

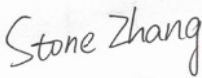
FCC PART 15.247 TEST REPORT

For

Sanwa Electronic Instrument Co Ltd

1-2-50, Honmachi, Yoshida, Higashi-Osaka, Osaka 578, Japan

FCC ID: L73MX-6

Report Type: CIIPC Report	Product Type: 2.4GHz Digital High Response System
Test Engineer:	Stone Zhang 
Report Number:	RSHE191103001-00A
Report Date:	2019-12-19
Reviewed By:	Oscar Ye  EMC Manager
Test Laboratory:	Bay Area Compliance Laboratories Corp. (Kunshan) No.248 Chenghu Road,Kunshan,Jiangsu province,China Tel: +86-0512-86175000 Fax: +86-0512-88934268 www.baclcorp.com.cn

Note: This test report is prepared for the customer shown above and for the equipment described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. This report is valid only with a valid digital signature. The digital signature may be available only under the Adobe software above version 7.0.

TABLE OF CONTENTS

GENERAL INFORMATION.....	3
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)	3
OBJECTIVE	3
RELATED SUBMITTAL(S)/GRANT(S).....	3
SYSTEM TEST CONFIGURATION.....	4
DESCRIPTION OF TEST CONFIGURATION	4
EUT EXERCISE SOFTWARE	4
SPECIAL ACCESSORIES.....	4
SUPPORT EQUIPMENT LIST AND DETAILS	5
EXTERNAL I/O CABLE.....	5
BLOCK DIAGRAM OF TEST SETUP	5
SUMMARY OF TEST RESULTS	7
TEST EQUIPMENT LIST	8
FCC §15.205, §15.209 & §15.247(D) – RADIATED EMISSIONS	9
APPLICABLE STANDARD	9
EUT SETUP	9
EMI TEST RECEIVER & SPECTRUM ANALYZER SETUP	10
TEST PROCEDURE	10
CORRECTED AMPLITUDE & MARGIN CALCULATION	10
TEST RESULTS SUMMARY	10
TEST DATA	11

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Applicant	Sanwa Electronic Instrument Co Ltd
Applicant Address	1-2-50, Honmachi, Yoshida, Higashi-Osaka, Osaka 578, Japan
Tested Model	MX-6
Product Type	2.4GHz Digital High Response System
Power Supply	DC 6.0V supplied from 1.5V*4cell "AA" alkaline battery
Channel Number	43
Channel Separation	1MHz
Antenna Type	Monopole Antenna

**All measurement and test data in this report was gathered from production sample serial number: 20191103001 (Assigned by the BACL. The EUT supplied by the applicant was received on 2019-11-03)*

Objective

This report is prepared on behalf of *Sanwa Electronic Instrument Co Ltd* in accordance with Part 2-Subpart J, Part 15-Subparts A and C of the Federal Communication Commissions rules.

The tests were performed in order to determine Compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.209 and 15.247 rules.

This is a CIIPC report base on the original report RSHA180202003-00B with FCC ID: L73MX-6 which was granted on 2019-12-12, the differences between the original device and the current one are as follows:

1. Cancel the C18 electrolytic capacitor and modify it to add C19 47uF tantalum capacitor (yellow shell) and R10 220 ohm resistance, C16 105 ceramic capacitor changed to 105 tantalum capacitor (yellow shell) and this change will only affect radiation spurious testing, for other item reference to the original report

Related Submittal(s)/Grant(s)

N/A

SYSTEM TEST CONFIGURATION

Description of Test Configuration

Test channel list is as below:

Channel list for FHSS(MSK) Modulation:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
5	2405.5	27	2427.5
6	2406.5	28	2428.5
7	2407.5	29	2429.5
8	2408.5	30	2430.5
9	2409.5	31	2431.5
10	2410.5	32	2432.5
11	2411.5	33	2433.5
12	2412.5	34	2434.5
13	2413.5	35	2435.5
14	2414.5	36	2436.5
15	2415.5	37	2437.5
16	2416.5	38	2438.5
17	2417.5	39	2439.5
18	2418.5	40	2440.5
19	2419.5	41	2441.5
20	2420.5	42	2442.5
21	2421.5	43	2443.5
22	2422.5	44	2444.5
23	2423.5	45	2445.5
24	2424.5	46	2446.5
25	2425.5	47	2447.5
26	2426.5	/	/

EUT was tested with Channel 5, 26 and 47.

EUT Exercise Software

The EUT was tested in the engineering mode; EUT can be setup for fixed channel mode and hopping mode.

Special Accessories

No special accessory.

Support Equipment List and Details

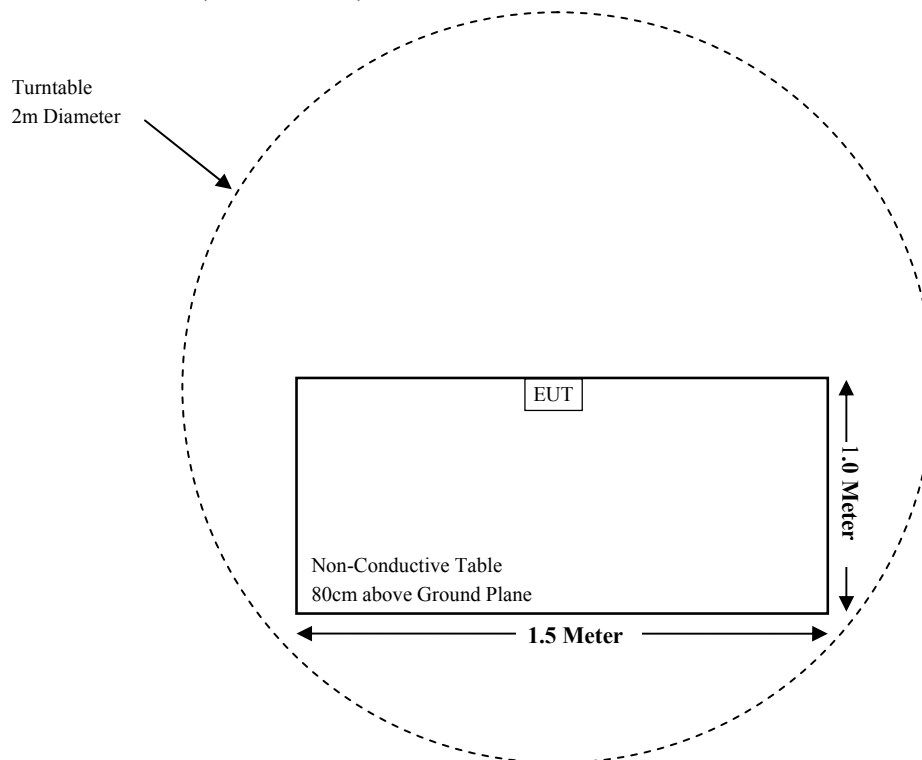
Manufacturer	Description	Model	Serial Number
/	/	/	/

External I/O Cable

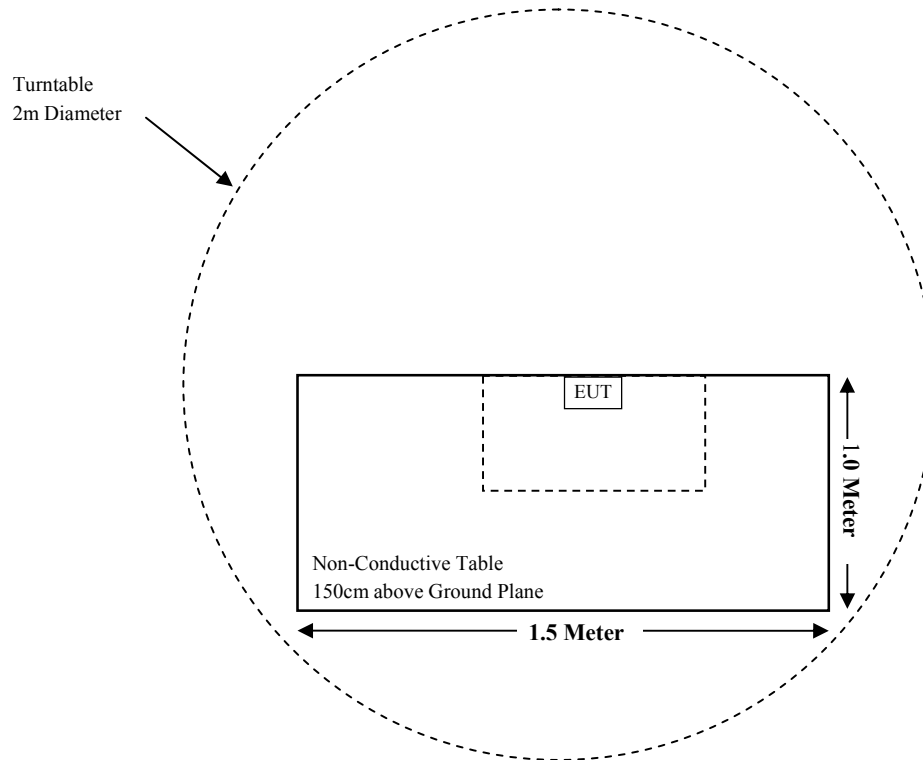
Cable Description	Length (m)	From Port	To
/	/	/	/

Block Diagram of Test Setup

For Radiated Emissions(Below 1GHz):



For Radiated Emissions(Above 1GHz):



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliant

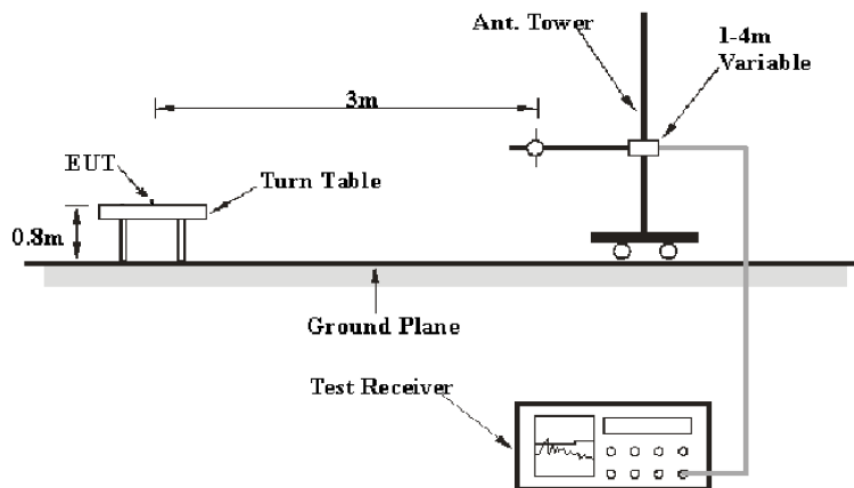
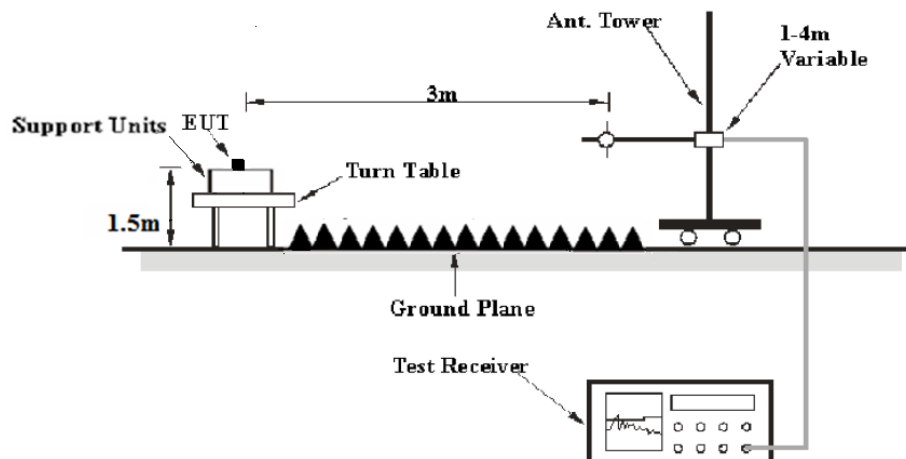
TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Emission Test (Chamber 1#)					
Rohde & Schwarz	EMI Test Receiver	ESCI	100195	2019-11-12	2020-11-11
Sunol Sciences	Broadband Antenna	JB3	A090413-1	2016-12-26	2019-12-25
Sonoma Instrument	Pre-amplifier	310N	171205	2019-08-14	2020-08-13
Rohde & Schwarz	Auto test Software	EMC32	100361	/	/
MICRO-COAX	Coaxial Cable	Cable-8	008	2019-08-15	2020-08-14
MICRO-COAX	Coaxial Cable	Cable-9	009	2019-08-15	2020-08-14
MICRO-COAX	Coaxial Cable	Cable-10	010	2019-08-15	2020-08-14
Radiated Emission Test (Chamber 2#)					
Rohde & Schwarz	EMI Test Receiver	ESU40	100207	2019-08-27	2020-08-26
ETS-LINDGREN	Horn Antenna	3115	9207-3900	2017-07-15	2020-07-14
ETS-LINDGREN	Horn Antenna	3116	00084159	2016-12-12	2019-12-11
A.H.Systems, inc	Amplifier	2641-1	491	2019-02-20	2020-02-19
EM Electronics Corporation	Amplifier	EM18G40G	060726	2019-03-22	2020-03-21
MICRO-TRONICS	Band Reject Filter	BRM50702	G024	2019-08-05	2020-08-04
Narda	Attenuator	10dB	010	2019-08-15	2020-08-14
Rohde & Schwarz	Auto test Software	EMC32	100361	N/A	N/A
MICRO-COAX	Coaxial Cable	Cable-6	006	2019-08-15	2020-08-14
MICRO-COAX	Coaxial Cable	Cable-11	011	2019-08-15	2020-08-14
MICRO-COAX	Coaxial Cable	Cable-12	012	2019-08-15	2020-08-14
MICRO-COAX	Coaxial Cable	Cable-13	013	2019-08-15	2020-08-14

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

FCC §15.205, §15.209 & §15.247(d) – RADIATED EMISSIONS**Applicable Standard**

FCC §15.205; §15.209; §15.247(d)

EUT Setup**Below 1 GHz:****Above 1GHz:**

The radiated emission tests were performed in the 3 meters, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209 and FCC 15.247 limits.

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 25 GHz.

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

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

Test Procedure

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

All final data was recorded in Quasi-peak detection mode for frequency range of 30 MHz -1 GHz and peak and Average detection 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 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 Results Summary

According to the recorded data in following table, the EUT complied with the FCC Title 47, Part 15, Subpart C, section 15.205, 15.209 and 15.247.

Test Data

Environmental Conditions

Temperature:	24.2~25.2 °C
Relative Humidity:	48~50%
ATM Pressure:	101.2~102.3 kPa

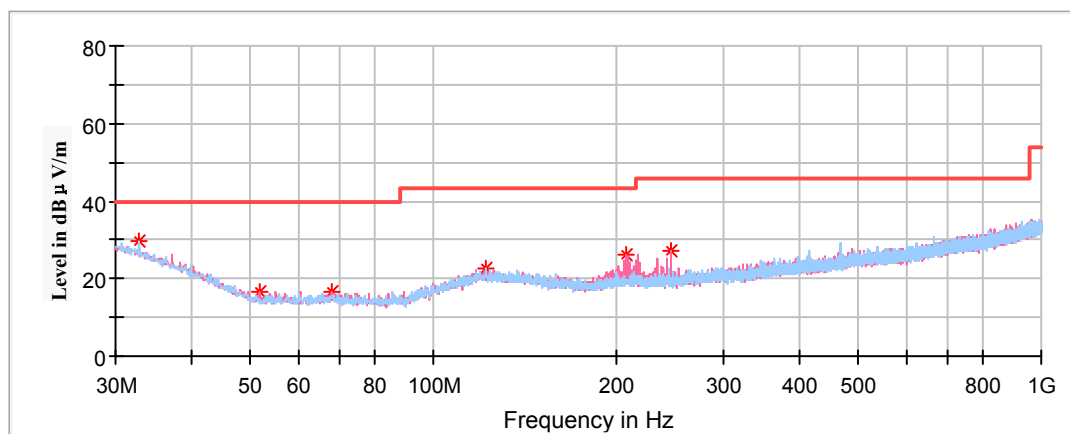
The testing was performed by Stone Zhang from 2019-11-16 to 2019-11-18.

EUT operation mode: Transmitting

Spurious Emission Test:

30MHz-1GHz:

Pre-Scan with low, middle and high channels in the X,Y and Z axes of orientation, the worst case **low channel in X-axis of orientation** was recorded



Frequency (MHz)	Corrected Amplitude	Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV/m)	Height (cm)	Polar (H/V)				
32.788750	29.57	100.0	H	137.0	-5.8	40.00	10.43
51.703750	16.68	100.0	V	109.0	-17.6	40.00	23.32
67.830000	16.69	200.0	V	97.0	-17.4	40.00	23.31
121.665000	22.64	200.0	H	49.0	-11.2	43.50	20.86
207.873750	26.21	100.0	V	268.0	-12.3	43.50	17.29
246.188750	27.10	200.0	V	194.0	-12.1	46.00	18.90

1GHz-18GHz:

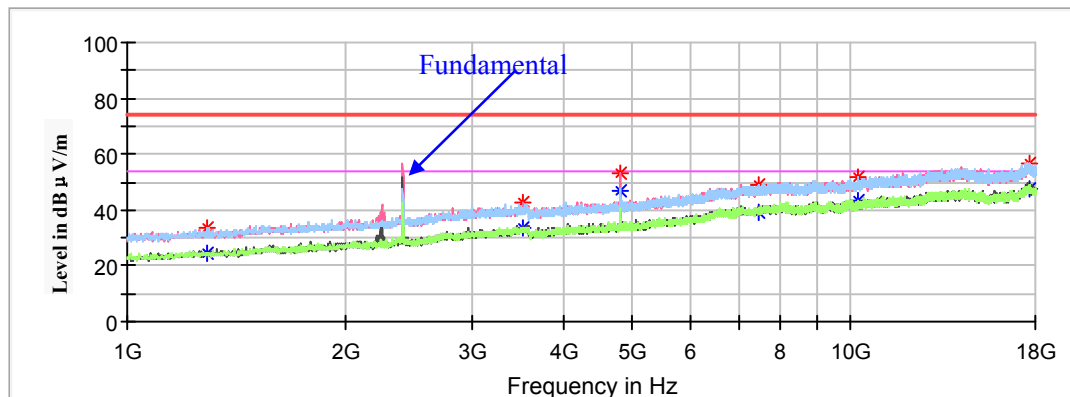
Pre-Scan in the X,Y and Z axes of orientation, the worst case in X-axis of orientation was recorded

Note:

1. This test was performed with the 2.4-2.4835GHz band reject filter.
2. Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
Corrected Amplitude = Corrected Factor + Reading
Margin = Limit - Corrected. Amplitude

Low Channel: 2405.5MHz

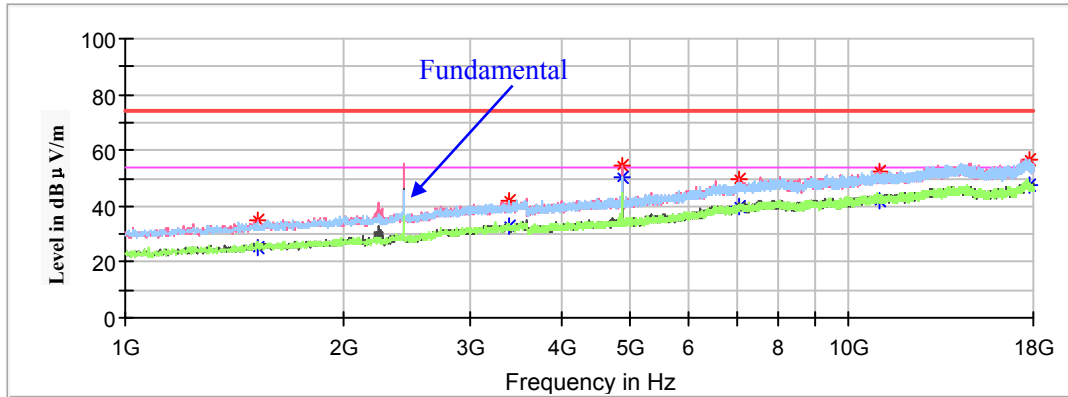
Full Spectrum



Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV/m)	Average (dBµV/m)	Height (cm)	Polar (H/V)				
1289.00	---	24.15	200.0	H	110.0	-11.1	54.00	29.85
1289.00	33.51	---	200.0	H	110.0	-11.1	74.00	40.49
3517.70	---	33.26	150.0	V	355.0	-3.5	54.00	20.74
3517.70	42.49	---	150.0	V	355.0	-3.5	74.00	31.51
4811.00	---	46.94	100.0	V	79.0	-0.5	54.00	7.06
4811.00	52.93	---	100.0	V	79.0	-0.5	74.00	21.07
7475.30	---	38.94	100.0	V	158.0	6.1	54.00	15.06
7475.30	48.96	---	100.0	V	158.0	6.1	74.00	25.04
10219.10	---	43.53	150.0	H	81.0	8.6	54.00	10.47
10219.10	51.64	---	150.0	H	81.0	8.6	74.00	22.36
17692.30	---	47.21	150.0	V	22.0	14.0	54.00	6.79
17692.30	56.90	---	150.0	V	22.0	14.0	74.00	17.10

Middle Channel: 2426.5MHz

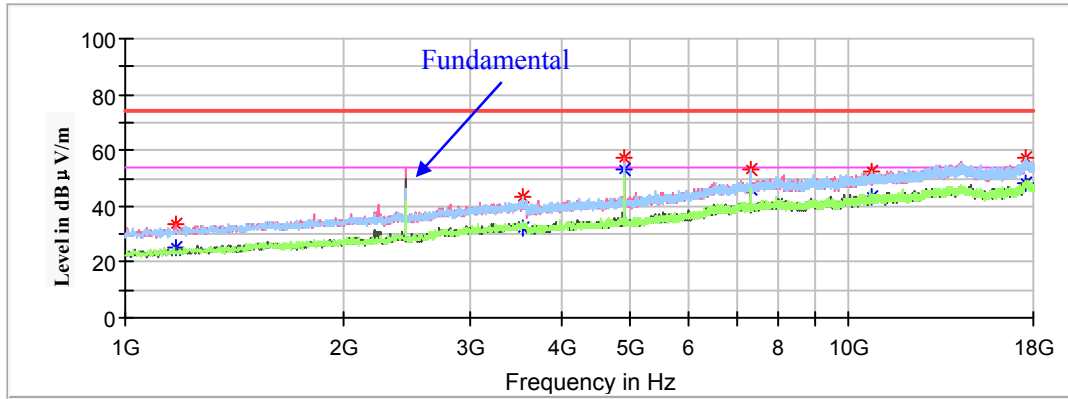
Full Spectrum



Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV/m)	Average (dBμV/m)	Height (cm)	Polar (H/V)				
1525.30	---	24.95	200.0	V	358.0	-9.8	54.00	29.05
1525.30	35.31	---	200.0	V	358.0	-9.8	74.00	38.69
3386.80	---	32.78	100.0	H	296.0	-3.7	54.00	21.22
3386.80	42.07	---	100.0	H	296.0	-3.7	74.00	31.93
4853.00	---	50.50	100.0	V	289.0	-0.5	54.00	3.50
4853.00	54.43	---	100.0	V	289.0	-0.5	74.00	19.57
7057.10	---	40.05	200.0	V	161.0	5.4	54.00	13.95
7057.10	49.51	---	200.0	V	161.0	5.4	74.00	24.49
11002.80	---	42.12	150.0	V	328.0	9.8	54.00	11.88
11002.80	52.57	---	150.0	V	328.0	9.8	74.00	21.43
17746.70	---	47.65	150.0	H	358.0	13.9	54.00	6.35
17746.70	56.59	---	150.0	H	358.0	13.9	74.00	17.41

High Channel: 2447.5MHz

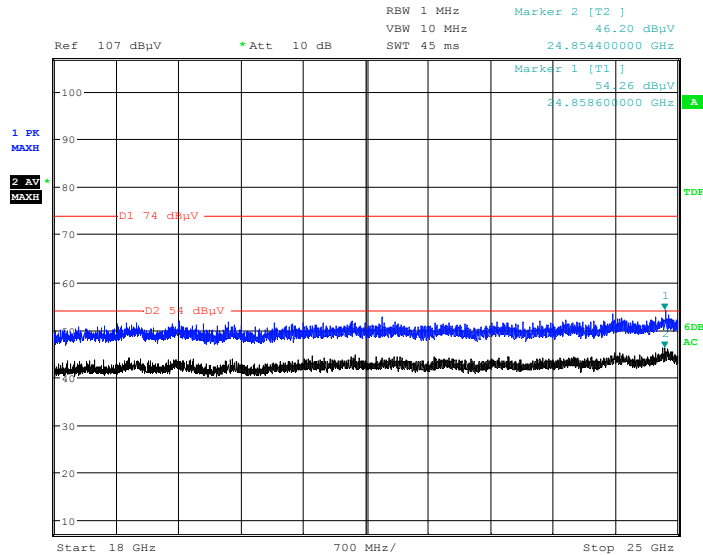
Full Spectrum



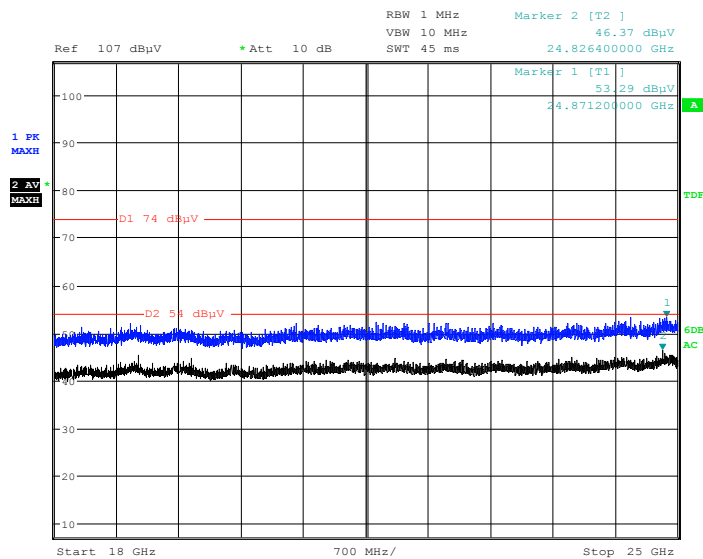
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV/m)	Average (dBμV/m)	Height (cm)	Polar (H/V)				
1171.70	33.81	---	150.0	V	189.0	-11.7	74.00	40.19
1171.70	---	24.95	150.0	V	189.0	-11.7	54.00	29.05
3548.30	---	32.41	100.0	H	29.0	-3.4	54.00	21.59
3548.30	43.35	---	100.0	H	29.0	-3.4	74.00	30.65
4895.00	57.47	---	150.0	V	58.0	-0.4	74.00	16.53
4895.00	---	53.17	150.0	V	58.0	-0.4	54.00	0.83
7342.50	---	45.81	150.0	H	350.0	5.9	54.00	8.19
7342.50	53.04	---	150.0	H	350.0	5.9	74.00	20.96
10747.80	---	43.12	150.0	H	251.0	9.4	54.00	10.88
10747.80	52.12	---	150.0	H	251.0	9.4	74.00	21.88
17578.40	---	48.47	200.0	H	130.0	14.2	54.00	5.53
17578.40	57.59	---	200.0	H	130.0	14.2	74.00	16.41

18GHz-25GHz:

*Pre-Scan with low, middle and high channels in the X,Y and Z axes of orientation, the worst case **low channel in X-axis of orientation** was recorded*

Horizontal

Date: 18.NOV.2019 10:00:26

Vertical

Date: 18.NOV.2019 10:20:50

Restricted Bands Emissions:

*Pre-Scan in the X,Y and Z axes of orientation, the worst case **in X-axis of orientation** was recorded*

Note:

1. Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor

Corrected Amplitude = Corrected Factor + Reading

Margin = Limit - Corrected. Amplitude

Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV /m)	Average (dBμV /m)	Height (cm)	Polar (H/V)				
Low Channel: 2405.5MHz								
2390.00	---	49.77	200.0	V	101.0	2.8	54.00	4.23
2390.00	58.49	---	200.0	V	101.0	2.8	74.00	15.51
High Channel: 2447.5MHz								
2483.50	---	45.20	150.0	V	278.0	3.0	54.00	8.80
2483.50	52.45	---	150.0	V	278.0	3.0	74.00	21.55