

FCC PART 15.249

TEST REPORT

For

Beijing Noitom Technology Ltd.

502,Tower A,28 Xijiekouwai Blvd, Beijing,China

FCC ID: 2ABTR-E01-NYT-02

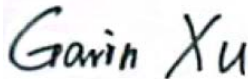
Report Type: Original Report	Product Name: Perception Neuron Studio
Report Number: RBJ191126054-00	
Report Date: 2019-12-26	
Reviewed By:	Gavin Xu RF Engineer 
Test Laboratory:	Bay Area Compliance Laboratories Corp. (Dongguan) No.69 Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, Guangdong, China Tel: +86-769-86858888 Fax: +86-769-86858891 www.baclcorp.com.cn

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

EUT Name:	Perception Neuron Studio
EUT Model:	E01-NYT-02
Operation Frequency:	2402-2482 MHz
Modulation Type:	GFSK
Rated Input Voltage:	DC 3.3V
Serial Number:	RBJ191126054-RF-S1
EUT Received Date:	2019/12/9
EUT Received Status:	Good

Objective

This type approval report is prepared on behalf of **Beijing Noitom Technology Ltd.** in accordance with Part 2-Subpart J, and Part 15-Subparts A and C of the Federal Communication Commissions rules.

The tests were performed in order to determine compliance with FCC Rules Part 15, Subpart C, and section 15.203, 15.205, 15.209 and 15.249 rules.

Related Submittal(s)/Grant(s)

No related submittal.

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

All emissions measurement was performed and Bay Area Compliance Laboratories Corp. (Dongguan).

Measurement Uncertainty

Parameter	Measurement Uncertainty
Occupied Channel Bandwidth	$\pm 5\%$
Unwanted Emissions, radiated	30M~200MHz: 4.58 dB for Horizontal, 4.59 dB for Vertical 200M~1GHz: 4.83 dB for Horizontal, 5.85 dB for Vertical 1G~6GHz: 4.45 dB, 6G~26.5GHz: 5.23 dB
Temperature	$\pm 1^{\circ}\text{C}$
Humidity	$\pm 5\%$
DC and low frequency voltages	$\pm 0.4\%$
Duty Cycle	1%
AC Power Lines Conducted Emission	3.12 dB (150 kHz to 30 MHz)

Note: Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty. The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.69 Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, Guangdong, China.

The lab has been recognized as the FCC accredited lab under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 897218, the FCC Designation No. : CN1220.

The lab has been recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements, the CAB identifier: CN0022.

Declarations

BACL is not responsible for the authenticity of any test data provided by the applicant. Data included from the applicant that may affect test results are marked with a triangle symbol “ $\triangle$ ”. Customer model name, addresses, names, trademarks etc. are not considered data.

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.

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SYSTEM TEST CONFIGURATION

Justification

The EUT was configured in operating mode for testing which was provided by the manufacturer.

The device employs total 81 channels as below:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2402	41	2442
2	2403	42	2443
3	2404	...	...
...	...	81	2482
40	2441	/	/

2402MHz, 2441MHz, 2482MHz was tested.

EUT Exercise Software

No software was used in test.

Equipment Modifications

No modifications were made to the EUT.

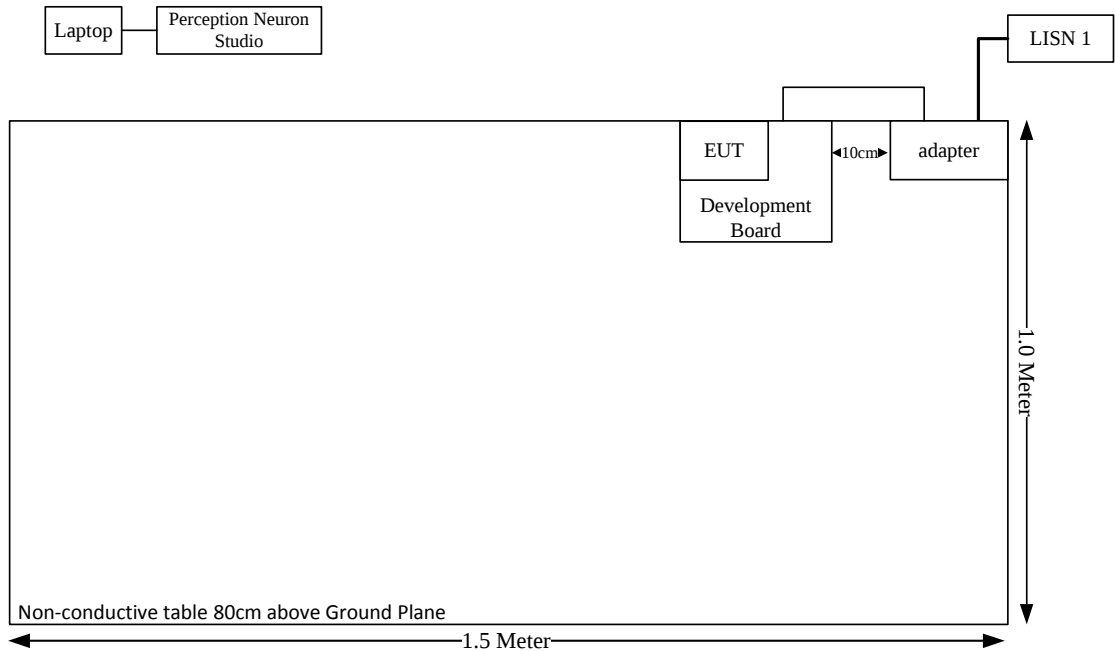
Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
DELL	Laptop	E6410	/
HUAWEI	Adapter	HW-0102000US	/
Noitom	Development Board	/	/
PN Studio	Perception Neuron Studio	NTM-MCP-04-TC-01	/

Support Cable List and Details

Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
USB Cable	Yes	Yes	1	Adapter	EUT

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliance
§15.207(a)	Conduction Emissions	Compliance
15.205, §15.209, §15.249	Radiated Emissions	Compliance
§15.215 (c)	20 dB Bandwidth	Compliance

FCC§15.203 - ANTENNA REQUIREMENT

Applicable Standard

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

Antenna Connector Construction

The EUT has one internal antenna arrangement, and the antenna gain is 1.5 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

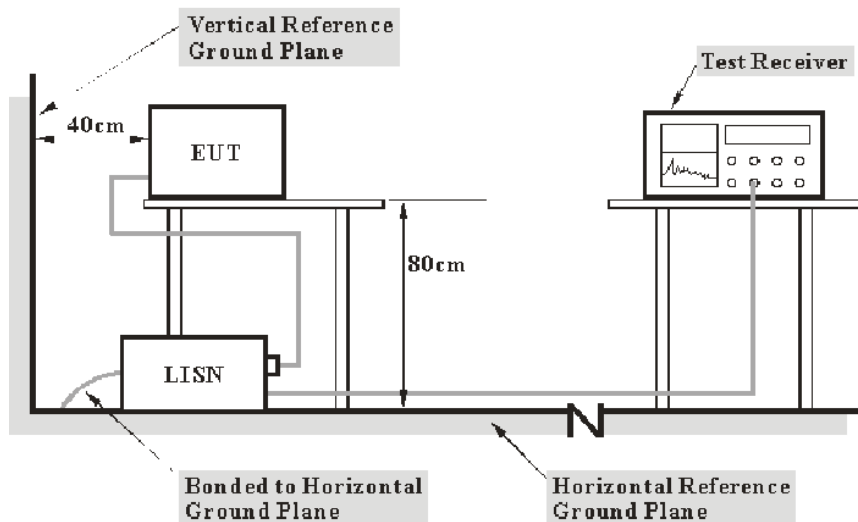
Result: Compliance.

FCC §15.207 (a)– AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC§15.207(a)

EUT Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207.

The spacing between the peripherals was 10 cm.

The adapter was connected to the main LISN with a 120 V/60 Hz AC power source.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

Test Procedure

During the conducted emission test, the adapter was connected to the first LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the Quasi-peak and average detection mode.

Corrected Amplitude & Margin Calculation

The basic equation is as follows:

$$V_C = V_R + A_C + VDF$$

$$C_f = A_C + VDF$$

Herein,

V_C (cord. Reading): corrected voltage amplitude

V_R : reading voltage amplitude

A_C : attenuation caused by cable loss

VDF: voltage division factor of AMN

C_f : Correction Factor

The “**Margin**” column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

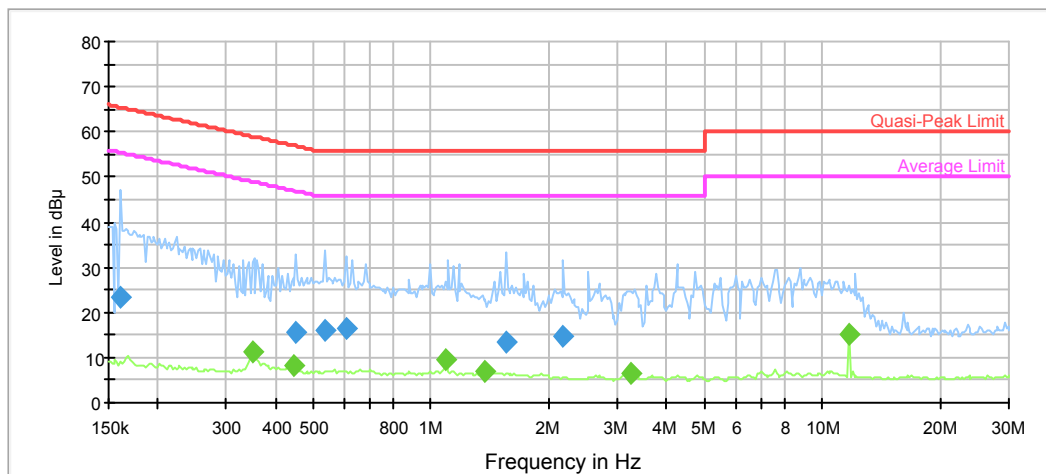
Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Unknown	Coaxial Cable	C-NJNJ-50	C-0200-01	2019-09-05	2020-09-05
R&S	Test Software	EMC32	Version8.53.0	N/A	N/A
R&S	Two-line V-network	ENV 216	101614	2019-09-12	2020-09-12
R&S	EMI Test Receiver	ESCI	101121	2019-05-09	2020-05-09

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

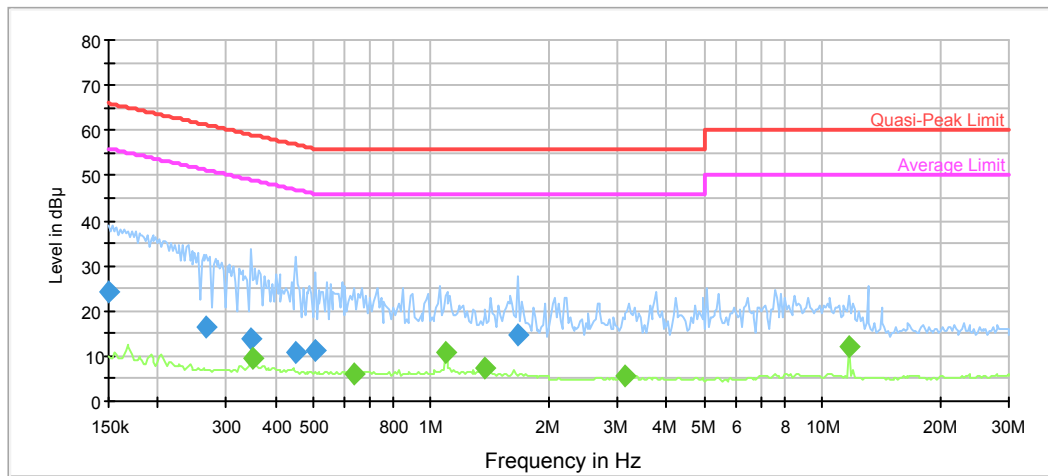
Test Data**Environmental Conditions**

Temperature:	21.8°C
Relative Humidity:	63 %
ATM Pressure:	101.8 kPa
Tester:	Sem Xiang
Test Date:	2019-12-23

Test Mode: Transmitting**AC120V, 60 Hz**

Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.160820	23.2	9.000	L1	9.7	42.2	65.4
0.452652	15.7	9.000	L1	9.7	41.1	56.8
0.536077	16.1	9.000	L1	9.7	39.9	56.0
0.610106	16.4	9.000	L1	9.7	39.6	56.0
1.554585	13.5	9.000	L1	9.8	42.5	56.0
2.180425	14.5	9.000	L1	9.8	41.5	56.0

Frequency (MHz)	Average (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.349469	11.2	9.000	L1	9.7	37.8	49.0
0.443733	8.2	9.000	L1	9.7	38.8	47.0
1.086538	9.6	9.000	L1	9.7	36.4	46.0
1.365955	6.7	9.000	L1	9.7	39.3	46.0
3.246355	6.3	9.000	L1	9.8	39.7	46.0
11.717994	15.3	9.000	L1	10.1	34.7	50.0



Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.150000	24.1	9.000	N	9.7	41.9	66.0
0.267135	16.2	9.000	N	9.7	45.0	61.2
0.346009	14.0	9.000	N	9.6	45.1	59.1
0.452652	11.0	9.000	N	9.6	45.8	56.8
0.505009	11.4	9.000	N	9.6	44.6	56.0
1.666725	14.7	9.000	N	9.6	41.3	56.0

Frequency (MHz)	Average (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.349469	9.4	9.000	N	9.6	39.6	49.0
0.634879	6.2	9.000	N	9.6	39.8	46.0
1.086538	10.8	9.000	N	9.6	35.2	46.0
1.365955	7.5	9.000	N	9.6	38.5	46.0
3.119684	5.6	9.000	N	9.6	40.4	46.0
11.717994	12.2	9.000	N	9.8	37.8	50.0

FCC§15.205, §15.209&§15.249- RADIATED EMISSIONS**Applicable Standard**

As per FCC§15.249 (a), except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

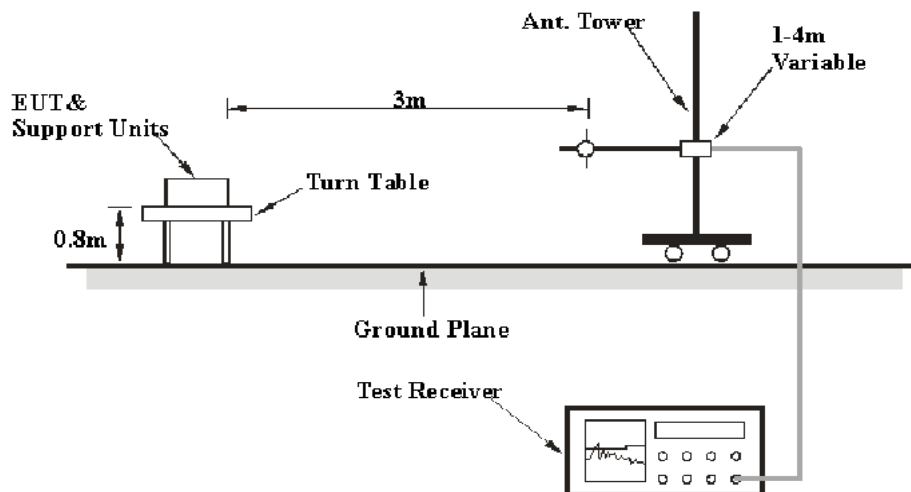
Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902–928 MHz	50	500
2400–2483.5 MHz	50	500
5725–5875 MHz	50	500
24.0–24.25 GHz	250	2500

As per FCC§15.249 (c), Field strength limits are specified at a distance of 3 meters.

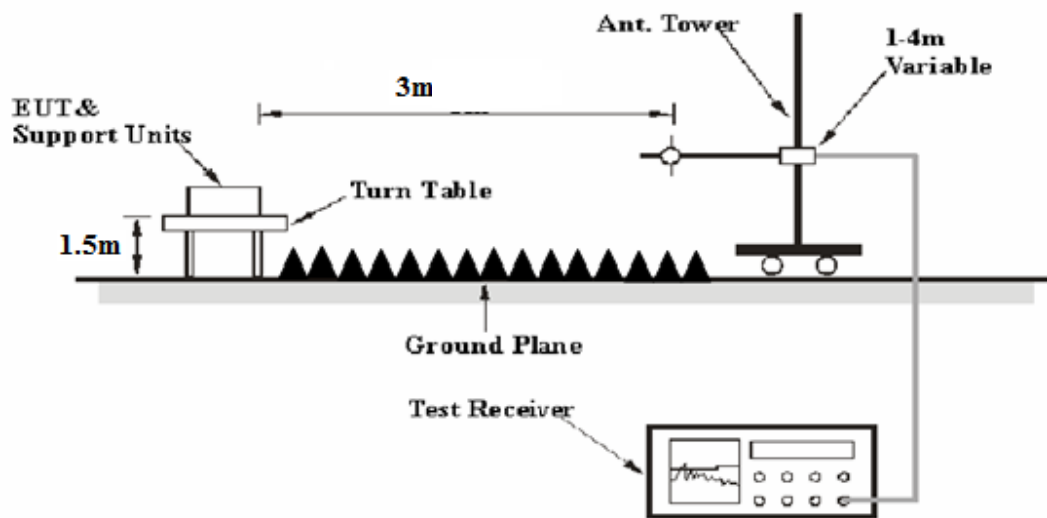
(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

EUT Setup

Below 1 GHz:



Above 1 GHz:



The radiated emission below 1GHz tests were performed in the 10 meters chamber test site, above 1GHz tests were performed in the 3 meters chamber test site B, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209, and FCC 15.249 limits.

Test Equipment Setup

The system was investigated from 30 MHz to 25 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Measurement
30 MHz – 1000 MHz	120 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1MHz	3 MHz	/	PK
	1MHz	10 Hz	/	AV

If the maximized peak measured value complies with under the QP/Average limit more than 6dB, then it is unnecessary to perform an QP/Average measurement.

Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

All data was recorded in the Quasi-peak detection mode from 30 MHz to 1GHz, peak and average detection mode above 1 GHz.

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated emissions below 1GHz					
R&S	EMI Test Receiver	ESR3	102453	2019-09-12	2020-09-12
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A
Sunol Sciences	Antenna	JB3	A060611-1	2017-11-10	2020-11-10
Unknown	Coaxial Cable	C-NJNJ-50	C-0400-01	2019-09-05	2020-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-0075-01	2019-09-05	2020-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-1400-01	2019-05-06	2020-05-06
HP	Amplifier	8447D	2727A05902	2019-09-05	2020-09-05
Radiated emissions above 1GHz					
Agilent	Spectrum Analyzer	E4440A	SG43360054	2019-05-09	2020-05-09
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A
TDK RF	Horn Antenna	HRN-0118	130 084	2018-10-12	2021-10-12
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-01 1304	2017-12-06	2020-12-05
MICRO-COAX	Coaxial Cable	UFA147-1-2362-100100	64639 231029-001	2019-02-24	2020-02-24
Quinstar	Amplifier	QLW-18405536-JO	15964001001	2019-06-27	2020-06-27
E-Microwave	Band-stop Filters	OBSF-2400-2483.5-S	OE01601525	2019-06-16	2020-06-16
Mini Circuits	High Pass Filter	VHF-6010+	31118	2019-06-16	2020-06-16
Quinstar	Amplifier	QLW-18405536-JO	15964001001	2019-06-27	2020-06-27

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

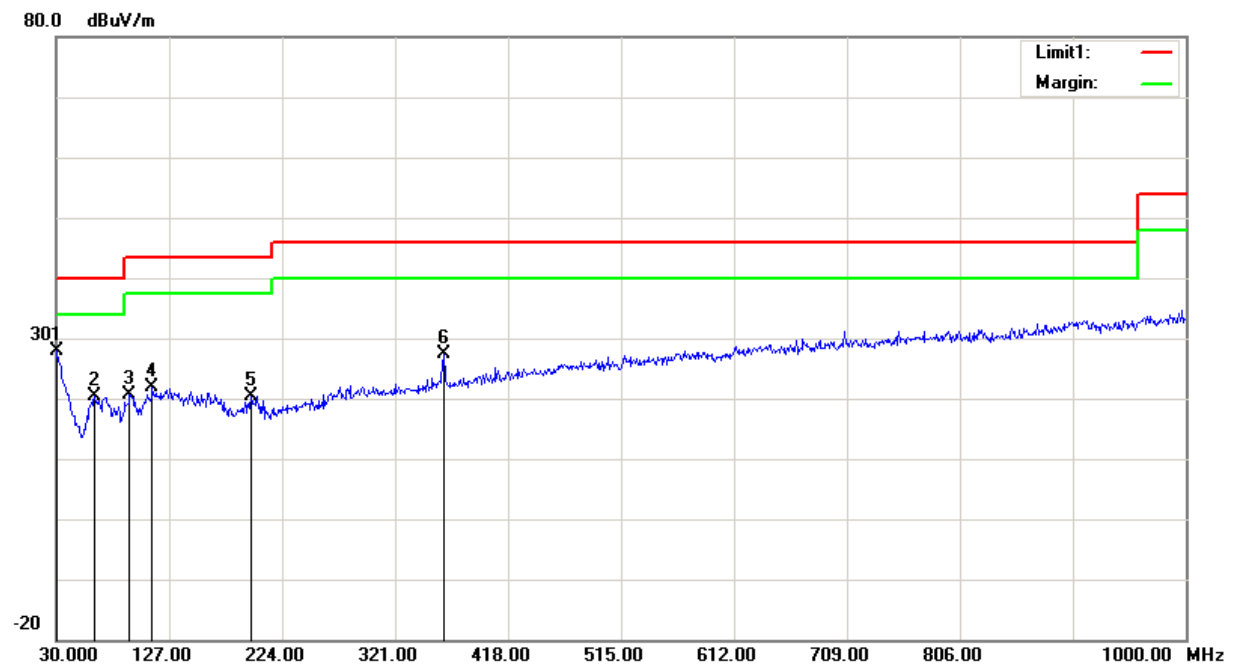
Test Data**Environmental Conditions**

Test Items	Radiation Below 1GHz	Radiation Above 1GHz
Temperature:	23.8°C	23.9°C
Relative Humidity:	43%	39%
ATM Pressure:	102.6 kPa	102.6 kPa
Tester:	Davy Wany	Davy Wany
Test Date:	2019-12-23	2019-12-25

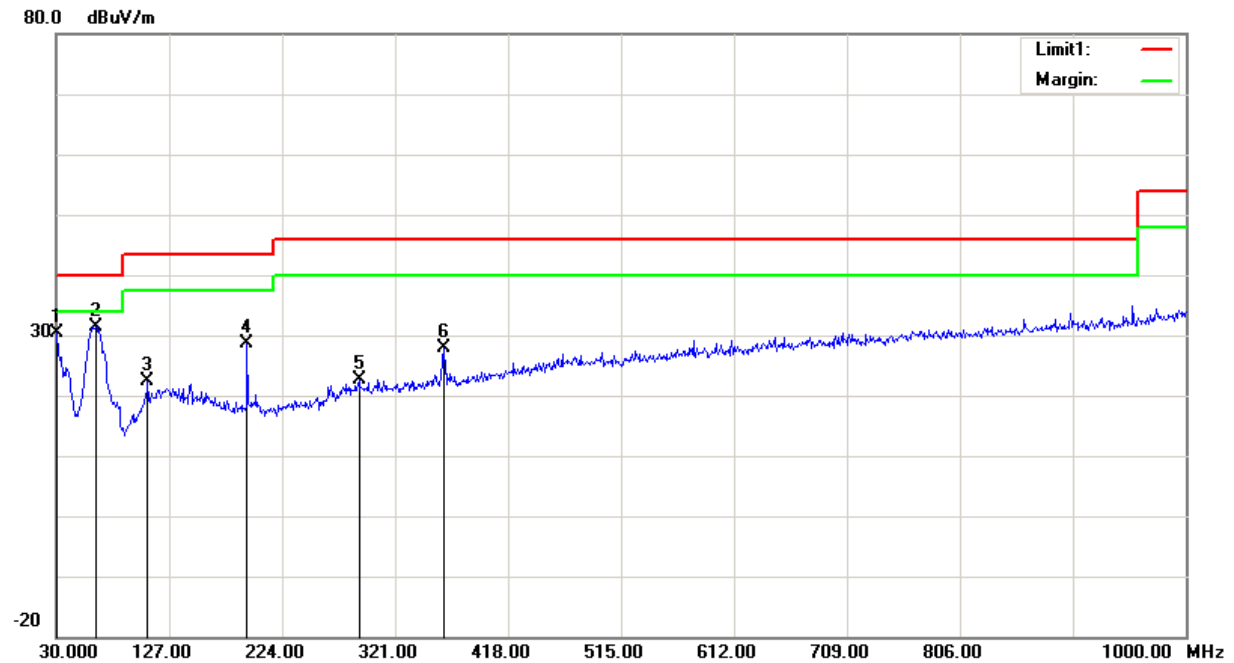
Test Mode: Transmitting

1) 30MHz-1GHz (Low channel is the worst):

Horizontal:



Frequency (MHz)	Receiver Reading (dBuV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBuV/m)	Limit (dBuV/m)	Margin (dB)
30.9700	27.04	peak	0.91	27.95	40.00	12.05
62.9800	32.21	peak	-11.86	20.35	40.00	19.65
93.0500	31.36	peak	-10.73	20.63	43.50	22.87
112.4500	27.71	peak	-5.80	21.91	43.50	21.59
197.8100	26.71	peak	-6.26	20.45	43.50	23.05
362.7100	30.12	peak	-2.81	27.31	46.00	18.69

Vertical:

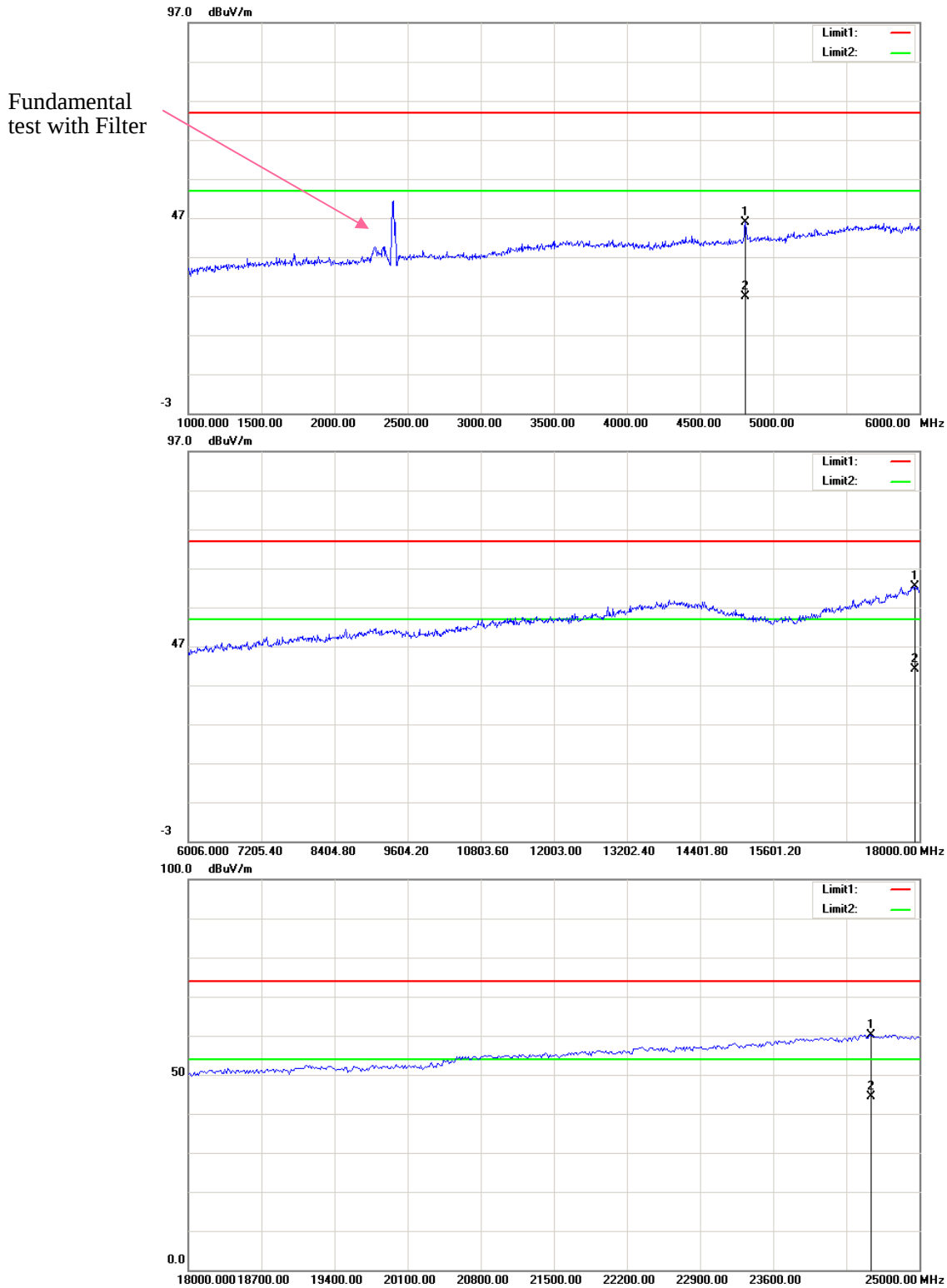
Frequency (MHz)	Receiver Reading (dBuV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBuV/m)	Limit (dBuV/m)	Margin (dB)
30.9700	29.43	peak	0.91	30.34	40.00	9.66
63.9500	43.11	peak	-11.70	31.41	40.00	8.59
108.5700	29.08	peak	-6.69	22.39	43.50	21.11
193.9300	35.38	peak	-6.80	28.58	43.50	14.92
289.9600	26.61	peak	-3.94	22.67	46.00	23.33
362.7100	30.67	peak	-2.81	27.86	46.00	18.14

2) 1GHz-25GHz

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector	Polar (H/V)	Factor (dB/m)					
Low Channel: 2402 MHz									
2402.00	66.86	PK	H	24.82	3.34	0.00	95.02	113.98	18.96
2402.00	28.33	AV	H	24.82	3.34	0.00	56.49	93.98	37.49
2402.00	75.28	PK	V	24.82	3.34	0.00	103.44	113.98	10.54
2402.00	35.70	AV	V	24.82	3.34	0.00	63.86	93.98	30.12
2400.00	20.50	PK	V	24.82	3.34	0.00	48.66	74.00	25.34
2400.00	14.72	AV	V	24.82	3.34	0.00	42.88	54.00	11.12
4804.00	45.35	PK	V	29.71	4.58	27.36	52.28	74.00	21.72
4804.00	24.35	AV	V	29.71	4.58	27.36	31.28	54.00	22.72
7206.00	38.65	PK	V	33.93	5.59	27.19	50.98	74.00	23.02
7206.00	23.53	AV	V	33.93	5.59	27.19	35.86	54.00	18.14
Middle Channel: 2441 MHz									
2441.00	65.98	PK	H	24.89	3.36	0.00	94.23	113.98	19.75
2441.00	28.86	AV	H	24.89	3.36	0.00	57.11	93.98	36.87
2441.00	74.29	PK	V	24.89	3.36	0.00	102.54	113.98	11.44
2441.00	34.47	AV	V	24.89	3.36	0.00	62.72	93.98	31.26
4882.00	45.01	PK	V	29.86	4.56	27.56	51.87	74.00	22.13
4882.00	24.04	AV	V	29.86	4.56	27.56	30.90	54.00	23.10
7323.00	36.45	PK	V	34.12	5.69	27.26	49.00	74.00	25.00
7323.00	23.00	AV	V	34.12	5.69	27.26	35.55	54.00	18.45
High Channel: 2482 MHz									
2482.00	62.56	PK	H	24.97	3.38	0.00	90.91	113.98	23.07
2482.00	27.96	AV	H	24.97	3.38	0.00	56.31	93.98	37.67
2482.00	73.27	PK	V	24.97	3.38	0.00	101.62	113.98	12.36
2482.00	37.62	AV	V	24.97	3.38	0.00	65.97	93.98	28.01
2483.50	31.11	PK	V	24.97	3.38	0.00	59.46	74.00	14.54
2483.50	16.00	AV	V	24.97	3.38	0.00	44.35	54.00	9.65
4964.00	45.45	PK	V	30.03	4.58	27.35	52.71	74.00	21.29
4964.00	24.31	AV	V	30.03	4.58	27.35	31.57	54.00	22.43
7446.00	37.23	PK	V	34.31	5.79	27.23	50.10	74.00	23.90
7446.00	23.78	AV	V	34.31	5.79	27.23	36.65	54.00	17.35

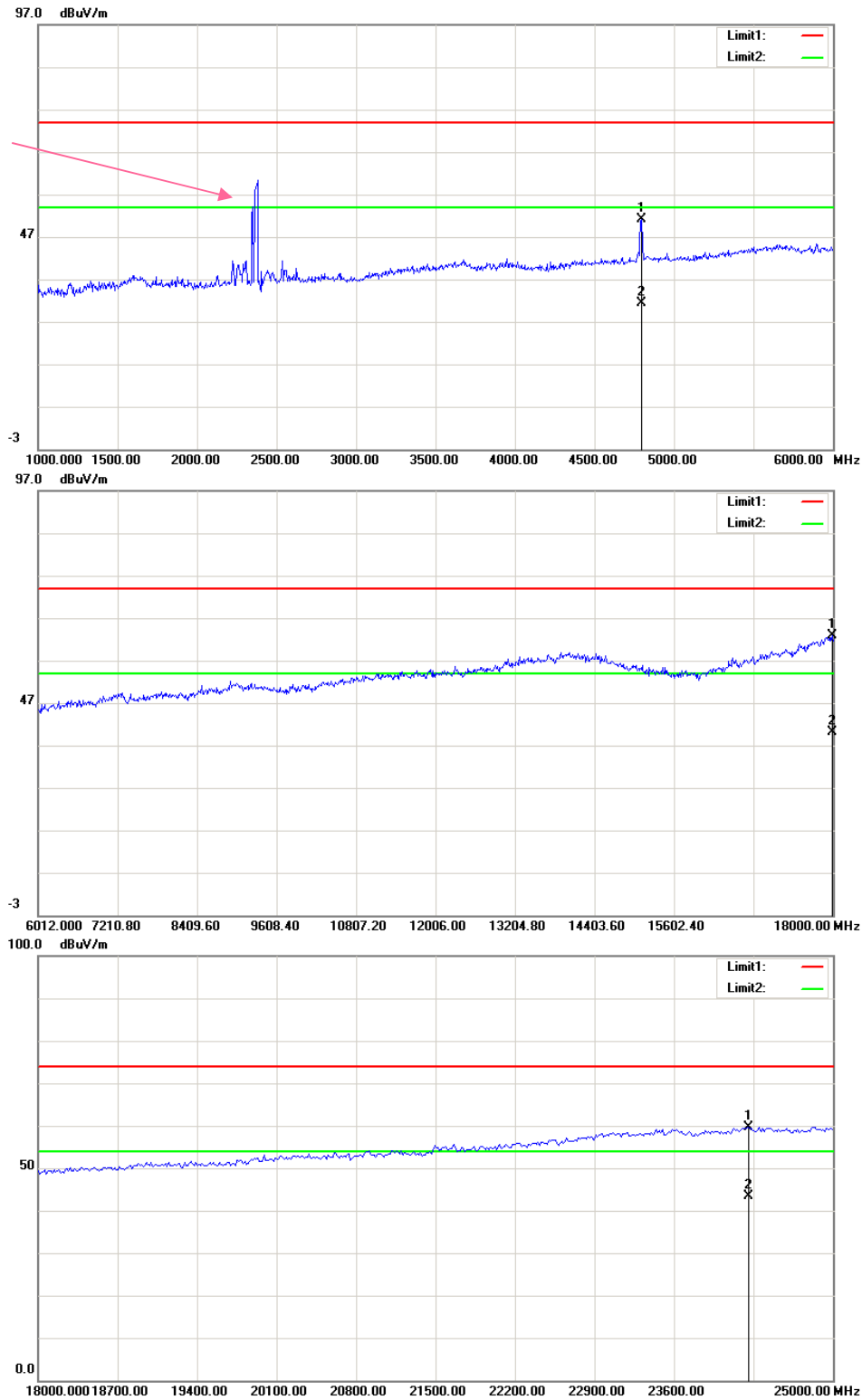
3) Worst Test Plots (Above 1GHz) (High channel was the worst)

Horizontal



Vertical

Fundamental
test with Filter



FCC §15.215(c) – 20 dB BANDWIDTH TESTING

Applicable Standard

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
3. Repeat above procedures until all frequencies measured were complete.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSP 38	100478	2019-12-10	2020-12-10
Unknown	Coaxial Cable	C-SJ00-0010	C0010/05	Each time	/

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

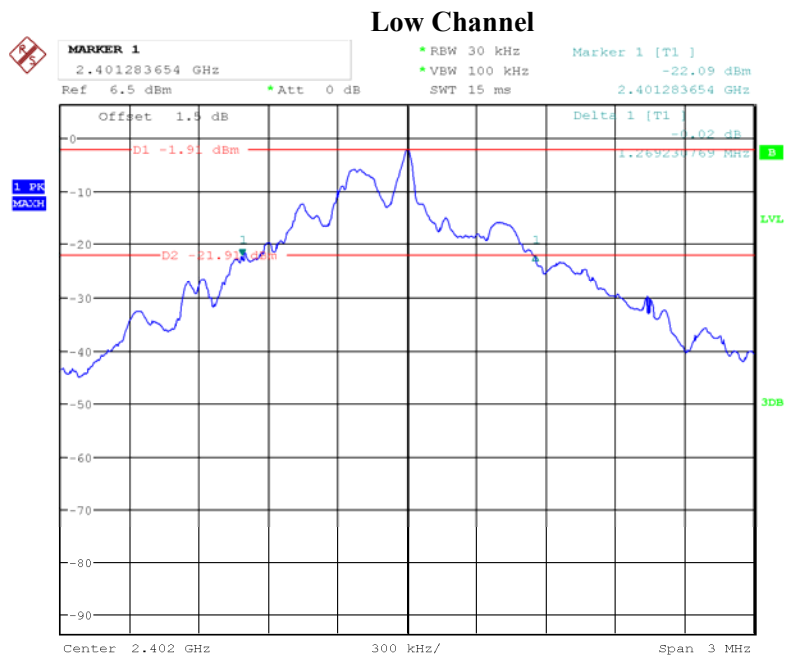
Temperature:	24.3°C
Relative Humidity:	63%
ATM Pressure:	102.6 kPa
Tester:	Vern Shen
Test Date:	2019-12-25

Test Result: Compliance.

Please refer to following tables and plots

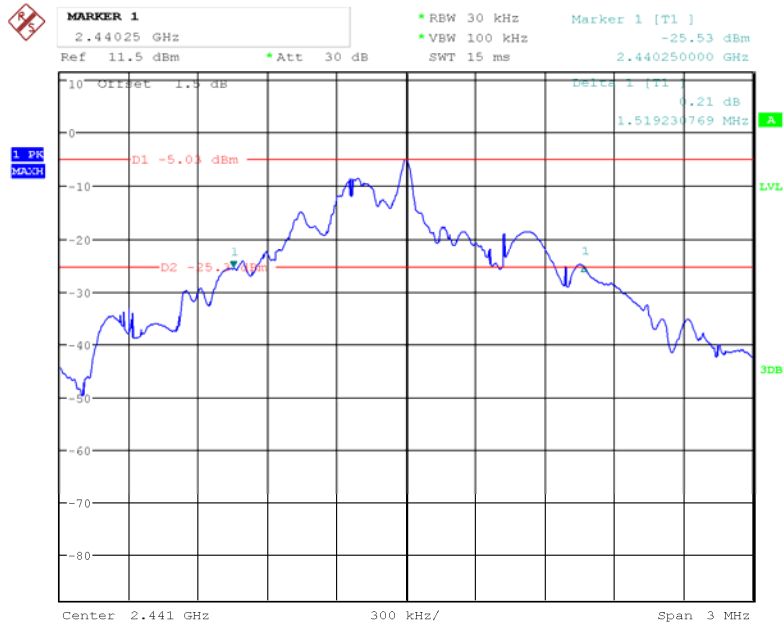
Test Mode: Transmitting

Channel	Frequency (MHz)	20 dB Bandwidth (MHz)
Low	2402	1.269
Middle	2441	1.519
High	2482	1.389



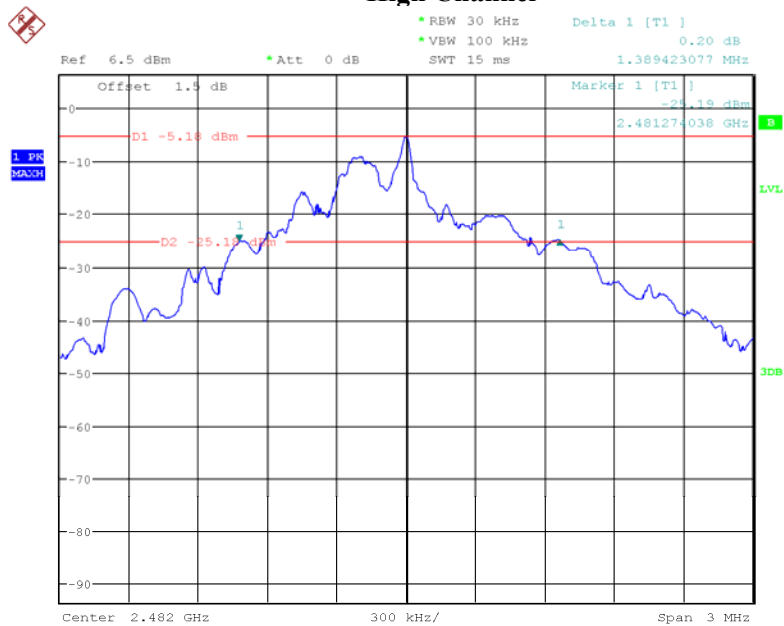
Date: 28.DEC.2019 09:29:17

Middle Channel



Date: 25.DEC.2019 16:22:11

High Channel



Date: 28.DEC.2019 09:37:10

***** END OF REPORT *****