



FCC - TEST REPORT

Report Number : **64.790.18.04216.01-1** Date of Issue: November 30, 2018

Model : H82364-

Product Type : IP touch 7"

Applicant : ABB Genway Xiamen Electrical Equipment Co.,Ltd

Manufacturer : ABB Genway Xiamen Electrical Equipment Co.,Ltd

Address : No.7 Fangshan South Road, Torch High Technology,Development Zone
(Xiang An), Industrial Zone, 361000 Xiamen S.E.Z, Fujian Province,
PEOPLE'S REPUBLIC OF CHINA

Test Result : Positive Negative



Total pages including
Appendices : 48

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2 Details about the Test Laboratory

Details about the Test Laboratory

Test Site 1

Company name: TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch
Building 12&13, Zhiheng Wisdomland Business Park,
Nantou Checkpoint Road 2, Nanshan District,
Shenzhen City, 518052,
P. R. China

Telephone: 86 755 8828 6998
Fax: 86 755 8828 5299

FCC Registration No.: 514049
IC registration number: 10320A

3 Description of the Equipment Under Test

Product:	IP touch 7"
Model no.:	H82364-
FCC ID:	2AEBL-H82364
Options and accessories:	Nil
Rating Input:	DC 24V
RF Transmission Frequency:	2412MHz-2462MHz
No. of Operated Channel:	802.11b/g/n20: 11 channel 802.11n40: 7 channel
Modulation:	802.11b: CCK DSSS 802.11g: OFDM 802.11n20: OFDM 802.11n40: OFDM
Antenna Type:	Internal antenna
Antenna Gain:	ANT1:3.6dBi ANT2:3.6dBi
Description of the EUT:	The EUT is a IP touch 7" of a door entry system.

4 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C 10-1-2017 Edition	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators

All the test methods were according to KDB558074 v05r02 issued by August 24, 2018 and ANSI C63.10 (2013).

5 Summary of Test Results

Technical Requirements			
FCC Part 15 Subpart C			
Test Condition		Pages	Test Result
§15.207	Conducted emission AC power port	10	Pass
§15.247(b)(1)	Conducted peak output power	13	Pass
§15.247(e)	Power spectral density	14	Pass
§15.247(a)(2)	6dB bandwidth	15	Pass
§15.247(a)(1)	20dB bandwidth and 99% Occupied Bandwidth	--	N/A
§15.247(a)(1)	Carrier frequency separation	--	N/A
§15.247(a)(1)(iii)	Number of hopping frequencies	--	N/A
§15.247(a)(1)(iii)	Dwell Time	--	N/A
§15.247(d)	Spurious RF conducted emissions	21	Pass
§15.247(d)	Band edge	38	Pass
§15.247(d) & §15.209 &	Spurious radiated emissions for transmitter	43	Pass
§15.203	Antenna requirement	See note 1	Pass

Note 1: N/A=Not Applicable.

Note 2: The EUT uses two internal antennas (antenna 1 support 802.11b/g/n(20)/n(40); antenna 2 only support 802.11n(20)), both gains are 3.6dBi. In accordance to §15.203, it is considered sufficiently to comply with the provisions of this section.

6 General Remarks

Remarks

EUT supports Wi-Fi functions: 2412MHz - 2472MHz for 2.4GHz Wi-Fi; 5150 - 5250 MHz, 5250 - 5350 MHz, 5470 - 5725 MHz and 5725-5850 MHz for 5GHz Wi-Fi. There are two antennas for 2.4GHz Wi-Fi band: antenna 1 supports 802.11b/g/n(20)/n(40), antenna 2 only support 802.11n(20).

This submittal(s) (test report) is intended for FCC ID:2AEBL-H82364 and only for the 2.4GHz Wi-Fi band. It complies with Section 15.207, 15.209, 15.247 of the FCC Part 15, Subpart C rules.

SUMMARY:

All tests according to the regulations cited on page 5 were

n - Performed

o - **Not** Performed

The Equipment under Test

n - **Fulfills** the general approval requirements.

o - **Does not** fulfill the general approval requirements.

Sample Received Date: 2018-07-10

Testing Start Date: 2018-07-11

Testing End Date: 2018-08-13

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Reviewed by:



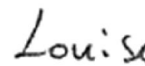
Tony Liu

Prepared by:



Kevin Ouyang

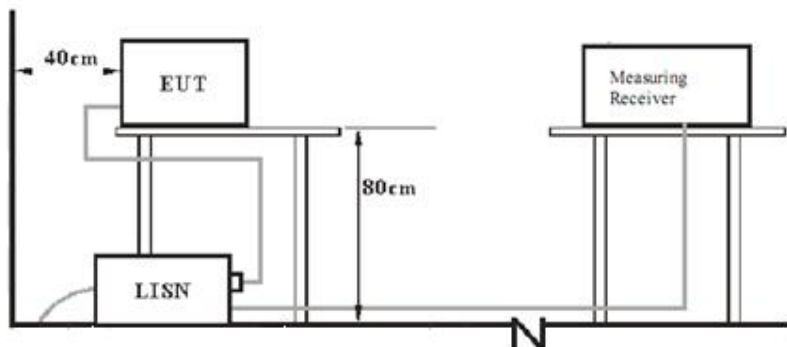
Tested by:



Louise Liu

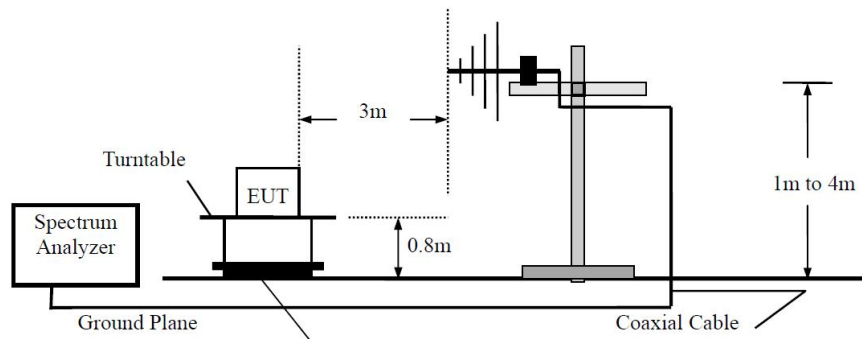
7 Test Setups

7.1 AC Power Line Conducted Emission test setups

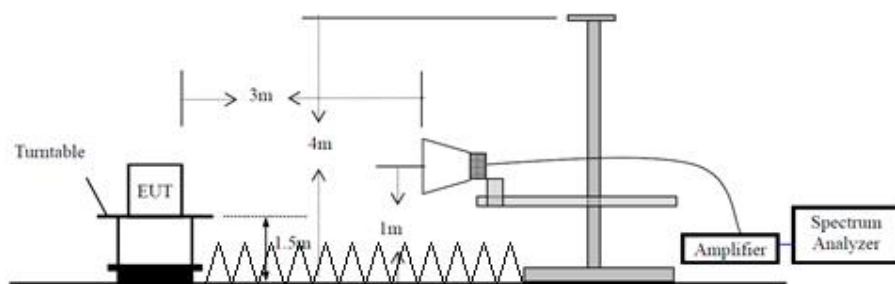


7.2 Radiated test setups

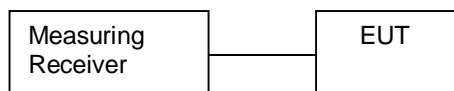
Below 1GHz



Above 1GHz



7.3 Conducted RF test setups



8 Systems test configuration

Auxiliary Equipment Used during Test:

DESCRIPTION	MODEL NO.(SHIELD)	MANUFACTURER
Laptop	T460S	LENOVO
Software	TI_Wireless_Tools_3.0.2.1	/
Welcome IP Access Point	D04012	ABB
Interface module	52361EX	ABB
ABB Welcome IP pushbutton video outdoor station	H81381P.-.	ABB
ABB Welcome IP keypad video outdoor station	H8138.K.-.	ABB
ABB Welcome IP touch 5" video outdoor station	H8138.T.-.	ABB
Outdoor station A/V module	H85138.M-S	ABB
Outdoor station touch 5" module	H85138.DP	ABB
Outdoor station Bar pushbutton module	5138.SP.	ABB
Outdoor station Round pushbutton module	5138.RP.	ABB
Outdoor station keypad module	5138.K.-.	ABB
IP Actuator	H8304	ABB
Guard unit	H8303	ABB
System controller	YSM01	ABB
POE Switch	TL-SL1218P	TP-LINK

Test channel & mode:

The was Interactive Tablet configured using a proprietary communication interface provided by the client. The interface allows channel control required to support the evaluation.

Duty cycle during test: 100%

802.11b/802.11g/802.11n-HT20

Test mode	Channel	Frequency(MHz)
TX	1	2412
TX	6	2437
TX	11	2462

802.11n-HT40

Test mode	Channel	Frequency(MHz)
TX	3	2422
TX	6	2437
TX	9	2452

9 Technical Requirement

9.1 Conducted Emission

Test Method

1. The EUT was placed on a table, which is 0.8m above ground plane
2. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.).
3. Maximum procedure was performed to ensure EUT compliance
4. A EMI test receiver is used to test the emissions from both sides of AC line

Limit

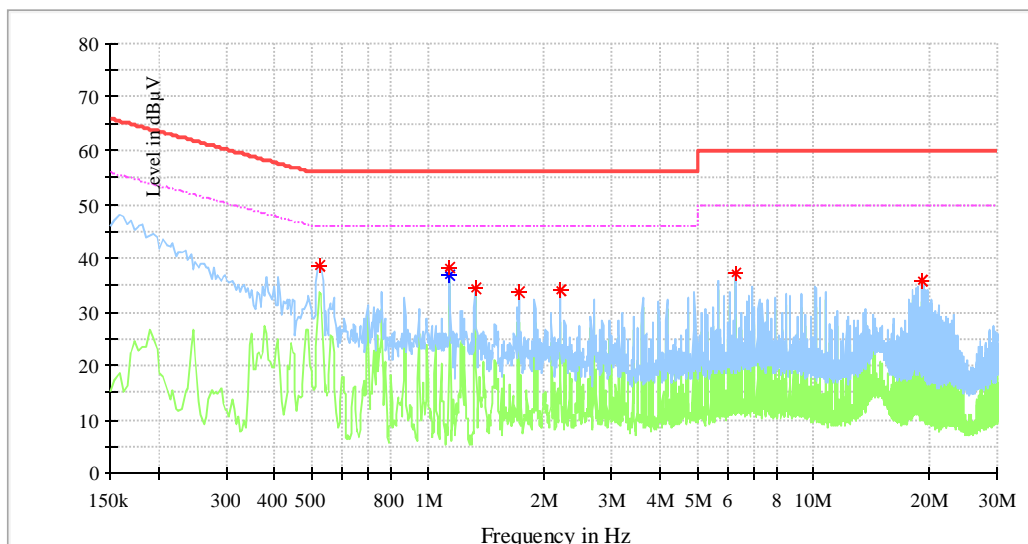
Frequency MHz	QP Limit dB μ V	AV Limit dB μ V
0.150-0.500	66-56*	56-46*
0.500-5	56	46
5-30	60	50

Decreasing linearly with logarithm of the frequency

Test data:

Conducted Emission

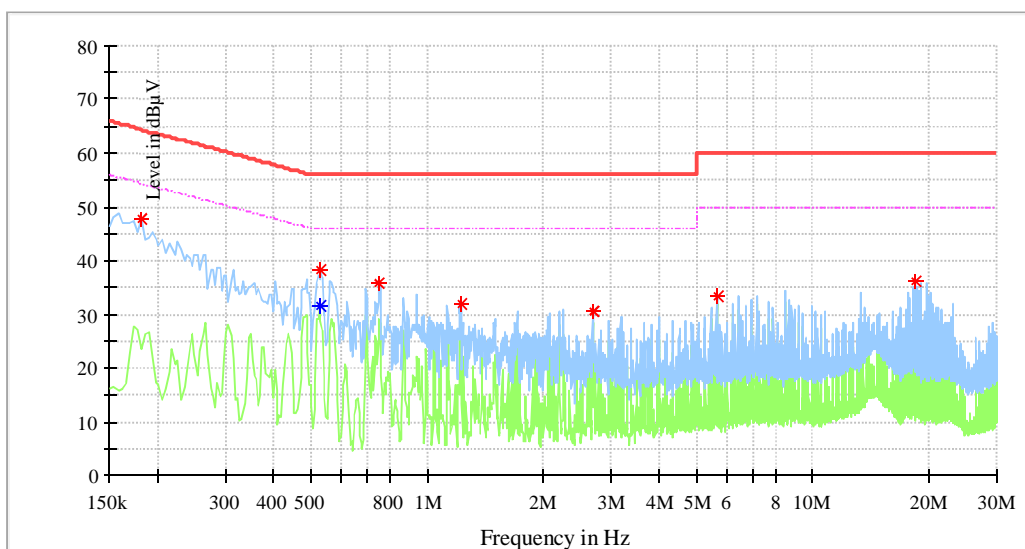
Product Type : IP touch 7"
M/N : H82364-
Operating Condition : WiFi function on.
Test Specification : L
Comment : AC 120V/60Hz
Test date : 2018-07-11



No significant emission was detected within 10 dB to limit

Conducted Emission

Product Type : IP touch 7"
 M/N : H82364-
 Operating Condition : WiFi function on.
 Test Specification : N
 Comment : AC 120V/60Hz
 Test date : 2018-07-11



No significant emission was detected within 10 dB to limit

9.2 Conducted peak output power

Test Method

1. Connect the power meter to the EUT
 - a) The EUT is configured to transmit continuously, or to transmit with a constant duty factor.
 - b) At all times the EUT is transmitting at its maximum power control level.
 - c) The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five.
2. Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.
3. Adjust the measurement in dBm by adding $10\log(1/x)$, where x is the duty cycle to the measurement result.

Limits

Frequency Range MHz	Limit W	Limit dBm
2400-2483.5	≤1	≤30

Conducted peak output power

TestMode	Antenna	Channel (MHz)	Peak power		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Verdict		
			Chain1 (dBm)	Chain2 (dBm)						
11B	Ant1	2412	11.65	\		11.65	30	PASS		
		2437	12.00			12.00	30	PASS		
		2462	12.30			12.30	30	PASS		
11G	Ant1	2412	16.63			16.63	30	PASS		
		2437	17.18			17.18	30	PASS		
		2462	17.34			17.34	30	PASS		
11N20	Ant1	2412	15.55			18.21	102.11	20.09	28	PASS
		2437	16.24			18.05	105.90	20.25	28	PASS
		2462	16.32			17.89	104.37	20.19	28	PASS
11N40	Ant1	2422	16.14	\		16.14	30	PASS		
		2437	16.37			16.37	30	PASS		
		2452	16.49			16.49	30	PASS		

Remark:

Chain1(antenna 2.4GHz WIFI-1) supports 802.11b/g/n(20)/n(40), Chain2(antenna 2.4GHz WIFI-2) only support 802.11n(20).

Per KDB 662911, the conducted powers Chain1 and Chain2 were first measured separately during MIMO transmission as shown in section above. The measured values were then summed in linear power units then converted back to dBm.

Note: For 11N20, directional gain shall be calculated as the sum of 10 log (number of array elements) plus the directional gain of the element having the highest gain. directional gain= $10\log(2)+3.6$ dBi = 6.6 dBi > 6 dBi, the limit of 11N20 shall be reduced by 2dB.

9.3 Power spectral density

Test Method

This procedure shall be used if maximum peak conducted output power was used to demonstrate compliance:

1. Set analyzer center frequency to DTS channel center frequency.
RBW=3kHz, VBW≥3RBW, Span=1.5 times DTS bandwidth, Detector=Peak, Sweep=auto, Trace= max hold
2. Allow trace to fully stabilize, use the peak marker function to determine the maximum amplitude level within the RBW.
3. Repeat above procedures until other frequencies measured were completed

Limit

Limit

≤ 8 dBm/3KHz

TestMode	Antenna	Channel (MHz)	PSD measured (dBm/3KHz)		Total PSD (dBm/3KHz)	Limit (dBm/3KHz)	Verdict
			Chain1	Chain2			
11B	Ant1	2412	-13.86	/	-13.86	8	PASS
		2437	-13.88		-13.88	8	PASS
		2462	-13.90		-13.90	8	PASS
11G	Ant1	2412	-16.94		-16.94	8	PASS
		2437	-16.22		-16.22	8	PASS
		2462	-15.90		-15.90	8	PASS
11N20	Ant1 & Ant2	2412	-16.56	-14.84	-12.60	6	PASS
		2437	-16.25	-15.01	-12.52	6	PASS
		2462	-16.25	-15.72	-12.92	6	PASS
11N40	Ant1	2422	-21.04	/	-21.04	8	PASS
		2437	-19.88		-19.88	8	PASS
		2452	-18.51		-18.51	8	PASS

Remark: For 11N20, directional gain shall be calculated as the sum of 10 log (number of array elements) plus the directional gain of the element having the highest gain.

So directional gain= 10log(2)+3.6 dBi = 6.6 dBi > 6 dBi, the limit of 11N20 shall be reduced by 2dB.

9.4 6 dB Bandwidth

Test Method

1. Use the following spectrum analyzer settings:
RBW=100K, VBW \geq 3RBW, Sweep = auto, Detector function = peak, Trace = max hold
2. Use the automatic bandwidth measurement capability of an instrument, may be employed using the X dB bandwidth mode with X set to 6, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be \geq 6 dB.
3. Allow the trace to stabilize, record the X dB Bandwidth value.

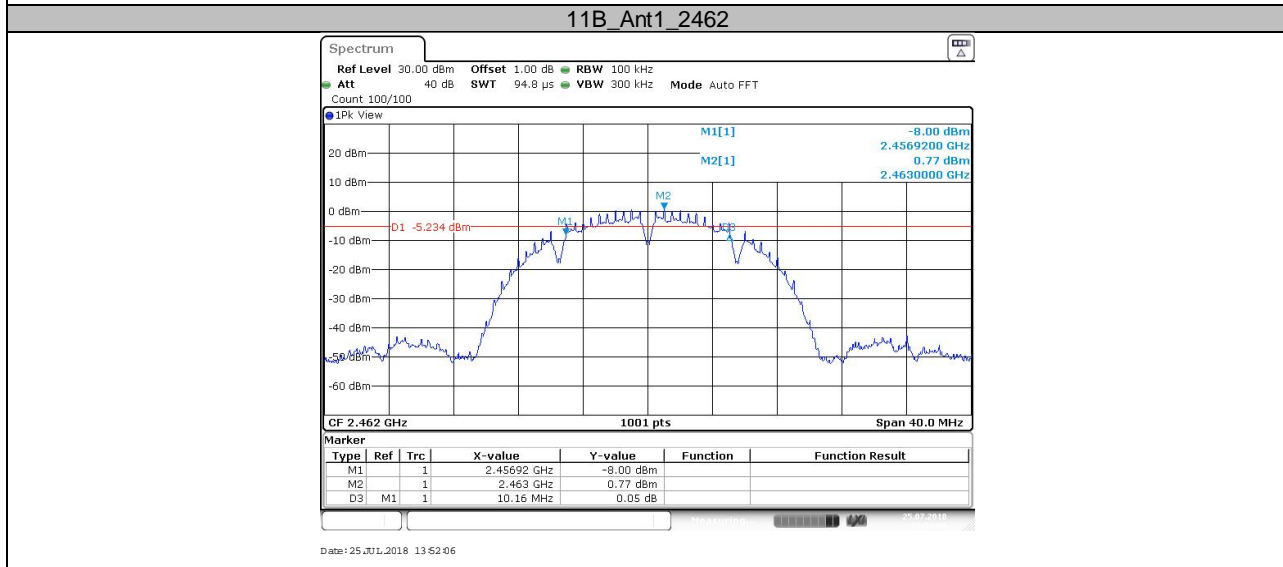
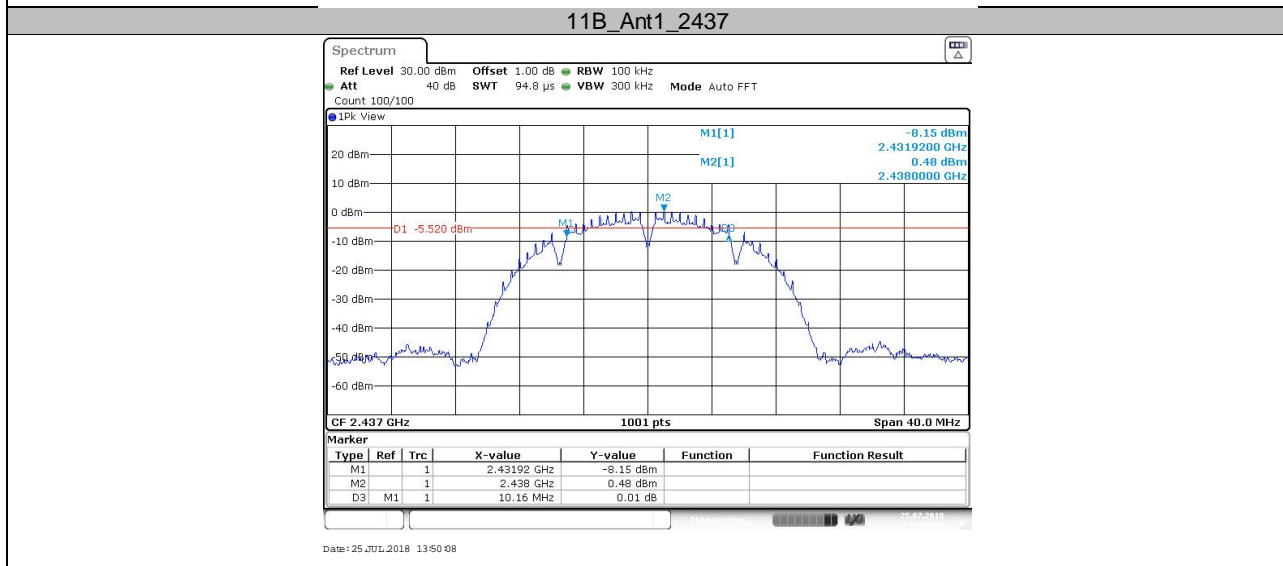
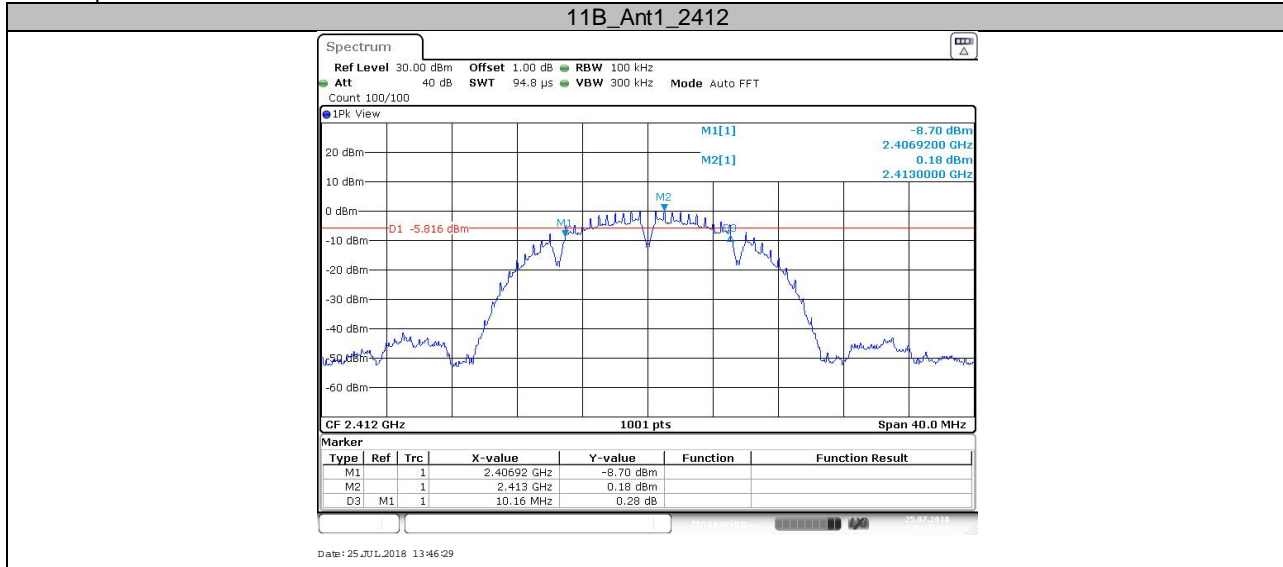
Limit

Limit [kHz]

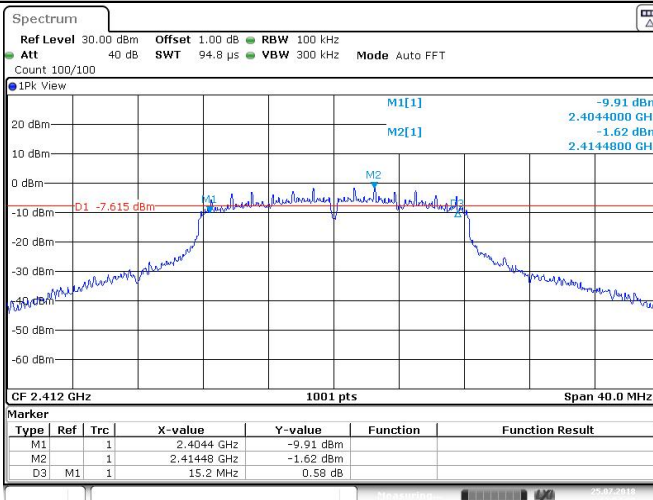
≥500

TestMode	Antenna	Channel (MHz)	DTS BW [MHz]	FL[MHz]	FH[MHz]	Verdict
11B	Ant1	2412	10.160	2406.920	2417.080	PASS
		2437	10.160	2431.920	2442.080	PASS
		2462	10.160	2456.920	2467.080	PASS
11G	Ant1	2412	15.200	2404.400	2419.600	PASS
		2437	15.200	2429.400	2444.600	PASS
		2462	15.200	2454.400	2469.600	PASS
11N20	Ant1	2412	15.200	2404.400	2419.600	PASS
		2437	15.200	2429.400	2444.600	PASS
		2462	15.200	2454.400	2469.600	PASS
11N40	Ant1	2422	35.280	2404.400	2439.680	PASS
		2437	35.280	2419.400	2454.680	PASS
		2452	35.280	2434.400	2469.680	PASS
11N20	Ant2	2412	15.800	2404.400	2420.200	PASS
		2437	15.200	2429.400	2444.600	PASS
		2462	15.200	2454.400	2469.600	PASS

Test Graphs

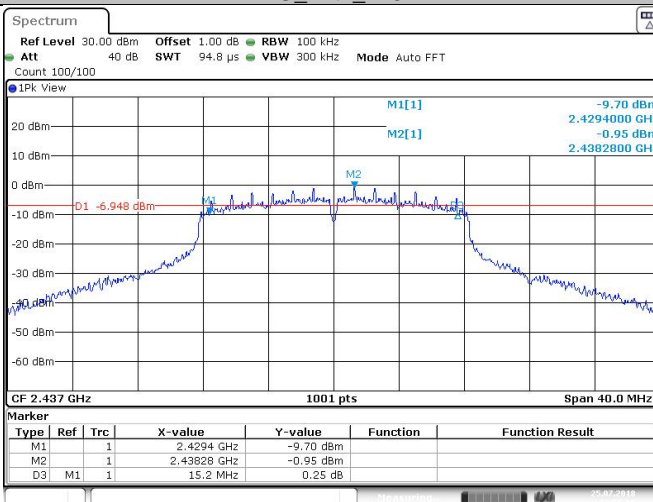


11G_Ant1_2412



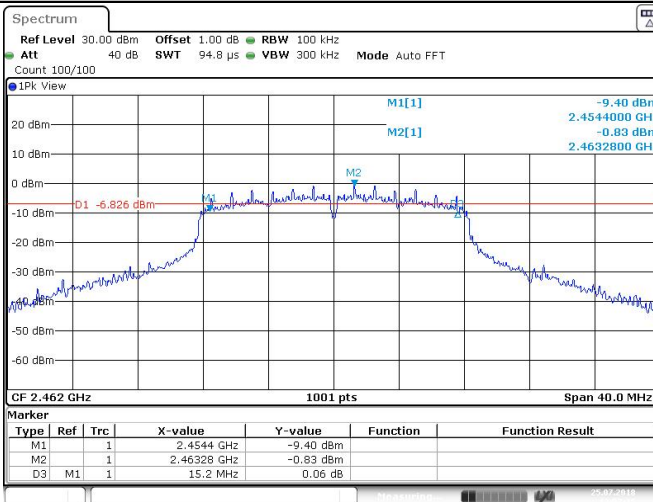
Date: 25 JUL 2018 13:54:00

11G_Ant1_2437



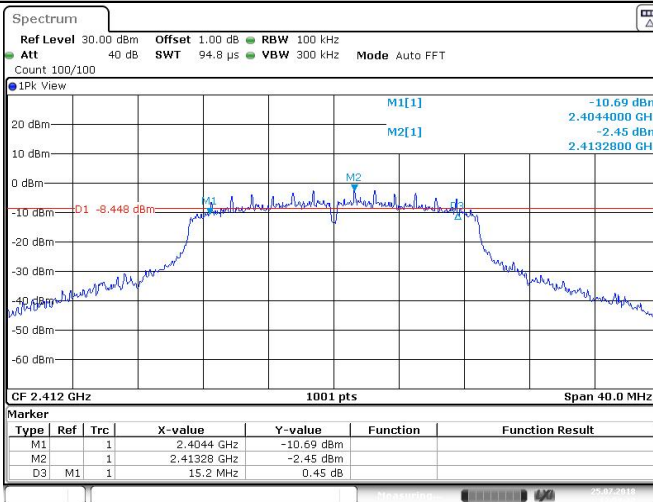
Date: 25 JUL 2018 13:55:37

11G_Ant1_2462



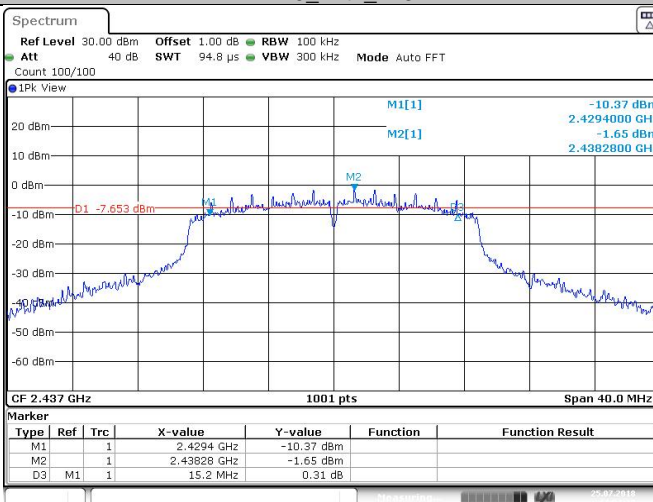
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11N20_Ant1_2412



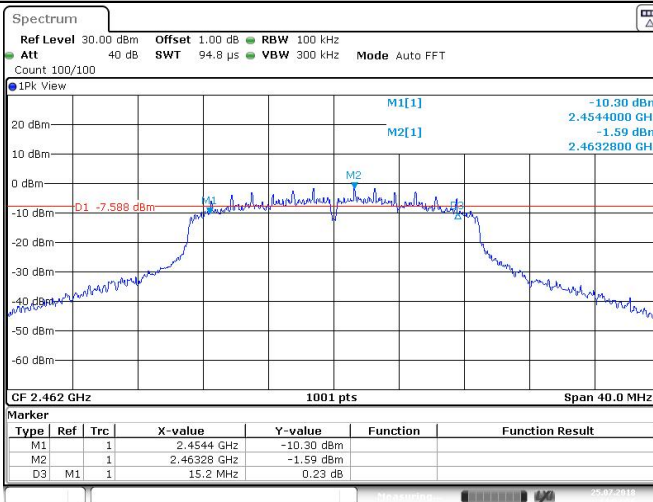
Date: 25 JUL 2018 13:59:23

11N20_Ant1_2437



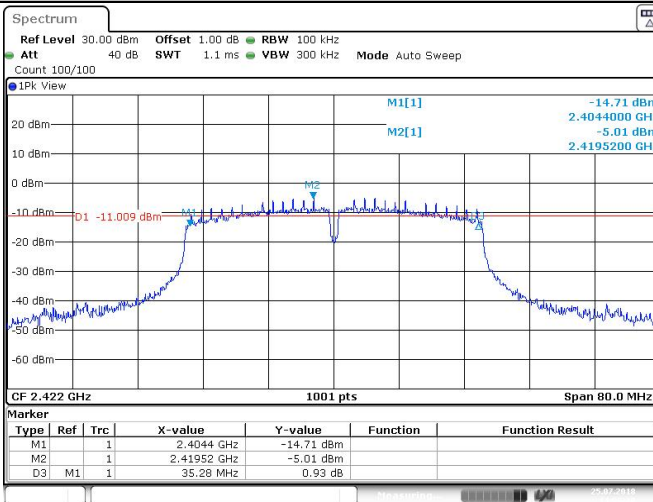
Date: 25 JUL 2018 14:01:49

11N20_Ant1_2462



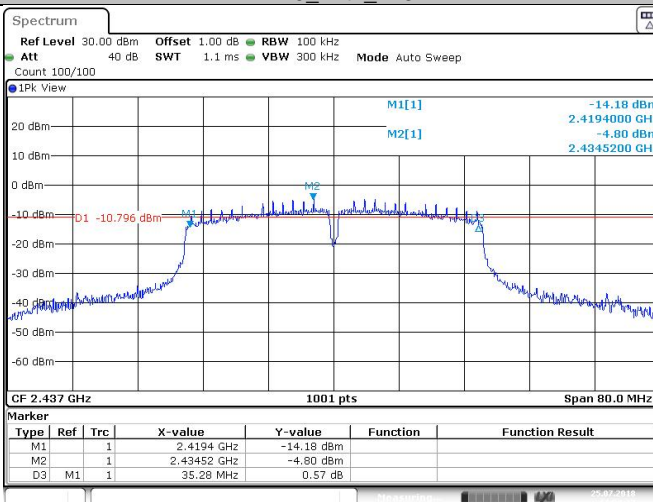
Date: 25 JUL 2018 14:02:57

11N40_Ant1_2422



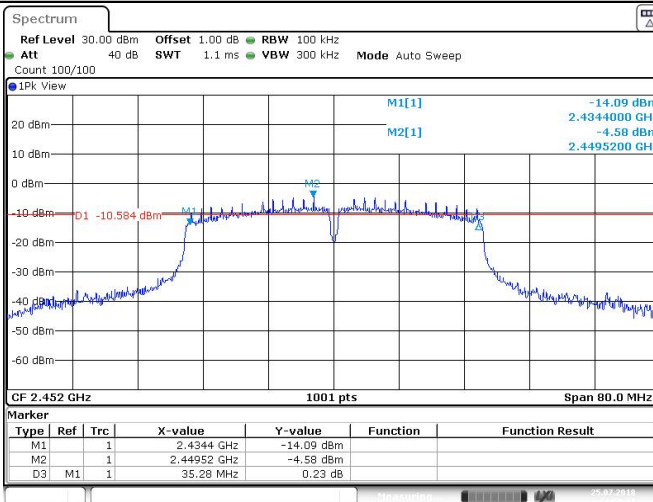
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11N40_Ant1_2437



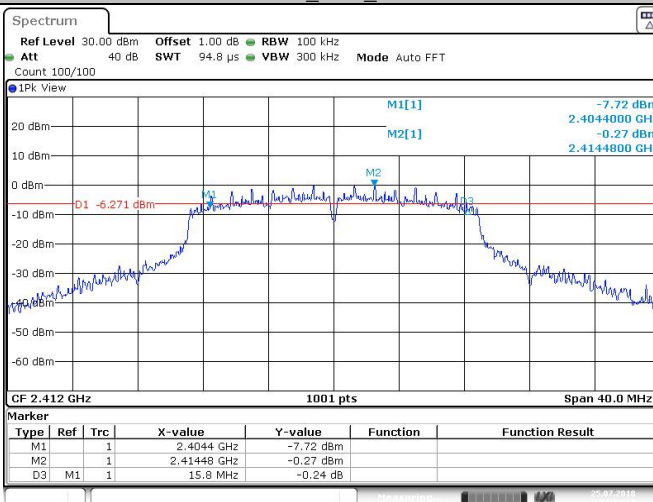
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11N40_Ant1_2452



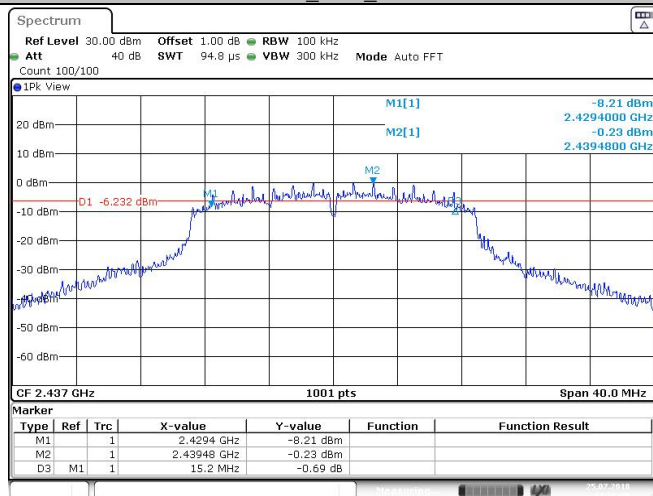
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11N20_Ant2_2412



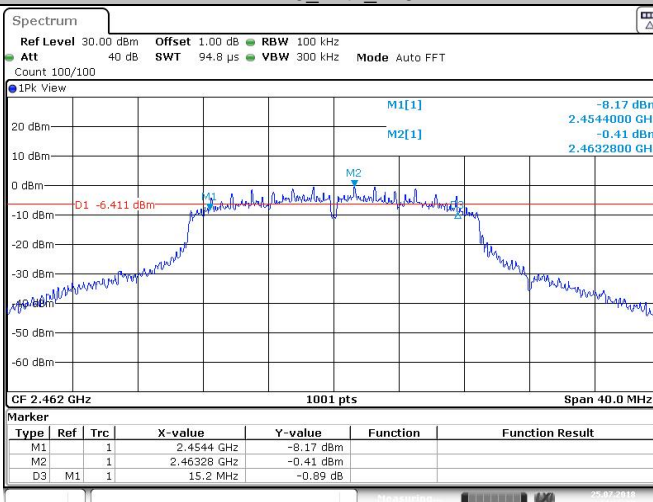
Date: 25 JUL 2018 14:13:32

11N20_Ant2_2437



Date: 25 JUL 2018 14:15:40

11N20_Ant2_2462



Date: 25 JUL 2018 14:16:37

9.5 Spurious RF conducted emissions

Test Method

1. Use the following spectrum analyzer settings:
Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.
RBW = 100 kHz, VBW \geq RBW, Sweep = auto, Detector function = peak, Trace = max hold
2. Allow the trace to stabilize. Set the marker on the peak of any spurious emission recorded.
3. The level displayed must comply with the limit specified in this Section. Submit these plots.
4. Repeat above procedures until all frequencies measured were complete.

Limit

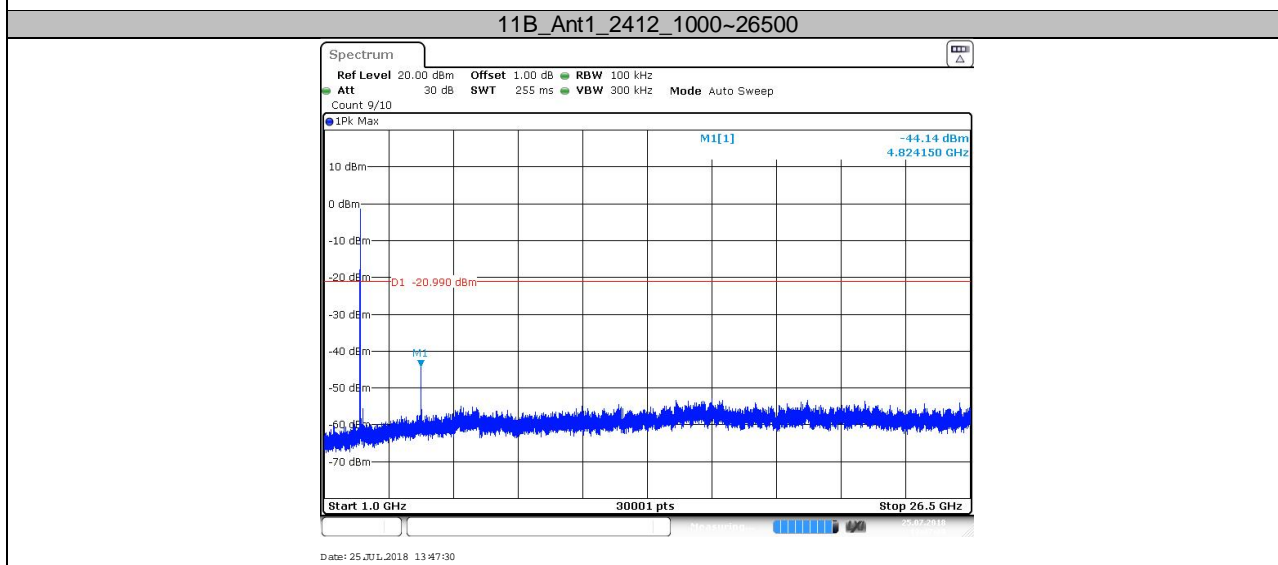
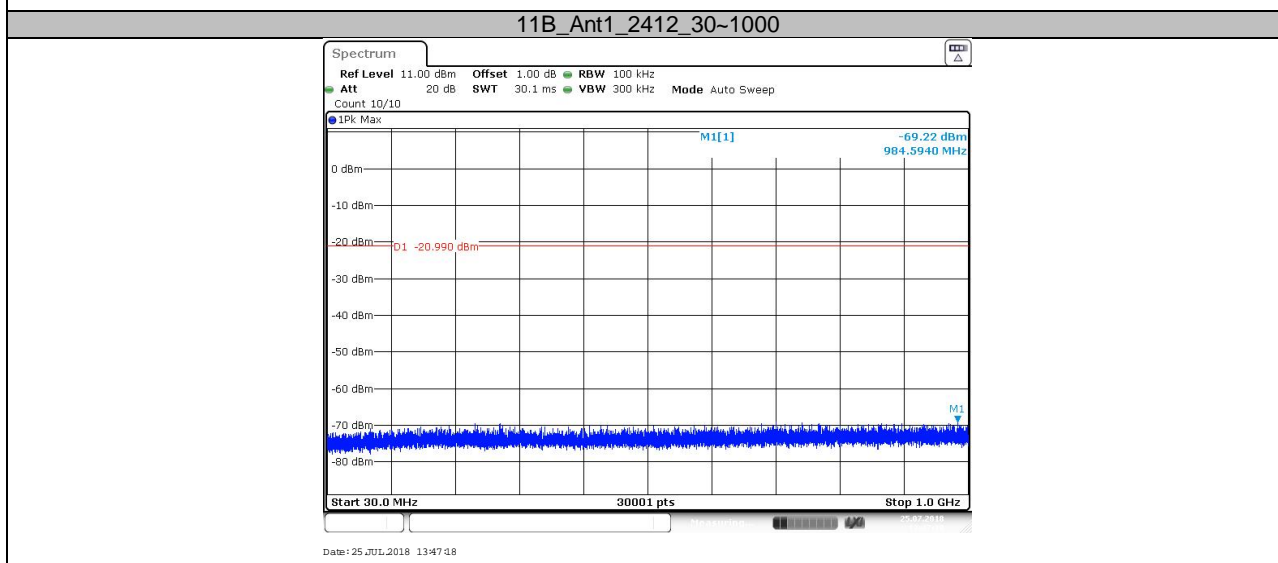
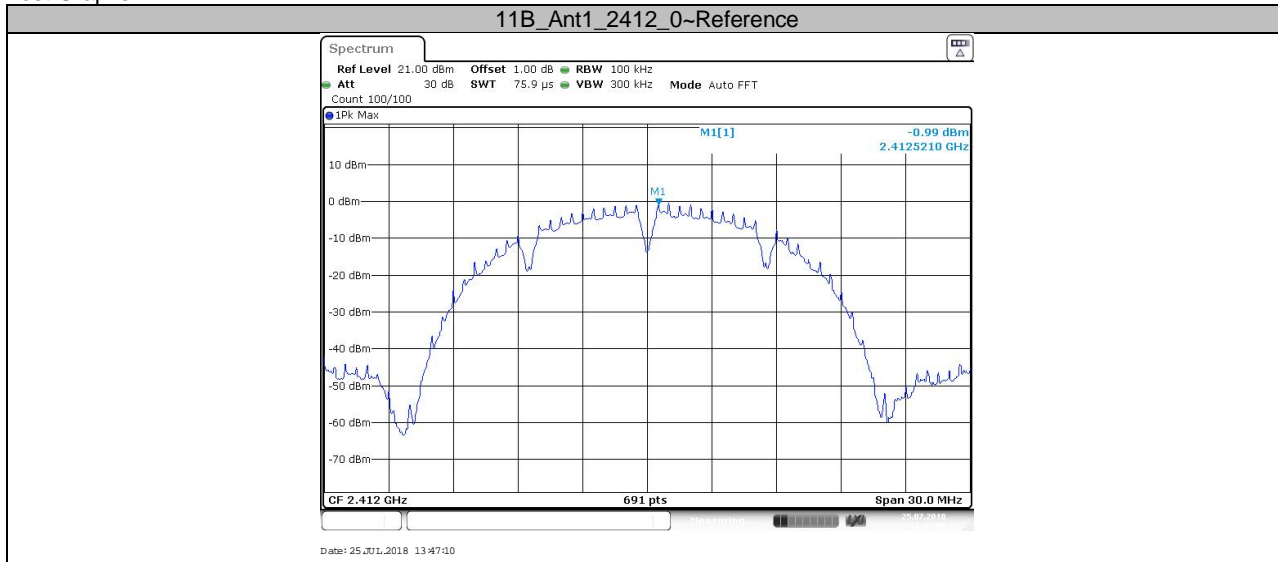
Frequency Range MHz	Limit (dBc)
30-25000	-20

Spurious RF conducted emissions

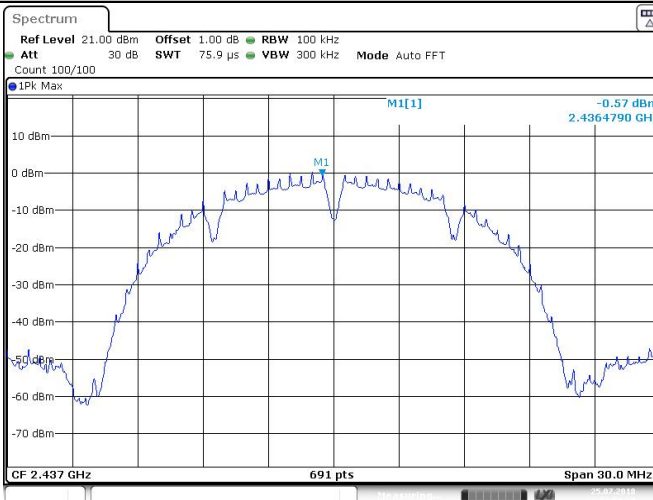
Test Result

TestMode	Antenna	Channel (MHz)	FreqRange (MHz)	RefLevel (dBm)	Result (dBm)	Limit (dBm)	Verdict
11B	Ant1	2412	Reference	-0.99	-0.99	---	PASS
		2412	30~1000	-0.99	-69.22	-20.99	PASS
		2412	1000~26500	-0.99	-44.14	-20.99	PASS
		2437	Reference	-0.57	-0.57	---	PASS
		2437	30~1000	-0.57	-68.27	-20.57	PASS
		2437	1000~26500	-0.57	-44.85	-20.57	PASS
		2462	Reference	-0.02	-0.02	---	PASS
		2462	30~1000	-0.02	-68.86	-20.02	PASS
11G	Ant1	2462	1000~26500	-0.02	-47.35	-20.02	PASS
		2412	Reference	-1.62	-1.62	---	PASS
		2412	30~1000	-1.62	-68.5	-21.62	PASS
		2412	1000~26500	-1.62	-52.53	-21.62	PASS
		2437	Reference	-0.97	-0.97	---	PASS
		2437	30~1000	-0.97	-68.33	-20.97	PASS
		2437	1000~26500	-0.97	-53.14	-20.97	PASS
		2462	Reference	-0.85	-0.85	---	PASS
11N20	Ant1	2462	30~1000	-0.85	-68.53	-20.85	PASS
		2462	1000~26500	-0.85	-52.48	-20.85	PASS
		2412	Reference	-2.53	-2.53	---	PASS
		2412	30~1000	-2.53	-69.07	-22.53	PASS
		2412	1000~26500	-2.53	-52.71	-22.53	PASS
		2437	Reference	-1.86	-1.86	---	PASS
		2437	30~1000	-1.86	-68.7	-21.86	PASS
		2437	1000~26500	-1.86	-53.03	-21.86	PASS
11N40	Ant1	2462	Reference	-1.60	-1.60	---	PASS
		2462	30~1000	-1.60	-69.05	-21.6	PASS
		2462	1000~26500	-1.60	-53.19	-21.6	PASS
		2422	Reference	-5.15	-5.15	---	PASS
		2422	30~1000	-5.15	-69.11	-25.15	PASS
		2422	1000~26500	-5.15	-51.68	-25.15	PASS
		2437	Reference	-5.07	-5.07	---	PASS
		2437	30~1000	-5.07	-69.17	-25.07	PASS
11N20	Ant2	2437	1000~26500	-5.07	-53.28	-25.07	PASS
		2452	Reference	-4.63	-4.63	---	PASS
		2452	30~1000	-4.63	-68.7	-24.63	PASS
		2452	1000~26500	-4.63	-52.88	-24.63	PASS
		2412	Reference	-0.37	-0.37	---	PASS
		2412	30~1000	-0.37	-68.12	-20.37	PASS
		2412	1000~26500	-0.37	-51.65	-20.37	PASS
		2437	Reference	-0.25	-0.25	---	PASS
11N20	Ant2	2437	30~1000	-0.25	-68.53	-20.25	PASS
		2437	1000~26500	-0.25	-52.29	-20.25	PASS
		2462	Reference	-0.45	-0.45	---	PASS
		2462	30~1000	-0.45	-69.01	-20.45	PASS
		2462	1000~26500	-0.45	-52.23	-20.45	PASS

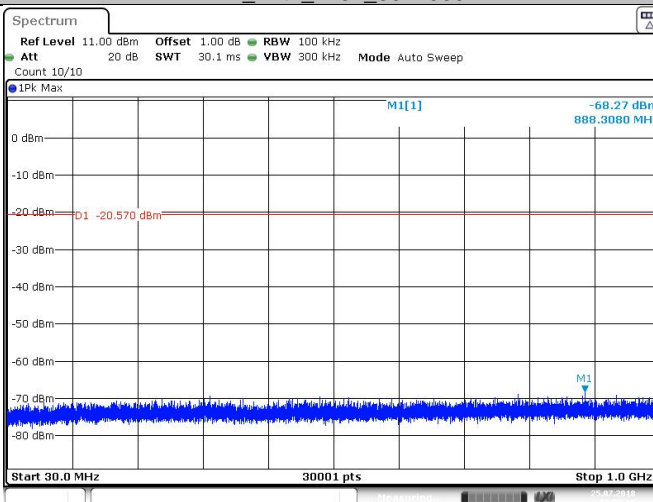
Test Graphs



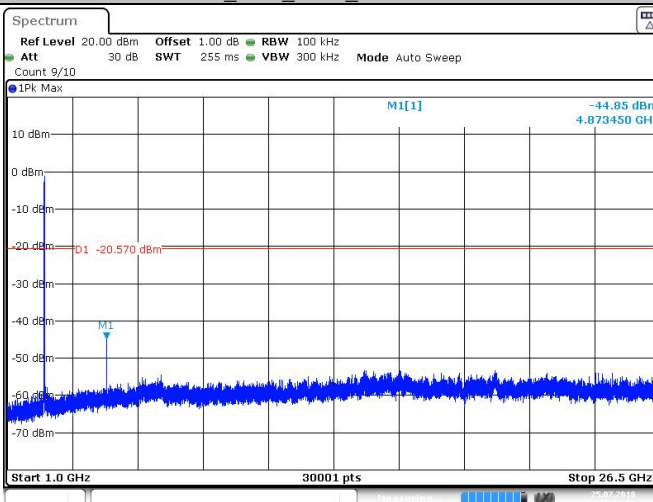
11B_Ant1_2437_0~Reference



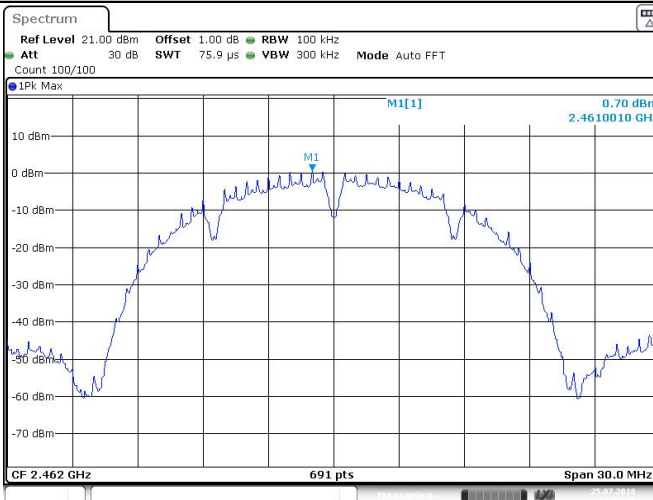
11B_Ant1_2437_30~1000



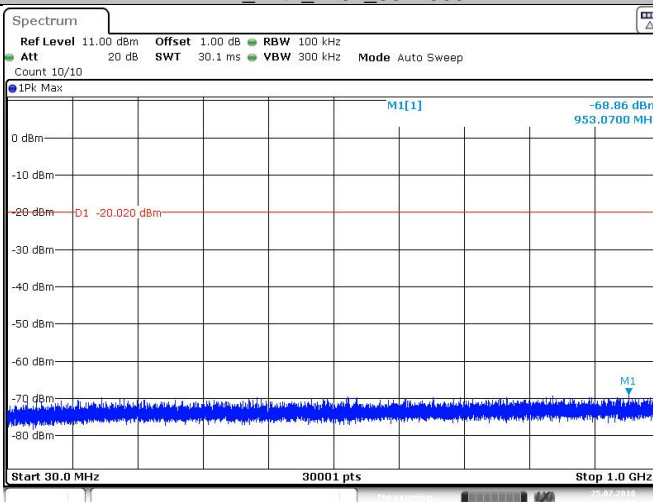
11B_Ant1_2437_1000~26500



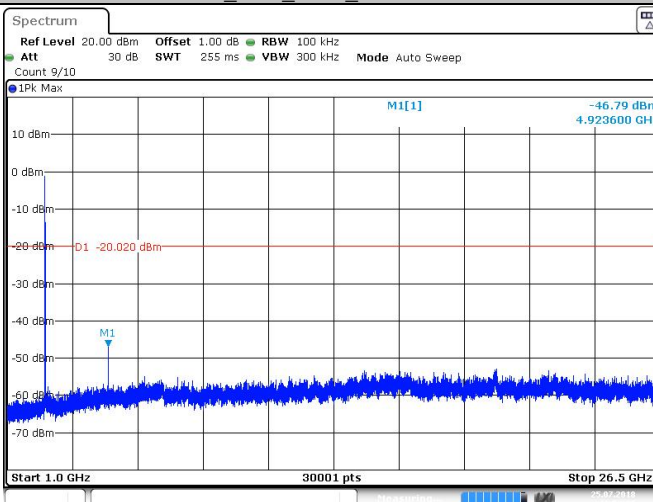
11B_Ant1_2462_0~Reference



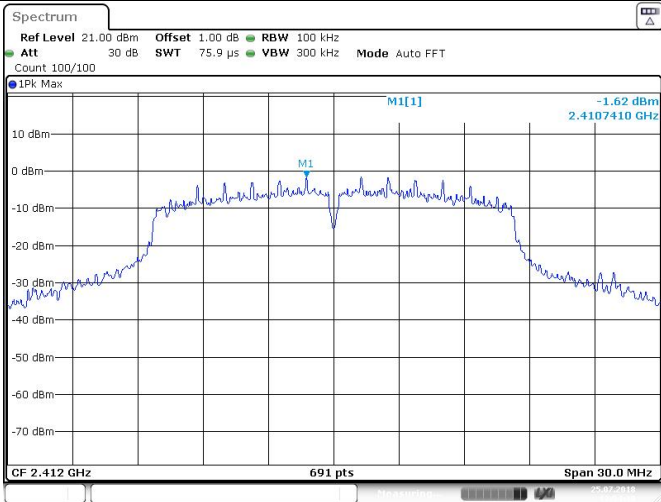
11B_Ant1_2462_30~1000



11B_Ant1_2462_1000~26500

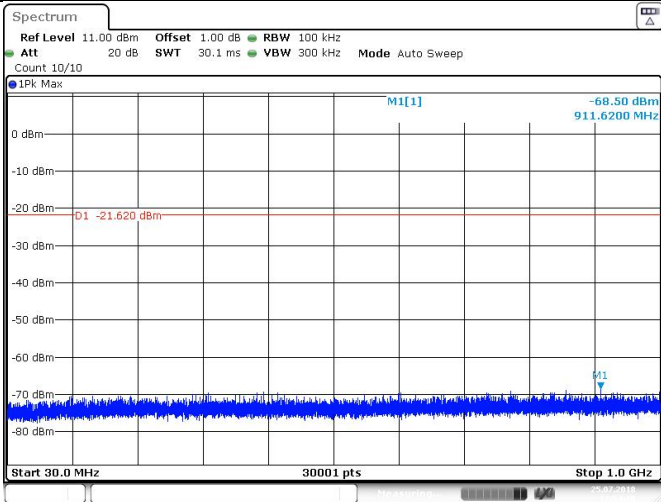


11G_Ant1_2412_0~Reference



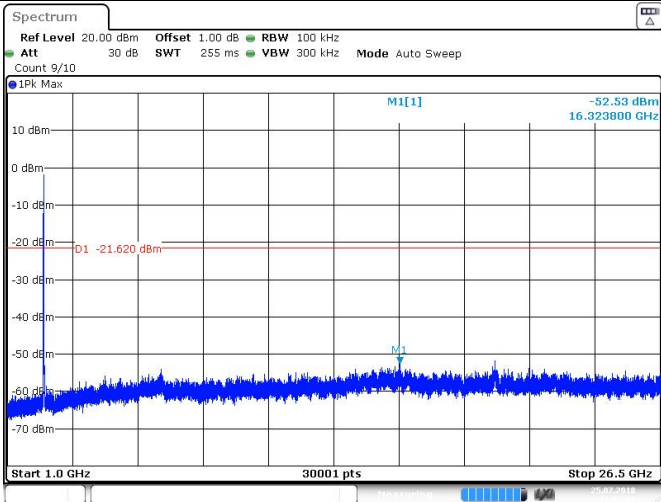
Date: 25 JUL 2018 13:54:40

11G_Ant1_2412_30~1000



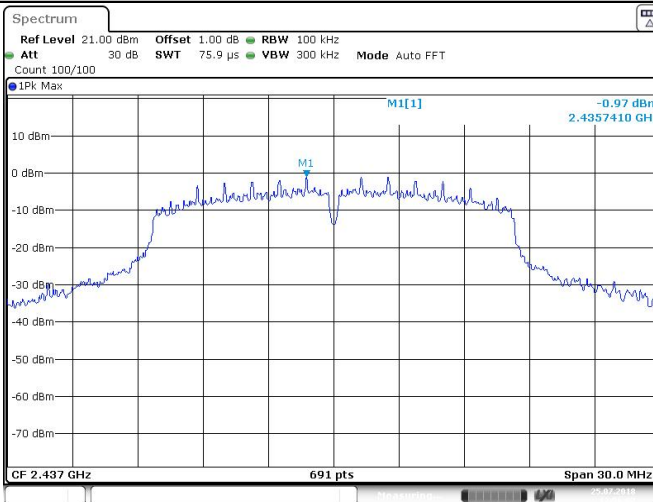
Date: 25 JUL 2018 13:54:48

11G_Ant1_2412_1000~26500



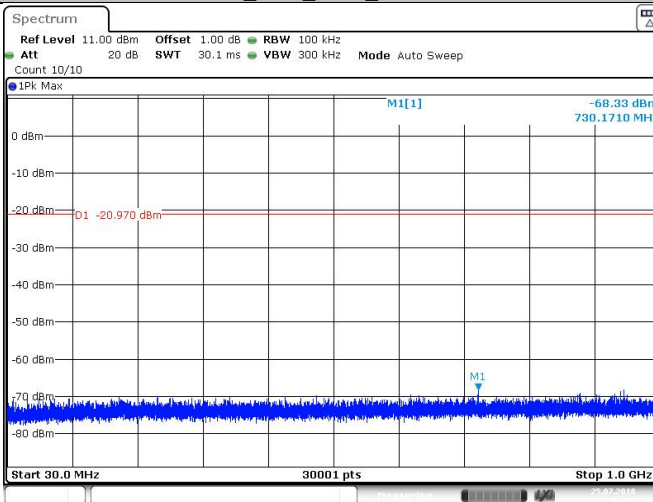
Date: 25 JUL 2018 13:55:00

11G_Ant1_2437_0~Reference



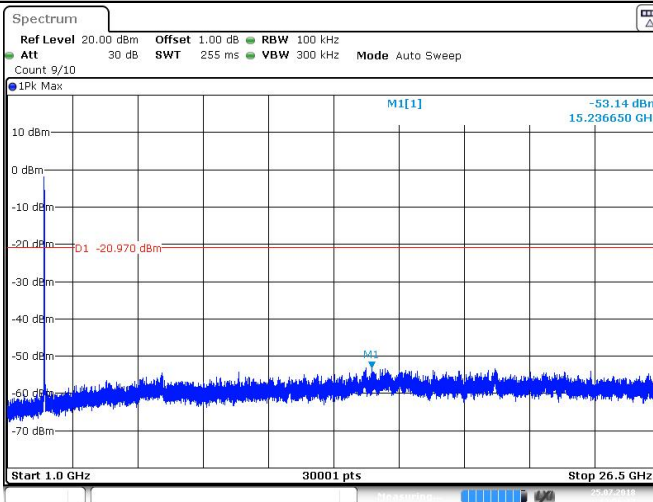
Date: 25 JUL 2018 13:56:07

11G_Ant1_2437_30~1000



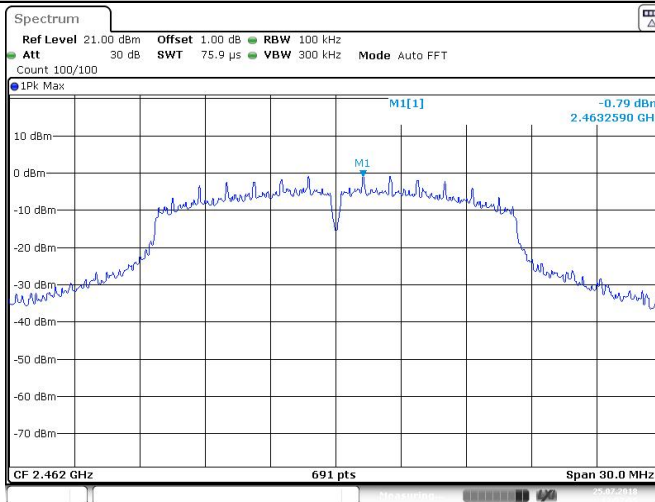
Date: 25 JUL 2018 13:56:45

11G_Ant1_2437_1000~26500



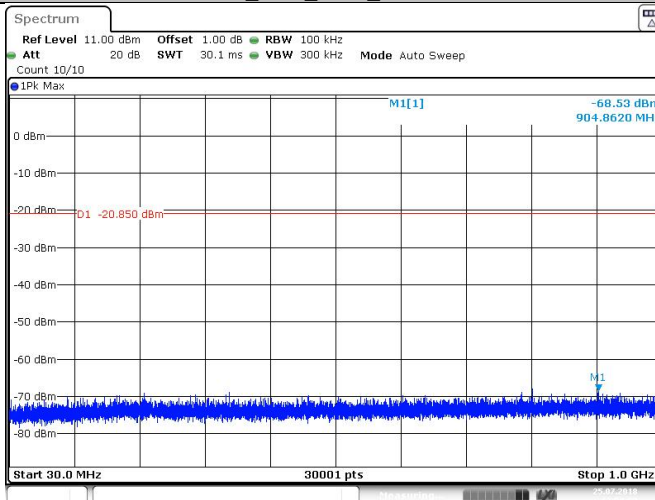
Date: 25 JUL 2018 13:56:27

11G_Ant1_2462_0-Reference



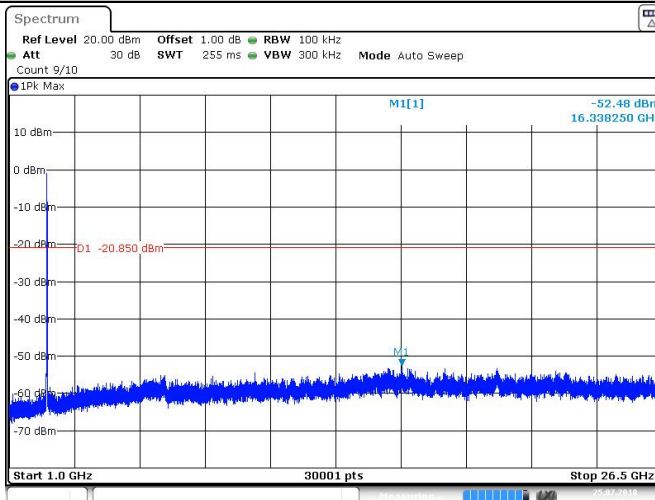
Date: 25 JUL 2018 13:57:55

11G_Ant1_2462_30~1000

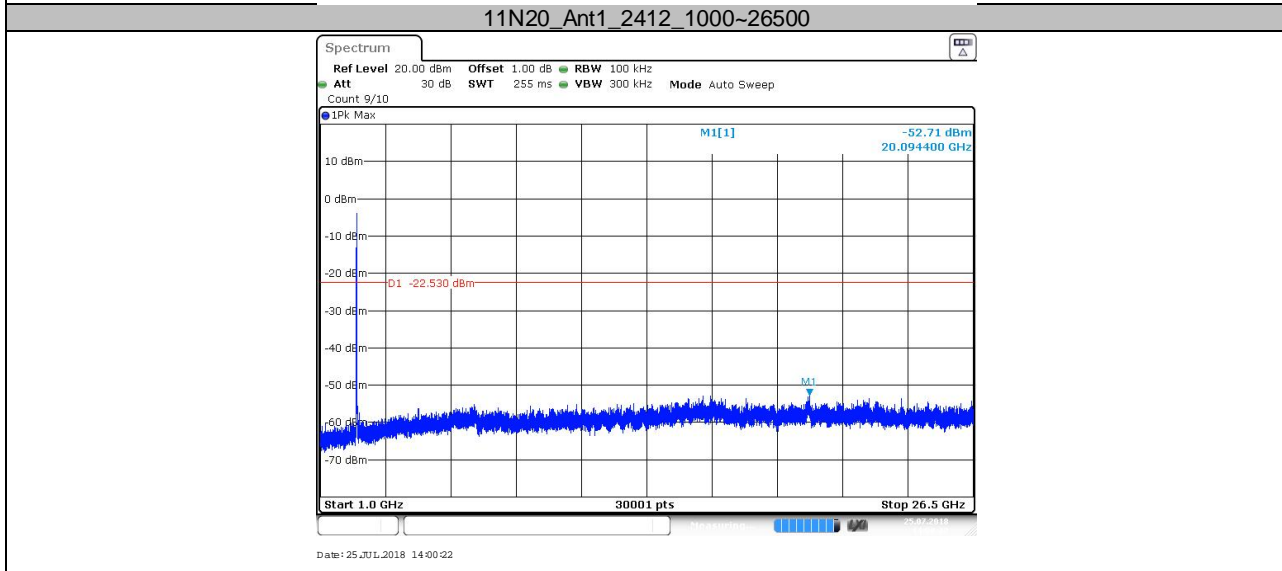
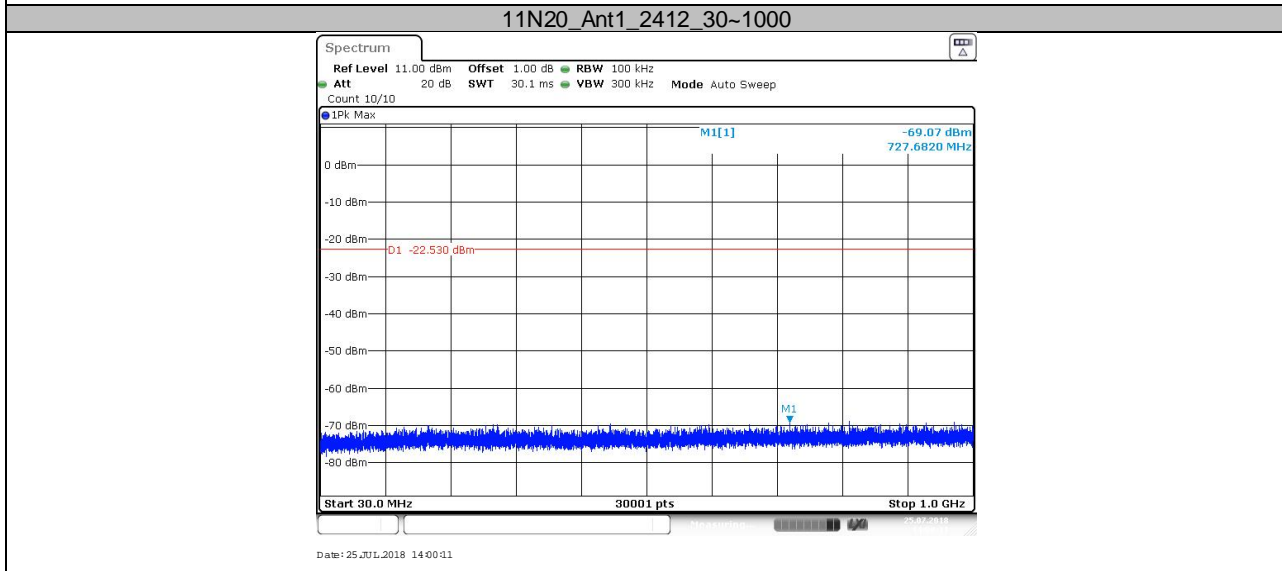
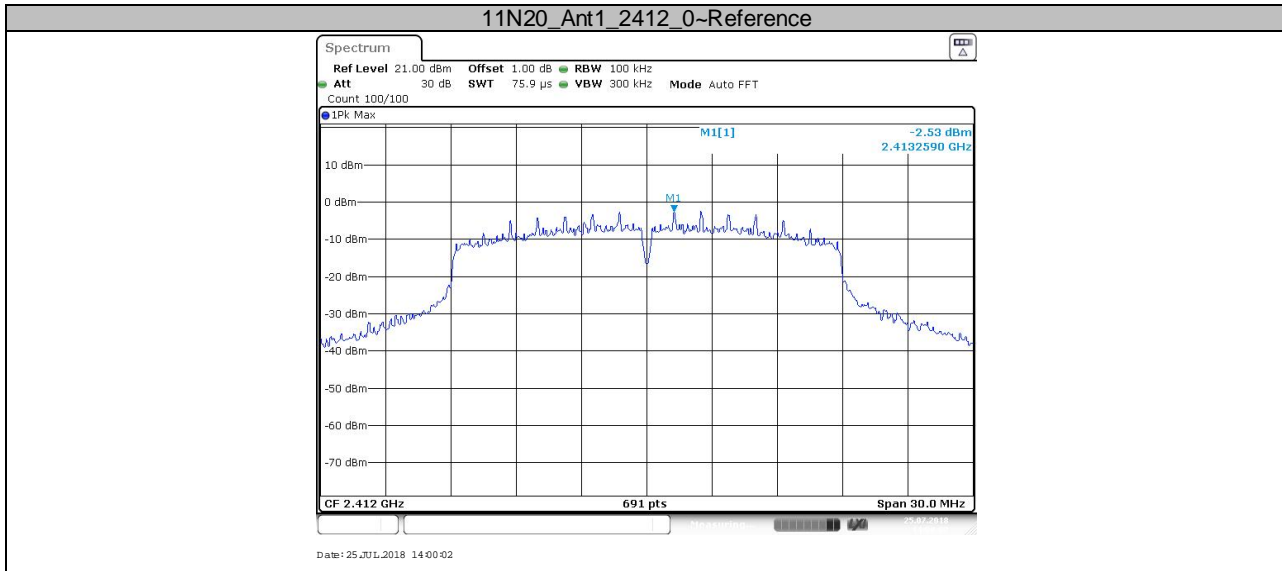


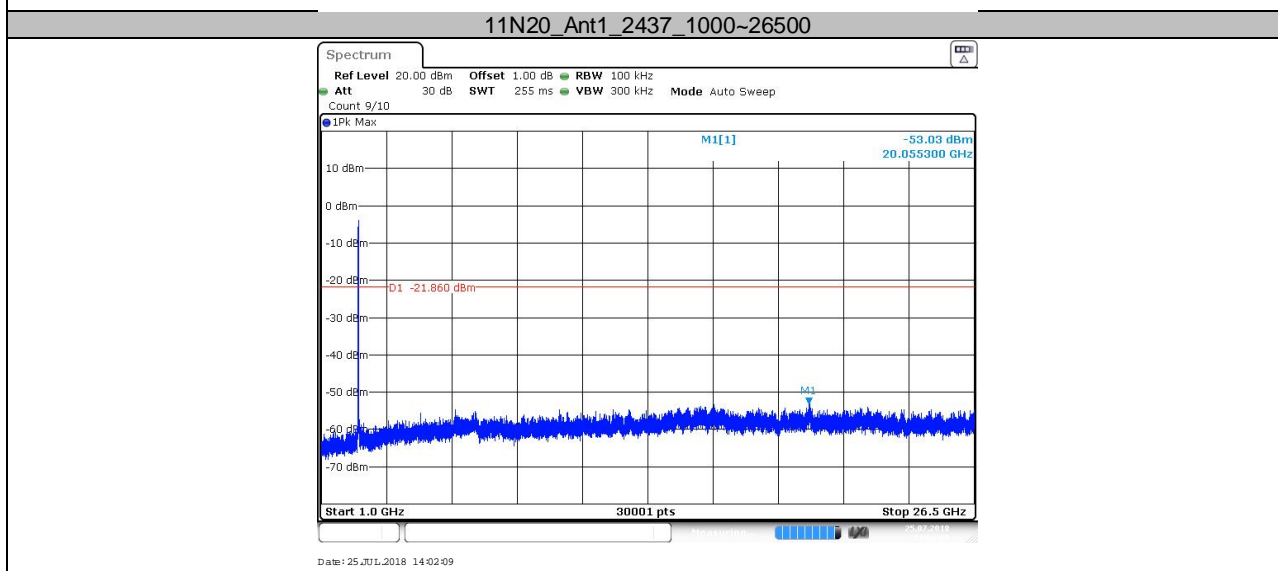
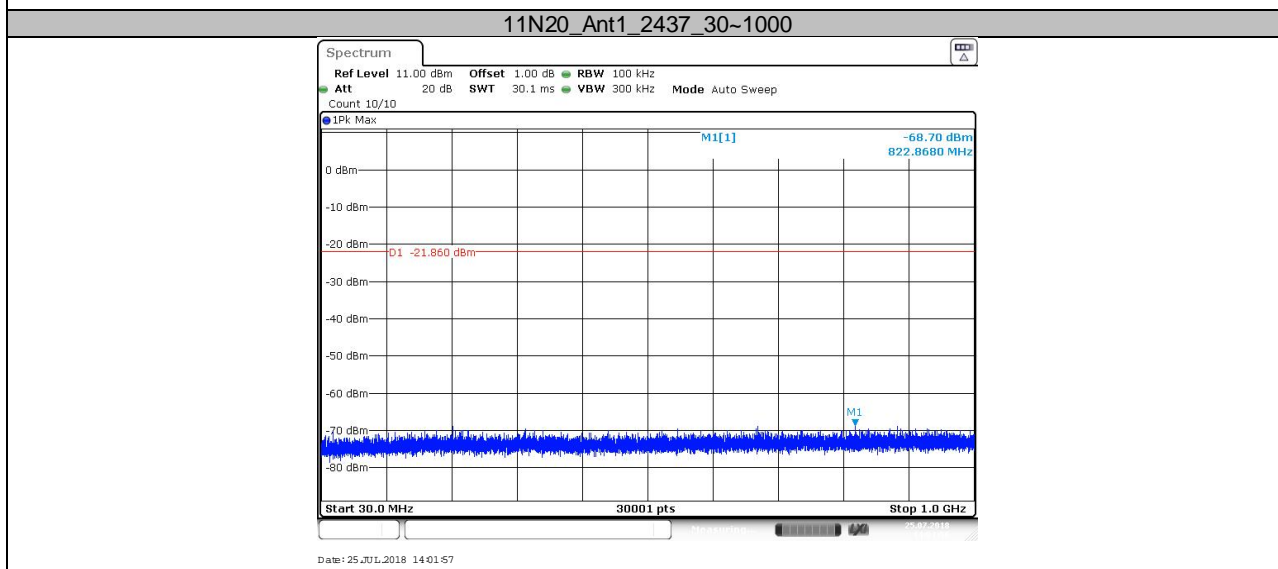
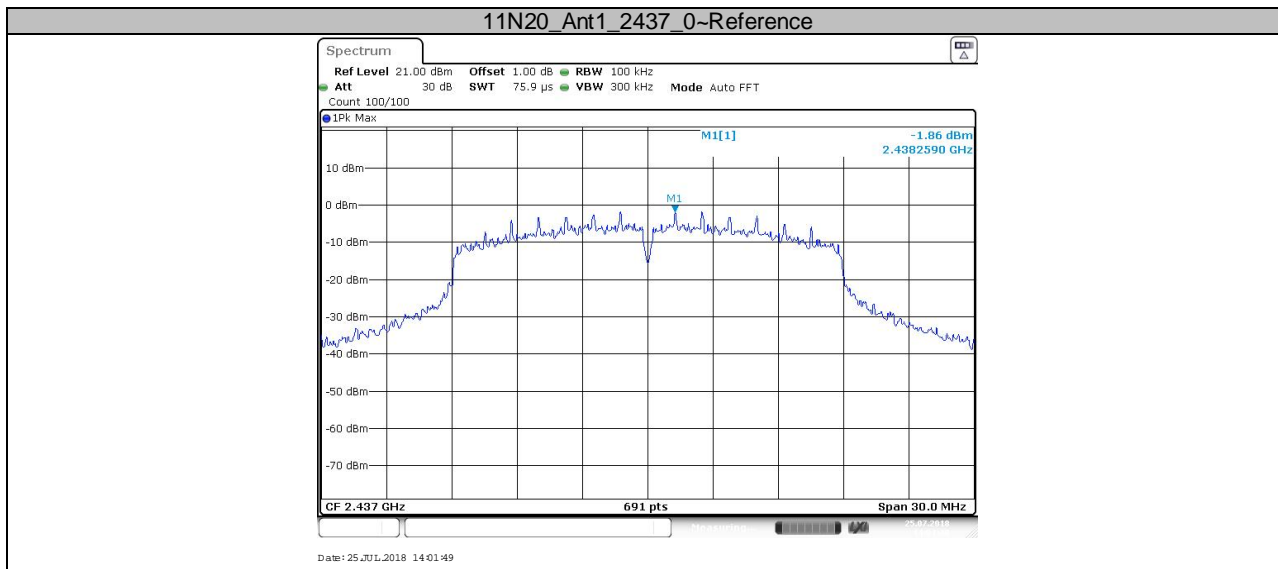
Date: 25 JUL 2018 13:58:04

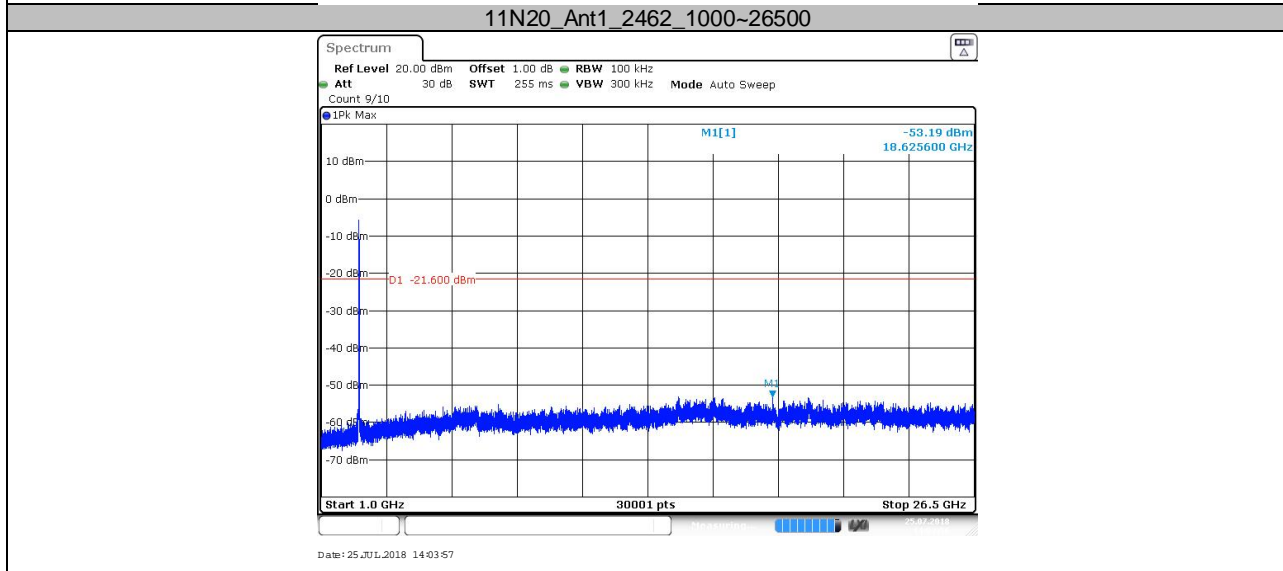
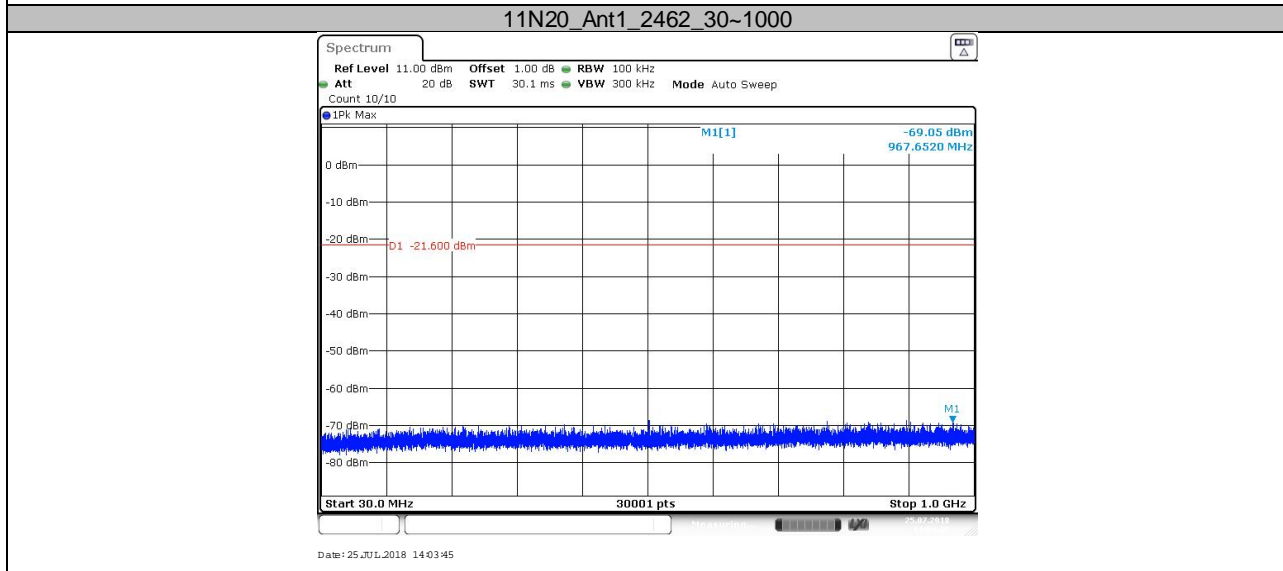
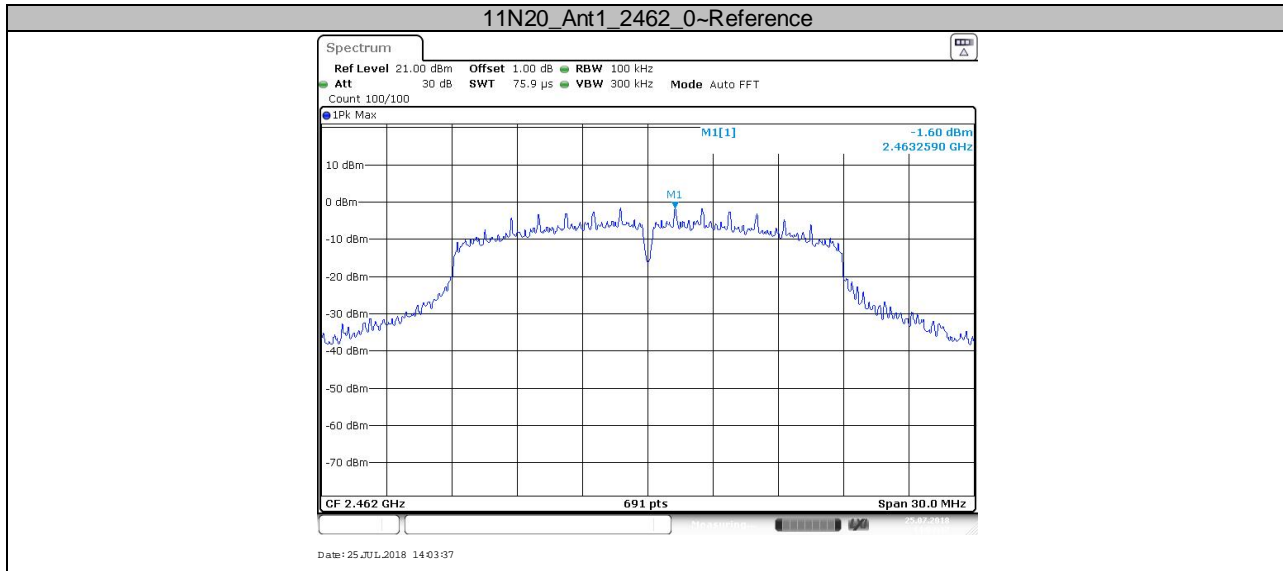
11G_Ant1_2462_1000~26500



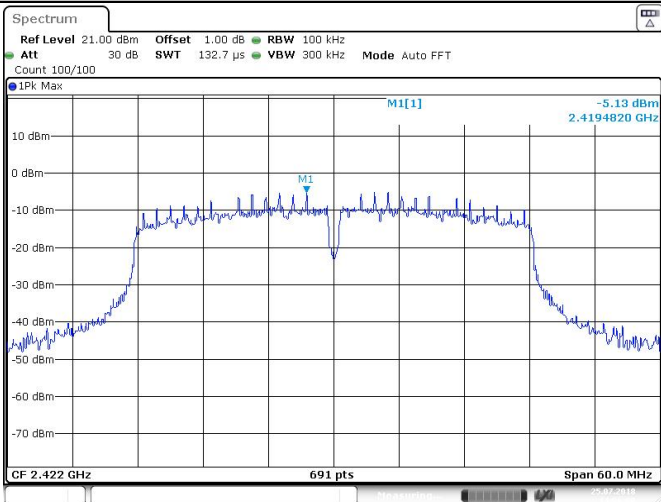
Date: 25 JUL 2018 13:58:15





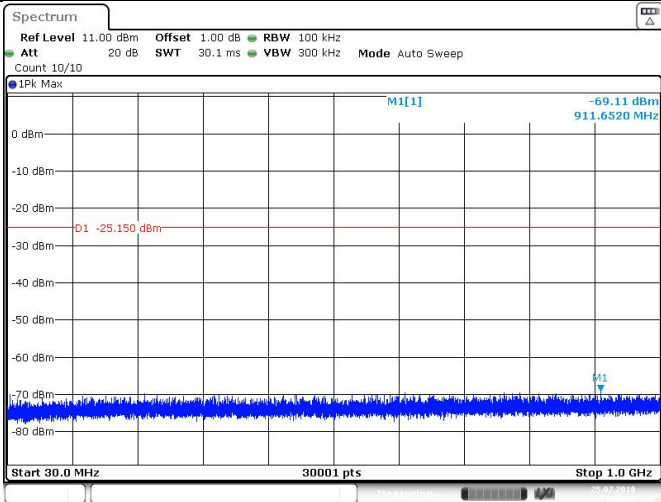


11N40_Ant1_2422_0~Reference



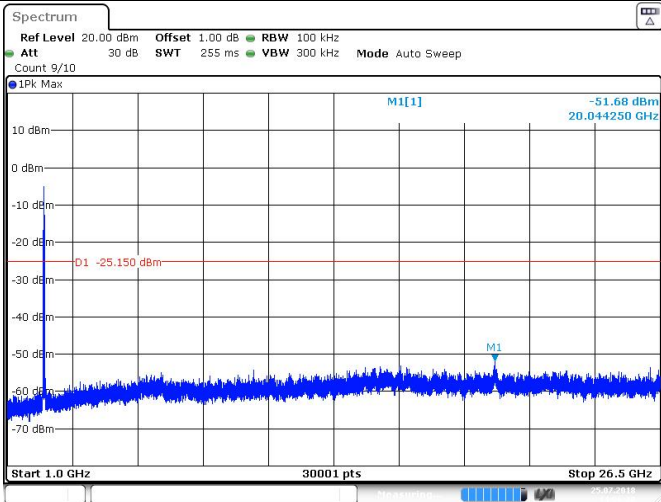
Date: 25 JUL 2018 14:06:00

11N40_Ant1_2422_30~1000



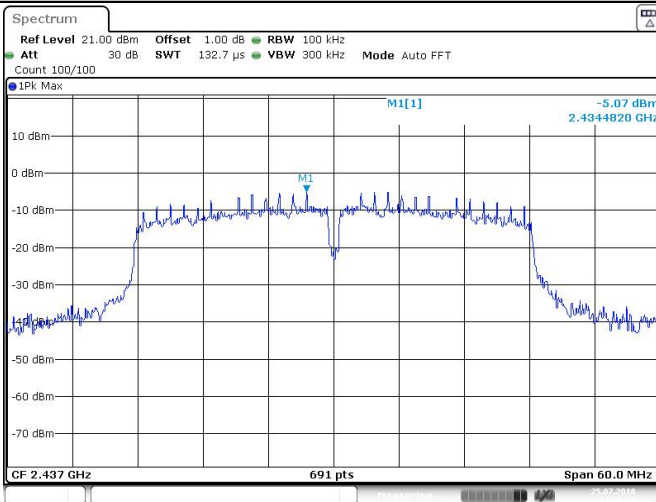
Date: 25 JUL 2018 14:06:08

11N40_Ant1_2422_1000~26500

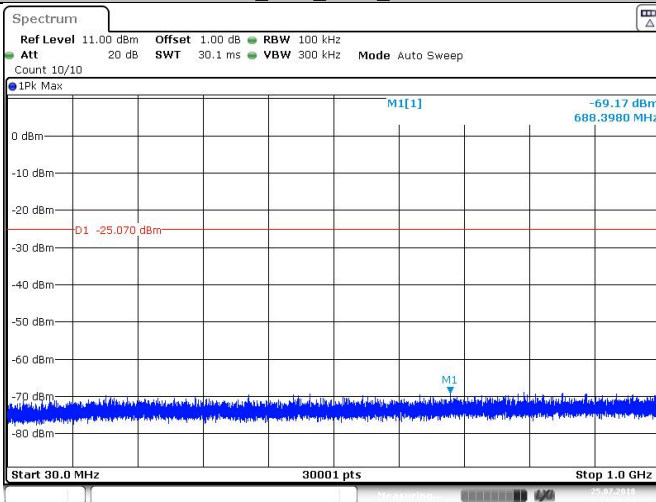


Date: 25 JUL 2018 14:06:20

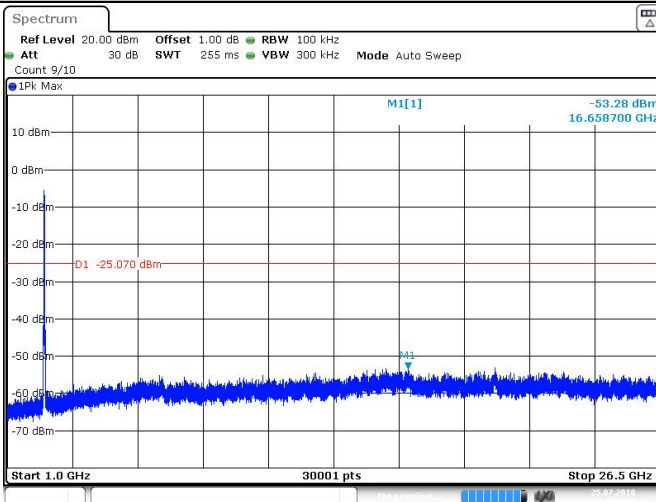
11N40_Ant1_2437_0~Reference



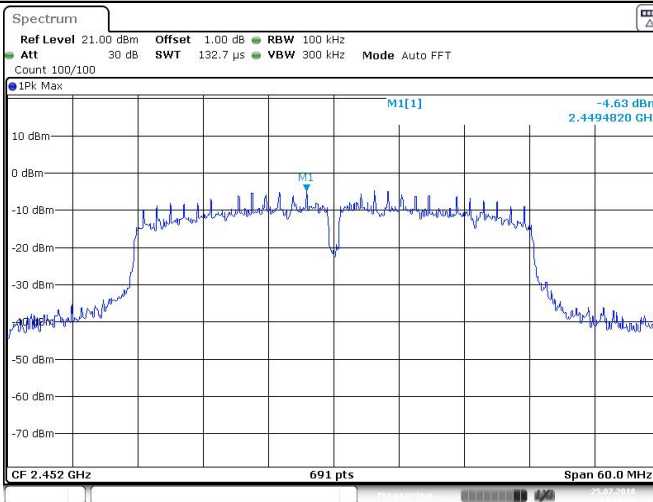
11N40_Ant1_2437_30~1000



11N40_Ant1_2437_1000~26500

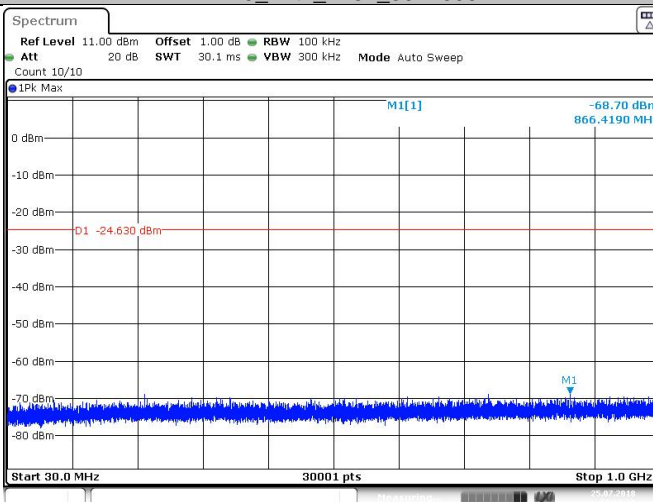


11N40_Ant1_2452_0~Reference



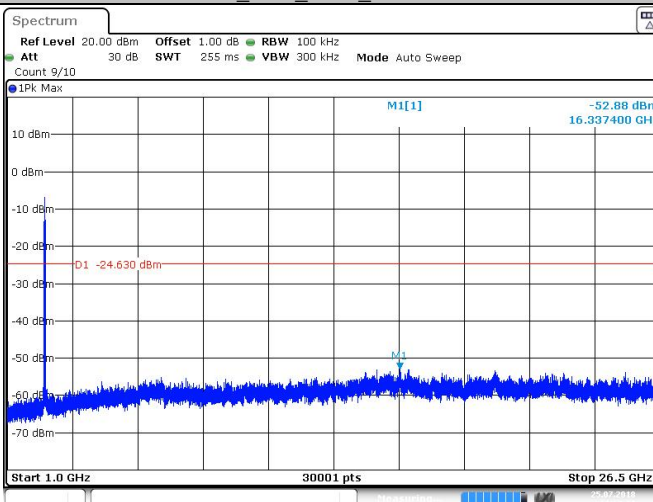
Date: 25 JUL 2018 14:10:20

11N40_Ant1_2452_30~1000

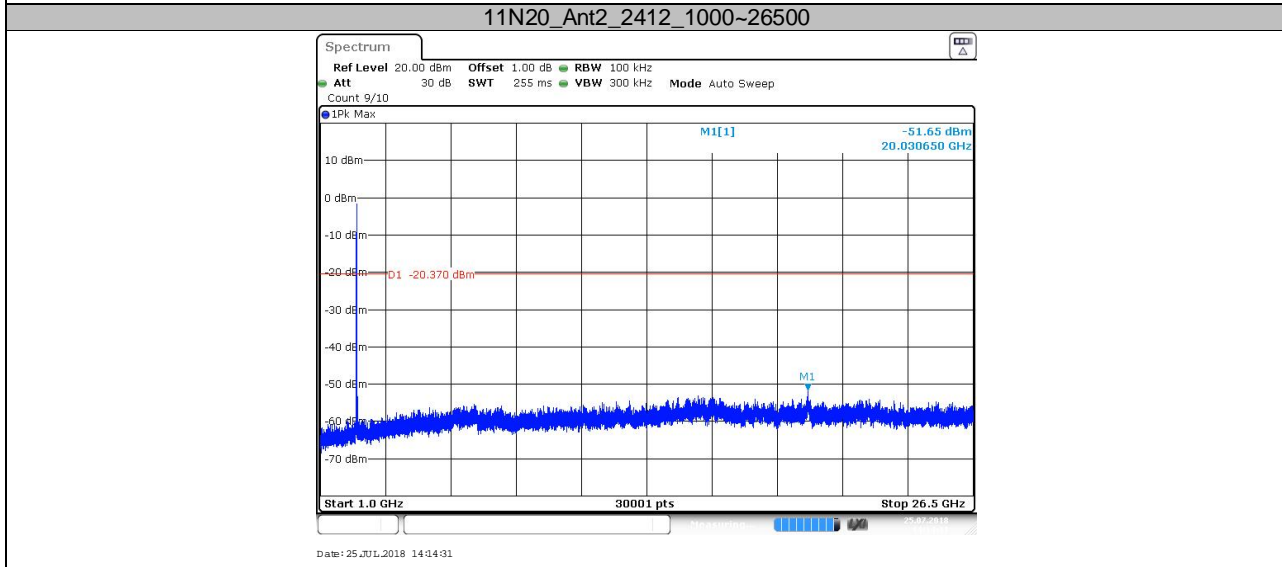
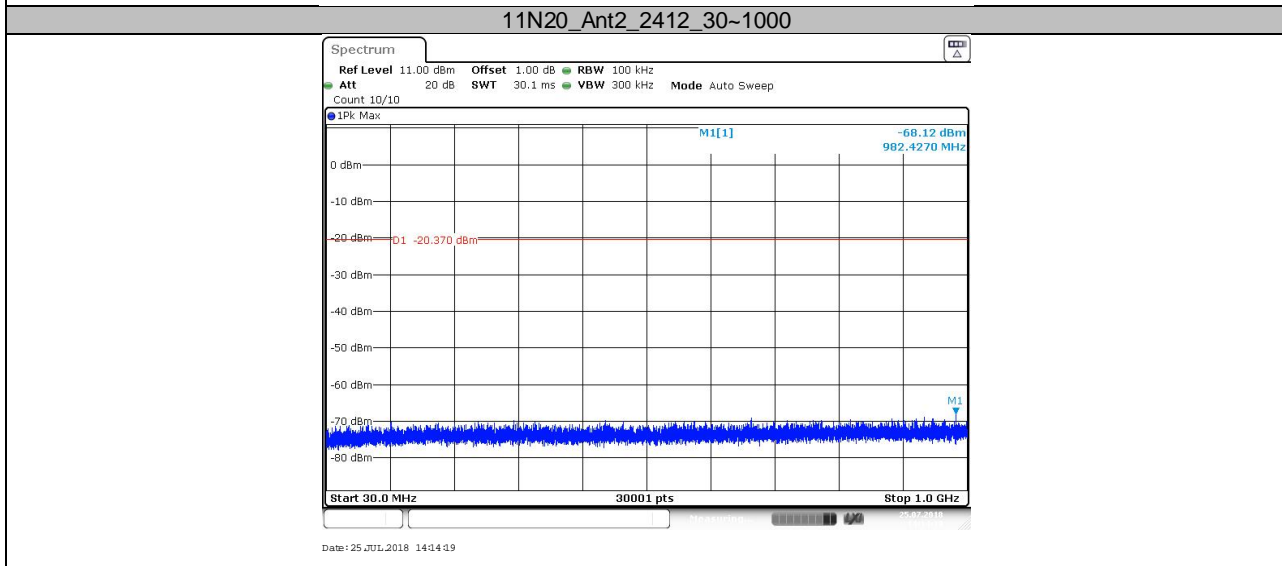
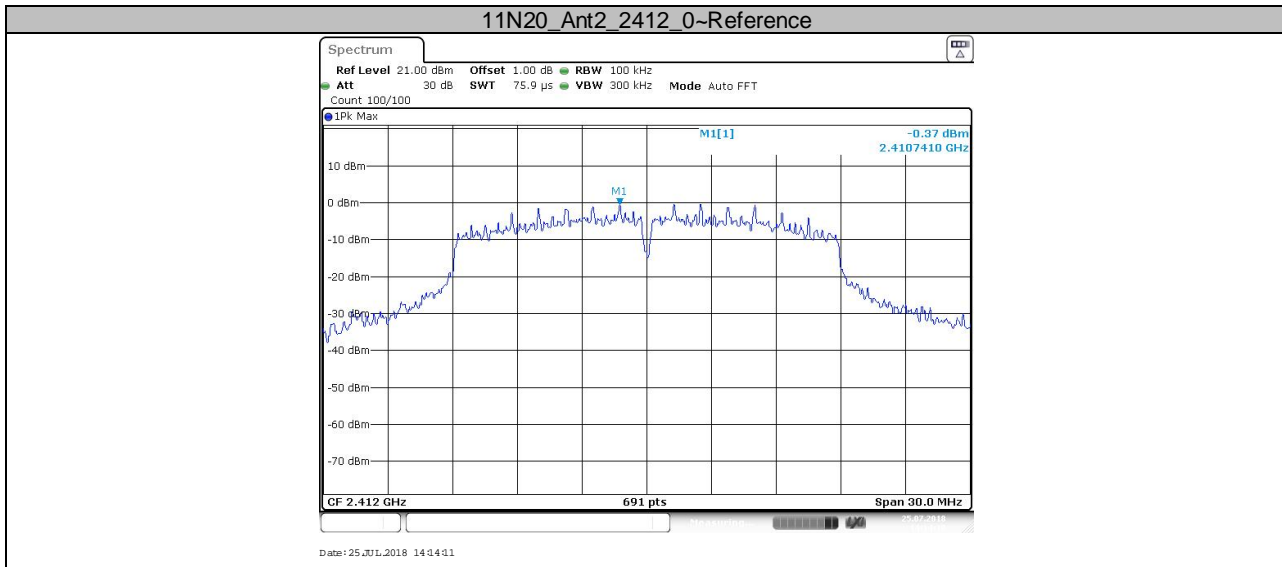


Date: 25 JUL 2018 14:10:29

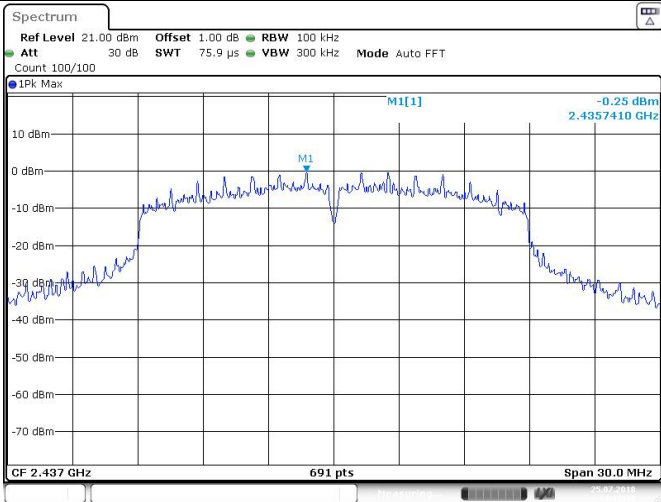
11N40_Ant1_2452_1000~26500



Date: 25 JUL 2018 14:10:41

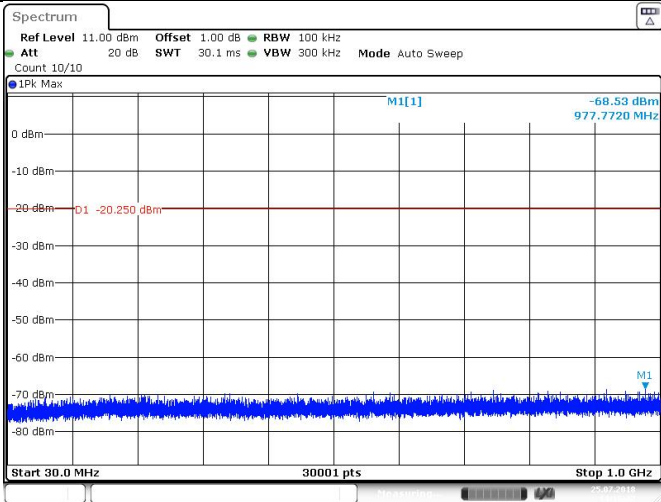


11N20_Ant2_2437_0~Reference



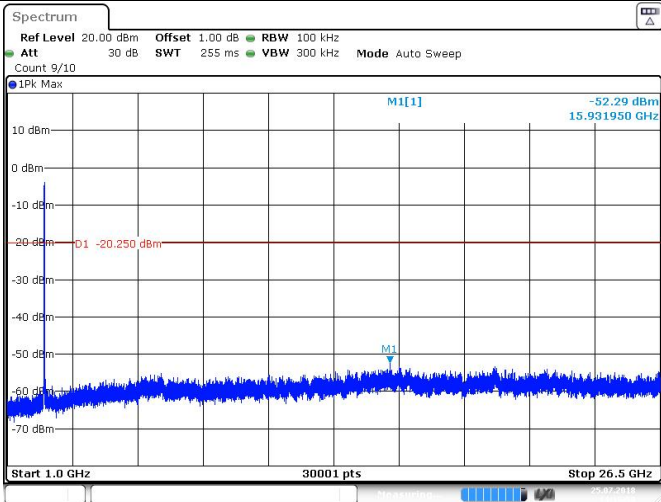
Date: 25 JUL 2018 14:15:39

11N20_Ant2_2437_30~1000



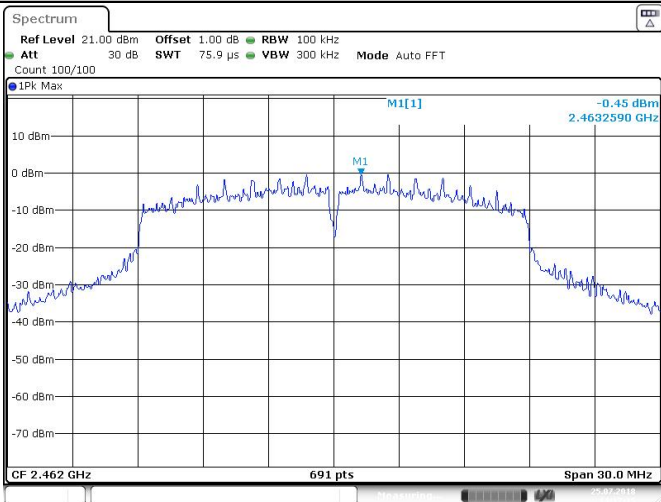
Date: 25 JUL 2018 14:15:47

11N20_Ant2_2437_1000~26500



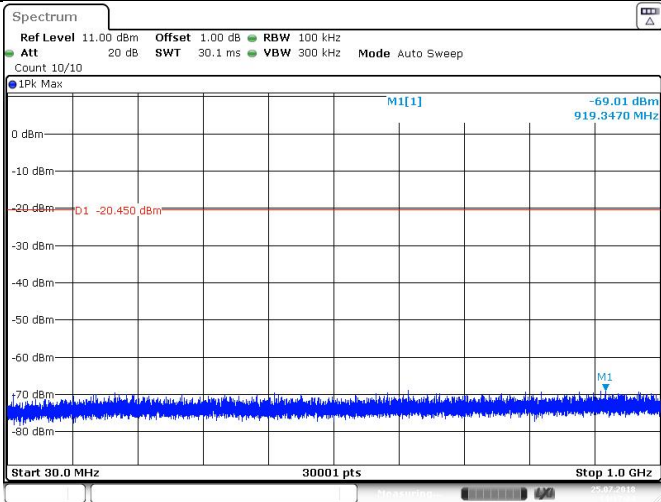
Date: 25 JUL 2018 14:15:59

11N20_Ant2_2462_0~Reference



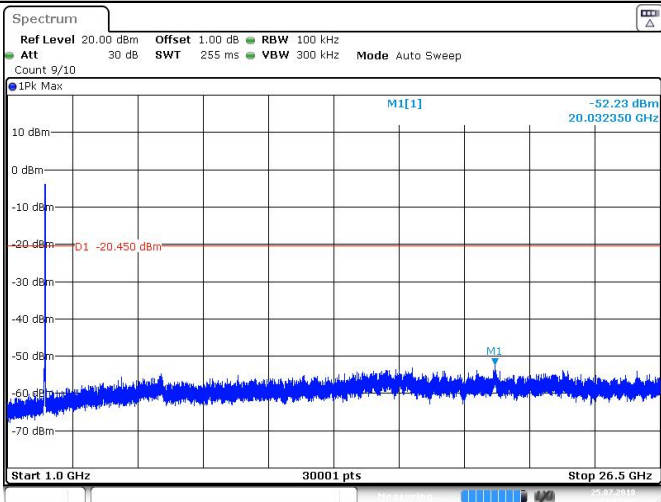
Date: 25 JUL 2018 14:17:16

11N20_Ant2_2462_30~1000



Date: 25 JUL 2018 14:17:24

11N20_Ant2_2462_1000~26500



Date: 25 JUL 2018 14:17:36

9.6 Band edge testing

Test Method

- 1 Use the following spectrum analyzer settings:
Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 100 kHz, VBW \geq RBW, Sweep = auto, Detector function = peak, Trace = max hold
- 2 Allow the trace to stabilize, use the peak and delta measurement to record the result.
- 3 The level displayed must comply with the limit specified in this Section. .
- 4 Repeat the test at the hopping off and hopping on mode, submit all the plots.

Limit:

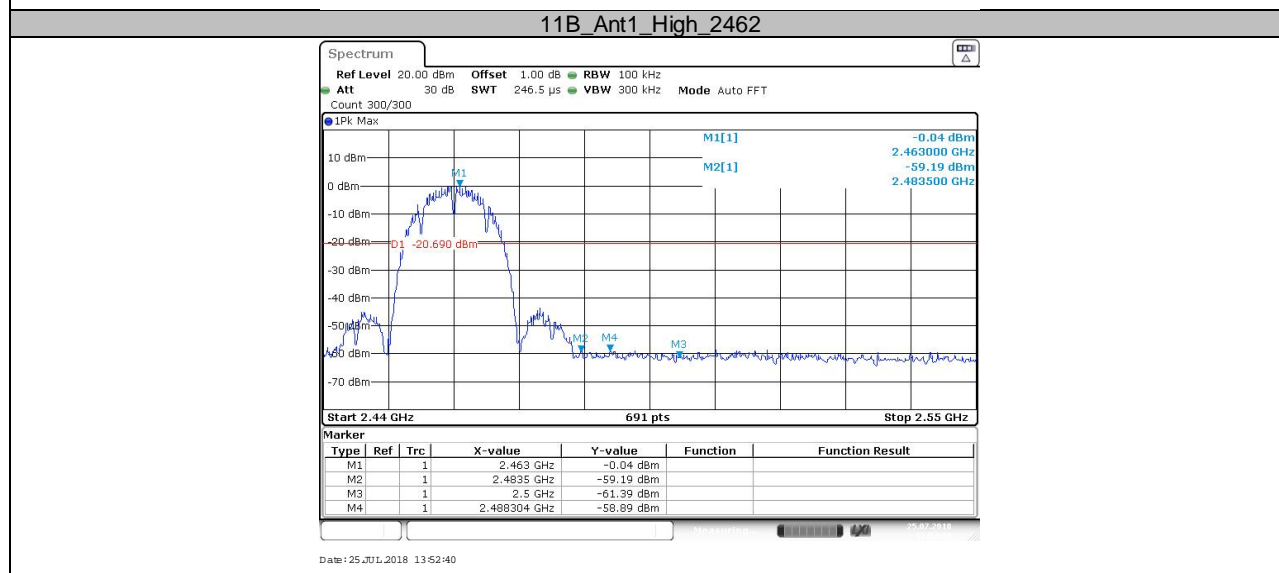
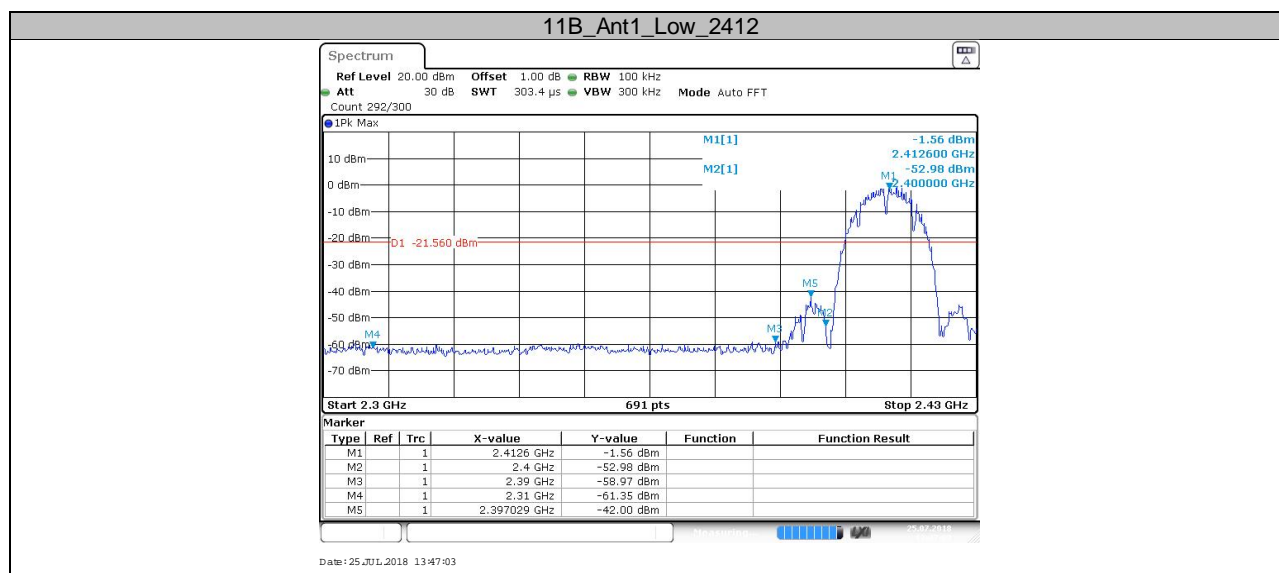
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits.

Band edge testing

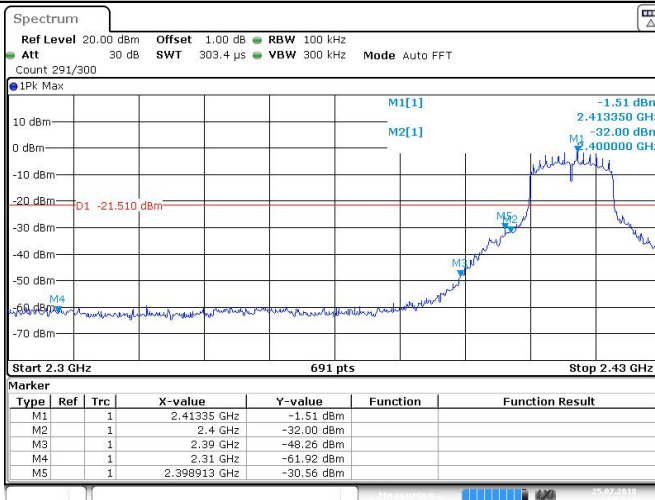
Test result

TestMode	Antenna	ChName	Channel (MHz)	RefLevel (dBm)	Result (dBm)	Limit (dBm)	Verdict
11B	Ant1	Low	2412	-1.56	-42	-21.56	PASS
		High	2462	-0.69	-58.89	-20.69	PASS
11G	Ant1	Low	2412	-1.51	-30.56	-21.51	PASS
		High	2462	-0.90	-46.39	-20.9	PASS
11N20	Ant1	Low	2412	-2.34	-32.93	-22.34	PASS
		High	2462	-1.77	-47.42	-21.77	PASS
11N40	Ant1	Low	2422	-5.33	-39.41	-25.33	PASS
		High	2452	-4.55	-38	-24.55	PASS
11N20	Ant2	Low	2412	-0.50	-30.06	-20.5	PASS
		High	2462	-0.50	-47.93	-20.5	PASS

Test Graphs

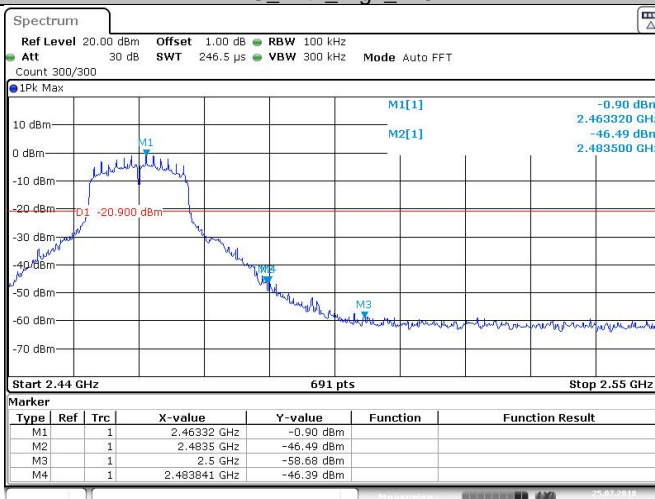


11G_Ant1_Low_2412



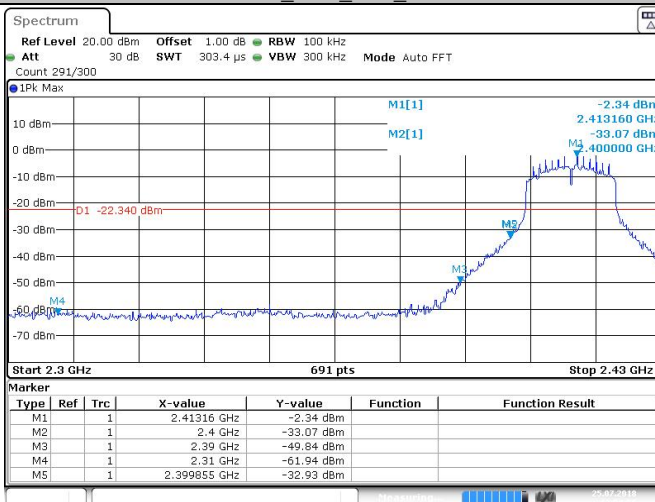
Date: 25 JUL 2018 13:54:33

11G_Ant1_High_2462



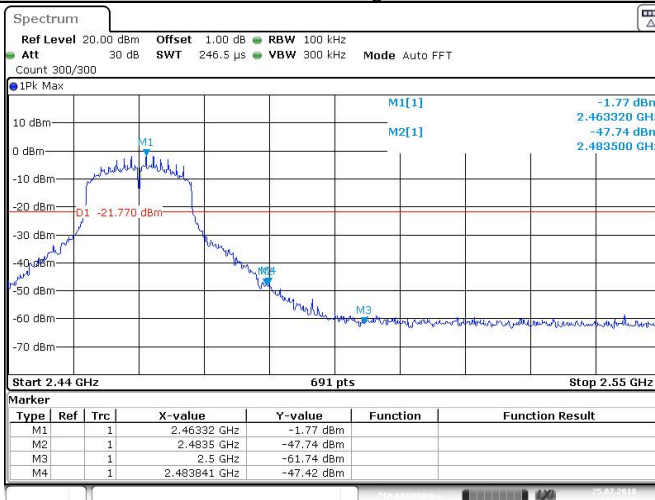
Date: 25 JUL 2018 13:57:49

11N20_Ant1_Low_2412



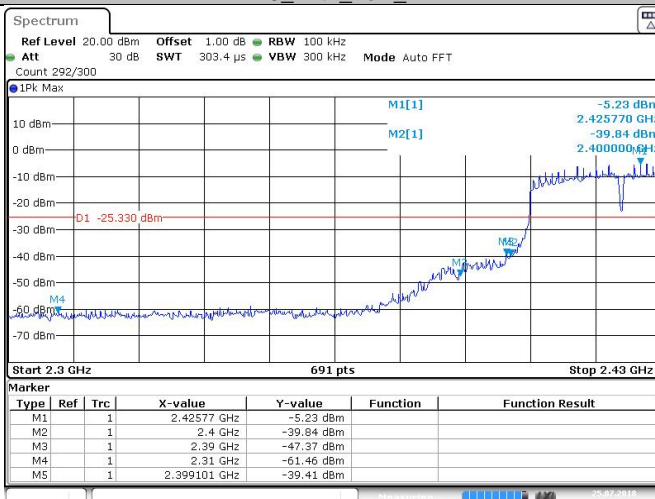
Date: 25 JUL 2018 13:59:56

11N20_Ant1_High_2462



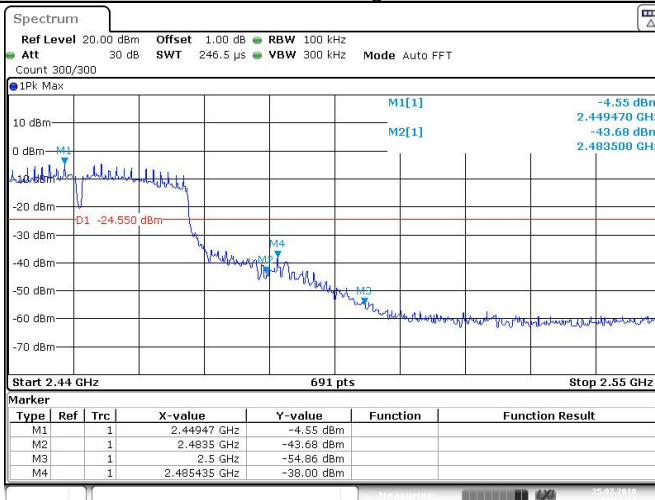
Date: 25 JUL 2018 14:03:30

11N40_Ant1_Low_2422



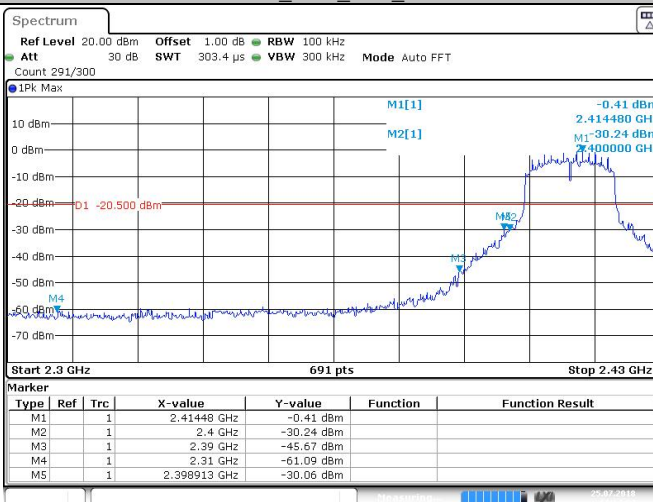
Date: 25 JUL 2018 14:05:54

11N40_Ant1_High_2452



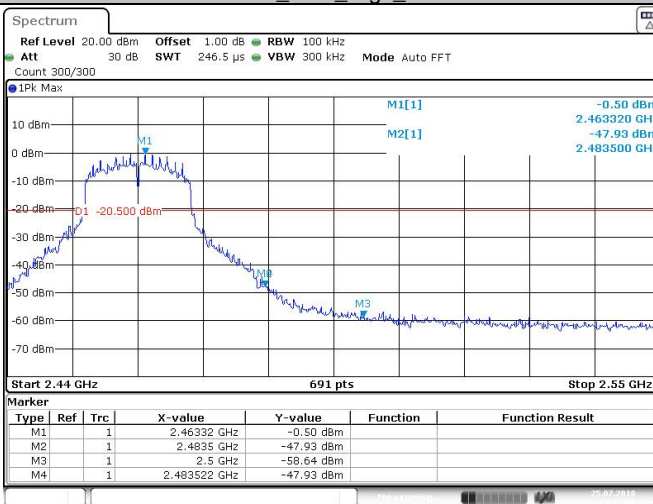
Date: 25 JUL 2018 14:00:14

11N20_Ant2_Low_2412



Date: 25 JUL 2018 14:14:05

11N20_Ant2_High_2462



Date: 25 JUL 2018 14:17:00

9.7 Spurious radiated emissions for transmitter

Test Method

- 1: The EUT was placed on a turn table which is 1.5m above ground plane for above 1GHz and 0.8m above ground for below 1GHz at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- 2: The EUT was set 3 meters away from the interference – receiving antenna, which was mounted on the top of a variable – height antenna tower.
- 3: The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- 4: For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- 5: Use the following spectrum analyzer settings According to C63.10:
For Above 1GHz

Span = wide enough to capture the peak level of the in-band emission and all spurious
 RBW = 1MHz, VBW ≥ RBW for peak measurement and VBW = 10Hz for average measurement, Sweep = auto, Detector function = peak, Trace = max hold.

For Below 1GHz

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious
 RBW = 100 KHz, VBW ≥ RBW for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.

Note:

- 1: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 KHz for Quasi-peak detection (QP) at frequency below 1GHz.
- 2: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for peak detection (PK) at frequency above 1GHz.
- 3: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for RMS Average ((duty cycle < 98%) for Average detection (AV) at frequency above 1GHz, then the measurement results was added to a correction factor (20log(1/duty cycle)).
- 4: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz (duty cycle > 98%) for Average detection (AV) at frequency above 1GHz.

Limit

The radio emission outside the operating frequency band 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. Radiated emissions which fall in the restricted bands, as defined in section 15.205, must comply with the radiated emission limits specified in section 15.209.

Frequency MHz	Field Strength uV/m	Field Strength dBuV/m	Detector
30-88	100	40	QP
88-216	150	43.5	QP
216-960	200	46	QP
960-1000	500	54	QP
Above 1000	500	54	AV
Above 1000	5000	74	PK

Spurious radiated emissions for transmitter

According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.

Pretest all modulation type, report the data of the worst case.

Transmitting spurious emission test result as below:

ANT1:

Emission below 1GHz

Frequency (MHz)	MaxPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Pol	Corr. (dB)
44.118889	16.81	40.00	23.19	H	-24.6
98.277222	24.02	43.50	19.48	H	-28.0
224.107778	24.57	46.00	21.43	H	-28.6
66.213333	27.19	40.00	12.81	V	-29.7
93.642778	28.61	43.50	14.89	V	-29.0
334.364444	20.93	46.00	25.07	V	-24.0

Emission between 1G-25GHz

802.11b Modulation:

2412MHz Test Result

Frequency (MHz)	MaxPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Pol	Corr. (dB)
1777.500000	27.98	74.00	46.02	H	-8.7
2308.937500	34.86	74.00	39.14	H	-6.3
2409.562500	34.36	74.00	39.64	H	-5.9
2514.062500	40.94	74.00	33.06	H	-5.4
4823.906250	52.81	74.00	21.19	H	2.9
1000.000000	20.32	54.00	53.68	V	-14.1
1253.625000	27.11	74.00	46.89	V	-12.0
2133.062500	29.31	74.00	44.69	V	-6.6
2411.500000	32.74	74.00	41.26	V	-5.8
2517.500000	30.90	74.00	43.10	V	-5.3
4823.906250	44.90	74.00	29.10	V	3.1
8722.031250	42.88	74.00	31.12	V	8.7
10624.218750	42.03	74.00	31.97	V	10.4

2437MHz Test Result

Frequency (MHz)	MaxPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Pol	Corr. (dB)
1252.687500	25.90	74.00	48.10	H	-12.1
1770.125000	28.14	74.00	45.86	H	-8.7
2331.812500	35.08	74.00	38.92	H	-6.2
2438.562500	40.35	74.00	33.65	H	-5.8
2540.500000	41.85	74.00	32.15	H	-5.4
4874.062500	51.57	74.00	22.43	H	2.7
7618.593750	40.99	74.00	33.01	H	6.8
11735.625000	42.63	74.00	31.37	H	11.1
1000.000000	20.17	54.00	53.83	V	-14.1
1246.062500	28.60	74.00	45.40	V	-12.1
2027.687500	27.72	74.00	46.28	V	-7.0
2438.000000	39.41	74.00	34.59	V	-5.7
4874.062500	43.26	74.00	30.74	V	2.8
8754.843750	41.72	74.00	32.28	V	8.7
10795.312500	41.80	74.00	32.20	V	10.4

2462MHz Test Result

Frequency (MHz)	MaxPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Pol	Corr. (dB)
2357.062500	39.57	74.00	34.43	H	-6.1
2459.000000	37.01	74.00	36.99	H	-5.7
2510.000000	38.81	74.00	35.19	H	-5.4
2567.062500	43.20	74.00	30.80	H	-5.2
4923.750000	51.05	74.00	22.95	H	3.1
8729.531250	40.60	74.00	33.40	H	8.6
9755.156250	43.81	74.00	30.19	H	9.5
1000.000000	19.96	54.00	54.04	V	-14.1
1267.187500	26.14	74.00	47.86	V	-11.8
1847.062500	27.74	74.00	46.26	V	-8.0
2459.125000	37.96	74.00	36.04	V	-5.6
2826.625000	35.13	74.00	38.87	V	-4.5
4923.750000	44.21	74.00	29.79	V	3.2
8744.062500	41.13	74.00	32.87	V	8.7
10618.12500	42.81	74.00	31.19	V	10.4

AN1+ANT2: 802.11n(20) Modulation with both antennas:

Emission below 1GHz

Frequency (MHz)	MaxPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Pol	Corr. (dB)
76.937222	24.95	40.00	15.05	H	-31.8
192.151667	20.31	43.50	23.19	H	-30.2
877.348889	30.56	46.00	15.44	H	-15.8
78.392222	25.41	40.00	14.59	V	-31.9
121.233889	20.50	43.50	23.00	V	-30.0
857.248333	26.53	46.00	19.47	V	-16.5

Emission between 1G-25GHz

2412MHz Test Result

Frequency (MHz)	MaxPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Pol	Corr. (dB)
1279.375000	33.78	74.00	40.22	H	-12.3
1764.750000	30.34	74.00	43.66	H	-8.7
2510.062500	33.44	74.00	40.56	H	-5.4
4823.906250	41.16	74.00	32.84	H	2.9
6276.562500	37.33	74.00	36.67	H	4.3
8655.937500	41.00	74.00	33.00	H	8.3
1268.375000	32.33	74.00	41.67	V	-12.2
1778.500000	29.04	74.00	44.96	V	-8.5
2580.875000	29.57	74.00	44.43	V	-5.0
4350.000000	33.05	74.00	40.95	V	1.4
5976.562500	36.96	74.00	37.04	V	4.2
7498.593750	41.14	74.00	32.86	V	6.6

2437MHz Test Result

Frequency (MHz)	MaxPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Pol	Corr. (dB)
1269.000000	32.76	74.00	41.24	H	-12.3
2331.750000	35.10	74.00	38.90	H	-6.2
2539.562500	34.89	74.00	39.11	H	-5.2
4874.062500	44.95	74.00	29.05	H	2.7
8745.937500	41.50	74.00	32.50	H	8.6
10080.46875	41.45	74.00	32.55	H	9.6
1261.062500	32.64	74.00	41.36	V	-12.2

1784.625000	30.46	74.00	43.54	V	-8.6
2588.500000	28.84	74.00	45.16	V	-4.9
4927.031250	35.36	74.00	38.64	V	3.3
7501.406250	39.57	74.00	34.43	V	6.7
8720.156250	41.79	74.00	32.21	V	8.7

2462MHz Test Result

Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV /m)	Margin (dB)	Pol	Corr. (dB)
1269.312500	33.84	74.00	40.16	H	-12.3
2351.750000	31.65	74.00	42.35	H	-6.2
2567.312500	40.28	74.00	33.72	H	-5.1
4923.750000	45.70	74.00	28.30	H	3.1
8132.812500	39.37	74.00	34.63	H	7.7
9794.062500	41.16	74.00	32.84	H	9.6
1263.687500	32.06	74.00	41.94	V	-12.2
1782.500000	29.76	74.00	44.24	V	-8.6
2576.500000	30.26	74.00	43.74	V	-5.0
4923.750000	38.87	74.00	35.13	V	3.2
7500.000000	39.73	74.00	34.27	V	6.7
9394.687500	40.33	74.00	33.67	V	9.0

Remark:

- (1) "*" means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.
- (2) Data of measurement within this frequency range shown "--" in the table above means the reading of emissions are the noise floor or attenuated more than 10dB below the permissible limits or the field strength is too small to be measured.
- (3) Above 1GHz: Corrector factor = Antenna Factor + Cable Loss- Amplifier Gain
Below 1GHz: Corrector factor = Antenna Factor + Cable Loss

10 Test Equipment List

List of Test Instruments

	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
CE	EMI Test Receiver	Rohde & Schwarz	ESR 3	101782	2019-7-6
	LISN	Rohde & Schwarz	ENV432	101318	2019-7-6
	Attenuator	Shanghai Huaxiang	TS2-26-3	080928189	2019-7-6
	Test software	Rohde & Schwarz	EMC32	Version9.15.00	N/A
C	Signal Generator	Rohde & Schwarz	SMB100A	108272	2019-7-6
	Signal Analyzer	Rohde & Schwarz	FSV40	101030	2019-7-6
	Vector Signal Generator	Rohde & Schwarz	SMU 200A	105324	2019-7-6
	RF Switch Module	Rohde & Schwarz	OSP120/OSP-B157	101226/100851	2019-7-6
RE	EMI Test Receiver	Rohde & Schwarz	ESR 26	101269	2019-7-6
	Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9163	707	2019-6-28
	Horn Antenna	Rohde & Schwarz	HF907	102294	2019-6-28
	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100398	2019-7-6
	Pre-amplifier	Rohde & Schwarz	SCU 18	102230	2019-7-6
	Signal Generator	Rohde & Schwarz	SMY01	839369/005	2019-7-6
	Attenuator	Agilent	8491A	MY39264334	2019-7-6
	Test software	Rohde & Schwarz	EMC32	Version 9.15.00	N/A

C - Conducted RF tests

- Conducted peak output power
- 6dB bandwidth
- 20dB bandwidth and 99% Occupied Bandwidth
- Carrier frequency separation
- Number of hopping frequencies
- Dwell Time
- Power spectral density
- Spurious RF conducted emissions
- Band edge

11 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

System Measurement Uncertainty	
Test Items	Extended Uncertainty
Uncertainty for Radiated Emission in 3m chamber 30MHz-1000MHz	Horizontal: 4.91dB; Vertical: 4.89dB;
Uncertainty for Radiated Emission in 3m chamber 1000MHz-18000MHz	Horizontal: 4.80dB; Vertical: 4.79dB;
Uncertainty for Radiated Spurious Emission 18000MHz-40000MHz	Horizontal: 5.05dB; Vertical: 5.04dB;
Uncertainty for Conducted Emission 150kHz-30MHz	3.21dB
Uncertainty for Conducted RF test with TS 8997	RF Power Conducted: 1.16dB Frequency test involved: 0.6×10 ⁻⁷ or 1%
Uncertainty Evaluation for Power Spectral Density Conducted measurement	1.17dB
Uncertainty Evaluation for Spurious emissions Conducted measurement	1.43dB