

C TEST REPORT

(PART 24)

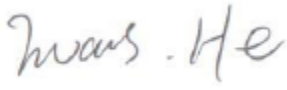
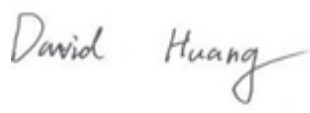
Applicant:	PUNDI X LABS PTE. LTD.
Address:	6 Raffles Boulevard,#03-308 Marina Square Singapore, 039594

Manufacturer or Supplier:	PUNDI X LABS PTE. LTD.
Address:	6 Raffles Boulevard,#03-308 Marina Square Singapore, 039594
Product:	XPOS
Brand Name:	Pundi X
Model Name:	X2
FCC ID:	2ASTH-X2
Date of tests:	Dec. 19, 2018 ~ Mar. 07, 2019

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

- ☒ **FCC PART 24, Subpart E** ☒ **ANSI C63.26-2015**
☒ **ANSI/TIA/EIA-603-D** ☒ **ANSI/TIA/EIA-603-E**

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

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

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BUREAU
VERITAS

Test Report No.: RF181102N040-8_R1

RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF181102N040-8	Original release	Mar. 07, 2019
RF181102N040-8_R1	Updated the applicant and manufacturer address from "99 DUXTON ROAD 089543, Singapor" to "6 Raffles Boulevard,#03-308 Marina Square Singapore, 039594"	Apr. 24, 2019



1 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 24 & Part 2			
STANDARD SECTION	TEST TYPE	RESULT	REMARK
2.1046 24.232	Equivalent Isotropic Radiated Power	PASS	Meet the requirement of limit.
2.1055 24.235	Frequency Stability	PASS	Meet the requirement of limit.
2.1049 24.238(b)	Occupied Bandwidth	PASS	Meet the requirement of limit.
24.232(d)	Peak to average ratio	PASS	Meet the requirement of limit.
24.238(b)	Band Edge Measurements	PASS	Meet the requirement of limit.
2.1051 24.238	Conducted Spurious Emissions	PASS	Meet the requirement of limit.
2.1053 24.238	Radiated Spurious Emissions	PASS	Meet the requirement of limit. Minimum passing margin is -6.75dB at 1961.485MHz.

NOTE : Test Lab Information:

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

Test Lab Address: Zone A, Floor 1, Building 2 Wan Ye Long Technology Park
South Side of Zhoushi Road, Bao'an District Shenzhen, Guangdong, 518108, People's
Republic of China

1.1 MEASUREMENT UNCERTAINTY

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

MEASUREMENT	FREQUENCY	UNCERTAINTY
Conducted emissions	9kHz~30MHz	3.11dB
Radiated emissions	9KHz ~ 30MHz	3.11dB
	30MHz ~ 1GHz	5.12dB
	1GHz ~ 18GHz	5.34dB
	18GHz ~ 40GHz	5.02dB

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



1.2 TEST SITE AND INSTRUMENTS

Instrument	Model	Serial #	Cal Date	Cal Due
EMI test receiver	ESL6	100262	Jan. 04, 19	Jan. 03, 20
Active Antenna	AL-130	121031	Feb. 07, 19	Feb. 06, 20
3m Semi-anechoic Chamber	9m*6m*6m	N/A	Oct. 18, 18	Oct. 17, 19
Signal Amplifier	8447E	443008	Jan. 24, 19	Jan. 23, 20
MXA signal analyzer	N9020A	MY49100060	Jan. 04, 19	Jan. 03, 20
Horn Antenna	HAH-118	71259	Jan. 25, 19	Jan. 24, 20
Horn Antenna	HAH-118	71283	Feb. 01, 19	Jan. 31, 20
AMPLIFIER	EM01G26G	60613	Jan. 24, 19	Jan. 23, 20
AMPLIFIER	Emc012645	980077	Jan. 04, 19	Jan. 03, 20
Bilog Antenna (30MHz~6GHz)	JB6	A110712	Feb. 07, 19	Feb. 06, 20
DC Power Supply	E3640A	MY40004013	Jan. 04, 19	Jan. 03, 20
MXA Signal Analyzer	N9020A	MY49100060	Jan. 04, 19	Jan. 03, 20
MXG Vector Signal Generator	N5182A	MY50140530	Jan. 04, 19	Jan. 03, 20
Series Signal Generator	E4421B	US40051152	May. 12, 18	May. 11, 19
RF control unit	JS0806-0806-2	188060112	Apr. 25, 18	Apr. 24, 19
Wireless Connectivity Tester	CMW270	1201.0002K75-10 1601-PE	Apr. 25, 18	Apr. 24, 19
Universal Radio Communication Tester	CMU200	121393	Jan. 04, 19	Jan. 03, 20
Programmable Temperature & Humidity Chamber	HYL-TH-225D H	DG-180746	Jul. 15, 18	Jul. 14, 19
Test Software	EZ-EMC	ver.lcp-03A1	N/A	N/A

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



2 GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

PRODUCT	XPOS	
BRAND NAME	Pundi X	
MODEL NAME	X2	
POWER SUPPLY	5.0Vdc (adapter or host equipment) 3.8Vdc (Li-ion, ion battery)	
MODULATION TYPE	GSM, GPRS: GMSK EDGE: GMSK, 8PSK WCDMA : BPSK LTE Band 2: QPSK, 16QAM	
FREQUENCY RANGE	GSM, GPRS, EDGE	1850.2MHz ~ 1909.8MHz
	WCDMA	1852.4MHz ~ 1907.6MHz
	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	770.9mW
	EDGE	187.5mW
	WCDMA	213.8mW
	LTE Band 2 Channel Bandwidth: 1.4MHz	175.79mW
	LTE Band 2 Channel Bandwidth: 3MHz	173.78mW
	LTE Band 2 Channel Bandwidth: 5MHz	170.22mW
	LTE Band 2 Channel Bandwidth: 10MHz	155.6mW
	LTE Band 2 Channel Bandwidth: 15MHz	181.55mW
	LTE Band 2 Channel Bandwidth: 20MHz	192.75mW



EMISSION DESIGNATOR	GSM	245KGXW
	EDGE	248KG7W
	WCDMA	4M15F9W
	LTE Band 2 Channel Bandwidth: 1.4MHz	QPSK: 1M09G7D 16QAM: 1M09W7D
	LTE Band 2 Channel Bandwidth: 3MHz	QPSK: 2M69G7D 16QAM: 2M68W7D
	LTE Band 2 Channel Bandwidth: 5MHz	QPSK: 4M48G7D 16QAM: 4M48W7D
	LTE Band 2 Channel Bandwidth: 10MHz	QPSK: 8M94G7D 16QAM: 8M94W7D
	LTE Band 2 Channel Bandwidth: 15MHz	QPSK: 13M4G7D 16QAM: 13M4W7D
	LTE Band 2 Channel Bandwidth: 20MHz	QPSK: 17M8G7D 16QAM: 17M8W7D
ANTENNA TYPE	FPC Antenna with 0.9dBi gain for GSM/WCDMA FPC Antenna with 1.2dBi gain for LTE Band2	
HW VERSION	JP800_MB_V1.1	
SW VERSION	JP800_MB_V1.1	
I/O PORTS	Refer to user's manual	
CABLE SUPPLIED	Power cable: non-shielded, detachable, 1.4m	

NOTE:

- For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.
- The EUT was powered by the following adapter:

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

- The EUT matched the following USB cable:

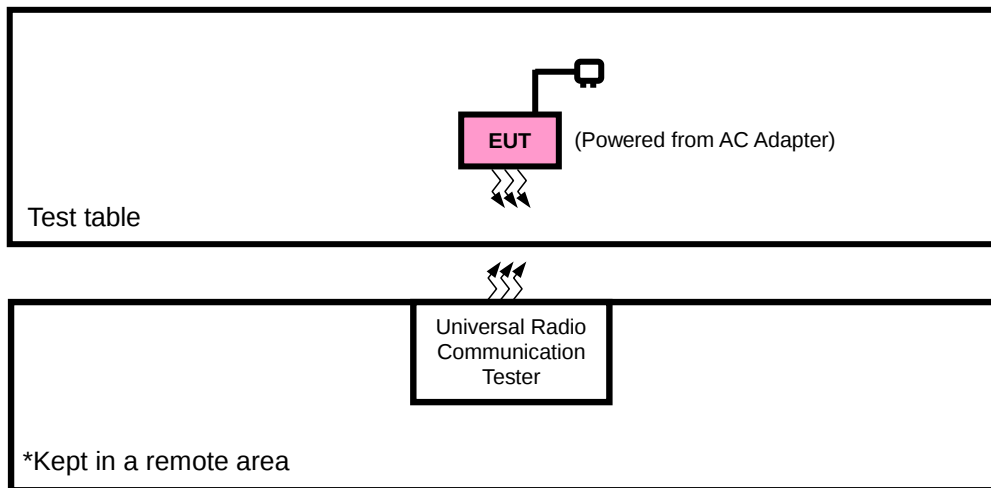
USB CABLE	
BRAND:	N/A
MODEL:	N/A
SIGNAL LINE:	1.4 METER

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

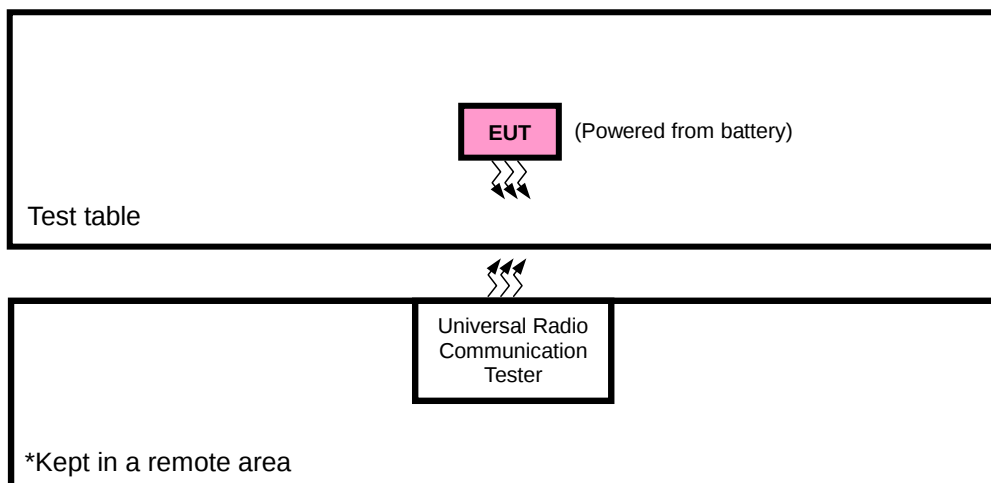


2.2 CONFIGURATION OF SYSTEM UNDER TEST

FOR RADIATION EMISSION TEST



FOR CONDUCTED & E.I.R.P. TEST





2.3 DESCRIPTION OF SUPPORT UNITS

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

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

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

2.4 TEST ITEM AND TEST CONFIGURATION

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and antenna ports

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

EUT CONFIGURE MODE	DESCRIPTION
A	EUT + Adapter with GSM ,WCDMA or LTE link
B	EUT + Battery with GSM ,WCDMA or LTE link

GSM MODE

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



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WCDMA MODE

EUT CONFIGURE MODE	TEST ITEM	AVAILABLE CHANNEL	TESTED CHANNEL	MODE
B	EIRP	9262 to 9538	9262, 9400, 9538	WCDMA
B	FREQUENCY STABILITY	9262 to 9538	9262, 9538	WCDMA
B	OCCUPIED BANDWIDTH	9262 to 9538	9262, 9400, 9538	WCDMA
B	PEAK TO AVERAGE RATIO	9262 to 9538	9262, 9400, 9538	WCDMA
B	BAND EDGE	9262 to 9538	9262, 9538	WCDMA
B	CONDCUETED EMISSION	9262 to 9538	9262, 9400, 9538	WCDMA
A	RADIATED EMISSION	9262 to 9538	9262, 9400, 9538	WCDMA

LTE BAND 2

EUT CONFIGURE MODE	TEST ITEM	AVAILABLE CHANNEL	TESTED CHANNEL	CHANNEL BANDWIDTH	MODULATION	MODE
B	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
B	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
B	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	15 RB / 0 RB Offset
		18625 to 19175	18625, 18900, 19175	5MHz	QPSK,16QAM	25 RB / 0 RB Offset
		18650 to 19150	18650, 18900, 19150	10MHz	QPSK,16QAM	50 RB / 0 RB Offset
		18675 to 19125	18675, 18900, 19125	15MHz	QPSK,16QAM	75 RB / 0 RB Offset
		18700 to 19100	18700, 18900, 19100	20MHz	QPSK,16QAM	100 RB / 0 RB Offset
B	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



B	BAND EDGE	18607 to 19193	18607	1.4MHz	QPSK	1 RB / 0 RB Offset
			19193	1.4MHz	QPSK	6 RB / 0 RB Offset
		18615 to 19185	18615	3MHz	QPSK	1 RB / 5 RB Offset
			19185	3MHz	QPSK	6 RB / 0 RB Offset
		18625 to 19175	18625	5MHz	QPSK	1 RB / 0 RB Offset
			19175	5MHz	QPSK	15 RB / 0 RB Offset
		18650 to 19150	18650	10MHz	QPSK	1 RB / 14 RB Offset
			19150	10MHz	QPSK	15 RB / 0 RB Offset
		18675 to 19125	18675	15MHz	QPSK	1 RB / 0 RB Offset
			19125	15MHz	QPSK	25 RB / 0 RB Offset
		18700 to 19100	18700	20MHz	QPSK	1 RB / 24 RB Offset
			19100	20MHz	QPSK	25 RB / 0 RB Offset
B	CONDCUDED 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	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

TEST CONDITION:

TEST ITEM	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
EIRP	25deg. C, 58%RH	3.8Vdc from Battery	Evans He
FREQUENCY STABILITY	25deg. C, 58%RH	DC 3.3V/3.8V/4.3V	Aaron Liang
OCCUPIED BANDWIDTH	25deg. C, 58%RH	3.8Vdc from Battery	Aaron Liang
PEAK TO AVERAGE RATIO	25deg. C, 58%RH	3.8Vdc from Battery	Aaron Liang
BAND EDGE	25deg. C, 58%RH	3.8Vdc from Battery	Aaron Liang
CONDCUDED EMISSION	25deg. C, 58%RH	3.8Vdc from Battery	Evans He
RADIATED EMISSION	25deg. C, 61%RH	5Vdc from adapter	Evans He



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 v03

ANSI/TIA/EIA-603-D

ANSI/TIA/EIA-603-E

ANSI C63.26-2015

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



3 TEST TYPES AND RESULTS

3.1 OUTPUT POWER MEASUREMENT

3.1.1 LIMITS OF OUTPUT POWER MEASUREMENT

Mobile and portable stations are limited to 2 watts EIRP.

3.1.2 TEST PROCEDURES

EIRP MEASUREMENT:

- a. All measurements were done at low, middle and high operational frequency range. RBW and VBW is 1MHz for GSM & GPRS, 5MHz for WCDMA mode and 10MHz for LTE mode.
- b. 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.
- c. The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a tx cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to "Read Value" of step b. Record the power level of S.G
- d. $EIRP = \text{Output power level of S.G} - \text{TX cable loss} + \text{Antenna gain of substitution horn}.$

CONDUCTED POWER MEASUREMENT:

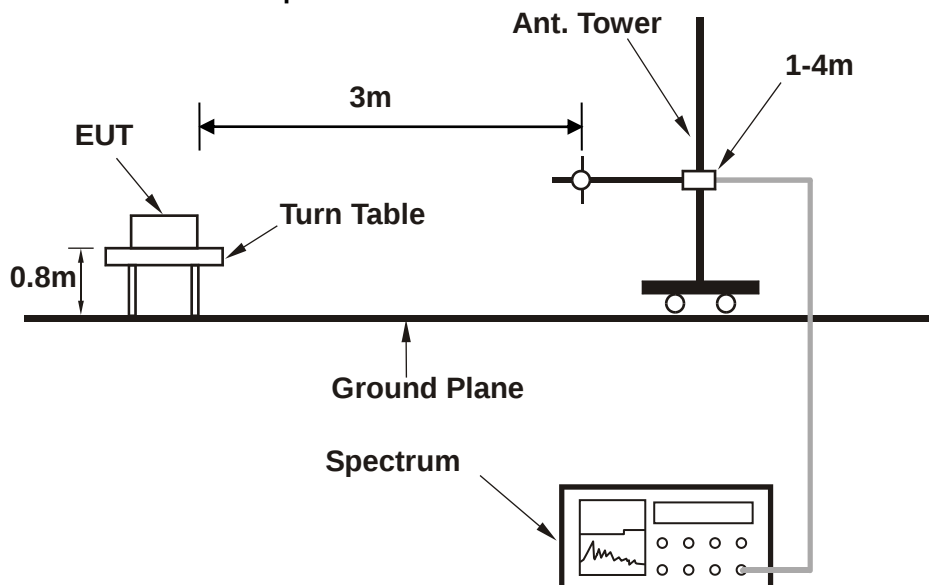
The EUT was set up for the maximum power with GSM, GPRS, EDGE & WCDMA link data modulation and link up with simulator. Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator.



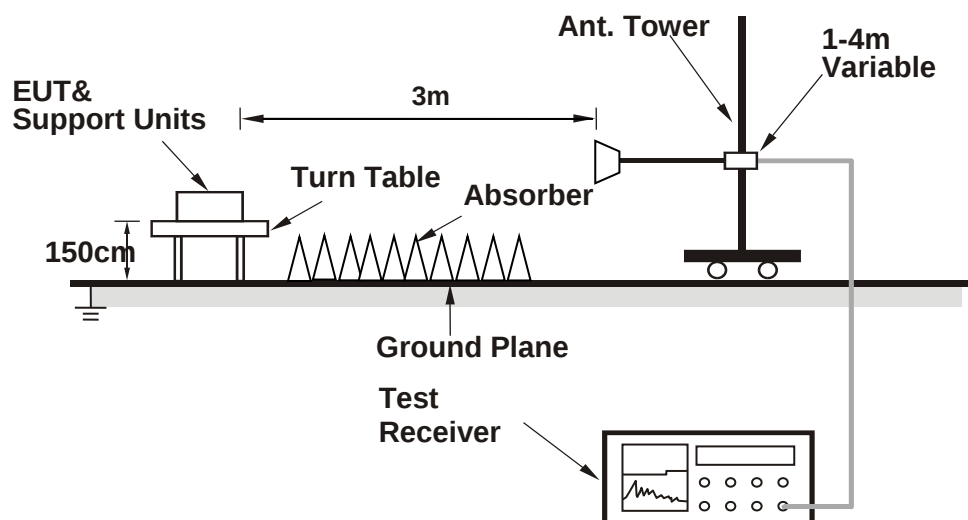
3.1.3 TEST SETUP

EIRP / ERP Measurement:

<Radiated Emission below or equal 1 GHz>

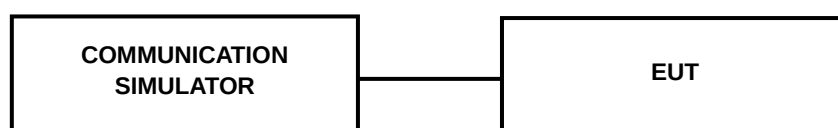


<Radiated Emission above 1 GHz>



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

CONDUCTED POWER MEASUREMENT:





3.1.4 TEST RESULTS

CONDUCTED OUTPUT POWER (dBm)

Band	GSM1900		
Channel	512	661	810
Frequency (MHz)	1850.2	1880.0	1909.8
GPRS 8	29.53	29.56	29.55
GPRS 10	28.78	28.81	28.80
GPRS 11	27.08	27.11	27.10
GPRS 12	26.00	26.03	26.02
EDGE 8 (MCS9)	25.83	25.86	25.85
EDGE 10 (MCS9)	24.91	24.94	24.93
EDGE 11 (MCS9)	23.01	23.04	23.03
EDGE 12 (MCS9)	21.88	21.91	21.90

Band	WCDMA II		
Channel	9262	9400	9538
Frequency (MHz)	1852.4	1880.0	1907.6
RMC 12.2K	21.09	21.23	21.06
HSPA			
HSDPA Subtest-1	21.03	21.17	21.00
HSDPA Subtest-2	21.01	21.15	20.98
HSDPA Subtest-3	20.89	21.03	20.86
HSDPA Subtest-4	20.27	20.41	20.24
HSUPA Subtest-1	20.57	20.71	20.54
HSUPA Subtest-2	20.35	20.49	20.32
HSUPA Subtest-3	21.02	21.16	20.99
HSUPA Subtest-4	20.34	20.48	20.31
HSUPA Subtest-5	20.82	20.96	20.79



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	
1.4MHz	QPSK	1	0	21.51	21.52	21.40	0
		1	2	21.34	21.35	21.23	0
		1	5	20.74	20.75	20.63	0
		3	0	20.43	20.44	20.32	0
		3	1	20.39	20.40	20.28	0
		3	3	20.32	20.33	20.21	0
		6	0	20.36	20.37	20.25	1
	16QAM	1	0	20.40	20.41	20.29	1
		1	2	20.51	20.52	20.40	1
		1	5	19.99	20.00	19.88	1
		3	0	19.43	19.44	19.32	1
		3	1	19.41	19.42	19.30	1
		3	3	19.32	19.33	19.21	1
		6	0	19.35	19.36	19.24	2
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	
3 MHz	QPSK	1	0	21.54	21.55	21.43	0
		1	7	21.37	21.38	21.26	0
		1	14	20.77	20.78	20.66	0
		8	0	20.44	20.45	20.33	1
		8	3	20.40	20.41	20.29	1
		8	7	20.33	20.34	20.22	1
		15	0	20.37	20.38	20.26	1
	16QAM	1	0	20.43	20.44	20.32	1
		1	7	20.54	20.55	20.43	1
		1	14	20.02	20.03	19.91	1
		8	0	19.45	19.46	19.34	2
		8	3	19.43	19.44	19.32	2
		8	7	19.34	19.35	19.23	2
		15	0	19.37	19.38	19.26	2



LTE Band 2							
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	
5 MHz	QPSK	1	0	21.57	21.58	21.46	0
		1	12	21.40	21.41	21.29	0
		1	24	20.80	20.81	20.69	0
		12	0	20.47	20.48	20.36	1
		12	6	20.43	20.44	20.32	1
		12	13	20.36	20.37	20.25	1
		25	0	20.40	20.41	20.29	1
	16QAM	1	0	20.46	20.47	20.35	1
		1	12	20.57	20.58	20.46	1
		1	24	20.05	20.06	19.94	1
		12	0	19.48	19.49	19.37	2
		12	6	19.46	19.47	19.35	2
		12	13	19.37	19.38	19.26	2
		25	0	19.40	19.41	19.29	2
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	
10 MHz	QPSK	1	0	21.59	21.60	21.48	0
		1	24	21.42	21.43	21.31	0
		1	49	20.82	20.83	20.71	0
		25	0	20.49	20.50	20.38	1
		25	12	20.45	20.46	20.34	1
		25	25	20.38	20.39	20.27	1
		50	0	20.42	20.43	20.31	1
	16QAM	1	0	20.48	20.49	20.37	1
		1	24	20.59	20.60	20.48	1
		1	49	20.07	20.08	19.96	1
		25	0	19.50	19.51	19.39	2
		25	12	19.48	19.49	19.37	2
		25	25	19.39	19.40	19.28	2
		50	0	19.42	19.43	19.31	2



LTE Band 2							
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	
15 MHz	QPSK	1	0	21.45	21.46	21.34	0
		1	37	20.85	20.86	20.74	0
		1	74	20.52	20.53	20.41	0
		36	0	20.48	20.49	20.37	1
		36	19	20.41	20.42	20.30	1
		36	39	20.45	20.46	20.34	1
		75	0	20.51	20.52	20.40	1
	16QAM	1	0	20.62	20.63	20.51	1
		1	37	20.10	20.11	19.99	1
		1	74	19.53	19.54	19.42	1
		36	0	19.51	19.52	19.40	2
		36	19	19.42	19.43	19.31	2
		36	39	19.45	19.46	19.34	2
		75	0	21.45	21.46	21.34	2
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	
20MHz	QPSK	1	0	21.67	21.68	21.56	0
		1	50	21.50	21.51	21.39	0
		1	99	20.90	20.91	20.79	0
		50	0	20.57	20.58	20.46	1
		50	25	20.53	20.54	20.42	1
		50	50	20.46	20.47	20.35	1
		100	0	20.50	20.51	20.39	1
	16QAM	1	0	20.56	20.57	20.45	1
		1	50	20.67	20.68	20.56	1
		1	99	20.15	20.16	20.04	1
		50	0	19.58	19.59	19.47	2
		50	25	19.56	19.57	19.45	2
		50	50	19.47	19.48	19.36	2
		100	0	19.50	19.51	19.39	2



EIRP POWER (dBm)

GSM

Channel	Frequency (MHz)	SPA LVL (dBm)	Correction Factor(dB)	EIRP(dBm)	EIRP(mW)	Polarization (H/V)
512	1850.2	-17.87	44.22	26.35	431.52	H
661	1880	-17.87	44.92	27.05	506.99	H
810	1909.8	-16.59	43.98	27.39	548.28	H
512	1850.2	-15.86	44.73	28.87	770.9	V
661	1880	-18.39	45.69	27.3	537.03	V
810	1909.8	-17.27	44.86	27.59	574.12	V

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

EDGE

Channel	Frequency (MHz)	SPA LVL (dBm)	Correction Factor(dB)	EIRP(dBm)	EIRP(mW)	Polarization (H/V)
512	1850.2	-22.53	44.22	21.69	147.57	H
661	1880	-24.69	44.92	20.23	105.44	H
810	1909.8	-22.07	43.98	21.91	155.24	H
512	1850.2	-22	44.73	22.73	187.5	V
661	1880	-23.5	45.69	22.19	165.58	V
810	1909.8	-23.07	44.86	21.79	151.01	V

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

WCDMA

Channel	Frequency (MHz)	SPA LVL (dBm)	Correction Factor(dB)	EIRP(dBm)	EIRP(mW)	Polarization (H/V)
9262	1852.4	-23.95	45.39	21.44	139.32	H
9400	1880	-22.77	44.13	21.36	136.77	H
9538	1907.6	-25.59	45.62	20.03	100.69	H
9262	1852.4	-22.88	46.12	23.24	210.86	V
9400	1880	-22.31	45.61	23.3	213.8	V
9538	1907.6	-22.57	45.71	23.14	206.06	V

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



LTE BAND 2

CHANNEL BANDWIDTH: 1.4MHz QPSK

Channel	Frequency (MHz)	SPA LVL (dBm)	Correction Factor(dB)	EIRP(dBm)	EIRP(mW)	Polarization (H/V)	LIMIT (W)
18607	1850.7	-19.23	40.6	21.37	137.09	H	2
18900	1880	-19.52	40.64	21.12	129.42	H	2
19193	1909.3	-19.45	40.66	21.21	132.13	H	2
18607	1850.7	-19.53	41.98	22.45	175.79	V	2
18900	1880	-18.34	40.64	22.3	169.82	V	2
19193	1909.3	-19.22	41.53	22.31	170.22	V	2

CHANNEL BANDWIDTH: 1.4MHz 16QAM

Channel	Frequency (MHz)	SPA LVL (dBm)	Correction Factor(dB)	EIRP(dBm)	EIRP(mW)	Polarization (H/V)	LIMIT (W)
18607	1850.7	-19.53	40.2	20.67	116.68	H	2
18900	1880	-19.47	40.64	21.17	130.92	H	2
19193	1909.3	-19.04	40.96	21.92	155.6	H	2
18607	1850.7	-20.94	41.87	20.93	123.88	V	2
18900	1880	-18.3	40.64	22.34	171.4	V	2
19193	1909.3	-19.24	41.28	22.04	159.96	V	2

CHANNEL BANDWIDTH: 3MHz QPSK

Channel	Frequency (MHz)	SPA LVL (dBm)	Correction Factor(dB)	EIRP(dBm)	EIRP(mW)	Polarization (H/V)	LIMIT (W)
18615	1851.5	-20.13	41.2	21.07	127.94	H	2
18900	1880	-18.83	40.64	21.81	151.71	H	2
19185	1908.5	-19.45	40.21	20.76	119.12	H	2
18615	1851.5	-19.98	41.62	21.64	145.88	V	2
18900	1880	-18.72	40.64	21.92	155.6	V	2
19185	1908.5	-18.94	40.84	21.9	154.88	V	2



CHANNEL BANDWIDTH: 3MHz 16QAM

Channel	Frequency (MHz)	SPA LVL (dBm)	Correction Factor(dB)	EIRP(dBm)	EIRP(mW)	Polarization (H/V)	LIMIT (W)
18615	1851.5	-21.02	41.09	20.07	101.62	H	2
18900	1880	-18.65	40.64	21.99	158.12	H	2
19185	1908.5	-17.48	39.88	22.4	173.78	H	2
18615	1851.5	-18.91	41.3	22.39	173.38	V	2
18900	1880	-19.07	40.64	21.57	143.55	V	2
19185	1908.5	-19.35	40.39	21.04	127.06	V	2

CHANNEL BANDWIDTH: 5MHz QPSK

Channel	Frequency (MHz)	SPA LVL (dBm)	Correction Factor(dB)	EIRP(dBm)	EIRP(mW)	Polarization (H/V)	LIMIT (W)
18625	1852.5	-21.21	42.21	21	125.89	H	2
18900	1880	-18.33	40.64	22.31	170.22	H	2
19175	1907.5	-21.2	41.75	20.55	113.5	H	2
18625	1852.5	-19.5	41.57	22.07	161.06	V	2
18900	1880	-19.47	40.64	21.17	130.92	V	2
19175	1907.5	-21.26	42.11	20.85	121.62	V	2

CHANNEL BANDWIDTH: 5MHz 16QAM

Channel	Frequency (MHz)	SPA LVL (dBm)	Correction Factor(dB)	EIRP(dBm)	EIRP(mW)	Polarization (H/V)	LIMIT (W)
18625	1852.5	-19.95	42.15	22.2	165.96	H	2
18900	1880	-19.77	40.64	20.87	122.18	H	2
19175	1907.5	-21.8	42.07	20.27	106.41	H	2
18625	1852.5	-20.42	42.07	21.65	146.22	V	2
18900	1880	-19.55	40.64	21.09	128.53	V	2
19175	1907.5	-20.46	41.78	21.32	135.52	V	2



CHANNEL BANDWIDTH: 10MHz QPSK

Channel	Frequency (MHz)	SPA LVL (dBm)	Correction Factor(dB)	EIRP(dBm)	EIRP(mW)	Polarization (H/V)	LIMIT (W)
18650	1855	-18.75	40.64	21.89	154.53	H	2
18900	1880	-20.32	40.64	20.32	107.65	H	2
19150	1905	-19.81	40.18	20.37	108.89	H	2
18650	1855	-20.11	41.49	21.38	137.4	V	2
18900	1880	-19.27	40.64	21.37	137.09	V	2
19150	1905	-19.83	41.37	21.54	142.56	V	2

CHANNEL BANDWIDTH: 10MHz 16QAM

Channel	Frequency (MHz)	SPA LVL (dBm)	Correction Factor(dB)	EIRP(dBm)	EIRP(mW)	Polarization (H/V)	LIMIT (W)
18650	1855	-18.71	40.63	21.92	155.6	H	2
18900	1880	-19.78	40.64	20.86	121.9	H	2
19150	1905	-18.36	39.9	21.54	142.56	H	2
18650	1855	-20.71	41.57	20.86	121.9	V	2
18900	1880	-18.82	40.64	21.82	152.05	V	2
19150	1905	-19.71	41.17	21.46	139.96	V	2

CHANNEL BANDWIDTH: 15MHz QPSK

Channel	Frequency (MHz)	SPA LVL (dBm)	Correction Factor(dB)	EIRP(dBm)	EIRP(mW)	Polarization (H/V)	LIMIT (W)
18675	1857.5	-20.32	40.79	20.47	111.43	H	2
18900	1880	-18.59	40.64	22.05	160.32	H	2
19125	1902.5	-18.91	41.4	22.49	177.42	H	2
18675	1857.5	-19.07	41.66	22.59	181.55	V	2
18900	1880	-19.66	40.64	20.98	125.31	V	2
19125	1902.5	-19.43	41.51	22.08	161.44	V	2



CHANNEL BANDWIDTH: 15MHz 16QAM

Channel	Frequency (MHz)	SPA LVL (dBm)	Correction Factor(dB)	EIRP(dBm)	EIRP(mW)	Polarization (H/V)	LIMIT (W)
18675	1857.5	-18.81	40.86	22.05	160.32	H	2
18900	1880	-18.75	40.64	21.89	154.53	H	2
19125	1902.5	-20.7	41.57	20.87	122.18	H	2
18675	1857.5	-19.04	41.21	22.17	164.82	V	2
18900	1880	-18.14	40.64	22.5	177.83	V	2
19125	1902.5	-20.32	41.72	21.4	138.04	V	2

CHANNEL BANDWIDTH: 20MHz QPSK

Channel	Frequency (MHz)	SPA LVL (dBm)	Correction Factor(dB)	EIRP(dBm)	EIRP(mW)	Polarization (H/V)	LIMIT (W)
18700	1860	-18.54	40.64	22.1	162.18	H	2
18900	1880	-18.91	40.64	21.73	148.94	H	2
19100	1900	-21.14	41.82	20.68	116.95	H	2
18700	1860	-20.01	42.09	22.08	161.44	V	2
18900	1880	-18.24	40.64	22.4	173.78	V	2
19100	1900	-18.82	41.25	22.43	174.98	V	2

CHANNEL BANDWIDTH: 20MHz 16QAM

Channel	Frequency (MHz)	SPA LVL (dBm)	Correction Factor(dB)	EIRP(dBm)	EIRP(mW)	Polarization (H/V)	LIMIT (W)
18700	1860	-18.56	40.7	22.14	163.68	H	2
18900	1880	-19.06	40.64	21.58	143.88	H	2
19100	1900	-20.21	41.4	21.19	131.52	H	2
18700	1860	-19.58	41.7	22.12	162.93	V	2
18900	1880	-19.56	40.64	21.08	128.23	V	2
19100	1900	-18.28	41.13	22.85	192.75	V	2

REMARKS: 1. EIRP Output Power (dBm) = SPA LVL (dBm) + Correction Factor (dB).

2. Correction factor (dB) = Free Space Loss + Antenna Factor + Cable Loss



3.2 FREQUENCY STABILITY MEASUREMENT

3.2.1 LIMITS OF FREQUENCY STABILITY MEASUREMENT

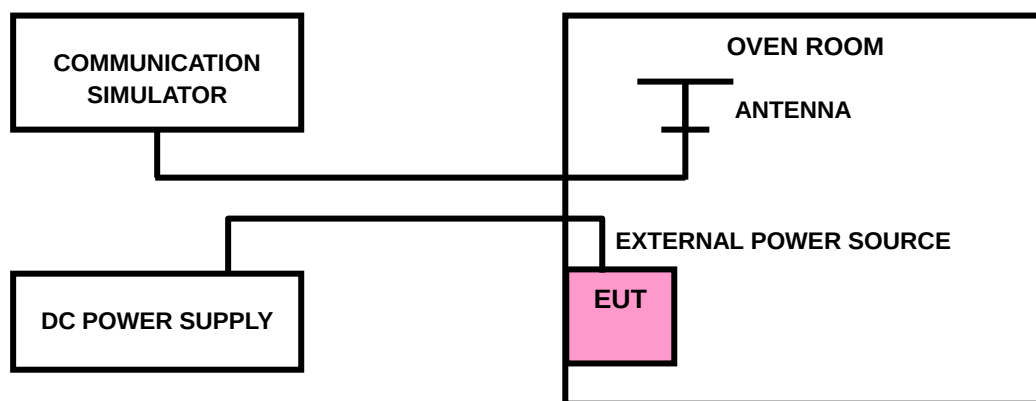
The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

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	
3.8	-0.0029	-0.0048	2.5
3.3(BEP)	-0.0024	-0.0044	2.5
4.3	0.0062	0.0019	2.5

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

FREQUENCY ERROR vs. TEMPERATURE.

TEMP. (°C)	FREQUENCY ERROR (ppm)		LIMIT (ppm)
	Low Channel	High Channel	
-30	0.0010	0.0042	2.5
-20	0.0029	0.0038	2.5
-10	0.0022	-0.0004	2.5
0	0.0023	0.0054	2.5
10	0.0015	-0.0002	2.5
20	0.0065	0.0038	2.5
30	0.0043	-0.0024	2.5
40	-0.0047	0.0026	2.5
50	0.0060	-0.0009	2.5
60	0.0078	0.0051	2.5

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

VOLTAGE (Volts)	FREQUENCY ERROR (ppm)		LIMIT (ppm)
	Low Channel	High Channel	
3.8	0.0023	0.0043	2.5
3.3(BEP)	-0.0046	0.0036	2.5
4.3	0.0048	-0.0045	2.5

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

FREQUENCY ERROR vs. TEMPERATURE.

TEMP. (°C)	FREQUENCY ERROR (ppm)		LIMIT (ppm)
	Low Channel	High Channel	
-30	-0.0017	-0.0031	2.5
-20	-0.0029	0.0055	2.5
-10	0.0020	-0.0021	2.5
0	-0.0020	0.0027	2.5
10	0.0049	-0.0053	2.5
20	0.0067	-0.0023	2.5
30	0.0047	0.0037	2.5
40	0.0051	-0.0040	2.5
50	0.0025	-0.0022	2.5
60	0.0089	0.0015	2.5



WCDMA

FREQUENCY ERROR VS. VOLTAGE

VOLTAGE (Volts)	FREQUENCY ERROR (ppm)		LIMIT (ppm)
	Low Channel	High Channel	
3.8	-0.0048	-0.0041	2.5
3.3(BEP)	-0.0049	0.0022	2.5
4.3	0.0063	-0.0047	2.5

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

FREQUENCY ERROR vs. TEMPERATURE.

TEMP. (°C)	FREQUENCY ERROR (ppm)		LIMIT (ppm)
	Low Channel	High Channel	
-30	-0.0052	0.0005	2.5
-20	-0.0022	0.0025	2.5
-10	0.0065	0.0022	2.5
0	-0.0012	-0.0036	2.5
10	-0.0045	0.0054	2.5
20	0.0085	-0.0022	2.5
30	0.0040	0.0043	2.5
40	0.0038	0.0052	2.5
50	0.0027	0.0047	2.5



LTE BAND 2

FREQUENCY ERROR VS. VOLTAGE

VOLTAGE (Volts)	1.4MHz		LIMIT (ppm)
	FREQUENCY ERROR (ppm)		
	Low Channel	High Channel	
3.8	-0.0053	-0.0045	2.5
3.3(BEP)	0.0044	0.0005	2.5
4.3	0.0052	-0.0033	2.5

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

FREQUENCY ERROR vs. TEMPERATURE.

TEMP. (°C)	1.4MHz		LIMIT (ppm)
	FREQUENCY ERROR (ppm)		
	Low Channel	High Channel	
-30	0.0000	-0.0004	2.5
-20	0.0021	0.0014	2.5
-10	0.0012	-0.0042	2.5
0	-0.0035	-0.0024	2.5
10	0.0031	-0.0038	2.5
20	0.0068	0.0016	2.5
30	0.0021	0.0014	2.5
40	-0.0007	-0.0023	2.5
50	0.0081	-0.0042	2.5

**FREQUENCY ERROR VS. VOLTAGE**

VOLTAGE (Volts)	3MHz		LIMIT (ppm)
	FREQUENCY ERROR (ppm)		
	Low Channel	High Channel	
3.8	0.0032	0.0027	2.5
3.3(BEP)	-0.0037	-0.0037	2.5
4.3	0.0074	-0.0015	2.5

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

FREQUENCY ERROR vs. TEMPERATURE.

TEMP. (°C)	3MHz		LIMIT (ppm)
	FREQUENCY ERROR (ppm)		
	Low Channel	High Channel	
-30	-0.0045	-0.0014	2.5
-20	-0.0018	-0.0012	2.5
-10	0.0081	0.0045	2.5
0	0.0041	0.0029	2.5
10	-0.0027	-0.0055	2.5
20	0.0085	-0.0026	2.5
30	-0.0017	-0.0026	2.5
40	0.0035	-0.0023	2.5
50	0.0012	-0.0038	2.5



FREQUENCY ERROR VS. VOLTAGE

VOLTAGE (Volts)	5MHz		LIMIT (ppm)
	FREQUENCY ERROR (ppm)		
	Low Channel	High Channel	
3.8	0.0009	0.0050	2.5
3.3(BEP)	-0.0039	0.0037	2.5
4.3	0.0081	0.0036	2.5

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

FREQUENCY ERROR vs. TEMPERATURE.

TEMP. (°C)	5MHz		LIMIT (ppm)
	FREQUENCY ERROR (ppm)		
	Low Channel	High Channel	
-30	0.0041	-0.0013	2.5
-20	-0.0047	0.0049	2.5
-10	0.0043	-0.0023	2.5
0	-0.0038	0.0013	2.5
10	-0.0018	0.0025	2.5
20	0.0063	0.0048	2.5
30	0.0031	0.0029	2.5
40	0.0003	0.0048	2.5
50	0.0047	0.0055	2.5

**FREQUENCY ERROR VS. VOLTAGE**

VOLTAGE (Volts)	10MHz		LIMIT (ppm)
	FREQUENCY ERROR (ppm)		
	Low Channel	High Channel	
3.8	0.0009	-0.0023	2.5
3.3(BEP)	0.0021	0.0005	2.5
4.3	0.0092	-0.0031	2.5

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

FREQUENCY ERROR vs. TEMPERATURE.

TEMP. (°C)	10MHz		LIMIT (ppm)
	FREQUENCY ERROR (ppm)		
	Low Channel	High Channel	
-30	0.0051	0.0005	2.5
-20	-0.0044	0.0008	2.5
-10	0.0068	0.0053	2.5
0	0.0006	0.0006	2.5
10	0.0027	-0.0033	2.5
20	0.0076	0.0046	2.5
30	-0.0037	-0.0041	2.5
40	-0.0026	-0.0038	2.5
50	0.0062	-0.0024	2.5



FREQUENCY ERROR VS. VOLTAGE

VOLTAGE (Volts)	15MHz		LIMIT (ppm)
	FREQUENCY ERROR (ppm)		
	Low Channel	High Channel	
3.8	-0.0015	-0.0005	2.5
3.3(BEP)	-0.0022	-0.0020	2.5
4.3	0.0032	-0.0035	2.5

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

FREQUENCY ERROR vs. TEMPERATURE.

TEMP. (°C)	15MHz		LIMIT (ppm)
	FREQUENCY ERROR (ppm)		
	Low Channel	High Channel	
-30	0.0004	-0.0034	2.5
-20	0.0011	0.0036	2.5
-10	0.0046	0.0026	2.5
0	0.0018	0.0007	2.5
10	0.0013	0.0043	2.5
20	0.0037	-0.0005	2.5
30	0.0033	0.0015	2.5
40	-0.0010	-0.0025	2.5
50	0.0019	-0.0026	2.5



FREQUENCY ERROR VS. VOLTAGE

VOLTAGE (Volts)	20MHz		LIMIT (ppm)
	FREQUENCY ERROR (ppm)		
	Low Channel	High Channel	
3.8	-0.0036	0.0012	2.5
3.3(BEP)	-0.0032	-0.0053	2.5
4.3	0.0083	-0.0045	2.5

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

FREQUENCY ERROR vs. TEMPERATURE.

TEMP. (°C)	20MHz		LIMIT (ppm)
	FREQUENCY ERROR (ppm)		
	Low Channel	High Channel	
-30	-0.0054	0.0022	2.5
-20	0.0037	0.0045	2.5
-10	0.0077	-0.0039	2.5
0	-0.0022	-0.0038	2.5
10	0.0006	-0.0017	2.5
20	0.0061	-0.0040	2.5
30	-0.0007	0.0027	2.5
40	-0.0045	-0.0025	2.5
50	0.0051	-0.0016	2.5

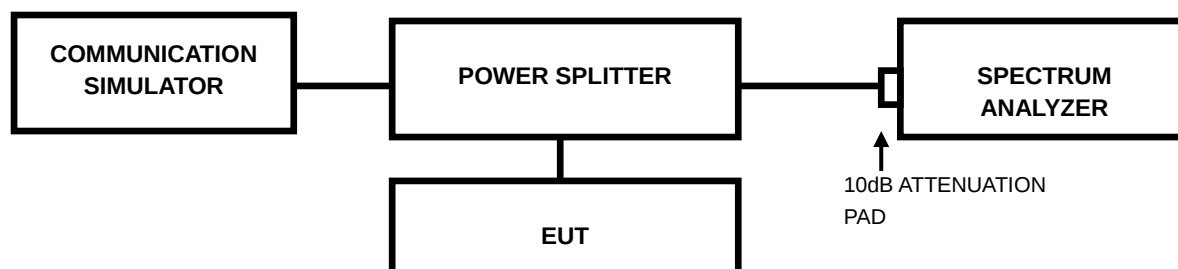


3.3 OCCUPIED BANDWIDTH MEASUREMENT

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.

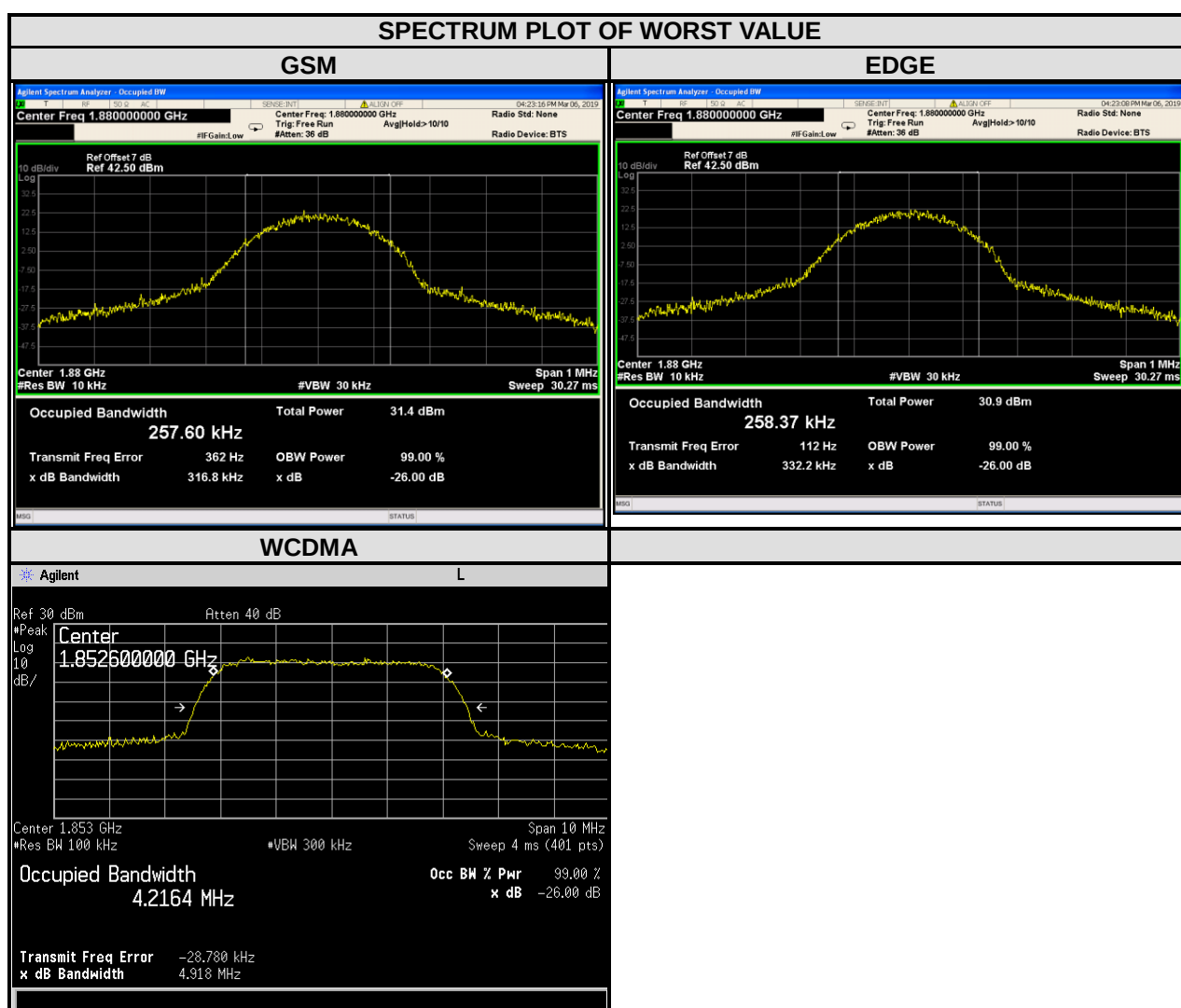
3.3.2 TEST SETUP





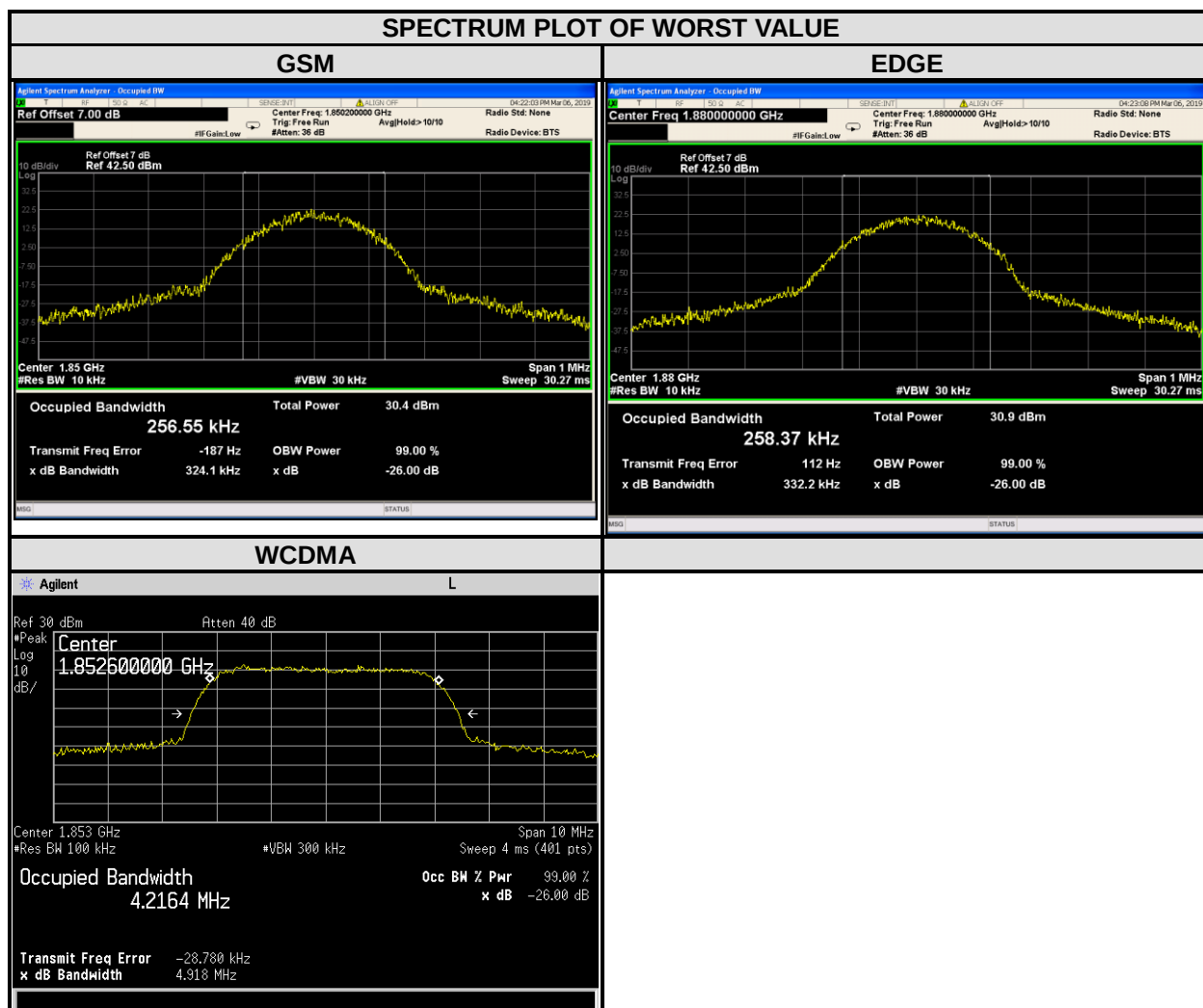
3.3.3 TEST RESULTS

Channel	Frequency (MHz)	99% Occupied bandwidth (kHz)		Channel	Frequency (MHz)	99% Occupied bandwidth (MHz)
		GSM	EDGE			WCDMA
512	1850	256.55	242.58	9262	1853	4.2164
661	1880	257.60	258.37	9400	1880.0	4.2125
810	1910	253.14	251.15	9538	1907	4.2023



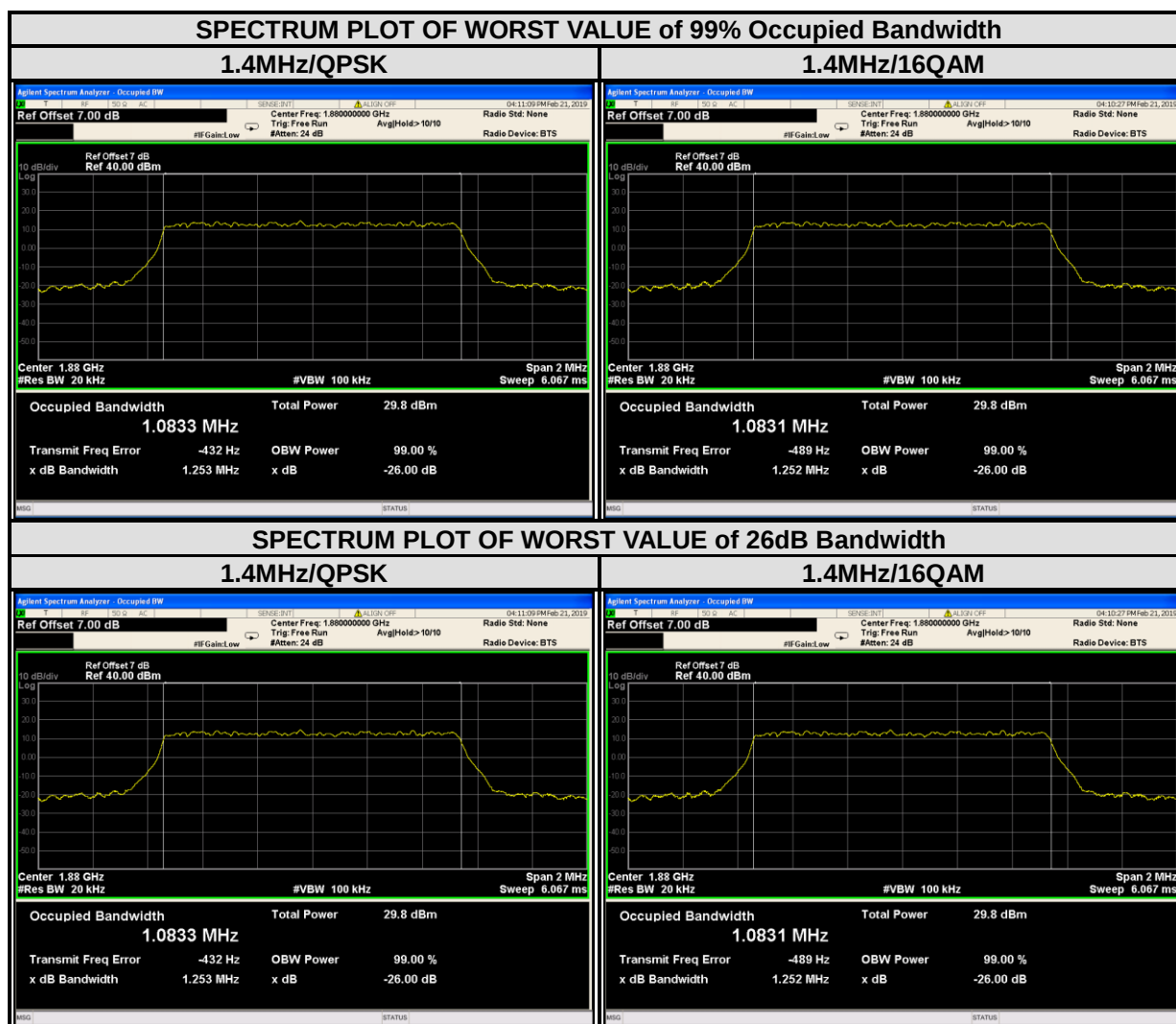


Channel	Frequency (MHz)	26dB bandwidth (kHz)		CHANNEL	FREQUENCY (MHz)	26dB bandwidth (MHz)
		GSM	EDGE			WCDMA
512	1850	324.1	291.6	9262	1853	4.918
661	1880	316.8	332.2	9400	1880	4.916
810	1910	313.1	309.1	9538	1907	4.882





LTE band 2							
Channel Bandwidth : 1.4MHz							
Channel	Frequency (MHz)	99% Occupied bandwidth (MHz)		Channel	Frequency (MHz)	26dB bandwidth (MHz)	
		QPSK	16QAM			QPSK	16QAM
18607	1850.7	1.0757	1.0726	18607	1850.7	1.211	1.233
18900	1880	1.0833	1.0831	18900	1880	1.253	1.252
19193	1909.3	1.0824	1.0824	19193	1909.3	1.242	1.214

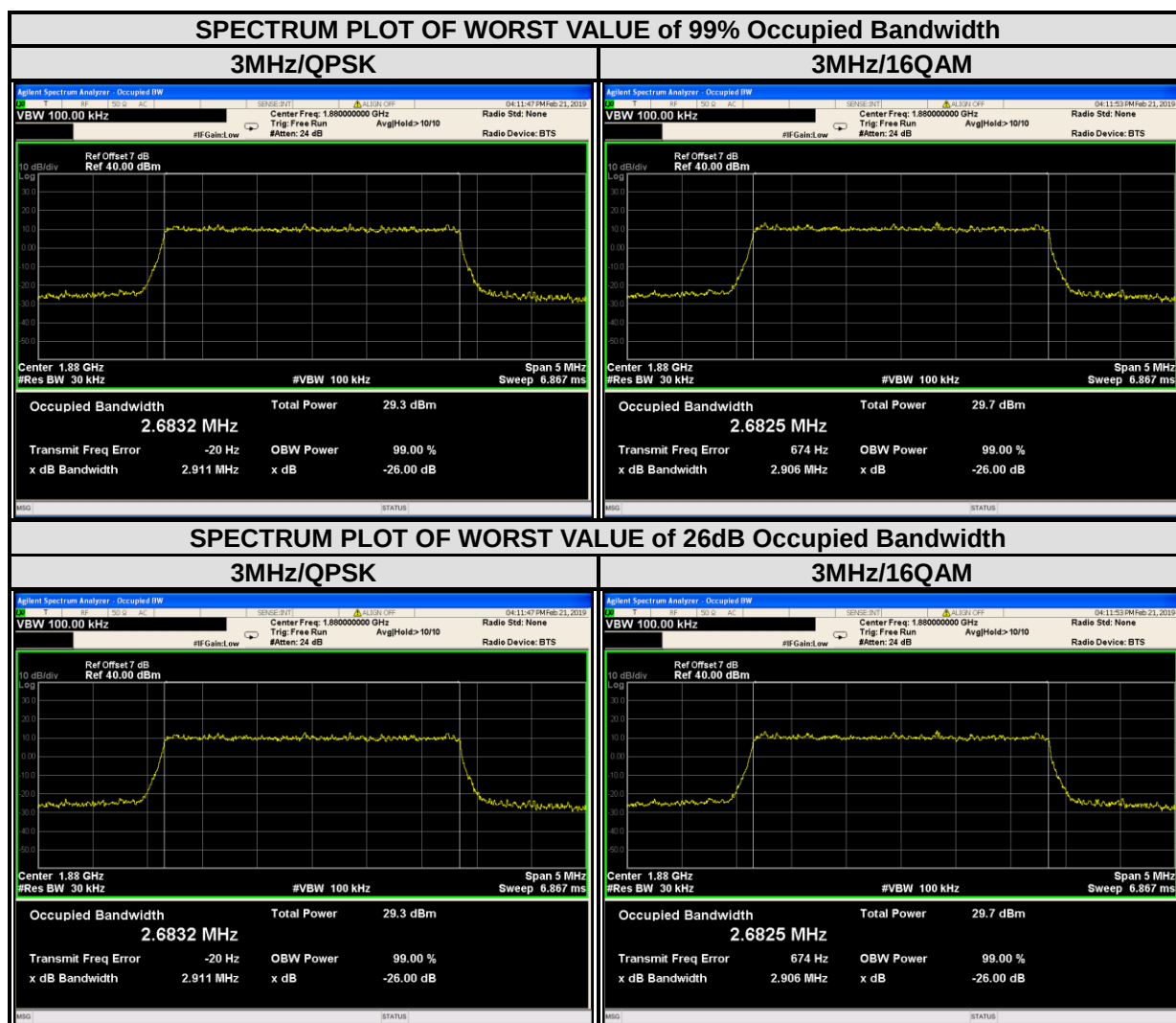




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Test Report No.: RF181102N040-8_R1

LTE band 2							
Channel Bandwidth : 3MHz							
Channel	Frequency (MHz)	99% Occupied bandwidth (MHz)		Channel	Frequency (MHz)	26dB bandwidth (MHz)	
		QPSK	16QAM			QPSK	16QAM
18615	1851.5	2.6875	2.6821	18615	1851.5	2.867	2.887
18900	1880	2.6832	2.6825	18900	1880	2.911	2.906
19185	1908.5	2.6785	2.6810	19185	1908.5	2.884	2.865

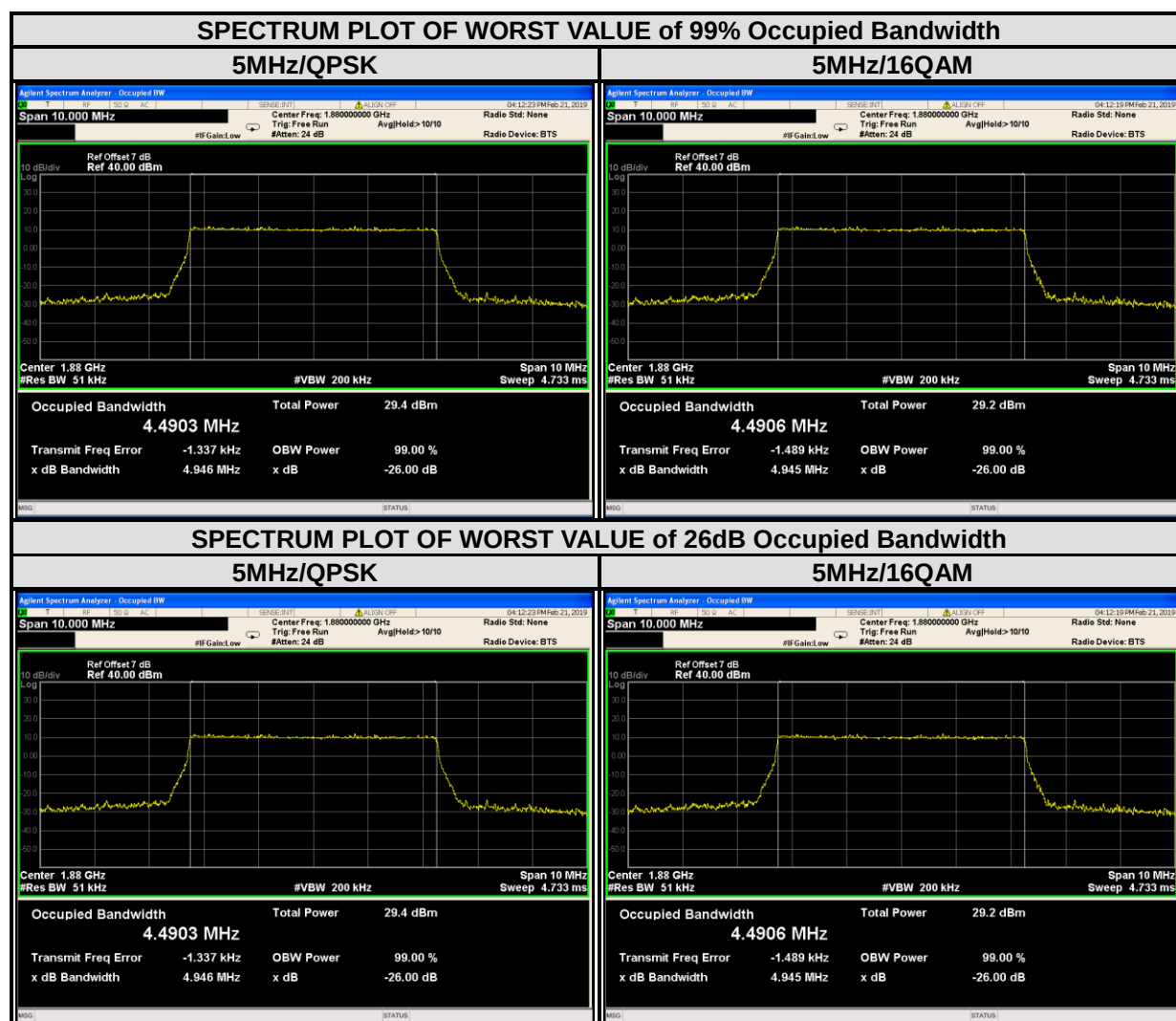




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Test Report No.: RF181102N040-8_R1

LTE band 2							
Channel Bandwidth : 5 MHz							
Channel	Frequency (MHz)	99% Occupied bandwidth (MHz)		Channel	Frequency (MHz)	26dB bandwidth (MHz)	
		QPSK	16QAM			QPSK	16QAM
18625	1852.5	4.4637	4.4644	18625	1852.5	4.812	4.877
18900	1880	4.4903	4.4906	18900	1880	4.946	4.945
19175	1907.5	4.4854	4.4758	19175	1907.5	4.835	4.833

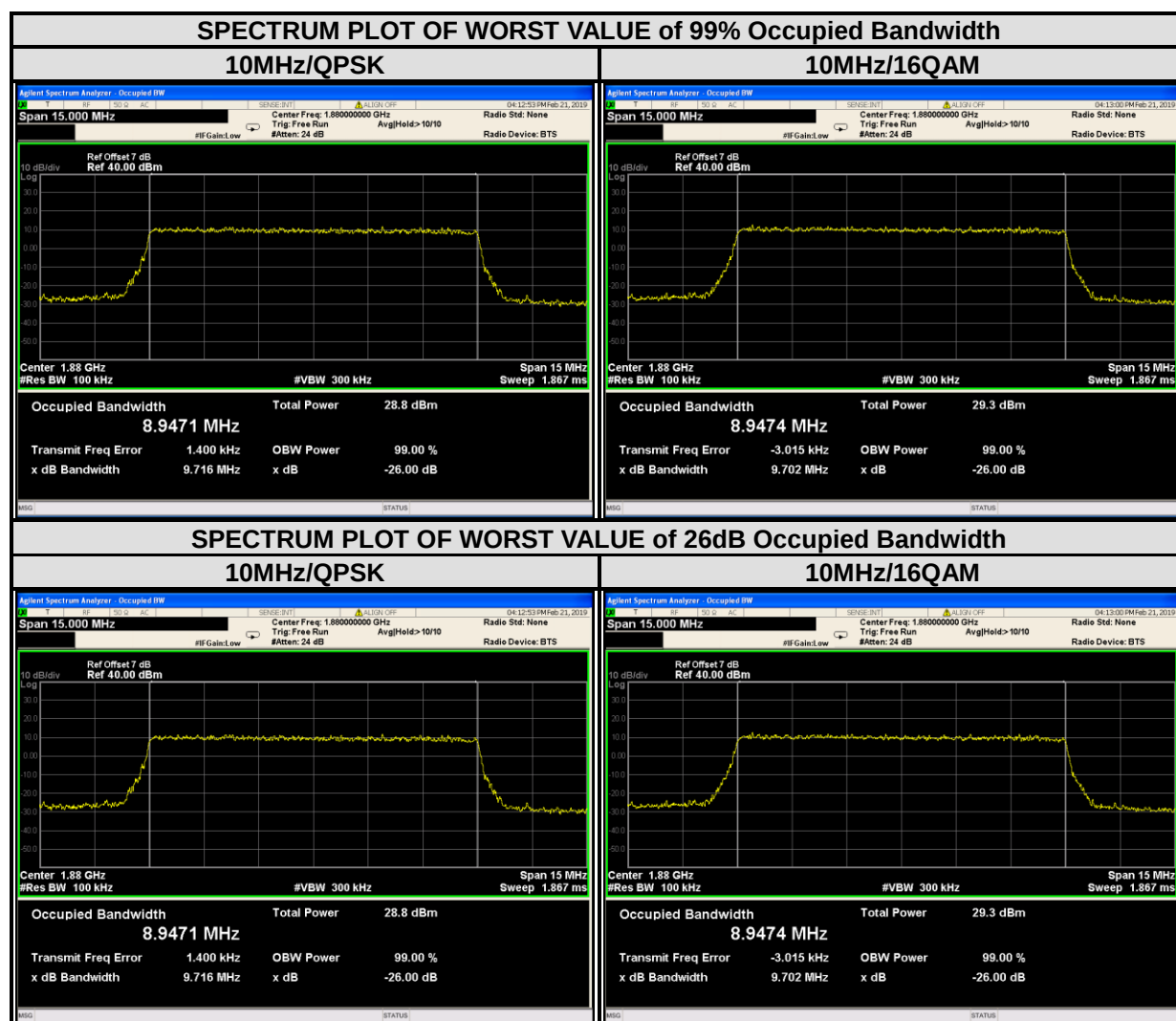




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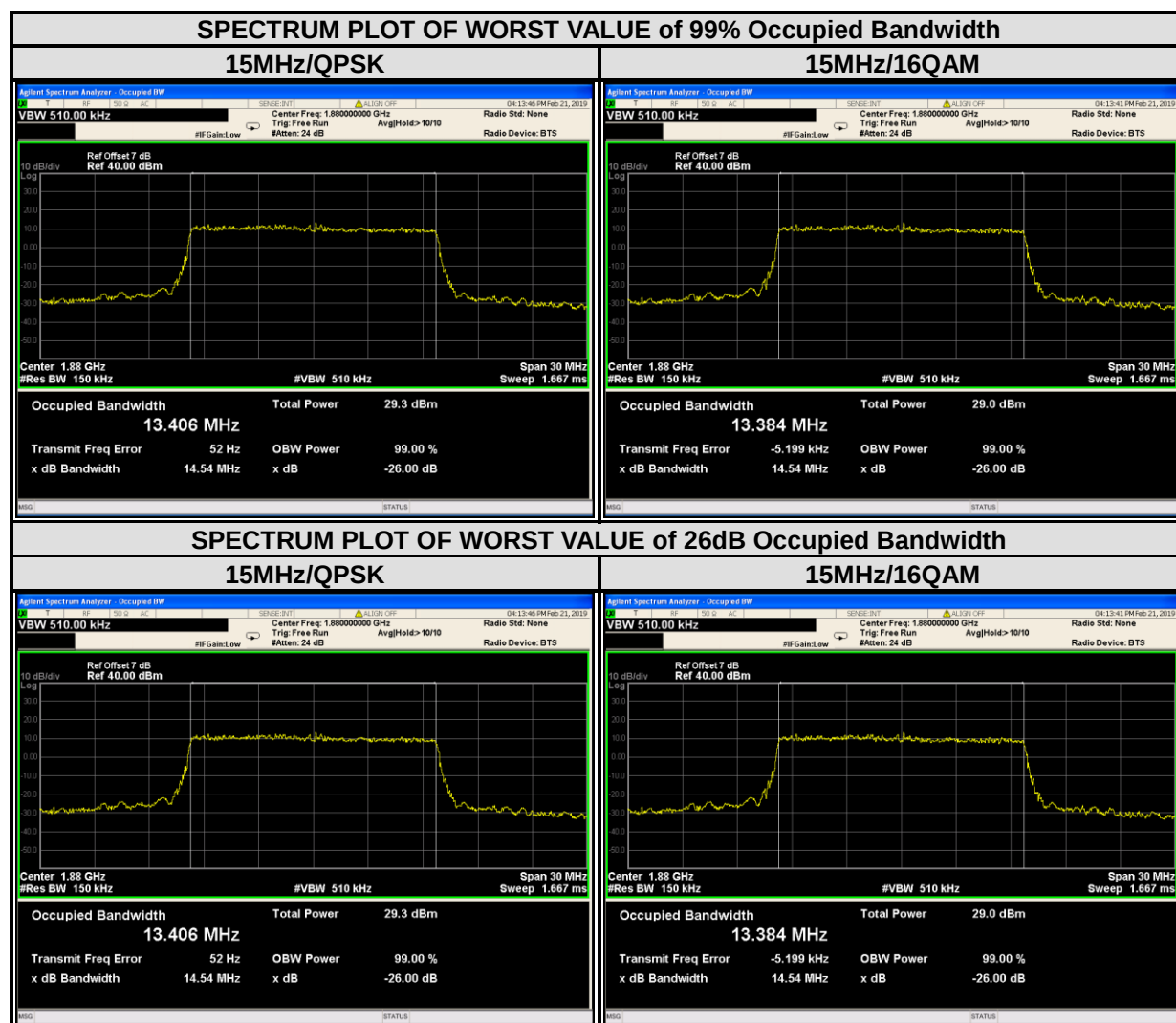
Test Report No.: RF181102N040-8_R1

LTE band 2							
Channel Bandwidth : 10 MHz							
Channel	Frequency (MHz)	99% Occupied bandwidth (MHz)		Channel	Frequency (MHz)	26dB bandwidth (MHz)	
		QPSK	16QAM			QPSK	16QAM
18650	1855	8.9135	8.9218	18650	1855	9.687	9.688
18900	1880	8.9471	8.9474	18900	1880	9.716	9.702
19150	1905	8.9250	8.9341	19150	1905	9.655	9.614



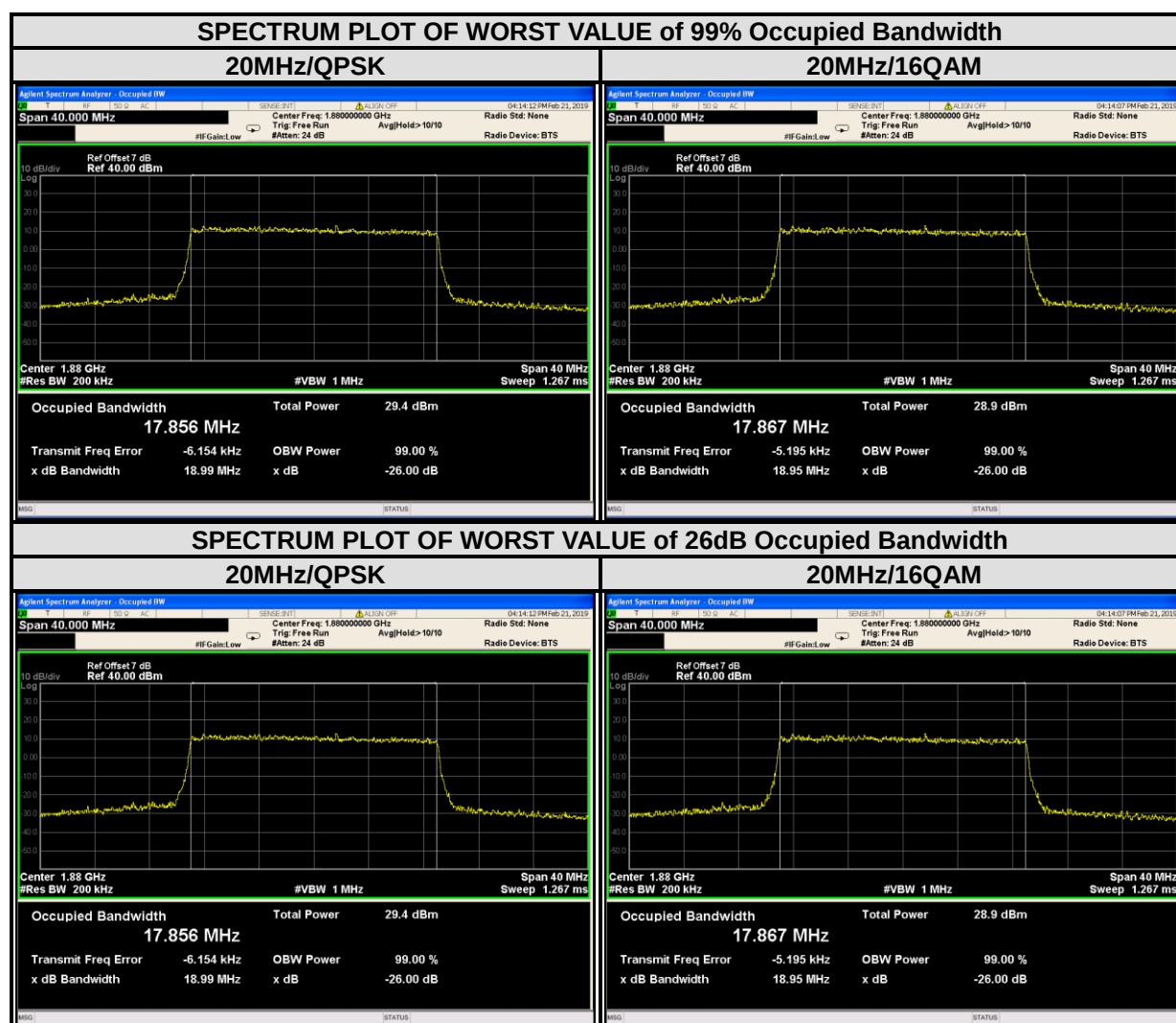


LTE band 2							
Channel Bandwidth : 15 MHz							
Channel	Frequency (MHz)	99% Occupied bandwidth (MHz)		Channel	Frequency (MHz)	26dB bandwidth (MHz)	
		QPSK	16QAM			QPSK	16QAM
18675	1857.5	13.358	13.318	18675	1857.5	14.37	14.27
18900	1880	13.406	13.384	18900	1880	14.54	14.54
19125	1902.5	13.377	13.347	19125	1902.5	14.22	14.07





LTE band 2							
Channel Bandwidth : 20 MHz							
Channel	Frequency (MHz)	99% Occupied bandwidth (MHz)		Channel	Frequency (MHz)	26dB bandwidth (MHz)	
		QPSK	16QAM			QPSK	16QAM
18700	1860	17.768	17.790	18700	1860	18.27	18.31
18900	1880	17.856	17.867	18900	1880	18.99	18.95
19100	1900	17.812	17.831	19100	1900	17.54	17.28



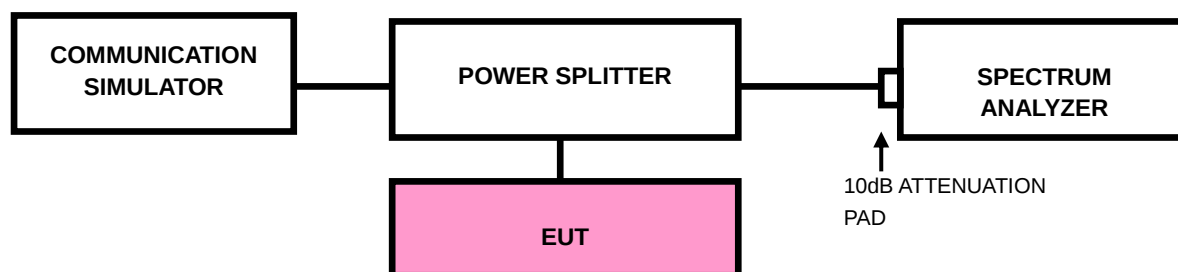


3.4 BAND EDGE MEASUREMENT

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

- All measurements were done at low and high operational frequency range.
- The center frequency of spectrum is the band edge frequency and span is 1.5 MHz. RBW of the spectrum is 10kHz and VBW of the spectrum is 30kHz (GSM/GPRS/ EDGE).
- The center frequency of spectrum is the band edge frequency and span is 10MHz. RBW of the spectrum is 100kHz and VBW of the spectrum is 300kHz (WCDMA).
- 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)
- 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)
- 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

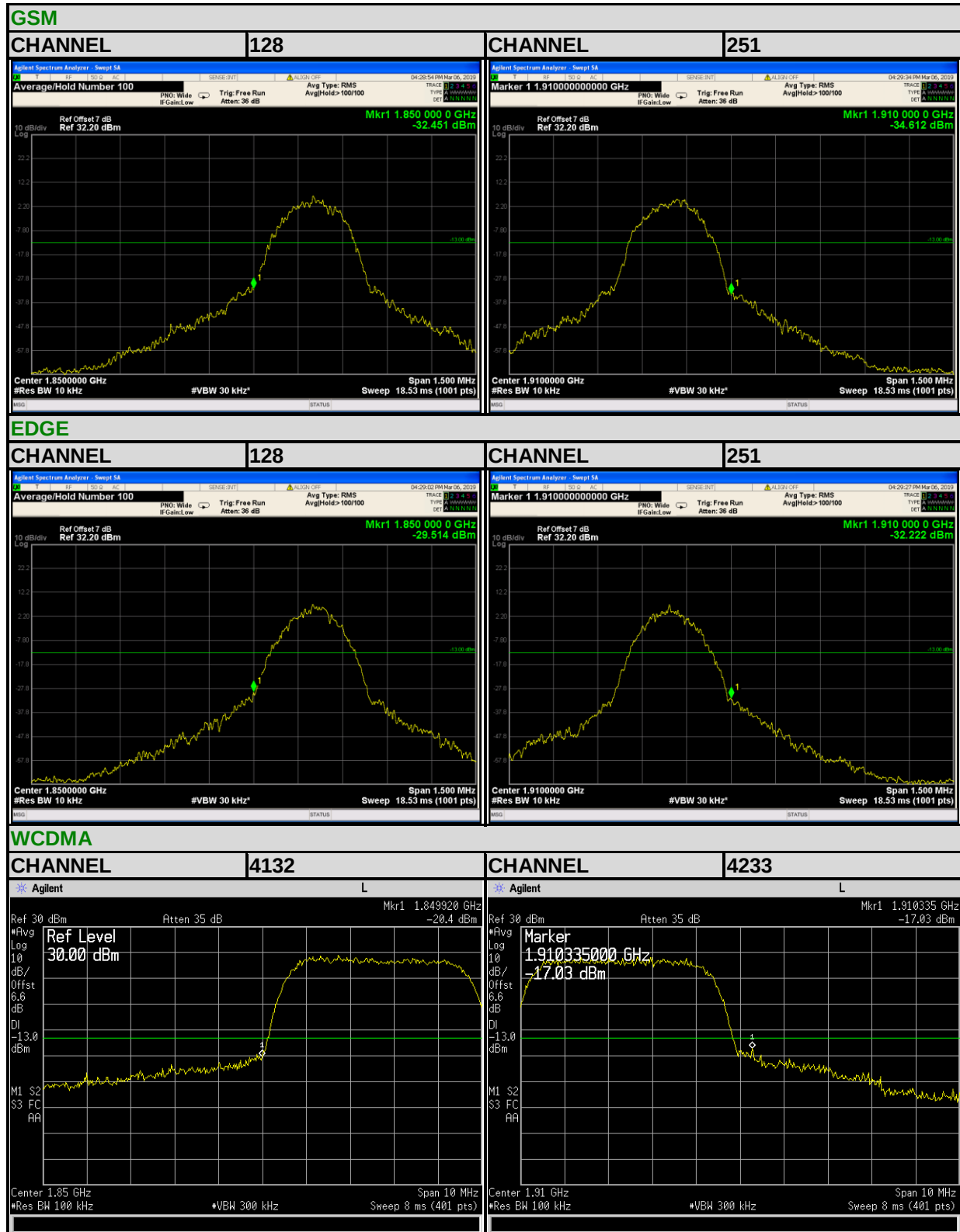


200kHz. (LTE bandwidth 5MHz)

- g. 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)
- h. 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)
- i. 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)
- j. Record the max trace plot into the test report.



3.4.4. TEST RESULTS

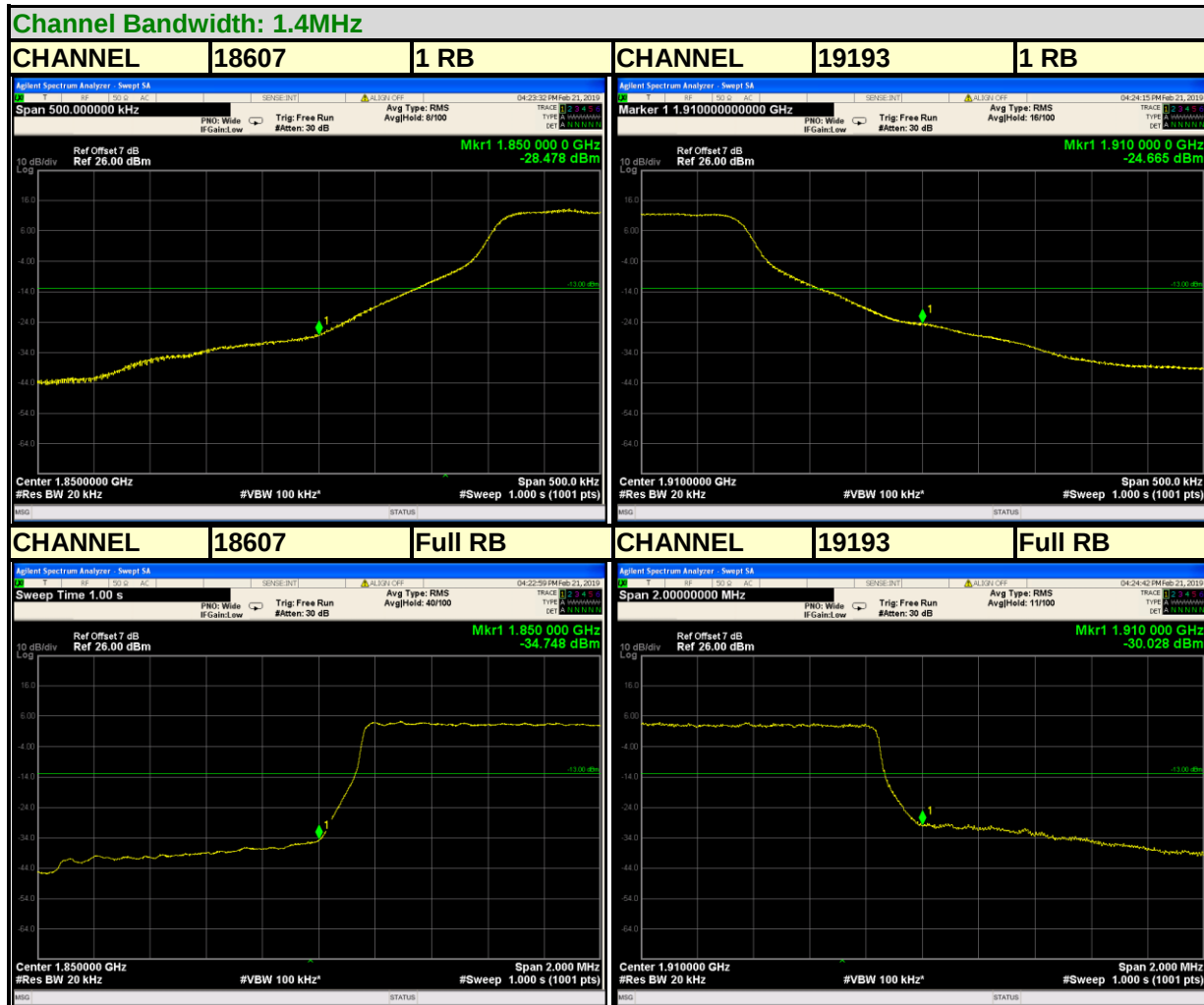




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Test Report No.: RF181102N040-8_R1

LTE BAND 2



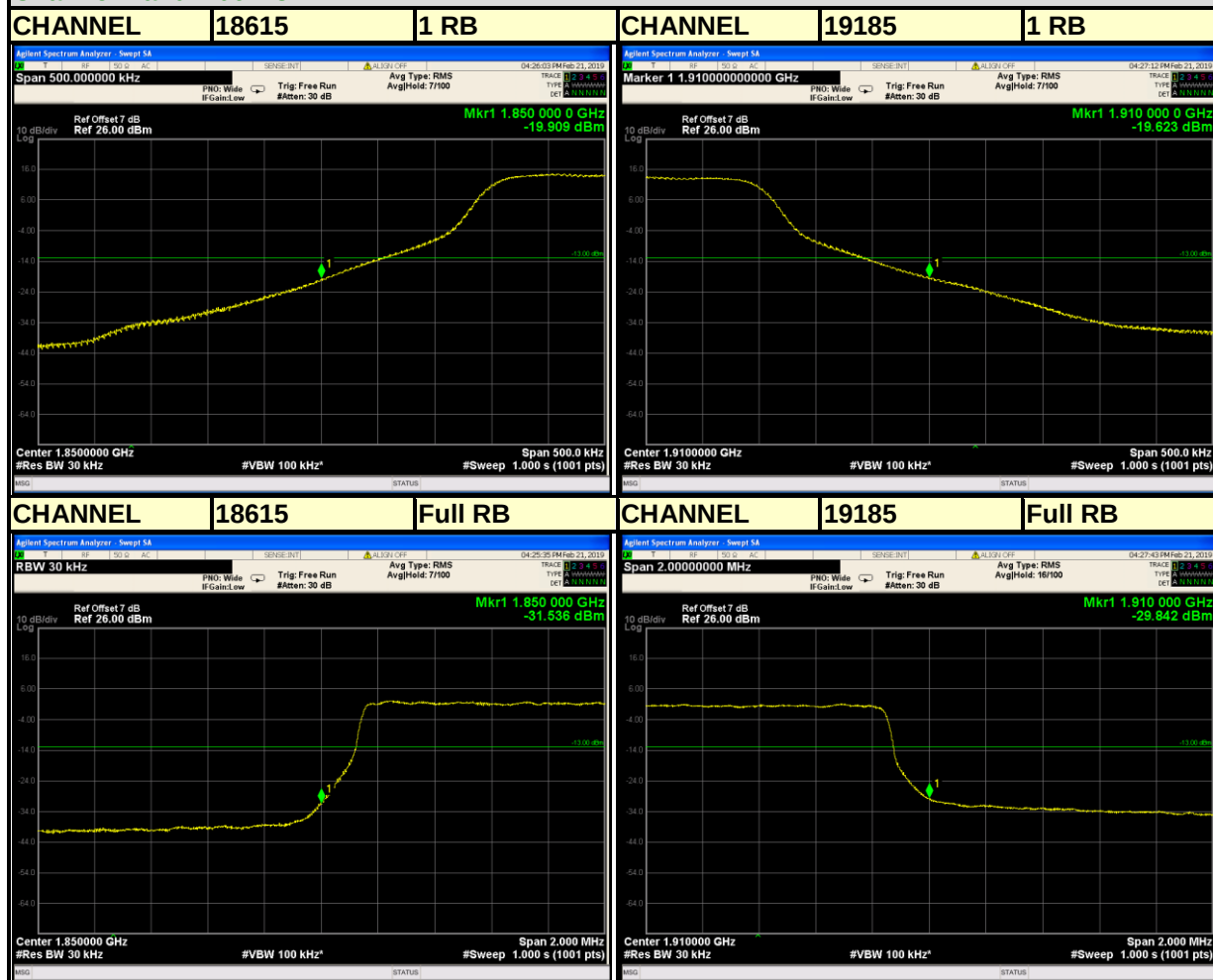


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Test Report No.: RF181102N040-8_R1

LTE BAND 2

Channel Bandwidth: 3MHz



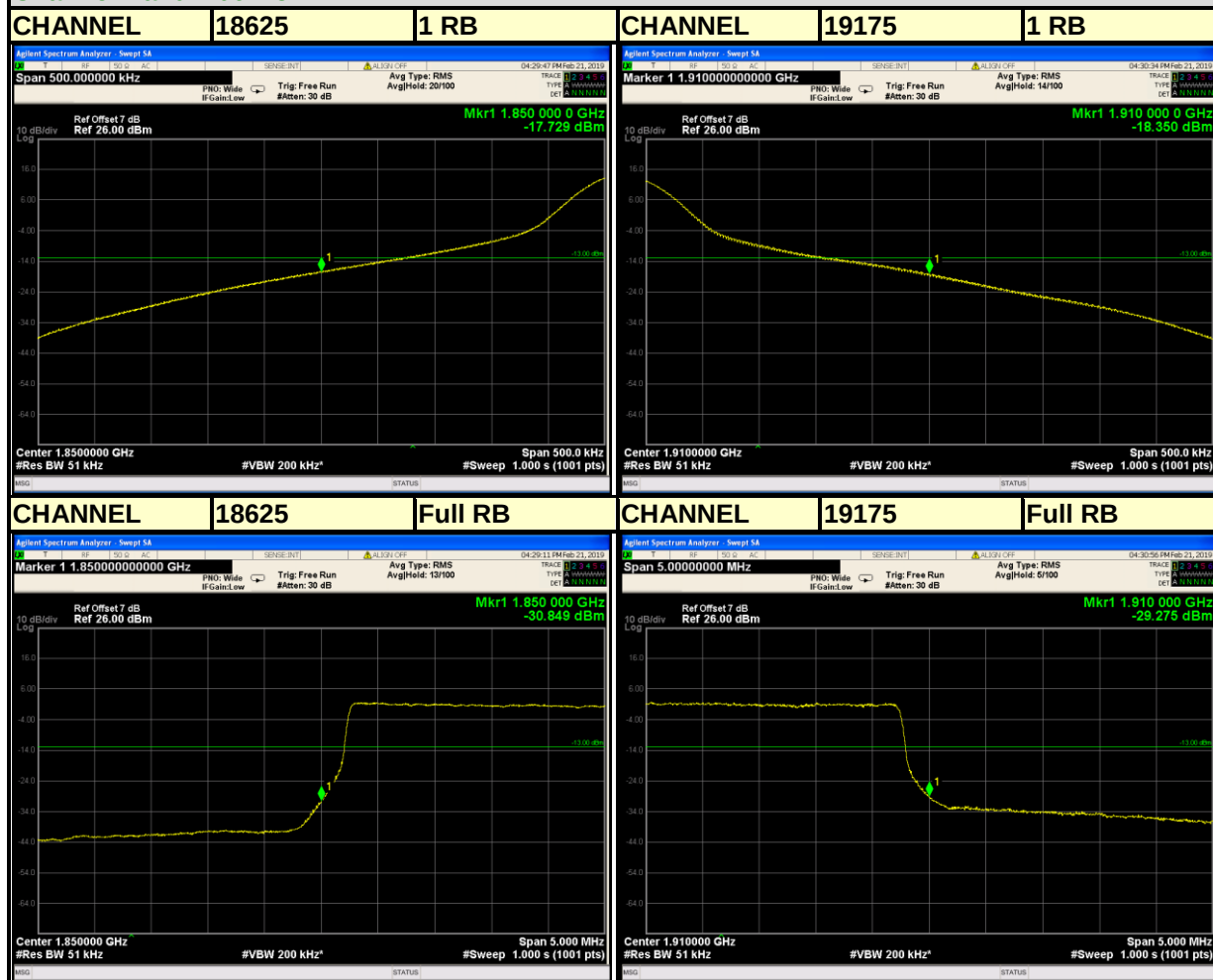


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Test Report No.: RF181102N040-8_R1

LTE BAND 2

Channel Bandwidth: 5MHz



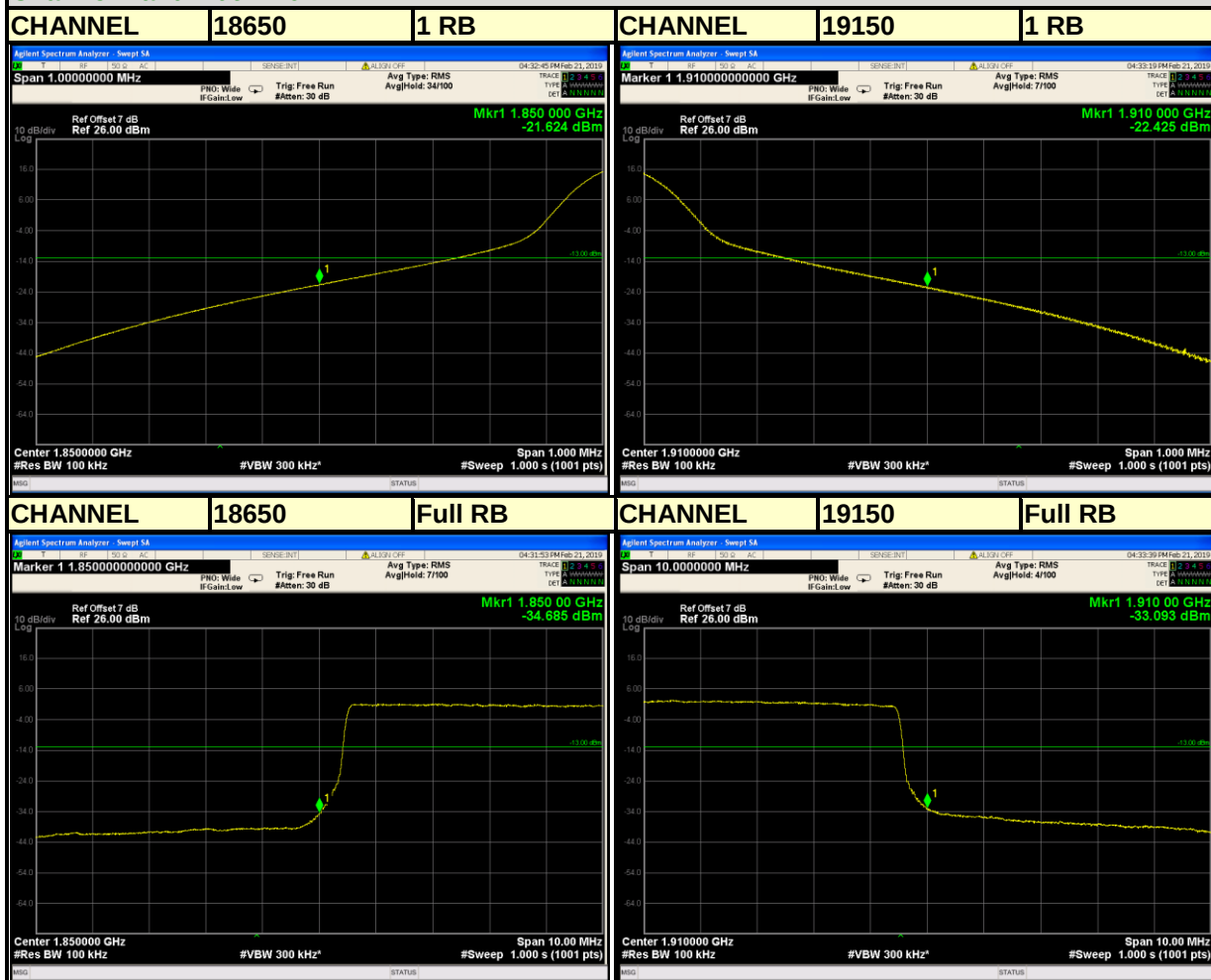


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Test Report No.: RF181102N040-8_R1

LTE BAND 2

Channel Bandwidth: 10MHz



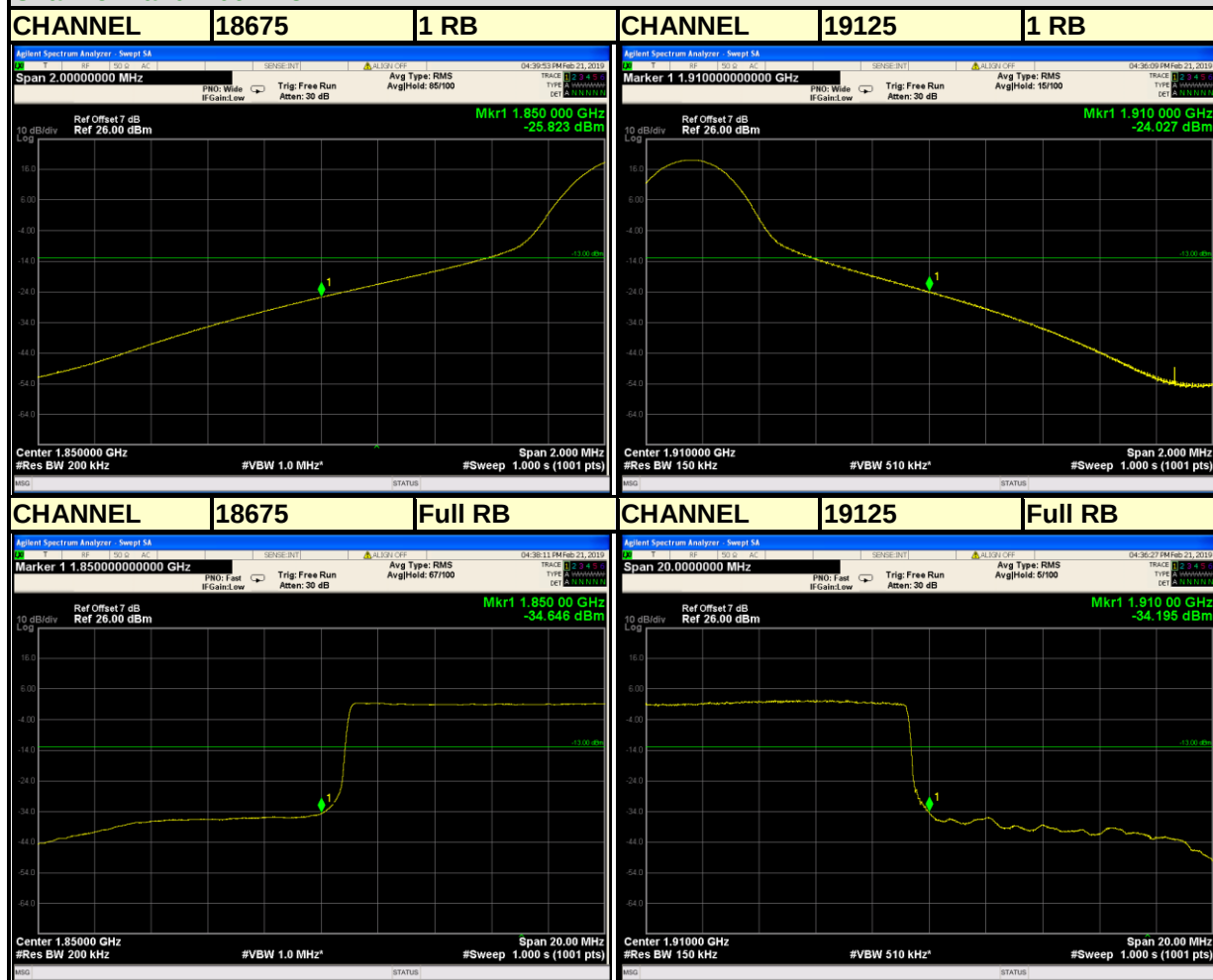


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Test Report No.: RF181102N040-8_R1

LTE BAND 2

Channel Bandwidth: 15MHz



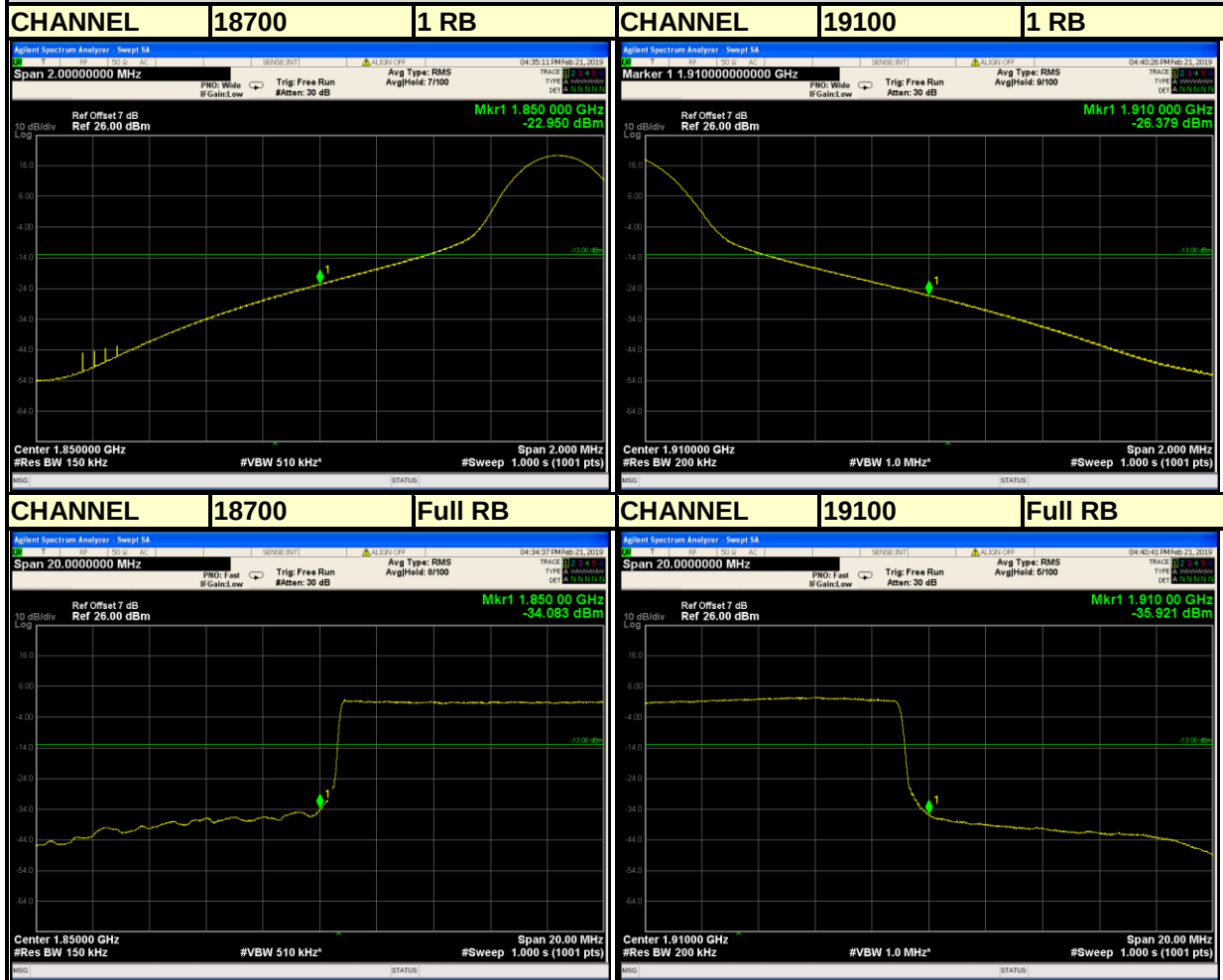


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Test Report No.: RF181102N040-8_R1

LTE BAND 2

Channel Bandwidth: 20MHz





3.5 CONDUCTED SPURIOUS EMISSIONS

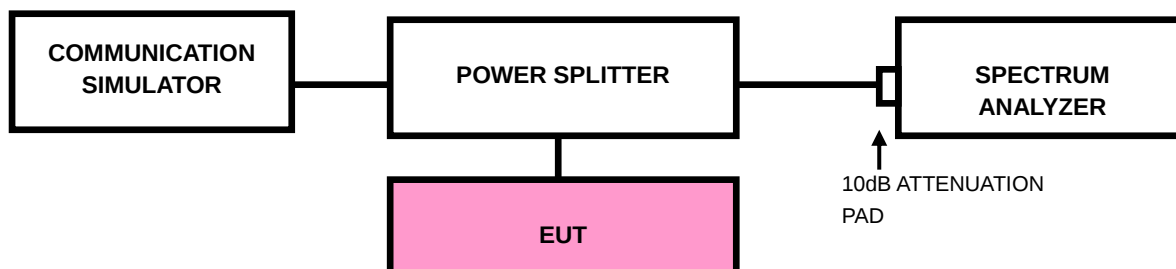
3.5.1 LIMITS OF CONDUCTED SPURIOUS EMISSIONS MEASUREMENT

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

3.5.2 TEST PROCEDURE

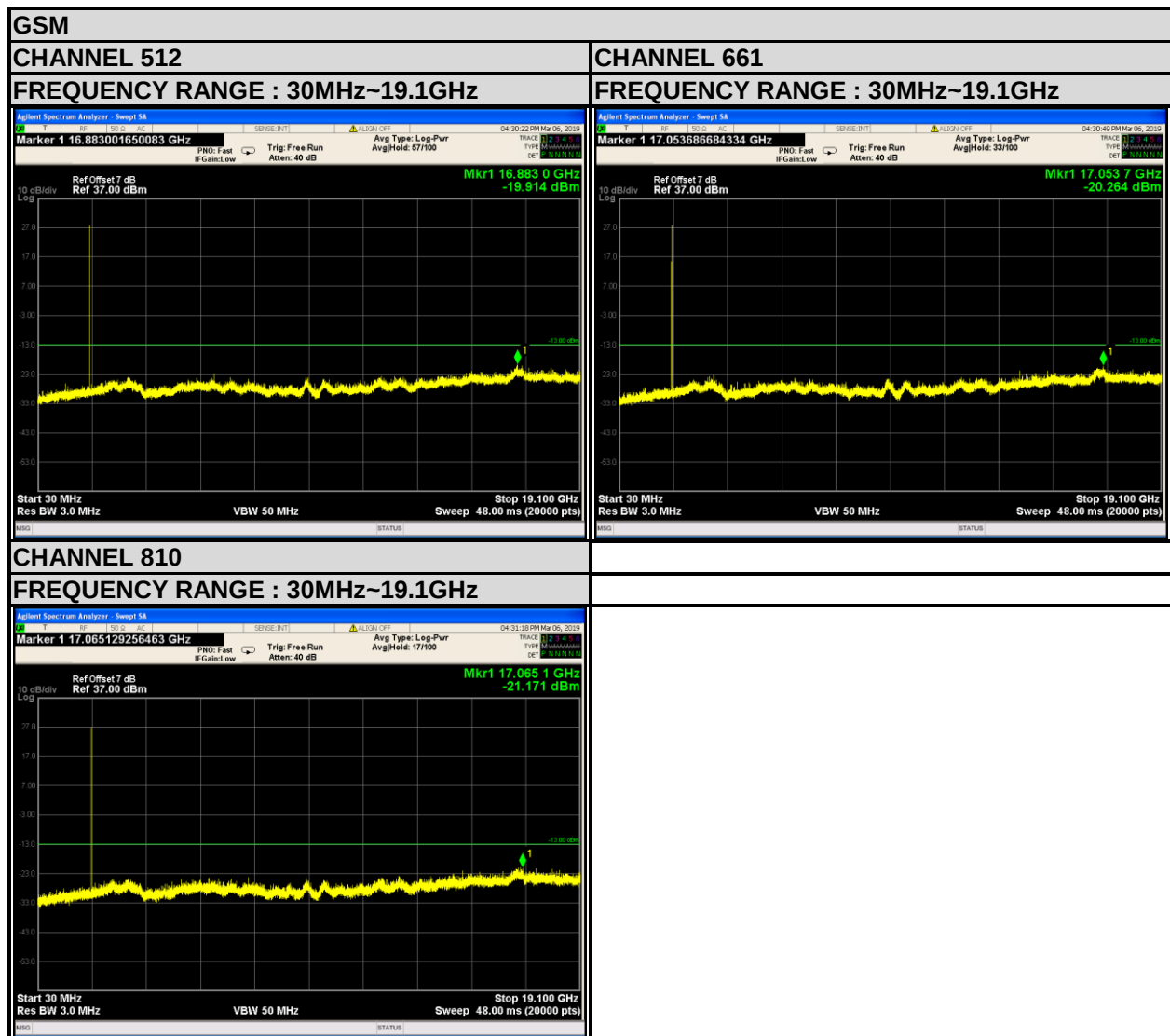
- a. The EUT makes a phone call to the communication simulator. All measurements were done at low, middle and high operational frequency range.
- b. Measuring frequency range is from 9 kHz to 19.1GHz. 10dB attenuation pad is connected with spectrum. RBW=1MHz and VBW=3MHz is used for conducted emission measurement.

3.5.3 TEST SETUP





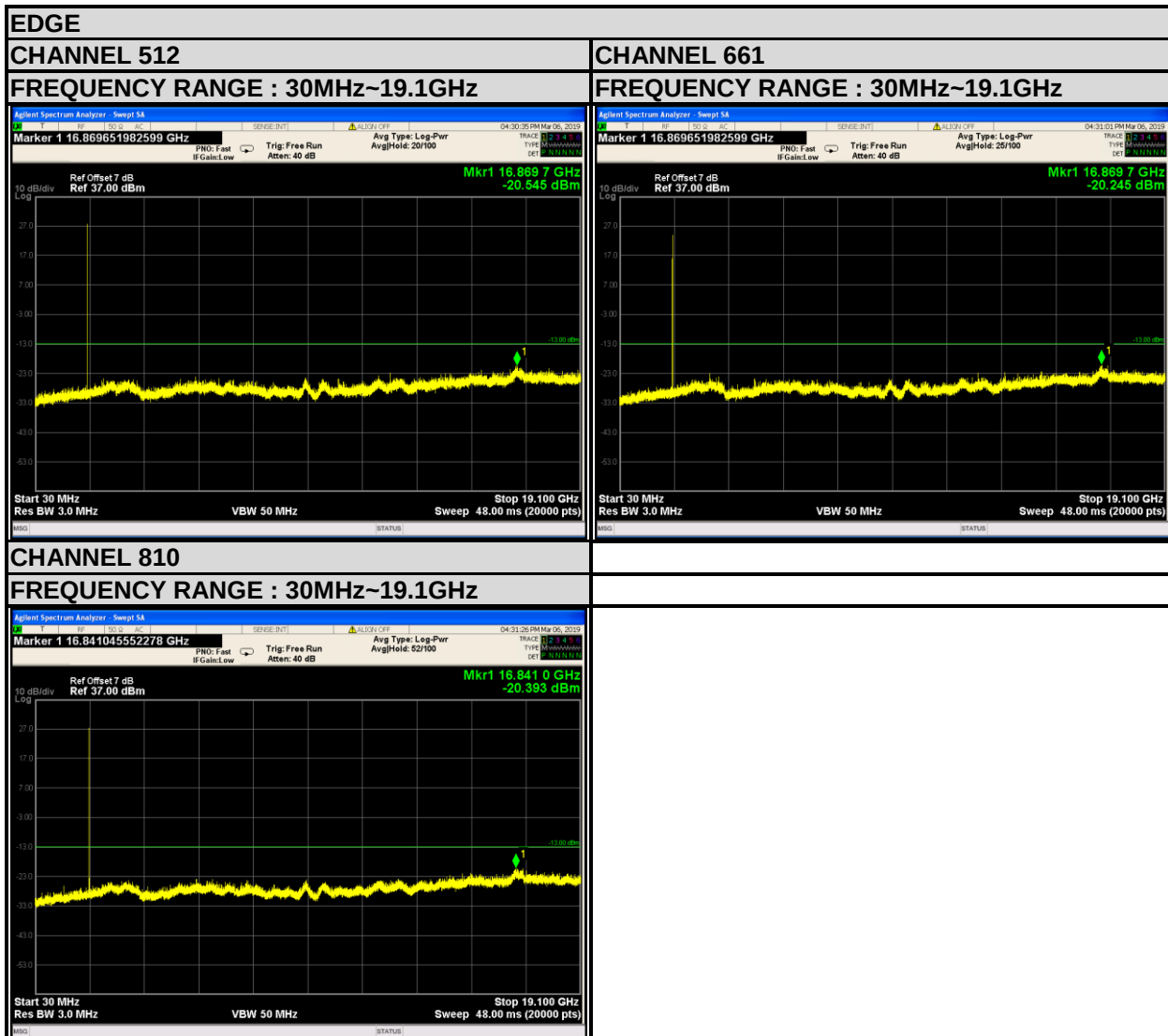
3.5.4 TEST RESULTS





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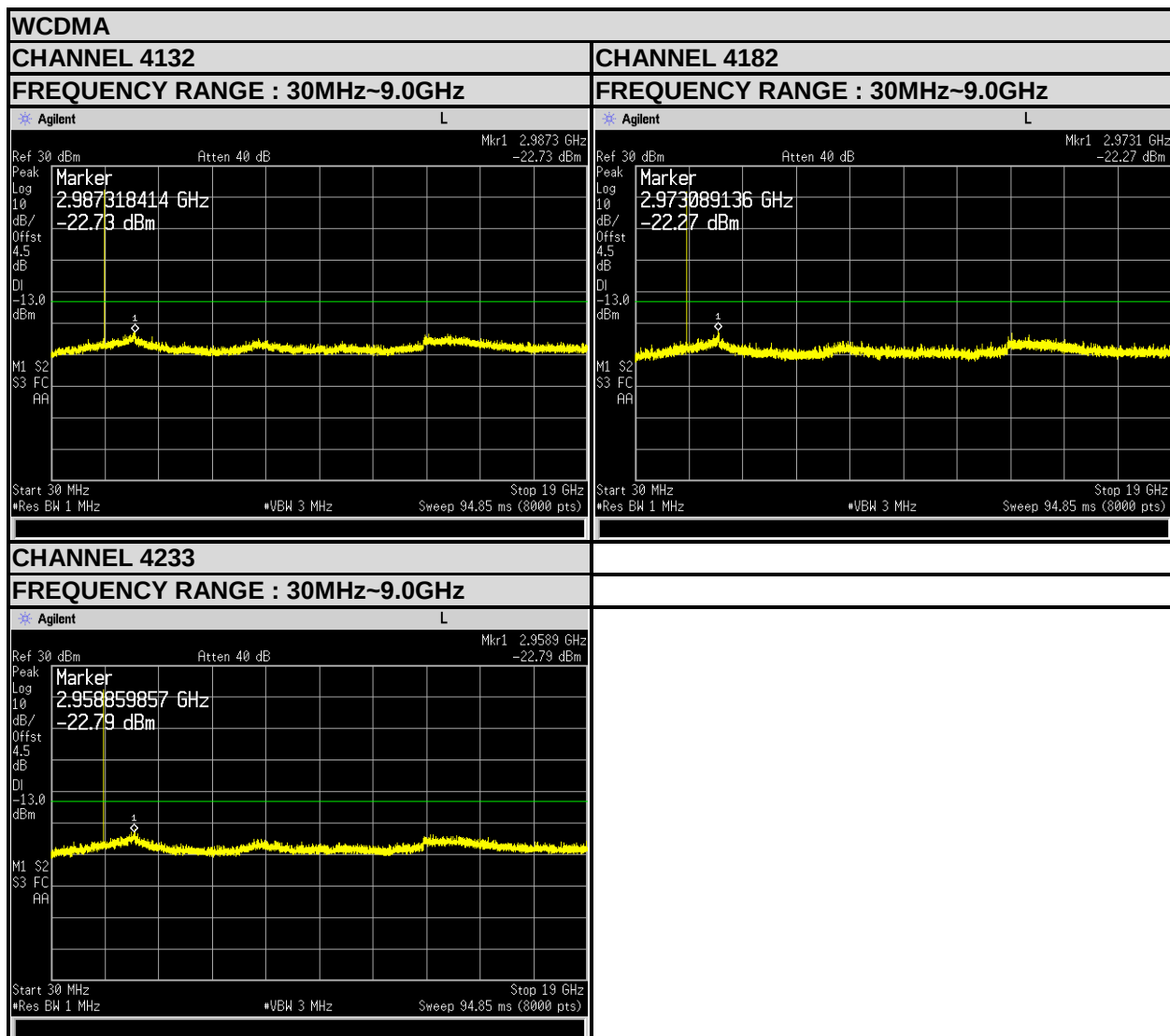
Test Report No.: RF181102N040-8_R1



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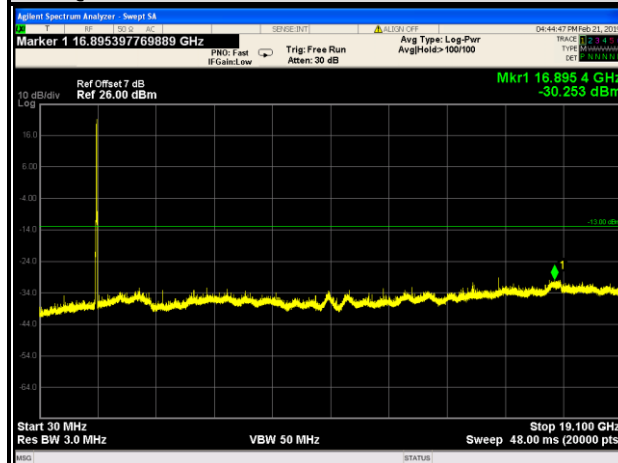
Test Report No.: RF181102N040-8_R1

LTE BAND 2

1.4MHz / QPSK

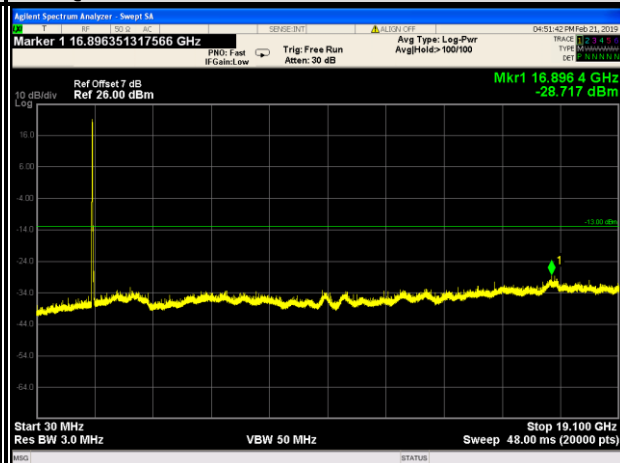
CHANNEL 18607

FREQUENCY RANGE : 30MHz~19.1GHz



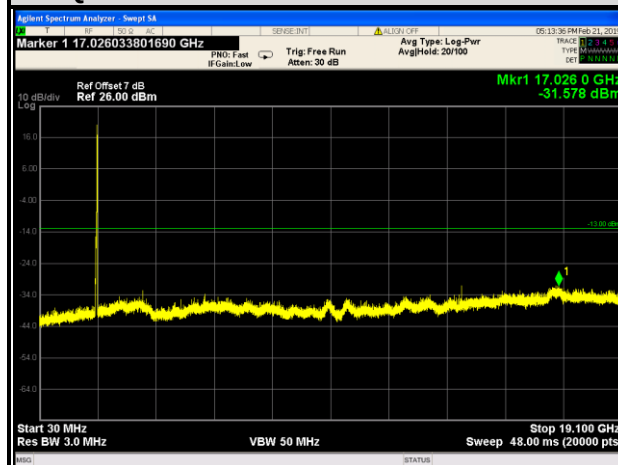
CHANNEL 18900

FREQUENCY RANGE : 30MHz~19.1GHz



CHANNEL 19193

FREQUENCY RANGE : 30MHz~19.1GHz





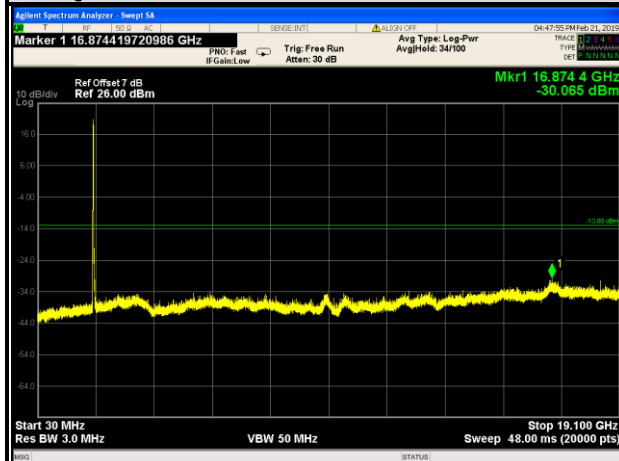
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Test Report No.: RF181102N040-8_R1

3MHz / QPSK

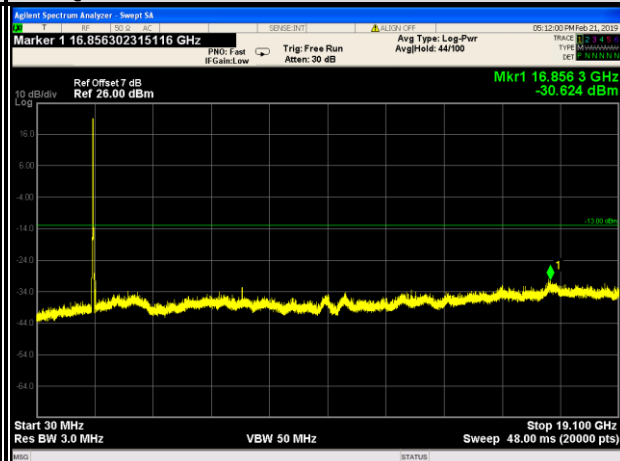
CHANNEL 18615

FREQUENCY RANGE : 30MHz~19.1GHz



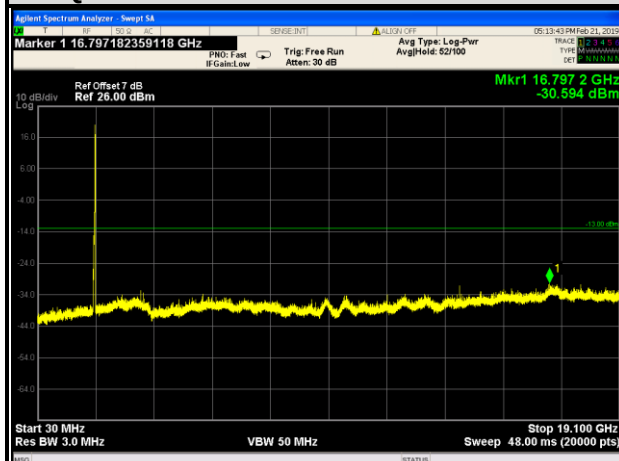
CHANNEL 18900

FREQUENCY RANGE : 30MHz~19.1GHz



CHANNEL 19185

FREQUENCY RANGE : 30MHz~19.1GHz



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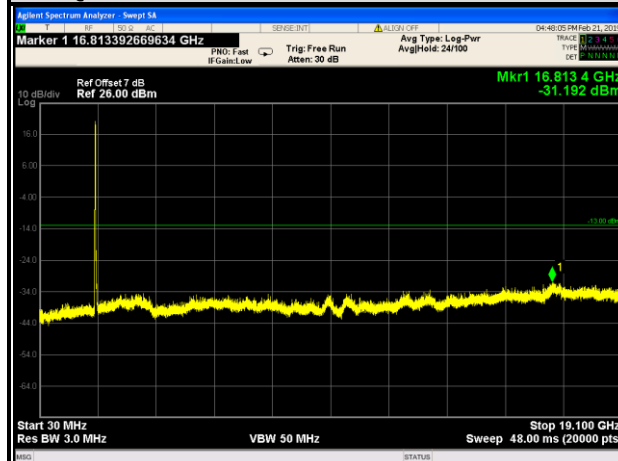
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Test Report No.: RF181102N040-8_R1

5MHz / QPSK

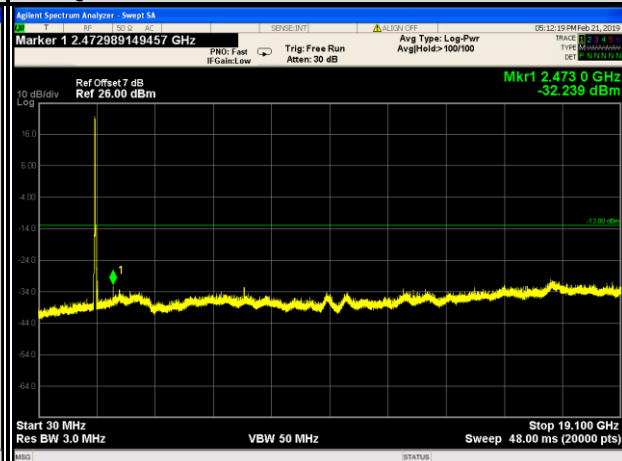
CHANNEL 18625

FREQUENCY RANGE : 30MHz~19.1GHz



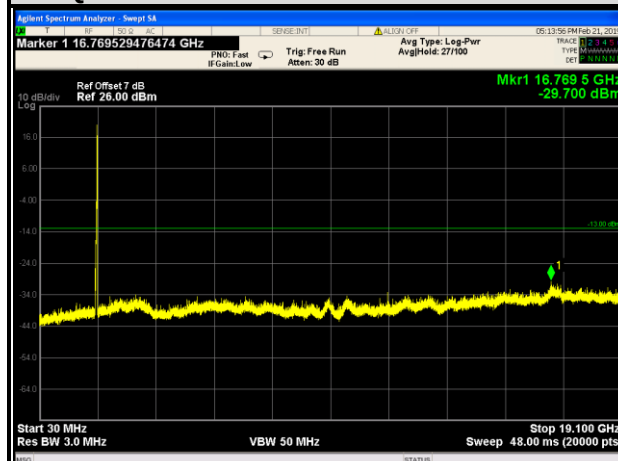
CHANNEL 18900

FREQUENCY RANGE : 30MHz~19.1GHz



CHANNEL 19175

FREQUENCY RANGE : 30MHz~19.1GHz





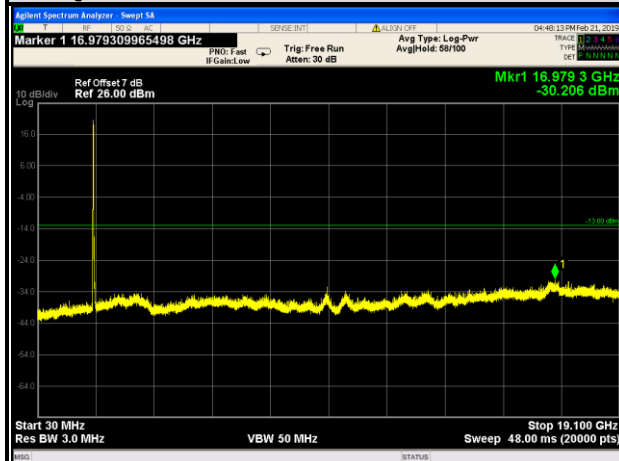
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Test Report No.: RF181102N040-8_R1

10MHz / QPSK

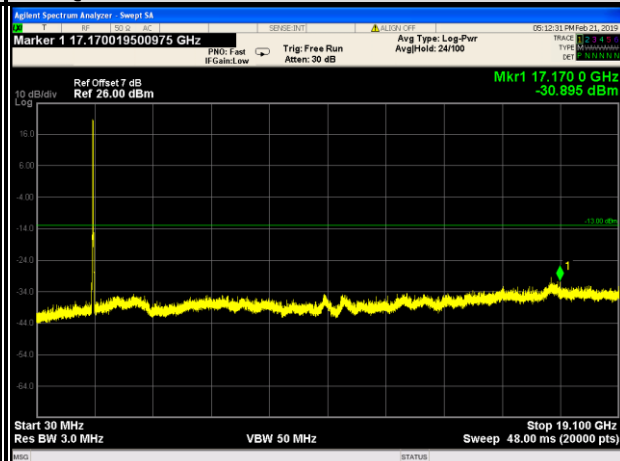
CHANNEL 18650

FREQUENCY RANGE : 30MHz~19.1GHz



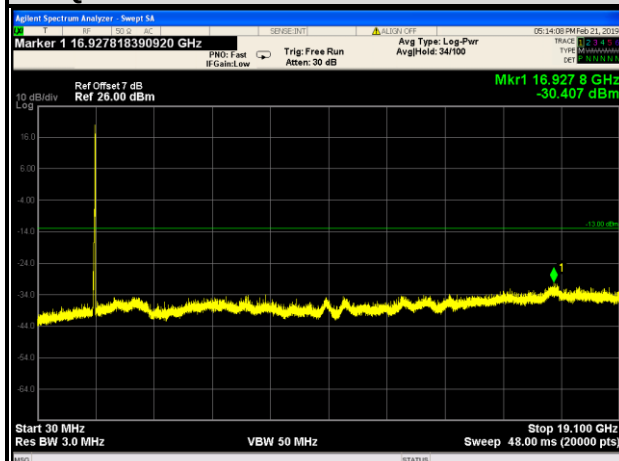
CHANNEL 18900

FREQUENCY RANGE : 30MHz~19.1GHz



CHANNEL 19150

FREQUENCY RANGE : 30MHz~19.1GHz





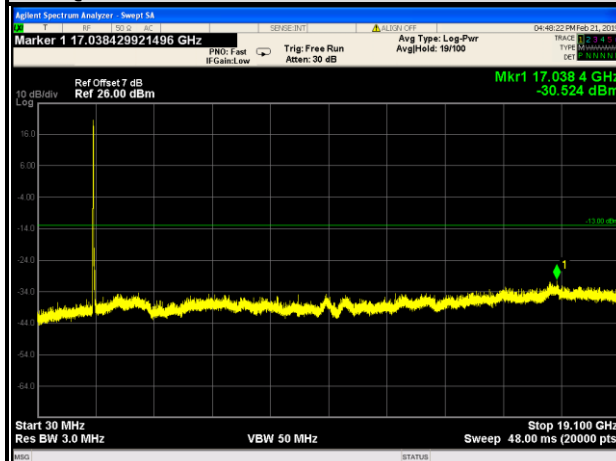
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Test Report No.: RF181102N040-8_R1

15MHz / QPSK

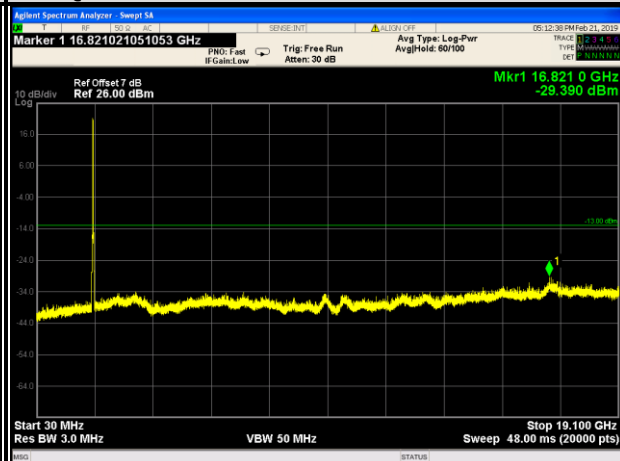
CHANNEL 18675

FREQUENCY RANGE : 30MHz~19.1GHz



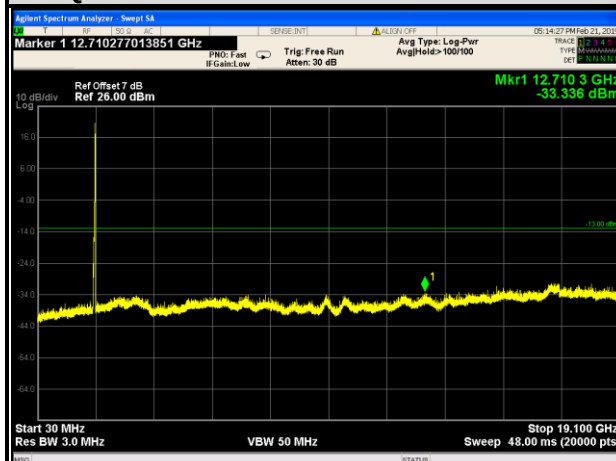
CHANNEL 18900

FREQUENCY RANGE : 30MHz~19.1GHz



CHANNEL 19125

FREQUENCY RANGE : 30MHz~19.1GHz



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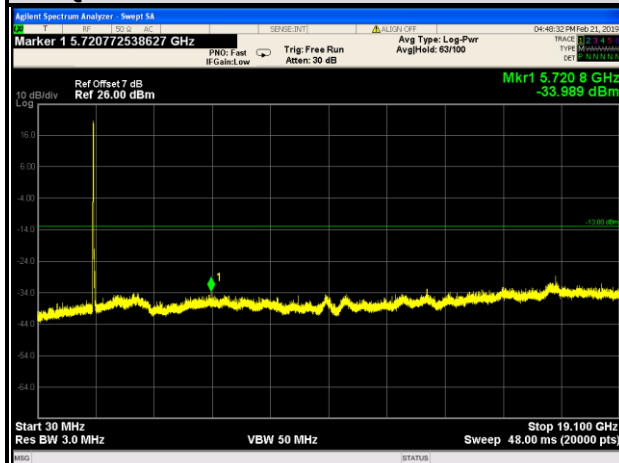
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Test Report No.: RF181102N040-8_R1

20MHz / QPSK

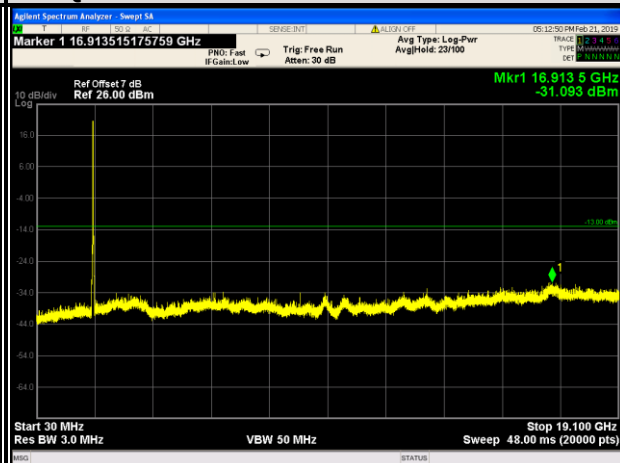
CHANNEL 18700

FREQUENCY RANGE : 30MHz~19.1GHz



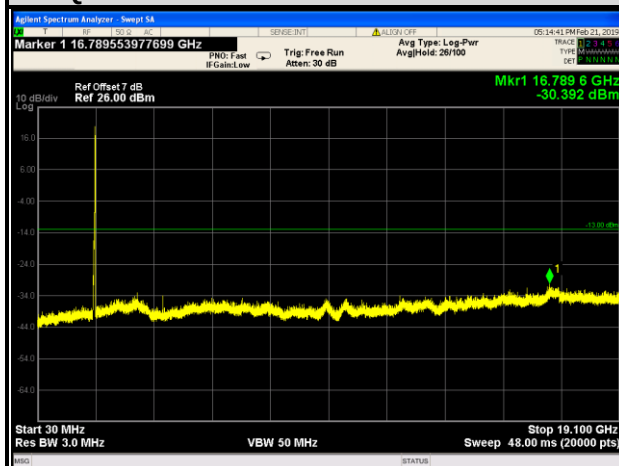
CHANNEL 18900

FREQUENCY RANGE : 30MHz~19.1GHz



CHANNEL 19100

FREQUENCY RANGE : 30MHz~19.1GHz





3.6 RADIATED EMISSION MEASUREMENT

3.6.1 LIMITS OF RADIATED EMISSION MEASUREMENT

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

3.6.2 TEST PROCEDURES

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

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

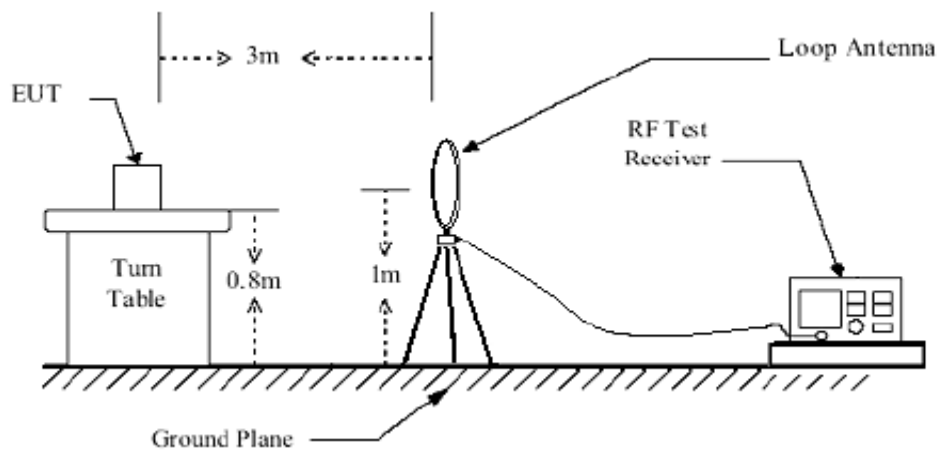
3.6.3 DEVIATION FROM TEST STANDARD

No deviation

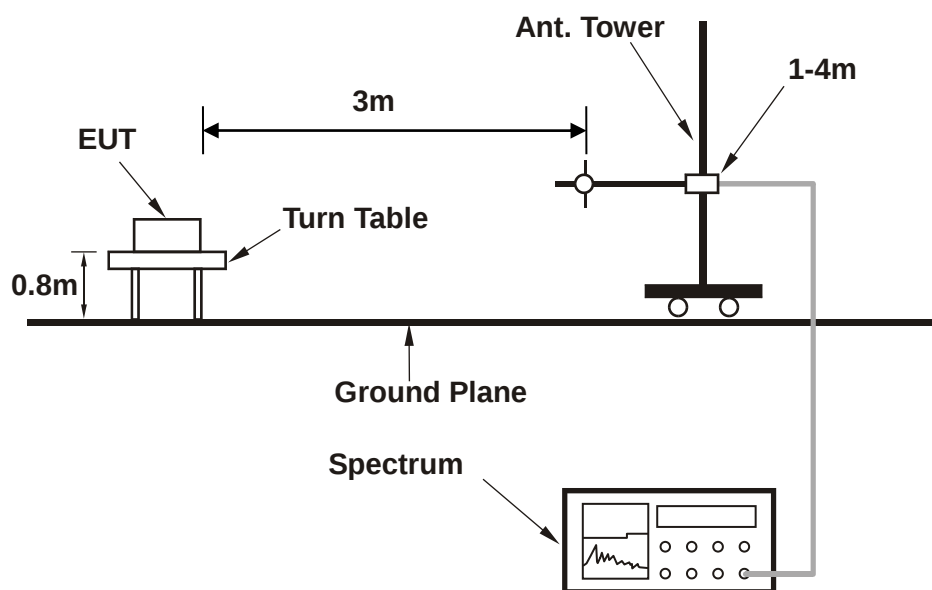


3.6.4 TEST SETUP

<Below 30MHz>

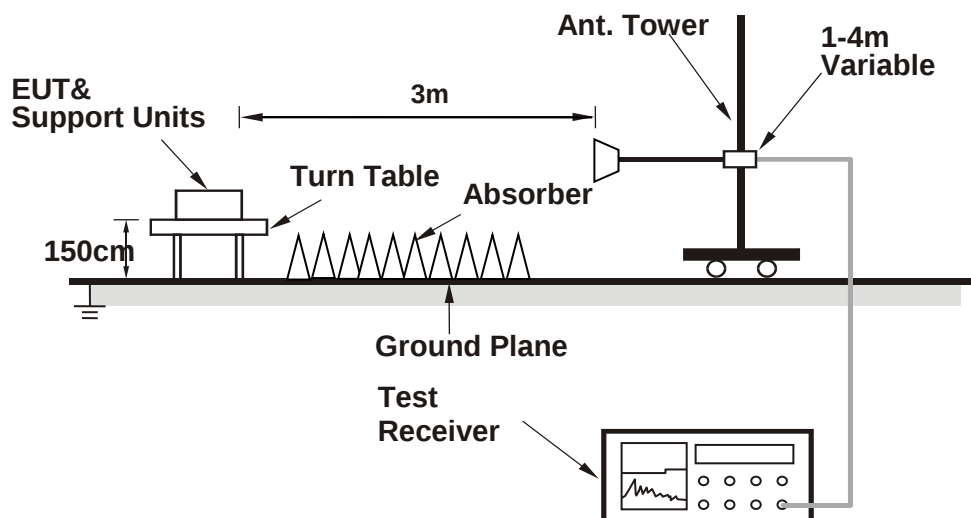


< Frequency Range 30MHz~1GHz >





< Frequency Range above 1GHz >



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



3.6.5 TEST RESULTS

BELOW 1GHz WORST-CASE DATA

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

30 MHz – 1GHz data:

EDGE 1900:

MODE	TX channel 189	FREQUENCY RANGE	Below 1000MHz
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	INPUT POWER	DC 5V from adapter
TESTED BY	Simon Lin		
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M			



No.	Frequency (MHz)	Reading (dBm)	Result (dBm)	Limit (dBm)	Margin (dB)
1	206.3976	-63.00	-62.71	-13.00	-49.71
2	284.9767	-70.34	-69.06	-13.00	-56.06
3	605.6592	-79.19	-71.37	-13.00	-58.37
4	114.5146	-71.76	-73.04	-13.00	-60.04
5	75.7114	-71.46	-74.25	-13.00	-61.25
6	30.0000	-81.01	-66.89	-13.00	-53.89



**BUREAU
VERITAS**

Test Report No.: RF181102N040-8_R1

MODE	TX channel 189	FREQUENCY RANGE	Below 1000MHz
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	INPUT POWER	DC 5V from adapter
TESTED BY	Simon Lin		
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M			



No.	Frequency (MHz)	Reading (dBm)	Result (dBm)	Limit (dBm)	Margin (dB)
1	207.1226	-61.84	-58.72	-13.00	-45.72
2	118.1862	-67.30	-62.02	-13.00	-49.02
3	57.9993	-62.19	-65.78	-13.00	-52.78
4	67.2022	-64.84	-66.72	-13.00	-53.72
5	51.4807	-62.28	-66.78	-13.00	-53.78
6	127.2176	-69.28	-64.11	-13.00	-51.11



ABOVE 1GHz DATA

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

PCS 1900:

Low channel

Frequency (MHz)	Antenna Polarization (H/V)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
3700.4	V	-29.18	-13	-16.18
3700.4	H	-33.14	-13	-20.14
479.96	V	-40.46	-13	-27.46
637.06	H	-35.79	-13	-22.79

Middle channel

Frequency (MHz)	Antenna Polarization (H/V)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
3760	V	-29.61	-13	-16.61
3760	H	-32.84	-13	-19.84
296.03	V	-36.79	-13	-23.79
579.77	H	-40.35	-13	-27.35

High channel

Frequency (MHz)	Antenna Polarization (H/V)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
3819.6	V	-36.4	-13	-23.4
3819.6	H	-36.31	-13	-23.31
590.84	V	-41.78	-13	-28.78
687.8	H	-40.19	-13	-27.19

Note:

- 1, The testing has been conformed to $10 \times 1909.8 \text{ MHz} = 19,098 \text{ MHz}$
- 2, All other emissions more than 30 dB below the limit
- 3, X-Axis, Y-Axis and Z-Axis were investigated. The results above show only the worst case.
- 4, The radiated spurious test above 18GHz is subcontracted to Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch Laboratories and found 30dB below the limit at least.



EDGE 1900:

Low channel

Frequency (MHz)	Antenna Polarization (H/V)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
3700.4	V	-35.37	-13	-22.37
3700.4	H	-33.41	-13	-20.41
2763.46	V	-40.85	-13	-27.85
1961.485	H	-19.75	-13	-6.75

Middle channel

Frequency (MHz)	Antenna Polarization (H/V)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
3760	V	-35.78	-13	-22.78
3760	H	-34.37	-13	-21.37
7378.19	V	-38.92	-13	-25.92
3113.72	H	-40.75	-13	-27.75

High channel

Frequency (MHz)	Antenna Polarization (H/V)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
3819.6	V	-31.92	-13	-18.92
3819.6	H	-30.37	-13	-17.37
5108.72	V	-41.08	-13	-28.08
4308.88	H	-40.14	-13	-27.14

Note:

- 1, The testing has been conformed to 10*1909.8MHz=19,098MHz
- 2, All other emissions more than 30 dB below the limit
- 3, X-Axis, Y-Axis and Z-Axis were investigated. The results above show only the worst case.
- 4, The radiated spurious test above 18GHz is subcontracted to Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch Laboratories and found 30dB below the limit at least.



WCDMA:

Low channel

Frequency (MHz)	Antenna Polarization (H/V)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
3704.8	V	-30.2	-13	-17.2
3704.8	H	-28.09	-13	-15.09
692.04	V	-42.12	-13	-29.12
430.5	H	-38.65	-13	-25.65

Middle channel

Frequency (MHz)	Antenna Polarization (H/V)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
3760	V	-32.18	-13	-19.18
3760	H	-35.64	-13	-22.64
387.59	V	-32.57	-13	-19.57
452.02	H	-38.13	-13	-25.13

High channel

Frequency (MHz)	Antenna Polarization (H/V)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
3815.2	V	-27.99	-13	-14.99
3815.2	H	-32.87	-13	-19.87
822.02	V	-37.22	-13	-24.22
287.01	H	-40.68	-13	-27.68

Note:

- 1, The testing has been conformed to $10 \times 1908.75 \text{ MHz} = 19,088 \text{ MHz}$
- 2, All other emissions more than 30 dB below the limit
- 3, X-Axis, Y-Axis and Z-Axis were investigated. The results above show only the worst case.
- 4, The radiated spurious test above 18GHz is subcontracted to Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch Laboratories and found 30dB below the limit at least.



LTE Band 2:

1.4M QPSK

Middle channel

Frequency (MHz)	Antenna Polarization (H/V)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
585.8	V	-37.32	-13	-24.32
601.8	H	-32.74	-13	-19.74
603.3	V	-37.92	-13	-24.92
495.1	H	-38.89	-13	-25.89

3M QPSK

Middle channel

Frequency (MHz)	Antenna Polarization (H/V)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
214.4	V	-41.97	-13	-28.97
265.3	H	-34.05	-13	-21.05
135.4	V	-31.03	-13	-18.03
663.6	H	-33.06	-13	-20.06

5M QPSK

Middle channel

Frequency (MHz)	Antenna Polarization (H/V)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
856.6	V	-33.15	-13	-20.15
430	H	-41.01	-13	-28.01
849.8	V	-38.96	-13	-25.96
334.9	H	-35.36	-13	-22.36



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10M QPSK

Middle channel

Frequency (MHz)	Antenna Polarization (H/V)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
862.3	V	-34.42	-13	-21.42
798.4	H	-33.5	-13	-20.5
328.8	V	-34.23	-13	-21.23
799.6	H	-40.54	-13	-27.54

15M QPSK

Middle channel

Frequency (MHz)	Antenna Polarization (H/V)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
747.3	V	-40.09	-13	-27.09
197.7	H	-40.54	-13	-27.54
549.8	V	-37.33	-13	-24.33
232.9	H	-34.03	-13	-21.03

20M QPSK

Middle channel

Frequency (MHz)	Antenna Polarization (H/V)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
700.8	V	-33.05	-13	-20.05
209.5	H	-34.25	-13	-21.25
878.3	V	-41.39	-13	-28.39
844.6	H	-41.82	-13	-28.82

Note:

- 1, The testing has been conformed to $10 \times 1909.3 \text{ MHz} = 19,093 \text{ MHz}$
- 2, All other emissions more than 30 dB below the limit
- 3, X-Axis, Y-Axis and Z-Axis were investigated. The results above show only the worst case.
- 4, The radiated spurious test above 18GHz is subcontracted to Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch Laboratories and found 30dB below the limit at least.

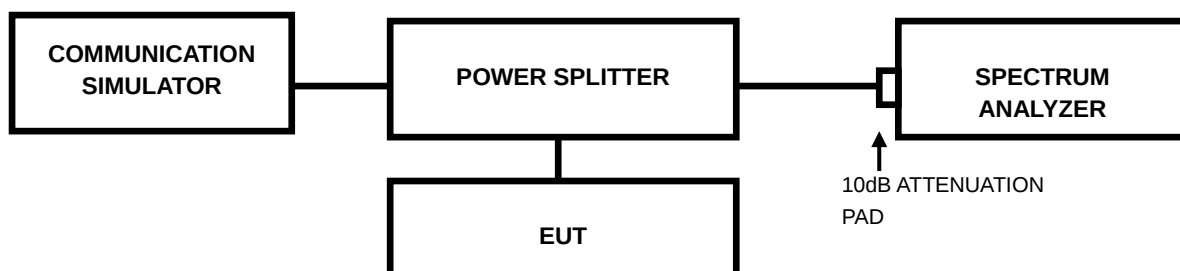


3.7 PEAK TO AVERAGE RATIO

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

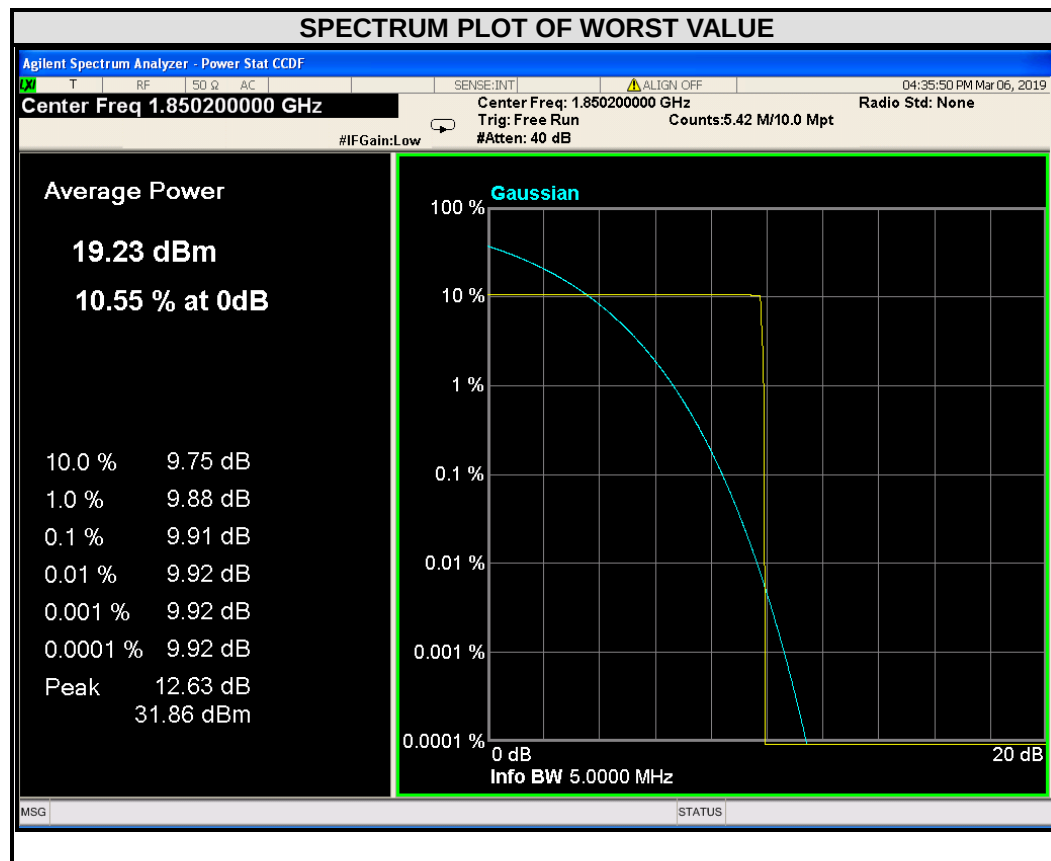
1. Set resolution/measurement bandwidth $\geq$ signal's occupied bandwidth;
2. Set the number of counts to a value that stabilizes the measured CCDF curve;
3. Record the maximum PAPR level associated with a probability of 0.1%.



3.7.4 TEST RESULTS

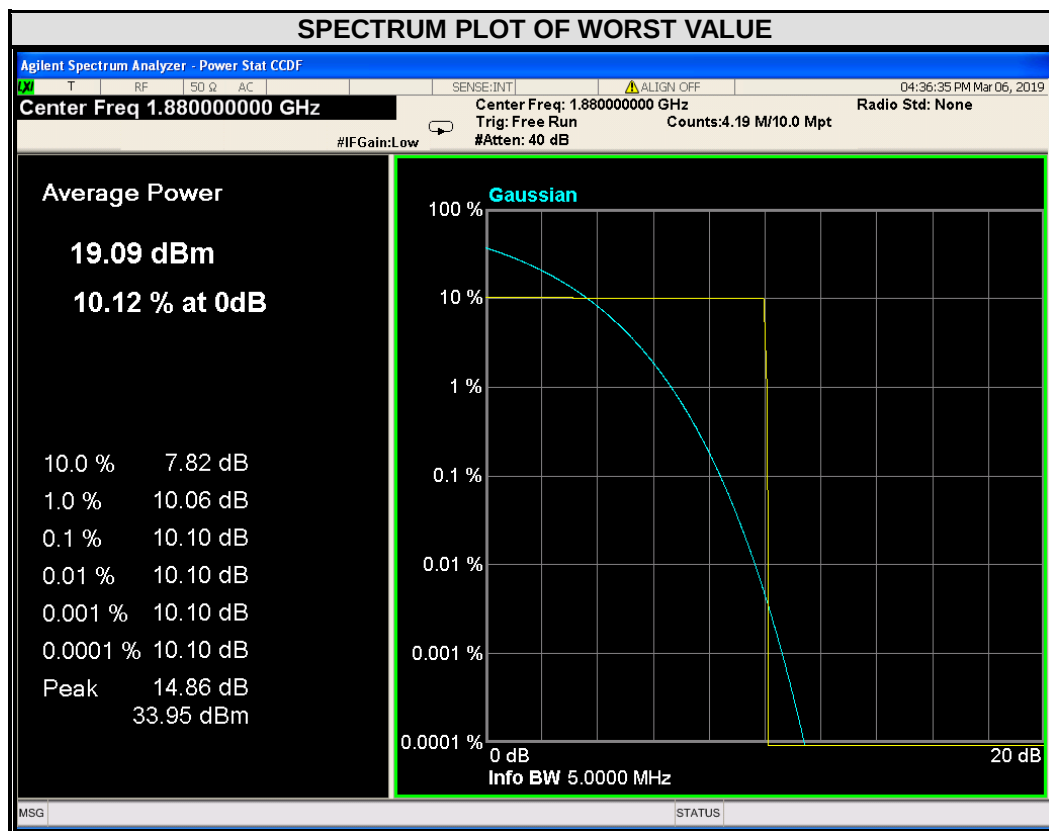
GSM

CHANNEL	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
512	1850.2	9.91



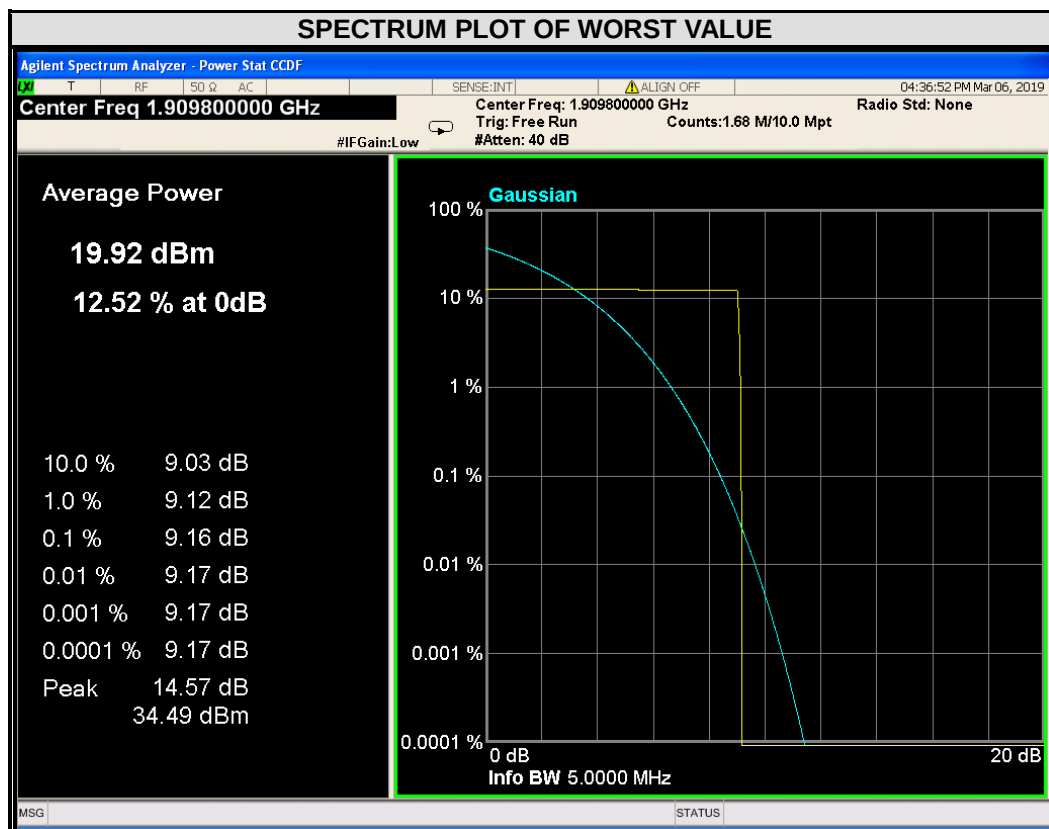


CHANNEL	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
661	1880	10.10





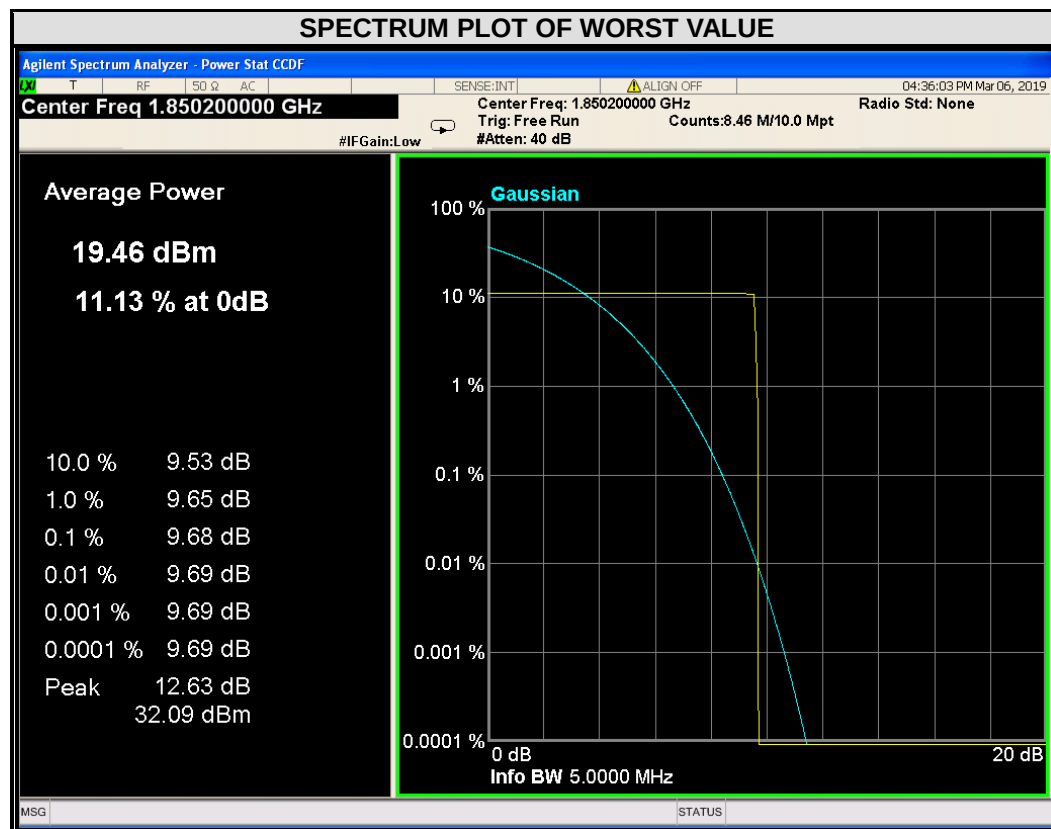
CHANNEL	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
810	1909.8	9.16





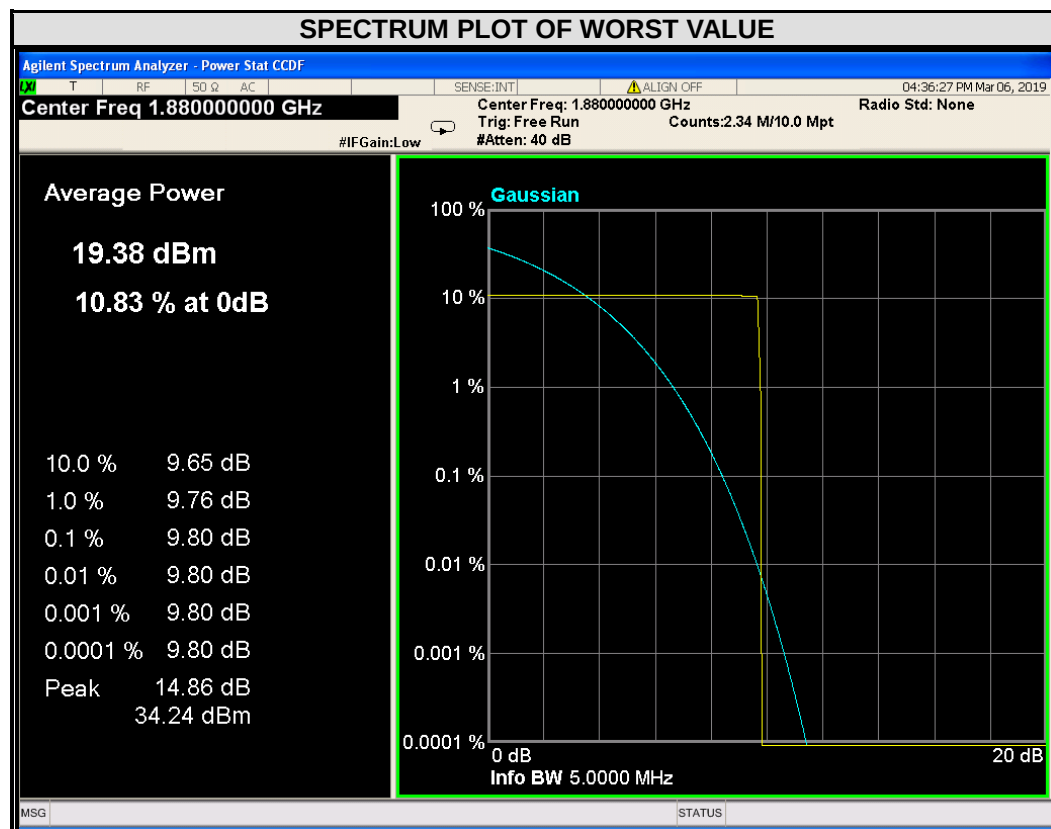
EDGE

CHANNEL	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
512	1850.2	9.68



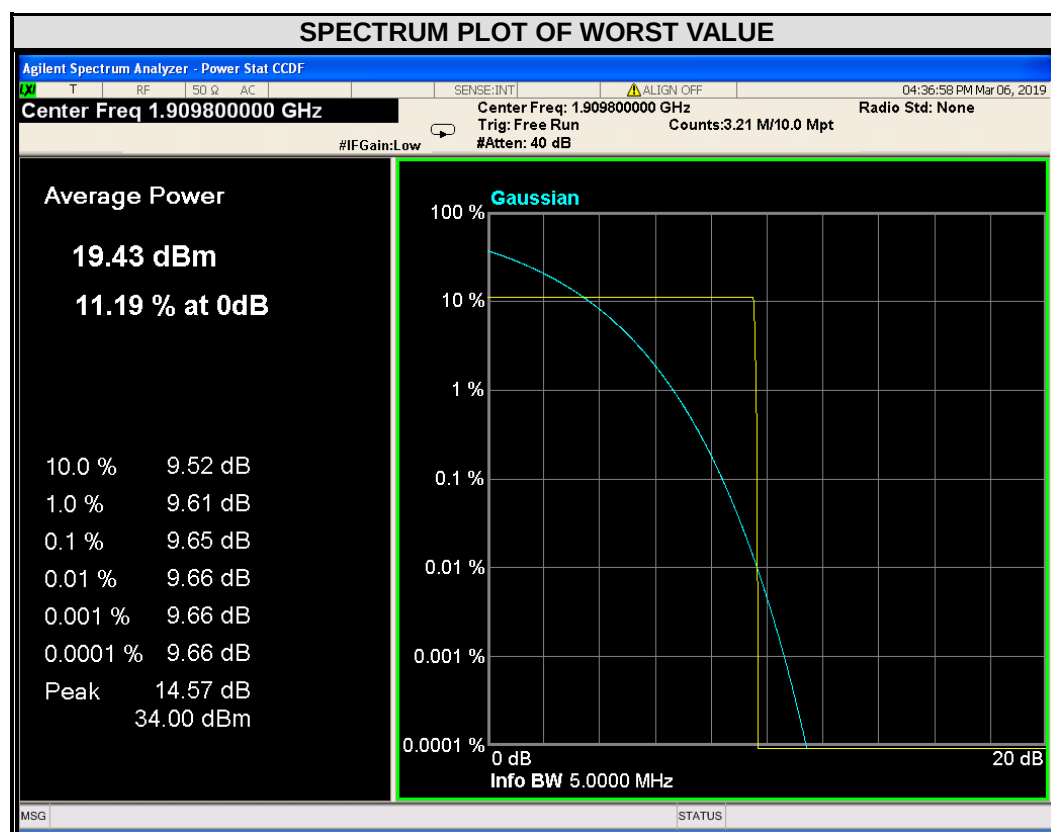


CHANNEL	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
661	1880	9.80





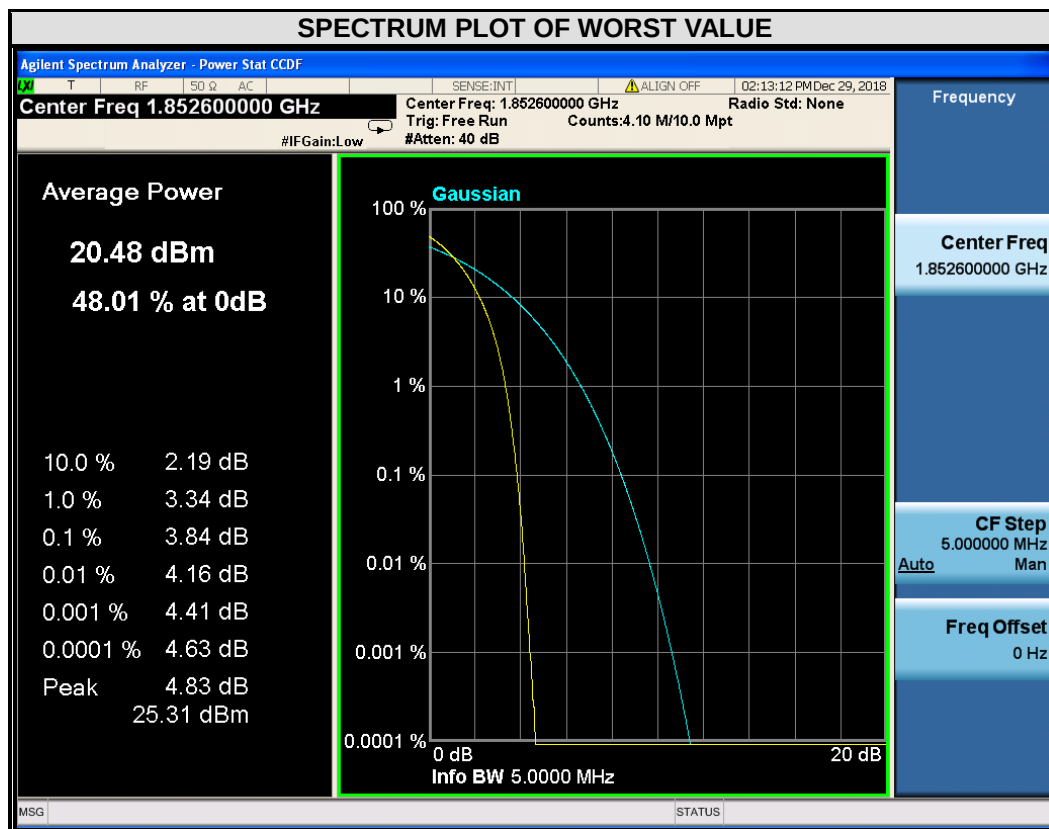
CHANNEL	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
810	1909.8	9.65





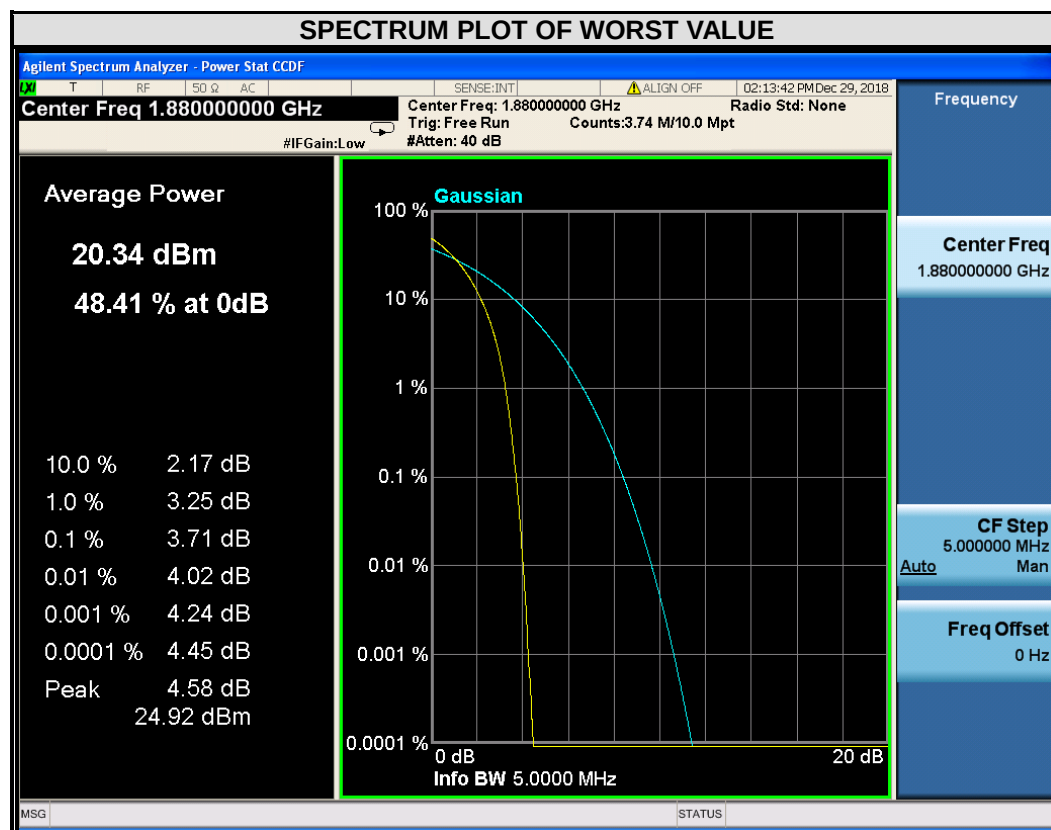
WCDMA

CHANNEL	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
9262	1852.4	3.84



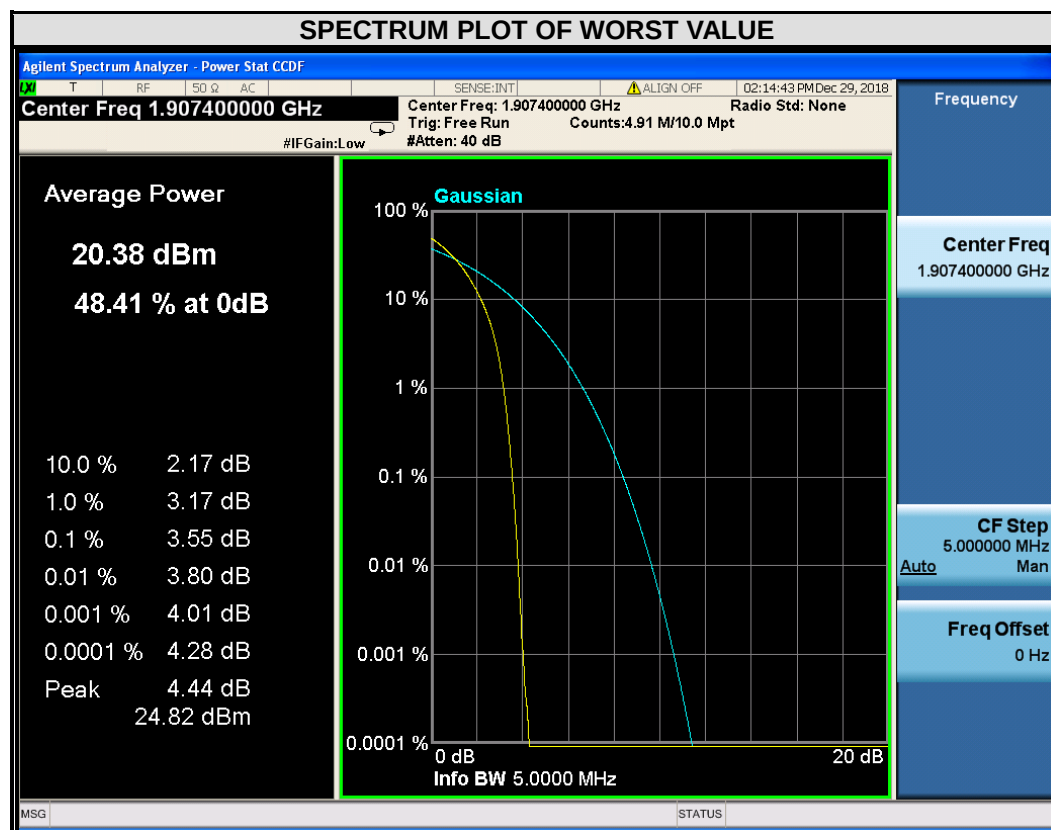


CHANNEL	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
9400	1880.0	3.71





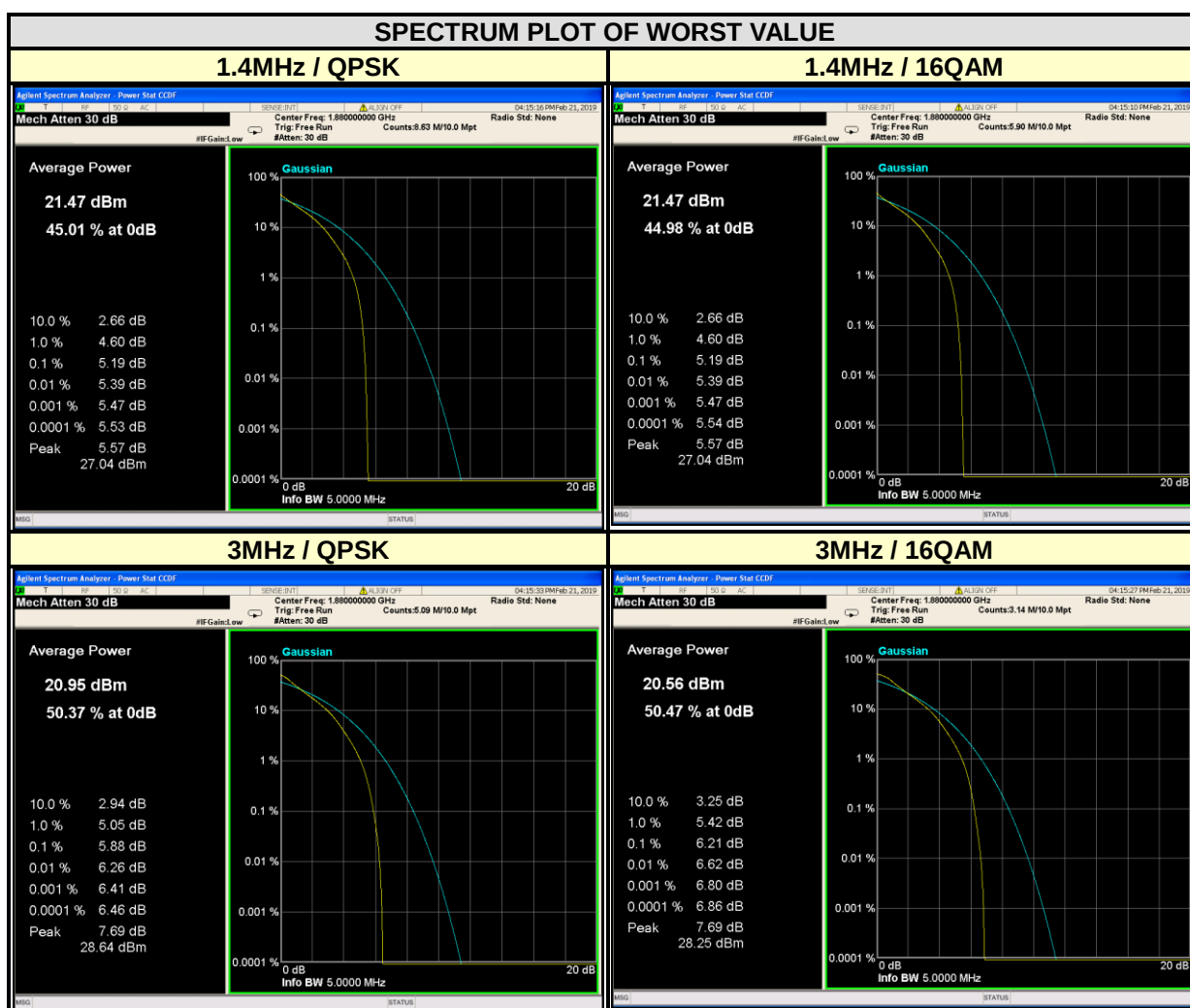
CHANNEL	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
9538	1907.4	3.55





LTE BAND 2

CHANNEL BANDWIDTH: 1.4MHz				CHANNEL BANDWIDTH: 3MHz			
CHANNEL	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)		CHANNEL	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)	
		QPSK	16QAM			QPSK	16QAM
18607	1850.7	4.68	5.41	18615	1851.5	4.87	5.63
18900	1880	5.19	5.19	18900	1880	5.88	6.21
19193	1909.3	4.37	5.27	19185	1908.5	4.91	5.77



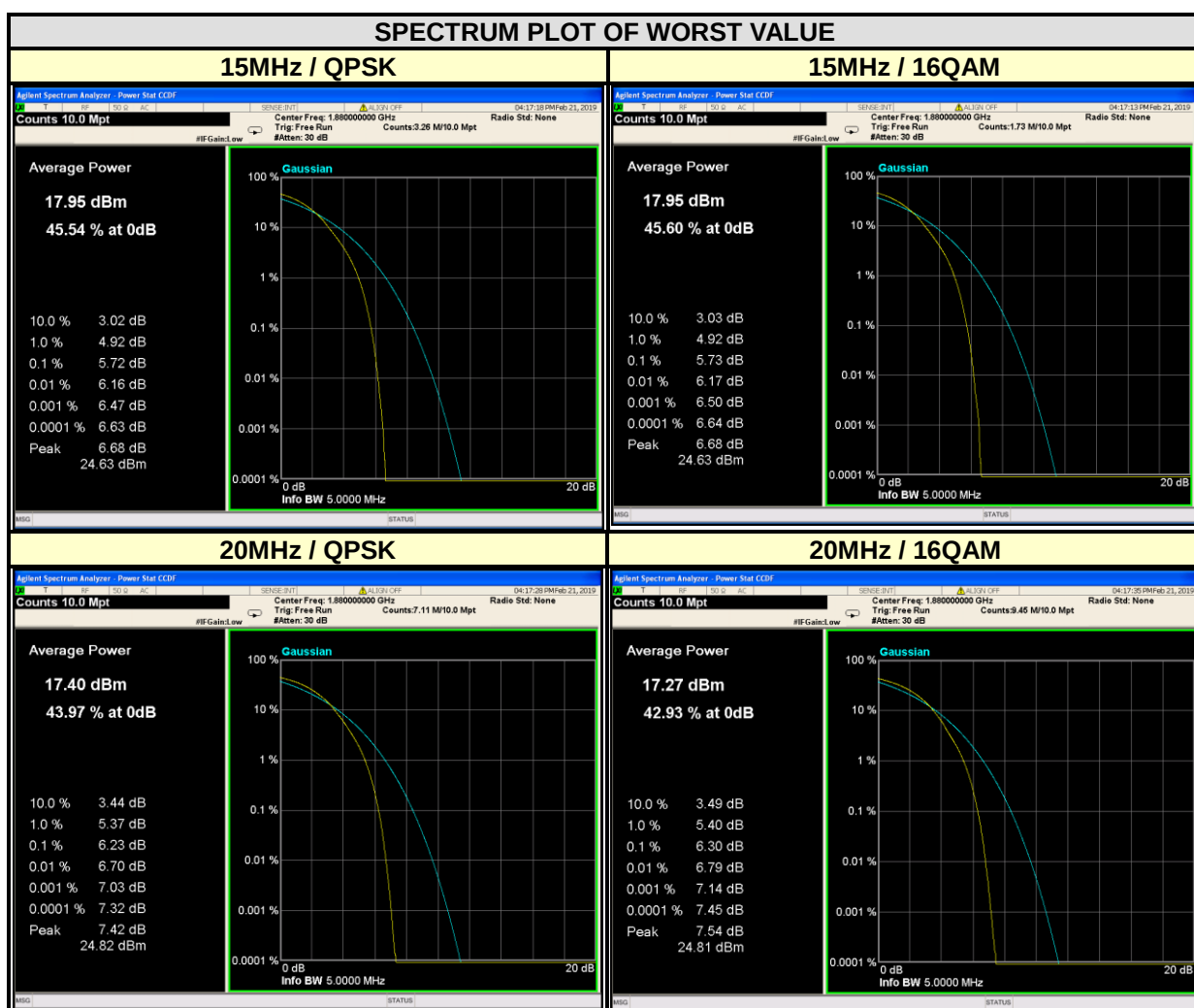


CHANNEL BANDWIDTH: 5MHz				CHANNEL BANDWIDTH: 10MHz			
CHANNEL	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)		CHANNEL	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)	
		QPSK	16QAM			QPSK	16QAM
18625	1852.5	4.79	5.47	18650	1855	4.60	4.17
18900	1880	5.80	5.80	18900	1880	4.75	4.79
19175	1907.5	4.88	5.77	19150	1905	4.51	5.22





CHANNEL BANDWIDTH: 15MHz				CHANNEL BANDWIDTH: 20MHz			
CHANNEL	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)		CHANNEL	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)	
		QPSK	16QAM			QPSK	16QAM
18675	1857.5	5.36	5.47	18700	1860	5.74	5.33
18900	1880	5.72	5.73	18900	1880	6.23	6.30
19125	1902.5	5.14	5.62	19100	1900	5.69	5.74





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4 PHOTOGRAPHS OF THE TEST CONFIGURATION

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



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---