

	 MS ISO/IEC 17025 TESTING SMM No. 0825																										
MOTOROLA PENANG ADV. COMM. LABORATORY Motorola Solutions Malaysia Sdn Bhd, Innoplex Plot 2A, Medan Bayan Lepas, Mukim 12 S.W.D, 11900 Bayan Lepas, Penang, Malaysia.	FCC / ISED TEST REPORT Report Revision : Rev.A																										
<table><tr><td>Date/s Tested</td><td>: 27-Dec-2018 - 23-Jan-2019</td></tr><tr><td>Manufacturer/Location</td><td>: Motorola Solutions - Schaumburg</td></tr><tr><td>Requestor</td><td>: HOPKINS, SEAN</td></tr><tr><td>Product Type</td><td>: Hand-held</td></tr><tr><td>Product Version (PMN)</td><td>: P1B</td></tr><tr><td>Model Number (HVIN)</td><td>: H55TGT9PW8AN</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>: 109AK</td></tr><tr><td>Firmware Version (FVIN)</td><td>: D00.00.31</td></tr></table> The equipment was tested accordance to the requirement listed below: <table><tr><td>(LTE Band 14) FCC 47 CFR Part 2 / 90</td><td>PASS</td></tr></table> 		Date/s Tested	: 27-Dec-2018 - 23-Jan-2019	Manufacturer/Location	: Motorola Solutions - Schaumburg	Requestor	: HOPKINS, SEAN	Product Type	: Hand-held	Product Version (PMN)	: P1B	Model Number (HVIN)	: H55TGT9PW8AN	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	: 109AK	Firmware Version (FVIN)	: D00.00.31	(LTE Band 14) FCC 47 CFR Part 2 / 90	PASS
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Prepared By:  Maheshvaran Rajagopal Technician	Approved By:  Goh Aik Hong Responsible Engineer																										

Table of Contents

1.0. Summary of Test Results	3
1.1. Measurement Uncertainty	3
1.2. Equipment List.....	3
1.3. General Information.....	4
1.4. Channel number and frequency info.....	5
1.5. Test Mode Applicability and Tested Channel Detail.....	6
1.6. Conducted RF Output Power	7
1.6.1. Test Setup.....	7
1.6.2. Test Limits	7
1.6.3. Conducted RF Output Power – LTE Band 14 (788-798MHz).....	7
1.7. Peak-to-Average Power Ratio.....	9
1.7.1. Test Setup.....	9
1.7.2. Test Limit.....	9
1.7.3. Peak To Average Power Ratio – LTE Band 14 (788-798MHz).....	9
1.8. Occupied Bandwidth.....	11
1.8.1. Test Setup.....	11
1.8.2. Test Limit.....	11
1.8.3. Occupied Bandwidth - LTE Band 14 (788-798MHz)	11
1.9. Frequency Stability	14
1.9.1. Test Setup.....	14
1.9.2. Test Limit.....	14
1.9.3. Frequency Stability - LTE Band 14 (788-798MHz).....	14
1.10. Band Edge/Emission Mask Conducted Spurious Emission.....	16
1.10.1. Test Setup.....	16
1.10.2. Test Limit.....	16
1.10.3. Band Edge/Emission Mask Conducted Spurious Emission - LTE Band 14 (788-798MHz)	16
1.11. Conducted Spurious Emission	25
1.11.1. Test Setup.....	25
1.11.2. Test Limit.....	25
1.11.3. Conducted Spurious Emission - LTE Band 14 (788-798MHz).....	26
1.12. Radiated Spurious Emission	29
1.12.1. Test Setup.....	29
1.12.2. Test Limit.....	29
1.12.3. Radiated Spurious Emission – LTE Band 14 (788-798MHz)	30
1.13. Effective Radiated Power (ERP)	31
1.13.1. Test Setup.....	31
1.13.2. Test Limit.....	31
1.13.3. Effective Radiated Power (ERP) – LTE Band 14 (788-798MHz)	31

REVISION HISTORY

Revision History	Description	Date	Originator
Rev A.	Initial Report	26-Feb-2019	Maheshvaran Rajagopal

1.0. Summary of Test Results

FCC Clause	Test Item	Results	Remarks	Serial Number Tested
2.1046	Conducted RF Output Power	Pass	Meet the requirement of limit.	437P1B0011
2.1046	Peak-to-Average Power Ratio	Pass	Meet the requirement of limit.	437P1B0011
2.1049	Occupied Bandwidth (26dBc, 99%)	Pass	Meet the requirement of limit.	437P1B0011
2.1055	Frequency Stability	Pass	Meet the requirement of limit.	437P1B0011
2.1051 90.210 90.543(e)	Band Edge Conducted Spurious Emission	Pass	Meet the requirement of limit.	437P1B0011
2.1051 90.543(e)	Conducted Spurious Emissions	Pass	Meet the requirement of limit.	437P1B0011
2.1051 90.543(e)	Radiated Spurious Emission	Not Performed.	Not Performed.	Not Performed.
90.542(a)	Effective Radiated Power (ERP)	Not Performed.	Not Performed.	Not Performed.

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 (Test Software Version : R&S CMWRun 1.8.9)				
Wideband Radio Communication Tester	CMW500	153174	12-Apr-17	12-Apr-19
Signal Analyzer	FSV40	101431	13-Jul-17	12-Jul-19
Chamber	SH-641	92002651	5-Mar-18	5-Mar-19
Power Supply	6623A	3417A03546	15-Nov-17	15-Nov-19

1.3. General Information

General Description of EUT

Product	Hand-held			
Brand	Motorola Solutions			
Test Model	H55TGT9PW8AN			
Power Supply Rating	7.5 Vdc			
Mode of operation	LTE Band 14			
Modulation Type	QPSK, 16QAM			
Operating Frequency	LTE Band 14	Channel Bandwidth 5MHz	790.5MHz~795.5MHz	
		Channel Bandwidth 10MHz	793.0MHz	
Max. Conducted RF Output Power	LTE Band 14 QPSK	Channel Bandwidth 5MHz	22.798dBm (0.190W)	
		Channel Bandwidth 10MHz	22.683dBm (0.185W)	
	LTE Band 14 16QAM	Channel Bandwidth 5MHz	22.048dBm (0.160W)	
		Channel Bandwidth 10MHz	22.137dBm (0.164W)	
Emission Designator	LTE Band 14		QPSK	16QAM
		Channel Bandwidth 5MHz	4M48G7D	4M48D7W
		Channel Bandwidth 10MHz	8M93G7D	8M93D7W
Antenna Type	LTE Band 14	Stamped Metal with -3.52dBi gain		
SW Version	D00.00.31			
HW Version	P1B			

Note:

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

Item	Brand	Model or P/N	Specification
DMR Portable Programming Cable	Motorola Solutions	PMKN4012B	-

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	153174	NA

Note:

- 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 90

KDB 971168 D01 Power Meas License Digital Systems v03r01

ANSI C63.26-2015

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

Deviation from standard

Not applicable as no deviation from standard test method.

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 14	5 MHz	23305 ~ 23355	23305	23330	23355	790.5	793.0	795.5
	10 MHz	23330	-	23330	-	-	793.0	-

1.5. Test Mode Applicability and Tested Channel Detail

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

The following channel(s) was (were) selected for the final test as listed below:

LTE Band 14

Test Item	Available Channel	Tested Channel	Channel Bandwidth	Uplink Modulation	Mode
Conducted RF Output Power	23305~ 23355	23305, 23330, 23355	5 MHz	QPSK, 16QAM	As per table 1.6.2
	23330	23330	10 MHz		
Peak to Average Power Ratio	23305~ 23355	23305, 23330, 23355	5 MHz	QPSK, 16QAM	25 RB / 0 RB Offset
	23330	23330	10 MHz		50 RB / 0 RB Offset
Occupied Bandwidth	23305~ 23355	23305, 23330, 23355	5 MHz	QPSK, 16QAM	25 RB / 0 RB Offset
	23330	23330	10 MHz		50 RB / 0 RB Offset
Frequency Stability	23305~ 23355	23305, 23355	5 MHz	QPSK	25 RB / 0 RB Offset
	23330	23330	10 MHz		50 RB / 0 RB Offset
Band Edge Conducted Spurious Emission	23305~ 23355	23305, 23355	5 MHz	QPSK, 16QAM	1 RB / 0 RB Offset 1 RB / 24 RB Offset 25 RB / 0 RB Offset
	23330	23330	10 MHz		1 RB / 0 RB Offset 1 RB / 49 RB Offset 50 RB / 0 RB Offset
Conducted Spurious Emission	23305~ 23355	23305, 23330, 23355	5 MHz	QPSK	1 RB / 13 RB Offset
	23330	23330	10 MHz		1 RB / 0 RB Offset
Radiated Spurious Emission	23305~ 23355	23305, 23330, 23355	5 MHz	QPSK	Not Performed.
	23330	23330	10 MHz		
Effective Radiated Power (ERP)	23305~ 23355	23305, 23330, 23355	5 MHz	QPSK, 16QAM	Not Performed.
	23330	23330	10 MHz		

NOTE:

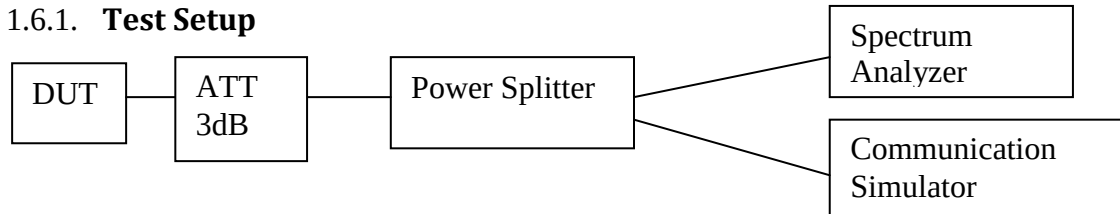
1. The Conducted RF Output Power for QPSK and 16QAM, measured value of QPSK is higher than 16QAM mode. Therefore, only Conducted Spurious Emission had been tested under QPSK modes.
2. Band Edge was performed with 1 and full Resource Block at the lowest and highest operating frequency band.
3. Peak to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

Test Condition:

Test Item	Environmental Conditions	Input Power	Tested By
Conducted RF Output Power	25°C, 50% RH	7.5V DC	Maheshvaran
Peak-to-Average Power Ratio	25°C, 50% RH	7.5V DC	Maheshvaran
Occupied Bandwidth	25°C, 50% RH	7.5V DC	Maheshvaran
Frequency Stability	25°C, 50% RH	7.5V DC	Maheshvaran
Band Edge Conducted Spurious Emission	25°C, 50% RH	7.5V DC	Maheshvaran
Conducted Spurious Emission	25°C, 50% RH	7.5V DC	Maheshvaran
Radiated Spurious Emission	Not Performed.		
Effective Radiated Power (ERP)	Not Performed.		

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 were done at low, mid, high channel for each band and different modulation.
5. Record the average power into the test report.

1.6.2. Test Limits

FCC: Portable stations (hand-held devices) transmitting in the 758-768 MHz band and the 788-798 MHz band are limited to 3 watts ERP.

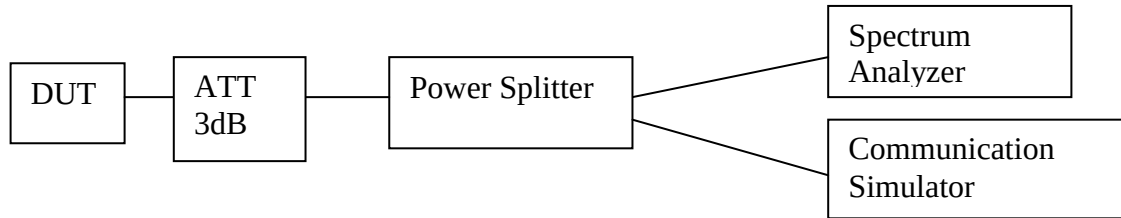
1.6.3. Conducted RF Output Power – LTE Band 14 (788-798MHz)

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
			23305	23330	23355	23305	23330	23355
			790.5MHz	793.0MHz	795.5 MHz	790.5 MHz	793.0MHz	795.5 MHz
Band 14 / 5MHz	1	0	22.779	22.689	22.754	21.877	21.724	22.003
	1	13	22.798	22.698	22.74	21.926	21.77	22.048
	1	24	22.722	22.654	22.717	21.87	21.691	21.952
	12	0	21.783	21.722	21.698	20.782	20.836	20.802
	12	6	21.777	21.744	21.697	20.778	20.822	20.784
	12	13	21.764	21.716	21.69	20.735	20.778	20.753
	25	0	21.777	21.725	21.701	20.824	20.795	20.803

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
				23330			23330	
				793.0MHz			793.0MHz	
Band 14 / 10MHz	1	0		22.683			22.137	
	1	25		22.657			22.044	
	1	49		22.645			21.995	
	25	0		21.731			20.876	
	25	13		21.73			20.851	
	25	25		21.71			20.822	
	50	0		21.715			20.843	

1.7. Peak-to-Average Power Ratio

1.7.1. Test Setup



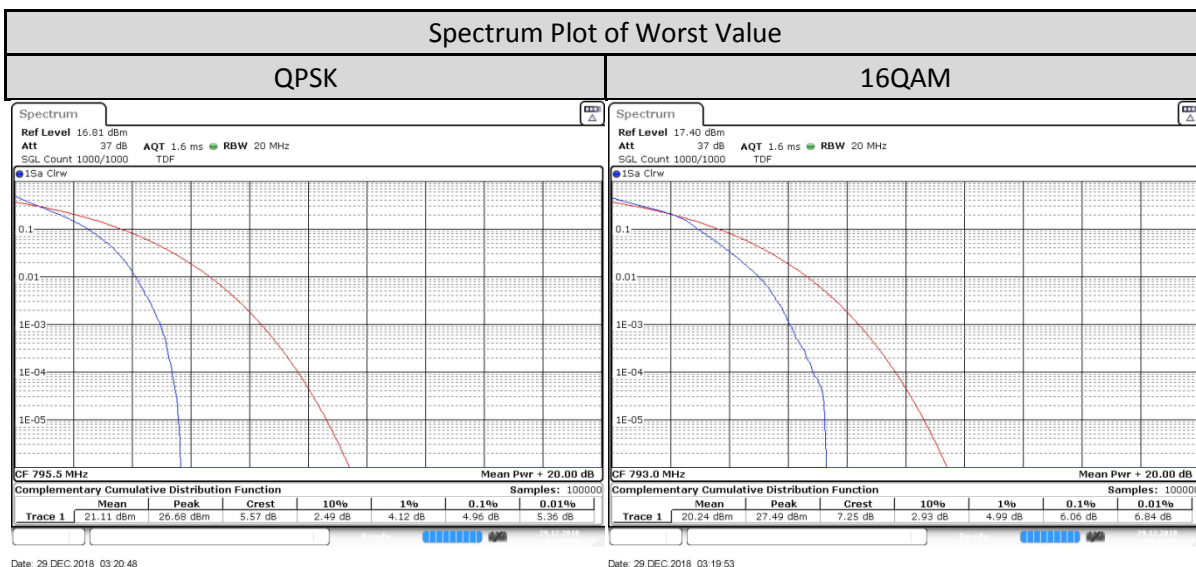
- 1) The DUT transmitter output port was connected to communication simulator with above setup.
- 2) Path loss for the measurement included.
- 3) Set DUT to transmit maximum power through communication simulator
- 4) Set the CCDF (Complementary Cumulative Distribution Function) option in the spectrum 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 measurements were done at low, mid, high channel for each band and different modulation.

1.7.2. Test Limit

The peak-to-average ratio (PAR) of the transmission may not exceed 13 dB

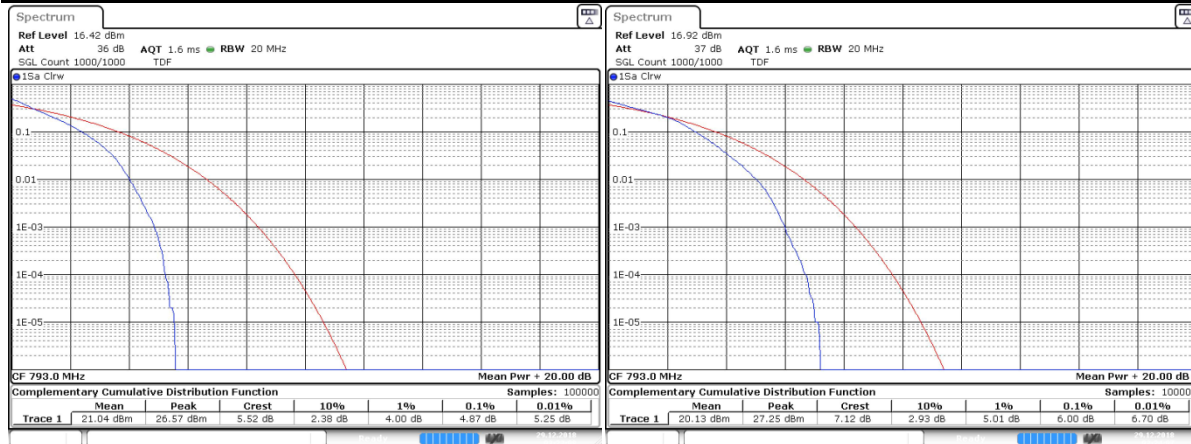
1.7.3. Peak To Average Power Ratio - LTE Band 14 (788-798MHz)

LTE Band/BW/RB Size/RB Offset	Channel Number	Tx Frequency	Peak To Average (dB)	
			QPSK Modulation	16QAM Modulation
Band 14/5MHz/25/0	Low CH 23305	790.5 MHz	4.899	6
	Mid CH 23330	793 MHz	4.841	6.058
	High CH 23355	795.5 MHz	4.957	5.884



LTE Band/BW/RB Size/RB Offset	Channel Number	Tx Frequency	Peak To Average (dB)	
			QPSK Modulation	16QAM Modulation
Band 14/10MHz/50/0	Low CH			
	Mid CH 23330	793 MHz	4.87	6
	High CH			

Spectrum Plot of Worst Value	
QPSK	16QAM

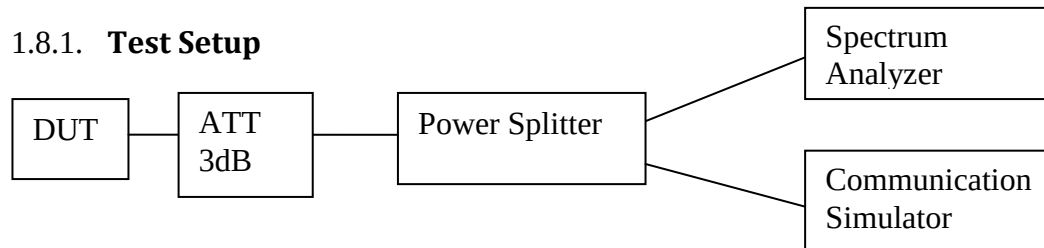


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1.8. Occupied Bandwidth

1.8.1. Test Setup



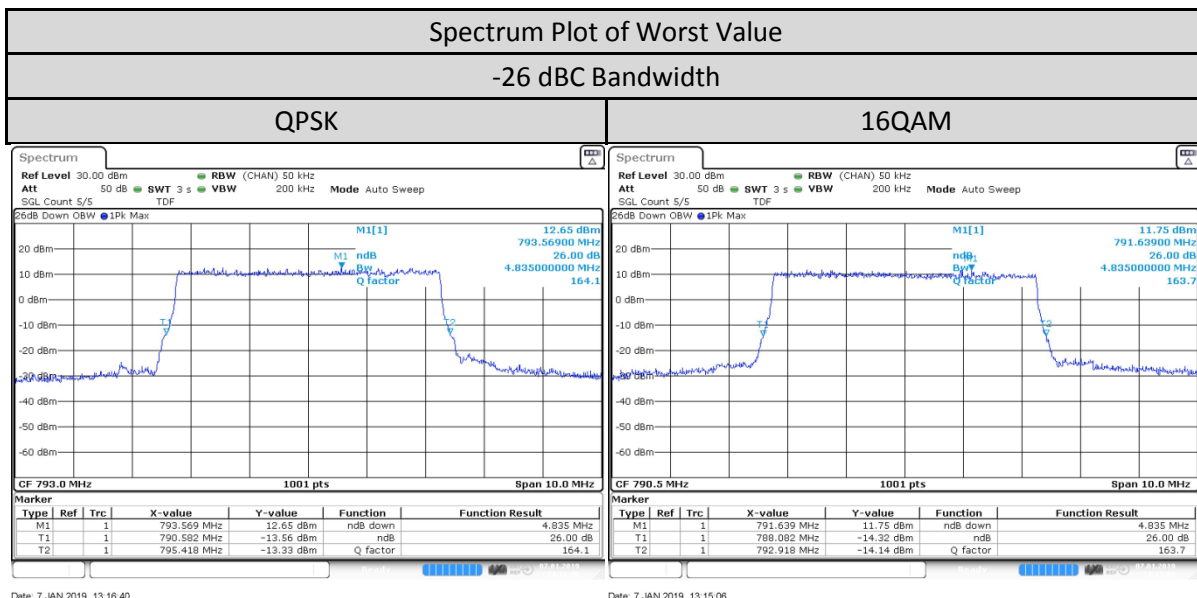
- 1) The DUT transmitter output port was connected to communication simulator with above setup.
- 2) Path loss for the measurement included.
- 3) For LTE measurement, set DUT to transmit maximum power & full RB size through communication simulator.
- 4) For LTE measurement, set DUT to transmit maximum 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

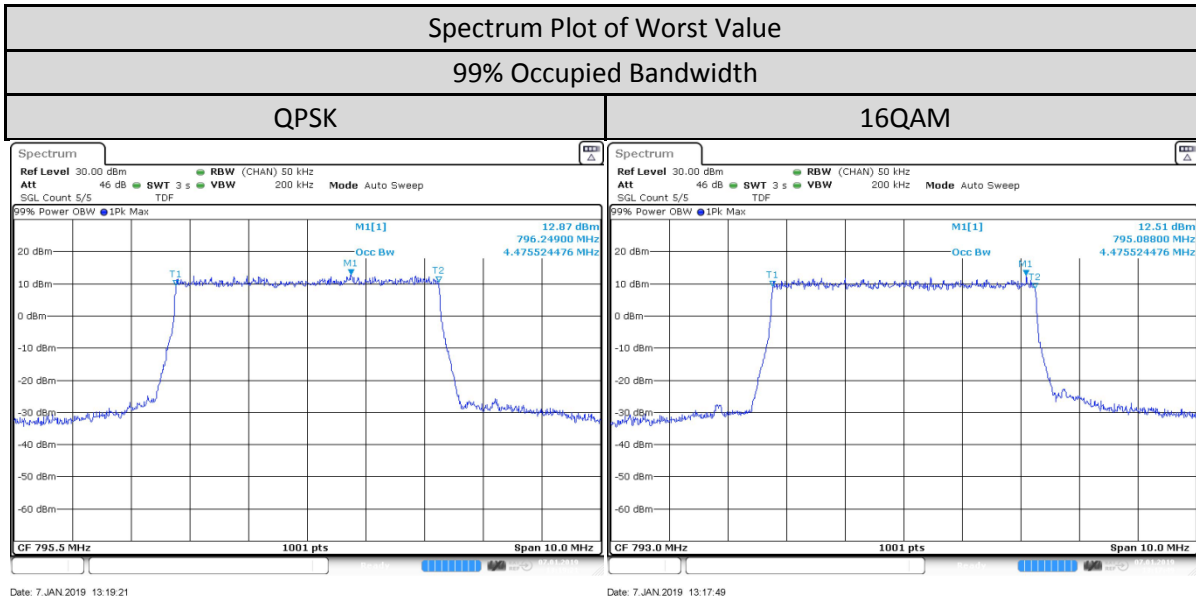
For measurement 99% of occupied bandwidth that is required by FCC 2.1049.

1.8.3. Occupied Bandwidth - LTE Band 14 (788-798MHz)

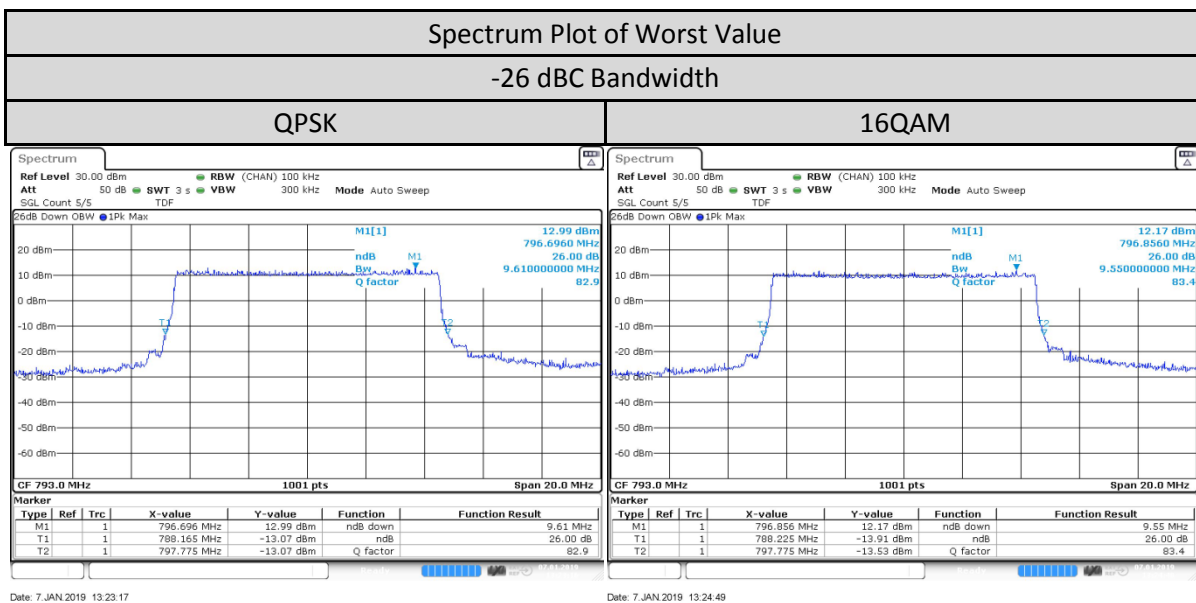
LTE Band/BW/RB Size/RB Offset	Channel Number	Tx Frequency	-26 dBc Bandwidth (MHz)	
			QPSK Modulation	16QAM Modulation
Band 14/5MHz/25/0	Low CH 23305	790.5 MHz	4.825	4.835
	Mid CH 23330	793 MHz	4.835	4.785
	High CH 23355	795.5 MHz	4.815	4.805



LTE Band/BW/RB Size/RB Offset	Channel Number	Tx Frequency	99% Occupied Bandwidth (MHz)	
			QPSK Modulation	16QAM Modulation
Band 14/5MHz/25/0	Low CH 23305	790.5 MHz	4.466	4.466
	Mid CH 23330	793 MHz	4.466	4.476
	High CH 23355	795.5 MHz	4.476	4.466

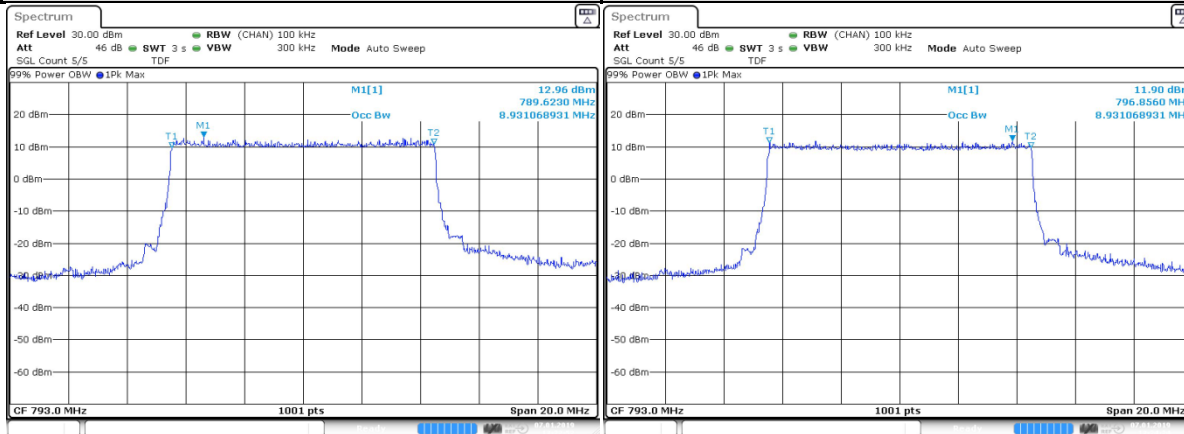


LTE Band/BW/RB Size/RB Offset	Channel Number	Tx Frequency	-26 dBc Bandwidth (MHz)	
			QPSK Modulation	16QAM Modulation
Band 14/10MHz/50/0	Low CH			
	Mid CH 23330	793 MHz	9.61	9.55
	High CH			



LTE Band/BW/RB Size/RB Offset	Channel Number	Tx Frequency	99% Occupied Bandwidth (MHz)	
			QPSK Modulation	16QAM Modulation
Band 14/10MHz/50/0	Low CH			
	Mid CH 23330	793 MHz	8.931	8.931
	High CH			

Spectrum Plot of Worst Value	
99% Occupied Bandwidth	
QPSK	16QAM

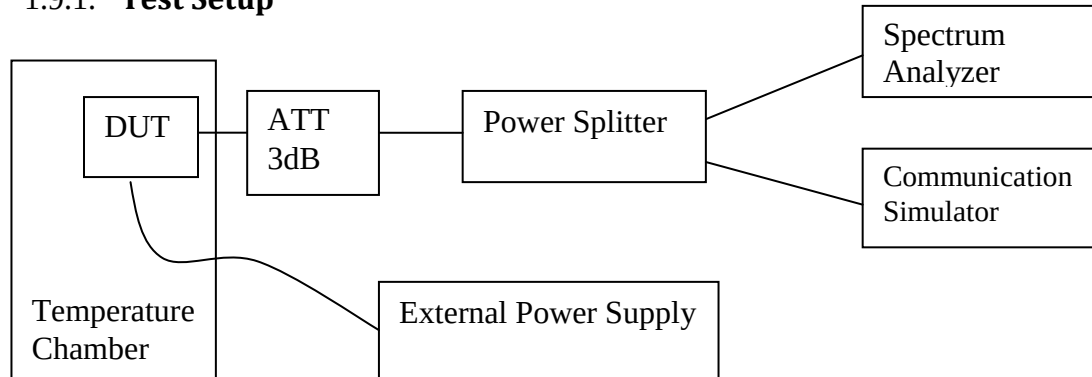


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1.9. Frequency Stability

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

The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

1.9.3. Frequency Stability - LTE Band 14 (788-798MHz)

Band	Temp (Deg C)	Frequency Error VS Temperature			
		Channel Bandwidth: 5 MHz			
		Low Channel		High Channel	
		790.5MHz		795.5MHz	
		Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
LTE Band 14	50	790.499994	-0.007872	795.500009	0.010933
	40	790.500005	0.006026	795.50001	0.012624
	30	790.500007	0.00932	795.500008	0.01052
	20	790.500005	0.006895	795.500011	0.013918
	10	790.500008	0.009826	795.500012	0.015321
	0	790.499997	-0.003891	795.500011	0.013415
	-10	790.500005	0.006098	795.500007	0.009387
	-20	790.500007	0.009139	795.500008	0.009531
	-30	790.500006	0.007745	795.500009	0.011005

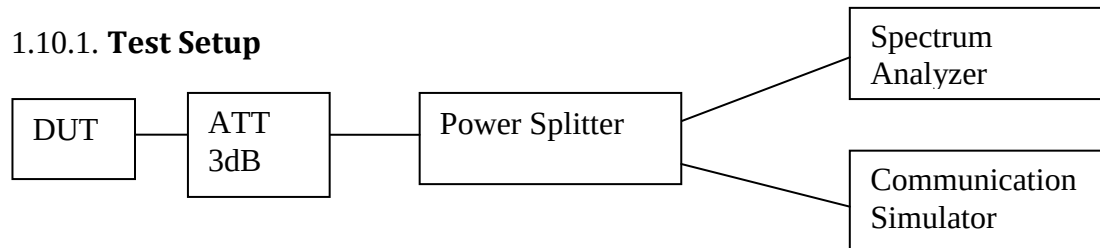
Band	Voltage (V)	Frequency Error VS Voltage			
		Channel Bandwidth: 5 MHz			
		Low Channel		High Channel	
		790.5MHz		795.5MHz	
LTE Band 14		Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
	9	790.500006	0.007709	795.50001	0.01275
	7.5	790.500005	0.006768	795.500012	0.014854
	6	790.500006	0.008017	795.500008	0.010484

Band	Temp (Deg C)	Frequency Error VS Temperature	
		Channel Bandwidth: 10 MHz	
		Mid Channel	
		793MHz	
LTE Band 14		Frequency (MHz)	Frequency Error (ppm)
	50	792.999993	-0.009344
	40	792.999991	-0.010751
	30	792.999993	-0.008659
	20	792.999993	-0.008442
	10	792.999994	-0.008118
	0	792.999995	-0.006729
	-10	792.999994	-0.007811
	-20	792.999994	-0.007198
	-30	792.999995	-0.006602

Band	Voltage (V)	Frequency Error VS Voltage	
		Channel Bandwidth: 10 MHz	
		Mid Channel	
		793MHz	
LTE Band 14		Frequency (MHz)	Frequency Error (ppm)
	9	792.999993	-0.009128
	7.5	792.999994	-0.007775
	6	792.999993	-0.008839

1.10. Band Edge/Emission Mask Conducted Spurious Emission

1.10.1. 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) 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, RBW is 1~3% of EBW and VBW is 3 times of RBW.
- 6) Record the maximum trace plot into the test report.

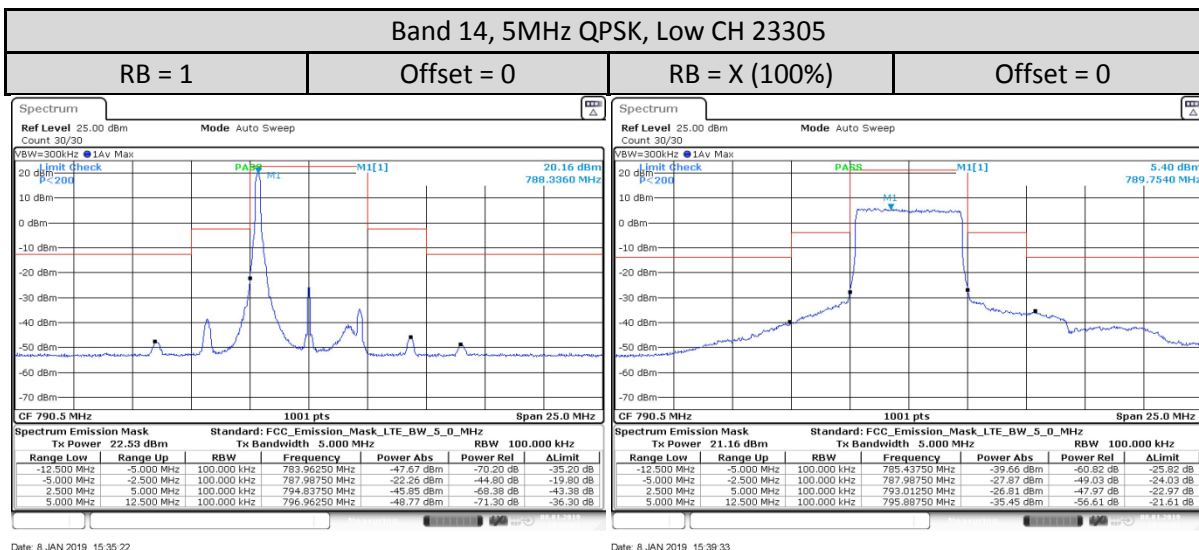
1.10.2. Test Limit

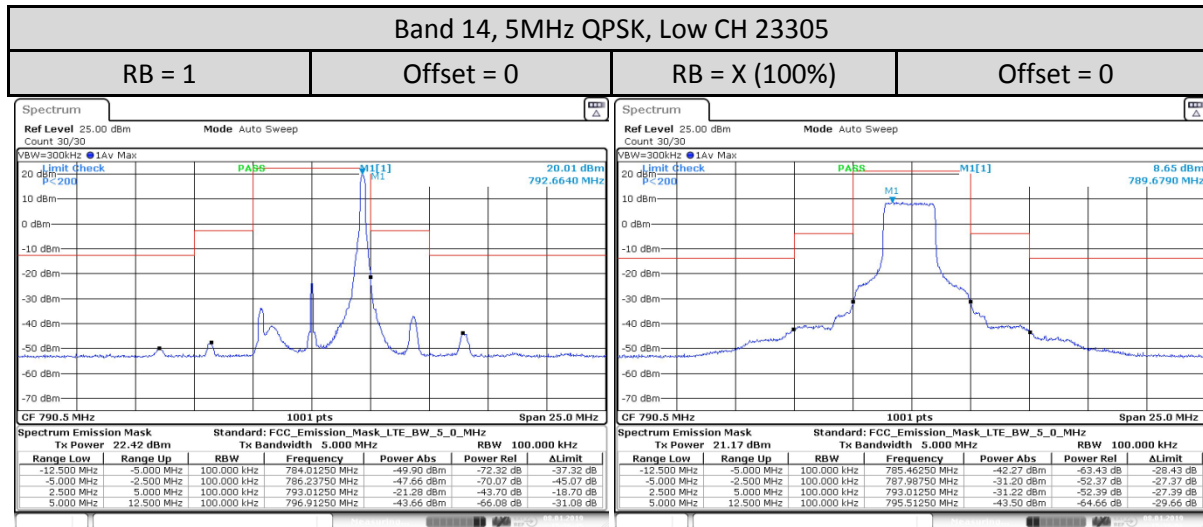
(b) *Emission Mask B.* For transmitters that are equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows:

- (1) On any frequency removed from the assigned frequency by more than 50 percent, but not more than 100 percent of the authorized bandwidth: At least 25 dB.
- (2) On any frequency removed from the assigned frequency by more than 100 percent, but not more than 250 percent of the authorized bandwidth: At least 35 dB.
- (3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least $43 + 10 \log (P)$ dB.

1.10.3. Band Edge/Emission Mask Conducted Spurious Emission - LTE Band 14 (788-798MHz)

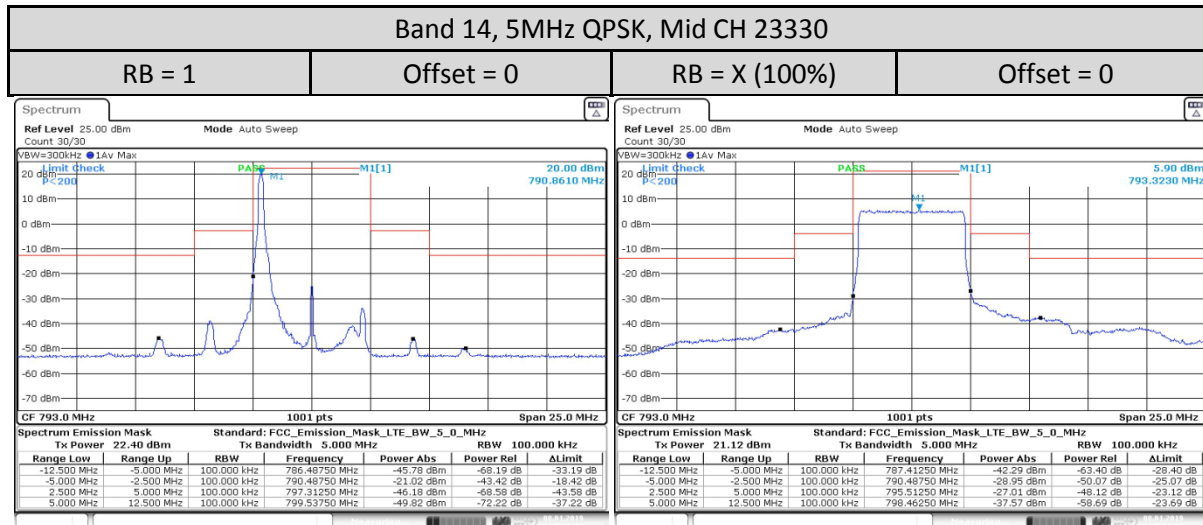
Emission Mask Conducted Spurious Emission





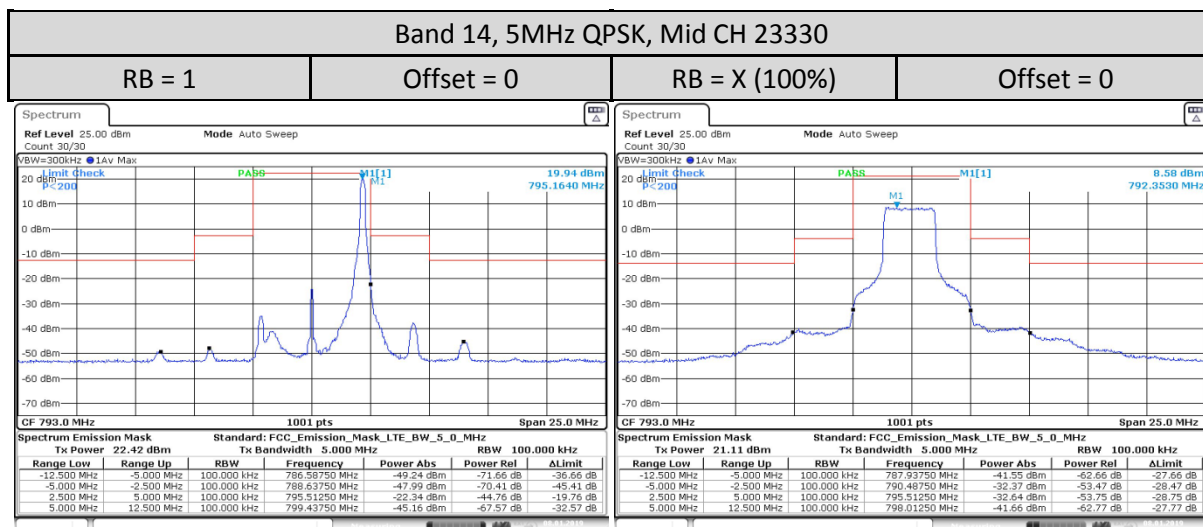
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