

FCC PART 15B, CLASS B TEST REPORT

For

TP-Link Technologies Co., Ltd.

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Nanshan, Shenzhen, China

FCC ID: TE7X20V1

Report Type: Original Report	Product Type: X20 FDD-LTE Smartphone
Report Number: RSZ190626008-00A	
Report Date: 2019-07-23	
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The information marked # is provided by the applicant, the laboratory is not responsible for its authenticity.

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product	X20 FDD-LTE Smartphone
Tested Model	TP7071C
Multiple Model [#]	TP7071CXYZZ
Voltage Range	DC 3.85V from battery or DC 5V from adapter
Highest operating frequency	5825 MHz
Date of Test	2019-07-19 ~ 2019-07-22
Sample serial number	190626008 (Assigned by Shenzhen BACL)
Received date	2019-06-26
Sample/EUT Status	Good condition
Adapter information	Model: A8A-050200U-US1 Input: AC 100-240V, 50/60Hz, 0.3A Output: DC 5V, 2A

Notes: This series products model: TP7071CXYZZ and TP7071C are electrically identical. Model TP7071C was selected for fully testing, the detailed information can be referred to the product similarity declaration letter.

Objective

This test report is prepared on behalf of *TP-Link Technologies Co., Ltd.* 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)

FCC Part 15.247 DSS&DTS, FCC Part 22H&24E&27 PCE and Part 15.407 NII submissions with FCC ID: TE7X20V1.

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 expended 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		$\pm 1.95\text{dB}$
Emissions, radiated	Below 1GHz	$\pm 4.75\text{dB}$
	Above 1GHz	$\pm 4.88\text{dB}$

Note: 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 operation mode: Downloading (data transfer with computer)

EUT Exercise Software

“BurnIn test v5.3” exercise software was used.

Special Accessories

No special accessory.

Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

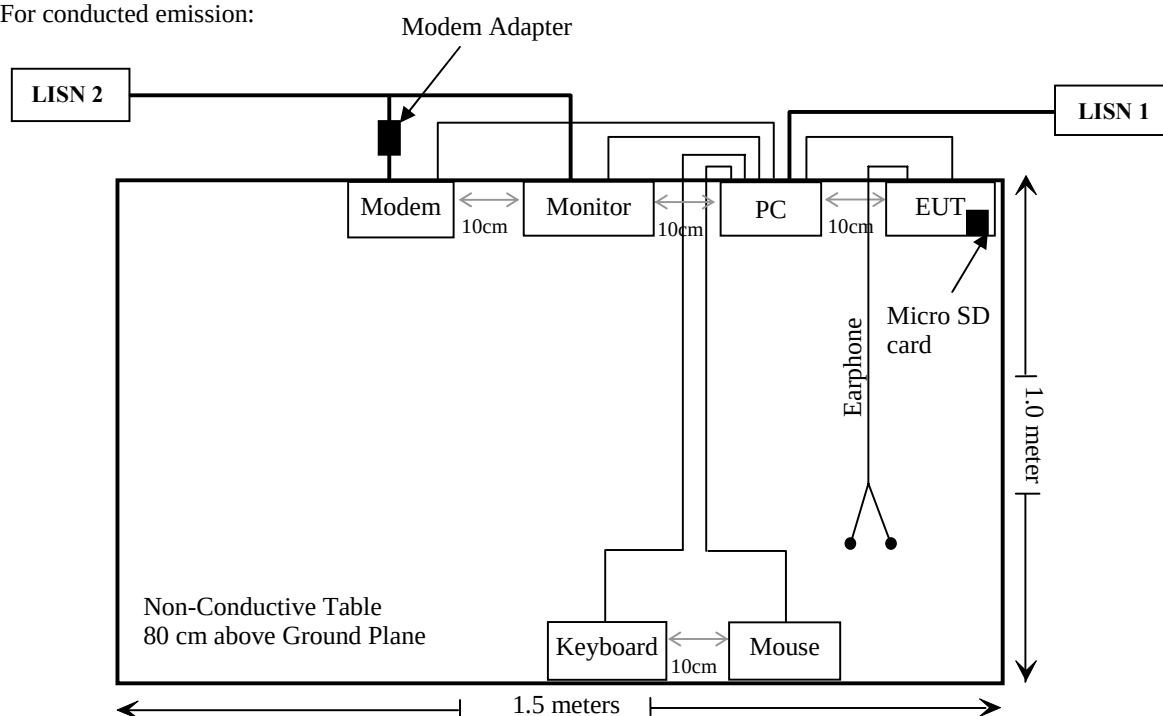
Manufacturer	Description	Model	Serial Number
DELL	Host PC	DCSCSF	127BP2X
TCL	Monitor	TFT1560PS	ALA560806C160409
Microsoft	Keyboard	1406	0200706128743
DELL	Mouse	MOC5UO	G1900NKD
SAST	Modem	AEM-2100	0293
Kingston	Micro SD card	1 GB	N/A

External I/O Cable

Cable Description	Length (m)	From/Port	To
Un-Shielding Detachable USB Cable	1.5	Host PC	Mouse
Shielding Detachable Serial Cable	1.2	Host PC	Modem
Shielding Detachable K/B Cable	1.5	Host PC	Keyboard
Shielding Detachable VGA Cable	1.5	Host PC	LCD Monitor
Un-Shielding Detachable USB Cable	1.0	EUT	Host PC
Un-shielding Detachable Earphone Cable	1.2	EUT	Earphone

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
AC Line Conducted Emission Test					
Rohde & Schwarz	EMI Test Receiver	ESCS30	100176	2019-07-11	2020-07-11
Rohde & Schwarz	LISN	ENV216	3560.6650.12-101613-Yb	2019-01-25	2020-01-25
Rohde & Schwarz	Transient Limiter	ESH3Z2	DE25985	2019-03-02	2020-03-01
Rohde & Schwarz	CE Test software	EMC 32	V8.53.0	NCR	NCR
Unknown	Conducted Emission Cable	78652	UF A210B-1-0720-504504	2018-11-12	2019-11-12
Radiated Emission Test					
A.H. System	Horn Antenna	SAS-200/571	135	2018-09-01	2021-08-31
Rohde & Schwarz	Signal and Spectrum Analyzer	FSV40-N	102259	2019-06-22	2020-06-22
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2017-12-22	2020-12-21
COM-POWER	Pre-amplifier	PA-122	181919	2018-11-12	2019-11-12
Sonoma Instrument	Amplifier	310N	186238	2018-11-12	2019-11-12
Rohde & Schwarz	EMI Test Receiver	ESR	1316.3003K03-101746-zn	2019-07-11	2020-07-11
UTiFLEX MICRO-C0AX	RF Cable	UFA147A-2362-100100	MFR64639 231029-003	2018-11-12	2019-11-12
Ducommun technologies	RF Cable	104PEA	218124002	2018-11-12	2019-11-12
Ducommun Technologies	RF Cable	RG-214	1	2019-05-21	2019-11-19
Ducommun Technologies	RF Cable	RG-214	2	2018-11-12	2019-11-12
Heatsink Required	Amplifier	QLW-18405536-J0	15964001002	2018-11-12	2019-11-12
Rohde & Schwarz	Auto test software	EMC 32	V9.10	NCR	NCR
Agilent	Spectrum Analyzer	8564E	3943A01781	2019-03-02	2020-03-01
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-04	2017-12-29	2020-12-28
Ducommun Technologies	Horn Antenna	ARH-2823-02	1007726-04	2016-11-18	2019-11-18

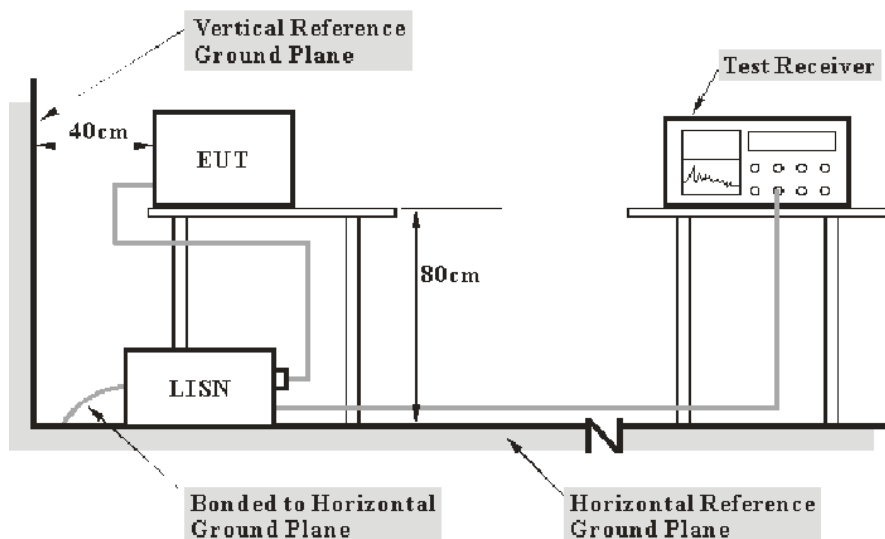
* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

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

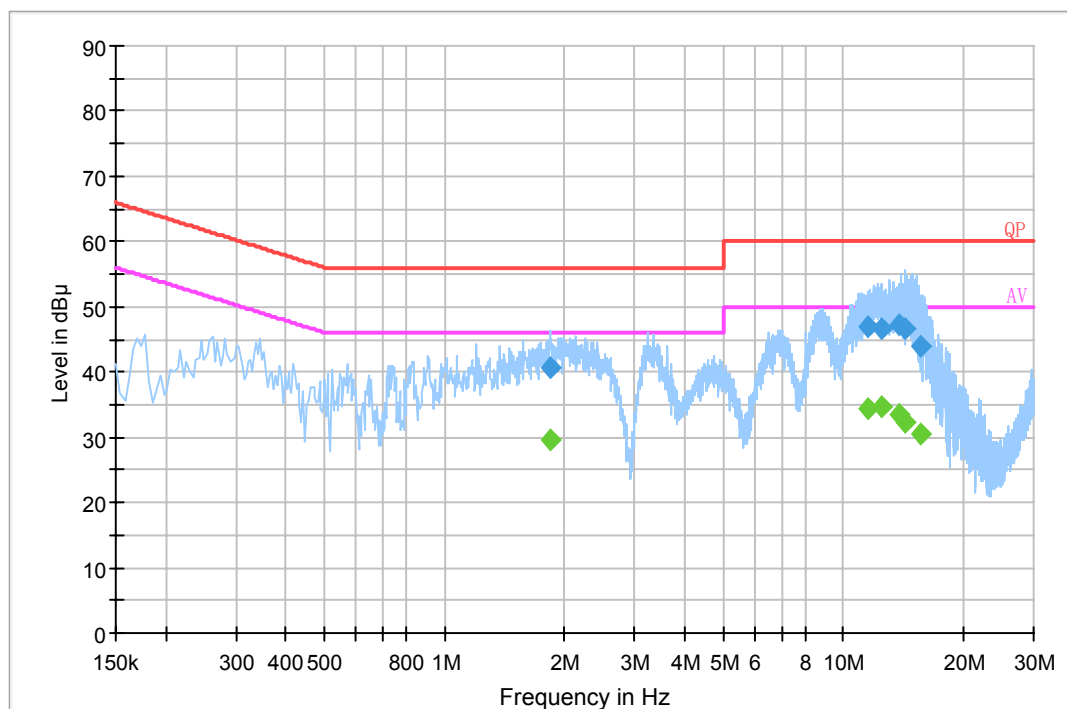
Environmental Conditions

Temperature:	25 °C
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

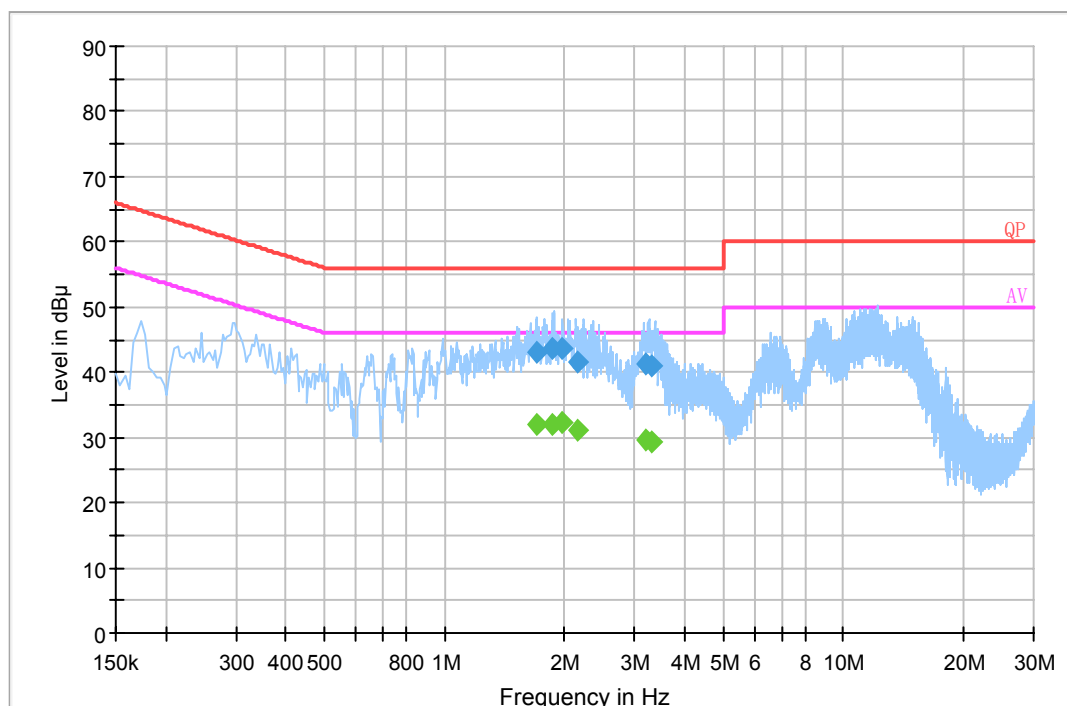
The testing was performed by Haiguo Li on 2019-07-19.

EUT Operation Mode: Downloading

AC 120V/60 Hz, Line



Frequency (MHz)	Corrected Amplitude (dBμV)	Correction Factor (dB)	Limit (dBμV)	Margin (dB)	Detector (PK/Ave./QP)
1.838490	40.6	19.9	56.0	15.4	QP
11.537170	46.9	20.0	60.0	13.1	QP
12.469930	46.7	20.0	60.0	13.3	QP
13.841050	47.3	20.0	60.0	12.7	QP
14.330870	46.6	20.0	60.0	13.4	QP
15.675710	44.1	20.0	60.0	15.9	QP
1.838490	29.6	19.9	46.0	16.4	Ave.
11.537170	34.3	20.0	50.0	15.7	Ave.
12.469930	34.6	20.0	50.0	15.4	Ave.
13.841050	33.6	20.0	50.0	16.4	Ave.
14.330870	32.3	20.0	50.0	17.7	Ave.
15.675710	30.4	20.0	50.0	19.6	Ave.

AC 120V/60 Hz, Neutral

Frequency (MHz)	Corrected Amplitude (dBμV)	Correction Factor (dB)	Limit (dBμV)	Margin (dB)	Detector (PK/Ave./QP)
1.696590	43.2	19.8	56.0	12.8	QP
1.873650	43.8	19.9	56.0	12.2	QP
1.964270	43.7	19.9	56.0	12.3	QP
2.165930	41.4	19.9	56.0	14.6	QP
3.198690	41.1	19.9	56.0	14.9	QP
3.293190	40.9	19.9	56.0	15.1	QP
1.696590	32.0	19.8	46.0	14.0	Ave.
1.873650	32.1	19.9	46.0	13.9	Ave.
1.964270	32.2	19.9	46.0	13.8	Ave.
2.165930	31.0	19.9	46.0	15.0	Ave.
3.198690	29.5	19.9	46.0	16.5	Ave.
3.293190	29.3	19.9	46.0	16.7	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

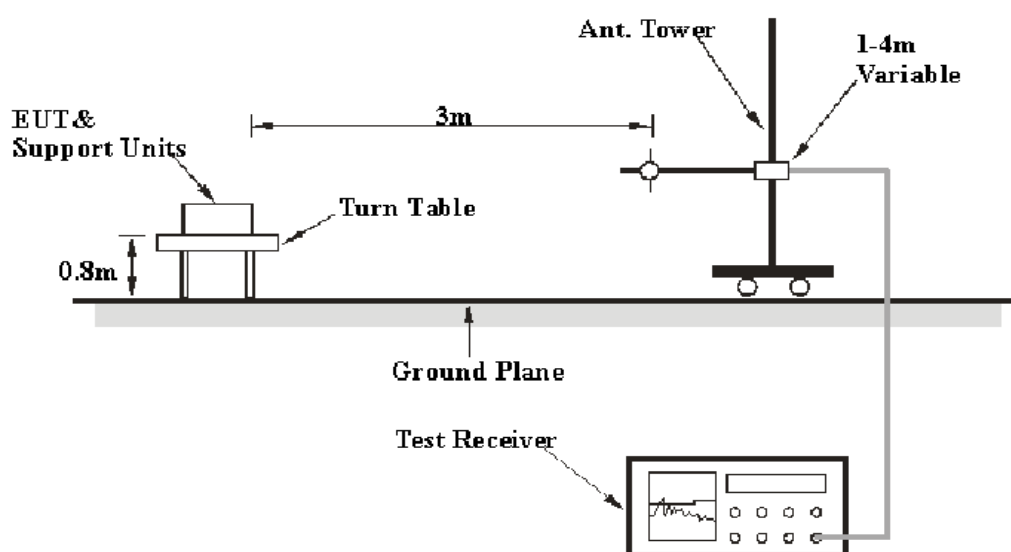
FCC §15.109 - RADIATED SPURIOUS EMISSIONS

Applicable Standard

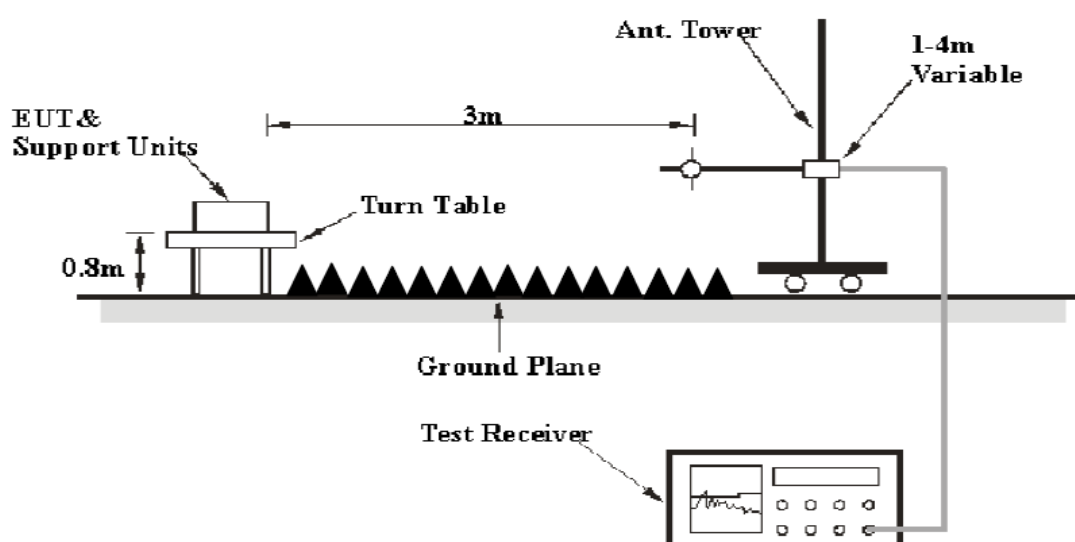
FCC §15.109

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 30 GHz.

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

Frequency Range	RBW	Video B/W	IF B/W	Measurment
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 the EUT complied with the FCC §15.109 Class B.

Test Data

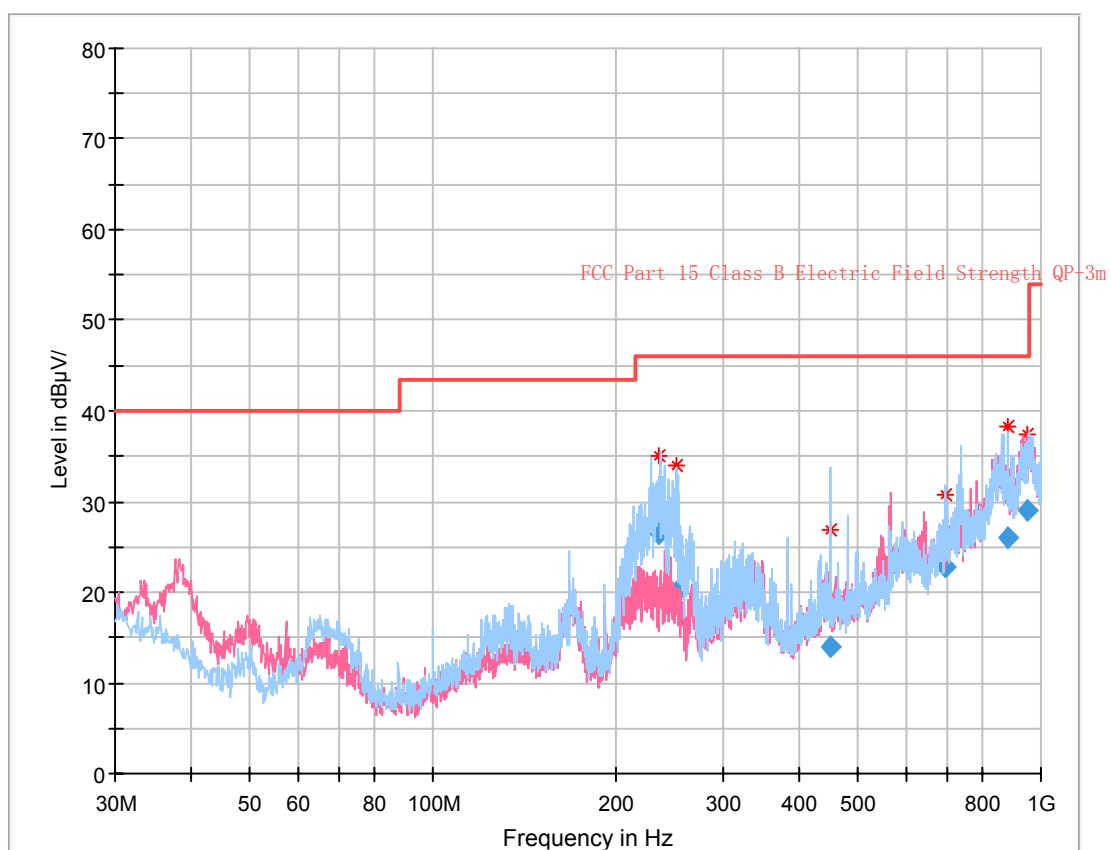
Environmental Conditions

Temperature:	24~25 °C
Relative Humidity:	49~52 %
ATM Pressure:	100.0~101.0 kPa

The testing was performed by Andy Yu and Alan He from 2019-07-20 to 2019-07-22.

EUT Operation Mode: Downloading

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)
235.831500	26.41	181.0	H	49.0	-14.1	46.00	19.59
252.104125	19.90	215.0	H	36.0	-14.0	46.00	26.10
450.250125	13.88	102.0	H	228.0	-8.2	46.00	32.12
696.559750	22.78	165.0	H	309.0	-1.4	46.00	23.22
880.146875	26.00	274.0	H	328.0	5.3	46.00	20.00
952.763125	28.94	277.0	V	332.0	9.7	46.00	17.06

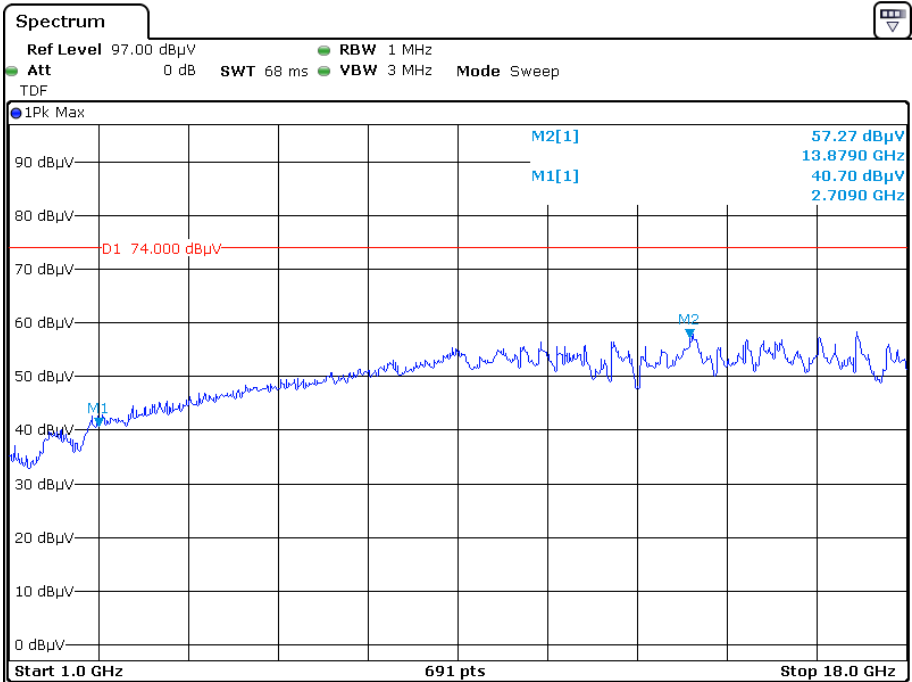
1 GHz – 30 GHz:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBuV/m)	FCC Part 15B	
	Reading (dBμV)	PK/QP/Ave.		Height (m)	Polar (H / V)			Limit (dBuV/m)	Margin (dB)
1197.90	42.85	PK	50	1.1	H	-4.88	37.97	74	36.03
1197.90	27.93	Ave.	50	1.1	H	-4.88	23.05	54	30.95
1197.90	42.76	PK	70	1.9	V	-4.88	37.88	74	36.12
1197.90	27.88	Ave.	70	1.9	V	-4.88	23.00	54	31.00
2709.00	43.40	PK	49	1.1	H	0.42	43.82	74	30.18
2709.00	28.35	Ave.	49	1.1	H	0.42	28.77	54	25.23
2709.00	43.16	PK	314	2.0	V	0.42	43.58	74	30.42
2709.00	28.14	Ave.	314	2.0	V	0.42	28.56	54	25.44

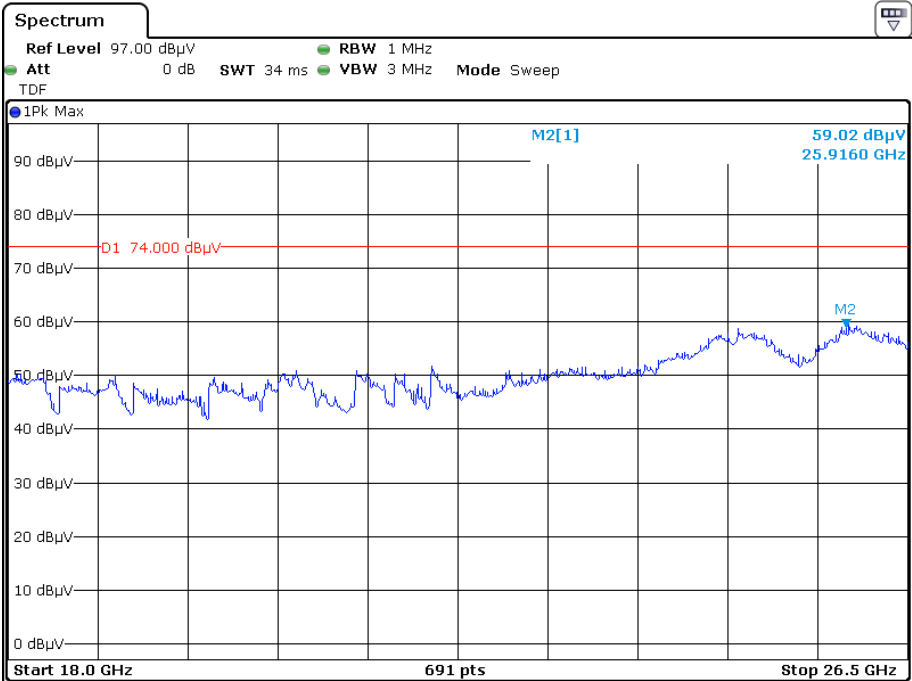
Note:

- 1) Correction Factor=Antenna factor (RX) + cable loss – amplifier factor
- 2) Corrected Amplitude = Correction Factor + Reading
- 3) Margin = Limit - Corrected Amplitude
- 4) 18G-30GHz pot use two kinds of antenna (18-26.5GHz and 26.5-40 GHz horn antenna) test

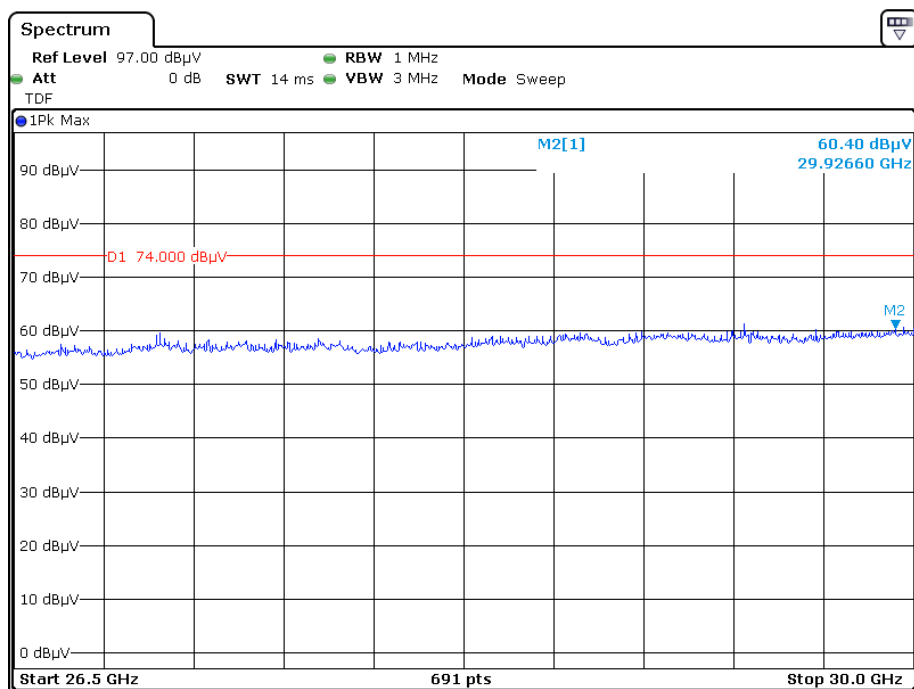
Pre-scan for peak
Horizontal



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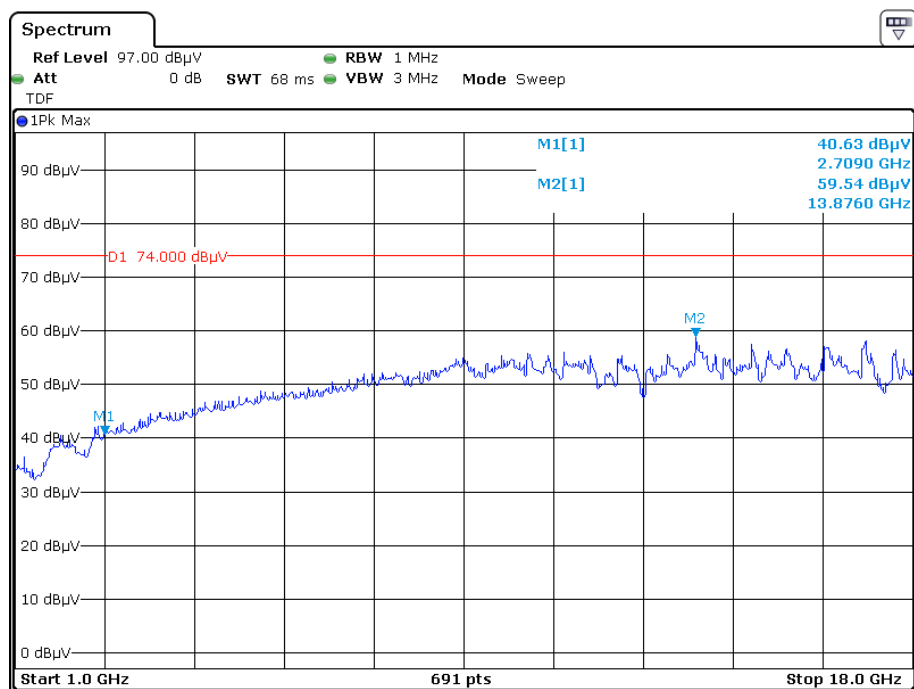


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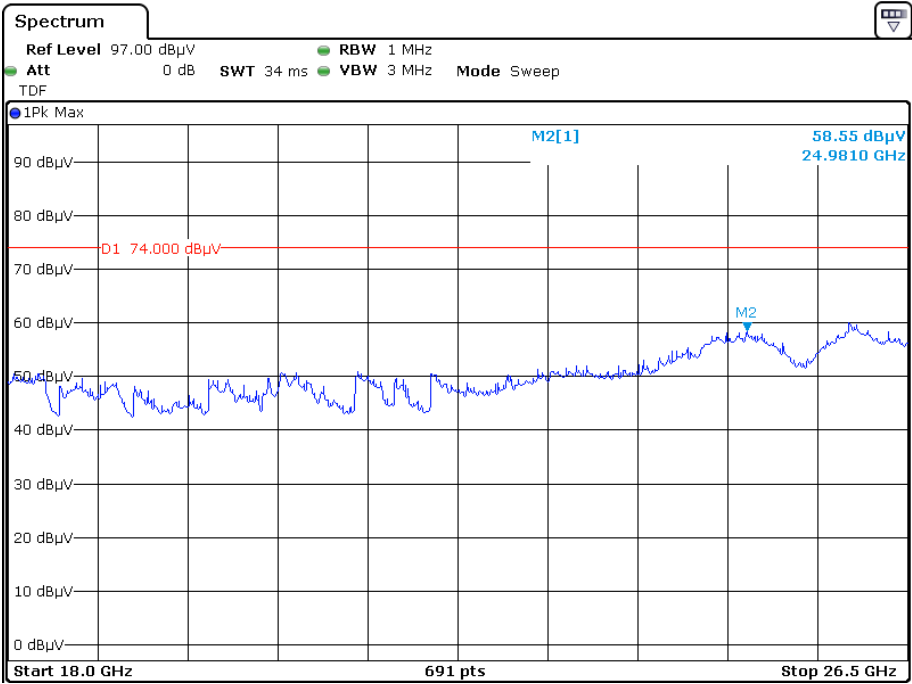


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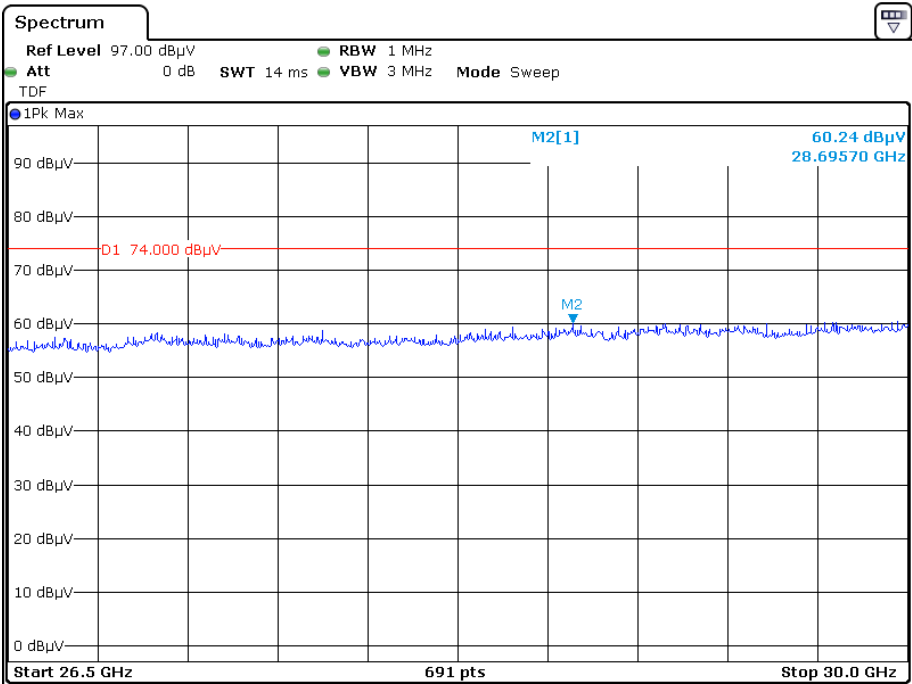
Vertical - Peak



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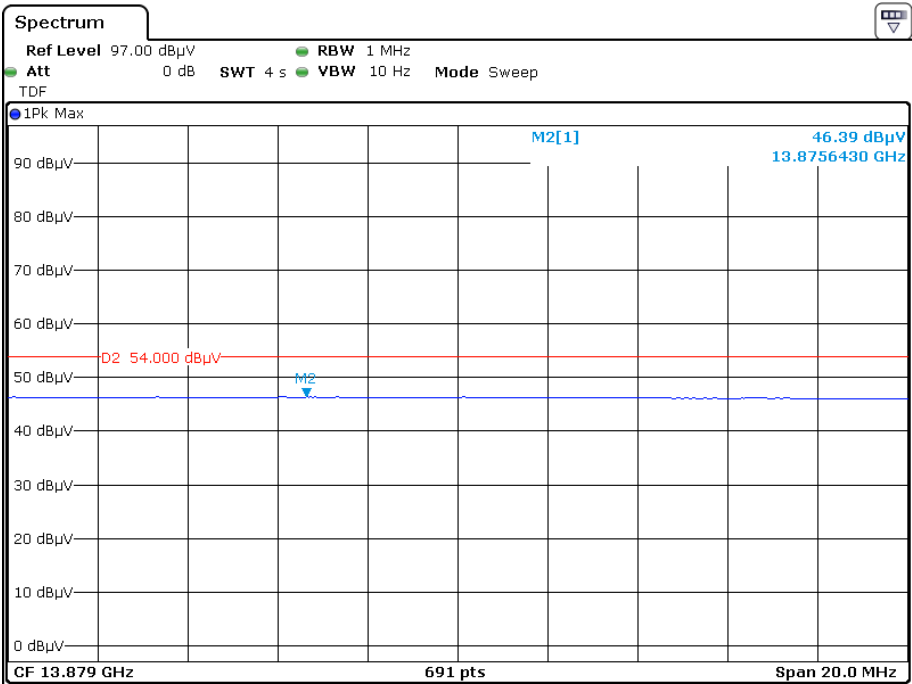


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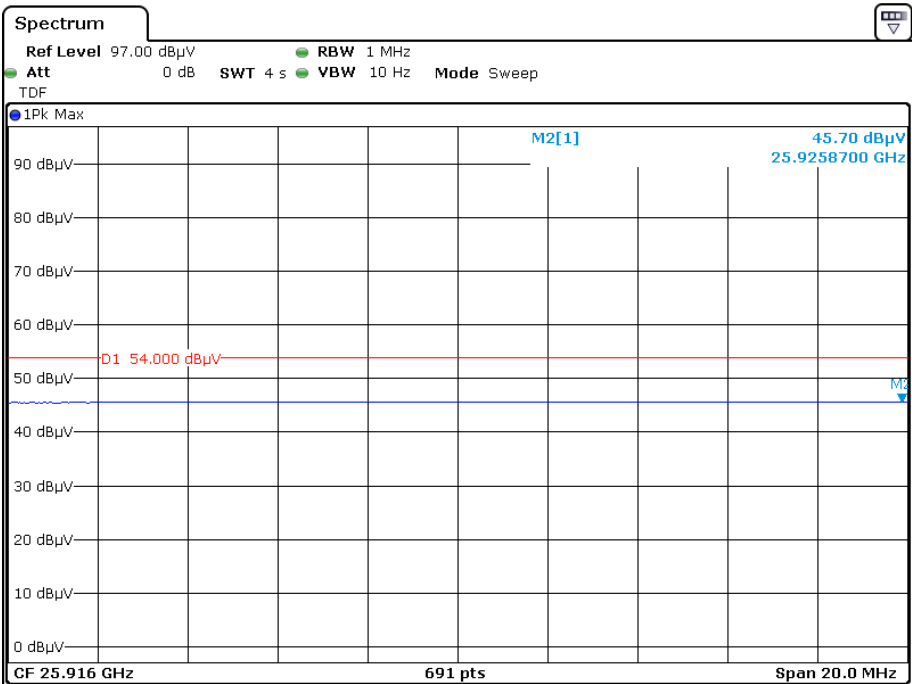


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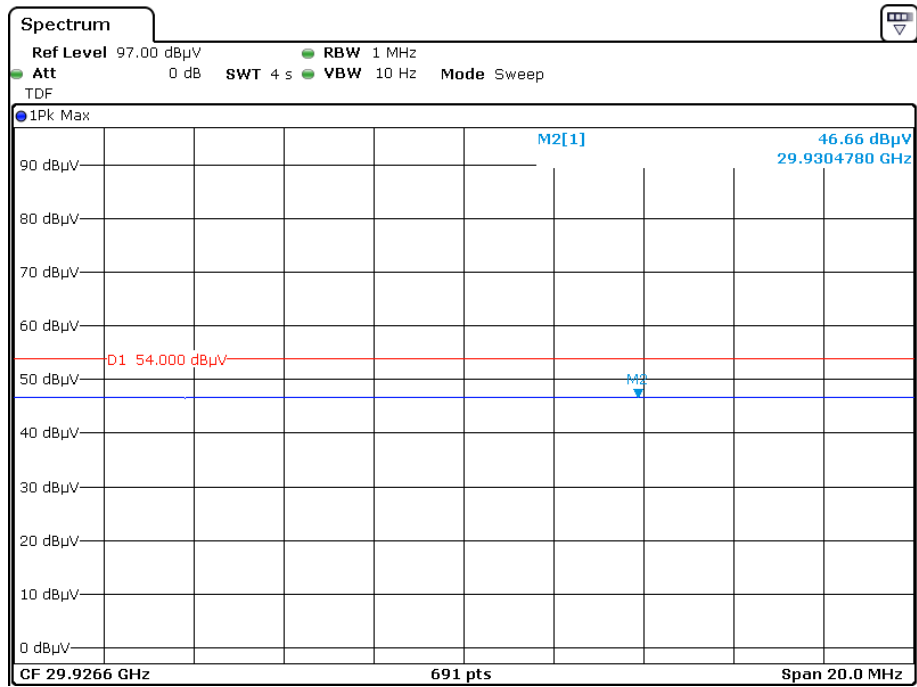
Horizontal – Average



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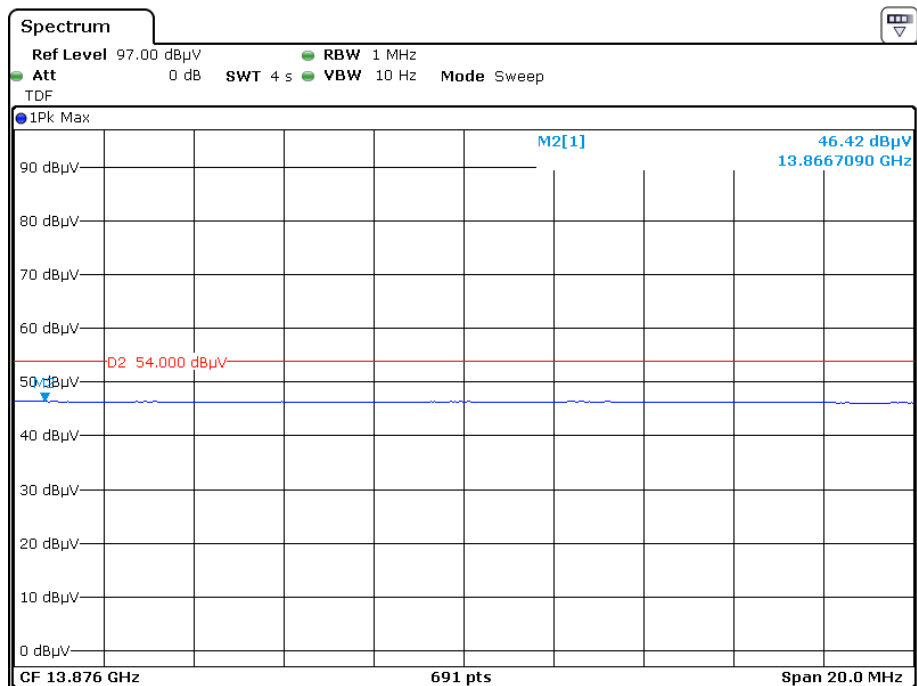


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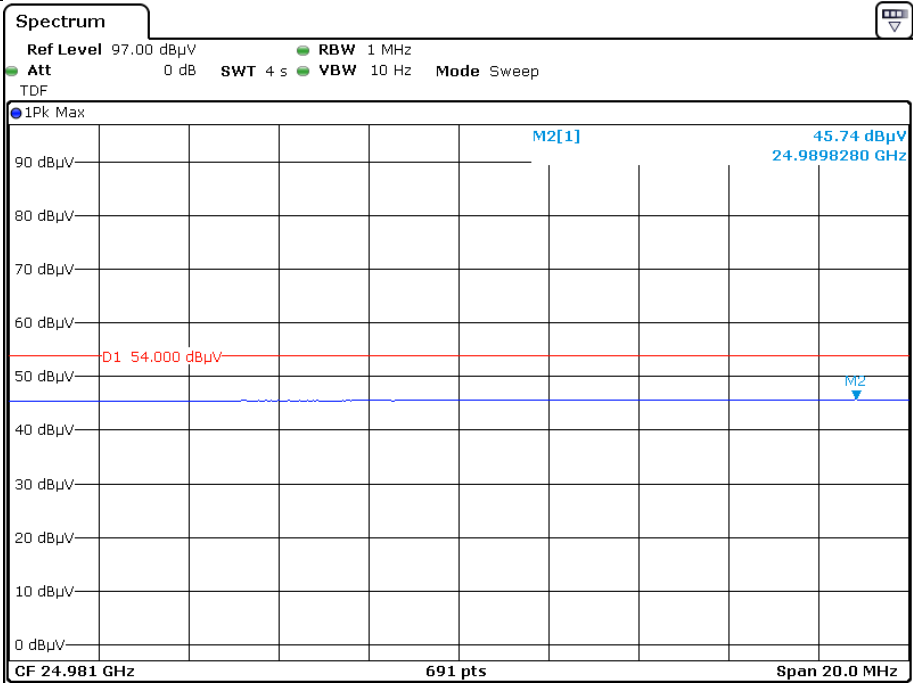


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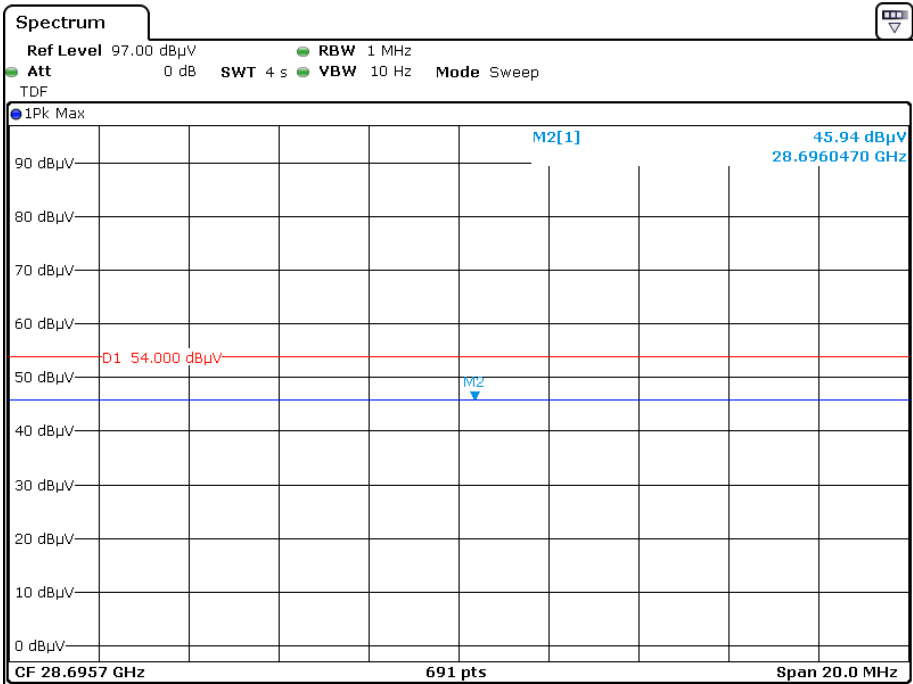
Vertical - Average



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Date: 22.JUL.2019 10:03:54

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