

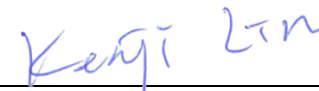
# FCC Radio Test Report

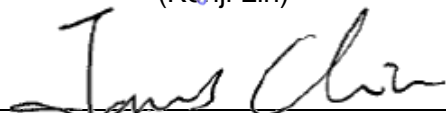
## FCC ID: M82-PWS872

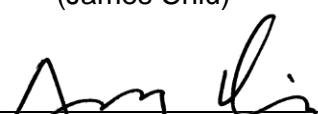
This report concerns (check one):  Original Grant  Class I Change  Class II Change

**Project No.** : 1706122  
**Equipment** : Computer  
**Test Model** : PWS-872  
**Series Model** : N/A  
**Applicant** : Advantech Co., Ltd.  
**Address** : No.1, Alley 20, Lane 26, Rueiguang Road, Neihu District, Taipei 11491, Taiwan, R.O.C.

**Date of Receipt** : Jul. 21, 2017  
**Date of Test** : Jul. 21, 2017 ~ Sep. 05, 2017  
**Issued Date** : Sep. 13, 2017  
**Tested by** : BTL Inc.

**Testing Engineer** :   
(Kenji Lin)

**Technical Manager** :   
(James Chiu)

**Authorized Signatory** :   
(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



Testing Laboratory  
0659

### **Declaration**

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

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

**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
<b>1 . CERTIFICATION</b>	<b>7</b>
<b>2 . SUMMARY OF TEST RESULTS</b>	<b>8</b>
2.1 TEST FACILITY	9
2.2 MEASUREMENT UNCERTAINTY	9
<b>3 . GENERAL INFORMATION</b>	<b>11</b>
3.1 GENERAL DESCRIPTION OF EUT	11
3.2 DESCRIPTION OF TEST MODES	13
3.3 TABLE OF PARAMETERS OF TEXT SOFTWARE SETTING	13
3.4 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED	14
3.5 DESCRIPTION OF SUPPORT UNITS	14
<b>4 . EMC EMISSION TEST</b>	<b>15</b>
4.1 CONDUCTED EMISSION MEASUREMENT	15
4.1.1 POWER LINE CONDUCTED EMISSION LIMITS	15
4.1.2 TEST PROCEDURE	15
4.1.3 DEVIATION FROM TEST STANDARD	15
4.1.4 TEST SETUP	16
4.1.5 EUT OPERATING CONDITIONS	16
4.1.6 EUT TEST CONDITIONS	16
4.1.7 TEST RESULTS	16
4.2 RADIATED EMISSION MEASUREMENT	17
4.2.1 RADIATED EMISSION LIMITS	17
4.2.2 TEST PROCEDURE	18
4.2.3 DEVIATION FROM TEST STANDARD	18
4.2.4 TEST SETUP	19
4.2.5 EUT OPERATING CONDITIONS	20
4.2.6 EUT TEST CONDITIONS	20
4.2.7 TEST RESULTS (9KHZ TO 30MHZ)	20
4.2.8 TEST RESULTS (30MHZ TO 1000 MHZ)	20
4.2.9 TEST RESULTS (ABOVE 1000 MHZ)	20
<b>5 . NUMBER OF HOPPING CHANNEL</b>	<b>21</b>
5.1 APPLIED PROCEDURES	21
5.1.1 TEST PROCEDURE	21
5.1.2 DEVIATION FROM STANDARD	21
5.1.3 TEST SETUP	21
5.1.4 EUT OPERATION CONDITIONS	21
5.1.5 EUT TEST CONDITIONS	21
5.1.6 TEST RESULTS	21

**Table of Contents**

**Page**

<b>6 . AVERAGE TIME OF OCCUPANCY</b>	<b>22</b>
<b>6.1 APPLIED PROCEDURES / LIMIT</b>	<b>22</b>
6.1.1 TEST PROCEDURE	22
6.1.2 DEVIATION FROM STANDARD	22
6.1.3 TEST SETUP	22
6.1.4 EUT OPERATION CONDITIONS	23
6.1.5 EUT TEST CONDITIONS	23
6.1.6 TEST RESULTS	23
<b>7 . HOPPING CHANNEL SEPARATION MEASUREMENT</b>	<b>24</b>
<b>7.1 APPLIED PROCEDURES / LIMIT</b>	<b>24</b>
7.1.1 TEST PROCEDURE	24
7.1.2 DEVIATION FROM STANDARD	24
7.1.3 TEST SETUP	24
7.1.4 EUT TEST CONDITIONS	24
7.1.5 TEST RESULTS	24
<b>8 . BANDWIDTH TEST</b>	<b>25</b>
<b>8.1 APPLIED PROCEDURES</b>	<b>25</b>
8.1.1 TEST PROCEDURE	25
8.1.2 DEVIATION FROM STANDARD	25
8.1.3 TEST SETUP	25
8.1.4 EUT OPERATION CONDITIONS	25
8.1.5 EUT TEST CONDITIONS	25
8.1.6 TEST RESULTS	25
<b>9 . PEAK OUTPUT POWER TEST</b>	<b>26</b>
<b>9.1 APPLIED PROCEDURES / LIMIT</b>	<b>26</b>
9.1.1 TEST PROCEDURE	26
9.1.2 DEVIATION FROM STANDARD	26
9.1.3 TEST SETUP	26
9.1.4 EUT OPERATION CONDITIONS	26
9.1.5 EUT TEST CONDITIONS	26
9.1.6 TEST RESULTS	26
<b>10 . ANTENNA CONDUCTED SPURIOUS EMISSION</b>	<b>27</b>
<b>10.1 APPLIED PROCEDURES / LIMIT</b>	<b>27</b>
10.1.1 TEST PROCEDURE	27
10.1.2 DEVIATION FROM STANDARD	27
10.1.3 TEST SETUP	27
10.1.4 EUT OPERATION CONDITIONS	27
10.1.5 EUT TEST CONDITIONS	27
10.1.6 TEST RESULTS	27
<b>11 . MEASUREMENT INSTRUMENTS LIST</b>	<b>28</b>

<b>Table of Contents</b>	<b>Page</b>
<b>12 . EUT TEST PHOTO</b>	<b>30</b>
<b>APPENDIX A - CONDUCTED EMISSION</b>	<b>34</b>
<b>APPENDIX B - RADIATED EMISSION (9KHZ-30MHZ)</b>	<b>37</b>
<b>APPENDIX C - RADIATED EMISSION (30MHZ TO 1000MHZ)</b>	<b>42</b>
<b>APPENDIX D - RADIATED EMISSION (ABOVE 1000MHZ)</b>	<b>45</b>
<b>APPENDIX E - NUMBER OF HOPPING CHANNEL</b>	<b>70</b>
<b>APPENDIX F - AVERAGE TIME OF OCCUPANCY</b>	<b>72</b>
<b>APPENDIX G - HOPPING CHANNEL SEPARATION MEASUREMENT</b>	<b>85</b>
<b>APPENDIX H - BANDWIDTH</b>	<b>90</b>
<b>APPENDIX I - PEAK OUTPUT POWER</b>	<b>95</b>
<b>APPENDIX J - ANTENNA CONDUCTED SPURIOUS EMISSION</b>	<b>100</b>

### REPORT ISSUED HISTORY

Issued No.	Description	Issued Date
BTL-FCCP-1-1706122	Original Issue.	Sep. 13, 2017

## 1. CERTIFICATION

Equipment : Computer  
Brand Name : ADVANTECH  
Test Model : PWS-872  
Series Model : N/A  
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.  
Factory : N/A  
Address : N/A  
Date of Test : Jul. 21, 2017 ~ Sep. 05, 2017  
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-1-1706122) 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 EDR part.**

## 2. SUMMARY OF TEST RESULTS

Test procedures according to the technical standard(s):

Applied Standard(s): FCC Part15, Subpart C (15.247)			
Standard(s) Section	Test Item	Judgment	Remark
15.207	Conducted Emission	PASS	
15.247(d)	Antenna conducted Spurious Emission	PASS	
15.247 (a)(1)	Hopping Channel Separation	PASS	
15.247(a)(1)	Bandwidth	PASS	
15.247 (b)(1)	Peak Output Power	PASS	
15.247(d) 15.209	Radiated Spurious Emission	PASS	
15.247 (a)(1)(iii)	Number of Hopping Frequency	PASS	
15.247 (a)(1)(iii)	Dwell Time	PASS	
15.205	Restricted Bands	PASS	
15.203	Antenna Requirement	PASS	

Note:

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



## 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):

**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

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  $U_{\text{CISPR}}$  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	2.68

### B. Radiated emission test:

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

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

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

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

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

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

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

It can be seen that our  $U_{lab}$  values are smaller than  $U_{CISPR}$ .

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

### 3. GENERAL INFORMATION

#### 3.1 GENERAL DESCRIPTION OF EUT

Equipment	Computer	
Brand Name	ADVANTECH	
Test Model	PWS-872	
Series Model	N/A	
Model Difference	N/A	
Output Power (Max.)	Operation Frequency	2402~2480 MHz
	Modulation Technology	GFSK(1Mbps) $\pi$ /4-DQPSK(2Mbps)
	Bit Rate of Transmitter	8-DPSK(3Mbps)
	Output Power Max.	1.08 dBm(1Mbps) 2.93 dBm(3Mbps)
Power Source	DC voltage supplied from External Power Supply.	
Power Rating	EUT Rating: I/P: 19VDC, 3.42A External Power Supply (FSP/FSP065-REBN2): I/P: 100-240VAC, 50-60Hz, 1.5A O/P: 19Vdc, 3.42A	
Products Covered	1 * CPU: Intel / I7-6600U 2.8GHz 1 * Mother Board: Advantech / PWS-872 A101 1 * 10.1" LCD Display: AUO / AUO G101EVN01.0 1 * SSD: Advantech / SQF-SMSM4-64G-S9C / 64GB 1 * WLAN + BT: Enli / NFA364A 1 * External Power Supply: FSP / FSP065-REBN2	

Note:

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

2. Channel List:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	2402	27	2429	54	2456
01	2403	28	2430	55	2457
02	2404	29	2431	56	2458
03	2405	30	2432	57	2459
04	2406	31	2433	58	2460
05	2407	32	2434	59	2461
06	2408	33	2435	60	2462
07	2409	34	2436	61	2463
08	2410	35	2437	62	2464
09	2411	36	2438	63	2465
10	2412	37	2439	64	2466
11	2413	38	2440	65	2467
12	2414	39	2441	66	2468
13	2415	40	2442	67	2469
14	2416	41	2443	68	2470
15	2417	42	2444	69	2471
16	2418	43	2445	70	2472
17	2419	44	2446	71	2473
18	2420	45	2447	72	2474
19	2421	46	2448	73	2475
20	2422	47	2449	74	2476
21	2423	48	2450	75	2477
22	2424	49	2451	76	2478
23	2425	50	2452	77	2479
24	2426	51	2453	78	2480
25	2427	52	2454		
26	2428	53	2455		

3. Table for Filed Antenna

Ant.	Brand	Test Model	Antenna Type	Connector	Gain (dBi)
1	An jie	AJDP1J-B0026	PIFA	I-PEX_IV	3.56

### 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 <b>Note (1)</b>

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

For Conducted Emission	
Final Test Mode	Description
Mode 1	TX Mode

For Radiated Emission	
Final Test Mode	Description
Mode 1	TX Mode <b>Note (1)</b>

**Note:**

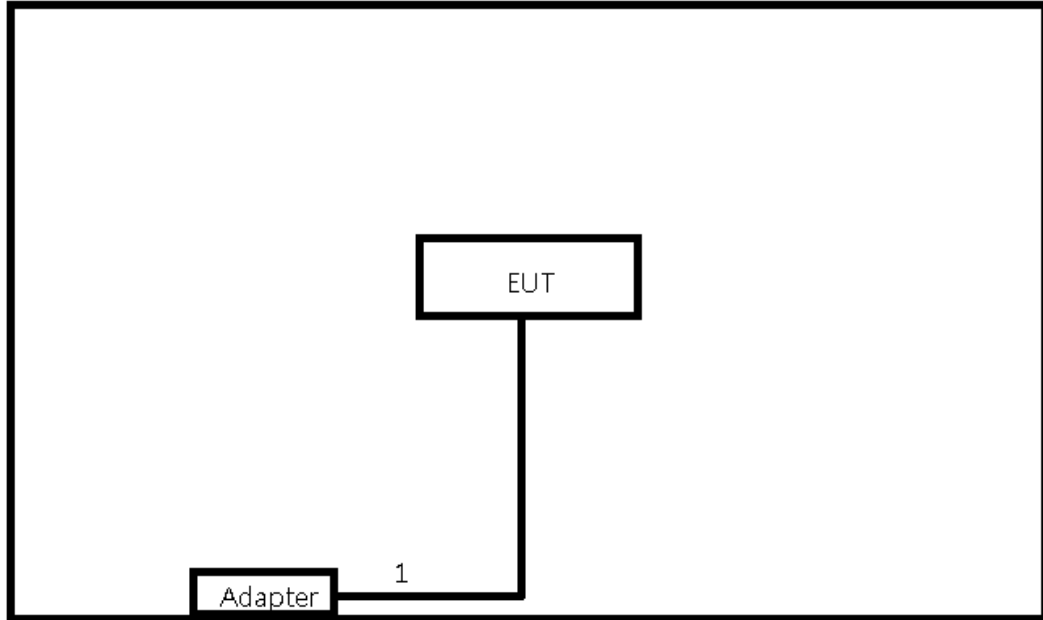
- (1) The measurements are performed at the high, middle, low available channels.
- (2) The measurements for Hopping Channel Separation, Bandwidth and Peak Output Power were tested during 1Mbps, 2Mbps and 3Mbps, the worst case are 1Mbps and 3Mbps, only worst case was documented.

### 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 FHSS

Test Software Version	QRCT_CONN_v30169		
Frequency	2402 MHz	2441 MHz	2480 MHz
Parameters(1Mbps)	7	7	7
Parameters(3Mbps)	7	7	7

**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
1	YES	YES	1.5m	Power 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 -0.50	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

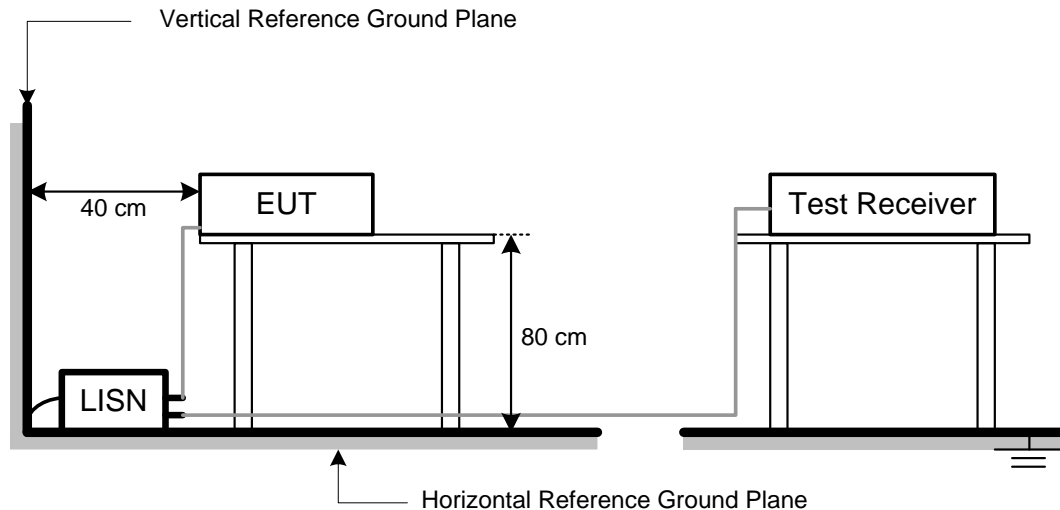
#### 4.1.2 TEST PROCEDURE

- 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 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



#### 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: 25°C

Relative Humidity: 55%

Test Voltage: AC 120V/60Hz

#### 4.1.7 TEST RESULTS

Please refer to the Appendix A.

Remark:

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



## 4.2 RADIATED EMISSION MEASUREMENT

### 4.2.1 RADIATED EMISSION LIMITS (Frequency Range 9KHz -1000MHz)

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.

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

### LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RBW / VBW (emission in restricted band)	1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average

Spectrum 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

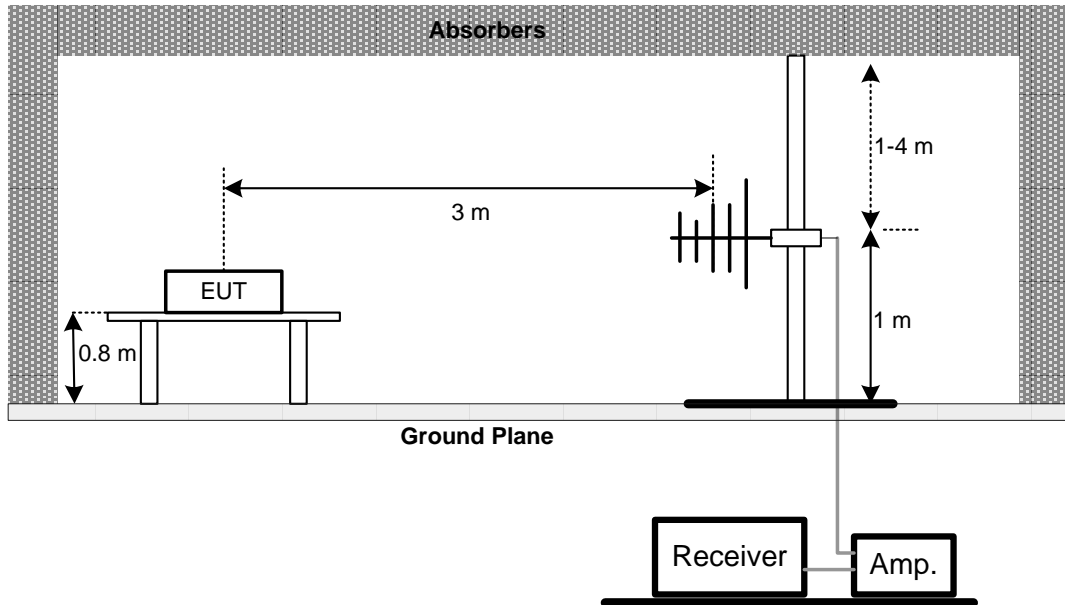
- a. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1GHz)
- b. The measuring distance 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 0.8m or 1.5m; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights find the maximum reading (used Bore sight function).
- e. The receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1GHz.
- f. The initial step in collecting radiated emission data is a receiver peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- g. All readings are Peak unless otherwise stated QP in column of Note. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform. (below 1GHz)
- h. All readings are Peak Mode value unless otherwise stated AVG in column of Note. If the Peak Mode Measured value compliance with the Peak Limits and lower than AVG Limits, the EUT shall be deemed to meet both Peak & AVG Limits and then only Peak Mode was measured, but AVG Mode didn't perform. (above 1GHz)
- i. For the actual test configuration, please refer to the related Item –EUT Test Photos.

#### 4.2.3 DEVIATION FROM TEST STANDARD

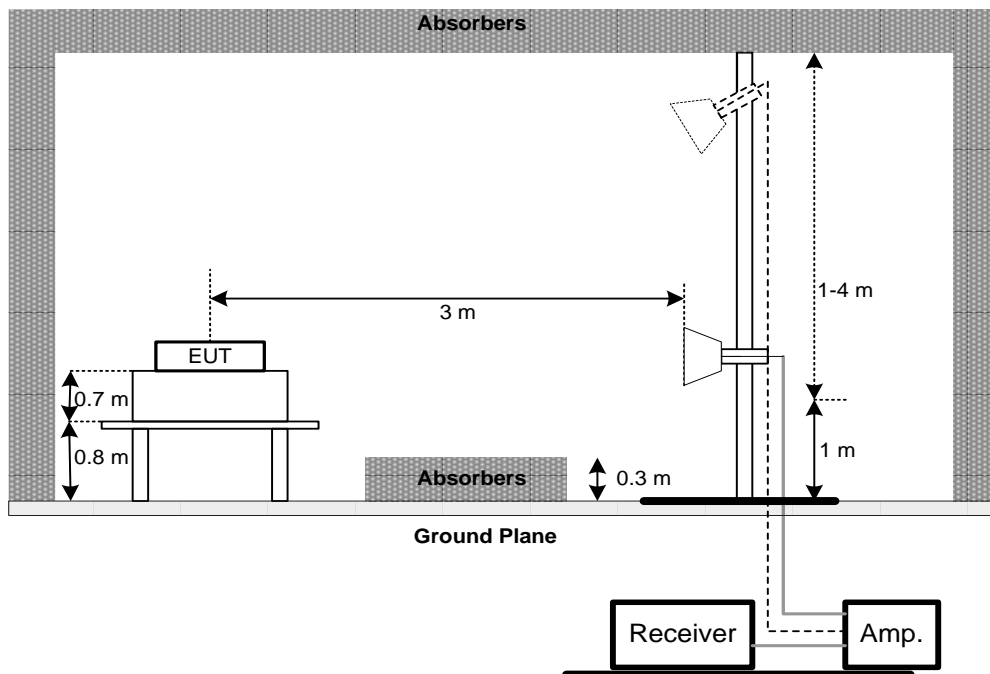
No deviation

**4.2.4 TEST SETUP**

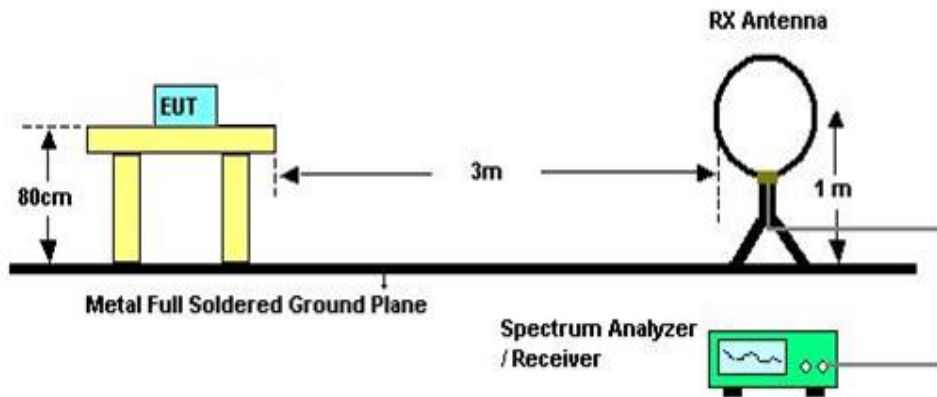
(A) Radiated Emission Test Set-Up Frequency Below 1 GHz



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



(C) For Radiated Emissions Below 30MHz



**4.2.5 EUT OPERATING CONDITIONS**

The EUT was programmed to be in continuously transmitting mode.

**4.2.6 EUT TEST CONDITIONS**

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

**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 1000 MHZ)**

Please refer to the Appendix C.

**4.2.9 TEST RESULTS (ABOVE 1000 MHZ)**

Please refer to the Appendix D.

Remark:

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

## 5. NUMBER OF HOPPING CHANNEL

### 5.1 APPLIED PROCEDURES

FCC Part15 (15.247) , Subpart C			
Section	Test Item	Frequency Range (MHz)	Result
15.247(a)(1)(iii)	Number of Hopping Channel	2400-2483.5	PASS

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	> Operating Frequency Range
RBW	100 KHz
VBW	100 KHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

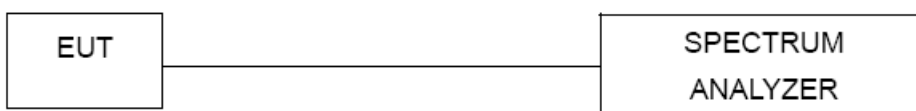
#### 5.1.1 TEST PROCEDURE

- 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=100KHz, Sweep time = Auto.

#### 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 Appendix E

## 6. AVERAGE TIME OF OCCUPANCY

### 6.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(a)(1)(iii)	Average Time of Occupancy	0.4sec	2400-2483.5	PASS

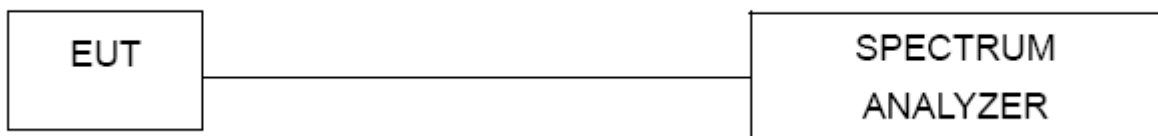
#### 6.1.1 TEST PROCEDURE

- a. The transmitter output (antenna port) was connected to the spectrum analyzer
- b. Set RBW of spectrum analyzer to 1MHz and VBW to 1MHz.
- c. Use a video trigger with the trigger level set to enable triggering only on full pulses.
- d. Sweep Time is more than once pulse time.
- e. Set the center frequency on any frequency would be measure and set the frequency span to zero span.
- f. Measure the maximum time duration of one single pulse.
- g. Set the EUT for DH5, DH3 and DH1 packet transmitting.
- h. Measure the maximum time duration of one single pulse.
- i. DH5 Packet permit maximum  $1600 / 79 / 6 = 3.37$  hops per second in each channel (5 time slots TX, 1 time slot RX). So, the dwell time is the time duration of the pulse times  $3.37 \times 31.6 = 106.6$  within 31.6 seconds.
- j. DH3 Packet permit maximum  $1600 / 79 / 4 = 5.06$  hops per second in each channel (3 time slots TX, 1 time slot RX). So, the dwell time is the time duration of the pulse times  $5.06 \times 31.6 = 160$  within 31.6 seconds.
- k. DH1 Packet permit maximum  $1600 / 79 / 2 = 10.12$  hops per second in each channel (1 time slot TX, 1 time slot RX). So, the dwell time is the time duration of the pulse times  $10.12 \times 31.6 = 320$  within 31.6 seconds.

#### 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 Appendix F

## 7. HOPPING CHANNEL SEPARATION MEASUREMENT

### 7.1 APPLIED PROCEDURES / LIMIT

Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 KHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	> Measurement Bandwidth or Channel Separation
RBW	30 KHz
VBW	100 KHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

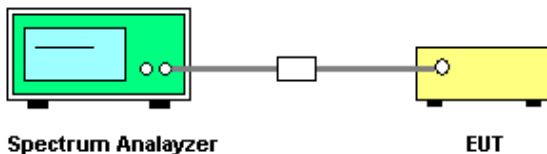
#### 7.1.1 TEST PROCEDURE

- a. The EUT must have its hopping function enabled
- b. Span = wide enough to capture the peaks of two adjacent channels
  - Resolution (or IF) Bandwidth (RBW)  $\geq$  1% of the span
  - Video (or Average) Bandwidth (VBW)  $\geq$  RBW
  - Sweep = Auto
  - Detector function = Peak
  - Trace = Max Hold

#### 7.1.2 DEVIATION FROM STANDARD

No deviation.

#### 7.1.3 TEST SETUP



#### 7.1.4 EUT TEST CONDITIONS

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

#### 7.1.5 TEST RESULTS

Please refer to the Appendix G



## 8. BANDWIDTH TEST

### 8.1 APPLIED PROCEDURES

FCC Part15 (15.247) , Subpart C		
Section	Test Item	Frequency Range (MHz)
15.247(a)(2)	Bandwidth	2400-2483.5

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	> Measurement Bandwidth or Channel Separation
RBW	30 KHz (20dB Bandwidth) / 30 KHz (Channel Separation)
VBW	100 KHz (20dB Bandwidth) / 100 KHz (Channel Separation)
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

#### 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= 30KHz, VBW=100KHz, 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 Appendix H

## 9. PEAK OUTPUT POWER TEST

### 9.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(b)(1)	Peak Output Power	1 Watt or 30dBm ( hopping channel >75) 0.125Watt or 21dBm (hopping channel <75)	2400-2483.5	PASS

#### 9.1.1 TEST PROCEDURE

- a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
- b. Spectrum Setting: RBW= 1MHz/3MHz, VBW= 1MHz/3MHz, Sweep time = Auto.

#### 9.1.2 DEVIATION FROM STANDARD

No deviation.

#### 9.1.3 TEST SETUP



#### 9.1.4 EUT OPERATION CONDITIONS

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

#### 9.1.5 EUT TEST CONDITIONS

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

#### 9.1.6 TEST RESULTS

Please refer to the Appendix I

## 10. ANTENNA CONDUCTED SPURIOUS EMISSION

### 10.1 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.

#### 10.1.1 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=100KHz, Sweep time = Auto.
- c. Offset=antenna gain+cable loss

#### 10.1.2 DEVIATION FROM STANDARD

No deviation.

#### 10.1.3 TEST SETUP



#### 10.1.4 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.

#### 10.1.5 EUT TEST CONDITIONS

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

#### 10.1.6 TEST RESULTS

Please refer to the Appendix J

## 11. 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. 25, 2018
2	Test Cable	TIMES	CFD300-NL	C02	Jun. 14, 2018
3	EMI Test Receiver	R&S	ESR7	101433	Dec. 09, 2017
4	Measurement Software	EZ	EZ EMC (Version NB-03A)	N/A	N/A

Radiated Emission Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Preamplifier	EMCI	012645B	980267	Feb. 28, 2018
2	Preamplifier	EMCI	EMC02325	980217	Dec. 29, 2018
3	Preamplifier	EMCI	EMC2654045	980030	Feb. 14, 2018
4	Test Cable	EMCI	EMC104-SM-S M-8000	8m	Jan. 04, 2018
5	Test Cable	EMCI	EMC104-SM-S M-800	150207	Jan. 04, 2018
6	Test Cable	EMCI	EEMC104-SM-S M-3000	151205	Jan. 04, 2018
7	MXE EMI Receiver	Agilent	N9038A	MY55420127	Jan. 09, 2018
8	Signal Analyzer	Agilent	N9010A	MY52220990	Feb. 22, 2018
9	Loop Ant	EMCO	6502	42960	Nov. 24, 2017
10	Horn Ant	SCHWARZBECK	BBHA 9120D	9120D-1342	Feb. 28, 2018
11	Horn Ant	Schwarzbeck	BBHA 9170	187	Dec. 07, 2017
12	Trilog-Broadband Antenna	Schwarzbeck	VULB 9168	9168-548	Jan. 16, 2018
13	5dB Attenuator	EMCI	EMCI-N-6-05	AT-N0623	Jan. 16, 2018

Number of Hopping Channel					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	R&S/FSP30	100854	May 25, 2018

Average Time of Occupancy					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	R&S/FSP30	100854	May 25, 2018

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

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

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

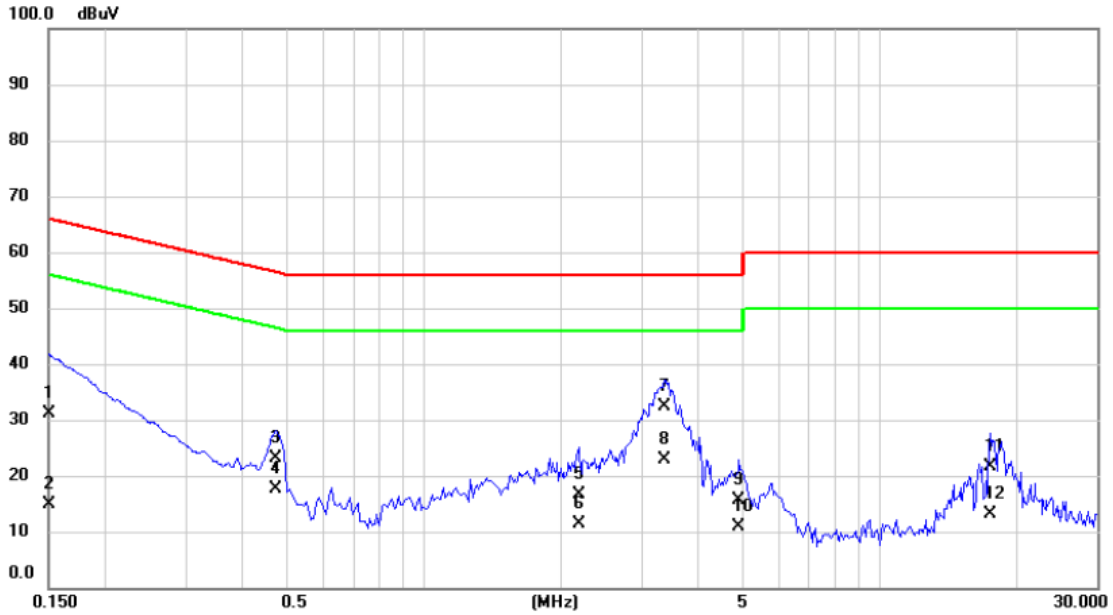
Antenna Conducted Spurious Emission					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	R&S/FSP30	100854	May 25, 2018

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

## APPENDIX A - CONDUCTED EMISSION

Test Mode: TX Mode

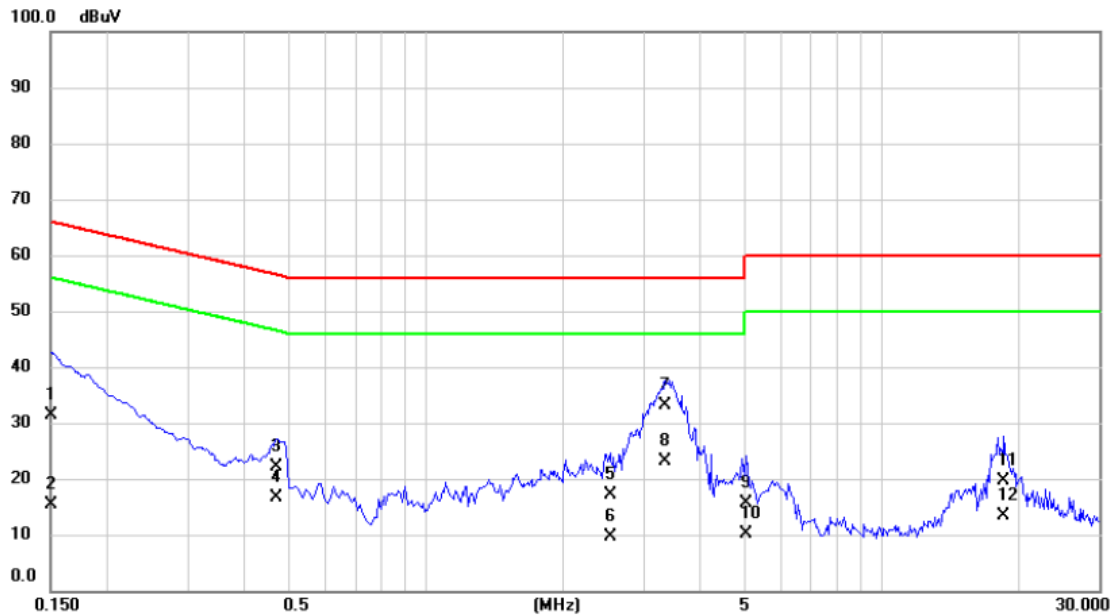
### Line



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1		0.1500	31.10	-0.01	31.09	66.00	-34.91	QP	
2		0.1500	14.90	-0.01	14.89	56.00	-41.11	AVG	
3		0.4741	23.00	0.03	23.03	56.44	-33.41	QP	
4		0.4741	17.70	0.03	17.73	46.44	-28.71	AVG	
5		2.1830	16.60	0.04	16.64	56.00	-39.36	QP	
6		2.1830	11.30	0.04	11.34	46.00	-34.66	AVG	
7		3.3620	32.40	0.07	32.47	56.00	-23.53	QP	
8	*	3.3620	22.90	0.07	22.97	46.00	-23.03	AVG	
9		4.9100	15.60	0.09	15.69	56.00	-40.31	QP	
10		4.9100	10.90	0.09	10.99	46.00	-35.01	AVG	
11		17.5000	21.39	0.23	21.62	60.00	-38.38	QP	
12		17.5000	12.99	0.23	13.22	50.00	-36.78	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		0.1500	31.50	-0.01	31.49	66.00	-34.51	QP	
2		0.1500	15.50	-0.01	15.49	56.00	-40.51	AVG	
3		0.4700	22.00	0.03	22.03	56.51	-34.48	QP	
4		0.4700	16.50	0.03	16.53	46.51	-29.98	AVG	
5		2.5340	17.20	0.05	17.25	56.00	-38.75	QP	
6		2.5340	9.50	0.05	9.55	46.00	-36.45	AVG	
7		3.3530	33.00	0.07	33.07	56.00	-22.93	QP	
8	*	3.3530	23.10	0.07	23.17	46.00	-22.83	AVG	
9		5.0500	15.60	0.09	15.69	60.00	-44.31	QP	
10		5.0500	10.10	0.09	10.19	50.00	-39.81	AVG	
11		18.5000	19.30	0.23	19.53	60.00	-40.47	QP	
12		18.5000	13.20	0.23	13.43	50.00	-36.57	AVG	

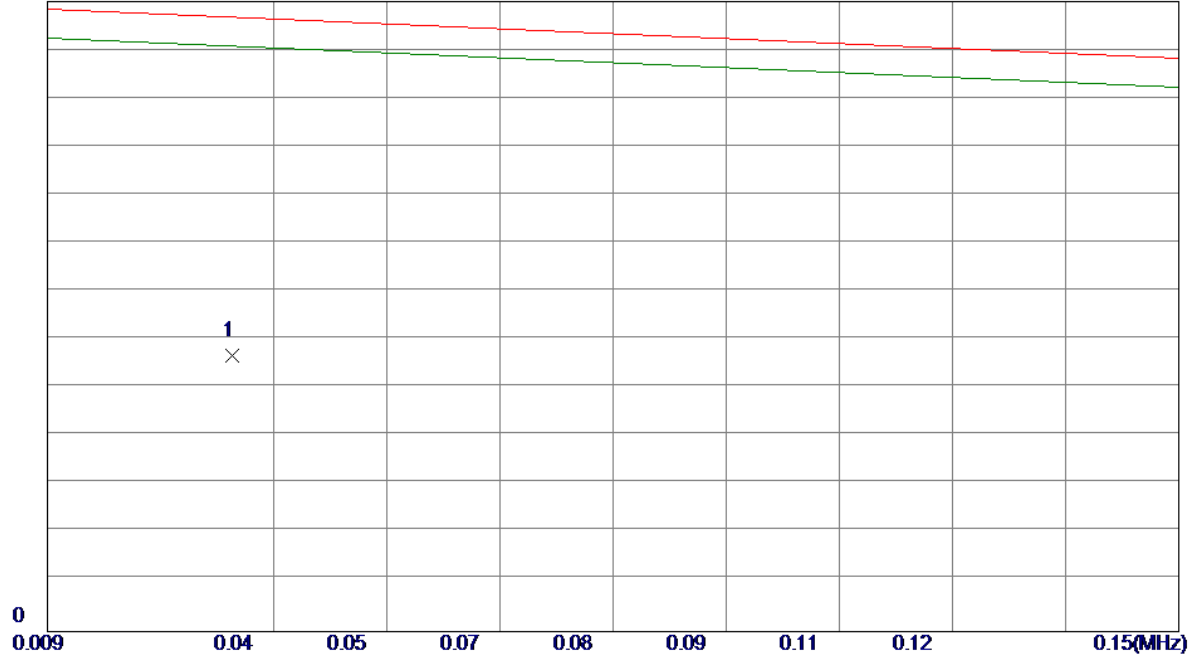


## APPENDIX B - RADIATED EMISSION (9KHZ-30MHZ)

Test Mode: TX Mode

Ant 0°

130 dBuV/m

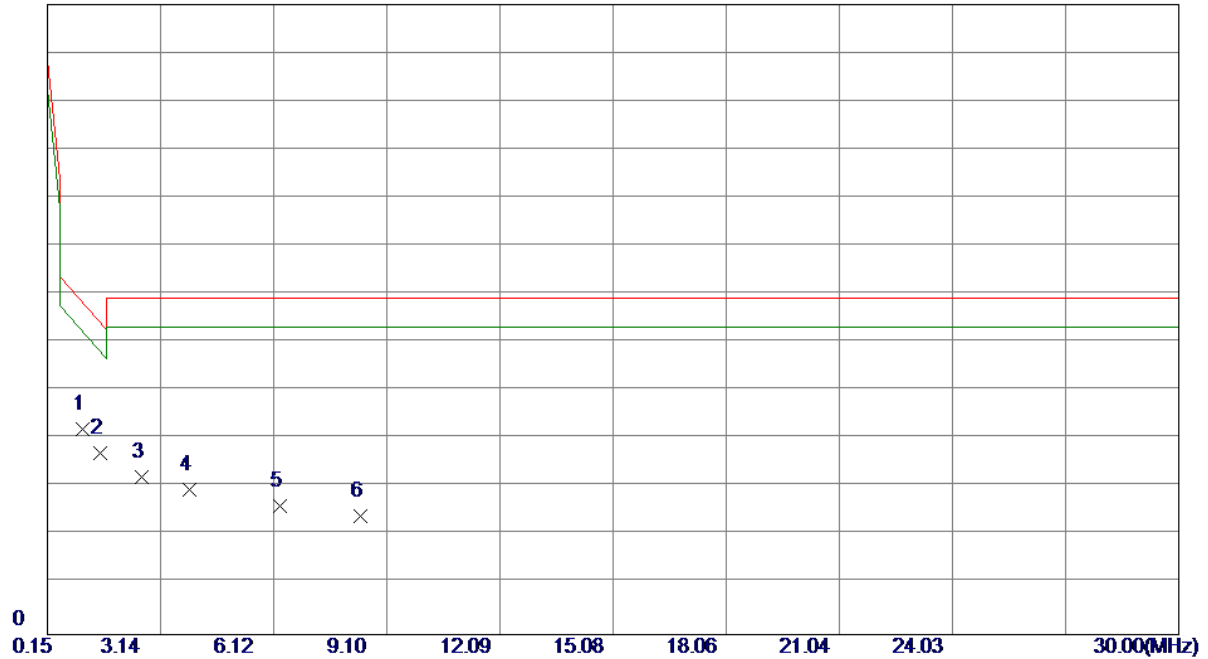


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	0.0320	42.17	14.79	56.96	126.85	-69.89	Peak	

Test Mode: TX Mode

Ant 0°

130 dBuV/m

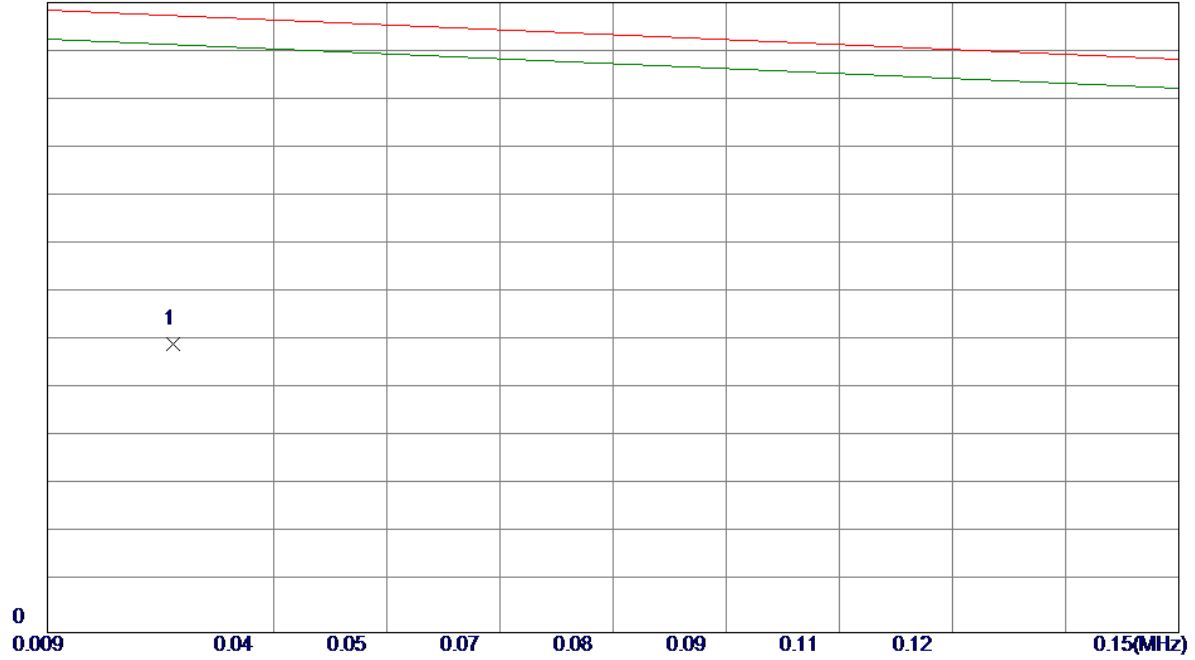


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	1.0750	30.36	11.97	42.33	68.58	-26.25	Peak	
2	1.5530	25.58	11.75	37.33	64.32	-26.99	Peak	
3	2.6274	21.29	11.27	32.56	69.54	-36.98	Peak	
4	3.9110	18.67	11.24	29.91	69.54	-39.63	Peak	
5	6.2991	15.05	11.37	26.42	69.54	-43.12	Peak	
6	8.4184	13.23	11.33	24.56	69.54	-44.98	Peak	

Test Mode: TX Mode

Ant 90°

130 dBuV/m

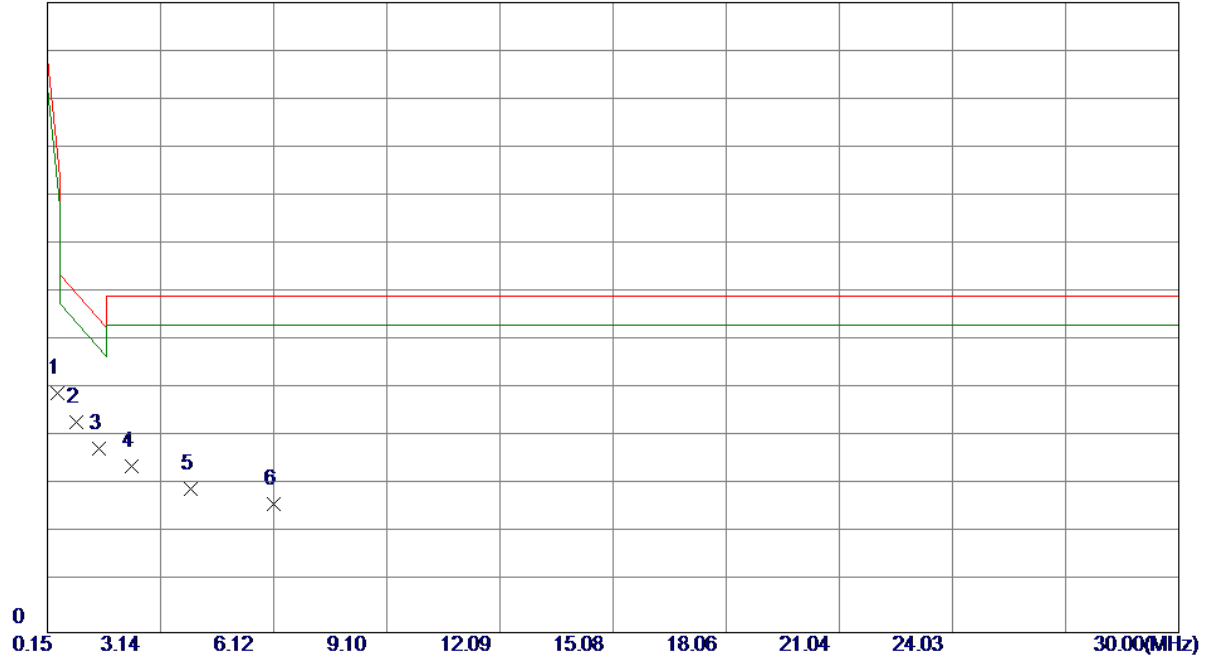


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	0.0246	43.19	16.46	59.65	127.39	-67.74	Peak	

Test Mode: TX Mode

Ant 90°

130 dBuV/m

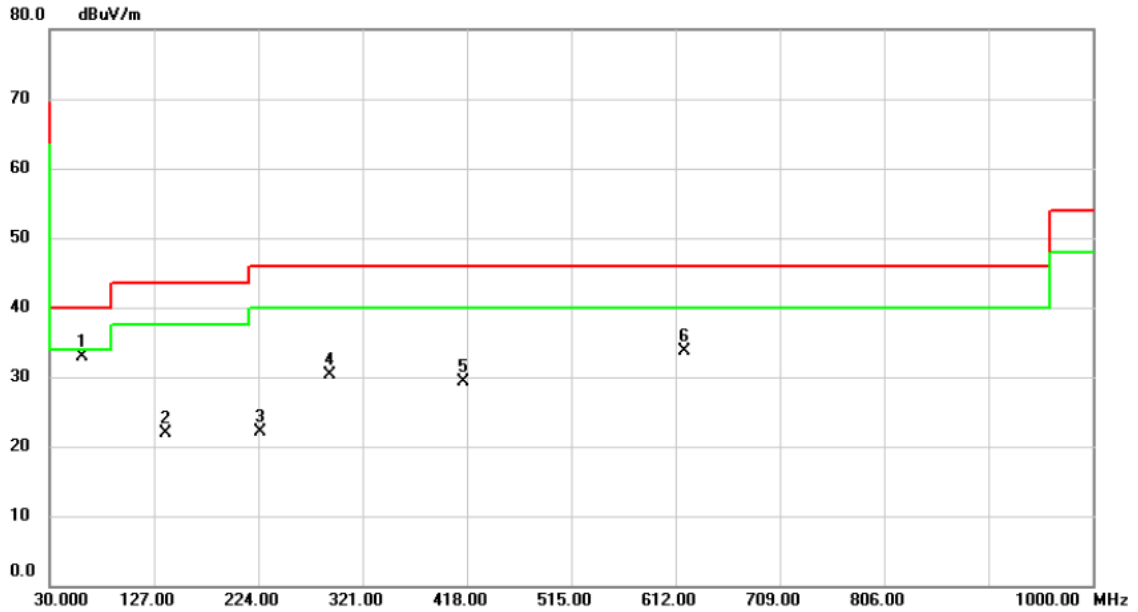


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	0.4187	37.60	11.80	49.40	98.94	-49.54	Peak	
2 *	0.9261	31.48	11.97	43.45	69.91	-26.46	Peak	
3	1.5230	26.24	11.76	38.00	64.59	-26.59	Peak	
4	2.3887	22.98	11.38	34.36	69.54	-35.18	Peak	
5	3.9410	18.34	11.24	29.58	69.54	-39.96	Peak	
6	6.1200	15.19	11.38	26.57	69.54	-42.97	Peak	

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

Test Mode: TX 2480MHz\_CH78\_3 Mbps

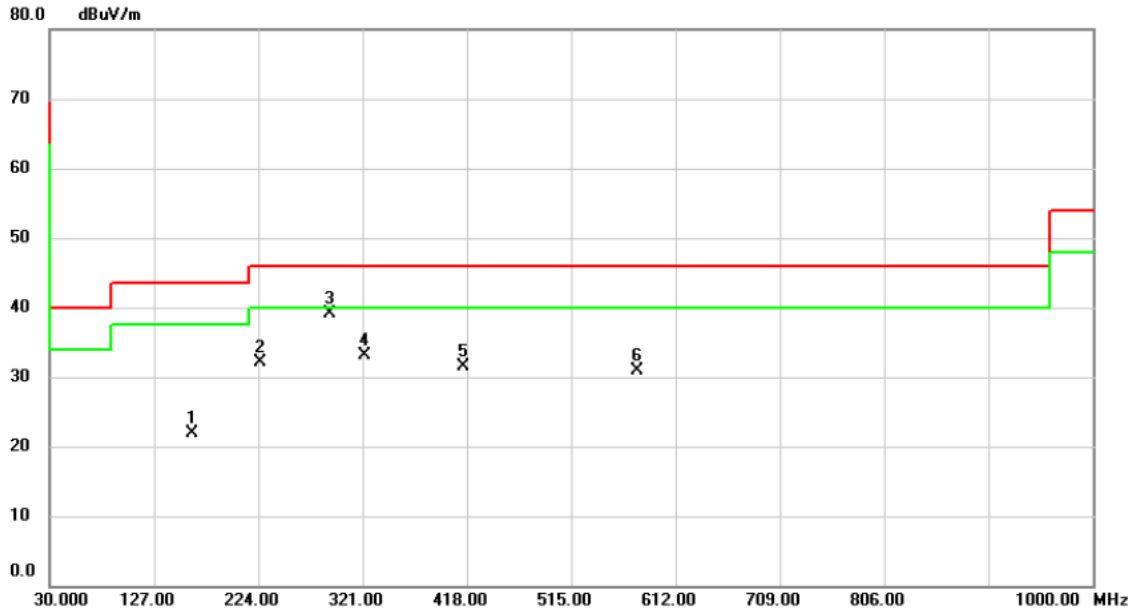
**Vertical**



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1	*	60.0700	41.49	-8.61	32.88	40.00	-7.12			peak
2		137.6700	31.23	-9.25	21.98	43.50	-21.52			peak
3		225.9400	32.46	-10.39	22.07	46.00	-23.93			peak
4		290.9300	37.91	-7.69	30.22	46.00	-15.78			peak
5		414.1200	33.95	-4.55	29.40	46.00	-16.60			peak
6		620.7300	33.97	-0.26	33.71	46.00	-12.29			peak

Test Mode: TX 2480MHz\_CH78\_3 Mbps

**Horizontal**



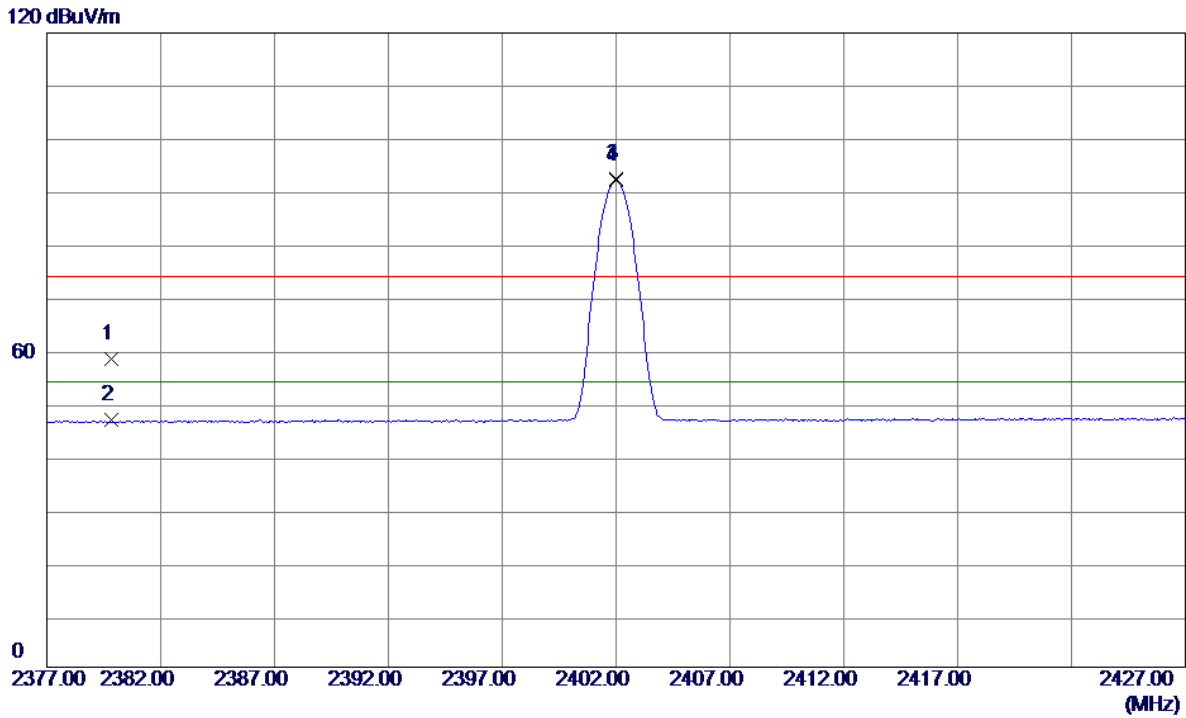
No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1		161.9200	30.39	-8.58	21.81	43.50	-21.69			peak
2		225.9400	42.48	-10.39	32.09	46.00	-13.91			peak
3	*	290.9300	46.89	-7.69	39.20	46.00	-6.80			peak
4		322.9400	39.97	-6.92	33.05	46.00	-12.95			peak
5		414.1200	36.11	-4.55	31.56	46.00	-14.44			peak
6		576.1100	31.92	-1.04	30.88	46.00	-15.12			peak



## APPENDIX D - RADIATED EMISSION (ABOVE 1000MHZ)

Test Mode : TX 2402MHz \_CH00\_1Mbps

**Vertical**

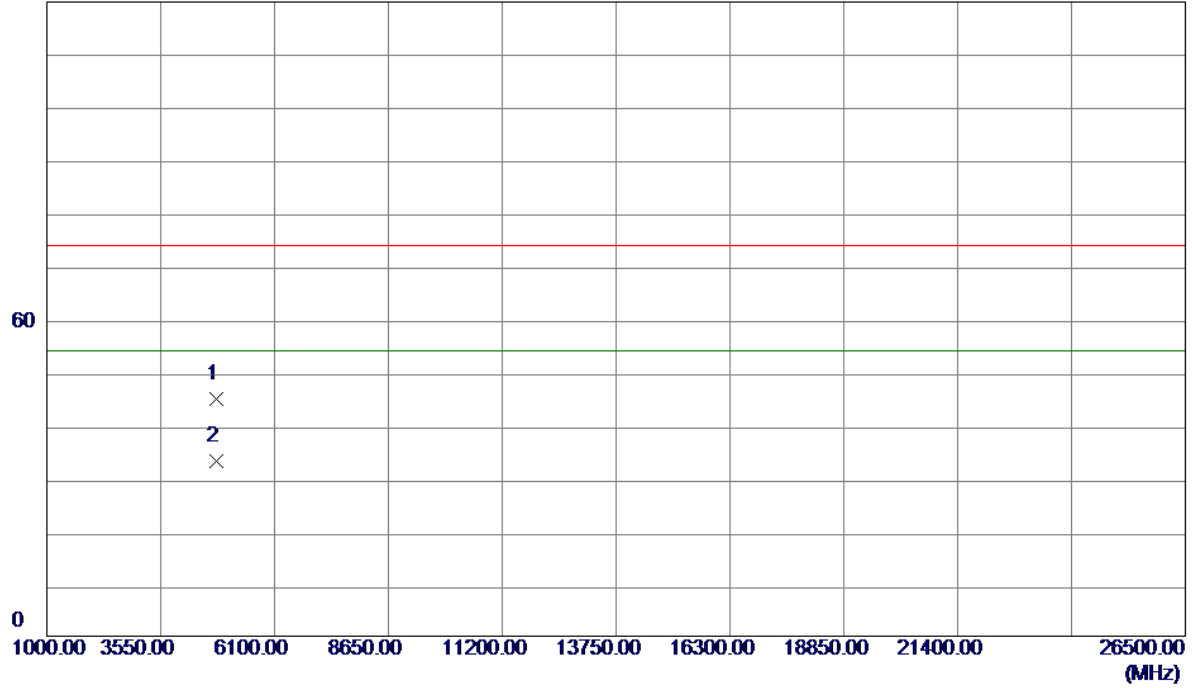


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	2379.8080	27.28	31.03	58.31	74.00	-15.69	Peak	
2	2379.8080	15.76	31.03	46.79	54.00	-7.21	AVG	
3	2402.0000	61.32	31.11	92.43	74.00	18.43	Peak	No Limit
4 *	2402.0000	61.01	31.11	92.12	54.00	38.12	AVG	No Limit

Test Mode : TX 2402MHz \_CH00\_1Mbps

**Vertical**

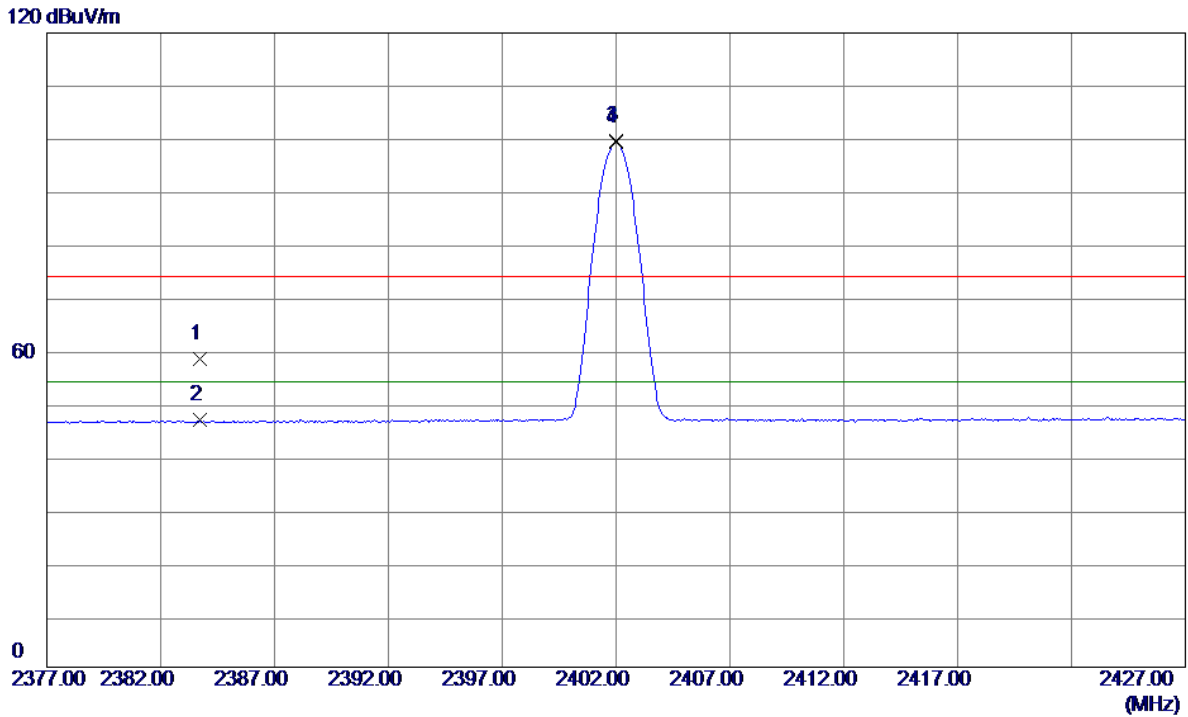
120 dBuV/m



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	4804.0000	56.38	-11.40	44.98	74.00	-29.02	Peak	
2 *	4804.0000	44.41	-11.40	33.01	54.00	-20.99	AVG	

Test Mode : TX 2402MHz \_CH00\_1Mbps

Horizontal

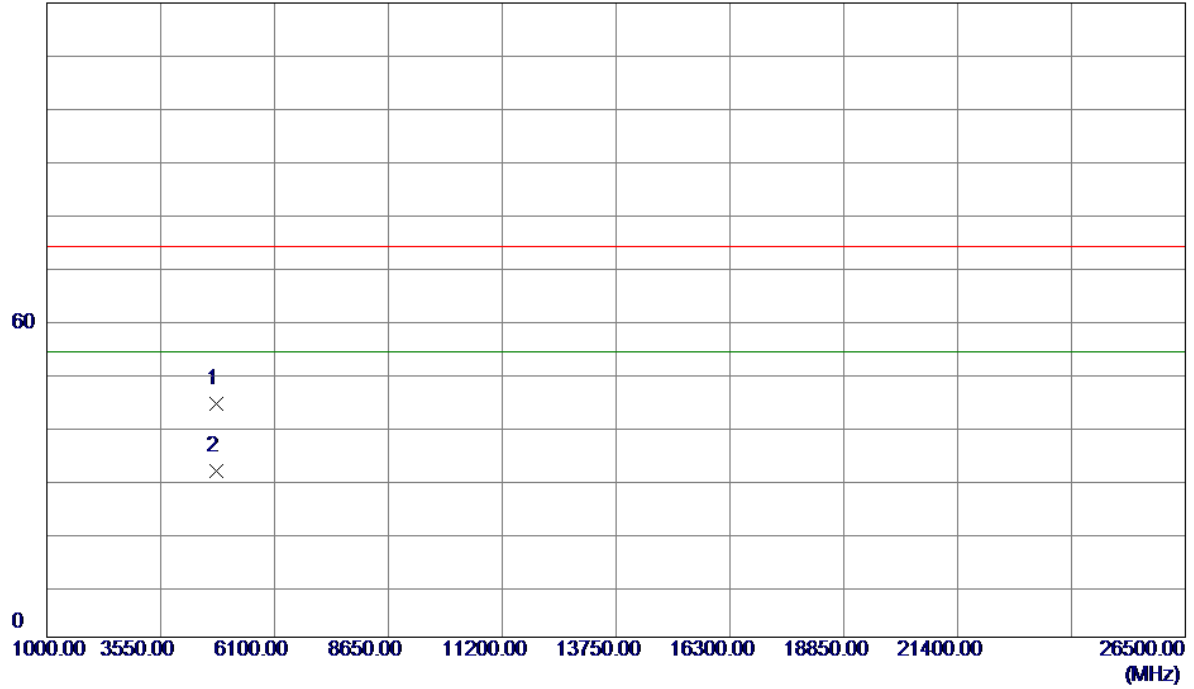


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	2383.7340	27.28	31.04	58.32	74.00	-15.68	Peak	
2	2383.7340	15.71	31.04	46.75	54.00	-7.25	AVG	
3	2402.0000	68.51	31.11	99.62	74.00	25.62	Peak	No Limit
4 *	2402.0000	68.17	31.11	99.28	54.00	45.28	AVG	No Limit

Test Mode : TX 2402MHz \_CH00\_1Mbps

**Horizontal**

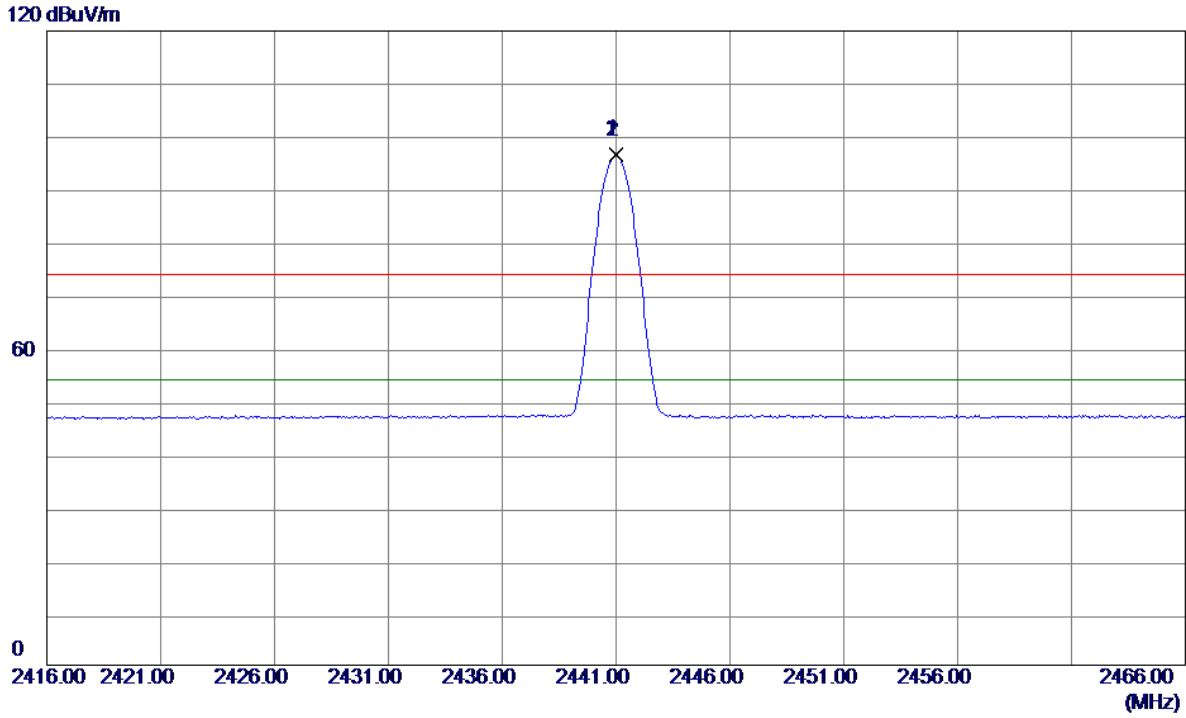
120 dBuV/m



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	4804.0000	55.48	-11.40	44.08	74.00	-29.92	Peak	
2 *	4804.0000	42.90	-11.40	31.50	54.00	-22.50	AVG	

Test Mode : TX 2441MHz \_CH39\_1Mbps

**Vertical**

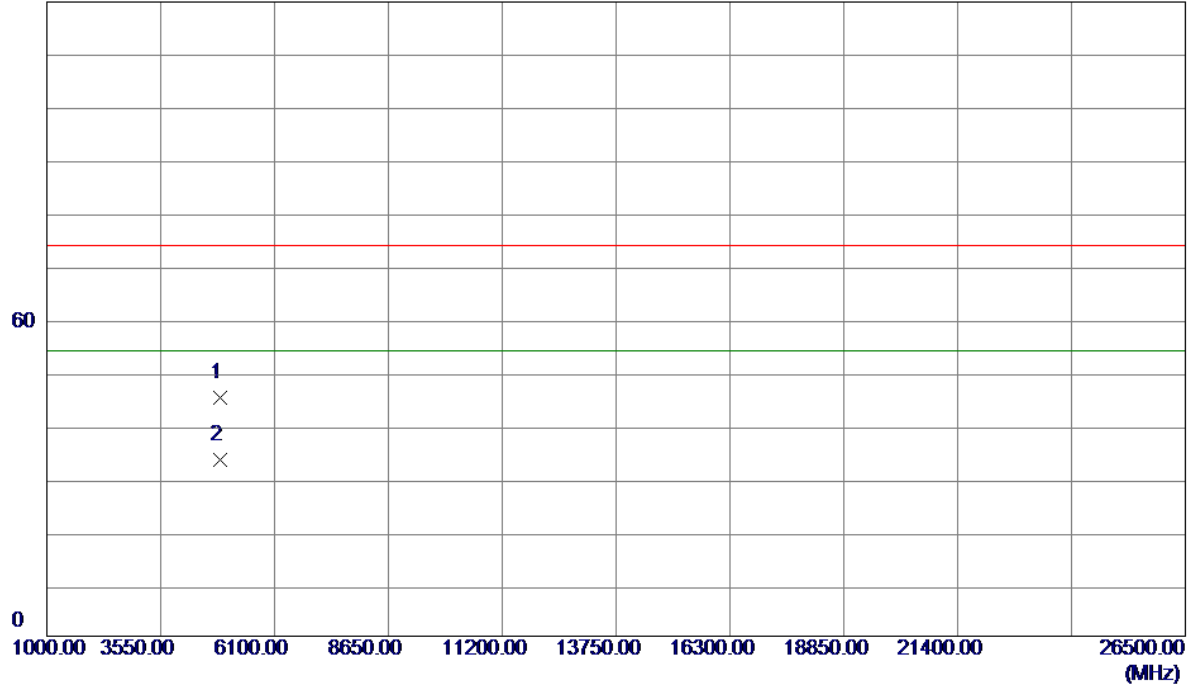


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	2441.0000	65.55	31.25	96.80	74.00	22.80	Peak	No Limit
2 *	2441.0000	65.17	31.25	96.42	54.00	42.42	AVG	No Limit

Test Mode : TX 2441MHz \_CH39\_1Mbps

**Vertical**

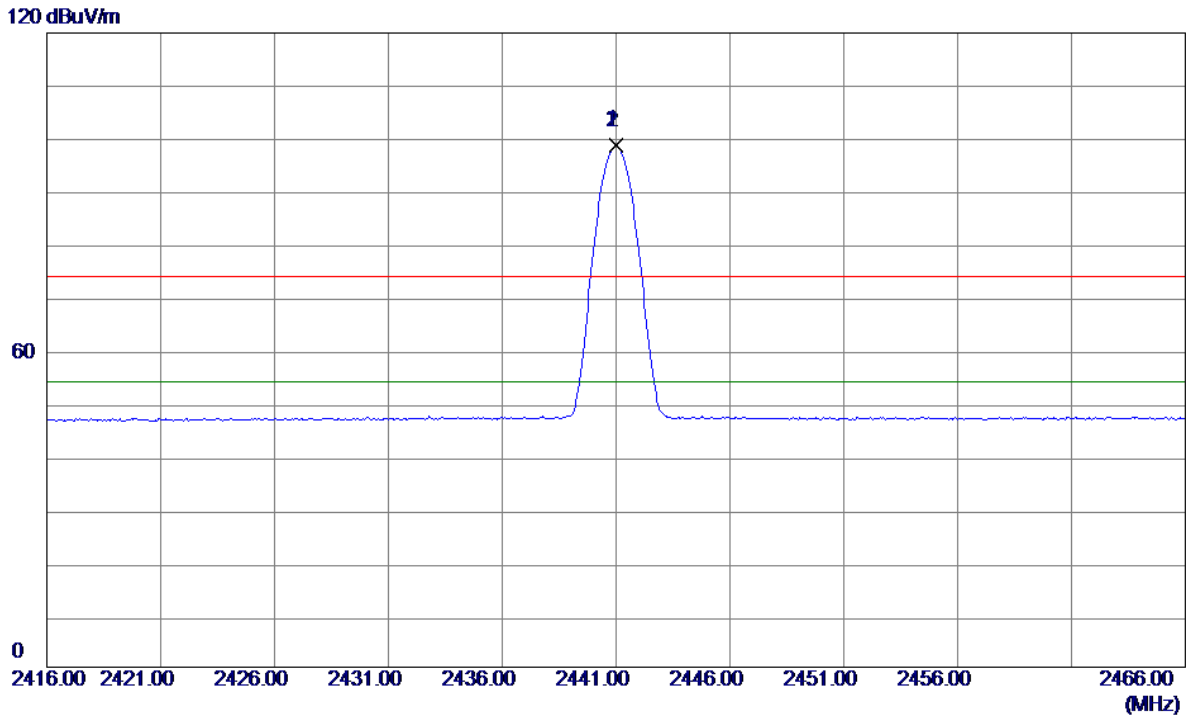
120 dBuV/m



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	4882.0000	56.42	-11.28	45.14	74.00	-28.86	Peak	
2 *	4882.0000	44.66	-11.28	33.38	54.00	-20.62	AVG	

Test Mode : TX 2441MHz \_CH39\_1Mbps

**Horizontal**



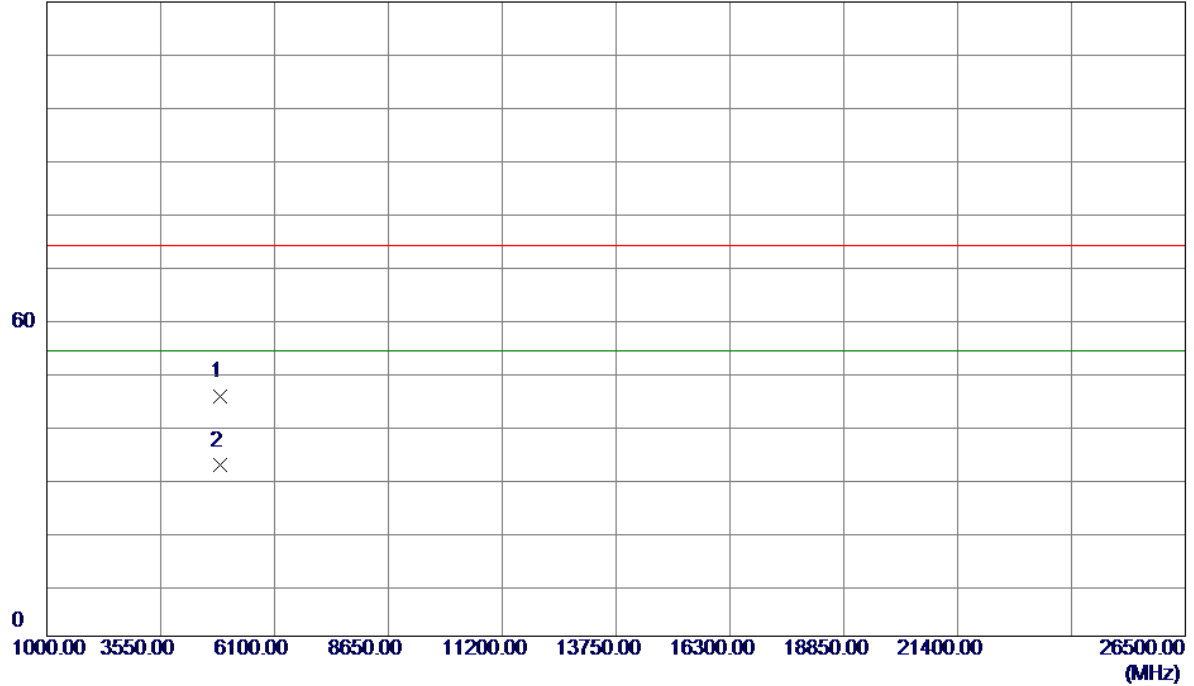
No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	2441.0000	67.74	31.25	98.99	74.00	24.99	Peak	No Limit
2 *	2441.0000	67.35	31.25	98.60	54.00	44.60	AVG	No Limit



Test Mode : TX 2441MHz \_CH39\_1Mbps

**Horizontal**

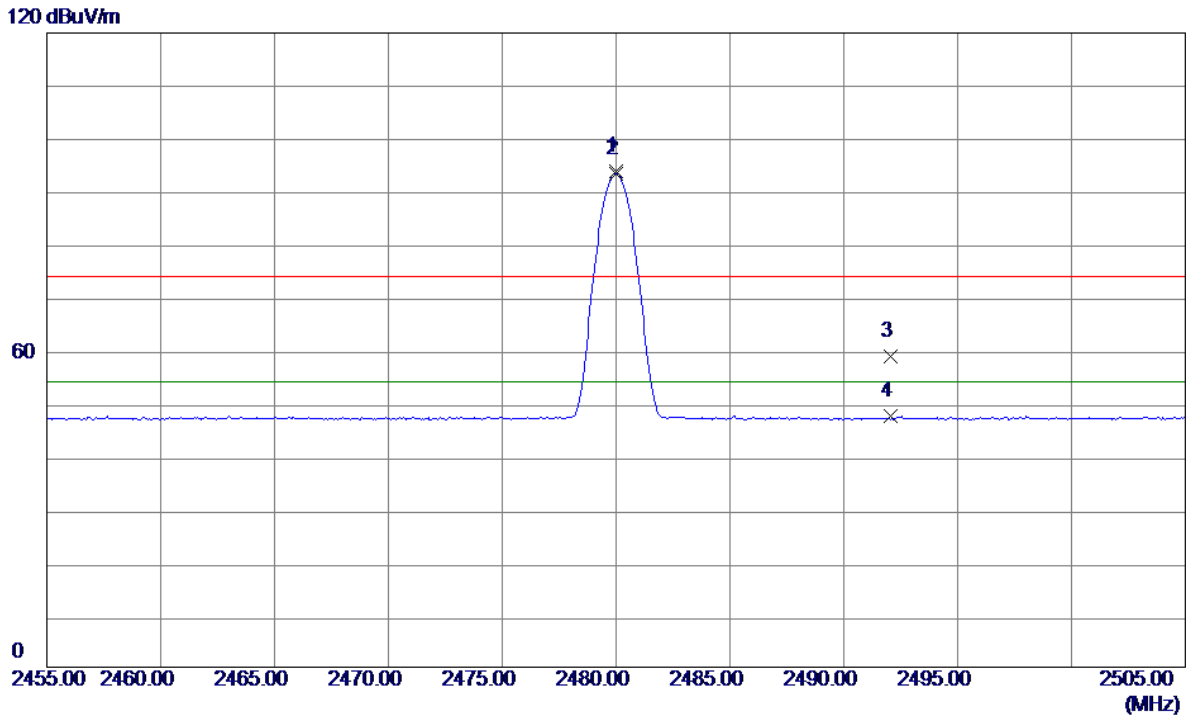
120 dBuV/m



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	4882.0000	56.62	-11.28	45.34	74.00	-28.66	Peak	
2 *	4882.0000	43.56	-11.28	32.28	54.00	-21.72	AVG	

Test Mode : TX 2480MHz \_CH78\_1Mbps

**Vertical**

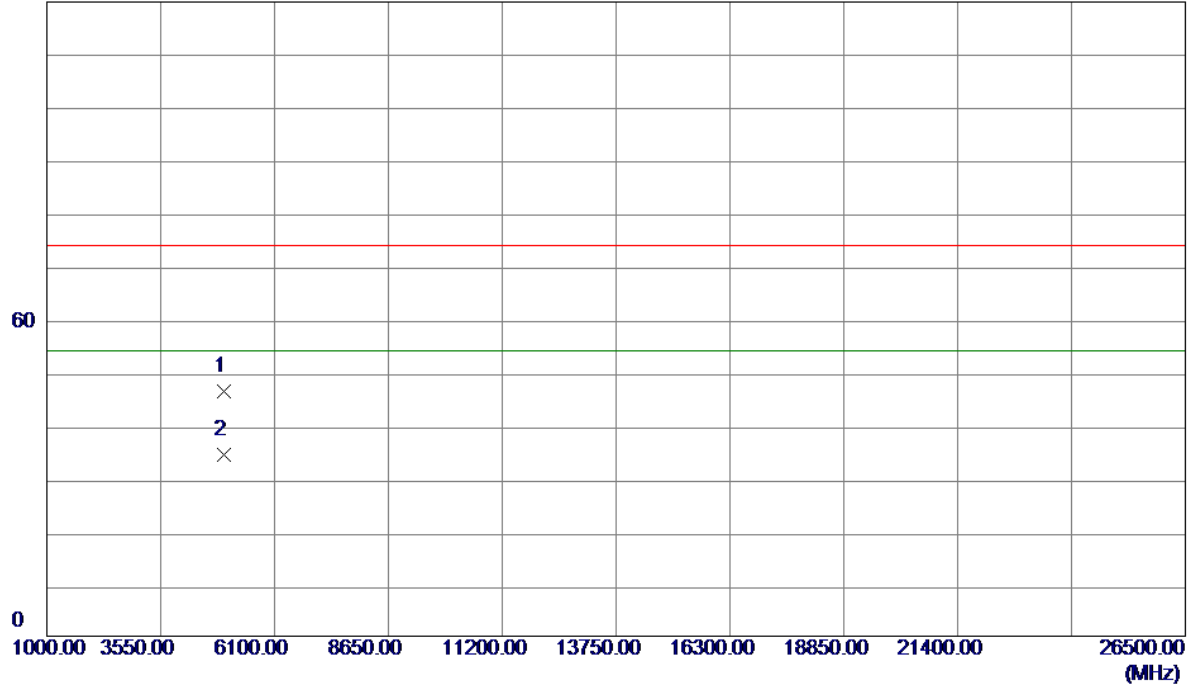


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	2480.0000	62.33	31.40	93.73	74.00	19.73	Peak	No Limit
2 *	2480.0000	62.03	31.40	93.43	54.00	39.43	AVG	No Limit
3	2492.0800	27.25	31.44	58.69	74.00	-15.31	Peak	
4	2492.0800	15.98	31.44	47.42	54.00	-6.58	AVG	

Test Mode : TX 2480MHz \_CH78\_1Mbps

**Vertical**

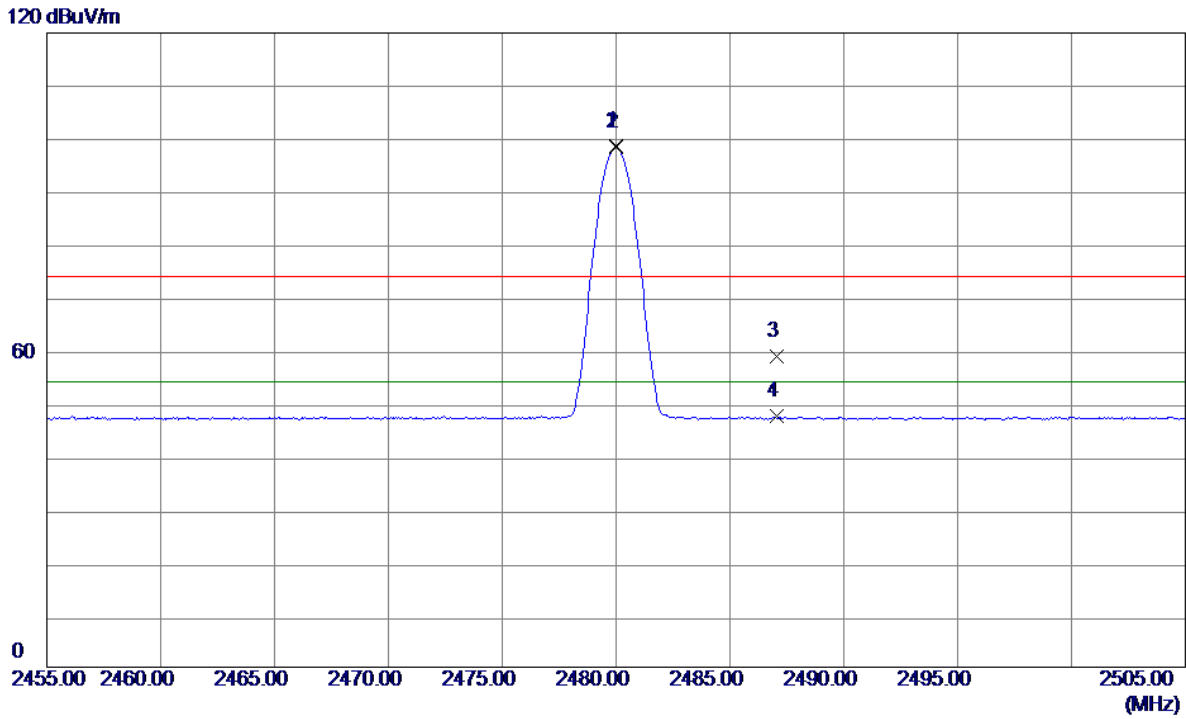
120 dBuV/m



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	4960.0000	57.59	-11.16	46.43	74.00	-27.57	Peak	
2 *	4960.0000	45.56	-11.16	34.40	54.00	-19.60	AVG	

Test Mode : TX 2480MHz \_CH78\_1Mbps

**Horizontal**

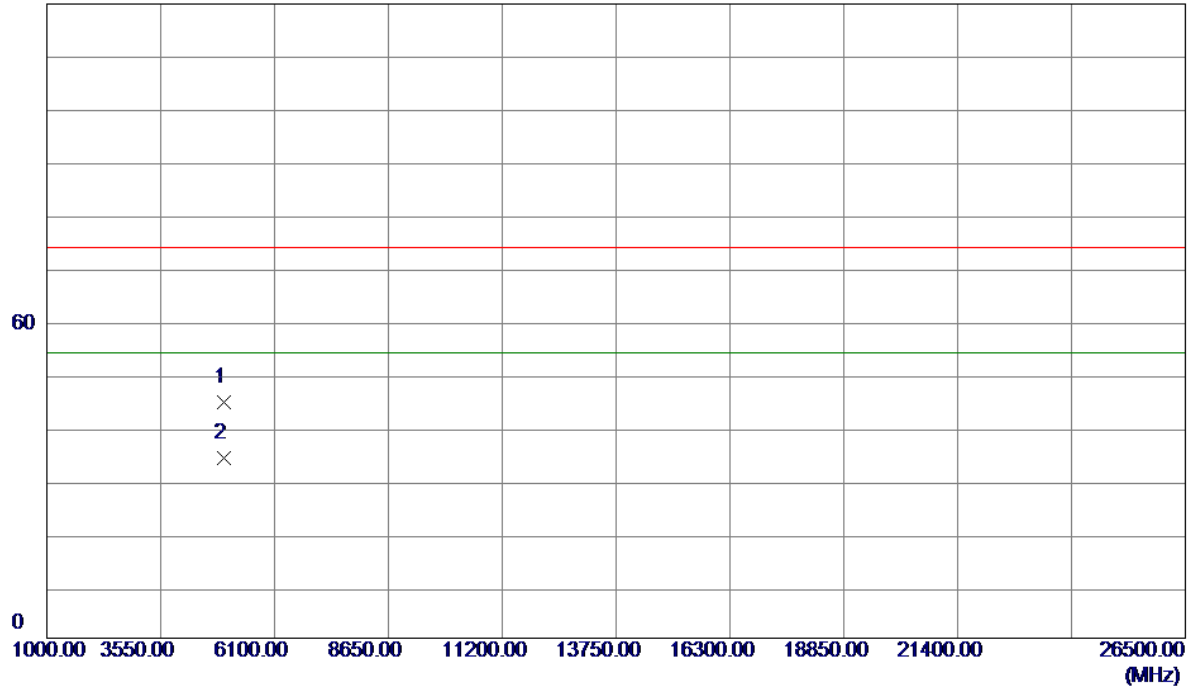


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	2480.0000	67.30	31.40	98.70	74.00	24.70	Peak	No Limit
2 *	2480.0000	66.93	31.40	98.33	54.00	44.33	AVG	No Limit
3	2487.0810	27.35	31.42	58.77	74.00	-15.23	Peak	
4	2487.0810	16.02	31.42	47.44	54.00	-6.56	AVG	

Test Mode : TX 2480MHz \_CH78\_1Mbps

**Horizontal**

120 dBuV/m

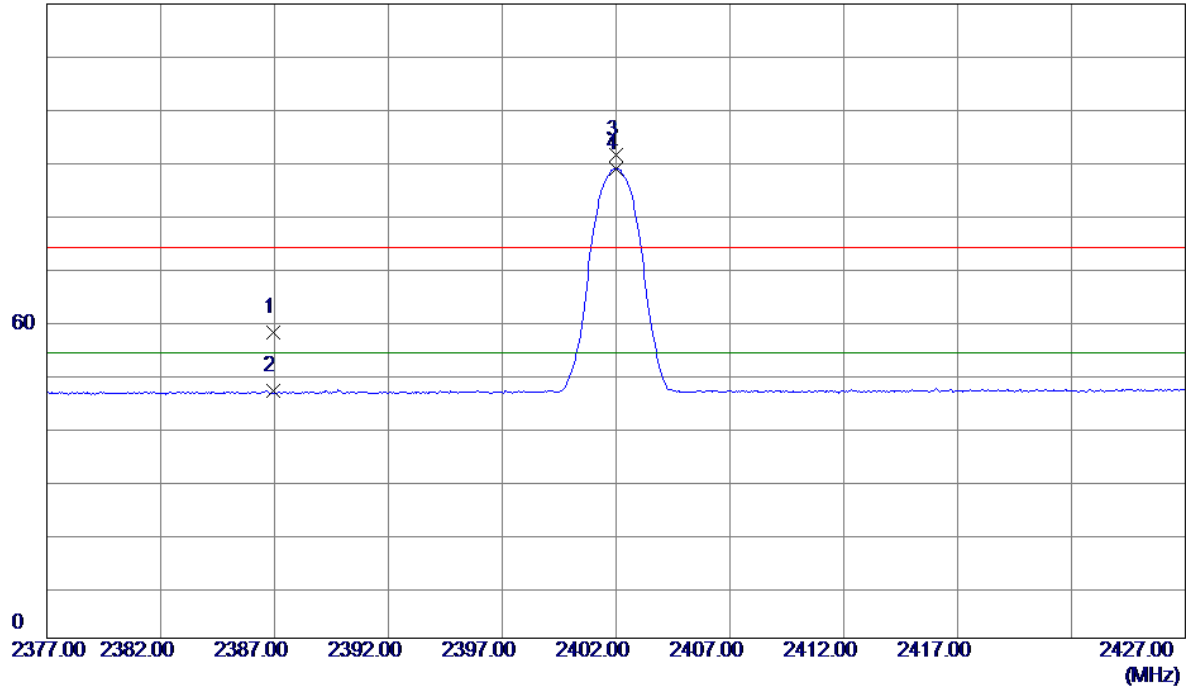


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	4960.0000	55.81	-11.16	44.65	74.00	-29.35	Peak	
2 *	4960.0000	45.15	-11.16	33.99	54.00	-20.01	AVG	

Test Mode : TX 2402MHz \_CH00\_3Mbps

**Vertical**

120 dBuV/m

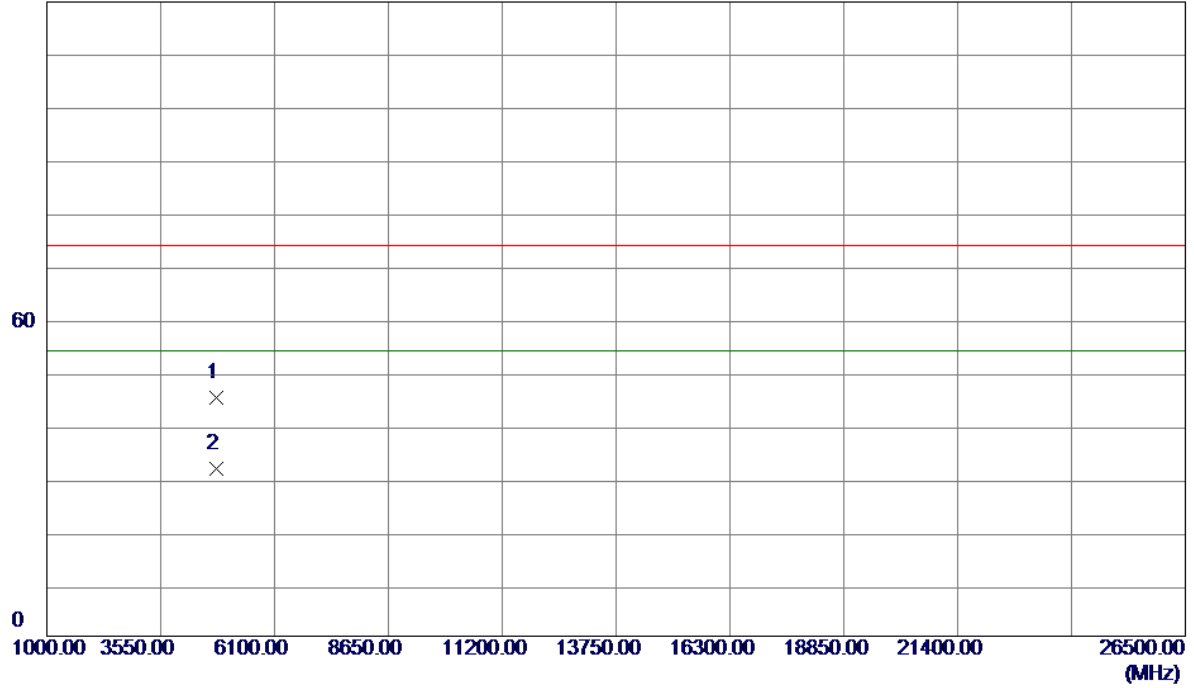


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	2386.9190	26.77	31.05	57.82	74.00	-16.18	Peak	
2	2386.9190	15.71	31.05	46.76	54.00	-7.24	AVG	
3	2402.0000	60.42	31.11	91.53	74.00	17.53	Peak	No Limit
4 *	2402.0000	57.69	31.11	88.80	54.00	34.80	AVG	No Limit

Test Mode : TX 2402MHz \_CH00\_3Mbps

**Vertical**

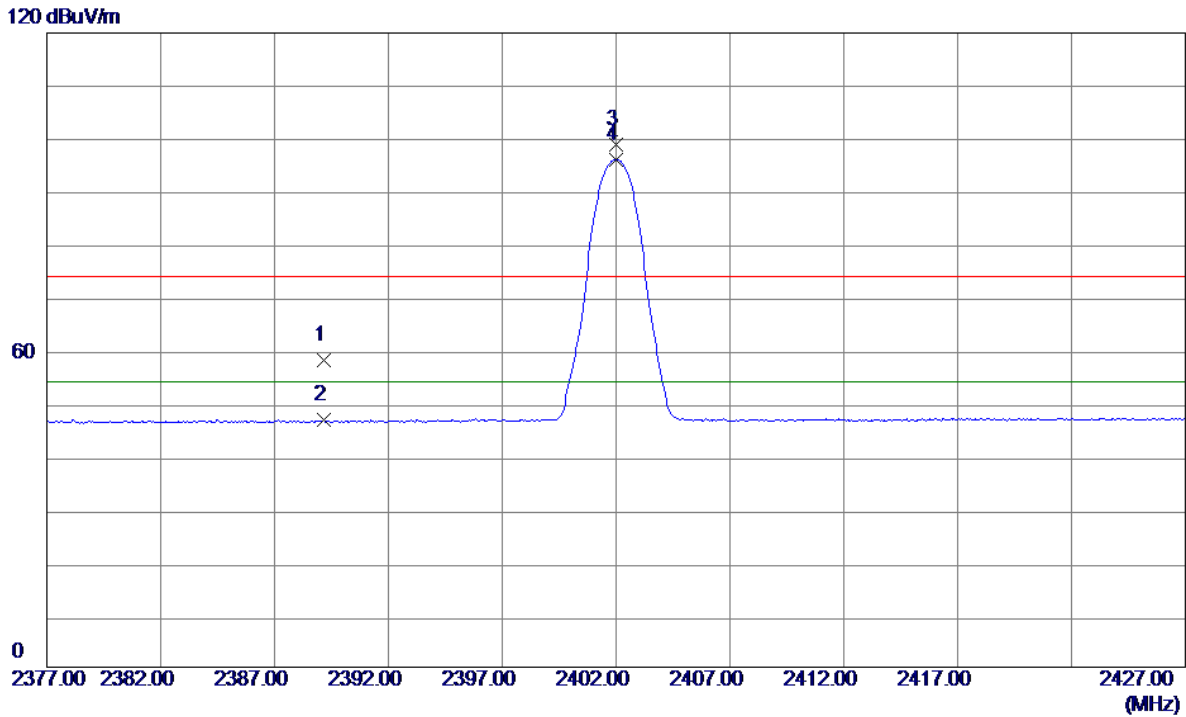
120 dBuV/m



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	4804.0000	56.44	-11.40	45.04	74.00	-28.96	Peak	
2 *	4804.0000	43.16	-11.40	31.76	54.00	-22.24	AVG	

Test Mode : TX 2402MHz \_CH00\_3Mbps

**Horizontal**



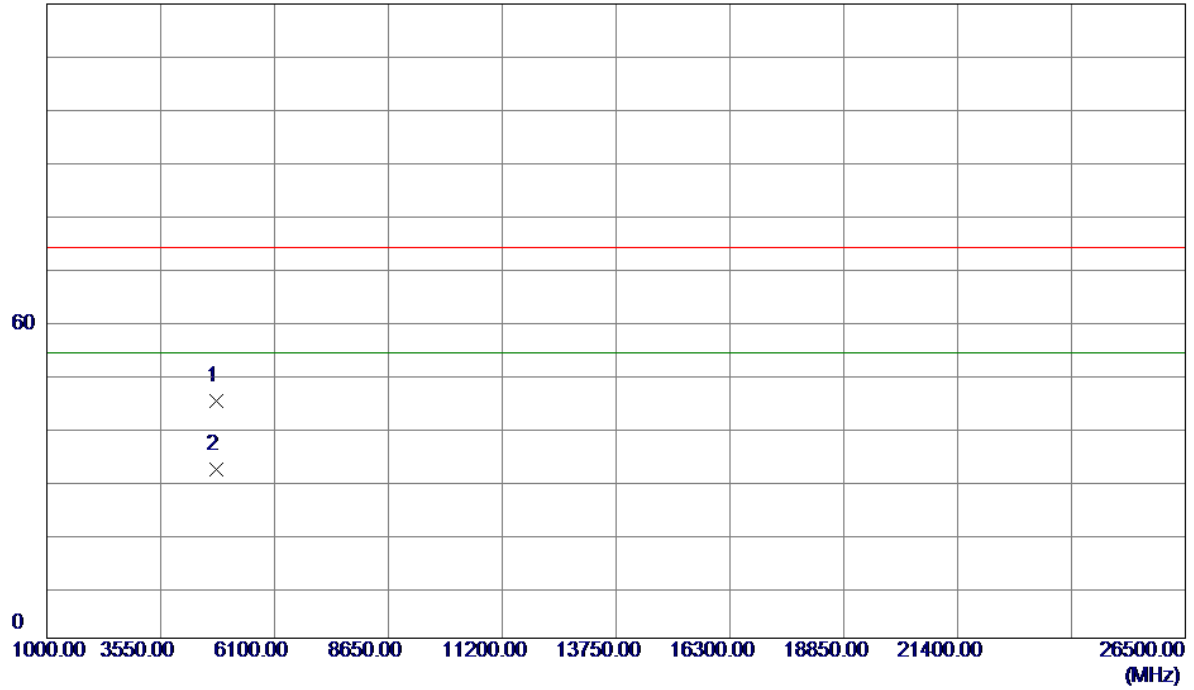
No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	2389.1940	27.10	31.06	58.16	74.00	-15.84	Peak	
2	2389.1940	15.76	31.06	46.82	54.00	-7.18	AVG	
3	2402.0000	67.82	31.11	98.93	74.00	24.93	Peak	No Limit
4 *	2402.0000	64.92	31.11	96.03	54.00	42.03	AVG	No Limit



Test Mode : TX 2402MHz \_CH00\_3Mbps

**Horizontal**

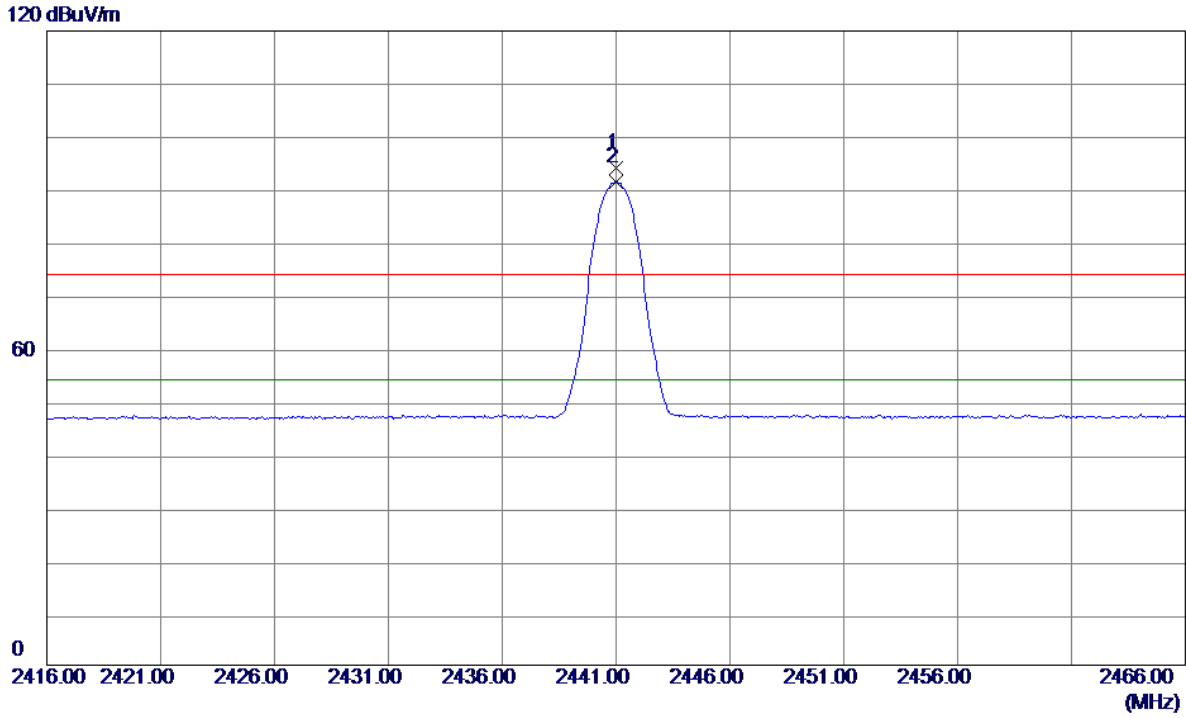
120 dBuV/m



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	4804.0000	56.21	-11.40	44.81	74.00	-29.19	Peak	
2 *	4804.0000	43.21	-11.40	31.81	54.00	-22.19	AVG	

Test Mode : TX 2441MHz \_CH39\_3Mbps

**Vertical**

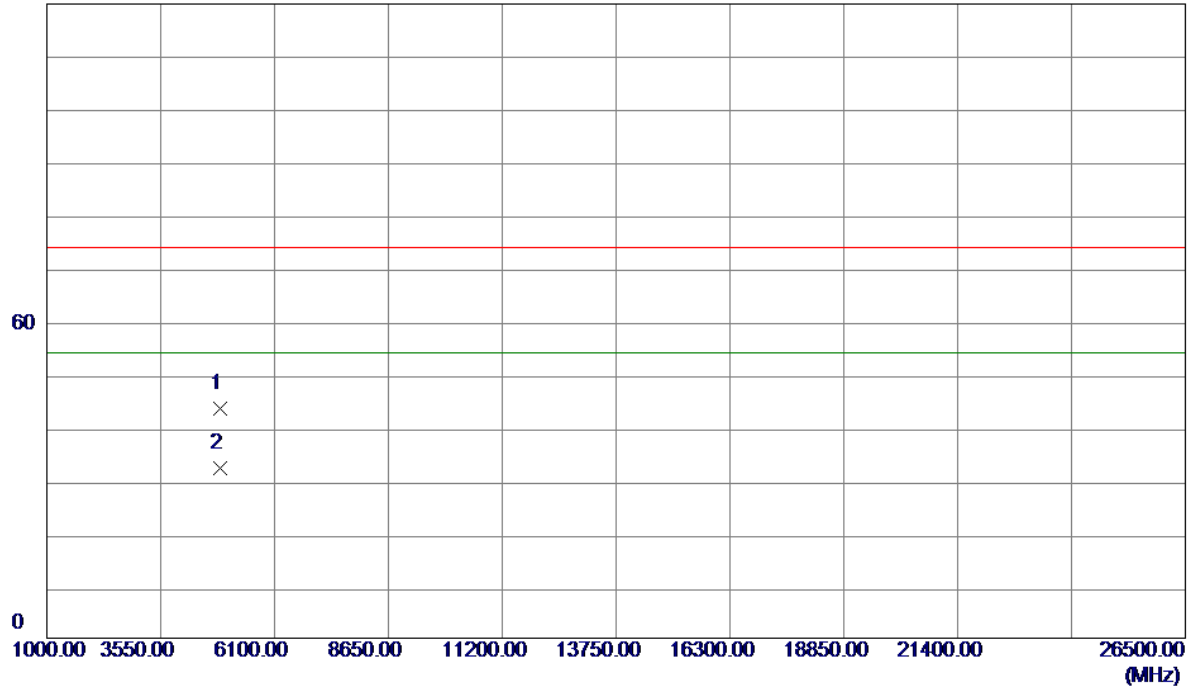


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	2441.0000	62.91	31.25	94.16	74.00	20.16	Peak	No Limit
2 *	2441.0000	60.10	31.25	91.35	54.00	37.35	AVG	No Limit

Test Mode : TX 2441MHz \_CH39\_3Mbps

**Vertical**

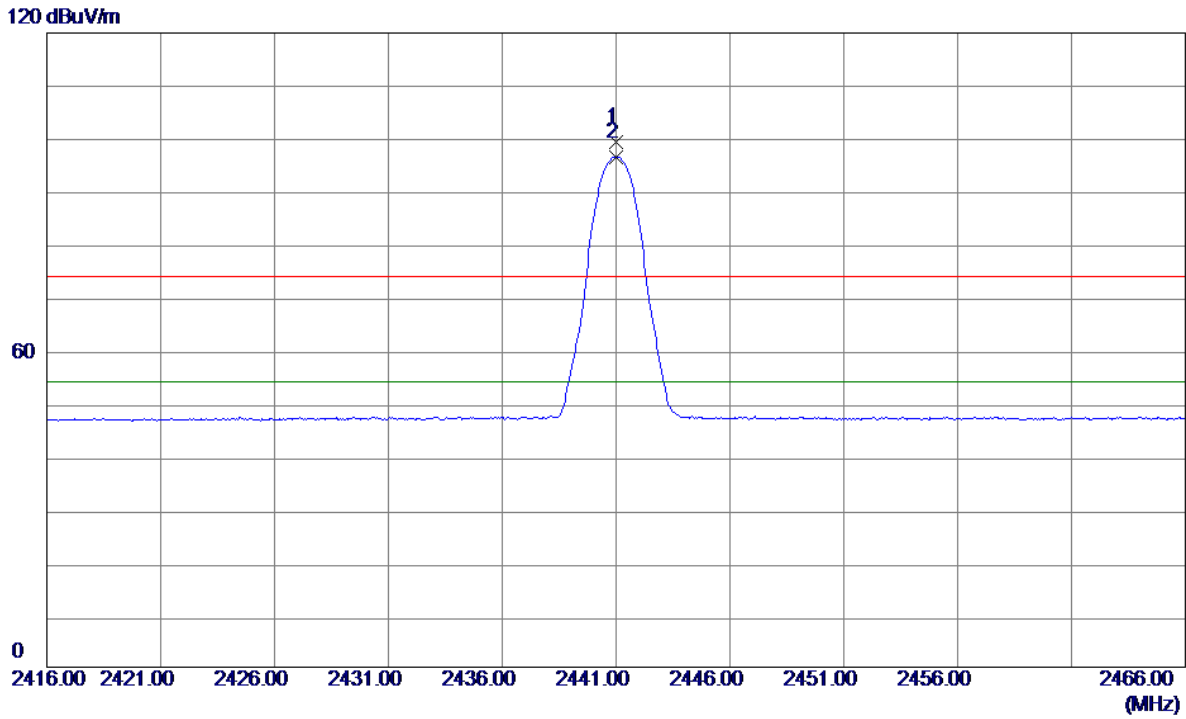
120 dBuV/m



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	4882.0000	54.63	-11.28	43.35	74.00	-30.65	Peak	
2 *	4882.0000	43.33	-11.28	32.05	54.00	-21.95	AVG	

Test Mode : TX 2441MHz \_CH39\_3Mbps

**Horizontal**

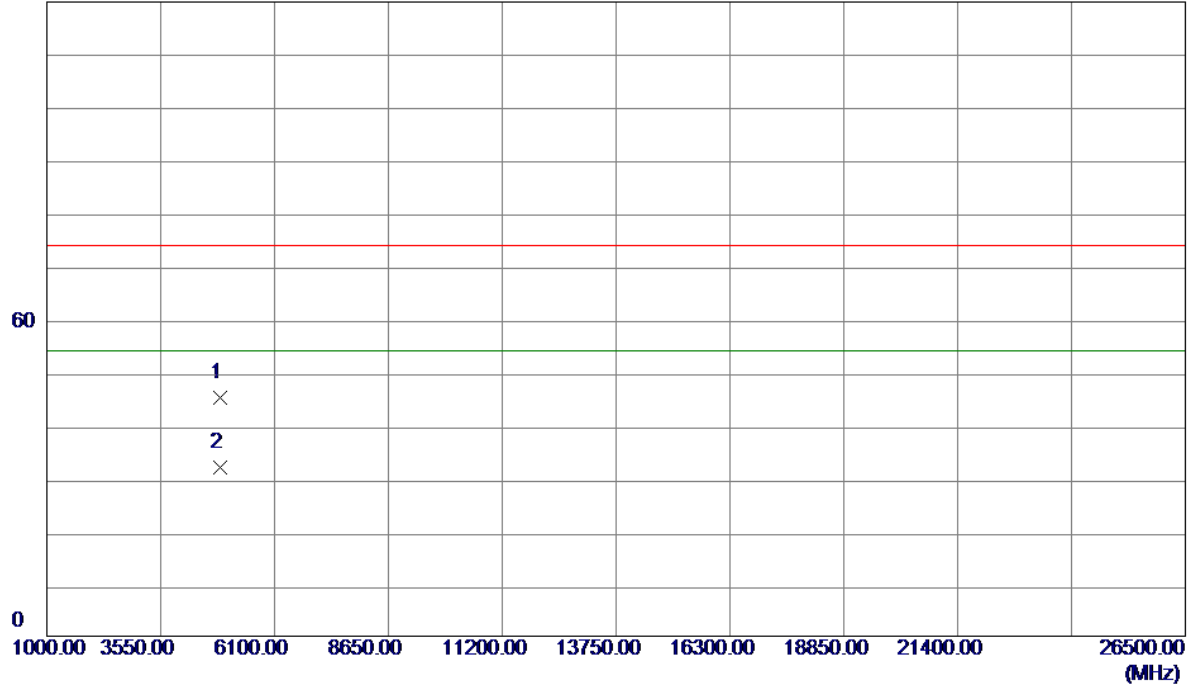


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	2441.0000	68.02	31.25	99.27	74.00	25.27	Peak	No Limit
2 *	2441.0000	65.32	31.25	96.57	54.00	42.57	AVG	No Limit

Test Mode : TX 2441MHz \_CH39\_3Mbps

**Horizontal**

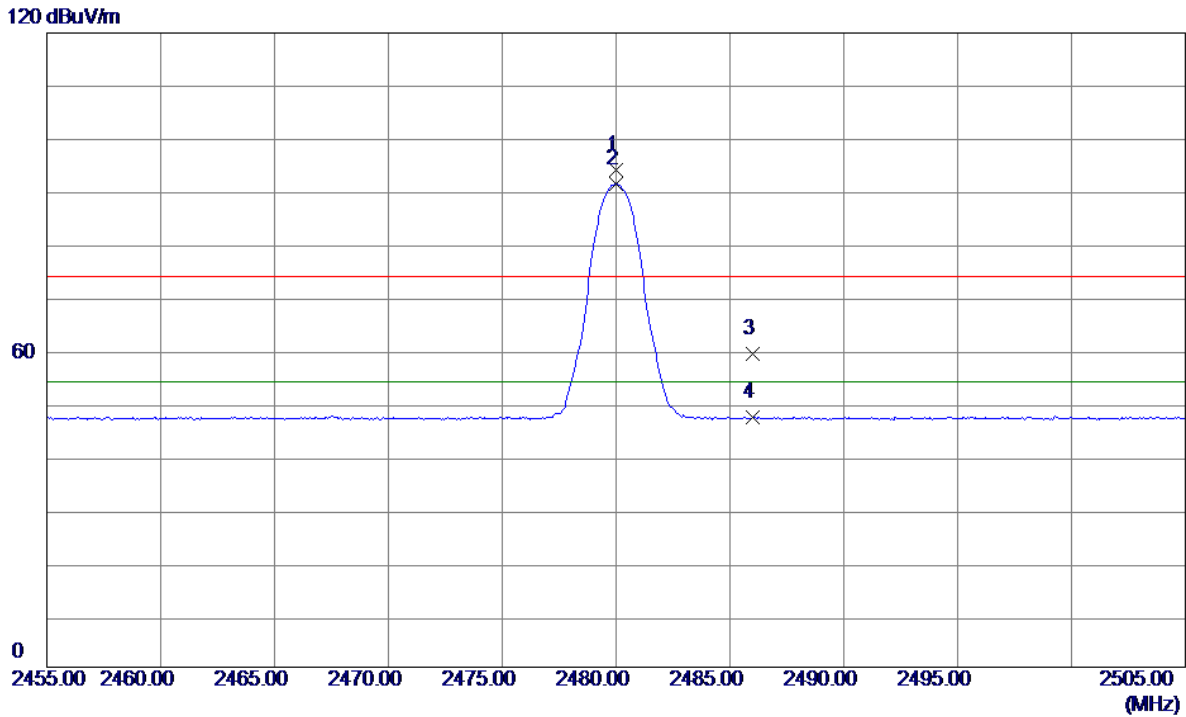
120 dBuV/m



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	4882.0000	56.37	-11.28	45.09	74.00	-28.91	Peak	
2 *	4882.0000	43.18	-11.28	31.90	54.00	-22.10	AVG	

Test Mode : TX 2480MHz \_CH78\_3Mbps

**Vertical**

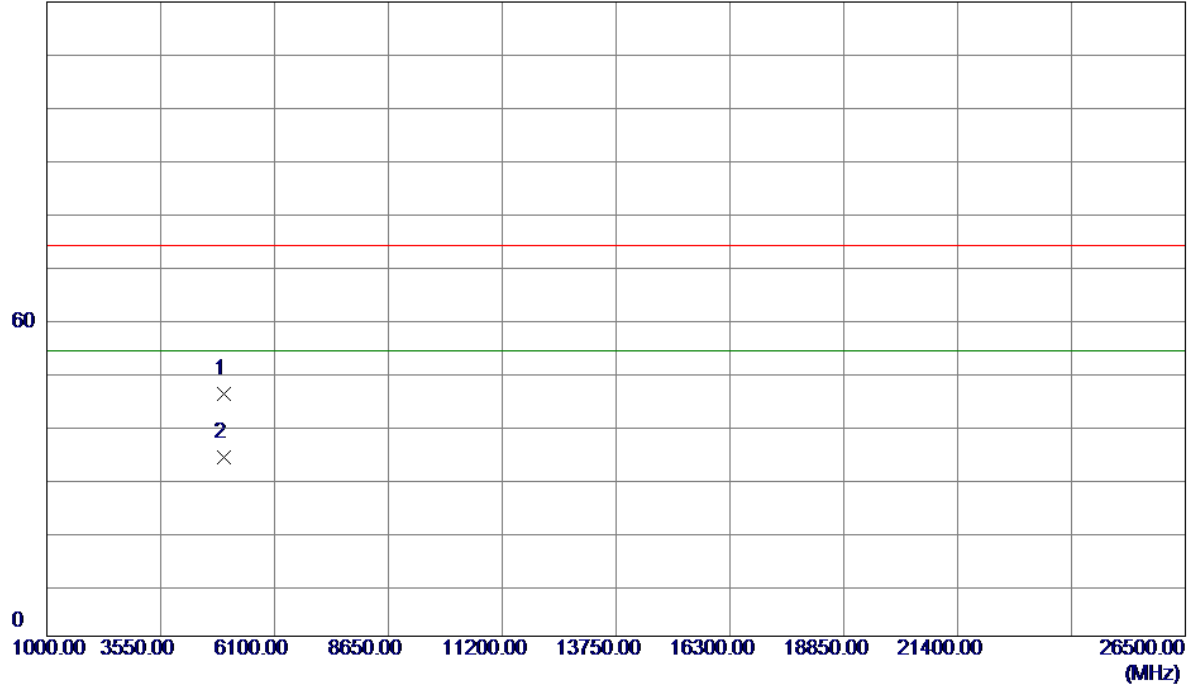


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	2480.0000	62.61	31.40	94.01	74.00	20.01	Peak	No Limit
2 *	2480.0000	59.96	31.40	91.36	54.00	37.36	AVG	No Limit
3	2485.9750	27.84	31.42	59.26	74.00	-14.74	Peak	
4	2485.9750	15.96	31.42	47.38	54.00	-6.62	AVG	

Test Mode : TX 2480MHz \_CH78\_3Mbps

**Vertical**

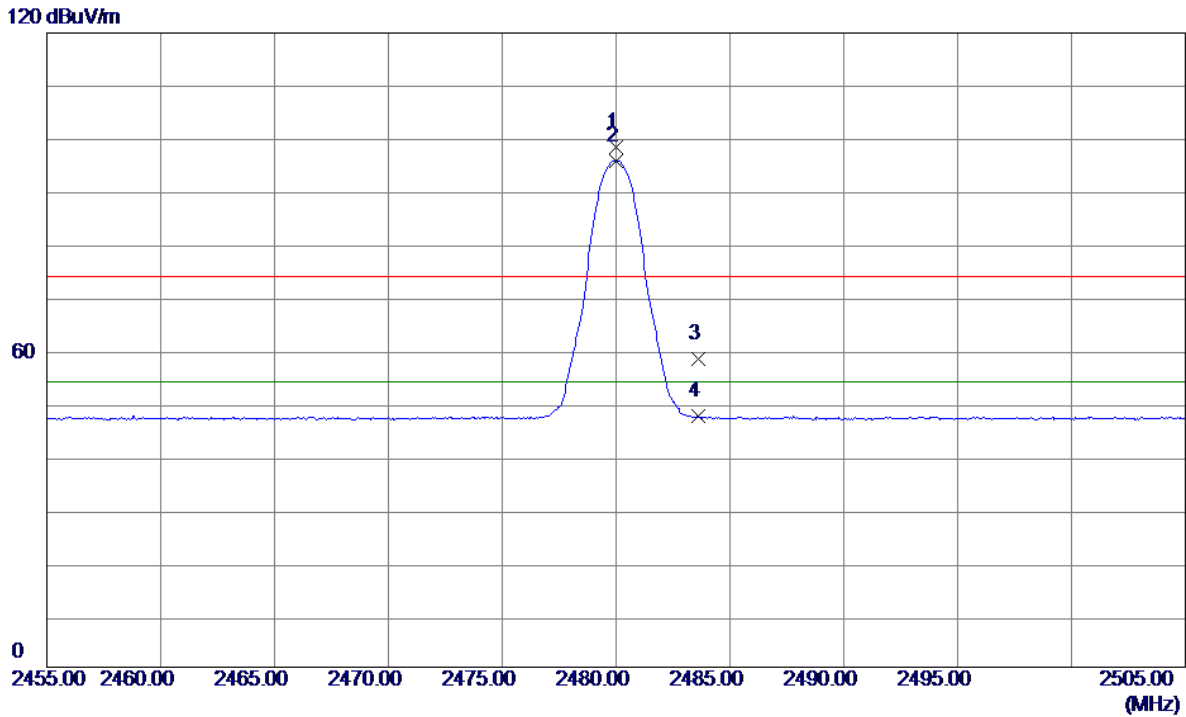
120 dBuV/m



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	4960.0000	57.02	-11.16	45.86	74.00	-28.14	Peak	
2 *	4960.0000	44.89	-11.16	33.73	54.00	-20.27	AVG	

Test Mode : TX 2480MHz \_CH78\_3Mbps

**Horizontal**



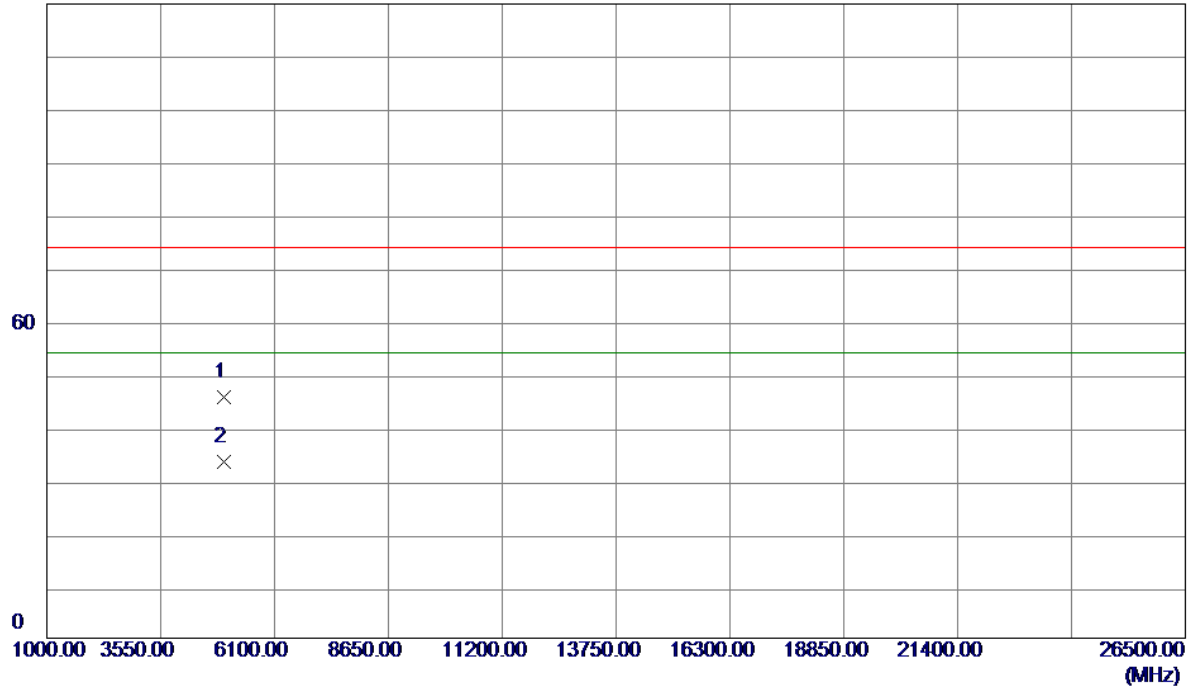
No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	2480.0000	67.07	31.40	98.47	74.00	24.47	Peak	No Limit
2 *	2480.0000	64.45	31.40	95.85	54.00	41.85	AVG	No Limit
3	2483.6319	26.94	31.41	58.35	74.00	-15.65	Peak	
4	2483.6319	16.07	31.41	47.48	54.00	-6.52	AVG	



Test Mode : TX 2480MHz \_CH78\_3Mbps

**Horizontal**

120 dBuV/m

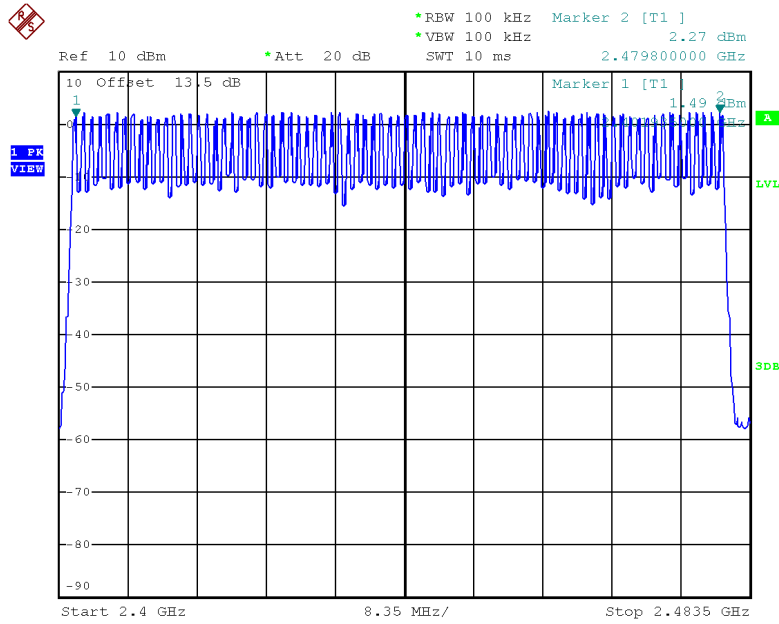


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	4960.0000	56.86	-11.16	45.70	74.00	-28.30	Peak	
2 *	4960.0000	44.54	-11.16	33.38	54.00	-20.62	AVG	

## APPENDIX E - NUMBER OF HOPPING CHANNEL

### Test Mode Hopping Mode\_1Mbps

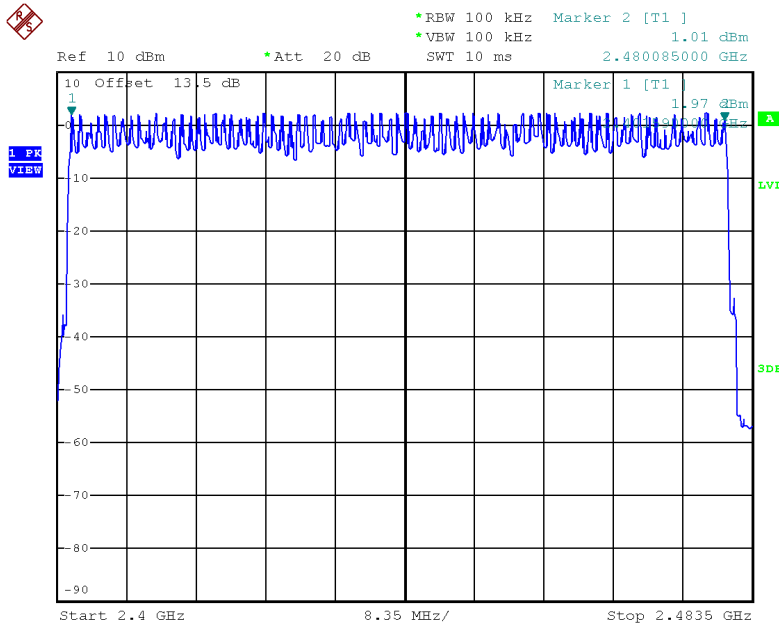
Number of Hopping Channel 79



Date: 22.AUG.2017 15:49:04

### Test Mode Hopping Mode\_3Mbps

Number of Hopping Channel 79



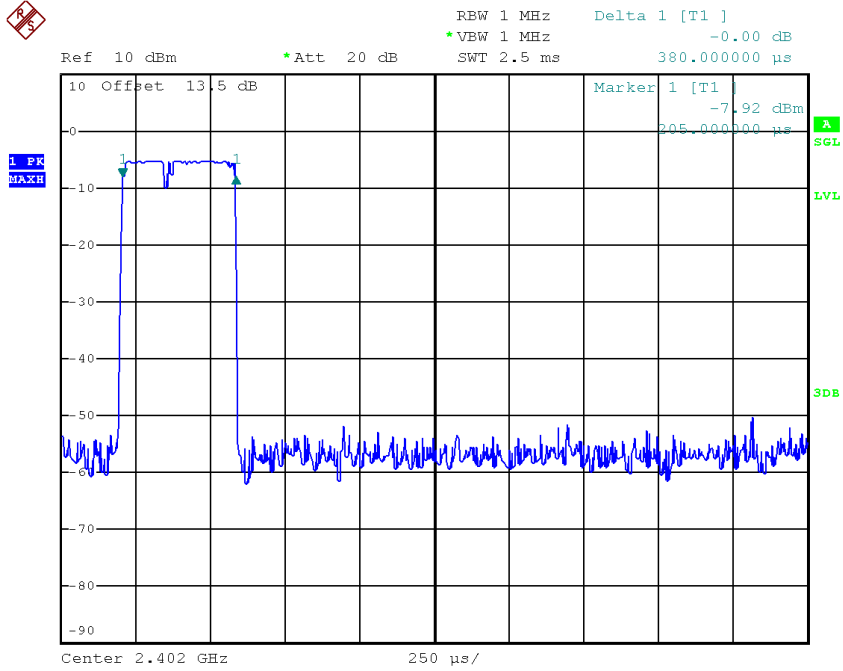
Date: 22.AUG.2017 16:08:57

## APPENDIX F - AVERAGE TIME OF OCCUPANCY

Test Mode :	TX Mode_1Mbps
-------------	---------------

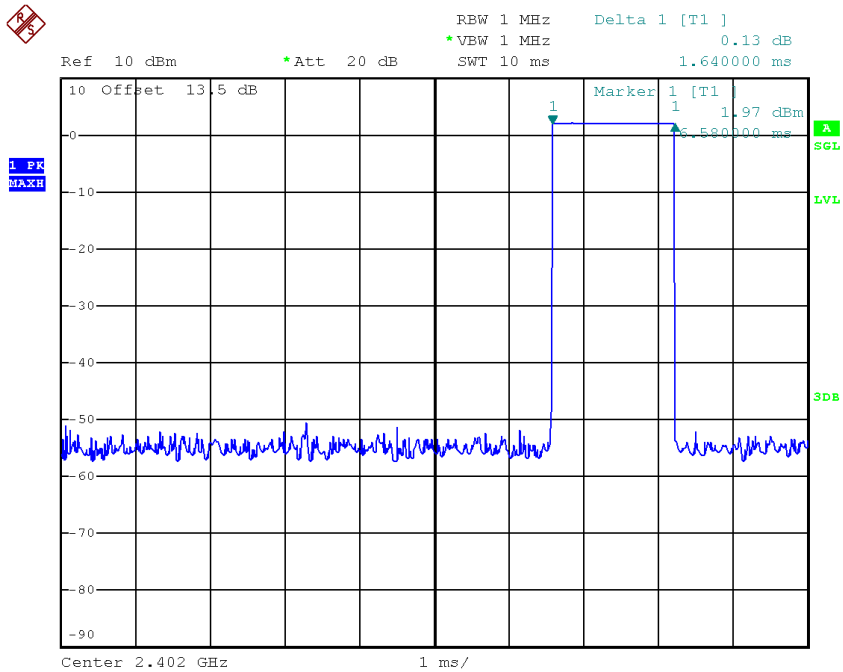
Data Packet	Frequency (MHz)	Pulse Duration (ms)	Dwell Time (s)	Limits (s)	Test Result
DH5	2402	2.8800	0.3072	0.4000	Pass
DH3	2402	1.6400	0.2624	0.4000	Pass
DH1	2402	0.3800	0.1216	0.4000	Pass
DH5	2441	2.8800	0.3072	0.4000	Pass
DH3	2441	1.6400	0.2624	0.4000	Pass
DH1	2441	0.3850	0.1232	0.4000	Pass
DH5	2480	2.8800	0.3072	0.4000	Pass
DH3	2480	1.6400	0.2624	0.4000	Pass
DH1	2480	0.3800	0.1216	0.4000	Pass

### CH00-DH1



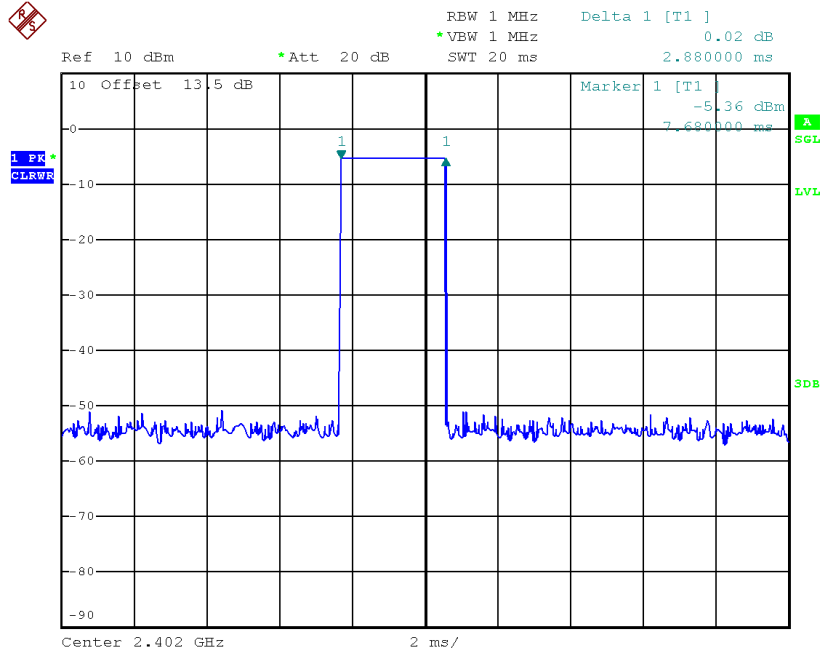
Date: 22.AUG.2017 15:43:33

### CH00-DH3



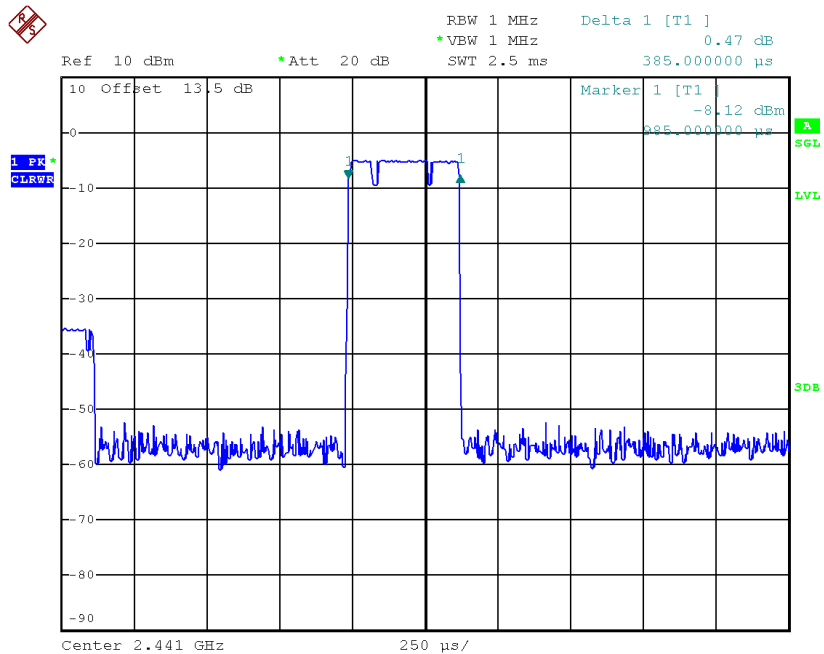
Date: 22.AUG.2017 15:50:52

### CH00-DH5



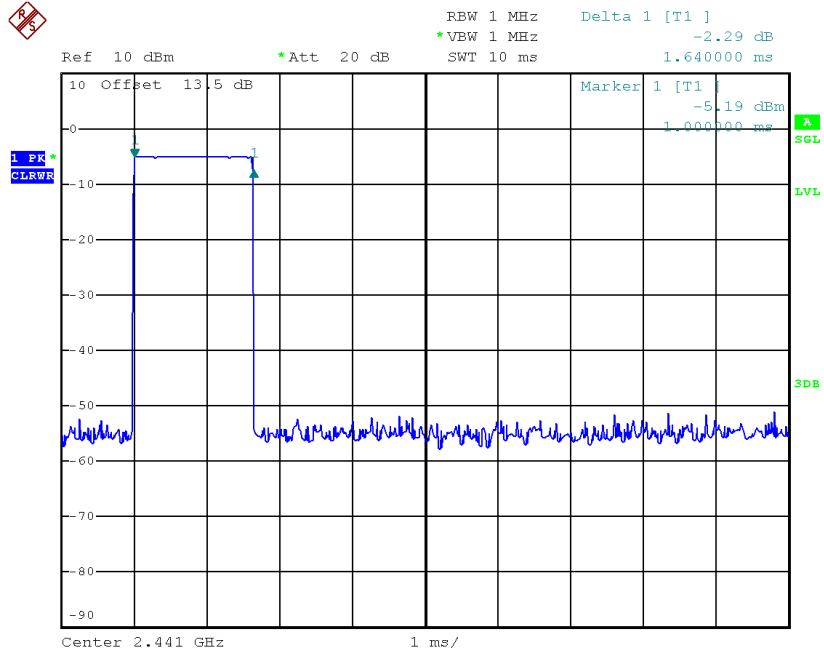
Date: 22.AUG.2017 15:52:09

### CH39-DH1



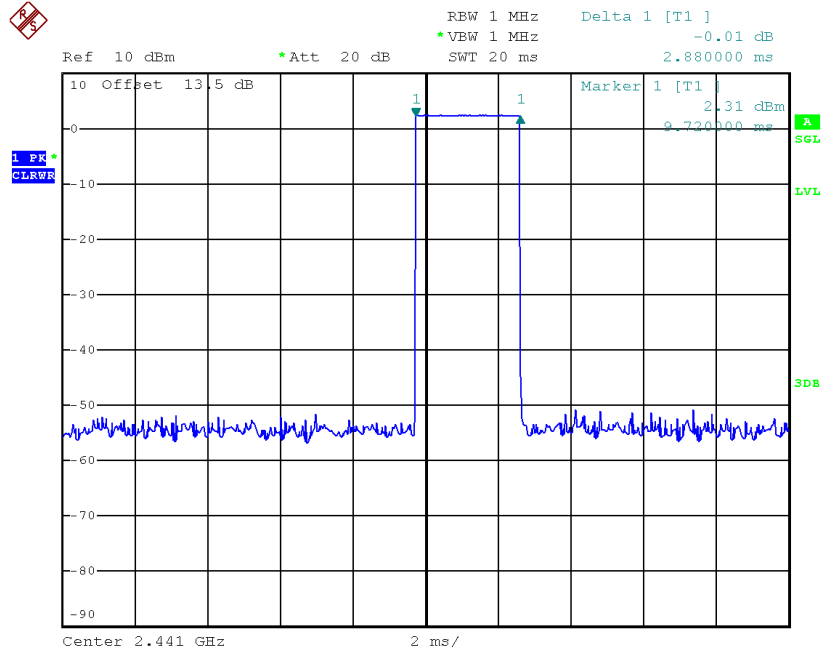
Date: 22.AUG.2017 15:43:53

### CH39-DH3



Date: 22.AUG.2017 15:51:12

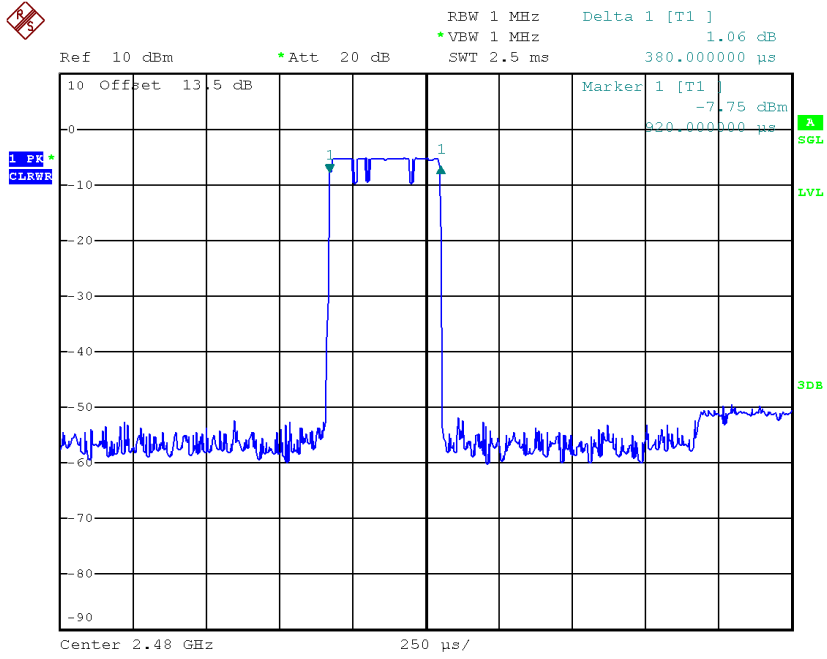
### CH39-DH5



Date: 22.AUG.2017 15:52:12

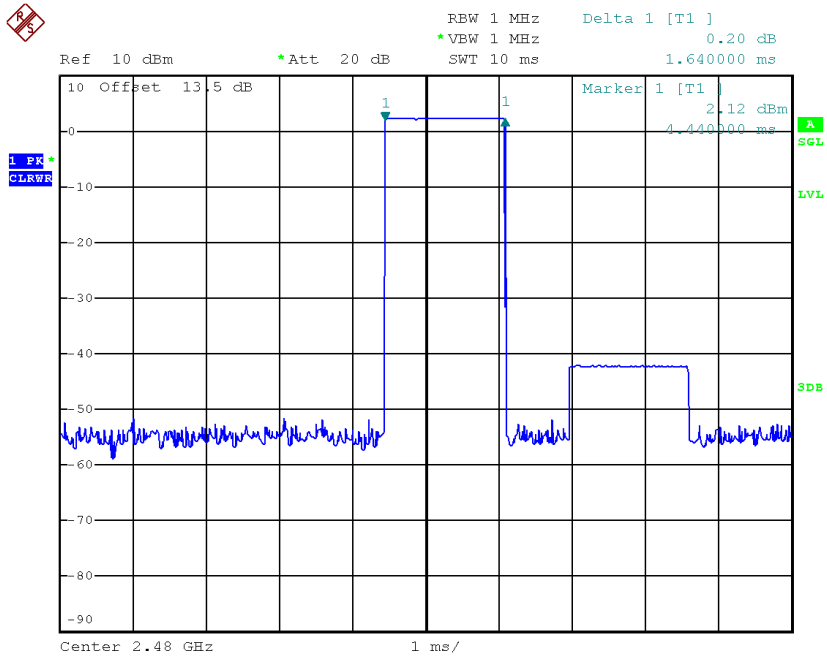


### CH78-DH1



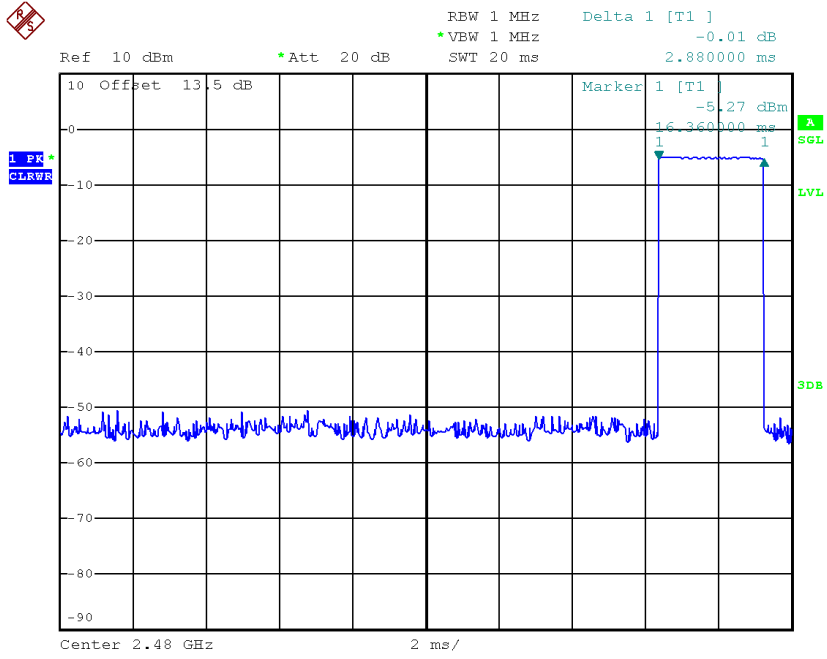
Date: 22.AUG.2017 15:43:57

### CH78-DH3



Date: 22.AUG.2017 15:51:17

### CH78-DH5

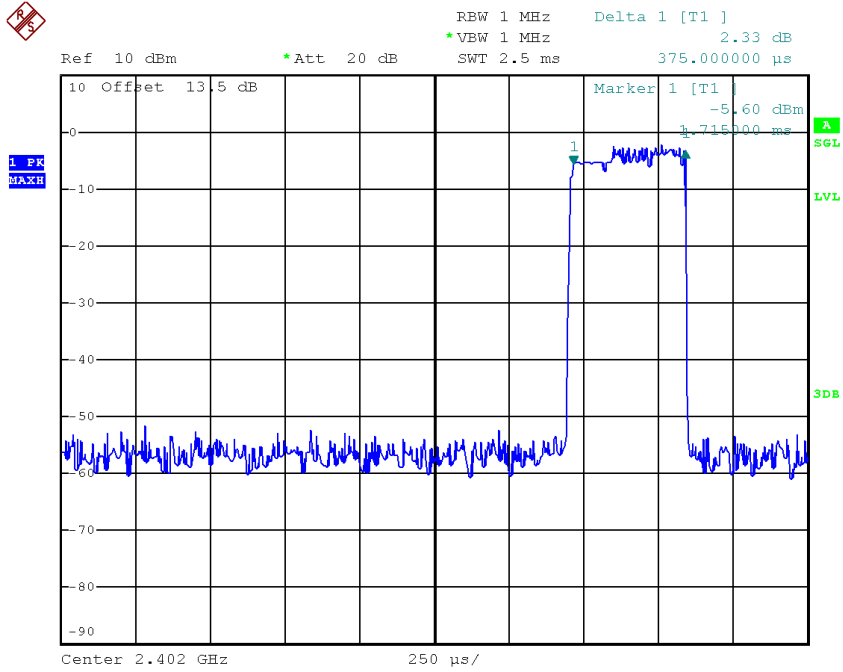


Date: 22.AUG.2017 15:52:15

Test Mode :	TX Mode_3Mbps
-------------	---------------

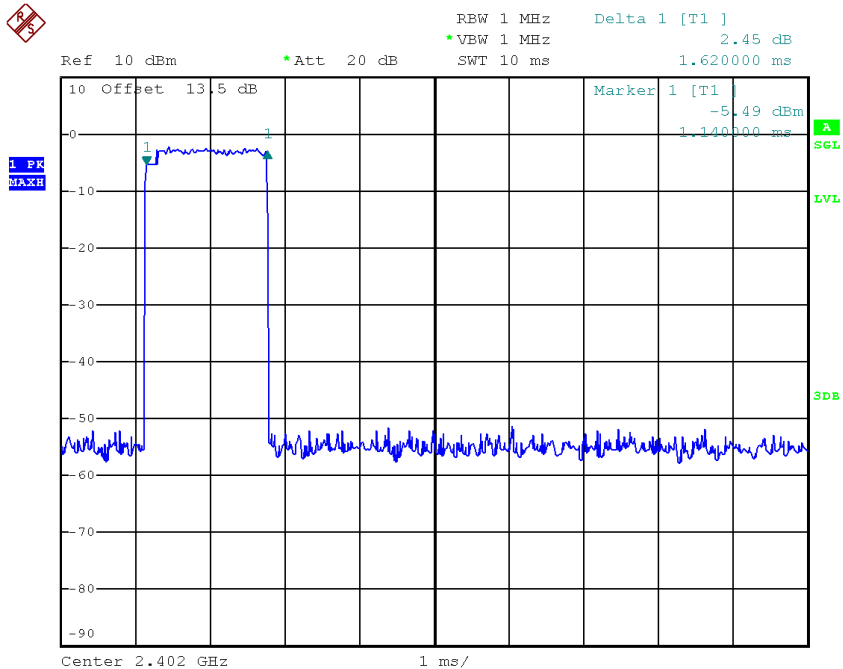
Data Packet	Frequency	Pulse Duration(ms)	Dwell Time(s)	Limits(s)	Test Result
DH5	2402	2.8800	0.3072	0.4000	Pass
DH3	2402	1.6200	0.2592	0.4000	Pass
DH1	2402	0.3750	0.1200	0.4000	Pass
DH5	2441	2.9200	0.3115	0.4000	Pass
DH3	2441	1.6400	0.2624	0.4000	Pass
DH1	2441	0.3800	0.1216	0.4000	Pass
DH5	2480	2.9200	0.3115	0.4000	Pass
DH3	2480	1.6400	0.2624	0.4000	Pass
DH1	2480	0.3850	0.1232	0.4000	Pass

### CH00-DH1



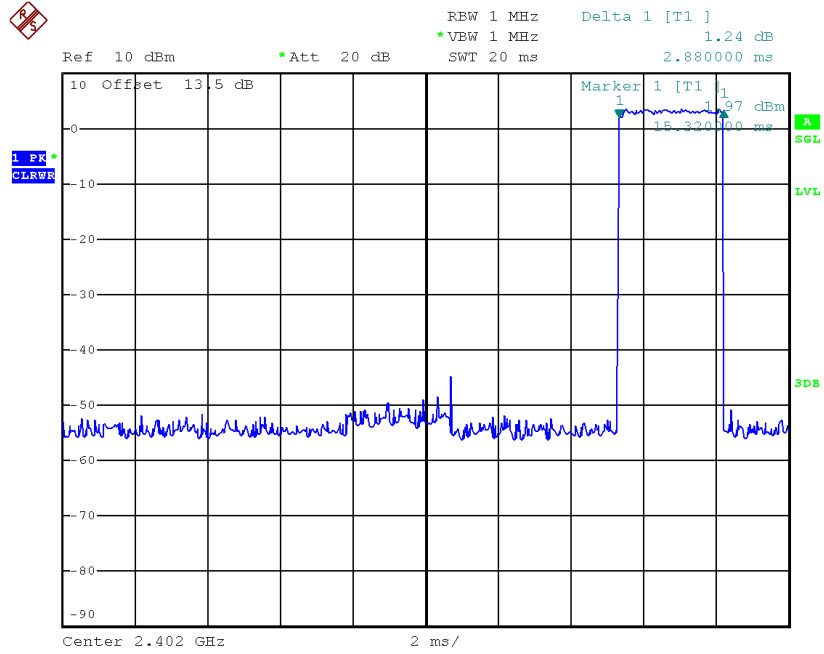
Date: 22.AUG.2017 16:00:24

### CH00-DH3



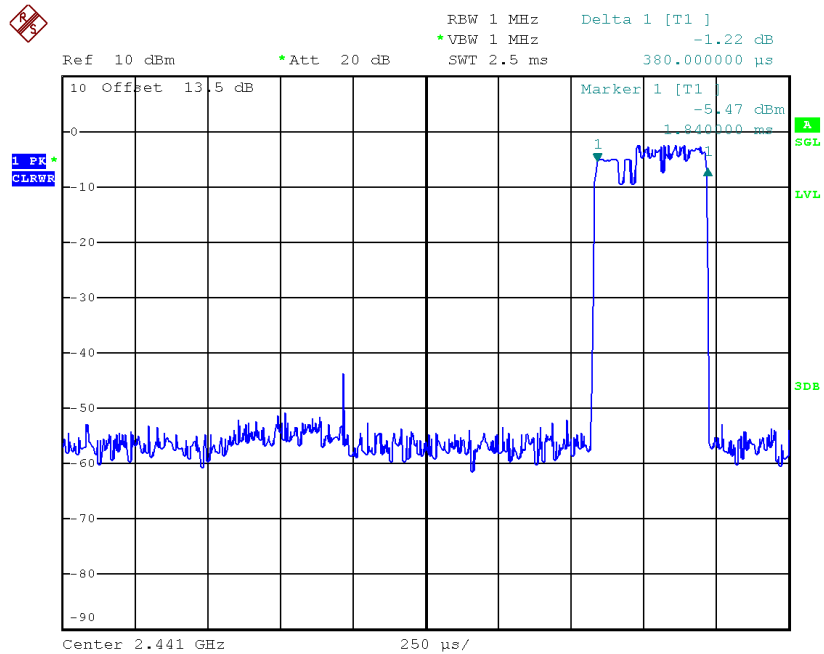
Date: 22.AUG.2017 16:10:27

### CH00-DH5



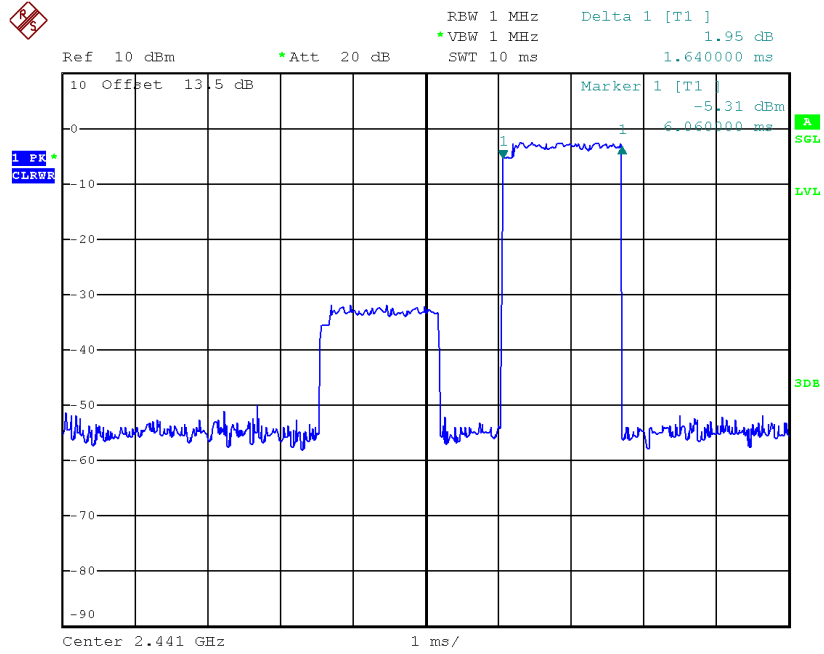
Date: 22.AUG.2017 16:11:05

### CH39-DH1



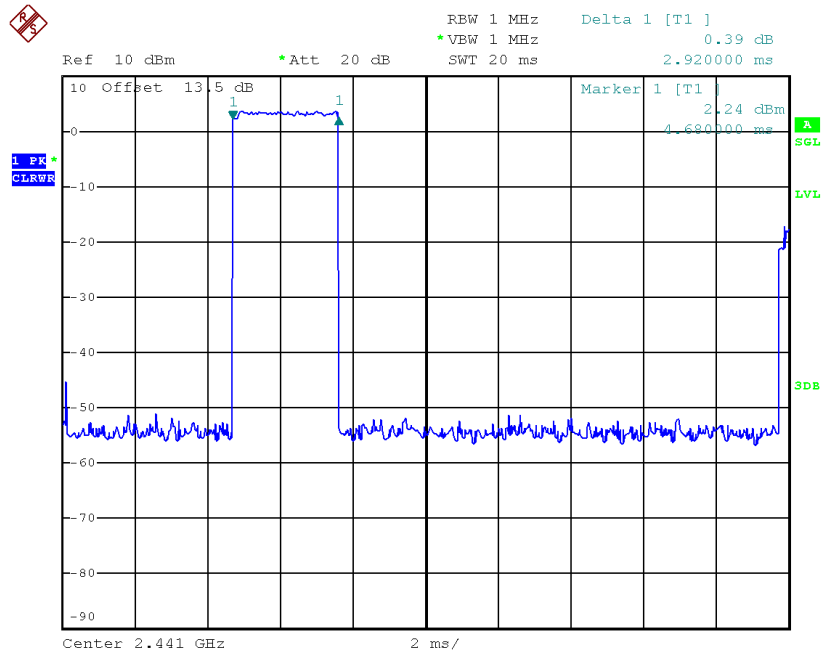
Date: 22.AUG.2017 16:00:44

### CH39-DH3



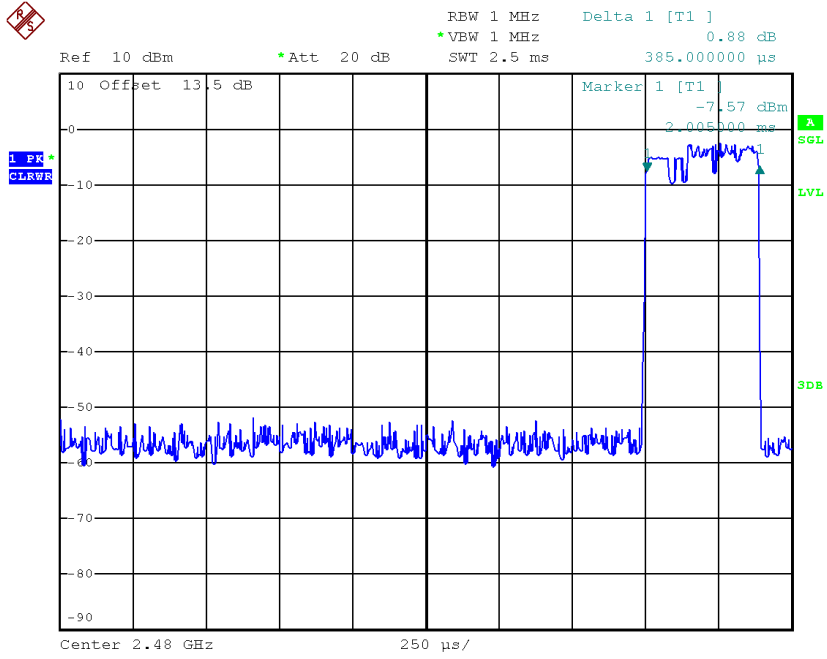
Date: 22.AUG.2017 16:10:47

### CH39-DH5



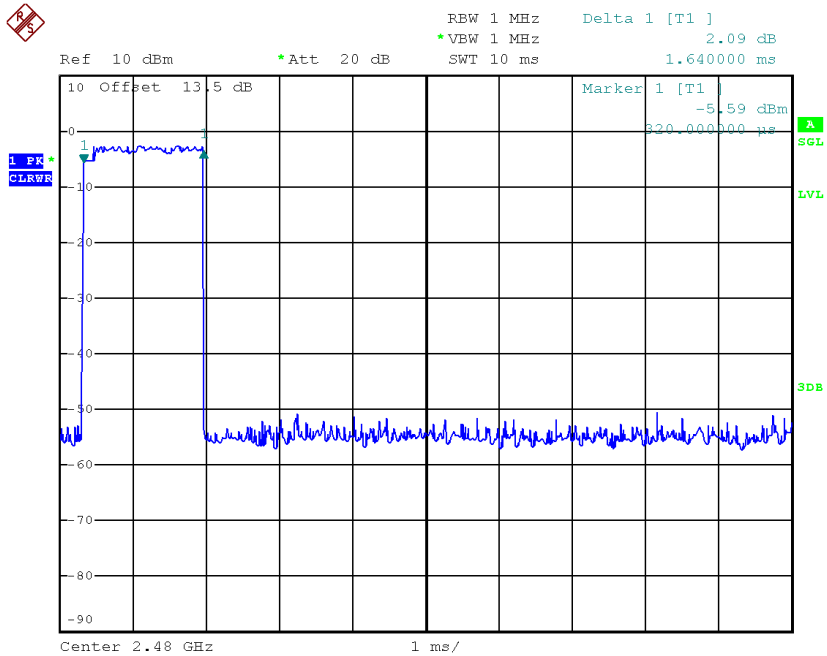
Date: 22.AUG.2017 16:11:09

### CH78-DH1



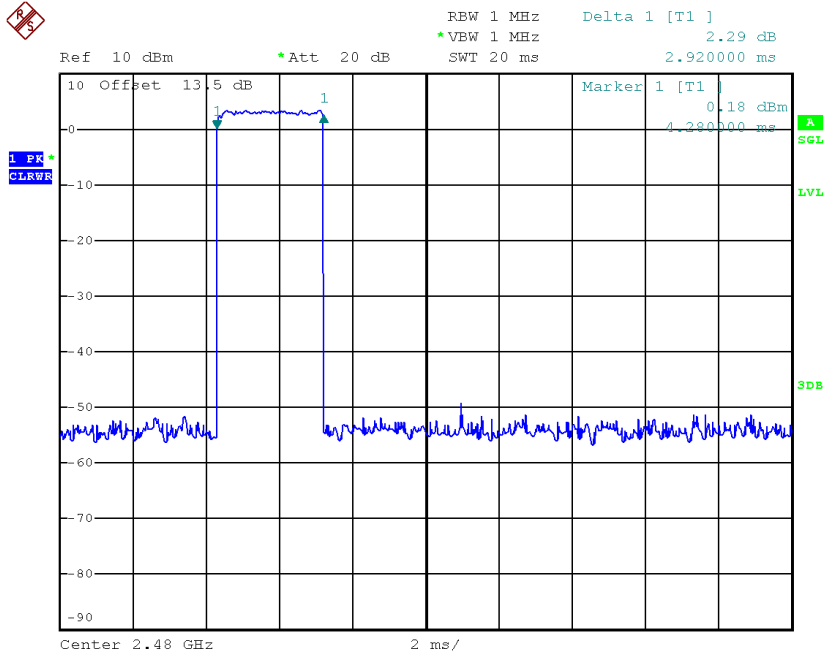
Date: 22.AUG.2017 16:00:48

### CH78-DH3



Date: 22.AUG.2017 16:10:51

### CH78-DH5



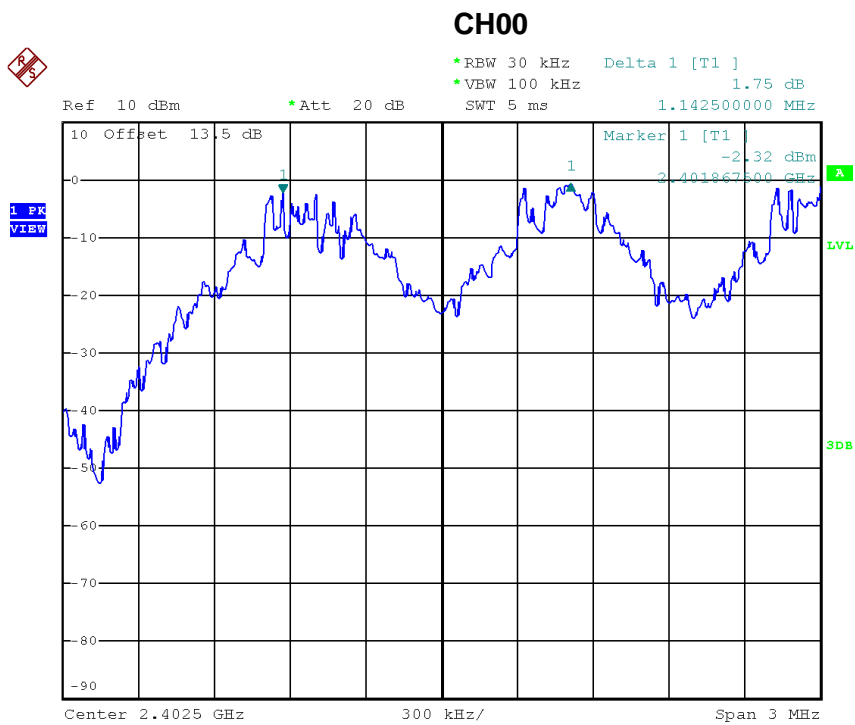
Date: 22.AUG.2017 16:11:13



## APPENDIX G - HOPPING CHANNEL SEPARATION MEASUREMENT

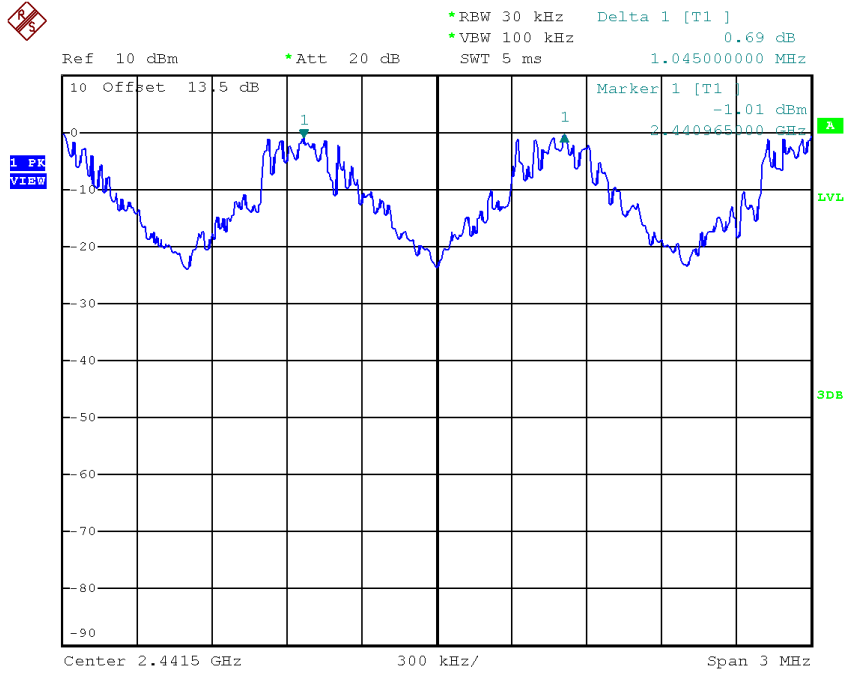
Test Mode : Hopping on \_1Mbps

Frequency (MHz)	Channel Separation (MHz)	2/3 of 20dB Bandwidth (MHz)	Test Result
2402	1.143	0.633	Pass
2441	1.045	0.629	Pass
2480	1.008	0.688	Pass



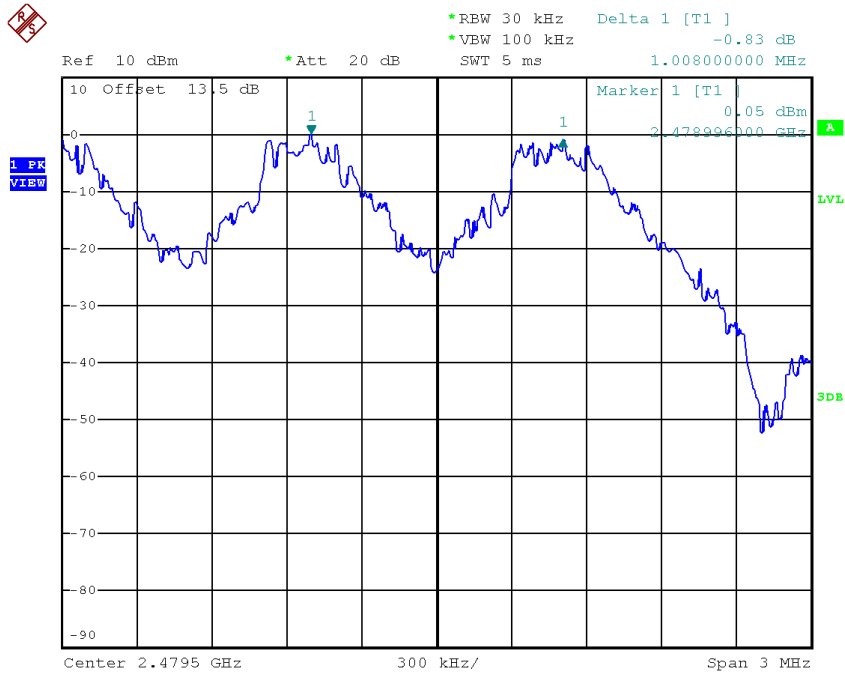
Date: 22.AUG.2017 15:45:05

### CH39



Date: 22.AUG.2017 15:46:12

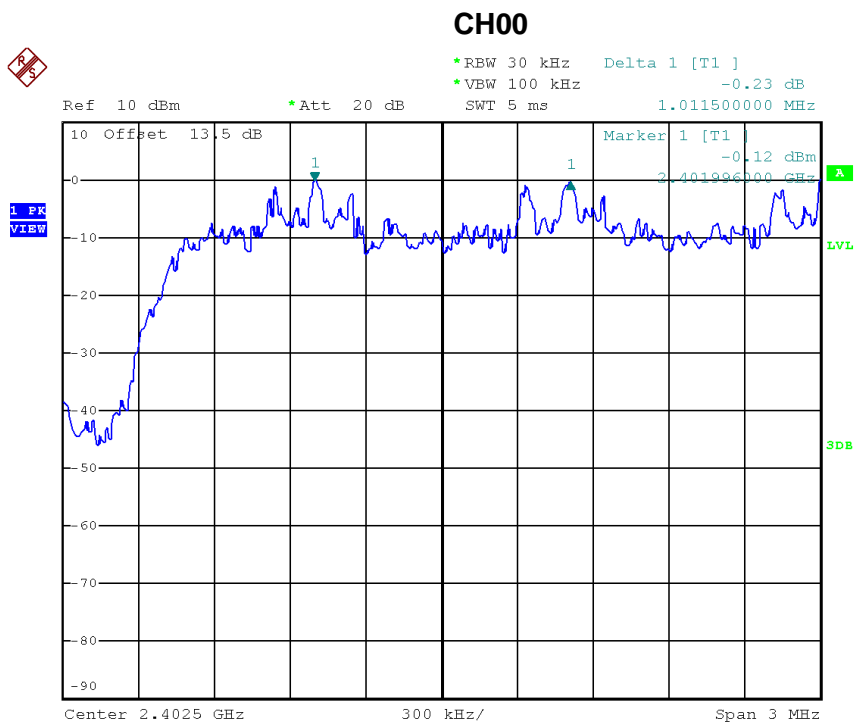
### CH78



Date: 22.AUG.2017 15:47:16

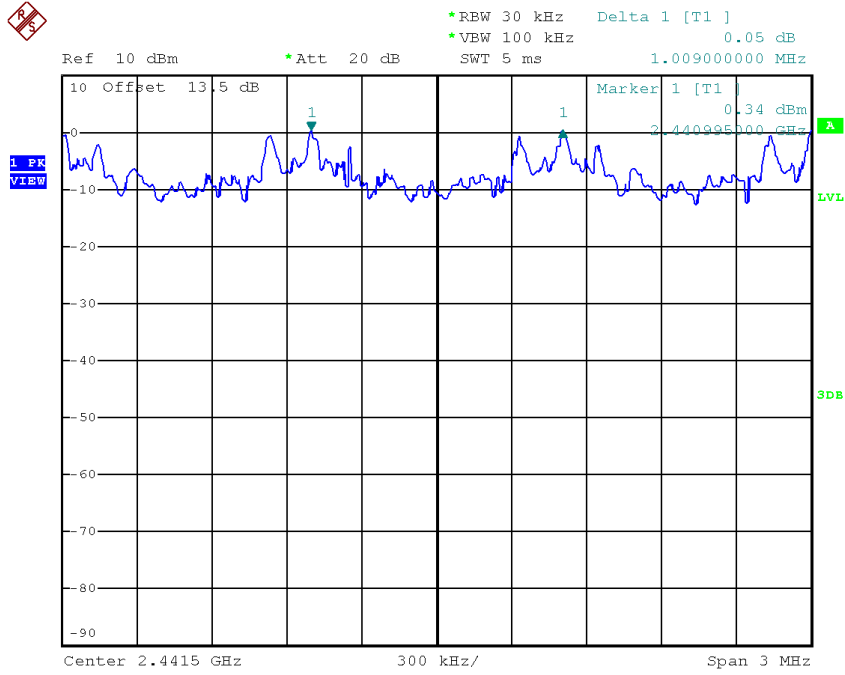
Test Mode : Hopping on \_3Mbps

Frequency (MHz)	Channel Separation (MHz)	2/3 of 20dB Bandwidth (MHz)	Test Result
2402	1.012	0.867	Pass
2441	1.009	0.865	Pass
2480	1.002	0.873	Pass



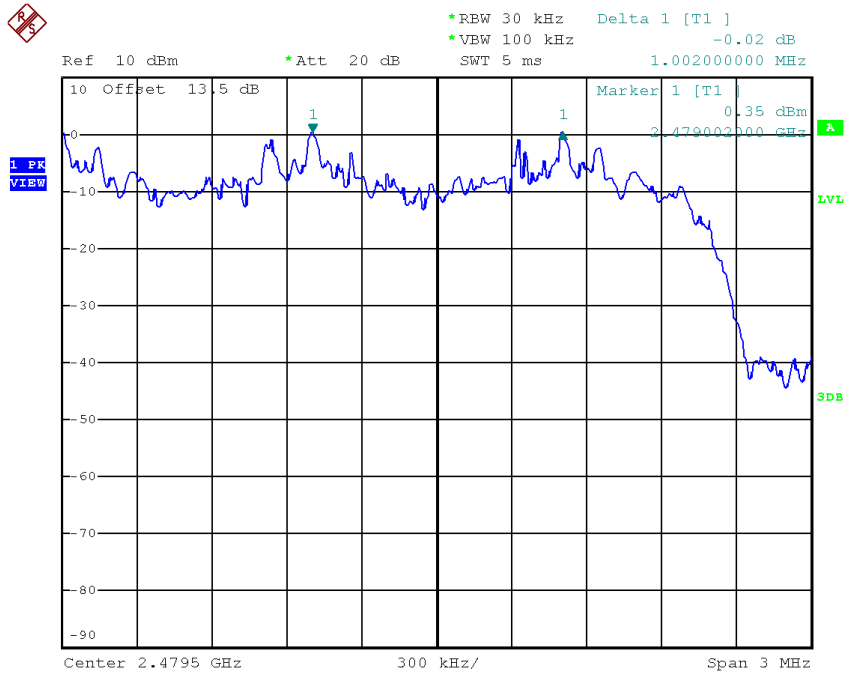
Date: 22.AUG.2017 16:02:57

### CH39



Date: 22.AUG.2017 16:05:05

### CH78

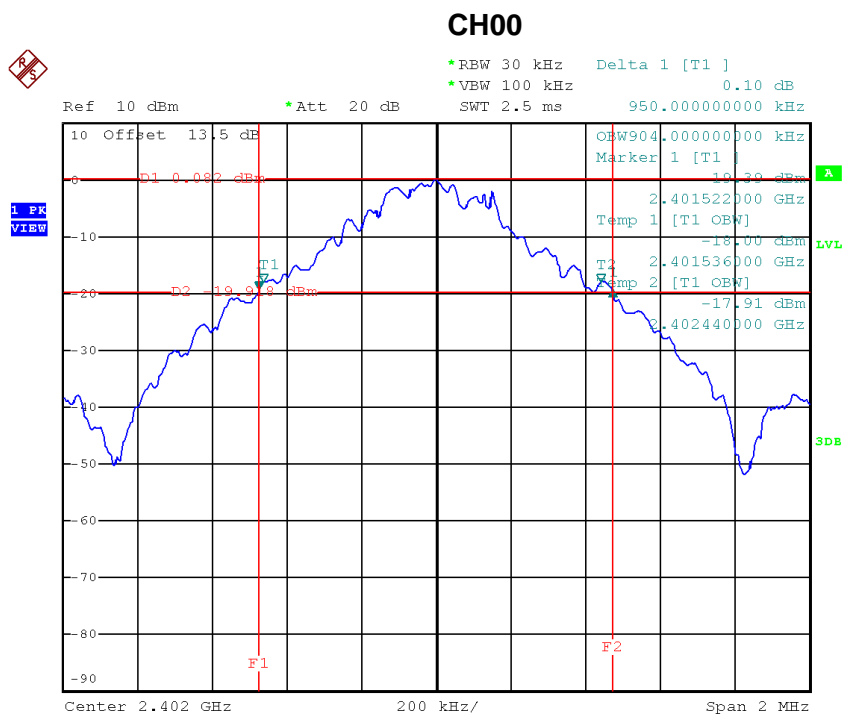


Date: 22.AUG.2017 16:07:09

## APPENDIX H - BANDWIDTH

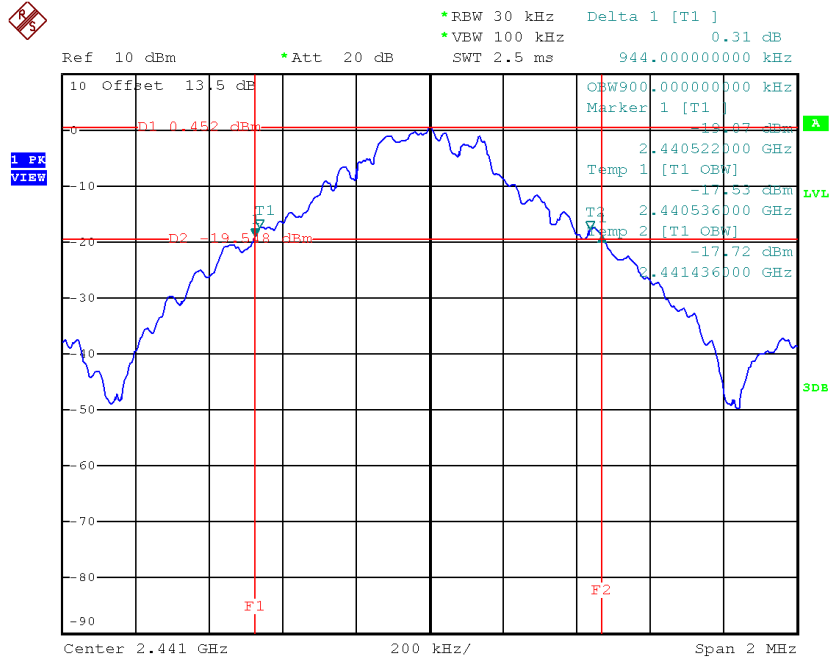
Test Mode : TX Mode \_1Mbps

Frequency (MHz)	20dB Bandwidth (MHz)	99% Occupied BW (MHz)	Test Result
2402	0.950	0.904	Pass
2441	0.944	0.900	Pass
2480	1.032	0.904	Pass



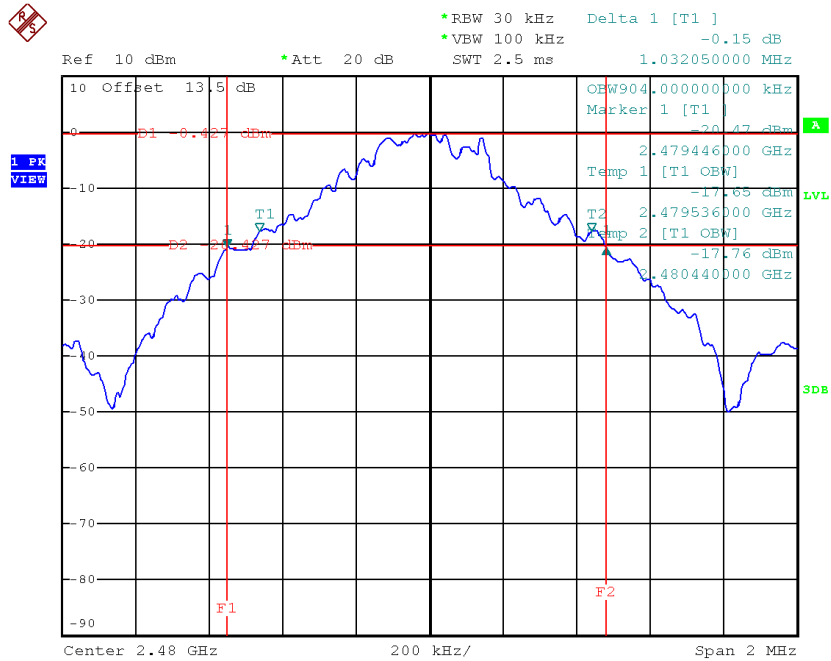
Date: 22.AUG.2017 15:39:43

**CH39**



Date: 22.AUG.2017 15:41:36

**CH78**

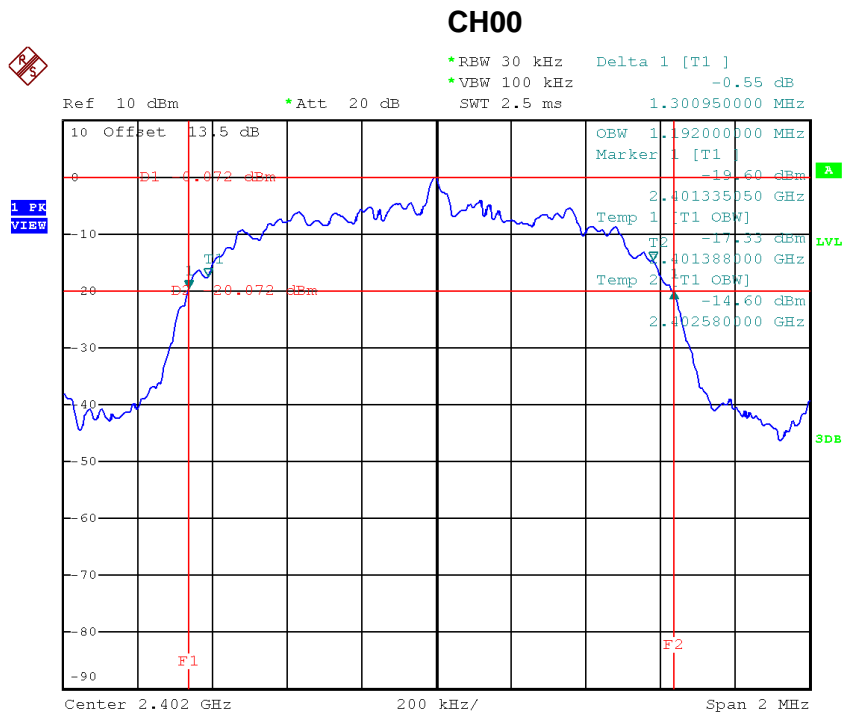


Date: 22.AUG.2017 15:42:40



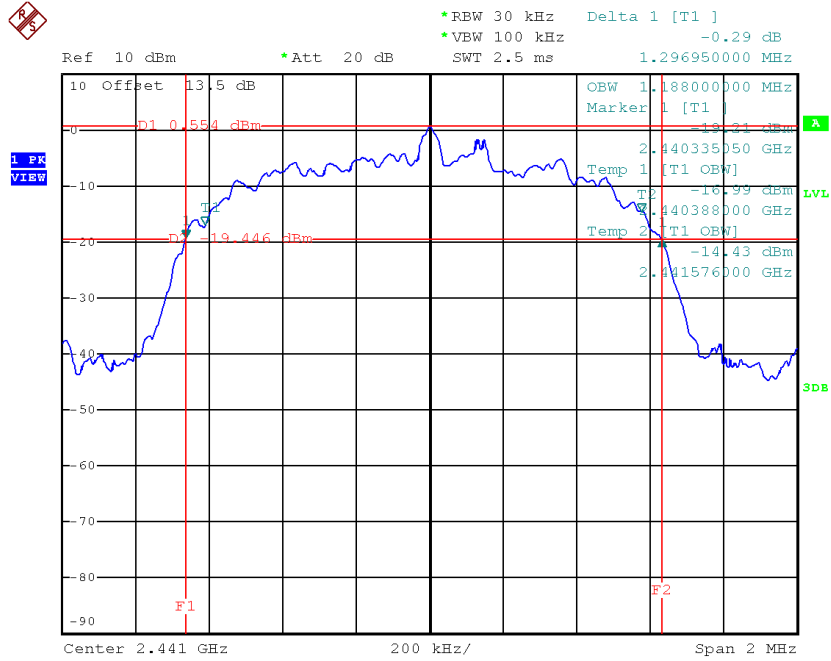
Test Mode : TX Mode \_3Mbps

Frequency (MHz)	20dB Bandwidth (MHz)	99% Occupied BW (MHz)	Test Result
2402	1.301	1.192	Pass
2441	1.297	1.188	Pass
2480	1.310	1.196	Pass



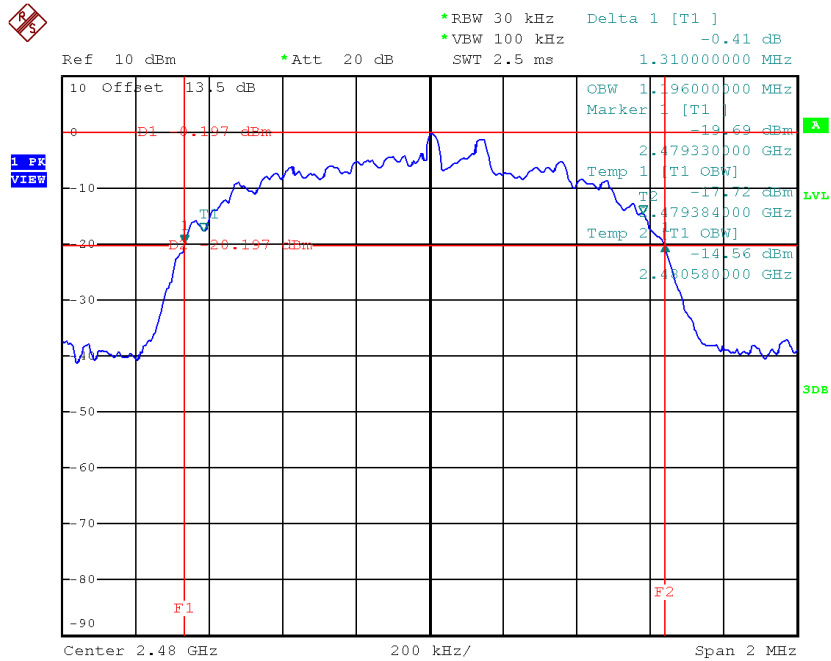
Date: 22.AUG.2017 15:56:17

### CH39



Date: 22.AUG.2017 15:58:27

### CH78

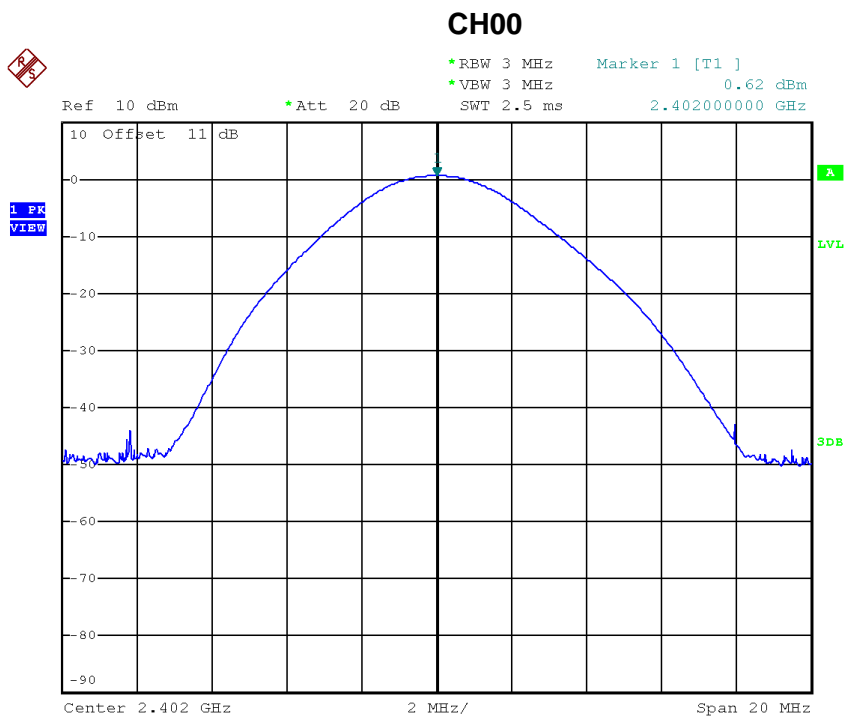


Date: 22.AUG.2017 15:59:34

## APPENDIX I - PEAK OUTPUT POWER

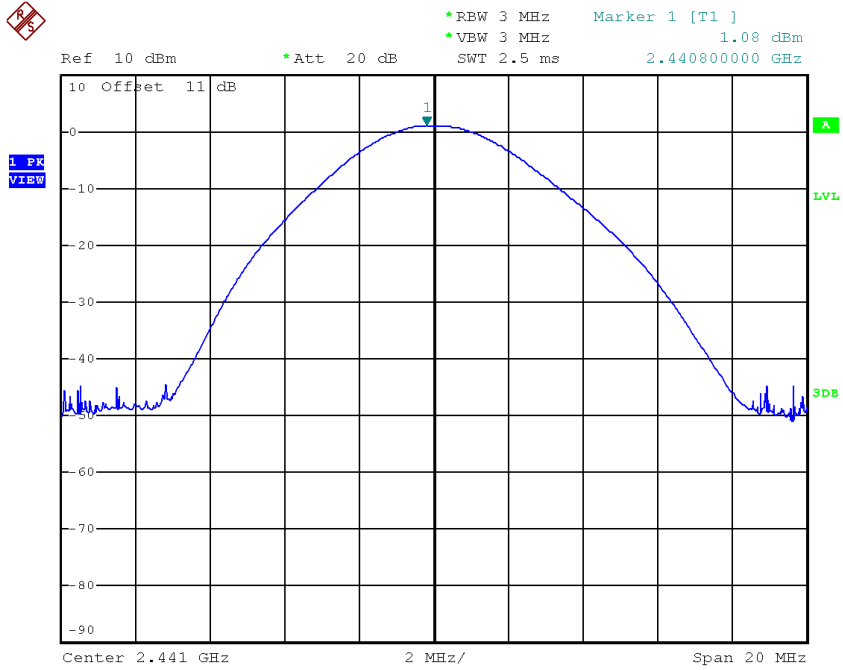
Test Mode : TX Mode \_1Mbps

Frequency (MHz)	Conducted Power (dBm)	Conducted Power (W)	Max. Limit (dBm)	Max. Limit (W)	Test Result
2402	0.62	0.0012	30.00	1.00	Pass
2441	1.08	0.0013	30.00	1.00	Pass
2480	0.96	0.0012	30.00	1.00	Pass



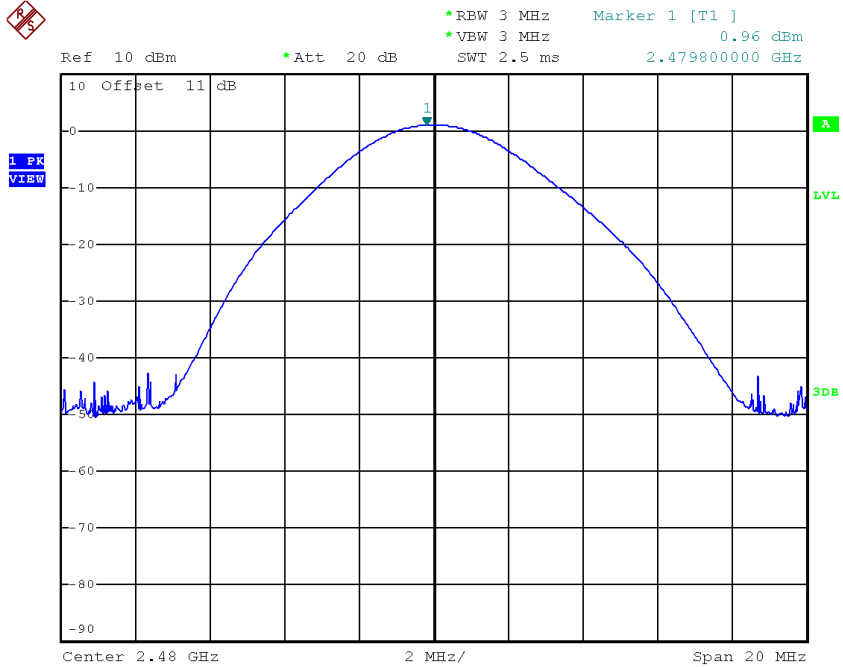
Date: 11.AUG.2017 19:05:15

### CH39



Date: 11.AUG.2017 19:05:36

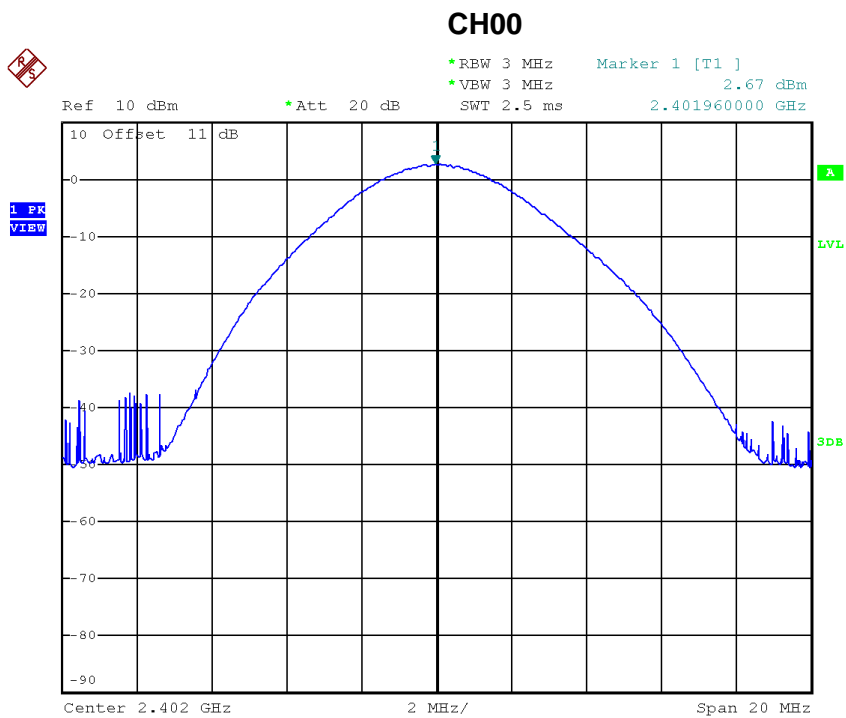
### CH78



Date: 11.AUG.2017 19:05:58

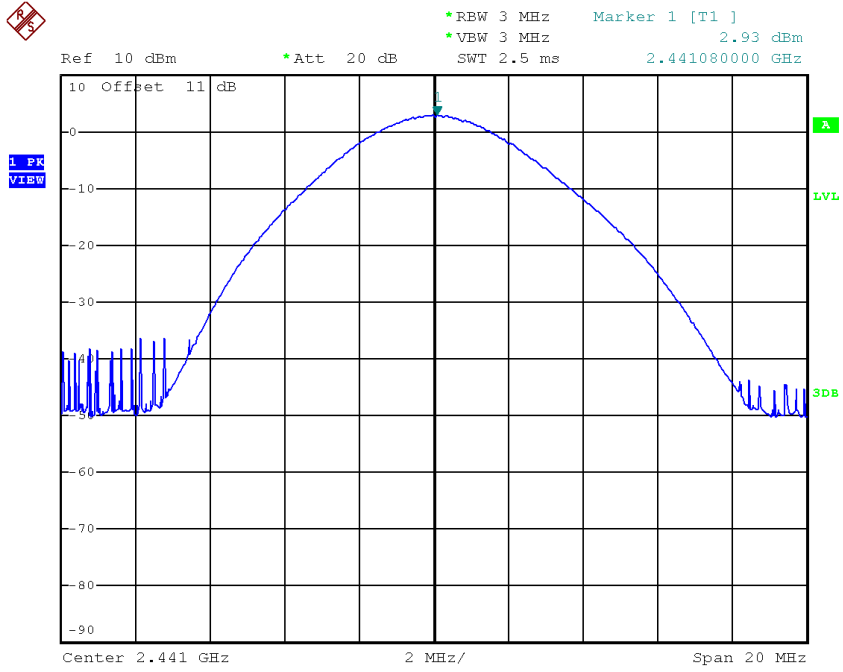
Test Mode : TX Mode \_3Mbps

Frequency (MHz)	Conducted Power (dBm)	Conducted Power (W)	Max. Limit (dBm)	Max. Limit (W)	Test Result
2402	2.67	0.0018	30.00	1.00	Pass
2441	2.93	0.0020	30.00	1.00	Pass
2480	2.62	0.0018	30.00	1.00	Pass



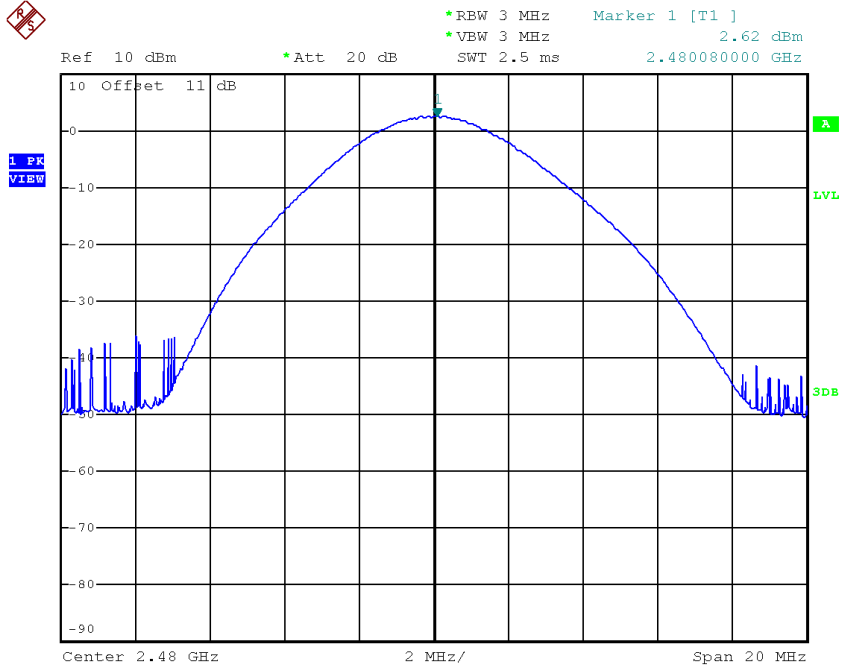
Date: 11.AUG.2017 19:06:49

### CH39



Date: 11.AUG.2017 19:07:11

### CH78

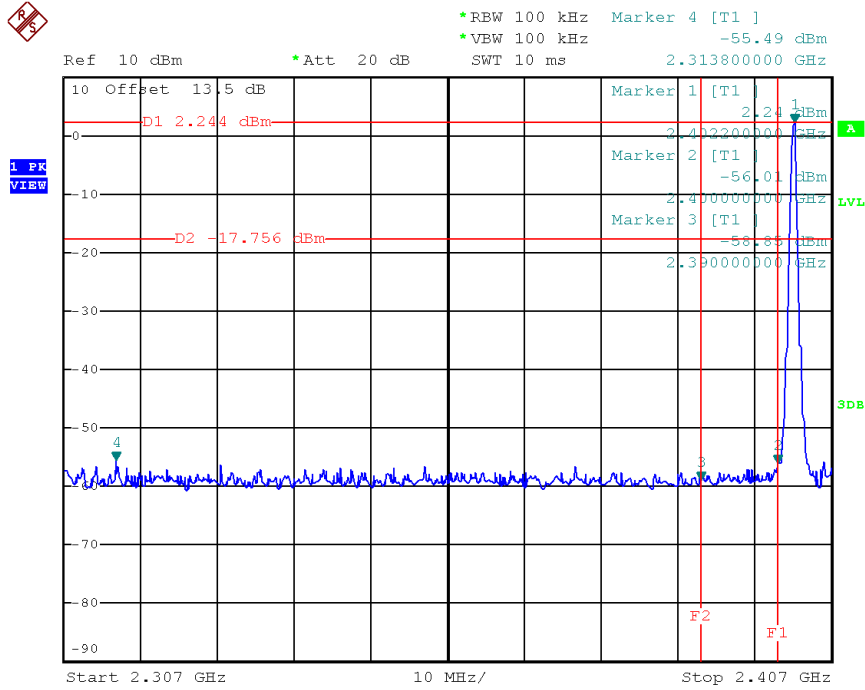


Date: 11.AUG.2017 19:07:32

## APPENDIX J - ANTENNA CONDUCTED SPURIOUS EMISSION

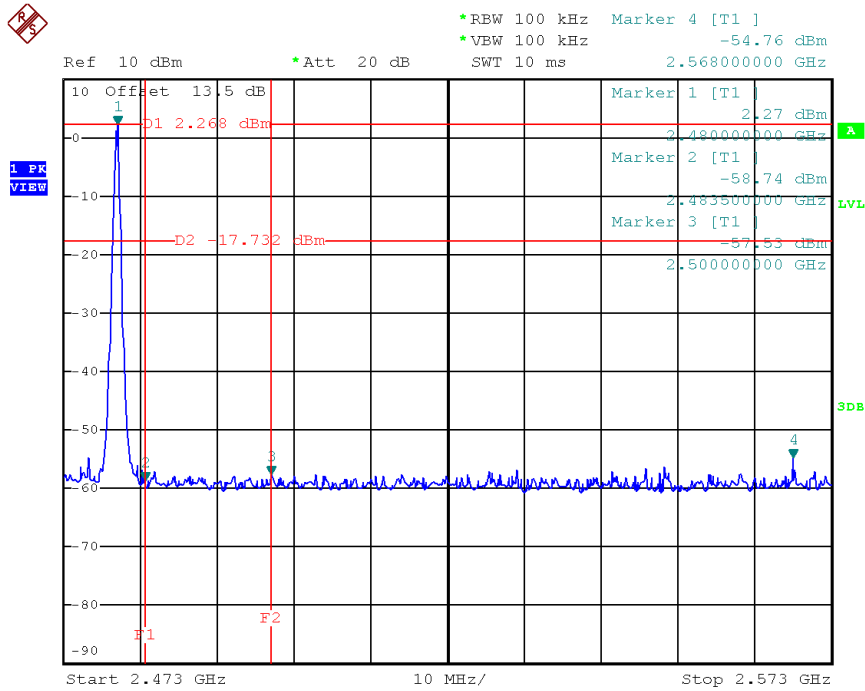


### CH00 (Lower)\_1Mbps



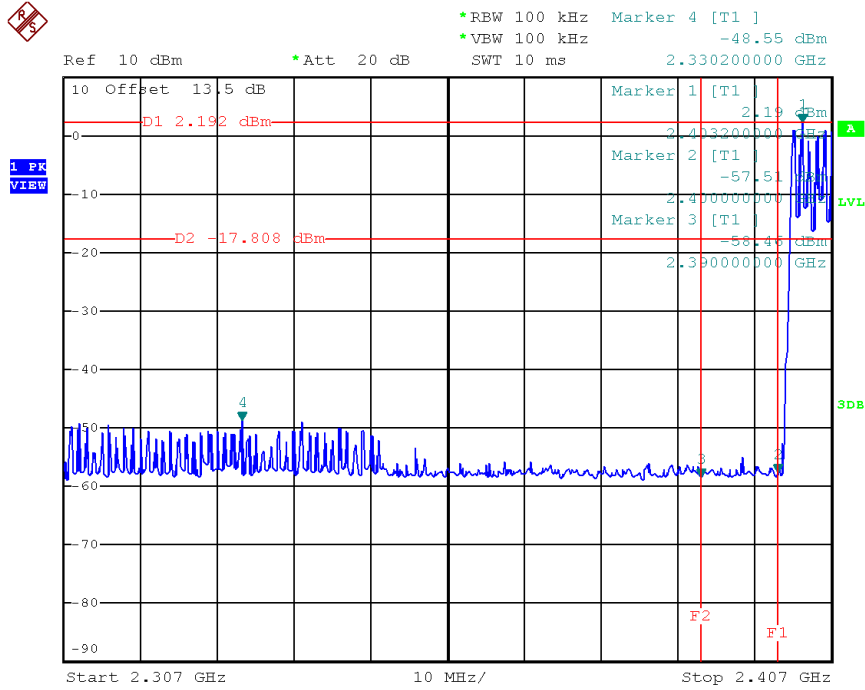
Date: 22.AUG.2017 15:39:06

### CH78 (Upper)\_1Mbps



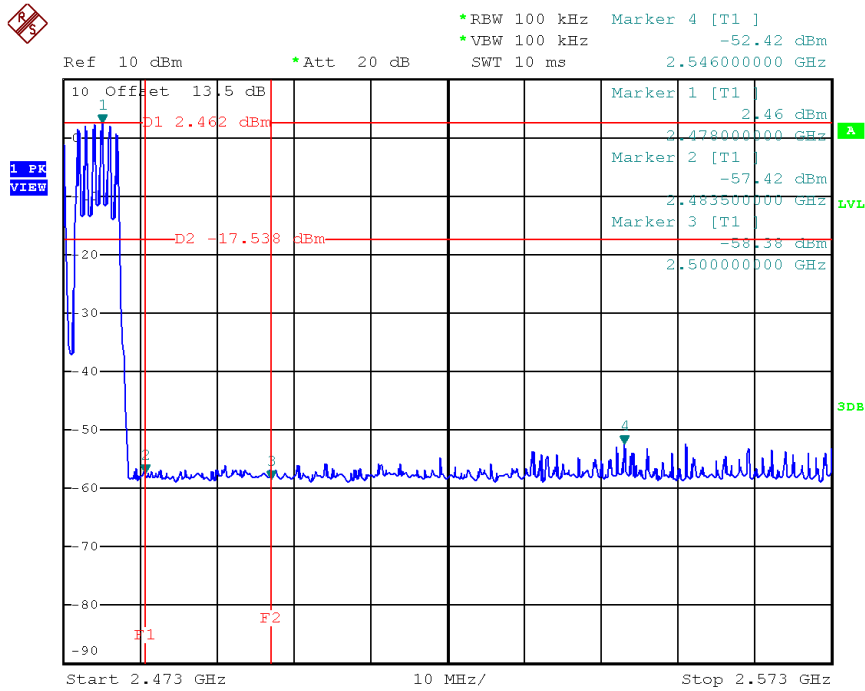
Date: 22.AUG.2017 15:42:05

### CH00 Hopping on mode (Lower)\_1Mbps



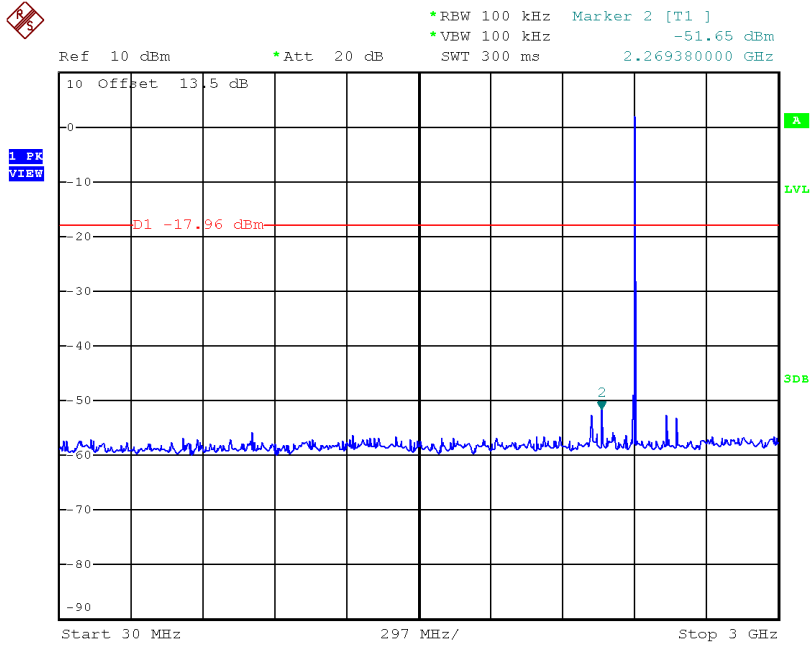
Date: 22.AUG.2017 15:49:39

### CH78 Hopping on mode (Upper)\_1Mbps

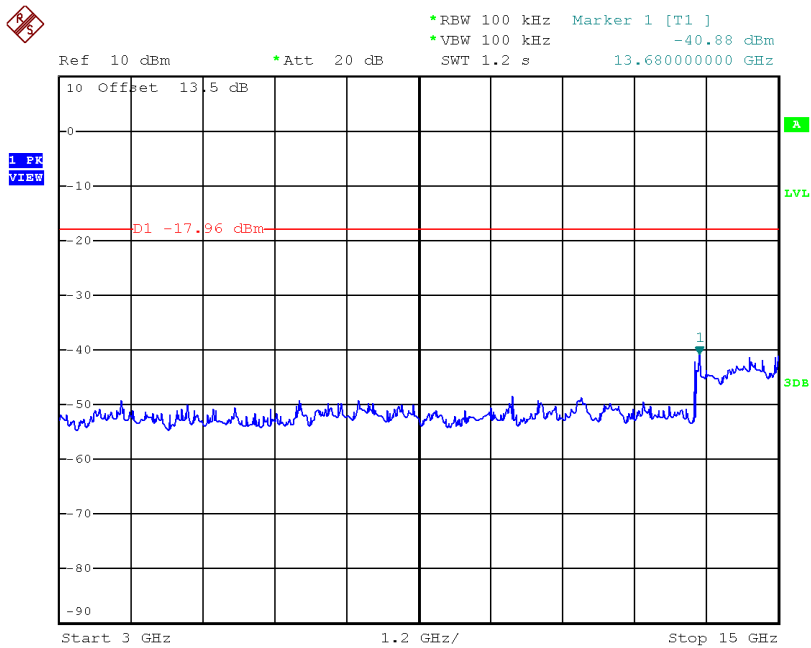


Date: 22.AUG.2017 15:50:31

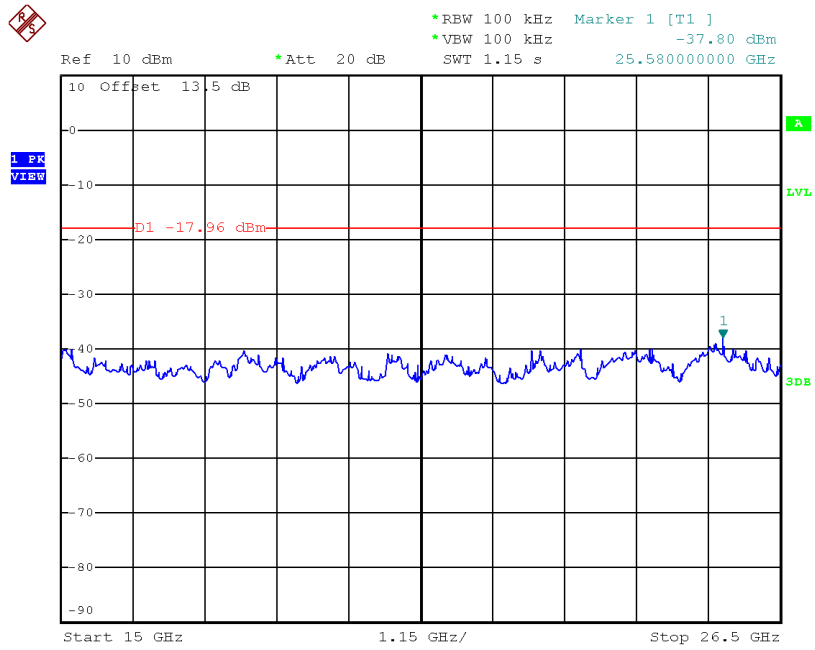
CH00 (10 Harmonic of the frequency) \_1Mbps



Date: 22.AUG.2017 15:39:55

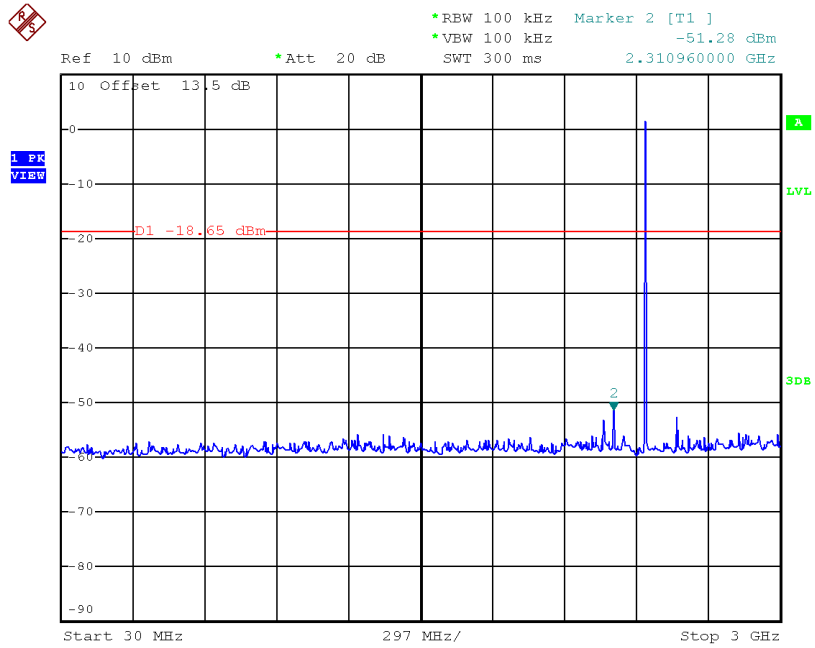


Date: 22.AUG.2017 15:40:02

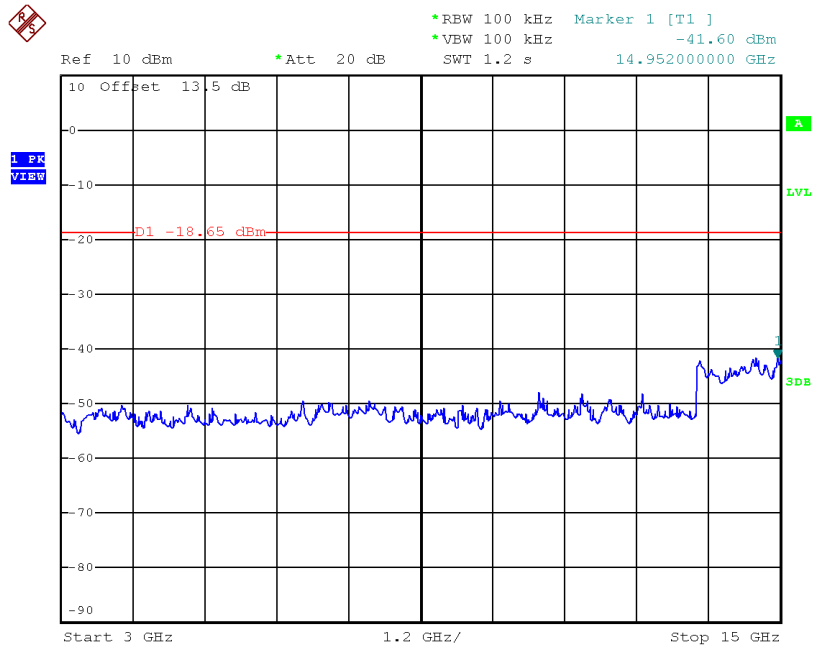


Date: 22.AUG.2017 15:40:09

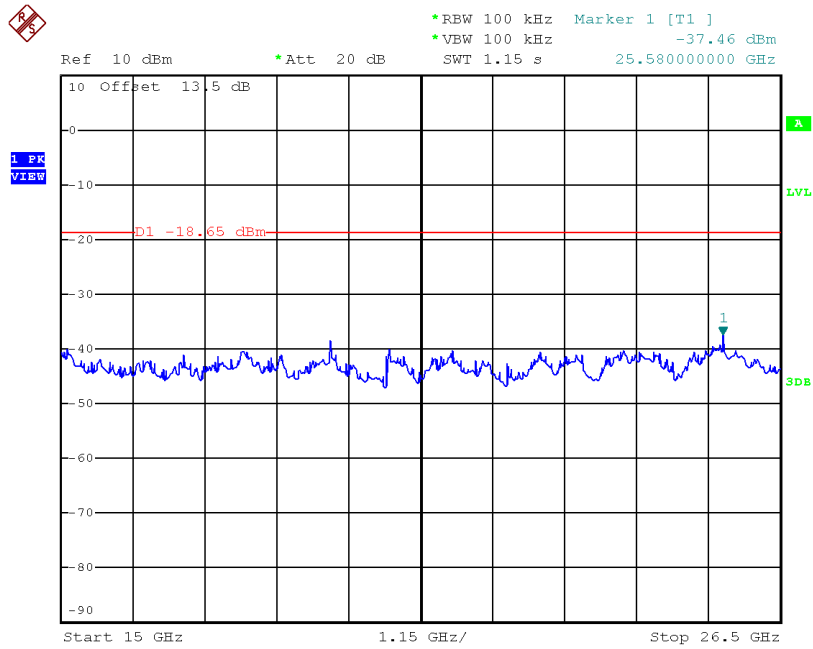
### CH39 (10 Harmonic of the frequency) \_1Mbps



Date: 22.AUG.2017 15:40:47

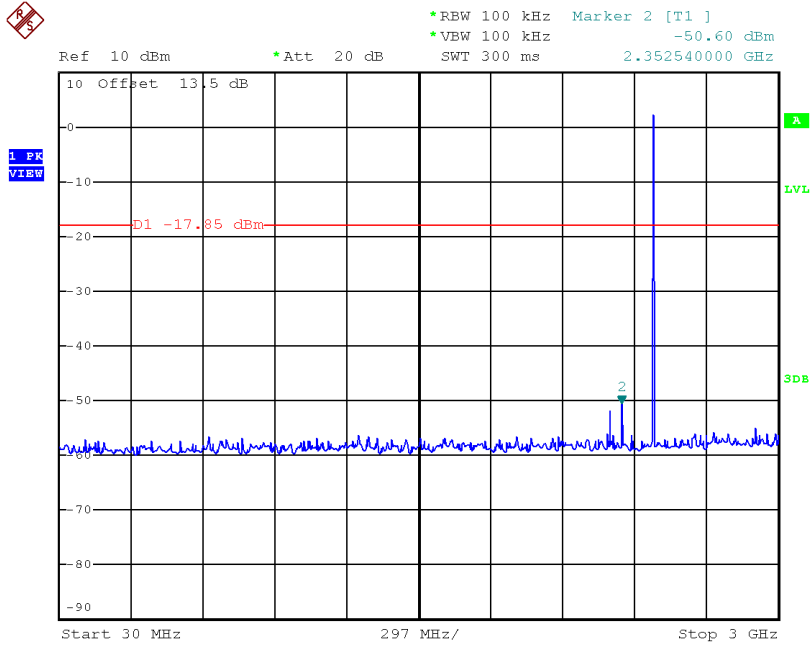


Date: 22.AUG.2017 15:40:53

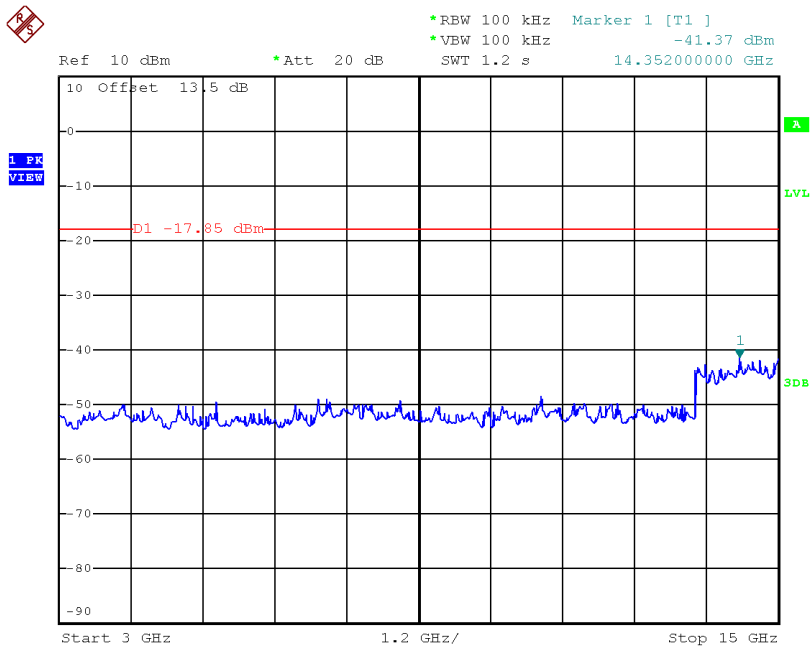


Date: 22.AUG.2017 15:41:00

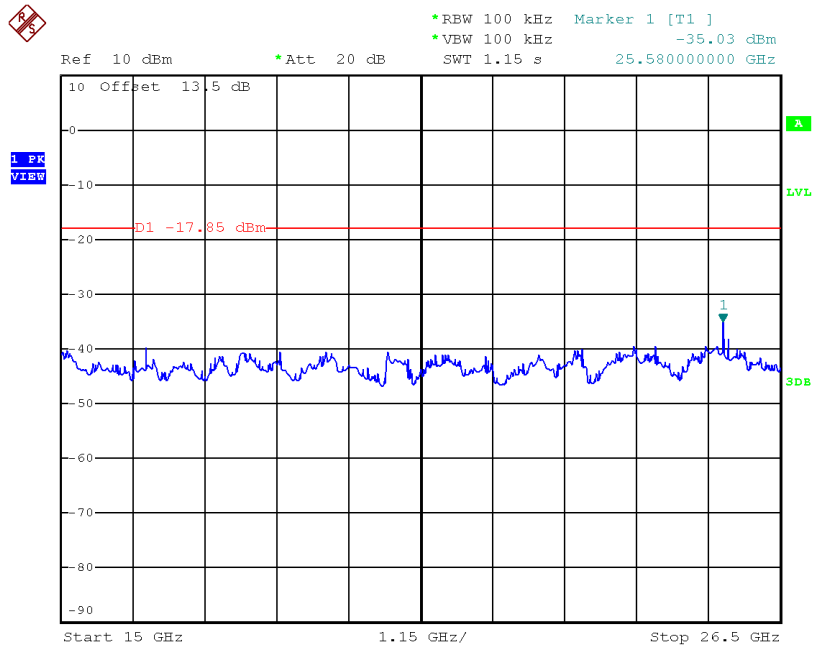
### CH78 (10 Harmonic of the frequency) \_1Mbps



Date: 22.AUG.2017 15:42:53

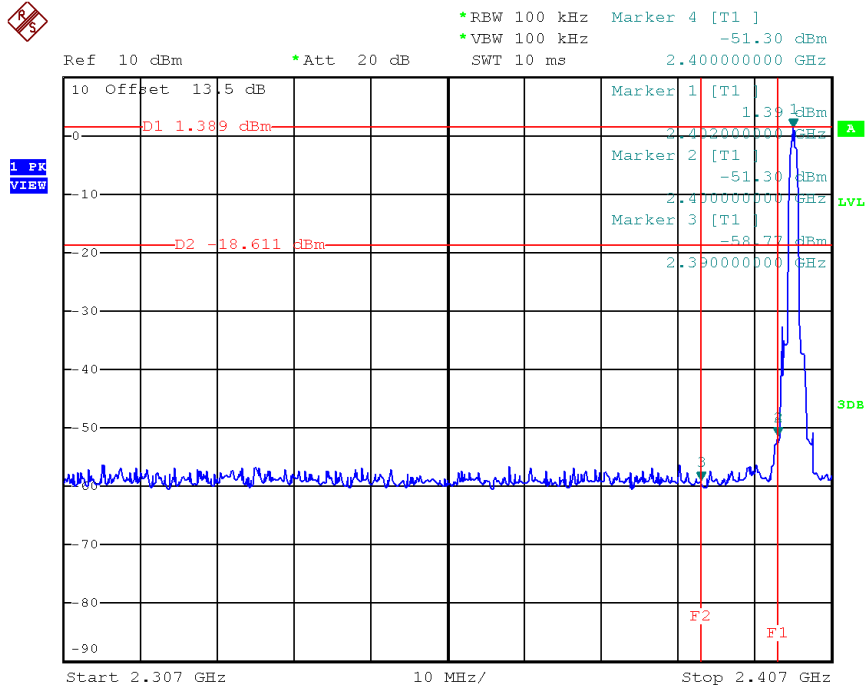


Date: 22.AUG.2017 15:43:00



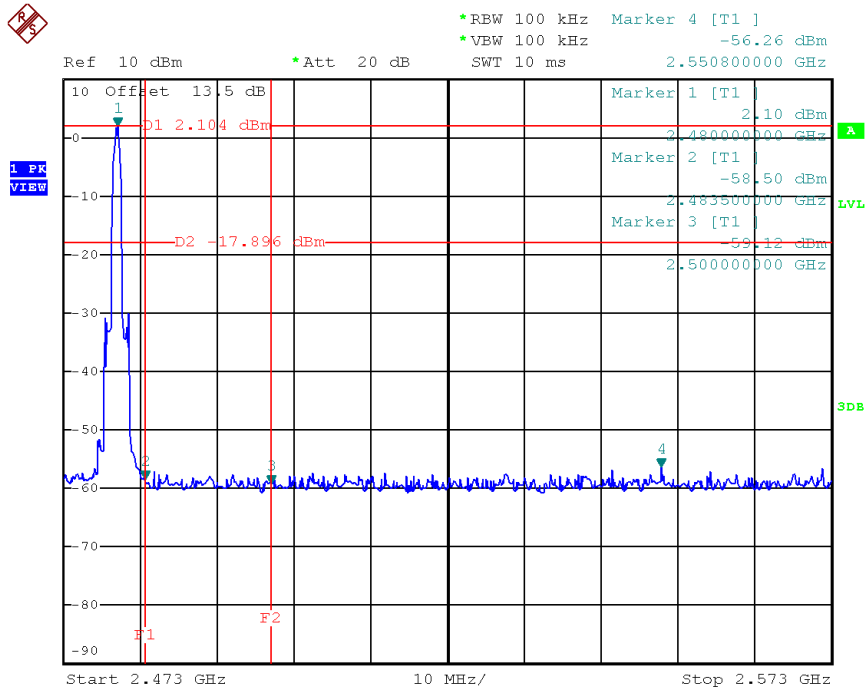
Date: 22.AUG.2017 15:43:07

### CH00 (Lower) \_3Mbps



Date: 22.AUG.2017 15:55:50

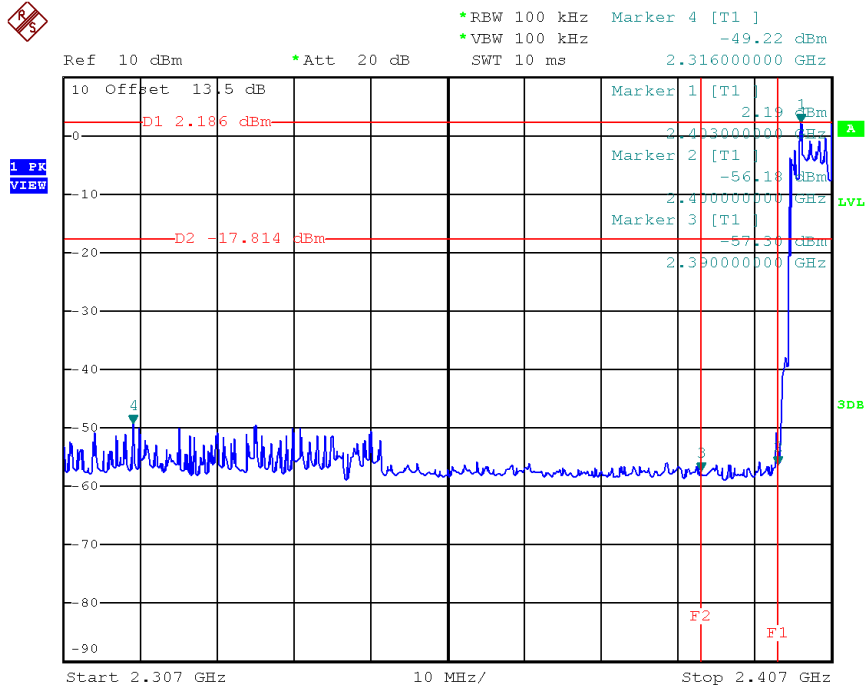
### CH78 (Upper) \_3Mbps



Date: 22.AUG.2017 15:59:02

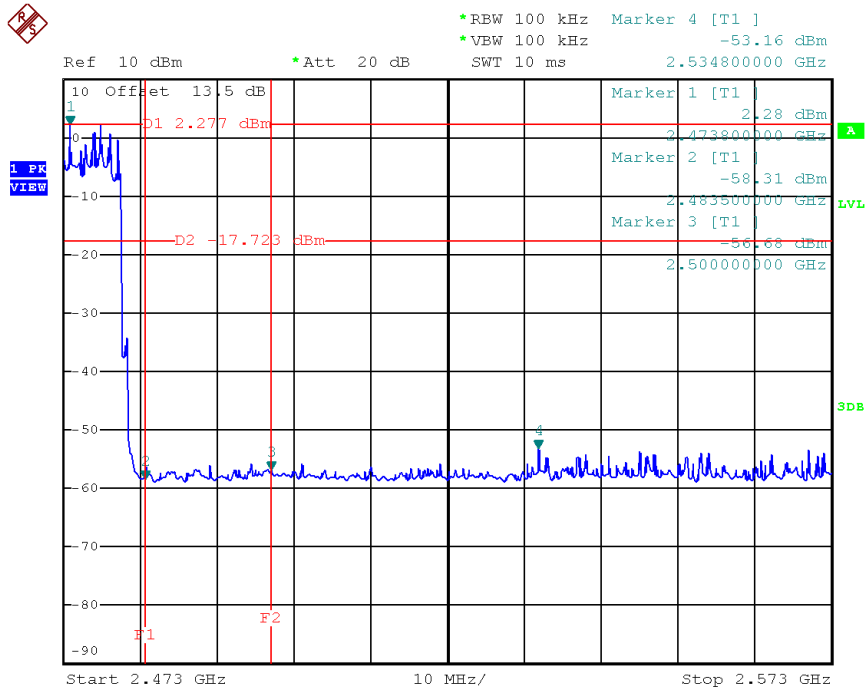


### CH00 Hopping on mode (Lower)\_3Mbps



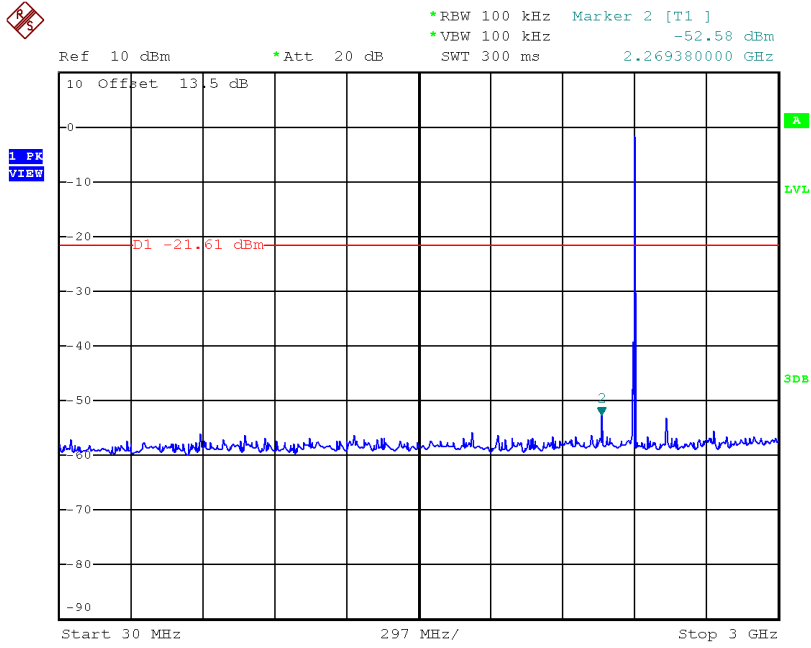
Date: 22.AUG.2017 16:09:32

### CH78 Hopping on mode (Upper)\_3Mbps

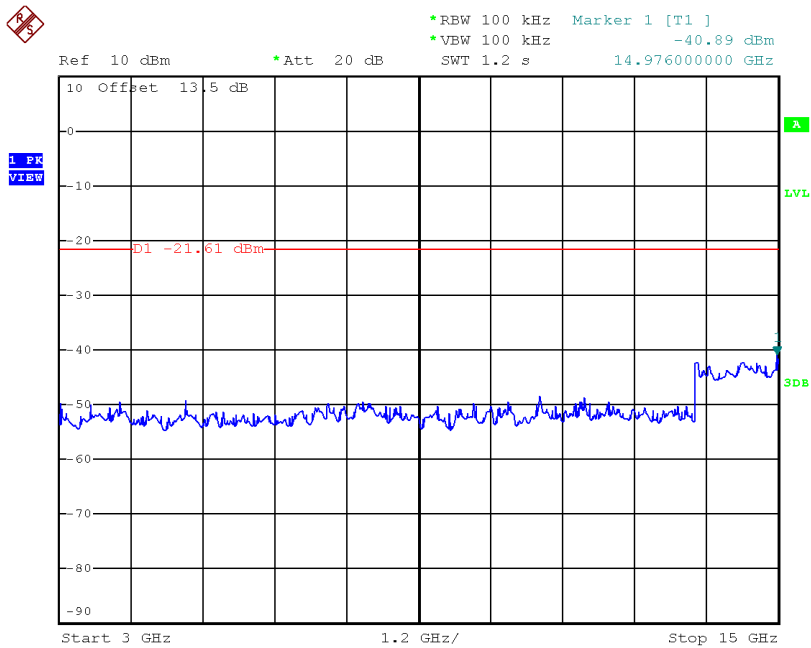


Date: 22.AUG.2017 16:10:06

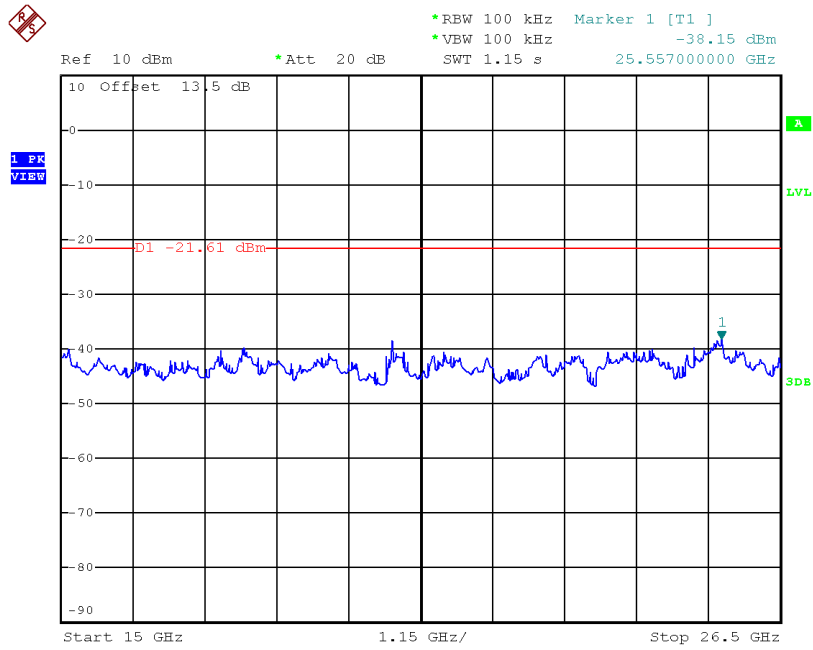
### CH00 (10 Harmonic of the frequency) \_3Mbps



Date: 22.AUG.2017 15:56:30

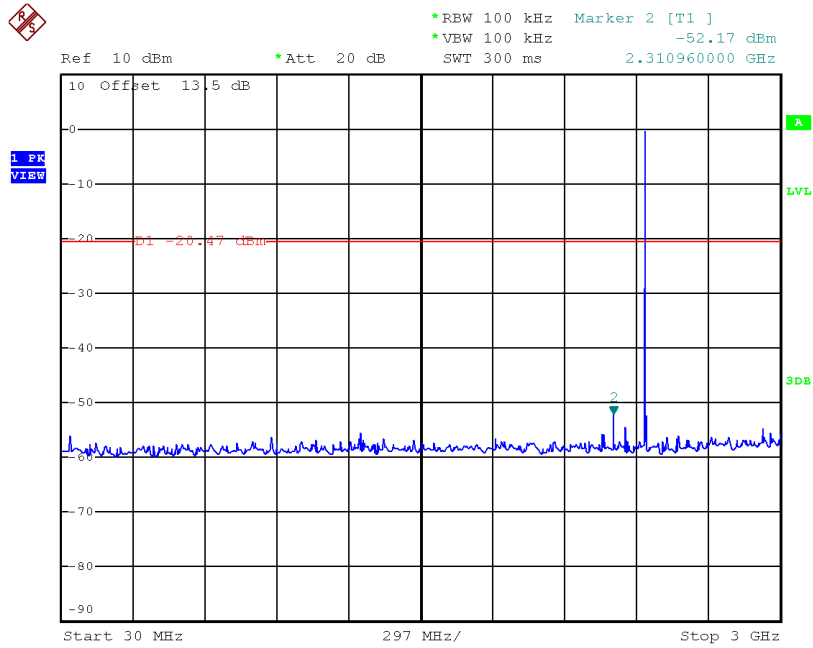


Date: 22.AUG.2017 15:56:37

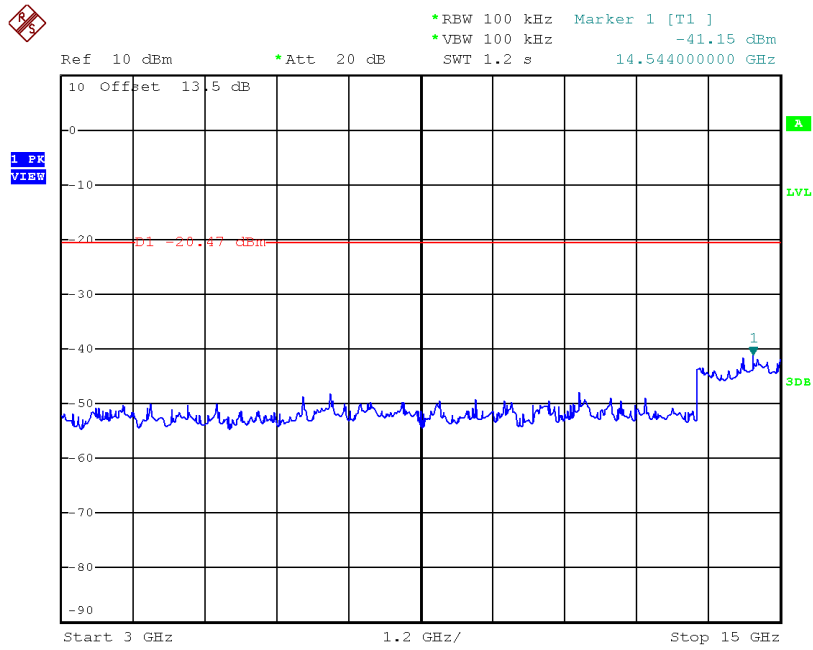


Date: 22.AUG.2017 15:56:44

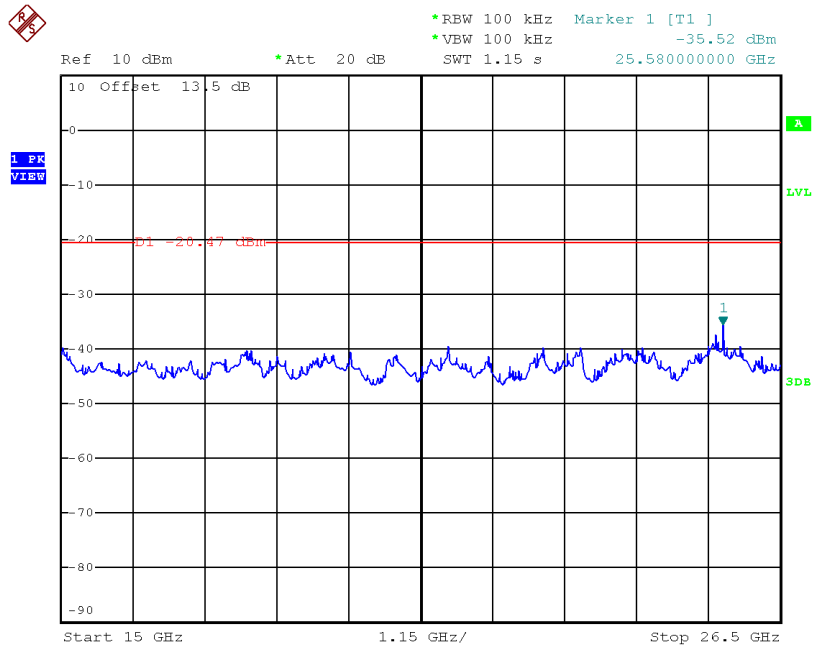
**CH39 (10 Harmonic of the frequency) \_3Mbps**



Date: 22.AUG.2017 15:57:43

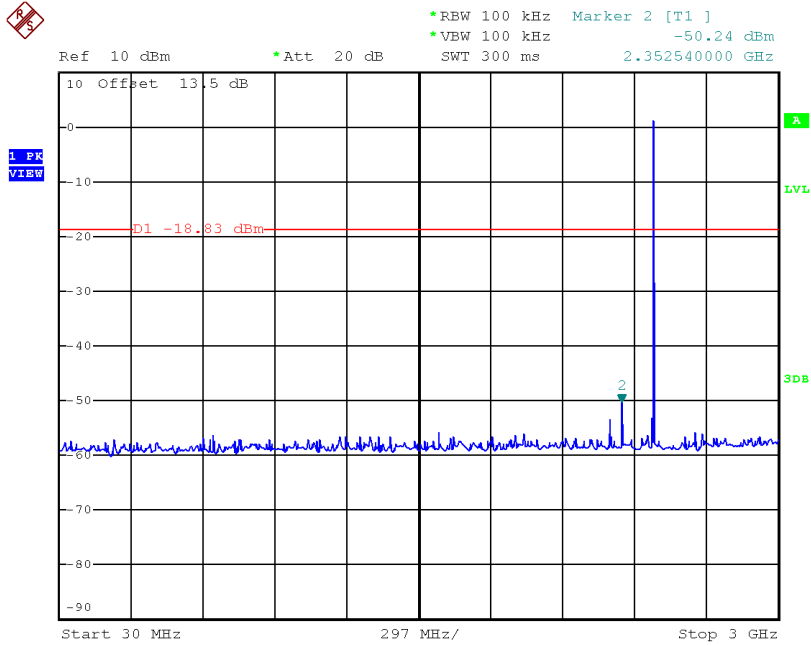


Date: 22.AUG.2017 15:57:50

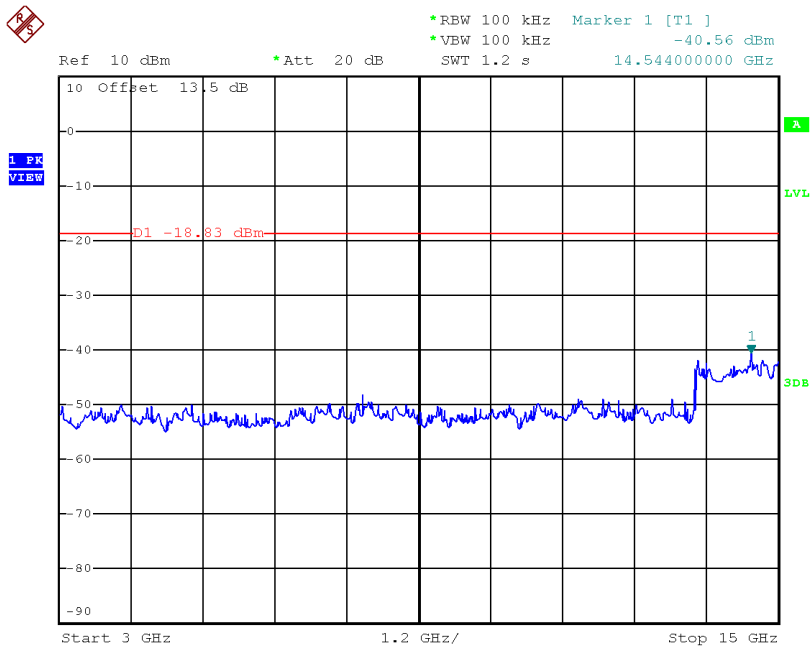


Date: 22.AUG.2017 15:57:57

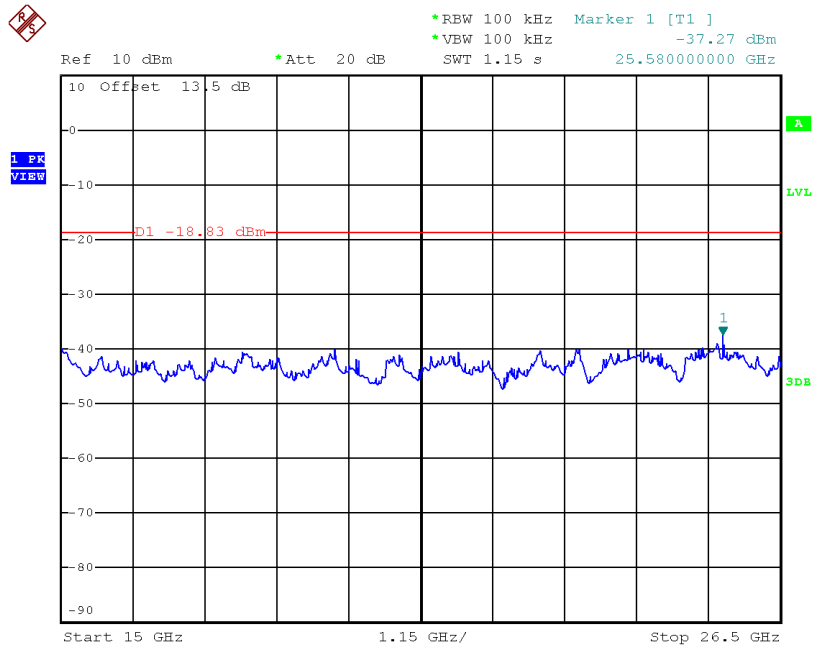
### CH78 (10 Harmonic of the frequency) \_3Mbps



Date: 22.AUG.2017 15:59:47



Date: 22.AUG.2017 15:59:54



Date: 22.AUG.2017 16:00:01