TECHNICAL REPORT

Report No.: FCC 2004181
File Reference No.: 2020-05-06

Applicant: Greensens GmbH

Product: Gateway

Model No.: GGW-1219-01

Trademark: N/A

Test Standards: FCC Part 15.247

Test Result: It is herewith confirmed and found to comply with the requirements set up by ANSI C63.10, FCC Part 15.247 for the evaluation of electromagnetic compatibility

Approved By

Jack Chung

Jack Chung

Manager

Dated: May 06, 2020

Results appearing herein relate only to the sample tested
The technical reports is issued errors and omissions exempt and is subject to withdrawal at

SHENZHEN TIMEWAY TESTING LABORATORIES

Zone C, 1st Floor, Block B, Jun Xiang Da Building, Zhongshan Park Road West, Tong Le Village, Nanshan District, Shenzhen, China
Tel (755) 83448688, Fax (755) 83442996, E-Mail:info@timeway-lab.com

Special Statement：

The testing quality ability of our laboratory meet with "Quality Law of People's Republic of China" Clause 19.

The testing quality system of our laboratory meet with ISO/IEC-17025 requirements, which is approved by CNAL. This approval result is accepted by MRA of APLAC.

Our test facility is recognized, certified, or accredited by the following organizations:

CNAS-LAB Code: L2292

The EMC Laboratory has been assessed and in compliance with CNAS-CL01 accreditation criteria for testing Laboratories (identical to ISO/IEC 17025:2005 General Requirements) for the Competence of testing Laboratories.

FCC-Registration No.: 744189

The EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications commission. The acceptance letter from the FCC is maintained in our files. Registration No.: 744189.

Industry Canada (IC) —Registration No.:5205A

The EMC Laboratory has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 5205A.

A2LA (Certification Number:5013.01)

The EMC Laboratory has been accredited by the American Association for Laboratory Accreditation (A2LA). Certification Number:5013.01

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Test Report Conclusion

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1.0 **General Details**

1.1 Test Lab Details

Name : SHENZHEN TIMEWAY TESTING LABORATORIES.

Address: Zone C, 1st Floor, Block B, Jun Xiang Da Building, Zhongshan Park Road West, Tong Le Village, Nanshan District, Shenzhen, China

Telephone: (755) 83448688

Fax: (755) 83442996

Site Listed with Federal Communications commission (FCC)

Registration Number:744189

For 3m Anechoic Chamber

Site Listed with Industry Canada of Ottawa, Canada

Registration Number: IC: 5205A-02

For 3m Anechoic Chamber

1.2 Applicant Details

Applicant: Greensens GmbH

Address: Karlstrasse 22, 65185, Wiesbaden, Germany

Telephone: +4917684881628

Fax: --

1.3 Description of EUT

Product: Gateway

Manufacturer: Greensens GmbH

Address: Karlstrasse 22, 65185, Wiesbaden, Germany

Brand Name: N/A

Model Number: GGW-1219-01

Additional Model Number: N/A

Type of Modulation	IEEE 802.11b : DSSS (CCK, QPSK, DBPSK)
	IEEE 802.11g/n (HT20) : OFDM(64QAM, 16QAM, QPSK, BPSK)
Frequency range	IEEE 802.11b/g/n (HT20) : 2412-2462MHz
Channel Spacing	5MHz for IEEE 802.11b/g/n HT20
Air Data Rate	IEEE 802.11b : 11, 5.5, 2, 1 Mbps
	IEEE 802.11g : 54, 48,36, 24, 18, 12, 9, 6 Mbps
	IEEE 802.11n HT20: mcs0-mcs7
Frequency Selection	By software
Channel Number	IEEE 802.11b/g/n (HT20) : 11 Channels
Antenna:	PCB antenna used. The gain of the antennas is 2.0dBi
Input Voltage:	DC5V, 500mA (From USB Port)

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1.4 Submitted Sample: 1 Samples

1.5 Test Duration
2020-04-14 to 2020-05-06

1.6 Test Uncertainty
Conducted Emissions Uncertainty =3.6dB
Radiated Emissions below 1GHz Uncertainty =4.7dB
Radiated Emissions above 1GHz Uncertainty =6.0dB
Conducted Power Uncertainty =6.0dB
Occupied Channel Bandwidth Uncertainty =5%

1.7 Test Engineer

The sample tested by Terry Tang

Print Name: Terry Tang

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2.0 Test Equipment					
Instrument Type	Manufacturer	Model	Serial No.	Date of Cal.	Due Date
ESPI Test Receiver	R&S	ESPI 3	100379	2019-06-21	2020-06-20
TWO Line-V-NETW	R&S	EZH3-Z5	100294	2019-06-21	2020-06-20
TWO Line-V-NETW	R&S	EZH3-Z5	100253	2019-06-21	2020-06-20
Impuls-Begrenzer	R&S	ESH3-Z2	100281	2019-06-21	2020-06-20
Loop Antenna	EMCO	6507	00078608	2020-06-20	2020-06-20
Spectrum	R&S	FSIQ26	100292	2019-06-21	2020-06-20
Horn Antenna	A-INFO	LB-180400-KF	J211060660	2019-06-21	2020-06-20
Horn Antenna	R&S	BBHA 9120D	9120D-631	2018-07-09	2021-07-08
Power meter	Anritsu	ML2487A	6K00003613	2019-08-22	2020-08-21
Power sensor	Anritsu	MA2491A	32263	2019-08-22	2020-08-21
Bilog Antenna	Schwarebeck	VULB9163	9163/340	2018-07-04	2021-07-03
9*6*6 Anechoic	--	--	N/A	2018-02-07	2021-02-06
EMI Test Receiver	RS	ESVB	826156/011	2019-06-21	2020-06-20
EMI Test Receiver	RS	ESH3	860904/006	2019-06-21	2020-06-20
Spectrum	HP/Agilent	ESA-L1500A	US37451154	2019-06-21	2020-06-20
Spectrum	HP/Agilent	E4407B	MY50441392	2019-06-21	2020-06-20
Spectrum	RS	FSP	1164.4391.38	2020-01-18	2021-01-17
RF Cable	Zhengdi	ZT26-NJ-NJ-8 M/FA	--	2019-06-21	2020-06-20
RF Cable	Zhengdi	7m	--	2019-06-21	2020-06-20
RF Switch	EM	EMSW18	060391	2019-06-21	2020-06-20
Pre-Amplifier	Schwarebeck	BBV9743	#218	2019-06-21	2020-06-20
Pre-Amplifier	HP/Agilent	8449B	3008A00160	2019-06-21	2020-06-20
LISN	SCHAFFNER	NNB42	00012	2020-01-07	2021-01-06

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3. DESCRIPTION OF TEST MODES

IEEE 802.11b, 802.11g, 802.11n (HT20) mode

The EUT had been tested under operating condition. There are three channels have been tested as following:

Channel	Frequency (MHz)
Low	2412
Middle	2437
High	2462

IEEE 802.11b mode: 1Mbps data rate (worst case) was chosen for full testing. IEEE 802.11g mode: 6Mbps data rate (worst case) was chosen for full testing. IEEE 802.11n (HT20) mode: mcs0 (worst case) were chosen for full testing

Note: During the test, the duty cycle is more than 98%. That can be set by the test software.

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3.0 Technical Details

3.1 Summary of test results

The EUT has been tested according to the following specifications:

Standard	Test Type	Result	Notes
FCC Part 15, Paragraph 15.107 & 15.207	Conducted Emission Test	PASS	Complies
FCC Part 15 Subpart C Paragraph 15.247(a)(2) Limit	Spectrum bandwidth of a Orthogonal Frequency Division Multiplex System Limit: 6dB bandwidth>500kHz	PASS	Complies
FCC Part 15, Paragraph 15.247(b)	Maximum peak output power Limit: max. 30dBm	PASS	Complies
FCC Part 15, Paragraph 15.109,15.205 & 15.209	Transmitter Radiated Emission Limit: Table 15.209	PASS	Complies
FCC Part 15, Paragraph 15.247(e)	Power Spectral Density Limit: max. 8dBm	PASS	Complies
FCC Part 15, Paragraph 15.247(d)	Out of Band Emission and Restricted Band Radiation Limit: 20dB less than peak value of fundamental frequency Restricted band limit: Table 15.209	PASS	Complies

3.2 Test Standards

FCC Part 15 Subpart & Subpart C, Paragraph 15.247

4.0 EUT Modification

No modification by SHENZHEN TIMEWAY TESTING LABORATORIES.

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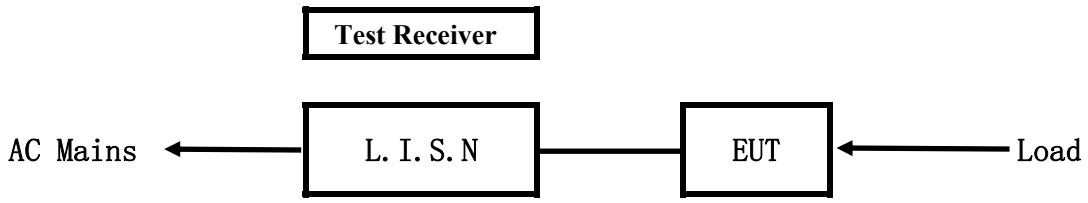
5.0 Power Line Conducted Emission Test

5.1 Schematics of the test



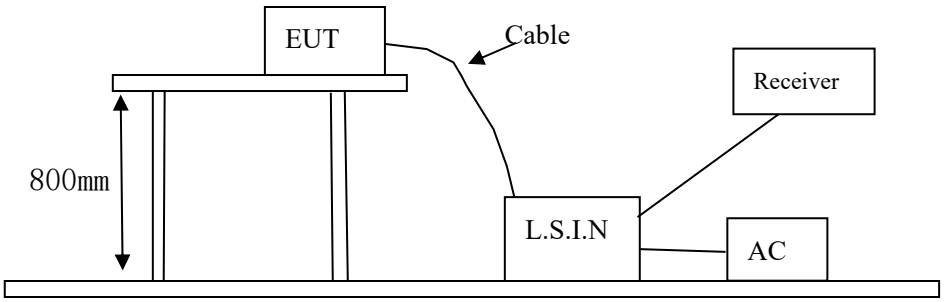
EUT: Equipment Under Test

5.2 Test Method and test Procedure

The EUT was tested according to ANSI C63.10-2013.The Frequency spectrum From 0.15MHz to 30MHz was investigated. The LISN used was 50ohm/50uH as specified by section 5.1 of ANSI C63.10 –2013.

Test Voltage: 120V~, 60Hz

Block diagram of Test setup



5.3 Configuration of The EUT

The EUT was configured according to ANSI C63.10-2013. All interface ports were connected to the appropriate peripherals. All peripherals and cables are listed below.

A. EUT

Device	Manufacturer	Model	FCC ID
Gateway	Greensens GmbH	GGW-1219-01	2AWFD-GGW121901

B. Internal Device

Device	Manufacturer	Model	FCC ID/DOC
N/A			

C. Peripherals

Device	Manufacturer	Model	Rating
--			

5.4 EUT Operating Condition

Operating condition is according to ANSI C63.10-2013.

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A Setup the EUT and simulators as shown on follow

B Enable AF signal and confirm EUT active to normal condition

5.5 Power line conducted Emission Limit according to Paragraph 15.207 and 15.107

Frequency (MHz)	Class A Limits (dB μ V)		Class B Limits (dB μ V)	
	Quasi-peak Level	Average Level	Quasi-peak Level	Average Level
0.15 ～ 0.50	79.0	66.0	66.0～56.0*	56.0～46.0*
0.50 ～ 5.00	73.0	60.0	56.0	46.0
5.00 ～ 30.00	73.0	60.0	60.0	50.0

Notes: 1. *Decreasing linearly with logarithm of frequency.
2. The tighter limit shall apply at the transition frequencies

5.6 Test Results

The frequency spectrum from 0.15MHz to 30MHz was investigated. All reading are quasi-peak values with a resolution bandwidth of 9kHz.

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A: Conducted Emission on Live Terminal (150kHz to 30MHz)

EUT Operating Environment

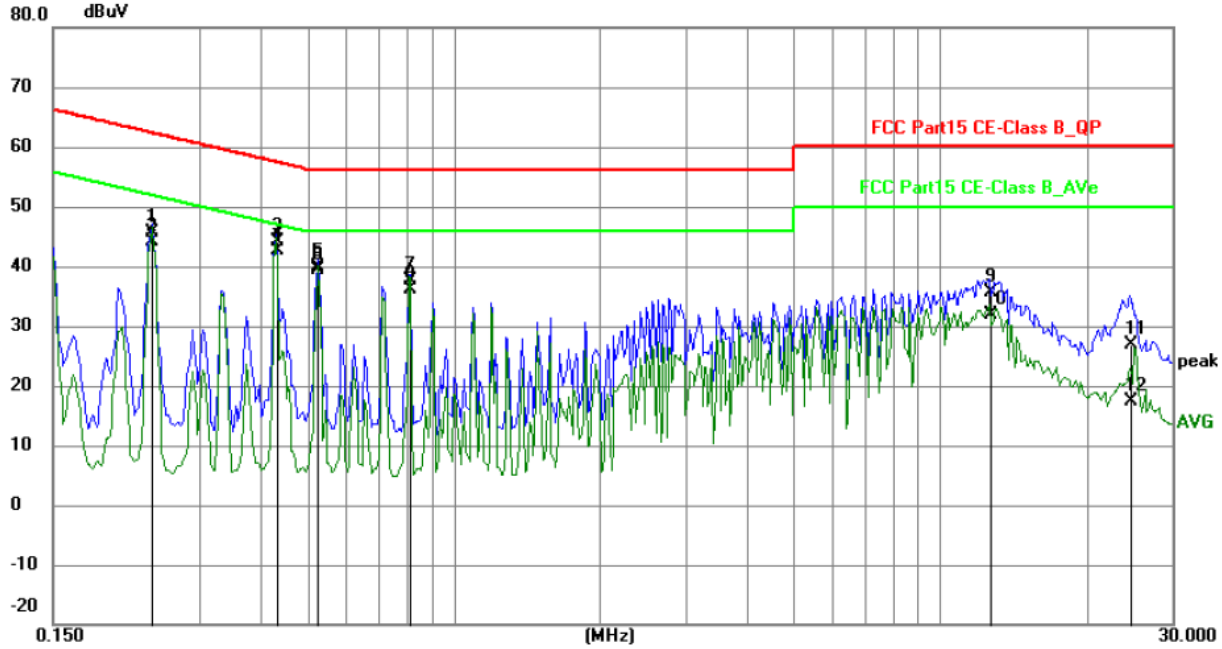
Temperature: 26℃ Humidity: 65%RH Atmospheric Pressure: 101 KPa

EUT set Condition: Keep WIFI Transmitting

Equipment Level: Class B

Results: PASS

Please refer to following diagram for individual



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.2397	35.97	9.75	45.72	62.11	-16.39	QP	P
2	0.2397	34.43	9.75	44.18	52.11	-7.93	AVG	P
3	0.4308	34.42	9.77	44.19	57.24	-13.05	QP	P
4	0.4308	32.94	9.77	42.71	47.24	-4.53	AVG	P
5	0.5243	30.09	9.77	39.86	56.00	-16.14	QP	P
6	0.5243	29.51	9.77	39.28	46.00	-6.72	AVG	P
7	0.8130	27.86	9.78	37.64	56.00	-18.36	QP	P
8	0.8130	26.32	9.78	36.10	46.00	-9.90	AVG	P
9	12.6564	25.36	10.28	35.64	60.00	-24.36	QP	P
10	12.6564	21.69	10.28	31.97	50.00	-18.03	AVG	P
11	24.5591	16.01	10.96	26.97	60.00	-33.03	QP	P
12	24.5591	6.46	10.96	17.42	50.00	-32.58	AVG	P

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B: Conducted Emission on Neutral Terminal (150kHz to 30MHz)

EUT Operating Environment

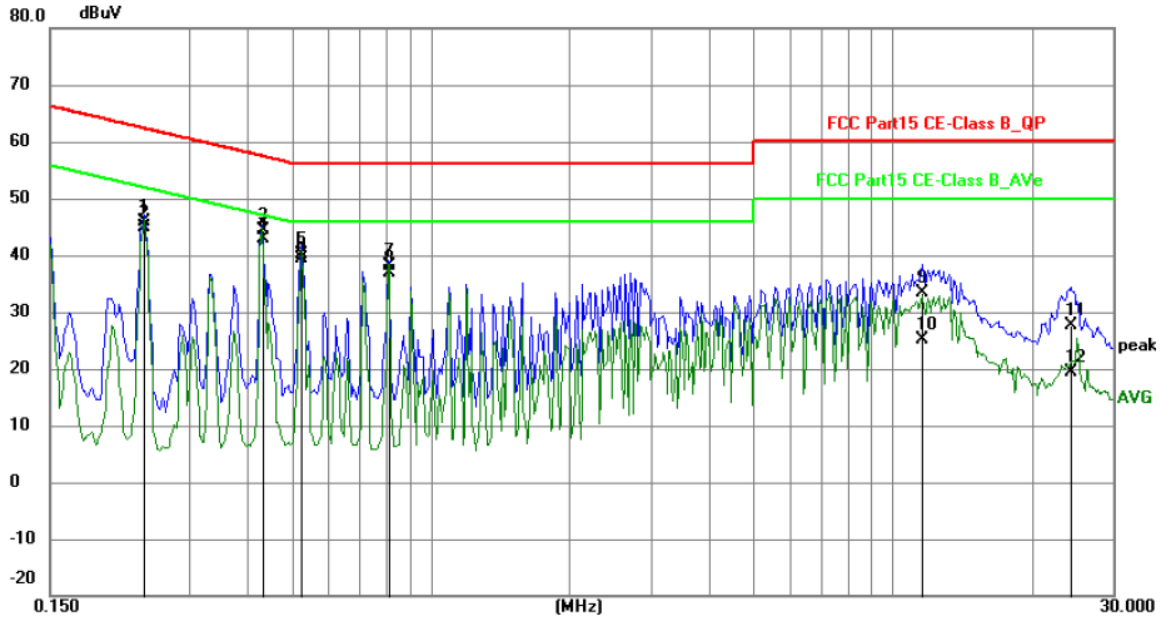
Temperature: 26℃ Humidity: 65%RH Atmospheric Pressure: 101 KPa

EUT set Condition: Keep WIFI Transmitting

Equipment Level: Class B

Results: Pass

Please refer to following diagram for individual



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.2397	36.21	9.75	45.96	62.11	-16.15	QP	P
2	0.2397	35.07	9.75	44.82	52.11	-7.29	AVG	P
3	0.4308	34.52	9.77	44.29	57.24	-12.95	QP	P
4	0.4308	33.10	9.77	42.87	47.24	-4.37	AVG	P
5	0.5243	30.38	9.77	40.15	56.00	-15.85	QP	P
6	0.5243	29.51	9.77	39.28	46.00	-6.72	AVG	P
7	0.8130	28.23	9.78	38.01	56.00	-17.99	QP	P
8	0.8130	27.13	9.78	36.91	46.00	-9.09	AVG	P
9	11.5917	23.23	10.23	33.46	60.00	-26.54	QP	P
10	11.5917	14.81	10.23	25.04	50.00	-24.96	AVG	P
11	24.3057	16.57	10.95	27.52	60.00	-32.48	QP	P
12	24.3057	8.36	10.95	19.31	50.00	-30.69	AVG	P

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6 Radiated Emission Test

6.1 Test Method and test Procedure:

(1) The EUT was tested according to ANSI C63.10-2013. The radiated test was performed at Timeway EMC Laboratory. This site is on file with the FCC laboratory division, Registration No. 744189

(2) The EUT, peripherals were put on the turntable which table size is 1m x 1.5 m, table high 0.8 m. All set up is according to ANSI C63.10-2013.

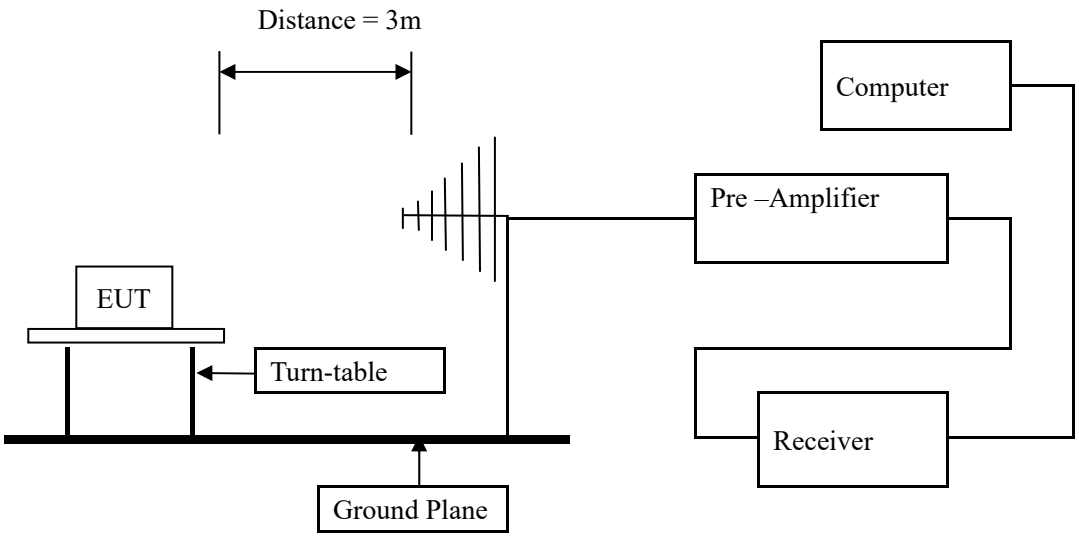
(3) The frequency spectrum from 30 MHz to 25 GHz was investigated. All readings from 30 MHz to 1 GHz are Quasi-peak values with a resolution bandwidth of 120 kHz. F For measurement above 1GHz, peak values with RBW=1MHz VBW=3MHz and PK detector. AV value with RBW=1MHz, VBW=3MHz and RMS detector. Measurements were made at 3 meters.

(4) The antenna high is varied from 1 m to 4 m high to find the maximum emission for each frequency.

(5) Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance is with all installation combinations. All data was recorded in the peak detection mode. Quasi-peak readings was performed only when an emission was found to be marginal (within -4 dB of specification limit), and are distinguished with a "**QP**" in the data table.

(6) The antenna polarization : Vertical polarization and Horizontal polarization.

Block diagram of Test setup



6.2 Configuration of The EUT

Same as section 5.3 of this report

6.3 EUT Operating Condition

Same as section 5.4 of this report.

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6.4 Radiated Emission Limit

All emission from a digital device, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strength specified below:

Frequencies in restricted band are complied to limit on Paragraph 15.209 and 15.109

Frequency Range (MHz)	Distance (m)	Field strength (dB μ V/m)
30-88	3	40.0
88-216	3	43.5
216-960	3	46.0
Above 960	3	54.0

Note: 1. RF Voltage (dBuV) = 20 log RF Voltage (uV)

2. In the Above Table, the higher limit applies at the band edges.

3. Distance refers to the distance in meters between the measuring instrument antenna and the EUT

4. Worse case were recorded in the test report. 802.11n HT20was the worst case.

The report refers only to the sample tested and does not apply to the bulk.
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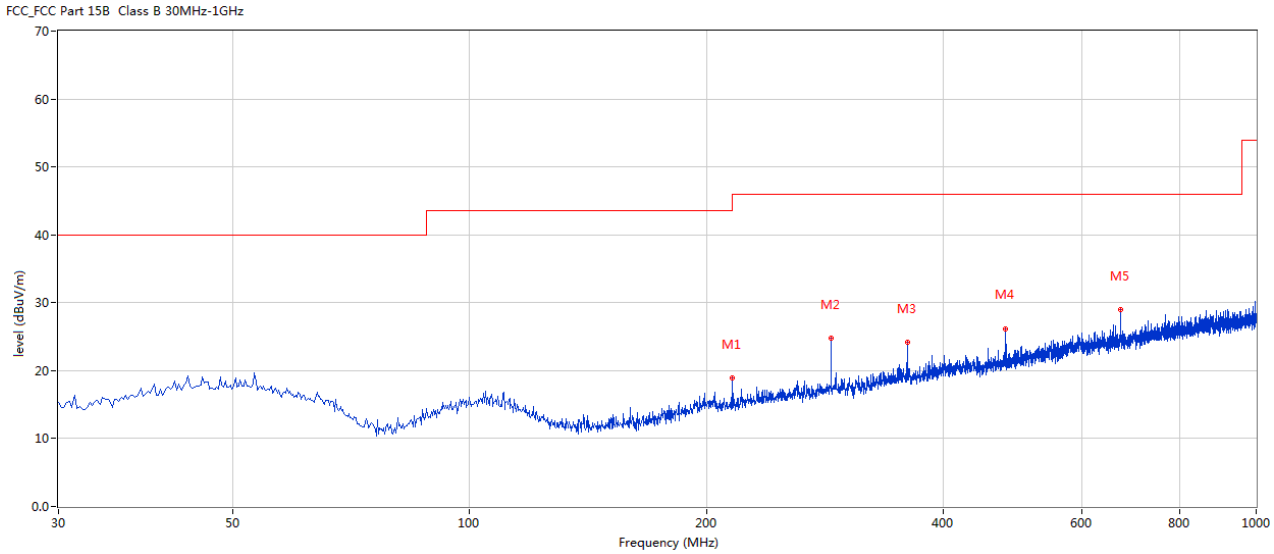
Test result

General Radiated Emission Data and Harmonics Radiated Emission Data

Radiated Emission In Horizontal (30MHz----1000MHz)

EUT set Condition: **Keep Transmitting**

Results: **Pass**



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	215.951	18.89	-13.60	43.5	-24.61	Peak	205.00	100	H	Pass
2	287.956	24.79	-11.27	46.0	-21.21	Peak	316.00	100	H	Pass
3	359.960	24.15	-9.46	46.0	-21.85	Peak	104.00	100	H	Pass
4	479.968	26.19	-7.40	46.0	-19.81	Peak	360.00	200	H	Pass
5	671.980	28.97	-4.48	46.0	-17.03	Peak	59.00	100	H	Pass

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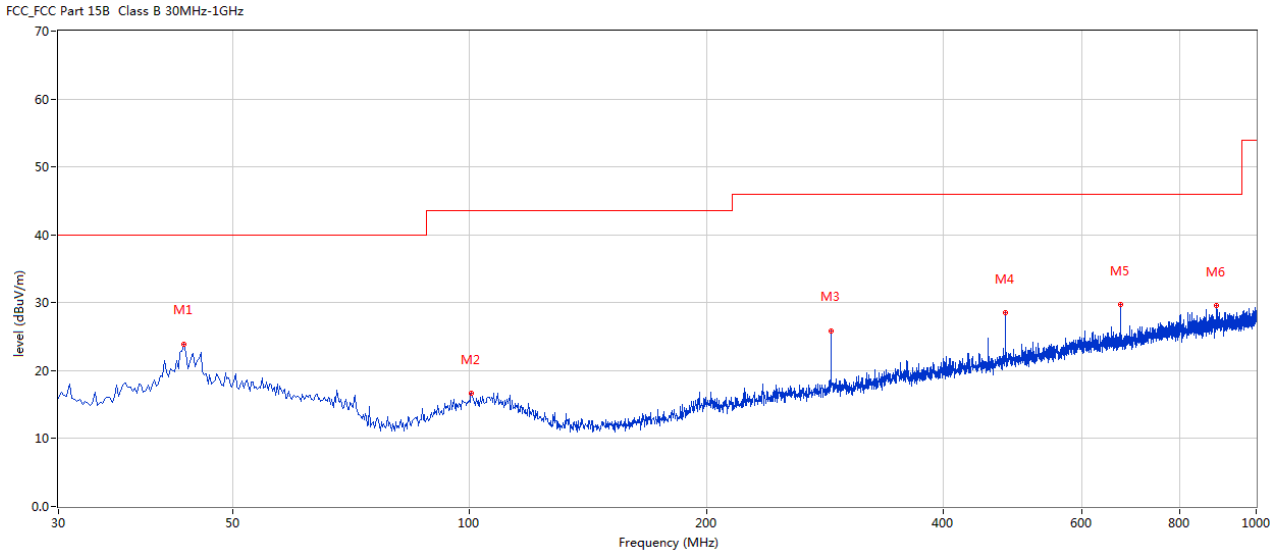
Test result

General Radiated Emission Data and Harmonics Radiated Emission Data

Radiated Emission In Vertical (30MHz----1000MHz)

EUT set Condition: **Keep Transmitting**

Results: **Pass**



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	43.334	23.94	-11.49	40.0	-16.06	Peak	104.00	100	V	Pass
2	100.550	16.61	-13.48	43.5	-26.89	Peak	130.00	200	V	Pass
3	287.956	25.91	-11.27	46.0	-20.09	Peak	144.00	200	V	Pass
4	479.968	28.57	-7.40	46.0	-17.43	Peak	113.00	100	V	Pass
5	671.980	29.75	-4.48	46.0	-16.25	Peak	73.00	200	V	Pass
6	890.175	29.54	-1.89	46.0	-16.46	Peak	201.00	200	V	Pass

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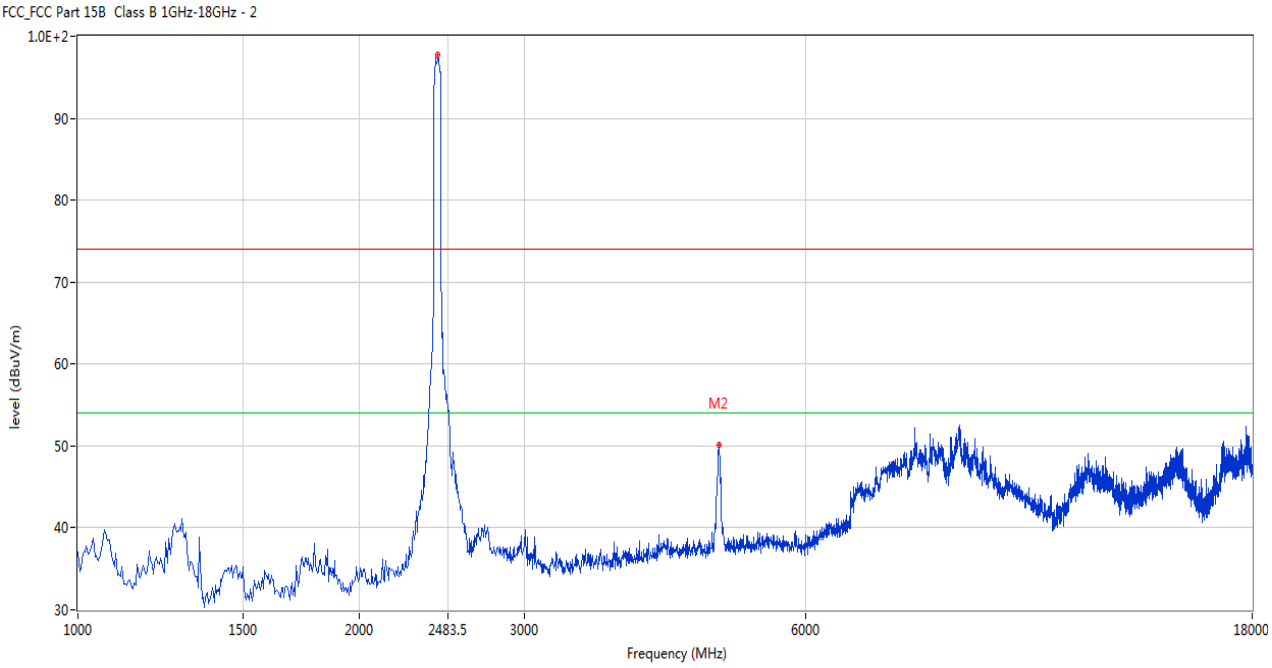
Please refer to the following test plots for details:

CH01 for 11n HT20at msc0: Horizontal



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
2	4826.040	50.18	3.16	54.0	-3.82	Peak	126.00	100	H	Pass

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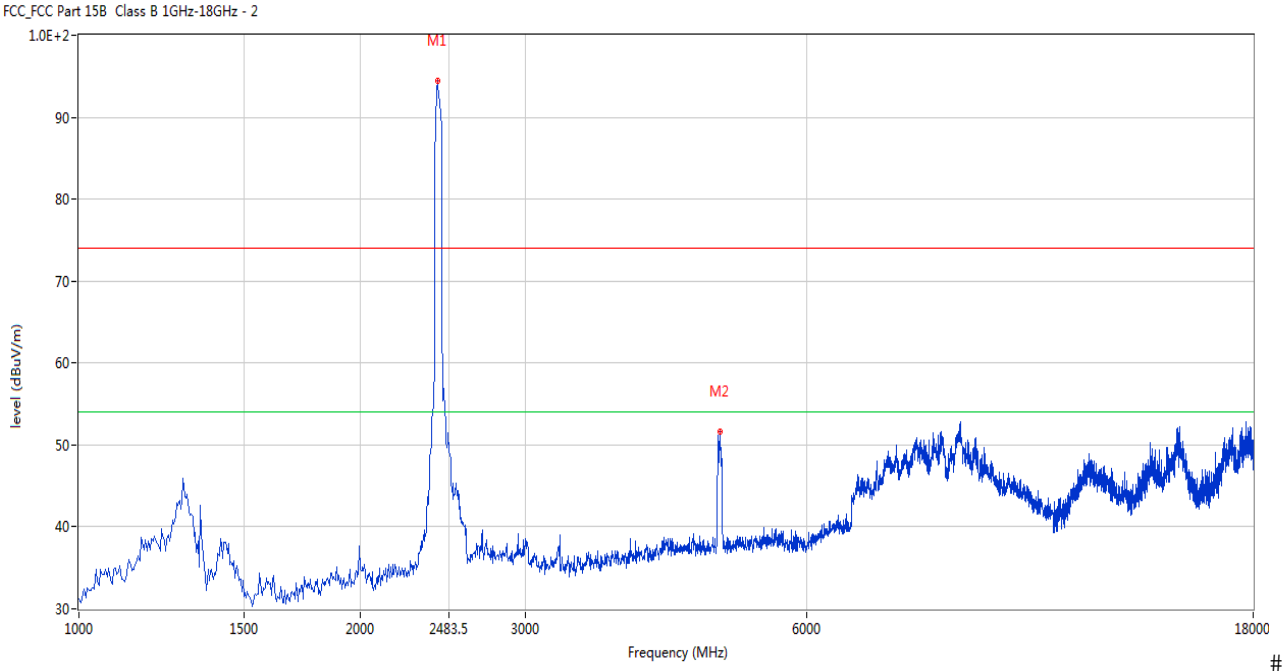
CH01 for 11n HT20 at msc0: Vertical



#

No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
2	4826.040	51.56	3.16	54.0	-2.44	Peak	217.00	100	V	Pass

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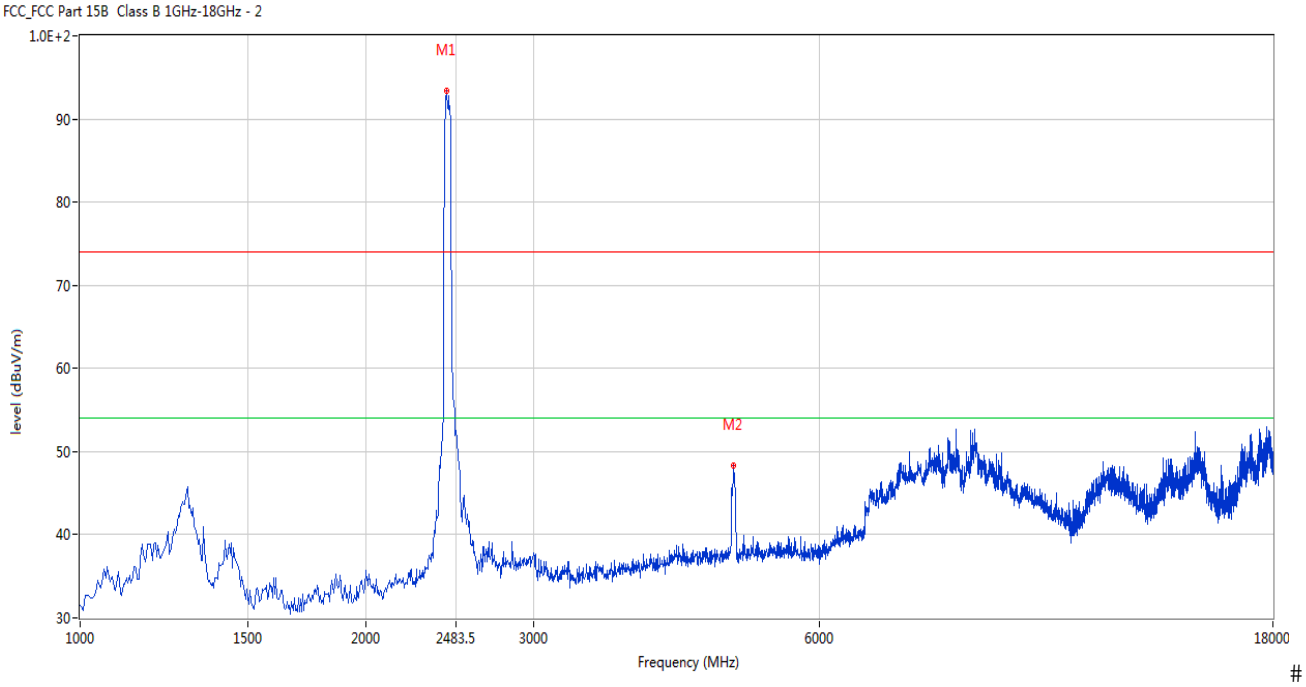
CH06 for 11n HT20 at msc0: Vertical



#

No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
2	4870.782	48.31	3.19	54.0	-5.69	Peak	215.00	100	V	Pass

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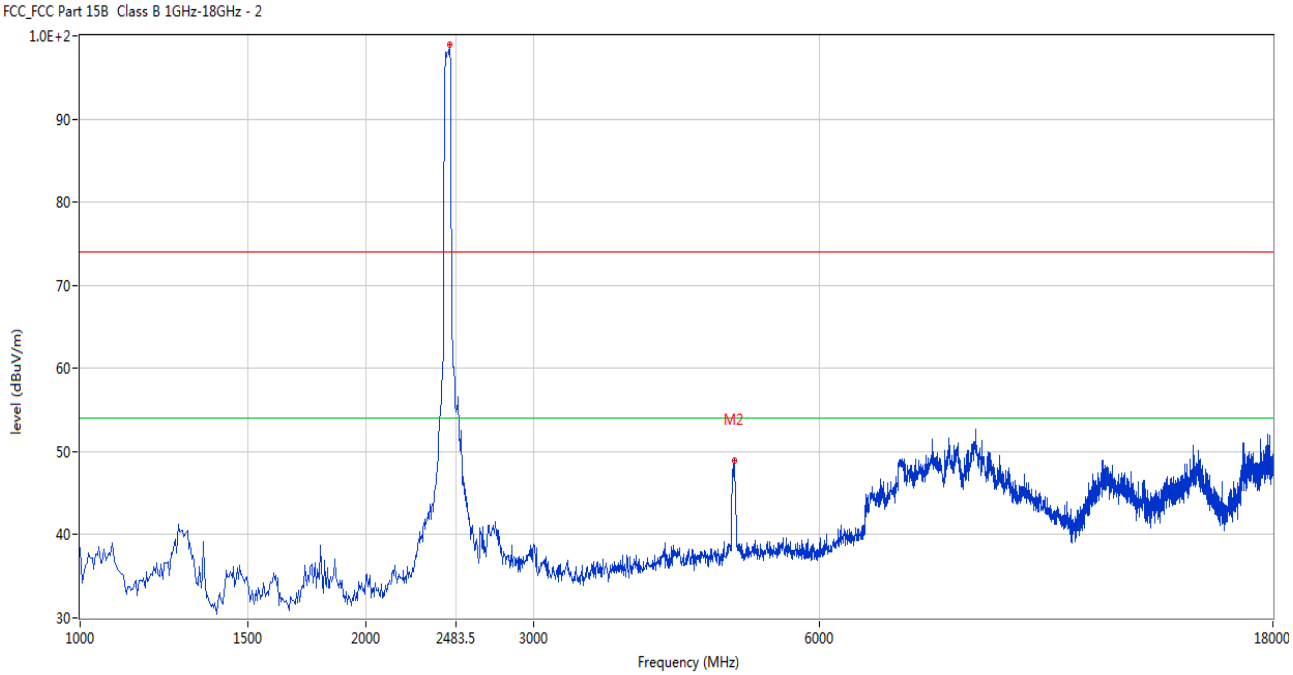
CH06 for 11n HT20 at msc0: Horizontal



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
2	4883.529	49.00	3.20	54.0	-5.00	Peak	174.00	100	H	Pass

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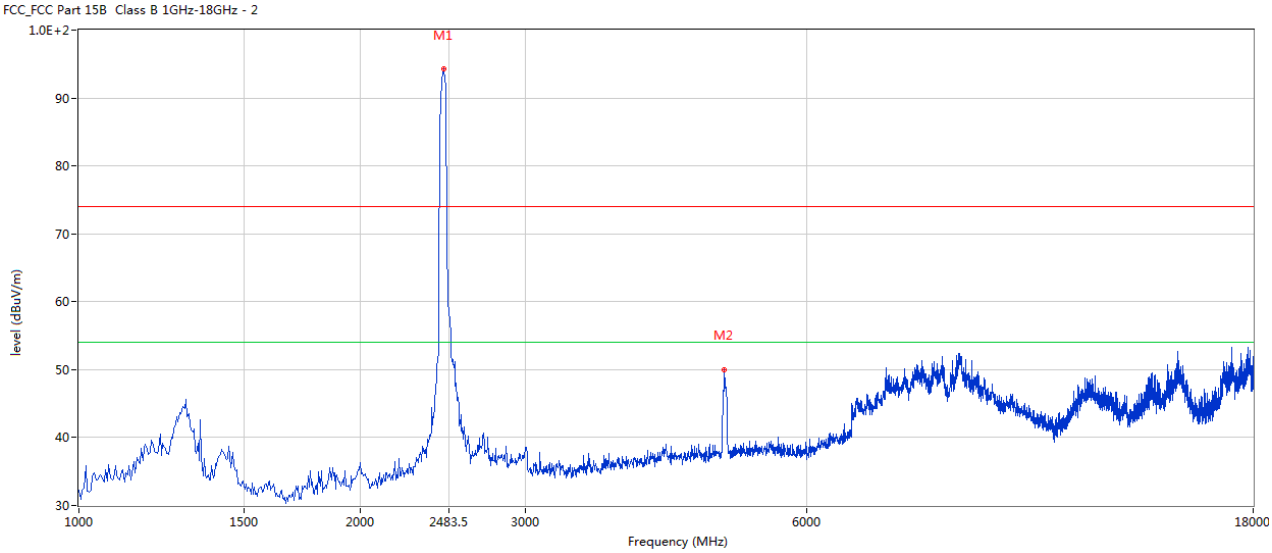
CH11 for 11n HT20 at msc0: Vertical



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
2	4921.525	50.00	3.22	54.0	-4.00	Peak	337.00	100	V	Pass

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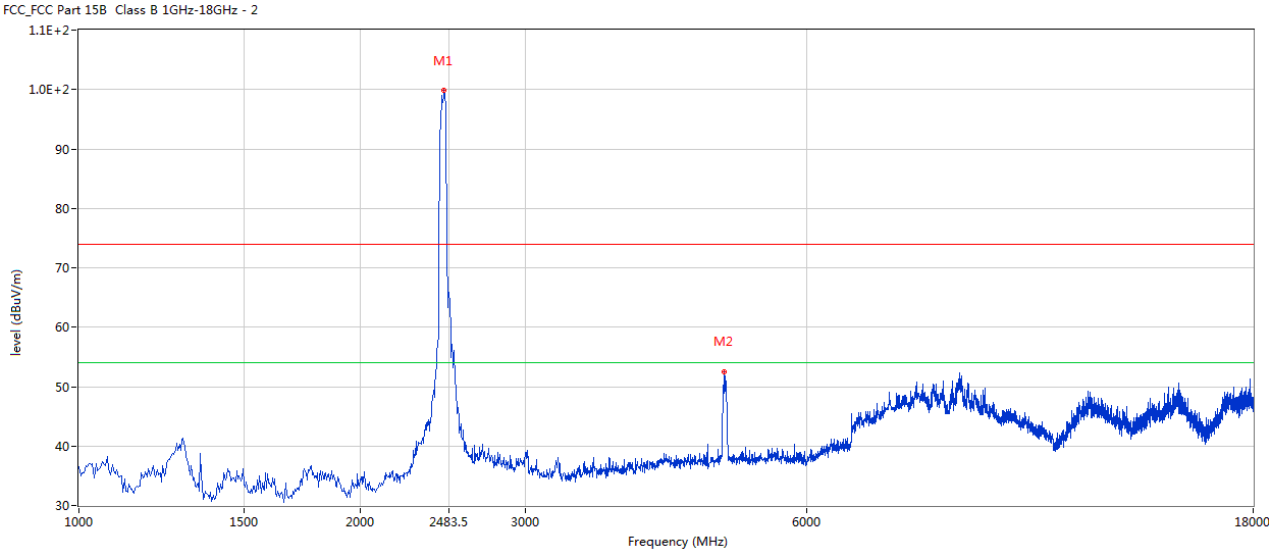
CH11 for 11n HT20 at msc0: Horizontal



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
2	4921.525	53.48	3.22	54.0	-0.52	Peak	142.00	100	H	Pass

Note: 1. Result Level = Reading + Factor

2. Factor= AF + Cable Loss- Preamp

3. Margin = Result– Limit

4. The measured PK value less than the AV limit, no necessary to take down the AV measurement result.

5. For radiated Emissions from 18-25GHz, it is only the floor noise.

5. For radiated emissions below 30MHz, it is the floor noise and the field strength is much less than the limit for 20dB.

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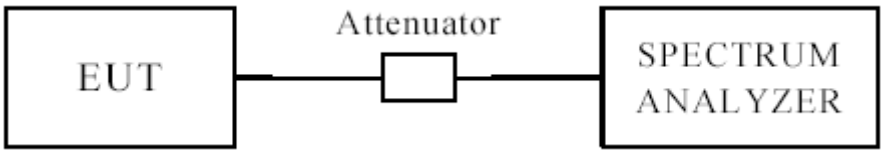
7.0 6dB Bandwidth Measurement

7.1 Test Setup



7.2 Limits of 6dB Bandwidth Measurement

The minimum of 6dB Bandwidth Measurement is >500 kHz

7.3 Test Procedure

1. Set resolution bandwidth (RBW) = 100 kHz
2. Set the video bandwidth (VBW) ≥ 3 x RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

7.4 Test Result

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6dB Occupied Bandwidth

EUT	Gateway	Model	GGW-1219-01
Mode	802.11b	Input Voltage	DC5V
Temperature	24 deg. C,	Humidity	56% RH

Channel	Channel Frequency (MHz)	Data Transfer Rate (Mbps)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass/ Fail
1	2412	1	10.10	0.5	Pass
6	2437	1	10.04	0.5	Pass
11	2462	1	10.04	0.5	Pass
1	2412	11	9.68	0.5	Pass
6	2437	11	9.68	0.5	Pass
11	2462	11	9.68	0.5	Pass

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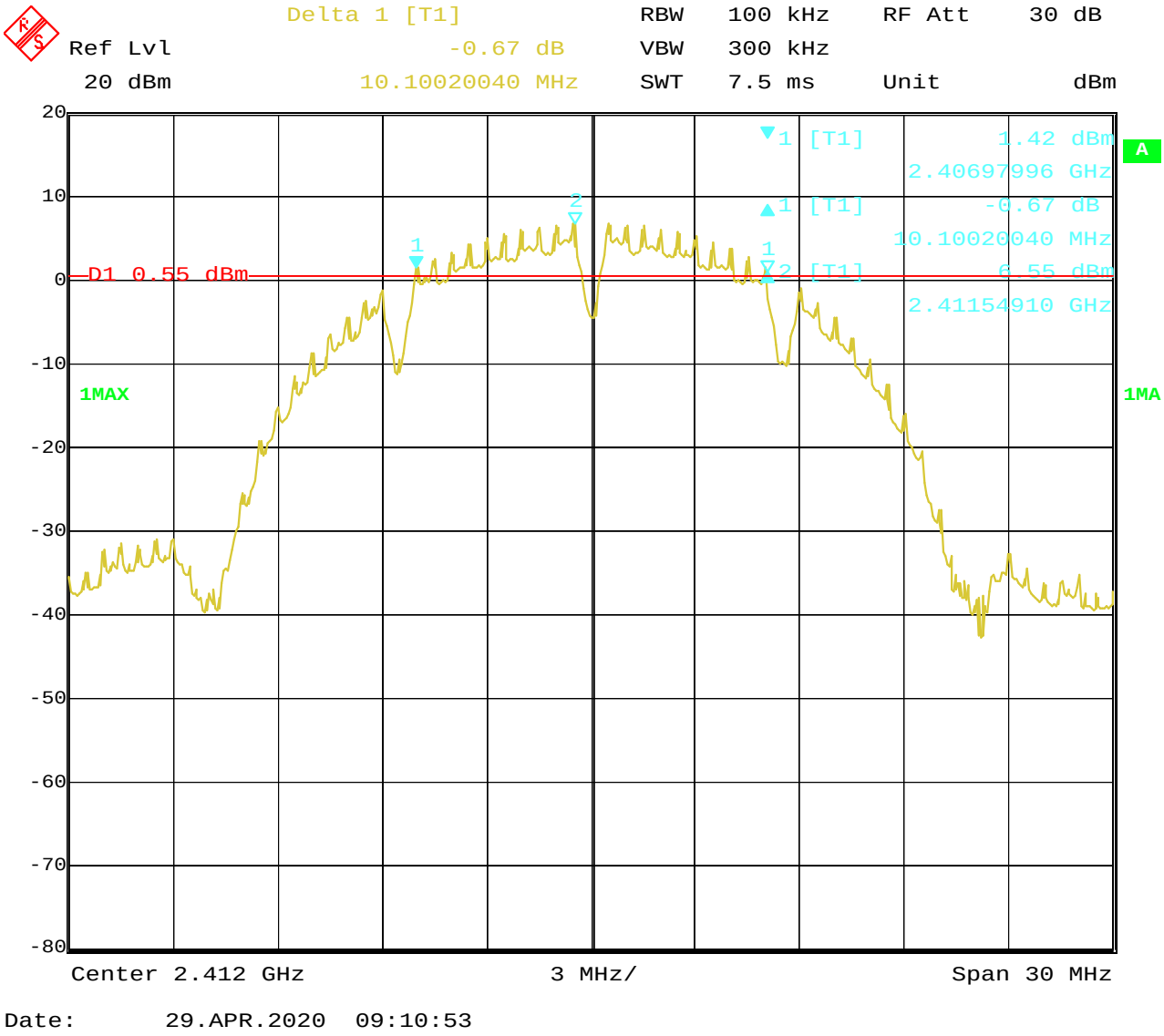
1. 802.11b at 1Mbps of CH01



Date: 29.APR.2020 09:10:53

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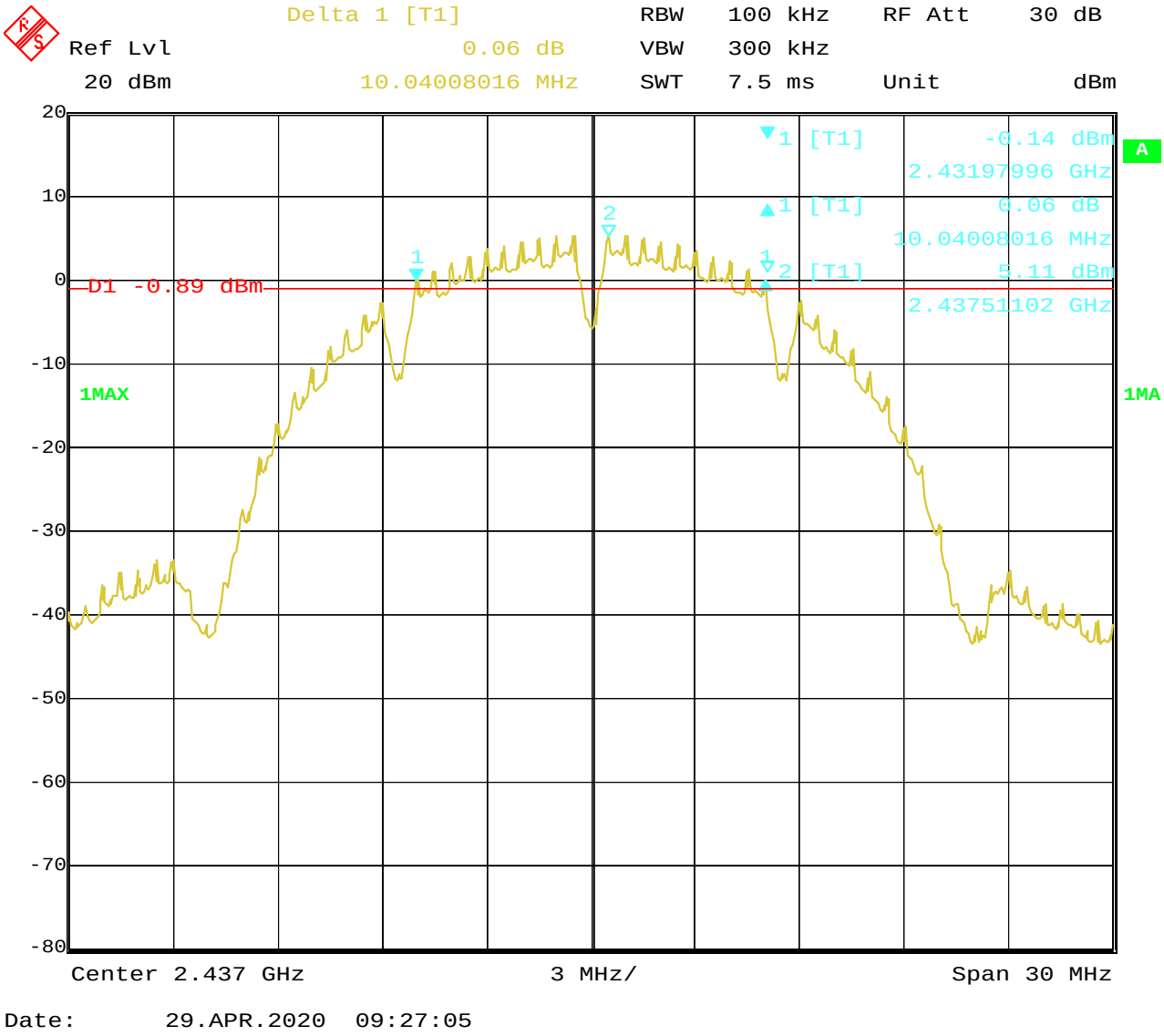
2. 802.11b at 1Mbps of CH06



Date: 29.APR.2020 09:27:05

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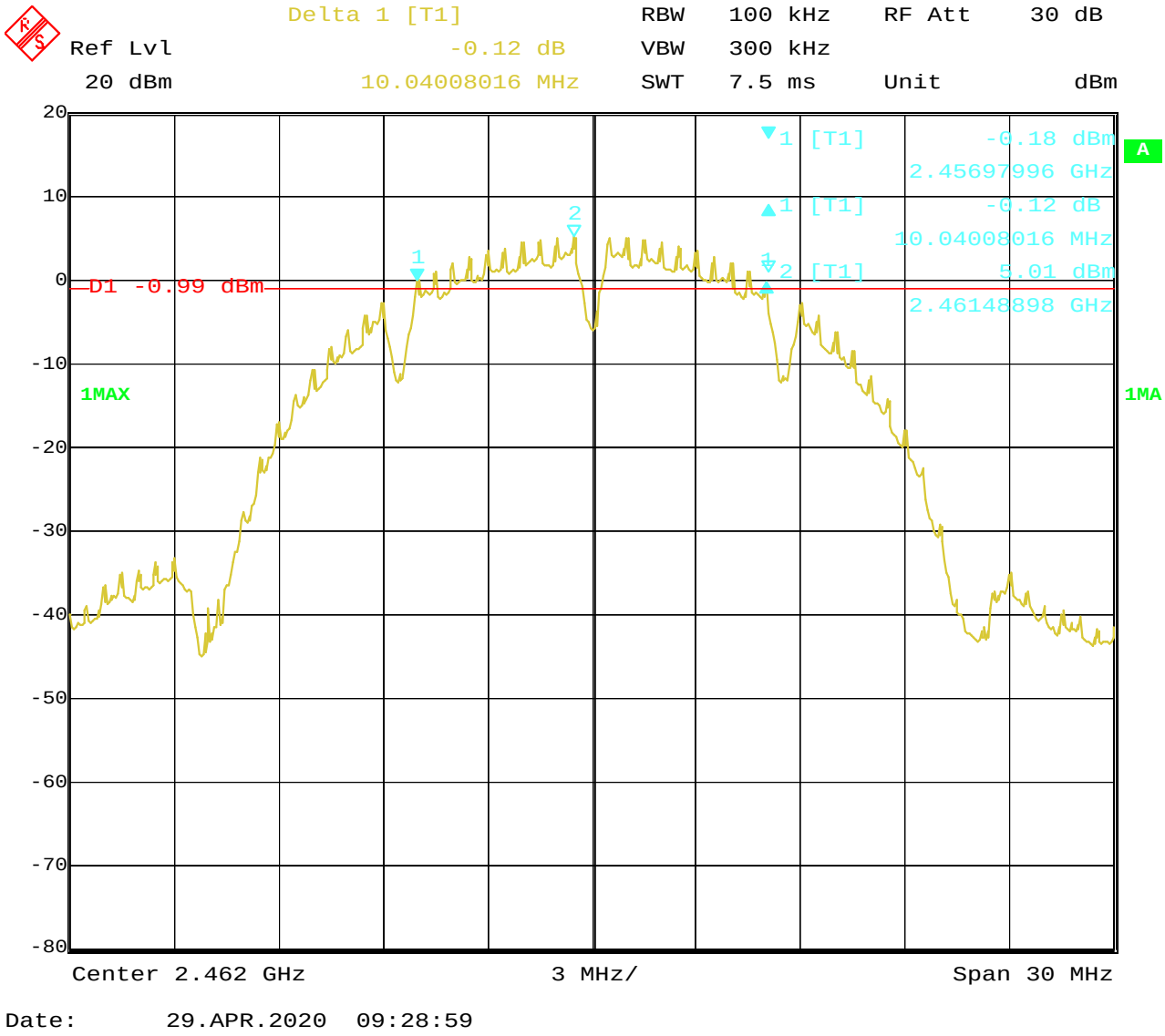
3. 802.11b at 1Mbps of CH11



Date: 29.APR.2020 09:28:59

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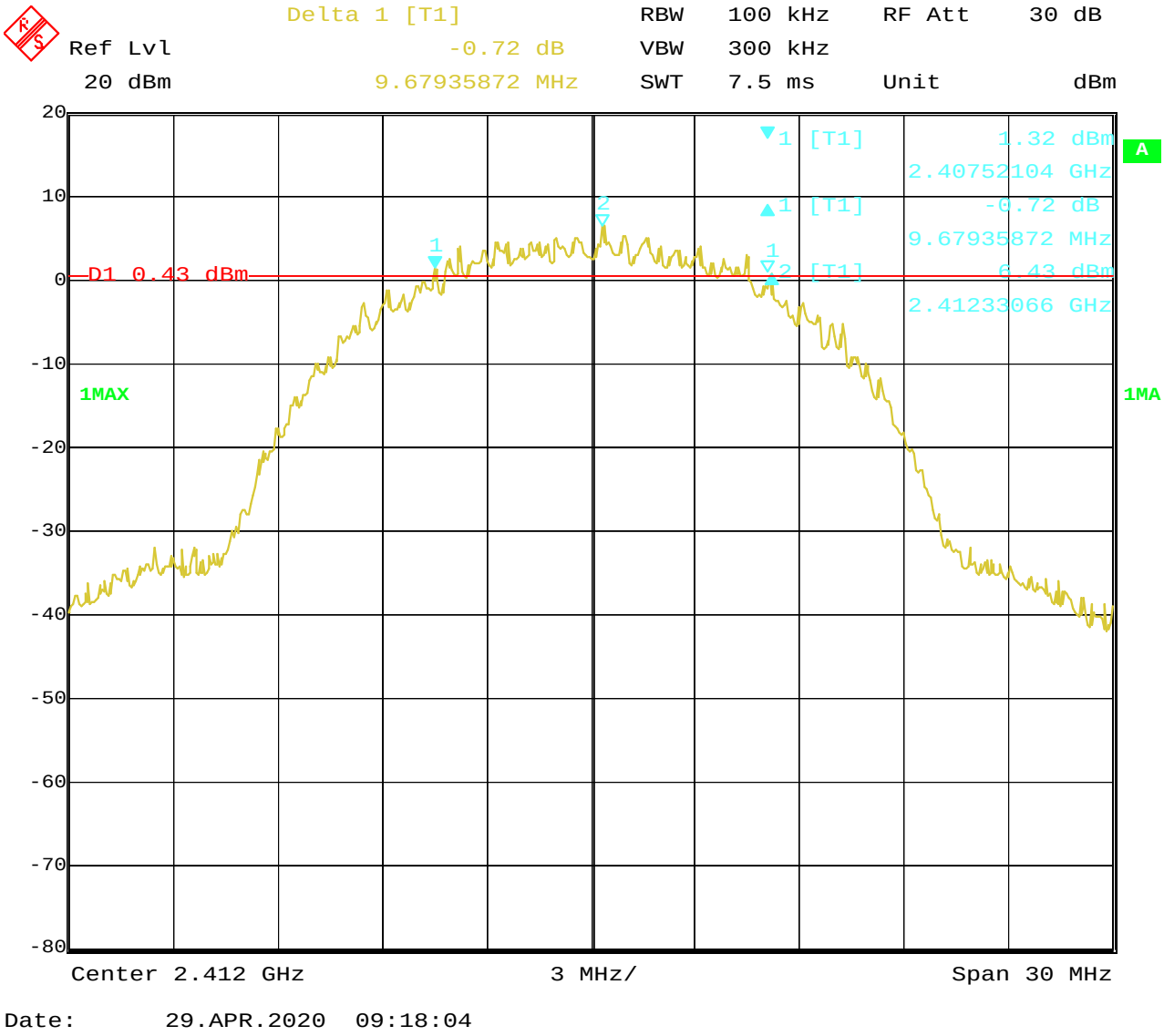
4. 802.11b at 11Mbps of CH01



Date: 29.APR.2020 09:18:04

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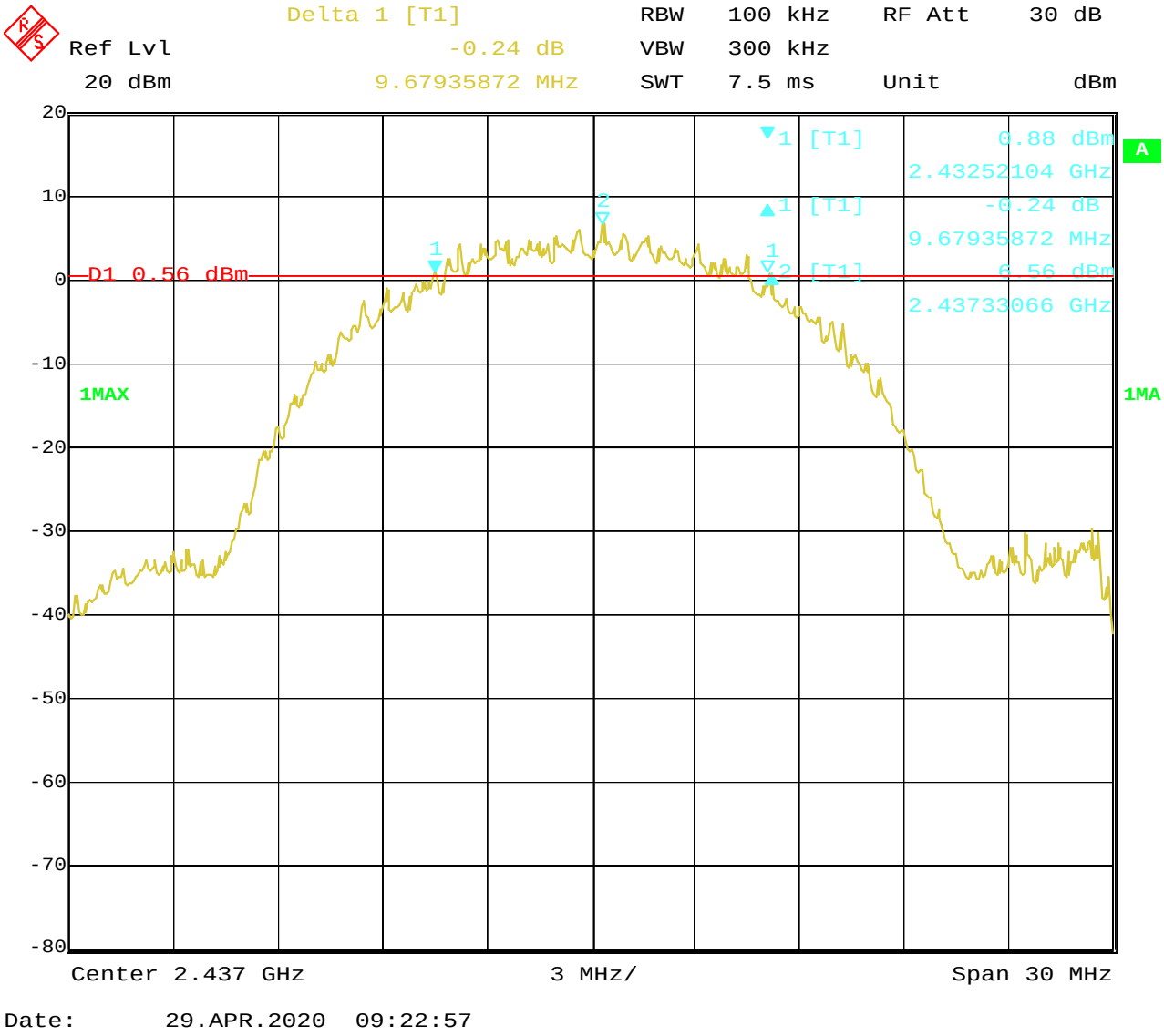
5. 802.11b at 11Mbps of CH06



Date: 29.APR.2020 09:22:57

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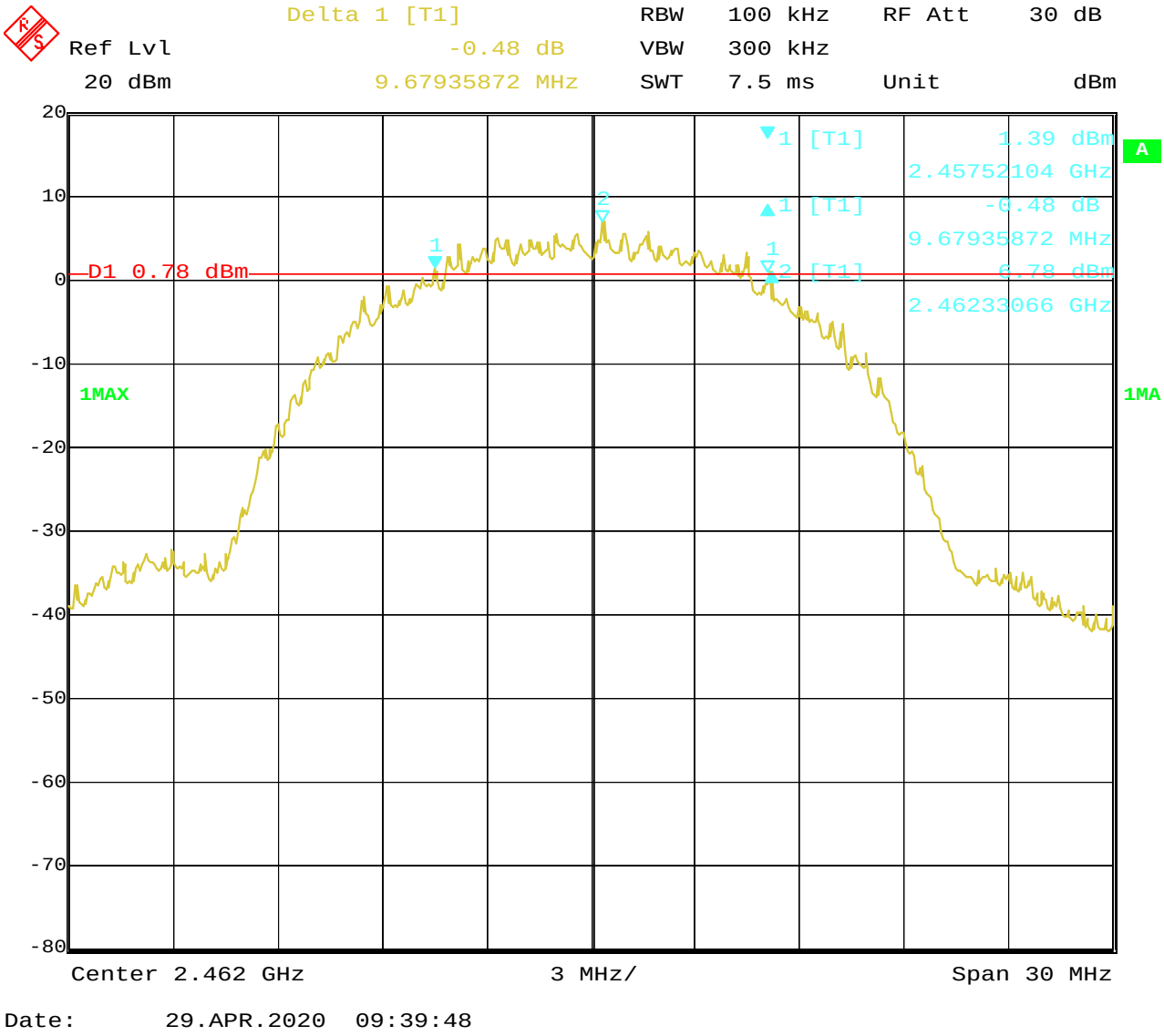
6. 802.11b at 11Mbps of CH11



Date: 29.APR.2020 09:39:48

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6dB Occupied Bandwidth

EUT	Gateway	Model	GGW-1219-01
Mode	802.11g	Input Voltage	DC5V
Temperature	24 deg. C,	Humidity	56% RH

Channel	Channel Frequency (MHz)	Data Transfer Rate (Mbps)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass/ Fail
1	2412	6	16.41	0.5	Pass
6	2437	6	16.41	0.5	Pass
11	2462	6	16.41	0.5	Pass

The report refers only to the sample tested and does not apply to the bulk.
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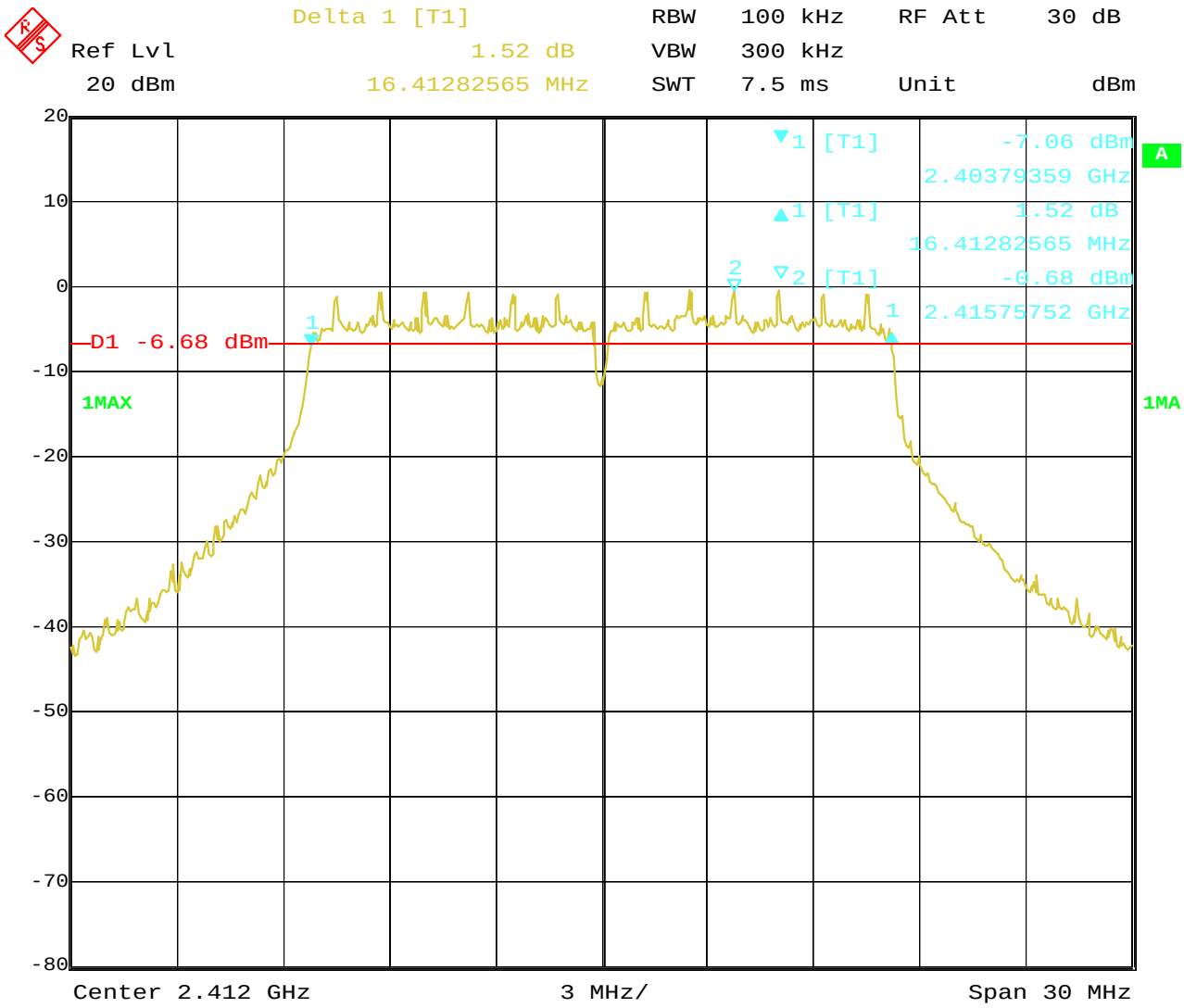
Test Plots:

1. 802.11g at 6Mbps of CH01



Date: 29.APR.2020 09:15:58

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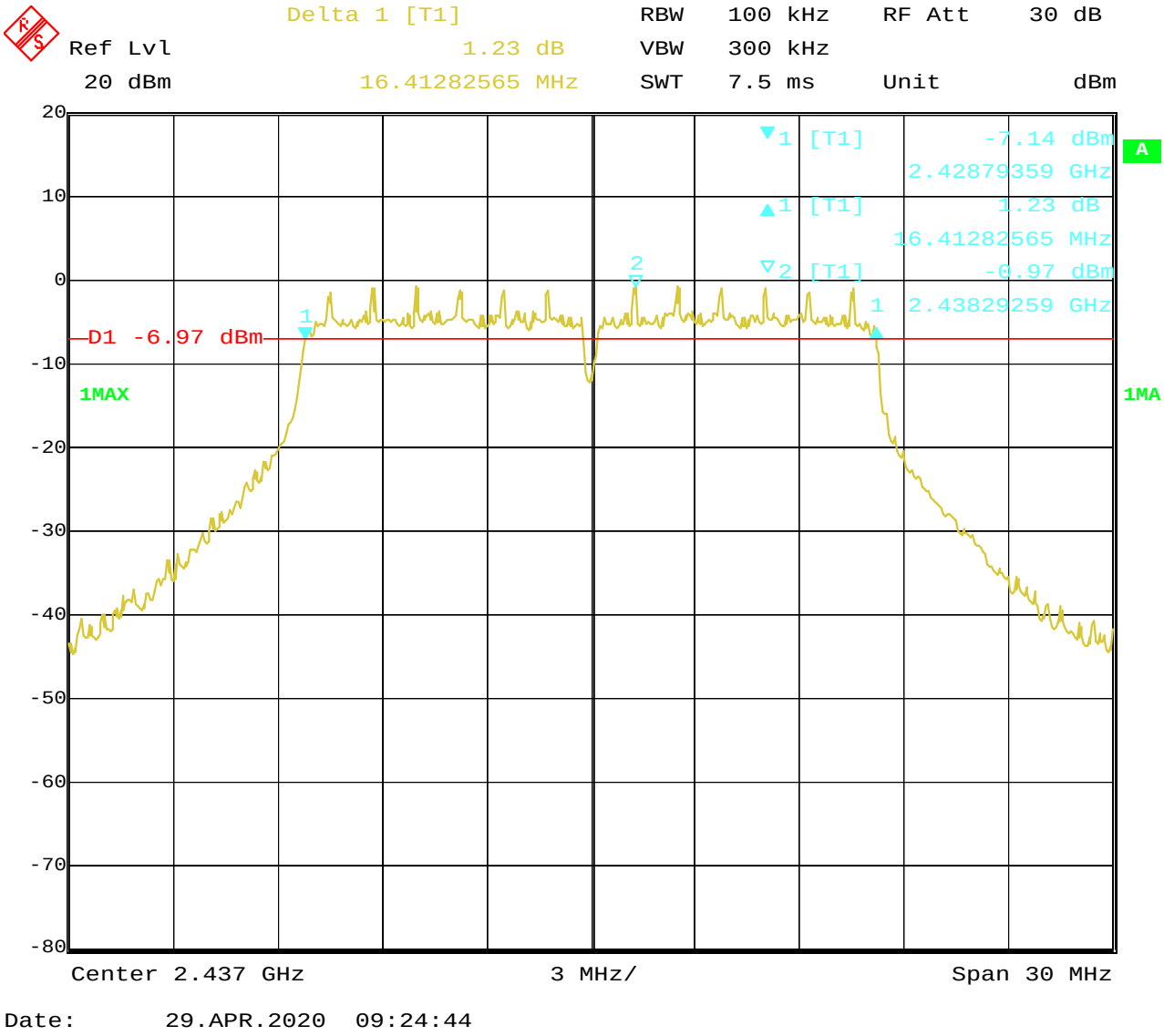
2. 802.11g at 6Mbps of CH06



Date: 29.APR.2020 09:24:44

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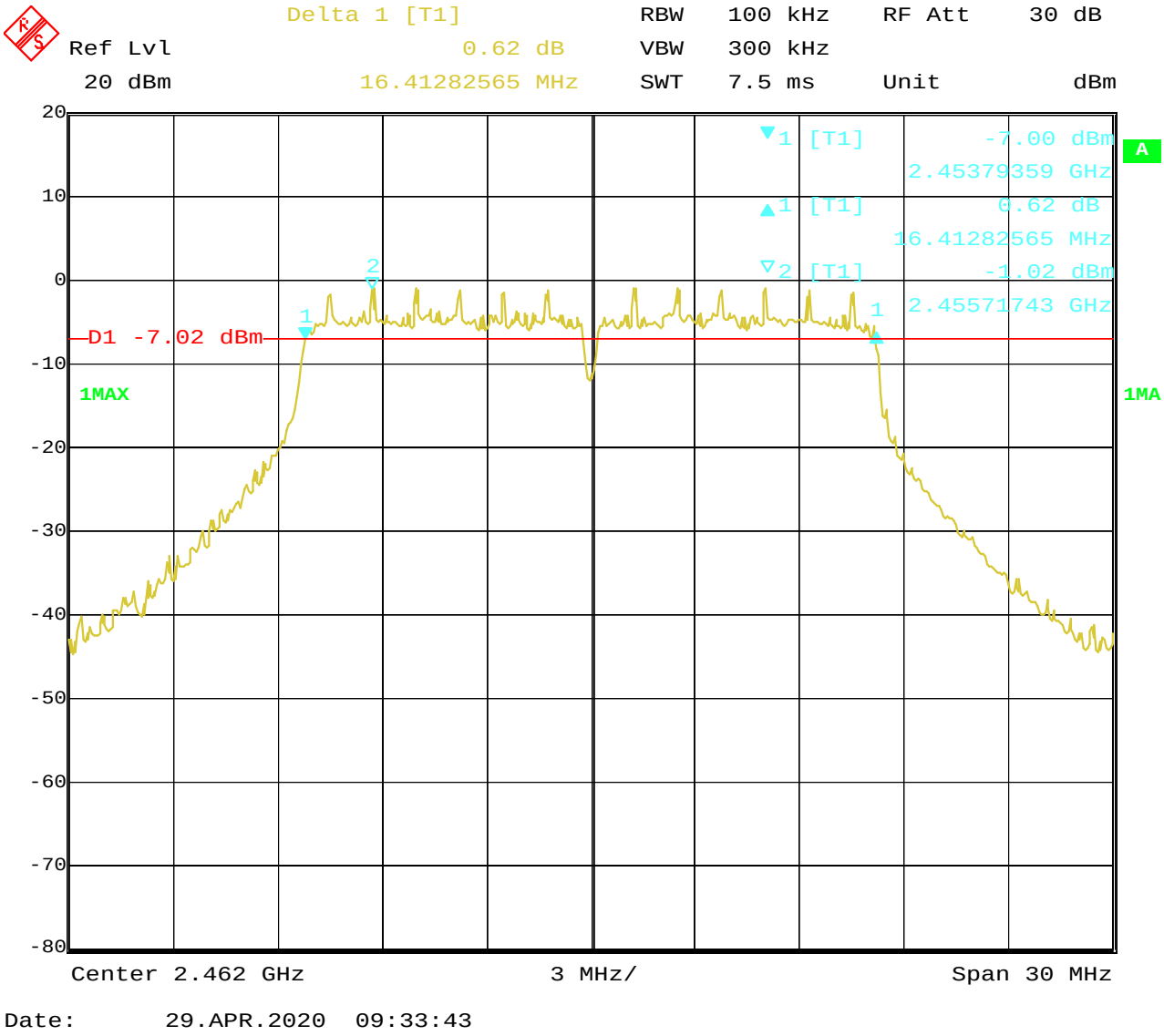
3. 802.11g at 6Mbps of CH11



Date: 29.APR.2020 09:33:43

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6dB Occupied Bandwidth

EUT	Gateway	Model	GGW-1219-01
Mode	802.11n HT20	Input Voltage	DC5V
Temperature	24 deg. C,	Humidity	56% RH

Channel	Channel Frequency (MHz)	Data Transfer Rate (Mbps)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass/ Fail
1	2412	mcs0	17.56	0.5	Pass
6	2437	mcs0	17.56	0.5	Pass
11	2462	mcs0	17.56	0.5	Pass

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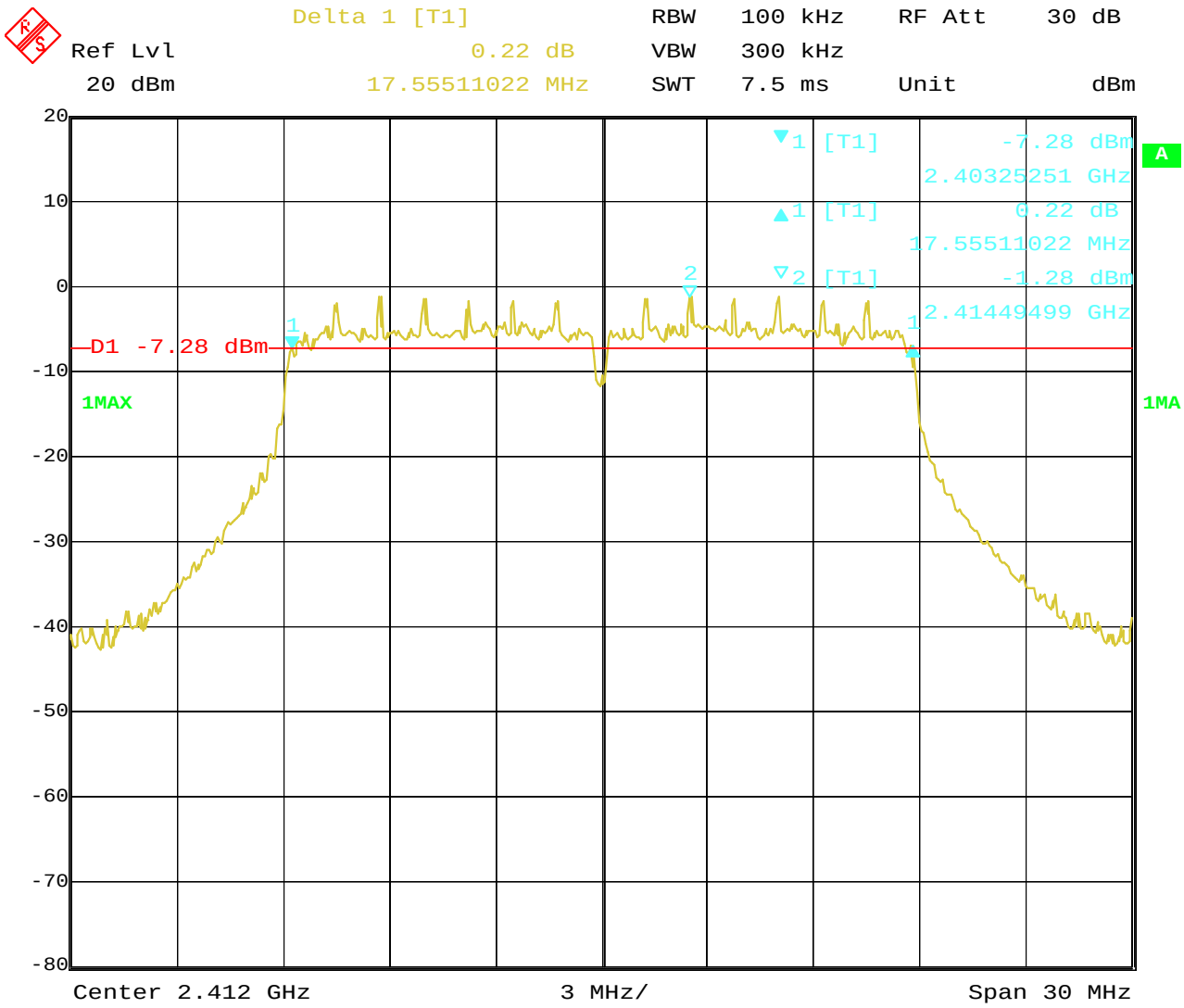
Test Plots:

1. 802.11n at HT20 of CH01



Date: 29.APR.2020 09:46:37

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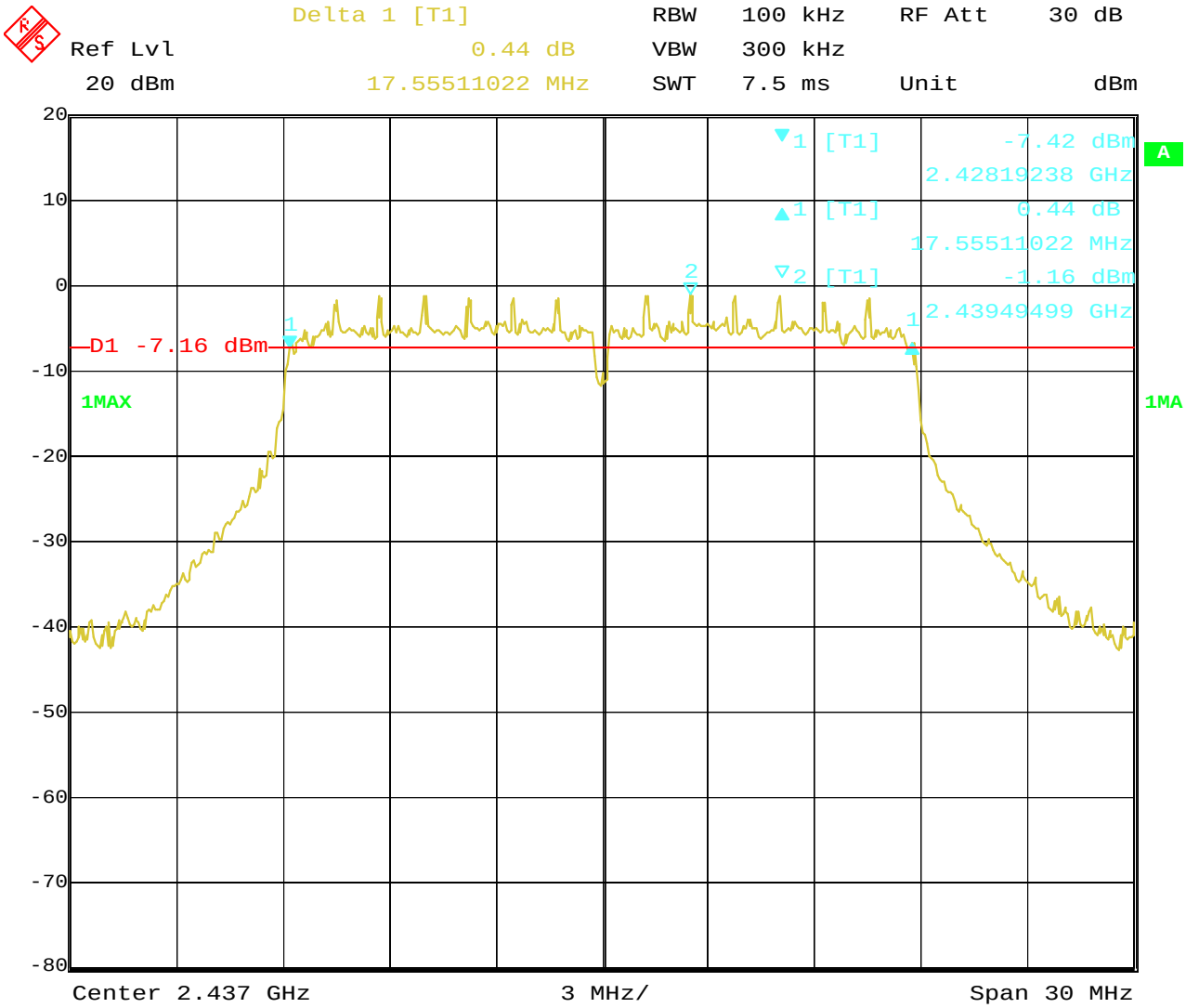
2. 802.11n at HT20 of CH06



Date: 29.APR.2020 09:44:50

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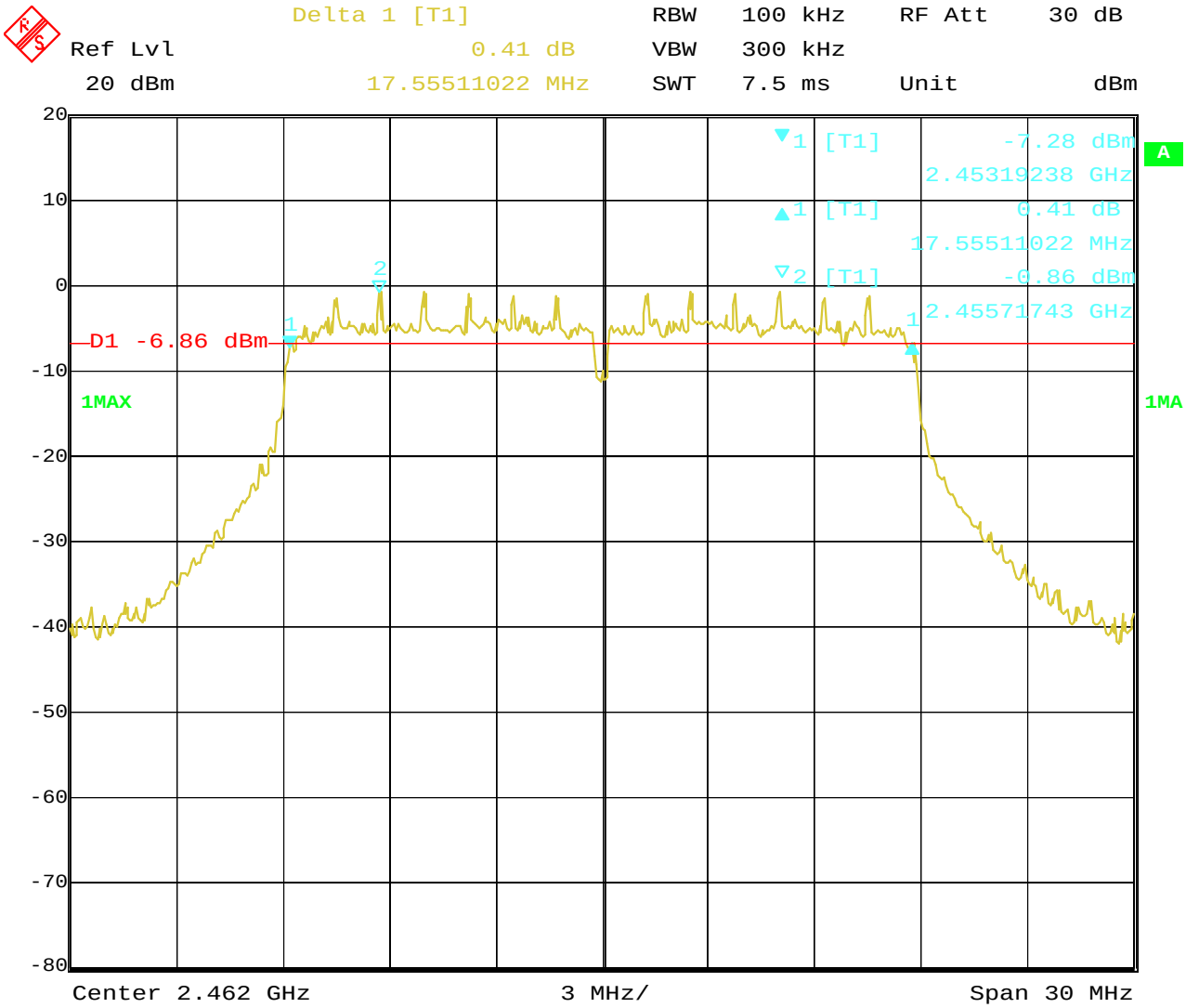
3. 802.11n at HT20 of CH11



Date: 29.APR.2020 09:43:00

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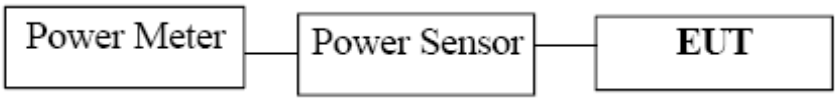
8. Maximum Output Power

8.1 Test Setup



8.2 Limits of Maximum Output Power

The Maximum Output Power Measurement is 30dBm.

8.3 Test Procedure

The RF power output was measured with a Power meter connected to the RF Antenna connector (conducted measurement) while EUT was operating in transmit mode at the appropriate centre frequency.

Note: The AV power was measured

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8.4Test Results

EUT	Gateway	Model	GGW-1219-01
Mode	802.11b	Input Voltage	DC5V
Temperature	24 deg. C,	Humidity	56% RH

Channel	Frequency (MHz)	Max. Power Output (dBm)	Power Limit (dBm)	Pass/ Fail
1	2412	9.52	30	Pass
6	2437	9.60	30	Pass
11	2462	9.55	30	Pass

Note: 1. At finial test to get the worst-case emission at 1Mbps for CH01, CH06 and CH11
2. The result basic equation calculation as follow:
Power Output = Power Reading + Cable loss + Attenuator
3. The worse case was recorded

EUT	Gateway	Model	GGW-1219-01
Mode	802.11g	Input Voltage	DC5V
Temperature	24 deg. C,	Humidity	56% RH

Channel	Frequency (MHz)	Max. Power Output (dBm)	Power Limit (dBm)	Pass/ Fail
1	2412	8.08	30	Pass
6	2437	8.16	30	Pass
11	2462	8.22	30	Pass

Note: 1. At finial test to get the worst-case emission at 6Mbps for CH01, CH06 and CH11
2. The result basic equation calculation as follow:
Power Output = Power Reading + Cable loss + Attenuator
3. The worse case was recorded

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EUT	Gateway	Model	GGW-1219-01
Mode	802.11n (HT20)	Input Voltage	DC5V
Temperature	24 deg. C,	Humidity	56% RH

Channel	Frequency (MHz)	Max. Power Output (dBm)	Power Limit (dBm)	Pass/ Fail
1	2412	8.29	30	Pass
6	2437	8.33	30	Pass
11	2462	8.35	30	Pass

Note: 1. At finial test to get the worst-case emission at mcs0 of 11n HT20 for CH01, CH06 and CH11

2. The result basic equation calculation as follow:

Power Output = Power Reading + Cable loss + Attenuator

3. The worse case was recorded

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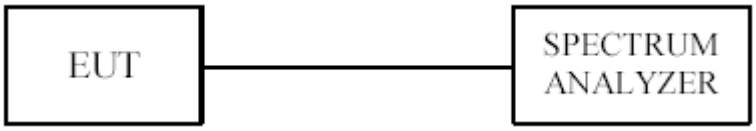
9. Power Spectral Density Measurement

9.1 Test Setup



9.2 Limits of Power Spectral Density Measurement

The Maximum Power Spectral Density Measurement is 8dBm.

9.3 Test Procedure

1. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
2. Set the RBW = 10 kHz.
3. Set the VBW ≥ 30 kHz.
4. Set the span to 1.5 times the DTS channel bandwidth.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.
11. The resulting peak PSD level must be ≤ 8 dBm.

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9.4Test Result

EUT	Gateway	Model	GGW-1219-01
Mode	802.11b 11Mbps	Input Voltage	DC5V
Temperature	24 deg. C,	Humidity	56% RH

Channel	Frequency (MHz)	Power Spectral Density (dBm)	Limit (dBm)	Pass/ Fail
1	2412	-3.86	8	Pass
6	2437	-3.61	8	Pass
11	2462	-3.24	8	Pass

EUT	Gateway	Model	GGW-1219-01
Mode	802.11b 1Mbps	Input Voltage	DC5V
Temperature	24 deg. C,	Humidity	56% RH

Channel	Frequency (MHz)	Power Spectral Density (dBm)	Limit (dBm)	Pass/ Fail
1	2412	-3.87	8	Pass
6	2437	-3.79	8	Pass
11	2462	-3.88	8	Pass

EUT	Gateway	Model	GGW-1219-01
Mode	802.11g 6Mbps	Input Voltage	DC5V
Temperature	24 deg. C,	Humidity	56% RH

Channel	Frequency (MHz)	Power Spectral Density (dBm)	Limit (dBm)	Pass/ Fail
1	2412	-10.21	8	Pass
6	2437	-10.06	8	Pass
11	2462	-10.32	8	Pass

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EUT	Gateway	Model	GGW-1219-01
Mode	802.11n HT20 mcs0	Input Voltage	DC5V
Temperature	24 deg. C,	Humidity	56% RH

Channel	Frequency (MHz)	Total Power Spectral Density (dBm)	Limit (dBm)	Pass/ Fail
1	2412	-10.70	8	Pass
6	2437	-10.48	8	Pass
11	2462	-10.40	8	Pass

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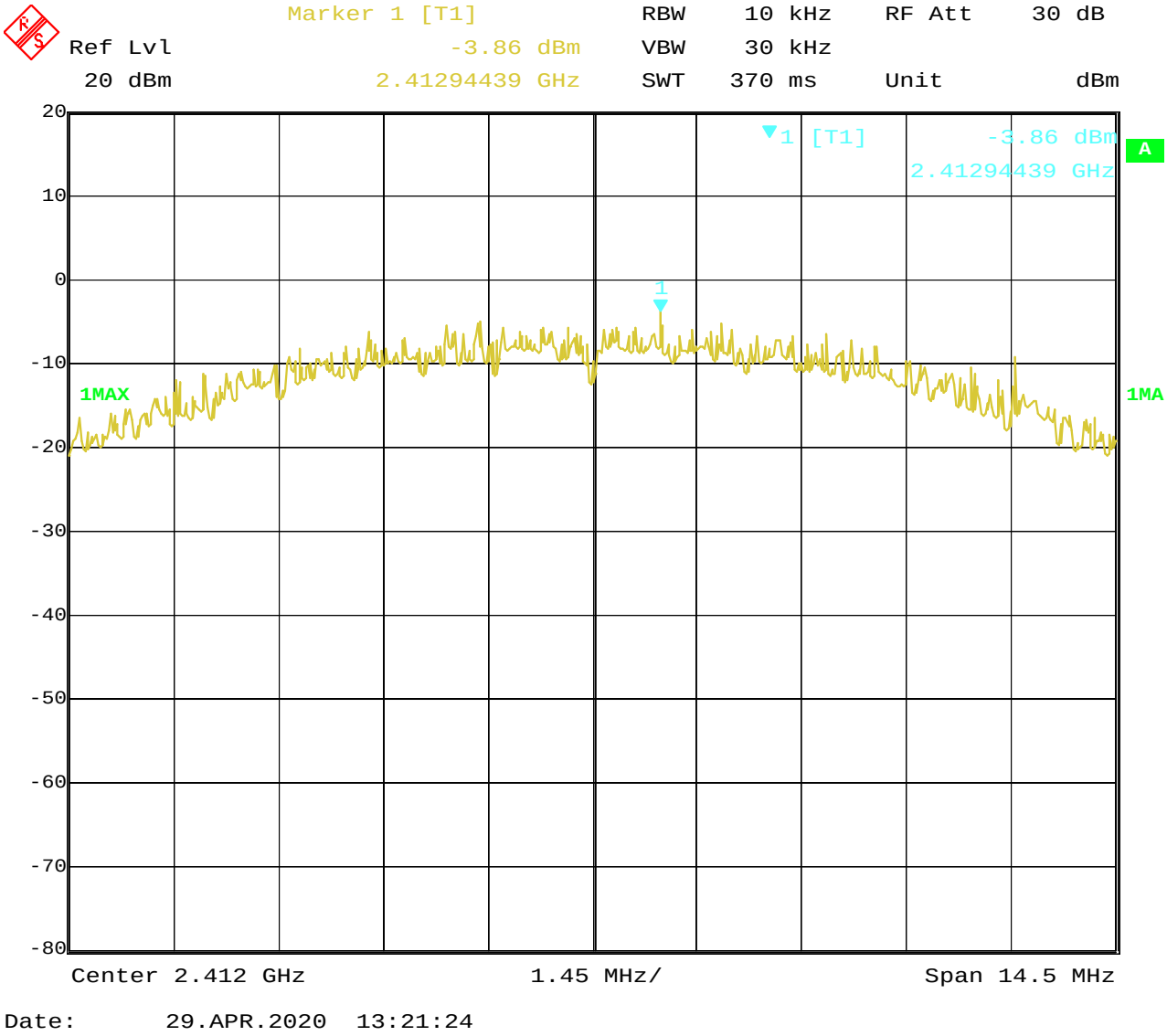
9.5 Photo of Power Spectral Density Measurement

1.802.11b at 11Mbps of CH01



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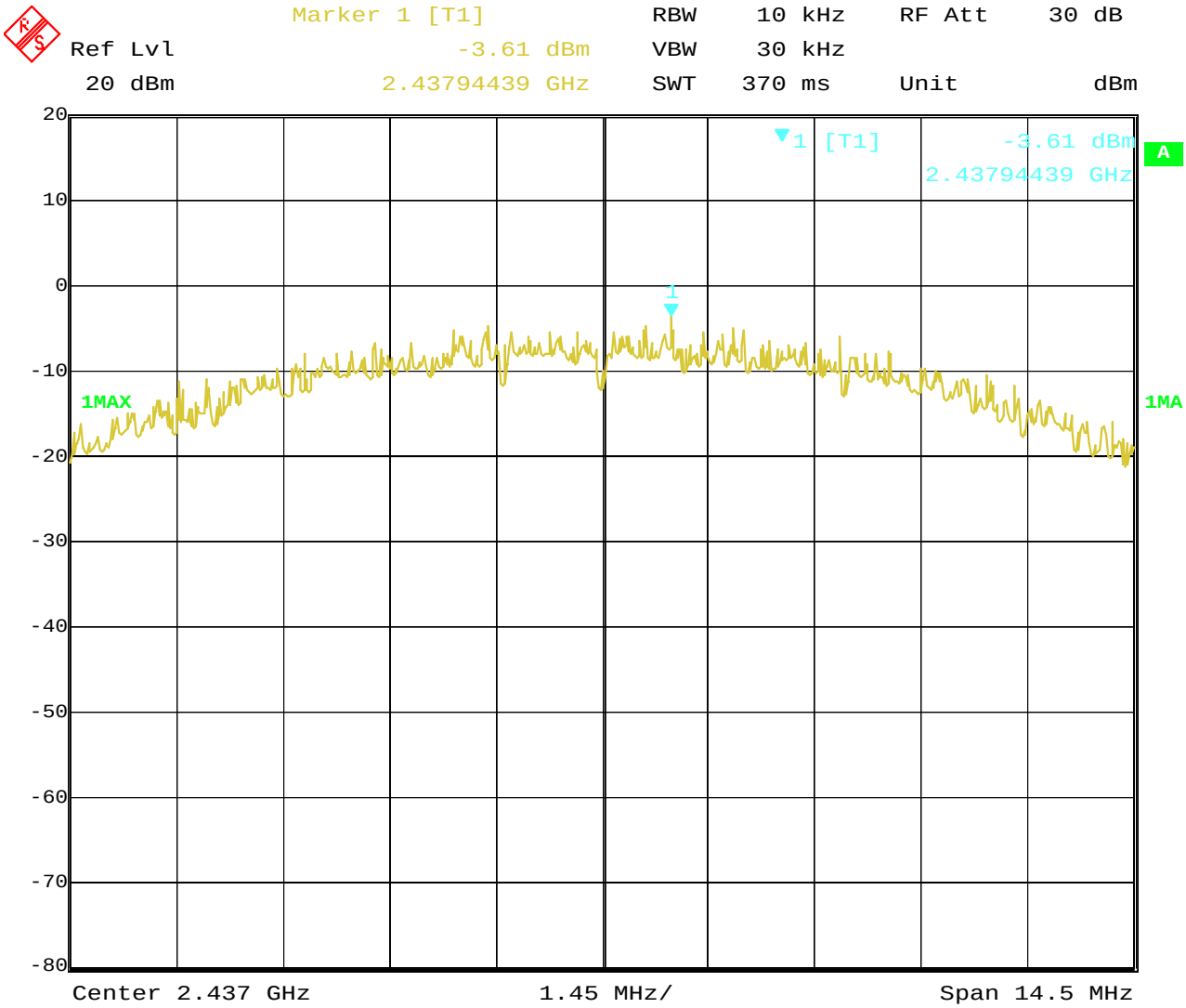
2. 802.11b at 11Mbps at CH06



Date: 29.APR.2020 13:21:50

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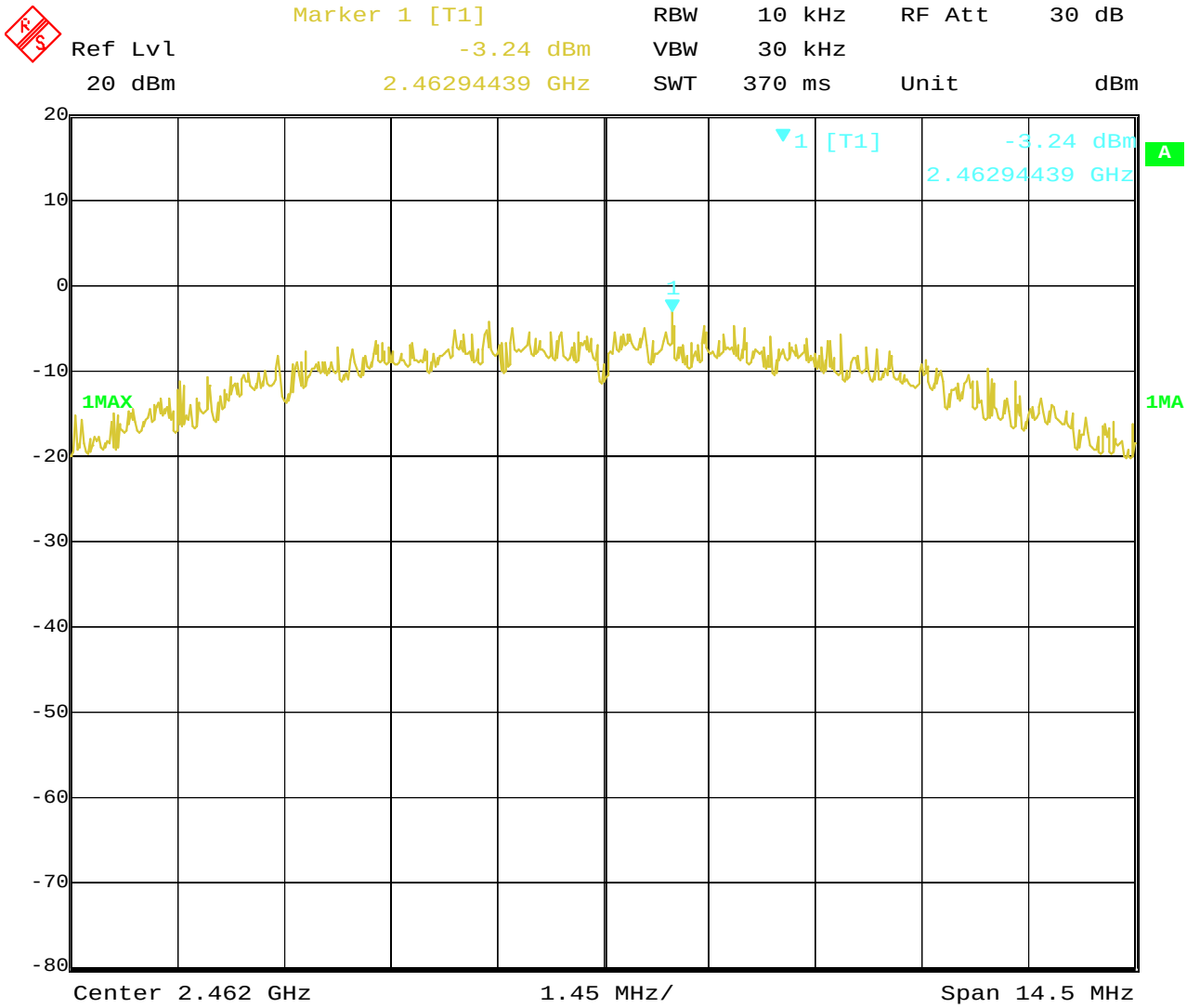
3. 802.11b at 11Mbps of CH11



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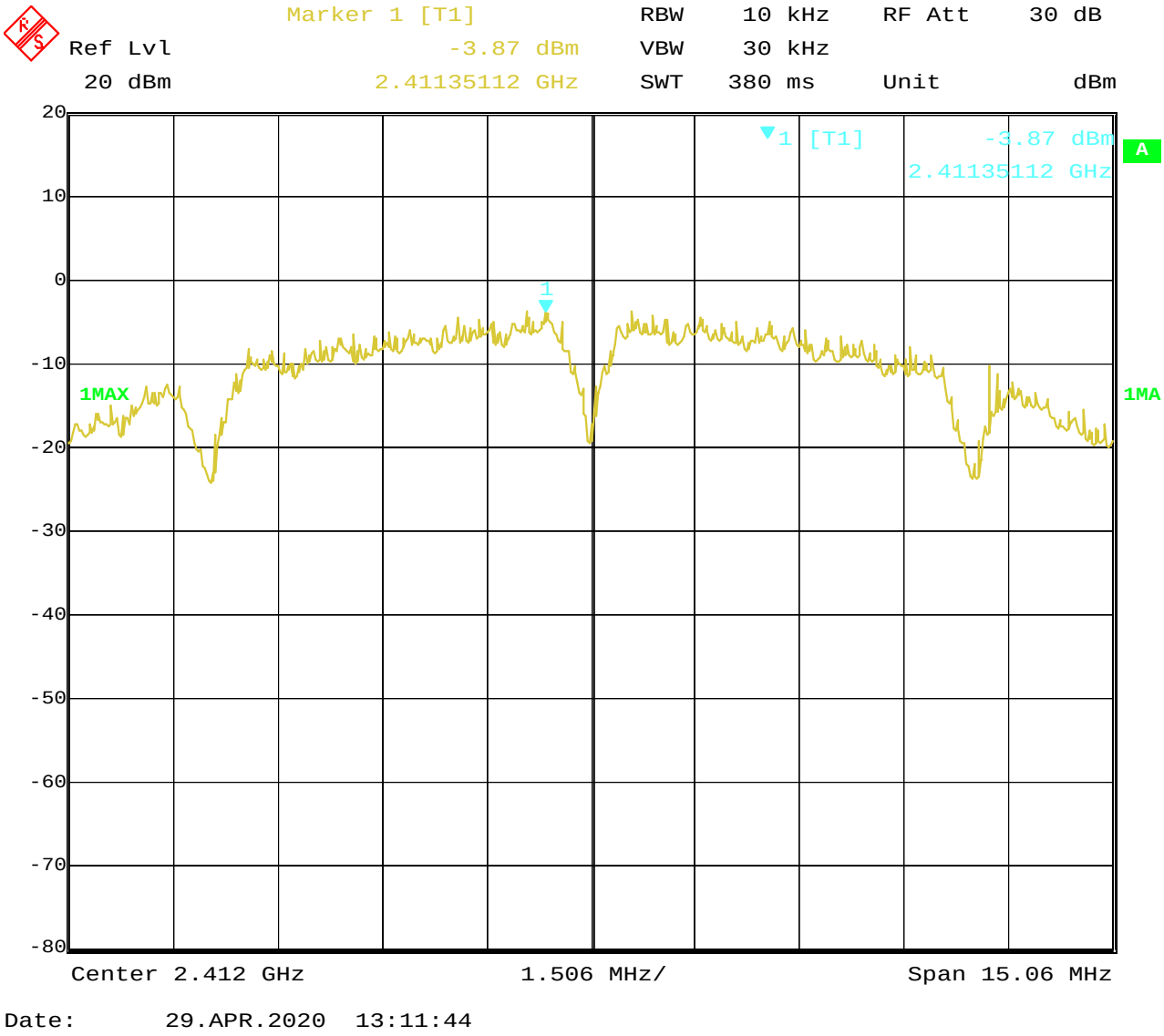
4. 802.11b at 1Mbps of CH1



Date: 29.APR.2020 13:11:44

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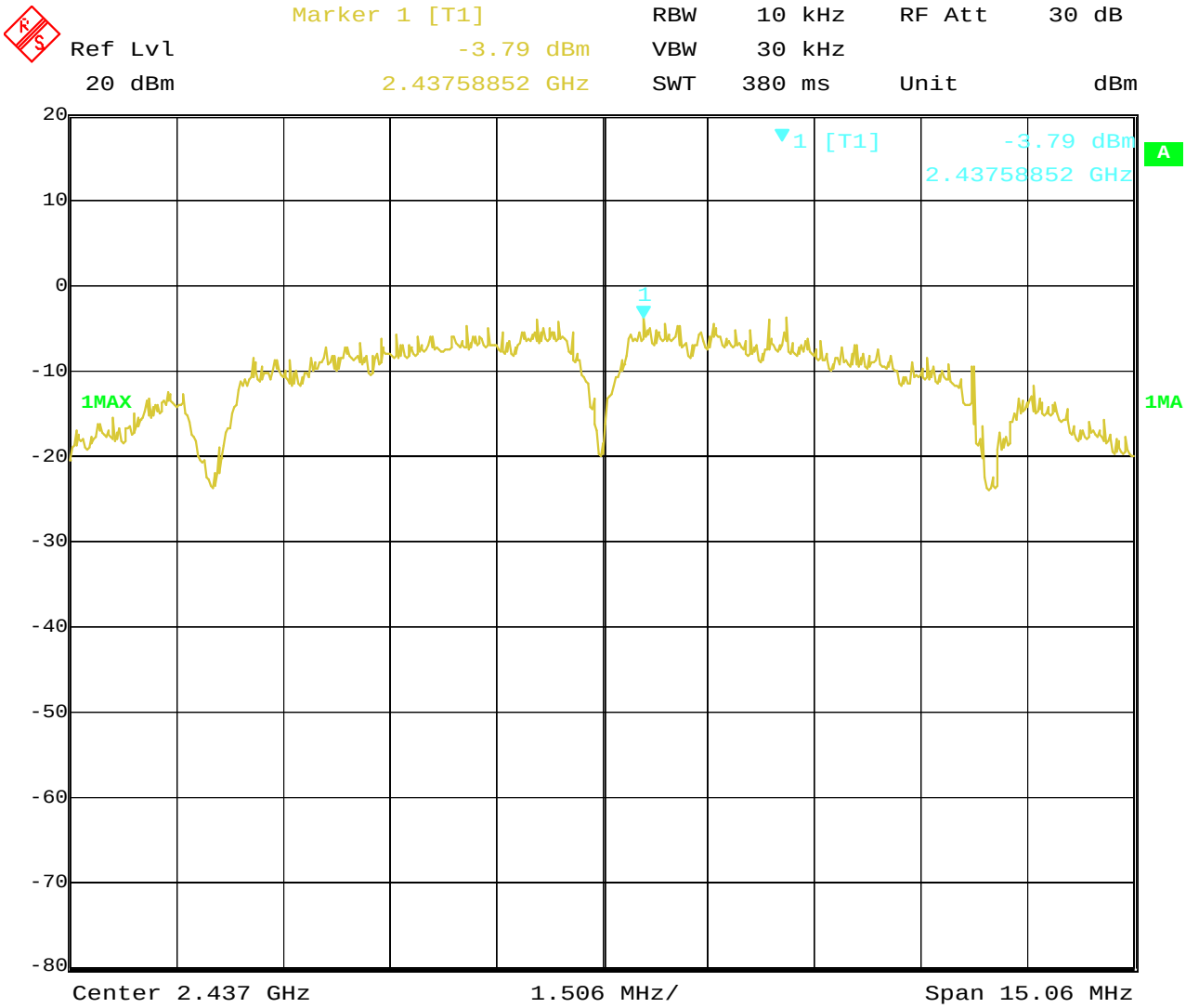
5. 802.11b at 1Mbps of CH6



Date: 29.APR.2020 13:13:15

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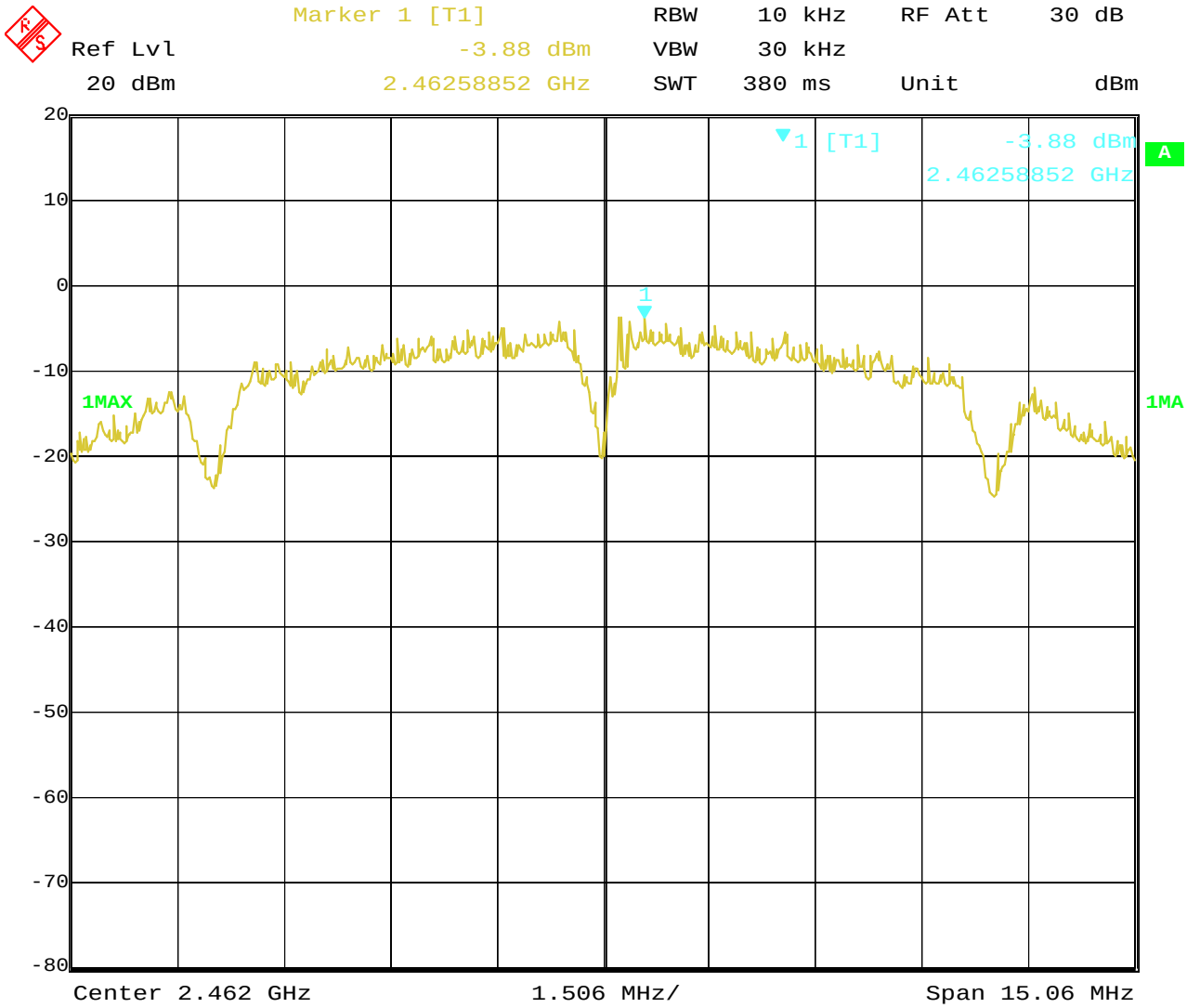
6. 802.11b at 1Mbps of CH11



Date: 29.APR.2020 13:13:56

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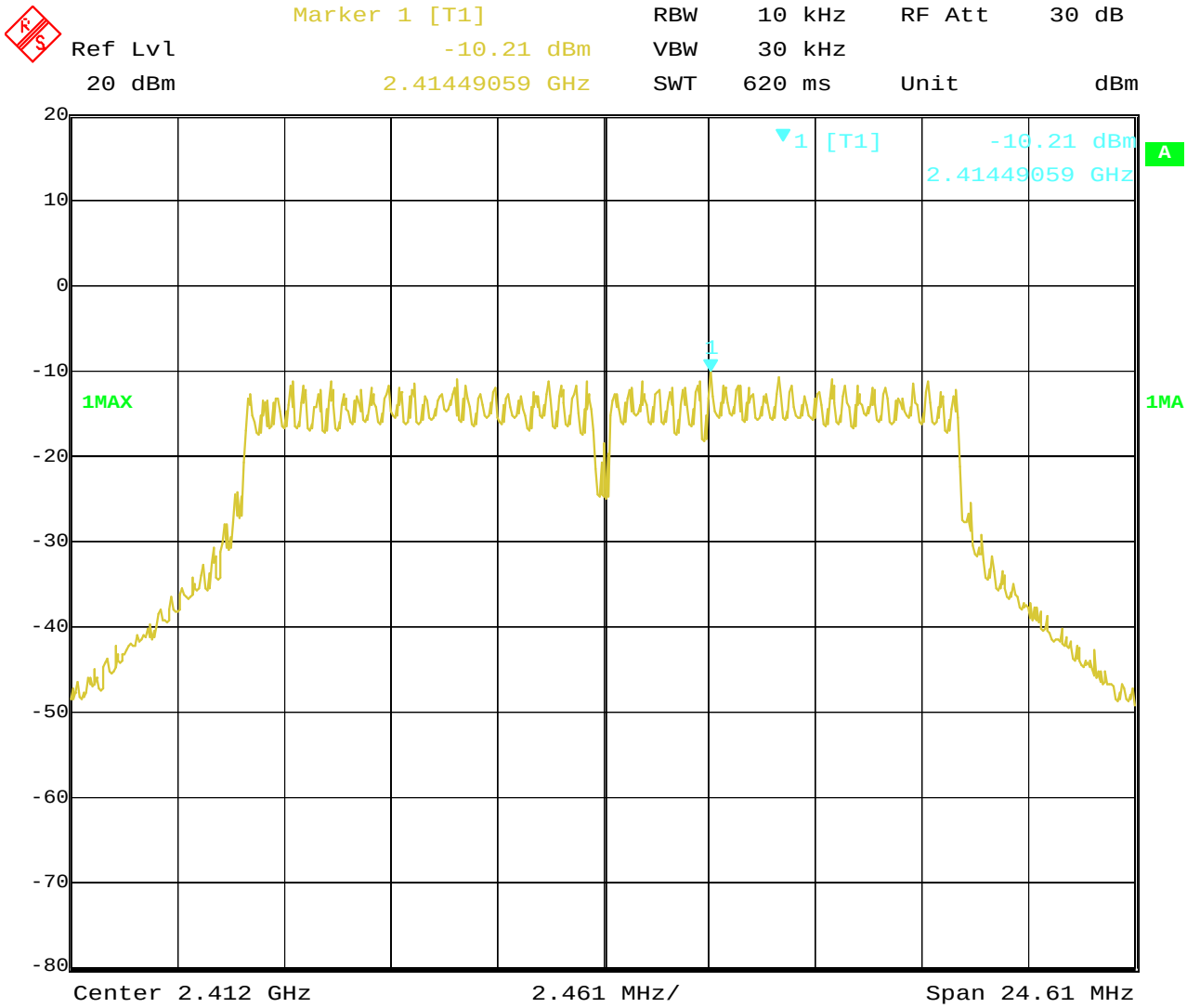
7. 802.11g at 6Mbps of CH1



Date: 29.APR.2020 13:20:41

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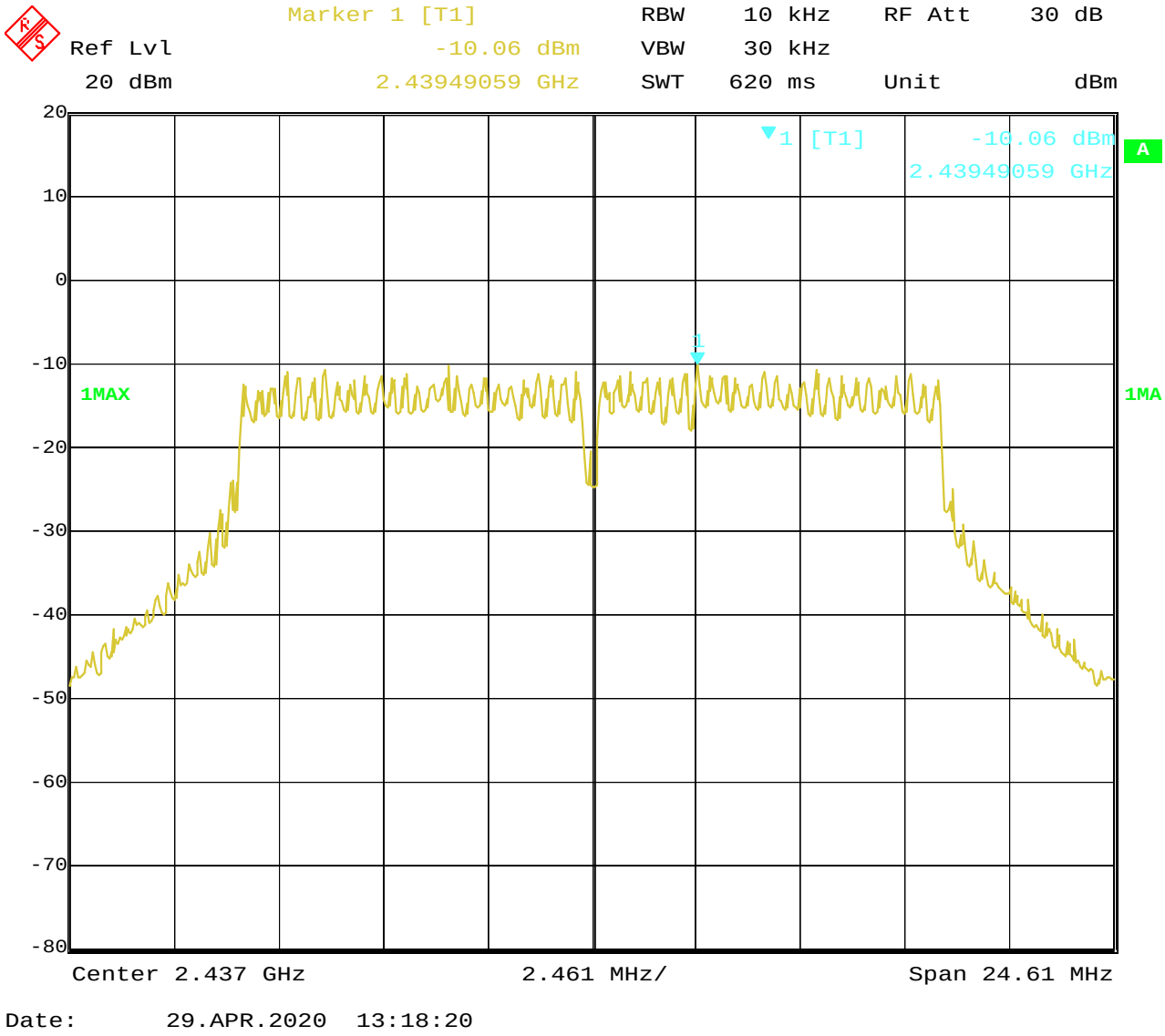
8. 802.11g at 6Mbps of CH6



Date: 29.APR.2020 13:18:20

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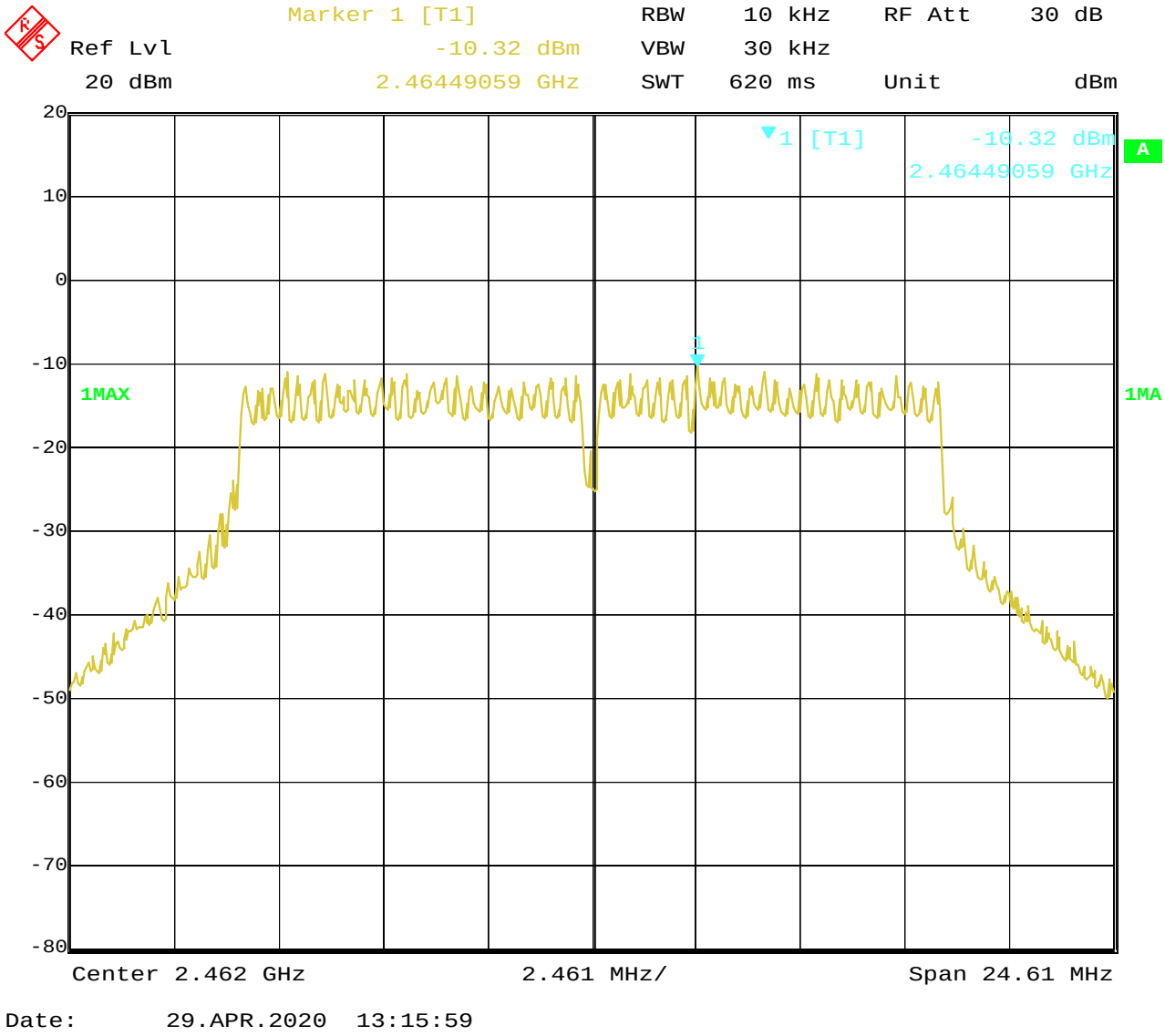
9. 802.11g at 6Mbps of CH11



Date: 29.APR.2020 13:15:59

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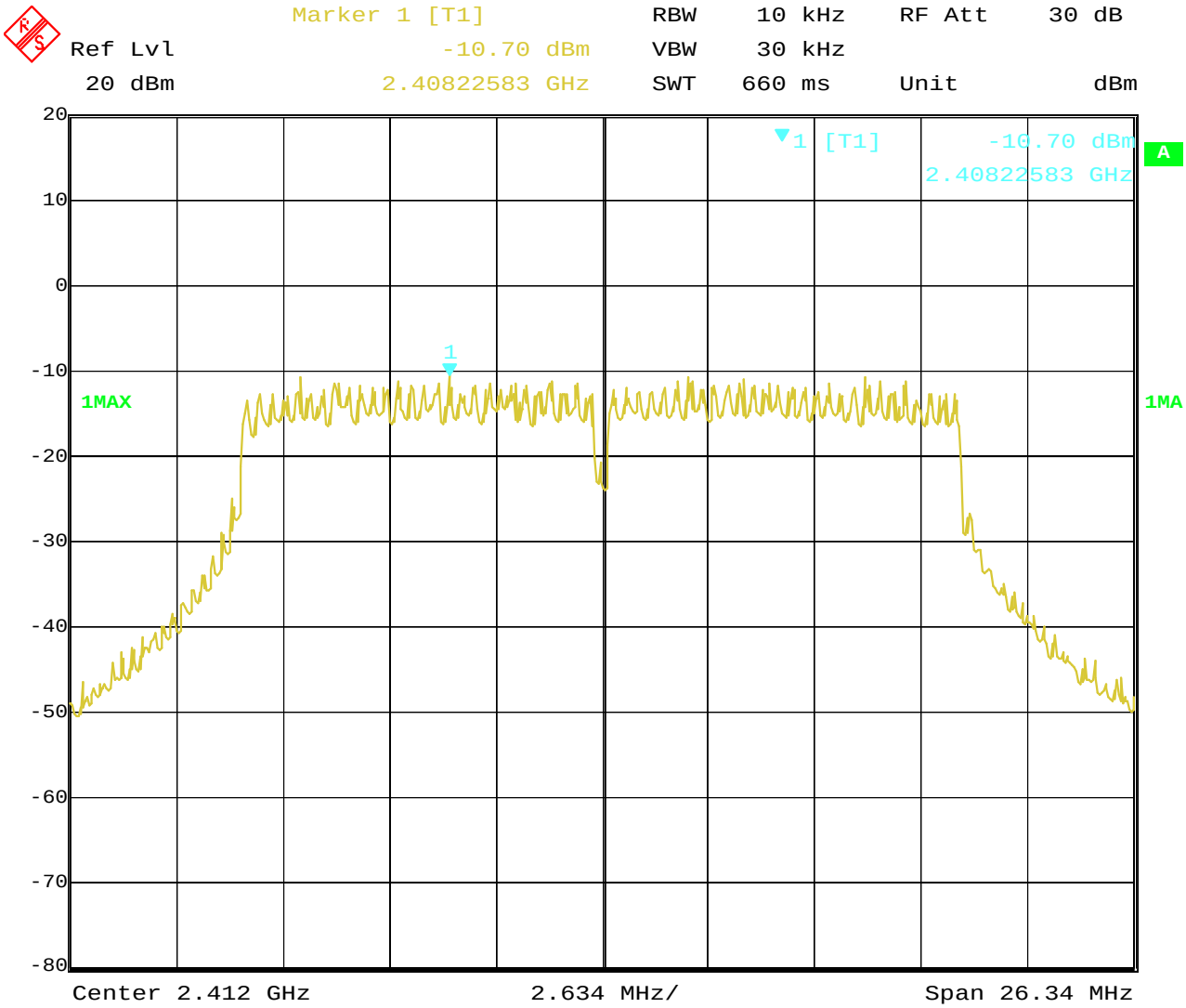
10. 802.11n at HT20 of CH01



Date: 29.APR.2020 13:26:27

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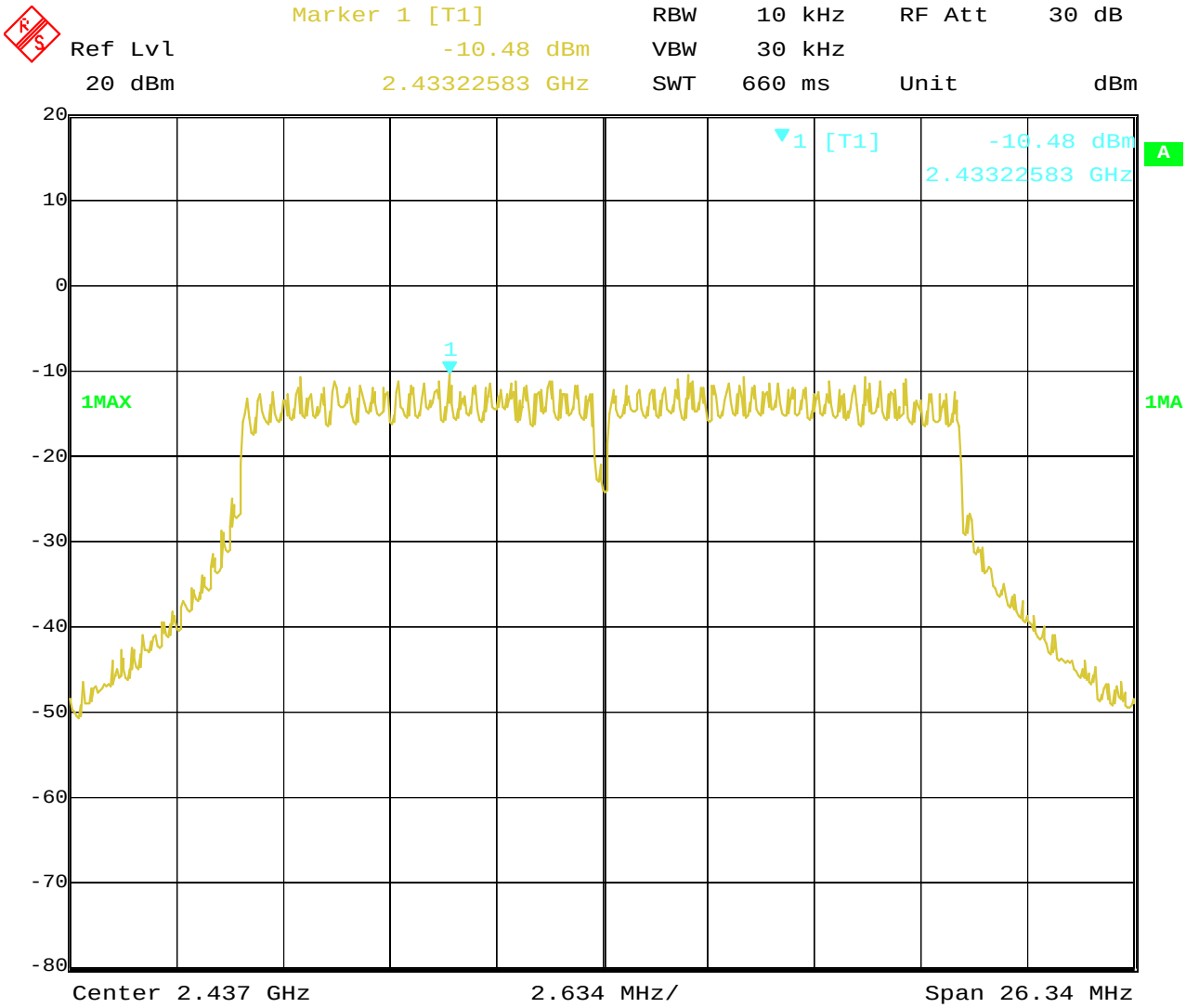
11. 802.11n at HT20 of CH06



Date: 29.APR.2020 13:24:49

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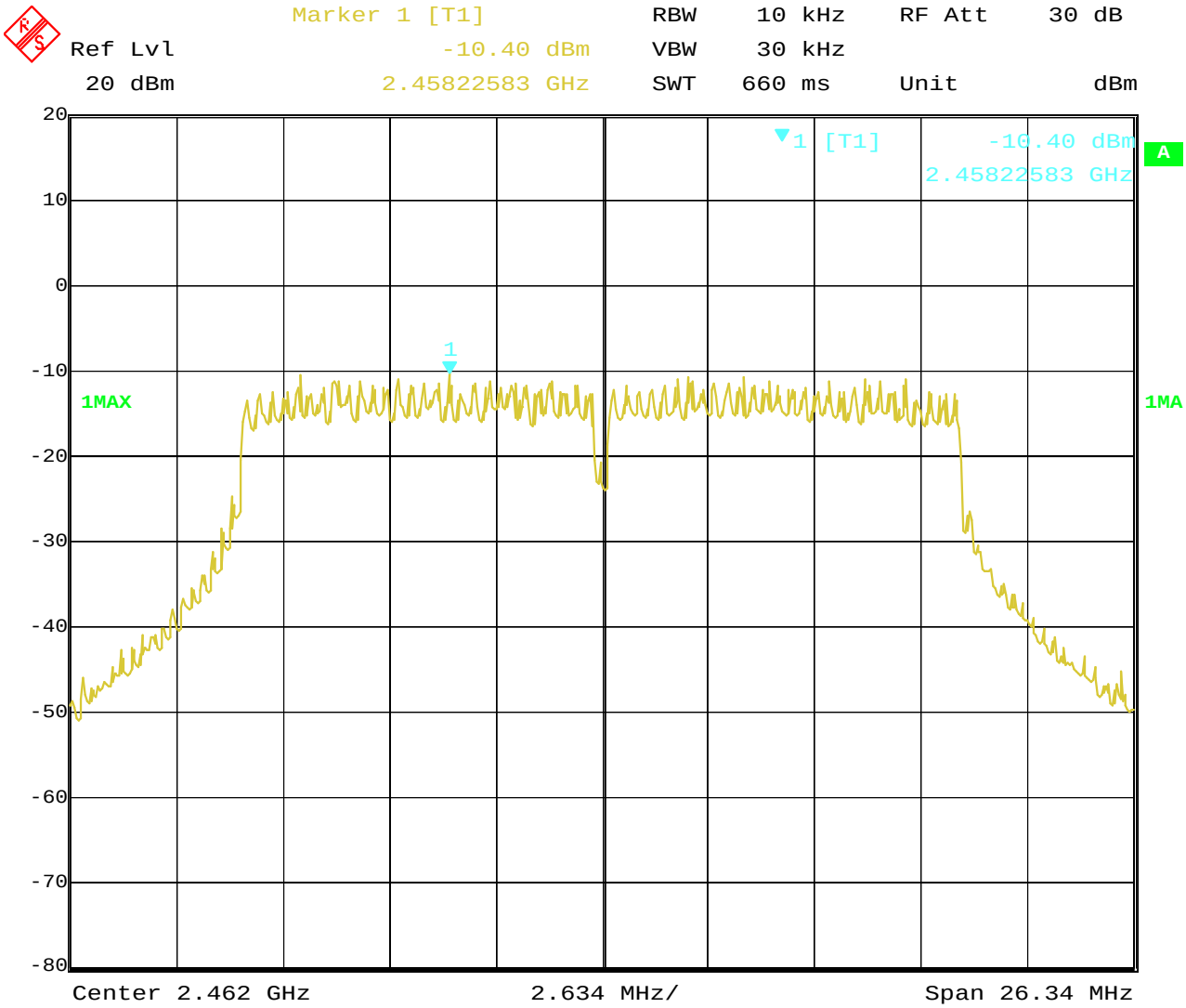
12. 802.11n at HT20 of CH11



Date: 29.APR.2020 13:23:30

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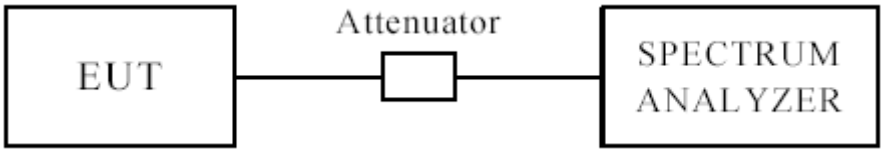
10 Out of Band Measurement

10.1 Test Setup for band edge



The restricted band requirement based on radiated emission test; please see the clause 6 for the test setup

10.2 Limits of Out of Band Emissions Measurement

1. Below –30dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).
2. Fall in the restricted bands listed in section 15.205. The maximum permitted average field strength is listed in section 15.209.

10.3 Test Procedure

For signals in the restricted bands above and below the 2.4-2.483GHz allocated band a measurement was made of radiated emission test. (Peak values with RBW=VBW=1MHz and PK detector. AV value with RBW=1MHz, VBW=3MHz and RMS detector)

For bandage test, the spectrum set as follows: RBW=100, VBW=300 kHz. A conducted measurement used

10.4 Test Result

Please see next pages

Note: 1. for band-edge measurement, the frequency from 30MHz-25GHz was tested. And It met the FCC rule.

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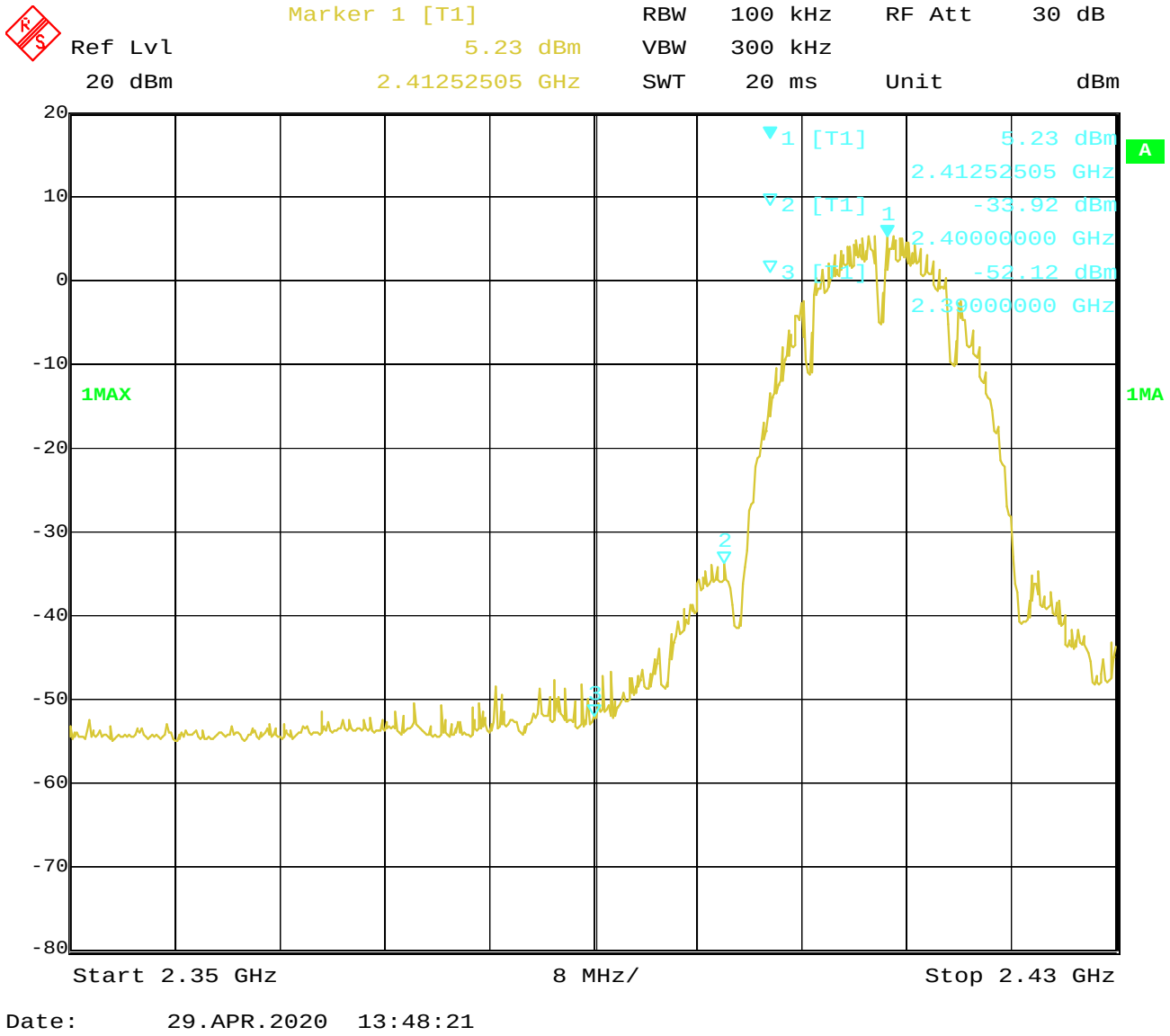
For 802.11b mode

CH01 at 1Mbps

10.4 Band-edge Measurement

EUT	Gateway	Model	GGW-1219-01
Mode	Keeping Transmitting	Input Voltage	DC5V
Temperature	24 deg. C,	Humidity	56% RH
Test Result:	Pass	Detector	PK

Test Figure:



Date: 29.APR.2020 13:48:21

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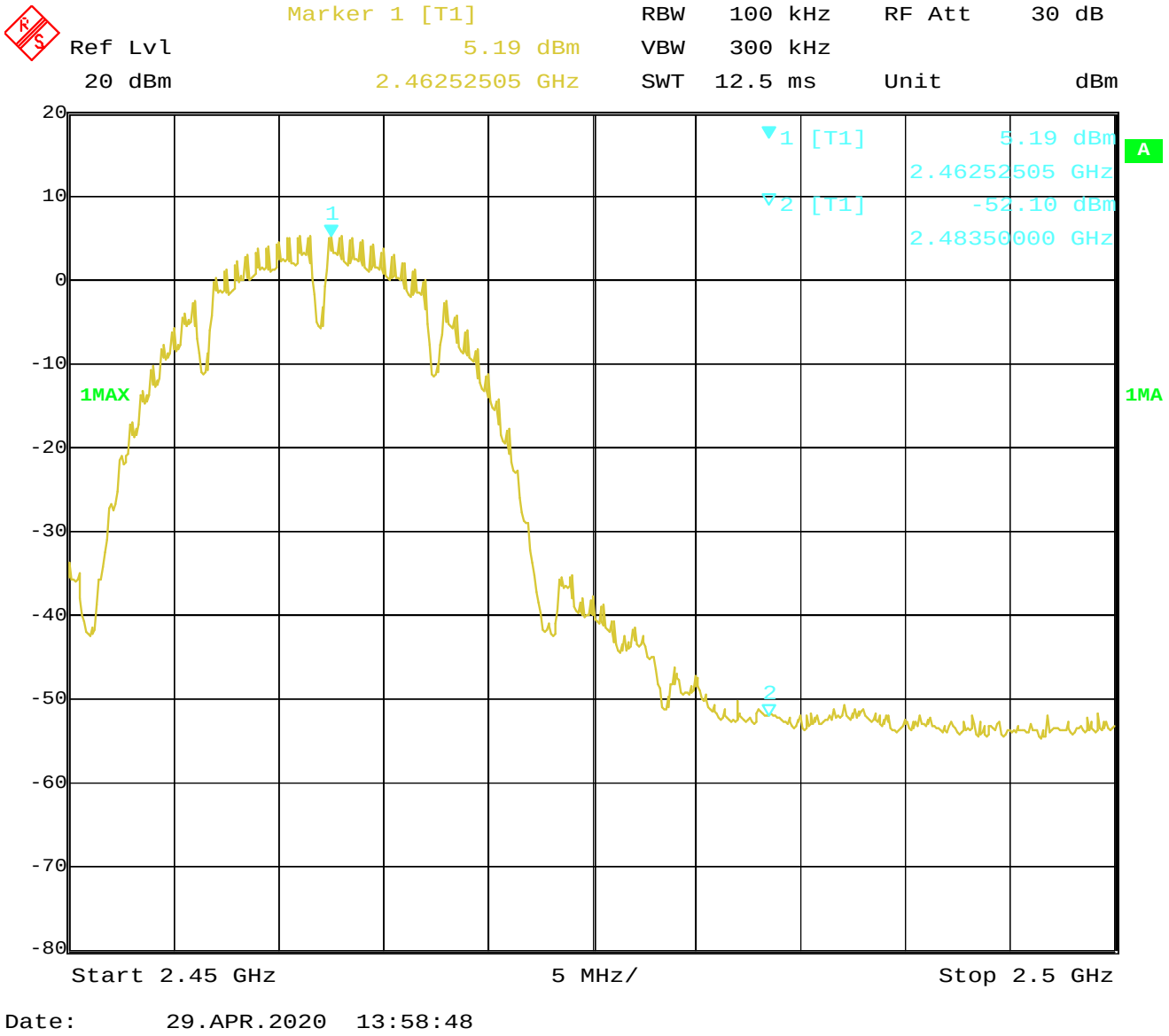
CH11 at 1Mbps

10.4 Band-edge Measurement

EUT	Gateway	Model	GGW-1219-01
Mode	Keeping Transmitting	Input Voltage	DC5V
Temperature	24 deg. C,	Humidity	56% RH
Test Result:	Pass	Detector	PK

Test Figure:



Date: 29.APR.2020 13:58:48

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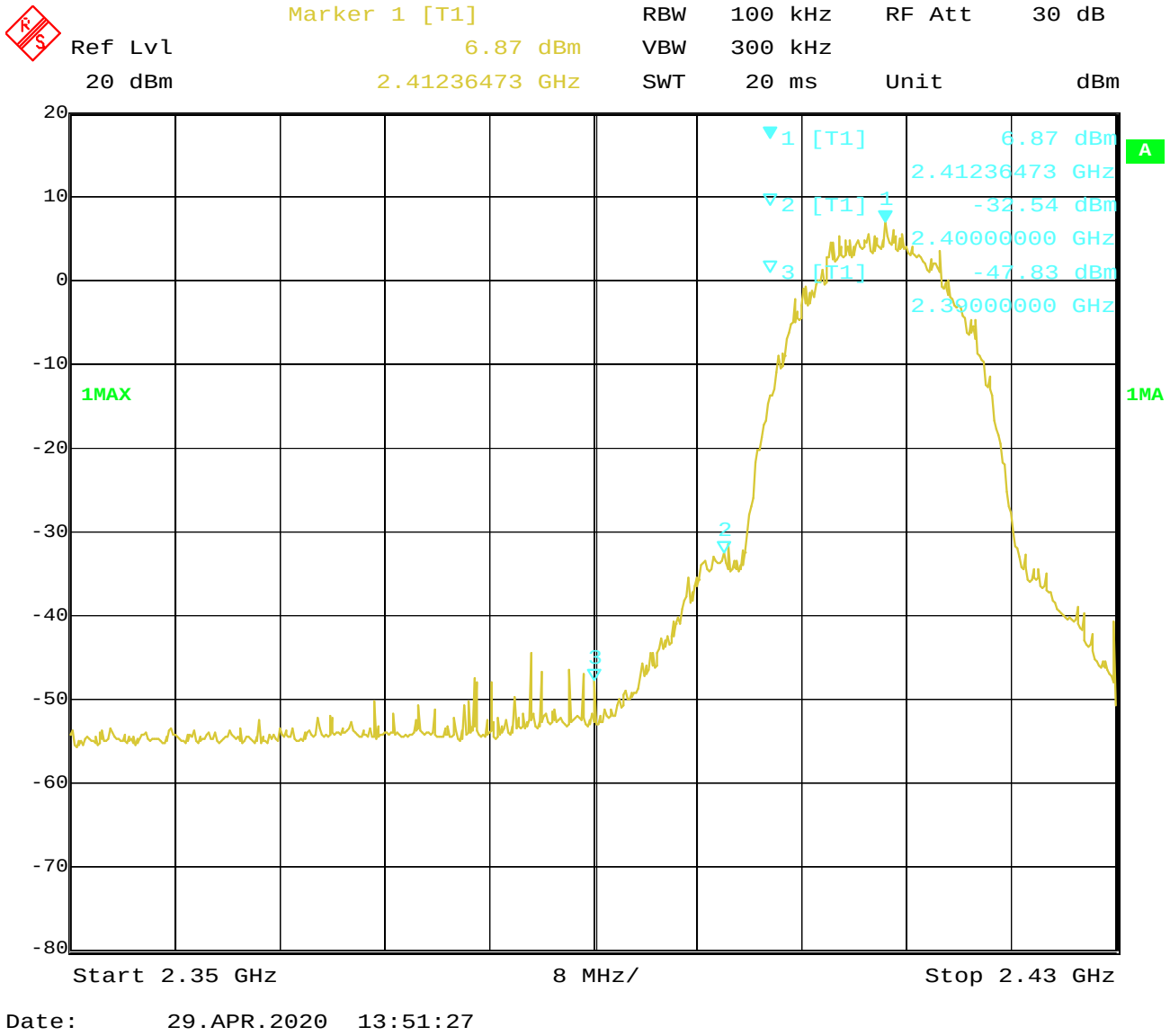
For 802.11b mode

CH01 at 11Mbps

10.4 Band-edge Measurement

EUT	Gateway	Model	GGW-1219-01
Mode	Keeping Transmitting	Input Voltage	DC5V
Temperature	24 deg. C,	Humidity	56% RH
Test Result:	Pass	Detector	PK

Test Figure:



Date: 29.APR.2020 13:51:27

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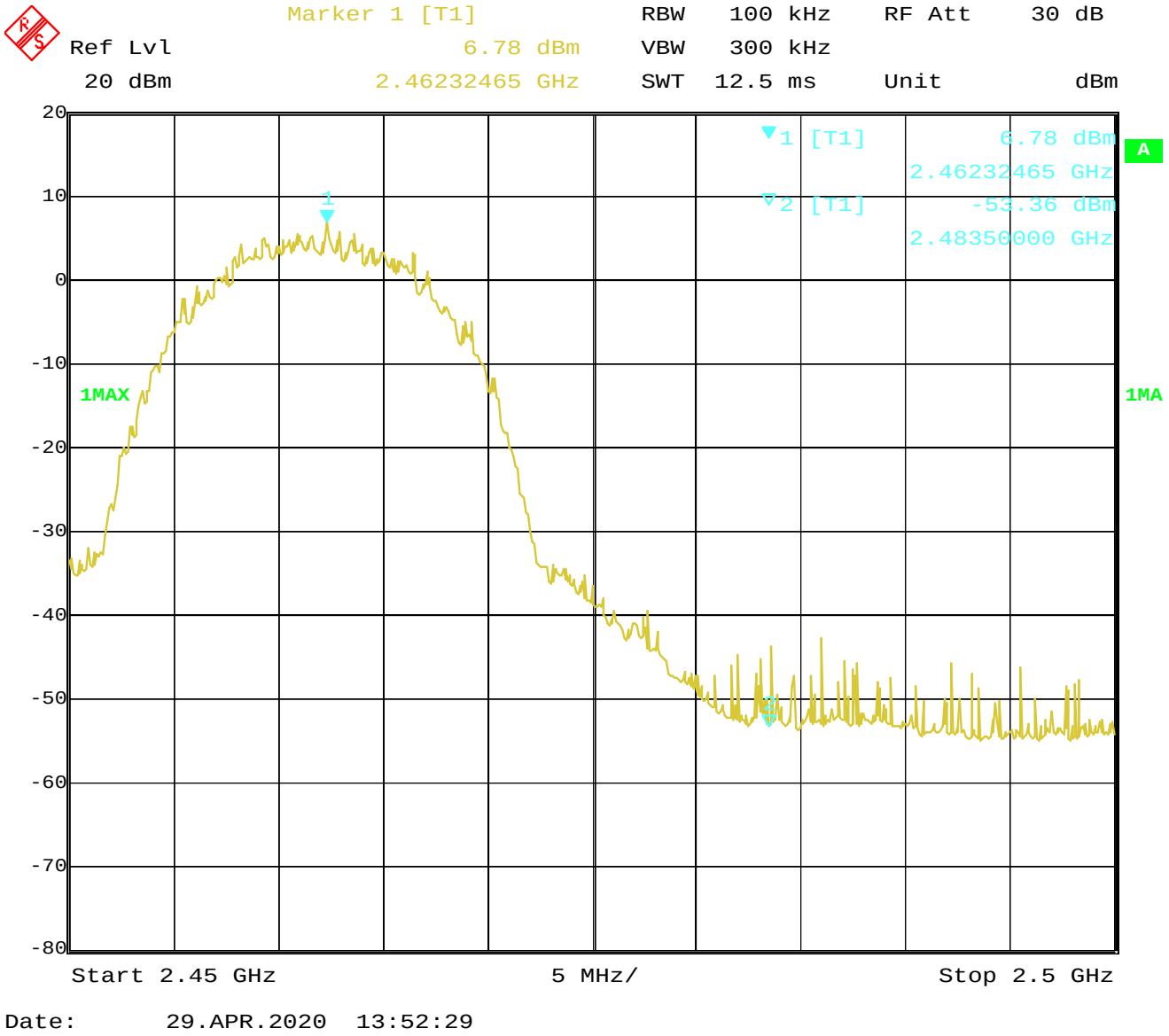
CH11 at 11Mbps

10.4 Band-edge Measurement

EUT	Gateway	Model	GGW-1219-01
Mode	Keeping Transmitting	Input Voltage	DC5V
Temperature	24 deg. C,	Humidity	56% RH
Test Result:	Pass	Detector	PK

Test Figure:



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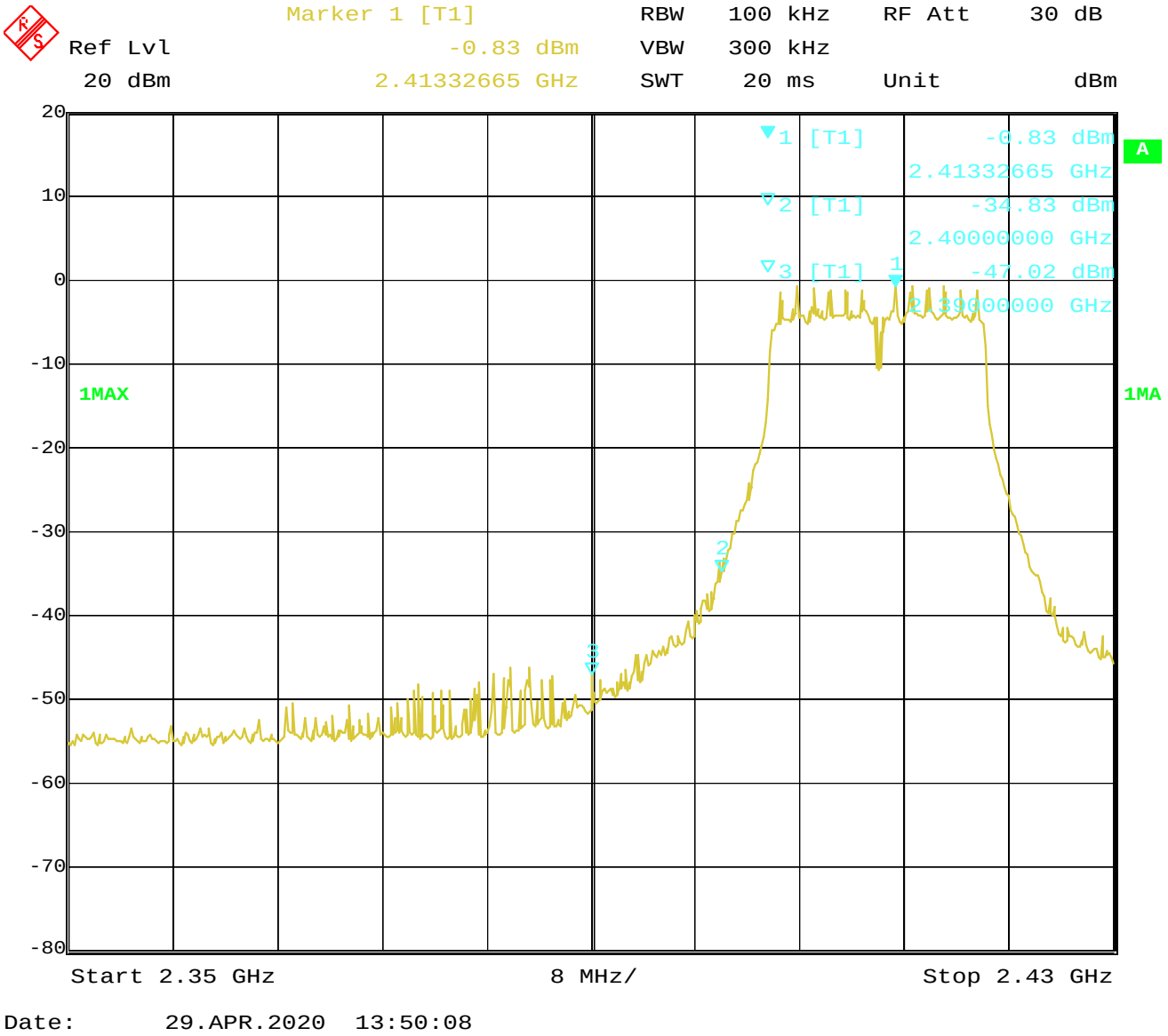
For 802.11g mode

CH01 at 6Mbps

10.4 Band-edge Measurement

EUT	Gateway	Model	GGW-1219-01
Mode	Keeping Transmitting	Input Voltage	DC5V
Temperature	24 deg. C,	Humidity	56% RH
Test Result:	Pass	Detector	PK

Test Figure:



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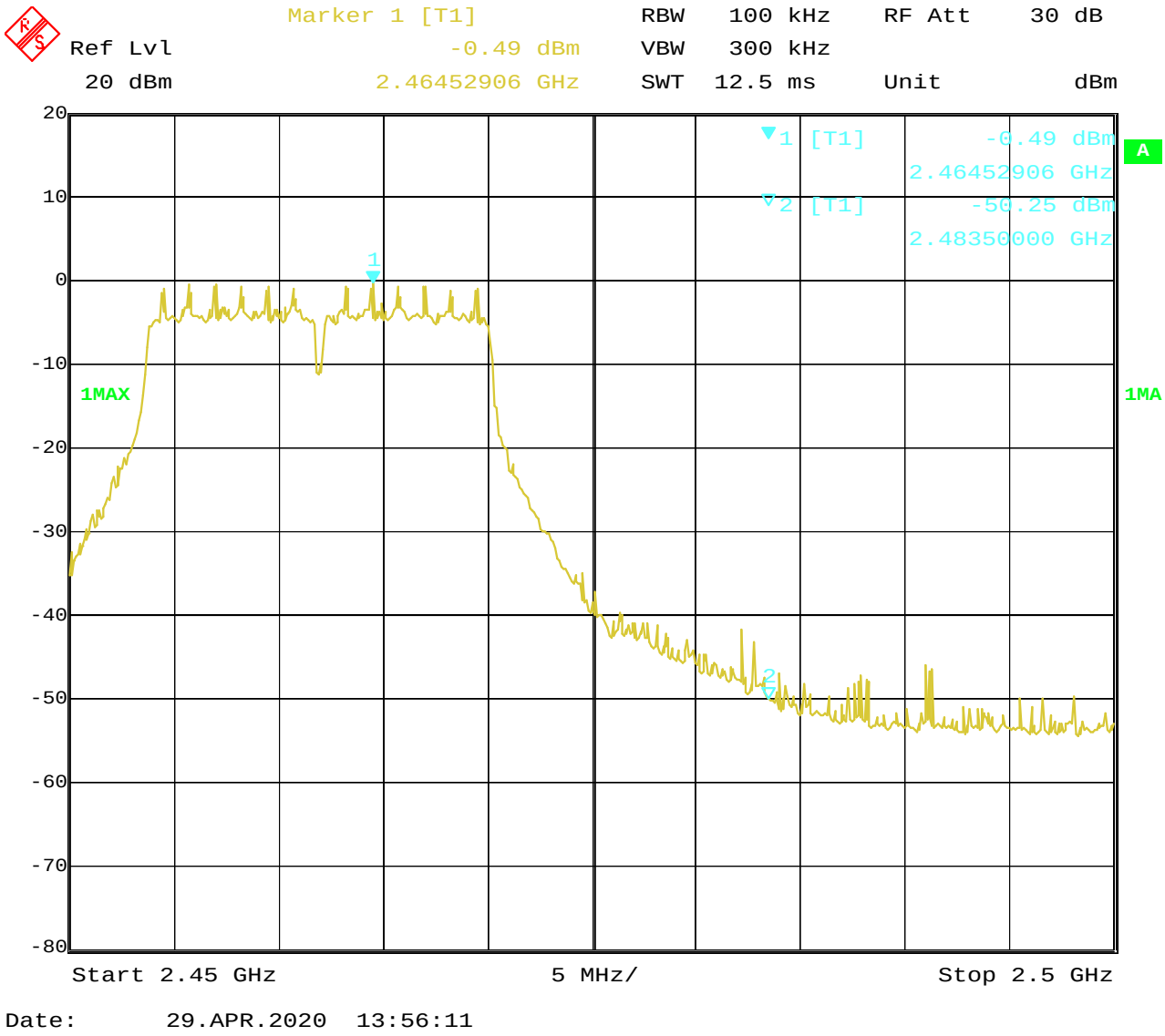
CH11 at 6Mbps

10.4 Band-edge Measurement

EUT	Gateway	Model	GGW-1219-01
Mode	Keeping Transmitting	Input Voltage	DC5V
Temperature	24 deg. C,	Humidity	56% RH
Test Result:	Pass	Detector	PK

Test Figure:



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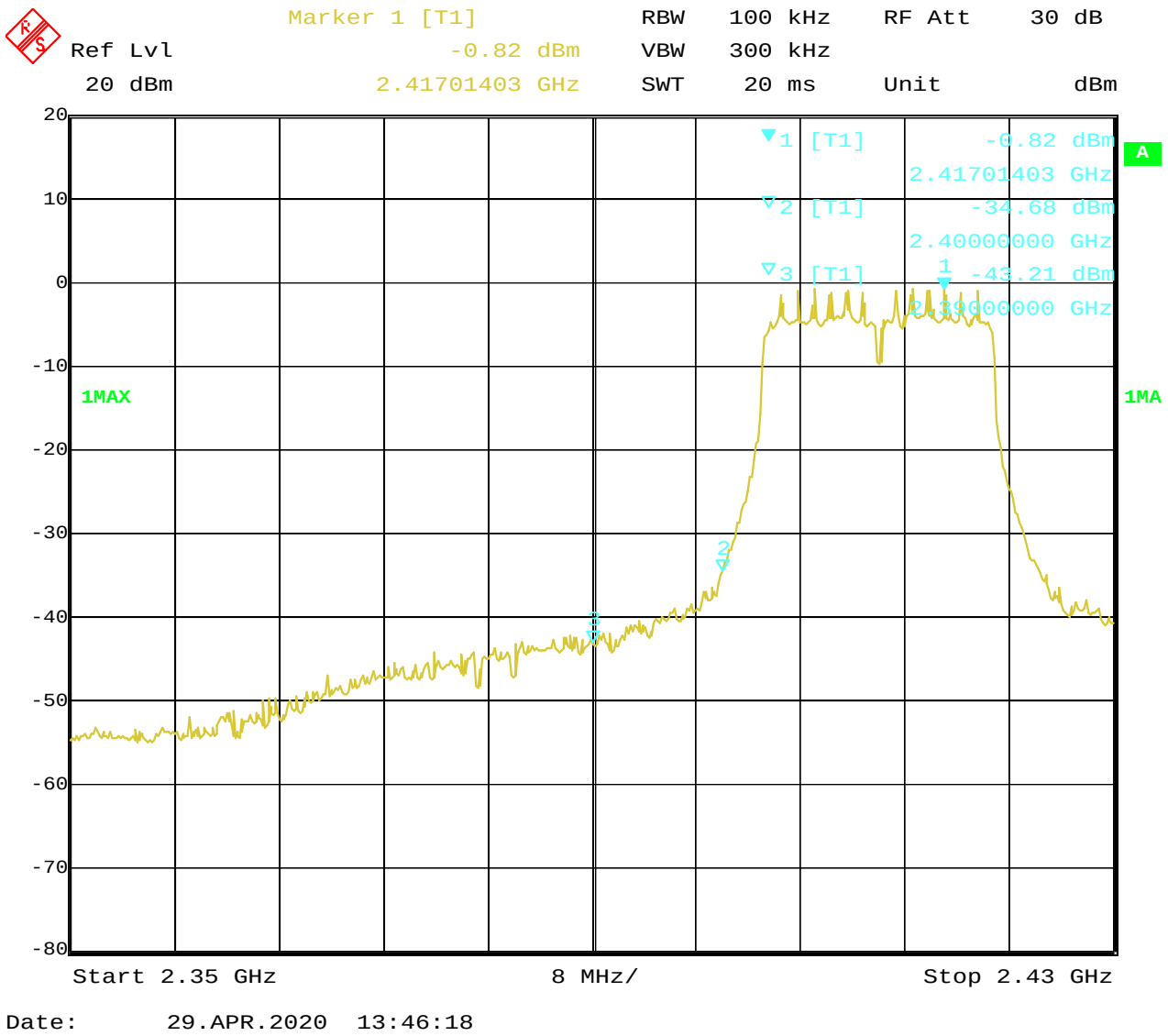
For 802.11n (HT20) mode

CH01 at mcs0

10.4 Band-edge Measurement

EUT	Gateway	Model	GGW-1219-01
Mode	Keeping Transmitting	Input Voltage	DC5V
Temperature	24 deg. C,	Humidity	56% RH
Test Result:	Pass	Detector	PK

Test Figure:



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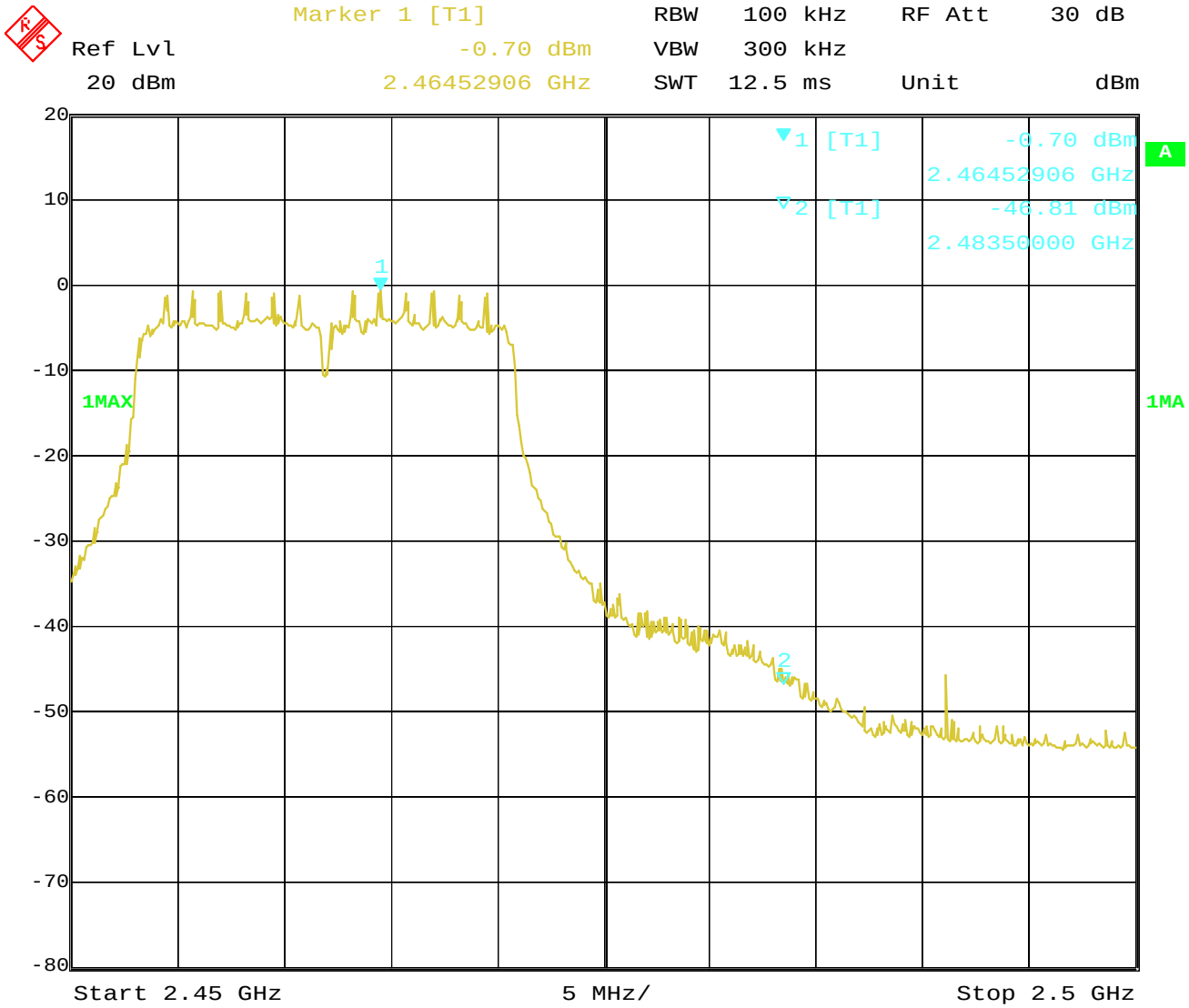
CH11 at mcs0

10.4 Band-edge Measurement

EUT	Gateway	Model	GGW-1219-01
Mode	Keeping Transmitting	Input Voltage	DC5V
Temperature	24 deg. C,	Humidity	56% RH
Test Result:	Pass	Detector	PK

Test Figure:



Date: 29.APR.2020 14:01:47

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10.5 Restricted band Measurement

EUT	Gateway		Model	GGW-1219-01
Mode	Keeping Transmitting		Input Voltage	DC5V
Temperature	24 deg. C,		Humidity	56% RH
Test Result:	Pass		Detector	PK
802.11b mode, Low Channel, Horizontal				
2390	PK (dBμV/m)	48.11	Limit	74(dBμV/m)
	AV (dBμV/m)	--		54(dBμV/m)
802.11b mode, Vertical				
2390	PK (dBμV/m)	45.32	Limit	74(dBμV/m)
	AV (dBμV/m)	--		54(dBμV/m)

10.5 Restricted band Measurement

EUT	Gateway		Model	GGW-1219-01
Mode	Keeping Transmitting		Input Voltage	DC5V
Temperature	24 deg. C,		Humidity	56% RH
Test Result:	Pass		Detector	PK
802.11b mode, High Channel, Horizontal				
2483.5	PK (dBμV/m)	47.06	Limit	74(dBμV/m)
	AV (dBμV/m)	--		54(dBμV/m)
802.11b mode, High Channel, Vertical				
2483.5	PK (dBμV/m)	44.37	Limit	74(dBμV/m)
	AV (dBμV/m)	--		54(dBμV/m)

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10.5 Restricted band Measurement

EUT	Gateway		Model	GGW-1219-01
Mode	Keeping Transmitting		Input Voltage	DC5V
Temperature	24 deg. C,		Humidity	56% RH
Test Result:	Pass		Detector	PK
802.11g mode, Low Channel, Horizontal				
2390	PK (dBμV/m)	56.21	Limit	74(dBμV/m)
	AV (dBμV/m)	44.71		54(dBμV/m)
802.11g mode, Vertical				
2390	PK (dBμV/m)	53.52	Limit	74(dBμV/m)
	AV (dBμV/m)	39.81		54(dBμV/m)

10.5 Restricted band Measurement

EUT	Gateway		Model	GGW-1219-01
Mode	Keeping Transmitting		Input Voltage	DC5V
Temperature	24 deg. C,		Humidity	56% RH
Test Result:	Pass		Detector	PK
802.11g mode, High Channel, Horizontal				
2483.5	PK (dBμV/m)	52.19	Limit	74(dBμV/m)
	AV (dBμV/m)	38.23		54(dBμV/m)
802.11g mode, High Channel, Vertical				
2483.5	PK (dBμV/m)	49.21	Limit	74(dBμV/m)
	AV (dBμV/m)	--		54(dBμV/m)

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10.5 Restricted band Measurement

EUT	Gateway		Model	GGW-1219-01
Mode	Keeping Transmitting		Input Voltage	DC5V
Temperature	24 deg. C,		Humidity	56% RH
Test Result:	Pass		Detector	PK
802.11n HT20 mode, Low Channel, Horizontal				
2390	PK (dBμV/m)	57.36	Limit	74(dBμV/m)
	AV (dBμV/m)	45.29		54(dBμV/m)
802.11n HT20 mode, Low Channel, Vertical				
2390	PK (dBμV/m)	55.71	Limit	74(dBμV/m)
	AV (dBμV/m)	41.89		54(dBμV/m)

10.5 Restricted band Measurement

EUT	Gateway		Model	GGW-1219-01
Mode	Keeping Transmitting		Input Voltage	DC5V
Temperature	24 deg. C,		Humidity	56% RH
Test Result:	Pass		Detector	PK
802.11n HT20 mode, High Channel, Horizontal				
2483.5	PK (dBμV/m)	54.26	Limit	74(dBμV/m)
	AV (dBμV/m)	40.92		54(dBμV/m)
802.11n HT20 mode, High Channel, Vertical				
2483.5	PK (dBμV/m)	51.68	Limit	74(dBμV/m)
	AV (dBμV/m)	38.52		54(dBμV/m)

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11.0 Antenna Requirement

11.1 Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

And according to FCC 47 CFR Section 15.247 (b), if transmitter antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the mount in dB that the directional gain of the antenna exceeds 6 dBi.

11.2 Antenna Connected construction

PCB antenna used. The gain of each antenna is 2.0dBi.

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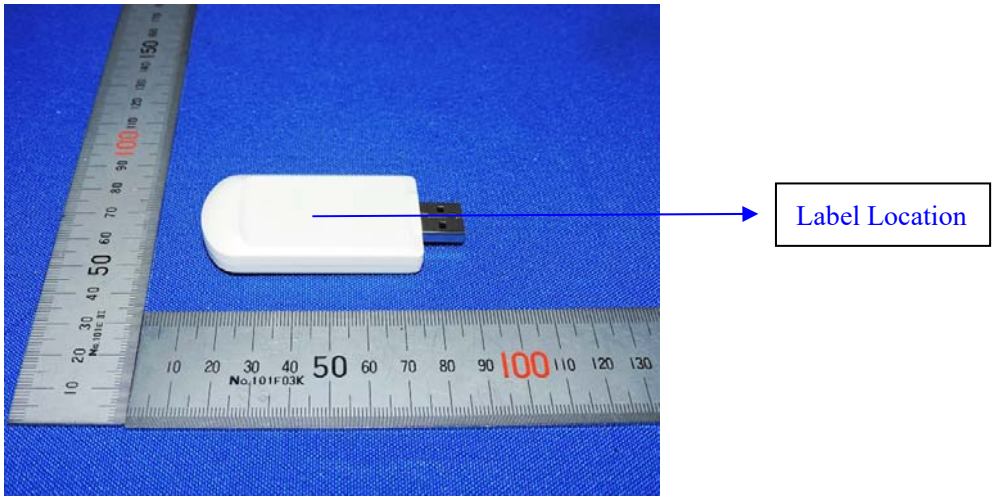
12.0 FCC ID Label

FCC ID: 2AWFD-GGW121901

The label must not be a stick-on paper label. The label on these products must be permanently affixed to the product and readily visible at the time of purchase and must last the expected lifetime of the equipment not be readily detachable.

Mark Location:



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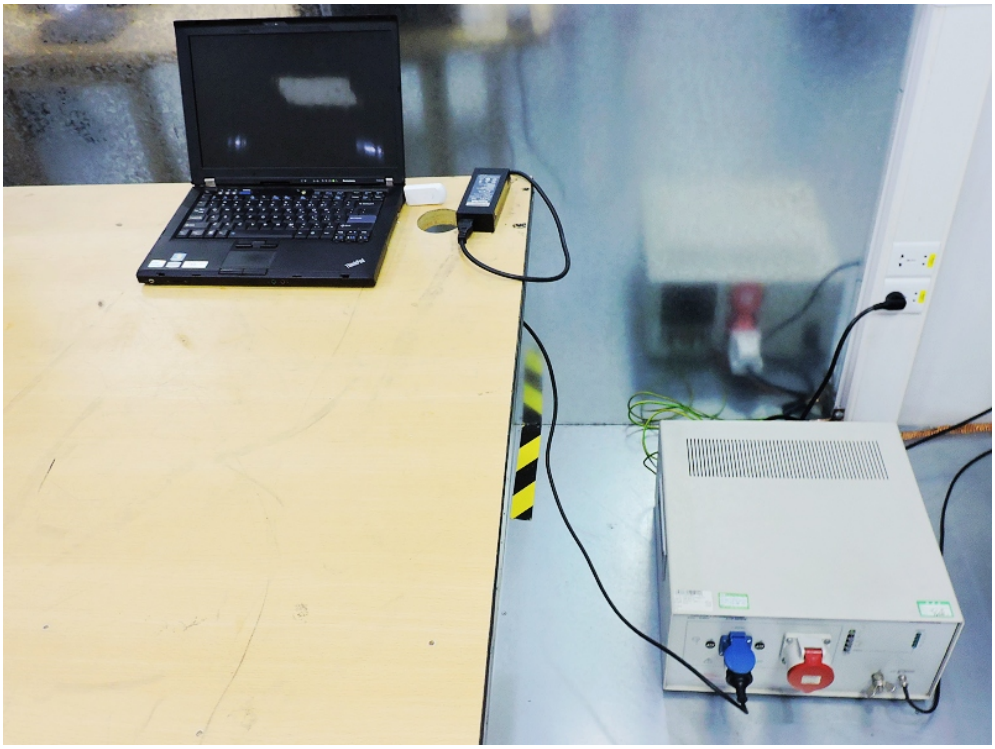
13.0 Photo of testing

Conducted Emission Test Setup:



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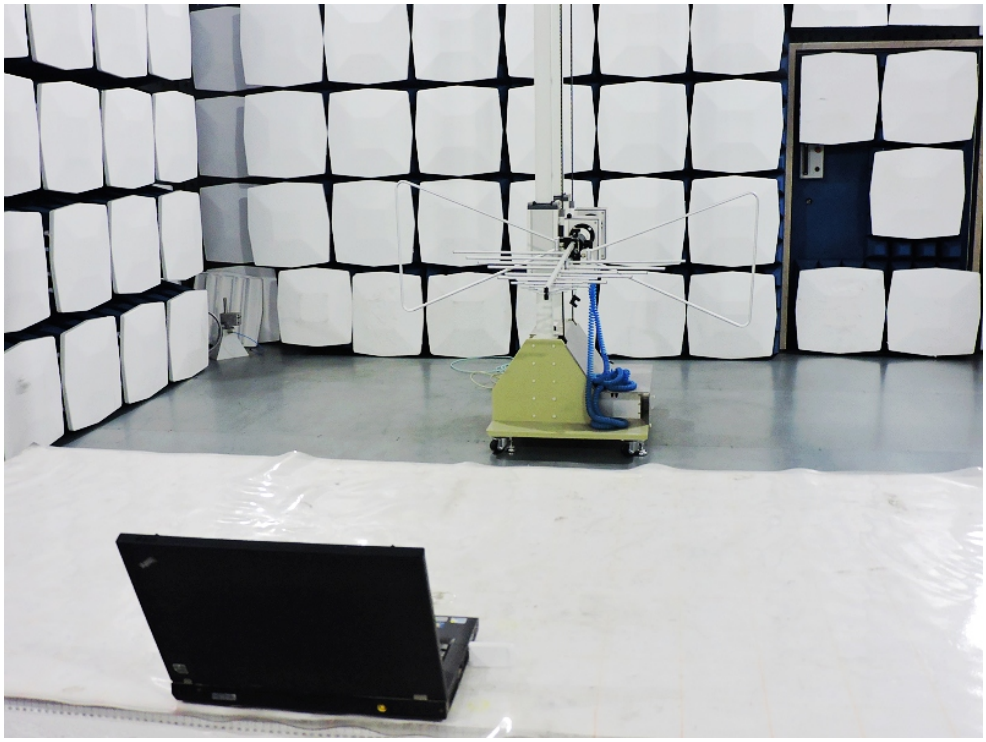
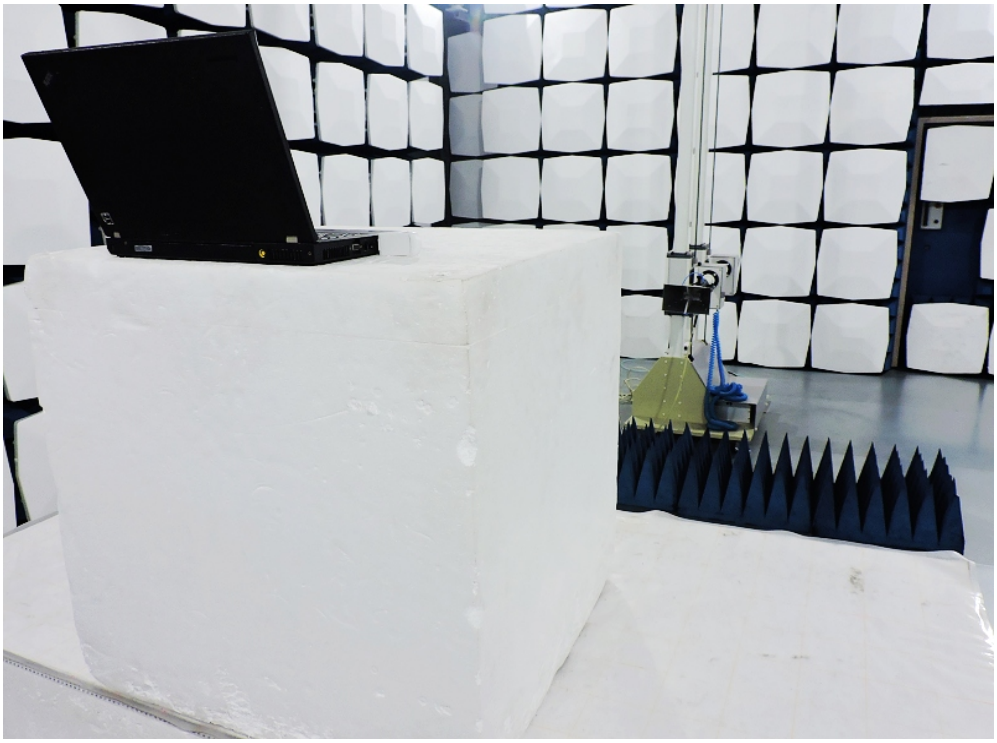
Radiated Emission Test Setup:





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Photographs – EUT

Outside View

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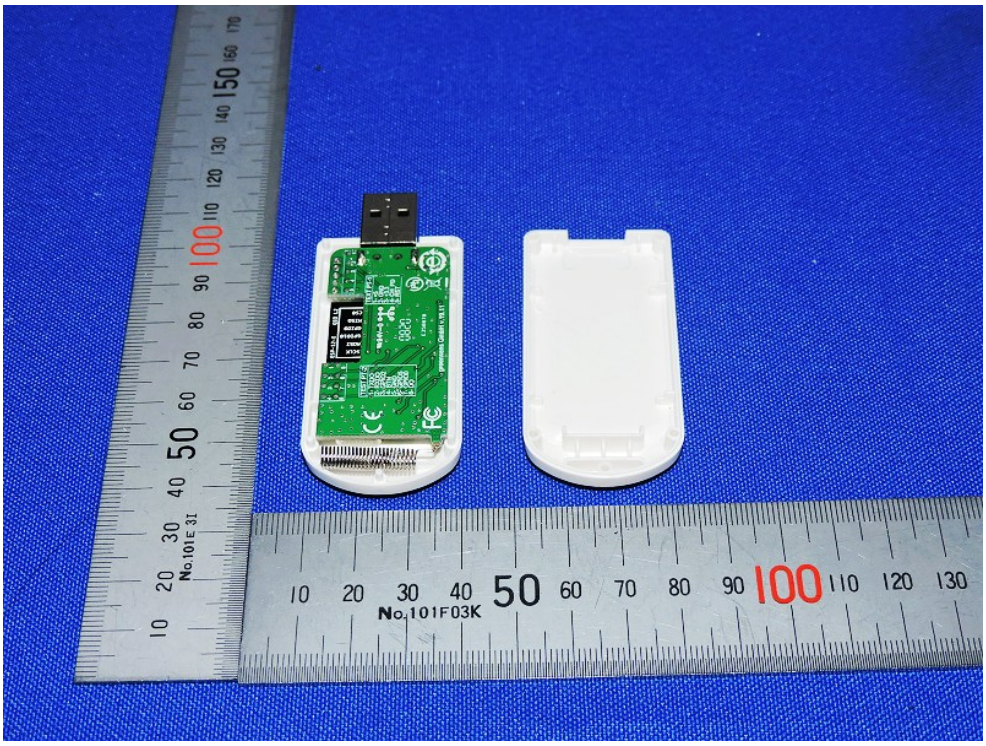
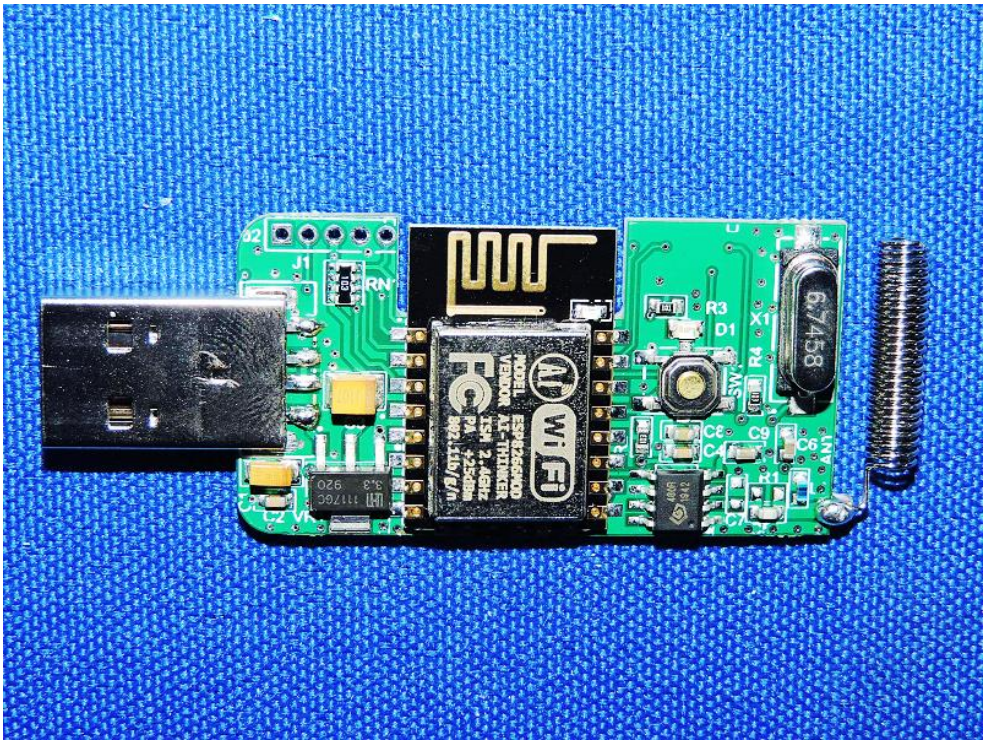
Inside view





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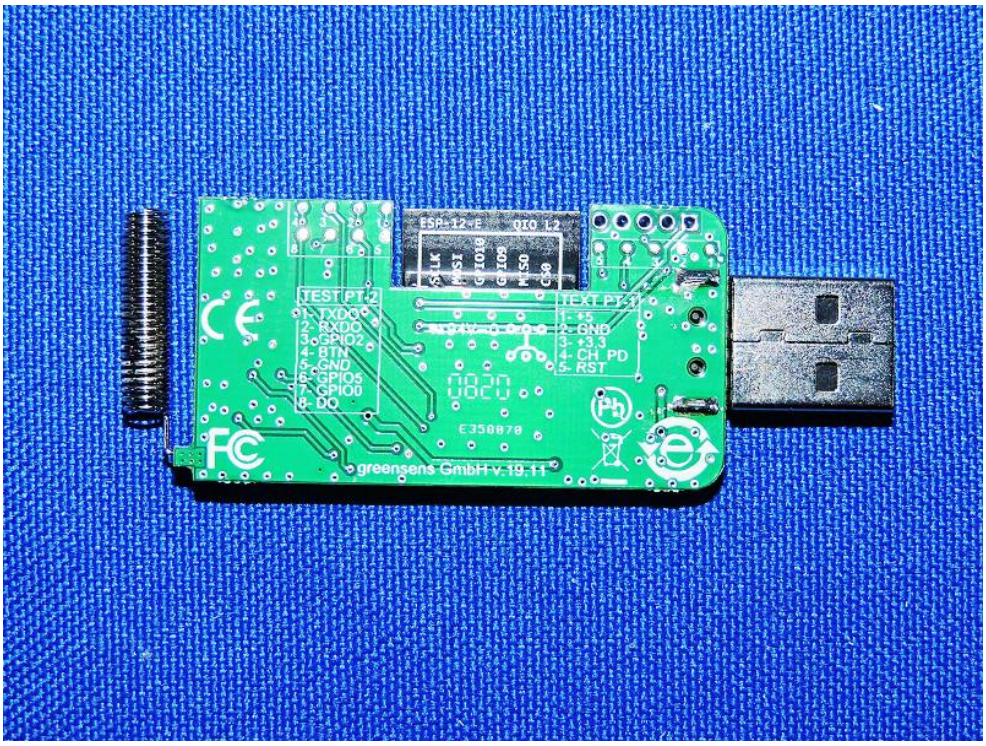
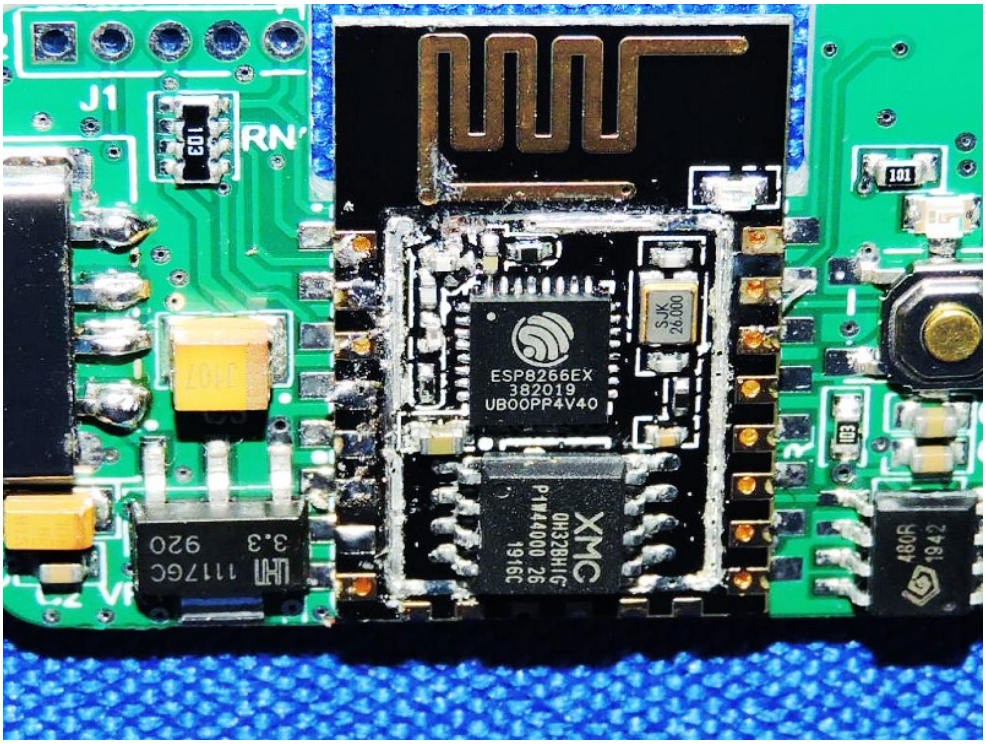
Inside view





End of the report

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