

	    CERTIFICATE 2518.08 MS ISO/IEC 17025 TESTING SAMM NO. 0825																												
MOTOROLA PENANG ADV. COMM. LABORATORY Motorola Solutions Malaysia Sdn Bhd, Plot 2A, Medan Bayan Lepas, Mukim 12 S.W.D, 11900 Bayan Lepas, Penang, Malaysia.	FCC / ISED TEST REPORT Report Revision : Rev.B																												
<table><tr><td>Date/s Tested</td><td>: 10-August-2020 - 27-August-2020</td></tr><tr><td>Manufacturer/Location</td><td>: Motorola Solutions Malaysia Sdn Bhd</td></tr><tr><td>Manufacturer Address</td><td>: Plot 2A, Medan Bayan lepas, Mukim 12, S.W.D. 11900 Bayan Lepas, Penang, Malaysia</td></tr><tr><td>Requestor</td><td>: SIEW KHENG TAN</td></tr><tr><td>Product Type</td><td>: Portable</td></tr><tr><td>Product Version (PMN)</td><td>: P2B</td></tr><tr><td>Model Number (HVIN)</td><td>: AAH90ZDU9RH1AN</td></tr><tr><td>Frequency Band</td><td>: Refer to section 1.4</td></tr><tr><td>Applicant Name</td><td>: Motorola Solutions Inc</td></tr><tr><td>Applicant Address</td><td>: 8000 West Sunrise Boulevard, Fort Lauderdale, Florida 33322.</td></tr><tr><td>FCC Registrations</td><td>: 461337</td></tr><tr><td>ISED Registrations</td><td>: MY0001</td></tr><tr><td>Firmware Version (FVIN)</td><td>: I02.21.01.0029 (BP), D00.00.65 (AP)</td></tr></table>  The equipment was tested accordance to the requirement listed below: <table><tr><td>(LTE Band 12) FCC 47 CFR Part 2 / 27 ISED RSS GEN / 130</td><td>PASS</td></tr></table>		Date/s Tested	: 10-August-2020 - 27-August-2020	Manufacturer/Location	: Motorola Solutions Malaysia Sdn Bhd	Manufacturer Address	: Plot 2A, Medan Bayan lepas, Mukim 12, S.W.D. 11900 Bayan Lepas, Penang, Malaysia	Requestor	: SIEW KHENG TAN	Product Type	: Portable	Product Version (PMN)	: P2B	Model Number (HVIN)	: AAH90ZDU9RH1AN	Frequency Band	: Refer to section 1.4	Applicant Name	: Motorola Solutions Inc	Applicant Address	: 8000 West Sunrise Boulevard, Fort Lauderdale, Florida 33322.	FCC Registrations	: 461337	ISED Registrations	: MY0001	Firmware Version (FVIN)	: I02.21.01.0029 (BP), D00.00.65 (AP)	(LTE Band 12) FCC 47 CFR Part 2 / 27 ISED RSS GEN / 130	PASS
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Prepared By:  Lim Khay Kwang Technician	Approve Signatory:  Ho Sze Khian Technical Manager																												

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REVISION HISTORY

Revision History	Description	Date	Originator
Rev A	Initial Report	7-September-2020	Lim Khay Kwang
Rev B	Update 1.3. General Information Table	11-November-2020	Lim Khay Kwang

1.0. Summary of Test Results

FCC Clause	ISED Clause	Test Item	Results	Remarks	Serial Number Tested
2.1046	RSS-Gen 6.12 RSS-130 4.1	Conducted RF Output Power	Pass	Meet the requirement of limit	734TWP0386
-	RSS 130 4.4	Peak-to-Average Power Ratio	Pass	Meet the requirement of limit	734TWP0386
2.1046	RSS-Gen 6.7	Occupied Bandwidth (26dBc, 99%)	Pass	Meet the requirement of limit	734TWP0386
2.1055 27.54	RSS-130 4.3	Frequency Stability	Pass	Meet the requirement of limit	734TWP0386
2.1051 27.53(g)	RSS-Gen 6.13 RSS-130 4.6	Band Edge Conducted Spurious Emission	Pass	Meet the requirement of limit	734TWP0386
2.1051 27.53(g)	RSS-Gen 6.13 RSS-130 4.6	Conducted Spurious Emissions	Pass	Meet the requirement of limit	734TWP0386
2.1053 27.53 (g)	RSS-130 4.6	Radiated Spurious Emission	Pass	Meet the requirement of limit	734TWP0308
2.1049 27.50(c)(9) (10)	RSS-130 4.4	Effective Radiated Power (ERP)	Pass	Meet the requirement of limit	734TWP0386

1.1. Measurement Uncertainty

Measurement	Frequency	Expanded Uncertainty (k=1.96) (±dB)
Radiated Emissions up to 1 GHz	30MHz ~ 200MHz	5.01
	200MHz ~ 1000MHz	5.01
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	5.01
	18GHz ~ 25GHz	5.01

1.2. Equipment List

Description	Model	Serial Number	Calibration Date	Calibration Due Date
Broadband ATE 1 (RF Conducted Tests); Test Software Version: CMWRun v1.8.9				
SIGNAL ANALYZER	FSV40	101431	16-Jul-19	16-Jul-21
CHAMBER	SH-641	92003150	25-Sep-19	25-Sep-20
WIDEBAND RADIO COMMUNICATION TESTER	CMW500	154550	23-Jul-19	23-Jul-21
POWER SUPPLY	6652A	3117A00162	16-Mar-20	16-Mar-21
Radiated Spurious Emission (EMC Chamber 1); Test Software Version: EMC_FCC_RE_v1.6.2				
DRG HORN FREQ.	SAS-571	720	21-Mar-19	21-Mar-21

DRG HORN FREQ.	SAS-571	1143	14-Feb-19	14-Feb-21
POWER SUPPLY	6032A	2615A01178	21-MAY-20	21-MAY-21
SIGNAL GENERATOR	SMB 100A	181117	8-Nov-18	8-Nov-21
EMI TEST RECEIVER	ESW44	101750	24-Jul-19	24-Sep-20
EMI TEST RECEIVER	ESIB26	100017	19-Jul-19	19-Sep-20
5m Semi-anechoic Chamber	S800-HX	J2308	Not Required	Not Required
BILOG ANTENNA	CBL6112B	2964	23-Apr-19	23-Apr-21
BILOG ANTENNA	CBL6112B	2950	8-Jul-19	8-Jul-21
DATA LOGGER	SDL500	A.016776	4-Jun-20	4-Jun-21
SYSTEM CONTROLLER	SC104V	050806-1	Not Required	Not Required
TURNTABLE FLUSH MOUNT 2M	FM2011	NA	Not Required	Not Required
ANTENNA POSITIONING TOWER	TLT2	NA	Not Required	Not Required
BROAD-BAND HORN ANTENNA	BBHA9170	BBHA9170255	27-Jan-20	27-Jan-21
18 - 40GHz PREAMPLIFIER	Miteq Hi Gain Sucoflex	001	Not Required	Not Required
PREAMPLIFIER	PAM-0118	269	24-May-19	24-May-22
LOOP ANTENNA	6502	00208416	5-Sep-19	5-Sep-20

1.3. General Information

General Description of EUT

Product	MACKENZIE UHF NAG MODEL		
Brand	Motorola Solutions		
Test Model	AAH90ZDU9RH1AN		
Power Supply Rating	7.5Vdc		
Mode of operation	LTE Band 12		
Modulation Type	QPSK, 16QAM		
Operating Frequency	LTE Band 12	Channel Bandwidth 1.4MHz	699.7MHz~715.3MHz
		Channel Bandwidth 3MHz	700.5MHz~714.5MHz
		Channel Bandwidth 5MHz	701.5MHz~713.5MHz
		Channel Bandwidth 10MHz	704.0MHz~711.0MHz
Max. ERP Power	LTE Band 12 QPSK	Channel Bandwidth 1.4MHz	22.386dBm (0.1732W)
		Channel Bandwidth 3MHz	22.432dBm (0.1751W)
		Channel Bandwidth 5MHz	22.319dBm (0.1706W)
		Channel Bandwidth 10MHz	22.259dBm (0.1682W)
	LTE Band 12 16QAM	Channel Bandwidth 1.4MHz	21.512dBm (0.1416w)
		Channel Bandwidth 3MHz	21.569dBm (0.1435W)
		Channel Bandwidth 5MHz	21.385dBm (0.1376W)
		Channel Bandwidth 10MHz	21.367dBm (0.137W)
Emission Designator	LTE Band 12		QPSK 16QAM
		Channel Bandwidth 1.4MHz	1M09G7D 1M08D7W
		Channel Bandwidth 3MHz	2M68G7D 2M68D7W

		Channel Bandwidth 5MHz	4M47G7D	4M48D7W
		Channel Bandwidth 10MHz	8M91G7D	8M93D7W
Antenna Type	LTE Band 12	LTE LOW BAND MAIN ANTENNA (1.15dBi)		
SW Version	I02.21.01.0029 (BP), D00.00.65 (AP)			
HW Version	P2B			

Note:

1. The EUT contains following accessory devices and data cable.

Item	Brand	Model or P/N	Specification
Li-Ion	MOTOROLA	PMNN4804A	BATTERY PACK,BATTERY PACK,IMPRES GEN2, LIION,IP68, 2820T

Description of Support Units

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

NO.	Product	Brand	Model No.	Serial No.	FCC ID
1	Wideband Radio Communication Tester	R&S	CMW500	154550	NA

NO.	Signal Cable Description of The above Support Units
1	NA

Note:

1. All power cords of the above support units are non-shielded.
2. Item 1 acted as a communication partner to transfer data.

EUT Operating Conditions

The EUT makes a call to the communication simulator. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency.

General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC 47 CFR Part 2

FCC 47 CFR Part 27

KDB 971168 D01 Power Meas License Digital Systems v03r01

KDB 971168 D02 Misc OOB License Digital Systems v02r01

ANSI C63.26

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

1.4. Channel number and frequency info

Band	Bandwidth supported	Available Channel Number	Test Channel Number			Test Channel Frequency (MHz)		
			Low Channel	Mid Channel	High Channel	Low Channel	Mid Channel	High Channel
LTE Band 12	1.4 MHz	23017 ~ 23173	23017	23095	23173	699.7	707.5	715.3
	3 MHz	23025 ~ 23165	23025	23095	23165	700.5	707.5	714.5
	5 MHz	23035 ~ 23155	23035	23095	23155	701.5	707.5	713.5
	10 MHz	23060 ~ 23130	23060	23095	23130	704.0	707.5	711.0

1.5. Test Mode Applicability and Tested Channel Detail

LTE Band 12

Test Item	Available Channel	Tested Channel	Channel Bandwidth	Uplink Modulation	Mode
Conducted RF Output Power	23017 ~ 23173	23017, 23095, 23173	1.4 MHz	QPSK, 16QAM	As per table 1.6.3
	23025 ~ 23165	23025, 23095, 23165	3 MHz		
	23035 ~ 23155	23035, 23095, 23155	5 MHz		
	23060 ~ 23130	23060, 23095, 23130	10 MHz		
Peak to Average Power Ratio	23017 ~ 23173	23017, 23095, 23173	1.4 MHz	QPSK, 16QAM	6 RB / 0 RB Offset
	23025 ~ 23165	23025, 23095, 23165	3 MHz		15 RB / 0 RB Offset
	23035 ~ 23155	23035, 23095, 23155	5 MHz		25 RB / 0 RB Offset
	23060 ~ 23130	23060, 23095, 23130	10 MHz		50 RB / 0 RB Offset
Occupied Bandwidth	23017 ~ 23173	23017, 23095, 23173	1.4 MHz	QPSK, 16QAM	6 RB / 0 RB Offset
	23025 ~ 23165	23025, 23095, 23165	3 MHz		15 RB / 0 RB Offset
	23035 ~ 23155	23035, 23095, 23155	5 MHz		25 RB / 0 RB Offset
	23060 ~ 23130	23060, 23095, 23130	10 MHz		50 RB / 0 RB Offset
Frequency Stability	23017 ~ 23173	23017, 23173	1.4 MHz	QPSK	6 RB / 0 RB Offset
	23025 ~ 23165	23025, 23165	3 MHz		15 RB / 0 RB Offset
	23035 ~ 23155	23035, 23155	5 MHz		25 RB / 0 RB Offset
	23060 ~ 23130	23060, 23130	10 MHz		50 RB / 0 RB Offset
Band Edge Conducted Spurious Emission	23017 ~ 23173	23017, 23173	1.4 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
					1 RB / 5 RB Offset
					6 RB / 0 RB Offset
	23025 ~ 23165	23025, 23165	3 MHz		1 RB / 0 RB Offset
					1 RB / 14 RB Offset
					15 RB / 0 RB Offset
	23035 ~ 23155	23035, 23155	5 MHz		1 RB / 0 RB Offset
					1 RB / 24 RB Offset
					25 RB / 0 RB Offset
	23060 ~ 23130	23060, 23130	10 MHz		1 RB / 0 RB Offset
					1 RB / 49 RB Offset
					50 RB / 0 RB Offset
Conducted Spurious Emission	23017 ~ 23173	23017, 23095, 23173	1.4 MHz	QPSK	3 RB / 2 RB Offset
	23025 ~ 23165	23025, 23095, 23165	3 MHz		1 RB / 7 RB Offset
	23035 ~ 23155	23035, 23095, 23155	5 MHz		1 RB / 13 RB Offset

	23060 ~ 23130	23060, 23095, 23130	10 MHz		1 RB / 0 RB Offset
Radiated Spurious Emission	23025 ~ 23165	23025	3 MHz	QPSK	1 RB / 7 RB Offset
	23017 ~ 23173	23095	1.4 MHz		1 RB / 3 RB Offset
	23025 ~ 23165	23165	3 MHz		1 RB / 7 RB Offset
Effective Radiated Power (ERP)	23017 ~ 23173	23017, 23095, 23173	1.4 MHz	QPSK, 16QAM	As per table 1.6.4
	23025 ~ 23165	23025, 23095, 23165	3 MHz		
	23035 ~ 23155	23035, 23095, 23155	5 MHz		
	23060 ~ 23130	23060, 23095, 23130	10 MHz		

NOTE:

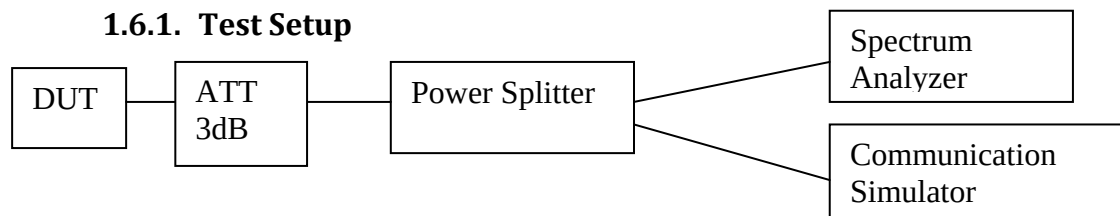
1. The Conducted RF Output Power for QPSK and 16QAM, measured value of QPSK mode is higher than 16QAM mode. Therefore, only Conducted Spurious Emission and Radiated Emission had been tested under QPSK modes.
2. Band Edge was performed with 1 and full Resource Block at the lowest and highest operating frequency band.
3. The Equivalent Isotropically Radiated Power (EIRP) was calculated from Conducted RF Output Power results in QPSK and 16QAM modulation.
4. Peak to Average and Occupied Bandwidth were performed with full Resource Block which is the worst case.
5. Frequency stability was performed with full Resource Block in QPSK modulation.

Test Condition:

Test Item	Environmental Conditions	Input Power	Tested By
Conducted RF Output Power	25°C, 50% RH	7.5V DC	Khay Kwang
Peak-to-Average Power Ratio	25°C, 50% RH	7.5V DC	Khay Kwang
Occupied Bandwidth	25°C, 50% RH	7.5V DC	Khay Kwang
Frequency Stability	25°C, 50% RH	7.5V DC	Khay Kwang
Band Edge Conducted Spurious Emission	25°C, 50% RH	7.5V DC	Khay Kwang
Conducted Spurious Emission	25°C, 50% RH	7.5V DC	Khay Kwang
Radiated Spurious Emission	25°C, 63.7% RH	7.5V DC	Nazrin&Fendi
Equivalent Isotropically Radiated Power (EIRP)	25°C, 63.7% RH	7.5V DC	Khay Kwang

1.6. Conducted RF Output Power

1.6.1. Test Setup



1. The DUT transmitter output port was connected to communication simulator with above setup.
2. Path loss for the measurement included.
3. Set DUT to transmit maximum power through communication simulator
4. All the measurement was done at low, mid, high channel for each band and different modulation.
5. Record the average power into the test report.

1.6.2. Limits

FCC: Portable stations (hand-held devices) in the 600 MHz uplink band and the 698-746 MHz band, and fixed and mobile stations in the 600 MHz uplink band are limited to 3 watts ERP.

ISED: The e.i.r.p. shall not exceed 50 watts for mobile equipment or for outdoor fixed subscriber equipment, nor shall it exceed 5 watts for portable equipment or for indoor fixed subscriber equipment.

1.6.3. Conducted RF Output Power – LTE Band 12 (698-716MHz)

Conducted Output Power (dBm)								
LTE Band/BW	RB Size	RB Offset	QPSK Modulation			16QAM Modulation		
			Low CH	Mid CH	High CH	Low CH	Mid CH	High CH
			23017	23095	23173	23017	23095	23173
			699.7 MHz	707.5 MHz	715.3 MHz	699.7 MHz	707.5 MHz	715.3 MHz
Band 12 / 1.4 MHz	1	0	22.973	23.012	23.328	22.043	22.083	22.468
	1	3	23.132	23.064	23.357	22.109	22.182	22.512
	1	5	23.069	22.992	23.319	22.05	22.088	22.454
	3	0	23.024	22.924	23.334	22.213	22.171	22.357
	3	2	23.088	22.978	23.386	22.278	22.233	22.418
	3	3	23.034	22.908	23.303	22.246	22.163	22.372
	6	0	21.995	21.95	22.337	21.155	21.049	21.374

Conducted Output Power (dBm)								
LTE Band/BW	RB Size	RB Offset	QPSK Modulation			16QAM Modulation		
			Low CH	Mid CH	High CH	Low CH	Mid CH	High CH
			23025	23095	23165	23025	23095	23165
			700.5 MHz	707.5 MHz	714.5 MHz	700.5 MHz	707.5 MHz	714.5 MHz
Band 12 / 3MHz	1	0	23.113	22.923	23.411	22.128	22.356	22.537
	1	7	23.177	23.004	23.432	22.172	22.414	22.569
	1	14	23.073	22.909	23.305	22.099	22.261	22.456
	8	0	22.108	22.009	22.358	21.182	21.231	21.412
	8	4	22.125	22.038	22.407	21.227	21.249	21.421
	8	7	22.058	21.968	22.324	21.179	21.184	21.369
	15	0	22.097	21.987	22.364	21.187	21.112	21.413

Conducted Output Power (dBm)								
LTE Band/BW	RB Size	RB Offset	QPSK Modulation			16QAM Modulation		
			Low CH	Mid CH	High CH	Low CH	Mid CH	High CH
			23035	23095	23155	23035	23095	23155
			701.5 MHz	707.5 MHz	713.5 MHz	701.5 MHz	707.5 MHz	713.5 MHz
Band 12 / 5MHz	1	0	23.049	23.059	23.191	22.113	22.371	22.243
	1	13	23.072	23.057	23.319	22.2	22.361	22.385
	1	25	23.082	22.928	23.21	22.227	22.274	22.28
	12	0	22.102	22.069	22.284	21.125	21.126	21.381
	12	6	22.082	22.05	22.377	21.107	21.092	21.457
	12	13	22.123	21.978	22.322	21.145	21.058	21.373
	25	0	22.163	22.026	22.244	21.24	21.105	21.278

Conducted Output Power (dBm)								
LTE Band/BW	RB Size	RB Offset	QPSK Modulation			16QAM Modulation		
			Low CH	Mid CH	High CH	Low CH	Mid CH	High CH
			23060	23095	23130	23060	23095	23130
			704.0 MHz	707.5 MHz	711.0 MHz	704.0 MHz	707.5MHz	711.0 MHz
Band 12 / 10MHz	1	0	23.022	22.917	23.259	22.017	22.367	22.308
	1	25	23.065	22.945	23.144	22.092	22.332	22.166
	1	49	22.966	22.926	23.175	21.984	22.321	22.184
	25	0	22.113	22.069	22.212	21.215	21.191	21.359
	25	13	22.098	22.052	22.192	21.206	21.19	21.306
	25	25	22.033	21.988	22.093	21.161	21.108	21.236
	50	0	22.073	22.031	22.173	21.18	21.146	21.29

1.6.4. Effective Radiated Power (ERP) - LTE Band 12 (698-716MHz)

Effective Radiated Power (dBm)								
LTE Band/BW	RB Size	RB Offset	QPSK Modulation			16QAM Modulation		
			Low CH	Mid CH	High CH	Low CH	Mid CH	High CH
			23017	23095	23173	23017	23095	23173
			699.7 MHz	707.5 MHz	715.3 MHz	699.7 MHz	707.5 MHz	715.3 MHz
Band 12 / 1.4 MHz	1	0	21.973	22.012	22.328	21.043	21.083	21.468
	1	3	22.132	22.064	22.357	21.109	21.182	21.512
	1	5	22.069	21.992	22.319	21.05	21.088	21.454
	3	0	22.024	21.924	22.334	21.213	21.171	21.357
	3	2	22.088	21.978	22.386	21.278	21.233	21.418
	3	3	22.034	21.908	22.303	21.246	21.163	21.372
	6	0	20.995	20.95	21.337	20.155	20.049	20.374

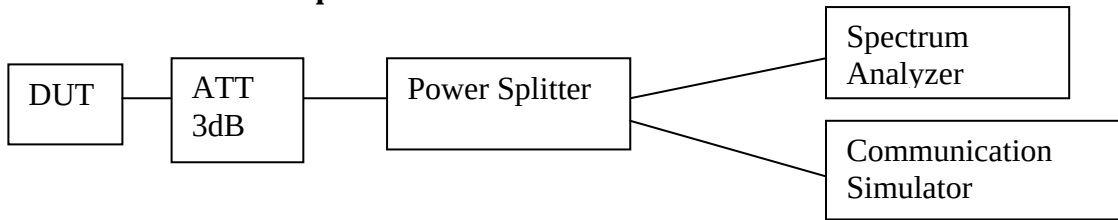
Effective Radiated Power (dBm)								
LTE Band/BW	RB Size	RB Offset	QPSK Modulation			16QAM Modulation		
			Low CH	Mid CH	High CH	Low CH	Mid CH	High CH
			23025	23095	23165	23025	23095	23165
			700.5 MHz	707.5 MHz	714.5 MHz	700.5 MHz	707.5 MHz	714.5 MHz
Band 12 / 3MHz	1	0	22.113	21.923	22.411	21.128	21.356	21.537
	1	7	22.177	22.004	22.432	21.172	21.414	21.569
	1	14	22.073	21.909	22.305	21.099	21.261	21.456
	8	0	21.108	21.009	21.358	20.182	20.231	20.412
	8	4	21.125	21.038	21.407	20.227	20.249	20.421
	8	7	21.058	20.968	21.324	20.179	20.184	20.369
	15	0	21.097	20.987	21.364	20.187	20.112	20.413

Effective Radiated Power (dBm)								
LTE Band/BW	RB Size	RB Offset	QPSK Modulation			16QAM Modulation		
			Low CH	Mid CH	High CH	Low CH	Mid CH	High CH
			23035	23095	23155	23035	23095	23155
			701.5 MHz	707.5 MHz	713.5 MHz	701.5 MHz	707.5 MHz	713.5 MHz
Band 12 / 5MHz	1	0	22.049	22.059	22.191	21.113	21.371	21.243
	1	13	22.072	22.057	22.319	21.2	21.361	21.385
	1	25	22.082	21.928	22.21	21.227	21.274	21.28
	12	0	21.102	21.069	21.284	20.125	20.126	20.381
	12	6	21.082	21.05	21.377	20.107	20.092	20.457
	12	13	21.123	20.978	21.322	20.145	20.058	20.373
	25	0	21.163	21.026	21.244	20.24	20.105	20.278

Effective Radiated Power (dBm)								
LTE Band/BW	RB Size	RB Offset	QPSK Modulation			16QAM Modulation		
			Low CH	Mid CH	High CH	Low CH	Mid CH	High CH
			23060	23095	23130	23060	23095	23130
			704.0 MHz	707.5 MHz	711.0 MHz	704.0 MHz	707.5MHz	711.0 MHz
Band 12 / 10MHz	1	0	22.022	21.917	22.259	21.017	21.367	21.308
	1	25	22.065	21.945	22.144	21.092	21.332	21.166
	1	49	21.966	21.926	22.175	20.984	21.321	21.184
	25	0	21.113	21.069	21.212	20.215	20.191	20.359
	25	13	21.098	21.052	21.192	20.206	20.19	20.306
	25	25	21.033	20.988	21.093	20.161	20.108	20.236
	50	0	21.073	21.031	21.173	20.18	20.146	20.29

1.7. Peak-to-Average Power Ratio

1.7.1. Test Setup



1. The DUT transmitter output port was connected to communication simulator with above setup.
2. Path loss for the measurement included.
3. Set DUT to transmit maximum power through communication simulator
4. Set the CCDF (Complementary Cumulative Distribution Function) option in the spectrum analyzer.
5. Spectrum Analyzer setting, RBW = 20MHz.
6. Recorded the maximum PAR level associated with a probability of 0.1% as Peak to Average Ratio.
7. All the measurement was done at low, mid, high channel for each band and different modulation.

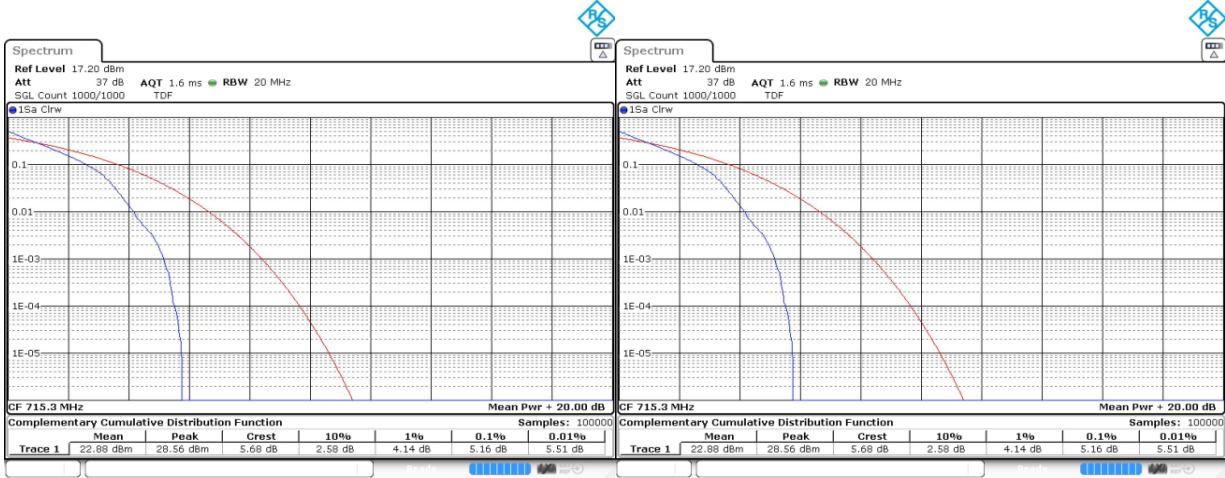
1.7.2. Test Limit

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.

1.7.3. Peak-to-Average Power Ratio – LTE Band 12 (698-716MHz)

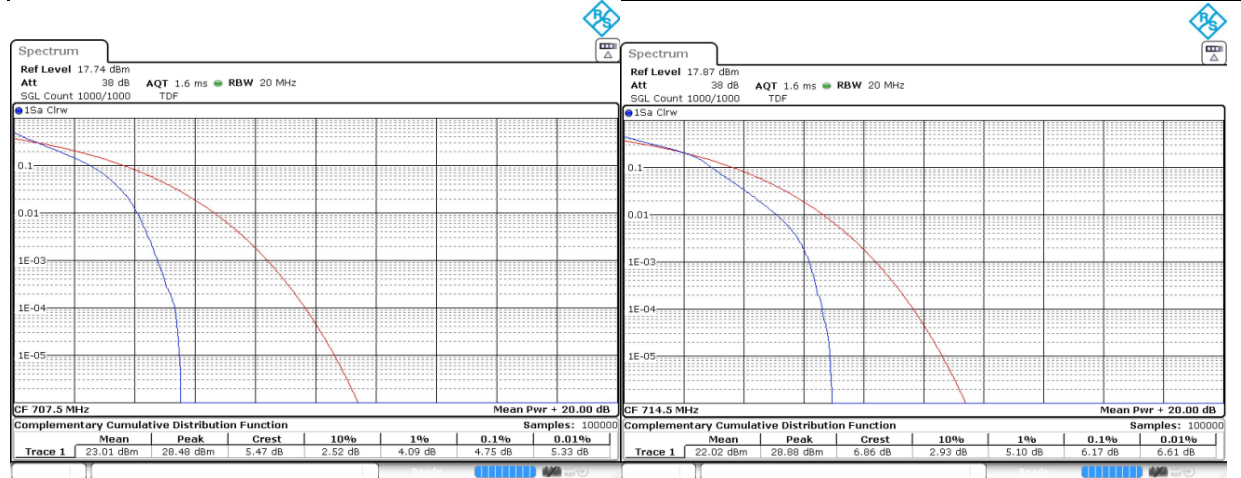
LTE Band/BW/RB Size/RB Offset	Channel Number	Tx Frequency	Peak To Average (dB)	
			QPSK Modulation	16QAM Modulation
Band 7/1.4MHz/6/0	Low CH 23017	699.7 MHz	4.58	5.565
	Mid CH 23095	707.5 MHz	5.014	6.29
	High CH 23173	715.3 MHz	5.159	6.319

Spectrum Plot of Worst Value	
QPSK	16QAM



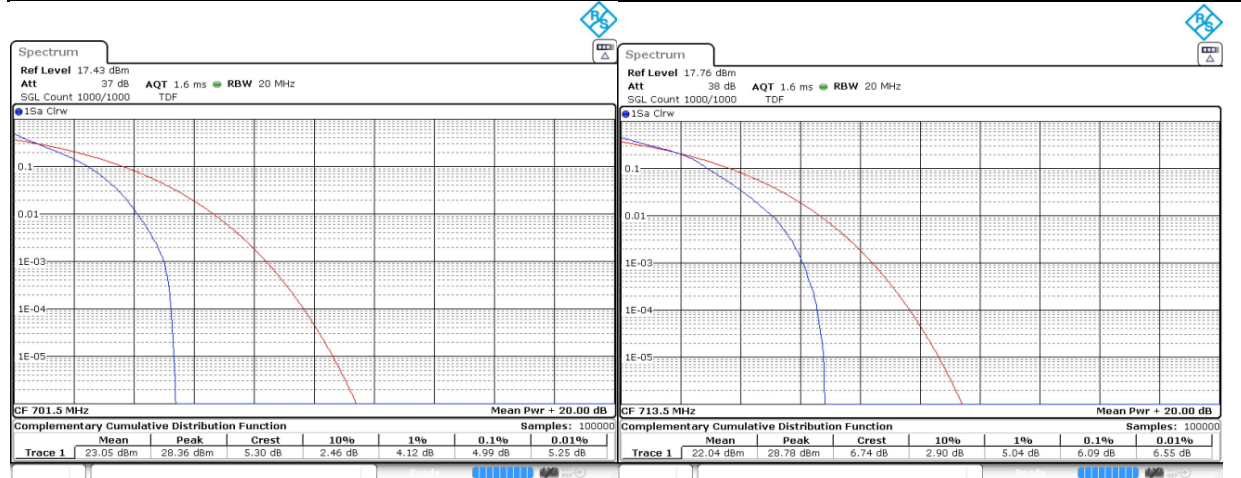
LTE Band/BW/RB Size/RB Offset	Channel Number	Tx Frequency	Peak To Average (dB)	
			QPSK Modulation	16QAM Modulation
Band 7/3MHz/15/0	Low CH 23025	700.5 MHz	4.667	5.681
	Mid CH 23095	707.5 MHz	4.754	5.971
	High CH 23165	714.5 MHz	4.725	6.174

Spectrum Plot of Worst Value	
QPSK	16QAM



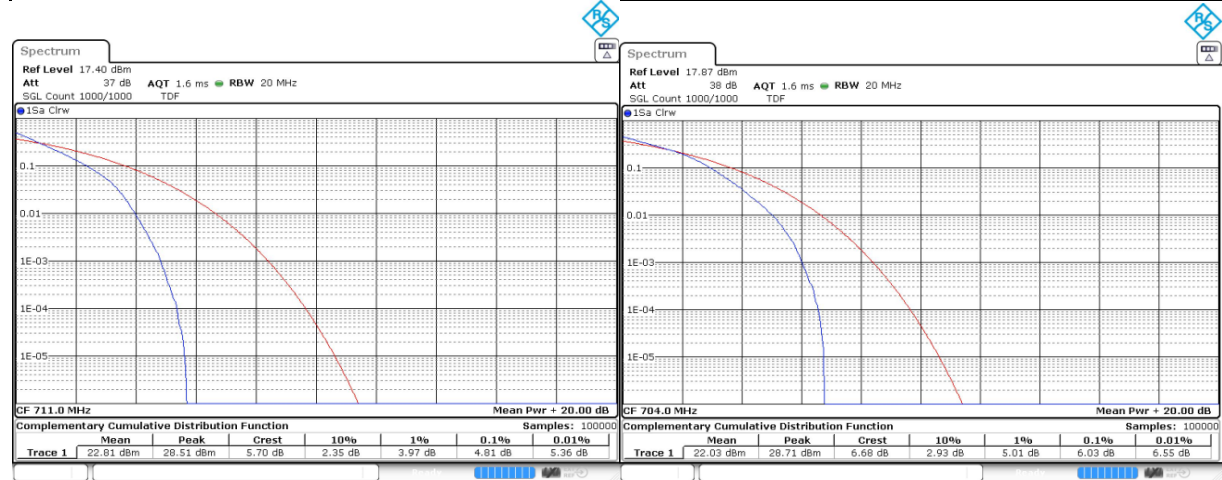
LTE Band/BW/RB Size/RB Offset	Channel Number	Tx Frequency	Peak To Average (dB)	
			QPSK Modulation	16QAM Modulation
Band 7/5MHz/25/0	Low CH 23035	701.5 MHz	4.986	6
	Mid CH 23095	707.5 MHz	4.928	6
	High CH 23155	713.5 MHz	4.841	6.087

Spectrum Plot of Worst Value	
QPSK	16QAM



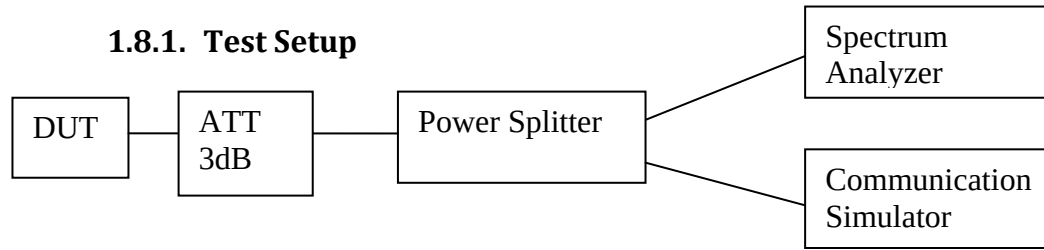
LTE Band/BW/RB Size/RB Offset	Channel Number	Tx Frequency	Peak To Average (dB)	
			QPSK Modulation	16QAM Modulation
Band 7/10MHz/50/0	Low CH 23060	704 MHz	4.783	6.029
	Mid CH 23095	707.5 MHz	4.754	6.029
	High CH 23130	711 MHz	4.812	6

Spectrum Plot of Worst Value	
QPSK	16QAM



1.8. Occupied Bandwidth

1.8.1. Test Setup



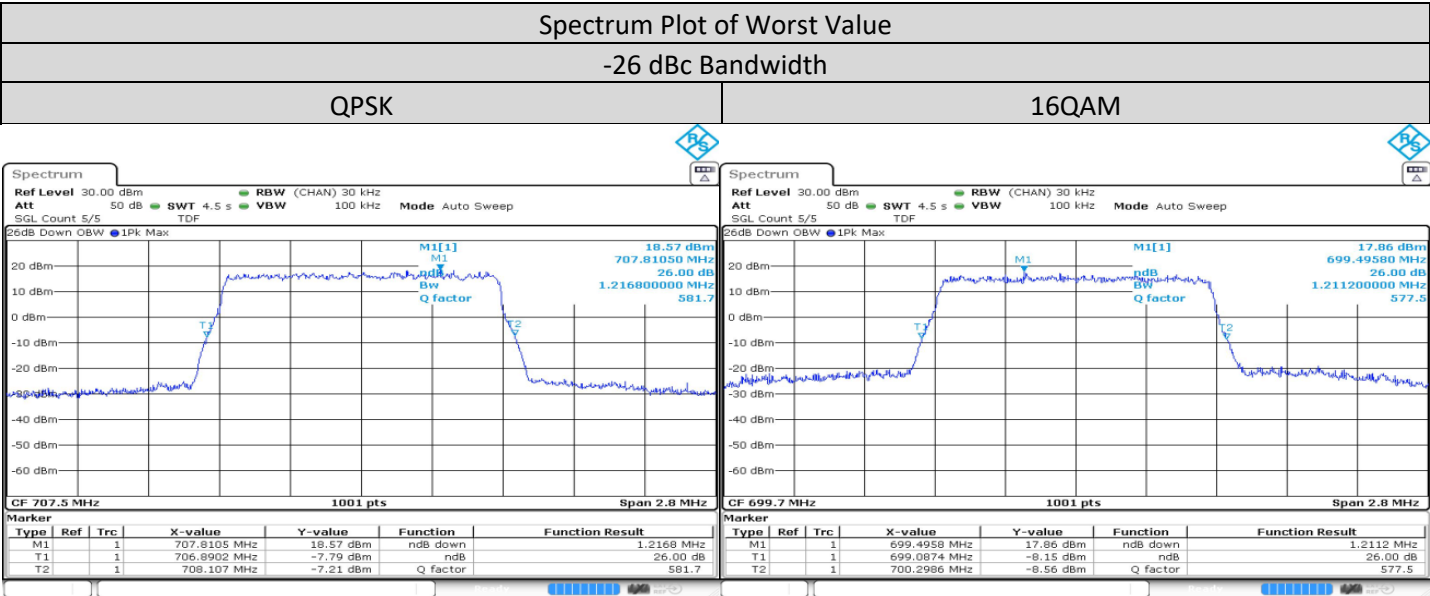
- 1) The DUT transmitter output port was connected to communication simulator with above setup.
- 2) Path loss for the measurement included.
- 3) For LTE measurement, set DUT to transmit maximum power & full RB size through communication simulator.
- 4) For LTE measurement, set DUT to transmit maximum power through communication simulator.
- 5) Spectrum Analyzer setting, RBW is 1% of OBW and VBW is 3 times of RBW.
- 6) Measure & record -26dBc and 99% occupied bandwidth (BW).
- 7) All the measurement was done at low, mid, high channel for each band and different modulation.

1.8.2. Test Limit

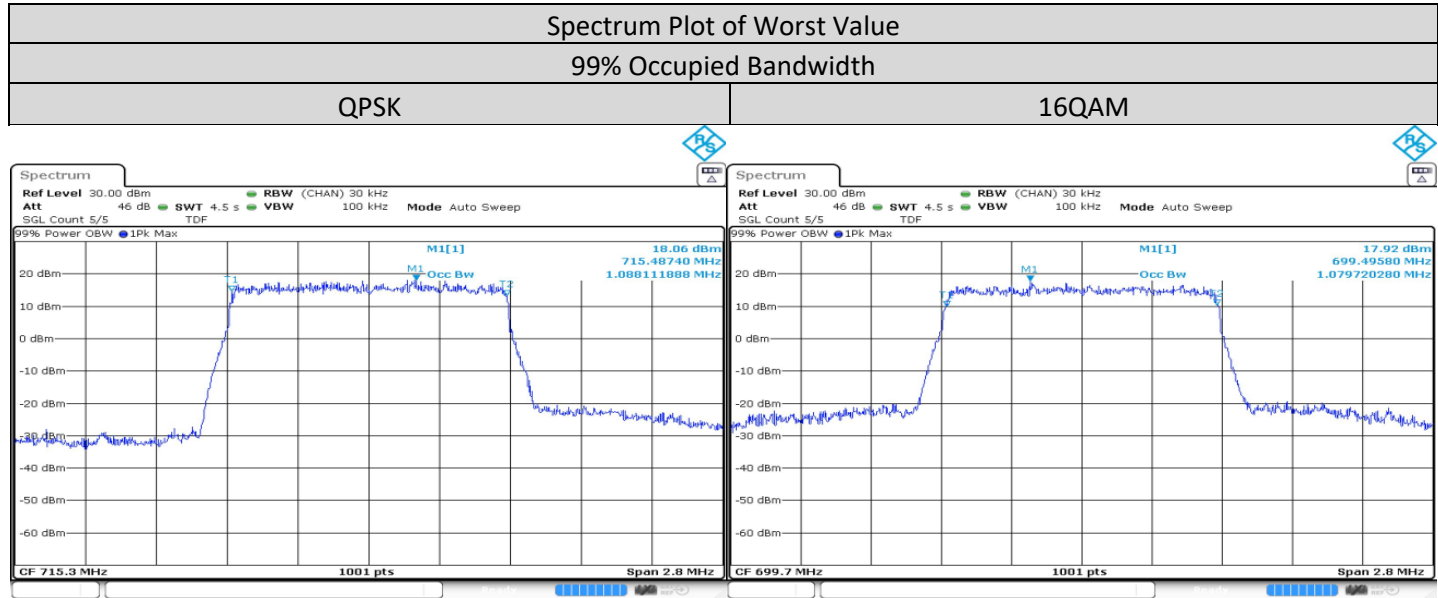
For measurement 99% of occupied bandwidth that is required by FCC 2.1049 and RSS Gen 6.6.

1.8.3. Occupied Bandwidth - LTE Band 12 (698-716MHz)

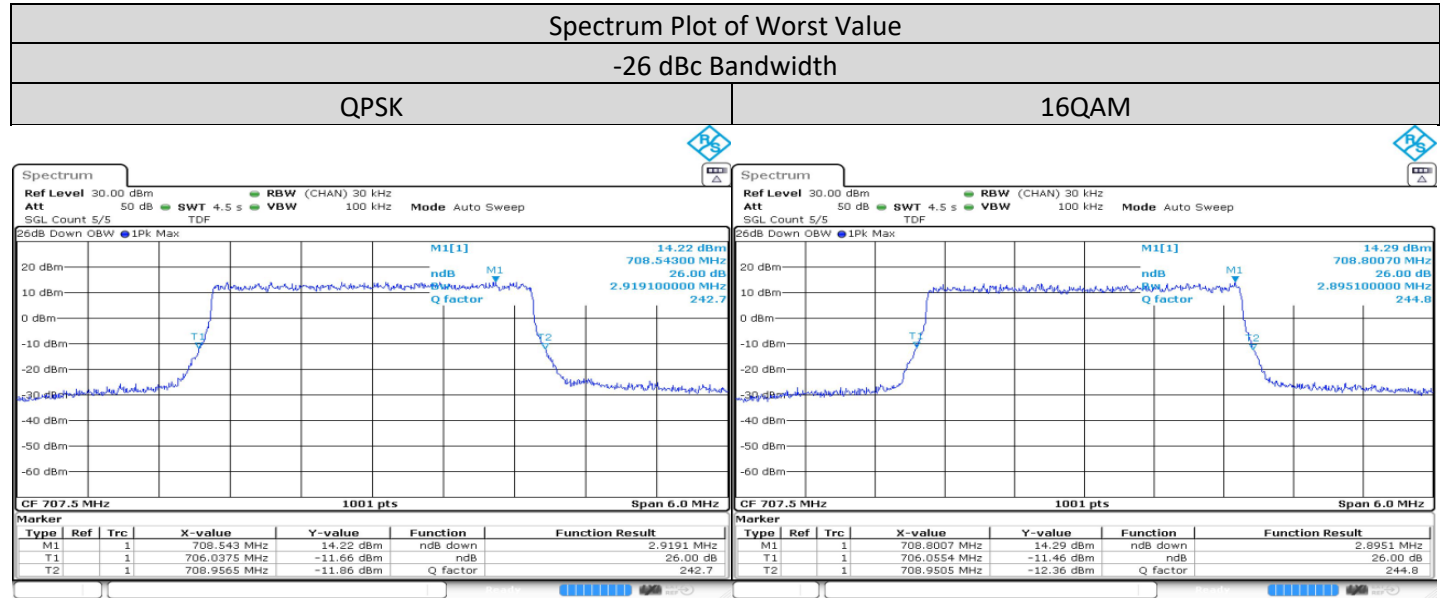
LTE Band/ BW/ RB Size/ RB Offset	Channel Number	Tx Frequency (MHz)	-26 dBc Bandwidth (MHz)	
			QPSK Modulation	16QAM Modulation
Band 12 / 1.4MHz/6/0	Low CH 23017	699.7 MHz	1.214	1.211
	Mid CH 23095	707.5 MHz	1.217	1.208
	High CH 23173	715.3 MHz	1.217	1.203



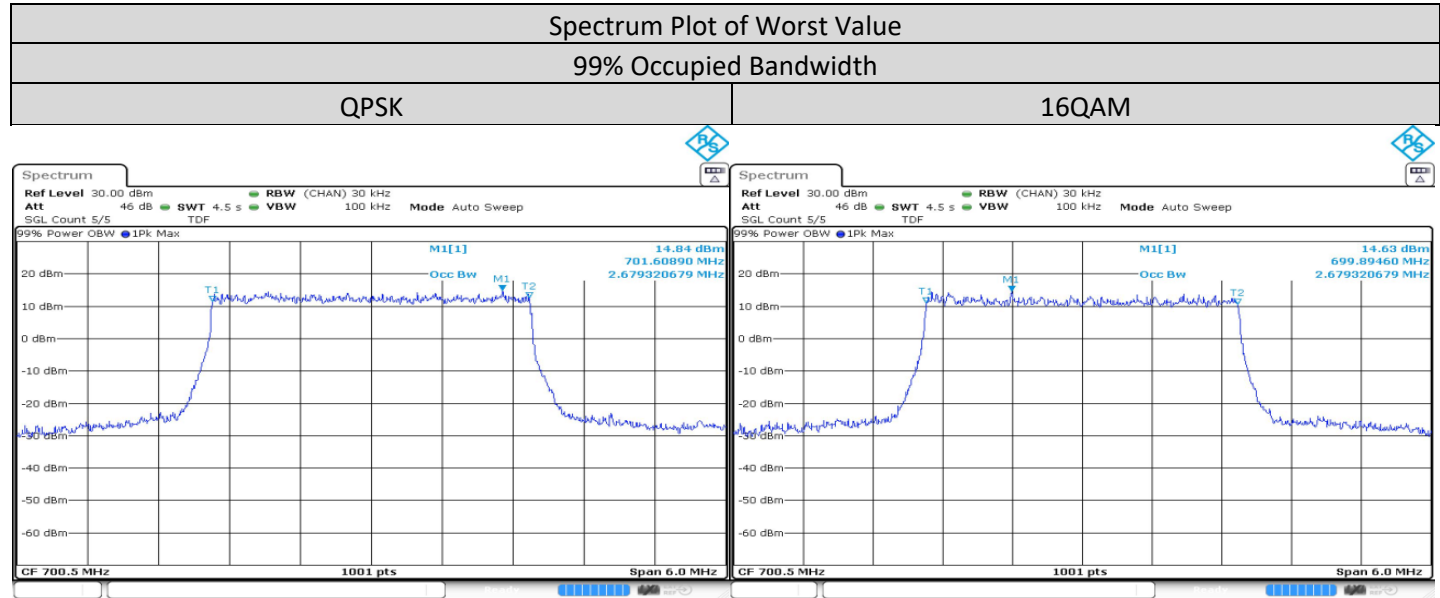
LTE Band/ BW/ RB Size/ RB Offset	Channel Number	Tx Frequency (MHz)	99% Occupied Bandwidth (MHz)	
			QPSK Modulation	16QAM Modulation
Band 12 / 1.4MHz/6/0	Low CH 23017	699.7 MHz	1.08	1.08
	Mid CH 23095	707.5 MHz	1.083	1.08
	High CH 23173	715.3 MHz	1.088	1.077



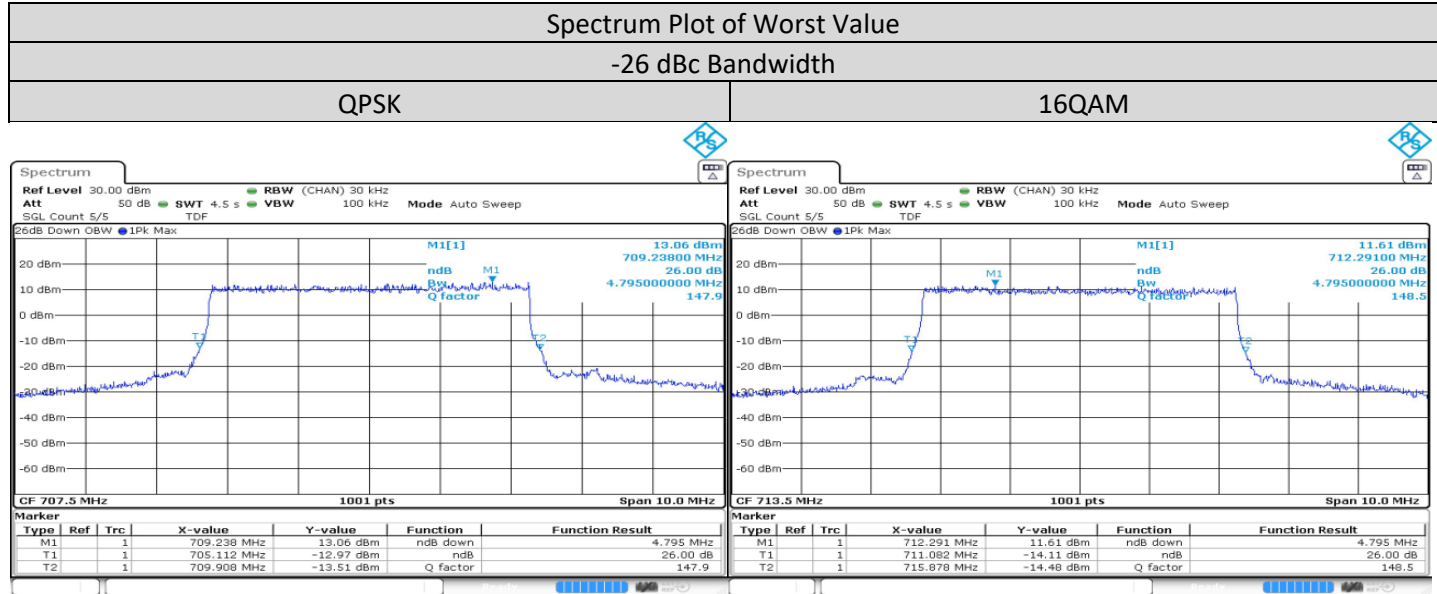
LTE Band/ BW/ RB Size/ RB Offset	Channel Number	Tx Frequency (MHz)	-26 dBc Bandwidth (MHz)	
			QPSK Modulation	16QAM Modulation
Band 12 / 3MHz/15/0	Low CH 23025	700.5 MHz	2.901	2.883
	Mid CH 23095	707.5 MHz	2.919	2.895
	High CH 23165	714.5 MHz	2.895	2.895



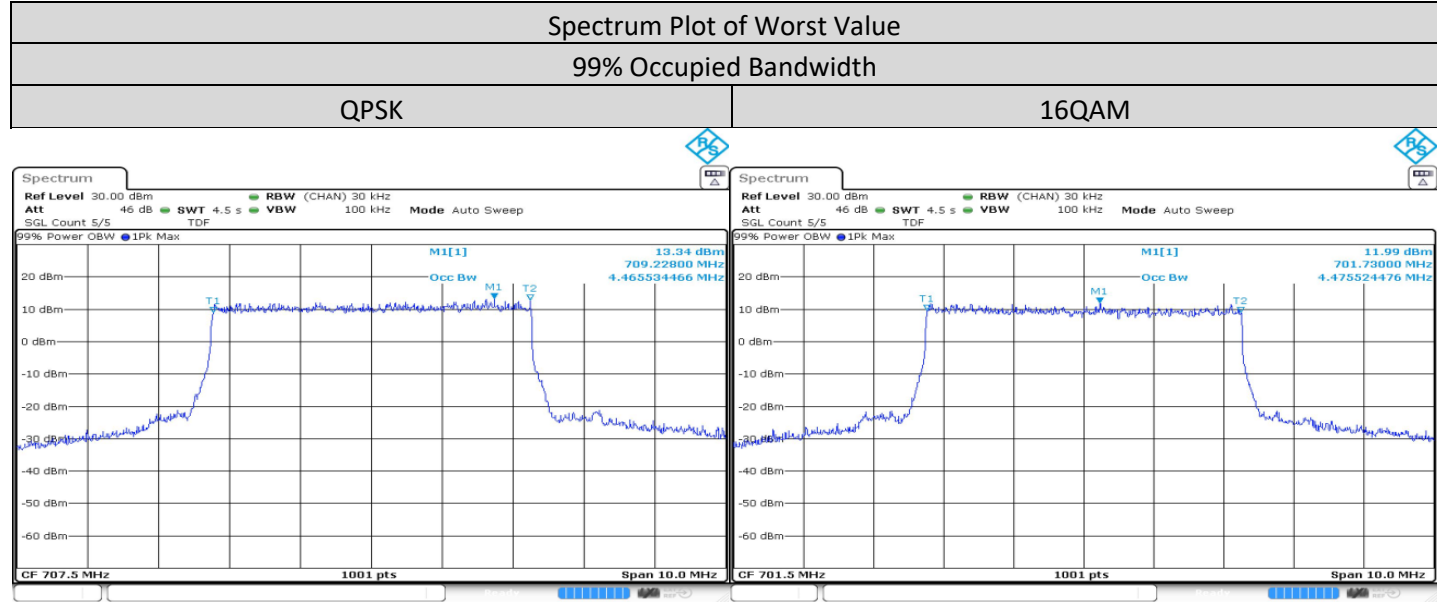
LTE Band/ BW/ RB Size/ RB Offset	Channel Number	Tx Frequency (MHz)	99% Occupied Bandwidth (MHz)	
			QPSK Modulation	16QAM Modulation
Band 12 / 3MHz/15/0	Low CH 23025	700.5 MHz	2.679	2.679
	Mid CH 23095	707.5 MHz	2.679	2.679
	High CH 23165	714.5 MHz	2.673	2.679



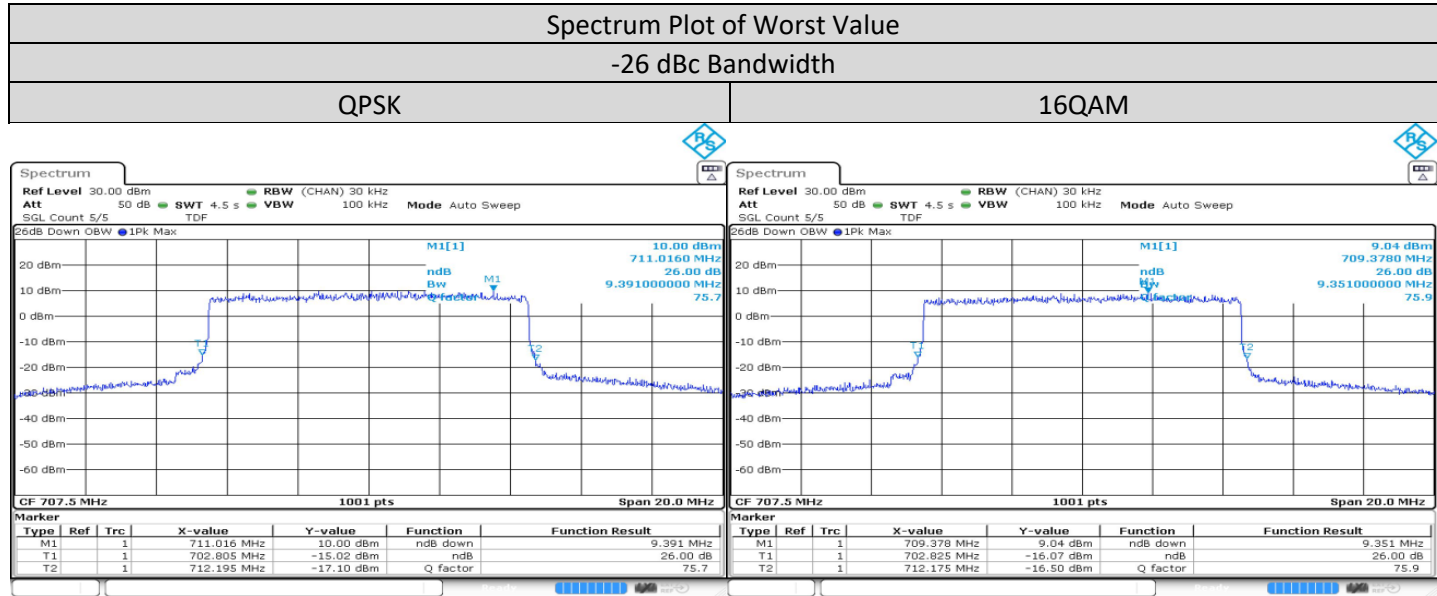
LTE Band/ BW/ RB Size/ RB Offset	Channel Number	Tx Frequency (MHz)	-26 dBc Bandwidth (MHz)	
			QPSK Modulation	16QAM Modulation
Band 12 / 5MHz/25/0	Low CH 23035	701.5 MHz	4.745	4.745
	Mid CH 23095	707.5 MHz	4.795	4.735
	High CH 23155	713.5 MHz	4.775	4.795



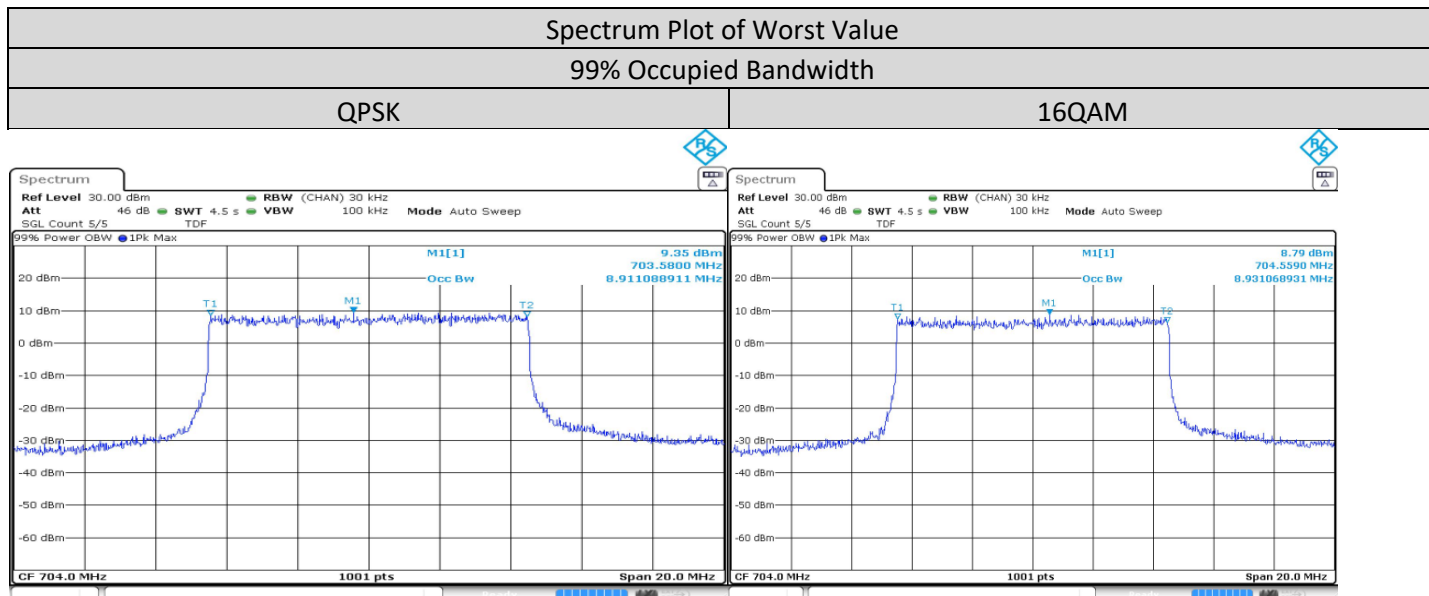
LTE Band/ BW/ RB Size/ RB Offset	Channel Number	Tx Frequency (MHz)	99% Occupied Bandwidth (MHz)	
			QPSK Modulation	16QAM Modulation
Band 12 / 5MHz/25/0	Low CH 23035	701.5 MHz	4.456	4.476
	Mid CH 23095	707.5 MHz	4.466	4.466
	High CH 23155	713.5 MHz	4.466	4.466



LTE Band/ BW/ RB Size/ RB Offset	Channel Number	Tx Frequency (MHz)	-26 dBc Bandwidth (MHz)	
			QPSK Modulation	16QAM Modulation
Band 12 / 10MHz/50/0	Low CH 23060	704 MHz	9.331	9.331
	Mid CH 23095	707.5 MHz	9.391	9.351
	High CH 23130	711 MHz	9.351	9.251

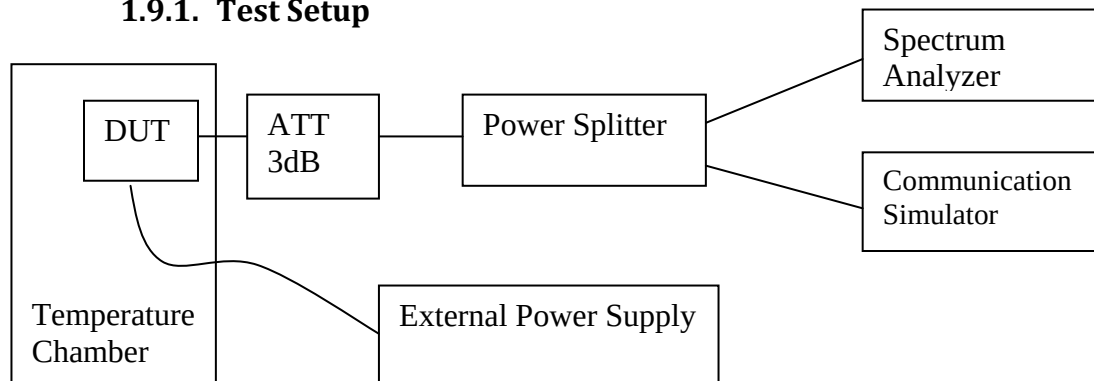


LTE Band/ BW/ RB Size/ RB Offset	Channel Number	Tx Frequency (MHz)	99% Occupied Bandwidth (MHz)	
			QPSK Modulation	16QAM Modulation
Band 7 / 10MHz/50/0	Low CH 23060	704 MHz	8.911	8.931
	Mid CH 23095	707.5 MHz	8.911	8.911
	High CH 23130	711 MHz	8.911	8.911



1.9. Frequency Stability

1.9.1. Test Setup



- 1) The DUT is placed in the temperature chamber and DUT is power up by external power supply to control the DC input voltage.
- 2) The temperature chamber could control the temperature and humidity and external power supply could control the test voltage range from minimum to maximum operating voltage.
- 3) Measured frequency error from the communication simulator by vary below step :
 - i. Vary temperature of the temperature chamber from -30 ~ 50 deg C (10 deg C / Step) and set external supply voltage constant at nominal voltage.
 - ii. Vary external supply voltage from minimum to maximum operation voltage support by DUT and set temperature chamber constant at room temp.
- 4) All the measurement was done at mid channel for each band.

1.9.2. Test Limit

As per manufacturer declared product operating at -20 to 60 deg C with spec of +/- 0.1ppm.

1.9.3. Frequency Stability – LTE Band 12 (698-716MHz)

Band	Temp (Deg C)	Frequency Error VS Temperature			
		Channel Bandwidth: 1.4 MHz			
		Low Channel		High Channel	
		699.7MHz		715.3MHz	
LTE Band 12		Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
	60	699.699989	-0.015395	715.299988	-0.016079
	50	699.699995	-0.007626	715.300004	0.00562
	40	699.699994	-0.008628	715.299991	-0.012559
	30	699.699987	-0.018523	715.299992	-0.010999
	20	699.699999	-0.014066	715.299993	-0.009519
	10	699.699999	-0.014168	715.299991	-0.011899
	0	699.699996	-0.005234	715.299995	-0.00674
	-10	699.699991	-0.012451	715.299993	-0.010019
	-20	699.699989	-0.015027	715.299994	-0.00798

Band	Voltage (V)	Frequency Error VS Voltage			
		Channel Bandwidth: 1.4 MHz			
		Low Channel		High Channel	
		699.7MHz		715.3MHz	
LTE Band 12		Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
	9	699.699992	-0.010754	715.299993	-0.010359
	7.5	699.699992	-0.01104	715.299999	-0.013939
	6	699.699999	-0.013861	715.299992	-0.010699

Band	Temp (Deg C)	Frequency Error VS Temperature			
		Channel Bandwidth: 3 MHz			
		Low Channel		High Channel	
		700.5MHz		714.5MHz	
LTE Band 12		Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
	60	700.499991	-0.01309	714.500009	0.013034
	50	700.500006	0.009026	714.500006	0.008449
	40	700.499993	-0.009496	714.500012	0.016397
	30	700.499993	-0.010047	714.50001	0.014615
	20	700.500007	0.0097	714.500011	0.014896
	10	700.500009	0.012355	714.500011	0.015496
	0	700.500009	0.013376	714.500008	0.011612
	-10	700.499996	-0.0058	714.500012	0.016858
	-20	700.500007	0.009333	714.500011	0.014696

Band	Voltage (V)	Frequency Error VS Voltage			
		Channel Bandwidth: 3 MHz			
		Low Channel		High Channel	
		700.5MHz		714.5MHz	
LTE Band 12		Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
	9	700.500008	0.011456	714.500011	0.015076
	7.5	700.500007	0.010456	714.500012	0.016497
	6	700.500004	0.005146	714.500004	0.005706

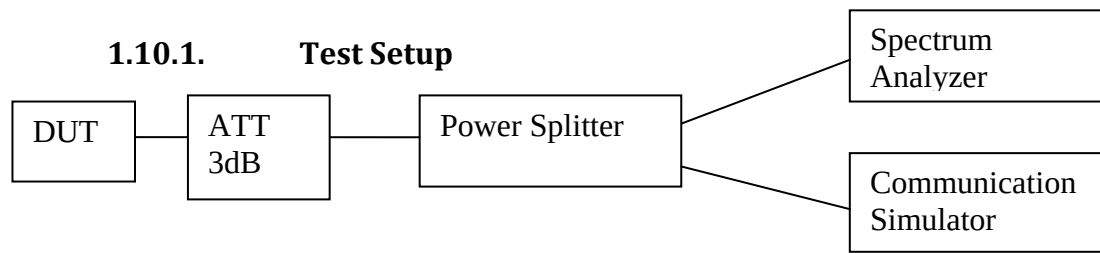
Band	Temp (Deg C)	Frequency Error VS Temperature			
		Channel Bandwidth: 5 MHz			
		Low Channel		High Channel	
		701.5MHz		713.5MHz	
LTE Band 12		Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
	60	701.499991	-0.013031	713.49999	-0.013453
	50	701.49999	-0.014254	713.49999	-0.013393
	40	701.499991	-0.013398	713.49999	-0.014335
	30	701.499991	-0.012766	713.499989	-0.015157
	20	701.499991	-0.012276	713.499991	-0.01213
	10	701.499992	-0.011155	713.499991	-0.012631
	0	701.499994	-0.008809	713.499994	-0.007759
	-10	701.499992	-0.011522	713.499986	-0.019528
	-20	701.499993	-0.009707	713.499987	-0.017583

Band	Voltage (V)	Frequency Error VS Voltage			
		Channel Bandwidth: 5 MHz			
		Low Channel		High Channel	
		701.5MHz		713.5MHz	
LTE Band 12		Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
	9	701.499992	-0.01195	713.499989	-0.015037
	7.5	701.499992	-0.012113	713.499991	-0.01221
	6	701.499992	-0.011134	713.499994	-0.008561

Band	Temp (Deg C)	Frequency Error VS Temperature			
		Channel Bandwidth: 10 MHz			
		Low Channel		High Channel	
		704MHz		711MHz	
LTE Band 12		Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
	60	704.000011	0.015504	710.999992	-0.010724
	50	704.000012	0.017028	710.999993	-0.009577
	40	704.000001	0.014813	710.999992	-0.011589
	30	704.000011	0.016215	710.999992	-0.010865
	20	704.000012	0.016967	711.000009	0.013299
	10	704.000012	0.016642	711.000007	0.010221
	0	704.000016	0.022128	711.000007	0.009154
	-10	704.000007	0.010505	711.000008	0.011247
	-20	704.000012	0.017048	711.000007	0.010221

Band	Voltage (V)	Frequency Error VS Voltage			
		Channel Bandwidth: 10 MHz			
		Low Channel		High Channel	
		704MHz		711MHz	
LTE Band 12		Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
	9	704.000012	0.017211	710.999993	-0.009376
	7.5	704.000011	0.016093	710.999993	-0.009416
	6	704.000001	0.014691	711.000004	0.005251

1.10. Band Edge Conducted Spurious Emission



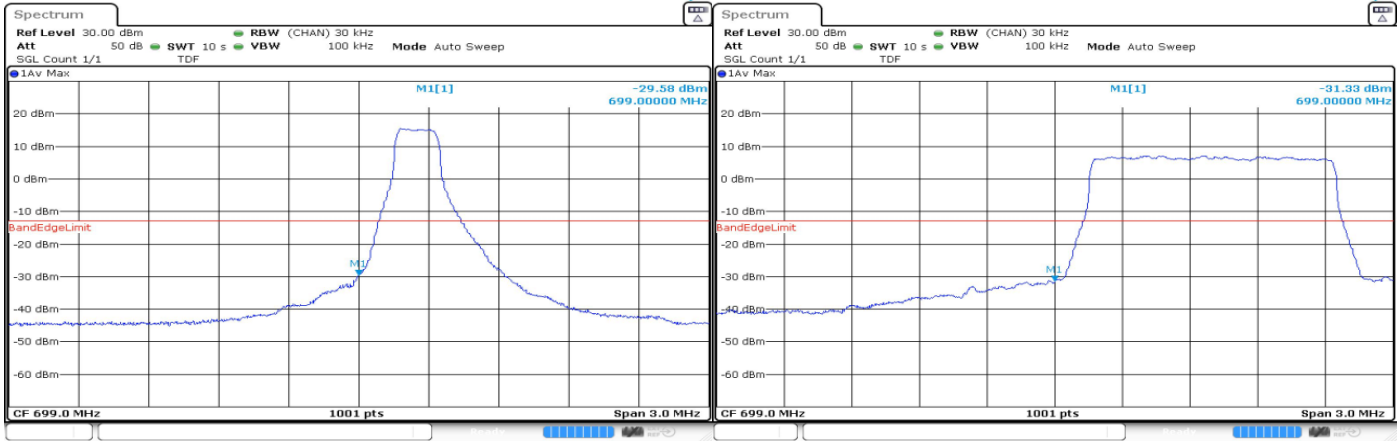
- 1) The DUT transmitter output port was connected to communication simulator with above setup.
- 2) Path loss for the measurement included.
- 3) Set DUT to transmit maximum power through communication simulator.
- 4) The band edges of lowest and highest channels with the highest RF powers were measured.
- 5) The center frequency of spectrum is the band edge frequency, span is 3MHz, RBW is 1~3% of EBW and VBW is at least 3 times of RBW
- 6) Record the maximum trace plot into the test report.

1.10.2. Test Limit

For operations in the 600 MHz band and the 698-746 MHz band, 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.

1.10.3. Band Edge / Emission Mask Conducted Spurious Emission – LTE Band 12 (698-716MHz)

Band 12, 1.4MHz QPSK , Low CH 23017			
RB = 1	Offset = 0	RB = X (100%)	Offset = 0



Band 12, 1.4MHz QPSK , High CH 23173			
RB = 1	Offset =X-1	RB = X (100%)	Offset = 0

