

FCC Radio Test Report

FCC ID: 2AAGJHEOS514A

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

Project No. : 1503C045
Equipment : Wireless TV Sound System
Model Name : SC-HHC-Sub
Applicant : Tymphany HK Limited
Address : Room 1307-8, Dominion Centre, 43-59 Queen's Road East, WanChai, Hong Kong

Date of Receipt : Mar. 05, 2015
Date of Test : Mar. 05, 2015 ~ Apr. 03, 2015
Issued Date : Apr. 07, 2015
Tested by : BTL Inc.

Testing Engineer : David Mao
(David Mao)
Technical Manager : Leo Hung
(Leo Hung)
Authorized Signatory : Steven Lu
(Steven Lu)

B T L I N C .

No.3, Jinshagang 1st Road, Shixia, Dalang Town, Dongguan,
Guangdong, China.

TEL: +86-769-8318-3000 FAX: +86-769-8319-6000

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 the standards traceable to National Measurement Laboratory (**NML**) of **R.O.C.**, or National Institute of Standards and Technology (**NIST**) of **U.S.A.**

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.

BTL's reports must not be used by the client to claim product endorsement by the authorities or any agency of the Government.

This report is the confidential property of the client. As a mutual protection to the clients, the public and **BTL-self**, extracts from the test report shall not be reproduced except in full with **BTL's** authorized written approval.

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.

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.

Table of Contents	Page
1 . CERTIFICATION	7
2 . SUMMARY OF TEST RESULTS	8
2.1 TEST FACILITY	9
2.2 MEASUREMENT UNCERTAINTY	9
3 . GENERAL INFORMATION	10
3.1 GENERAL DESCRIPTION OF EUT	10
3.2 DESCRIPTION OF TEST MODES	11
3.3 TABLE OF PARAMETERS OF TEXT SOFTWARE SETTING	11
3.4 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED	12
3.5 DESCRIPTION OF SUPPORT UNITS	12
4 . EMC EMISSION TEST	13
4.1 CONDUCTED EMISSION MEASUREMENT	13
4.1.1 POWER LINE CONDUCTED EMISSION	13
4.1.2 TEST PROCEDURE	13
4.1.3 DEVIATION FROM TEST STANDARD	13
4.1.4 TEST SETUP	14
4.1.5 EUT OPERATING CONDITIONS	14
4.1.6 EUT TEST CONDITIONS	14
4.1.7 TEST RESULTS	14
4.2 RADIATED EMISSION MEASUREMENT	15
4.2.1 RADIATED EMISSION LIMITS	15
4.2.2 TEST PROCEDURE	16
4.2.3 DEVIATION FROM TEST STANDARD	16
4.2.4 TEST SETUP	16
4.2.5 EUT OPERATING CONDITIONS	17
4.2.6 EUT TEST CONDITIONS	17
4.2.7 TEST RESULTS (9K TO 30MHz)	18
4.2.8 TEST RESULTS (BETWEEN 30 TO 1000 MHz)	18
4.2.9 TEST RESULTS (ABOVE 1000 MHz)	18
5 . 26dB SPECTRUM BANDWIDTH	19
5.1 APPLIED PROCEDURES / LIMIT	19
5.1.1 TEST PROCEDURE	19
5.1.2 DEVIATION FROM STANDARD	19
5.1.3 TEST SETUP	19
5.1.4 EUT OPERATION CONDITIONS	19
5.1.5 EUT TEST CONDITIONS	19
5.1.6 TEST RESULTS	19
6 . MAXIMUM CONDUCTED OUTPUT POWER	20

Table of Contents	Page
6.1 APPLIED PROCEDURES / LIMIT	20
6.1.1 TEST PROCEDURE	20
6.1.2 DEVIATION FROM STANDARD	21
6.1.3 TEST SETUP	21
6.1.4 EUT OPERATION CONDITIONS	21
6.1.5 EUT TEST CONDITIONS	21
6.1.6 TEST RESULTS	21
7 . ANTENNA CONDUCTED SPURIOUS EMISSION	22
7.1 APPLIED PROCEDURES / LIMIT	22
7.1.1 TEST PROCEDURE	22
7.1.2 DEVIATION FROM STANDARD	22
7.1.3 TEST SETUP	22
7.1.4 EUT OPERATION CONDITIONS	22
7.1.5 EUT TEST CONDITIONS	22
7.1.6 TEST RESULTS	22
8 . POWER SPECTRAL DENSITY TEST	23
8.1 APPLIED PROCEDURES / LIMIT	23
8.1.1 TEST PROCEDURE	23
8.1.1 DEVIATION FROM STANDARD	24
8.1.2 TEST SETUP	24
8.1.3 EUT OPERATION CONDITIONS	24
8.1.4 EUT TEST CONDITIONS	24
8.1.5 TEST RESULTS	24
9 . FREQUENCY STABILITY MEASUREMENT	25
9.1 APPLIED PROCEDURES / LIMIT	25
9.1.1 TEST PROCEDURE	25
9.1.2 DEVIATION FROM STANDARD	25
9.1.3 TEST SETUP	25
9.1.4 EUT OPERATION CONDITIONS	25
9.1.5 EUT TEST CONDITIONS	25
9.1.6 TEST RESULTS	25
10 . MEASUREMENT INSTRUMENTS LIST	26
11 . EUT TEST PHOTOS	28
ATTACHMENT A - CONDUCTED EMISSION	32
ATTACHMENT B - RADIATED EMISSION (9KHZ TO 30MHZ)	35
ATTACHMENT C - RADIATED EMISSION (30MHZ TO 1000MHZ)	37
ATTACHMENT D - RADIATED EMISSION (ABOVE 1000MHZ)	40
ATTACHMENT E - BANDWIDTH	54

Table of Contents

Page

ATTACHMENT F - MAXIMUM OUTPUT POWER	57
ATTACHMENT G - ANTENNA CONDUCTED SPURIOUS EMISSION	59
ATTACHMENT H - POWER SPECTRAL DENSITY	61
ATTACHMENT I - FREQUENCY STABILITY	64

REPORT ISSUED HISTORY

Issued No.	Description	Issued Date
BTL-FCCP-2-1503C045	Original Issue.	Apr. 07, 2015

1. CERTIFICATION

Equipment : Wireless TV Sound System
Brand Name : DENON
Model Name : SC-HHC-Sub
Applicant : Tymphany HK Limited
Manufacturer : D&M Holdings Inc.
Address : 2-1 Nisshin-cho, Kawasaki-ku, Kawasaki-shi, Kanagawa, 210-8569 Japan
Factory : Premium Loudspeakers (HuiZhou) Co. Ltd
Address : Tymphany Industrial Area, Xin Lian Village, Xin Xu Town, Hui Yang District, Hui Zhou City, Guangdong, China
Date of Test : Mar. 05, 2015 ~ Apr. 03, 2015
Test Sample : ENGINEERING SAMPLE
Standard(s) : FCC Part15, Subpart E(15.407) / ANSI C63.4: 2009
FCC KDB 789033 D02 General UNII Test Procedures New Rules v01.

The above equipment has been tested and found 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-2-1503C045) 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).

2. SUMMARY OF TEST RESULTS

Test procedures according to the technical standard(s):

FCC Part15, Subpart E			
Standard(s) Section	Test Item	Judgment	Remark
FCC			
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	

NOTE:

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

(2) FCC KDB 789033 D02 General UNII Test Procedures New Rules v01.

2.1 TEST FACILITY

The test facilities used to collect the test data in this report is **DG-C02/DG-CB03** at the location of No.3, Jinshagang 1st Road, Shixia, Dalang Town, Dongguan, Guangdong, China. 523792
BTL's test firm number for FCC: 319330

2.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement $y \pm U$, 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 Measurement:

Test Site	Method	Measurement Frequency Range	U , (dB)	NOTE
DG-C02	CISPR	150 KHz ~ 30MHz	1.94	

B. Radiated Measurement:

Test Site	Method	Measurement Frequency Range	Ant. H / V	U , (dB)	NOTE
DG-CB03	CISPR	9KHz~30MHz	V	3.79	
		9KHz~30MHz	H	3.57	
		30MHz ~ 200MHz	V	3.82	
		30MHz ~ 200MHz	H	3.60	
		200MHz ~ 1,000MHz	V	3.86	
		200MHz ~ 1,000MHz	H	3.94	
		1GHz~18GHz	V	3.12	
		1GHz~18GHz	H	3.68	
		18GHz~40GHz	V	4.15	
		18GHz~40GHz	H	4.14	

3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

Equipment	Wireless TV Sound System	
Brand Name	DENON	
Model Name	SC-HHC-Sub	
Mode Different	N/A	
Product Description	Operation Frequency	5736~5814 MHz
	Modulation Type	QPSK
	Bit Rate of Transmitter	150Mbps
	Output Power (Max.)	2.48dBm
Power Source	AC Mains.	
Power Rating	AC 120V 60Hz 75W	



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)
01	5736	02	5762	03	5814

3. Antenna Specification:

Ant.	Manufacturer	Model Name	Antenna Type	Connector	Gain (dBi)	Note
1	 SMSC SUCCESS BY DESIGN	DWHP83	Internal	N/A	3.20	TX
2	 SMSC SUCCESS BY DESIGN	DWHP83	Internal	N/A	3.20	RX

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 Test Mode	Description
Mode 1	TX Mode / CH01, CH02, CH03
Mode 2	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 2	TX Mode

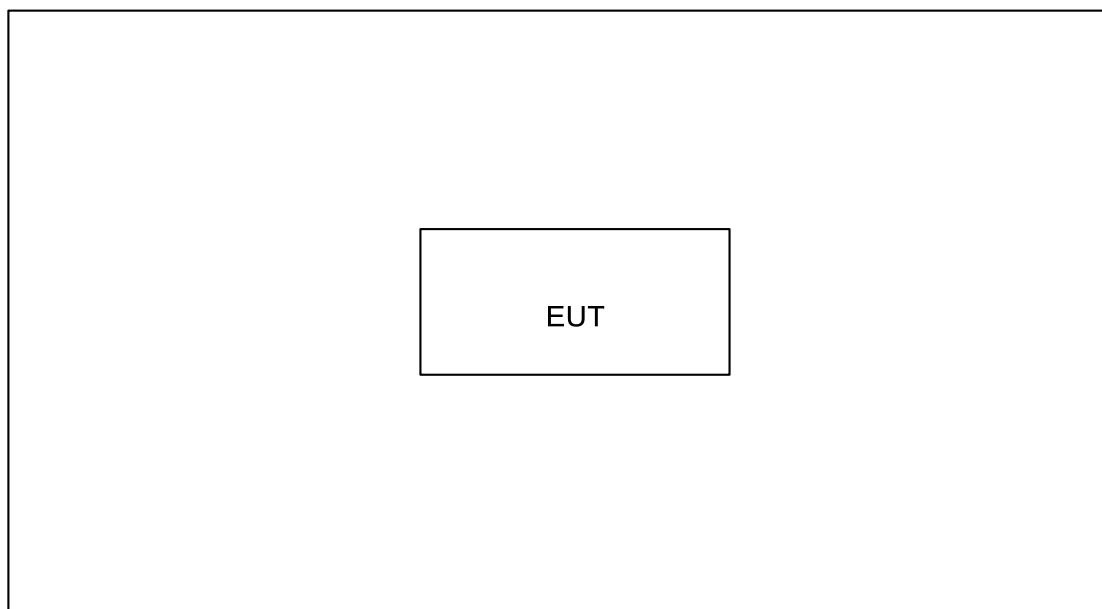
For Radiated Test	
Final Test Mode	Description
Mode 1	TX Mode / CH01, CH02, CH03

3.3 TABLE OF PARAMETERS OF TEXT 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)	5736	5762	5814
-	N/A	N/A	N/A

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.	Note
-	-	-	-	-	-	

Item	Shielded Type	Ferrite Core	Length	Note
-	-	-	-	

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.

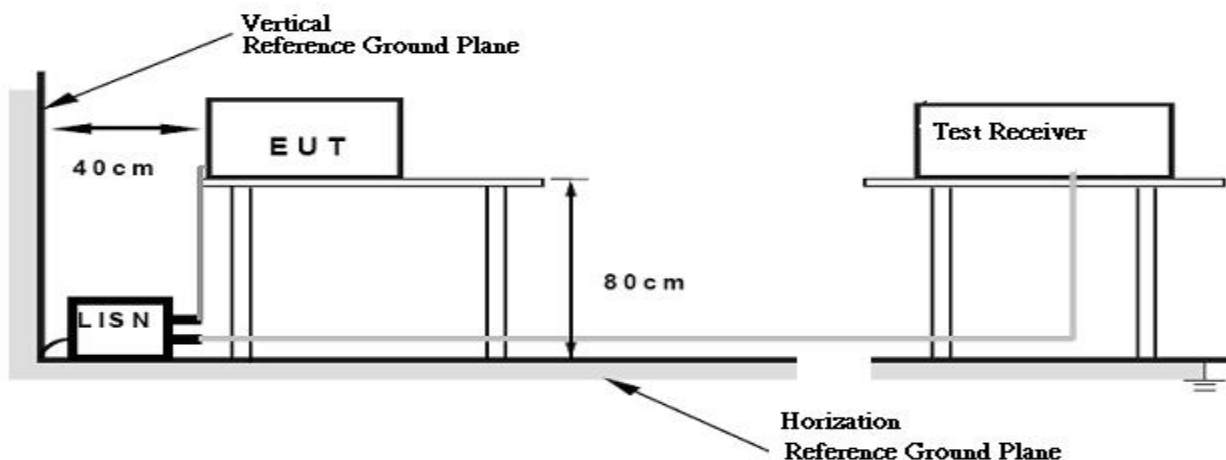
4.1.2 TEST PROCEDURE

- 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 Attachment 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

20dBc in any 100 kHz bandwidth outside the operating frequency band. 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

Note:

- (1) The limit for radiated test was performed according to FCC PART 15C.
- (2) The tighter limit applies at the band edges.

LIMITS OF UNWANTED EMISSION OUT OF THE RESTRICTED BANDS

Frequencies (MHz)	EIRP Limit (dBm)	Equivalent Field Strength at 3m (dBμV/m)
5736~5814	-27 (beyond 10MHz of the band edge)	68.3
	-17 (within 10 MHz of band edge)	78.3

Note: 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)

4.2.2 TEST PROCEDURE

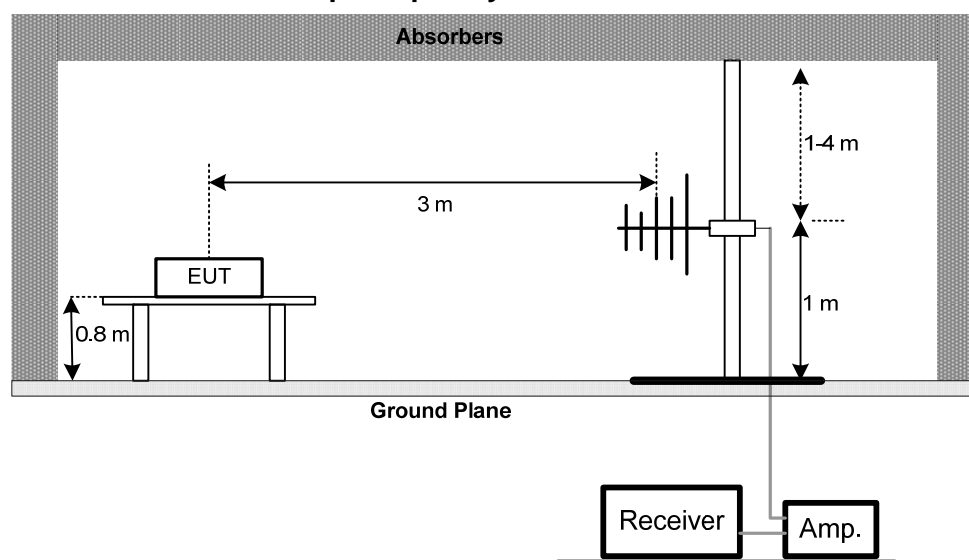
- The measuring distance of at 3m shall be used for measurements at frequency up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
- The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- The height of the equipment or of the substitution antenna shall be 0.8 m; 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.
- The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

4.2.3 DEVIATION FROM TEST STANDARD

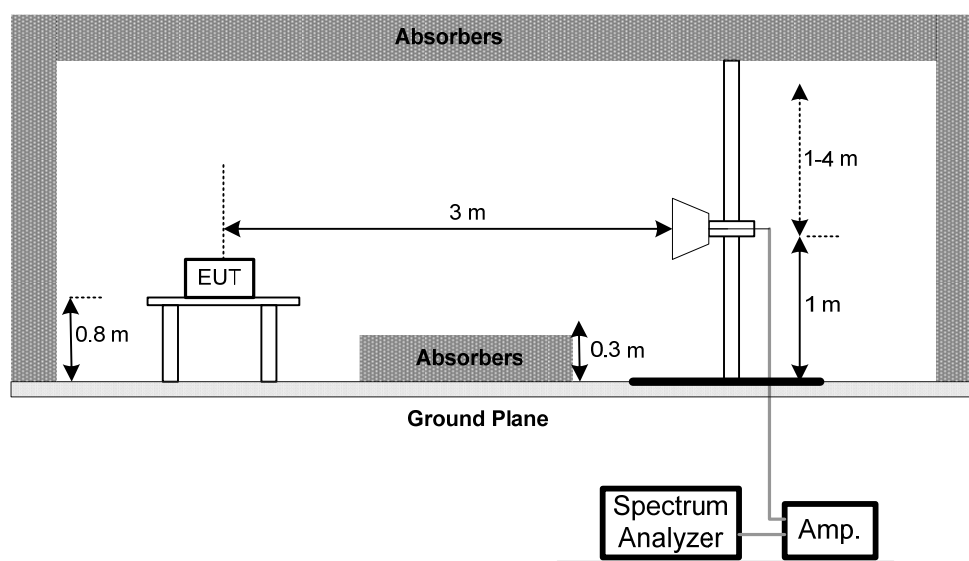
No deviation

4.2.4 TEST SETUP

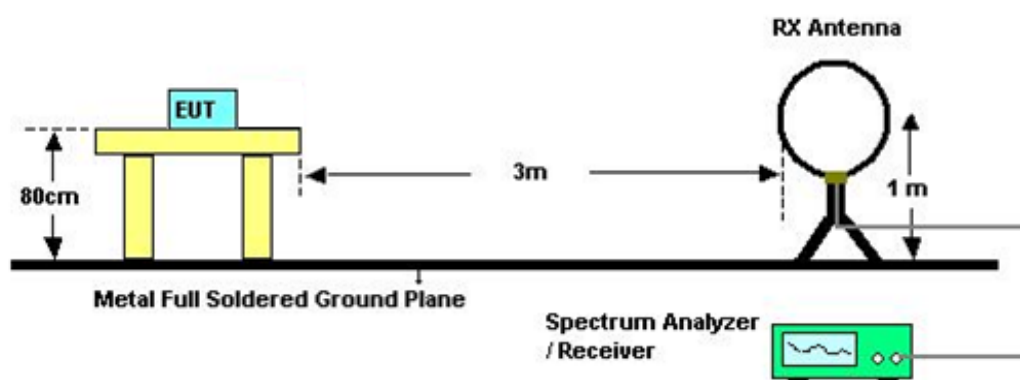
(A) Radiated Emission Test Set-Up Frequency 30 - 1000MHz



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



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

4.2.7 TEST RESULTS (9K TO 30MHz)

Please refer to the Attachment 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 = $40 \log (\text{specific distance} / \text{test distance})$ (dB);
- (3) Limit line = specific limits (dBuV) + distance extrapolation factor.

4.2.8 TEST RESULTS (BETWEEN 30 TO 1000 MHz)

Please refer to the Attachment C.

Remark:

- (1) Reading in which marked as QP or Peak means measurements by using are Quasi-Peak Mode or Peak Mode with Detector BW=120KHz ; SPA setting in RBW=120KHz, VBW =120KHz, Swp. Time = 0.3 sec./MHz ◦
- (2) 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 ◦
- (3) Measuring frequency range from 30MHz to 1000MHz ◦
- (4) If the peak scan value lower limit more than 20dB, then this signal data does not show in table ◦

4.2.9 TEST RESULTS (ABOVE 1000 MHz)

Please refer to the Attachment D.

Remark:

- (1) Spectrum Setting: 30MHz – 1000MHz , RBW= 100KHz, VBW=100KHz, Sweep time = 200 ms. 1GHz- 40GHz, RBW= 1MHz, VBW= 1MHz, Sweep time = Auto
- (2) All readings are Peak unless otherwise stated AV in column of 『Note』 . Peak denotes that the Peak reading compliance with the AV Limits and then AV Mode measurement didn't perform.
- (3) Radiated emissions measured in frequency range above 1000MHz were made with an instrument using Peak detector mode and AV detector mode of the emission ◦
- (4) Data of measurement within this frequency range shown “ * ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (5) A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.
- (6) EUT Orthogonal Axes:
“X” - denotes Laid on Table ; “Y” - denotes Vertical Stand ; “Z” - denotes Side Stand
- (7) During the measurements above 1GHz it is taken care of that the EUT is always within the 3dB cone of radiation BW of the used antenna.
- (8) 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	Minimum 500KHz 6dB Bandwidth	5736~5814	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
VBW	1000 kHz
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: 25°C Relative Humidity: 55% Test Voltage: AC 120V/60Hz

5.1.6 TEST RESULTS

Please refer to the Attachment 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	1 Watt (30dBm)	5736~5814	PASS

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

6.1.6 TEST RESULTS

Please refer to the Attachment F.

7. ANTENNA CONDUCTED SPURIOUS EMISSION

7.1 APPLIED PROCEDURES / LIMIT

FCC Part15, Subpart E			
Test Item	Limit	Frequency Range (MHz)	Result
Antenna conducted Spurious Emission	Below -17dBm/MHz within 10MHz of band edge, below -27dBm/MHz beyond 10MHz of the band edge	5736~5814	PASS

7.1.1 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
RBW	1000kHz
VBW	1000kHz
Trace	Max Hold
Sweep Time	Auto

7.1.2 DEVIATION FROM STANDARD

No deviation.

7.1.3 TEST SETUP



7.1.4 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.

7.1.5 EUT TEST CONDITIONS

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

7.1.6 TEST RESULTS

Please refer to the Attachment G.

8. POWER SPECTRAL DENSITY TEST

8.1 APPLIED PROCEDURES / LIMIT

FCC Part15, Subpart E			
Test Item	Limit	Frequency Range (MHz)	Result
Power Spectral Density	30dBm/500KHz	5736~5814	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	Max Hold
Sweep Time	Auto

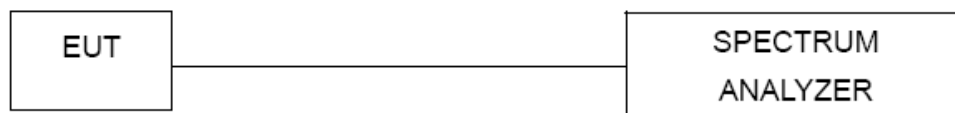
Note:

- For UNII-3, according to KDB publication 789033 D02 General UNII Test Procedures New Rules v01, 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.
- The value measured with RBW=1MHz is to be added with $10\log(500\text{kHz}/1\text{MHz})$ 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.

8.1.1 DEVIATION FROM STANDARD

No deviation.

8.1.2 TEST SETUP



8.1.3 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.

8.1.4 EUT TEST CONDITIONS

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

8.1.5 TEST RESULTS

Please refer to the Attachment H.

9. FREQUENCY STABILITY MEASUREMENT

9.1 APPLIED PROCEDURES / LIMIT

FCC Part15, Subpart E			
Test Item	Limit	Frequency Range (MHz)	Result
Frequency Stability	Specified in the user's manual	5736~5814	PASS

9.1.1 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

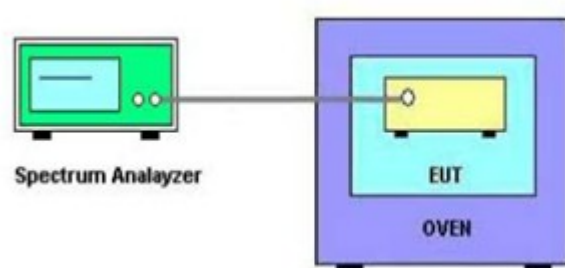
c. The test extreme voltage is to change the primary supply voltage from 85 to 115 percent of the nominal value.

d. User manual temperature is 0°C~50°C.

9.1.2 DEVIATION FROM STANDARD

No deviation.

9.1.3 TEST SETUP



9.1.4 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.

9.1.5 EUT TEST CONDITIONS

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

9.1.6 TEST RESULTS

Please refer to the Attachment I.

10. MEASUREMENT INSTRUMENTS LIST

Conducted Emission Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	LISN	EMCO	3816/2	00052765	Mar. 28, 2016
2	LISN	R&S	ENV216	100087	Mar. 28, 2016
3	Test Cable	N/A	C_17	N/A	Mar. 13, 2016
4	EMI TEST RECEIVER	R&S	ESCS30	826547/022	Mar. 28, 2016
5	50Ω Terminator	SHX	TF2-3G-A	08122902	Mar. 28, 2016
6	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A

Radiated Emission Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Antenna	Schwarzbeck	VULB9160	9160-3232	Mar. 28, 2016
2	Amplifier	HP	8447D	2944A09673	Mar. 28, 2016
3	Receiver	AGILENT	N9038A	MY52130039	Sep. 30, 2015
4	Test Cable	N/A	C-01_CB03	N/A	Jul. 01, 2015
5	Controller	CT	SC100	N/A	N/A
6	Antenna	ETS	3115	00075789	Mar. 28, 2016
7	Amplifier	Agilent	8449B	3008A02274	Mar. 28, 2016
8	Receiver	AGILENT	N9038A	MY52130039	Sep. 30, 2015
9	Test Cable	HUBER+SUHNER	C-48	N/A	Apr. 30, 2015
10	Controller	CT	SC100	N/A	N/A
11	Broad-Band Horn Antenna	Schwarzbeck	BBHA 9170	9170319	Feb. 21, 2016
12	Microwave Preamplifier With Adaptor	EMC INSTRUMENT	EMC2654045	980039 & HA01	Feb. 21, 2016
13	Active Loop Antenna	R&S	HFH2-Z2	830749/020	Mar. 28, 2016
14	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A

Spectrum Bandwidth Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP 40	100185	Nov. 02, 2015

Maximum Conducted Output Power Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	P-series Power meter	Agilent	N1911A	MY45100473	Mar. 28, 2016
2	Wireband Power sensor	Agilent	N1921A	MY51100041	Mar. 28, 2016

Antenna Conducted Spurious Emission Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP 40	100185	Nov. 02, 2015

Power Spectral Density Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP 40	100185	Nov. 02, 2015

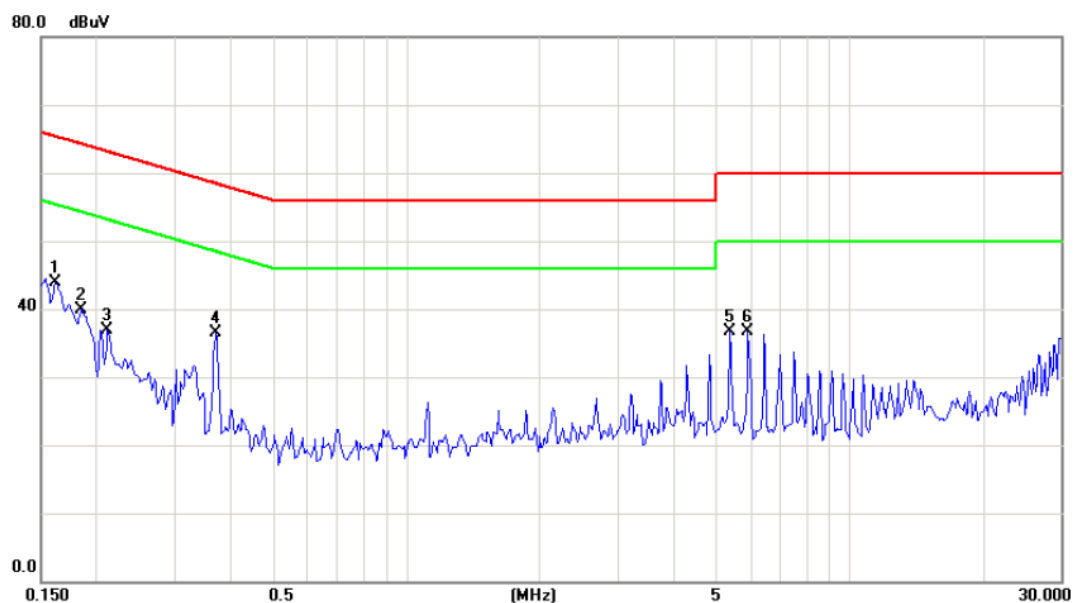
Frequency Stability Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP 40	100185	Nov. 02, 2015
2	Precision Oven Tester	HOLINK	H-T-1F-D	BA03101701	May. 24, 2015

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

ATTACHMENT A - CONDUCTED EMISSION

Test Mode: TX MODE

Line

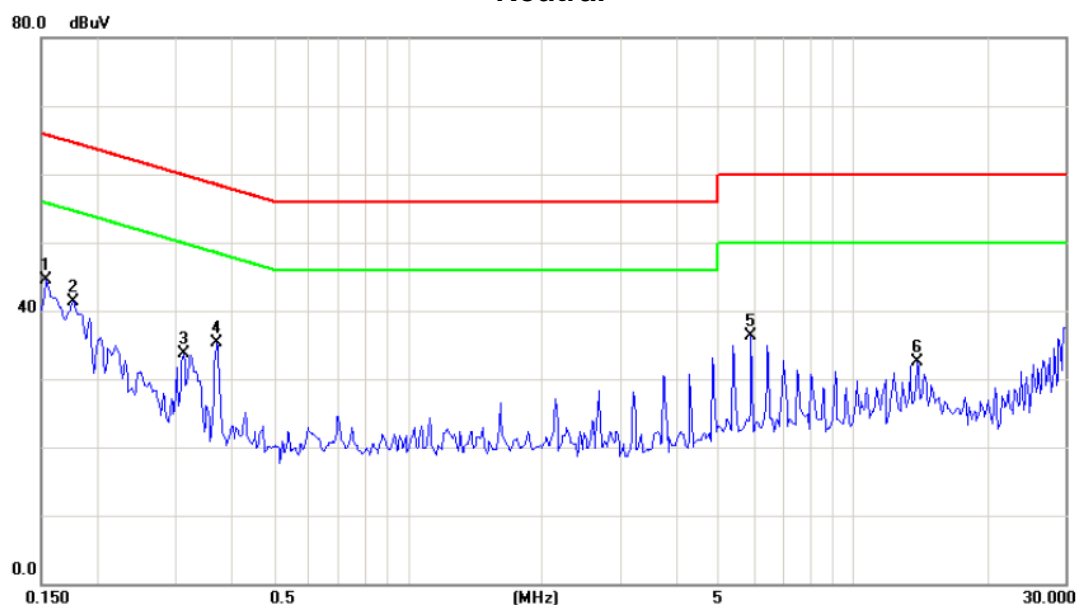


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1	*	0.1617	34.39	9.49	43.88	65.38	-21.50	peak	
2		0.1852	30.39	9.50	39.89	64.25	-24.36	peak	
3		0.2125	27.37	9.52	36.89	63.11	-26.22	peak	
4		0.3727	26.83	9.59	36.42	58.44	-22.02	peak	
5		5.3672	26.93	9.68	36.61	60.00	-23.39	peak	
6		5.9023	27.10	9.70	36.80	60.00	-23.20	peak	

Note : The test result has included the cable loss.

Test Mode: TX MODE

Neutral



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1	*	0.1540	34.83	9.60	44.43	65.78	-21.35	peak	
2		0.1773	31.79	9.59	41.38	64.61	-23.23	peak	
3		0.3141	24.06	9.58	33.64	59.86	-26.22	peak	
4		0.3727	25.81	9.59	35.40	58.44	-23.04	peak	
5		5.9023	26.66	9.69	36.35	60.00	-23.65	peak	
6		13.9531	22.62	9.91	32.53	60.00	-27.47	peak	

Note : The test result has included the cable loss.

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

Test Mode: TX MODE

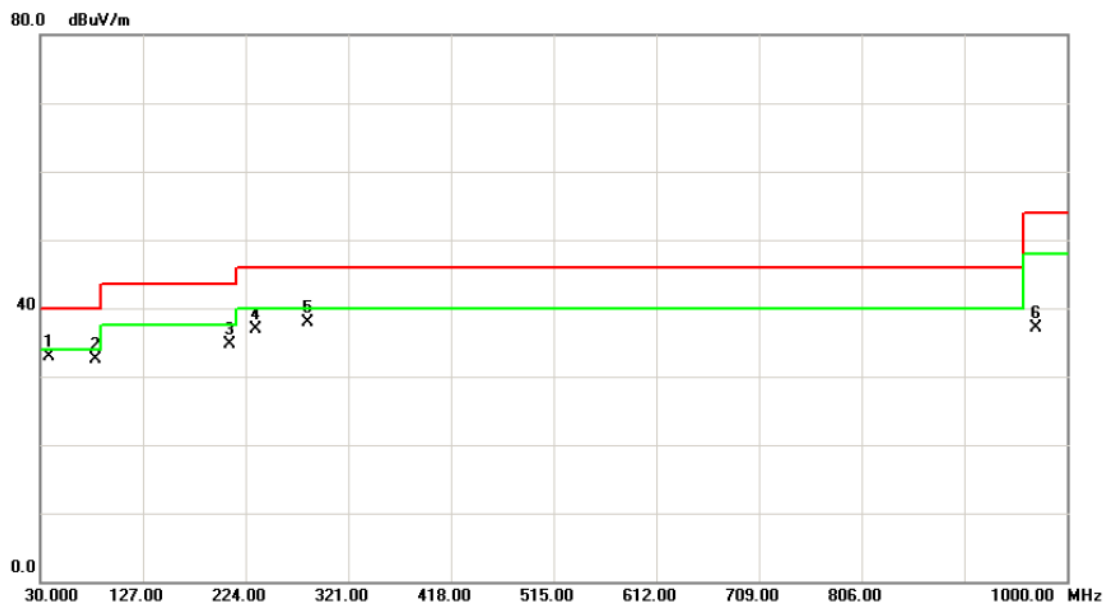
Freq. (MHz)	Ant. 0°/90°	Reading(RA) (dBuV)	Corr.Factor(CF) (dB)	Measured(FS) (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Note
0.0103	0°	9.25	24.30	33.55	127.38	-93.83	AV
0.0103	0°	11.62	24.30	35.92	147.38	-111.46	PK
0.0283	0°	7.83	23.77	31.60	118.57	-86.96	AV
0.0283	0°	8.57	23.77	32.34	138.57	-106.22	PK
0.0308	0°	3.72	23.62	27.34	117.83	-90.50	AV
0.0308	0°	5.18	23.62	28.80	137.83	-109.04	PK
0.0417	0°	1.06	22.93	23.99	115.20	-91.22	AV
0.0417	0°	2.68	22.93	25.61	135.20	-109.60	PK
0.4951	0°	16.85	19.81	36.66	73.71	-37.05	QP
1.9326	0°	20.13	19.51	39.64	69.54	-29.90	QP

Freq. (MHz)	Ant. 0°/90°	Reading(RA) (dBuV)	Corr.Factor(CF) (dB)	Measured(FS) (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Note
0.0096	90°	7.58	24.30	31.88	127.96	-96.08	AV
0.0096	90°	9.21	24.30	33.51	147.96	-114.45	PK
0.0291	90°	5.72	23.72	29.44	118.33	-88.88	AV
0.0291	90°	6.49	23.72	30.21	138.33	-108.11	PK
0.0370	90°	2.65	23.22	25.87	116.24	-90.37	AV
0.0370	90°	3.47	23.22	26.69	136.24	-109.55	PK
0.0452	90°	0.19	22.70	22.89	114.50	-91.61	AV
0.0452	90°	1.36	22.70	24.06	134.50	-110.44	PK
0.5216	90°	18.25	19.87	38.12	73.26	-35.14	QP
2.1276	90°	22.78	19.42	42.20	69.54	-27.34	QP

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

Test Mode: TX 5736MHz

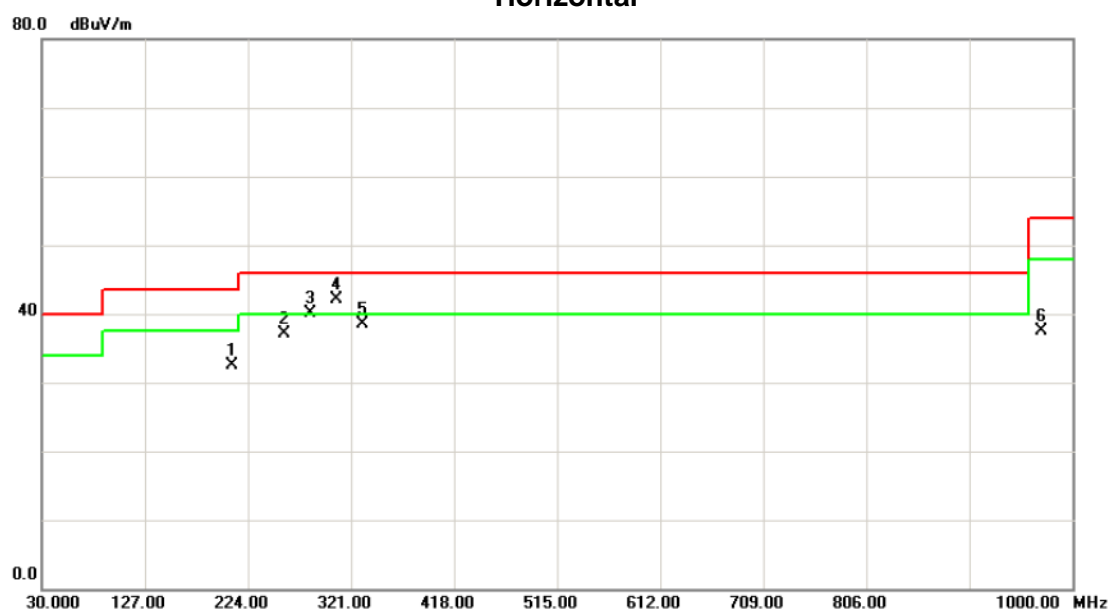
Vertical



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1	*	37.7600	47.24	-14.38	32.86	40.00	-7.14	peak	
2		82.3800	49.87	-17.29	32.58	40.00	-7.42	peak	
3		208.4800	49.95	-15.33	34.62	43.50	-8.88	peak	
4		233.7000	51.04	-14.16	36.88	46.00	-9.12	peak	
5		282.2000	49.88	-12.06	37.82	46.00	-8.18	peak	
6		970.9000	37.37	-0.30	37.07	54.00	-16.93	peak	

Test Mode: TX 5736MHz

Horizontal

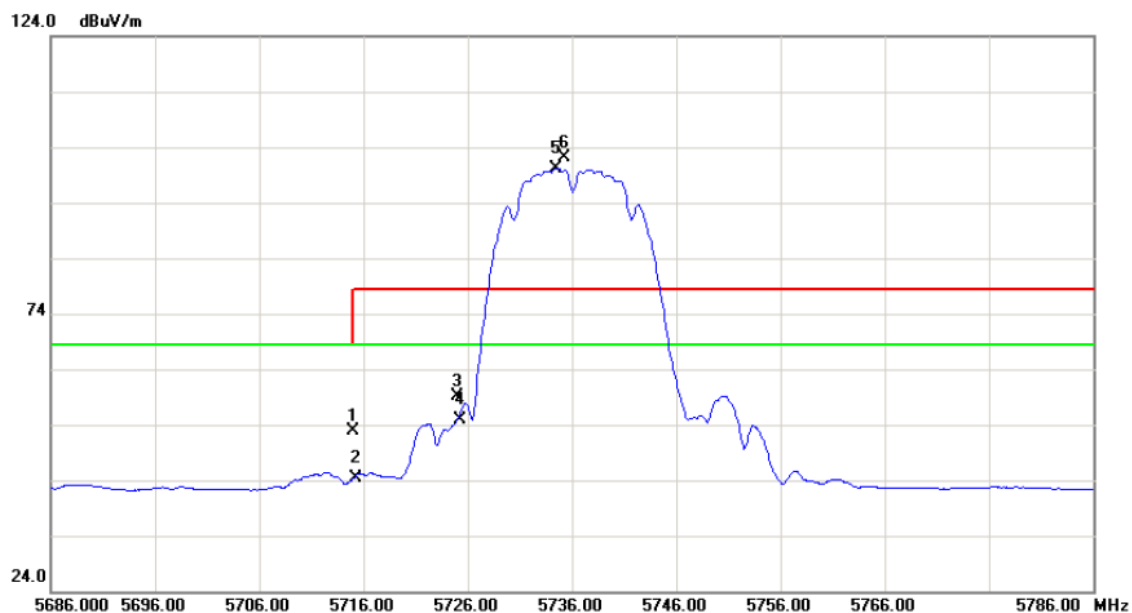


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		208.4800	47.76	-15.33	32.43	43.50	-11.07	peak	
2		257.9500	51.02	-13.83	37.19	46.00	-8.81	peak	
3	!	282.2000	52.08	-12.06	40.02	46.00	-5.98	peak	
4	*	307.4200	53.26	-11.11	42.15	46.00	-3.85	peak	
5		331.6700	49.95	-11.50	38.45	46.00	-7.55	peak	
6		970.9000	37.78	-0.30	37.48	54.00	-16.52	peak	

ATTACHMENT D - RADIATED EMISSION (ABOVE 1000MHZ)

Orthogonal Axis:	X
Test Mode:	TX 5736MHz

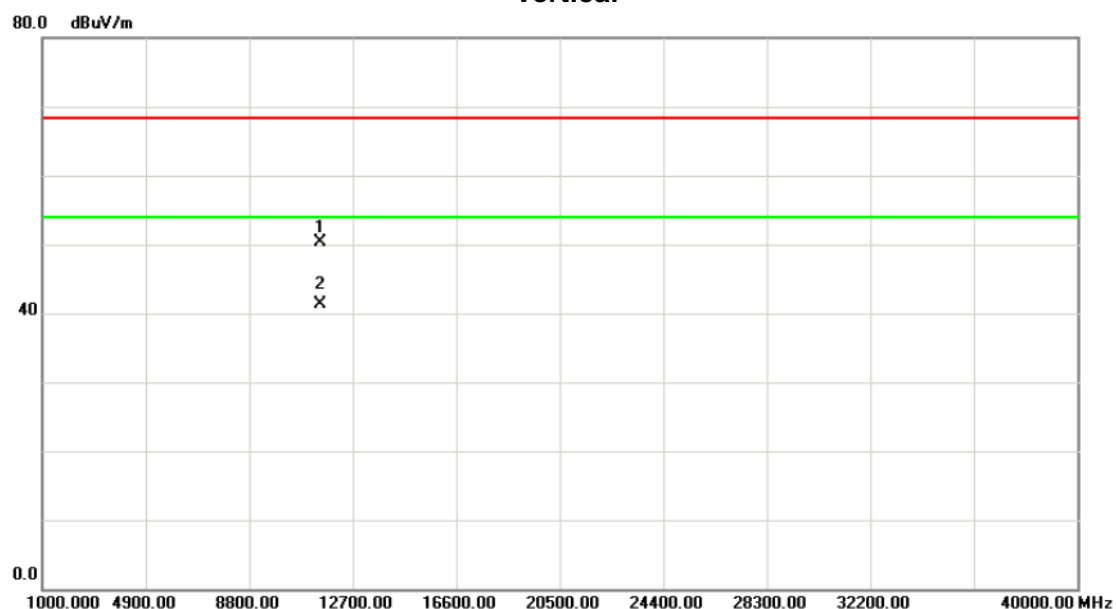
Vertical



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		5715.000	11.72	41.06	52.78	68.30	-15.52	peak	
2		5715.000	3.22	41.06	44.28	68.30	-24.02	AVG	
3		5725.000	18.15	41.10	59.25	78.30	-19.05	peak	
4		5725.000	13.71	41.10	54.81	68.30	-13.49	AVG	
5	*	5734.400	58.97	41.13	100.10	68.30	31.80	AVG	NO limit
6	X	5735.200	60.98	41.13	102.11	78.30	23.81	peak	NO limit

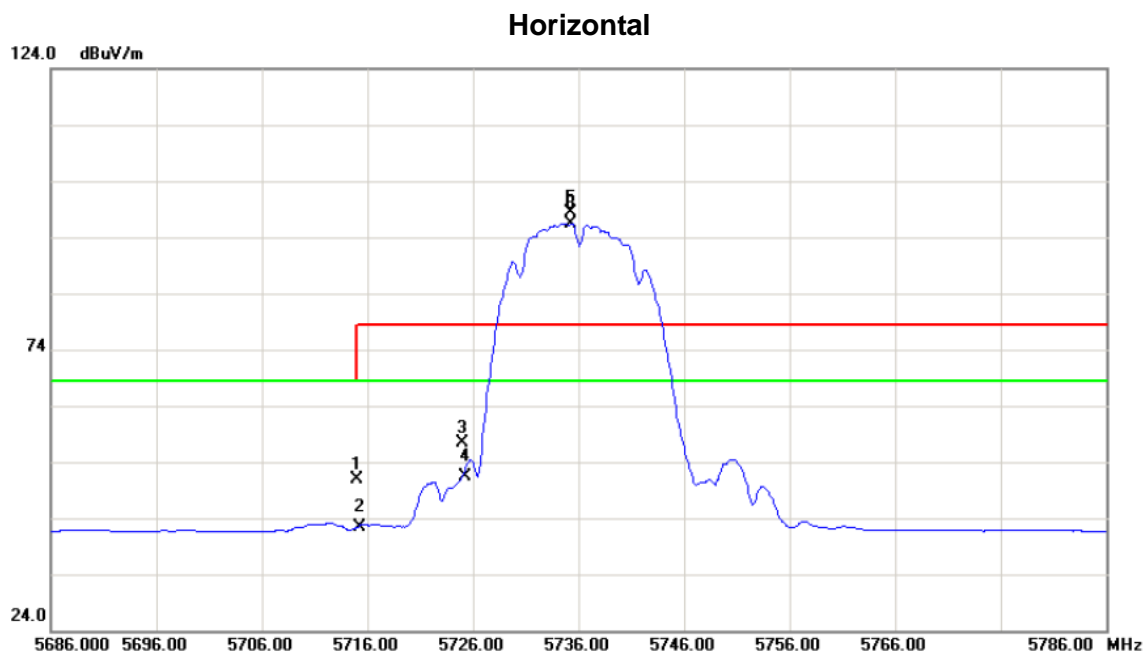
Orthogonal Axis:	X
Test Mode:	TX 5736MHz

Vertical



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		11472.14	37.41	12.85	50.26	68.30	-18.04	peak	
2	*	11472.14	28.39	12.85	41.24	54.00	-12.76	AVG	

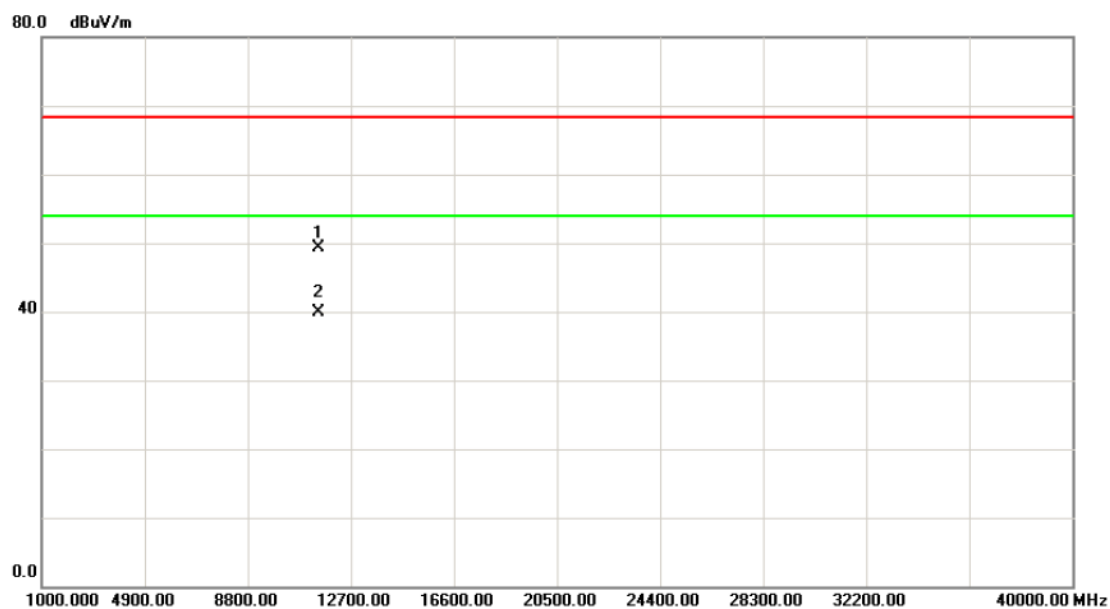
Orthogonal Axis:	X
Test Mode:	TX 5736MHz



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		5715.000	9.88	41.06	50.94	68.30	-17.36	peak	
2		5715.000	1.32	41.06	42.38	68.30	-25.92	AVG	
3		5725.000	16.33	41.10	57.43	78.30	-20.87	peak	
4		5725.000	10.23	41.10	51.33	68.30	-16.97	AVG	
5	X	5735.200	57.33	41.13	98.46	78.30	20.16	peak	NO limit
6	*	5735.300	55.33	41.14	96.47	68.30	28.17	AVG	NO limit

Orthogonal Axis:	X
Test Mode:	TX 5736MHz

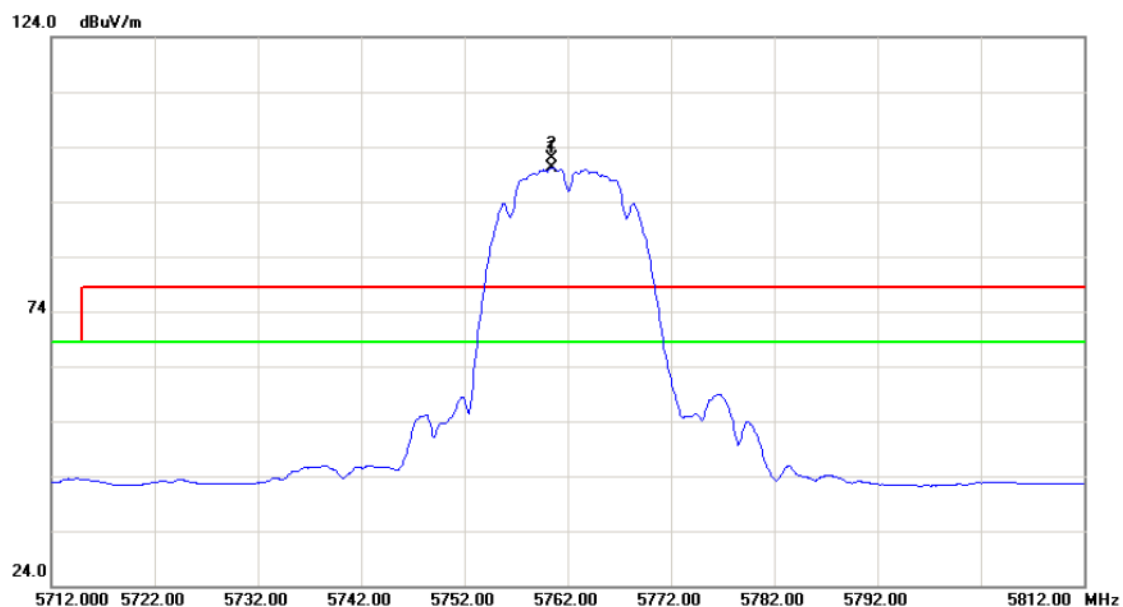
Horizontal



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		11472.22	36.52	12.85	49.37	68.30	-18.93	peak	
2	*	11472.22	27.09	12.85	39.94	54.00	-14.06	AVG	

Orthogonal Axis:	X
Test Mode:	TX 5762MHz

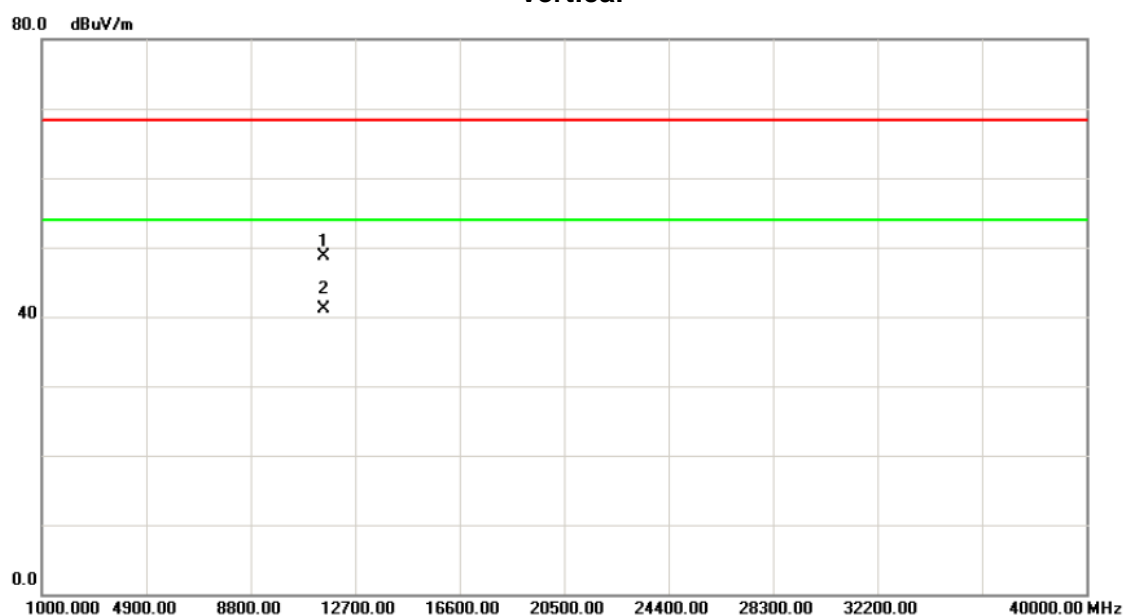
Vertical



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1	*	5760.400	58.83	41.25	100.08	68.30	31.78	AVG	NO limit
2	X	5760.500	60.73	41.25	101.98	78.30	23.68	peak	NO limit

Orthogonal Axis:	X
Test Mode:	TX 5762MHz

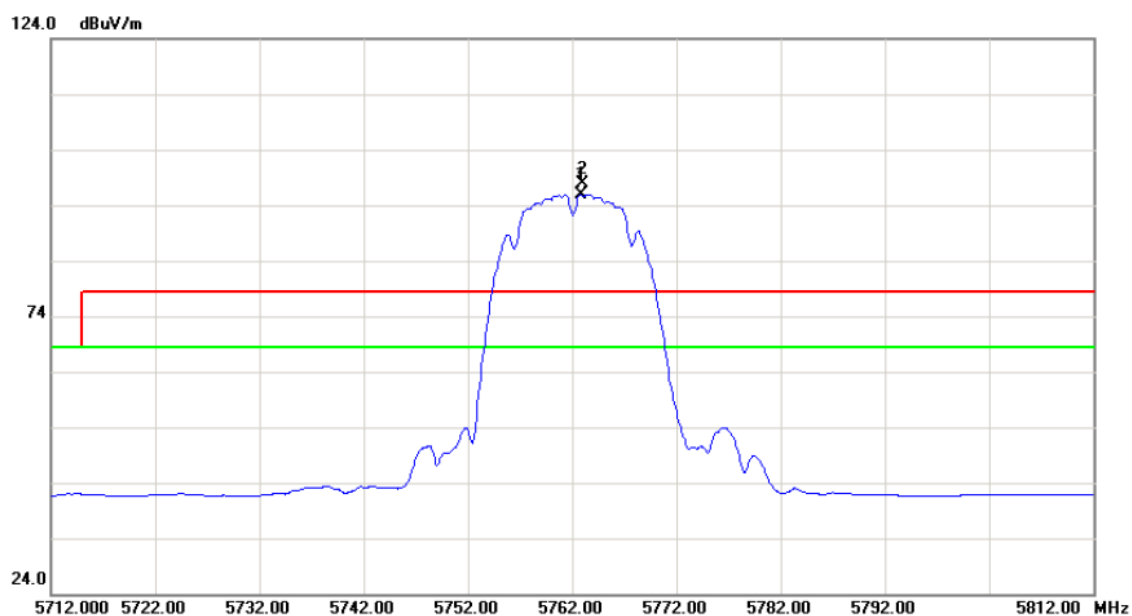
Vertical



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		11524.21	35.78	12.92	48.70	68.30	-19.60	peak	
2	*	11524.21	28.19	12.92	41.11	54.00	-12.89	AVG	

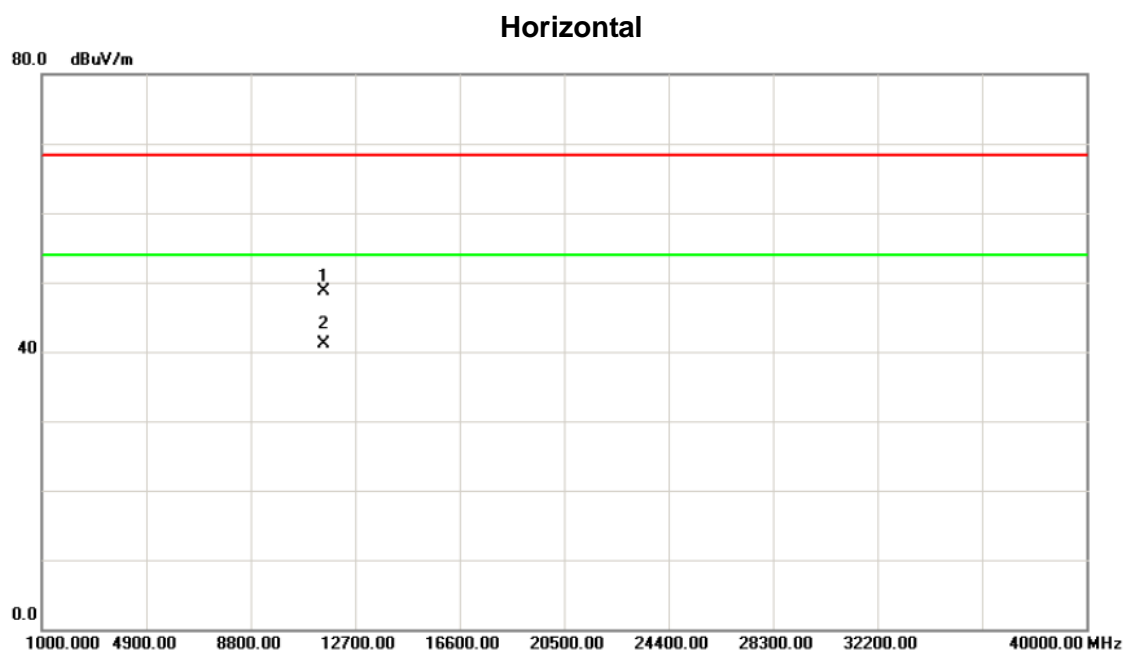
Orthogonal Axis:	X
Test Mode:	TX 5762MHz

Horizontal



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1	*	5762.800	54.66	41.26	95.92	68.30	27.62	AVG	NO limit
2	X	5763.000	56.63	41.26	97.89	78.30	19.59	peak	NO limit

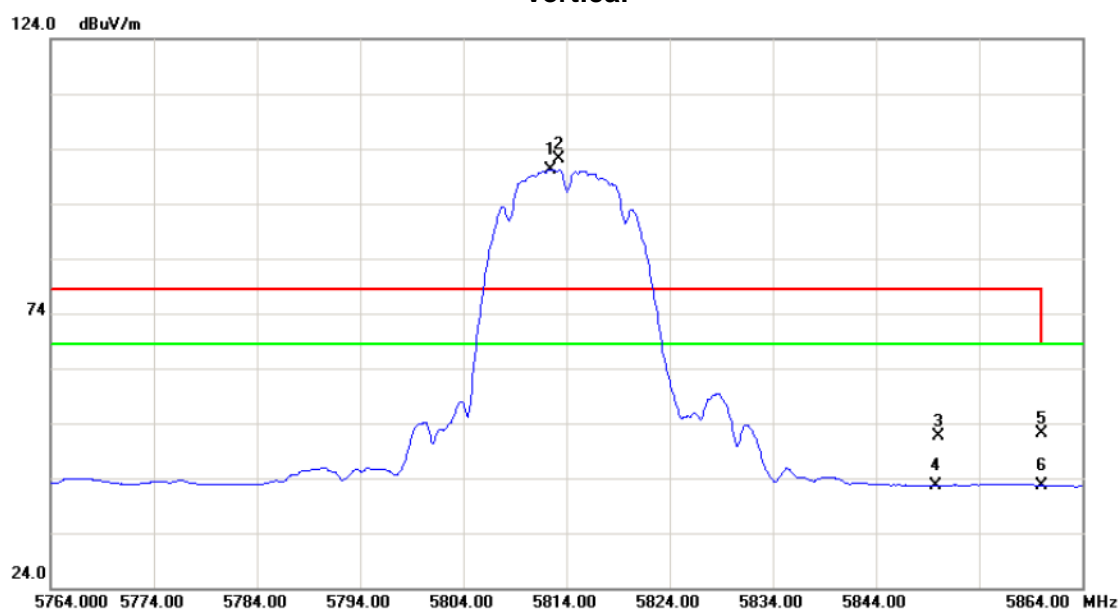
Orthogonal Axis:	X
Test Mode:	TX 5762MHz



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		11524.21	35.78	12.92	48.70	68.30	-19.60	peak	
2	*	11524.21	28.19	12.92	41.11	54.00	-12.89	AVG	

Orthogonal Axis:	X
Test Mode:	TX 5814MHz

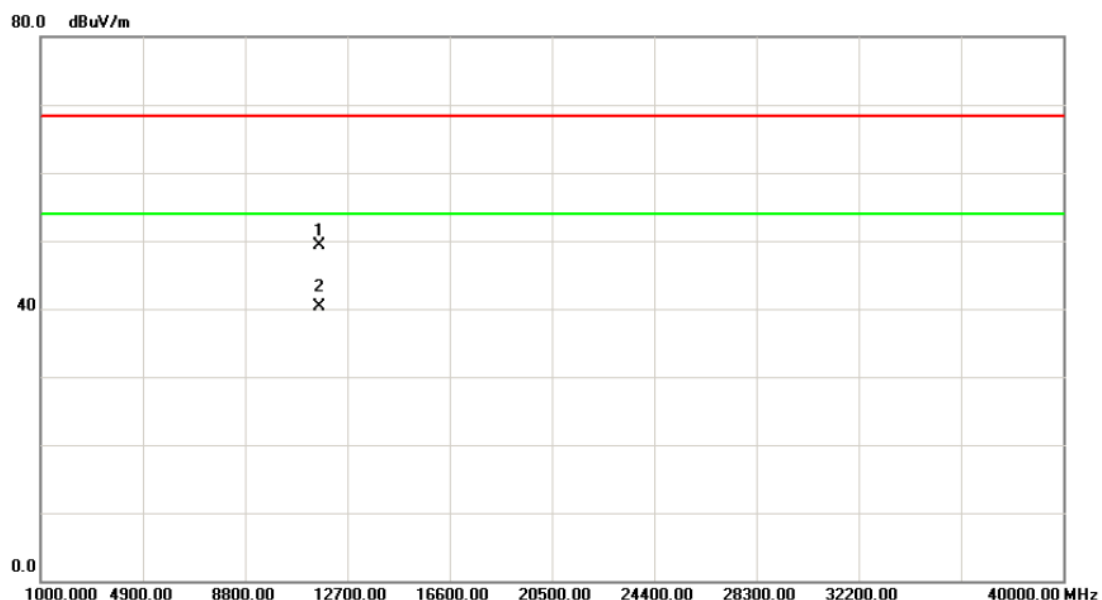
Vertical



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1	*	5812.400	58.78	41.46	100.24	68.30	31.94	AVG	NO limit
2	X	5813.200	60.78	41.46	102.24	78.30	23.94	peak	NO limit
3		5850.000	10.08	41.62	51.70	78.30	-26.60	peak	
4		5850.000	1.03	41.62	42.65	68.30	-25.65	AVG	
5		5860.000	10.41	41.65	52.06	68.30	-16.24	peak	
6		5860.000	1.10	41.65	42.75	68.30	-25.55	AVG	

Orthogonal Axis:	X
Test Mode:	TX 5814MHz

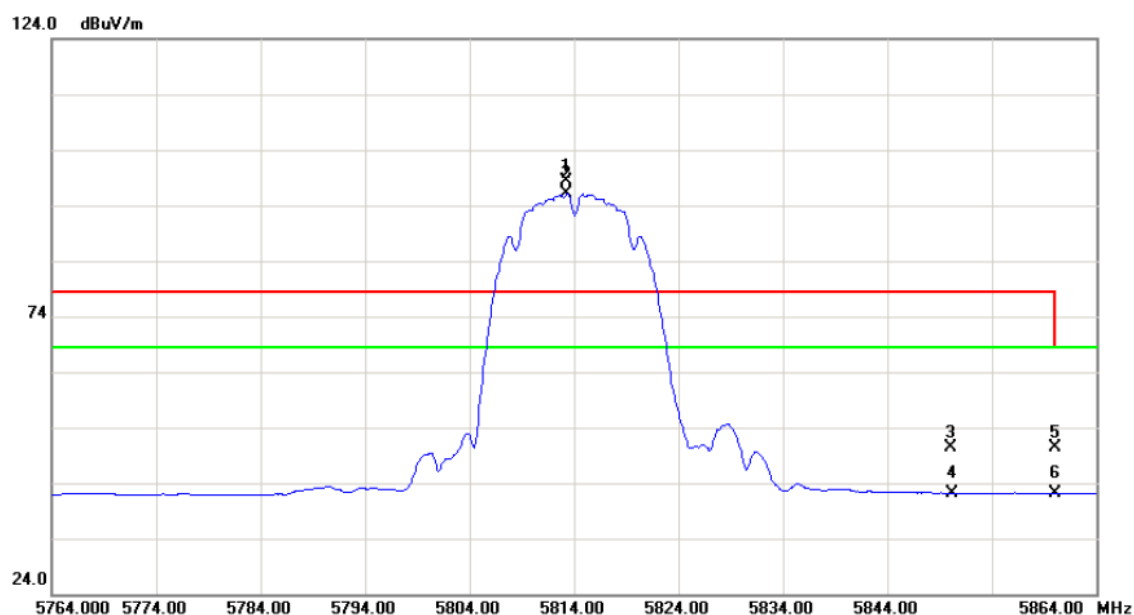
Vertical



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		11628.25	36.48	12.86	49.34	68.30	-18.96	peak	
2	*	11628.25	27.35	12.86	40.21	54.00	-13.79	AVG	

Orthogonal Axis:	X
Test Mode:	TX 5814MHz

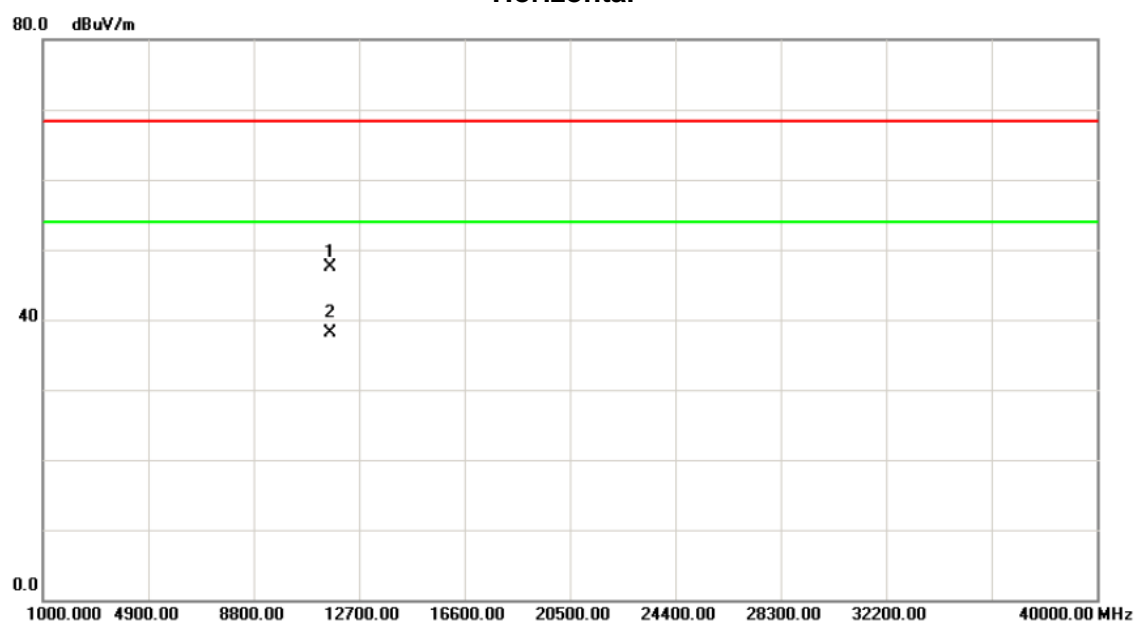
Horizontal



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1	X	5813.200	56.85	41.46	98.31	78.30	20.01	peak	NO limit
2	*	5813.300	54.55	41.46	96.01	68.30	27.71	AVG	NO limit
3		5850.000	8.74	41.62	50.36	78.30	-27.94	peak	
4		5850.000	0.51	41.62	42.13	68.30	-26.17	AVG	
5		5860.000	8.69	41.65	50.34	68.30	-17.96	peak	
6		5860.000	0.51	41.65	42.16	68.30	-26.14	AVG	

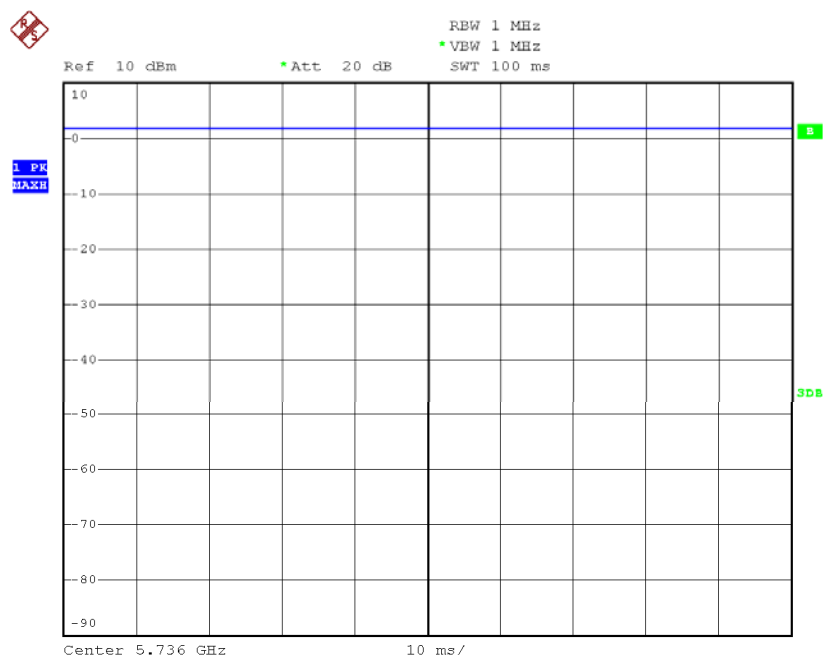
Orthogonal Axis:	X
Test Mode:	TX 5814MHz

Horizontal



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		11628.12	34.59	12.86	47.45	68.30	-20.85	peak	
2	*	11628.12	25.31	12.86	38.17	54.00	-15.83	AVG	

TX _DUTY CYCLE



Date: 2.APR.2015 23:07:08

Duty cycle: TX 5736MHz

Duty cycle = T_{ON} / T_{Total}

T_{ON} : 100 msec

T_{Total} : 100 msec

Duty cycle: 1

Duty Factor = $10 \log(1/\text{Duty cycle})$

Duty Factor = 0.00

Note: The EUT was programmed to be in countinously transmitting mode and the transmit duty cycle is less than 98 %, so, the output power and power density should be cacluated as

Output Power = Measured power + Ducus factor

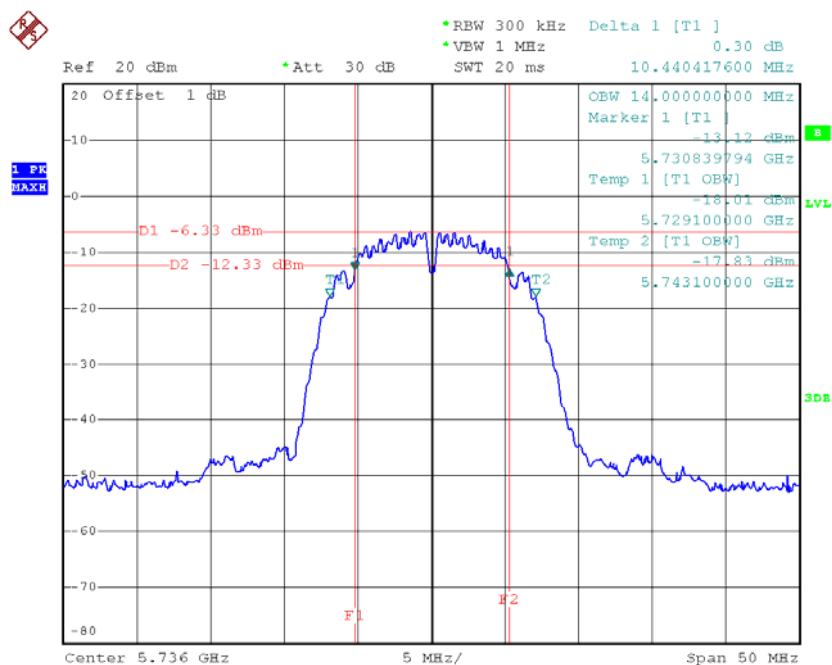
Power Spectral Density = Measured density + Duty factor

ATTACHMENT E - BANDWIDTH

Test Mode: TX Mode / CH01, CH02, CH03

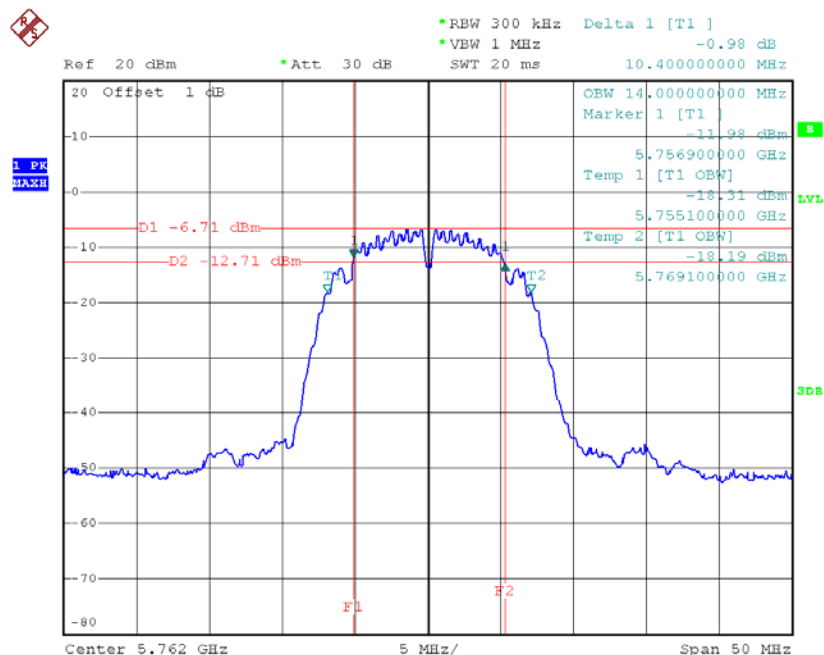
Channel	Frequency (MHz)	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Limit (KHz)
CH01	5736	10.44	14.00	>=500
CH02	5762	10.40	14.00	>=500
CH03	5814	10.40	14.00	>=500

TX CH01



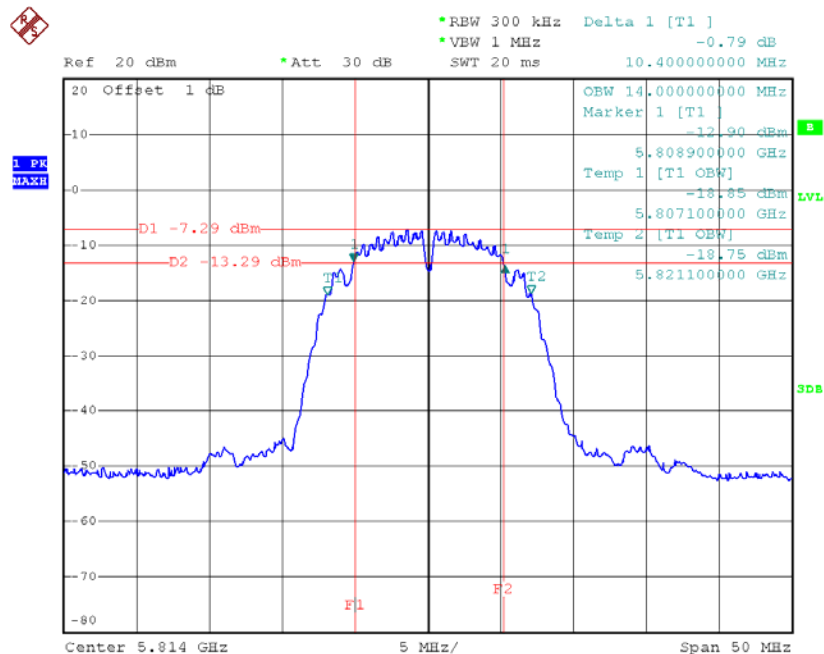
Date: 2.APR.2015 23:04:09

TX CH02



Date: 2.APR.2015 23:11:59

TX CH03



Date: 2.APR.2015 23:18:53

ATTACHMENT F - MAXIMUM OUTPUT POWER

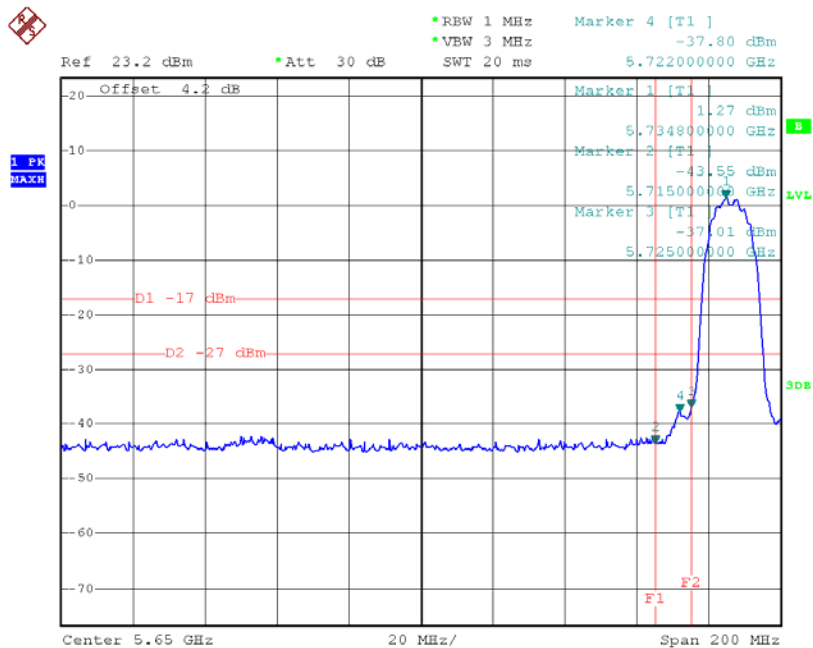
TX Mode / CH01, CH02, CH03

Channel	Frequency (MHz)	Output Power (dBm)	Duty Factor (dBm)	Output Power + Duty Factor (dBm)	Limit (dBm)	Limit (Watt)
CH01	5736	2.48	0.00	2.48	30.00	1.00
CH02	5762	1.82	0.00	1.82	30.00	1.00
CH03	5814	1.25	0.00	1.25	30.00	1.00

ATTACHMENT G - ANTENNA CONDUCTED SPURIOUS EMISSION

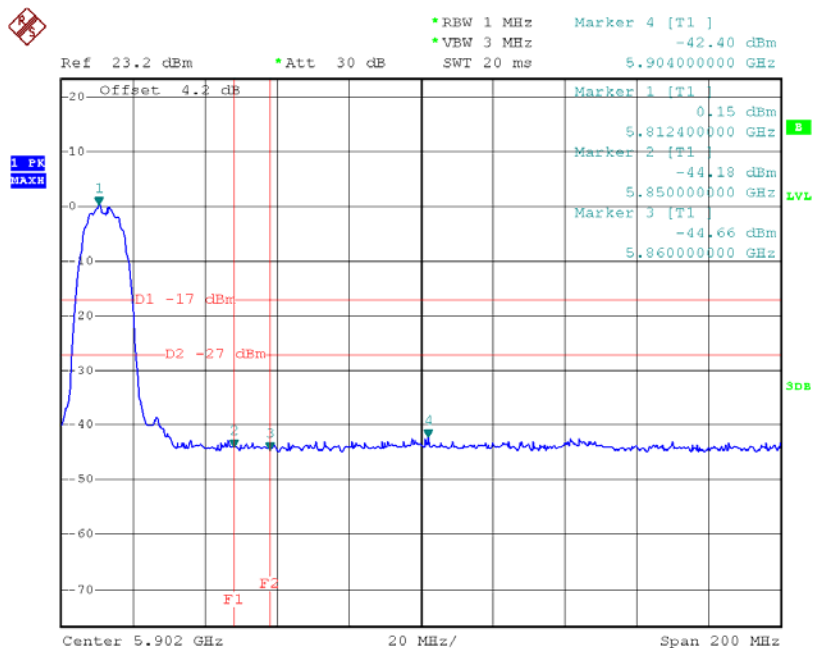
Test Mode: CH01, CH03

TX mode CH01



Date: 2.APR.2015 23:00:24

TX mode CH03



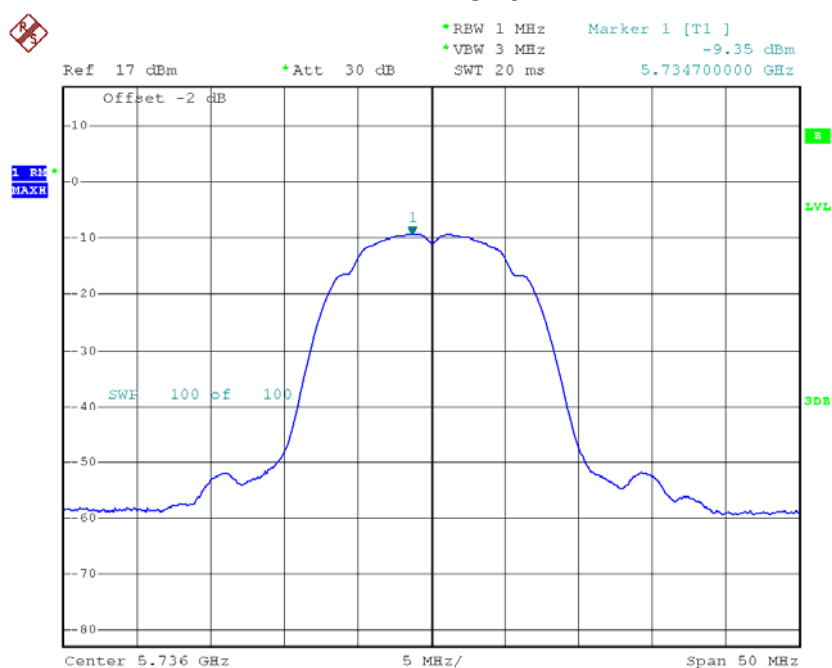
Date: 2.APR.2015 23:15:30

ATTACHMENT H - POWER SPECTRAL DENSITY

Test Mode: TX Mode / CH01, CH02, CH03

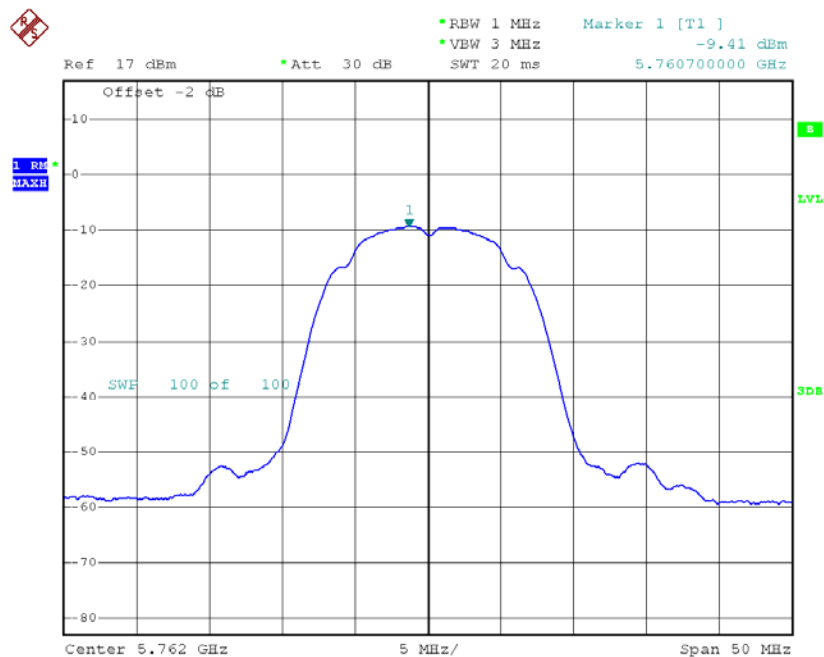
Channel	Frequency (MHz)	Power Density (dBm/MHz)	Duty Factor (dBm/MHz)	Power Density + Duty Factor (dBm/MHz)	Limit (dBm/MHz)
CH01	5736	-9.35	0.00	-9.35	30.00
CH02	5762	-9.41	0.00	-9.41	30.00
CH03	5814	-9.92	0.00	-9.92	30.00

TX CH01



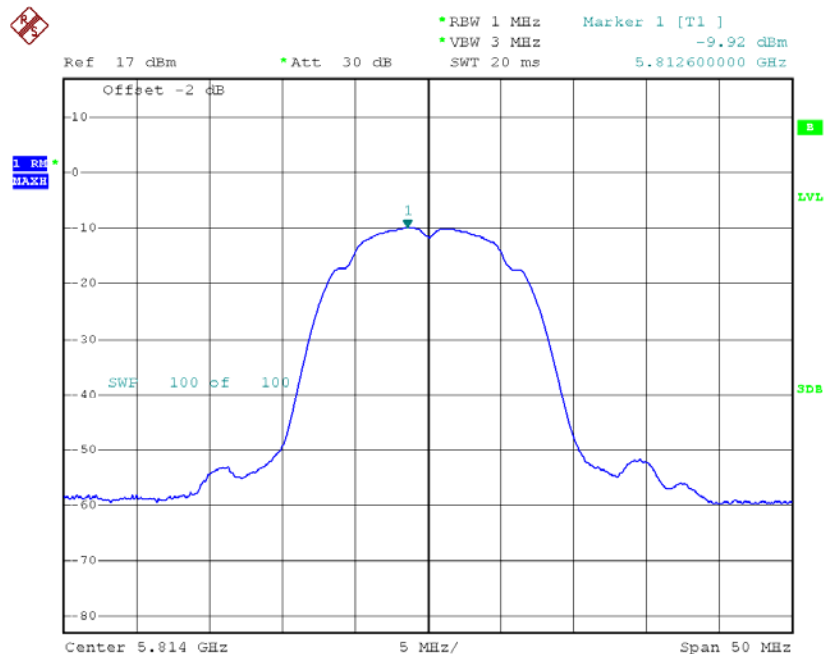
Date: 2.APR.2015 23:01:52

TX CH02



Date: 2.APR.2015 23:09:30

TX CH03



Date: 2.APR.2015 23:16:51

ATTACHMENT I - FREQUENCY STABILITY

Test Mode:	TX Mode / CH01
-------------------	-----------------------

Voltage vs. Frequency Stability

Voltage	Measurement Frequency (MHz)
(V)	5736.0000
132	5736.0568
120	5736.0572
108	5736.0571
Max. Deviation (MHz)	0.0572
Max. Deviation (ppm)	9.9721

Temperature vs. Frequency Stability

Voltage	Measurement Frequency (MHz)
(°C)	5736.0000
0	5736.0569
5	5736.0570
15	5736.0571
25	5736.0572
35	5736.0568
Max. Deviation (MHz)	0.0572
Max. Deviation (ppm)	9.9721