



Report No.SH16110074W02

FCC RF TEST REPORT

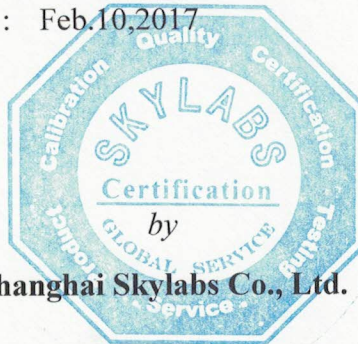
Issued to

Shanghai Sunly Technology Co., Ltd.

For

Alpha CAM Drone

Model Name : SUNLY17A
Trade Name : SUNLYTECH
Brand Name : Alpha CAM
Standard : 47 CFR Part 15, Subpart C
ANSI C63.10-2013
FCC ID : 2AKX4-SUNLY17A
Test date : Jan.1,2017 - Feb.6,2017
Issue date : Feb.10,2017



Tested by Wu Hongfei

Approved by Gu Yanyun

Review by Xiao dong Wei

The report refers only to the sample tested and does not apply to the bulk. This report is issued in confidence to the client and it will be strictly treated as such by the Shanghai Skylabs Co., Ltd. It may not be reproduced in its entirety or in part and it may not be used for advertising. The client to whom the report is issued may, however, show or send it or a certified copy thereof prepared by the Shanghai Skylabs Co., Ltd to his customer. Supplier or others persons directly concerned. Shanghai Skylabs Co., Ltd will not, without the consent of the client enters into any discussion of correspondence with any third party concerning the contents of the report. In the event of the improper use of the report, Shanghai Skylabs Co., Ltd reserves the rights to withdraw it and to adopt any other remedies which may be appropriate.



DIRECTORY

1.	General Information	4
1.1	Applicant	4
1.2	Manufacturer	4
1.3	Description of EUT	4
2.	Facilities and Accreditations	6
2.1	Test Facility	6
2.2	Environmental Conditions	6
2.3	Measurement Uncertainty	6
2.4	List of Equipments Used	7
2.5	Accessories	7
3.	Test Standards and Results	8
4.	47 CFR Part 15C	9
4.1	Antenna requirement	9
5.	Test Result	10
5.1	Peak Output Power	10
5.2	6dB Bandwidth	12
5.3	Conducted Spurious Emissions and Band Edge	23
5.4	Power Spectral Density (PSD)	40
5.5	Restricted Frequency Bands	51
5.6	Conducted Emission	57
5.7	Radiated Emission	61
Annex A	Photos of the EUT	65
Annex B	Photos of Setup	66



Change History

Issue	Date	Reason for change
1.0	Feb.10,2017	First edition



1. General Information

1.1 Applicant

Shanghai Sunly Technology Co., Ltd.

D1106.D-1108.Minggu Science&Technology Park,No.7001 Zhongchun Rd.,Shanghai,China

1.2 Manufacturer

Shanghai Sunly Technology Co., Ltd.

D1106.D-1108.Minggu Science&Technology Park,No.7001 Zhongchun Rd.,Shanghai,China

1.3 Description of EUT

EUT Name.....: Alpha CAM Drone
Model Name.....: SUNLY17A
Brand Name.....: Alpha CAM
Trade Name.....: SUNLYTECH
Hardware Version.....: V1.05
Software Version.....: V1.0.5
Modulation Type.....: OFDM (802.11g/n20/n40)
Frequency Range.....: 2412-2462MHz
Channel Number.....: 11
Antenna Type.....: FPCB antenna
Antenna Gain.....: 1.2 dBi

Charger

Brand Name.....: RUIDIR
Mode No.....: RD0882500-USBA-62GB
Electrical Rating [Input].....: 100-240V, 0.7A
Electrical Rating [Output]: 9V, 2.5A
Manufacturer.....: Shenzhen Ruide Electronic Industrial Co., Ltd
Manufacturer Address.....: 10A-1001,F1 Block ,TCL International E City.Zhong Shan Yuan
Road NanShanDistrict, ShenZhen, China

NOTE 1:

The EUT contains WIFI Module operating at 2.4GHz ISM band; it supports 802.11g, 802.11n(20MHz) and they are all tested in this report.

*For 802.11g/n(20MHz)The frequencies allocated is $F \text{ (MHz)} = 2412 + 5 * (n - 1)$ ($1 \leq n \leq 11$). The lowest, middle, highest channel numbers of the EUT used and tested in this report are separately 1*



(2412MHz), 6 (2437MHz) and 11 (2462MHz).

For 802.11n(40MHz), the lowest, middle, highest channel numbers of the EUT used and tested in this report are separately 3 (2422MHz), 6 (2437MHz) and 9 (2452MHz).

NOTE 2:

For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacture.

2.4GHz Band WIFI Channel Information:

g: Ch No.	n20: Ch No.	n40: Ch No.	Center Frequency (MHz)
1	1		2412
2	2		2417
3	3	3	2422
4	4	4	2427
5	5	5	2432
6	6	6	2437
7	7	7	2442
8	8	8	2447
9	9	9	2452
10	10		2457
11	11		2462
11 Channels	11 Channels	7 Channels	



2. Facilities and Accreditations

2.1 Test Facility

Shanghai Skylabs Co., Ltd. (Skylabs Laboratory) is a third party testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L6644. FCC registered number is 196218. IC registered number is 21609

A 9*6*6(m) full/semi-anechoic chamber was used for the radiated emissions test.

2.2 Environmental Conditions

Ambient temperature: 15~35°C

Relative humidity: 30~60%

Atmosphere pressure: 86-106kPa

2.3 Measurement Uncertainty

The uncertainty is calculated using the methods suggested in the "Guide to the Expression of Uncertainty in Measurement" (GUM) published by ISO.

Uncertainty of Conducted Emission: $\pm 1.76\text{dB}$

Uncertainty of Radiated Emission: $\pm 3.16\text{dB}$



2.4 List of Equipments Used

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Service Simulator	Agilent	N4010A	MY47230669	2016.9.21	1year
Spectrum Analyzer	R&S	FSU26	200880	2016.2.25	1year
Power Splitter	Weinschel	1506A	NW521	(n.a.)	(n.a.)
Power Splitter	Mini-Circuits	ZFRSC-183-S+	76500F1016	(n.a.)	(n.a.)
Attenuator 1	Resnet	10dB	(n.a.)	(n.a.)	(n.a.)
Attenuator 2	Resnet	3dB	(n.a.)	(n.a.)	(n.a.)
Power Supplier	NF	ES2000S	9087735	2016.10.17	1year
Full/Semi-Anechoic Chamber	CHENGYU	9.2×6.25×6.15m	SAR	2016.04.11	3years
Shielding Room	CHENGYU	5m×4m×3m	CR	2016.04.11	3years
EMI Test Receiver	R&S	ESCI7	100787	2017.01.28	1year
Dual-line V-network	TESTQ	NNB 51	33285	2017.01.28	1year
Personal Computer	HP	6300P	CNG24296YW	(n.a.)	(n.a.)
Test Antenna-Horn	Schwarzbeck	BBHA9170	BBHA91970171	2016.9.21	1year
Broadband Trilog Antenna	Schwarzbeck	VULB 9163	9163-561	2016.07.25	2year
Test Antenna-Loop	Rohde&Schwarz	FMZB 1519	1519-025	2016.9.21	1year
Broadband Horn Antenna	Schwarzbeck	BBHA 9120 D	9120D-1033	2015.07.25	2year
EPM Series Power Meter	Agilent	E4418B	GB43318055	2016.5.23	1year
Power Sensor	Agilent	8482A	MY41091706	2016.5.23	1year
Temporary Antenna Connector	Farpu	SMA-K	(n.a.)	(n.a.)	(n.a.)
RF Cable	(n.a.)	0-25G	(n.a.)	(n.a.)	(n.a.)

NOTE:

Equipments listed above have been calibrated and are in the period of validation.

2.5 Accessories

NO.	Product	Brand	Model	Serial No.	Remark
1	Laptop PC	Lenovo	X200	44C0970	
2	Adaptor	Lenovo	42T4416	98N4A0	
3	USB Cable	CE—LINK	Type-C	N/A	



3. Test Standards and Results

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

FCC Part 15 Subpart C §15.247

ANSI C63.10-2013

June 2015 KDB558074

NOTE:

(1) All test items were verified and recorded according to the standards and without any deviation during the test.

(2) This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart C (WIFI, 2.4GHz ISM band radiators), recorded in a separate test report.

Test items and the results are as bellow:

No.	FCC Rules	Description	Result
1	15.203	Antenna Requirement	Pass
2	15.247(b)	Peak Output power	Pass
3	15.247(b)	Average power	Pass
4	15.247(a)	6dB Bandwidth	Pass
5	15.247(d)	Conducted Spurious Emission and Band Edge	Pass
6	15.247(d)	Restricted Frequency Bands	Pass
7	15.207	Conducted Emission	Pass
8	15.247(d) 15.209	Radiated Emission	Pass
9	15.247(e)	Power Spectral Density (PSD)	Pass



4. 47 CFR Part 15C

4.1 Antenna requirement

4.1.1 Applicable standard

According to FCC 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

4.1.2 Result: Compliant

The EUT has a permanently and irreplaceable attached antenna. Please refer to the EUT internal photos.



5. Test Result

5.1 Peak Output Power

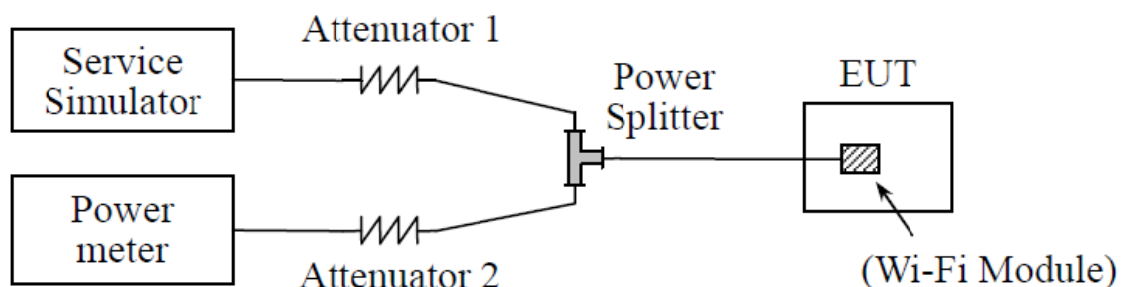
5.1.1 Requirement

According to FCC section 15.247(b)(3), For systems using digital modulation in the 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz bands: The maximum peak conducted output power of the intentional radiator shall not exceed 1 Watt.

5.1.2 Test Description

The measured output power was calculated by the reading of the spectrum analyzer and calibration.

A. Test Setup:



The EUT (Equipment under the test) is coupled to the Power Meter; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading, all test result in power meter.



5.1.3 Test Result

The lowest, middle and highest channels are selected to perform testing to verify the conducted RF output peak power of the Module. (Duty cycle > 98%)

A. Test Verdict:

Ant1

Mode	Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
			dBm	W	dBm	W	
802.11g	1	2412	24.20	0.26303	30	1	Pass
	6	2437	23.94	0.24774			Pass
	11	2462	23.80	0.23988			Pass
802.11n (20MHz)	1	2412	23.13	0.20559			Pass
	6	2437	23.40	0.21878			Pass
	11	2462	24.06	0.25468			Pass
802.11n (40MHz)	3	2422	24.29	0.26853			Pass
	6	2437	24.33	0.27102			Pass
	9	2452	25.19	0.33037			Pass

Ant2

Mode	Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
			dBm	W	dBm	W	
802.11g	1	2412	22.14	0.16368	30	1	Pass
	6	2437	22.30	0.16982			Pass
	11	2462	22.60	0.18197			Pass
802.11n (20MHz)	1	2412	21.30	0.13490			Pass
	6	2437	21.42	0.13868			Pass
	11	2462	21.64	0.14588			Pass
802.11n (40MHz)	3	2422	21.84	0.15276			Pass
	6	2437	21.77	0.15031			Pass
	9	2452	22.19	0.16558			Pass

Ant1+ Ant 2

Mode	Channel	Frequency (MHz)	Combined Output Peak Power		Limit		Verdict
			dBm	W	dBm	W	
802.11n (20MHz)	1	2412	25.32	0.340485	30	1	Pass
	6	2437	25.53	0.357452			Pass
	11	2462	26.03	0.400564			Pass
802.11n (40MHz)	3	2422	26.25	0.421291			Pass
	6	2437	26.25	0.421333			Pass
	9	2452	26.95	0.495947			Pass

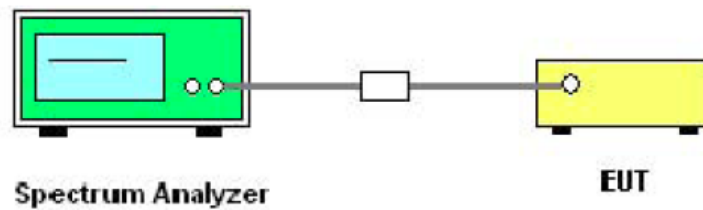


5.2 6dB Bandwidth

5.2.1 Requirement

According to FCC section 15.247(a) (2), Systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

5.2.2 Test Description



5.2.3 Test Result

The lowest, middle and highest channels are selected to perform testing to record the 6 dB bandwidth of the Module.

A. Test Verdict:

Ant1

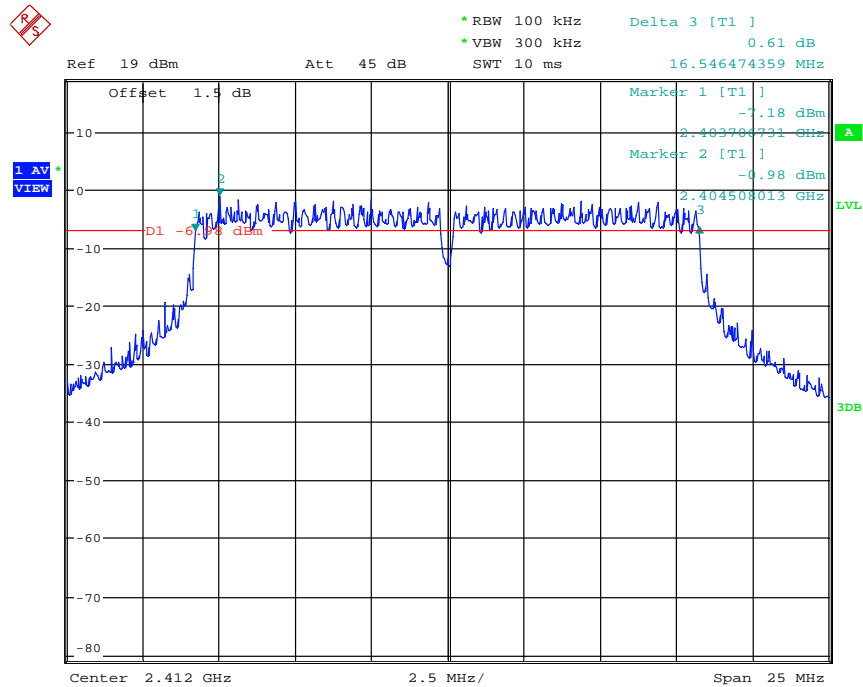
Test mode	Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Refer to plot	Limit (KHz)	Result
802.11g	1	2412	16.546	Plot A1	≥ 500	Pass
	6	2437	16.466	Plot B1		Pass
	11	2462	16.506	Plot C1		Pass
802.11n (20MHz)	1	2412	17.764	Plot D1		Pass
	6	2437	17.708	Plot E1		Pass
	11	2462	17.708	Plot F1		Pass
802.11n (40MHz)	3	2422	36.570	Plot G1		Pass
	6	2437	36.570	Plot H1		Pass
	9	2452	36.506	Plot I1		Pass



Ant2

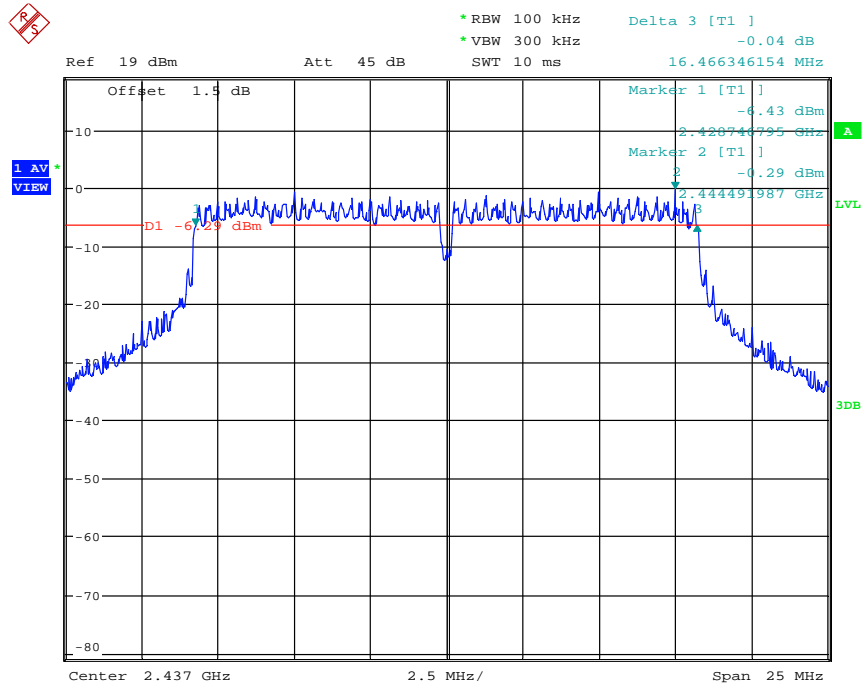
Test mode	Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Refer to plot	Limit (KHz)	Result
802.11g	1	2412	16.426	Plot A2	≥ 500	Pass
	6	2437	16.386	Plot B2		Pass
	11	2462	16.386	Plot C2		Pass
802.11n (20MHz)	1	2412	17.628	Plot D2		Pass
	6	2437	17.628	Plot E2		Pass
	11	2462	17.588	Plot F2		Pass
802.11n (40MHz)	3	2422	36.314	Plot G2		Pass
	6	2437	36.394	Plot H2		Pass
	9	2452	36.169	Plot I2		Pass

B. Test Plots:



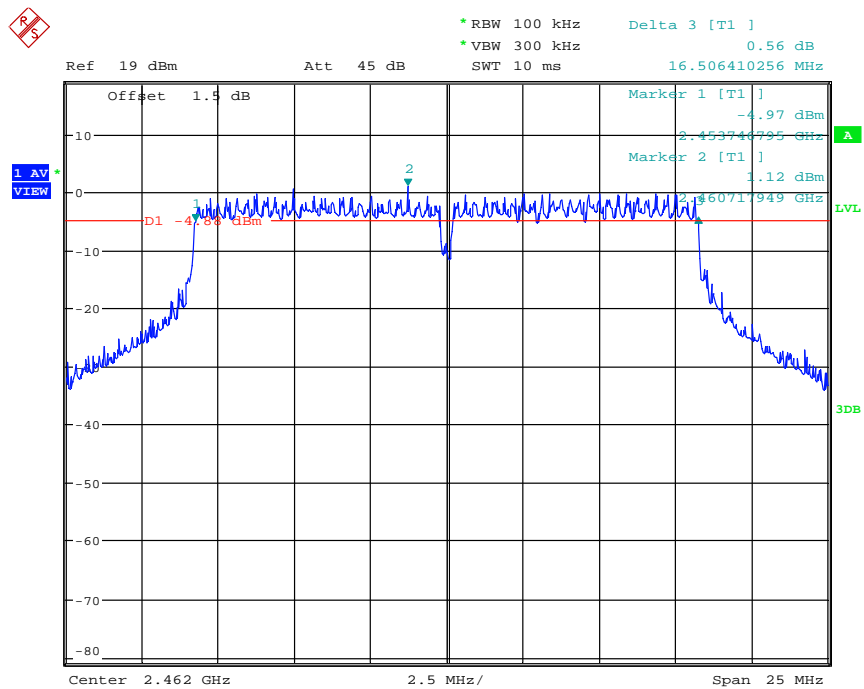
Date: 10.FEB.2017 17:48:00

Plot A1



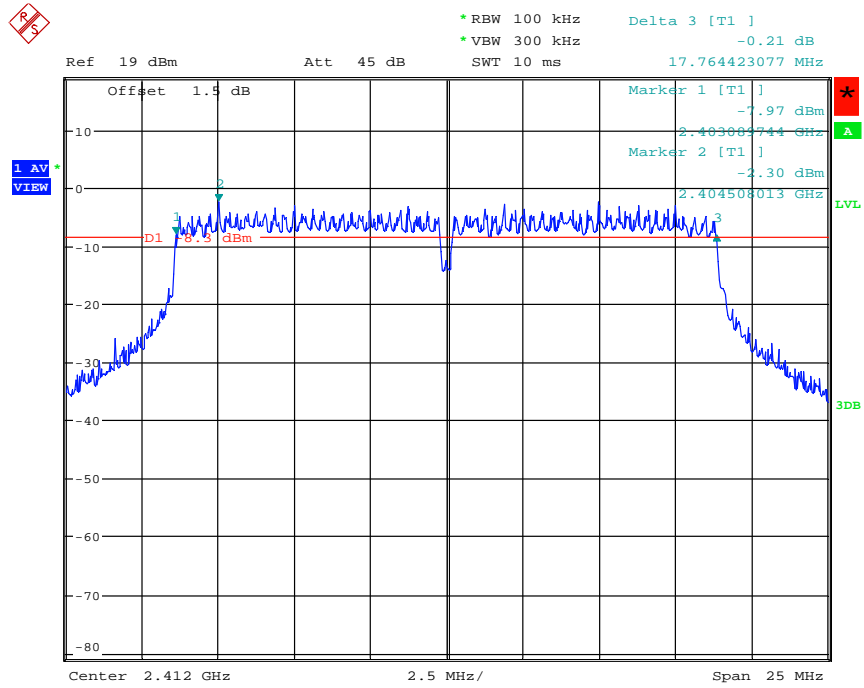
Date: 10.FEB.2017 17:46:38

Plot B1



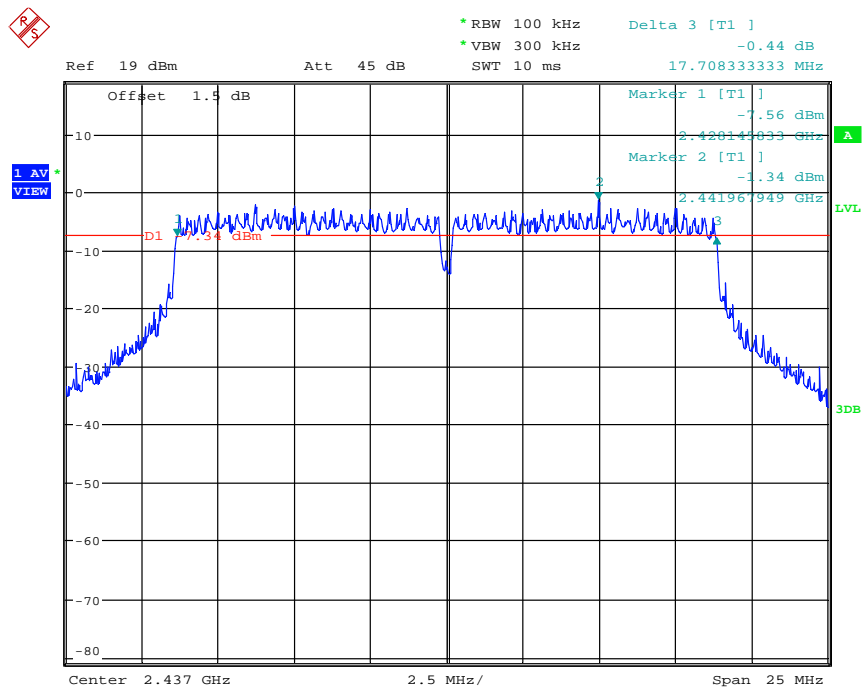
Date: 10.FEB.2017 17:45:44

Plot C1



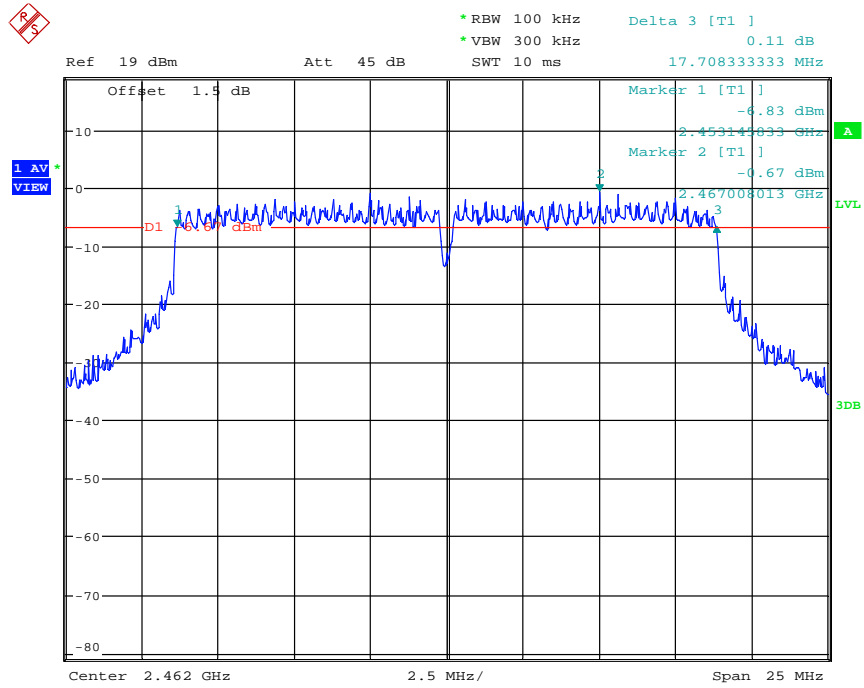
Date: 10.FEB.2017 17:41:33

Plot D1



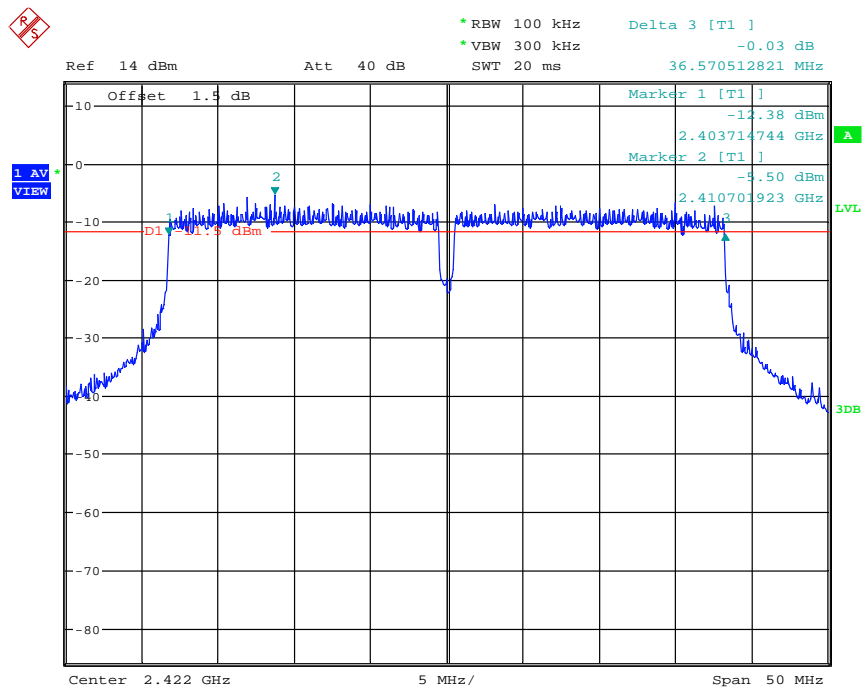
Date: 10.FEB.2017 17:42:35

Plot E1



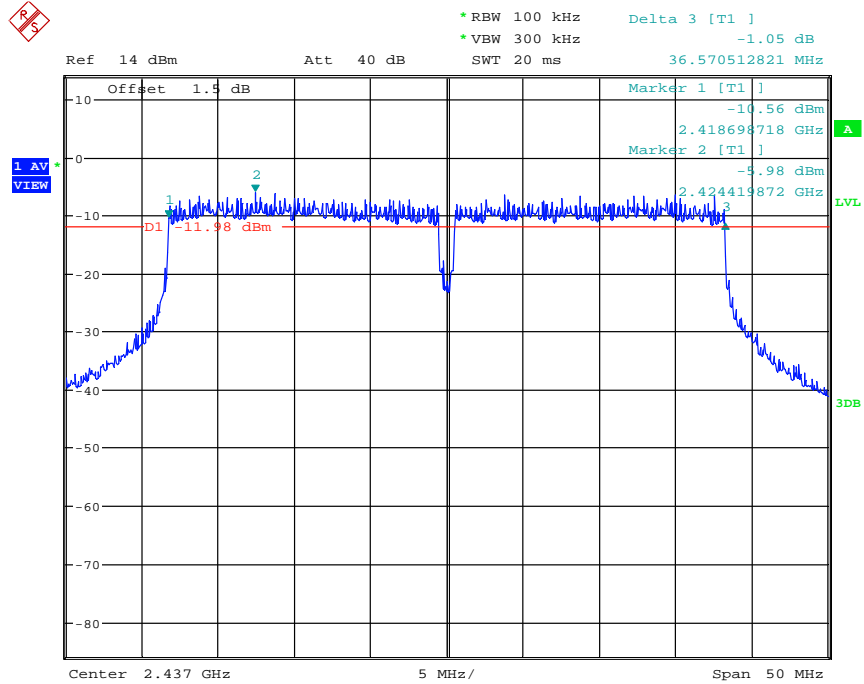
Date: 10.FEB.2017 17:44:03

Plot F1



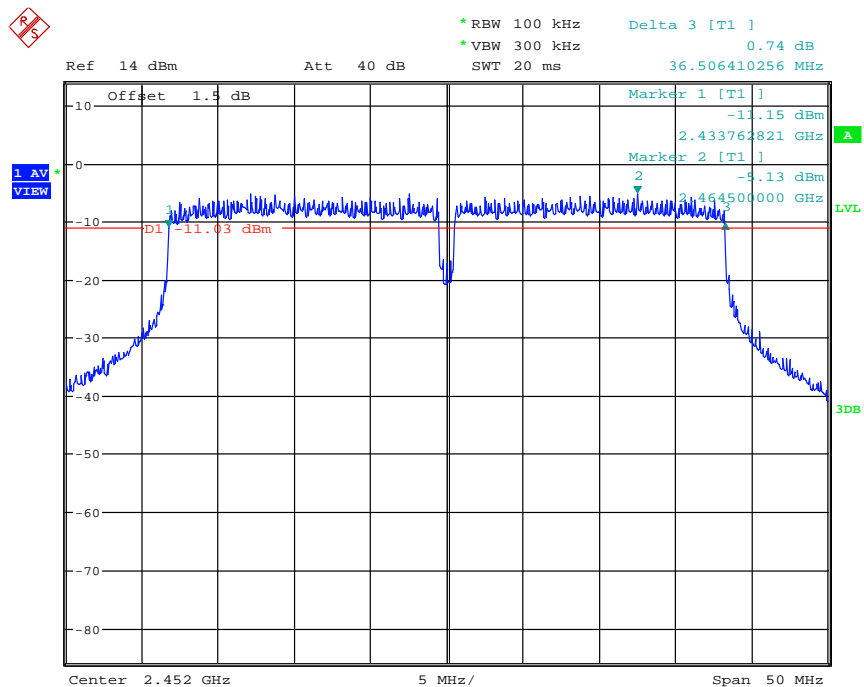
Date: 10.FEB.2017 17:39:57

Plot G1



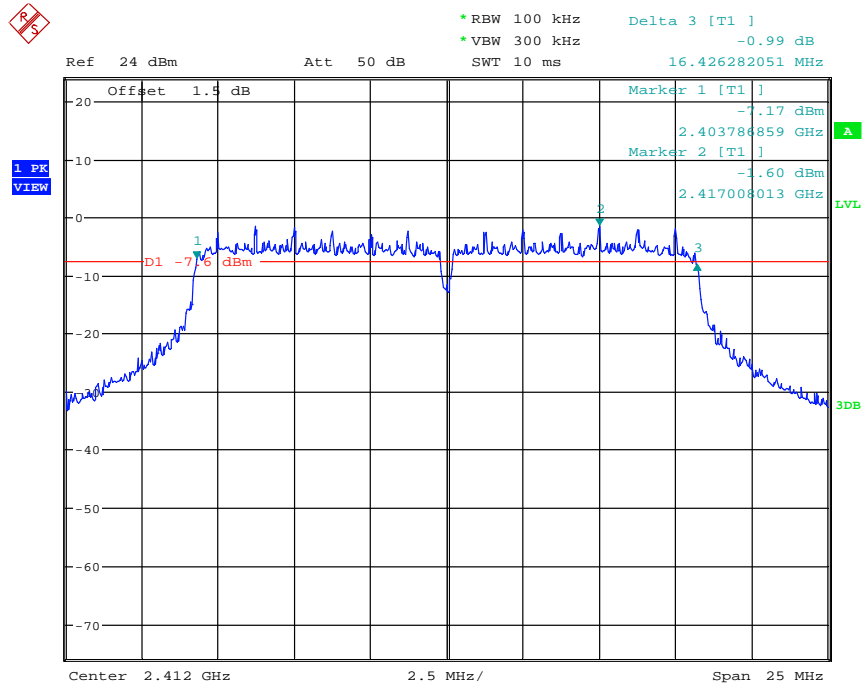
Date: 10.FEB.2017 17:38:53

Plot H1



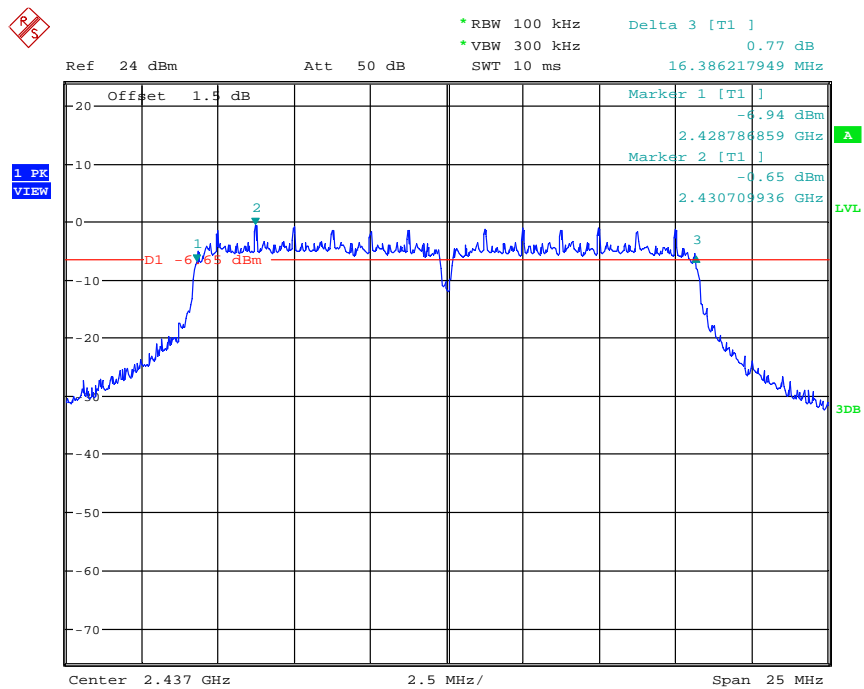
Date: 10.FEB.2017 17:37:48

Plot I1



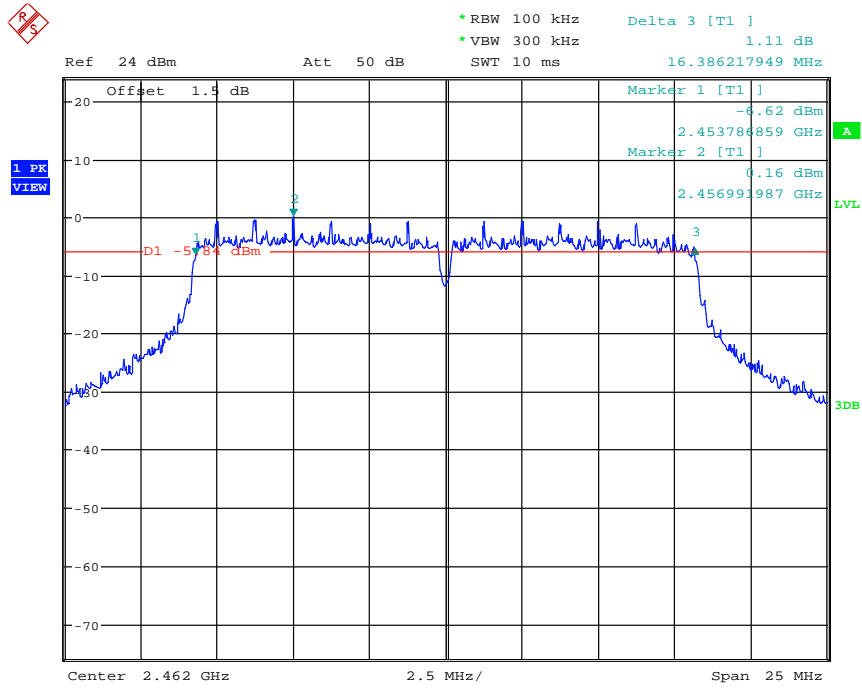
Date: 10.FEB.2017 18:49:34

Plot A2



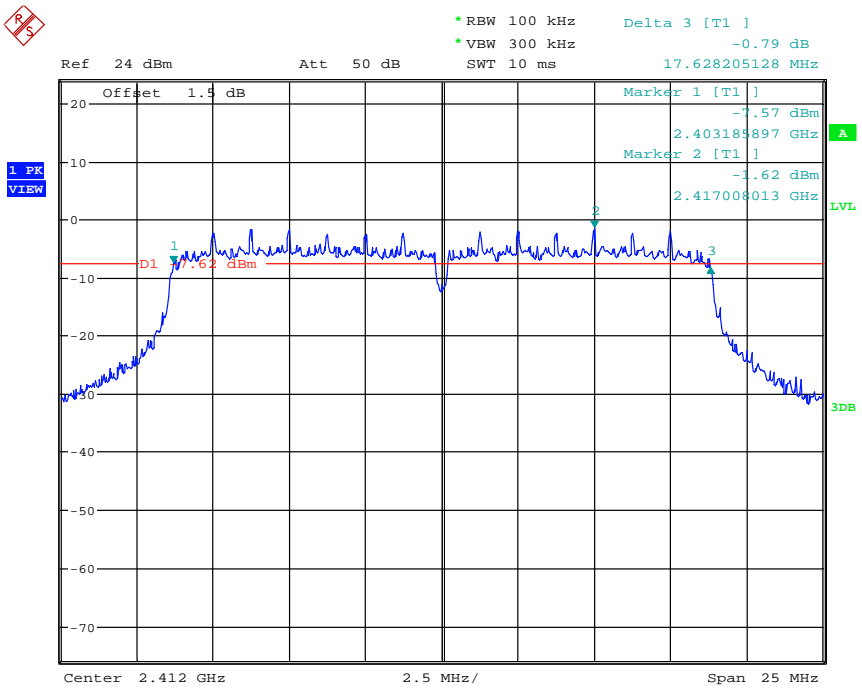
Date: 10.FEB.2017 18:48:37

Plot B2



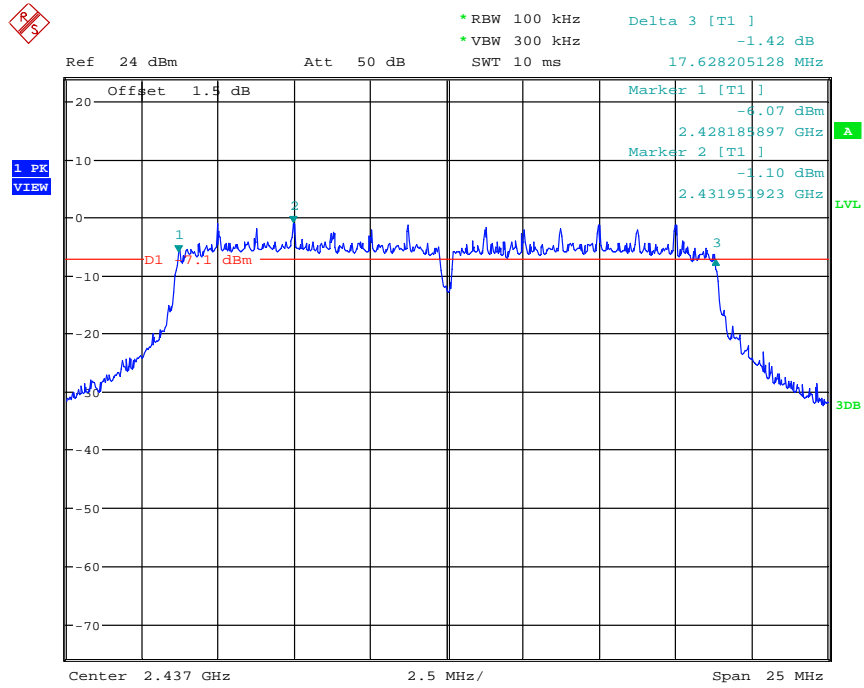
Date: 10.FEB.2017 18:47:20

Plot C2



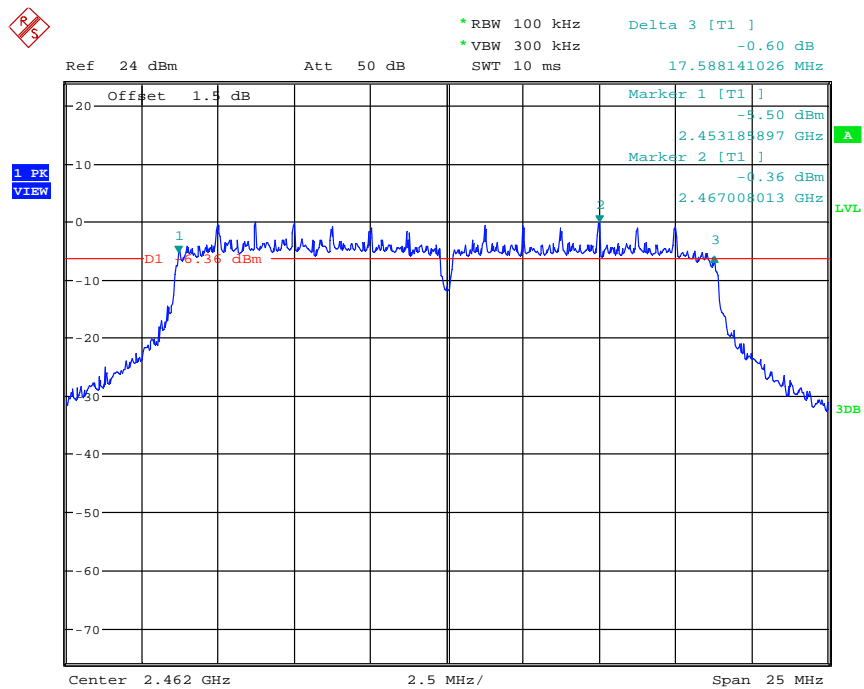
Date: 10.FEB.2017 18:40:56

Plot D2



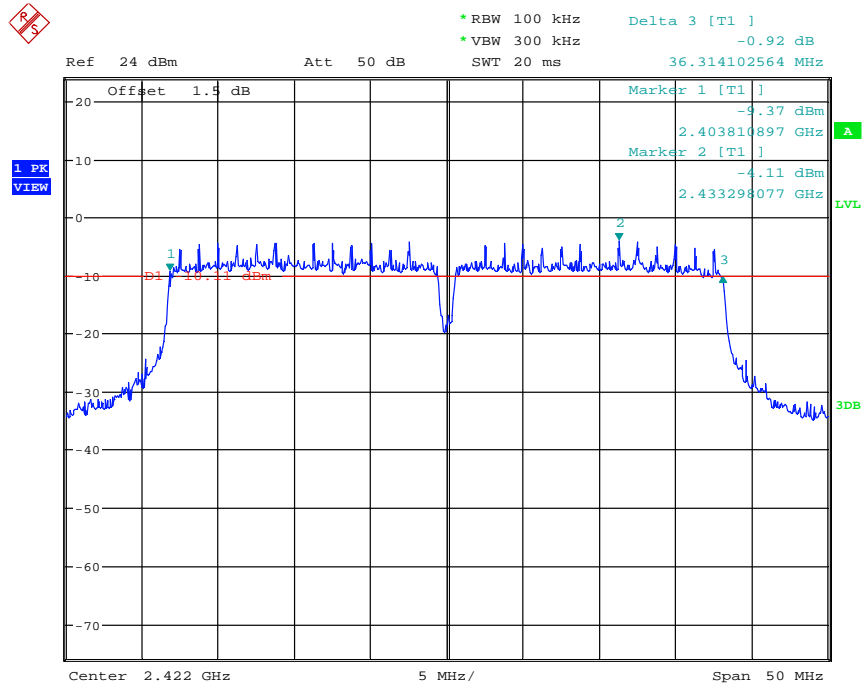
Date: 10.FEB.2017 18:41:59

Plot E2



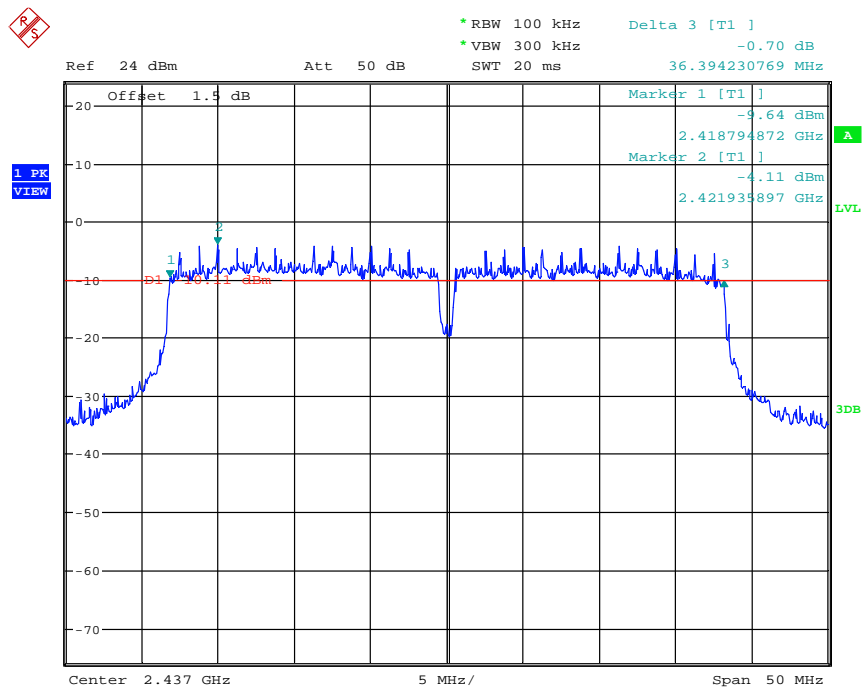
Date: 10.FEB.2017 18:46:12

Plot F2



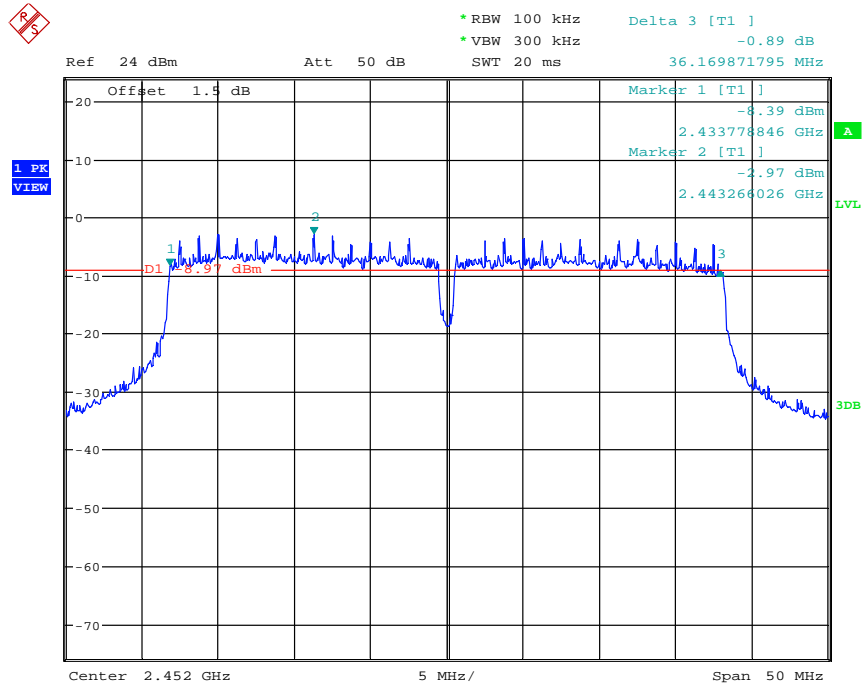
Date: 10.FEB.2017 18:37:52

Plot G2



Date: 10.FEB.2017 18:36:38

Plot H2



Date: 10.FEB.2017 18:35:21

Plot I2

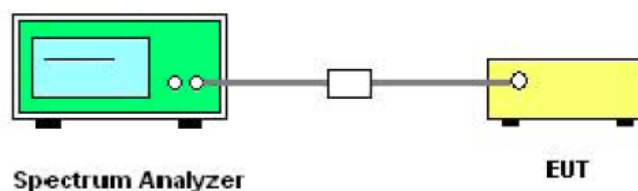


5.3 Conducted Spurious Emissions and Band Edge

5.3.1 Requirement

According to FCC section 15.247(d), in any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

5.3.2 Test Description



5.3.3 Test Result

The Wifi Module operates at hopping-off test mode. The measurement frequency range is from 30MHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions.

A. Test Verdict:

Ant1 802.11g Test mode

Channel	Frequency (MHz)	Measured max out of band emission(dBm)	Refer to plot	Limit(dBm)		Result
				Carrier level	Calculated 20dBc limit	
1	2412	-31.69	Plot A1/A2	1.08	-18.92	Pass
6	2437	-34.04	Plot B	0.47	-19.53	Pass
11	2462	-36.47	Plot C1/C2	0.46	-19.54	Pass

Ant1 802.11n (20MHz) Test mode

Channel	Frequency (MHz)	Measured max out of band emission(dBm)	Refer to plot	Limit(dBm)		Result
				Carrier level	Calculated 20dBc limit	
1	2412	-32.47	Plot D1/D2	-1.29	-21.29	Pass
6	2437	-34.77	Plot E	-0.75	-20.75	Pass
11	2462	-36.27	Plot F1/F2	-0.61	-20.61	Pass



Ant1 802.11n (40MHz) Test mode

Channel	Frequency (MHz)	Measured max out of band emission(dBm)	Refer to plot	Limit(dBm)		Result
				Carrier level	Calculated 20dBc limit	
3	2422	-32.75	Plot G1/G2	-1.96	-21.96	Pass
6	2437	-34.60	Plot H	-1.86	-21.86	Pass
9	2452	-34.19	Plot I1/I2	-0.94	-20.94	Pass

Ant2 802.11g Test mode

Channel	Frequency (MHz)	Measured max out of band emission(dBm)	Refer to plot	Limit(dBm)		Result
				Carrier level	Calculated 20dBc limit	
1	2412	-31.51	Plot J1/J2	-1.51	-21.51	Pass
6	2437	-31.49	Plot K	-2.41	-22.41	Pass
11	2462	-31.54	Plot L1/L2	0.04	-19.96	Pass

Ant2 802.11n (20MHz) Test mode

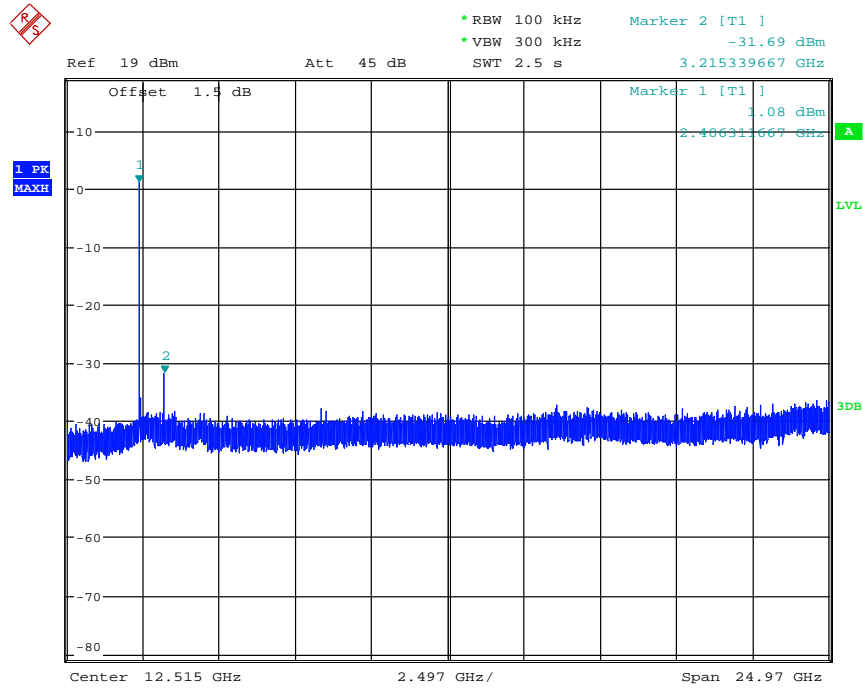
Channel	Frequency (MHz)	Measured max out of band emission(dBm)	Refer to plot	Limit(dBm)		Result
				Carrier level	Calculated 20dBc limit	
1	2412	-31.85	Plot M1/M2	-2.04	-22.04	Pass
6	2437	-31.98	Plot N	-2.29	-22.29	Pass
11	2462	-31.29	Plot O1/O2	-1.84	-21.84	Pass

Ant2 802.11n (40MHz) Test mode

Channel	Frequency (MHz)	Measured max out of band emission(dBm)	Refer to plot	Limit(dBm)		Result
				Carrier level	Calculated 20dBc limit	
3	2422	-32.30	Plot P1/P2	-3.93	-23.93	Pass
6	2437	-31.50	Plot Q	-4.23	-24.23	Pass
9	2452	-31.75	Plot R1/R2	-3.62	-23.62	Pass

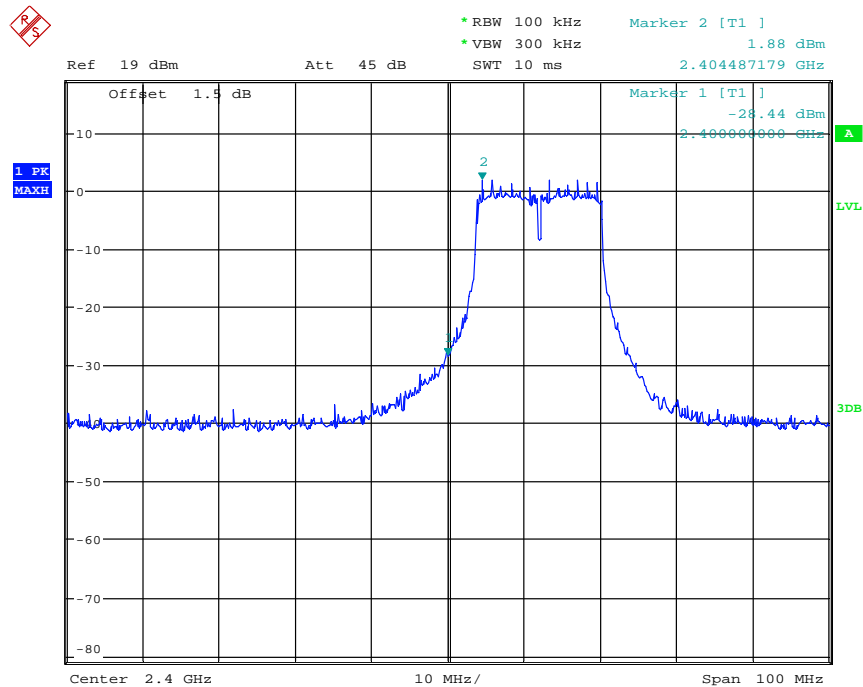


B. Test Plot:



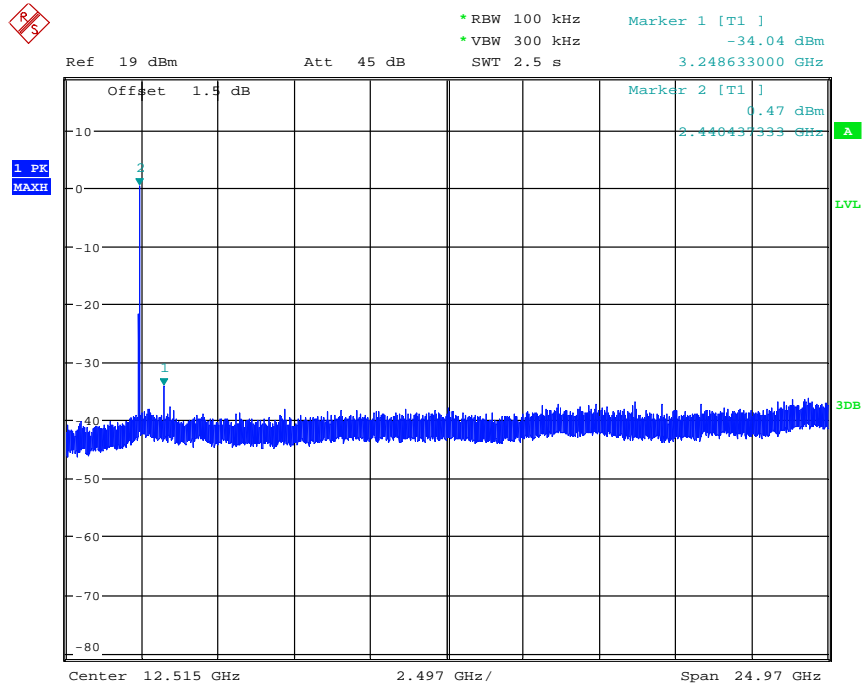
Date: 10.FEB.2017 18:08:03

Plot A1 Ant1 802.11g Channel 1 30MHz~25GHz



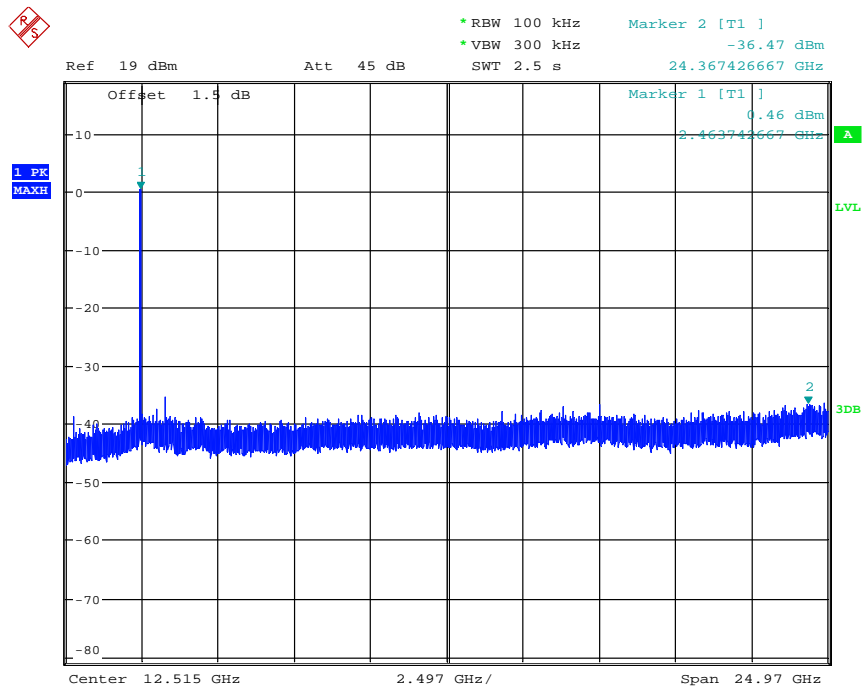
Date: 10.FEB.2017 18:13:14

Plot A2 Ant1 802.11g Channel 1 Band Edge



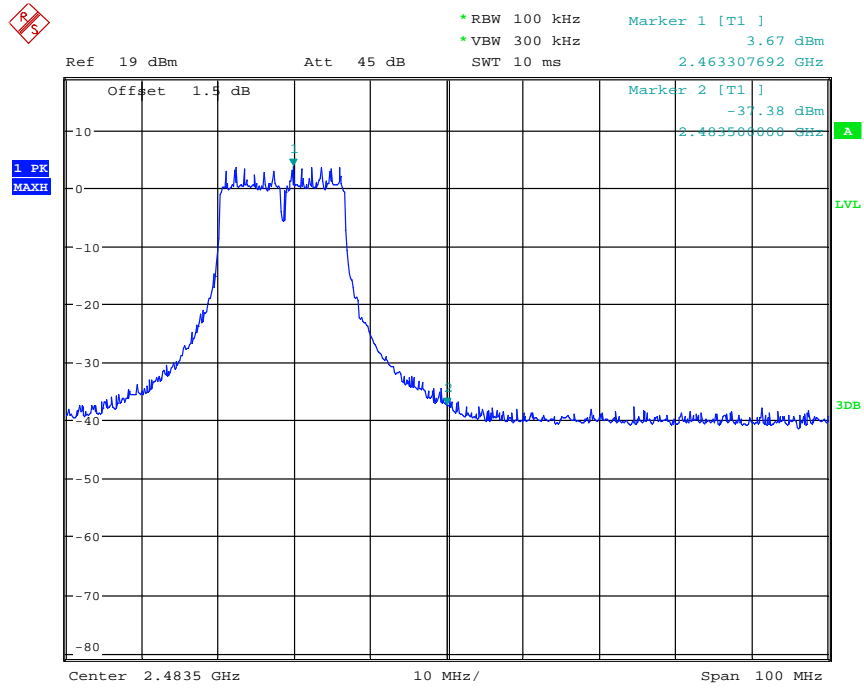
Date: 10.FEB.2017 18:09:18

Plot B Ant1 802.11g Channel 6 30MHz~25GHz



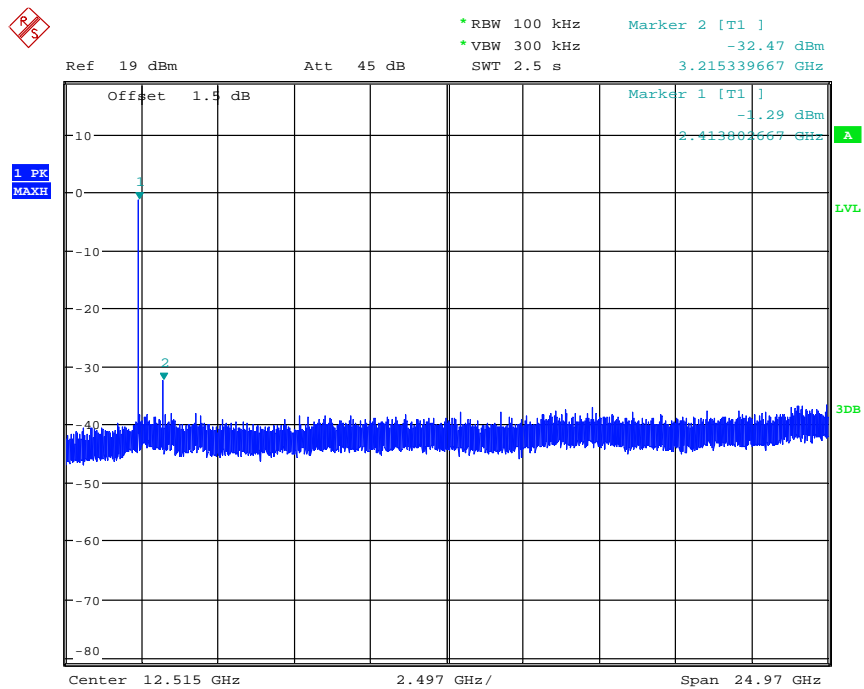
Date: 10.FEB.2017 18:09:57

Plot C1 Ant1 802.11g Channel 11 30MHz~25GHz



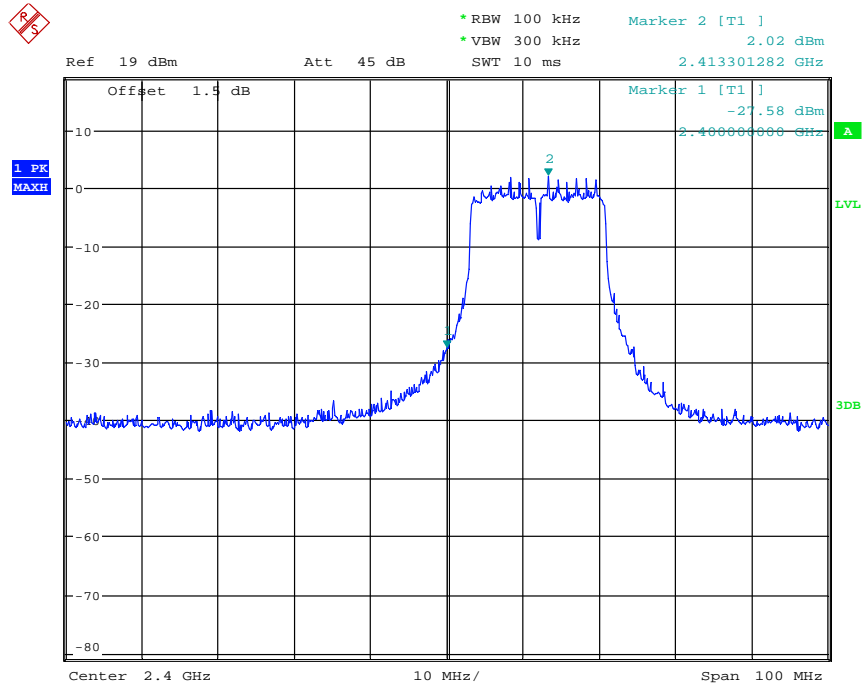
Date: 10.FEB.2017 18:11:15

Plot C2 Ant1 802.11g Channel 11 Band Edge



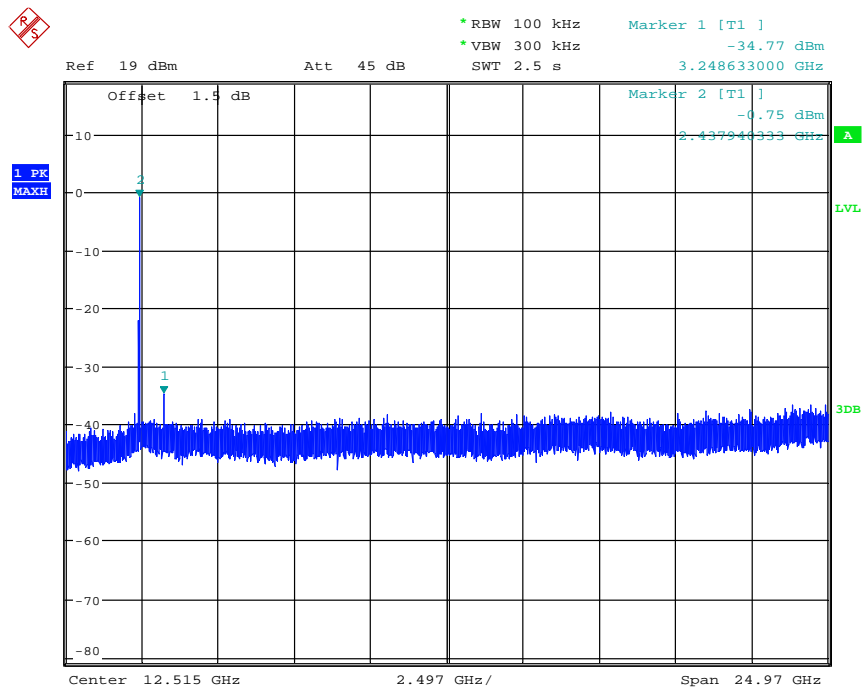
Date: 10.FEB.2017 18:05:29

Plot D1 Ant1 802.11n-20 Channel 1 30MHz~25GHz



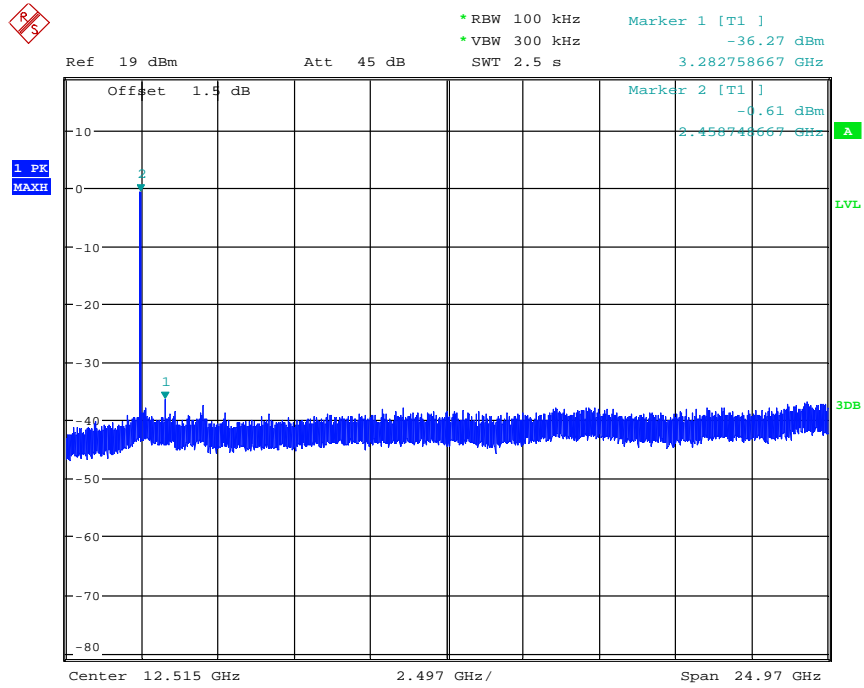
Date: 10.FEB.2017 18:13:37

Plot D2 Ant1 802.11n-20 Channel 1 Band Edge



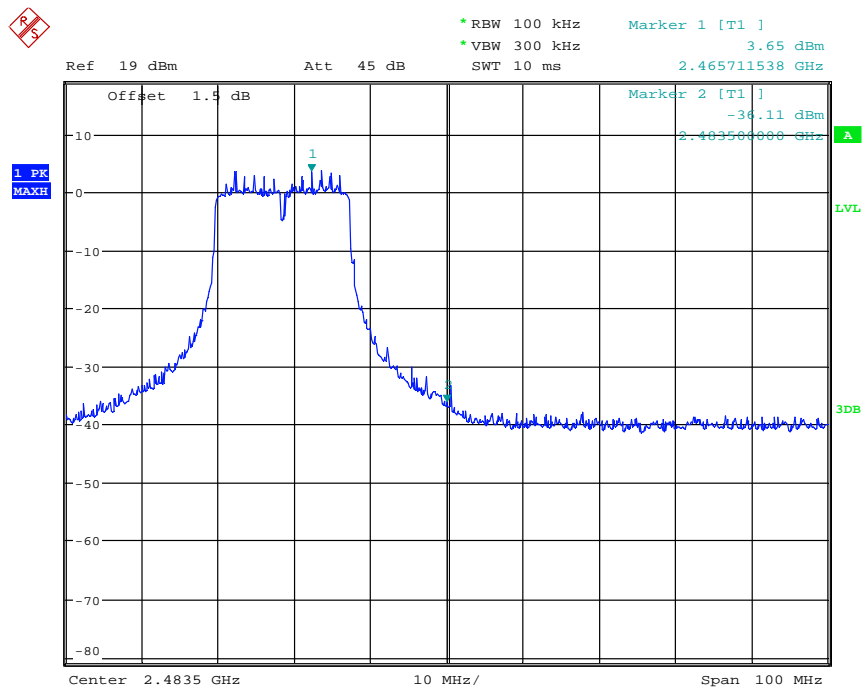
Date: 10.FEB.2017 18:06:05

Plot E Ant1 802.11n-20 Channel 6 30MHz~25GHz



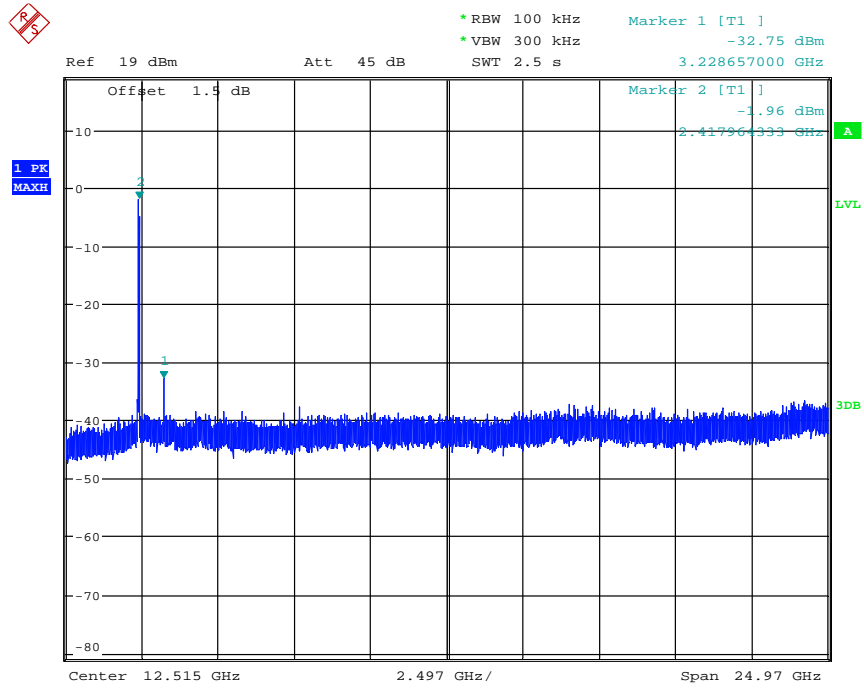
Date: 10.FEB.2017 18:06:56

Plot F1 Ant1 802.11n-20 Channel 11 30MHz~25GHz



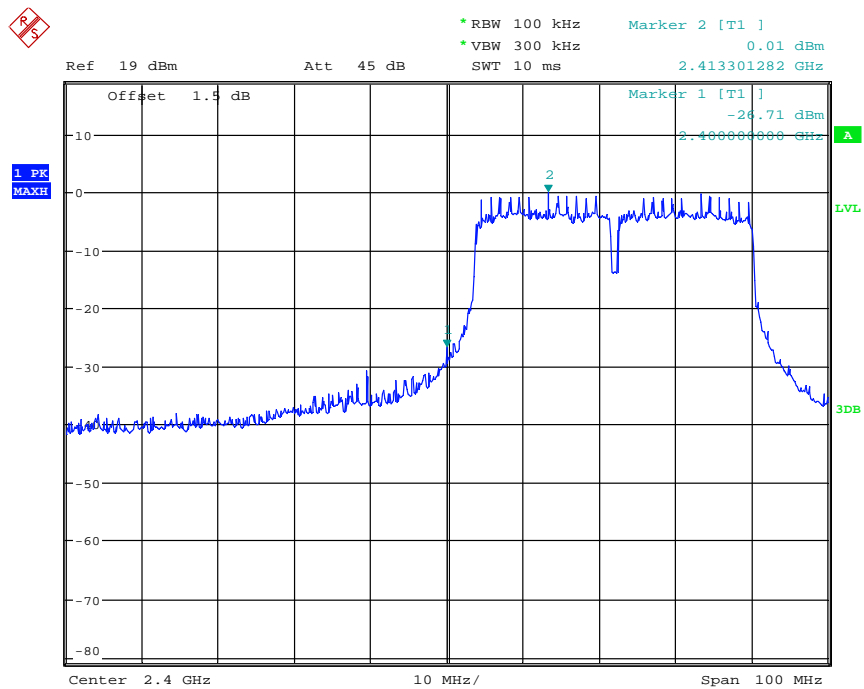
Date: 10.FEB.2017 18:11:53

Plot F2 Ant1 802.11n-20 Channel 11 Band Edge



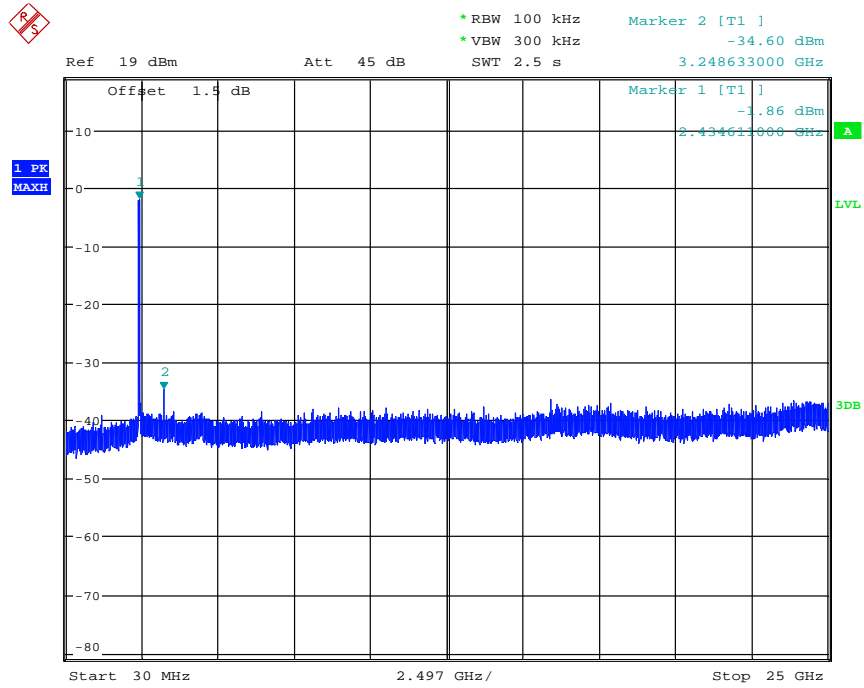
Date: 10.FEB.2017 18:04:49

Plot G1 Ant1 802.11n-40 Channel 3 30MHz~25GHz



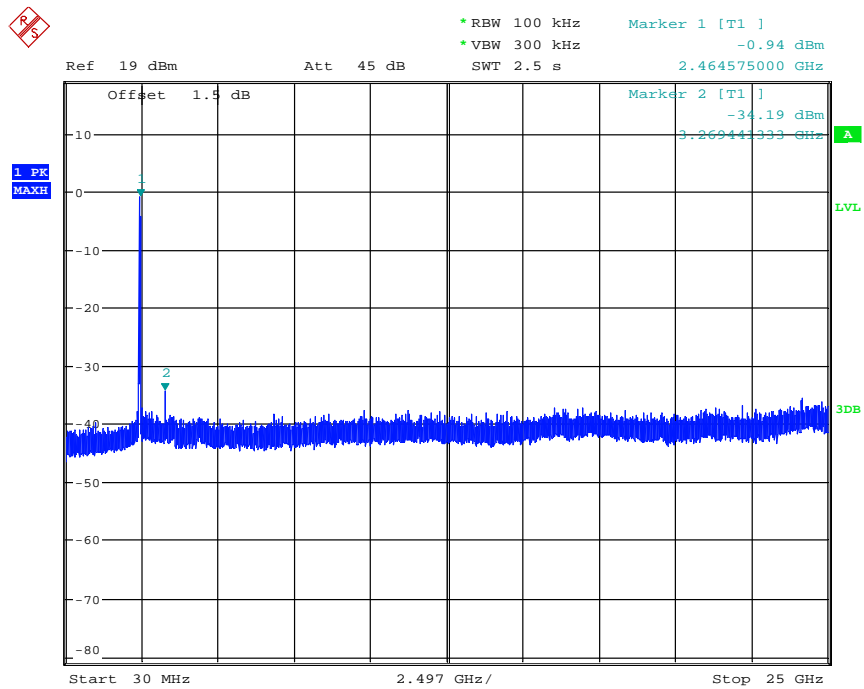
Date: 10.FEB.2017 18:14:00

Plot G2 Ant1 802.11n-40 Channel 3 Band Edge



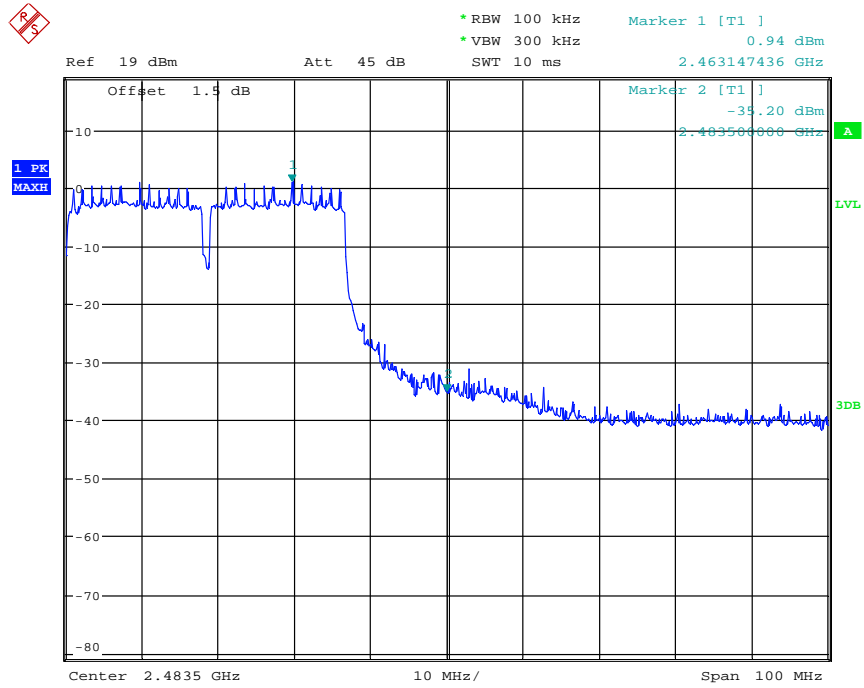
Date: 10.FEB.2017 18:04:01

Plot H Ant1 802.11n-40 Channel 6 30MHz~25GHz



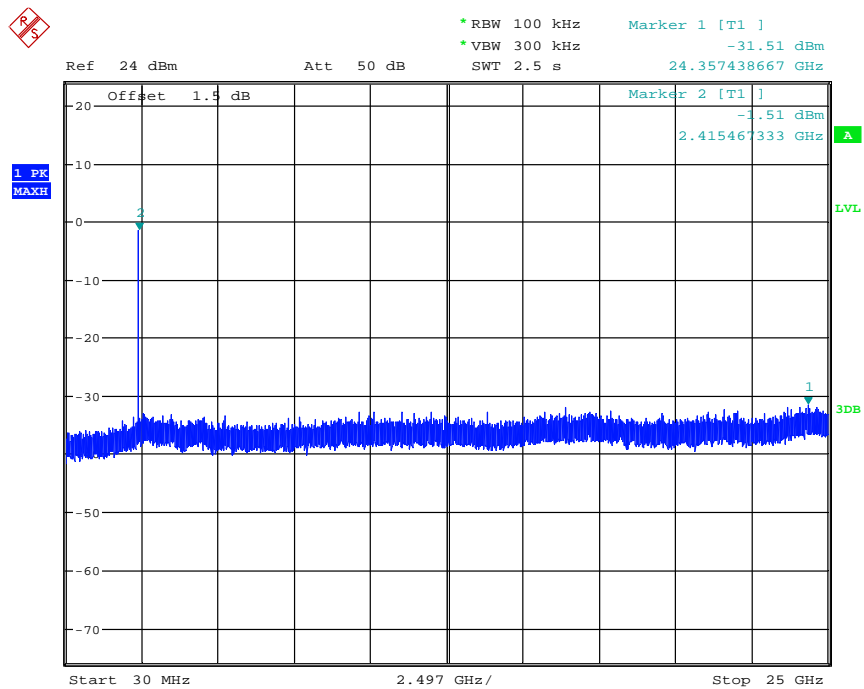
Date: 10.FEB.2017 18:02:15

Plot I1 Ant1 802.11n-40 Channel 9 30MHz~25GHz



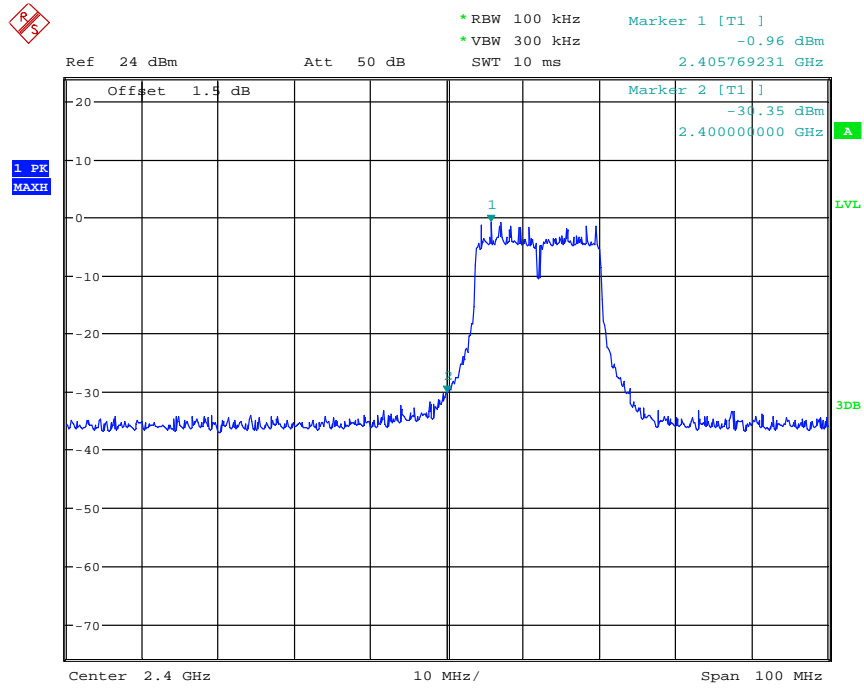
Date: 10.FEB.2017 18:12:35

Plot I2 Ant1 802.11n-40 Channel 9 Band Edge



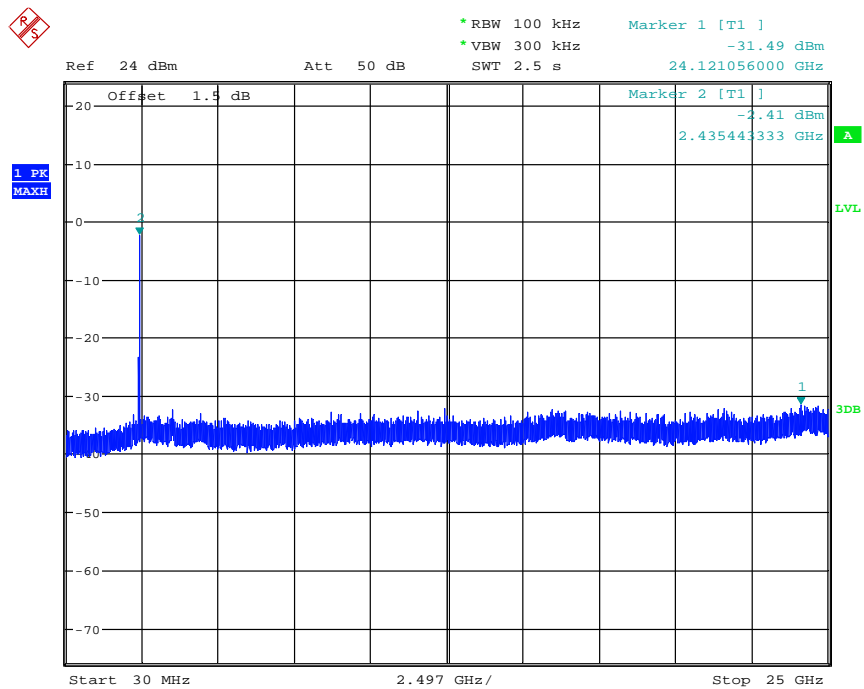
Date: 10.FEB.2017 19:27:23

Plot J1 Ant2 802.11g Channel 1 30MHz~25GHz



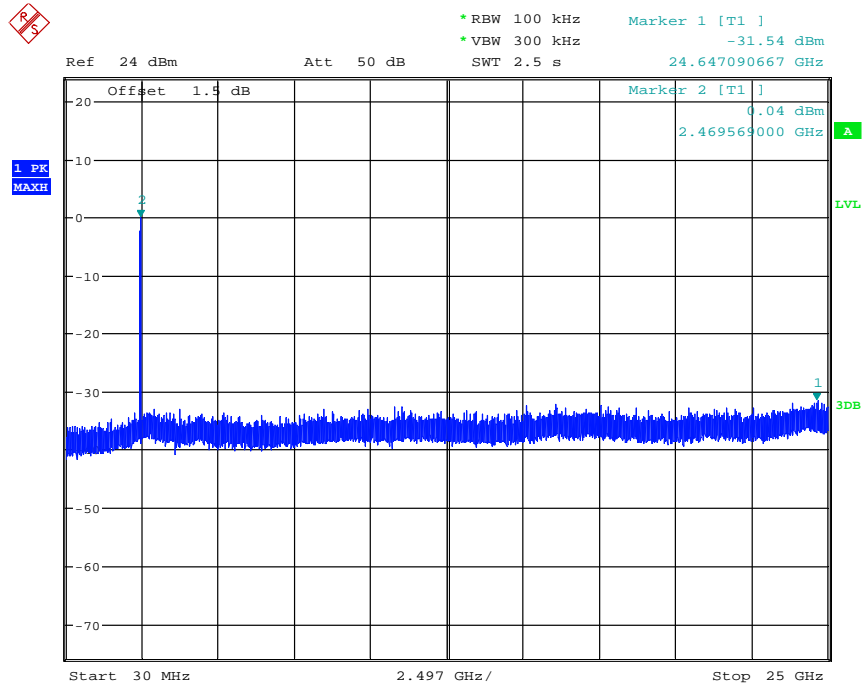
Date: 10.FEB.2017 19:32:57

Plot J2 Ant2 802.11g Channel 1 Band Edge



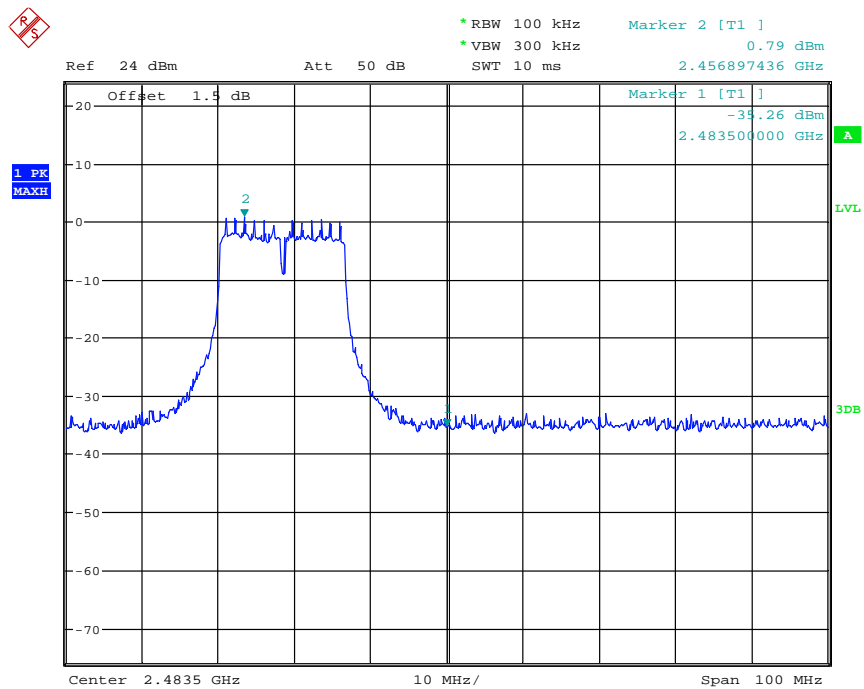
Date: 10.FEB.2017 19:28:40

Plot K 8 Ant2 02.11g Channel 6 30MHz~25GHz



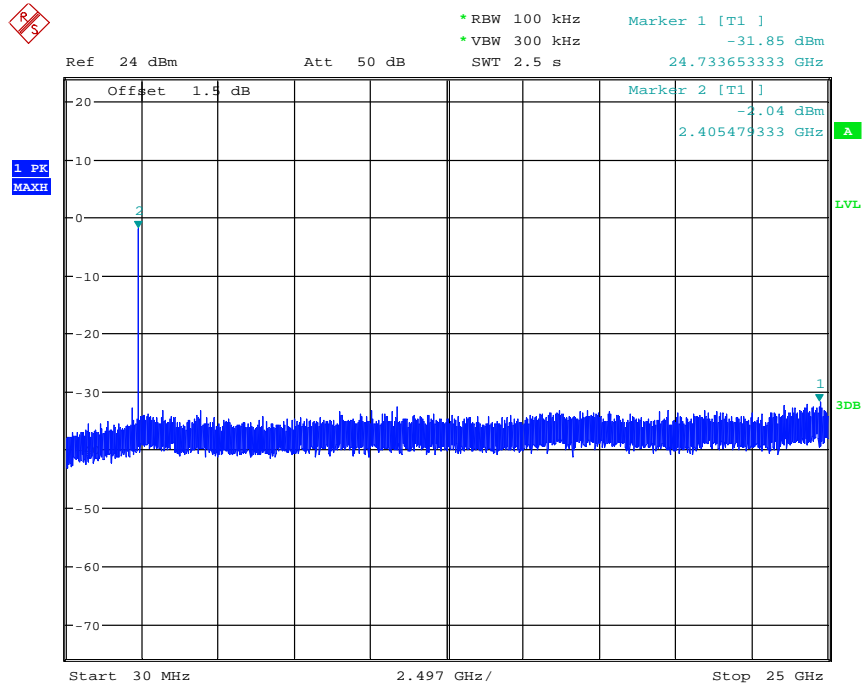
Date: 10.FEB.2017 19:29:40

Plot L1 Ant2 802.11g Channel 11 30MHz~25GHz



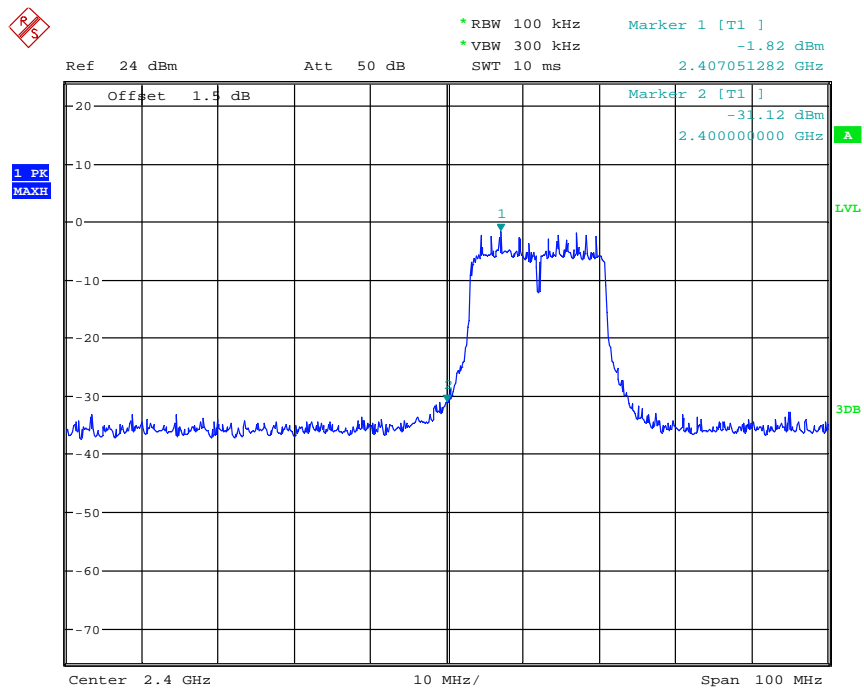
Date: 10.FEB.2017 19:30:30

Plot L2 Ant2 802.11g Channel 11 Band Edge



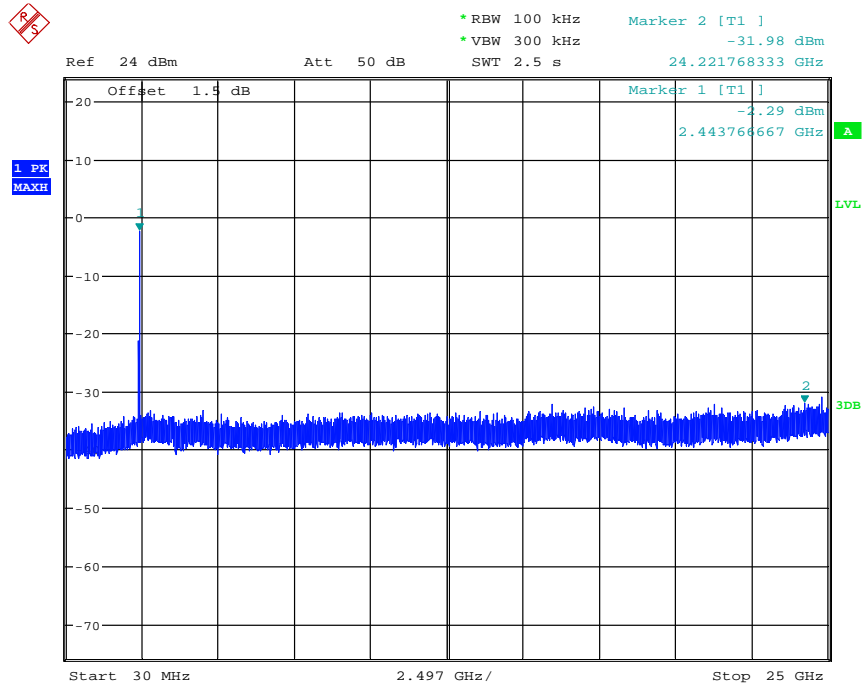
Date: 10.FEB.2017 19:15:38

Plot M1 Ant2 802.11n-20 Channel 1 30MHz~25GHz



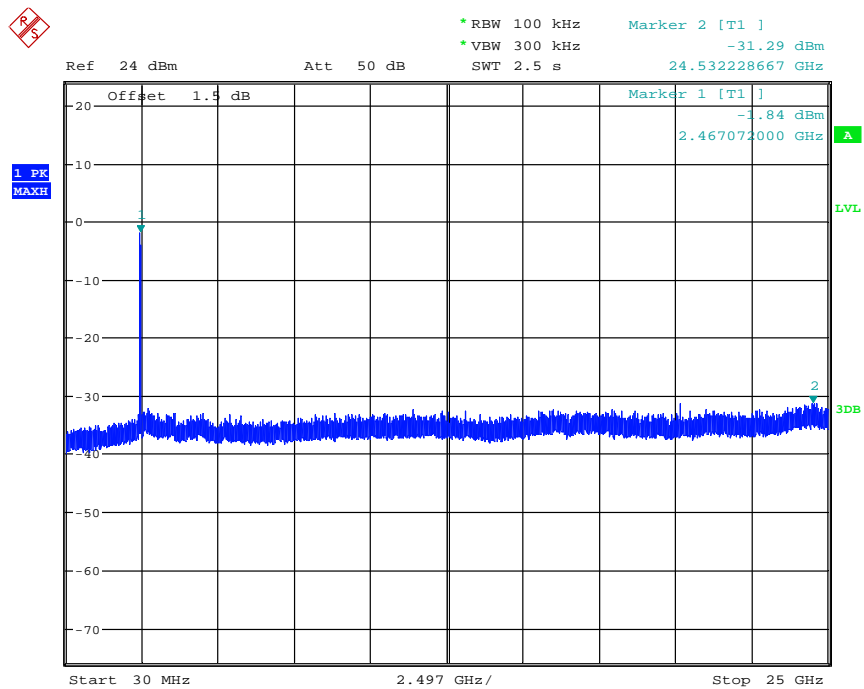
Date: 10.FEB.2017 19:33:21

Plot M2 Ant2 802.11 n-20 Channel 1 Band Edge



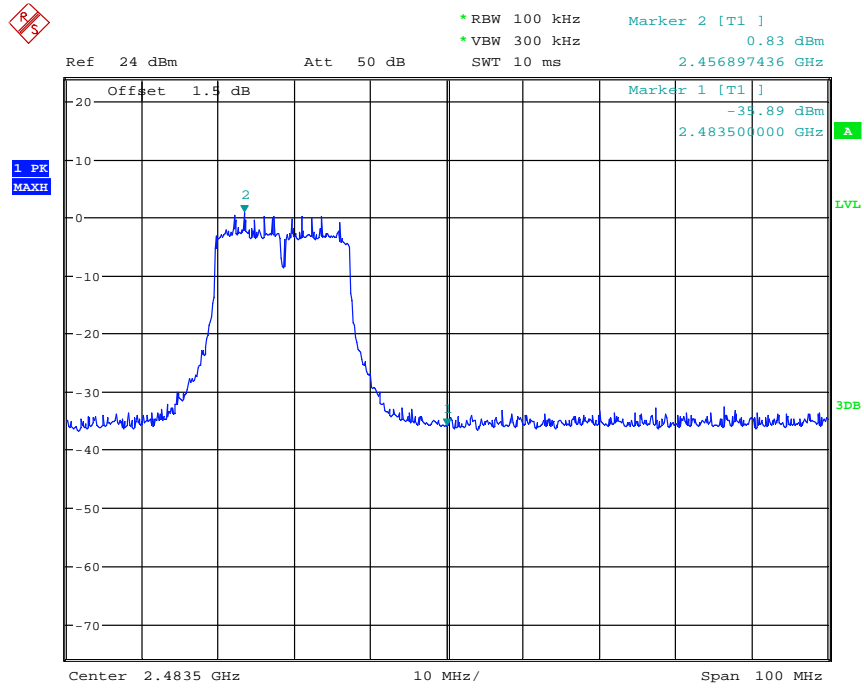
Date: 10.FEB.2017 19:24:54

Plot N Ant2 802.11n-20 Channel 6 30MHz~25GHz



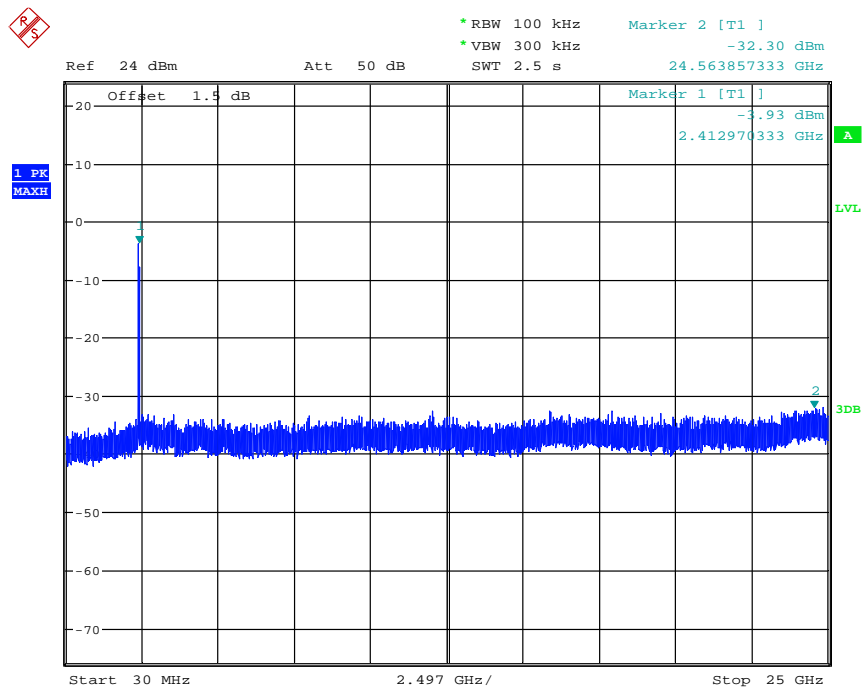
Date: 10.FEB.2017 19:23:21

Plot O1 Ant2 802.11n-20 Channel 11 30MHz~25GHz



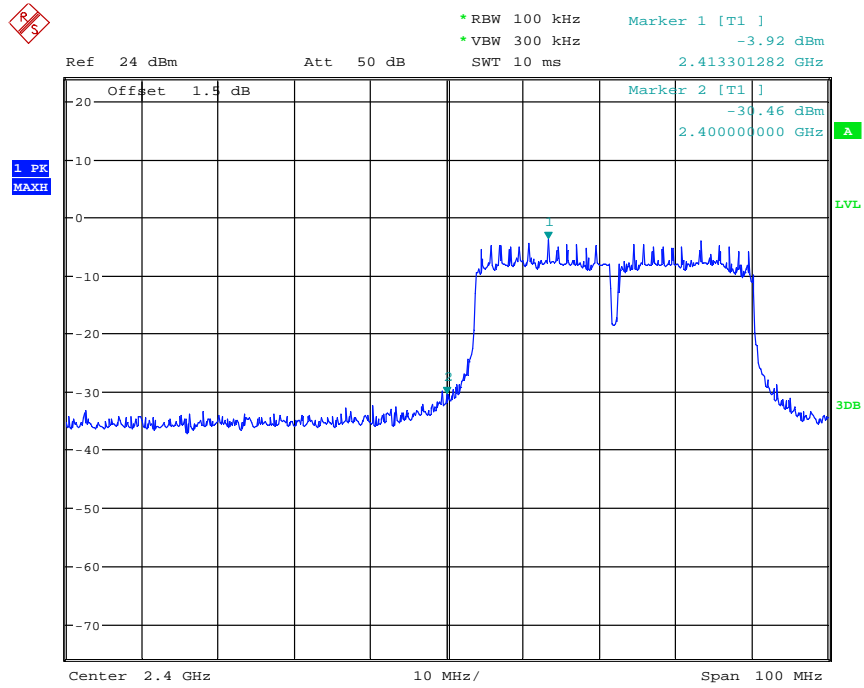
Date: 10.FEB.2017 19:31:08

Plot O2 Ant2 802.11n-20 Channel 11 Band Edge



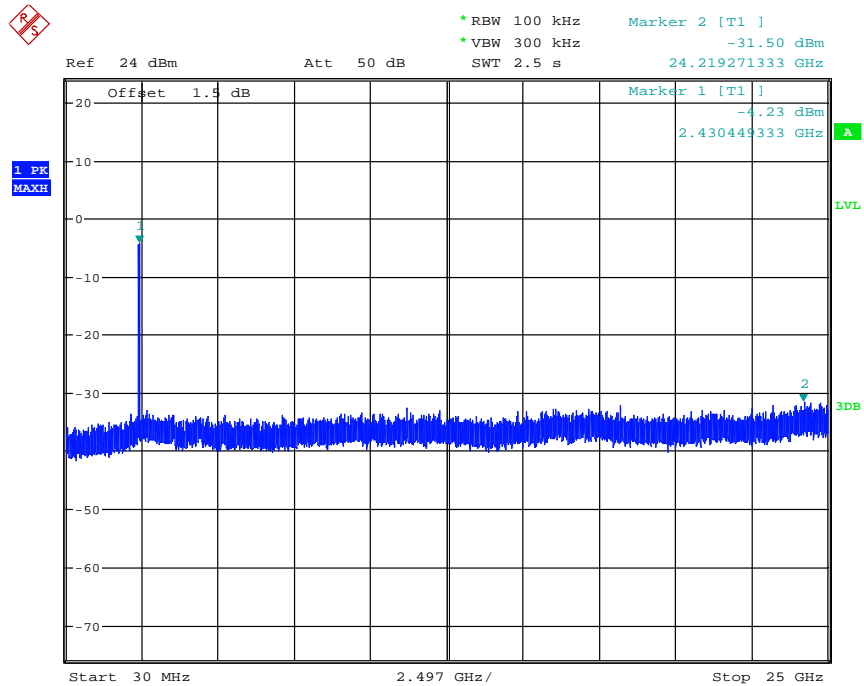
Date: 10.FEB.2017 19:14:54

Plot P1 Ant2 802.11n-40 Channel 3 30MHz~25GHz



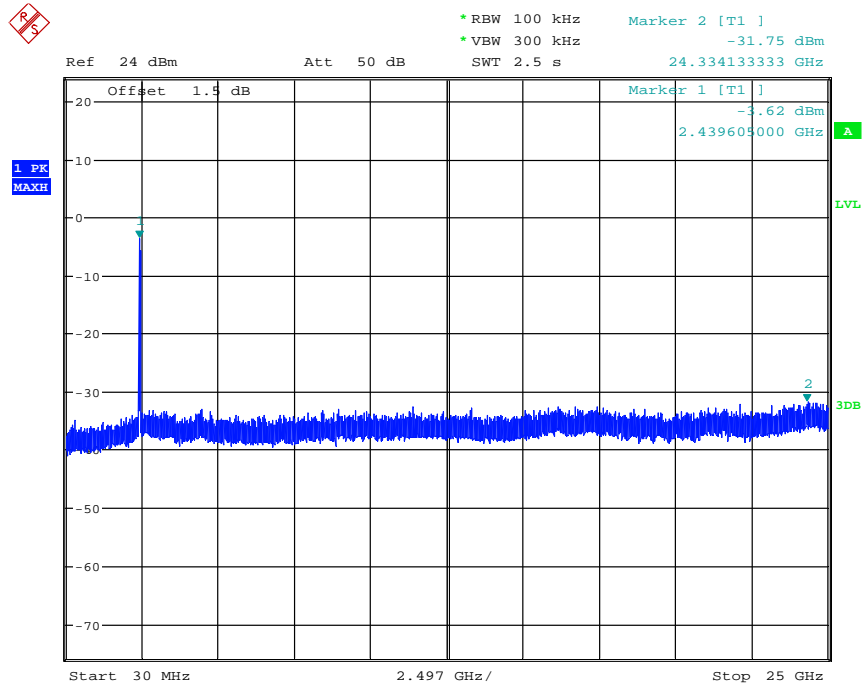
Date: 10.FEB.2017 19:33:47

Plot P2 Ant2 802.11n-40 Channel 3 Band Edge



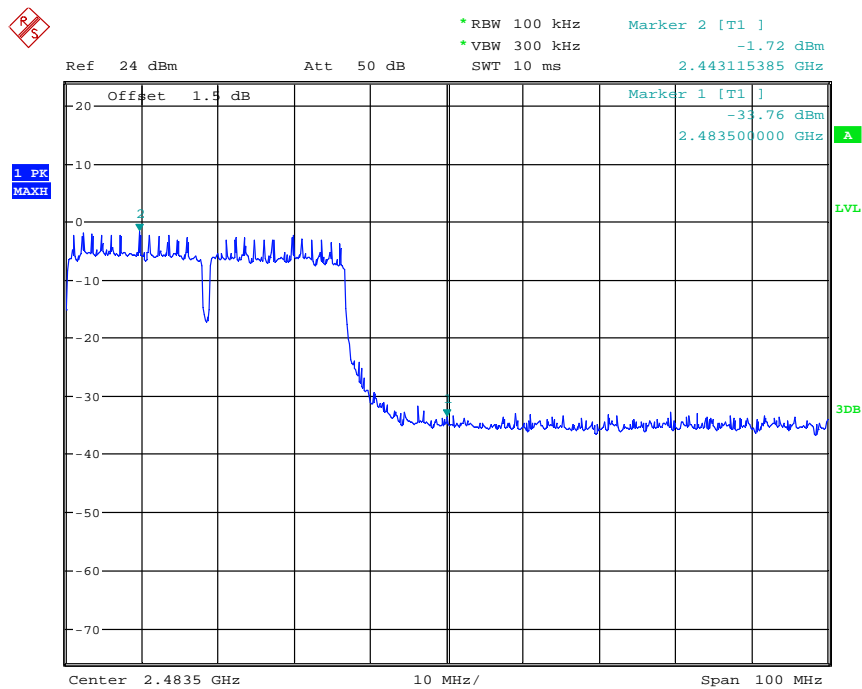
Date: 10.FEB.2017 19:14:09

Plot Q Ant2 802.11n-40 Channel 6 30MHz~25GHz



Date: 10.FEB.2017 19:12:50

Plot R1 Ant2 802.11n-40 Channel 9 30MHz~25GHz



Date: 10.FEB.2017 19:31:39

Plot R2 Ant2 802.11n-40 Channel 9 Band Edge

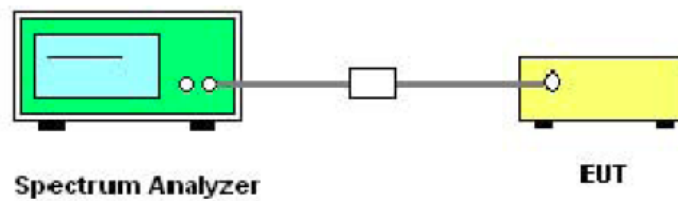


5.4 Power Spectral Density (PSD)

5.4.1 Requirement

According to FCC section 15.247(e), the same method of determining the conducted output power shall be used to determine the power spectral density. If a peak output power is measured, then a peak power spectral density measurement is required. If an average output power is measured, then an average power spectral density measurement should be used

5.4.2 Test Description



5.4.3 Test Result

A. Test Verdict

Ant1

Test mode	Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)	Refer to plot	Limit (dBm/3kHz)	Result
802.11g	1	2412	-11.36	Plot A1	8	Pass
	6	2437	-11.21	Plot B1		Pass
	11	2462	-8.90	Plot C1		Pass
802.11n (20MHz)	1	2412	-11.35	Plot D1		Pass
	6	2437	-11.17	Plot E1		Pass
	11	2462	-11.19	Plot F1		Pass
802.11n (40MHz)	3	2422	-15.28	Plot G1		Pass
	6	2437	-15.03	Plot H1		Pass
	9	2452	-13.83	Plot I1		Pass



Ant2

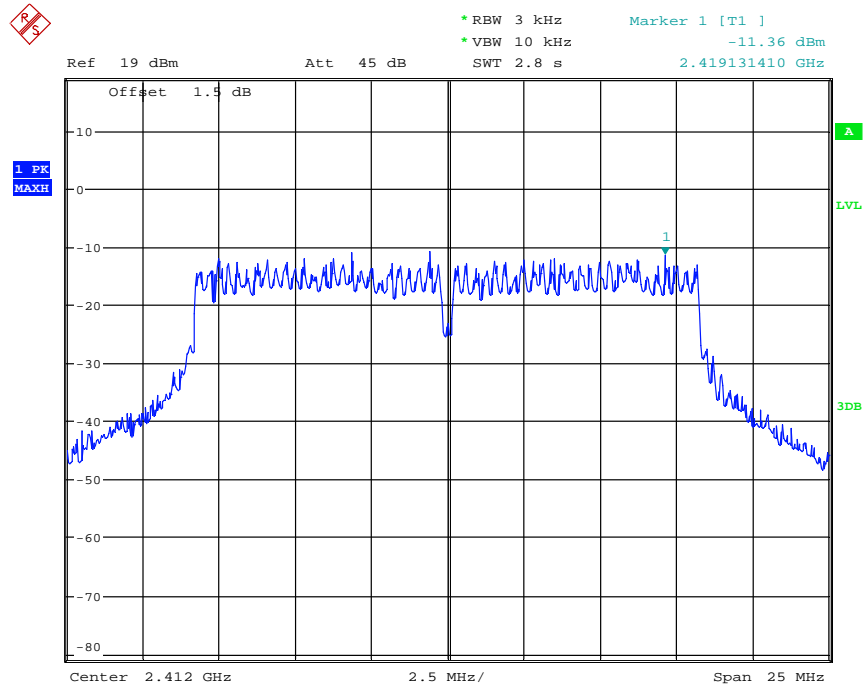
Test mode	Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)	Refer to plot	Limit (dBm/3kHz)	Result
802.11g	1	2412	-13.35	Plot A2	8	Pass
	6	2437	-13.38	Plot B2		Pass
	11	2462	-13.21	Plot C2		Pass
802.11n (20MHz)	1	2412	-15.71	Plot D2		Pass
	6	2437	-15.48	Plot E2		Pass
	11	2462	-15.00	Plot F2		Pass
802.11n (40MHz)	3	2422	-18.22	Plot G2		Pass
	6	2437	-17.30	Plot H2		Pass
	9	2452	-17.69	Plot I2		Pass

Ant1+ Ant 2

Test mode	Channel	Frequency (MHz)	Combined PSD (dBm/3kHz)	Limit (dBm/3kHz)	Result
802.11n (20MHz)	1	2412	-9.99	8	Pass
	6	2437	-9.80		Pass
	11	2462	-9.68		Pass
802.11n (40MHz)	3	2422	-13.50		Pass
	6	2437	-13.01		Pass
	9	2452	-12.33		Pass

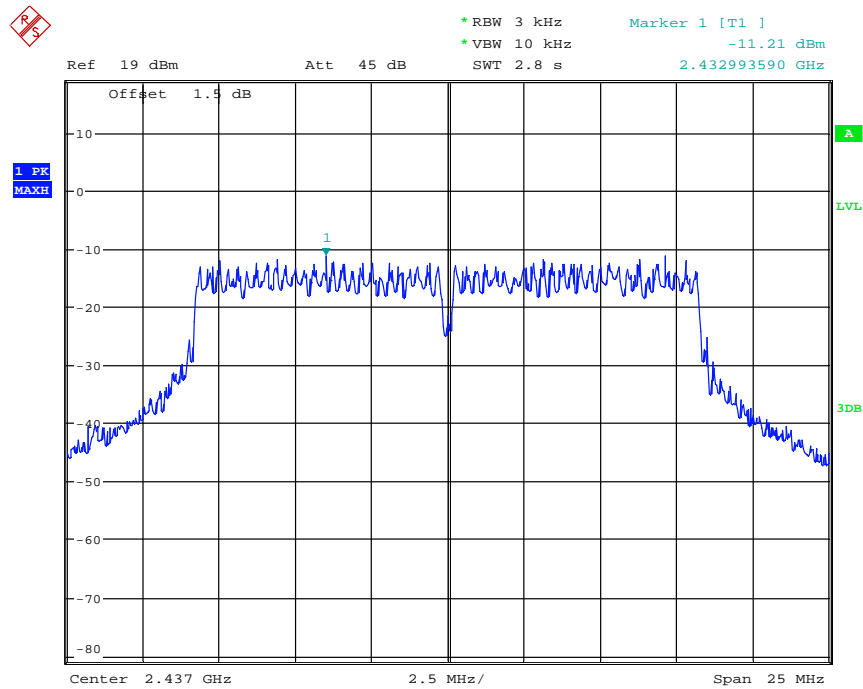


B. Test Plot



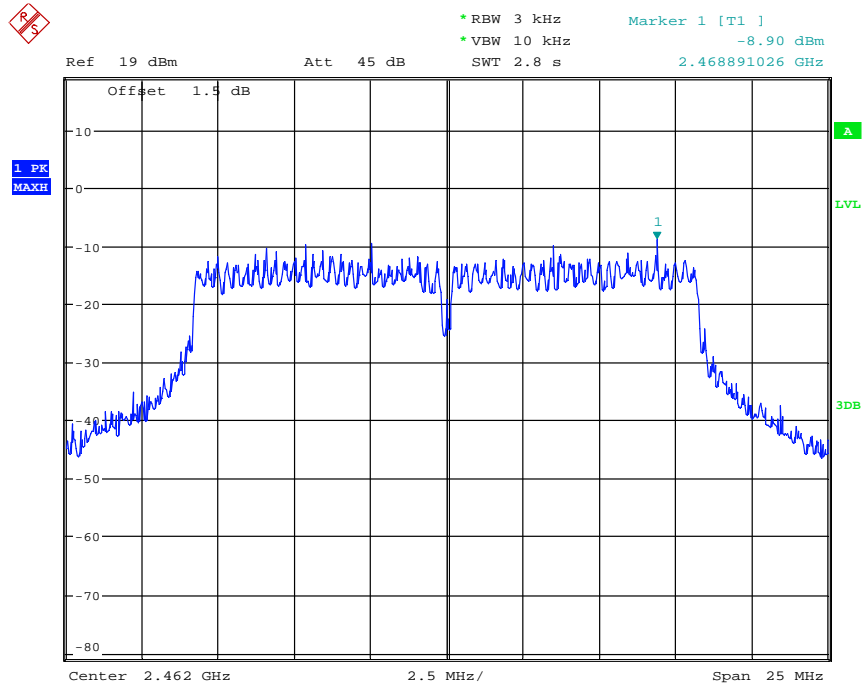
Date: 10.FEB.2017 17:54:25

Plot A1



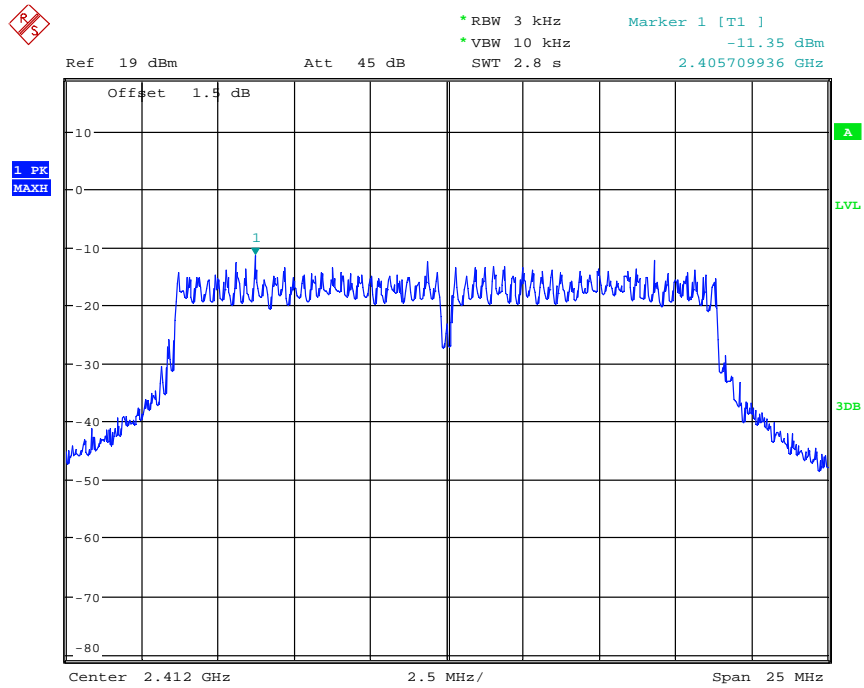
Date: 10.FEB.2017 17:55:14

Plot B1



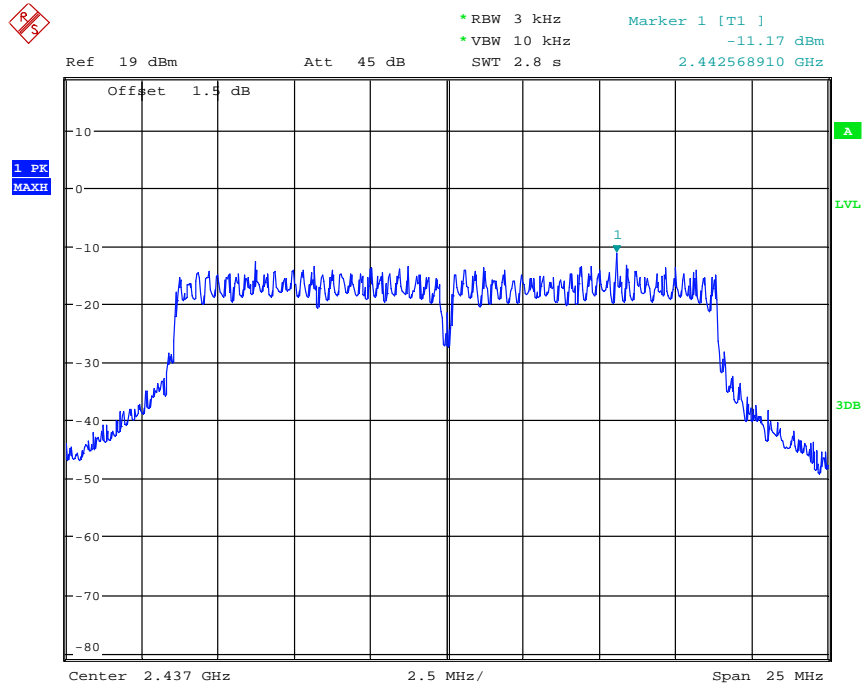
Date: 10.FEB.2017 17:55:52

Plot C1



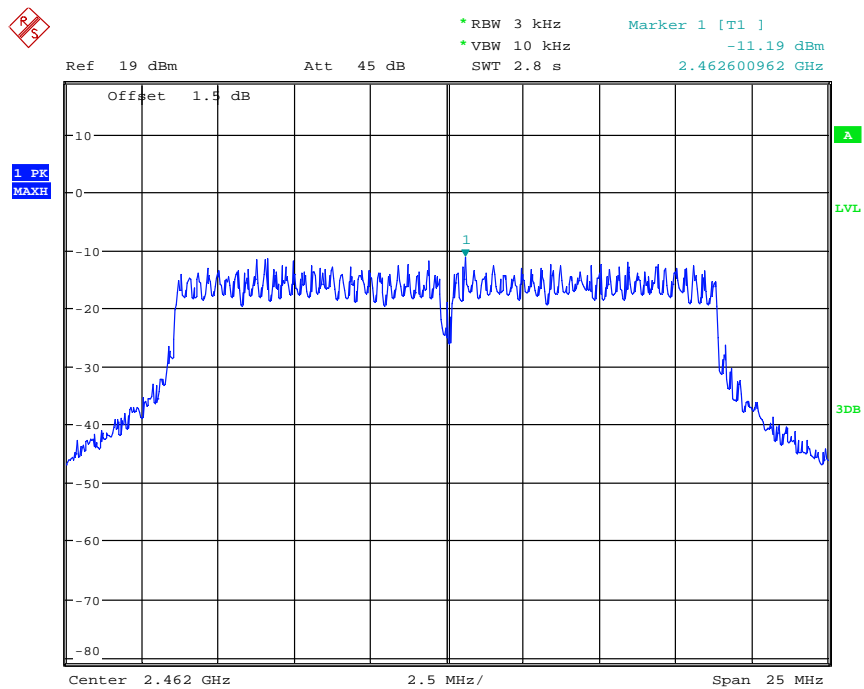
Date: 10.FEB.2017 17:57:29

Plot D1



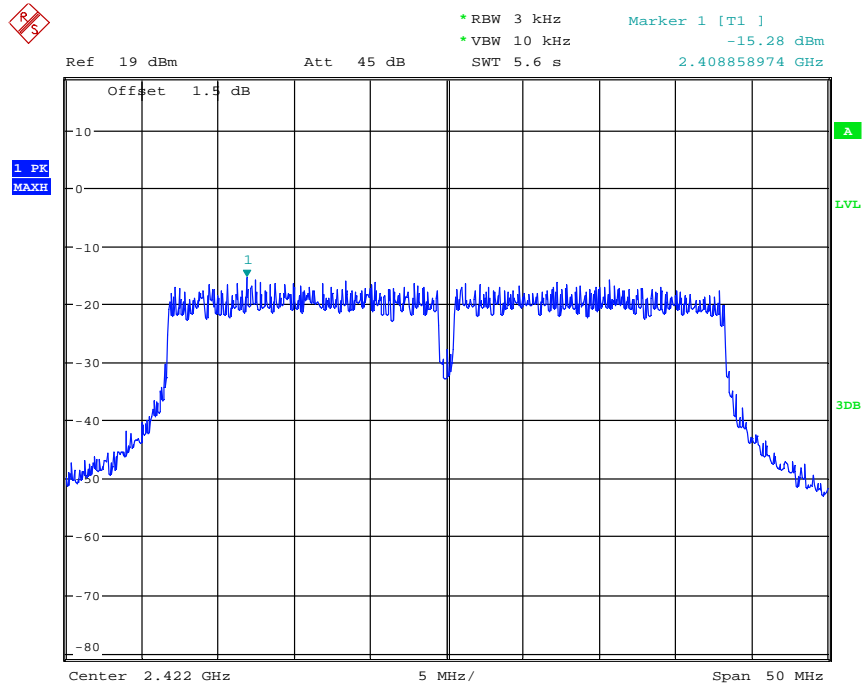
Date: 10.FEB.2017 17:56:54

Plot E1



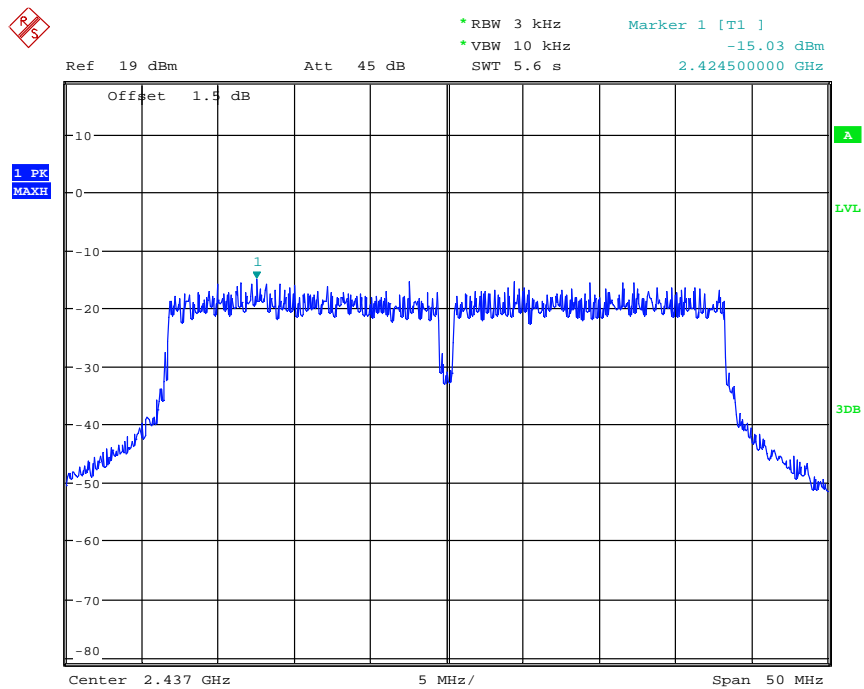
Date: 10.FEB.2017 17:56:20

Plot F1



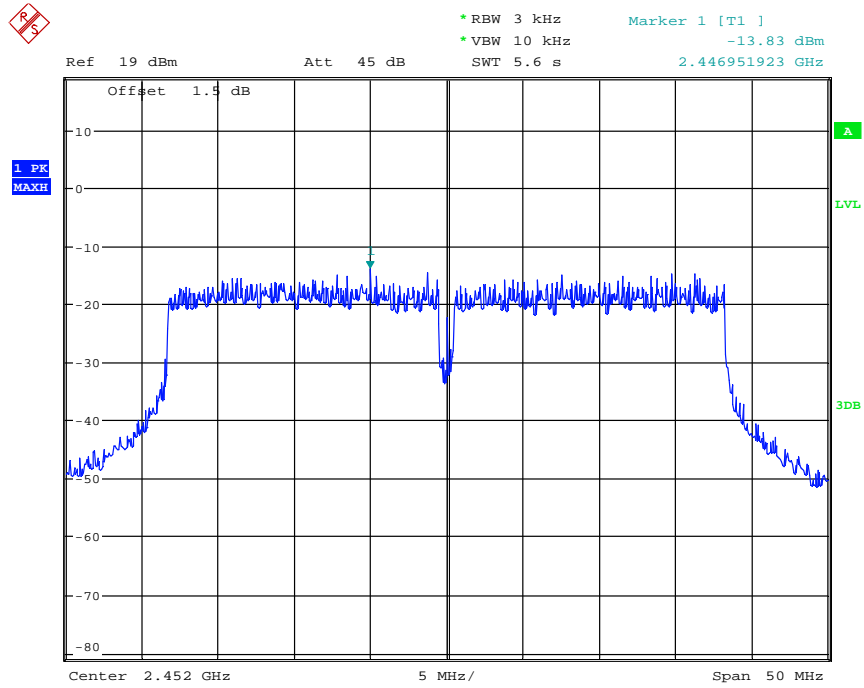
Date: 10.FEB.2017 17:58:11

Plot G1



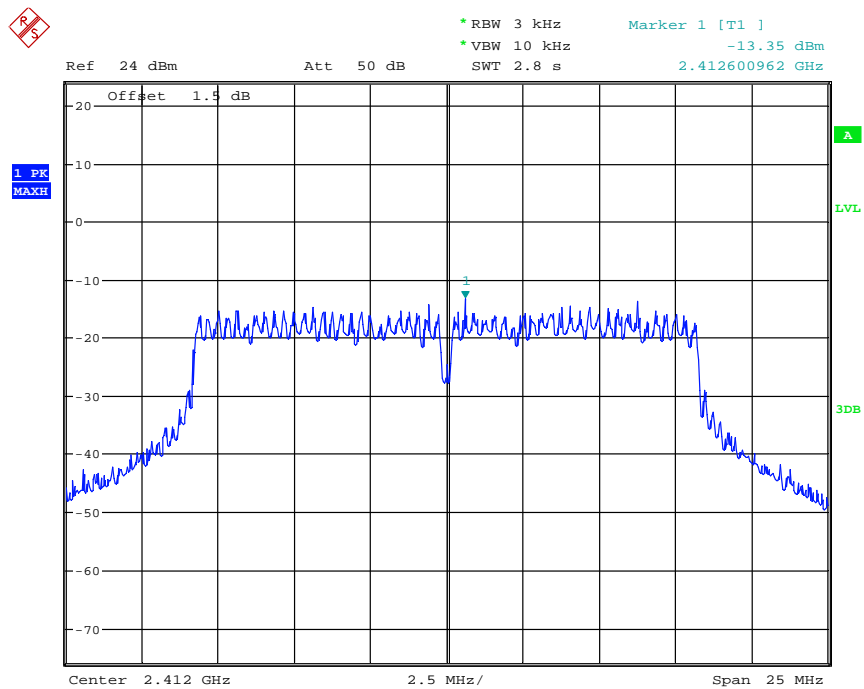
Date: 10.FEB.2017 17:59:58

Plot H1



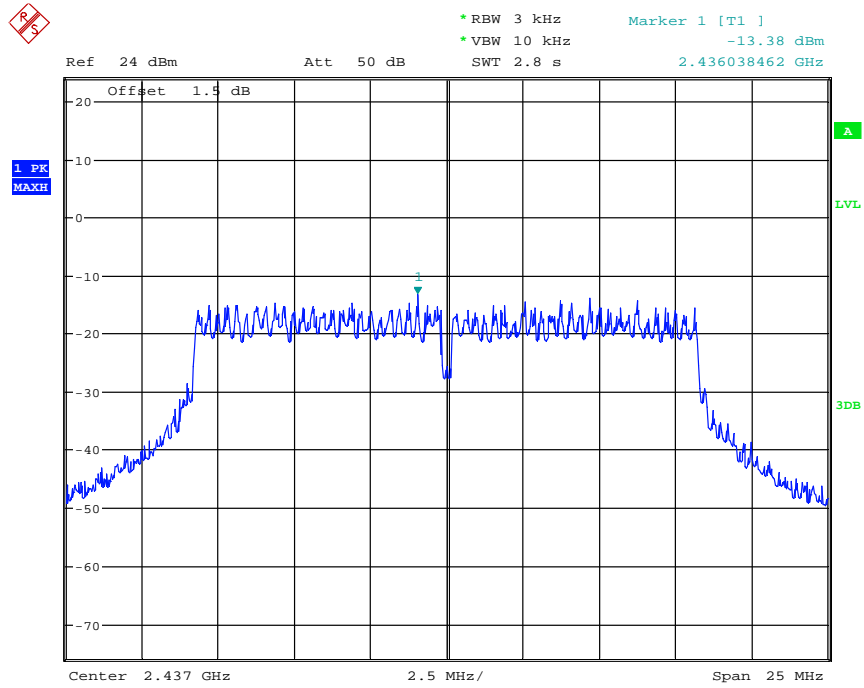
Date: 10.FEB.2017 18:00:45

Plot I1



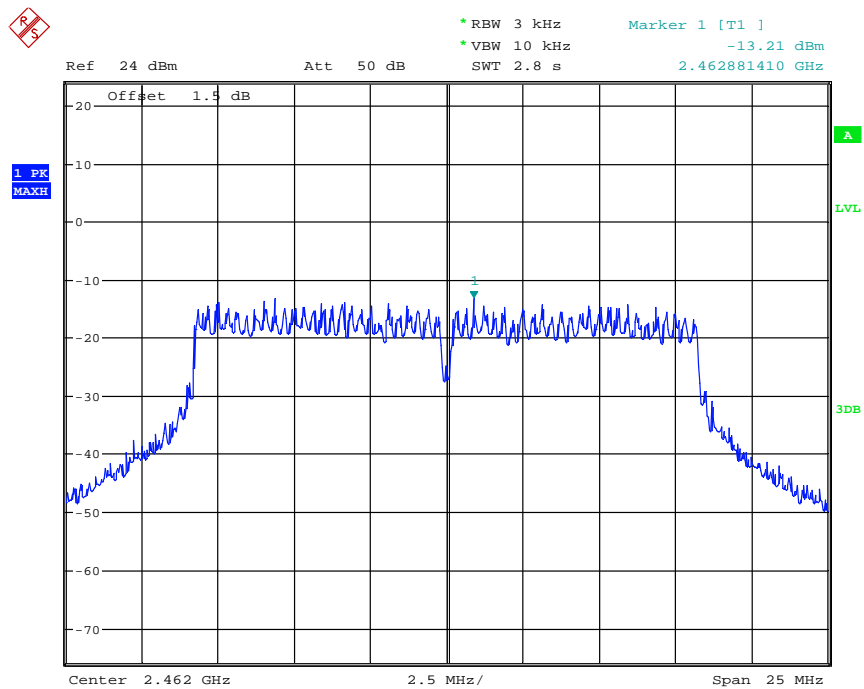
Date: 10.FEB.2017 18:58:29

Plot A2



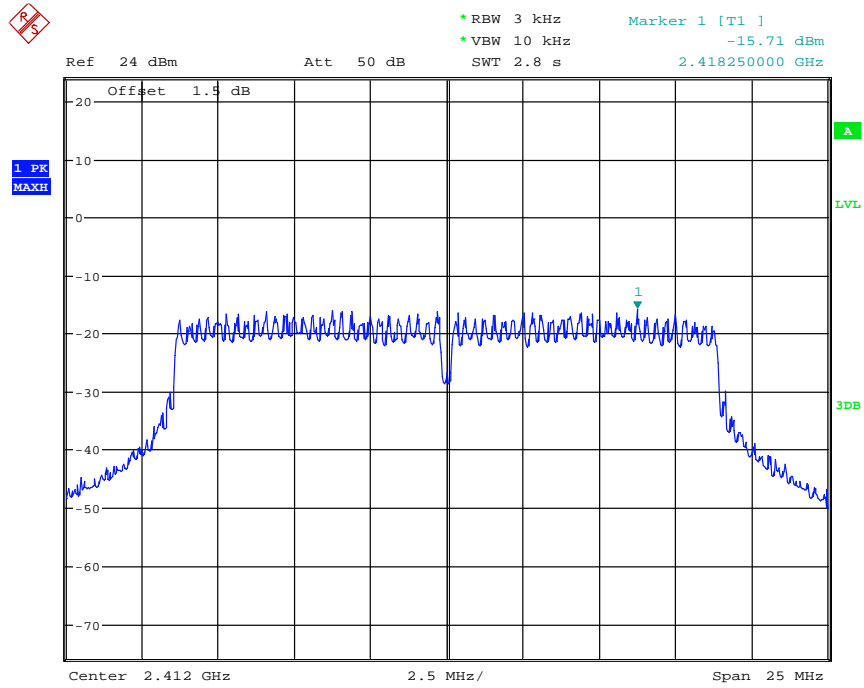
Date: 10.FEB.2017 18:57:37

Plot B2



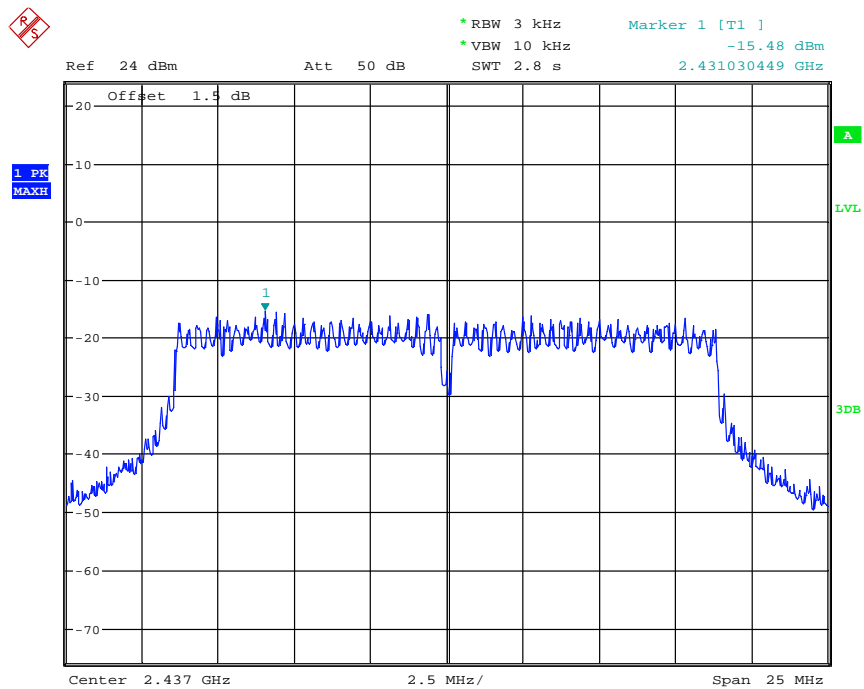
Date: 10.FEB.2017 19:00:23

Plot C2



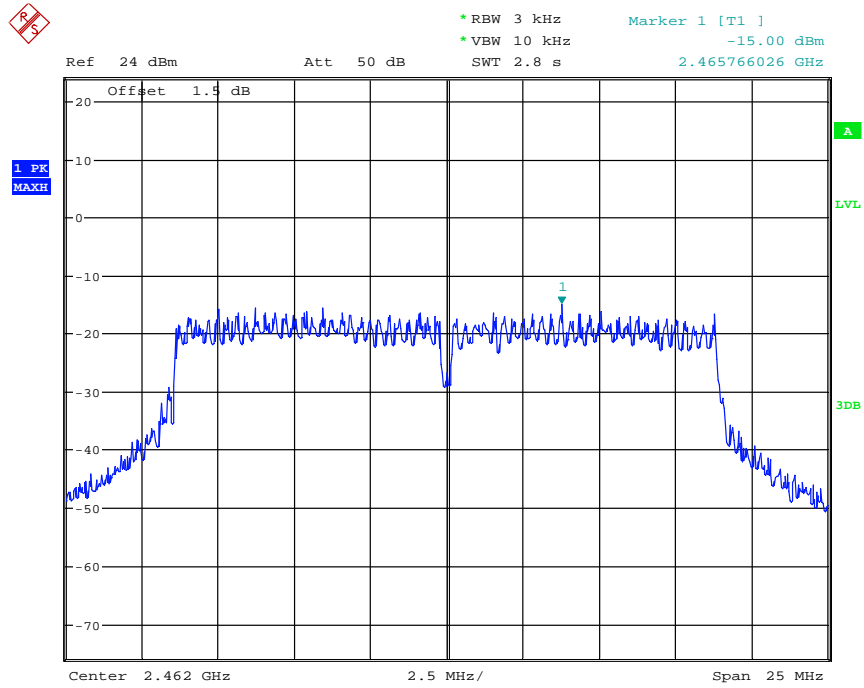
Date: 10.FEB.2017 19:07:25

Plot D2



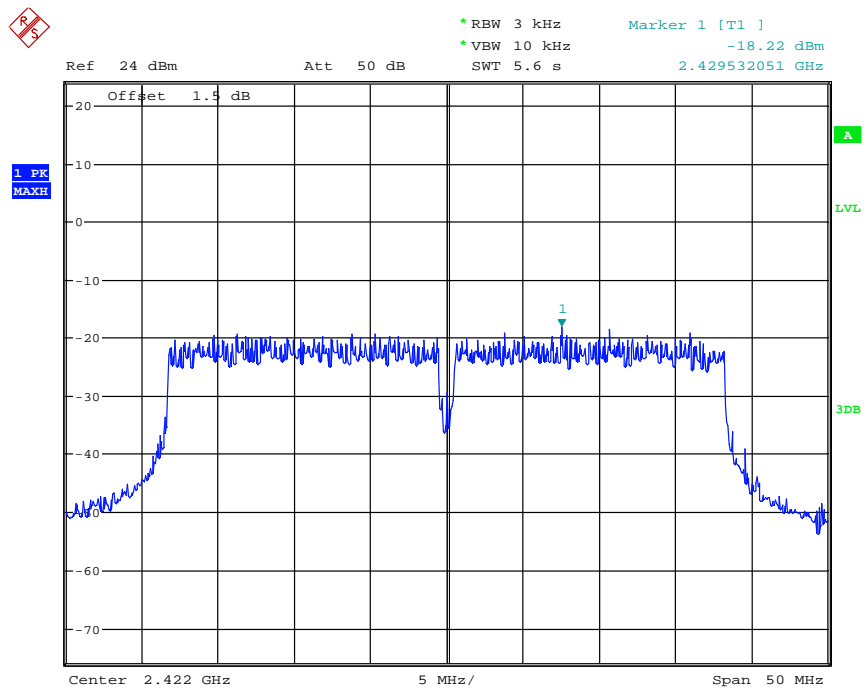
Date: 10.FEB.2017 19:03:31

Plot E2



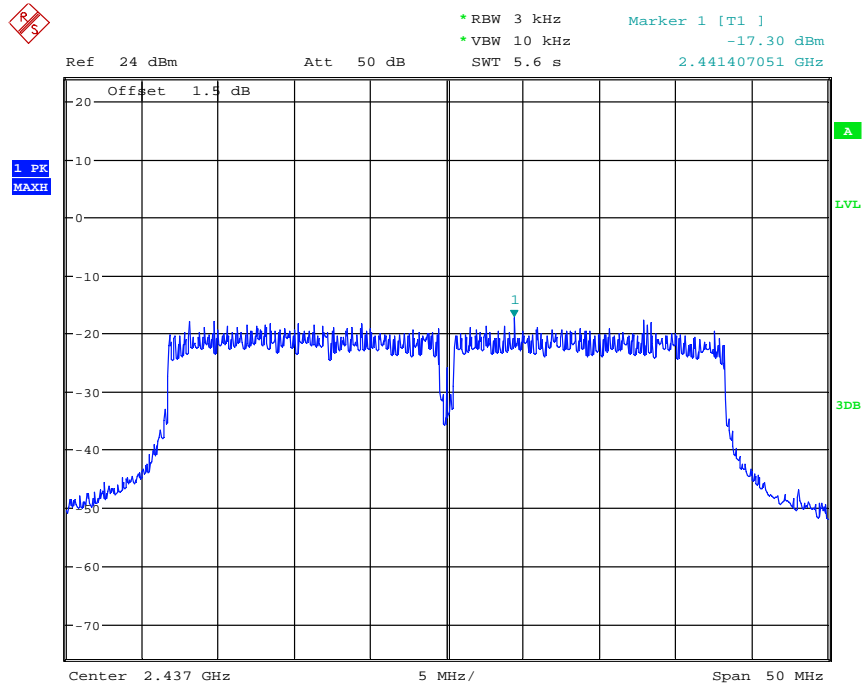
Date: 10.FEB.2017 19:02:54

Plot F2



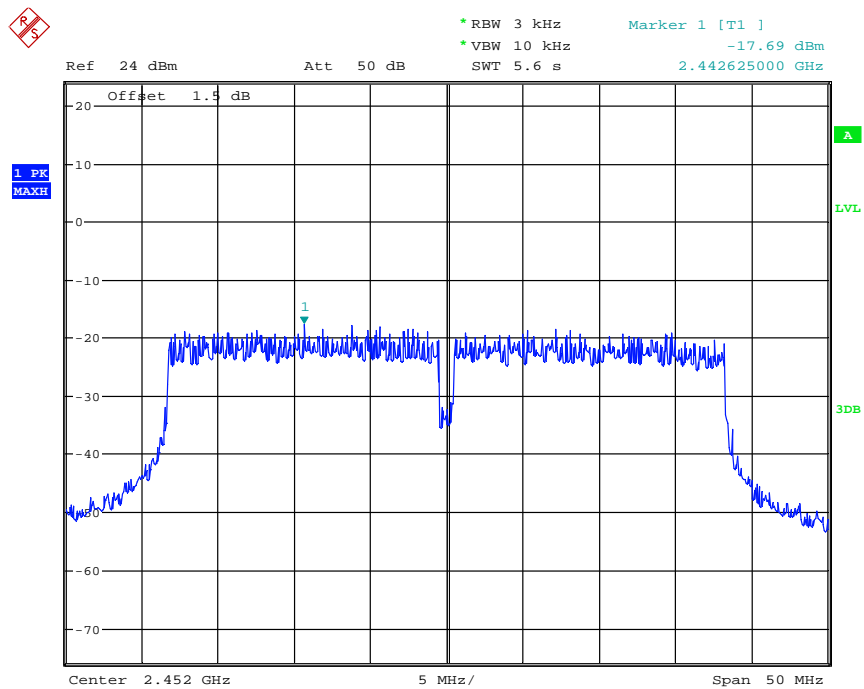
Date: 10.FEB.2017 19:08:18

Plot G2



Date: 10.FEB.2017 19:10:18

Plot H2



Date: 10.FEB.2017 19:10:58

Plot I2

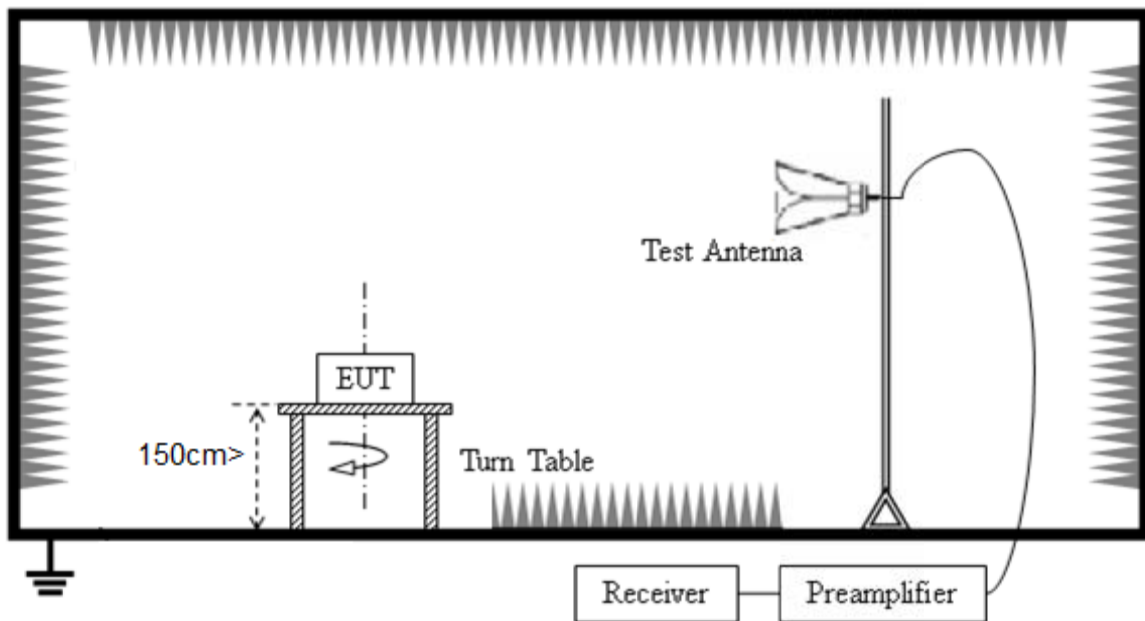


5.5 Restricted Frequency Bands

5.5.1 Requirement

According to FCC section 15.247(d), in any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, , In addition, radiated emissions which fall in the restricted bands, as defined in 15.205(a), must also comply with the radiated emission limits specified in 15.209(a).

5.5.2 Test Description



The Module is located in a 3m Semi-Anechoic Chamber; the antenna factors, cable loss and so on of the site as factors are calculated to correct the reading.

For the Test Antenna:

Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength.

5.5.3 Test Result

The lowest and highest channels are tested to verify the Restricted Frequency Bands.

The measurement results are obtained as below:

$E \text{ [dBV/m]} = UR + AT + A\text{Factor [dB]}; AT = LCable \text{ loss [dB]} - G\text{preamp [dB]}$

AT: Total correction Factor except Antenna

UR: Receiver Reading

Gpreamp: Preamplifier Gain

AFactor: Antenna Factor at 3m

Note: Restricted Frequency Bands were performed when antenna was at vertical and horizontal polarity, and only the worse test condition (vertical) was recorded in this test report.

The lowest and highest channels are tested to verify the Restricted Frequency Bands



A. Test Verdict

Ant1 802.11g Test mode

Ch	Frequency (MHz)	Detector PK/AV	Max. Emission (dBμV/m)	Limit (dBμV/m)	Plot	Result
1	2389.90	PK	53.49	74	Plot A	Pass
1	2389.90	AV	45.60	54		Pass
11	2485.07	PK	48.01	74	Plot B	Pass
11	2484.73	AV	41.88	54		Pass

Ant2 802.11g Test mode

Ch	Frequency (MHz)	Detector PK/AV	Max. Emission (dBμV/m)	Limit (dBμV/m)	Plot	Result
1	2389.01	PK	49.83	74	Plot C	Pass
1	2389.01	AV	39.88	54		Pass
11	2483.59	PK	46.97	74	Plot D	Pass
11	2483.67	AV	37.60	54		Pass

Ant1+ Ant12 802.11n (20MHz) Test mode

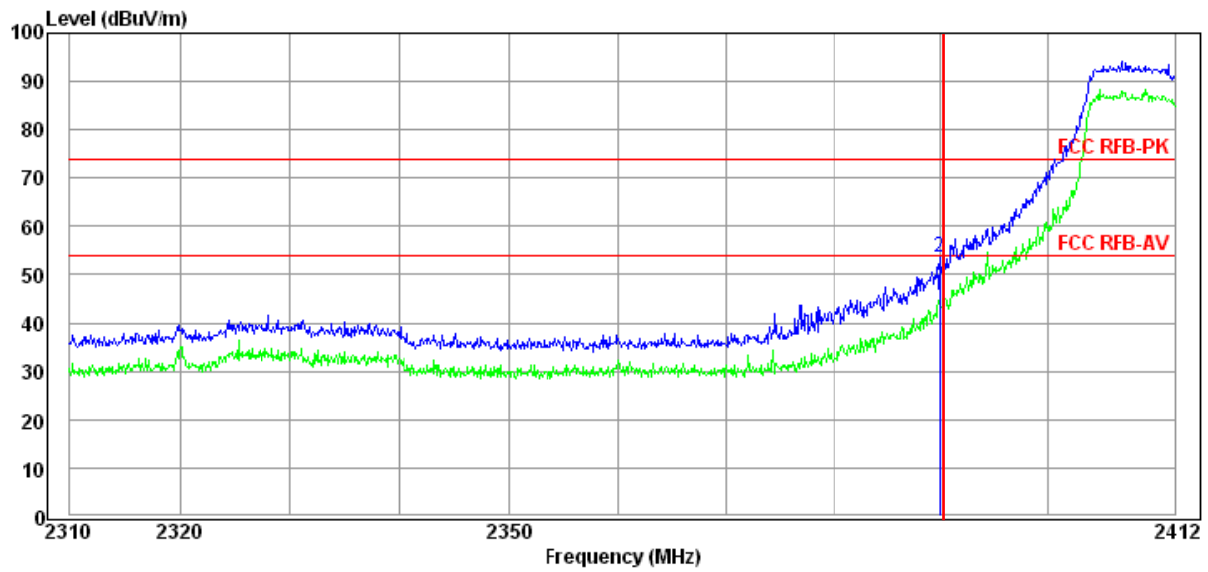
Ch	Frequency (MHz)	Detector PK/AV	Max. Emission (dBμV/m)	Limit (dBμV/m)	Plot	Result
1	2387.39	PK	46.11	74	Plot E	Pass
1	2349.04	AV	37.19	54		Pass
11	2484.15	PK	44.01	74	Plot F	Pass
11	2485.17	AV	37.28	54		Pass

Ant1+2 802.11n (40MHz) Test mode

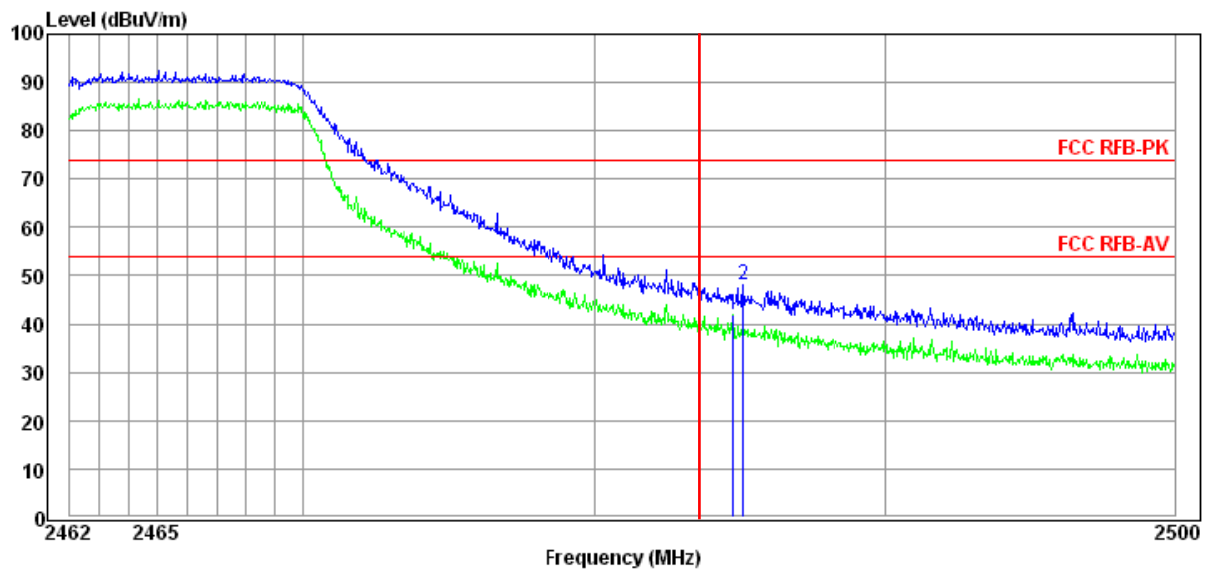
Ch	Frequency (MHz)	Detector PK/AV	Max. Emission (dBμV/m)	Limit (dBμV/m)	Plot	Result
3	2388.97	PK	57.25	74	Plot G	Pass
3	2388.97	AV	48.11	54		Pass
6	2483.67	PK	43.39	74	Plot H	Pass
6	2484.39	AV	36.47	54		Pass



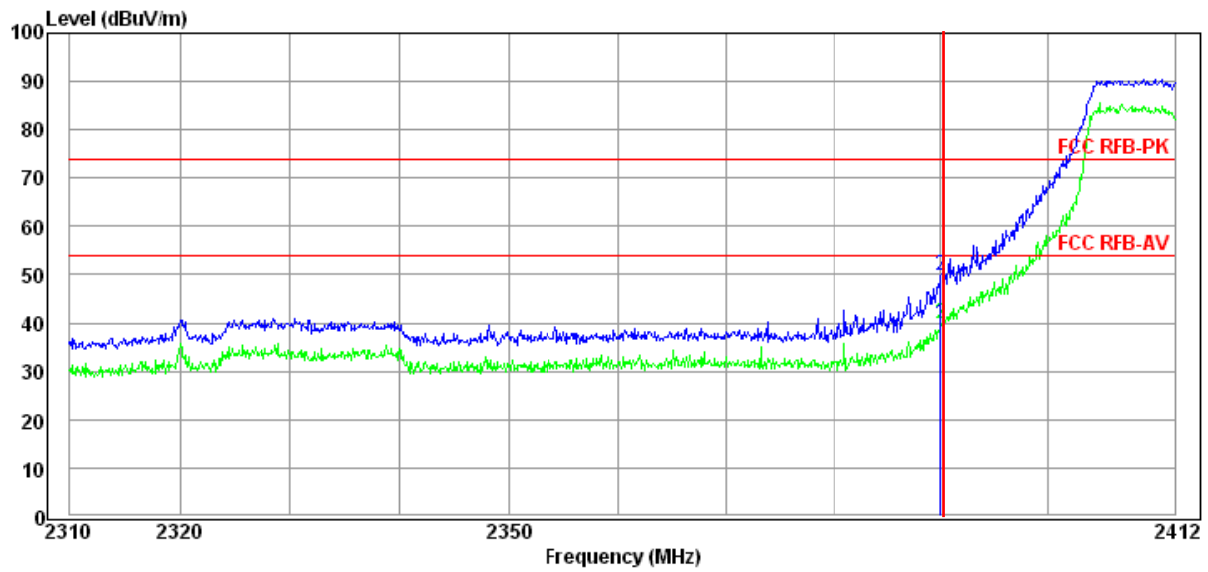
B. Test Plot



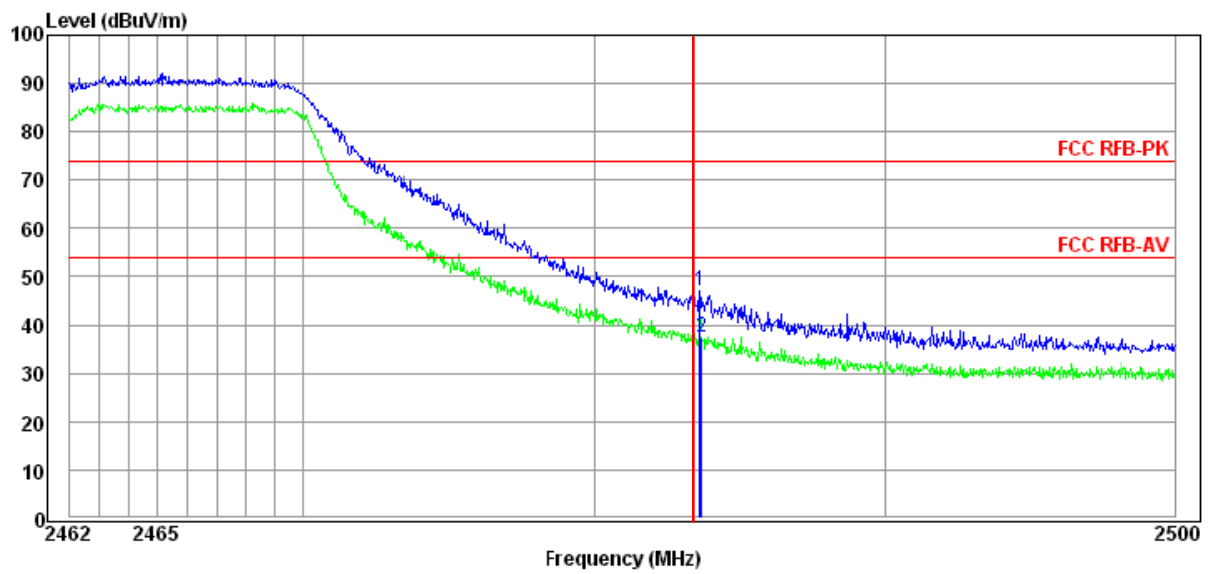
Plot A



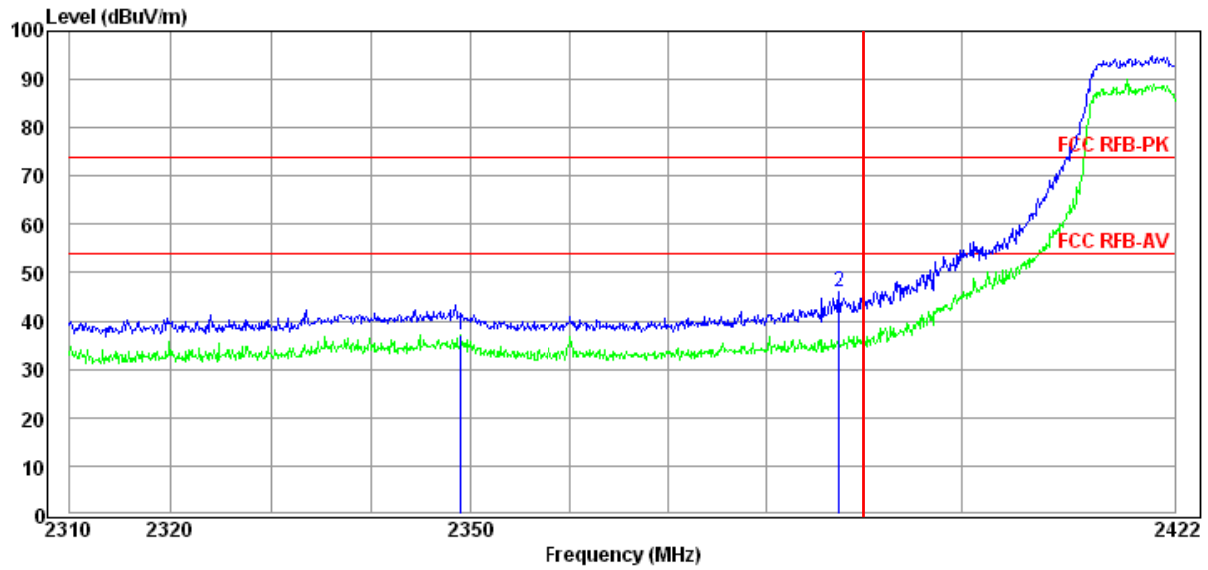
Plot B



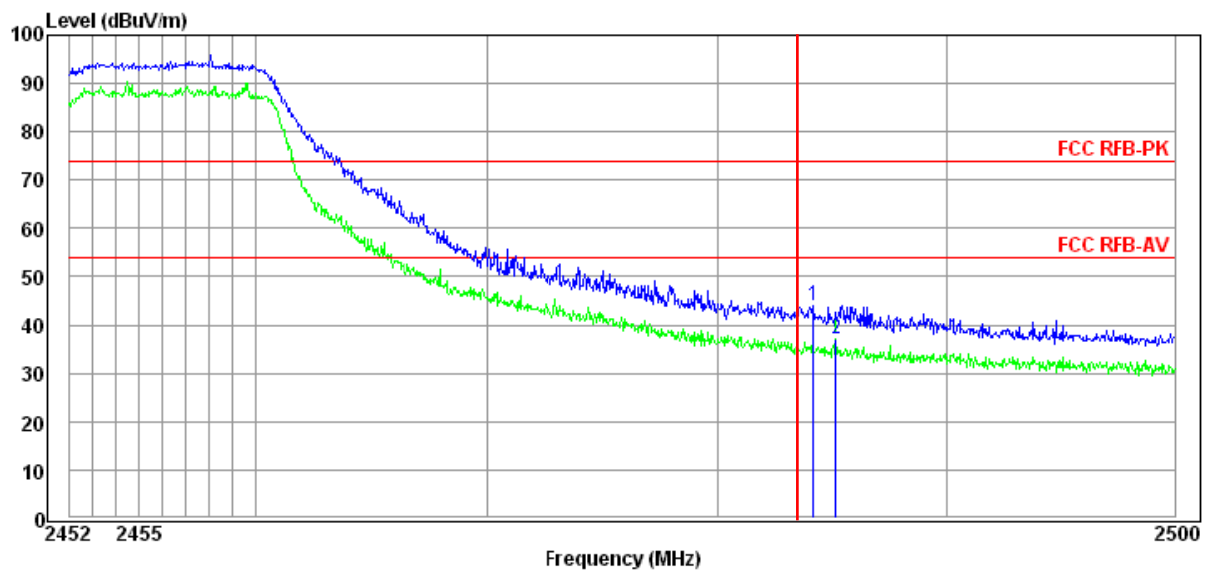
Plot C



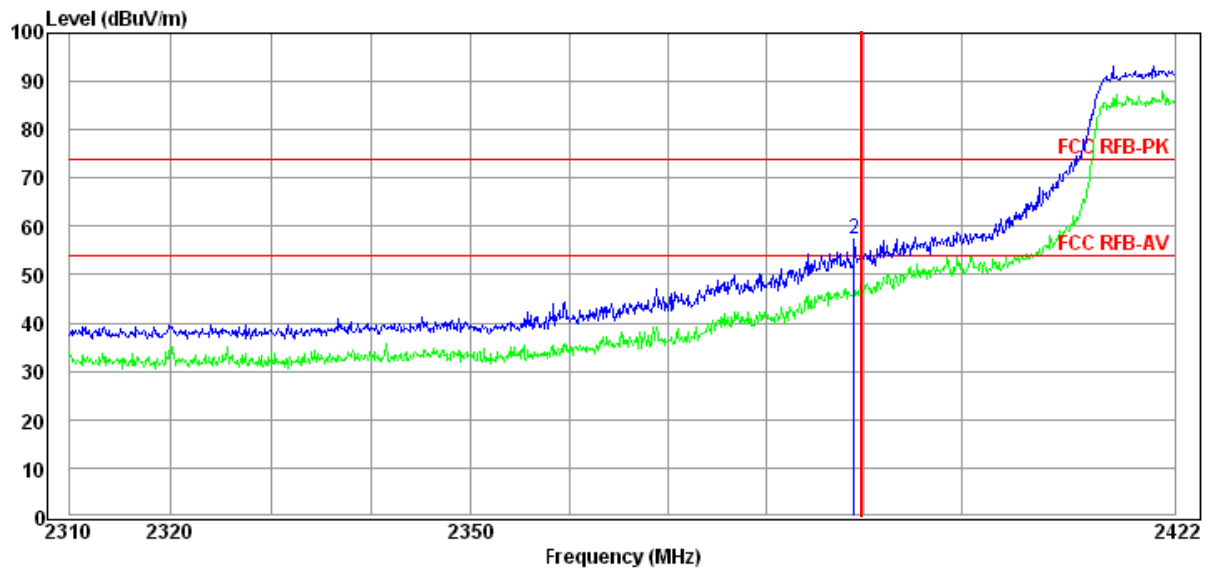
Plot D



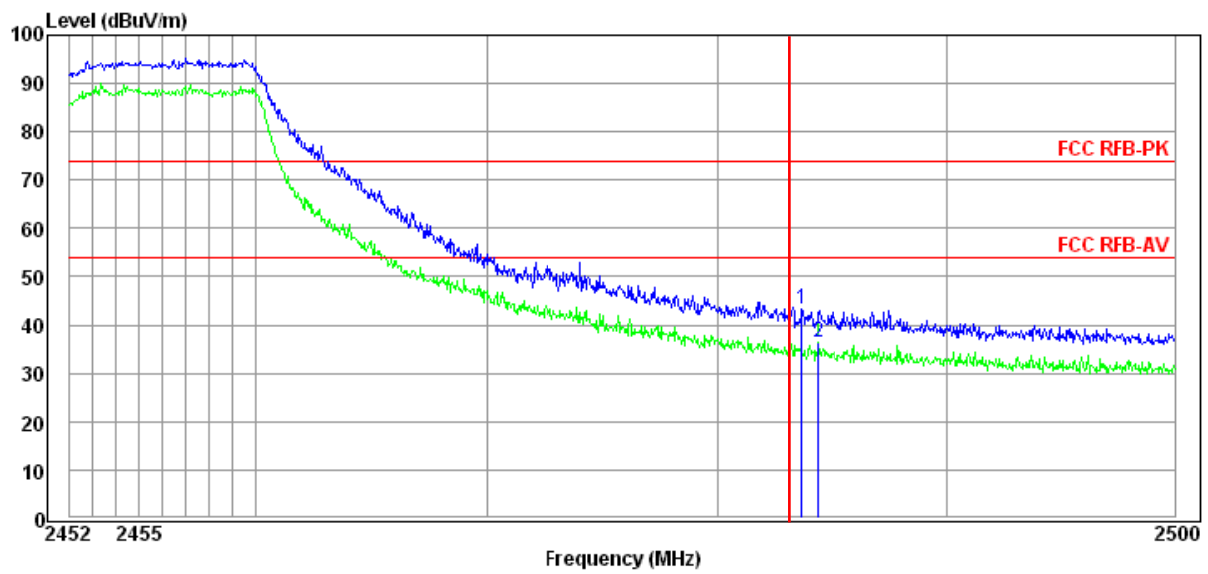
Plot E



Plot F



Plot G



Plot H



5.6 Conducted Emission

5.6.1 Requirement

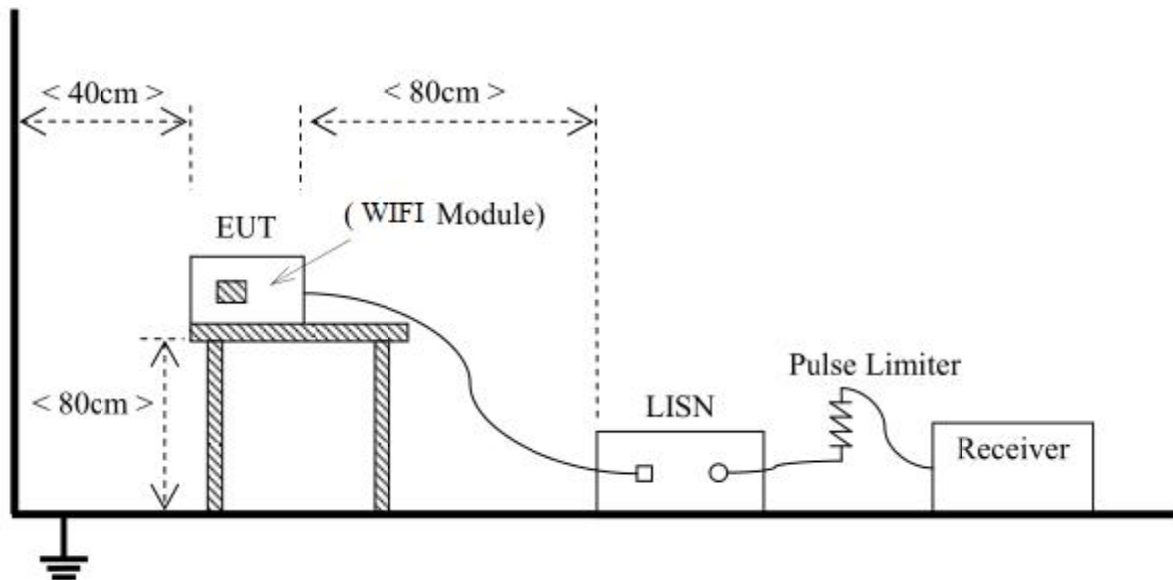
According to FCC section 15.207, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 Ω line impedance stabilization network (LISN).

Frequency range (MHz)	Conducted Limit (dB μ V)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 - 30	60	50

NOTE:

- (a) The lower limit shall apply at the band edges.
- (b) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50MHz.

5.6.2 Test Description



The EUT was placed upon a non-metallic table 0.8m above the horizontal metal reference ground plane. EUT was connected to LISN and LISN was connected to reference Ground Plane. EUT was 80cm from LISN. Power supplier is setting to 120V/60Hz. The set-up and test methods were according to ANSI C63.10:2013

With testing software which was provided by the applicant and installed on a laptop PC, the equipment under test (EUT) could be set to a continuous transmit mode with a certain modulation scheme and data rate on a certain frequency.



For this test report, all configurations of the EUT were tested in 2.4G frequency band which was able to operate according to the specification of 802.11 g/n. The mode below is the worst case operation mode during the tests:

Operation Mode	Description of the Operation Mode	Modulation	Data Rate
On Ground	TX Mode 2412MHz(Channel 1) + Charger + USB data exchange	64QAM	54Mbps

NOTE:

In this model, the battery of EUT is at low power level, the Charger is charging the battery in common conditions similar to the way did by USER.

Mains supply for Adaptor: 120V, AC 60Hz

5.6.3 Test result

Test Verdict Recorded:

Line	Freq MHz	Result dBμV	Limit dBμV	Margin dB
Average	0.20	16.64	53.45	36.81
QP	0.20	28.32	63.45	35.13
Average	0.49	41.16	46.14	4.98
QP	0.49	47.89	56.14	8.25
Average	0.54	30.38	46.00	15.62
QP	0.54	42.45	56.00	13.55
Average	0.63	22.57	46.00	23.43
QP	0.63	31.59	56.00	24.41
Average	0.98	25.08	46.00	20.92
QP	0.98	32.35	56.00	23.65
Average	1.62	14.45	46.00	31.55
QP	1.62	31.37	56.00	24.63

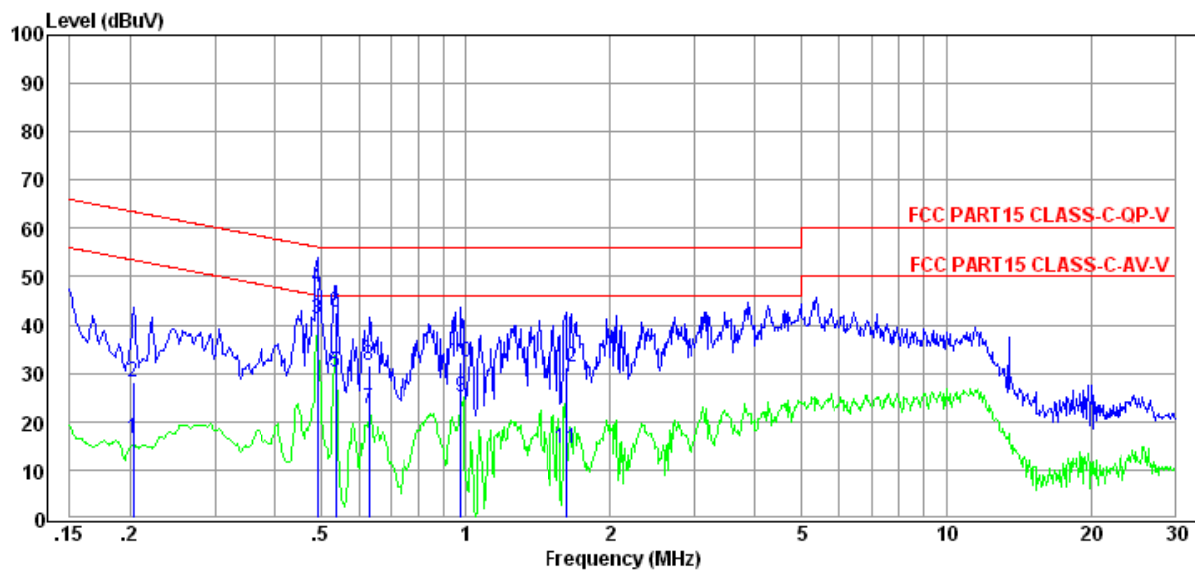
Neutral	Freq MHz	Result dBμV	Limit dBμV	Margin dB
Average	0.21	15.37	53.10	37.73
QP	0.21	29.69	63.10	33.41
Average	0.33	17.18	49.35	32.17
QP	0.33	28.38	59.35	30.97
Average	0.53	32.52	46.00	13.48



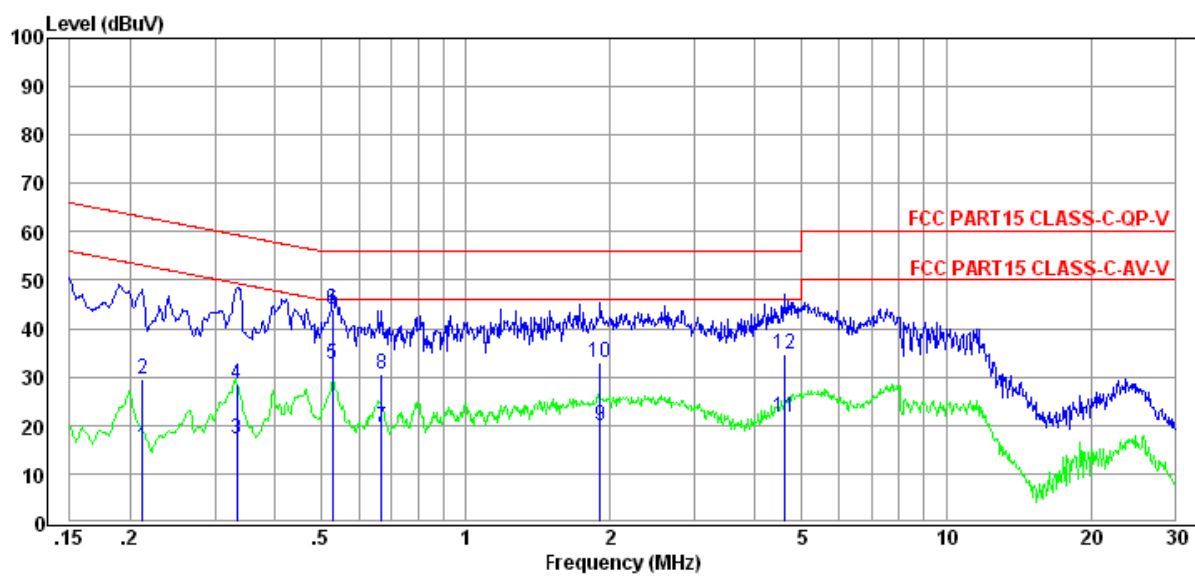
QP	0.53	43.98	56.00	12.02
Average	0.67	19.42	46.00	26.58
QP	0.67	30.65	56.00	25.35
Average	1.91	19.80	46.00	26.20
QP	1.91	33.14	56.00	22.86
Average	4.60	21.57	46.00	24.43
QP	4.60	34.57	56.00	21.43



5.6.4 Test Plot



L Line



N Line

5.6.5 Conclusion: Pass



5.7 Radiated Emission

5.7.1 Requirement

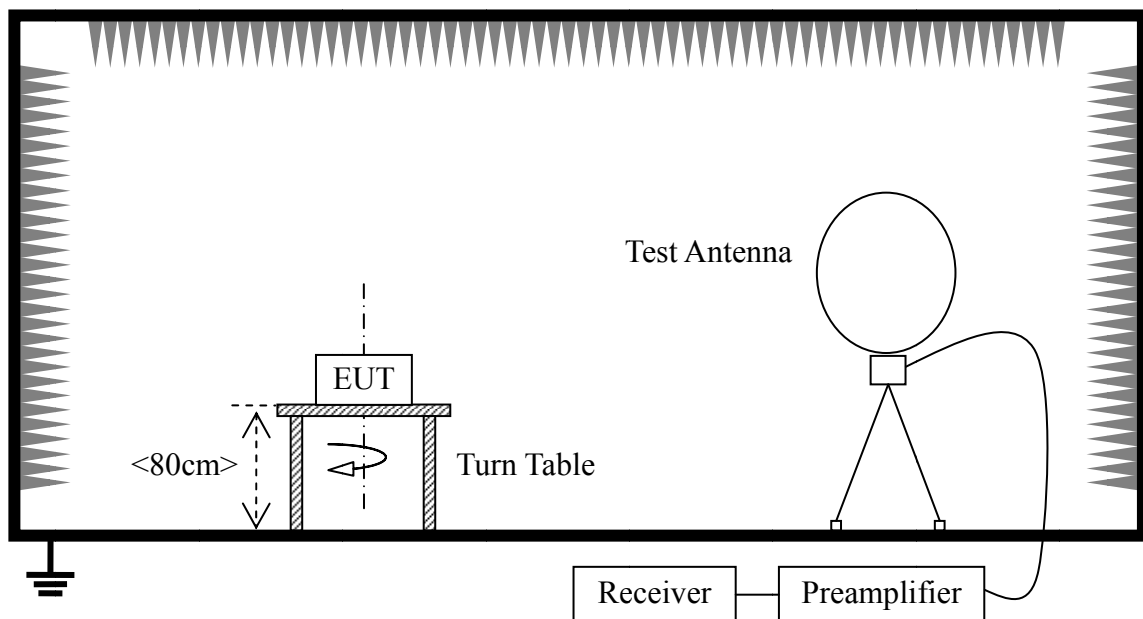
According to FCC section 15.247(c), radiated emission outside the frequency band attenuation below the general limits specified in FCC section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in FCC section 15.205(a), must also comply with the radiated emission limits specified in FCC section 15.209(a).

According to FCC section 15.209 (a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table

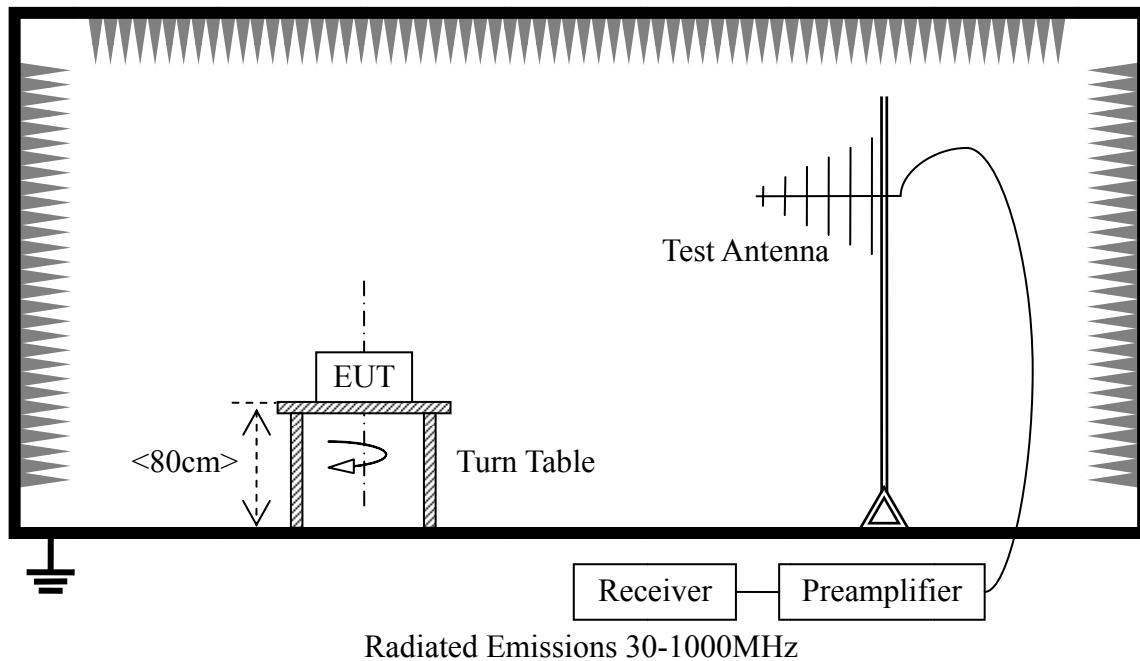
Frequency (MHz)	Field Strength ($\mu\text{V/m}$)	Measurement Distance (m)	Limit($\text{dB}\mu\text{V/m}$)	Detector
0.009-0.490	2400/F(kHz)	300	/	/
0.490-1.705	24000/F(kHz)	30	/	/
1.705-30	30	30	/	/
30 - 88	100	3	40	QP
88 - 216	150	3	43.5	QP
216 - 960	200	3	46	QP
960 - 1000	500	3	54	QP
Above 1000	500	3	54	AV

In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), also should comply with the radiated emission limits specified in Section 15.209(a)(above table)

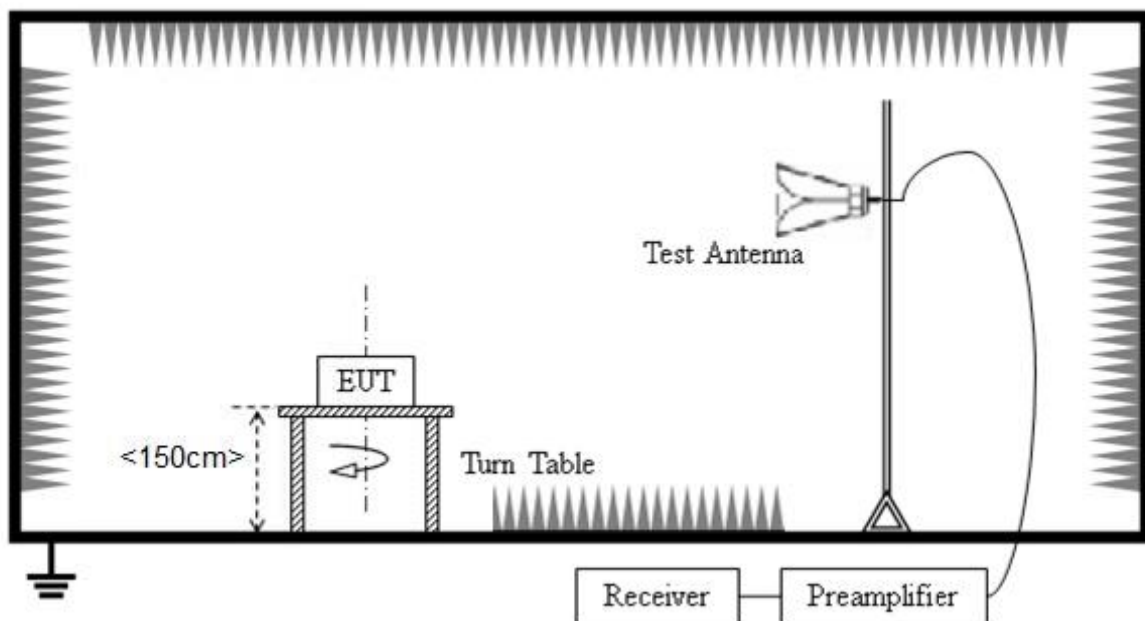
5.7.2 Test setup



Radiated Emissions Below 30MHz



Radiated Emissions 30-1000MHz



Radiated Emissions above 1000MHz

The test site semi-anechoic chamber has met the requirement of NSA tolerance 4dB according to the standards: ANSI C63.10-2013. Below 1GHz, the EUT was set-up on insulator 80cm above the Ground Plane. Above 1GHz, the EUT was set-up on insulator 150cm above the Ground Plane. The set-up and test methods were according to ANSI C63.10

The EUT is located in a 3m Semi-Anechoic Chamber; the antenna factors, cable loss and so on of the site as factors are calculated to correct the reading. During the measurement, the Wifi Module is activated and controlled by the Wifi Service Supplier (SS) via a Common Antenna, and is set to operate under transmitting at maximum power.



For the Test Antenna: In the frequency range above 30MHz, Bi-Log Test Antenna (30MHz to 1GHz) and Horn Test Antenna (above 1GHz) are used. Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength, the azimuth range of turntable was 0° to 360° , the receive antenna has two polarizations horizontal and vertical. When doing measurements above 1GHz, the EUT was placed within the 3dB beam width range of the horn antenna, and the EUT was tested in 3 orthogonal positions as recommended in ANSI C63.10 for Radiated Emissions and the worst-case data was presented.

With testing software which was provided by the applicant and installed on a laptop PC, the equipment under test (EUT) could be set to a continuous transmit mode with a certain modulation scheme and data rate on a certain frequency.

For this test report, all configurations of the EUT were tested in 2.4G frequency band which was able to operate according to the specification of 802.11 g/n. The mode below is the worst case operation mode during the tests:

Operation Mode	Description of the Operation Mode	Modulation	Data Rate
On Air	TX Mode 2412MHz(Channel 1)	64QAM	54Mbps

NOTE:

In this model, the battery of EUT is at low power level, the Charger is charging the battery in common conditions similar to the way did by USER.

5.7.3 Test Result

A. Test Result for 9kHz~30MHz

Frequency (MHz)	Level (dBμV)	Over Limit (dB)	Limit Line (dBμV)	Remark
--	--	20	--	See Note

Note:

- The amplitude of spurious emissions that are attenuated by more than 20dB below the permissible value has no need to be reported.*
- Distance extrapolation factor = 40 log (specific distance / test distance) (dB);*
- Limit line = specific limits (dBμV) + distance extrapolation factor.*
- Test Result for above 30MHz ~ 10th Harmonic*

No.	Frequency (MHz)	Emission Level (dBμV/m)		Quasi-Peak Limit (dBμV/m)	Margin (dB)	Detector	Result
		Result (dBμV)	Antenna Polarization				
1	59.86	24.71	V	40.00	15.29	QP	PASS
2	67.68	20.66	V	40.00	19.34	QP	PASS
3	81.21	19.11	V	40.00	20.89	QP	PASS
4	95.43	21.63	V	40.00	18.37	QP	PASS
5	451.14	30.67	V	47.00	16.33	QP	PASS



6	649.66	32.32	V	47.00	14.68	QP	PASS
7	1593.38	14.13	V	54.00	39.87	Average	PASS
8	1593.38	28.54	V	74.00	45.46	Peak	PASS
9	1678.36	11.70	V	54.00	42.30	Average	PASS
10	1678.36	24.66	V	74.00	49.34	Peak	PASS
11	3227.83	13.29	V	54.00	40.71	Average	PASS
12	3227.83	23.99	V	74.00	50.01	Peak	PASS
13	4856.57	39.03	V	54.00	14.97	Average	PASS
14	4856.57	51.91	V	74.00	22.09	Peak	PASS
15	47.99	20.56	H	40.00	19.44	QP	PASS
16	104.17	20.05	H	40.00	19.95	QP	PASS
17	180.65	21.62	H	40.00	18.38	QP	PASS
18	235.82	25.69	H	47.00	21.31	QP	PASS
19	400.43	34.02	H	47.00	12.98	QP	PASS
20	649.66	34.42	H	47.00	12.58	QP	PASS
21	1717.92	21.58	H	54.00	32.42	Average	PASS
22	1717.92	36.11	H	74.00	37.89	Peak	PASS
23	1889.05	24.32	H	54.00	29.68	Average	PASS
24	1889.05	35.97	H	74.00	38.03	Peak	PASS
25	3227.83	13.45	H	54.00	40.55	Average	PASS
26	3227.83	23.77	H	74.00	50.23	Peak	PASS
27	4847.87	52.45	H	54.00	1.55	Average	PASS
28	4847.87	64.82	H	74.00	9.18	Peak	PASS

Note:

In this table, the testing frequency ranges from 30MHz to no less than 10th main frequency.



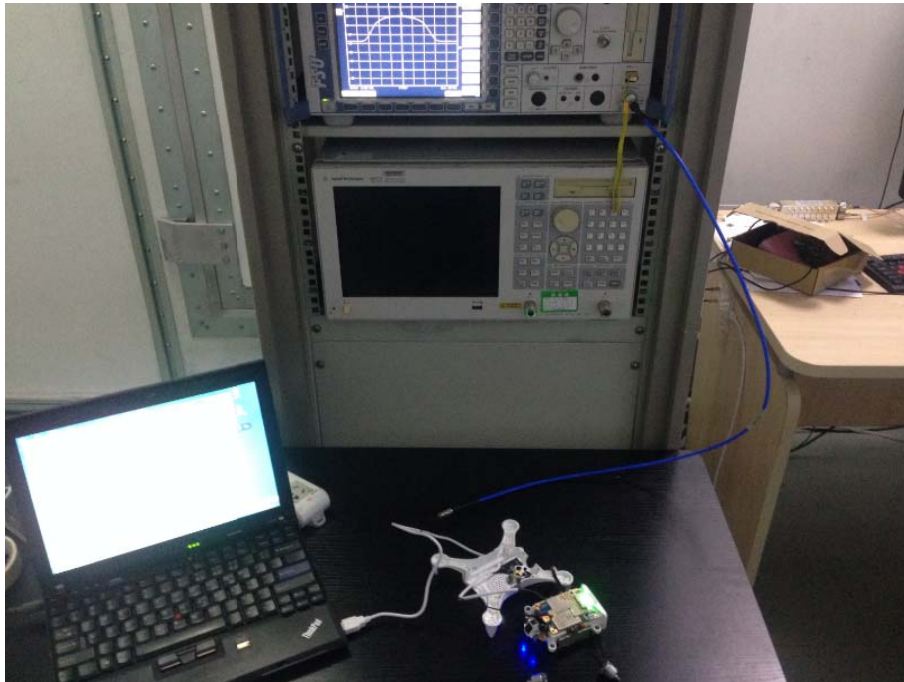
Annex A Photos of the EUT





Annex B Photos of Setup

1. RF



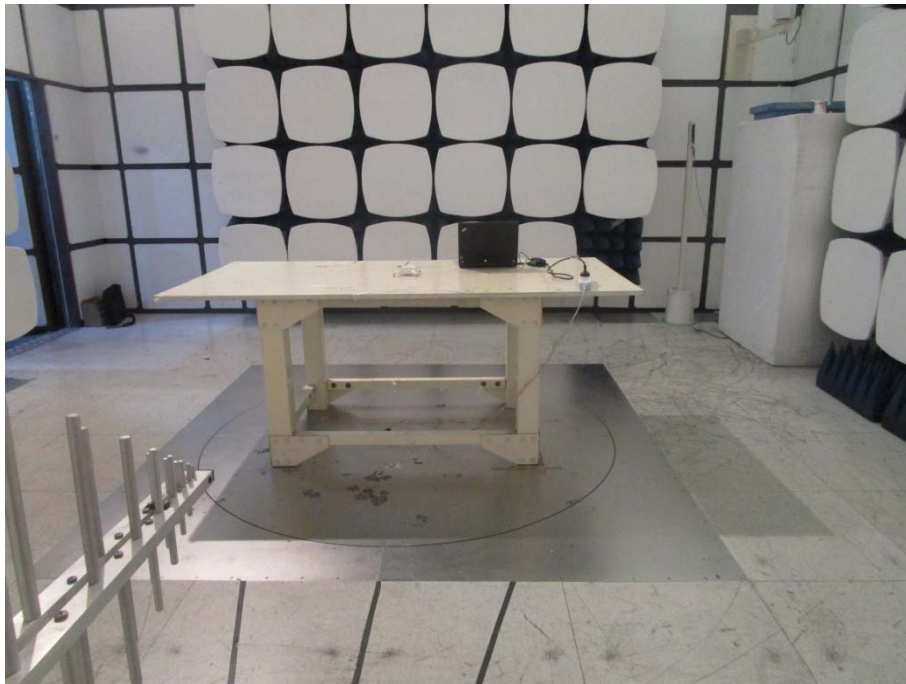
2. Conducted Emission



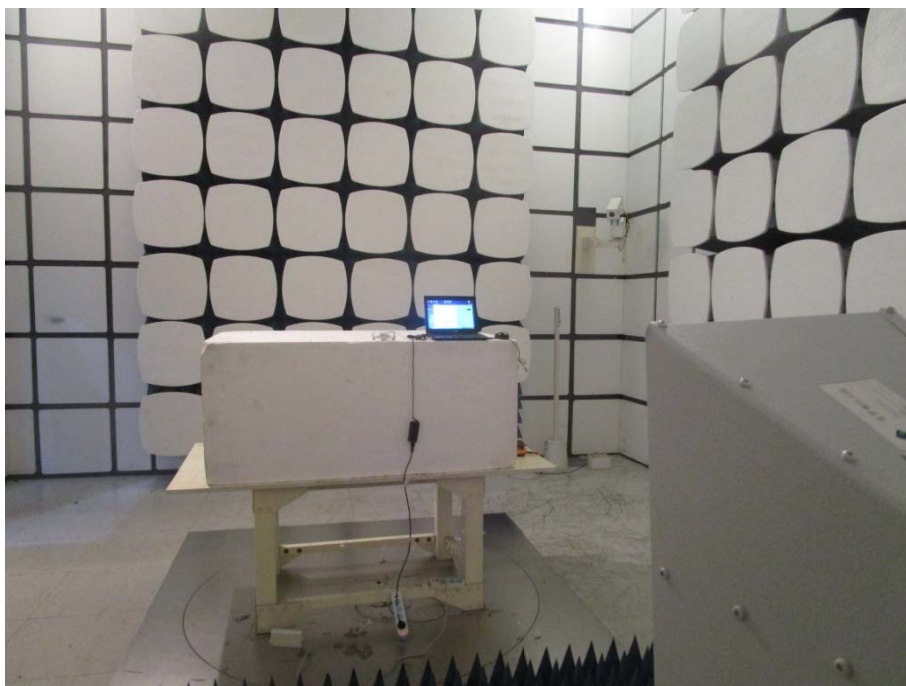
150k~30MHz



3. Radiated Emission



30M~1GHz



1G~18GHz

**** END OF REPORT ****