

FCC TEST REPORT

(PART 24)

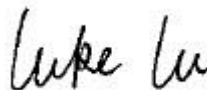
Applicant:	MUNIC
Address:	100 Avenue de Stalingrad 94800 Villejuif – France

Manufacturer or Supplier:	MUNIC
Address:	100 Avenue de Stalingrad 94800 Villejuif – France
Product:	Telematic embedded system
Brand Name:	MUNIC
Model Name:	C4D-4MUSAB_V8
FCC ID:	A6GC4D-4MUSABV8
Date of tests:	Sep. 10, 2021 ~ Nov. 17, 2021

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

Prepared by Simon Wang Engineer / Mobile Department	Approved by Luke Lu Manager / Mobile Department
	
Date: Nov. 17, 2021	Date: Nov. 17, 2021

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TABLE OF CONTENTS

RELEASE CONTROL RECORD	4
1 SUMMARY OF TEST RESULTS	5
1.1 MEASUREMENT UNCERTAINTY	6
1.2 TEST SITE AND INSTRUMENTS	7
2 GENERAL INFORMATION	8
2.1 GENERAL DESCRIPTION OF EUT	8
2.2 CONFIGURATION OF SYSTEM UNDER TEST	10
2.3 DESCRIPTION OF SUPPORT UNITS	11
2.4 TEST ITEM AND TEST CONFIGURATION	11
2.5 EUT OPERATING CONDITIONS	14
2.6 GENERAL DESCRIPTION OF APPLIED STANDARDS	14
3 TEST TYPES AND RESULTS	15
3.1 OUTPUT POWER MEASUREMENT	15
3.1.1 LIMITS OF OUTPUT POWER MEASUREMENT	15
3.1.2 TEST PROCEDURES	15
3.1.3 TEST SETUP	16
3.1.4 TEST RESULTS	16
3.2 FREQUENCY STABILITY MEASUREMENT	24
3.2.1 LIMITS OF FREQUENCY STABILITY MEASUREMENT	24
3.2.2 TEST PROCEDURE	24
3.2.3 TEST SETUP	24
3.2.4 TEST RESULTS	25
3.3 OCCUPIED BANDWIDTH MEASUREMENT	33
3.3.1 TEST PROCEDURES	33
3.3.2 TEST SETUP	33
3.3.3 TEST RESULTS	34
3.4 BAND EDGE MEASUREMENT	41
3.4.1 LIMITS OF BAND EDGE MEASUREMENT	41
3.4.2 TEST SETUP	41
3.4.3 TEST PROCEDURES	42
3.4.4 TEST RESULTS	43
3.5 CONDUCTED SPURIOUS EMISSIONS	56
3.5.1 LIMITS OF CONDUCTED SPURIOUS EMISSIONS MEASUREMENT	56
3.5.2 TEST PROCEDURE	56
3.5.3 TEST SETUP	56
3.5.4 TEST RESULTS	57
3.6 RADIATED EMISSION MEASUREMENT	65
3.6.1 LIMITS OF RADIATED EMISSION MEASUREMENT	65
3.6.2 TEST PROCEDURES	65
3.6.3 DEVIATION FROM TEST STANDARD	65



Test Report No.: W7L-P21090017RF01

3.6.4 TEST SETUP	66
3.6.5 TEST RESULTS	67
3.7 PEAK TO AVERAGE RATIO	97
3.7.1 LIMITS OF PEAK TO AVERAGE RATIO MEASUREMENT	97
3.7.2 TEST SETUP	97
3.7.3 TEST PROCEDURES	97
3.7.4 TEST RESULTS	98
4 INFORMATION ON THE TESTING LABORATORIES	110
5 APPENDIX A – MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB	111



Test Report No.: W7L-P21090017RF01

RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
W7L-P21090017RF01	Original release	Nov. 17, 2021

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	$\pm 76.97\text{Hz}$
Radiated emissions & Radiated Power (30MHz~1GMHz)	$\pm 4.98\text{dB}$
Radiated emissions & Radiated Power (1GMHz ~6GMHz)	$\pm 4.70\text{dB}$
Radiated emissions (6GMHz ~18GMHz)	$\pm 4.60\text{dB}$
Radiated emissions (18GMHz ~40GMHz)	$\pm 4.12\text{dB}$
Conducted emissions	$\pm 4.01\text{dB}$
Occupied Channel Bandwidth	$\pm 43.58\text{KHz}$
Conducted Output power	$\pm 2.06\text{dB}$
Band Edge Measurements	$\pm 4.70\text{dB}$
Peak to average ratio	$\pm 0.76\text{dB}$

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	Apr. 22,21	Apr. 21,22
EXA Signal Analyzer	KEYSIGHT	N9010A-544	MY54510355	Jun. 03,21	Jun. 02,22
Bilog Antenna	ETS-LINDGREN	3143B	00161965	Mar. 05,21	Mar. 04,22
Horn Antenna	ETS-LINDGREN	3117	00168728	Apr. 02,21	Apr. 01,22
Horn Antenna (18GHz-40GHz)	N/A	QWH-SL-18-40-K-SG/QMS-00361	15433	Aug. 25, 21	Aug. 24, 22
Radio Communication Analyzer	ANRITSU	MT8820C	6201465426	Feb. 25,21	Feb. 24,22
Signal Pre-Amplifier	EMSI	EMC 9135	980249	Jun. 02,21	Jun. 01,22
Signal Pre-Amplifier	EMSI	EMC 012645B	980257	Jun. 03,21	Jun. 02,22
Signal Pre-Amplifier	EMSI	EMC 184045B	980259	Apr. 22,21	Apr. 21,22
3m Semi-anechoic Chamber	ETS-LINDGREN	9m*6m*6m	Euroshieldpn-CT0001143-1216	May. 19,20	May. 18,23
Test Software	E3	V 9.160323	N/A	N/A	N/A
Test Software	ADT	ADT_Radiated_V 7.6.15.9.2	N/A	N/A	N/A
10dB Attenuator	JFW/USA	50HF-010-SMA	1505	Jun. 03,21	Jun. 02,22
Power Meter	Anritsu	ML2495A	1506002	Apr. 07,21	Apr. 06,22
Power Sensor	Anritsu	MA2411B	1339352	May. 07,21	May. 06,22
Temperature Chamber	ESPEC	SH-242	93000855	Jun. 02,21	Jun. 01,22
MXG Analog Microwave Signal Generator	KEYSIGHT	N5183A	MY50143024	Mar. 05,21	Mar. 04,22
Power Divider	MCLI/USA	PS2-15	24880	N/A	N/A

NOTE: 1. The calibration interval of the above test instruments is 12 months or 36 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.

2. The test was performed in 3m Semi-anechoic Chamber and RF Oven Room.

3. The horn antenna is used only for the measurement of emission frequency above 1GHz if tested.

4. The FCC Site Registration No. is 525120; The Designation No. is CN1171.

2 GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

PRODUCT	Telematics Embedded System	
BRAND NAME	MUNIC	
MODEL NAME	C4D-4MUSAB_V8	
NOMINAL VOLTAGE	DC 13.7V	
MODULATION TYPE	GSM/GPRS/EDGE: GMSK, 8PSK	
	LTE: QPSK, 16QAM	
FREQUENCY RANGE	GSM/GPRS/EDGE	824.2MHz ~ 848.8MHz
	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	GSM	1164.13mW
	EDGE	434.51mW
	LTE Band 2 Channel Bandwidth: 1.4MHz	221.82mW
	LTE Band 2 Channel Bandwidth: 3MHz	219.79mW
	LTE Band 2 Channel Bandwidth: 5MHz	222.23mW
	LTE Band 2 Channel Bandwidth: 10MHz	222.23mW
	LTE Band 2 Channel Bandwidth: 15MHz	221.31mW
	LTE Band 2 Channel Bandwidth: 20MHz	223.36mW



EMISSION DESIGNATOR	GSM	246KG7W
	EDGE	247KG7W
	LTE Band 2 Channel Bandwidth: 1.4MHz	QPSK: 1M10G7D 16QAM: 1M09W7D
	LTE Band 2 Channel Bandwidth: 3MHz	QPSK: 2M69G7D 16QAM: 1M27W7D
	LTE Band 2 Channel Bandwidth: 5MHz	QPSK: 1M09G7D 16QAM: 1M09W7D
	LTE Band 2 Channel Bandwidth: 10MHz	QPSK: 1M09G7D 16QAM: 1M09W7D
	LTE Band 2 Channel Bandwidth: 15MHz	QPSK: 1M09G7D 16QAM: 1M10W7D
	LTE Band 2 Channel Bandwidth: 20MHz	QPSK: 1M09G7D 16QAM: 1M10W7D
ANTENNA TYPE	Fixed Internal Antenna with 0.8dBi gain for GSM 1900 Fixed Internal Antenna with 0.8dBi gain for LTE Band 2	
HW VERSION	HC4D-4MUSAB_V8.01	
SW VERSION	SC4D-4MUSAB_V8.01	
I/O PORTS	Refer to user's manual	
CABLE SUPPLIED	N/A	
EXTREME TEMPERATURE	-30 - 50°C	
EXTREME VOLTAGE	8V-18V	

NOTE:

- For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.
- For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report and in this report ,Sample 1 was used to test..

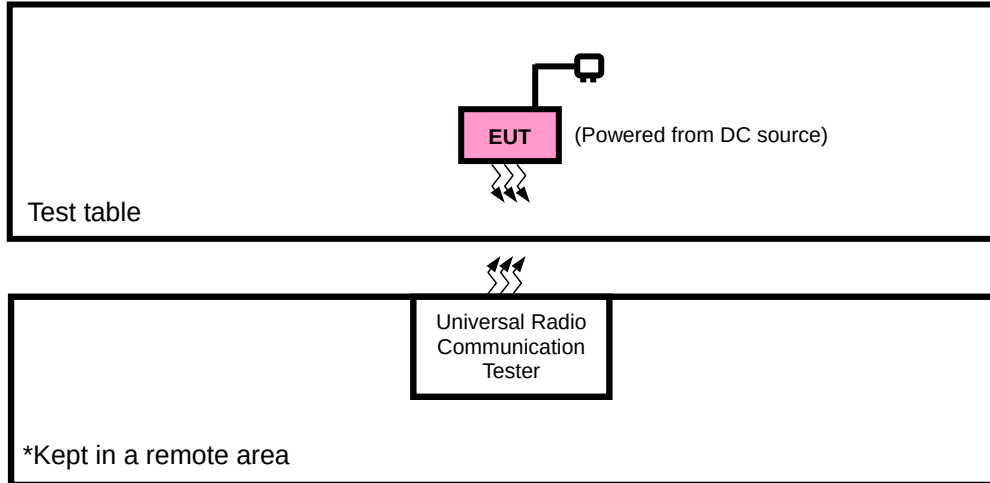
List of Accessory:

ACCESSORIES	BRAND	MODEL	SPECIFICATION
Battery	Howell	Li-polymer 552535H	Capacity : Li-ion, 450mAh



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	DC source	Kikusui/JP	PMX18-5A	0000001	N/A

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	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
A	EUT + DC Source with GSM & LTE link

GSM MODE

EUT CONFIGURE MODE	TEST ITEM	AVAILABLE CHANNEL	TESTED CHANNEL	MODE
A	EIRP	512 to 810	512, 661, 810	GPRS, EDGE
A	FREQUENCY STABILITY	512 to 810	512, 810	GPRS, EDGE
A	OCCUPIED BANDWIDTH	512 to 810	512, 661, 810	GPRS, EDGE
A	PEAK TO AVERAGE RATIO	512 to 810	512, 661, 810	GPRS, EDGE
A	BAND EDGE	512 to 810	512, 810	GPRS, EDGE
A	CONDUCTED EMISSION	512 to 810	512, 661, 810	GPRS, EDGE
A	RADIATED EMISSION	512 to 810	512, 661, 810	GPRS, EDGE

LTE BAND 2

EUT CONFIGURE MODE	TEST ITEM	AVAILABLE CHANNEL	TESTED CHANNEL	CHANNEL BANDWIDTH	MODULATION	MODE
A	EIRP	18607 to 19193	18607, 18900, 19193	1.4MHz	QPSK,16QAM,	1 RB / 0 RB Offset
		18615 to 19185	18615, 18900, 19185	3MHz	QPSK,16QAM	1 RB / 0 RB Offset
		18625 to 19175	18625, 18900, 19175	5MHz	QPSK,16QAM	1 RB / 0 RB Offset
		18650 to 19150	18650, 18900, 19150	10MHz	QPSK,16QAM	1 RB / 0 RB Offset
		18675 to 19125	18675, 18900, 19125	15MHz	QPSK,16QAM	1 RB / 0 RB Offset
		18700 to 19100	18700, 18900, 19100	20MHz	QPSK,16QAM	1 RB / 0 RB Offset
A	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
A	OCCUPIED BANDWIDTH	18607 to 19193	18607, 18900, 19193	1.4MHz	QPSK,16QAM	6 RB / 0 RB Offset
		18615 to 19185	18615, 18900, 19185	3MHz	QPSK,16QAM	6 RB / 0 RB Offset
		18625 to 19175	18625, 18900, 19175	5MHz	QPSK,16QAM	6 RB / 0 RB Offset
		18650 to 19150	18650, 18900, 19150	10MHz	QPSK,16QAM	6 RB / 0 RB Offset
		18675 to 19125	18675, 18900, 19125	15MHz	QPSK,16QAM	6 RB / 0 RB Offset
		18700 to 19100	18700, 18900, 19100	20MHz	QPSK,16QAM	6 RB / 0 RB Offset
A	PEAK TO AVERAGE RATIO	18607 to 19193	18607, 18900, 19193	1.4MHz	QPSK,16QAM	1 RB / 0 RB Offset
		18615 to 19185	18615, 18900, 19185	3MHz	QPSK,16QAM	1 RB / 0 RB Offset
		18625 to 19175	18625, 18900, 19175	5MHz	QPSK,16QAM	1 RB / 0 RB Offset
		18650 to 19150	18650, 18900, 19150	10MHz	QPSK,16QAM	1 RB / 0 RB Offset
		18675 to 19125	18675, 18900, 19125	15MHz	QPSK,16QAM	1 RB / 0 RB Offset
		18700 to 19100	18700, 18900, 19100	20MHz	QPSK,16QAM	1 RB / 0 RB Offset

A	BAND EDGE	18607 to 19193	18607	1.4MHz	QPSK,16QAM	1 RB / 0 RB Offset
			19193	1.4MHz	QPSK,16QAM	6 RB / 0 RB Offset
		18615 to 19185	18615	3MHz	QPSK,16QAM	1 RB / 5 RB Offset
			19185	3MHz	QPSK,16QAM	6 RB / 0 RB Offset
		18625 to 19175	18625	5MHz	QPSK,16QAM	1 RB / 0 RB Offset
			19175	5MHz	QPSK,16QAM	6 RB / 0 RB Offset
		18650 to 19150	18650	10MHz	QPSK,16QAM	1 RB / 5 RB Offset
			19150	10MHz	QPSK,16QAM	6 RB / 0 RB Offset
		18675 to 19125	18675	15MHz	QPSK,16QAM	1 RB / 0 RB Offset
			19125	15MHz	QPSK,16QAM	6 RB / 0 RB Offset
		18700 to 19100	18700	20MHz	QPSK,16QAM	1 RB / 5 RB Offset
			19100	20MHz	QPSK,16QAM	6 RB / 0 RB Offset
A	CONDUCTED 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
A	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	18607, 18900, 19193	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

**TEST CONDITION:**

TEST ITEM	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
ERP	23deg. C, 70%RH	DC 13.7V	Jace Hu
FREQUENCY STABILITY	23deg. C, 70%RH	DC 13.7V	Jace Hu
OCCUPIED BANDWIDTH	23deg. C, 70%RH	DC 13.7V	Jace Hu
BAND EDGE	23deg. C, 70%RH	DC 13.7V	Jace Hu
CONDCUDED EMISSION	23deg. C, 70%RH	DC 13.7V	Jace Hu
RADIATED EMISSION	23deg. C, 70%RH	DC 13.7V	Jace Hu
PEAK TO AVERAGE RATIO	23deg. C, 70%RH	DC 13.7V	Jace Hu

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_{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.

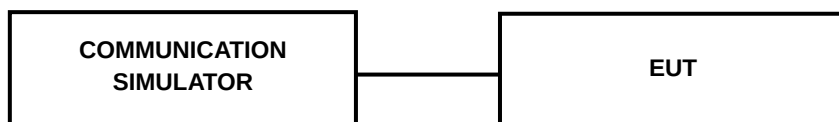
CONDUCTED POWER MEASUREMENT:

The EUT was set up for the maximum power with GSM/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

EIRP / ERP Measurement:

CONDUCTED POWER MEASUREMENT:



3.1.4 TEST RESULTS

CONDUCTED OUTPUT POWER (dBm)

Band	GSM1900			Max. Tune-up Power
Channel	512	661	810	
Frequency	1850.2	1880	1909.8	
GPRS (GMSK, 1Tx-slot)	29.61	29.79	29.86	30.0
GPRS (GMSK, 2Tx-slot)	29.57	29.65	29.77	30.0
GPRS (GMSK, 3Tx-slot)	29.44	29.51	29.62	30.0
GPRS (GMSK, 4Tx-slot)	29.20	29.42	29.47	30.0
EDGE (8PSK, 1Tx-slot)	25.42	25.45	25.58	26.0
EDGE (8PSK, 2Tx-slot)	25.33	25.37	25.42	26.0
EDGE (8PSK, 3Tx-slot)	25.25	25.30	25.35	26.0
EDGE (8PSK, 4Tx-slot)	25.09	25.14	25.21	26.0



LTE BAND 2

Band/BW	Modulation	RB Size	RB Offset	Low CH 18607	Mid CH 18900	High CH 19193	MPR
				Frequency 1850.7 MHz	Frequency 1880 MHz	Frequency 1909.3 MHz	
2/ 1.4	QPSK	1	0	22.56	22.48	22.40	0
		1	5	22.66	22.51	22.49	0
		3	0	22.49	22.39	22.46	0
		3	3	22.65	22.54	22.42	0
		6	0	22.61	22.44	22.46	1
	16QAM	1	0	22.48	22.39	22.33	1
		1	5	22.45	22.29	22.35	1
		3	0	22.43	22.27	22.31	1
		3	3	22.30	22.32	22.24	1
		6	0	22.43	22.34	22.25	2

Band/BW	Modulation	RB Size	RB Offset	Low CH 18615	Mid CH 18900	High CH 19185	MPR
				Frequency 1851.5 MHz	Frequency 1880 MHz	Frequency 1908.5 MHz	
2/ 3	QPSK	1	0	22.58	22.50	22.39	0
		1	5	22.62	22.52	22.49	0
		3	0	22.48	22.42	22.46	1
		3	3	22.58	22.54	22.44	1
		6	0	22.58	22.45	22.40	1
	16QAM	1	0	22.45	22.45	22.36	1
		1	5	22.42	22.32	22.33	1
		3	0	22.39	22.28	22.31	2
		3	3	22.35	22.27	22.27	2
		6	0	22.43	22.28	22.28	2

Band/BW	Modulation	RB Size	RB Offset	Low CH 18625	Mid CH 18900	High CH 19175	MPR
				Frequency 1852.5 MHz	Frequency 1880 MHz	Frequency 1907.5 MHz	
2/ 5	QPSK	1	0	22.59	22.45	22.40	0
		1	5	22.67	22.49	22.49	0
		3	0	22.51	22.42	22.43	1
		3	3	22.58	22.55	22.45	1
		6	0	22.56	22.48	22.43	1
	16QAM	1	0	22.46	22.41	22.36	1
		1	5	22.39	22.35	22.32	1
		3	0	22.39	22.26	22.28	2
		3	3	22.32	22.31	22.23	2
		6	0	22.43	22.29	22.25	2

Band/BW	Modulation	RB Size	RB Offset	Low CH 18650	Mid CH 18900	High CH 19150	MPR
				Frequency 1855 MHz	Frequency 1880 MHz	Frequency 1905 MHz	
2/ 10	QPSK	1	0	22.56	22.48	22.40	0
		1	5	22.67	22.49	22.50	0
		3	0	22.52	22.41	22.46	1
		3	3	22.64	22.49	22.45	1
		6	0	22.61	22.48	22.40	1
	16QAM	1	0	22.46	22.38	22.32	1
		1	5	22.44	22.31	22.35	1
		3	0	22.41	22.24	22.34	2
		3	3	22.36	22.25	22.28	2
		6	0	22.47	22.28	22.29	2

Band/BW	Modulation	RB Size	RB Offset	Low CH 18675	Mid CH 18900	High CH 19125	MPR
				Frequency 1857.5 MHz	Frequency 1880 MHz	Frequency 1902.5 MHz	
2/ 15	QPSK	1	0	22.63	22.48	22.37	0
		1	5	22.65	22.54	22.45	0
		3	0	22.49	22.42	22.47	1
		3	3	22.65	22.54	22.45	1
		6	0	22.61	22.46	22.45	1
	16QAM	1	0	22.50	22.45	22.32	1
		1	5	22.43	22.32	22.35	1
		3	0	22.45	22.24	22.35	2
		3	3	22.30	22.29	22.24	2
		6	0	22.48	22.31	22.22	2

Band/BW	Modulation	RB Size	RB Offset	Low CH 18700	Mid CH 18900	High CH 19100	MPR
				Frequency 1860 MHz	Frequency 1880 MHz	Frequency 1900 MHz	
2/ 20	QPSK	1	0	22.64	22.52	22.45	0
		1	5	22.69	22.57	22.51	0
		3	0	22.55	22.47	22.48	1
		3	3	22.66	22.56	22.50	1
		6	0	22.62	22.50	22.48	1
	16QAM	1	0	22.53	22.46	22.38	1
		1	5	22.47	22.37	22.37	1
		3	0	22.47	22.32	22.36	2
		3	3	22.38	22.33	22.29	2
		6	0	22.49	22.36	22.30	2

**EIRP POWER (dBm)****GSM**

Channel	Frequency (MHz)	Conducted Power (dBm)	G _T -L _C (dB)	ERP (dBm)	ERP (mW)	Limit (W)
512	1850.2	29.61	0.8	30.41	1099.01	2
661	1880	29.79	0.8	30.59	1145.51	2
810	1909.8	29.86	0.8	30.66	1164.13	2

REMARKS: ERP Output Power (dBm) = EIRP (dBm) -2.15(dB).**EDGE**

Channel	Frequency (MHz)	Conducted Power (dBm)	G _T -L _C (dB)	ERP (dBm)	ERP (mW)	Limit (W)
512	1850.2	25.42	0.8	26.22	418.79	2
661	1880	25.45	0.8	26.25	421.7	2
810	1909.8	25.58	0.8	26.38	434.51	2

REMARKS: ERP Output Power (dBm) = EIRP (dBm) -2.15(dB).

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	22.66	0.8	23.46	221.82	2
18900	1880.0	22.54	0.8	23.34	215.77	2
19193	1908.3	22.49	0.8	23.29	213.3	2

CHANNEL BANDWIDTH: 1.4MHz 16QAM

Channel	Frequency (MHz)	Conducted Power (dBm)	G _T -L _C (dB)	EIRP (dBm)	EIRP (mW)	Limit (W)
18607	1850.7	22.48	0.8	23.28	212.81	2
18900	1880.0	22.39	0.8	23.19	208.45	2
19193	1908.3	22.35	0.8	23.15	206.54	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	22.62	0.8	23.42	219.79	2
18900	1880.0	22.54	0.8	23.34	215.77	2
19185	1908.5	22.49	0.8	23.29	213.3	2

CHANNEL BANDWIDTH: 3MHz 16QAM

Channel	Frequency (MHz)	Conducted Power (dBm)	G _T -L _C (dB)	EIRP (dBm)	EIRP (mW)	Limit (W)
18615	1851.5	22.45	0.8	23.25	211.35	2
18900	1880.0	22.45	0.8	23.25	211.35	2
19185	1908.5	22.36	0.8	23.16	207.01	2



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VERITAS

Test Report No.: W7L-P21090017RF01

CHANNEL BANDWIDTH: 5MHz QPSK

Channel	Frequency (MHz)	Conducted Power (dBm)	G _T -L _C (dB)	EIRP (dBm)	EIRP (mW)	Limit (W)
18625	1852.5	22.67	0.8	23.47	222.33	2
18900	1880.0	22.55	0.8	23.35	216.27	2
19175	1907.5	22.49	0.8	23.29	213.3	2

CHANNEL BANDWIDTH: 5MHz 16QAM

Channel	Frequency (MHz)	Conducted Power (dBm)	G _T -L _C (dB)	EIRP (dBm)	EIRP (mW)	Limit (W)
18625	1852.5	22.46	0.8	23.26	211.84	2
18900	1880.0	22.41	0.8	23.21	209.41	2
19175	1907.5	22.36	0.8	23.16	207.01	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	22.67	0.8	23.47	222.33	2
18900	1880.0	22.49	0.8	23.29	213.3	2
19150	1905.0	22.5	0.8	23.3	213.8	2

CHANNEL BANDWIDTH: 10MHz 16QAM

Channel	Frequency (MHz)	Conducted Power (dBm)	G _T -L _C (dB)	EIRP (dBm)	EIRP (mW)	Limit (W)
18650	1855.0	22.47	0.8	23.27	212.32	2
18900	1880.0	22.38	0.8	23.18	207.97	2
19150	1905.0	22.35	0.8	23.15	206.54	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	22.65	0.8	23.45	221.31	2
18900	1880.0	22.54	0.8	23.34	215.77	2
19125	1902.5	22.47	0.8	23.27	212.32	2

CHANNEL BANDWIDTH: 15MHz 16QAM

Channel	Frequency (MHz)	Conducted Power (dBm)	G _T -L _C (dB)	EIRP (dBm)	EIRP (mW)	Limit (W)
18675	1857.5	22.5	0.8	23.3	213.8	2
18900	1880.0	22.45	0.8	23.25	211.35	2
19125	1902.5	22.35	0.8	23.15	206.54	2

CHANNEL BANDWIDTH: 20MHz QPSK

Channel	Frequency (MHz)	Conducted Power (dBm)	G _T -L _C (dB)	EIRP (dBm)	EIRP (mW)	Limit (W)
18700	1860	22.69	0.8	23.49	223.36	2
18900	1880	22.57	0.8	23.37	217.27	2
19100	1900	22.51	0.8	23.31	214.29	2

CHANNEL BANDWIDTH: 20MHz 16QAM

Channel	Frequency (MHz)	Conducted Power (dBm)	G _T -L _C (dB)	EIRP (dBm)	EIRP (mW)	Limit (W)
18700	1860	22.53	0.8	23.33	215.28	2
18900	1880	22.46	0.8	23.26	211.84	2
19100	1900	22.38	0.8	23.18	207.97	2

REMARKS: ERP Output Power (dBm) = EIRP (dBm) -2.15(dB).



3.2 FREQUENCY STABILITY MEASUREMENT

3.2.1 LIMITS OF FREQUENCY STABILITY MEASUREMENT

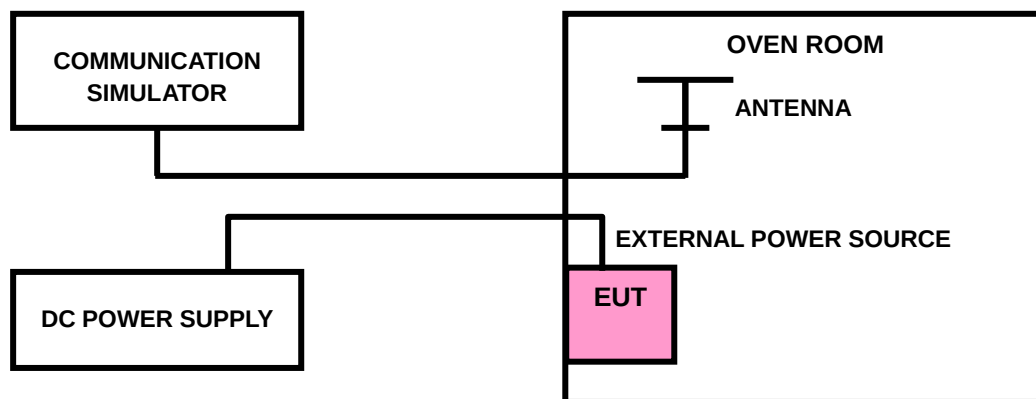
The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

3.2.2 TEST PROCEDURE

- 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.
- 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.
- 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





3.2.4 TEST RESULTS

GSM1900

FREQUENCY ERROR VS. VOLTAGE

VOLTAGE (Volts)	FREQUENCY ERROR (ppm)		LIMIT (ppm)
	Low Channel	High Channel	
V_{nor}	0.0002	0.0013	2.5
V_{min}	-0.0015	-0.0016	2.5
V_{max}	0.0010	0.0007	2.5

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

FREQUENCY ERROR vs. TEMPERATURE.

TEMP. (°C)	FREQUENCY ERROR (ppm)		LIMIT (ppm)
	Low Channel	High Channel	
-10	-0.0034	-0.0037	2.5
0	-0.0012	-0.0039	2.5
10	-0.0021	-0.0026	2.5
20	-0.0015	-0.0024	2.5
30	-0.0019	-0.0016	2.5
40	-0.0014	-0.0010	2.5
55	-0.0023	-0.0003	2.5

**EDGE 1900****FREQUENCY ERROR VS. VOLTAGE**

VOLTAGE (Volts)	FREQUENCY ERROR (ppm)		LIMIT (ppm)
	Low Channel	High Channel	
V_{nor}	0.0008	0.0011	2.5
V_{min}	-0.0014	-0.0013	2.5
V_{max}	0.0009	0.0009	2.5

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

FREQUENCY ERROR vs. TEMPERATURE.

TEMP. (°C)	FREQUENCY ERROR (ppm)		LIMIT (ppm)
	Low Channel	High Channel	
-10	-0.0038	-0.0035	2.5
0	-0.0035	-0.0032	2.5
10	-0.0021	-0.0019	2.5
20	-0.0018	-0.0017	2.5
30	-0.0013	-0.0012	2.5
40	-0.0009	-0.0009	2.5
55	-0.0001	-0.0001	2.5

LTE BAND 2

FREQUENCY ERROR VS. VOLTAGE

VOLTAGE (Volts)	1.4MHz		LIMIT (ppm)
	FREQUENCY ERROR (ppm)		
	Low Channel	High Channel	
V _{nor}	0.0021	0.0023	2.5
V _{min}	-0.0031	-0.0030	2.5
V _{max}	0.0022	0.0021	2.5

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

FREQUENCY ERROR vs. TEMPERATURE.

TEMP. (°C)	1.4MHz		LIMIT (ppm)
	FREQUENCY ERROR (ppm)		
	Low Channel	High Channel	
-30	-0.0120	-0.0110	2.5
-20	-0.0113	-0.0096	2.5
-10	-0.0084	-0.0081	2.5
0	-0.0076	-0.0076	2.5
10	-0.0053	-0.0045	2.5
20	-0.0042	-0.0041	2.5
30	-0.0042	-0.0029	2.5
40	-0.0019	-0.0018	2.5
50	-0.0005	-0.0001	2.5

FREQUENCY ERROR VS. VOLTAGE

VOLTAGE (Volts)	3MHz		LIMIT (ppm)
	FREQUENCY ERROR (ppm)		
	Low Channel	High Channel	
V _{nor}	0.0021	0.0020	2.5
V _{min}	-0.0022	-0.0025	2.5
V _{max}	0.0018	0.0018	2.5

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

FREQUENCY ERROR vs. TEMPERATURE.

TEMP. (°C)	3MHz		LIMIT (ppm)
	FREQUENCY ERROR (ppm)		
	Low Channel	High Channel	
-30	-0.0119	-0.0119	2.5
-20	-0.0107	-0.0108	2.5
-10	-0.0086	-0.0079	2.5
0	-0.0078	-0.0073	2.5
10	-0.0055	-0.0048	2.5
20	-0.0039	-0.0043	2.5
30	-0.0028	-0.0040	2.5
40	-0.0019	-0.0017	2.5
50	-0.0002	-0.0004	2.5

FREQUENCY ERROR VS. VOLTAGE

VOLTAGE (Volts)	5MHz		LIMIT (ppm)
	FREQUENCY ERROR (ppm)		
	Low Channel	High Channel	
V _{nor}	0.0021	0.0026	2.5
V _{min}	-0.0023	-0.0030	2.5
V _{max}	0.0021	0.0020	2.5

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

FREQUENCY ERROR vs. TEMPERATURE.

TEMP. (°C)	5MHz		LIMIT (ppm)
	FREQUENCY ERROR (ppm)		
	Low Channel	High Channel	
-30	-0.0114	-0.0119	2.5
-20	-0.0108	-0.0098	2.5
-10	-0.0085	-0.0080	2.5
0	-0.0074	-0.0074	2.5
10	-0.0050	-0.0054	2.5
20	-0.0040	-0.0037	2.5
30	-0.0039	-0.0026	2.5
40	-0.0022	-0.0022	2.5
50	-0.0004	-0.0002	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}	0.0027	0.0024	2.5

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

FREQUENCY ERROR vs. TEMPERATURE.

TEMP. (°C)	10MHz		LIMIT (ppm)
	FREQUENCY ERROR (ppm)		
	Low Channel	High Channel	
-30	-0.0114	-0.0111	2.5
-20	-0.0103	-0.0103	2.5
-10	-0.0083	-0.0084	2.5
0	-0.0075	-0.0074	2.5
10	-0.0050	-0.0044	2.5
20	-0.0039	-0.0043	2.5
30	-0.0038	-0.0042	2.5
40	-0.0020	-0.0017	2.5
50	-0.0004	-0.0004	2.5

FREQUENCY ERROR VS. VOLTAGE

VOLTAGE (Volts)	15MHz		LIMIT (ppm)
	FREQUENCY ERROR (ppm)		
	Low Channel	High Channel	
V _{nor}	0.0024	0.0025	2.5
V _{min}	-0.0031	-0.0030	2.5
V _{max}	0.0026	0.0024	2.5

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

FREQUENCY ERROR vs. TEMPERATURE.

TEMP. (°C)	15MHz		LIMIT (ppm)
	FREQUENCY ERROR (ppm)		
	Low Channel	High Channel	
-30	-0.0121	-0.0112	2.5
-20	-0.0110	-0.0104	2.5
-10	-0.0084	-0.0082	2.5
0	-0.0078	-0.0076	2.5
10	-0.0055	-0.0046	2.5
20	-0.0044	-0.0042	2.5
30	-0.0032	-0.0029	2.5
40	-0.0019	-0.0017	2.5
50	-0.0005	-0.0004	2.5

FREQUENCY ERROR VS. VOLTAGE

VOLTAGE (Volts)	20MHz		LIMIT (ppm)
	FREQUENCY ERROR (ppm)		
	Low Channel	High Channel	
V _{nor}	0.0026	0.0025	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 from V_{min} to V_{max} .

FREQUENCY ERROR vs. TEMPERATURE.

TEMP. (°C)	20MHz		LIMIT (ppm)
	FREQUENCY ERROR (ppm)		
	Low Channel	High Channel	
-30	-0.0117	-0.0111	2.5
-20	-0.0108	-0.0098	2.5
-10	-0.0082	-0.0082	2.5
0	-0.0075	-0.0073	2.5
10	-0.0049	-0.0047	2.5
20	-0.0042	-0.0039	2.5
30	-0.0029	-0.0029	2.5
40	-0.0021	-0.0020	2.5
50	-0.0002	-0.0004	2.5

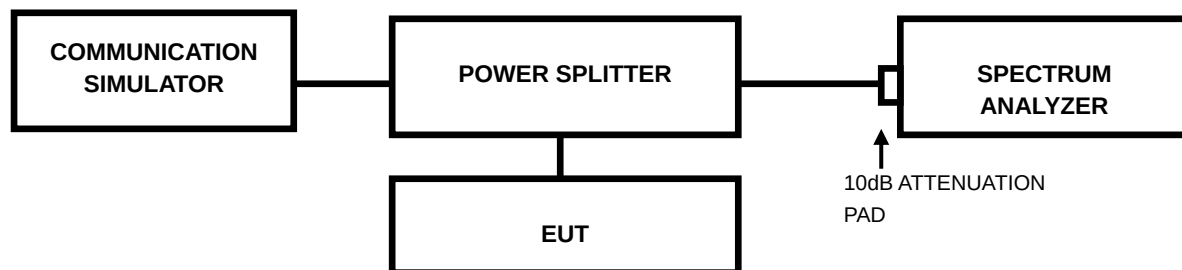


3.3 OCCUPIED BANDWIDTH MEASUREMENT

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.

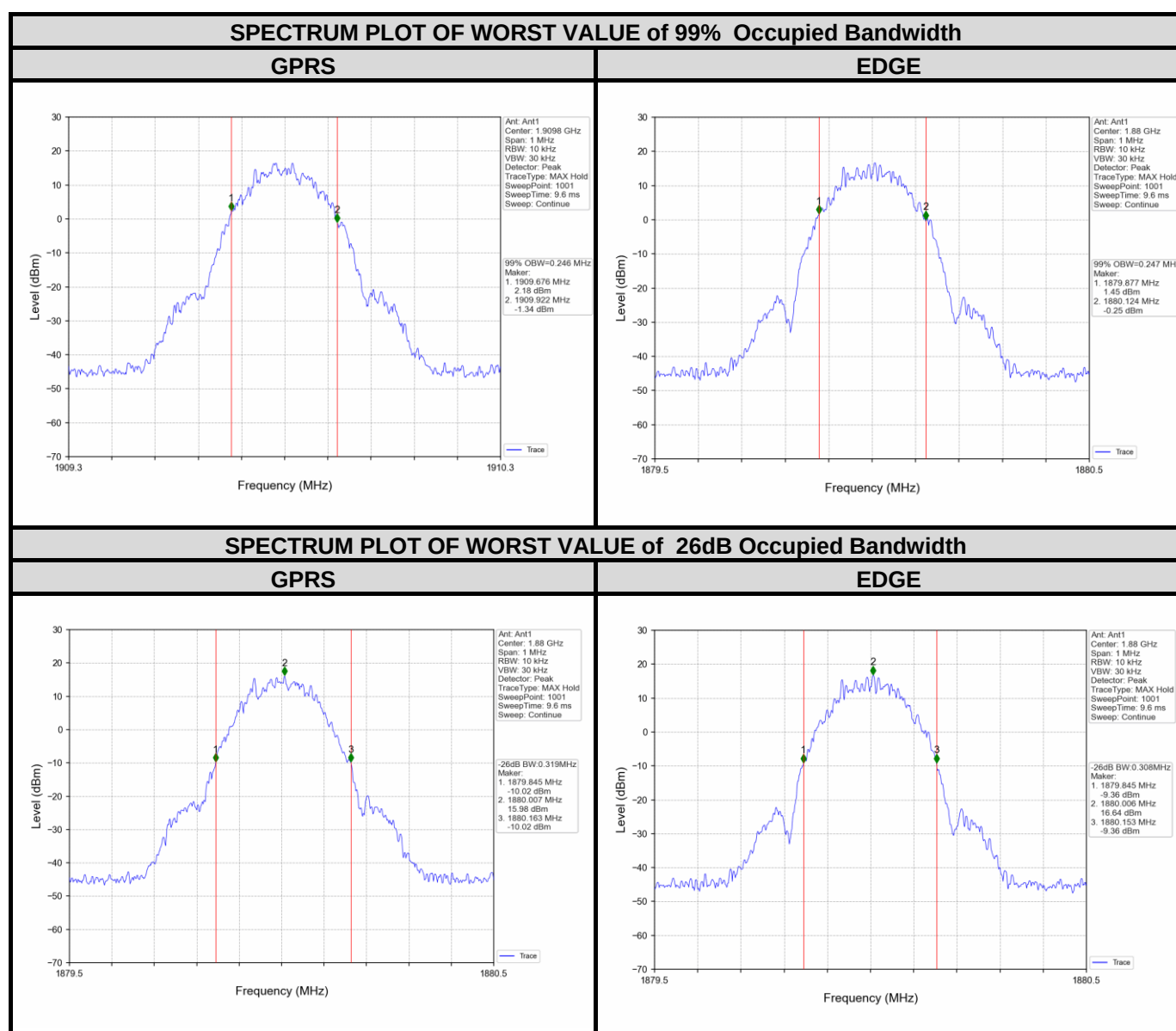
3.3.2 TEST SETUP



3.3.3 TEST RESULTS

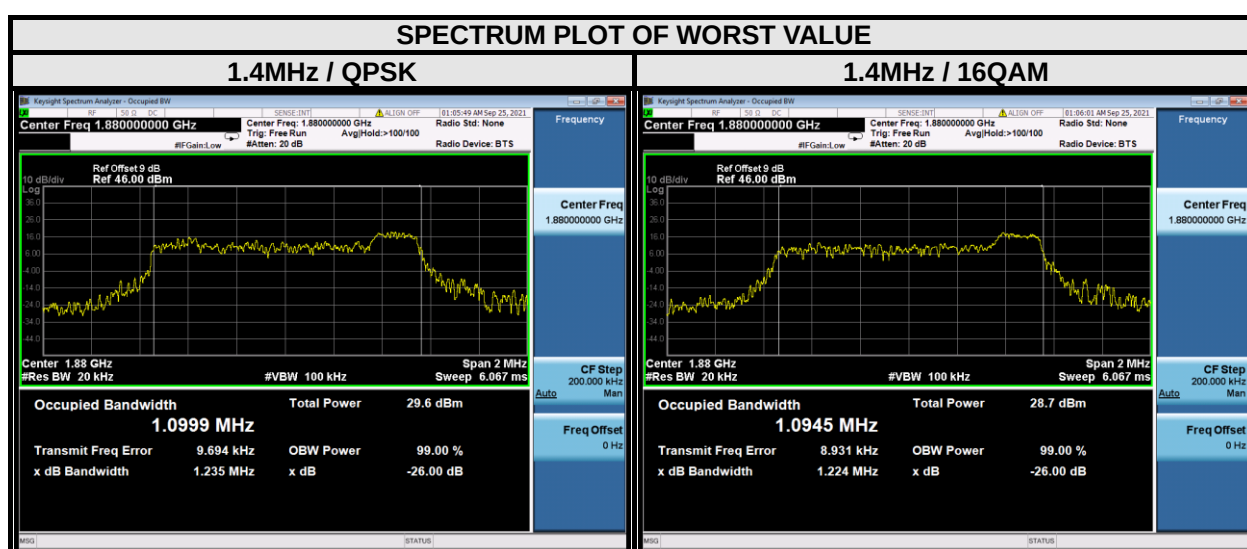
GSM&EDGE

CHANNEL	Frequency (MHz)	99% OCCUPIED Bandwidth (MHz)		CHANNEL	Frequency (MHz)	26dB Bandwidth (MHz)	
		GSM	EDGE			GSM	EDGE
512	1850.2	0.245	0.242	512	1850.2	0.309	0.306
661	1880	0.241	0.247	661	1880	0.319	0.308
810	1909.8	0.246	0.243	810	1909.8	0.317	0.305



LTE BAND 2

LTE band 2							
CHANNEL BANDWIDTH: 1.4MHz							
CHANNEL	FREQUENCY (MHz)	99% OCCUPIED BANDWIDTH (MHz)			26dB BANDWIDTH (MHz)		
		QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
18607	1850.7	1.09	1.09	/	1.20	1.23	/
18900	1880	1.10	1.09	/	1.24	1.22	/
19193	1909.3	1.10	1.09	/	1.24	1.23	/

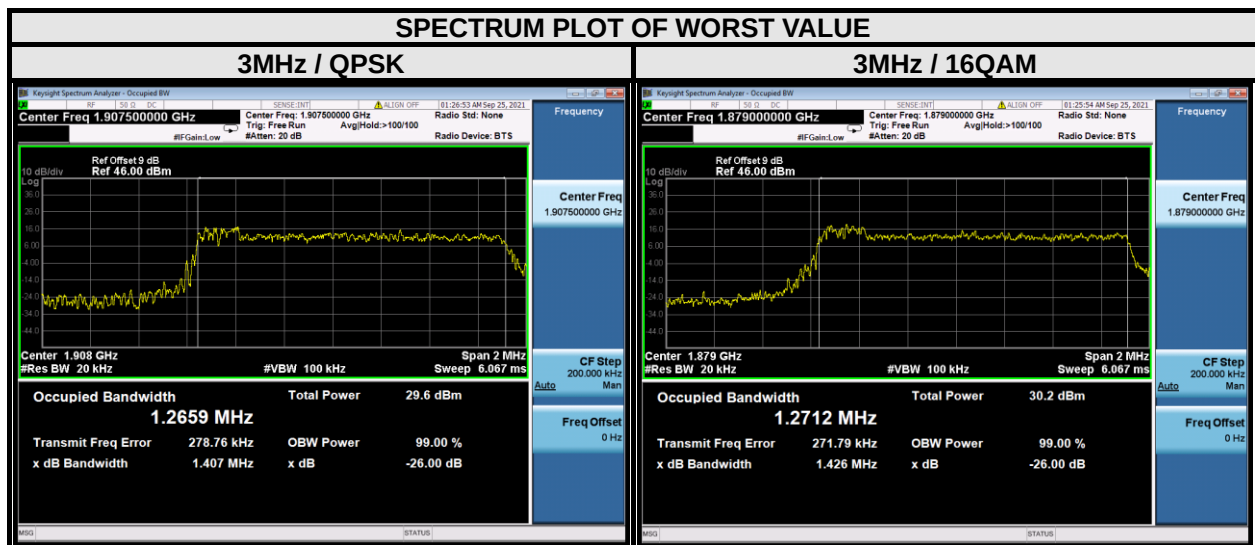




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Test Report No.: W7L-P21090017RF01

CHANNEL BANDWIDTH: 3MHz							
CHANNEL	Frequency (MHz)	99% OCCUPIED Bandwidth (MHz)			26 dB bandwidth (MHz)		
		QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
18615	1851.5	1.08	1.09	/	1.33	1.39	/
18900	1880	1.26	1.27	/	1.42	1.43	/
19185	1908.5	1.27	1.27	/	1.41	1.37	/

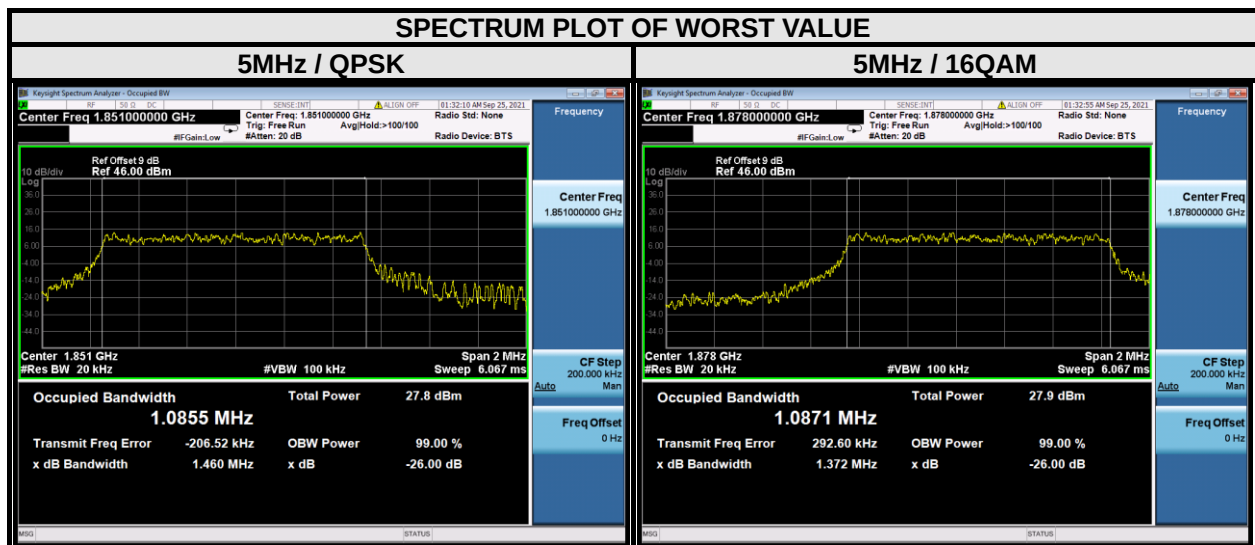




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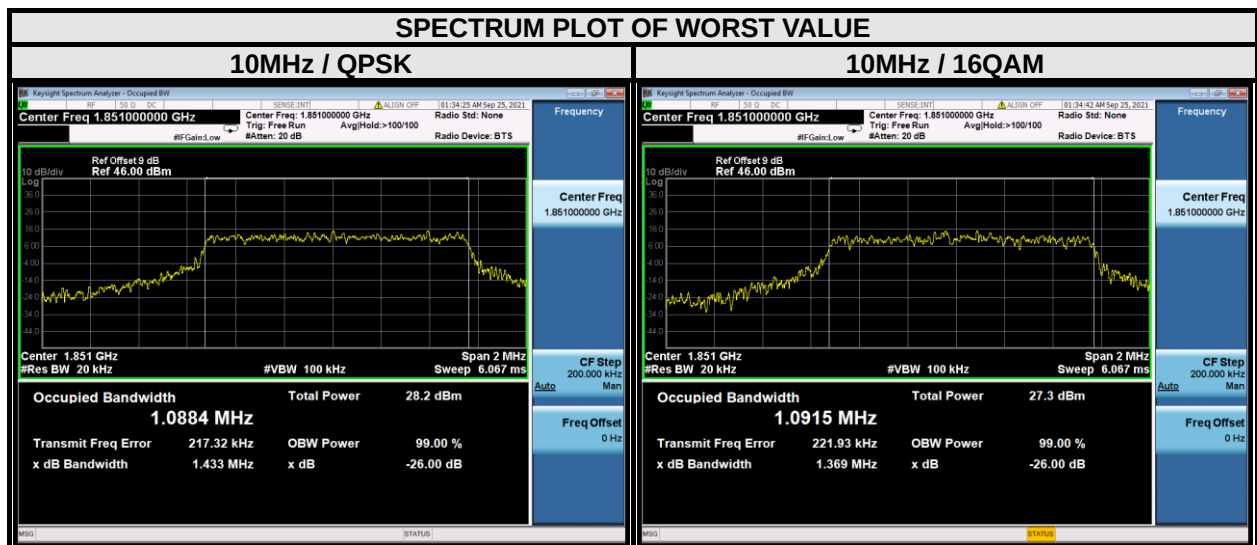
Test Report No.: W7L-P21090017RF01

CHANNEL BANDWIDTH: 5MHz							
CHANNEL	Frequency (MHz)	99% OCCUPIED Bandwidth (MHz)			26 dB bandwidth (MHz)		
		QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
18625	1852.5	1.09	1.08	/	1.46	1.36	/
18900	1880	1.08	1.09	/	1.31	1.37	/
19175	1907.5	1.08	1.07	/	1.30	1.32	/





CHANNEL BANDWIDTH: 10MHz							
CHANNEL	Frequency (MHz)	99% OCCUPIED Bandwidth (MHz)			26 dB bandwidth (MHz)		
		QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
18650	1855	1.09	1.09	/	1.43	1.37	/
18900	1880	1.09	1.08	/	1.53	1.40	/
19150	1905	1.09	1.09	/	1.46	1.45	/

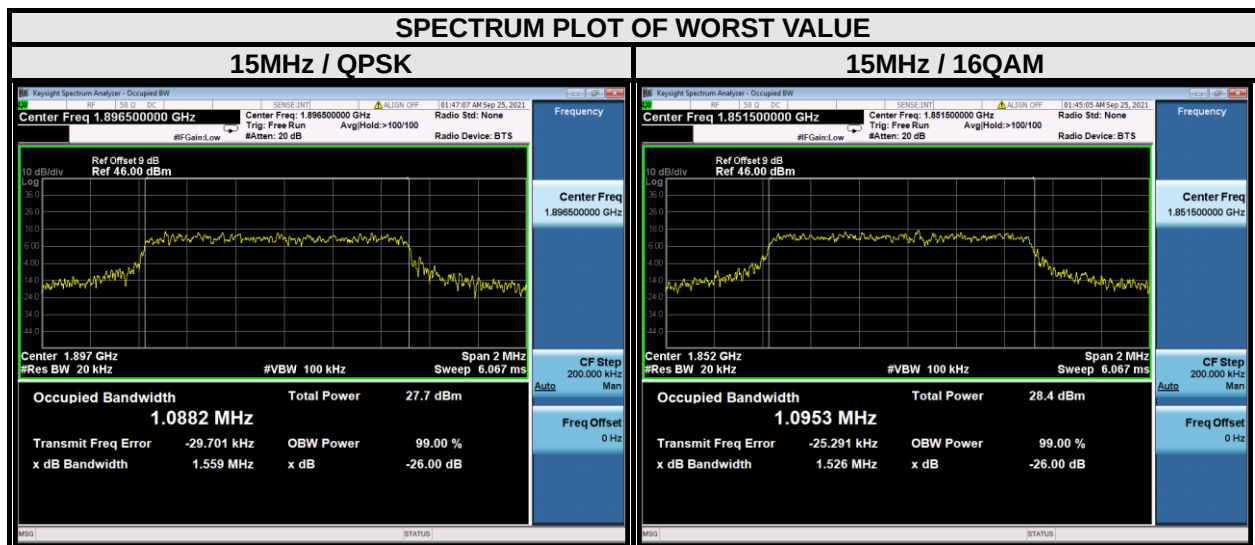




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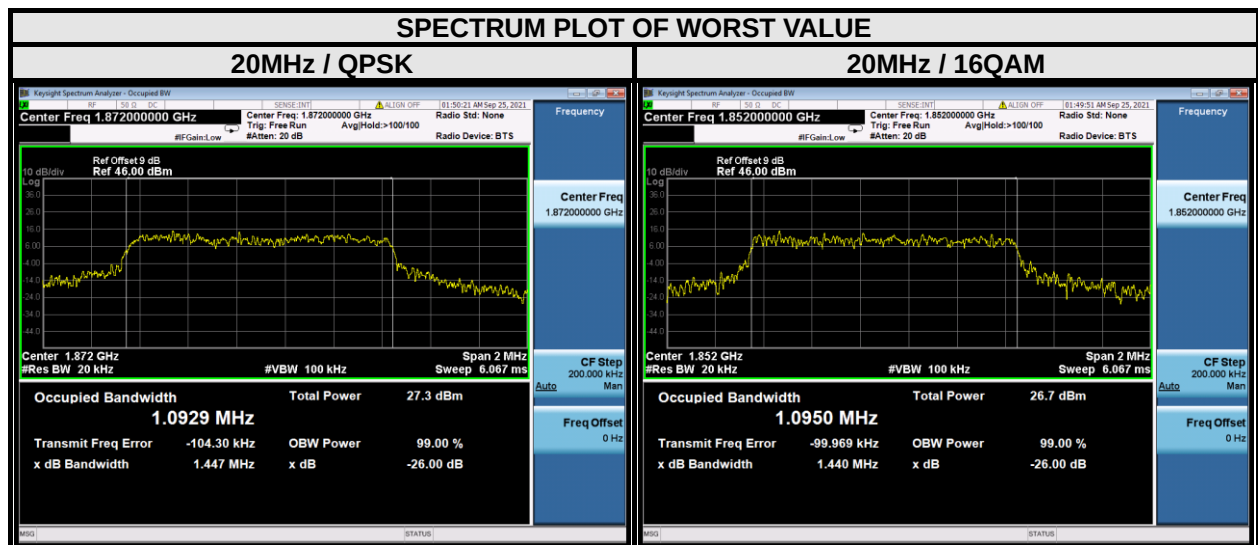
Test Report No.: W7L-P21090017RF01

CHANNEL BANDWIDTH: 15MHz							
CHANNEL	Frequency (MHz)	99% OCCUPIED Bandwidth (MHz)			26 dB bandwidth (MHz)		
		QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
18675	1857.5	1.08	1.10	/	1.44	1.53	/
18900	1880	1.09	1.09	/	1.59	1.49	/
19125	1902.5	1.09	1.08	/	1.56	1.39	/





CHANNEL BANDWIDTH: 20MHz							
CHANNEL	Frequency (MHz)	99% OCCUPIED Bandwidth (MHz)			26 dB bandwidth (MHz)		
		QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
18700	1860	1.09	1.10	/	1.53	1.44	/
18900	1880	1.09	1.09	/	1.45	1.48	/
19100	1900	1.09	1.09	/	1.46	1.50	/



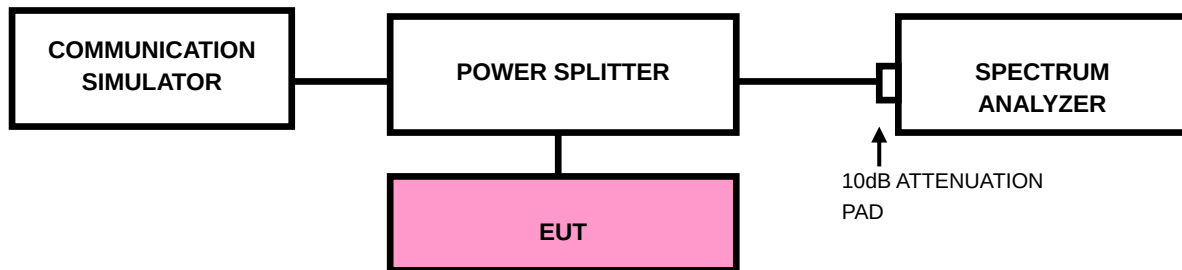


3.4 BAND EDGE MEASUREMENTC

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





Test Report No.: W7L-P21090017RF01

3.4.3 TEST PROCEDURES

- a. All measurements were done at low and high operational frequency range.
- b. Set spectrum is the band edge frequency and span is 3/5/10/15/20 MHz. RBW of the spectrum is 20kHz(greater than 1 percent of emission bandwidth) and VBW of the spectrum is 100kHz.



BUREAU
VERITAS

Test Report No.: W7L-P21090017RF01

3.4.4. TEST RESULTS

