FCC Radio Test Report

FCC ID: 2AMHM-AD00A10055

Report No.	:	BTL-FCCP-7-1911T165
Equipment	:	iTraMS Gen2A
Model Name	:	CU-303-0403
Brand Name	:	Bosch
Applicant	:	Robert Bosch Engineering & Business Solution Pvt. Ltd.
Address	:	123, Industrial Layout, Hosur Road, Koramangala, Bengaluru, 560095 Bengaluru India
Radio Function	:	LTE Band 4 & Band 12
FCC Rule Part(s)	:	47 CFR FCC Part 27 Subpart L 47 CFR FCC Part 27 Subpart H 47 CFR FCC Part 2 ANSI/TIA/EIA-603-E-2016 KDB 971168 D01 Power Meas License Digital Systems v03r01
Measurement Procedure(s)	:	ANSI C63.10-2013
Date of Receipt	:	2019/11/27
Date of Test	:	2019/11/27 ~ 2020/1/7
Issued Date	:	2020/3/16

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

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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.

The report must not be used by the client to claim product certification, approval, or endorsement by NIST, A2LA, or any agency of the U.S. Government.

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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 are not use in determining the Pass/Fail results.

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REPORT ISSUED HISTORY

Report Version	Description	Issued Date
R00	Original Issue.	2020/3/3
R01	Revised report to address TCB's comments.	2020/3/16

1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standard(s):

FCC Part 27 Subpart L, H & Part 2			
Standard(s) Section	**Test Item**	**Judgment**	**Remark**
2.1046 27.50(d)(4) 27.50(c)(10)	Effective Radiated Power & Equivalent Isotropic Radiated Power	PASS	------
2.1049	Occupied Bandwidth	PASS	------
2.1051 27.53(h) 27.53(g) 27.53(c)(2)(4)	Conducted Spurious Emissions	PASS	------
2.1053 27.53(h) 27.53(g) 27.53(c)(2)(4)	Radiated Spurious Emissions	PASS	------
2.1051 27.53(h) 27.53(g) 27.53(c)(2)(4)	Band Edge Measurements	PASS	------
-	Peak To Average Ratio	PASS	Record Only
2.1055 27.54	Frequency Stability	PASS	------

Note:

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

(2) The report format version is TP.1.1.1.

1.1 TEST FACILITY

The test facilities used to collect the test data in this report:

No. 68-1, Ln. 169, Sec. 2, Datong Rd., Xizhi Dist., New Taipei City 221, Taiwan
The test sites and facilities are covered under FCC RN: 355421 and DN: TW1099.

☐ C05 ☐ CB08 ☐ CB11 ☐ CB15 ☐ CB16
☒ SR06

No.18, Ln. 171, Sec. 2, Jiuzong Rd., Neihu Dist., Taipei City 114, Taiwan
The test sites and facilities are covered under FCC RN: 325517 and DN: TW1115.

☐ C03 ☒ CB18 ☐ CB19

1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement **y** ± **U**, where expanded uncertainty **U** is based on a standard uncertainty multiplied by a coverage factor of **k = 2**, providing a level of confidence of approximately **95 %**. The measurement instrumentation uncertainty considerations contained in CISPR 16-4-2. The BTL measurement uncertainty is less than the CISPR 16-4-2 U_{cispr} requirement.

A. Radiated emissions test :

Test Site	Measurement Frequency Range	U,(dB)
CB18	0.03 GHz ~ 0.2 GHz	4.17
	0.2 GHz ~ 1 GHz	4.72
	1 GHz ~ 6 GHz	5.21
	6 GHz ~ 18 GHz	5.51
	18 GHz ~ 26 GHz	3.69
	26 GHz ~ 40 GHz	4.23

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	Environment Condition	Test Voltage	Tested By
Output Power & ERP & EIRP	24.6 °C, 54.3 %	DC 32V	Eric Lee
Occupied Bandwidth	24.6 °C, 54.3 %	DC 32V	Eric Lee
Conducted Spurious Emissions	24.6 °C, 54.3 %	DC 32V	Eric Lee
Radiated Spurious Emissions	23 °C, 65 %	DC 32V	Hunter Chiang
Band Edge	24.6 °C, 54.3 %	DC 32V	Eric Lee
Peak to Average Ratio	24.6 °C, 54.3 %	DC 32V	Eric Lee
Frequency Stability	Normal and Extreme		Eric Lee

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Equipment	iTraMS Gen2A
Brand Name	Bosch
Test Model	CU-303-0403
Series Model	N/A
Model Difference(s)	N/A
Hardware Version	B2
Software Version	MS8
Power Source	Supplied from Battery.
Power Rating	DC 9-32V
Modulation Type	UL: QPSK,16QAM DL: QPSK,16QAM

Note:

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

2. Channel List:

LTE Band 4					
Test Frequency ID	Bandwidth (MHz)	N_{UL}	Frequency of Uplink (MHz)	N_{DL}	Frequency of Downlink (MHz)
Low Range	1.4	19957	1710.7	1957	2110.7
	3	19965	1711.5	1965	2111.5
	5	19975	1712.5	1975	2112.5
	10	20000	1715	2000	2115
	15	20025	1717.5	2025	2117.5
	20	20050	1720	2050	2120
Mid Range	1.4/3/5/10/15/20	20175	1732.5	2175	2132.5
High Range	1.4	20393	1754.3	2393	2154.3
	3	20385	1753.5	2385	2153.5
	5	20375	1752.5	2375	2152.5
	10	20350	1750	2350	2150
	15	20325	1747.5	2325	2147.5
	20	20300	1745	2300	2145

LTE Band 12					
Test Frequency ID	Bandwidth (MHz)	N_{UL}	Frequency of Uplink (MHz)	N_{DL}	Frequency of Downlink (MHz)
Low Range	1.4	23017	699.7	5017	729.7
	3	23025	700.5	5025	730.5
	5	23035	701.5	5035	731.5
	10	23060	704	5060	734
Mid Range	1.4/3/5/10	23095	707.5	5095	737.5
High Range	1.4	23173	715.3	5173	745.3
	3	23165	714.5	5165	744.5
	5	23155	713.5	5155	743.5
	10	23130	711	5130	741

3. Table for Filed Antenna:

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	Note
CH0	BOSCH	N/A	PCB	N/A	2.8	Band 4
					0	Band 12

2.2 DESCRIPTION OF TEST MODES

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

LTE BAND 4 MODE					
Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
Output Power	19957 to 20393	19957, 20175, 20393	1.4MHz	QPSK, 16QAM	1RB/3RB/6RB
	19965 to 20385	19965, 20175, 20385	3MHz	QPSK, 16QAM	1RB/8RB/15RB
	19975 to 20375	19975, 20175, 20375	5MHz	QPSK, 16QAM	1RB/12RB/25RB
	20000 to 20350	20000, 20175, 20350	10MHz	QPSK, 16QAM	1RB/25RB/50RB
	20025 to 20325	20025, 20175, 20325	15MHz	QPSK, 16QAM	1RB/36RB/75RB
	20050 to 20300	20050, 20175, 20300	20MHz	QPSK, 16QAM	1RB/50RB/100RB
EIRP	20050 to 20300	20050, 20175, 20300	20MHz	QPSK	1RB/50RB/100RB
Occupied Bandwidth	19957 to 20393	19957, 20175, 20393	1.4MHz	QPSK, 16QAM	6RB
	19965 to 20385	19965, 20175, 20385	3MHz	QPSK, 16QAM	15RB
	19975 to 20375	19975, 20175, 20375	5MHz	QPSK, 16QAM	25RB
	20000 to 20350	20000, 20175, 20350	10MHz	QPSK, 16QAM	50RB
	20025 to 20325	20025, 20175, 20325	15MHz	QPSK, 16QAM	75 RB
	20050 to 20300	20050, 20175, 20300	20MHz	QPSK, 16QAM	100RB
Conducted Spurious Emissions	19957 to 20393	20175	1.4MHz	QPSK	1RB
	19965 to 20385	20175	3MHz	QPSK	1RB
	19975 to 20375	20175	5MHz	QPSK	1RB
	20000 to 20350	20175	10MHz	QPSK	1RB
	20025 to 20325	20175	15MHz	QPSK	1RB
	20050 to 20300	20175	20MHz	QPSK	1RB
Radiated Spurious Emissions	20050 to 20300	20175	20MHz	QPSK	1RB
Band Edge	19957 to 20393	19957, 20393	1.4MHz	QPSK	1RB/6RB
	19965 to 20385	19965, 20385	3MHz	QPSK	1RB/15RB
	19975 to 20375	19975, 20375	5MHz	QPSK	1RB/25RB
	20000 to 20350	20000, 20350	10MHz	QPSK	1RB/50RB
	20025 to 20325	20025, 20325	15MHz	QPSK	1RB/75RB
	20050 to 20300	20050, 20300	20MHz	QPSK	1RB/100RB
Peak To Average Ratio	19957 to 20393	19957, 20175, 20393	1.4MHz	QPSK, 16QAM	1RB
	19965 to 20385	19965, 20175, 20385	3MHz	QPSK, 16QAM	1RB
	19975 to 20375	19975, 20175, 20375	5MHz	QPSK, 16QAM	1RB
	20000 to 20350	20000, 20175, 20350	10MHz	QPSK, 16QAM	1RB
	20025 to 20325	20025, 20175, 20325	15MHz	QPSK, 16QAM	1RB
	20050 to 20300	20050, 20175, 20300	20MHz	QPSK, 16QAM	1RB
Frequency Stability	19957 to 20393	20175	1.4MHz	QPSK	1RB
	19965 to 20385	20175	3MHz	QPSK	1RB
	19975 to 20375	20175	5MHz	QPSK	1RB
	20000 to 20350	20175	10MHz	QPSK	1RB
	20025 to 20325	20175	15MHz	QPSK	1RB
	20050 to 20300	20175	20MHz	QPSK	1RB

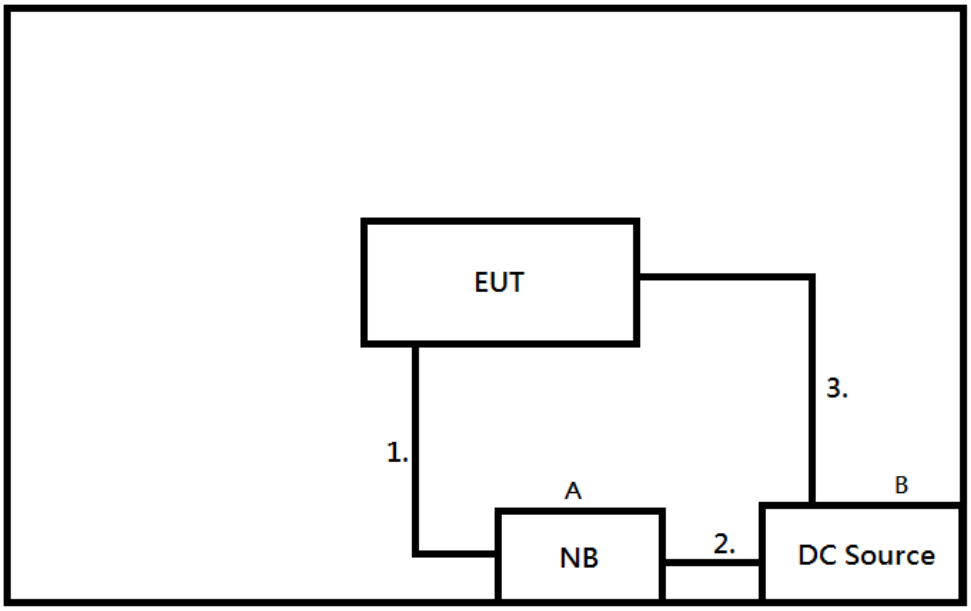
LTE BAND 12 MODE					
Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
Output Power	23017 to 23173	23017, 23095, 23173	1.4MHz	QPSK, 16QAM	1RB/3RB/6RB
	23025 to 23165	23025, 23095, 23165	3MHz	QPSK, 16QAM	1RB/8RB/15RB
	23035 to 23155	23035, 23095, 23155	5MHz	QPSK, 16QAM	1RB/12RB/25RB
	23060 to 23130	23060, 23095, 23130	10MHz	QPSK, 16QAM	1RB/25RB/50RB
ERP	23060 to 23130	23060, 23095, 23130	10MHz	QPSK	1RB/25RB/50RB
Occupied Bandwidth	23017 to 23173	23017, 23095, 23173	1.4MHz	QPSK, 16QAM	6RB
	23025 to 23165	23025, 23095, 23165	3MHz	QPSK, 16QAM	15RB
	23035 to 23155	23035, 23095, 23155	5MHz	QPSK, 16QAM	25RB
	23060 to 23130	23060, 23095, 23130	10MHz	QPSK, 16QAM	50RB
Conducted Spurious Emissions	23017 to 23173	23095	1.4MHz	QPSK	1RB
	23025 to 23165	23095	3MHz	QPSK	1RB
	23035 to 23155	23095	5MHz	QPSK	1RB
	23060 to 23130	23095	10MHz	QPSK	1RB
Radiated Spurious Emissions	23060 to 23130	23095	10MHz	QPSK	1RB
Band Edge	23017 to 23173	23017, 23173	1.4MHz	QPSK, 16QAM	1RB/6RB
	23025 to 23165	23025, 23165	3MHz	QPSK, 16QAM	1RB/15RB
	23035 to 23155	23035, 23155	5MHz	QPSK, 16QAM	1RB/25RB
	23060 to 23130	23060, 23130	10MHz	QPSK, 16QAM	1RB/50RB
Peak To Average Ratio	23017 to 23173	23017, 23095, 23173	1.4MHz	QPSK, 16QAM	1RB/3RB/6RB
	23025 to 23165	23025, 23095, 23165	3MHz	QPSK, 16QAM	1RB/8RB/15RB
	23035 to 23155	23035, 23095, 23155	5MHz	QPSK, 16QAM	1RB/12RB/25RB
	23060 to 23130	23060, 23095, 23130	10MHz	QPSK, 16QAM	1RB/25RB/50RB
Frequency Stability	23017 to 23173	23095	1.4MHz	QPSK	1RB
	23025 to 23165	23095	3MHz	QPSK	1RB
	23035 to 23155	23095	5MHz	QPSK	1RB
	23060 to 23130	23095	10MHz	QPSK	1RB

NOTE:

(1) All X, Y and Z axes are evaluated, but only the worst case (LTE Band 4: Y axis, LTE Band 12: Z axis) is recorded.

(2)

2.3 BLOCK DIGRAM SHOWING THECONFIGURATIONOFSYSTEMTESTED



3.4 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	Brand	Model No.	Series No.	Remarks
A	notebook	hp	TPN-1119	NA	-
B	DC Source	twintex	TP-6010	1616AP051502100	-
-	2*LTE MIMO & GNSS Antenna	TAOGLAS	MA250.A.LBI.001	-	External Antenna Supplied by test requester. For evaluation only.

Item	Shielded	Ferrite Core	Length	Cable Type	Remarks
1	NO	NO	1m	Lan to USB	-
2	YES	NO	0.5m	RS232 to USB	-
3	NO	NO	1.5m	Power cable	-

3. TEST RESULT

3.1 OUTPUT POWER MEASUREMENT

3.1.1 LIMIT

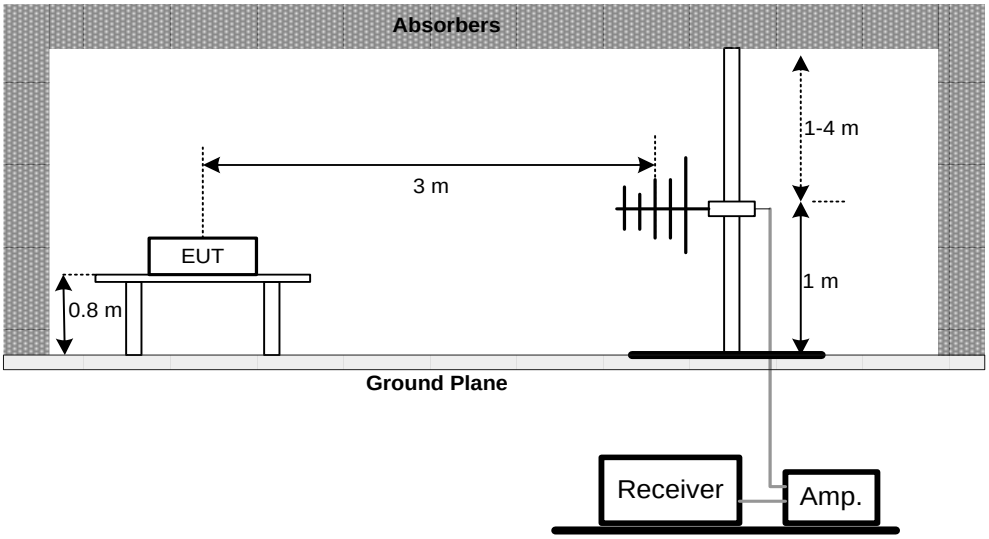
Mobile / Portable station are limited to 1 watts e.i.r.p. (Part 27 Subpart L)
Mobile / Portable station are limited to 3 watts e.r.p. (Part 27 Subpart H)

3.1.2 TEST PROCEDURES

1. 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.
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 = Output power level of S.G – TX cable loss + Antenna gain of substitution horn.
4. E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole, E.R.P power = E.I.R.P power - 2.15dBi.
5. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1MHz/3MHz.

3.1.3 TEST SETUP LAYOUT

Radiated Power Measurement



3.1.4 TEST DEVIATION

No deviation

3.1.5 TEST RESULTS

Please refer to the APPENDIX A.

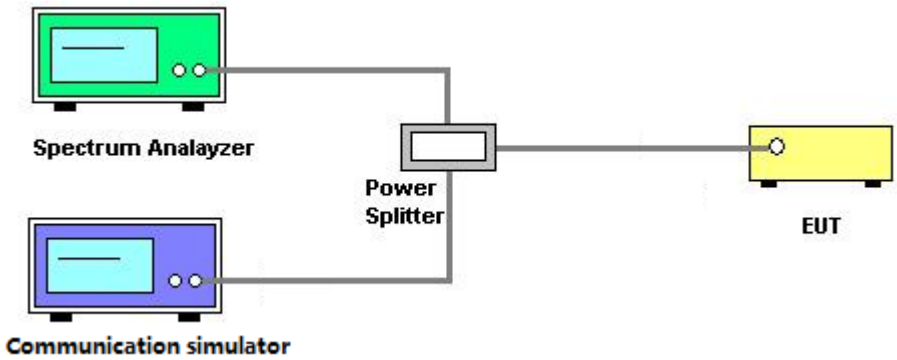
3.2 OCCUPIED BANDWIDTH MEASUREMENT

3.2.1 TEST PROCEDURES

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% ~ 5%)*EBW
   VBW≥3* 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

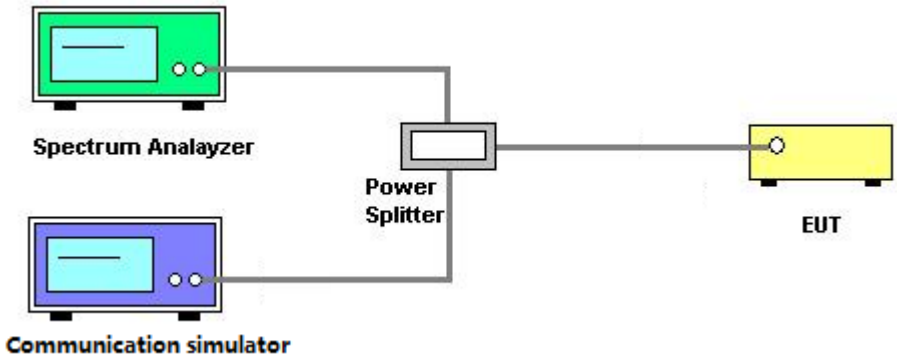
The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB. The emission limit equal to -13dBm. (Part 27 Subpart L & H)

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>=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. (Part 27 Subpart L & H)

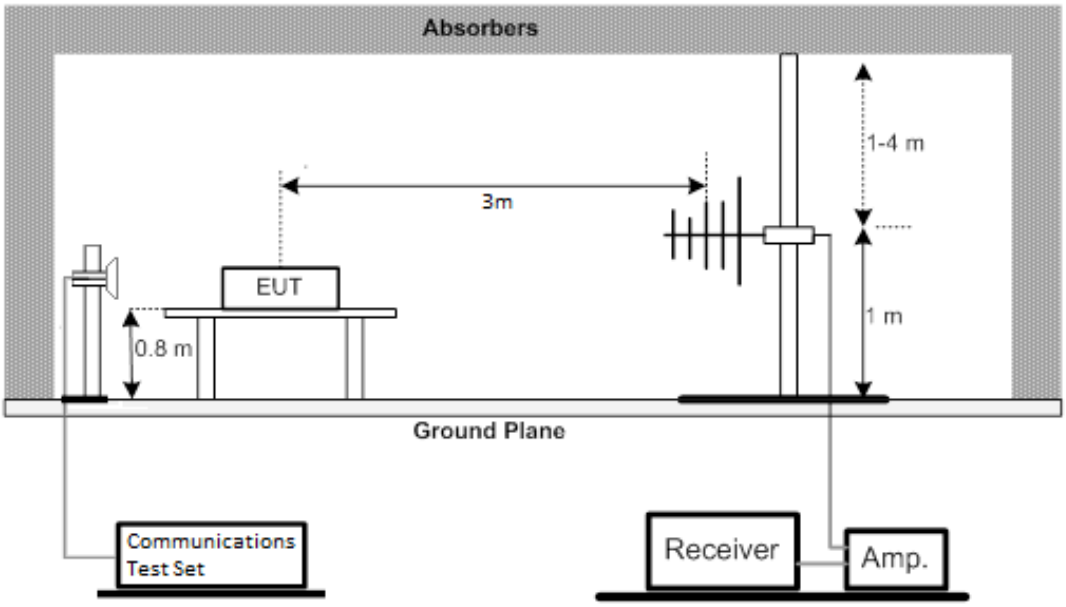
3.4.2 TEST PROCEDURES

The testing follows FCC KDB 971168 v03r01 Section 6.2.

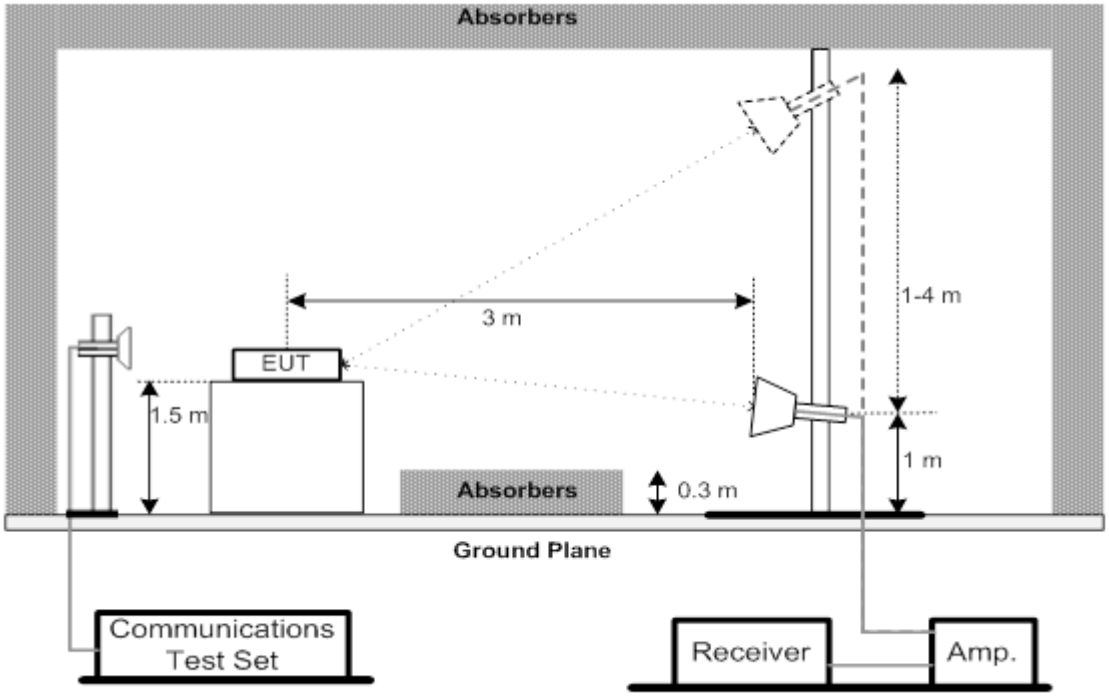
1. In the semi-anechoic chamber, EUT placed on the 0.8m height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum polar radiated power.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

3.4.3 TEST SETUP LAYOUT

30MHz to 1GHz



Above 1GHz



3.4.4 TEST RESULTS (30MHZ TO 1000MHZ)

Please refer to the APPENDIX D.

3.4.5 TEST RESULTS (ABOVE 1000MHZ)

Please refer to the APPENDIX E.

3.5 BAND EDGE MEASUREMENT

3.5.1 LIMIT

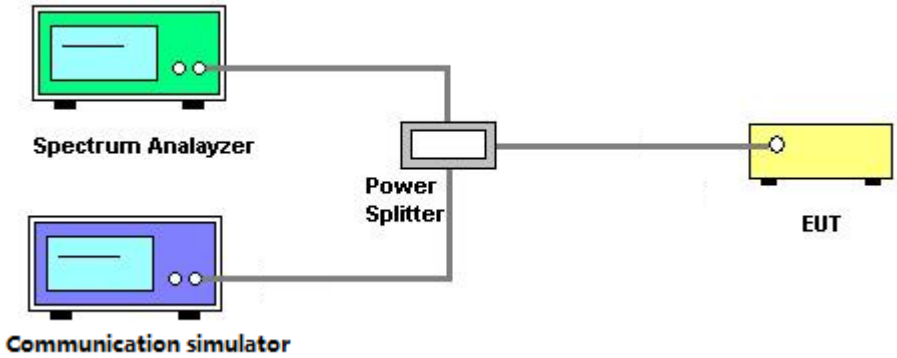
The power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed. (Part 27 Subpart L & H)

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 F.

3.6 PEAK TO AVERAGE RATIO MEASUREMENT

3.6.1 LIMIT

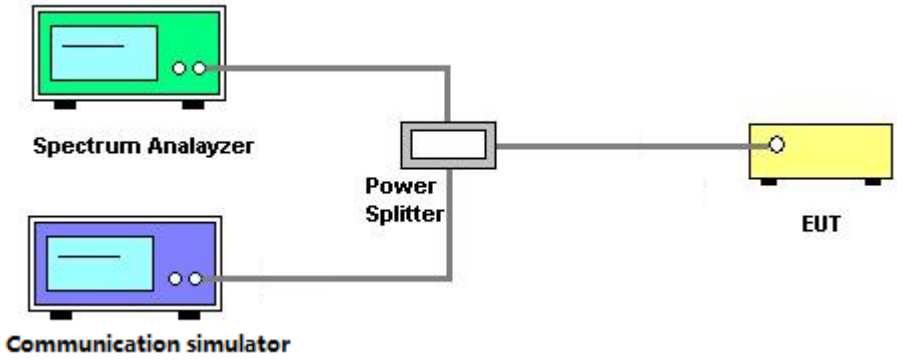
In measuring transmissions in this band using an average power technique, the peak to-average ratio (PAR) of the transmission may not exceed 13 dB.

3.6.2 TEST PROCEDURES

The testing follows FCC KDB 971168 v03r01 Section 5.7.

1. Set resolution/measurement bandwidth ≥ 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 G.

3.7 FREQUENCY STABILITY MEASUREMENT

3.7.1 LIMIT

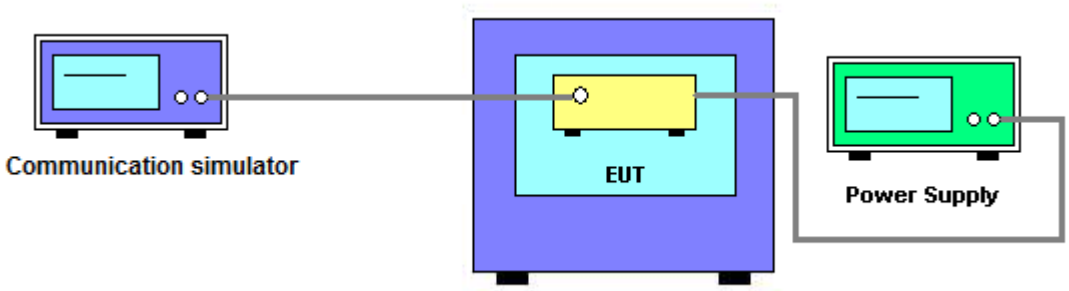
±1.5 ppm is for base and fixed station. ±2.5 ppm is for mobile station.

3.7.2 TEST PROCEDURES

The testing follows FCC KDB 971168 v03r01 Section 9.

1. 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.
2. 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.
3. The temperature range step is 10 degrees in this test items. All temperature levels shall be hold the ±0.5°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.
4. The frequency error was recorded frequency error from the communication simulator.

3.7.3 TEST SETUP LAYOUT



3.7.4 TEST DEVIATION

No deviation

3.7.5 TEST RESULTS

Please refer to the APPENDIX H.

4. LIST OF MEASUREMENT EQUIPMENTS

Radiated Emissions Measurement & ERP Power Measurement						
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Date	Calibrated Until
1	Preamplifier	EMCI	EMC001340	980555	2019/4/12	2020/4/11
2	Preamplifier	EMCI	EMC02325B	980217	2019/4/12	2020/4/11
3	Preamplifier	EMCI	EMC012645B	980267	2019/4/12	2020/4/11
4	Preamplifier	EMCI	EMC2654045	980030	2019/2/2	2020/2/1
5	Test Cable	EMCI	EMC104-SM-SM-800	150207	2019/4/12	2020/4/11
6	Test Cable	EMCI	EMC104-SM-SM-3000	151205	2019/4/12	2020/4/11
7	Test Cable	EMCI	EMC-SM-SM-7000	180408	2019/4/12	2020/4/11
8	MXE EMI Receiver	Agilent	N9038A	MY55420127	2019/3/26	2020/3/25
9	Signal Analyzer	Agilent	N9010A	MY56480554	2019/6/6	2020/6/5
10	Horm Ant	SCHWARZBECK	BBHA 9120D	9120D-1342	2019/6/10	2020/6/9
11	Horm Ant	Schwarzbeck	BBHA 9170	187	2018/12/22	2019/12/21
12	Trilog-Broadband Antenna	Schwarzbeck	VULB 9168	000992	2019/5/29	2020/5/28
13	5dB Attenuator	EMCI	EMCI-N-6-05	AT-N0508	2019/5/29	2020/5/28

Frequency Stability Measurement						
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Date	Calibrated Until
1	Spectrum Analyzer	R&S	FSP40	100129	2019/5/23	2020/5/22

Others Conducted Measurement						
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Date	Calibrated Until
1	Spectrum Analyzer	R&S	FSP40	100129	2019/5/23	2020/5/21

Remark: “N/A” denotes no model name, no serial no. or no calibration specified.
All calibration period of equipment list is one year.

5. EUT TEST PHOTOS

Please refer to document Appendix No.: TP-1911T165-FCCP-1 (APPENDIX-TEST PHOTOS).

6. EUT PHOTOS

Please refer to document Appendix No.: EP-1911T165-1 (APPENDIX-EUT PHOTOS).

APPENDIX A - RADIATED POWER

Output Power (dBm):

LTE Band / BW	Modulation	RB Size	RB Offset	Low CH	Mid CH	High CH
				19957CH	20175CH	20393CH
				1710.7MHz	1732.5MHz	1754.2MHz
4 / 1.4M	QPSK	1	0	24.3	24.4	24.3
		1	2	23.9	24.0	24.1
		1	5	23.6	24.0	23.8
		3	0	24.3	24.4	24.3
		3	1	23.9	24.0	24.1
		3	2	23.6	24.0	23.8
		6	0	22.7	23.2	22.9
	16QAM	1	0	23.4	23.5	23.4
		1	2	22.9	23.1	23.2
		1	5	22.7	23.2	23.0
		3	0	23.4	23.5	23.4
		3	1	22.9	23.1	23.2
		3	2	22.7	23.2	23.0
		6	0	21.7	20.5	20.6

LTE Band / BW	Modulation	RB Size	RB Offset	Low CH	Mid CH	High CH
				19965CH	20175CH	20385CH
				1711.5MHz	1732.5MHz	1753.5MHz
4 / 3M	QPSK	1	0	24.3	24.4	24.3
		1	7	23.9	24.0	24.1
		1	14	23.6	24.0	23.8
		8	0	23.4	23.6	23.4
		8	4	23.1	23.2	23.2
		8	7	22.7	23.1	23.0
		15	0	22.7	23.2	22.9
	16QAM	1	0	23.4	23.5	23.4
		1	7	22.9	23.1	23.2
		1	14	22.7	23.2	23.0
		8	0	22.4	22.5	22.4
		8	4	22.1	22.1	22.2
		8	7	21.7	22.2	21.9
		15	0	21.7	22.1	21.9

LTE Band / BW	Modulation	RB Size	RB Offset	Low CH	Mid CH	High CH
				19975CH	20175CH	20375CH
				1712.5MHz	1732.5MHz	1752.5MHz
4 / 5M	QPSK	1	0	24.4	24.5	24.4
		1	12	24.0	24.1	24.2
		1	24	23.7	24.1	23.9
		12	0	23.5	23.7	23.5
		12	6	23.2	23.3	23.3
		12	11	22.8	23.2	23.1
		25	0	22.8	23.3	23.0
	16QAM	1	0	23.5	23.6	23.5
		1	12	23.0	23.2	23.3
		1	24	22.8	23.3	23.1
		12	0	22.5	22.6	22.5
		12	6	22.2	22.2	22.3
		12	11	21.8	22.3	22.0
		25	0	21.8	22.2	22.0

LTE Band / BW	Modulation	RB Size	RB Offset	Low CH	Mid CH	High CH
				20000CH	20175CH	20350CH
				1715MHz	1732.5MHz	1750MHz
4 / 10M	QPSK	1	0	24.4	24.5	24.4
		1	24	24.0	24.1	24.2
		1	49	23.7	24.1	23.9
		25	0	23.5	23.7	23.5
		25	12	23.2	23.3	23.3
		25	24	22.8	23.2	23.1
		50	0	22.8	23.3	23.0
	16QAM	1	0	23.5	23.6	23.5
		1	24	23.0	23.2	23.3
		1	49	22.8	23.3	23.1
		25	0	22.5	22.6	22.5
		25	12	22.2	22.2	22.3
		25	24	21.8	22.3	22.0
		50	0	21.8	22.2	22.0

LTE Band / BW	Modulation	RB Size	RB Offset	Low CH	Mid CH	High CH
				20025CH	20175CH	20325CH
				1717.5MHz	1732.5MHz	1747.5MHz
4 / 15M	QPSK	1	0	24.5	24.6	24.5
		1	37	24.1	24.2	24.3
		1	74	23.8	24.2	24.0
		36	0	23.6	23.8	23.6
		36	18	23.3	23.4	23.4
		36	35	22.9	23.3	23.2
		75	0	22.9	23.4	23.1
	16QAM	1	0	23.6	23.7	23.6
		1	37	23.1	23.3	23.4
		1	74	22.9	23.4	23.2
		36	0	22.6	22.7	22.6
		36	18	22.3	22.3	22.4
		36	35	21.9	22.4	22.1
		75	0	21.9	22.3	22.1

LTE Band / BW	Modulation	RB Size	RB Offset	Low CH	Mid CH	High CH
				20050CH	20175CH	20300CH
				1720MHz	1732.5MHz	1745MHz
4 / 20M	QPSK	1	0	24.5	24.6	24.5
		1	49	24.1	24.2	24.3
		1	99	23.8	24.2	24.0
		50	0	23.6	23.8	23.6
		50	24	23.3	23.4	23.4
		50	49	22.9	23.3	23.2
		100	0	22.9	23.4	23.1
	16QAM	1	0	23.6	23.7	23.6
		1	49	23.1	23.3	23.4
		1	99	22.9	23.4	23.2
		50	0	22.6	22.7	22.6
		50	24	22.3	22.3	22.4
		50	49	21.9	22.4	22.1
		100	0	21.9	22.3	22.1

LTE Band / BW	Modulation	RB Size	RB Offset	Low CH	Mid CH	High CH
				23017CH	23095CH	23173CH
				699.7MHz	707.5MHz	715.3MHz
12 / 1.4M	QPSK	1	0	24.6	24.5	24.6
		1	2	24.5	24.5	24.5
		1	5	24.3	24.2	23.9
		3	0	24.6	24.5	24.6
		3	1	24.5	24.5	24.5
		3	2	24.3	24.2	23.9
		6	0	23.4	23.4	23.0
	16QAM	1	0	23.7	23.7	23.7
		1	2	23.6	23.7	23.6
		1	5	23.4	23.3	23.0
		3	0	23.7	23.7	23.7
		3	1	23.6	23.7	23.6
		3	2	23.4	23.3	23.0
		6	0	22.4	20.5	20.6

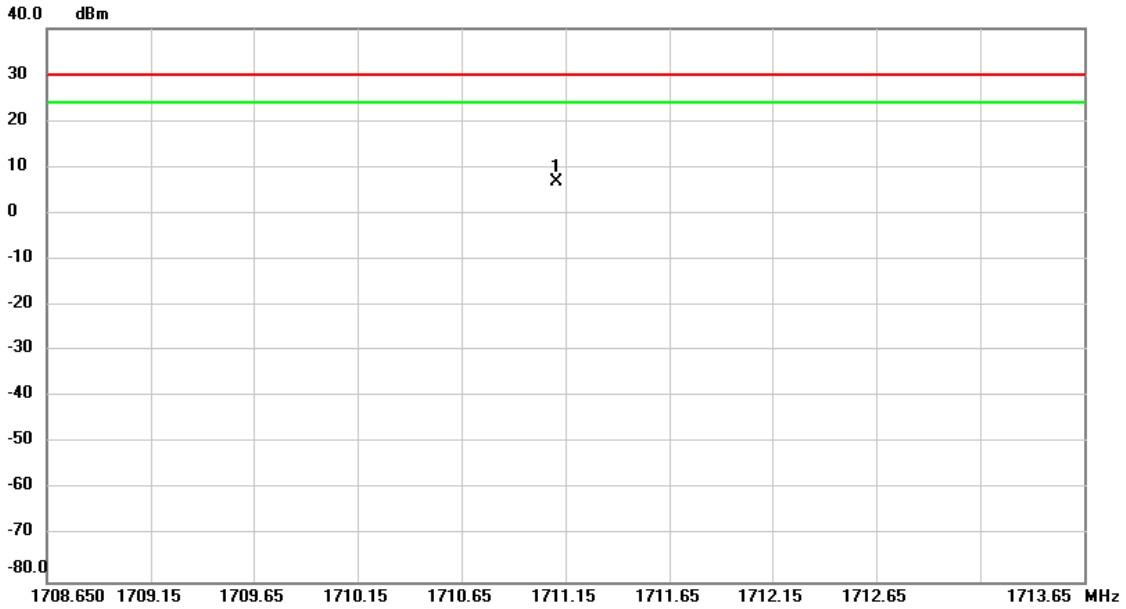
LTE Band / BW	Modulation	RB Size	RB Offset	Low CH	Mid CH	High CH
				23025CH	23095CH	23165CH
				700.5MHz	707.5MHz	714.5MHz
12 / 3M	QPSK	1	0	24.6	24.5	24.6
		1	7	24.5	24.5	24.5
		1	14	24.3	24.2	23.9
		8	0	23.7	23.6	23.7
		8	4	23.6	23.7	23.6
		8	7	23.4	23.3	23.0
		15	0	23.4	23.4	23.0
	16QAM	1	0	23.7	23.7	23.7
		1	7	23.6	23.7	23.6
		1	14	23.4	23.3	23.0
		8	0	22.7	22.6	22.8
		8	4	22.6	22.7	22.6
		8	7	22.5	22.4	22.1
		15	0	22.4	22.3	22.0

LTE Band / BW	Modulation	RB Size	RB Offset	Low CH	Mid CH	High CH
				23035CH	23095CH	23155CH
				701.5MHz	707.5MHz	713.5MHz
12 / 5M	QPSK	1	0	24.7	24.6	24.7
		1	12	24.6	24.6	24.6
		1	24	24.4	24.3	24.0
		12	0	23.8	23.7	23.8
		12	6	23.7	23.8	23.7
		12	11	23.5	23.4	23.1
		25	0	23.5	23.5	23.1
	16QAM	1	0	23.8	23.8	23.8
		1	12	23.7	23.8	23.7
		1	24	23.5	23.4	23.1
		12	0	22.8	22.7	22.9
		12	6	22.7	22.8	22.7
		12	11	22.6	22.5	22.2
		25	0	22.5	22.4	22.1

LTE Band / BW	Modulation	RB Size	RB Offset	Low CH	Mid CH	High CH
				23060CH	23095CH	23130CH
				704MHz	707.5MHz	711MHz
12 / 10M	QPSK	1	0	24.7	24.6	24.7
		1	24	24.6	24.6	24.6
		1	49	24.4	24.3	24.0
		25	0	23.8	23.7	23.8
		25	12	23.7	23.8	23.7
		25	24	23.5	23.4	23.1
		50	0	23.5	23.5	23.1
	16QAM	1	0	23.8	23.8	23.8
		1	24	23.7	23.8	23.7
		1	49	23.5	23.4	23.1
		25	0	22.8	22.7	22.9
		25	12	22.7	22.8	22.7
		25	24	22.6	22.5	22.2
		50	0	22.5	22.4	22.1

EIRP (dBm):

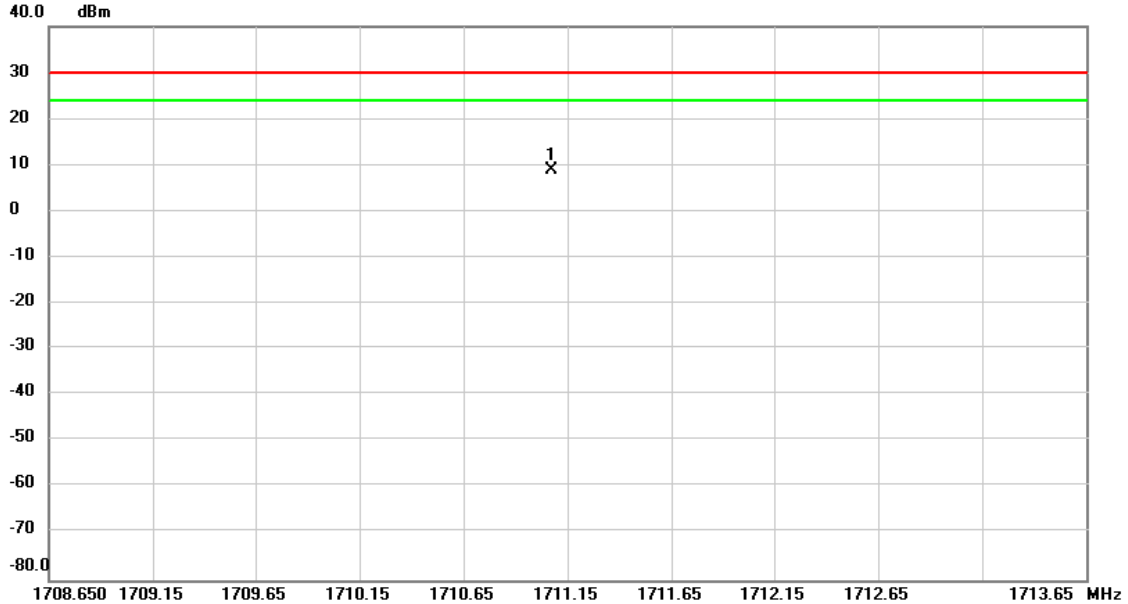
Test Mode	LTE Band 4_Link CH 20050_Internal Antenna	Tested Date	2019/12/22
Test Voltage	DC 32V	Polarization	Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1	*	1711.110	13.80	-6.98	6.82	30.00	-23.18	peak	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

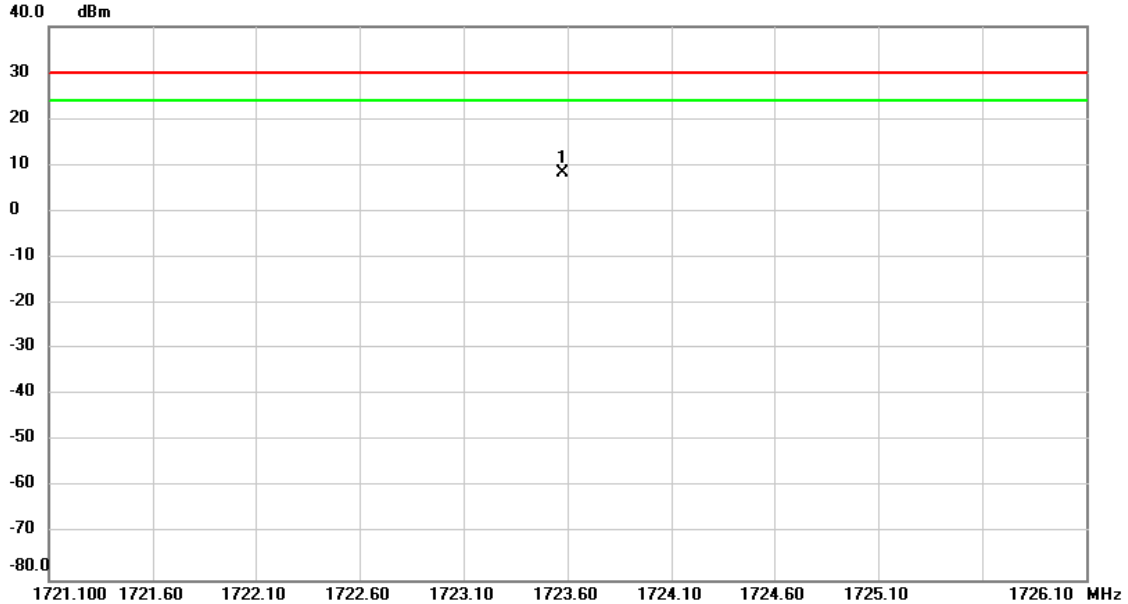
Test Mode	LTE Band 4_Link CH 20050_Internal Antenna	Tested Date	2019/12/22
Test Voltage	DC 32V	Polarization	Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1	*	1711.075	16.02	-6.98	9.04	30.00	-20.96	peak	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

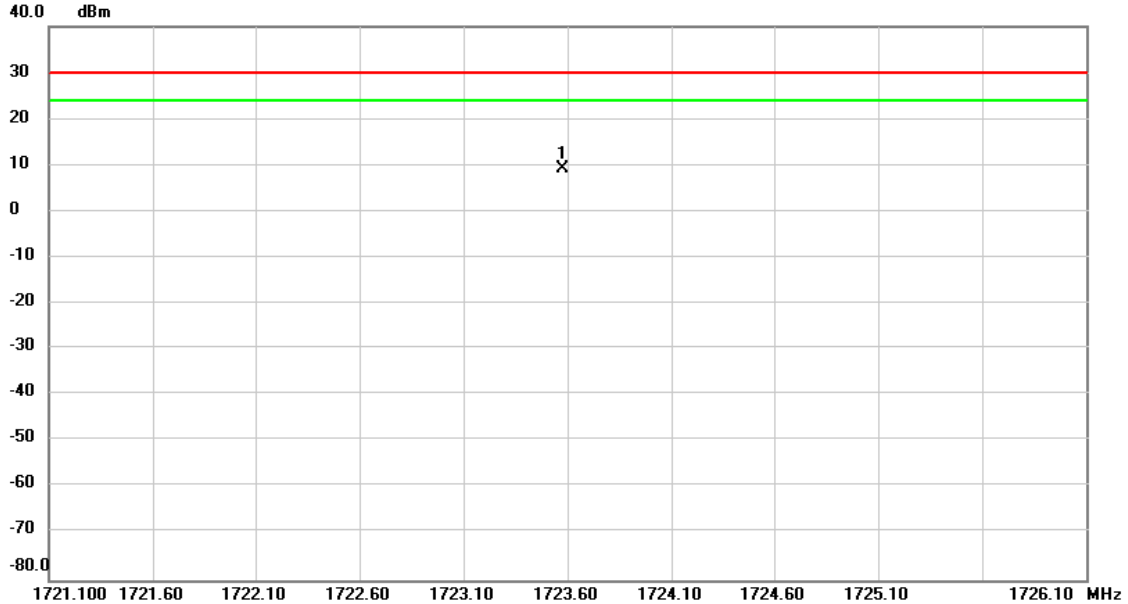
Test Mode	LTE Band 4_Link CH 20175_Internal Antenna	Tested Date	2019/12/22
Test Voltage	DC 32V	Polarization	Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1	*	1723.575	15.07	-6.72	8.35	30.00	-21.65	peak	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

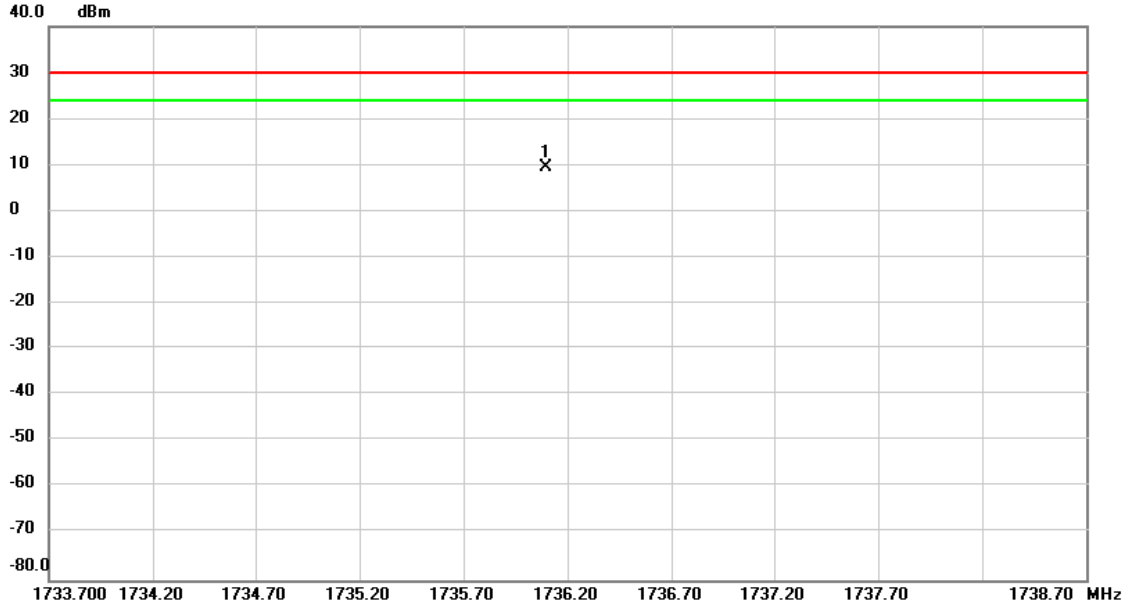
Test Mode	LTE Band 4_Link CH 20175_Internal Antenna	Tested Date	2019/12/22
Test Voltage	DC 32V	Polarization	Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1	*	1723.575	16.05	-6.72	9.33	30.00	-20.67	peak	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

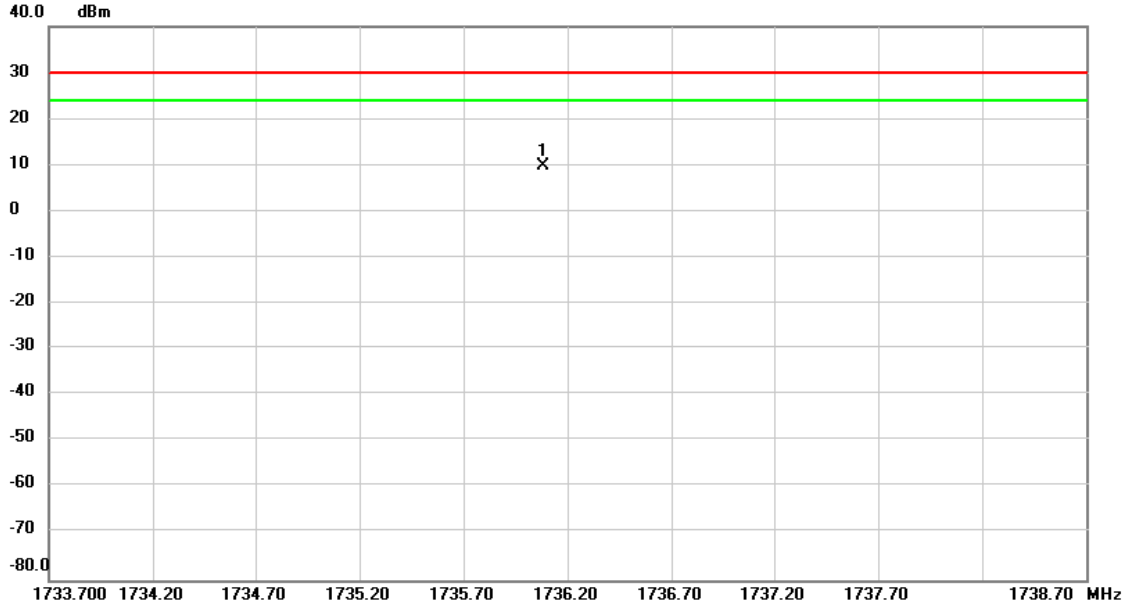
Test Mode	LTE Band 4_Link CH 20300_Internal Antenna	Tested Date	2019/12/22
Test Voltage	DC 32V	Polarization	Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1	*	1736.100	16.17	-6.47	9.70	30.00	-20.30	peak	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

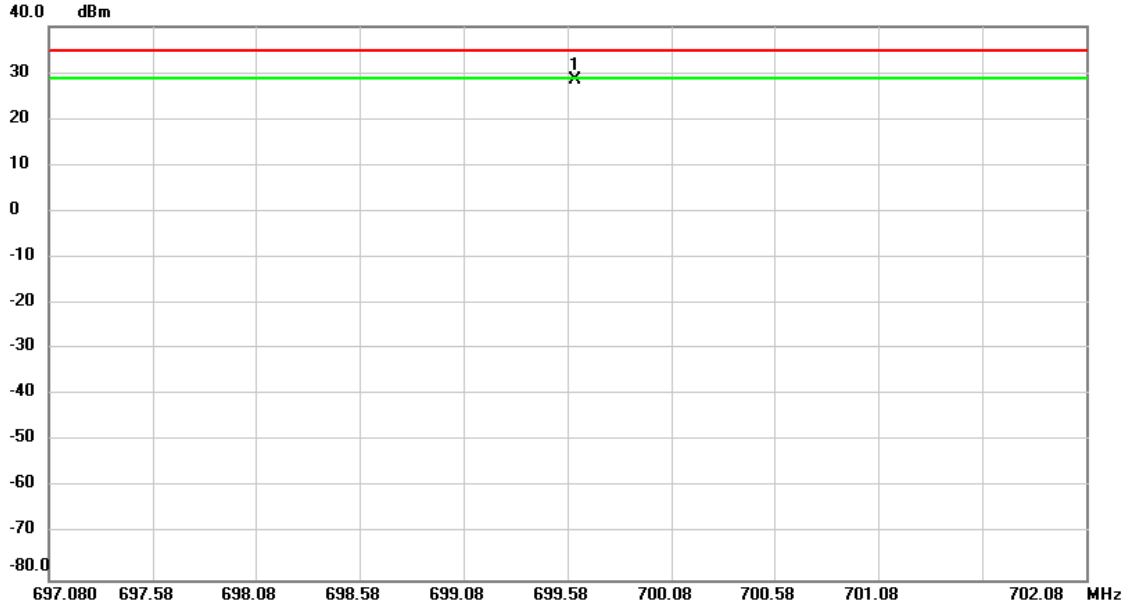
Test Mode	LTE Band 4_Link CH 20300_Internal Antenna	Tested Date	2019/12/22
Test Voltage	DC 32V	Polarization	Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1	*	1736.085	16.19	-6.47	9.72	30.00	-20.28	peak	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

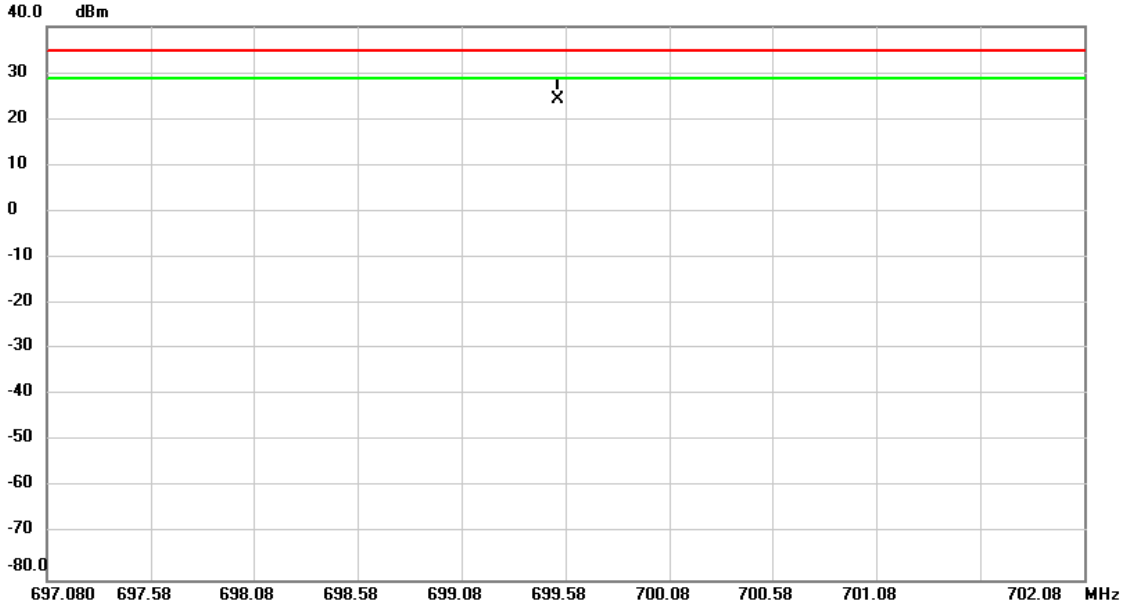
Test Mode	LTE Band 12_Link CH23060_Internal Antenna	Tested Date	2019/12/22
Test Voltage	DC 32V	Polarization	Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1	*	699.6150	13.83	14.66	28.49	34.77	-6.28	peak	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

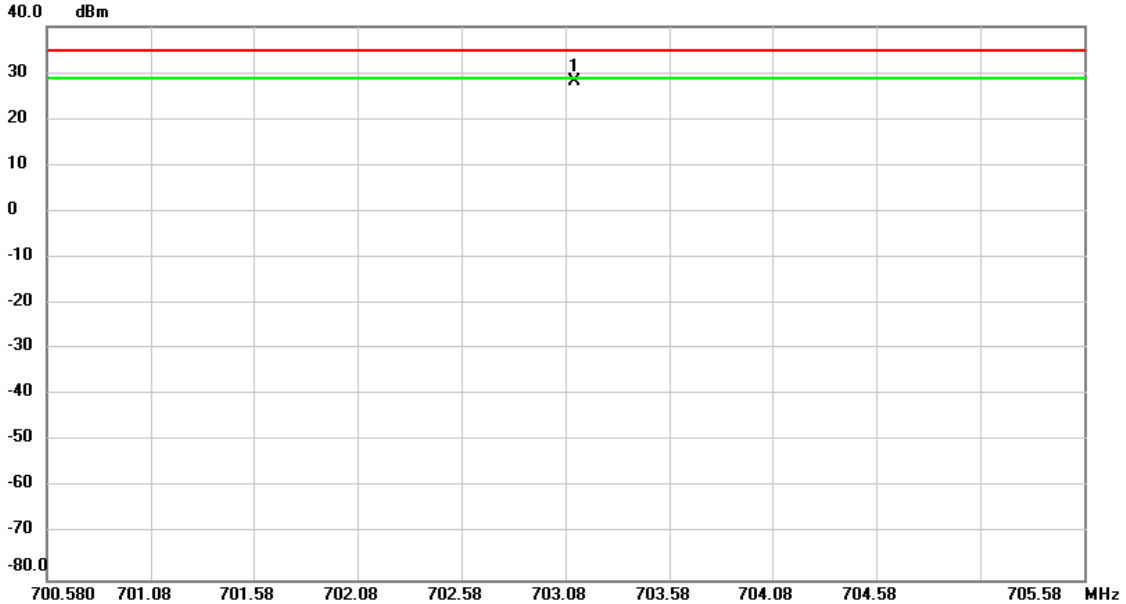
Test Mode	LTE Band 12_Link CH23060_Internal Antenna	Tested Date	2019/12/22
Test Voltage	DC 32V	Polarization	Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1	*	699.5450	9.46	14.66	24.12	34.77	-10.65	peak	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

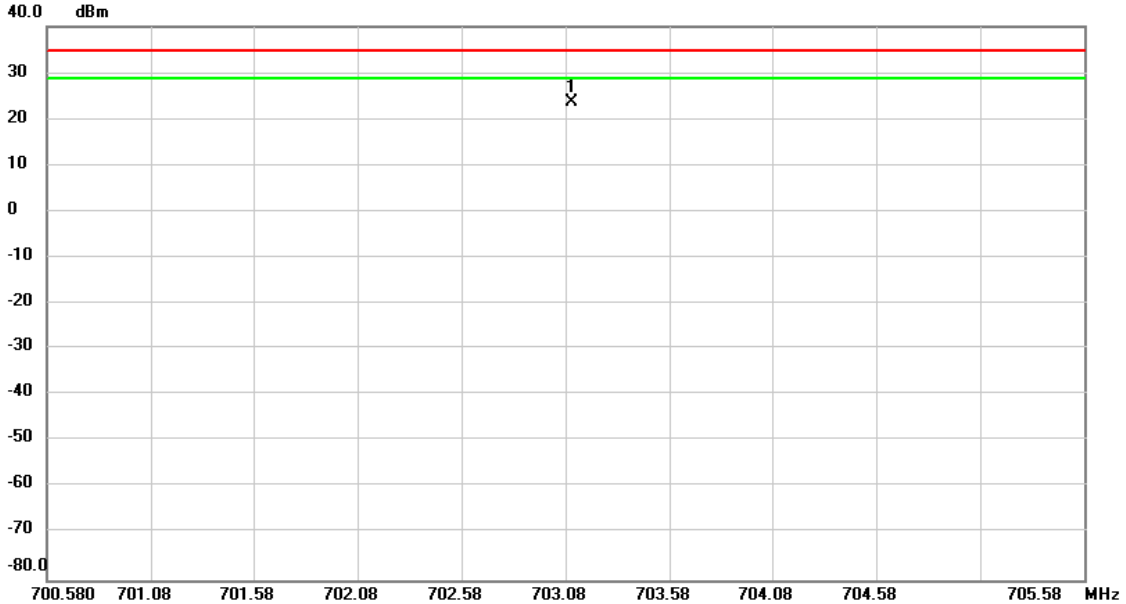
Test Mode	LTE Band 12_Link CH23095_Internal Antenna	Tested Date	2019/12/22
Test Voltage	DC 32V	Polarization	Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1	*	703.1250	13.67	14.53	28.20	34.77	-6.57	peak	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

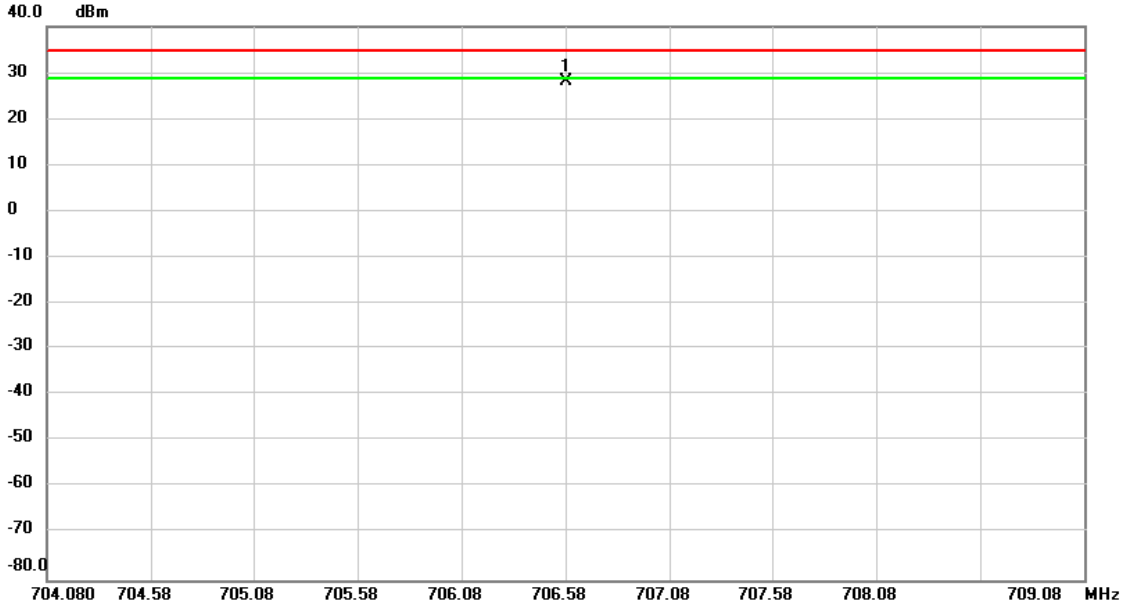
Test Mode	LTE Band 12_Link CH23095_Internal Antenna	Tested Date	2019/12/22
Test Voltage	DC 32V	Polarization	Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1	*	703.1100	9.03	14.53	23.56	34.77	-11.21	peak	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

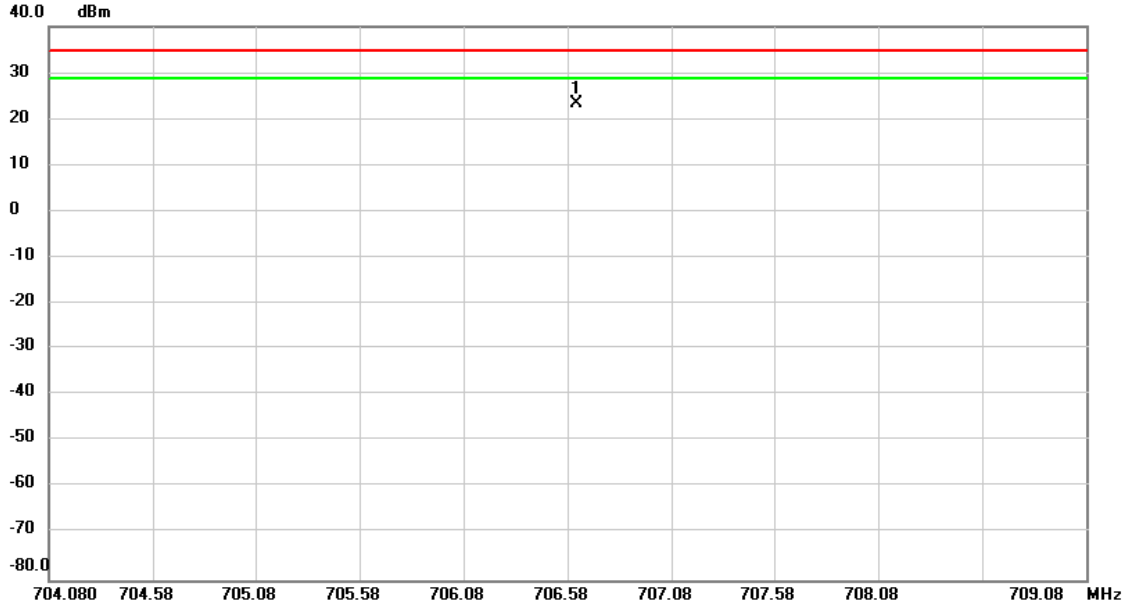
Test Mode	LTE Band 12_Link CH23130_Internal Antenna	Tested Date	2019/12/22
Test Voltage	DC 32V	Polarization	Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1	*	706.5800	13.65	14.38	28.03	34.77	-6.74	peak	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

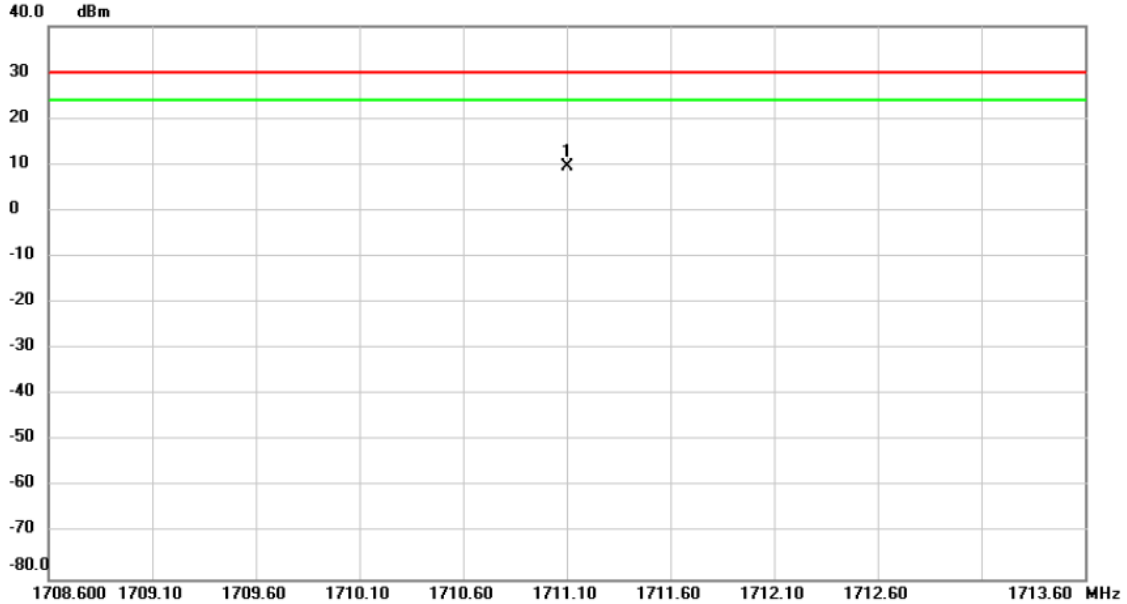
Test Mode	LTE Band 12_Link CH23130_Internal Antenna	Tested Date	2019/12/22
Test Voltage	DC 32V	Polarization	Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1	*	706.6250	8.88	14.38	23.26	34.77	-11.51	peak	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

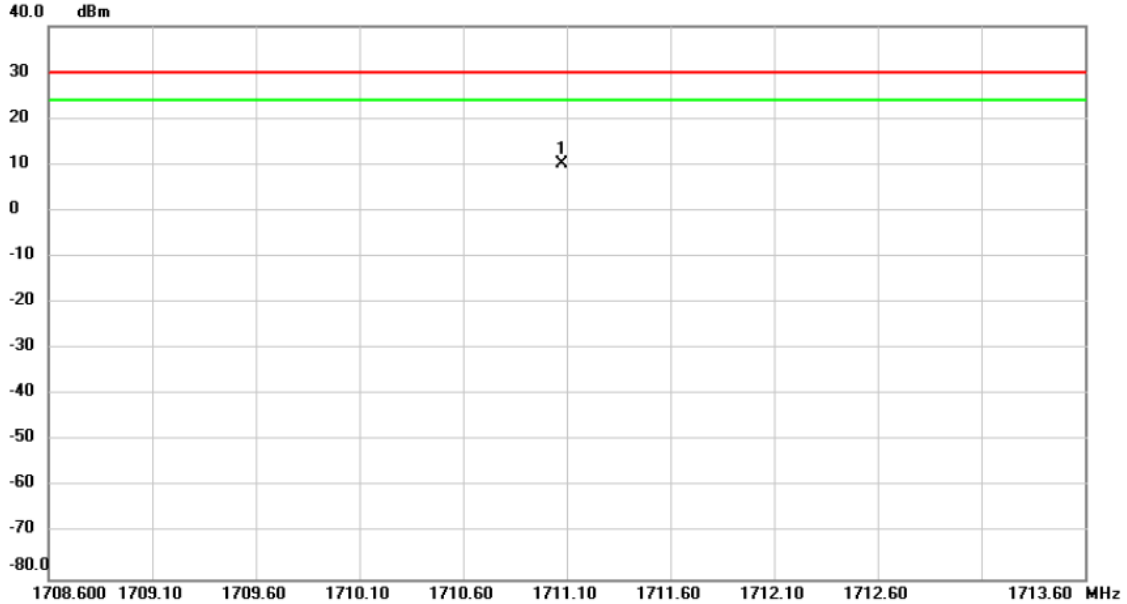
Test Mode	LTE Band 4_Link CH 20050_External Antenna	Tested Date	2019/12/22
Test Voltage	DC 32V	Polarization	Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1	*	1711.105	16.46	-6.98	9.48	30.00	-20.52	peak	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

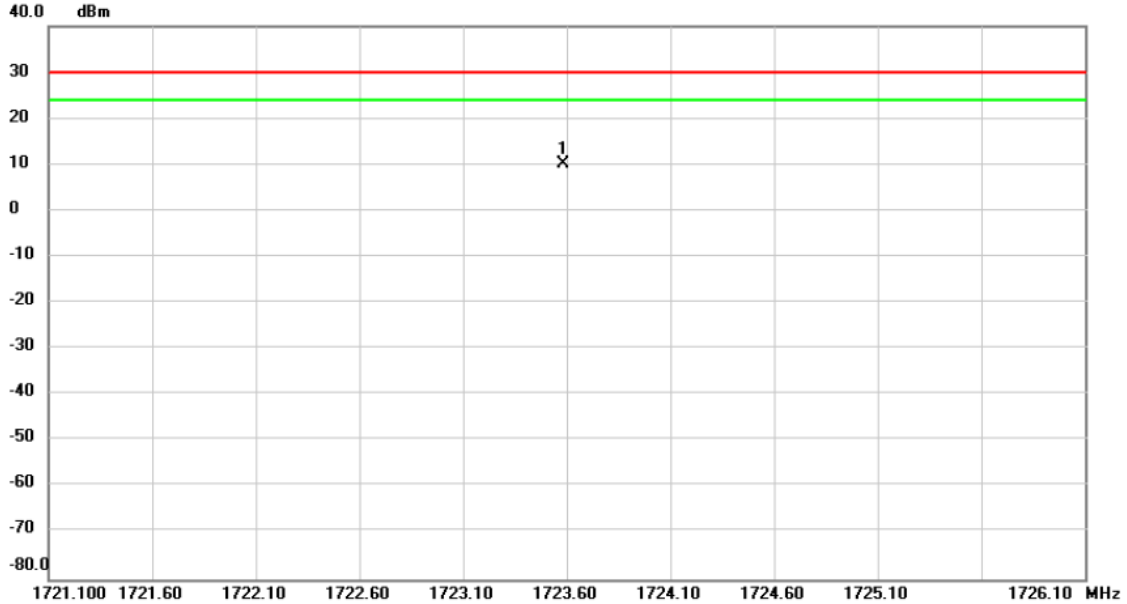
Test Mode	LTE Band 4_Link CH 20050_External Antenna	Tested Date	2019/12/22
Test Voltage	DC 32V	Polarization	Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1	*	1711.075	17.04	-6.98	10.06	30.00	-19.94	peak	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

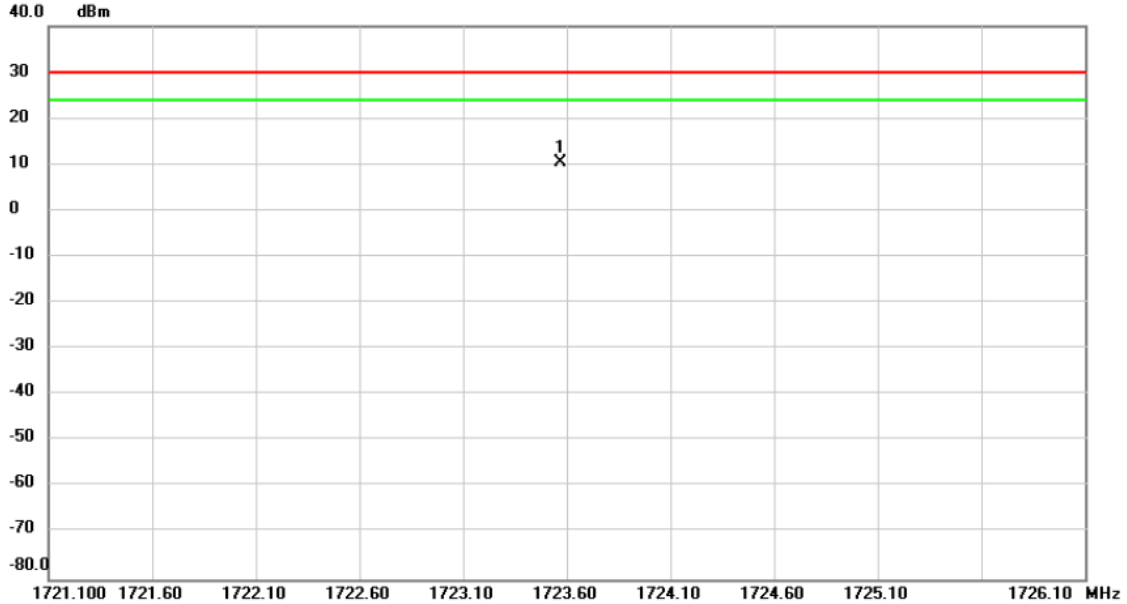
Test Mode	LTE Band 4_Link CH 20175_External Antenna	Tested Date	2019/12/22
Test Voltage	DC 32V	Polarization	Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1	*	1723.585	17.02	-6.72	10.30	30.00	-19.70	peak	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

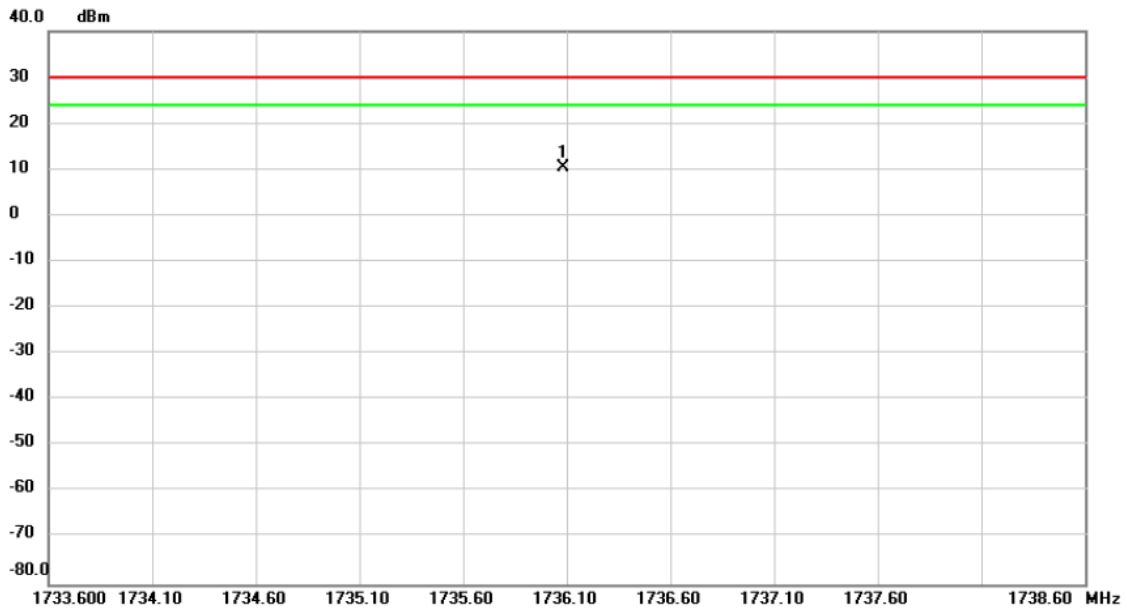
Test Mode	LTE Band 4_Link CH 20175_External Antenna	Tested Date	2019/12/22
Test Voltage	DC 32V	Polarization	Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1	*	1723.570	17.06	-6.72	10.34	30.00	-19.66	peak	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

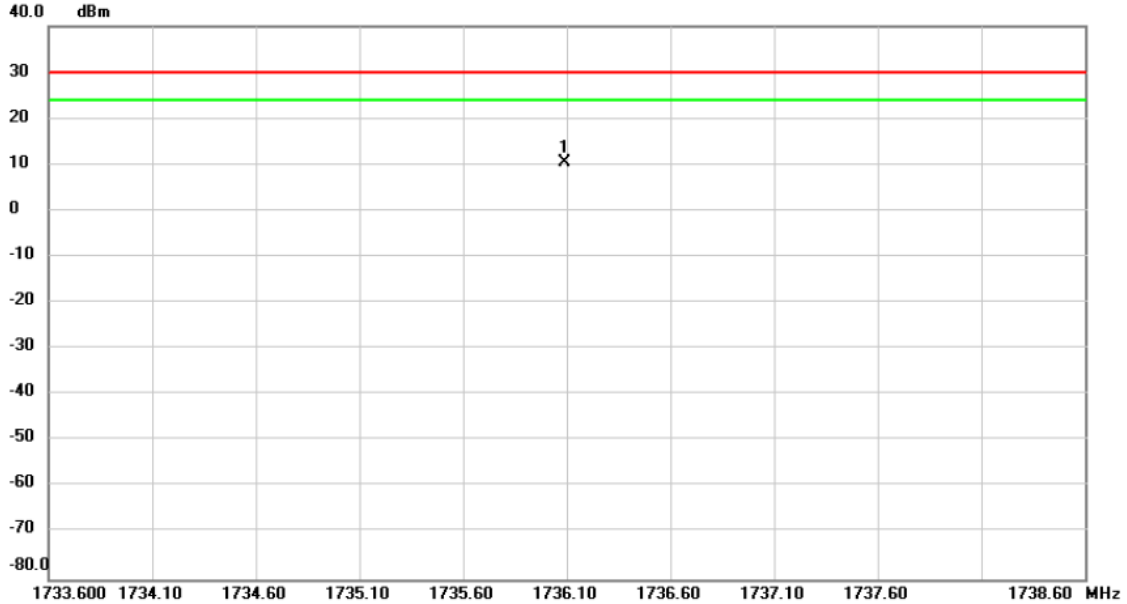
Test Mode	LTE Band 4_Link CH 20300_External Antenna	Tested Date	2019/12/22
Test Voltage	DC 32V	Polarization	Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1	*	1736.080	17.03	-6.47	10.56	30.00	-19.44	peak	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

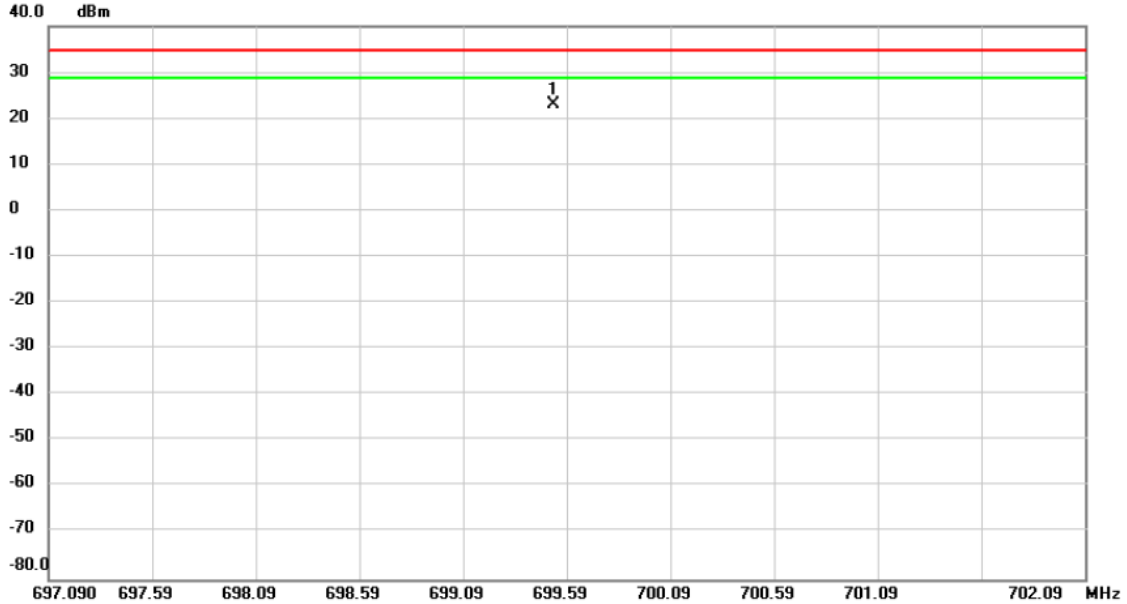
Test Mode	LTE Band 4_Link CH 20300_External Antenna	Tested Date	2019/12/22
Test Voltage	DC 32V	Polarization	Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1	*	1736.090	17.07	-6.47	10.60	30.00	-19.40	peak	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

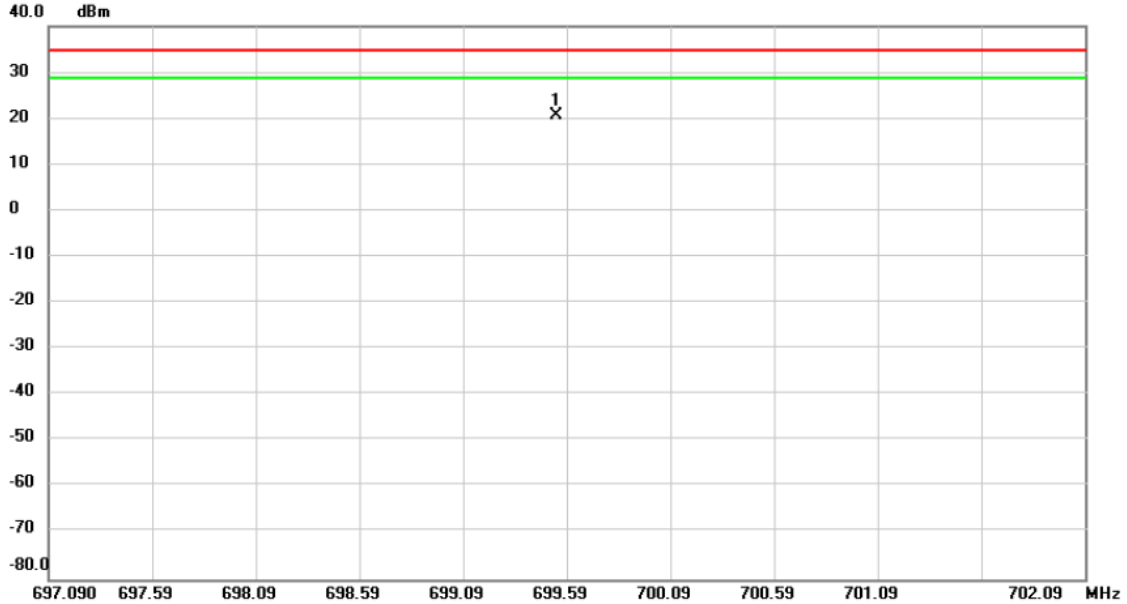
Test Mode	LTE Band 12_Link CH23060_External Antenna	Tested Date	2019/12/22
Test Voltage	DC 32V	Polarization	Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1	*	699.5300	13.69	9.36	23.05	34.77	-11.72	peak	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

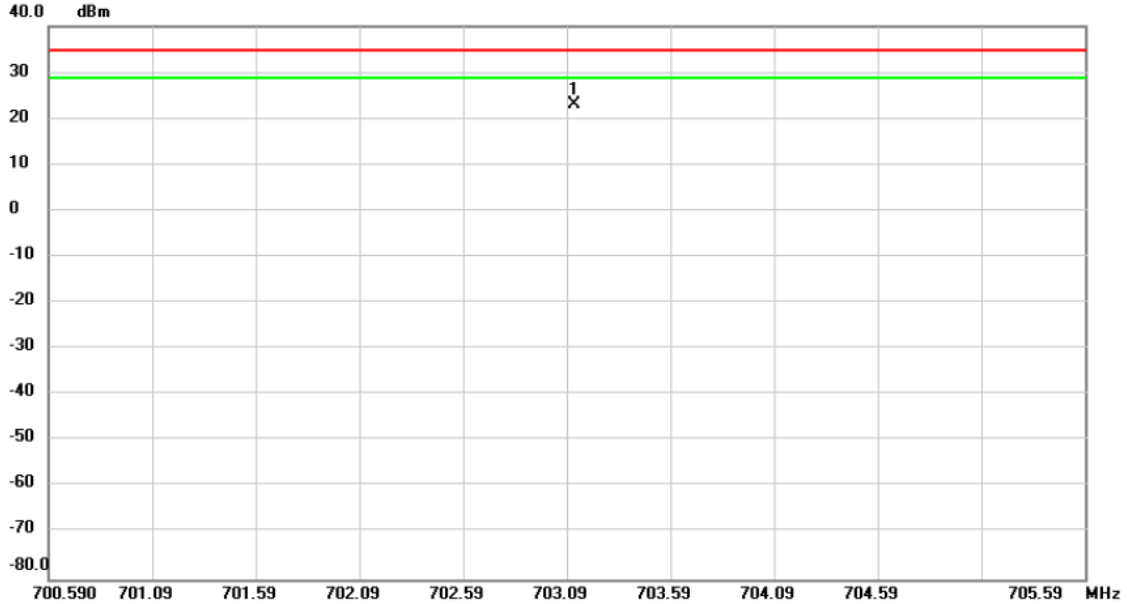
Test Mode	LTE Band 12_Link CH23060_External Antenna	Tested Date	2019/12/22
Test Voltage	DC 32V	Polarization	Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1	*	699.5400	11.33	9.36	20.69	34.77	-14.08	peak	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

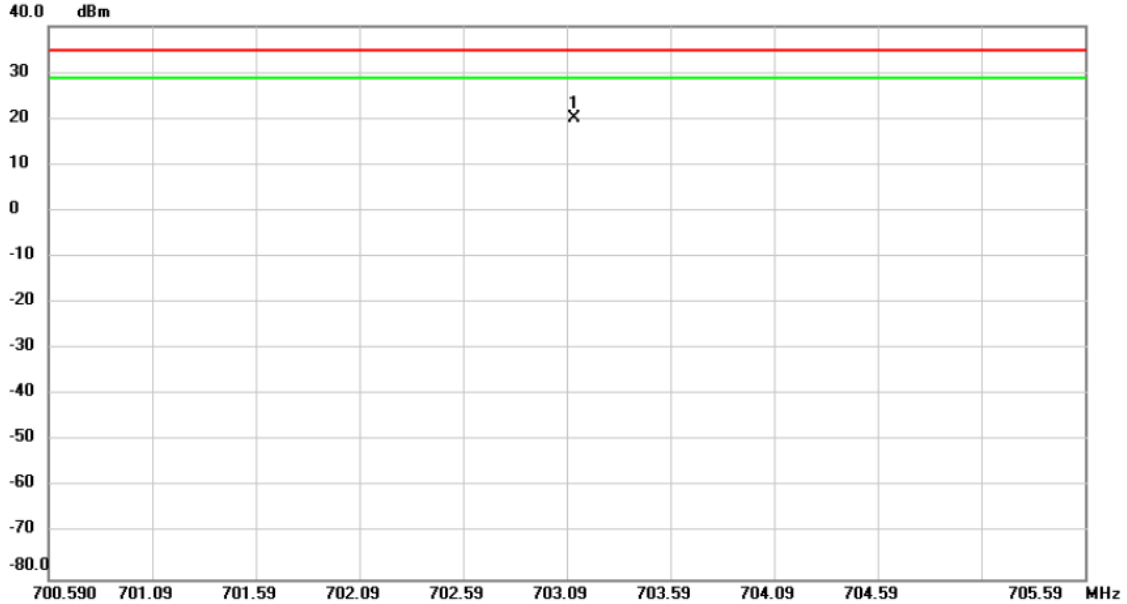
Test Mode	LTE Band 12_Link CH23095_External Antenna	Tested Date	2019/12/22
Test Voltage	DC 32V	Polarization	Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1	*	703.1300	13.43	9.59	23.02	34.77	-11.75	peak	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

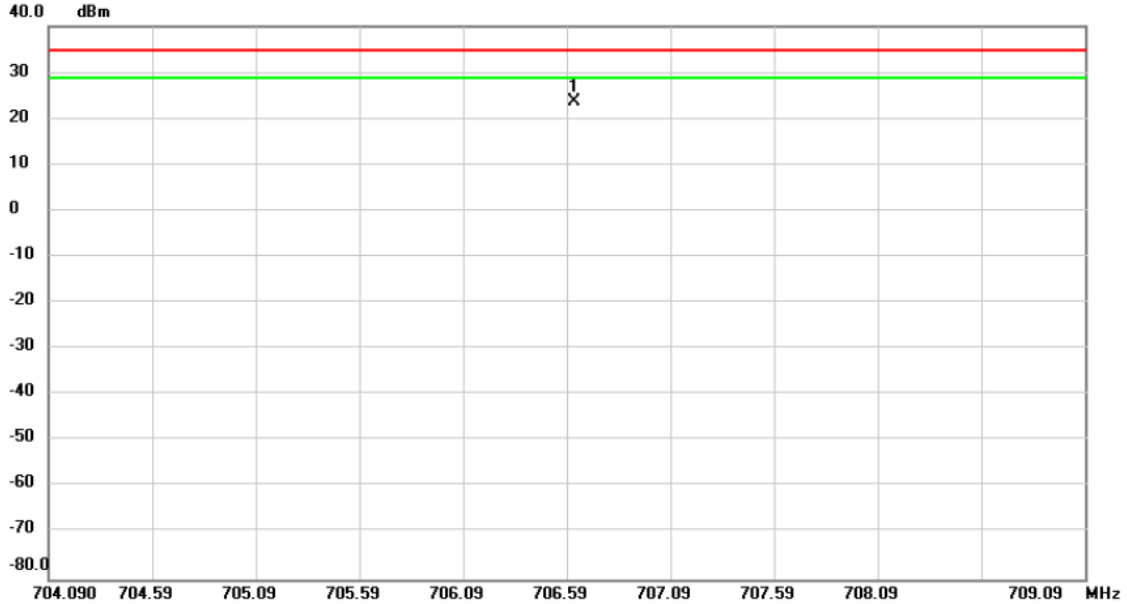
Test Mode	LTE Band 12_Link CH23095_External Antenna	Tested Date	2019/12/22
Test Voltage	DC 32V	Polarization	Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1	*	703.1300	10.46	9.59	20.05	34.77	-14.72	peak	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

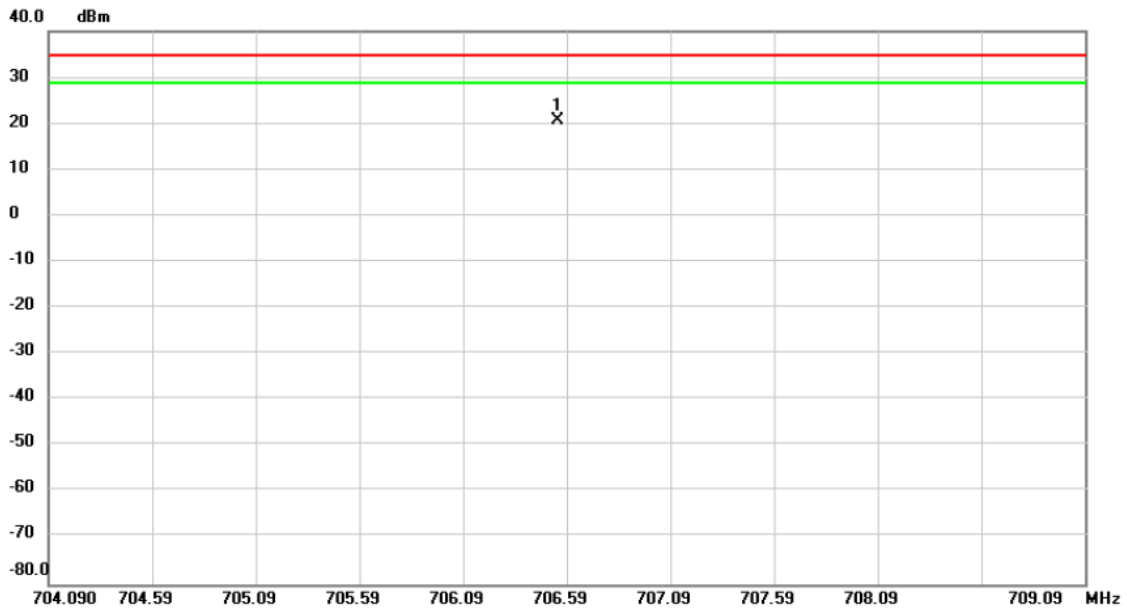
Test Mode	LTE Band 12_Link CH23130_External Antenna	Tested Date	2019/12/22
Test Voltage	DC 32V	Polarization	Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1	*	706.6250	13.92	9.83	23.75	34.77	-11.02	peak	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

Test Mode	LTE Band 12_Link CH23130_External Antenna	Tested Date	2019/12/22
Test Voltage	DC 32V	Polarization	Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1	*	706.5450	10.74	9.82	20.56	34.77	-14.21	peak	

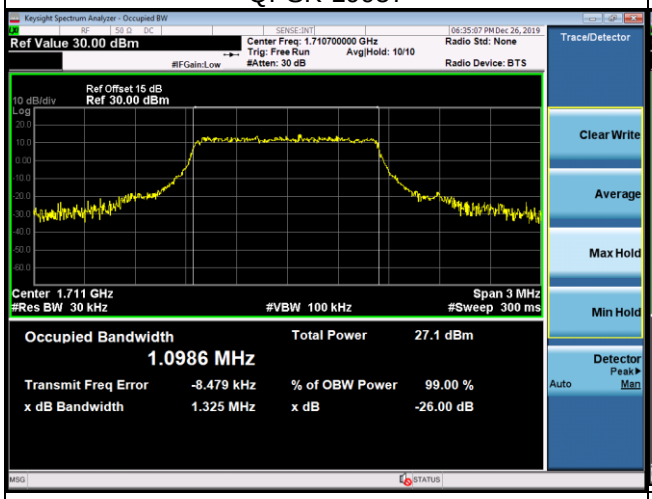
REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

APPENDIX B - OCCUPIED BANDWIDTH

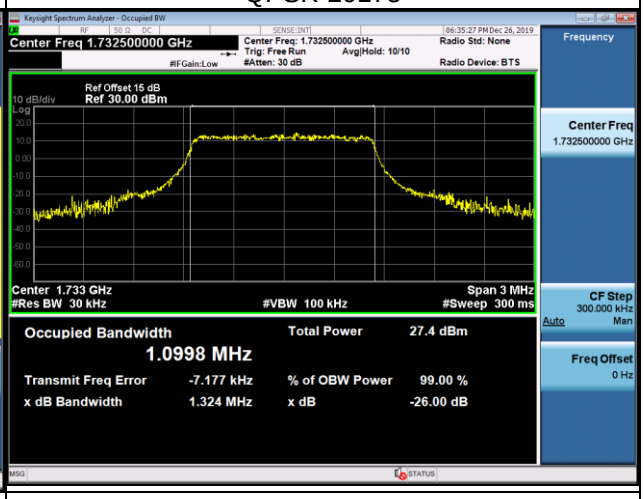
LTE Band 4_1.4M					
QPSK					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
19957	1710.7	1.0986	19957	1710.7	1.325
20175	1732.5	1.0998	20175	1732.5	1.324
20393	1754.3	1.0969	20393	1754.3	1.340
16QAM					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
19957	1710.7	1.1006	19957	1710.7	1.345
20175	1732.5	1.0994	20175	1732.5	1.354
20393	1754.3	1.1003	20393	1754.3	1.352

Spectrum Plot

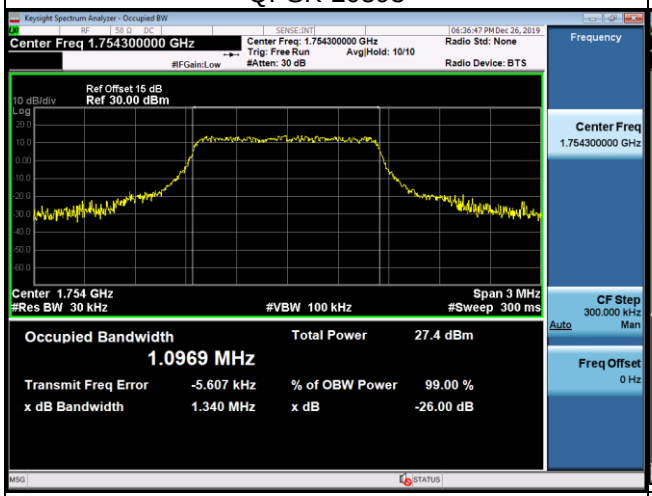
QPSK-19957



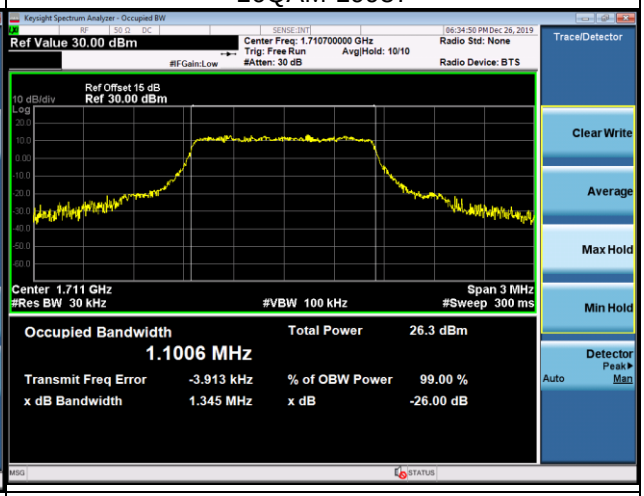
QPSK-20175



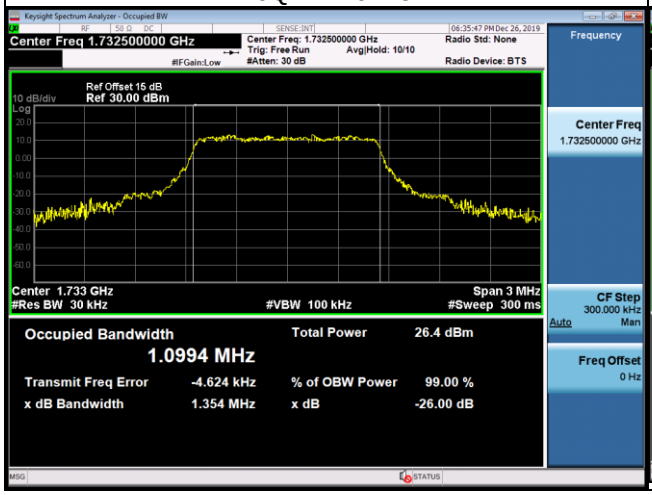
QPSK-20393



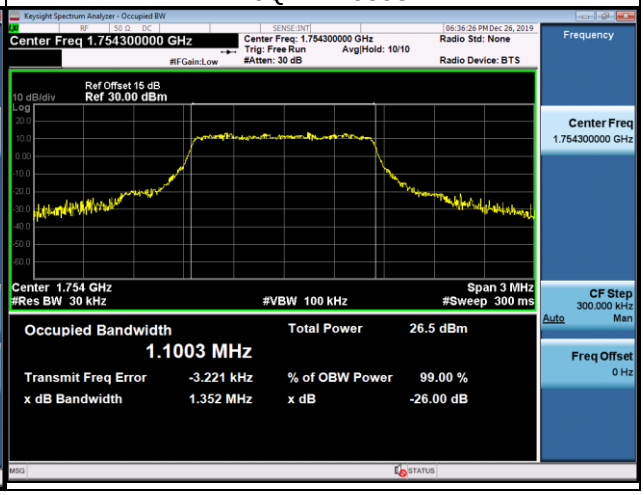
16QAM-19957



16QAM-20175



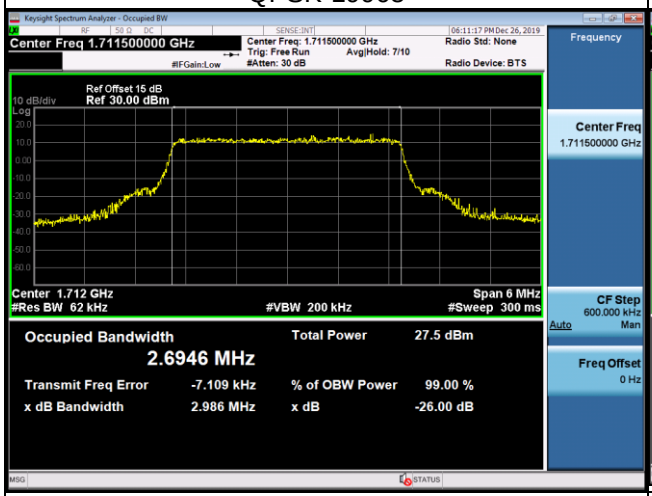
16QAM-20393



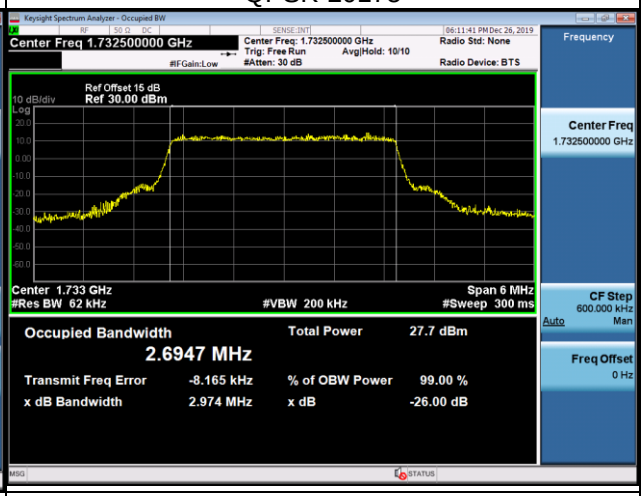
LTE Band 4_3M					
QPSK					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
19965	1711.5	2.6946	19965	1711.5	2.986
20175	1732.5	2.6947	20175	1732.5	2.974
20385	1753.5	2.6952	20385	1753.5	2.981
16QAM					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
19965	1711.5	2.6977	19965	1711.5	3.025
20175	1732.5	2.6978	20175	1732.5	3.031
20385	1753.5	2.6982	20385	1753.5	3.021

Spectrum Plot

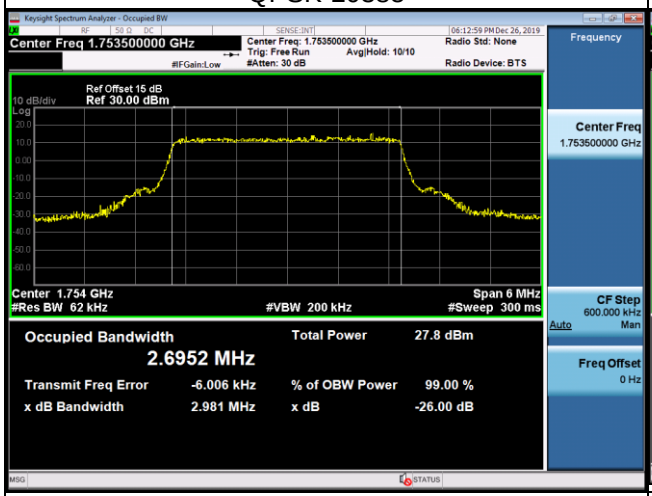
QPSK-19965



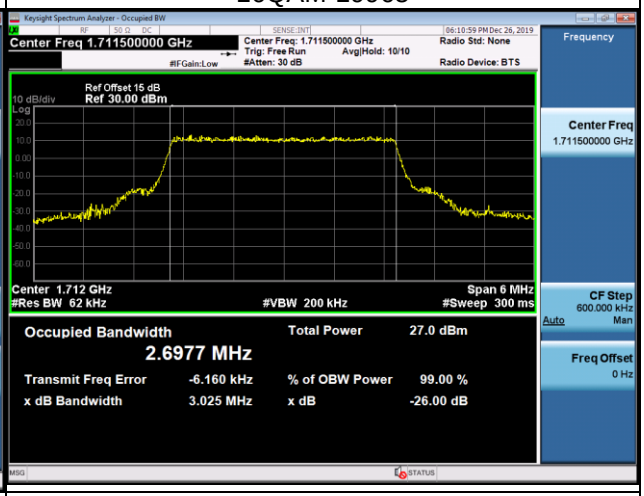
QPSK-20175



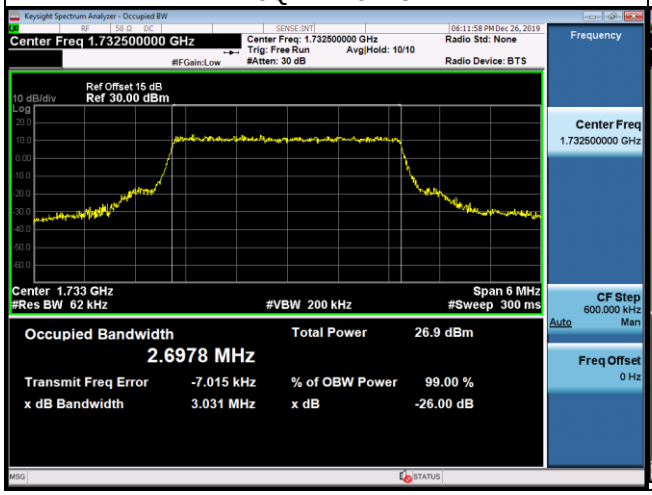
QPSK-20385



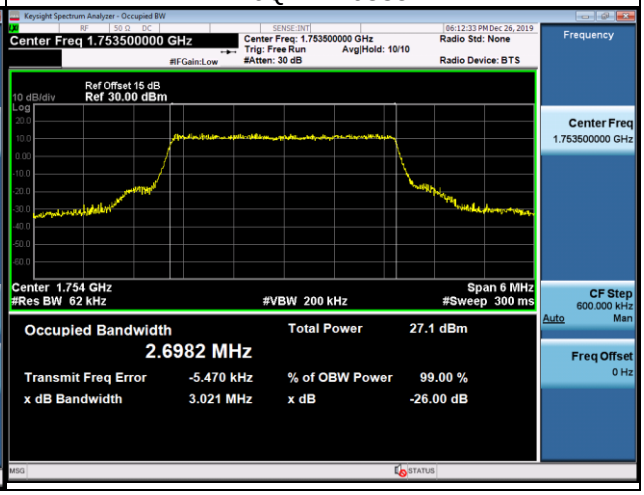
16QAM-19965



16QAM-20175



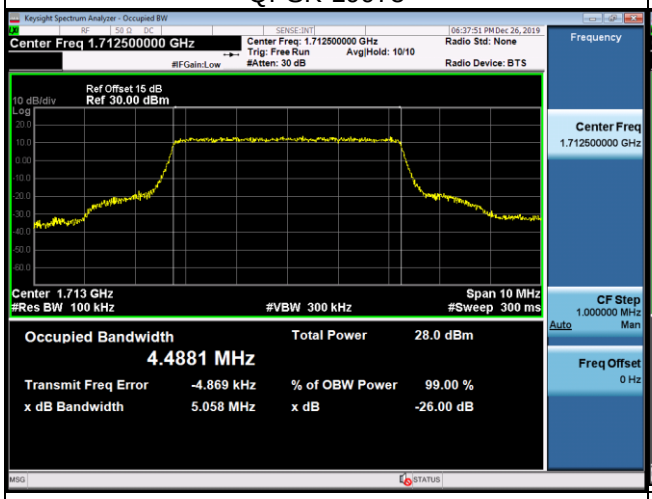
16QAM-20385



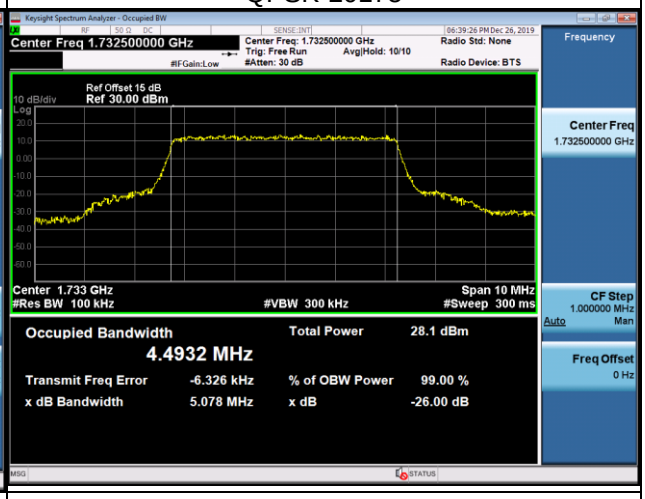
LTE Band 4_5M					
QPSK					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
19975	1712.5	4.4881	19975	1712.5	5.058
20175	1732.5	4.4932	20175	1732.5	5.078
20375	1752.5	4.4907	20375	1752.5	5.091
16QAM					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
19975	1712.5	4.4822	19975	1712.5	5.062
20175	1732.5	4.4837	20175	1732.5	5.062
20375	1752.5	4.4902	20375	1752.5	5.045

Spectrum Plot

QPSK-19975

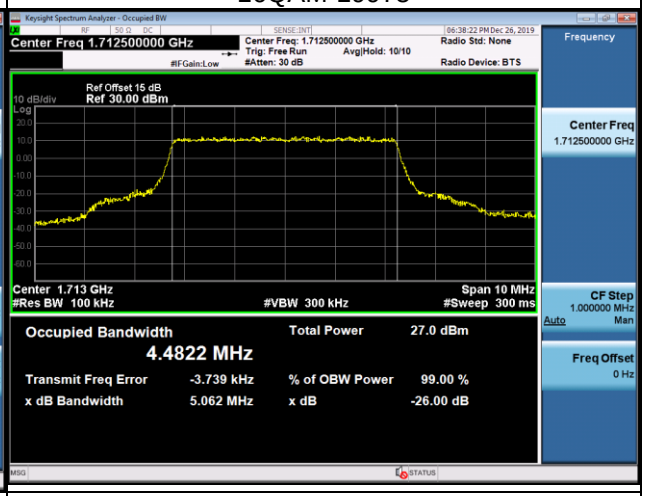


QPSK-20175

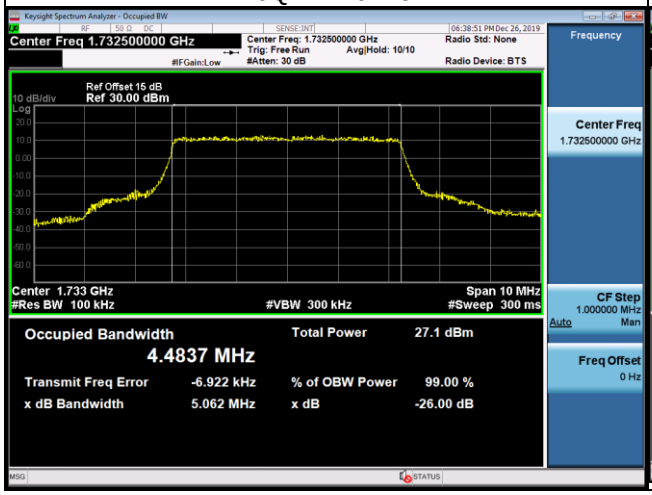


QPSK-20375

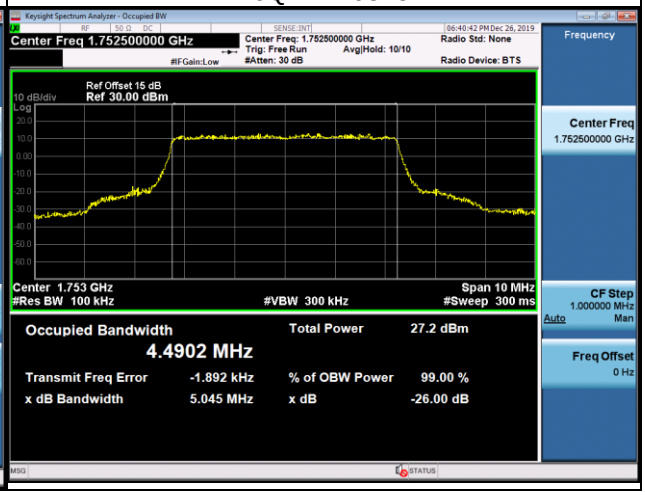
16QAM-19975



16QAM-20175



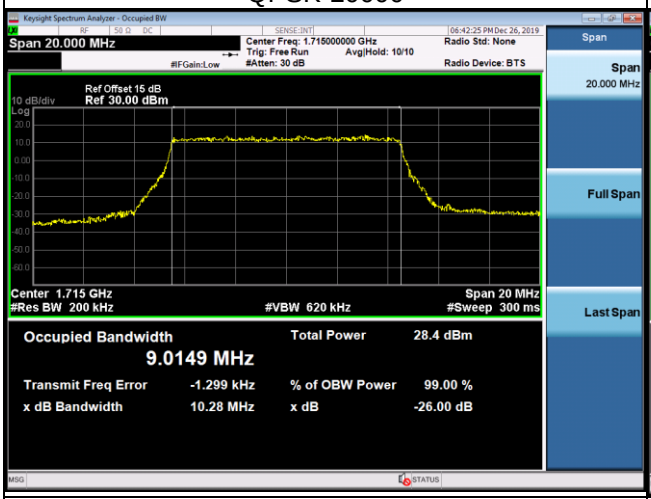
16QAM-20375



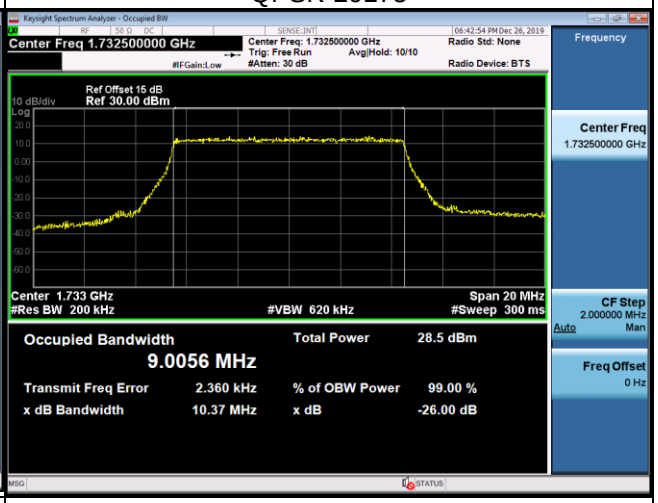
LTE Band 4_10M					
QPSK					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
20000	1715	9.0149	20000	1715	10.28
20175	1732.5	9.0056	20175	1732.5	10.37
20350	1750	8.9978	20350	1750	10.38
16QAM					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
20000	1715	8.9736	20000	1715	10.20
20175	1732.5	8.9604	20175	1732.5	10.14
20350	1750	8.9779	20350	1750	10.18

Spectrum Plot

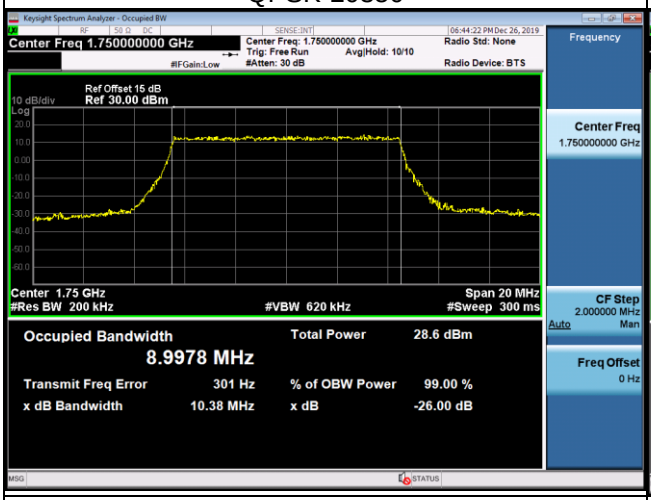
QPSK-20000



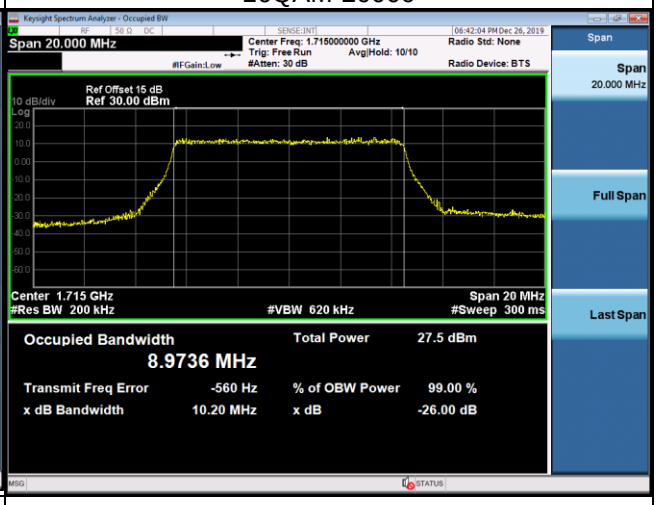
QPSK-20175



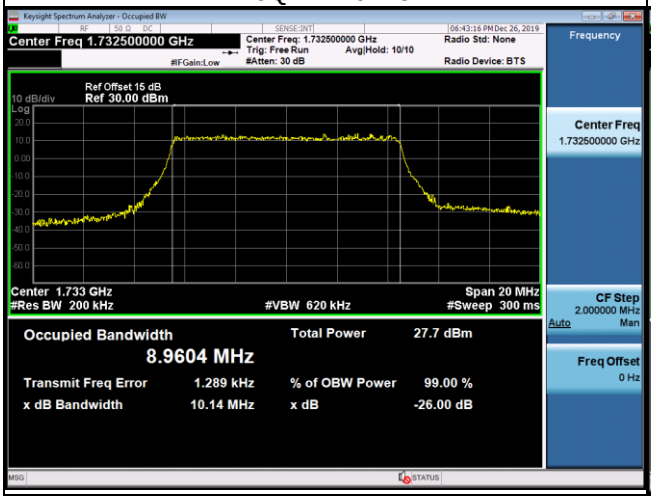
QPSK-20350



16QAM-20000



16QAM-20175



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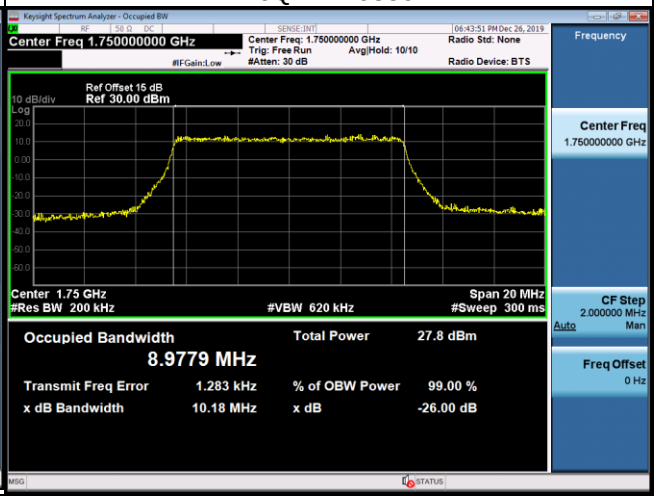
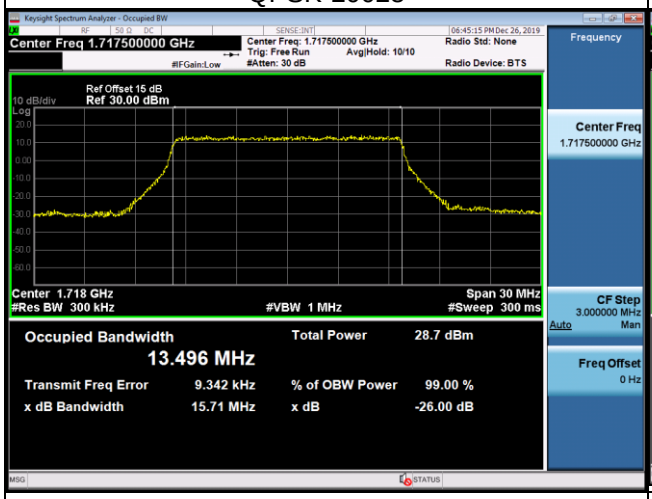


LTE Band 4_15M					
QPSK					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
20025	1717.5	13.496	20025	1717.5	15.71
20175	1732.5	13.488	20175	1732.5	15.61
20325	1747.5	13.526	20325	1747.5	15.82
16QAM					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
20025	1717.5	13.512	20025	1717.5	16.02
20175	1732.5	13.491	20175	1732.5	15.97
20325	1747.5	13.533	20325	1747.5	15.93

Spectrum Plot

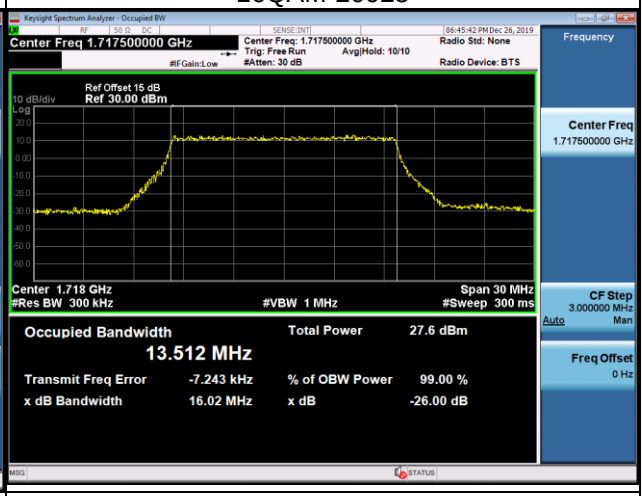
QPSK-20025



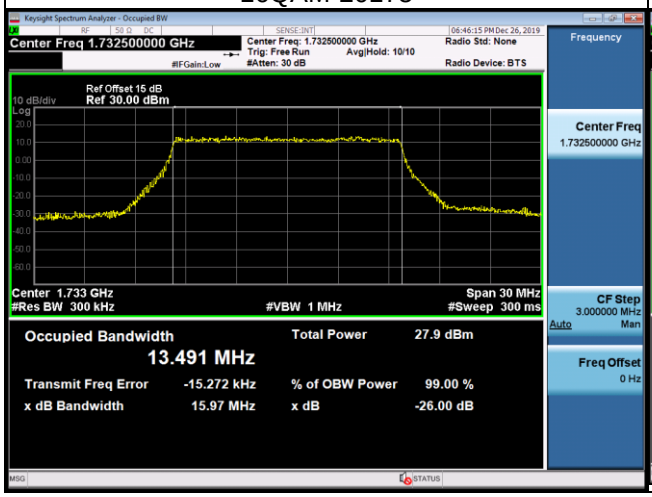
QPSK-20175

QPSK-20325

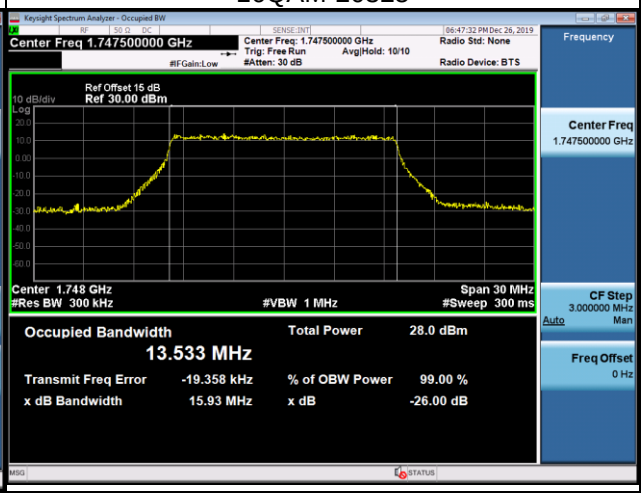
16QAM-20025



16QAM-20175



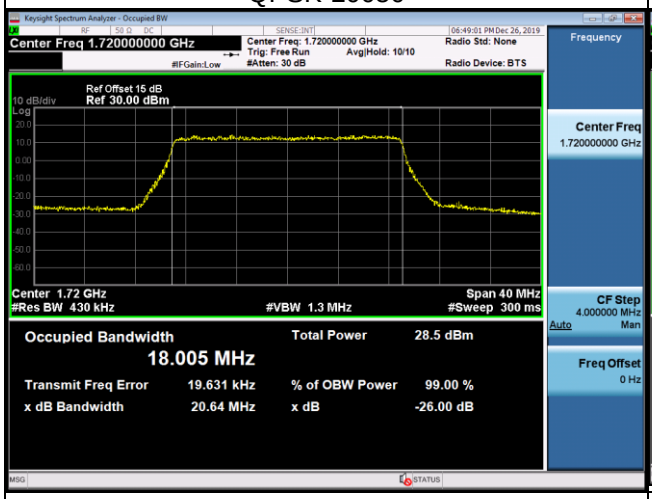
16QAM-20325



LTE Band 4_20M					
QPSK					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
20050	1720	18.005	20050	1720	20.64
20175	1732.5	17.961	20175	1732.5	20.56
20300	1745	18.010	20300	1745	20.66
16QAM					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
20050	1720	18.010	20050	1720	20.76
20175	1732.5	17.989	20175	1732.5	20.49
20300	1745	18.006	20300	1745	20.61

Spectrum Plot

QPSK-20050

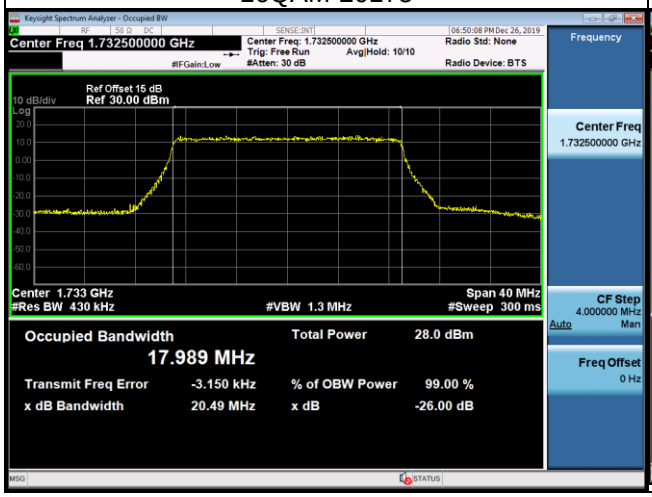


QPSK-20175

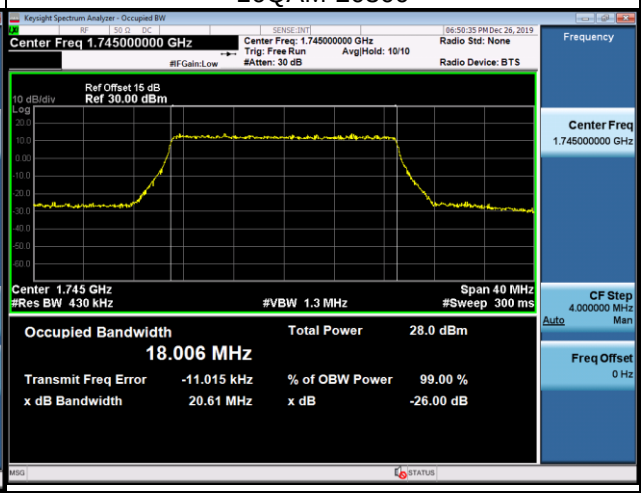
QPSK-20300

16QAM-20050

16QAM-20175



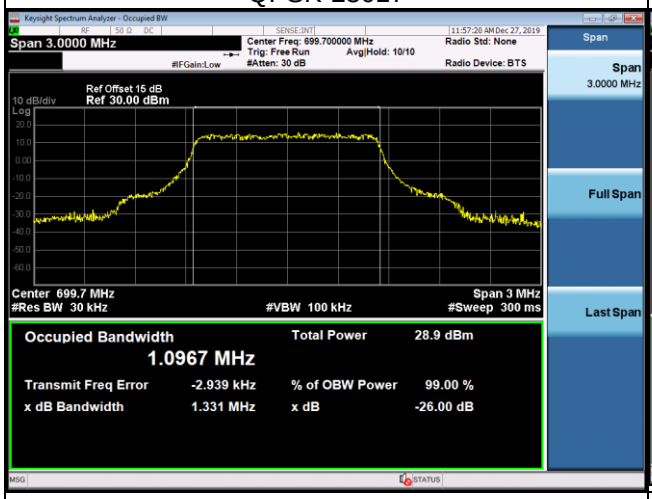
16QAM-20300



LTE Band 12_1.4M					
QPSK					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
23017	699.7	1.0967	23017	699.7	1.331
23095	707.5	1.0995	23095	707.5	1.329
23173	715.3	1.0984	23173	715.3	1.316
16QAM					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
23017	699.7	1.1004	23017	699.7	1.327
23095	707.5	1.0989	23095	707.5	1.344
23173	715.3	1.0997	23173	715.3	1.340

Spectrum Plot

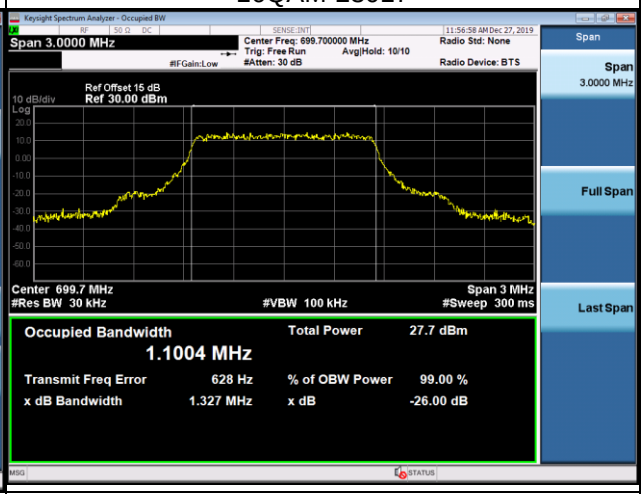
QPSK-23017



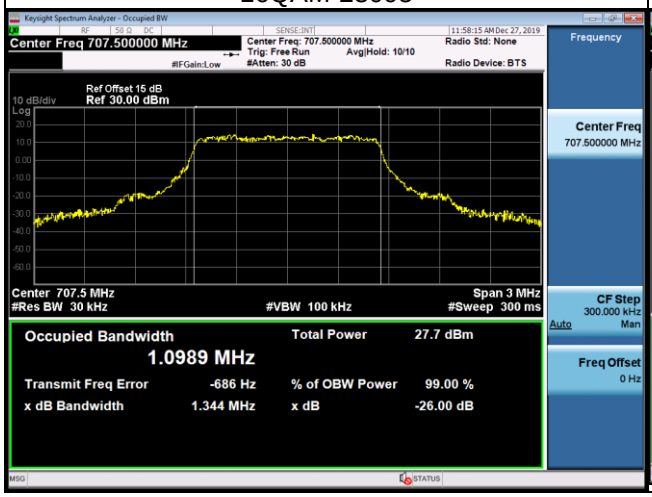
QPSK-23095

QPSK-23173

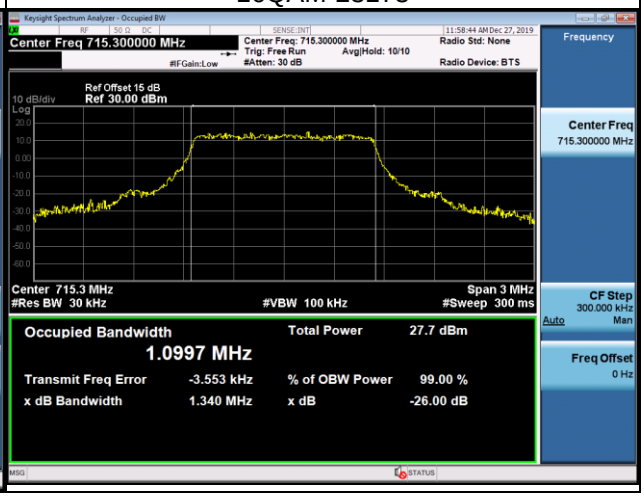
16QAM-23017



16QAM-23095



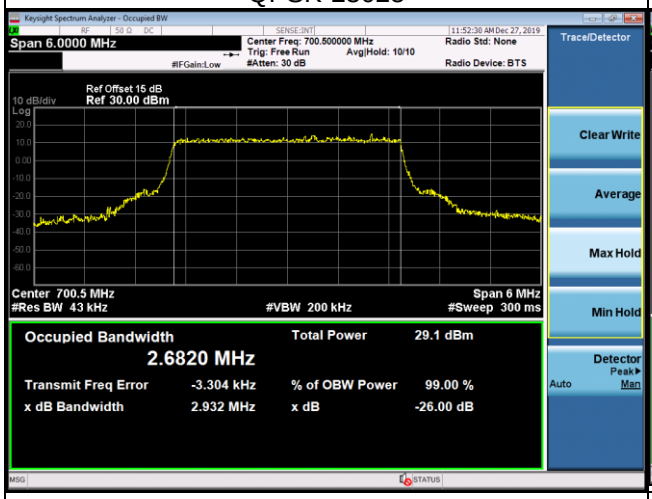
16QAM-23173



LTE Band 12_3M					
QPSK					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
23025	700.5	2.6820	23025	700.5	2.932
23095	707.5	2.6866	23095	707.5	2.944
23165	714.5	2.6820	23165	714.5	2.932
16QAM					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
23025	700.5	2.6835	23025	700.5	2.975
23095	707.5	2.6891	23095	707.5	2.977
23165	714.5	2.6827	23165	714.5	2.952

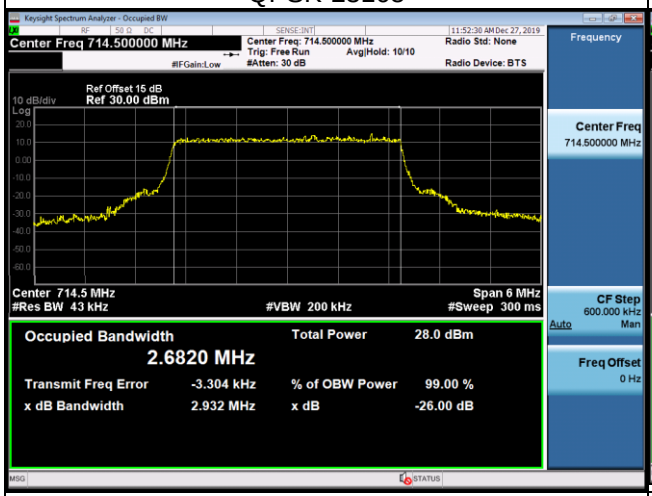
Spectrum Plot

QPSK-23025



QPSK-23095

QPSK-23165



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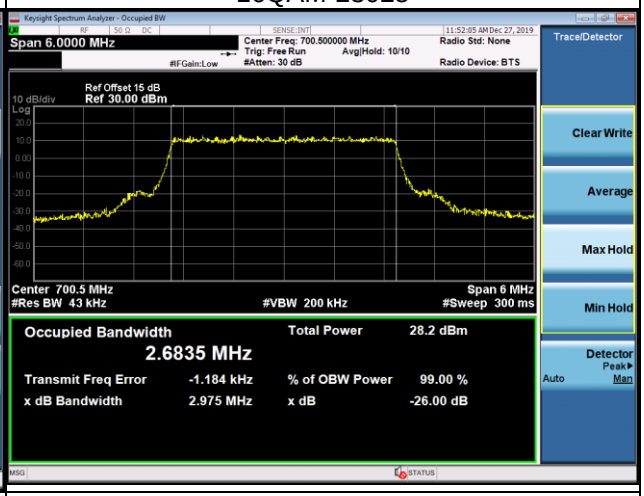
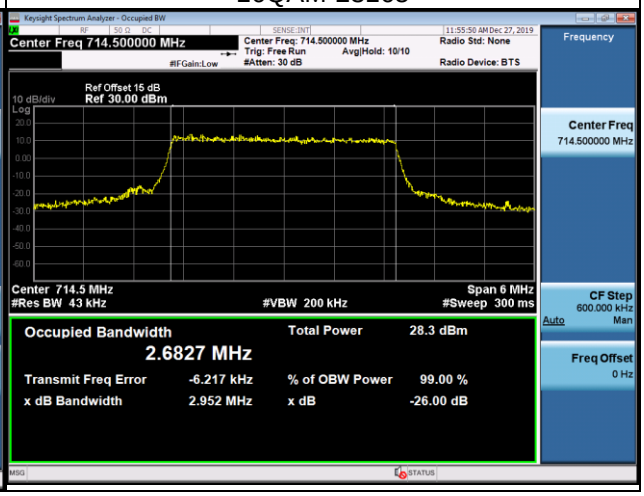


16QAM-23095

16QAM-23165



LTE Band 12_5M					
QPSK					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
23035	701.5	4.4828	23035	701.5	5.046
23095	707.5	4.4900	23095	707.5	5.057
23155	713.5	4.4857	23155	713.5	5.056
16QAM					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
23035	701.5	4.4786	23035	701.5	5.010
23095	707.5	4.4891	23095	707.5	5.066
23155	713.5	4.4815	23155	713.5	5.015