FCC&ISED Radio Test Report

FCC ID: 2AFWN-ST-GR42003N

IC: 22800- STGR42003N

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

Project No.	:	1707C027
Equipment	:	ESL Graphic TAG
Model Name	:	ST-GR42003N
Applicant	:	SOLUM CO.,LTD.
Address	:	4,5,6th F, 357, Guseong-ro, Giheung-gu, Gyeonggi-do, Yongin-si, South Korea （FCC） A-6th floor, 357, Guseong-ro, Giheung-gu Yongin-si, Gyeonggi-do 16914 Korea (Republic Of) （ISED）

Date of Receipt	:	Jul. 06, 2017
Date of Test	:	Jul. 06, 2017 ~ Jul. 27, 2017
Issued Date	:	Jul. 28, 2017
Tested by	:	BTL Inc.

Testing Engineer : Shawn Xiao

(Shawn Xiao)

Technical Manager : David Mao

(David Mao)

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BTL INC.

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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).

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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-FICP-1-1707C027	Original Issue.	Jul. 28, 2017

1. CERTIFICATION

Equipment	:	ESL Graphic TAG
Brand Name	:	N/A
Model Name	:	ST-GR42003N
Applicant	:	SOLUM CO.,LTD.
Manufacturer	:	SOLUM CO.,LTD.
Address	:	4,5,6th F, 357, Guseong-ro, Giheung-gu, Gyeonggi-do, Yongin-si, South Korea （FCC）
		A-6th floor, 357, Guseong-ro, Giheung-gu Yongin-si, Gyeonggi-do 16914 Korea (Republic Of) （ISED）
Factory	:	SOLUM VINA CO., LTD.
Address	:	Plot B3, Ba Thien 2 Industrial park, ThienKe Ward, BinhXuten District, VinhPhuc Province, 281200., Peple's Republic of Vietnam
Date of Test	:	Jul. 06, 2017 ~ Jul. 27, 2017
Test Sample	:	Engineering Sample
Standard(s)	:	FCC Part15, Subpart C (15.247) / ANSI C63.10-2013
		RSS-247 Issue 2, Feb. 2017
		RSS-GEN Issue 4, Nov 2014

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-FICP-1-1707C027) 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):

Applied Standard(s): FCC Part15 (15.247) , Subpart C Canada RSS-247 Issue 2, Feb. 2017, RSS-GEN Issue 4, Nov				
Standard(s) Section		Test Item	Judgment	Remark
FCC	**IC**			
15.207	RSS-GEN 8.8	Conducted Emission	N/A	**NOTE (1)**
15.247(d)	RSS-247 5.5	Antenna conducted Spurious Emission	PASS	
15.247(a)(2)	RSS-247 5.2 (a)	6dB Bandwidth	PASS	
15.247(b)(3)	RSS-247 5.4 (d)	Peak Output Power	PASS	
15.247(e)	RSS-247 5.2 (b)	Power Spectral Density	PASS	
15.203	-	Antenna Requirement	PASS	
15.247(d)/ 15.205/ 15.209	RSS-247 5.5	Transmitter Radiated Emissions	PASS	

NOTE:

(1)" N/A" denotes test is not applicable to this device.

2.1 TEST FACILITY

The test facilities used to collect the test data in this report is at the location of No.3, Jinshagang 1st Road, Shixia, Dalang Town, Dongguan, Guangdong, China.
BTL's test firm number for FCC: 319330
BTL's test firm number for IC: 4428B-1

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 measurement instrumentation uncertainty considerations contained in CISPR 16-4-2.

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. Radiated Measurement:

Test Site	Method	Measurement Frequency Range	Ant. H / V	U, (dB)
DG-CB03	CISPR	9KHz~30MHz	V	3.79
		9KHz~30MHz	H	3.57
		30MHz ~ 200MHz	V	3.82
		30MHz ~ 200MHz	H	3.78
		200MHz ~ 1,000MHz	V	4.10
		200MHz ~ 1,000MHz	H	4.06
		1GHz~18GHz	V	3.12
		1GHz~18GHz	H	3.68
		18GHz~40GHz	V	4.15
		18GHz~40GHz	H	4.14

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	ESL Graphic TAG	
Brand Name	N/A	
Model Name	ST-GR42003N	
Model Difference	N/A	
Product Description	Operation Frequency	2405~2480 MHz
	Modulation Technology	O-QPSK
	Bit Rate of Transmitter	250 kbps
	Output Power (Max.)	2.26 dBm
Power Source	Support from Lithium Battery (CR2450).	
Power Rating	DC 3V	

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)
01	2405	09	2445
02	2410	10	2450
03	2415	11	2455
04	2420	12	2460
05	2425	13	2465
06	2430	14	2470
07	2435	15	2475
08	2440	16	2480

3. Table for Filed Antenna:

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	N/A	N/A	Printed	N/A	-3.51

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 **NOTE (1)**

For Conducted Test	
Final Test Mode	Description
N/A	” N/A” denotes test is not applicable to this device.

For Radiated Test	
Final Test Mode	Description
Mode 1	TX Mode **NOTE (1)**

Note:

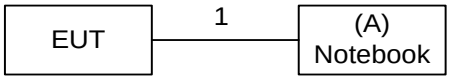
(1) The measurements are performed at the high, middle, low available channels.

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 power parameters of IEEE 802.15.4.

Test Software Version	N/A		
Frequency (MHz)	2405	2445	2480
IEEE 802.15.4	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.
A	Notebook	Lenovo	E46L	DOC	EB22953770

Item	Shielded Type	Ferrite Core	Length	Note
1	NO	NO	1.2m	USB Cable

4. EMC EMISSION TEST

4.1 CONDUCTED EMISSION MEASUREMENT

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

Frequency of Emission (MHz)	Conducted Limit (dBμV)	
	Quasi-peak	Average
0.15 -0.5	66 to 56*	56 to 46*
0.50 -5.0	56	46
5.0 -30.0	60	50

Note:

(1) The limit of " * " decreases with the logarithm of the frequency

(2) The test result calculated as following:
Measurement Value = Reading Level + Correct Factor
Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain(if use)
Margin Level = Measurement Value - Limit Value

The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

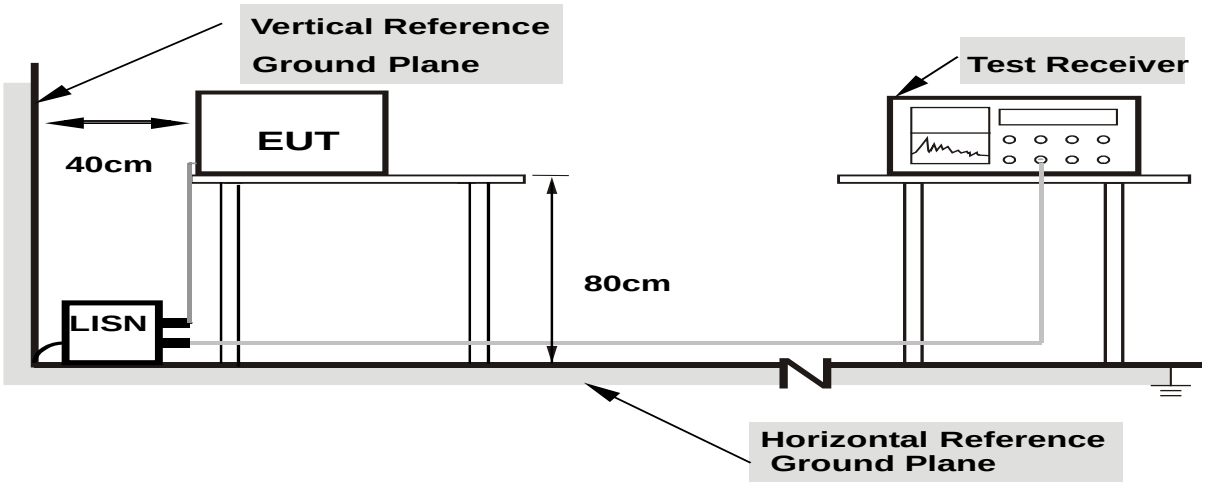
4.1.2 TEST PROCEDURE

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 equipment 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



Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

4.1.5 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical function (as a customer would normally use it), EUT was programmed to be in continuously transmitting/receiving data or hopping on mode.

4.1.6 EUT TEST CONDITIONS

Temperature: N/A
Relative Humidity: N/A
Test Voltage: N/A

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.
(3) " N/A" denotes test is not applicable to this device.

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) & RSS-247 5.5, then the 15.209(a) & RSS-Gen limit in the table below has to be followed.

LIMITS OF RADIATED EMISSION MEASUREMENT (9KHz-1000MHz)

Frequency (MHz)	Field Strength (microvolts/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
960~1000	500	3

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

Frequency (MHz)	Band edge at 3m (dBµV/m)		Harmonic at 1.5m (dBµV/m)	
	Peak	Average	Peak	Average
Above 1000	74	54	80 (Note 5)	60(Note 5)

Notes:

(1) The limit for radiated test was performed according to FCC PART 15C/RSS-247.

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

(3) Emission level (dBuV/m)=20log Emission level (uV/m).

(4) The test result calculated as following:
Measurement Value = Reading Level + Correct Factor
Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain(if use)
Margin Level = Measurement Value - Limit Value

(5)

$$FS_{\text{limit}} = FS_{\max} - 20\log\left(\frac{d_{\text{limit}}}{d_{\text{measure}}}\right)$$

20log d limit/d measure=20log 3/1.5=6dB.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RBW / VBW (Emission in restricted band)	RBW 1MHz VBW 3MHz peak detector for Pk value RMS detector for AV value

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9KHz~90KHz for PK/AVG detector
Start ~ Stop Frequency	90KHz~110KHz for QP detector
Start ~ Stop Frequency	110KHz~490KHz for PK/AVG detector
Start ~ Stop Frequency	490KHz~30MHz for QP detector
Start ~ Stop Frequency	30MHz~1000MHz for QP detector

4.2.2 TEST PROCEDURE

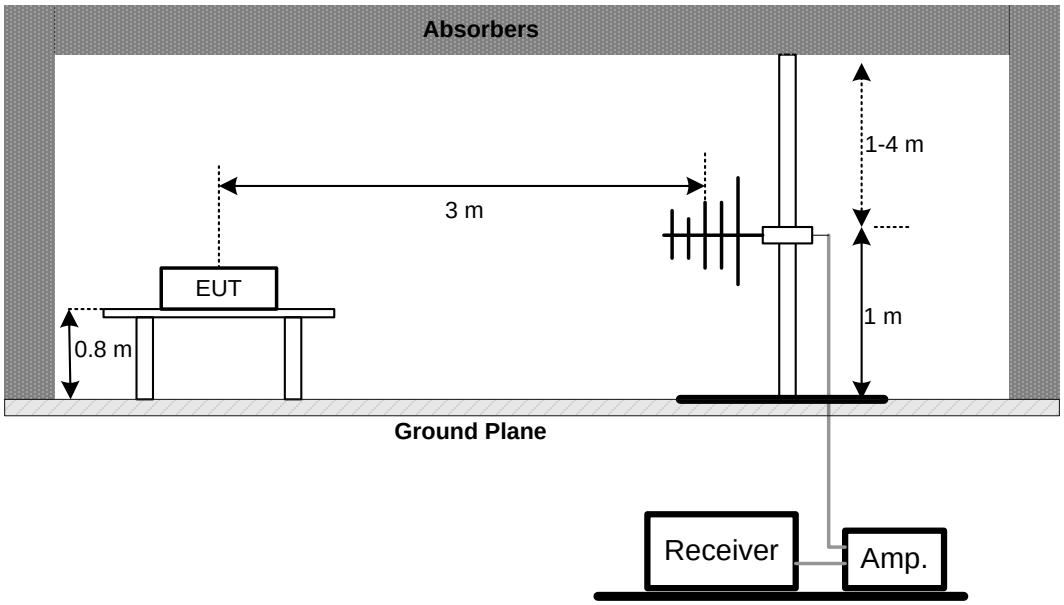
a. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1GHz)
b. The measuring distance 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 0.8 m or 1.5 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.
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

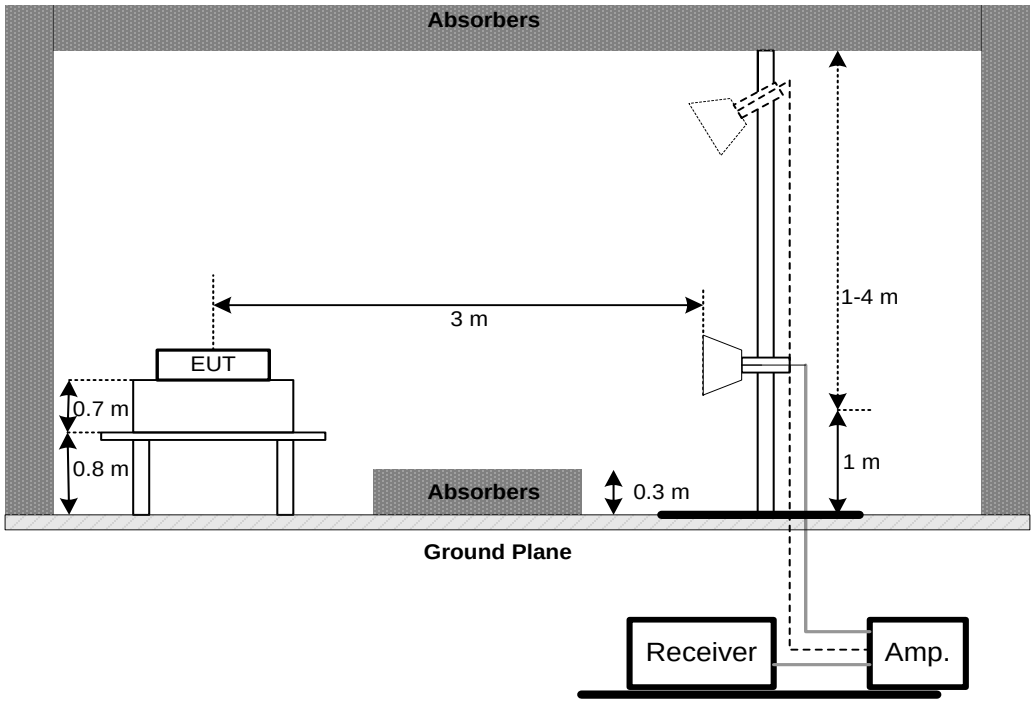
No deviation

4.2.4 TEST SETUP

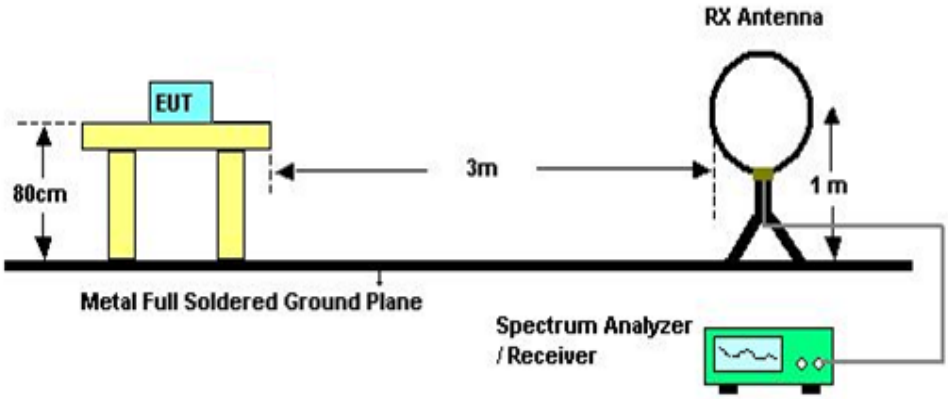
(A) Radiated Emission Test Set-Up Frequency Below 1 GHz



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



(C) For Radiated Emissions Below 30MHz



4.2.5 EUT TEST CONDITIONS

Temperature: 25°C
Relative Humidity: 55%
Test Voltage: DC 3V

4.2.6TEST RESULTS (9KHZ 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 (specific distance / test distance) (dB).
(3) Limit line = specific limits (dBuV) + distance extrapolation factor.

4.2.7TEST RESULTS (30MHZ TO 1000 MHZ)

Please refer to the Attachment C.

Remark:

(1) Measuring frequency range from 30MHz to 1000MHz.
(2) If the peak scan value lower limit more than 20dB, then this signal data does not show in table.

4.2.8TEST RESULTS (ABOVE 1000 MHZ)

Please refer to the Attachment D.

Remark:

(1) Radiated emissions measured in frequency range above 1000MHz were made with an instrument using Peak detector mode and AV detector mode of the emission
(2) A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.
(3) EUT Orthogonal Axis:
"X" - denotes Laid on Table,"Y" - denotes Vertical Stand,"Z" - denotes Side Stand
(4) During the measurements above 1 GHz it is taken care of that the EUT is always within the 3 dB cone of radiation BW of the used antenna
(5) No limit: This is fundamental signal, the judgment is not applicable.
For fundamental signal judgment was referred to Peak output test.

5. BANDWIDTH TEST

5.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C/ RSS-GEN and RSS-247				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(a)(2) RSS-GEN section 6.6 RSS-247 5.2 (a)	Bandwidth	>= 500KHz (6dB bandwidth)	2405~2480 MHz	PASS

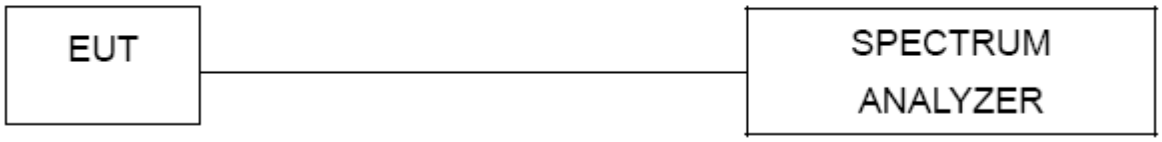
5.1.1 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
b. Spectrum Setting : RBW= 100KHz, VBW=300KHz, Sweep time = 2.5 ms.

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: DC 3V

5.1.6 TEST RESULTS

Please refer to the Attachment E.

6. MAXIMUM OUTPUT POWER TEST

6.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C/ RSS-247				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(b)(3) RSS-247 5.4 (d)	Maximum Output Power	1 watt or 30dBm	2405~2480 MHz	PASS

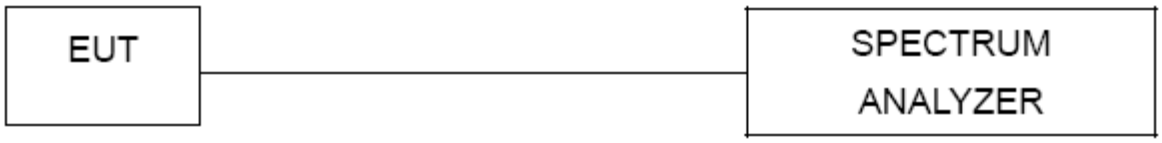
6.1.1 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
b. The maximum peak conducted output power was performed in accordance with method 9.1.1 of FCC KDB 558074 D01 DTS Meas Guidance v03r05.
c. Spectrum Setting : RBW= 3MHz, VBW=10MHz, Sweep time = 2.5 ms.

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: DC 3V

6.1.6 TEST RESULTS

Please refer to the Attachment F.

7. ANTENNA CONDUCTED SPURIOUS EMISSION

7.1 APPLIED PROCEDURES / LIMIT

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

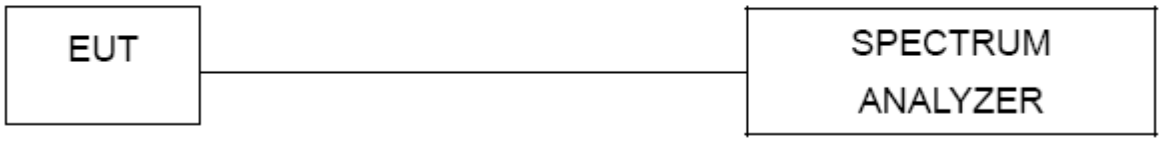
7.1.1 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
b. Spectrum Setting : RBW= 100KHz, VBW=300KHz, Sweep time = 10 ms.
c. Offset=antenna gain + cable loss

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 OPERATION CONDITIONS

Temperature: 25°C
Relative Humidity: 55%
Test Voltage: DC 3V

7.1.6 TEST RESULTS

Please refer to the Attachment G.

8. POWER SPECTRAL DENSITY TEST

8.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C / RSS-247				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(e) RSS-247 5.2 (b)	Power Spectral Density	8 dBm (in any 3KHz)	2405~2480 MHz	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 Setting: RBW=3KHz, VBW=10 KHz, Sweep time = auto.

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: DC 3V

8.1.6 TEST RESULTS

Please refer to the Attachment H.

9. MEASUREMENT INSTRUMENTS LIST

Radiated Emission Measurement - Below 1GHz					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Antenna	Schwarbeck	VULB9160	9160-3232	Mar. 26, 2018
2	Amplifier	HP	8447D	2944A09673	Oct. 20, 2017
3	Receiver	Agilent	N9038A	MY52130039	Sep. 04, 2017
4	Cable	emci	LMR-400(30MHz-1 GHz)(8m+5m)	N/A	Jun. 26, 2018
5	Controller	CT	SC100	N/A	N/A
6	Controller	MF	MF-7802	MF780208416	N/A
7	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A
8	Active Loop Antenna	R&S	HFH2-Z2	830749/020	Sep. 07, 2017

Radiated Emission Measurement - Above 1GHz					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Double Ridged Guide Antenna	ETS	3115	75789	Mar. 26, 2018
2	Broad-Band Horn Antenna	Schwarzbeck	BBHA 9170	9170319	Jun. 08, 2018
3	Amplifier	Agilent	8449B	3008A02274	May. 16, 2018
4	Microwave Preamplifier With Adaptor	EMC INSTRUMENT	EMC2654045	980039 & HA01	Mar. 26, 2018
5	Receiver	Agilent	N9038A	MY52130039	Sep. 04, 2017
6	Antenna	EM	EM-6876-1	230	Jul. 07, 2018
7	Controller	CT	SC100	N/A	N/A
8	Controller	MF	MF-7802	MF780208416	N/A
9	Cable	emci	EMC104-SM-SM-1 2000(12m)	N/A	Jun. 26, 2018
10	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A

6dB Bandwidth Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP40	100185	Sep. 04, 2017

Peak Output Power Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP40	100185	Sep. 04, 2017

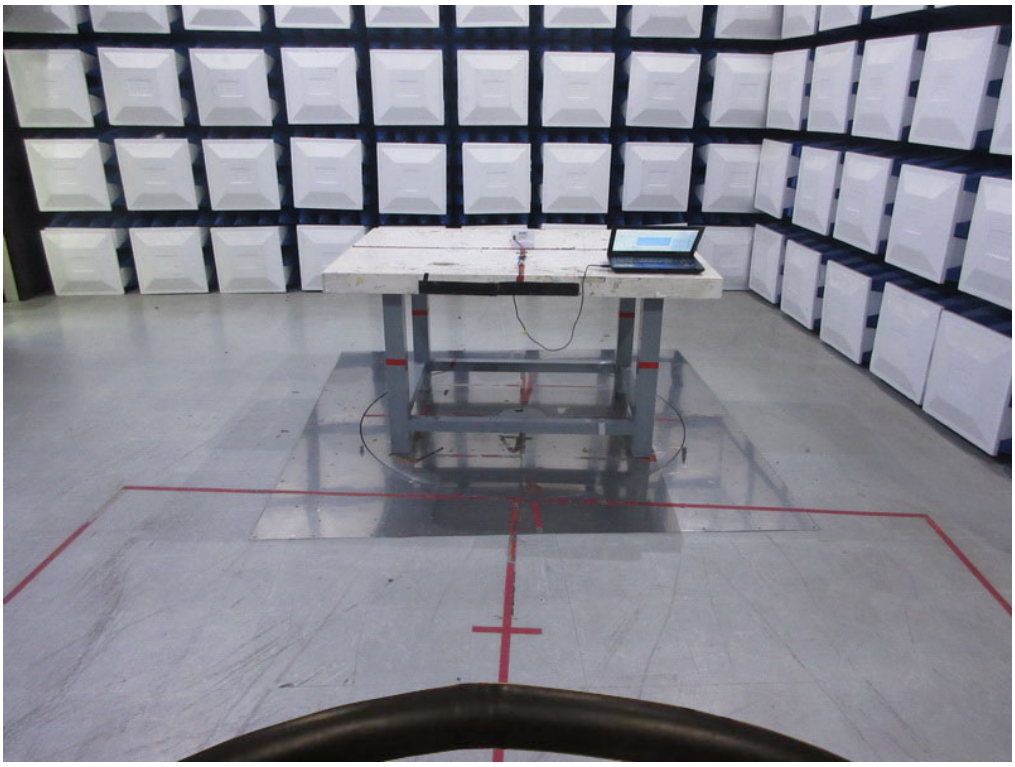
Antenna Conducted Spurious Emission Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP40	100185	Sep. 04, 2017

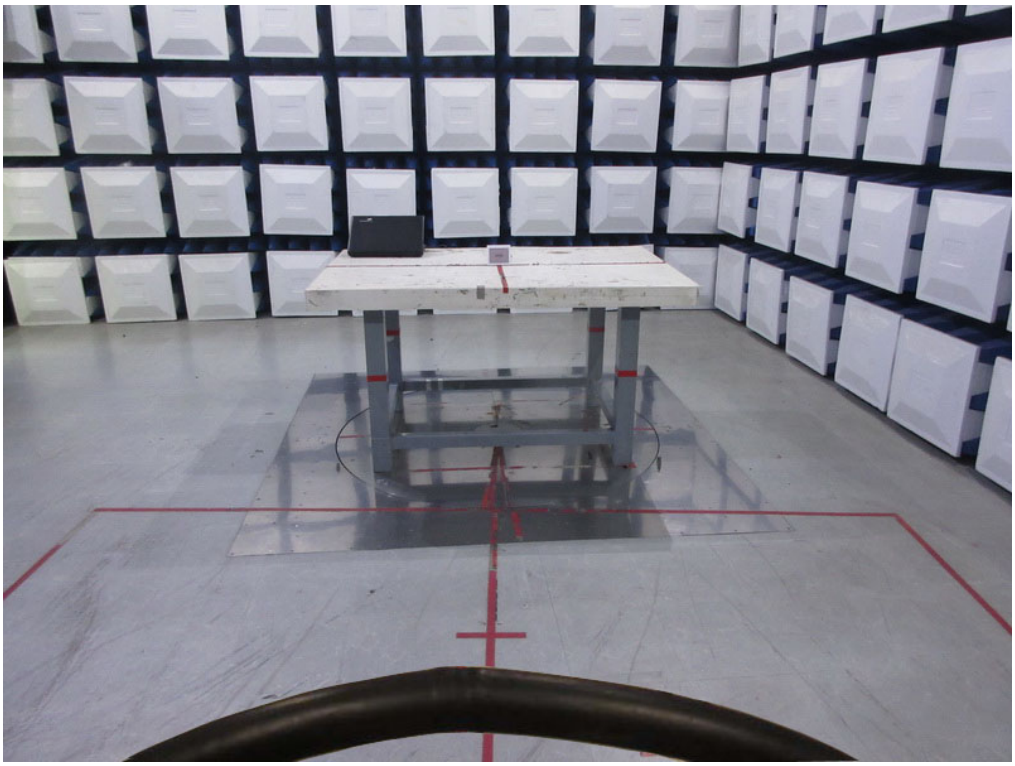
Power Spectral Density Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP40	100185	Sep. 04, 2017

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

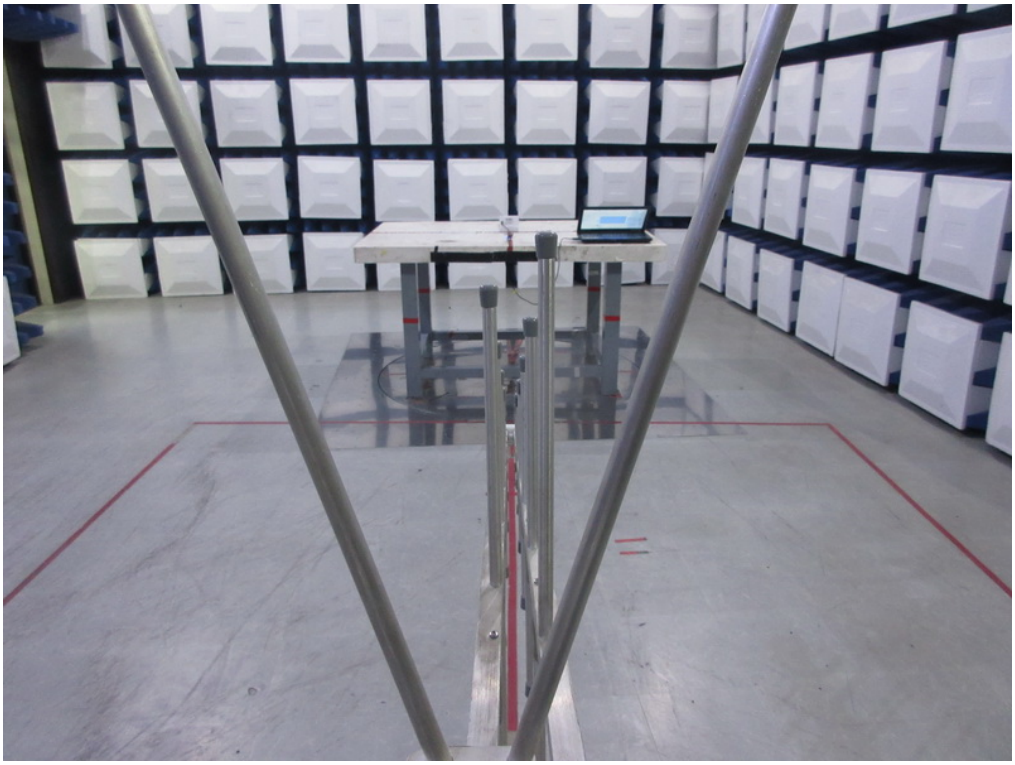
10. EUT TEST PHOTO

9kHz to 30MHz Radiated Measurement Photos

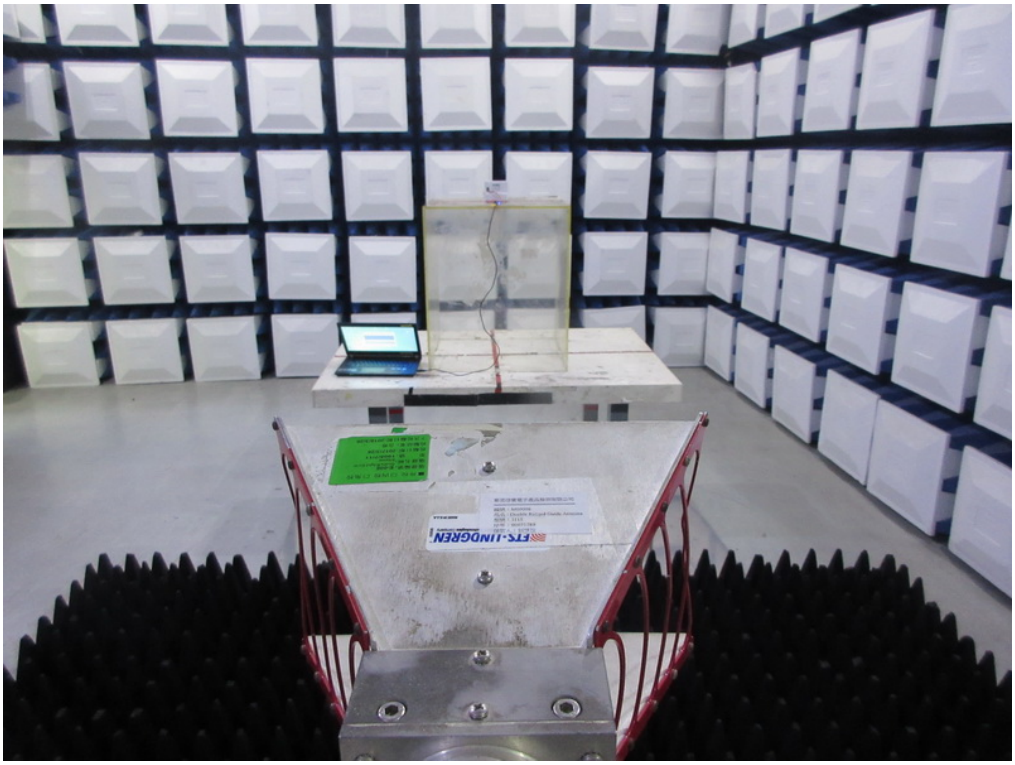




30MHz to 1000MHz Radiated Measurement Photos



Above 1GHz Radiated Measurement Photos



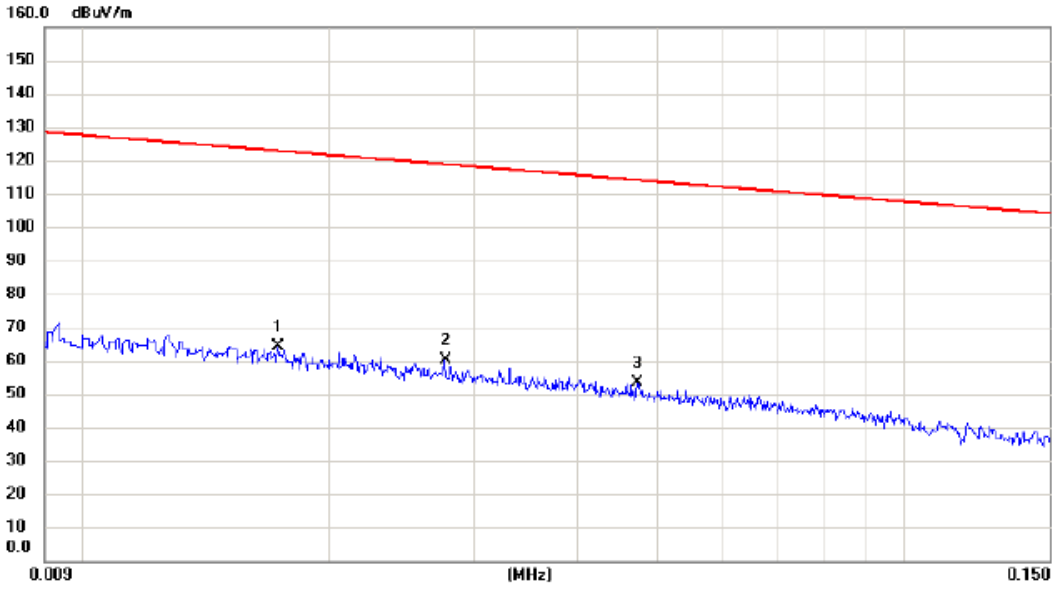
ATTACHMENT A - CONDUCTED EMISSION

Test Mode :	N/A
Note:	” N/A” denotes test is not applicable to this device.

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

Test Mode:	TX Mode

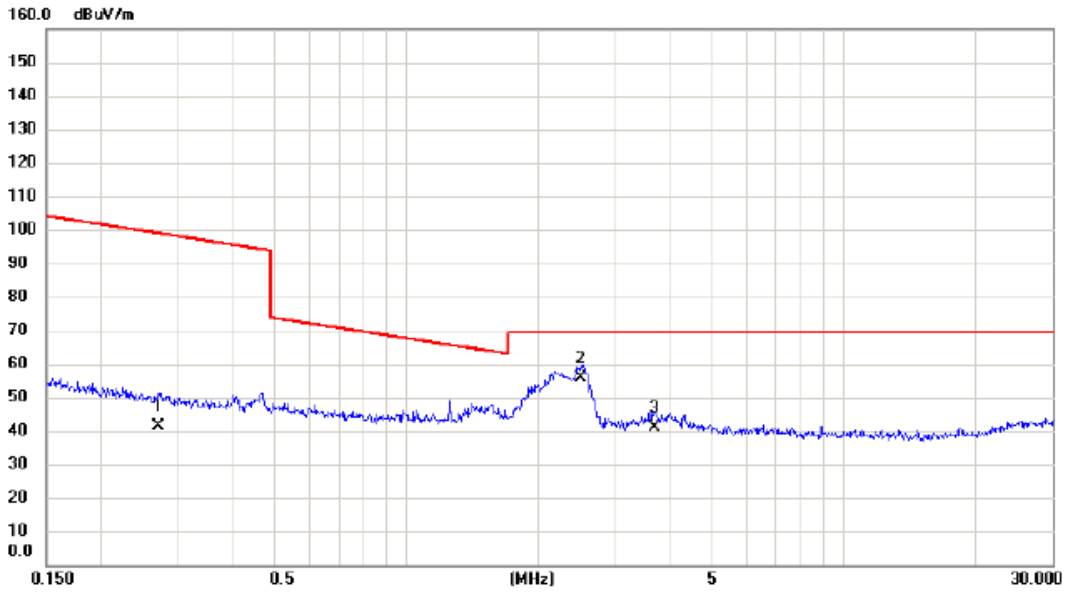
Ant 0°



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	0.0173	44.35	19.97	64.32	122.84	-58.52	AVG	
2		0.0277	40.69	19.39	60.08	118.76	-58.68	AVG	
3		0.0473	34.59	18.80	53.39	114.11	-60.72	AVG	

Test Mode:	TX Mode

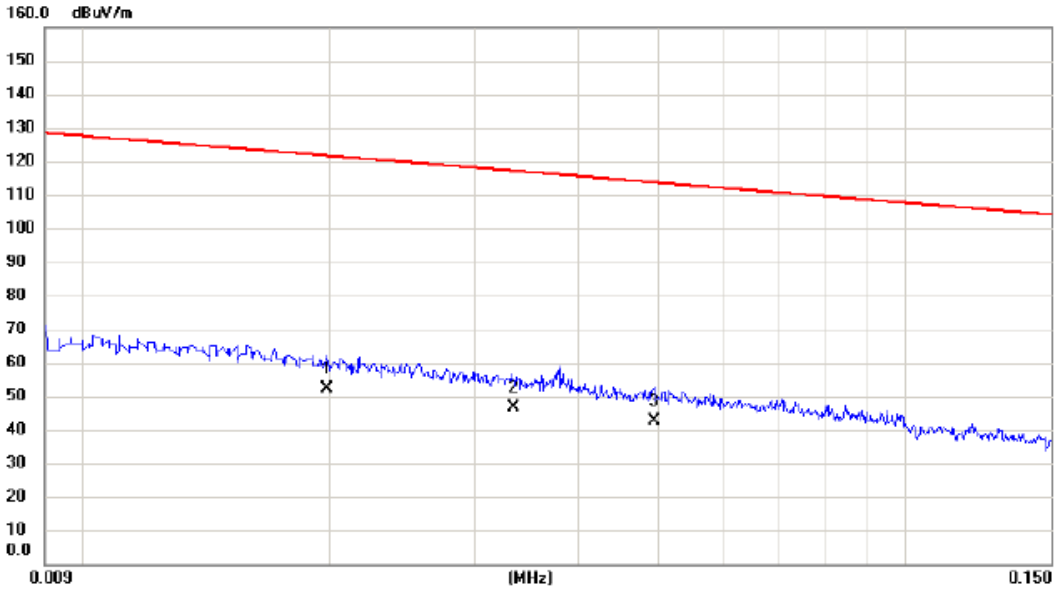
Ant 0°



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		0.2700	24.89	16.64	41.53	98.98	-57.45	AVG	
2	*	2.5132	40.32	15.37	55.69	69.54	-13.85	QP	
3		3.6806	25.77	15.04	40.81	69.54	-28.73	QP	

Test Mode:	TX Mode

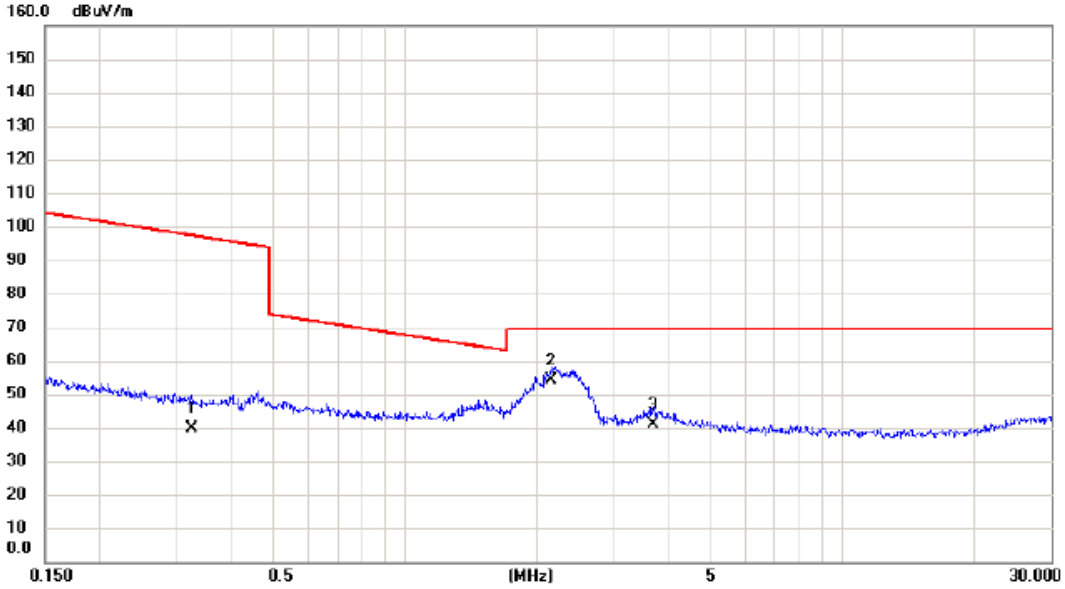
Ant 90°



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	0.0198	32.63	19.65	52.28	121.67	-69.39	AVG	
2		0.0334	27.43	19.22	46.65	117.13	-70.48	AVG	
3		0.0495	23.79	18.73	42.52	113.71	-71.19	AVG	

Test Mode:	TX Mode

Ant 90°

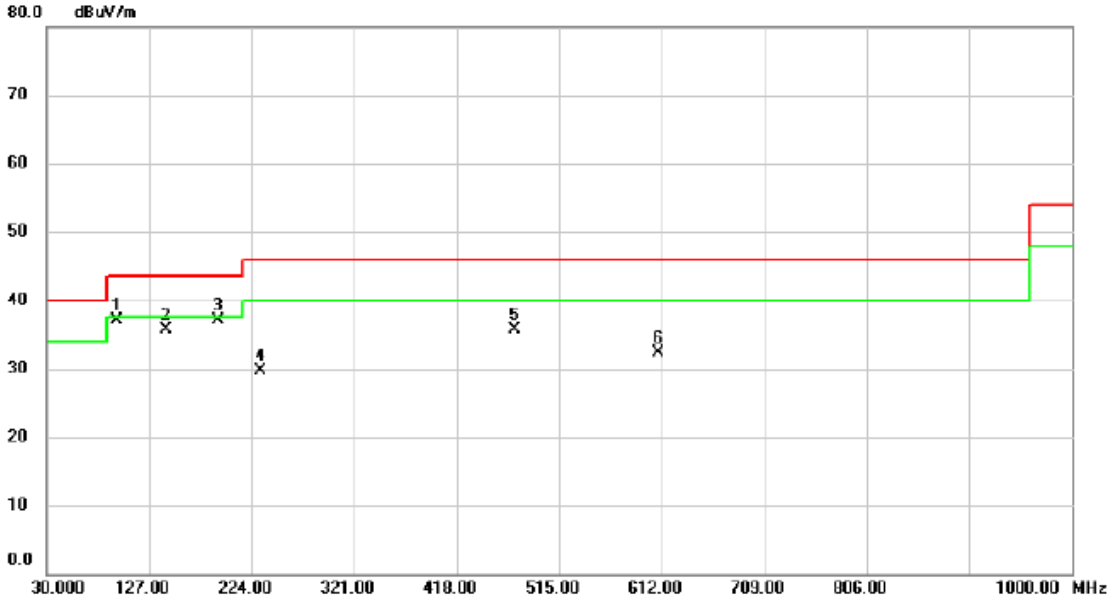


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		0.3251	23.22	16.60	39.82	97.36	-57.54	AVG	
2	*	2.1552	38.61	15.46	54.07	69.54	-15.47	QP	
3		3.6806	26.11	15.04	41.15	69.54	-28.39	QP	

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

Test Mode:	TX 2405MHz

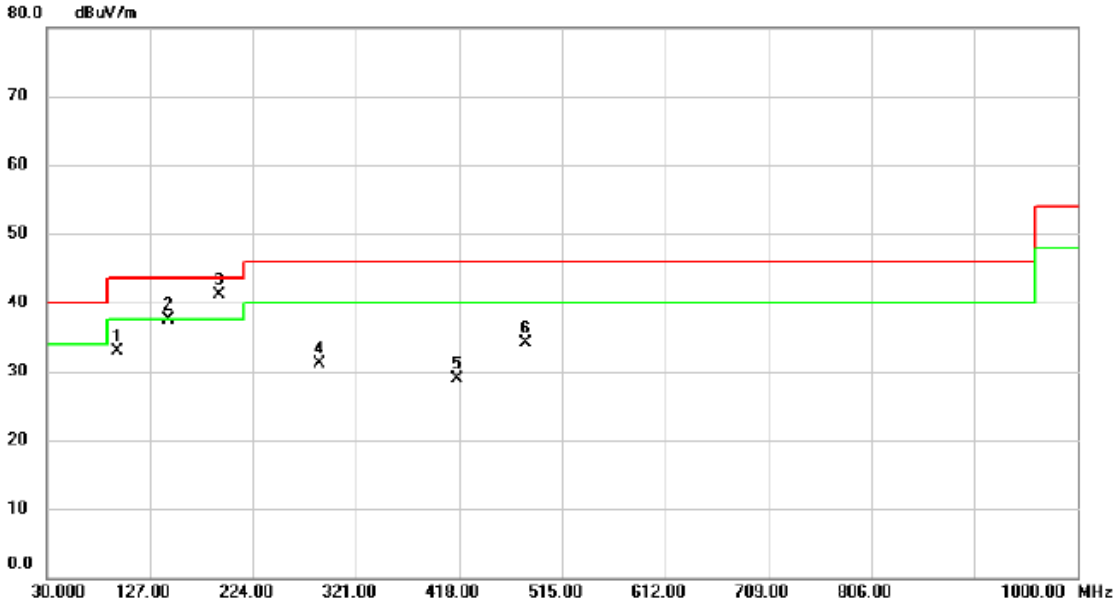
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		95.960	55.65	-18.56	37.09	43.50	-6.41	peak	
2		143.490	49.59	-13.97	35.62	43.50	-7.88	peak	
3	*	191.990	50.18	-13.02	37.16	43.50	-6.34	peak	
4		232.730	43.87	-14.19	29.68	46.00	-16.32	peak	
5		473.290	45.16	-9.36	35.80	46.00	-10.20	peak	
6		608.120	38.56	-6.27	32.29	46.00	-13.71	peak	

Test Mode:	TX 2405MHz

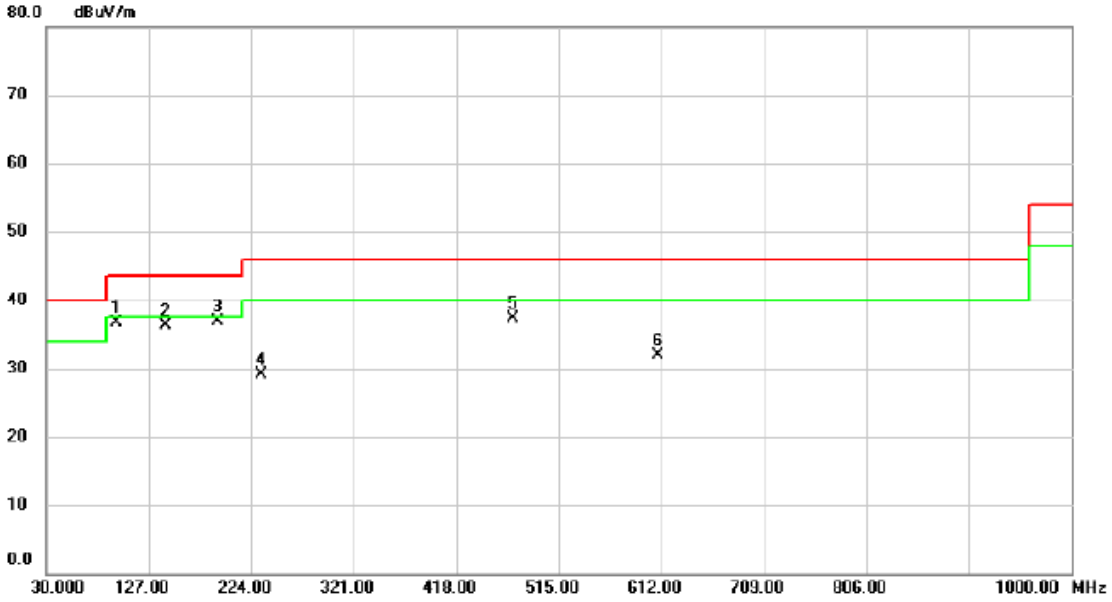
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		95.960	51.49	-18.56	32.93	43.50	-10.57	peak	
2		144.460	51.34	-13.91	37.43	43.50	-6.07	peak	
3	*	191.990	54.19	-13.02	41.17	43.50	-2.33	peak	
4		287.050	45.45	-14.37	31.08	46.00	-14.92	peak	
5		416.060	39.85	-10.91	28.94	46.00	-17.06	peak	
6		481.050	43.33	-9.18	34.15	46.00	-11.85	peak	

Test Mode:	TX 2445MHz

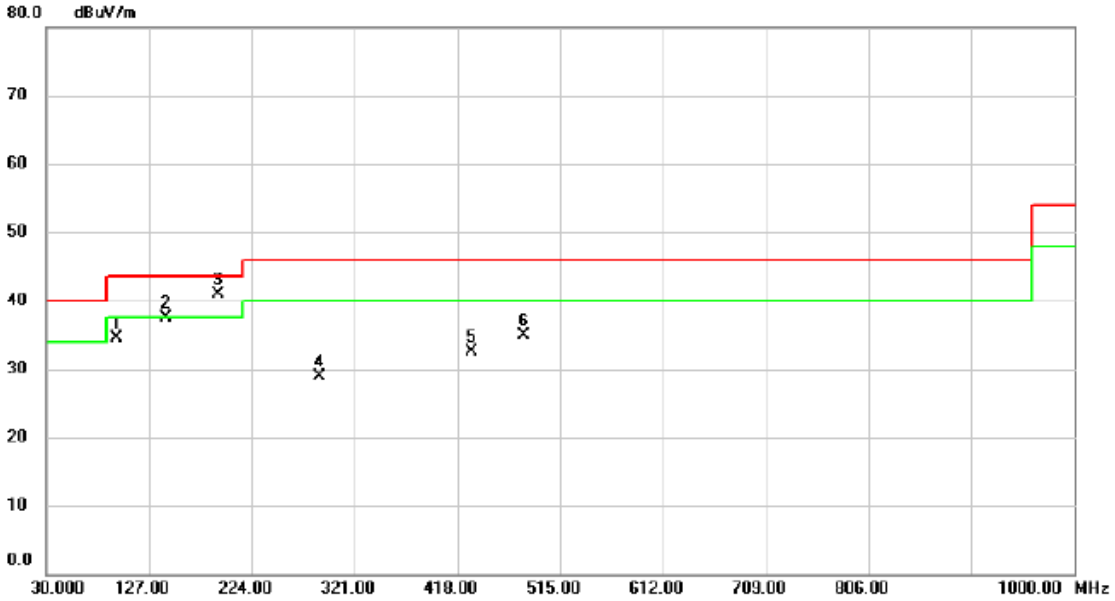
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		95.960	55.29	-18.56	36.73	43.50	-6.77	peak	
2		143.490	50.21	-13.97	36.24	43.50	-7.26	peak	
3	*	191.990	50.01	-13.02	36.99	43.50	-6.51	peak	
4		233.700	43.37	-14.22	29.15	46.00	-16.85	peak	
5		471.350	46.66	-9.41	37.25	46.00	-8.75	peak	
6		608.120	38.26	-6.27	31.99	46.00	-14.01	peak	

Test Mode:	TX 2445MHz

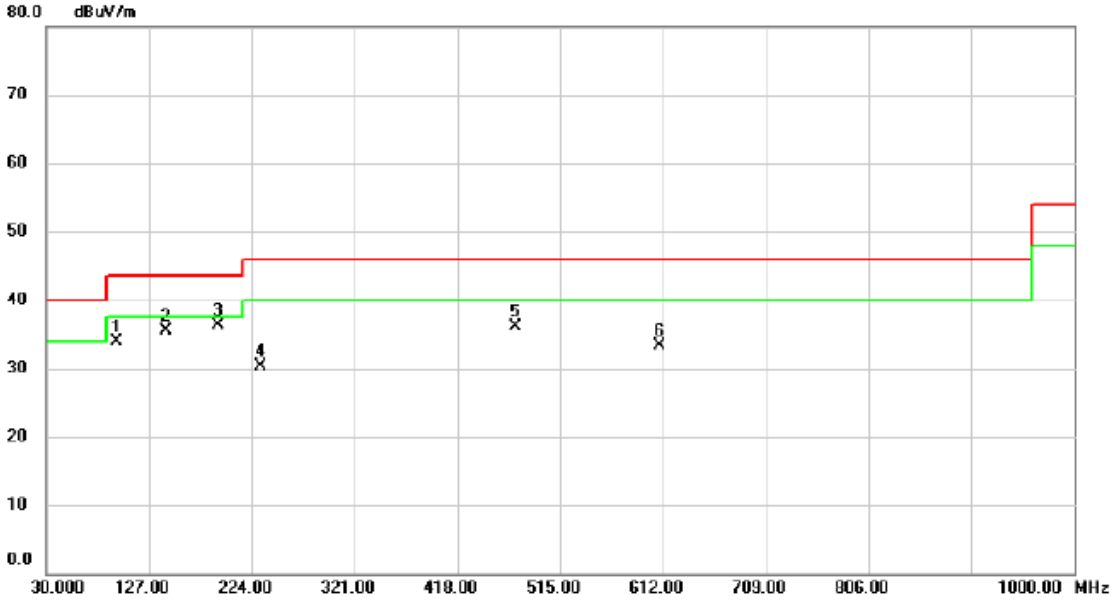
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		95.960	53.12	-18.56	34.56	43.50	-8.94	peak	
2		143.490	51.45	-13.97	37.48	43.50	-6.02	peak	
3	*	191.990	54.01	-13.02	40.99	43.50	-2.51	peak	
4		288.020	43.21	-14.31	28.90	46.00	-17.10	peak	
5		431.580	43.03	-10.46	32.57	46.00	-13.43	peak	
6		480.080	44.14	-9.21	34.93	46.00	-11.07	peak	

Test Mode:	TX 2480MHz

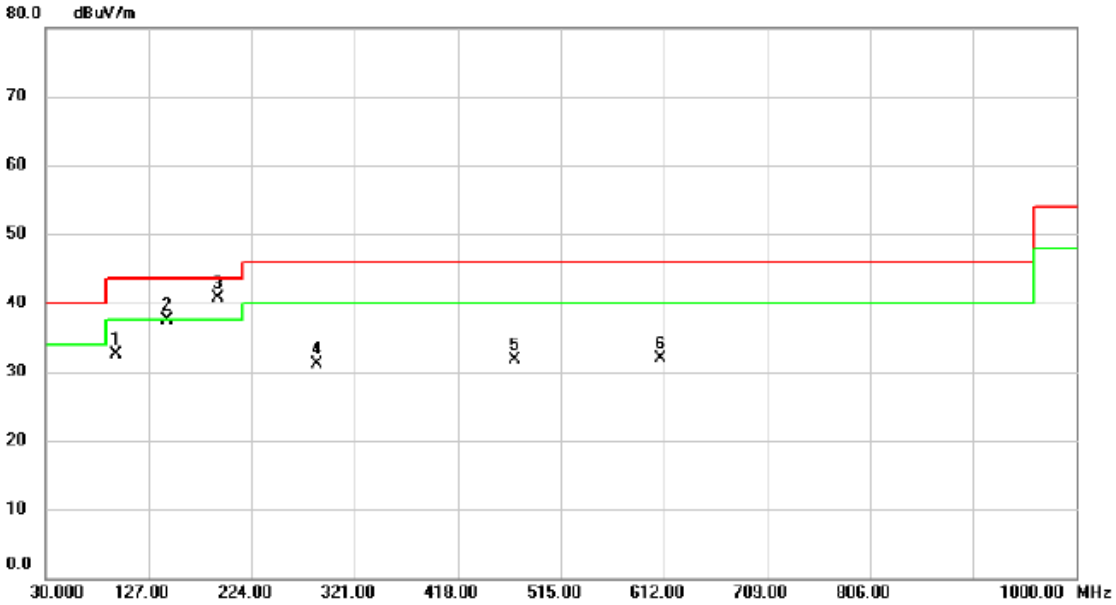
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		95.960	52.43	-18.56	33.87	43.50	-9.63	peak	
2		143.490	49.55	-13.97	35.58	43.50	-7.92	peak	
3	*	191.990	49.28	-13.02	36.26	43.50	-7.24	peak	
4		232.730	44.55	-14.19	30.36	46.00	-15.64	peak	
5		473.290	45.41	-9.36	36.05	46.00	-9.95	peak	
6		608.120	39.51	-6.27	33.24	46.00	-12.76	peak	

Test Mode:	TX 2480MHz

Horizontal

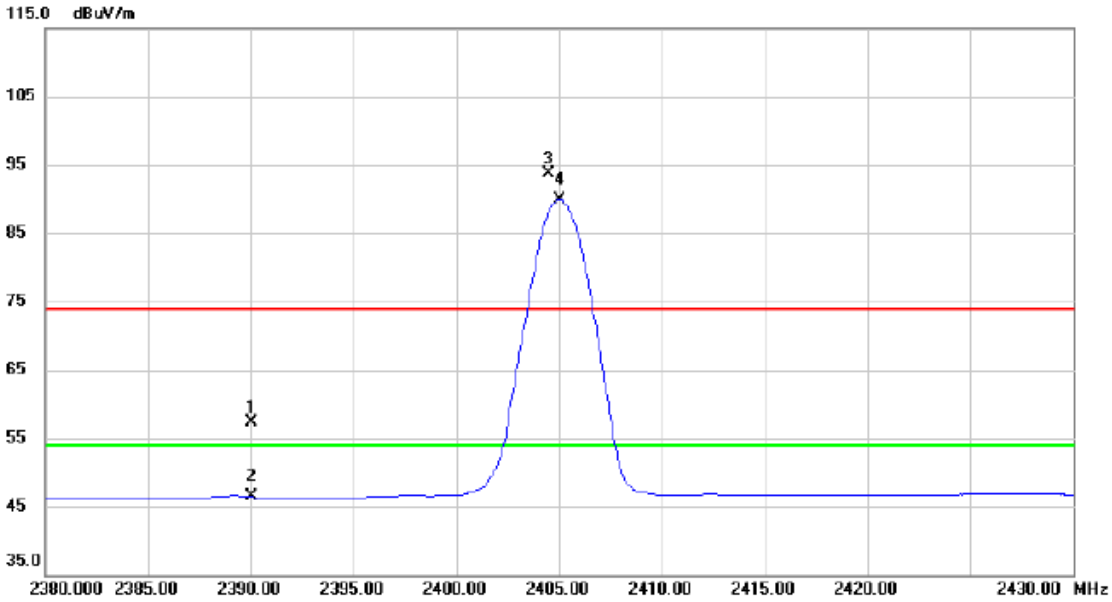


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		95.960	51.03	-18.56	32.47	43.50	-11.03	peak	
2		144.460	51.32	-13.91	37.41	43.50	-6.09	peak	
3	*	191.990	53.79	-13.02	40.77	43.50	-2.73	peak	
4		285.110	45.54	-14.48	31.06	46.00	-14.94	peak	
5		471.350	41.21	-9.41	31.80	46.00	-14.20	peak	
6		608.120	38.19	-6.27	31.92	46.00	-14.08	peak	

ATTACHMENT D - RADIATED EMISSION (ABOVE 1000MHZ)

Test Mode :	TX 2405MHz

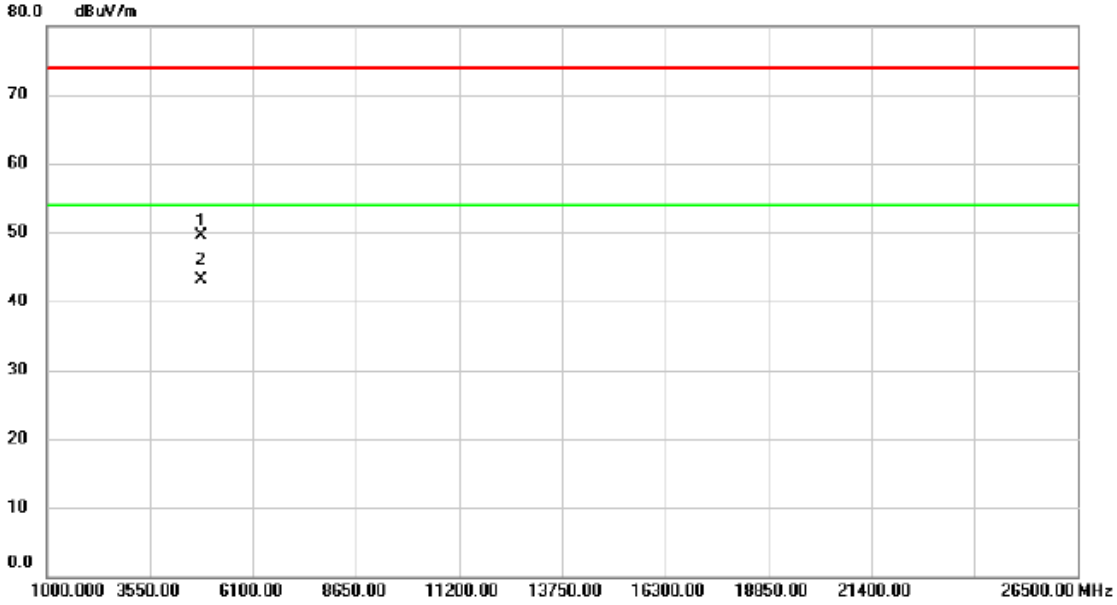
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2390.000	24.17	33.05	57.22	74.00	-16.78	peak	
2		2390.000	13.38	33.05	46.43	54.00	-7.57	AVG	
3	X	2404.500	60.67	33.11	93.78	74.00	19.78	peak	No Limit
4	*	2405.000	56.84	33.11	89.95	54.00	35.95	AVG	No Limit

Test Mode :	TX 2405MHz

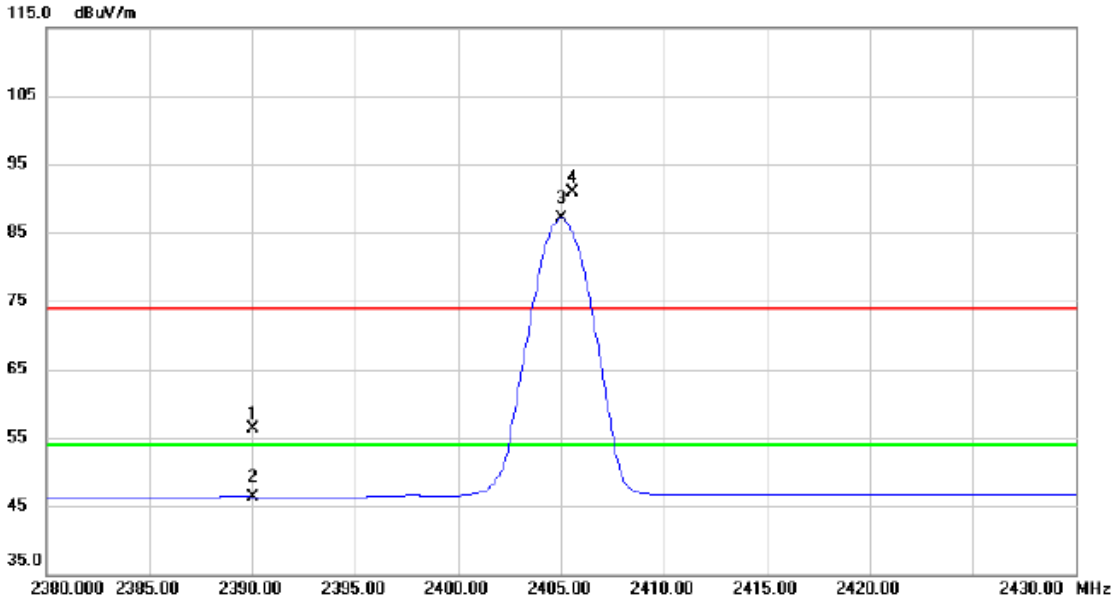
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4809.015	43.24	6.28	49.52	74.00	-24.48	peak	
2	*	4809.030	36.77	6.28	43.05	54.00	-10.95	AVG	

Test Mode :	TX 2405MHz

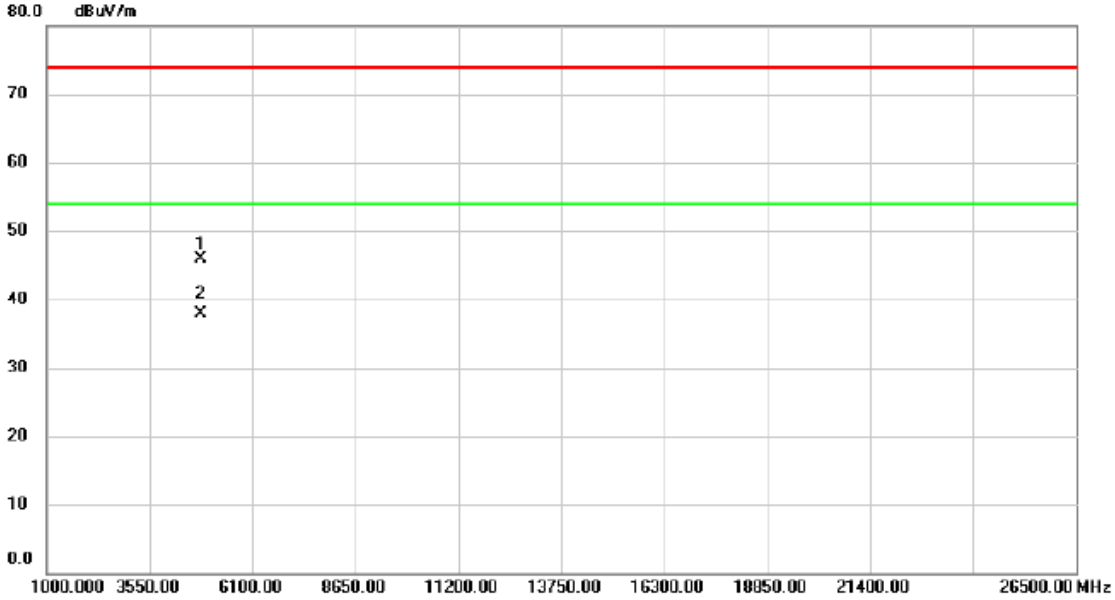
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2390.000	23.17	33.05	56.22	74.00	-17.78	peak	
2		2390.000	13.33	33.05	46.38	54.00	-7.62	AVG	
3	*	2405.050	53.95	33.11	87.06	54.00	33.06	AVG	No Limit
4	X	2405.550	57.80	33.11	90.91	74.00	16.91	peak	No Limit

Test Mode :	TX 2405MHz

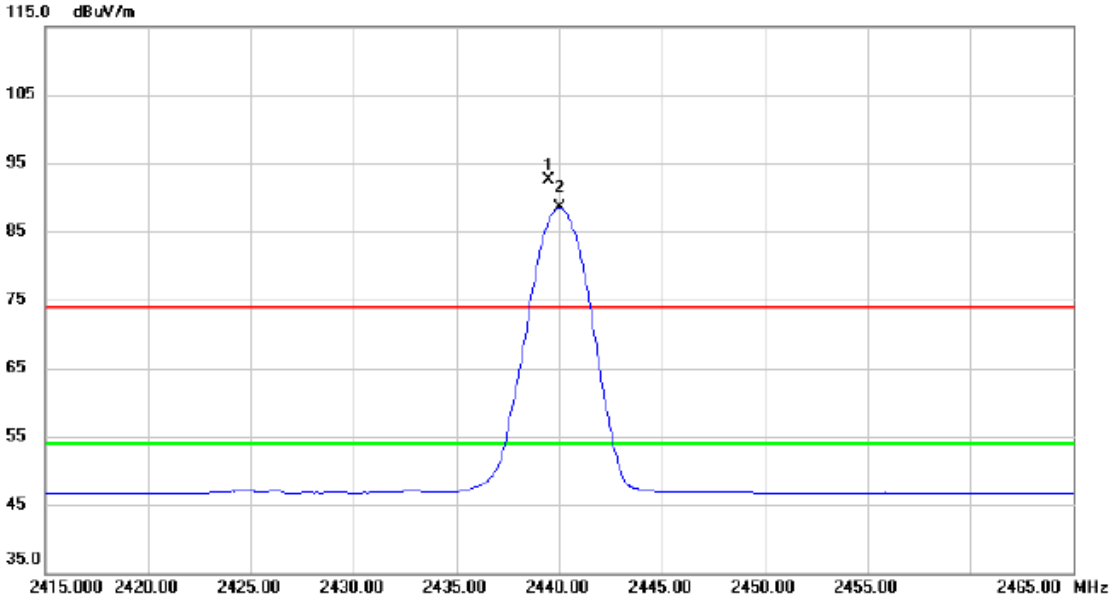
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4808.870	39.56	6.28	45.84	74.00	-28.16	peak	
2	*	4811.045	31.71	6.28	37.99	54.00	-16.01	AVG	

Test Mode :	TX 2445MHz

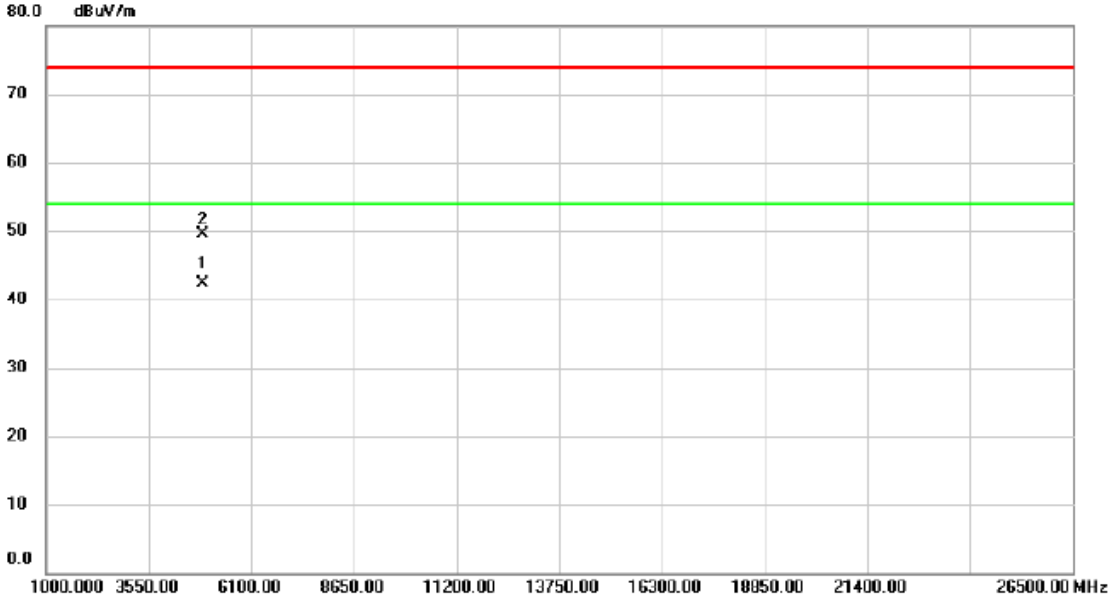
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	X	2439.500	59.26	33.24	92.50	74.00	18.50	peak	No Limit
2	*	2440.000	55.28	33.24	88.52	54.00	34.52	AVG	No Limit

Test Mode :	TX 2445MHz

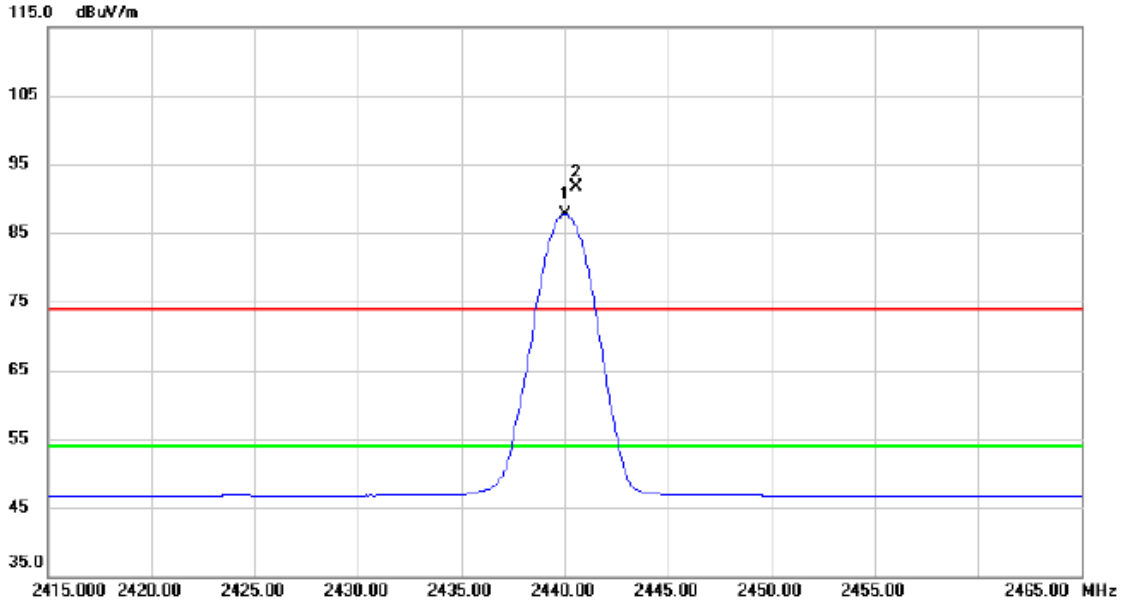
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	4880.930	35.76	6.46	42.22	54.00	-11.78	AVG	
2		4881.115	42.98	6.46	49.44	74.00	-24.56	peak	

Test Mode :	TX 2445MHz

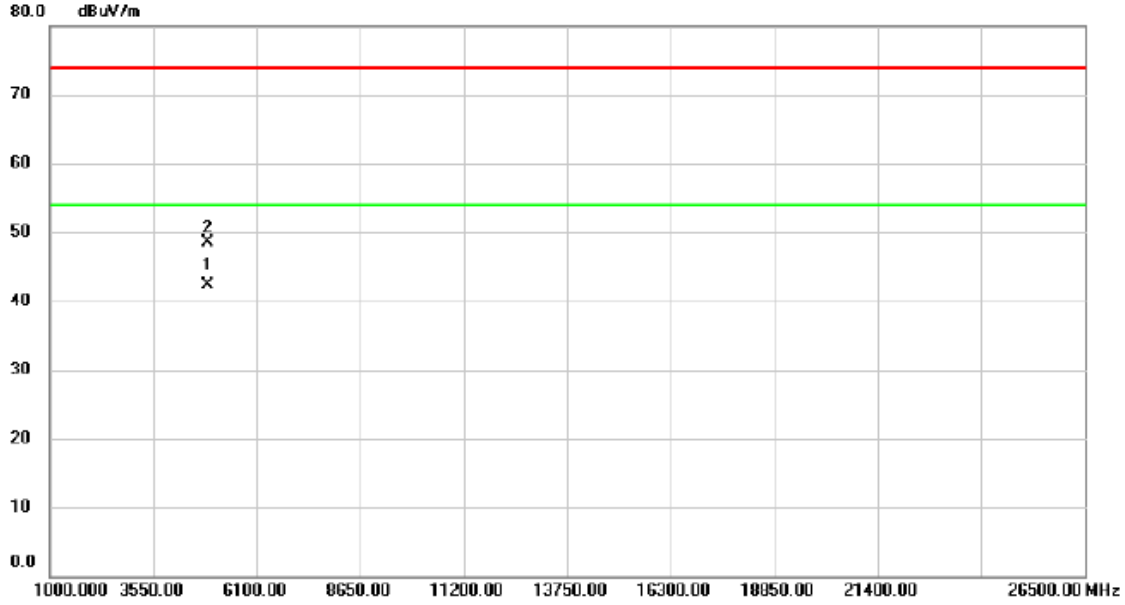
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	2440.000	54.53	33.24	87.77	54.00	33.77	AVG	No Limit
2	X	2440.600	58.46	33.25	91.71	74.00	17.71	peak	No Limit

Test Mode :	TX 2445MHz

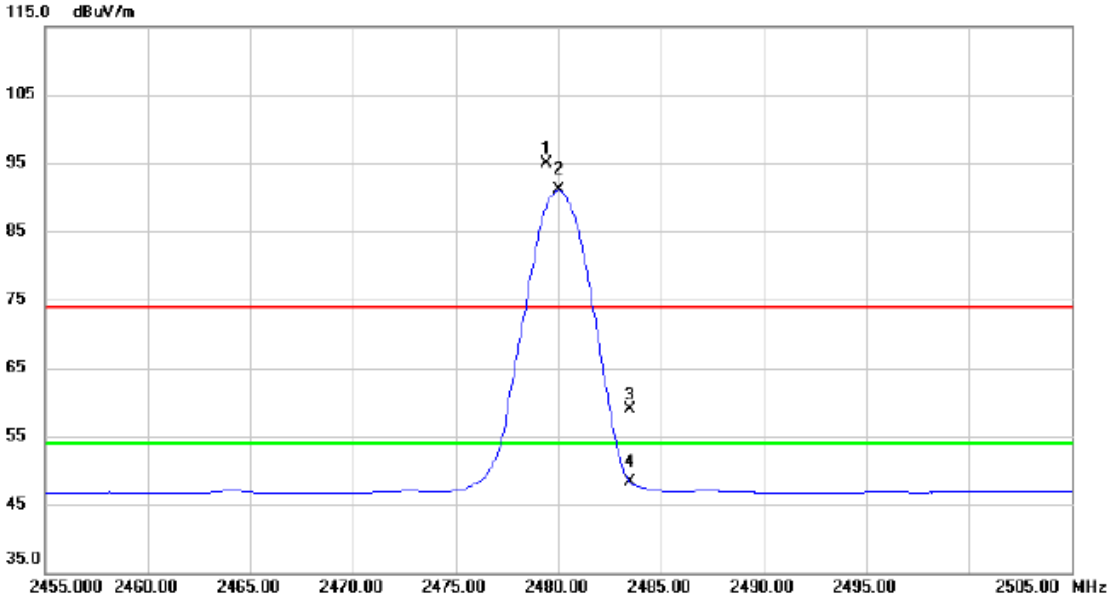
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	4880.065	35.93	6.45	42.38	54.00	-11.62	AVG	
2		4880.170	42.01	6.45	48.46	74.00	-25.54	peak	

Test Mode :	TX 2480MHz

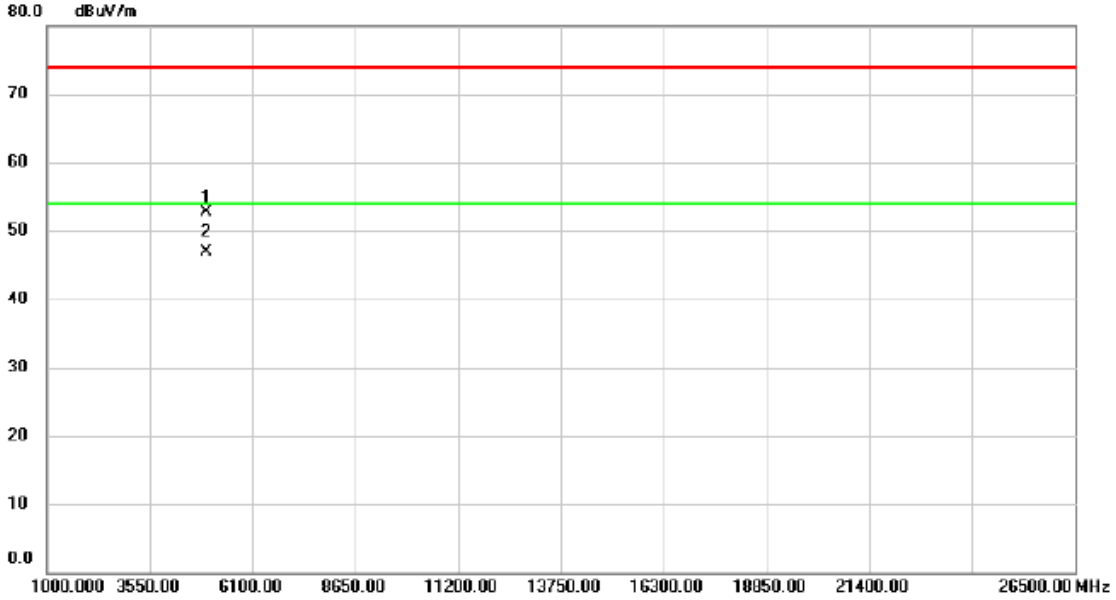
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	X	2479.450	61.54	33.40	94.94	74.00	20.94	peak	No Limit
2	*	2480.000	57.63	33.40	91.03	54.00	37.03	AVG	No Limit
3		2483.500	25.42	33.41	58.83	74.00	-15.17	peak	
4		2483.500	14.92	33.41	48.33	54.00	-5.67	AVG	

Test Mode :	TX 2480MHz

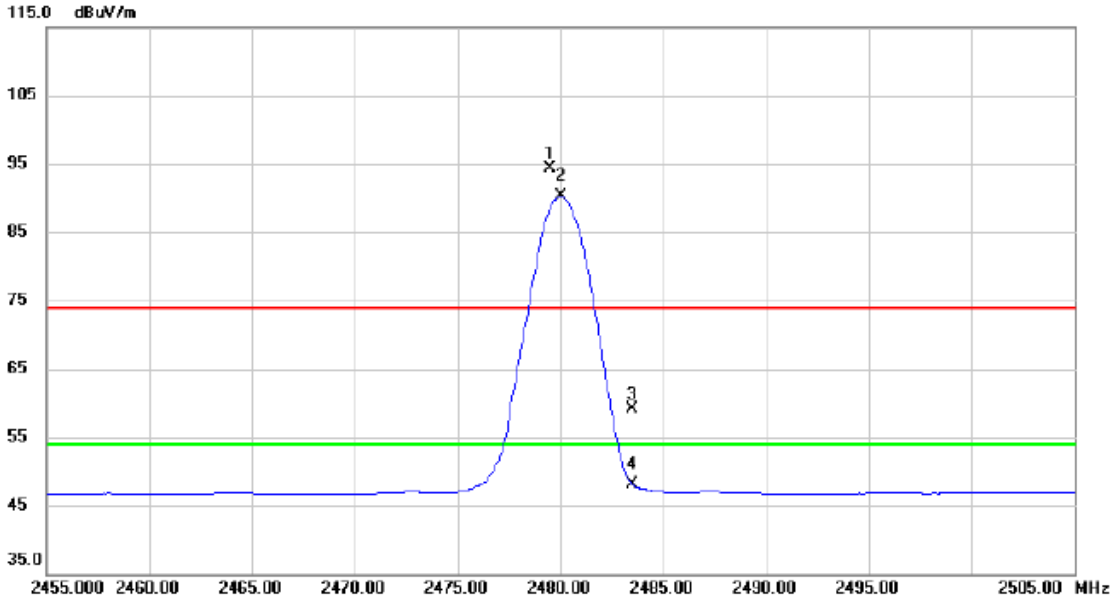
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4960.880	46.13	6.66	52.79	74.00	-21.21	peak	
2	*	4960.970	40.20	6.66	46.86	54.00	-7.14	AVG	

Test Mode :	TX 2480MHz

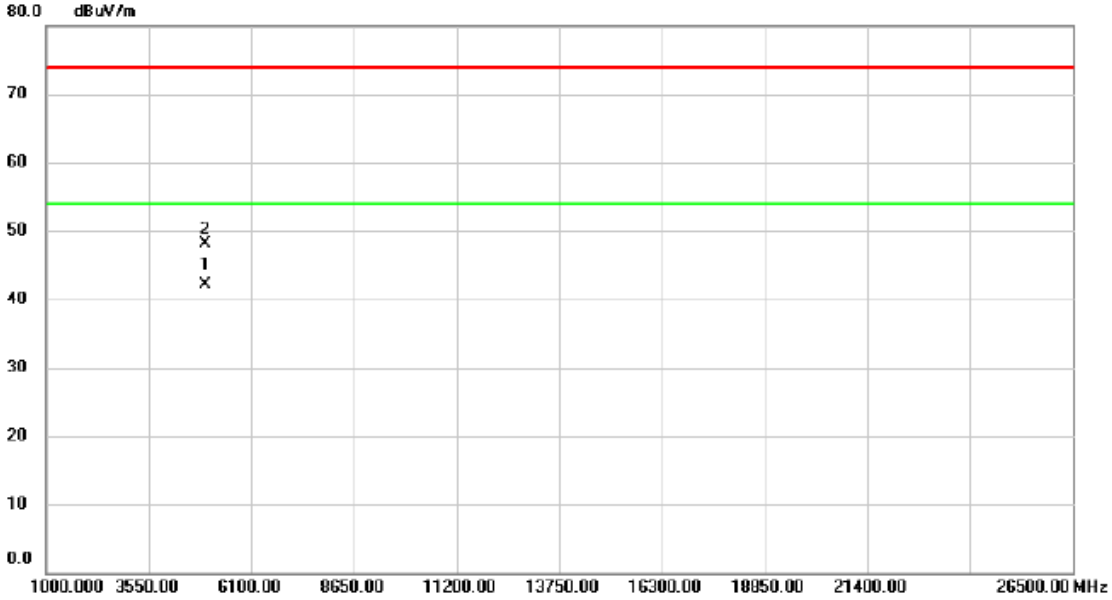
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	X	2479.500	60.83	33.40	94.23	74.00	20.23	peak	No Limit
2	*	2480.000	56.92	33.40	90.32	54.00	36.32	AVG	No Limit
3		2483.500	25.64	33.41	59.05	74.00	-14.95	peak	
4		2483.500	14.77	33.41	48.18	54.00	-5.82	AVG	

Test Mode :	TX 2480MHz

Horizontal



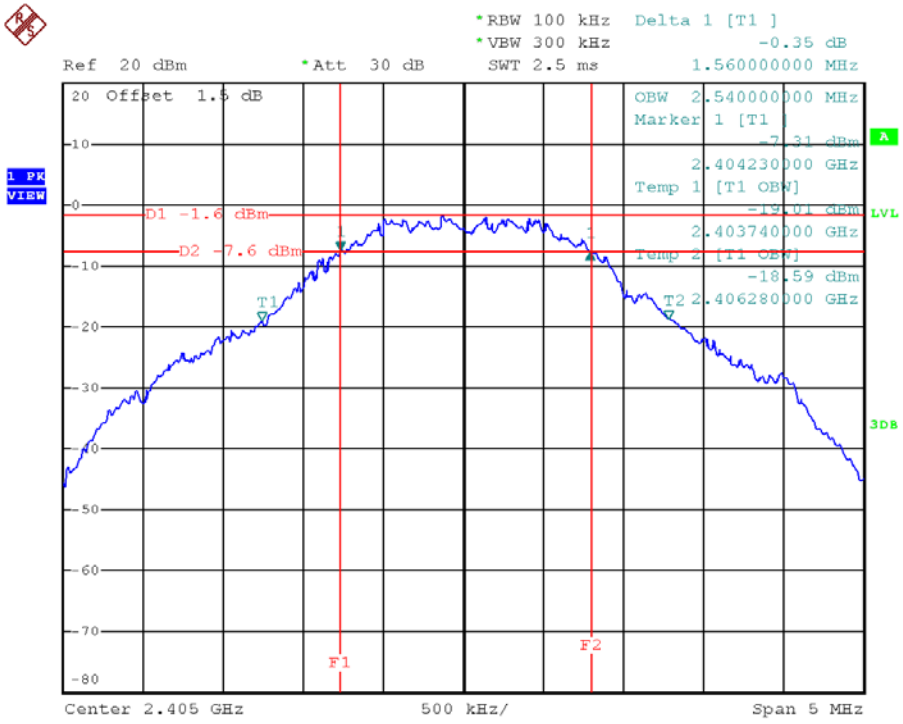
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	4960.960	35.54	6.66	42.20	54.00	-11.80	AVG	
2		4961.135	41.48	6.66	48.14	74.00	-25.86	peak	

ATTACHMENT E - BANDWIDTH

Test Mode :	TX Mode

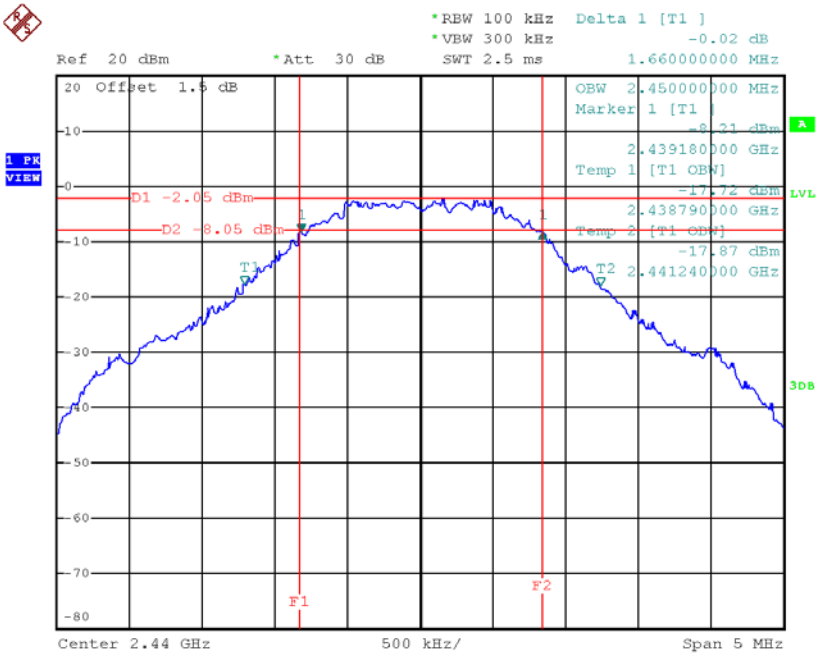
Frequency (MHz)	6dB Bandwidth (MHz)	99% Occupied BW (MHz)	Min. Limit (kHz)	Test Result
2405	1.56	2.54	500	Complies
2445	1.66	2.45	500	Complies
2480	1.64	2.71	500	Complies

2405MHz



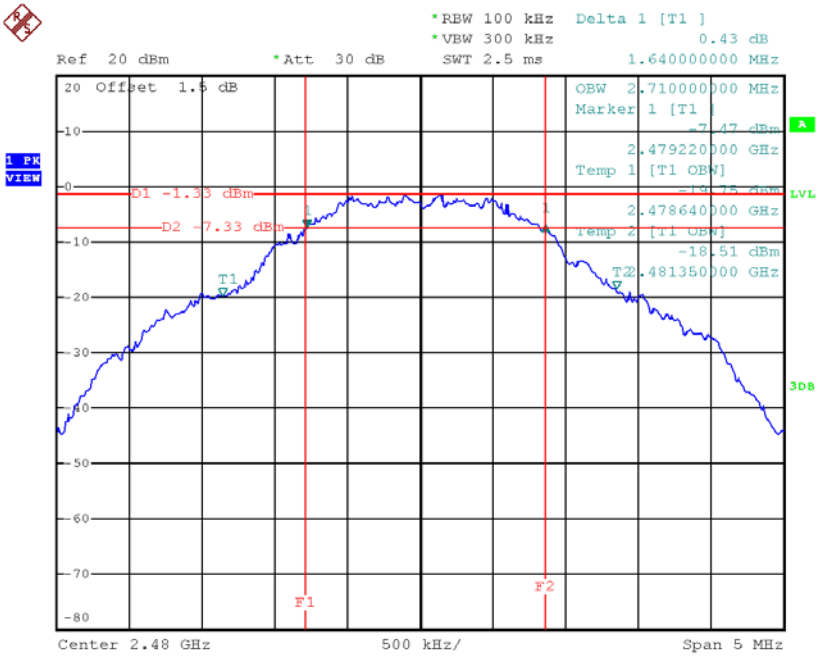
Date: 14.JUL.2017 10:03:41

2445MHz



Date: 14.JUL.2017 10:02:42

2480MHz



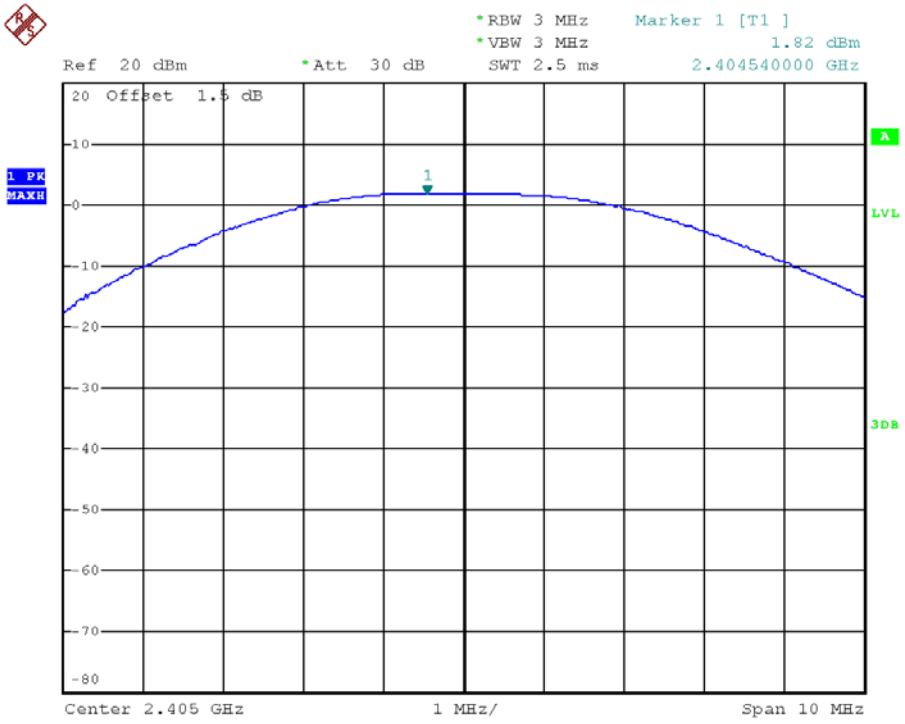
Date: 14.JUL.2017 10:00:56

ATTACHMENT F - MAXIMUM OUTPUT POWER TEST

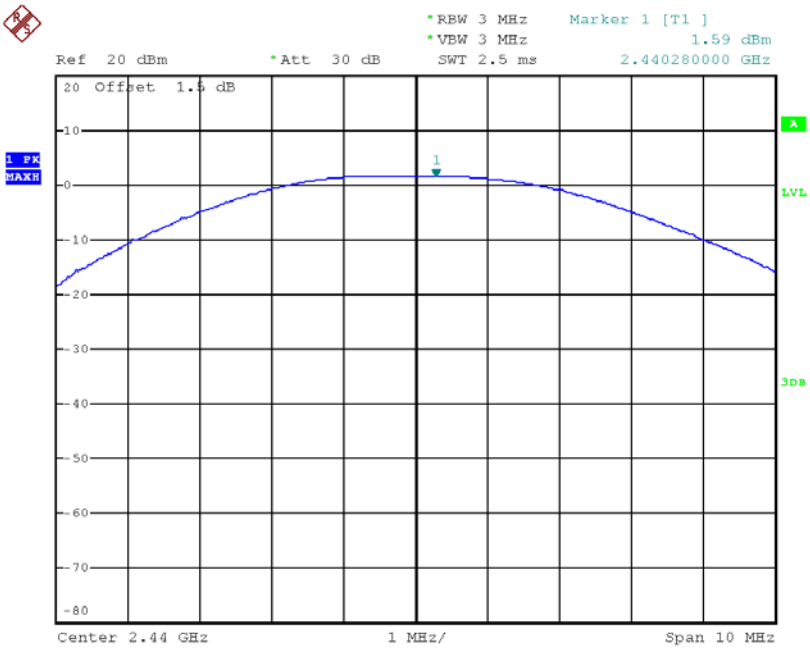
Test Mode :	TX Mode

Frequency (MHz)	Conducted Power (dBm)	Conducted Power (Watt)	Max. Limit (dBm)	Max. Limit (Watt)	Test Result
2405	1.82	0.0015	30.00	1.00	Complies
2445	1.59	0.0014	30.00	1.00	Complies
2480	2.26	0.0017	30.00	1.00	Complies

2405MHz

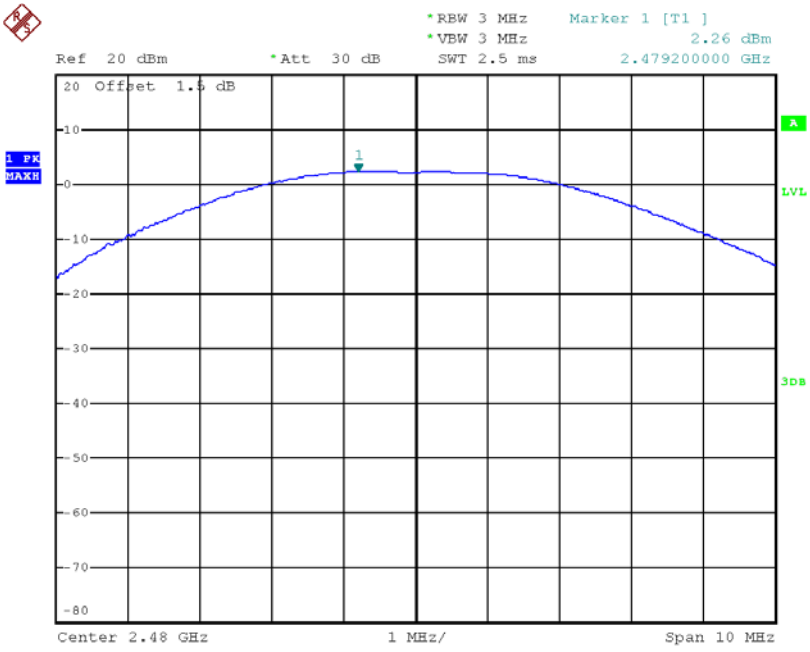


2445MHz



Date: 14.JUL.2017 09:50:26

TX 2480MHz

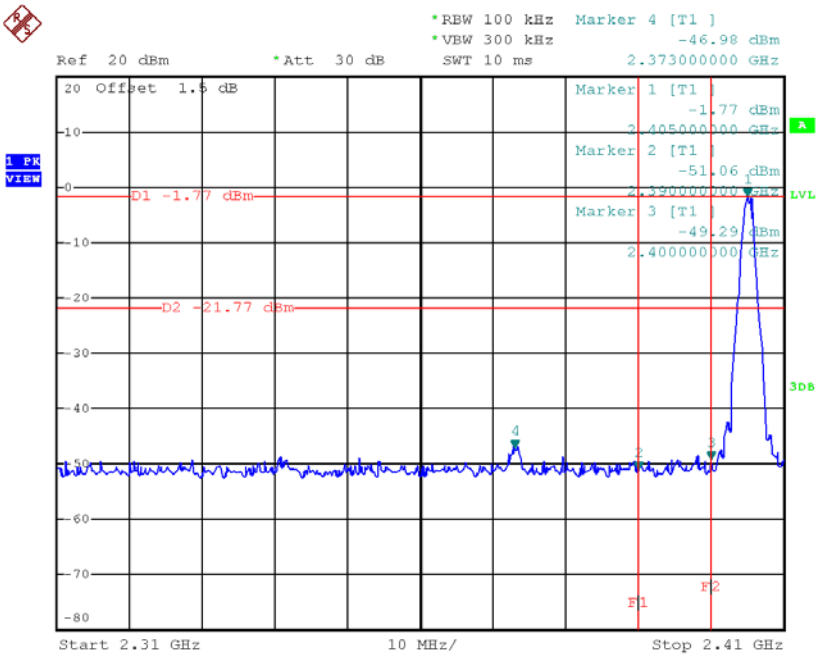


Date: 14.JUL.2017 09:50:56

ATTACHMENT G - ANTENNA CONDUCTED SPURIOUS EMISSION

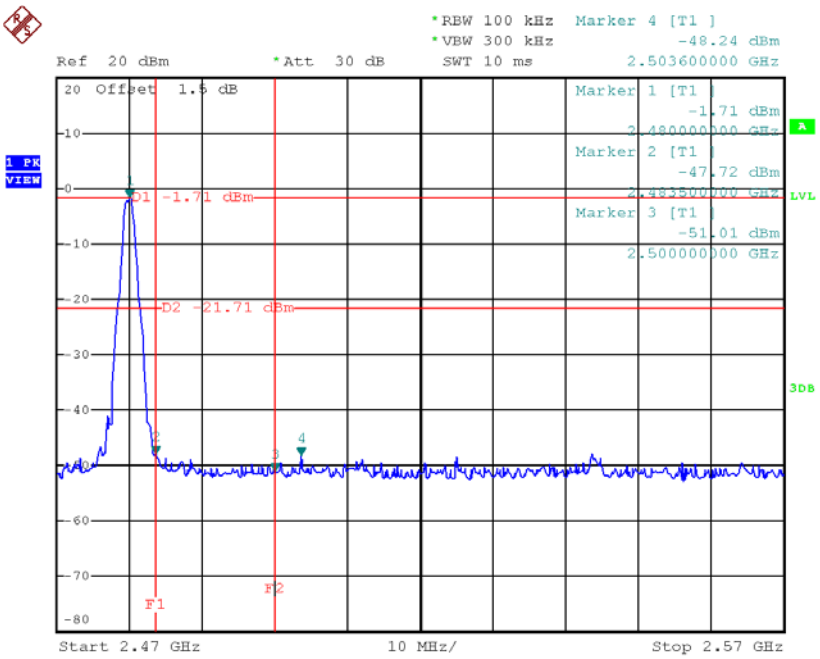
Test Mode :	TX Mode

2405MHz (Lower)



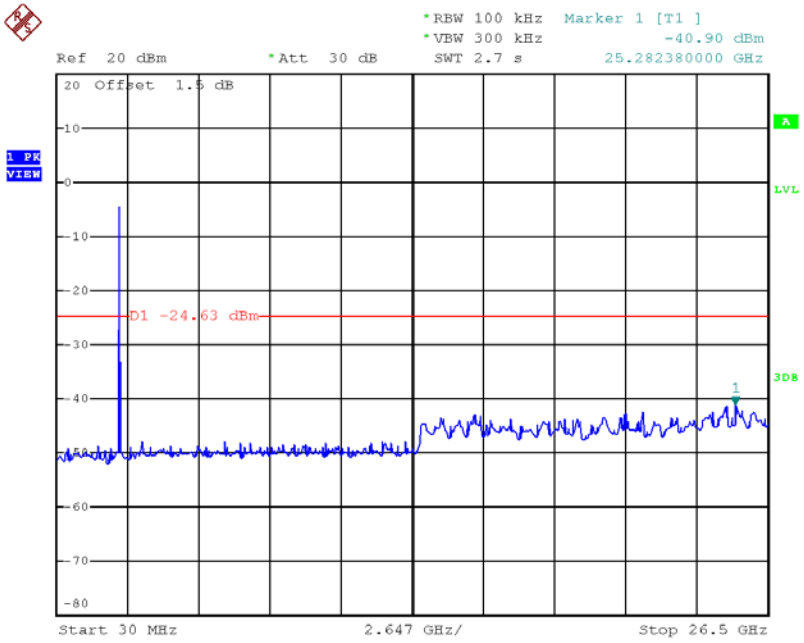
Date: 14.JUL.2017 09:56:32

2480MHz (upper)



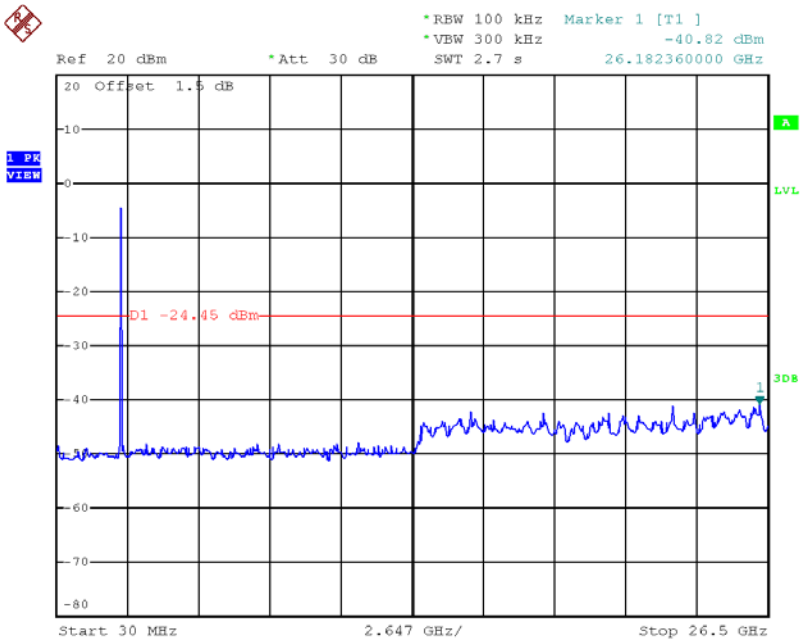
Date: 14.JUL.2017 09:59:00

2405MHz (10 Harmonic of the frequency)



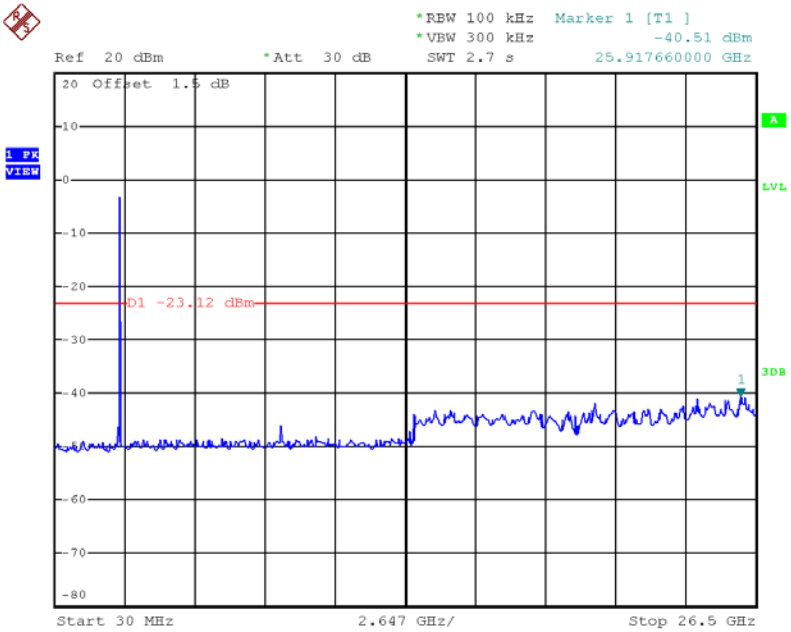
Date: 14.JUL.2017 09:53:21

2445MHz (10 Harmonic of the frequency)



Date: 14.JUL.2017 09:52:53

2480MHz (10 Harmonic of the frequency)



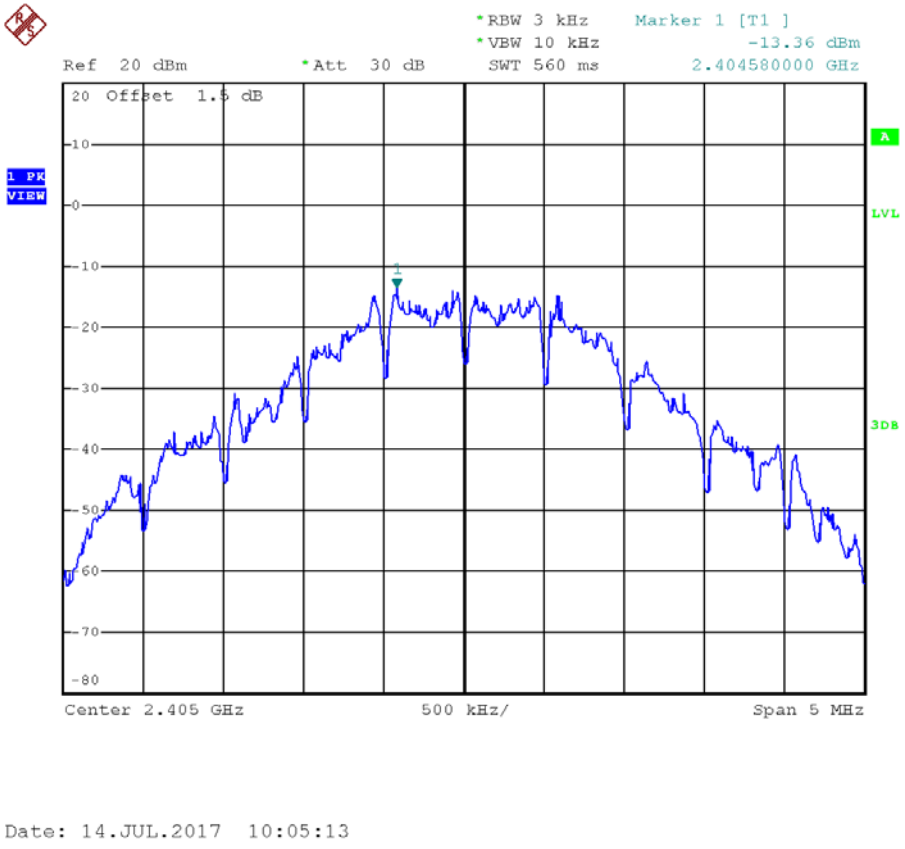
Date: 14.JUL.2017 09:52:17

ATTACHMENT H - POWER SPECTRAL DENSITY TEST

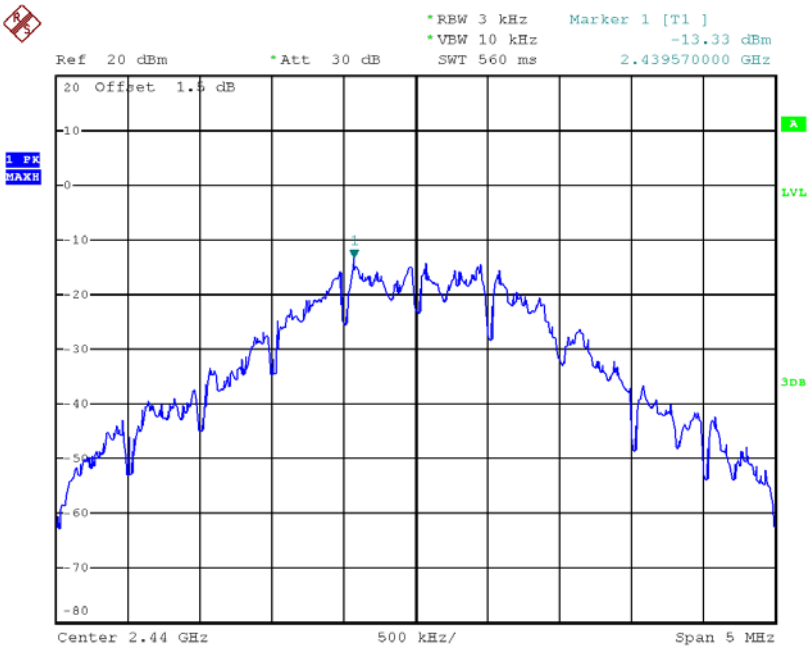
Test Mode :	TX Mode

Frequency (MHz)	Power Density (dBm)	Max. Limit (dBm)	Result
2405	-13.36	8	Complies
2445	-13.33	8	Complies
2480	-12.99	8	Complies

2405MHz

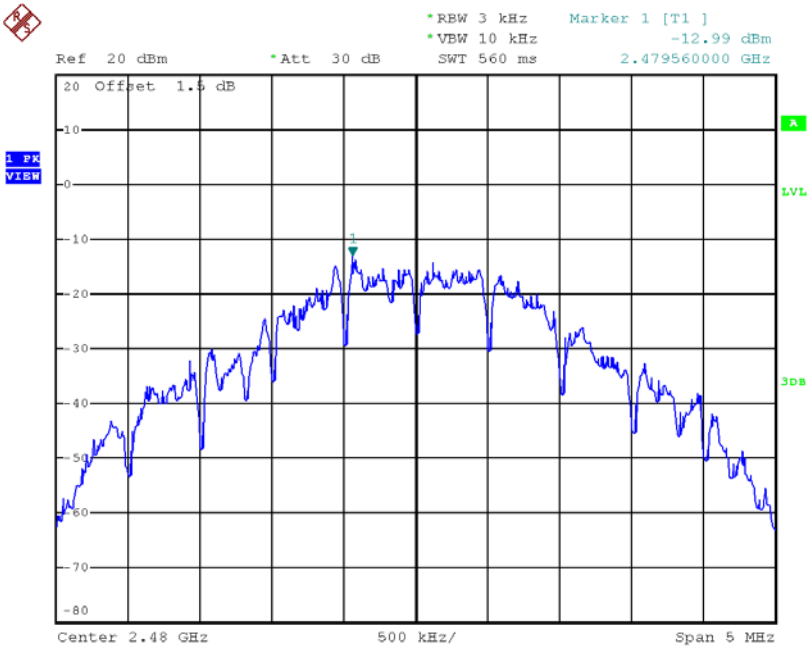


2445MHz



Date: 14.JUL.2017 10:06:18

TX 2480MHz



Date: 14.JUL.2017 10:06:43