

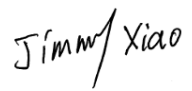
# FCC PART 15B, CLASS B MEASUREMENT AND TEST REPORT

For

**Helium Systems Inc.**

51 Federal Street #100 San Francisco California United States 94107

**FCC ID: 2ADMK-2**

<b>Report Type:</b> Original Report	<b>Product Type:</b> Helium Hotspot
<b>Report Number:</b> RSZ200305001-00	
<b>Report Date:</b> 2020-03-24	
Jimmy Xiao 	
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## GENERAL INFORMATION

### Product Description for Equipment under Test (EUT)

Product	Helium Hotspot
Tested Model	HS1
Voltage Range	DC 5.0V from adapter
Highest operating frequency	5825MHz
Date of Test	2020-03-09 to 2020-03-15
Sample serial number	RSZ200305001-RF-S1(Assigned by BACL, Shenzhen)
Received date	2020-03-05
Sample/EUT Status	Good condition
Adapter information	Model: RA040-0503000US Input: AC 100-240V, 50/60Hz, 0.6A Output: DC 5.0V, 3.0A

### Objective

This test report is prepared on behalf of *Helium Systems Inc.* in accordance with Part 2-Subpart J, Part 15-Subparts A, B of the Federal Communication Commissions rules.

The objective of the manufacturer is to determine the compliance of the EUT with FCC Part 15 B.

### Related Submittal(s)/Grant(s)

N/A

### Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

All emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Shenzhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

## Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on CISPR 16-4-2:2011, the expanded combined standard uncertainty of test at Bay Area Compliance Laboratories Corp. (Shenzhen) is shown as below. And the uncertainty will be taken into consideration for the test data recorded in the report

Parameter		uncertainty
Conducted Emissions		$\pm 1.95\text{Db}$
Radiated Emissions	Below 1GHz	$\pm 4.75\text{Db}$
	Above 1GHz	$\pm 4.88\text{Db}$

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

## Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No.: 342867, the FCC Designation No.: CN1221.

The test site has been registered with ISED Canada under ISED Canada Registration Number 3062B.

## SYSTEM TEST CONFIGURATION

### Description of Test Configuration

The system was configured for testing in a manufacturer testing fashion.

### EUT Exercise Software

N/A

### Special Accessories

No special accessory.

### Equipment Modifications

No modification was made to the EUT tested.

### Local Support Equipment List and Details

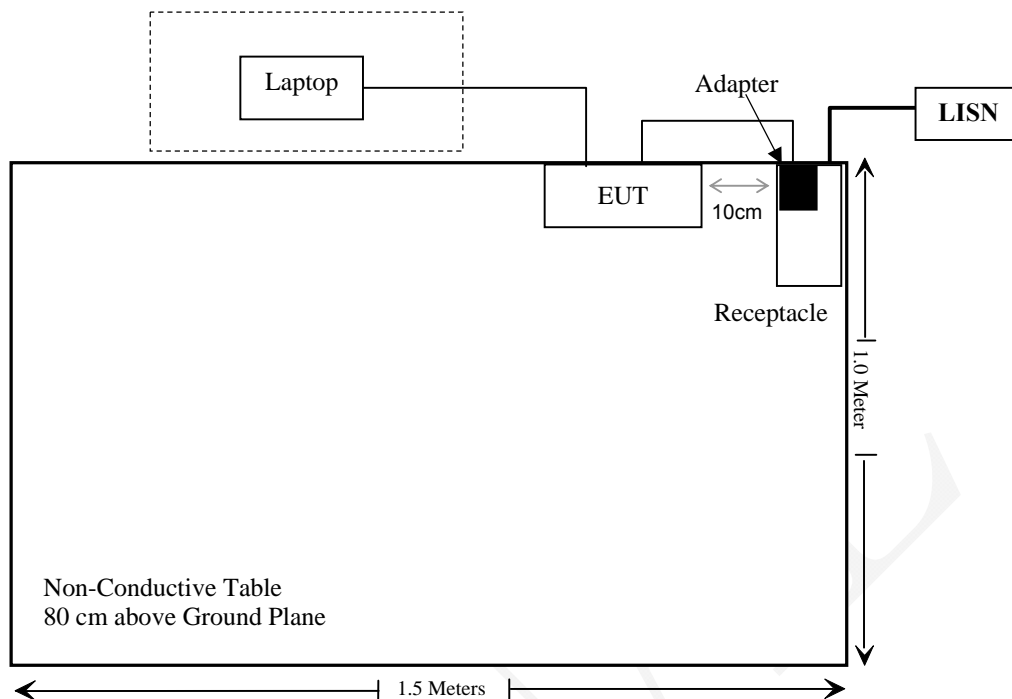
Manufacturer	Description	Model	Serial Number
Dell	Laptop	Latitude E5430	MY159423

### External I/O Cable

Cable Description	Length (m)	From Port	To
Un-shield Un-Detachable DC Power Cable	1.5	EUT	Adapter
Un-shield Detachable RJ45 Cable	10	EUT	Laptop

## Block Diagram of Test Setup

For conducted emission



**SUMMARY OF TEST RESULTS**

FCC Rules	Description of Test	Results
§15.107	AC Line Conducted Emissions	Compliance
§15.109	Radiated Spurious Emissions	Compliance

**TEST EQUIPMENT LIST**

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
<b>AC Line Conducted Emission Test</b>					
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2019/7/9	2020/7/8
Rohde & Schwarz	LISN	ENV216	101613	2020/1/22	2021/1/21
Rohde & Schwarz	Transient Limitor	ESH3Z2	DE25985	2019/11/29	2020/11/28
Unknow	CE Cable	CE Cable	UF A210B-1-0720-504504	2019/11/29	2020/11/28
Rohde & Schwarz	CE Test software	EMC 32	V8.53.0	NCR	NCR
<b>Radiated Emission Test</b>					
R&S	EMI Test Receiver	ESR3	102455	2019/7/9	2020/7/8
Sonoma instrument	Pre-amplifier	310 N	186238	2019/4/20	2020/4/20
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2017/12/22	2020/12/21
Unknow	Cable	Chamber Cable 1	F-03-EM236	2019/11/29	2020/11/28
Unknow	Cable	Chamber Cable 4	EC-007	2019/11/29	2020/11/28
Rohde & Schwarz	Auto test software	EMC 32	V9.10	NCR	NCR
Rohde & Schwarz	Spectrum Analyzer	FSV40-N	102259	2019/7/22	2020/07/21
COM-POWER	Pre-amplifier	PA-122	181919	2019/11/29	2020/11/28
Quinstar	Amplifier	QLW-18405536-J0	15964001002	2019/11/29	2020/11/28
Sunol Sciences	Horn Antenna	DRH-118	A052604	2017/12/22	2020/12/21
Insulted Wire Inc.	RF Cable	SPS-2503-3150	02222010	2019/11/29	2020/11/28
Unknow	RF Cable	W1101-EQ1 OUT	F-19-EM005	2019/11/29	2020/11/28
Ducommun Technologies	Horn antenna	ARH-4223-02	1007726-02 1304	2017/12/6	2020/12/5
Ducommun Technologies	Horn antenna	ARH-2823-02	1007726-02 1302	2017/12/6	2020/12/5

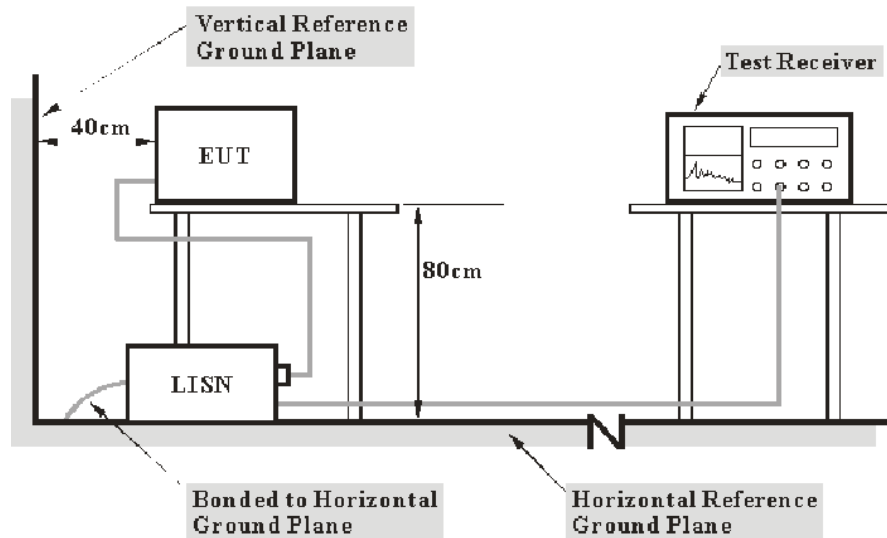
\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

## FCC §15.107 – AC LINE CONDUCTED EMISSIONS

### Applicable Standard

According to FCC §15.107

### 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 measurement procedure of EUT setup is according with per ANSI C63.4-2014. The related limit was specified in FCC Part 15.107 Class B.

The spacing between the peripherals was 10 cm.

### 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 host PC was connected to the first LISN and the other relevant equipments were connected to the second 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 Factor & Margin Calculation

The Corrected factor is calculated by adding LISN/ISN VDF (Voltage Division Factor), Cable Loss and Transient Limiter Attenuation. The basic equation is as follows:

$$\text{Correction Factor} = \text{LISN VDF} + \text{Cable Loss} + \text{Transient Limiter Attenuation}$$

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

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

## Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Part 15.107,

## Test Data

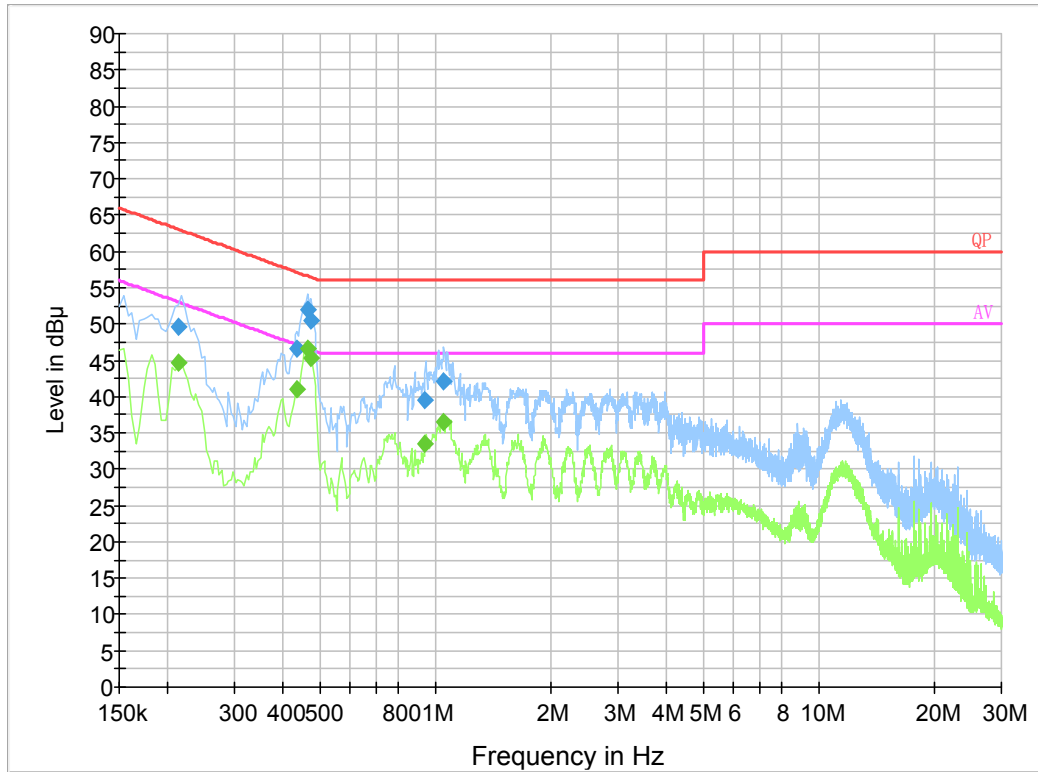
### Environmental Conditions

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	65 %
<b>ATM Pressure:</b>	101.0 kPa

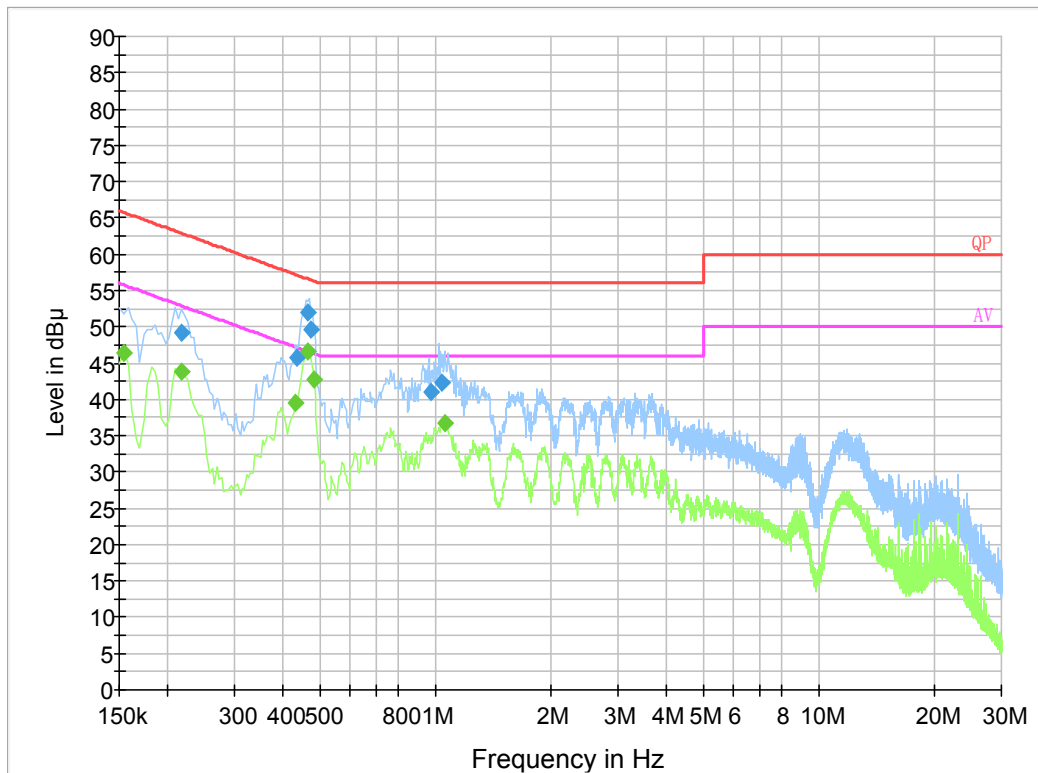
*The testing was performed by Haiguo Li on 2020-03-09.*

EUT Operation Mode: Ping with laptop

AC 120V/60 Hz, Line



Frequency (MHz)	Corrected Amplitude (dBμV)	Correction Factor (Db)	Limit (dBμV)	Margin (dB)	Detector (PK/Ave./QP)
0.213500	49.7	19.8	63.1	13.4	QP
0.436450	46.6	19.8	57.1	10.6	QP
0.467010	52.0	19.8	56.6	4.5	QP
0.474770	50.5	19.8	56.4	5.9	QP
0.943810	39.5	19.8	56.0	16.5	QP
1.054190	42.0	19.9	56.0	14.0	QP
0.213500	44.7	19.8	53.1	8.4	Ave.
0.436450	41.1	19.8	47.1	6.1	Ave.
0.467010	46.5	19.8	46.6	0.1	Ave.
0.474770	45.4	19.8	46.4	1.1	Ave.
0.943810	33.5	19.8	46.0	12.5	Ave.
1.054190	36.6	19.9	46.0	9.4	Ave.

**AC 120V/60 Hz, Neutral**

Frequency (MHz)	Corrected Amplitude (dBμV)	Correction Factor (Db)	Limit (dBμV)	Margin (dB)	Detector (PK/Ave./QP)
0.217500	49.3	19.8	62.9	13.6	QP
0.436450	45.7	19.8	57.1	11.4	QP
0.466950	52.1	19.8	56.6	4.5	QP
0.474770	49.7	19.8	56.4	6.8	QP
0.971570	41.0	19.8	56.0	15.0	QP
1.037330	42.4	19.8	56.0	13.6	QP
0.154000	46.4	19.8	55.8	9.4	Ave.
0.218000	43.9	19.8	52.9	9.0	Ave.
0.430000	39.5	19.8	47.3	7.8	Ave.
0.466000	46.5	19.8	46.6	0.1	Ave.
0.482000	42.6	19.8	46.3	3.7	Ave.
1.062000	36.7	19.8	46.0	9.3	Ave.

**Note:**

- 1) Correction Factor = LISN VDF (Voltage Division Factor) + Cable Loss + Transient Limiter Attenuation
- 2) Corrected Amplitude = Reading + Correction Factor
- 3) Margin = Limit – Corrected Amplitude

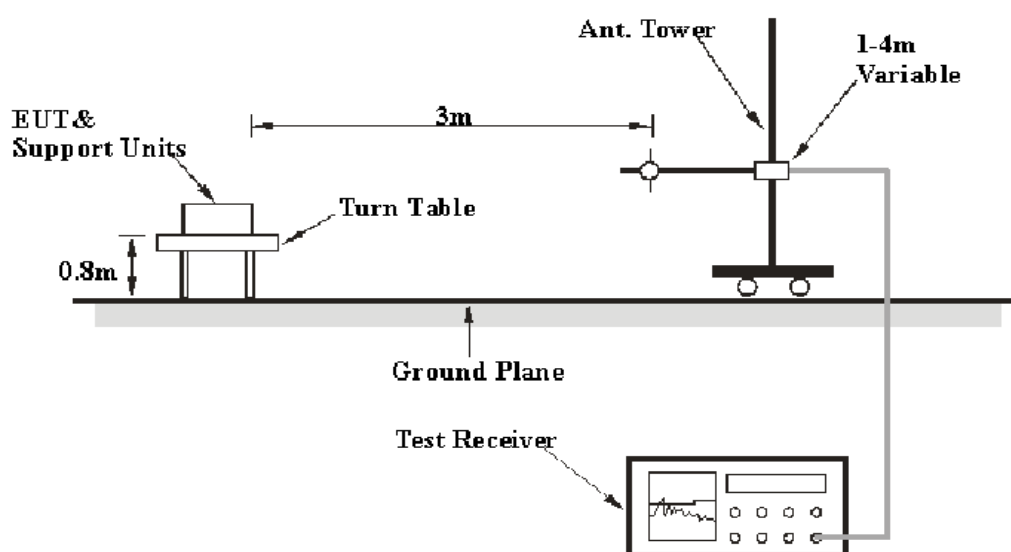
## FCC §15.109 – RADIATED SPURIOUS EMISSIONS

### Applicable Standard

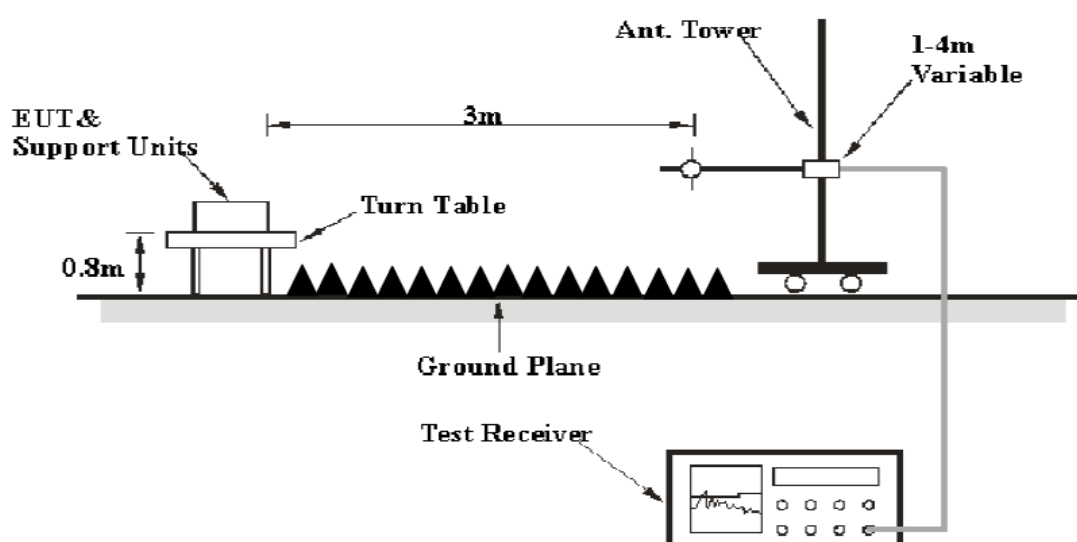
FCC §15.109

### EUT Setup

Below 1GHz:



Above 1GHz:



The radiated emission tests were performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.4-2014. The specification used was the FCC Part 15.109 Class B limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

### EMI Test Receiver Setup

The system was investigated from 30 MHz to 30GHz.

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

Frequency Range	RBW	Video B/W	IF B/W	Measurement
30 MHz – 1000 MHz	100 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1MHz	3 MHz	/	PK
	1MHz	10 Hz	/	Ave.

### 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 detector mode from 30 MHz to 1 GHz and PK and average detector modes for frequencies 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 7 Db means the emission is 7 Db below the limit. The equation for margin calculation is as follows:

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

### Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC §15.109 Class B.

### Test Data

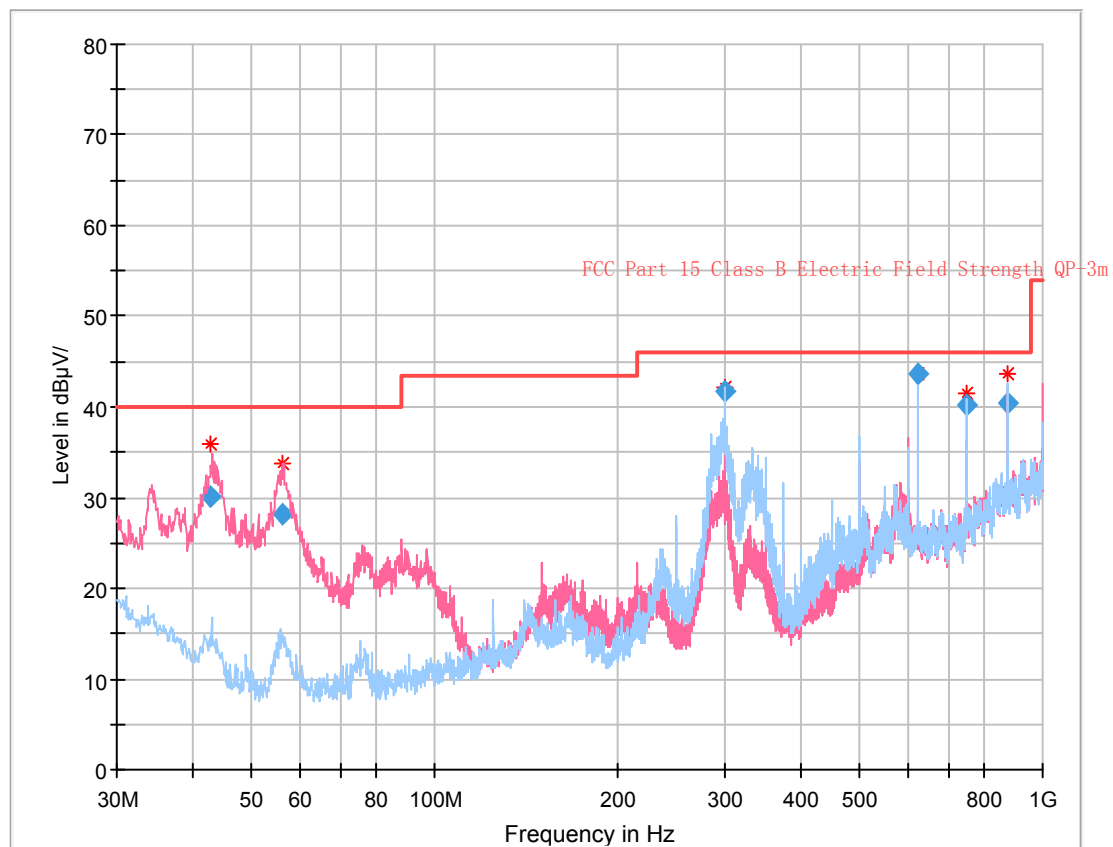
#### Environmental Conditions

<b>Temperature:</b>	23 °C
<b>Relative Humidity:</b>	58 %
<b>ATM Pressure:</b>	101.0 kPa

*The testing was performed by Zero Yan on 2020-03-10 for below 1G and Charlie Cha on 2020-03-15 for above 1G.*

EUT Operation Mode: Ping with laptop

30 MHz – 1 GHz:



Frequency (MHz)	Corrected Amplitude (dBμV/m)	Antenna height (cm)	Antenna Polarity	Turntable position (degree)	Correction Factor (Db/m)	Limit (dBμV/m)	Margin (Db)
42.782250	30.20	112.0	V	237.0	-15.7	40.00	9.80
56.046375	28.21	138.0	V	240.0	-20.0	40.00	11.79
299.996000	41.74	108.0	H	96.0	-10.6	46.00	4.26
625.000250	43.73	141.0	H	15.0	-1.6	46.00	2.27
750.007750	40.22	112.0	H	343.0	-0.4	46.00	5.78
874.997375	40.48	103.0	H	13.0	3.6	46.00	5.52

**Above 1 GHz:**

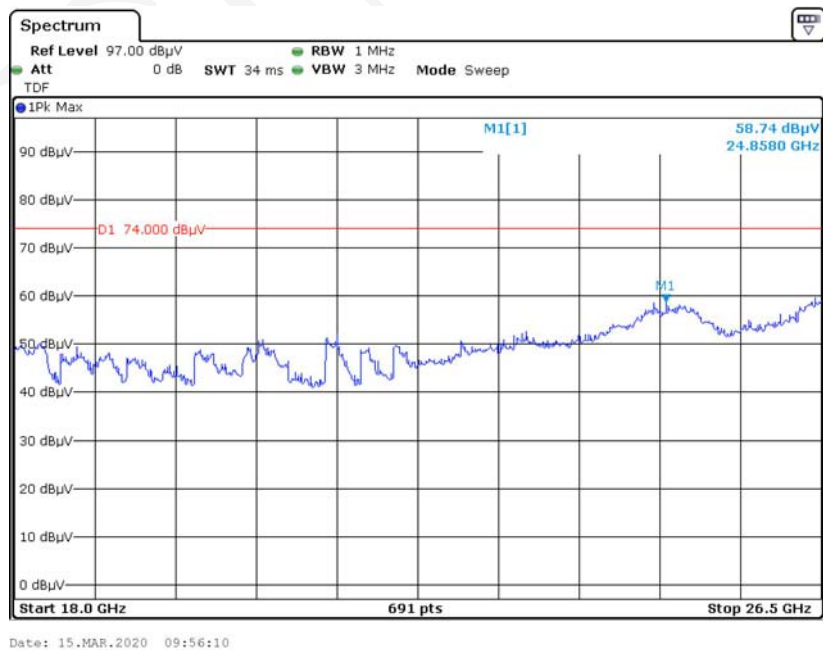
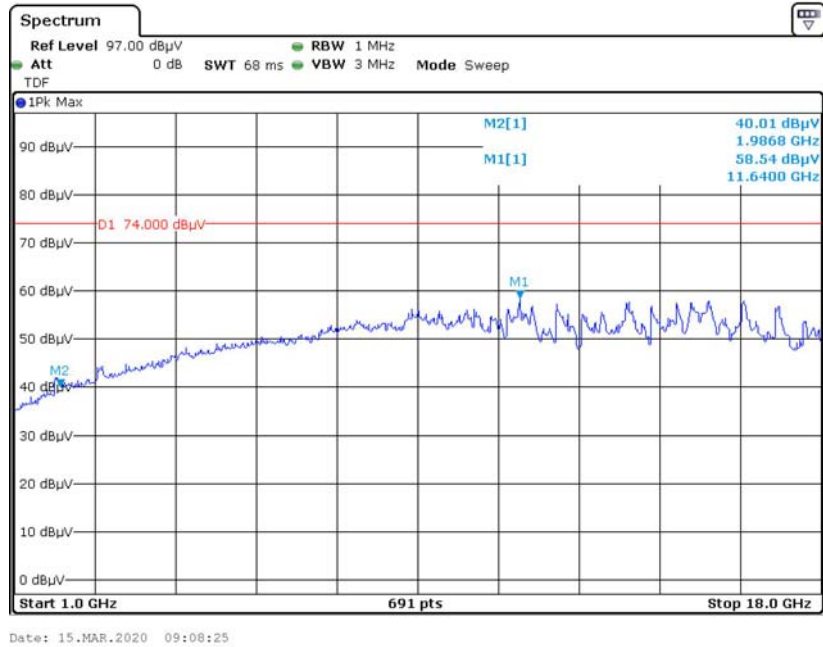
Frequency (MHz)	Measurement		Turntable Degree	Rx Antenna		Corrected Factor (Db/m)	Corrected Amplitude (dBμV/m)	FCC Part 15B	
	Reading (dBμV)	PK/QP/Ave.		Height (m)	Polar (H / V)			Limit (dBμV/m)	Margin (dB)
1305.26	43.06	PK	174	2.3	H	-4.31	38.75	74	35.25
1305.26	28.13	Ave.	174	2.3	H	-4.31	23.82	54	30.18
1305.26	43.25	PK	99	2.1	V	-4.31	38.94	74	35.06
1305.26	28.16	Ave.	99	2.1	V	-4.31	23.85	54	30.15
1986.79	42.89	PK	169	1.3	H	-1.29	41.60	74	32.40
1986.79	28.09	Ave.	169	1.3	H	-1.29	26.80	54	27.20
1986.79	43.41	PK	213	1.2	V	-1.29	42.12	74	31.88
1986.79	28.26	Ave.	213	1.2	V	-1.29	26.97	54	27.03

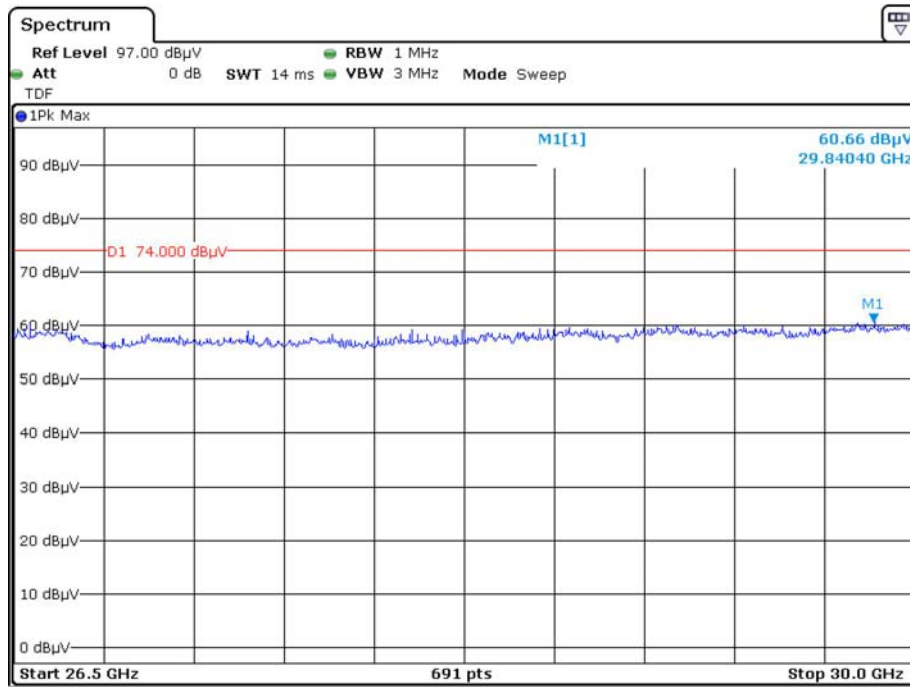
**Note:**

- 1) Correction Factor=Antenna factor (RX) + cable loss – amplifier factor
- 2) Corrected Amplitude = Correction Factor + Reading
- 3) Margin = Limit – Corrected Amplitude

# Pre-scan for peak

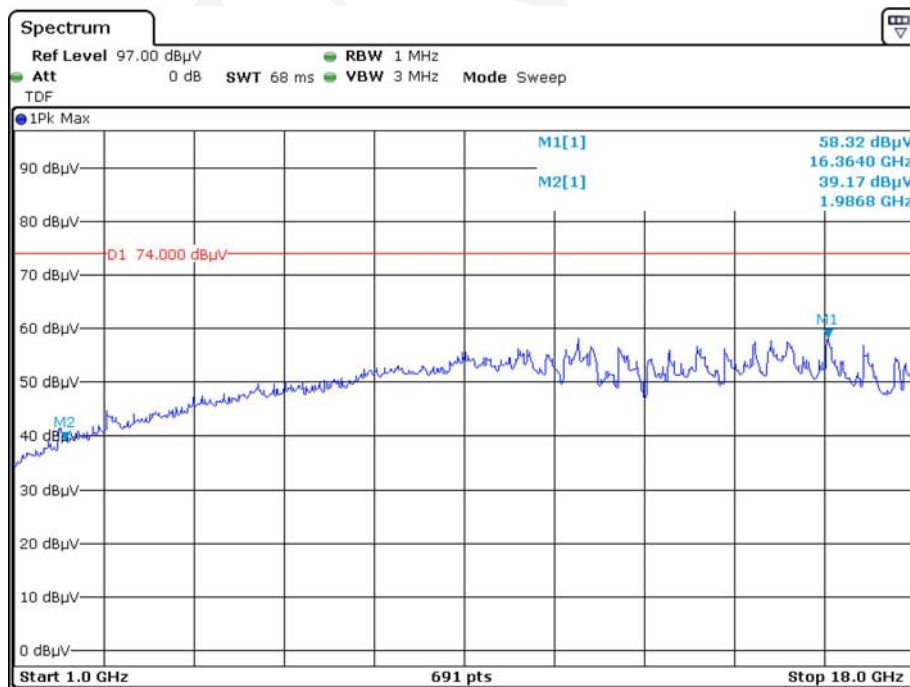
## Horizontal



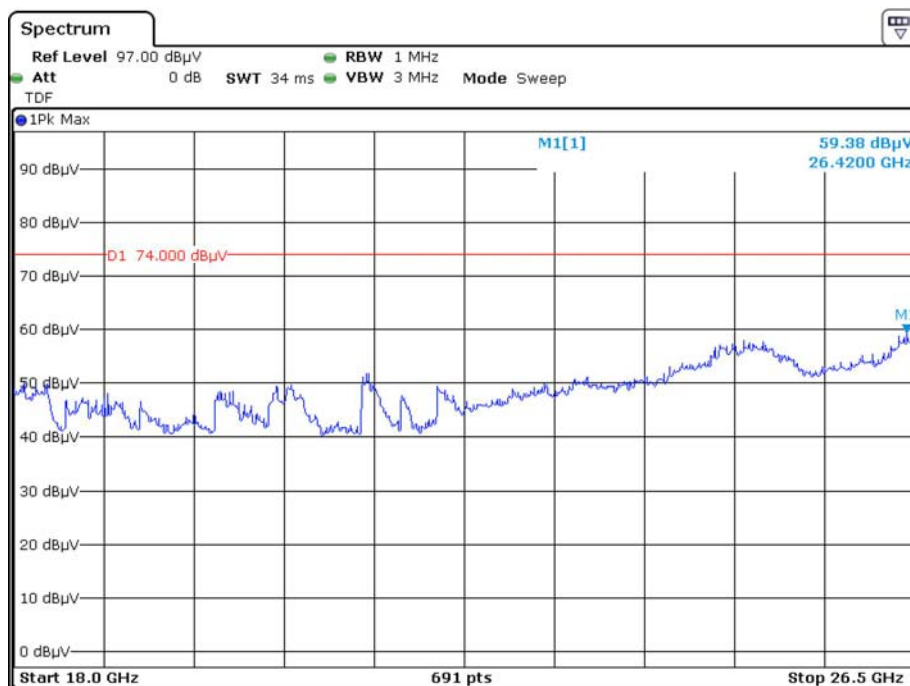


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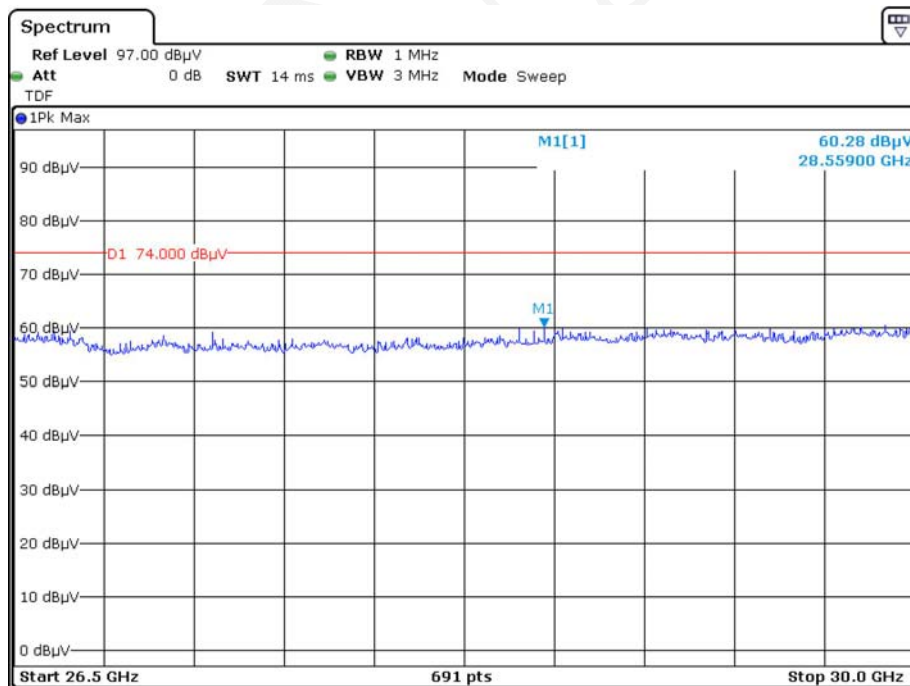
Vertical



Date: 15.MAR.2020 09:18:20



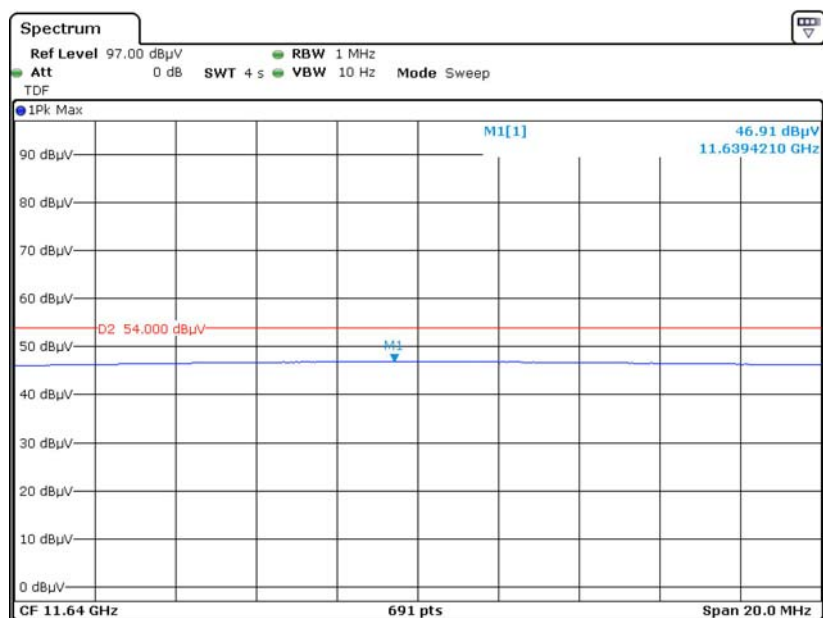
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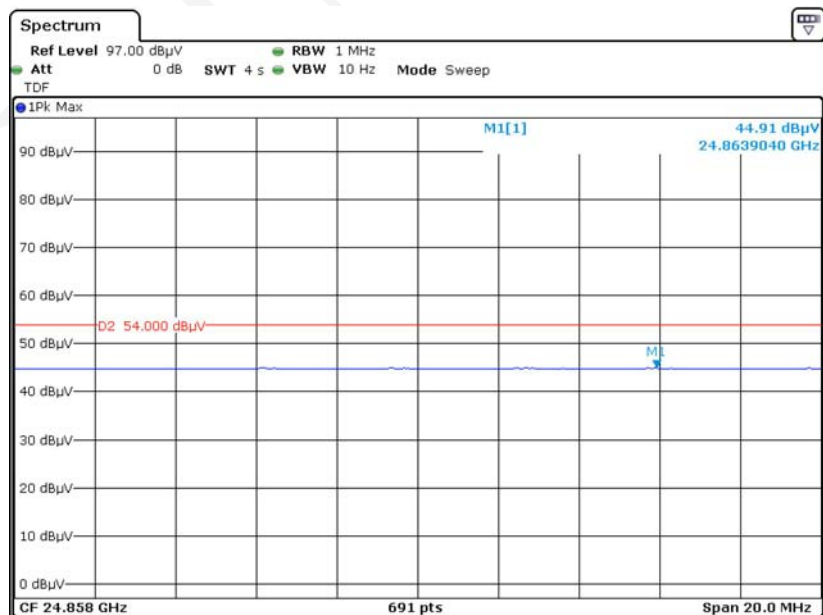
Date: 15.MAR.2020 10:49:20

# Pre-scan for Average

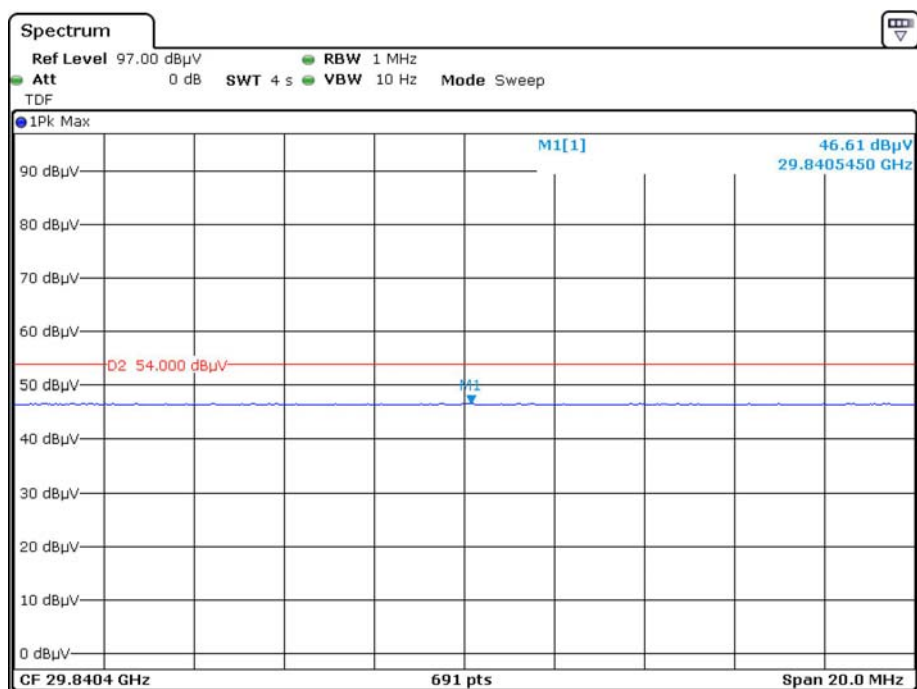
## Horizontal



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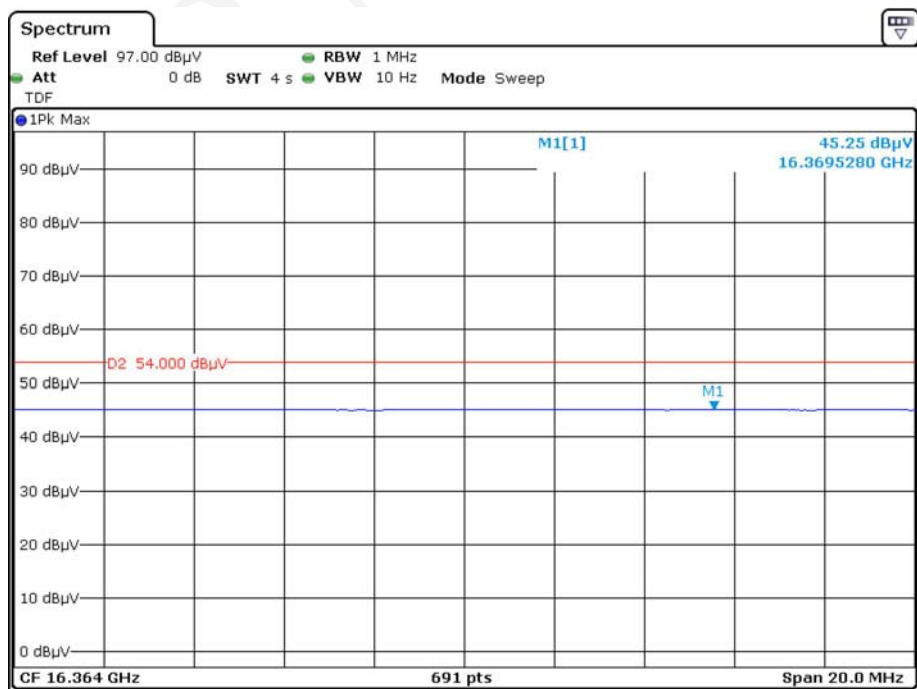


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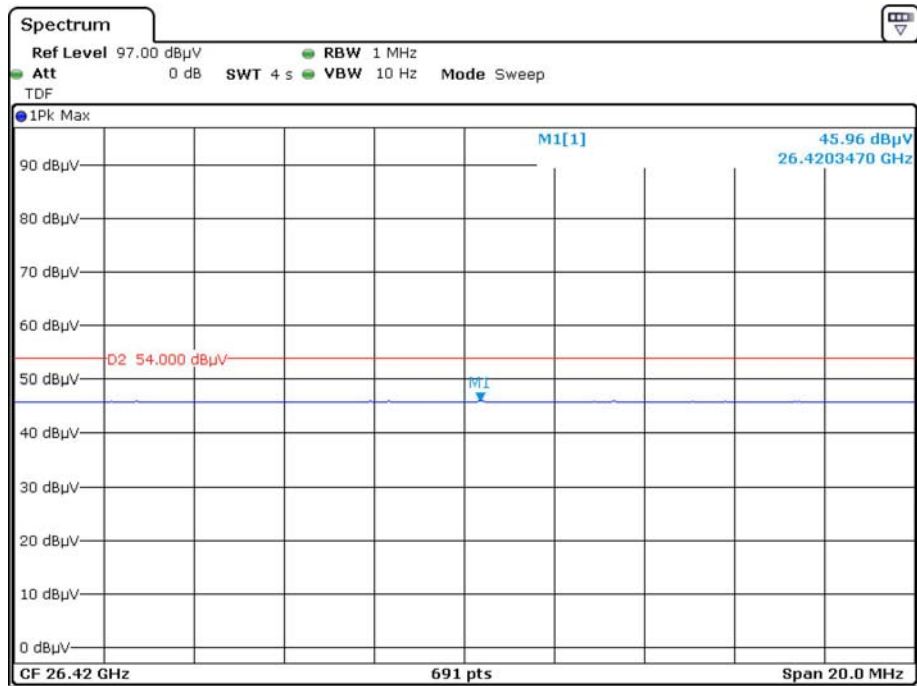


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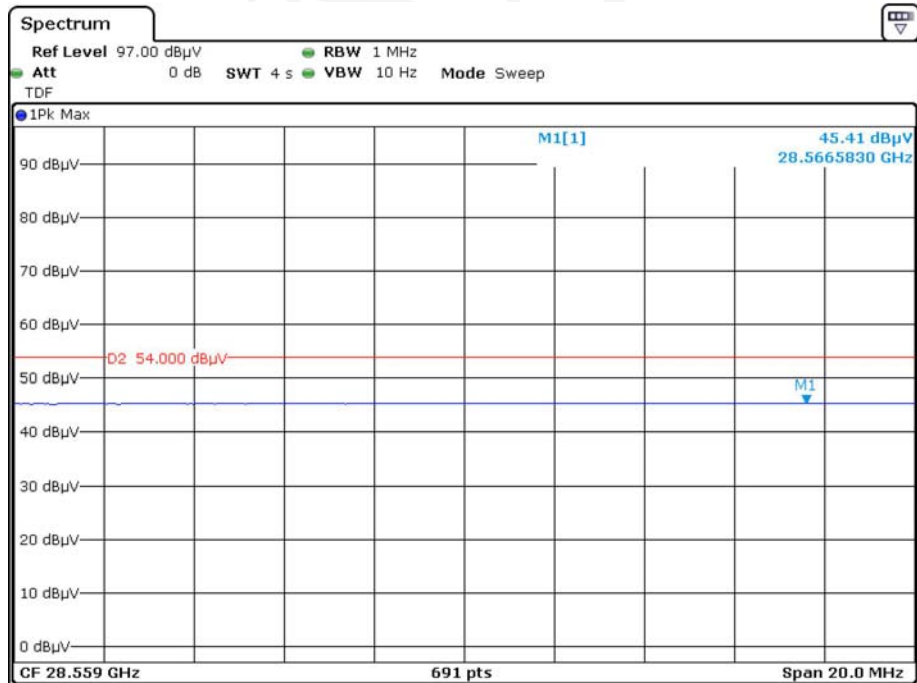
Vertical



Date: 15.MAR.2020 09:21:55



Date: 15.MAR.2020 10:09:57



Date: 15.MAR.2020 10:53:53

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