

FCC Radio Test Report

FCC ID: M82-ARK1123

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

Project No. : 1604060
Equipment : Computer
Test Model : ARK-1123H
Series Model : ARK-1123H-U0A1E,
ARK1123XXXXXXXXXXXXXXXXXX (where "X" may be
any alphanumeric character, "-" or blank)
Applicant : Advantech Co., Ltd.
Address : No.1, Alley 20, Lane 26, Rueiguang Road, NeiHu
District, Taipei 11491, Taiwan, R.O.C.

Date of Receipt : Apr. 19, 2016
Date of Test : Apr. 19, 2016 ~ Jun. 23, 2016
Issued Date : Jun. 28, 2016
Tested by : BTL Inc.

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REPORT ISSUED HISTORY

Issued No.	Description	Issued Date
BTL-FCCP-2-1604060	Original Issue.	Jun. 28, 2016

1. CERTIFICATION

Equipment : Computer
Brand Name : ADVANTECH
Test Model : ARK-1123H
Series Model : ARK-1123H-U0A1E, ARK1123XXXXXXXXXXXXXXXXXX (where "X" may be any alphanumeric character, "-" or blank)
Applicant : Advantech Co., Ltd.
Manufacturer : Advantech Co., Ltd.
Address : No.1, Alley 20, Lane 26, Rueiguang Road, Neihu District, Taipei 11491, Taiwan, R.O.C.
Date of Test : Apr. 19, 2016 ~ Jun. 23, 2016
Test Sample : Production Unit
Standard(s) : FCC Part15, Subpart C (15.247) / ANSI C63.10-2013

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-2-1604060) 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 results included in this report is only for the Bluetooth LE part.

2. SUMMARY OF TEST RESULTS

Test procedures according to the technical standard(s):

Applied Standard(s): FCC Part15 (15.247) , Subpart C				
Standard(s)	Section	Test Item	Judgment	Remark
	15.207	Conducted Emission	PASS	
	15.247(d)	Antenna conducted Spurious Emission	PASS	
	15.247(a)(2)	6dB Bandwidth	PASS	
	15.247(b)(3)	Peak Output Power	PASS	
	15.247(e)	Power Spectral Density	PASS	
	15.203	Antenna Requirement	PASS	
	15.209/15.205	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:

Conducted emission Test:

C05: (VCCI RN: C-4742; FCC RN:965108; FCC DN:TW1082)

No. 68-1, Ln. 169, Sec.2, Datong Rd., Xizhi Dist., New Taipei City 221, Taiwan

Radiated emission Test (Below 1 GHz):

CB11: (VCCI RN: R-4260; FCC RN:949005; FCC DN:TW1082; IC Assigned Code:20088-2)

No. 68-1, Ln. 169, Sec.2, Datong Rd., Xizhi Dist., New Taipei City 221, Taiwan

Radiated emission Test (Above 1 GHz):

CB11: (VCCI RN: G-868; FCC RN:949005; FCC DN:TW1082; IC Assigned Code:20088-2)

No. 68-1, Ln. 169, Sec.2, Datong Rd., Xizhi Dist., New Taipei City 221, Taiwan

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 $y \pm U$, 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 emission test:

Test Site	Method	Measurement Frequency Range	U, (dB)
C05	CISPR	150 kHz~30MHz	2.04

B. Radiated emission test:

Test Site	Method	Measurement Frequency Range	U, (dB)
CB11 (3m)	CISPR	9kHz ~ 150kHz	4.00
		150kHz ~ 30MHz	4.00

Test Site	Method	Measurement Frequency Range	Ant. H / V	U, (dB)
CB11 (3m)	CISPR	30 MHz ~ 200 MHz	V	3.06
		30 MHz ~ 200 MHz	H	2.58
		200 MHz ~ 1, 000 MHz	V	3.50
		200 MHz ~ 1, 000 MHz	H	3.10

Test Site	Method	Measurement Frequency Range	Ant. H / V	U, (dB)
CB11 (3m)	CISPR	1GHz ~ 6GHz	V	4.14
		1GHz ~ 6GHz	H	4.14

Test Site	Method	Measurement Frequency Range	Ant. H / V	U, (dB)
CB11 (1m)	CISPR	6GHz ~ 18GHz	V	5.34
		6GHz ~ 18GHz	H	5.34

Test Site	Method	Measurement Frequency Range	U, (dB)
CB08 (1m)	CISPR	18 ~ 26.5 GHz	4.66
		26.5 ~ 40 GHz	4.74

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	Computer		
Brand Name	ADVANTECH		
Test Model	ARK-1123H		
Series Model	ARK-1123H-U0A1E, ARK1123XXXXXXXXXXXXXXXXXX (where “X” may be any alphanumeric character, “-” or blank)		
Model Difference	FOR MARKETING NAME		
EUT Power Rating	I/P: DC 12V		
Power Adapter Manufacturer	FSP	Model	FSP036-RBBN2
Power Adapter Power Rating	I/P: AC 100-240V 1.2A 50-60Hz O/P: DC 12V 3.0A		
Product Description	Operation Frequency		2402~2480 MHz
	Modulation Technology		GFSK(1Mbps)
	Bit Rate of Transmitter		
	Output Power (Max.)		2.50 dBm
CPU Manufacturer	Intel	Model	Celeron™ J1900 Quad Core 2.0 GHz
Main Board Manufacturer	ADVANTECH	Model	MIO-2263
I/O Board Manufacturer	ADVANTECH	Model	AMO-M010
Memory Manufacturer	ADVANTECH	Model	AQD-SD3L8GN16-SG, 8 GB
SSD Manufacturer	ADVANTECH	Spec.	32 GB
PCIE 802.11A/B/G/N 2.4GZ/5GHZ + USB BT 4.0 CARD Manufacturer	ADVANTECH	Model	AR5B22

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)
00	2402	20	2442
01	2404	21	2444
02	2406	22	2446
03	2408	23	2448
04	2410	24	2450
05	2412	25	2452
06	2414	26	2454
07	2416	27	2456
08	2418	28	2458
09	2420	29	2460
10	2422	30	2462
11	2424	31	2464
12	2426	32	2466
13	2428	33	2468
14	2430	34	2470
15	2432	35	2472
16	2434	36	2474
17	2436	37	2476
18	2438	38	2478
19	2440	39	2480

3. Table for Filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	Invax	R-AN2450-5701 RS	Dipole	SMA Male Reverse	1.47

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)
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 NOTE (1)

Note:

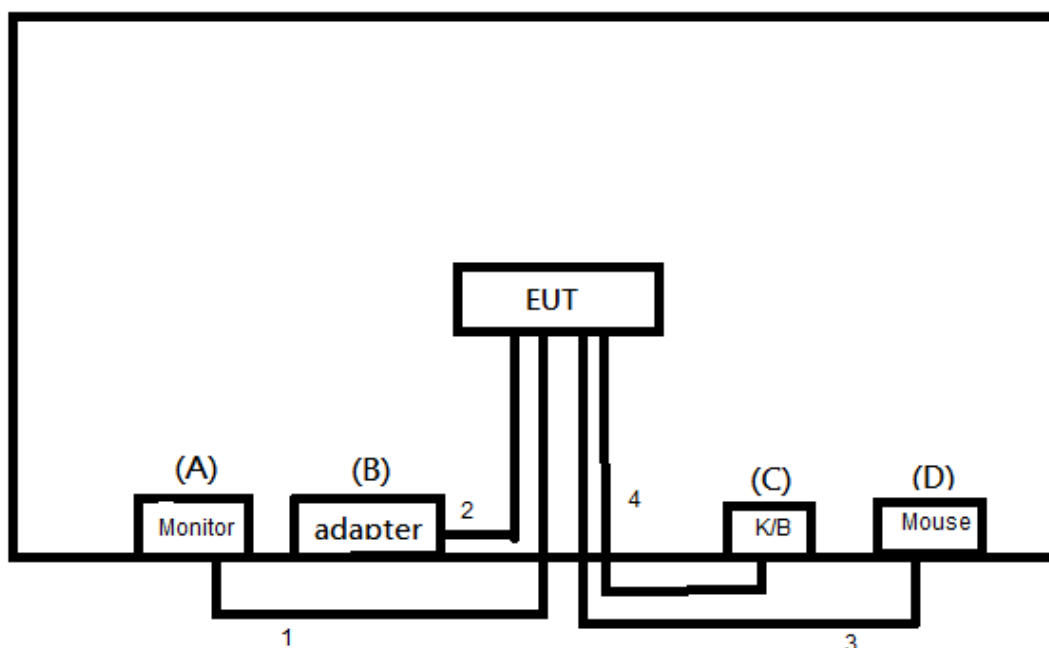
(1) The measurements are performed at the high, middle, low available channels.

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 WLAN

Test Software Version	BtUSBTool		
Frequency (MHz)	2402	2440	2480
BT LE	37	37	37

3.2 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



3.3 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	30" LCD Monitor	DELL	3008WFPt	DOC	CN-0G501H74445-95K-0
B	Adapter	FSP GROUP	FSP036-RBBN2	N/A	H5341000328
C	USB K/B	Logitech	Y-BL49	DOC	STW43302534
D	PS/2 Mouse	Logitech	M-SBF69	DOC	HCA44601156

Item	Shielded Type	Ferrite Core	Length	Note
1	NO	NO	1.5m	HDMI
2	NO	NO	1.5m	Power Core
3	NO	NO	1.5m	USB Cable
4	NO	NO	1.5m	USB Cable

Note:

(1) For detachable type I/O cable should be specified the length in m in 『Length』 column.

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 = Insertion Loss + Cable Loss + Attenuator Factor(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

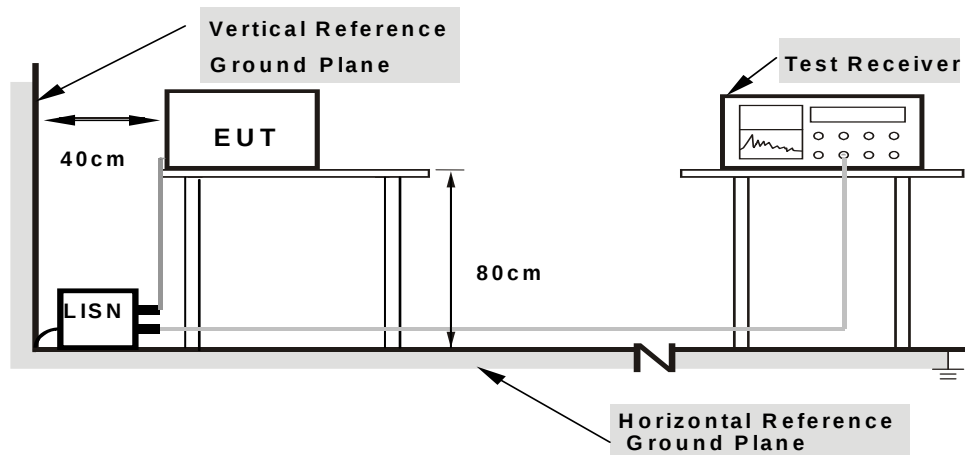
4.1.2 TEST PROCEDURE

- 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 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



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 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.

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.
- (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), then the 15.209(a) 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)	(dBuV/m) (at 3 meters)	
	PEAK	AVERAGE
Above 1000	74	54

Notes:

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

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

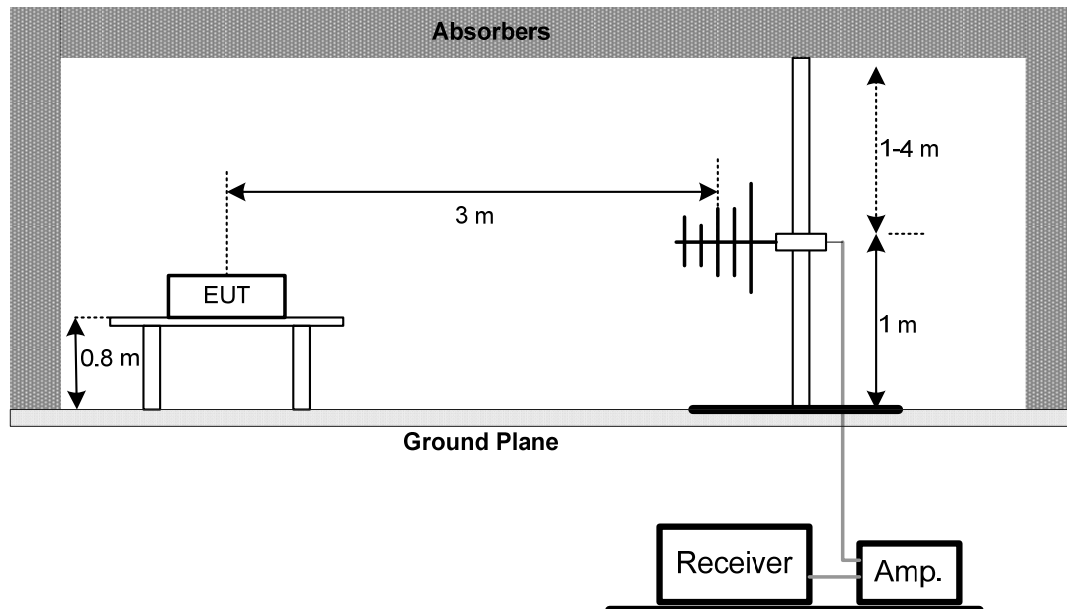
- The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1GHz)
- The measuring distance of 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)
- 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.
- 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).
- 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.
- 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.
- 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)
- 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)
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

4.2.3 DEVIATION FROM TEST STANDARD

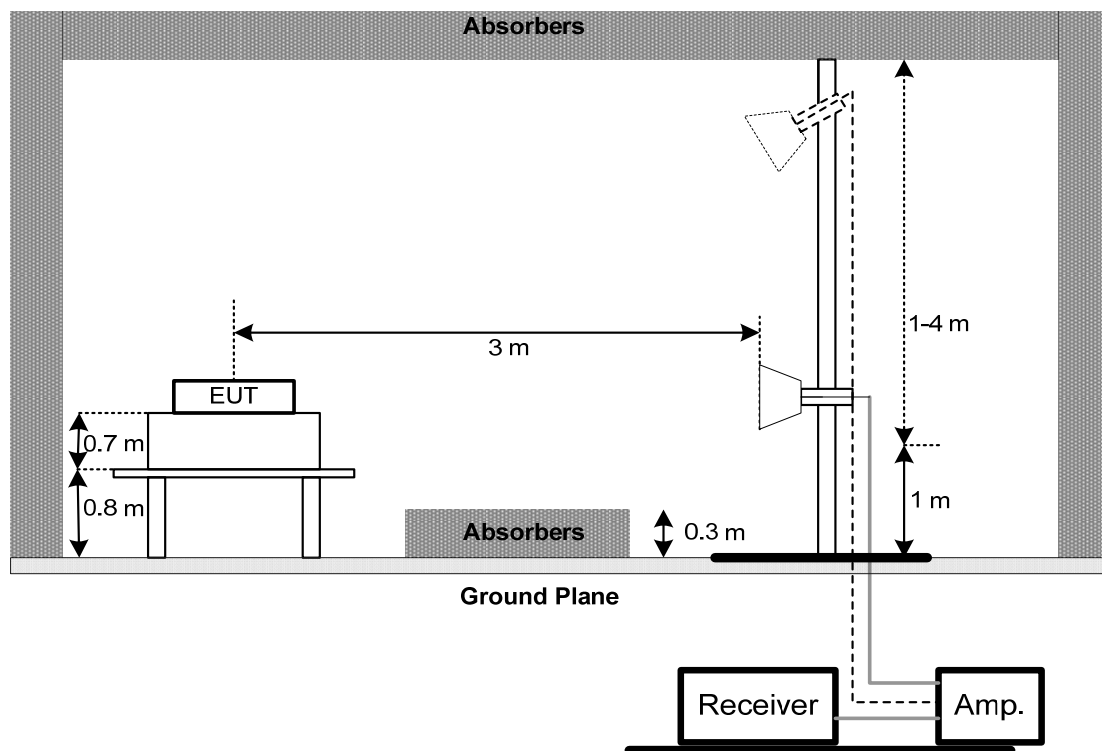
No deviation

4.2.4 TEST SETUP

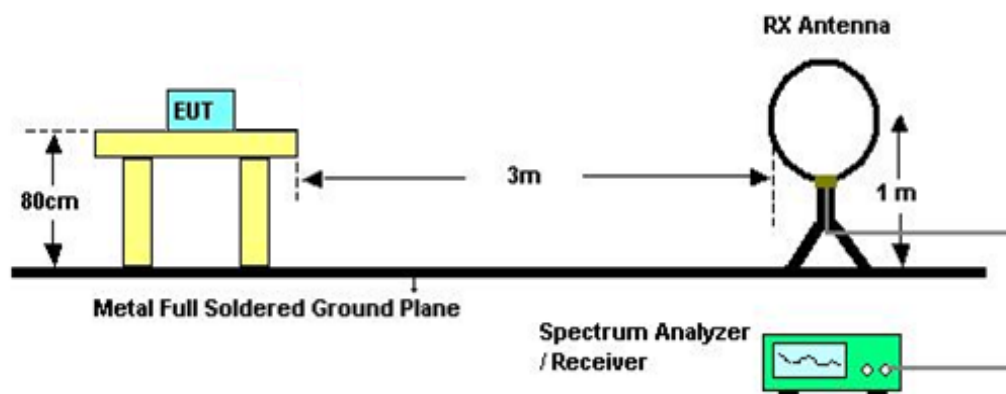
(A) Radiated Emission Test Set-Up Frequency Below 1 GHz



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



(C) For radiated emissions below 30MHz



4.2.5 EUT 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: 45% Test Voltage: AC 120V/60Hz

4.2.7 TEST 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 = $40 \log (\text{specific distance} / \text{test distance})$ (dB).
- (3) Limit line = specific limits (dBuV) + distance extrapolation factor.

4.2.8 TEST RESULTS (30MHZ 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) 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.
- (2) Radiated emissions measured in frequency range above 1000MHz were made with an instrument using Peak detector mode and AV detector mode of the emission
- (3) A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.
- (4) EUT Orthogonal Axis:
"X" - denotes Laid on Table ; "Y" - denotes Vertical Stand ; "Z" - denotes Side Stand
- (5) 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
- (6) 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				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(a)(2)	Bandwidth	$\geq 500\text{KHz}$ (6dB bandwidth)	2400-2483.5	PASS

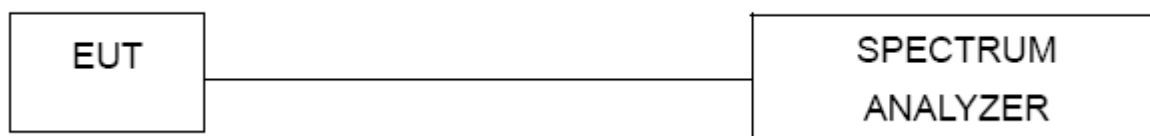
5.1.1 TEST PROCEDURE

- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
- 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: AC 120V/60Hz

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				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(b)(3)	Maximum Output Power	1 watt or 30dBm	2400-2483.5	PASS

6.1.1 TEST PROCEDURE

- The EUT was directly connected to the power meter and antenna output port as show in the block diagram below,
- The maximum peak conducted output power was performed in accordance with method 9.1.2 of FCC KDB 558074 D01 DTS Meas Guidance v03r04.

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

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced 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 or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits.

7.1.1 TEST PROCEDURE

- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
- Spectrum Setting : RBW= 100KHz, VBW=300KHz, Sweep time = 10 ms.
- Offset=antanna 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: 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 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(e)	Power Spectral Density	8 dBm (in any 3KHz)	2400-2483.5	PASS

8.1.1 TEST PROCEDURE

- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
- 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: AC 120V/60Hz

8.1.6 TEST RESULTS

Please refer to the Attachment H.

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. 26, 2017
2	Test Cable	TIMES	CFD300-NL	C02	Jun. 14, 2016
3	EMI Test Receiver	R&S	ESR7	101433	Dec. 09, 2016
4	Power Dividers	HP	11636A	8103	May 03, 2017
5	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	Spectrum Analyzer	Agilent	N9038A	MY51210215	Jun. 06, 2017
2	Horn Antenna	Schwarzbeck	BBHA 9120	D 546	Nov. 04, 2016
3	Microwave Pre-amplifier	HP	8447D	2944A08891	Mar. 07, 2017
4	Test Cable	EMCI	EMC104-SM-S M-5000	150302	Mar. 07, 2017
5	Test Cable	EMCI	EMC104-SM-S M-800	150305	Mar. 07, 2017
6	Test Cable	EMCI	EMC104-SM-S M-2500	150306	Mar. 07, 2017
7	Test Cable	EMCI	EMC8D-NM-NM -8000	150301	Mar. 07, 2017
8	Test Cable	EMCI	EMC8D-NM-NM -2500	150303	Mar. 07, 2017
9	Test Cable	EMCI	EMC8D-NM-NM -1000	150304	Mar. 07, 2017
10	Pre-Amplifier	Agilent	8449B	3008A02331	Jan. 23, 2017
11	Trilog-Broadband Antenna	Schwarzbeck	VULB9168	9168-364	Feb. 03, 2017
12	Preamplifier With Adaptor	EMC	EMC2654045	980030	Feb. 14, 2017
13	Loop Antenna	EMCO	6502	00042960	Nov. 15, 2016

6dB Bandwidth Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP-40	100129	Jan. 17, 2017

Peak Output Power Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Power Meter	Anritsu	ML2487A	6K00004714	May 18, 2017
2	Power Meter Sensor	Anritsu	MA2491A	034138	May 17, 2017

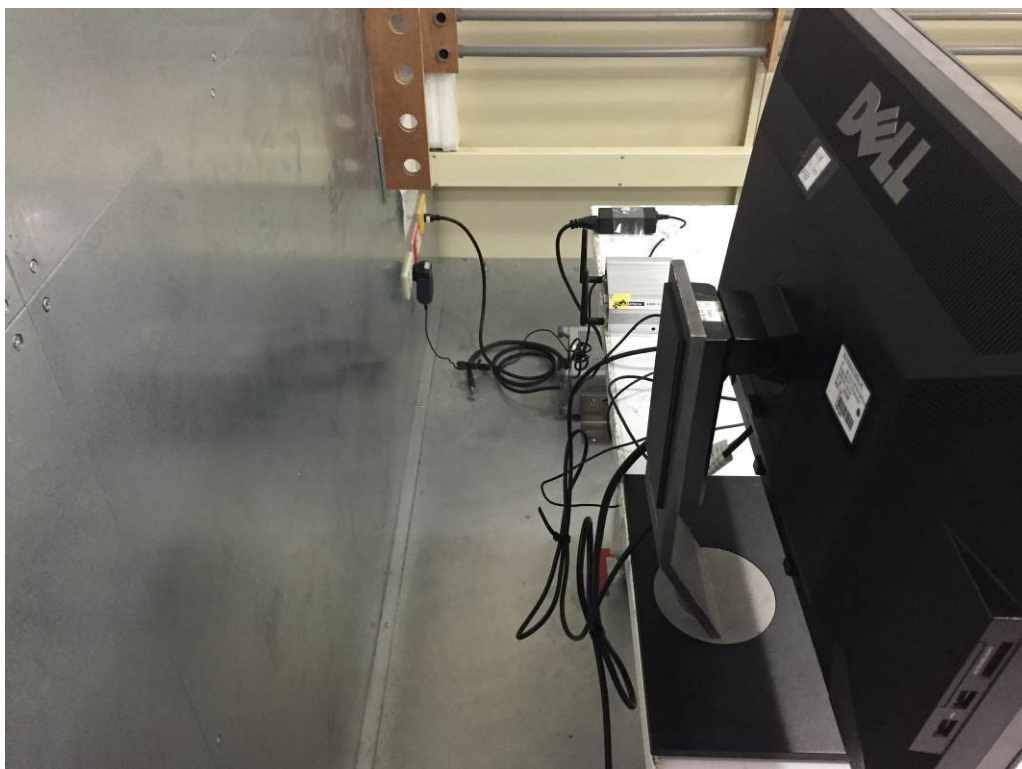
Antenna Conducted Spurious Emission Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP-40	100129	Jan. 17, 2017

Power Spectral Density Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP-40	100129	Jan. 17, 2017

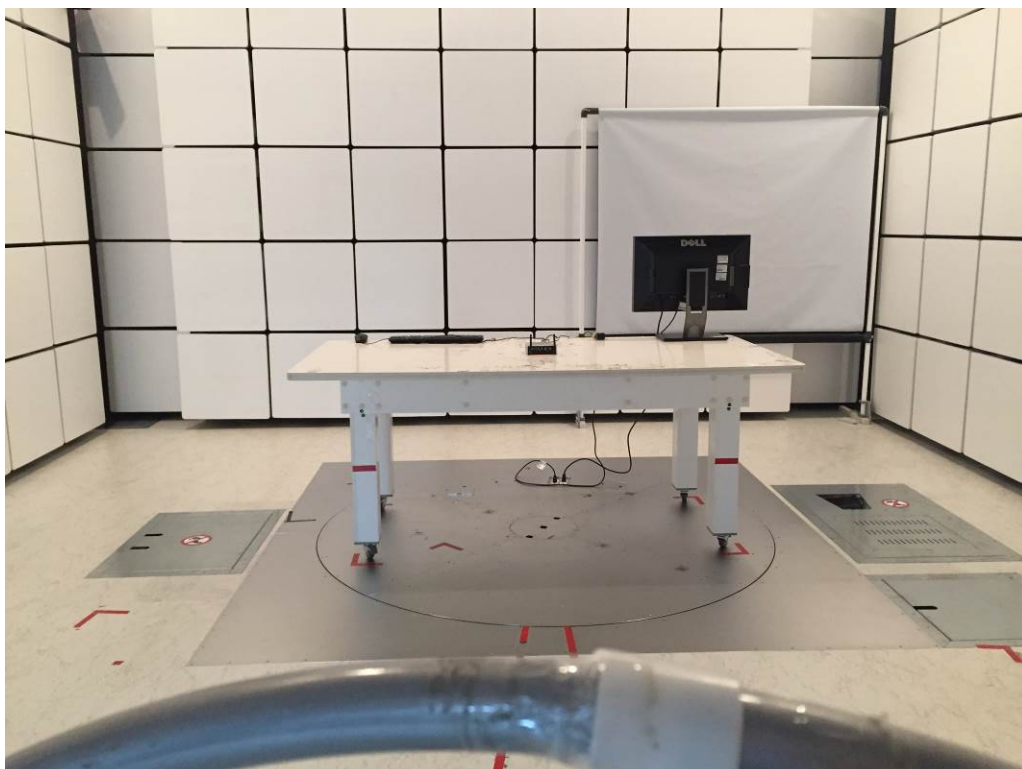
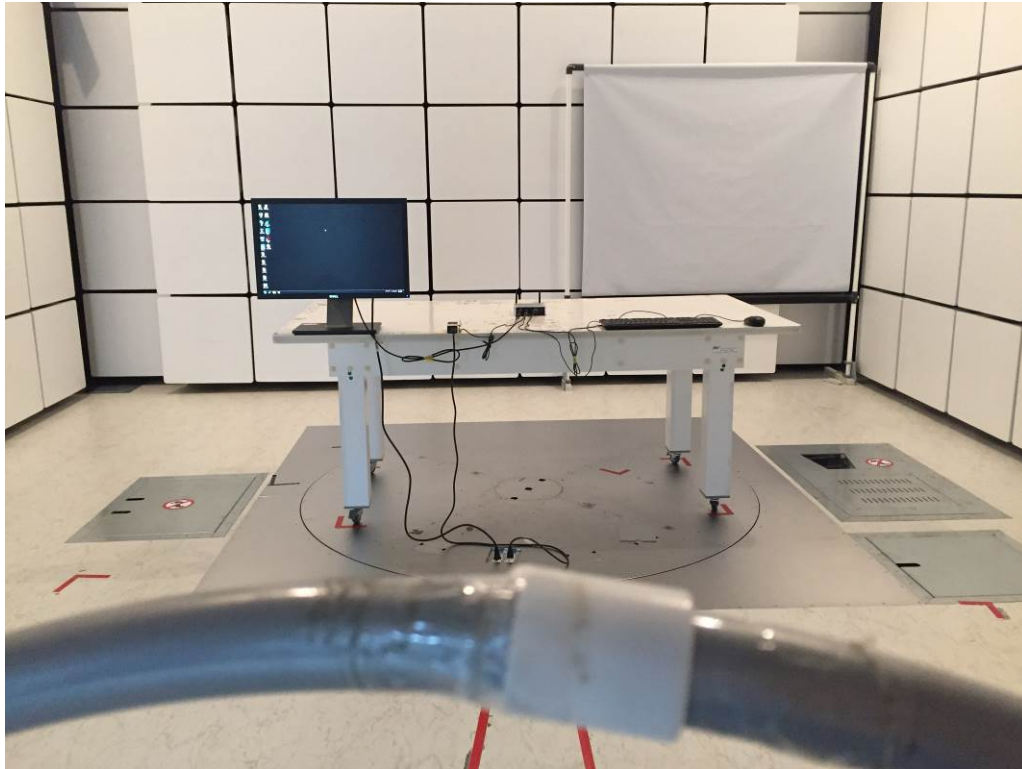
Remark: "N/A" denotes no model name, serial no. or calibration specified.
All calibration period of equipment list is one year.

10. EUT TEST PHOTO

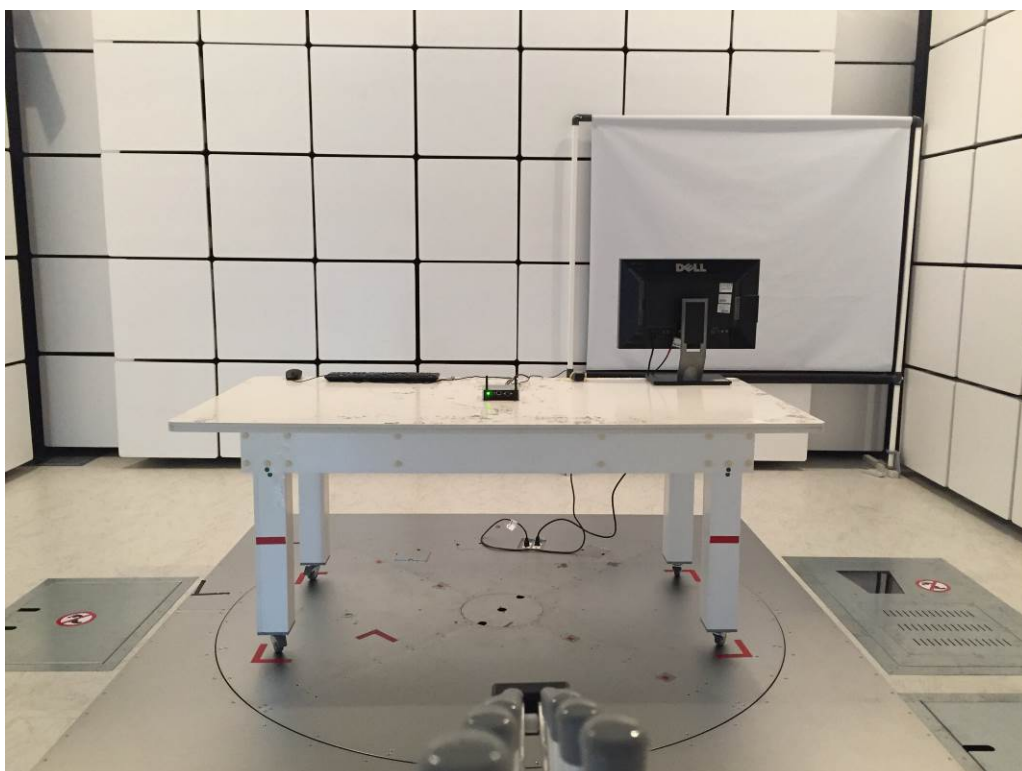
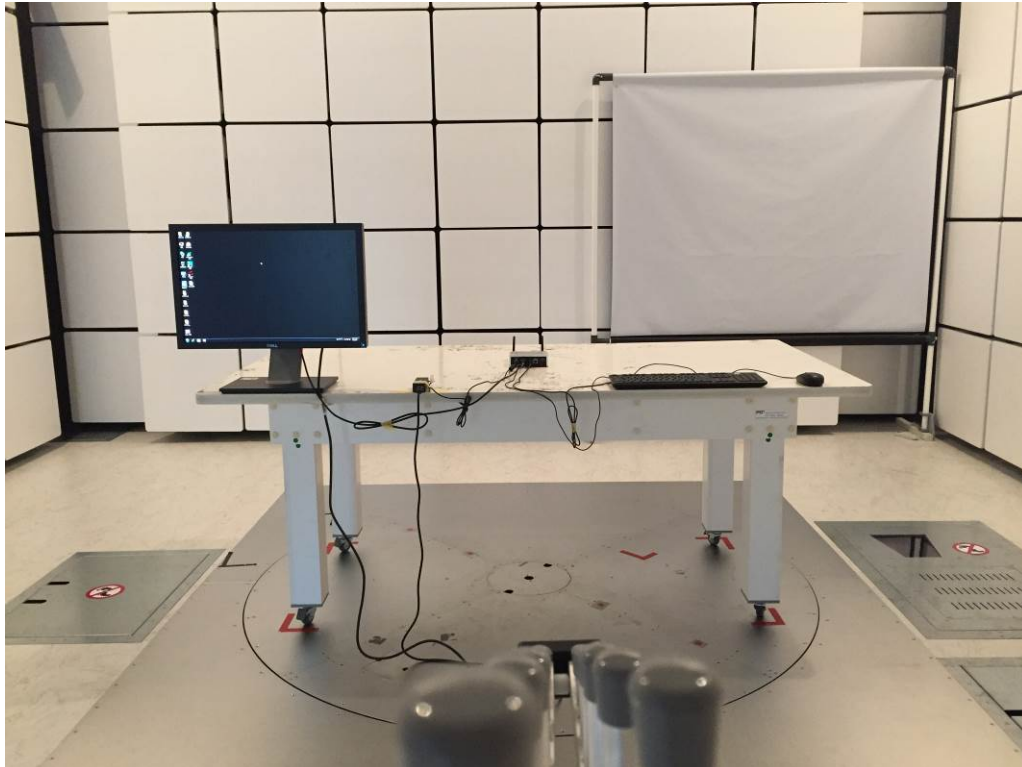
Conducted Measurement Photos



**Radiated Measurement Photos
9KHz to 30MHz**



**Radiated Measurement Photos
30MHz to 1000MHz**



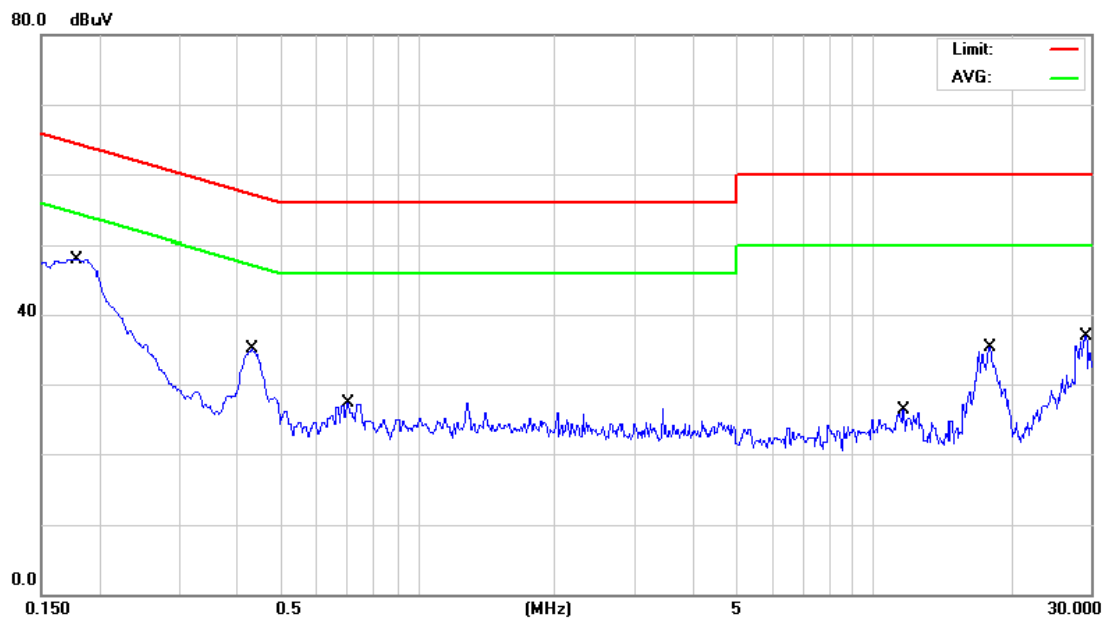
**Radiated Measurement Photos
Above 1000MHz**



ATTACHMENT A - CONDUCTED EMISSION

Test Mode: TX Mode

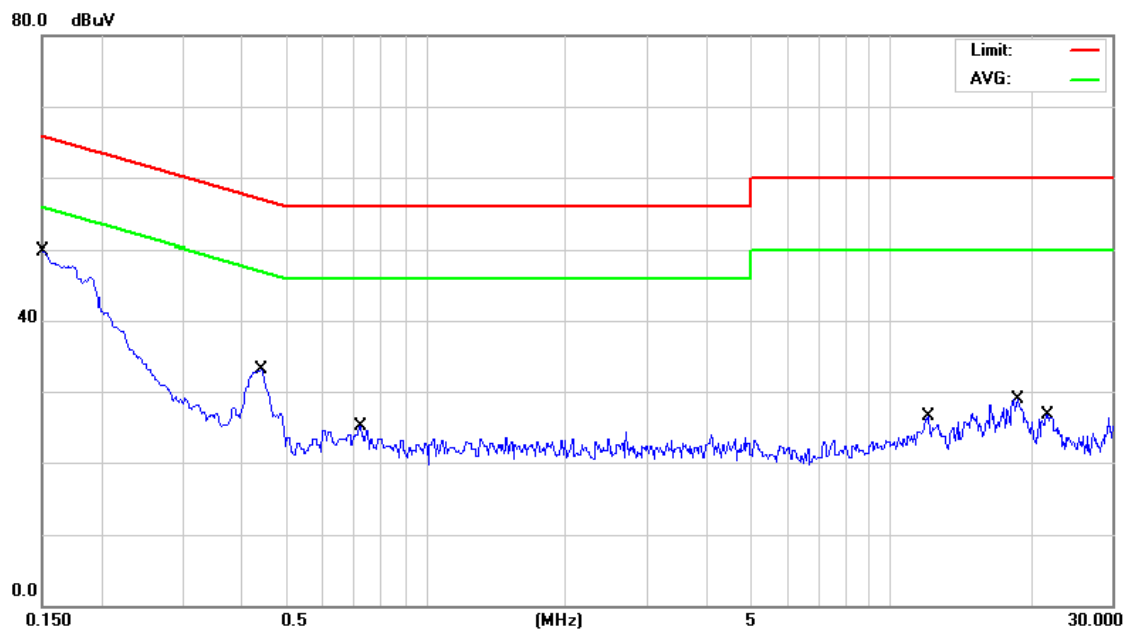
Line



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1		0.1794	32.60	9.68	42.28	64.51	-22.23	QP	
2	*	0.1794	23.70	9.68	33.38	54.51	-21.13	AVG	
3		0.4342	20.20	9.69	29.89	57.17	-27.28	QP	
4		0.4342	14.60	9.69	24.29	47.17	-22.88	AVG	
5		0.7070	11.10	9.70	20.80	56.00	-35.20	QP	
6		0.7070	6.50	9.70	16.20	46.00	-29.80	AVG	
7		11.6500	8.50	9.93	18.43	60.00	-41.57	QP	
8		11.6500	3.80	9.93	13.73	50.00	-36.27	AVG	
9		17.8500	19.10	9.91	29.01	60.00	-30.99	QP	
10		17.8500	11.00	9.91	20.91	50.00	-29.09	AVG	
11		29.1000	22.20	9.94	32.14	60.00	-27.86	QP	
12		29.1000	12.90	9.94	22.84	50.00	-27.16	AVG	

Test Mode: TX Mode

Neutral

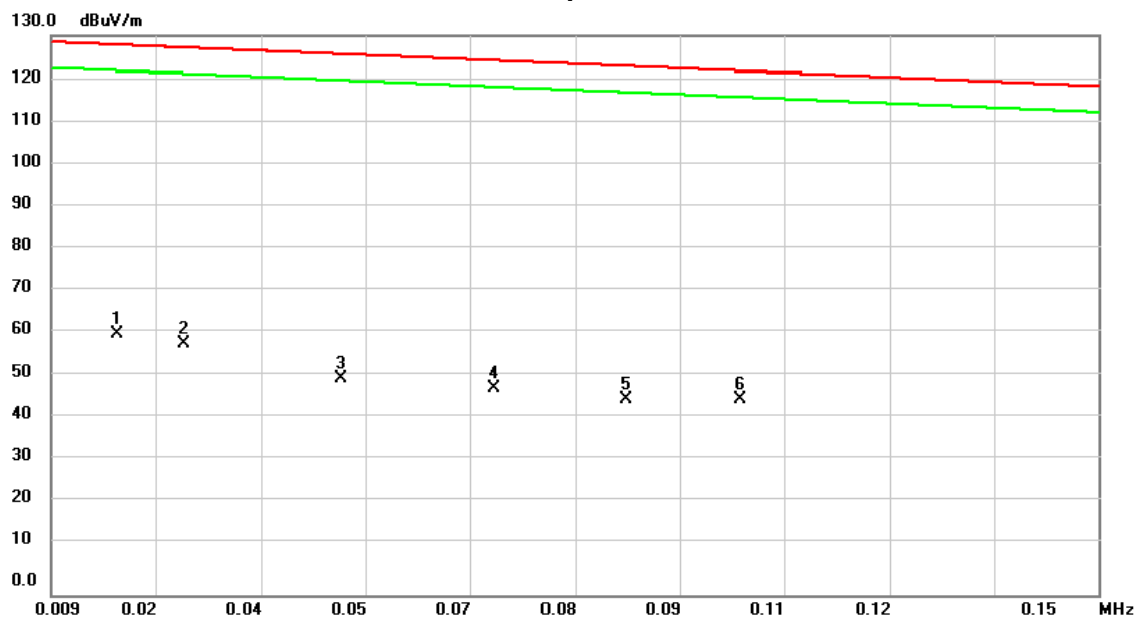


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1	*	0.1507	33.60	9.69	43.29	65.96	-22.67	QP	
2		0.1507	18.80	9.69	28.49	55.96	-27.47	AVG	
3		0.4433	17.80	9.69	27.49	57.00	-29.51	QP	
4		0.4433	12.20	9.69	21.89	47.00	-25.11	AVG	
5		0.7250	10.30	9.71	20.01	56.00	-35.99	QP	
6		0.7250	5.80	9.71	15.51	46.00	-30.49	AVG	
7		12.1000	7.90	9.93	17.83	60.00	-42.17	QP	
8		12.1000	3.50	9.93	13.43	50.00	-36.57	AVG	
9		18.7000	11.40	9.90	21.30	60.00	-38.70	QP	
10		18.7000	5.50	9.90	15.40	50.00	-34.60	AVG	
11		21.6500	5.40	9.94	15.34	60.00	-44.66	QP	
12		21.6500	1.20	9.94	11.14	50.00	-38.86	AVG	

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

Test Mode: TX Mode

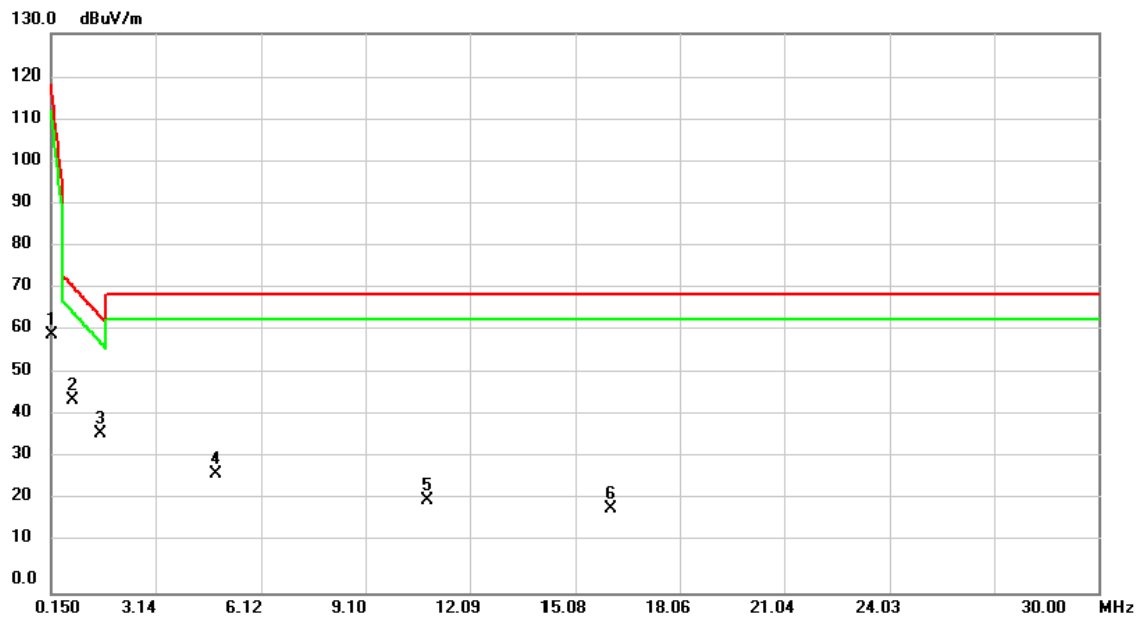
Open



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1	*	0.0180	42.36	18.30	60.66	127.87	-67.21	peak	
2		0.0270	42.44	15.82	58.26	127.22	-68.96	peak	
3		0.0481	37.28	13.19	50.47	125.70	-75.23	peak	
4		0.0687	35.70	12.66	48.36	124.21	-75.85	peak	
5		0.0863	33.30	12.35	45.65	122.94	-77.29	peak	
6		0.1017	33.62	12.10	45.72	121.83	-76.11	peak	

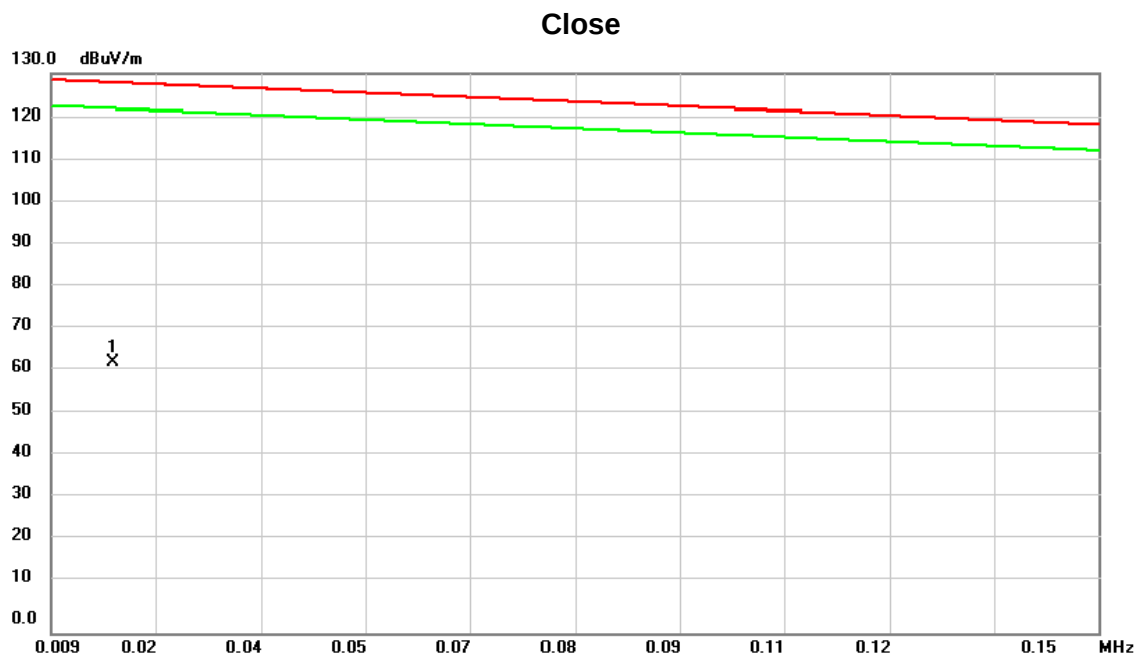
Test Mode:	TX Mode
------------	---------

Open



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		0.1500	47.93	12.03	59.96	118.34	-58.38	peak	
2	*	0.7470	33.04	11.90	44.94	71.51	-26.57	peak	
3		1.5430	25.44	11.76	37.20	64.41	-27.21	peak	
4		4.8464	16.28	11.38	27.66	69.54	-41.88	peak	
5		10.8562	10.46	11.27	21.73	69.54	-47.81	peak	
6		16.0700	8.66	11.12	19.78	69.54	-49.76	peak	

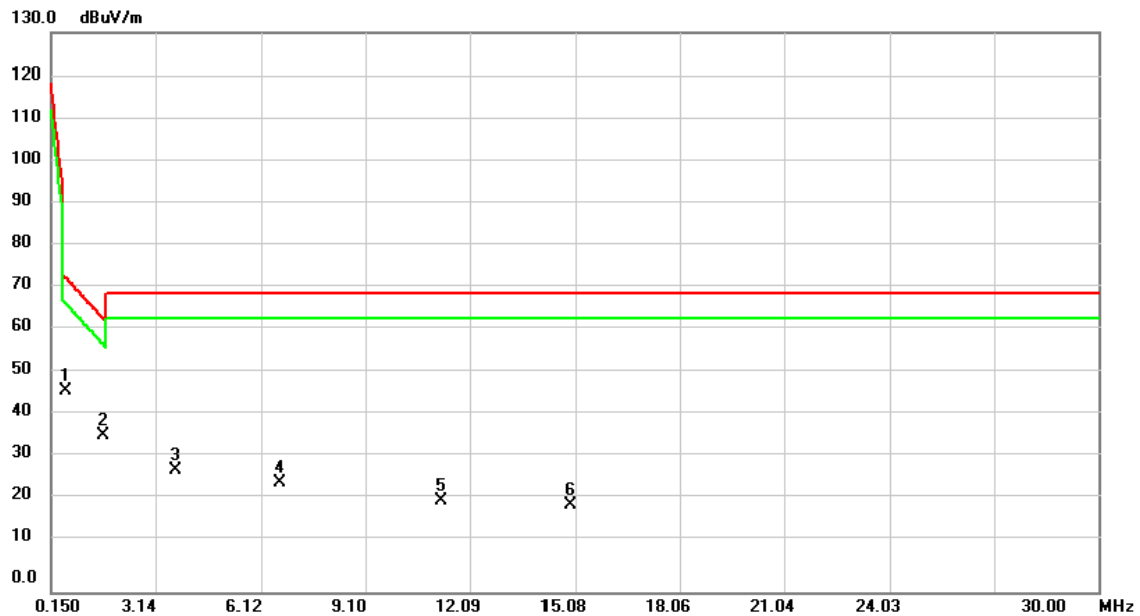
Test Mode:	TX Mode
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No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	0.0173	44.50	18.49	62.99	127.92	-64.93	peak	

Test Mode:	TX Mode
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Close

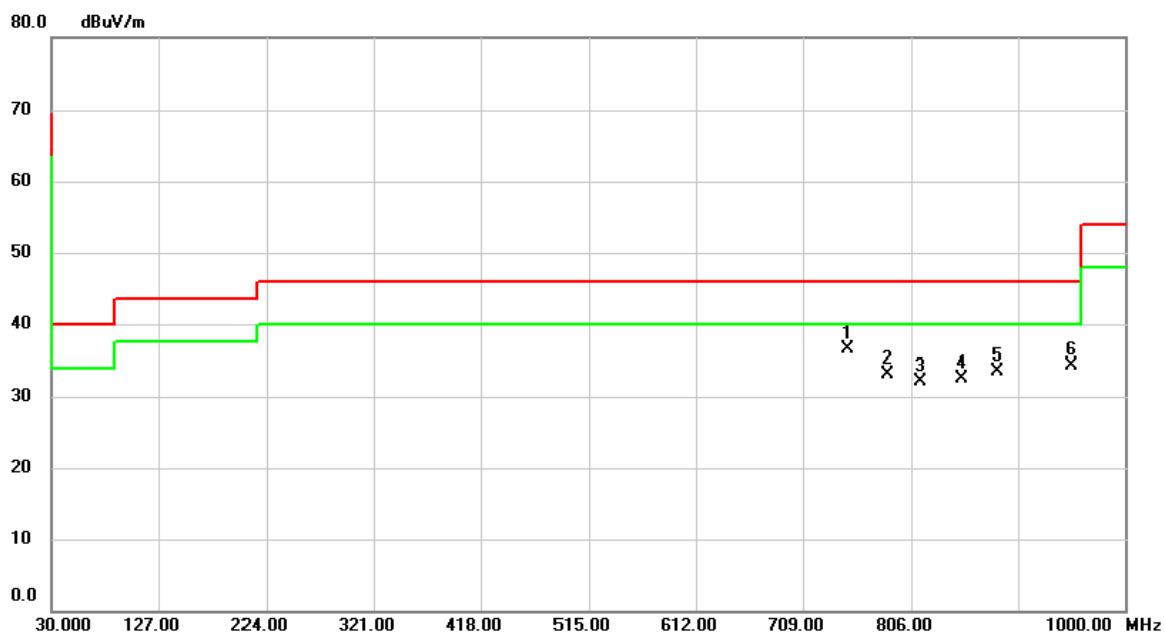


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1	*	0.5480	35.21	11.82	47.03	73.28	-26.25	peak	
2		1.6226	24.87	11.72	36.59	63.70	-27.11	peak	
3		3.6922	17.26	11.20	28.46	69.54	-41.08	peak	
4		6.6374	14.15	11.37	25.52	69.54	-44.02	peak	
5		11.2542	10.14	11.26	21.40	69.54	-48.14	peak	
6		14.9158	9.16	11.15	20.31	69.54	-49.23	peak	

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

Test Mode: TX 2402MHz –CH39

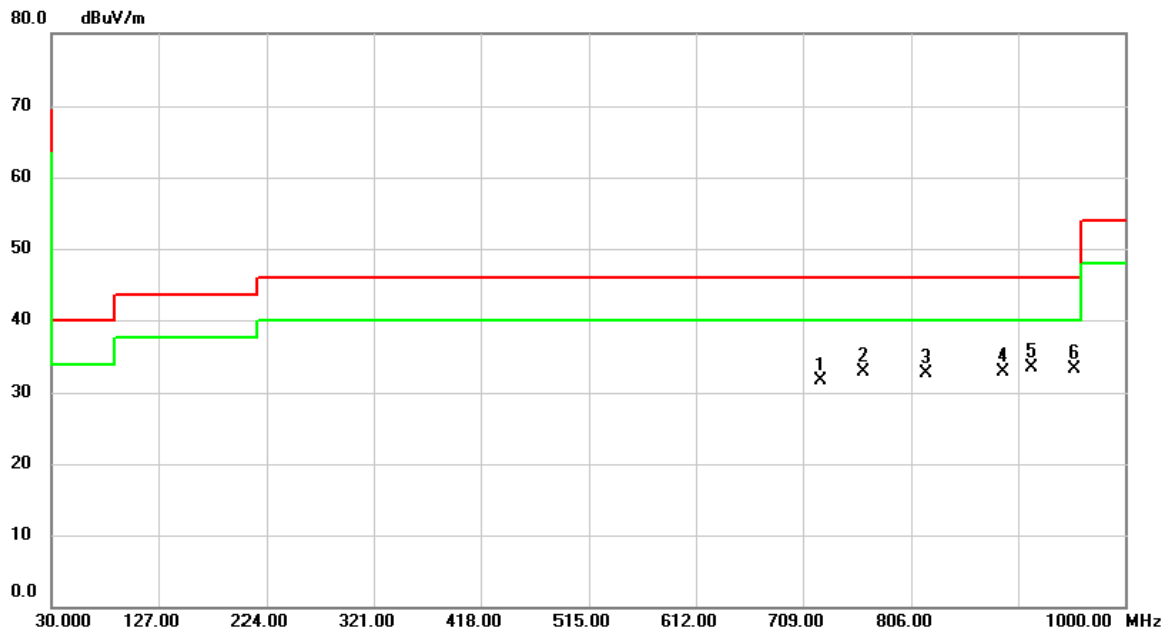
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	749.7400	34.08	2.33	36.41	46.00	-9.59	peak	
2		784.6600	30.48	2.72	33.20	46.00	-12.80	peak	
3		813.7600	29.04	3.08	32.12	46.00	-13.88	peak	
4		851.5900	28.97	3.63	32.60	46.00	-13.40	peak	
5		884.5700	29.14	4.29	33.43	46.00	-12.57	peak	
6		951.5000	28.82	5.51	34.33	46.00	-11.67	peak	

Test Mode:	TX 2402MHz -CH39
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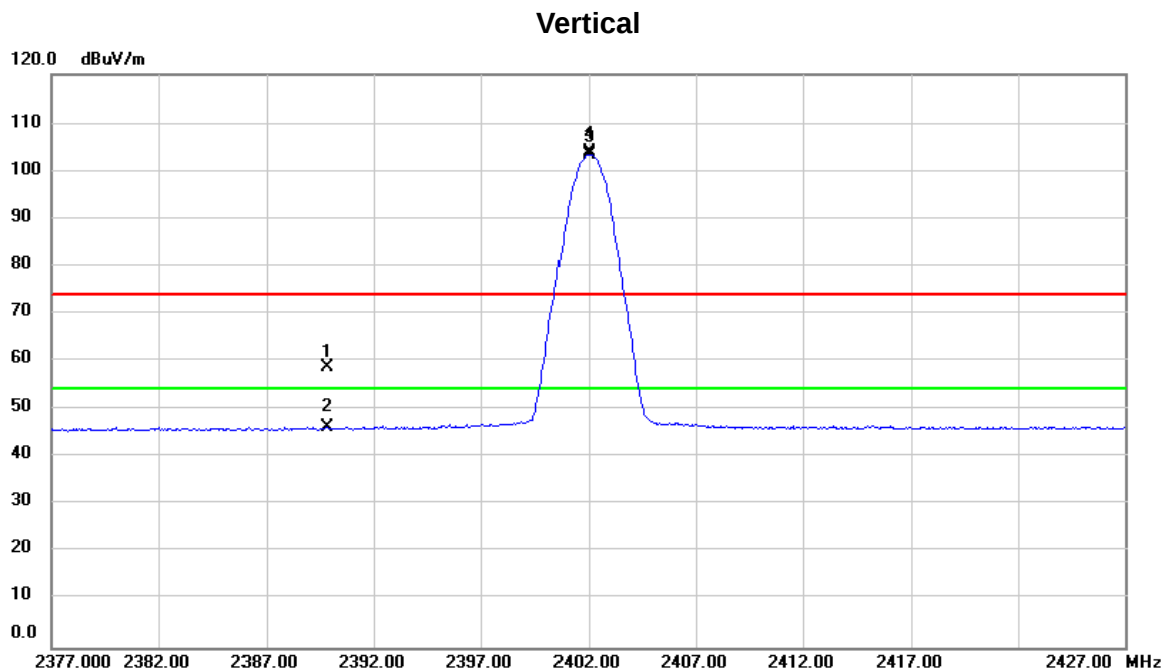
Horizontal



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		725.4900	29.95	1.82	31.77	46.00	-14.23	peak	
2		764.2900	30.46	2.50	32.96	46.00	-13.04	peak	
3		819.5800	29.63	3.16	32.79	46.00	-13.21	peak	
4		889.4200	28.61	4.39	33.00	46.00	-13.00	peak	
5	*	915.6100	28.67	4.89	33.56	46.00	-12.44	peak	
6		953.4400	27.87	5.53	33.40	46.00	-12.60	peak	

ATTACHMENT D - RADIATED EMISSION (ABOVE 1000MHZ)

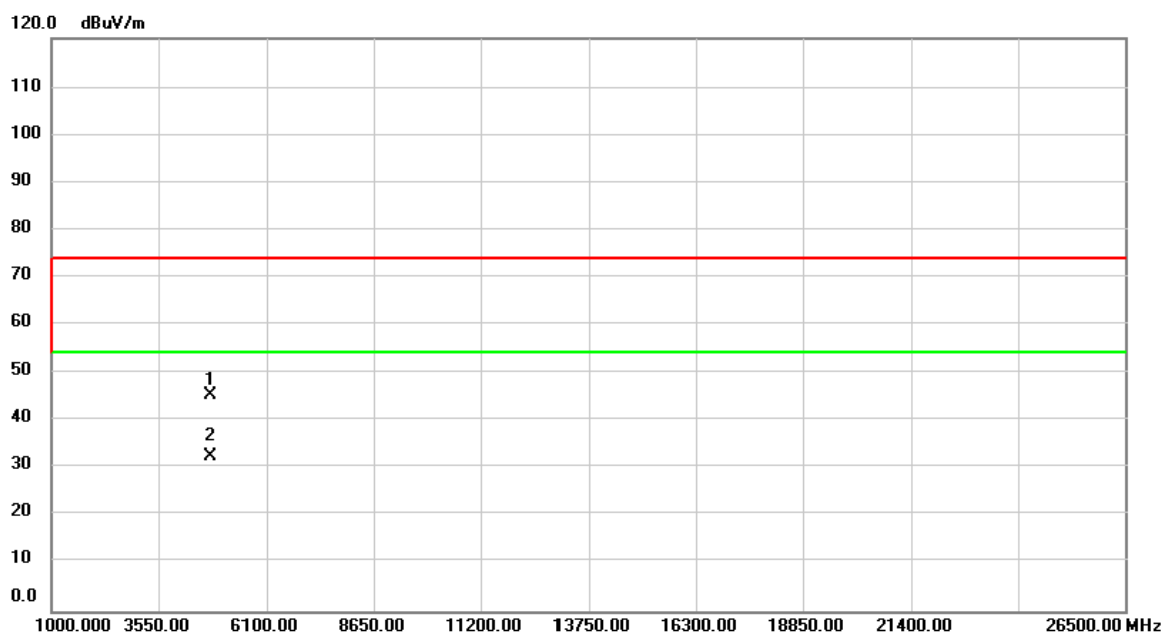
Orthogonal Axis :	X
Test Mode :	TX 2402MHz _CH00_1Mbps



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		2389.800	27.08	31.70	58.78	74.00	-15.22	peak	
2		2389.800	14.70	31.70	46.40	54.00	-7.60	AVG	
3	X	2402.000	72.05	31.76	103.81	74.00	29.81	peak	No Limit
4	*	2402.000	71.72	31.76	103.48	54.00	49.48	AVG	No Limit

Orthogonal Axis :	X
Test Mode :	TX 2402MHz _CH00_1Mbps

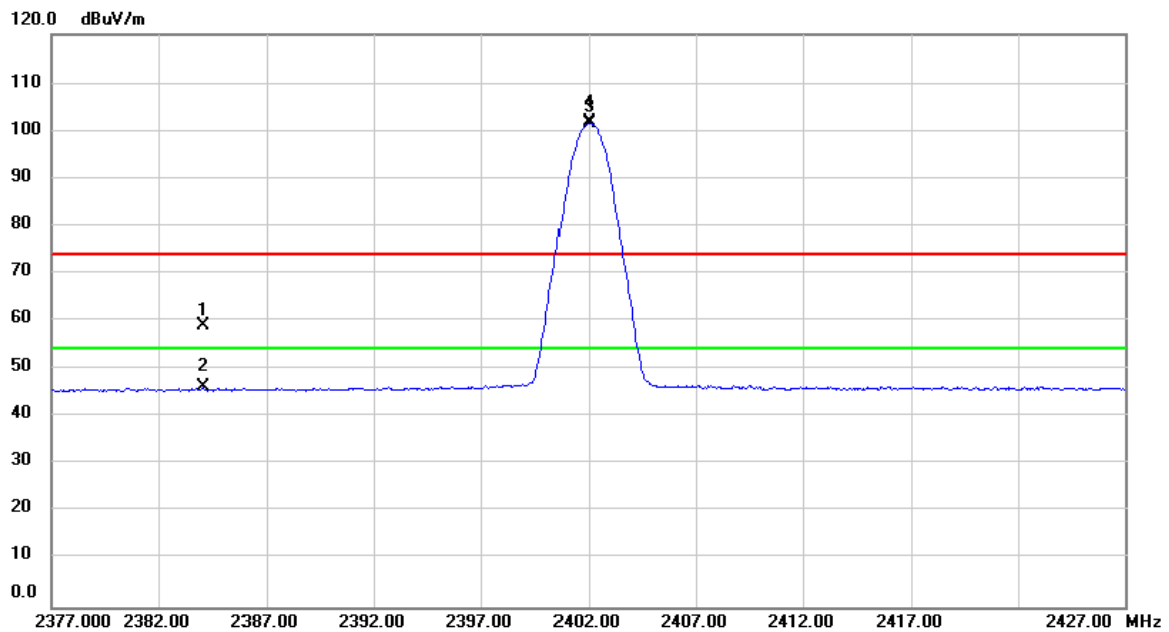
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4804.000	56.11	-10.51	45.60	74.00	-28.40	peak	
2	*	4804.000	43.16	-10.51	32.65	54.00	-21.35	AVG	

Orthogonal Axis :	X
Test Mode :	TX 2402MHz _CH00_1Mbps

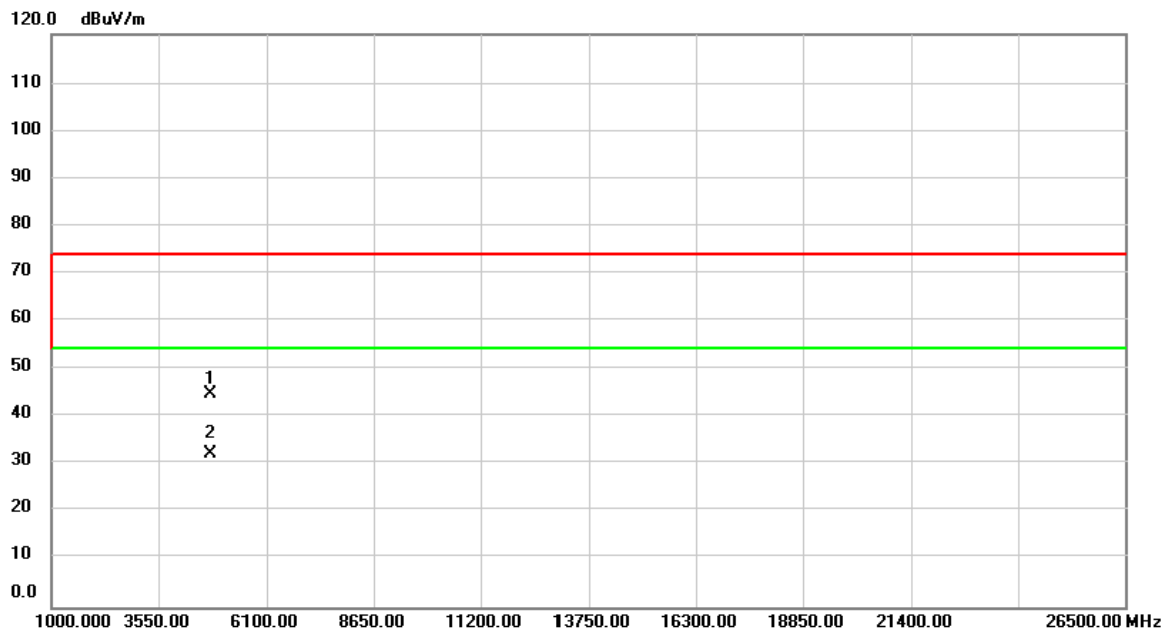
Horizontal



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		2384.100	27.26	31.69	58.95	74.00	-15.05	peak	
2		2384.100	14.52	31.69	46.21	54.00	-7.79	AVG	
3	X	2402.000	70.13	31.76	101.89	74.00	27.89	peak	No Limit
4	*	2402.000	69.75	31.76	101.51	54.00	47.51	AVG	No Limit

Orthogonal Axis :	X
Test Mode :	TX 2402MHz _CH00_1Mbps

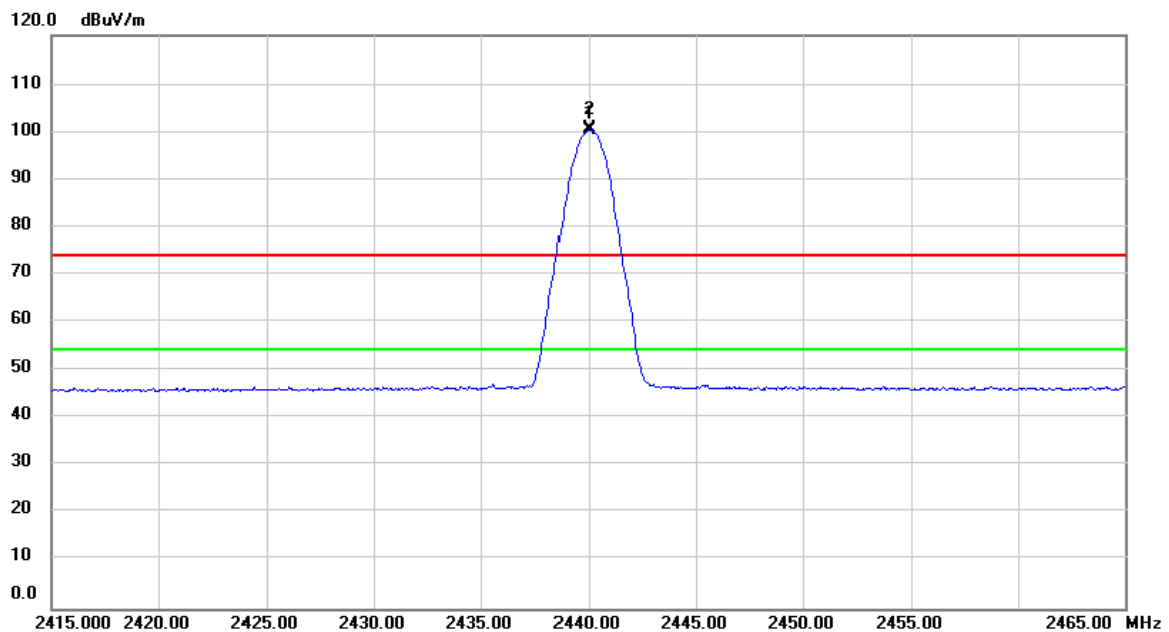
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4804.000	55.45	-10.51	44.94	74.00	-29.06	peak	
2	*	4804.000	42.82	-10.51	32.31	54.00	-21.69	AVG	

Orthogonal Axis :	X
Test Mode :	TX 2440MHz _CH19_1Mbps

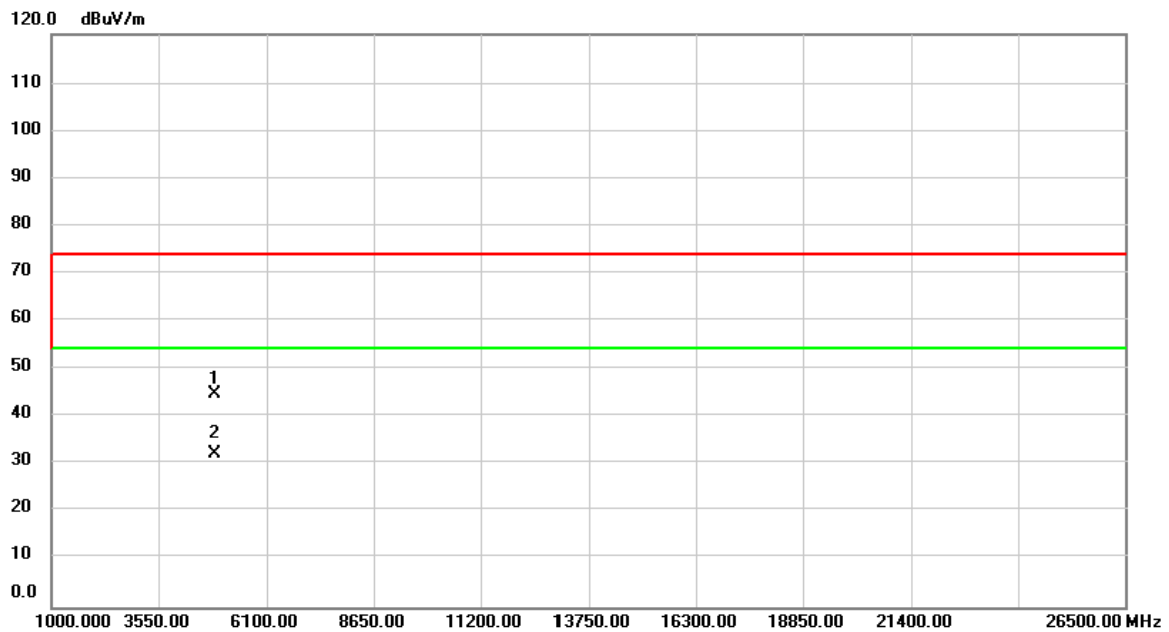
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	X	2440.000	68.77	31.90	100.67	74.00	26.67	peak	No Limit
2	*	2440.000	68.44	31.90	100.34	54.00	46.34	AVG	No Limit

Orthogonal Axis :	X
Test Mode :	TX 2440MHz _CH19_1Mbps

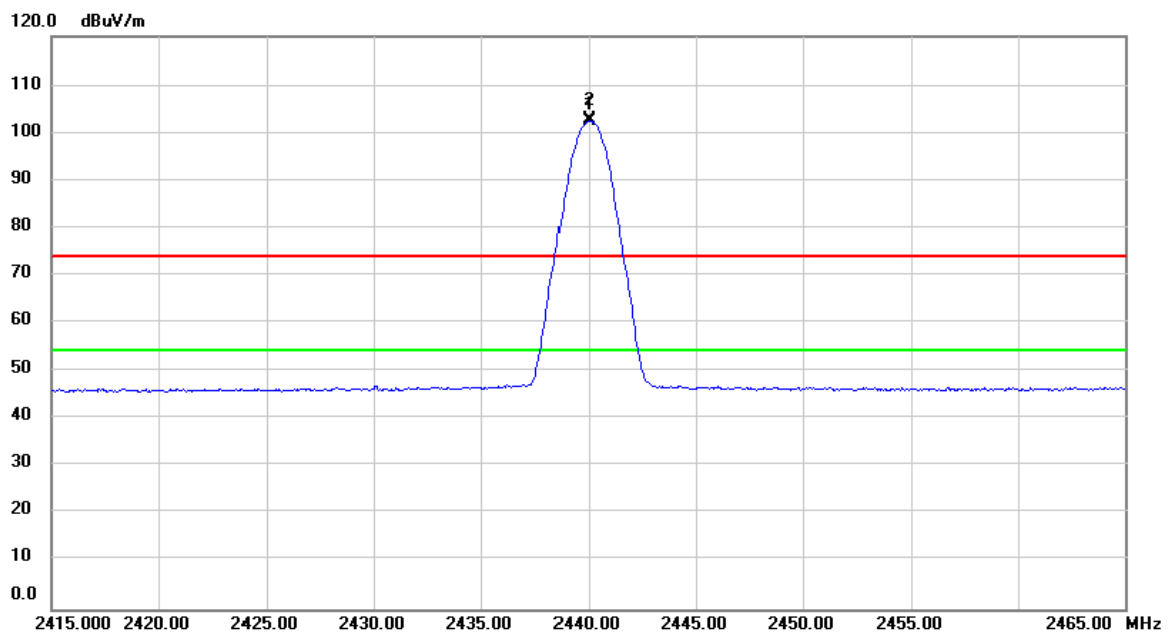
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4880.000	55.20	-10.39	44.81	74.00	-29.19	peak	
2	*	4880.000	42.53	-10.39	32.14	54.00	-21.86	AVG	

Orthogonal Axis :	X
Test Mode :	TX 2440MHz _CH19_1Mbps

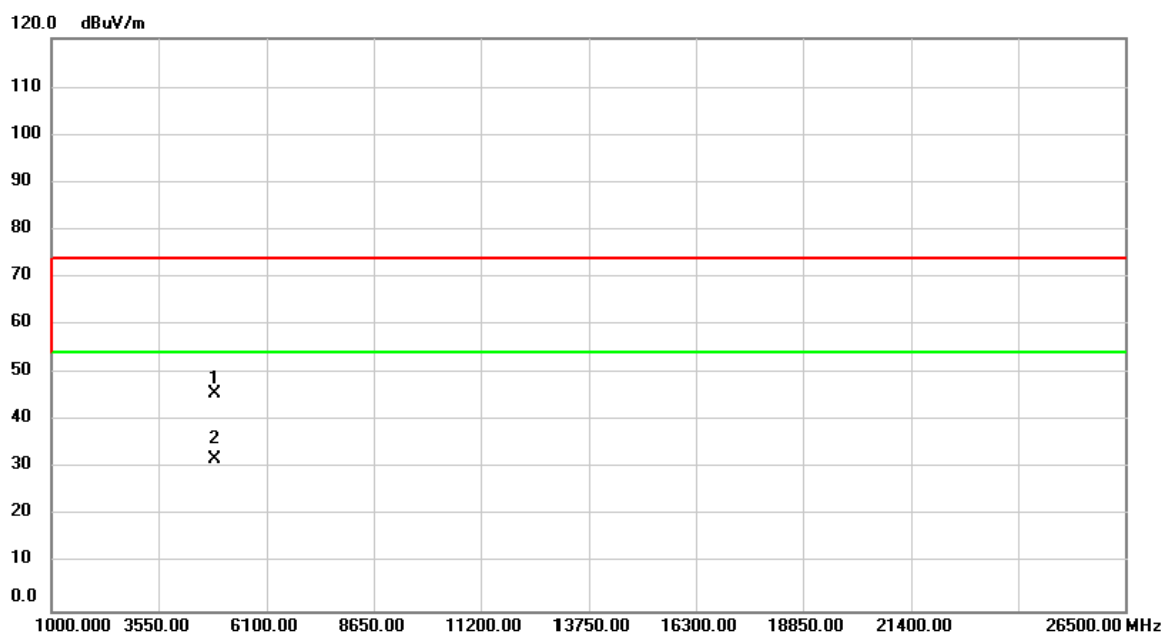
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	X	2440.000	70.83	31.90	102.73	74.00	28.73	peak	No Limit
2	*	2440.000	70.51	31.90	102.41	54.00	48.41	AVG	No Limit

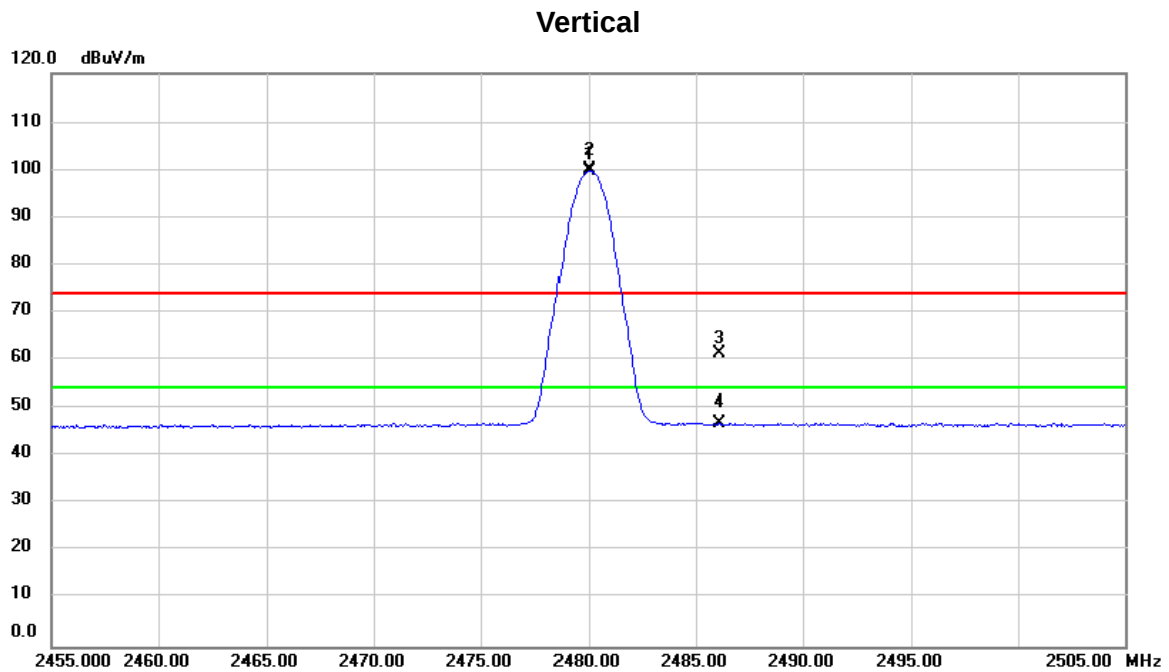
Orthogonal Axis :	X
Test Mode :	TX 2440MHz _CH19_1Mbps

Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4880.000	56.05	-10.39	45.66	74.00	-28.34	peak	
2	*	4880.000	42.36	-10.39	31.97	54.00	-22.03	AVG	

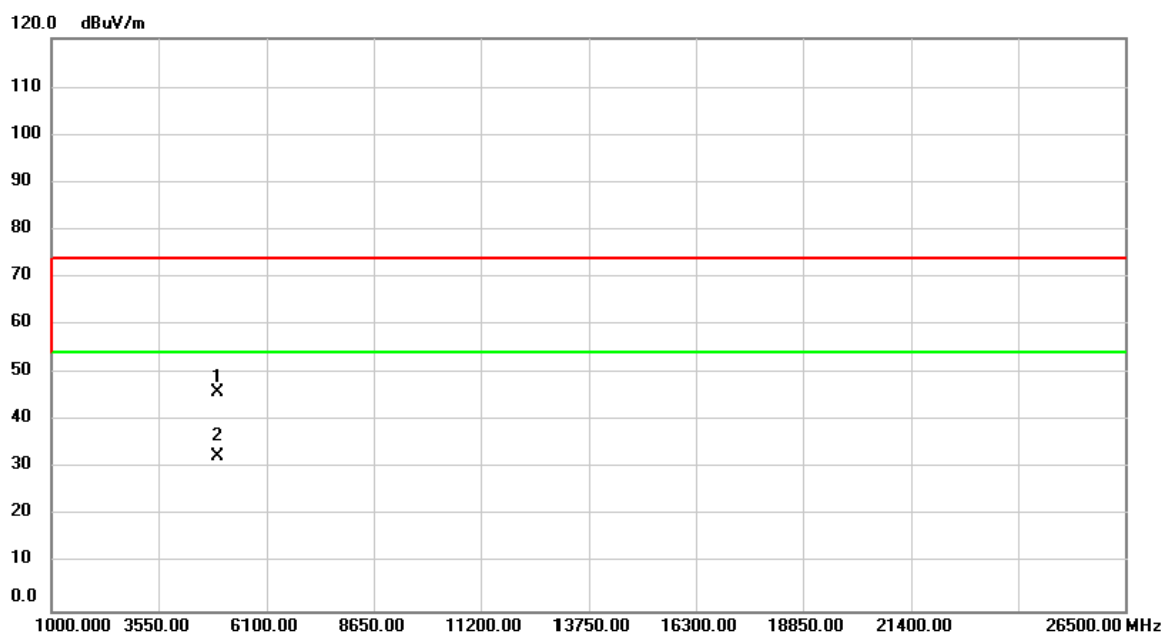
Orthogonal Axis :	X
Test Mode :	TX 2480MHz _CH39_1Mbps



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1	X	2480.000	68.06	32.05	100.11	74.00	26.11	peak	No Limit
2	*	2480.000	67.66	32.05	99.71	54.00	45.71	AVG	No Limit
3		2486.100	29.34	32.08	61.42	74.00	-12.58	peak	
4		2486.100	14.99	32.08	47.07	54.00	-6.93	AVG	

Orthogonal Axis :	X
Test Mode :	TX 2480MHz _CH39_1Mbps

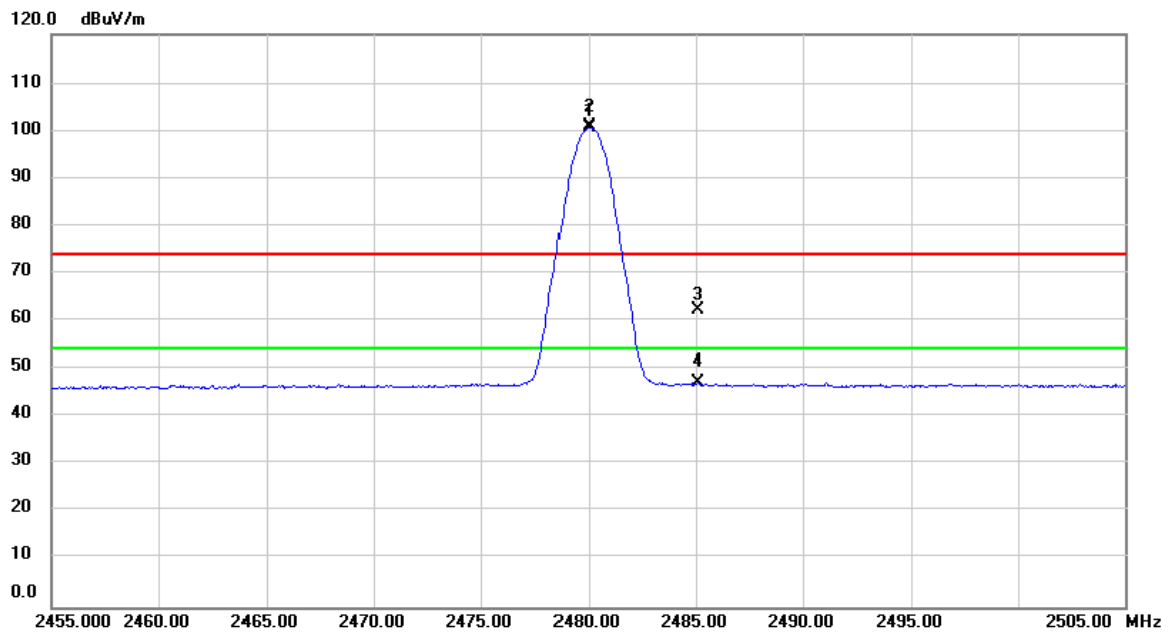
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4960.000	56.18	-10.26	45.92	74.00	-28.08	peak	
2	*	4960.000	42.67	-10.26	32.41	54.00	-21.59	AVG	

Orthogonal Axis :	X
Test Mode :	TX 2480MHz _CH39_1Mbps

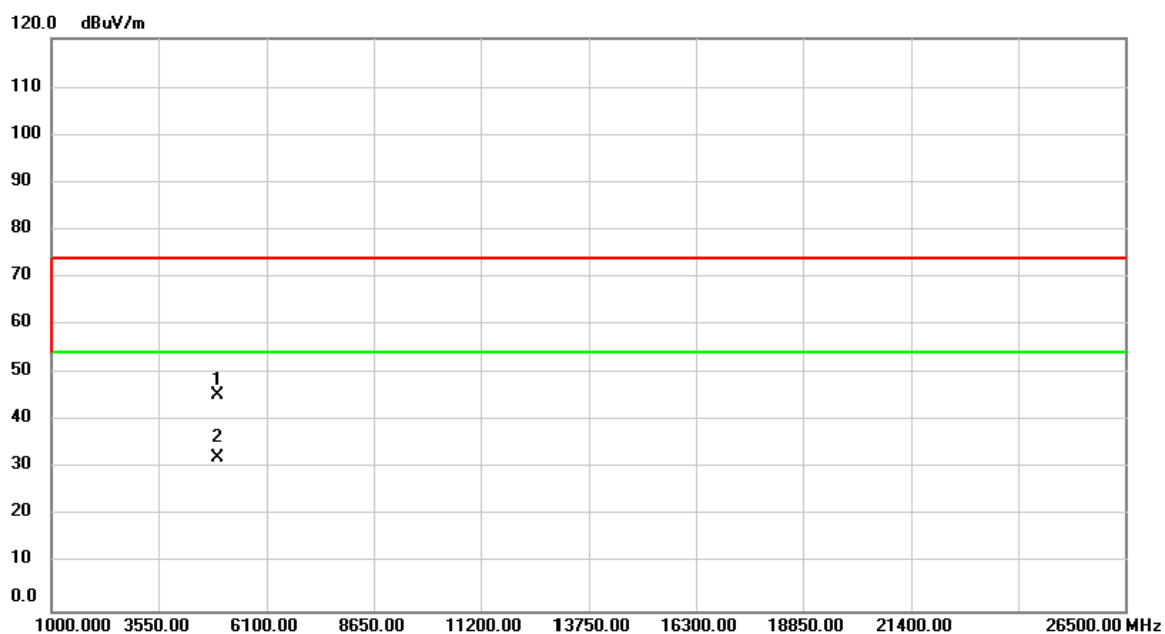
Horizontal



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1	X	2480.000	68.97	32.05	101.02	74.00	27.02	peak	No Limit
2	*	2480.000	68.57	32.05	100.62	54.00	46.62	AVG	No Limit
3		2485.100	30.05	32.07	62.12	74.00	-11.88	peak	
4		2485.100	15.14	32.07	47.21	54.00	-6.79	AVG	

Orthogonal Axis :	X
Test Mode :	TX 2480MHz _CH39_1Mbps

Horizontal



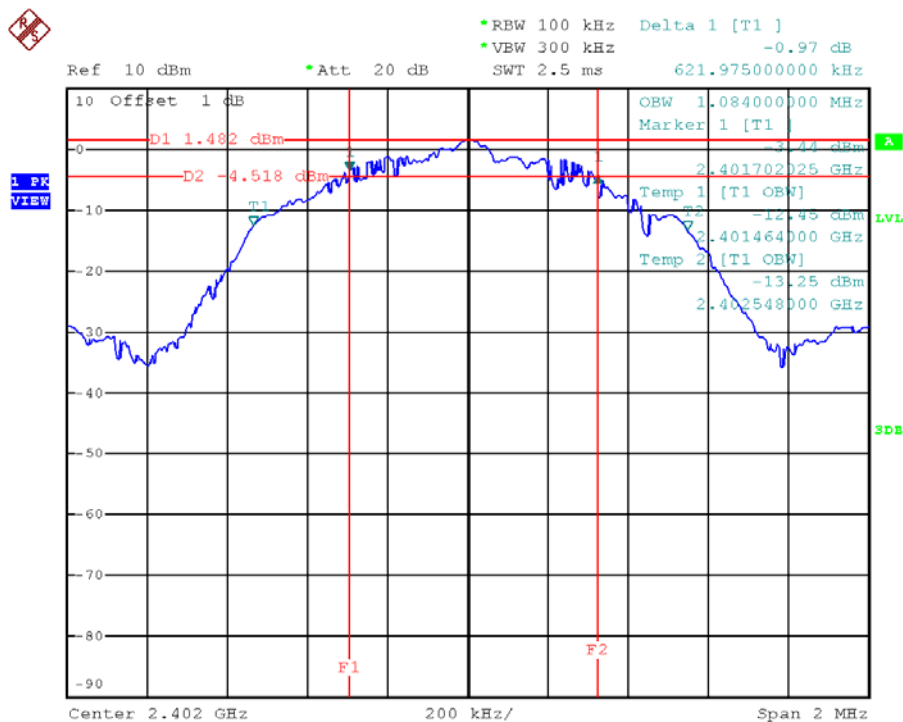
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		4960.000	55.59	-10.26	45.33	74.00	-28.67	peak	
2	*	4960.000	42.61	-10.26	32.35	54.00	-21.65	AVG	

ATTACHMENT E - BANDWIDTH

Test Mode :	CH00, CH19 , CH39 - 1Mbps
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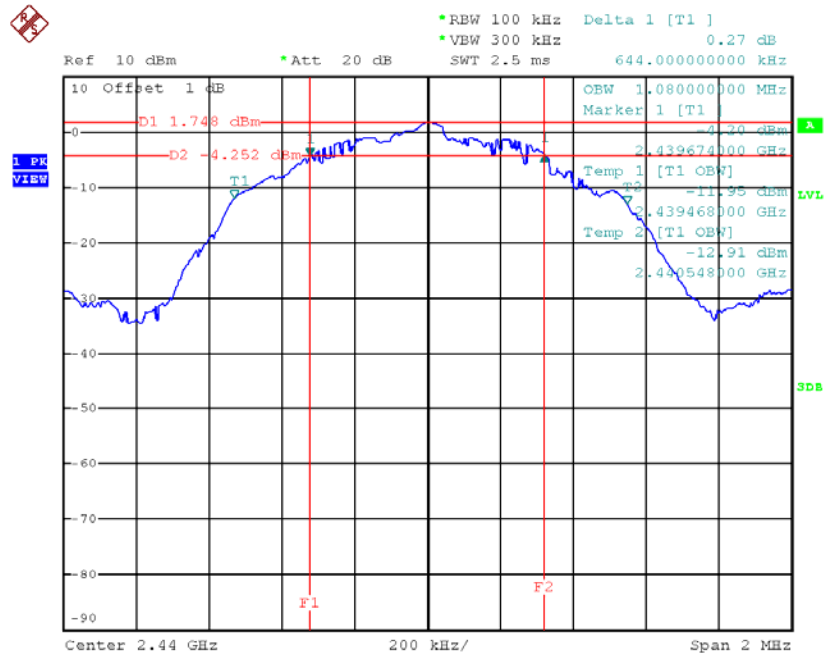
Frequency (MHz)	6dB Bandwidth (MHz)	99% Occupied BW (MHz)	Min. Limit (kHz)	Test Result
2402	0.62	1.08	500	Complies
2440	0.64	1.08	500	Complies
2480	0.65	1.08	500	Complies

TX CH00



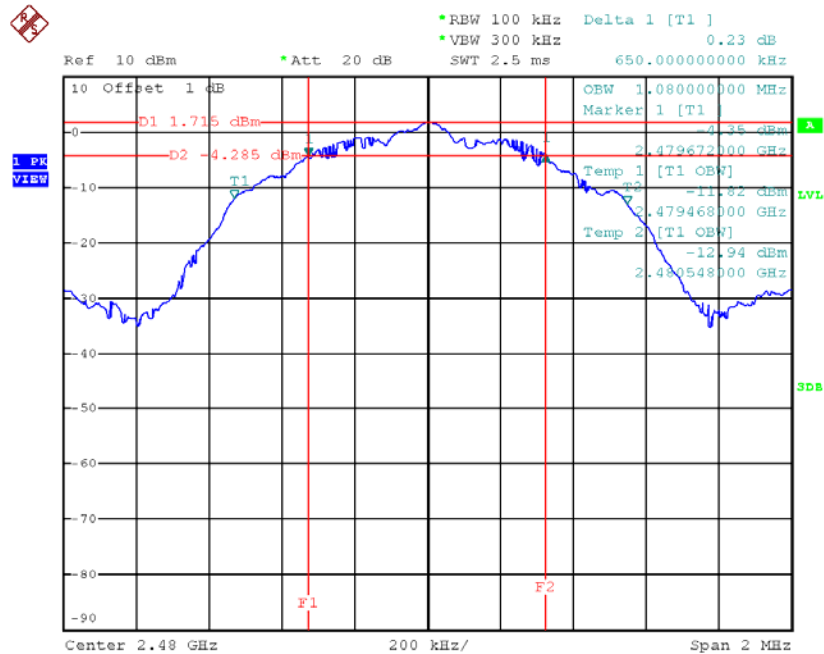
Date: 21.JUN.2016 17:09:33

TX CH19



Date: 21.JUN.2016 17:11:57

TX CH39



Date: 21.JUN.2016 17:13:54

ATTACHMENT F - MAXIMUM OUTPUT POWER TEST

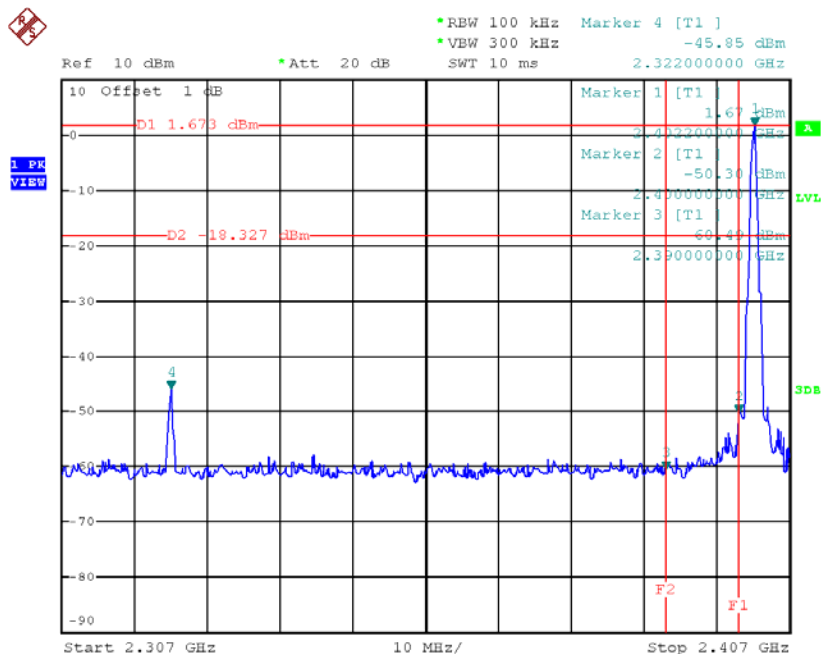
Test Mode :	CH00, CH19 , CH39 - 1Mbps
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Frequency (MHz)	Conducted Power (dBm)	Conducted Power (Watt)	Max. Limit (dBm)	Max. Limit (Watt)	Test Result
2402	2.50	0.0018	30.00	1.00	Complies
2440	2.45	0.0018	30.00	1.00	Complies
2480	2.47	0.0018	30.00	1.00	Complies

ATTACHMENT G - ANTENNA CONDUCTED SPURIOUS EMISSION

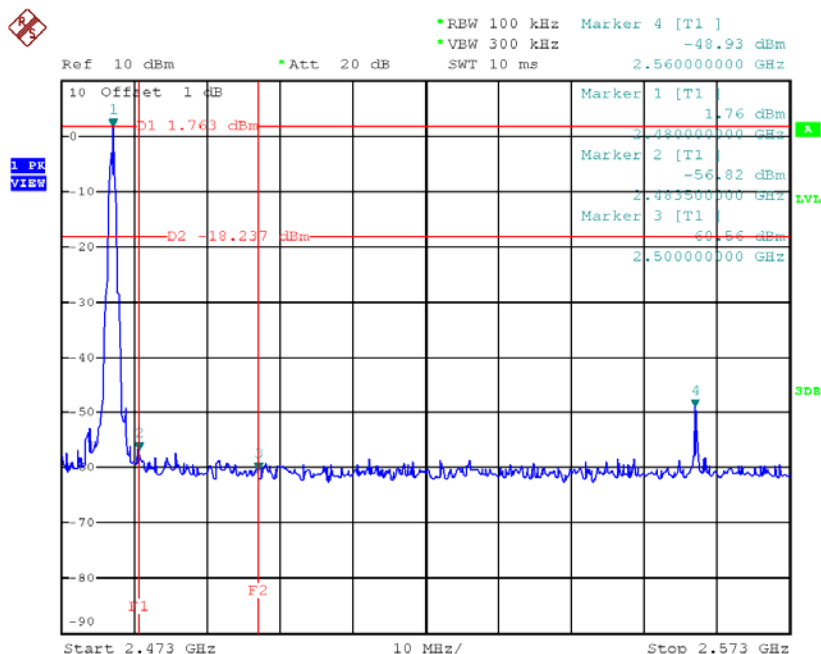
Test Mode : CH00, CH19 , CH39 - 1Mbps

CH00 (Lower) - 1Mbps



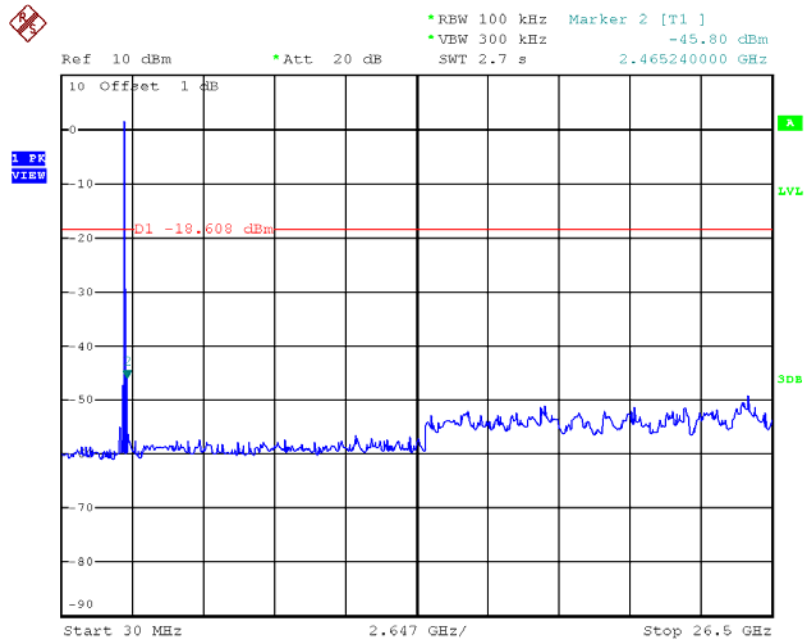
Date: 21.JUN.2016 17:09:41

CH39 (upper) - 1Mbps



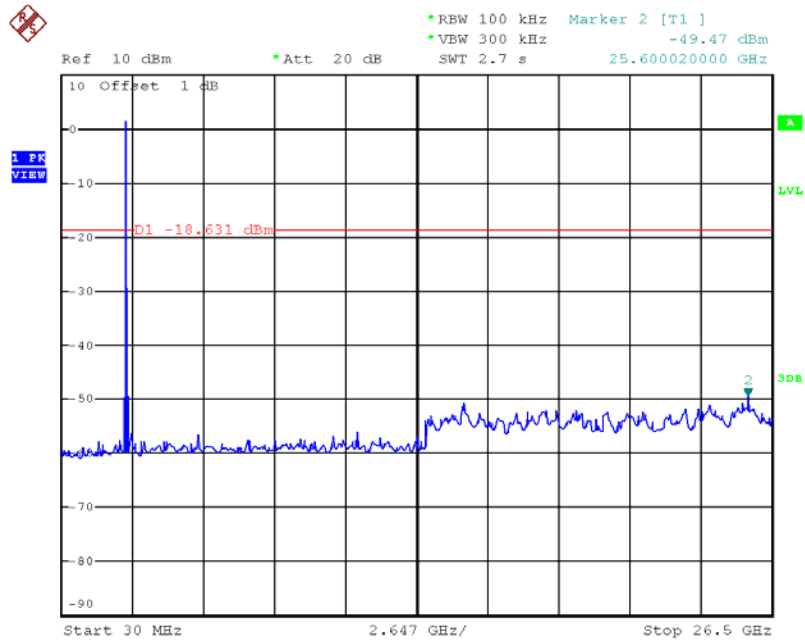
Date: 21.JUN.2016 17:14:02

CH00 (10 Harmonic of the frequency)



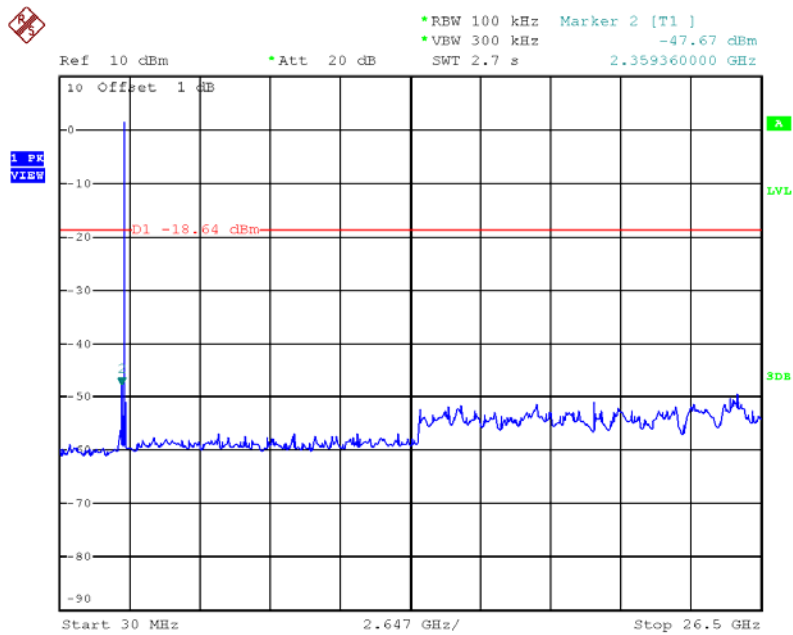
Date: 21.JUN.2016 17:09:54

CH19 (10 Harmonic of the frequency)



Date: 21.JUN.2016 17:12:10

CH39 (10 Harmonic of the frequency)



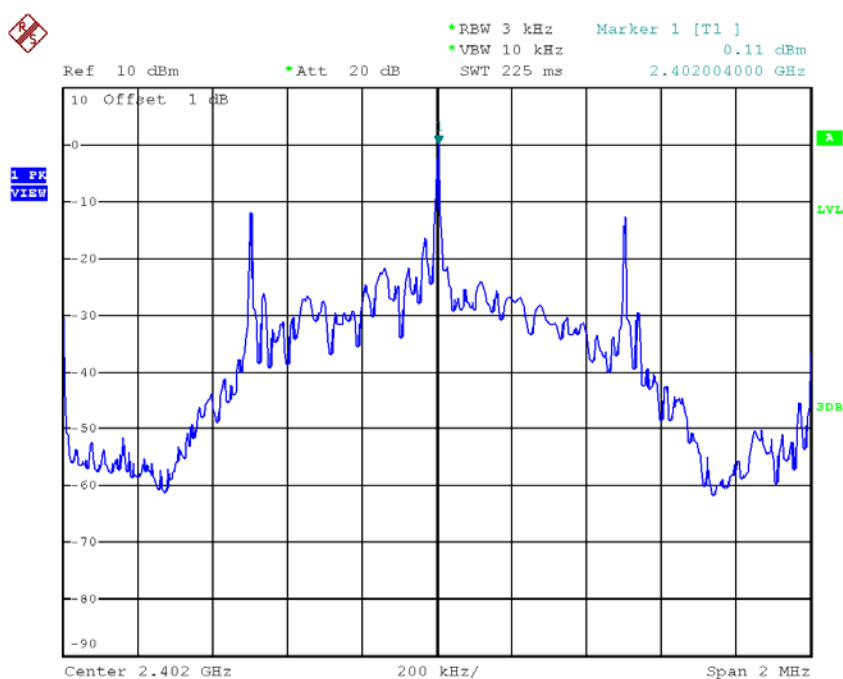
Date: 21.JUN.2016 17:14:15

ATTACHMENT H - POWER SPECTRAL DENSITY TEST

Test Mode :	CH00, CH19 , CH39 - 1Mbps
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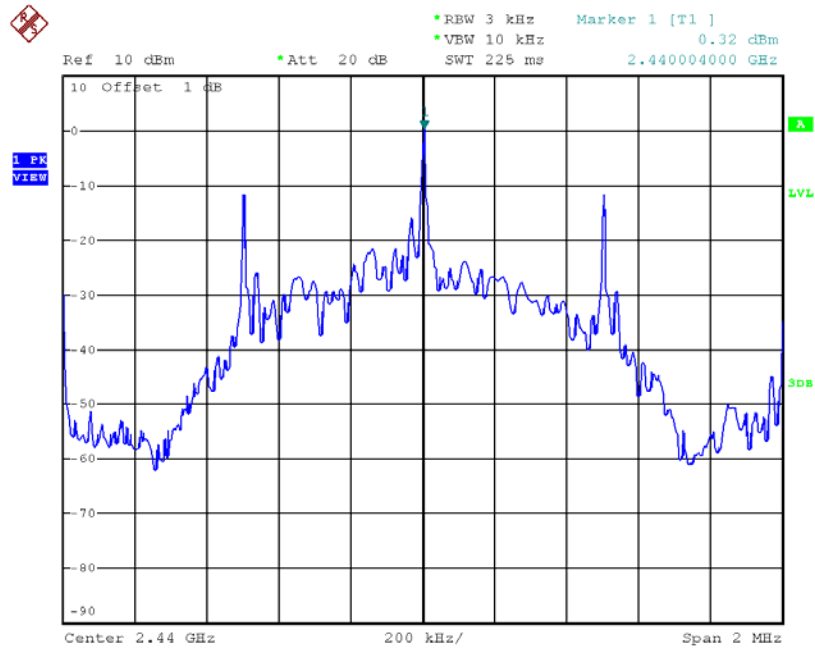
Frequency (MHz)	Power Density (dBm)	Max. Limit (dBm)	Result
2402	0.11	8	Complies
2440	0.32	8	Complies
2480	0.39	8	Complies

TX CH00



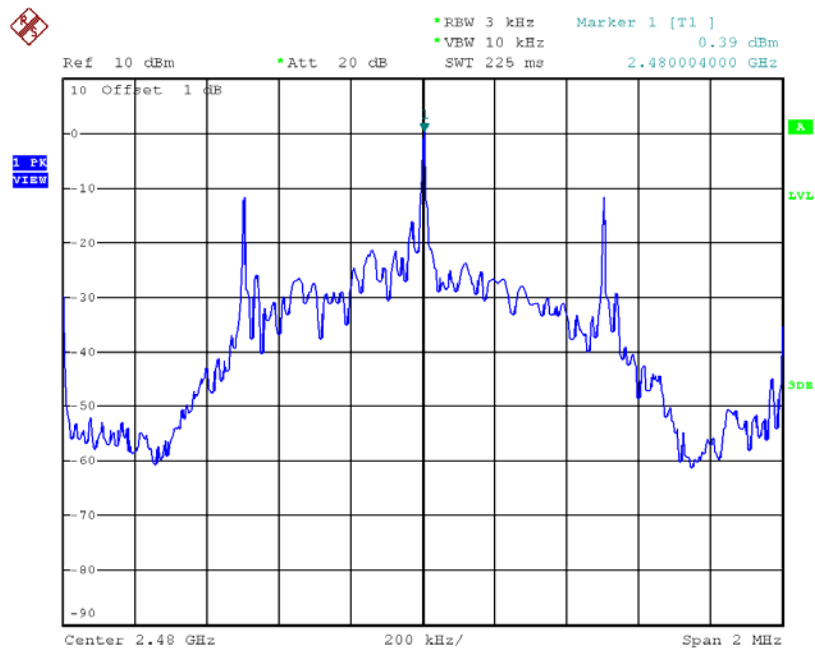
Date: 21.JUN.2016 17:09:59

TX CH19



Date: 21.JUN.2016 17:12:16

TX CH39



Date: 21.JUN.2016 17:14:20