



FCC TEST REPORT

FCC ID: SY4-A02026

On Behalf of

Shanghai Huace Navigation Technology LTD.

Geodetic GNSS Receiver

Model No.: i50

Prepared for : Shanghai Huace Navigation Technology LTD.
Address : 599 Gaojing Road, Building D, Shanghai 201702, China

Prepared By : Shenzhen Alpha Product Testing Co., Ltd.
Address : Building i, No.2, Lixin Road, Fuyong Street, Bao'an District, 518103,
Shenzhen, Guangdong, China

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TEST REPORT DECLARATION

Applicant : Shanghai Huace Navigation Technology LTD.
 Address : 599 Gaojing Road, Building D, Shanghai 201702, China
 Manufacturer : Shanghai Huace Navigation Technology LTD.
 Address : 599 Gaojing Road, Building D, Shanghai 201702, China
 EUT Description : Geodetic GNSS Receiver
 (A) Model No. : i50

(B) Trademark : 

Measurement Standard Used:

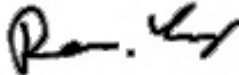
FCC Rules and Regulations Part 15 Subpart C Section 15.247
ANSI C63.10:2013

The device described above is tested by Shenzhen Alpha Product Testing Co., Ltd. to determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 15 Subpart C limits both conducted and radiated emissions. The test results are contained in this test report and Shenzhen Alpha Product Testing Co., Ltd. is assumed of full responsibility for the accuracy and completeness of these tests.

After the test, our opinion is that EUT compliance with the requirement of the above standards.

This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Shenzhen Alpha Product Testing Co., Ltd.

Tested by (name + signature).....: Reak Yang
 Project Engineer



Approved by (name + signature).....: Simple Guan
 Project Manager



Date of issue..... : July 14, 2020

Revision History

Revision	Issue Date	Revisions	Revised By
V0	July 14, 2020	Initial released Issue	Reak Yang

1. Summary Of Standards And Results

1.1. Description of Standards and Results

The EUT have been tested according to the applicable standards as referenced below:

Test Item	Standards Paragraph	Result
Conducted Emission	FCC PART 15: 15.207 ANSI C63.10 :2013	P
6dB Bandwidth	FCC PART 15: 15.247 (a)(2) ANSI C63.10 :2013	P
Output Power	FCC PART 15: 15.247 (b)(3) ANSI C63.10 :2013	P
Radiated Spurious Emission	FCC PART 15: 15.247 (c) ANSI C63.10 :2013	P
Conducted Spurious & Band Edge Emission	FCC PART 15: 15.247 (d) ANSI C63.10 :2013	P
Power Spectral Density	FCC PART 15: 15.247 (e) ANSI C63.10 :2013	P
Radiated Band Edge Emission	FCC PART 15: 15.205 ANSI C63.10 :2013	P
Antenna Requirement	FCC PART 15: 15.203 ANSI C63.10 :2013	P
Note:	1. P is an abbreviation for Pass. 2. F is an abbreviation for Fail. 3. N/A is an abbreviation for Not Applicable.	

2. General Information

2.1. Description of Device (EUT)

Description : Geodetic GNSS Receiver

Trademark : 

Model Number : i50

Diff : N/A

Test Voltage : DC 12-36V, 2A (for DC port)
or DC 7.4V, 3400mAh (for replaceable lithium battery)

Operation frequency : 2412MHz-2462MHz for IEEE 802.11 b, g, n/HT20,
2422MHz~2452MHz for IEEE802.11n/HT40

Channel No. : 802.11b/802.11g /802.11n(HT20): 11CH
802.11(HT40): 7CH

Modulation type : IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK)
IEEE 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK)
IEEE 802.11n :OFDM(64QAM, 16QAM, QPSK, BPSK)

Antenna Type : Composite antenna, Maximum Gain is 1dBi

Software version : V1.0

Hardware version : i50_MAIN_V2.1

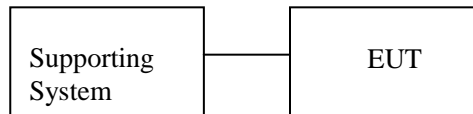
2.2. Accessories of Device (EUT)

Accessories1 : /
Manufacturer : /
Model : /
Input : /
Output : /

2.3. Tested Supporting System Details

No.	Description	Manufacturer	Model	Serial Number	Certification or DOC
--	--	--	--	--	--

2.4. Block Diagram of connection between EUT and simulators



2.5. Test Mode Description

Duty cycle :100% Keeping TX			
Mode	data rate (Mbps)(see Note)	Channel	Frequency (MHz)
IEEE 802.11b	1	Low :CH1	2412
	1	Middle: CH6	2437
	1	High: CH11	2462
IEEE 802.11g	6	Low :CH1	2412
	6	Middle: CH6	2437
	6	High: CH11	2462
IEEE 802.11 n/HT20 with 2.4G	6.5	Low :CH1	2412
	6.5	Middle: CH6	2437
	6.5	High: CH11	2462
IEEE 802.11 n/HT40 with 2.4G	13	Low :CH3	2422
	13	Middle: CH6	2437
	13	High: CH9	2452

Note: According exploratory test, EUT will have maximum output power in those data rate. so those data rate were used for all test.

Channel list:					
For IEEE 802.11b, g, n/HT20 with 2.4G					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
CH1	2412	CH5	2432	CH9	2452
CH2	2417	CH6	2437	CH10	2457
CH3	2422	CH7	2442	CH11	2462
CH4	2427	CH8	2447		
For IEEE 802.11 n/HT40 with 2.4G					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
CH1	2422	CH5	2442		
CH2	2427	CH6	2447		
CH3	2432	CH7	2452		
CH4	2437				

2.6. Test Conditions

Items	Required	Actual
Temperature range:	15-35°C	24°C
Humidity range:	25-75%	56%
Pressure range:	86-106kPa	98kPa

2.7. Test Facility

Shenzhen Alpha Product Testing Co., Ltd
Building i, No.2, Lixin Road, Fuyong Street, Bao'an District, 518103,
Shenzhen, Guangdong, China

June 21, 2018 File on Federal Communication Commission
Registration Number: 293961
Designation Number: CN1236
July 15, 2019 Certificated by IC
Registration Number: CN0085

2.8.Measurement Uncertainty

(95% confidence levels, k=2)

Item	Uncertainty
Uncertainty for Power point Conducted Emissions Test	2.74dB
Uncertainty for Radiation Emission test in 3m chamber (below 30MHz)	2.13 dB(Polarize: V)
	2.57dB(Polarize: H)
Uncertainty for Radiation Emission test in 3m chamber (30MHz to 1GHz)	3.77dB(Polarize: V)
	3.80dB(Polarize: H)
Uncertainty for Radiation Emission test in 3m chamber (1GHz to 25GHz)	4.16dB(Polarize: H)
	4.13dB(Polarize: V)
Uncertainty for radio frequency	5.4×10^{-8}
Uncertainty for conducted RF Power	0.37dB
Uncertainty for temperature	0.2°C
Uncertainty for humidity	1%
Uncertainty for DC and low frequency voltages	0.06%

2.9. Test Equipment List

Equipment	Manufacture	Model No.	Serial No.	Last cal.	Cal Interval
9*6*6 anechoic chamber	CHENYU	9*6*6	N/A	2019.09.06	3Year
Spectrum analyzer	ROHDE&SCHWARZ	FSV40-N	102137	2019.09.05	1Year
Spectrum analyzer	Agilent	N9020A	MY499100060	2019.09.05	1Year
Receiver	ROHDE&SCHWARZ	ESR	1316.3003K03-102082-Wa	2019.09.06	1Year
Receiver	R&S	ESCI	101165	2019.09.05	1Year
Bilog Antenna	Schwarzbeck	VULB 9168	VULB9168-438	2020.04.12	2Year
Horn Antenna	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D(1201)	2020.04.12	2Year
Active Loop Antenna	SCHWARZBECK	FMZB 1519B	00059	2019.09.07	2Year
Cable	Resenberger	N/A	No.1	2019.09.05	1Year
Cable	Resenberger	N/A	No.2	2019.09.05	1Year
Cable	Resenberger	N/A	No.3	2019.09.05	1Year
Pre-amplifier	HP	HP8347A	2834A00455	2019.09.05	1Year
Pre-amplifier	Agilent	8449B	3008A02664	2019.09.05	1Year
L.I.S.N.#1	Schwarzbeck	NSLK8126	8126466	2019.09.05	1Year
L.I.S.N.#2	ROHDE&SCHWARZ	ENV216	101043	2019.09.05	1 Year
20db Attenuator	ICPROBING	IATS1	82347	2019.08.26	1 Year
Horn Antenna	A-INFOMW	BBHA9170	00946	2019.09.07	2 Year
Preamplifier	SKET	LNPA_1840-50	SK2018101801	2019.09.06	1 Year
Power Meter	Agilent	E9300A	MY41496625	2019.09.06	1 Year
Temp. & Humid. Chamber	Weihuang	WHTH-1000-40-880	100631	2019.09.06	1 Year
Switching Mode Power Supply	JUNKE	JK12010S	20140927-6	2019.09.05	1 Year

3. Spurious Emission

3.1. Test Limits

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

Harmonic emissions limits comply with below 54 dBuV/m at 3m. Other emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or comply with the radiated emissions limits specified in section 15.209(a) limit in the table below has to be followed.

NOTE:

- a) The tighter limit applies at the band edges.
- b) Emission Level(dB uV/m)=20log Emission Level(Uv/m)

3.2. Test Procedure

The measuring distance of 3m shall be used for measurements at frequency below 1GHz and above 1GHz, The EUT was placed on a rotating 80cm above the ground plane inside a semi-anechoic chamber for below 1GHz and 150cm above the ground plane inside a semi-anechoic chamber for above 1GHz, The table was rotated 360 degrees to determine the position of the highest radiation.

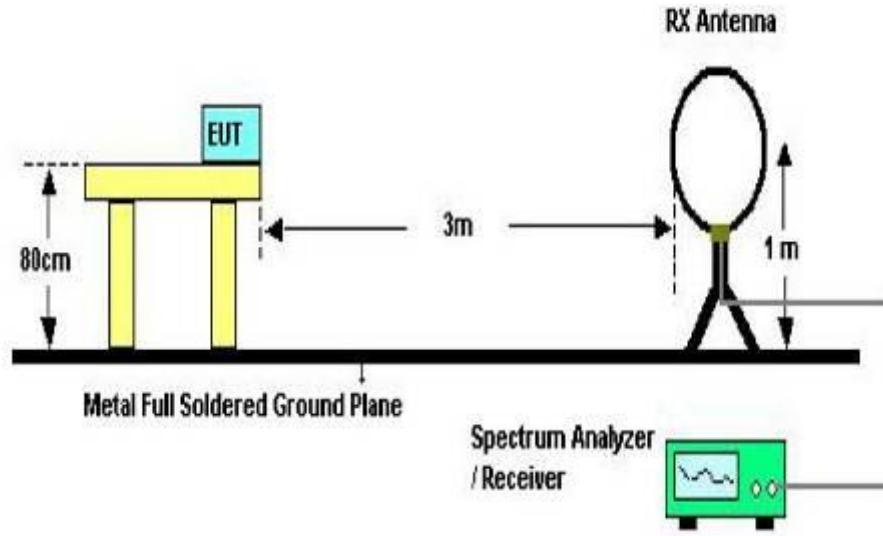
The Test antenna shall vary between 1m and 4m, Both Horizontal and Vertical antenna are set of make measurement.

The initial step in collecting conducted emission data is a spectrum analyzer Peak detector mode pre-scanning the measurement frequency range. Significant Peaks are then marked. and then Qusia Peak Detector mode premeasured.

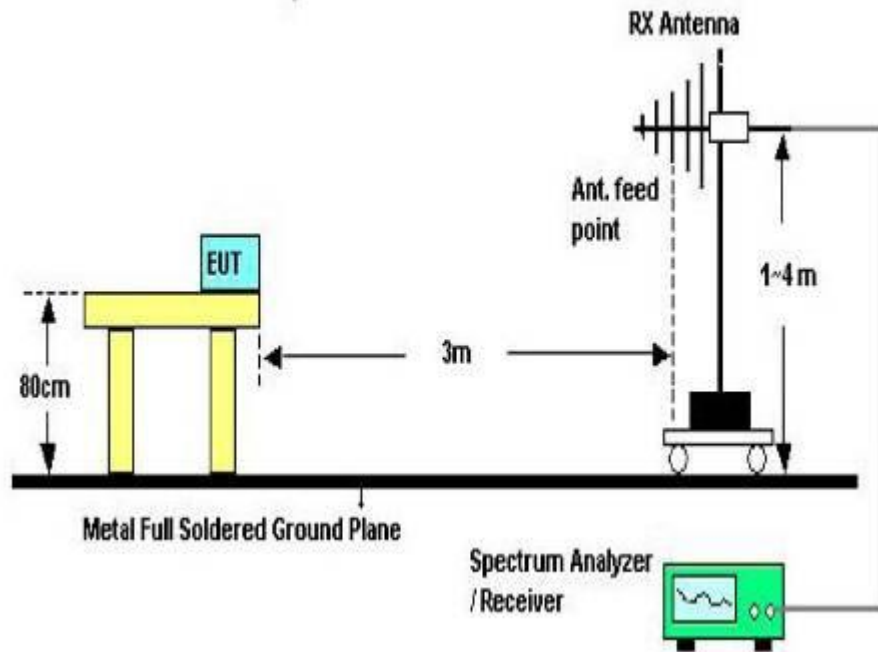
If Peak value comply with QP limit Below 1GHz.The EUT deemed to comply with QP limit. But the Peak value and average value both need to comply with applicable limit above 1GHz.

For the actual test configuration, please see the test setup photo.

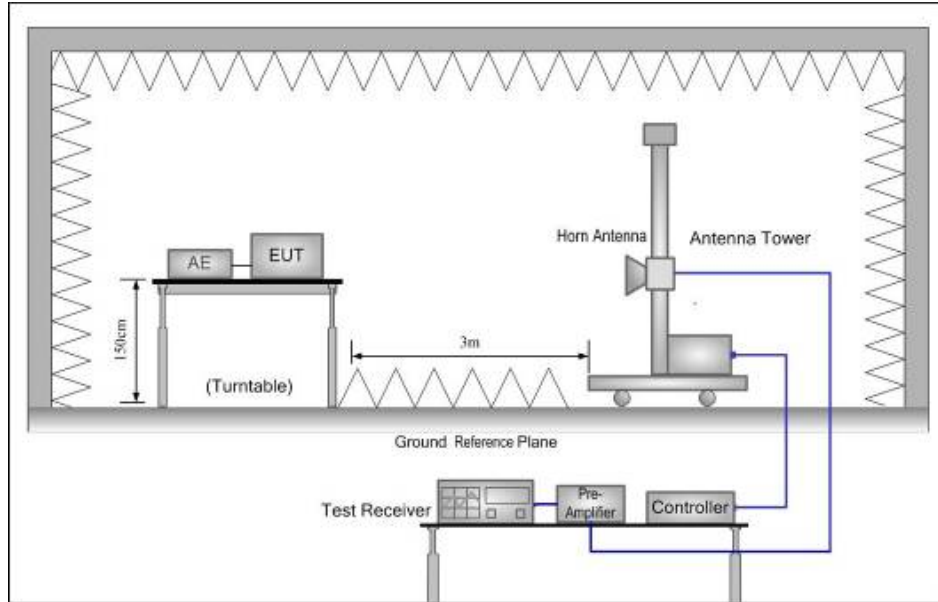
3.3. Test Setup



Below 30MHz Test Setup



Above 30MHz Test Setup



Above 1GHz Test Setup

3.4. Test Results

Test Condition

Continual Transmitting in maximum power.

9KHz~150KHz	RBW200Hz	VBW1KHz
150KHz~30MHz	RBW9KHz	VBW 30KHz
30MHz~1GHz	RBW120KHz	VBW 300KHz
Above1GHz	RBW1MHz	VBW 3MHz

We have scanned the 10th harmonic from 9 kHz to the EUT.

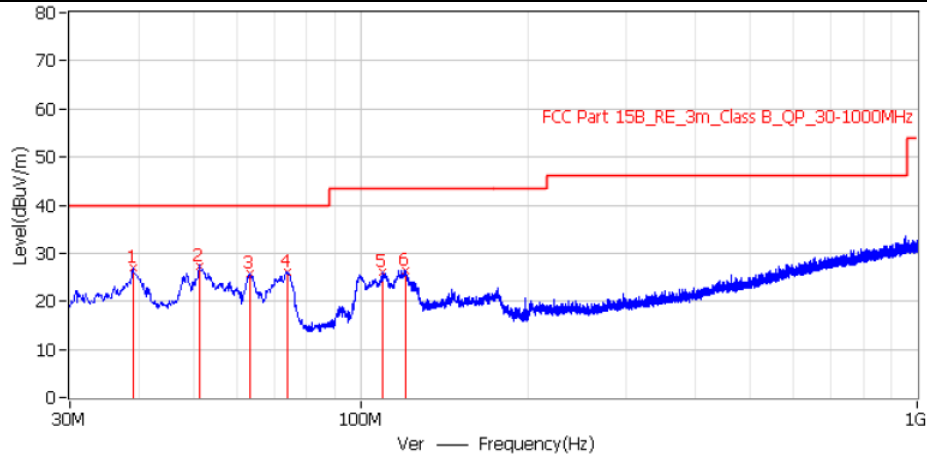
Detailed information please see the following page.

From 9KHz to 30MHz: Conclusion: PASS

Note:1.The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

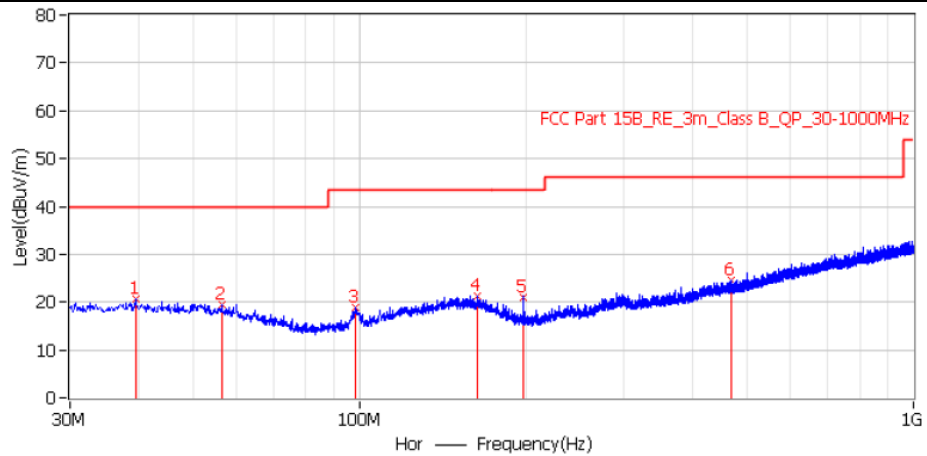
2.Only show the test data of the worst Channel in this report.

EUT Description	Geodetic GNSS Receiver	Model No.	i50
Temperature	24°C	Humidity	56%
Pol	Vertical	Test date	2020/07/09
Test Voltage	DC 7.4V	Test mode	802.11b (2412MHz)



No.	Frequency	Level dBuV/m	Factor dB/m	Limit dBuV/m	Margin dB	Detector	Polar	Height cm	Angle deg
1*	38.972 MHz	27.0	20.2	40.0	-13.0	PK	Ver	100.0	134.0
2*	51.340 MHz	27.4	19.7	40.0	-12.6	PK	Ver	100.0	1.0
3*	63.222 MHz	25.9	18.5	40.0	-14.1	PK	Ver	100.0	11.0
4*	73.771 MHz	26.2	16.6	40.0	-13.8	PK	Ver	100.0	91.0
5*	109.419 MHz	26.0	17.6	43.5	-17.5	PK	Ver	100.0	80.0
6*	120.453 MHz	26.5	18.9	43.5	-17.0	PK	Ver	100.0	74.0

Pol	Horizontal
------------	------------



No.	Frequency	Level dBuV/m	Factor dB/m	Limit dBuV/m	Margin dB	Detector	Polar	Height cm	Angle deg
1*	39.458 MHz	20.6	20.2	40.0	-19.4	PK	Hor	100.0	323.0
2*	56.311 MHz	19.4	19.4	40.0	-20.6	PK	Hor	100.0	285.0
3*	98.142 MHz	18.8	16.5	43.5	-24.7	PK	Hor	100.0	218.0
4*	163.254 MHz	21.4	20.6	43.5	-22.1	PK	Hor	100.0	285.0
5*	197.931 MHz	21.1	16.8	43.5	-22.4	PK	Hor	100.0	261.0
6*	469.774 MHz	24.5	23.6	46.0	-21.5	PK	Hor	100.0	333.0

Note: 1. *:Maximum data; x:Over limit; !:over margin.
 2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

From 1G-25GHz

Test Mode: IEEE 802.11b TX Low									
Freq (MHz)	Read Level (dBuV/m)	Polar (H/V)	Antenna Factor (dB/m)	Cable loss(dB)	Amp Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4824	43.76	V	33.95	10.18	34.26	53.63	74	-20.37	PK
4824	35.03	V	33.95	10.18	34.26	44.90	54	-9.10	AV
7236	/	/	/	/	/	/	/	/	/
9648	/	/	/	/	/	/	/	/	/
4824	42.42	H	33.95	10.18	34.26	52.29	74	-21.71	PK
4824	35.36	H	33.95	10.18	34.26	45.23	54	-8.77	AV
7236	/	/	/	/	/	/	/	/	/
9648	/	/	/	/	/	/	/	/	/
Test Mode: IEEE 802.11b TX Mid									
4874	45.61	V	33.93	10.2	34.29	55.45	74	-18.55	PK
4874	36.13	V	33.93	10.2	34.29	45.97	54	-8.03	AV
7311	/	/	/	/	/	/	/	/	/
9748	/	/	/	/	/	/	/	/	/
4874	44.88	H	33.93	10.2	34.29	54.72	74	-19.28	PK
4874	34.18	H	33.93	10.2	34.29	44.02	54	-9.98	AV
7311	/	/	/	/	/	/	/	/	/
9748	/	/	/	/	/	/	/	/	/
Test Mode: IEEE 802.11b TX High									
4924	43.60	V	33.98	10.22	34.25	53.55	74	-20.45	PK
4924	35.56	V	33.98	10.22	34.25	45.51	54	-8.49	AV
7386	/	/	/	/	/	/	/	/	/
9848	/	/	/	/	/	/	/	/	/
4924	46.61	H	33.98	10.22	34.25	56.56	74	-17.44	PK
4924	35.82	H	33.98	10.22	34.25	45.77	54	-8.23	AV
7386	/	/	/	/	/	/	/	/	/
9848	/	/	/	/	/	/	/	/	/
Note:									
1, Result = Read level + Antenna factor + cable loss-Amp factor									
2, All the other emissions not reported were too low to read and deemed to comply with FCC limit.									

Test Mode: IEEE 802.11g TX Low									
Freq (MHz)	Read Level (dBuV/m)	Polar (H/V)	Antenna Factor (dB/m)	Cable loss(dB)	Amp Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4824	43.87	V	33.95	10.18	34.26	53.74	74	-20.26	PK
4824	34.87	V	33.95	10.18	34.26	44.74	54	-9.26	AV
7236	/	/	/	/	/	/	/	/	/
9648	/	/	/	/	/	/	/	/	/
4824	42.36	H	33.95	10.18	34.26	52.23	74	-21.77	PK
4824	35.34	H	33.95	10.18	34.26	45.21	54	-8.79	AV
7236	/	/	/	/	/	/	/	/	/
9648	/	/	/	/	/	/	/	/	/
Test Mode: IEEE 802.11g TX Mid									
4874	45.88	V	33.93	10.2	34.25	55.76	74	-18.24	PK
4874	35.55	V	33.93	10.2	34.25	45.43	54	-8.57	AV
7311	/	/	/	/	/	/	/	/	/
9748	/	/	/	/	/	/	/	/	/
4874	44.42	H	33.93	10.2	34.29	54.26	74	-19.74	PK
4874	33.67	H	33.93	10.2	34.29	43.51	54	-10.49	AV
7311	/	/	/	/	/	/	/	/	/
9748	/	/	/	/	/	/	/	/	/
Test Mode: IEEE 802.11g TX High									
4924	43.73	V	33.98	10.22	34.25	53.68	74	-20.32	PK
4924	35.18	V	33.98	10.22	34.25	45.13	54	-8.87	AV
7386	/	/	/	/	/	/	/	/	/
9848	/	/	/	/	/	/	/	/	/
4924	47.23	H	33.98	10.22	34.25	57.18	74	-16.82	PK
4924	36.08	H	33.98	10.22	34.25	46.03	54	-7.97	AV
7386	/	/	/	/	/	/	/	/	/
9848	/	/	/	/	/	/	/	/	/
Note:									
1, Result = Read level + Antenna factor + cable loss-Amp factor									
2, All the other emissions not reported were too low to read and deemed to comply with FCC limit.									

Test Mode:IEEE 802.11n HT20 TX Low									
Freq (MHz)	Read Level (dBuV/m)	Polar (H/V)	Antenna Factor (dB/m)	Cable loss(dB)	Amp Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4824	43.87	V	33.95	10.18	34.26	53.74	74	-20.26	PK
4824	34.87	V	33.95	10.18	34.26	44.74	54	-9.26	AV
7236	/	/	/	/	/	/	/	/	/
9648	/	/	/	/	/	/	/	/	/
4824	42.36	H	33.95	10.18	34.26	52.23	74	-21.77	PK
4824	35.34	H	33.95	10.18	34.26	45.21	54	-8.79	AV
7236	/	/	/	/	/	/	/	/	/
9648	/	/	/	/	/	/	/	/	/
Test Mode:IEEE 802.11n HT20 TX Mid									
4874	45.88	V	33.93	10.2	34.25	55.76	74	-18.24	PK
4874	35.55	V	33.93	10.2	34.25	45.43	54	-8.57	AV
7311	/	/	/	/	/	/	/	/	/
9748	/	/	/	/	/	/	/	/	/
4874	44.42	H	33.93	10.2	34.29	54.26	74	-19.74	PK
4874	33.67	H	33.93	10.2	34.29	43.51	54	-10.49	AV
7311	/	/	/	/	/	/	/	/	/
9748	/	/	/	/	/	/	/	/	/
Test Mode:IEEE 802.11n HT20 TX High									
4924	43.73	V	33.98	10.22	34.25	53.68	74	-20.32	PK
4924	35.18	V	33.98	10.22	34.25	45.13	54	-8.87	AV
7386	/	/	/	/	/	/	/	/	/
9848	/	/	/	/	/	/	/	/	/
4924	47.23	H	33.98	10.22	34.25	57.18	74	-16.82	PK
4924	36.08	H	33.98	10.22	34.25	46.03	54	-7.97	AV
7386	/	/	/	/	/	/	/	/	/
9848	/	/	/	/	/	/	/	/	/
Note:									
1, Result = Read level + Antenna factor + cable loss-Amp factor									
2, All the other emissions not reported were too low to read and deemed to comply with FCC limit.									

Test Mode:IEEE 802.11n HT40 TX Low									
Freq (MHz)	Read Level (dBuV/m)	Polar (H/V)	Antenna Factor (dB/m)	Cable loss(dB)	Amp Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4844	44.43	V	33.95	10.18	34.26	54.30	74	-19.70	PK
4844	35.43	V	33.95	10.18	34.26	45.30	54	-8.70	AV
7266	/	/	/	/	/	/	/	/	/
9688	/	/	/	/	/	/	/	/	/
4844	42.41	H	33.95	10.18	34.26	52.28	74	-21.72	PK
4844	34.73	H	33.95	10.18	34.26	44.60	54	-9.40	AV
7266	/	/	/	/	/	/	/	/	/
9688	/	/	/	/	/	/	/	/	/
Test Mode:IEEE 802.11n HT40 TX Mid									
4874	45.66	V	33.93	10.2	34.29	55.50	74	-18.50	PK
4874	35.28	V	33.93	10.2	34.29	45.12	54	-8.88	AV
7311	/	/	/	/	/	/	/	/	/
9748	/	/	/	/	/	/	/	/	/
4874	45.14	H	33.93	10.2	34.29	54.98	74	-19.02	PK
4874	33.81	H	33.93	10.2	34.29	43.65	54	-10.35	AV
7311	/	/	/	/	/	/	/	/	/
9748	/	/	/	/	/	/	/	/	/
Test Mode:IEEE 802.11n HT40 TX High									
4904	43.86	V	33.98	10.22	34.25	53.81	74	-20.19	PK
4904	35.59	V	33.98	10.22	34.25	45.54	54	-8.46	AV
7356	/	/	/	/	/	/	/	/	/
9808	/	/	/	/	/	/	/	/	/
4904	46.75	H	33.98	10.22	34.25	56.70	74	-17.30	PK
4904	36.31	H	33.98	10.22	34.25	46.26	54	-7.74	AV
7356	/	/	/	/	/	/	/	/	/
9808	/	/	/	/	/	/	/	/	/
Note:									
1, Result = Read level + Antenna factor + cable loss-Amp factor									
2, All the other emissions not reported were too low to read and deemed to comply with FCC limit.									

4. Power Line Conducted Emission

4.1. Test Limits

Frequency MHz	Limits dB(μ V)	
	Quasi-peak Level	Average Level
0.15 -0.50	66 -56*	56 - 46*
0.50 -5.00	56	46
5.00 -30.00	60	50

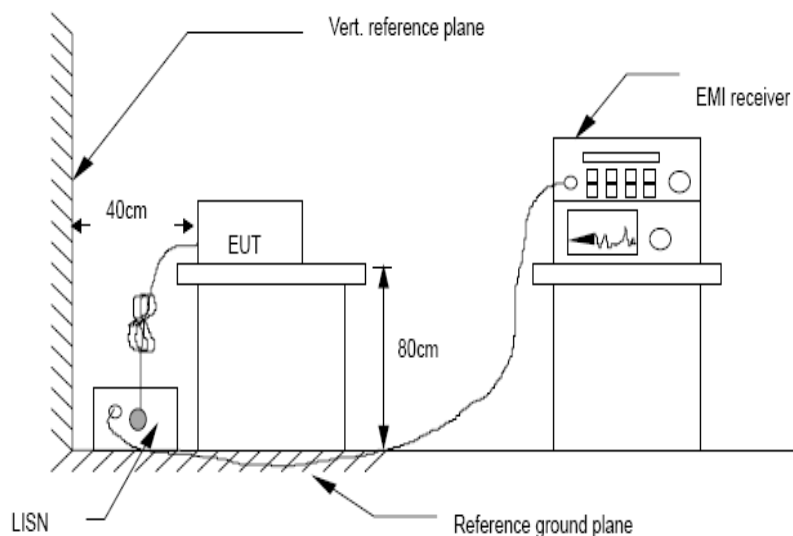
- Notes: 1. *Decreasing linearly with logarithm of frequency.
 2. The lower limit shall apply at the transition frequencies.
 3. The limit decreases in line with the logarithm of the frequency in the rang of 0.15 to 0.50 MHz.

4.2. Test Procedure

The EUT is put on the plane 0.8m high above the ground by insulating support and is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both sides of AC lines are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to ANSI C63.10:2013 on Conducted Emission Measurement.

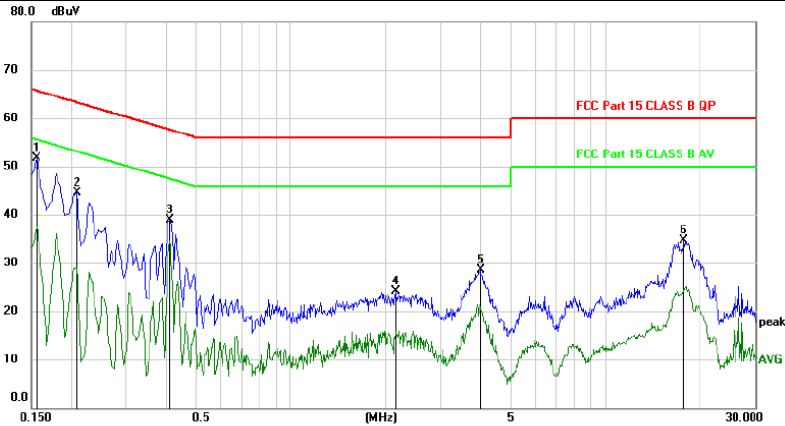
The bandwidth of test receiver is set at 9 kHz.

4.3. Test Setup



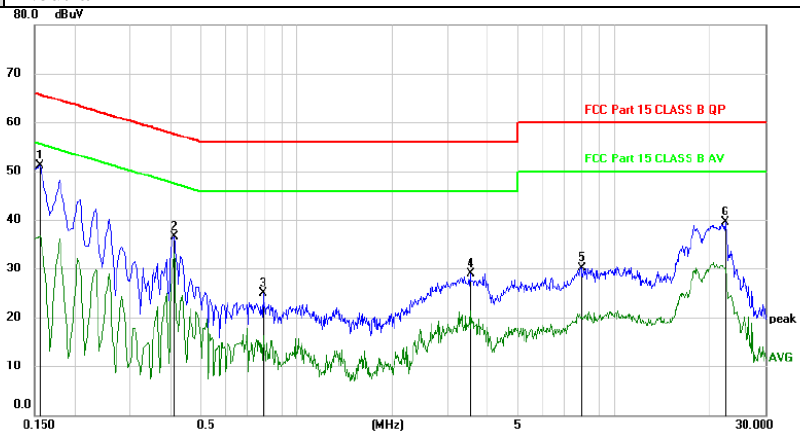
4.4. Test Results

EUT Description	Geodetic GNSS Receiver	Model No.	i50
Temperature	24°C	Humidity	56%
Pol	Line	Test date	2020/07/09
Test Voltage	AC 120V/60Hz	Test mode	802.11b (2412MHz)



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measurement dBuV	Limit dBuV	Margin dB	Detector	Comment
1	*	0.1560	41.68	9.94	51.62	65.67	-14.05	peak	
2		0.2100	34.66	9.93	44.59	63.21	-18.62	peak	
3		0.4140	29.06	9.94	39.00	57.57	-18.57	peak	
4		2.1660	14.16	9.89	24.05	56.00	-31.95	peak	
5		4.0260	18.45	9.97	28.42	56.00	-27.58	peak	
6		17.8200	24.39	10.41	34.80	60.00	-25.20	peak	

Pol	Neutral
------------	---------



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measurement dBuV	Limit dBuV	Margin dB	Detector	Comment
1	*	0.1560	41.22	9.94	51.16	65.67	-14.51	peak	
2		0.4140	26.51	9.94	36.45	57.57	-21.12	peak	
3		0.7860	14.89	9.94	24.83	56.00	-31.17	peak	
4		3.5460	18.87	9.96	28.83	56.00	-27.17	peak	
5		7.9260	20.00	10.15	30.15	60.00	-29.85	peak	
6		22.3020	28.99	10.45	39.44	60.00	-20.56	peak	

Note: 1. *:Maximum data; x:Over limit; !:over margin.
 2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

5. Conducted Maximum Output Power

5.1. Test limits

Please refer section 15.247.

Regulation 15.247(b) The limit of Maximum PK Output Power Measurement is 1 W (30dBm)

5.2. Test Procedure

Details see the KDB558074 D01 Meas Guidance v05r02

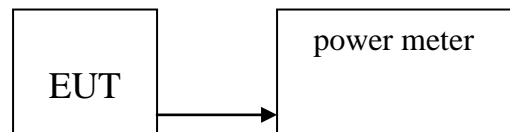
5.2.1 Place the EUT on the table and set it in transmitting mode.

5.2.2 Connected the EUT's antenna port to PK power meter by 20dB attenuator.

5.2.3 Measure out each mode and each bands PK output power of EUT.

Note: The cable loss and attenuator loss were offset into measure device as amplitude offset.

5.3. Test Setup



5.4. Test Results

PASS

Detailed information please see the following page.

Condition	Mode	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Verdict
NVNT	802.11b	2412	11.179	30	Pass
NVNT	802.11b	2437	11.103	30	Pass
NVNT	802.11b	2462	12.693	30	Pass
NVNT	802.11g	2412	16.403	30	Pass
NVNT	802.11g	2437	15.743	30	Pass
NVNT	802.11g	2462	17.07	30	Pass
NVNT	802.11n(HT20)	2412	15.186	30	Pass
NVNT	802.11n(HT20)	2437	14.875	30	Pass
NVNT	802.11n(HT20)	2462	16.3	30	Pass
NVNT	802.11n(HT40)	2422	-2.668	30	Pass
NVNT	802.11n(HT40)	2437	-1.695	30	Pass
NVNT	802.11n(HT40)	2452	-1.195	30	Pass

6. Power Spectral Density

6.1. Test limits

6.1.1 Please refer section 15.247.

6.1.2 For direct sequence systems, the Average power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission.

6.1.3 The direct sequence operating of the hybrid system, with the frequency hopping operation turned off, shall comply with the power density requirements of paragraph (d) of this section.

6.2. Test Procedure

Details see the KDB558074 D01 Meas Guidance v05r02

6.2.1 Place the EUT on the table and set it in transmitting mode.

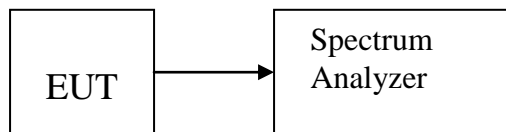
6.2.2 Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

6.2.3 Detector = RMS. Set the spectrum analyzer as $RBW = 3\text{kHz}$ (Set the RBW to: $3\text{kHz} \leq RBW \leq 100\text{kHz}$), $VBW = 10\text{kHz}$ (Set the $VBW \geq 3 \times RBW$), $span = 1.5 \times \text{DTS bandwidth}$., detail see the test plot.

6.2.4 Record the max reading.

6.2.5 Repeat the above procedure until the measurements for all frequencies are completed.

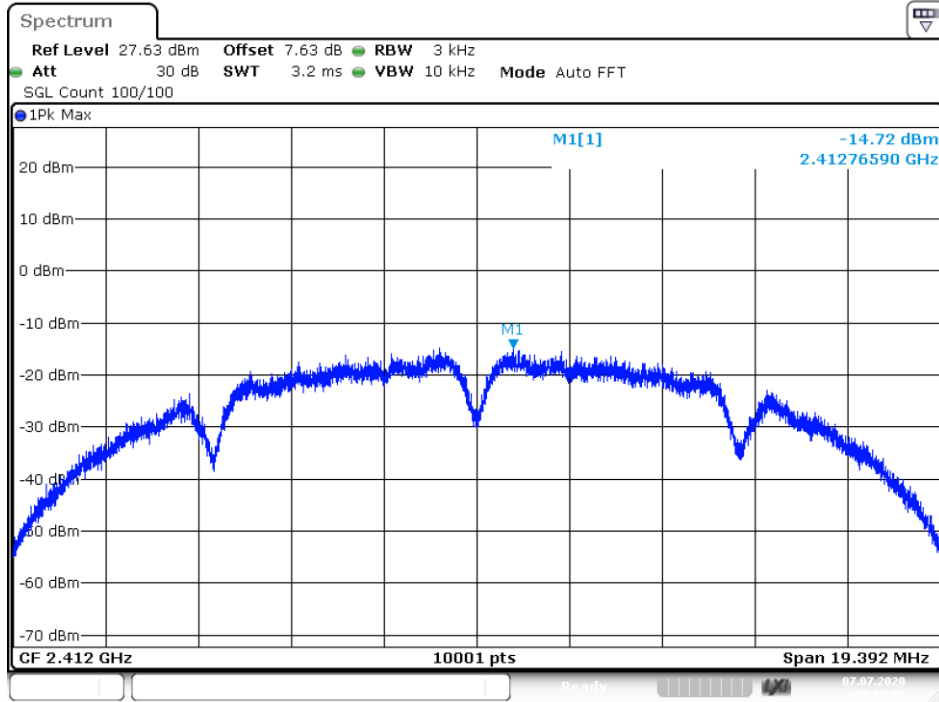
6.3. Test Setup



6.4. Test Results

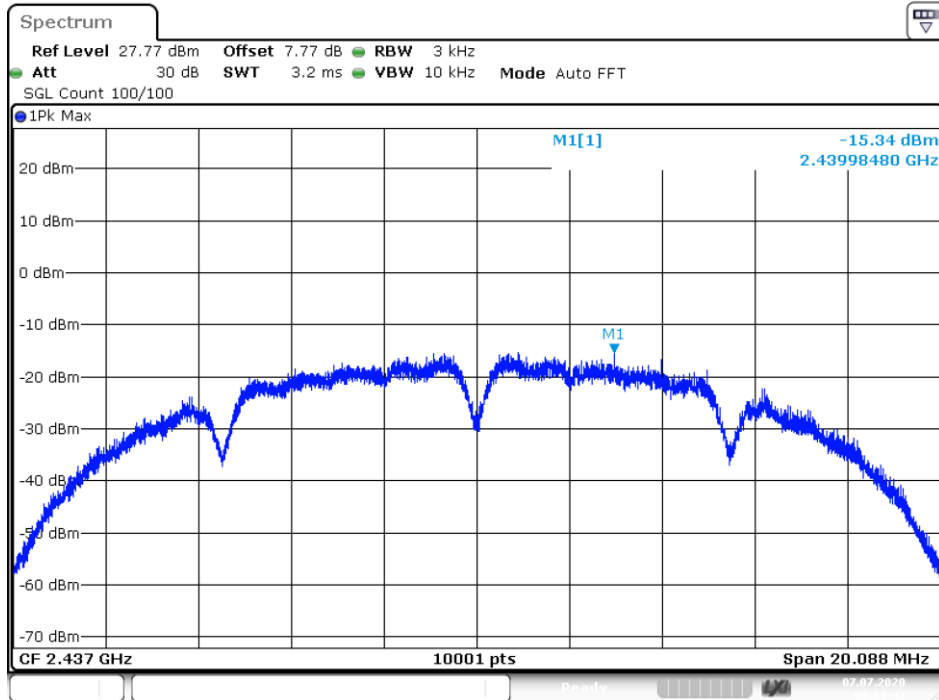
Condition	Mode	Frequency (MHz)	Max PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
NVNT	802.11b	2412	-14.724	8	Pass
NVNT	802.11b	2437	-15.343	8	Pass
NVNT	802.11b	2462	-13.874	8	Pass
NVNT	802.11g	2412	-15.791	8	Pass
NVNT	802.11g	2437	-16.762	8	Pass
NVNT	802.11g	2462	-14.981	8	Pass
NVNT	802.11n(HT20)	2412	-16.129	8	Pass
NVNT	802.11n(HT20)	2437	-16.261	8	Pass
NVNT	802.11n(HT20)	2462	-15.072	8	Pass
NVNT	802.11n(HT40)	2422	-20.361	8	Pass
NVNT	802.11n(HT40)	2437	-19.947	8	Pass
NVNT	802.11n(HT40)	2452	-20.206	8	Pass

PSD NVNT 802.11b 2412MHz Ant1



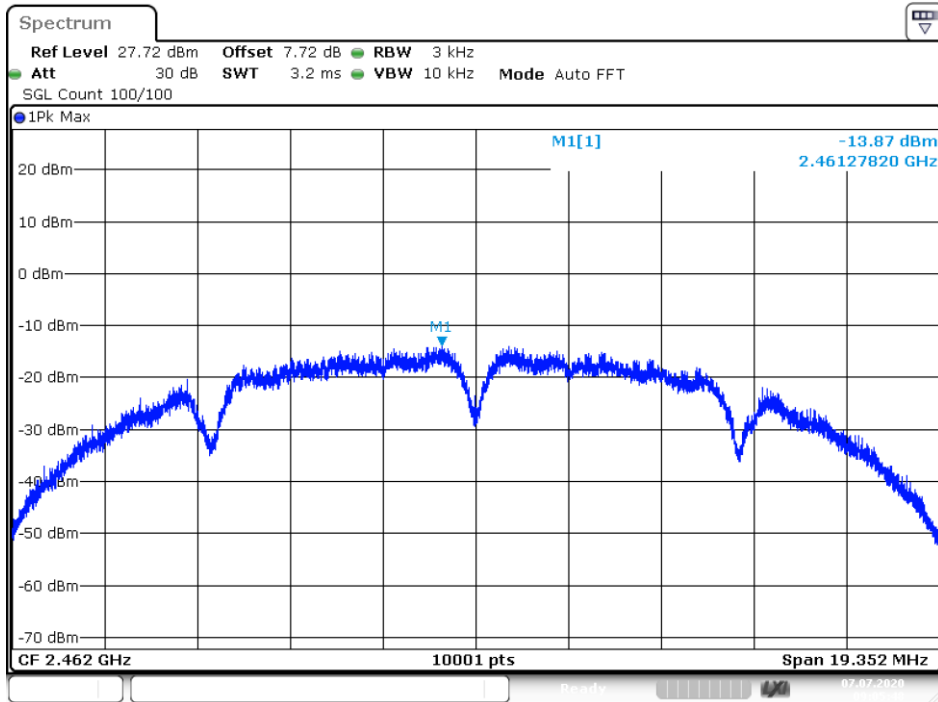
Date: 7.JUL.2020 09:00:05

PSD NVNT 802.11b 2437MHz Ant1



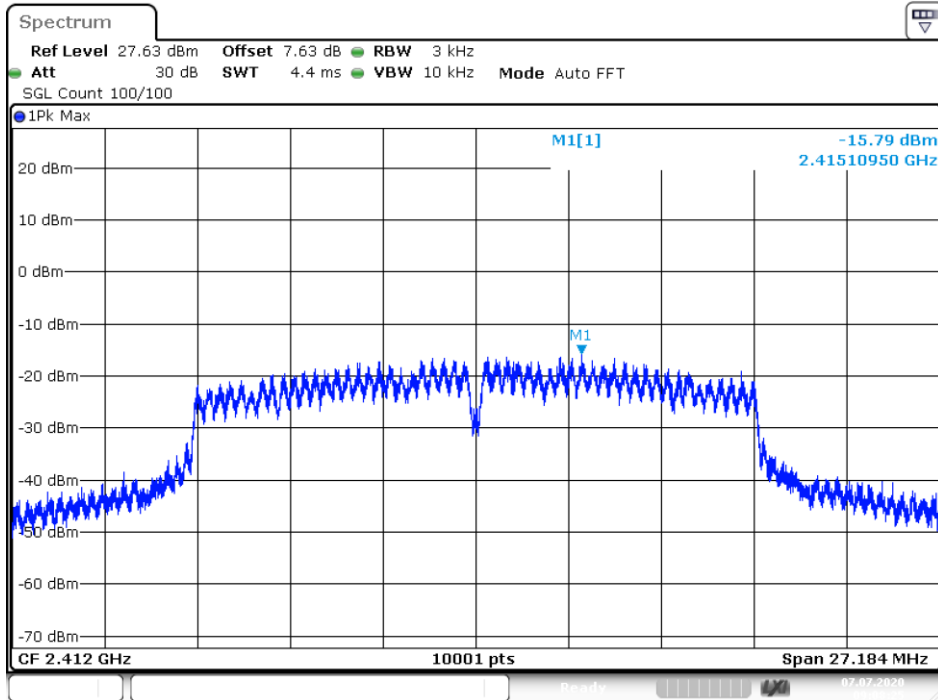
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PSD NVNT 802.11b 2462MHz Ant1



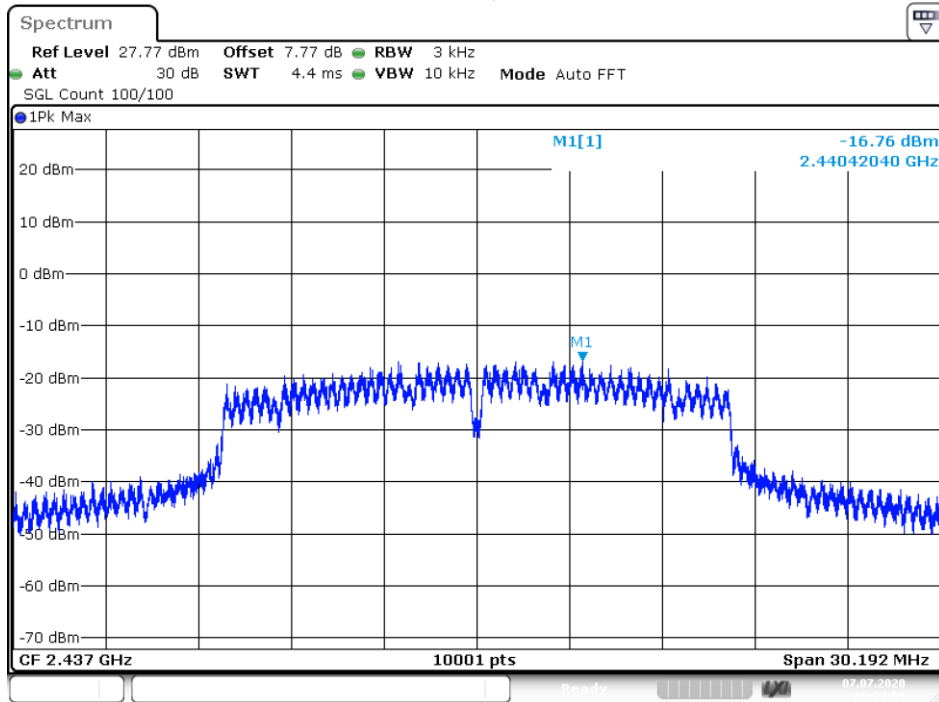
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PSD NVNT 802.11g 2412MHz Ant1

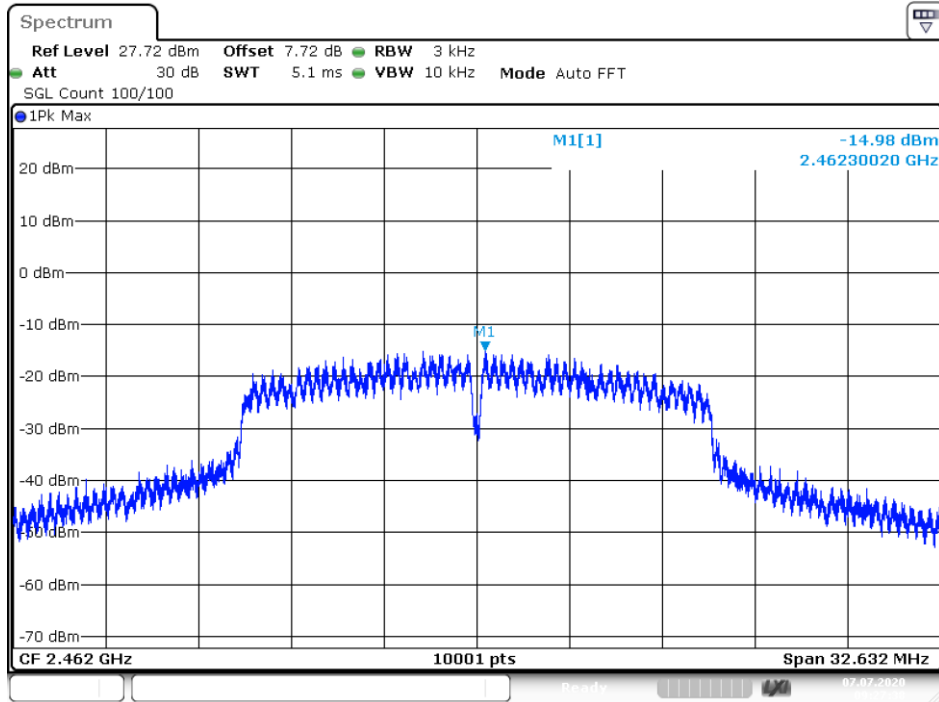


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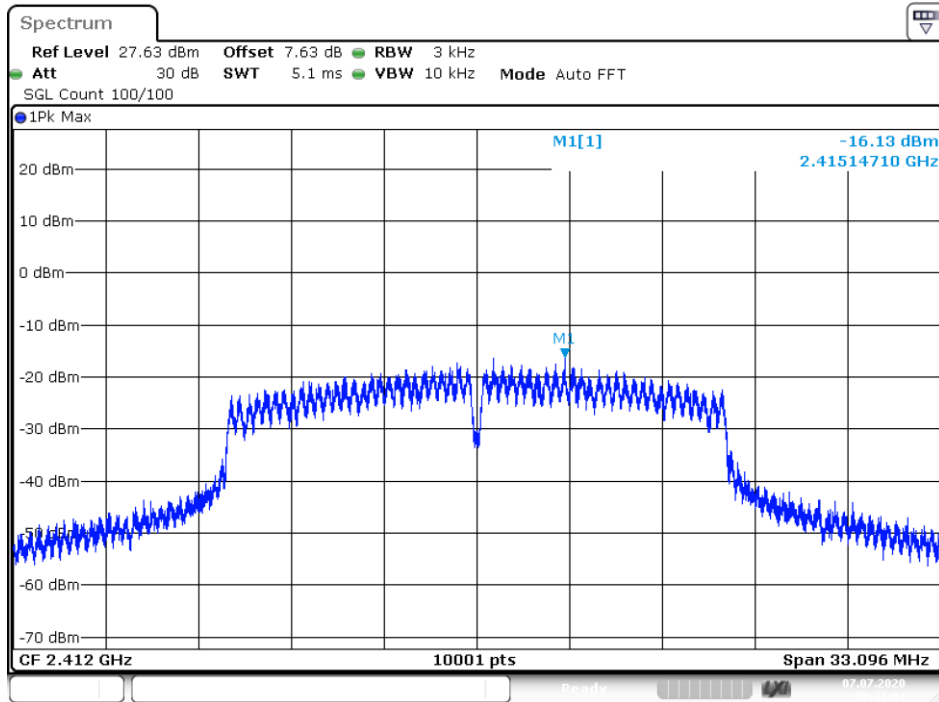
PSD NVNT 802.11g 2437MHz Ant1



PSD NVNT 802.11g 2462MHz Ant1

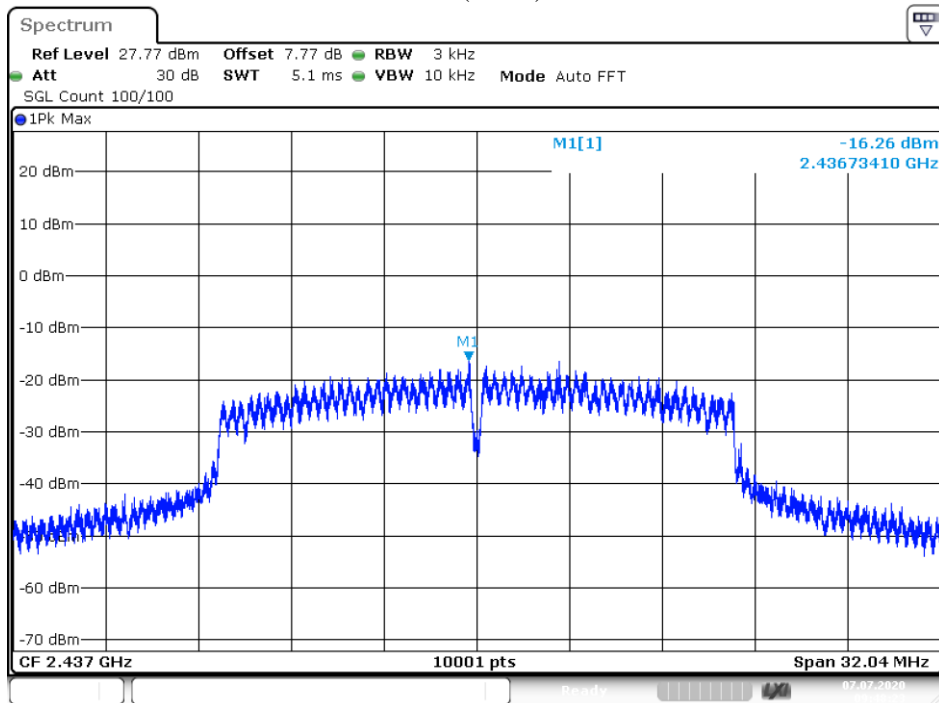


PSD NVNT 802.11n(HT20) 2412MHz Ant1



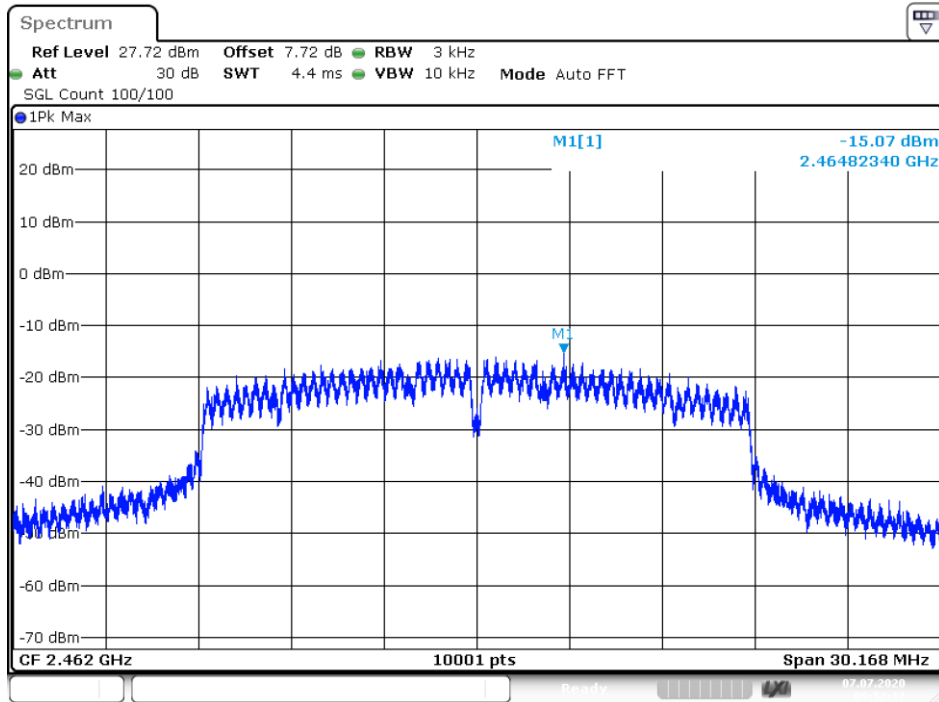
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PSD NVNT 802.11n(HT20) 2437MHz Ant1



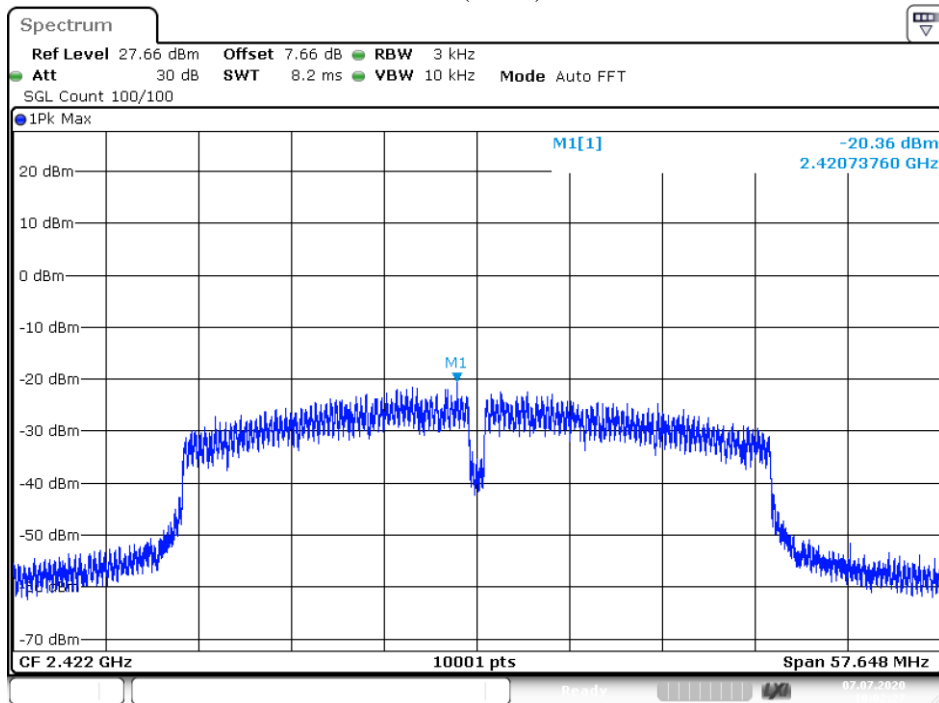
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PSD NVNT 802.11n(HT20) 2462MHz Ant1



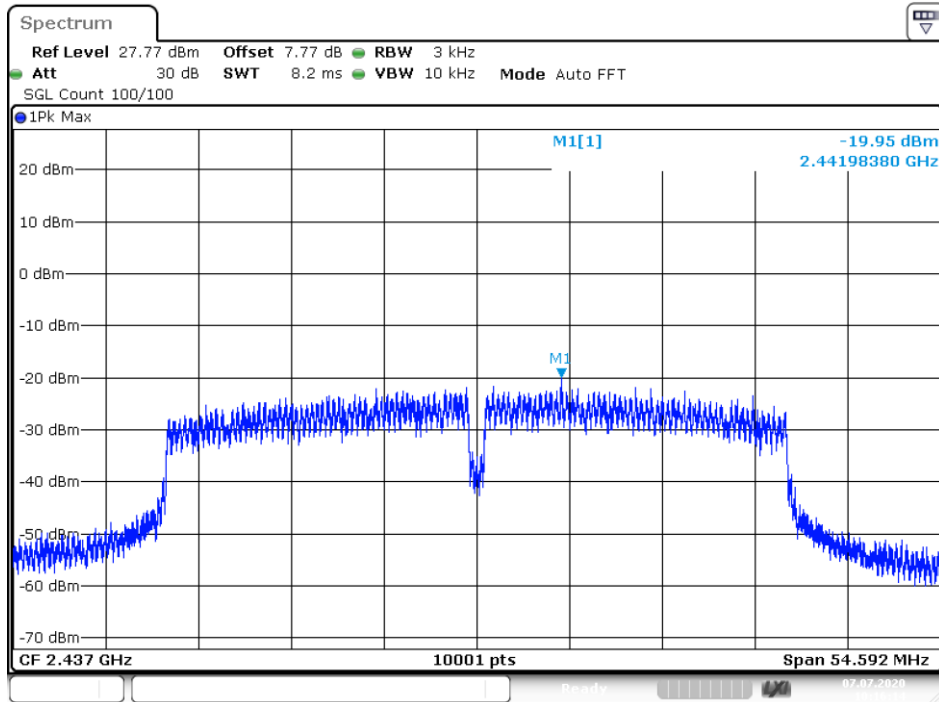
Date: 7.JUL.2020 09:52:11

PSD NVNT 802.11n(HT40) 2422MHz Ant1



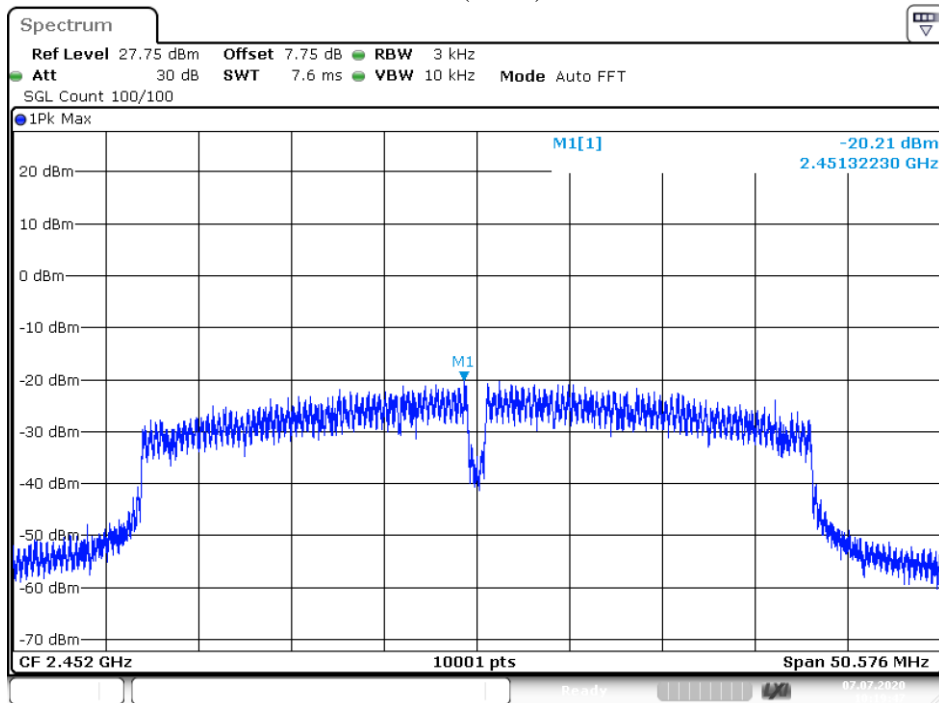
Date: 7.JUL.2020 10:02:26

PSD NVNT 802.11n(HT40) 2437MHz Ant1



Date: 7.JUL.2020 10:16:15

PSD NVNT 802.11n(HT40) 2452MHz Ant1



Date: 7.JUL.2020 10:19:47

7. Bandwidth

7.1. Test limits

Please refer section 15.2.47

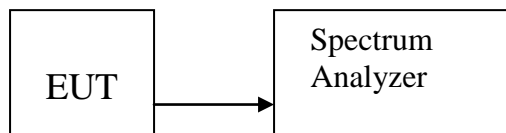
For direct sequence systems, the minimum 6dB bandwidth shall be at least 500 kHz.

7.2. Test Procedure

Details see the KDB558074 D01 Meas Guidance v05r02

- a) The bandwidth is measured at an amplitude level reduced 20dB from the reference level. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency. Once the reference level is established, the equipment is conditioned with typical modulating signal to produce the worst-case (i.e. the widest) bandwidth.
- b) The test receiver set $RBW = 100\text{kHz}$, $VBW \geq 3 * RBW = 300\text{kHz}$, Peak Detector, Sweep time set auto, detail see the test plot.

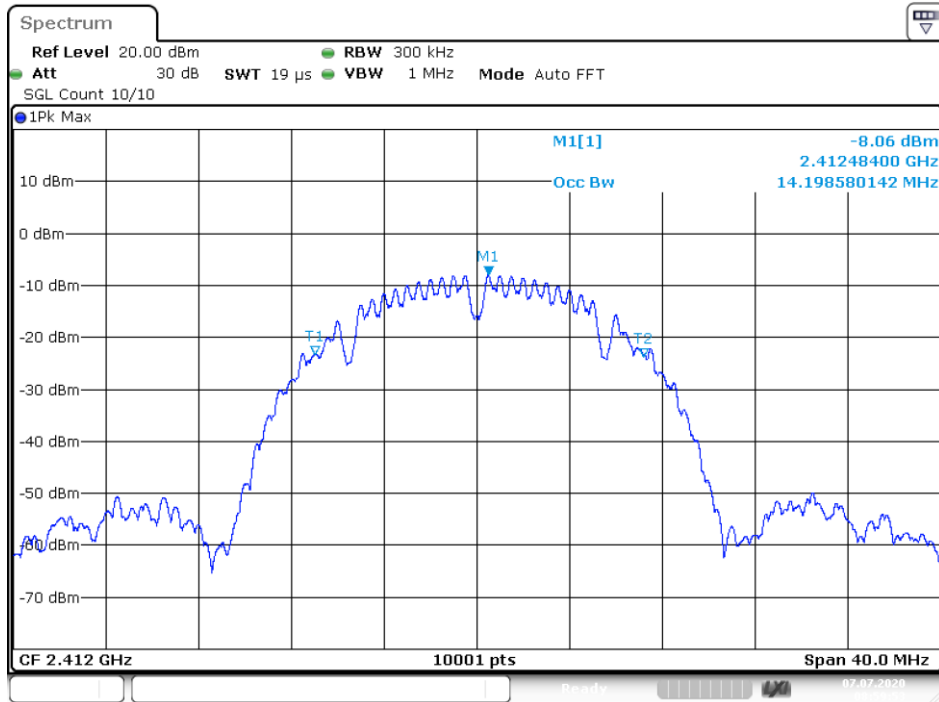
7.3. Test Setup



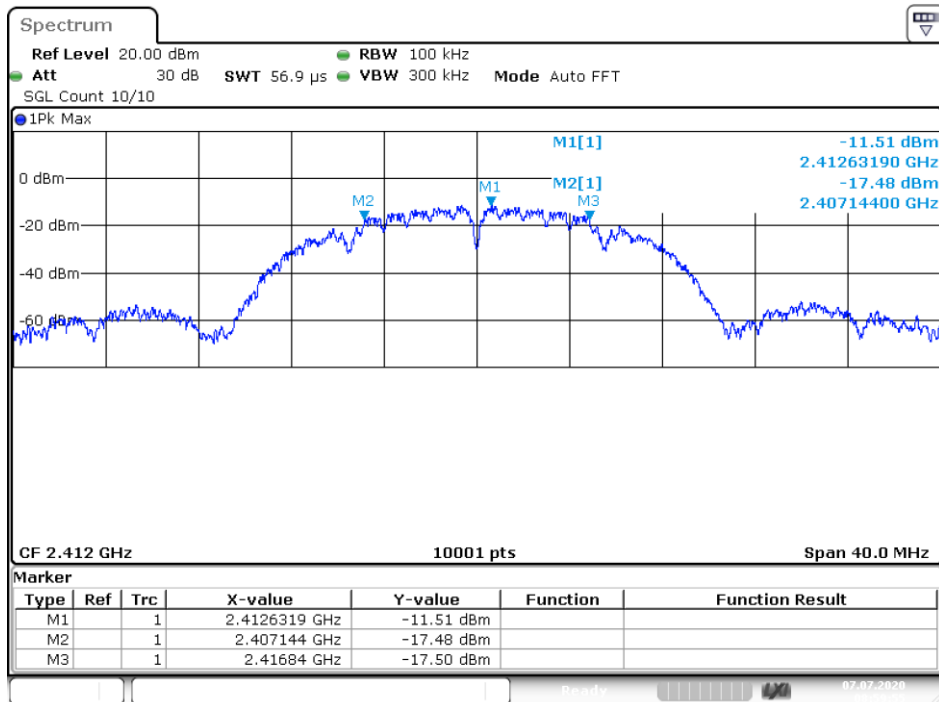
7.4. Test Results

Condition	Mode	Frequency (MHz)	99% OBW (MHz)	-6 dB Bandwidth (MHz)	Limit -6 dB Bandwidth (MHz)	Verdict
NVNT	802.11b	2412	14.1986	9.696	0.5	Pass
NVNT	802.11b	2437	14.6665	10.044	0.5	Pass
NVNT	802.11b	2462	14.5345	9.676	0.5	Pass
NVNT	802.11g	2412	17.1303	13.592	0.5	Pass
NVNT	802.11g	2437	20.486	15.096	0.5	Pass
NVNT	802.11g	2462	16.5943	16.316	0.5	Pass
NVNT	802.11n(HT20)	2412	17.8462	16.548	0.5	Pass
NVNT	802.11n(HT20)	2437	17.7902	16.02	0.5	Pass
NVNT	802.11n(HT20)	2462	18.3342	15.084	0.5	Pass
NVNT	802.11n(HT40)	2422	35.7164	28.824	0.5	Pass
NVNT	802.11n(HT40)	2437	35.9964	27.296	0.5	Pass
NVNT	802.11n(HT40)	2452	35.6204	25.288	0.5	Pass

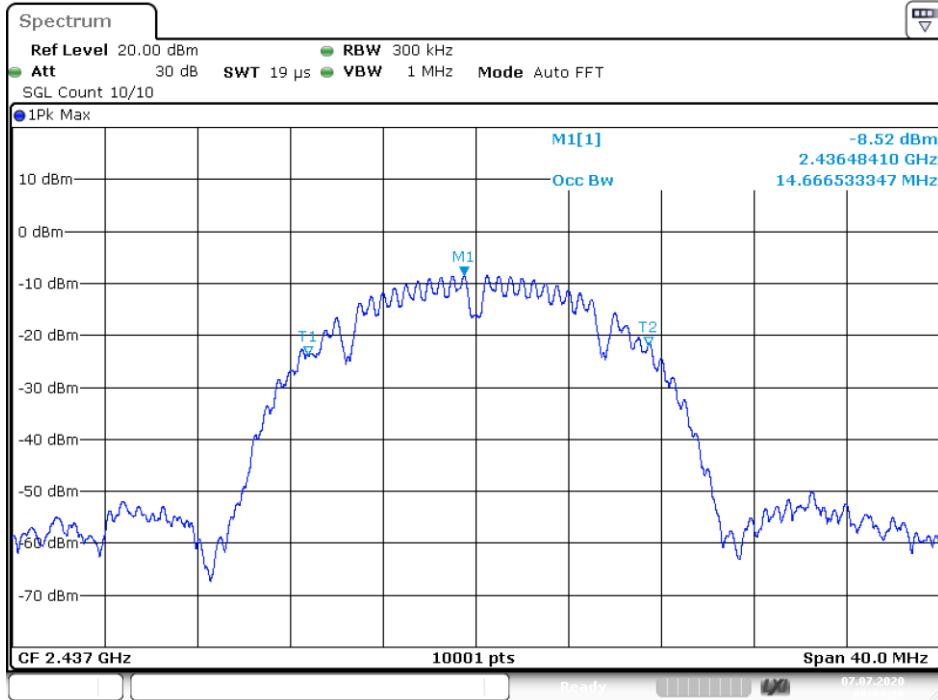
OBW NVNT 802.11b 2412MHz Ant1



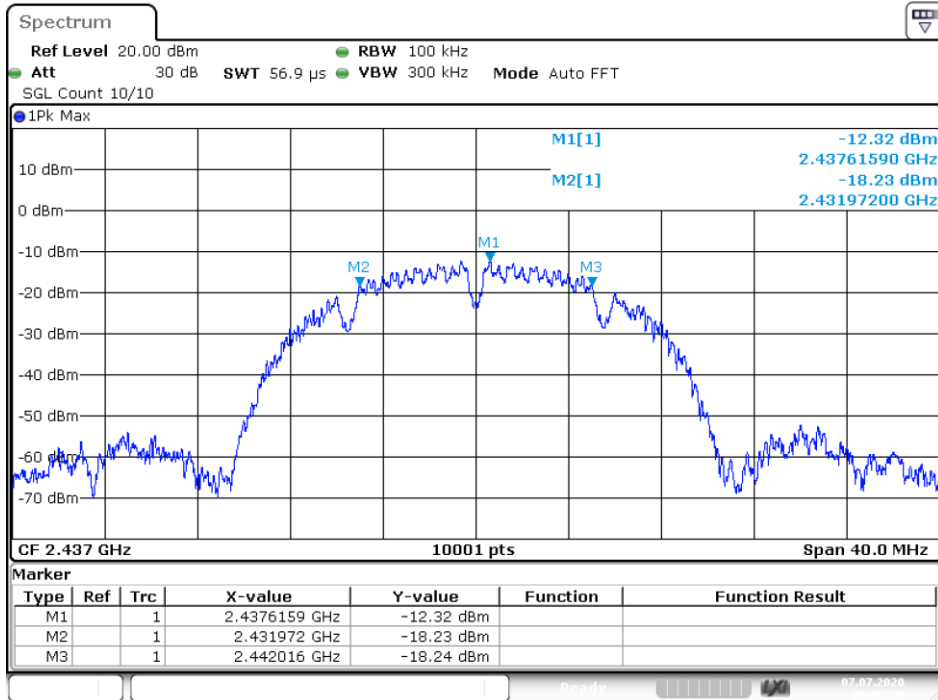
-6 dB BW NVNT 802.11b 2412MHz Ant1



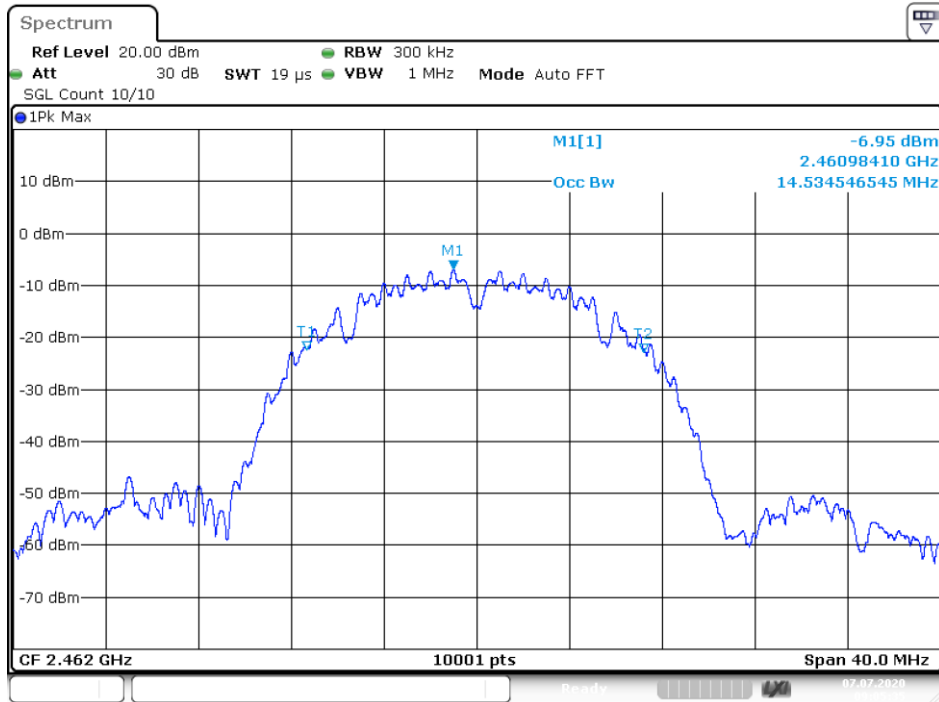
OBW NVNT 802.11b 2437MHz Ant1



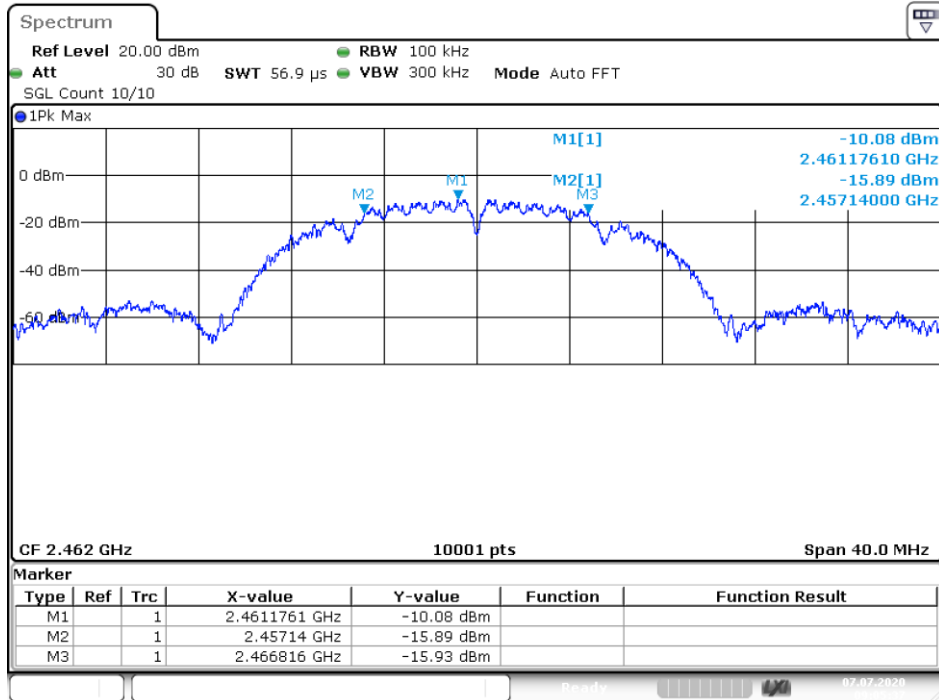
-6 dB BW NVNT 802.11b 2437MHz Ant1



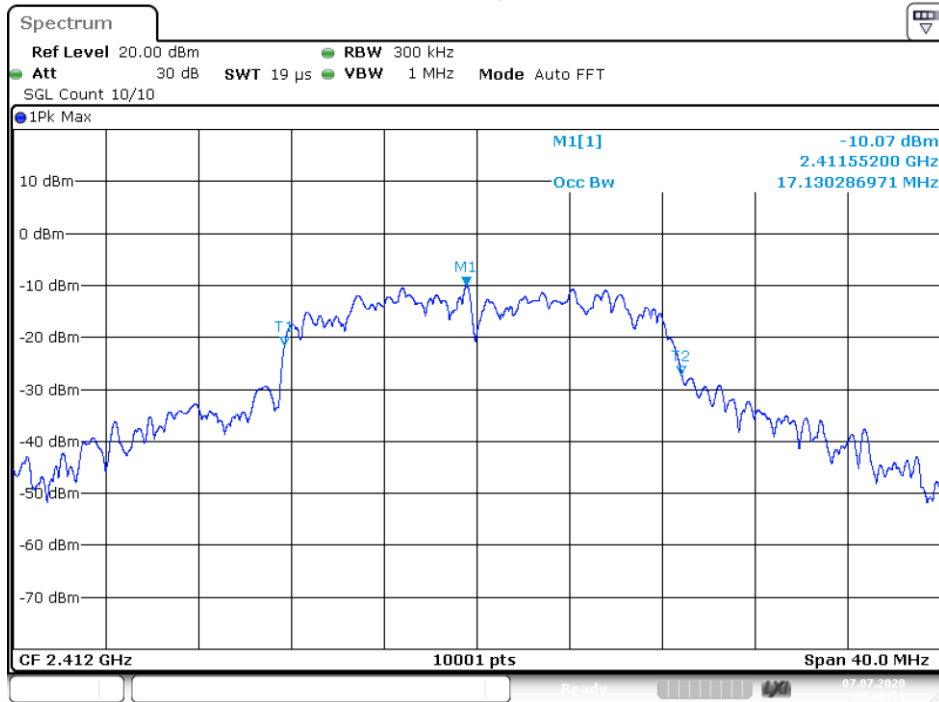
OBW NVNT 802.11b 2462MHz Ant1



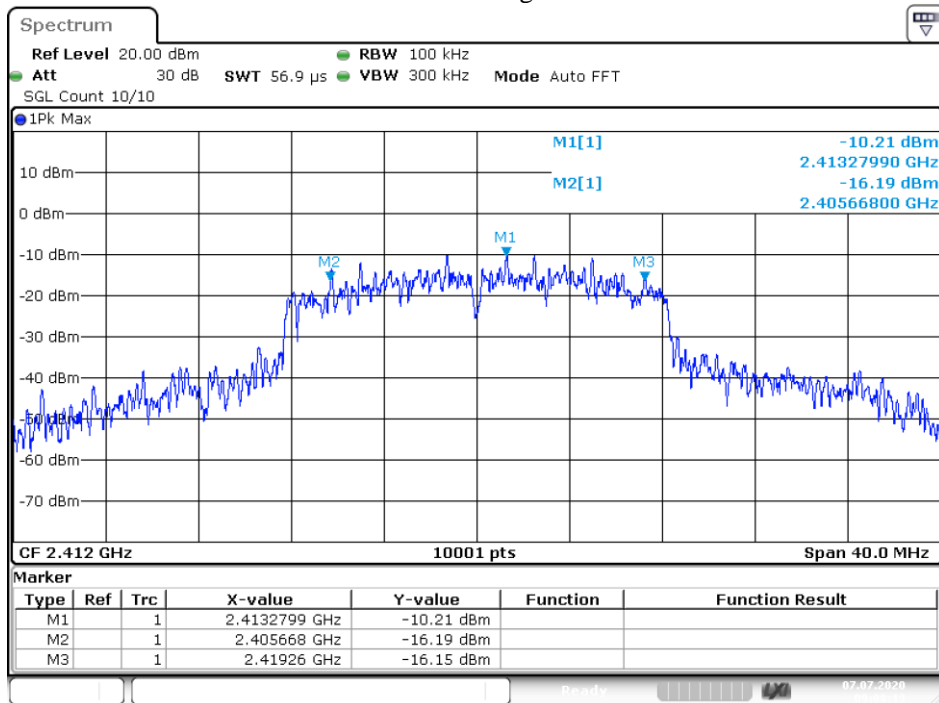
-6 dB BW NVNT 802.11b 2462MHz Ant1



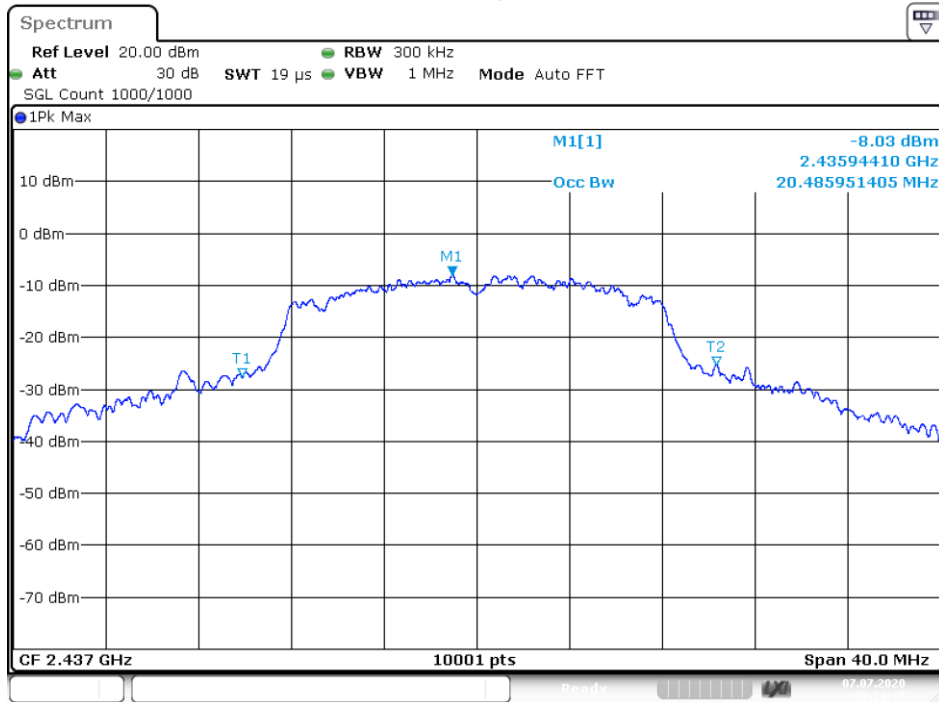
OBW NVNT 802.11g 2412MHz Ant1



-6 dB BW NVNT 802.11g 2412MHz Ant1

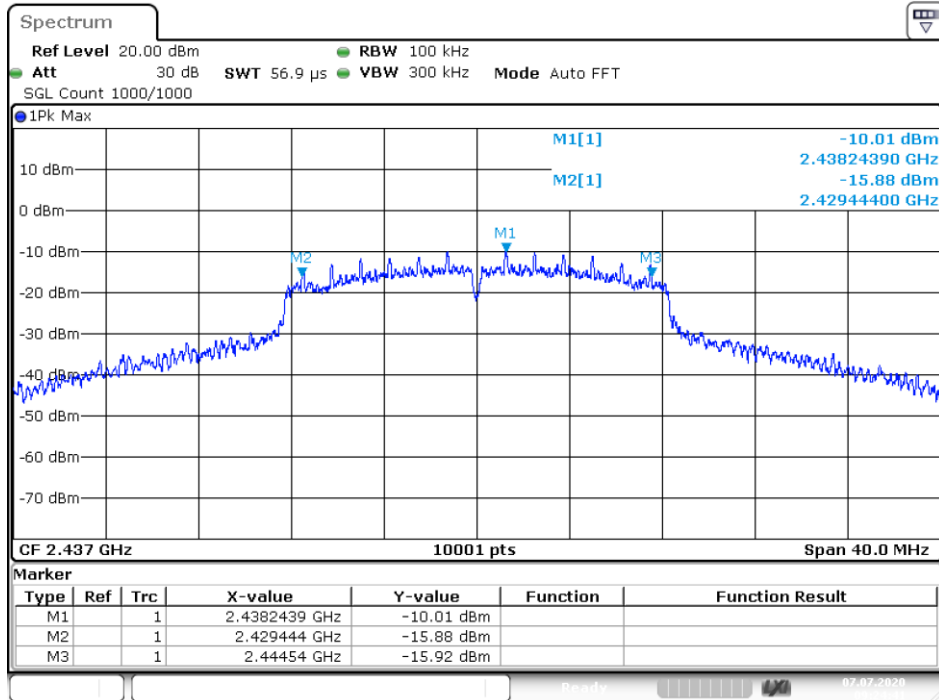


OBW NVNT 802.11g 2437MHz Ant1



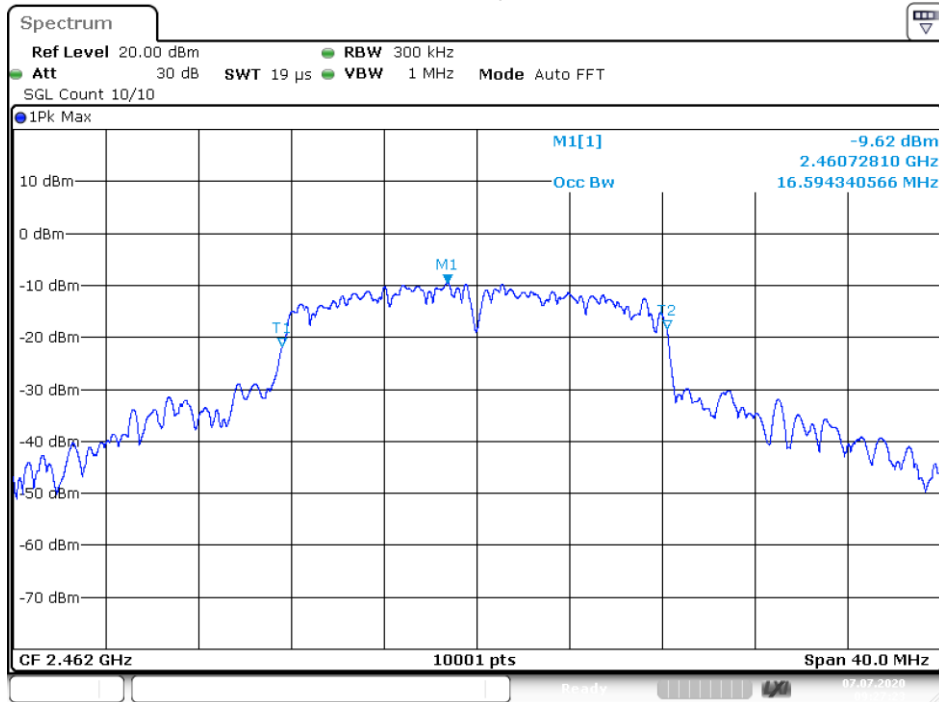
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-6 dB BW NVNT 802.11g 2437MHz Ant1

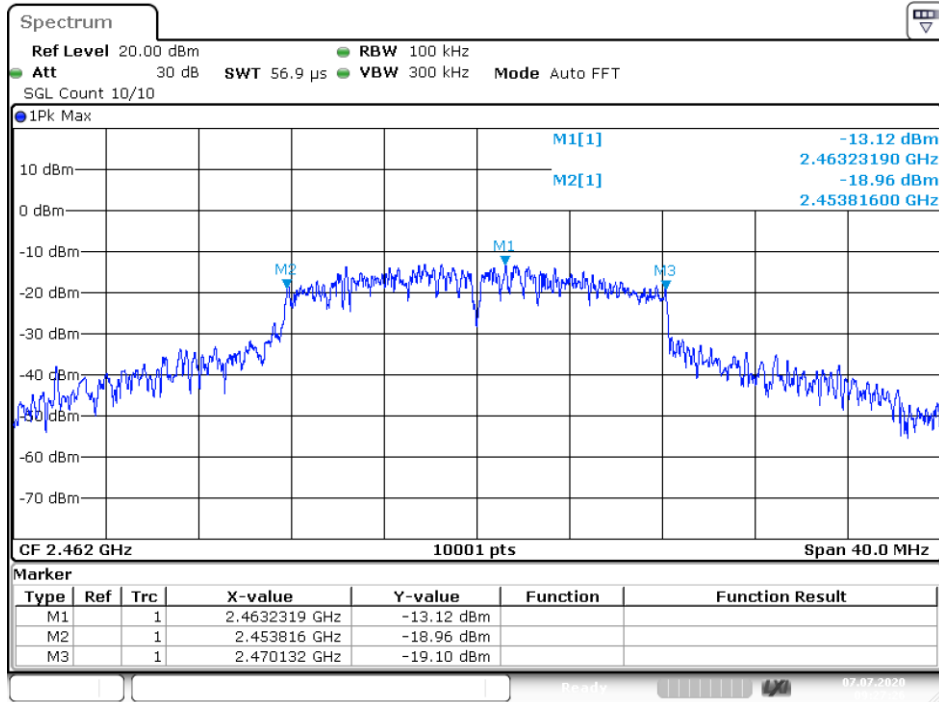


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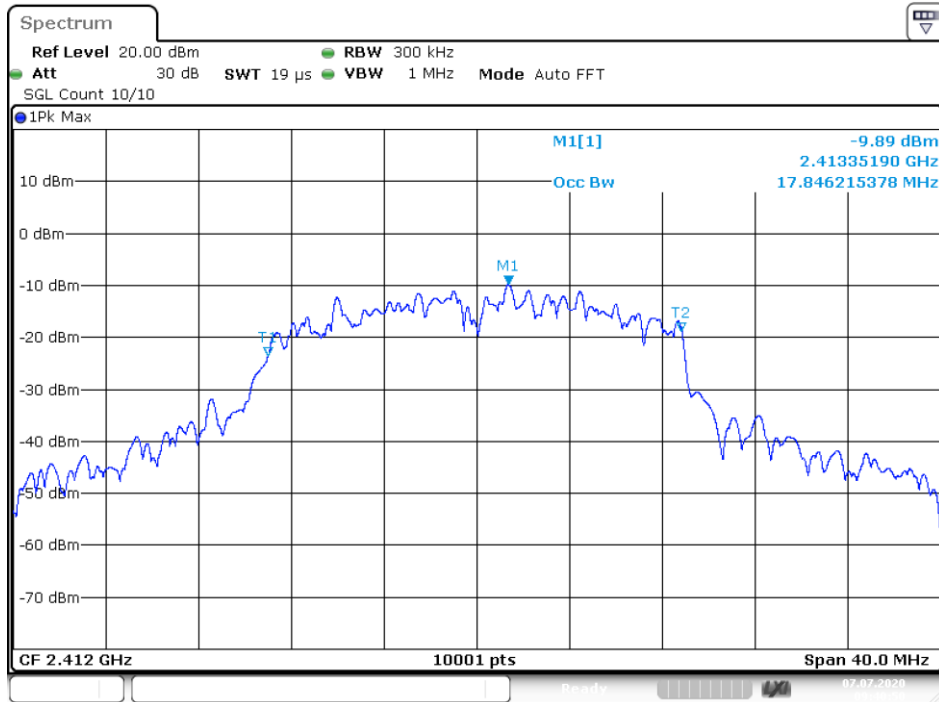
OBW NVNT 802.11g 2462MHz Ant1



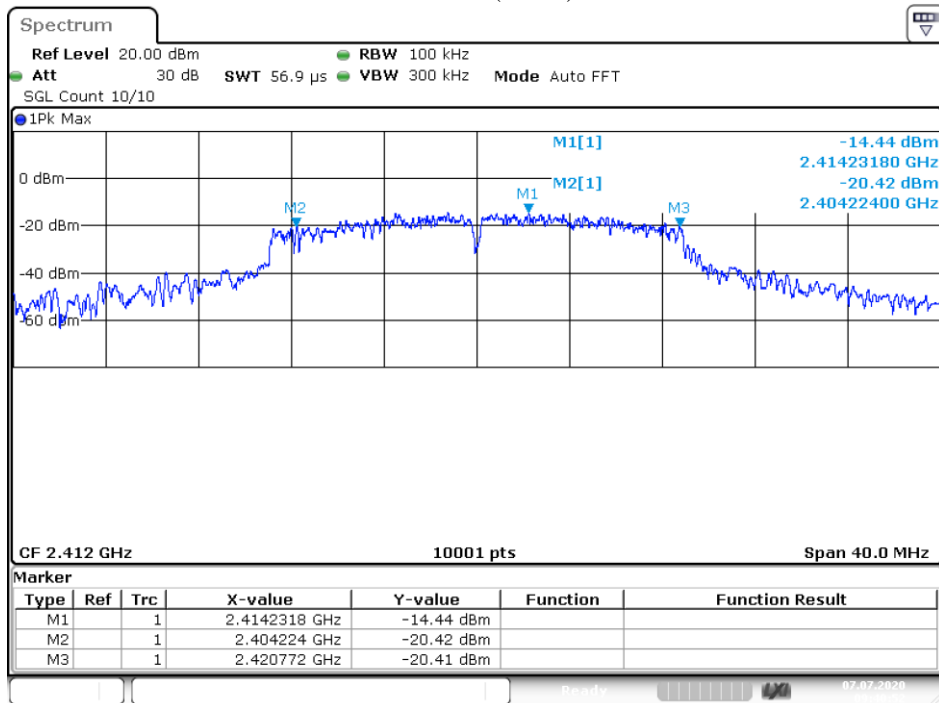
-6 dB BW NVNT 802.11g 2462MHz Ant1



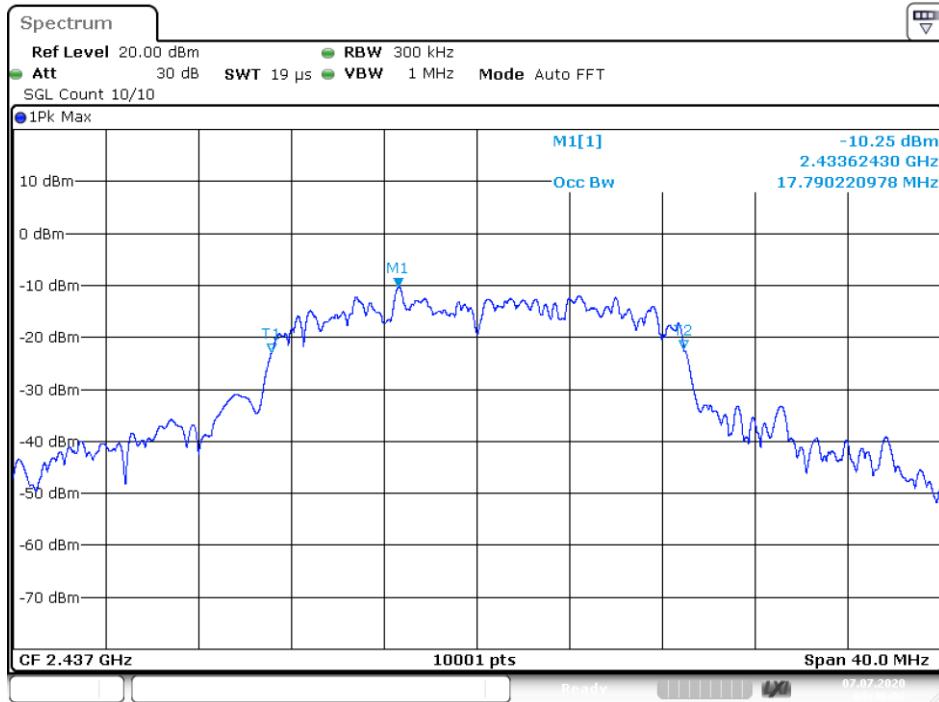
OBW NVNT 802.11n(HT20) 2412MHz Ant1



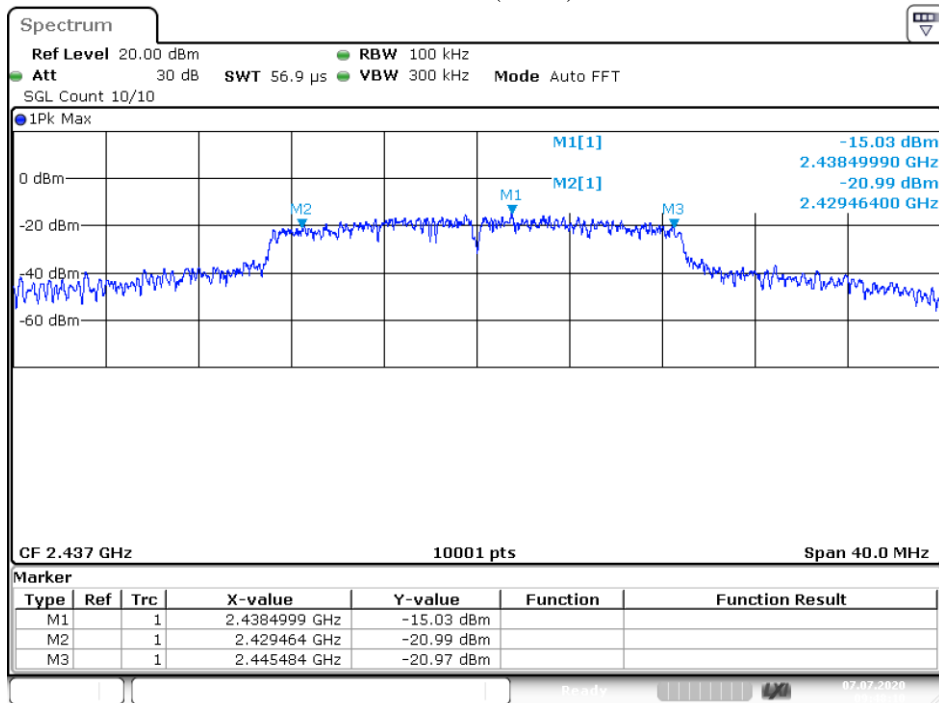
-6 dB BW NVNT 802.11n(HT20) 2412MHz Ant1



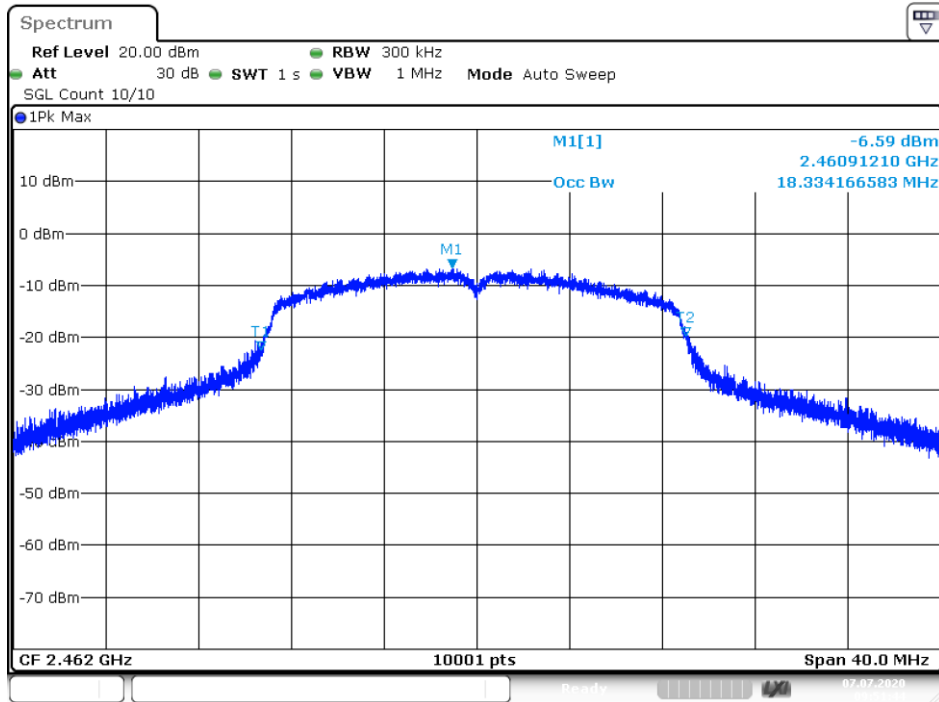
OBW NVNT 802.11n(HT20) 2437MHz Ant1



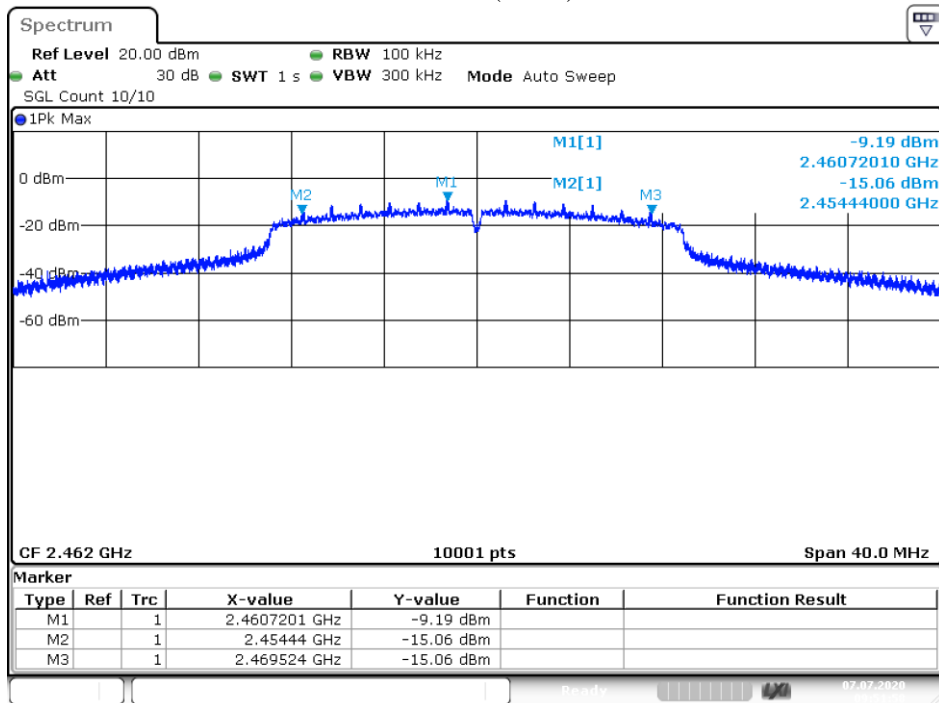
-6 dB BW NVNT 802.11n(HT20) 2437MHz Ant1



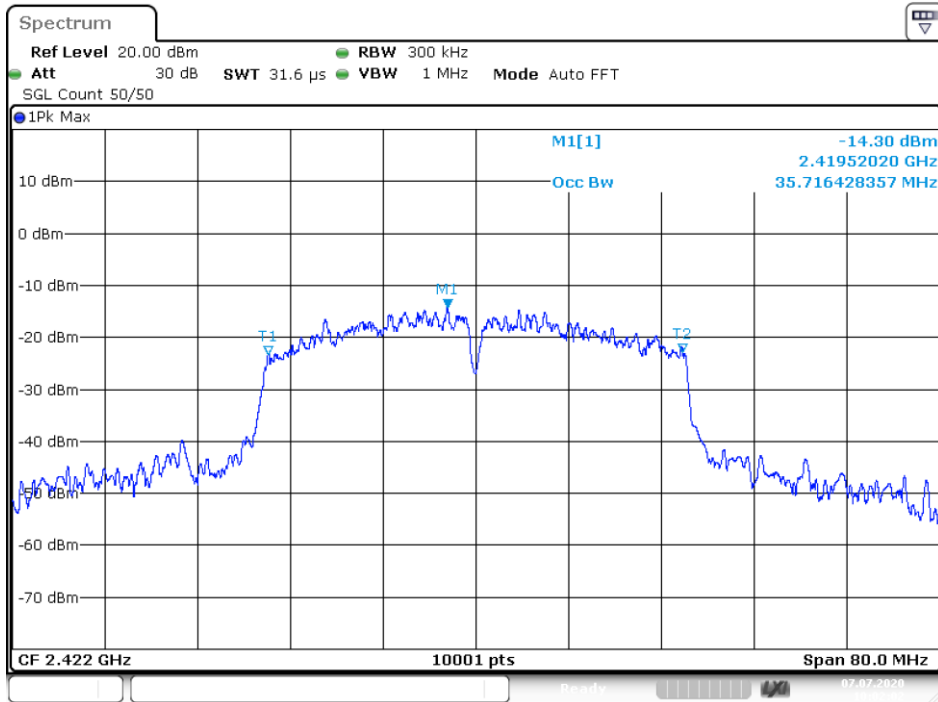
OBW NVNT 802.11n(HT20) 2462MHz Ant1



-6 dB BW NVNT 802.11n(HT20) 2462MHz Ant1

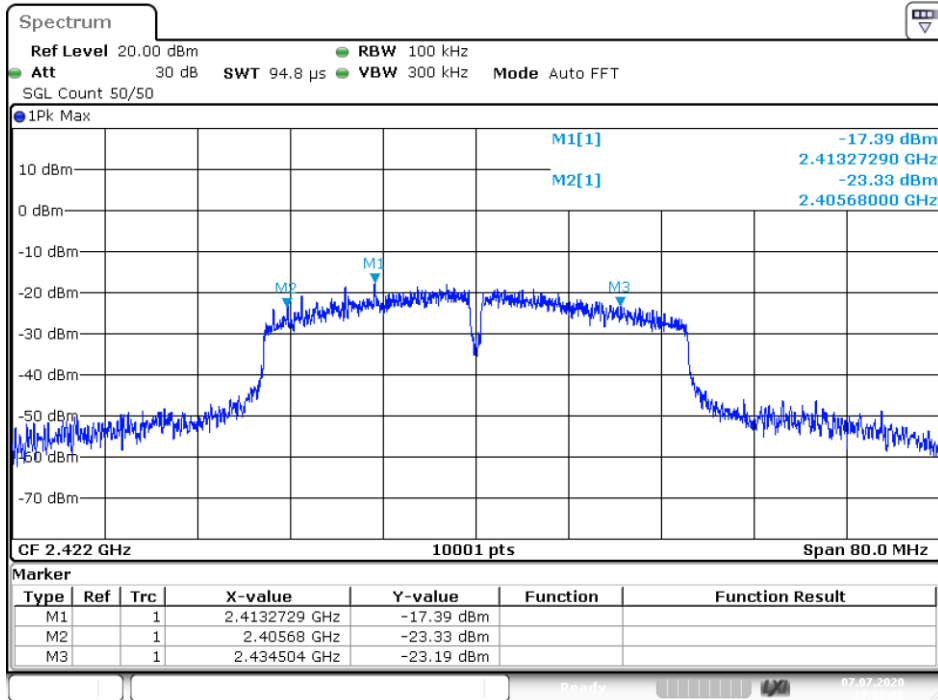


OBW NVNT 802.11n(HT40) 2422MHz Ant1



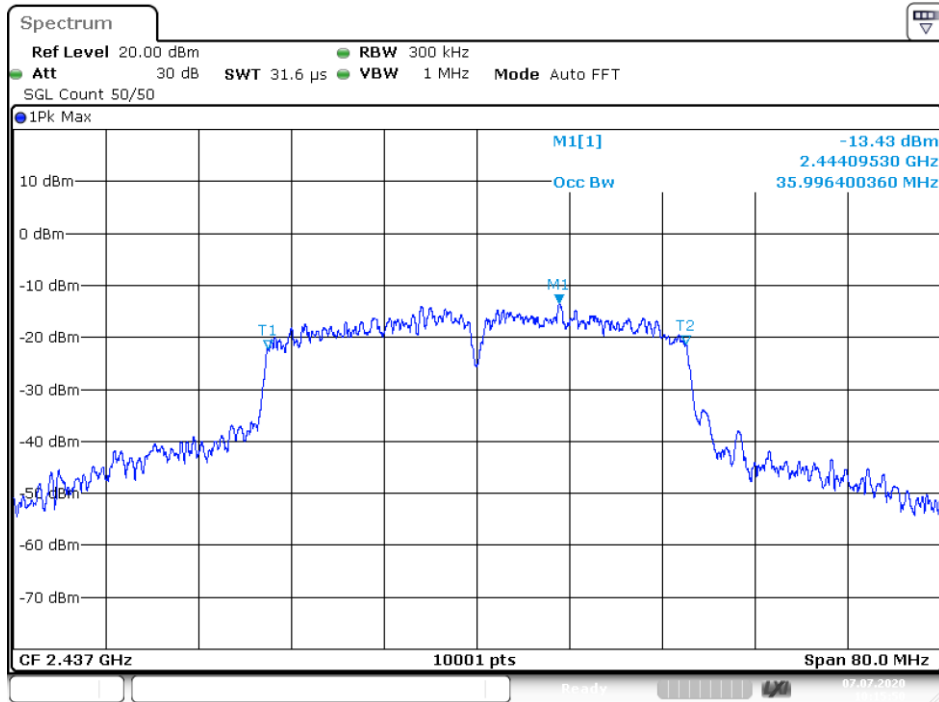
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-6 dB BW NVNT 802.11n(HT40) 2422MHz Ant1

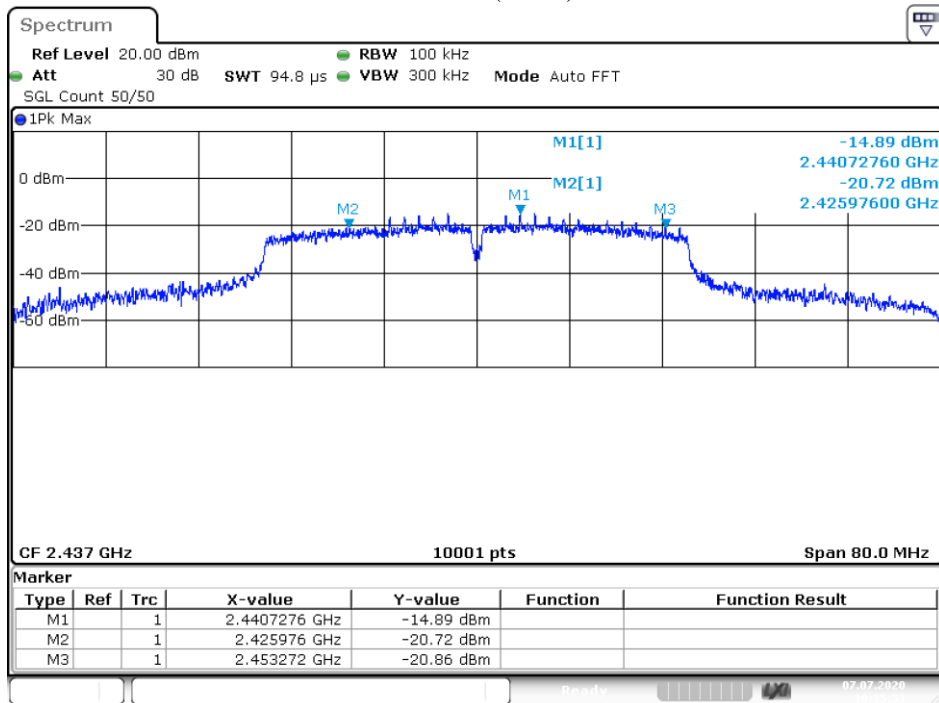


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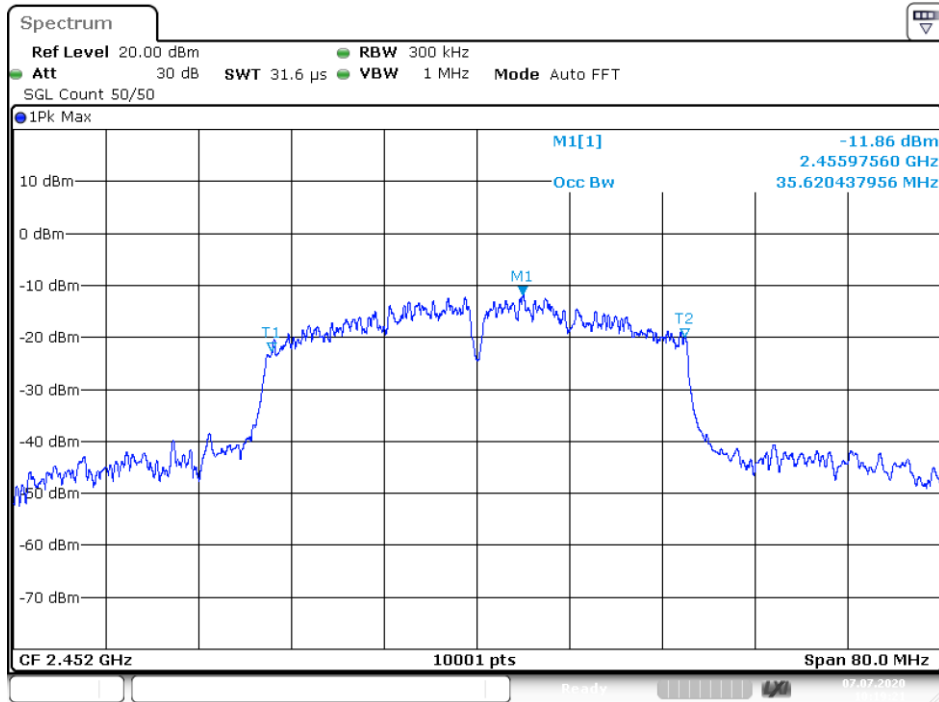
OBW NVNT 802.11n(HT40) 2437MHz Ant1



-6 dB BW NVNT 802.11n(HT40) 2437MHz Ant1

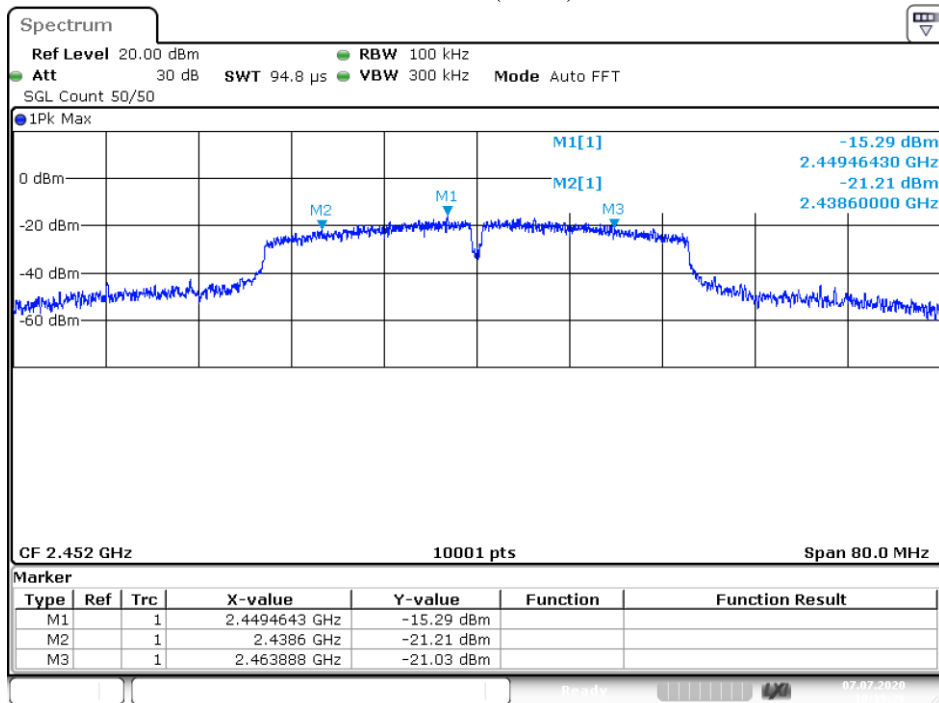


OBW NVNT 802.11n(HT40) 2452MHz Ant1



Date: 7.JUL.2020 10:19:22

-6 dB BW NVNT 802.11n(HT40) 2452MHz Ant1



Date: 7.JUL.2020 10:19:25

8. Band Edge Check

8.1. Test limits

Please refer section 15.247

All the lower and upper band-edges emissions appearing within 2310MHz to 2390MHz and 2483.5MHz to 2500MHz restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions outside operation frequency band 2400MHz to 2483.5MHz and 5725MHz to 5850MHz shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits.

8.2. Test Procedure

Details see the KDB558074 D01 Meas Guidance v05r02

8.2.1 Put the EUT on a 1.5m high table, power on the EUT. Emissions were scanned and measured rotating the EUT to 360 degrees, Find the maximum Emission

8.2.2 Check the spurious emissions out of band.

8.2.3 RBW 1MHz, VBW 3MHz, peak detector for peak value , RBW 1MHz ,VBW 10Hz , RMS detector for AV value.

8.3. Test Setup

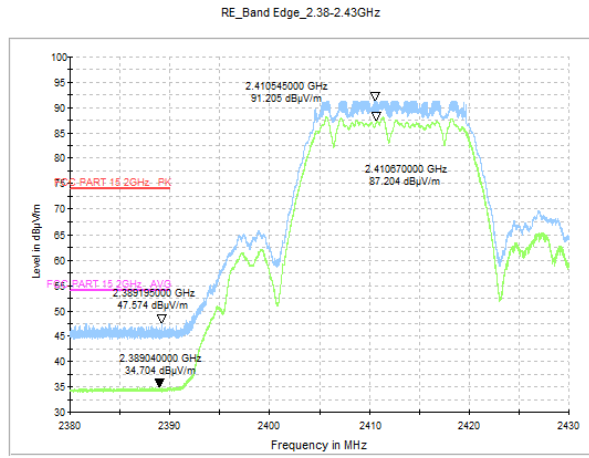
Same as 5.2.2.

8.4. Test Results

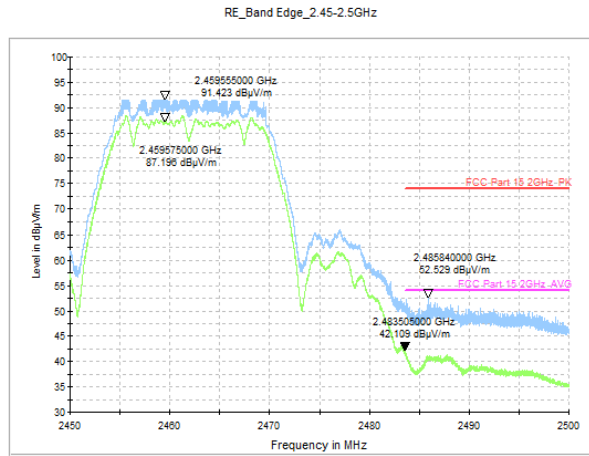
PASS.

Detailed information please see the following page.

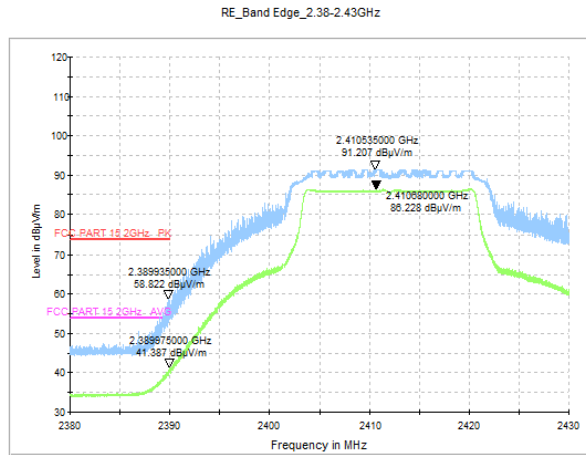
Test Mode: IEEE 802.11b-Low
Polarization: Vertical & Horizontal



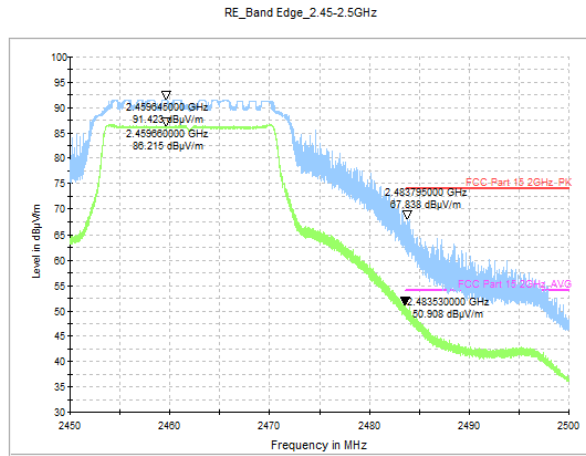
Test Mode: IEEE 802.11b-High
Polarization: Vertical & Horizontal



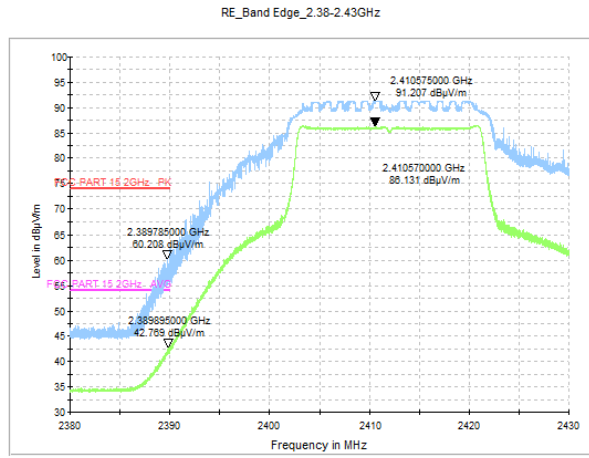
Test Mode: IEEE 802.11g-Low
Polarization: Vertical & Horizontal



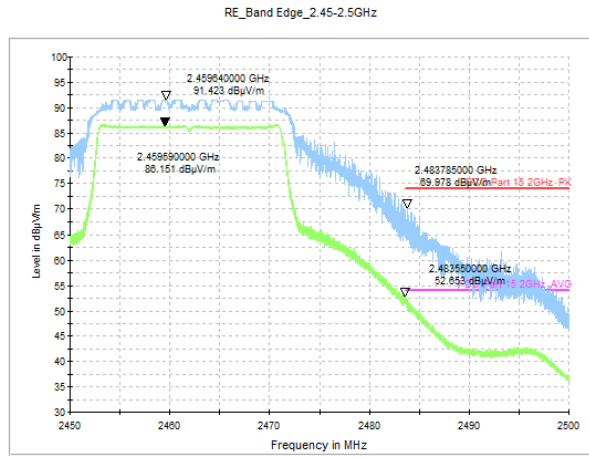
Test Mode: IEEE 802.11g-High
Polarization: Vertical & Horizontal



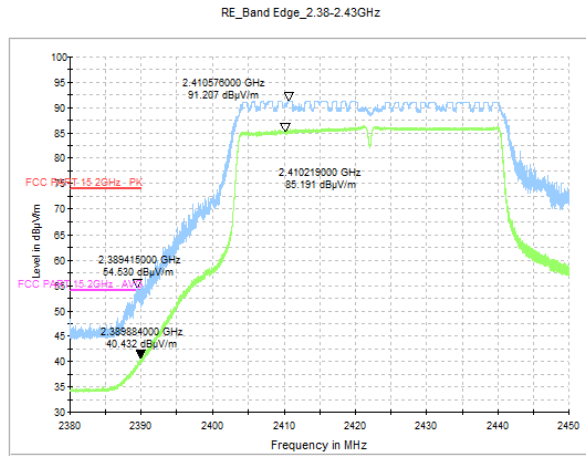
Test Mode: IEEE 802.11n20-Low
Polarization: Vertical & Horizontal



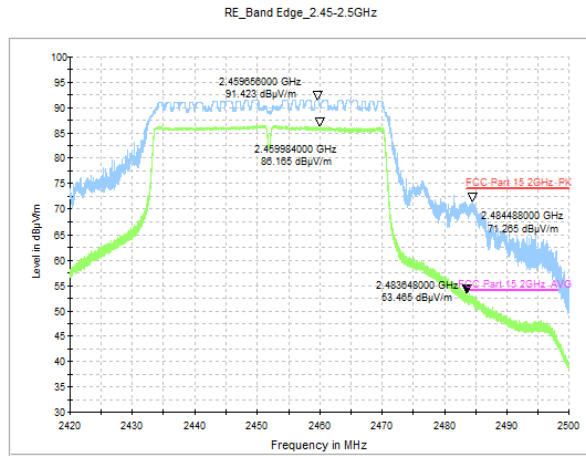
Test Mode: IEEE 802.11n20-High
Polarization: Vertical & Horizontal



Test Mode: IEEE 802.11n40-Low
Polarization: Vertical & Horizontal



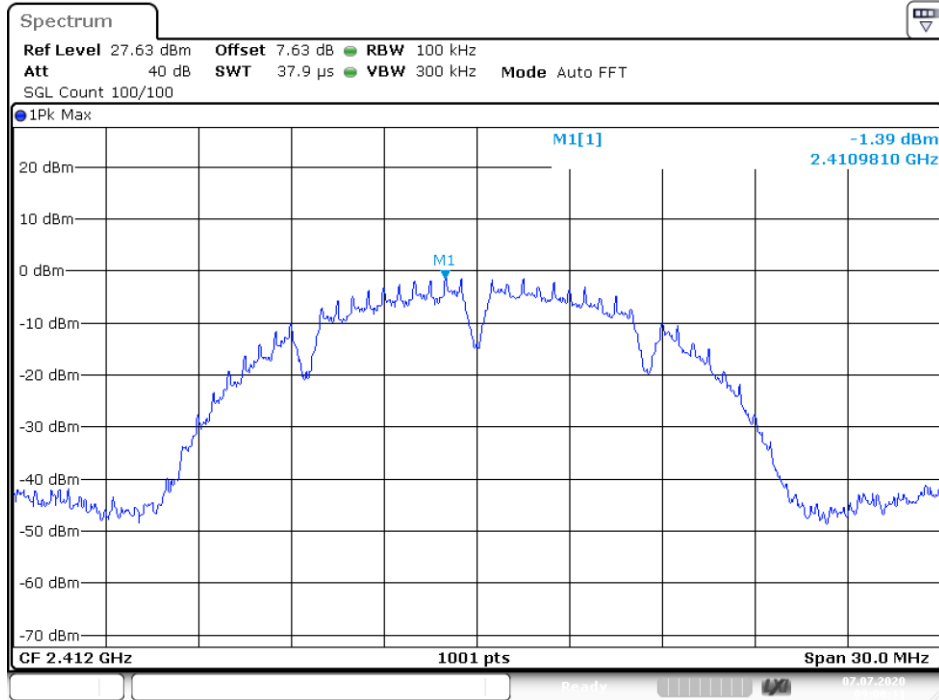
Test Mode: IEEE 802.11n40-High
Polarization: Vertical & Horizontal



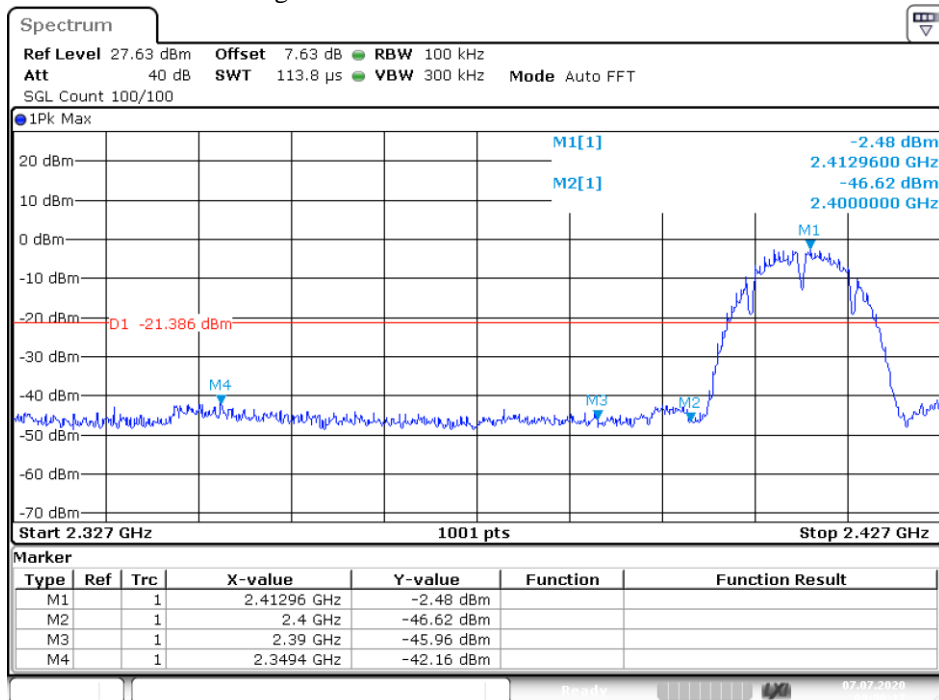
Conduction Band Edge:

Condition	Mode	Frequency (MHz)	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	802.11b	2412	-40.76381590366	-20	Pass
NVNT	802.11b	2462	-42.7671247673	-20	Pass
NVNT	802.11g	2412	-38.50589150429	-20	Pass
NVNT	802.11g	2462	-35.4754778862	-20	Pass
NVNT	802.11n(HT20)	2412	-39.01562969208	-20	Pass
NVNT	802.11n(HT20)	2462	-35.45643398285	-20	Pass
NVNT	802.11n(HT40)	2422	-29.5438484955	-20	Pass
NVNT	802.11n(HT40)	2452	-34.20384609222	-20	Pass

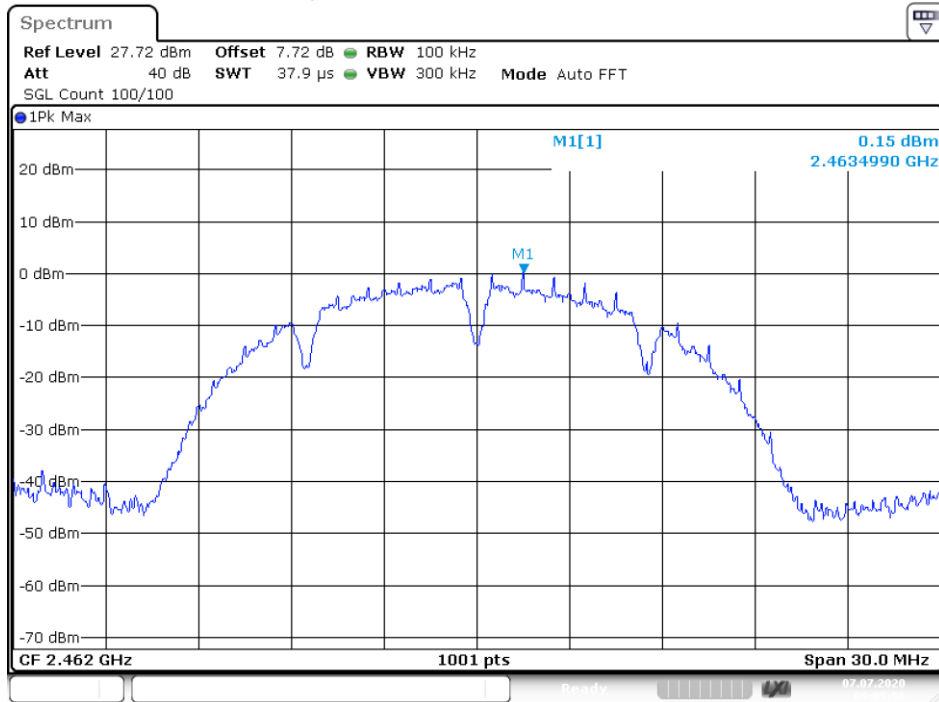
Band Edge NVNT 802.11b 2412MHz Ant1 Ref



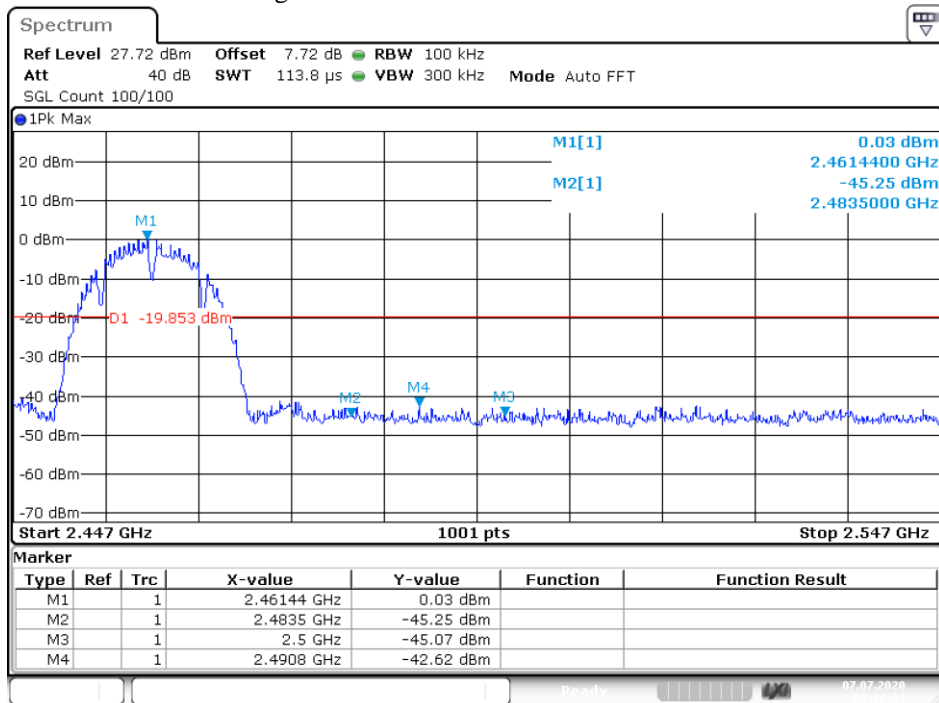
Band Edge NVNT 802.11b 2412MHz Ant1 Emission



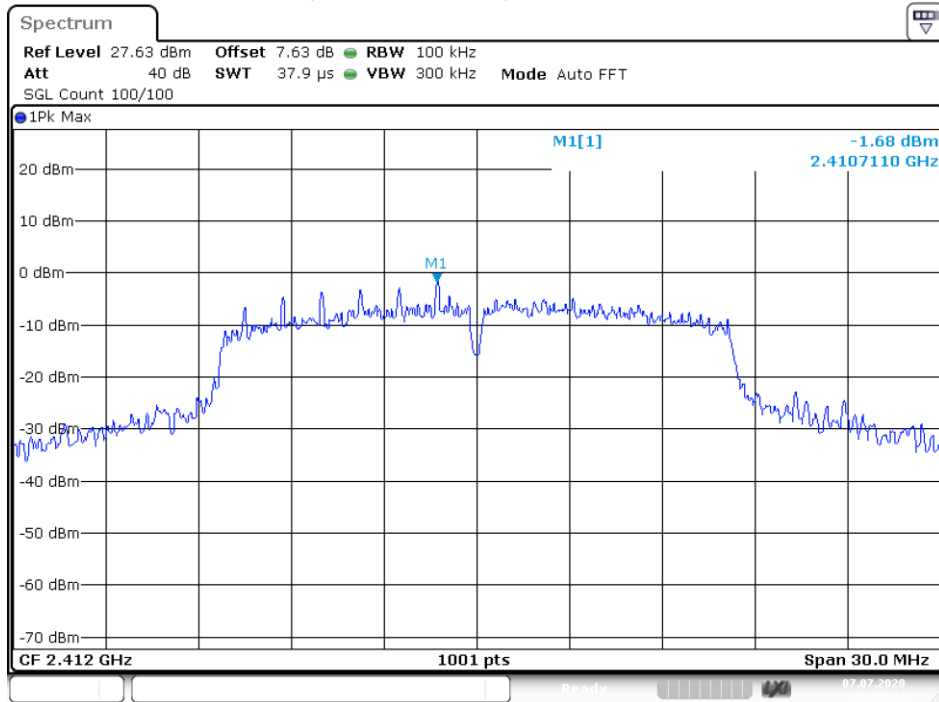
Band Edge NVNT 802.11b 2462MHz Ant1 Ref



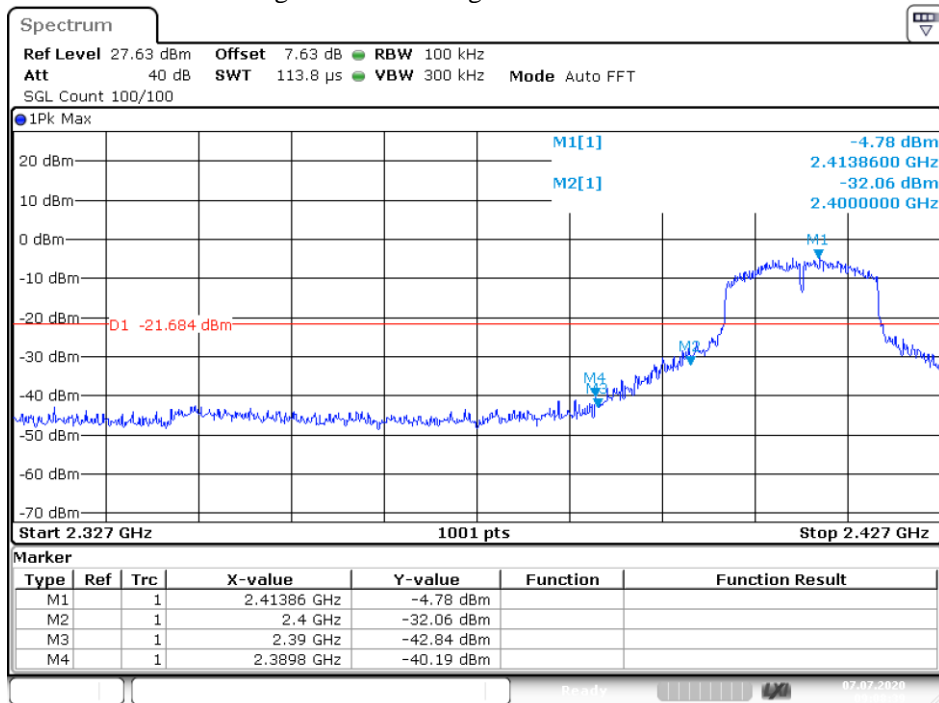
Band Edge NVNT 802.11b 2462MHz Ant1 Emission



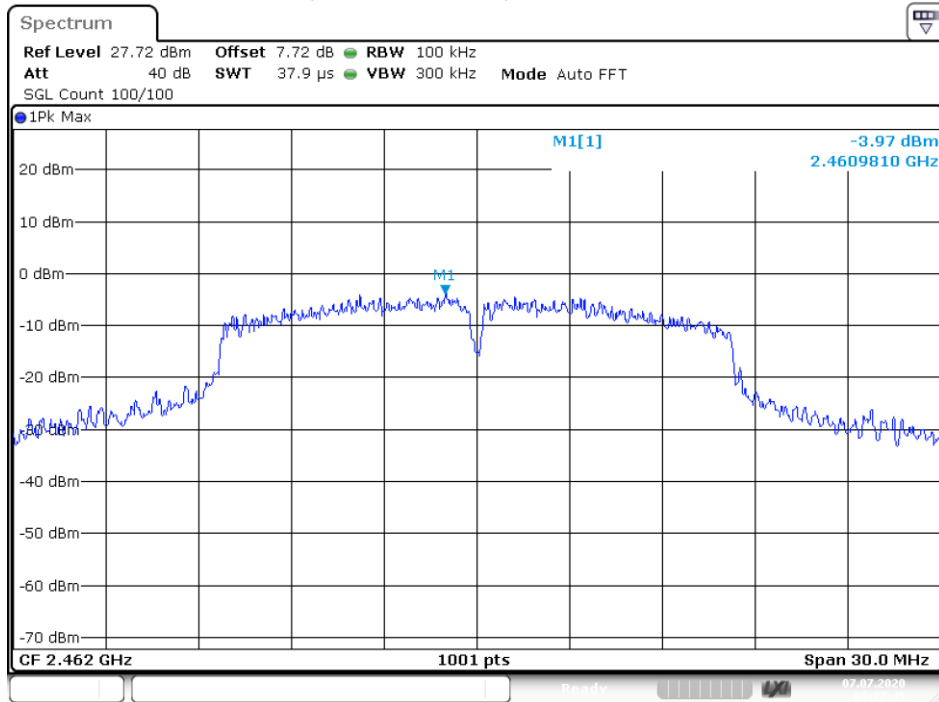
Band Edge NVNT 802.11g 2412MHz Ant1 Ref



Band Edge NVNT 802.11g 2412MHz Ant1 Emission



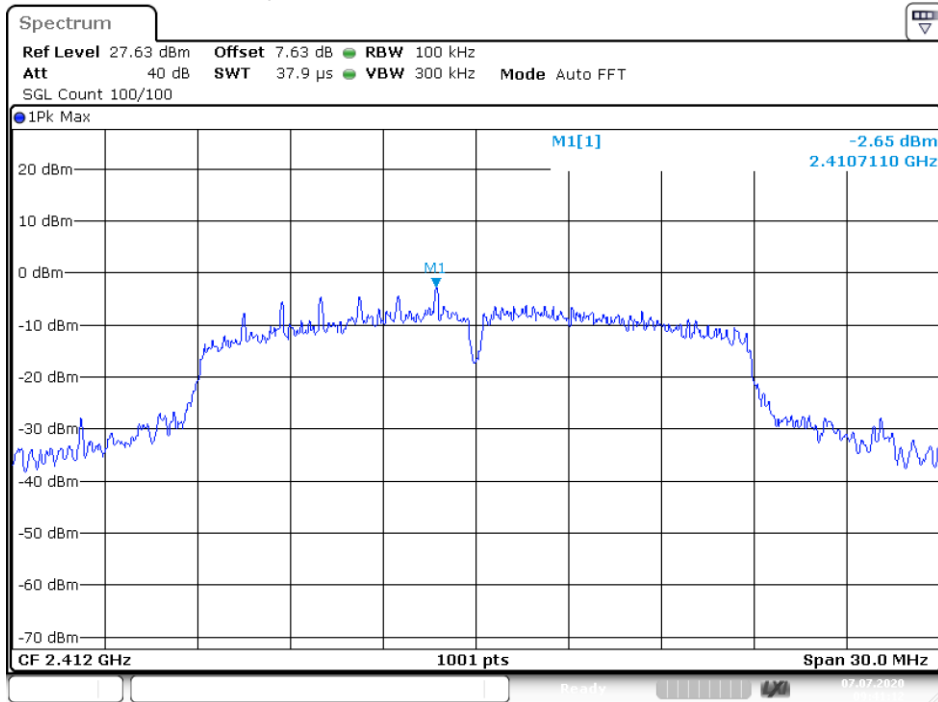
Band Edge NVNT 802.11g 2462MHz Ant1 Ref



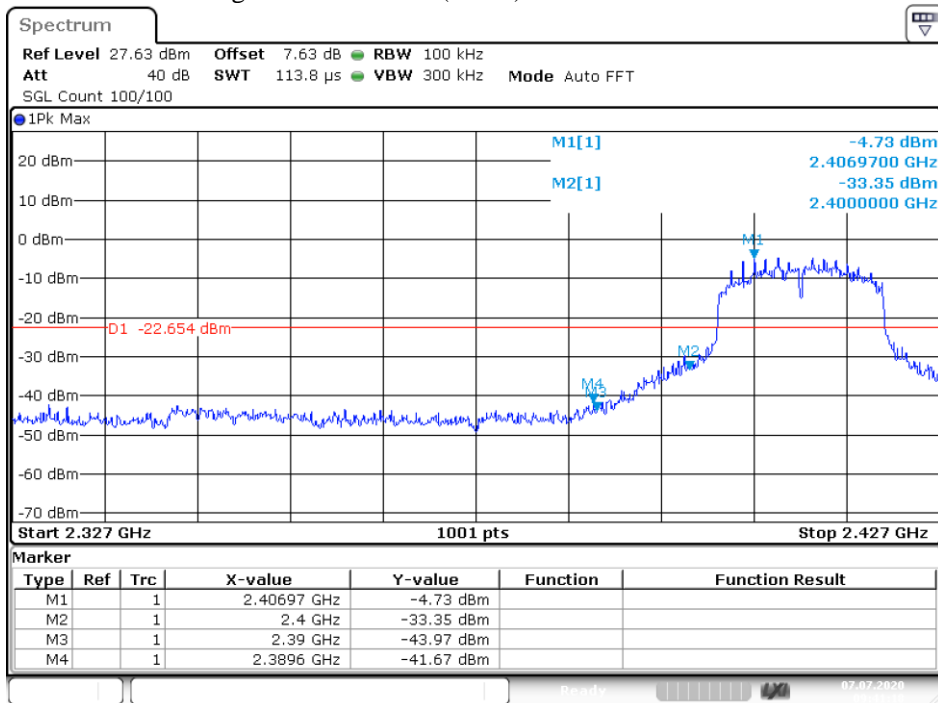
Band Edge NVNT 802.11g 2462MHz Ant1 Emission



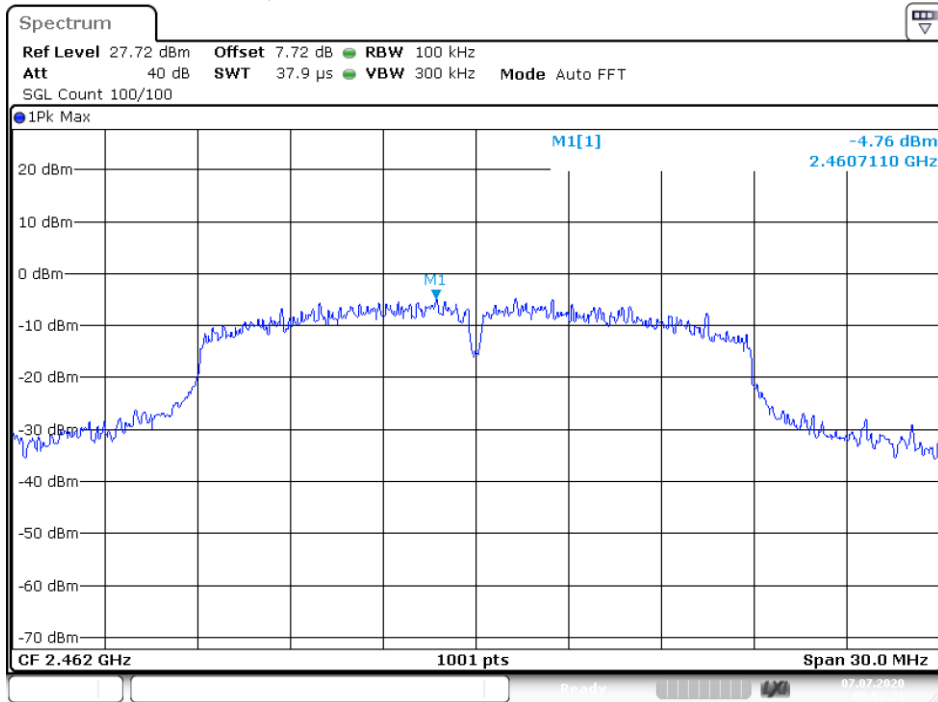
Band Edge NVNT 802.11n(HT20) 2412MHz Ant1 Ref



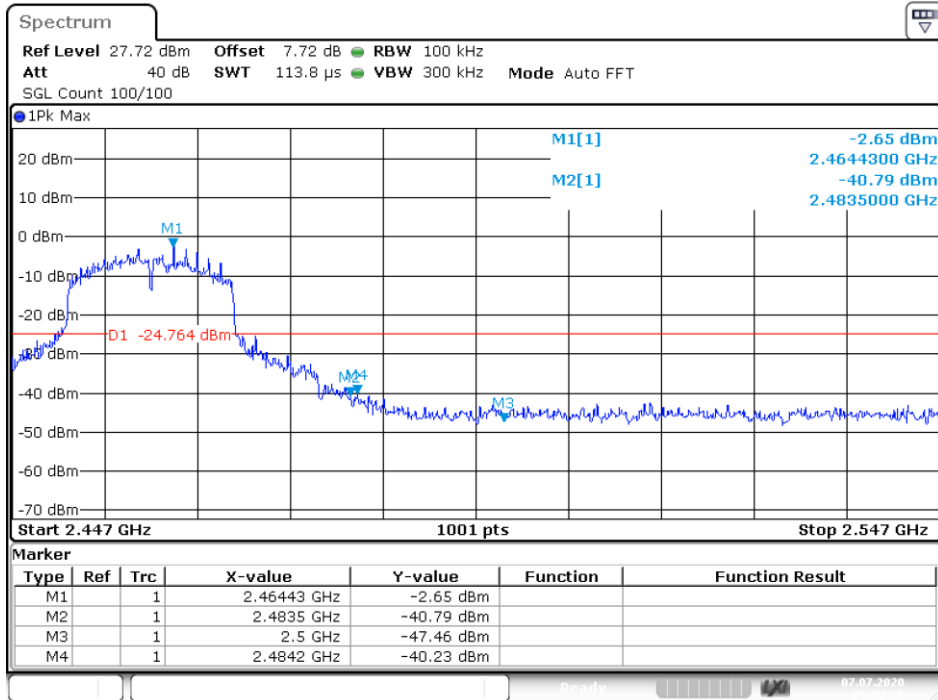
Band Edge NVNT 802.11n(HT20) 2412MHz Ant1 Emission



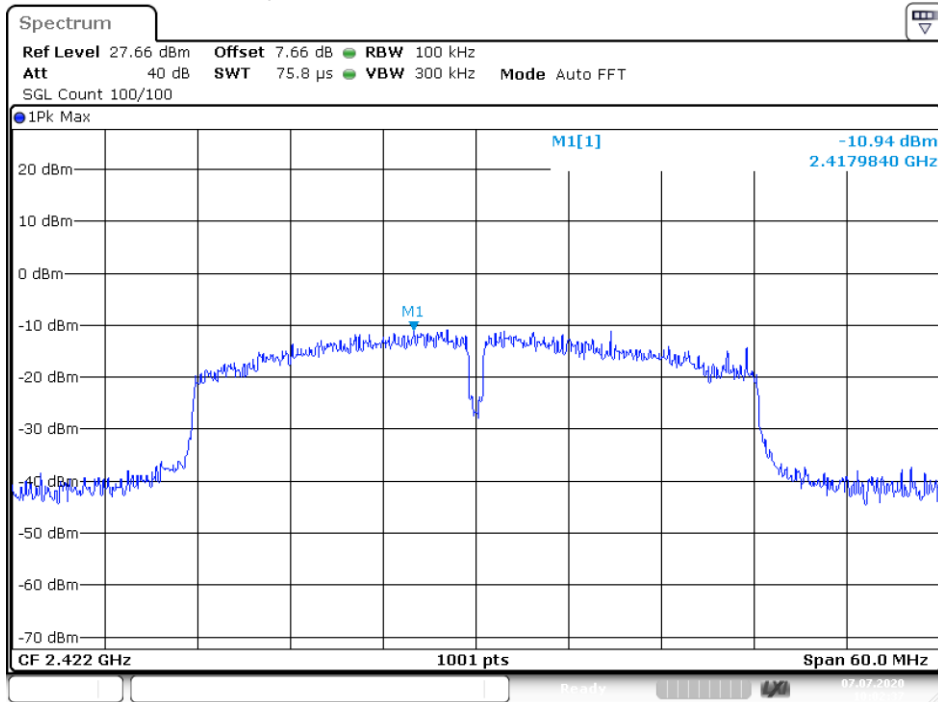
Band Edge NVNT 802.11n(HT20) 2462MHz Ant1 Ref



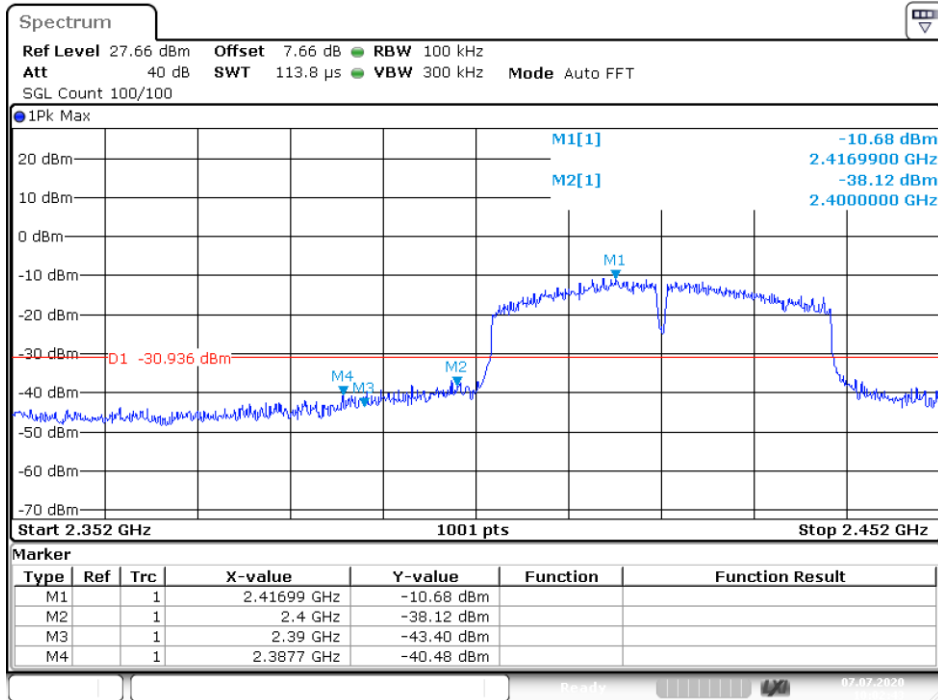
Band Edge NVNT 802.11n(HT20) 2462MHz Ant1 Emission



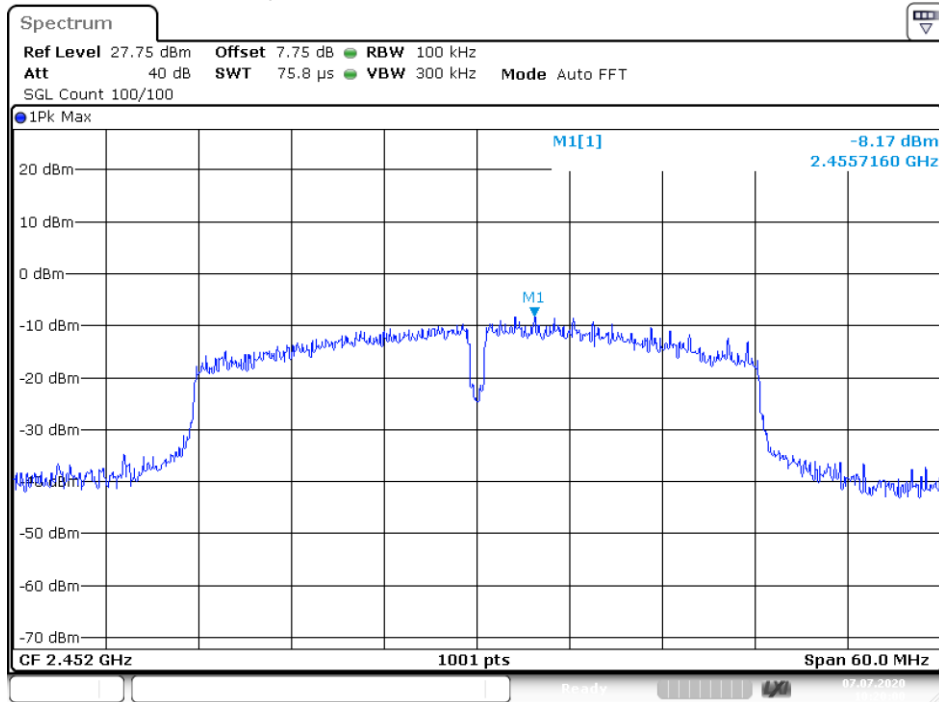
Band Edge NVNT 802.11n(HT40) 2422MHz Ant1 Ref



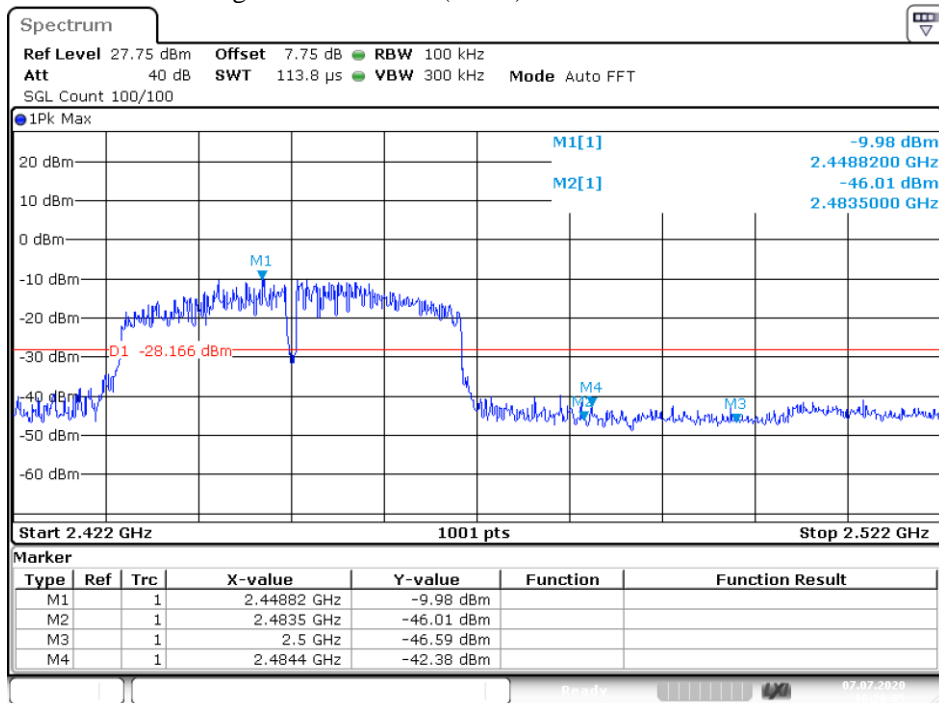
Band Edge NVNT 802.11n(HT40) 2422MHz Ant1 Emission



Band Edge NVNT 802.11n(HT40) 2452MHz Ant1 Ref



Band Edge NVNT 802.11n(HT40) 2452MHz Ant1 Emission



9. Antenna Requirement

9.1. Standard Requirement

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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

9.2. Antenna Connected Construction

The antenna connector is unique antenna and no consideration of replacement. Please see EUT photo for details.

9.3. Results

The EUT antenna is Internal antenna. It complies with the standard requirement.

10. Test Setup Photo

Please refer to separated files for Test Setup Photos of the EUT.

11. Photographs Of The EUT

Please refer to separated files for External Photos of the EUT and Internal Photos of the EUT.

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