

FCC/IC - TEST REPORT

Report Number : **68.940.19.0039.01** Date of Issue: September 17, 2019

Model : **LB126**

Product Type : Smart LED Bulb

Applicant : Shenzhen Apeman Innovations Technology Co.,Ltd

Address : Building P11, Huanancheng, Longgang District, Shenzhen, China

Production Facility : Huizhou Light Engine Limited

Address : No.9 Yuanhui Road, Chenjiang Zhongkai Hi-tech Industrial,
Development

Zone, 516029 Huizhou, PEOPLE'S REPUBLIC OF CHINA

Test Result : **n Positive** **o Negative**

Total pages including Appendices : **50**

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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

FCC Registration Number: 514049

ISED#: 10320A

CAB identifier: CN0077

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

Test Site 2

Company name: Dongguan Dongdian Testing Service Co., Ltd.
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Dongguan City,Guangdong Province, China, 523808

Telephone: +86-0769-38826678
Fax: +86-0769-38826678

IC Registration No.: 10288A

CAB identifier: CN0048

3 Description of the Equipment under Test

Description of the Equipment Under Test

Product/PMN:	Smart LED Bulb
Model no./HVIN:	LB126
FCC ID:	2ARER-LB126
IC:	25047-LB126
Options and accessories:	NIL
Ratings:	AC 120V/60Hz, 0.145A, 10W
RF Transmission Frequency:	2412-2462MHz
No. of Operated Channel:	11
Modulation:	CCK, DQPSK, DBPSK for 802.11b QPSK, BPSK for 802.11g/n
Duty Cycle:	100%
Antenna Type:	Integral Antenna
Antenna Gain:	2dBi
Description of the EUT:	The Equipment Under Test (EUT) is a Smart LED Bulb supports 2.4GHz WI-FI function.

4 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C 10-1-2018 Edition	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators
RSS-Gen Issue 5, Amendment 1, March 2019	General Requirements and Information for the Certification of Radio Apparatus
RSS-247 Issue 2 February 2017	Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSS) and License-Exempt Local Area Network (LE-LAN) Devices

All the test methods were according to KDB558074 D01 DTS Meas Guidance v05r02 and ANSI C63.10 (2013).

5 Summary of Test Results

Technical Requirements						
FCC Part 15 Subpart C/ RSS-247 Issue 2/RSS-Gen Issue 5						
Test Condition		Pages	Test Site	Test Result		
				Pass	Fail	N/A
§15.207 & RSS-GEN 8.8	Conducted emission AC power port	10	Site 1	☒	☐	☐
§15.247 (b) (1) & RSS-247 5.4(d)	Conducted peak output power	13	Site 2	☒	☐	☐
RSS-247 5.4(d)	Equivalent Isotropic Radiated Power	13	Site 2	☒	☐	☐
§15.247(a)(1) & RSS-247 5.1(b)	20dB bandwidth	---	---	☐	☐	☒
§15.247(a)(1) & RSS-247 5.1(b)	Carrier frequency separation	---	---	☐	☐	☒
§15.247(a)(1)(iii) & RSS-247 5.1(d)	Number of hopping frequencies	---	---	☐	☐	☒
§15.247(a)(1)(iii) & RSS-247 5.1(d)	Dwell Time	---	---	☐	☐	☒
§15.247(a)(2) & RSS-247 5.2(a) & RSS-GEN 6.7	6dB bandwidth and 99% Occupied Bandwidth	14	Site 2	☒	☐	☐
§15.247(e) & RSS-247 5.2(b)	Power spectral density	19	Site 2	☒	☐	☐
§15.247(d) & RSS-247 5.5	Spurious RF conducted emissions	24	Site 2	☒	☐	☐
§15.247(d) & RSS-247 5.5	Band edge	37	Site 2	☒	☐	☐
§15.247(d) & §15.209 & RSS-247 5.5 & RSS-Gen 6.13	Spurious radiated emissions for transmitter	42	Site 2	☒	☐	☐
§15.203 & RSS-Gen 6.8	Antenna requirement	See note 1		☒	☐	☐

Note 1: N/A=Not Applicable.

Note 2: The EUT uses an integral antenna, which gain is 2.0dBi. In accordance to §15.203 and RSS-Gen 6.8, It is considered sufficiently to comply with the provisions of this section.

6 General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID: 2ARER-LB126, IC: 25047-LB126, complies with Section 15.207, 15.209, 15.247 of the FCC Part 15, Subpart C rules and RSS-247, RSS-GEN.

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: August 26, 2019

Testing Start Date: August 26, 2019

Testing End Date: September 03, 2019

- TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch -

Reviewed by:

Prepared by:

Tested by:

Tested by:







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EMC Project
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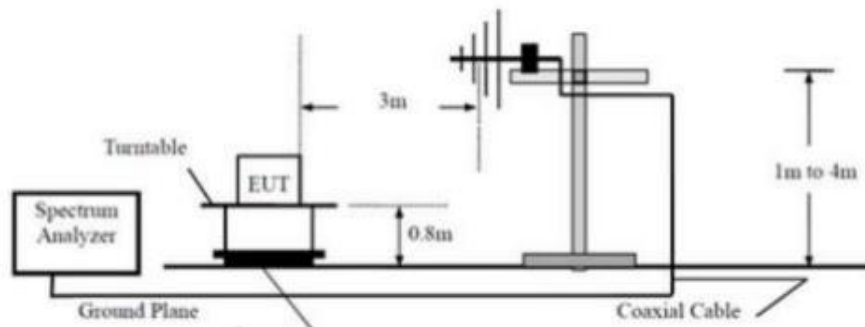
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Test Site 1

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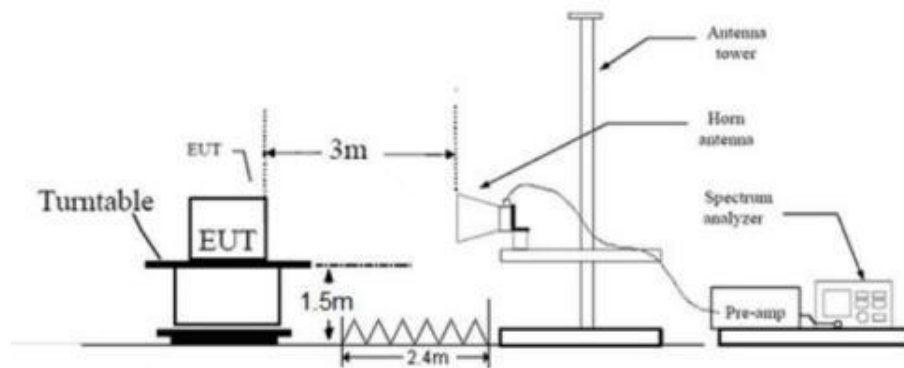
7 Test Setups

7.1 Radiated test setups

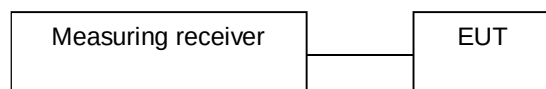
Below 1GHz



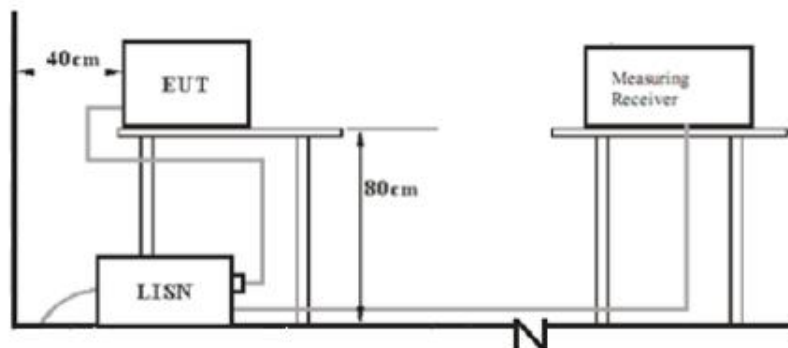
Above 1GHz



7.2 Conducted RF test setups



7.3 AC Power Line Conducted Emission test setups



8 Systems test configuration

Auxiliary Equipment Used during Test:

DESCRIPTION	MANUFACTURER	MODEL NO.	S/N
---	---	---	---

Test software information:

Test Software Version	UI_mptool_1V15	
Modulation	Setting TX Power	Packet Type
802.11b	34	---
802.11g	42	---
802.11nHT20	42	---
802.11Nht40	40	---

The system was configured to channel 1, 6 and 11 for the test.

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 an 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

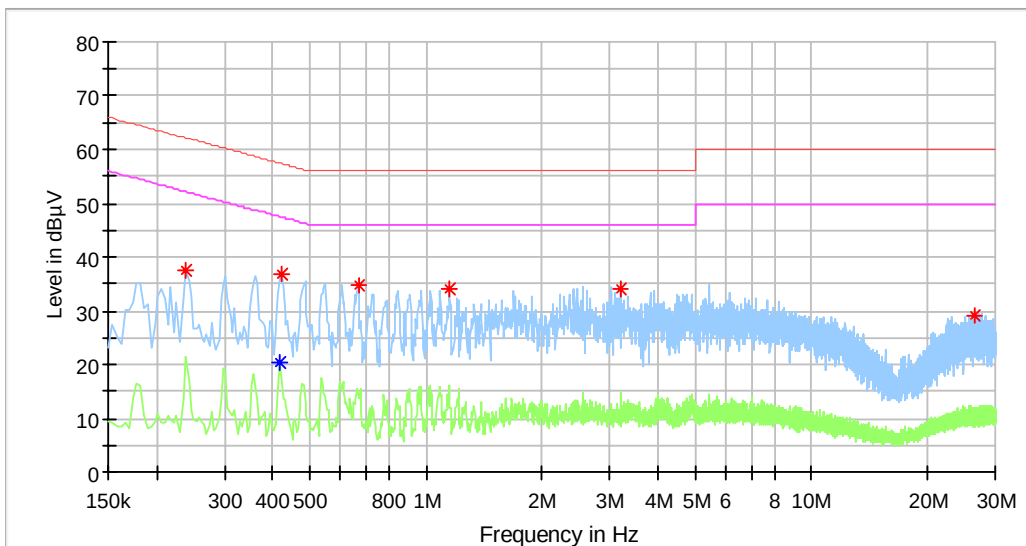
Limit

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

Note: “*” means Decreasing line;

Conducted Emission

Product Type : Smart LED Bulb
 M/N : LB126
 Operating Condition : Normal working with transmitting
 Test Specification : Power Line, Live
 Comment : AC 120V/60Hz



Critical_Freqs

Frequency (MHz)	MaxPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Line	Corr. (dB)
0.238000	37.53	---	62.17	24.64	L1	10.3
0.418000	---	20.24	47.49	27.25	L1	10.3
0.422000	36.92	---	57.41	20.49	L1	10.3
0.666000	34.64	---	56.00	21.36	L1	10.3
1.150000	33.90	---	56.00	22.10	L1	10.3
3.202000	34.15	---	56.00	21.85	L1	10.4
26.494000	29.21	---	60.00	30.79	L1	11.3

Remark :

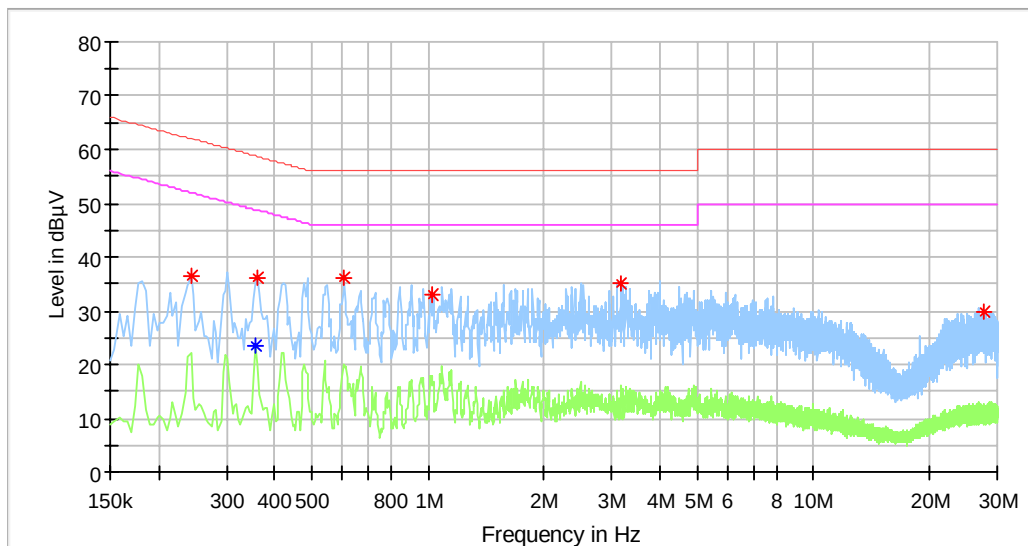
Level=Reading Level + Correction Factor

Correction Factor=Cable Loss + LISN Factor

(The Reading Level is recorded by software which is not shown in the sheet)

Conducted Emission

Product Type : Smart LED Bulb
 M/N : LB126
 Operating Condition : Normal working with transmitting
 Test Specification : Power Line, Neutral
 Comment : AC 120V/60Hz



Critical_Freqs

Frequency (MHz)	MaxPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Line	Corr. (dB)
0.242000	36.57	---	62.03	25.46	N	10.3
0.358000	---	23.66	48.77	25.12	N	10.3
0.362000	35.98	---	58.68	22.70	N	10.3
0.606000	36.06	---	56.00	19.94	N	10.3
1.026000	32.97	---	56.00	23.03	N	10.3
3.154000	35.06	---	56.00	20.94	N	10.4
27.802000	29.76	---	60.00	30.24	N	11.7

Remark :

Level=Reading Level + Correction Factor

Correction Factor=Cable Loss + LISN Factor

(The Reading Level is recorded by software which is not shown in the sheet)

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

According to §15.247 (b) (1), conducted peak output power limit as below:

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

Test result

802.11b

Frequency MHz	Conducted Peak Output Power dBm	Antenna Gain dBi	EIRP dBm	Result
Top channel 2412MHz	13.67	2	15.67	Pass
Middle channel 2437MHz	13.35	2	15.35	Pass
Bottom channel 2462MHz	13.89	2	15.89	Pass

802.11g

Frequency MHz	Conducted Peak Output Power dBm	Antenna Gain dBi	EIRP dBm	Result
Top channel 2412MHz	12.40	2	14.40	Pass
Middle channel 2437MHz	12.42	2	14.42	Pass
Bottom channel 2462MHz	12.93	2	14.93	Pass

802.11nHT20

Frequency MHz	Conducted Peak Output Power dBm	Antenna Gain dBi	EIRP dBm	Result
Top channel 2412MHz	12.70	2	14.70	Pass
Middle channel 2437MHz	12.67	2	14.67	Pass
Bottom channel 2462MHz	13.40	2	15.40	Pass

802.11nHT40

Frequency MHz	Conducted Peak Output Power dBm	Antenna Gain dBi	EIRP dBm	Result
Top channel 2422MHz	11.25	2	13.25	Pass
Middle channel 2437MHz	11.21	2	13.21	Pass
Bottom channel 2452MHz	11.66	2	13.66	Pass

9.3 6dB and 99% bandwidth

Test Method

1. Connect EUT test port to spectrum analyzer.
2. Use the following spectrum analyzer settings:
Set RBW ³ 1% of the 99% bandwidth, VBW ³ RBW.
Sweep = auto, Detector function = peak, Trace = max hold
3. Use the automatic bandwidth measurement capability of an instrument, may be employed using the X dB bandwidth mode with X set to 6 dB, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be ≥ 6 dB.
4. Allow the trace to stabilize, record the X dB Bandwidth value.

Limit

Limit [kHz]

≥ 500

Test result

802.11b

Frequency MHz	6dB bandwidth MHz	99% bandwidth MHz	Result
Bottom channel 2412MHz	10.120	14.76	Pass
Middle channel 2437MHz	10.160	14.8	Pass
Top channel 2462MHz	10.120	14.8	Pass

802.11g

Frequency MHz	6dB bandwidth MHz	99% bandwidth MHz	Result
Bottom channel 2412MHz	16.600	16.44	Pass
Middle channel 2437MHz	16.600	16.44	Pass
Top channel 2462MHz	16.560	16.44	Pass

802.11nHT20

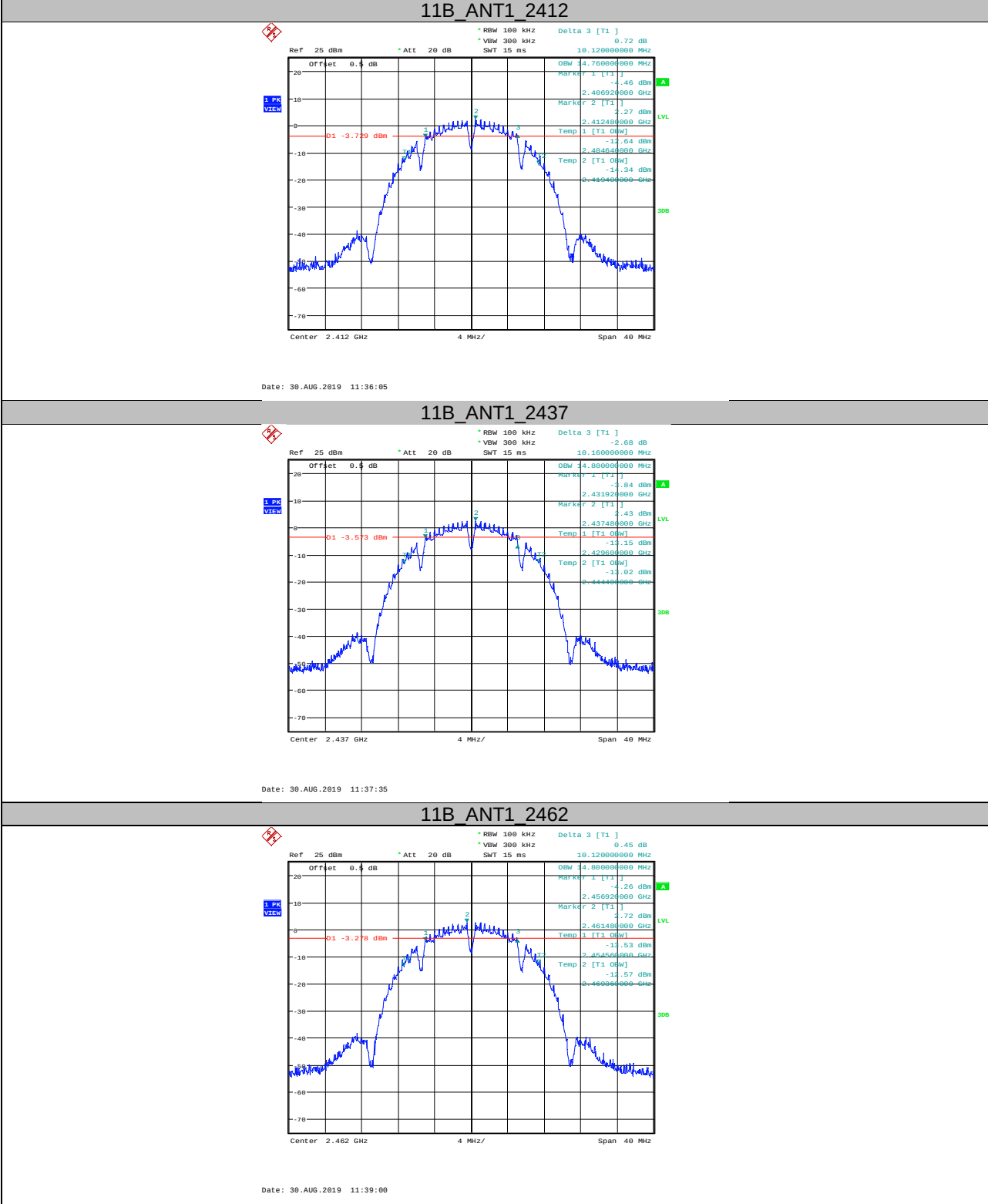
Frequency MHz	6dB bandwidth MHz	99% bandwidth MHz	Result
Bottom channel 2412MHz	17.840	17.68	Pass
Middle channel 2437MHz	17.840	17.64	Pass
Top channel 2462MHz	17.800	17.64	Pass

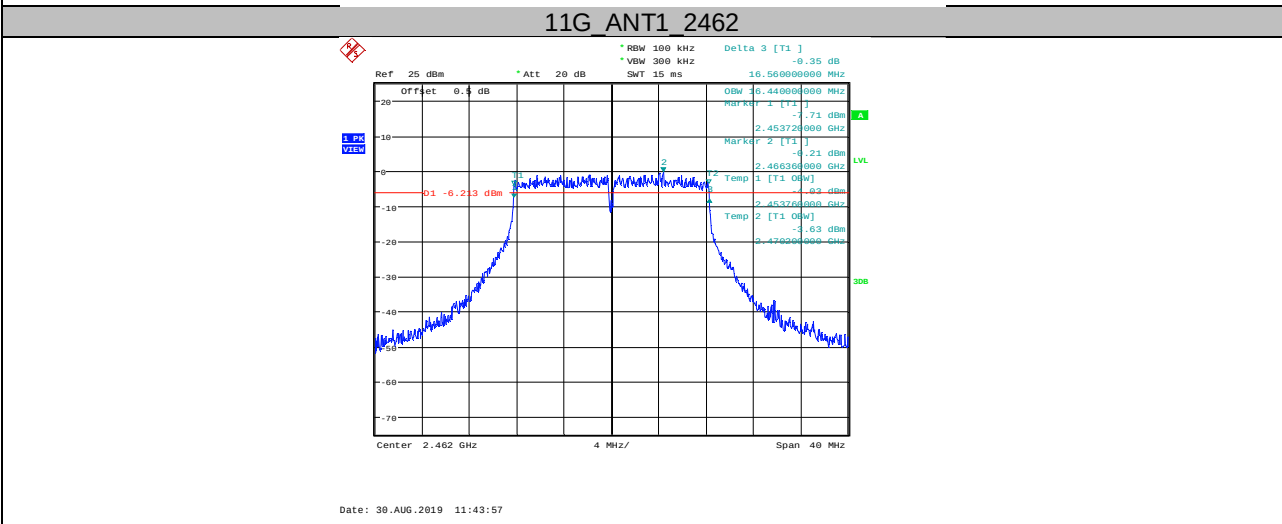
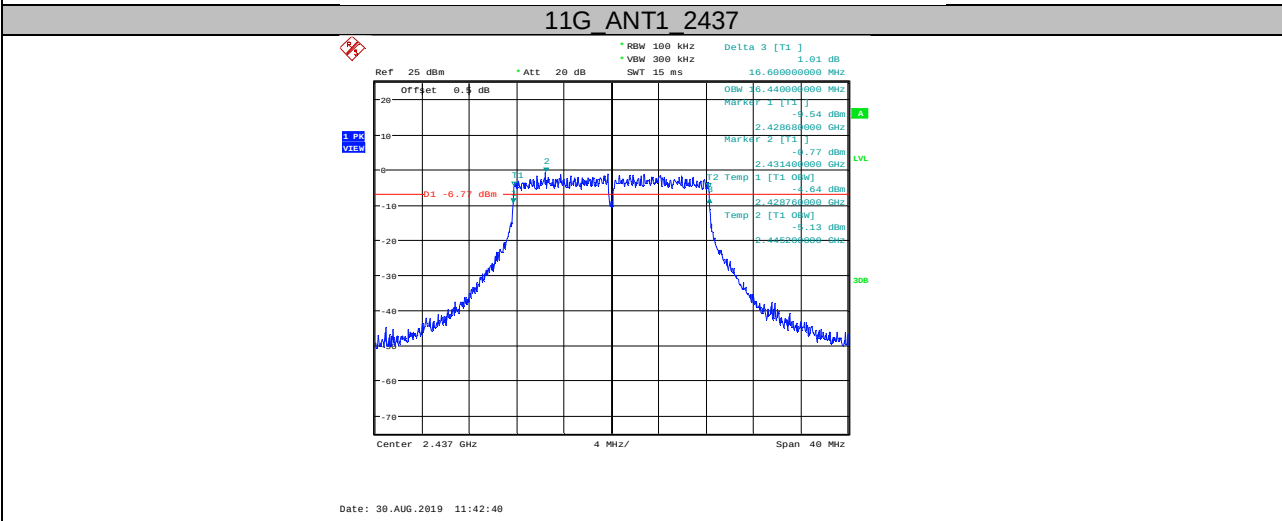
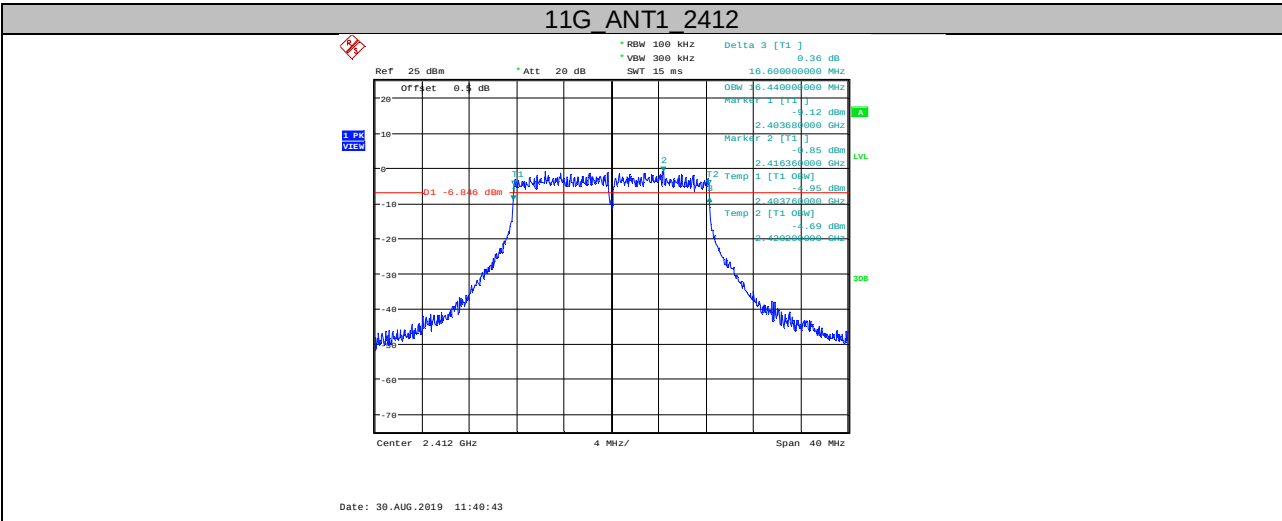
802.11nHT40

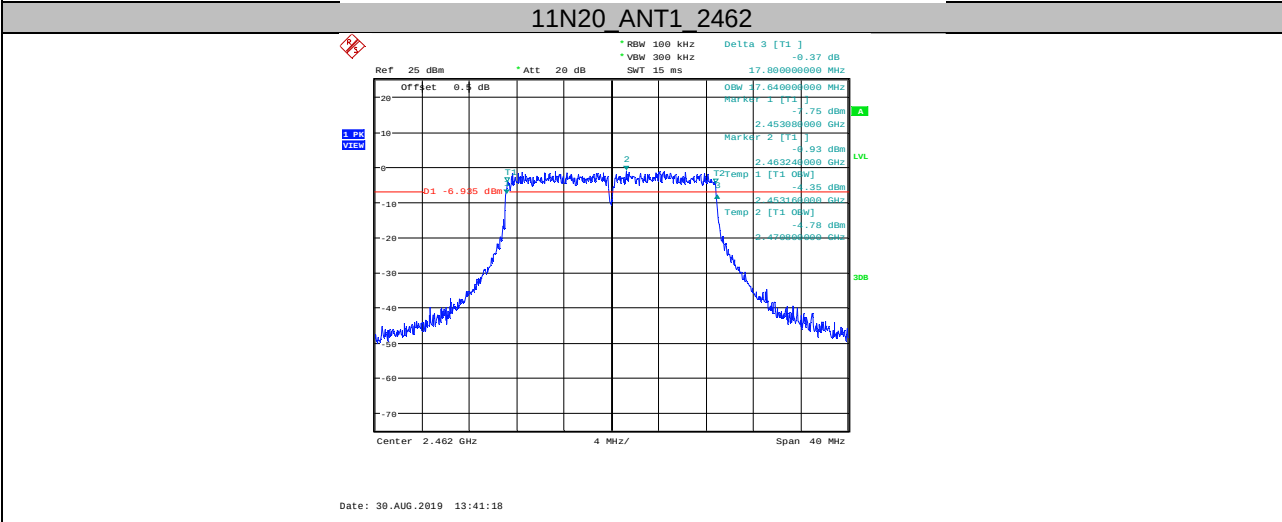
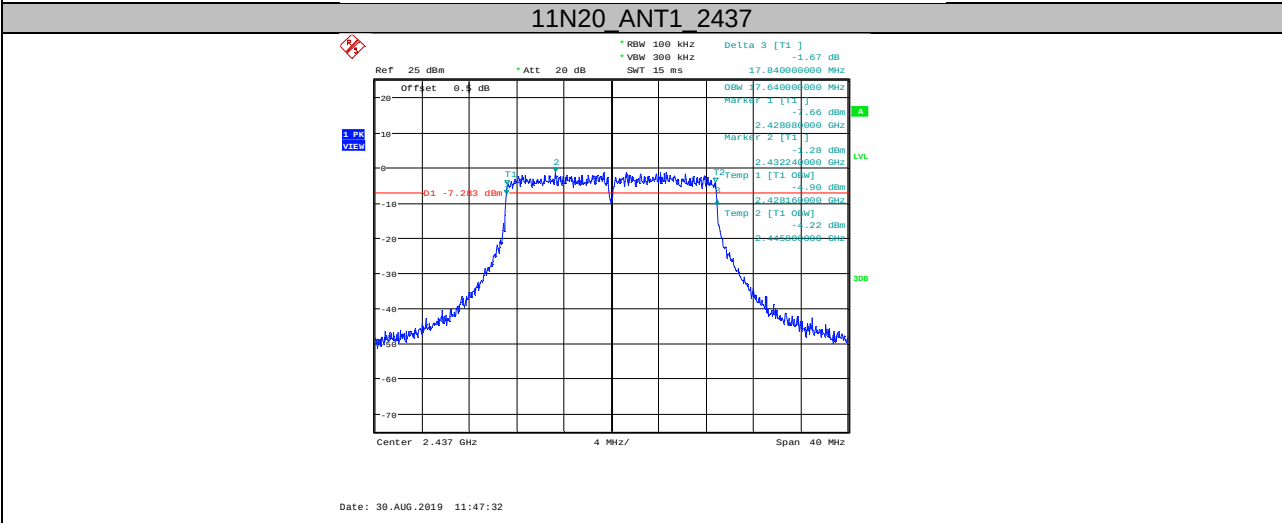
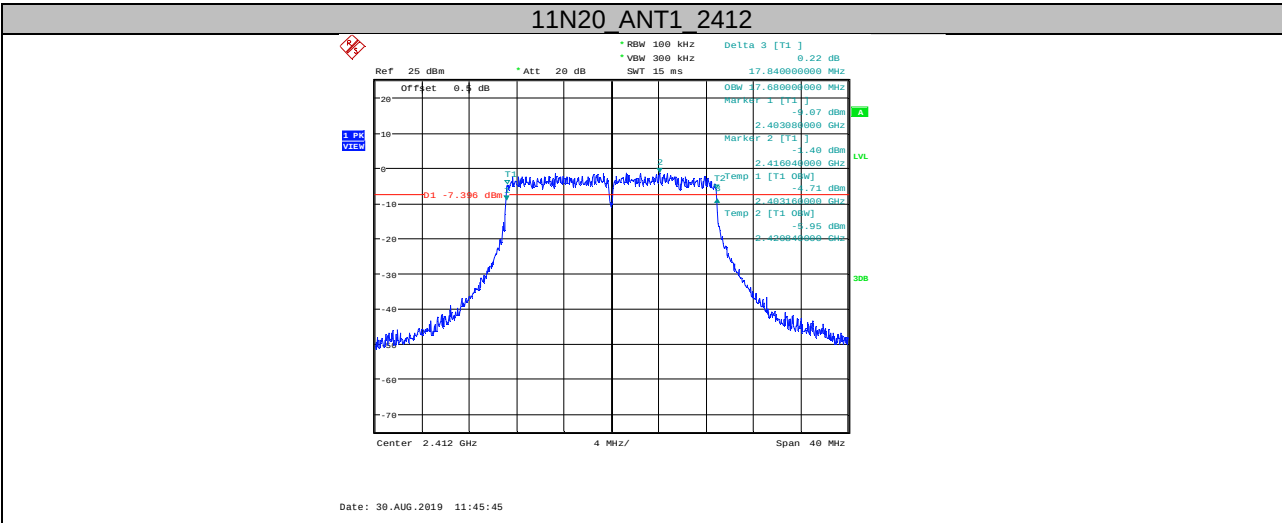
Frequency MHz	6dB bandwidth MHz	99% bandwidth MHz	Result
Bottom channel 2412MHz	36	36.480	Pass
Middle channel 2437MHz	36	36.640	Pass
Top channel 2452MHz	36	36.560	Pass

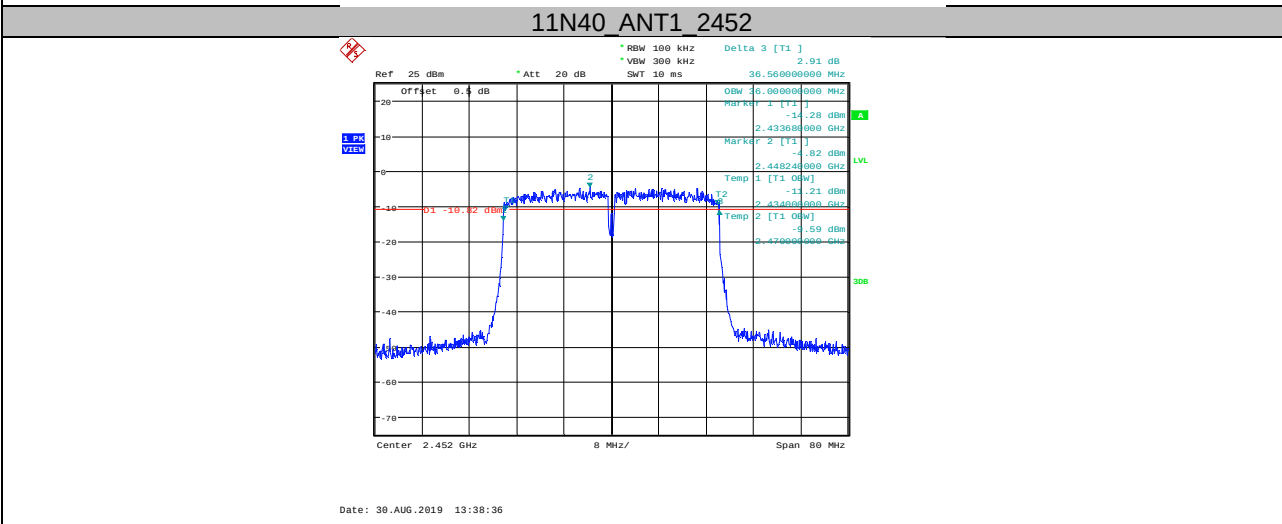
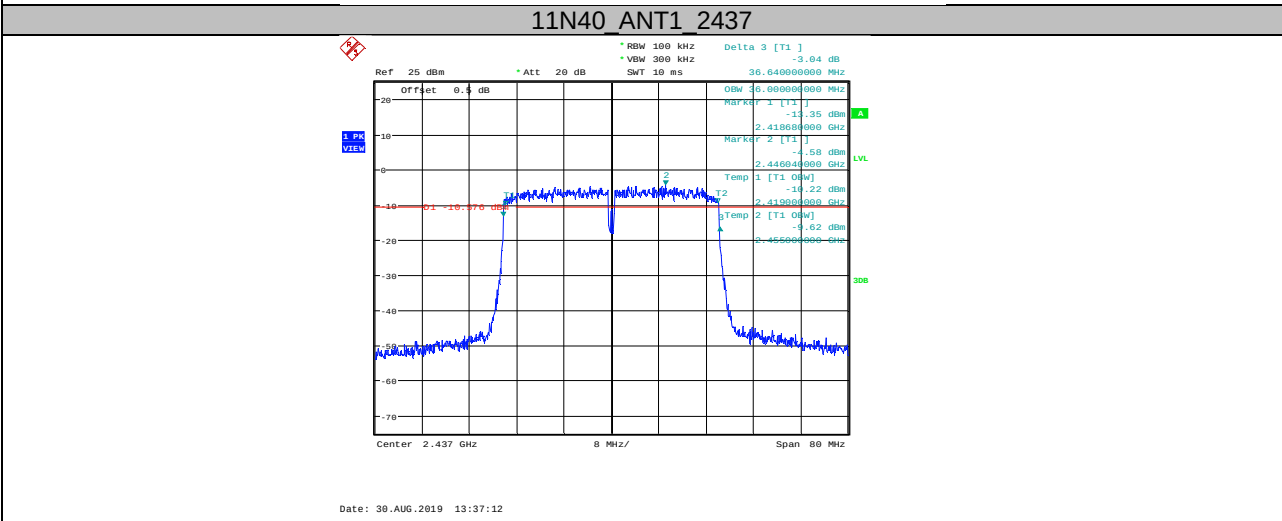
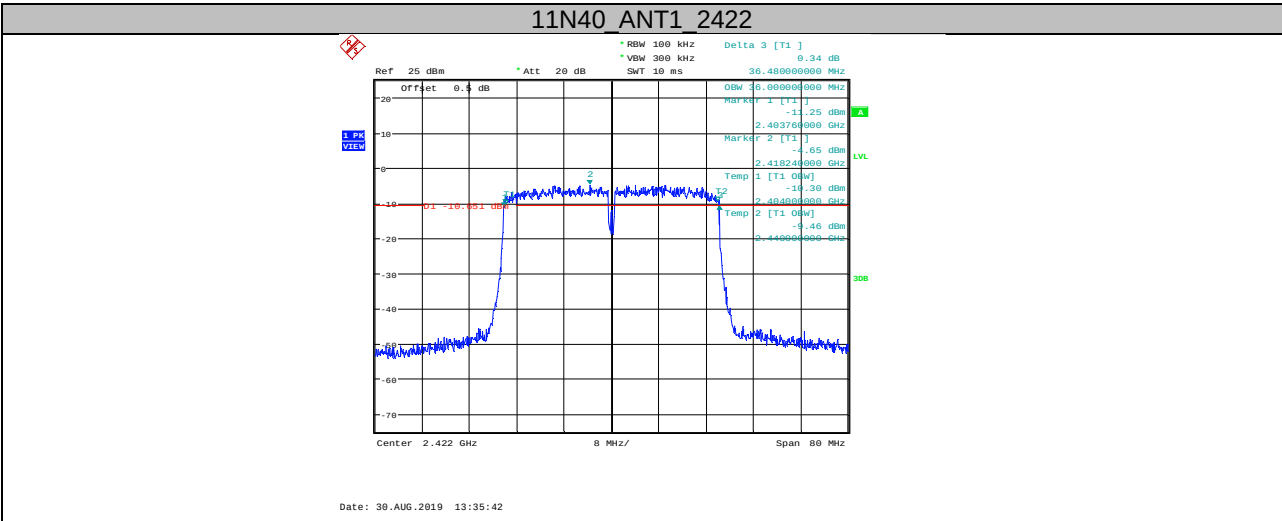


Test Graphs









9.4 Power spectral density

Test Method

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

Limit

Limit [dBm/3KHz]

≤ 8

Test result

802.11b

Frequency MHz	Power spectral density dBm/3KHz	Result
Top channel 2412MHz	-13.81	Pass
Middle channel 2437MHz	-13.09	Pass
Bottom channel 2462MHz	-12.82	Pass

802.11g

Frequency MHz	Power spectral density dBm/3KHz	Result
Top channel 2412MHz	-14.88	Pass
Middle channel 2437MHz	-14.77	Pass
Bottom channel 2462MHz	-14.3	Pass

802.11nHT20

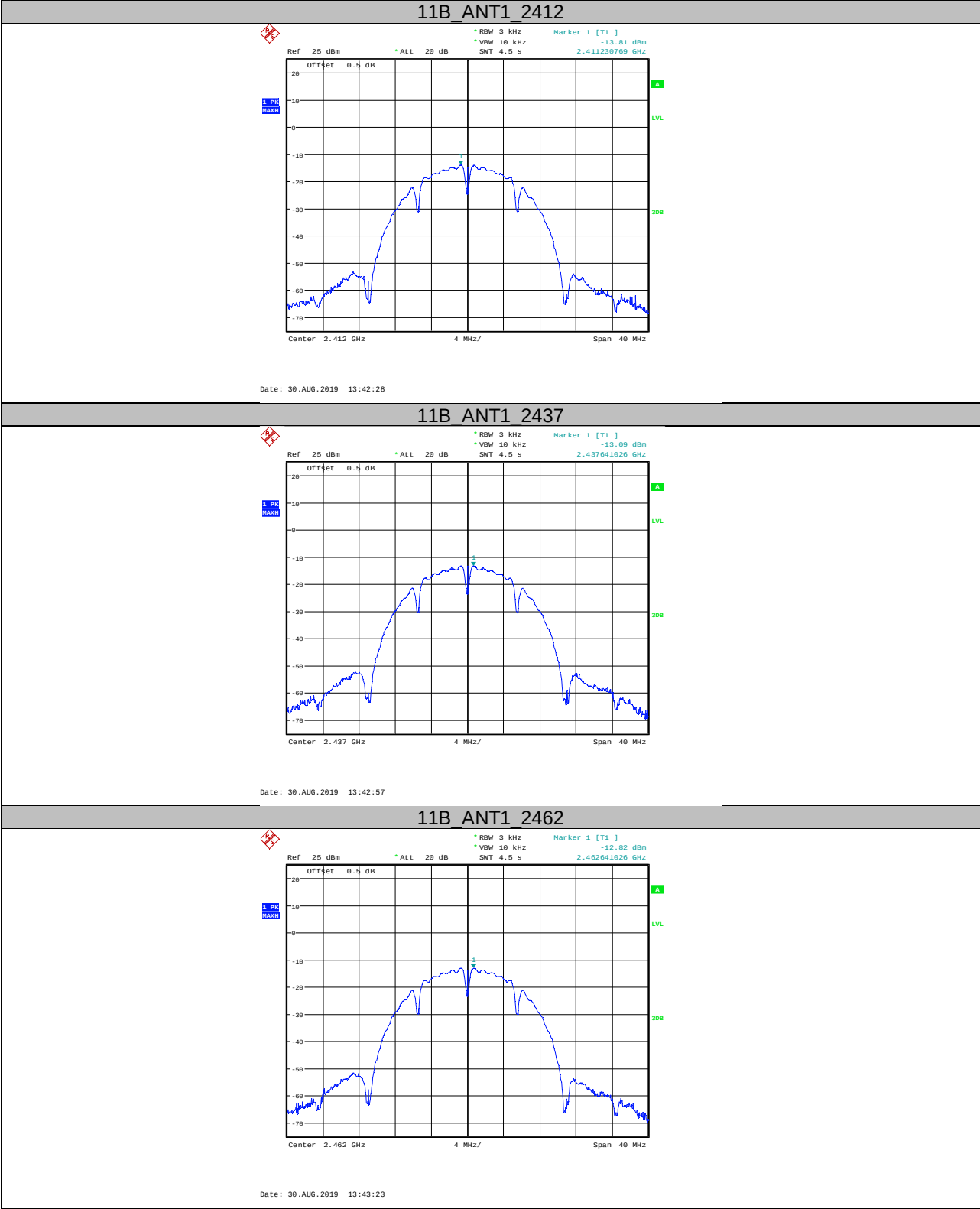
Frequency MHz	Power spectral density dBm/3KHz	Result
Top channel 2412MHz	-15.25	Pass
Middle channel 2437MHz	-14.75	Pass
Bottom channel 2462MHz	-14.35	Pass

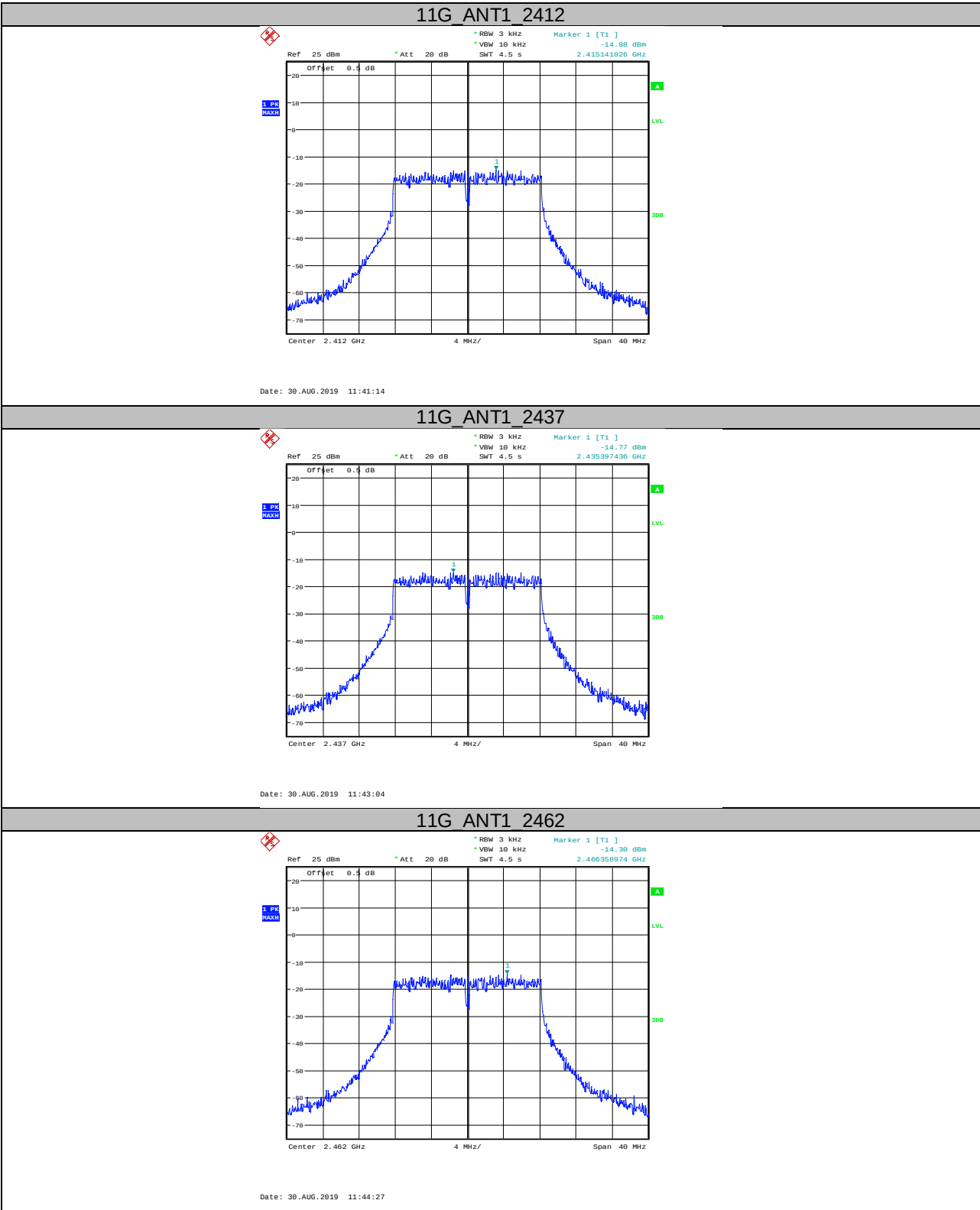
802.11nHT40

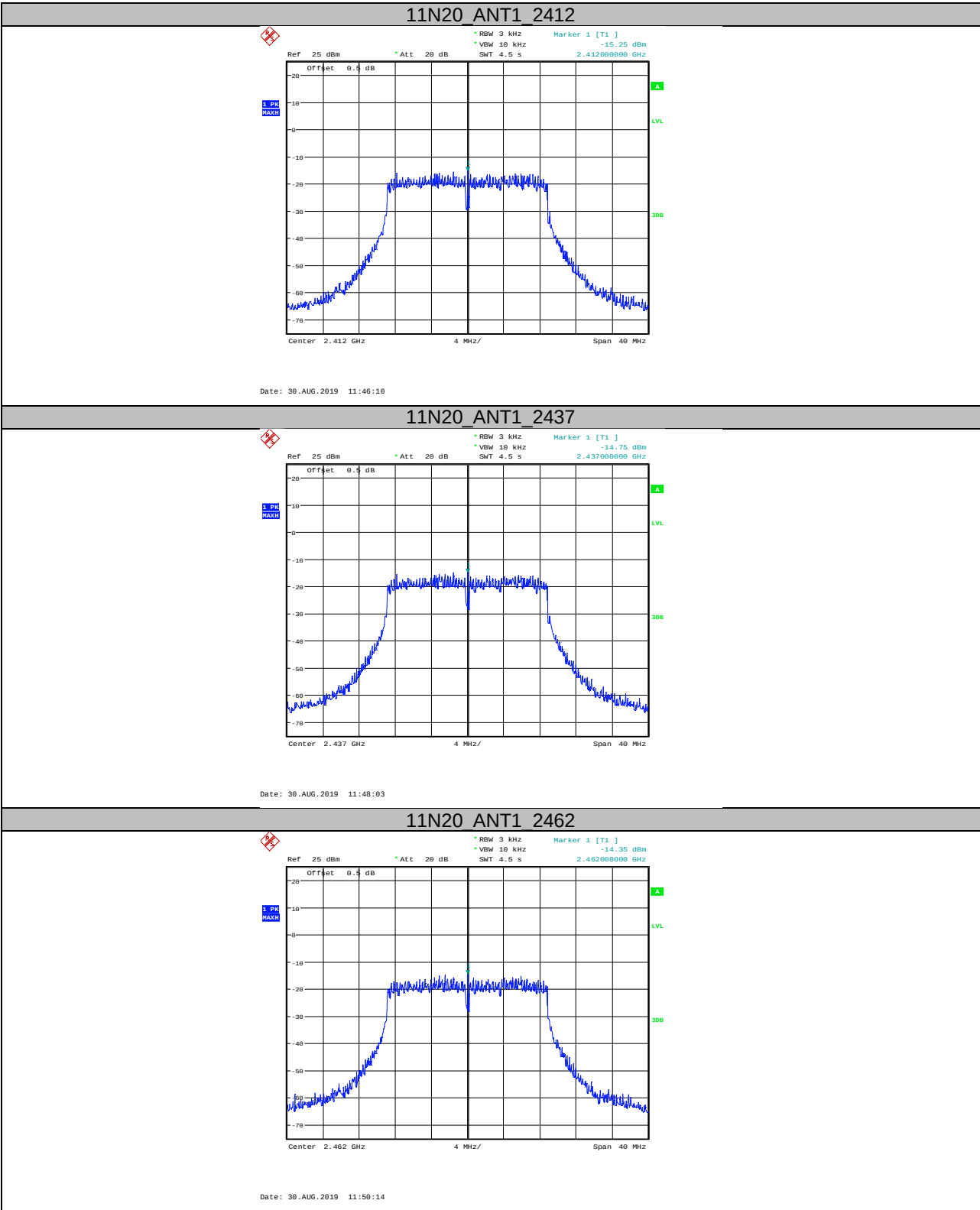
Frequency MHz	Power spectral density dBm/3KHz	Result
Top channel 2422MHz	-13.87	Pass
Middle channel 2437MHz	-14.08	Pass
Bottom channel 2452MHz	-13.73	Pass

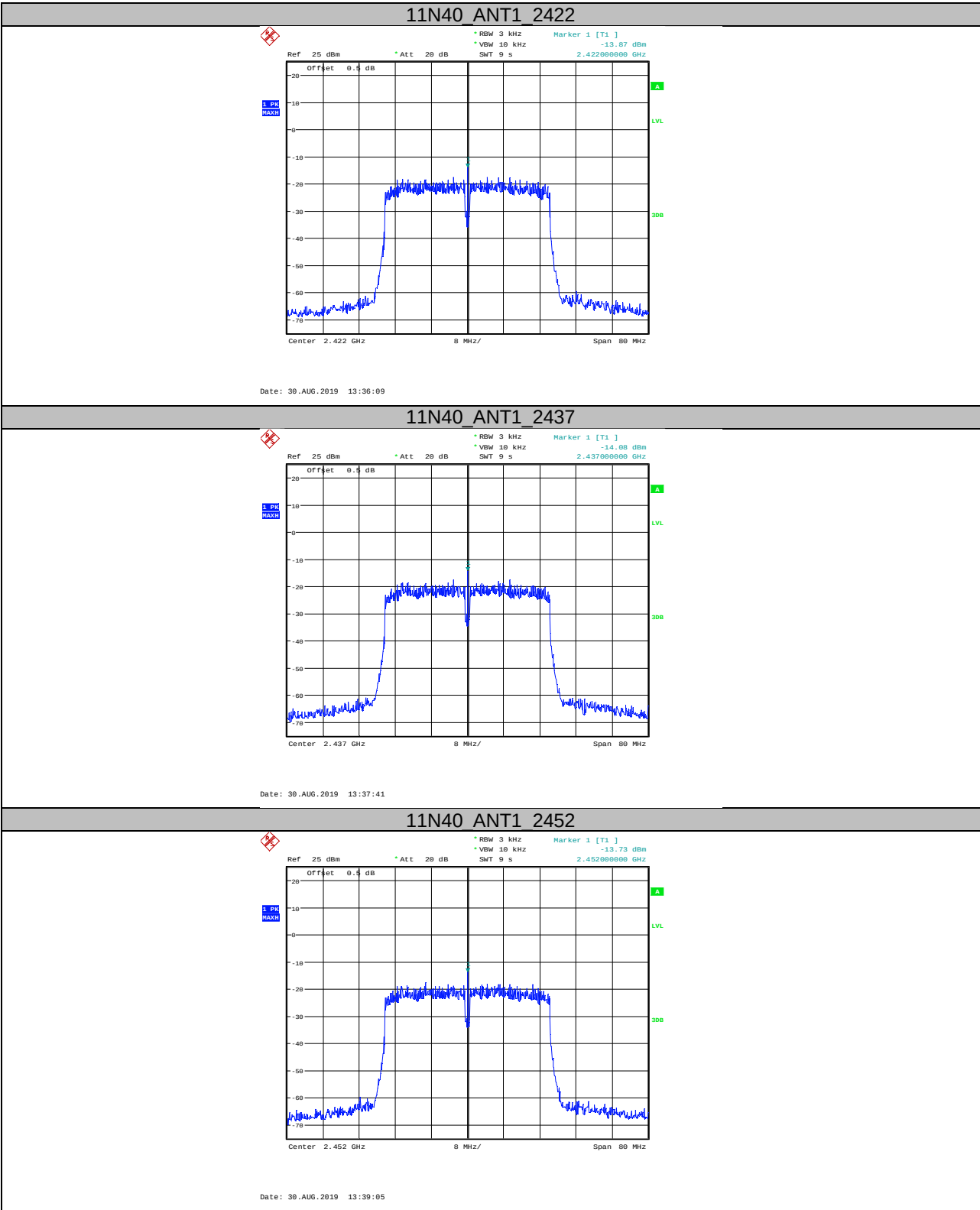


Test Graphs









9.5 Spurious RF conducted emissions

Test Method

1. Connect EUT test port to spectrum analyzer.
2. Establish a reference level by using the following procedure:
 - a. Set RBW=100 kHz. VBW $\geq$ 3RBW. Detector =peak, Sweep time = auto couple, Trace mode = max hold.
 - b. Allow trace to fully stabilize, use the peak marker function to determine the maximum PSD level.
3. Use the maximum PSD level to establish the reference level.
 - a. Set the center frequency and span to encompass frequency range to be measured.
 - b. Use the peak marker function to determine the maximum amplitude level. Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) are attenuated by at least the minimum requirements, report the three highest emissions relative to the limit.
4. Repeat above procedures until other frequencies measured were completed.

Limit

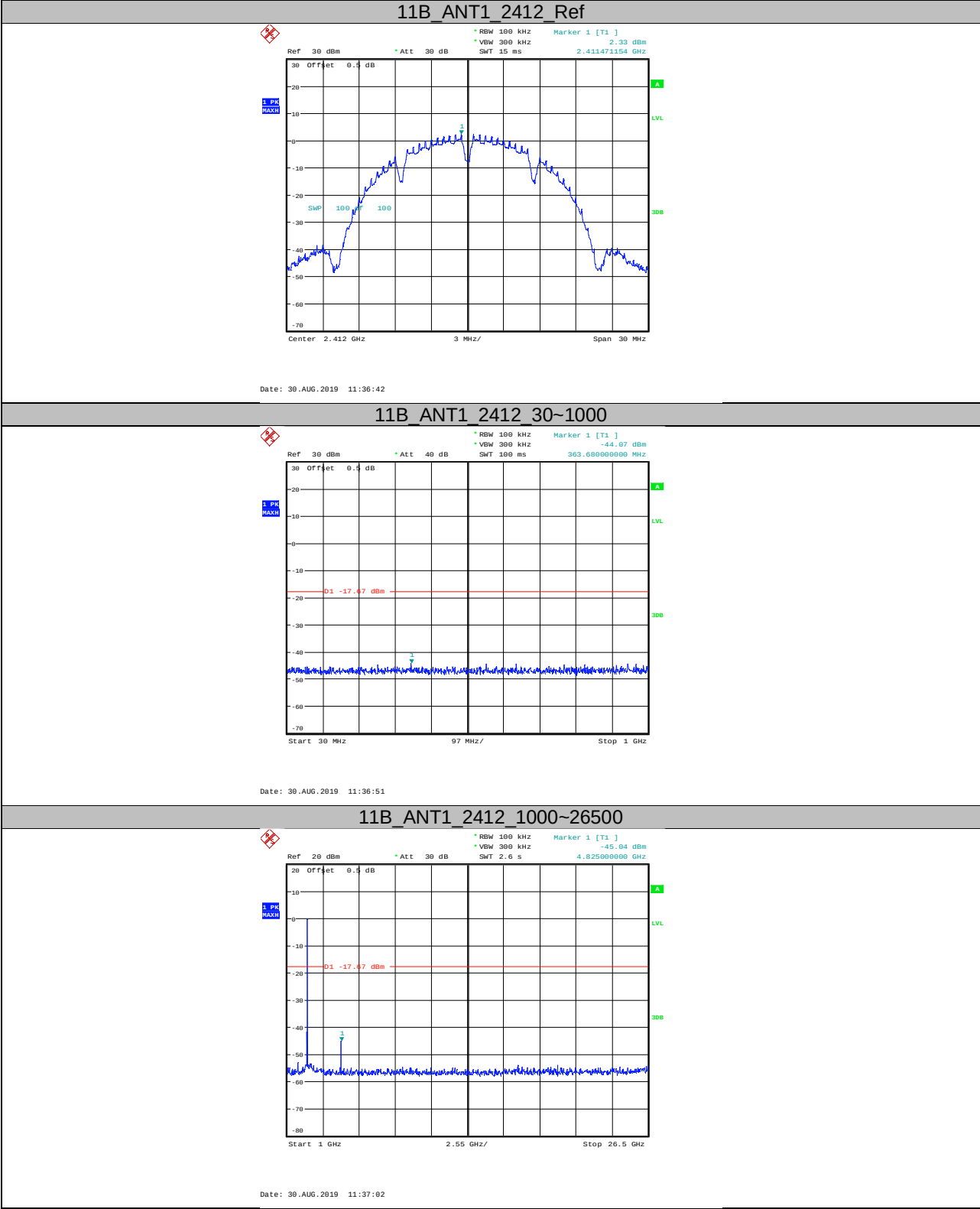
Frequency Range MHz	Limit (dBc)
30-25000	-20

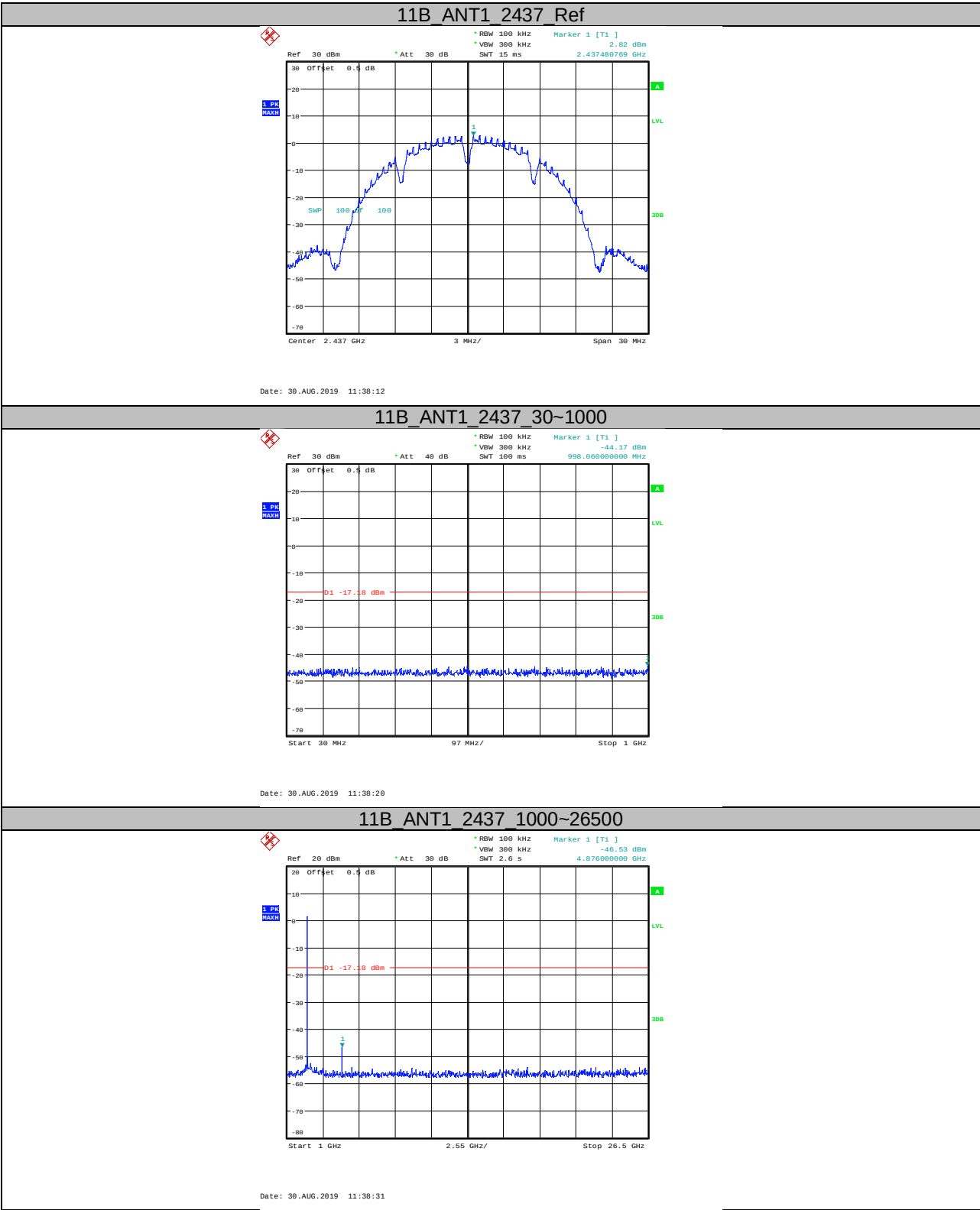
Test result

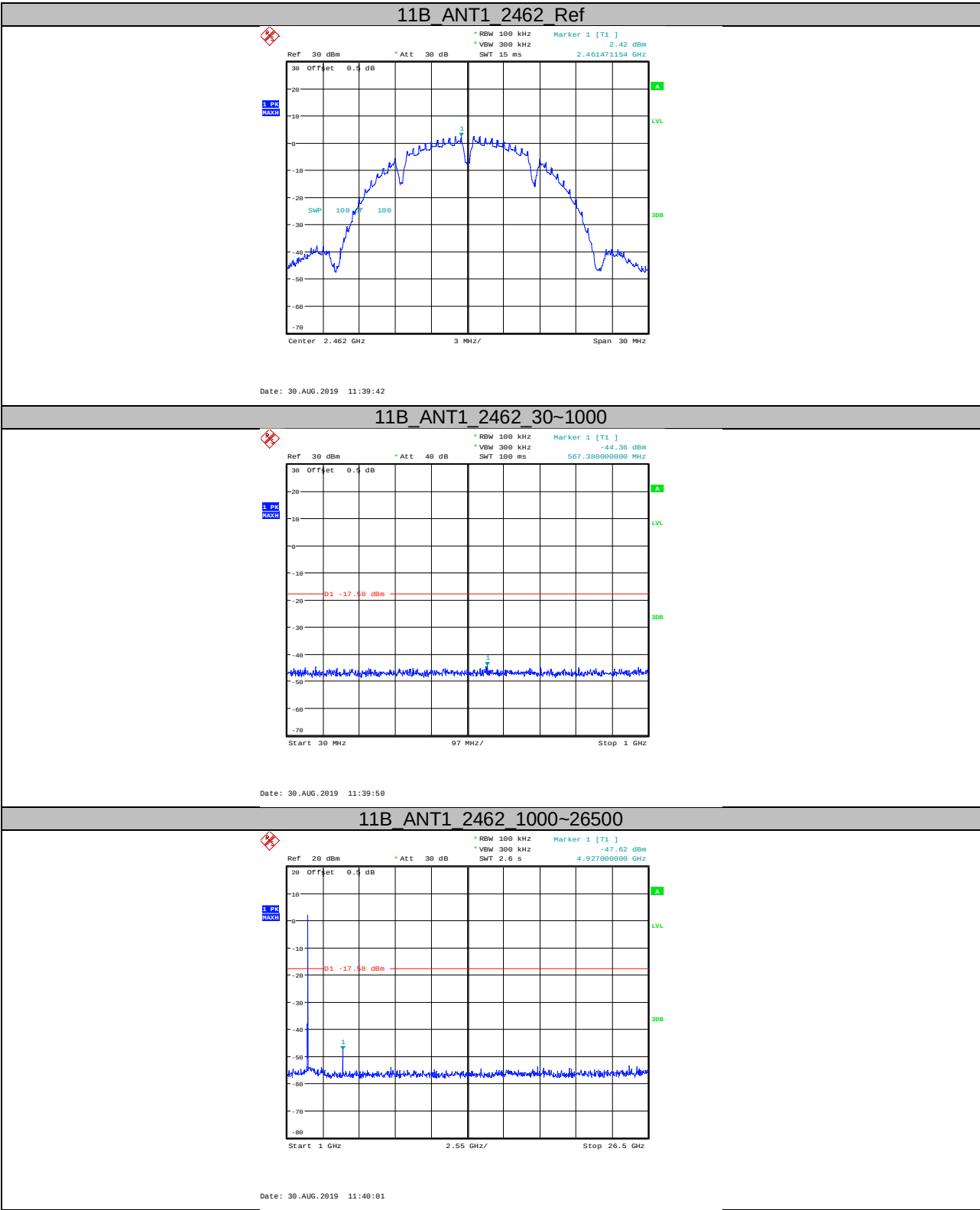
Test Mode	Antenna	Channel (MHz)	Freq Range (MHz)	Ref Level	Result (dBm)	Limit (dBm)	Verdict
11B	ANT1	2412	30~1000	2.33	-44.07	-17.67	PASS
11B	ANT1	2412	1000~26500	2.33	-45.04	-17.67	PASS
11B	ANT1	2437	30~1000	2.82	-44.17	-17.18	PASS
11B	ANT1	2437	1000~26500	2.82	-46.53	-17.18	PASS
11B	ANT1	2462	30~1000	2.42	-44.36	-17.58	PASS
11B	ANT1	2462	1000~26500	2.42	-47.62	-17.58	PASS
11G	ANT1	2412	30~1000	-2.88	-43.83	-22.88	PASS
11G	ANT1	2412	1000~26500	-2.88	-50.28	-22.88	PASS
11G	ANT1	2437	30~1000	-0.62	-44.36	-20.62	PASS
11G	ANT1	2437	1000~26500	-0.62	-50.25	-20.62	PASS
11G	ANT1	2462	30~1000	-0.59	-44.7	-20.59	PASS
11G	ANT1	2462	1000~26500	-0.59	-50.14	-20.59	PASS
11N20	ANT1	2412	30~1000	-1.60	-44.4	-21.6	PASS
11N20	ANT1	2412	1000~26500	-1.60	-51.61	-21.6	PASS
11N20	ANT1	2437	30~1000	-1.24	-44.56	-21.24	PASS
11N20	ANT1	2437	1000~26500	-1.24	-50.88	-21.24	PASS
11N20	ANT1	2462	30~1000	-4.27	-44.12	-24.27	PASS
11N20	ANT1	2462	1000~26500	-4.27	-50.51	-24.27	PASS
11N40	ANT1	2422	30~1000	-4.70	-44.18	-24.7	PASS
11N40	ANT1	2422	1000~26500	-4.70	-51.37	-24.7	PASS
11N40	ANT1	2437	30~1000	-5.14	-44.22	-25.14	PASS
11N40	ANT1	2437	1000~26500	-5.14	-50.73	-25.14	PASS
11N40	ANT1	2452	30~1000	-4.57	-44.2	-24.57	PASS
11N40	ANT1	2452	1000~26500	-4.57	-51.9	-24.57	PASS

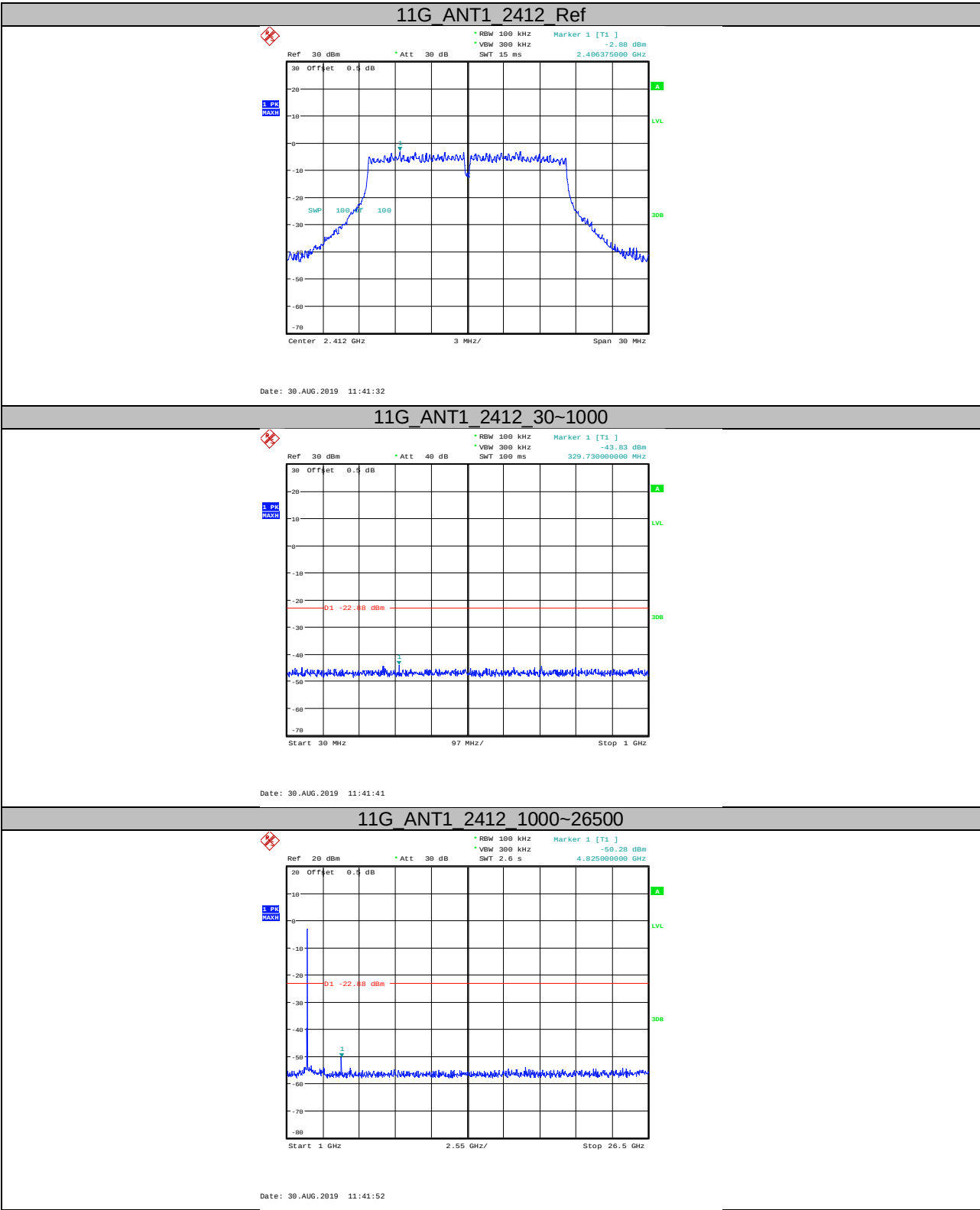


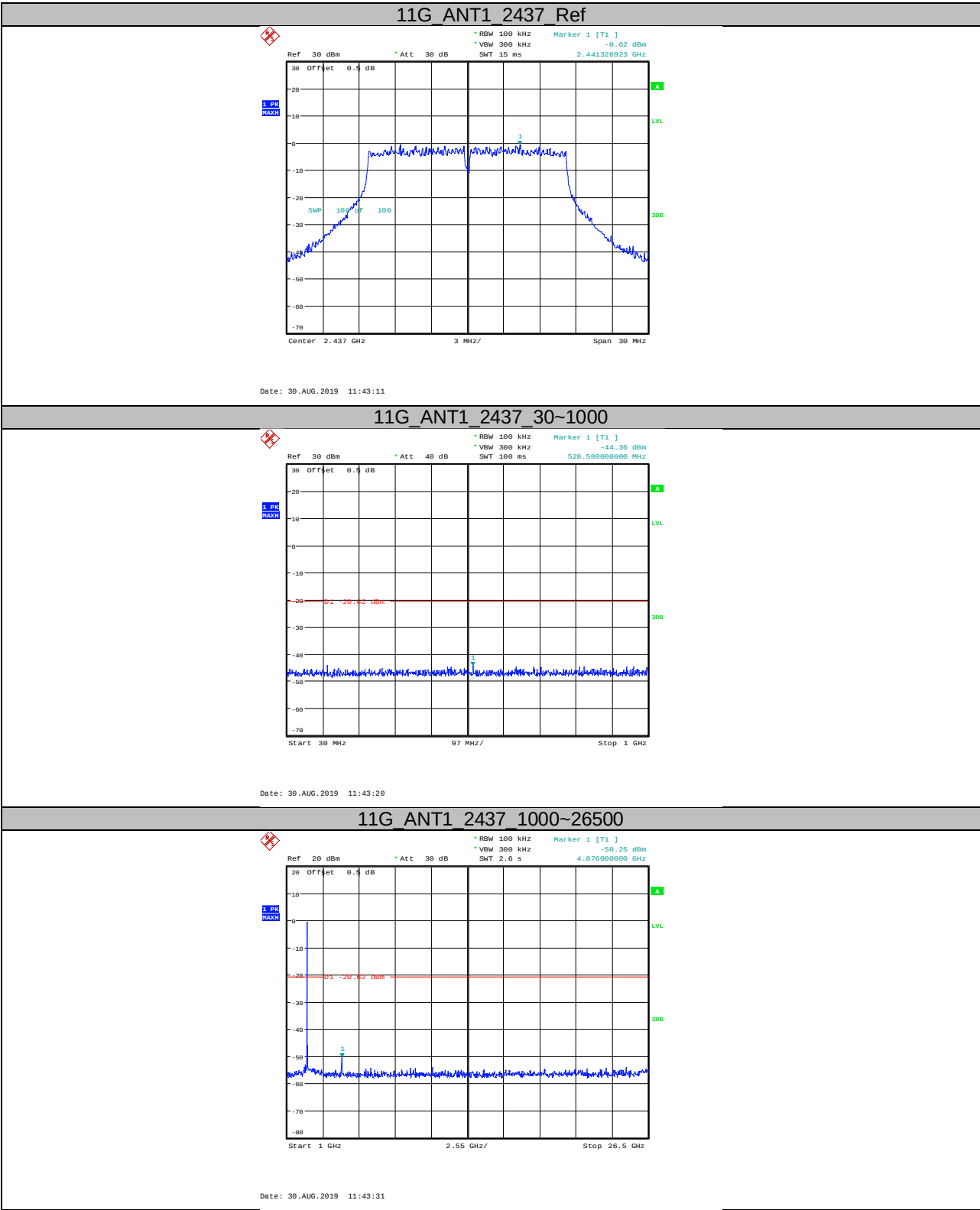
Test Graphs

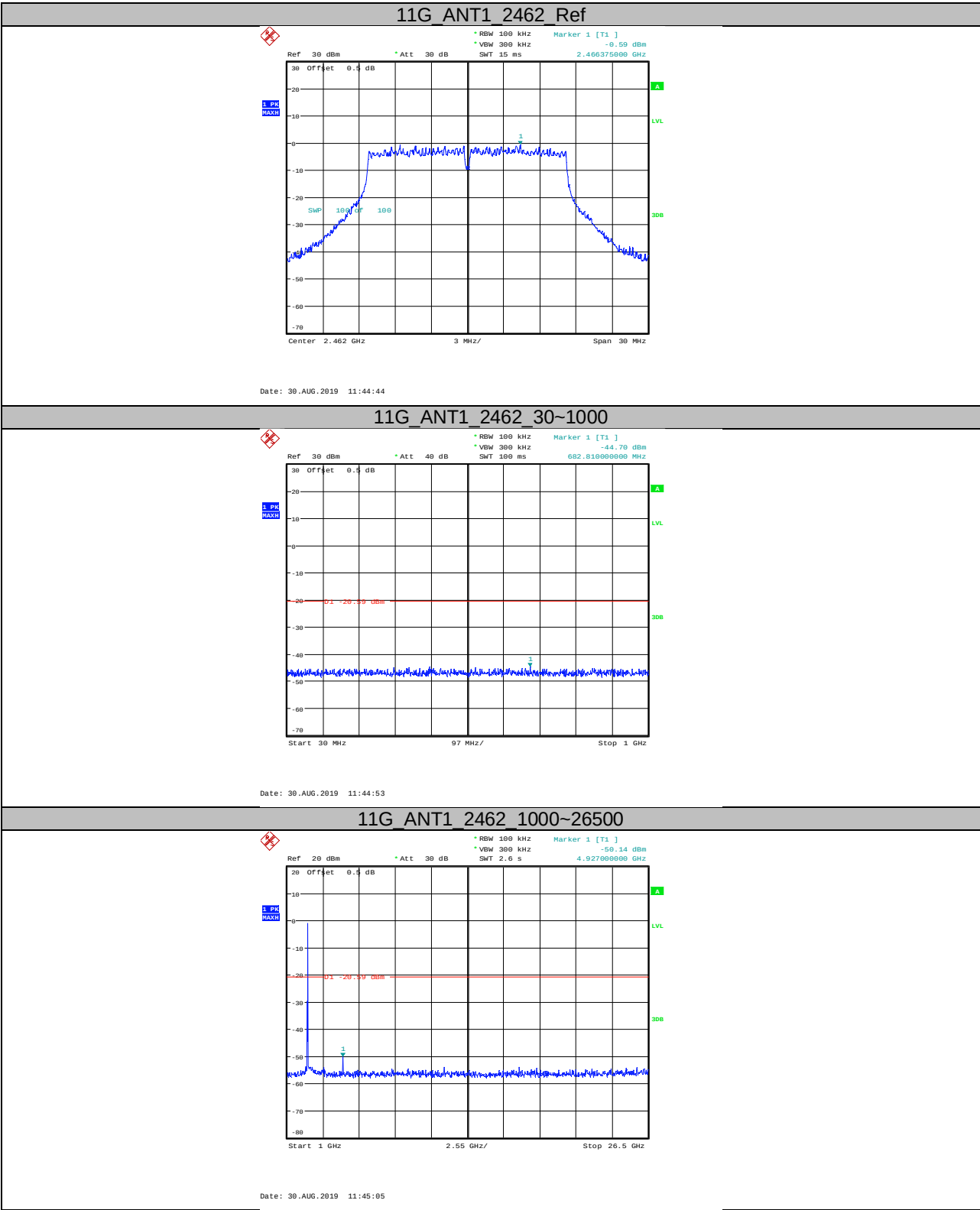


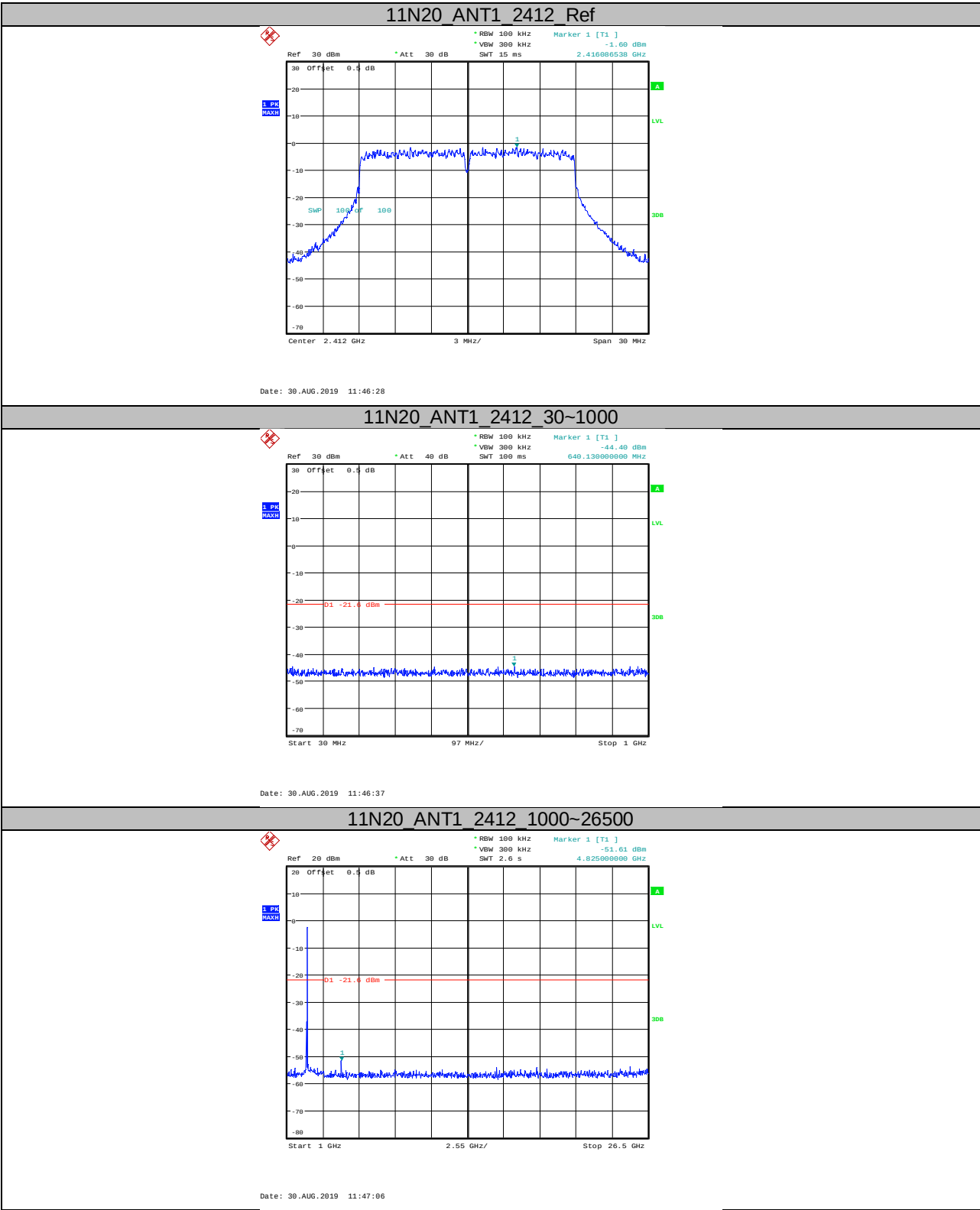


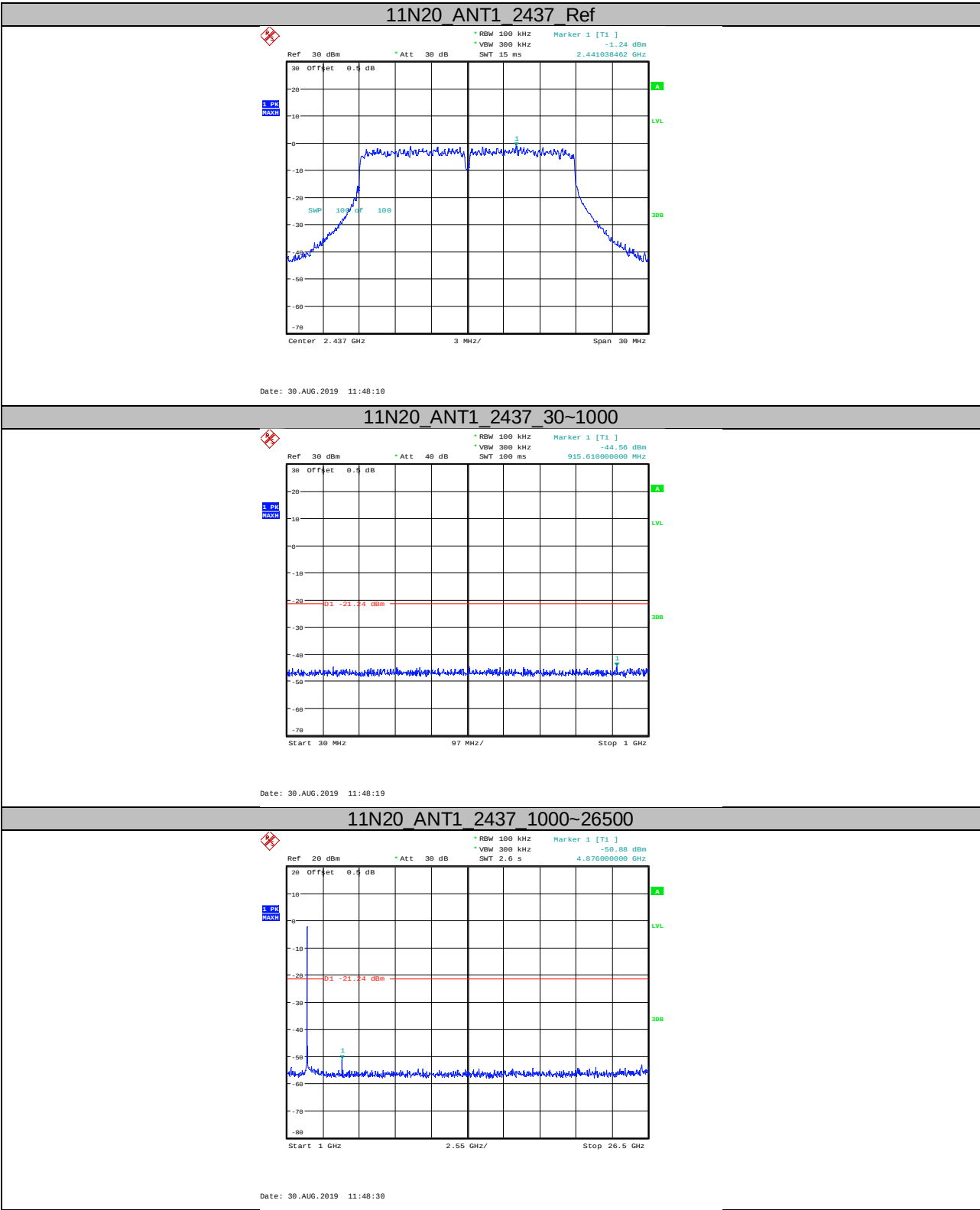


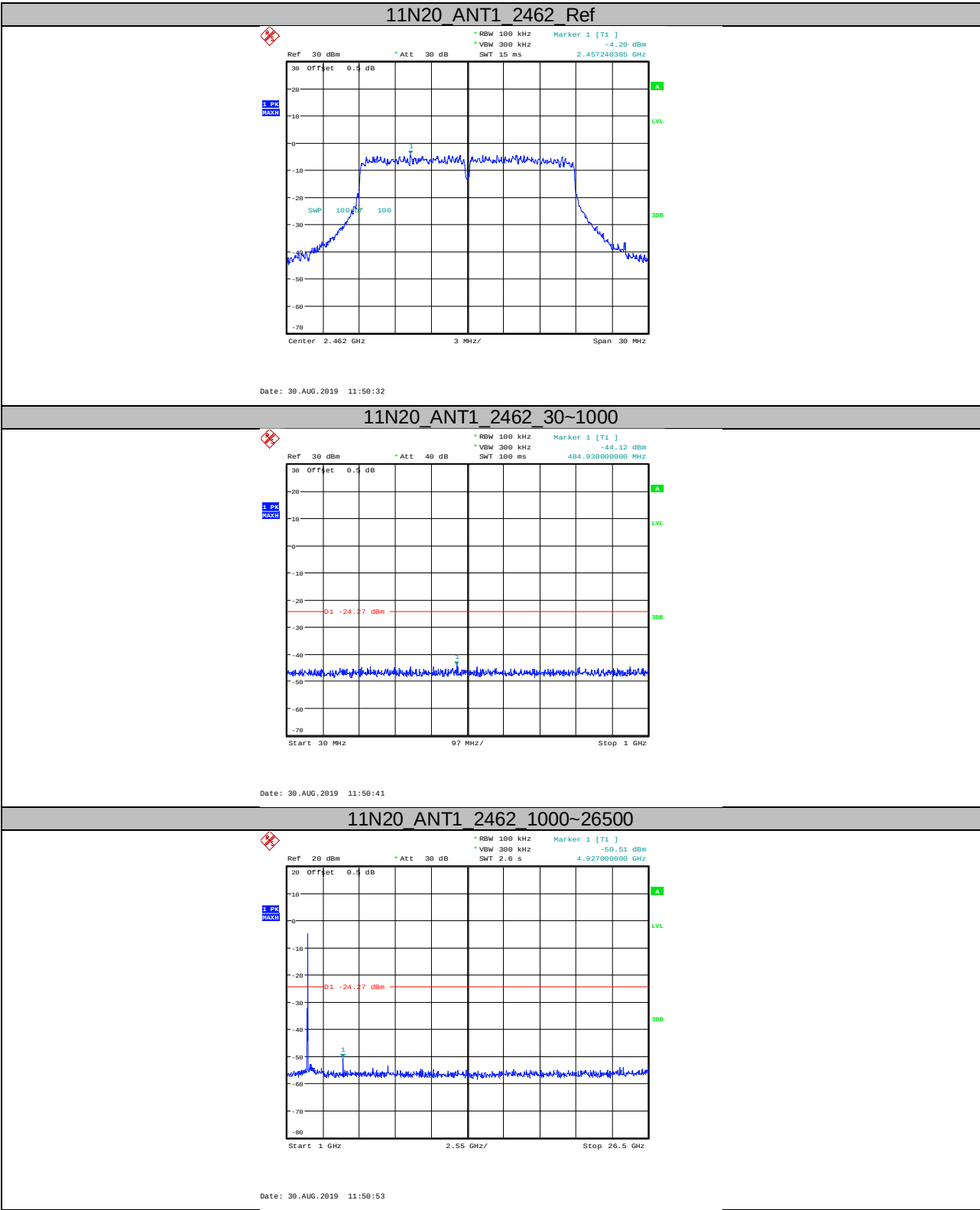


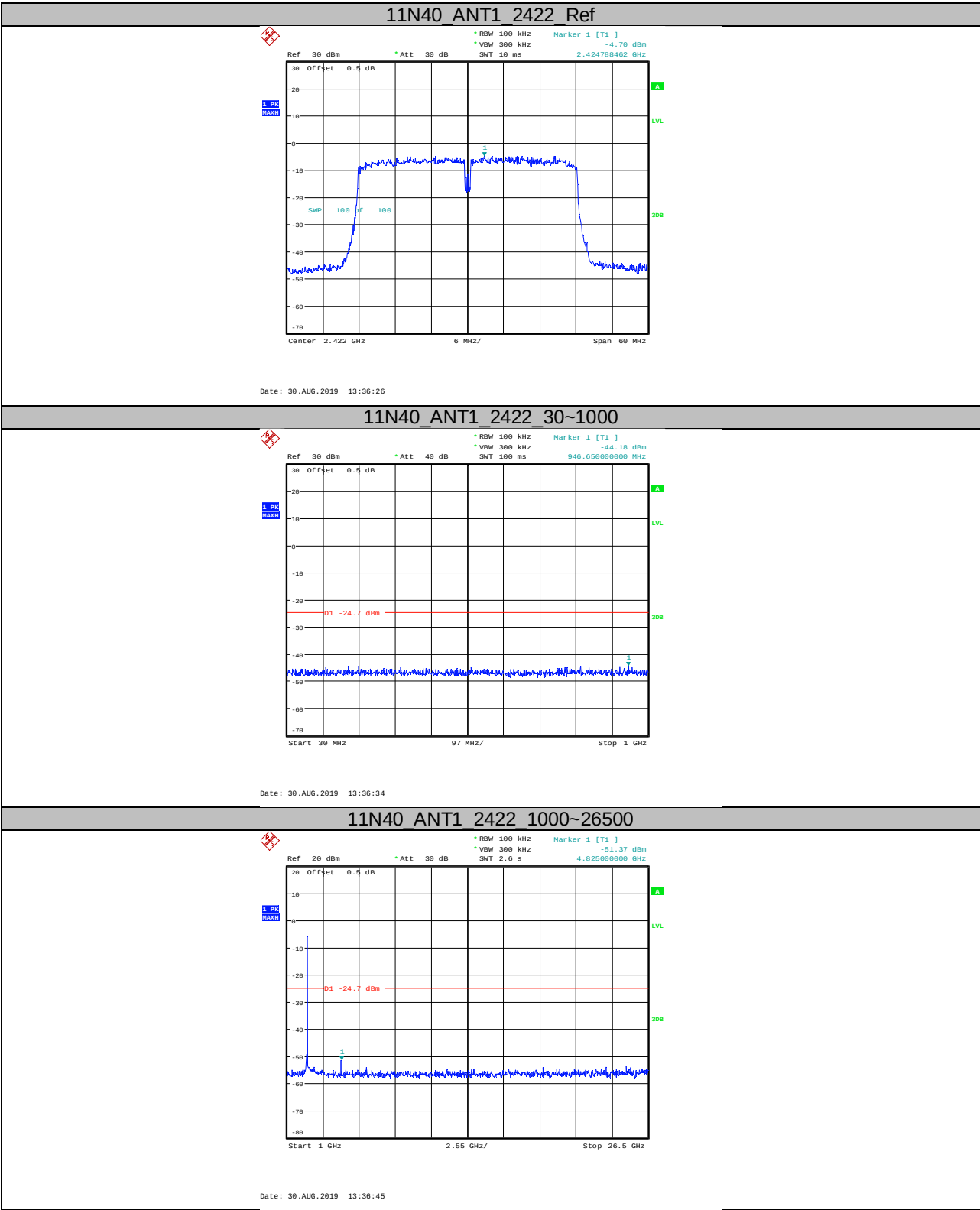


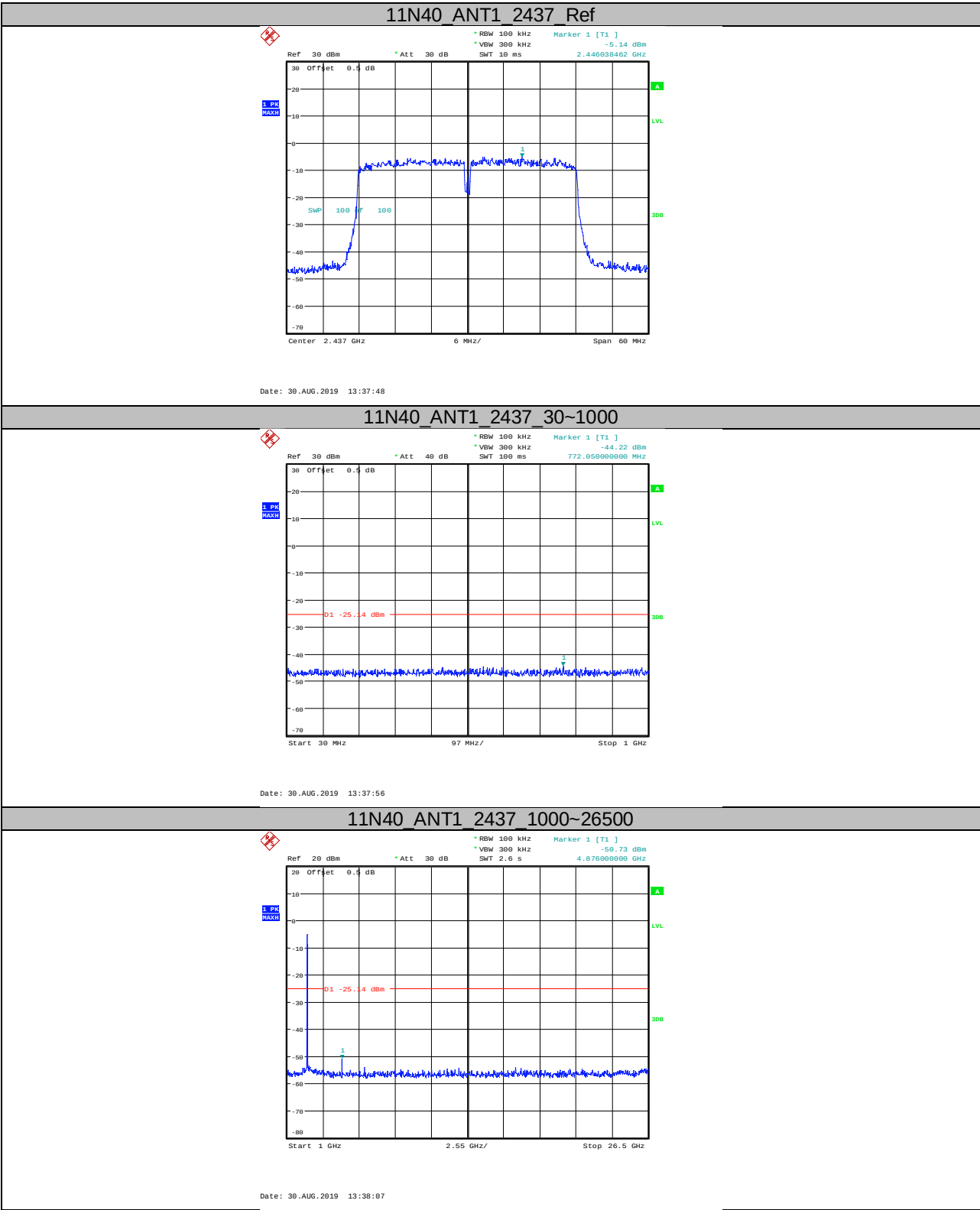


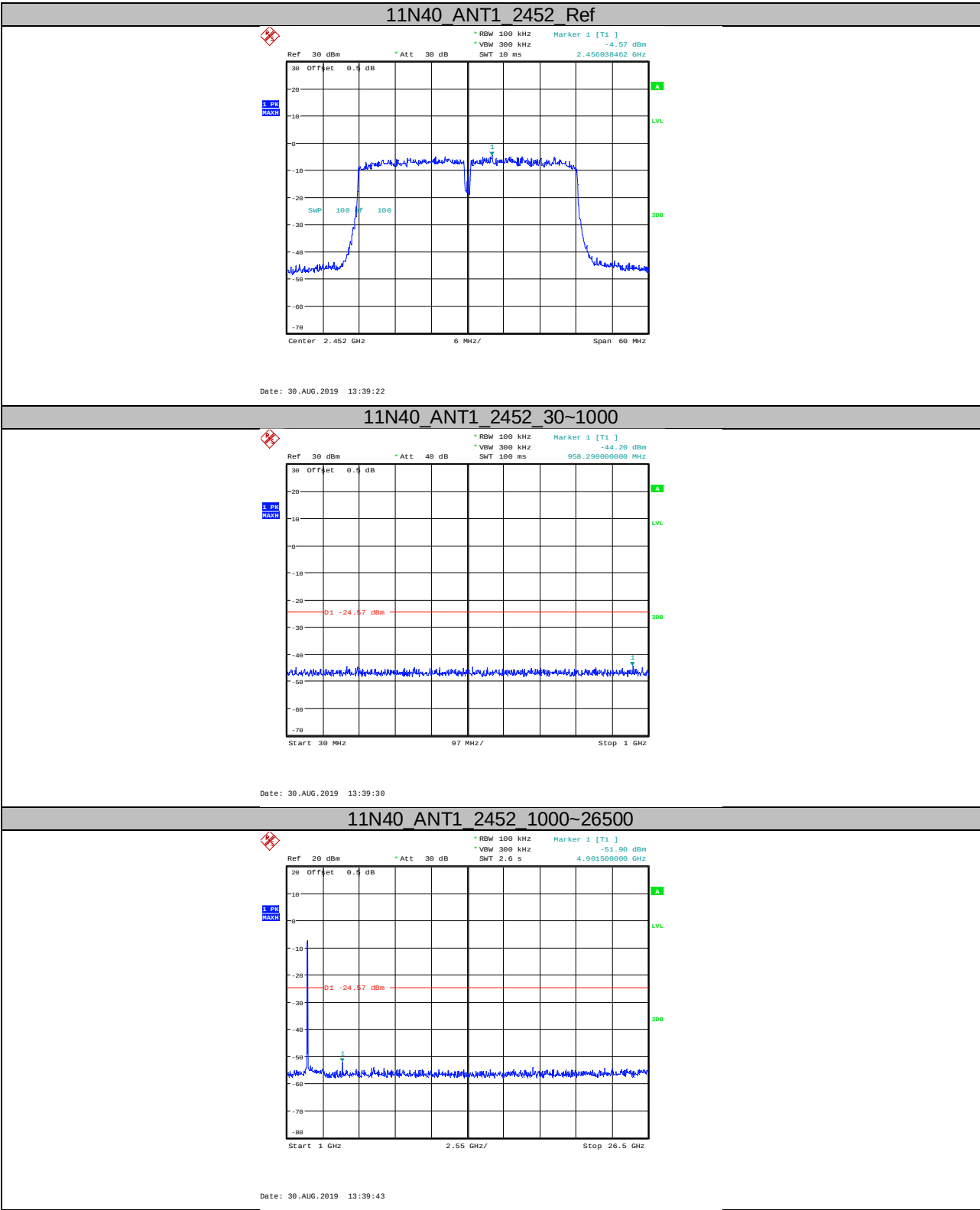












9.6 Band edge

Test Method

1. Connect EUT test port to spectrum analyzer.
2. Set spectrum analyzer setting as below:
Set RBW ³ 1% of the span, VBW ³ RBW.
Set Sweep = auto. Set Detector function = peak. Allow the trace to stabilize.
Set Span = wide enough to capture the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products which fall outside of the authorized band of operation.
3. Repeat above procedures until all frequencies measured were complete.

Limit

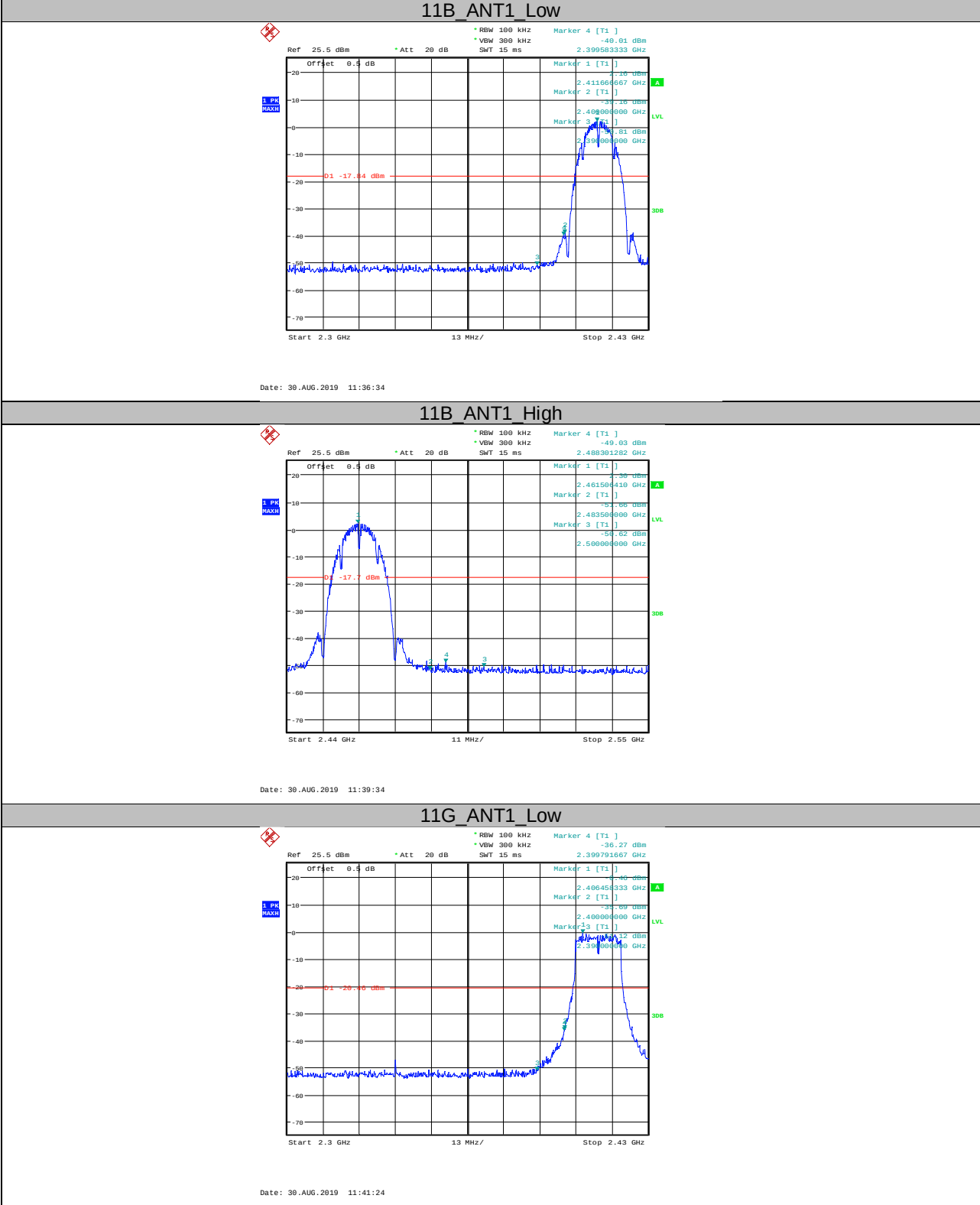
Frequency Range MHz	Limit (dBc)
30-25000	-20

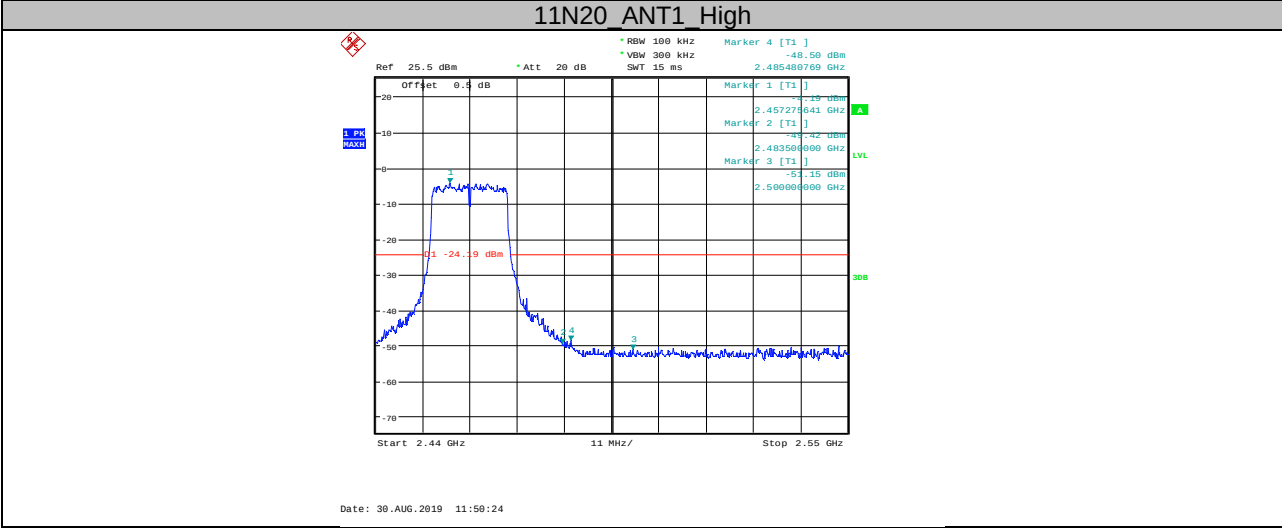
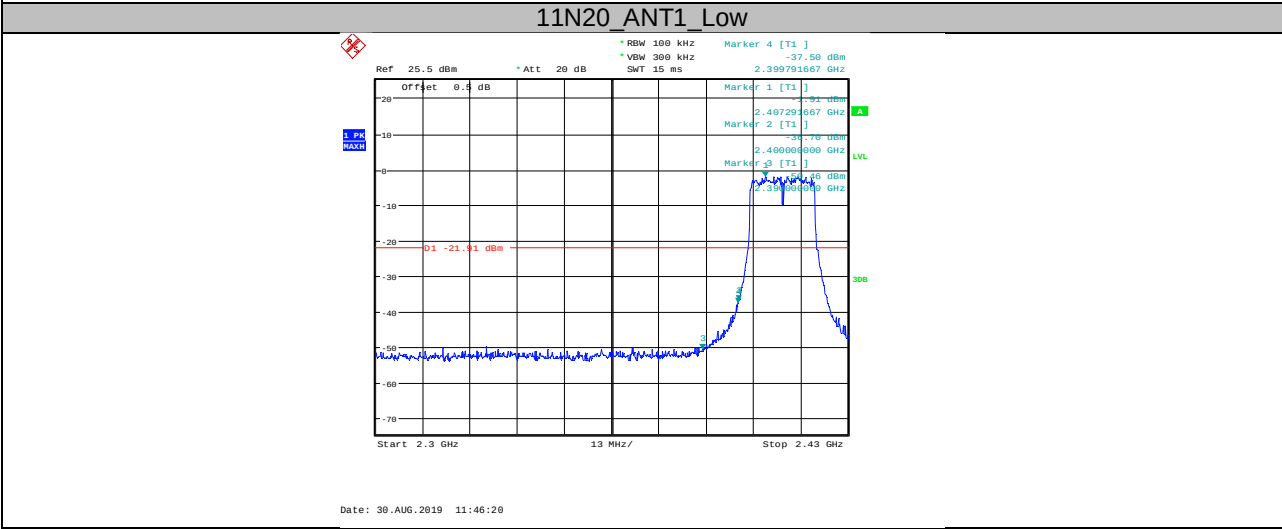
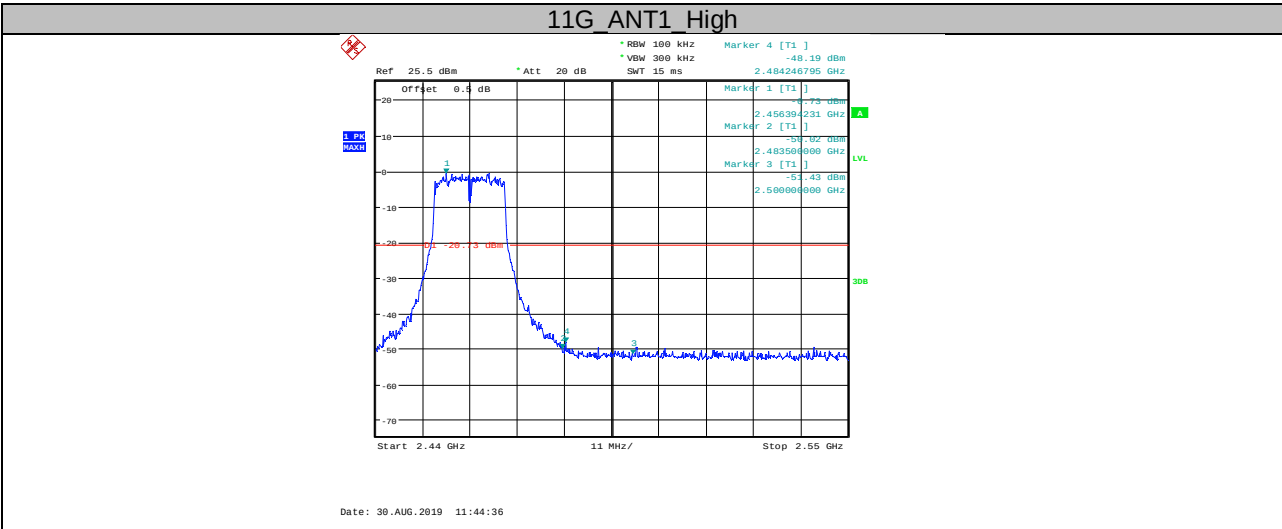
Test result

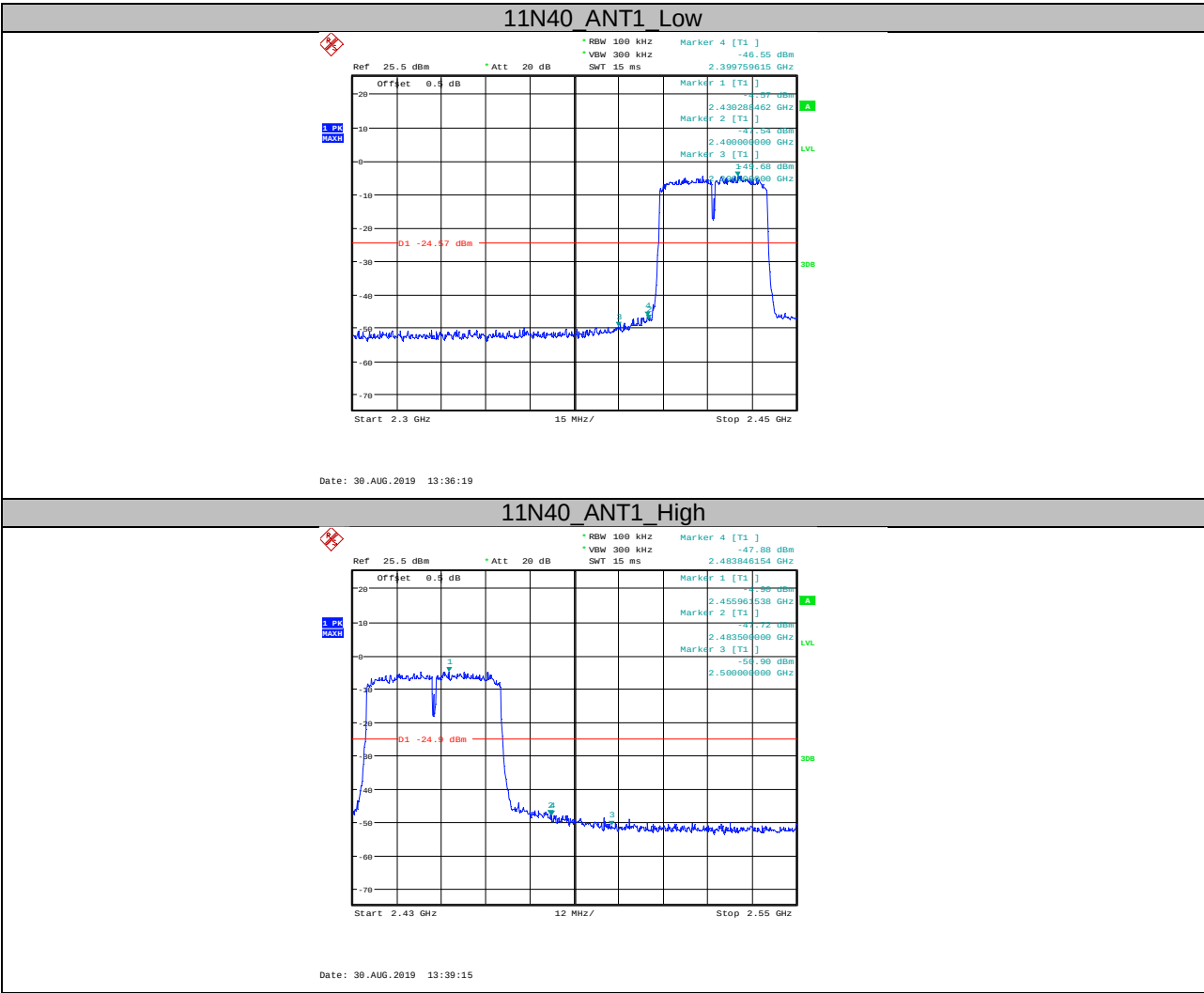
Test Mode	Antenna	Ch Name	Channel	Max. Level	Result (dBm)	Limit (dBm)	Verdict
11B	ANT1	Low	2412	2.16	-40.01	-17.84	PASS
11B	ANT1	High	2462	2.30	-49.03	-17.7	PASS
11G	ANT1	Low	2412	-0.46	-36.27	-20.46	PASS
11G	ANT1	High	2462	-0.73	-48.19	-20.73	PASS
11N20	ANT1	Low	2412	-1.91	-37.5	-21.91	PASS
11N20	ANT1	High	2462	-4.19	-48.5	-24.19	PASS
11N40	ANT1	Low	2422	-4.57	-46.55	-24.57	PASS
11N40	ANT1	High	2452	-4.90	-47.88	-24.9	PASS



Test Graphs







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 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 to 120KHz, VBW ≥ RBW for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.

For Peak unwanted emissions 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, Sweep = auto, Detector function = peak, Trace = max hold.

Procedures for average unwanted emissions measurements above 1000 MHz

- a) RBW = 1 MHz.
- b) VBW $\geq [3 \times \text{RBW}]$.
- c) Detector = RMS (power averaging), if $[\text{span} / (\# \text{ of points in sweep})] \geq \text{RBW} / 2$.
 Satisfying this condition can require increasing the number of points in the sweep or reducing the span. If the condition is not satisfied, then the detector mode shall be set to peak.
- d) Averaging type = power (i.e., rms) (As an alternative, the detector and averaging type may be set for linear voltage averaging. Some instruments require linear display mode to use linear voltage averaging. Log or dB averaging shall not be used.)
- e) Sweep time = auto.
- f) Perform a trace average of at least 100 traces if the transmission is continuous. If the transmission is not continuous, then the number of traces shall be increased by a factor of $1 / D$, where D is the duty cycle. For example, with 50% duty cycle, at least 200 traces shall be averaged. (If a specific emission is demonstrated to be continuous—i.e., 100% duty cycle—then rather than turning ON and OFF with the transmit cycle, at least 100 traces shall be averaged.)
- g) If tests are performed with the EUT transmitting at a duty cycle less than 98%, then a correction factor shall be added to the measurement results prior to comparing with the emission limit, to compute the emission level that would have been measured had the test been performed at 100% duty cycle. The correction factor is computed as follows:
 - 1) If power averaging (rms) mode was used in the preceding step e), then the correction factor is $[10 \log (1 / D)]$, where D is the duty cycle. For example, if the transmit duty

cycle was 50%, then 3 dB shall be added to the measured emission levels.

2) If linear voltage averaging mode was used in the preceding step e), then the correction factor is $[20 \log (1 / D)]$, where D is the duty cycle. For example, if the transmit duty cycle was 50%, then 6 dB shall be added to the measured emission levels.

3) If a specific emission is demonstrated to be continuous (100% duty cycle) rather than turning ON and OFF with the transmit cycle, then no duty cycle correction is required for that emission.

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 dBμV/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.

Transmitting spurious emission test result as below:

802.11b

2412MHz (30MHz – 1GHz)

Frequency MHz	Emission Level dBuV/m	Polarization	Limit dBuV/m	Margin dB	Detector	Antenna Factor dB	PRM Factor dB	Cable Loss dB	Result
239.99	30.39	Horizontal	46.00	15.61	QP	12.57	--	4.96	Pass
872.18	36.67	Vertical	46.00	17.08	QP	21.43	--	6.80	Pass

2412MHz (Above 1GHz)

Frequency MHz	Emission Level dBuV/m	Polarization	Limit dBuV/m	Margin dB	Detector	Antenna Factor dB	PRM Factor dB	Cable Loss dB	Result
17524.00	58.42	Horizontal	74.00	15.58	PK	43.74	41.44	11.36	Pass
17524.00	47.87	Horizontal	54.00	6.13	AV	43.74	41.44	11.36	Pass
17796.00*	59.03	Vertical	74.00	14.97	PK	44.24	41.30	11.66	Pass
17796.00*	47.82	Vertical	54.00	6.18	AV	44.24	41.30	11.66	Pass

2437MHz (30MHz – 1GHz)

Frequency MHz	Emission Level dBuV/m	Polarization	Limit dBuV/m	Margin dB	Detector	Antenna Factor dB	PRM Factor dB	Cable Loss dB	Result
383.93	33.37	Horizontal	46.00	12.63	QP	15.37	--	5.45	Pass
932.27	28.48	Vertical	46.00	17.52	QP	22.07	--	7.06	Pass

2437MHz (Above 1GHz)

Frequency MHz	Emission Level dBuV/m	Polarization	Limit dBuV/m	Margin dB	Detector	Antenna Factor dB	PRM Factor dB	Cable Loss dB	Result
17966.00*	57.95	Horizontal	74.00	16.05	PK	44.54	41.21	11.85	Pass
17966.00*	47.93	Horizontal	54.00	6.07	AV	44.54	41.21	11.85	Pass
17558.00	57.92	Vertical	74.00	16.08	PK	43.81	41.42	11.40	Pass
17558.00	47.72	Vertical	54.00	6.28	AV	43.81	41.42	11.40	Pass

2462MHz (30MHz – 1GHz)

Frequency MHz	Emission Level dBuV/m	Polarization	Limit dBuV/m	Margin dB	Detector	Antenna Factor dB	PRM Factor dB	Cable Loss dB	Result
480.53	33.32	Horizontal	46.00	12.68	QP	16.83	--	5.76	Pass
480.53	26.30	Vertical	46.00	19.70	QP	16.83	--	5.76	Pass

2462MHz (Above 1GHz)

Frequency MHz	Emission Level dBuV/m	Polarization	Limit dBuV/m	Margin dB	Detector	Antenna Factor dB	PRM Factor dB	Cable Loss dB	Result
17524.00	59.65	Horizontal	74.00	14.35	PK	43.74	41.44	11.36	Pass
17524.00	47.81	Horizontal	54.00	6.19	AV	43.74	41.44	11.36	Pass
17660.00	58.12	Vertical	74.00	15.88	PK	43.99	41.37	11.51	Pass
17660.00	47.78	Vertical	54.00	6.22	AV	43.99	41.37	11.51	Pass

802.11g

2412MHz (30MHz – 1GHz)

Frequency MHz	Emission Level dBuV/m	Polarization	Limit dBuV/m	Margin dB	Detector	Antenna Factor dB	PRM Factor dB	Cable Loss dB	Result
383.93	32.41	Horizontal	46.00	13.59	QP	15.37	--	5.45	Pass
689.57	29.76	Vertical	46.00	16.24	QP	19.94	--	6.35	Pass

2412MHz (Above 1GHz)

Frequency MHz	Emission Level dBuV/m	Polarization	Limit dBuV/m	Margin dB	Detector	Antenna Factor dB	PRM Factor dB	Cable Loss dB	Result
17745.00*	58.05	Horizontal	74.00	15.95	PK	44.14	41.32	11.61	Pass
17745.00*	47.85	Horizontal	54.00	6.15	AV	44.14	41.32	11.61	Pass
17881.00*	58.43	Vertical	74.00	15.57	PK	44.39	41.25	11.76	Pass
17881.00*	47.87	Vertical	54.00	6.13	AV	44.39	41.25	11.76	Pass

2437MHz (30MHz – 1GHz)

Frequency MHz	Emission Level dBuV/m	Polarization	Limit dBuV/m	Margin dB	Detector	Antenna Factor dB	PRM Factor dB	Cable Loss dB	Result
383.93	32.60	Horizontal	46.00	13.40	QP	15.37	--	5.45	Pass
935.55	30.90	Vertical	46.00	15.10	QP	22.10	--	7.06	Pass

2437MHz (Above 1GHz)

Frequency MHz	Emission Level dBuV/m	Polarization	Limit dBuV/m	Margin dB	Detector	Antenna Factor dB	PRM Factor dB	Cable Loss dB	Result
17609.00	58.41	Horizontal	74.00	15.59	PK	43.90	41.39	11.46	Pass
17609.00	47.77	Horizontal	54.00	6.23	AV	43.90	41.39	11.46	Pass
17779.00*	58.48	Vertical	74.00	15.52	PK	44.21	41.30	11.64	Pass
17779.00*	47.89	Vertical	54.00	6.11	AV	44.21	41.30	11.64	Pass

2462MHz (30MHz – 1GHz)

Frequency MHz	Emission Level dBuV/m	Polarization	Limit dBuV/m	Margin dB	Detector	Antenna Factor dB	PRM Factor dB	Cable Loss dB	Result
480.53	36.01	Horizontal	46.00	9.99	QP	16.83	--	5.76	Pass
833.32	29.46	Vertical	46.00	16.54	QP	21.05	--	6.68	Pass

2462MHz (Above 1GHz)

Frequency MHz	Emission Level dBuV/m	Polarization	Limit dBuV/m	Margin dB	Detector	Antenna Factor dB	PRM Factor dB	Cable Loss dB	Result
17830.00*	58.32	Horizontal	74.00	15.68	PK	44.30	41.28	11.70	Pass
17830.00*	47.86	Horizontal	54.00	6.14	AV	44.30	41.28	11.70	Pass
17524.00	58.95	Vertical	74.00	15.05	PK	43.74	41.44	11.36	Pass
17524.00	47.88	Vertical	54.00	6.12	AV	43.74	41.44	11.36	Pass

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2412MHz (30MHz – 1GHz)

Frequency MHz	Emission Level dBuV/m	Polarization	Limit dBuV/m	Margin dB	Detector	Antenna Factor dB	PRM Factor dB	Cable Loss dB	Result
478.85	33.79	Horizontal	46.00	12.21	QP	16.81	--	5.76	Pass
414.72	24.92	Vertical	46.00	21.08	QP	15.84	--	5.56	Pass

2412MHz (Above 1GHz)

Frequency MHz	Emission Level dBuV/m	Polarization	Limit dBuV/m	Margin dB	Detector	Antenna Factor dB	PRM Factor dB	Cable Loss dB	Result
18000.00*	58.13	Horizontal	74.00	15.87	PK	44.60	41.19	11.89	Pass
18000.00*	47.96	Horizontal	54.00	6.04	AV	44.60	41.19	11.89	Pass
17949.00*	58.24	Vertical	74.00	15.76	PK	44.51	41.22	11.83	Pass
17949.00*	47.99	Vertical	54.00	6.01	AV	44.51	41.22	11.83	Pass

2437MHz (30MHz – 1GHz)

Frequency MHz	Emission Level dBuV/m	Polarization	Limit dBuV/m	Margin dB	Detector	Antenna Factor dB	PRM Factor dB	Cable Loss dB	Result
382.59	34.85	Horizontal	46.00	11.15	QP	15.35	--	5.45	Pass
480.53	27.63	Vertical	46.00	18.37	QP	16.83	--	5.76	Pass

2437MHz (Above 1GHz)

Frequency MHz	Emission Level dBuV/m	Polarization	Limit dBuV/m	Margin dB	Detector	Antenna Factor dB	PRM Factor dB	Cable Loss dB	Result
17881.00*	58.70	Horizontal	74.00	15.30	PK	44.39	41.25	11.76	Pass
17881.00*	47.93	Horizontal	54.00	-6.07	AV	44.39	41.25	11.76	Pass
18000.00*	59.36	Vertical	74.00	14.64	PK	44.60	41.19	11.89	Pass
18000.00*	47.97	Vertical	54.00	6.03	AV	44.60	41.19	11.89	Pass

2462MHz (30MHz – 1GHz)

Frequency MHz	Emission Level dBuV/m	Polarization	Limit dBuV/m	Margin dB	Detector	Antenna Factor dB	PRM Factor dB	Cable Loss dB	Result
480.53	28.28	Horizontal	46.00	17.72	QP	16.83	--	5.76	Pass
714.17	29.09	Vertical	46.00	16.91	QP	20.19	--	6.42	Pass

2462MHz (Above 1GHz)

Frequency MHz	Emission Level dBuV/m	Polarization	Limit dBuV/m	Margin dB	Detector	Antenna Factor dB	PRM Factor dB	Cable Loss dB	Result
17949.00*	58.75	Horizontal	74.00	15.25	PK	44.51	41.22	11.83	Pass
17949.00*	47.96	Horizontal	54.00	6.04	AV	44.51	41.22	11.83	Pass
17524.00	57.92	Vertical	74.00	16.08	PK	43.74	41.44	11.36	Pass
17524.00	47.88	Vertical	54.00	6.12	AV	43.74	41.44	11.36	Pass

802.11nHT40

2422MHz (30MHz – 1GHz)

Frequency MHz	Emission Level dBuV/m	Polarization	Limit dBuV/m	Margin dB	Detector	Antenna Factor dB	PRM Factor dB	Cable Loss dB	Result
383.93	33.57	Horizontal	46.00	12.43	QP	15.37	--	5.45	Pass
714.17	28.09	Vertical	46.00	17.91	QP	20.19	--	6.42	Pass

2422MHz (Above 1GHz)

Frequency MHz	Emission Level dBuV/m	Polarization	Limit dBuV/m	Margin dB	Detector	Antenna Factor dB	PRM Factor dB	Cable Loss dB	Result
17575.00	59.63	Horizontal	74.00	14.37	PK	43.84	41.41	11.42	Pass
17575.00	47.68	Horizontal	54.00	6.32	AV	43.84	41.41	11.42	Pass
18000.00*	58.48	Vertical	74.00	15.52	PK	44.60	41.19	11.89	Pass
18000.00*	47.96	Vertical	54.00	6.04	AV	44.60	41.19	11.89	Pass

2437MHz (30MHz – 1GHz)

Frequency MHz	Emission Level dBuV/m	Polarization	Limit dBuV/m	Margin dB	Detector	Antenna Factor dB	PRM Factor dB	Cable Loss dB	Result
383.93	34.57	Horizontal	46.00	11.43	QP	15.37	--	5.45	Pass
665.80	29.63	Vertical	46.00	16.37	QP	19.58	--	6.28	Pass

2437MHz (Above 1GHz)

Frequency MHz	Emission Level dBuV/m	Polarization	Limit dBuV/m	Margin dB	Detector	Antenna Factor dB	PRM Factor dB	Cable Loss dB	Result
17694.00	58.27	Horizontal	74.00	15.73	PK	44.05	41.35	11.55	Pass
17694.00	47.90	Horizontal	54.00	6.10	AV	44.05	41.35	11.55	Pass
17575.00	58.86	Vertical	74.00	15.14	PK	43.84	41.41	11.42	Pass
17575.00	47.75	Vertical	54.00	6.25	AV	43.84	41.41	11.42	Pass

2452MHz (30MHz – 1GHz)

Frequency MHz	Emission Level dBuV/m	Polarization	Limit dBuV/m	Margin dB	Detector	Antenna Factor dB	PRM Factor dB	Cable Loss dB	Result
383.93	34.57	Horizontal	46.00	11.43	QP	15.37	--	5.45	Pass
480.53	26.51	Vertical	46.00	19.49	QP	16.83	--	5.76	Pass

2452MHz (Above 1GHz)

Frequency MHz	Emission Level dBuV/m	Polarization	Limit dBuV/m	Margin dB	Detector	Antenna Factor dB	PRM Factor dB	Cable Loss dB	Result
17524.00	57.64	Horizontal	74.00	16.36	PK	43.74	41.44	11.36	Pass
17524.00	47.88	Horizontal	54.00	-6.12	AV	43.74	41.44	11.36	Pass
17354.00	57.95	Vertical	74.00	16.05	PK	43.53	41.53	11.17	Pass
17354.00	47.86	Vertical	54.00	6.14	AV	43.53	41.53	11.17	Pass

Remark:

- (1) "*" means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.
- (2) Duty Cycle=100%
- (3) 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.
- (4) Level=Reading Level + Correction Factor
 Above 1GHz: Corrector factor = Antenna Factor + Cable Loss- Amplifier Gain
 Below 1GHz: Corrector factor = Antenna Factor + Cable Loss
 (The Reading Level is recorded by software which is not shown in the sheet)

10 Test Equipment List

Site 1: Conducted Emission Test

DESCRIPTION	MANUFACTURER	MODEL NO.	EQUIPMENT ID	SERIAL NO.	CAL. DUE DATE
EMI Test Receiver	Rohde & Schwarz	ESR 3	68-4-74-14-001	101782	2020-6-28
LISN	Rohde & Schwarz	ENV4200	8-4-87-14-001	100249	2020-6-28
LISN	Rohde & Schwarz	ENV432	68-4-87-16-001	101318	2020-7-19
LISN	Rohde & Schwarz	ENV216	68-4-87-14-002	100326	2020-6-28
ISN	Rohde & Schwarz	ENY81	68-4-87-14-003	100177	2020-6-28
ISN	Rohde & Schwarz	ENY81-CA6	68-4-87-14-004	101664	2020-6-28
High Voltage Probe	Rohde & Schwarz	TK9420(VT9 420)	68-4-27-14-001	9420-584	2020-6-24
RF Current Probe	Rohde & Schwarz	EZ-17	68-4-27-14-002	100816	2020-7-2
Attenuator	Shanghai Huaxiang	TS2-26-3	68-4-81-16-003	080928189	2020-6-28
Test software	Rohde & Schwarz	EMC32	68-4-90-14-003-A10	Version9.15.00	N/A

Test Site 2: Radiated Emission Test

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
EMI Test Receiver	R&S	ESU8	100316	Oct. 12, 2018	1 Year
Spectrum analyzer	Agilent	E4447A	MY50180031	Jun. 25, 2019	1 Year
Trilog Broadband Antenna	Schwarzbeck	VULB9163	9163-462	Nov. 09, 2018	1 Year
Active Loop antenna	Schwarzbeck	FMZB-1519	1519-038	Oct. 20, 2018	1 Year
Double Ridged Horn Antenna	R&S	HF907	100276	Nov. 16, 2018	1 Year
Broad Band Horn Antenna	Schwarzbeck	BBHA 9170	790	Oct. 25, 2018	1 Year
Pre-amplifier	A.H.	PAM-0118	360	Oct. 12, 2018	1 Year
Pre-amplifier	TERA-MW	TRLA-0040G35	101303	Oct. 12, 2018	1 Year
RF Cable	HUBSER	CP-X2+ CP-X1	W11.03+ W12.02	Oct. 21, 2018	1 Year
RF Cable	N/A	SMAJ-SMAJ-1M+ 11M	17070133+17070131	Nov. 08, 2018	1 Year
MI Cable	HUBSER	C10-01-01-1M	1091629	Oct. 21, 2018	1 Year
Test software	Audix	E3	V 6.11111b	N/A	N/A

RF Conducted Test

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
Spectrum analyzer	R&S	FSU26	200071	Oct. 12, 2018	1 Year
Wideband Radio Communication tester	R&S	CMW500	117491	Jun. 25, 2019	1 Year
Vector Signal Generator	Agilent	E8267D	US49060192	Oct. 12, 2018	1 Year
Vector Signal Generator	Agilent	N5182A	MY48180737	Jun. 25, 2019	1 Year
Power Sensor	Agilent	U2021XA	MY55150010	Jun. 28, 2019	1 Year
Power Sensor	Agilent	U2021XA	MY55150011	Jun. 28, 2019	1 Year
DC Power Source	MATRIS	MPS-3005L-3	D813058W	Aug. 18, 2019	1 Year
Attenuator	Mini-Circuits	BW-S10W2	101109	Aug. 18, 2019	1 Year
RF Cable	Micable	C10-01-01-1	100309	Oct. 21, 2018	1 Year
Temp&Humi Programmable	ZHIXIANG	ZXGDJS-150L	ZX170110-A	Oct. 21, 2018	1 Year
Test Software	JS Tonscend	JS1120-3	Ver.2.7	N/A	N/A

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:

Site 1:

System Measurement Uncertainty	
Test Items	Extended Uncertainty
Uncertainty for Conducted Emission 150kHz-30MHz (for test using AMN ENV432 or ENV4200)	3.21dB

Site 2:

Test Item	Uncertainty
Bandwidth	1.1%
Peak Output Power(Conducted)(Spectrum analyzer)	0.86dB (10 MHz $\leq$ f < 3.6GHz); 1.38dB (3.6GHz $\leq$ f < 8GHz)
Peak Output Power(Conducted)(Power Sensor)	0.74dB
Power Spectral Density	0.74dB (10 MHz $\leq$ f < 3.6GHz); 1.38dB (3.6GHz $\leq$ f < 8GHz)
Frequencies Stability	6.7×10^{-8} (Antenna couple method) 5.5×10^{-8} (Conducted method)
Conducted spurious emissions	0.86dB (10 MHz $\leq$ f < 3.6GHz); 1.40dB (3.6GHz $\leq$ f < 8GHz) 1.66dB (8GHz $\leq$ f < 22GHz)
Uncertainty for radio frequency (RBW<20kHz)	3×10^{-8}
Uncertainty for Radiation Emission test (30MHz-1GHz)	4.70 dB (Antenna Polarize: V) 4.84 dB (Antenna Polarize: H)
Uncertainty for Radiation Emission test (1GHz-40GHz)	4.10dB (1-6GHz) 4.40dB (6GHz-18GHz) 3.54dB (18GHz-26GHz) 4.30dB (26GHz-40GHz)
Uncertainty for Power line conduction emission test	3.32dB (150kHz-30MHz)