


TEST REPORT

Applicant Name : NINGBO BAIHUANG ELECTRIC APPLIANCES CO., LTD.
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 315318 China
 Report Number : RA221129-57907E-RF-00A
 FCC ID: Q92-BH-V1

Test Standard (s)
 FCC PART 15.231

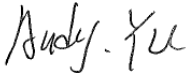
Sample Description

Product Type: Remote Control Transmitter
 Model No.: BH-V1, BH-P1
 Trade Mark: 
 Date Received: 2022-11-29
 Date of Test: 2022-12-21 to 2023-02-13
 Report Date: 2023-02-16

Test Result:	Pass*
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* In the configuration tested, the EUT complied with the standards above.

Prepared and Checked By:



 Audy.Yu
 EMC Engineer

Approved By:



 Candy Li
 EMC Engineer

Note: This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk "★".
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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	RA221129-57907E-RF-00A	Original Report	2023-02-16

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product	Remote Control Transmitter
Tested Model	BH-V1
Multiple Model	BH-P1
Model difference*	Please refer to the DoS letter.
Frequency Range	433.92MHz
E-field strength	81.38dBuV/m@3m
Modulation Technique	ASK
Antenna Specification*	0dBi (It is provided by the applicant)
Voltage Range	DC12V from battery
Sample serial number	RA221129-57907E-RF-S1 (Assigned by ATC, Shenzhen)
Sample/EUT Status	Good condition

Objective

All the test measurements were performed according to the measurement procedure described in ANSI C63.10 - 2013.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, section 15.203, 15.205, 15.209, 15.35(c) and 15.231 rules.

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 at Shenzhen Accurate Technology Co., Ltd. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Each test item follows test standards and with no deviation.

Measurement Uncertainty

Parameter		Uncertainty
Occupied Channel Bandwidth		5%
RF output power, conducted		0.73dB
Unwanted Emission, conducted		1.6dB
Emissions, Radiated	30MHz - 1GHz	4.28dB
	1GHz - 18GHz	4.98dB
Temperature		1°C
Humidity		6%
Supply voltages		0.4%

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 Shenzhen Accurate Technology Co., Ltd. to collect test data is located on the 1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. 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.: 708358, the FCC Designation No.: CN1189.

Accredited by American Association for Laboratory Accreditation (A2LA). The Certificate Number is 4297.01

The lab has been recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements, the CAB identifier: CN0016. The Registration Number is 5077A.

SYSTEM TEST CONFIGURATION

Justification

The system was configured for testing in Engineering Mode and the power is default, which was provided and declared by manufacturer.

Operating frequency: 433.92MHz

Special Accessories

No special accessories was used

Equipment Modifications

No modification was made to the EUT.

Support Equipment List and Details

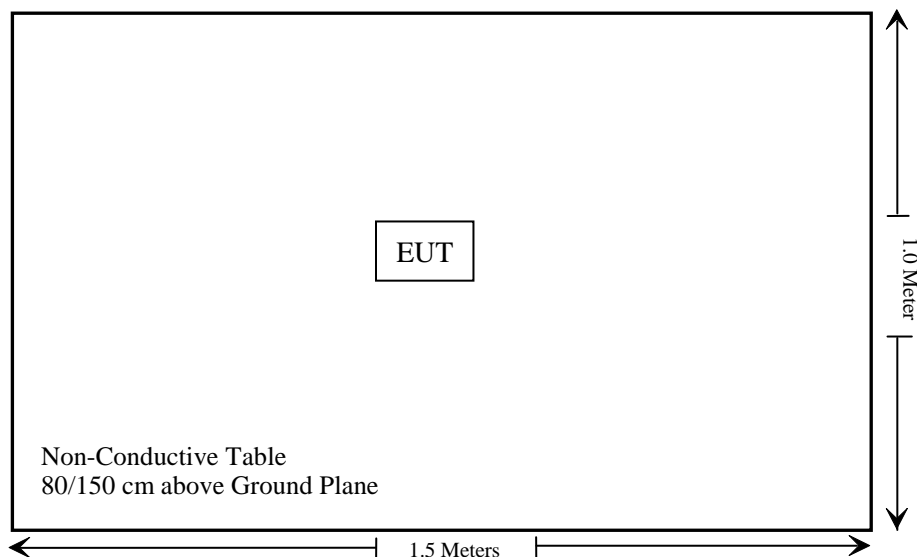
Manufacturer	Description	Model	Serial Number
/	/	/	/

External I/O Cable

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

Block Diagram of Test Setup

For radiated emission



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§ 1.1307 (b) & §2.1093	RF EXPOSURE	Compliant
§15.203	Antenna Requirement	Compliant
§15.207	AC Line Conducted Emission	Not Applicable
§15.205, §15.209, §15.231(b)	Radiated Emissions	Compliant
§15.231 (c)	20dB Emission Bandwidth	Compliant
§15.231 (a) (1)	Deactivation	Compliant

Not Applicable--The device is powered by battery only.

Note: the EUT have 10 keys, pre-scan all keys, the worst case 1ON key was tested and recorded in the report.

TEST EQUIPMENT LIST AND DETAILS

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Test Receiver	ESR	102725	2022/11/25	2023/11/24
Rohde&Schwarz	Spectrum Analyzer	FSV40	101949	2022/11/25	2023/11/24
SONOMA INSTRUMENT	Amplifier	310 N	186131	2022/11/08	2023/11/07
A.H. Systems, inc.	Preamplifier	PAM-0118P	135	2022/11/08	2023/11/07
Schwarzbeck	Bilog Antenna	VULB9163	9163-323	2021/07/06	2024/07/05
Schwarzbeck	Horn Antenna	BBHA9120D	9120D-1067	2020/01/05	2023/01/04
Unknown	RF Coaxial Cable	No.10	N050	2022/11/25	2023/11/24
Unknown	RF Coaxial Cable	No.11	N1000	2022/11/25	2023/11/24
Unknown	RF Coaxial Cable	No.12	N040	2022/11/25	2023/11/24
Unknown	RF Coaxial Cable	No.13	N300	2022/11/25	2023/11/24
Unknown	RF Coaxial Cable	No.14	N800	2022/11/25	2023/11/24
Radiated Emission Test Software: e3 19821b (V9)					

* **Statement of Traceability:** Shenzhen Accurate Technology Co., Ltd. attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

FCC §1.1307 (b) & §2.1093 – RF EXPOSURE

Applicable Standard

According to FCC §2.1093 and §1.1307(b), 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 KDB 447498 D04 Interim General RF Exposure Guidance v01, clause 2.1.2 – 1-mW test Exemption:

Per § 1.1307(b)(3)(i)(A), a single RF source is exempt RF device (from the requirement to show data demonstrating compliance to RF exposure limits, as previously mentioned) if the available maximum time-averaged power is no more than 1 mW, regardless of separation distance.

This exemption applies to all operating configurations and exposure conditions, for the frequency range 100 kHz to 100 GHz, regardless of fixed, mobile, or portable device exposure conditions. This is a standalone exemption, and it cannot be applied in conjunction with any other test exemption.

Test Result:

For worst case:

Mode	Frequency	Maximum Tune-up Power (ERP)		1-mW test Exemption
	(MHz)	(dBm)	(mW)	
SRD	433.92	-15.15	0.031	Yes

Note 1: $E(\text{dBuV/m}) = \text{EIRP}(\text{dBm}) - 95.2$ for distance 3m
so the $\text{EIRP} = 81.38 \text{dBuV/m} - 95.2 = -13.82 \text{dBm}$

Note 2: The tune-up EIRP is -13dBm, which was declared by the applicant.

Note 3: $\text{EIRP}(\text{dBm}) = \text{ERP} + 2.15 \text{dBi}$
so the $\text{ERP} = -13 \text{dBm} - 2.15 \text{dBi} = -15.15 \text{dBm}$

Result: Compliant.

FCC §15.203 - ANTENNA REQUIREMENT

Applicable Standard

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.

Antenna Connector Construction

The EUT has one internal on board PCB antenna arrangement which was permanently attached. And the antenna gain is 0dBi; fulfill the requirement of this section. Please refer to EUT photos.

Result: Compliant.

FCC §15.205, §15.209, §15.231 (b) - RADIATED EMISSIONS

Applicable Standard

FCC §15.205, §15.209, §15.231 (b)

According to FCC §15.231(b), the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

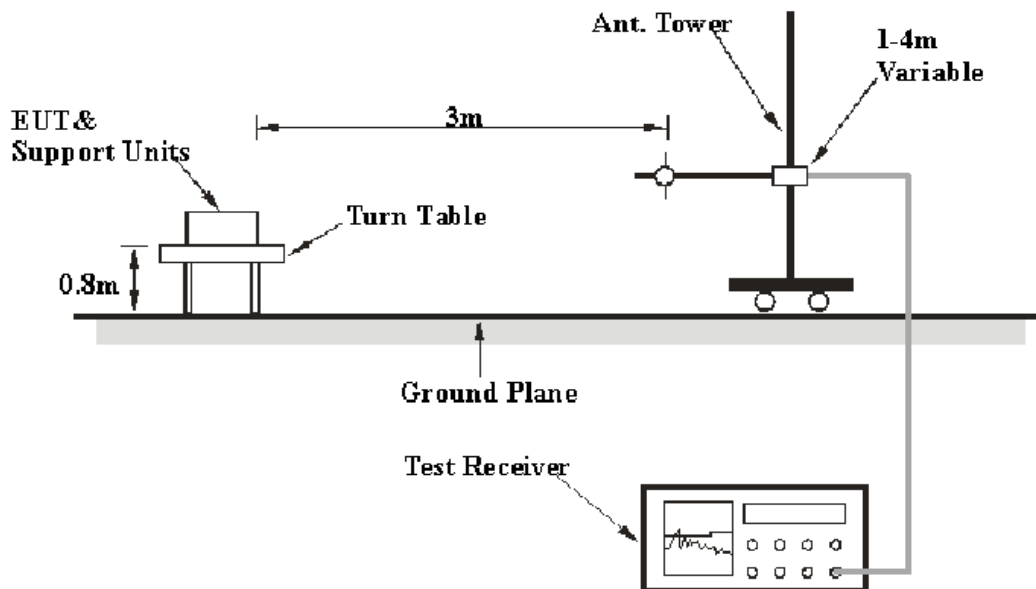
Fundamental frequency (MHz)	Field Strength of Fundamental (Microvolts /meter)	Field Strength of spurious emissions ((Microvolts /meter)
40.66-40.70	2250	225
70-130	1250	125
130-174	1250 to 3750**	125 to 375**
174-260	3750	375
260-470	3750 to 12500**	375 to 1250**
Above 470	12500	1250

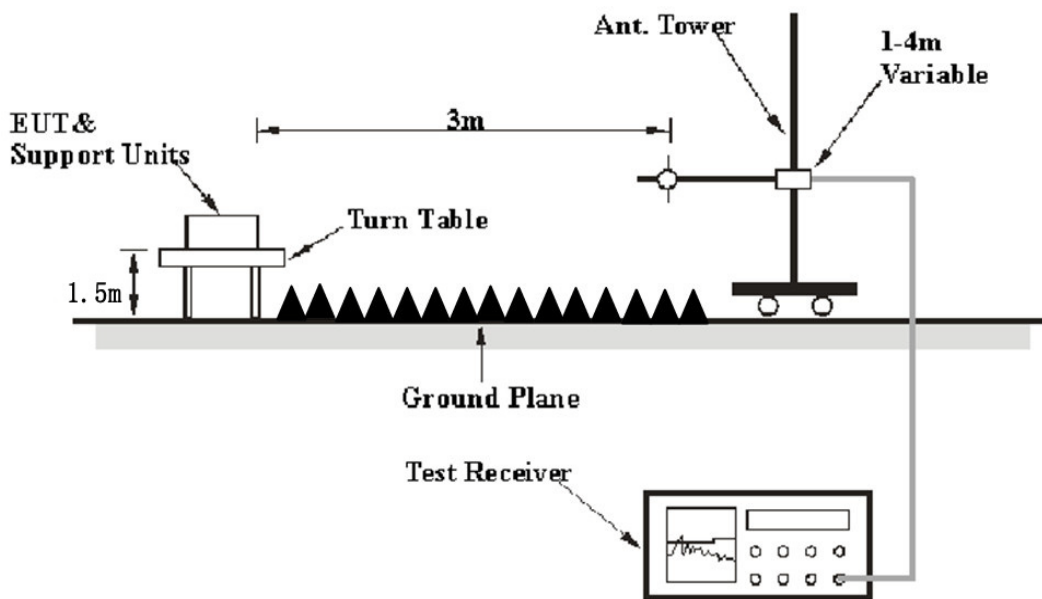
**linear interpolations

The above field strength limits are specified at a distance of 3-meters the tighter limits apply at the band edges.

EUT Setup

Below 1 GHz:



Above 1 GHz:

The radiated emission tests were performed in the 3 meters test site, using the setup accordance with the ANSI C63.10 - 2013. The specification used was the FCC 15 § 15.209, 15.205 and 15.231.

EMI Test Receiver Setup

The system was investigated from 30 MHz to 5 GHz.

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

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

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 the Quasi-peak detection mode from 30MHz to 1GHz, Peak and average detection mode above 1 GHz.

If the maximized peak measured value complies with the limit, then it is unnecessary to perform QP/Average measurement.

Corrected Amplitude & Margin Calculation

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

$$\text{Factor} = \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

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

$$\begin{aligned} \text{Over Limit/Margin} &= \text{Level} / \text{Corrected Amplitude} - \text{Limit} \\ \text{Level} / \text{Corrected Amplitude} &= \text{Read Level} + \text{Factor} \end{aligned}$$

Test Results Summary

According to the data in the following table, the EUT complied with the FCC §15.205, §15.209, §15.231 (b).

Test Data

Environmental Conditions

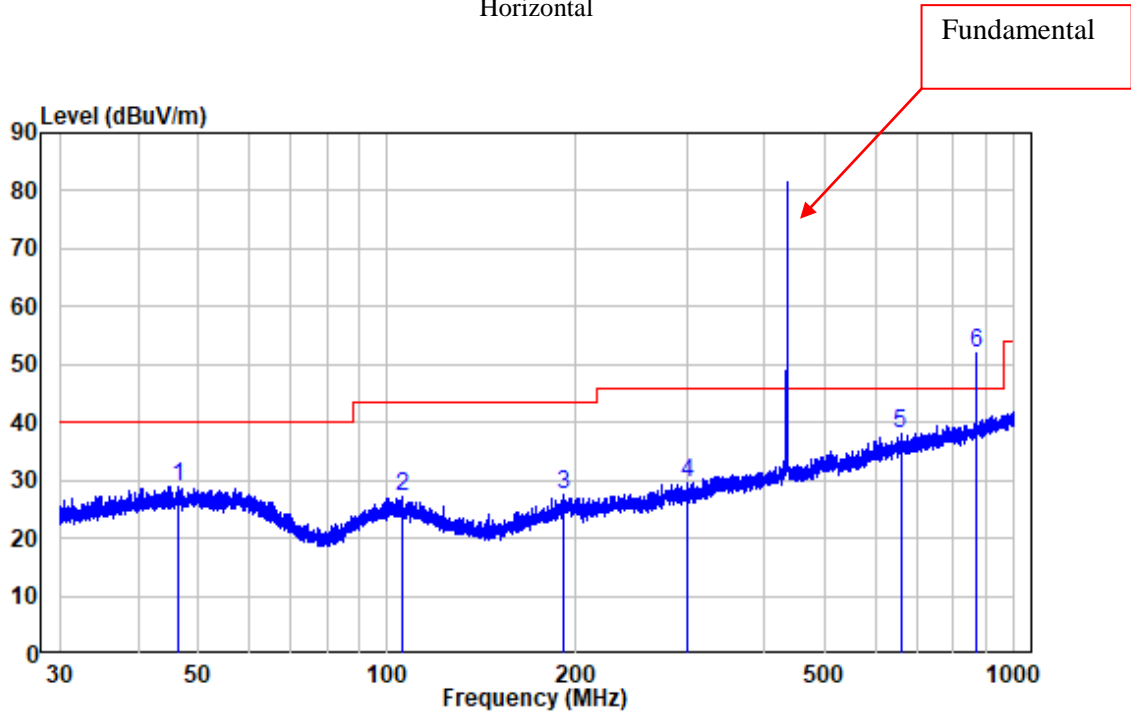
Temperature:	24°C
Relative Humidity:	50-54 %
ATM Pressure:	101.0 kPa

The testing was performed by Jimi Zheng on 2022-12-21 for RF Radiated and Glenn Jiang on 2022-12-23 and 2023-02-13 for Duty cycle.

Test mode: Transmitting (Pre-scan in the X, Y and Z axes of orientation, the worst case as setup photos was recorded)

30MHz – 1 GHz:

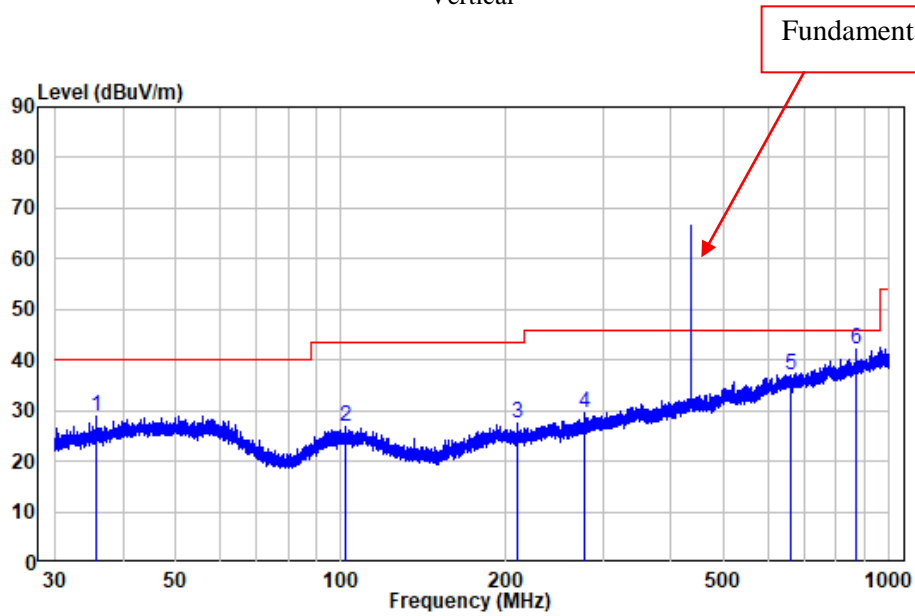
Horizontal



Site : chamber
 Condition: 3m HORIZONTAL
 Job No. : RA221129-57907E-RF
 Test Mode: Transmitting

	Freq	Factor	Read Level	Level	Limit	Over	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	46.462	-10.00	38.87	28.87	40.00	-11.13	Peak
2	105.734	-11.90	39.12	27.22	43.50	-16.28	Peak
3	190.739	-11.46	38.80	27.34	43.50	-16.16	Peak
4	301.819	-9.16	38.72	29.56	46.00	-16.44	Peak
5	658.836	-1.63	39.68	38.05	46.00	-7.95	Peak
6	867.840	0.86	51.22	52.08	80.83	-28.75	Peak

Vertical



Site : chamber
 Condition: 3m VERTICAL
 Job No. : RA221129-57907E-RF
 Test Mode: Transmitting

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	35.640	-11.33	40.34	29.01	40.00	-10.99	Peak
2	102.225	-11.59	38.29	26.70	43.50	-16.80	Peak
3	209.588	-11.86	39.31	27.45	43.50	-16.05	Peak
4	278.677	-9.67	39.05	29.38	46.00	-16.62	Peak
5	659.992	-1.64	38.82	37.18	46.00	-8.82	Peak
6	867.840	0.86	41.40	42.26	80.83	-38.57	Peak

Fundamental:

Frequency (MHz)	Receiver		Turn-Table	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dB μ V/m)	FCC Part 15.231(b)	
	Reading (dB μ V)	PK/QP/Ave.	Angle Degree	Height (m)	Polar (H/V)			Limit (dB μ V/m)	Margin (dB)
433.92MHz									
433.92	87.11	PK	220	1.7	H	-5.73	81.38	100.83	-19.45
433.92	72.34	PK	174	2.1	V	-5.73	66.61	100.83	-34.22

1GHz - 5 GHz:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dB μ V/m)	FCC Part 15.231(b)	
	Reading (dB μ V)	PK/QP/Ave.		Height (m)	Polar (H/V)			Limit (dB μ V/m)	Margin (dB)
433.92MHz									
1301.76	55.57	PK	180	1.2	H	-10.2	45.37	74	-28.63
1301.76	51.23	PK	150	2.1	V	-10.2	41.03	74	-32.97
2169.6	52.29	PK	180	1.2	H	-7.22	45.07	80.83	-35.76
2169.6	49.71	PK	150	2.1	V	-7.22	42.49	80.83	-38.34
2603.52	61.15	PK	354	1.4	H	-6.85	54.3	80.83	-26.53
2603.52	53.55	PK	359	1.2	V	-6.85	46.7	80.83	-34.13
3037.44	53.21	PK	86	1.9	H	-5.84	47.37	80.83	-33.46
3037.44	48.93	PK	241	1.5	V	-5.84	43.09	80.83	-37.74
3905.28	55.16	PK	279	1.6	H	-5.54	49.62	74	-24.38
3905.28	47.75	PK	54	1.0	V	-5.54	42.21	74	-31.79
4339.2	54.61	PK	259	1.7	H	-4.83	49.78	74	-24.22
4339.2	48.74	PK	231	1.5	V	-4.83	43.91	74	-30.09

Field Strength of Average							
Frequency (MHz)	Peak Measurement @3m (dBµV/m)	Polar (H/V)	Duty Cycle Correction Factor (dB)	Corrected Amplitude (dBµV/m)	Part 15.231		
					Limit (dBµV/m)	Margin (dB)	Comment
433.92MHz							
433.92	81.38	H	-7.42	73.96	80.83	-6.87	Fundamental

Note:

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

Corrected Amplitude = Factor + Reading

Margin = Corrected Amplitude – Limit

Average= Peak + Duty Cycle Corrected Factor

The other spurious emission which is 20dB below limit or in the noise floor level was not recorded.

The test result of peak was 20dB below to the limit of peak, which can be compliant to the average limit, so just peak value was recorded.

Duty cycle:

Refer below plot, one complete pulse train not exceed 0.1 seconds, so in one pulse train:

Ton1=0.638ms; N1=10;

Ton2=0.275ms; N2=15

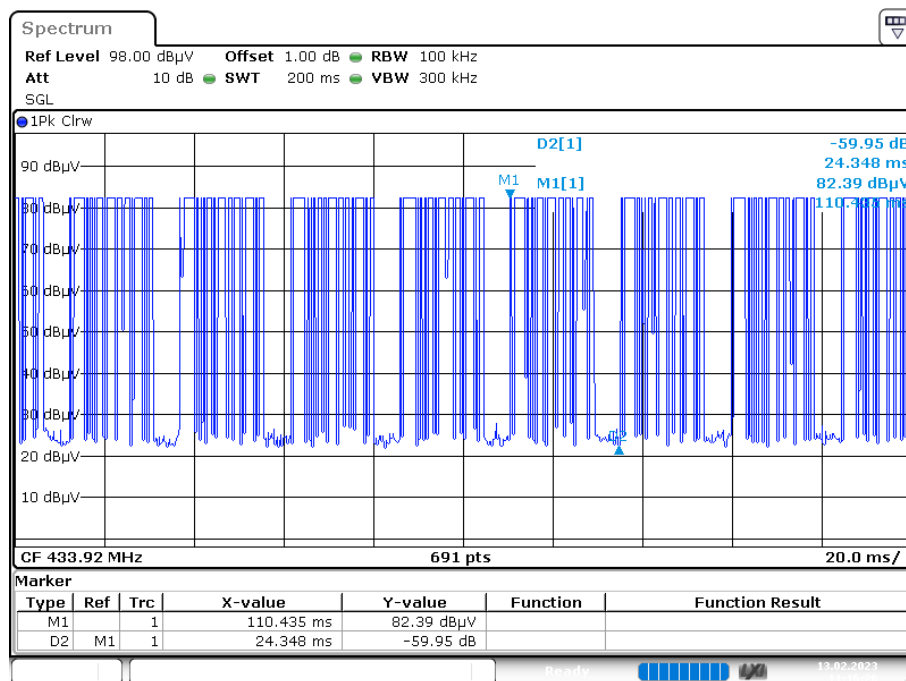
Ton =Ton1*N1+Ton2*N2=10.505ms

Tp = 24.696ms

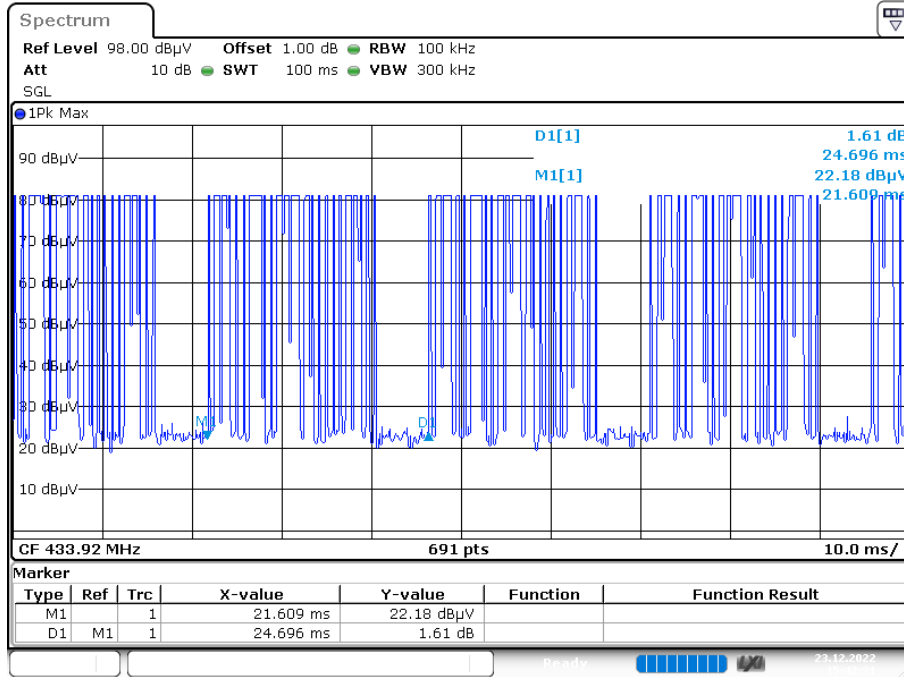
Duty cycle = Ton/Tp =0.4254

Duty Cycle Corrected Factor = 20lg (Duty cycle) = 20lg0.4254= -7.42

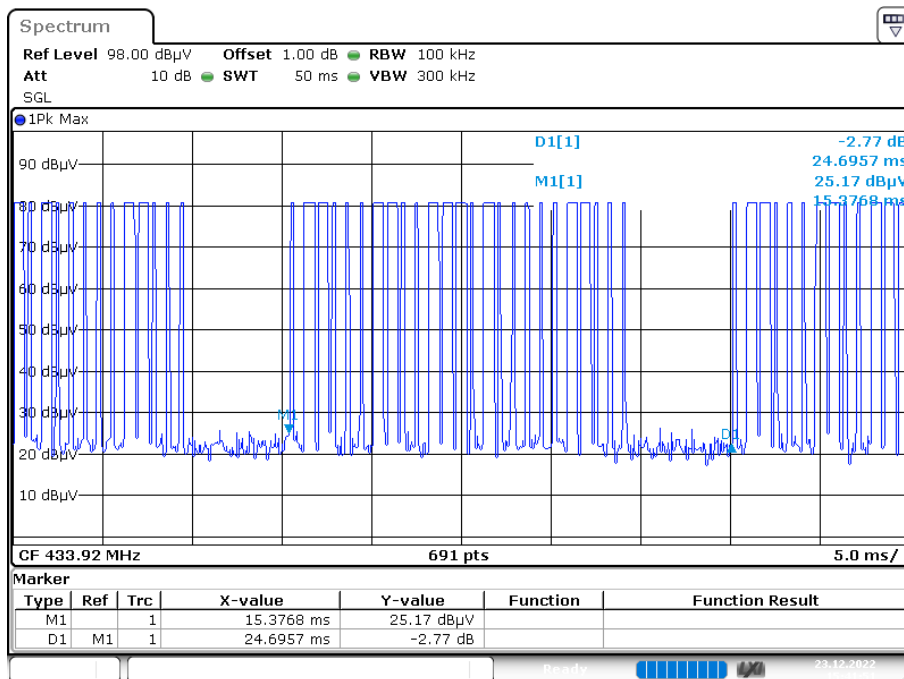
Duty Cycle



Date: 13.FEB.2023 11:16:27

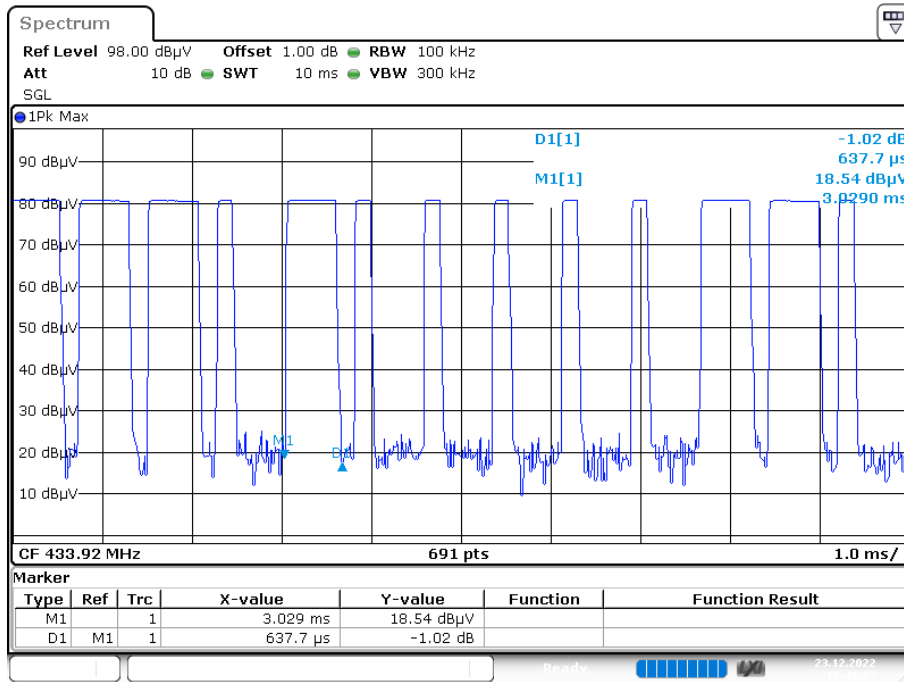


Date: 23.DEC.2022 15:42:32



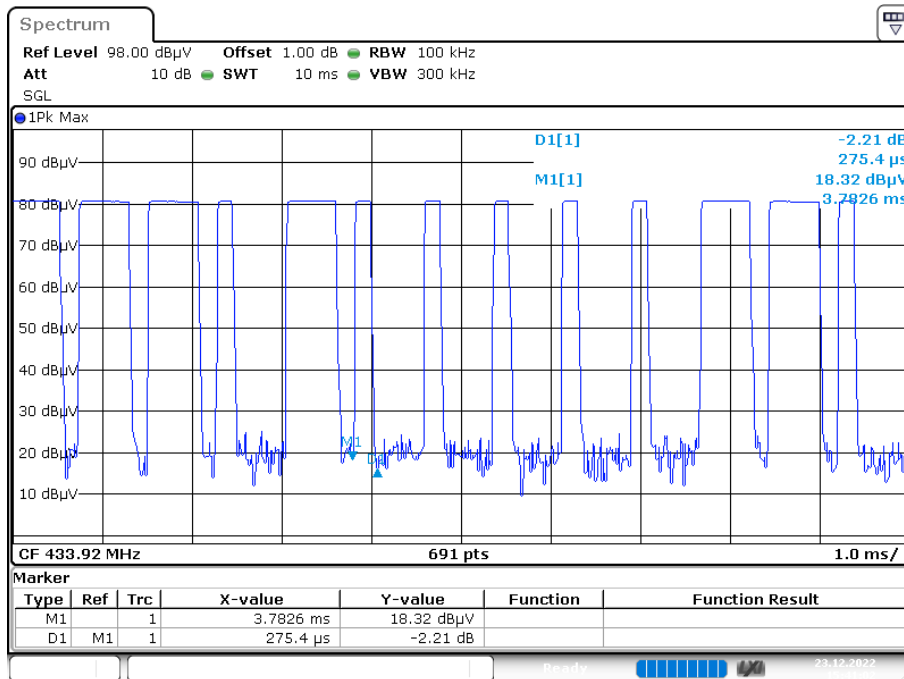
Date: 23.DEC.2022 15:41:52

Ton1



Date: 23.DEC.2022 15:40:24

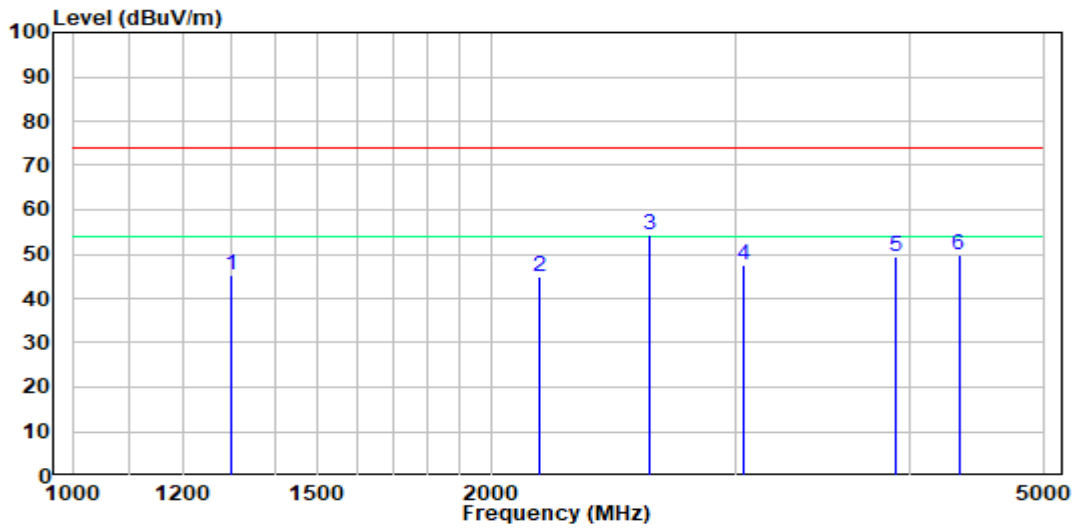
Ton2



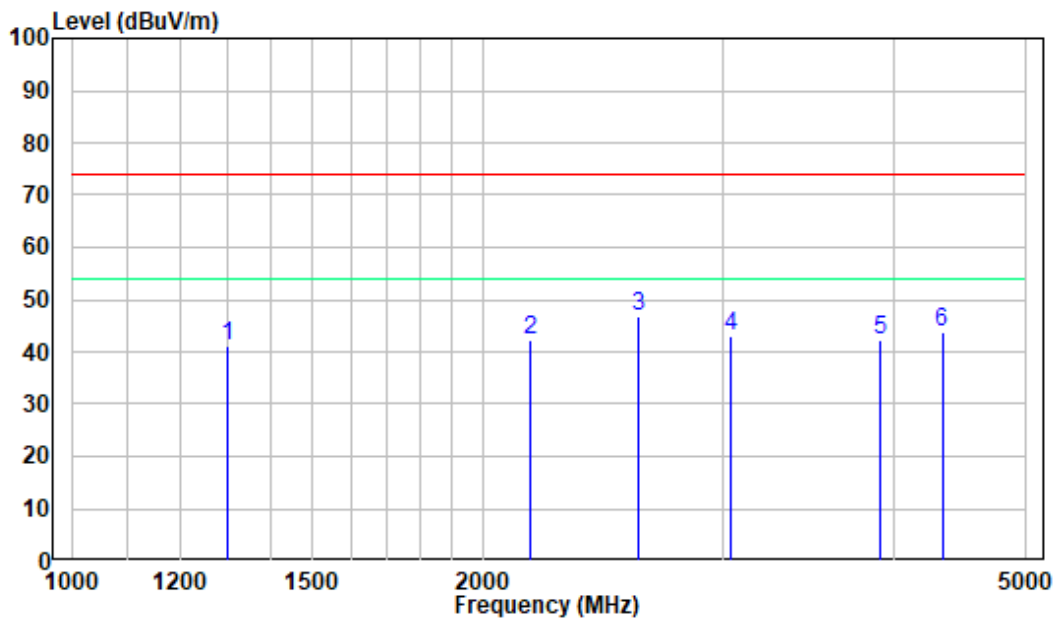
Date: 23.DEC.2022 15:41:02

Pre-scan plots:

Horizontal



Vertical



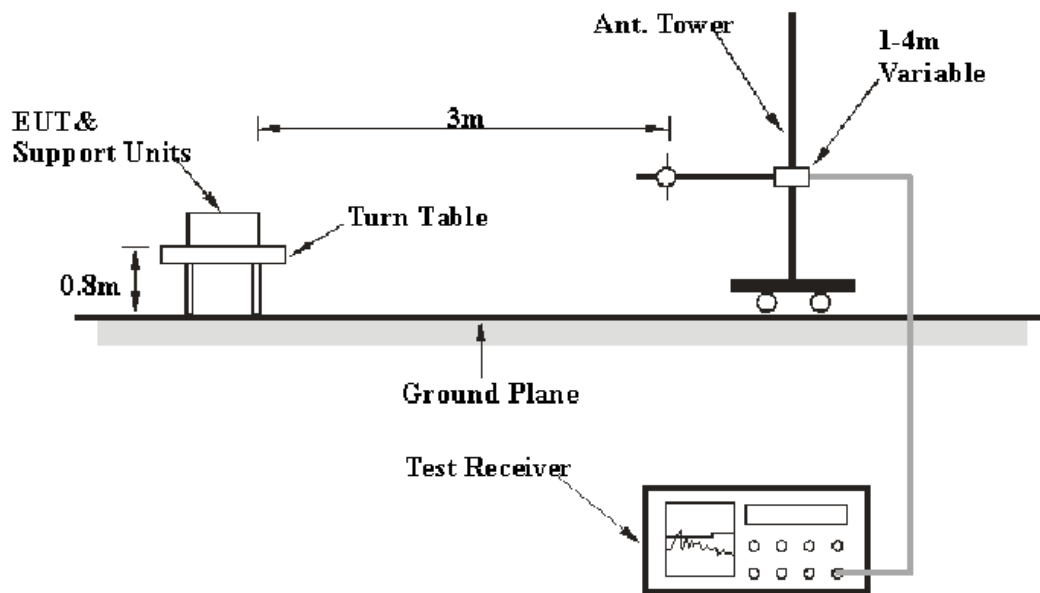
FCC §15.231(a) (1) - DEACTIVATION TESTING

Applicable Standard

Per FCC §15.231(a) (1), A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

Test Procedure

1. Set center frequency of spectrum analyzer=operating frequency.
2. Set the spectrum analyzer as RBW=100kHz/ VBW=300kHz/ Span=0Hz.
3. Repeat above procedures until all frequency measured was complete.



Test Data

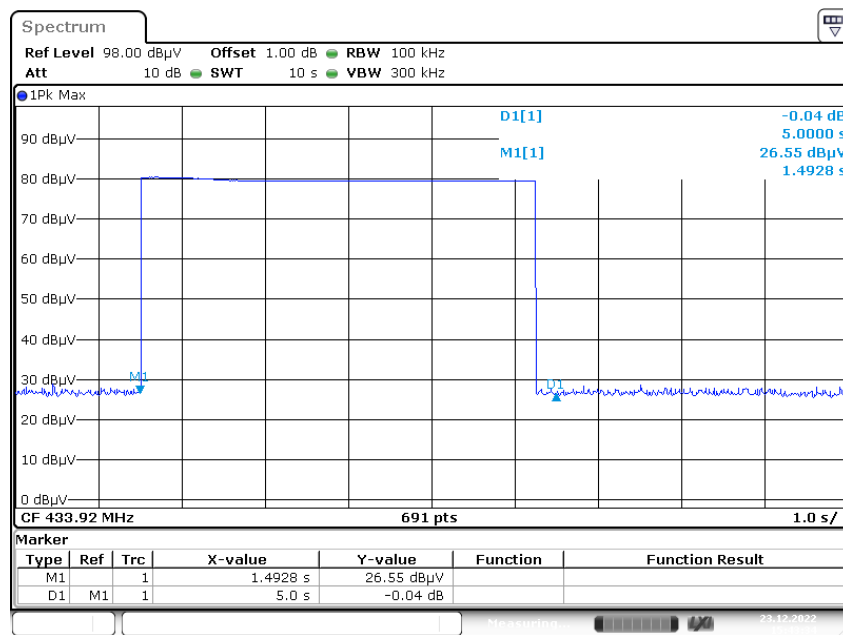
Environmental Conditions

Temperature:	24°C
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

The testing was performed by Glenn Jiang on 2022-12-23.

Test mode: Transmitting

Test Result: Compliant. This product will cease transmission within 5 seconds after activation. Please refer to following plots.



Date: 23.DEC.2022 15:43:34

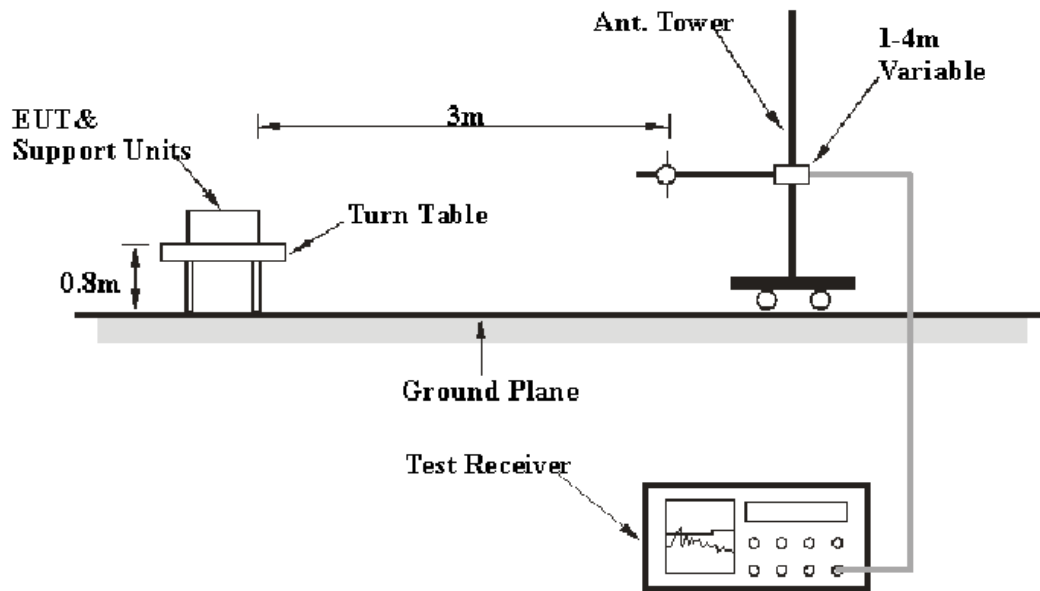
FCC §15.231(c) – 20 dB EMISSION BANDWIDTH TESTING

Applicable Standard

Per 15.231(c), The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. Bandwidth is determined at the points 20 dB down from the modulated carrier.

Test Procedure

The EUT is setting to the transmit mode, the waveform was received by the test antenna which was connected to the spectrum analyzer, plot the 20 dB bandwidth.



Test Data

Environmental Conditions

Temperature:	24°C
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

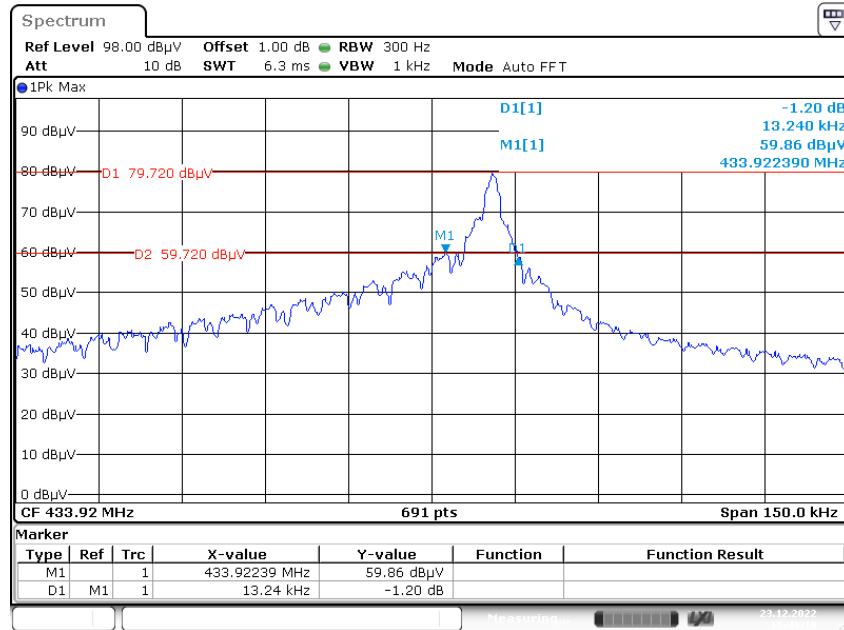
The testing was performed by Glenn Jiang on 2022-12-23.

Test Mode: Transmitting

Please refer to following table and plots.

Channel Frequency (MHz)	20 dB Emission Bandwidth (kHz)	Limit (kHz)	Result
433.92	13.24	<1084.8	Pass

20 dB Emission Bandwidth



Date: 23.DEC.2022 15:48:11

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