

# FCC Radio Test Report

## FCC ID: VIXSP446

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

**Project No.** : 1706133  
**Equipment** : WIRELESS SPEAKER  
**Test Model** : SP446  
**Series Model** : N/A  
**Applicant** : Voxx Accessories Corp.  
**Address** : 3502 Woodview Trace, Suite 220 Indianapolis, IN  
46268 USA

**Date of Receipt** : Jun. 21, 2017  
**Date of Test** : Jun. 21, 2017~ Jul. 03, 2017  
**Issued Date** : Jul. 05, 2017  
**Tested by** : BTL Inc.

**Testing Engineer** : Rush Kao  
(Rush Kao)

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### REPORT ISSUED HISTORY

Issued No.	Description	Issued Date
BTL-FCCP-1-1706133	Original Issue.	Jul. 05, 2017

## 1. CERTIFICATION

Equipment : WIRELESS SPEAKER  
Brand Name : 808  
Test Model : SP446  
Series Model : N/A  
Applicant : Voxx Accessories Corp.  
Manufacturer : Dong Guan Lightion Electronics Co., LTD.  
Address : Meilin District 523823, Dalingshan, Dongguan City, Guangdong Province, China  
Factory : Dong Guan Lightion Electronics Co., LTD.  
Address : Meilin District 523823, Dalingshan, Dongguan City, Guangdong Province, China  
Date of Test : Jun. 21, 2017~ Jul. 03, 2017  
Standard(s) : FCC Part15, Subpart C (15.247)/ ANSI C63.10-2013

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

The test data, data evaluation, and equipment configuration contained in our test report (Ref No. BTL-FCCP-1-1706133) were obtained utilizing the test procedures, test instruments, test sites that has been accredited by the Authority of TAF according to the ISO-17025 quality assessment standard and technical standard(s).

## 2. SUMMARY OF TEST RESULTS

Test procedures according to the technical standard(s):

Applied Standard(s): FCC Part 15 (15.247), Subpart C			
Standard(s) Section	Test Item	Judgment	Remark
15.207	Conducted Emission	PASS	-
15.247(d)	Antenna conducted Spurious Emission	PASS	-
15.247 (a)(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	-



## 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	3.06

### B. Radiated emission test:

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

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

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

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

### 3. GENERAL INFORMATION

#### 3.1 GENERAL DESCRIPTION OF EUT

Equipment	WIRELESS SPEAKER	
Brand Name	808	
Test Model	SP446	
Series Model	N/A	
Model Difference	The SP446 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)
	Bit Rate of Transmitter	8-DPSK(3Mbps)
	Output Power Max.	10.04 dBm(1Mbps) 11.47 dBm(3Mbps)
PowerSource	#1DC voltage supplied from USB port. #2 Supplied from Li-ion battery.	
Power Rating	#1 DC 5V 1A #2 DC 3.7V 700mAh 2.59Wh	

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	AIROHA	pcbmonoA1	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

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

**Note:**

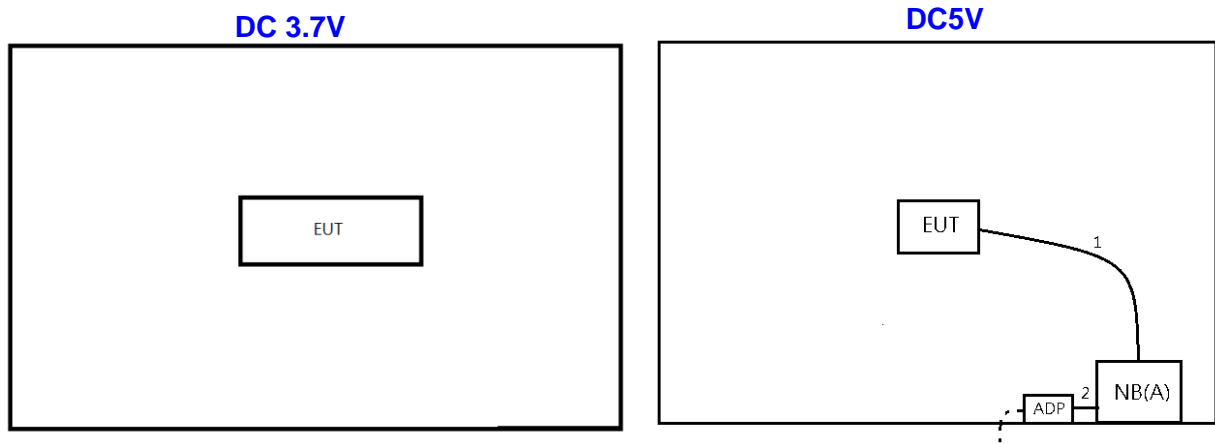
- (1) The measurements are performed at the high, middle, low available channels.
- (2) The measurements for Hopping Channel Separation, Bandwidth and Peak Output Power were tested during 1Mbps, 2Mbps and 3Mbps, the worst case are 1Mbps and 3Mbps, only worst case was documented.
- (3) The EUT was pre-tested on positioned of each 3 axis. The worst case was found positioned on Z-plane. Therefore only the test data of this Z-plane was used for radiated emission measurement test.

### 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	Airoha.AB152x_verC_LabTestTool_2.1.0.11688		
Frequency	2402 MHz	2441 MHz	2480 MHz
Parameters(1Mbps)	63	63	63
Parameters(3Mbps)	63	63	63

**3.4 BLOCKDIAGRAMSHOWINGTHECONFIGURATIONOFSYSTEMTESTED**



**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	NB	DELL	PP18L	N/A	N/A

Item	Shielded Type	Ferrite Core	Length	Note
1	No	No	0.6M	Micro USB Cable
2	No	Yes	1.2M	ADP Power Cord

## 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

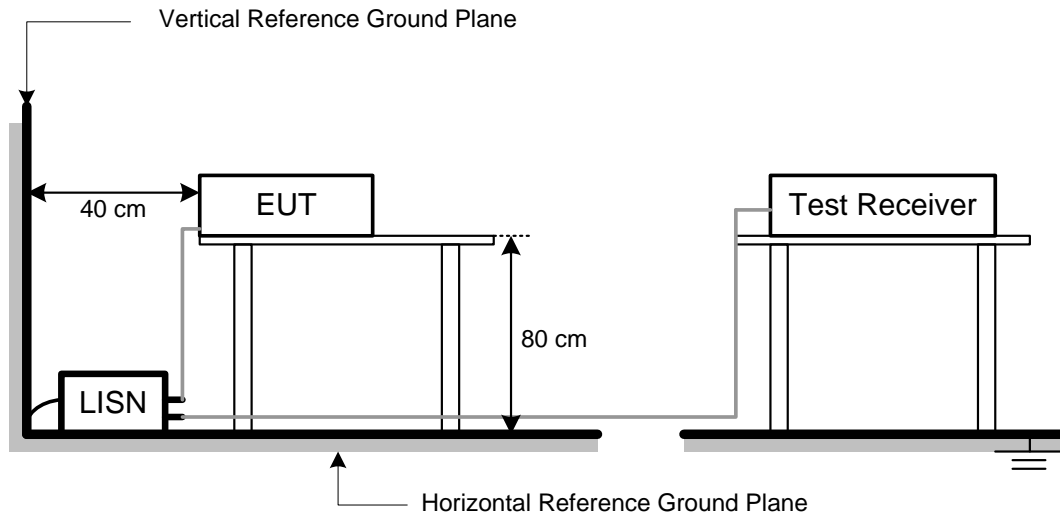
#### 4.1.2 TEST PROCEDURE

- 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 groundplane 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 TESTSETUP



#### 4.1.5 EUT OPERATINGCONDITIONS

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: DC 5V

#### 4.1.7 TEST RESULTS

Please refer to the Attachment A.

Remark:

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

## 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

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

#### Notes:

- (1) The limit for radiated test was performed according to FCC PART 15C/RSS-247.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).
- (4) The test result calculated as following:  
 Measurement Value = Reading Level + Correct Factor  
 Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain(if use)  
 Margin Level = Measurement Value - Limit Value

$$(5) \quad FS_{\text{limit}} = FS_{\text{max}} - 20 \log \left( \frac{d_{\text{limit}}}{d_{\text{measure}}} \right)$$

$$20 \log d_{\text{limit}}/d_{\text{measure}} = 20 \log 3/1.5 = 6 \text{dB}$$

### 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

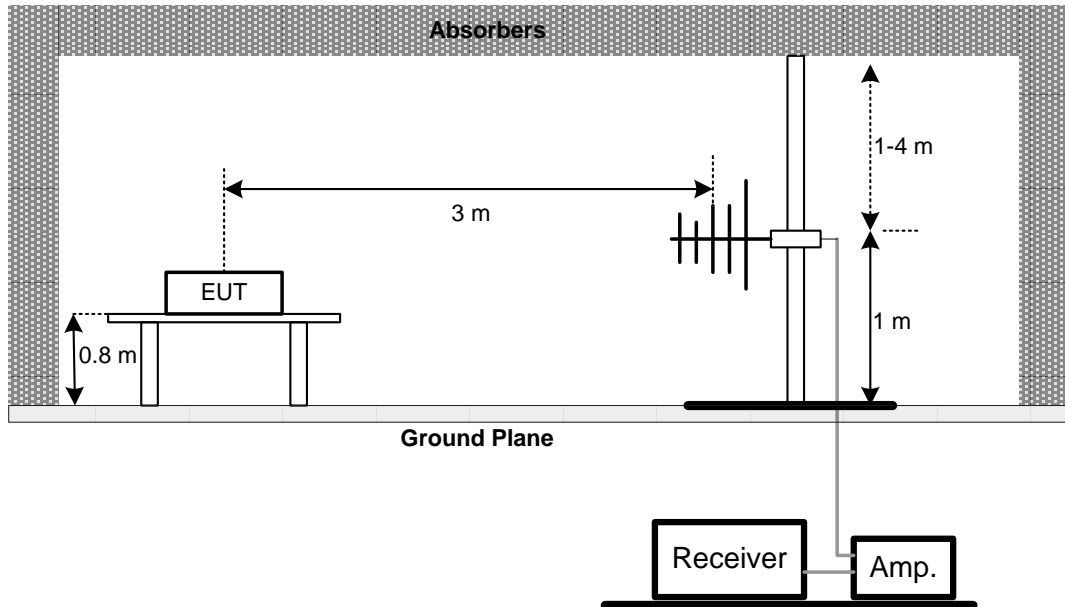
- a. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1GHz)
- b. The measuring distance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

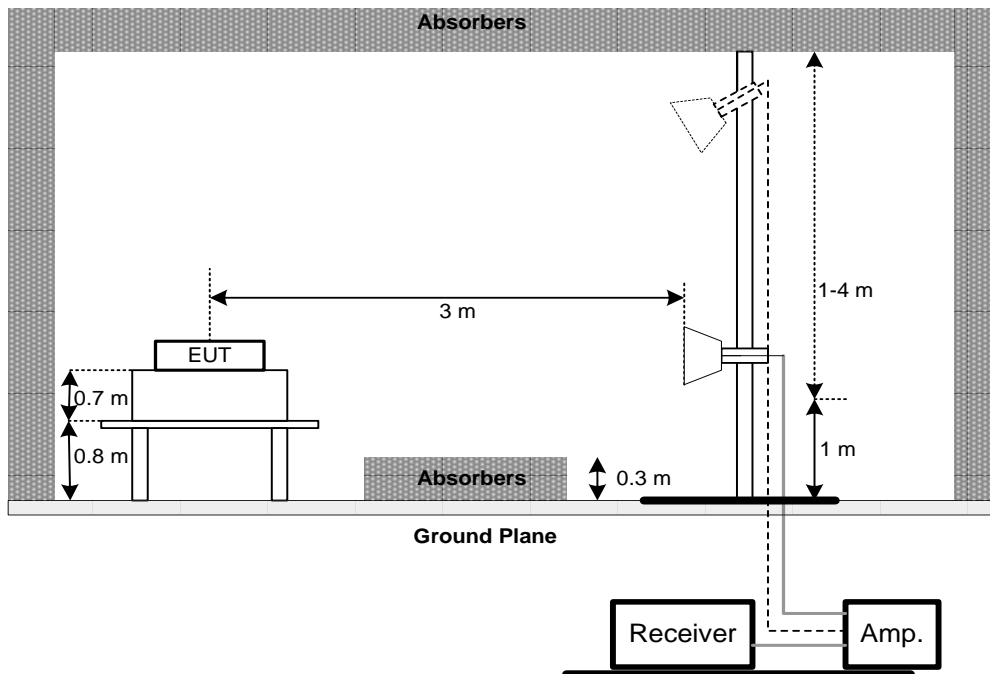
No deviation

**4.2.4 TEST SETUP**

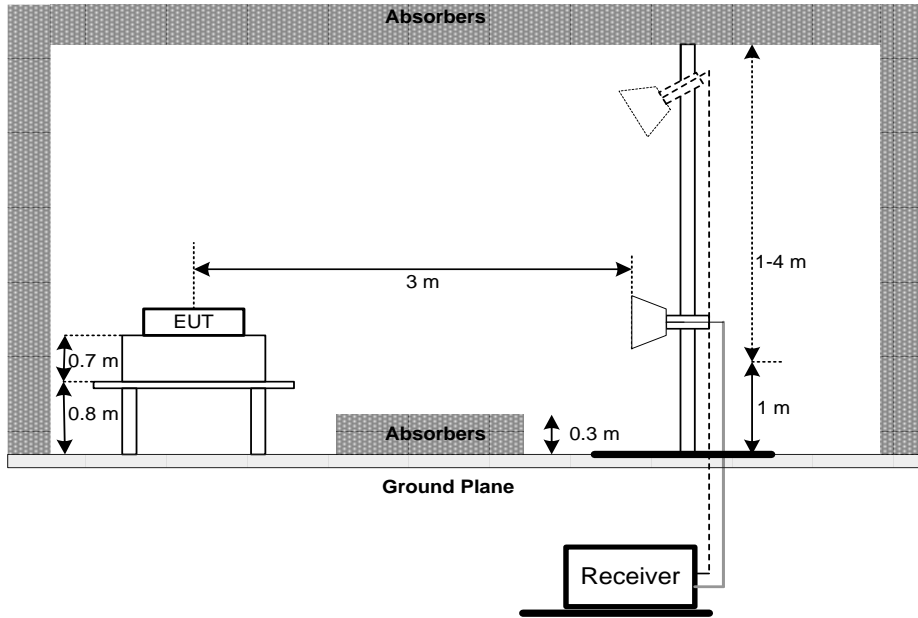
(A) Radiated Emission Test Set-Up Frequency Below 1 GHz



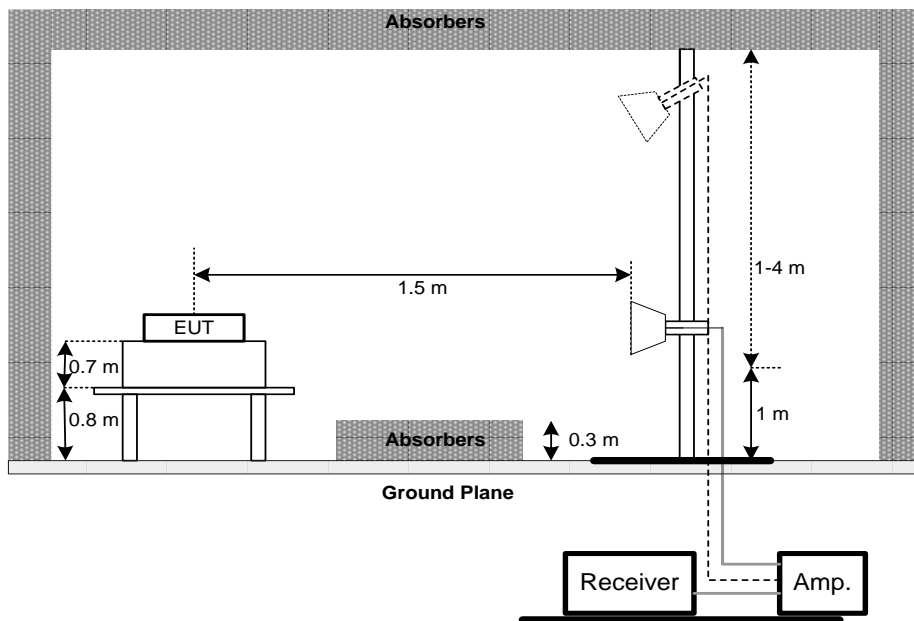
(B) Radiated Emission Test Set-Up Frequency Above 1 GHz



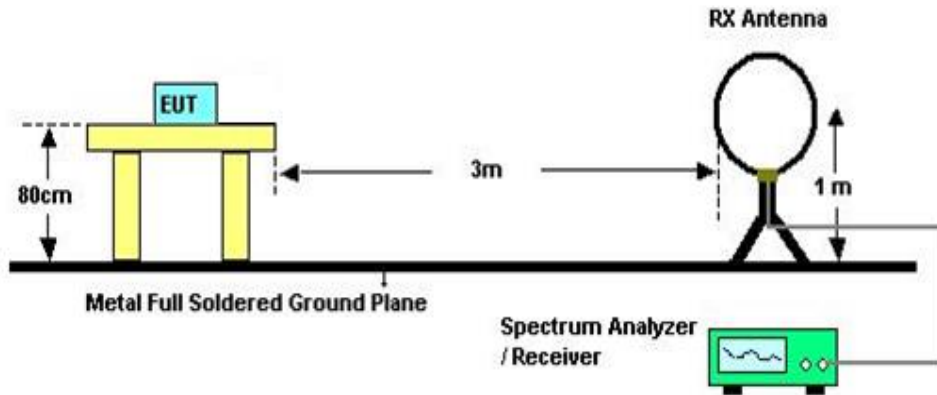
(B) Radiated Emission Test Set-Up Frequency Above 1 GHz  
 Band edge



Harmonic



(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 / 23°C  
 Relative Humidity: 55% / 70%  
 Test Voltage: DC 3.7V / DC 5V

**4.2.7 TEST RESULTS (9KHZ TO 30MHZ)**

Please refer to the Attachment B

Remark:

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

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

Please refer to the Attachment C.

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

Please refer to the Attachment 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	100KHz
VBW	100KHz
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: 60%  
 Test Voltage: DC 5V

#### 5.1.6 TEST RESULTS

Please refer to the Attachment 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 slotsTX, 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 slotsTX, 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: 60%

Test Voltage: DC 5V

#### **6.1.6 TEST RESULTS**

Please refer to the Attachment 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

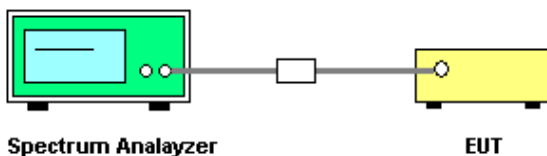
#### 7.1.1 TEST PROCEDURE

- 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: 60%  
 Test Voltage: DC 5V

#### 7.1.5 TEST RESULTS

Please refer to the Attachment 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	30KHz (20dB Bandwidth) / 30KHz (Channel Separation)
VBW	100KHz (20dB Bandwidth) / 100KHz (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: 60%  
 Test Voltage: DC 5V

#### 8.1.6 TEST RESULTS

Please refer to the Attachment H

**9. PEAKOUTPUT 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

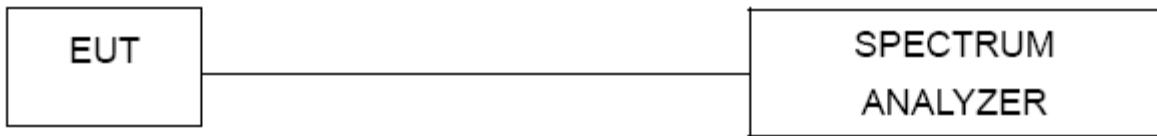
**9.1.1 TEST PROCEDURE**

- 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: 60%  
 Test Voltage: DC 5V

**9.1.6 TEST RESULTS**

Please refer to the Attachment 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 originally 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: 60%  
 Test Voltage: DC 5V

#### 10.1.6 TEST RESULTS

Please refer to the Attachment 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. 15, 2017
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, 2017
3	Test Cable	EMCI	EMC104-SM-S M-8000	8m	Jan. 04, 2018
4	Test Cable	EMCI	EMC104-SM-S M-800	150207	Jan. 04, 2018
5	Test Cable	EMCI	EEMC104-SM-S M-3000	151205	Jan. 04, 2018
6	MXE EMI Receiver	Agilent	N9038A	MY55420127	Jan. 09, 2018
7	Signal Analyzer	Agilent	N9010A	MY52220990	Feb. 22, 2018
8	Loop Ant	EMCO	6502	42960	Nov. 24, 2017
9	Horn Ant	SCHWARZBECK	BBHA 9120D	9120D-1342	Feb. 28, 2018
10	Trilog-Broadband Antenna	Schwarzbeck	VULB 9168	9168-548	Jan. 16, 2018
11	5dB Attenuator	EMCI	EMCI-N-6-05	AT-N0623	Jan. 16, 2018

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
2	Power Meter	Anritsu	ML2495A	1128008	Aug. 17, 2017
3	Power Sensor	Anritsu	MA2411B	1126001	Aug. 17, 2017

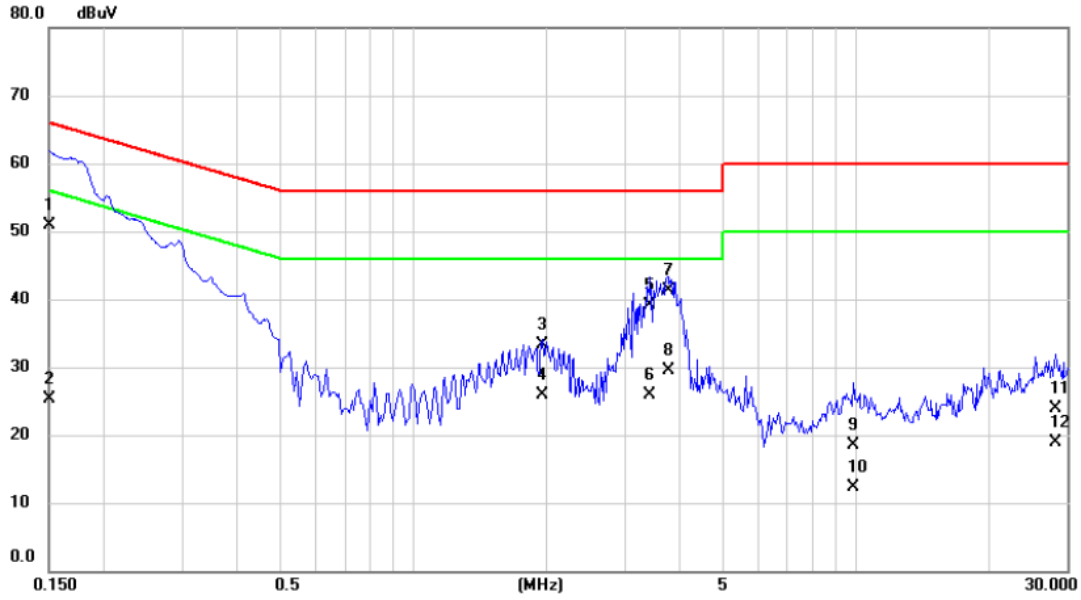
Antenna Conducted Spurious Emission					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	R&S/FSP30	100854	May 25, 2018

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

## ATTACHMENT A - CONDUCTED EMISSION

Test Mode: TX Mode

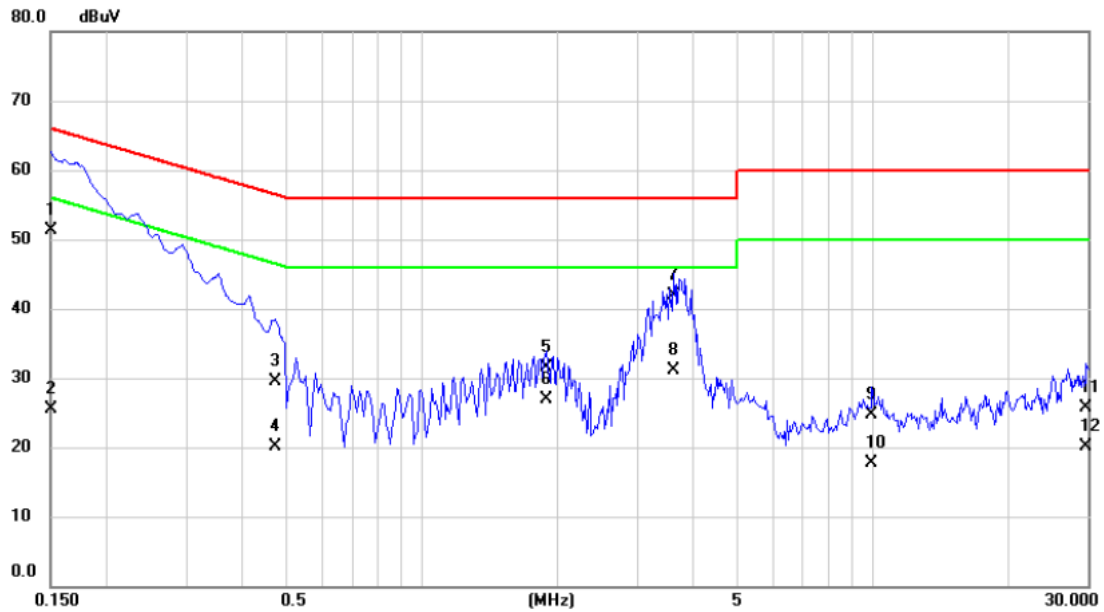
### Line



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1		0.1500	41.20	9.76	50.96	66.00	-15.04	QP	
2		0.1500	15.50	9.76	25.26	56.00	-30.74	AVG	
3		1.9490	23.50	9.83	33.33	56.00	-22.67	QP	
4		1.9490	16.10	9.83	25.93	46.00	-20.07	AVG	
5		3.4250	29.30	9.85	39.15	56.00	-16.85	QP	
6		3.4250	16.10	9.85	25.95	46.00	-20.05	AVG	
7	*	3.7670	31.40	9.86	41.26	56.00	-14.74	QP	
8		3.7670	19.60	9.86	29.46	46.00	-16.54	AVG	
9		9.8500	8.60	10.00	18.60	60.00	-41.40	QP	
10		9.8500	2.40	10.00	12.40	50.00	-37.60	AVG	
11		28.3500	14.10	9.89	23.99	60.00	-36.01	QP	
12		28.3500	9.10	9.89	18.99	50.00	-31.01	AVG	

Test Mode: TX Mode

### Neutral



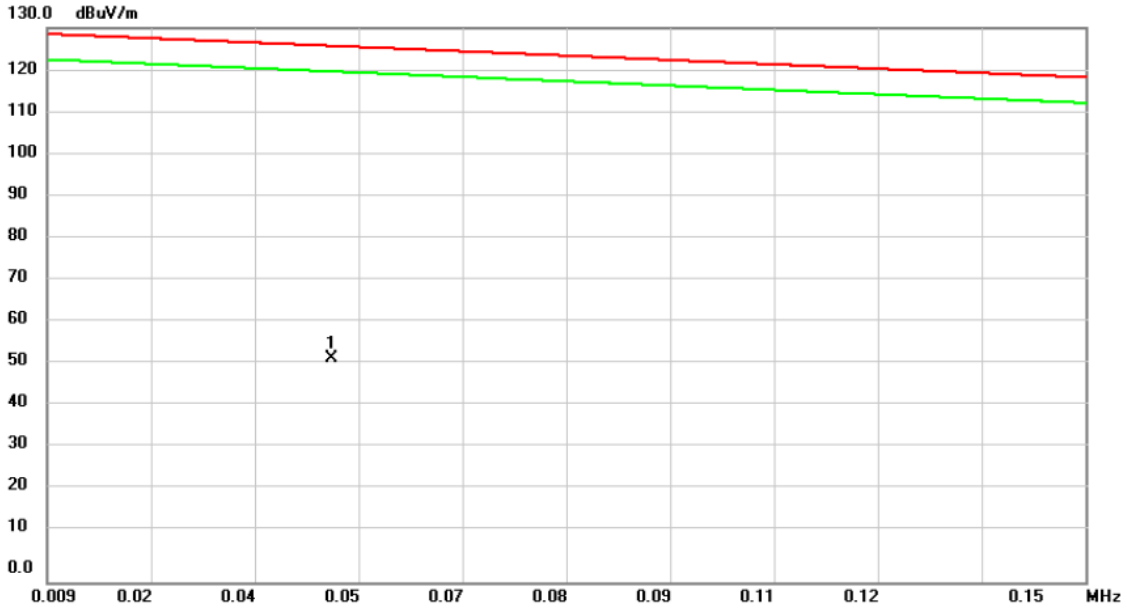
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1		0.1500	41.60	9.68	51.28	66.00	-14.72	QP	
2		0.1500	15.90	9.68	25.58	56.00	-30.42	AVG	
3		0.4720	19.90	9.70	29.60	56.48	-26.88	QP	
4		0.4720	10.40	9.70	20.10	46.48	-26.38	AVG	
5		1.8860	21.80	9.77	31.57	56.00	-24.43	QP	
6		1.8860	17.20	9.77	26.97	46.00	-19.03	AVG	
7	*	3.6050	32.00	9.82	41.82	56.00	-14.18	QP	
8		3.6050	21.20	9.82	31.02	46.00	-14.98	AVG	
9		9.9500	14.70	9.98	24.68	60.00	-35.32	QP	
10		9.9500	7.70	9.98	17.68	50.00	-32.32	AVG	
11		29.7500	15.70	10.03	25.73	60.00	-34.27	QP	
12		29.7500	10.10	10.03	20.13	50.00	-29.87	AVG	



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

Test Mode: TX Mode\_DC 3.7V

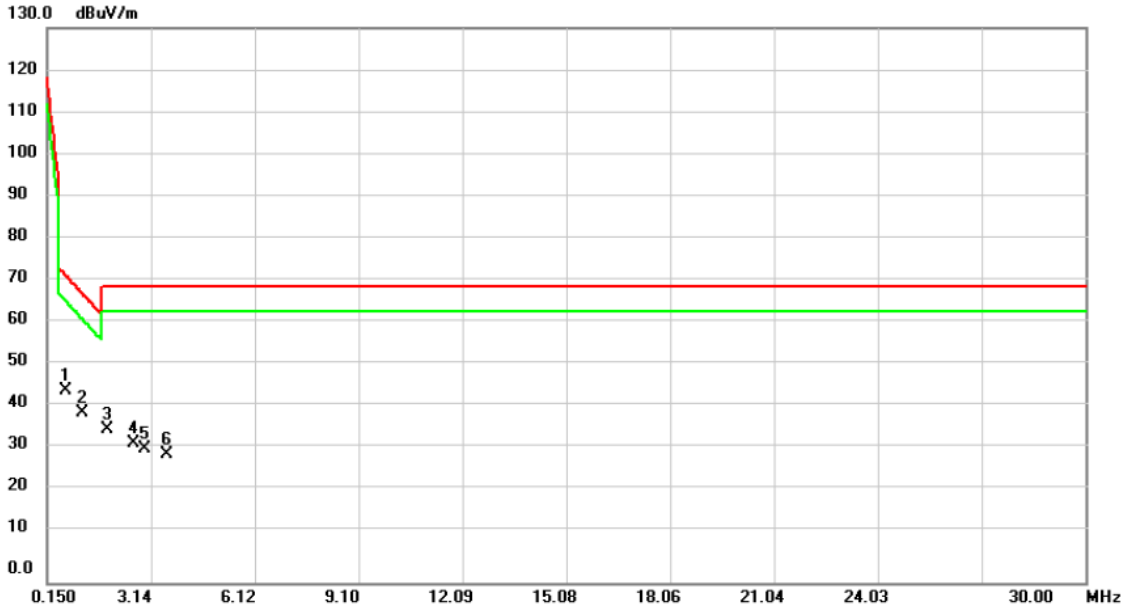
Ant 0°



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	*	0.0476	39.18	13.24	52.42	125.73	-73.31	peak	

Test Mode: TX Mode\_DC 3.7V

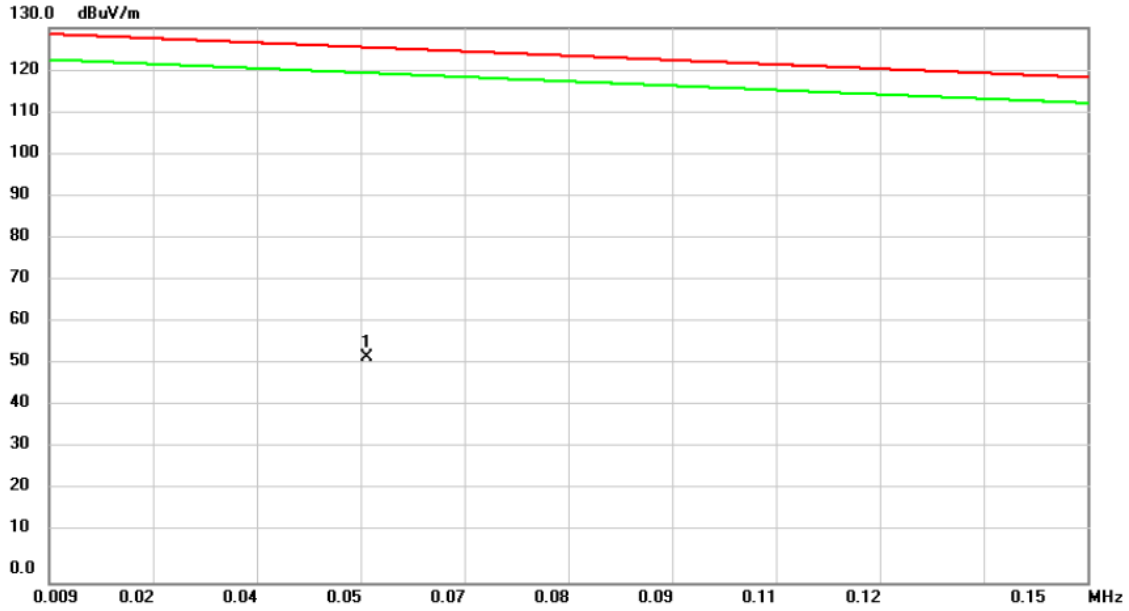
Ant 0°



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	*	0.6873	33.26	11.87	45.13	72.04	-26.91	peak	
2		1.1650	28.03	11.93	39.96	67.78	-27.82	peak	
3		1.8810	24.44	11.60	36.04	69.54	-33.50	peak	
4		2.6274	21.29	11.27	32.56	69.54	-36.98	peak	
5		2.9560	20.15	11.12	31.27	69.54	-38.27	peak	
6		3.5825	18.91	11.19	30.10	69.54	-39.44	peak	

Test Mode: TX Mode\_DC 3.7V

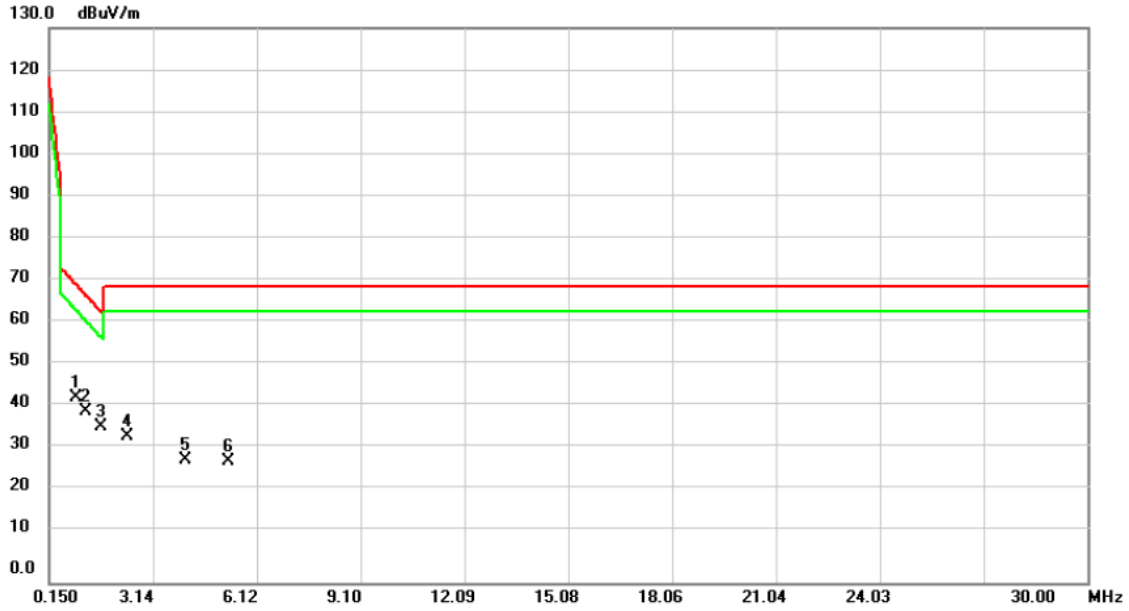
Ant 90°



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Detector	Comment
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB		
1	*	0.0521	39.97	12.96	52.93	125.41	-72.48	peak	

Test Mode: TX Mode\_DC 3.7V

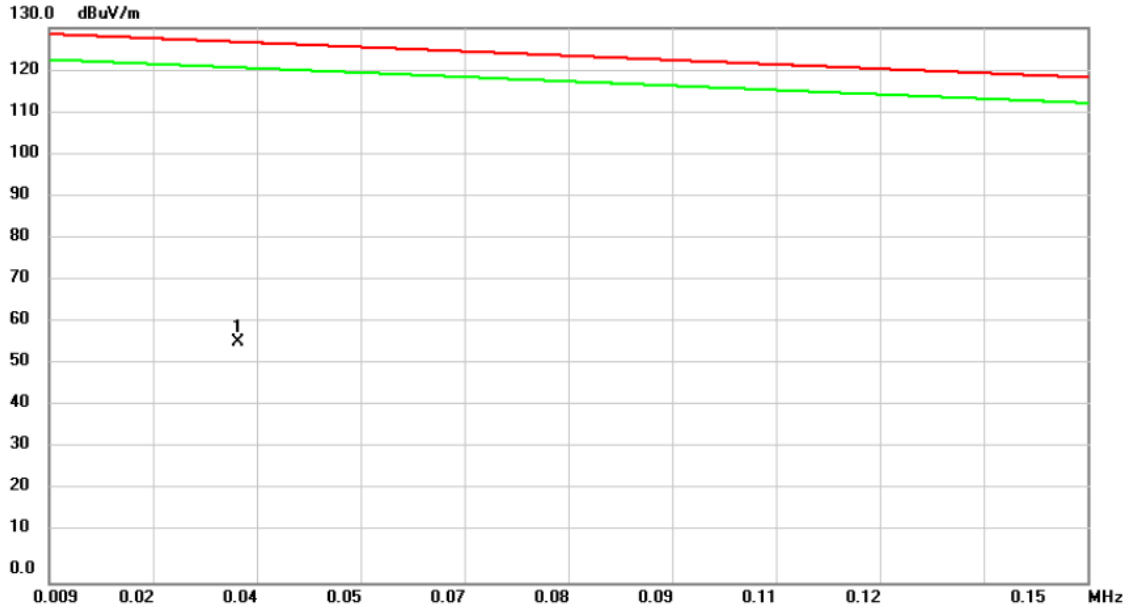
Ant 90°



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	*	0.9261	31.48	11.97	43.45	69.91	-26.46	peak	
2		1.2240	28.18	11.90	40.08	67.26	-27.18	peak	
3		1.6425	24.87	11.71	36.58	63.53	-26.95	peak	
4		2.3887	22.98	11.38	34.36	69.54	-35.18	peak	
5		4.0602	17.63	11.26	28.89	69.54	-40.65	peak	
6		5.2842	16.97	11.39	28.36	69.54	-41.18	peak	

Test Mode: TX Mode\_DC 5V

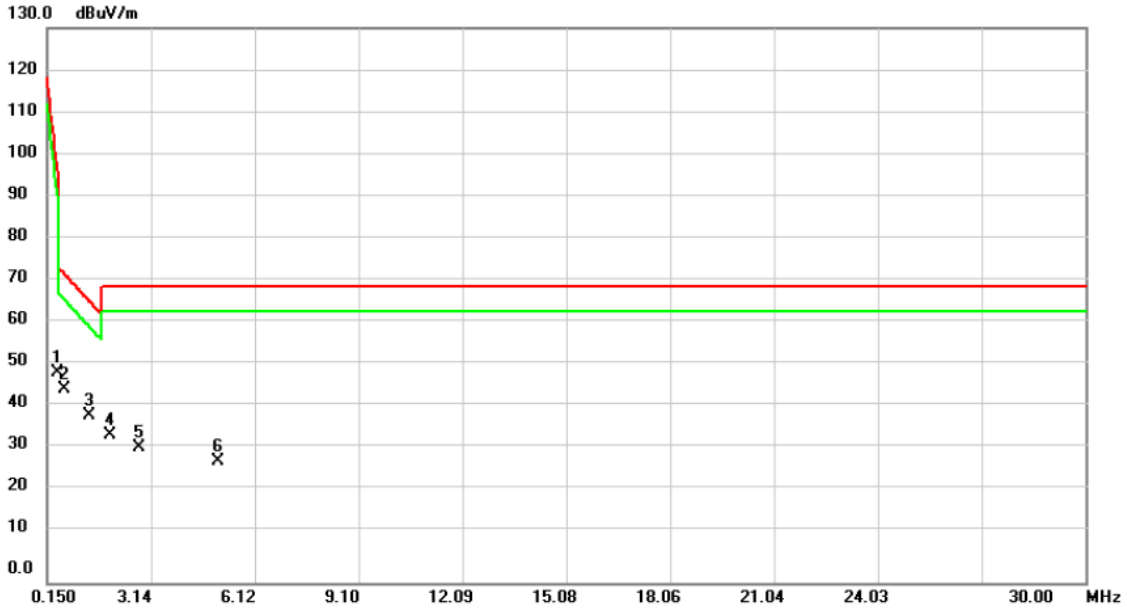
Ant 0°



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	*	0.0347	41.87	14.53	56.40	126.66	-70.26	peak	

Test Mode: TX Mode\_DC 5V

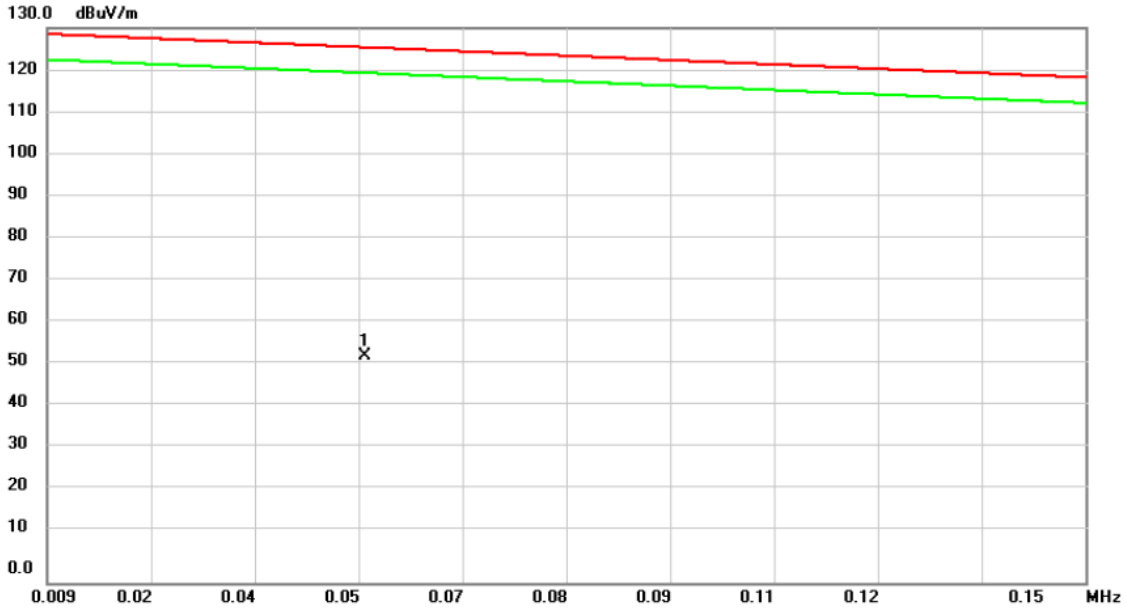
Ant 0°



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		0.4485	37.41	11.80	49.21	96.80	-47.59	peak	
2		0.6572	33.42	11.86	45.28	72.31	-27.03	peak	
3	*	1.3440	27.36	11.85	39.21	66.19	-26.98	peak	
4		1.9708	23.01	11.56	34.57	69.54	-34.97	peak	
5		2.8065	20.46	11.19	31.65	69.54	-37.89	peak	
6		5.0750	16.98	11.40	28.38	69.54	-41.16	peak	

Test Mode: TX Mode\_DC 5V

Ant 90°

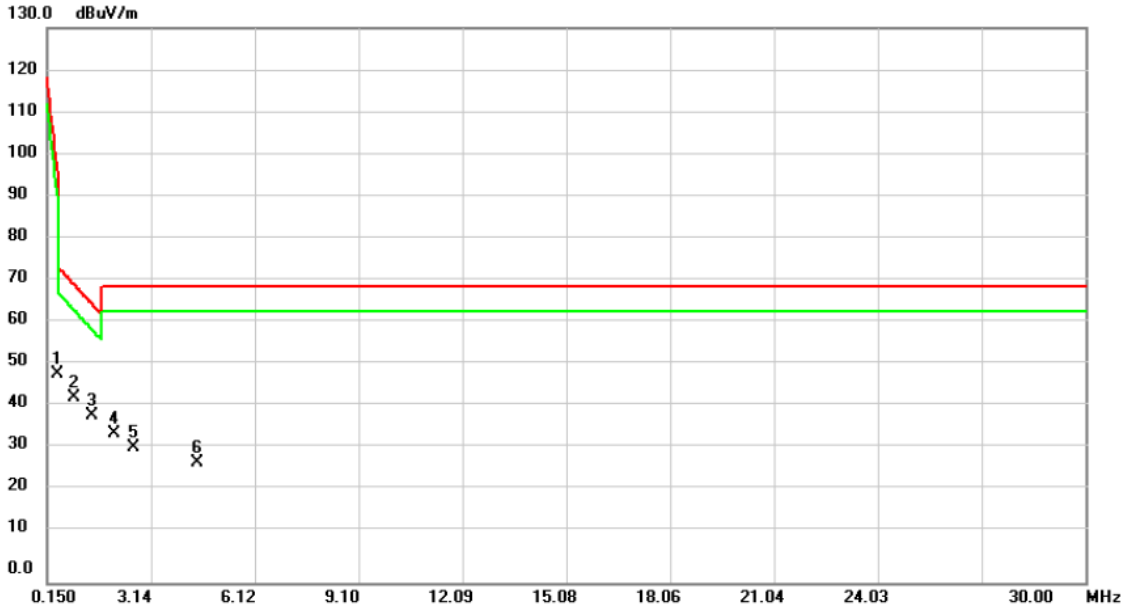


No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Detector	Comment
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB		
1	*	0.0522	40.30	12.96	53.26	125.40	-72.14	peak	



Test Mode: TX Mode\_DC 5V

Ant 90°

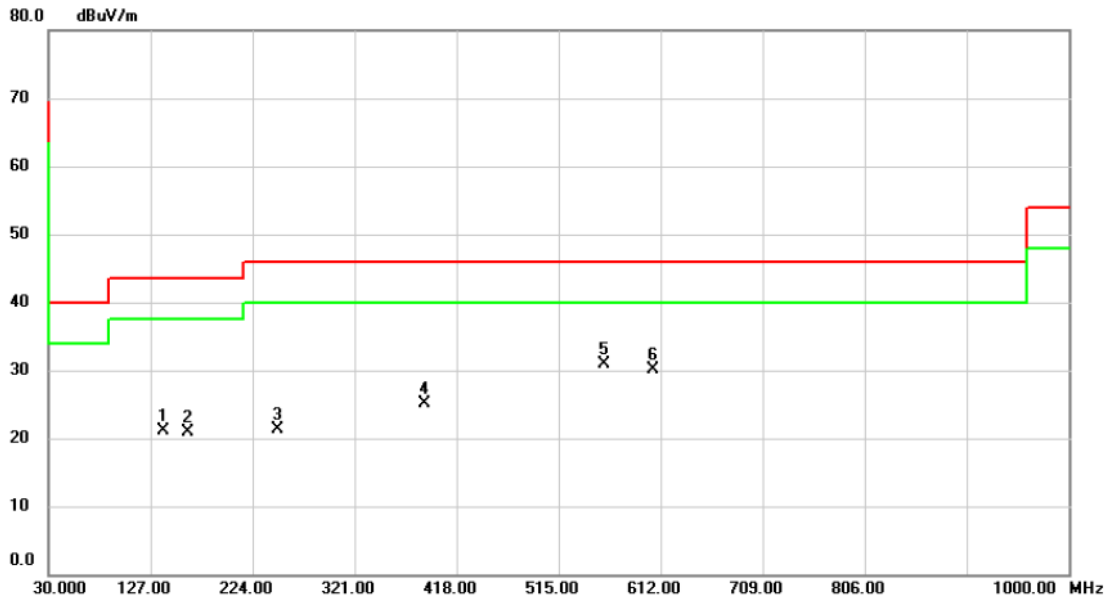


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		0.4485	37.06	11.80	48.86	96.80	-47.94	peak	
2		0.9261	31.48	11.97	43.45	69.91	-26.46	peak	
3	*	1.4334	27.49	11.80	39.29	65.39	-26.10	peak	
4		2.0604	23.36	11.52	34.88	69.54	-34.66	peak	
5		2.6573	20.52	11.25	31.77	69.54	-37.77	peak	
6		4.4484	16.93	11.32	28.25	69.54	-41.29	peak	

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

Test Mode: TX 2480MHz\_CH79\_3Mbps\_DC 3.7V

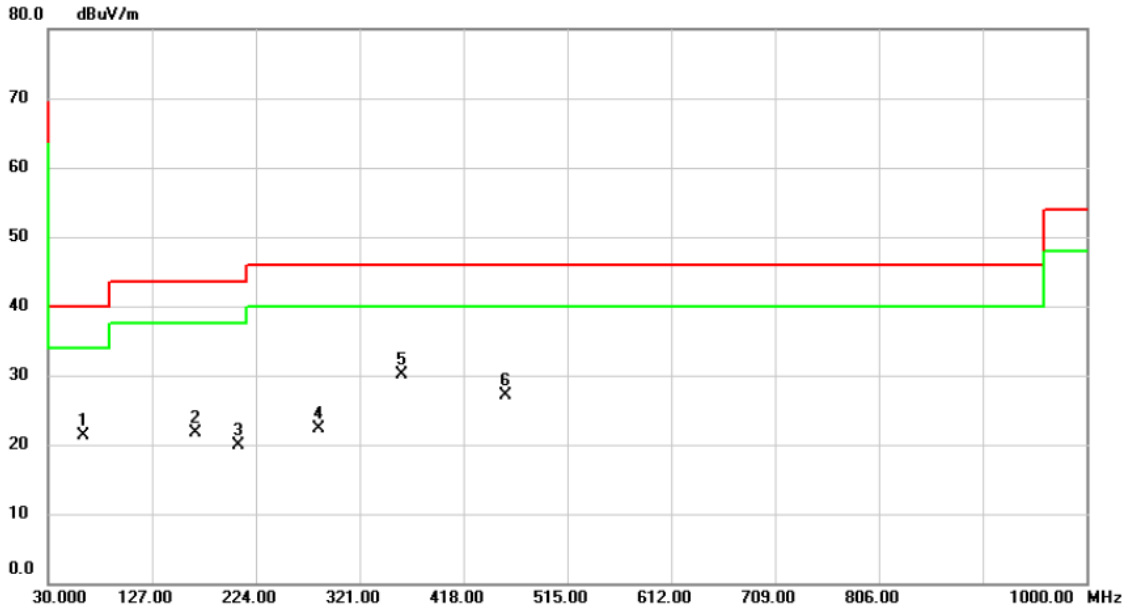
**Vertical**



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		139.6100	30.20	-9.19	21.01	43.50	-22.49	peak	
2		161.9200	29.54	-8.58	20.96	43.50	-22.54	peak	
3		247.2800	30.38	-9.17	21.21	46.00	-24.79	peak	
4		386.9600	30.34	-5.28	25.06	46.00	-20.94	peak	
5	*	558.6500	32.32	-1.49	30.83	46.00	-15.17	peak	
6		604.2400	30.48	-0.38	30.10	46.00	-15.90	peak	

Test Mode: TX 2480MHz\_CH79\_3Mbps\_DC 3.7V

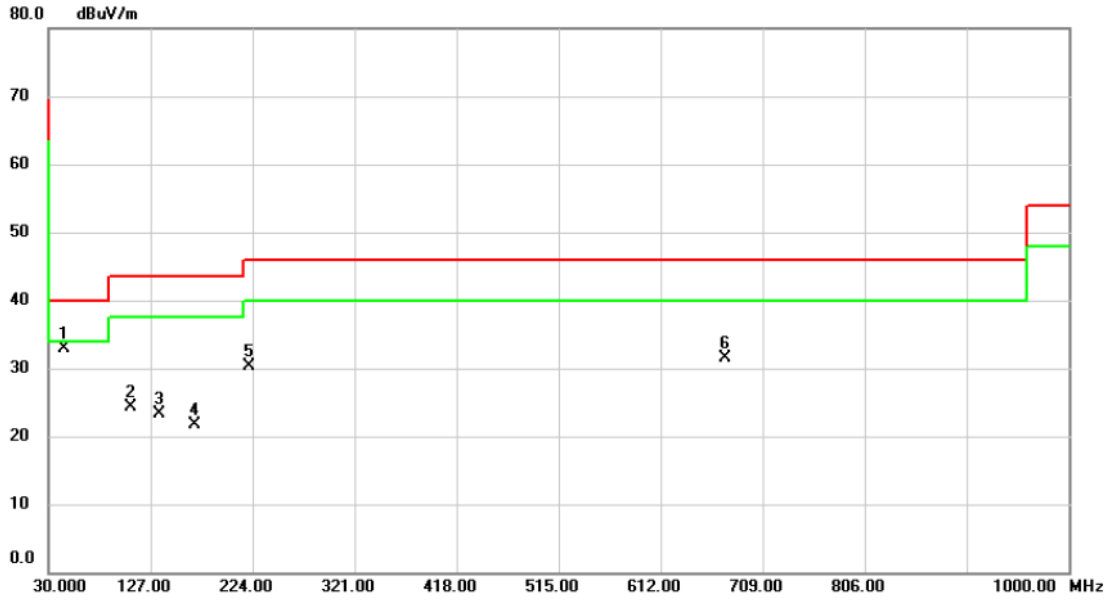
Horizontal



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		62.9800	30.32	-9.07	21.25	40.00	-18.75	peak	
2		167.7400	30.36	-8.59	21.77	43.50	-21.73	peak	
3		207.5100	30.70	-10.87	19.83	43.50	-23.67	peak	
4		282.2000	30.35	-7.95	22.40	46.00	-23.60	peak	
5	*	359.8000	36.14	-5.98	30.16	46.00	-15.84	peak	
6		457.7700	30.46	-3.43	27.03	46.00	-18.97	peak	

Test Mode: TX 2480MHz\_CH79\_3Mbps\_DC 5V

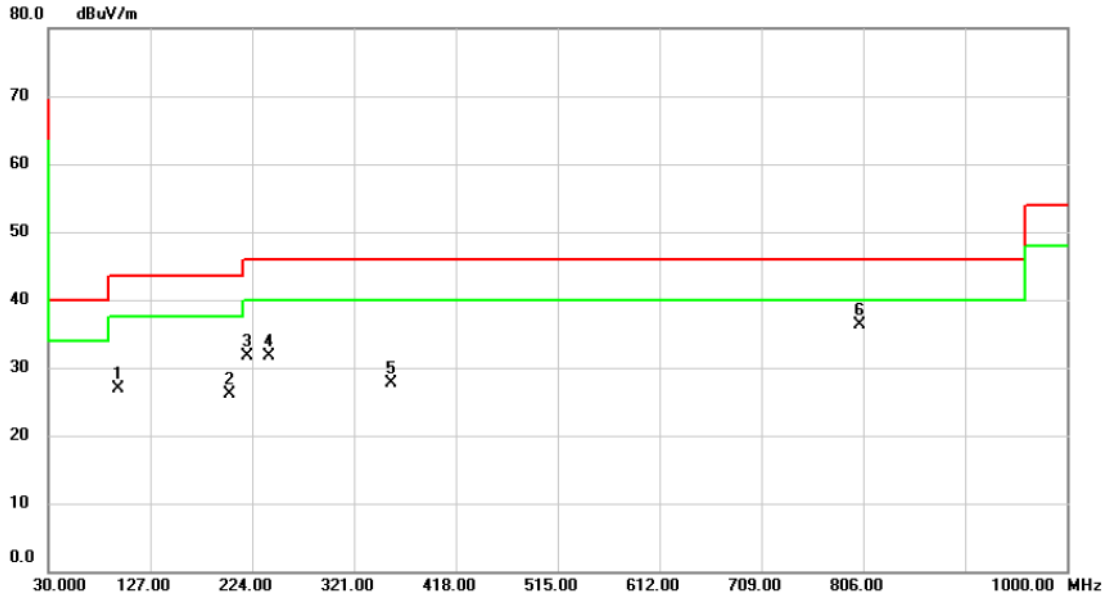
**Vertical**



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	*	44.5500	41.58	-8.58	33.00	40.00	-7.00	peak	
2		108.5700	35.40	-11.00	24.40	43.50	-19.10	peak	
3		134.7600	32.65	-9.38	23.27	43.50	-20.23	peak	
4		168.7100	30.23	-8.60	21.63	43.50	-21.87	peak	
5		220.1200	41.02	-10.81	30.21	46.00	-15.79	peak	
6		673.1100	31.07	0.38	31.45	46.00	-14.55	peak	

Test Mode: TX 2480MHz\_CH79\_3Mbps\_DC 5V

**Horizontal**

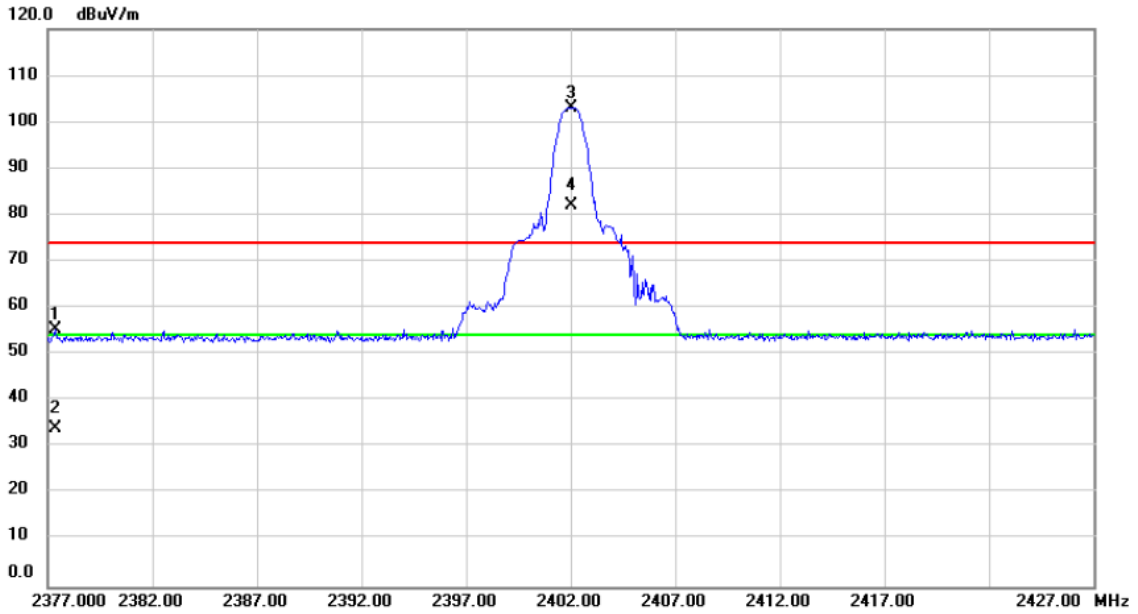


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		95.9600	39.65	-12.73	26.92	43.50	-16.58	peak	
2		202.6600	36.87	-10.72	26.15	43.50	-17.35	peak	
3		219.1500	42.55	-10.83	31.72	46.00	-14.28	peak	
4		239.5200	41.18	-9.42	31.76	46.00	-14.24	peak	
5		356.8900	33.69	-6.06	27.63	46.00	-18.37	peak	
6	*	802.1200	33.74	2.65	36.39	46.00	-9.61	peak	

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

Test Mode : TX 2402MHz\_CH00\_1Mbps

**Vertical**

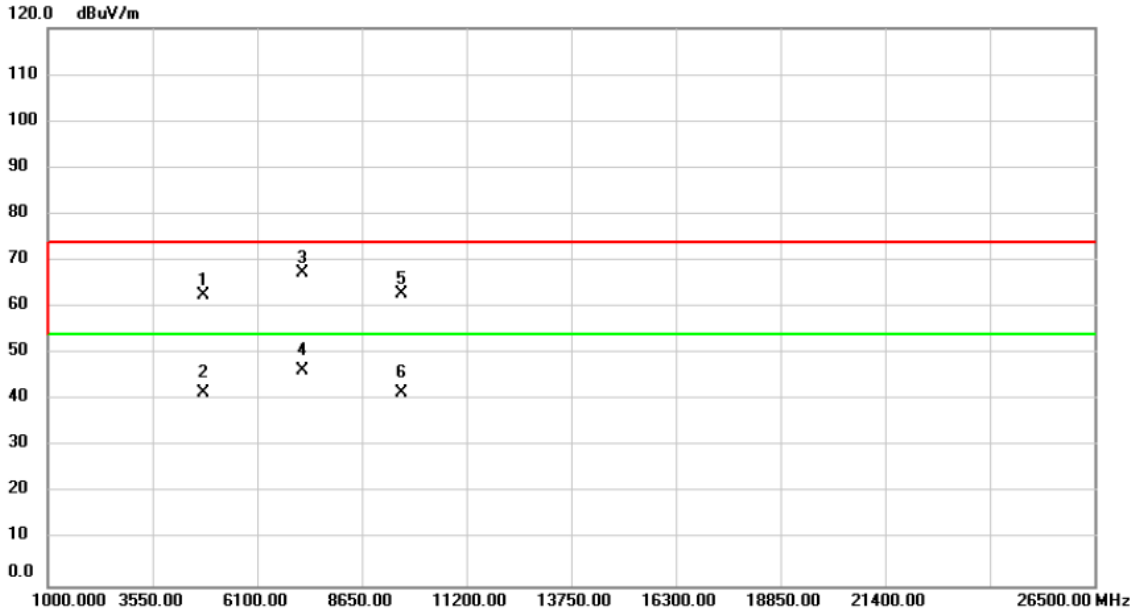


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		2377.350	28.28	26.96	55.24	74.00	-18.76	peak	
2		2377.350	7.17	26.96	34.13	54.00	-19.87	AVG	
3	*	2402.000	75.99	27.03	103.02	74.00	29.02	peak	No Limit
4	X	2402.000	54.88	27.03	81.91	54.00	27.91	AVG	No Limit



Test Mode : TX 2402MHz\_CH00\_1Mbps

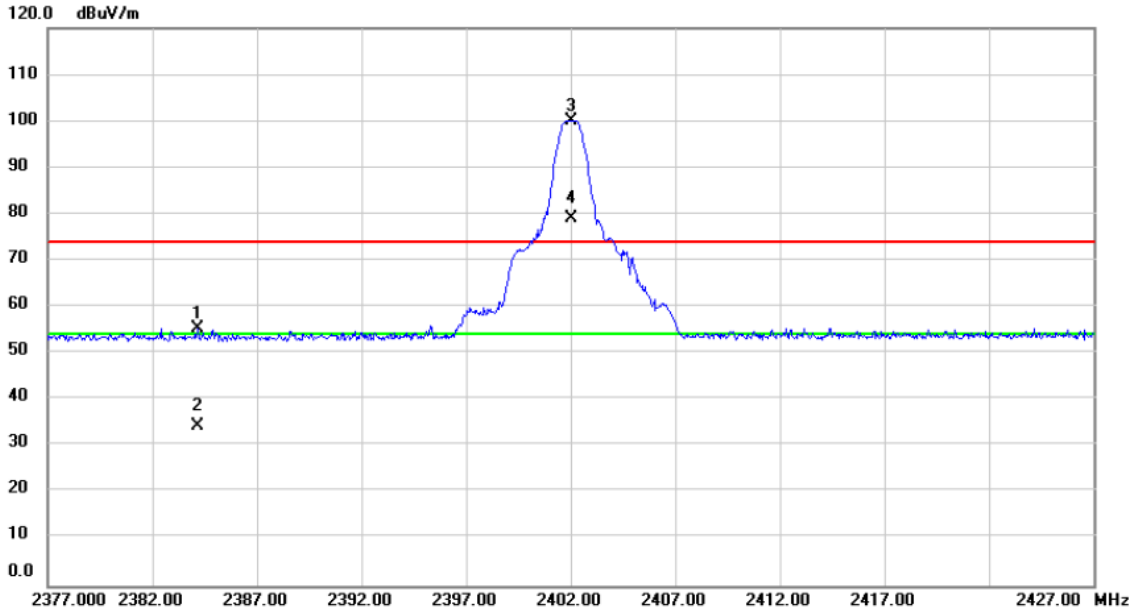
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Detector	Comment
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB		
1		4804.000	73.96	-11.40	62.56	74.00	-11.44	peak	
2		4804.000	52.85	-11.40	41.45	54.00	-12.55	AVG	
3	*	7206.000	72.93	-5.52	67.41	74.00	-6.59	peak	
4		7206.000	51.82	-5.52	46.30	54.00	-7.70	AVG	
5		9608.000	62.38	0.38	62.76	74.00	-11.24	peak	
6		9608.000	41.27	0.38	41.65	54.00	-12.35	AVG	

Test Mode : TX 2402MHz\_CH00\_1Mbps

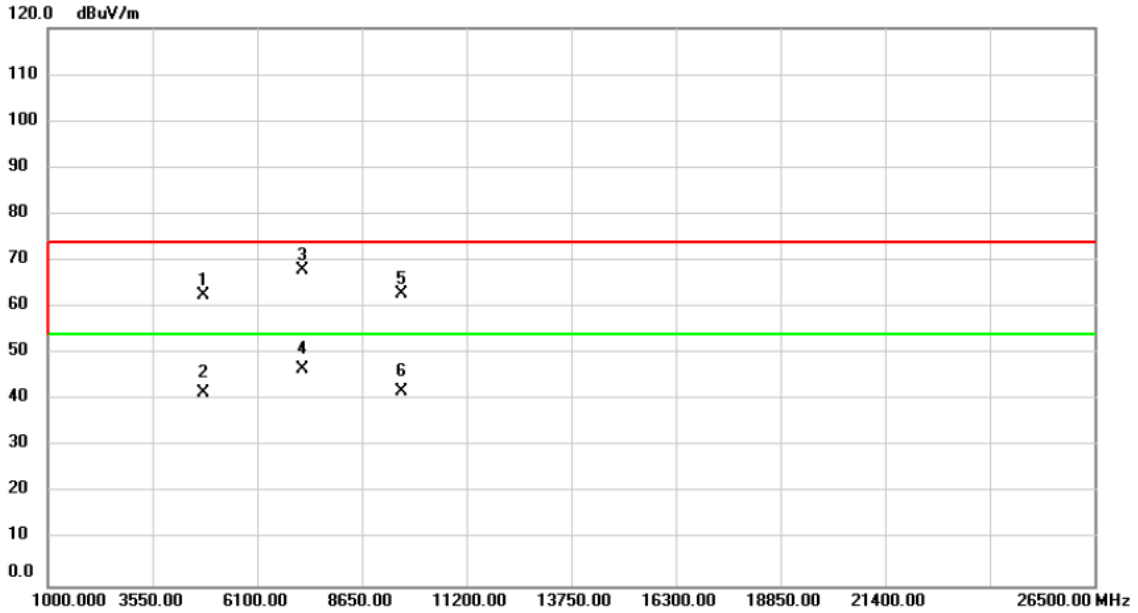
**Horizontal**



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		2384.200	28.43	26.98	55.41	74.00	-18.59	peak	
2		2384.200	7.32	26.98	34.30	54.00	-19.70	AVG	
3	*	2402.000	73.15	27.03	100.18	74.00	26.18	peak	No Limit
4	X	2402.000	52.04	27.03	79.07	54.00	25.07	AVG	No Limit

Test Mode : TX 2402MHz\_CH00\_1Mbps

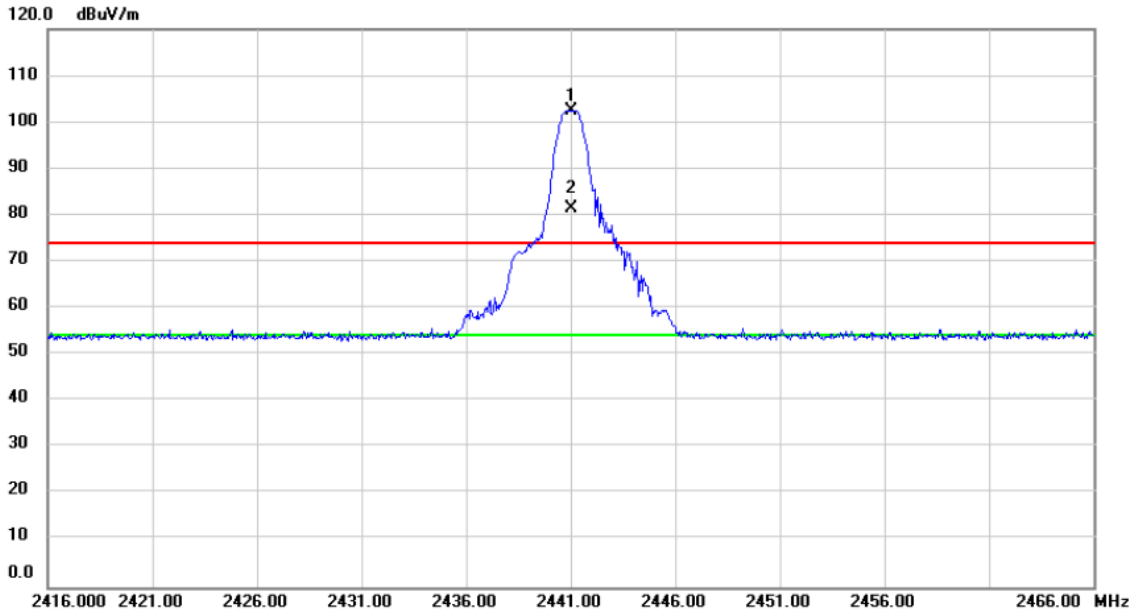
**Horizontal**



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Detector	Comment
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB		
1		4804.000	73.94	-11.40	62.54	74.00	-11.46	peak	
2		4804.000	52.83	-11.40	41.43	54.00	-12.57	AVG	
3	*	7206.000	73.38	-5.52	67.86	74.00	-6.14	peak	
4		7206.000	52.27	-5.52	46.75	54.00	-7.25	AVG	
5		9608.000	62.51	0.38	62.89	74.00	-11.11	peak	
6		9608.000	41.40	0.38	41.78	54.00	-12.22	AVG	

Test Mode : TX 2441MHz\_CH39\_1Mbps

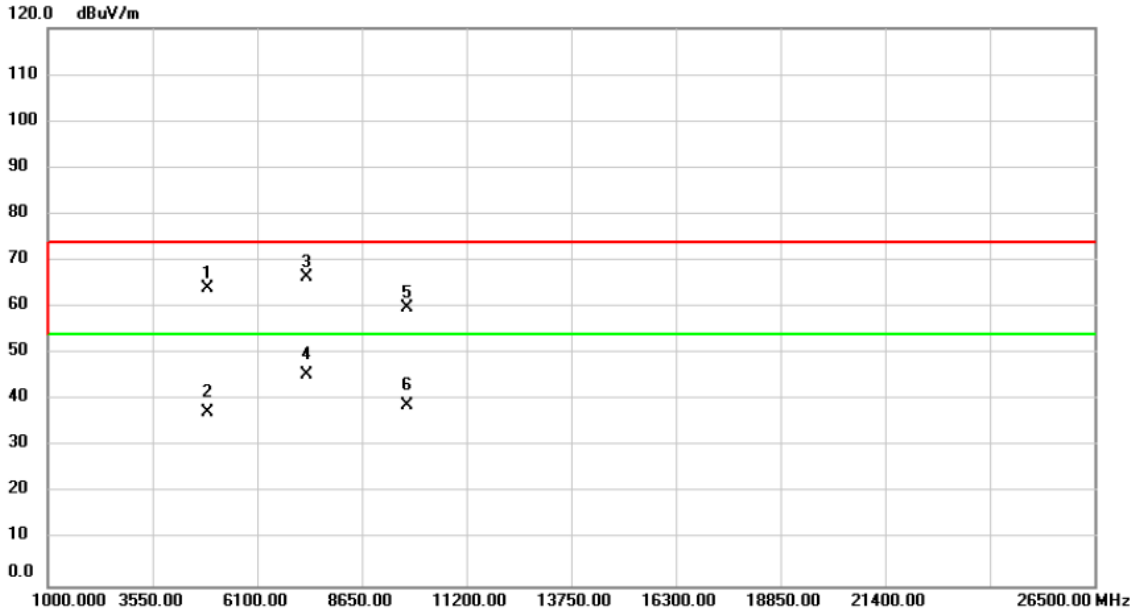
**Vertical**



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Detector	Comment
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB		
1	*	2441.000	75.46	27.13	102.59	74.00	28.59	peak	No Limit
2	X	2441.000	54.35	27.13	81.48	54.00	27.48	AVG	No Limit

Test Mode : TX 2441MHz\_CH39\_1Mbps

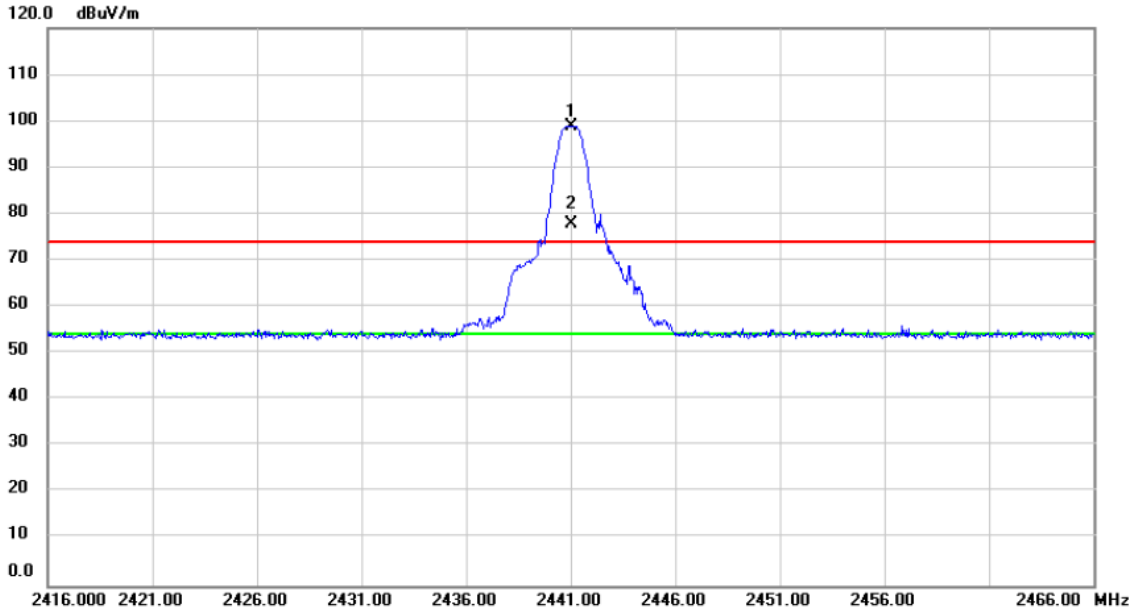
**Vertical**



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		4882.000	75.34	-11.28	64.06	74.00	-9.94	peak	
2		4882.000	48.70	-11.28	37.42	54.00	-16.58	AVG	
3	*	7323.000	71.56	-5.09	66.47	74.00	-7.53	peak	
4		7323.000	50.45	-5.09	45.36	54.00	-8.64	AVG	
5		9764.000	58.94	0.96	59.90	74.00	-14.10	peak	
6		9764.000	37.83	0.96	38.79	54.00	-15.21	AVG	

Test Mode : TX 2441MHz\_CH39\_1Mbps

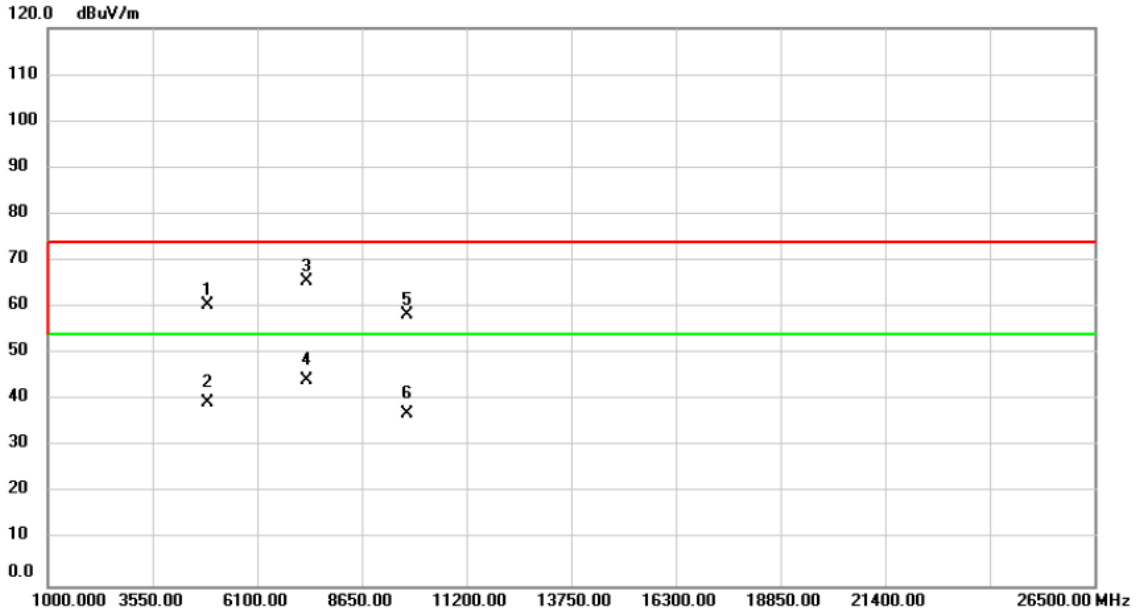
**Horizontal**



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	*	2441.000	71.84	27.13	98.97	74.00	24.97	peak	No Limit
2	X	2441.000	50.73	27.13	77.86	54.00	23.86	AVG	No Limit

Test Mode : TX 2441MHz\_CH39\_1Mbps

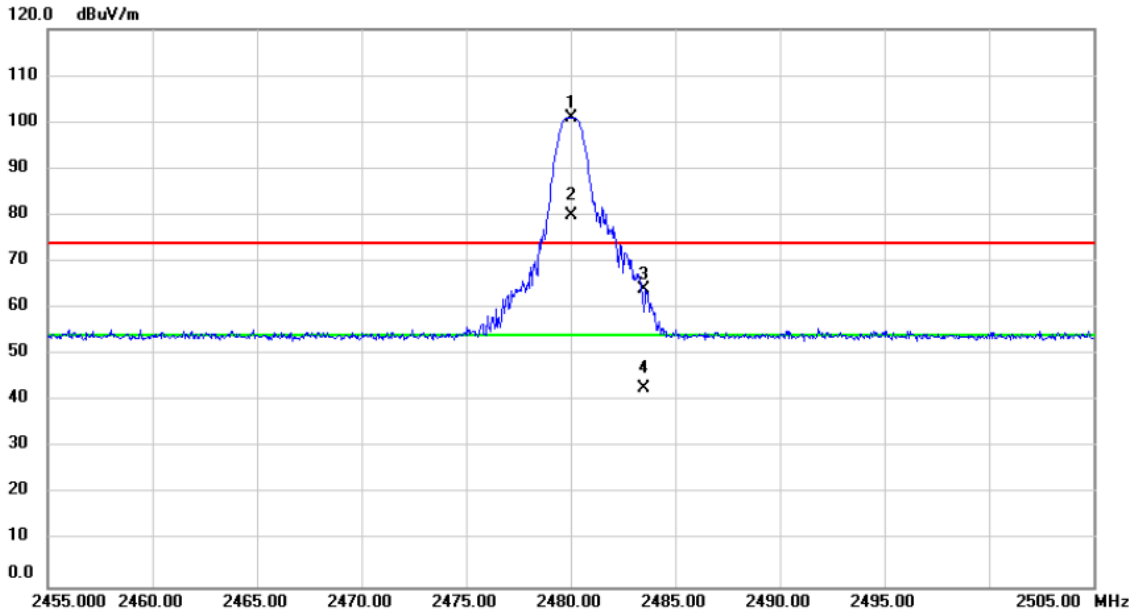
**Horizontal**



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		4882.000	71.70	-11.28	60.42	74.00	-13.58	peak	
2		4882.000	50.59	-11.28	39.31	54.00	-14.69	AVG	
3	*	7323.000	70.57	-5.09	65.48	74.00	-8.52	peak	
4		7323.000	49.46	-5.09	44.37	54.00	-9.63	AVG	
5		9764.000	57.26	0.96	58.22	74.00	-15.78	peak	
6		9764.000	36.15	0.96	37.11	54.00	-16.89	AVG	

Test Mode : TX 2480MHz\_CH78\_1Mbps

**Vertical**

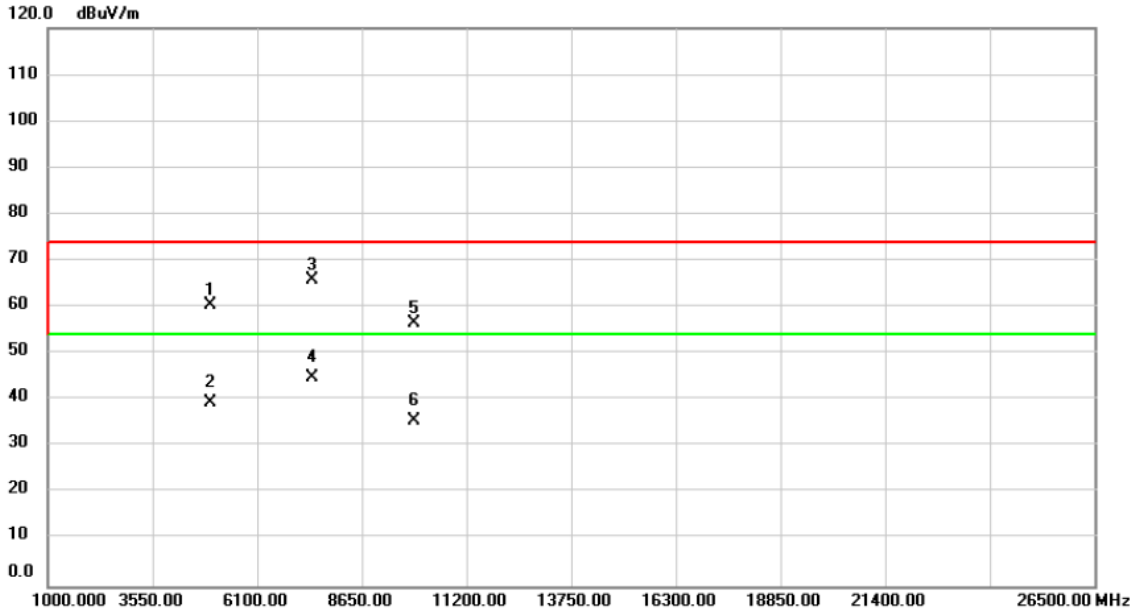


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	*	2480.000	73.74	27.24	100.98	74.00	26.98	peak	No Limit
2	X	2480.000	52.63	27.24	79.87	54.00	25.87	AVG	No Limit
3		2483.500	36.75	27.25	64.00	74.00	-10.00	peak	
4		2483.500	15.64	27.25	42.89	54.00	-11.11	AVG	



Test Mode : TX 2480MHz\_CH78\_1Mbps

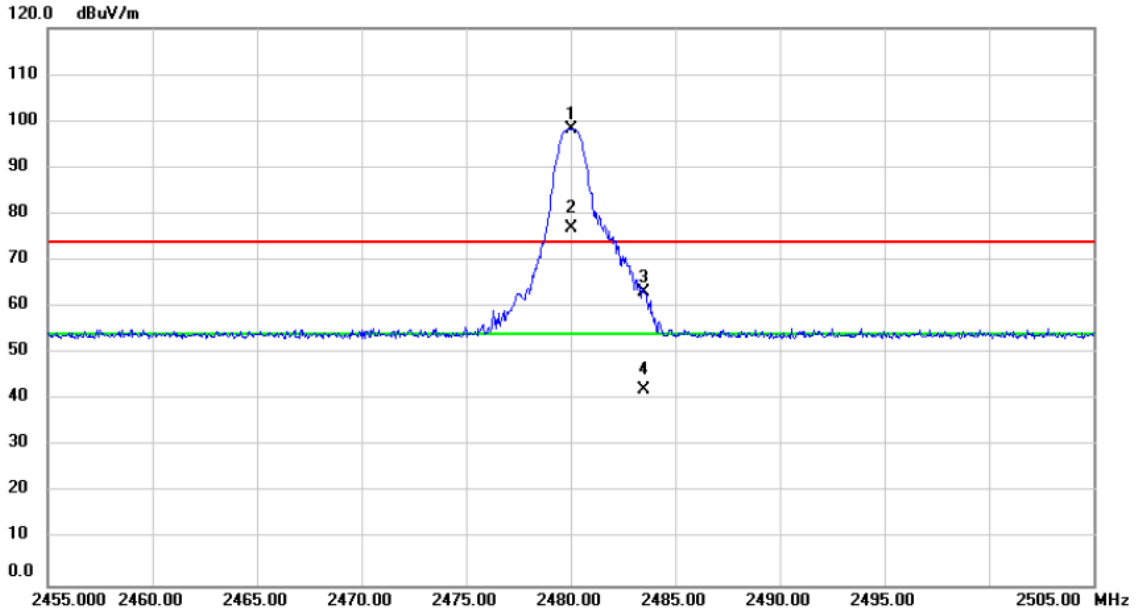
Vertical



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		4960.000	71.72	-11.15	60.57	74.00	-13.43	peak	
2		4960.000	50.61	-11.15	39.46	54.00	-14.54	AVG	
3	*	7440.000	70.63	-4.68	65.95	74.00	-8.05	peak	
4		7440.000	49.52	-4.68	44.84	54.00	-9.16	AVG	
5		9920.000	54.98	1.54	56.52	74.00	-17.48	peak	
6		9920.000	33.87	1.54	35.41	54.00	-18.59	AVG	

Test Mode : TX 2480MHz\_CH78\_1Mbps

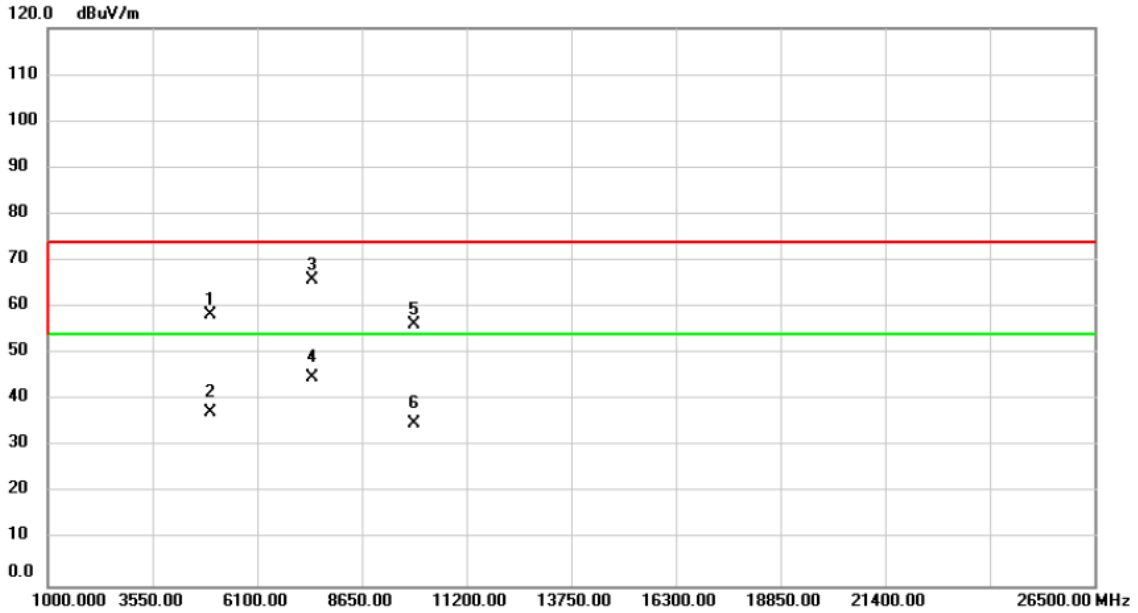
**Horizontal**



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	*	2480.000	70.97	27.24	98.21	74.00	24.21	peak	No Limit
2	X	2480.000	49.86	27.24	77.10	54.00	23.10	AVG	No Limit
3		2483.500	35.89	27.25	63.14	74.00	-10.86	peak	
4		2483.500	14.78	27.25	42.03	54.00	-11.97	AVG	

Test Mode : TX 2480MHz\_CH78\_1Mbps

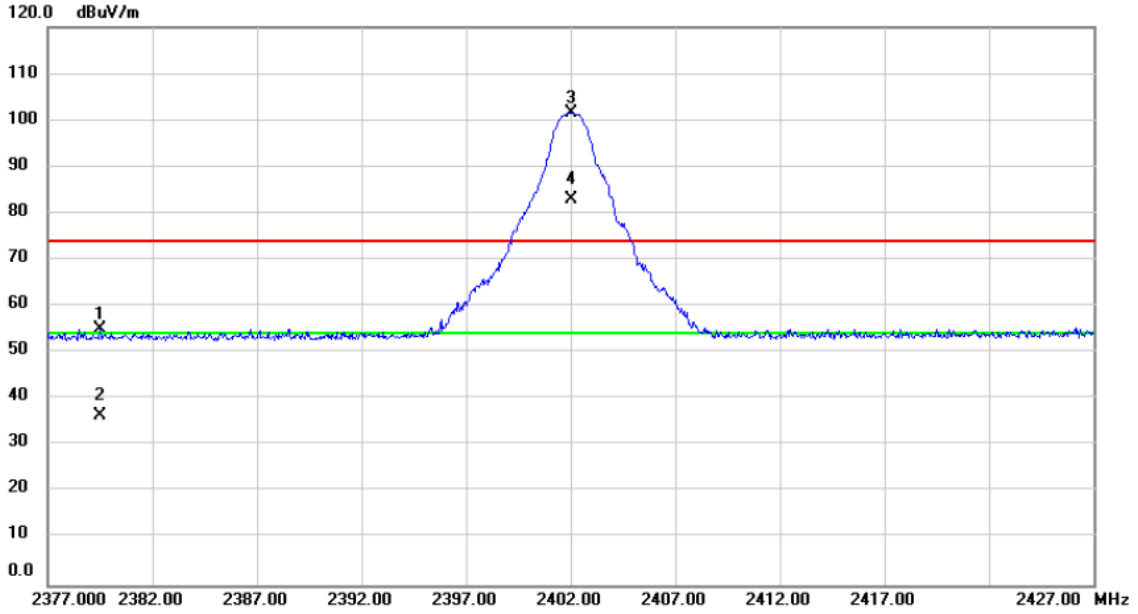
Horizontal



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		4960.000	69.50	-11.15	58.35	74.00	-15.65	peak	
2		4960.000	48.39	-11.15	37.24	54.00	-16.76	AVG	
3	*	7440.000	70.66	-4.68	65.98	74.00	-8.02	peak	
4		7440.000	49.55	-4.68	44.87	54.00	-9.13	AVG	
5		9920.000	54.66	1.54	56.20	74.00	-17.80	peak	
6		9920.000	33.55	1.54	35.09	54.00	-18.91	AVG	

Test Mode : TX 2402MHz\_CH00\_3Mbps

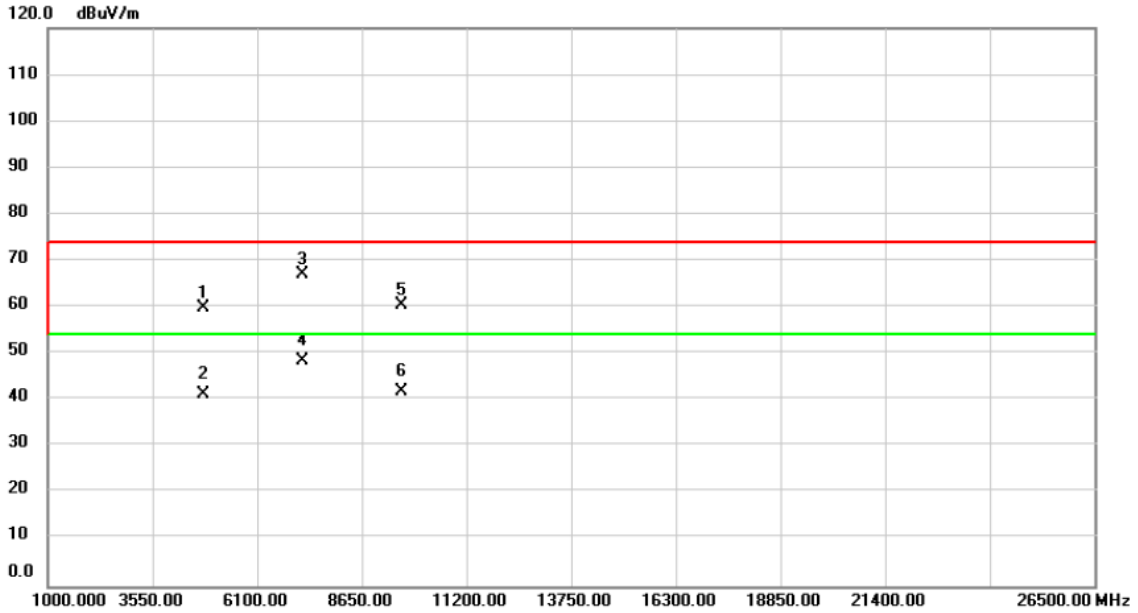
**Vertical**



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		2379.500	28.10	26.96	55.06	74.00	-18.94	peak	
2		2379.500	9.54	26.96	36.50	54.00	-17.50	AVG	
3	X	2402.000	74.44	27.03	101.47	74.00	27.47	peak	No Limit
4	*	2402.000	55.88	27.03	82.91	54.00	28.91	AVG	No Limit

Test Mode : TX 2402MHz\_CH00\_3Mbps

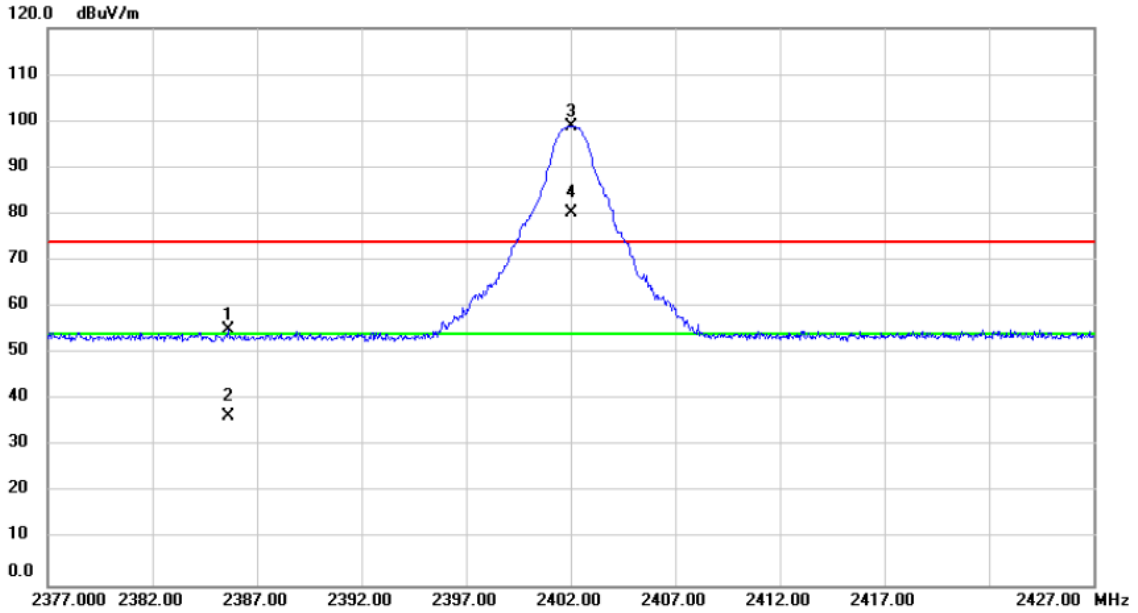
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Detector	Comment
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB		
1		4804.000	71.32	-11.40	59.92	74.00	-14.08	peak	
2		4804.000	52.76	-11.40	41.36	54.00	-12.64	AVG	
3		7206.000	72.52	-5.52	67.00	74.00	-7.00	peak	
4	*	7206.000	53.96	-5.52	48.44	54.00	-5.56	AVG	
5		9608.000	60.01	0.38	60.39	74.00	-13.61	peak	
6		9608.000	41.45	0.38	41.83	54.00	-12.17	AVG	

Test Mode : TX 2402MHz\_CH00\_3Mbps

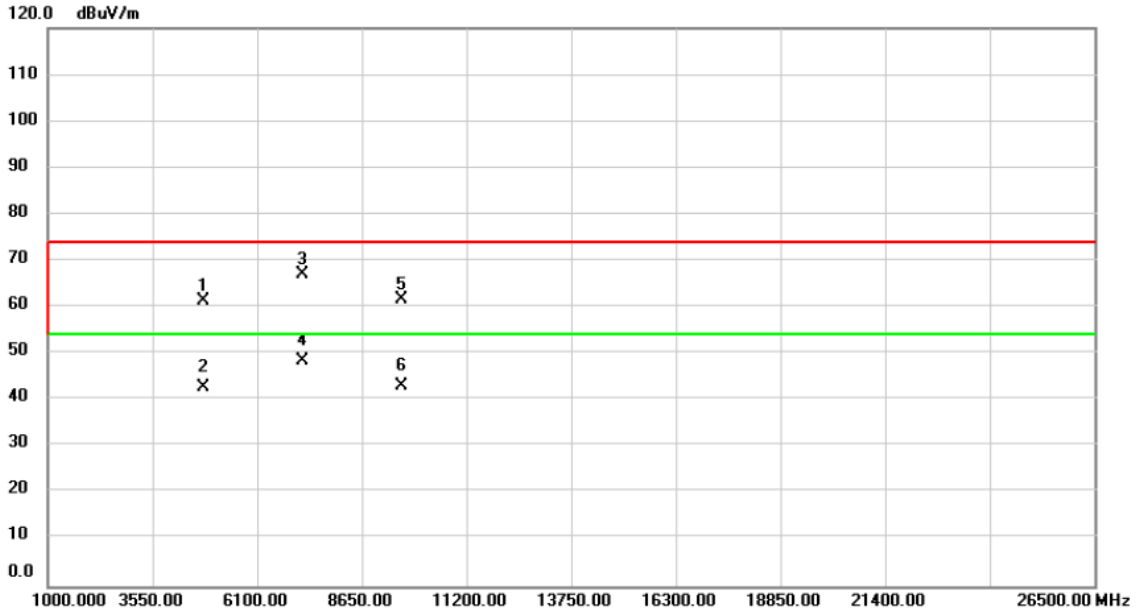
**Horizontal**



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		2385.650	28.04	26.98	55.02	74.00	-18.98	peak	
2		2385.650	9.48	26.98	36.46	54.00	-17.54	AVG	
3	X	2402.000	71.77	27.03	98.80	74.00	24.80	peak	No Limit
4	*	2402.000	53.21	27.03	80.24	54.00	26.24	AVG	No Limit

Test Mode : TX 2402MHz\_CH00\_3Mbps

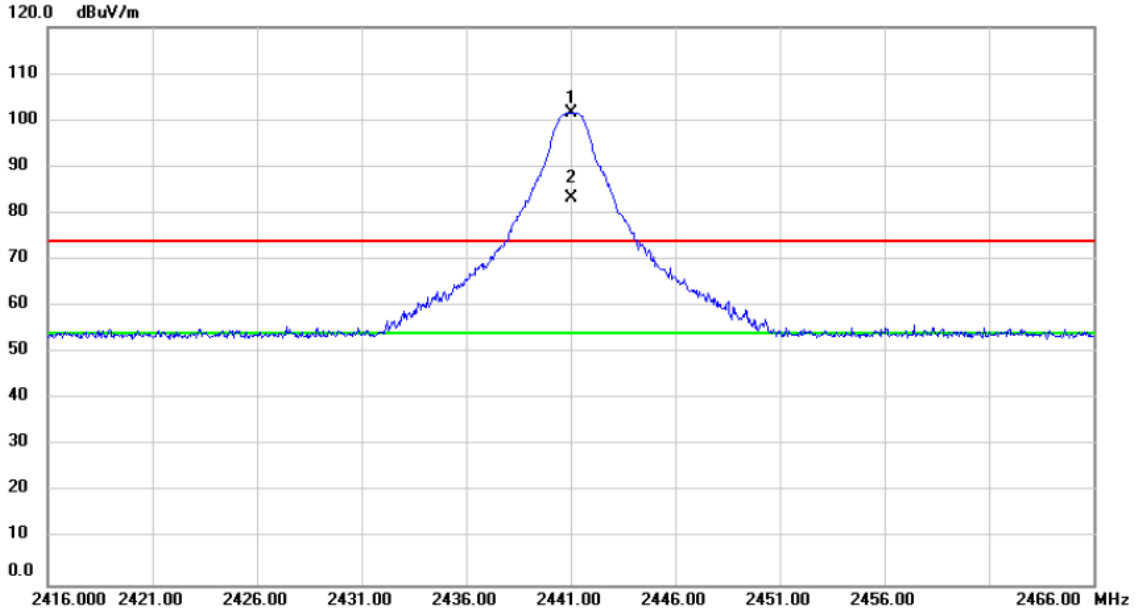
Horizontal



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		4804.000	72.62	-11.40	61.22	74.00	-12.78	peak	
2		4804.000	54.06	-11.40	42.66	54.00	-11.34	AVG	
3		7206.000	72.54	-5.52	67.02	74.00	-6.98	peak	
4	*	7206.000	53.98	-5.52	48.46	54.00	-5.54	AVG	
5		9608.000	61.22	0.38	61.60	74.00	-12.40	peak	
6		9608.000	42.66	0.38	43.04	54.00	-10.96	AVG	

Test Mode : TX 2441MHz\_CH39\_3Mbps

**Vertical**

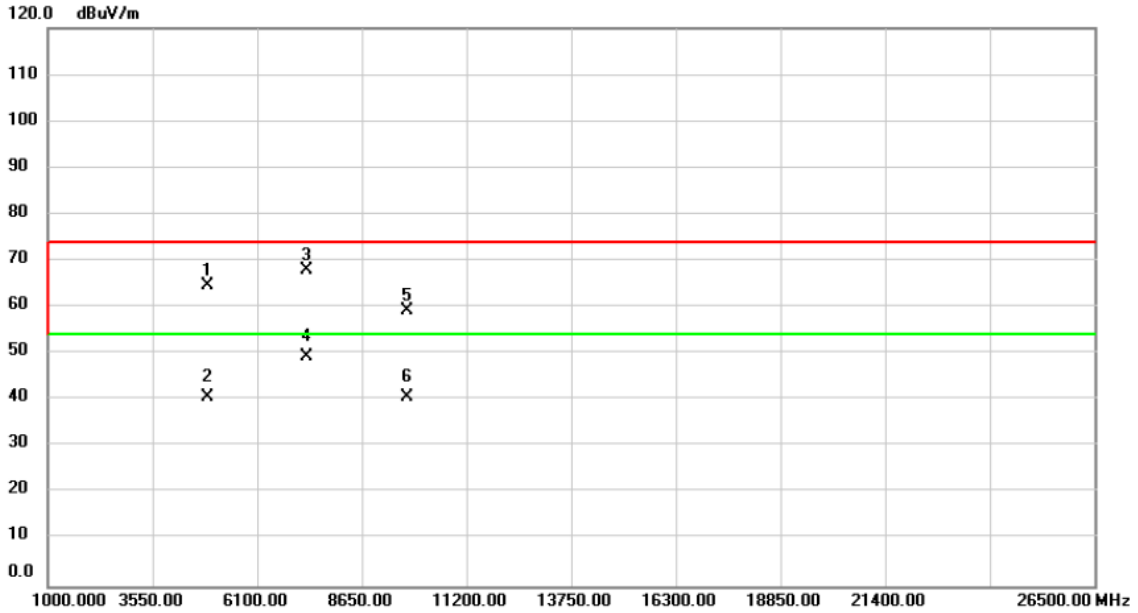


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	X	2441.000	74.54	27.13	101.67	74.00	27.67	peak	No Limit
2	*	2441.000	55.98	27.13	83.11	54.00	29.11	AVG	No Limit



Test Mode : TX 2441MHz\_CH39\_3Mbps

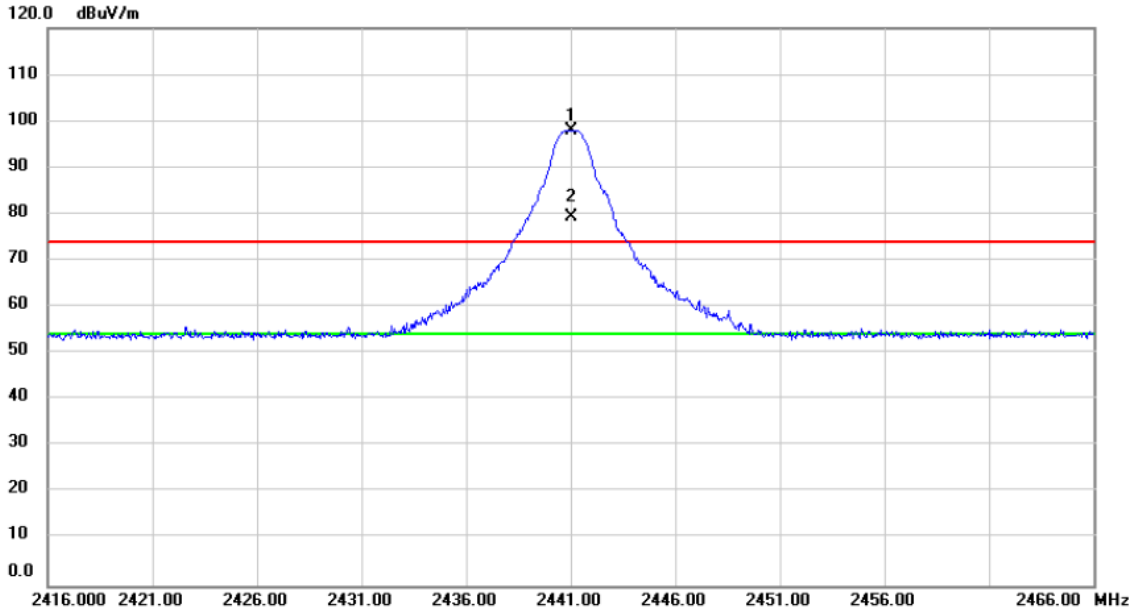
Vertical



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		4882.000	75.96	-11.28	64.68	74.00	-9.32	peak	
2		4882.000	51.87	-11.28	40.59	54.00	-13.41	AVG	
3		7323.000	73.09	-5.09	68.00	74.00	-6.00	peak	
4	*	7323.000	54.53	-5.09	49.44	54.00	-4.56	AVG	
5		9764.000	58.40	0.96	59.36	74.00	-14.64	peak	
6		9764.000	39.84	0.96	40.80	54.00	-13.20	AVG	

Test Mode : TX 2441MHz\_CH39\_3Mbps

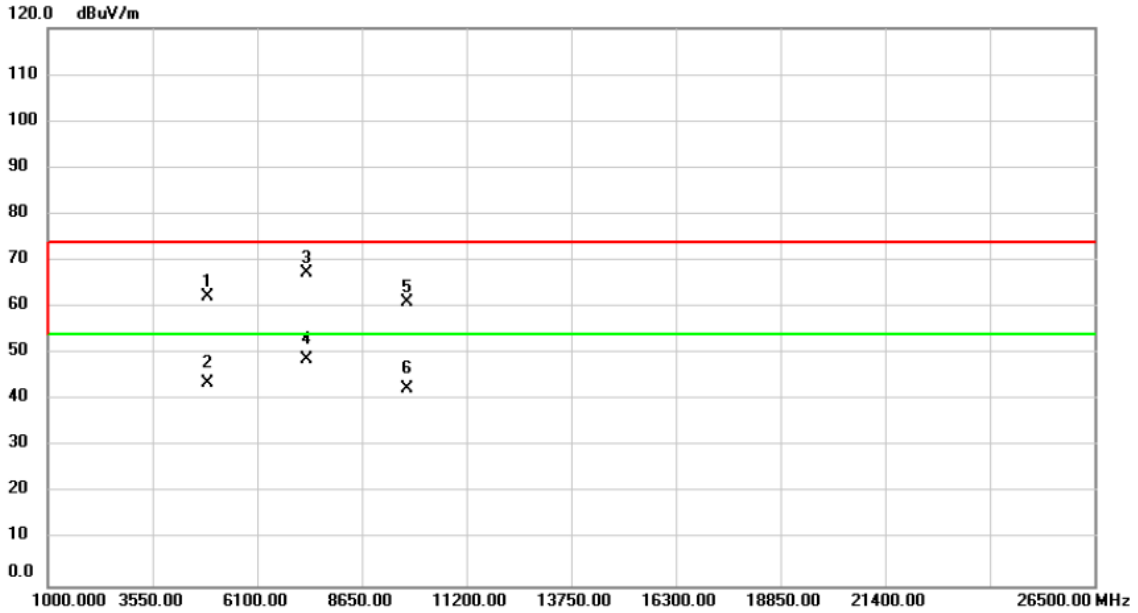
**Horizontal**



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Detector	Comment
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB		
1	X	2441.000	70.92	27.13	98.05	74.00	24.05	peak	No Limit
2	*	2441.000	52.36	27.13	79.49	54.00	25.49	AVG	No Limit

Test Mode : TX 2441MHz\_CH39\_3Mbps

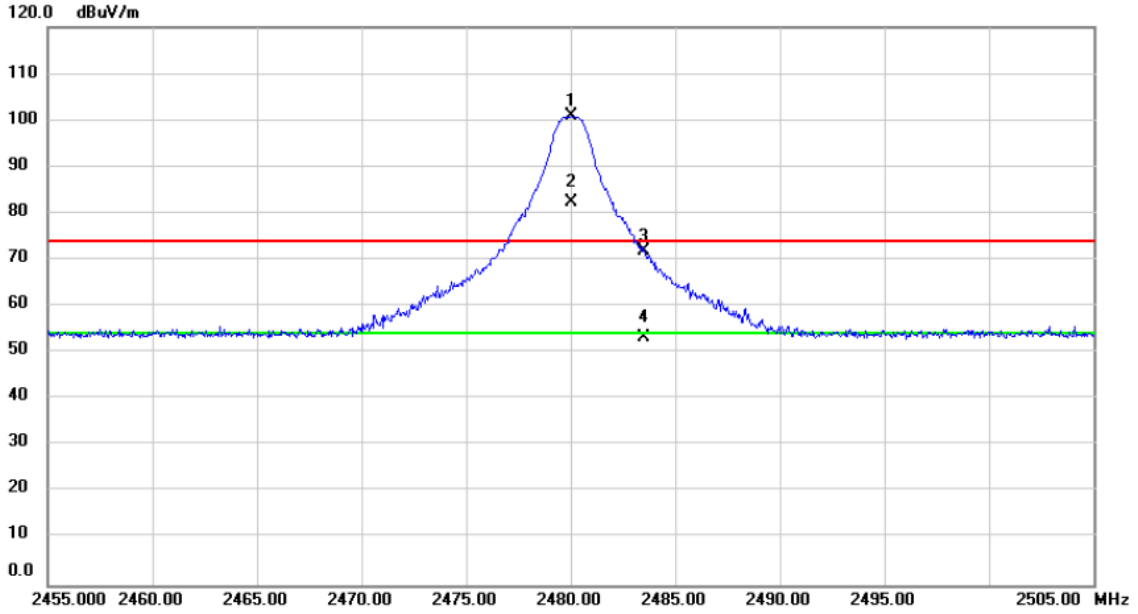
**Horizontal**



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		4882.000	73.60	-11.28	62.32	74.00	-11.68	peak	
2		4882.000	55.04	-11.28	43.76	54.00	-10.24	AVG	
3		7323.000	72.46	-5.09	67.37	74.00	-6.63	peak	
4	*	7323.000	53.90	-5.09	48.81	54.00	-5.19	AVG	
5		9764.000	60.05	0.96	61.01	74.00	-12.99	peak	
6		9764.000	41.49	0.96	42.45	54.00	-11.55	AVG	

Test Mode : TX 2480MHz\_CH78\_3Mbps

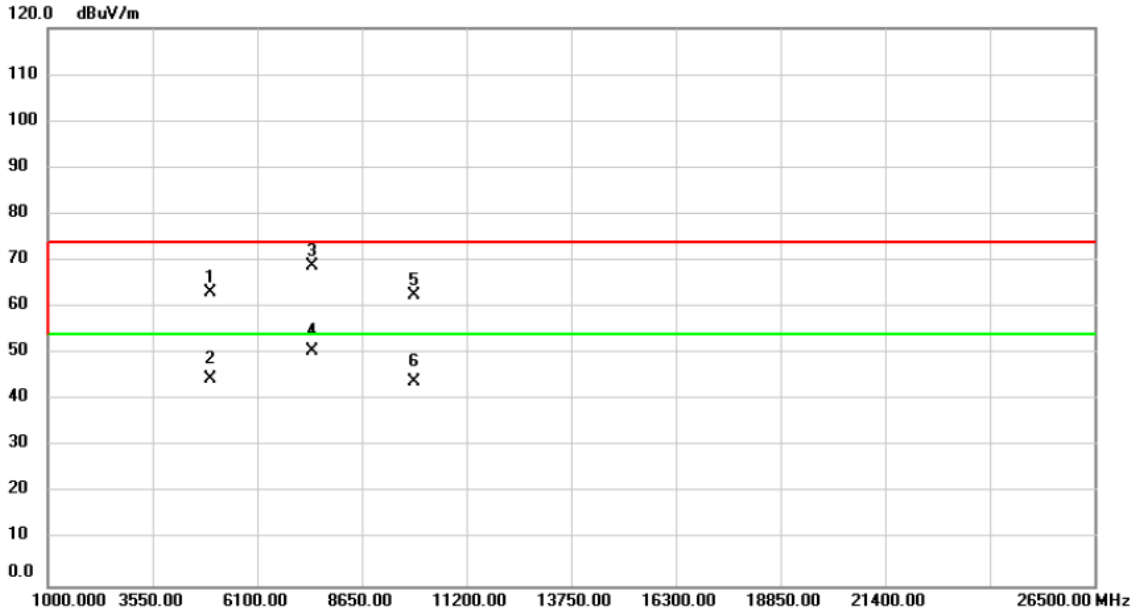
**Vertical**



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	X	2480.000	73.61	27.24	100.85	74.00	26.85	peak	No Limit
2	*	2480.000	55.05	27.24	82.29	54.00	28.29	AVG	No Limit
3		2483.500	44.69	27.25	71.94	74.00	-2.06	peak	
4		2483.500	26.13	27.25	53.38	54.00	-0.62	AVG	

Test Mode : TX 2480MHz\_CH78\_3Mbps

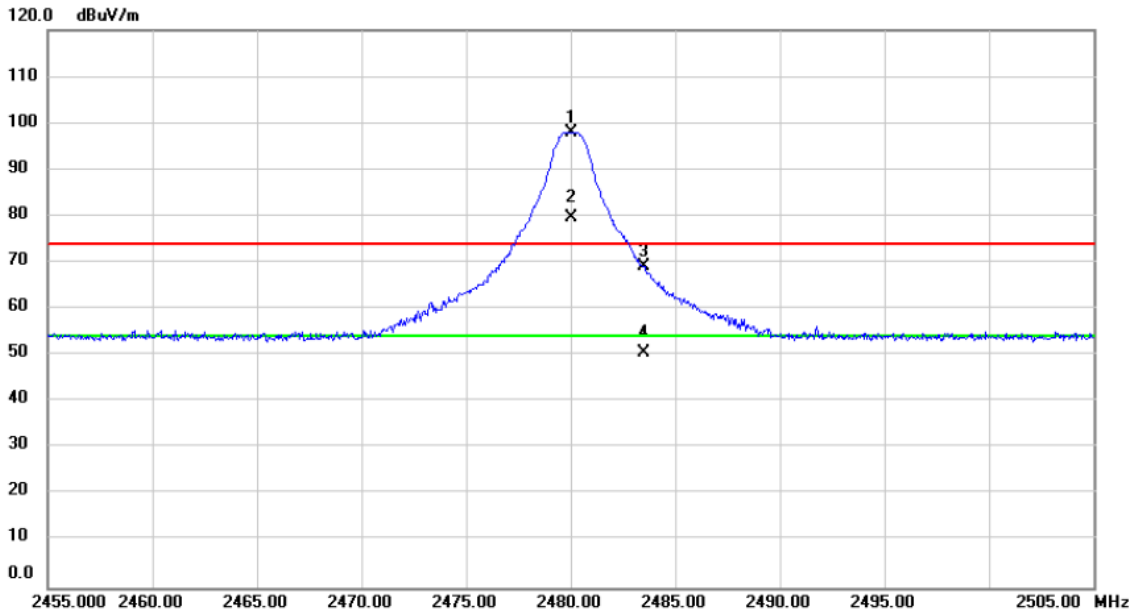
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Detector	Comment
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB		
1		4960.000	74.35	-11.15	63.20	74.00	-10.80	peak	
2		4960.000	55.79	-11.15	44.64	54.00	-9.36	AVG	
3		7440.000	73.66	-4.68	68.98	74.00	-5.02	peak	
4	*	7440.000	55.10	-4.68	50.42	54.00	-3.58	AVG	
5		9920.000	61.10	1.54	62.64	74.00	-11.36	peak	
6		9920.000	42.54	1.54	44.08	54.00	-9.92	AVG	

Test Mode : TX 2480MHz\_CH78\_3Mbps

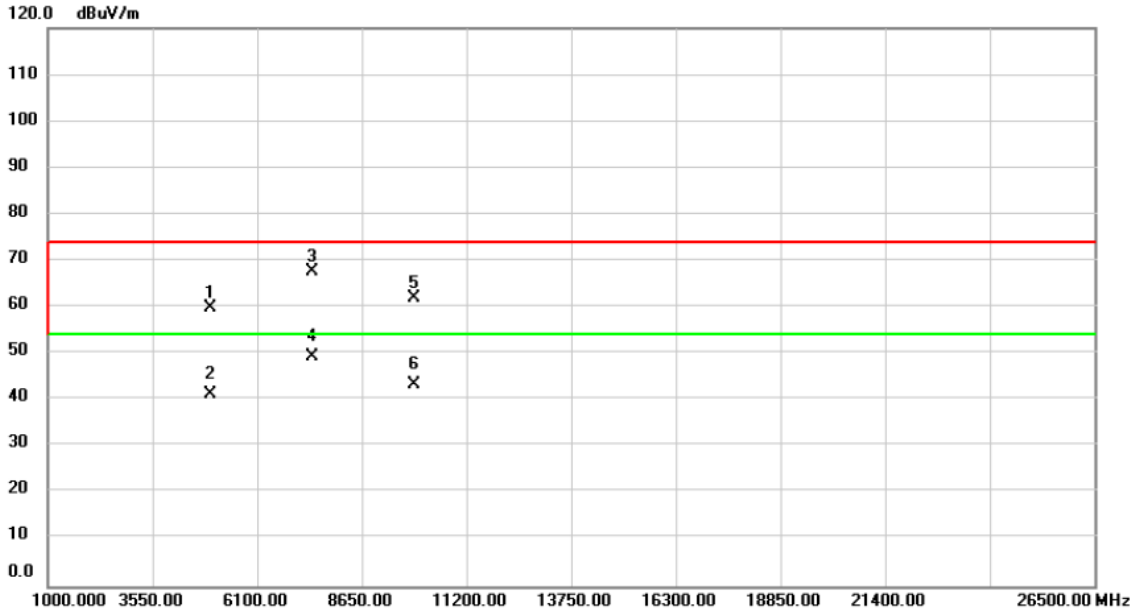
**Horizontal**



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	X	2480.000	70.85	27.24	98.09	74.00	24.09	peak	No Limit
2	*	2480.000	52.29	27.24	79.53	54.00	25.53	AVG	No Limit
3		2483.500	41.82	27.25	69.07	74.00	-4.93	peak	
4		2483.500	23.26	27.25	50.51	54.00	-3.49	AVG	

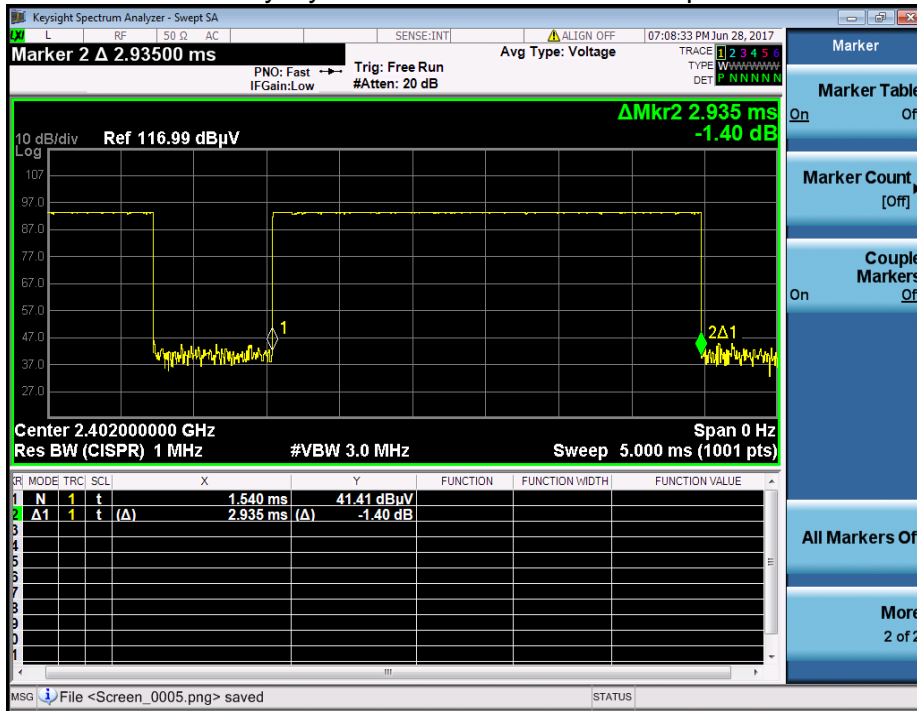
Test Mode : TX 2480MHz\_CH78\_3Mbps

Horizontal

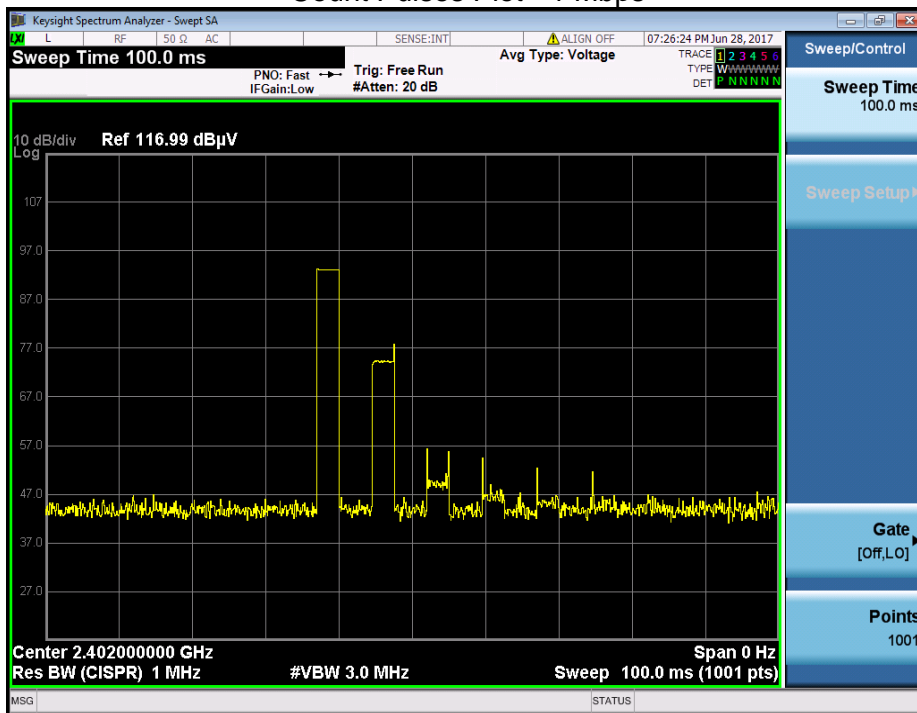


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		4960.000	71.09	-11.15	59.94	74.00	-14.06	peak	
2		4960.000	52.53	-11.15	41.38	54.00	-12.62	AVG	
3		7440.000	72.48	-4.68	67.80	74.00	-6.20	peak	
4	*	7440.000	53.92	-4.68	49.24	54.00	-4.76	AVG	
5		9920.000	60.44	1.54	61.98	74.00	-12.02	peak	
6		9920.000	41.88	1.54	43.42	54.00	-10.58	AVG	

### Duty Cycle Correction Factor - 1 Mbps



### Count Pulses Plot - 1 Mbps



$$20\log(\text{Dwell Time}/100\text{ms})=20\log(\text{Time On}*\text{Number of hopping}/100\text{ms})$$

Time On(ms)	Number of hopping	Dwell Time	20log(Dwell Time/100ms)
2.935	3	8.805	-21.11

The average values are:

Average = Peak value + 20log (Dwell Time/100ms).

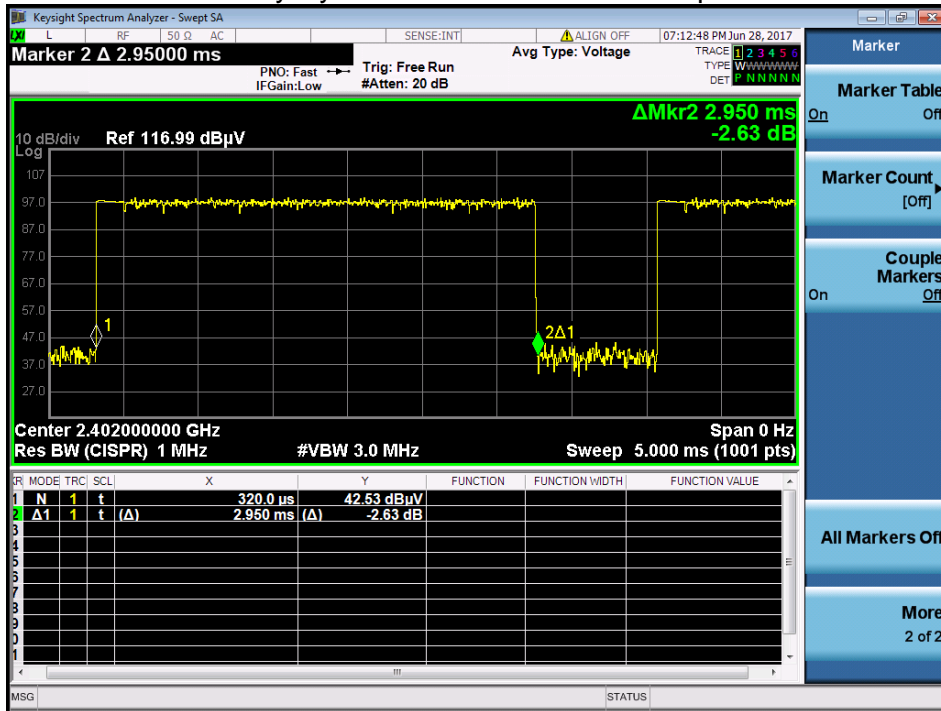
Where the duty factor is calculated from following formula:

$$20\log(\text{Dwell Time}/100\text{ms}) = 20\log(8.805/100) = -21.11$$

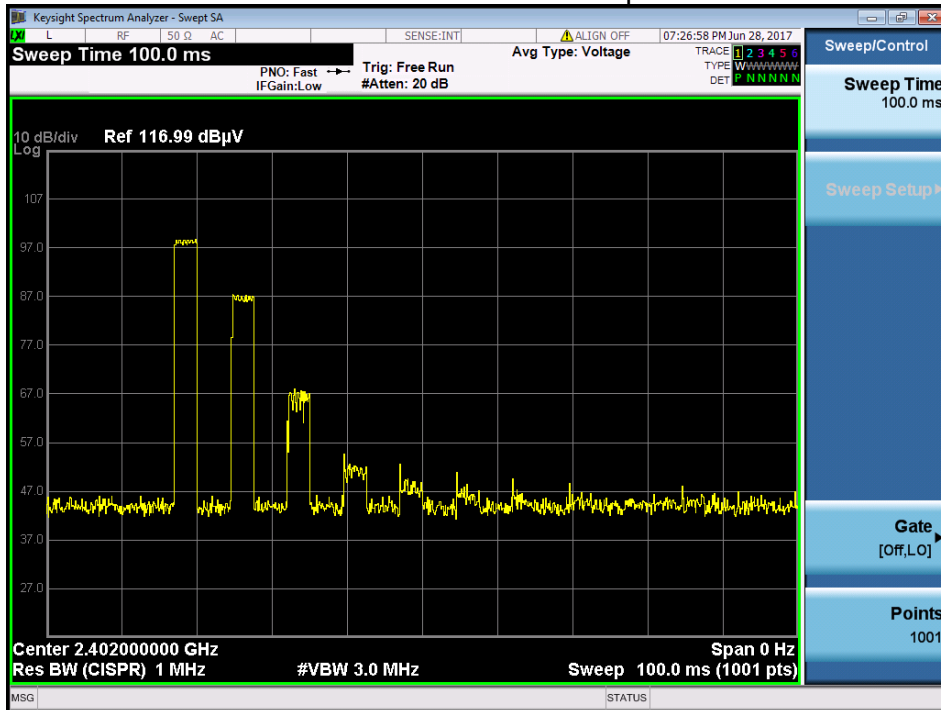
Please see as below for plotted duty.



### Duty Cycle Correction Factor - 3 Mbps



### Count Pulses Plot - 3 Mbps



$$20\log(\text{Dwell Time}/100\text{ms})=20\log(\text{Time On}*\text{Number of hopping}/100\text{ms})$$

Time On(ms)	Number of hopping	Dwell Time	$20\log(\text{Dwell Time}/100\text{ms})$
2.95	4	11.8	-18.56

The average values are:

Average = Peak value +  $20\log(\text{Dwell Time}/100\text{ms})$ .

Where the duty factor is calculated from following formula:

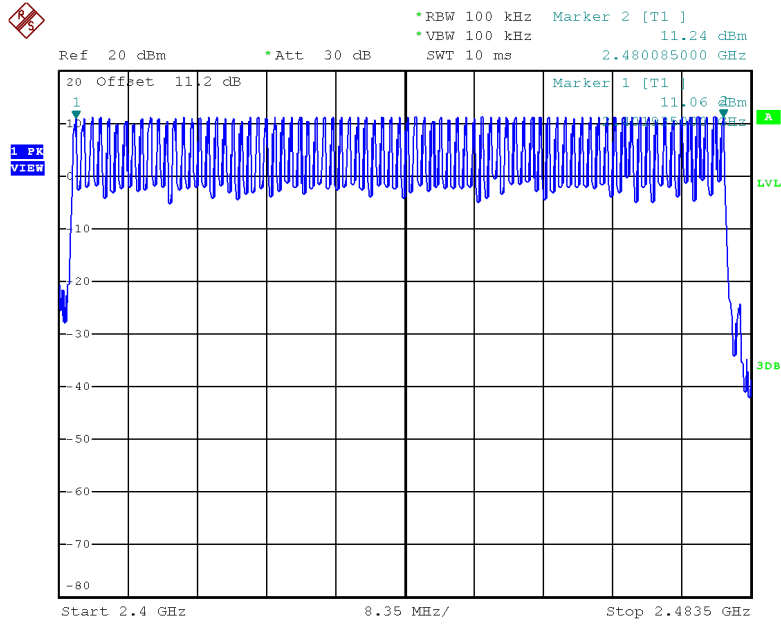
$$20\log(\text{Dwell Time}/100\text{ms}) = 20\log(11.8/100) = -18.56$$

Please see as below for plotted duty.

## ATTACHMENT E - NUMBER OF HOPPING CHANNEL

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

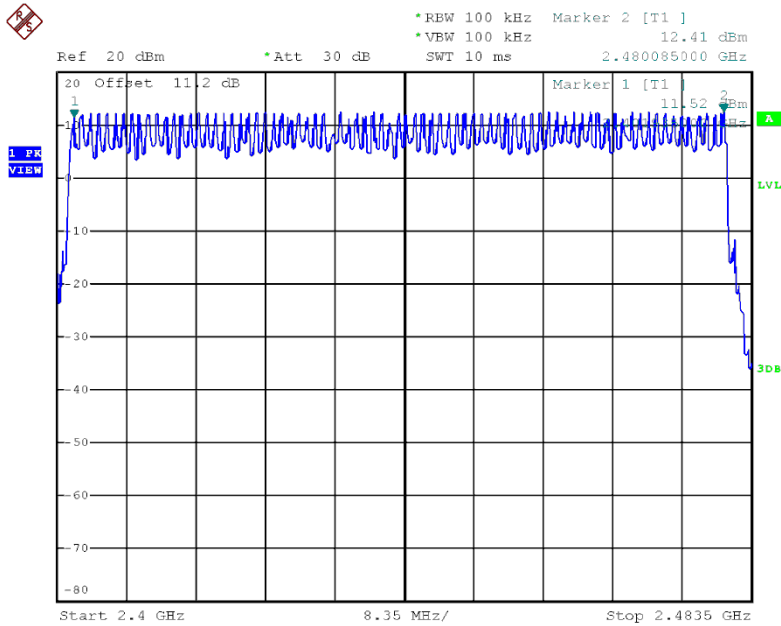
Number of Hopping Channel                      79



Date: 28.JUN.2017 16:36:04

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

Number of Hopping Channel                      79



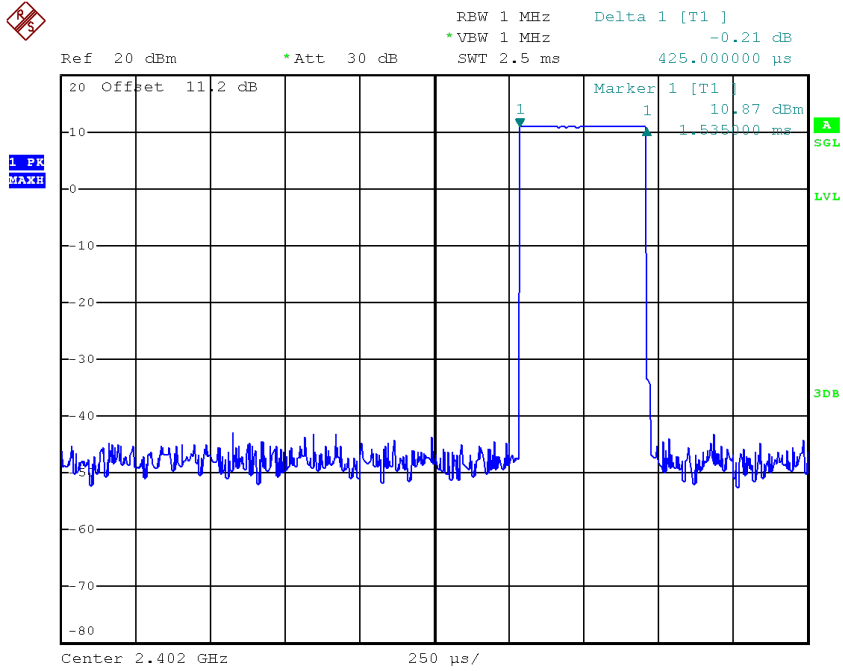
Date: 28.JUN.2017 16:59:42

## ATTACHMENT F - AVERAGE TIME OF OCCUPANCY

Test Mode :	TX Mode_1Mbps
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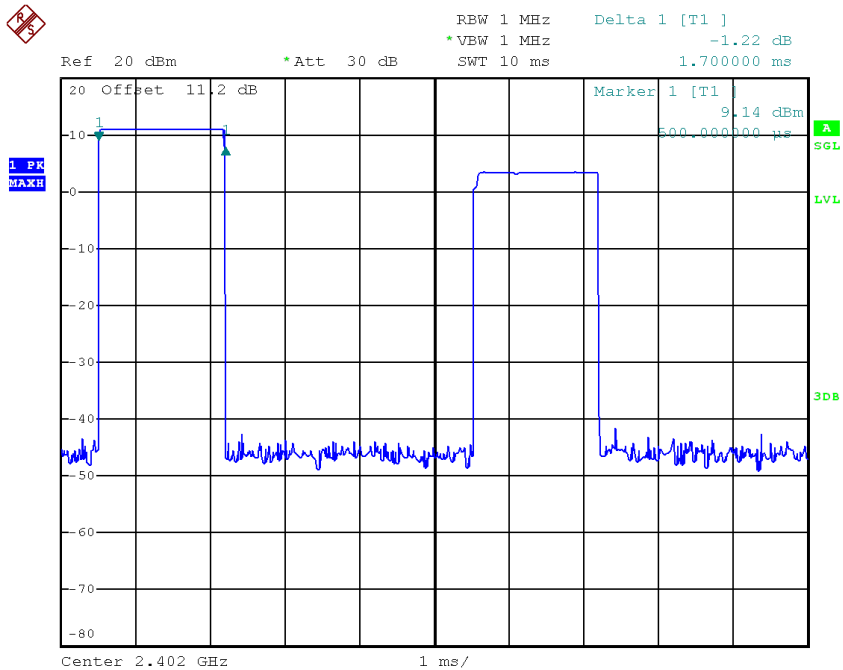
Data Packet	Frequency (MHz)	Pulse Duration (ms)	Dwell Time (s)	Limits (s)	Test Result
DH5	2402	2.9200	0.3115	0.4000	Pass
DH3	2402	1.7000	0.2720	0.4000	Pass
DH1	2402	0.4250	0.1360	0.4000	Pass
DH5	2441	2.9200	0.3115	0.4000	Pass
DH3	2441	1.6800	0.2688	0.4000	Pass
DH1	2441	0.4200	0.1344	0.4000	Pass
DH5	2480	2.9200	0.3115	0.4000	Pass
DH3	2480	1.6800	0.2688	0.4000	Pass
DH1	2480	0.4200	0.1344	0.4000	Pass

### CH00-DH1



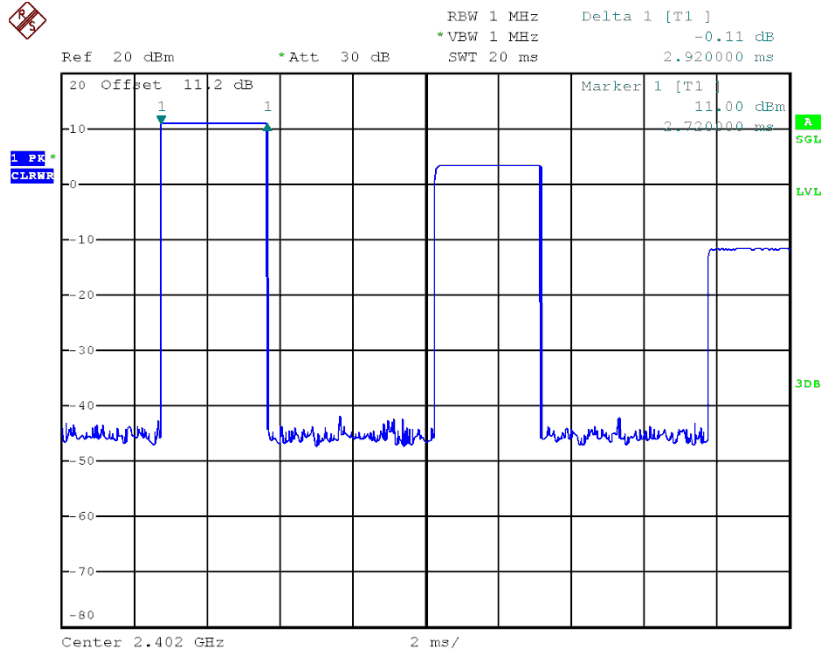
Date: 28.JUN.2017 16:30:32

### CH00-DH3



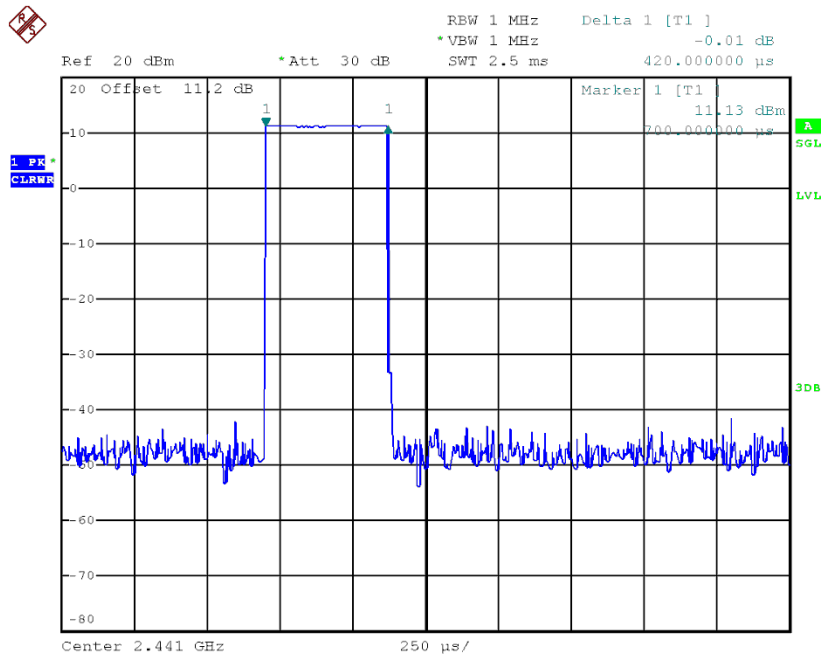
Date: 28.JUN.2017 16:38:05

**CH00-DH5**



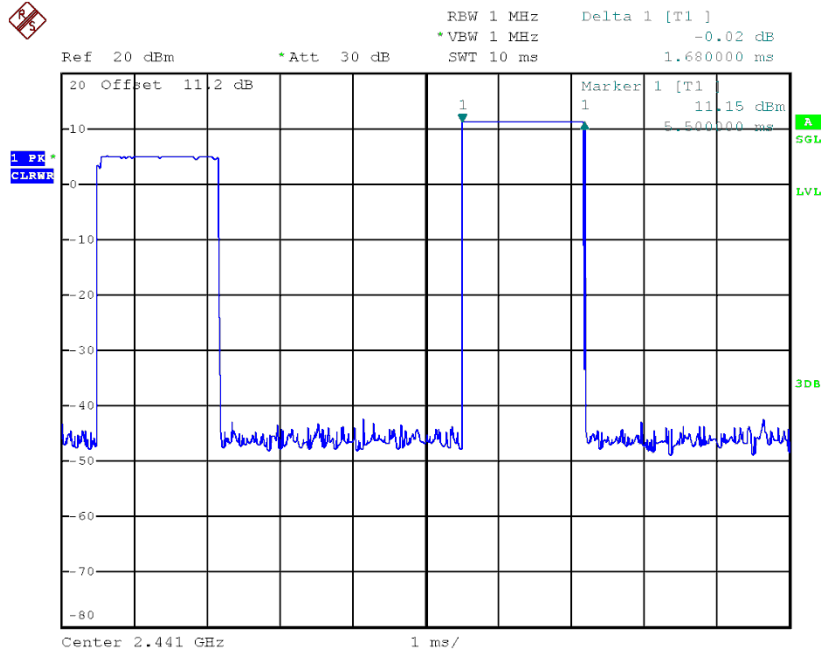
Date: 28.JUN.2017 16:39:59

**CH39-DH1**



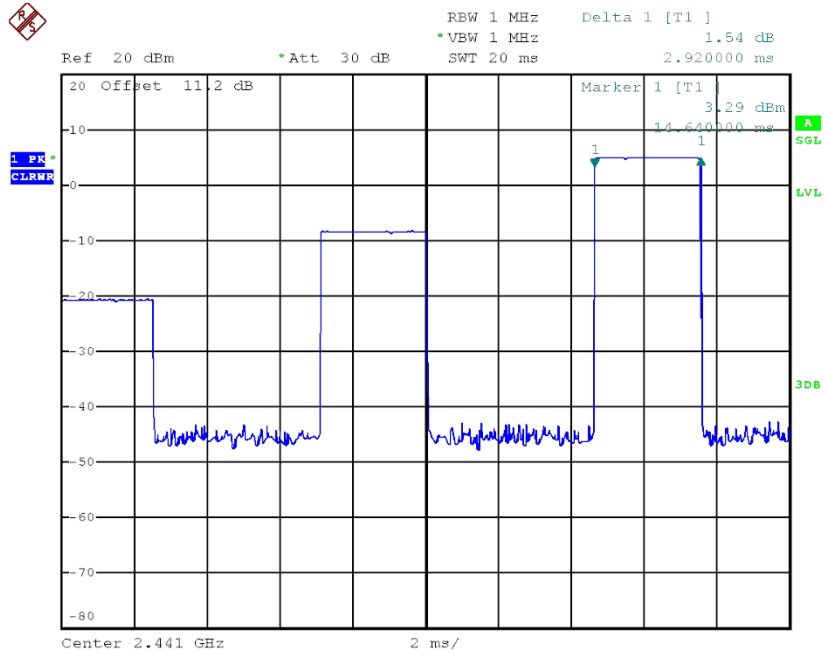
Date: 28.JUN.2017 16:30:52

### CH39-DH3



Date: 28.JUN.2017 16:38:24

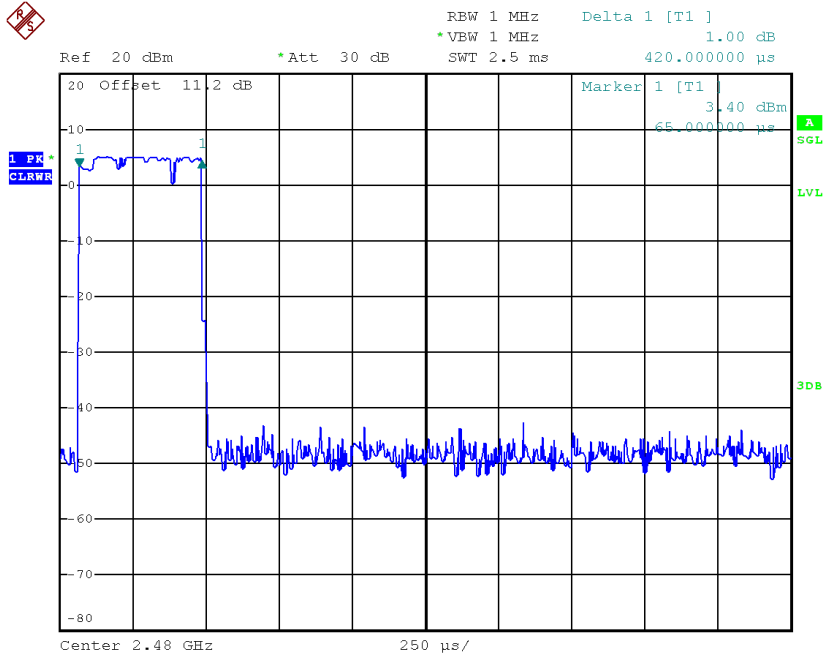
### CH39-DH5



Date: 28.JUN.2017 16:40:03

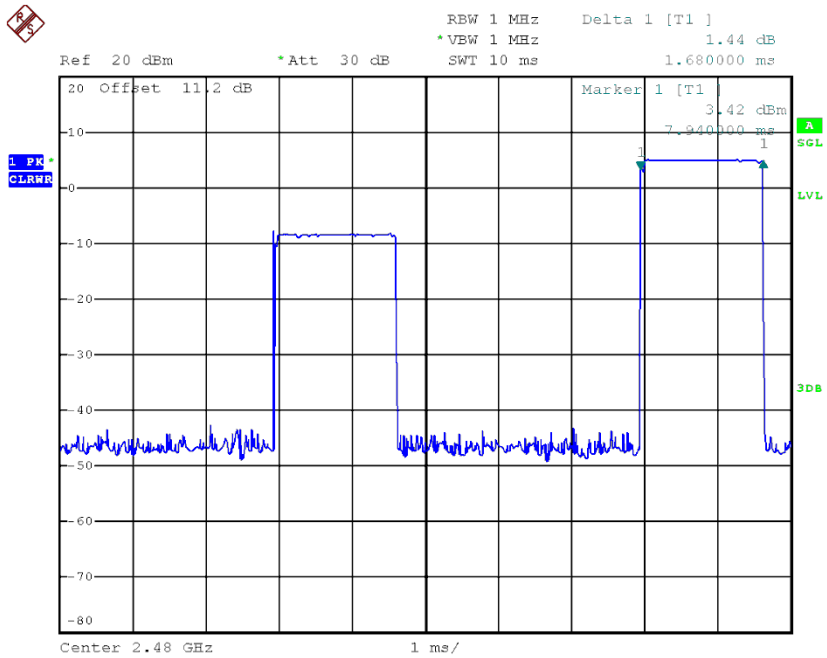


### CH78-DH1



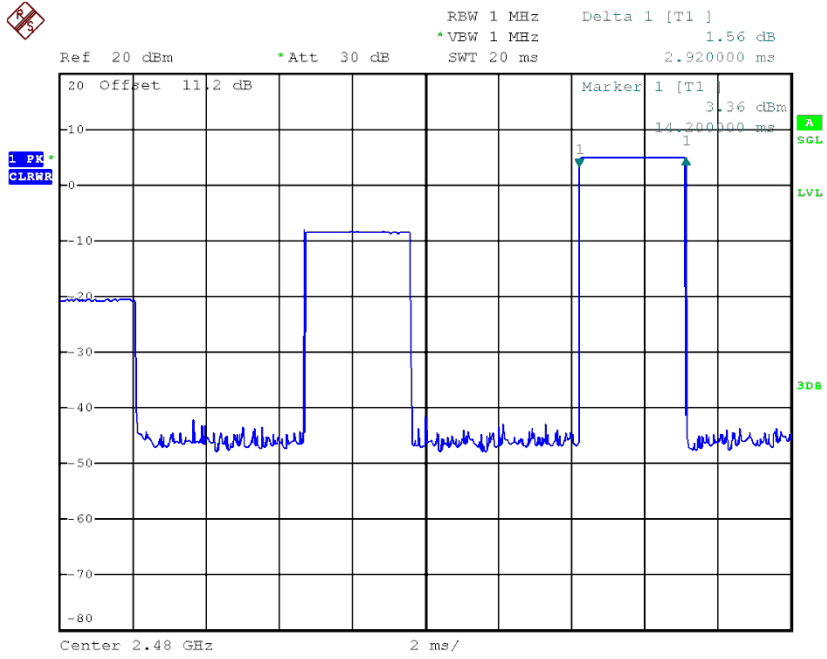
Date: 28.JUN.2017 16:30:58

### CH78-DH3



Date: 28.JUN.2017 16:38:28

### CH78-DH5

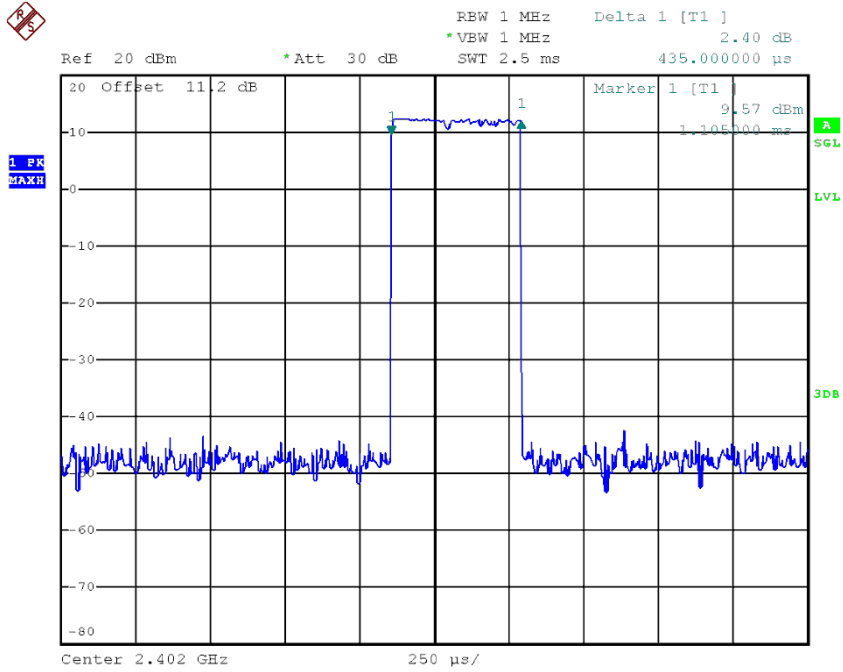


Date: 28.JUN.2017 16:40:07

Test Mode :	TX Mode_3Mbps
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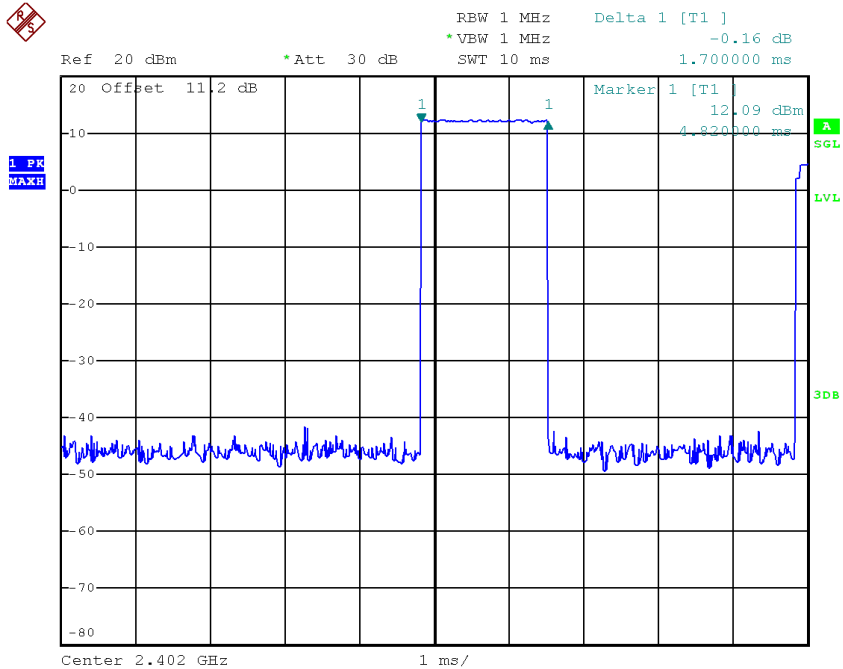
Data Packet	Frequency	Pulse Duration(ms)	Dwell Time(s)	Limits(s)	Test Result
DH5	2402	2.9600	0.3157	0.4000	Pass
DH3	2402	1.7000	0.2720	0.4000	Pass
DH1	2402	0.4350	0.1392	0.4000	Pass
DH5	2441	2.9600	0.3157	0.4000	Pass
DH3	2441	1.6800	0.2688	0.4000	Pass
DH1	2441	0.4350	0.1392	0.4000	Pass
DH5	2480	2.9200	0.3115	0.4000	Pass
DH3	2480	1.6800	0.2688	0.4000	Pass
DH1	2480	0.4350	0.1392	0.4000	Pass

### CH00-DH1



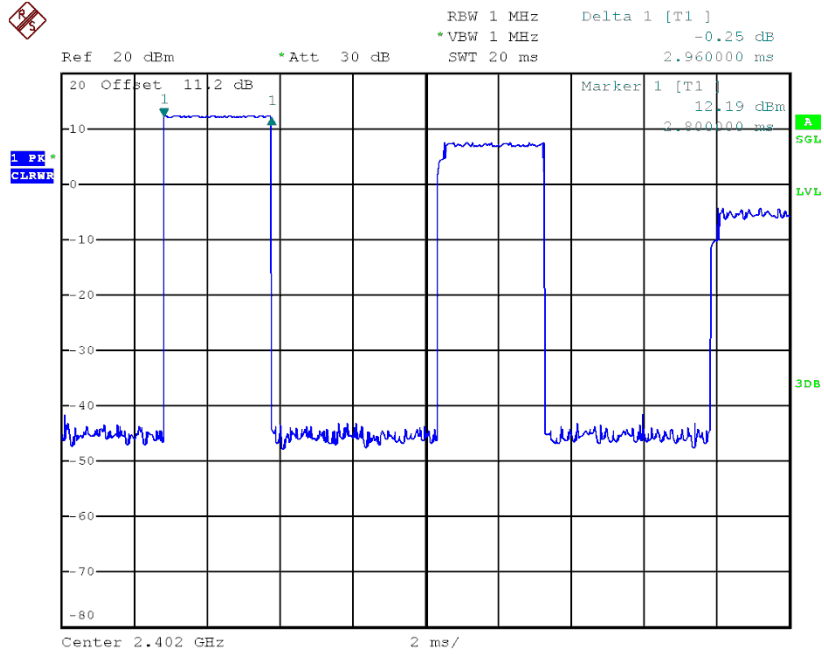
Date: 28.JUN.2017 17:24:09

### CH00-DH3



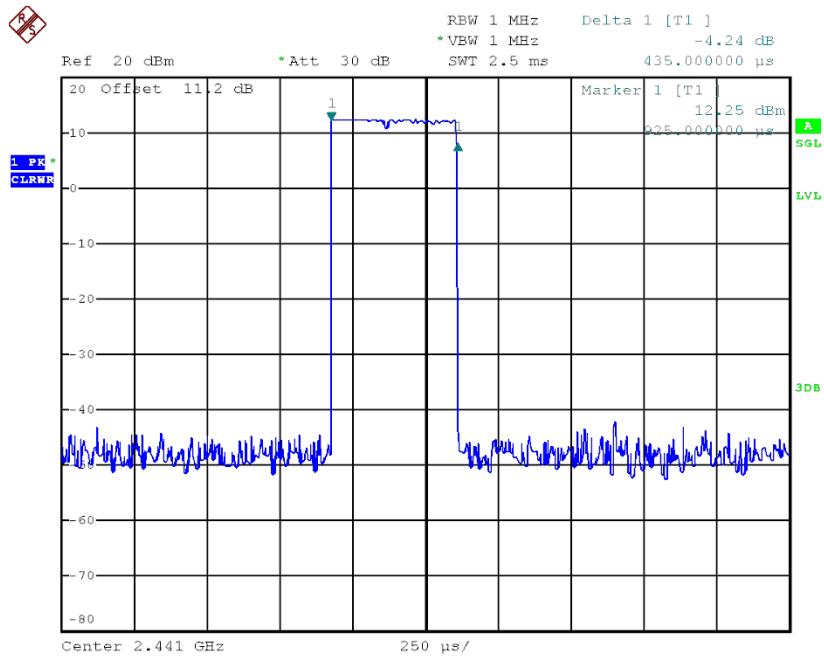
Date: 28.JUN.2017 17:01:21

**CH00-DH5**



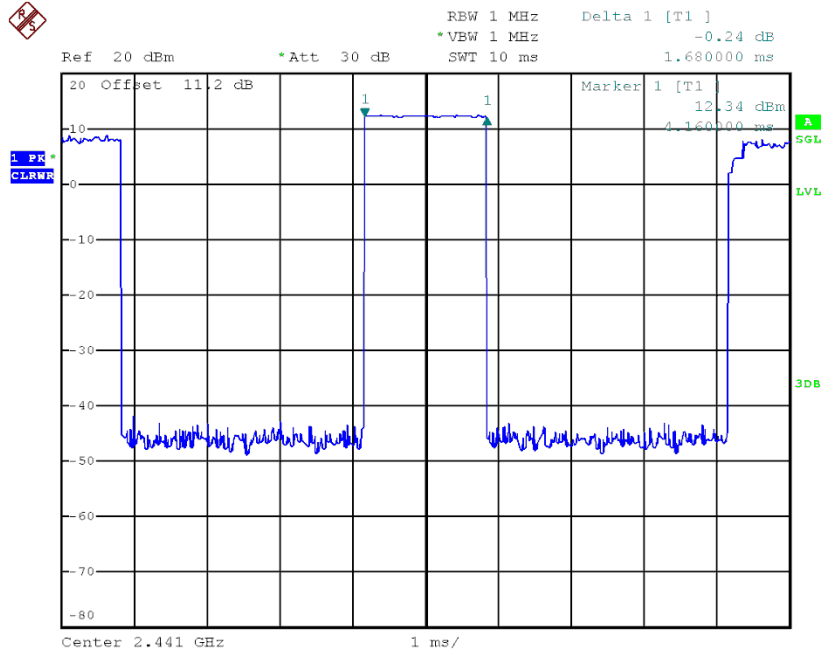
Date: 28.JUN.2017 17:02:06

**CH39-DH1**



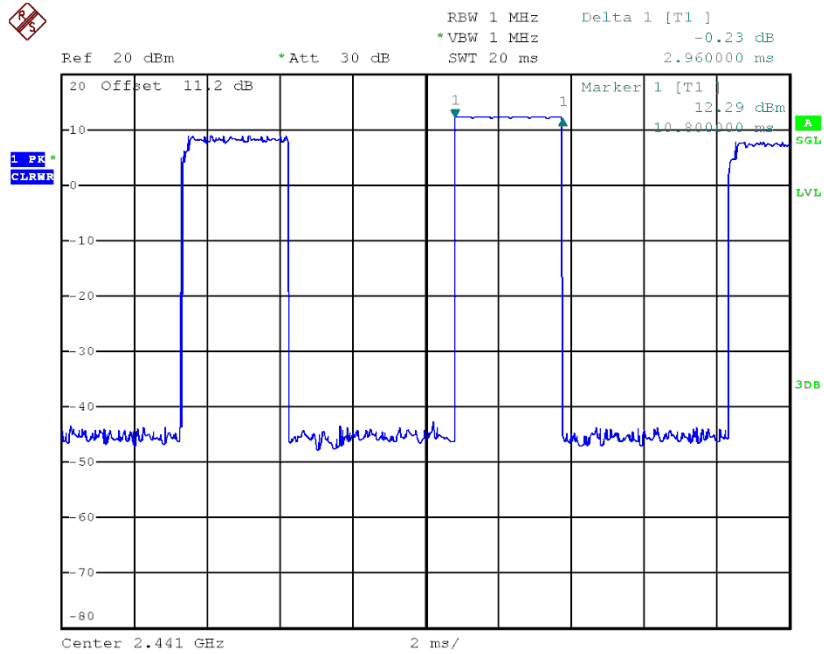
Date: 28.JUN.2017 17:24:30

### CH39-DH3



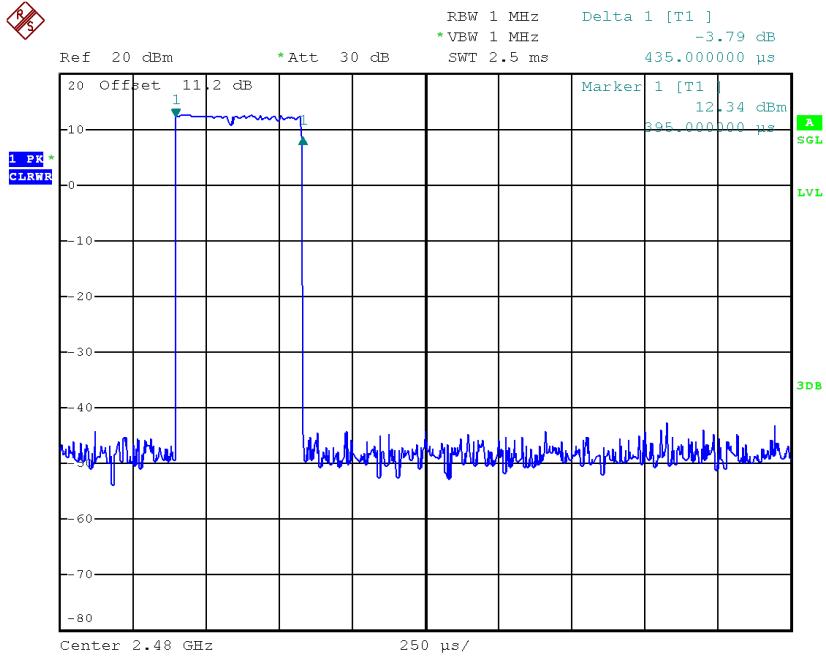
Date: 28.JUN.2017 17:01:41

### CH39-DH5



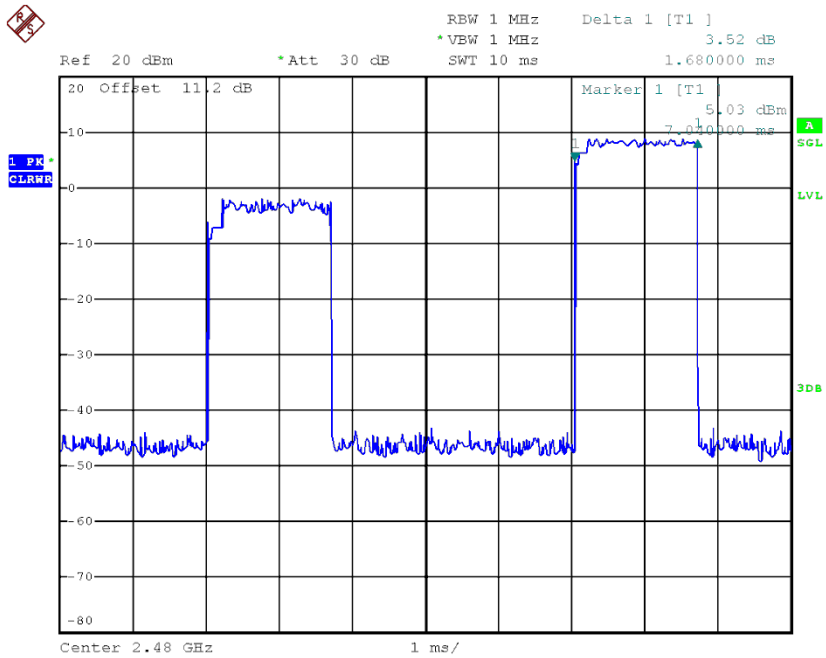
Date: 28.JUN.2017 17:02:09

### CH78-DH1



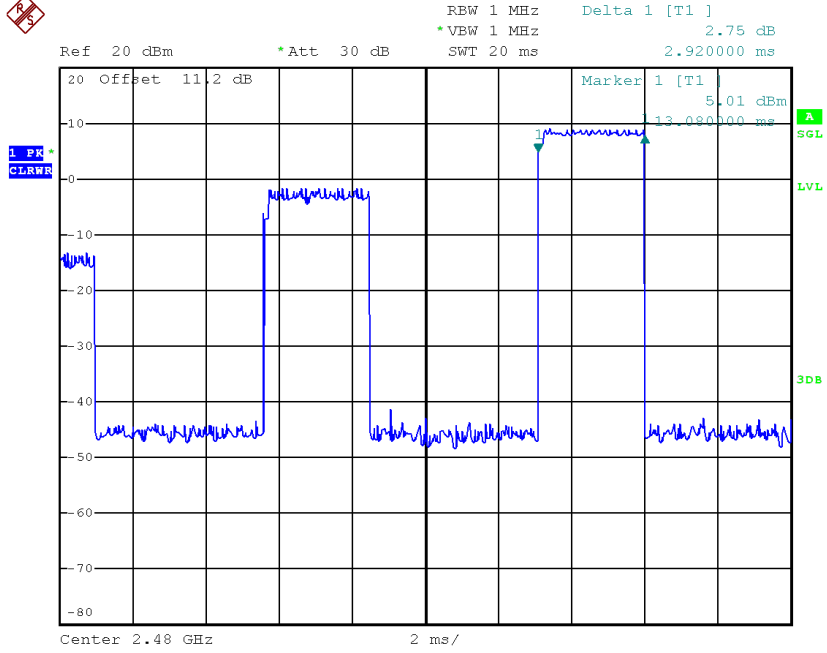
Date: 28.JUN.2017 16:54:34

### CH78-DH3



Date: 28.JUN.2017 17:01:44

### CH78-DH5



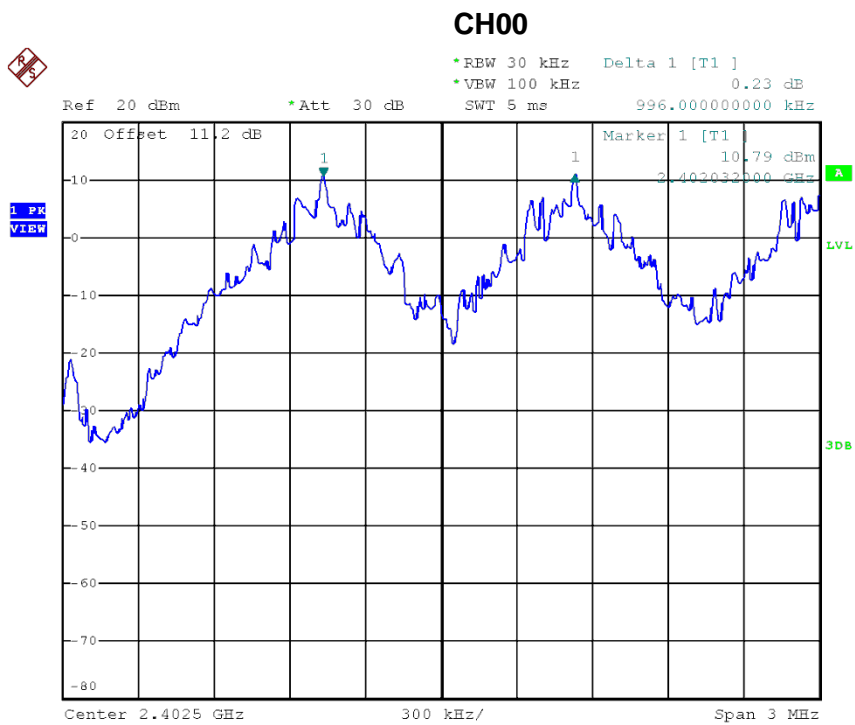
Date: 28.JUN.2017 17:02:12



# ATTACHMENT G - HOPPING CHANNEL SEPARATION MEASUREMENT

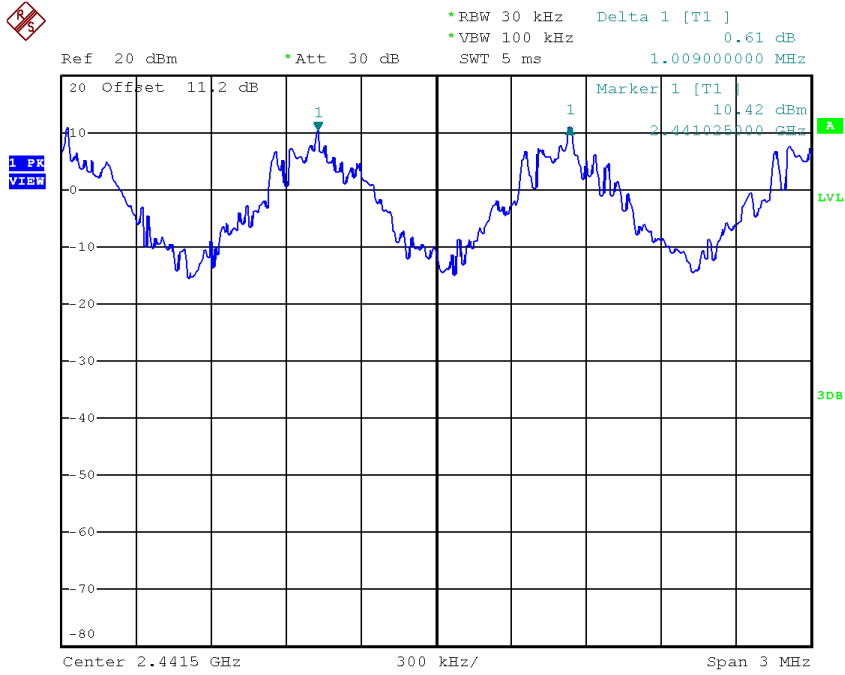
Test Mode : Hopping on \_1Mbps

Frequency (MHz)	Channel Separation (MHz)	2/3 of 20dB Bandwidth (MHz)	Test Result
2402	0.996	0.622	Pass
2441	1.009	0.608	Pass
2480	0.987	0.617	Pass



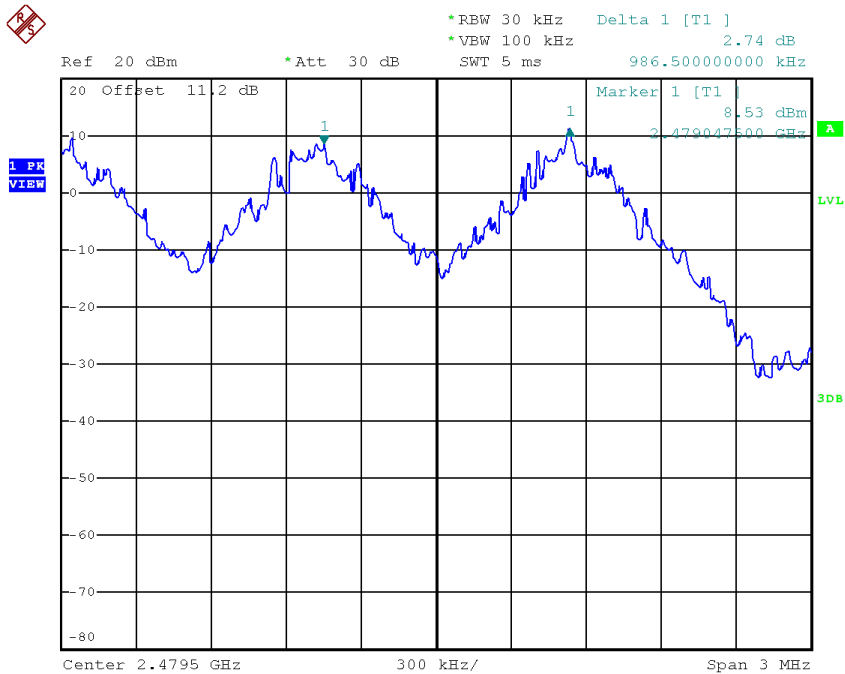
Date: 28.JUN.2017 16:32:02

### CH39



Date: 28.JUN.2017 16:33:09

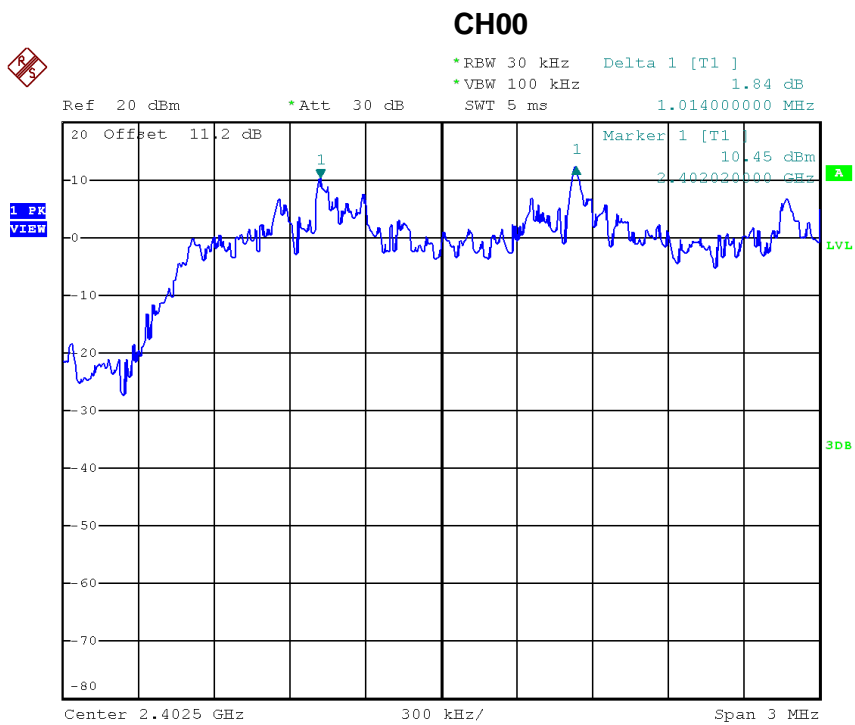
### CH78



Date: 28.JUN.2017 16:34:16

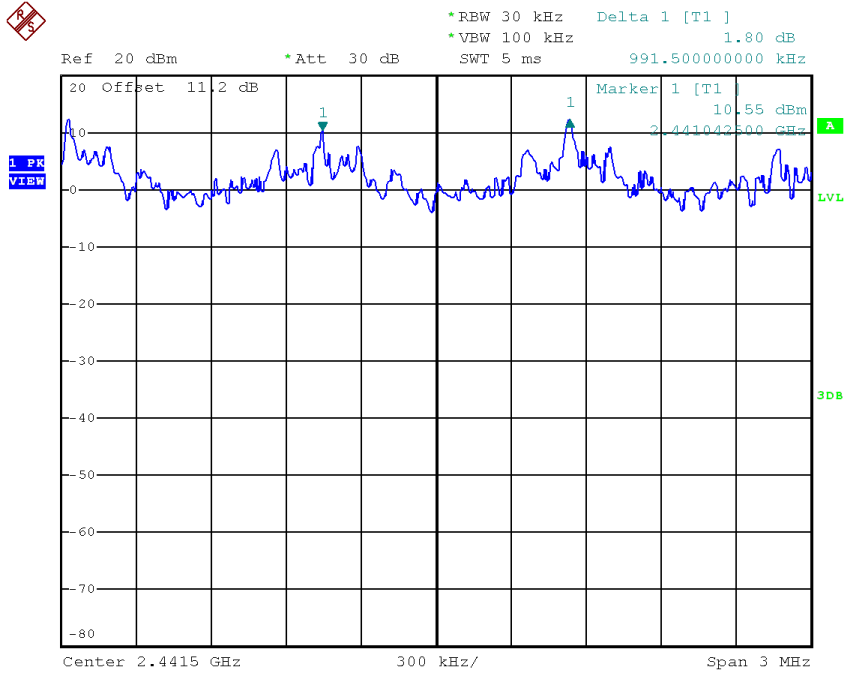
Test Mode : Hopping on \_3Mbps

Frequency (MHz)	Channel Separation (MHz)	2/3 of 20dB Bandwidth (MHz)	Test Result
2402	1.014	0.840	Pass
2441	0.992	0.848	Pass
2480	0.993	0.868	Pass



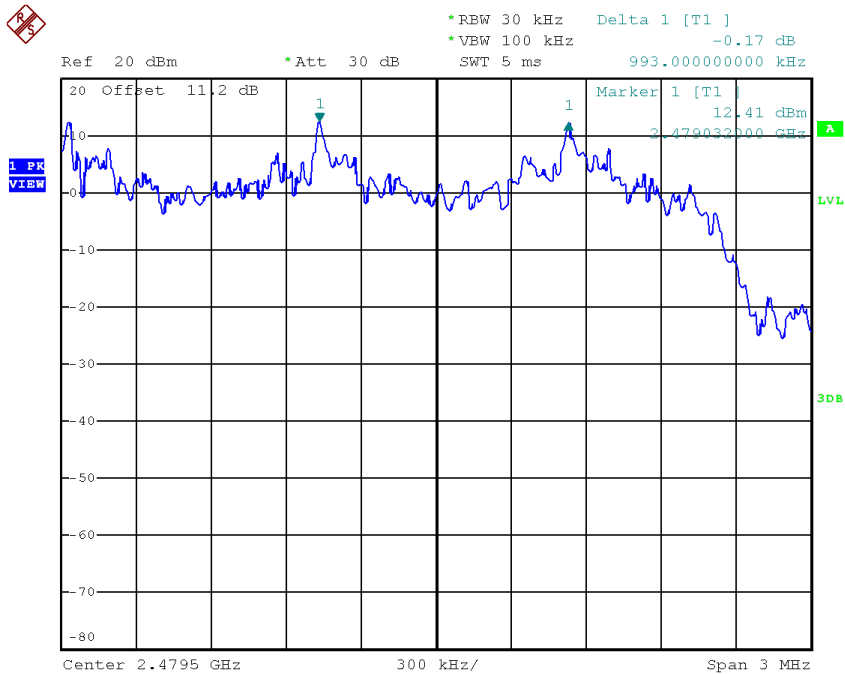
Date: 28.JUN.2017 16:55:38

### CH39



Date: 28.JUN.2017 16:56:45

### CH78

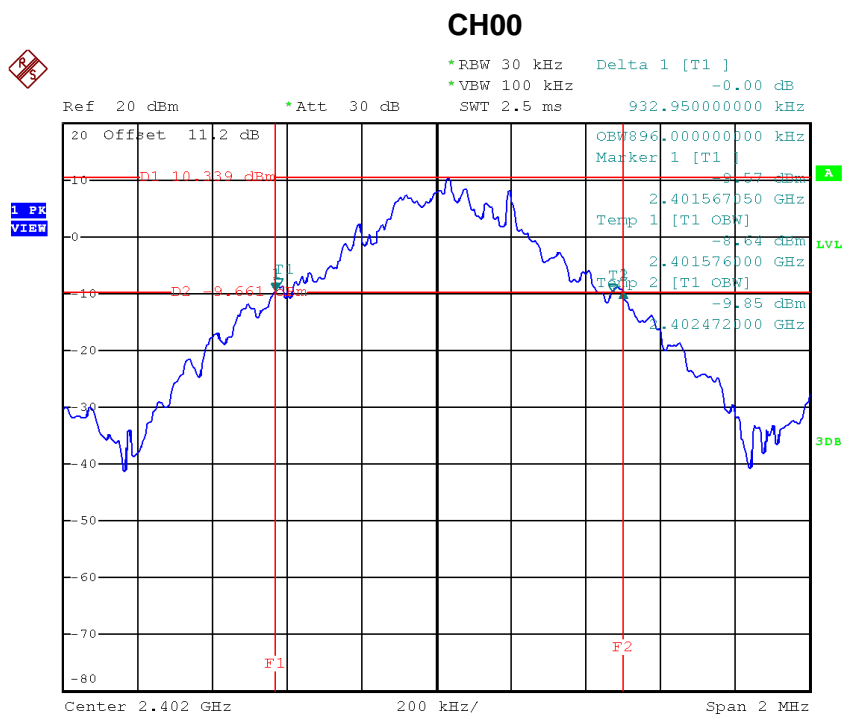


Date: 28.JUN.2017 16:57:54

## ATTACHMENT H - BANDWIDTH

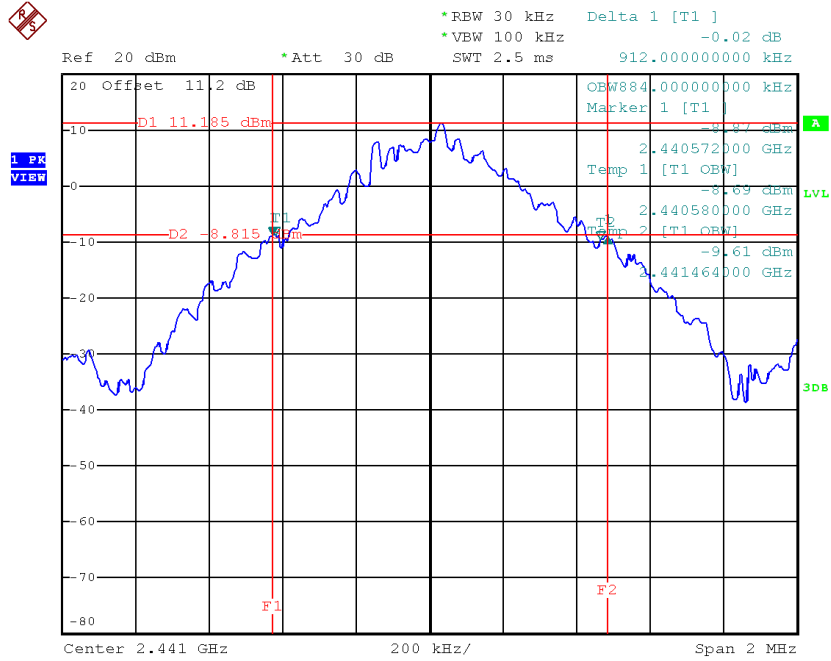
Test Mode : TX Mode \_1Mbps

Frequency (MHz)	20dB Bandwidth (MHz)	99% Occupied BW (MHz)	Test Result
2402	0.933	0.896	Pass
2441	0.912	0.884	Pass
2480	0.926	0.892	Pass



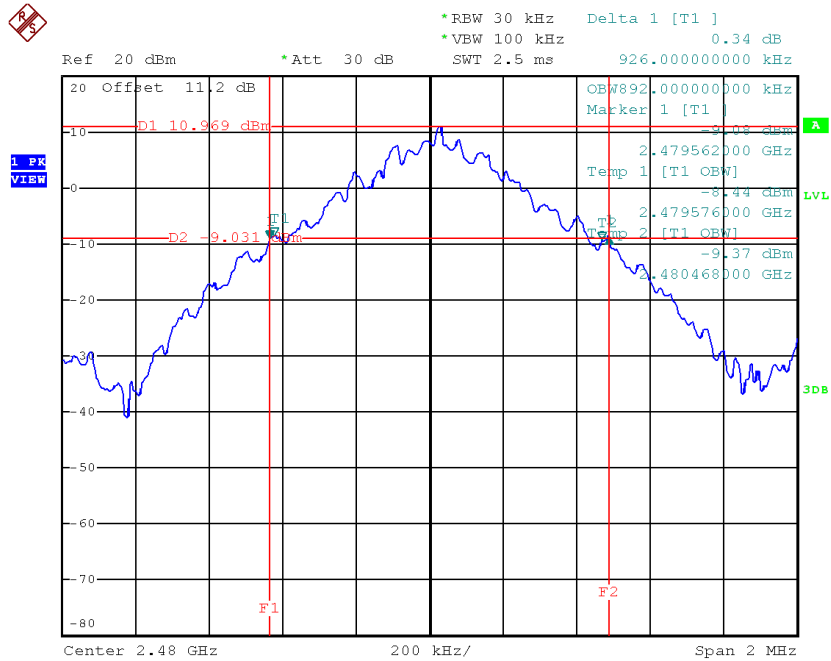
Date: 28.JUN.2017 16:21:09

**CH39**



Date: 28.JUN.2017 16:22:54

**CH78**

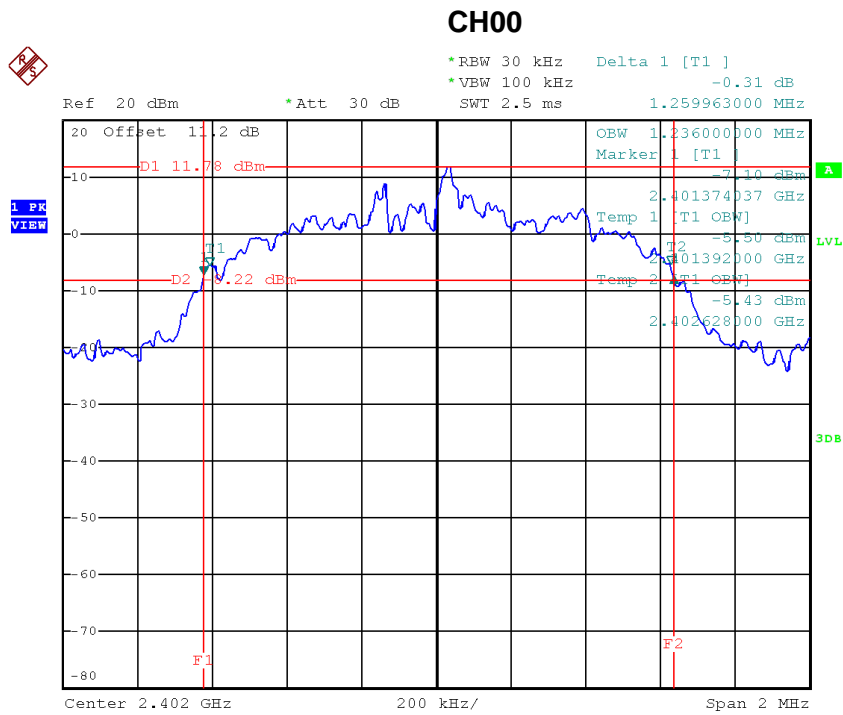


Date: 28.JUN.2017 16:29:01



Test Mode : TX Mode \_3Mbps

Frequency (MHz)	20dB Bandwidth (MHz)	99% Occupied BW (MHz)	Test Result
2402	1.260	1.236	Pass
2441	1.272	1.232	Pass
2480	1.302	1.236	Pass



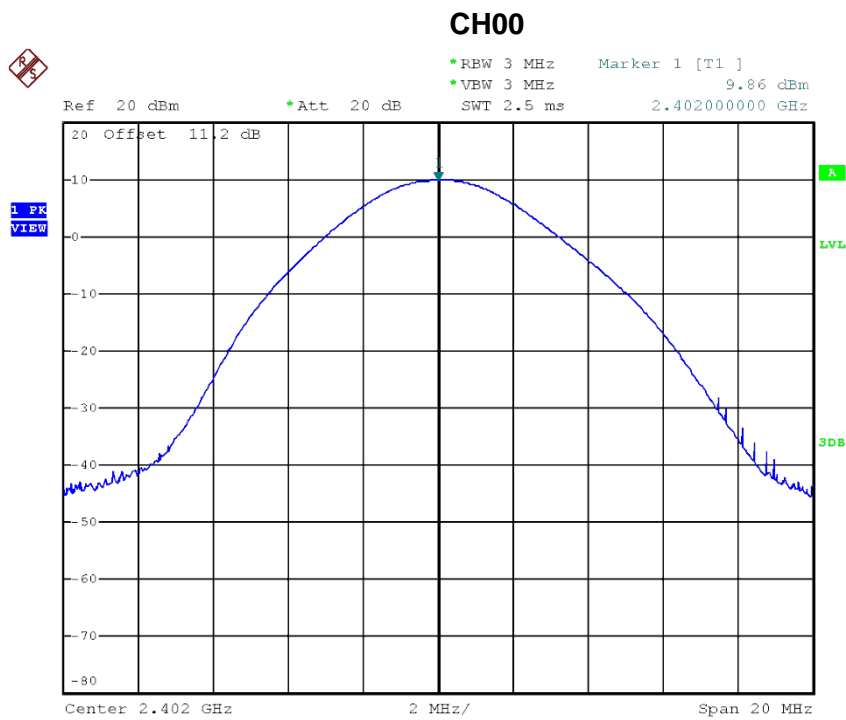
Date: 28.JUN.2017 16:50:07



## ATTACHMENT I - PEAK OUTPUT POWER

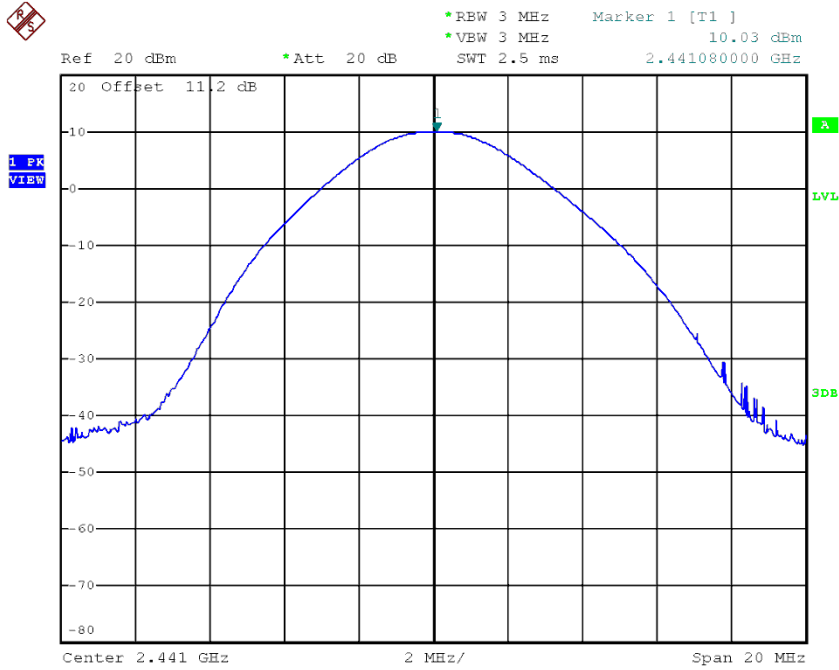
Test Mode : TX Mode \_1Mbps

Frequency (MHz)	Conducted Power (dBm)	Conducted Power (W)	Max. Limit (dBm)	Max. Limit (W)	Test Result
2402	9.86	0.0097	30.00	1.00	Pass
2441	10.03	0.0101	30.00	1.00	Pass
2480	10.04	0.0101	30.00	1.00	Pass



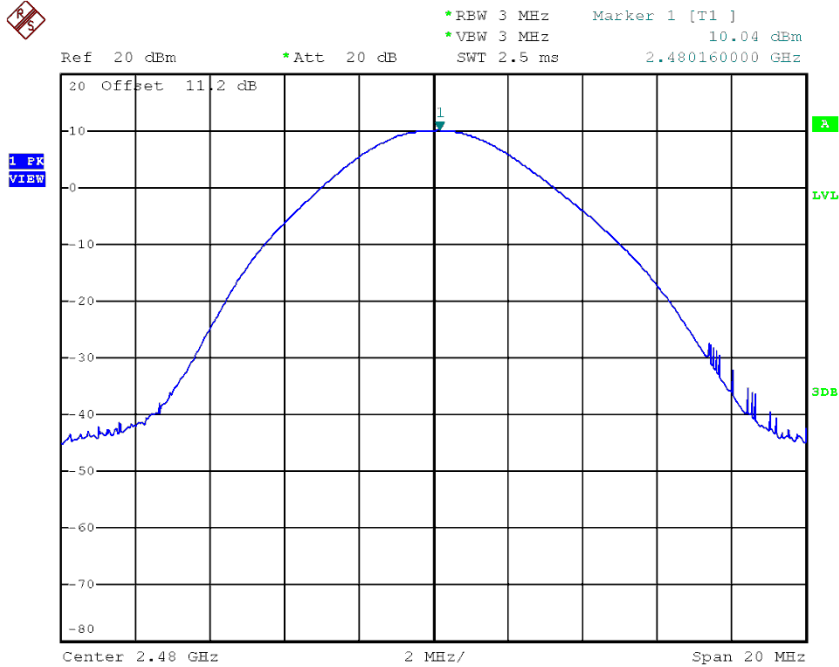
Date: 26.JUN.2017 20:37:41

### CH39



Date: 26.JUN.2017 20:37:59

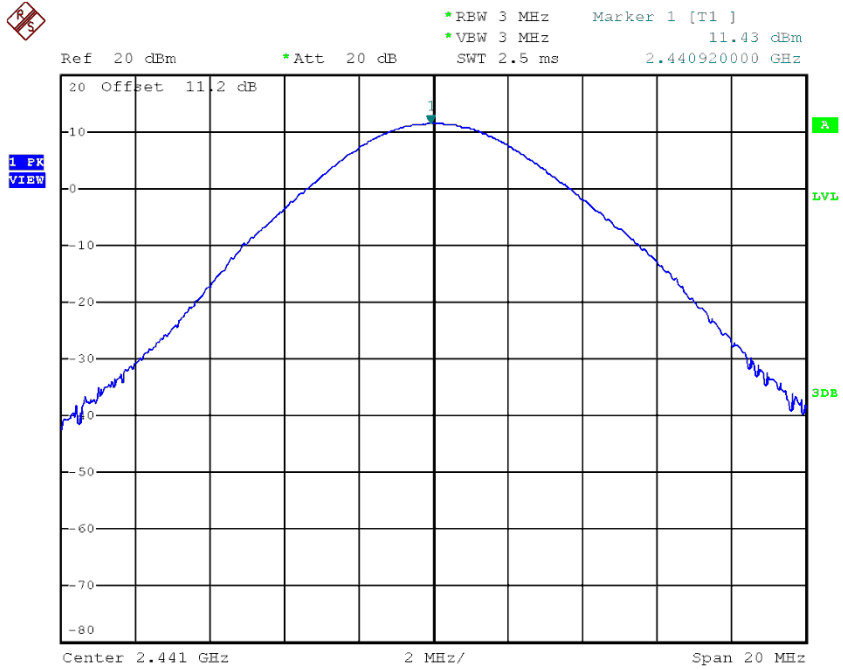
### CH78



Date: 26.JUN.2017 20:38:12

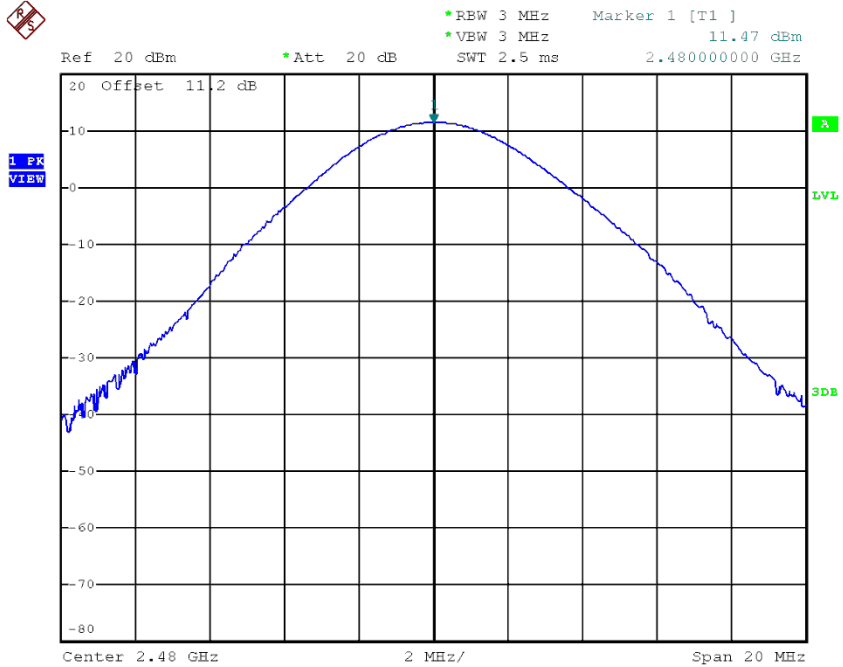


### CH39



Date: 26.JUN.2017 20:39:03

### CH78

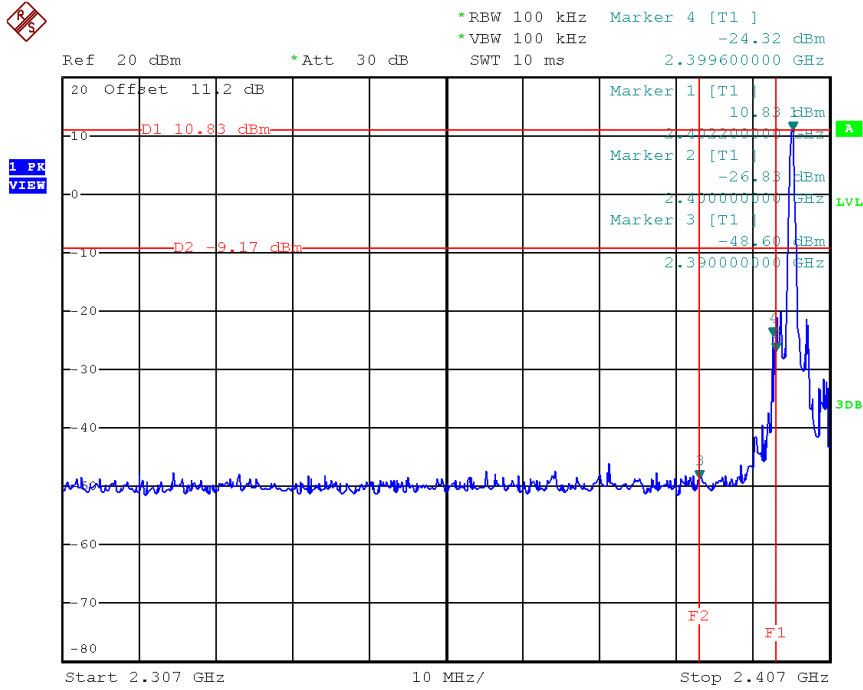


Date: 26.JUN.2017 20:39:17

# ATTACHMENT J - ANTENNA CONDUCTED SPURIOUS EMISSION

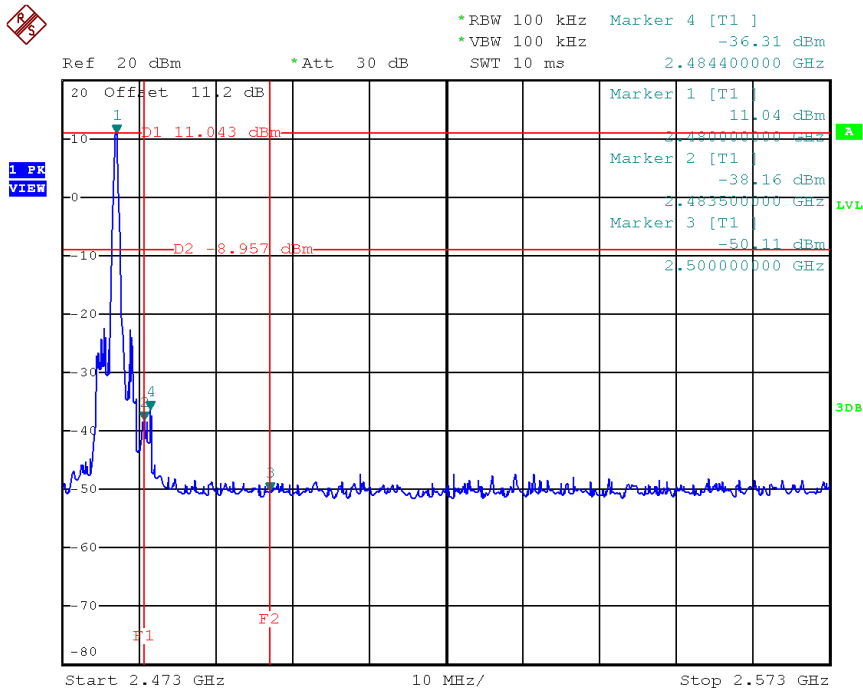


### CH00 (Lower)\_1Mbps



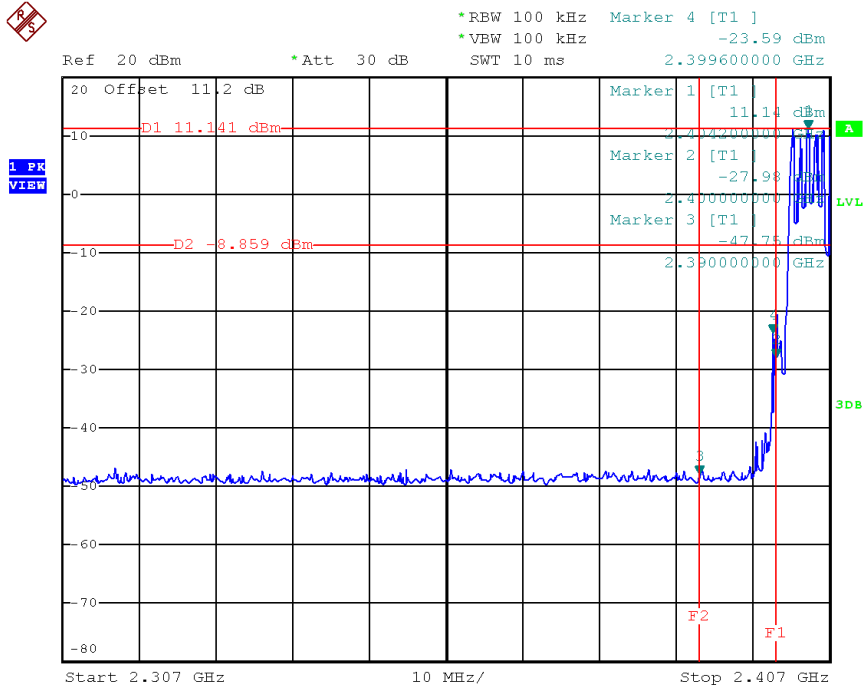
Date: 28.JUN.2017 16:20:37

### CH78 (Upper)\_1Mbps



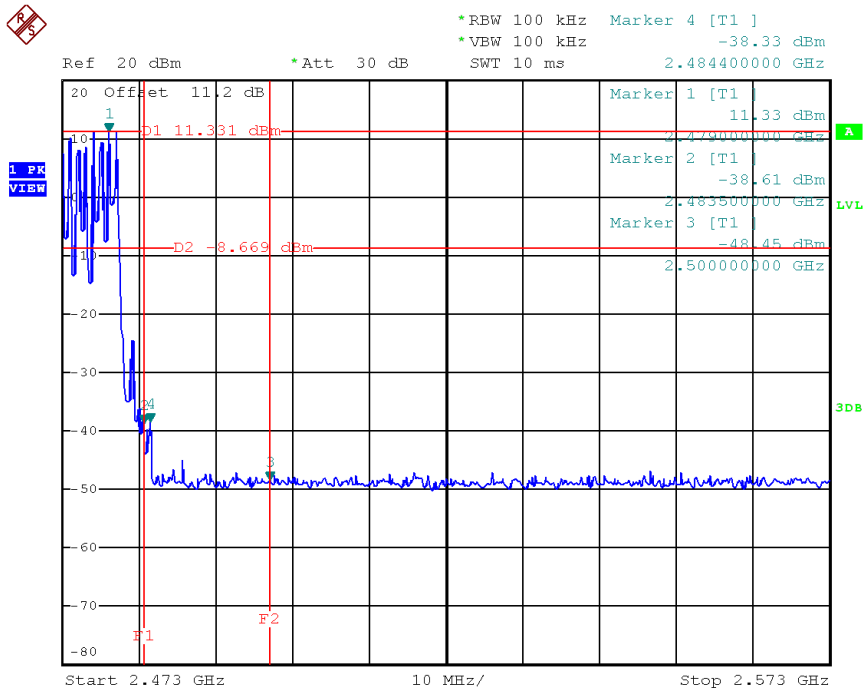
Date: 28.JUN.2017 16:28:28

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



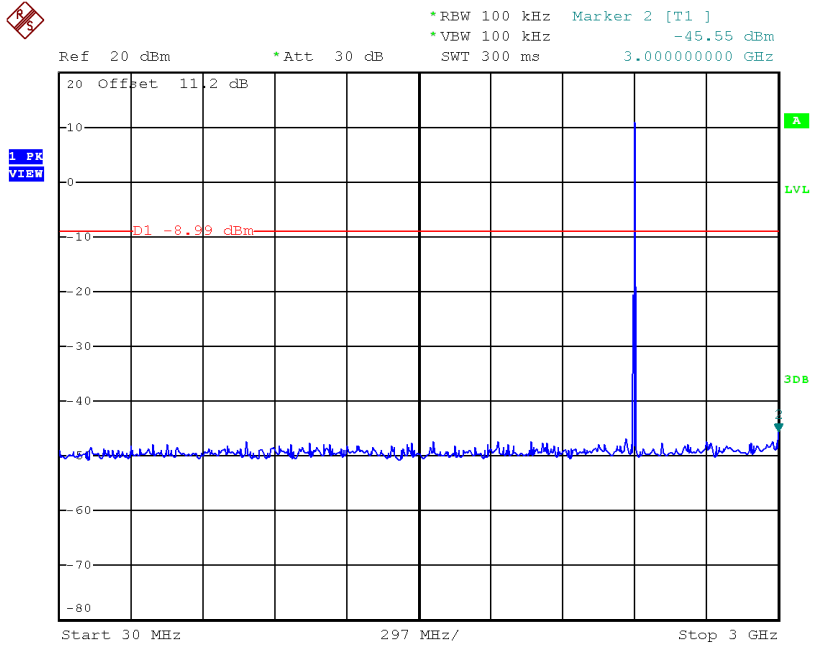
Date: 28.JUN.2017 16:36:54

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

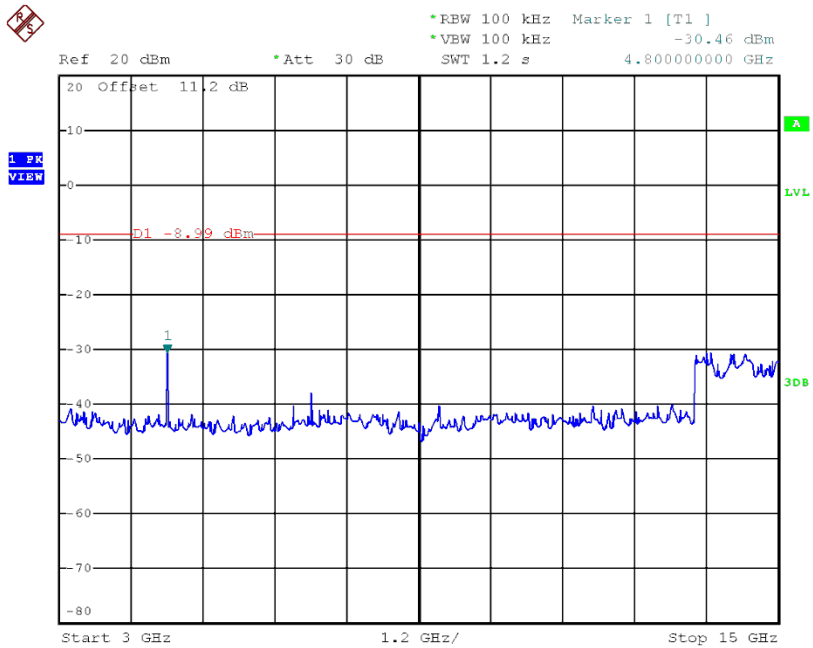


Date: 28.JUN.2017 16:37:28

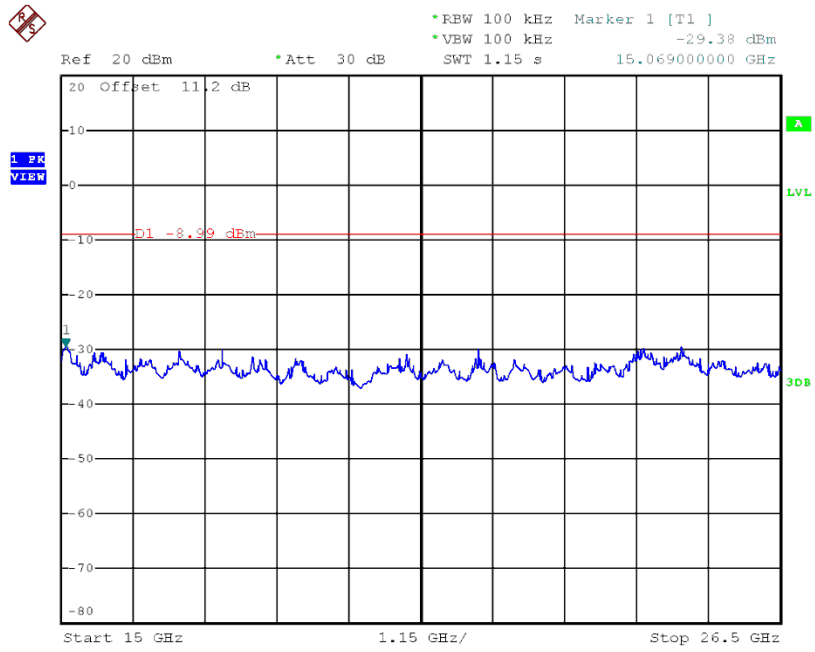
### CH00 (10 Harmonic of the frequency) \_1Mbps



Date: 28.JUN.2017 16:21:21

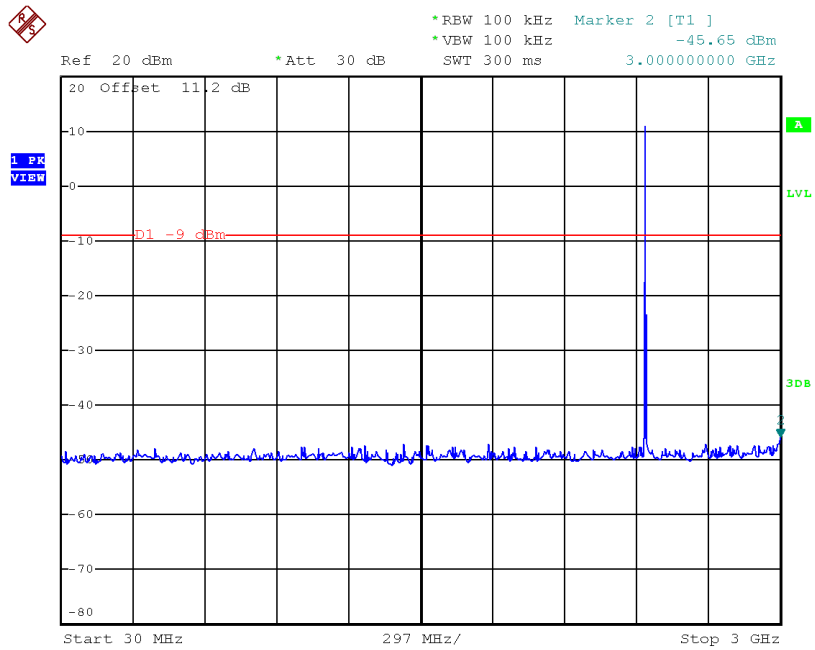


Date: 28.JUN.2017 16:21:28

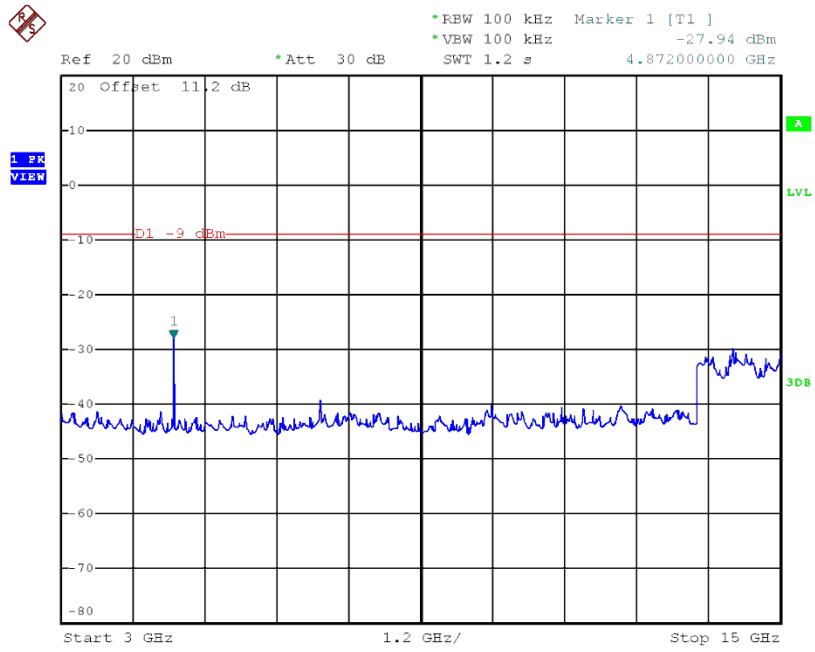


Date: 28.JUN.2017 16:21:34

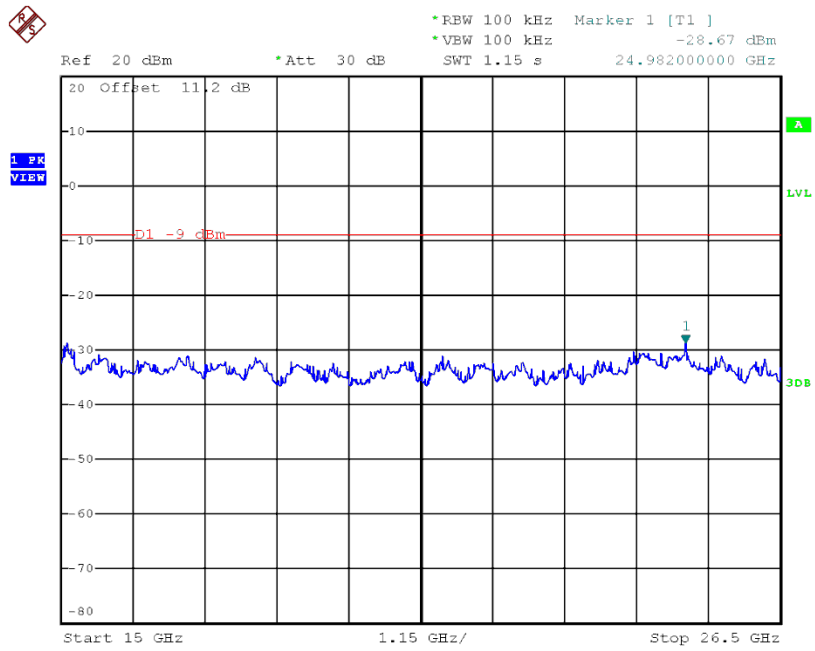
### CH39 (10 Harmonic of the frequency) \_1Mbps



Date: 28.JUN.2017 16:22:09

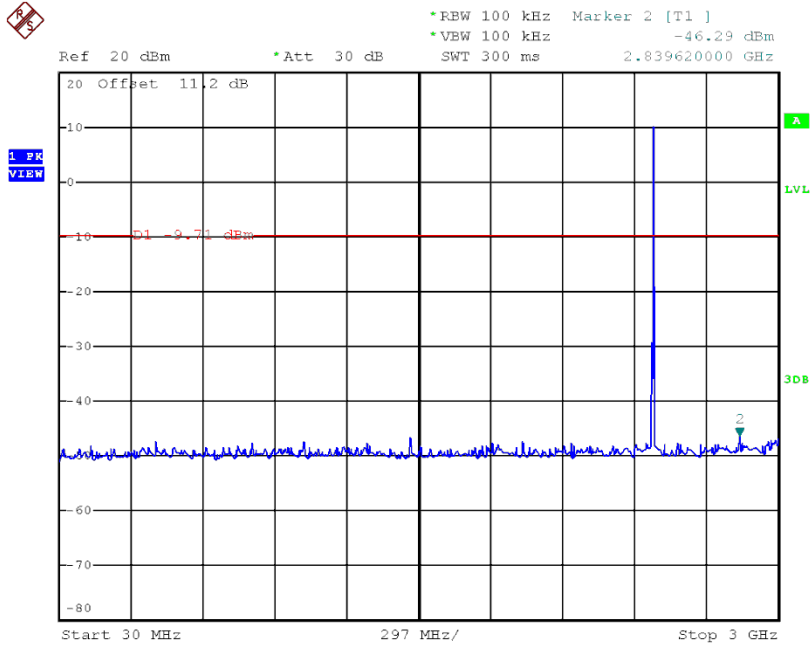


Date: 28.JUN.2017 16:22:16

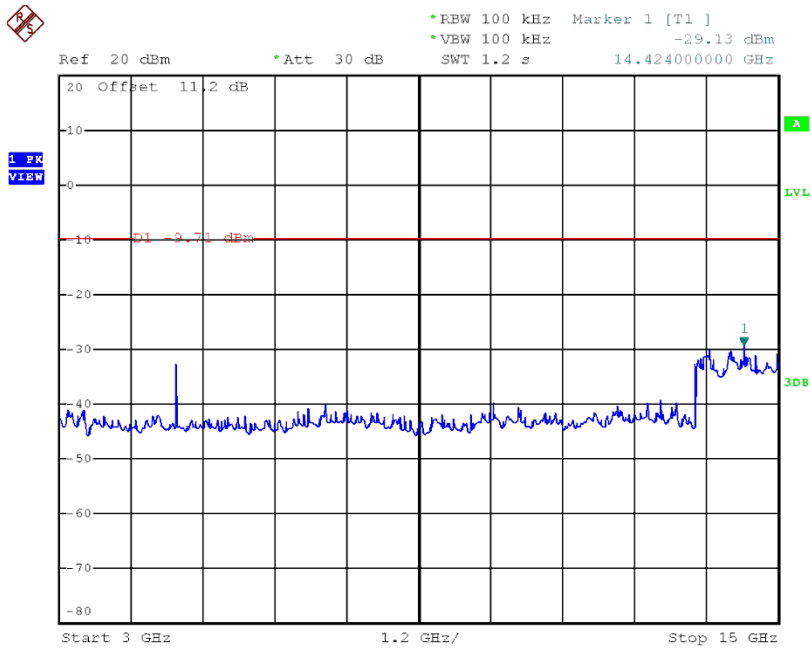


Date: 28.JUN.2017 16:22:23

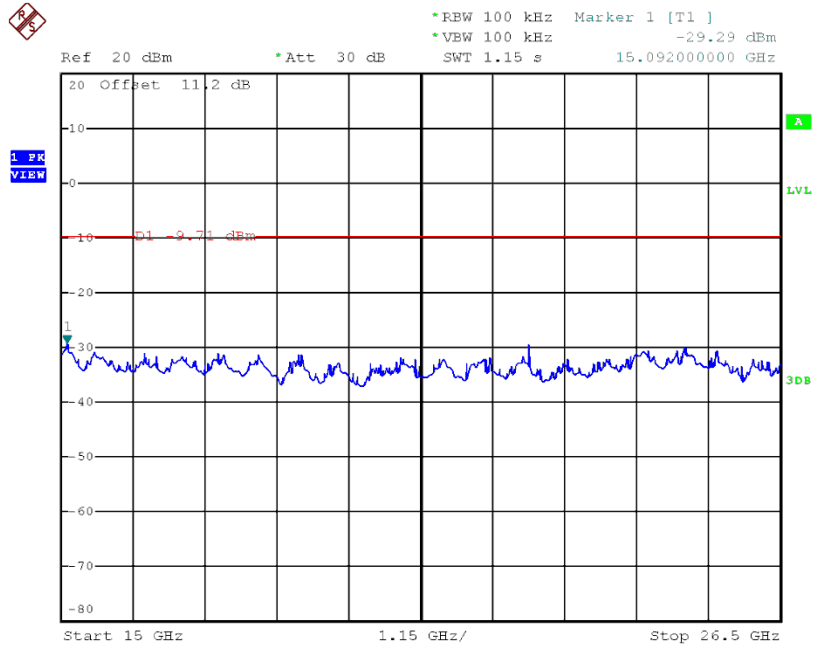
### CH78 (10 Harmonic of the frequency) \_1Mbps



Date: 28.JUN.2017 16:29:13

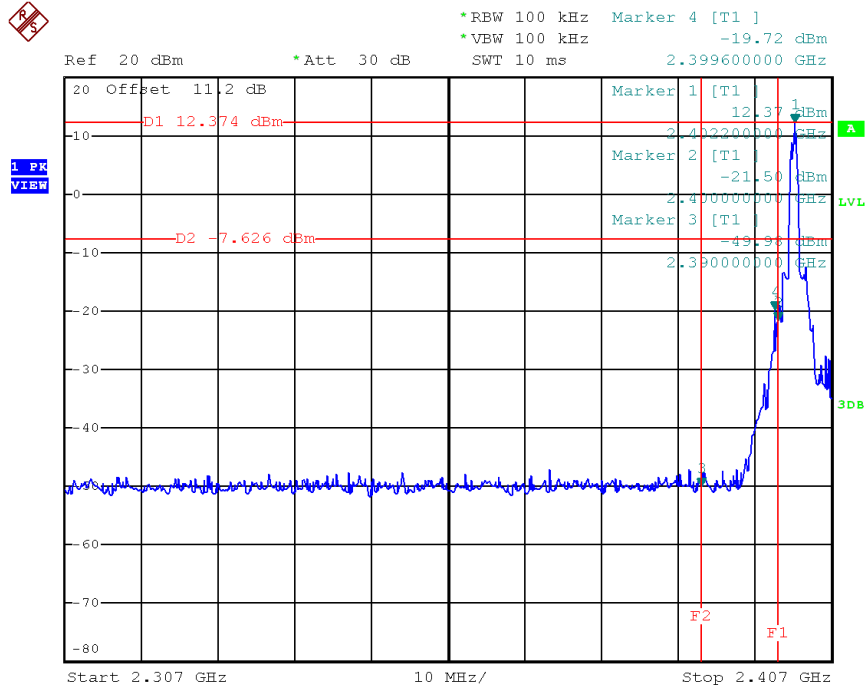


Date: 28.JUN.2017 16:29:20



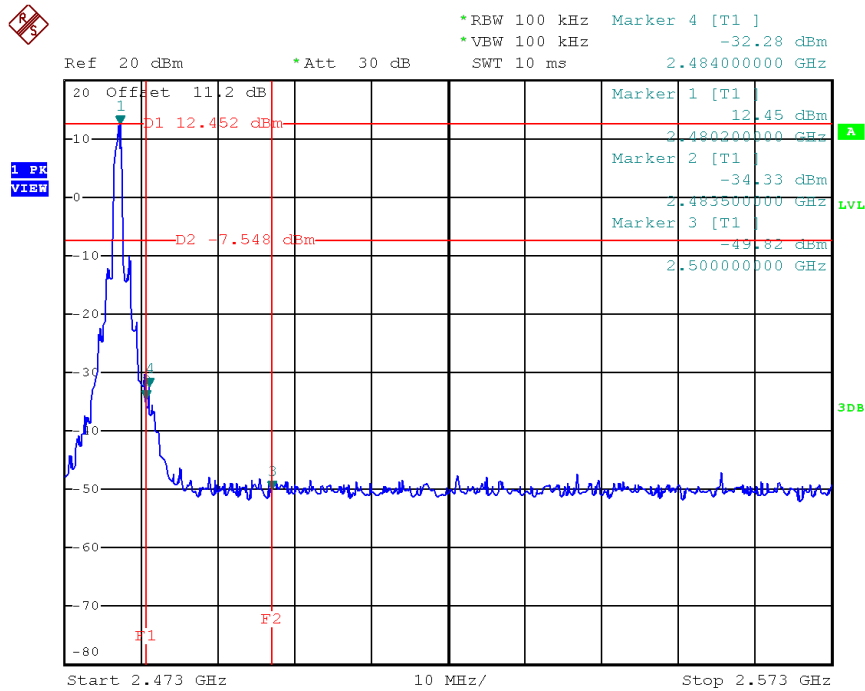
Date: 28.JUN.2017 16:29:27

### CH00 (Lower) \_3Mbps



Date: 28.JUN.2017 16:49:44

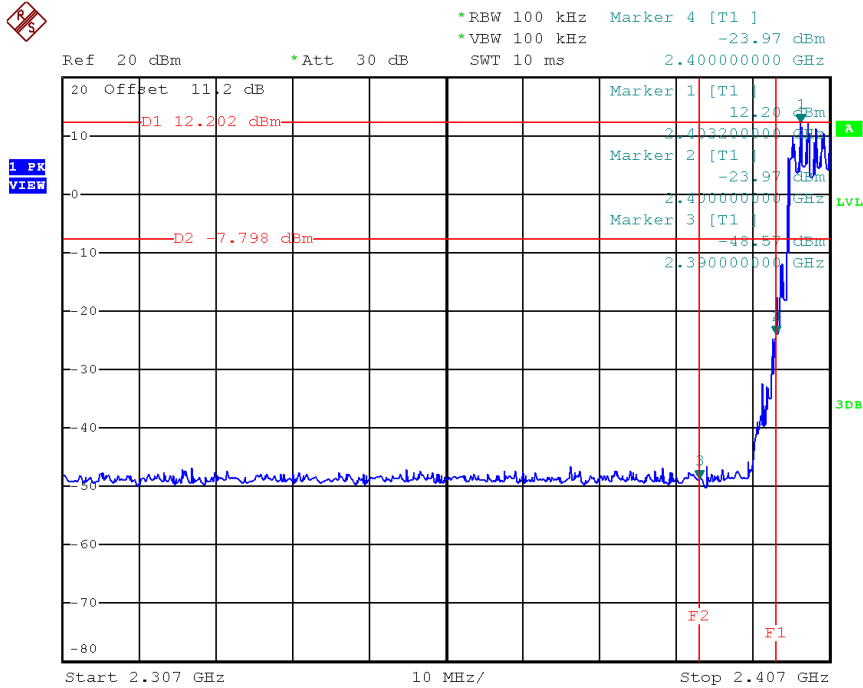
### CH78 (Upper) \_3Mbps



Date: 28.JUN.2017 16:52:35

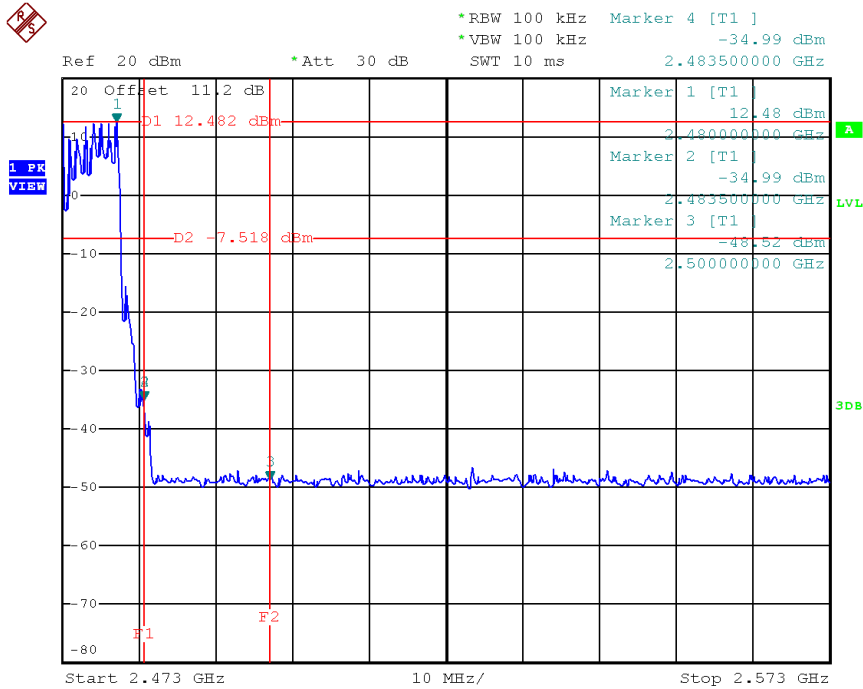


### CH00 Hopping on mode (Lower)\_3Mbps



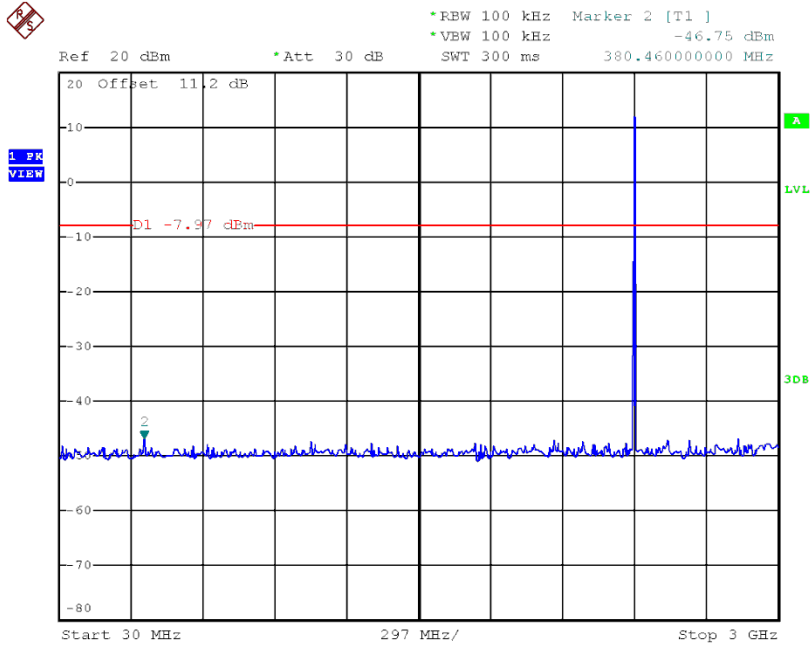
Date: 28.JUN.2017 17:00:32

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

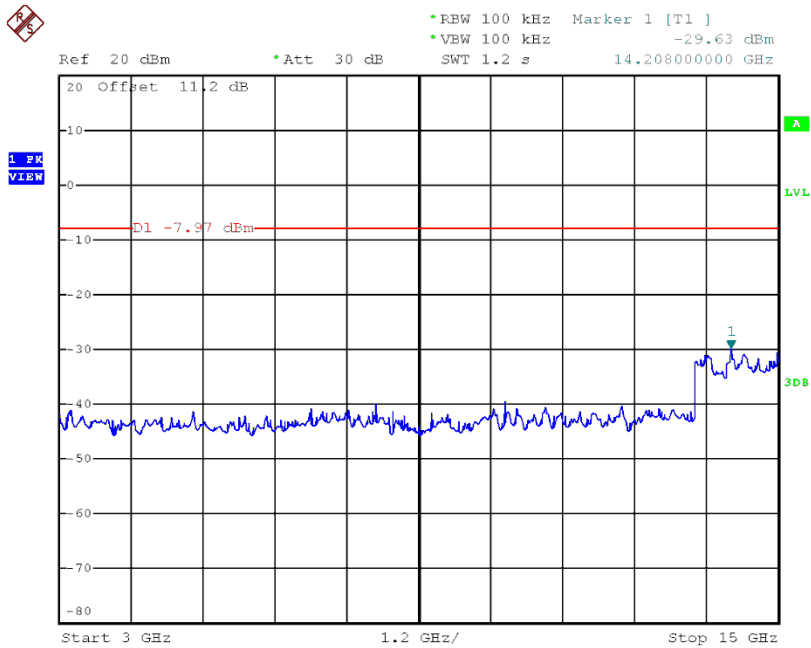


Date: 28.JUN.2017 17:01:06

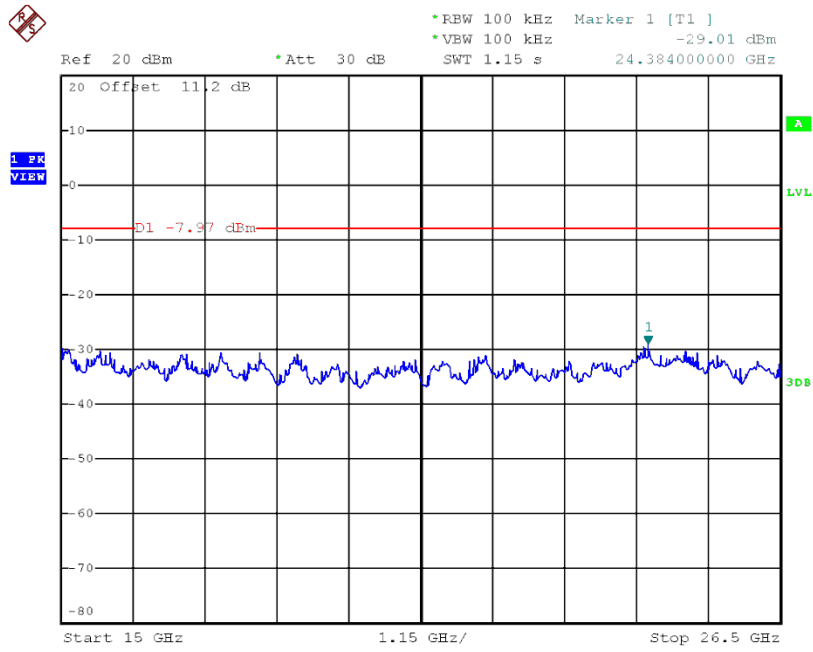
### CH00 (10 Harmonic of the frequency) \_3Mbps



Date: 28.JUN.2017 16:50:20

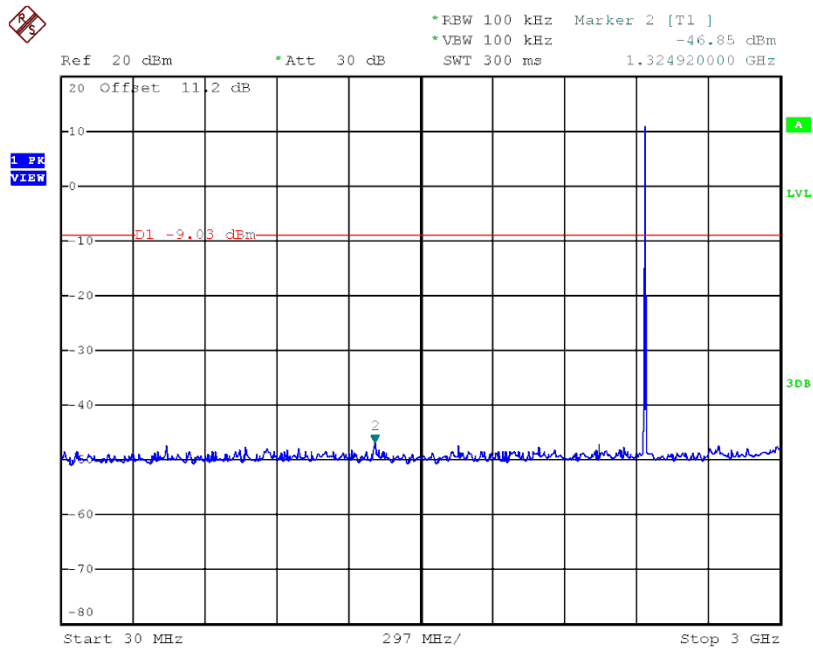


Date: 28.JUN.2017 16:50:27

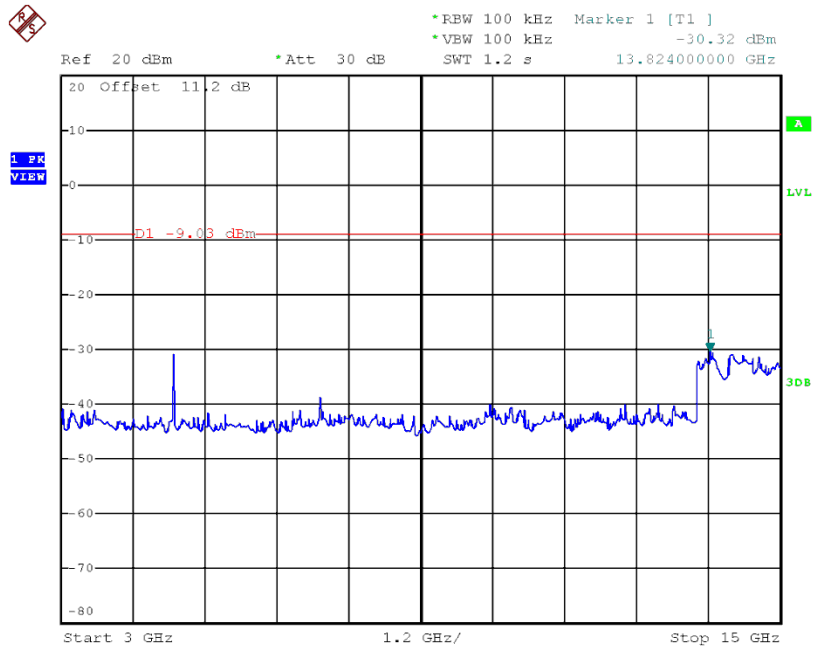


Date: 28.JUN.2017 16:50:33

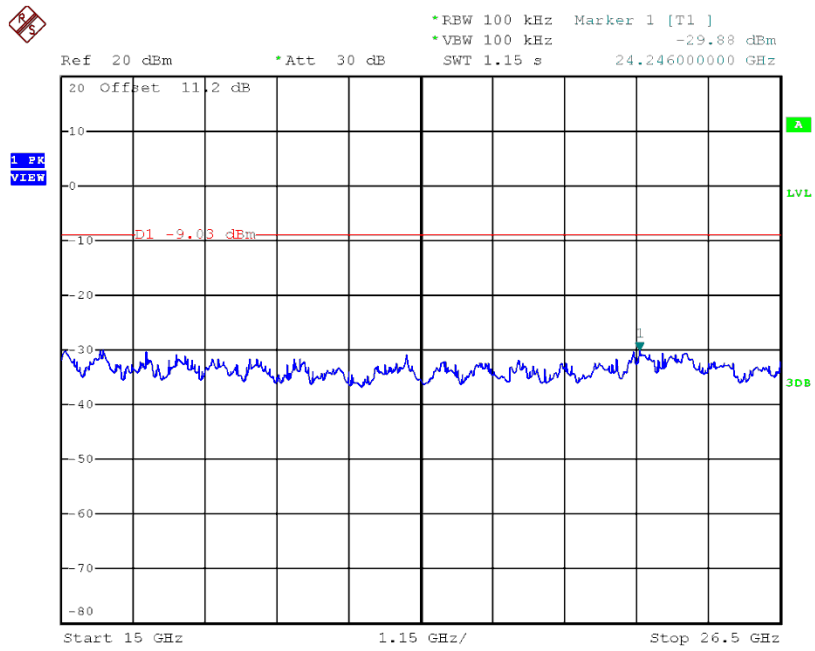
**CH39 (10 Harmonic of the frequency) \_3Mbps**



Date: 28.JUN.2017 16:51:25

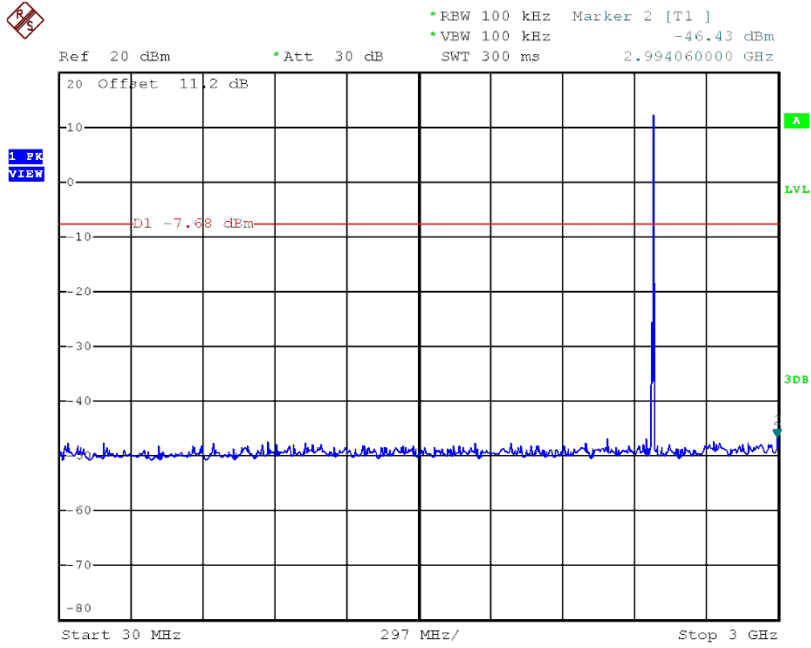


Date: 28.JUN.2017 16:51:32

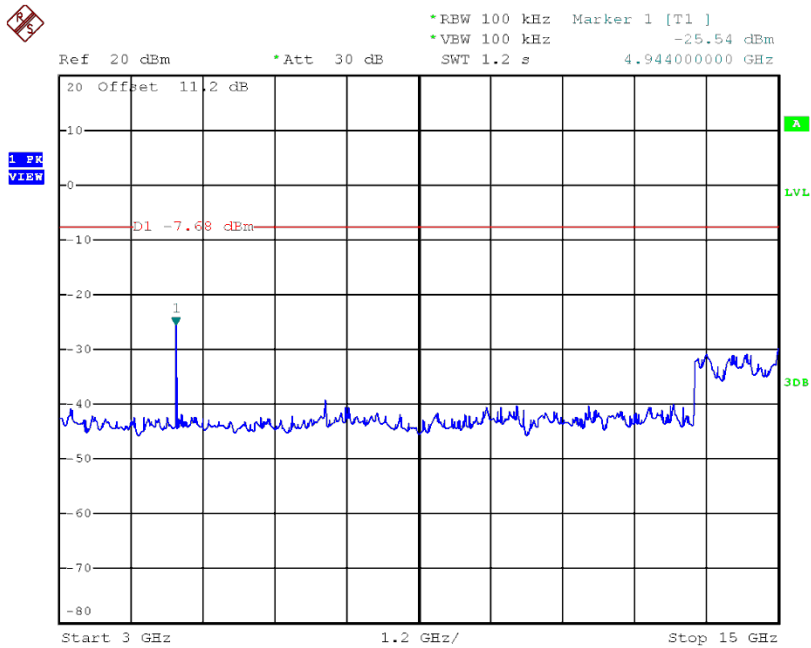


Date: 28.JUN.2017 16:51:39

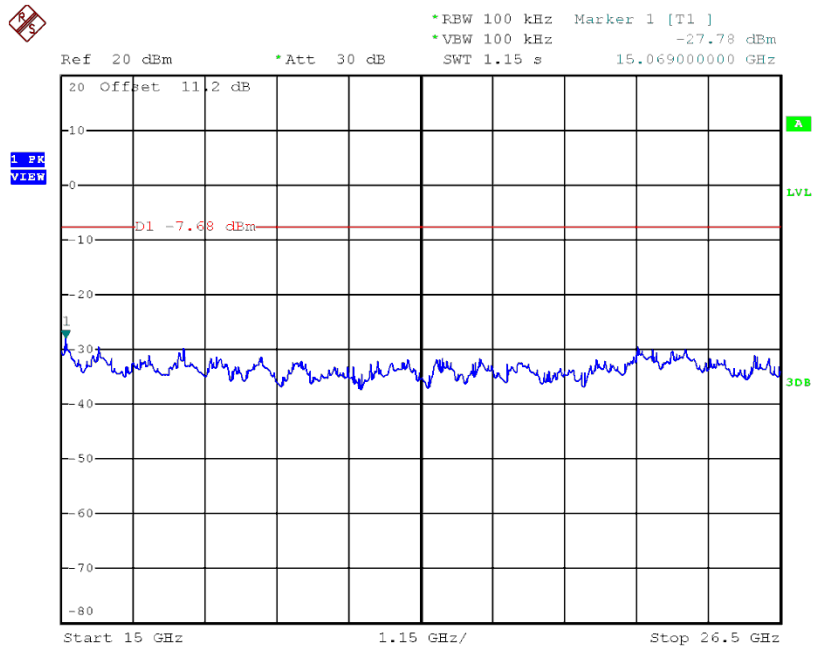
### CH78 (10 Harmonic of the frequency) \_3Mbps



Date: 28.JUN.2017 16:53:10



Date: 28.JUN.2017 16:53:17



Date: 28.JUN.2017 16:53:24