

# FCC Radio Test Report

## FCC ID: VIXSP201

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

**Project No.** : 1710179  
**Equipment** : WIRELESS SPEAKER  
**Model Name** : SP201  
**Applicant** : Voxx Accessories Corp.  
**Address** : 3502 Woodview Trace, Suite 220 Indianapolis, IN 46268 USA

**Date of Receipt** : Nov. 01, 2017  
**Date of Test** : Nov. 01, 2017 ~ Nov. 16, 2017  
**Issued Date** : Nov. 17, 2017  
**Tested by** : BTL Inc.

**Testing Engineer** : Rot - Liang  
(Rot Liang)

**Technical Manager** : Shawn Xiao  
(Shawn Xiao)

**Authorized Signatory** : David Mao  
(David Mao)

**B T L I N C .**

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

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



## Declaration

**BTL** represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with 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 manufacturer'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>
<b>2.1 TEST FACILITY</b>	<b>9</b>
<b>2.2 MEASUREMENT UNCERTAINTY</b>	<b>9</b>
<b>3 . GENERAL INFORMATION</b>	<b>10</b>
<b>3.1 GENERAL DESCRIPTION OF EUT</b>	<b>10</b>
<b>3.2 DESCRIPTION OF TEST MODES</b>	<b>12</b>
<b>3.3 TABLE OF PARAMETERS OF TEXT SOFTWARE SETTING</b>	<b>12</b>
<b>3.4 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED</b>	<b>13</b>
<b>3.5 DESCRIPTION OF SUPPORT UNITS</b>	<b>13</b>
<b>4 . EMC EMISSION TEST</b>	<b>14</b>
<b>4.1 CONDUCTED EMISSION MEASUREMENT</b>	<b>14</b>
<b>4.1.1 POWER LINE CONDUCTED EMISSION LIMITS</b>	<b>14</b>
<b>4.1.2 TEST PROCEDURE</b>	<b>14</b>
<b>4.1.3 DEVIATION FROM TEST STANDARD</b>	<b>14</b>
<b>4.1.4 TEST SETUP</b>	<b>15</b>
<b>4.1.5 EUT OPERATING CONDITIONS</b>	<b>15</b>
<b>4.1.6 EUT TEST CONDITIONS</b>	<b>15</b>
<b>4.1.7 TEST RESULTS</b>	<b>15</b>
<b>4.2 RADIATED EMISSION MEASUREMENT</b>	<b>16</b>
<b>4.2.1 RADIATED EMISSION LIMITS</b>	<b>16</b>
<b>4.2.2 TEST PROCEDURE</b>	<b>17</b>
<b>4.2.3 DEVIATION FROM TEST STANDARD</b>	<b>17</b>
<b>4.2.4 TEST SETUP</b>	<b>18</b>
<b>4.2.5 EUT OPERATING CONDITIONS</b>	<b>19</b>
<b>4.2.6 EUT TEST CONDITIONS</b>	<b>19</b>
<b>4.2.7 TEST RESULTS (9KHZ TO 30MHZ)</b>	<b>19</b>
<b>4.2.8 TEST RESULTS (30MHZ TO 1000MHZ)</b>	<b>19</b>
<b>4.2.9 TEST RESULTS (ABOVE 1000MHZ)</b>	<b>19</b>
<b>5 . NUMBER OF HOPPING CHANNEL</b>	<b>20</b>
<b>5.1 APPLIED PROCEDURES</b>	<b>20</b>
<b>5.1.1 TEST PROCEDURE</b>	<b>20</b>
<b>5.1.2 DEVIATION FROM STANDARD</b>	<b>20</b>
<b>5.1.3 TEST SETUP</b>	<b>20</b>
<b>5.1.4 EUT OPERATION CONDITIONS</b>	<b>20</b>
<b>5.1.5 EUT TEST CONDITIONS</b>	<b>20</b>
<b>5.1.6 TEST RESULTS</b>	<b>20</b>
<b>6 . AVERAGE TIME OF OCCUPANCY</b>	<b>21</b>

**Table of Contents**

	Page
<b>6.1 APPLIED PROCEDURES / LIMIT</b>	<b>21</b>
<b>6.1.1 TEST PROCEDURE</b>	21
<b>6.1.2 DEVIATION FROM STANDARD</b>	21
<b>6.1.3 TEST SETUP</b>	21
<b>6.1.4 EUT OPERATION CONDITIONS</b>	22
<b>6.1.5 EUT TEST CONDITIONS</b>	22
<b>6.1.6 TEST RESULTS</b>	22
<b>7 . HOPPING CHANNEL SEPARATION MEASUREMENT</b>	<b>23</b>
<b>7.1 APPLIED PROCEDURES / LIMIT</b>	23
<b>7.1.1 TEST PROCEDURE</b>	23
<b>7.1.2 DEVIATION FROM STANDARD</b>	23
<b>7.1.3 TEST SETUP</b>	23
<b>7.1.4 EUT TEST CONDITIONS</b>	23
<b>7.1.5 TEST RESULTS</b>	23
<b>8 . BANDWIDTH TEST</b>	<b>24</b>
<b>8.1 APPLIED PROCEDURES</b>	24
<b>8.1.1 TEST PROCEDURE</b>	24
<b>8.1.2 DEVIATION FROM STANDARD</b>	24
<b>8.1.3 TEST SETUP</b>	24
<b>8.1.4 EUT OPERATION CONDITIONS</b>	24
<b>8.1.5 EUT TEST CONDITIONS</b>	24
<b>8.1.6 TEST RESULTS</b>	24
<b>9 . PEAK OUTPUT POWER TEST</b>	<b>25</b>
<b>9.1 APPLIED PROCEDURES / LIMIT</b>	25
<b>9.1.1 TEST PROCEDURE</b>	25
<b>9.1.2 DEVIATION FROM STANDARD</b>	25
<b>9.1.3 TEST SETUP</b>	25
<b>9.1.4 EUT OPERATION CONDITIONS</b>	25
<b>9.1.5 EUT TEST CONDITIONS</b>	25
<b>9.1.6 TEST RESULTS</b>	25
<b>10 . ANTENNA CONDUCTED SPURIOUS EMISSION</b>	<b>26</b>
<b>10.1 APPLIED PROCEDURES / LIMIT</b>	26
<b>10.1.1 TEST PROCEDURE</b>	26
<b>10.1.2 DEVIATION FROM STANDARD</b>	26
<b>10.1.3 TEST SETUP</b>	26
<b>10.1.4 EUT OPERATION CONDITIONS</b>	26
<b>10.1.5 EUT TEST CONDITIONS</b>	26
<b>10.1.6 TEST RESULTS</b>	26
<b>11 . MEASUREMENT INSTRUMENTS LIST</b>	<b>27</b>
<b>12 . EUT TEST PHOTO</b>	<b>29</b>

Table of Contents	Page
<b>APPENDIX A - CONDUCTED EMISSION</b>	<b>33</b>
<b>APPENDIX B - RADIATED EMISSION (9KHZ-30MHZ)</b>	<b>36</b>
<b>APPENDIX C - RADIATED EMISSION (30MHZ TO 1000MHZ)</b>	<b>41</b>
<b>APPENDIX D - RADIATED EMISSION (ABOVE 1000MHZ)</b>	<b>48</b>
<b>APPENDIX E - NUMBER OF HOPPING CHANNEL</b>	<b>73</b>
<b>APPENDIX F - AVERAGE TIME OF OCCUPANCY</b>	<b>75</b>
<b>APPENDIX G - HOPPING CHANNEL SEPARATION MEASUREMENT</b>	<b>88</b>
<b>APPENDIX H - BANDWIDTH</b>	<b>93</b>
<b>APPENDIX I - PEAK OUTPUT POWER</b>	<b>98</b>
<b>APPENDIX J - ANTENNA CONDUCTED SPURIOUS EMISSION</b>	<b>103</b>

**REPORT ISSUED HISTORY**

Issued No.	Description	Issued Date
BTL-FCCP-1-1710179	Original Issue.	Nov. 17, 2017

## 1. CERTIFICATION

Equipment : WIRELESS SPEAKER

Brand Name : 808

Model Name : SP201

Applicant : Voxx Accessories Corp.

Date of Test : Nov. 01, 2017 ~ Nov. 16, 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 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-1-1710179) were obtained utilizing the test procedures, test instruments, test sites that has been accredited by the Authority of NVLAP 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, 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 is at the location of No.3, Jinshagang 1st Road, Shixia, Dalang Town, Dongguan, Guangdong, China.

BTL's test firm number for FCC: 854385

BTL's designation number for FCC: CN5020

## 2.2 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. The measurement instrumentation uncertainty considerations contained in CISPR 16-4-2.

The reported uncertainty of measurement  $y \pm U$ , where expanded uncertainty  $U$  is based on a standard uncertainty multiplied by a coverage factor of **k=2**, providing a level of confidence of approximately **95 %**.

#### A. Conducted Measurement :

Test Site	Method	Measurement Frequency Range	U, (dB)
DG-C02	CISPR	150 KHz ~ 30MHz	2.32

#### B. Radiated Measurement :

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

#### C. Other Measurement:

Test Item	Uncertainty
Conducted Spurious Emission	2.67dB
Hopping Channel Separation	53.46MHz
Peak Output Power	0.95dB
Number of Hopping Frequency	53.46MHz
Temperature	0.08°C
Humidity	1.5%

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	WIRELESS SPEAKER	
Brand Name	808	
Model Name	SP201	
Model Difference	The SP201 comes in color variations but are electrically and mechanically the same. The only difference is the color.	
Output Power (Max.)	Operation Frequency	2402~2480 MHz
	Modulation Technology	GFSK(1Mbps) $\pi$ /4-DQPSK(2Mbps) 8-DPSK(3Mbps)
	Bit Rate of Transmitter	
	Output Power Max.	2.59 dBm(1Mbps) 2.53 dBm(3Mbps)
Power Source	#1 DC voltage supplied from USB port. #2 Supplied from Li-ion battery.	
Power Rating	#1 DC 5V, 1A #2 DC 3.7V, 520mAh	

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	Model Name	Antenna Type	Connector	Gain (dBi)
1	SHENZHENSIXI N ZHONGXIN	F-6188	PCB	N/A	0

### 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

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

**Note:**

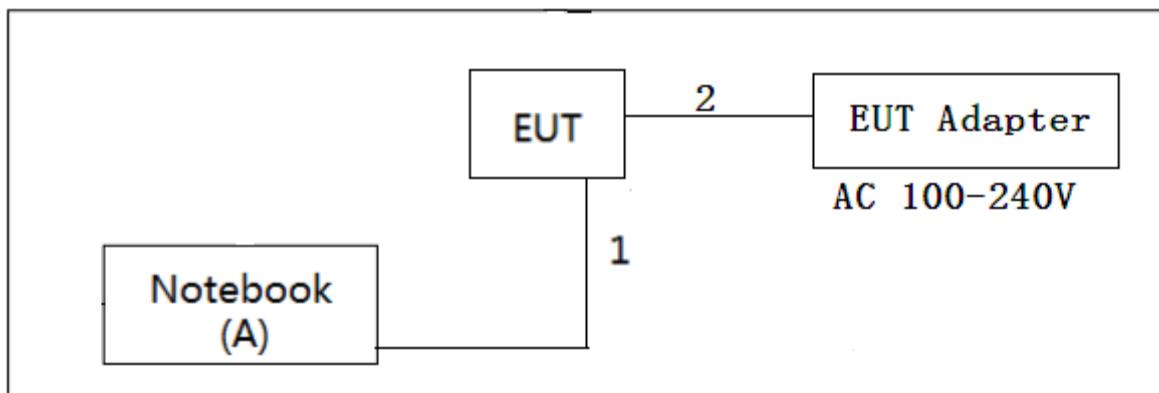
- (1) The measurements are performed at the high, middle, low available channels.
  - (2) The measurements for Hopping Channel Separation, Bandwidth and Peak Output Power were tested during 1Mbps, 2Mbps and 3Mbps, the worst case are 1Mbps and 3Mbps. only worst case was documented.

### 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		BK3256 RF Test_V1.3		
Frequency	2402 MHz	2441 MHz	2480 MHz	
Parameters(1Mbps)	3	3	3	
Parameters(3Mbps)	3	3	3	

### 3.4 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



### 3.5 DESCRIPTION OF SUPPORT UNITS

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

Item	Equipment	Mfr/Brand	Model/Type No.	FCC ID	Series No.
A	Notebook	DLEE	DLEE N4030	DOC	GYHG9N1

Item	Shielded Type	Ferrite Core	Length	Note
1	NO	NO	1m	USB Cable
2	NO	NO	0.5m	DC 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 (dB $\mu$ V)	
	Quasi-peak	Average <input type="checkbox"/>
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

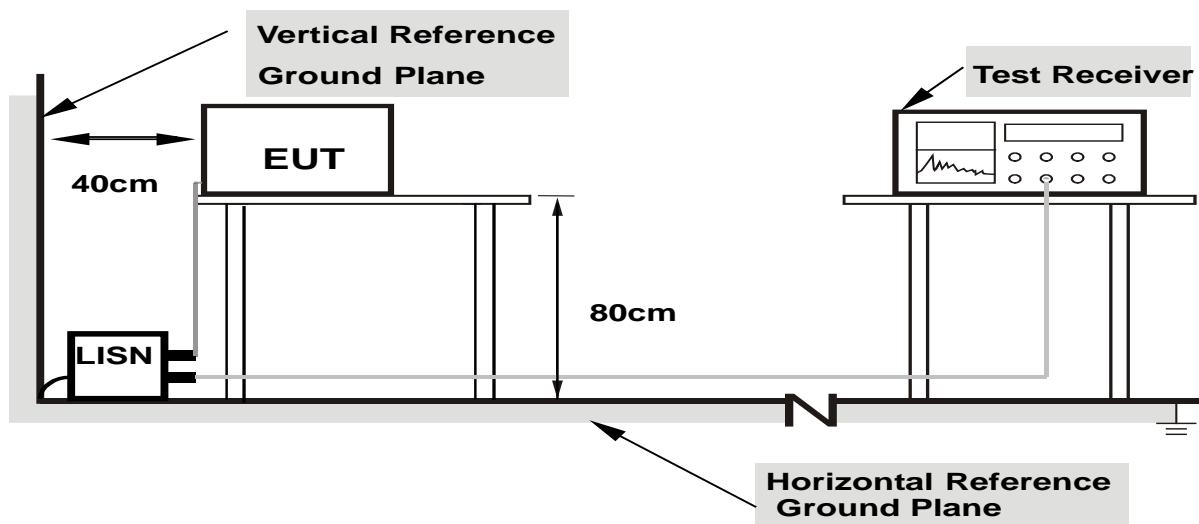
#### 4.1.2 TEST PROCEDURE

- 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



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

#### 4.1.5 EUT OPERATING CONDITIONS

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

#### 4.1.6 EUT TEST CONDITIONS

Temperature: 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

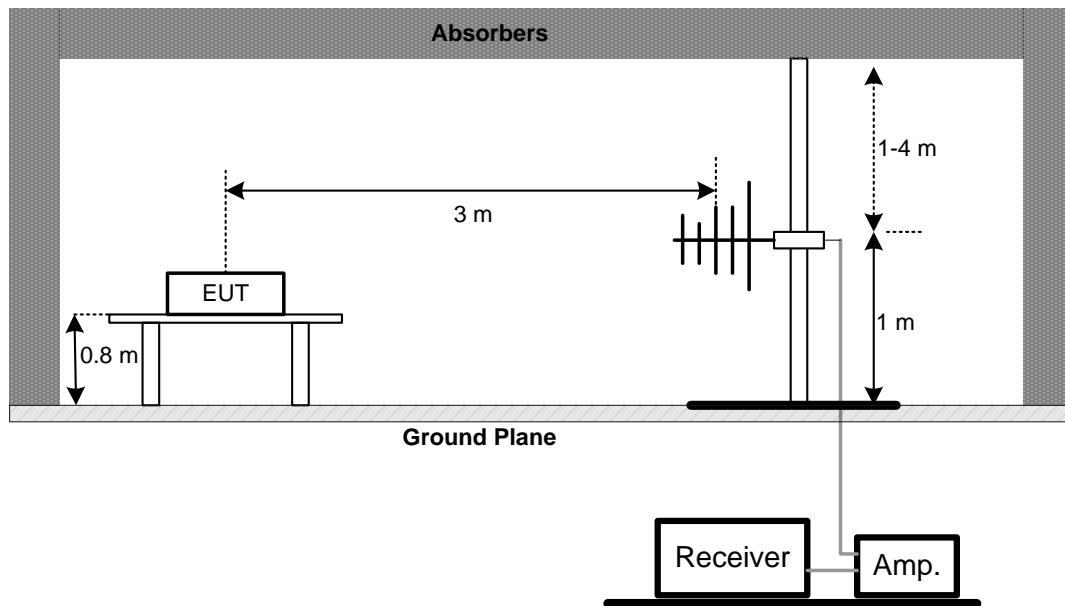
- The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1GHz)
- The measuring distance of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

#### 4.2.3 DEVIATION FROM TEST STANDARD

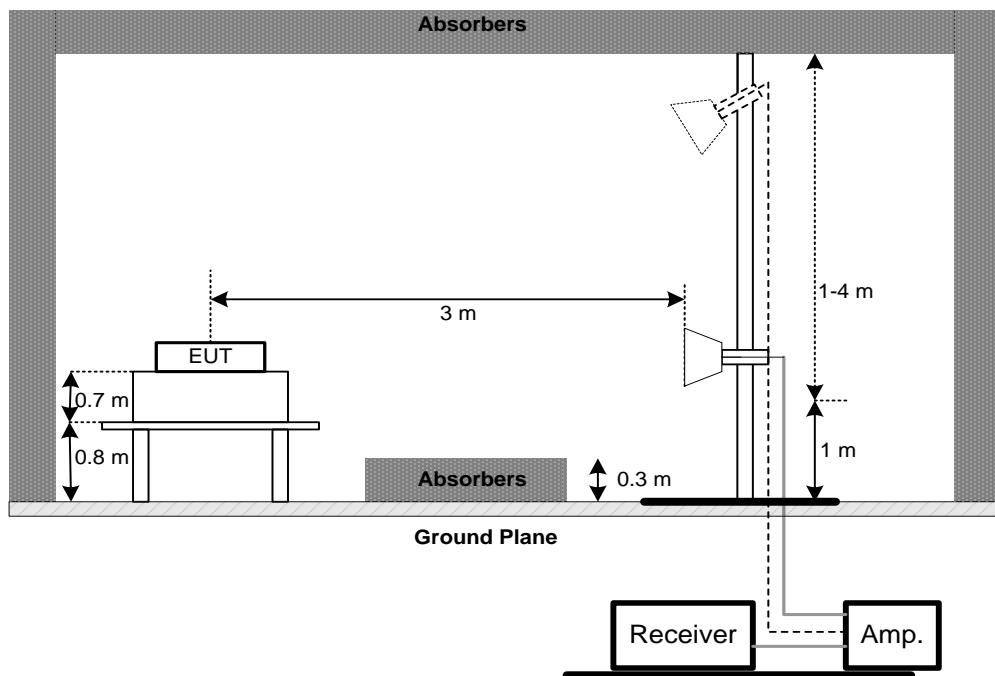
No deviation

#### 4.2.4 TEST SETUP

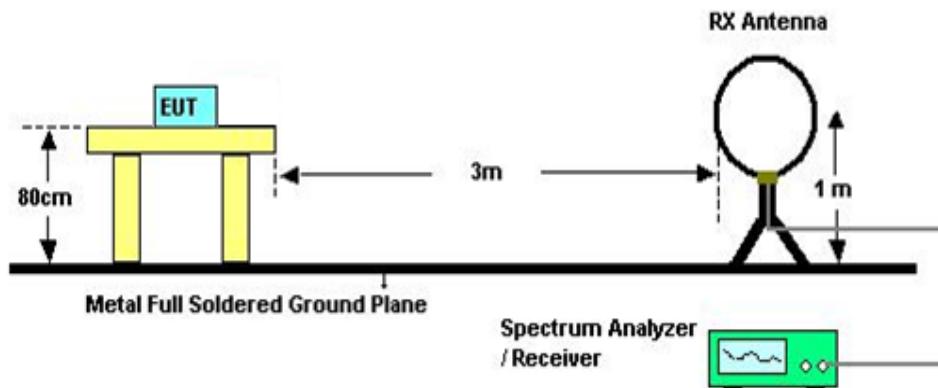
(A) Radiated Emission Test Set-Up Frequency Below 1 GHz



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



(C) For Radiated Emissions Below 30MHz



#### **4.2.5 EUT OPERATING CONDITIONS**

The EUT 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 (dB<sub>UV</sub>) + distance extrapolation factor.

#### **4.2.8 TEST RESULTS (30MHZ TO 1000MHZ)**

Please refer to the Appendix C.

#### **4.2.9 TEST RESULTS (ABOVE 1000MHz)**

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

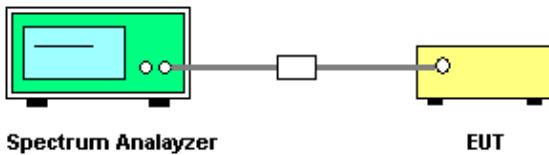
### **7.1.1 TEST PROCEDURE**

- 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

- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
- 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	EMI Test Receiver	R&S	ESCI	100382	Mar. 26, 2018
2	LISN	EMCO	3816/2	52765	Mar. 26, 2018
3	50Ω Terminator	SHX	TF2-3G-A	8122901	Mar. 26, 2018
4	TWO-LINE V-NETWORK	R&S	ENV216	101447	Mar. 26, 2018
5	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A
6	Cable	N/A	RG223	12m	Oct. 19, 2018

Radiated Emission Measurement - Below 1GHz					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Antenna	Schwarzbeck	VULB9160	9160-3232	Mar. 26, 2018
2	Amplifier	HP	8447D	2944A09673	Oct. 19, 2018
3	Receiver	Agilent	N9038A	MY52130039	Aug. 20, 2018
4	Cable	emci	LMR-400(30MHz-1 GHz)(8m+5m)	N/A	Jun. 26, 2018
5	Controller	CT	SC100	N/A	N/A
6	Controller	MF	MF-7802	MF780208416	N/A
7	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A

Radiated Emission Measurement - Above 1GHz					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Double Ridged Guide Antenna	ETS	3115	75789	Mar. 26, 2018
2	Broad-Band Horn Antenna	Schwarzbeck	BBHA 9170	9170319	Jun. 08, 2018
3	Amplifier	Agilent	8449B	3008A02274	May. 16, 2018
4	Microwave Preamplifier With Adaptor	EMC INSTRUMENT	EMC2654045	980039 & HA01	Mar. 26, 2018
5	Receiver	Agilent	N9038A	MY52130039	Aug. 20, 2018
6	Antenna	EM	EM-6876-1	230	Mar. 06, 2018
7	Controller	CT	SC100	N/A	N/A
8	Controller	MF	MF-7802	MF780208416	N/A
9	Cable	emci	EMC104-SM-SM-1 2000(12m)	N/A	Jun. 26, 2018
10	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A

**Number of Hopping Channel**

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP40	100185	Aug. 20, 2018

**Average Time of Occupancy**

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP40	100185	Aug. 20, 2018

**Hopping Channel Separation Measurement**

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP40	100185	Aug. 20, 2018

**Bandwidth**

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP40	100185	Aug. 20, 2018

**Peak Output Power**

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Power Meter	ANRITSU	ML2495A	1128009	Mar. 26, 2018
2	Pulse Power Sensor	ANRITSU	MA 2411B	1027500	Mar. 26, 2018

**Antenna Conducted Spurious Emission**

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP40	100185	Aug. 20, 2018

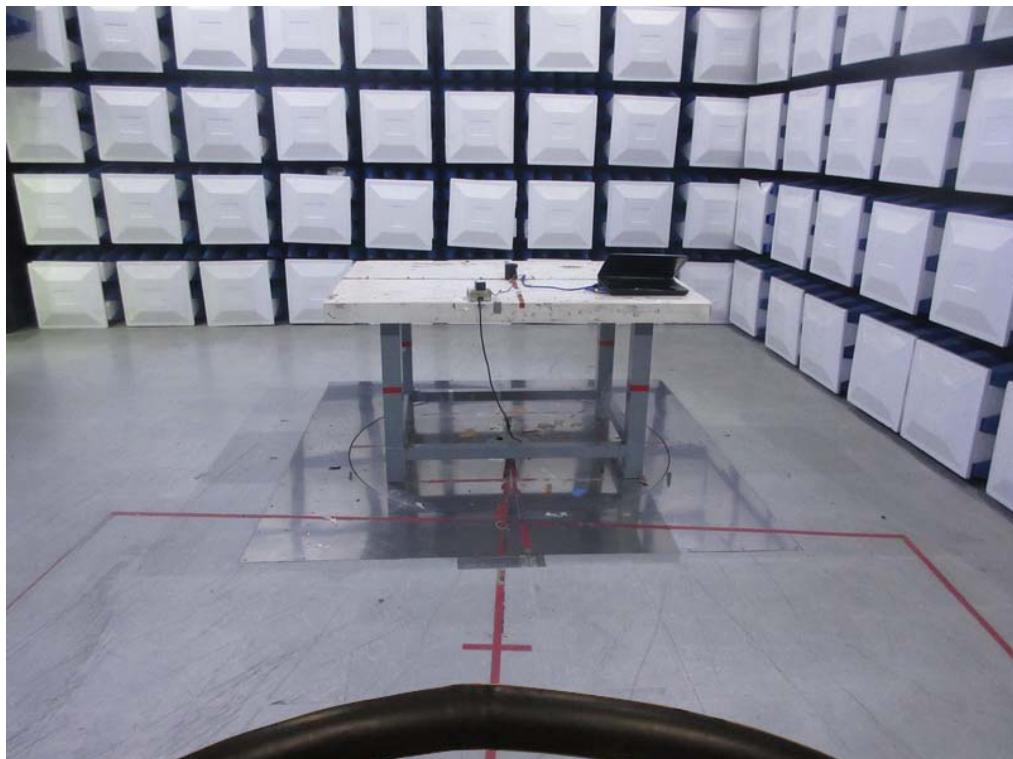
Remark: "N/A" denotes no model name, serial no. or calibration specified.

All calibration period of equipment list is one year.

**12. EUT TEST PHOTO****Conducted Measurement Photos**

## Radiated Measurement Photos

**9KHz to 30MHz**



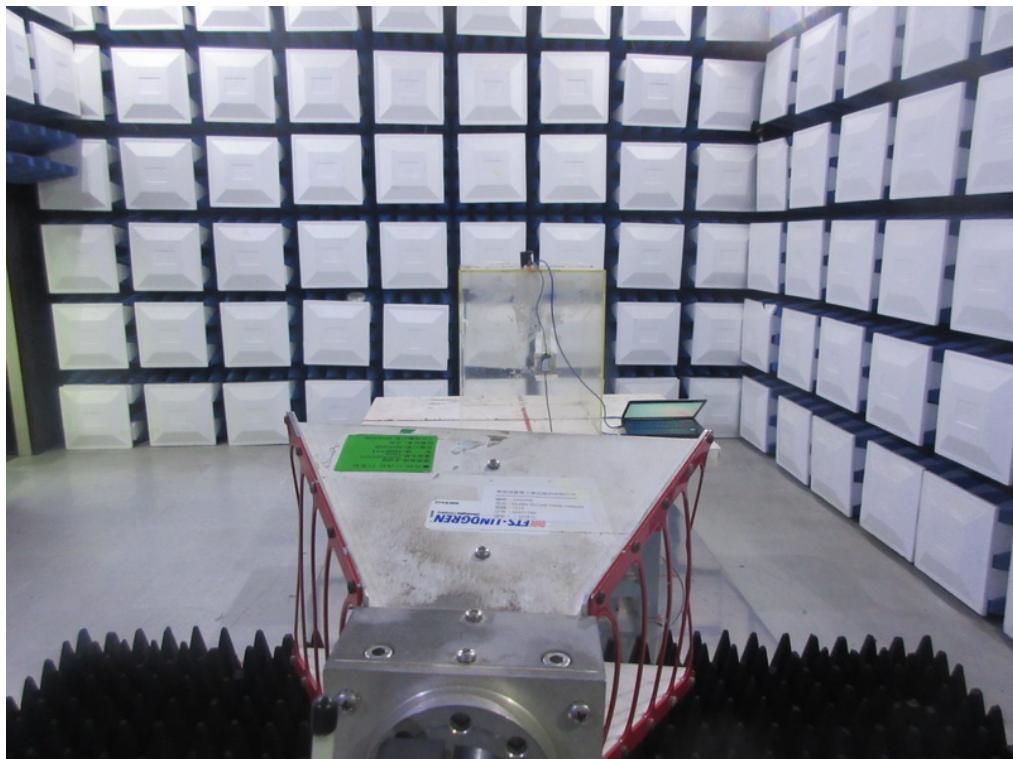
## Radiated Measurement Photos

30MHz to 1000MHz



## Radiated Measurement Photos

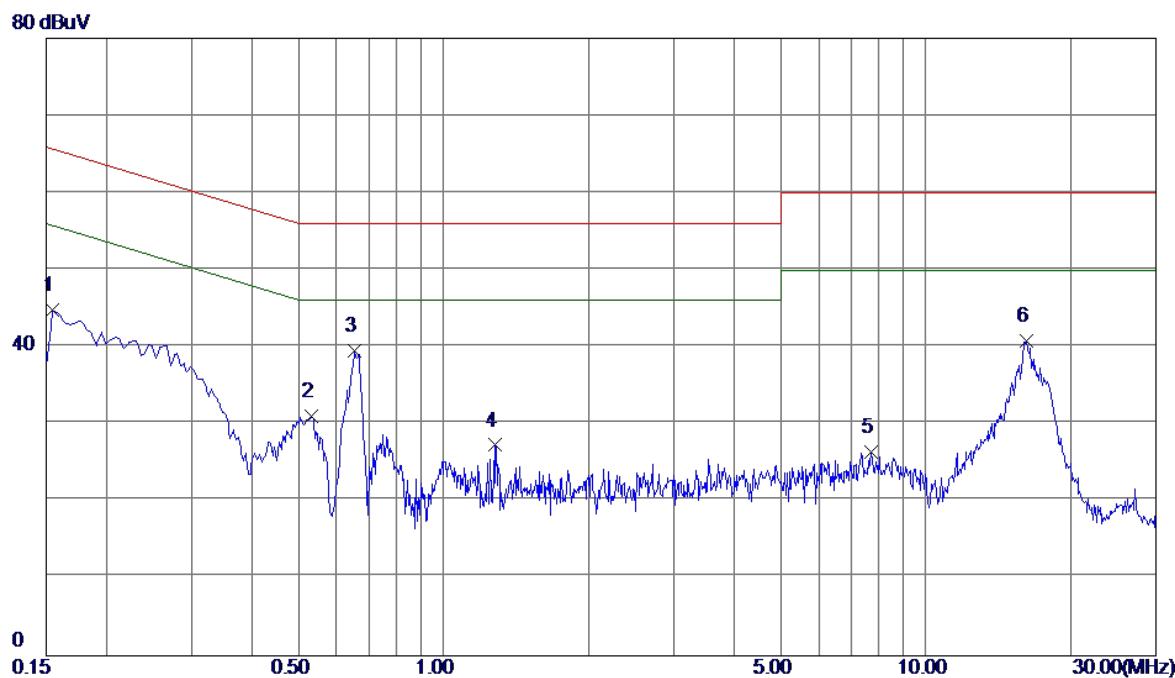
### Above 1000MHz



## APPENDIX A - CONDUCTED EMISSION

Test Mode: TX Mode

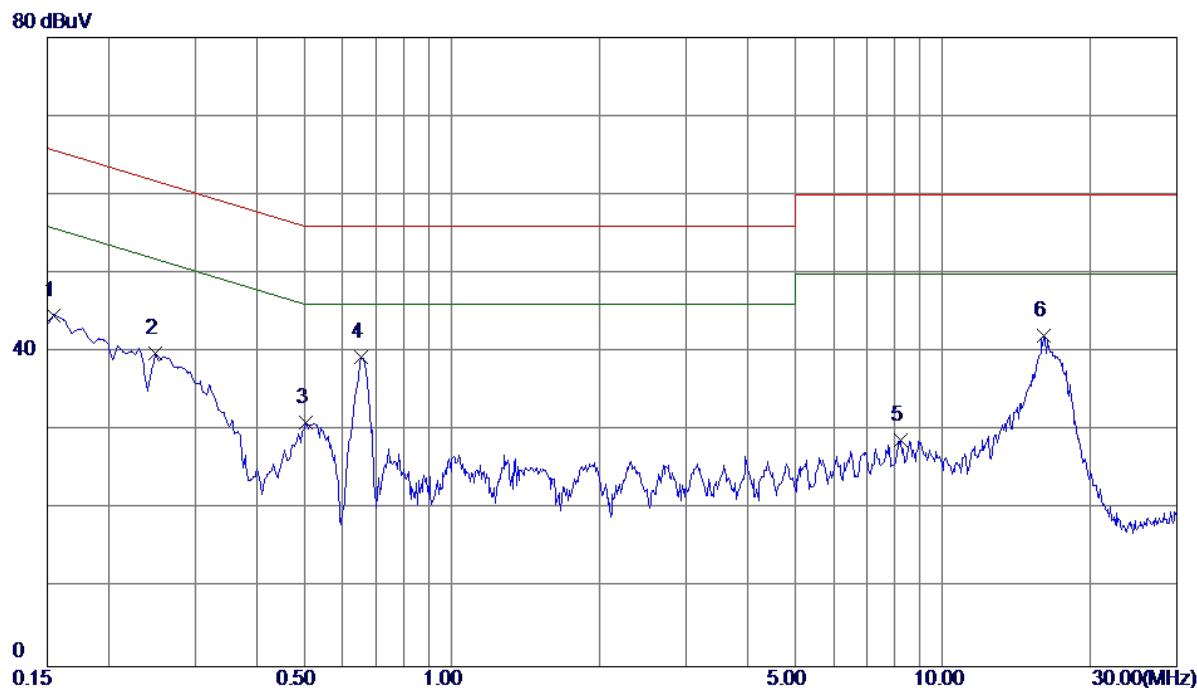
## Line



No.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1	0. 1545	34. 97	9. 79	44. 76	65. 75	-20. 99	Peak	
2	0. 5325	21. 20	9. 80	31. 00	56. 00	-25. 00	Peak	
3 *	0. 6540	29. 76	9. 82	39. 58	56. 00	-16. 42	Peak	
4	1. 2750	17. 40	9. 88	27. 28	56. 00	-28. 72	Peak	
5	7. 6965	16. 22	10. 22	26. 44	60. 00	-33. 56	Peak	
6	16. 2150	30. 17	10. 61	40. 78	60. 00	-19. 22	Peak	

Test Mode: TX Mode

## Neutral

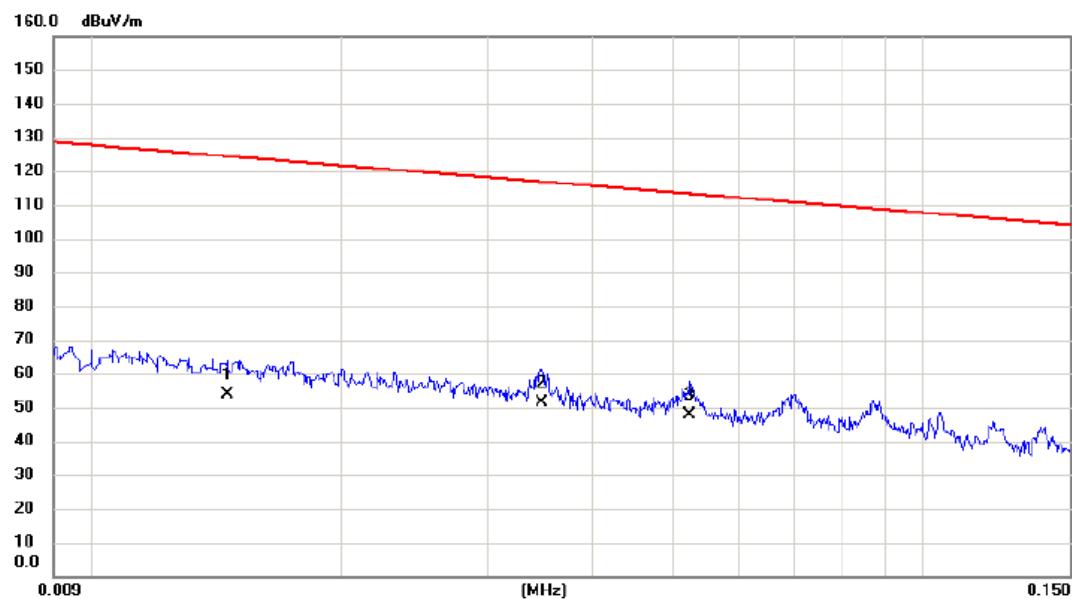


No.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1	0.1548	35.03	9.68	44.71	65.74	-21.03	Peak	
2	0.2490	30.16	9.67	39.83	61.79	-21.96	Peak	
3	0.5055	21.30	9.70	31.00	56.00	-25.00	Peak	
4 *	0.6540	29.60	9.72	39.32	56.00	-16.68	Peak	
5	8.2050	18.59	10.17	28.76	60.00	-31.24	Peak	
6	16.0665	31.39	10.66	42.05	60.00	-17.95	Peak	

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

Test Mode: TX Mode

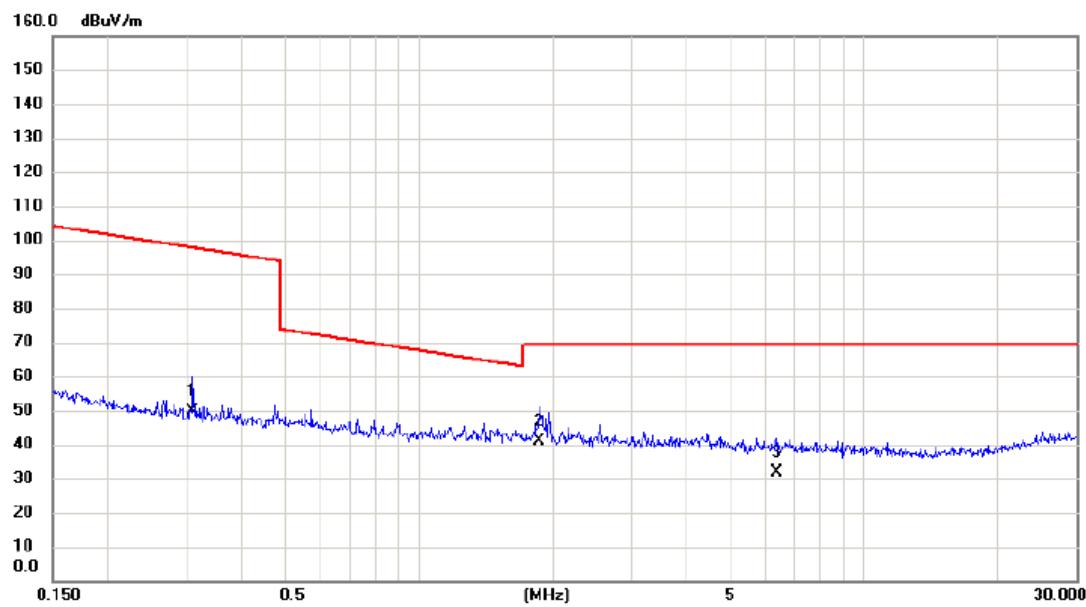
Ant 0°



No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Margin	Detector	Comment
			Level	Factor	ment				
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB		
1		0.0146	33.67	20.32	53.99	124.32	-70.33	AVG	
2		0.0348	32.12	19.18	51.30	116.77	-65.47	AVG	
3	*	0.0524	29.08	18.67	47.75	113.22	-65.47	AVG	

Test Mode: TX Mode

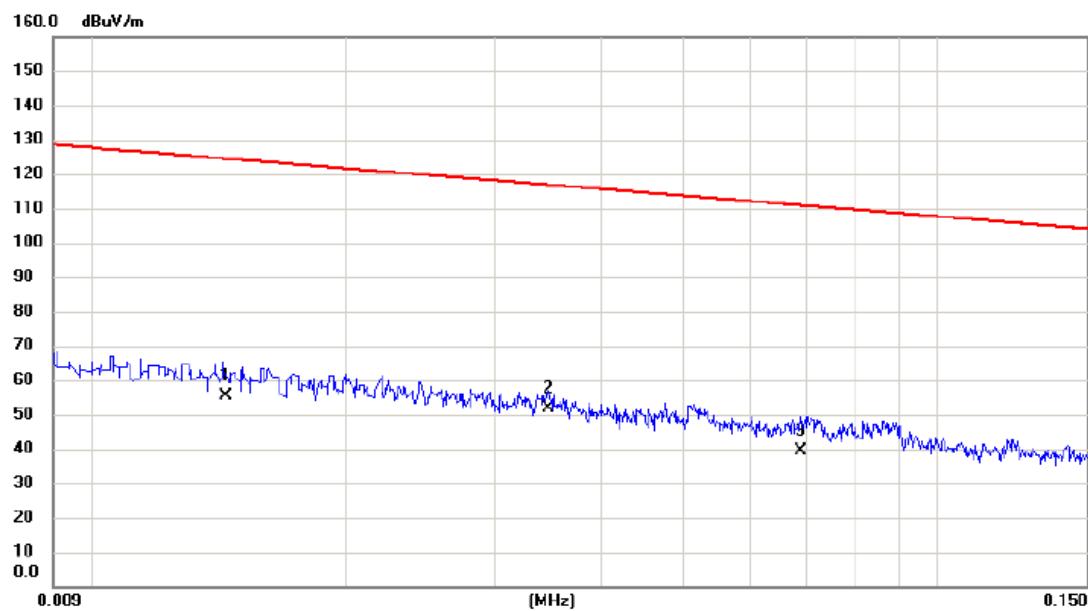
Ant 0°



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dB	Margin Detector	Comment
1		0.3100	33.16	16.61	49.77	97.78	-48.01	AVG
2	*	1.8581	25.62	15.57	41.19	69.54	-28.35	QP
3		6.3520	17.70	14.20	31.90	69.54	-37.64	QP

Test Mode: TX Mode

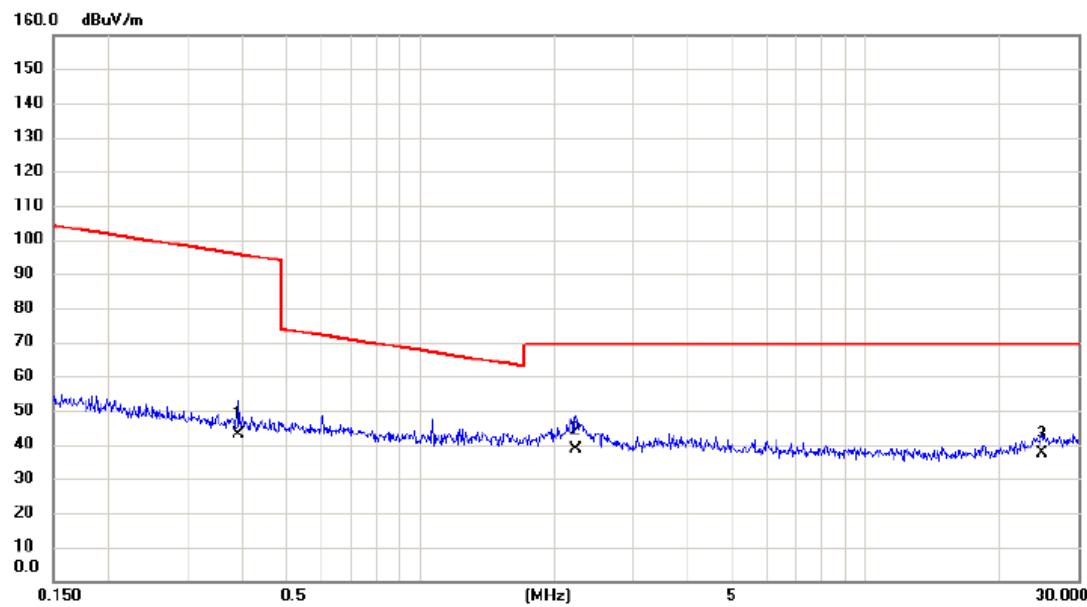
Ant 90°



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		0.0144	35.14	20.35	55.49	124.44	-68.95	AVG	
2	*	0.0347	32.74	19.18	51.92	116.80	-64.88	AVG	
3		0.0690	21.08	18.35	39.43	110.83	-71.40	AVG	

Test Mode: TX Mode

Ant 90°

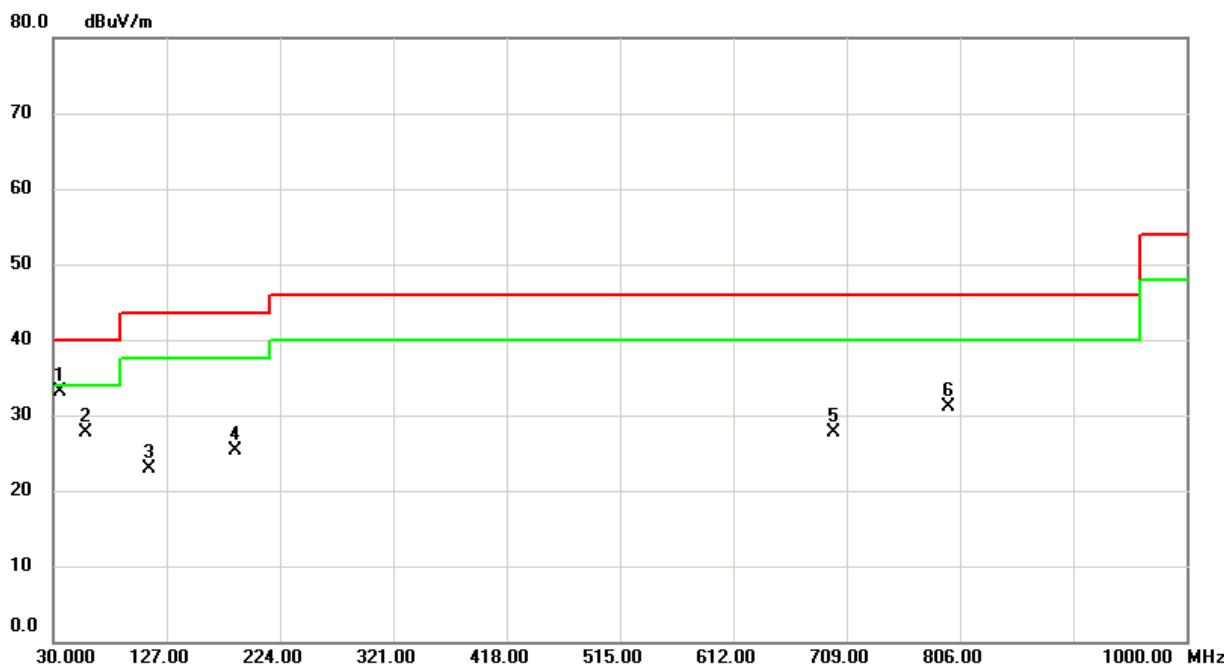


No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Margin	Detector	Comment
			Level	Factor	ment				
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB		
1		0.3914	26.28	16.55	42.83	95.75	-52.92	AVG	
2	*	2.2367	23.11	15.44	38.55	69.54	-30.99	QP	
3		24.9221	17.72	19.64	37.36	69.54	-32.18	QP	

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

Test Mode: TX 2402MHz \_CH00\_1Mbps

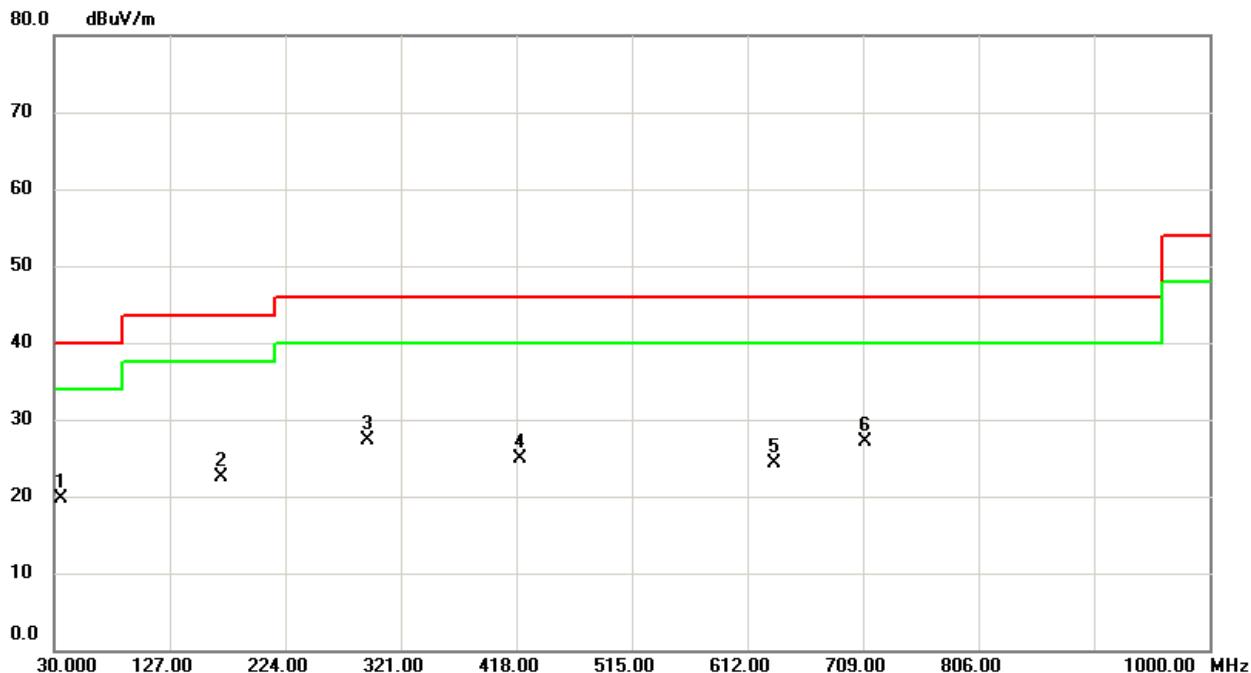
## Vertical



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	35.8200	47.69	-14.51	33.18	40.00	-6.82	Peak	
2	57.1600	41.73	-14.04	27.69	40.00	-12.31	Peak	
3	111.4800	38.95	-16.07	22.88	43.50	-20.62	Peak	
4	186.1700	37.88	-12.54	25.34	43.50	-18.16	Peak	
5	697.3600	31.67	-4.02	27.65	46.00	-18.35	Peak	
6	796.3000	32.47	-1.44	31.03	46.00	-14.97	Peak	

Test Mode: TX 2402MHz \_CH00\_1Mbps

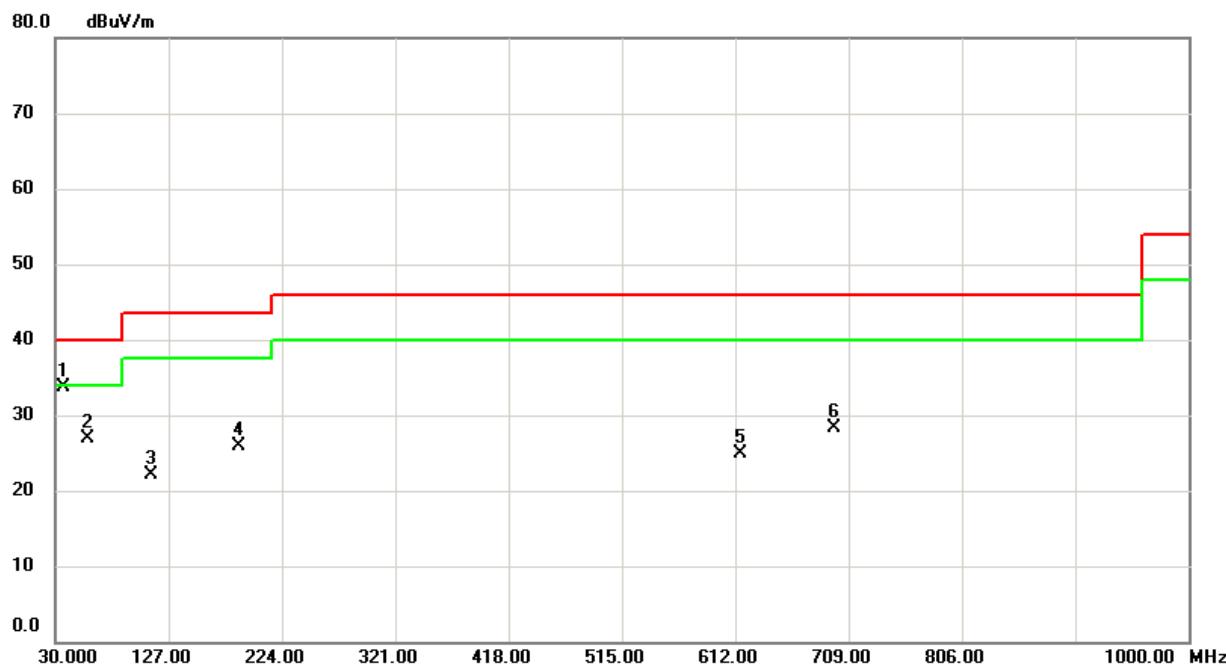
## Horizontal



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Margin	
							Detector	Comment
1	35.8200	34.19	-14.51	19.68	40.00	-20.32	Peak	
2	170.6500	34.81	-12.32	22.49	43.50	-21.01	Peak	
3 *	293.8400	40.97	-13.67	27.30	46.00	-18.70	Peak	
4	420.9100	35.68	-10.77	24.91	46.00	-21.09	Peak	
5	634.3100	30.09	-5.77	24.32	46.00	-21.68	Peak	
6	710.9400	30.68	-3.61	27.07	46.00	-18.93	Peak	

Test Mode: TX 2441MHz \_CH39\_1Mbps

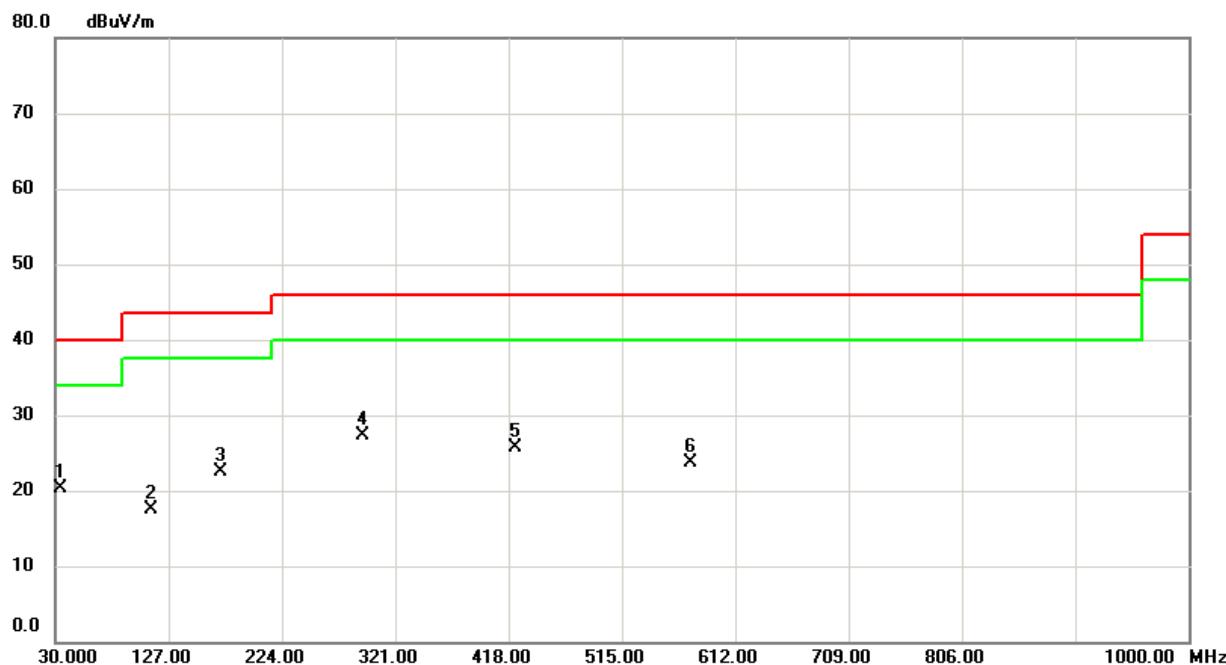
## Vertical



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	36.7900	48.21	-14.41	33.80	40.00	-6.20	Peak	
2	57.1600	40.94	-14.04	26.90	40.00	-13.10	Peak	
3	111.4800	38.21	-16.07	22.14	43.50	-21.36	Peak	
4	187.1400	38.46	-12.61	25.85	43.50	-17.65	Peak	
5	615.8800	31.10	-6.12	24.98	46.00	-21.02	Peak	
6	696.3900	32.30	-4.05	28.25	46.00	-17.75	Peak	

Test Mode: TX 2441MHz \_CH39\_1Mbps

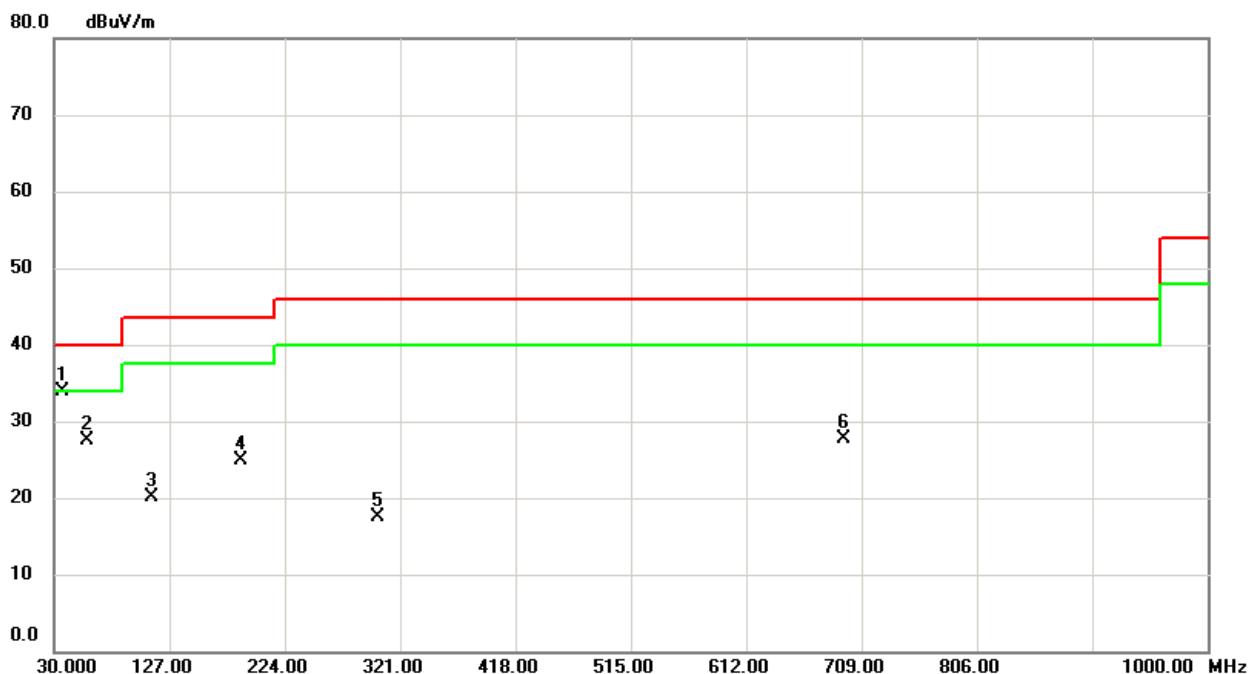
## Horizontal



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	33.8800	35.08	-14.73	20.35	40.00	-19.65	Peak	
2	112.4500	33.42	-16.00	17.42	43.50	-26.08	Peak	
3	171.6200	34.86	-12.29	22.57	43.50	-20.93	Peak	
4 *	292.8700	41.04	-13.81	27.23	46.00	-18.77	Peak	
5	423.8200	36.41	-10.68	25.73	46.00	-20.27	Peak	
6	573.2000	30.82	-7.11	23.71	46.00	-22.29	Peak	

Test Mode: TX 2480MHz \_CH78\_1Mbps

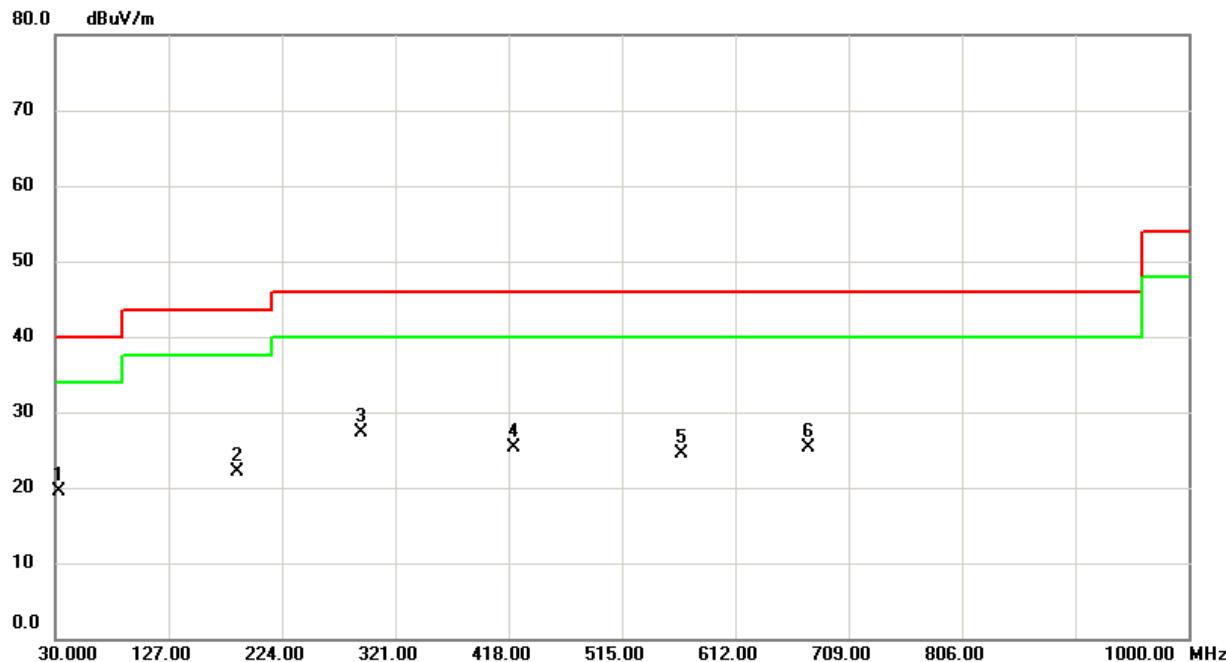
## Vertical



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	36.7900	48.32	-14.41	33.91	40.00	-6.09	Peak	
2	57.1600	41.55	-14.04	27.51	40.00	-12.49	Peak	
3	111.4800	36.18	-16.07	20.11	43.50	-23.39	Peak	
4	187.1400	37.47	-12.61	24.86	43.50	-18.64	Peak	
5	302.5700	30.30	-12.78	17.52	46.00	-28.48	Peak	
6	693.4800	31.94	-4.14	27.80	46.00	-18.20	Peak	

Test Mode: TX 2480MHz \_CH78\_1Mbps

## Horizontal



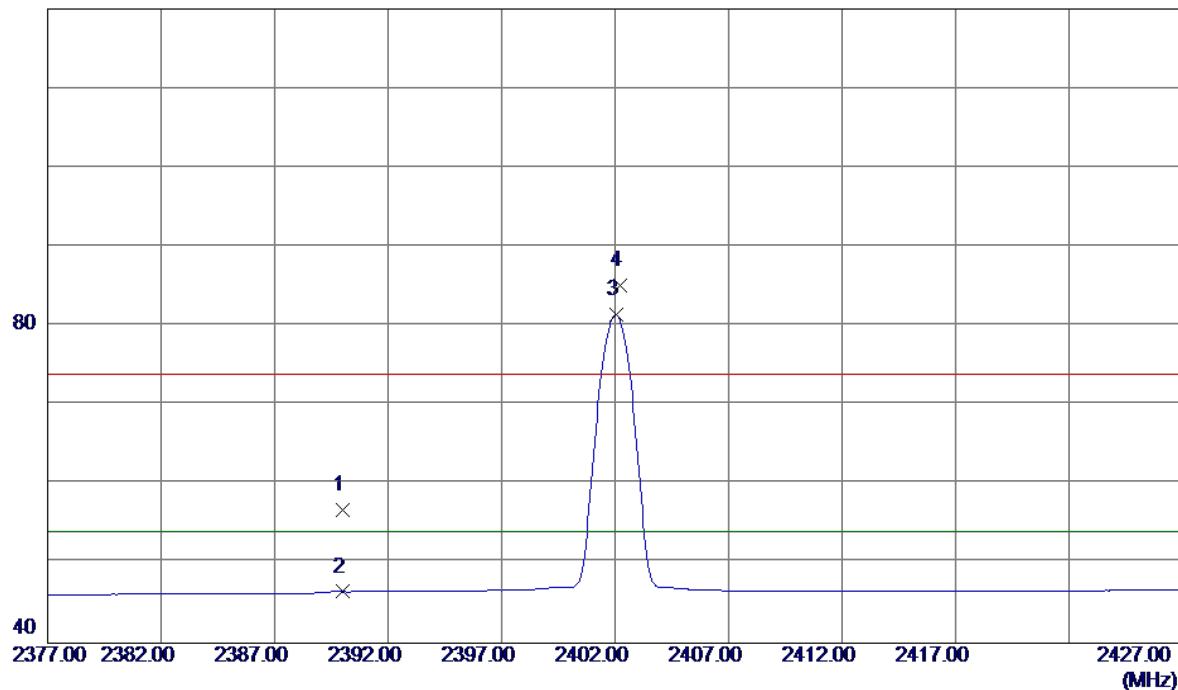
No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	32.9100	34.31	-14.89	19.42	40.00	-20.58	Peak	
2	185.2000	34.64	-12.46	22.18	43.50	-21.32	Peak	
3 *	291.9000	41.30	-13.94	27.36	46.00	-18.64	Peak	
4	421.8800	36.03	-10.74	25.29	46.00	-20.71	Peak	
5	565.4400	31.90	-7.32	24.58	46.00	-21.42	Peak	
6	674.0800	29.99	-4.74	25.25	46.00	-20.75	Peak	

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

Test Mode : TX 2402MHz \_CH00\_1Mbps

## Vertical

120 dBuV/m

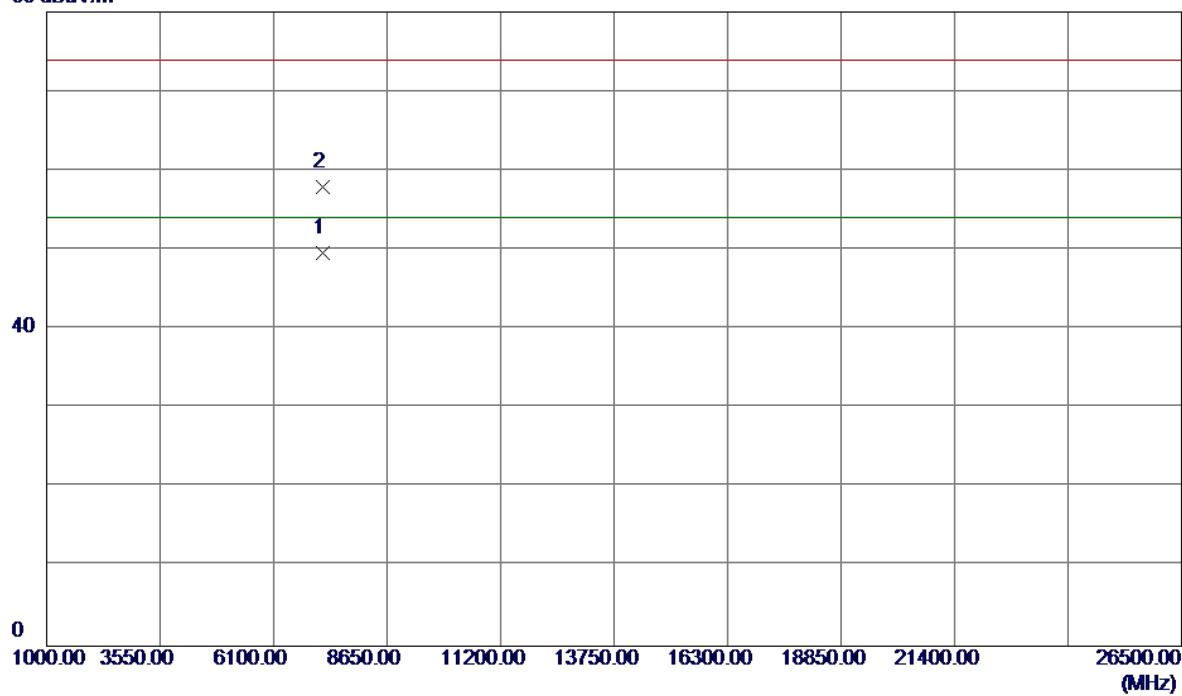


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dB	Margin Detector	Comment
1	2390.0000	24.08	32.70	56.78	74.00	-17.22	Peak
2	2390.0000	13.78	32.70	46.48	54.00	-7.52	AVG
3 *	2402.0500	48.63	32.75	81.38	54.00	27.38	AVG
4	2402.2000	52.42	32.75	85.17	74.00	11.17	Peak
							No Limit
							No Limit

Test Mode : TX 2402MHz \_CH00\_1Mbps

## Vertical

80 dBuV/m

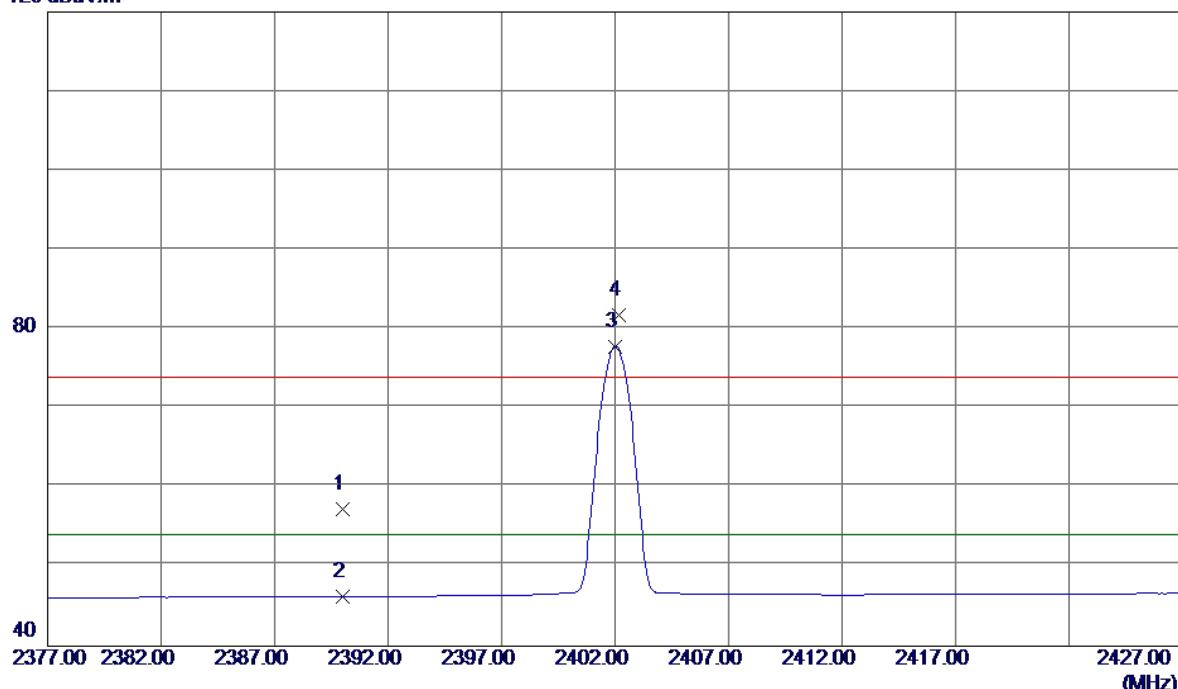


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	7205.9220	36.46	13.13	49.59	54.00	-4.41	Avg	
2	7206.4860	44.72	13.13	57.85	74.00	-16.15	Peak	

Test Mode : TX 2402MHz \_CH00\_1Mbps

## Horizontal

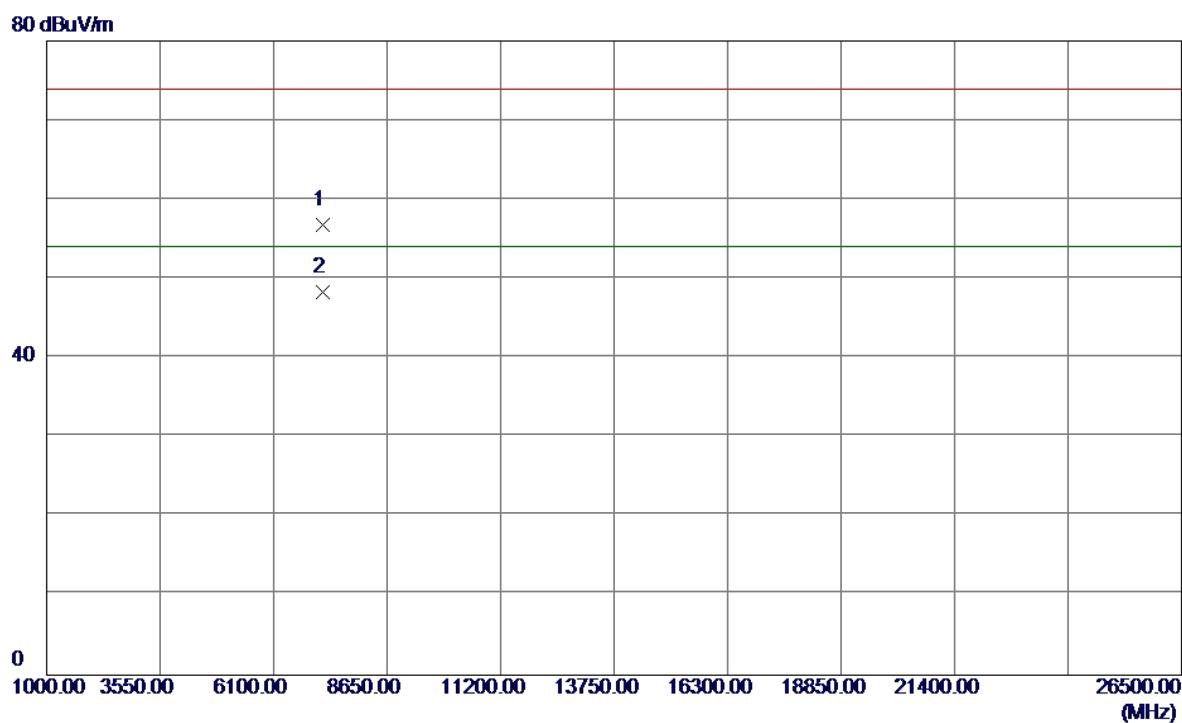
120 dBuV/m



No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	2390.0000	24.55	32.70	57.25	74.00	-16.75	Peak	
2	2390.0000	13.57	32.70	46.27	54.00	-7.73	AVG	
3 *	2402.0000	45.06	32.75	77.81	54.00	23.81	AVG	No Limit
4	2402.1500	49.03	32.75	81.78	74.00	7.78	Peak	No Limit

Test Mode : TX 2402MHz \_CH00\_1Mbps

## Horizontal

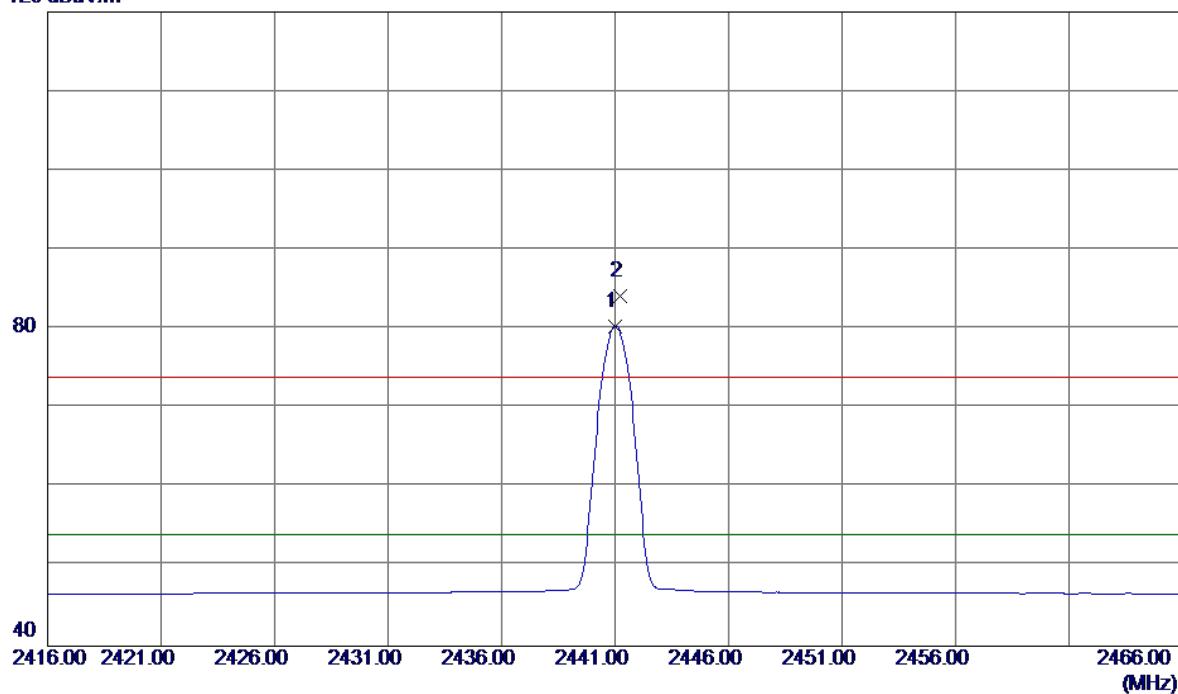


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dB	Margin Detector	Comment
1	7205.5200	43.63	13.13	56.76	74.00	-17.24	Peak
2 *	7206.0000	35.21	13.13	48.34	54.00	-5.66	AVG

Test Mode : TX 2441MHz \_CH39\_1Mbps

## Vertical

120 dBuV/m

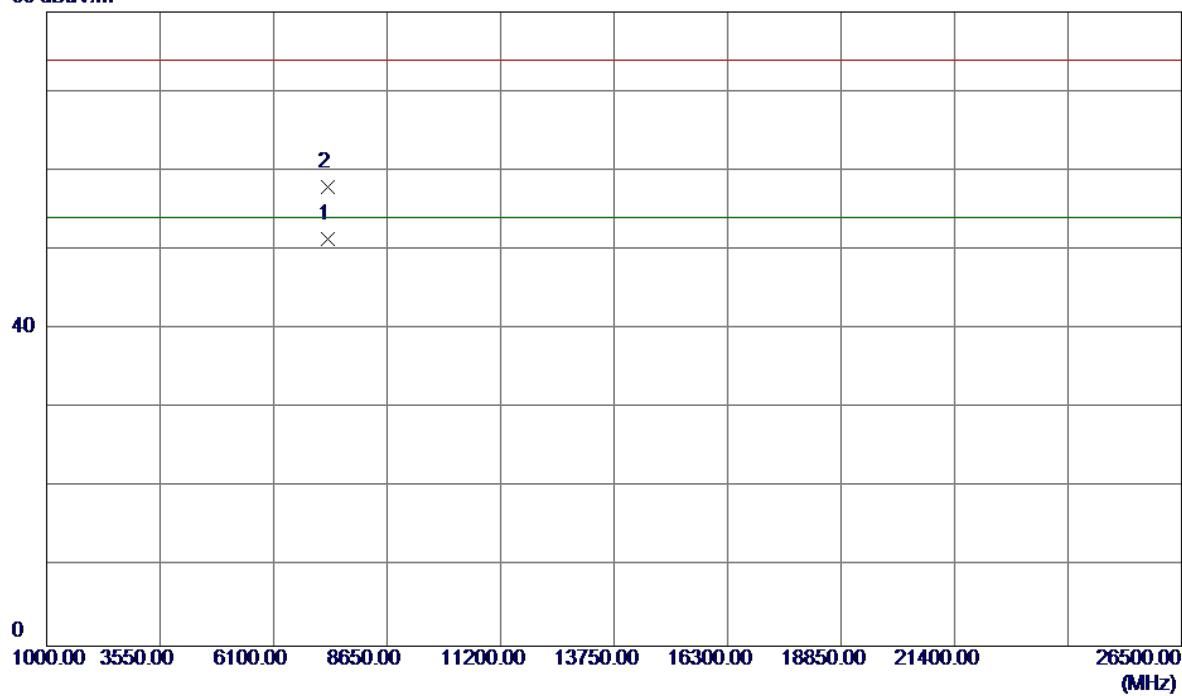


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	2441.0000	47.44	32.89	80.33	54.00	26.33	AVG	No Limit
2	2441.2000	51.33	32.89	84.22	74.00	10.22	Peak	No Limit

Test Mode : TX 2441MHz \_CH39\_1Mbps

## Vertical

80 dBuV/m

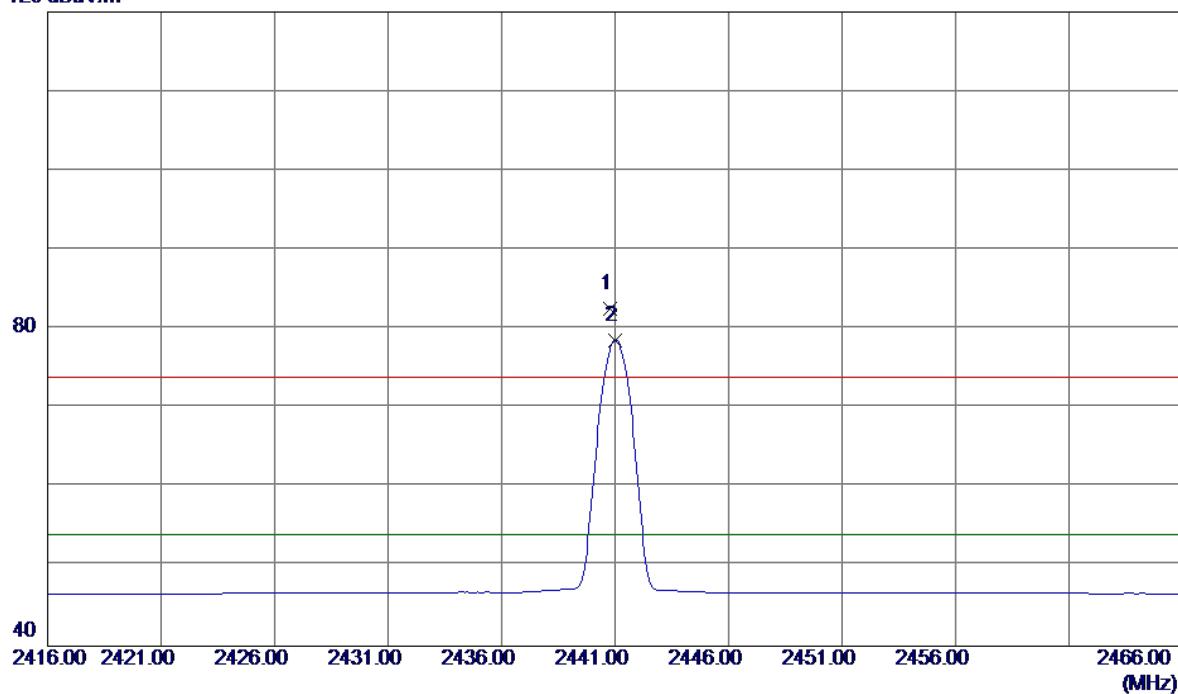


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	7322.8060	38.21	13.22	51.43	54.00	-2.57	AVG	
2	7323.4180	44.64	13.22	57.86	74.00	-16.14	Peak	

Test Mode : TX 2441MHz \_CH39\_1Mbps

## Horizontal

120 dBuV/m

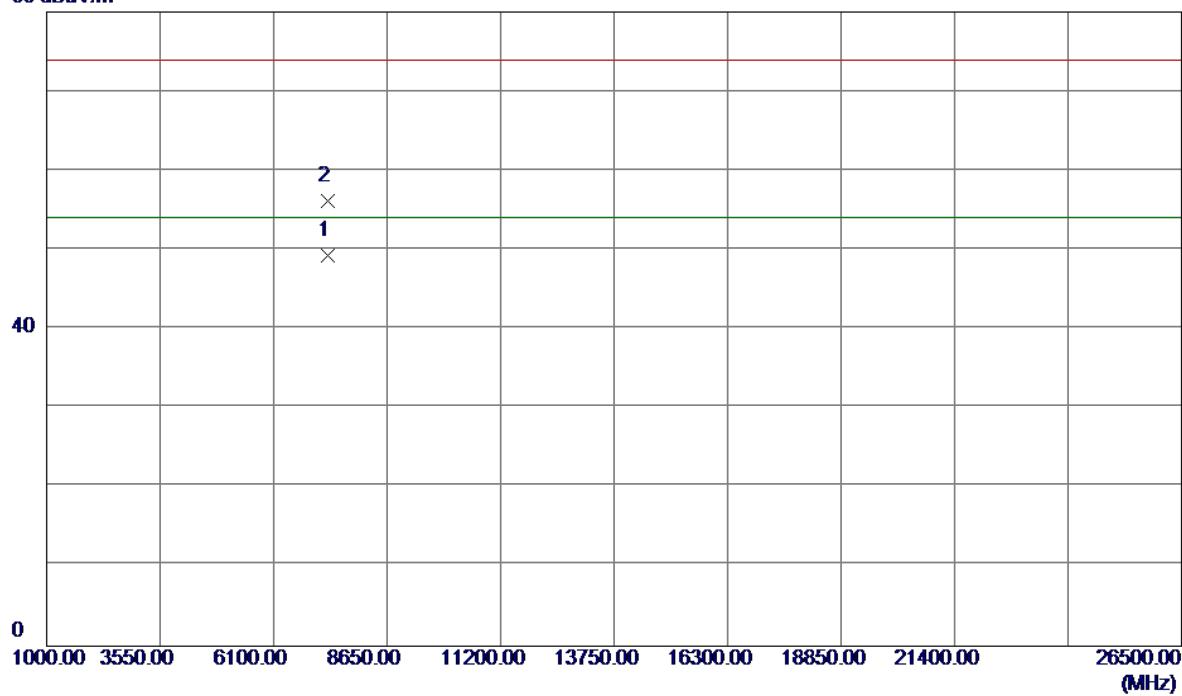


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	2440.8000	49.70	32.89	82.59	74.00	8.59	Peak	No Limit
2 *	2441.0000	45.73	32.89	78.62	54.00	24.62	AVG	No Limit

Test Mode : TX 2441MHz \_CH39\_1Mbps

## Horizontal

80 dBuV/m

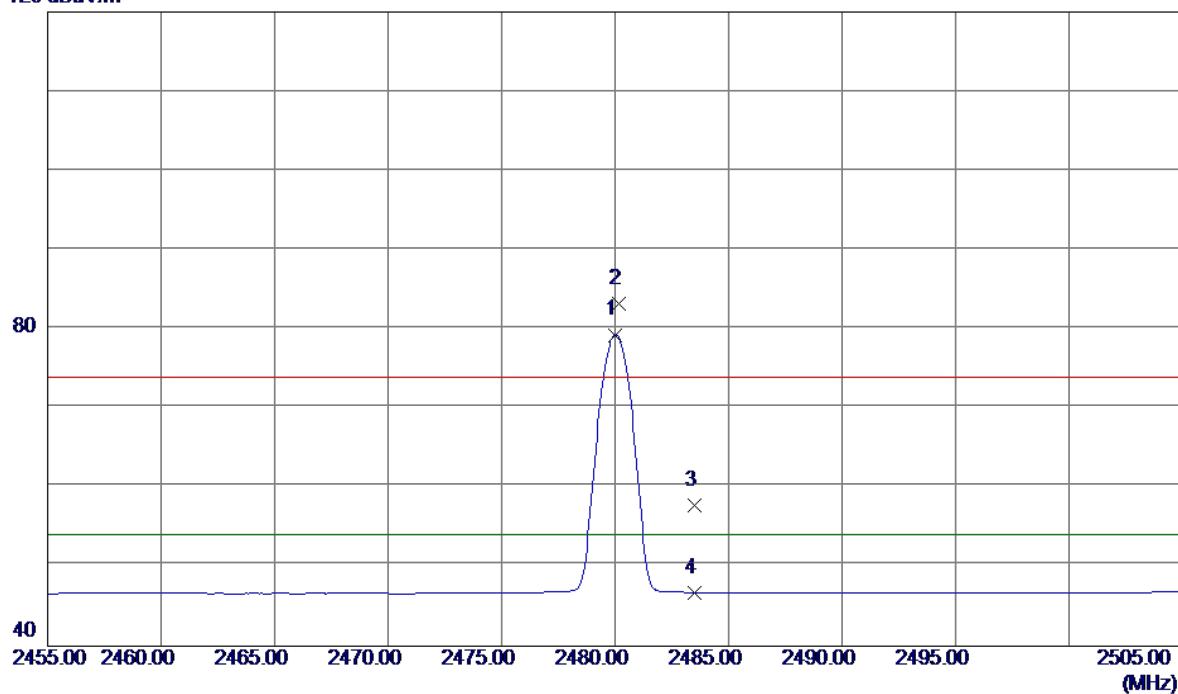


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	7323.0280	36.06	13.22	49.28	54.00	-4.72	AVG	
2	7323.5060	42.92	13.22	56.14	74.00	-17.86	Peak	

Test Mode : TX 2480MHz \_CH78\_1Mbps

## Vertical

120 dBuV/m

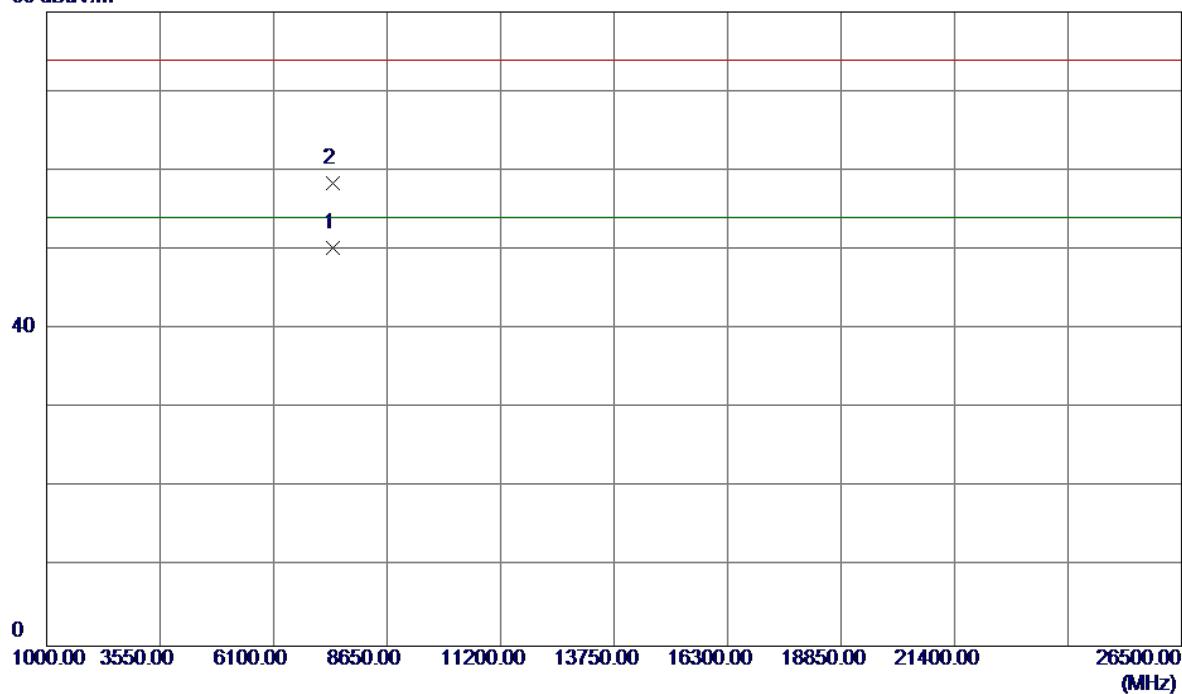


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	2480.0000	46.24	33.04	79.28	54.00	25.28	AVG	No Limit
2	2480.1500	50.09	33.04	83.13	74.00	9.13	Peak	No Limit
3	2483.5000	24.69	33.05	57.74	74.00	-16.26	Peak	
4	2483.5000	13.69	33.05	46.74	54.00	-7.26	AVG	

Test Mode : TX 2480MHz \_CH78\_1Mbps

## Vertical

80 dBuV/m

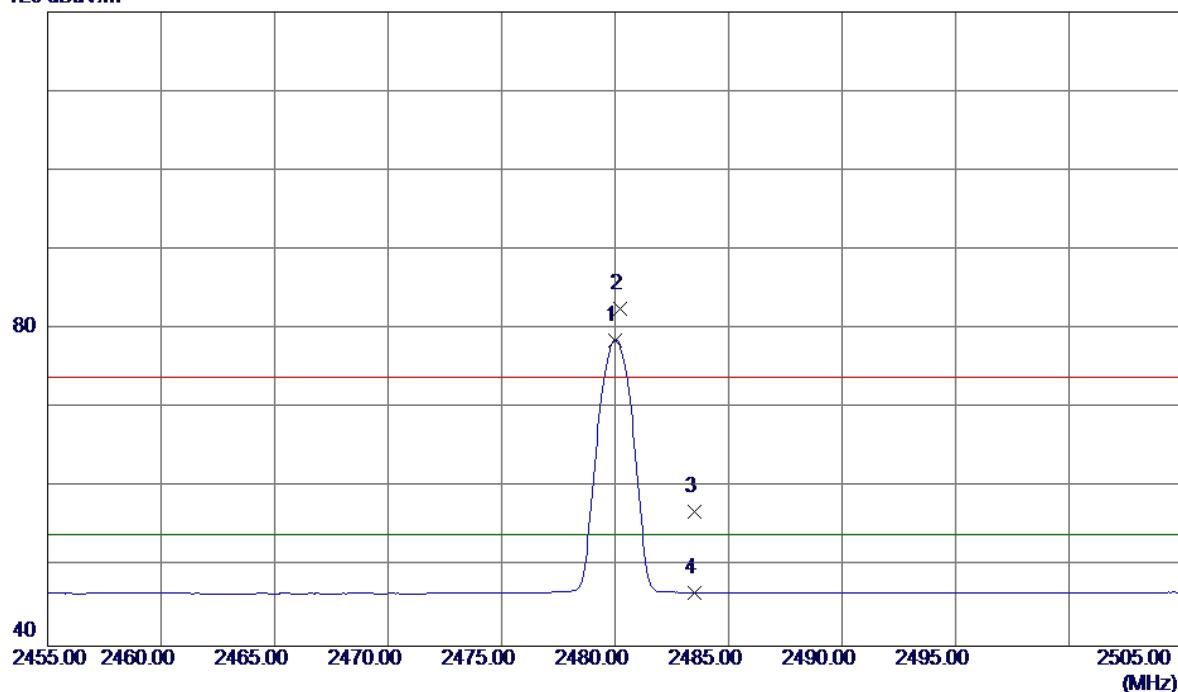


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	7439.9840	36.93	13.31	50.24	54.00	-3.76	AVG	
2	7440.3960	45.07	13.31	58.38	74.00	-15.62	Peak	

Test Mode : TX 2480MHz \_CH78\_1Mbps

## Horizontal

120 dBuV/m

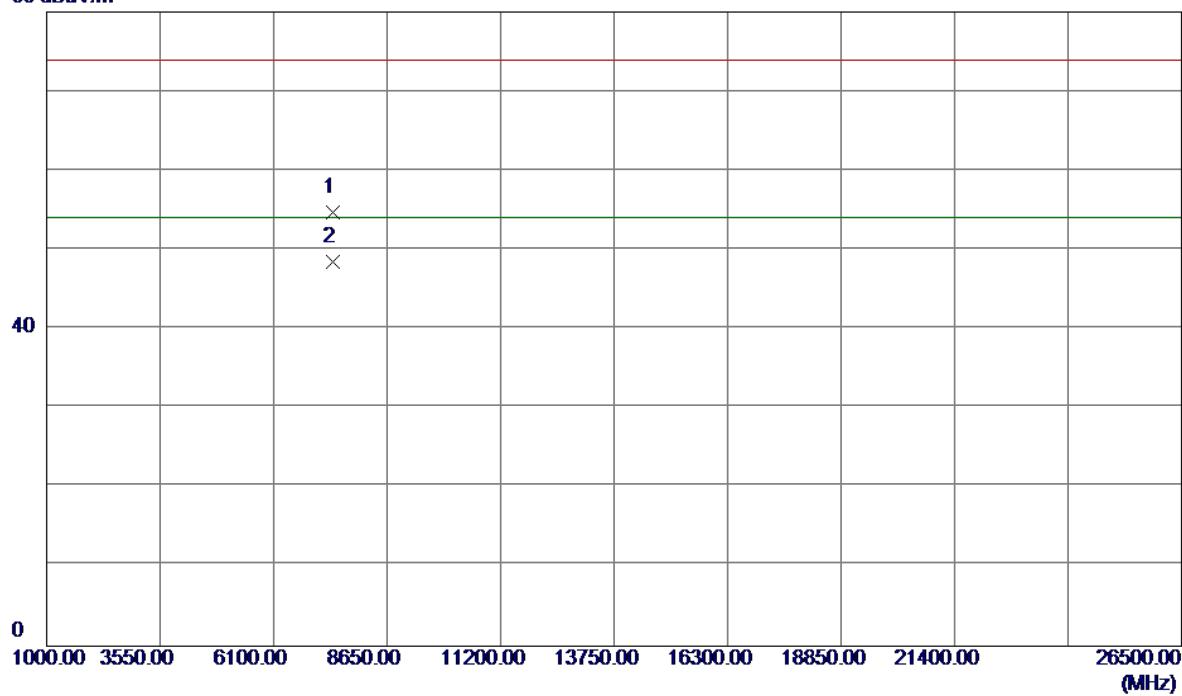


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	2480.0000	45.58	33.04	78.62	54.00	24.62	Avg	No Limit
2	2480.2000	49.55	33.04	82.59	74.00	8.59	Peak	No Limit
3	2483.5000	23.96	33.05	57.01	74.00	-16.99	Peak	
4	2483.5000	13.67	33.05	46.72	54.00	-7.28	Avg	

Test Mode : TX 2480MHz \_CH78\_1Mbps

## Horizontal

80 dBuV/m

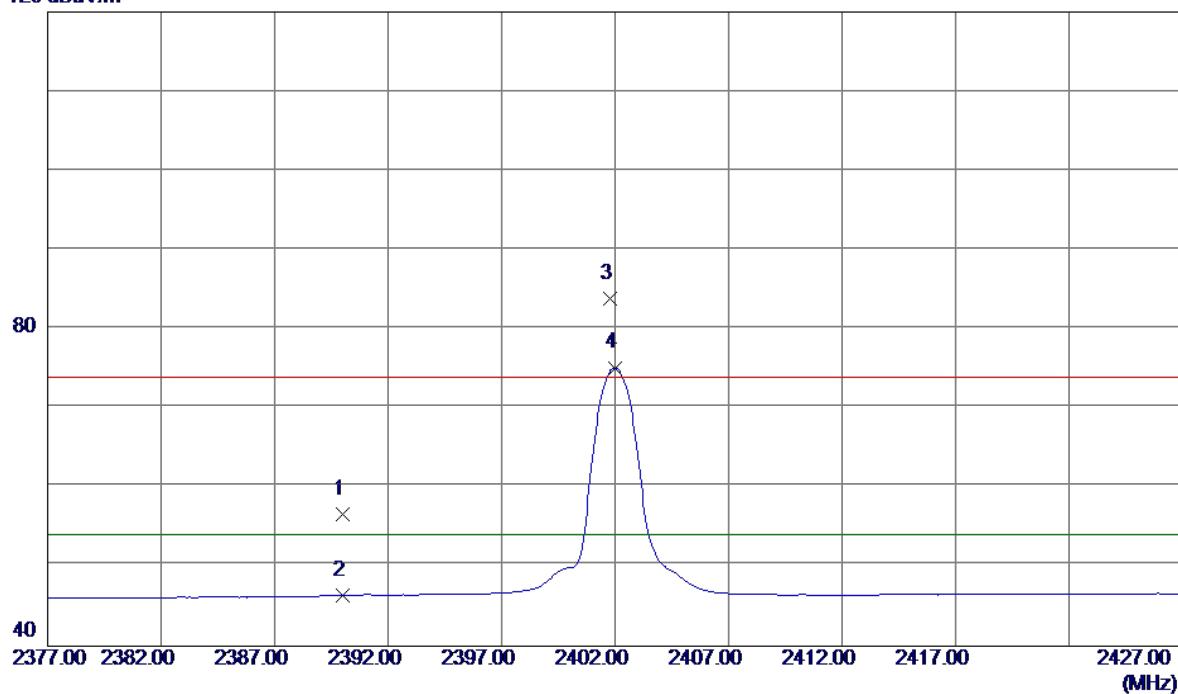


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	7439.3460	41.39	13.31	54.70	74.00	-19.30	Peak	
2 *	7440.0080	35.10	13.31	48.41	54.00	-5.59	AVG	

Test Mode : TX 2402MHz \_CH00\_3Mbps

## Vertical

120 dBuV/m

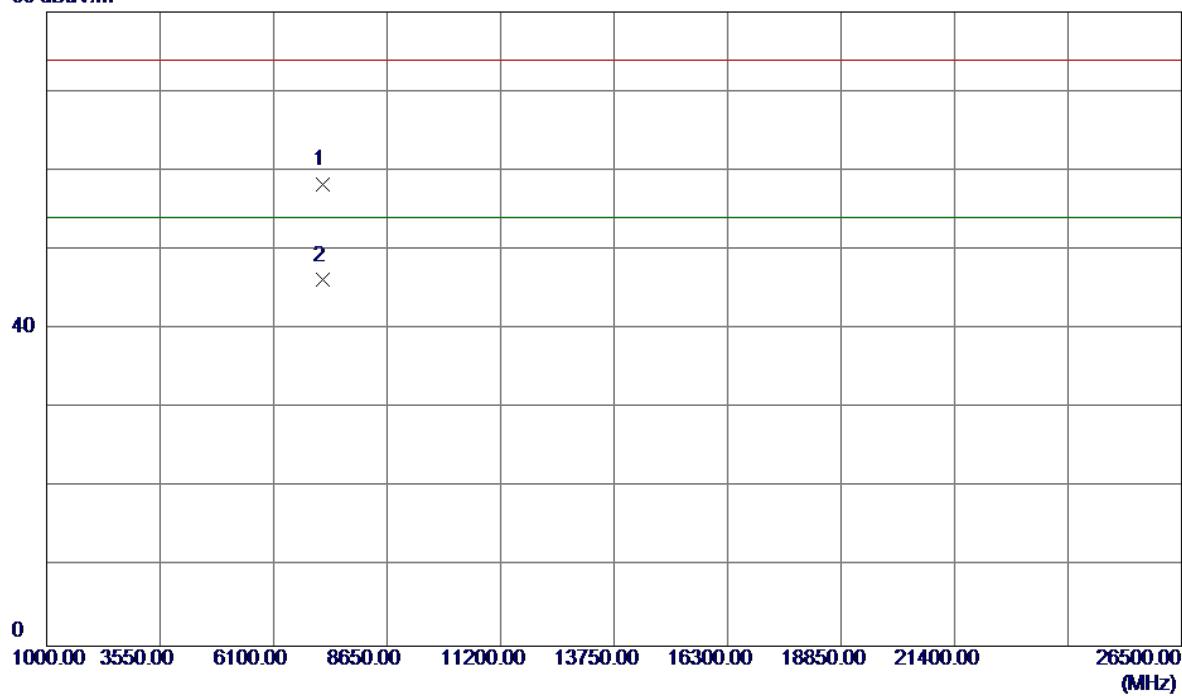


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	2390.0000	23.97	32.70	56.67	74.00	-17.33	Peak	
2	2390.0000	13.74	32.70	46.44	54.00	-7.56	AVG	
3	2401.8000	51.16	32.75	83.91	74.00	9.91	Peak	No Limit
4 *	2402.0000	42.37	32.75	75.12	54.00	21.12	AVG	No Limit

Test Mode : TX 2402MHz \_CH00\_3Mbps

## Vertical

80 dBuV/m

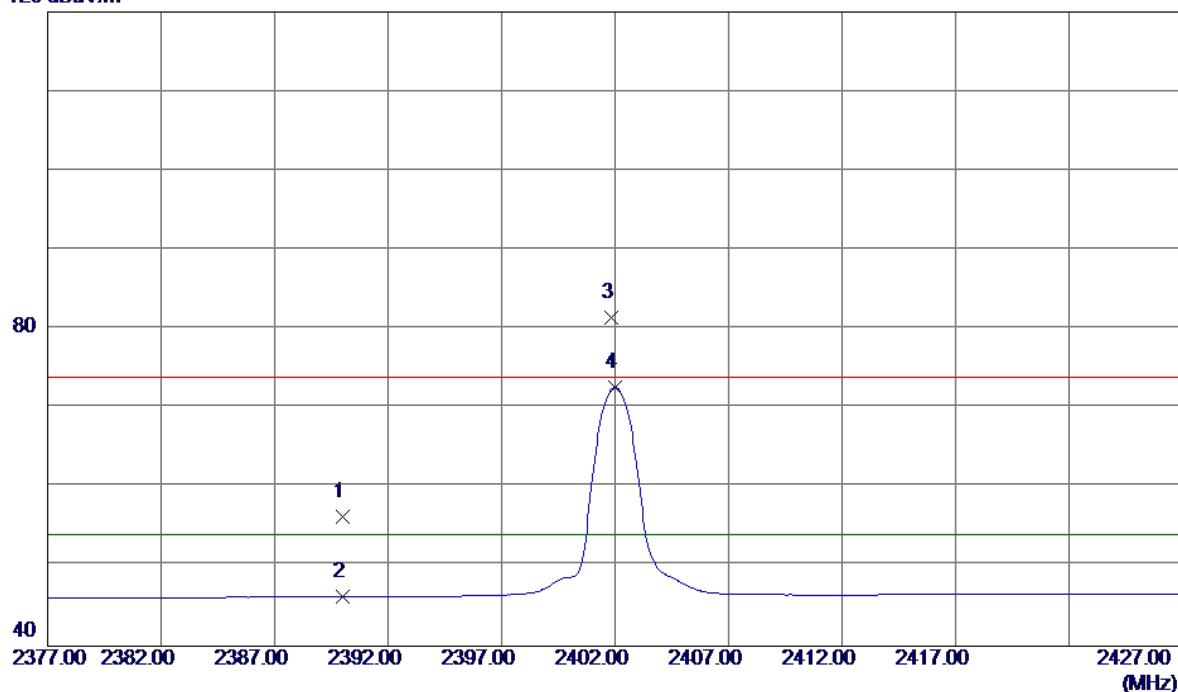


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	7205.4020	45.15	13.13	58.28	74.00	-15.72	Peak	
2 *	7205.7740	33.03	13.13	46.16	54.00	-7.84	AVG	

Test Mode : TX 2402MHz \_CH00\_3Mbps

## Horizontal

120 dBuV/m

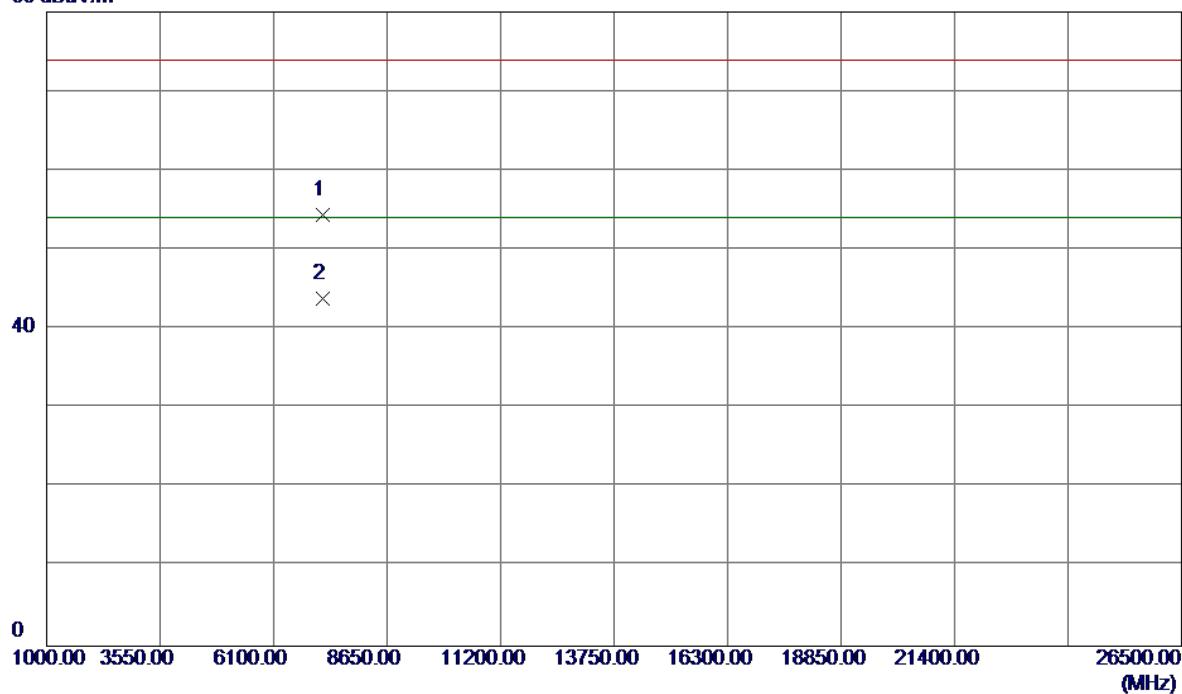


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	2390.0000	23.66	32.70	56.36	74.00	-17.64	Peak	
2	2390.0000	13.53	32.70	46.23	54.00	-7.77	AVG	
3	2401.8500	48.74	32.75	81.49	74.00	7.49	Peak	No Limit
4 *	2402.0000	39.84	32.75	72.59	54.00	18.59	AVG	No Limit

Test Mode : TX 2402MHz \_CH00\_3Mbps

## Horizontal

80 dBuV/m

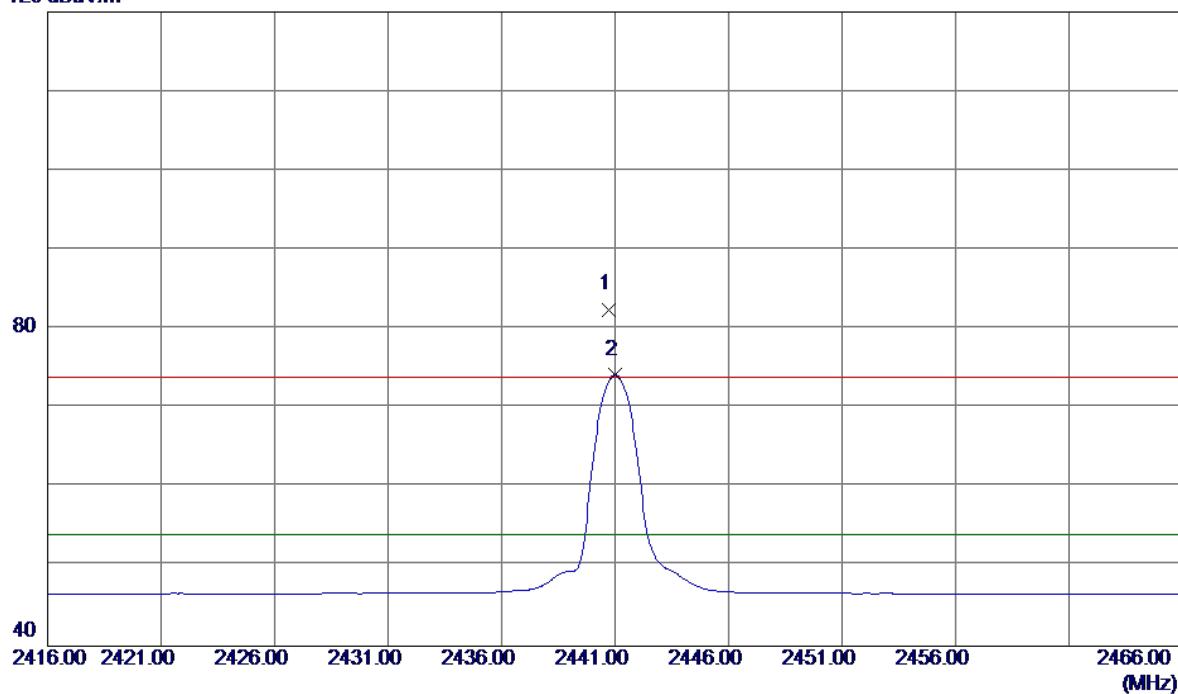


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	7205.2660	41.21	13.13	54.34	74.00	-19.66	Peak	
2 *	7205.5800	30.67	13.13	43.80	54.00	-10.20	AVG	

Test Mode : TX 2441MHz \_CH39\_3Mbps

Vertical

120 dBuV/m

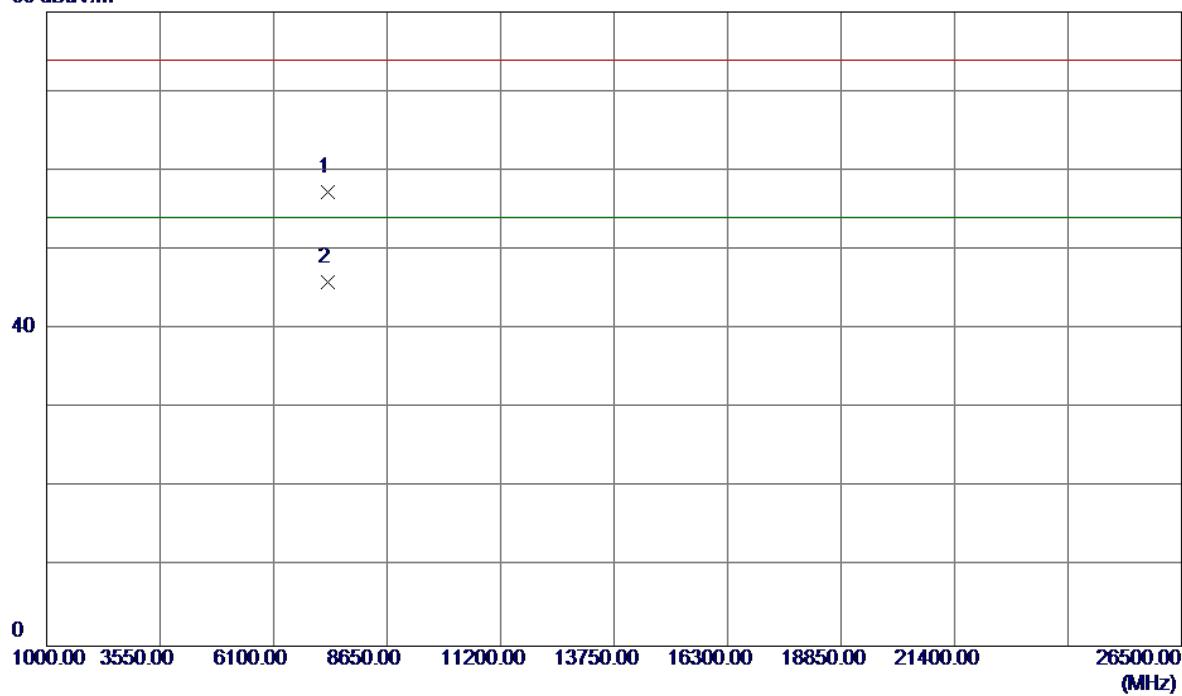


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	2440.7000	49.59	32.89	82.48	74.00	8.48	Peak	No Limit
2 *	2441.0000	41.31	32.89	74.20	54.00	20.20	AVG	No Limit

Test Mode : TX 2441MHz \_CH39\_3Mbps

## Vertical

80 dBuV/m

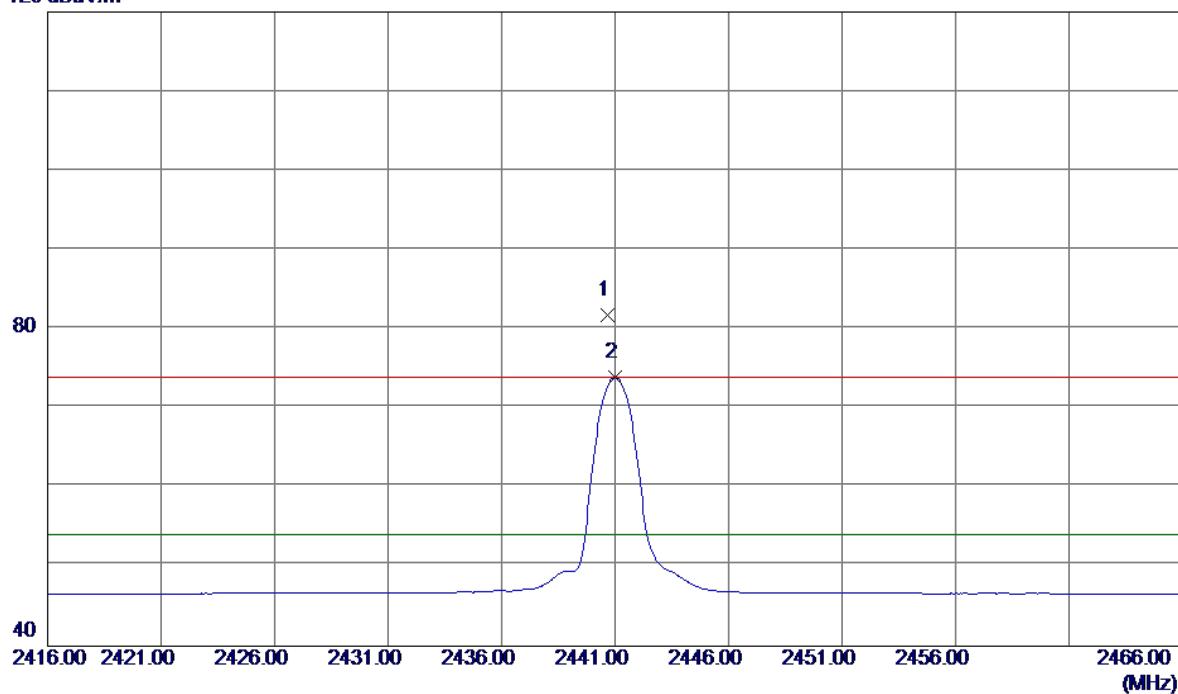


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	7322.5040	44.06	13.22	57.28	74.00	-16.72	Peak	
2 *	7322.5160	32.77	13.22	45.99	54.00	-8.01	AVG	

Test Mode : TX 2441MHz \_CH39\_3Mbps

## Horizontal

120 dBuV/m

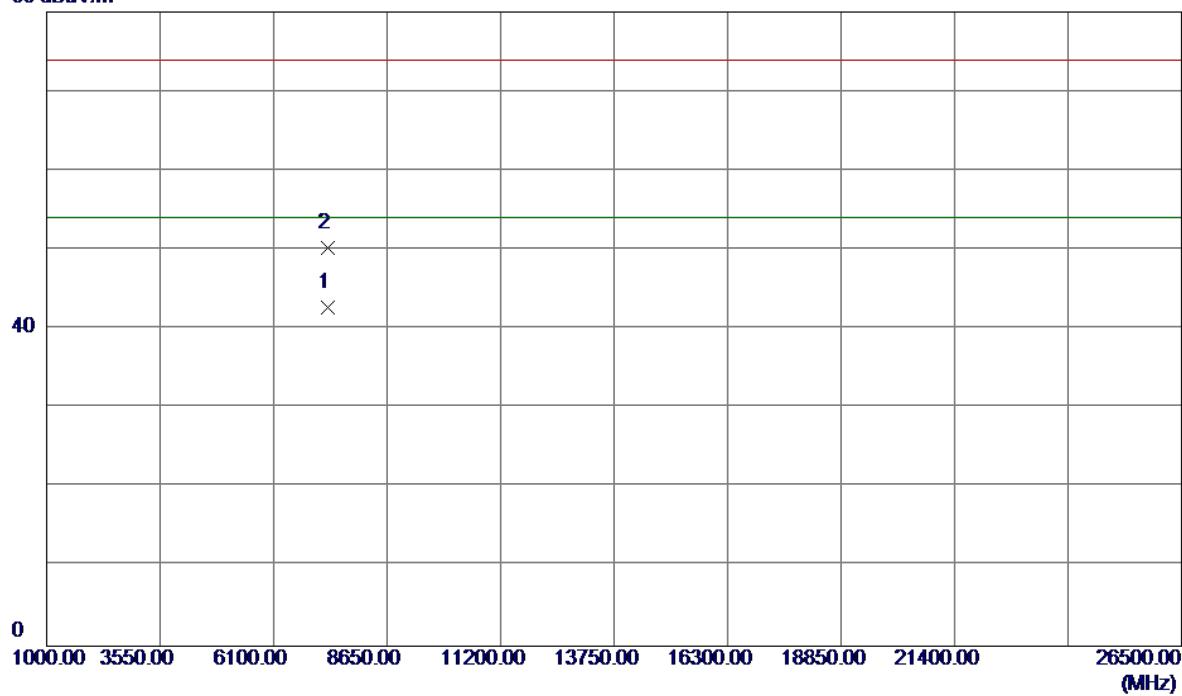


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	2440.6500	48.91	32.89	81.80	74.00	7.80	Peak	No Limit
2 *	2441.0000	41.00	32.89	73.89	54.00	19.89	AVG	No Limit

Test Mode : TX 2441MHz \_CH39\_3Mbps

## Horizontal

80 dBuV/m

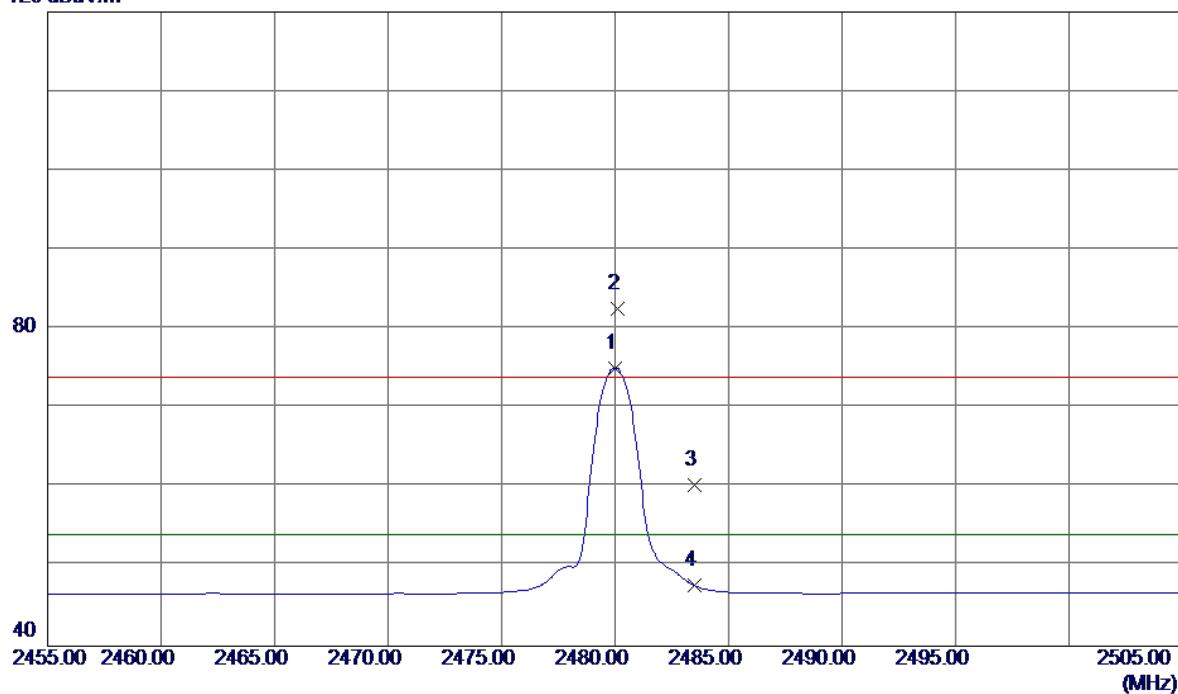


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dB	Margin Detector	Comment
1 *	7322.7860	29.54	13.22	42.76	54.00	-11.24	AVG
2	7322.8140	37.01	13.22	50.23	74.00	-23.77	Peak

Test Mode : TX 2480MHz \_CH78\_3Mbps

## Vertical

120 dBuV/m

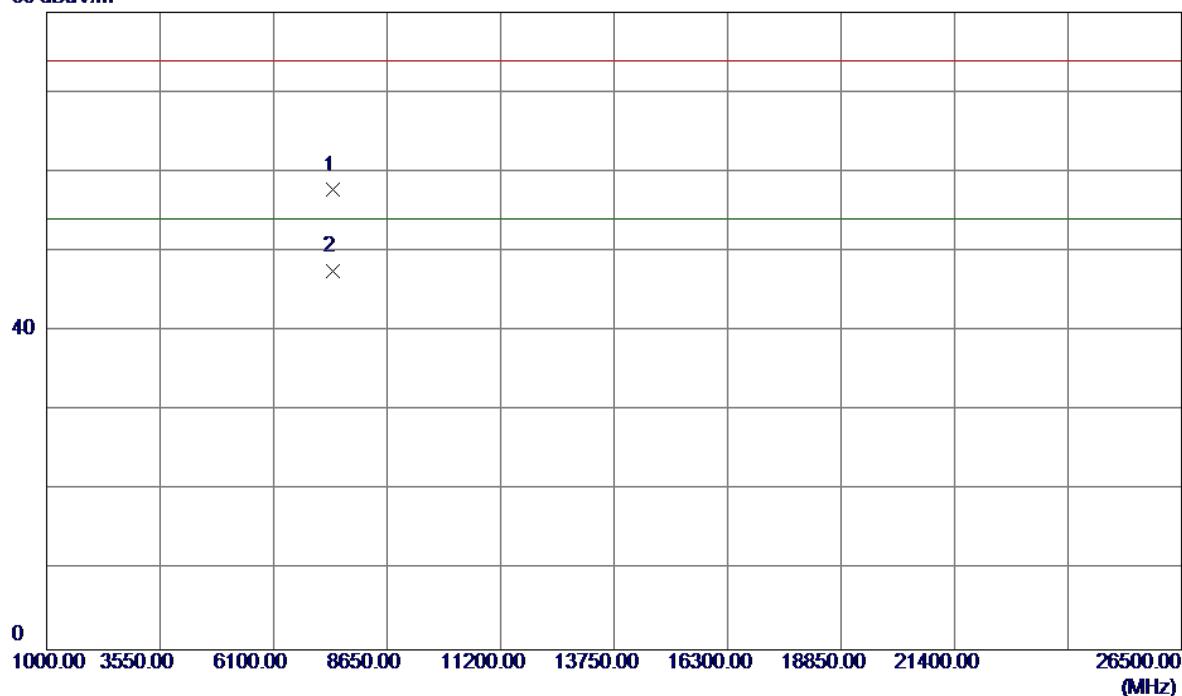


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	2480. 0000	42. 06	33. 04	75. 10	54. 00	21. 10	AVG	No Limit
2	2480. 1000	49. 46	33. 04	82. 50	74. 00	8. 50	Peak	No Limit
3	2483. 5000	27. 20	33. 05	60. 25	74. 00	-13. 75	Peak	
4	2483. 5000	14. 59	33. 05	47. 64	54. 00	-6. 36	AVG	

Test Mode : TX 2480MHz \_CH78\_3Mbps

Vertical

80 dBuV/m

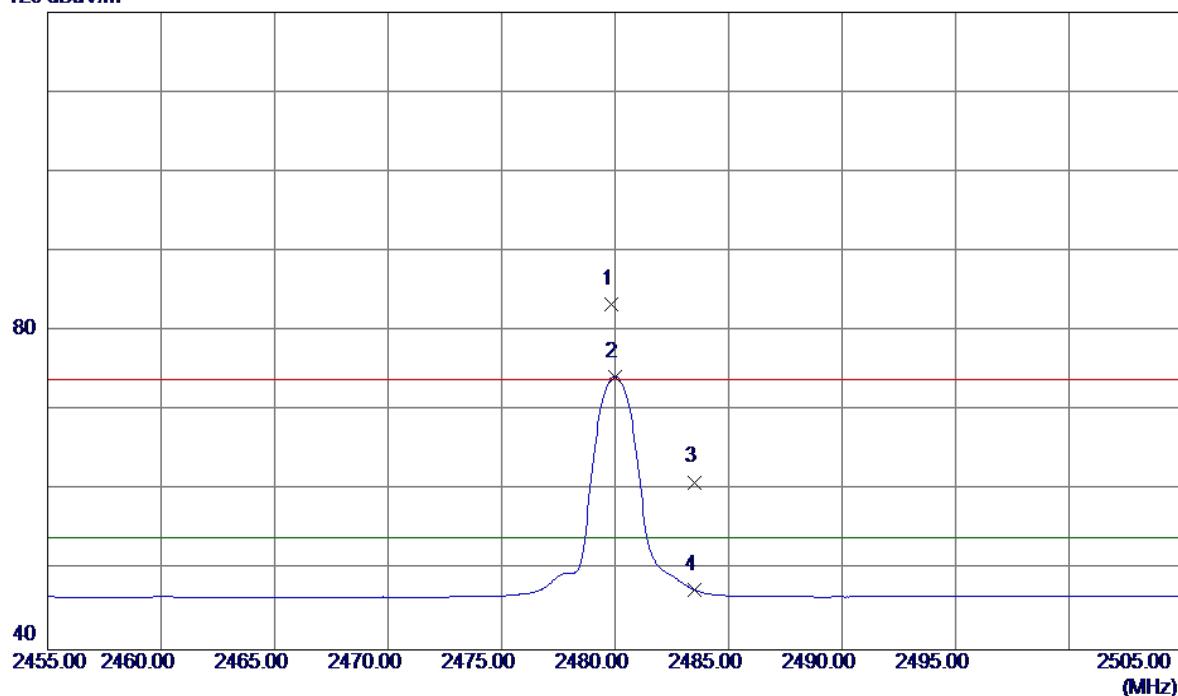


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	7439.3740	44.37	13.31	57.68	74.00	-16.32	Peak	
2 *	7439.8620	34.21	13.31	47.52	54.00	-6.48	AVG	

Test Mode : TX 2480MHz \_CH78\_3Mbps

## Horizontal

120 dBuV/m

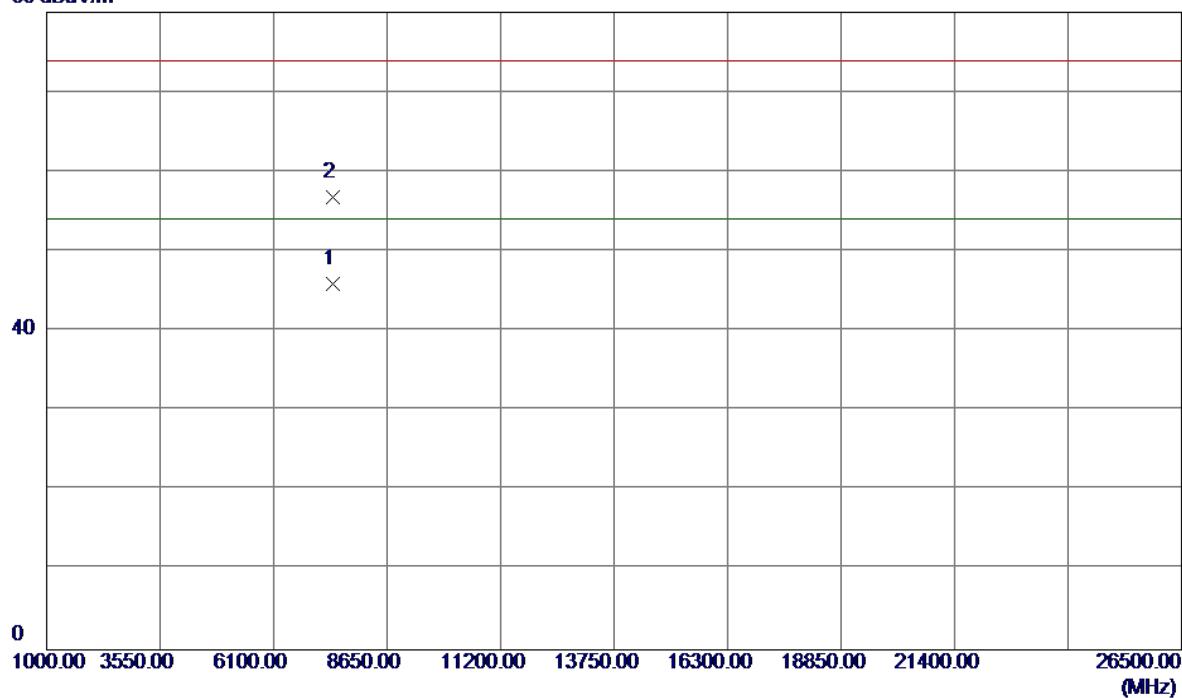


No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	2479.8500	50.29	33.04	83.33	74.00	9.33	Peak	No Limit
2 *	2480.0000	41.26	33.04	74.30	54.00	20.30	AVG	No Limit
3	2483.5000	27.99	33.05	61.04	74.00	-12.96	Peak	
4	2483.5000	14.46	33.05	47.51	54.00	-6.49	AVG	

Test Mode : TX 2480MHz \_CH78\_3Mbps

**Horizontal**

80 dBuV/m



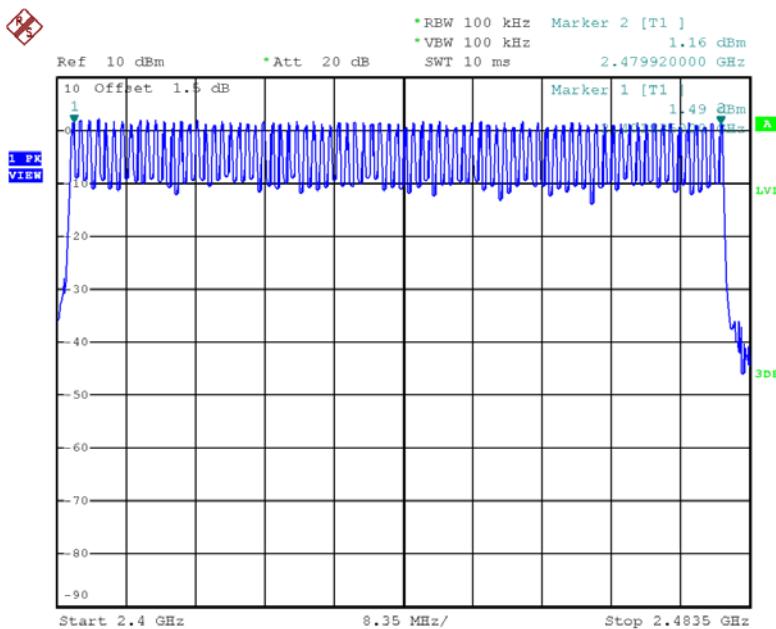
No.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1 *	7439.7180	32.67	13.31	45.98	54.00	-8.02	AVG	
2	7439.7400	43.50	13.31	56.81	74.00	-17.19	Peak	

## APPENDIX E - NUMBER OF HOPPING CHANNEL

**Test Mode****Hopping Mode\_1Mbps**

Number of Hopping Channel

79

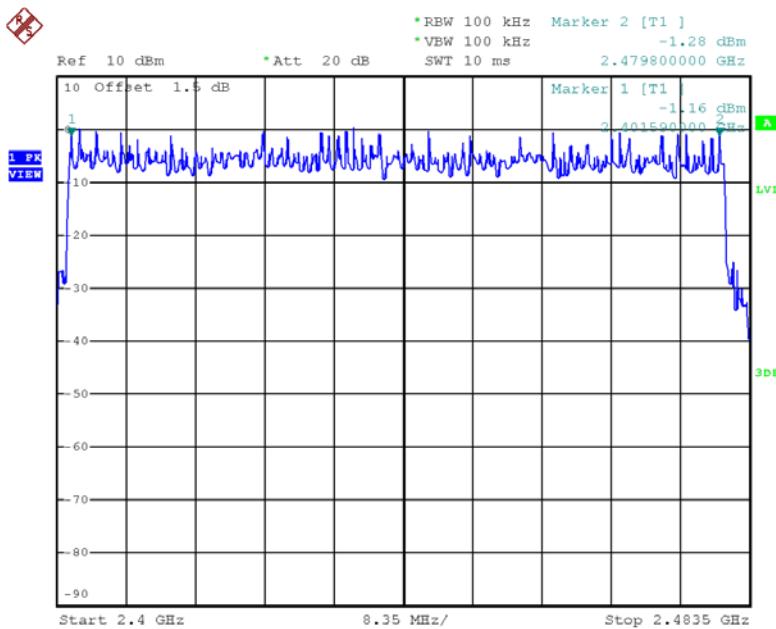


Date: 8.NOV.2017 11:05:35

**Test Mode****Hopping Mode\_3Mbps**

Number of Hopping Channel

79



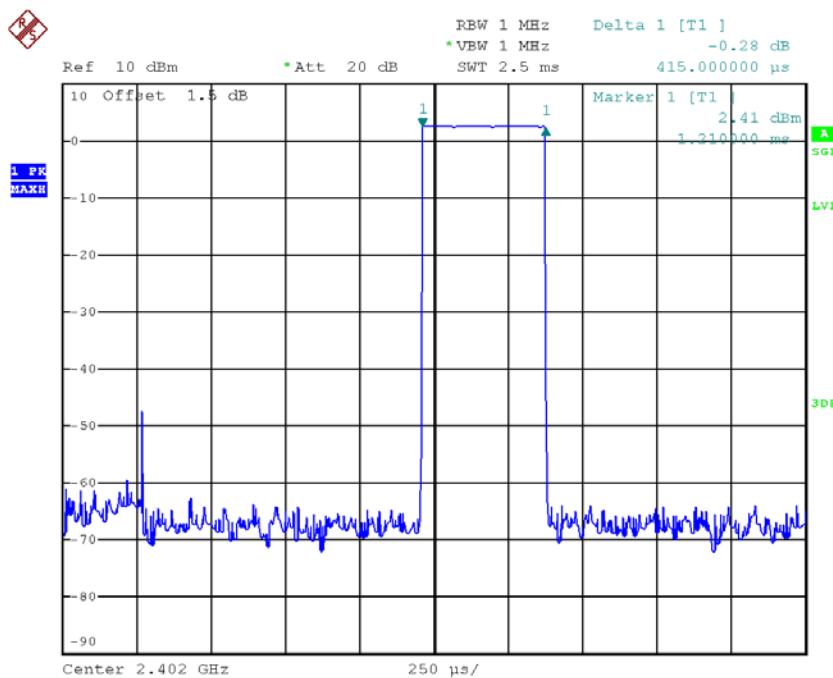
Date: 8.NOV.2017 11:21:21

## APPENDIX F - AVERAGE TIME OF OCCUPANCY

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

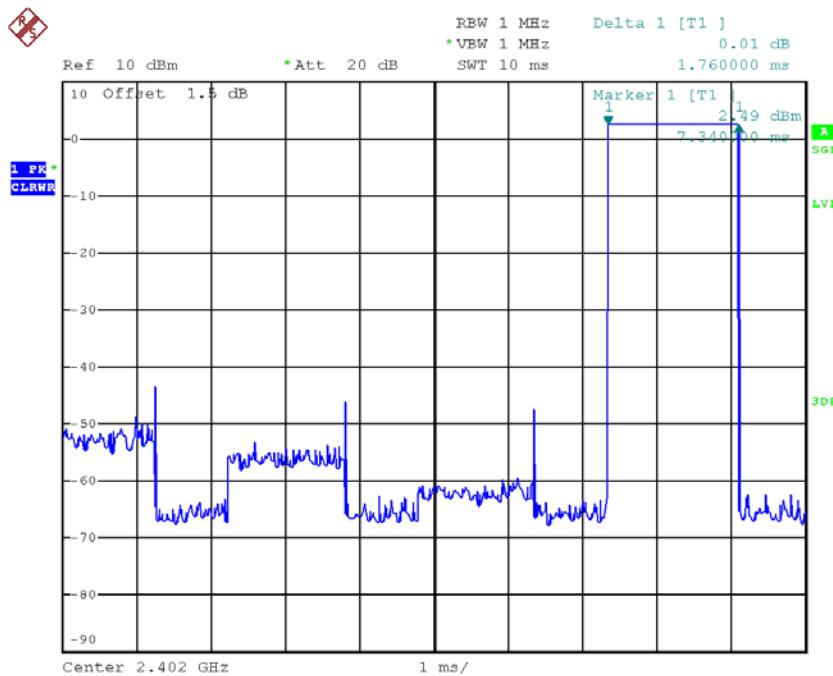
Data Packet	Frequency (MHz)	Pulse Duration (ms)	Dwell Time (s)	Limits (s)	Test Result
DH5	2402	2.7600	0.2944	0.4000	Pass
DH3	2402	1.7600	0.2816	0.4000	Pass
DH1	2402	0.4150	0.1328	0.4000	Pass
DH5	2441	2.8000	0.2987	0.4000	Pass
DH3	2441	1.6000	0.2560	0.4000	Pass
DH1	2441	0.4000	0.1280	0.4000	Pass
DH5	2480	2.7600	0.2944	0.4000	Pass
DH3	2480	1.6200	0.2592	0.4000	Pass
DH1	2480	0.4200	0.1344	0.4000	Pass

## CH00-DH1



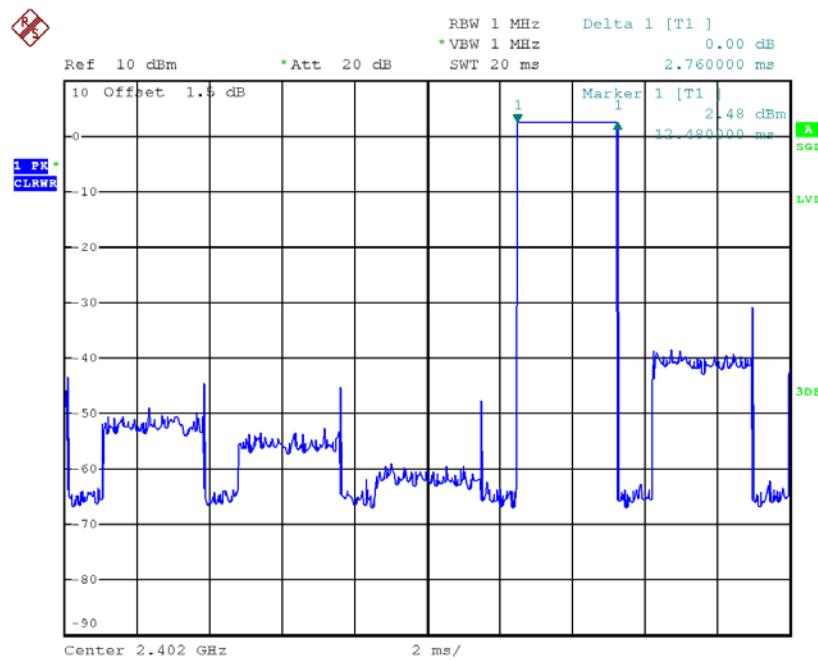
Date: 8.NOV.2017 10:59:15

## CH00-DH3



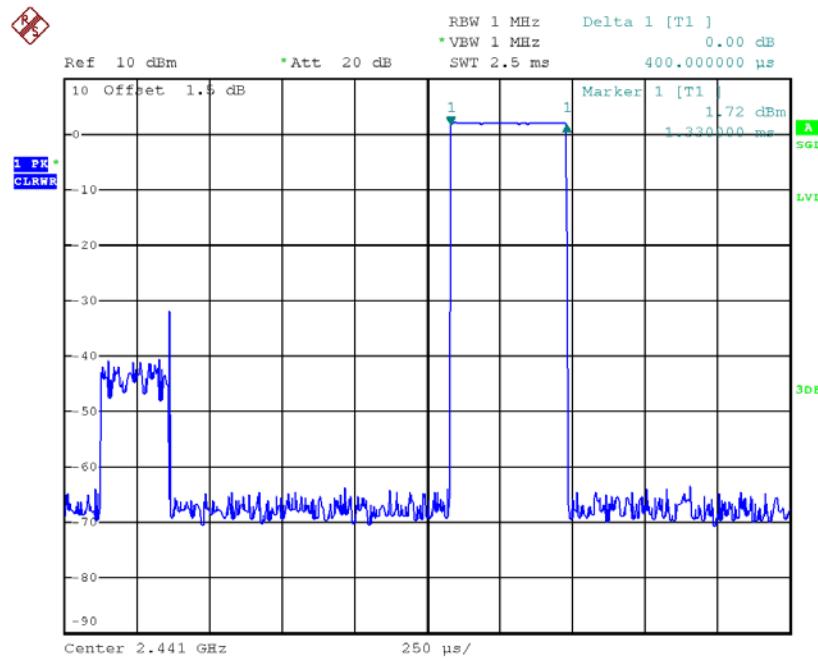
Date: 8.NOV.2017 11:07:39

## CH00-DH5



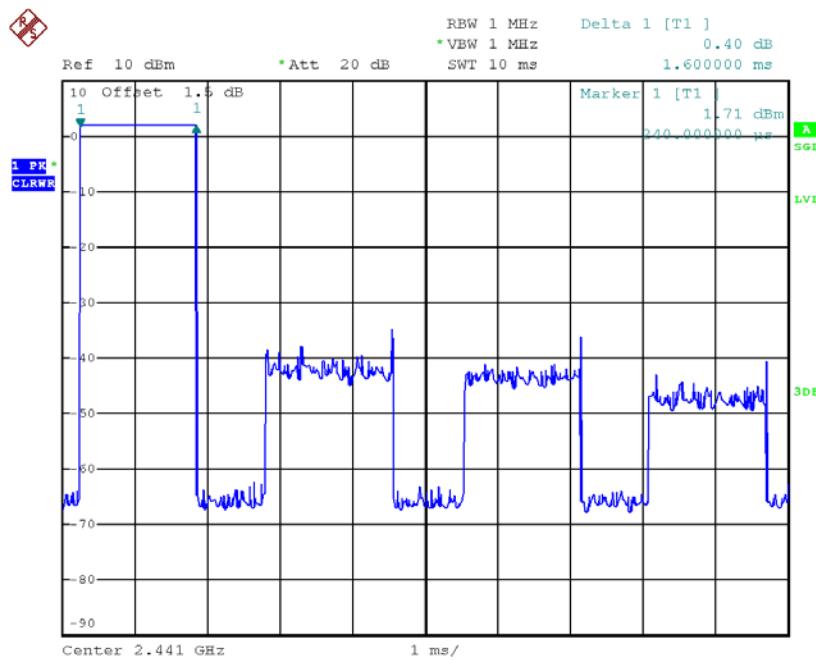
Date: 8.NOV.2017 11:08:05

## CH39-DH1



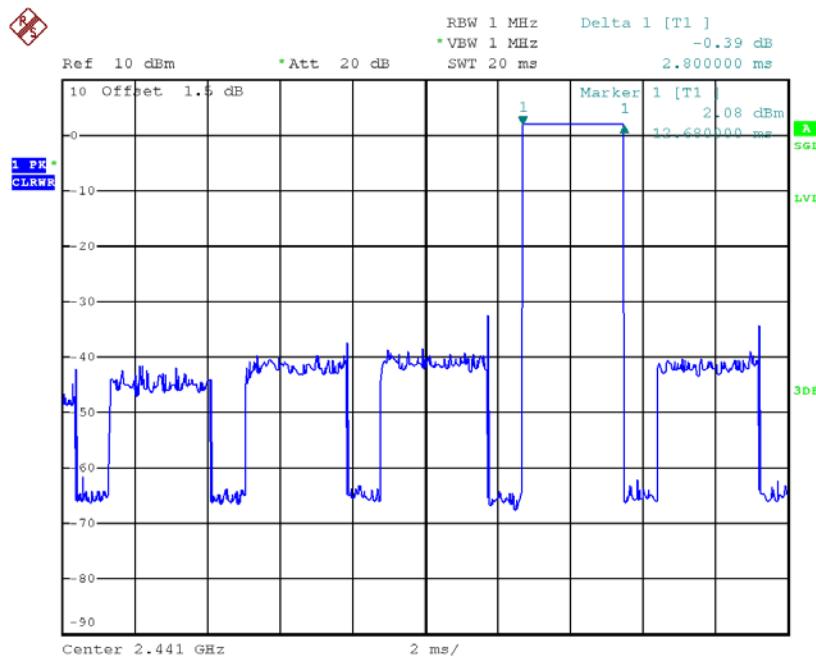
Date: 8.NOV.2017 11:00:03

## CH39-DH3



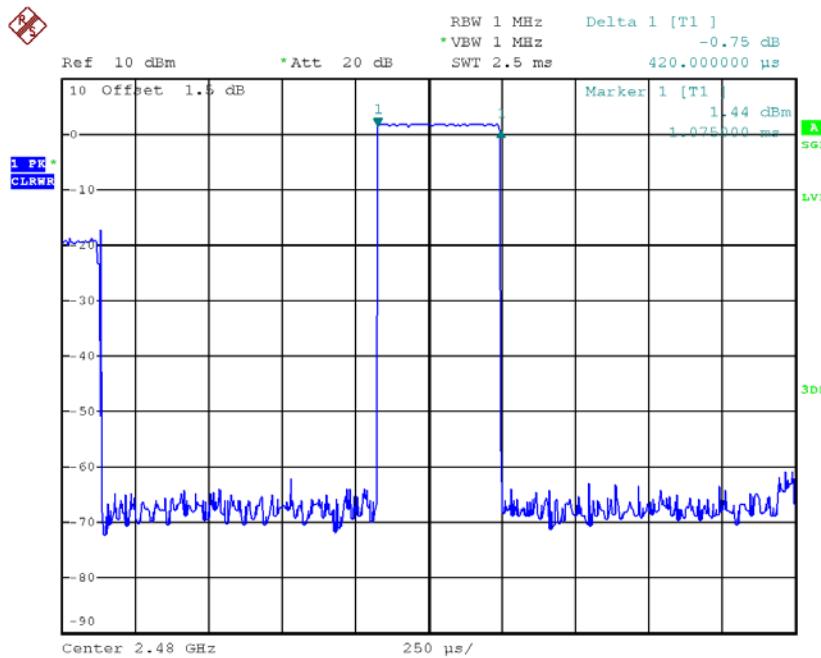
Date: 8.NOV.2017 11:07:03

## CH39-DH5



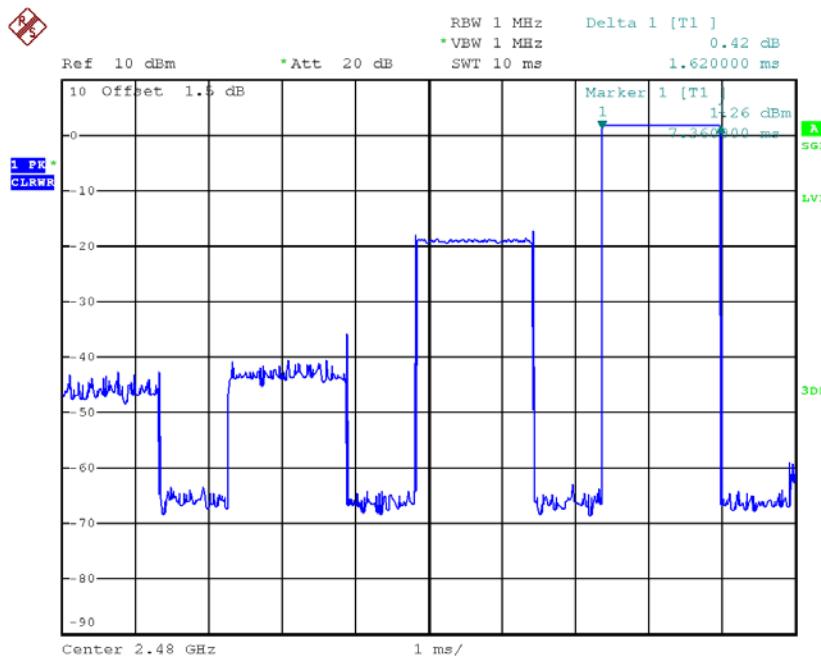
Date: 8.NOV.2017 11:08:09

## CH78-DH1



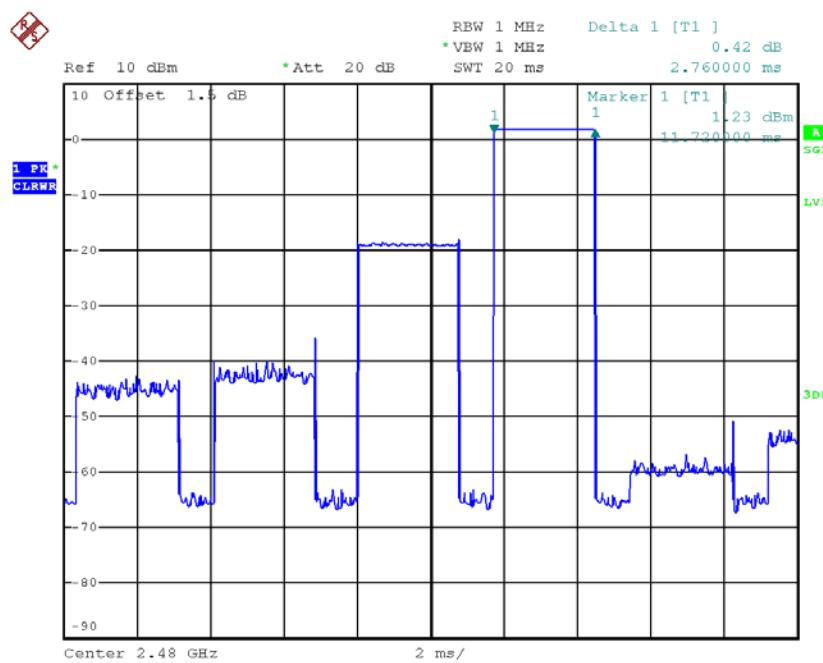
Date: 8.NOV.2017 11:00:35

## CH78-DH3



Date: 8.NOV.2017 11:07:44

## CH78-DH5

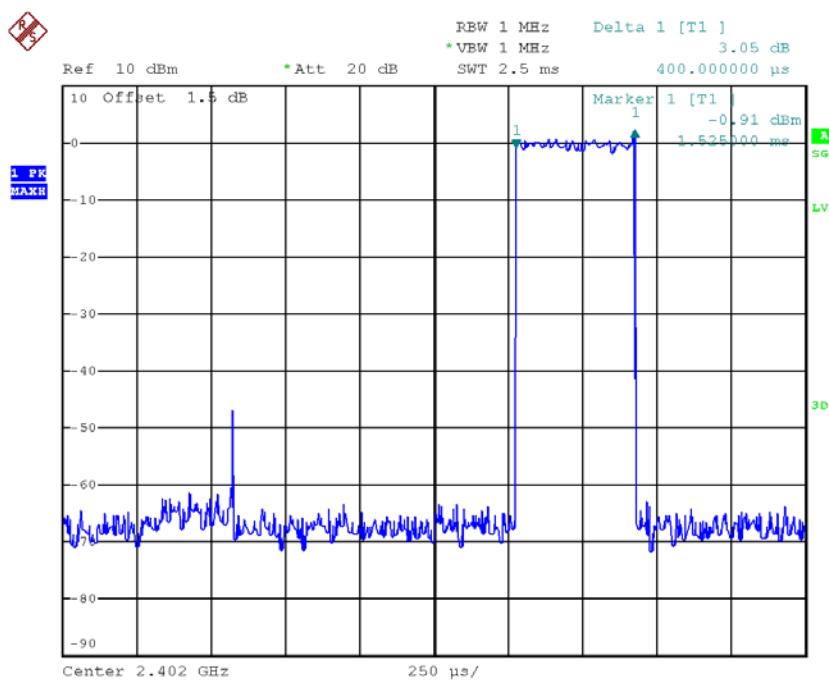


Date: 8.NOV.2017 11:08:33

Test Mode : TX Mode\_3Mbps

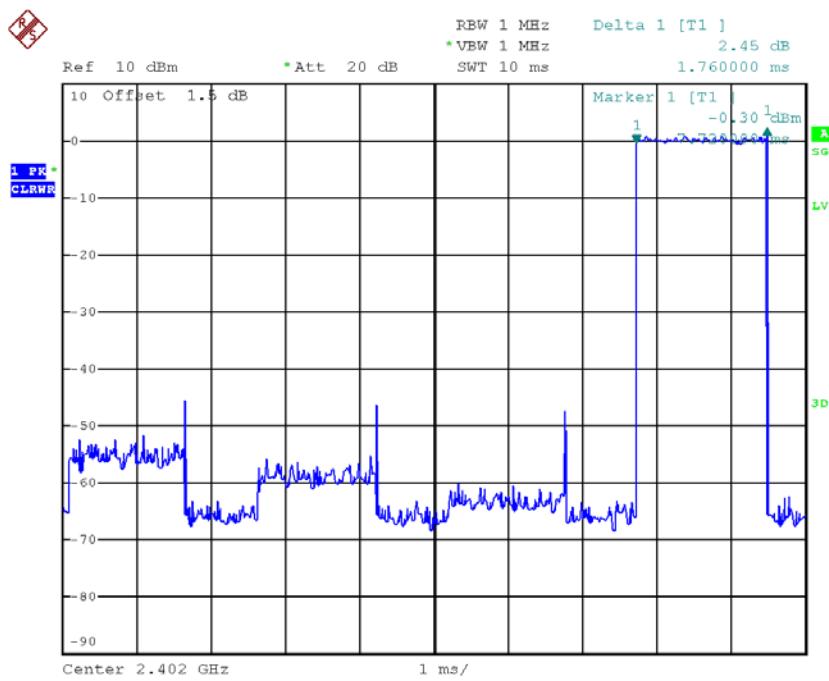
Data Packet	Frequency	Pulse Duration(ms)	Dwell Time(s)	Limits(s)	Test Result
DH5	2402	2.9600	0.3157	0.4000	Pass
DH3	2402	1.7600	0.2816	0.4000	Pass
DH1	2402	0.4000	0.1280	0.4000	Pass
DH5	2441	2.7200	0.2901	0.4000	Pass
DH3	2441	1.7600	0.2816	0.4000	Pass
DH1	2441	0.4150	0.1328	0.4000	Pass
DH5	2480	2.8000	0.2987	0.4000	Pass
DH3	2480	1.5800	0.2528	0.4000	Pass
DH1	2480	0.4200	0.1344	0.4000	Pass

## CH00-DH1



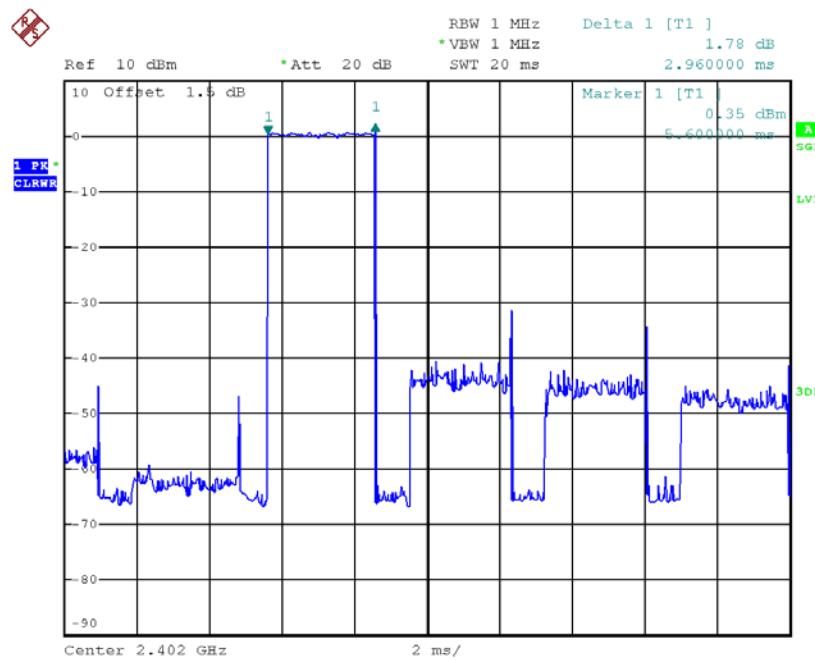
Date: 8.NOV.2017 11:12:39

## CH00-DH3



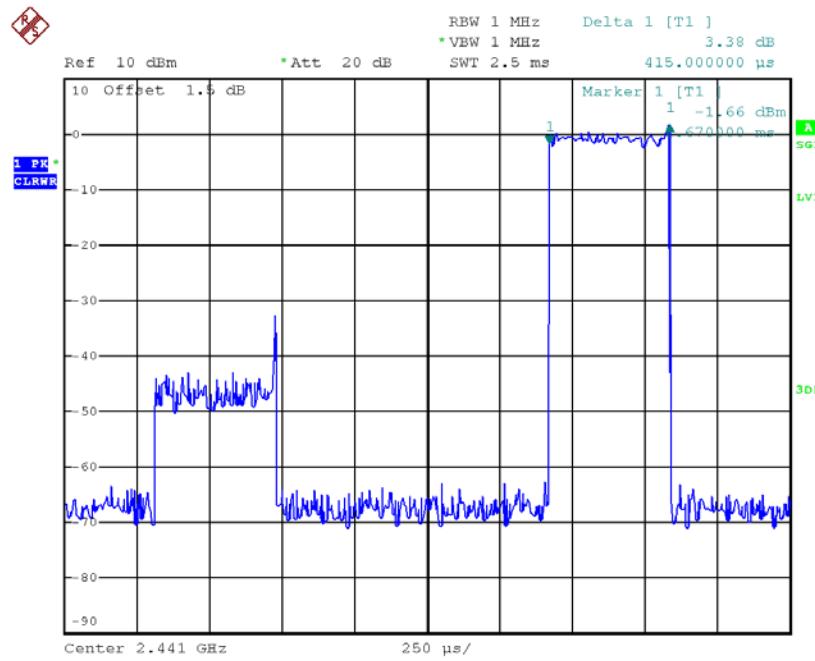
Date: 8.NOV.2017 11:30:20

## CH00-DH5



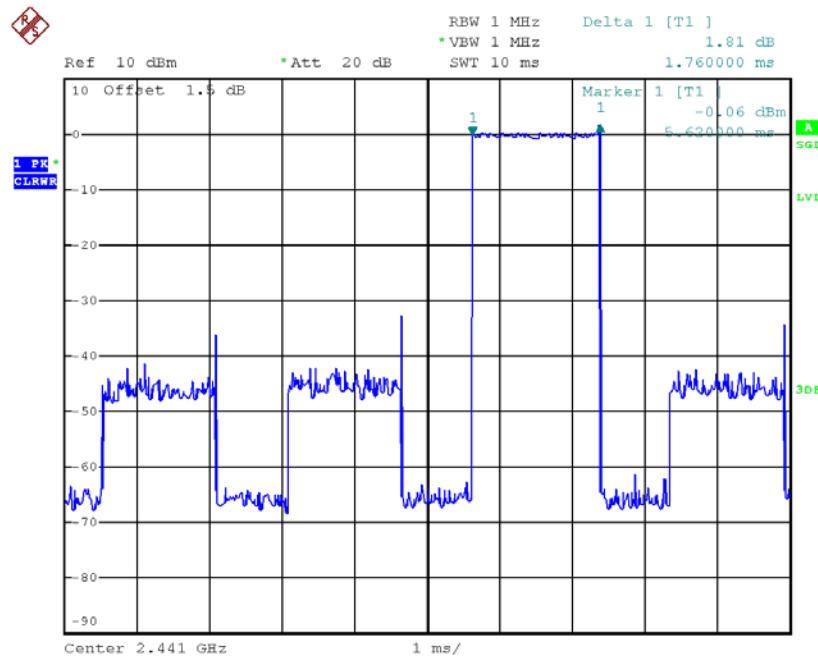
Date: 8.NOV.2017 11:30:40

## CH39-DH1



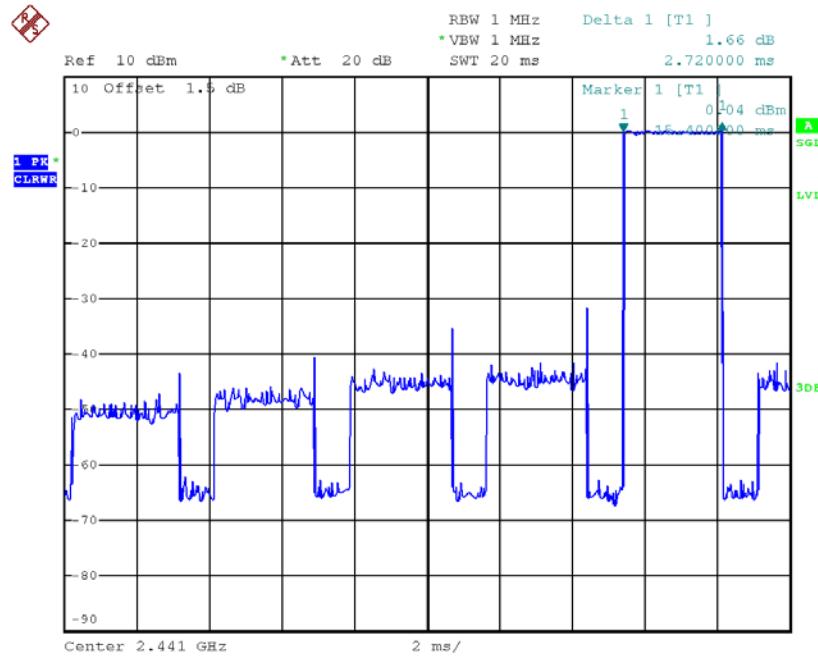
Date: 8.NOV.2017 11:13:45

## CH39-DH3



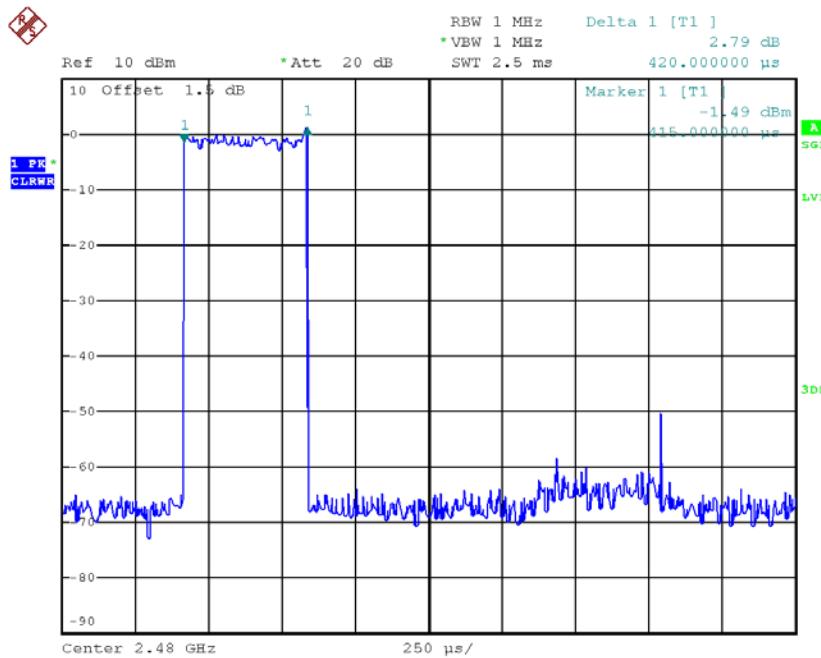
Date: 8.NOV.2017 11:30:03

## CH39-DH5



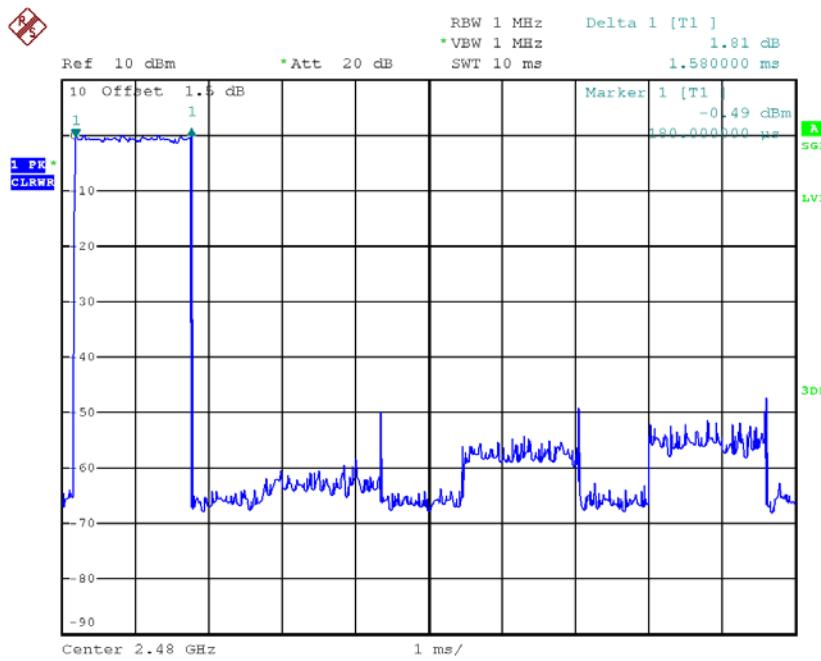
Date: 8.NOV.2017 11:31:16

## CH78-DH1



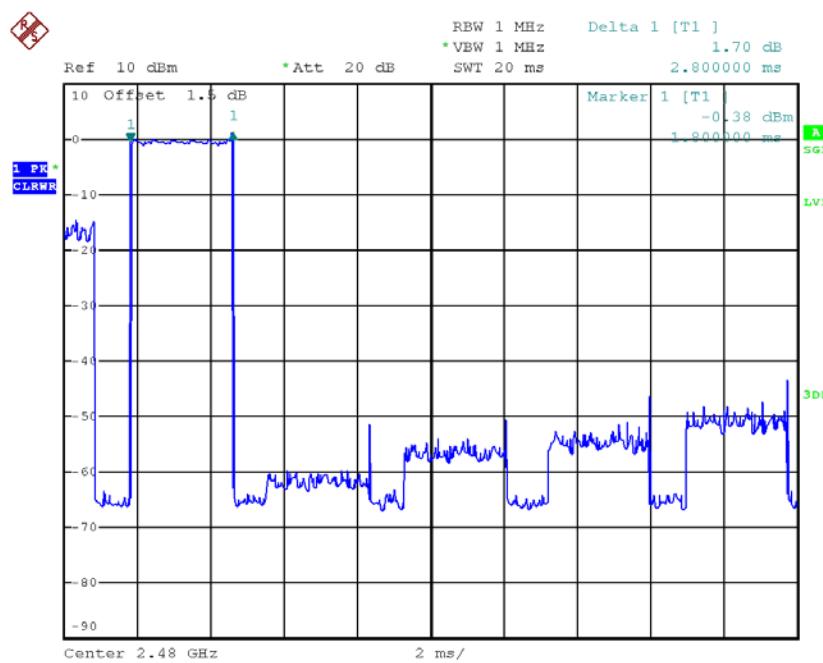
Date: 8.NOV.2017 11:13:15

## CH78-DH3



Date: 8.NOV.2017 11:30:24

## CH78-DH5

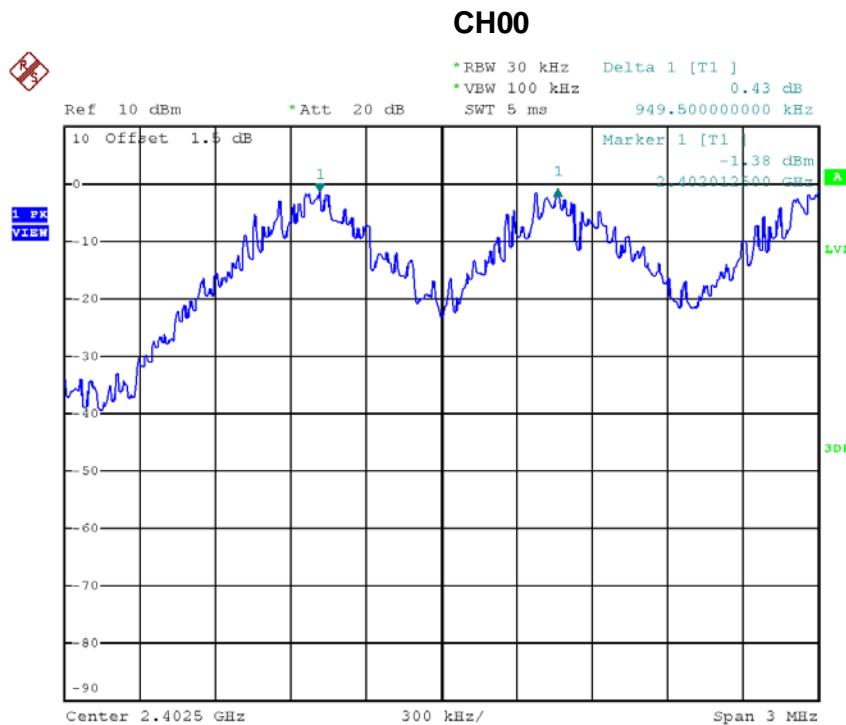


Date: 8.NOV.2017 11:30:47

## APPENDIX G - HOPPING CHANNEL SEPARATION MEASUREMENT

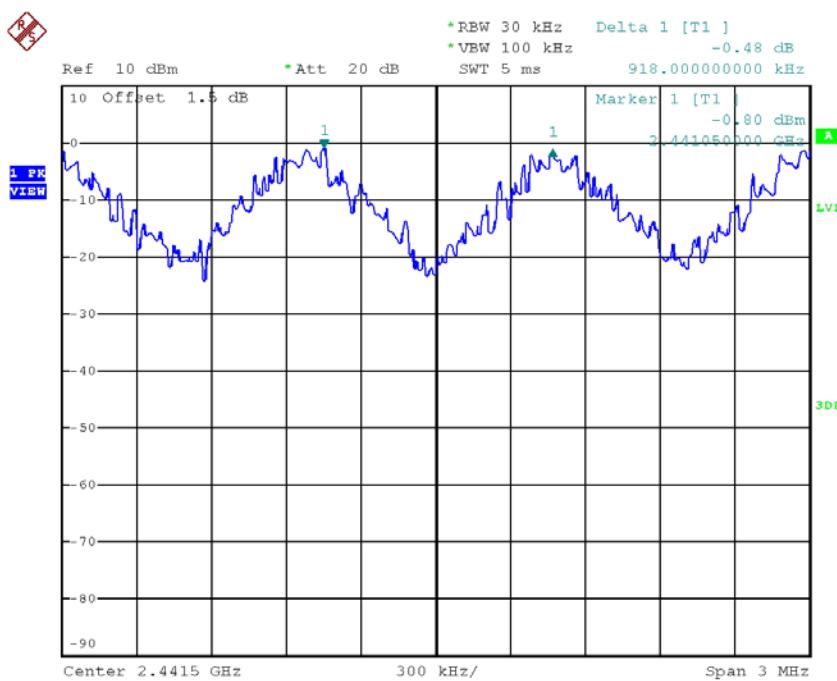
Test Mode : Hopping on \_1Mbps

Frequency (MHz)	Channel Separation (MHz)	2/3 of 20dB Bandwidth (MHz)	Test Result
2402	0.950	0.692	Pass
2441	0.918	0.728	Pass
2480	0.990	0.688	Pass



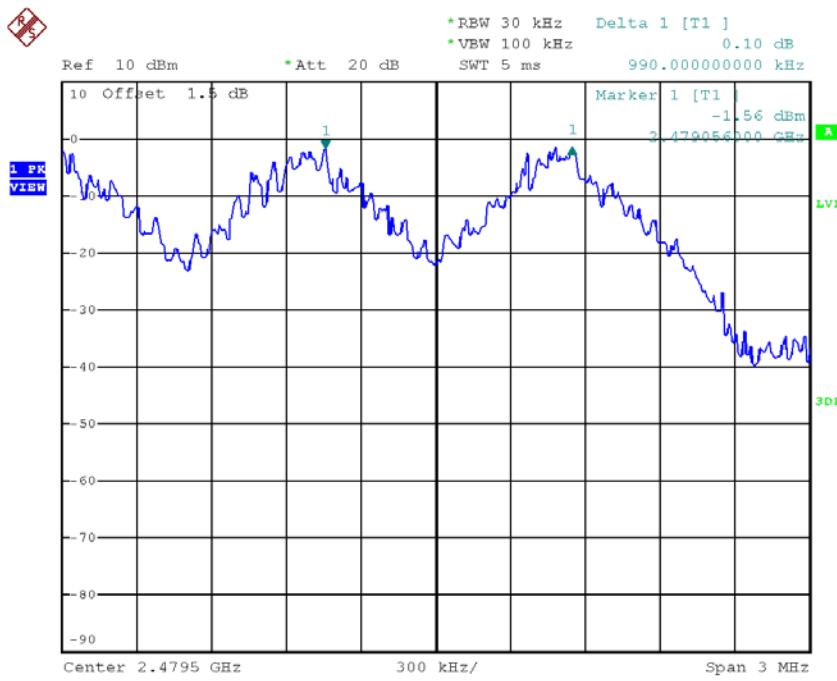
Date: 8.NOV.2017 11:01:42

## CH39



Date: 8.NOV.2017 11:02:45

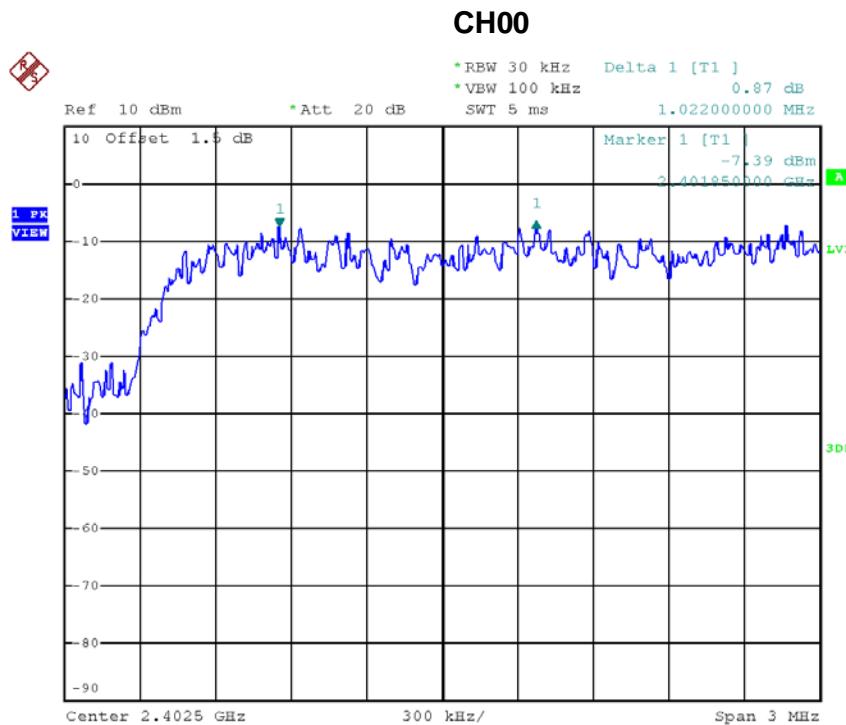
## CH78



Date: 8.NOV.2017 11:03:49

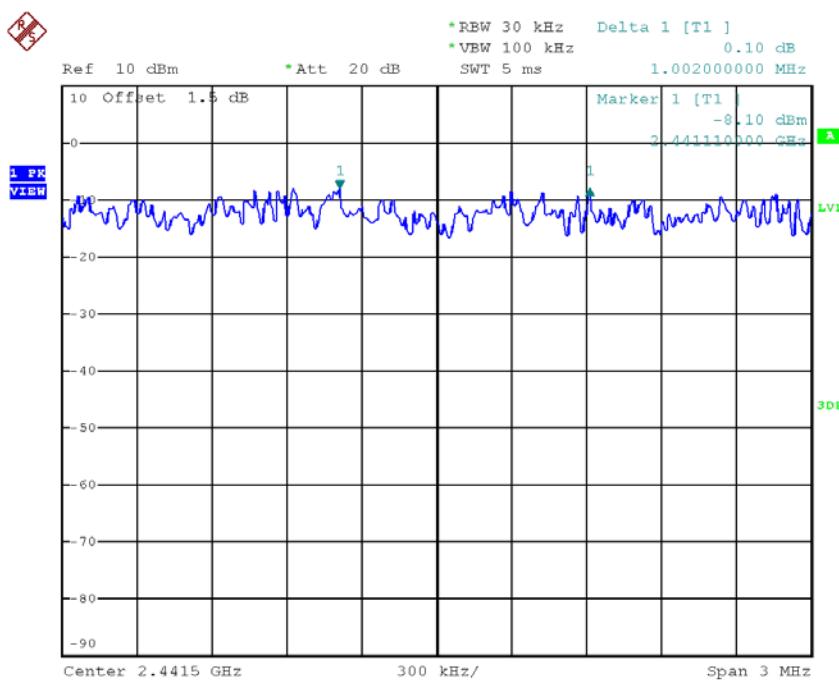
Test Mode : Hopping on \_3Mbps

Frequency (MHz)	Channel Separation (MHz)	2/3 of 20dB Bandwidth (MHz)	Test Result
2402	1.022	0.917	Pass
2441	1.002	0.912	Pass
2480	1.032	0.911	Pass



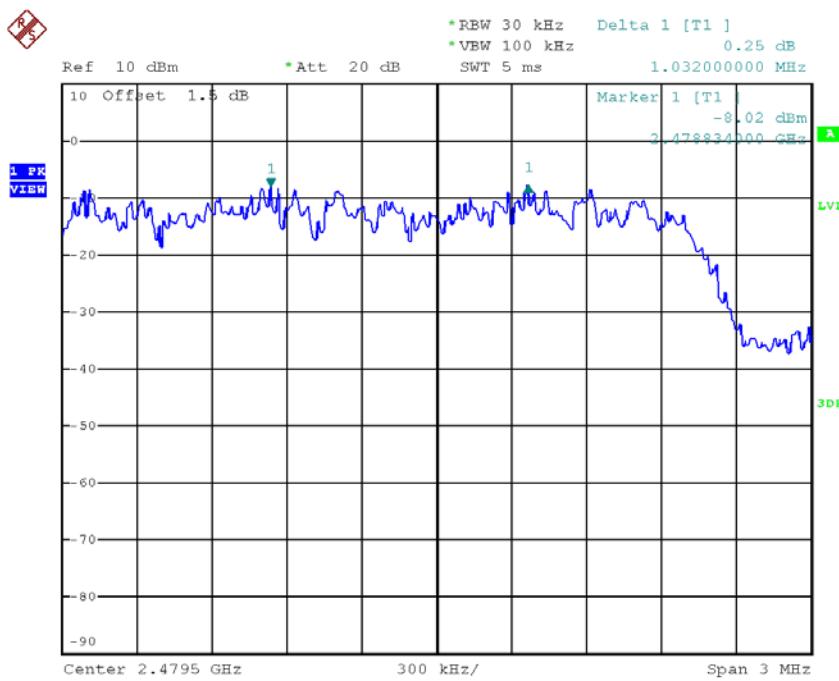
Date: 8.NOV.2017 11:17:24

## CH39



Date: 8.NOV.2017 11:24:33

## CH78

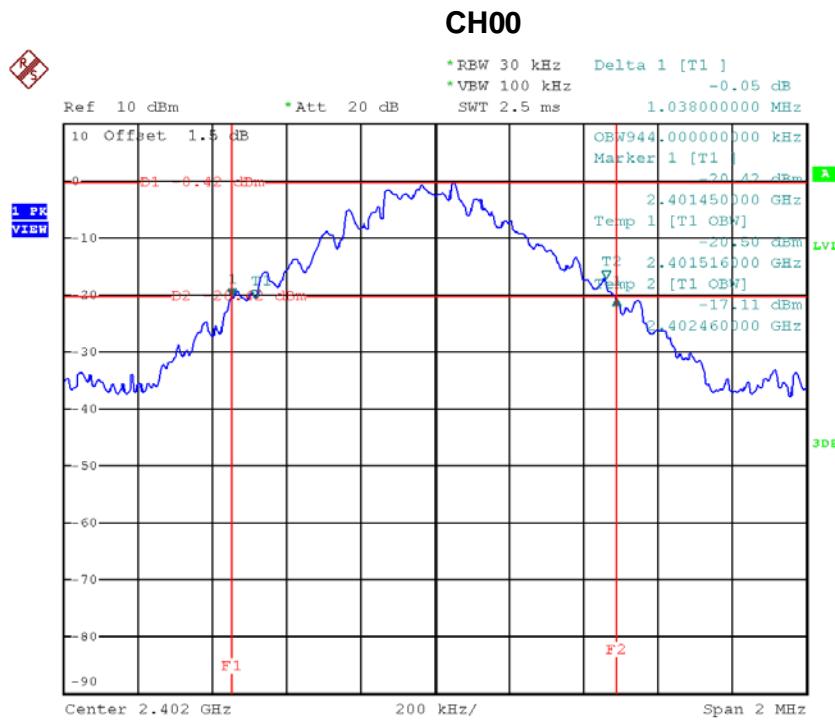


Date: 8.NOV.2017 11:29:02

## APPENDIX H - BANDWIDTH

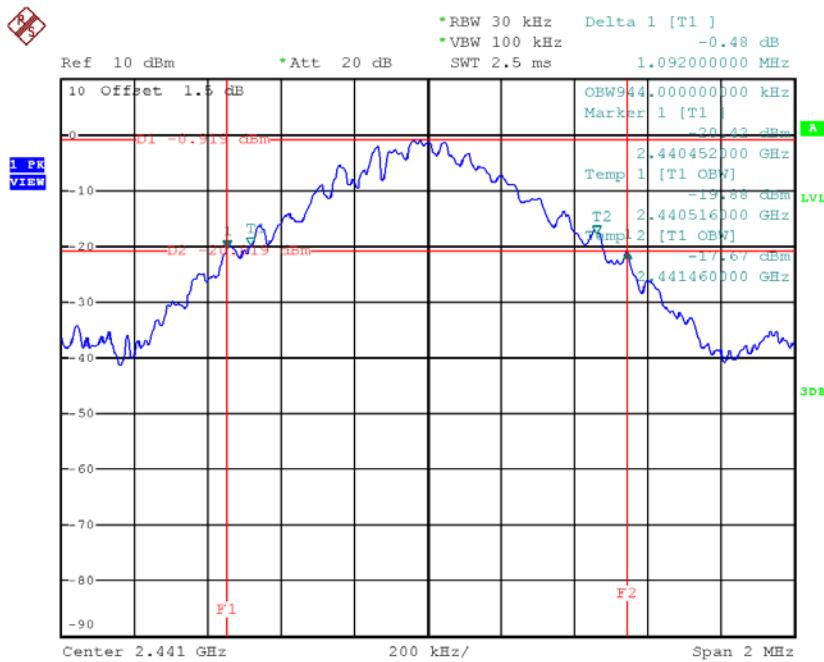
Test Mode : TX Mode \_1Mbps

Frequency (MHz)	20dB Bandwidth (MHz)	99% Occupied BW (MHz)	Test Result
2402	1.038	0.944	Pass
2441	1.092	0.944	Pass
2480	1.032	0.940	Pass



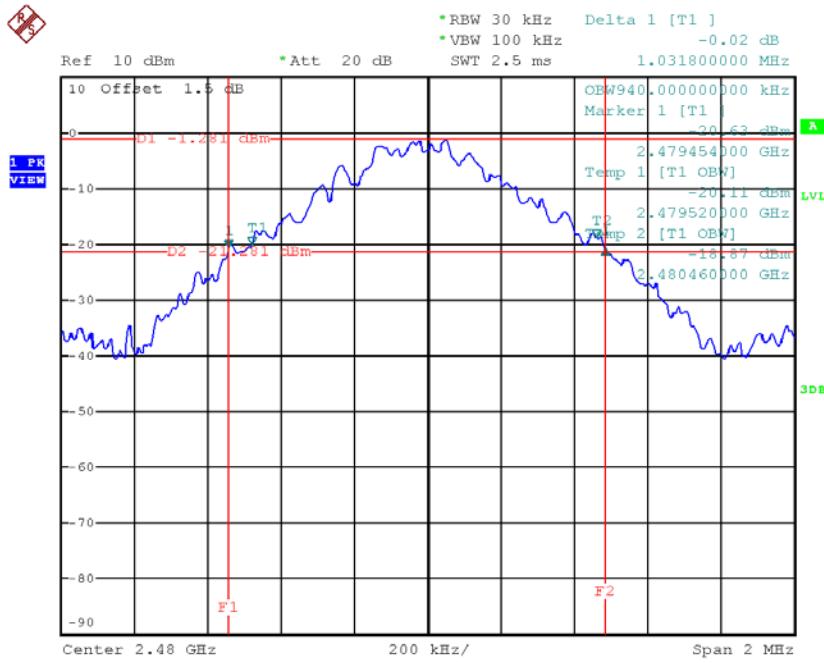
Date: 8.NOV.2017 10:53:19

## CH39



Date: 8.NOV.2017 10:56:56

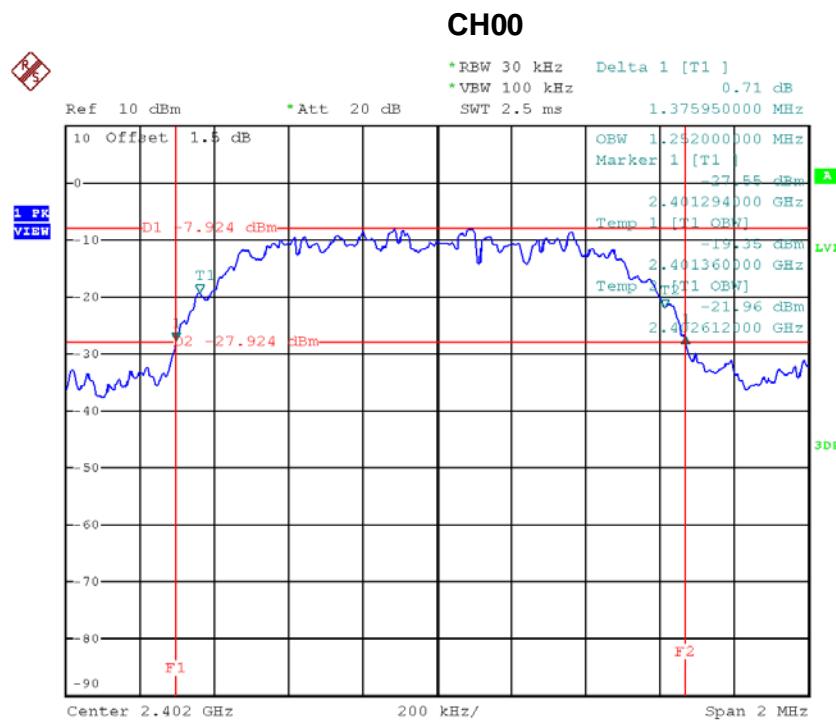
## CH78



Date: 8.NOV.2017 10:57:51

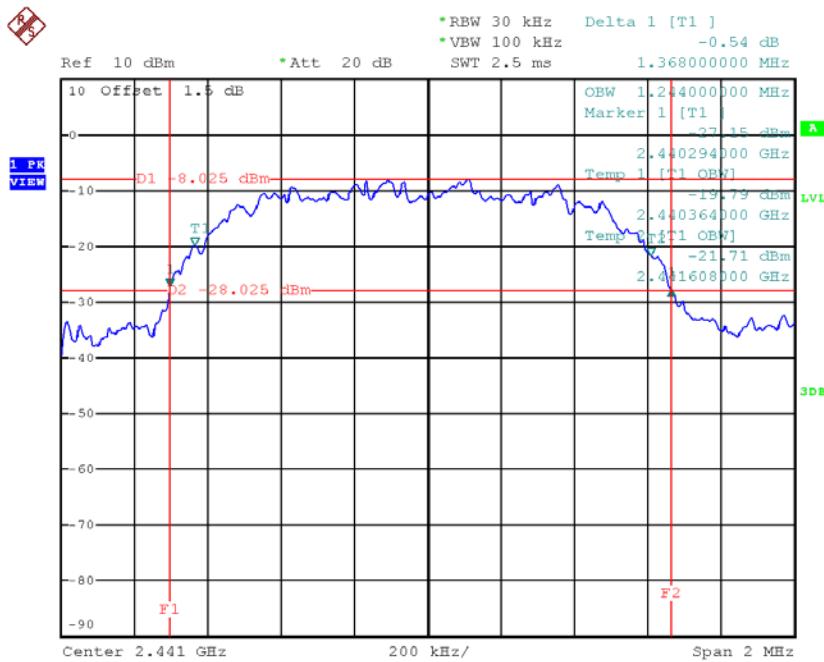
Test Mode :	TX Mode _3Mbps
-------------	----------------

Frequency (MHz)	20dB Bandwidth (MHz)	99% Occupied BW (MHz)	Test Result
2402	1.376	1.252	Pass
2441	1.368	1.244	Pass
2480	1.366	1.240	Pass



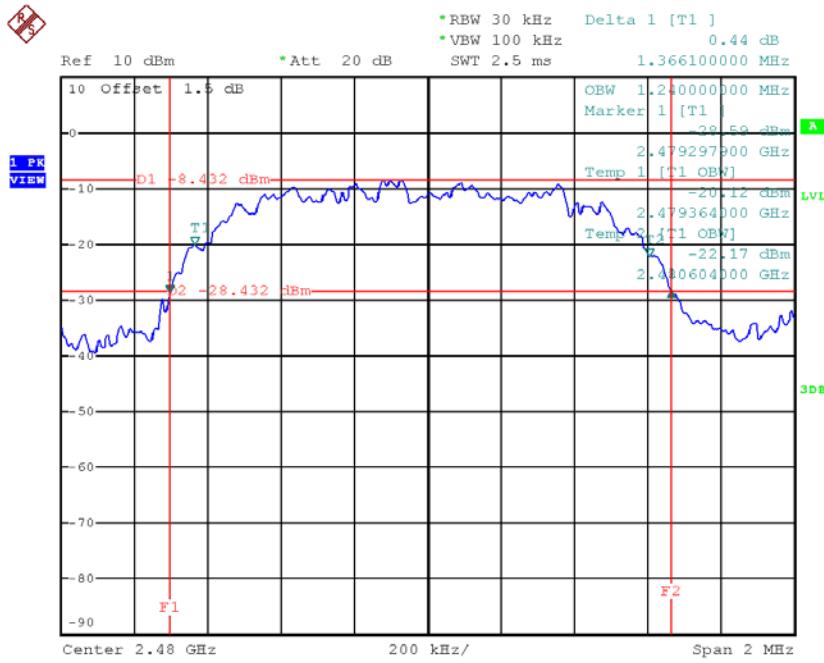
Date: 8.NOV.2017 11:09:36

## CH39



Date: 8.NOV.2017 11:11:08

## CH78



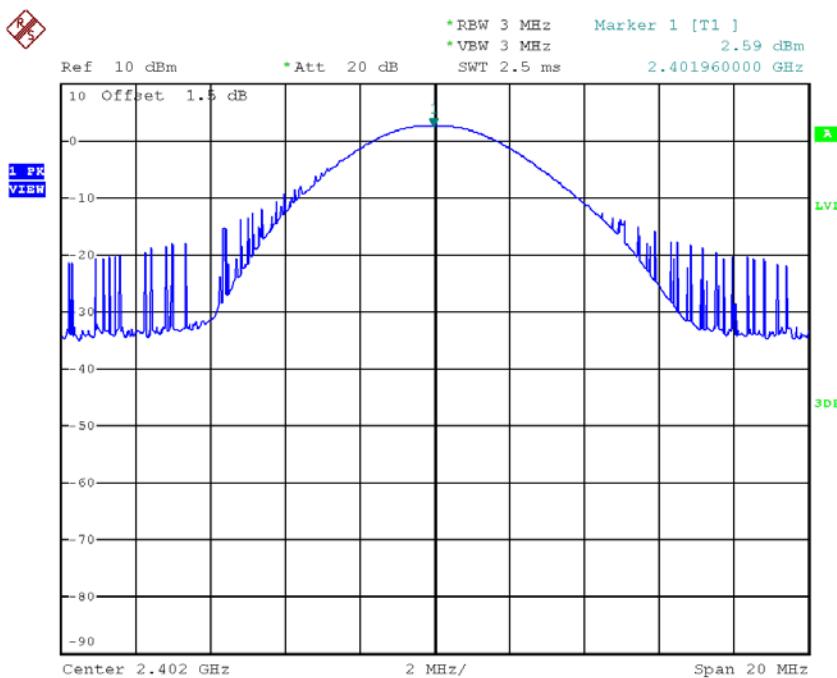
Date: 8.NOV.2017 11:11:46

## APPENDIX I - PEAK OUTPUT POWER

Test Mode : TX Mode \_1Mbps

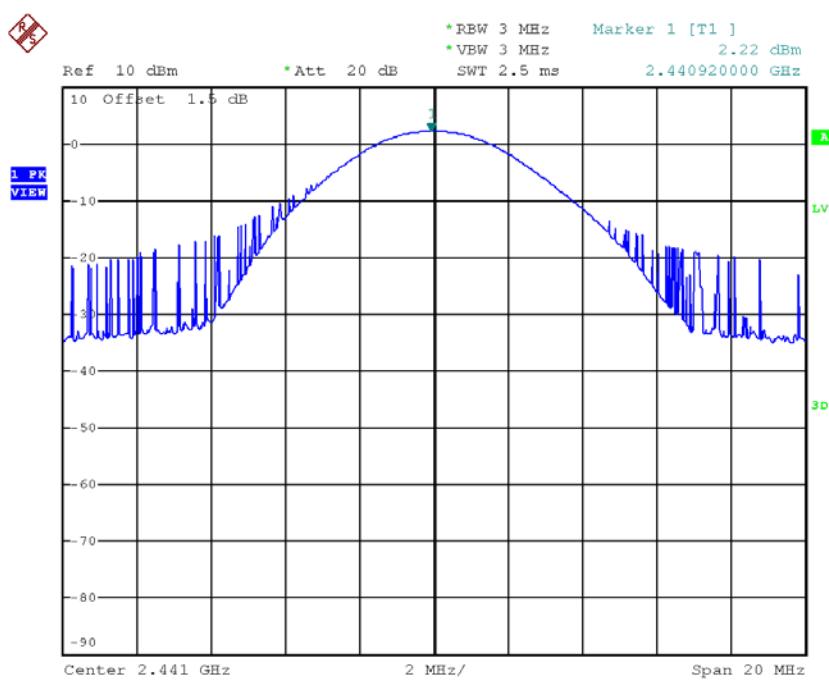
Frequency (MHz)	Conducted Power (dBm)	Conducted Power (W)	Max. Limit (dBm)	Max. Limit (W)	Test Result
2402	2.59	0.0018	30.00	1.00	Pass
2441	2.22	0.0017	30.00	1.00	Pass
2480	1.82	0.0015	30.00	1.00	Pass

## CH00



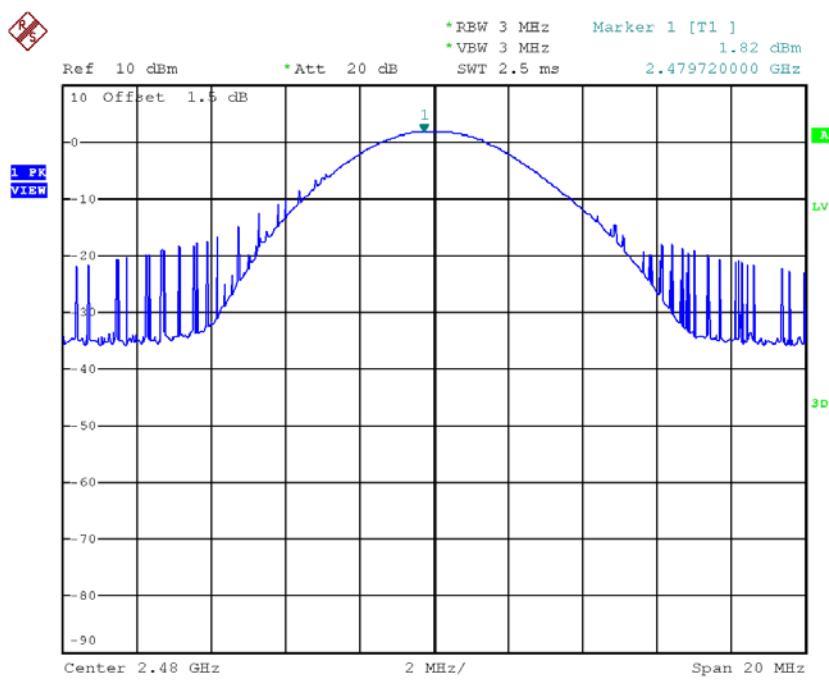
Date: 8.NOV.2017 10:53:52

## CH39



Date: 8.NOV.2017 10:57:01

## CH78

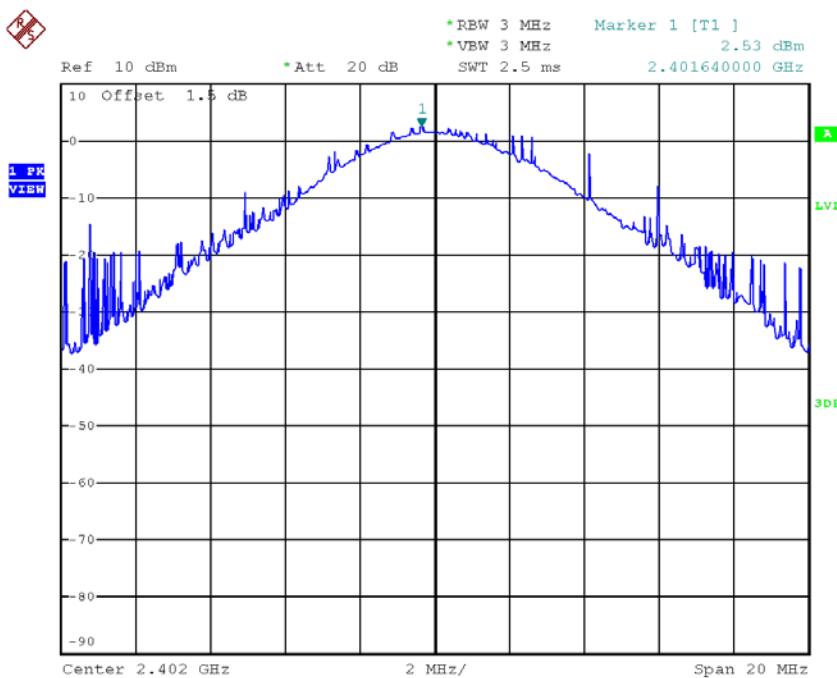


Date: 8.NOV.2017 10:58:24

Test Mode : TX Mode \_3Mbps

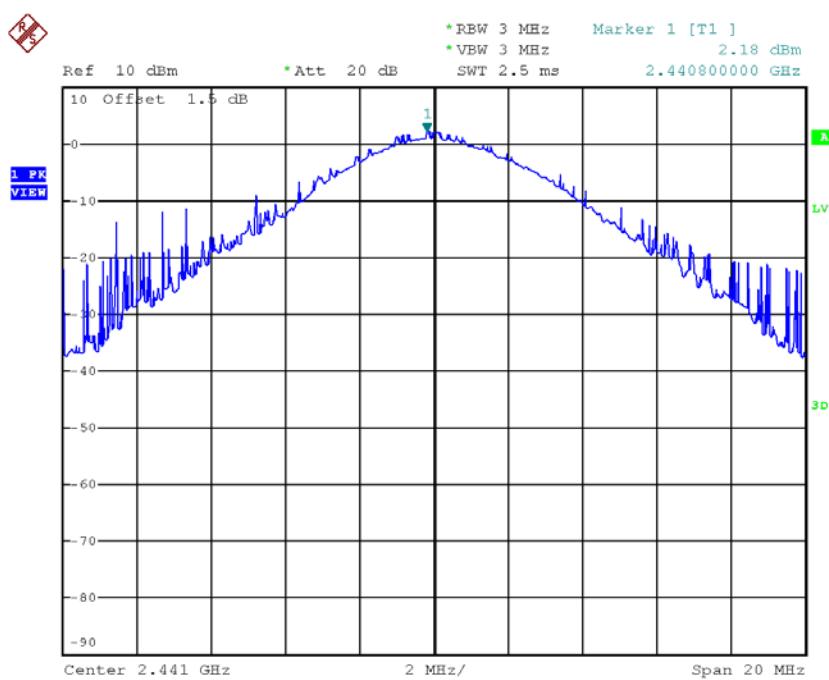
Frequency (MHz)	Conducted Power (dBm)	Conducted Power (W)	Max. Limit (dBm)	Max. Limit (W)	Test Result
2402	2.53	0.0018	30.00	1.00	Pass
2441	2.18	0.0017	30.00	1.00	Pass
2480	1.74	0.0015	30.00	1.00	Pass

## CH00



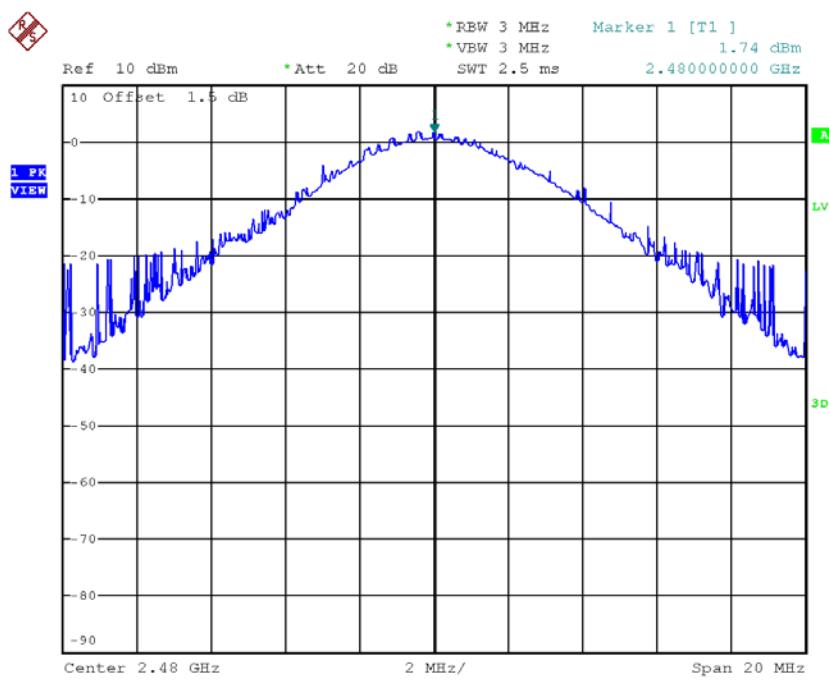
Date: 8.NOV.2017 11:10:09

## CH39



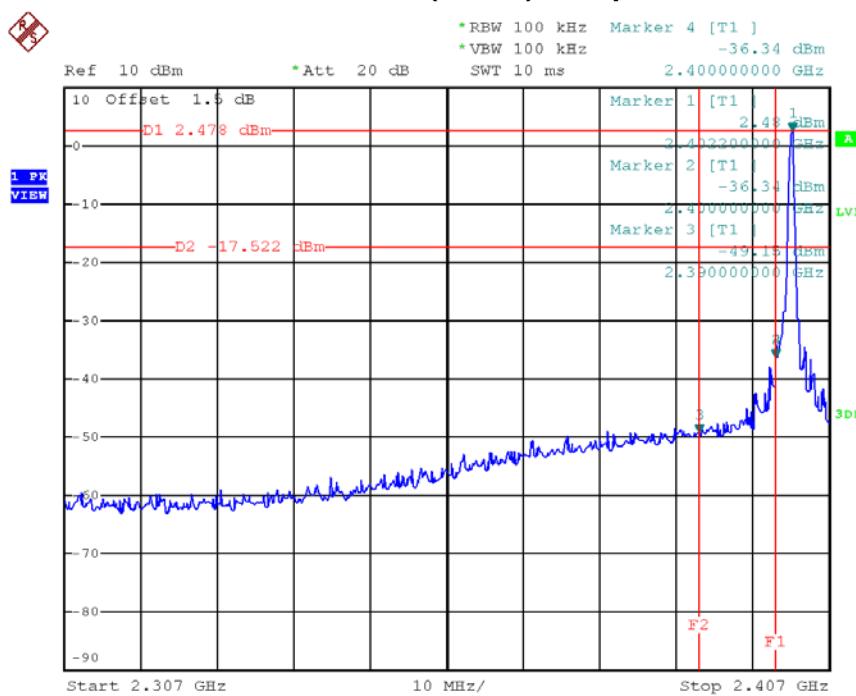
Date: 8.NOV.2017 11:11:14

## CH78

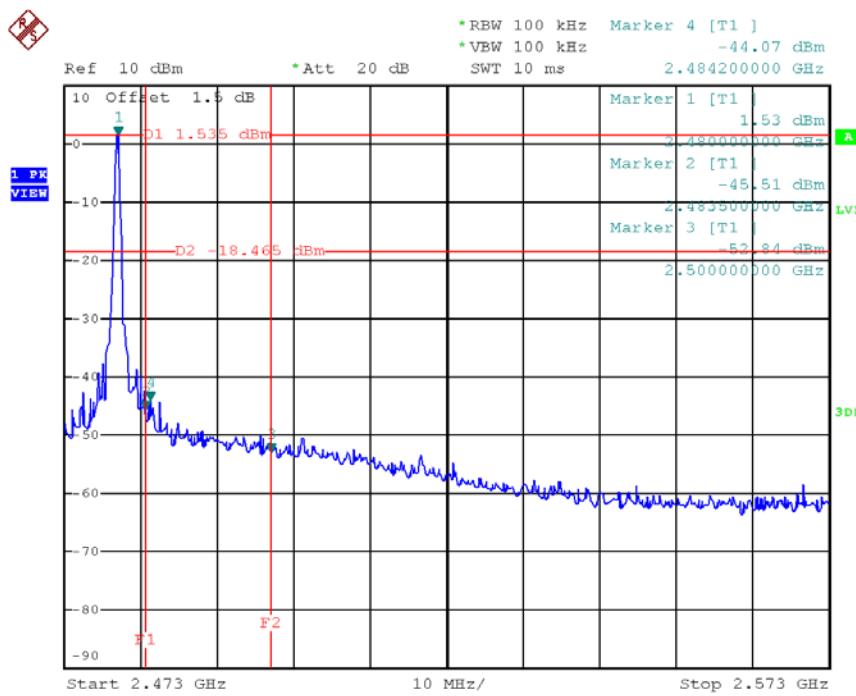


Date: 8.NOV.2017 11:12:18

## APPENDIX J - ANTENNA CONDUCTED SPURIOUS EMISSION

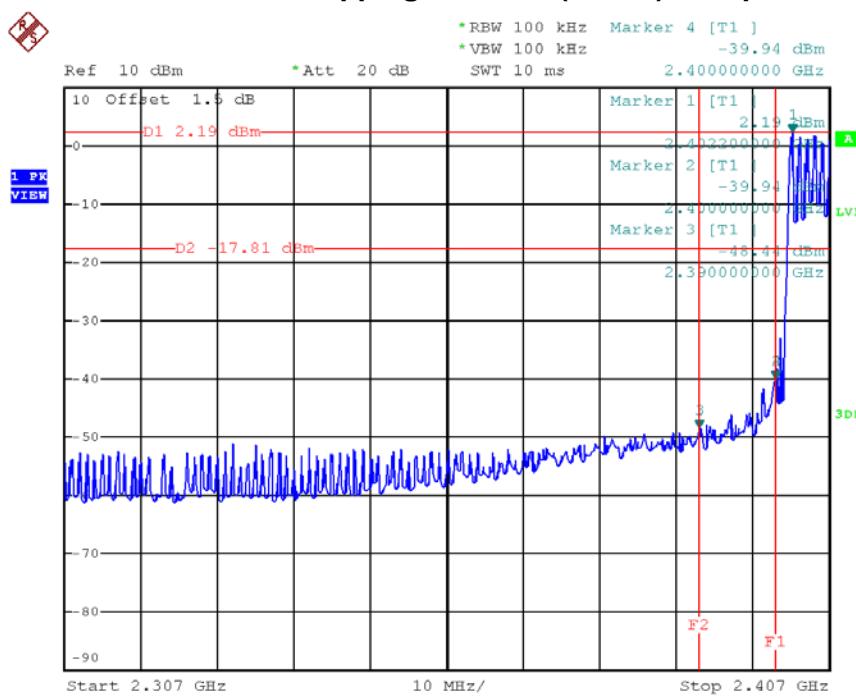
**CH00 (Lower) \_1Mbps**

Date: 8.NOV.2017 10:52:57

**CH78 (Upper) \_1Mbps**

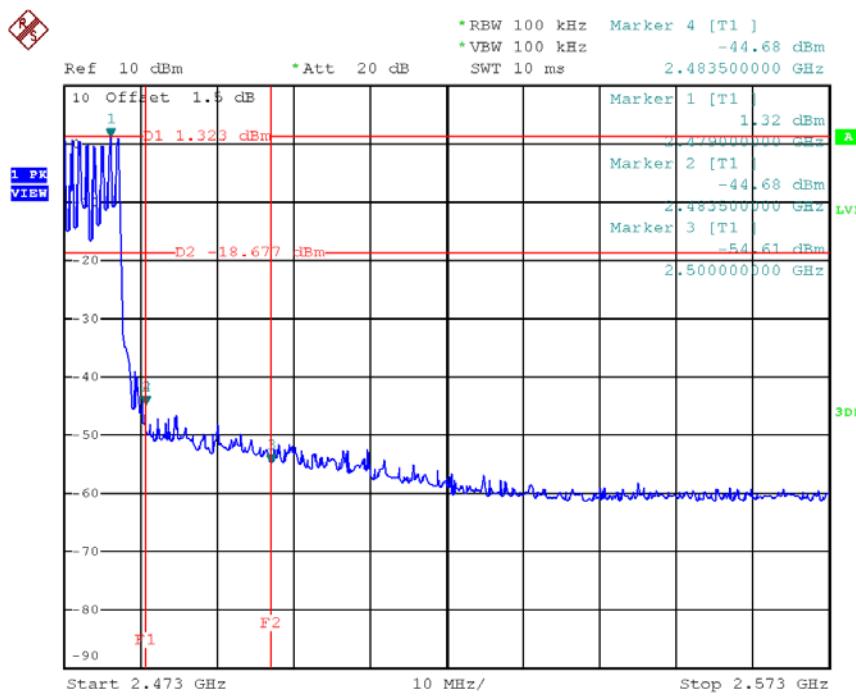
Date: 8.NOV.2017 10:57:29

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



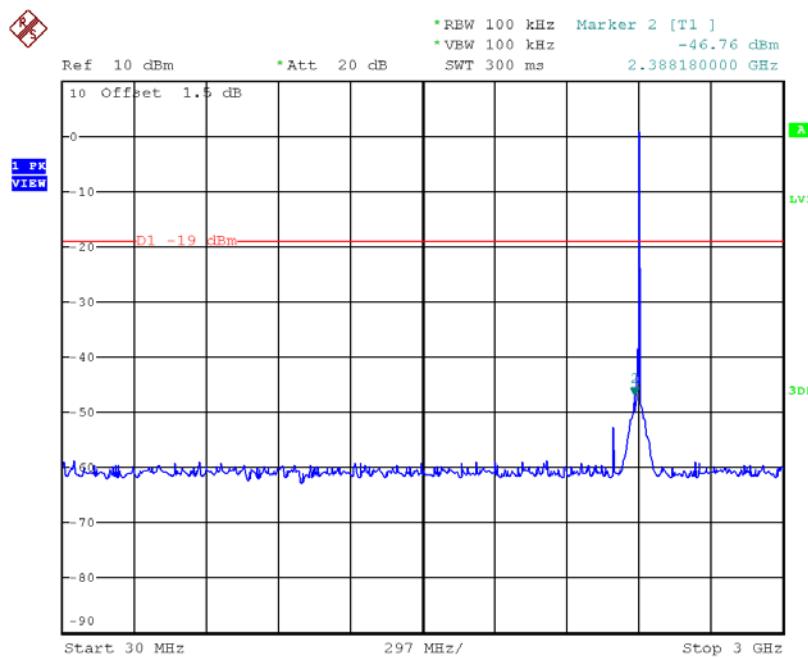
Date: 8.NOV.2017 11:06:11

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

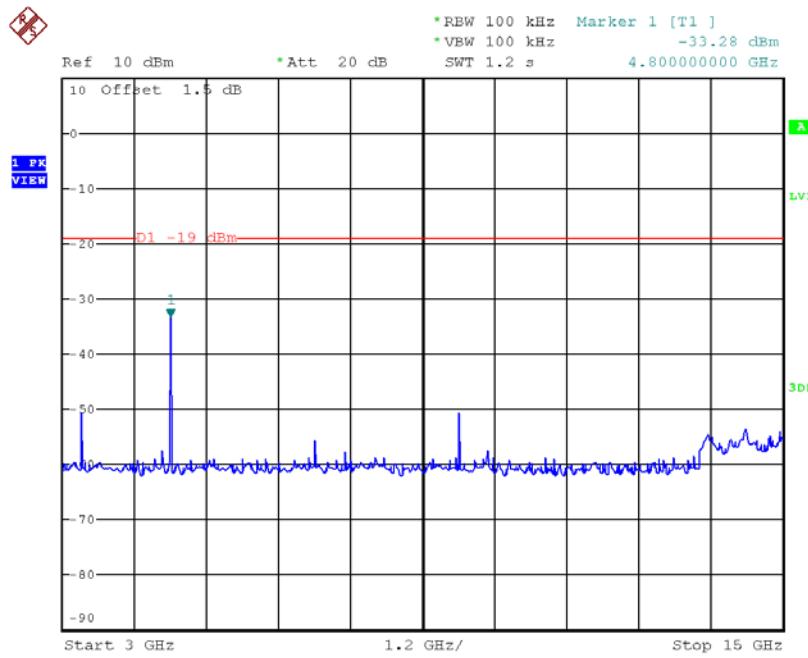


Date: 8.NOV.2017 11:06:45

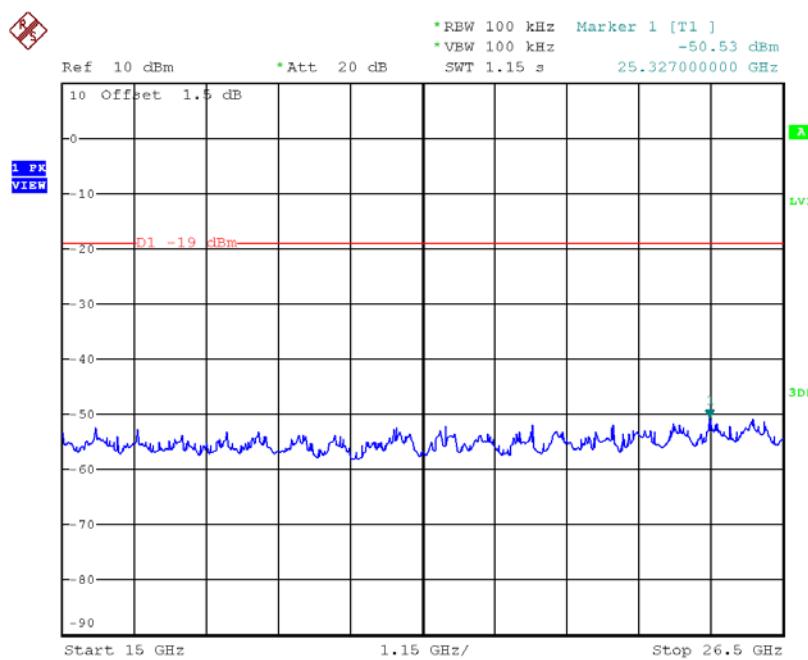
## CH00 (10 Harmonic of the frequency) \_1Mbps



Date: 8.NOV.2017 10:53:32

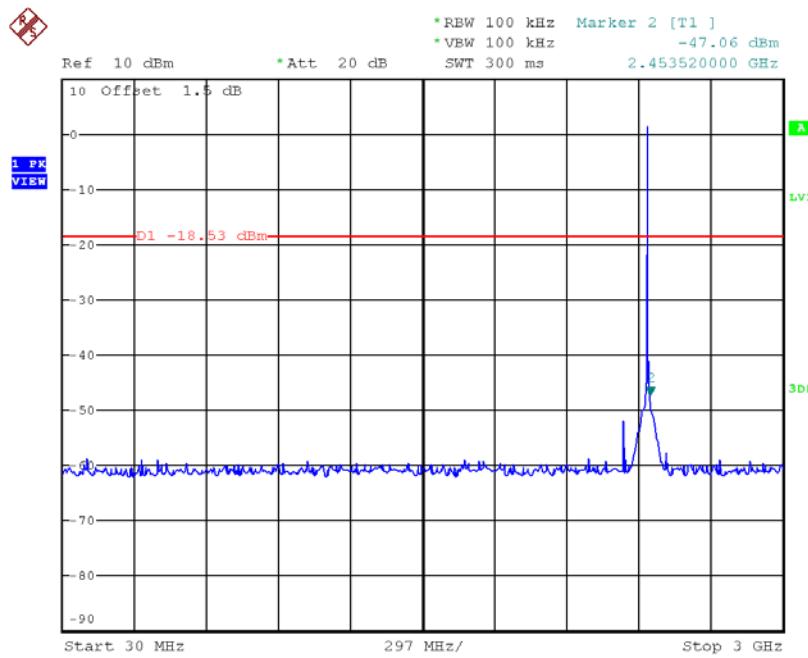


Date: 8.NOV.2017 10:53:39

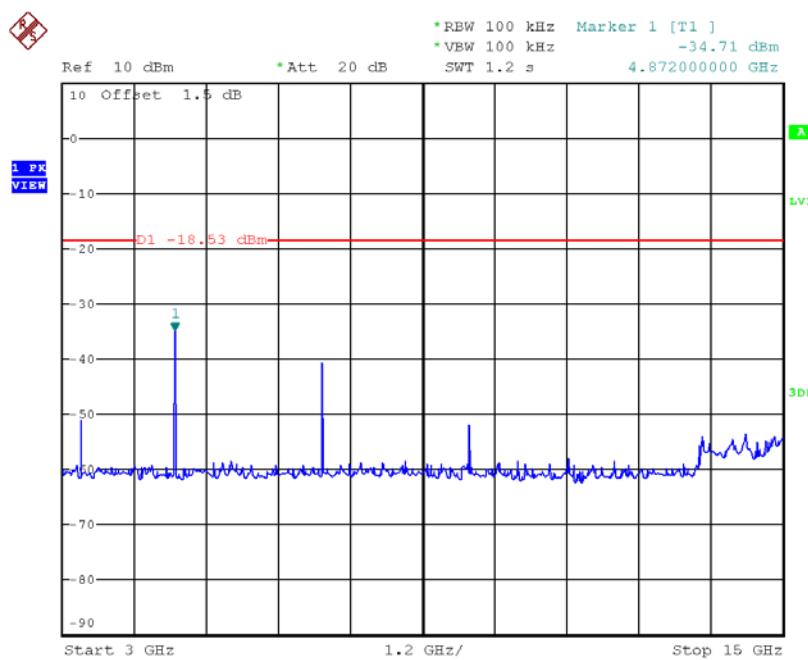


Date: 8.NOV.2017 10:53:46

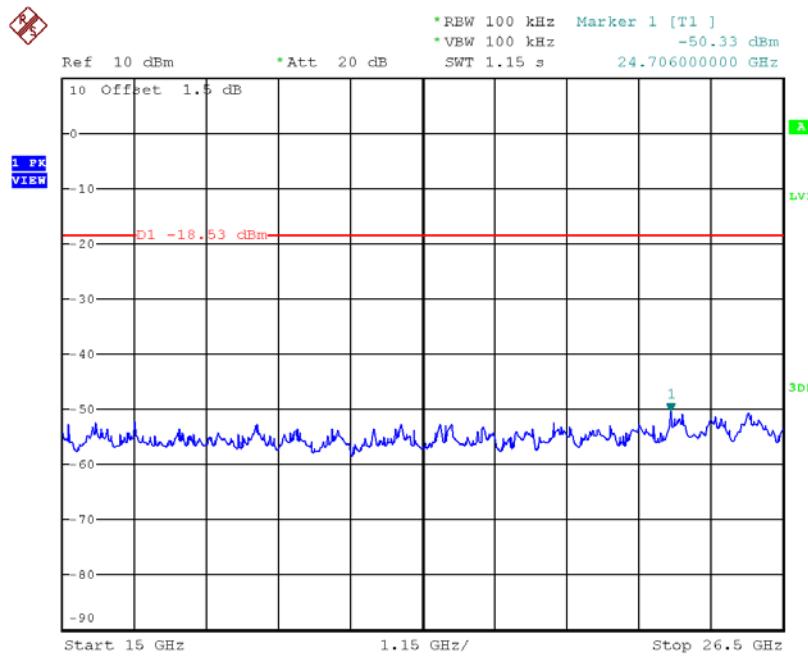
### CH39 (10 Harmonic of the frequency) \_1Mbps



Date: 8.NOV.2017 10:56:22

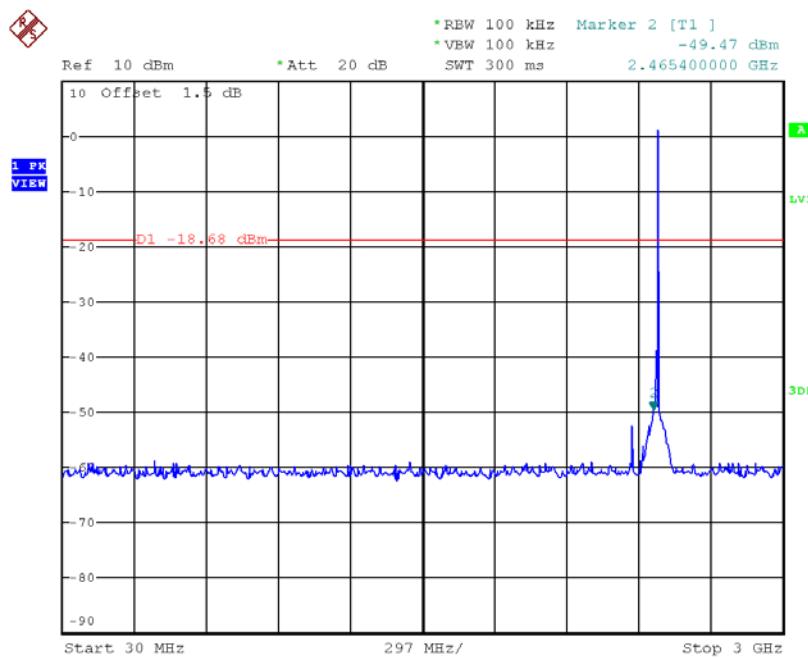


Date: 8.NOV.2017 10:56:29

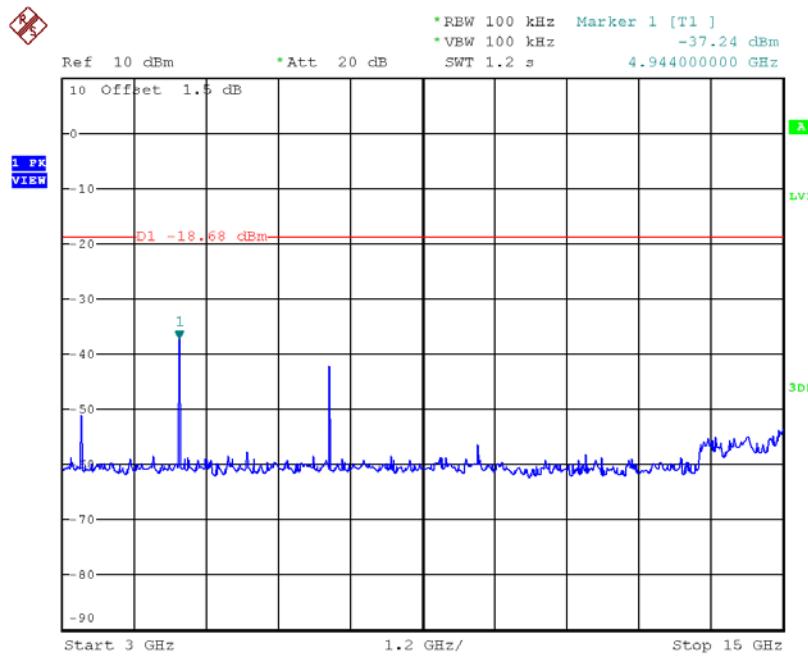


Date: 8.NOV.2017 10:56:36

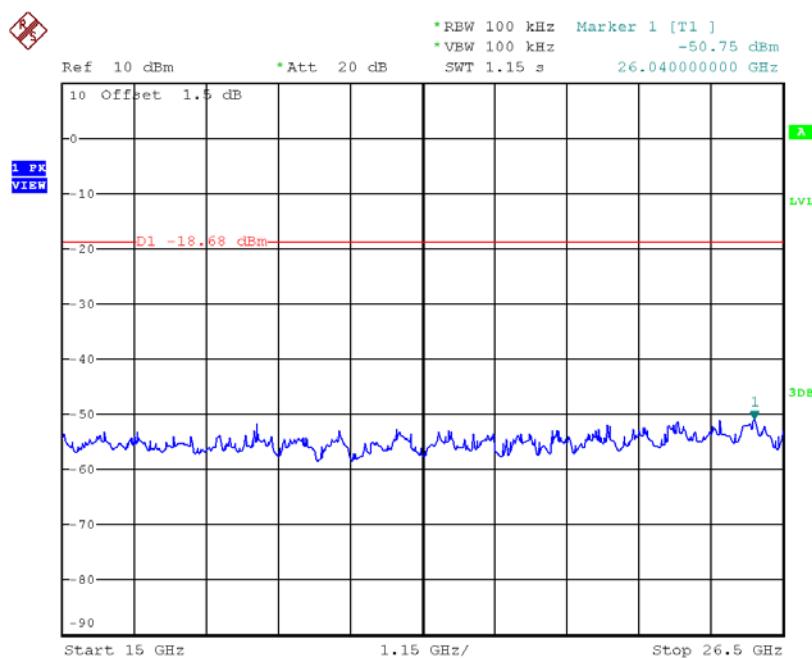
## CH78 (10 Harmonic of the frequency) \_1Mbps



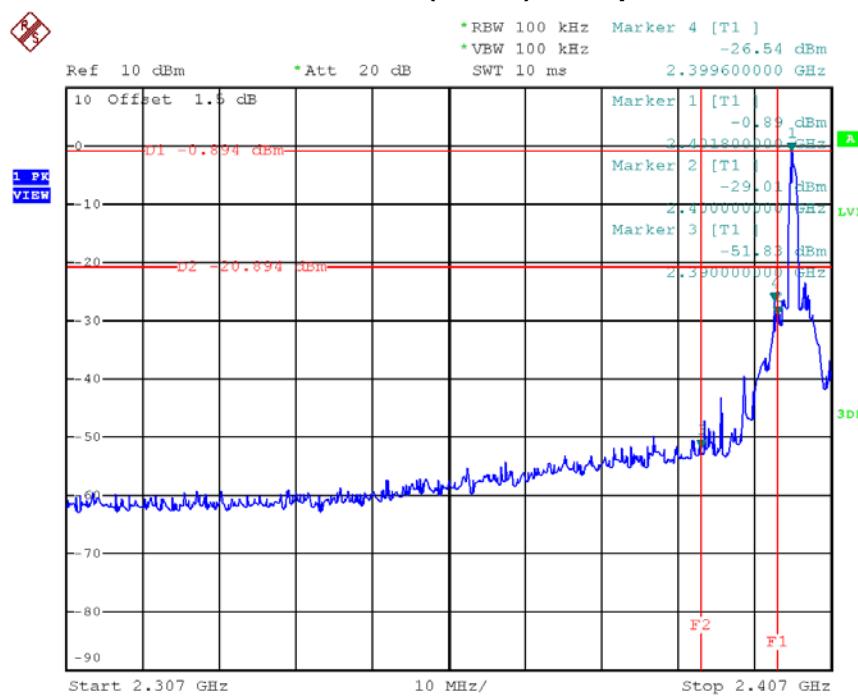
Date: 8.NOV.2017 10:58:04



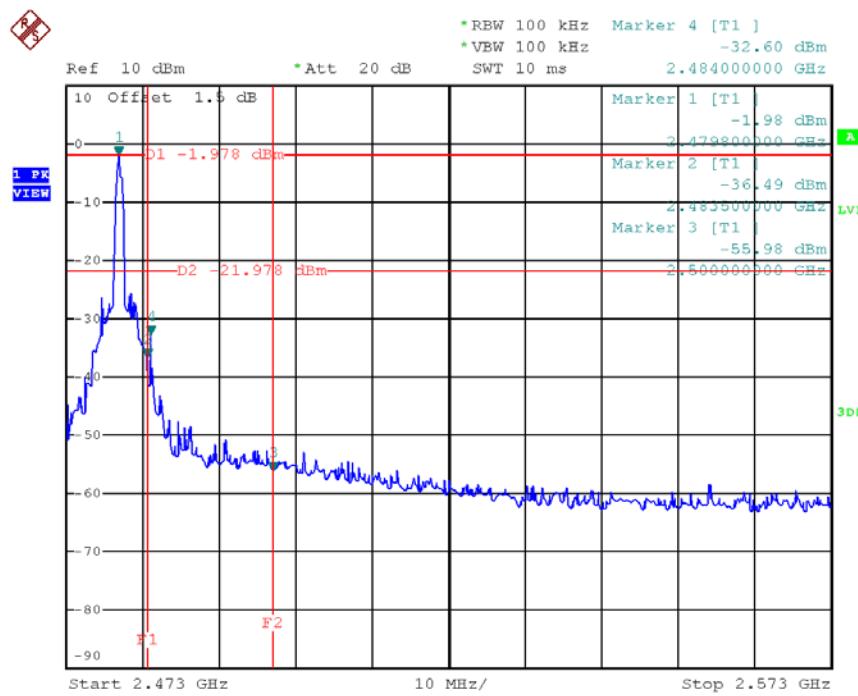
Date: 8.NOV.2017 10:58:11



Date: 8.NOV.2017 10:58:18

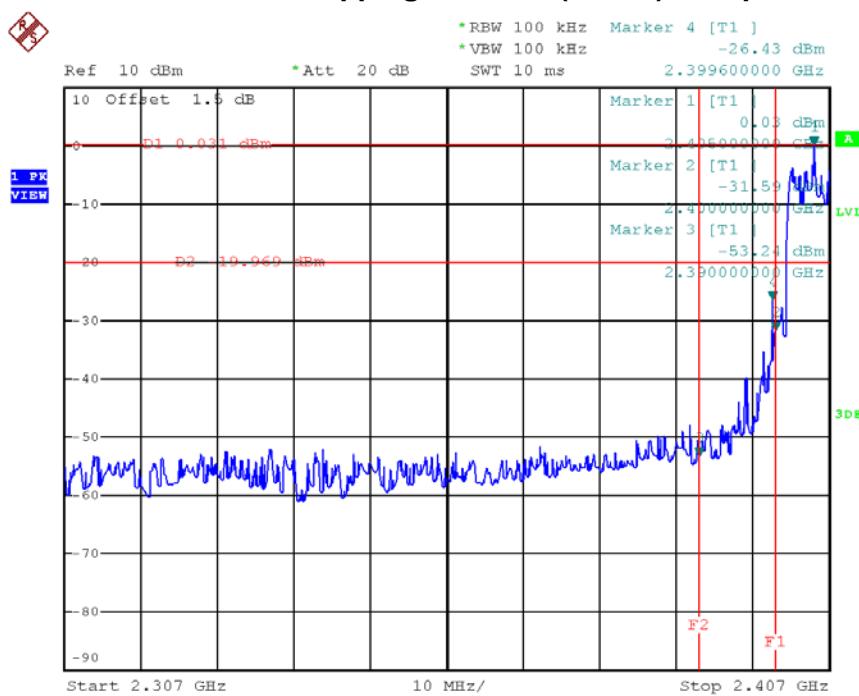
**CH00 (Lower) \_3Mbps**

Date: 8.NOV.2017 11:09:21

**CH78 (Upper) \_3Mbps**

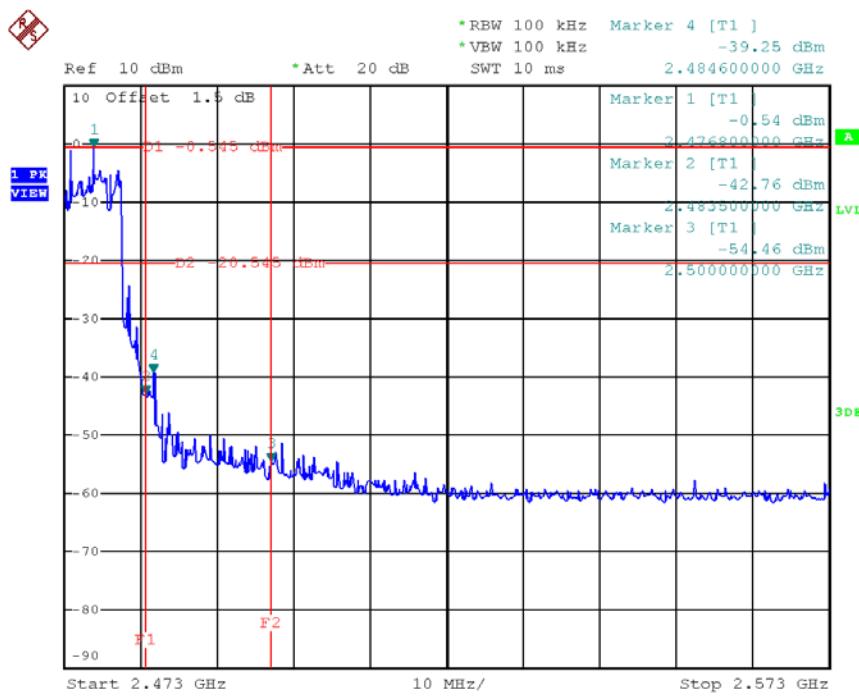
Date: 8.NOV.2017 11:11:30

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



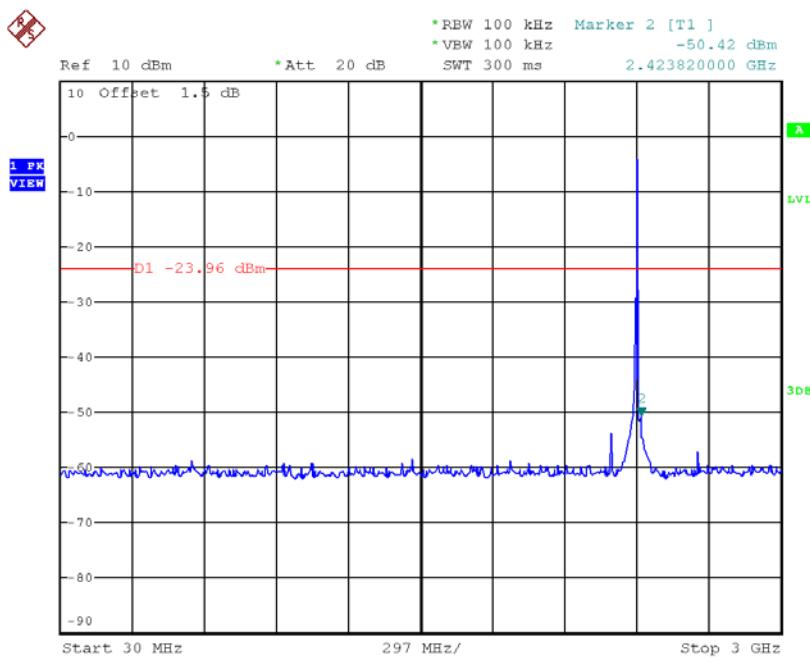
Date: 8.NOV.2017 11:29:36

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

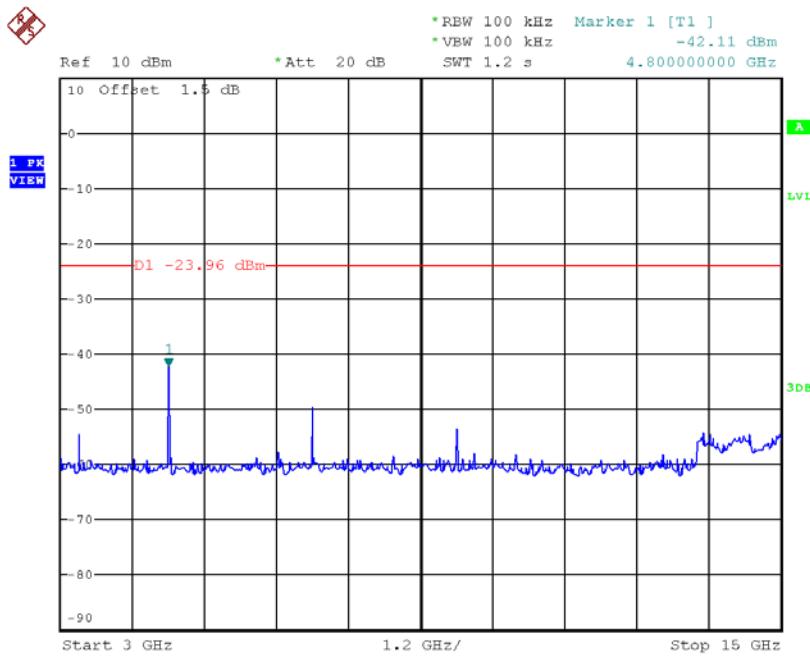


Date: 8.NOV.2017 11:22:30

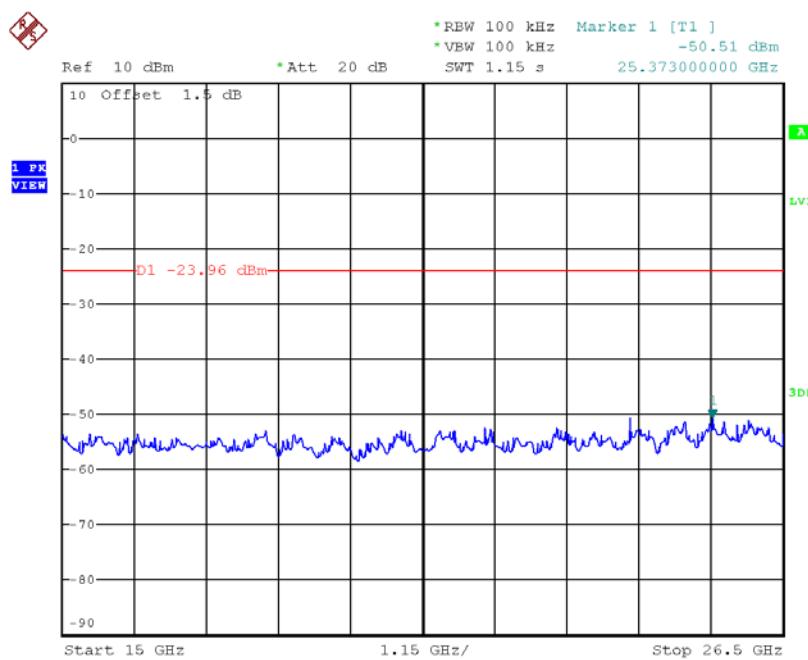
## CH00 (10 Harmonic of the frequency) \_3Mbps



Date: 8.NOV.2017 11:09:49

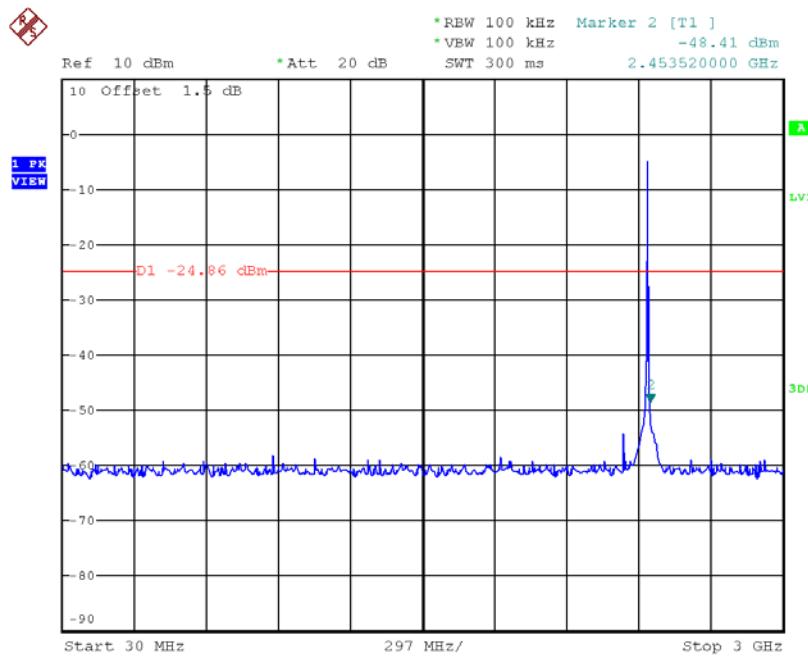


Date: 8.NOV.2017 11:09:56

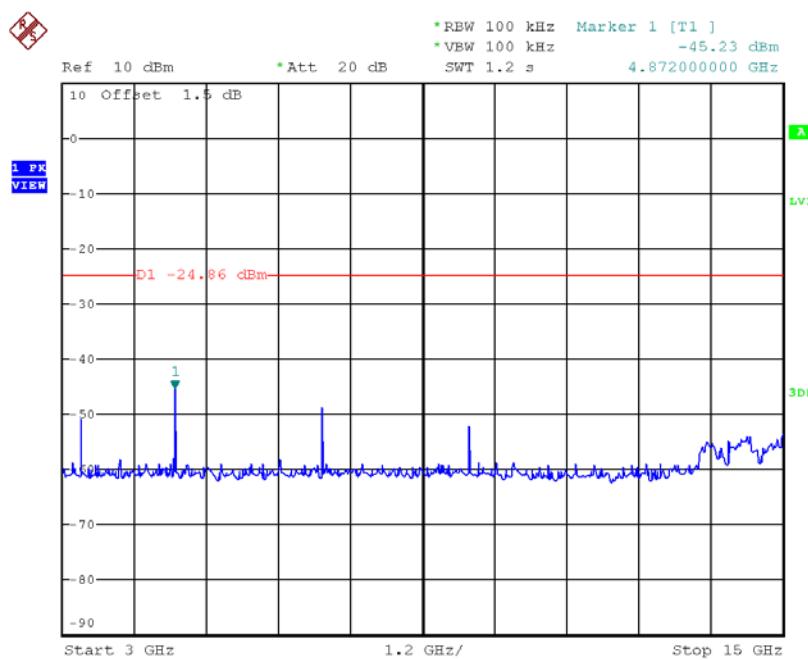


Date: 8.NOV.2017 11:10:03

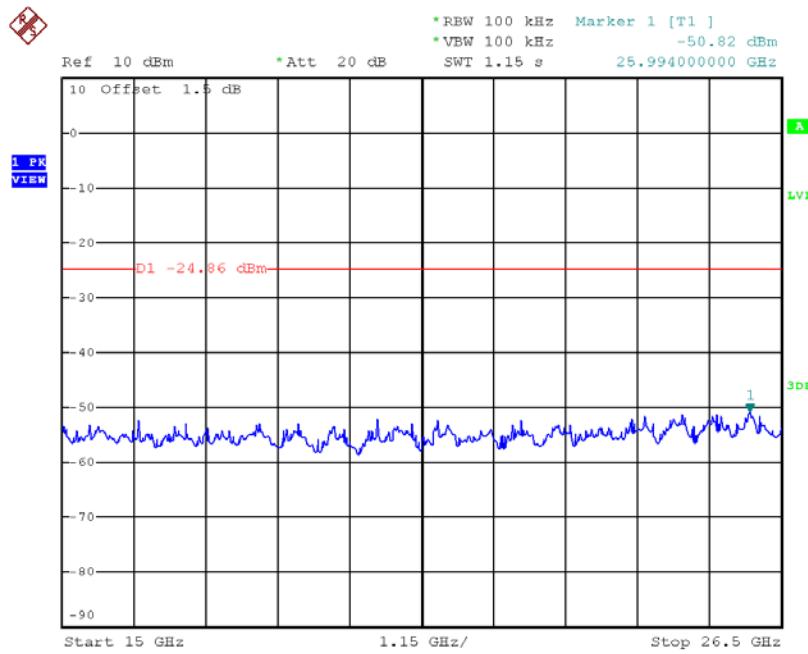
### CH39 (10 Harmonic of the frequency) \_3Mbps



Date: 8.NOV.2017 11:10:37

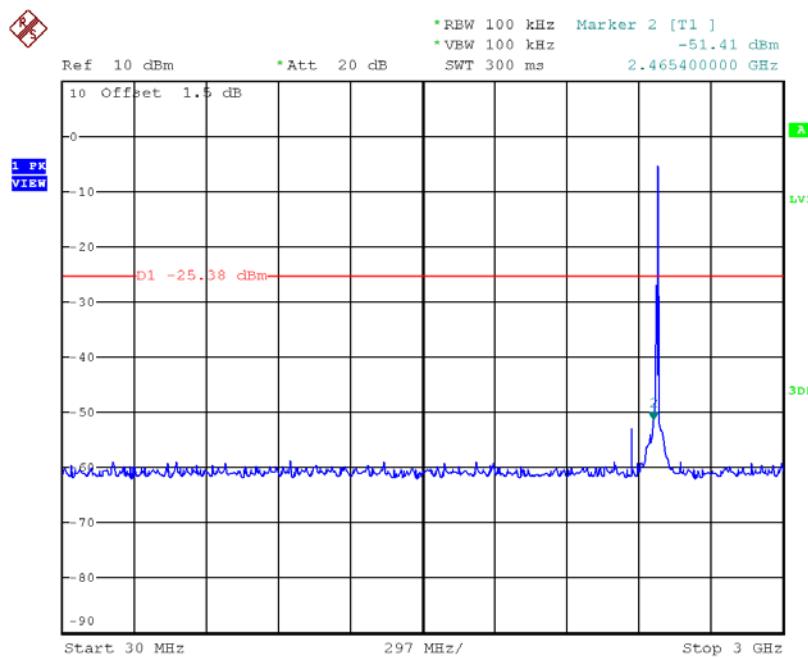


Date: 8.NOV.2017 11:10:44

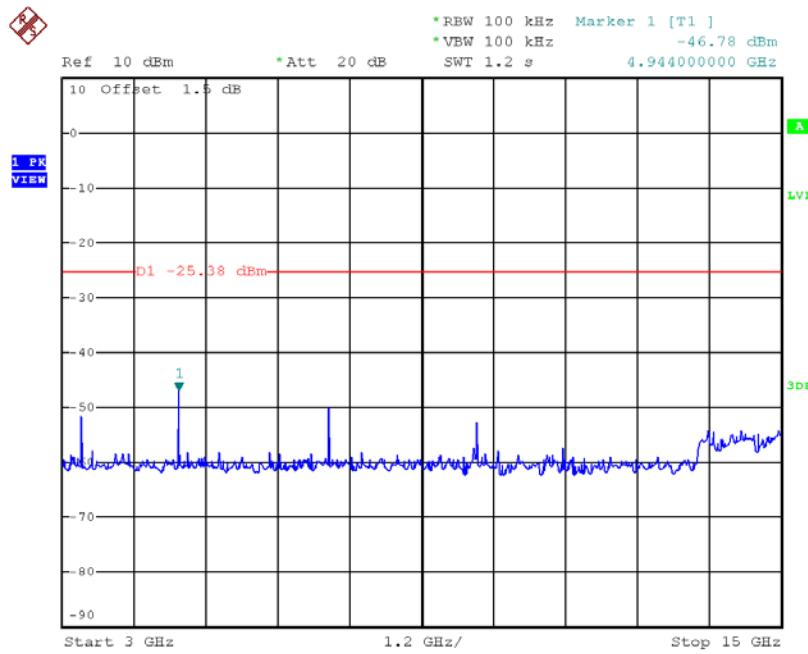


Date: 8.NOV.2017 11:10:52

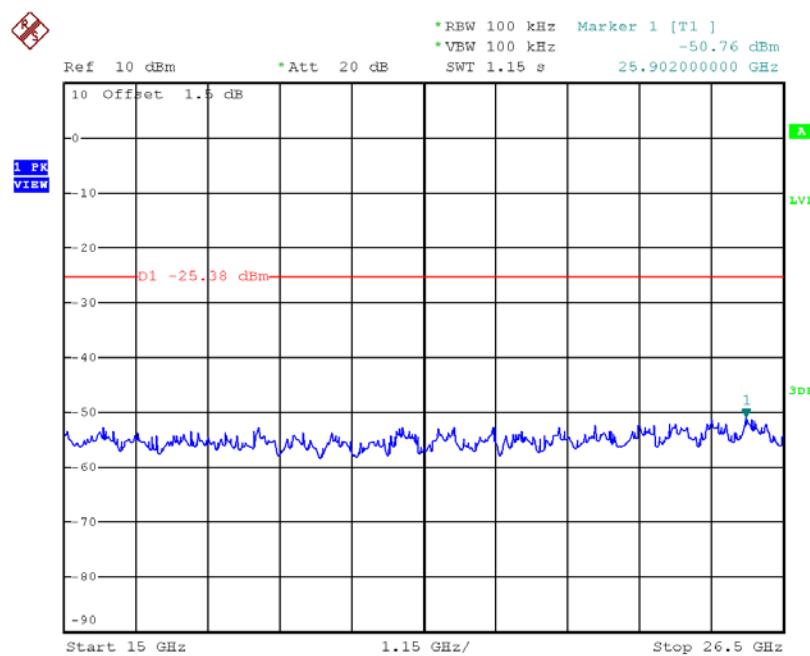
## CH78 (10 Harmonic of the frequency) \_3Mbps



Date: 8.NOV.2017 11:11:59



Date: 8.NOV.2017 11:12:06



Date: 8.NOV.2017 11:12:13