-20	-0.0112	-0.0098	2.5	
-10	-0.0082	-0.0081	2.5	
0	-0.0075	-0.0073	2.5	
10	-0.0045	-0.0052	2.5	
20	-0.0038	-0.0041	2.5	
30	-0.0034	-0.0038	2.5	
40	-0.0015	-0.0018	2.5	
50	-0.0002	-0.0005	2.5	



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#### FREQUENCY ERROR VS. VOLTAGE

VOLTAGE (Volts)	20MHz		LIMIT (ppm)	
	FREQUENCY ERROR (ppm)			
	Low Channel	High Channel		
V <sub>nor</sub>	0.0026	0.0025	2.5	
V <sub>min</sub>	-0.0031	-0.0030	2.5	
V <sub>max</sub>	0.0026	0.0024	2.5	

**NOTE:** The applicant defined the normal working voltage of the battery is V<sub>min</sub> to V<sub>max</sub>.

#### FREQUENCY ERROR vs. TEMPERATURE.

TEMP. (°C)	20MHz		LIMIT (ppm)	
	FREQUENCY ERROR (ppm)			
	Low Channel	High Channel		
-30	-0.0113	-0.0119	2.5	
-20	-0.0101	-0.0100	2.5	
-10	-0.0083	-0.0083	2.5	
0	-0.0075	-0.0074	2.5	
10	-0.0055	-0.0048	2.5	
20	-0.0041	-0.0038	2.5	
30	-0.0030	-0.0042	2.5	
40	-0.0018	-0.0020	2.5	
50	-0.0002	-0.0001	2.5	

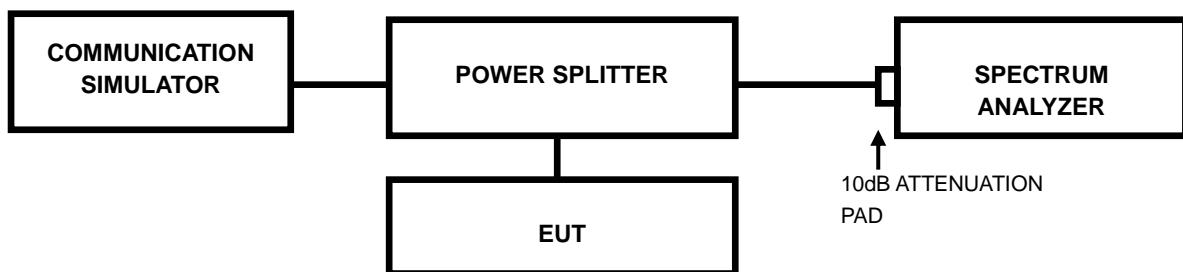


### 3.3 OCCUPIED BANDWIDTH MEASUREMENT

#### 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





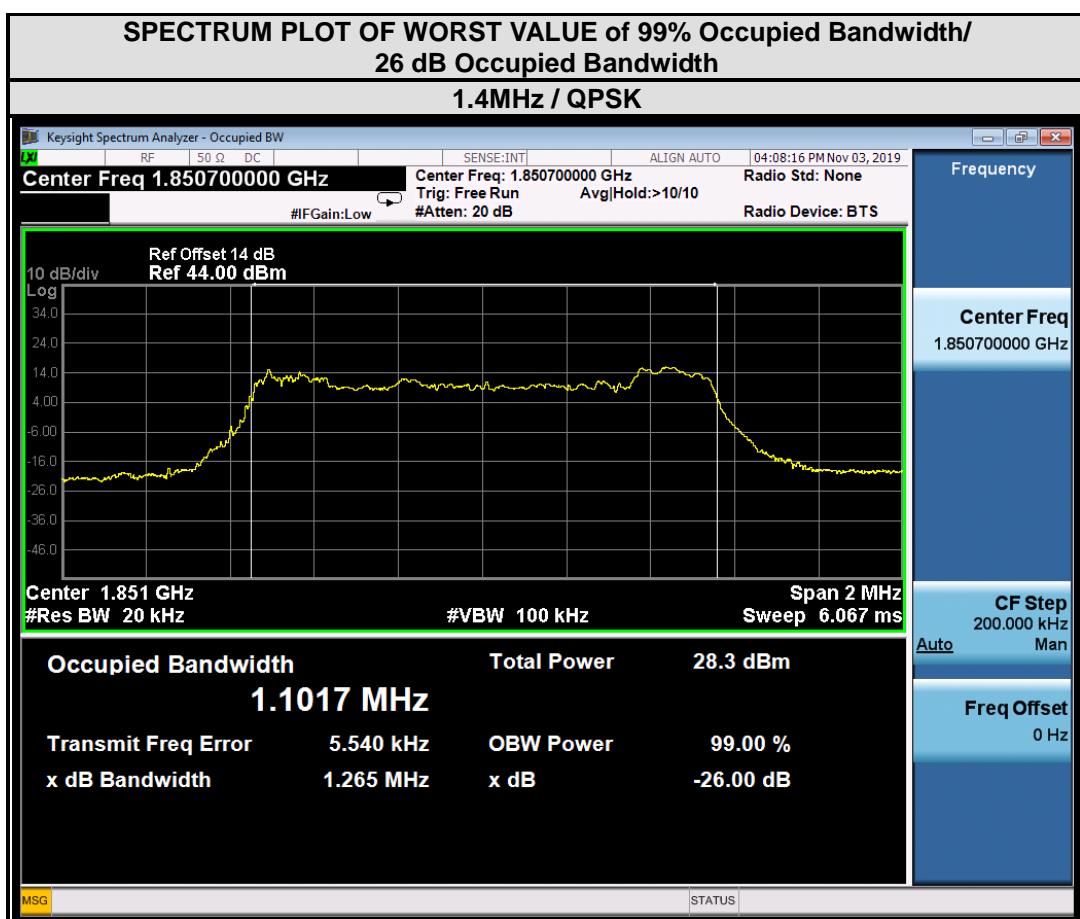
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### 3.3.3 TEST RESULTS

#### 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	1.27
18900	1880	1.10	1.25
19193	1909.3	1.09	1.24

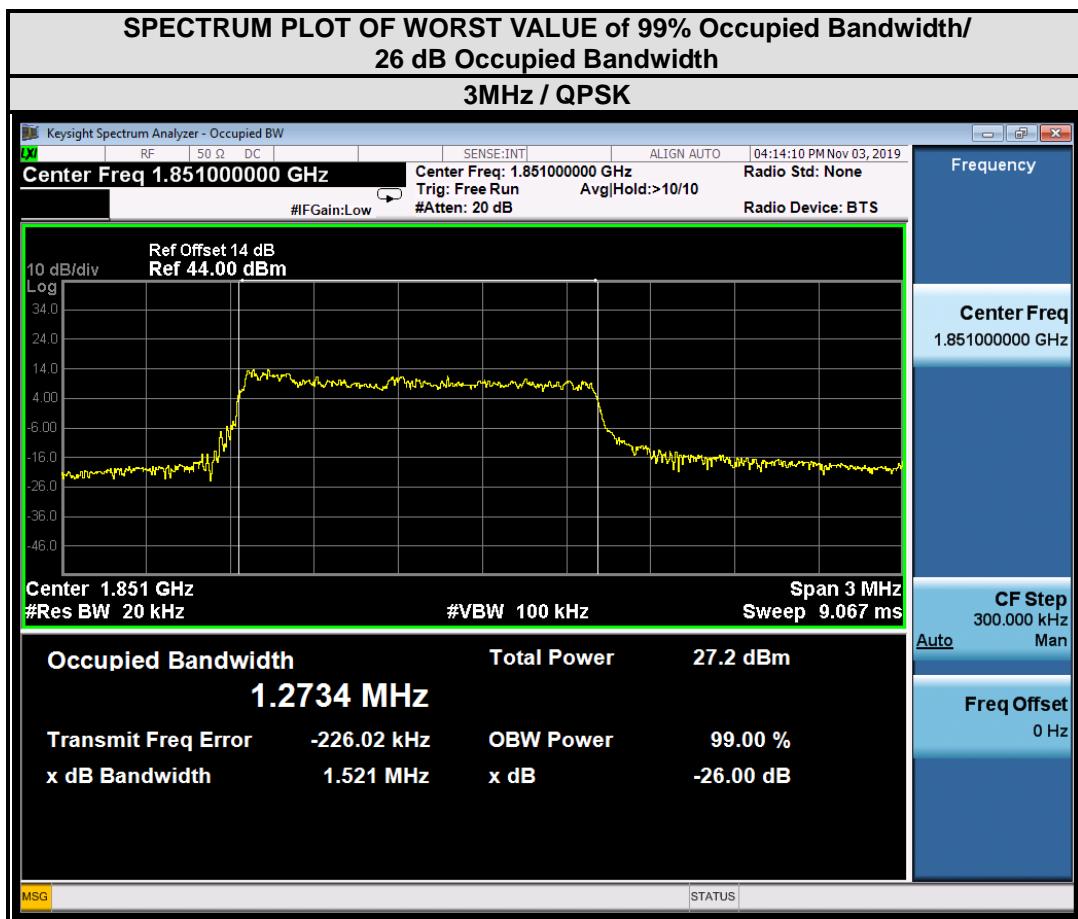




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CHANNEL BANDWIDTH:3MHz			
CHANNEL	Frequency (MHz)	99% OCCUPIED Bandwidth (MHz)	26 dB bandwidth (MHz)
		QPSK	QPSK
18615	1851.5	1.27	1.52
18900	1880	1.27	1.45
19185	1908.5	1.27	1.39

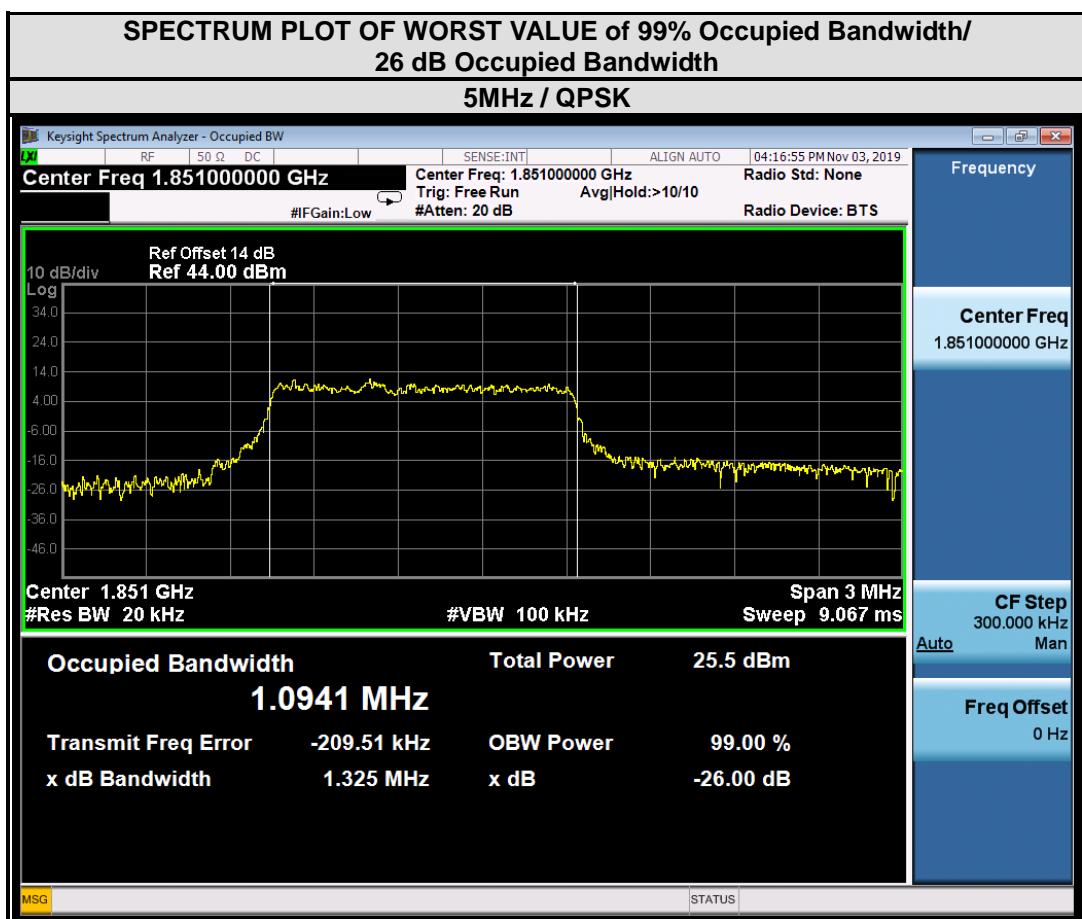




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Test Report No.: RFP20120029-2

CHANNEL BANDWIDTH:5MHz			
CHANNEL	Frequency (MHz)	99% OCCUPIED Bandwidth (MHz)	26 dB bandwidth (MHz)
		QPSK	QPSK
18625	1852.5	1.09	1.33
18900	1880	1.09	1.47
19175	1907.5	1.09	1.35

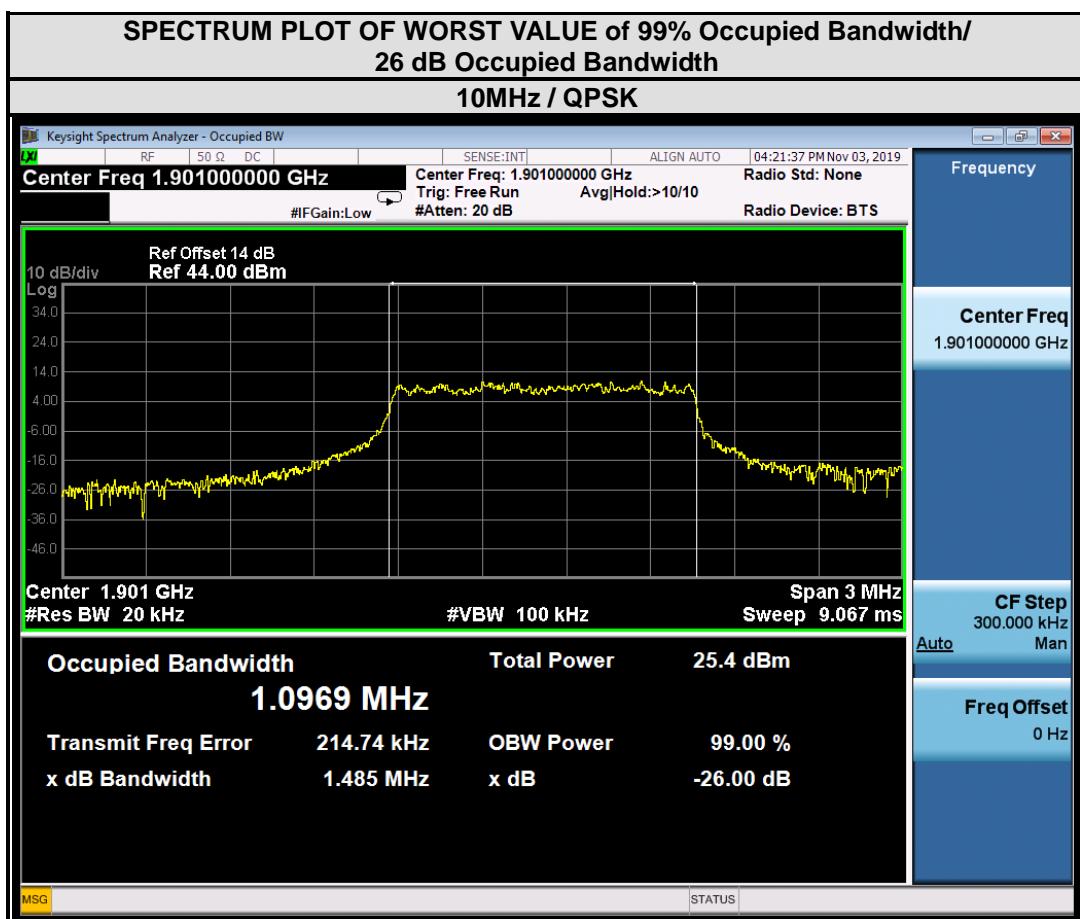




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Test Report No.: RFP20120029-2

CHANNEL BANDWIDTH:10MHz			
CHANNEL	Frequency (MHz)	99% OCCUPIED Bandwidth (MHz)	26 dB bandwidth (MHz)
		QPSK	QPSK
18650	1855	1.09	1.43
18900	1880	1.09	1.42
19150	1905	1.10	1.49

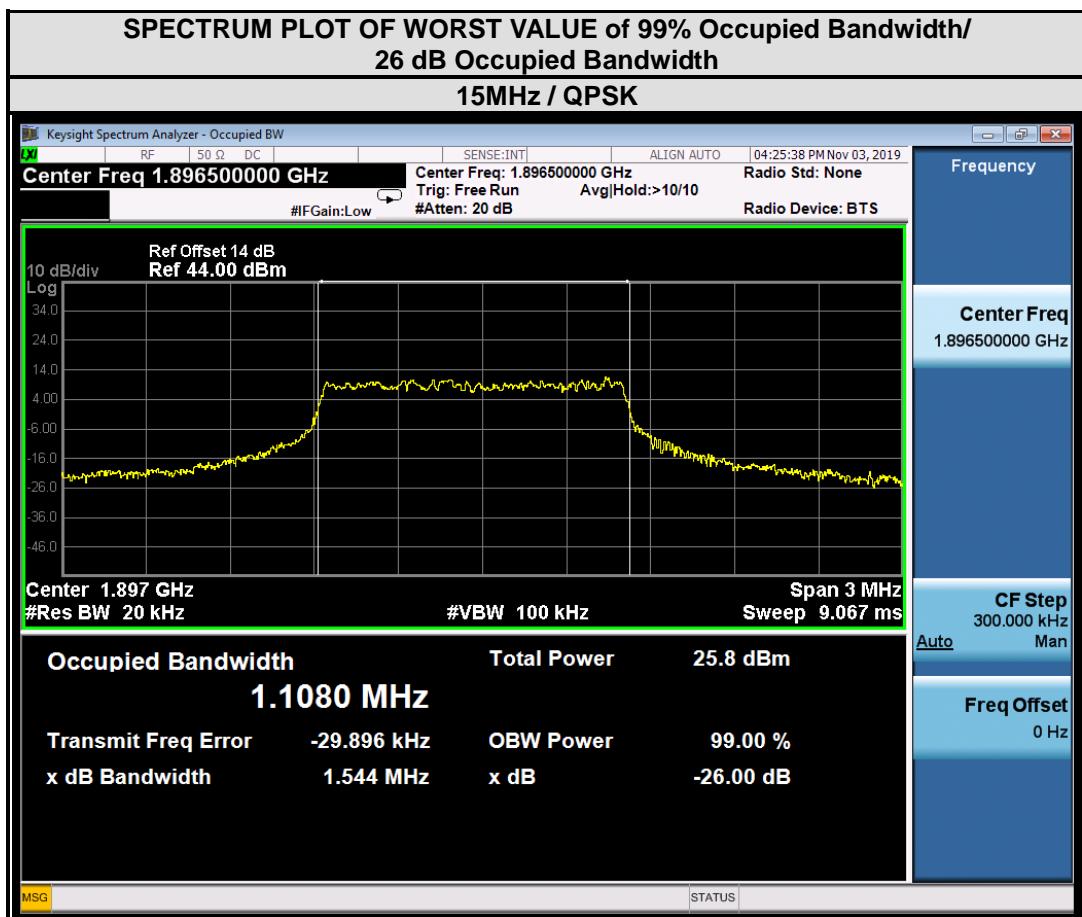




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Test Report No.: RFP20120029-2

CHANNEL BANDWIDTH:15MHz			
CHANNEL	Frequency (MHz)	99% OCCUPIED Bandwidth (MHz)	26 dB bandwidth (MHz)
		QPSK	QPSK
18675	1857.5	1.10	1.50
18900	1880	1.11	1.59
19125	1902.5	1.11	1.54

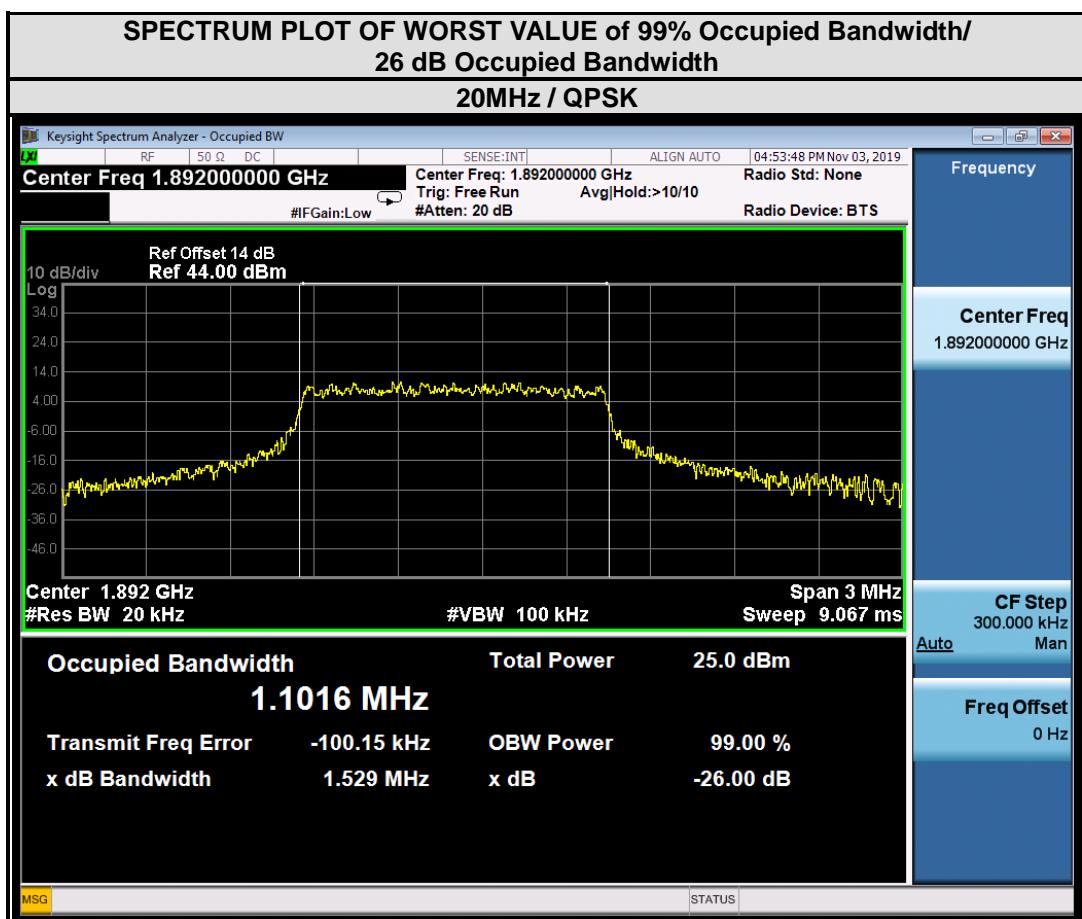




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Test Report No.: RFP20120029-2

CHANNEL BANDWIDTH:20MHz			
CHANNEL	Frequency (MHz)	99% OCCUPIED Bandwidth (MHz)	26 dB bandwidth (MHz)
		QPSK	QPSK
18700	1860	1.10	1.54
18900	1880	1.09	1.49
19100	1900	1.10	1.53



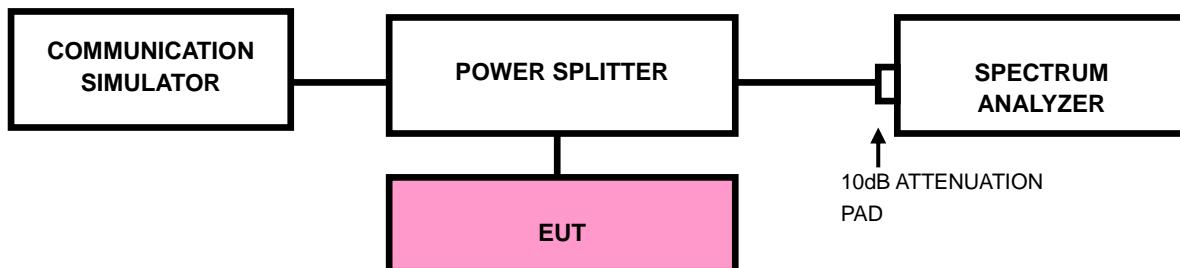


### 3.4 BAND EDGE MEASUREMENT

#### 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. 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 20MHz)
- h. Record the max trace plot into the test report.



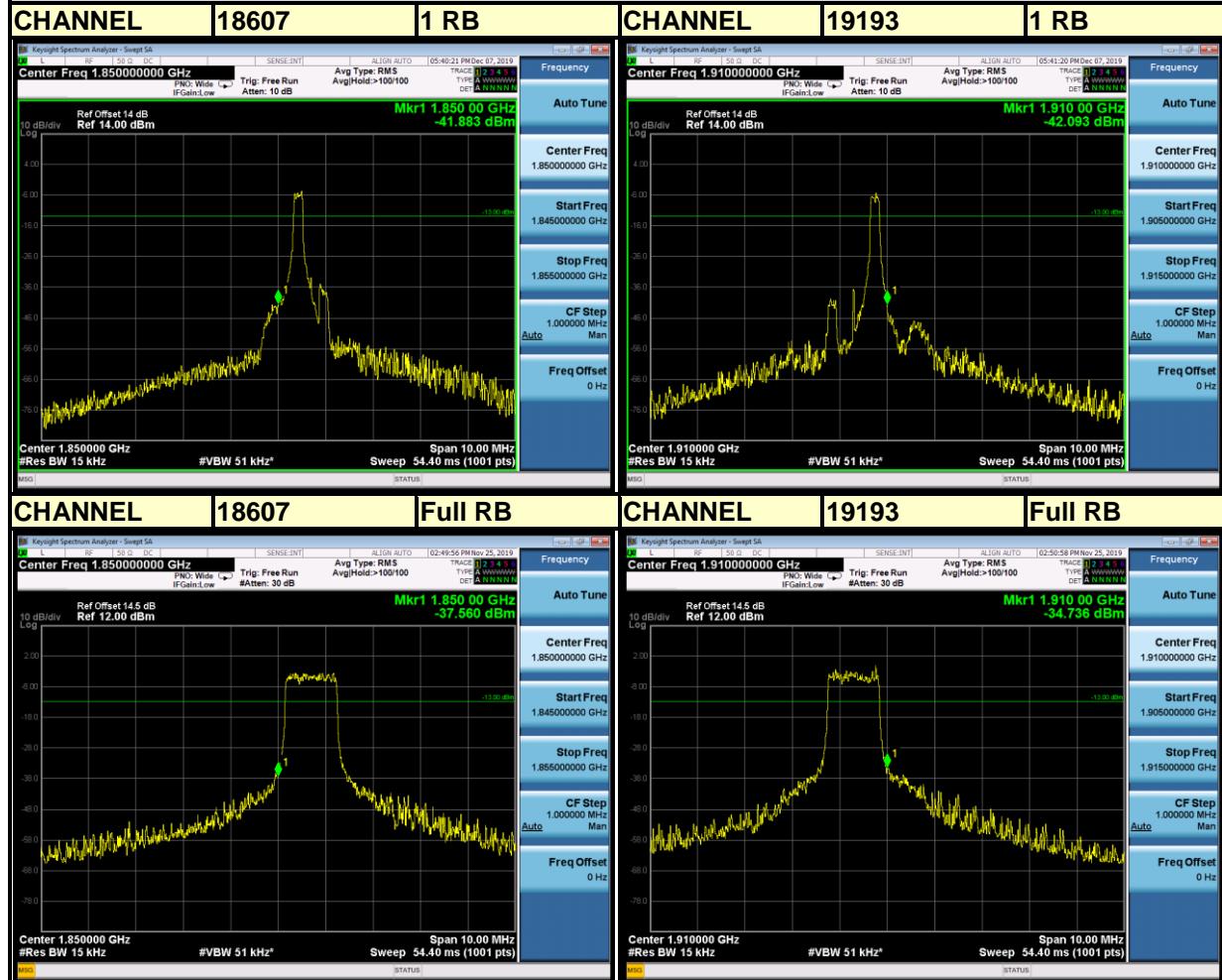
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Test Report No.: RFP20120029-2

### 3.4.4. TEST RESULTS

#### LTE BAND 2

##### Channel Bandwidth: 1.4MHz QPSK

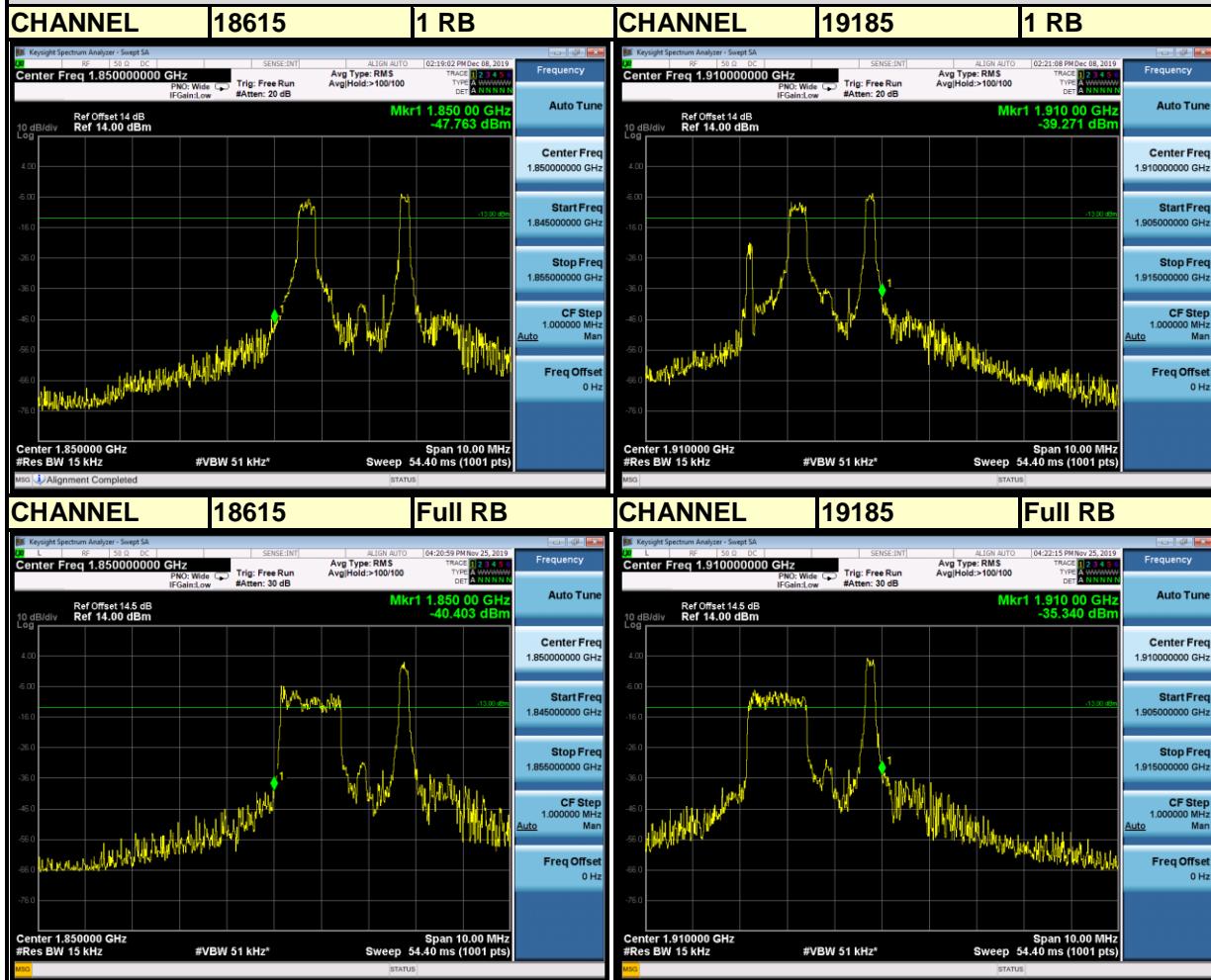




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Test Report No.: RFP20120029-2

### Channel Bandwidth: 3MHz QPSK

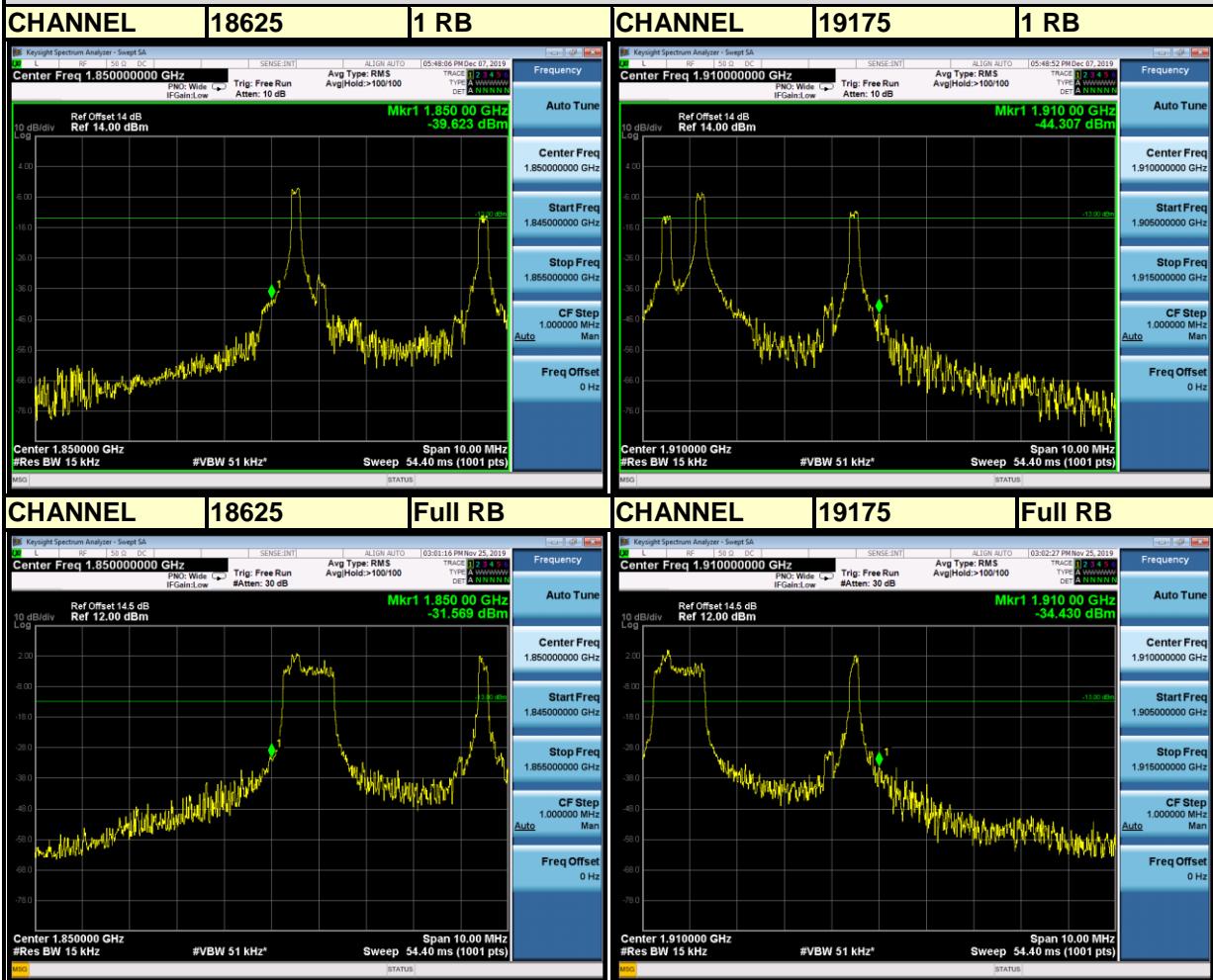




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Test Report No.: RFP20120029-2

### Channel Bandwidth: 5MHz QPSK

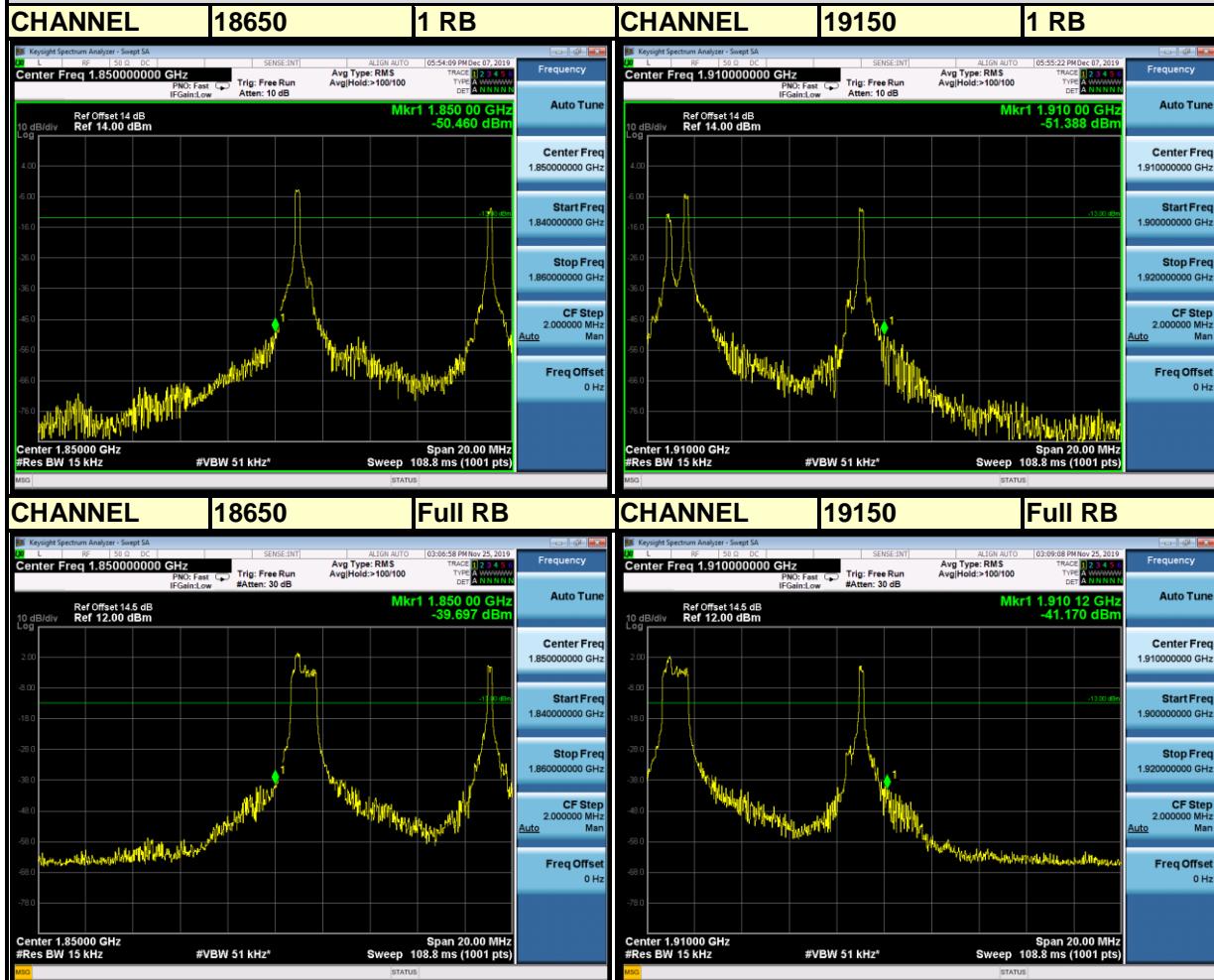




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Test Report No.: RFP20120029-2

### Channel Bandwidth: 10MHz QPSK

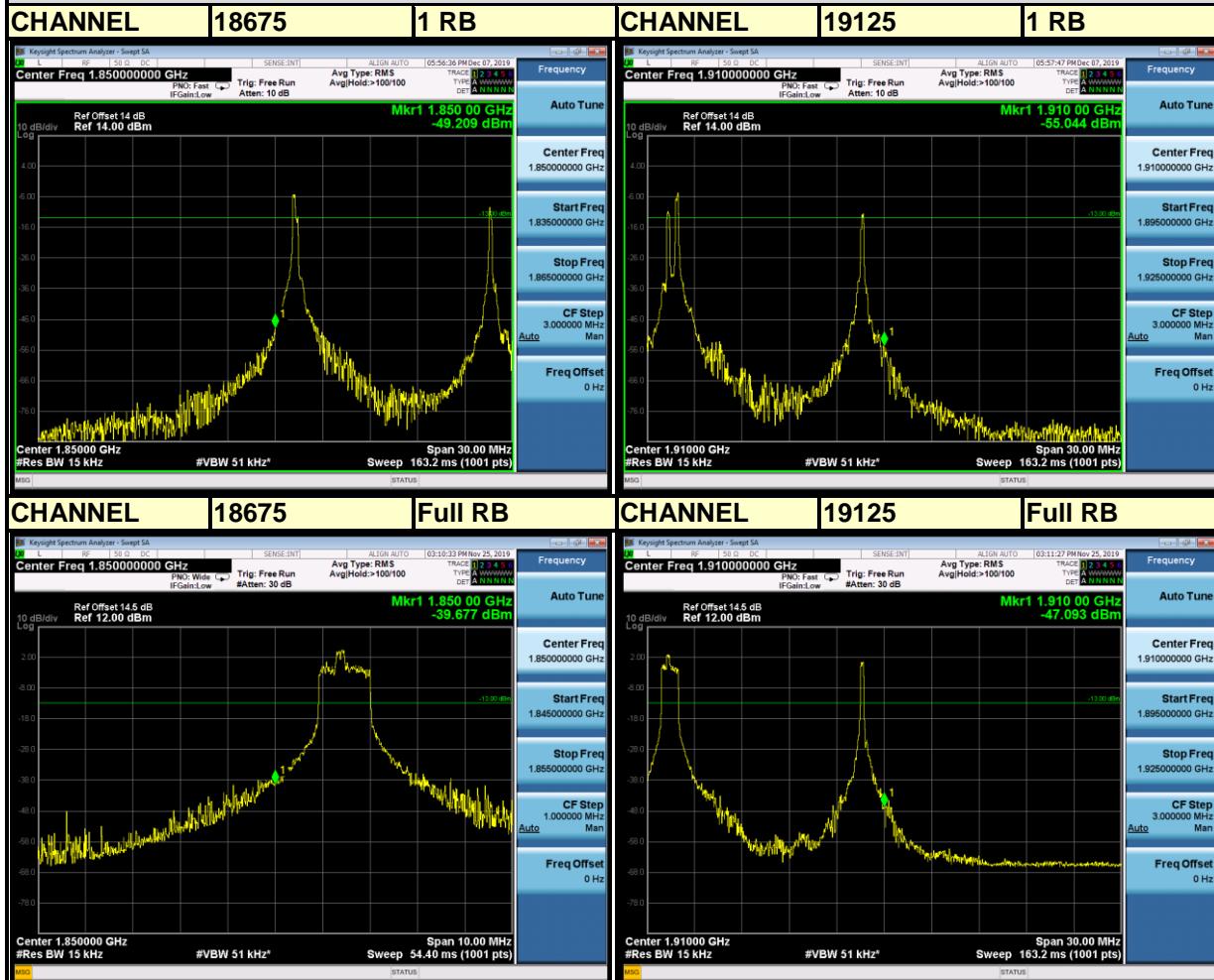




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Test Report No.: RFP20120029-2

### Channel Bandwidth: 15MHz QPSK

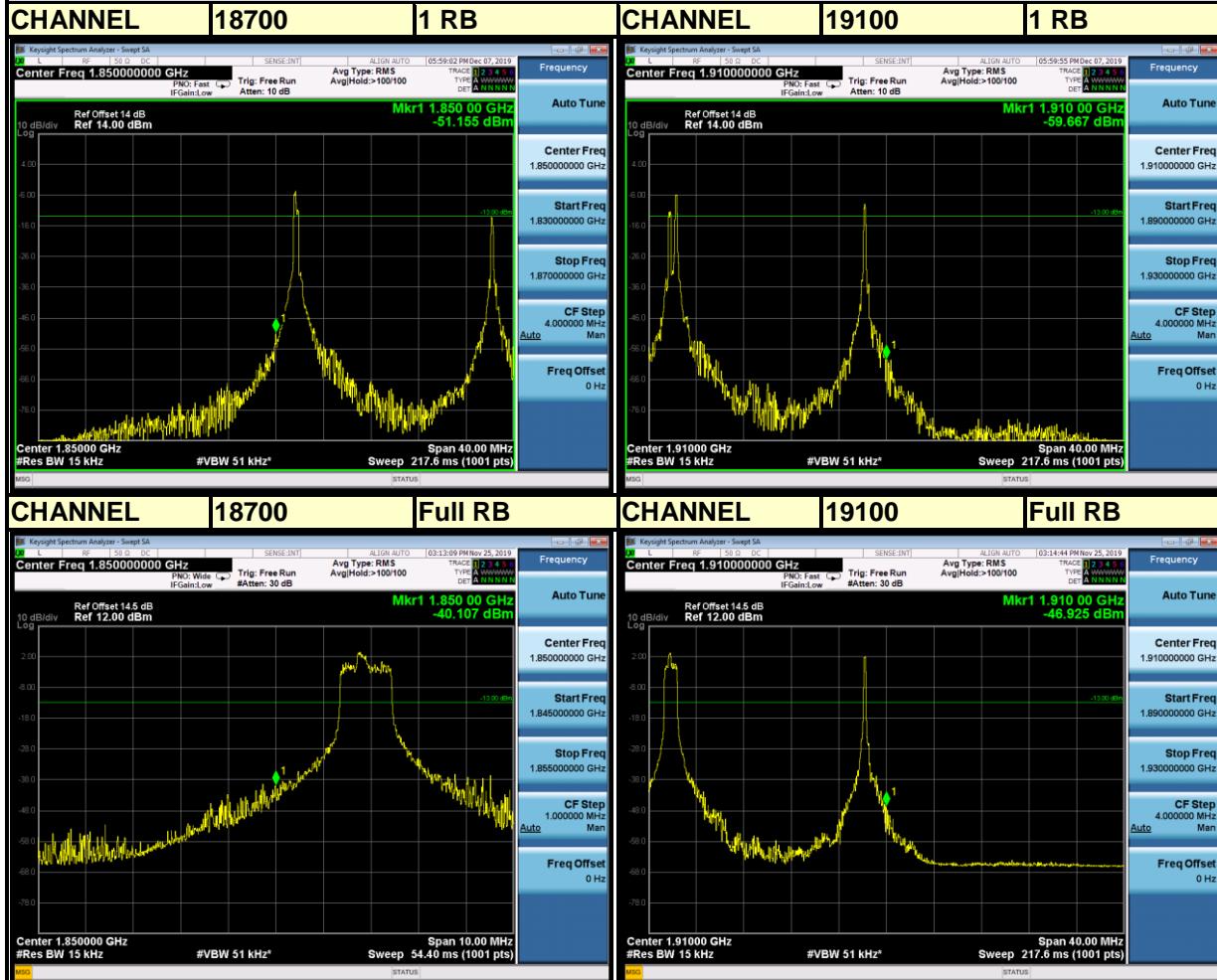




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Test Report No.: RFP20120029-2

### Channel Bandwidth: 20MHz QPSK





### 3.5 CONDUCTED SPURIOUS EMISSIONS

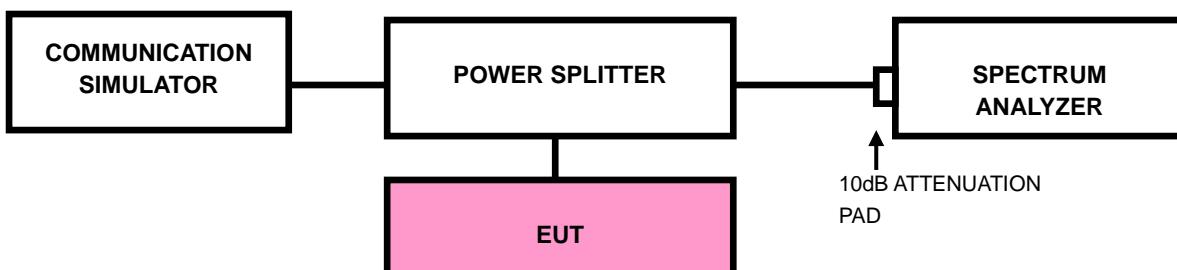
#### 3.5.1 LIMITS OF CONDUCTED SPURIOUS EMISSIONS MEASUREMENT

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  $-13\text{dBm}$ .

#### 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 30 MHz to 19.1GHz. 10dB attenuation pad is connected with spectrum. RBW=1MHz and VBW=3MHz is used for conducted emission measurement.

#### 3.5.3 TEST SETUP





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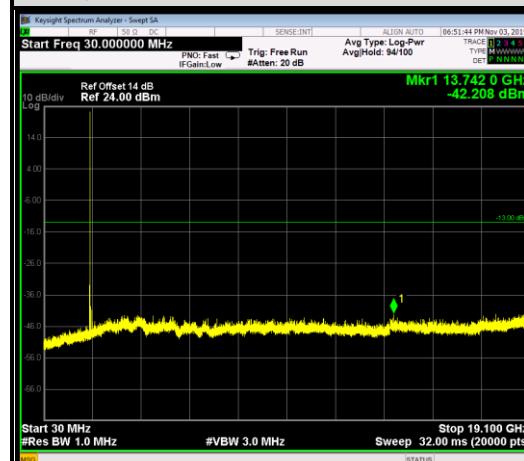
### 3.5.4 TEST RESULTS

#### LTE BAND 2

##### 1.4MHz / QPSK

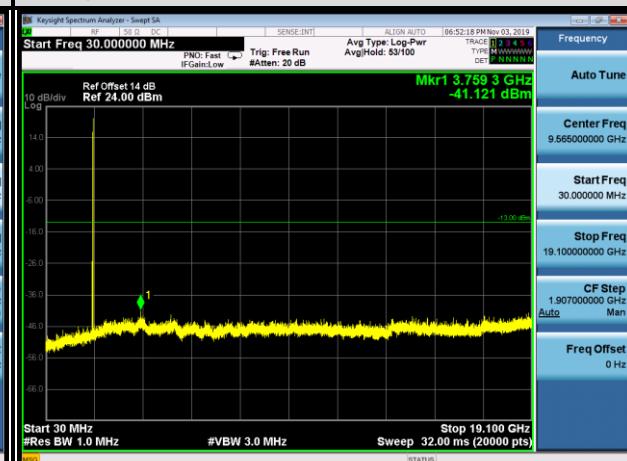
###### CHANNEL 18607

FREQUENCY RANGE : 30MHz~19.1GHz



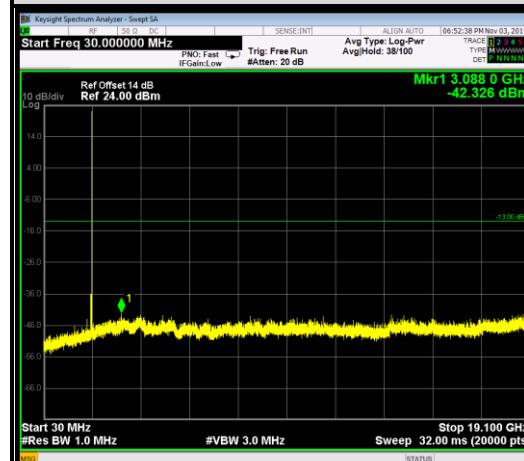
###### CHANNEL 18900

FREQUENCY RANGE : 30MHz~19.1GHz



###### CHANNEL 19193

FREQUENCY RANGE : 30MHz~19.1GHz





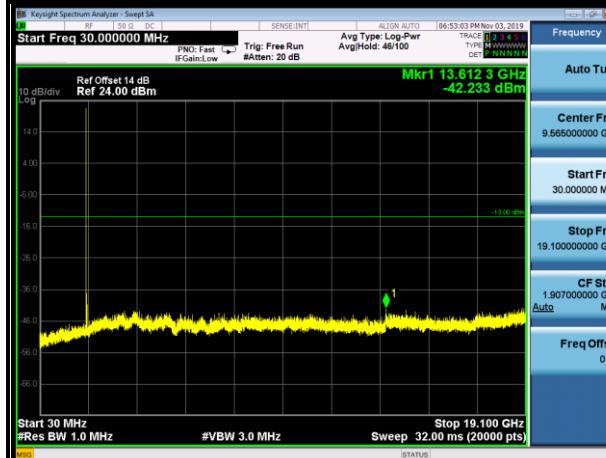
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Test Report No.: RFP20120029-2

### 3MHz / QPSK

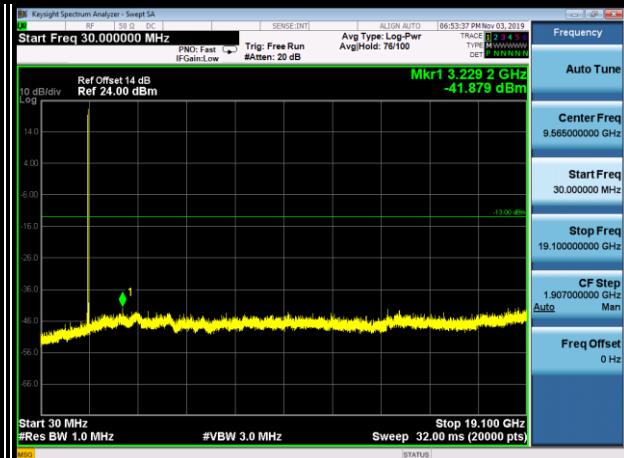
#### CHANNEL 18615

FREQUENCY RANGE : 30MHz~19.1GHz



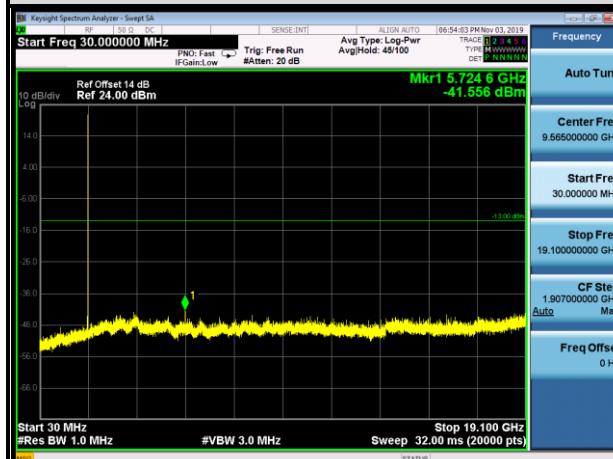
#### CHANNEL 18900

FREQUENCY RANGE : 30MHz~19.1GHz



#### CHANNEL 19185

FREQUENCY RANGE : 30MHz~19.1GHz





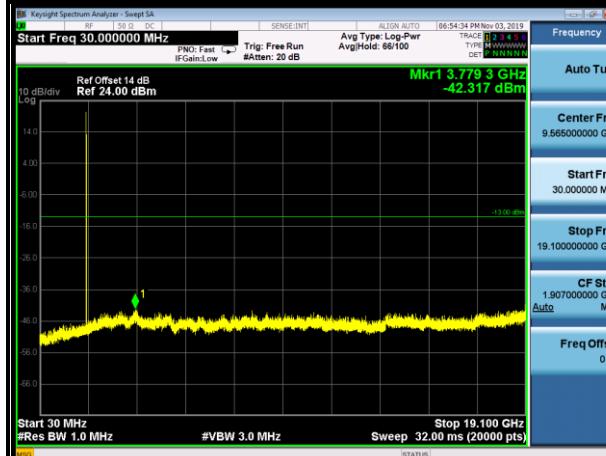
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Test Report No.: RFP20120029-2

## 5MHz / QPSK

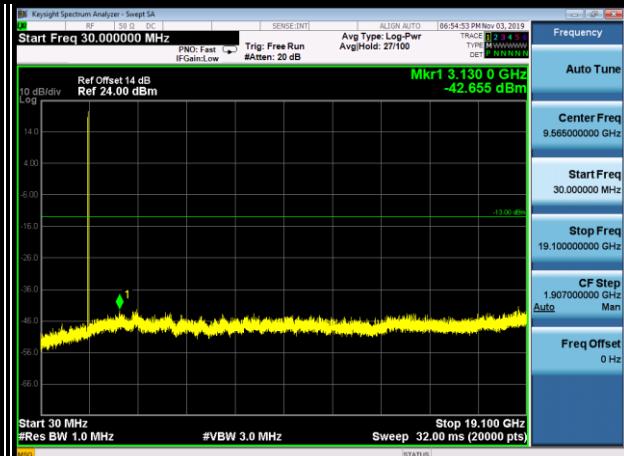
### CHANNEL 18625

FREQUENCY RANGE : 30MHz~19.1GHz



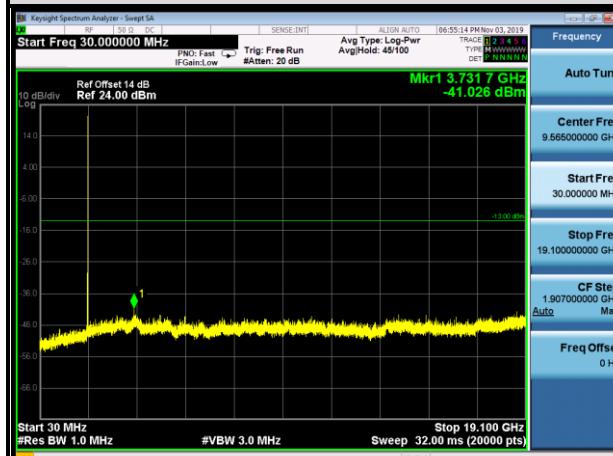
### CHANNEL 18900

FREQUENCY RANGE : 30MHz~19.1GHz



### CHANNEL 19175

FREQUENCY RANGE : 30MHz~19.1GHz





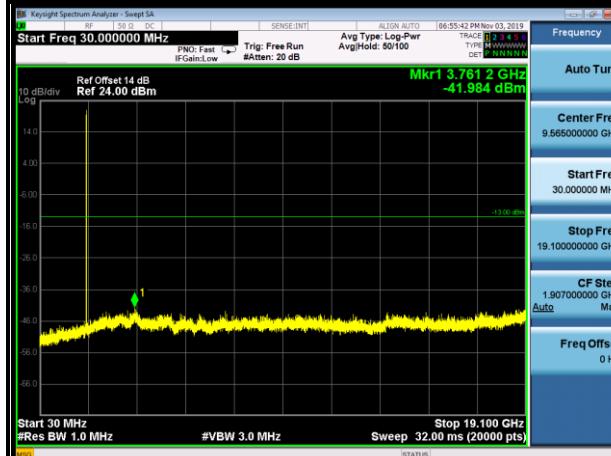
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Test Report No.: RFP20120029-2

## 10MHz / QPSK

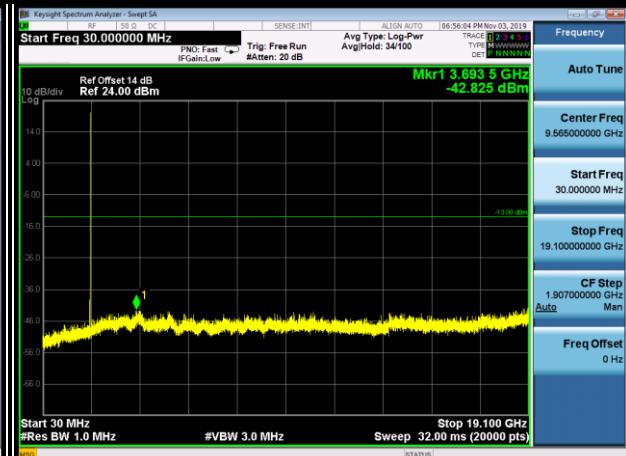
### CHANNEL 18650

FREQUENCY RANGE : 30MHz~19.1GHz



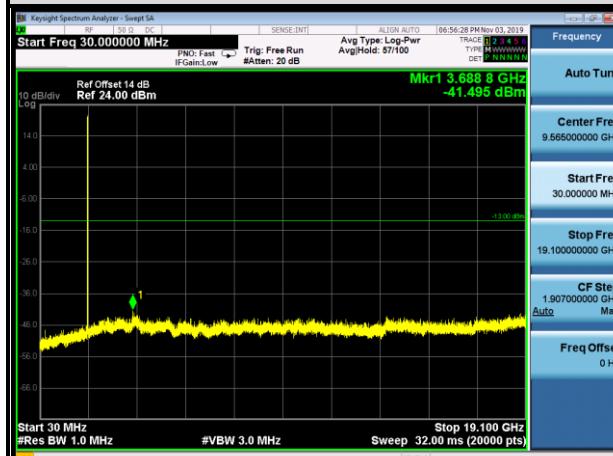
### CHANNEL 18900

FREQUENCY RANGE : 30MHz~19.1GHz



### CHANNEL 19150

FREQUENCY RANGE : 30MHz~19.1GHz





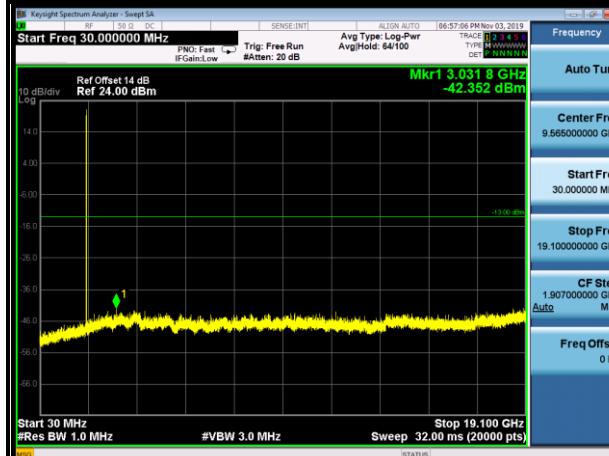
BUREAU  
VERITAS

Test Report No.: RFP20120029-2

## 15MHz / QPSK

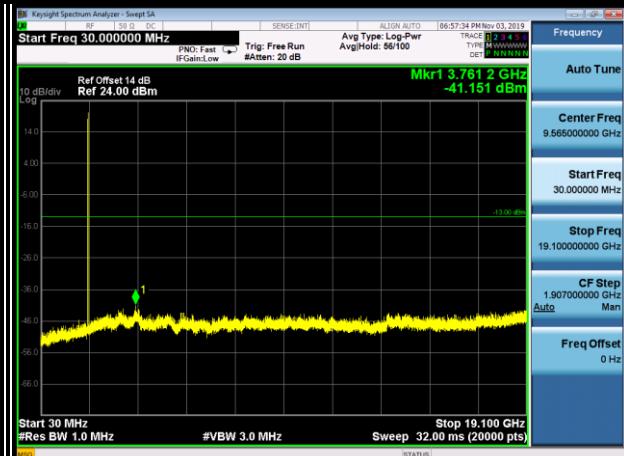
### CHANNEL 18675

FREQUENCY RANGE : 30MHz~19.1GHz



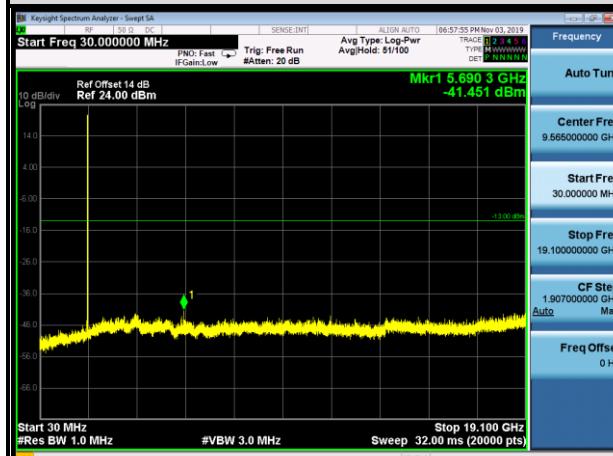
### CHANNEL 18900

FREQUENCY RANGE : 30MHz~19.1GHz



### CHANNEL 19125

FREQUENCY RANGE : 30MHz~19.1GHz





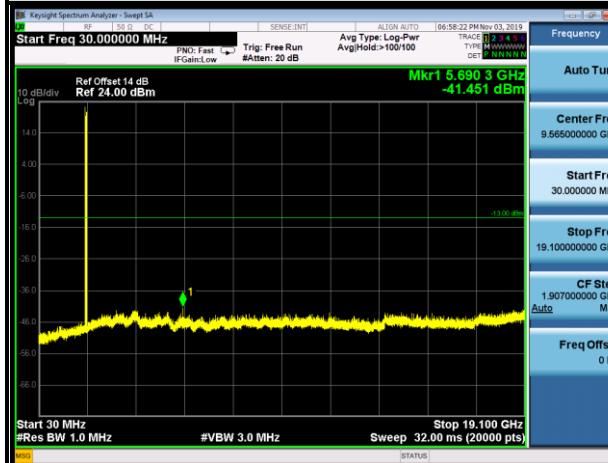
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Test Report No.: RFP20120029-2

## 20MHz / QPSK

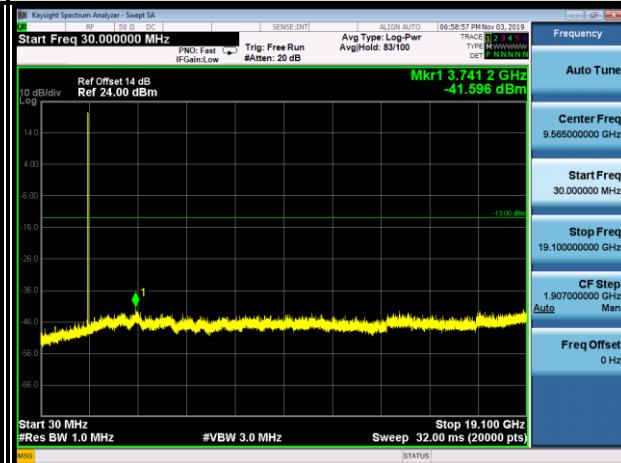
### CHANNEL 18700

FREQUENCY RANGE : 30MHz~19.1GHz



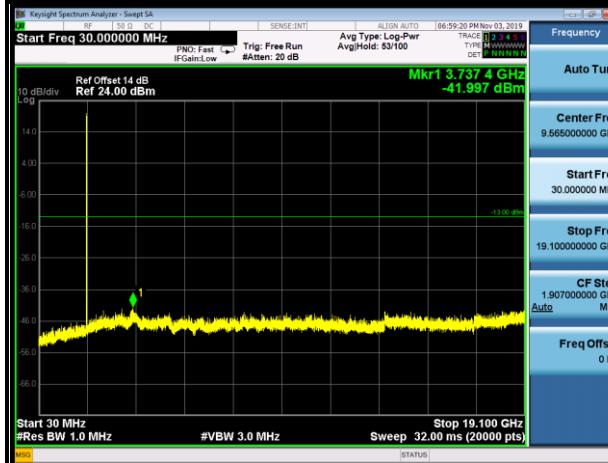
### CHANNEL 18900

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  $-13\text{dBm}$ .

#### 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 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.

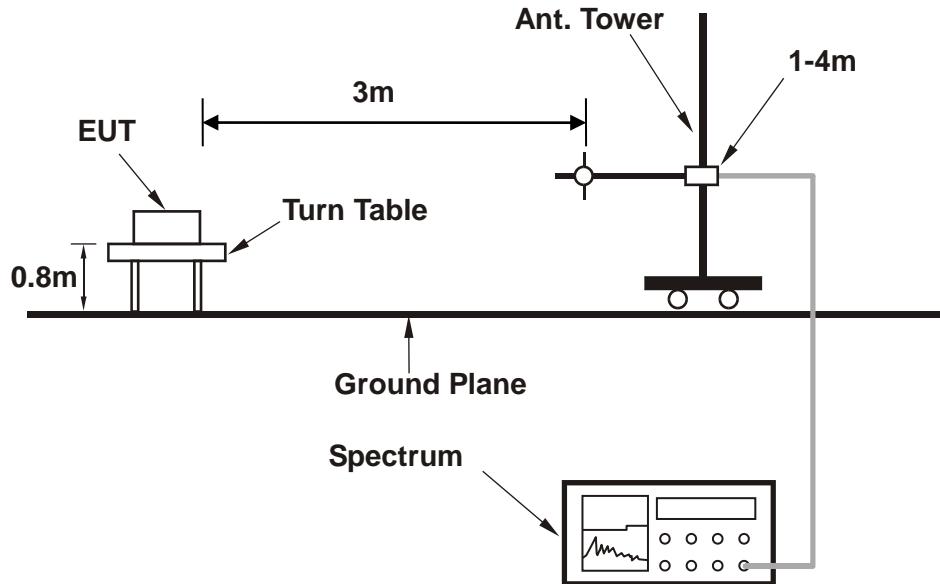
#### 3.6.3 DEVIATION FROM TEST STANDARD

No deviation

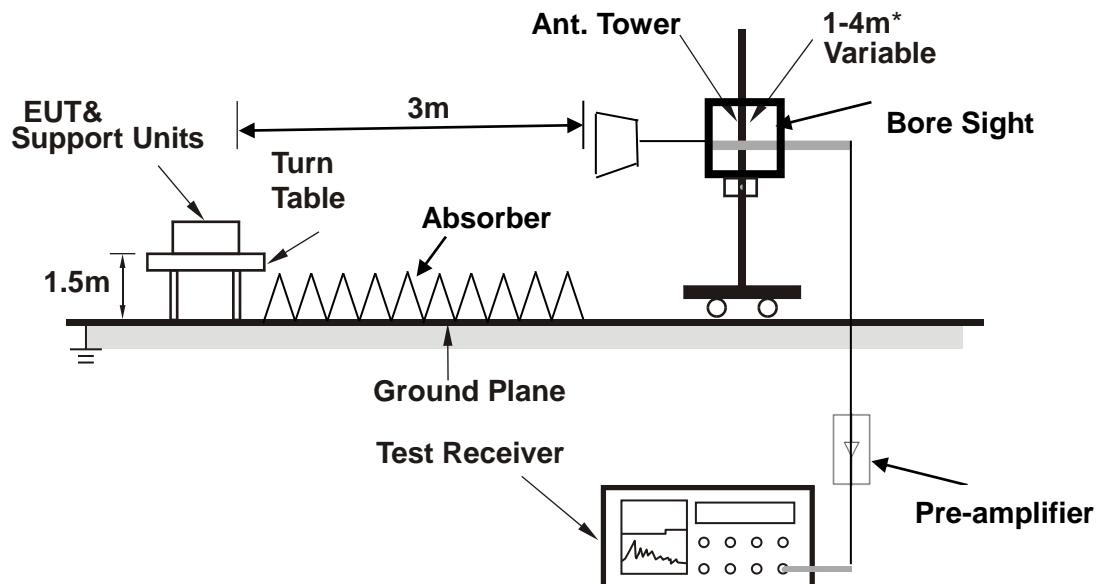


### 3.6.4 TEST SETUP

< 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).



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VERITAS Test Report No.: RFP20120029-2

### 3.6.5 TEST RESULTS

#### BELOW 1GHz WORST-CASE DATA

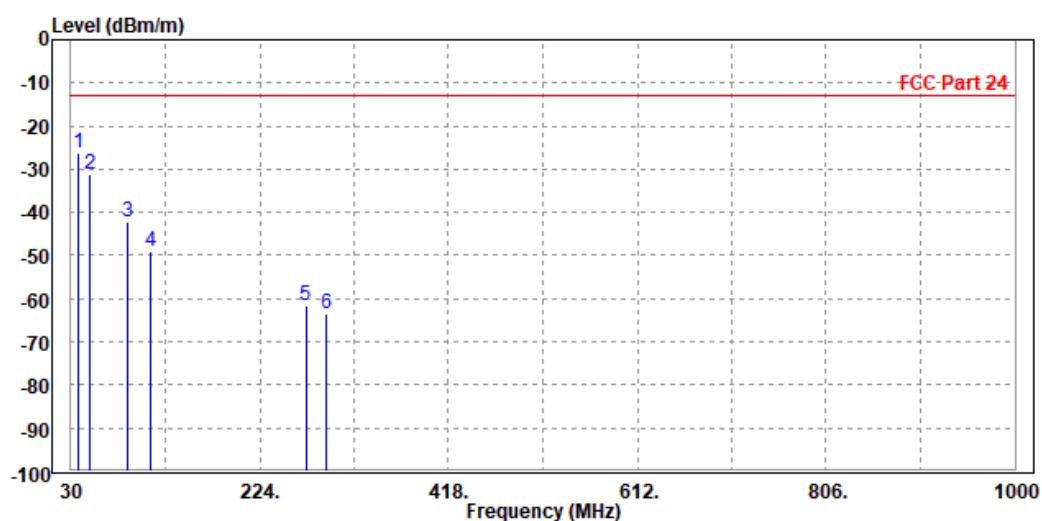
30 MHz – 1GHz data:

LTE Band 2

CHANNEL BANDWIDTH: 10MHz / QPSK

MODE	TX channel 18900	FREQUENCY RANGE	Below 1000MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70%RH	INPUT POWER	DC 3.7V by battery
TESTED BY	Star Le		
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M			

Freq	Level	Read	Limit	Over	Factor	Remark	Pol/Phase
		Line	Line	dB			
MHz	dBm/m	dBm	dBm/m	dB	dB/m		
1 PP	37.225	-26.36	-38.65	-13.00	-13.36	12.29 Peak	Horizontal
2	50.210	-31.30	-34.20	-13.00	-18.30	2.90 Peak	Horizontal
3	88.336	-42.29	-33.47	-13.00	-29.29	-8.82 Peak	Horizontal
4	111.254	-49.13	-35.63	-13.00	-36.13	-13.50 Peak	Horizontal
5	271.265	-61.45	-46.22	-13.00	-48.45	-15.23 Peak	Horizontal
6	293.145	-63.48	-49.33	-13.00	-50.48	-14.15 Peak	Horizontal



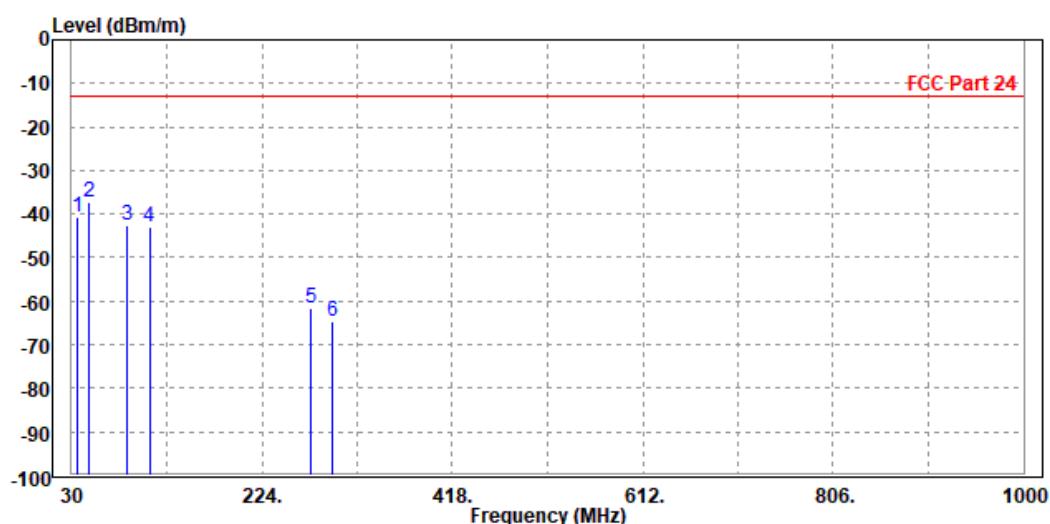


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Test Report No.: RFP20120029-2

MODE	TX channel 18900	FREQUENCY RANGE	Below 1000MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70%RH	INPUT POWER	DC 3.7V by battery
TESTED BY	Star Le		
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M			

	Freq	Read Level	Limit Level	Over Line	Over Limit	Factor	Remark	Pol/Phase
	MHz	dBm/m	dBm	dBm/m	dB	dB/m		
1	35.148	-40.58	-39.26	-13.00	-27.58	-1.32	Peak	Vertical
2 PP	47.215	-37.08	-33.22	-13.00	-24.08	-3.86	Peak	Vertical
3	86.174	-42.57	-32.14	-13.00	-29.57	-10.43	Peak	Vertical
4	109.360	-43.12	-31.21	-13.00	-30.12	-11.91	Peak	Vertical
5	273.360	-61.74	-50.33	-13.00	-48.74	-11.41	Peak	Vertical
6	296.215	-64.46	-53.15	-13.00	-51.46	-11.31	Peak	Vertical





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Test Report No.: RFP20120029-2

## ABOVE 1GHz DATA

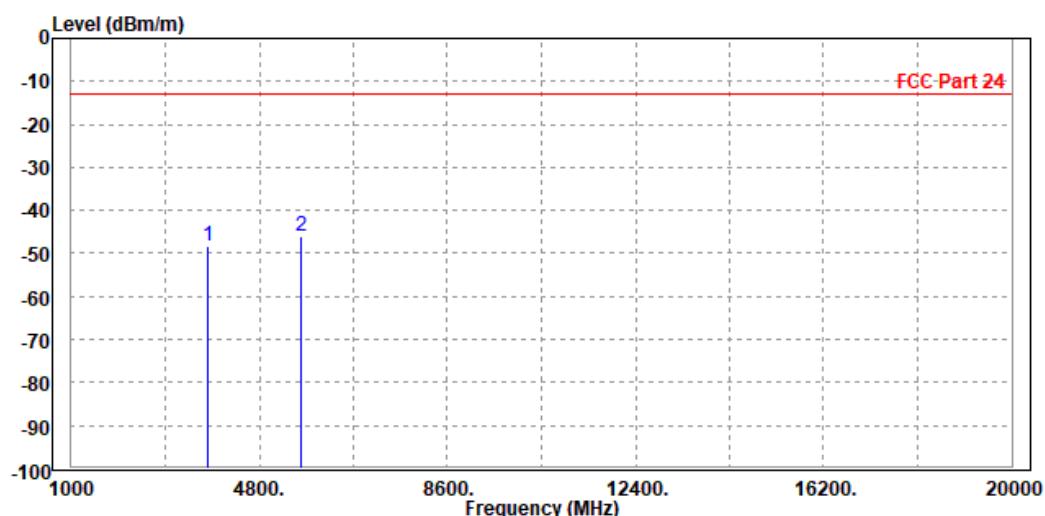
**Note:** For higher frequency, the emission is too low to be detected.

### LTE Band 2

CHANNEL BANDWIDTH: 1.4MHz / QPSK

MODE	TX channel 18900	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70%RH	INPUT POWER	DC 3.7V by battery
TESTED BY	Star Le		
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M			

Freq	Level	Read	Limit	Over	Factor	Remark	Pol/Phase
		Level	Line	Limit			
MHz	dBm/m	dBm	dBm/m	dB	dB/m		
1	3755.000	-48.34	-57.19	-13.00	-35.34	8.85 Peak	Horizontal
2	PP 5640.000	-45.86	-56.34	-13.00	-32.86	10.48 Peak	Horizontal



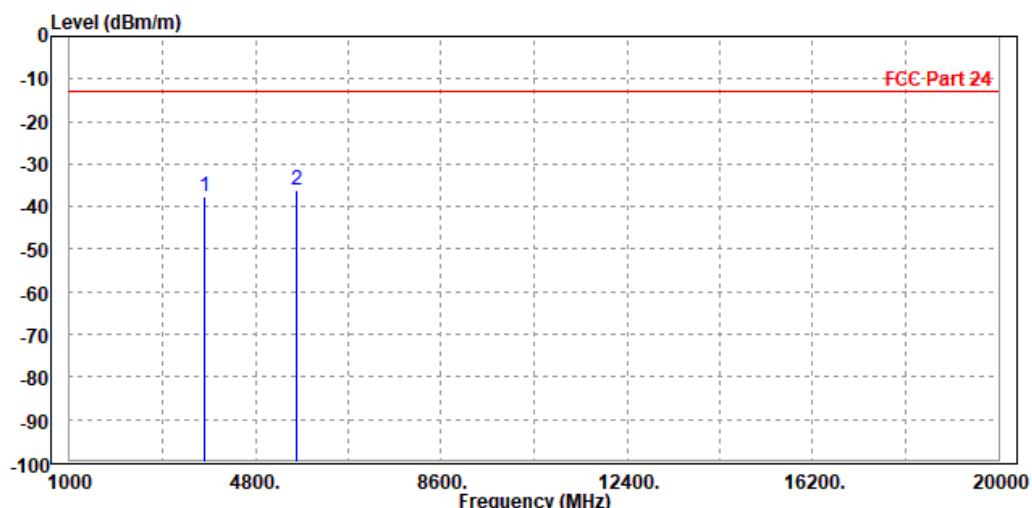


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Test Report No.: RFP20120029-2

MODE	TX channel 18900	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70%RH	INPUT POWER	DC 3.7V by battery
TESTED BY	Star Le		
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M			

Freq	Level	Read	Limit	Over	Remark	Pol/Phase
		Level	Line	Limit Factor		
MHz	dBm/m	dBm	dBm/m	dB	dB/m	
1	3760.000	-37.83	-52.65	-13.00	-24.83	14.82 Peak Vertical
2 PP	5640.000	-36.22	-54.11	-13.00	-23.22	17.89 Peak Vertical





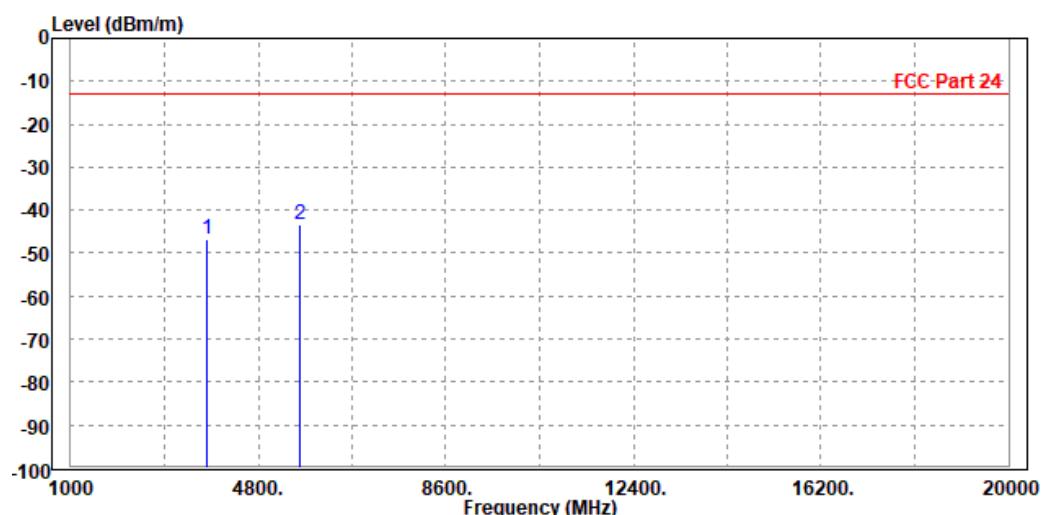
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VERITAS

Test Report No.: RFP20120029-2

CHANNEL BANDWIDTH: 3MHz / QPSK

MODE	TX channel 18900	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70%RH	INPUT POWER	DC 3.7V by battery
TESTED BY	Star Le		
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M			

Freq	Level	Read	Limit	Over	Remark	Pol/Phase
		Level	Line	Limit Factor		
MHz	dBm/m	dBm	dBm/m	dB	dB/m	
1	3755.000	-46.64	-55.49	-13.00	-33.64	8.85 Peak Horizontal
2 PP	5640.000	-43.28	-53.76	-13.00	-30.28	10.48 Peak Horizontal



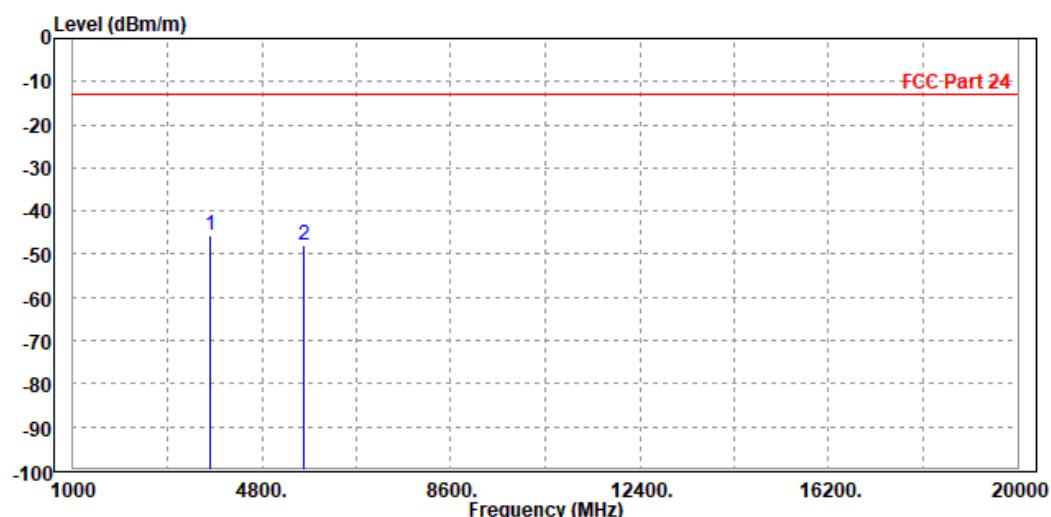


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VERITAS

Test Report No.: RFP20120029-2

MODE	TX channel 18900	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70%RH	INPUT POWER	DC 3.7V by battery
TESTED BY	Star Le		
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M			

Freq	Level	Read	Limit	Over	Factor	Remark	Pol/Phase
		Level	Line	Limit			
MHz	dBm/m	dBm	dBm/m	dB	dB/m		
1 PP 3755.000	-45.80	-55.07	-13.00	-32.80	9.27	Peak	Vertical
2 5640.000	-47.85	-58.10	-13.00	-34.85	10.25	Peak	Vertical



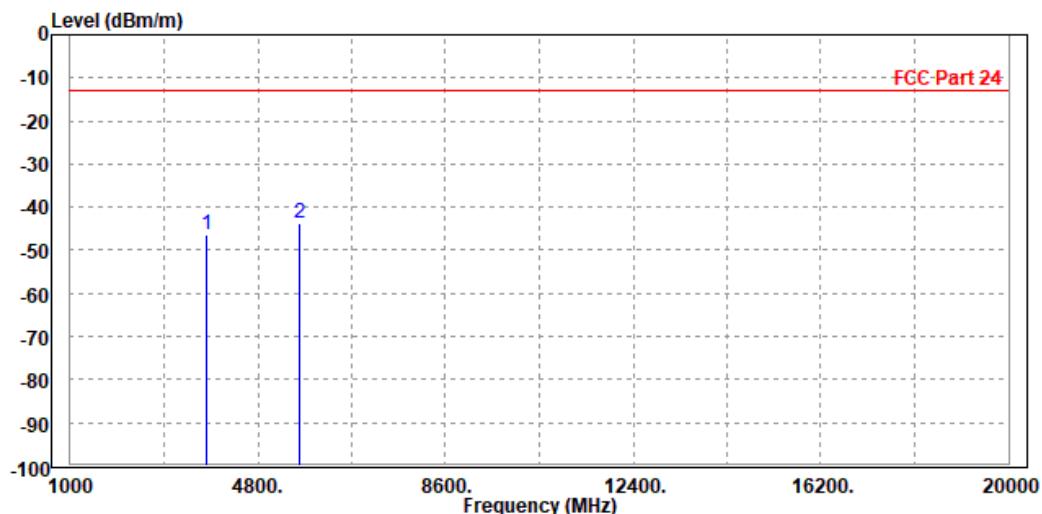


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VERITAS Test Report No.: RFP20120029-2

CHANNEL BANDWIDTH: 5MHz / QPSK

MODE	TX channel 18900	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70%RH	INPUT POWER	DC 3.7V by battery
TESTED BY	Star Le		
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M			

Freq	Level	Read	Limit	Over	Remark	Pol/Phase
		Level	Line	Limit Factor		
MHz	dBm/m	dBm	dBm/m	dB	dB/m	
1	3755.000	-46.38	-55.23	-13.00	-33.38	8.85 Peak Horizontal
2	PP 5640.000	-43.54	-54.02	-13.00	-30.54	10.48 Peak Horizontal



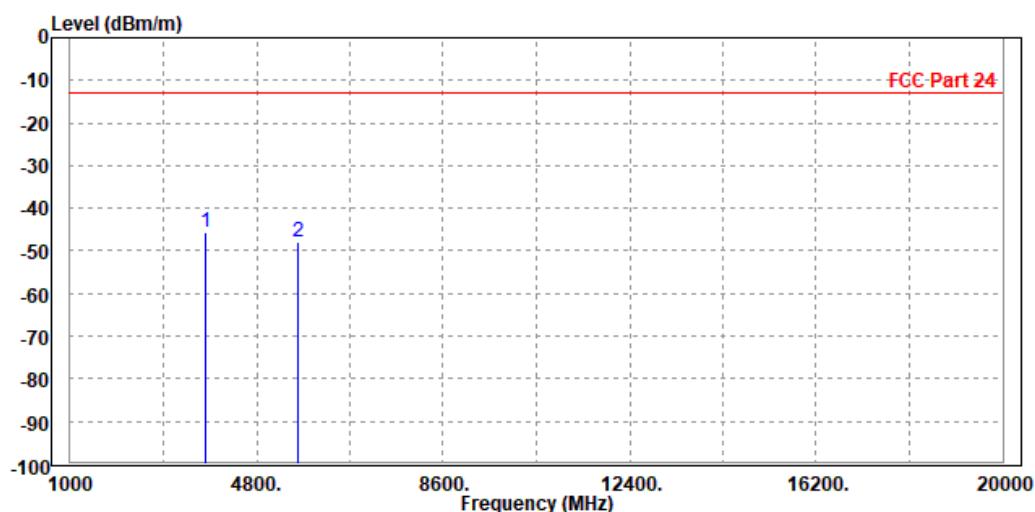


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Test Report No.: RFP20120029-2

MODE	TX channel 18900	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70%RH	INPUT POWER	DC 3.7V by battery
TESTED BY	Star Le		
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M			

Freq	Level	Read	Limit	Over	Factor	Remark	Pol/Phase	
		Line	Line	Limit Factor				
		MHz	dBm/m	dBm	dBm/m	dB	dB/m	
1	PP	3755.000	-45.46	-54.73	-13.00	-32.46	9.27 Peak	Vertical
2		5640.000	-47.87	-58.12	-13.00	-34.87	10.25 Peak	Vertical





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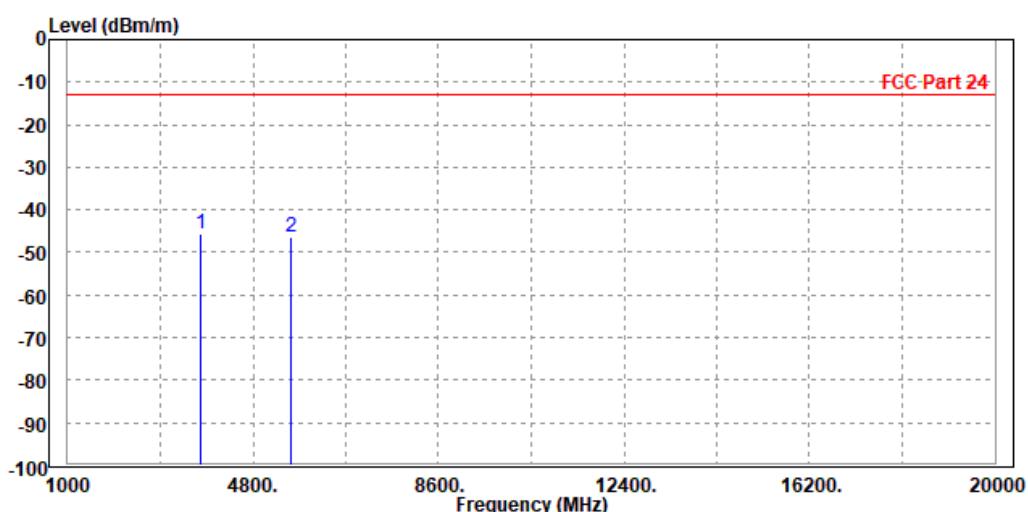
Test Report No.: RFP20120029-2

CHANNEL BANDWIDTH: 10MHz / QPSK

CH 18650

MODE	TX channel 18650	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70%RH	INPUT POWER	DC 3.7V by battery
TESTED BY	Star Le		
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M			

Freq MHz	Level dBm/m	Read Level	Limit Line	Over Limit	Factor	Remark	Pol/Phase
		dBm	dBm/m	dB			
1 PP 3717.000	-45.81	-54.62	-13.00	-32.81	8.81	Peak	Horizontal
2 5565.000	-46.20	-56.44	-13.00	-33.20	10.24	Peak	Horizontal



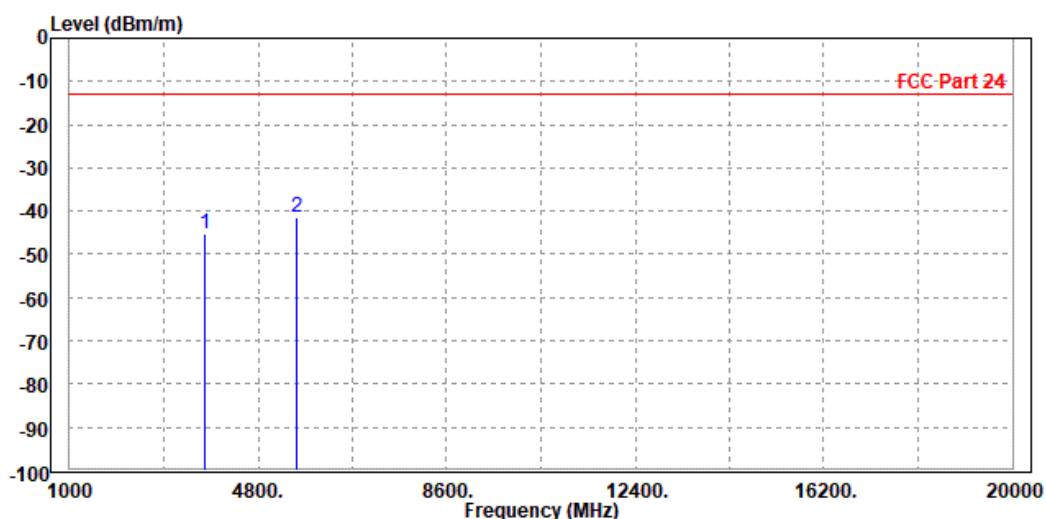


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VERITAS

Test Report No.: RFP20120029-2

MODE	TX channel 18650	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70%RH	INPUT POWER	DC 3.7V by battery
TESTED BY	Star Le		
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M			

Freq	Level	Read		Limit Line	Over Limit Factor	Remark	Pol/Phase
		MHz	dBm/m	dBm	dBm/m		
1	3717.000	-45.42	-54.68	-13.00	-32.42	9.26 Peak	Vertical
2 PP	5565.000	-41.30	-51.26	-13.00	-28.30	9.96 Peak	Vertical





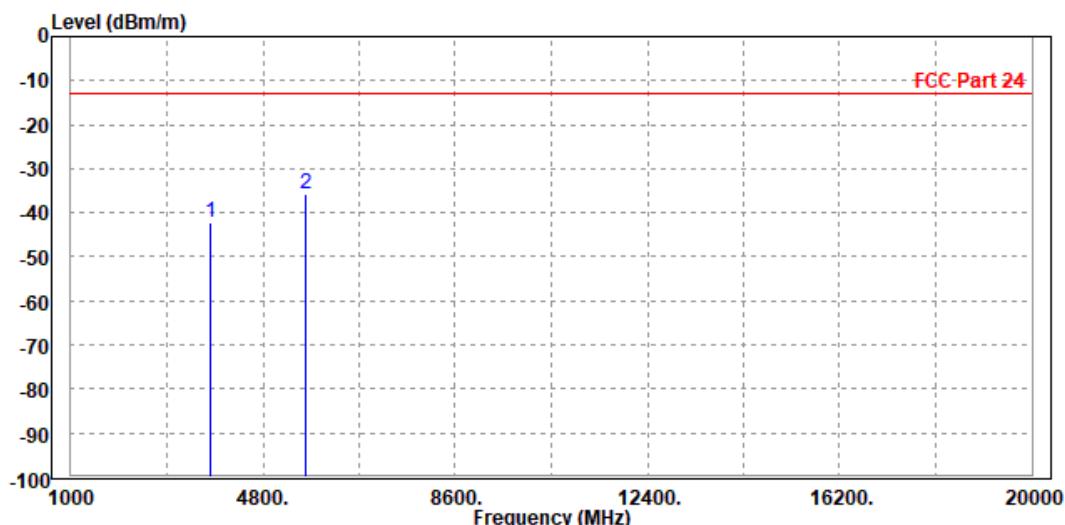
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VERITAS

Test Report No.: RFP20120029-2

CH 18900

MODE	TX channel 18900	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70%RH	INPUT POWER	DC 3.7V by battery
TESTED BY	Star Le		
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M			

Freq	Level	Read	Limit	Over	Remark	Pol/Phase
		Level	Line	Limit Factor		
MHz	dBm/m	dBm	dBm/m	dB	dB/m	
1	3755.000	-42.35	-51.20	-13.00	-29.35	8.85 Peak Horizontal
2 PP	5640.000	-35.82	-46.30	-13.00	-22.82	10.48 Peak Horizontal



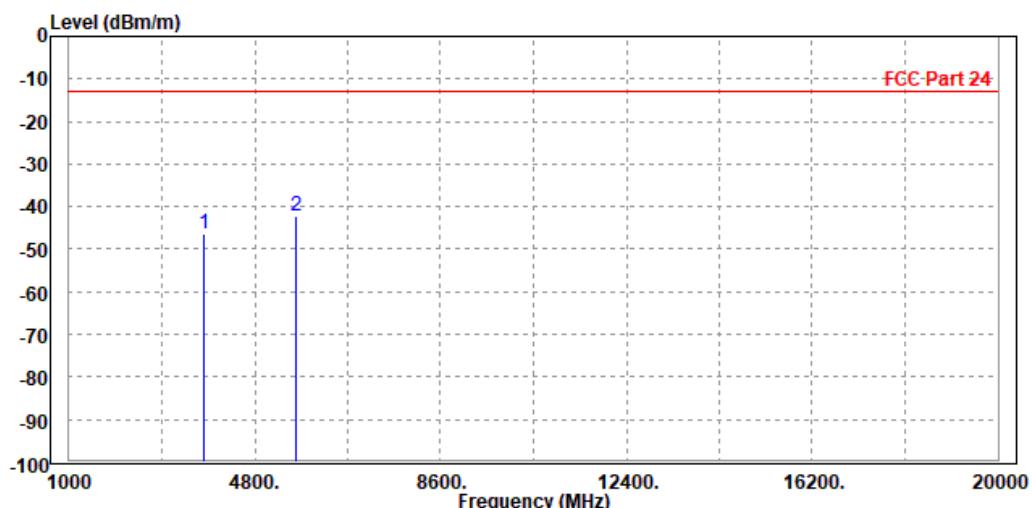


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VERITAS

Test Report No.: RFP20120029-2

MODE	TX channel 18900	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70%RH	INPUT POWER	DC 3.7V by battery
TESTED BY	Star Le		
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M			

Freq	Level	Read	Limit	Over	Factor	Remark	Pol/Phase
		Line	dBm/m	dBm			
MHz	dBm/m	dBm	dBm/m	dB	dB/m		
1	3755.000	-46.42	-55.69	-13.00	-33.42	9.27 Peak	Vertical
2	PP 5640.000	-42.31	-52.56	-13.00	-29.31	10.25 Peak	Vertical





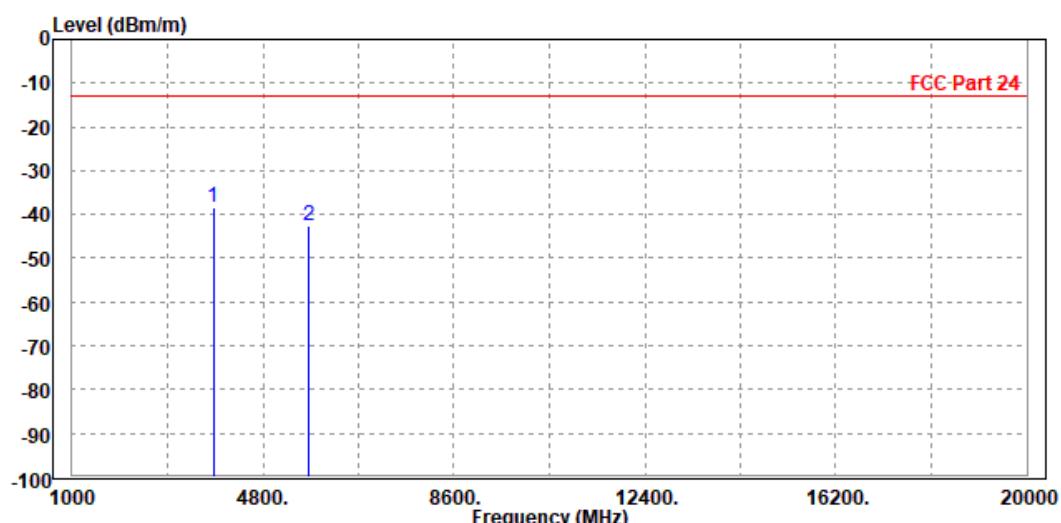
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VERITAS

Test Report No.: RFP20120029-2

CH 19150

MODE	TX channel 19150	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70%RH	INPUT POWER	DC 3.7V by battery
TESTED BY	Star Le		
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M			

Freq MHz	Level dBm/m	Read Level	Limit Line	Over Limit Factor	Over Limit Factor Remark	Pol/Phase
		dBm	dBm/m	dB	dB/m	
1 PP 3810.000	-38.48	-47.38	-13.00	-25.48	8.90 Peak	Horizontal
2 5715.000	-42.54	-53.27	-13.00	-29.54	10.73 Peak	Horizontal



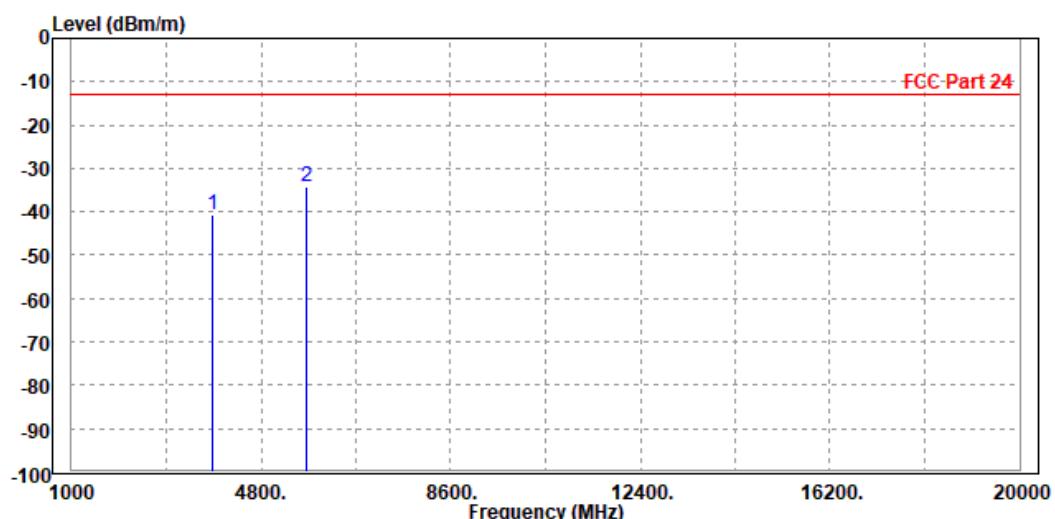


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Test Report No.: RFP20120029-2

MODE	TX channel 19150	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70%RH	INPUT POWER	DC 3.7V by battery
TESTED BY	Star Le		
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M			

	Freq	Read Level	Limit Level	Over Line	Over Limit	Factor	Remark	Pol/Phase
	MHz	dBm/m	dBm	dBm/m	dB	dB/m		
1	3812.000	-40.55	-49.84	-13.00	-27.55	9.29	Peak	Vertical
2	PP 5715.000	-34.38	-44.92	-13.00	-21.38	10.54	Peak	Vertical





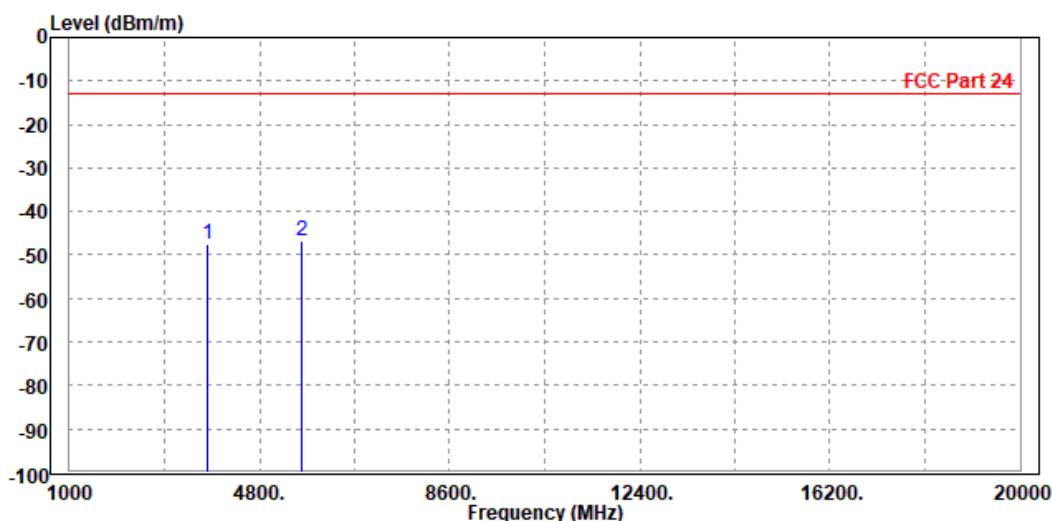
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VERITAS

Test Report No.: RFP20120029-2

CHANNEL BANDWIDTH: 15MHz / QPSK

MODE	TX channel 18900	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70%RH	INPUT POWER	DC 3.7V by battery
TESTED BY	Star Le		
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M			

	Freq	Read Level	Limit Level	Over Line	Limit	Factor	Remark	Pol/Phase
	MHz	dBm/m	dBm	dBm/m	dB	dB/m		
1	3755.000	-47.68	-56.53	-13.00	-34.68	8.85	Peak	Horizontal
2	PP 5640.000	-46.82	-57.30	-13.00	-33.82	10.48	Peak	Horizontal



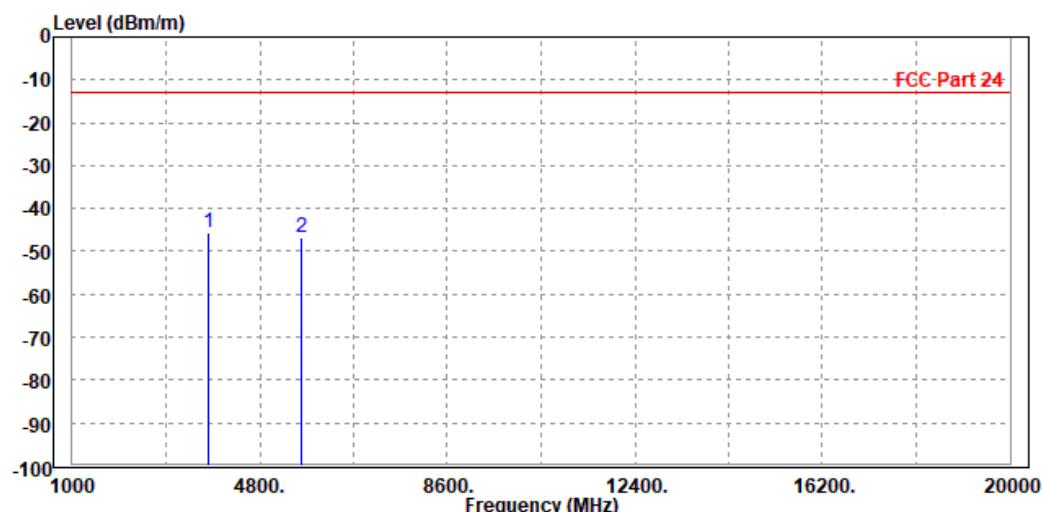


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Test Report No.: RFP20120029-2

MODE	TX channel 18900	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70%RH	INPUT POWER	DC 3.7V by battery
TESTED BY	Star Le		
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M			

Freq	Level	Read	Limit	Over	Remark	Pol/Phase		
		Line	dBm	dBm/m				
MHz	dBm/m	dBm	dBm/m	dB	dB/m			
1	PP	3755.000	-45.69	-54.96	-13.00	-32.69	9.27 Peak	Vertical
2		5640.000	-46.92	-57.17	-13.00	-33.92	10.25 Peak	Vertical





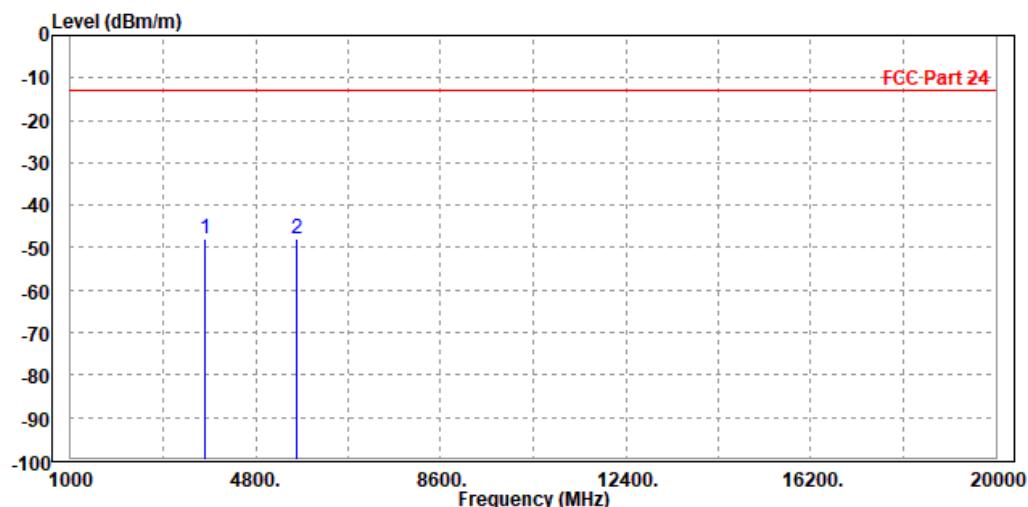
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VERITAS

Test Report No.: RFP20120029-2

CHANNEL BANDWIDTH: 20MHz / QPSK

MODE	TX channel 18900	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70%RH	INPUT POWER	DC 3.7V by battery
TESTED BY	Star Le		
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M			

Freq MHz	Read Level dBm/m	Limit Level dBm	Over Line dBm/m	Over Line dB	Over Line dB/m	Remark	Pol/Phase
1 PP 3755.000	-47.88	-56.73	-13.00	-34.88	8.85	Peak	Horizontal
2 5640.000	-47.93	-58.41	-13.00	-34.93	10.48	Peak	Horizontal



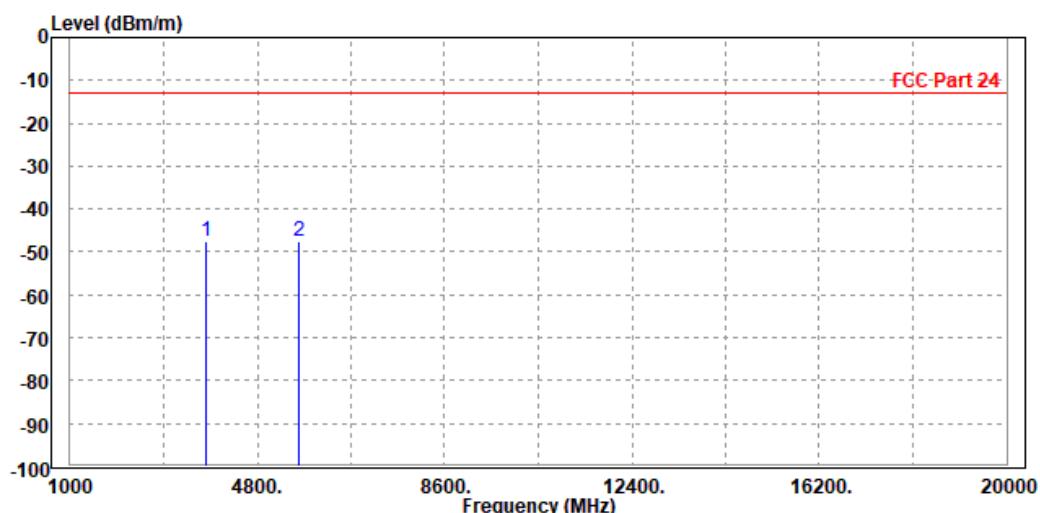


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Test Report No.: RFP20120029-2

MODE	TX channel 18900	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70%RH	INPUT POWER	DC 3.7V by battery
TESTED BY	Star Le		
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M			

Freq	Level	Read	Limit	Over	Remark	Pol/Phase
		Level	Line	Limit Factor		
MHz	dBm/m	dBm	dBm/m	dB	dB/m	
1 PP	3755.000	-47.51	-56.78	-13.00	-34.51	9.27 Peak Vertical
2	5640.000	-47.62	-57.87	-13.00	-34.62	10.25 Peak Vertical



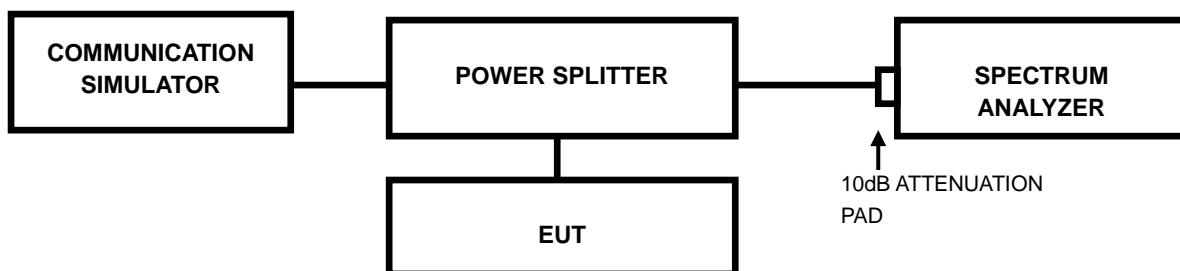


### 3.7 PEAK TO AVERAGE RATIO

#### 3.7.1 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

#### 3.7.2 TEST SETUP



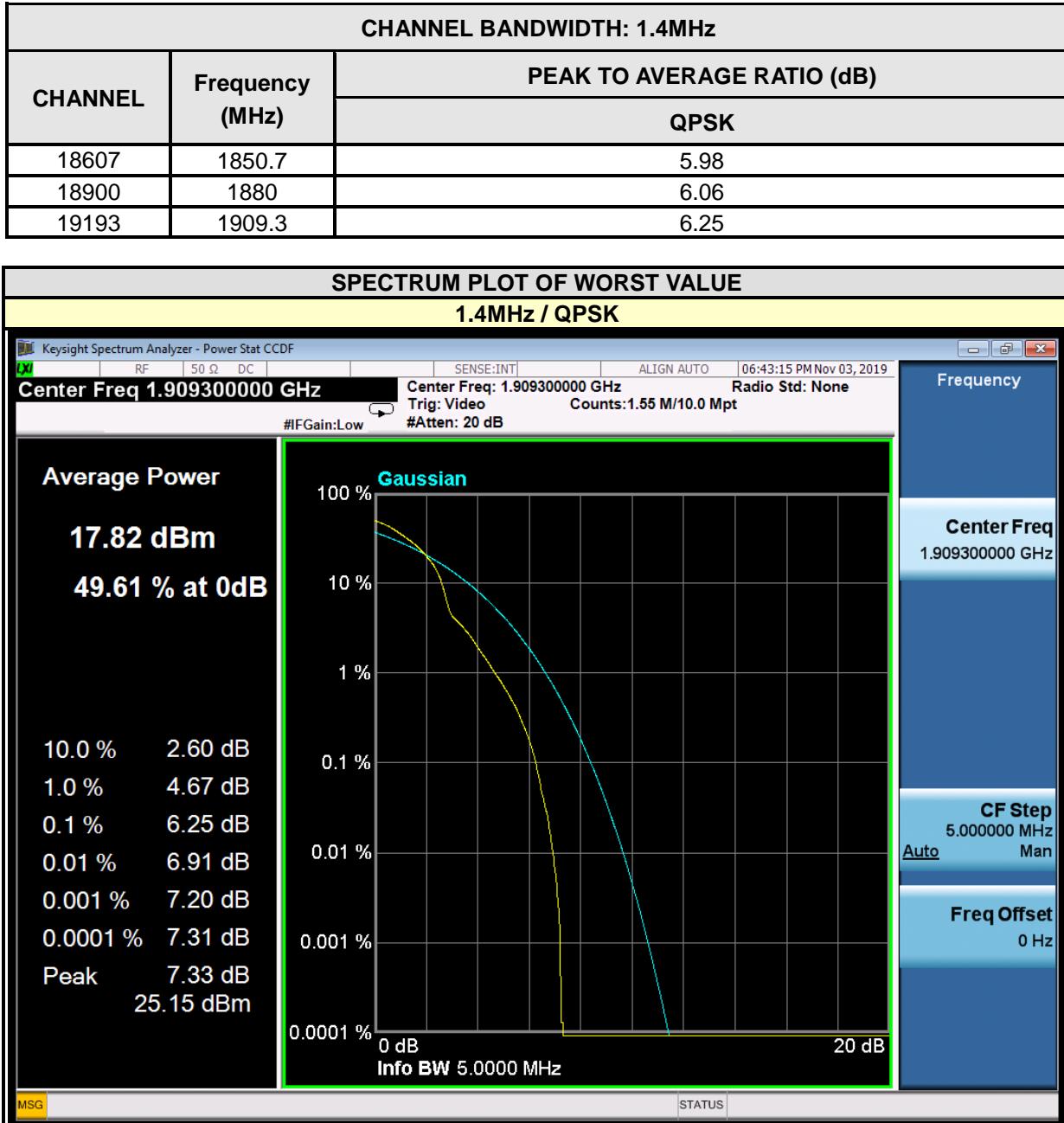
#### 3.7.3 TEST PROCEDURES

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%.



### 3.7.4 TEST RESULTS

#### LTE BAND 2





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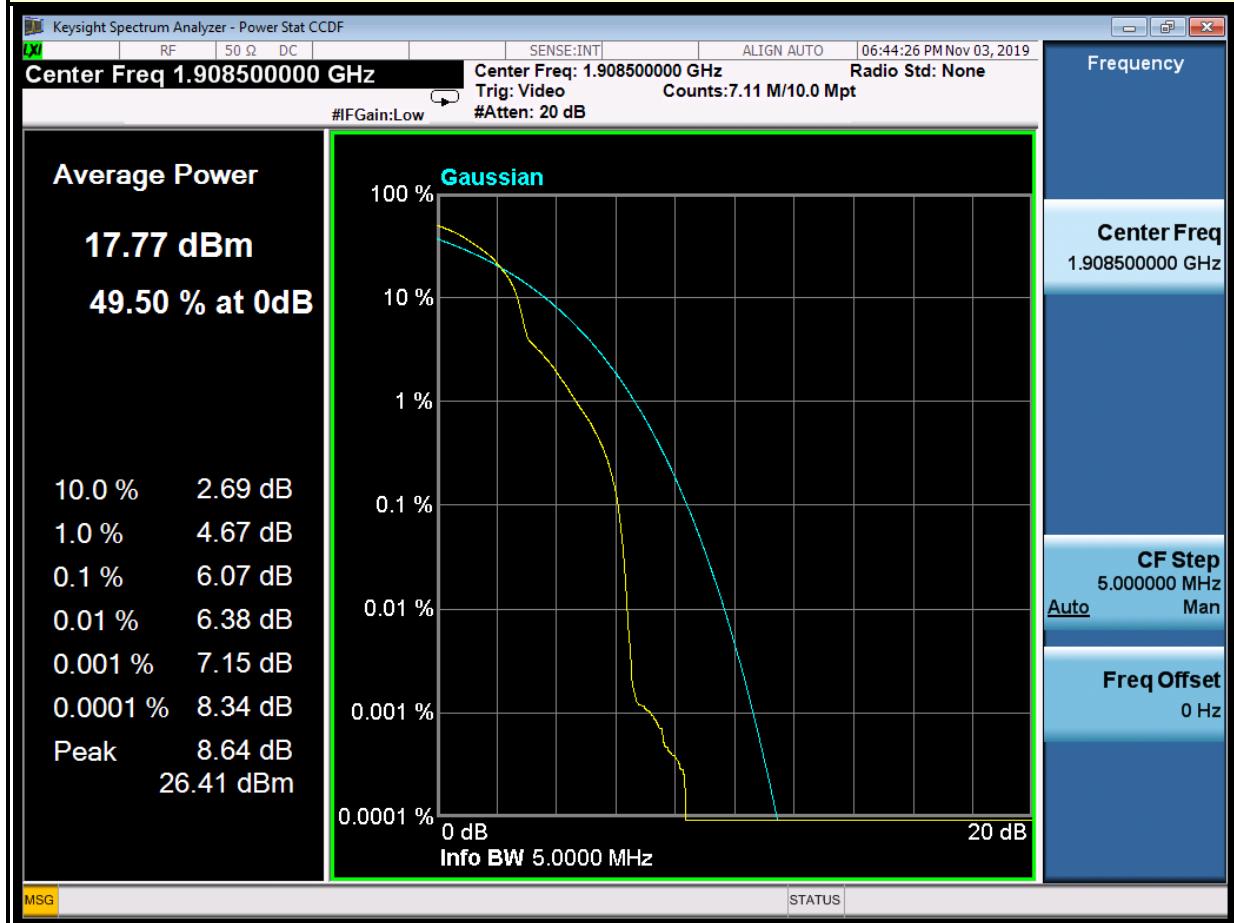
Test Report No.: RFP20120029-2

CHANNEL BANDWIDTH: 3MHz

CHANNEL	Frequency (MHz)	PEAK TO AVERAGE RATIO (dB)
		QPSK
18615	1851.5	5.85
18900	1880	5.87
19185	1908.5	6.07

SPECTRUM PLOT OF WORST VALUE

3MHz / QPSK





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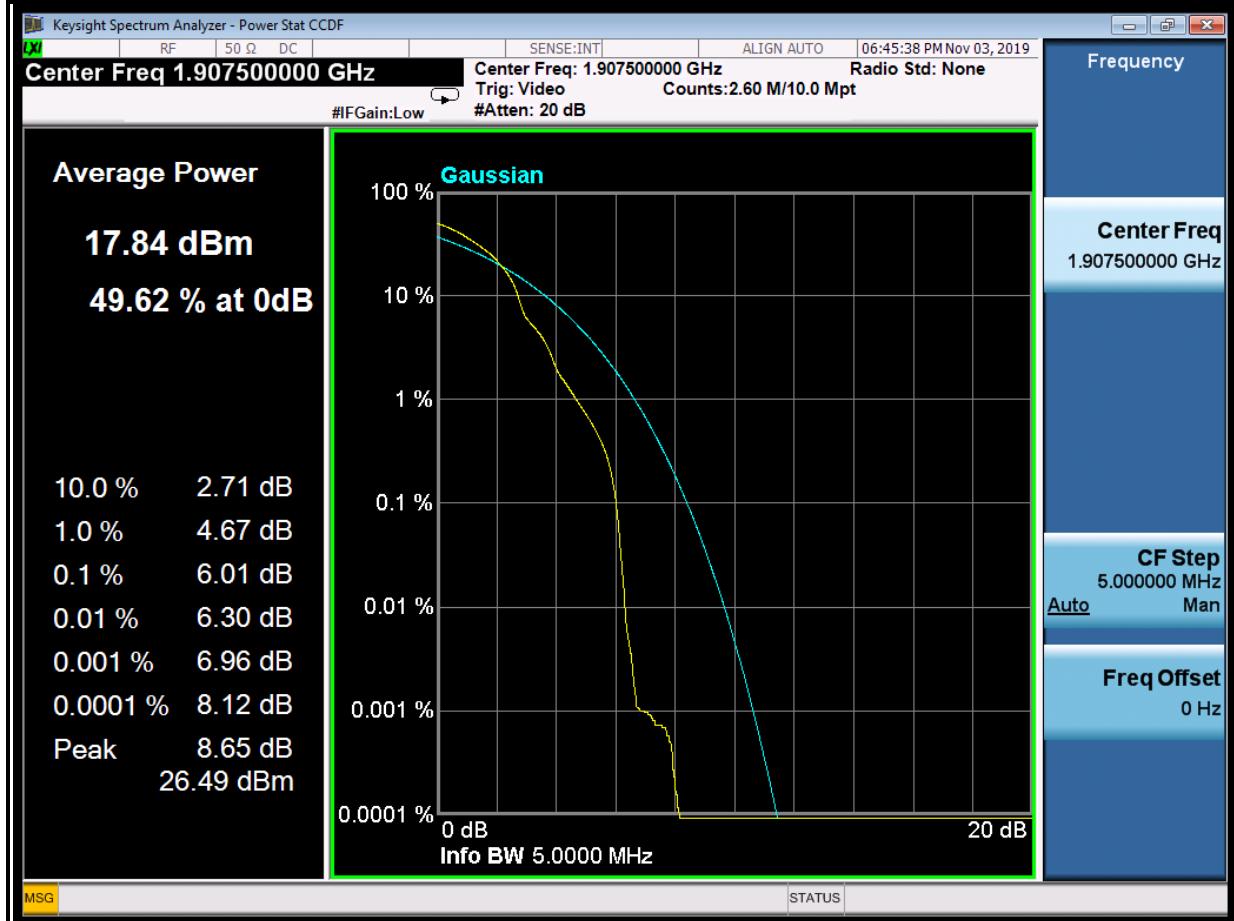
Test Report No.: RFP20120029-2

CHANNEL BANDWIDTH: 5MHz

CHANNEL	Frequency (MHz)	PEAK TO AVERAGE RATIO (dB)
		QPSK
18625	1852.5	5.85
18900	1880	5.86
19175	1907.5	6.01

SPECTRUM PLOT OF WORST VALUE

5MHz / QPSK





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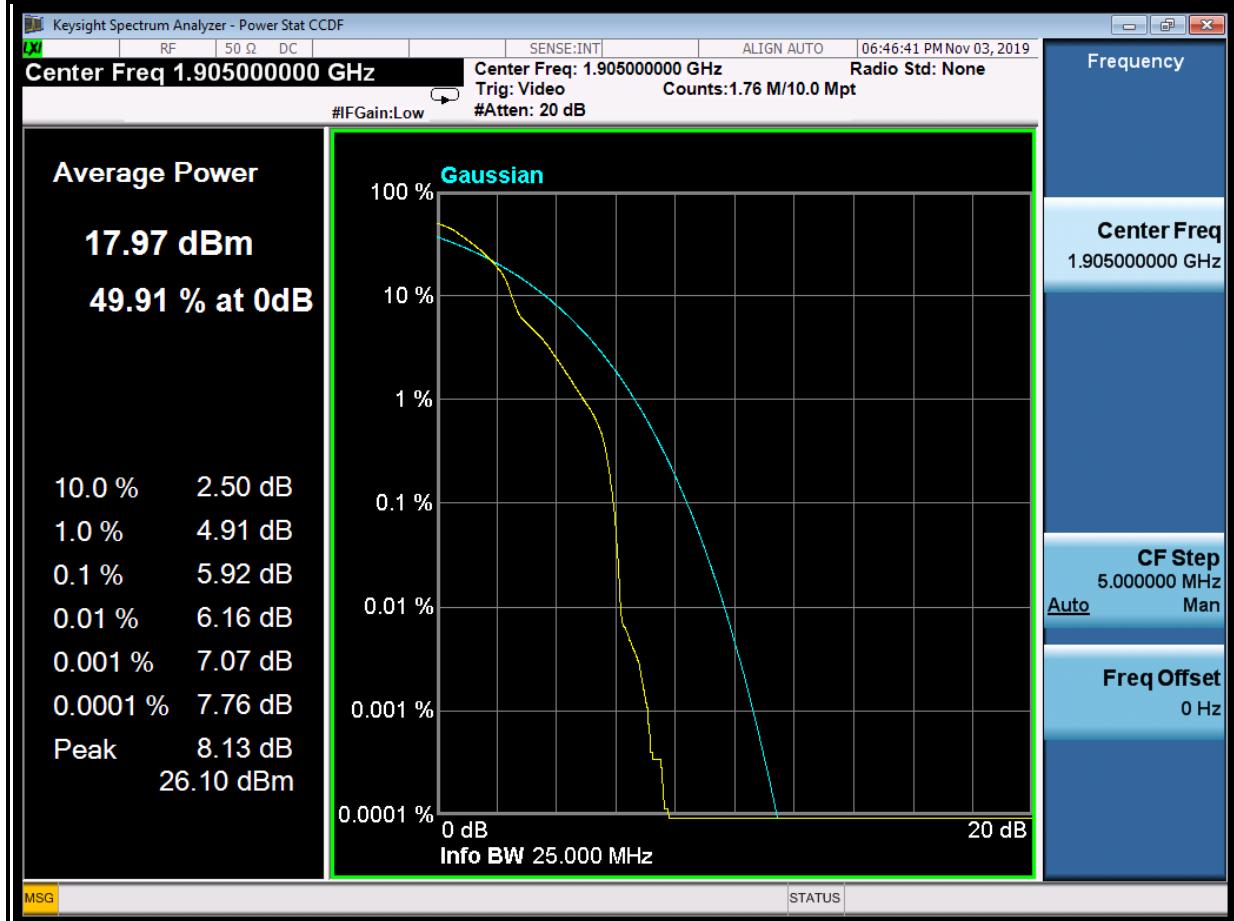
Test Report No.: RFP20120029-2

### CHANNEL BANDWIDTH: 10MHz

CHANNEL	Frequency (MHz)	PEAK TO AVERAGE RATIO (dB)
		QPSK
18650	1855	5.60
18900	1880	5.89
19150	1905	5.92

### SPECTRUM PLOT OF WORST VALUE

#### 10MHz / QPSK





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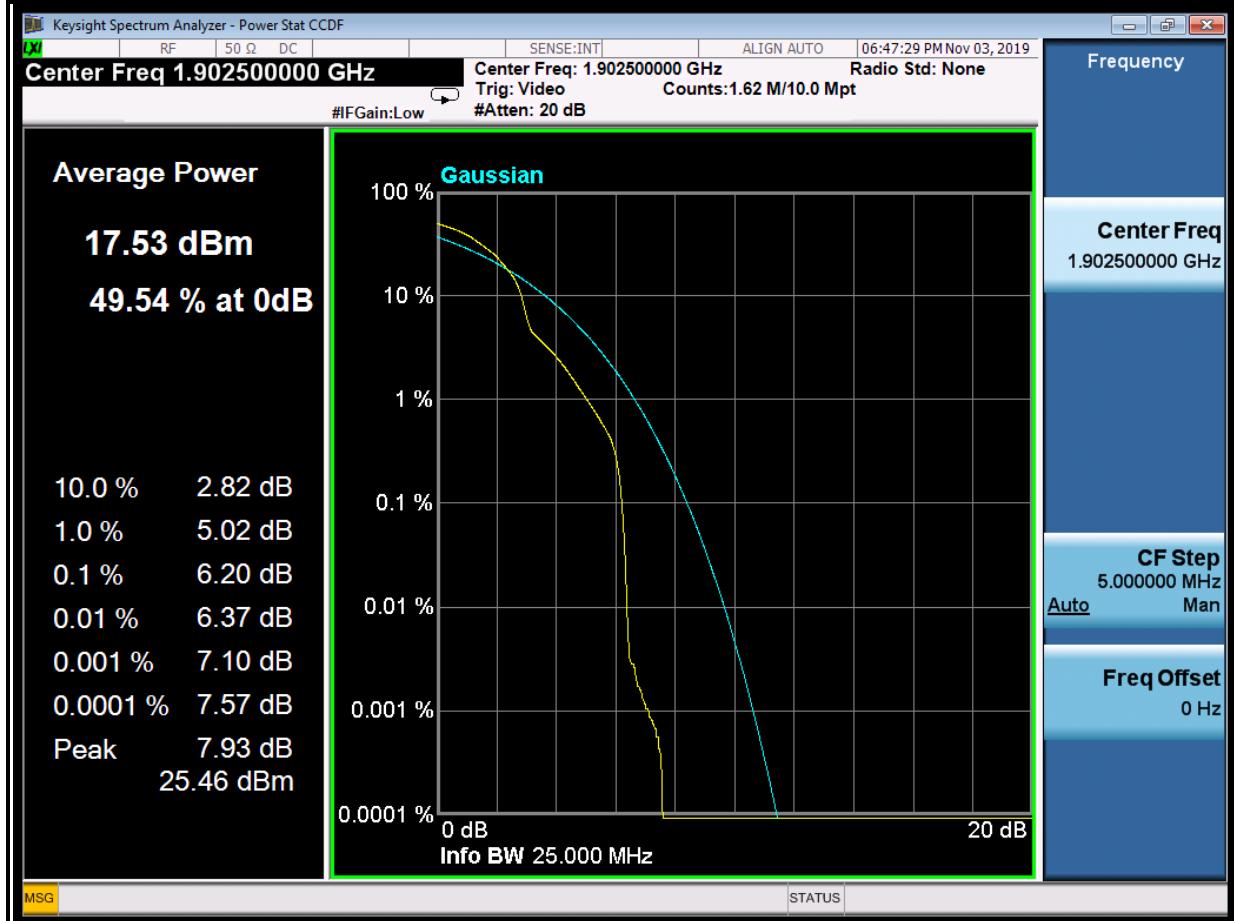
Test Report No.: RFP20120029-2

### CHANNEL BANDWIDTH: 15MHz

CHANNEL	Frequency (MHz)	PEAK TO AVERAGE RATIO (dB)
		QPSK
18675	1857.5	5.71
18900	1880	5.69
19125	1902.5	6.20

### SPECTRUM PLOT OF WORST VALUE

#### 15MHz / QPSK





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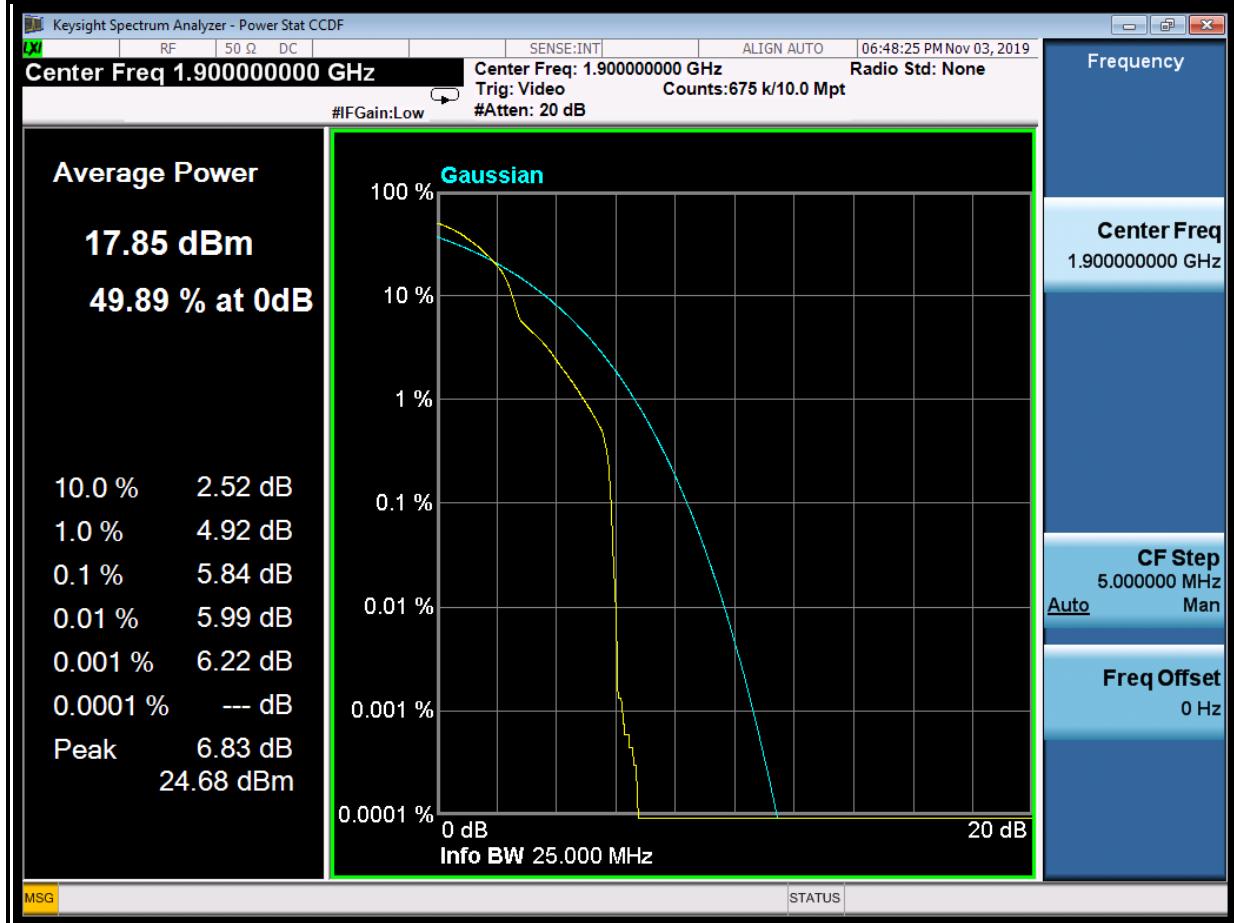
Test Report No.: RFP20120029-2

### CHANNEL BANDWIDTH: 20MHz

CHANNEL	Frequency (MHz)	PEAK TO AVERAGE RATIO (dB)
		QPSK
18700	1860	5.03
18900	1880	5.50
19100	1900	5.84

### SPECTRUM PLOT OF WORST VALUE

20MHz / QPSK





**Test Report No.: RFP20120029-2**

## **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, Telecom and Safety consultation. 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:

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**Email:** [customerservice.dg@cn.bureauveritas.com](mailto:customerservice.dg@cn.bureauveritas.com)

**Web Site:** [www.adt.com.tw](http://www.adt.com.tw)

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



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## 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---**