

FCC PART 15.247 TEST REPORT

For

SHANGHAI MERIT TECHNOLOGY CORP.

1058 TAOGAN RD., SHESHAN TOWN, SONGJIANG DISTRICT, SHANGHAI, China

FCC ID: XJ6MT-203-1

Report Type: CIIPC	Product Type: 3CH 2.4GHZ FHSS RADIO CONTROL SYSTEM
Project Engineer: <u>Miller Xie</u>	<i>Miller Xie</i>
Report Number: <u>RSHE210524001-00B</u>	
Report Date: <u>2021-06-07</u>	
Reviewed By: <u>Oscar Ye EMC Manager</u>	<i>Oscar Ye</i>
Prepared By:	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

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Applicant:	SHANGHAI MERIT TECHNOLOGY CORP.
Tested Model:	MT-203
Product Type:	3CH 2.4GHZ FHSS RADIO CONTROL SYSTEM
Power Supply:	DC 6V from 1.5V*4cell "AA" alkaline battery
RF Function:	SRD
Operating Band/Frequency:	2405-2450 MHz
Total Channel Number:	46
Hopping Channel Number	29
Minimum Hopping Channel Separation:	1 MHz
Modulation Type:	GFSK
Antenna Type:	Dipole antenna
*Maximum Antenna Gain:	2.0 dBi

Note*: The maximum antenna gain was provided by the manufacturer.

*All measurement and test data in this report was gathered from production sample serial number: RSHE210524001-1(Assigned by BACL, Kunshan). The EUT was received on 2021-05-24.

Objective

This test report is prepared on behalf of *SHANGHAI MERIT TECHNOLOGY CORP.* 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, section 15.203, 15.205, 15.209 and 15.247 rules.

This is a CIIPC report base on the original report RSHF200914001-00A with FCC ID: XJ6MT-203-1 grant at 2020-11-02, the differences between the original device and the current one as follows:

1. Comparing with the original certified device, the driver layout has fine adjustment of current device .

The above differences will affect part of tests, "Radiated Emissions" were presented in this report, and other data were referred to the original report.

Related Submittal(s)/Grant(s)

No Related Submittal(s)/Grant(s).

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliant Testing of Unlicensed Wireless Devices and FCC 558074 D01 15.247 Meas Guidance v05r02.

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

Measurement Uncertainty

Item		Uncertainty
AC Power Lines Conducted Emissions		3.19dB
RF conducted test with spectrum		0.9dB
RF Output Power with Power meter		0.5dB
Radiated emission	30MHz~1GHz	6.11dB
	1GHz~6GHz	4.45dB
	6GHz~18GHz	5.23dB
	18GHz~40GHz	5.65dB
Occupied Bandwidth		0.5kHz
Temperature		1.0℃
Humidity		6%

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Kunshan) to collect test data is located on the No.248 Chenghu Road, Kunshan, Jiangsu province, China.

Bay Area Compliance Laboratories Corp. (Kunshan) Lab is accredited to ISO/IEC 17025 by A2LA (Lab code: 4323.01), the FCC designation No. CN1185 under the FCC KDB 974614 D01 and CAB identifier CN0004 under the ISSED requirement. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2014.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

Channel list for FHSS (GFSK) Modulation:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2405	24	2428
2	2406	25	2429
3	2407	26	2430
4	2408	27	2431
5	2409	28	2432
6	2410	29	2433
7	2411	30	2434
8	2412	31	2435
9	2413	32	2436
10	2414	33	2437
11	2415	34	2438
12	2416	35	2439
13	2417	36	2440
14	2418	37	2441
15	2419	38	2442
16	2420	39	2443
17	2421	40	2444
18	2422	41	2445
19	2423	42	2446
20	2424	43	2447
21	2425	44	2448
22	2426	45	2449
23	2427	46	2450

For fixed channel mode: EUT was tested with Channel 1, 24, 46.

For Hopping mode: 29 random frequency hopping channels was test.

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.

Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

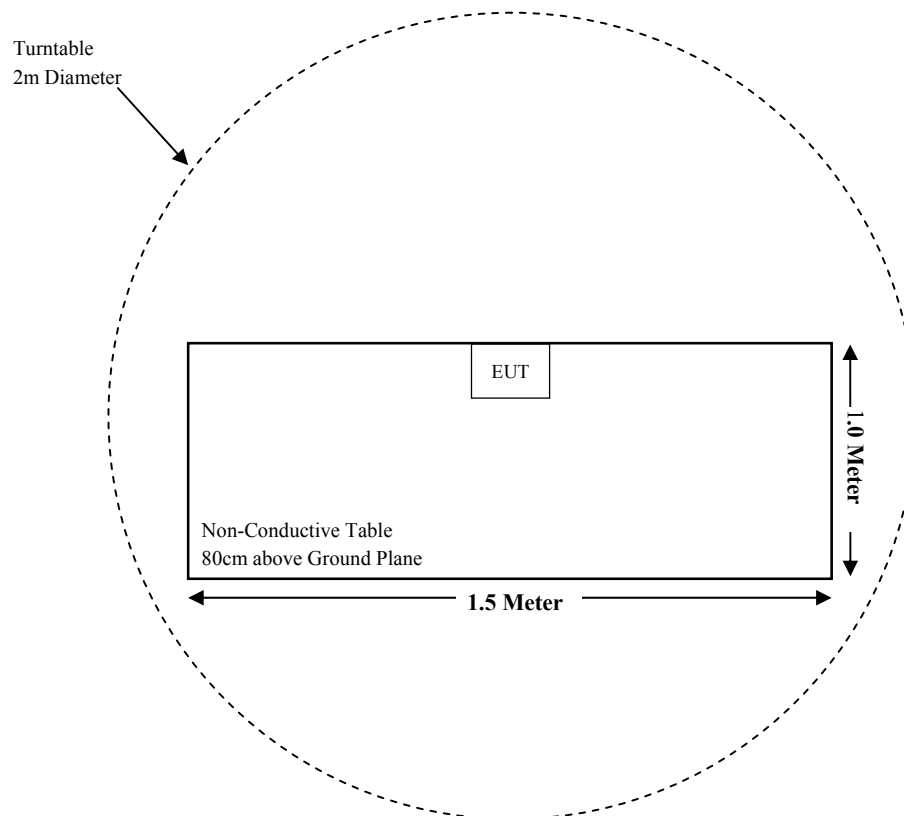
Manufacturer	Description	Model	Serial Number
/	/	/	/

External I/O Cable

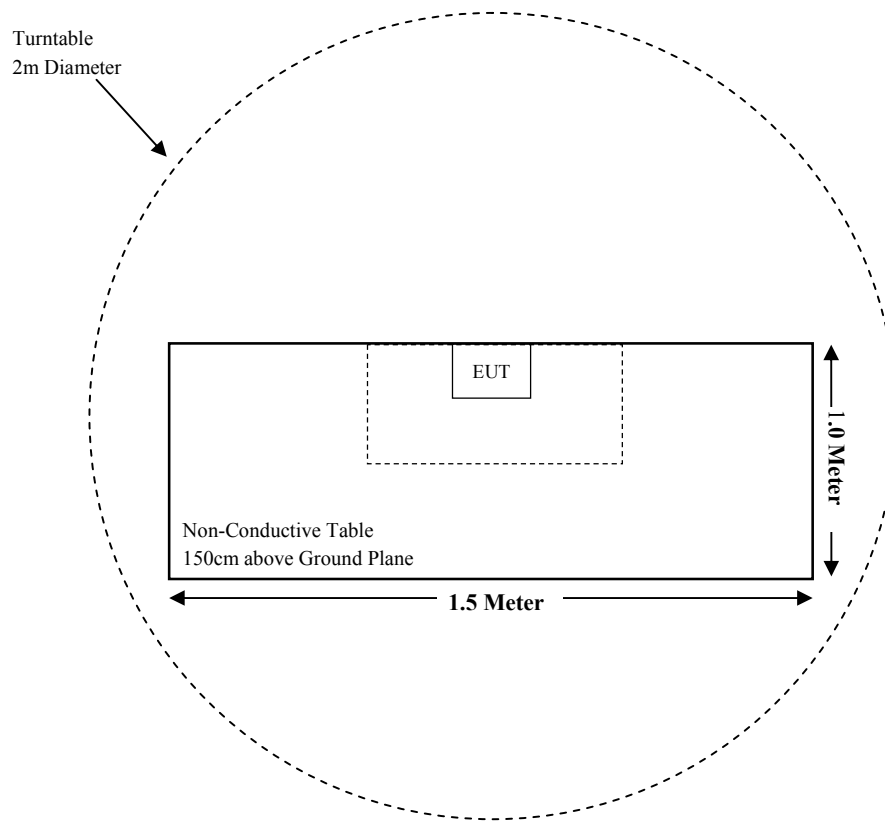
Cable Description	Length (m)	From Port	To
/	/	/	/

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
§15.247 (i)§1.1310 & §2.1093	RF Exposure	Compliant
§15.203	Antenna Requirement	Compliant
§15.207(a)	AC Line Conducted Emissions	Compliant (See Note 1)
§15.205, §15.209 & §15.247(d)	Radiated Emissions	Compliant
§15.247(a)(1)	20 dB Emission Bandwidth	Compliant (See Note 1)
§15.247(a)(1)	Channel Separation Test	Compliant (See Note 1)
§15.247(a)(1)(iii)	Time of Occupancy (Dwell Time)	Compliant (See Note 1)
§15.247(a)(1)(iii)	Quantity of hopping channel Test	Compliant (See Note 1)
§15.247(b)(1)	Peak Output Power Measurement	Compliant (See Note 1)
§15.247(d)	Band edges	Compliant (See Note 1)

Note 1: For these items, all the test data please refer to the original report RSHF200914001-00A with FCC ID: XJ6MT-203-1

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	2020-11-27	2021-11-26
Sunol Sciences	Broadband Antenna	JB3	A090314-1	2020-08-05	2023-08-04
Sonoma Instrument	Pre-amplifier	310N	171205	2020-08-14	2021-08-13
Rohde & Schwarz	Auto test Software	EMC32	100361	N/A	N/A
MICRO-COAX	Coaxial Cable	Cable-8	008	2020-08-15	2021-08-14
MICRO-COAX	Coaxial Cable	Cable-9	009	2020-08-15	2021-08-14
MICRO-COAX	Coaxial Cable	Cable-10	010	2020-08-15	2021-08-14
Radiated Emission Test (Chamber 2#)					
Rohde & Schwarz	EMI Test Receiver	ESU40	100207	2021-04-01	2022-03-31
ETS-LINDGREN	Horn Antenna	3115	9207-3900	2020-07-15	2023-07-14
ETS-LINDGREN	Horn Antenna	3116	84159	2019-12-12	2022-12-11
A.H.Systems,inc	Amplifier	PAM-0118P	512	2020-08-14	2021-08-13
EM Electronics Corporation	Amplifier	EM18G40G	060726	2021-03-22	2022-03-21
MICRO-TRONICS	Band Reject Filter	BRM50702	G024	2020-08-05	2021-08-04
Narda	Attenuator/10dB	10dB	010	2020-08-15	2021-08-14
Rohde & Schwarz	Auto test Software	EMC32	100361	N/A	N/A
MICRO-COAX	Coaxial Cable	Cable-6	006	2020-08-15	2021-08-14
MICRO-COAX	Coaxial Cable	Cable-11	011	2020-08-15	2021-08-14
MICRO-COAX	Coaxial Cable	Cable-12	012	2020-08-15	2021-08-14
MICRO-COAX	Coaxial Cable	Cable-13	013	2020-08-15	2021-08-14

* **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§15.247 (i), §1.1310 &§2.1093 – RF EXPOSURE

Applicable Standard

According to §2.1093 and §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

According to KDB447498 D01 General RF Exposure Guidance v06:

For 100 MHz to 6 GHz and test separation distances ≤ 50 mm, the 1-g and 10-g SAR test exclusion thresholds are determined by the following:

$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0$ for 1-g SAR, and ≤ 7.5 for 10-g extremity SAR

- $f(\text{GHz})$ is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison
- When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion

Measurement Result

Frequency Range (MHz)	Max Tune-up Conducted Power		Calculated Distance (mm)	Calculated Value	Threshold (10-g SAR)	SAR Test Exclusion
	(dBm)	(mW)				
2405-2450	18.60	72.44	20	5.67	7.5	Yes

Note:

1. This is a handheld device



Result: No SAR test is required.

FCC §15.203 – ANTENNA REQUIREMENT

Applicable Standard

According to FCC § 15.203, 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.

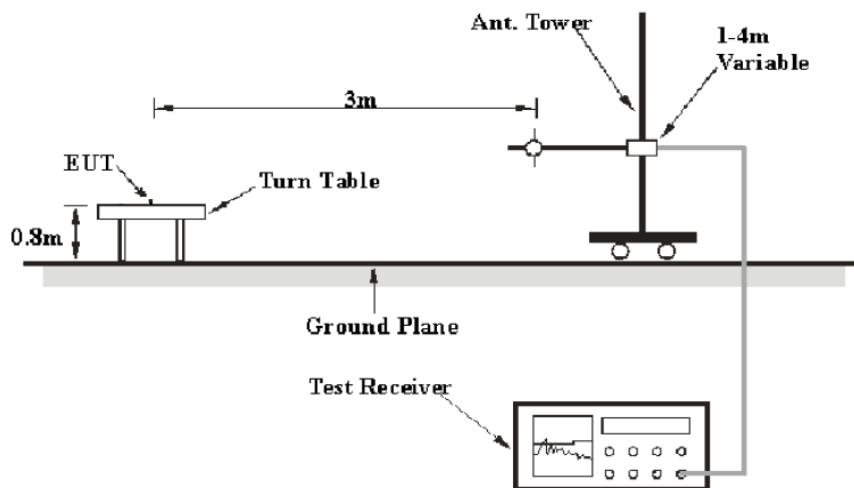
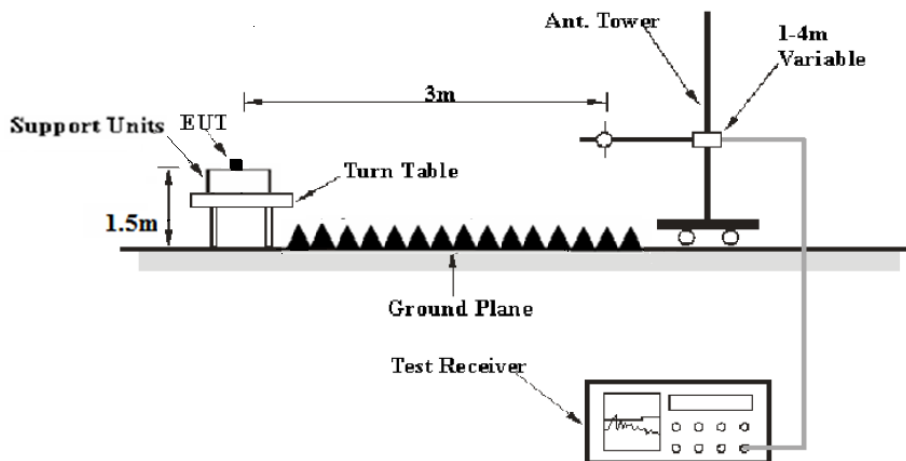
Antenna Information

The EUT has a dipole antenna, which the antenna gain is 2.0 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

Result: Compliant.

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 was 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	/	AVG

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**

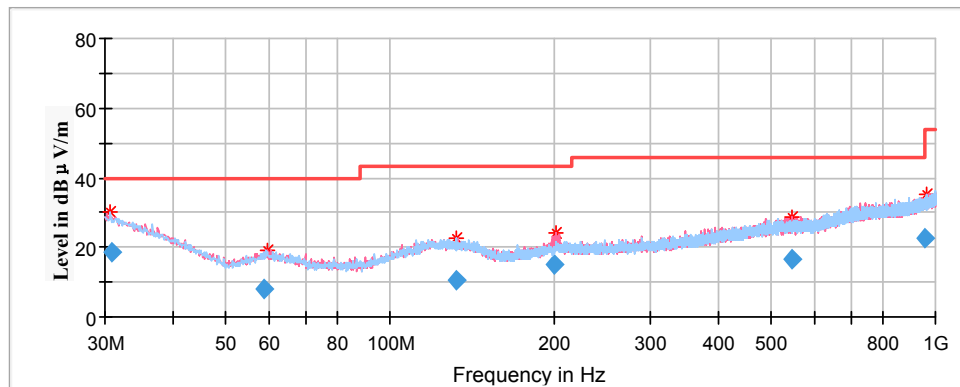
Temperature:	22.9 °C~23.5 °C
Relative Humidity:	51%~55%
ATM Pressure:	101kPa~102kPa

The testing was performed by Miller Xie from 2021-05-24 to 2021-05-28.

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)
	QuasiPeak (dBμV/m)	Height (cm)	Polar (H/V)				
30.879904	18.65	200.0	H	0.0	-4.2	40.00	21.35
58.607600	7.98	199.0	V	169.0	-14.8	40.00	32.02
132.298300	10.77	200.0	H	341.0	-11.3	43.50	32.73
200.759700	15.21	100.0	V	308.0	-12.0	43.50	28.29
546.373200	16.45	199.0	V	107.0	-5.2	46.00	29.55
956.966900	22.59	199.0	V	2.0	1.7	46.00	23.41

1GHz-18GHz

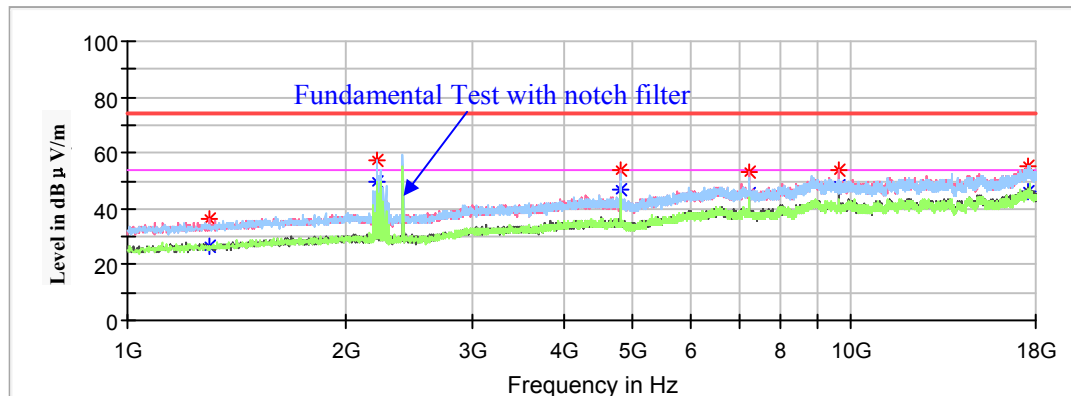
(Pre-scan in the X,Y and Z axes of orientation, the worst case **X-axis of orientation** was recorded.)

Note:

1. This test was performed with the 2.4 - 2.5GHz notch filter.
2. Corrected Factor (dB/m) = Antenna factor (RX) (dB/m) + Cable Loss (dB) - Amplifier Factor (dB)
 Corrected Amplitude (dBμV/m) = Corrected Factor (dB/m) + Reading (dBμV)
 Margin (dB) = Limit (dBμV/m) - Corrected Amplitude (dBμV/m)

Low Channel: 2405MHz

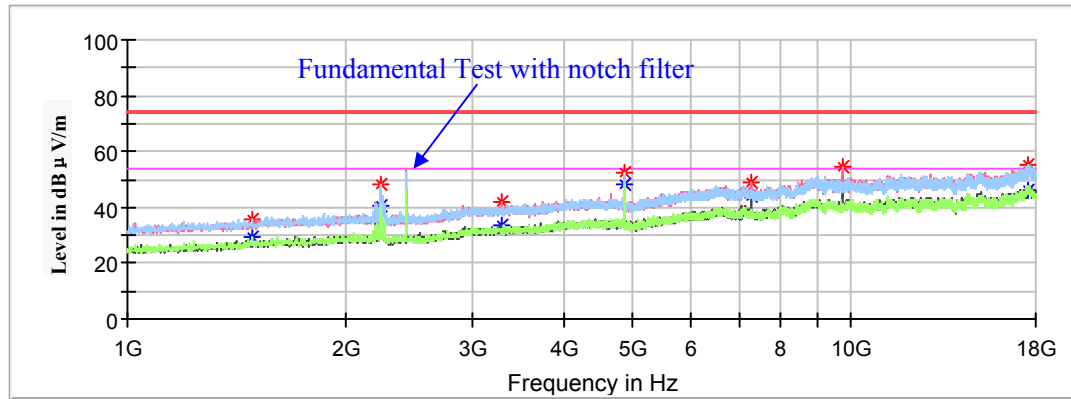
Full Spectrum



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)				
1299.200000	---	26.81	150.0	V	37.0	-7.5	54.00	27.19
1299.200000	36.20	---	150.0	V	37.0	-7.5	74.00	37.80
2212.100000	57.17	---	200.0	H	200.0	-4.5	74.00	16.83
2212.100000	---	49.65	200.0	H	200.0	-4.5	54.00	4.35
4810.000000	---	47.16	200.0	V	71.0	0.6	54.00	6.84
4810.000000	54.12	---	200.0	V	71.0	0.6	74.00	19.88
7215.000000	---	45.72	200.0	V	71.0	5.3	54.00	8.28
7215.000000	53.02	---	200.0	V	71.0	5.3	74.00	20.98
9620.700000	---	48.25	200.0	V	309.0	9.0	54.00	5.75
9620.700000	53.94	---	200.0	V	309.0	9.0	74.00	20.06
17546.100000	---	46.22	200.0	H	338.0	14.3	54.00	7.78
17546.100000	55.34	---	200.0	H	338.0	14.3	74.00	18.66

Middle Channel: 2428MHz

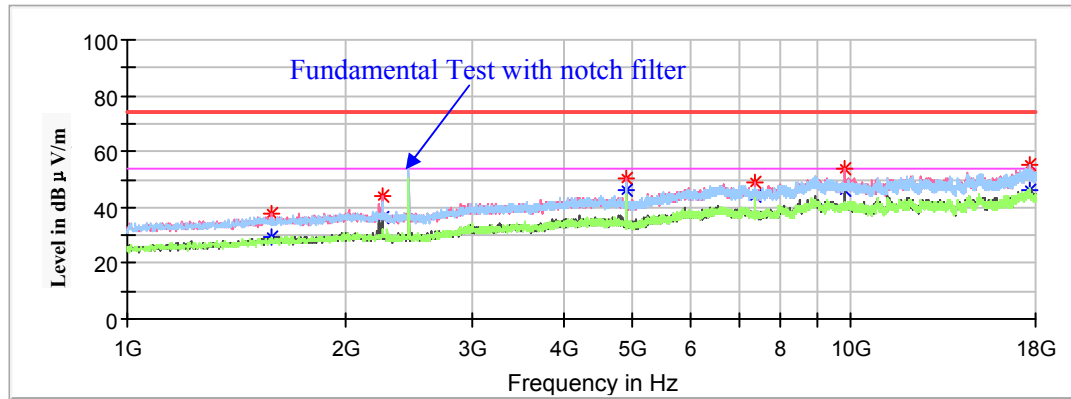
Full Spectrum



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)				
1484.500000	---	29.12	150.0	H	212.0	-6.6	54.00	24.88
1484.500000	35.96	---	150.0	H	212.0	-6.6	74.00	38.04
2234.200000	---	40.90	150.0	H	276.0	-4.5	54.00	13.10
2234.200000	48.03	---	150.0	H	276.0	-4.5	74.00	25.97
3298.400000	---	33.28	150.0	V	2.0	-1.8	54.00	20.72
3298.400000	41.63	---	150.0	V	2.0	-1.8	74.00	32.37
4856.000000	52.47	---	200.0	H	354.0	0.5	74.00	21.53
4856.000000	---	48.55	200.0	H	354.0	0.5	54.00	5.45
7284.000000	---	43.76	150.0	V	248.0	5.2	54.00	10.24
7284.000000	48.99	---	150.0	V	248.0	5.2	74.00	25.01
9710.800000	54.31	---	200.0	V	353.0	9.0	74.00	19.69
9710.800000	---	48.18	200.0	V	353.0	9.0	54.00	5.82

High Channel: 2450MHz

Full Spectrum

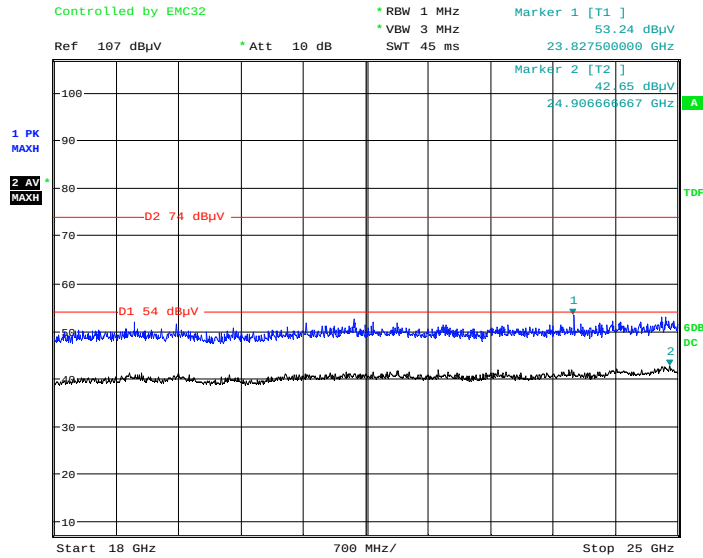


Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dB μ V/m)	Margin (dB)
	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Height (cm)	Polar (H/V)				
1584.800000	---	29.67	200.0	H	26.0	-6.2	54.00	24.33
1584.800000	37.58	---	200.0	H	26.0	-6.2	74.00	36.42
2256.300000	---	36.28	200.0	V	197.0	-4.4	54.00	17.72
2256.300000	43.82	---	200.0	V	197.0	-4.4	74.00	30.18
4900.000000	50.24	---	150.0	V	304.0	0.4	74.00	23.76
4900.000000	---	46.10	150.0	V	304.0	0.4	54.00	7.90
7350.000000	48.72	---	150.0	V	258.0	5.1	74.00	25.28
7350.000000	---	44.23	150.0	V	258.0	5.1	54.00	9.77
9799.200000	---	46.28	200.0	V	352.0	8.9	54.00	7.72
9799.200000	53.98	---	200.0	V	352.0	8.9	74.00	20.02
17654.900000	55.32	---	150.0	H	331.0	14.1	74.00	18.68
17654.900000	---	46.01	150.0	H	331.0	14.1	54.00	7.99

18GHz-25GHz:

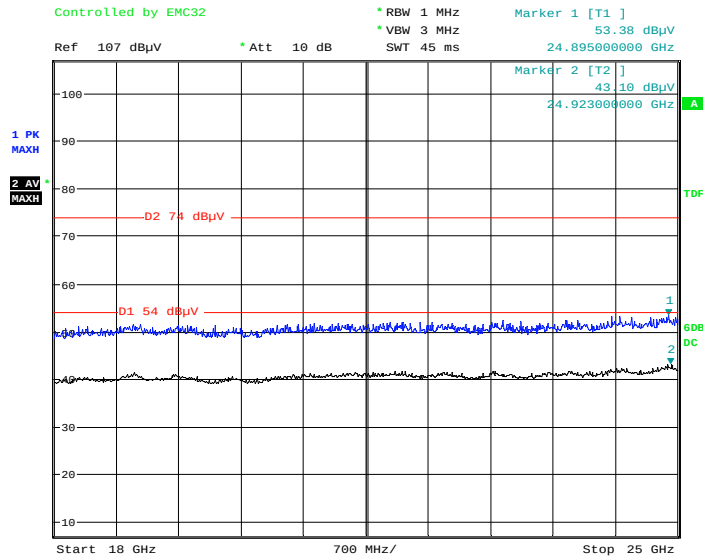
Pre-Scan with low, middle and high channels in the X,Y and Z axes of orientation, the worst case **low channel in X-axis of orientation** was recorded

Horizontal



Date: 24.MAY.2021 21:06:10

Vertical



Date: 24.MAY.2021 21:12:51

Fundamental Test & 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: 2405MHz								
2390.00	---	52.56	150.0	V	1.0	3.8	54.00	1.44
2390.00	65.70	---	150.0	V	1.0	3.8	74.00	8.30
High Channel: 2450MHz								
2483.50	64.92	---	200.0	V	2.0	4.1	74.00	9.08
2483.50	---	51.28	200.0	V	2.0	4.1	54.00	2.72

Declarations

- 1: 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 an asterisk '*'. Customer model name, addresses, names, trademarks etc. are not considered data.
- 2: Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.
- 3: Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.
- 4: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.
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