FCC Radio Test Report

FCC ID: 2AERPAIWA9002

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

Project No.	:	1605C225
Equipment	:	Exos-9 Portable Bluetooth Speaker
Test Model	:	Exos-9 9002-US
Series Model	:	Exos-9 9002-UK, Exos-9 9002-XX, Exos-9 XXXX-XX (X=blank, 0~9, A~Z)
Applicant	:	Hale Devices Inc
Address	:	650 West Lake Street #110, Chicago, IL 60661

Date of Receipt	:	Jun. 02, 2016
Date of Test	:	Jun. 02, 2016 ~ Jun. 17, 2016
Issued Date	:	Jun. 20, 2016
Tested by	:	BTL Inc.

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REPORT ISSUED HISTORY

Issued No.	Description	Issued Date
BTL-FCCP-1-1605C225	Original Issue.	Jun. 20, 2016

1. CERTIFICATION

Equipment	:	Exos-9 Portable Bluetooth Speaker
Brand Name	:	AIWA
Test Model	:	Exos-9 9002-US
Series Model	:	Exos-9 9002-UK, Exos-9 9002-XX, Exos-9 XXXX-XX (X=blank, 0~9, A~Z)
Applicant	:	Hale Devices Inc
Manufacturer	:	FORETECH OPTICAL (ZHONGSHAN) CO.
Address	:	No.8, Zhiye Road, Torch Development Zone, Zhongshan City, Guangdong
Factory	:	FORETECH OPTICAL (ZHONGSHAN) CO.
Address	:	No.8, Zhiye Road, Torch Development Zone, Zhongshan City, Guangdong
Date of Test	:	Jun. 16, 2016 ~ Jun. 17, 2016
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-1-1605C225) 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): 47 CFR Part 15, 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	

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: 319330

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** ± **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

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	Exos-9 Portable Bluetooth Speaker	
Brand Name	AIWA	
Test Model	Exos-9 9002-US	
Series Model	Exos-9 9002-UK, Exos-9 9002-XX, Exos-9 XXXX-XX(X=blank, 0~9, A~Z)	
Model Difference	With different power cord, for marketing purpose only	
Output Power (Max.)	Operation Frequency	2402~2480 MHz
	Modulation Technology	GFSK(1Mbps) π/4-DQPSK(2Mbps) 8-DPSK(3Mbps)
	Bit Rate of Transmitter	
	Output Power Max.	3.03 dBm(1Mbps) 3.50 dBm(3Mbps)
Power Source	AC Mains.	
Power Rating	I/P: 100-240V~ 50/60Hz 2A	

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

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Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	N/A	F00030-000150	PCB	N/A	1.5

3.2 DESCRIPTION OF TEST MODES

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

Pretest Mode	Description
Mode 1	TX Mode **Note (1)**

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 **Note (1)**

Note:

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

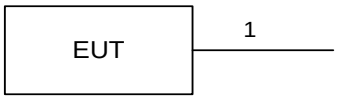
(2) The measurements for Hopping Channel Separation, Bandwidth and Peak Output Power were tested during 1Mbps, 2Mbps and 3Mbps, the worst case are 1Mbps and 3Mbps, only worst case was documented.

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	Blue Test3		
Frequency	2402 MHz	2441 MHz	2480 MHz
Parameters(1Mbps)	255.00	200.00	200.00
Parameters(3Mbps)	255.00	255.00	255.00

3.4 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



3.5 DESCRIPTION OF SUPPORT UNITS

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

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

Item	Shielded Type	Ferrite Core	Length	Note
1	NO	NO	1.5m	AC Cable

4. EMC EMISSION TEST

4.1 CONDUCTED EMISSION MEASUREMENT

4.1.1 POWER LINE CONDUCTED EMISSION LIMITS (Frequency Range 150KHz-30MHz)

Frequency of Emission (MHz)	Conducted Limit (dBμV)	
	Quasi-peak	Average
0.15 -0.50	66 to 56*	56 to 46*
0.50 -5.0	56	46
5.0 -30.0	60	50

Note:

(1) The limit of " * " decreases with the logarithm of the frequency

(2) The test result calculated as following:
Measurement Value = Reading Level + Correct Factor
Correct Factor = Insertion Loss + Cable Loss + Attenuator Factor(if use)
Margin Level = Measurement Value - Limit Value

The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 KHz

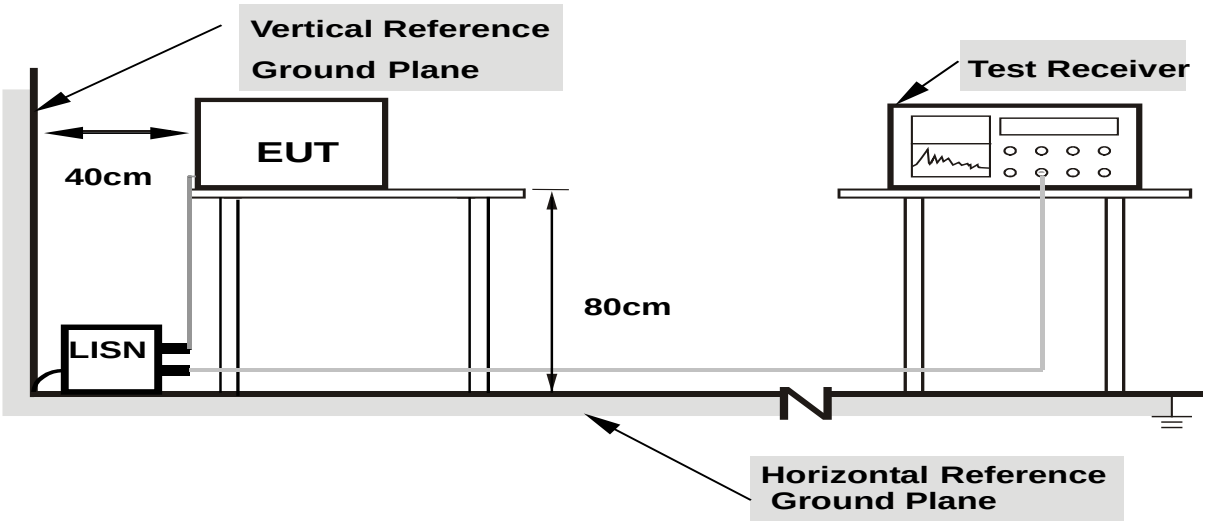
4.1.2 TEST PROCEDURE

a. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipment powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
d. LISN at least 80 cm from nearest part of EUT chassis.
e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

4.1.3 DEVIATION FROM TEST STANDARD

No deviation

4.1.4 TEST SETUP



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 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)	dB(uV/m) (at 3 meters)	
	Peak	Average
Above 1000	74	54

Notes:

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

(2) The tighter limit applies at the band edges.

(3) Emission level (dBuV/m) =20log Emission level (uV/m).

(4) The test result calculated as following:
Measurement Value = Reading Level + Correct Factor
Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain(if use)
Margin Level = Measurement Value - Limit Value

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

Spectrum Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9KHz ~90KHz for PK/AVG detector
Start ~ Stop Frequency	90KHz ~110KHz for QP detector
Start ~ Stop Frequency	110KHz ~490KHz for PK/AVG detector
Start ~ Stop Frequency	490KHz ~30MHz for QP detector
Start ~ Stop Frequency	30MHz~1000MHz for QP detector

4.2.2 TEST PROCEDURE

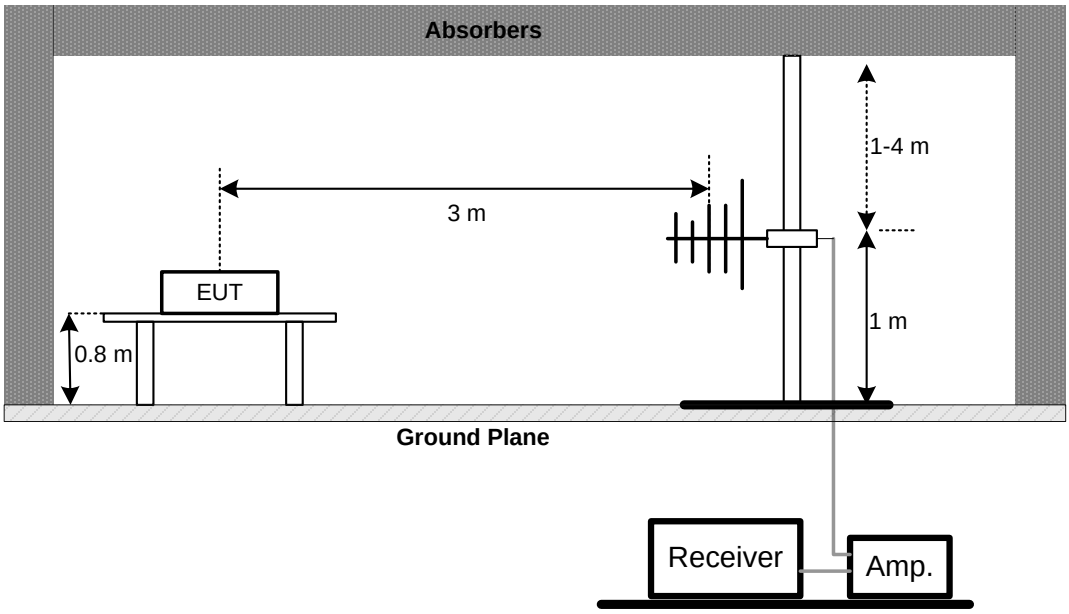
a. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1GHz)
b. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 1.5 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(above 1GHz)
c. The height of the equipment or of the substitution antenna shall be 0.8 m or 1.5m, the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights find the maximum reading (used Bore sight function).
e. The receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1GHz.
f. The initial step in collecting radiated emission data is a receiver peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
g. All readings are Peak unless otherwise stated QP in column of Note. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn‘t perform. (below 1GHz)
h. All readings are Peak Mode value unless otherwise stated AVG in column of Note. If the Peak Mode Measured value compliance with the Peak Limits and lower than AVG Limits, the EUT shall be deemed to meet both Peak & AVG Limits and then only Peak Mode was measured, but AVG Mode didn‘t perform. (above 1GHz)
i. For the actual test configuration, please refer to the related Item –EUT Test Photos.

4.2.3 DEVIATION FROM TEST STANDARD

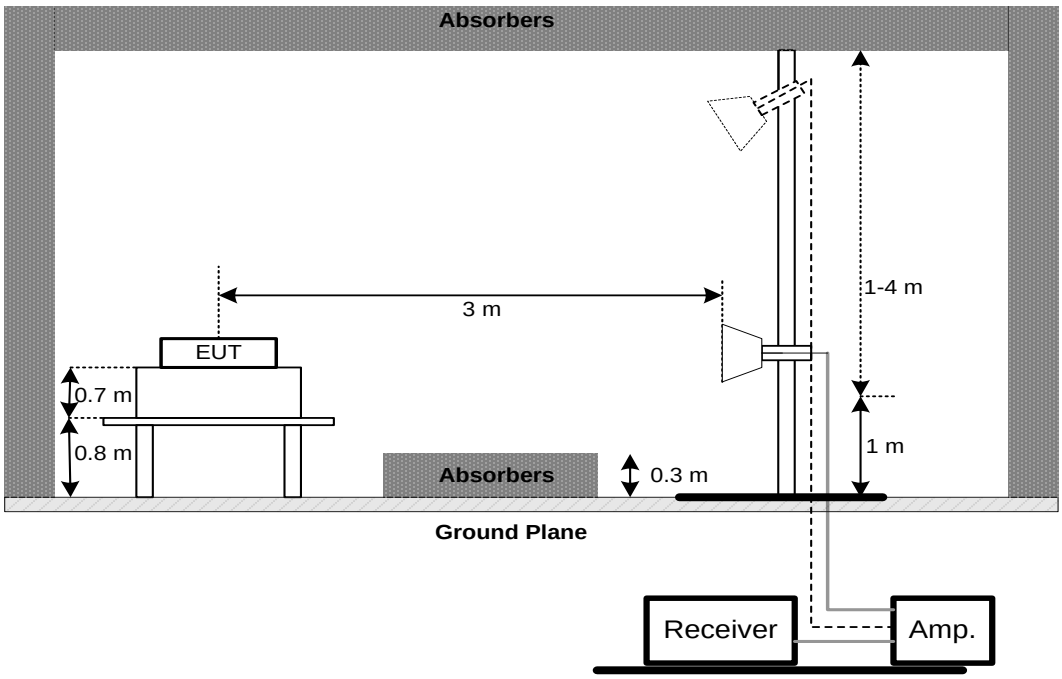
No deviation

4.2.4 TEST SETUP

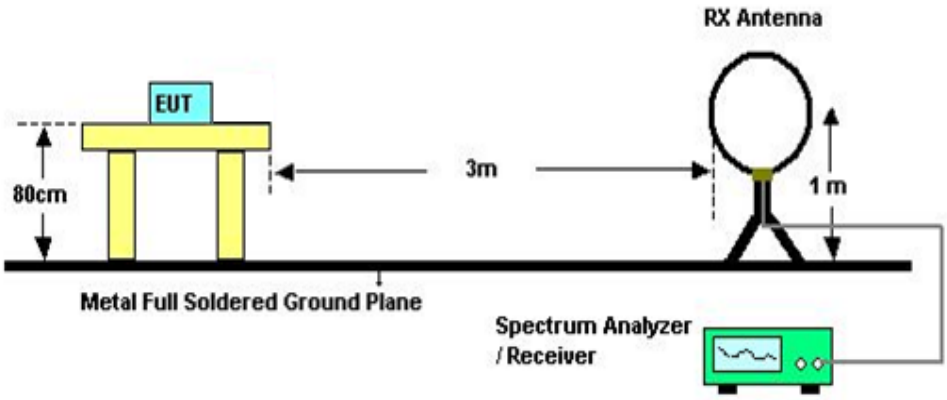
(A) Radiated Emission Test Set-Up Frequency Below 1 GHz



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



(C) For Radiated Emissions Below 30MHz



4.2.5 EUT OPERATING CONDITIONS

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

4.2.6 EUT TEST CONDITIONS

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

4.2.7 TEST RESULTS (9KHZ TO 30MHZ)

Please refer to the Attachment B

Remark:

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

4.2.8 TEST RESULTS (30MHZ TO 1000 MHZ)

Please refer to the Attachment C.

Remark:

(1) Reading in which marked as QP or Peak means measurements by using are Quasi-Peak Mode or Peak Mode with Detector BW=120KHz; SPA setting in RBW=120KHz, VBW =120KHz, Swp. Time = 0.3 sec./MHz.

(2) All readings are Peak unless otherwise stated QP in column of 『Note』. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform.

(3) Measuring frequency range from 30MHz to 1000MHz.

(4) If the peak scan value lower limit more than 20dB, then this signal data does not show in table.

4.2.9 TEST RESULTS (ABOVE 1000 MHZ)

Please refer to the Attachment D.

Remark:

(1) Radiated emissions measured in frequency range above 1000MHz were made with an instrument using Peak detector mode and AV detector mode of the emission

(2) A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.

(3) EUT Orthogonal Axis:
"X" - denotes Laid on Table; "Y" - denotes Vertical Stand; "Z" - denotes Side Stand

(4) During the measurements above 1 GHz it is taken care of that the EUT is always within the 3 dB cone of radiation BW of the used antenna

(5) 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

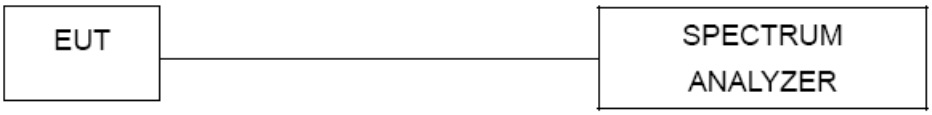
5.1.1 TEST PROCEDURE

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 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

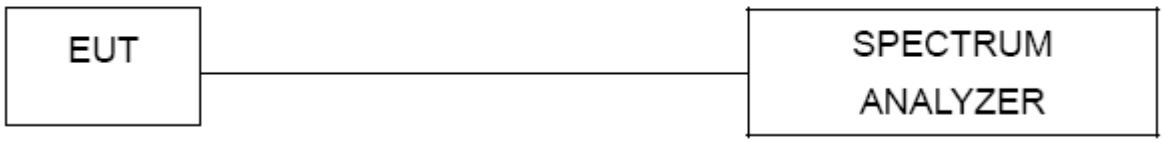
6.1.1 TEST PROCEDURE

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 slots TX, 1 time slot RX). So, the dwell time is the time duration of the pulse times 3.37 x 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 x 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 x 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 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

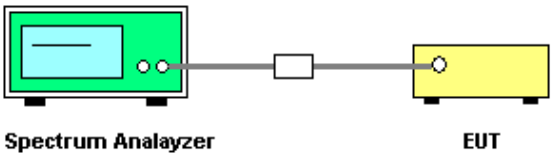
7.1.1 TEST PROCEDURE

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) ≥ 1% of the span
Video (or Average) Bandwidth (VBW) ≥ 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 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	30 KHz (20dB Bandwidth) / 30 KHz (Channel Separation)
VBW	100 KHz (20dB Bandwidth) / 100 KHz (Channel Separation)
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

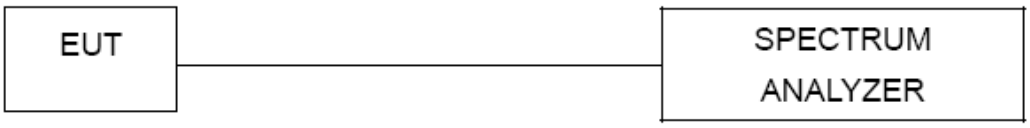
8.1.1 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
b. Spectrum Setting: RBW= 30KHz, VBW=100KHz, Sweep Time = Auto.

8.1.2 DEVIATION FROM STANDARD

No deviation.

8.1.3 TEST SETUP



8.1.4 EUT OPERATION CONDITIONS

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

8.1.5 EUT TEST CONDITIONS

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

8.1.6 TEST RESULTS

Please refer to the Attachment 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 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 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.

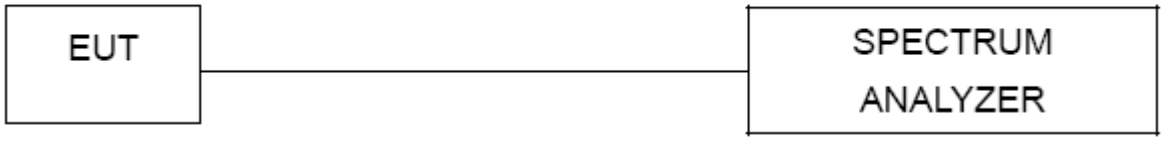
10.1.1 TEST PROCEDURE

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 Attachment J

11. MEASUREMENT INSTRUMENTS LIST

Conducted Emission Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	LISN	EMCO	3816/2	0052765	Mar. 27, 2017
2	LISN	R&S	ENV216	101447	Mar. 27, 2017
3	Test Cable	emci	RG223(9KHz -30MHz)	C_17	Mar. 10, 2017
4	EMI Test Receiver	R&S	ESCI	100382	Mar. 27, 2017
5	50Ω Terminator	SHX	TF2-3G-A	08122901	Mar. 27, 2017
6	Measurement Software	Farad	EZ-EMC Ver.NB-03A1 -01	N/A	N/A

Radiated Emission Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Antenna	Schwarbeck	VULB9160	9160-3232	Mar. 27, 2017
2	Amplifier	HP	8447D	2944A09673	Nov. 09, 2016
3	Receiver	AGILENT	N9038A	MY52130039	Oct. 11, 2016
4	Test Cable	emci	LMR-400(30MHz-1GHz)	C-01	Jun. 28, 2016
5	Control	CT	SC100	N/A	N/A
6	Position Control	MF	MF-7802	MF780208416	N/A
7	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A
8	Antenna	ETS	3115	00075789	Mar. 27, 2017
9	Amplifier	Agilent	8449B	3008A02274	Nov. 01, 2016
10	Receiver	AGILENT	N9038A	MY52130039	Oct. 11, 2016
11	Test Cable	emci	EMC104-SM-SM-10000(1GHz－26.5GHz)	C-68	Jun. 28, 2016
12	Broad-Band Horn Antenna	Schwarzbeck	BBHA 9170	9170319	Apr. 23, 2017
13	Microwave Preamplifier With Adaptor	EMC INSTRUMENT	EMC2654045	980039 & HA01	Mar. 27, 2017
14	Active Loop Antenna	R&S	HFH2-Z2	830749/020	Sep. 07, 2016

Number of Hopping Channel					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	EXA Spectrum Analyzer	Agilent	N9010A	MY50520044	Mar. 27, 2017

Average Time of Occupancy					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	EXA Spectrum Analyzer	Agilent	N9010A	MY50520044	Mar. 27, 2017

Hopping Channel Separation Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	EXA Spectrum Analyzer	Agilent	N9010A	MY50520044	Mar. 27, 2017

Bandwidth					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	EXA Spectrum Analyzer	Agilent	N9010A	MY50520044	Mar. 27, 2017

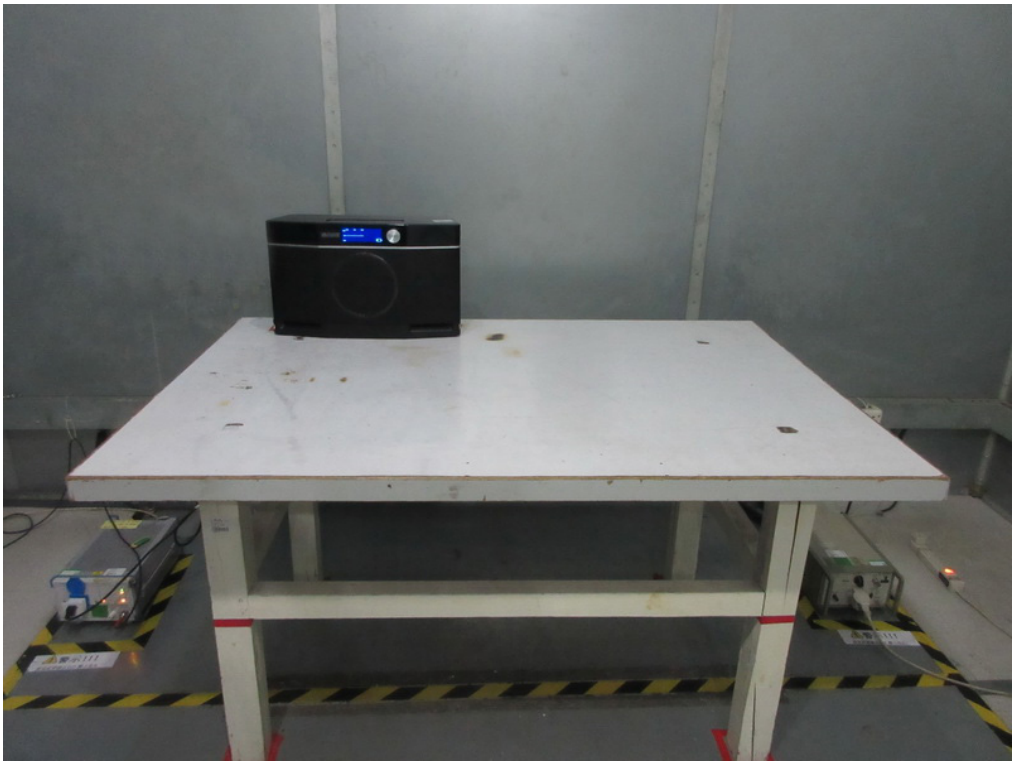
Peak Output Power					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	EXA Spectrum Analyzer	Agilent	N9010A	MY50520044	Mar. 27, 2017

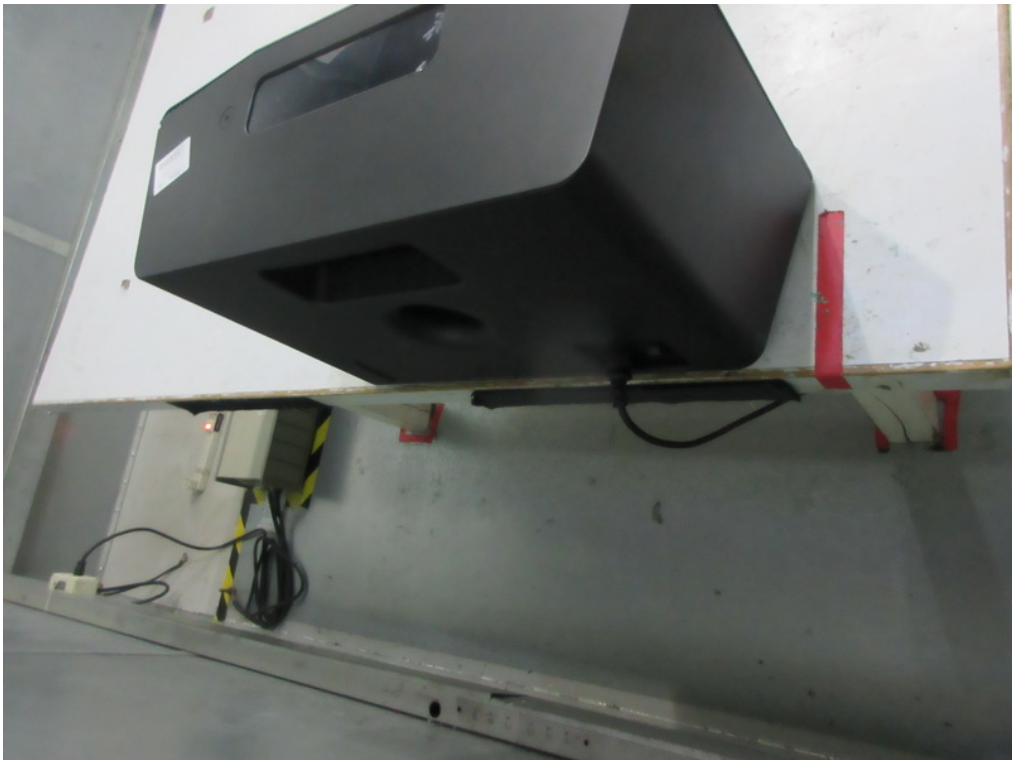
Antenna Conducted Spurious Emission					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	EXA Spectrum Analyzer	Agilent	N9010A	MY50520044	Mar. 27, 2017

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

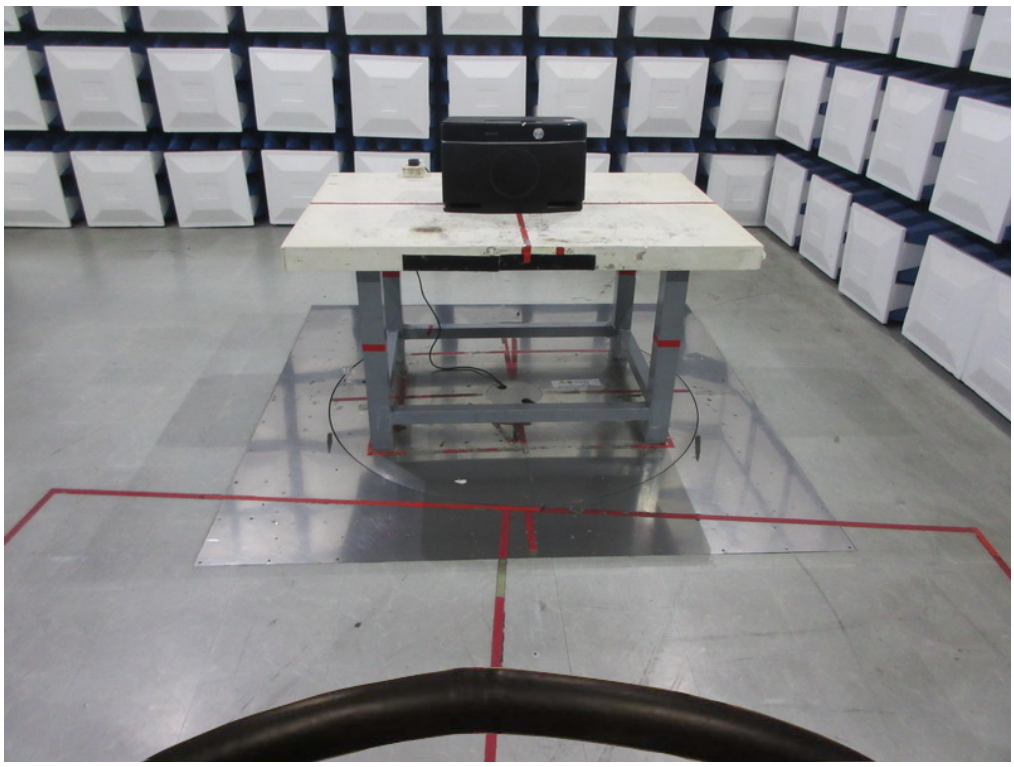
Conducted Measurement Photos

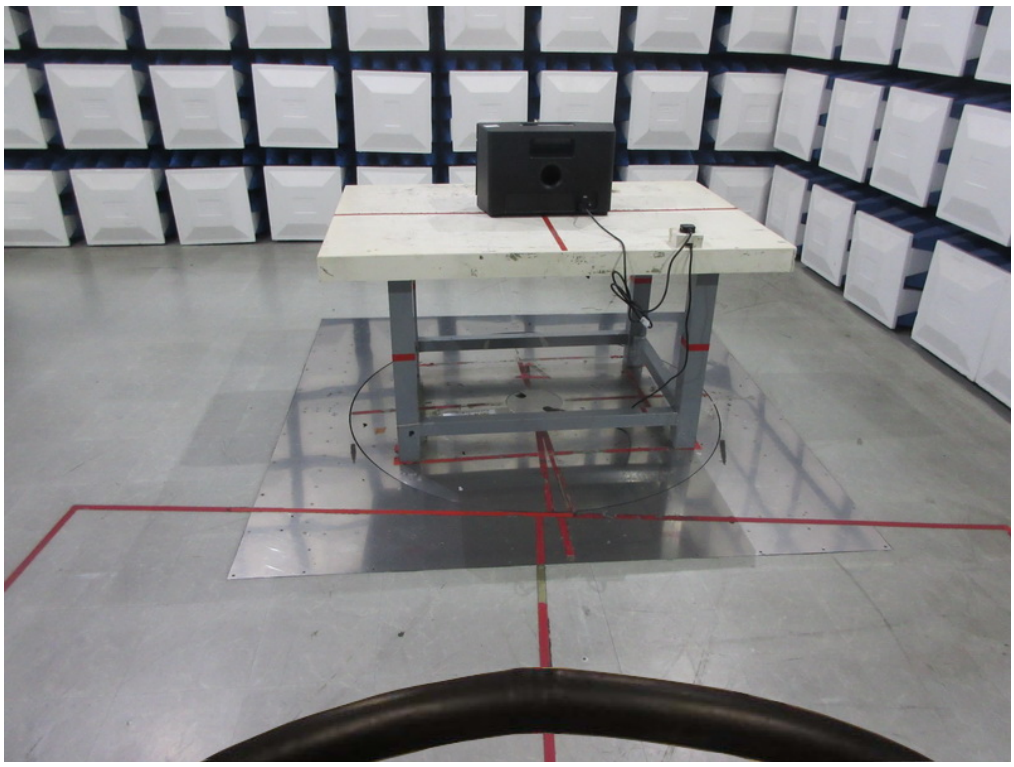




Radiated Measurement Photos

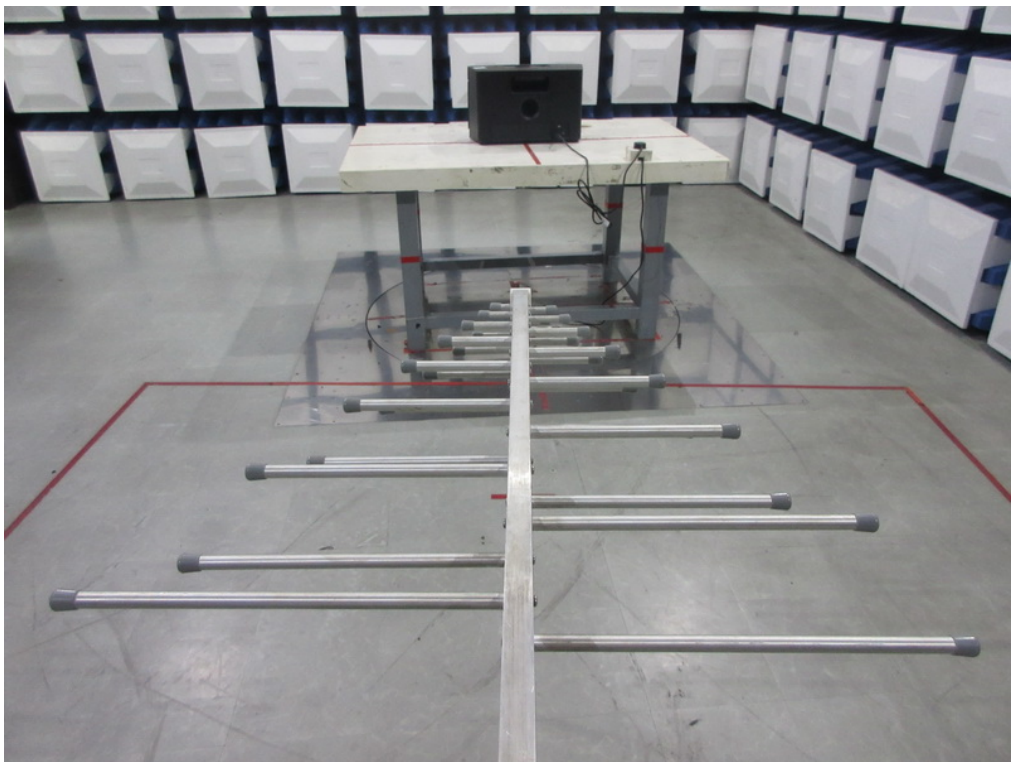
9KHz to 30MHz

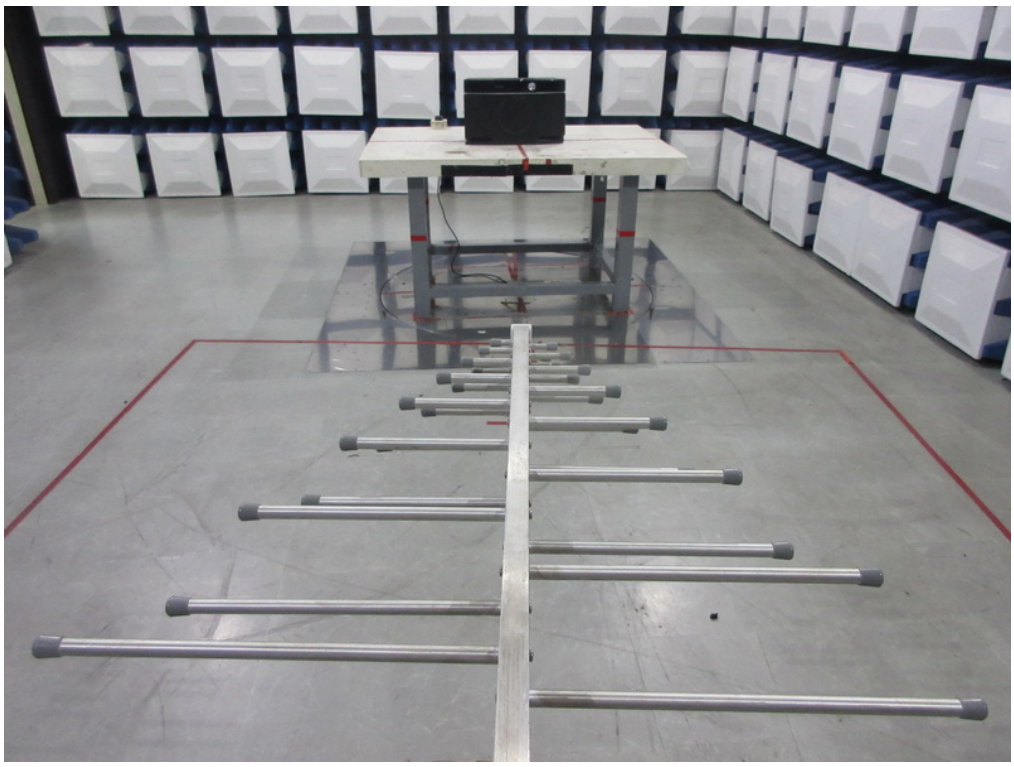




Radiated Measurement Photos

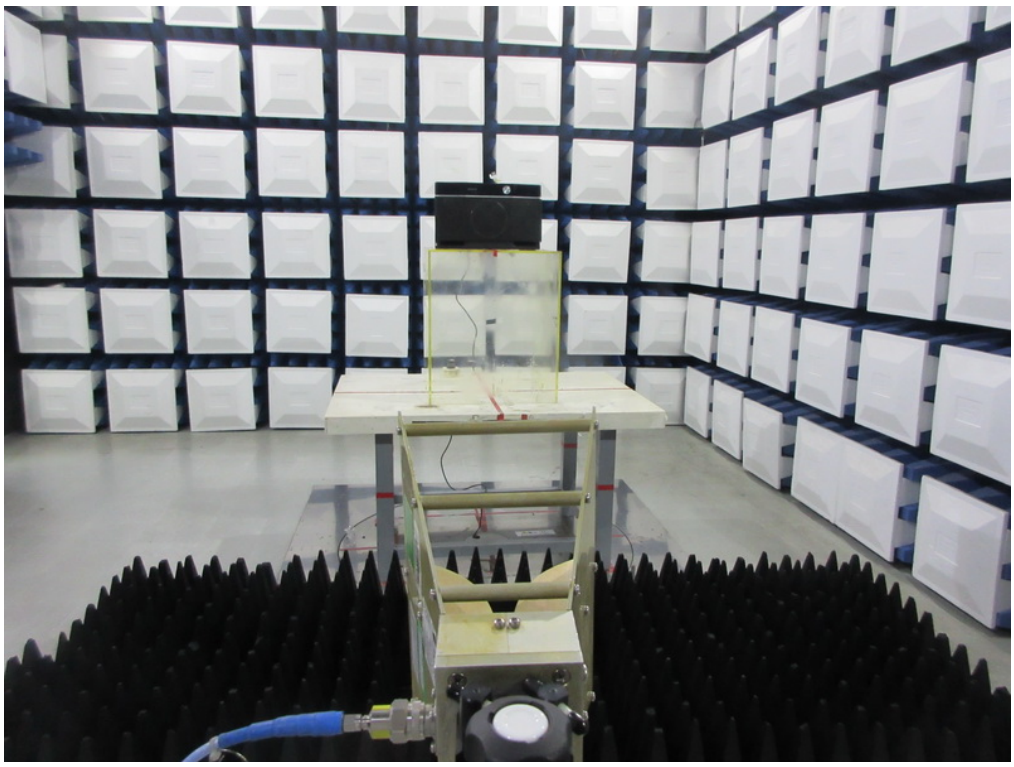
30MHz to 1000MHz

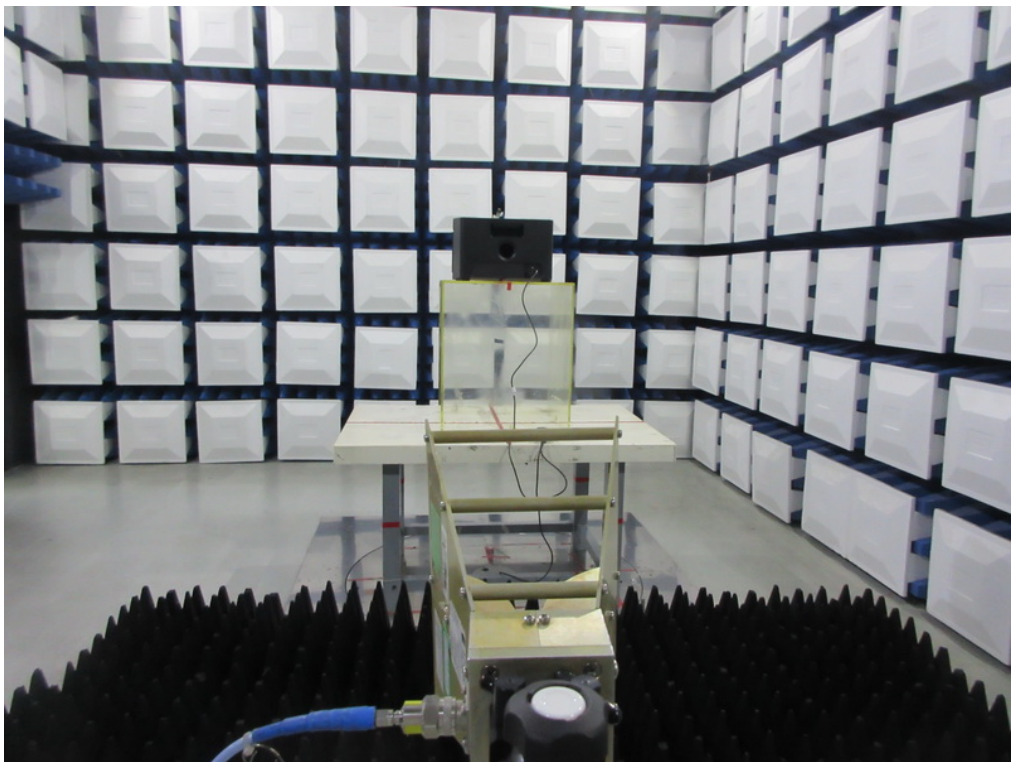




Radiated Measurement Photos

Above 1000MHz

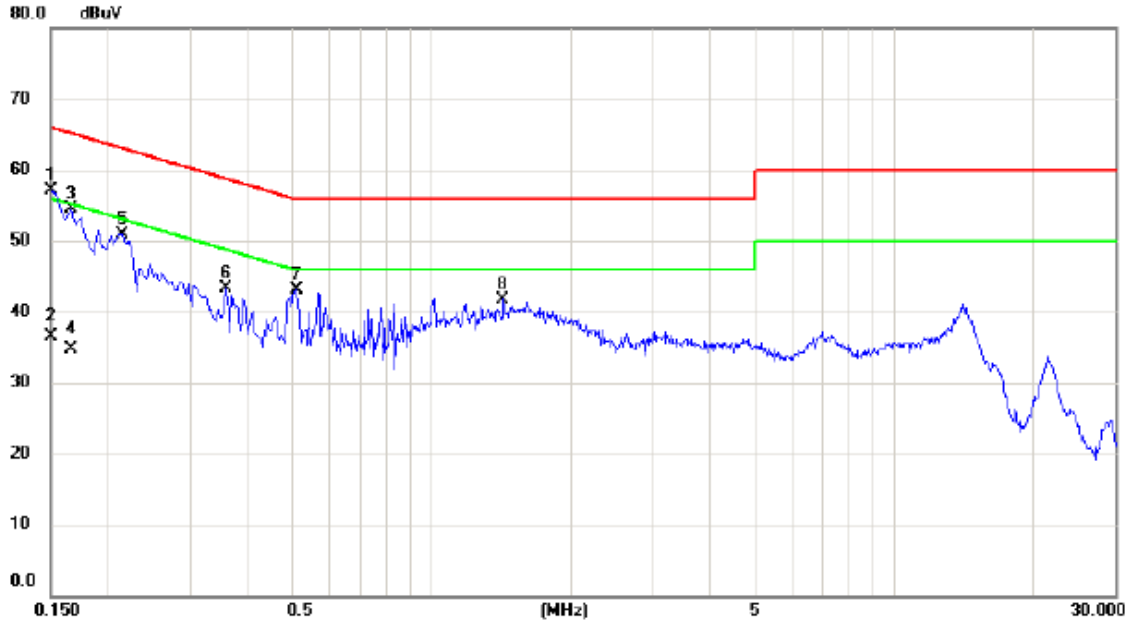




ATTACHMENT A - CONDUCTED EMISSION

Test Mode:	TX Mode

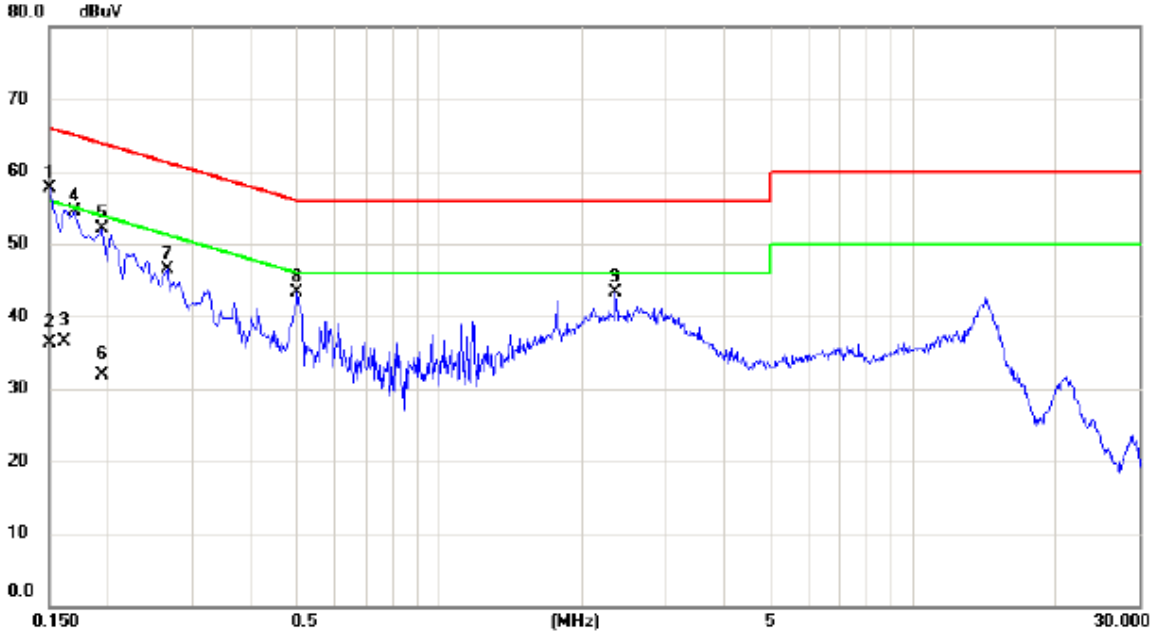
Line



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	*	0.1500	47.53	9.52	57.05	66.00	-8.95	peak	
2		0.1500	26.90	9.52	36.42	56.00	-19.58	AVG	
3		0.1660	44.99	9.52	54.51	65.16	-10.65	peak	
4		0.1660	25.10	9.52	34.62	55.16	-20.54	AVG	
5		0.2140	41.31	9.53	50.84	63.05	-12.21	peak	
6		0.3580	33.67	9.54	43.21	58.77	-15.56	peak	
7		0.5100	33.46	9.64	43.10	56.00	-12.90	peak	
8		1.4260	31.95	9.85	41.80	56.00	-14.20	peak	

Test Mode:	TX Mode

Neutral



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	*	0.1500	48.27	9.52	57.79	66.00	-8.21	peak	
2		0.1500	26.80	9.52	36.32	56.00	-19.68	AVG	
3		0.1620	27.10	9.46	36.56	55.36	-18.80	AVG	
4		0.1700	44.99	9.42	54.41	64.96	-10.55	peak	
5		0.1940	42.64	9.51	52.15	63.86	-11.71	peak	
6		0.1940	22.30	9.51	31.81	53.86	-22.05	AVG	
7		0.2660	36.95	9.53	46.48	61.24	-14.76	peak	
8		0.5020	33.92	9.44	43.36	56.00	-12.64	peak	
9		2.3580	33.59	9.76	43.35	56.00	-12.65	peak	

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

Test Mode:	TX Mode

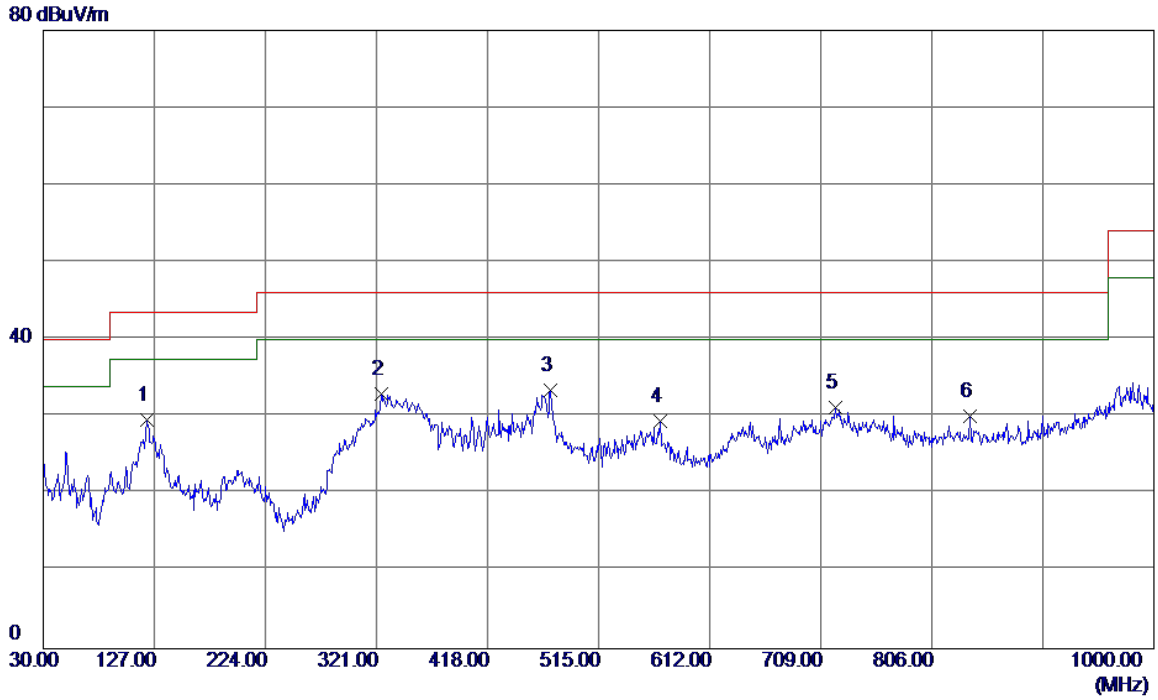
Frequency (MHz)	Ant 0°/90°	Read level dBuV/m	Factor (dB)	Measured(FS) (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Note
0.0091	0°	13.33	24.9903	38.3203	128.4234	-90.1031	AVG
0.0091	0°	14.29	24.9903	39.2803	148.4234	-109.1431	PEAK
0.0289	0°	6.77	23.7363	30.5063	118.3863	-87.8799	AVG
0.0289	0°	8.18	23.7363	31.9163	138.3863	-106.4699	PEAK
0.0358	0°	3.15	23.2993	26.4493	116.5266	-90.0772	AVG
0.0358	0°	5.54	23.2993	28.8393	136.5266	-107.6872	PEAK
0.058	0°	1.17	22.2400	23.4100	112.3357	-88.9257	AVG
0.058	0°	2.5	22.2400	24.7400	132.3357	-107.5957	PEAK
0.5092	0°	19.35	19.8294	39.1794	73.4665	-34.2870	QP
1.952	0°	23.57	19.5048	43.0748	69.5400	-26.4652	QP

Frequency (MHz)	Ant 0°/90°	Read level dBuV/m	Factor (dB)	Measured(FS) (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Note
0.012	90°	13.25	24.3000	37.5500	126.0206	-88.4706	AVG
0.012	90°	14.84	24.3000	39.1400	146.0206	-106.8806	PEAK
0.0261	90°	7.22	23.9137	31.1337	119.2714	-88.1377	AVG
0.0261	90°	8.9	23.9137	32.8137	139.2714	-106.4577	PEAK
0.0432	90°	5.18	22.8307	28.0107	114.8945	-86.8839	AVG
0.0432	90°	6.26	22.8307	29.0907	134.8945	-105.8039	PEAK
0.0578	90°	1.5	22.2440	23.7440	112.3657	-88.6217	AVG
0.0578	90°	2.8	22.2440	25.0440	132.3657	-107.3217	PEAK
0.6212	90°	22.24	20.1878	42.4278	71.7396	-29.3118	QP
2.054	90°	24.58	19.4676	44.0476	69.5400	-25.4924	QP

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

Test Mode:	TX 2402MHz _CH00_1Mbps

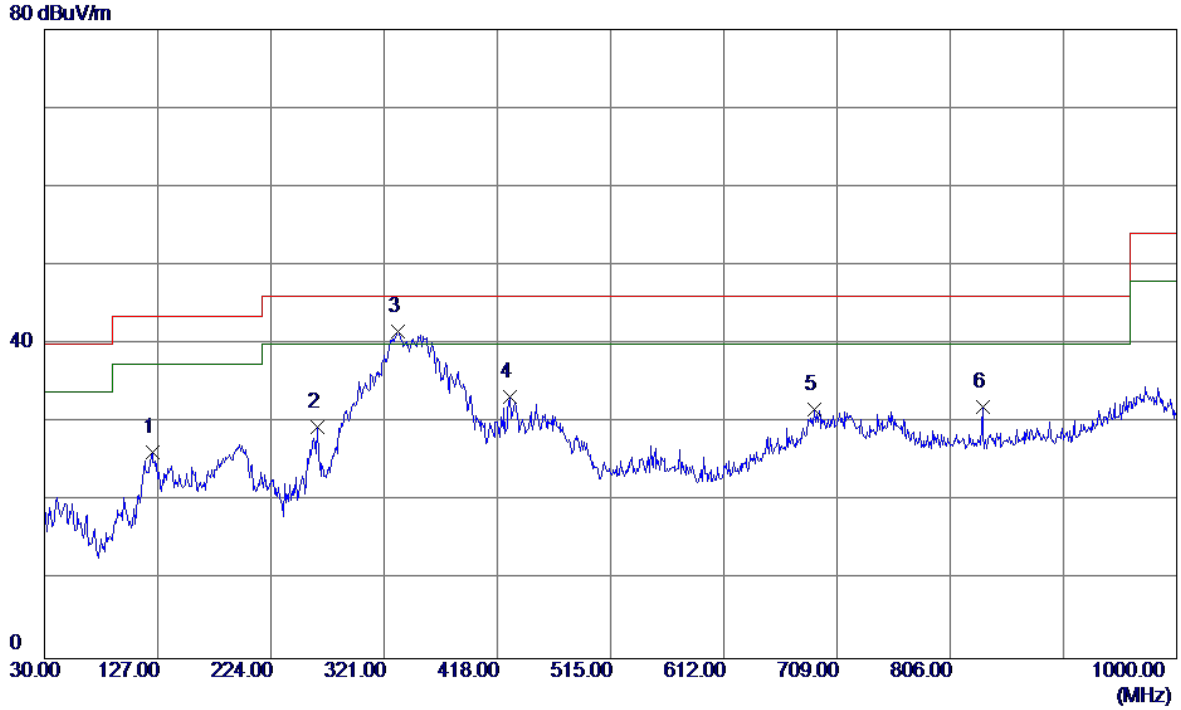
Vertical



No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	120.6950	42.08	-12.45	29.63	43.50	-13.87	Peak	
2	325.3650	43.38	-10.38	33.00	46.00	-13.00	Peak	
3 *	473.2900	40.81	-7.39	33.42	46.00	-12.58	Peak	
4	568.8350	34.27	-4.81	29.46	46.00	-16.54	Peak	
5	721.6100	32.28	-1.05	31.23	46.00	-14.77	Peak	
6	838.9800	30.02	0.11	30.13	46.00	-15.87	Peak	

Test Mode:	TX 2402MHz _CH00_1Mbps

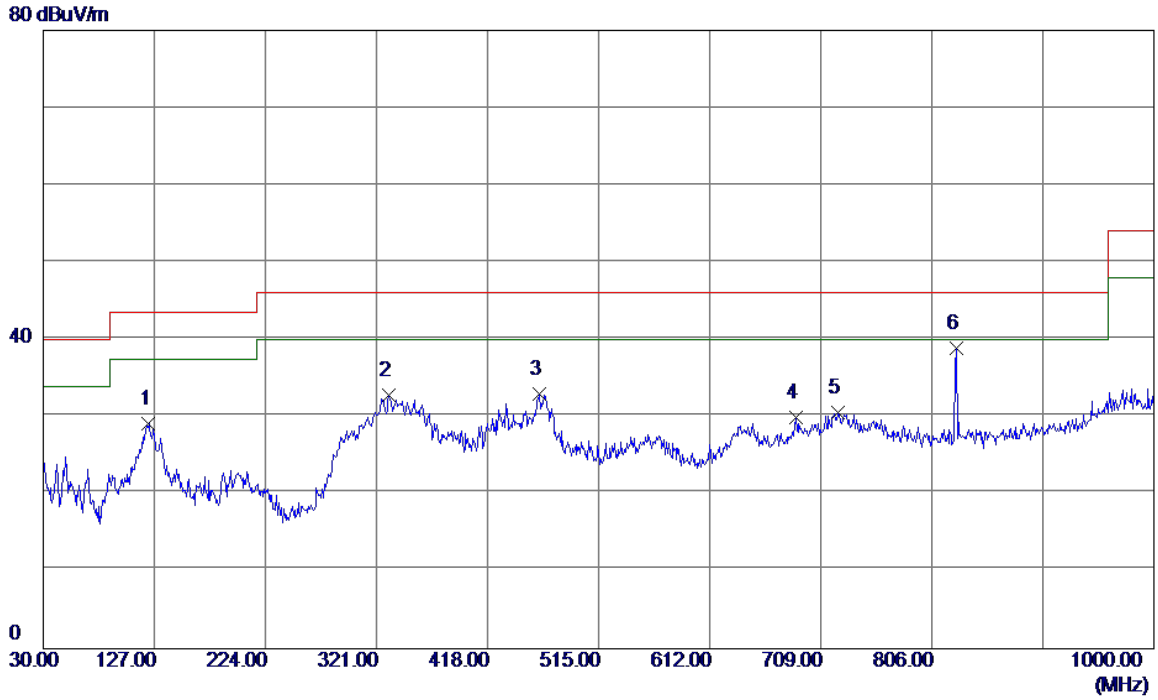
Horizontal



No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	122.6350	38.37	-12.17	26.20	43.50	-17.30	Peak	
2	264.2550	42.01	-12.54	29.47	46.00	-16.53	Peak	
3 *	333.1250	52.06	-10.51	41.55	46.00	-4.45	Peak	
4	428.6700	40.38	-7.12	33.26	46.00	-12.74	Peak	
5	690.0850	32.73	-1.09	31.64	46.00	-14.36	Peak	
6	833.6450	31.91	0.12	32.03	46.00	-13.97	Peak	

Test Mode:	TX 2441MHz _CH39_1Mbps

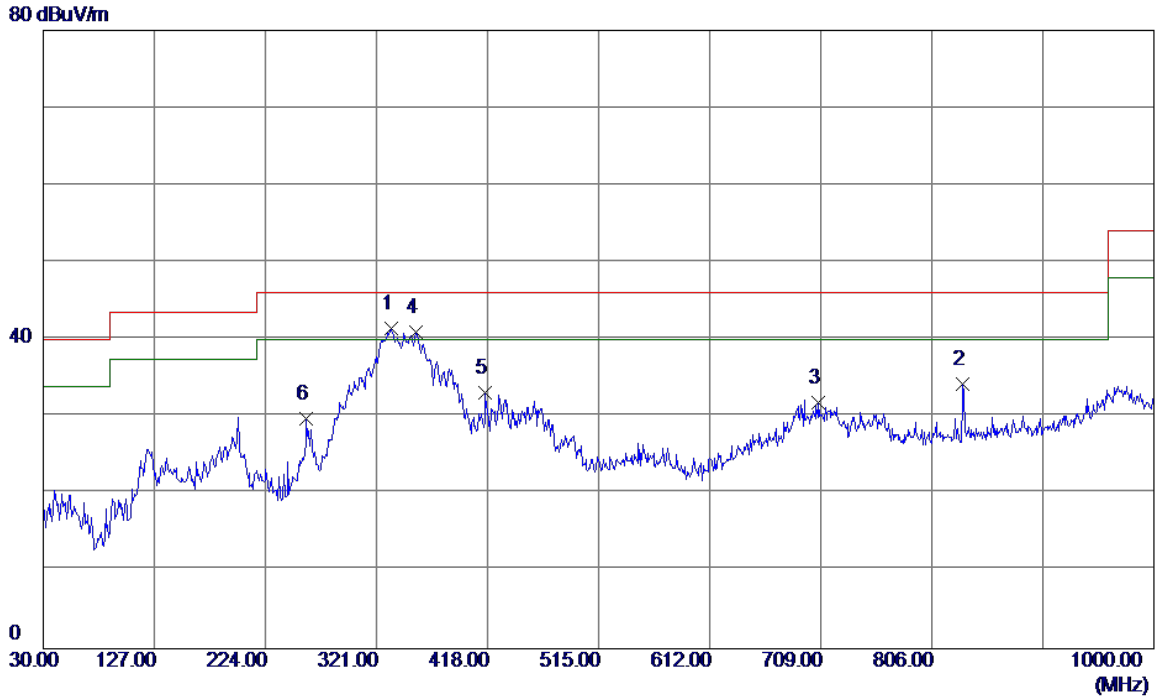
Vertical



No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	122.1500	41.41	-12.24	29.17	43.50	-14.33	Peak	
2	331.6700	43.26	-10.48	32.78	46.00	-13.22	Peak	
3	463.5900	40.17	-7.25	32.92	46.00	-13.08	Peak	
4	687.1750	31.05	-1.14	29.91	46.00	-16.09	Peak	
5	724.0349	31.62	-1.07	30.55	46.00	-15.45	Peak	
6 *	827.8250	38.68	0.14	38.82	46.00	-7.18	Peak	

Test Mode:	TX 2441MHz _CH39_1Mbps

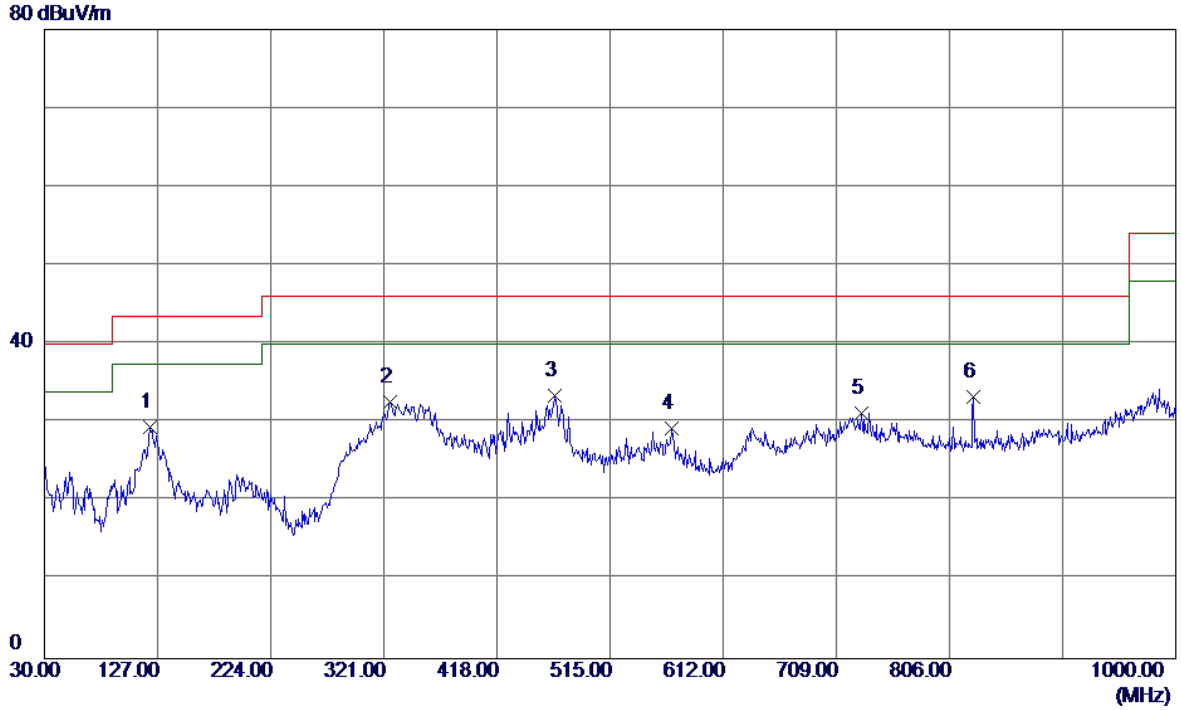
Horizontal



No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1 *	334.0950	52.02	-10.52	41.50	46.00	-4.50	Peak	
2	833.1599	34.07	0.12	34.19	46.00	-11.81	Peak	
3	707.0600	32.75	-0.94	31.81	46.00	-14.19	Peak	
4	355.9200	51.26	-10.36	40.90	46.00	-5.10	Peak	
5	416.0600	40.24	-7.16	33.08	46.00	-12.92	Peak	
6	259.8900	42.66	-12.90	29.76	46.00	-16.24	Peak	

Test Mode:	TX 2480MHz _CH78_1Mbps

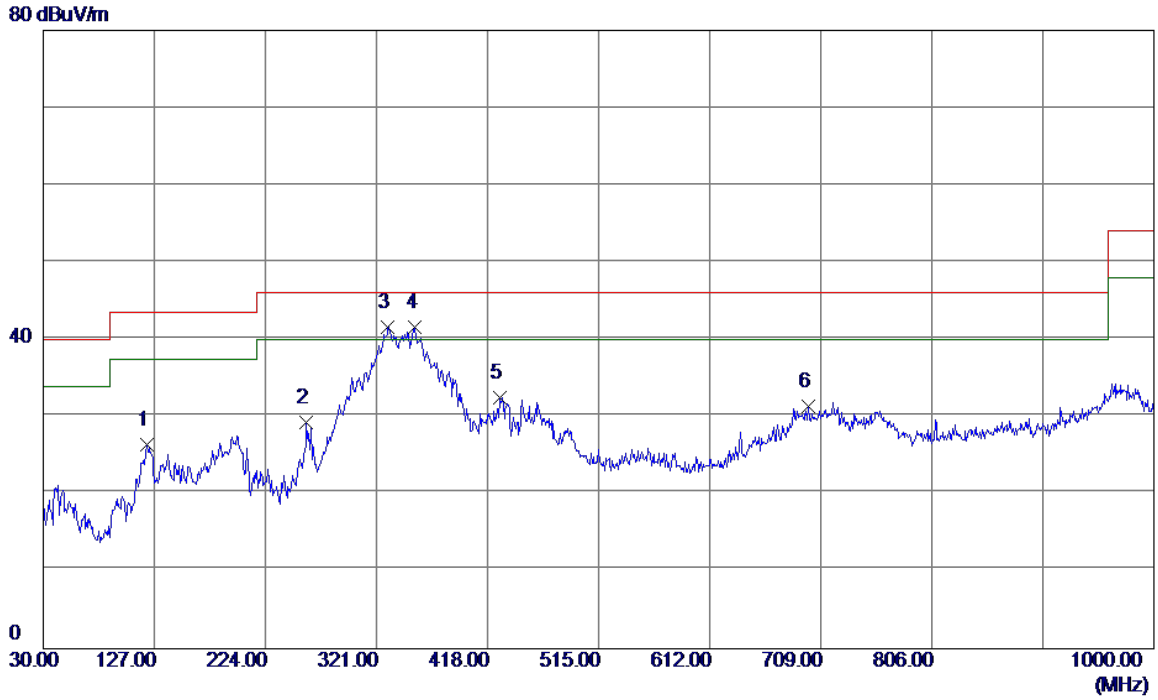
Vertical



No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	120.6950	41.87	-12.45	29.42	43.50	-14.08	Peak	
2	326.3350	43.03	-10.39	32.64	46.00	-13.36	Peak	
3 *	467.4700	40.77	-7.31	33.46	46.00	-12.54	Peak	
4	567.8650	34.07	-4.80	29.27	46.00	-16.73	Peak	
5	730.3400	32.38	-1.11	31.27	46.00	-14.73	Peak	
6	826.3700	33.20	0.14	33.34	46.00	-12.66	Peak	

Test Mode:	TX 2480MHz _CH78_1Mbps

Horizontal

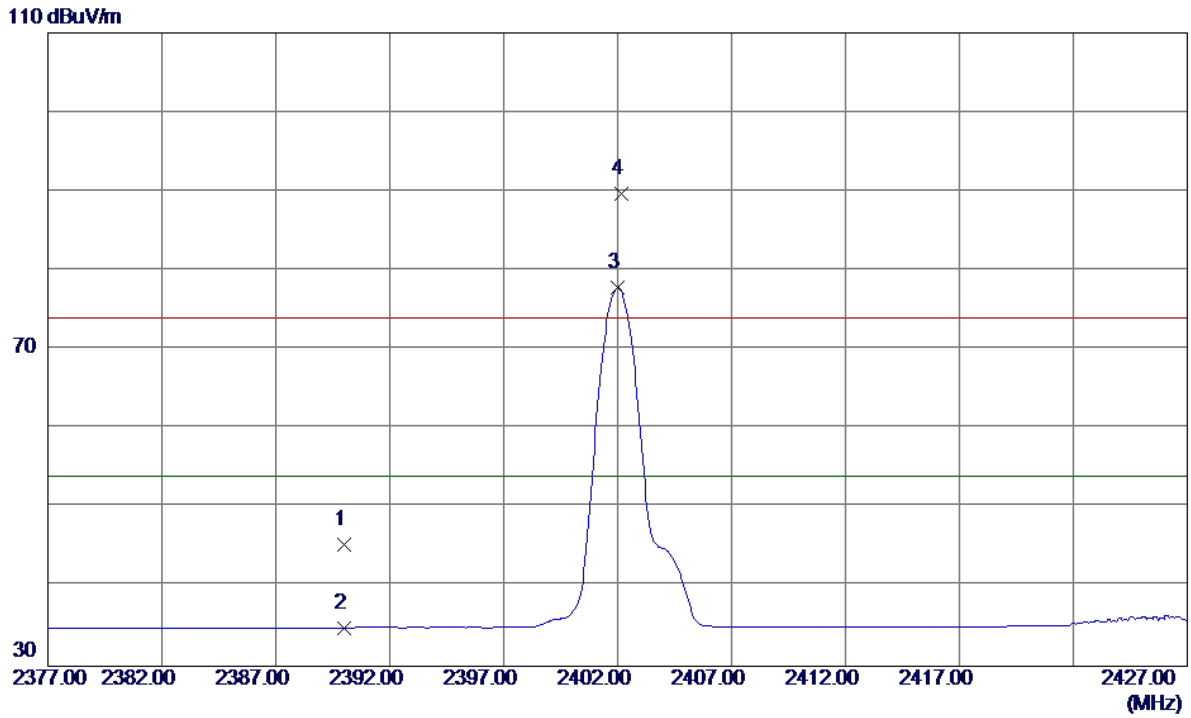


No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	120.2100	38.92	-12.52	26.40	43.50	-17.10	Peak	
2	259.8900	42.11	-12.90	29.21	46.00	-16.79	Peak	
3	331.1850	52.12	-10.47	41.65	46.00	-4.35	Peak	
4 *	354.9500	52.09	-10.43	41.66	46.00	-4.34	Peak	
5	429.1550	39.66	-7.12	32.54	46.00	-13.46	Peak	
6	698.3300	32.35	-0.92	31.43	46.00	-14.57	Peak	

ATTACHMENT D - RADIATED EMISSION (ABOVE 1000MHZ)

Test Mode :	TX 2402MHz _CH00_1Mbps

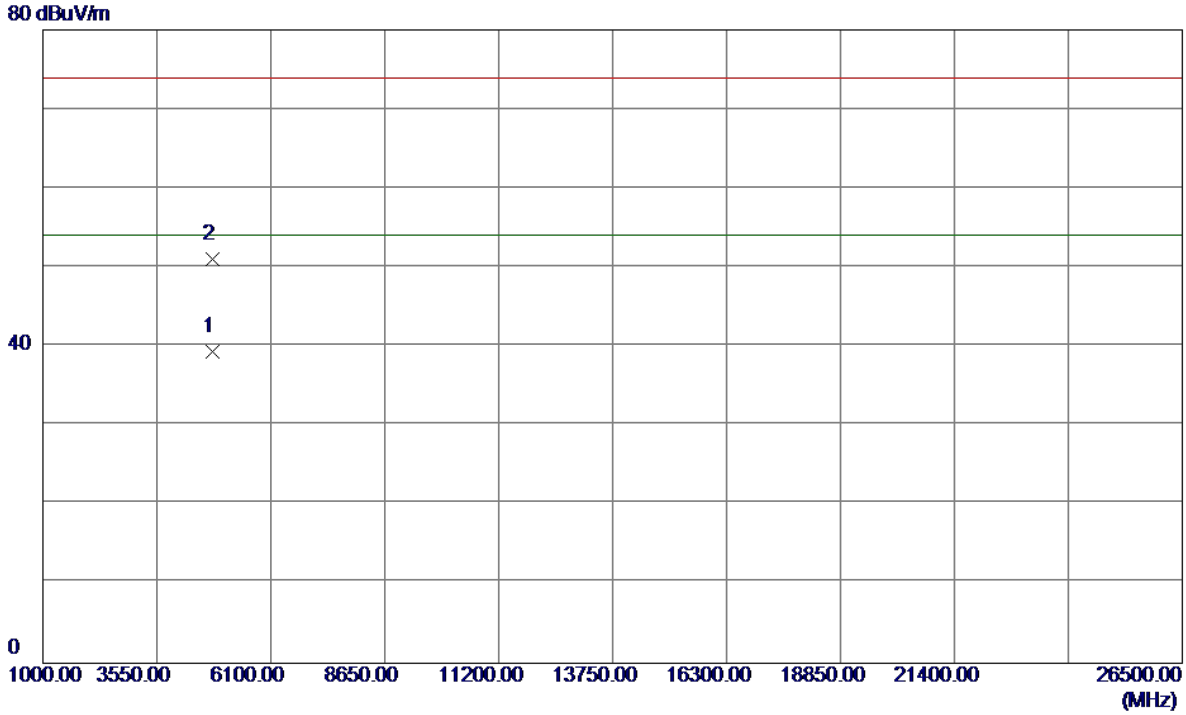
Vertical



No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	2390.0000	13.26	32.17	45.43	74.00	-28.57	Peak	
2	2390.0000	2.65	32.17	34.82	54.00	-19.18	AVG	
3 *	2402.0000	45.64	32.24	77.88	54.00	23.88	AVG	NO LIMIT
4	2402.1750	57.44	32.24	89.68	74.00	15.68	Peak	NO LIMIT

Test Mode :	TX 2402MHz _CH00_1Mbps

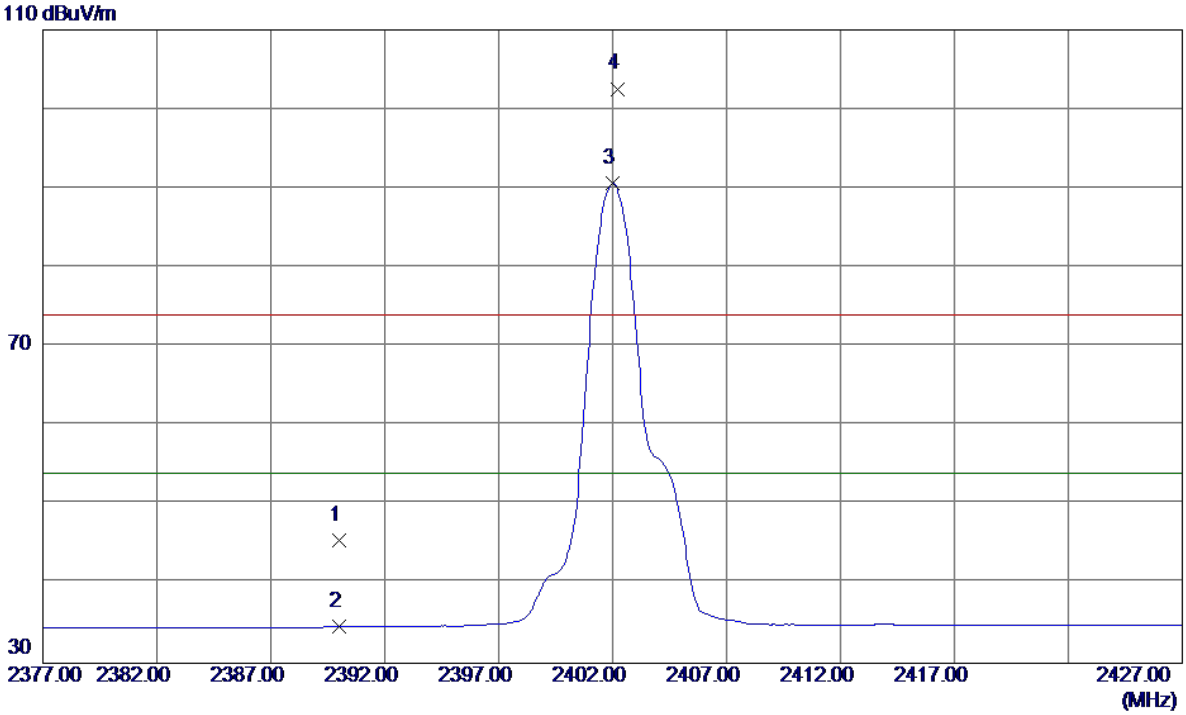
Vertical



No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1 *	4803.9900	35.59	3.79	39.38	54.00	-14.62	AVG	
2	4804.3000	47.25	3.79	51.04	74.00	-22.96	Peak	

Test Mode :	TX 2402MHz _CH00_1Mbps

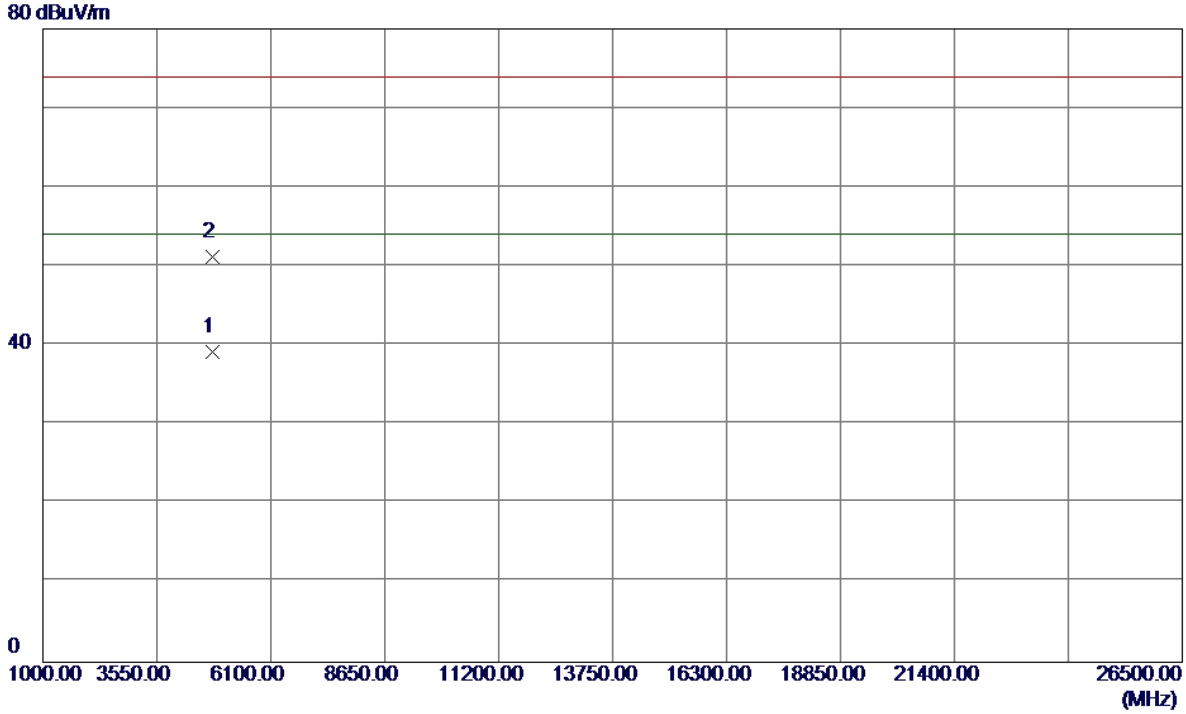
Horizontal



No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	2390.0000	13.32	32.17	45.49	74.00	-28.51	Peak	
2	2390.0000	2.45	32.17	34.62	54.00	-19.38	AVG	
3 *	2401.9750	58.37	32.24	90.61	54.00	36.61	AVG	NO LIMIT
4	2402.2000	70.32	32.24	102.56	74.00	28.56	Peak	NO LIMIT

Test Mode :	TX 2402MHz _CH00_1Mbps

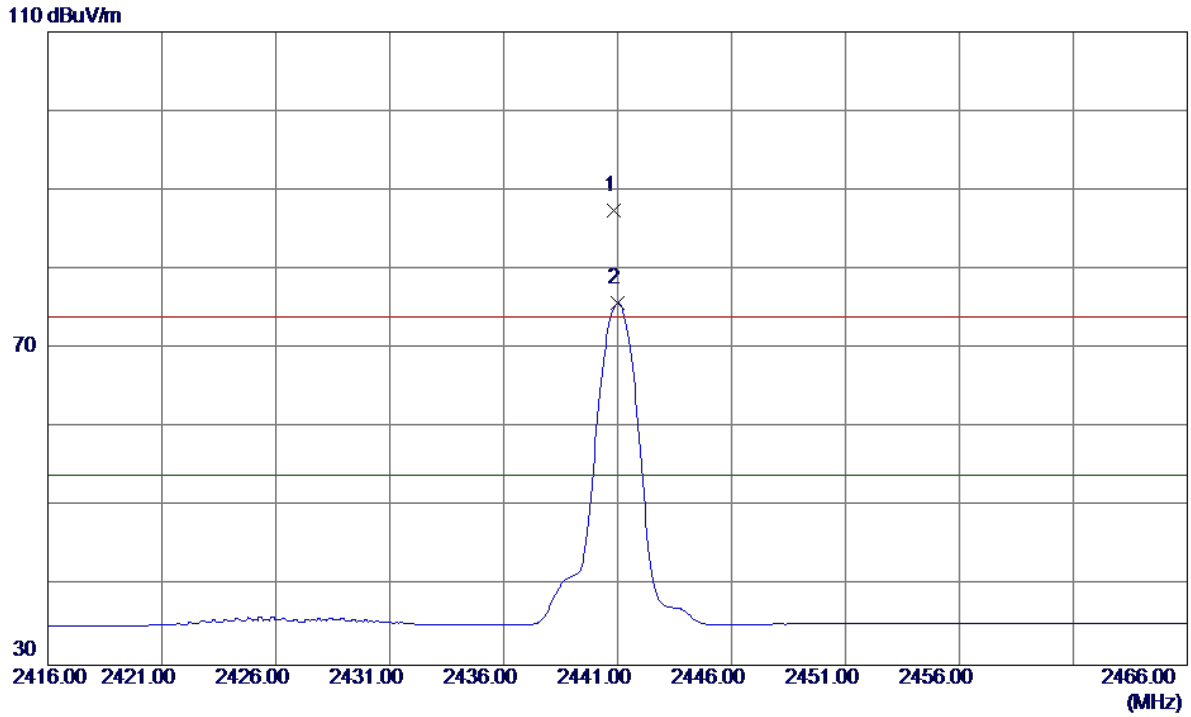
Horizontal



No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1 *	4803.9900	35.40	3.79	39.19	54.00	-14.81	AVG	
2	4804.3800	47.41	3.79	51.20	74.00	-22.80	Peak	

Test Mode :	TX 2441MHz _CH39_1Mbps

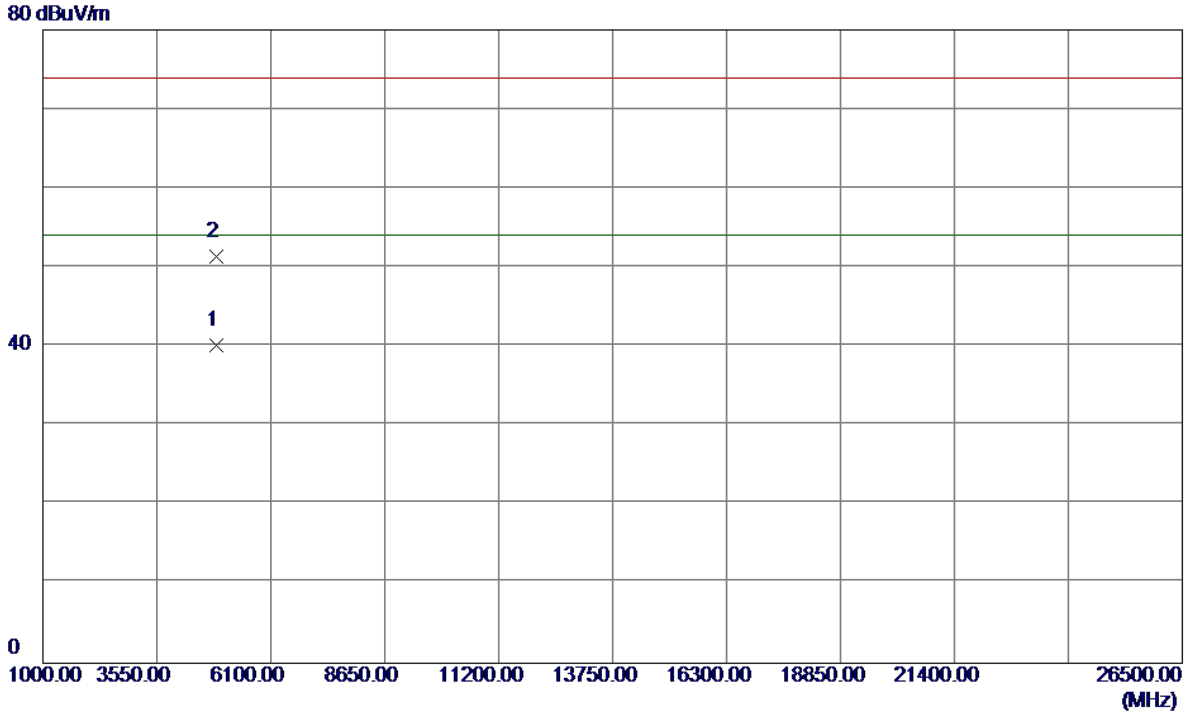
Vertical



No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	2440.8250	55.01	32.49	87.50	74.00	13.50	Peak	NO LIMIT
2 *	2441.0000	43.30	32.49	75.79	54.00	21.79	AVG	NO LIMIT

Test Mode :	TX 2441MHz _CH39_1Mbps

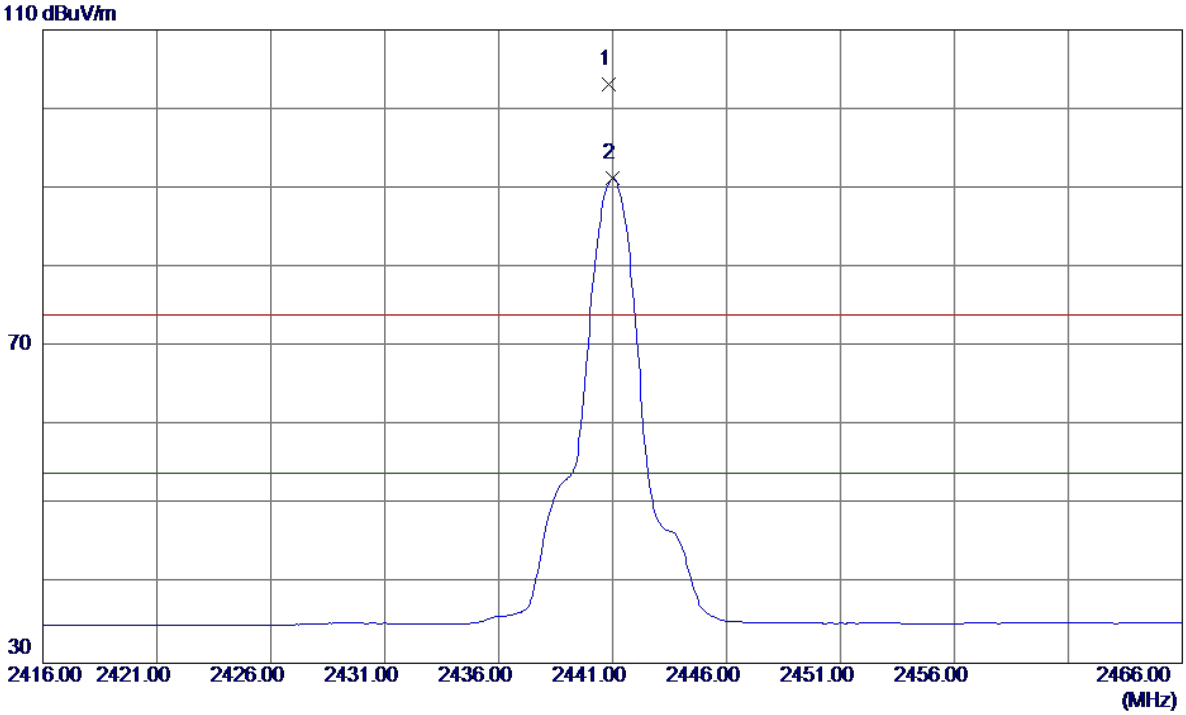
Vertical



No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1 *	4881.9900	36.18	4.03	40.21	54.00	-13.79	AVG	
2	4882.2100	47.39	4.03	51.42	74.00	-22.58	Peak	

Test Mode :	TX 2441MHz _CH39_1Mbps

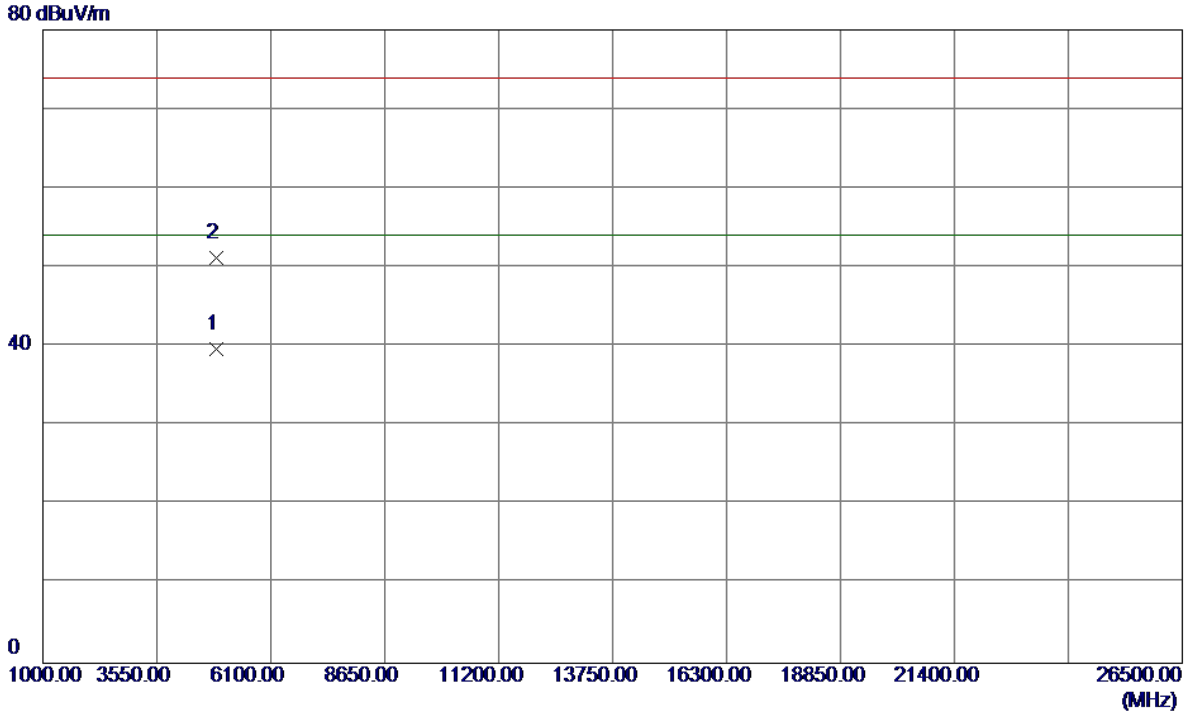
Horizontal



No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	2440.8500	70.62	32.49	103.11	74.00	29.11	Peak	NO LIMIT
2 *	2441.0000	58.74	32.49	91.23	54.00	37.23	AVG	NO LIMIT

Test Mode :	TX 2441MHz _CH39_1Mbps

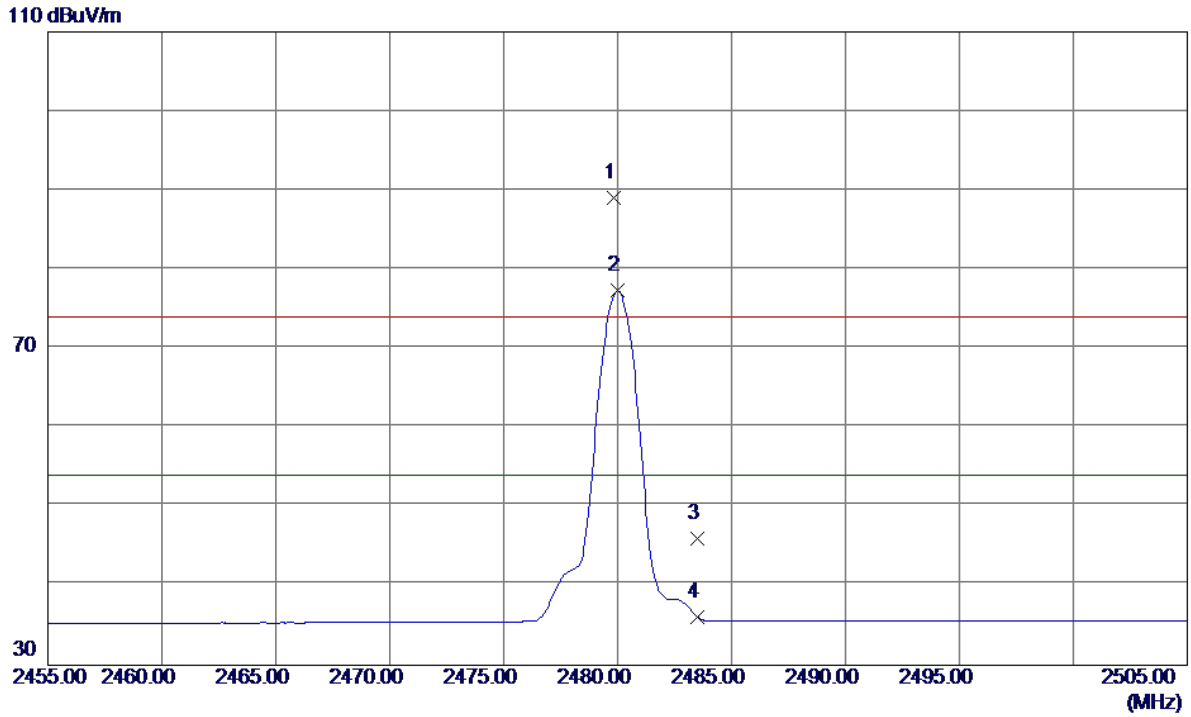
Horizontal



No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1 *	4881.9500	35.72	4.03	39.75	54.00	-14.25	AVG	
2	4882.3300	47.09	4.04	51.13	74.00	-22.87	Peak	

Test Mode :	TX 2480MHz _CH78_1Mbps

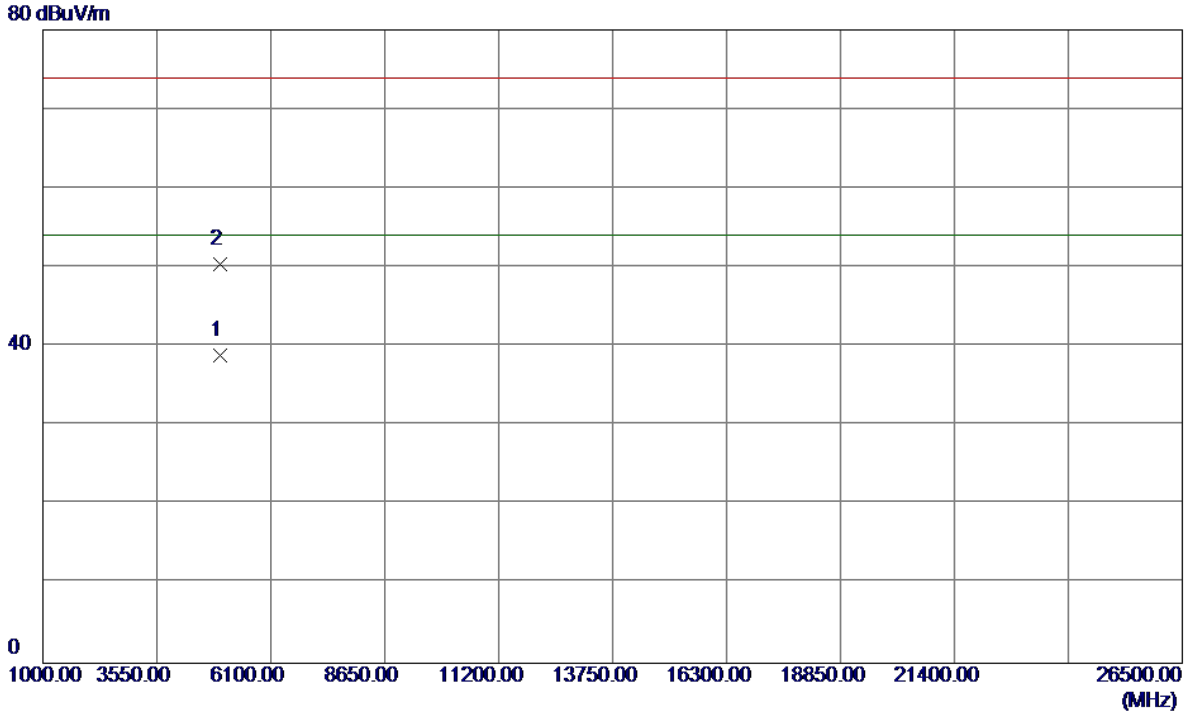
Vertical



No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	2479.8500	56.27	32.74	89.01	74.00	15.01	Peak	NO LIMIT
2 *	2480.0000	44.56	32.74	77.30	54.00	23.30	AVG	NO LIMIT
3	2483.5000	13.27	32.76	46.03	74.00	-27.97	Peak	
4	2483.5000	3.35	32.76	36.11	54.00	-17.89	AVG	

Test Mode :	TX 2480MHz _CH78_1Mbps

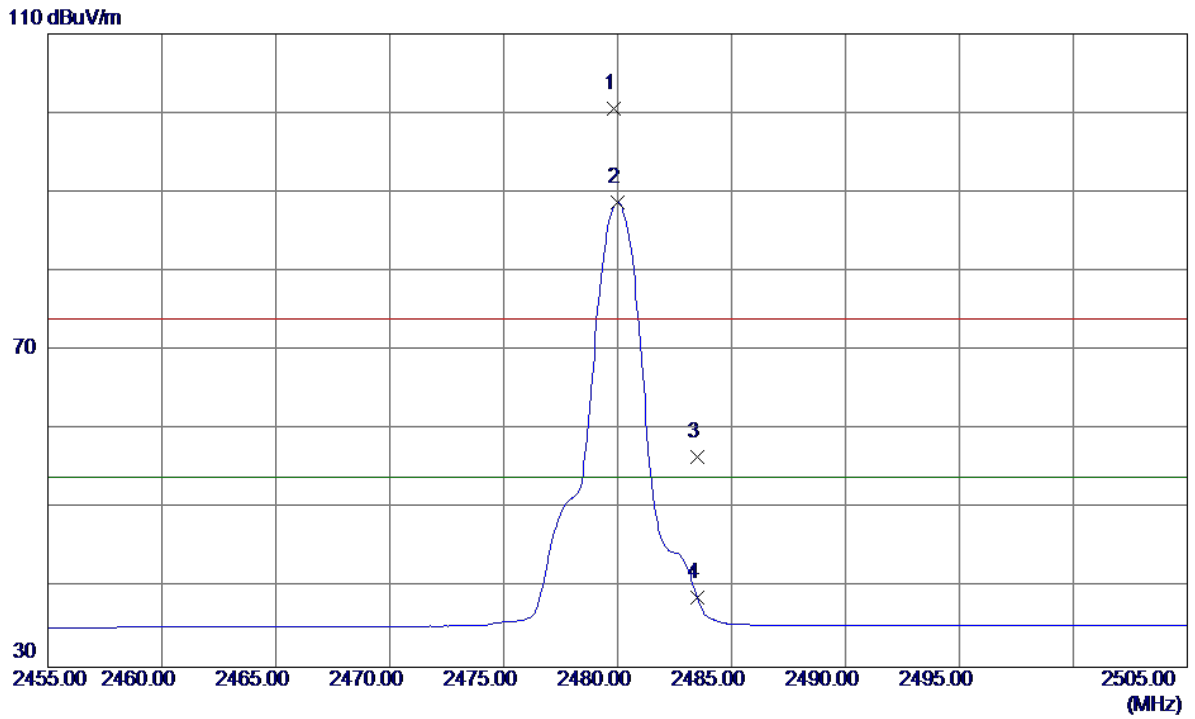
Vertical



No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1 *	4959.9800	34.60	4.28	38.88	54.00	-15.12	AVG	
2	4960.2100	46.18	4.28	50.46	74.00	-23.54	Peak	

Test Mode :	TX 2480MHz _CH78_1Mbps

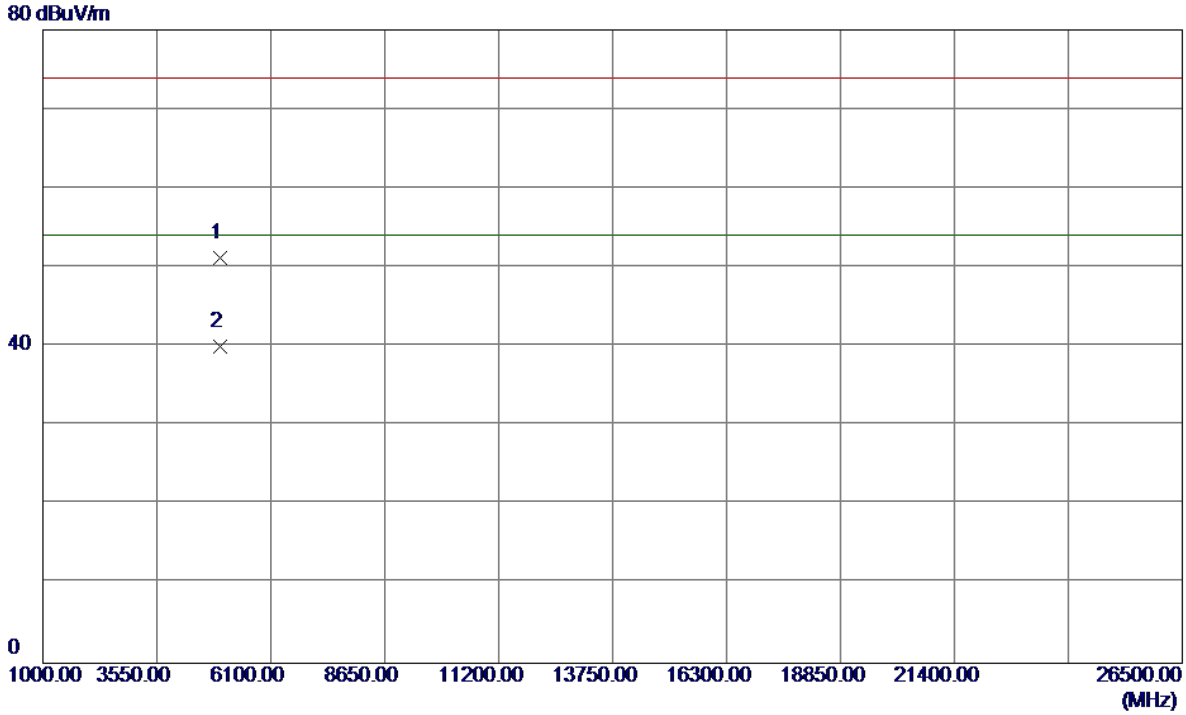
Horizontal



No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	2479.8250	67.88	32.74	100.62	74.00	26.62	Peak	NO LIMIT
2 *	2479.9750	55.95	32.74	88.69	54.00	34.69	AVG	NO LIMIT
3	2483.5000	23.80	32.76	56.56	74.00	-17.44	Peak	
4	2483.5000	6.04	32.76	38.80	54.00	-15.20	AVG	

Test Mode :	TX 2480MHz _CH78_1Mbps

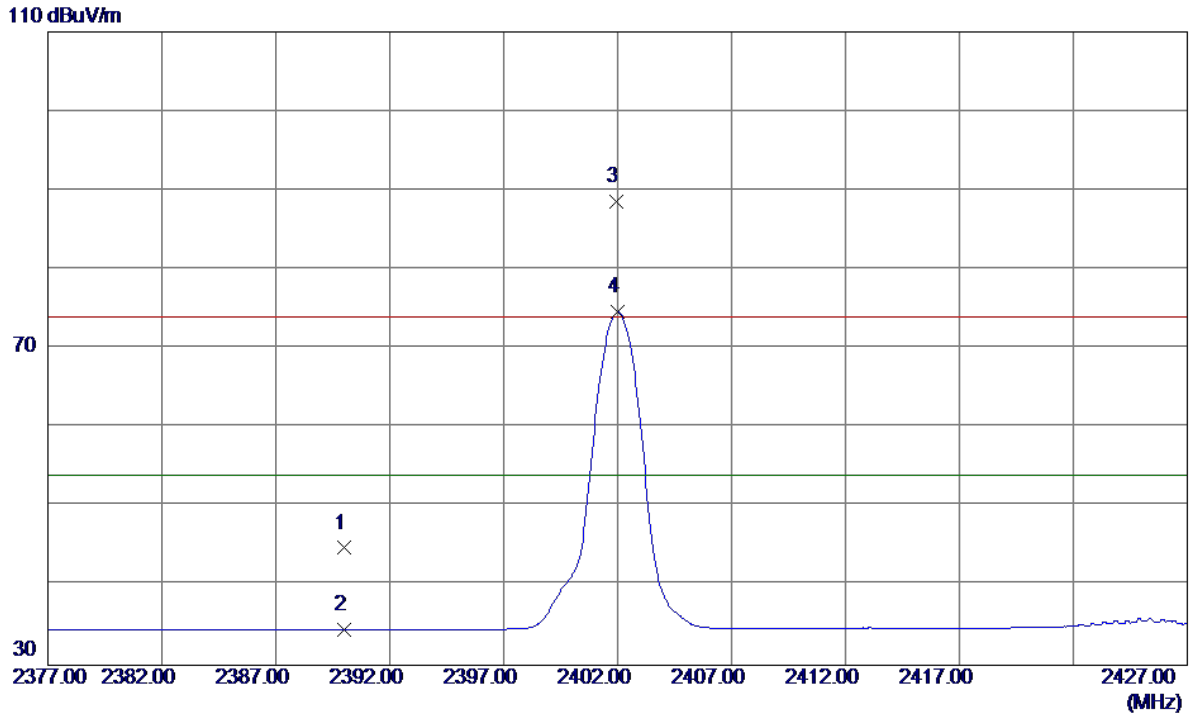
Horizontal



No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	4959.7000	46.86	4.28	51.14	74.00	-22.86	Peak	
2 *	4959.9800	35.66	4.28	39.94	54.00	-14.06	AVG	

Test Mode :	TX 2402MHz _CH00_3Mbps

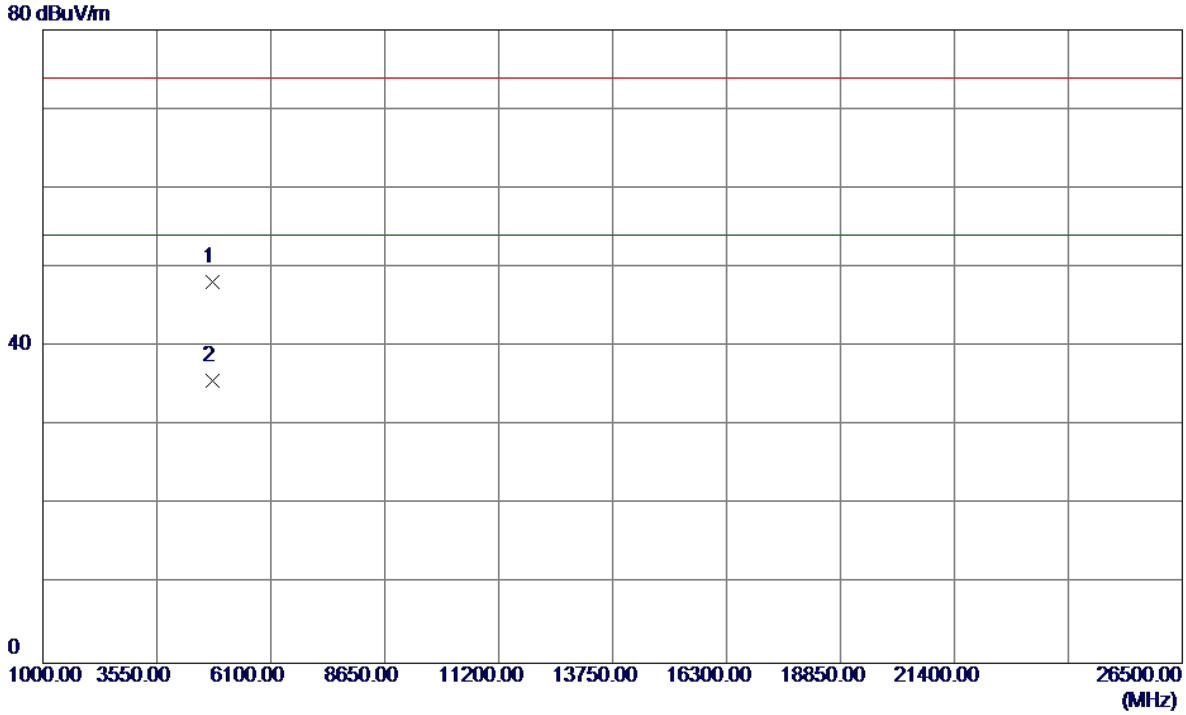
Vertical



No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	2390.0000	12.63	32.17	44.80	74.00	-29.20	Peak	
2	2390.0000	2.32	32.17	34.49	54.00	-19.51	AVG	
3	2401.9500	56.25	32.24	88.49	74.00	14.49	Peak	NO LIMIT
4 *	2402.0000	42.38	32.24	74.62	54.00	20.62	AVG	NO LIMIT

Test Mode :	TX 2402MHz _CH00_3Mbps

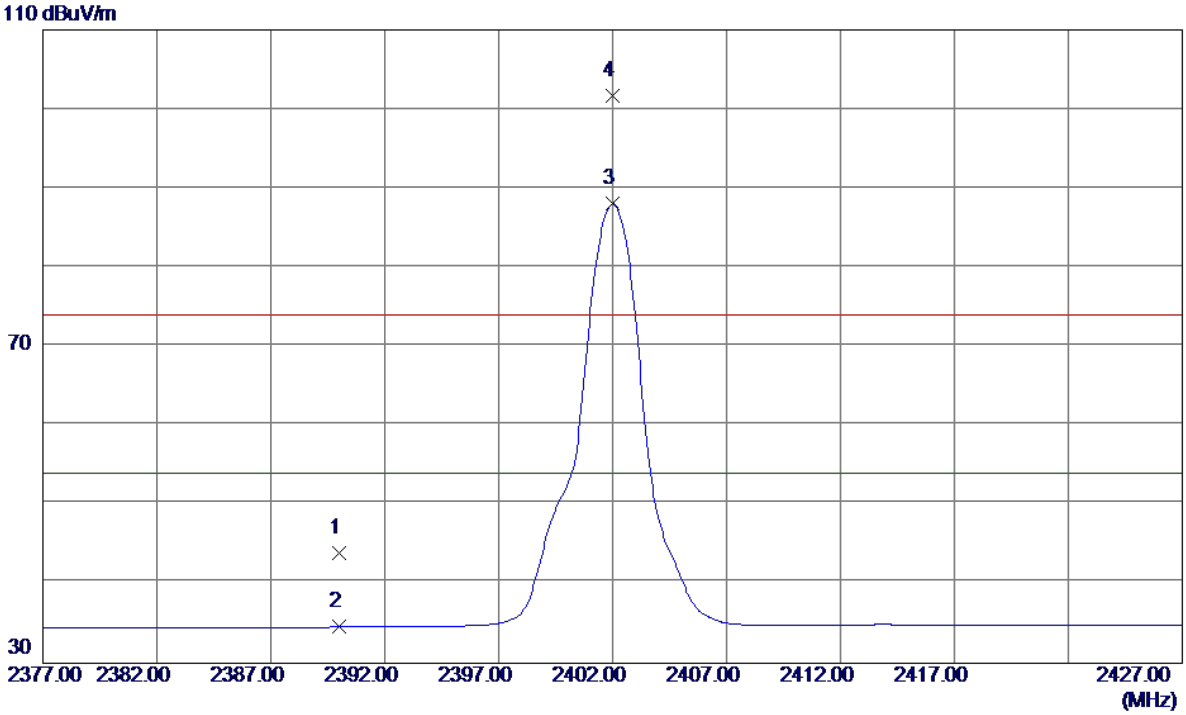
Vertical



No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	4803.7900	44.38	3.79	48.17	74.00	-25.83	Peak	
2 *	4803.9900	31.88	3.79	35.67	54.00	-18.33	AVG	

Test Mode :	TX 2402MHz _CH00_3Mbps

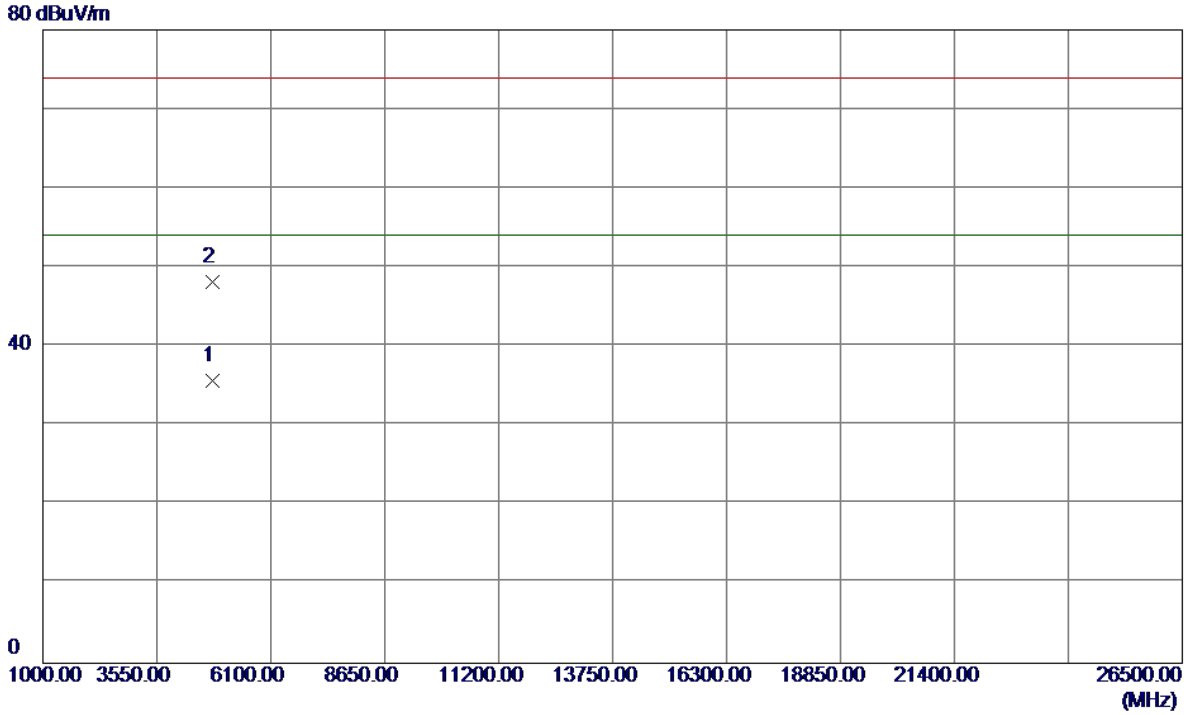
Horizontal



No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	2390.0000	11.76	32.17	43.93	74.00	-30.07	Peak	
2	2390.0000	2.41	32.17	34.58	54.00	-19.42	AVG	
3 *	2402.0000	55.81	32.24	88.05	54.00	34.05	AVG	NO LIMIT
4	2402.0250	69.47	32.24	101.71	74.00	27.71	Peak	NO LIMIT

Test Mode :	TX 2402MHz _CH00_3Mbps

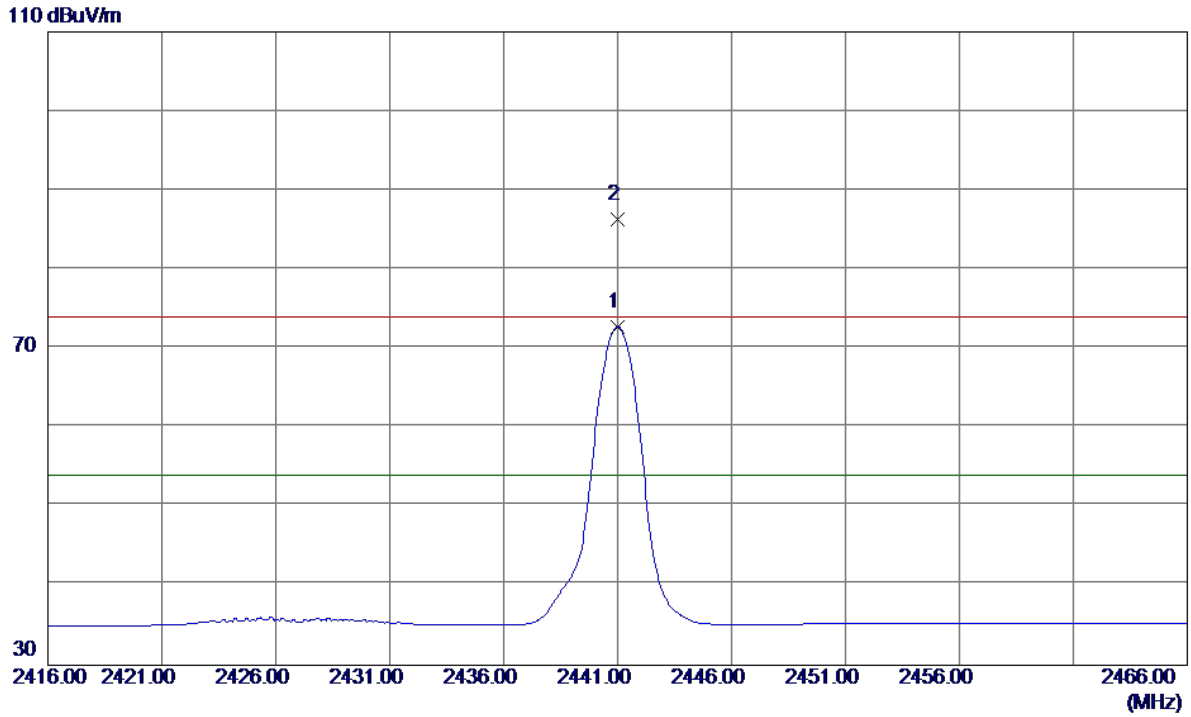
Horizontal



No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1 *	4803.9800	31.89	3.79	35.68	54.00	-18.32	AVG	
2	4804.2900	44.32	3.79	48.11	74.00	-25.89	Peak	

Test Mode :	TX 2441MHz _CH39_3Mbps

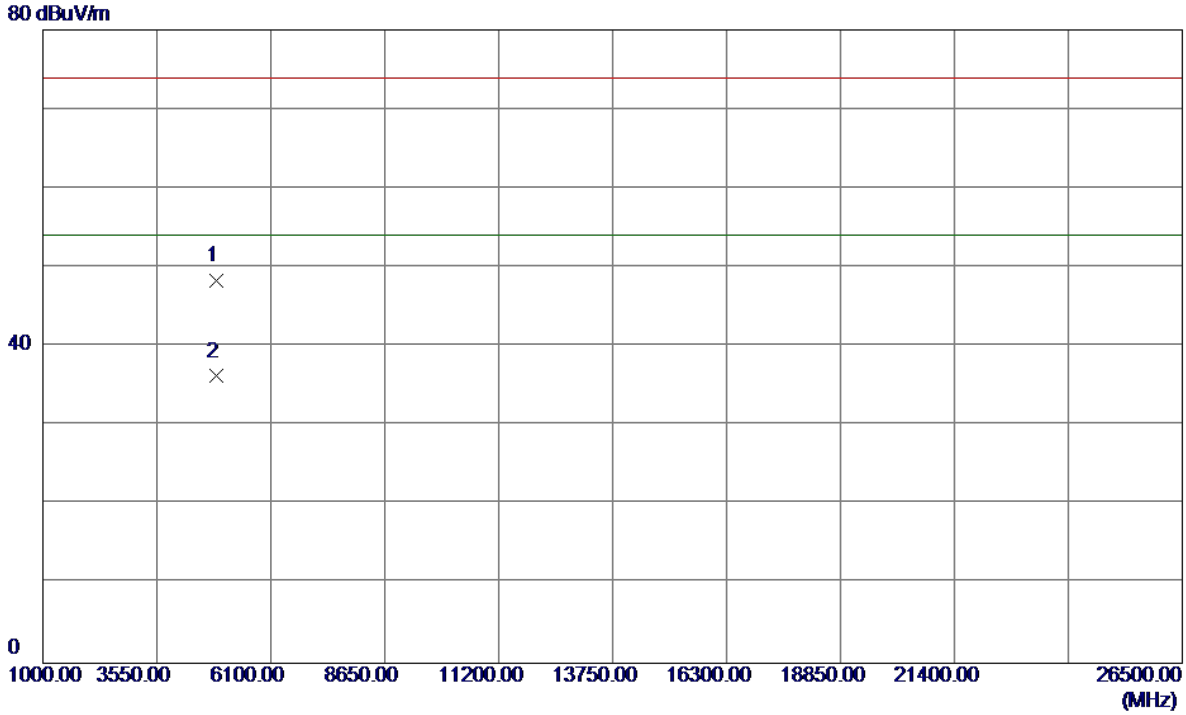
Vertical



No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1 *	2441.0000	40.28	32.49	72.77	54.00	18.77	AVG	NO LIMIT
2	2441.0250	53.87	32.49	86.36	74.00	12.36	Peak	NO LIMIT

Test Mode :	TX 2441MHz _CH39_3Mbps

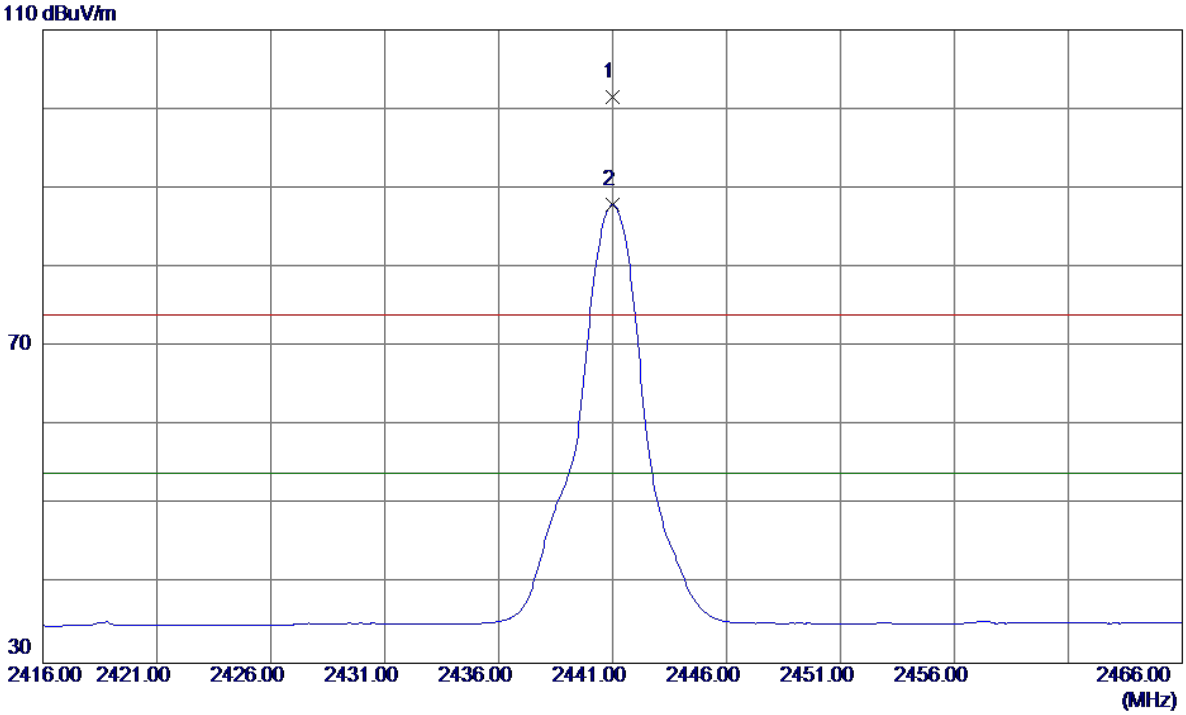
Vertical



No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	4881.7100	44.35	4.03	48.38	74.00	-25.62	Peak	
2 *	4881.9900	32.21	4.03	36.24	54.00	-17.76	AVG	

Test Mode :	TX 2441MHz _CH39_3Mbps

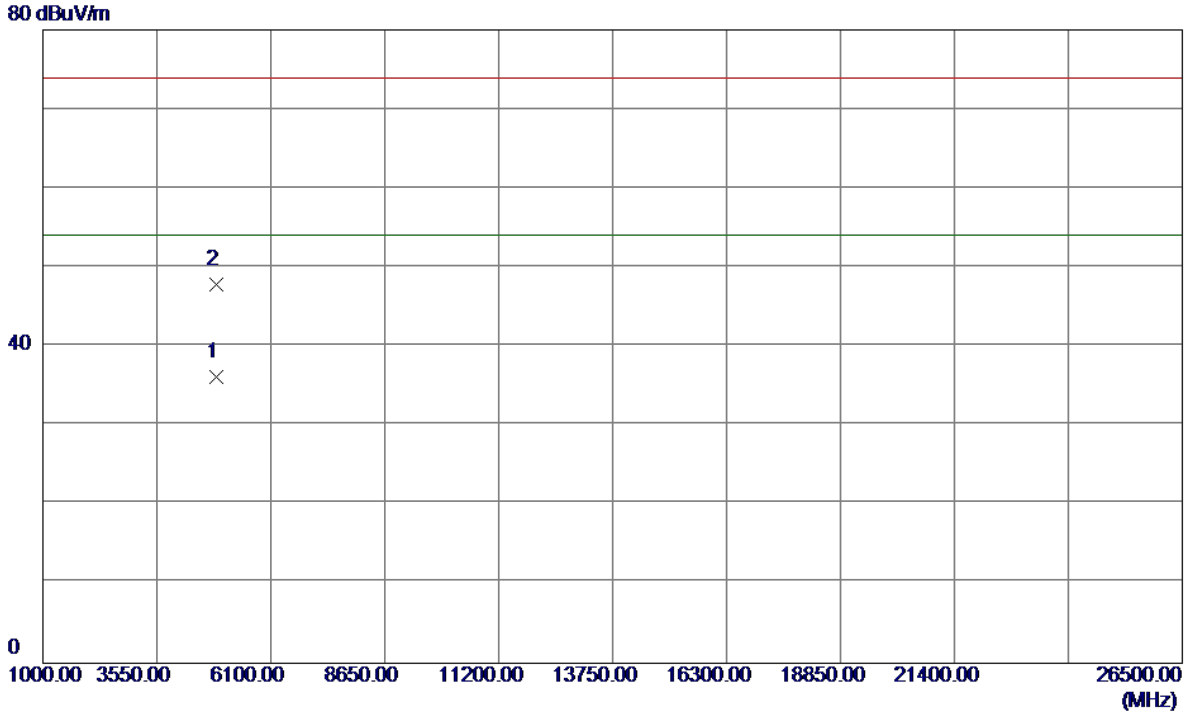
Horizontal



No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	2440.9750	69.10	32.49	101.59	74.00	27.59	Peak	NO LIMIT
2 *	2441.0000	55.45	32.49	87.94	54.00	33.94	AVG	NO LIMIT

Test Mode :	TX 2441MHz _CH39_3Mbps

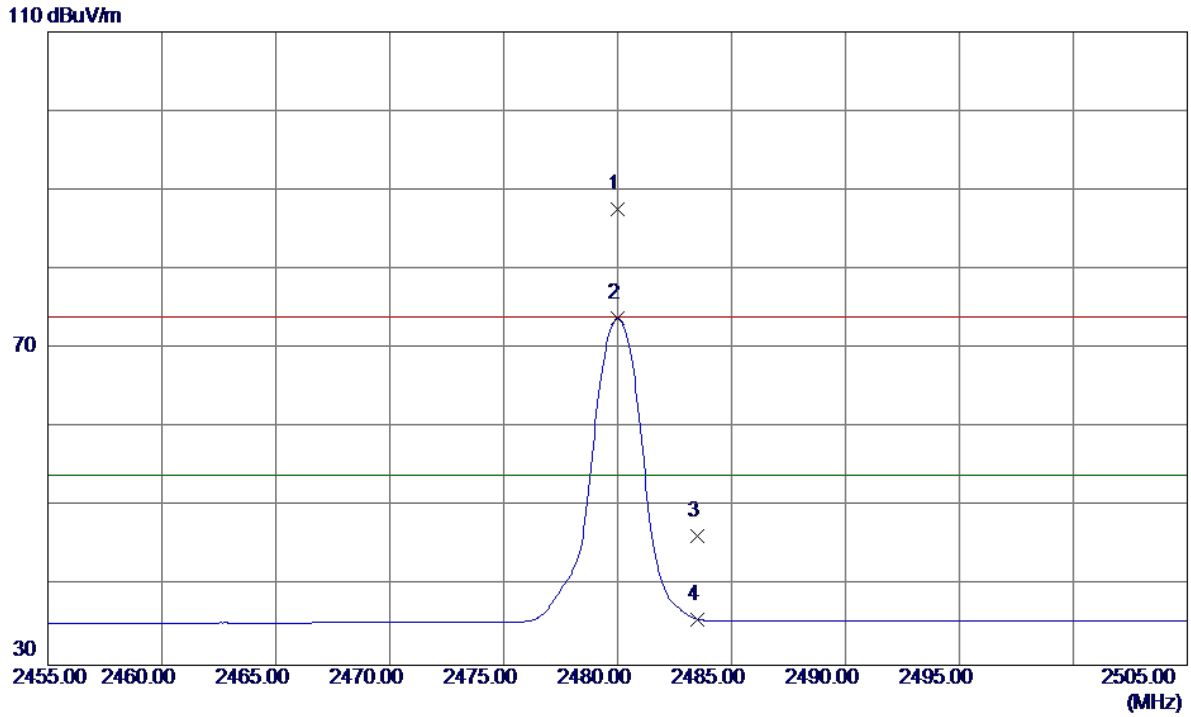
Horizontal



No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1 *	4881.9800	32.16	4.03	36.19	54.00	-17.81	AVG	
2	4881.8400	43.88	4.03	47.91	74.00	-26.09	Peak	

Test Mode :	TX 2480MHz _CH78_3Mbps

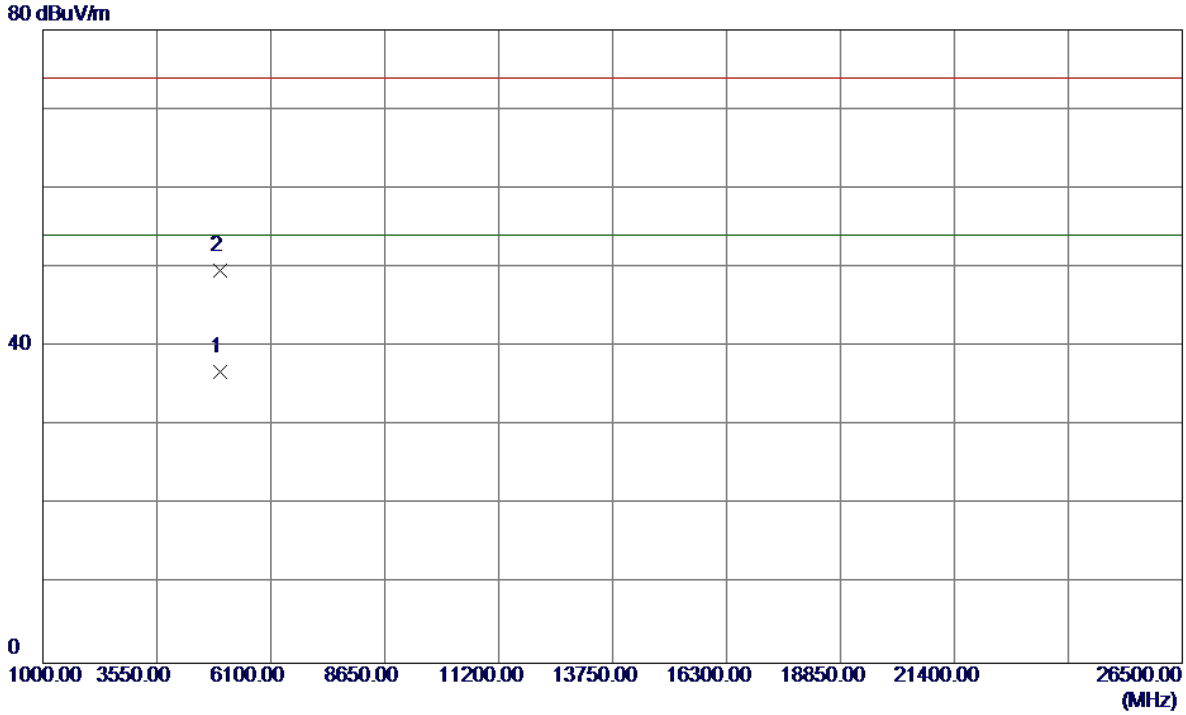
Vertical



No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	2480.0000	54.80	32.74	87.54	74.00	13.54	Peak	NO LIMIT
2 *	2480.0000	41.13	32.74	73.87	54.00	19.87	AVG	NO LIMIT
3	2483.5000	13.59	32.76	46.35	74.00	-27.65	Peak	
4	2483.5000	3.06	32.76	35.82	54.00	-18.18	AVG	

Test Mode :	TX 2480MHz _CH78_3Mbps

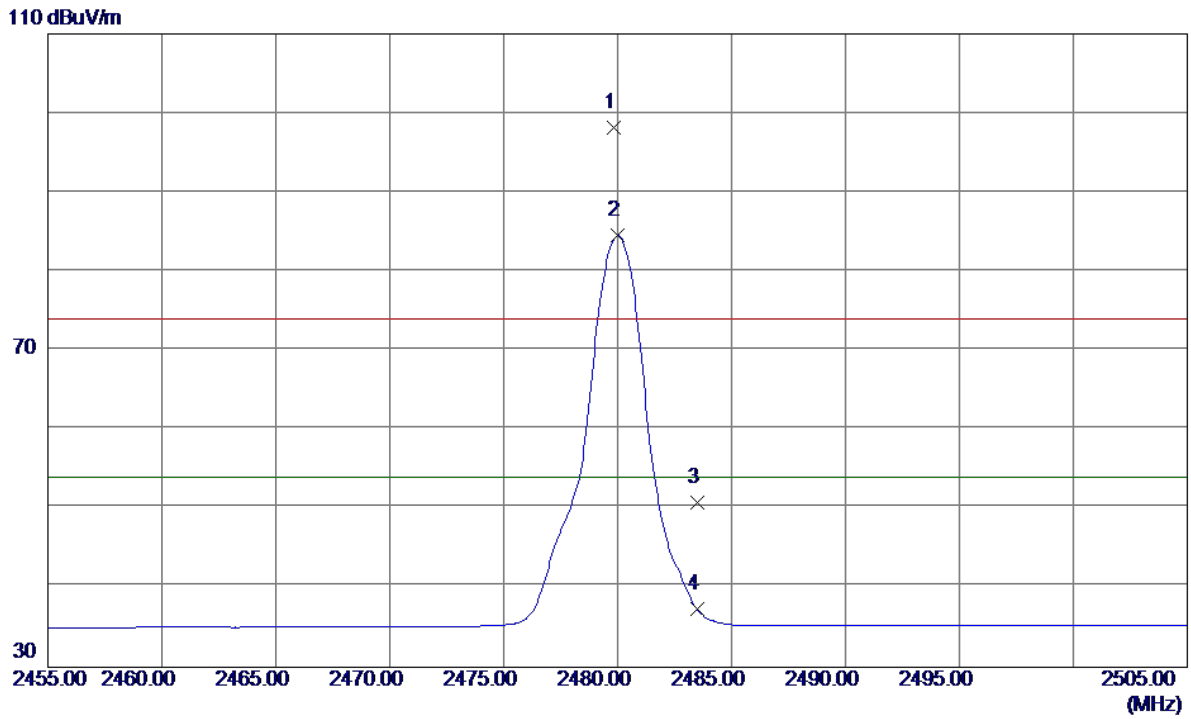
Vertical



No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1 *	4959.9800	32.47	4.28	36.75	54.00	-17.25	AVG	
2	4960.0200	45.39	4.28	49.67	74.00	-24.33	Peak	

Test Mode :	TX 2480MHz _CH78_3Mbps

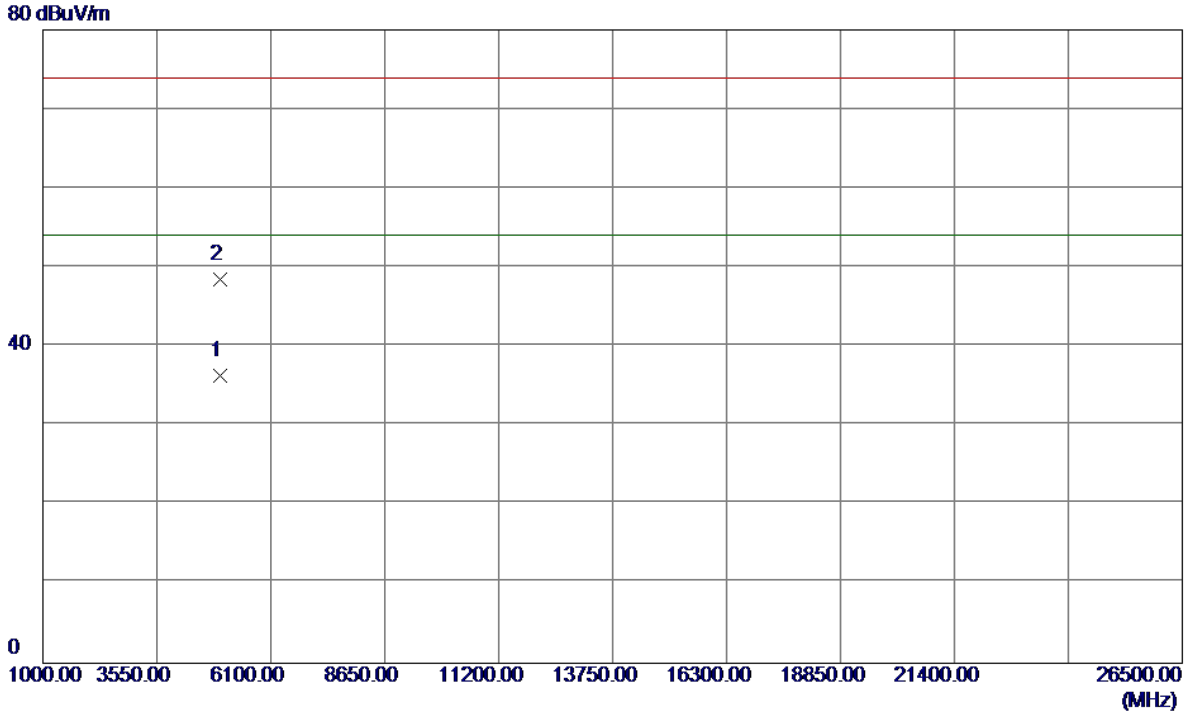
Horizontal



No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	2479.8250	65.44	32.74	98.18	74.00	24.18	Peak	NO LIMIT
2 *	2480.0000	51.81	32.74	84.55	54.00	30.55	AVG	NO LIMIT
3	2483.5000	18.02	32.76	50.78	74.00	-23.22	Peak	
4	2483.5000	4.54	32.76	37.30	54.00	-16.70	AVG	

Test Mode :	TX 2480MHz _CH78_3Mbps

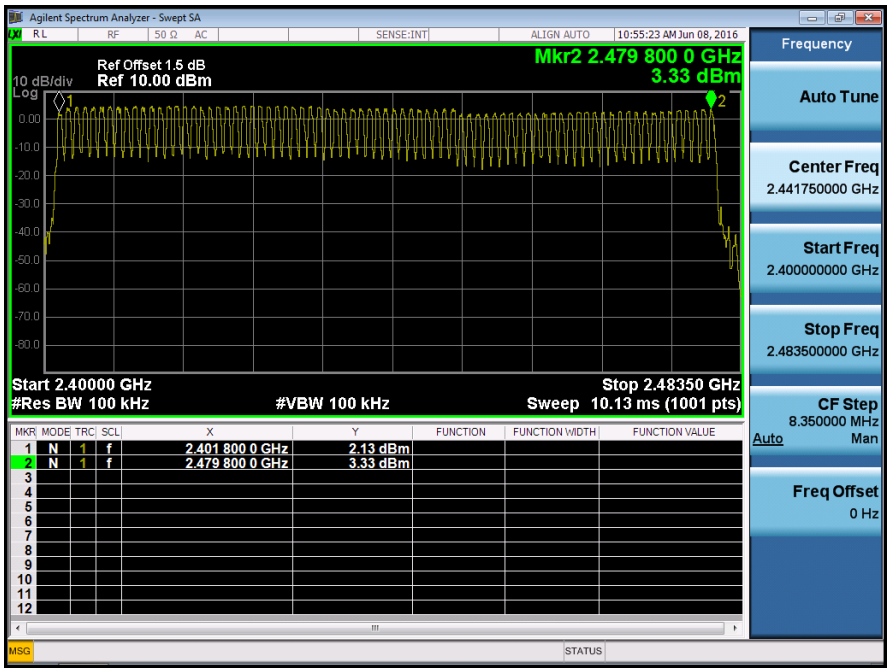
Horizontal



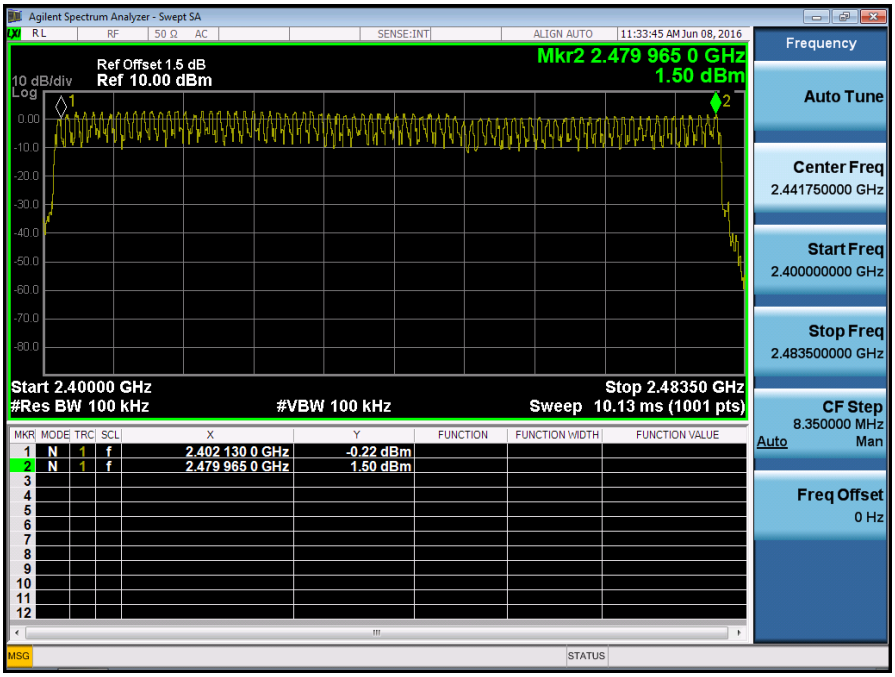
No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1 *	4959.9800	32.01	4.28	36.29	54.00	-17.71	AVG	
2	4960.0299	44.23	4.28	48.51	74.00	-25.49	Peak	

ATTACHMENT E - NUMBER OF HOPPING CHANNEL

Test Mode	Hopping Mode_1Mbps
Number of Hopping Channel	79



Test Mode	Hopping Mode_3Mbps
Number of Hopping Channel	79

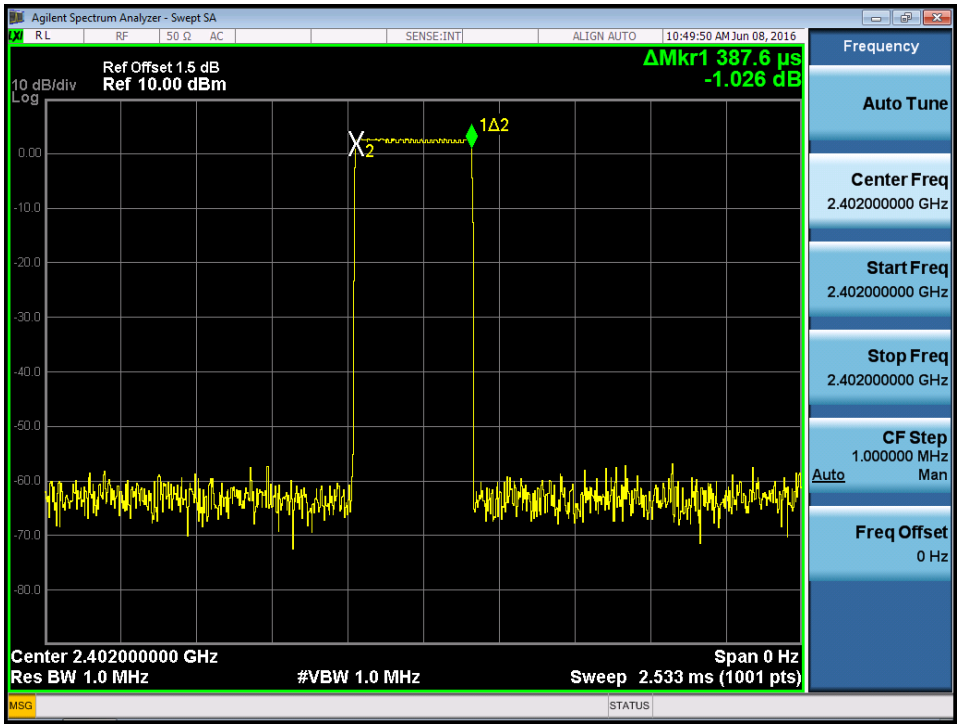


ATTACHMENT F - AVERAGE TIME OF OCCUPANCY

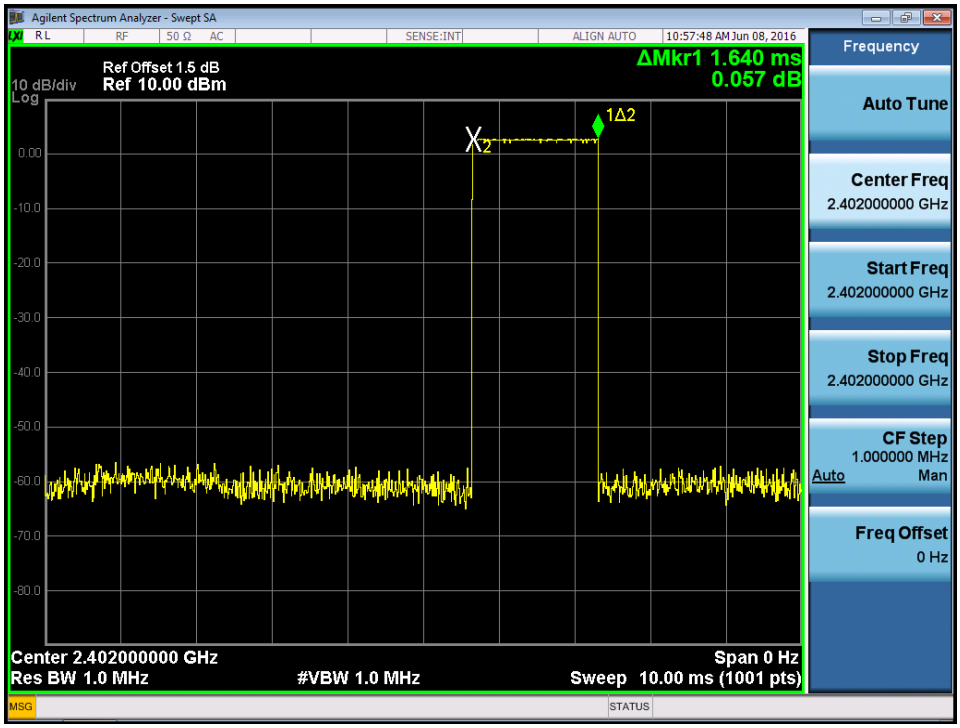
Test Mode :	TX Mode_1Mbps

Data Packet	Frequency (MHz)	Pulse Duration (ms)	Dwell Time (s)	Limits (s)	Test Result
DH5	2402	2.9000	0.3093	0.4000	Pass
DH3	2402	1.6400	0.1749	0.4000	Pass
DH1	2402	0.3876	0.0413	0.4000	Pass
DH5	2441	2.9000	0.3093	0.4000	Pass
DH3	2441	1.6400	0.1749	0.4000	Pass
DH1	2441	0.3851	0.0411	0.4000	Pass
DH5	2480	2.8800	0.3072	0.4000	Pass
DH3	2480	1.6400	0.1749	0.4000	Pass
DH1	2480	0.3876	0.0413	0.4000	Pass

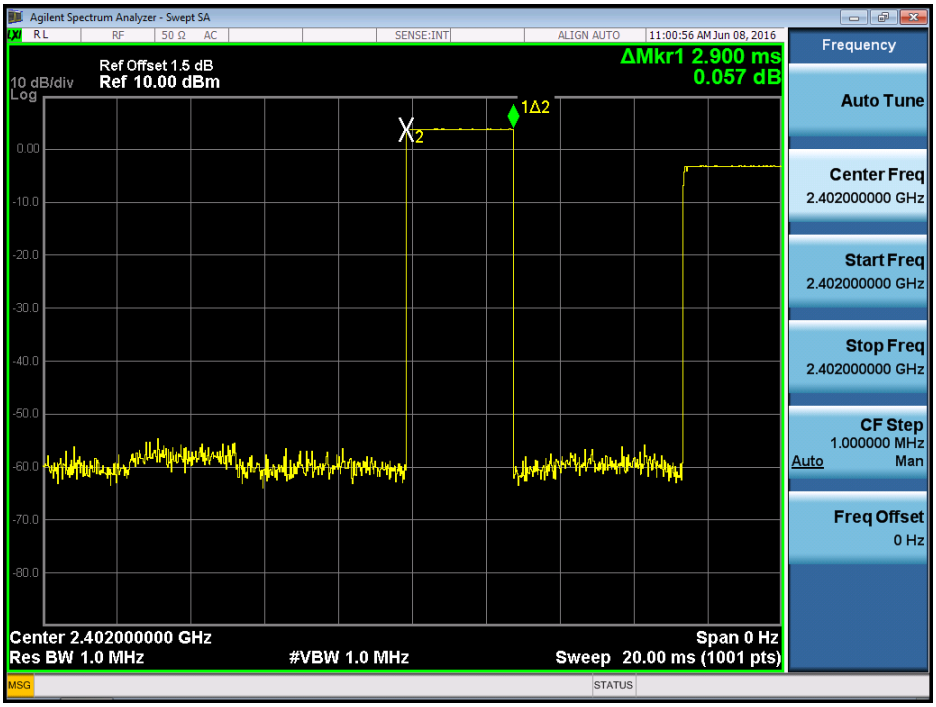
CH00-DH1



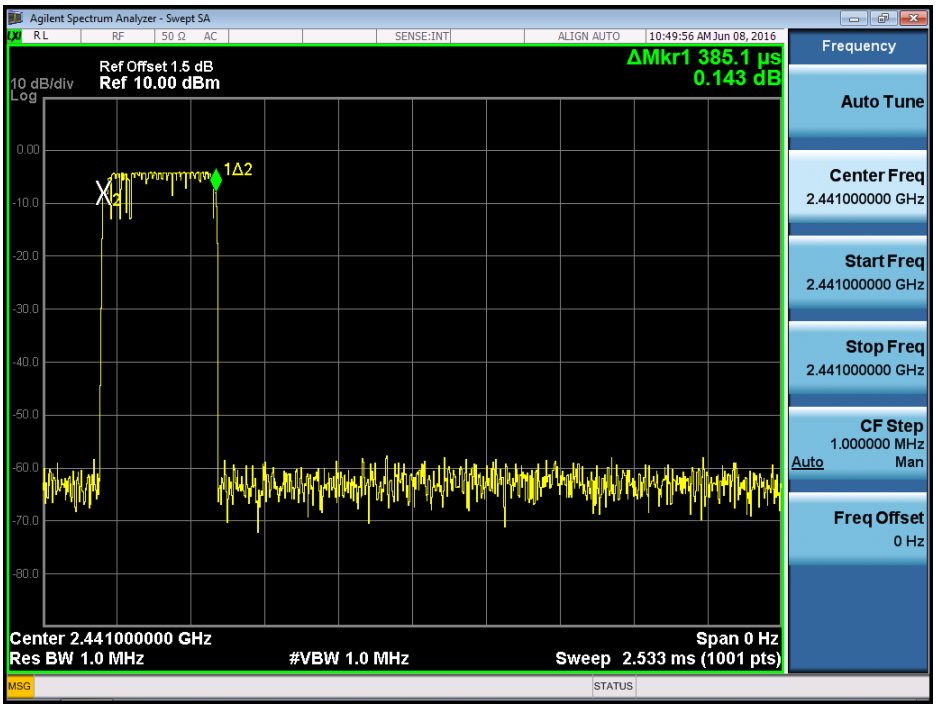
CH00-DH3



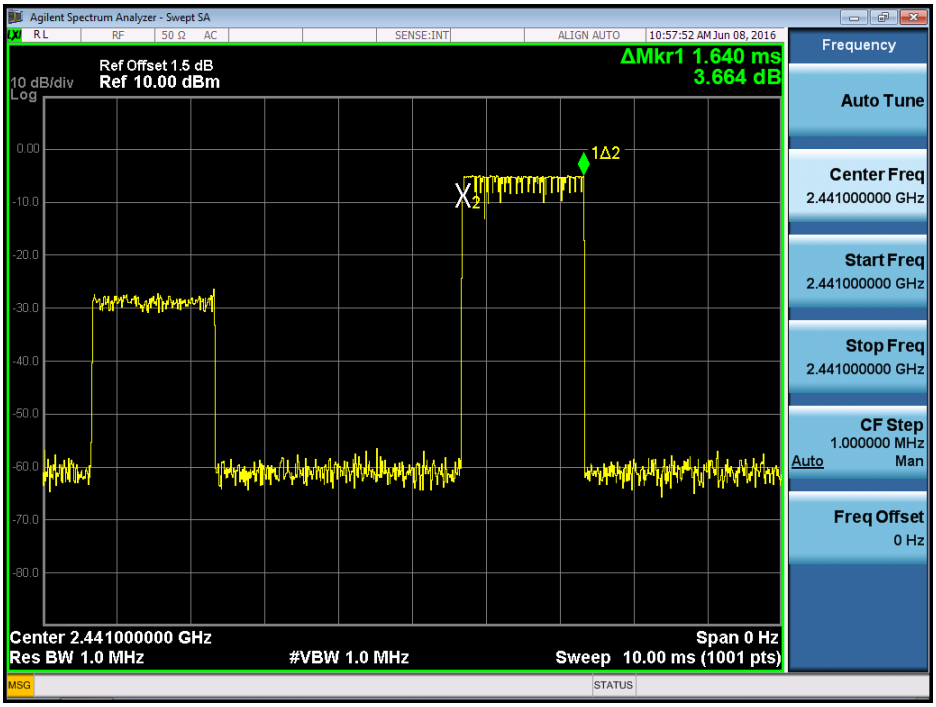
CH00-DH5



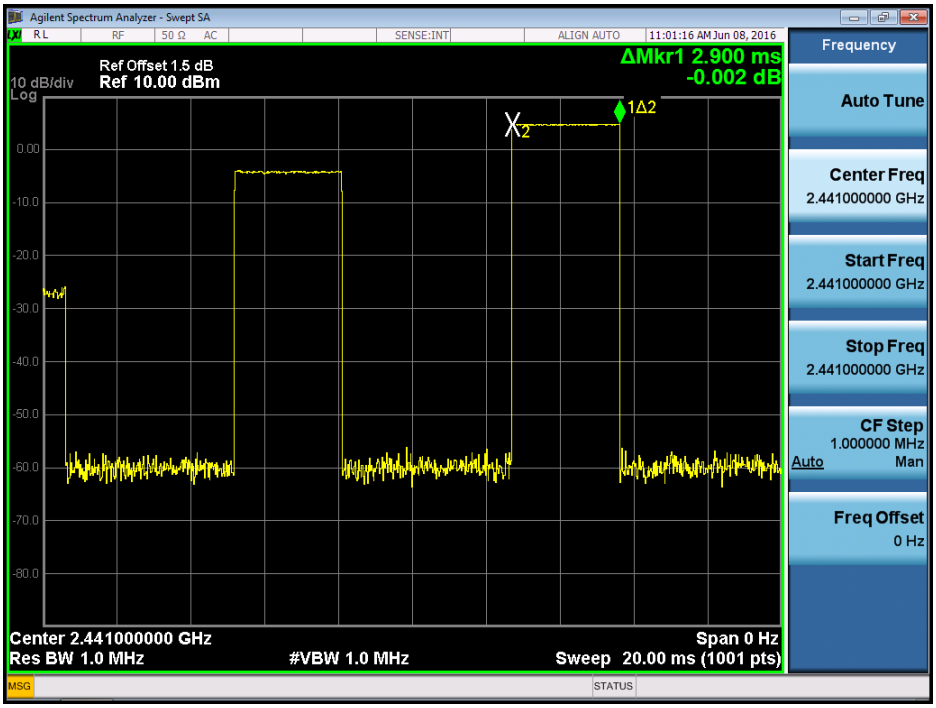
CH39-DH1



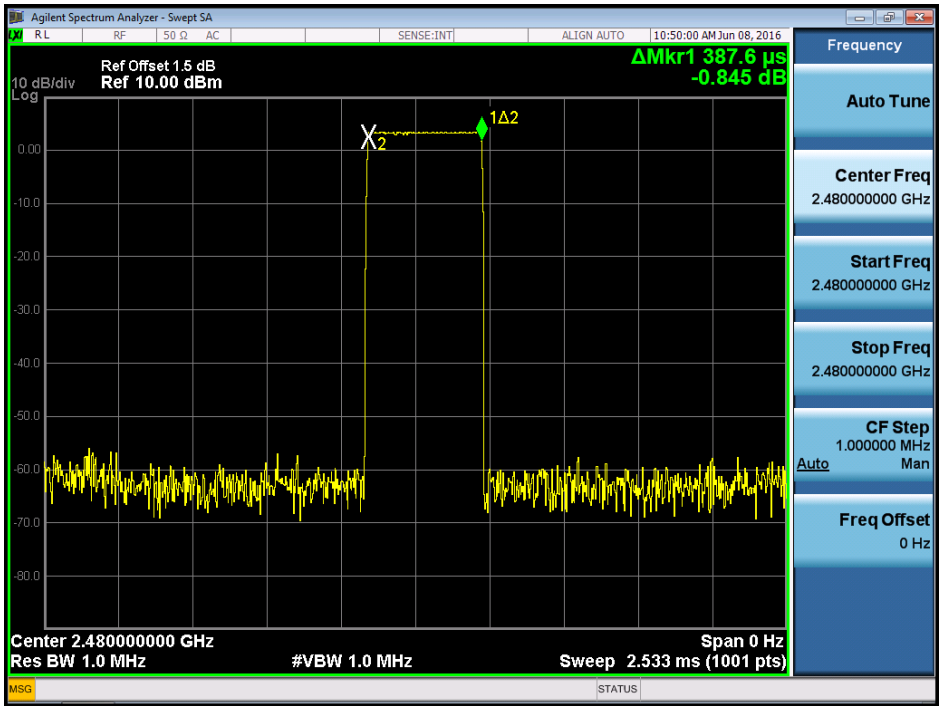
CH39-DH3



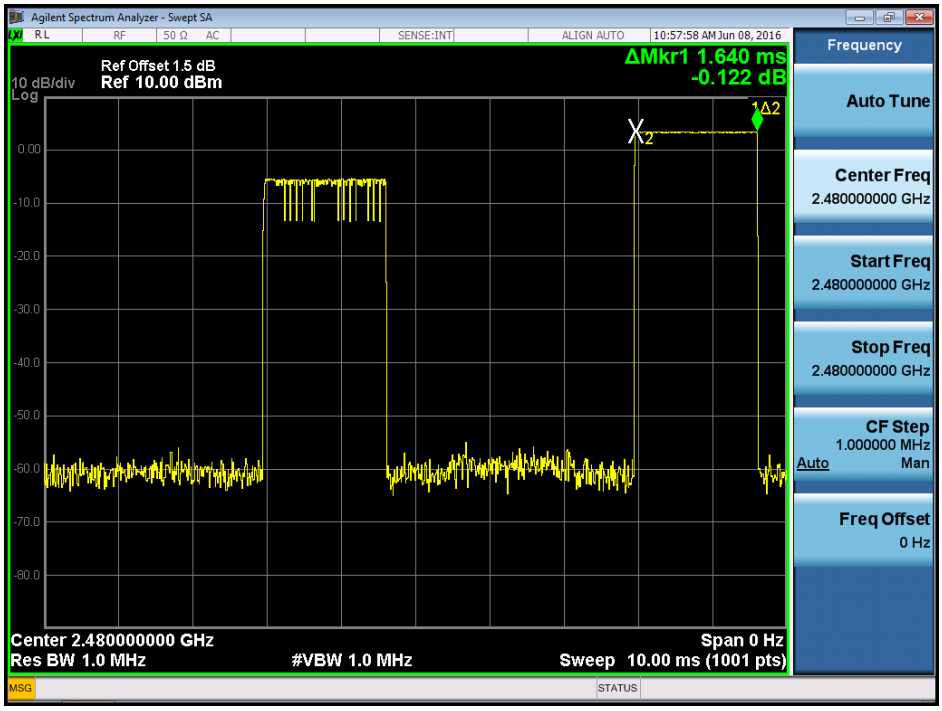
CH39-DH5



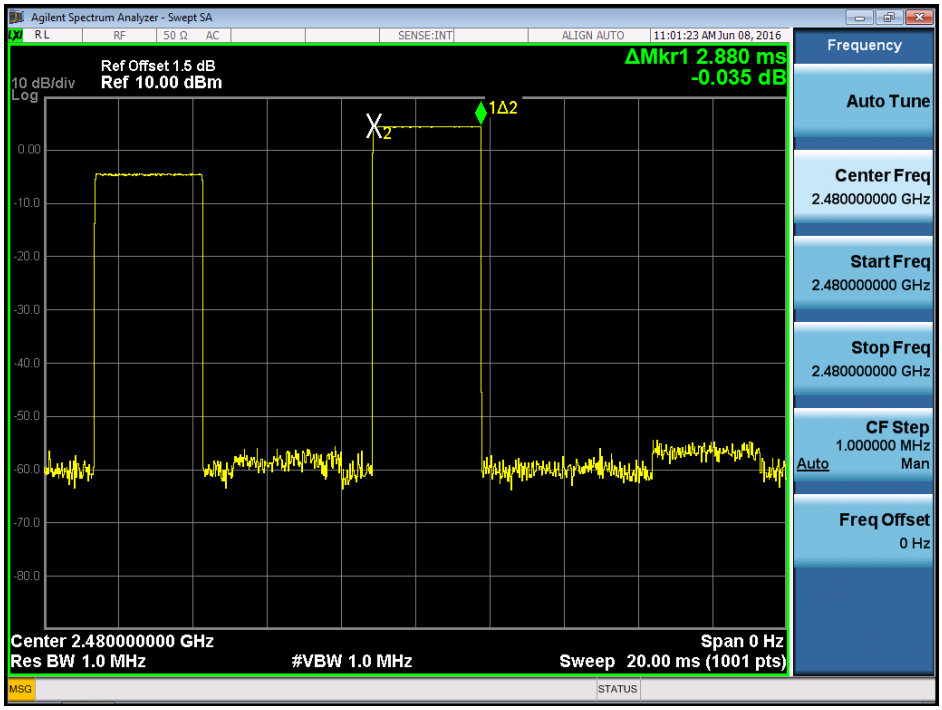
CH78-DH1



CH78-DH3



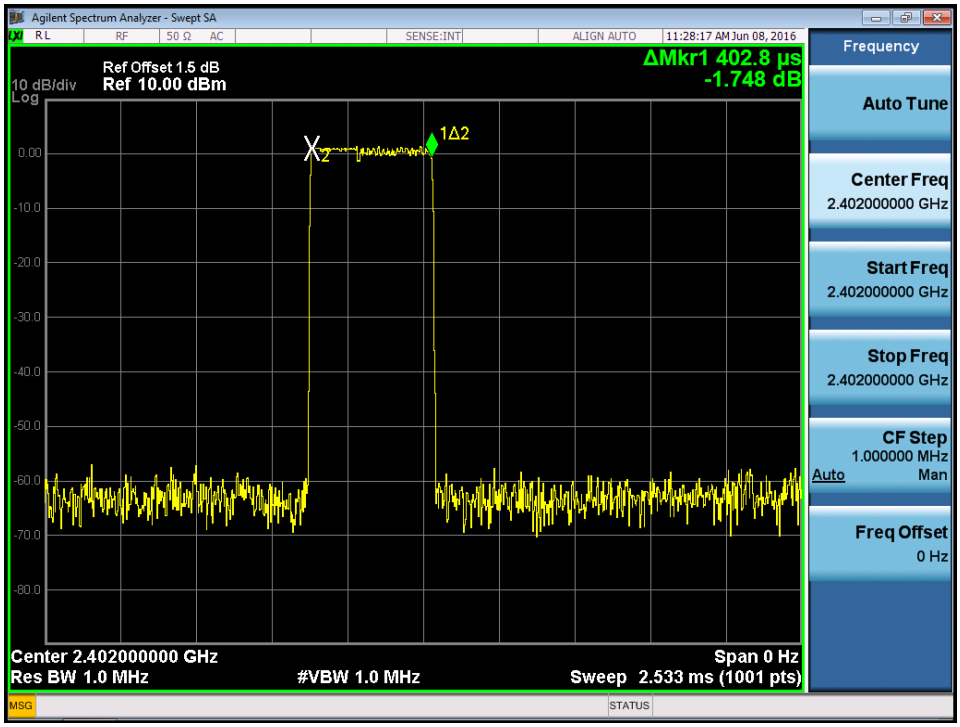
CH78-DH5


Agilent Spectrum Analyzer - Swept SA
R L
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
11:01:23 AM Jun 08, 2016
Ref Offset 1.5 dB
10 dB/div
Ref 10.00 dBm
Log
ΔMkr1 2.880 ms
-0.035 dB
1Δ2
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
Center 2.480000000 GHz
Res BW 1.0 MHz
#VBW 1.0 MHz
Span 0 Hz
Sweep 20.00 ms (1001 pts)
Frequency
Auto Tune
Center Freq
2.480000000 GHz
Start Freq
2.480000000 GHz
Stop Freq
2.480000000 GHz
CF Step
1.000000 MHz
Auto
Man
Freq Offset
0 Hz
MSG
STATUS

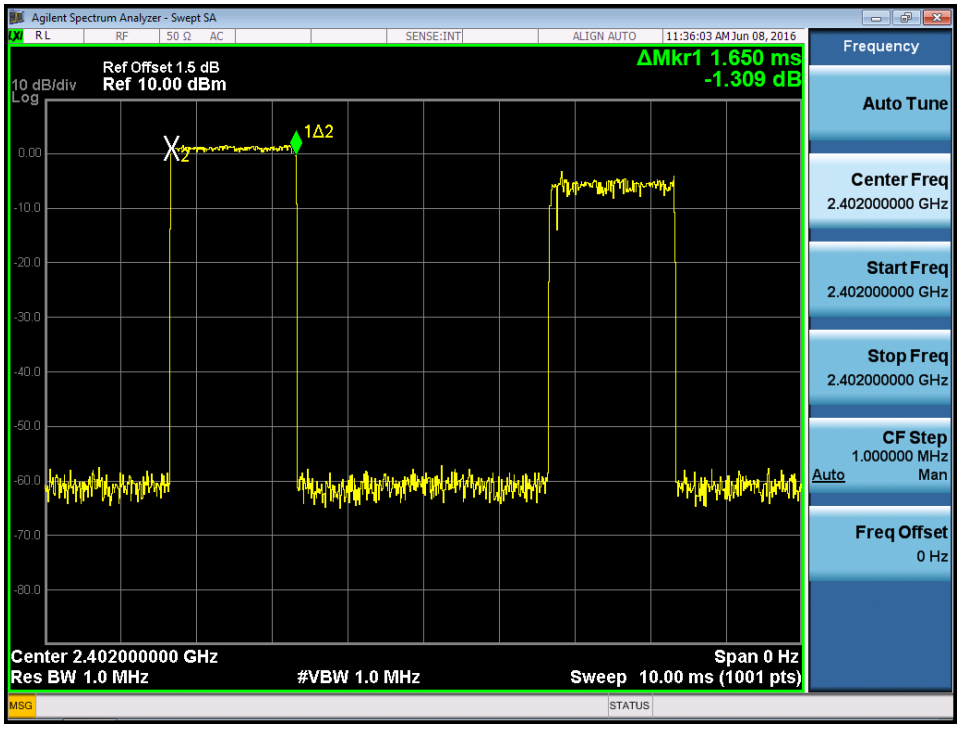
Test Mode :	TX Mode_3Mbps

Data Packet	Frequency	Pulse Duration(ms)	Dwell Time(s)	Limits(s)	Test Result
DH5	2402	2.9200	0.3115	0.4000	Pass
DH3	2402	1.6500	0.1760	0.4000	Pass
DH1	2402	0.4028	0.0430	0.4000	Pass
DH5	2441	2.9000	0.3093	0.4000	Pass
DH3	2441	1.6600	0.1771	0.4000	Pass
DH1	2441	0.3724	0.0397	0.4000	Pass
DH5	2480	2.9200	0.3115	0.4000	Pass
DH3	2480	1.6600	0.1771	0.4000	Pass
DH1	2480	0.4053	0.0432	0.4000	Pass

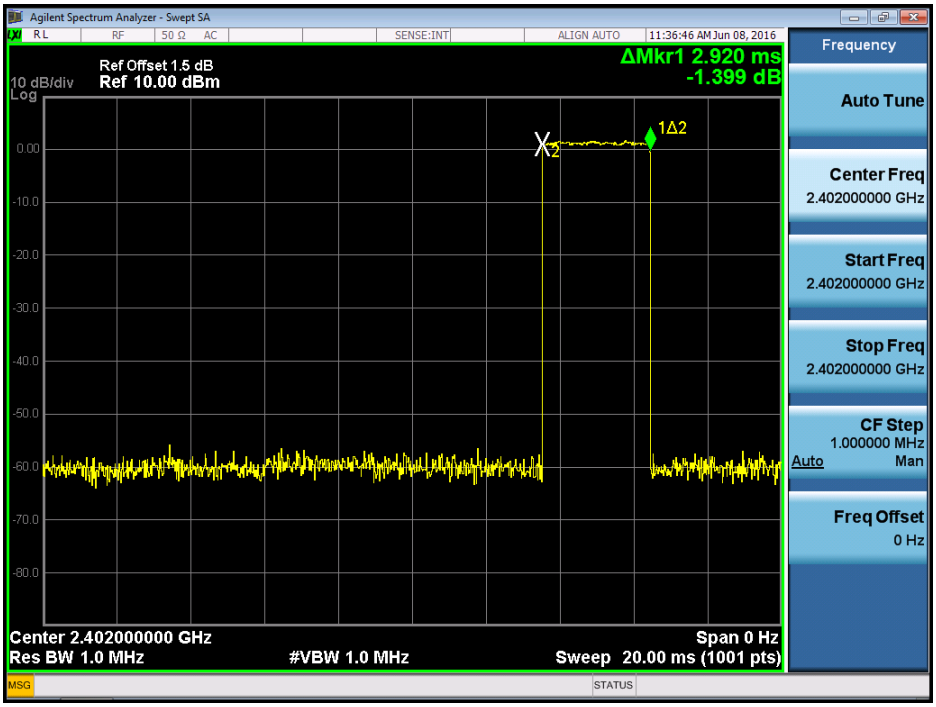
CH00-DH1



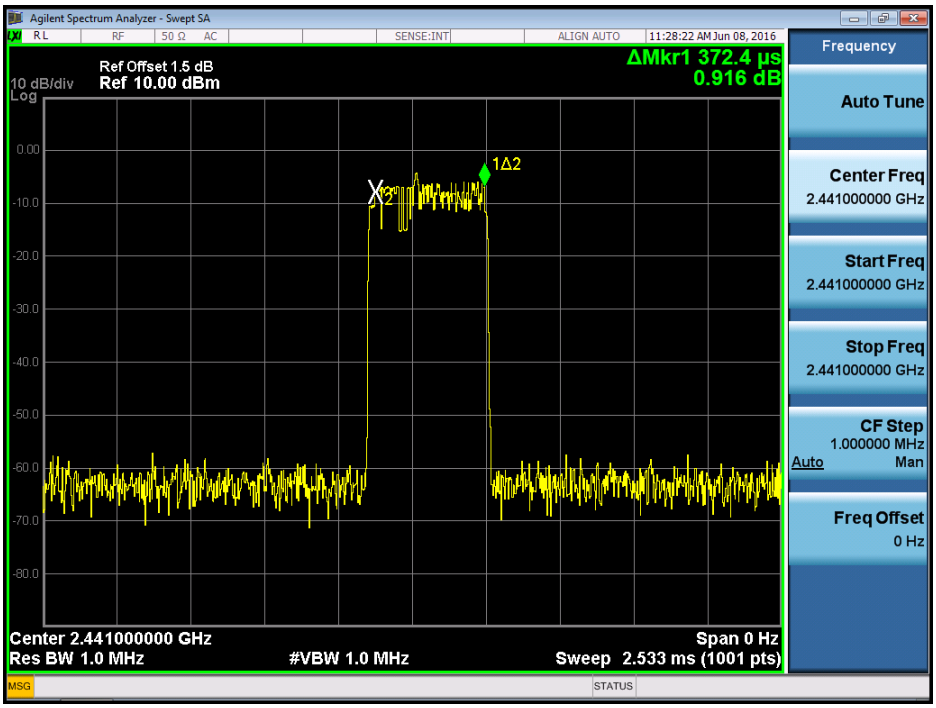
CH00-DH3



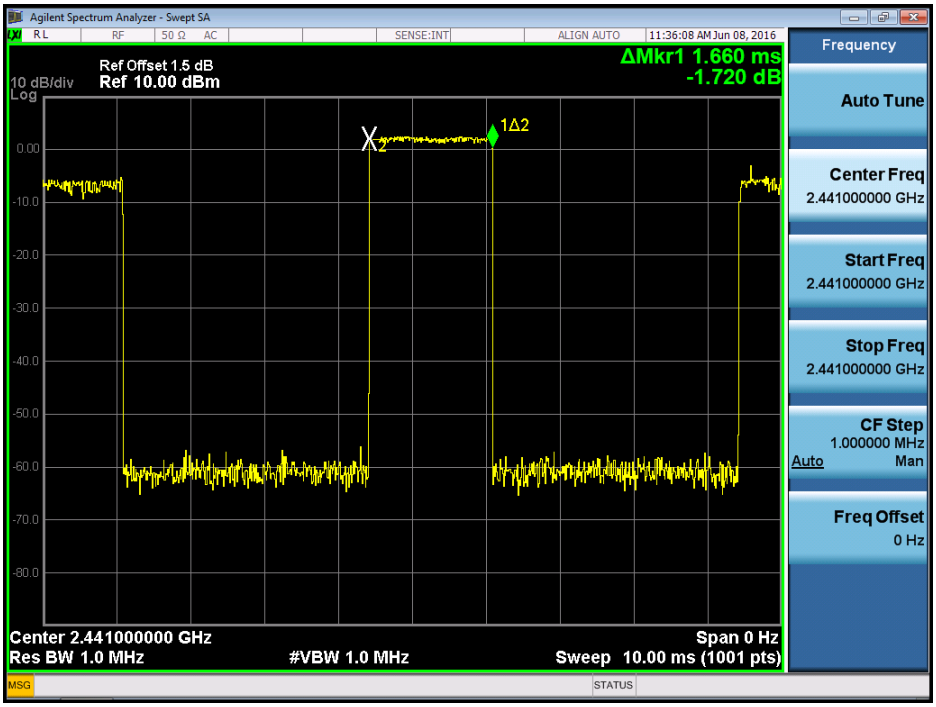
CH00-DH5



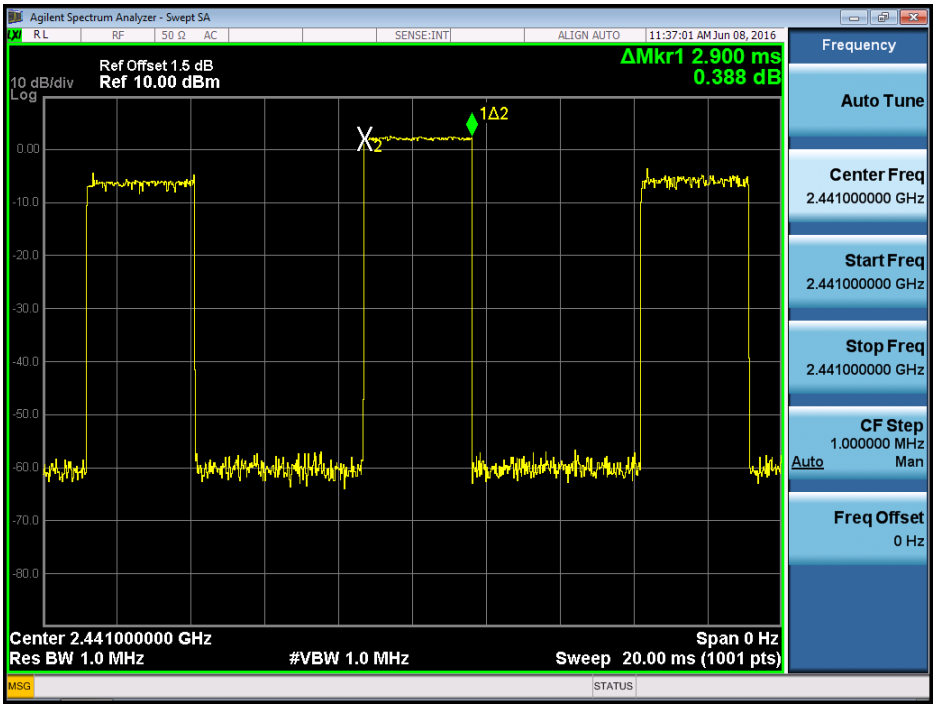
CH39-DH1



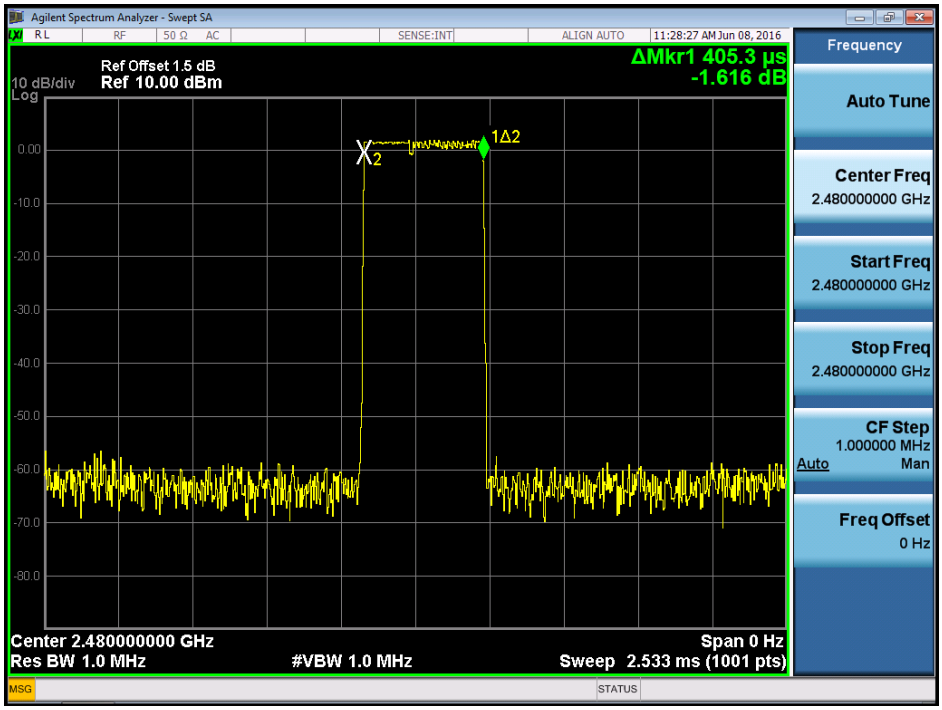
CH39-DH3



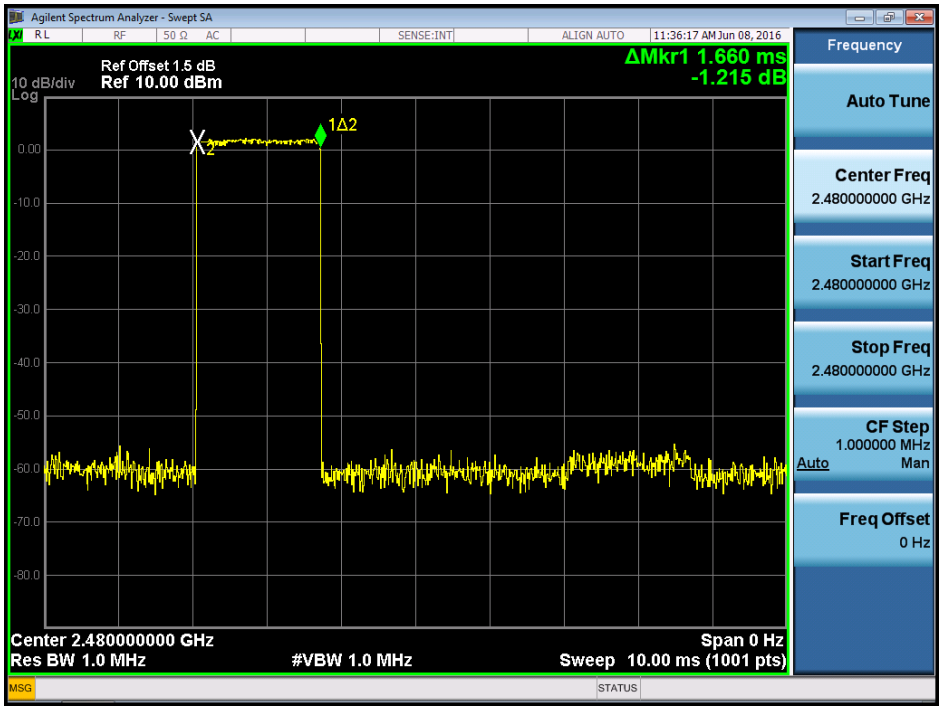
CH39-DH5



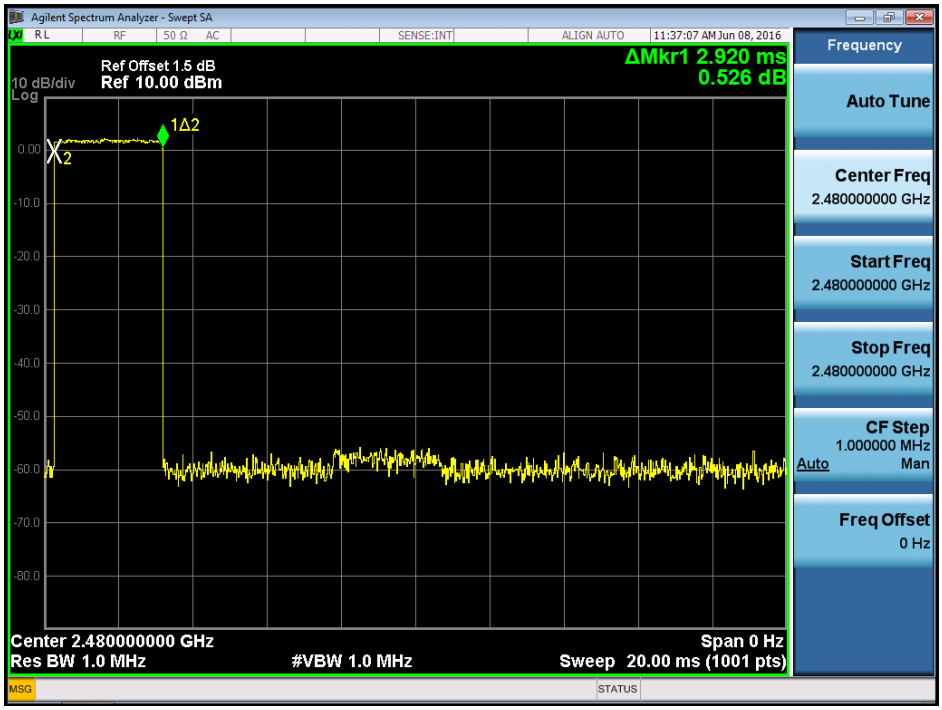
CH78-DH1



CH78-DH3



CH78-DH5


Agilent Spectrum Analyzer - Swept SA
R L
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
11:37:07 AM Jun 08, 2016
Ref Offset 1.5 dB
10 dB/div
Log
Ref 10.00 dBm
ΔMkr1 2.920 ms
0.526 dB
1Δ2
2
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
Center 2.480000000 GHz
Res BW 1.0 MHz
#VBW 1.0 MHz
Span 0 Hz
Sweep 20.00 ms (1001 pts)
Frequency
Auto Tune
Center Freq
2.480000000 GHz
Start Freq
2.480000000 GHz
Stop Freq
2.480000000 GHz
CF Step
1.000000 MHz
Auto
Man
Freq Offset
0 Hz
MSG
STATUS

ATTACHMENT G - HOPPING CHANNEL SEPARATION MEASUREMENT

Test Mode :	Hopping on _1Mbps

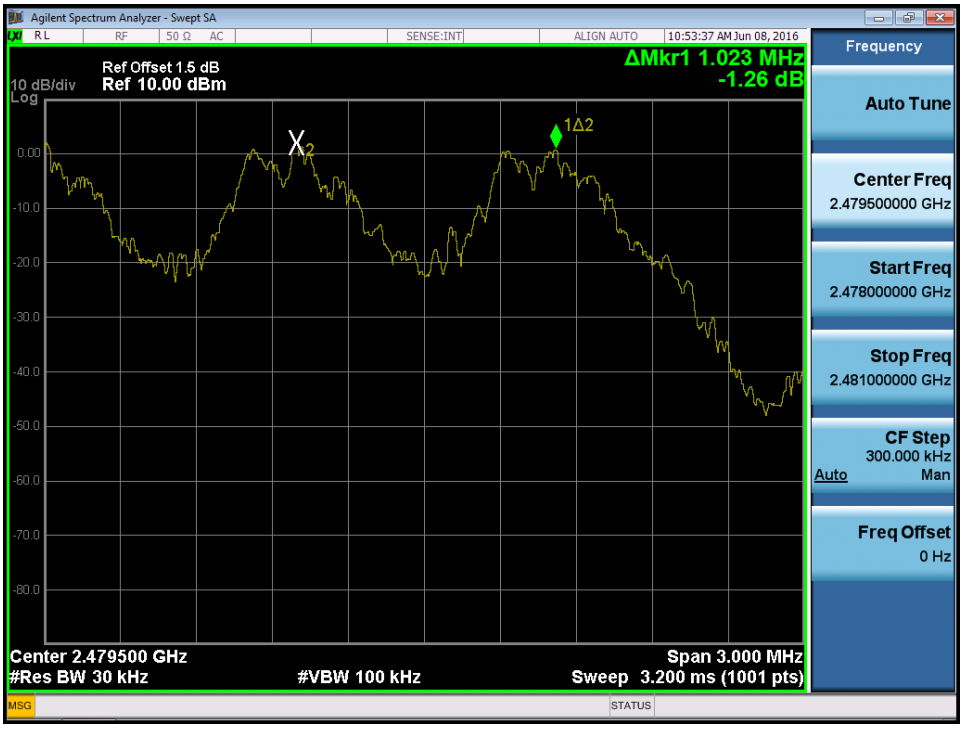
Frequency (MHz)	Channel Separation (MHz)	2/3 of 20dB Bandwidth (MHz)	Test Result
2402	1.008	0.589	Pass
2441	0.990	0.546	Pass
2480	1.023	0.543	Pass

CH00

CH39

Agilent Spectrum Analyzer - Swept SA
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
10:52:26 AM Jun 08, 2016
Ref Offset 1.5 dB
10 dB/div
Ref 10.00 dBm
Log
ΔMkr1 990 kHz
0.13 dB
1Δ2
X2
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
Center 2.441500 GHz
#Res BW 30 kHz
#VBW 100 kHz
Span 3.000 MHz
Sweep 3.200 ms (1001 pts)
Frequency
Auto Tune
Center Freq
2.441500000 GHz
Start Freq
2.440000000 GHz
Stop Freq
2.443000000 GHz
CF Step
300.000 kHz
Auto
Man
Freq Offset
0 Hz
MSG
STATUS

CH78

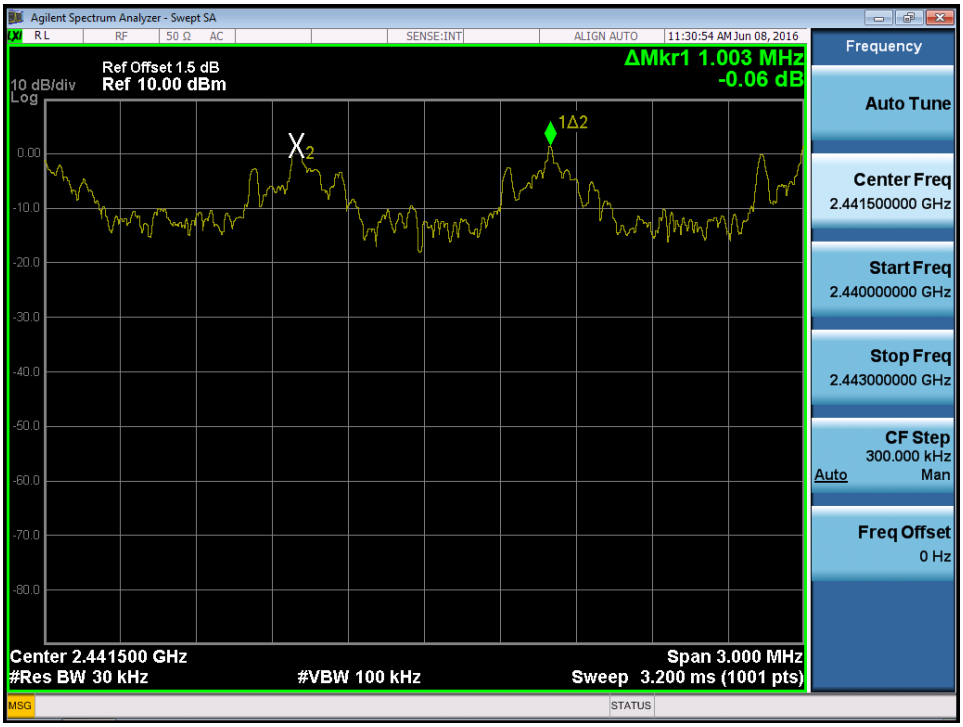

Agilent Spectrum Analyzer - Swept SA
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
10:53:37 AM Jun 08, 2016
Ref Offset 1.5 dB
10 dB/div
Ref 10.00 dBm
Log
ΔMkr1 1.023 MHz
-1.26 dB
1Δ2
X2
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
Center 2.479500 GHz
#Res BW 30 kHz
#VBW 100 kHz
Span 3.000 MHz
Sweep 3.200 ms (1001 pts)
Frequency
Auto Tune
Center Freq
2.479500000 GHz
Start Freq
2.478000000 GHz
Stop Freq
2.481000000 GHz
CF Step
300.000 kHz
Auto
Man
Freq Offset
0 Hz
MSG
STATUS

Test Mode :	Hopping on _3Mbps

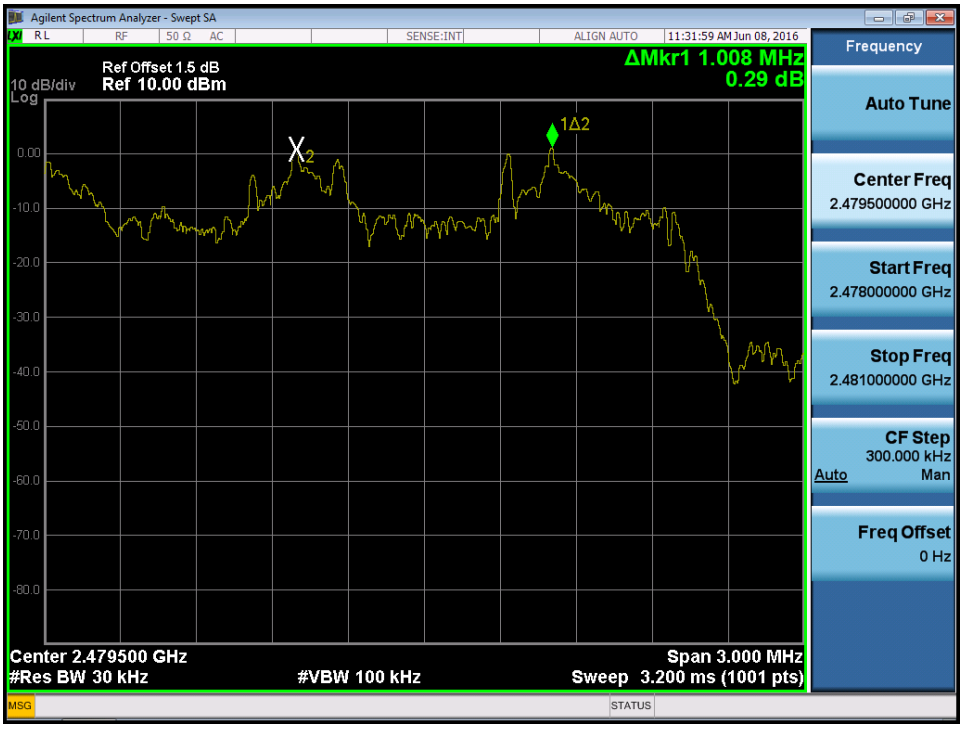
Frequency (MHz)	Channel Separation (MHz)	2/3 of 20dB Bandwidth (MHz)	Test Result
2402	0.983	0.769	Pass
2441	1.003	0.796	Pass
2480	1.008	0.788	Pass

CH00

CH39


Agilent Spectrum Analyzer - Swept SA
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
11:30:54 AM Jun 08, 2016
Ref Offset 1.5 dB
10 dB/div
Ref 10.00 dBm
Log
ΔMkr1 1.003 MHz
-0.06 dB
1Δ2
X2
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
Center 2.441500 GHz
#Res BW 30 kHz
#VBW 100 kHz
Span 3.000 MHz
Sweep 3.200 ms (1001 pts)
Frequency
Auto Tune
Center Freq
2.441500000 GHz
Start Freq
2.440000000 GHz
Stop Freq
2.443000000 GHz
CF Step
300.000 kHz
Auto
Man
Freq Offset
0 Hz
MSG
STATUS

CH78


Agilent Spectrum Analyzer - Swept SA
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
11:31:59 AM Jun 08, 2016
Ref Offset 1.5 dB
10 dB/div
Ref 10.00 dBm
Log
ΔMkr1 1.008 MHz
0.29 dB
1Δ2
X2
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
Center 2.479500 GHz
#Res BW 30 kHz
#VBW 100 kHz
Span 3.000 MHz
Sweep 3.200 ms (1001 pts)
Frequency
Auto Tune
Center Freq
2.479500000 GHz
Start Freq
2.478000000 GHz
Stop Freq
2.481000000 GHz
CF Step
300.000 kHz
Auto
Man
Freq Offset
0 Hz
MSG
STATUS

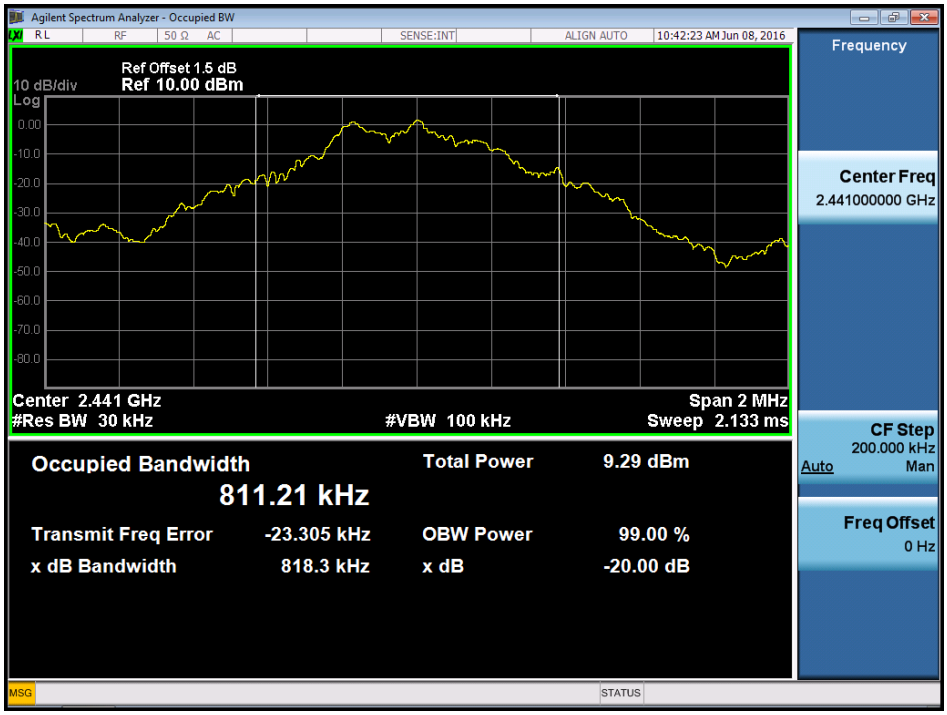
ATTACHMENT H - BANDWIDTH

Test Mode :	TX Mode _1Mbps

Frequency (MHz)	20dB Bandwidth (MHz)	99% Occupied BW (MHz)	Test Result
2402	0.841	0.801	Pass
2441	0.818	0.811	Pass
2480	0.815	0.811	Pass

CH00

CH39


Agilent Spectrum Analyzer - Occupied BW
R L
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
10:42:23 AM Jun 08, 2016
Ref Offset 1.5 dB
10 dB/div
Ref 10.00 dBm
Log
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
Center 2.441 GHz
#Res BW 30 kHz
#VBW 100 kHz
Span 2 MHz
Sweep 2.133 ms
Occupied Bandwidth
811.21 kHz
Total Power 9.29 dBm
Transmit Freq Error -23.305 kHz
OBW Power 99.00 %
x dB Bandwidth 818.3 kHz
x dB -20.00 dB
Frequency
Center Freq
2.441000000 GHz
CF Step
200.000 kHz
Auto
Man
Freq Offset
0 Hz
MSG
STATUS

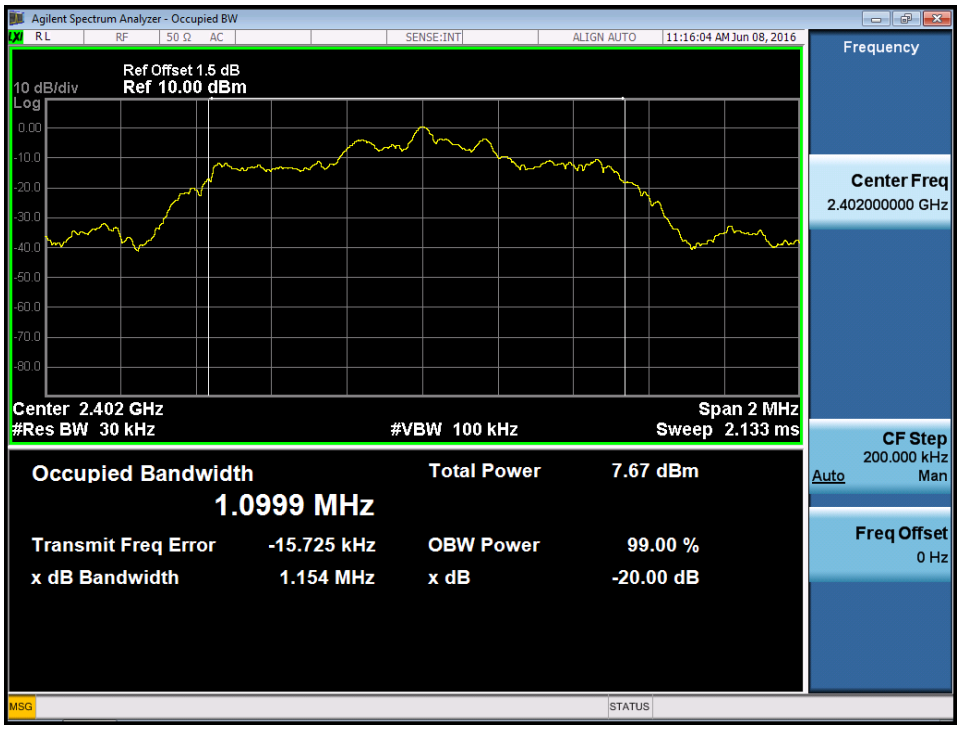
CH78

Agilent Spectrum Analyzer - Occupied BW
R L
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
10:42:54 AM Jun 08, 2016
Ref Offset 1.5 dB
10 dB/div
Ref 10.00 dBm
Log
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
Center 2.48 GHz
#Res BW 30 kHz
#VBW 100 kHz
Span 2 MHz
Sweep 2.133 ms
Occupied Bandwidth
811.01 kHz
Total Power 8.70 dBm
Transmit Freq Error -12.853 kHz
OBW Power 99.00 %
x dB Bandwidth 815.1 kHz
x dB -20.00 dB
Frequency
Center Freq
2.480000000 GHz
CF Step
200.000 kHz
Auto
Man
Freq Offset
0 Hz
MSG
STATUS

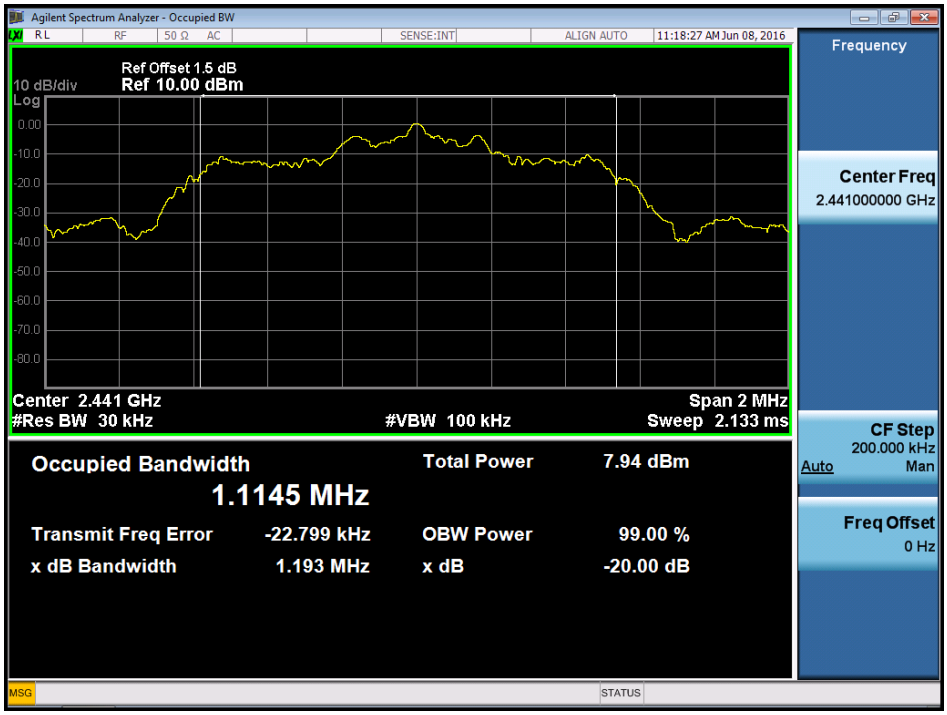
Test Mode :	TX Mode _3Mbps

Frequency (MHz)	20dB Bandwidth (MHz)	99% Occupied BW (MHz)	Test Result
2402	1.154	1.100	Pass
2441	1.193	1.115	Pass
2480	1.176	1.109	Pass

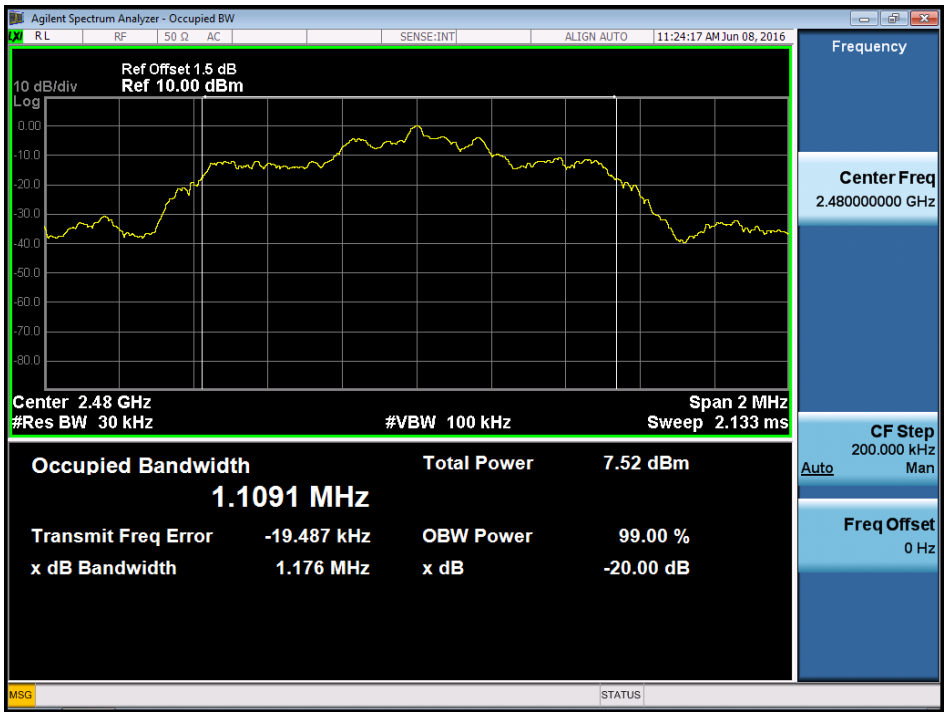
CH00



CH39


Agilent Spectrum Analyzer - Occupied BW
R L
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
11:18:27 AM Jun 08, 2016
Ref Offset 1.5 dB
10 dB/div
Ref 10.00 dBm
Log
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
Center 2.441 GHz
#Res BW 30 kHz
#VBW 100 kHz
Span 2 MHz
Sweep 2.133 ms
Occupied Bandwidth
1.1145 MHz
Total Power 7.94 dBm
Transmit Freq Error -22.799 kHz
OBW Power 99.00 %
x dB Bandwidth 1.193 MHz
x dB -20.00 dB
Frequency
Center Freq
2.441000000 GHz
CF Step
200.000 kHz
Auto
Man
Freq Offset
0 Hz
MSG
STATUS

CH78

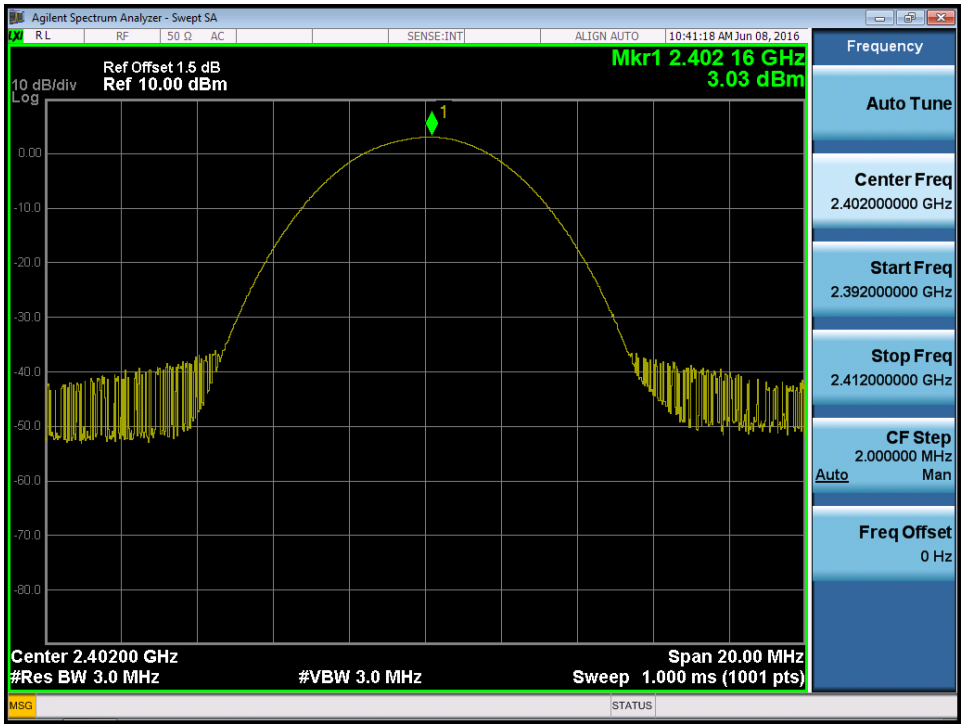

Agilent Spectrum Analyzer - Occupied BW
R L
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
11:24:17 AM Jun 08, 2016
Ref Offset 1.5 dB
10 dB/div
Ref 10.00 dBm
Log
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
Center 2.48 GHz
#Res BW 30 kHz
#VBW 100 kHz
Span 2 MHz
Sweep 2.133 ms
Occupied Bandwidth
1.1091 MHz
Total Power 7.52 dBm
Transmit Freq Error -19.487 kHz
OBW Power 99.00 %
x dB Bandwidth 1.176 MHz
x dB -20.00 dB
Frequency
Center Freq
2.480000000 GHz
CF Step
200.000 kHz
Auto
Man
Freq Offset
0 Hz
MSG
STATUS

ATTACHMENT I - PEAK OUTPUT POWER

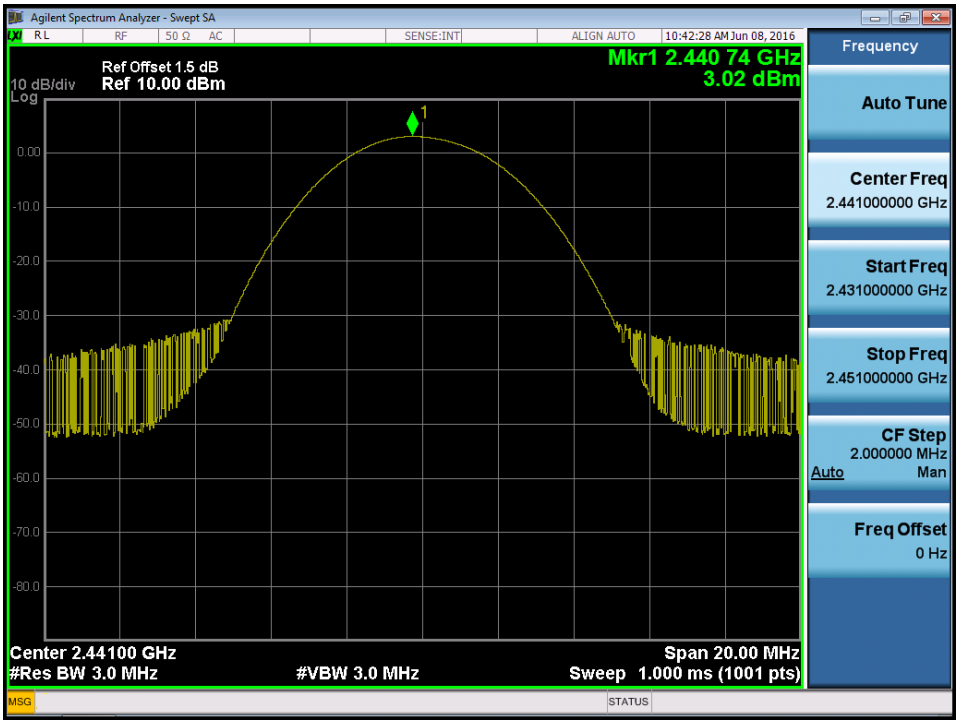
Test Mode :	TX Mode _1Mbps

Frequency (MHz)	Conducted Power (dBm)	Conducted Power (W)	Max. Limit (dBm)	Max. Limit (W)	Test Result
2402	3.03	0.0020	30.00	1.00	Pass
2441	3.02	0.0020	30.00	1.00	Pass
2480	2.39	0.0017	30.00	1.00	Pass

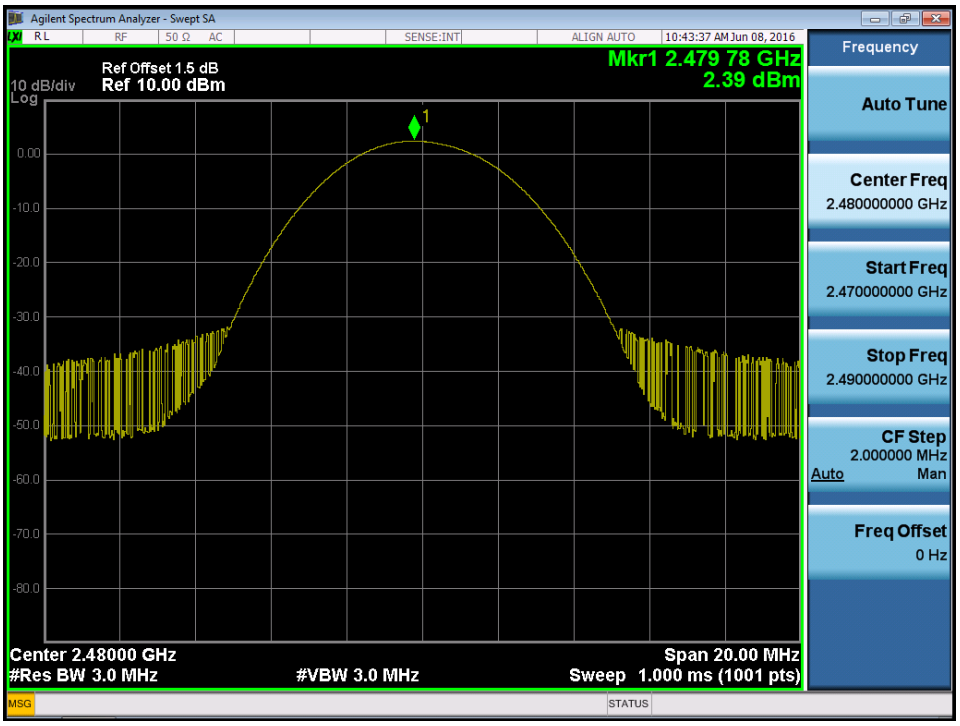
CH00



CH39


Agilent Spectrum Analyzer - Swept SA
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
10:42:28 AM Jun 08, 2016
Ref Offset 1.5 dB
10 dB/div
Ref 10.00 dBm
Log
Mkr1 2.440 74 GHz
3.02 dBm
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
Center 2.44100 GHz
#Res BW 3.0 MHz
#VBW 3.0 MHz
Span 20.00 MHz
Sweep 1.000 ms (1001 pts)
Frequency
Auto Tune
Center Freq
2.441000000 GHz
Start Freq
2.431000000 GHz
Stop Freq
2.451000000 GHz
CF Step
2.000000 MHz
Auto
Man
Freq Offset
0 Hz
MSG
STATUS

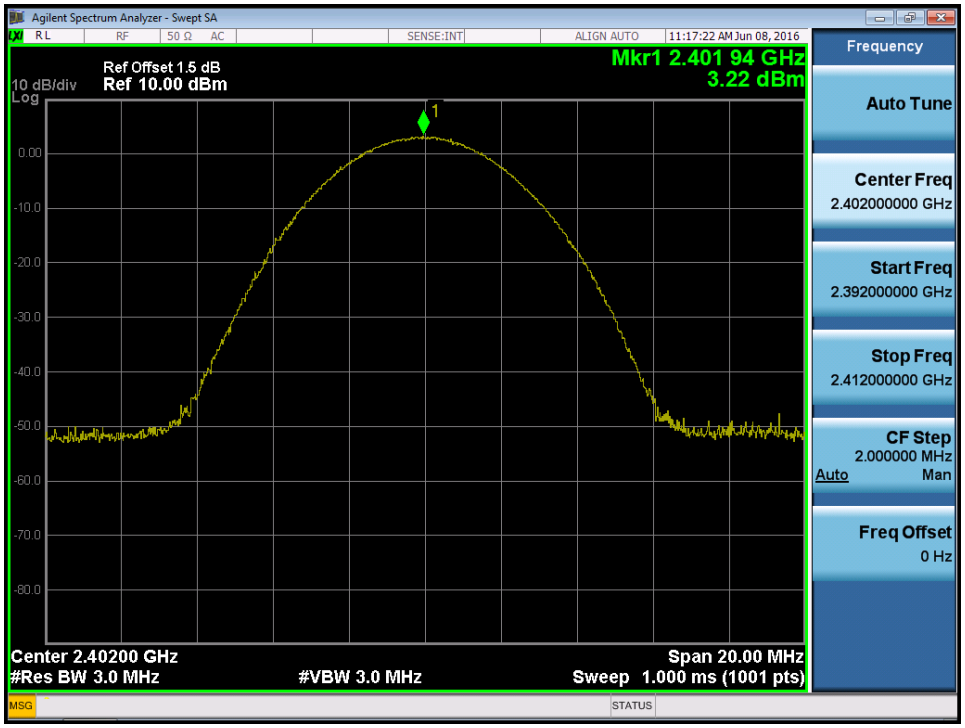
CH78


Agilent Spectrum Analyzer - Swept SA
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
10:43:37 AM Jun 08, 2016
Ref Offset 1.5 dB
10 dB/div
Ref 10.00 dBm
Log
Mkr1 2.479 78 GHz
2.39 dBm
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
Center 2.48000 GHz
#Res BW 3.0 MHz
#VBW 3.0 MHz
Span 20.00 MHz
Sweep 1.000 ms (1001 pts)
Frequency
Auto Tune
Center Freq
2.480000000 GHz
Start Freq
2.470000000 GHz
Stop Freq
2.490000000 GHz
CF Step
2.000000 MHz
Auto
Man
Freq Offset
0 Hz
MSG
STATUS

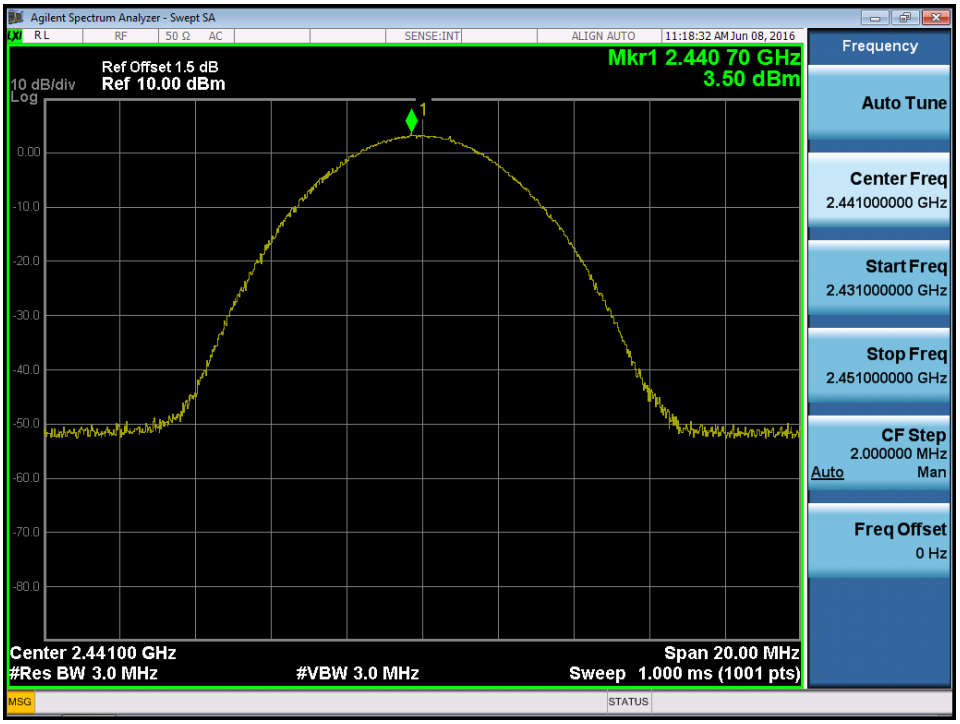
Test Mode :	TX Mode _3Mbps

Frequency (MHz)	Conducted Power (dBm)	Conducted Power (W)	Max. Limit (dBm)	Max. Limit (W)	Test Result
2402	3.22	0.0021	30.00	1.00	Pass
2441	3.50	0.0022	30.00	1.00	Pass
2480	2.90	0.0019	30.00	1.00	Pass

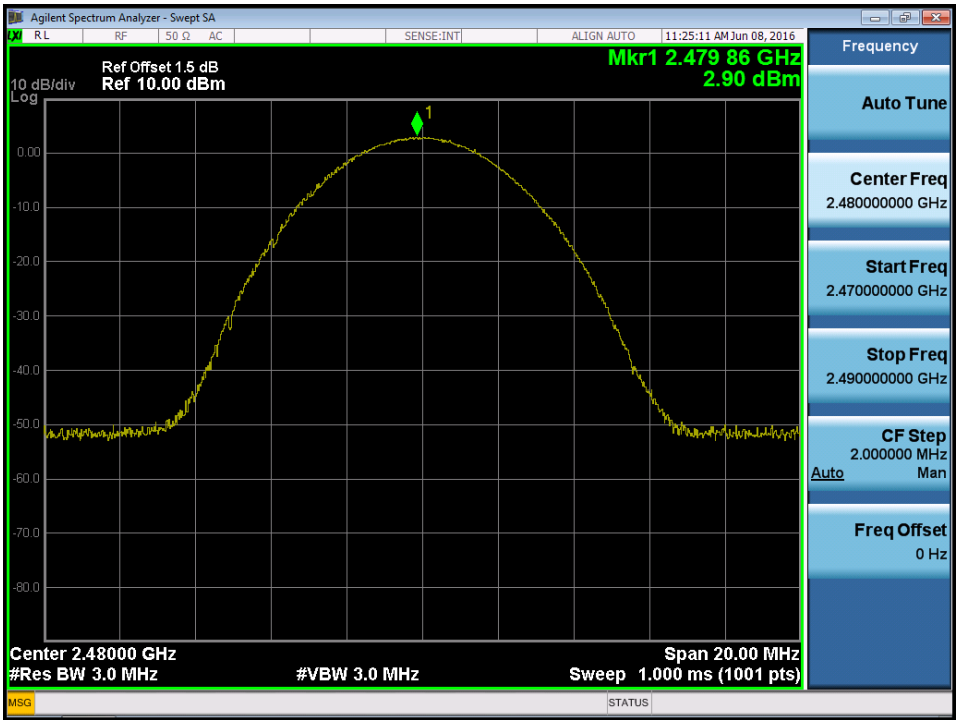
CH00



CH39

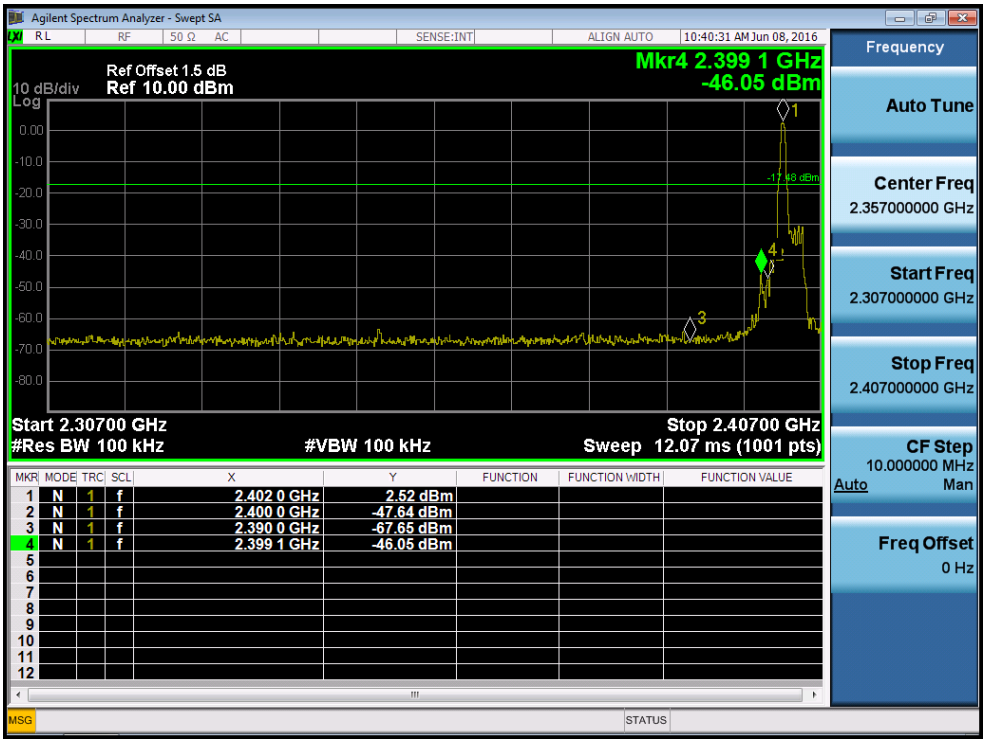

Agilent Spectrum Analyzer - Swept SA
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
11:18:32 AM Jun 08, 2016
Ref Offset 1.5 dB
10 dB/div
Ref 10.00 dBm
Log
Mkr1 2.440 70 GHz
3.50 dBm
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
Center 2.44100 GHz
#Res BW 3.0 MHz
#VBW 3.0 MHz
Span 20.00 MHz
Sweep 1.000 ms (1001 pts)
Frequency
Auto Tune
Center Freq
2.441000000 GHz
Start Freq
2.431000000 GHz
Stop Freq
2.451000000 GHz
CF Step
2.000000 MHz
Auto
Man
Freq Offset
0 Hz
MSG
STATUS

CH78

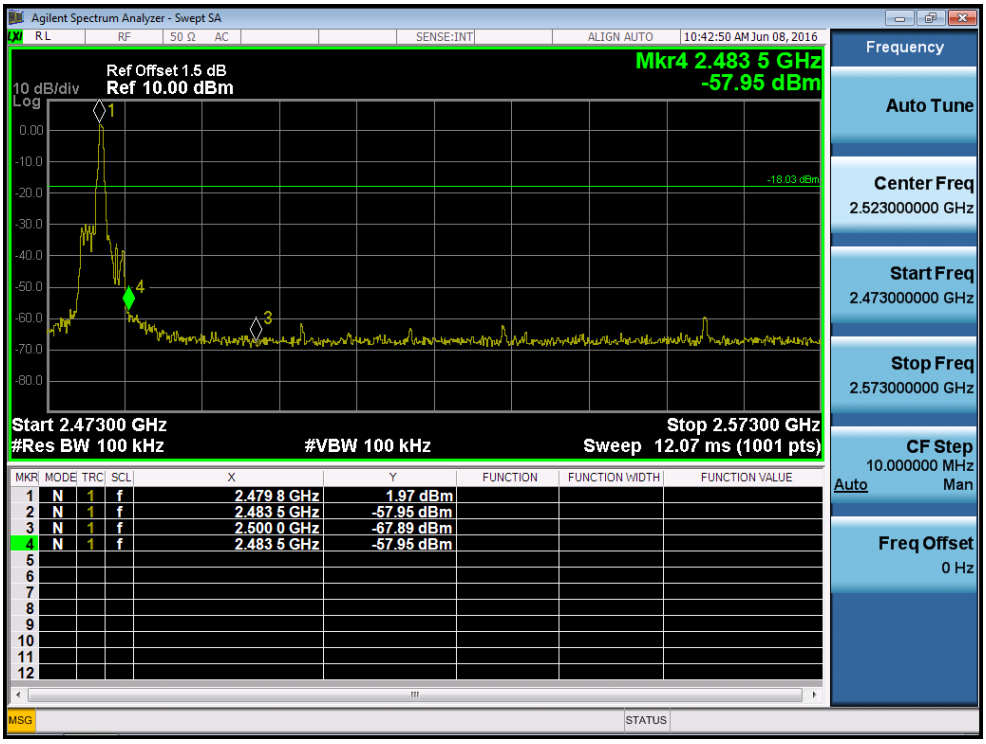

Agilent Spectrum Analyzer - Swept SA
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
11:25:11 AM Jun 08, 2016
Ref Offset 1.5 dB
10 dB/div
Ref 10.00 dBm
Log
Mkr1 2.479 86 GHz
2.90 dBm
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
Center 2.48000 GHz
#Res BW 3.0 MHz
#VBW 3.0 MHz
Span 20.00 MHz
Sweep 1.000 ms (1001 pts)
Frequency
Auto Tune
Center Freq
2.480000000 GHz
Start Freq
2.470000000 GHz
Stop Freq
2.490000000 GHz
CF Step
2.000000 MHz
Auto
Man
Freq Offset
0 Hz
MSG
STATUS

ATTACHMENT J - ANTENNA CONDUCTED SPURIOUS EMISSION

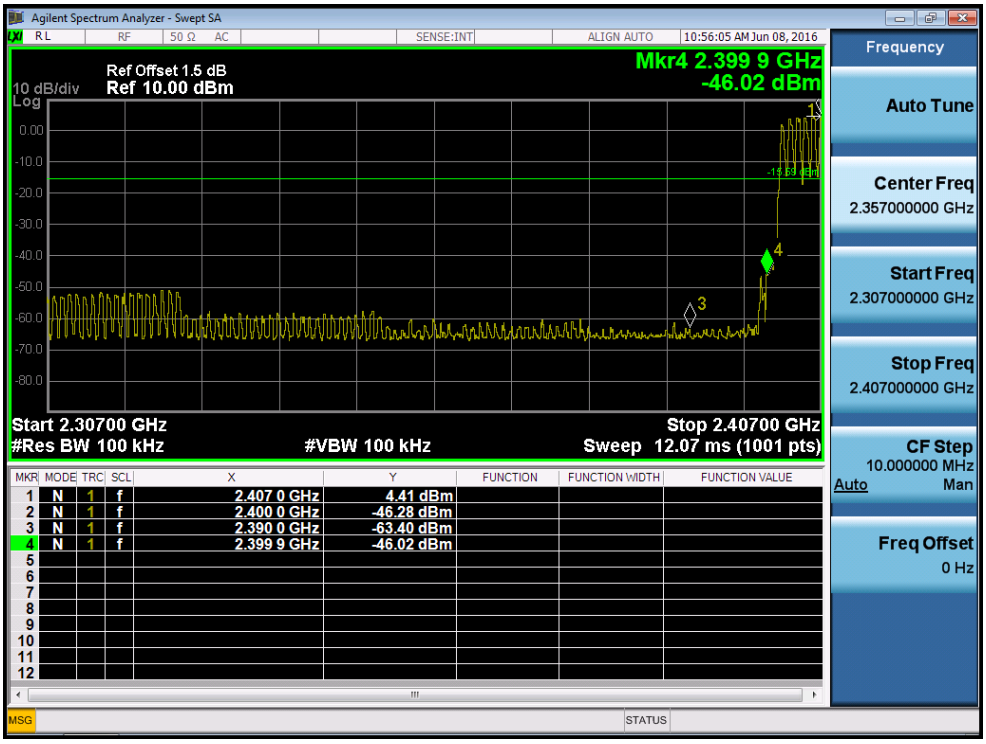
CH00 (Lower)_1Mbps



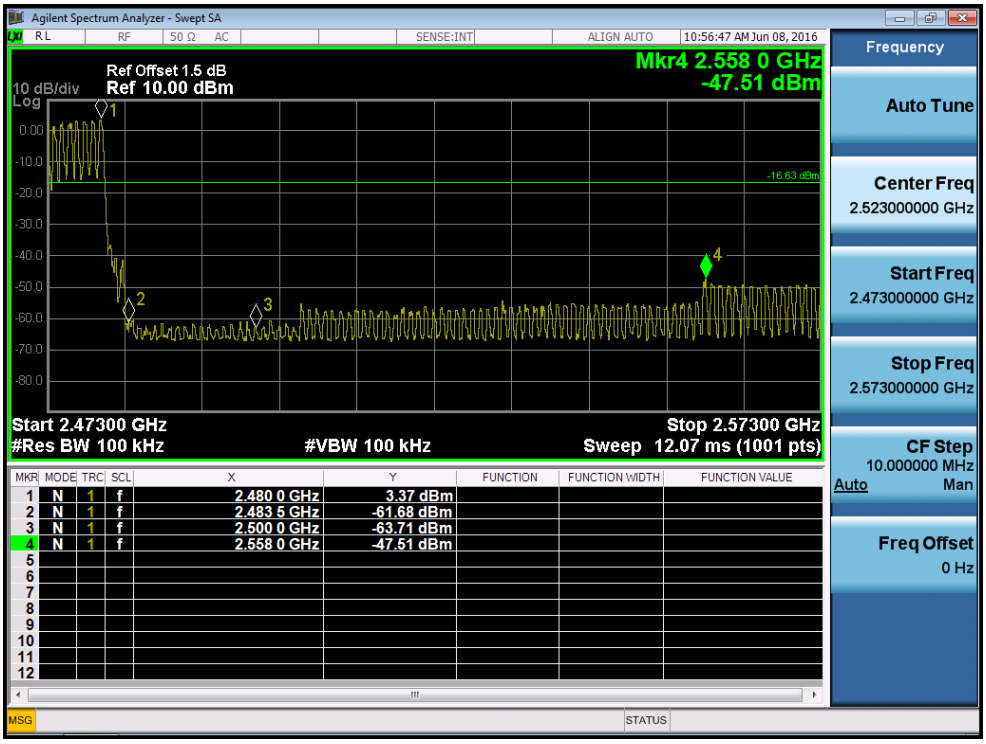
CH78 (Upper) _1Mbps



CH00 Hopping on mode (Lower)_1Mbps



CH78 Hopping on mode (Upper) _1Mbps

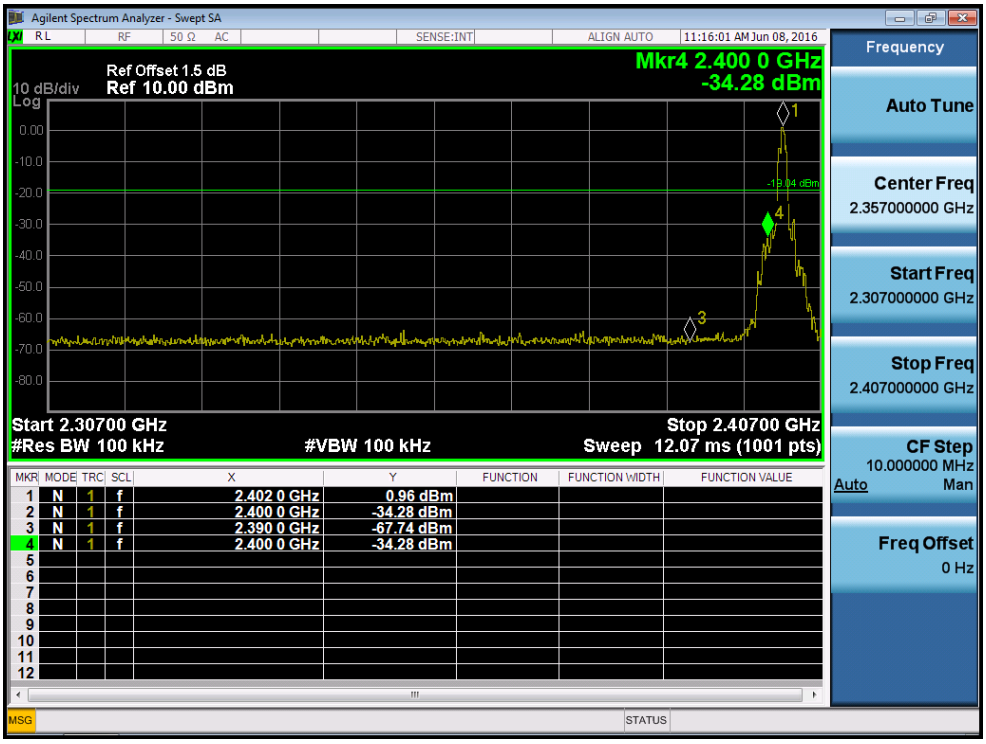


CH00 (10 Harmonic of the frequency) _1Mbps

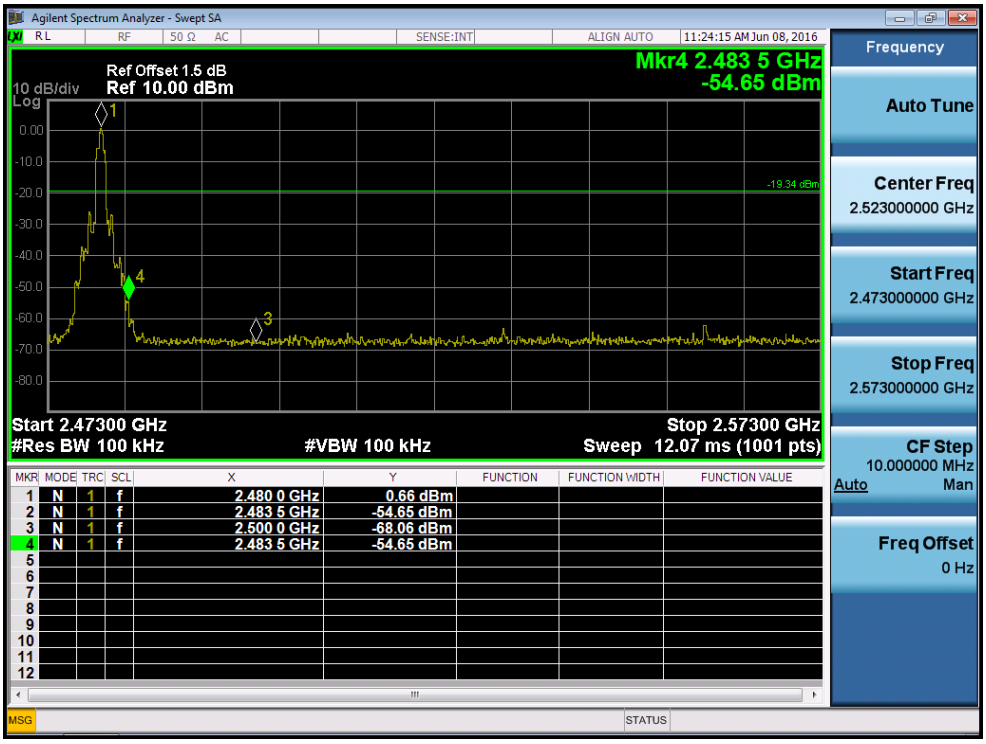
CH39 (10 Harmonic of the frequency) _1Mbps

CH78 (10 Harmonic of the frequency) _1Mbps

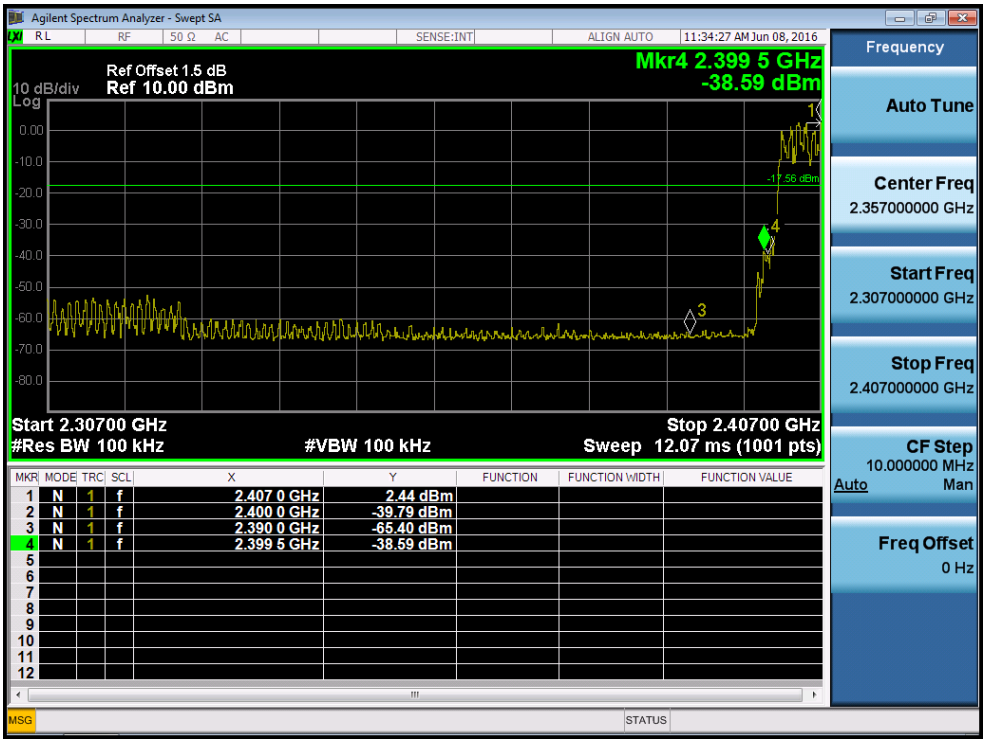
CH00 (Lower) _3Mbps



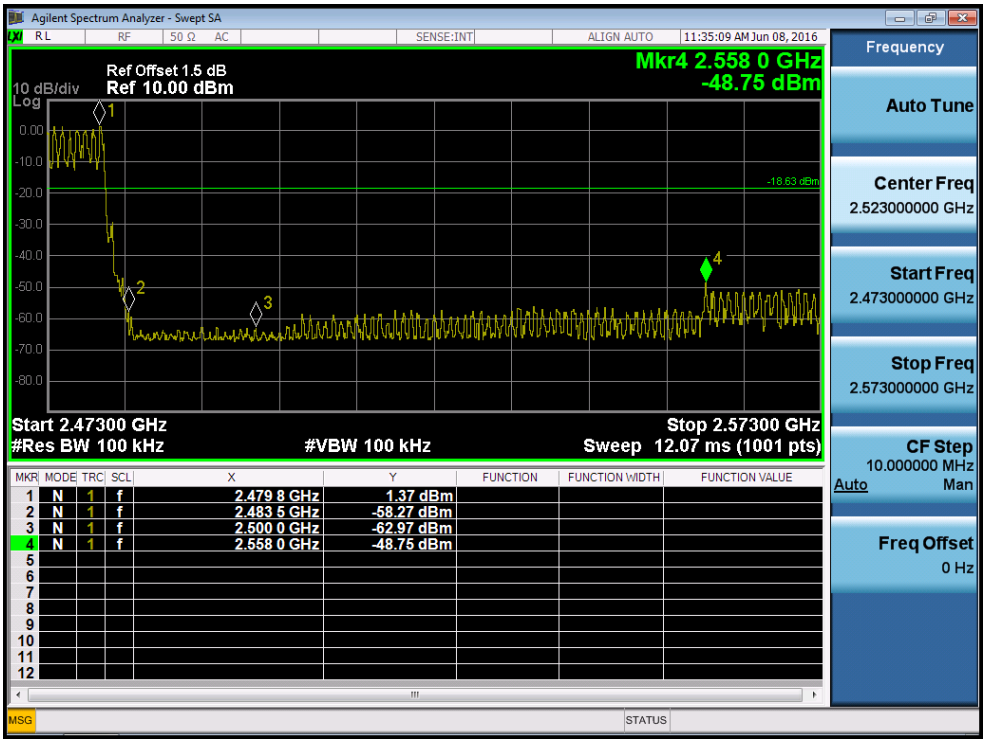
CH78 (Upper) _3Mbps



CH00 Hopping on mode (Lower)_3Mbps



CH78 Hopping on mode (Upper) _3Mbps



CH00 (10 Harmonic of the frequency) _3Mbps

CH39 (10 Harmonic of the frequency) _3Mbps

CH78 (10 Harmonic of the frequency) _3Mbps