

FCC REPORT

Applicant: Alligator Communications, Inc.

Address of Applicant: 1400 Coleman Avenue, Santa Clara, CA 95050.

Equipment Under Test (EUT)

Product Name: 757-758MHz Licensed MAS Radio

Model No.: 2788

FCC ID: JIL2788A

Applicable standards: FCC CFR Title 47 Part 2
FCC CFR Title 47 Part 27 Subpart G

Date of sample receipt: 08 Apr., 2019

Date of Test: 09 Apr., to 20 Nov., 2019

Date of report issued: 10 Dec., 2019

Test Result: PASS*

* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:



Bruce Zhang
Laboratory Manager

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product and does not permit the use of the CCIS product certification mark. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

This report may only be reproduced and distributed in full. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards.

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2. Version

Version No.	Date	Description
00	22 Nov., 2019	Original
01	09 Dec., 2019	Update page 4, 8, 22
02	10 Dec., 2019	Update page 18~23

Tested by:

Mike.ou

Date:

10 Dec., 2019

Test Engineer

Reviewed by:

Winner Zhang

Date:

10 Dec., 2019

Project Engineer

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4. Test Summary

Test Item	Section in CFR 47	Result
RF Output Power	Part 2.1046 Part 27.50 (b)(1)	Pass
Occupied Bandwidth	Part 2.1049	Pass
Spurious Emissions at Antenna Terminal	Part 2.1051 Part 27.53 (c)	Pass
Field Strength of Spurious Radiation	Part 2.1053 Part 27.53 (c)	Pass
Frequency stability	Part 2.1055 Part 27.54	Pass
<i>Pass: The EUT complies with the essential requirements in the standard.</i>		

5. General Information

5.1 Client Information

Applicant:	Alligator Communications Inc
Address:	1400 Coleman Avenue, Santa Clara, CA 95050.
Manufacturer/ Factory:	Alligator Communications
Address:	1400 Coleman Avenue, Santa Clara, CA 95050.

5.2 General Description of E.U.T.

Product Name:	757-758MHz Licensed MAS Radio
Model No.:	2788
Operation Frequency range:	757 MHz-758 MHz
Modulation type:	4GFSK
Antenna type:	External antenna ("N" type)
Antenna gain:	10 dBi
Power supply:	Operating Voltage Scope: 10V DC to 24V DC Normal test voltage: 13.8V DC.

Operation Frequency of Test Channel				
Test Channel	Bandwidth =12.5 (kHz)	Bandwidth = 25 (kHz)	Bandwidth = 50(kHz)	Bandwidth = 100 (kHz)
Lowest channel	757.0125 MHz	757.0250MHz	757.0500MHz	757.1000MHz
Middle channel	757.5000MHz	757.5000MHz	757.5000MHz	757.5000MHz
Highest channel	787.9875MHz	757.9750MHz	757.9500MHz	757.9000MHz

5.3 Test modes

Operating Environment:	
Temperature:	Normal: 15°C ~ 35°C, Extreme: -30°C ~ +50°C
Humidity:	20 % ~ 75 % RH
Atmospheric Pressure:	1008 mbar
Voltage:	Nominal: 13.8Vdc, Extreme: Low 10 Vdc, High 24 Vdc
Test mode:	
Transmitting mode	Keep the EUT in continuously transmitting mode with modulation.

5.4 Description of Support Units

Manufacturer	Description	Model	S/N	FCC ID/DoC
Lenovo	PC	ThinkPad-E450	2014AP5917	/
GS Japan	Lead-acid battery	55D26R-MFZ	8362810610	N/A

5.5 Measurement Uncertainty

Parameters	Expanded Uncertainty
Radiated Emission (9kHz ~ 30MHz)	±3.12 dB (k=2)
Radiated Emission (30MHz ~ 1000MHz)	±4.32 dB (k=2)
Radiated Emission (1GHz ~ 18GHz)	±5.38 dB (k=2)
Radiated Emission (18GHz ~ 40GHz)	±3.36 dB (k=2)

5.6 Laboratory Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **FCC - Registration No.: CN1211**

Shenzhen Zhongjian Nanfang Testing Co., Ltd. has been accredited as a testing laboratory by FCC (Federal Communications Commission). The Registration No. is 727551.

- **IC - Registration No.: CN0021**

The 3m Semi-anechoic chamber of Shenzhen Zhongjian Nanfang Testing Co., Ltd. has been Registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 10106A-1.

- **CNAS - Registration No.: CNAS L6048**

Shenzhen Zhongjian Nanfang Testing Co., Ltd. is accredited to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration laboratories for the competence of testing. The Registration No. is CNAS L6048.

- **A2LA - Registration No.: 4346.01**

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 General requirements for the competence of testing and calibration laboratories. The test scope can be found as below link: <https://portal.a2la.org/scopepdf/4346-01.pdf>

5.7 Laboratory Location

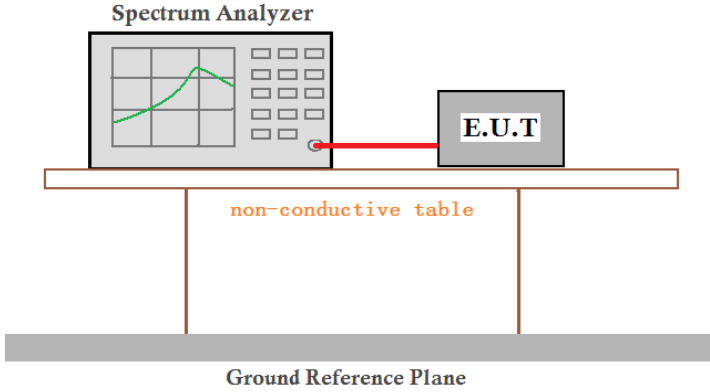
Shenzhen Zhongjian Nanfang Testing Co., Ltd.
 Address: No. B-C, 1/F., Building 2, Laodong No.2 Industrial Park, Xixiang Road,
 Bao'an District, Shenzhen, Guangdong, China
 Tel: +86-755-23118282, Fax: +86-755-23116366
 Email: info@ccis-cb.com, Website: http://www.ccis-cb.com

5.8 Test Instruments list

Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
3m SAC	SAEMC	9m*6m*6m	966	07-22-2017	07-21-2020
BiConiLog Antenna	SCHWARZBECK	VULB9163	497	03-18-2019	03-17-2020
Biconical Antenna	SCHWARZBECK	VUBA9117	359	06-22-2017	06-21-2020
Horn Antenna	SCHWARZBECK	BBHA9120D	916	03-18-2019	03-17-2020
Horn Antenna	SCHWARZBECK	BBHA9120D	1805	06-22-2017	06-21-2020
Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170582	11-21-2018	11-20-2019
EMI Test Software	AUDIX	E3	Version: 6.110919b		
Pre-amplifier	HP	8447D	2944A09358	03-18-2019	03-17-2020
Pre-amplifier	CD	PAP-1G18	11804	03-18-2019	03-17-2020
Spectrum analyzer	Rohde & Schwarz	FSP30	101454	03-18-2019	03-17-2020
EMI Test Receiver	Rohde & Schwarz	ESRP7	101070	03-18-2019	03-17-2020
Spectrum Analyzer	Agilent	N9020A	MY50510123	11-10-2018	11-09-2019
				11-10-2019	11-09-2020
Spectrum analyzer	Rohde & Schwarz	FSP40	100363	11-21-2018	11-20-2019
RF Switch Unit	MWRFTTEST	MW200	N/A	N/A	N/A
Cable	ZDECL	Z108-NJ-NJ-81	1608458	03-18-2019	03-17-2020
Cable	MICRO-COAX	MFR64639	K10742-5	03-18-2019	03-17-2020
Cable	SUHNER	SUCOFLEX100	58193/4PE	03-18-2019	03-17-2020
DC Power Supply	XinNuoEr	WYK-10020K	1409050110020	10-31-2018	10-30-2019
				10-31-2019	10-30-2020
Temperature Humidity Chamber	HengPu	HPGDS-500	20140828008	09-24-2018	09-23-2019
				09-24-2019	09-23-2020

6. Test results

6.1 RF Output Power, ERP

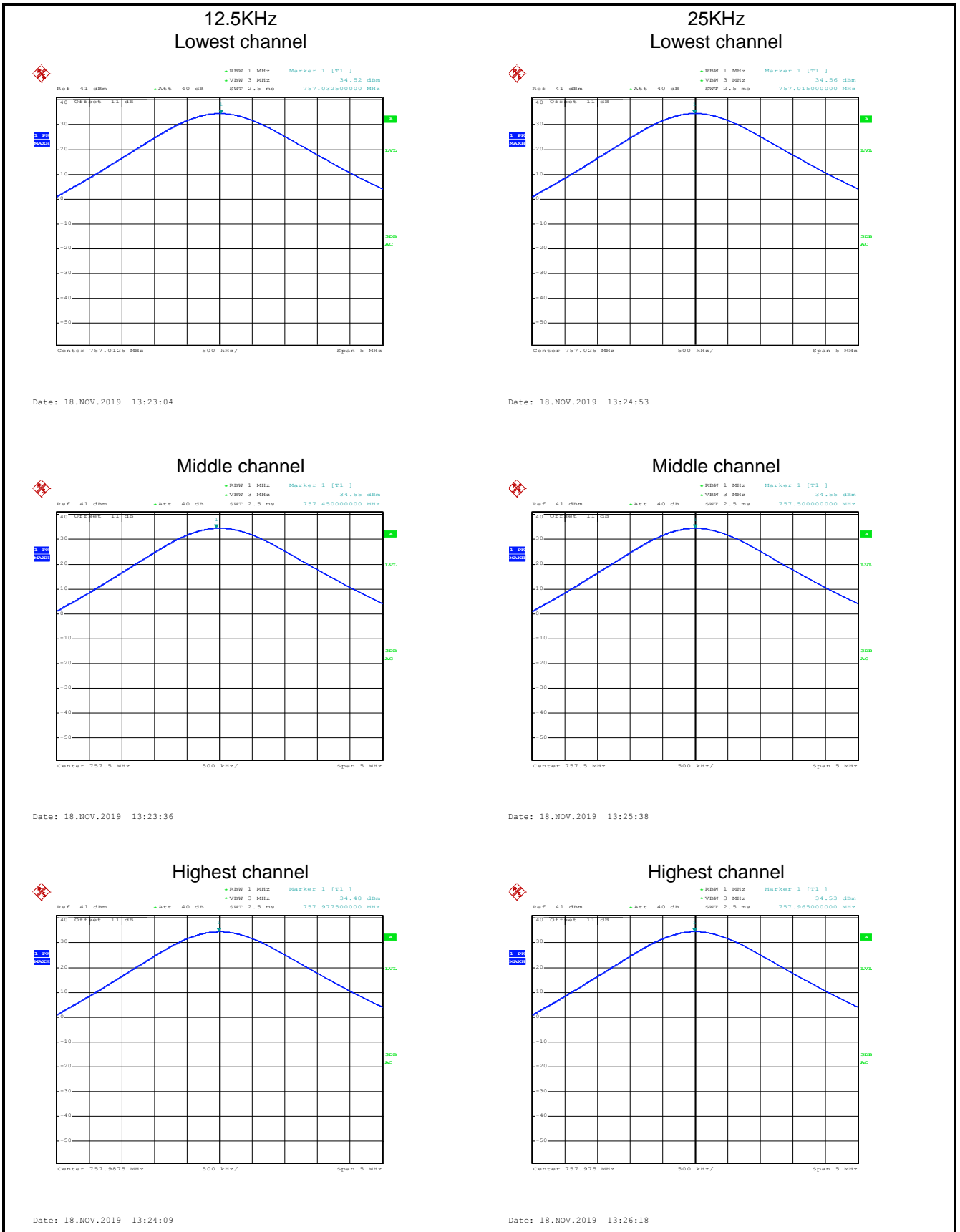
Test Requirement:	FCC Part 2.1046, Part 27.50 (b)(1)
Test Method:	ANSI/TIA-603-E 2016
Limit:	(1) Fixed and base stations transmitting a signal in the 757-758 and 775-776 MHz bands must not exceed an effective radiated power (ERP) of 1000 watts and an antenna height of 305 m height above average terrain (HAAT), except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 1000 watts ERP in accordance with Table 1 of this section.
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a short cable. Both the Spectrum Analyzer and the E.U.T. are placed on a non-conductive table. Below the table is a Ground Reference Plane.</p>
	<ol style="list-style-type: none"> 1. The EUT output RF connector was connected with a short cable to the spectrum analyzer. 2. Spectrum analyzer was set: RBW= 1MHz, VBW= 3 times RBW. 3. Use peak marker function to determine the peak amplitude level.
Test Instruments:	Refer to section 5.8 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

Measurement Data:

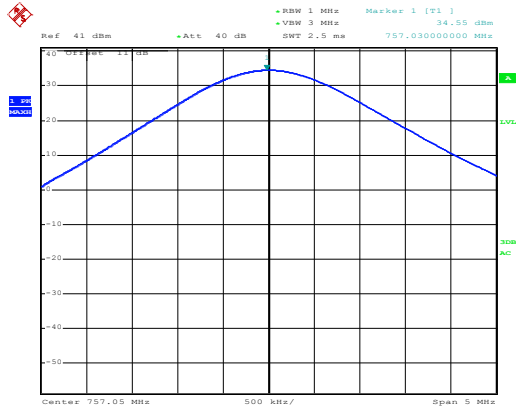
Bandwidth (kHz)	Test Channel	Conducted Output Power (dBm)	ANT Gain (dBi)	EPR (dBm)	ERP Limit (dBm)
12.5KHz	Lowest channel	34.52	10	42.37	60.00
	Middle channel	34.55	10	42.40	
	Highest channel	34.48	10	42.33	
25 KHz	Lowest channel	34.56	10	42.41	60.00
	Middle channel	34.55	10	42.40	
	Highest channel	34.53	10	42.38	
50 KHz	Lowest channel	34.55	10	42.40	60.00
	Middle channel	34.50	10	42.35	
	Highest channel	34.43	10	42.28	
100 KHz	Lowest channel	34.42	10	42.27	60.00
	Middle channel	34.43	10	42.28	
	Highest channel	34.38	10	42.23	

NOTE: EIRP= Conducted Output Power + ANT Gain, ERP=EIRP-2.15

Test plot as follows:

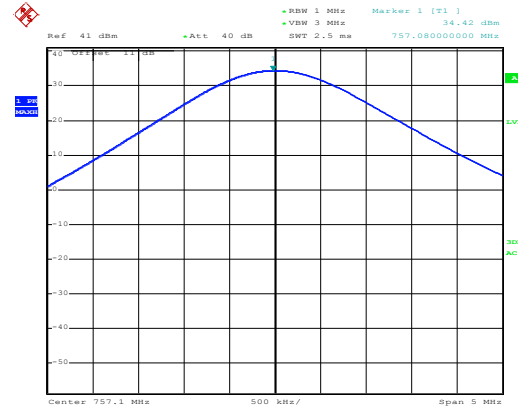


50KHz
Lowest channel



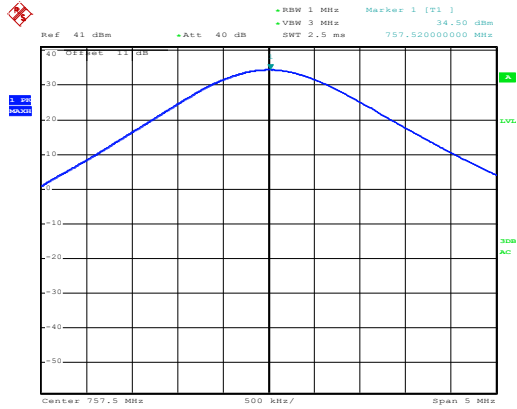
Date: 18.NOV.2019 13:27:15

100KHz
Lowest channel



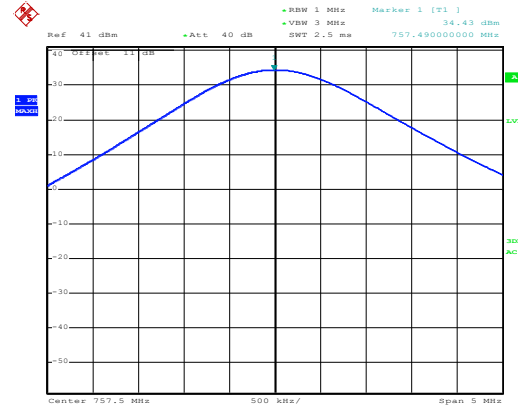
Date: 18.NOV.2019 13:29:21

Middle channel



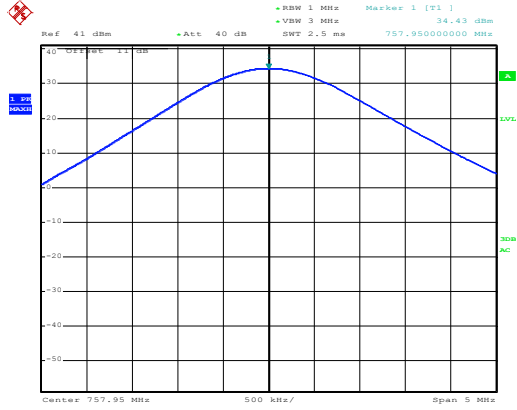
Date: 18.NOV.2019 13:28:05

Middle channel



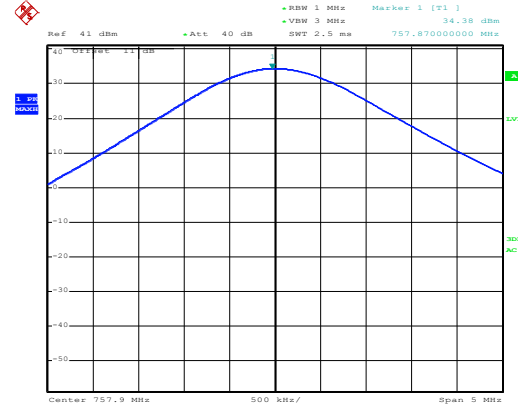
Date: 18.NOV.2019 13:29:46

Highest channel



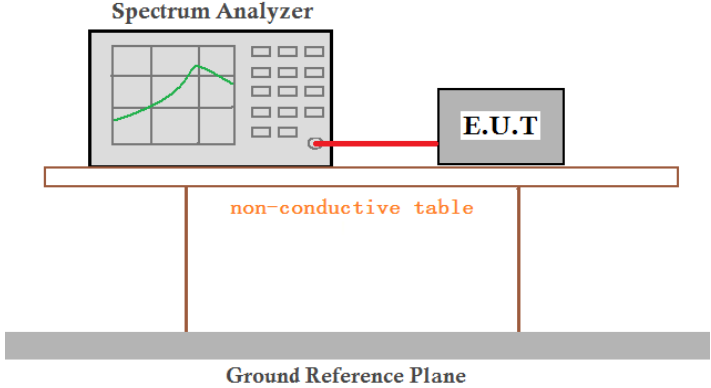
Date: 18.NOV.2019 13:28:34

Highest channel



Date: 18.NOV.2019 13:30:12

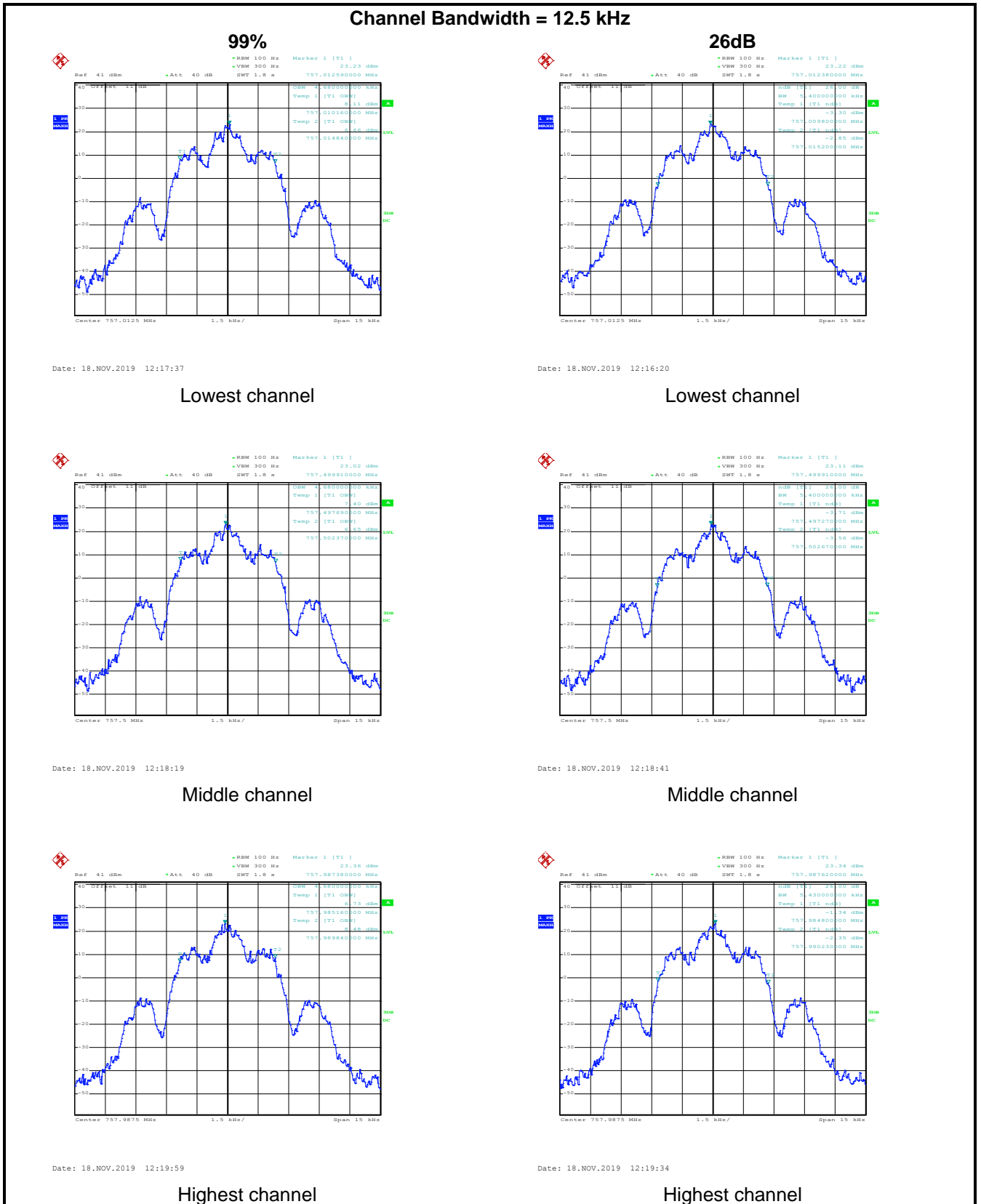
6.2 Occupied Bandwidth

Test Requirement:	Part 2.1049
Test Method:	ANSI/TIA-603-E 2016
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both the Spectrum Analyzer and the E.U.T. are placed on a non-conductive table. Below the table is a Ground Reference Plane.</p>
Test Procedure:	<ol style="list-style-type: none"> 1. The EUT output RF connector was connected with a short cable to the spectrum analyzer 2. RBW was set to about 1% of emission BW, VBW= 3 times RBW. 3. 99% bandwidth display line was placed on the screen, the occupied bandwidth is the delta frequency between the two points where the display line intersects the signal trace.
Test Instruments:	Refer to section 5.8 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

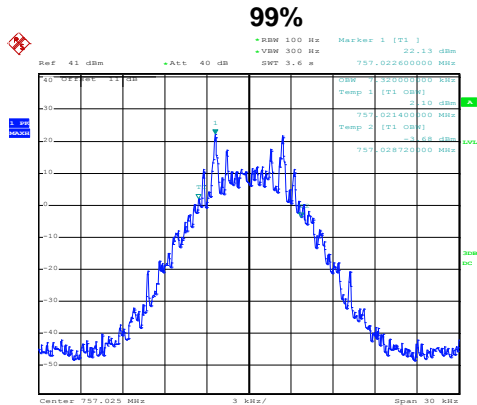
Measurement Data:

Bandwidth Channel (kHz)	Test Channel	99% Occupy bandwidth (kHz)	-26dB bandwidth (kHz)	Limit (kHz)
12.5	Lowest channel	4.68	5.40	N/A
	Middle channel	4.68	5.40	N/A
	Highest channel	4.68	5.43	N/A
25	Lowest channel	7.32	8.04	N/A
	Middle channel	7.44	8.10	N/A
	Highest channel	7.32	8.10	N/A
50	Lowest channel	13.60	15.70	N/A
	Middle channel	13.60	15.70	N/A
	Highest channel	13.60	14.70	N/A
100	Lowest channel	33.20	40.20	N/A
	Middle channel	33.20	40.80	N/A
	Highest channel	33.00	40.00	N/A

Test plot as follows:

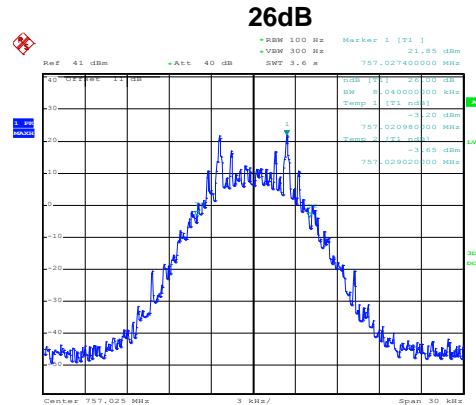


Channel Bandwidth = 25 kHz



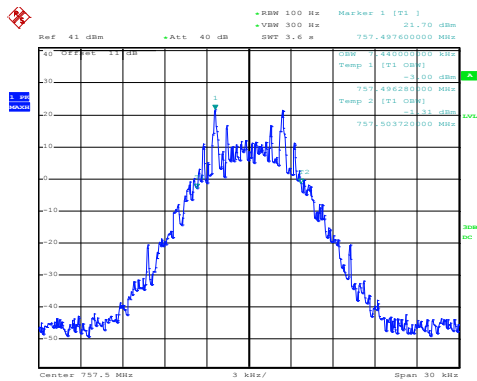
Date: 18.NOV.2019 12:24:47

Lowest channel



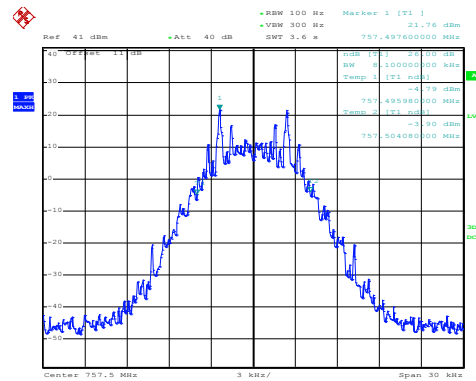
Date: 18.NOV.2019 12:25:28

Lowest channel



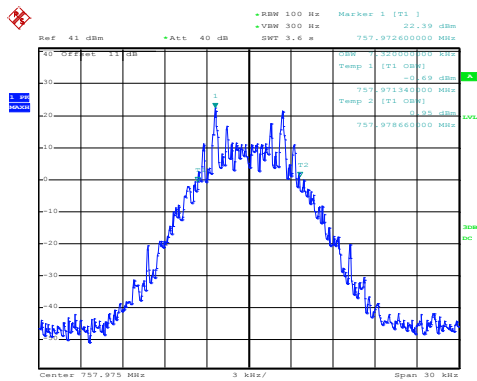
Date: 18.NOV.2019 12:27:04

Middle channel



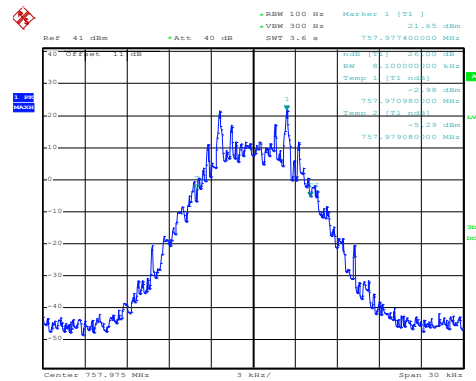
Date: 18.NOV.2019 12:26:26

Middle channel



Date: 18.NOV.2019 12:28:03

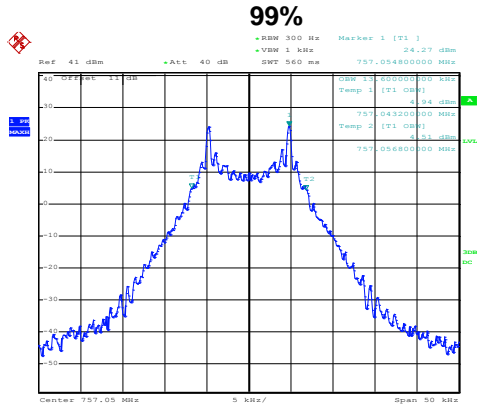
Highest channel



Date: 18.NOV.2019 12:29:02

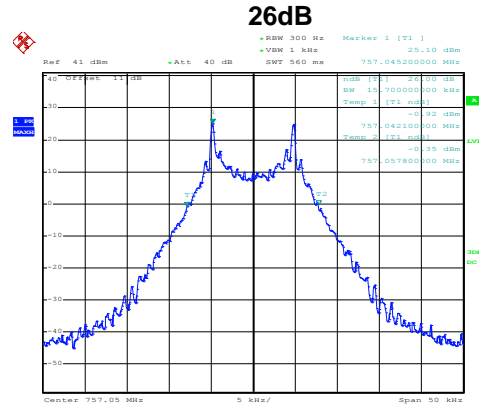
Highest channel

Channel Bandwidth = 50 kHz



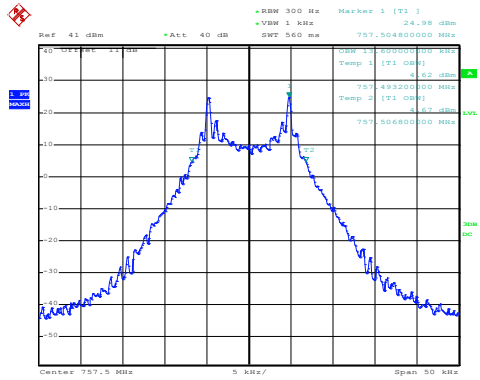
Date: 18.NOV.2019 12:30:45

Lowest channel



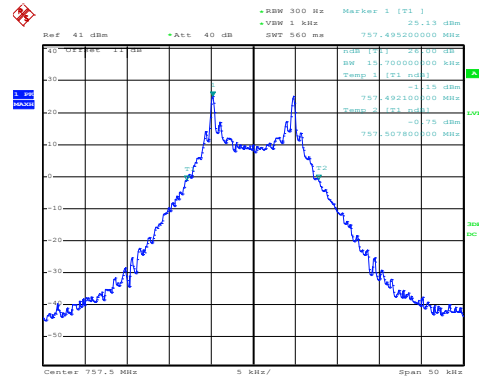
Date: 18.NOV.2019 12:30:31

Lowest channel



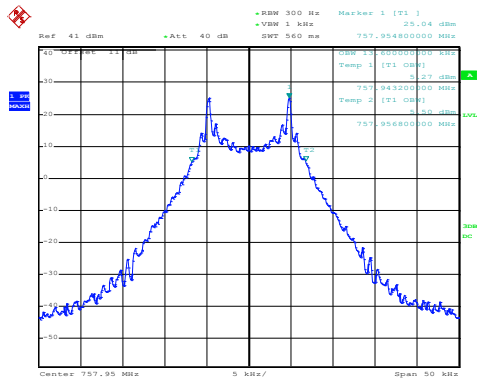
Date: 18.NOV.2019 12:31:40

Middle channel



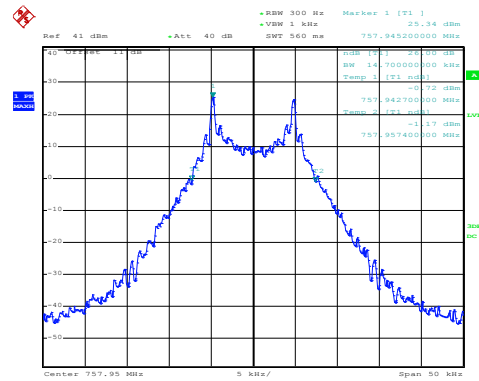
Date: 18.NOV.2019 12:32:13

Middle channel



Date: 18.NOV.2019 12:33:38

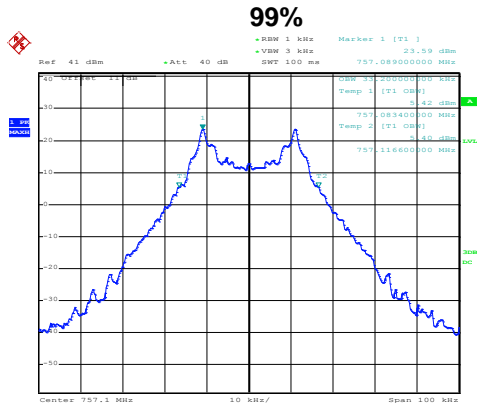
Highest channel



Date: 18.NOV.2019 12:32:53

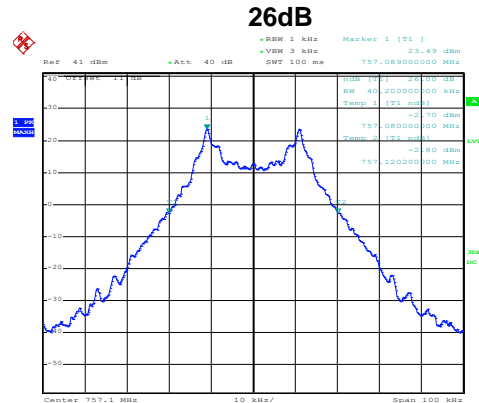
Highest channel

Channel Bandwidth = 100 kHz



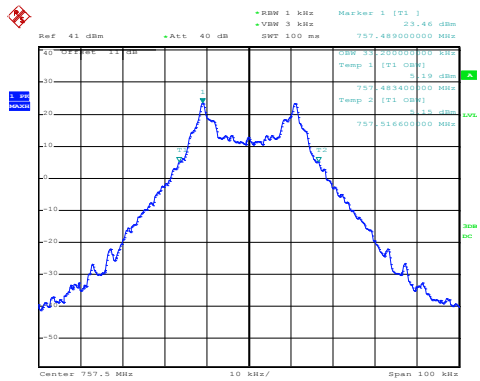
Date: 18.NOV.2019 12:35:36

Lowest channel



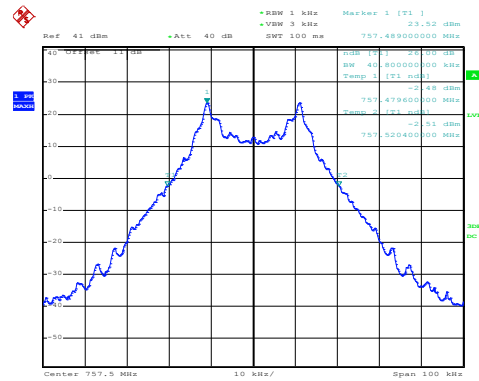
Date: 18.NOV.2019 12:36:32

Lowest channel



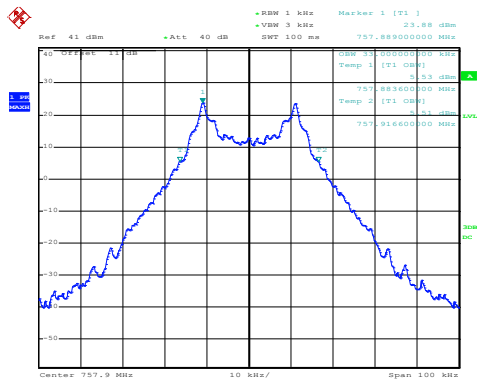
Date: 18.NOV.2019 12:38:27

Middle channel



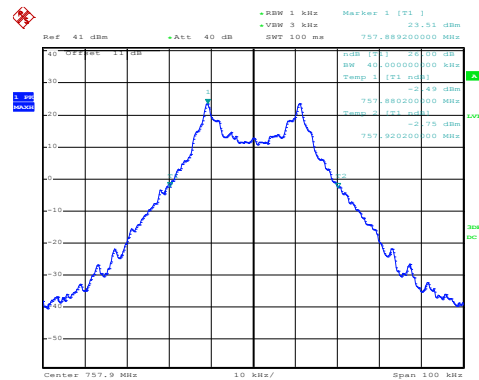
Date: 18.NOV.2019 12:38:06

Middle channel



Date: 18.NOV.2019 12:39:33

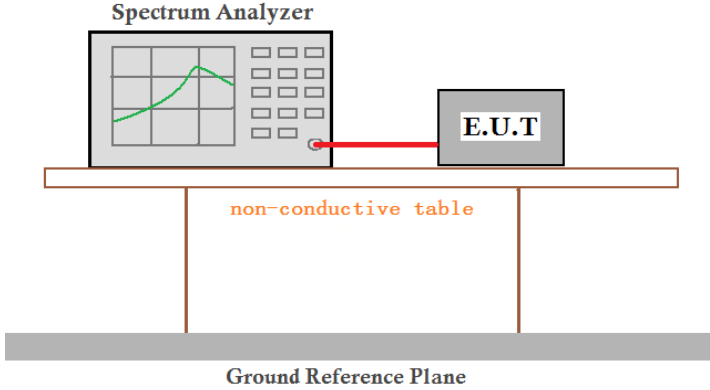
Highest channel



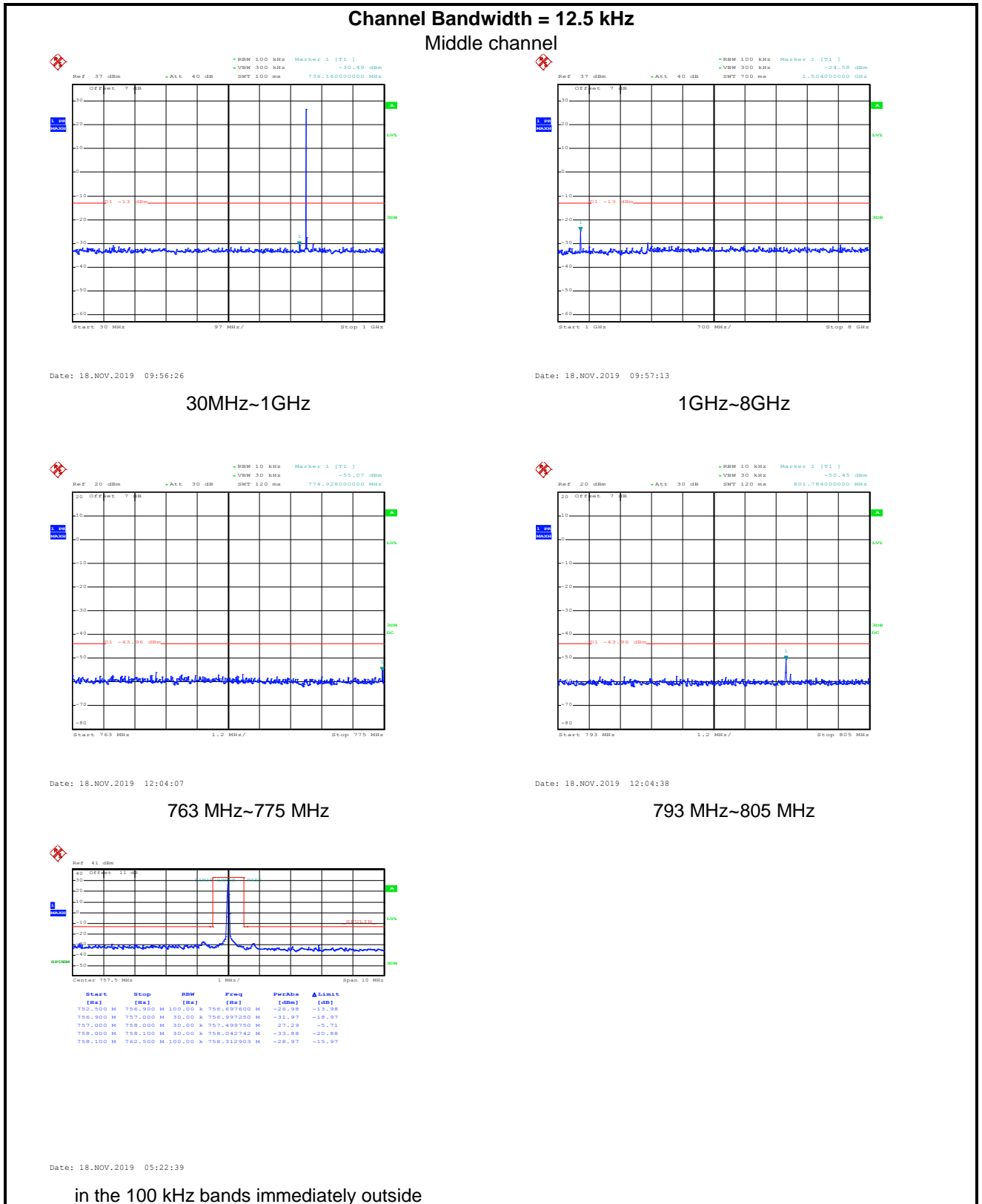
Date: 18.NOV.2019 12:40:25

Highest channel

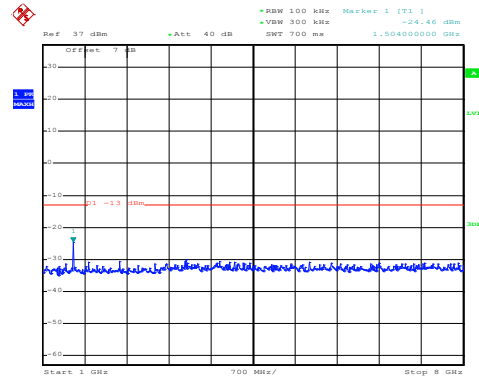
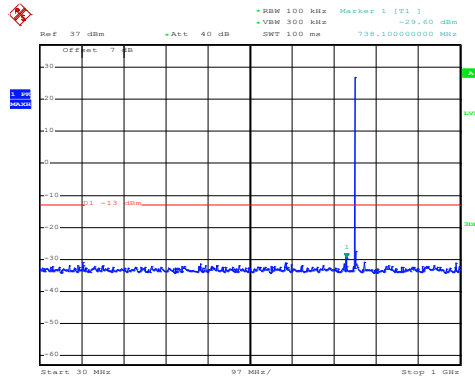
6.3 Out of band emission at antenna terminals

Test Requirement:	FCC part 2.1051, Part 27.53(c)
Test Method:	ANSI/TIA-603-E 2016
Limit:	<p>(c) For operations in the 746-758 MHz band and the 776-788 MHz band, the power of any emission outside the 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, in accordance with the following:</p> <p>(1) On any frequency outside the 746-758 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least $43 + 10 \log(P)$ dB;</p> <p>(2) On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least $43 + 10 \log(P)$ dB;</p> <p>(3) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than $76 + 10 \log(P)$ dB in a 6.25 kHz band segment, for base and fixed stations;</p> <p>(4) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than $65 + 10 \log(P)$ dB in a 6.25 kHz band segment, for mobile and portable stations;</p> <p>(5) Compliance with the provisions of paragraphs (c)(1) and (c)(2) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 30 kHz may be employed;</p> <p>(6) Compliance with the provisions of paragraphs (c)(3) and (c)(4) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.</p>
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected via a red cable to an Equipment Under Test (E.U.T.). Both are placed on a non-conductive table. Below the table is a Ground Reference Plane.</p>
Test Procedure:	<ol style="list-style-type: none"> 1 The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation. 2 The resolution bandwidth of the spectrum analyzer was set at 100 kHz when below 1GHz, 1MHz when above 1 GHz; sufficient scans were taken to show the out of band Emissions if any up to 10th harmonic.
Test Instruments:	Refer to section 5.8 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

Test plots as follows:



Channel Bandwidth = 25 kHz Middle channel

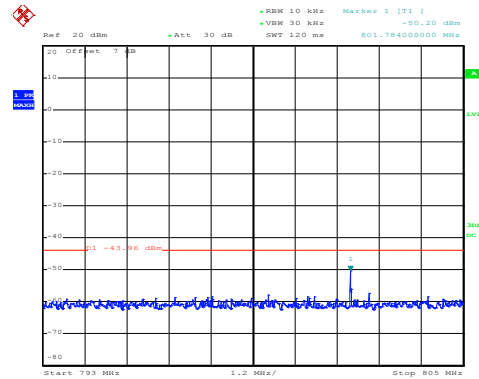
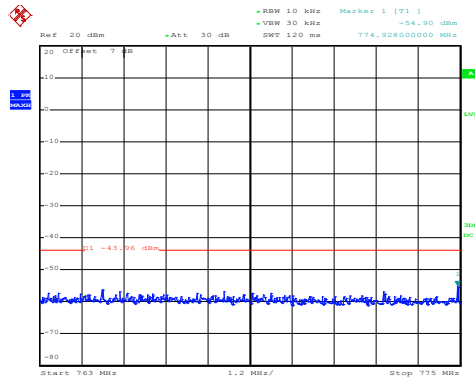


Date: 18.NOV.2019 10:10:08

Date: 18.NOV.2019 10:10:30

30MHz~1GHz

1GHz~8GHz

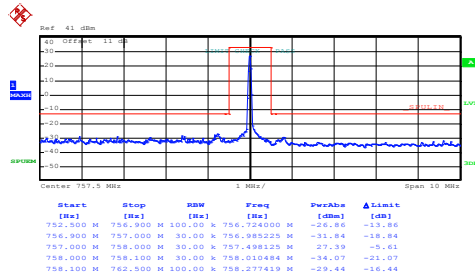


Date: 18.NOV.2019 12:05:47

Date: 18.NOV.2019 12:05:24

763 MHz~775 MHz

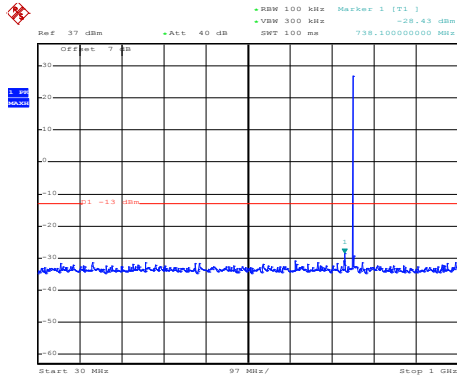
793 MHz~805 MHz



Date: 18.NOV.2019 05:25:03

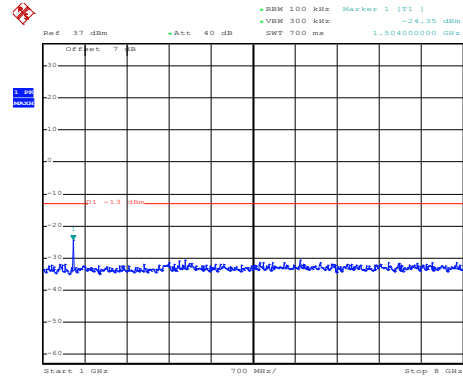
in the 100 kHz bands immediately outside

Channel Bandwidth = 50 kHz
Middle channel



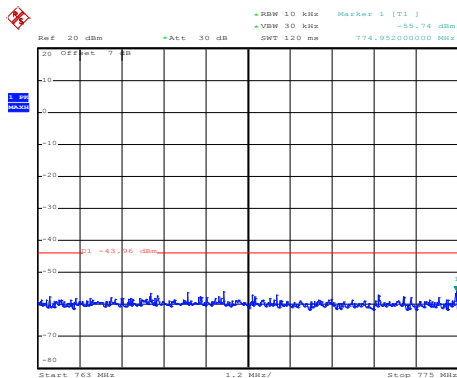
Date: 18.NOV.2019 10:11:31

30MHz~1GHz



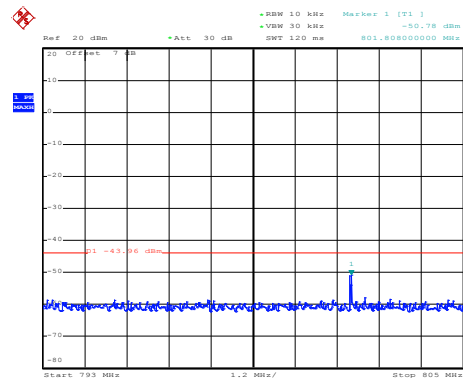
Date: 18.NOV.2019 10:11:07

1GHz~8GHz



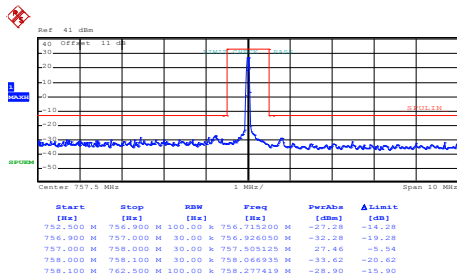
Date: 18.NOV.2019 12:06:25

763 MHz~775 MHz



Date: 18.NOV.2019 12:06:51

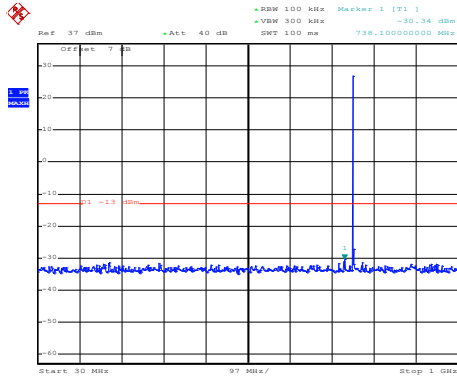
793 MHz~805 MHz



Date: 18.NOV.2019 05:26:44

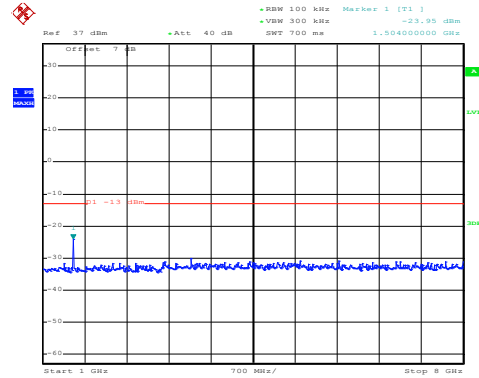
in the 100 kHz bands immediately outside

Channel Bandwidth = 100 kHz
Middle channel



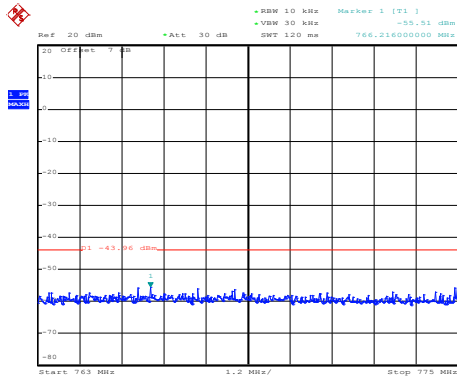
Date: 18.NOV.2019 10:15:01

30MHz~1GHz



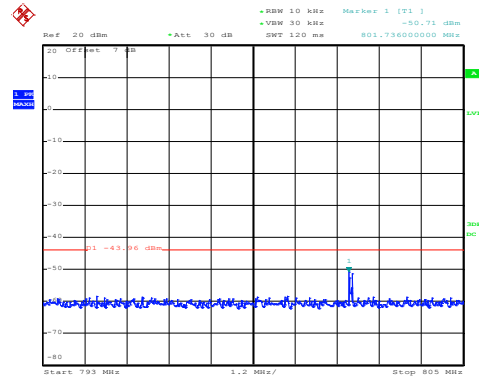
Date: 18.NOV.2019 10:15:29

1GHz~8GHz



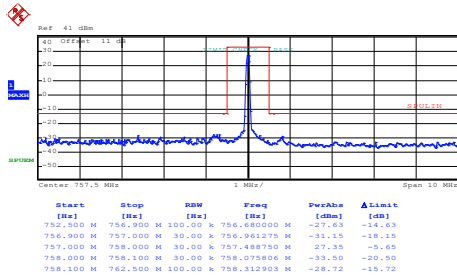
Date: 18.NOV.2019 12:07:54

763 MHz~775 MHz



Date: 18.NOV.2019 12:07:26

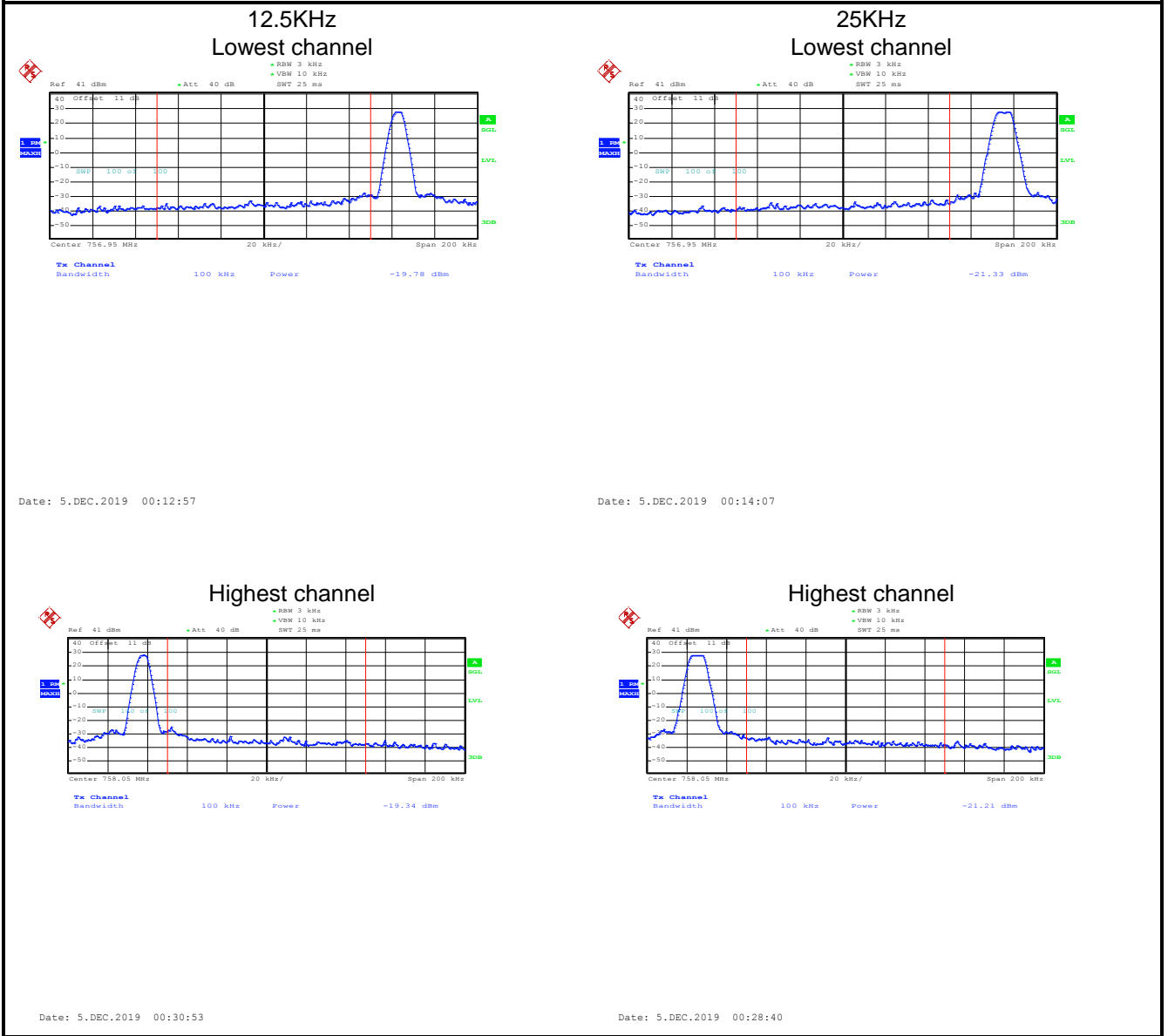
793 MHz~805 MHz

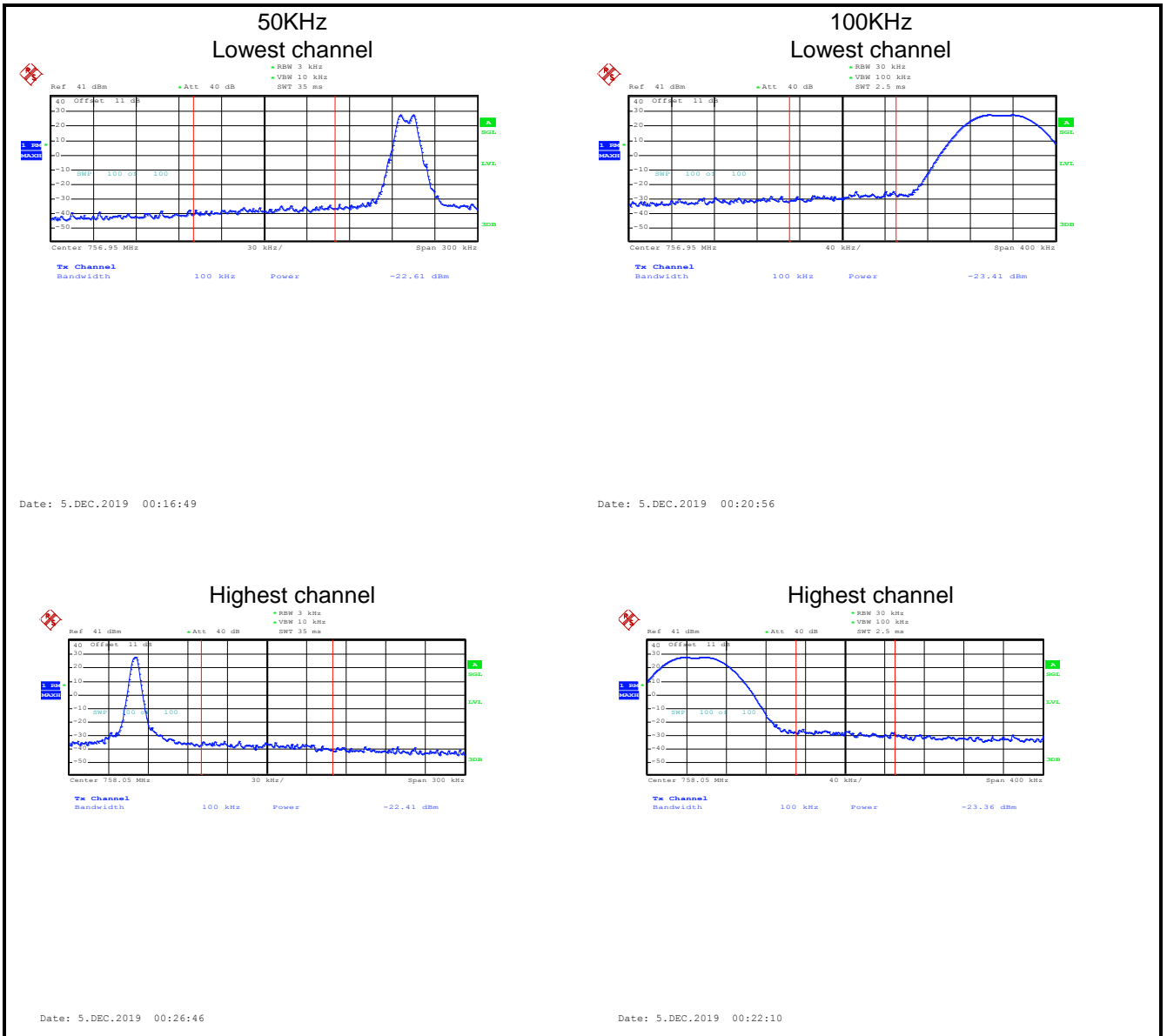


Date: 18.NOV.2019 05:27:31

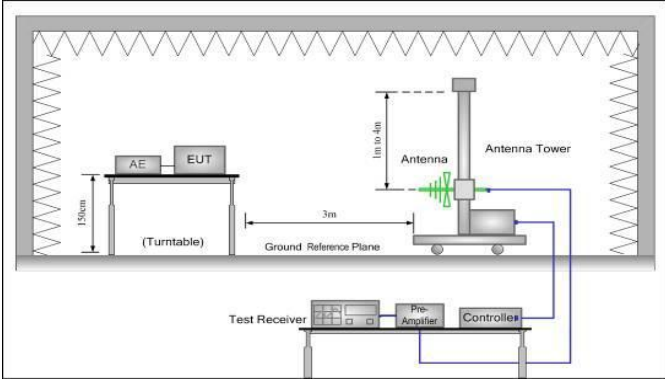
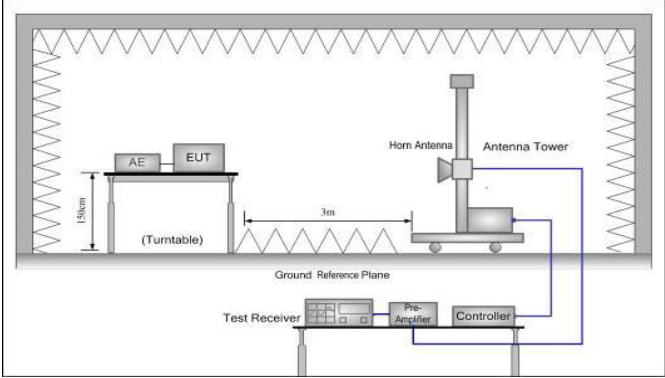
in the 100 kHz bands immediately outside

Band edge emission:





6.4 Field strength of spurious radiation measurement

Test Requirement:	FCC part 2.1051, Part 27.53(c)
Test Method:	ANSI/TIA-603-E 2016
Limit:	-13dBm
Test setup:	<p>Below 1GHz</p>  <p>Above 1GHz</p> 
Test Procedure:	<ol style="list-style-type: none"> 1. The EUT was placed on a non-conductive turntable using a non-conductive support. The radiated emission at the fundamental frequency was measured at 3 m with a test antenna and EMI spectrum analyzer. 2. During the tests, the antenna height and the EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. This maximization process was repeated with the EUT positioned in each of its three orthogonal orientations. 3. The frequency range up to tenth harmonic was investigated for each of three fundamental frequency (low, middle and high channels). Once spurious emission was identified, the power of the emission was determined using the substitution method. 4. The spurious emissions attenuation was calculated as the difference between radiated power at the fundamental frequency and the spurious emissions frequency. $ERP / EIRP = S.G. \text{ output (dBm)} + \text{Antenna Gain (dB/dBi)} - \text{Cable Loss (dB)}$
Test Instruments:	Refer to section 5.8 for details
Test mode:	Refer to section 5.3 for details.
Test results:	Passed

Measurement Data (worst case):

Channel Bandwidth = 12.5 kHz				
Middle channel				
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1515.0	Vertical	-58.10	-13.00	Pass
2272.5	V	-54.64		
3030.0	V	-51.33		
1515.0	Horizontal	-58.50	-25.00	Pass
2272.5	H	-55.28		
3030.0	H	-52.01		
Channel Bandwidth = 25 kHz				
Middle channel				
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1515.0	Vertical	-58.34	-13.00	Pass
2272.5	V	-54.86		
3030.0	V	-51.38		
1515.0	Horizontal	-58.86	-13.00	Pass
2272.5	H	-55.37		
3030.0	H	-52.24		
<i>Remark:</i>				
1. The emission levels of other frequency are very lower than the limit and not show in test report.				

Channel Bandwidth = 50 kHz				
Middle channel				
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1515.0	Vertical	-58.71	-13.00	Pass
2272.5	V	-54.89		
3030.0	V	-51.68		
1515.0	Horizontal	-58.92	-13.00	Pass
2272.5	H	-55.46		
3030.0	H	-52.38		
Channel Bandwidth = 100 kHz				
Middle channel				
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1515.0	Vertical	-58.73	-13.00	Pass
2272.5	V	-55.06		
3030.0	V	-52.31		
1515.0	Horizontal	-58.89	-13.00	Pass
2272.5	H	-55.67		
3030.0	H	-52.92		
<i>Remark:</i>				
2. The emission levels of other frequency are very lower than the limit and not show in test report.				

6.5 Frequency stability

Test Requirement:	FCC Part 27.54, FCC Part 2.1055
Test Method:	ANSI/TIA-603-E 2016
Limit:	Within the authorized bands of operation.
Test setup:	
Test procedure:	<p>For V.S. temperature measurement:</p> <ol style="list-style-type: none"> 1. The equipment under test was connected to an external power supply and input rated voltage. 2. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. 3. The EUT was placed inside the temperature chamber. 4. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 25°C operating frequency as reference frequency. 5. Turn EUT off and set the chamber temperature to -30°C. After the temperature stabilized for approximately 30 minutes recorded the frequency. 6. Repeat step measure with 10°C increased per stage until the highest temperature of +50°C reached. <p>For V.S. voltage measurement:</p> <ol style="list-style-type: none"> 1. Set chamber temperature to 25°C. Use a variable DC power source to power the EUT and set the voltage to rated voltage. 2. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency. 3. Reduce the input voltage to specify extreme voltage variation (+/- 15%) and endpoint, record the maximum frequency change.
Test Instruments:	Refer to section 5.8 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

a) For V.S. temperature measurement Data (the worst channel):

Reference Frequency =757.5MHz(Middle channel)					
Power supplied (Vdc)	Temperature (°C)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
13.8	-30	240	1.523810	Within the authorized bands	Pass
	-20	260	1.650794		
	-10	240	1.523810		
	0	220	1.396825		
	10	140	0.888889		
	20	80	0.507937		
	30	60	0.380952		
	40	60	0.380952		
	50	100	0.634921		

b) For V.S. temperature measurement Data (the worst channel):

Reference Frequency =757.5MHz(Middle channel)					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	10.0	0	0	Within the authorized bands	Pass
	13.8	0	0		
	24.0	0	0		