

FCC Radio Test Report

FCC ID: ZMONL668LA05

This report concerns: Original Grant

Project No. : 2111C171
Equipment : LTE Module
Brand Name : Fibocom
Test Model : NL668-LA
Series Model : NL668-LA-05, NL668-LA-10, NL668-LA-30
Applicant : Fibocom Wireless Inc.
Address : 1101,Tower A, Building 6, Shenzhen International Innovation Valley, Dashi 1st Rd, Nanshan,Shenzhen,China
Manufacturer : Fibocom Wireless Inc.
Address : 1101,Tower A, Building 6, Shenzhen International Innovation Valley, Dashi 1st Rd, Nanshan,Shenzhen,China
Factory : Huizhou HYE Technology Co., Ltd.
Address : No. 237, Sanhe group, Sanhe village, Tonghu Town, Zhongkai hi tech Zone, Huizhou
Date of Receipt : Nov. 29, 2021
Date of Test : Dec. 03, 2021 ~ Dec. 31, 2021
Issued Date : Feb. 14, 2022
Report Version : R00
Test Sample : Engineering Sample No.: DG20211201108 for conducted, DG20211201110 for radiated.
Standard(s) : 47 CFR FCC Part 24 Subpart E
47 CFR FCC Part 2
ANSI C63.26-2015
ANSI/TIA/EIA-603-E-2016
FCC KDB 971168 D01 Power Meas License Digital Systems v03r01

The above equipment has been tested and found compliance with the requirement of the relative standards by BTL Inc.

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TESTING CERT #5123.02

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Declaration

BTL represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with standards traceable to international standard(s) and/or national standard(s).

BTL's reports apply only to the specific samples tested under conditions. It is manufacture's responsibility to ensure that additional production units of this model are manufactured with the identical electrical and mechanical components. **BTL** shall have no liability for any declarations, inferences or generalizations drawn by the client or others from **BTL** issued reports.

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BTL's laboratory quality assurance procedures are in compliance with the **ISO/IEC 17025** requirements, and accredited by the conformity assessment authorities listed in this test report.

BTL is not responsible for the sampling stage, so the results only apply to the sample as received.

The information, data and test plan are provided by manufacturer which may affect the validity of results, so it is manufacturer's responsibility to ensure that the apparatus meets the essential requirements of applied standards and in all the possible configurations as representative of its intended use.

Limitation

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.

Please note that the measurement uncertainty is provided for informational purpose only and is not use in determining the Pass/Fail results.

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REPORT ISSUED HISTORY

Report Version	Description	Issued Date
R00	Original Issue.	Feb. 14, 2022

1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standard(s):

FCC Part 24 Subpart E & Part 2			
Standard(s) Section	Test Item	Judgment	Remark
2.1046 24.232(c)	Equivalent Isotropic Radiated Power	PASS	-----
2.1049	Occupied Bandwidth	PASS	-----
2.1051 24.238(a)	Conducted Spurious Emissions	PASS	-----
2.1053 24.238(a)	Radiated Spurious Emissions	PASS	-----
24.238(a)	Band Edge Measurements	PASS	-----
24.232(d)	Peak To Average Ratio	PASS	-----
2.1055 24.235	Frequency Stability	PASS	-----

Note:

(1) "N/A" denotes test is not applicable in this test report.

1.1 TEST FACILITY

The test facilities used to collect the test data of radiated in this report is at the location of No. 3 Jinshagang 1st Rd. Shixia, Dalang Town Dongguan City, Guangdong 523792 People's Republic of China.

The test facilities used to collect the test data of conducted in this report is at the location of Room 108, Building 2, No.1, Yile Road, Songshan Lake Zone, Dongguan City, Guangdong, People's Republic of China.

BTL's Test Firm Registration Number for FCC: 357015

BTL's Designation Number for FCC: CN1240

1.2 MEASUREMENT UNCERTAINTY

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2))

The BTL measurement uncertainty as below table:

A. Radiated Measurement:

Test Site	Method	Measurement Frequency Range	U,(dB)
DG-CB01	CISPR	9kHz ~ 30MHz	2.36

Test Site	Method	Measurement Frequency Range	Ant. H / V	U,(dB)
DG-CB03	CISPR	30MHz ~ 200MHz	V	4.36
		30MHz ~ 200MHz	H	3.32
		200MHz ~ 1,000MHz	V	4.08
		200MHz ~ 1,000MHz	H	3.96
		1GHz ~ 6GHz	-	3.80
		6GHz ~ 18GHz	-	4.82
		18 GHz ~ 26.5 GHz	-	3.62

B. Other Measurement:

Parameter	Uncertainty
Spectrum Bandwidth	±3.8 %
Maximum Output Power	±0.95 dB
Power Spectral Density	±0.86 dB
Frequency Stability	±0.16 dB
Temperature	±0.08 °C
Time	±0.58 %
Supply voltages	±0.3 %

Note: Unless specifically mentioned, the uncertainty of measurement has not been taken into account to declare the compliance or non-compliance to the specification.

1.3 TEST ENVIRONMENT CONDITIONS

Test Item	Temperature	Humidity	Test Voltage	Tested By
Output Power & EIRP	23°C	44%	DC 3.8V	Rick Liao
Occupied Bandwidth	23°C	44%	DC 3.8V	Rick Liao
Conducted Spurious Emissions	23°C	44%	DC 3.8V	Rick Liao
Radiated Spurious Emissions (9 kHz to 30 MHz)	22°C	50%	DC 3.8V	Kwok Guo
Radiated Spurious Emissions (30 MHz to 1000 MHz)	22°C	50%	DC 3.8V	Kwok Guo
Radiated Spurious Emissions (Above 1000 MHz)	22°C	50%	DC 3.8V	Kwok Guo
Band Edge	23°C	44%	DC 3.8V	Rick Liao
Peak to Average Ratio	23°C	44%	DC 3.8V	Rick Liao
Frequency Stability	Normal & Extreme	44%	Normal & Extreme	Rick Liao

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Equipment	LTE Module			
Brand Name	Fibocom			
Test Model	NL668-LA			
Series Model	NL668-LA-05, NL668-LA-10, NL668-LA-30			
Model Difference(s)	Only differ in memory.			
Hardware Version	V1.0.0			
Software Version	19005.1000.15.02.00.05			
Power Source	DC voltage supplied from external power supply.			
Power Rating	DC 3.3V~4.3V			
IMEI No.	Radiated	860333050418759		
	Conducted	860333050419385		
Modulation Type	GSM	GMSK		
	EDGE/GPRS	GMSK, 8PSK		
	WCDMA/HSDPA/HSUPA	UL: QPSK DL: QPSK, 16QAM		
	LTE	UL: QPSK, 16QAM DL: QPSK, 16QAM, 64QAM		
Max. EIRP	GSM 1900 / GPRS 1900		GMSK	29.25 dBm
	EDGE 1900		8PSK	25.02 dBm
	WCDMA Band II		QPSK	24.63 dBm
	HSDPA Band II		QPSK	23.36 dBm
	HSUPA Band II		QPSK	23.66 dBm
	LTE	Channel Bandwidth (MHz)	QPSK (dBm)	16QAM (dBm)
	Band 2	1.4	23.33	22.85
		3	23.43	23.33
		5	23.36	22.05
		10	23.92	23.08
		15	23.80	23.53
		20	23.43	22.20

Note:

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

2. Channel List:

PCS 1900				
Test Frequency ID	UARFCN	Frequency of Uplink (MHz)	UARFCN	Frequency of Downlink (MHz)
Low Range	512	1850.2	528	1930.2
Mid Range	661	1880	677	1960
High Range	810	1909.8	826	1989.8

WCDMA Band II				
Test Frequency ID	UARFCN	Frequency of Uplink (MHz)	UARFCN	Frequency of Downlink (MHz)
Low Range	9262	1852.4	9662	1932.4
Mid Range	9400	1880.0	9800	1960.0
High Range	9538	1907.6	9938	1987.6

LTE Band 2					
Test Frequency ID	Bandwidth (MHz)	N _{UL}	Frequency of Uplink (MHz)	N _{DL}	Frequency of Downlink (MHz)
Low Range	1.4	18607	1850.7	607	1930.7
	3	18615	1851.5	615	1931.5
	5	18625	1852.5	625	1932.5
	10	18650	1855	650	1935
	15	18675	1857.5	675	1937.5
	20	18700	1860	700	1940
Mid Range	1.4/3/5/10/15/20	18900	1880	900	1960
High Range	1.4	19193	1909.3	1193	1989.3
	3	19185	1908.5	1185	1988.5
	5	19175	1907.5	1175	1987.5
	10	19150	1905	1150	1985
	15	19125	1902.5	1125	1982.5
	20	19100	1900	1100	1980

3. Table for Filed Antenna:

Brand	Model Name	Antenna Type	Connector	Gain (dBi)	Note
N/A	N/A	Dipole	SMA	0.9	PCS 1900
N/A	N/A	Dipole	SMA	0.9	WCDMA Band II
N/A	N/A	Dipole	SMA	0.9	LTE Band 2

Note: The antenna gain is provided by the manufacturer.

2.2 DESCRIPTION OF TEST MODES

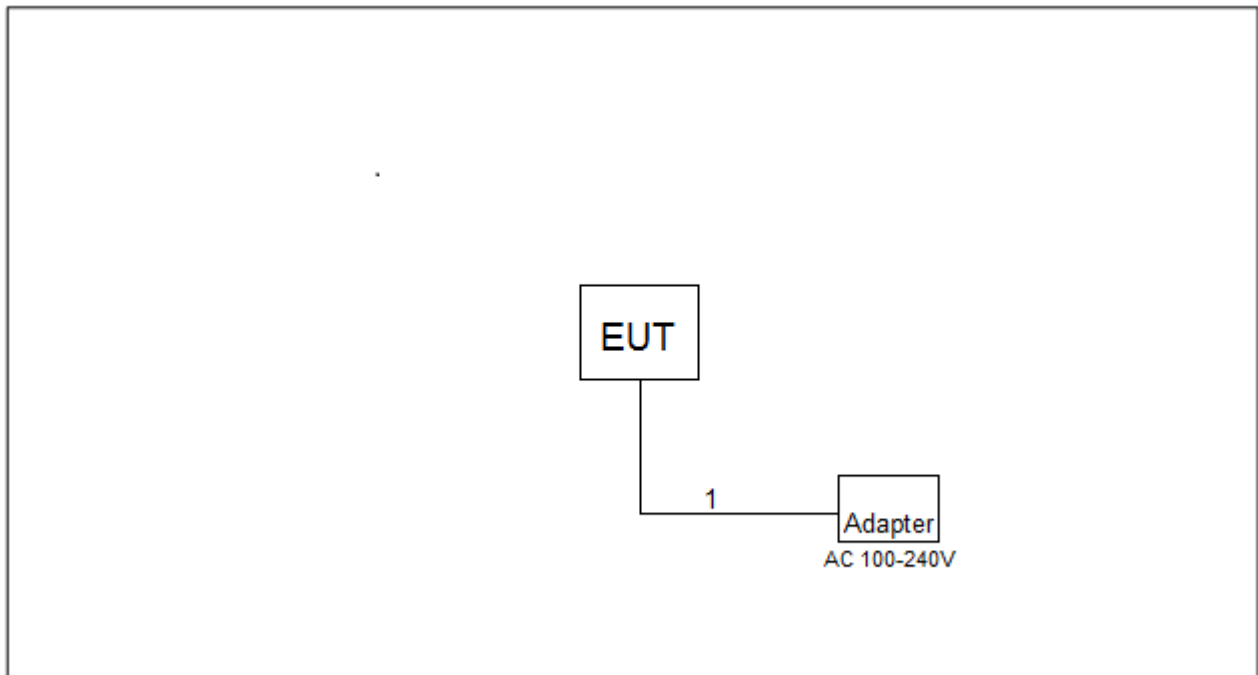
Following mode(s) is (were) found to be the worst case(s) and selected for the final test.

GSM MODE			
Test Item	Available Channel	Tested Channel	Mode
Output Power & EIRP	512 to 810	512, 661, 810	GSM, GPRS, EDGE
Occupied Bandwidth	512 to 810	512, 661, 810	GSM, EDGE
Conducted Spurious Emissions	512 to 810	661	GSM, EDGE
Radiated Spurious Emissions	512 to 810	661	GSM
Band Edge	512 to 810	512, 810	GSM, EDGE
Peak to Average Ratio	512 to 810	512, 661, 810	GSM, EDGE
Frequency Stability	512 to 810	512, 810	GSM

WCDMA BAND II MODE			
Test Item	Available Channel	Tested Channel	Mode
Output Power & EIRP	9262 to 9538	9262, 9400, 9538	WCDMA, HSDPA, HSUPA
Occupied Bandwidth	9262 to 9538	9262, 9400, 9538	WCDMA
Conducted Spurious Emissions	9262 to 9538	9400	WCDMA
Radiated Spurious Emissions	9262 to 9538	9400	WCDMA
Band Edge	9262 to 9538	9262, 9538	WCDMA
Peak to Average Ratio	9262 to 9538	9262, 9400, 9538	WCDMA
Frequency Stability	9262 to 9538	9262, 9538	WCDMA

LTE BAND 2 MODE					
Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
Output Power & EIRP	18607 to 19193	18607, 18900, 19193	1.4MHz	QPSK, 16QAM	1RB/3RB/6RB
	18615 to 19185	18615 , 18900, 19185	3MHz	QPSK, 16QAM	1RB/8RB/15RB
	18625 to 19175	18625, 18900, 19175	5MHz	QPSK, 16QAM	1RB/12RB/25RB
	18650 to 19150	18650, 18900, 19150	10MHz	QPSK, 16QAM	1RB/25RB/50RB
	18675 to 19125	18675, 18900, 19125	15MHz	QPSK, 16QAM	1RB/36RB/75RB
	18700 to 19100	18700, 18900, 19100	20MHz	QPSK, 16QAM	1RB/50RB/100RB
Occupied Bandwidth	18607 to 19193	18607, 18900, 19193	1.4MHz	QPSK, 16QAM	6RB
	18615 to 19185	18615 , 18900, 19185	3MHz	QPSK, 16QAM	15RB
	18625 to 19175	18625, 18900, 19175	5MHz	QPSK, 16QAM	25RB
	18650 to 19150	18650, 18900, 19150	10MHz	QPSK, 16QAM	50RB
	18675 to 19125	18675, 18900, 19125	15MHz	QPSK, 16QAM	75RB
	18700 to 19100	18700, 18900, 19100	20MHz	QPSK, 16QAM	100RB
Conducted Spurious Emissions	18607 to 19193	18900	1.4 MHz	QPSK	1RB
	18625 to 19175	18900	5MHz	QPSK	1RB
	18700 to 19100	18900	20MHz	QPSK	1RB
Radiated Spurious Emissions	18607 to 19193	18900	1.4 MHz	QPSK	1RB
	18625 to 19175	18900	5MHz	QPSK	1RB
	18700 to 19100	18900	20MHz	QPSK	1RB
Band Edge	18607 to 19193	18607, 19193	1.4MHz	QPSK	1RB/6RB
	18615 to 19185	18615, 19185	3MHz	QPSK	1RB/15RB
	18625 to 19175	18625, 19175	5MHz	QPSK	1RB/25RB
	18650 to 19150	18650, 19150	10MHz	QPSK	1RB/50RB
	18675 to 19125	18675, 19125	15MHz	QPSK	1RB/75RB
	18700 to 19100	18700, 19100	20MHz	QPSK	1RB/100RB
Peak To Average Ratio	18607 to 19193	18607, 18900, 19193	1.4MHz	QPSK, 16QAM	1RB
	18615 to 19185	18615 , 18900, 19185	3MHz	QPSK, 16QAM	1RB
	18625 to 19175	18625, 18900, 19175	5MHz	QPSK, 16QAM	1RB
	18650 to 19150	18650, 18900, 19150	10MHz	QPSK, 16QAM	1RB
	18675 to 19125	18675, 18900, 19125	15MHz	QPSK, 16QAM	1RB
	18700 to 19100	18700, 18900, 19100	20MHz	QPSK, 16QAM	1RB
Frequency Stability	18700 to 19100	18700, 19100	20MHz	QPSK	1RB

2.3 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



2.4 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.

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.
-	Adapter	HUAWEI	HW-050100U01	-

Item	Cable Type	Shielded Type	Ferrite Core	Length
1	USB Cable	YES	NO	1.2m

3. TEST RESULT

3.1 OUTPUT POWER MEASUREMENT

3.1.1 LIMIT

Mobile / Portable station are limited to 2 watts e.i.r.p.

3.1.2 TEST PROCEDURE

The testing follows FCC KDB 971168 v03r01 Section 5.

EIRP:

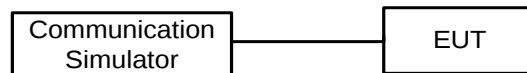
$EIRP = \text{Output Power} + \text{Antenan gain}$

Output Power:

The EUT was set up for the maximum power with GSM, GPRS, EDGE, WCDMA and 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 LAYOUT

Output Power Measurement



3.1.4 TEST DEVIATION

No deviation

3.1.5 TEST RESULTS

Please refer to the APPENDIX A.

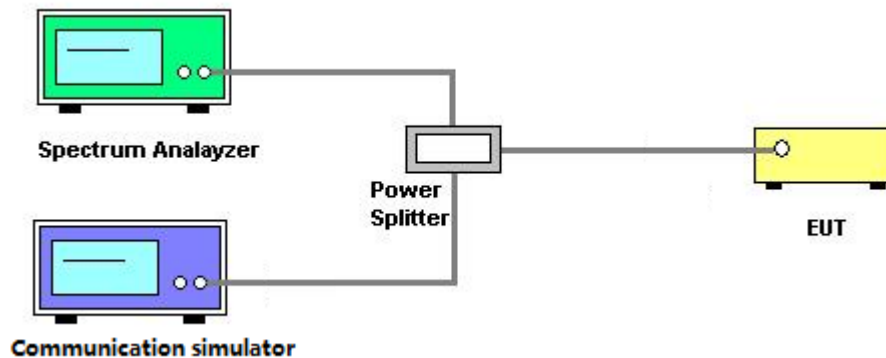
3.2 OCCUPIED BANDWIDTH MEASUREMENT

3.2.1 TEST PROCEDURE

The testing follows FCC KDB 971168 v03r01 Section 4.

1. 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 and 26dB bandwidth.
2. The EUT was connected to spectrum analyzer and system simulator via a power divider.
3. $RBW = (1\% \sim 5\%) \cdot EBW$
 $VBW \geq 3 \cdot RBW$
4. Set spectrum analyzer with Peak detector.

3.2.2 TEST SETUP LAYOUT



3.2.3 TEST DEVIATION

No deviation

3.2.4 TEST RESULTS

Please refer to the APPENDIX B.

3.3 CONDUCTED SPURIOUS EMISSIONS MEASUREMENT

3.3.1 LIMIT

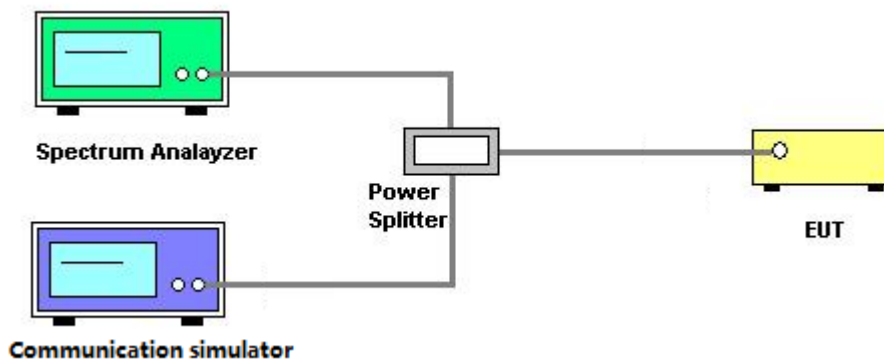
The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB. The emission limit equal to -13dBm.

3.3.2 TEST PROCEDURES

The testing follows FCC KDB 971168 v03r01 Section 6.

1. The EUT was connected to spectrum analyzer and system simulator via a power divider.
2. The band edges of low and high channels for the highest RF powers were measured. Set RBW $\geq 1\%$ EBW in the 1MHz band immediately outside and adjacent to the band edge.
3. Set spectrum analyzer with Peak detector.
4. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

3.3.3 TEST SETUP LAYOUT



3.3.4 TEST DEVIATION

No deviation

3.3.5 TEST RESULTS

Please refer to the APPENDIX C.

3.4 RADIATED SPURIOUS EMISSIONS MEASUREMENT

3.4.1 LIMIT

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.

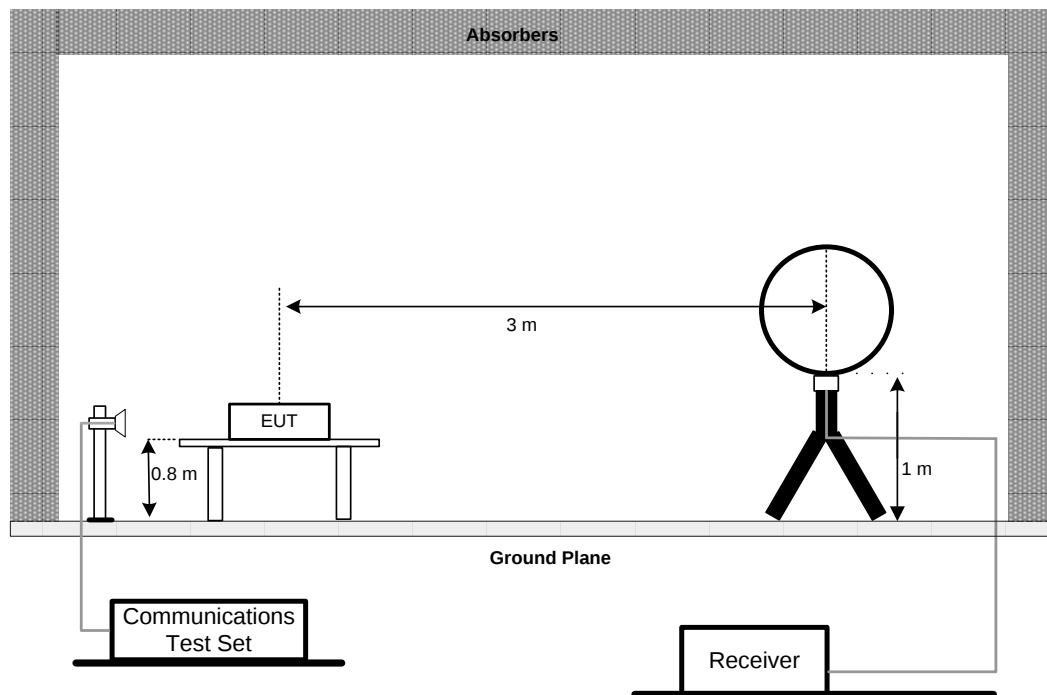
3.4.2 TEST PROCEDURES

The testing follows FCC KDB 971168 v03r01 Section 6.2.

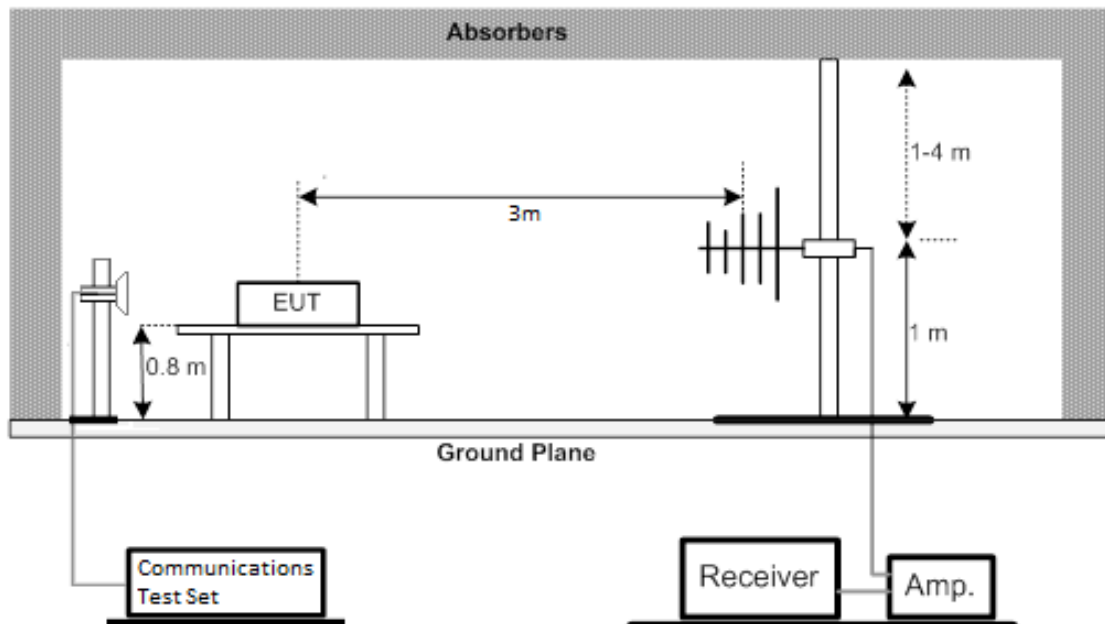
1. In the semi-anechoic chamber, EUT placed on the 0.8m height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum polar radiated power. The "Read Value" is the spectrum reading the maximum power value.
2. 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
3. $EIRP = \text{Output power level of S.G} - \text{TX cable loss} + \text{Antenna gain of substitution horn}.$
4. ERP can be calculated form EIRP by subtracting the gain of dipole, $ERP = EIPR - 2.15\text{dBi}.$
5. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1MHz/3MHz.

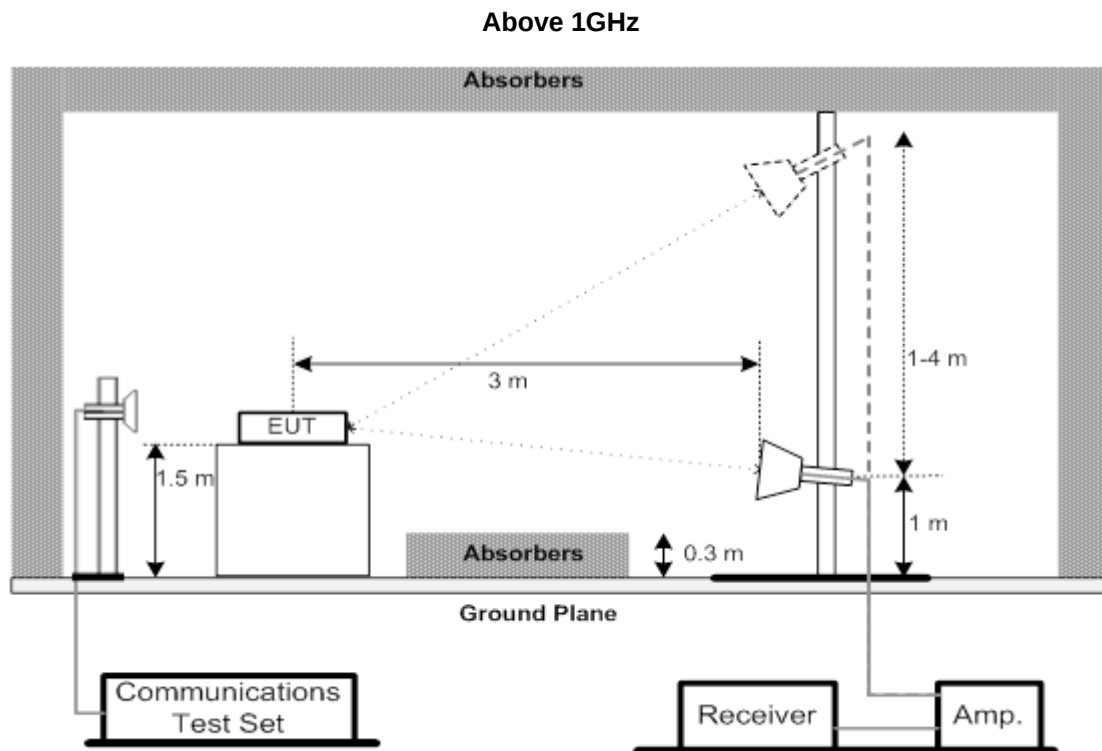
3.4.3 TEST SETUP LAYOUT

Below 30MHz



30MHz to 1000MHz





3.4.4 TEST DEVIATION

No deviation

3.4.5 TEST RESULTS (9KHZ TO 30MHZ)

Please refer to the APPENDIX D.

3.4.6 TEST RESULTS (30MHZ TO 1000MHZ)

Please refer to the APPENDIX E.

3.4.7 TEST RESULTS (ABOVE 1000MHZ)

Please refer to the APPENDIX F.

3.5 BAND EDGE MEASUREMENT

3.5.1 LIMIT

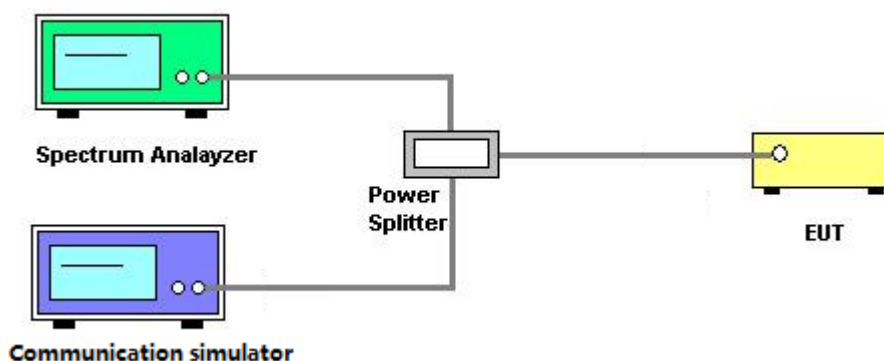
A Power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

3.5.2 TEST PROCEDURES

The testing follows FCC KDB 971168 v03r01 Section 6.

1. All measurements were done at low and high operational frequency range.
2. Record the max trace plot into the test report.

3.5.3 TEST SETUP LAYOUT



3.5.4 TEST DEVIATION

No deviation

3.5.5 TEST RESULTS

Please refer to the APPENDIX G.

3.6 PEAK TO AVERAGE RATIO MEASUREMENT

3.6.1 LIMIT

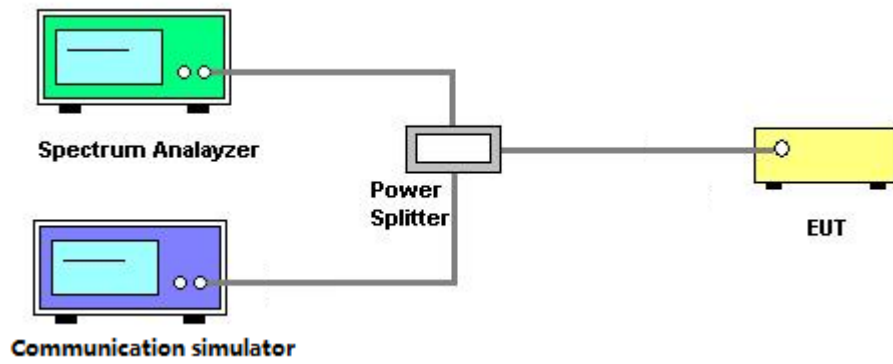
In measuring transmissions in this band using an average power technique, the peak to-average ratio (PAR) of the transmission may not exceed 13 dB.

3.6.2 TEST PROCEDURES

The testing follows FCC KDB 971168 v03r01 Section 5.7.

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%.

3.6.3 TEST SETUP LAYOUT



3.6.4 TEST DEVIATION

No deviation

3.6.5 TEST RESULTS

Please refer to the APPENDIX H.

3.7 FREQUENCY STABILITY MEASUREMENT

3.7.1 LIMIT

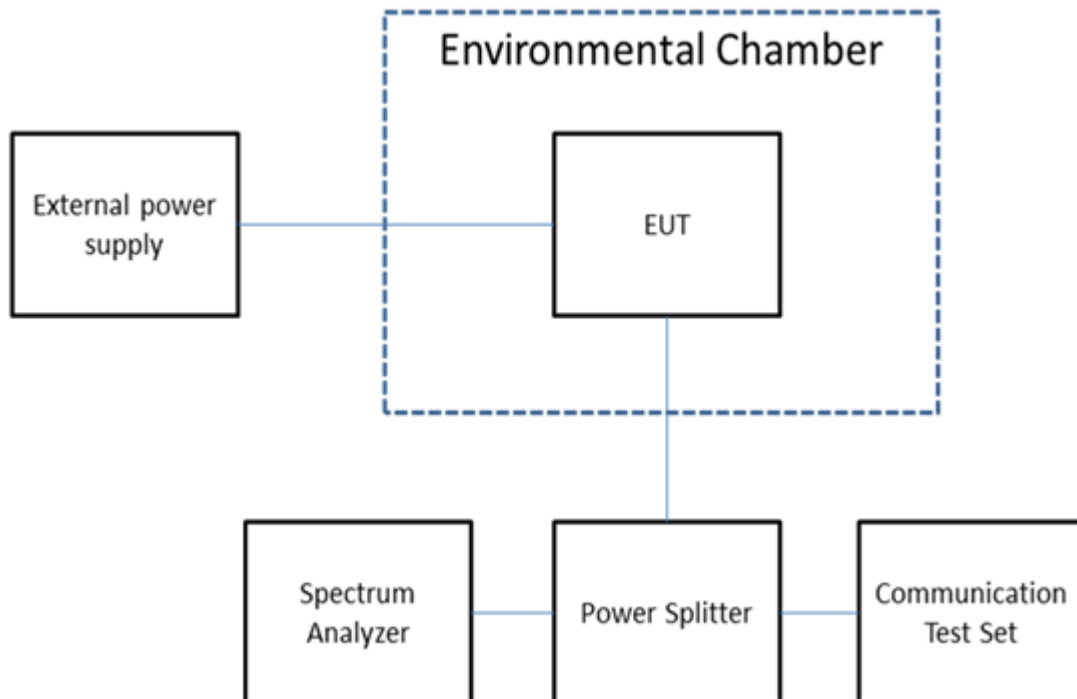
The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

3.7.2 TEST PROCEDURES

The testing follows ANSI C63.26-2015 Section 5.6.

1. A reference point shall be established at the applicable unwanted emissions limit using a RBW equal to the RBW required by the unwanted emissions specification of the applicable regulatory standard. These reference points measured using the lowest and highest channel of operation shall be identified as f_L and f_H respectively. The worst-case frequency offset determined in the above methods shall be added or subtracted from the values of f_L and f_H and the resulting frequencies must remain within the band.
2. The EUT was set up in the thermal chamber and connected with the system simulator.
3. With power OFF, the temperature was decreased to -30°C and the EUT was stabilized before testing. Power was applied and the maximum change in frequency was recorded within one minute.
4. With power OFF, the temperature was raised in 10°C step up to 50°C . The EUT was stabilized at each step for at least half an hour. Power was applied and the maximum frequency change was recorded within one minute.

3.7.3 TEST SETUP LAYOUT



3.7.4 TEST DEVIATION

No deviation

3.7.5 TEST RESULTS

Please refer to the APPENDIX I.

4. LIST OF MEASUREMENT EQUIPMENTS

Radiated Emissions - 9 kHz to 30 MHz					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	MXE EMI Receiver	Keysight	N9038A	MY56400091	Feb. 27, 2022
2*	Active Loop Antenna	R&S	HFH2-Z2	830749/020	Aug. 23, 2024
3	Cable	N/A	RG 213/U (9kHz~1GHz)	N/A	May 27, 2022
4	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A
5	wideband radio communication tester	R&S	CMW500	152372	Feb. 27, 2022
6	Wireless Communication Test SET	Agilent	E5515C	MY48364183	Feb. 28, 2022
7	966 Chamber Room	ETS	9*6*6	N/A	Jul. 17, 2022

Radiated Emissions - 30 MHz to 1 GHz					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Antenna	Schwarzbeck	VULB9160	9160-3232	Mar. 15, 2022
2	Amplifier	HP	8447D	2944A08742	Feb. 28, 2022
3	Cable	emci	LMR-400	N/A	May 20, 2022
4	Controller	CT	SC100	N/A	N/A
5	Controller	MF	MF-7802	MF780208416	N/A
6	Receiver	Agilent	N9038A	MY52130039	Mar. 19, 2022
7	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A
8	wideband radio communication tester	R&S	CMW500	152372	Feb. 27, 2022
9	Wireless Communication Test SET	Agilent	E5515C	MY48364183	Feb. 28, 2022
10	966 Chamber Room	RM	9*6*6	N/A	Jul. 24, 2022

Radiated Emissions - Above 1 GHz					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Double Ridged Horn Antenna	ARA	DRG-118A	16554	Apr. 21, 2022
2	Broad-Band Horn Antenna	Schwarzbeck	BBHA 9170	9170319	Jun. 30, 2022
3	Amplifier	Agilent	8449B	3008A02584	Jul. 10, 2022
4	Controller	CT	SC100	N/A	N/A
5	Controller	MF	MF-7802	MF780208416	N/A
6	Receiver	Agilent	N9038A	MY52130039	Mar. 19, 2022
7	EXA Spectrum Analyzer	Keysight	N9010A	MY56480488	Feb. 28, 2022
8	Low Noise Amplifier	CONNPHY	CLN-18G40G -4330-K	619413	Jul. 16, 2022
9	Cable	N/A	A81-SMAMSMAM -12.5M	N/A	Oct. 15, 2022
10	Cable	Talent microwave	A40-2.92M2.92M -2.5M	N/A	Nov. 30, 2022
11	Filter	STI	STI15-9912	N/A	Jul. 10, 2022
12	Measurement Software	Farad	EZ-EMC Ver.NB -03A1-01	N/A	N/A
13	wideband radio communication tester	R&S	CMW500	152372	Feb. 27, 2022
14	Wireless Communication Test SET	Agilent	E5515C	MY48364183	Feb. 28, 2022
15	966 Chamber Room	RM	9*6*6	N/A	Jul. 24, 2022

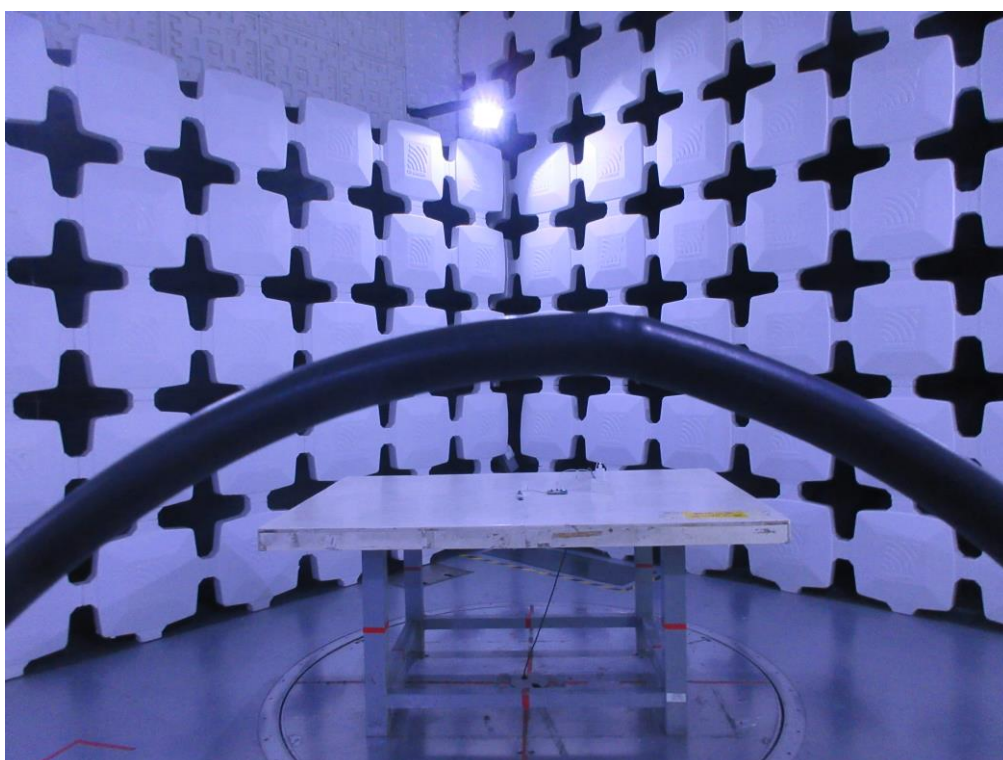
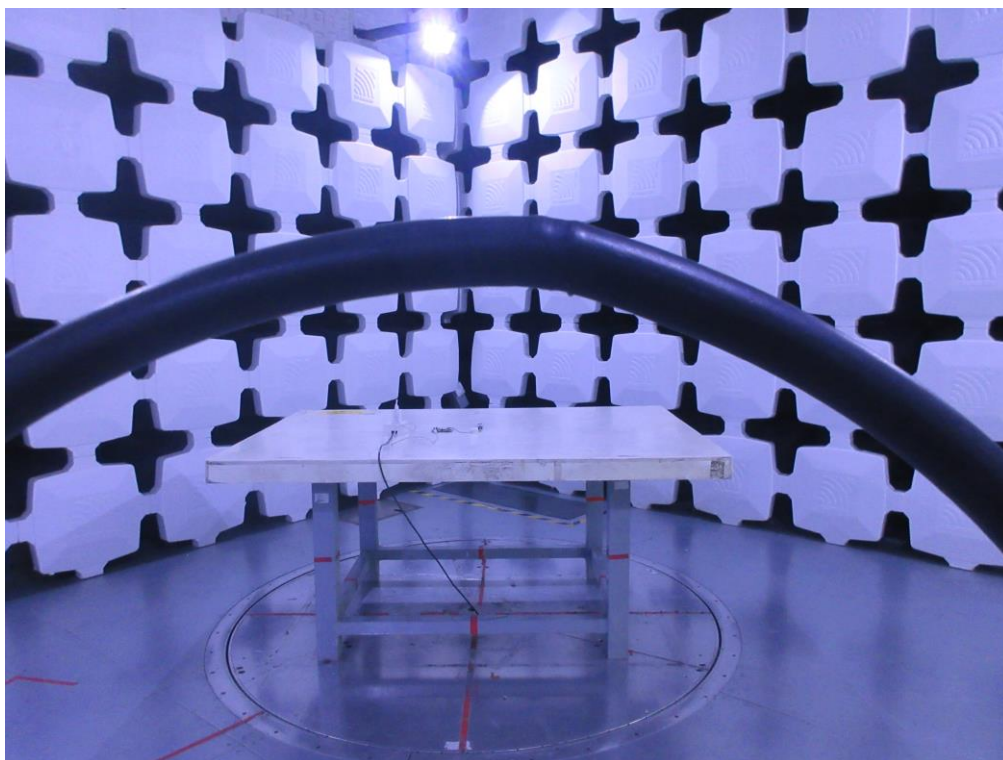
Conducted Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	8960 Series 10 Wireless Com Test set	Agilent	E5515E	MY52112163	Jul. 24, 2022
2	MXA Signal Analyzer	Keysight	N9020A	MY49100060	Jul. 24, 2022
3	Power Splitter	Mini-Circuits	ZFRSC-183-S+	SF103501511S	Jul. 24, 2022
4	wideband radio communication tester	R&S	CMW500	104462	Jul. 24, 2022
5	Const Temp. & Humidity Chamber	Bell	BTH-50C	20170306001	Feb. 27, 2022
6*	Multi-output DC Power Supply	GW Instek	GPC-3030DN	EK880675	Jul. 25, 2023
7	Signal Analyzer	R&S	FSQ-26	200822	Feb. 27, 2022

Remark: "N/A" denotes no model name, serial no. or calibration specified.
Except * item, all calibration period of equipment list is one year.
"***" calibration period of equipment list is three year.

5. EUT TEST PHOTO

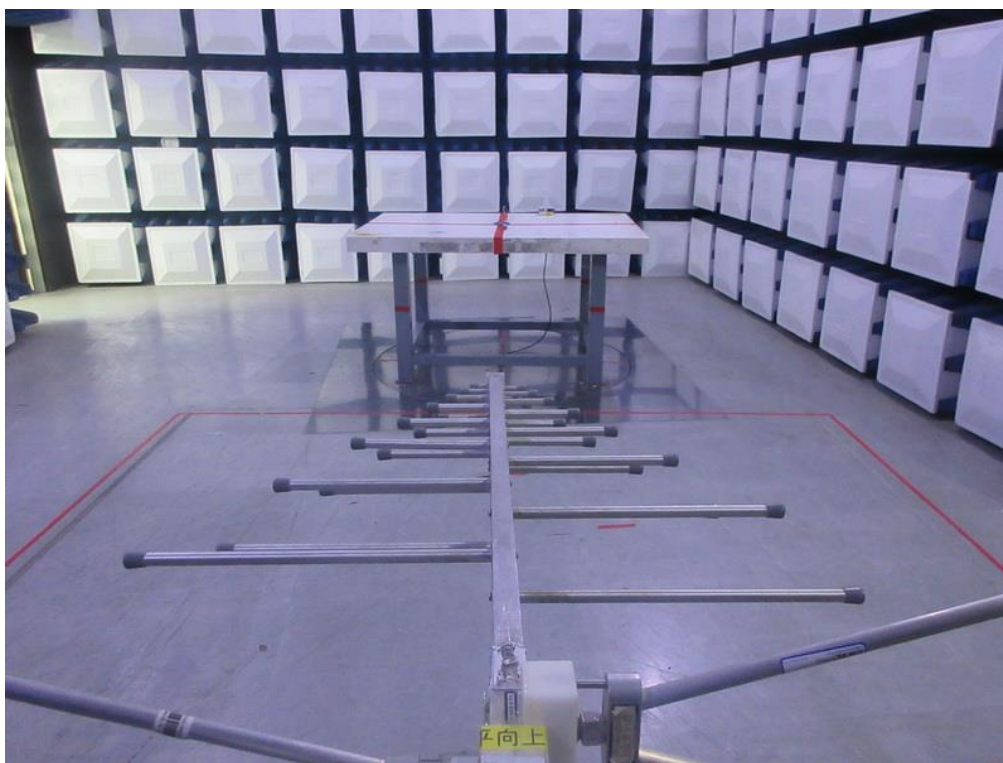
Radiated Emissions Test Photos

9 kHz to 30 MHz

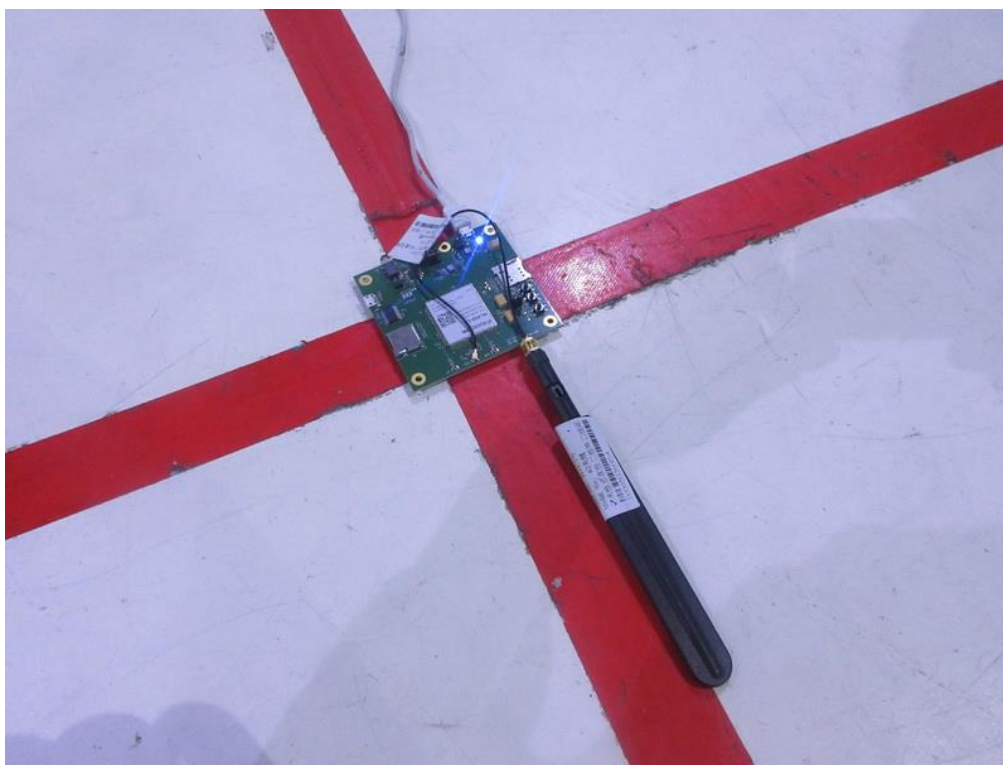


Radiated Emissions Test Photos

30 MHz to 1 GHz



Radiated Emissions Test Photos**Above 1 GHz**



APPENDIX A - OUTPUT POWER

Output Power (dBm):

PCS1900		512CH	661CH	810CH
		1850.2MHz	1880MHz	1909.8MHz
GSM (CS)		28.35	28.20	28.25
GPRS/EDGE (GMSK)	1 Tx Slot	27.95	27.89	27.94
	2 Tx Slot	25.42	25.46	25.48
	3 Tx Slot	24.33	24.32	24.38
	4 Tx Slot	22.66	22.67	22.82
EDGE (8PSK)	1 Tx Slot	23.7	23.98	24.12
	2 Tx Slot	21.7	21.66	21.42
	3 Tx Slot	20.4	20.45	20.62
	4 Tx Slot	18.51	18.46	18.15

Modulation	Band	WCDMA Band II		
	Tx Channel	9262CH	9400CH	9538CH
	Frequency	1852.4MHz	1880MHz	1907.6MHz
QPSK	RMC 12.2K	23.45	23.58	23.57
	RMC 64K	23.44	23.55	23.54
	RMC 144K	23.44	23.59	23.57
	RMC 384K	23.43	23.55	23.73
	HSDPA Subtest-1	22.34	22.46	22.4
	HSDPA Subtest-2	22.29	22.44	22.35
	HSDPA Subtest-3	21.87	21.94	21.87
	HSDPA Subtest-4	21.85	21.93	21.85
	HSUPA Subtest-1	22.58	22.53	22.42
	HSUPA Subtest-2	21.52	21.25	21.6
	HSUPA Subtest-3	21.42	20.94	21.6
	HSUPA Subtest-4	21.47	21.38	21.66
	HSUPA Subtest-5	22.5	22.57	22.76

LTE Band / BW	Modulation	RB Size	RB Offset	Low CH	Mid CH	High CH
				18607CH	18900CH	19193CH
				1850.7MHz	1880MHz	1909.3MHz
2 / 1.4MHz	QPSK	1	0	22.39	21.96	22.19
		1	2	22.35	22.22	22.14
		1	5	22.43	22.13	22.11
		3	0	22.41	22.03	22.20
		3	1	22.39	22.14	22.17
		3	2	22.35	22.08	22.17
		6	0	21.34	21.09	21.17
	16QAM	1	0	21.36	21.23	20.75
		1	2	21.95	21.42	20.99
		1	5	21.43	21.18	21.00
		3	0	21.72	21.23	20.88
		3	1	21.64	21.28	20.86
		3	2	21.63	21.24	20.94
		6	0	20.65	20.25	20.09

LTE Band / BW	Modulation	RB Size	RB Offset	Low CH	Mid CH	High CH
				18615CH	18900CH	19185CH
				1851.5MHz	1880MHz	1908.5MHz
2 / 3MHz	QPSK	1	0	22.50	22.21	22.43
		1	7	22.53	21.82	22.08
		1	14	22.52	21.89	22.07
		8	0	21.29	21.14	21.18
		8	4	21.50	21.13	21.24
		8	7	21.39	21.06	21.22
		15	0	21.37	21.22	21.20
	16QAM	1	0	21.63	20.99	21.46
		1	7	21.94	21.06	21.26
		1	14	22.43	20.94	20.80
		8	0	20.48	20.21	20.03
		8	4	20.53	20.18	20.04
		8	7	20.66	20.16	20.01
		15	0	20.37	20.21	19.96

LTE Band / BW	Modulation	RB Size	RB Offset	Low CH	Mid CH	High CH
				18625CH	18900CH	19175CH
				1852.5MHz	1880MHz	1907.5MHz
2 / 5MHz	QPSK	1	0	22.33	21.92	22.17
		1	13	22.28	21.99	21.97
		1	24	22.46	21.90	22.16
		12	0	21.45	21.28	21.04
		12	6	21.46	21.11	21.22
		12	11	21.39	21.13	21.24
		25	0	21.36	21.21	21.13
	16QAM	1	0	20.74	21.09	21.15
		1	13	21.13	20.65	20.86
		1	24	20.95	20.65	20.75
		12	0	20.29	20.11	20.00
		12	6	20.18	20.09	19.98
		12	11	20.12	20.11	20.08
		25	0	20.44	20.33	20.07

LTE Band / BW	Modulation	RB Size	RB Offset	Low CH	Mid CH	High CH
				18650CH	18900CH	19150CH
				1855MHz	1880MHz	1905MHz
2 / 10MHz	QPSK	1	0	22.42	22.52	22.37
		1	25	22.57	22.02	22.13
		1	49	23.02	22.04	22.33
		25	0	21.29	21.25	20.99
		25	13	21.36	21.11	21.07
		25	25	21.39	21.14	21.05
		50	0	21.36	21.14	20.96
	16QAM	1	0	21.73	21.30	21.64
		1	25	22.00	20.46	21.47
		1	49	22.18	20.56	21.03
		25	0	20.22	20.48	19.93
		25	13	20.33	20.31	19.92
		25	25	20.54	20.25	19.86
		50	0	20.48	20.35	19.97

LTE Band / BW	Modulation	RB Size	RB Offset	Low CH	Mid CH	High CH
				18675CH	18900CH	19125CH
				1857.5MHz	1880MHz	1902.5MHz
2 / 15MHz	QPSK	1	0	22.90	22.10	21.92
		1	38	22.83	21.95	21.88
		1	74	22.74	22.01	22.11
		36	0	21.23	21.08	20.98
		36	18	21.41	21.08	21.06
		36	39	21.49	21.07	20.93
		75	0	21.36	21.19	20.95
	16QAM	1	0	22.06	21.19	21.45
		1	38	22.36	21.02	21.46
		1	74	22.63	20.89	21.14
		36	0	20.23	20.29	19.78
		36	18	20.36	20.11	19.89
		36	39	20.41	20.03	19.96
		75	0	20.36	20.15	19.92

LTE Band / BW	Modulation	RB Size	RB Offset	Low CH	Mid CH	High CH
				18700CH	18900CH	19100CH
				1860MHz	1880MHz	1900MHz
2 / 20MHz	QPSK	1	0	22.24	22.41	21.76
		1	50	22.53	21.96	22.33
		1	99	22.01	22.03	22.22
		50	0	21.45	21.15	21.05
		50	25	21.52	21.15	21.05
		50	50	21.52	20.95	21.03
		100	0	21.43	21.10	21.05
	16QAM	1	0	21.01	21.14	20.58
		1	50	21.30	20.89	20.98
		1	99	20.81	20.76	20.89
		50	0	20.25	20.13	19.90
		50	25	20.48	20.13	19.94
		50	50	20.40	19.96	19.95
		100	0	20.34	20.19	19.92

EIRP (dBm):

PCS1900		512CH	661CH	810CH
		1850.2MHz	1880MHz	1909.8MHz
GSM (CS)		29.25	29.10	29.15
GPRS/EDGE (GMSK)	1 Tx Slot	28.85	28.79	28.84
	2 Tx Slot	26.32	26.36	26.38
	3 Tx Slot	25.23	25.22	25.28
	4 Tx Slot	23.56	23.57	23.72
EDGE (8PSK)	1 Tx Slot	24.60	24.88	25.02
	2 Tx Slot	22.60	22.56	22.32
	3 Tx Slot	21.30	21.35	21.52
	4 Tx Slot	19.41	19.36	19.05

Modulation	Band	WCDMA Band II		
	Tx Channel	9262CH	9400CH	9538CH
	Frequency	1852.4MHz	1880MHz	1907.6MHz
QPSK	RMC 12.2K	24.35	24.48	24.47
	RMC 64K	24.34	24.45	24.44
	RMC 144K	24.34	24.49	24.47
	RMC 384K	24.33	24.45	24.63
	HSDPA Subtest-1	23.24	23.36	23.30
	HSDPA Subtest-2	23.19	23.34	23.25
	HSDPA Subtest-3	22.77	22.84	22.77
	HSDPA Subtest-4	22.75	22.83	22.75
	HSUPA Subtest-1	23.48	23.43	23.32
	HSUPA Subtest-2	22.42	22.15	22.50
	HSUPA Subtest-3	22.32	21.84	22.50
	HSUPA Subtest-4	22.37	22.28	22.56
	HSUPA Subtest-5	23.40	23.47	23.66

LTE Band / BW	Modulation	RB Size	RB Offset	Low CH	Mid CH	High CH
				18607CH	18900CH	19193CH
				1850.7MHz	1880MHz	1909.3MHz
2 / 1.4MHz	QPSK	1	0	23.29	22.86	23.09
		1	2	23.25	23.12	23.04
		1	5	23.33	23.03	23.01
		3	0	23.31	22.93	23.10
		3	1	23.29	23.04	23.07
		3	2	23.25	22.98	23.07
		6	0	22.24	21.99	22.07
	16QAM	1	0	22.26	22.13	21.65
		1	2	22.85	22.32	21.89
		1	5	22.33	22.08	21.90
		3	0	22.62	22.13	21.78
		3	1	22.54	22.18	21.76
		3	2	22.53	22.14	21.84
		6	0	21.55	21.15	20.99

LTE Band / BW	Modulation	RB Size	RB Offset	Low CH	Mid CH	High CH
				18615CH	18900CH	19185CH
				1851.5MHz	1880MHz	1908.5MHz
2 / 3MHz	QPSK	1	0	23.40	23.11	23.33
		1	7	23.43	22.72	22.98
		1	14	23.42	22.79	22.97
		8	0	22.19	22.04	22.08
		8	4	22.40	22.03	22.14
		8	7	22.29	21.96	22.12
		15	0	22.27	22.12	22.10
	16QAM	1	0	22.53	21.89	22.36
		1	7	22.84	21.96	22.16
		1	14	23.33	21.84	21.70
		8	0	21.38	21.11	20.93
		8	4	21.43	21.08	20.94
		8	7	21.56	21.06	20.91
		15	0	21.27	21.11	20.86

LTE Band / BW	Modulation	RB Size	RB Offset	Low CH	Mid CH	High CH
				18625CH	18900CH	19175CH
				1852.5MHz	1880MHz	1907.5MHz
2 / 5MHz	QPSK	1	0	23.23	22.82	23.07
		1	13	23.18	22.89	22.87
		1	24	23.36	22.80	23.06
		12	0	22.35	22.18	21.94
		12	6	22.36	22.01	22.12
		12	11	22.29	22.03	22.14
		25	0	22.26	22.11	22.03
	16QAM	1	0	21.64	21.99	22.05
		1	13	22.03	21.55	21.76
		1	24	21.85	21.55	21.65
		12	0	21.19	21.01	20.90
		12	6	21.08	20.99	20.88
		12	11	21.02	21.01	20.98
		25	0	21.34	21.23	20.97

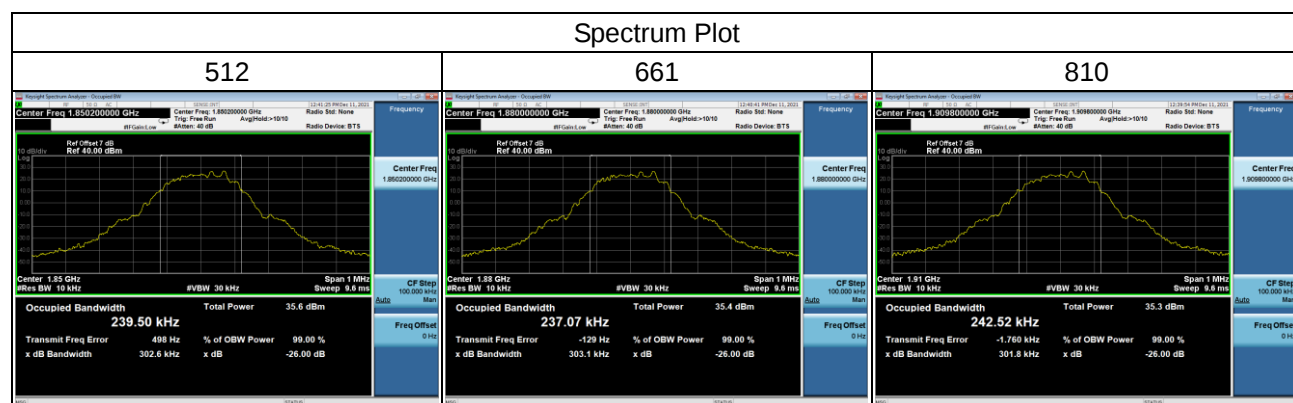
LTE Band / BW	Modulation	RB Size	RB Offset	Low CH	Mid CH	High CH
				18650CH	18900CH	19150CH
				1855MHz	1880MHz	1905MHz
2 / 10MHz	QPSK	1	0	23.32	23.42	23.27
		1	25	23.47	22.92	23.03
		1	49	23.92	22.94	23.23
		25	0	22.19	22.15	21.89
		25	13	22.26	22.01	21.97
		25	25	22.29	22.04	21.95
		50	0	22.26	22.04	21.86
	16QAM	1	0	22.63	22.20	22.54
		1	25	22.90	21.36	22.37
		1	49	23.08	21.46	21.93
		25	0	21.12	21.38	20.83
		25	13	21.23	21.21	20.82
		25	25	21.44	21.15	20.76
		50	0	21.38	21.25	20.87

LTE Band / BW	Modulation	RB Size	RB Offset	Low CH	Mid CH	High CH
				18675CH	18900CH	19125CH
				1857.5MHz	1880MHz	1902.5MHz
2 / 15MHz	QPSK	1	0	23.80	23.00	22.82
		1	38	23.73	22.85	22.78
		1	74	23.64	22.91	23.01
		36	0	22.13	21.98	21.88
		36	18	22.31	21.98	21.96
		36	39	22.39	21.97	21.83
		75	0	22.26	22.09	21.85
	16QAM	1	0	22.96	22.09	22.35
		1	38	23.26	21.92	22.36
		1	74	23.53	21.79	22.04
		36	0	21.13	21.19	20.68
		36	18	21.26	21.01	20.79
		36	39	21.31	20.93	20.86
		75	0	21.26	21.05	20.82

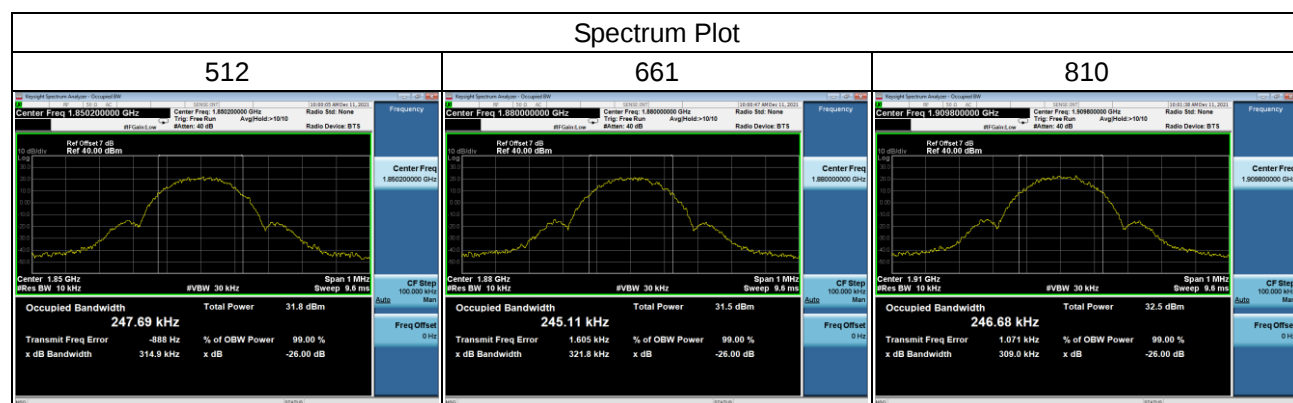
LTE Band / BW	Modulation	RB Size	RB Offset	Low CH	Mid CH	High CH
				18700CH	18900CH	19100CH
				1860MHz	1880MHz	1900MHz
2 / 20MHz	QPSK	1	0	23.14	23.31	22.66
		1	50	23.43	22.86	23.23
		1	99	22.91	22.93	23.12
		50	0	22.35	22.05	21.95
		50	25	22.42	22.05	21.95
		50	50	22.42	21.85	21.93
		100	0	22.33	22.00	21.95
	16QAM	1	0	21.91	22.04	21.48
		1	50	22.20	21.79	21.88
		1	99	21.71	21.66	21.79
		50	0	21.15	21.03	20.80
		50	25	21.38	21.03	20.84
		50	50	21.30	20.86	20.85
		100	0	21.24	21.09	20.82

APPENDIX B - OCCUPIED BANDWIDTH

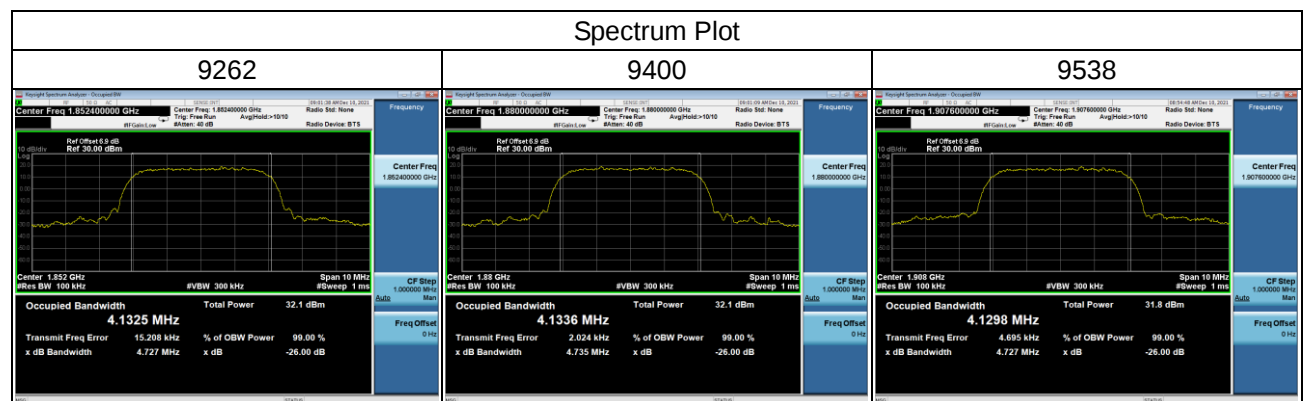
PCS1900_GSM			
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	26dB Bandwidth (MHz)
		QPSK	QPSK
512	1850.2	0.2395	0.3026
661	1880	0.2371	0.3031
810	1909.8	0.2425	0.3018



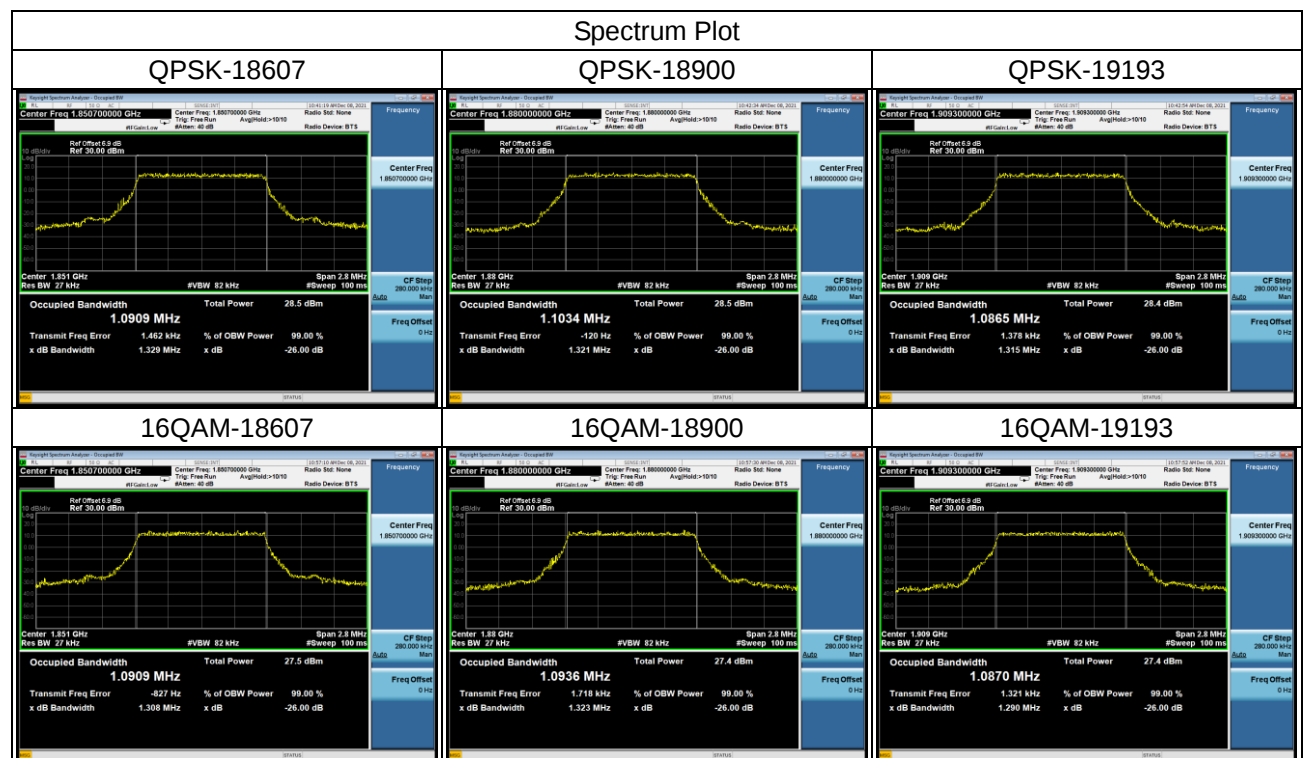
PCS1900_EDGE			
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	26dB Bandwidth (MHz)
		QPSK	QPSK
512	1850.2	0.2477	0.3149
661	1880	0.2451	0.3218
810	1909.8	0.2467	0.3090



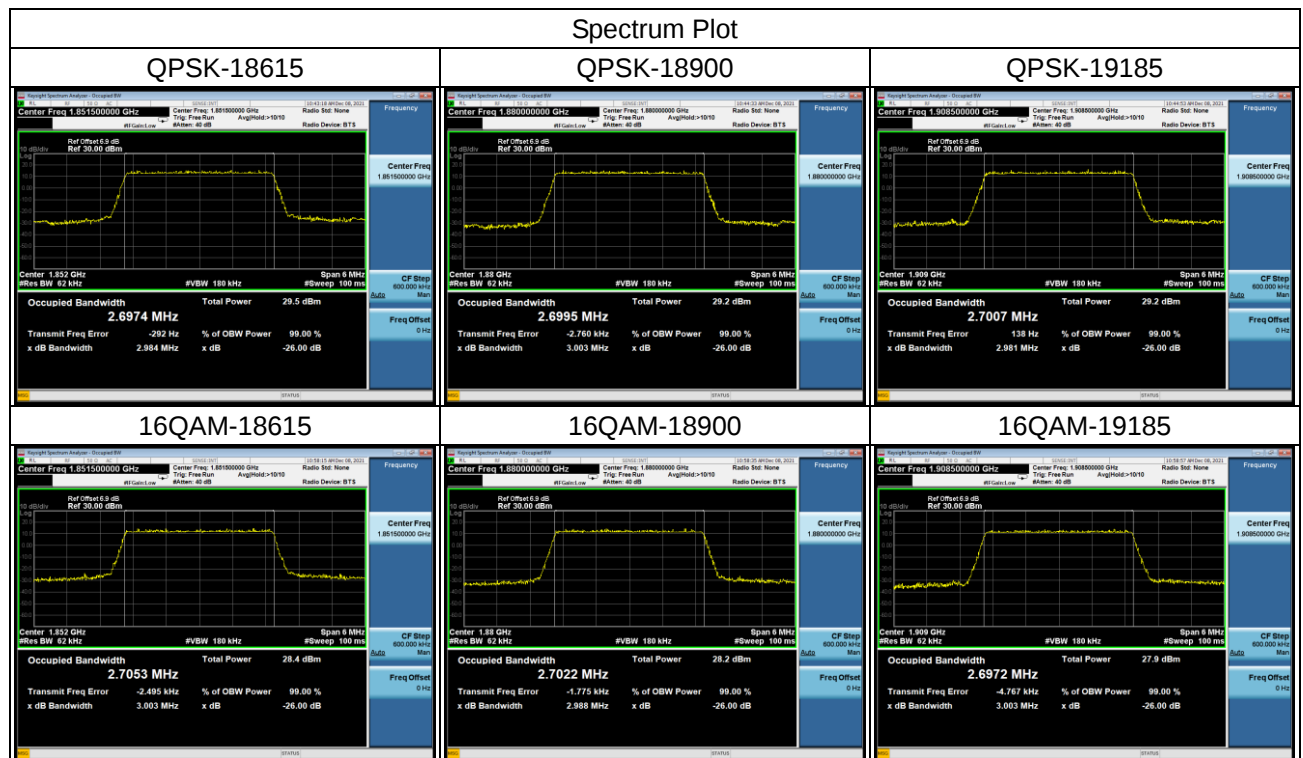
WCDMA Band II_WCDMA			
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	26dB Bandwidth (MHz)
		QPSK	QPSK
9262	1852.4	4.1325	4.727
9400	1880	4.1336	4.735
9538	1907.6	4.1298	4.727



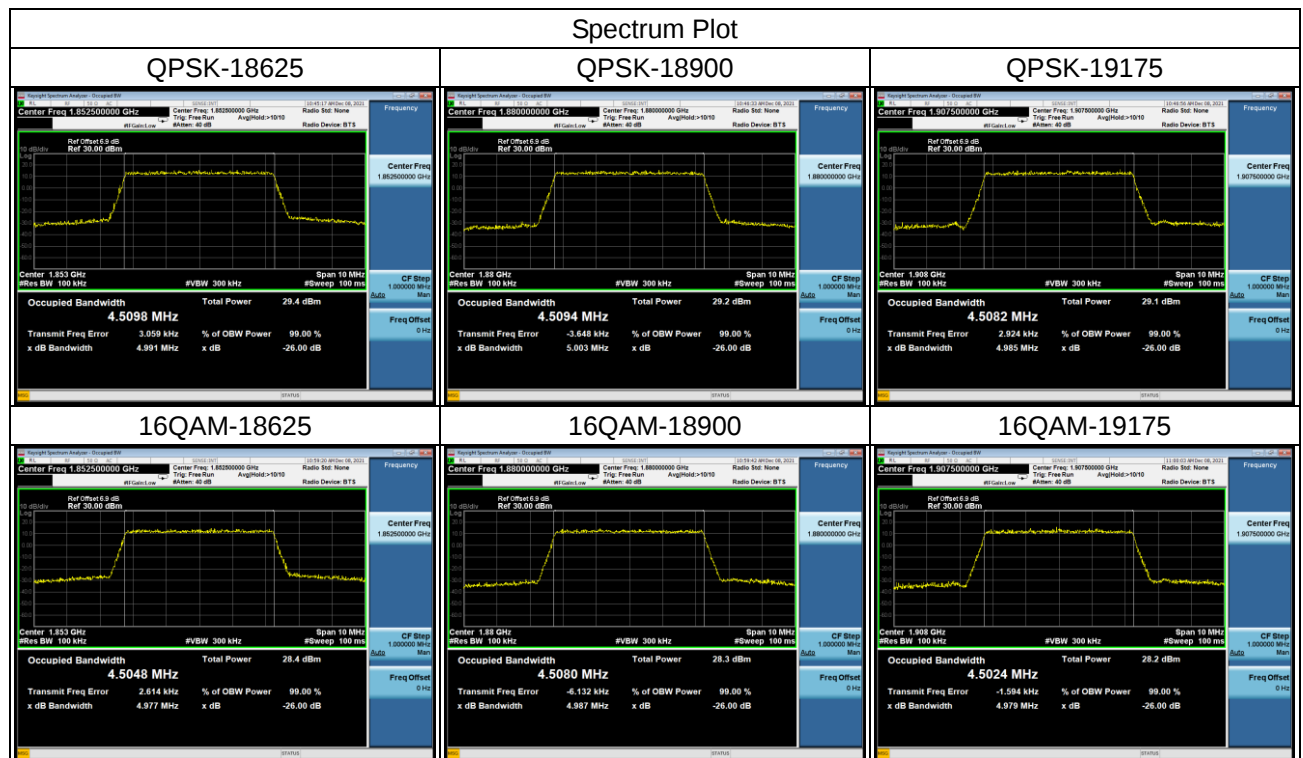
LTE Band 2_1.4MHz					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)		26dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
18607	1850.7	1.0909	1.0909	1.329	1.308
18900	1880	1.1034	1.0936	1.321	1.323
19193	1909.3	1.0865	1.0870	1.315	1.290



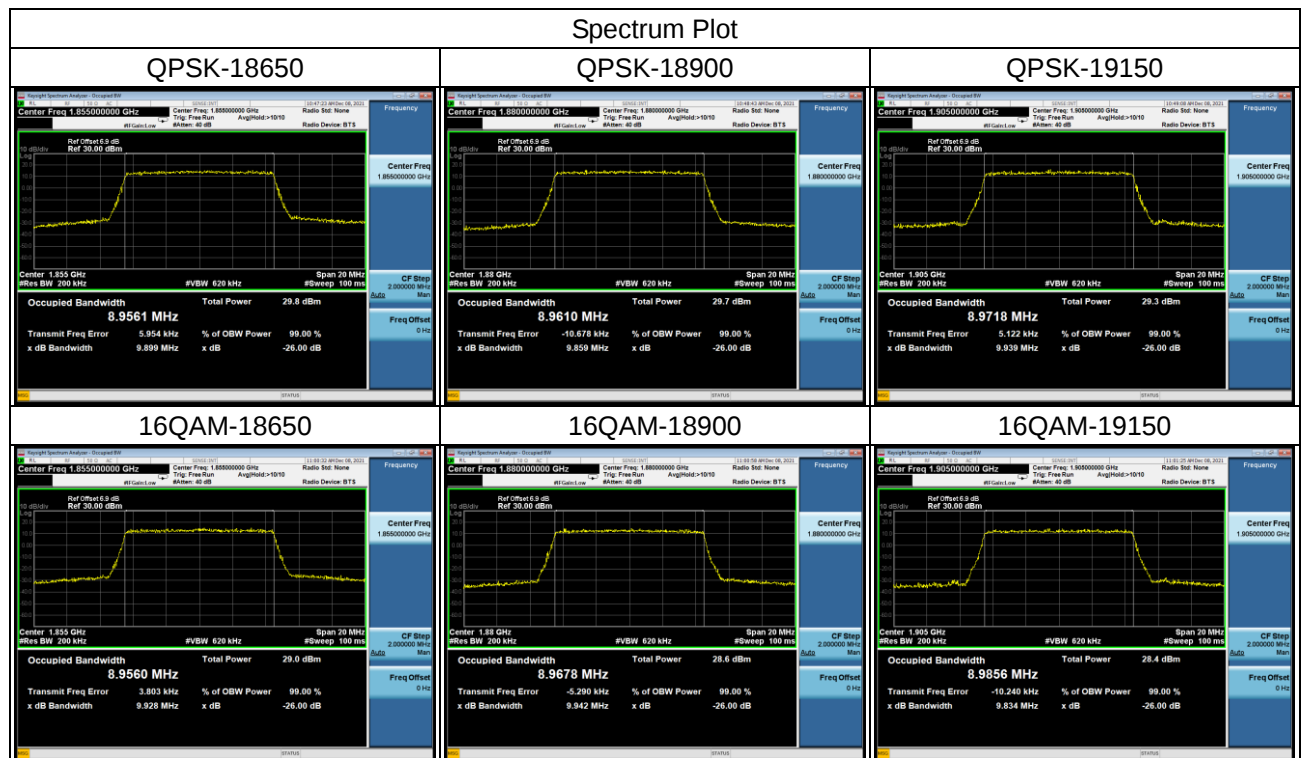
LTE Band 2_3MHz					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)		26dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
18615	1851.5	2.6974	2.7053	2.984	3.003
18900	1880	2.6995	2.7022	3.003	2.988
19185	1908.5	2.7007	2.6972	2.981	3.003



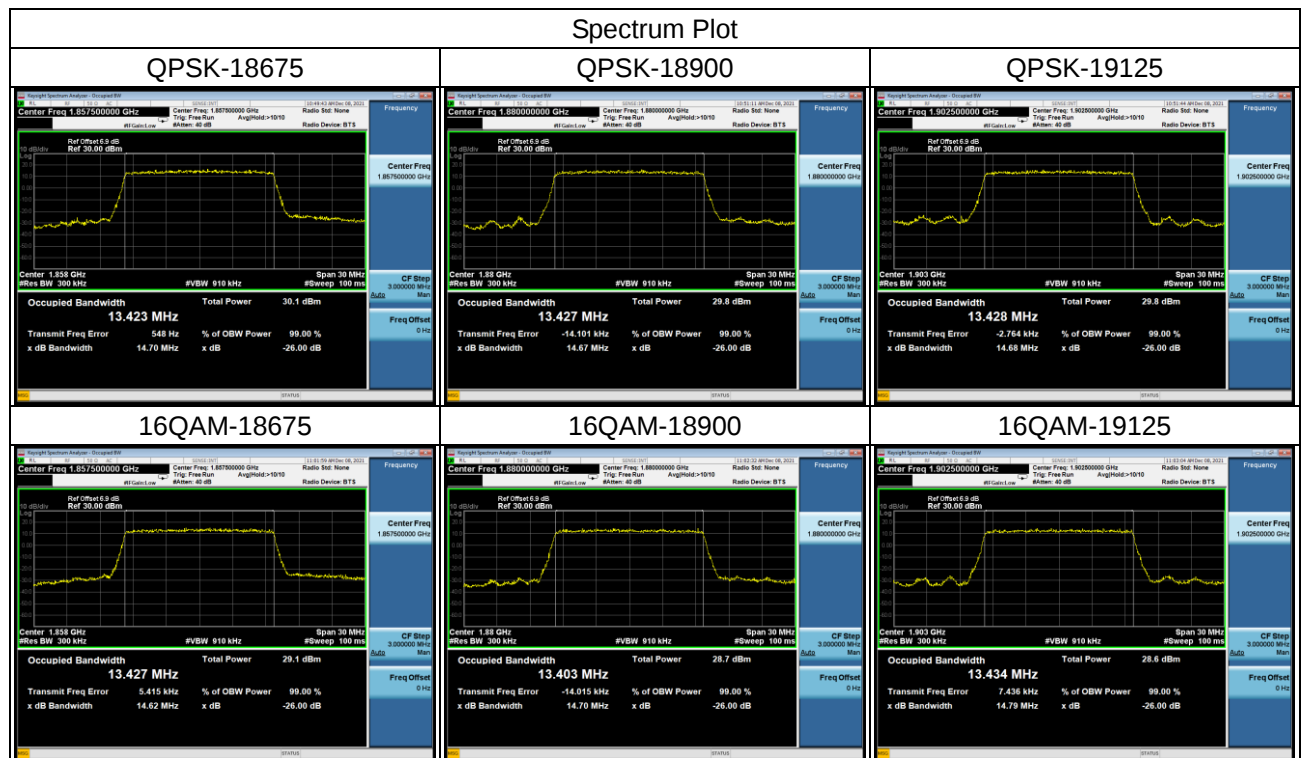
LTE Band 2_5MHz					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)		26dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
18625	1852.5	4.5098	4.5048	4.991	4.977
18900	1880	4.5094	4.5080	5.003	4.987
19175	1907.5	4.5082	4.5024	4.985	4.979



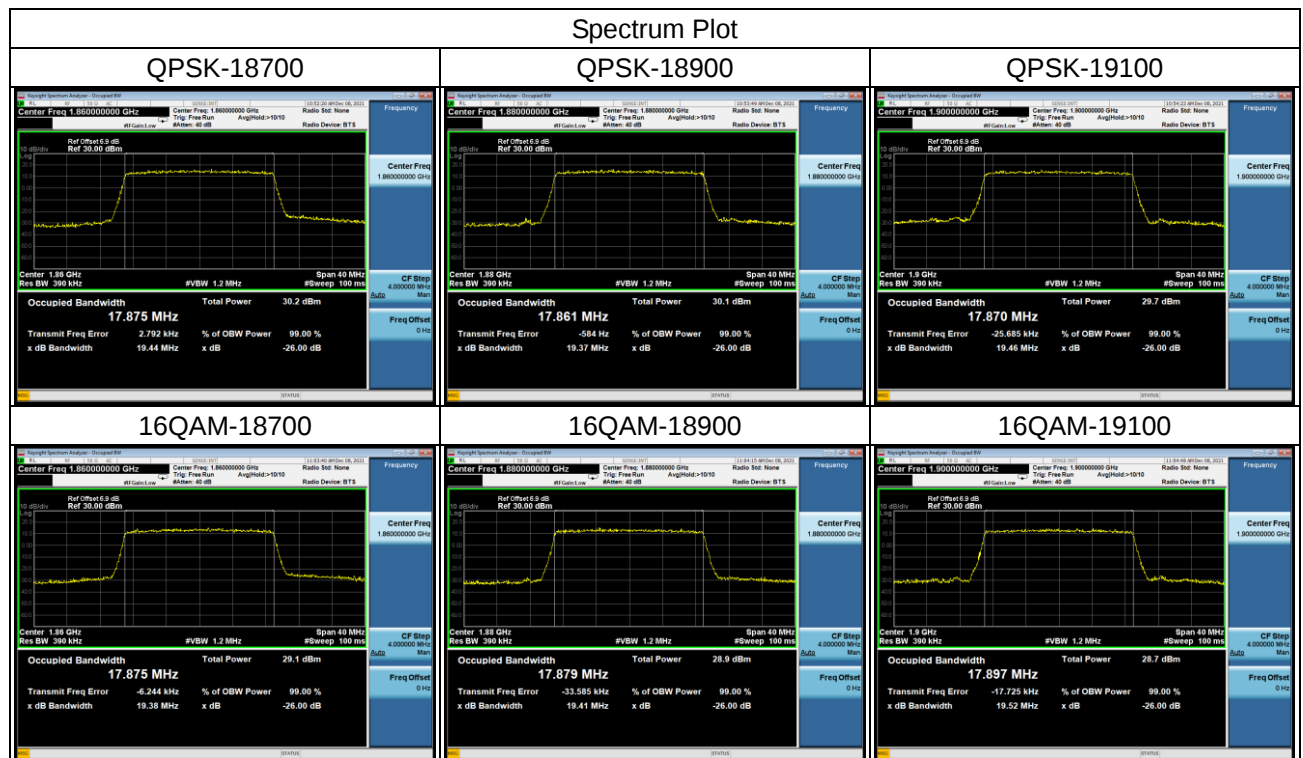
LTE Band 2_10MHz					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)		26dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
18650	1855	8.9561	8.9560	9.899	9.928
18900	1880	8.9610	8.9678	9.859	9.942
19150	1905	8.9718	8.9856	9.939	9.834



LTE Band 2_15MHz					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)		26dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
18675	1857.5	13.423	13.427	14.70	14.62
18900	1880	13.427	13.403	14.67	14.70
19125	1902.5	13.428	13.434	14.68	14.79

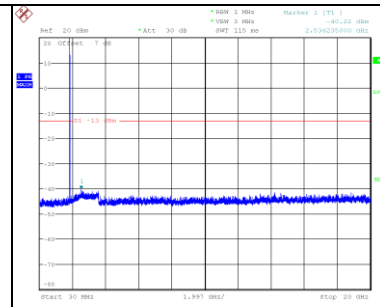
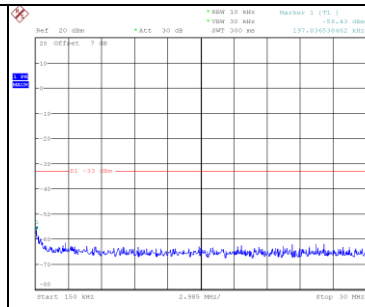
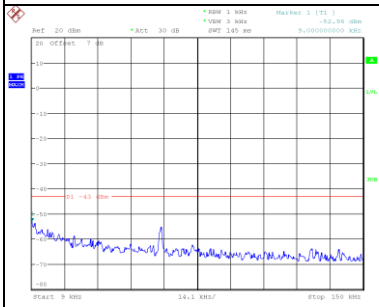


LTE Band 2_20MHz					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)		26dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
18700	1860	17.875	17.875	19.44	19.38
18900	1880	17.861	17.879	19.37	19.41
19100	1900	17.870	17.897	19.46	19.52

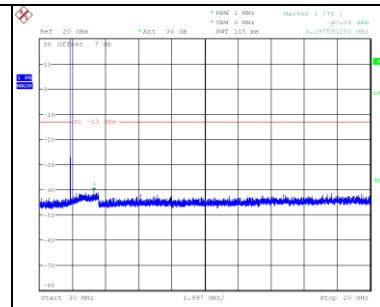
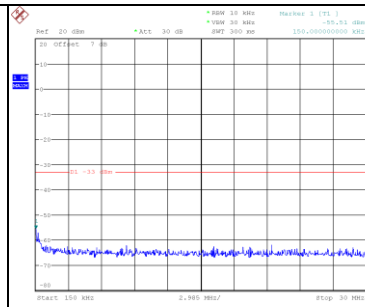
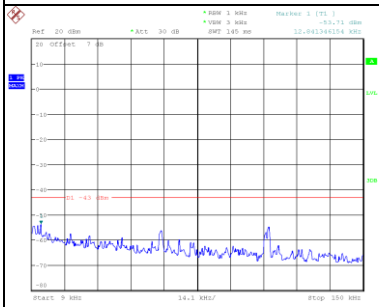


APPENDIX C - CONDUCTED SPURIOUS EMISSIONS

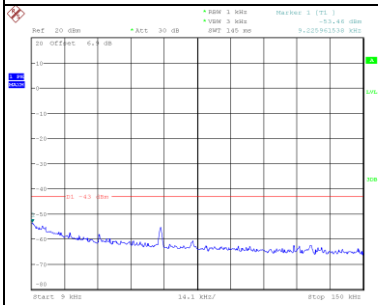
PCS1900_GSM_CH661 Spectrum Plot



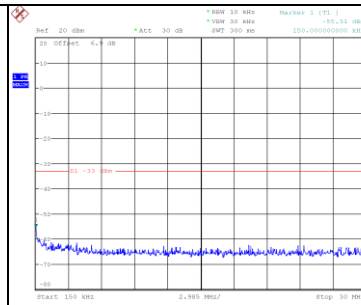
PCS1900_EDGE_CH661 Spectrum Plot



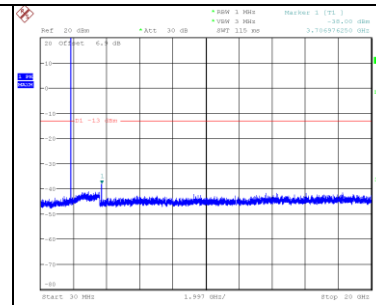
WCDMA Band II_WCDMA_CH9400 Spectrum Plot



Date: 10.DEC.2021 14:14:06

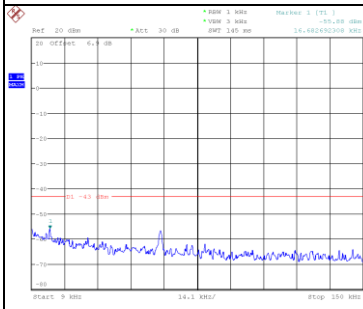


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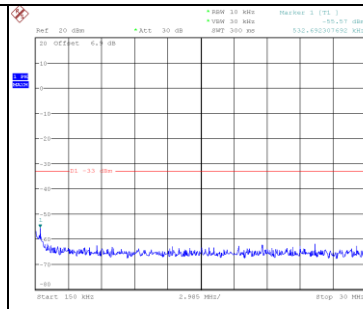


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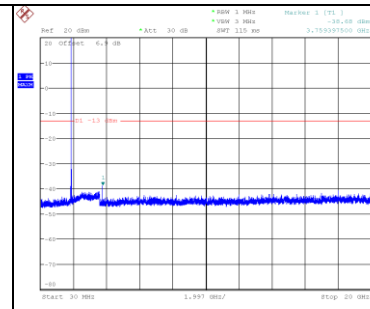
LTE Band 2_1.4MHz_CH18900 Spectrum Plot



Date: 8/20/2021 09:49:29

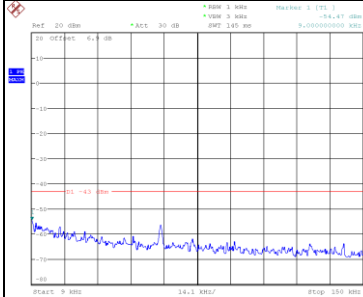


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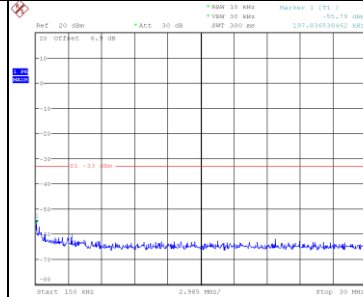


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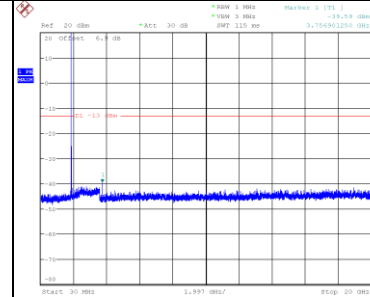
LTE Band 2_5MHz_CH18900 Spectrum Plot



Date: 8/20/2021 09:50:02

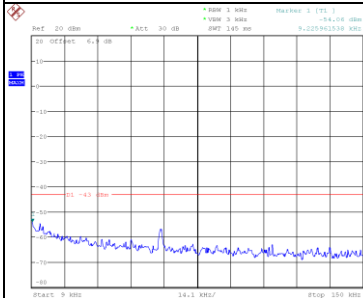


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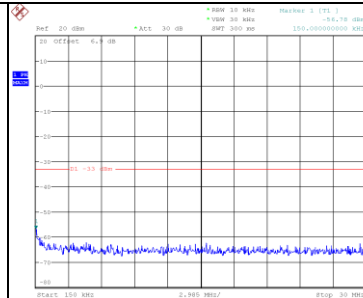


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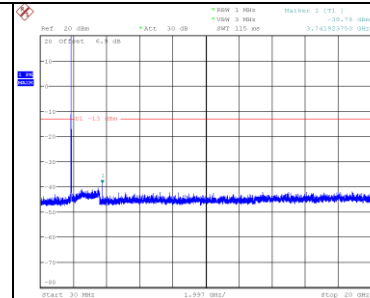
LTE Band 2_20MHz_CH18900 Spectrum Plot



Date: 8/20/2021 09:50:40



Date: 8/20/2021 09:51:27



Date: 8/20/2021 10:11:40

APPENDIX D - RADIATED SPURIOUS EMISSIONS (9KHZ TO 30MHZ)