

FCC Radio Test Report

FCC ID: H4IKB2065

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

Project No. : 1706043
Equipment : Wireless Keyboard
Test Model : TPC-L001K
Serial Model : N/A
Applicant : Lite-On Technology Corp.
Address : 16F, 392 , Ruey Kuang Road, Neihu, Taipei 11492,
Taiwan, R.O.C

Date of Receipt : Jun. 15, 2017
Date of Test : Jun. 15, 2017 ~ Jun. 29, 2017
Issued Date : Jun. 30, 2017
Tested by : BTL Inc.

Testing Engineer

: Rush Kao
(Rush Kao)

Technical Manager

: James Chiu
(James Chiu)

Authorized Signatory

: Andy Chiu
(Andy Chiu)

B T L I N C .

B1, No. 37, Lane 365, Yang-Guang St.,
Nei-Hu District, Taipei City 114, Taiwan.
TEL: +886-2-2657-3299 FAX: +886-2-2657-3331

Declaration

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

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

BTL's report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal 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	6
2 . SUMMARY OF TEST RESULTS	7
2.1 TEST FACILITY	7
2.2 MEASUREMENT UNCERTAINTY	8
3 . GENERAL INFORMATION	9
3.1 DESCRIPTION OF EUT	9
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 LIMITS	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	17
4.2.5 EUT OPERATING CONDITIONS	18
4.2.6 EUT TEST CONDITIONS	18
4.2.7 TEST RESULTS (9KHZ TO 30MHZ)	18
4.2.8 TEST RESULTS (30MHZ TO 1000MHZ)	18
4.2.9 TEST RESULTS (ABOVE 1000 MHZ)	19
5 . BANDWIDTH TEST	20
5.1 APPLIED PROCEDURES / LIMIT	20
5.1.1 TEST PROCEDURE	20
5.1.2 DEVIATION FROM STANDARD	20
5.1.3 TEST SETUP	20
5.1.4 EUT OPERATION CONDITIONS	20
5.1.5 EUT TEST CONDITIONS	20
5.1.6 TEST RESULTS	20

Table of Contents	Page
6 . CONDUCTED OUTPUT POWER TEST	21
6.1 APPLIED PROCEDURES / LIMIT	21
6.1.1 TEST PROCEDURE	21
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 OPERATION 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
8.1.2 DEVIATION FROM STANDARD	23
8.1.3 TEST SETUP	23
8.1.4 EUT OPERATION CONDITIONS	23
8.1.5 EUT TEST CONDITIONS	23
8.1.6 TEST RESULTS	23
9 . MEASUREMENT INSTRUMENTS LIST	24
10 . EUT TEST PHOTO	25
APPENDIX A - CONDUCTED EMISSION	28
APPENDIX B -RADIATED EMISSION (9KHZ TO 30MHZ)	29
APPENDIX C -RADIATED EMISSION (30MHZ TO 1000MHZ)	34
APPENDIX D -RADIATED EMISSION (ABOVE 1000MHZ)	37
APPENDIX E - BANDWIDTH	50
APPENDIX F - CONDUCTED POWER TEST	53
APPENDIX G - ANTENNA CONDUCTED SPURIOUS EMISSION	55
APPENDIX H - POWER SPECTRAL DENSITY TEST	62

REPORT ISSUED HISTORY

Issued No.	Description	Issued Date
BTL-FCCP-1-1706043	Original Issue.	Jun. 30, 2017

1. CERTIFICATION

Equipment : Wireless Keyboard
Brand Name : HP
Test Model : TPC-L001K
Serial Model : N/A
Applicant : Lite-On Technology Corp.
Date of Test : Jun. 15, 2017 ~ Jun. 29, 2017
Test Sample : Engineering Sample
Standard(s) : FCC Part15, Subpart C (15.247) / ANSI C63.10-2013

The above equipment has been tested and found in compliance with the requirement of the relative standards by BTL Inc.

The test data, data evaluation, and equipment configuration contained in our test report (Ref No. BTL-FCCP-1-1706043) 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			
Standard(s) Section	Test Item	Judgment	Remark
15.207	Conducted Emission	N/A	NOTE (1)
15.247(d)	Antenna conducted Spurious Emission	PASS	
15.247(a)(2)	6dB Bandwidth	PASS	
15.247(b)(3)	Output Power	PASS	
15.247(e)	Power Spectral Density	PASS	
15.203	Antenna Requirement	PASS	
15.209/15.205	Transmitter Radiated Emissions	PASS	
15.209/15.205	Band Edge 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:

Radiated emission Test (Below 1 GHz):

CB15: (FCC RN:674415; FCC DN:TW0659)

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

Radiated emission Test (Above 1 GHz):

CB15: (FCC RN:674415; FCC DN:TW0659)

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

2.2 MEASUREMENT UNCERTAINTY

The measurement uncertainty is not specified by FCC rules for reference only.

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%**.

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

The BTL measurement uncertainty is less than the CISPR 16-4-2 U_{CISPR} requirement.

A. Radiated Measurement :

Test Site	Method	Measurement Frequency Range	U,(dB)
CB15 (3m)	CISPR	9kHz ~ 150kHz	2.96
		150kHz ~ 30MHz	2.74

Test Site	Method	Measurement Frequency Range	Ant.	U,(dB)
CB15 (3m)	CISPR	30MHz ~ 200MHz	V	4.76
		30MHz ~ 200MHz	H	4.28
		200MHz ~ 1,000MHz	V	5.08
		200MHz ~ 1,000MHz	H	4.50

Test Site	Method	Measurement Frequency Range	Ant.	U,(dB)
CB15 (3m)	CISPR	1GHz ~ 6GHz	V	4.48
		1GHz ~ 6GHz	H	4.50
		6GHz ~ 18GHz	V	4.30
		6GHz ~ 18GHz	H	4.14

Test Site	Method	Measurement Frequency Range	U,(dB)
CB15 (1m)	CISPR	18 ~ 26.5 GHz	4.72
		26.5 ~ 40 GHz	5.20

Note: unless specifically mentioned, the uncertainty of measurement has not been taken into account to declare the compliance or non-compliance to the specification.

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} .

3. GENERAL INFORMATION

3.1 DESCRIPTION OF EUT

Product Name	Wireless Keyboard	
Brand	HP	
Test Model	TPC-L001K	
Series Model	N/A	
Model Difference	N/A	
Product Description	Operation Frequency	2403-2480 MHz
	Modulation Technology	GFSK
	Bit Rate of Transmitter	2 Mbps
	Output Power (Max.)	-2.79dBm
Power Source	Supplied from 2*AAA battery	
EUT Power Rating	DC 3V 50mA	

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	2403	27	2429	53	2455
02	2404	28	2430	54	2456
03	2405	29	2431	55	2457
04	2406	30	2432	56	2458
05	2407	31	2433	57	2459
06	2408	32	2434	58	2460
07	2409	33	2435	59	2461
08	2410	34	2436	60	2462
09	2411	35	2437	61	2463
10	2412	36	2438	62	2464
11	2413	37	2439	63	2465
12	2414	38	2440	64	2466
13	2415	39	2441	65	2467
14	2416	40	2442	66	2468
15	2417	41	2443	67	2469
16	2418	42	2444	68	2470
17	2419	43	2445	69	2471
18	2420	44	2446	70	2472
19	2421	45	2447	71	2473
20	2422	46	2448	72	2474
21	2423	47	2449	73	2475
22	2424	48	2450	74	2476
23	2425	49	2451	75	2477
24	2426	50	2452	76	2478
25	2427	51	2453	77	2479
26	2428	52	2454	78	2480

3. Table for Filed Antenna:

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	Note
1	N/A	N/A	PIFA	N/A	-3.85	

3.2 DESCRIPTION OF TEST MODES

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

Pretest Mode	Description
Mode 1	TX Mode

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

For Conducted Test	
Final Test Mode	Description
-	-

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

Note:

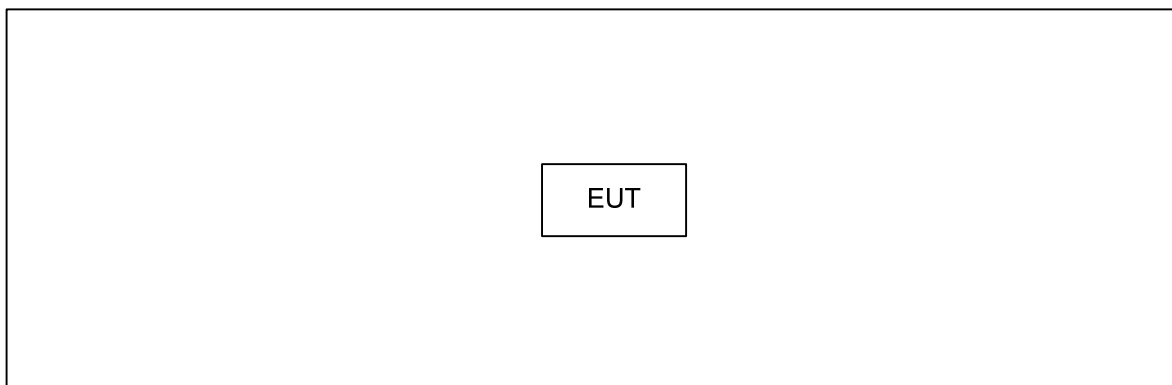
(1) The measurements are performed at the high, middle, low available channels.

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	N/A		
Frequency (MHz)	2403	2441	2480
-	DEF	DEF	DEF

3.4 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



3.5 DESCRIPTION OF SUPPORT UNITS

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

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

Item	Shielded Type	Ferrite Core	Length	Note
-	-	-	-	-

Note:

- (1) The support equipment was authorized by Declaration of Conformity (DOC).

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.	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 - 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

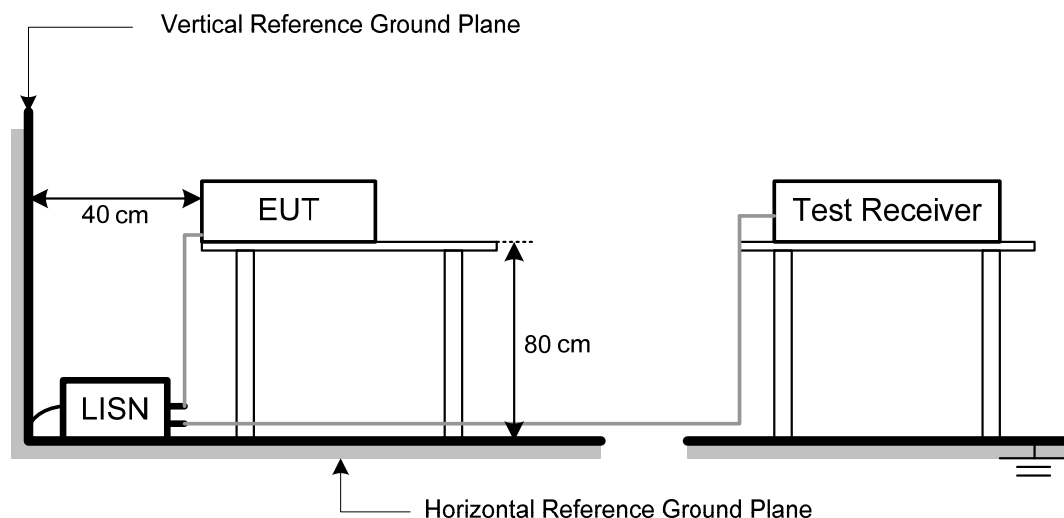
4.1.2 TEST PROCEDURE

- 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 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 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 Appendix A.

Remark:

- (1) All readings are QP Mode value unless otherwise stated AVG in column of 『Note』. If the QP Mode Measured value compliance with the QP Limits and lower than AVG Limits, the EUT shall be deemed to meet both QP & AVG Limits and then only QP Mode was measured, but AVG Mode didn't perform. In this case, a “ * ” marked in AVG Mode column of Interference Voltage Measured.
- (2) Measuring frequency range from 150KHz to 30MHz.
- (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

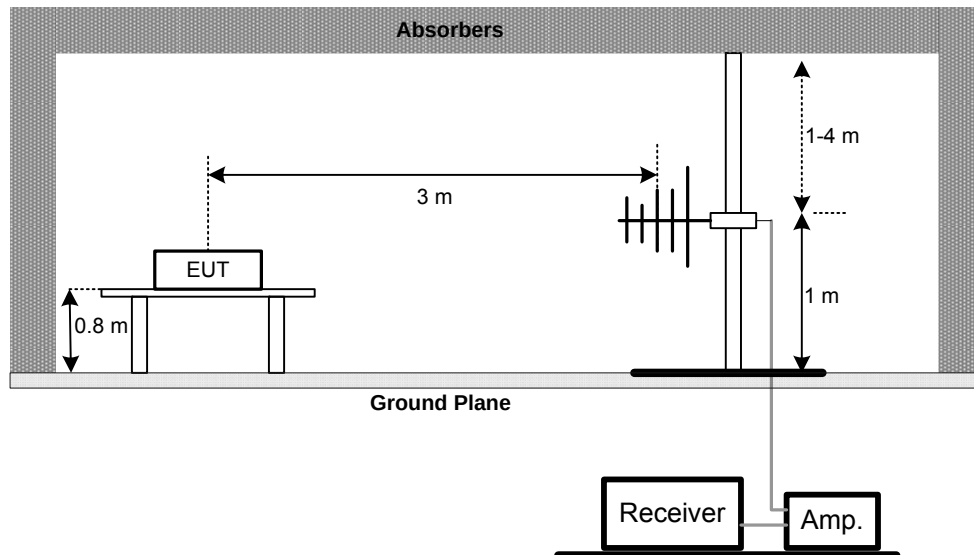
- The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1GHz)
- The measuring distance of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

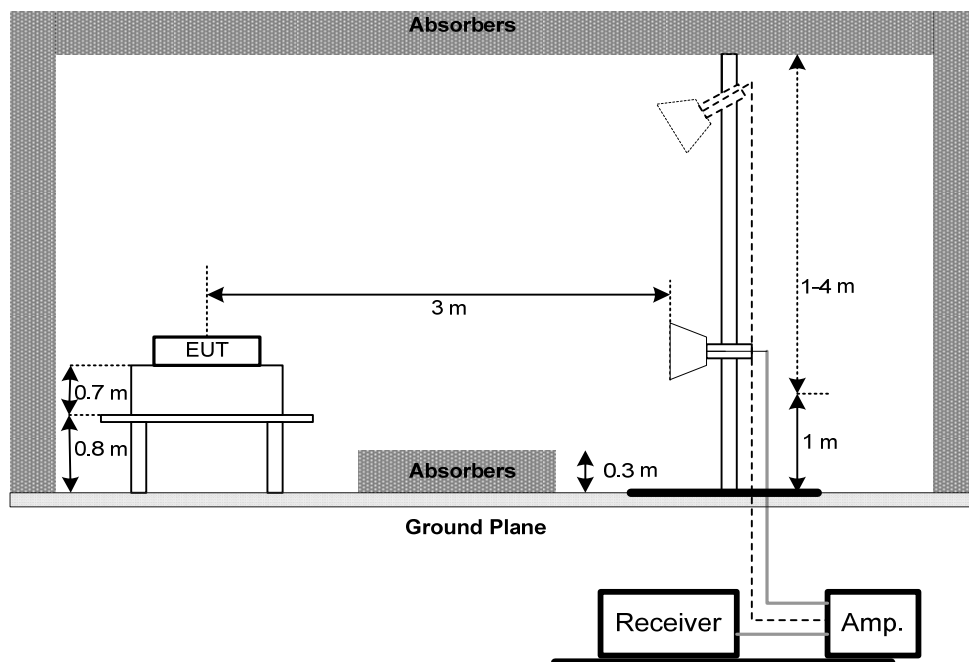
No deviation

4.2.4 TEST SETUP

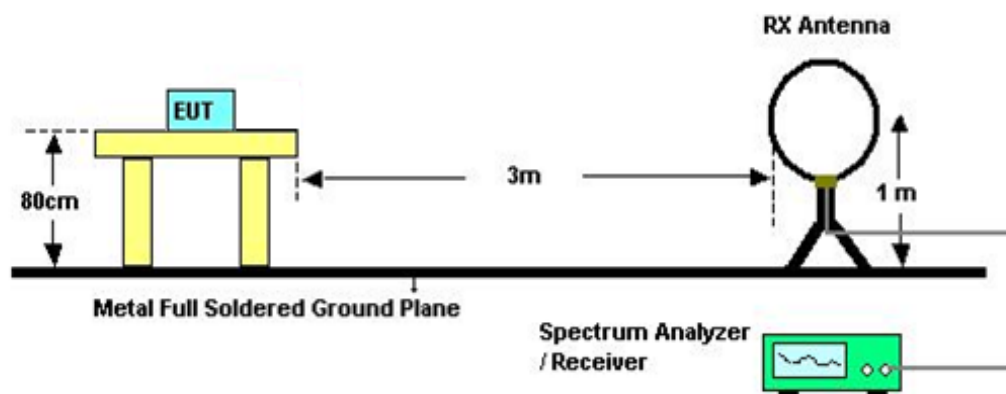
(A) Radiated Emission Test Set-Up Frequency Below 1 GHz



(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: 23°C

Relative Humidity: 70%

Test Voltage: DC 3V

4.2.7 TEST RESULTS (9KHZ TO 30MHZ)

Please refer to the Appendix B

Remark:

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

4.2.8 TEST RESULTS (30MHZ TO 1000MHZ)

Please refer to the Appendix 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.

4.2.9 TEST RESULTS (ABOVE 1000 MHZ)

Please refer to the Appendix 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

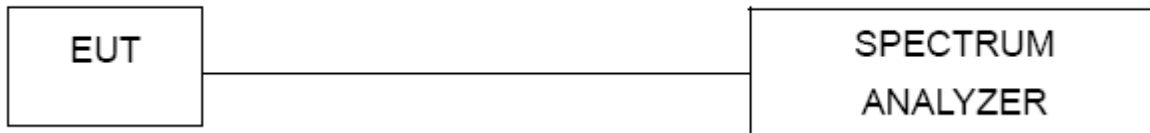
5.1.1 TEST PROCEDURE

- 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: 60% Test Voltage: DC 3V

5.1.6 TEST RESULTS

Please refer to the Appendix E.

6. CONDUCTED 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

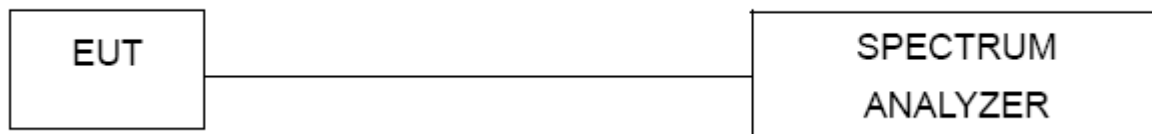
6.1.1 TEST PROCEDURE

- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
- The maximum conducted output power was performed in accordance with method 9.1.2 of FCC KDB 558074 D01 DTS Meas Guidance v03r05.

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: 60% Test Voltage: DC 3V

6.1.6 TEST RESULTS

Please refer to the Appendix 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=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: 60% Test Voltage: DC 3V

7.1.6 TEST RESULTS

Please refer to the Appendix 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

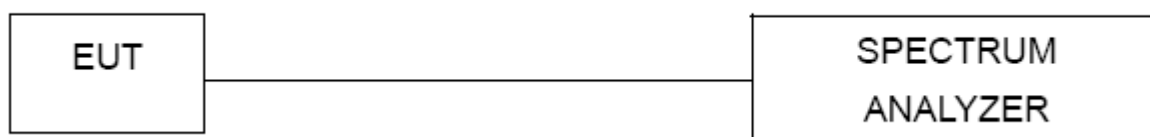
8.1.1 TEST PROCEDURE

- 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: 60% Test Voltage: DC 3V

8.1.6 TEST RESULTS

Please refer to the Appendix H.

9. MEASUREMENT INSTRUMENTS LIST

Radiated Emission Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Preamplifier	EMCI	012645B	980267	Feb. 28, 2018
2	Preamplifier	EMCI	EMC02325	980217	Dec. 29, 2017
3	Test Cable	EMCI	EMC104-SM-S M-8000	8m	Jan. 04, 2018
4	Test Cable	EMCI	EMC104-SM-S M-800	150207	Jan. 04, 2018
5	Test Cable	EMCI	EEMC104-SM-S M-3000	151205	Jan. 04, 2018
6	MXE EMI Receiver	Agilent	N9038A	MY55420127	Jan. 09, 2018
7	Signal Analyzer	Agilent	N9010A	MY52220990	Feb. 22, 2018
8	Loop Ant	EMCO	6502	42960	Nov. 24, 2017
9	Horn Ant	SCHWARZBECK	BBHA 9120D	9120D-1342	Feb. 28, 2018
10	Trilog-Broadband Antenna	Schwarzbeck	VULB 9168	9168-548	Jan. 16, 2018
11	5dB Attenuator	EMCI	EMCI-N-6-05	AT-N0623	Jan. 16, 2018

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

Conducted Output Power Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Power Meter	Anritsu	ML2495A	1128008	Aug. 17, 2017
2	Power Sensor	Anritsu	MA2411B	1126001	Aug. 17, 2017

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

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

Remark: "N/A" denotes no model name, serial no. or calibration specified.

All calibration period of equipment list is one year.

10. EUT TEST PHOTO

Radiated Measurement Photos

9K-30MHz



Radiated Measurement Photos

30MHz-1G



Radiated Measurement Photos

Above 1G



APPENDIX A - CONDUCTED EMISSION

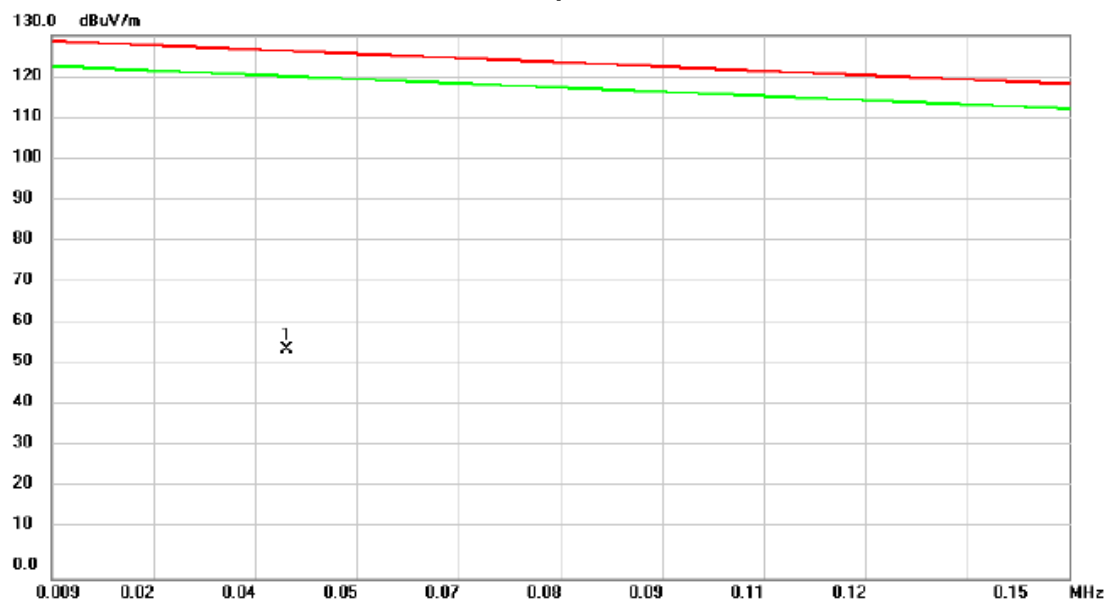
Test Mode: N/A

Note: "N/A" denotes test is not applicable to this device.

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

Test Mode	TX Mode_2403 MHz
-----------	------------------

Open



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	*	0.0417	41.08	13.83	54.91	126.16	-71.25	peak	

Test Mode	TX Mode_2403 MHz
-----------	------------------

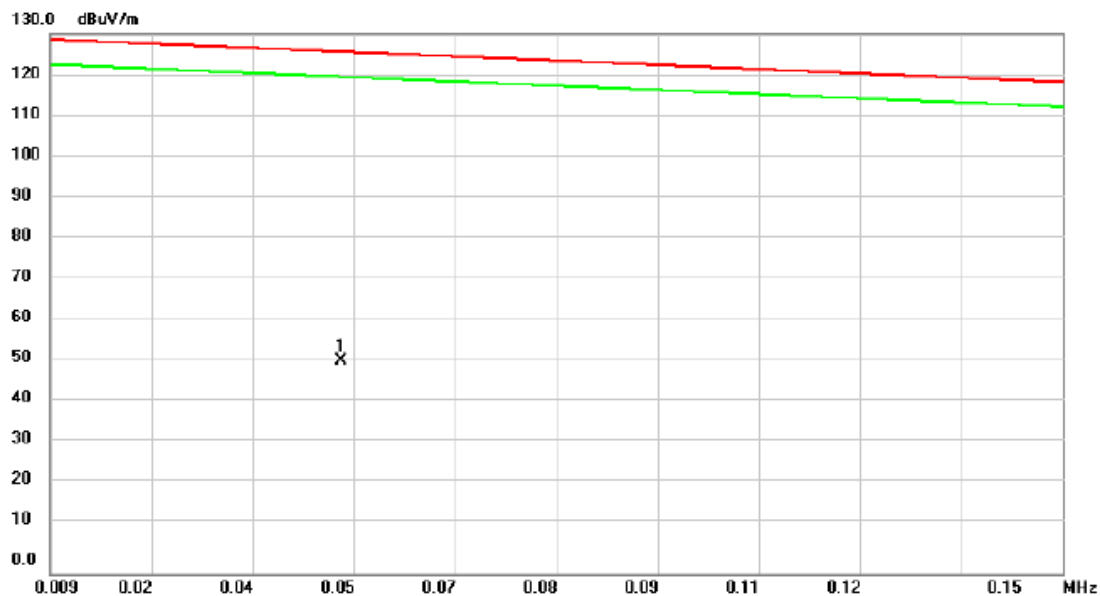
Open



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		0.2694	41.83	11.85	53.68	109.72	-56.04	peak	
2	*	0.5082	36.54	11.80	48.34	73.64	-25.30	peak	
3		1.3440	27.36	11.85	39.21	66.19	-26.98	peak	
4		4.0106	17.25	11.25	28.50	69.54	-41.04	peak	
5		6.8960	14.14	11.36	25.50	69.54	-44.04	peak	
6		10.8960	10.71	11.27	21.98	69.54	-47.56	peak	

Test Mode	TX Mode_2403 MHz
-----------	------------------

Close



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	0.0495	38.23	13.05	51.28	125.60	-74.32	peak	

Test Mode	TX Mode_2403 MHz
-----------	------------------

Close

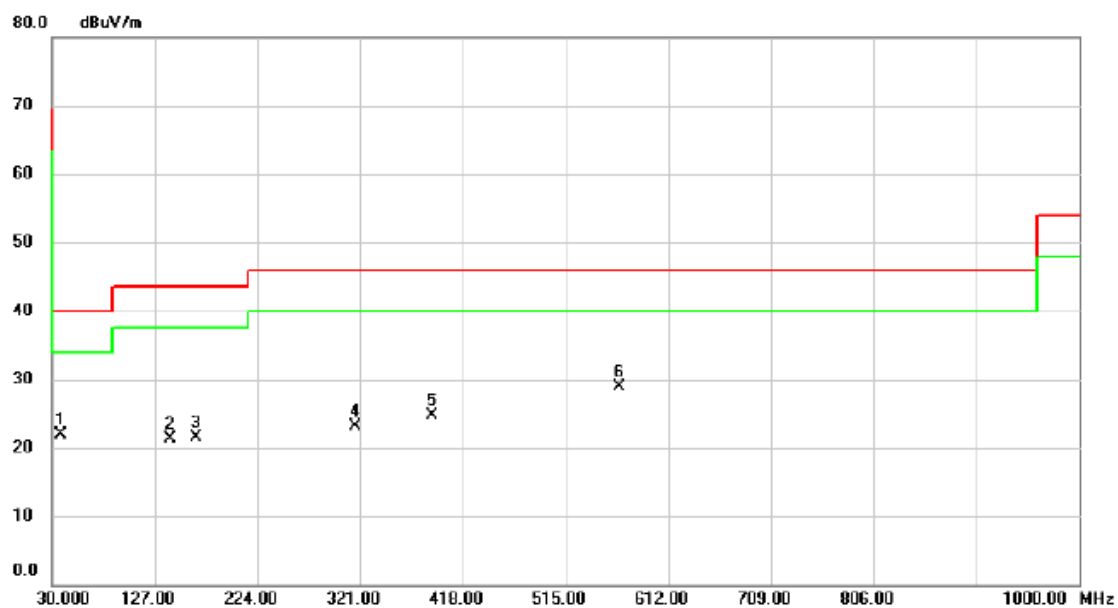


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		0.2296	43.07	11.91	54.98	112.60	-57.62	peak	
2		0.4684	36.41	11.80	48.21	95.36	-47.15	peak	
3	*	1.4633	25.70	11.79	37.49	65.12	-27.63	peak	
4		2.2594	22.76	11.43	34.19	69.54	-35.35	peak	
5		5.7618	13.66	11.38	25.04	69.54	-44.50	peak	
6		12.3686	10.54	11.23	21.77	69.54	-47.77	peak	

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

Test Mode TX Mode_2403 MHz

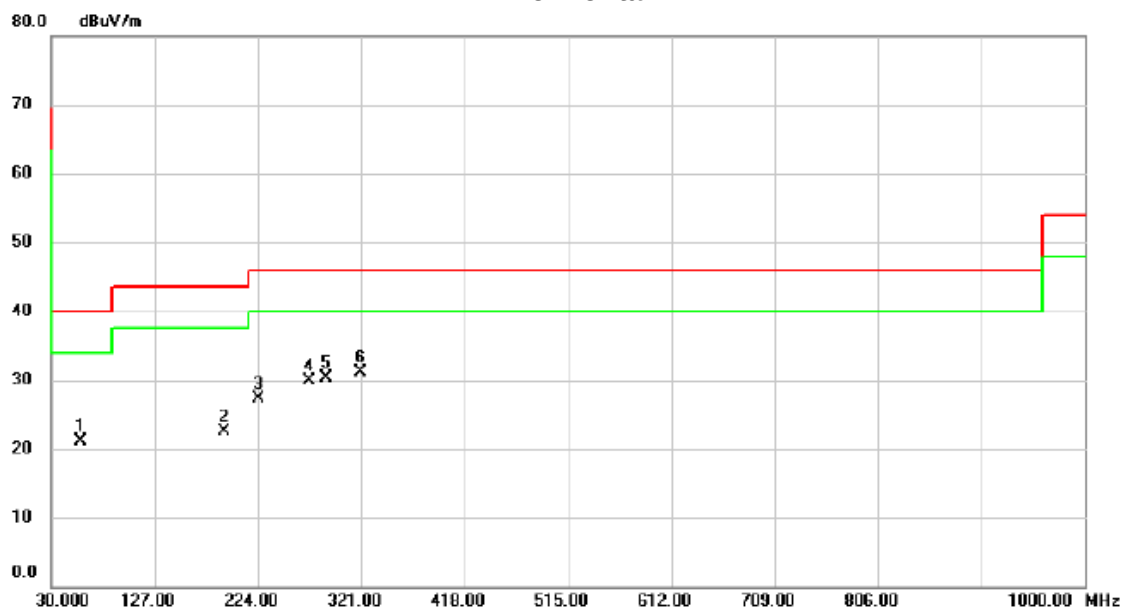
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		38.7300	30.42	-8.58	21.84	40.00	-18.16	peak	
2		141.5500	30.35	-9.14	21.21	43.50	-22.29	peak	
3		165.8000	30.01	-8.59	21.42	43.50	-22.08	peak	
4		316.1500	30.18	-7.09	23.09	46.00	-22.91	peak	
5		388.9000	29.96	-5.23	24.73	46.00	-21.27	peak	
6	*	566.4100	30.22	-1.30	28.92	46.00	-17.08	peak	

Test Mode	TX Mode_2403 MHz
-----------	------------------

Horizontal

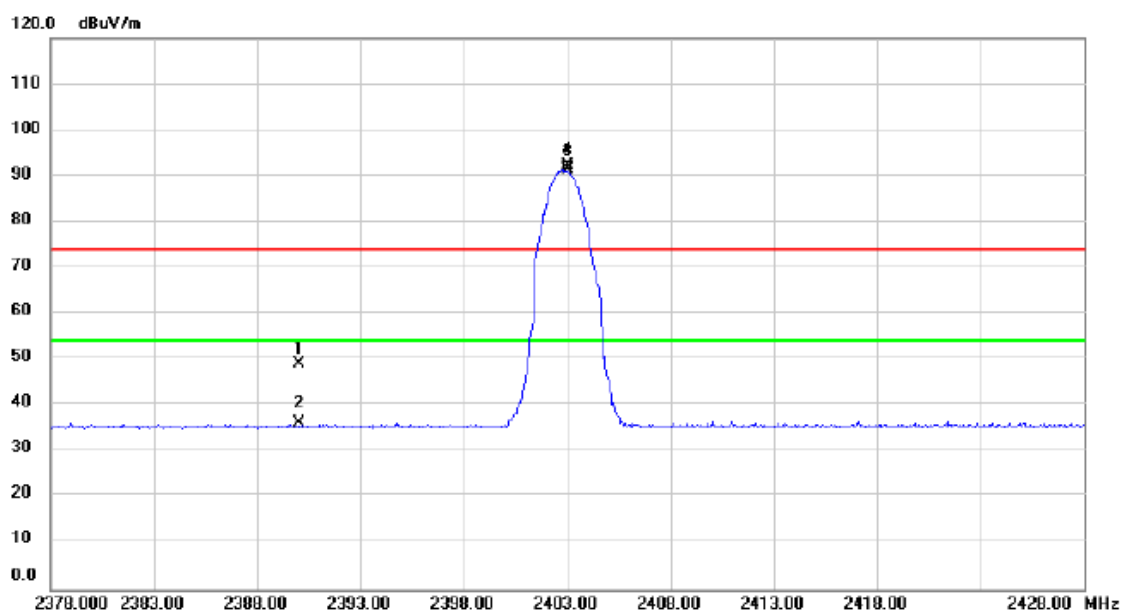


No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Detector	Comment
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB		
1		57.1600	29.59	-8.51	21.08	40.00	-18.92	peak	
2		191.9900	32.82	-10.40	22.42	43.50	-21.08	peak	
3		224.0000	37.92	-10.54	27.38	46.00	-18.62	peak	
4		272.5000	38.22	-8.34	29.88	46.00	-16.12	peak	
5		288.0200	38.02	-7.77	30.25	46.00	-15.75	peak	
6	*	320.0300	38.06	-6.99	31.07	46.00	-14.93	peak	

APPENDIX D -RADIATED EMISSION (ABOVE 1000MHZ)

Test Mode	TX Mode_2403 MHz
-----------	------------------

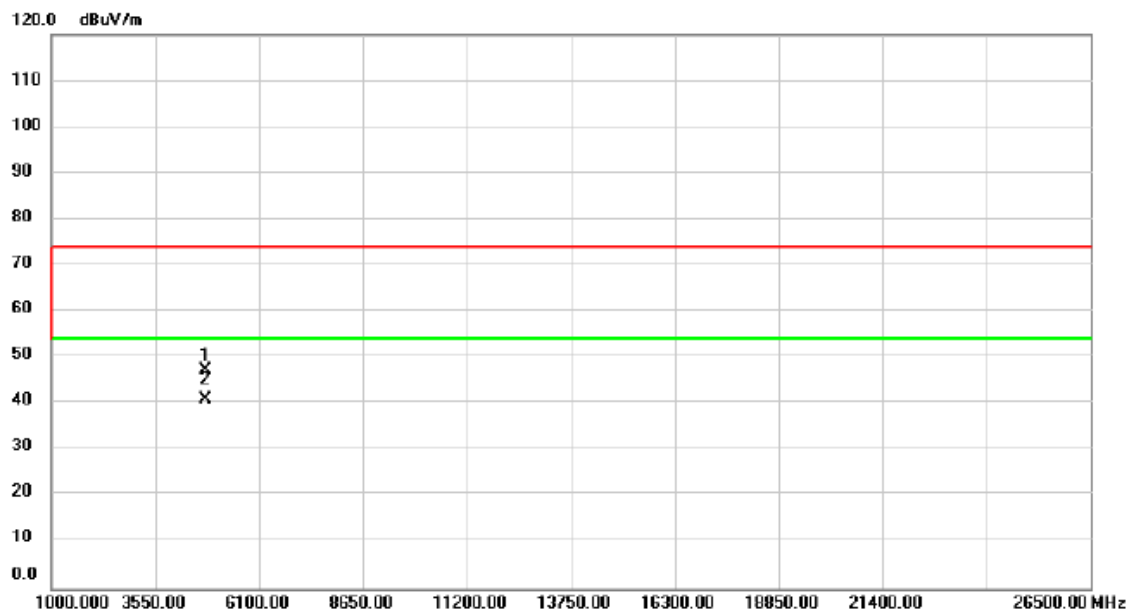
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2390.000	17.91	31.06	48.97	74.00	-25.03	peak	
2		2390.000	5.03	31.06	36.09	54.00	-17.91	AVG	
3	X	2403.000	61.12	31.11	92.23	74.00	18.23	peak	No Limit
4	*	2403.000	60.23	31.11	91.34	54.00	37.34	AVG	No Limit

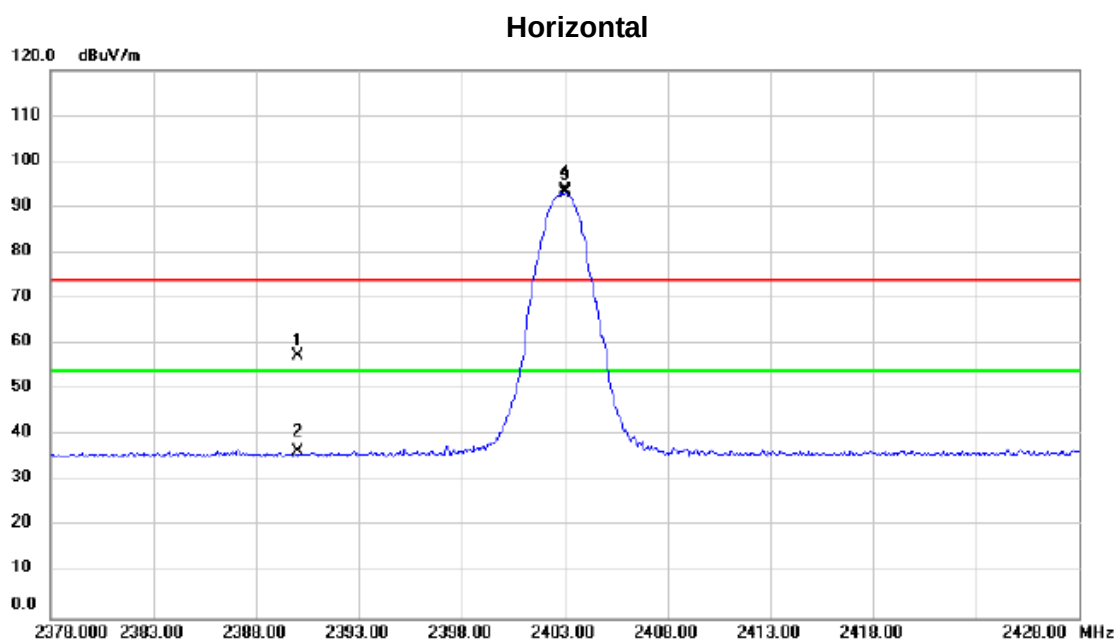
Test Mode	TX Mode_2403 MHz
-----------	------------------

Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4806.000	58.67	-11.40	47.27	74.00	-26.73	peak	
2	*	4806.000	52.38	-11.40	40.98	54.00	-13.02	AVG	

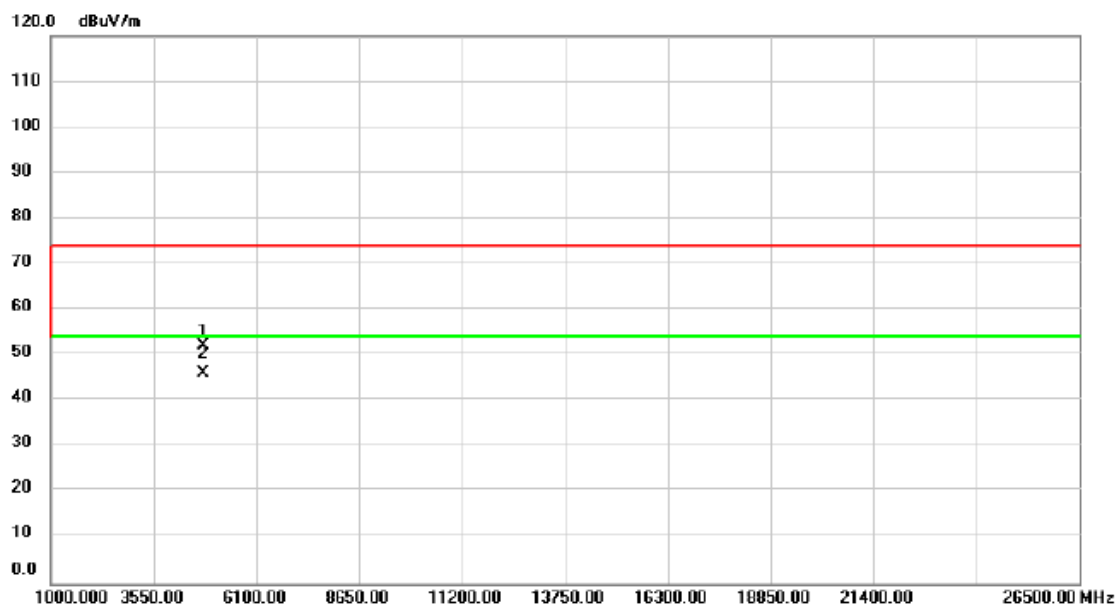
Test Mode	TX Mode_2403 MHz
-----------	------------------



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		2390.000	26.44	31.06	57.50	74.00	-16.50	peak	
2		2390.000	5.36	31.06	36.42	54.00	-17.58	AVG	
3	X	2403.000	62.65	31.11	93.76	74.00	19.76	peak	No Limit
4	*	2403.000	61.97	31.11	93.08	54.00	39.08	AVG	No Limit

Test Mode	TX Mode_2403 MHz
-----------	------------------

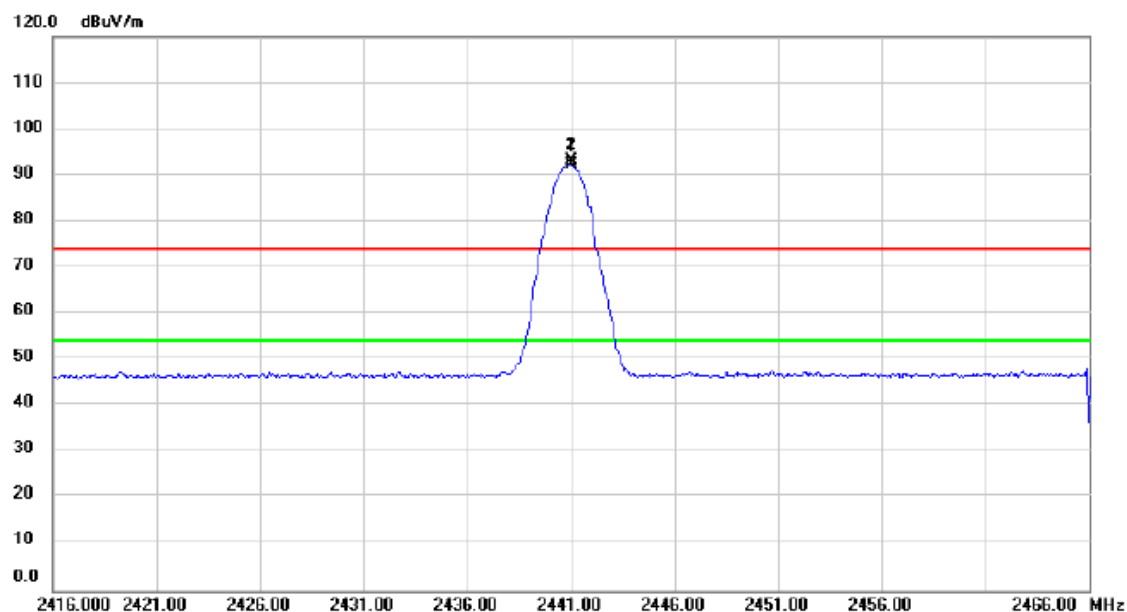
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4806.000	63.38	-11.40	51.98	74.00	-22.02	peak	
2	*	4806.000	57.41	-11.40	46.01	54.00	-7.99	AVG	

Test Mode	TX Mode_2441 MHz
-----------	------------------

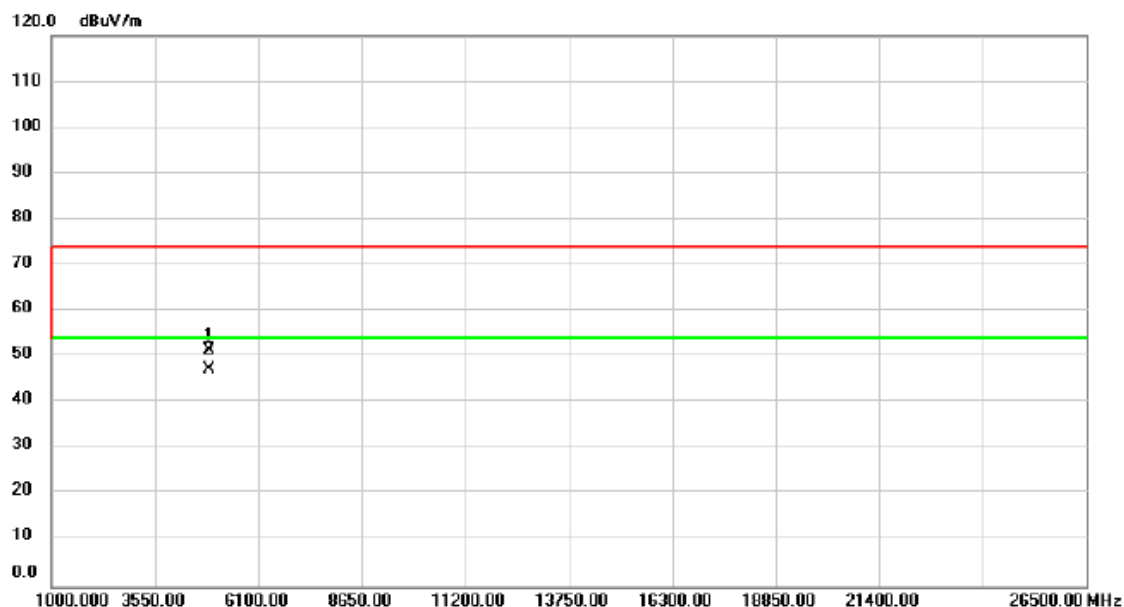
Vertical



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	X	2441.000	61.81	31.25	93.06	74.00	19.06	peak	No Limit
2	*	2441.000	60.97	31.25	92.22	54.00	38.22	AVG	No Limit

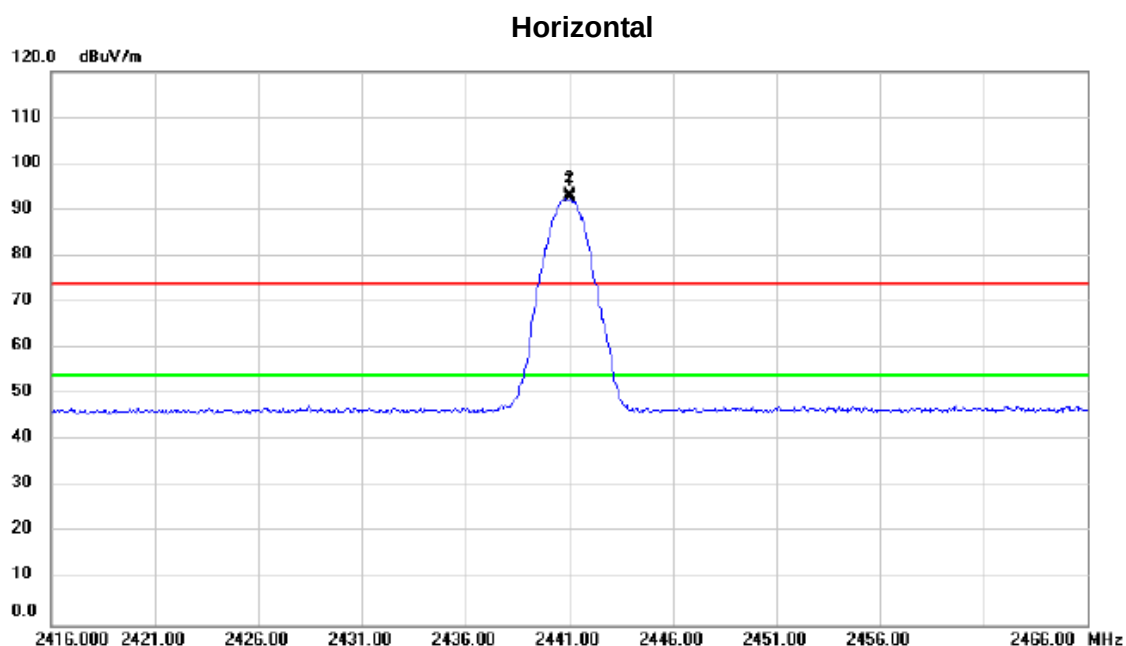
Test Mode	TX Mode_2441 MHz
-----------	------------------

Vertical



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		4882.000	62.67	-11.28	51.39	74.00	-22.61	peak	
2	*	4882.000	58.67	-11.28	47.39	54.00	-6.61	AVG	

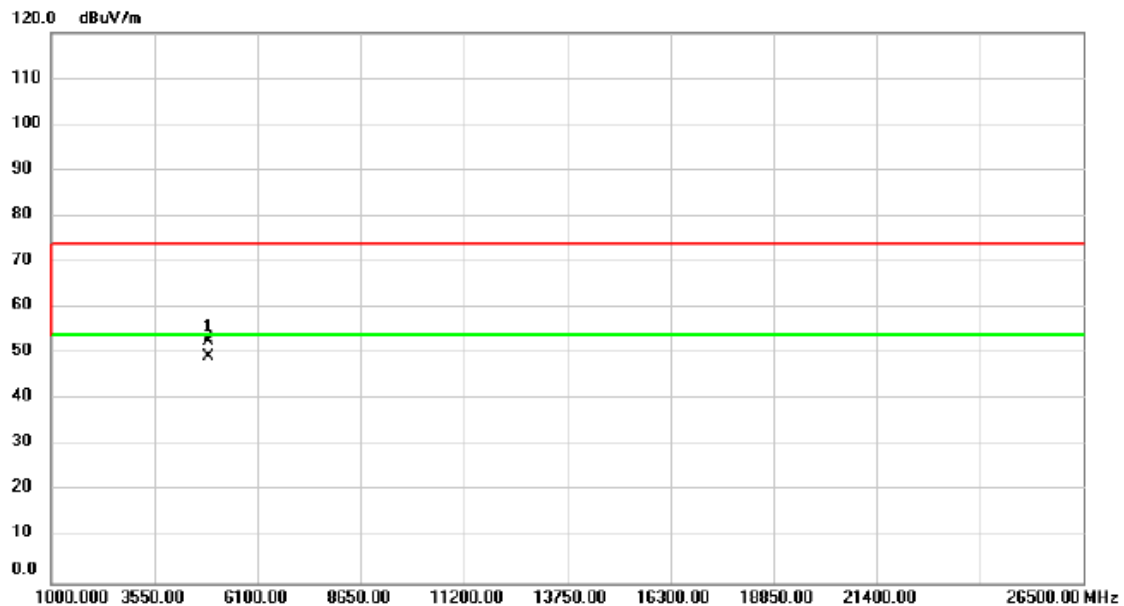
Test Mode	TX Mode_2441 MHz
-----------	------------------



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	X	2441.000	62.05	31.25	93.30	74.00	19.30	peak	No Limit
2	*	2441.000	61.16	31.25	92.41	54.00	38.41	AVG	No Limit

Test Mode	TX Mode_2441 MHz
-----------	------------------

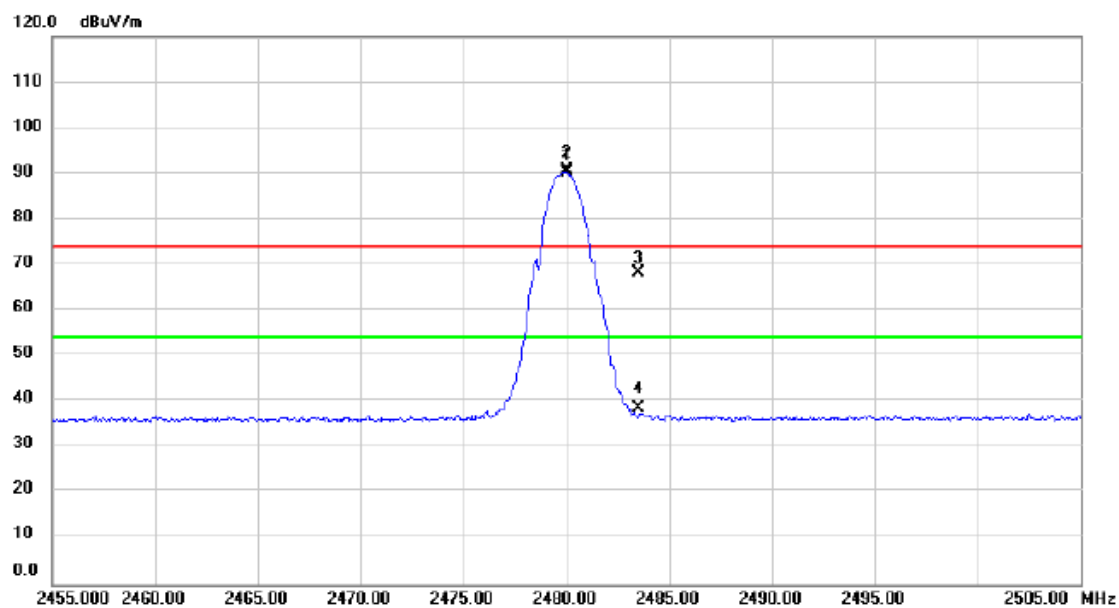
Horizontal



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		4882.000	64.02	-11.28	52.74	74.00	-21.26	peak	
2	*	4882.000	60.61	-11.28	49.33	54.00	-4.67	AVG	

Test Mode TX Mode_2480 MHz

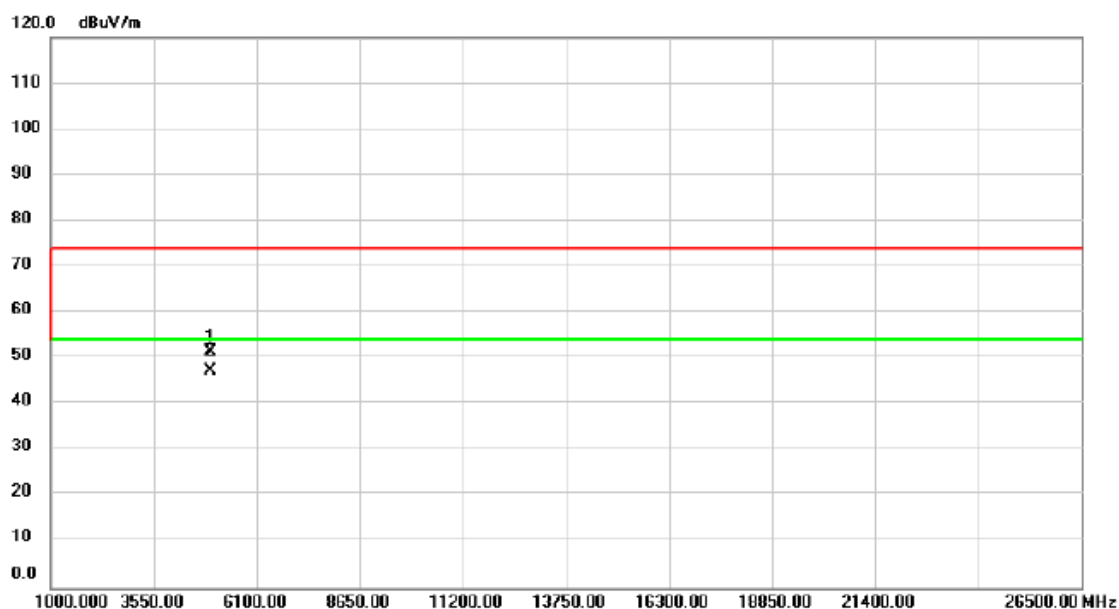
Vertical



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	X	2480.000	59.50	31.39	90.89	74.00	16.89	peak	No Limit
2	*	2480.000	58.89	31.39	90.28	54.00	36.28	AVG	No Limit
3		2483.500	36.74	31.41	68.15	74.00	-5.85	peak	
4		2483.500	7.00	31.41	38.41	54.00	-15.59	AVG	

Test Mode	TX Mode_2480 MHz
-----------	------------------

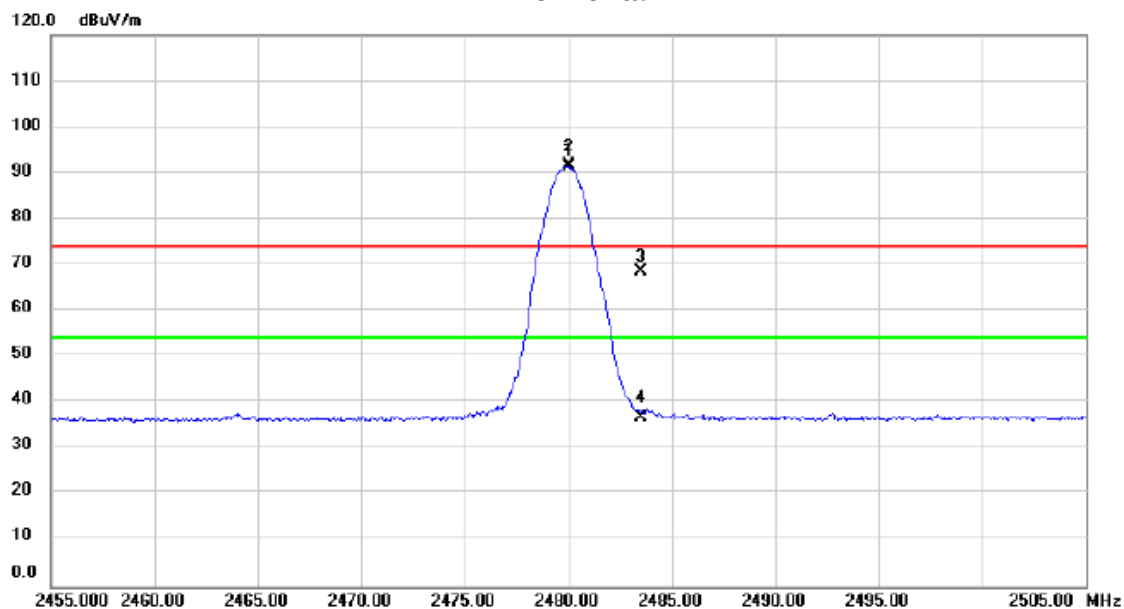
Vertical



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		4960.000	62.55	-11.15	51.40	74.00	-22.60	peak	
2	*	4960.000	58.54	-11.15	47.39	54.00	-6.61	AVG	

Test Mode TX Mode_2480 MHz

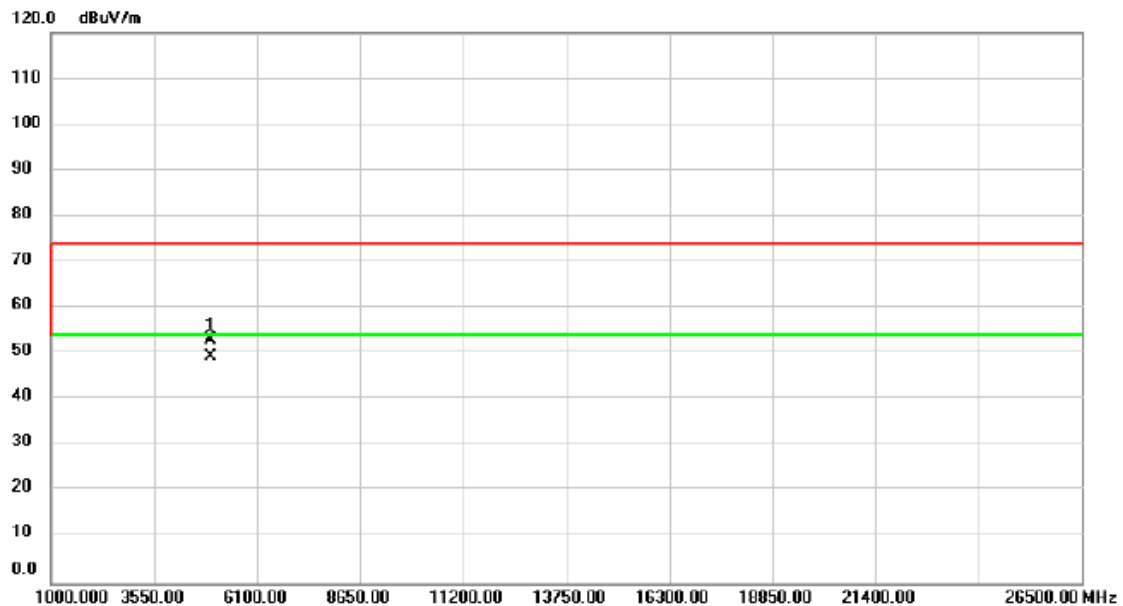
Horizontal



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	X	2480.000	60.33	31.39	91.72	74.00	17.72	peak	
2	*	2480.000	59.88	31.39	91.27	54.00	37.27	AVG	
3		2483.500	37.22	31.41	68.63	74.00	-5.37	peak	
4		2483.500	5.48	31.41	36.89	54.00	-17.11	AVG	

Test Mode	TX Mode_2480 MHz
-----------	------------------

Horizontal



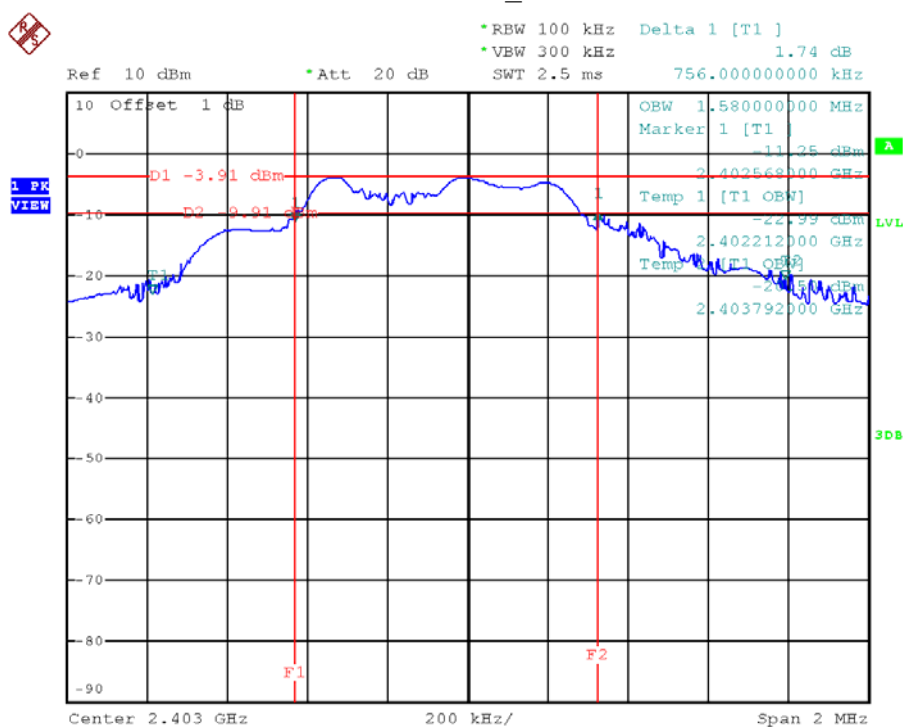
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		4960.000	64.11	-11.15	52.96	74.00	-21.04	peak	
2	*	4960.000	60.55	-11.15	49.40	54.00	-4.60	AVG	

APPENDIX E - BANDWIDTH

Test Mode:	TX Mode_2403 MHz/2441 MHz/2480 MHz
------------	------------------------------------

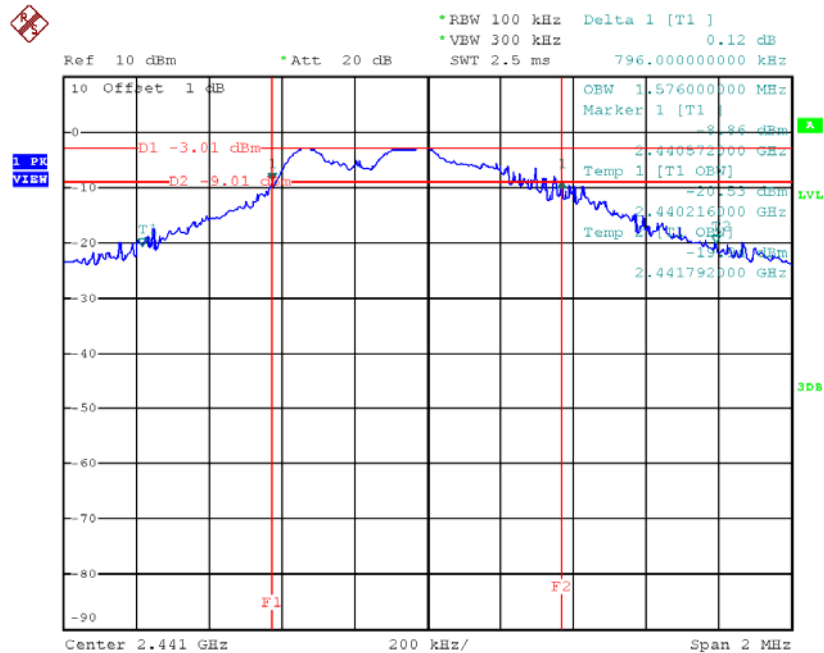
Frequency (MHz)	6dB Bandwidth (MHz)	99% Occupied BW (MHz)	Min. Limit (kHz)	Test Result
2403	0.756	1.580	500	Complies
2441	0.796	1.576	500	Complies
2480	0.762	2.538	500	Complies

TX Mode_2403 MHz



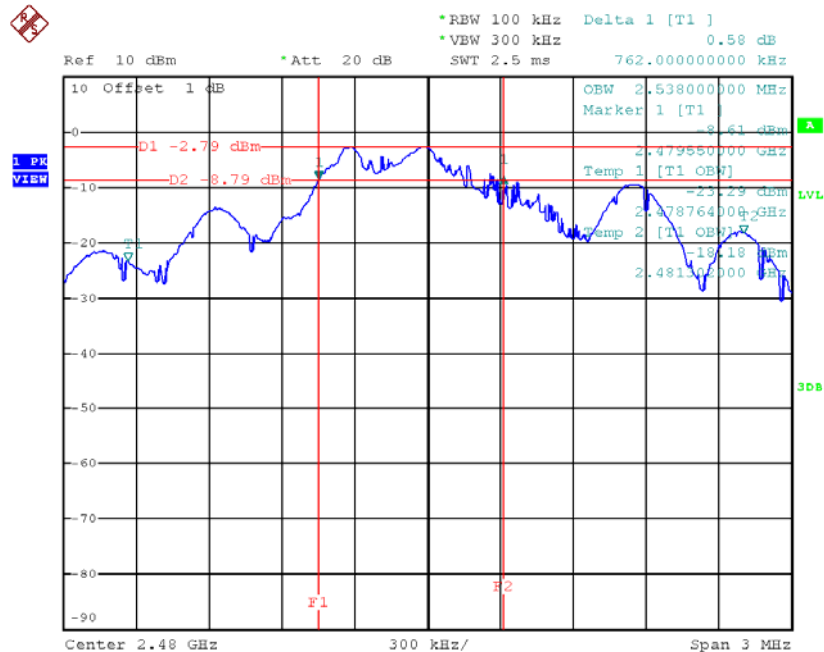
Date: 26.JUN.2017 14:52:16

TX Mode_2441 MHz



Date: 26.JUN.2017 15:12:10

TX Mode_2480 MHz



Date: 26.JUN.2017 15:35:39

APPENDIX F - CONDUCTED POWER TEST

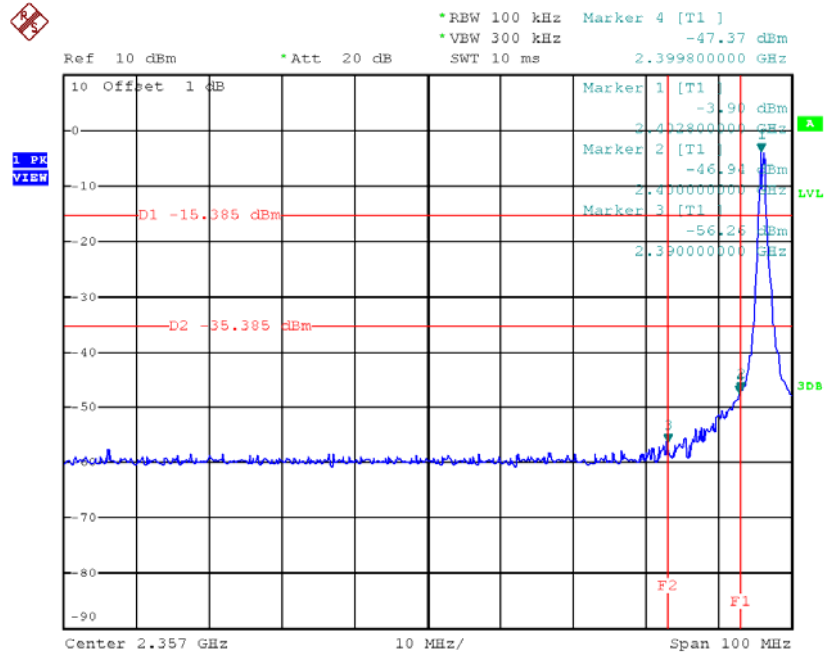
Test Mode:	TX Mode_2403 MHz/2441 MHz/2480 MHz
------------	------------------------------------

Frequency (MHz)	Conducted Power (dBm)	Conducted Power (W)	Max. Limit (dBm)	Max. Limit (W)	Result
2403	-3.59	0.0004	30.00	1.00	Complies
2441	-2.88	0.0005	30.00	1.00	Complies
2480	-2.79	0.0005	30.00	1.00	Complies

APPENDIX G - ANTENNA CONDUCTED SPURIOUS EMISSION

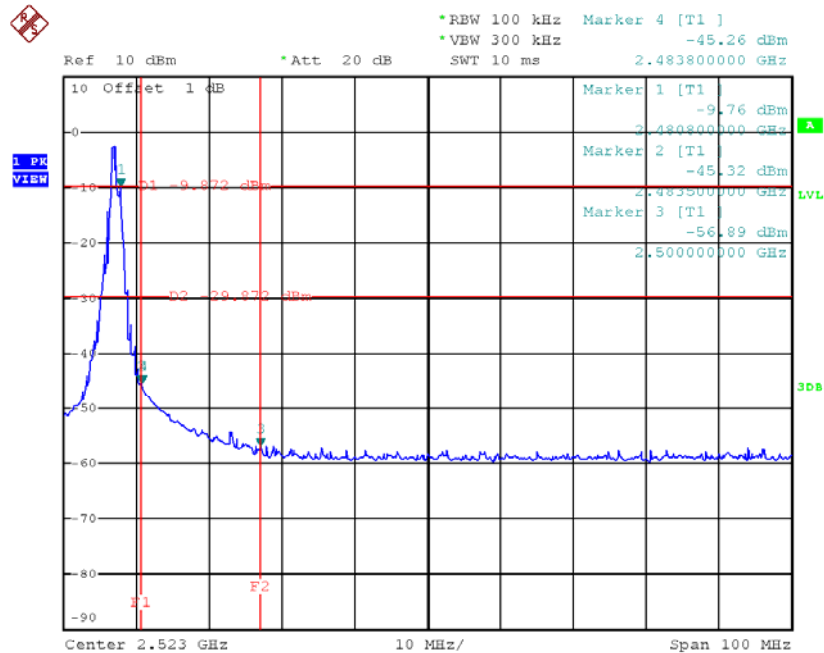
Test Mode: TX Mode_2403 MHz/2441 MHz/2480 MHz

CH01 (Lower)



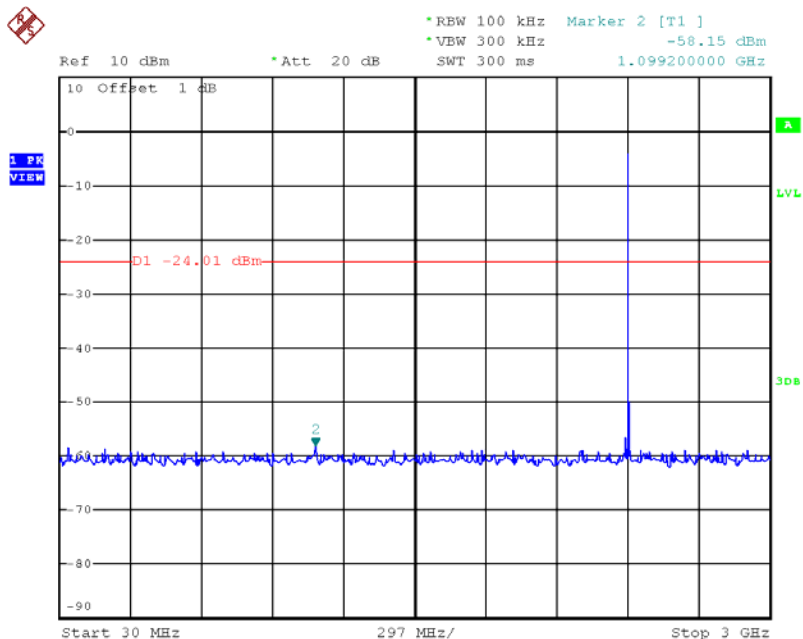
Date: 26.JUN.2017 14:29:10

CH78 (upper)



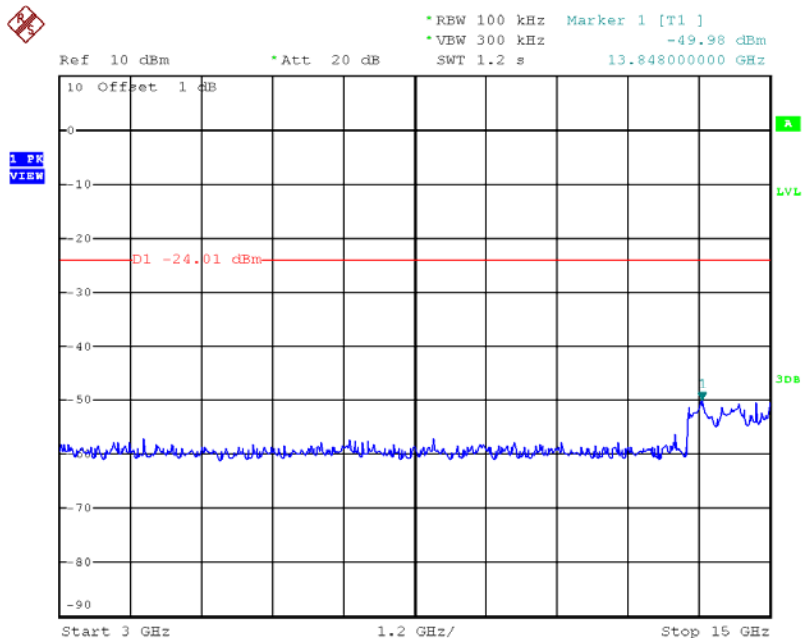
Date: 26.JUN.2017 15:55:56

CH01 (10 Harmonic of the frequency)



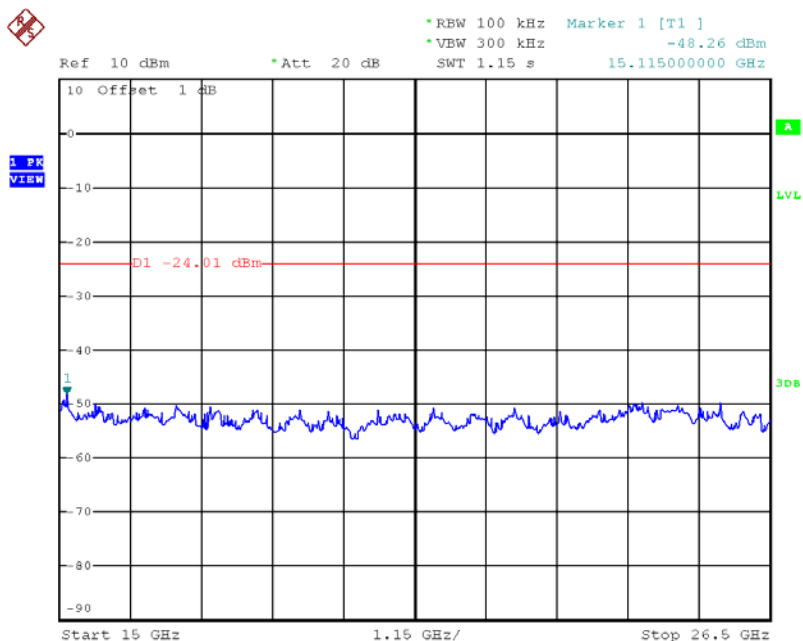
Date: 26.JUN.2017 14:30:03

CH01 (10 Harmonic of the frequency)



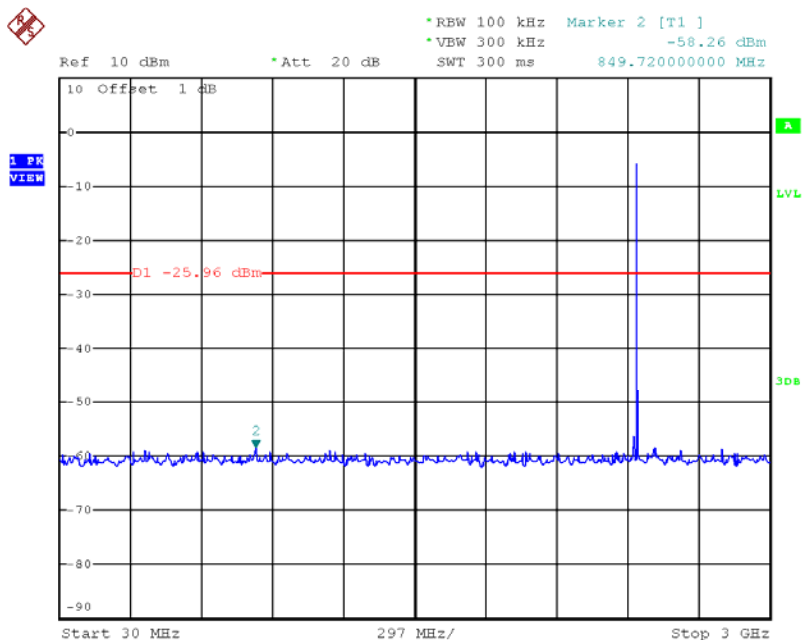
Date: 26.JUN.2017 14:30:10

CH01 (10 Harmonic of the frequency)



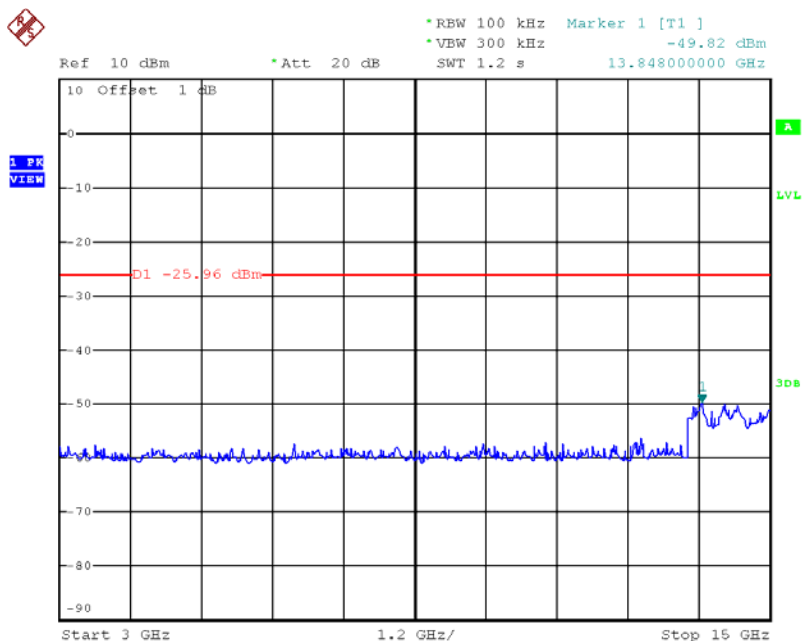
Date: 26.JUN.2017 14:30:17

CH39 (10 Harmonic of the frequency)



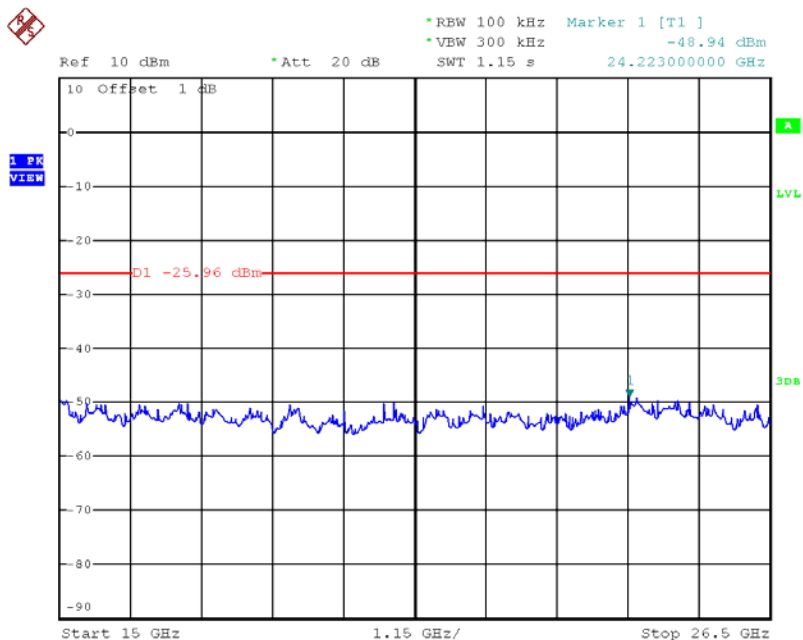
Date: 26.JUN.2017 15:13:32

CH39 (10 Harmonic of the frequency)



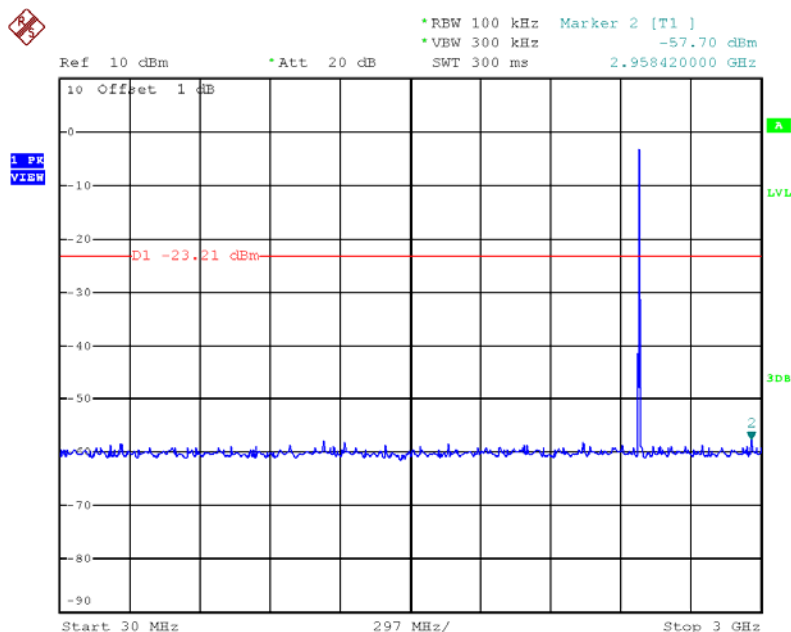
Date: 26.JUN.2017 15:23:06

CH39 (10 Harmonic of the frequency)

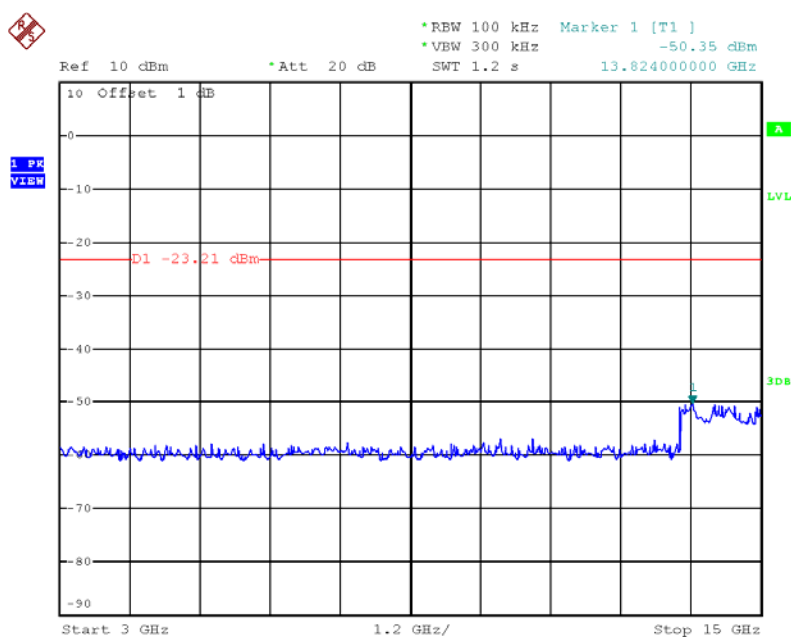


Date: 26.JUN.2017 15:23:13

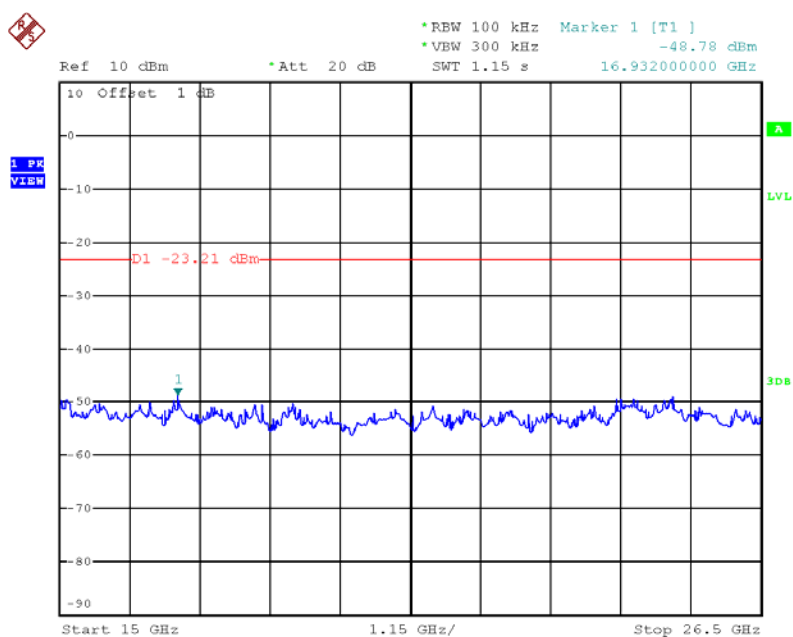
CH78 (10 Harmonic of the frequency)



Date: 26.JUN.2017 15:58:03



Date: 26.JUN.2017 15:58:10



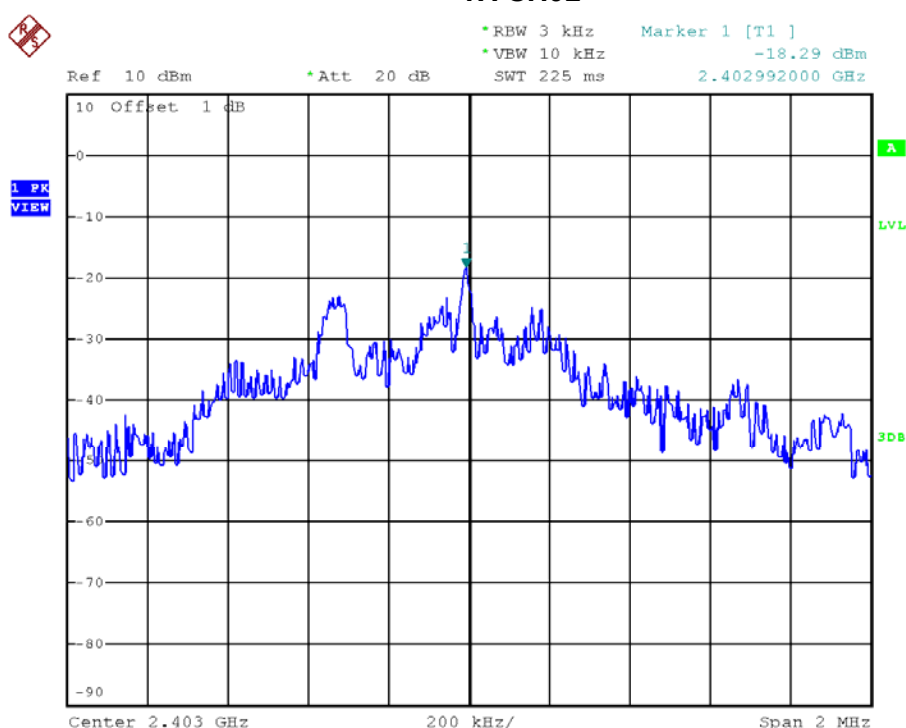
Date: 26.JUN.2017 15:58:17

APPENDIX H - POWER SPECTRAL DENSITY TEST

Test Mode:	TX Mode_2403 MHz/2441 MHz/2480 MHz
------------	------------------------------------

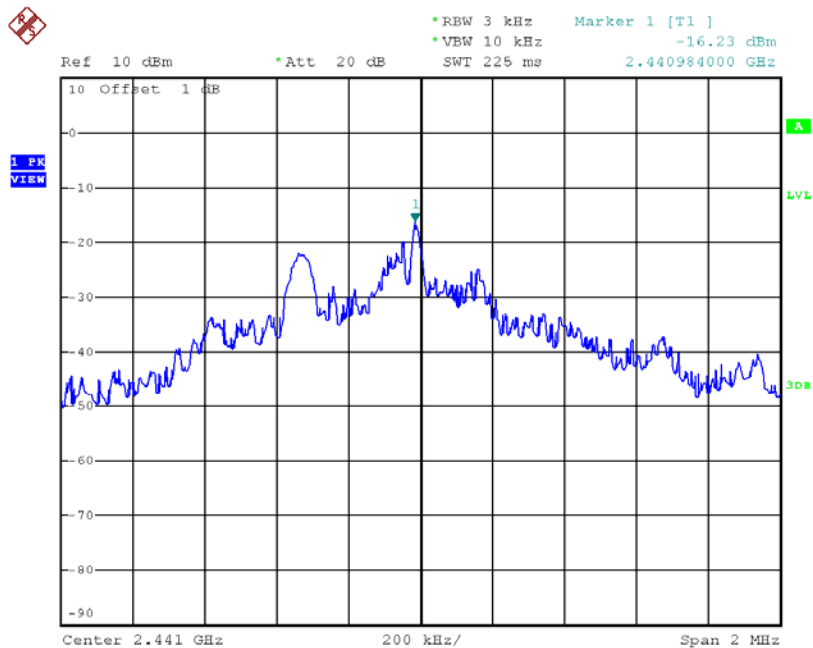
Frequency (MHz)	Power Density (dBm/3kHz)	Max. Limit (dBm/3kHz)	Result
2403	-18.29	8.00	Complies
2441	-16.23	8.00	Complies
2480	-16.90	8.00	Complies

TX CH01



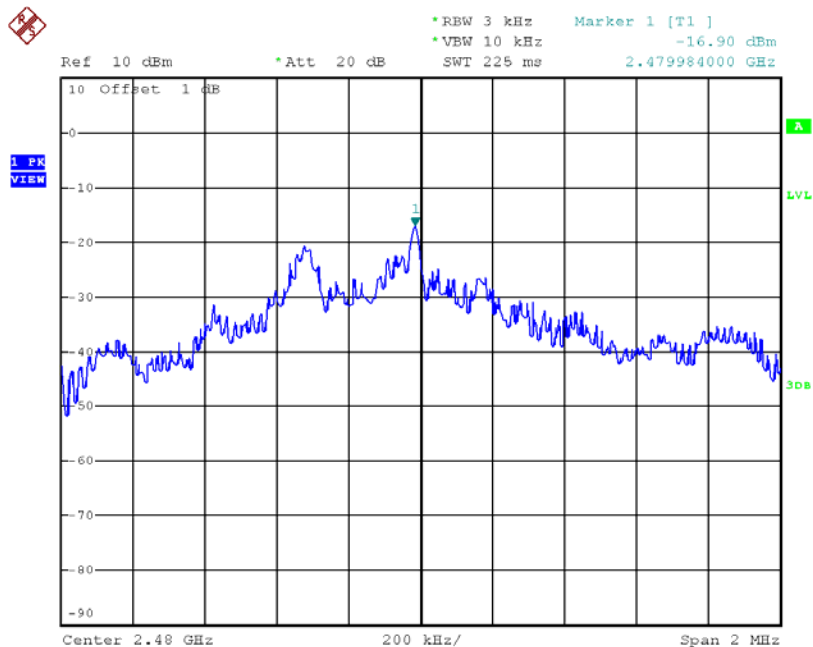
Date: 26.JUN.2017 14:33:45

TX CH39



Date: 26.JUN.2017 15:30:54

TX CH78



Date: 26.JUN.2017 16:03:47