FCC Radio Test Report

FCC ID: 2AOO5-BWS01A

This report concerns (check one): ☒**Original Grant** ☐**Class I Change** ☐**Class II Change**

Project No.	:	1712076
Equipment	:	WIRELESS STEREO SYSTEM
Test Model	:	BWS-01-A
Series Model	:	N/A
Applicant	:	FAVORTRON CO., LTD.
Address	:	4F., NO.108-2,Minchiuan Rd., Shindian Dist., New Taipei City 23141,Taiwan(R.O.C.)

Date of Receipt	:	Jan. 09, 2018
Date of Test	:	Jan. 09, 2018 ~ Apr. 11, 2018
Issued Date	:	Apr. 11, 2018
Tested by	:	BTL Inc.

Testing Engineer : _____
(Kenji Lin)

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Testing Laboratory
0659

Declaration

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

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

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BTL's laboratory quality assurance procedures are in compliance with the **ISO Guide 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, so it is manufacturer's responsibility to ensure that the apparatus meets the essential requirements 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.

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REPORT ISSUED HISTORY

Issued No.	Description	Issued Date
BTL-FCCP-2-1712076	Original Issue	Apr. 11, 2018

1. CERTIFICATION

Equipment	:	WIRELESS STEREO SYSTEM
Brand Name	:	BOOOM
Test Model	:	BWS-01-A
Series Model	:	N/A
Applicant	:	FAVORTRON CO., LTD.
Manufacturer	:	FAVORTRON CO., LTD.
Address	:	4F., NO.108-2,Minchiuan Rd., Shindian Dist., New Taipei City 23141, Taiwan(R.O.C.)
Date of Test	:	Jan. 09, 2018 ~ Apr. 11, 2018
Test Sample	:	Engineering Sample
Standard(s)	:	FCC Part15, Subpart E(15.407) / ANSI C63.10-2013

The above equipment has been tested and found in compliance with the requirement of the relative standards by BTL Inc.
The test data, data evaluation, and equipment configuration contained in our test report (Ref No. BTL-FCCP-2-1712076) were obtained utilizing the test procedures, test instruments, test sites that has been accredited by the Authority of TAF according to the ISO-17025 quality assessment standard and technical standard(s).

Test result included in this report is only for the 5.8GHz SRD part.

2. SUMMARY OF TEST RESULTS

Test procedures according to the technical standard(s):

FCC Part15, Subpart E(15.407)			
Standard(s) Section	Test Item	Judgment	Remark
15.207	AC Power Line Conducted Emissions	PASS	
15.407(a)	26dB Spectrum Bandwidth	PASS	
15.407(a)	Maximum Conducted Output Power	PASS	
15.407(a)	Power Spectral Density	PASS	
15.407(a)	Radiated Emissions	PASS	
15.407(b)	Band Edge Emissions	PASS	
15.407(g)	Frequency Stability	PASS	
15.203	Antenna Requirements	PASS	
15.407(c)	Automatically Discontinue Transmission	PASS	**NOTE (2)**

NOTE:

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

(2) During no any information transmission, the EUT can automatically discontinue transmission and becom standby mode for power saving.
The EUT can detect the controlling signal of ACK message transmitting from remote device and verify whether it shall resend or discontinue transmission.

2.1 TEST FACILITY

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

Conducted emission Test:

C05: (VCCI RN: C-4742; FCC RN:674415; FCC DN:TW0659)
No. 68-1, Ln. 169, Sec. 2, Datong Rd., Xizhi Dist., New Taipei City 221, Taiwan (R.O.C.)

Radiated emission Test (Below 1 GHz):

CB15: (VCCI RN: G-20020; FCC RN:674415; FCC DN:TW0659; ISED Assigned Code:20088-5)
No. 68-1, Ln. 169, Sec. 2, Datong Rd., Xizhi Dist., New Taipei City 221, Taiwan (R.O.C.)

Radiated emission Test (Above 1 GHz):

CB15: (VCCI RN: G-20031; FCC RN:674415; FCC DN:TW0659; ISED Assigned Code:20088-5)
No. 68-1, Ln. 169, Sec. 2, Datong Rd., Xizhi Dist., New Taipei City 221, Taiwan (R.O.C.)

2.2 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. The BTL measurement uncertainty is less than the CISPR 16-4-2 U_{cispr} requirement.
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 %.

A. Conducted emission test:

Test Site	Method	Measurement Frequency Range	U,(dB)
C05	CISPR	150 kHz ~ 30MHz	2.68

B. Radiated emission test:

Test Site	Method	Measurement Frequency Range	U,(dB)
CB15 (3m)	CISPR	9kHz ~ 150kHz	2.82
		150kHz ~ 30MHz	2.58

Test Site	Method	Measurement Frequency Range	Ant.	U,(dB)
CB15 (3m)	CISPR	30MHz ~ 200MHz	V	4.20
		30MHz ~ 200MHz	H	3.64
		200MHz ~ 1,000MHz	V	4.56
		200MHz ~ 1,000MHz	H	3.90

Test Site	Method	Measurement Frequency Range	Ant.	U,(dB)
CB15 (3m)	CISPR	1GHz ~ 6GHz	V	4.46
		1GHz ~ 6GHz	H	4.40
		6GHz ~ 18GHz	V	3.88
		6GHz ~ 18GHz	H	4.00

Test Site	Method	Measurement Frequency Range	U,(dB)
CB15 (1m)	CISPR	18 ~ 26.5 GHz	4.62
		26.5 ~ 40 GHz	5.12

Our calculated Measurement Instrumentation Uncertainty is shown in the tables above. These are our U_{lab} values in CISPR 16-4-2 terminology.
Since Table 1 of CISPR 16-4-2 has values of measurement instrumentation uncertainty, called U_{CISPR}, as follows:

Conducted Disturbance (mains port) – 150 kHz – 30 MHz: 3.6 dB

Radiated Disturbance (electric field strength on an open area test site or alternative test site) – 30 MHz – 1000 MHz: 5.2 dB

It can be seen that our U_{lab} values are smaller than U_{CISPR}.
Note: unless specifically mentioned, the uncertainty of measurement has not been taken into account to declare the compliance or non-compliance to the specification.

3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

Equipment	WIRELESS STEREO SYSTEM	
Brand Name	BOOOM	
Test Model	BWS-01-A	
Series Model	N/A	
Model Difference	N/A	
Product Description	Operation Frequency	5729~5823 MHz
	Modulation Technology	GFSK
	Output Power (Max.)	11.88 dBm
Power Source	DC Voltage supplied from AC/DC adapter.	
Power Rating	I/P: 100-240V~50/60Hz, 0.2A O/P: 5V⎓1.0A	
Products Covered	1 * Adapter: AMIGO / AMS66-0501000FU	

Note:

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

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	**5729**	07	5762	14	5797
01	5732	08	5767	15	5802
02	5737	09	5772	16	5807
03	5742	**10**	**5775**	17	5812
04	5747	11	5782	18	5817
05	5752	12	5787	19	5820
06	5757	13	5792	**20**	**5823**

3. Table for Filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	M.gear	N02001001618	Dipole	SMA Plug Reverse	2

3.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description
Mode 1	TX Mode

The EUT system operated these modes were found to be the worst case during the pre-scanning test as following:

For Conducted Test	
Final Test Mode	Description
Mode 1	TX Mode

For Radiated / Band Edge /6dB Spectrum Bandwidth/ Maximum AVG Output Power/ Power Spectral Density Test	
Final Test Mode	Description
Mode 1	TX Mode

Note:

(1) For radiated below 1GHz test, the CH00_ TX 5729MHz is found to be the worst case and recorded.

3.3 TABLE OF PARAMETERS OF TEST SOFTWARE SETTING

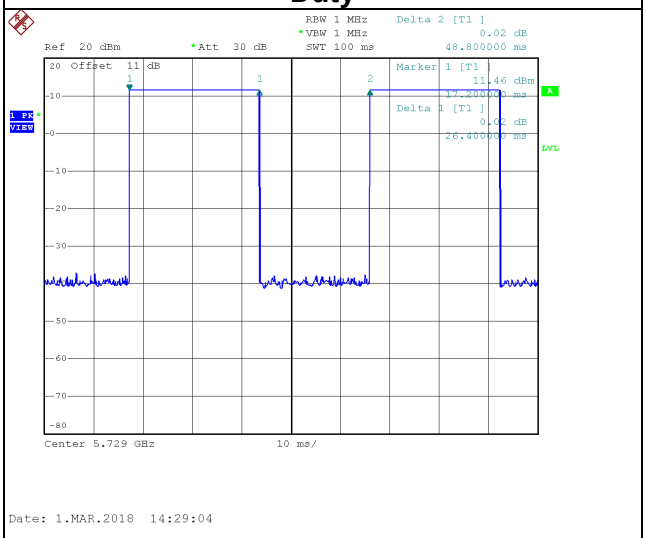
During testing channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product

Test software version	N/A		
Frequency (MHz)	5729	5775	5823
-	Default	Default	Default

3.3 DUTY CYCLE

If duty cycle is ≥ 98 %, duty factor is not required.
If duty cycle is < 98 %, duty factor shall be considered.

Duty

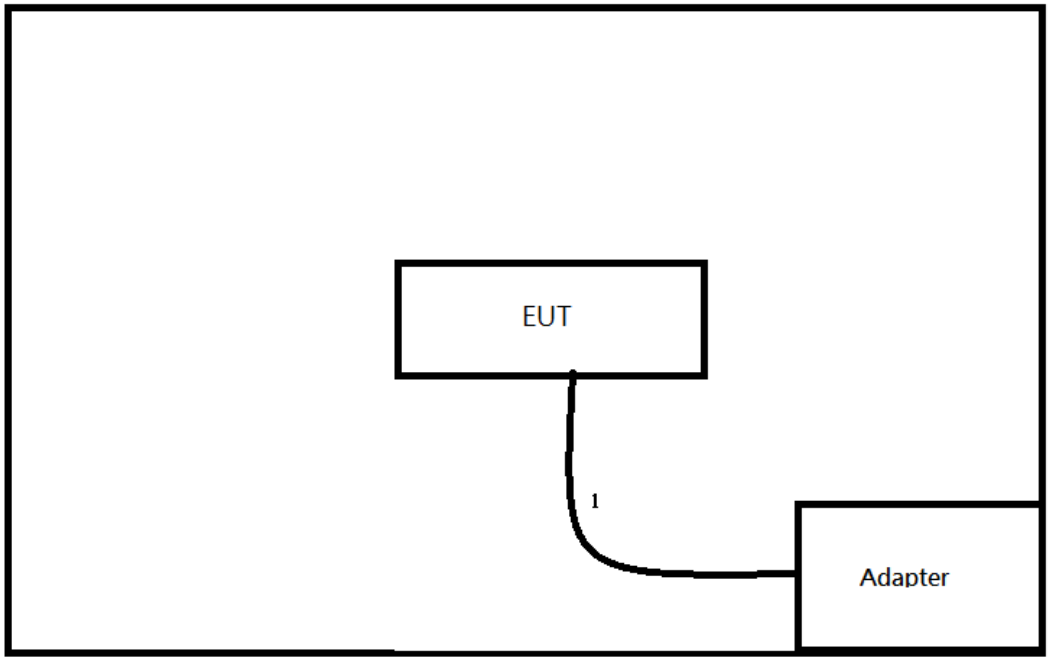


Duty cycle = 26.400 ms / 48.800 ms = 92.96 %
Duty Factor = 10 * log(1 / 0.9296) = 0.32

Note:

For radiated emissions frequency above 1 GHz, the resolution bandwidth of test receiver/spectrum analyzer is 2 MHz and the video bandwidth is 3 kHz (Duty cycle < 98%).

3.4 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



3.5 DESCRIPTION OF SUPPORT UNITS

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

Item	Equipment	Mfr/Brand	Model/Type No.	FCC ID	Series No.
-	-	-	-	-	-

Item	Shielded Type	Ferrite Core	Length	Note
	YES	NO	1.5m	Power Cable

4. EMC EMISSION TEST

4.1 CONDUCTED EMISSION MEASUREMENT

4.1.1 POWER LINE CONDUCTED EMISSION (Frequency Range 150kHz-30MHz)

FREQUENCY (MHz)	Class A (dBuV)		Class B (dBuV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 -0.5	79.00	66.00	66 - 56 *	56 - 46 *
0.50 -5.0	73.00	60.00	56.00	46.00
5.0 -30.0	73.00	60.00	60.00	50.00

Note:

(1) The tighter limit applies at the band edges.

(2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

4.1.2 TEST PROCEDURE

a. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.

b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.

c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.

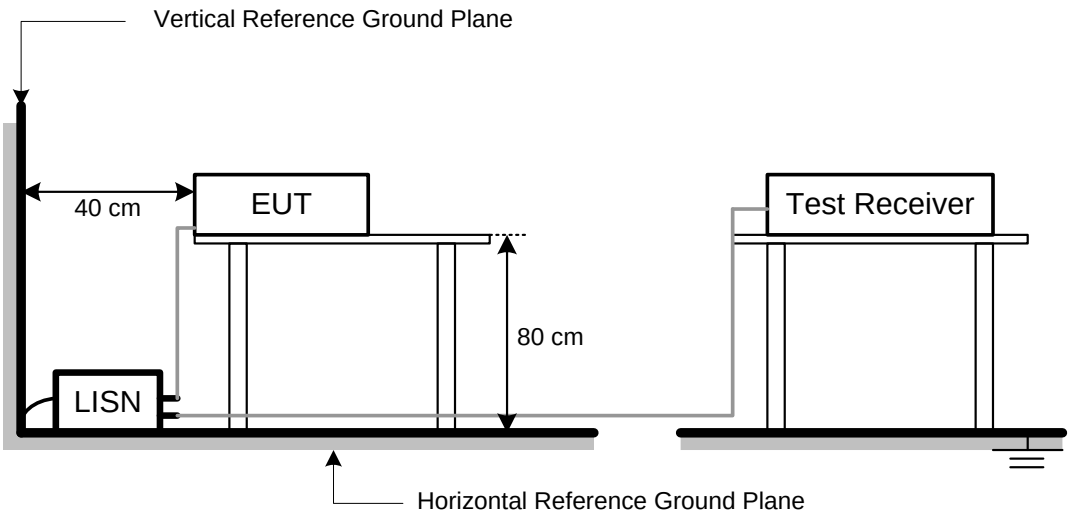
d. LISN at least 80 cm from nearest part of EUT chassis.

e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

4.1.3 DEVIATION FROM TEST STANDARD

No deviation

4.1.4 TEST SETUP



4.1.5 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.
The EUT was programmed to be in continuously transmitting/TX Mode mode.

4.1.6 EUT TEST CONDITIONS

Temperature: 25°C Relative Humidity: 55% Test Voltage: AC 120V/60Hz

4.1.7 TEST RESULTS

Please refer to the Appendix A.

Remark:

(1) All readings are QP Mode value unless otherwise stated AVG in column of『Note』. If the QP Mode Measured value compliance with the QP Limits and lower than AVG Limits, the EUT shall be deemed to meet both QP & AVG Limits and then only QP Mode was measured, but AVG Mode didn't perform。In this case, a " * " marked in AVG Mode column of Interference Voltage Measured。

(2) Measuring frequency range from 150kHz to 30MHz。

4.2 RADIATED EMISSION MEASUREMENT

4.2.1 RADIATED EMISSION LIMITS

In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(kHz)	300
0.490~1.705	24000/F(kHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

LIMITS OF UNWANTED EMISSION OUT OF THE RESTRICTED BANDS

Frequencies (MHz)	EIRP Limit (dBm)	Equivalent Field Strength at 3m (dBμV/m)
5150-5250	-27	68.3
5250-5350	-27	68.3
5470-5725	-27	68.3
5725-5850	-27(Note 2)	68.3
	10(Note 2)	105.3
	15.6(Note 2)	110.9
	27(Note 2)	122.3

Note:

1. The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength: $E = \frac{1000000\sqrt{30P}}{3}$ μV/m, where P is the eirp (Watts)

2. According to FCC 16-24,All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below theband edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above orbelow the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27dBm/MHz at the band edge.

4.2.2 TEST PROCEDURE

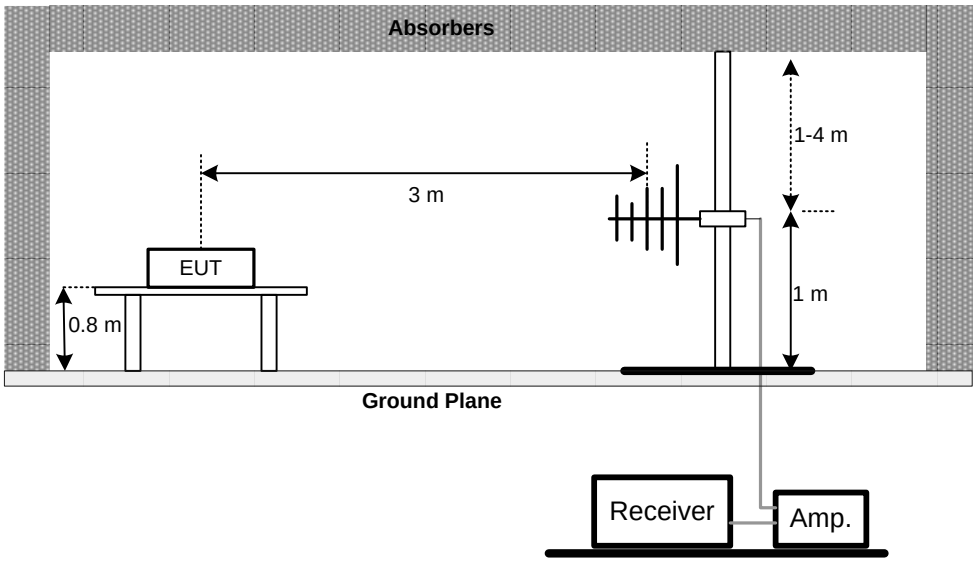
a. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1GHz)
b. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 1.5 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(above 1GHz)
c. The height of the equipment or of the substitution antenna shall be 0.8m or 1.5m; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights find the maximum reading (used Bore sight function).
e. The receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1GHz.
f. The initial step in collecting radiated emission data is a receiver peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
g. All readings are Peak unless otherwise stated QP in column of Note. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn‘t perform. (below 1GHz)
h. All readings are Peak Mode value unless otherwise stated AVG in column of Note. If the Peak Mode Measured value compliance with the Peak Limits and lower than AVG Limits, the EUT shall be deemed to meet both Peak & AVG Limits and then only Peak Mode was measured, but AVG Mode didn‘t perform. (above 1GHz)
i. For the actual test configuration, please refer to the related Item –EUT Test Photos.

4.2.3 DEVIATION FROM TEST STANDARD

No deviation

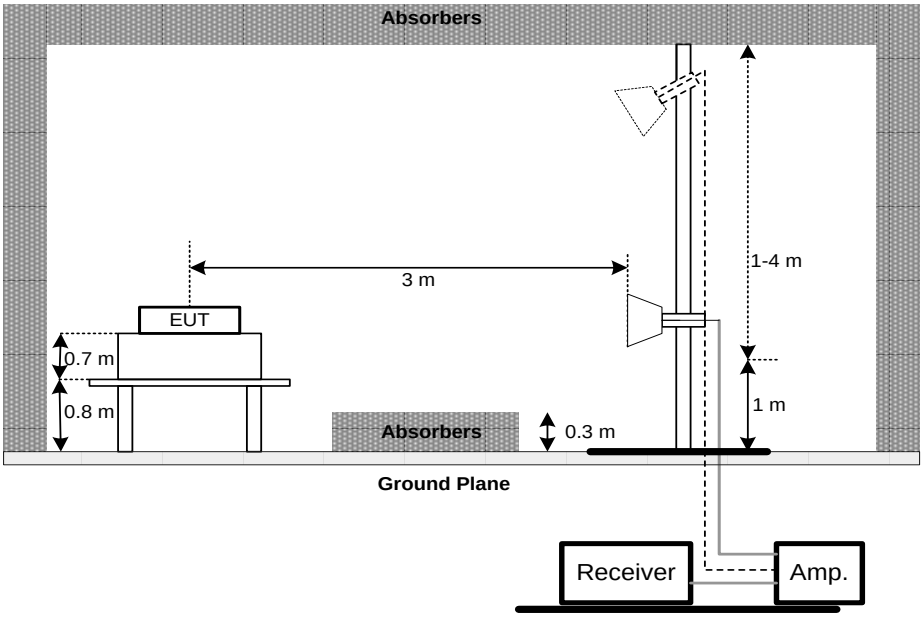
4.2.4 TEST SETUP

(A)Radiated Emission Test Set-Up Frequency Below 1GHz

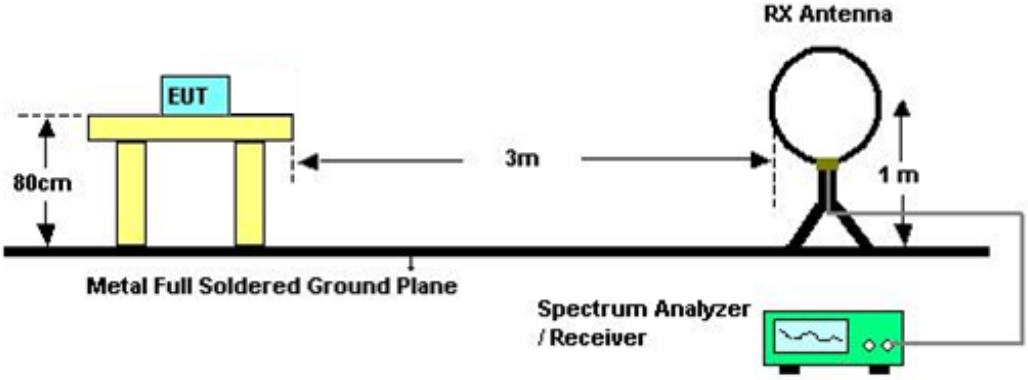


(B) Radiated Emission Test Set-Up Frequency Above 1 GHz

Band edge



(C) Radiated emissions below 30MHz



4.2.5 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 4.1.5 unless otherwise a special operating condition is specified in the follows during the testing.

4.2.6 EUT TEST CONDITIONS

Temperature: 23°C Relative Humidity: 70% Test Voltage: AC 120V/60Hz

4.2.7 TEST RESULTS (9K TO 30MHz)

Please refer to the Appendix B

Remark:

(1) The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.
(2) Distance extrapolation factor = 40 log (specific distance / test distance) (dB);
(3) Limit line = specific limits (dBuV) + distance extrapolation factor.

4.2.8 TEST RESULTS (BETWEEN 30 TO 1000 MHz)

Please refer to the Appendix C.

4.2.9 TEST RESULTS (ABOVE 1000 MHz)

Please refer to the Appendix D.

Remark:

(1) No limit: This is fundamental signal, the judgment is not applicable.
For fundamental signal judgment was referred to Peak output test.

5. 26dB SPECTRUM BANDWIDTH

5.1 APPLIED PROCEDURES / LIMIT

FCC Part15, Subpart E			
Test Item	Limit	Frequency Range (MHz)	Result
Bandwidth	26 dB Bandwidth	5150-5250	PASS
	26 dB Bandwidth	5250-5350	PASS
	26 dB Bandwidth	5470-5725	PASS
	Minimum 500kHz 6dB Bandwidth	5725-5850	PASS

5.1.1 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,

b.

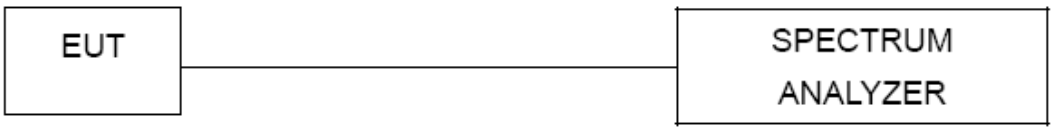
Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	> 26dB Bandwidth
RBW	300 kHz(Bandwidth 20MHz) 1MHz(Bandwidth 40MHz and 80MHz)
VBW	1MHz(Bandwidth 20MHz) 3MHz(Bandwidth 40MHz and 80MHz)
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

c. Measured the spectrum width with power higher than 26dB below carrier

5.1.2 DEVIATION FROM STANDARD

No deviation.

5.1.3 TEST SETUP



5.1.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 4.1.5 unless otherwise a special operating condition is specified in the follows during the testing.

5.1.5 EUT TEST CONDITIONS

Temperature: 23°C Relative Humidity: 70% Test Voltage: AC 120V/60Hz

5.1.6 TEST RESULTS

Please refer to the Appendix E.

6. MAXIMUM CONDUCTED OUTPUT POWER

6.1 APPLIED PROCEDURES / LIMIT

FCC Part15, Subpart E			
Test Item	Limit	Frequency Range (MHz)	Result
Conducted Output Power	Fixed:1 Watt (30dBm) Mobile and portable: 250mW (24dBm)	5150-5250	PASS
	250mW (24dBm)	5250-5350	PASS
	250mW (24dBm)	5470-5725	PASS
	1 Watt (30dBm)	5725-5850	PASS
Note: The maximum e.i.r.p at anyelevation angle above 30 degrees as measured from the horizon must not exceed 125mW(21dBm)			

6.1.1 TEST PROCEDURE

a. The EUT was directly connected to the power meter and antenna output port as show in the block diagram below,

b.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	Encompass the entire emissions bandwidth (EBW) of the signal
RBW	= 1MHz.
VBW	≥ 3MHz.
Detector	RMS
Trace	Max Hold
Sweep Time	auto

c. Test was performed in accordance with method of KDB 789033 D02.

6.1.2 DEVIATION FROM STANDARD

No deviation.

6.1.3 TEST SETUP

6.1.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 4.1.5 unless otherwise a special operating condition is specified in the follows during the testing.

6.1.5 EUT TEST CONDITIONS

Temperature: 23°C Relative Humidity: 70% Test Voltage: AC 120V/60Hz

6.1.6 TEST RESULTS

Please refer to the Appendix F.

7. POWER SPECTRAL DENSITY TEST

7.1 APPLIED PROCEDURES / LIMIT

FCC Part15, Subpart E			
Test Item	Limit	Frequency Range (MHz)	Result
Power Spectral Density	Other then Mobile and portable:17dBm/MHz Mobile and portable:11dBm/MHz	5150-5250	PASS
	11dBm/MHz	5250-5350	PASS
	11dBm/MHz	5470-5725	PASS
	30dBm/500kHz	5725-5850	PASS

8.1.1 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,

b.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	Encompass the entire emissions bandwidth (EBW) of the signal
RBW	= 1MHz.
VBW	≥ 3MHz.
Detector	RMS
Trace average	100 trace
Sweep Time	Auto

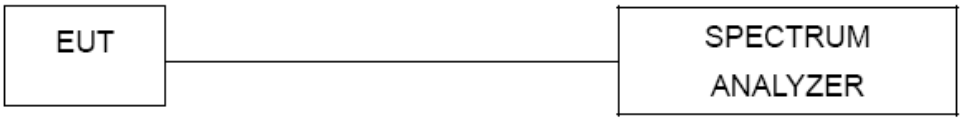
Note:

1. For UNII-3, according to KDB publication 789033 D02 General UNII Test Procedures New Rules v01r02, section II.F.5., it is acceptable to set RBW at 1MHz and VBW at 3MHz if the spectrum analyzer does not have 500kHz RBW.
2. The value measured with RBW=1MHz is to be added with 10log(500kHz/1MHz) which is -3dB. For example, if the measured value is +10dBm using RBW=1MHz (that is +10dBm/MHz), then the converted value will be +7dBm/500kHz.

7.1.1 DEVIATION FROM STANDARD

No deviation.

7.1.2 TEST SETUP



7.1.3 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 4.1.5 unless otherwise a special operating condition is specified in the follows during the testing.

7.1.4 EUT TEST CONDITIONS

Temperature: 23°C Relative Humidity: 70% Test Voltage: AC 120V/60Hz

7.1.5 TEST RESULTS

Please refer to the Appendix H.

8. FREQUENCY STABILITY MEASUREMENT

8.1 APPLIED PROCEDURES / LIMIT

FCC Part15, Subpart E			
Test Item	Limit	Frequency Range (MHz)	Result
Frequency Stability	Specified in the user's manual	5150-5250	PASS
		5250-5350	PASS
		5470-5725	PASS
		5725-5850	PASS

8.1.1 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,

b.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	Entire absence of modulation emissions bandwidth
RBW	10 kHz
VBW	10 kHz
Sweep Time	Auto

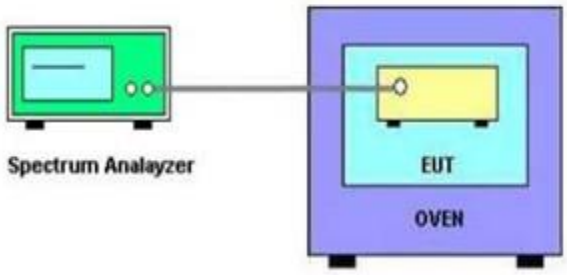
c. The test extreme voltage is to change the primary supply voltage from 85 to 115 percent of the nominal value.

d. User manual temperature is -20°C~50°C.

8.1.2 DEVIATION FROM STANDARD

No deviation.

8.1.3 TEST SETUP



8.1.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 4.1.5 unless otherwise a special operating condition is specified in the follows during the testing.

8.1.5 EUT TEST CONDITIONS

Temperature: 25°C Relative Humidity: 55% Test Voltage: AC 120V/60Hz

8.1.6 TEST RESULTS

Please refer to the Appendix I.

9. MEASUREMENT INSTRUMENTS LIST

Conducted Emission Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	TWO-LINE V-NETWORK	R&S	ENV216	101050	Jan. 24, 2019
2	Test Cable	TIMES	CFD300-NL	C02	Jun. 13, 2019
3	EMI Test Receiver	R&S	ESR7	101433	Dec. 07, 2018
4	Measurement Software	EZ	EZ_EMC (Version NB-03A)	N/A	N/A

Radiated Emission Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Preamplifier	EMCI	012645B	980267	Feb. 27, 2019
2	Preamplifier	EMCI	EMC02325	980217	Dec. 27, 2019
3	Preamplifier	EMCI	EMC2654045	980030	Feb. 13, 2019
4	Test Cable	EMCI	EMC104-SM-SM-8000	8m	Jan. 03, 2019
5	Test Cable	EMCI	EMC104-SM-SM-800	150207	Jan. 03, 2019
6	Test Cable	EMCI	EEMC104-SM-SM-3000	151205	Jan. 03, 2019
7	MXE EMI Receiver	Agilent	N9038A	MY55420127	Jan. 08, 2019
8	Signal Analyzer	Agilent	N9010A	MY52220990	Feb. 21, 2019
9	Loop Ant	EMCO	6502	42960	Nov. 23, 2018
10	Horm Ant	SCHWARZBECK	BBHA 9120D	9120D-1342	Feb. 27, 2019
11	Horm Ant	Schwarzbeck	BBHA 9170	187	Dec. 05, 2018
12	Trilog-Broadband Antenna	Schwarzbeck	VULB 9168	9168-548	Jan. 15, 2019
13	5dB Attenuator	EMCI	EMCI-N-6-05	AT-N0623	Jan. 15, 2019

6dB Bandwidth Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	R&S/FSP30	100854	May 25, 2018

Peak Output Power Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	R&S/FSP30	100854	May 25, 2018
2	Power Meter	Anritsu	ML2495A	1128008	Aug. 16, 2018
3	Power Sensor	Anritsu	MA2411B	1126001	Aug. 16, 2018

Antenna Conducted Spurious Emission Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	R&S/FSP30	100854	May 25, 2018

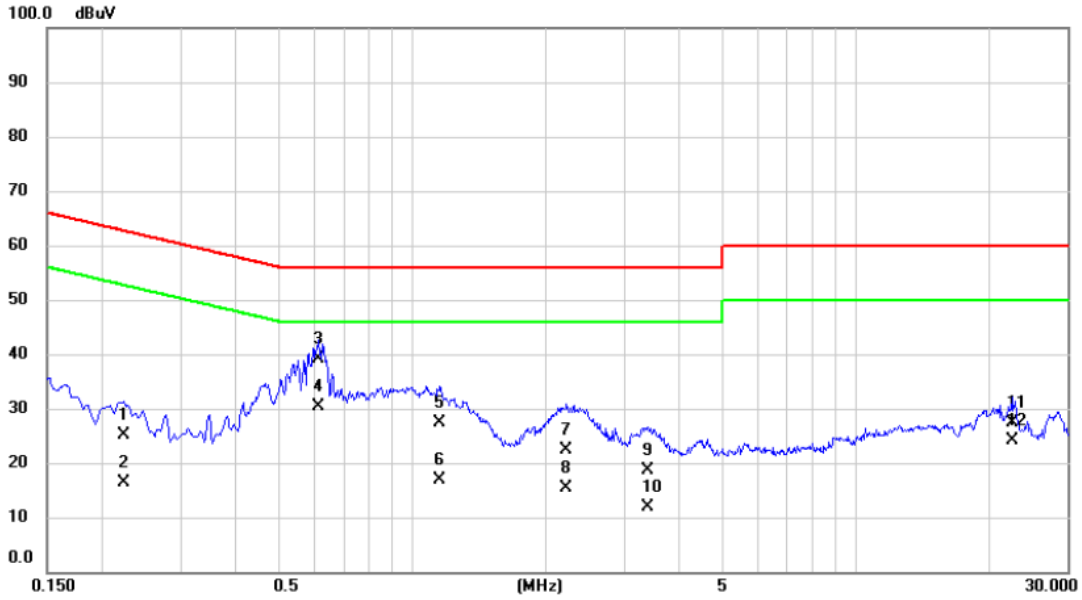
Power Spectral Density Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	R&S/FSP30	100854	May 25, 2018

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

APPENDIX A - CONDUCTED EMISSION

Test Mode:	TX Mode

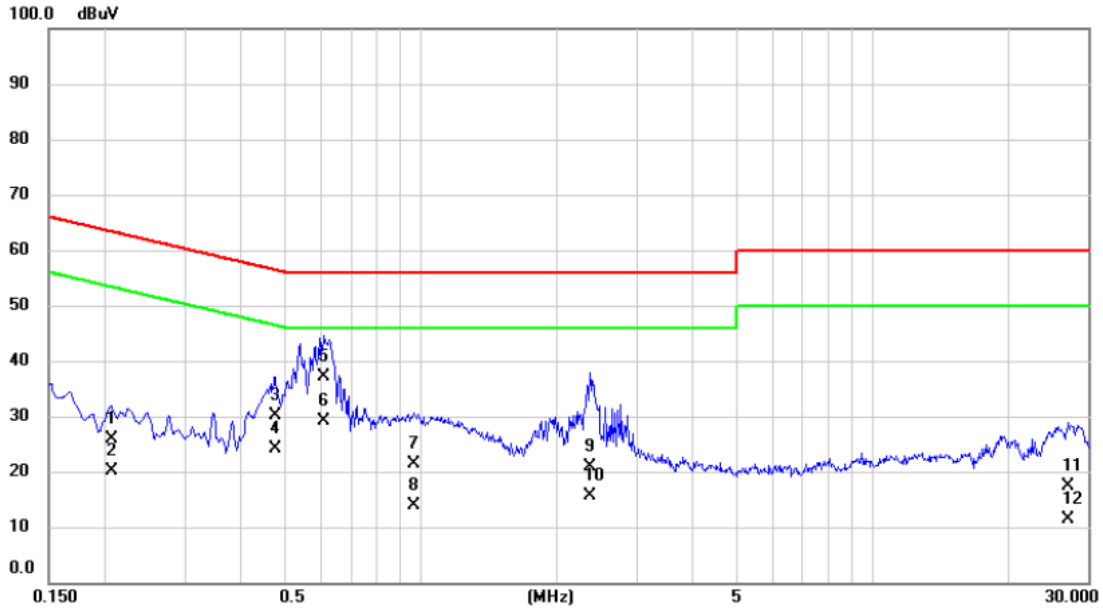
Line



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.2243	15.40	9.64	25.04	62.66	-37.62	QP	
2		0.2243	6.80	9.64	16.44	52.66	-36.22	AVG	
3		0.6134	29.50	9.66	39.16	56.00	-16.84	QP	
4	*	0.6134	20.80	9.66	30.46	46.00	-15.54	AVG	
5		1.1535	17.60	9.67	27.27	56.00	-28.73	QP	
6		1.1535	7.20	9.67	16.87	46.00	-29.13	AVG	
7		2.2268	12.80	9.69	22.49	56.00	-33.51	QP	
8		2.2268	5.70	9.69	15.39	46.00	-30.61	AVG	
9		3.3945	8.80	9.73	18.53	56.00	-37.47	QP	
10		3.3945	2.10	9.73	11.83	46.00	-34.17	AVG	
11		22.4880	17.50	9.96	27.46	60.00	-32.54	QP	
12		22.4880	14.10	9.96	24.06	50.00	-25.94	AVG	

Test Mode:	TX Mode

Neutral

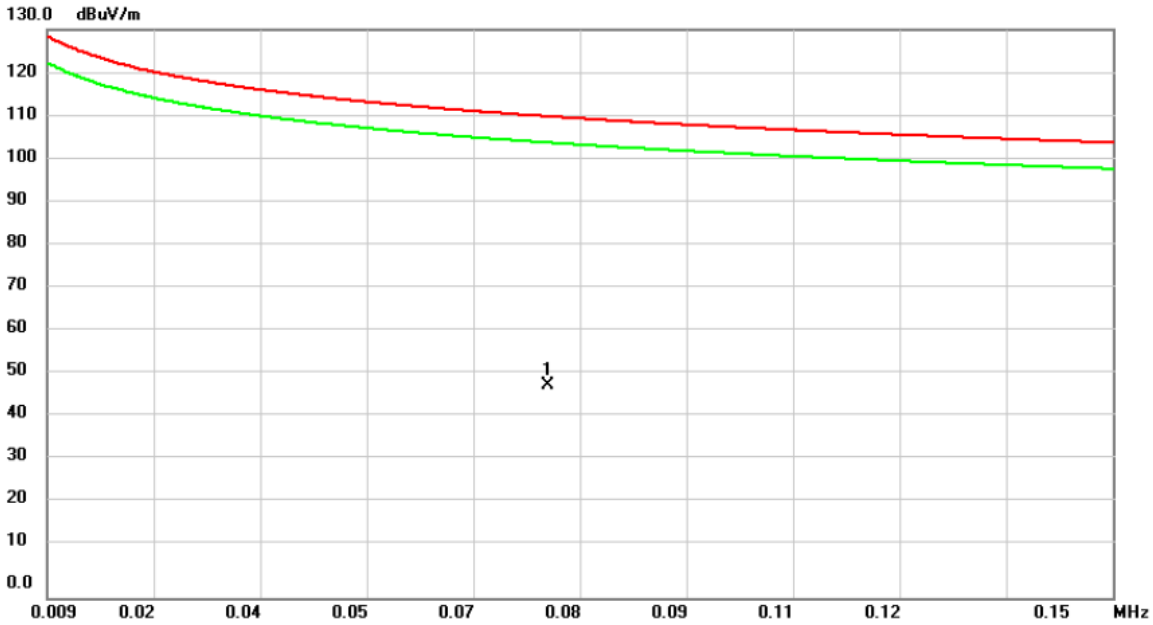


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.2063	16.30	9.61	25.91	63.35	-37.44	QP	
2		0.2063	10.50	9.61	20.11	53.35	-33.24	AVG	
3		0.4762	20.60	9.65	30.25	56.41	-26.16	QP	
4		0.4762	14.50	9.65	24.15	46.41	-22.26	AVG	
5		0.6112	27.60	9.65	37.25	56.00	-18.75	QP	
6	*	0.6112	19.50	9.65	29.15	46.00	-16.85	AVG	
7		0.9667	11.70	9.66	21.36	56.00	-34.64	QP	
8		0.9667	4.10	9.66	13.76	46.00	-32.24	AVG	
9		2.3663	11.30	9.68	20.98	56.00	-35.02	QP	
10		2.3663	6.00	9.68	15.68	46.00	-30.32	AVG	
11		27.0690	7.30	10.00	17.30	60.00	-42.70	QP	
12		27.0690	1.40	10.00	11.40	50.00	-38.60	AVG	

APPENDIX B - RADIATED EMISSION (9KHZ TO 30MHZ)

Test Mode:	TX MODE

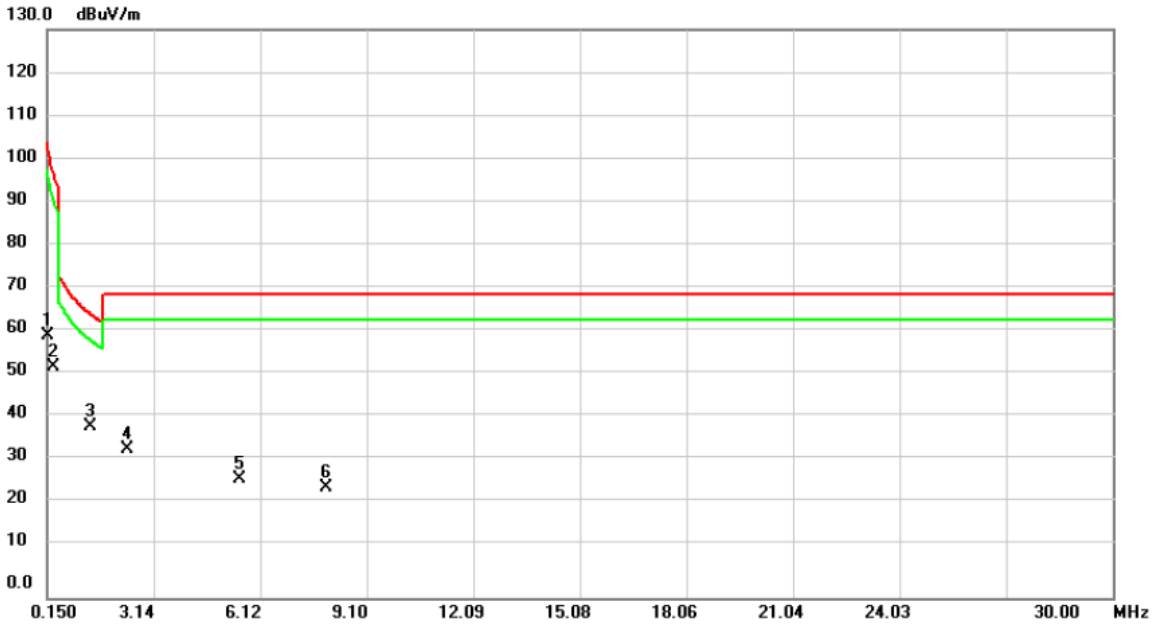
Ant 0°



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	0.0752	36.20	12.55	48.75	110.08	-61.33	peak	

Test Mode:	TX MODE

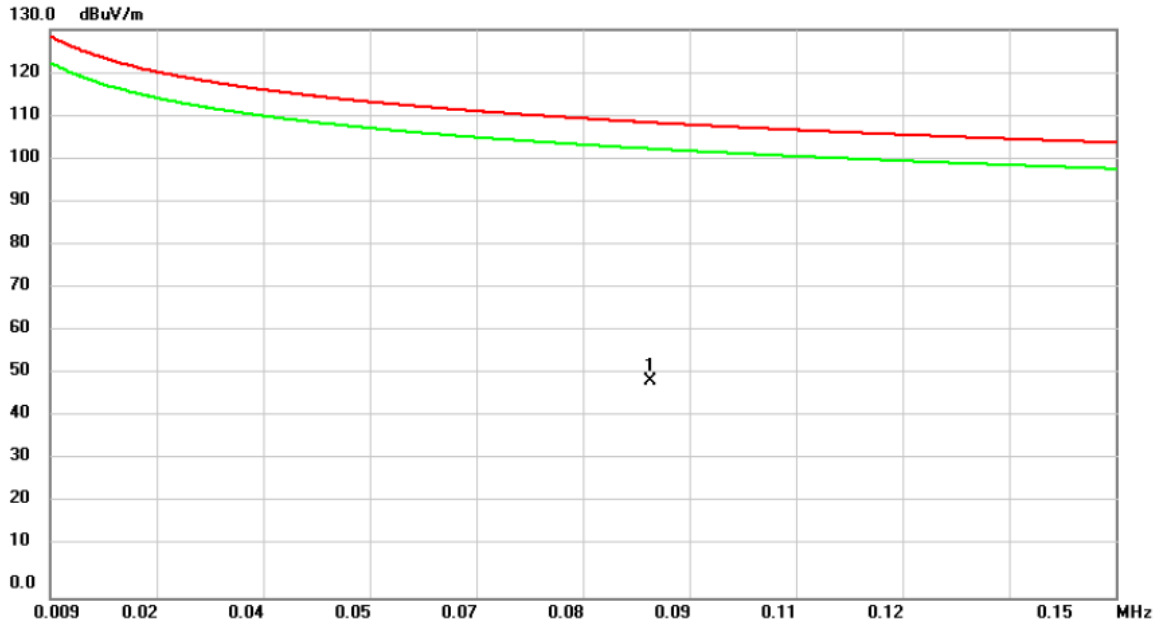
Ant 0°



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		0.1500	47.93	12.03	59.96	104.08	-44.12	peak	
2		0.3291	40.93	11.80	52.73	97.26	-44.53	peak	
3	*	1.3440	27.36	11.85	39.21	65.04	-25.83	peak	
4		2.3887	22.56	11.38	33.94	69.54	-35.60	peak	
5		5.5230	15.90	11.39	27.29	69.54	-42.25	peak	
6		7.9706	13.82	11.34	25.16	69.54	-44.38	peak	

Test Mode:	TX MODE

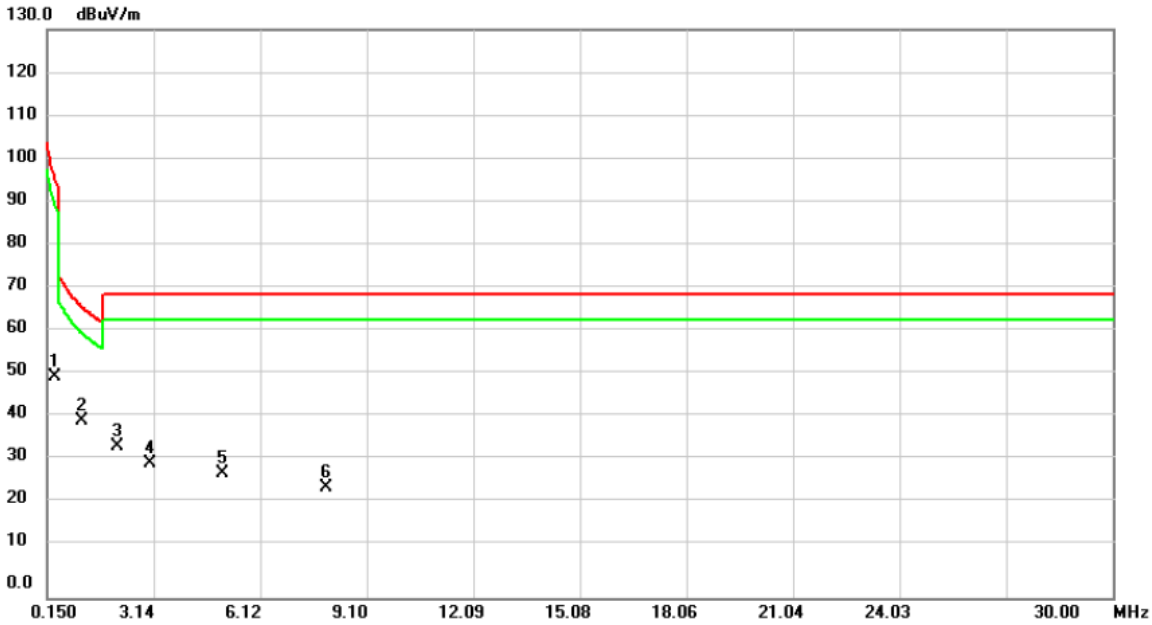
Ant 90°



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	0.0884	37.28	12.31	49.59	108.68	-59.09	peak	

Test Mode:	TX MODE

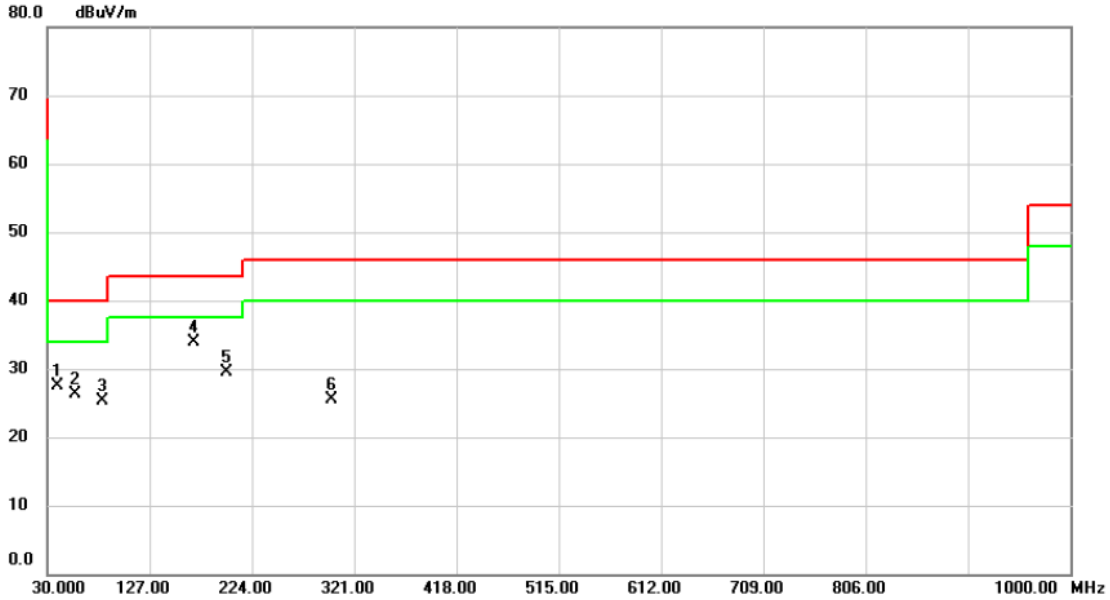
Ant 90°



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		0.3886	38.80	11.80	50.60	95.81	-45.21	peak	
2	*	1.1350	28.52	11.94	40.46	66.50	-26.04	peak	
3		2.1200	23.06	11.50	34.56	69.54	-34.98	peak	
4		3.0455	19.49	11.11	30.60	69.54	-38.94	peak	
5		5.0750	16.98	11.40	28.38	69.54	-41.16	peak	
6		7.9706	13.82	11.34	25.16	69.54	-44.38	peak	

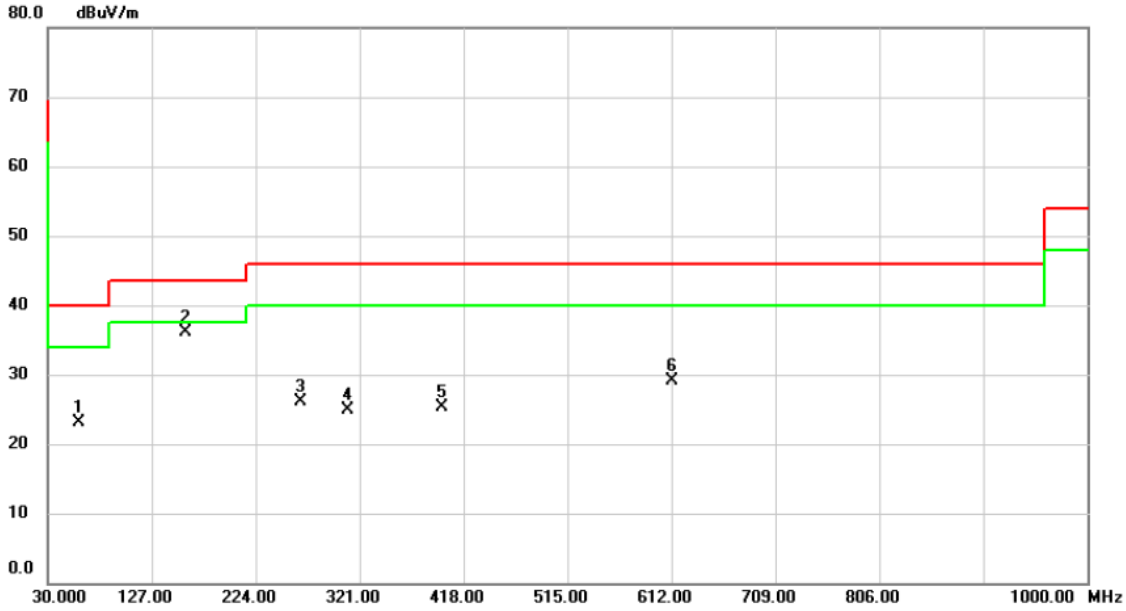
APPENDIX C - RADIATED EMISSION (30MHZ TO 1000MHZ)

Test Mode	TX 5729MHz _CH00	Polarization	Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		39.7000	36.14	-8.63	27.51	40.00	-12.49	peak	
2		56.1900	34.83	-8.48	26.35	40.00	-13.65	peak	
3		82.3800	38.09	-12.83	25.26	40.00	-14.74	peak	
4	*	168.7100	42.65	-8.82	33.83	43.50	-9.67	peak	
5		199.7500	40.32	-10.90	29.42	43.50	-14.08	peak	
6		299.6600	33.01	-7.52	25.49	46.00	-20.51	peak	

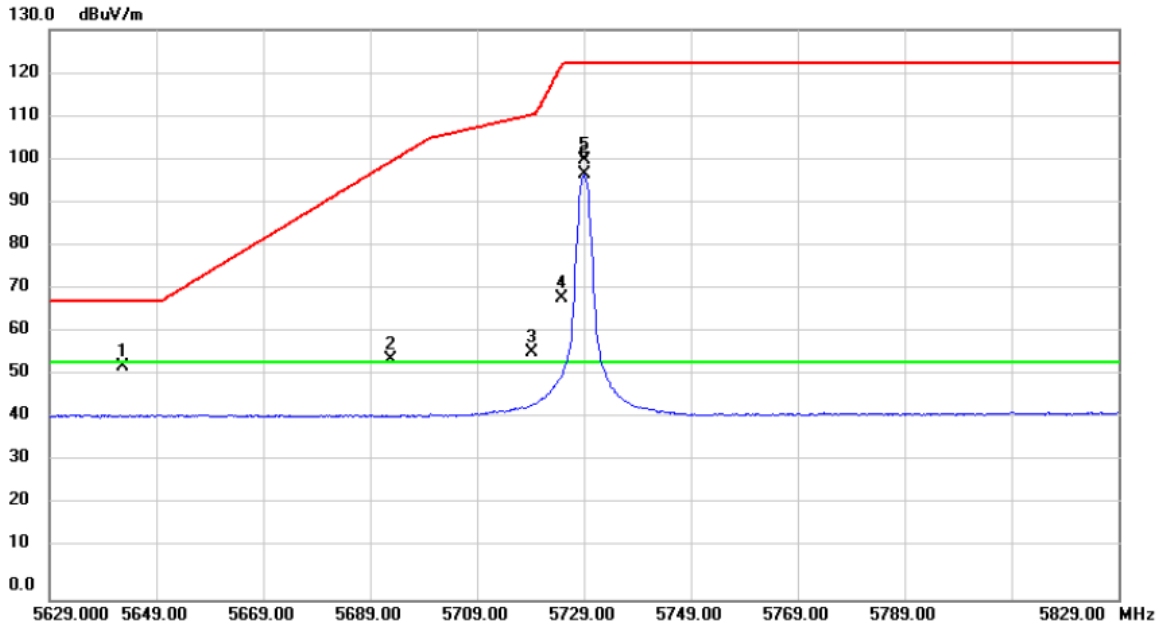
Test Mode	TX 5729MHz _CH00	Polarization	Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		59.1000	31.82	-8.69	23.13	40.00	-16.87	peak	
2	*	158.0400	44.71	-8.55	36.16	43.50	-7.34	peak	
3		265.7100	34.34	-8.31	26.03	46.00	-19.97	peak	
4		309.3600	32.09	-7.26	24.83	46.00	-21.17	peak	
5		397.6300	30.51	-5.12	25.39	46.00	-20.61	peak	
6		612.0000	29.46	-0.27	29.19	46.00	-16.81	peak	

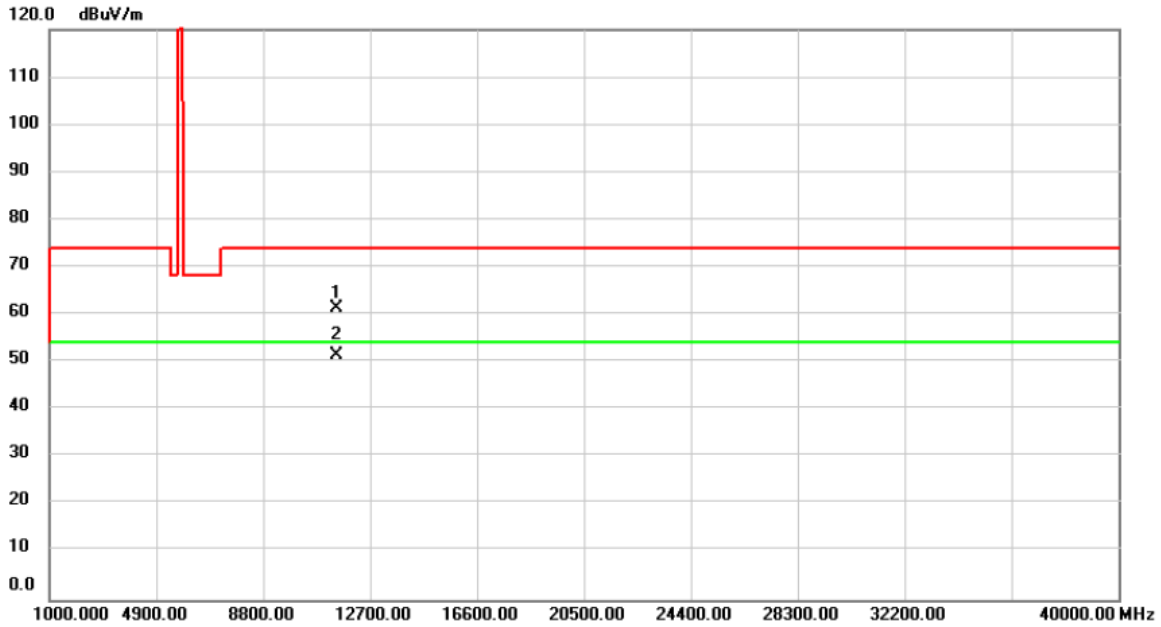
APPENDIX D - RADIATED EMISSION (ABOVE 1000MHZ)

Test Mode	TX Mode 5729MHz _CH00	Polarization	Vertical



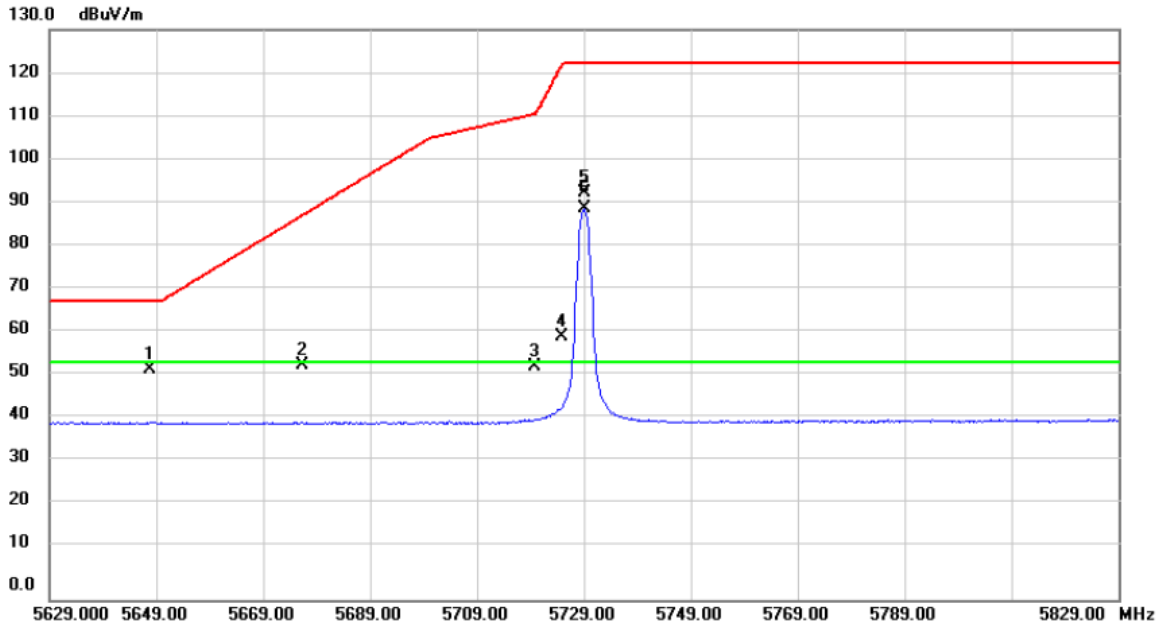
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		5642.671	14.98	38.31	53.29	68.20	-14.91	peak	
2		5692.800	16.18	38.45	54.63	99.89	-45.26	peak	
3		5719.380	17.93	38.52	56.45	110.63	-54.18	peak	
4		5724.995	30.25	38.53	68.78	122.19	-53.41	peak	
5		5729.000	61.72	38.55	100.27	122.20	-21.93	peak	No Limit
6	*	5729.000	58.37	38.55	96.92	54.00	42.92	AVG	No Limit

Test Mode	TX Mode 5729MHz _CH00	Polarization	Vertical



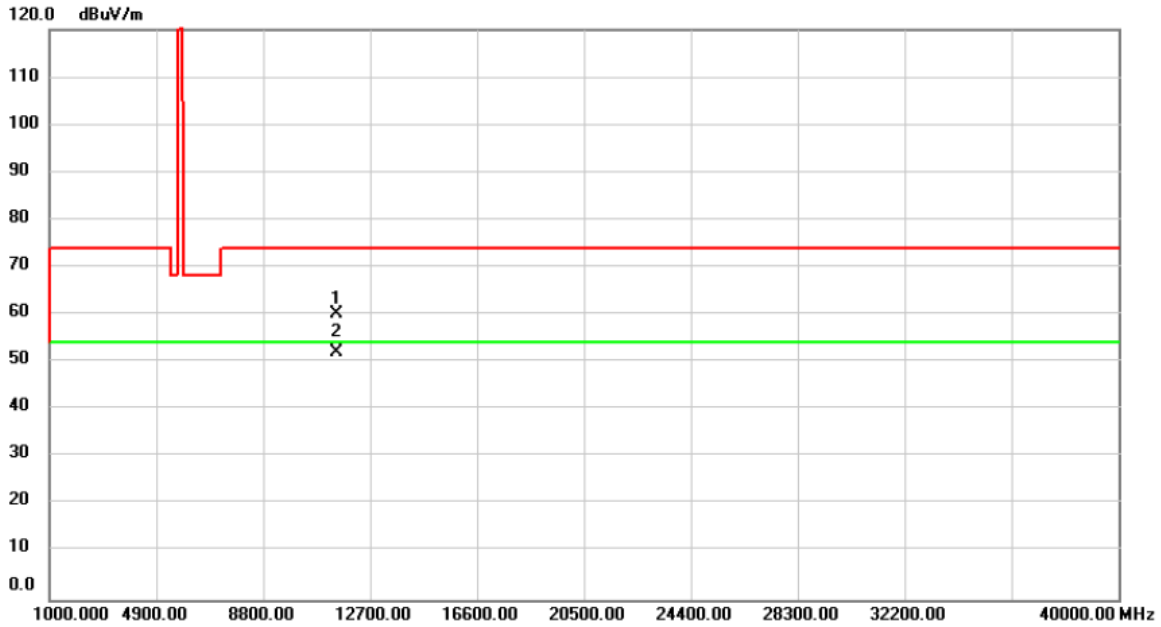
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		11458.00	58.12	3.38	61.50	74.00	-12.50	peak	
2	*	11458.00	48.16	3.38	51.54	54.00	-2.46	AVG	

Test Mode	TX Mode 5729MHz _CH00	Polarization	Horizontal



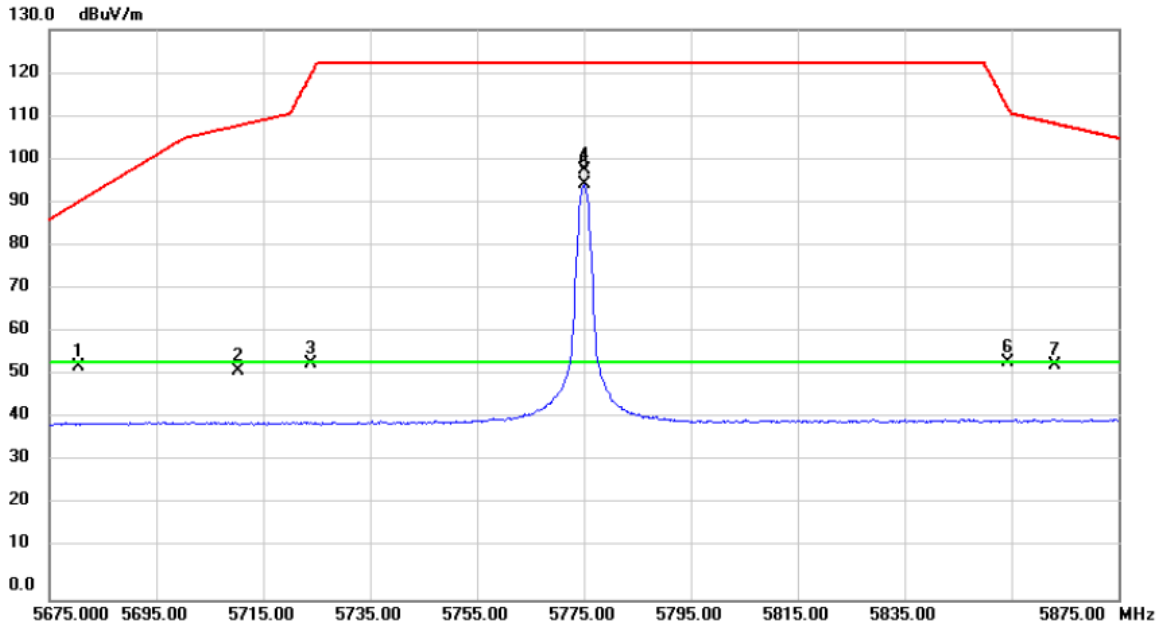
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		5647.774	14.06	38.33	52.39	68.20	-15.81	peak	
2		5676.350	15.22	38.40	53.62	87.74	-34.12	peak	
3		5719.860	14.57	38.52	53.09	110.76	-57.67	peak	
4		5724.955	21.37	38.53	59.90	122.10	-62.20	peak	
5		5729.000	54.12	38.55	92.67	122.20	-29.53	peak	No Limit
6	*	5729.000	50.58	38.55	89.13	54.00	35.13	AVG	No Limit

Test Mode	TX Mode 5729MHz _CH00	Polarization	Horizontal



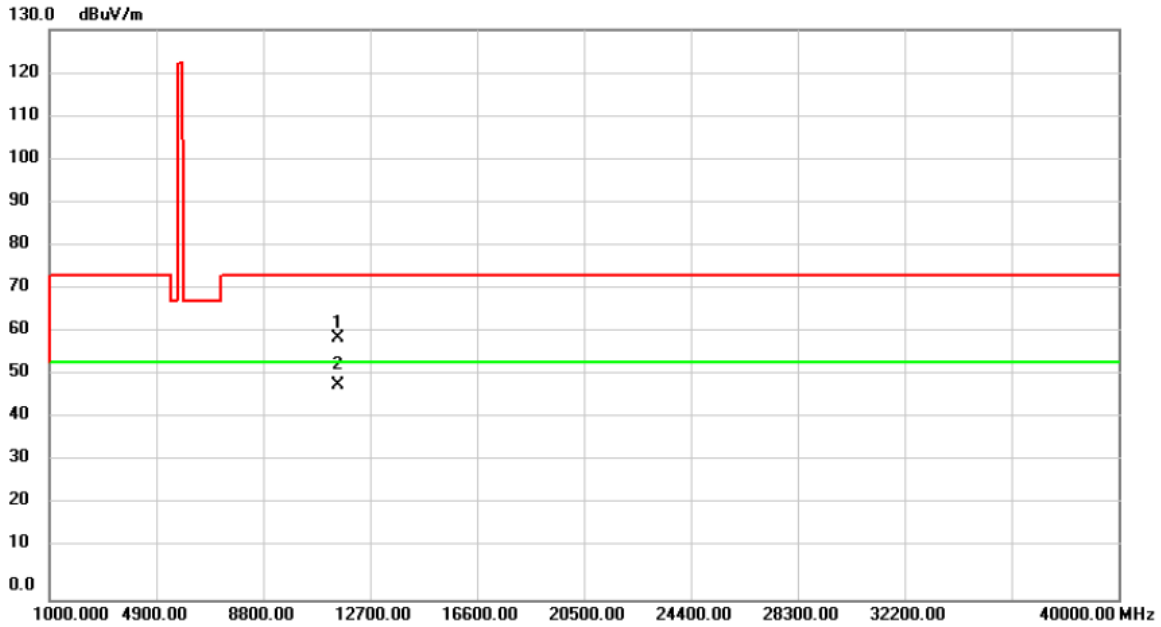
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		11458.00	56.65	3.38	60.03	74.00	-13.97	peak	
2	*	11458.00	48.56	3.38	51.94	54.00	-2.06	AVG	

Test Mode	TX Mode 5775MHz _CH10	Polarization	Vertical



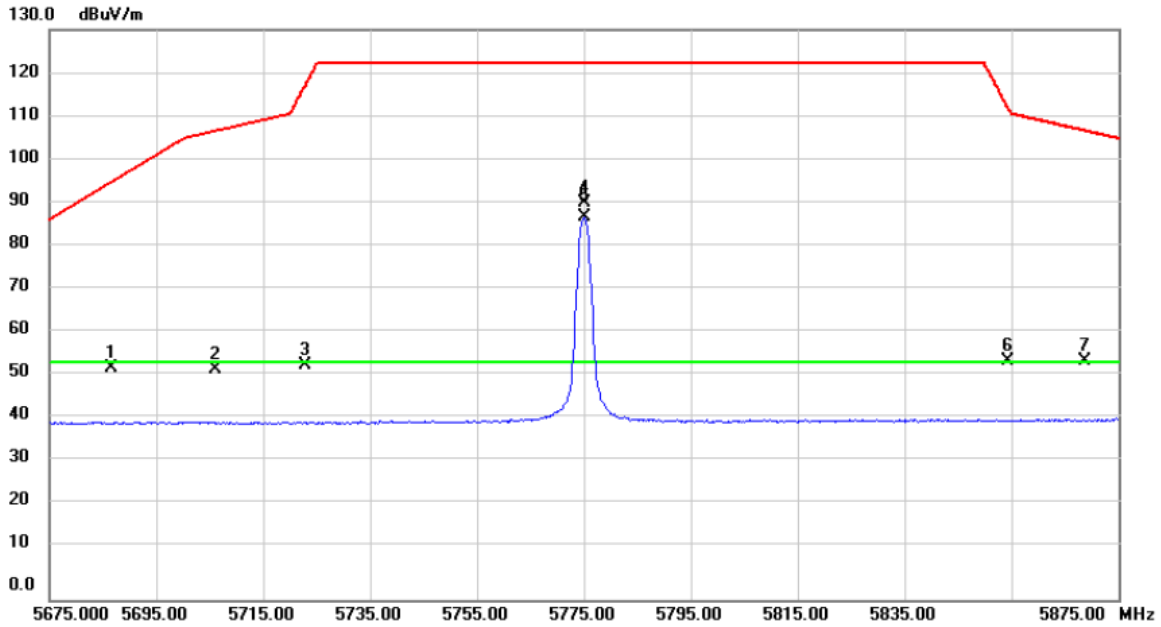
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		5680.475	14.63	38.41	53.04	90.79	-37.75	peak	
2		5710.380	13.70	38.50	52.20	108.11	-55.91	peak	
3		5724.050	15.18	38.53	53.71	120.03	-66.32	peak	
4		5775.000	59.19	38.67	97.86	122.20	-24.34	peak	No Limit
5	*	5775.000	55.98	38.67	94.65	54.00	40.65	AVG	No Limit
6		5854.365	15.18	38.89	54.07	112.25	-58.18	peak	
7		5863.160	14.49	38.91	53.40	108.51	-55.11	peak	

Test Mode	TX Mode 5775MHz _CH10	Polarization	Vertical



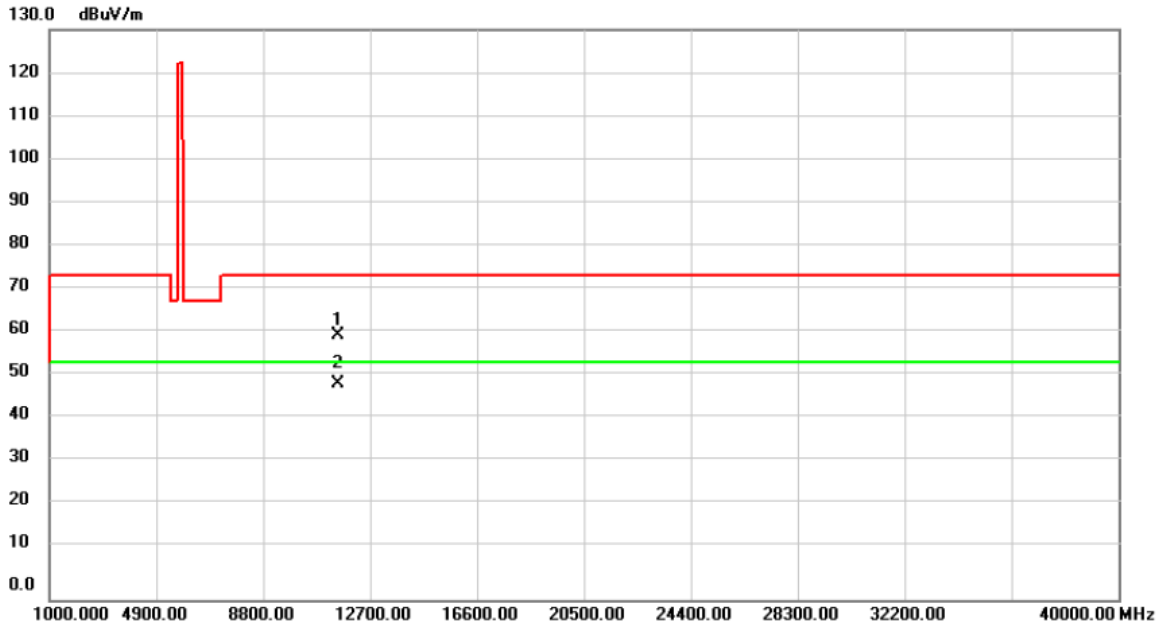
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		11550.00	56.35	3.32	59.67	74.00	-14.33	peak	
2	*	11550.00	45.62	3.32	48.94	54.00	-5.06	AVG	

Test Mode	TX Mode 5775MHz _CH10	Polarization	Horizontal



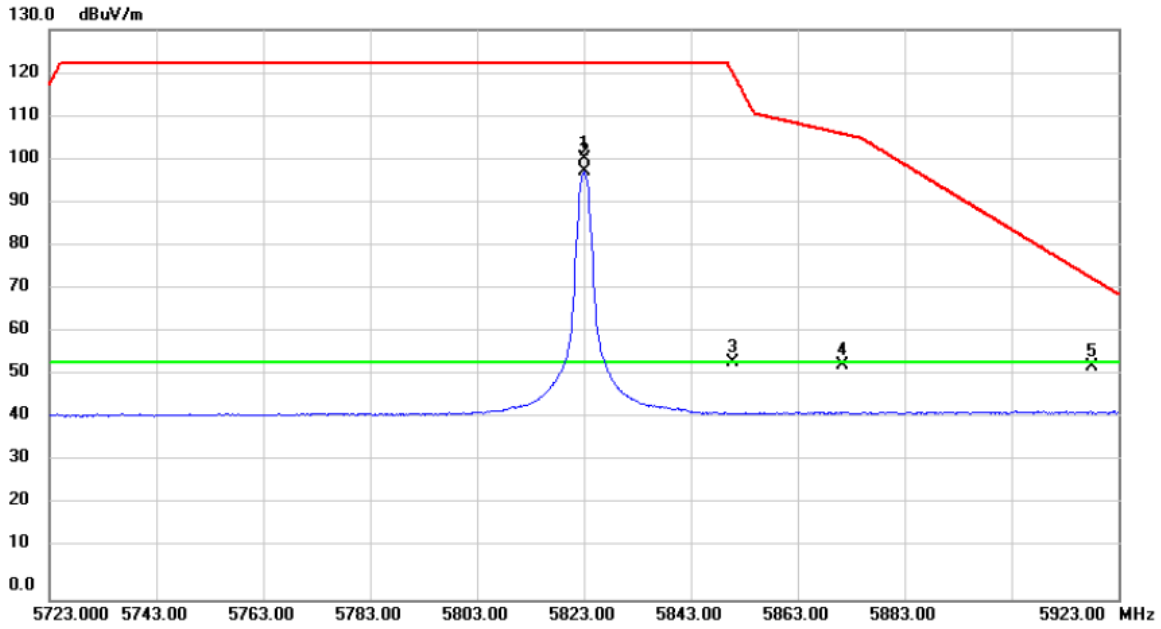
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		5686.500	14.49	38.43	52.92	95.24	-42.32	peak	
2		5706.080	13.97	38.48	52.45	106.90	-54.45	peak	
3		5722.740	14.90	38.53	53.43	117.05	-63.62	peak	
4		5775.000	51.86	38.67	90.53	122.20	-31.67	peak	No Limit
5	*	5775.000	48.60	38.67	87.27	54.00	33.27	AVG	No Limit
6		5854.360	15.71	38.89	54.60	112.26	-57.66	peak	
7		5868.800	15.65	38.92	54.57	106.93	-52.36	peak	

Test Mode	TX Mode 5775MHz _CH10	Polarization	Horizontal



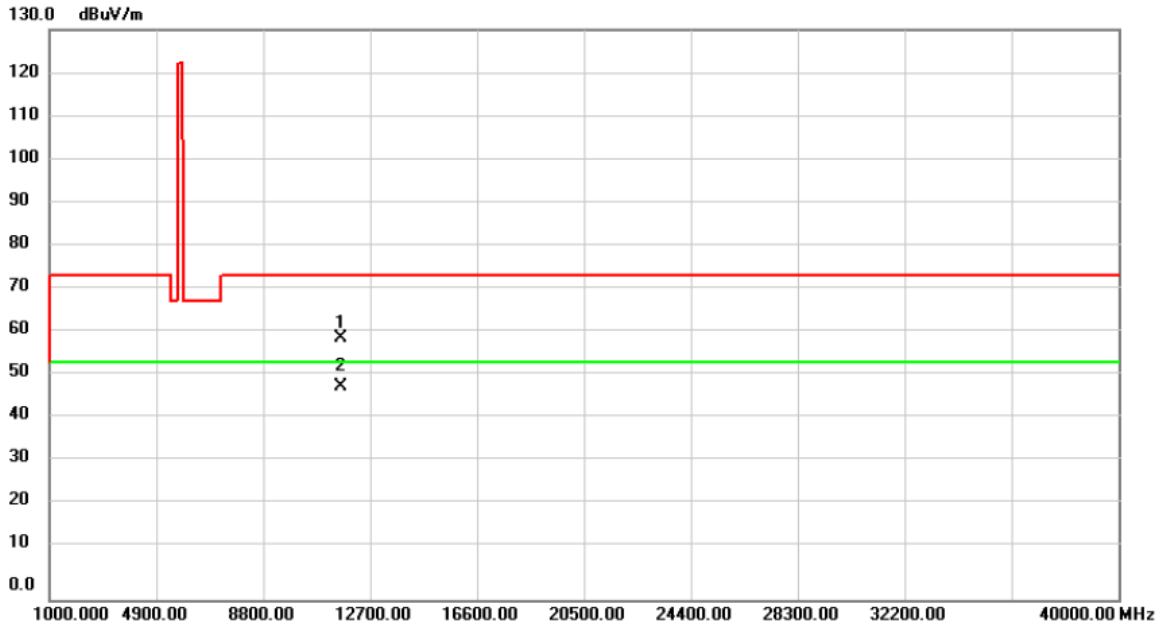
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		11550.00	56.93	3.32	60.25	74.00	-13.75	peak	
2	*	11550.00	45.83	3.32	49.15	54.00	-4.85	AVG	

Test Mode	TX Mode 5823MHz _CH20	Polarization	Vertical



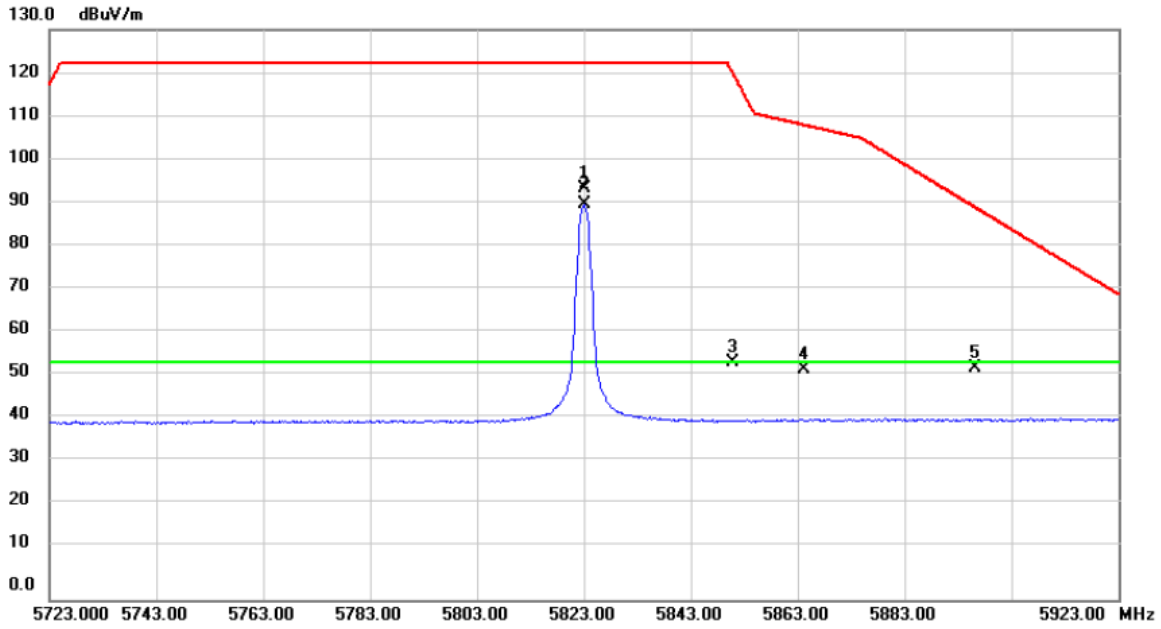
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		5823.000	61.94	38.80	100.74	122.20	-21.46	peak	No Limit
2	*	5823.000	58.76	38.80	97.56	54.00	43.56	AVG	No Limit
3		5850.860	15.38	38.87	54.25	120.24	-65.99	peak	
4		5871.340	14.48	38.93	53.41	106.22	-52.81	peak	
5		5918.008	14.24	39.06	53.30	73.36	-20.06	peak	

Test Mode	TX Mode 5823MHz _CH20	Polarization	Vertical



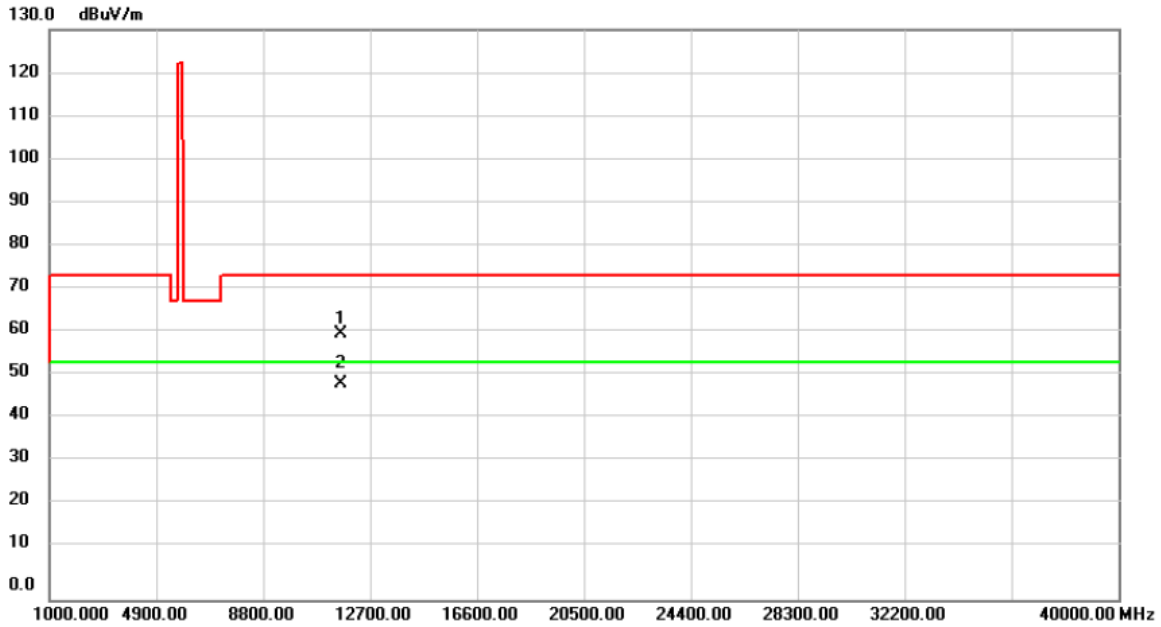
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		11646.00	56.49	3.13	59.62	74.00	-14.38	peak	
2	*	11646.00	45.59	3.13	48.72	54.00	-5.28	AVG	

Test Mode	TX Mode 5823MHz _CH20	Polarization	Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		5823.000	54.82	38.80	93.62	122.20	-28.58	peak	No Limit
2	*	5823.000	51.36	38.80	90.16	54.00	36.16	AVG	No Limit
3		5850.975	15.24	38.87	54.11	119.98	-65.87	peak	
4		5864.200	13.63	38.91	52.54	108.22	-55.68	peak	
5		5896.216	13.83	38.99	52.82	89.46	-36.64	peak	

Test Mode	TX Mode 5823MHz _CH20	Polarization	Horizontal

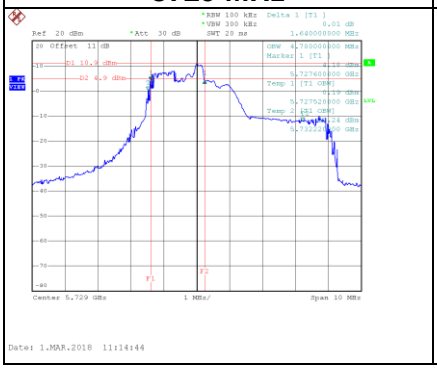
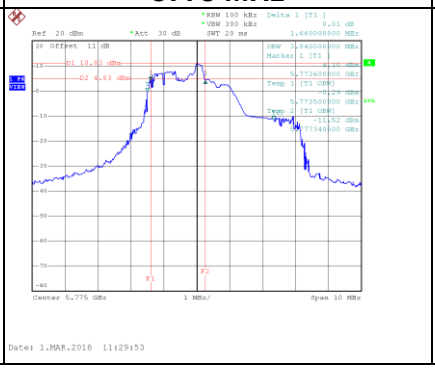
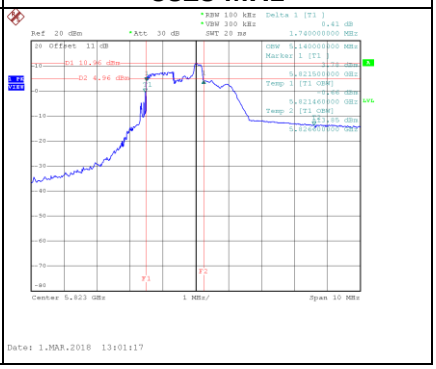


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		11646.00	57.49	3.13	60.62	74.00	-13.38	peak	
2	*	11646.00	46.13	3.13	49.26	54.00	-4.74	AVG	

APPENDIX E - BANDWIDTH

Test Mode: TX Mode / CH00, CH10, CH20

Frequency (MHz)	6dB Bandwidth (MHz)	99% Occupied BW (MHz)	Min. Limit (kHz)	Test Result
5729	1.64	4.70	500	Complies
5775	1.66	3.84	500	Complies
5823	1.74	5.14	500	Complies

5729 MHz	5775 MHz	5823 MHz
		

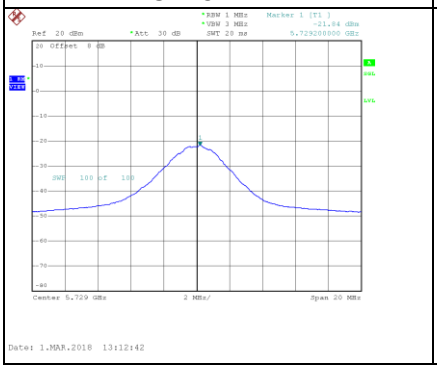
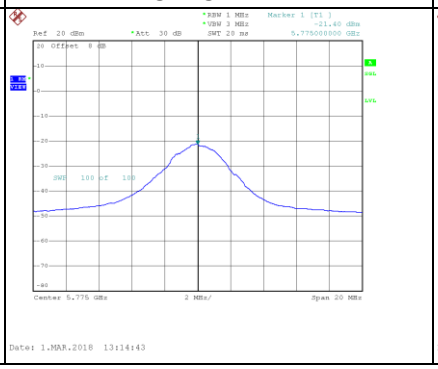
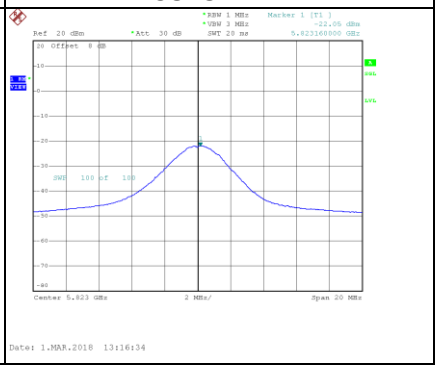
APPENDIX F - MAXIMUM OUTPUT POWER

Test Mode: TX Mode / CH00, CH10, CH20				
Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Limit (Watt)
CH00	5729	11.87	30.00	1.00
CH10	5775	11.88	30.00	1.00
CH20	5823	11.82	30.00	1.00

APPENDIX G - POWER SPECTRAL DENSITY

Test Mode: TX Mode / CH00, CH10, CH20

Channel	Frequency (MHz)	Power Density (dBm/500kHz)	Duty Factor	Power Density + Duty Factor (dBm/500kHz)	Limit (dBm/500kHz)
CH00	5729	-21.84	2.67	-19.17	30.00
CH10	5775	-21.40	2.67	-18.73	30.00
CH20	5823	-22.05	2.67	-19.38	30.00

5729 MHz	5775 MHz	5823 MHz
		

APPENDIX H - FREQUENCY STABILITY

Test Mode:	TX Mode

Voltage vs. Frequency Stability

Voltage	Measurement Frequency (MHz)
(V)	5729.0000
132	5728.9972
120	5728.9976
108	5728.9972
Max. Deviation (MHz)	0.0028
Max. Deviation (ppm)	0.4887

Temperature vs. Frequency Stability

Voltage	Measurement Frequency (MHz)
(℃)	5729.0000
0	5728.9964
10	5728.9964
20	5728.9968
30	5728.9964
40	5728.9968
Max. Deviation (MHz)	0.0036
Max. Deviation (ppm)	0.6284