FCC TEST REPORT

Test report
On Behalf of
Mishka AI, Inc.
For
Smart Teddy
Model No.: ST-01

FCC ID: 2AZPXST-01

Prepared for : Mishka AI, Inc.
3411 Silverside Road, Tatnall Building, Suite 104, Wilmington DE 19810,USA

Prepared By : Shenzhen Tongzhou Testing Co.,Ltd
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Date of Test: 2020/3/8 ~ 2021/3/22

Date of Report: 2021/3/24

Report Number: TZ210302013-E4

The test report apply only to the specific sample(s) tested under stated test conditions
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TEST RESULT CERTIFICATION

Applicant's name :	**Mishka AI, Inc.**
Address :	3411 Silverside Road, Tatnall Building, Suite 104, Wilmington DE 19810,USA
Manufacture's Name :	**Aurora World HK Limited., Ltd**
Address :	Hong Kong , Unit 1808, 18/FL, Greenfield Tower, Concordia Plaza, No.1 Science Museum Road, T.S.T. East, Kowloon
Product description	
Trade Mark :	N/A
Product name :	Smart Teddy
Model and/or type reference :	ST-01
Standards :	FCC Rules and Regulations Part 15.225 ANSI C63.10:2013

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Date of Test ..... :

Date (s) of performance of tests :	2020/3/8 ~ 2021/3/22
Date of Issue:	2021/3/24
Test Result :	Pass

Testing Engineer : Anna Hu

(Anna Hu)

Technical Manager : Hugo Chen

(Hugo Chen)

Authorized Signatory : Andy Zhang

(Andy Zhang)

Revision History

Revision	Issue Date	Revisions	Revised By
000	2021/3/24	Initial Issue	Andy Zhang

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1. GENERAL INFORMATION

1.1. Description of Device (EUT)

EUT	:	Smart Teddy
Model Number	:	ST-01
Model Declaration	:	N/A
Test Model	:	ST-01
Power Supply	:	DC 3.7V by battery
Hardware version	:	LLC MISHKA AI v1.4
Software version	:	V1.0
Sample ID	:	TZ210302013–1#
Bluetooth		
Bluetooth Version	:	V4.0+EDR
Channel Number	:	79 Channels for Bluetooth BR/EDR(DSS) 40 Channels for BLE (DTS)
Modulation Technology	:	GFSK, π/4-DQPSK, 8-DPSK for Bluetooth BR/EDR (DSS) GFSK for BLE (DTS)
Data Rates	:	Bluetooth BR/EDR (DSS): 1/2/3Mbps BLE (DTS): 1Mbps
Antenna Type And Gain		Internal Antenna /0.0 dBi(Max.)
WiFi		
WLAN	:	Supported IEEE 802.11b/g/n
WLAN FCC Operation Frequency	:	IEEE 802.11b:2412-2462MHz IEEE 802.11g:2412-2462MHz IEEE 802.11n HT20:2412-2462MHz IEEE 802.11n HT40:2422-2452MHz
WLAN Channel Number	:	11 Channels for 2412-2462MHz(IEEE 802.11b/g/n HT20) 7 Channels for 2422-2452MHz(IEEE 802.11n HT40)
WLAN Modulation Technology	:	IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK) IEEE 802.11g: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n: OFDM (64QAM, 16QAM, QPSK, BPSK)
Antenna Type And Gain	:	Internal Antenna /0.0 dBi(Max.)
NFC		
Frequency Range	:	13.56MHz
Antenna Type And Gain		Internal Antenna, 0.0dBi (Max.)

Note1: Antenna position refer to EUT Photos

1.2. Objective

The primary objective of the manufacturer is compliance with Subpart C of Part 15 of FCC Rules for the radiated and conducted emissions of intentional radiators. Certification of these devices is required as a prerequisite to marketing as defined in Part 2 the FCC Rules.

Certification is a procedure where the manufacturer or a contracted laboratory makes measurements and submits the test data and technical information to the FCC. The FCC issues a grant of equipment authorization upon successful completion of their review of the submitted documents. Once the equipment authorization has been obtained, the label indicating compliance must be attached to all identical units, which are subsequently manufactured.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product which may result in increased emissions should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different line filter, different power supply, harnessing or I/O cable changes, etc.).

1.3. Environmental Conditions

During the measurement the environmental conditions were within the listed ranges:
- Temperature: 15-35ºC
- Humidity: 30-60 %
- Atmospheric pressure: 86-106 kPa

1.4. Host System Configuration List and Details

Manufacturer	Description	Model	Serial Number	Certificate
Aohai	Adapter	A924-120200W-US1	N/A	N/A

1.5. EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

☑ supplied by the lab ☐ supplied by the manufacturer

Manufacturer	Description	Model	Serial Number	Certificate
AoHai	Adapter	A8A-050150U-US2	N/A	N/A

.....

1.6. External I/O Cable

I/O Port Description	Quantity	Cable
USB Port	1	N/A
Earphone Port	1	N/A

1.7. Description of Test Facility

FCC
Designation Number: CN1275
Test Firm Registration Number: 167722
Shenzhen Tongzhou Testing Co.,Ltd has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

A2LA
Certificate Number: 5463.01
Shenzhen Tongzhou Testing Co.,Ltd has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

IC
ISED#: 22033
CAB identifier: CN0099
Shenzhen Tongzhou Testing Co.,Ltd has been listed by Innovation, Science and Economic Development Canada to perform electromagnetic emission measurement.

The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.10 and CISPR 16-1-4:2010

1.8. Statement of the Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. To CISPR 16 – 4 “Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements” and is documented in the Shenzhen Tongzhou Testing Co.,Ltd’s quality system acc. To DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

1.9. Measurement Uncertainty

Test Item		Frequency Range	Uncertainty	Note
Radiation Uncertainty	:	9KHz~30MHz	±3.08dB	(1)
		30MHz~1000MHz	±4.42dB	(1)
		1GHz~40GHz	±4.06dB	(1)
Conduction Uncertainty	:	150kHz~30MHz	±2.23dB	(1)

(1). This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

1.10. Description of Test Modes

Mode	description
Mode 1	EUT work in 13.56MHz

1.11. Antenna System

The directional gains of antenna used for transmitting refer to section 1.1 of this report, and EUT uses an integral antenna which is permanently attached.

2. 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.
The radiated testing was performed at an antenna-to-EUT distance of 3 meters. All radiated and conducted emissions measurement was performed at Shenzhen Tongzhou Testing Co.,Ltd.

2.1. EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

2.2. EUT Exercise

The EUT was operated in the normal operating mode. The TX frequency that was fixed which was for the purpose of the measurements.
According to its specifications, the EUT must comply with the requirements of the Section 15.203, 15.205, 15.207, 15.209 and 15.225 under the FCC Rules Part 15 Subpart C.

2.3. General Test Procedures

2.3.1 Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 6.2.1 of ANSI C63.10-2013 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using Quasi-peak and average detector modes.

2.3.2 Radiated Emissions

The EUT is placed on a turn table, which is 1.5 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 6.3 of ANSI C63.10-2013

2.4. Instrument Calibration

All test equipment is regularly checked to ensure that performance is maintained in accordance with the manufacturer's specifications. All antennas are calibrated at regular intervals with respect to tuned half-wave dipoles. An exhibit of this report contains the list of test equipment used and calibration information.

2.5. Test Mode

The EUT has been tested under engineering mode. The field strength of radiation emission was measured in the following position: EUT stand-up position (Y axis), lie-down position (X, Z axis).
The worst case of X axis was reported.

3. SYSTEM TEST CONFIGURATION

3.1. Justification

The system was configured for testing in a continuous transmits condition.

3.2. EUT Exercise Software

N/A

3.3. Special Accessories

N/A

3.4. Block Diagram/Schematics

Please refer to the related document

3.5. Equipment Modifications

Shenzhen Tongzhou Testing Co.,Ltd. has not done any modification on the EUT.

4. SUMMARY OF TEST RESULTS

Rules	Description of test	Sample ID	Result
§15.205 §15.209 §15.225 (d)	Radiated Emissions	TZ210302013–1#	Compliant
§15.207	Conducted Emission	TZ210302013–1#	Compliant
§15.225 (a) (b) (c)	In-Band Emission	TZ210302013–1#	Compliant
§15.215 (c)	20dB Bandwidth	TZ210302013–1#	Compliant
15.225(e)	Frequency Tolerance	TZ210302013–1#	Compliant
§15.203	Antenna Requirement	TZ210302013–1#	Compliant

Note: All buttons have been taken into consideration and only worst case reported.

5. TEST ITEMS and RESULTs

5.1. AC Power line conducted emissions

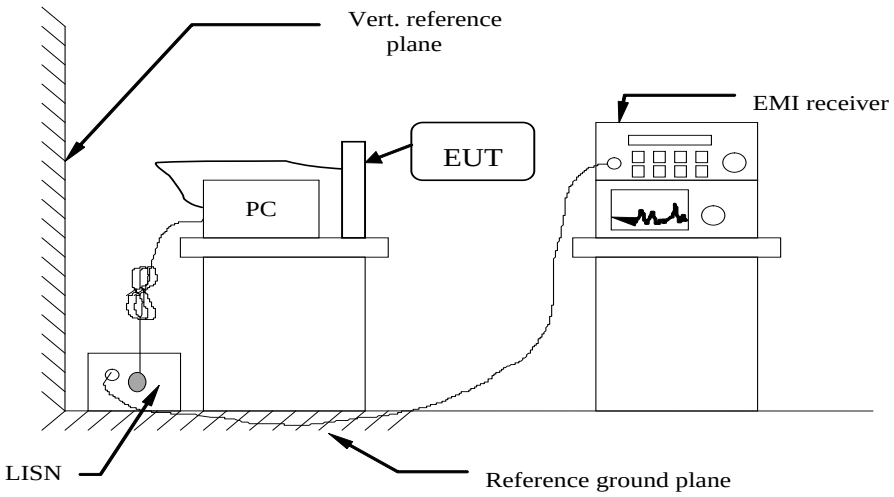
5.1.1. Standard Applicable

According to §15.207 (a): For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range are listed as follows:

Frequency Range (MHz)	Limits (dBμV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

* Decreasing linearly with the logarithm of the frequency

5.1.2. Block Diagram of Test Setup



5.1.3. Test Results

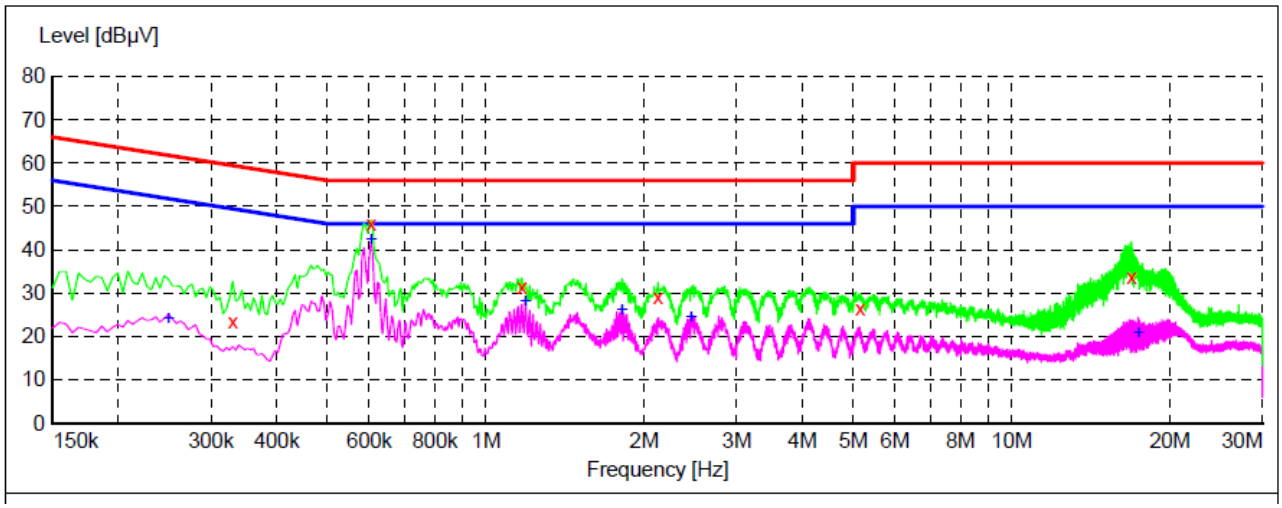
Temperature	24.5℃	Humidity	56%
Test Engineer	Anna Hu	Configurations	Normal Working
Test Date	2021/03/28		

PASS.

The test data please refer to following page.

AC Conducted Emission of power adapter @ AC 120V/60Hz(worst case)

Live

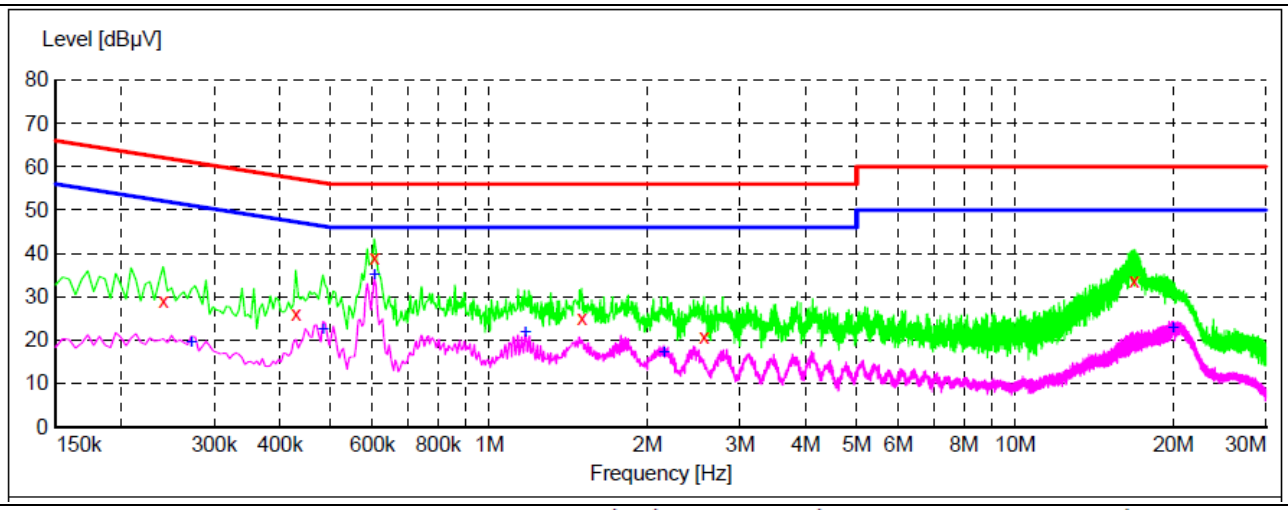


Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.330000	23.50	10.1	60	36.0	QP	L1	GND
0.604500	45.90	9.9	56	10.1	QP	L1	GND
1.171500	31.30	9.8	56	24.7	QP	L1	GND
2.125500	29.00	9.7	56	27.0	QP	L1	GND
5.149500	26.50	9.8	60	33.5	QP	L1	GND
16.912500	33.80	10.0	60	26.2	QP	L1	GND

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.249000	24.10	10.4	52	27.7	AV	L1	GND
0.604500	42.30	9.9	46	3.7	AV	L1	GND
1.189500	27.90	9.8	46	18.1	AV	L1	GND
1.815000	26.10	9.7	46	19.9	AV	L1	GND
2.458500	24.40	9.7	46	21.6	AV	L1	GND
17.398500	20.80	10.1	50	29.2	AV	L1	GND

Note:
1). Pre-scan all modes and recorded the worst case results in this report
2). Emission level (dBuV) = 20 log Emission level (uV).
3). Margin=Limit-Level

Neutral



Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.240000	28.90	10.5	62	33.2	QP	N	GND
0.429000	25.90	10.0	57	31.4	QP	N	GND
0.604500	38.90	9.9	56	17.1	QP	N	GND
1.500000	25.10	9.7	56	30.9	QP	N	GND
2.562000	20.90	9.7	56	35.1	QP	N	GND
16.822500	33.70	10.0	60	26.3	QP	N	GND

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.271500	19.50	10.3	51	31.6	AV	N	GND
0.483000	22.50	10.0	46	23.8	AV	N	GND
0.604500	35.10	9.9	46	10.9	AV	N	GND
1.171500	21.70	9.8	46	24.3	AV	N	GND
2.148000	17.20	9.7	46	28.8	AV	N	GND
19.968000	22.60	10.4	50	27.4	AV	N	GND

Note:
1). Pre-scan all modes and recorded the worst case results in this report
2). Emission level (dBuV) = 20 log Emission level (uV).
3). Margin=Limit-Level

5.2. Transmitter Field Strength of Emissions

5.2.1. Limit

§15.225(d)

(d) The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in §15.209.

§15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 -	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.52525	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	156.7 - 156.9	3260 - 3267	23.6 - 24.0
12.29 - 12.293	162.0125 - 167.17	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	167.72 - 173.2	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	240 - 285	3600 - 4400	([2])
13.36 – 13.41	322 - 335.4		

1 Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

2 Above 38.6

§15.205 (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

§15.209 (a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009–0.490	2400/F(kHz)	300
0.490–1.705	24000/F(kHz)	30
1.705–30.0	30	30
30–88	100**	3
88–216	150**	3
216–960	200**	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54 72 MHz, 76 88 MHz, 174 216 MHz or 470 806

MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

§15.209 (b) In the emission table above, the tighter limit applies at the band edges.

5.2.2. Measuring Instruments and Setting

Please refer to section 6 of equipments list in this report. The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (Emission in restricted band)	1MHz / 1MHz for Peak, 1 MHz / 10Hz for Average
RB / VB (Emission in non-restricted band)	1MHz / 1MHz for Peak, 1 MHz / 10Hz for Average

Spectrum Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

5.2.3. Test Procedures

1) Sequence of testing 9 kHz to 30 MHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 0.8 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions.

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna height is 0.8 meter.

--- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions

Final measurement:

--- Identified emissions during the premeasurement the software maximizes by rotating the turntable position (0° to 360°) and by rotating the elevation axes (0° to 360°).

--- The final measurement will be done in the position (turntable and elevation) causing the highest emissions with QPK detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

2) Sequence of testing 30 MHz to 1 GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height changes from 1 to 3 meter.

--- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°) and antenna movement between 1 and 4 meter.

--- The final measurement will be done with QP detector with an EMI receiver.

--- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

3) Sequence of testing 1 GHz to 18 GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height scan range is 1 meter to 2.5 meter.

--- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions.

Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°) and antenna movement between 1 and 4 meter. This procedure is repeated for both antenna polarizations.

--- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and Average detector.

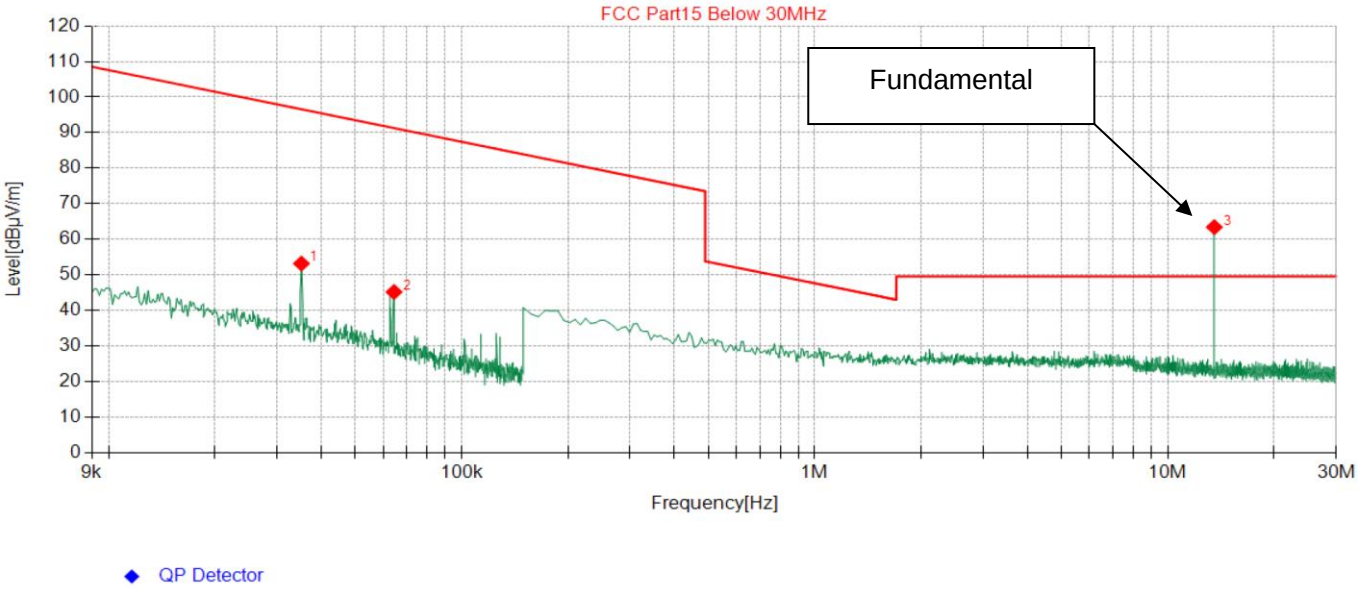
--- The final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

5.2.4. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.2.5. Results of Radiated Emissions (9 kHz ~30MHz)

Temperature	24.5℃	Humidity	56%
Test Engineer	Anna Hu	Configurations	Normal Working
Test Date	2021/03/28		



Suspected Data List							
NO.	Freq. [MHz]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	0.0352	53.15	96.55	43.40	100	139	Horizontal
2	0.0644	45.16	91.27	46.11	100	216	Horizontal
3	13.560	63.40	49.50	-13.90	100	126	Horizontal

Note:

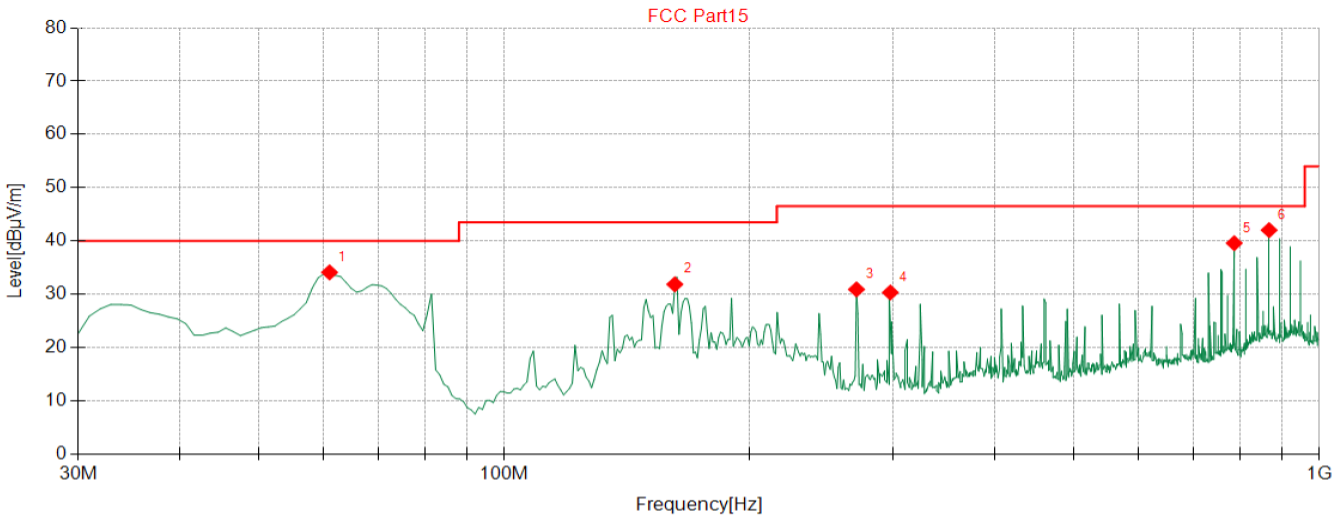
The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.

Distance extrapolation factor = 40 log (specific distance / test distance) (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor.

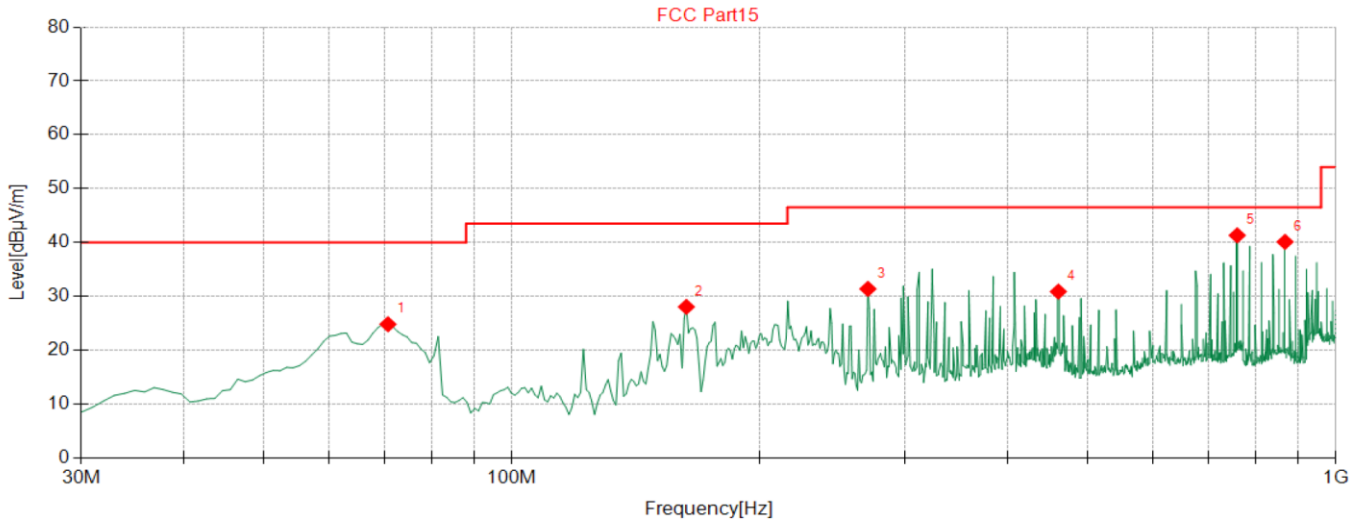
5.2.6. Results of Radiated Emissions (30MHz~1GHz)

Temperature	24.5℃	Humidity	56%
Test Engineer	Anna Hu	Configurations	Normal Working
Test Date	2021/03/28		



◆ QP Detector

Suspected Data List							
NO.	Freq. [MHz]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	61.040	34.10	40.00	5.90	100	339	Vertical
2	161.92	31.85	43.50	11.65	100	163	Vertical
3	270.56	30.90	46.50	15.60	200	189	Vertical
4	297.72	30.32	46.50	16.18	200	164	Vertical
5	786.60	39.57	46.50	6.93	100	143	Vertical
6	868.08	42.02	46.50	4.48	100	24	Vertical

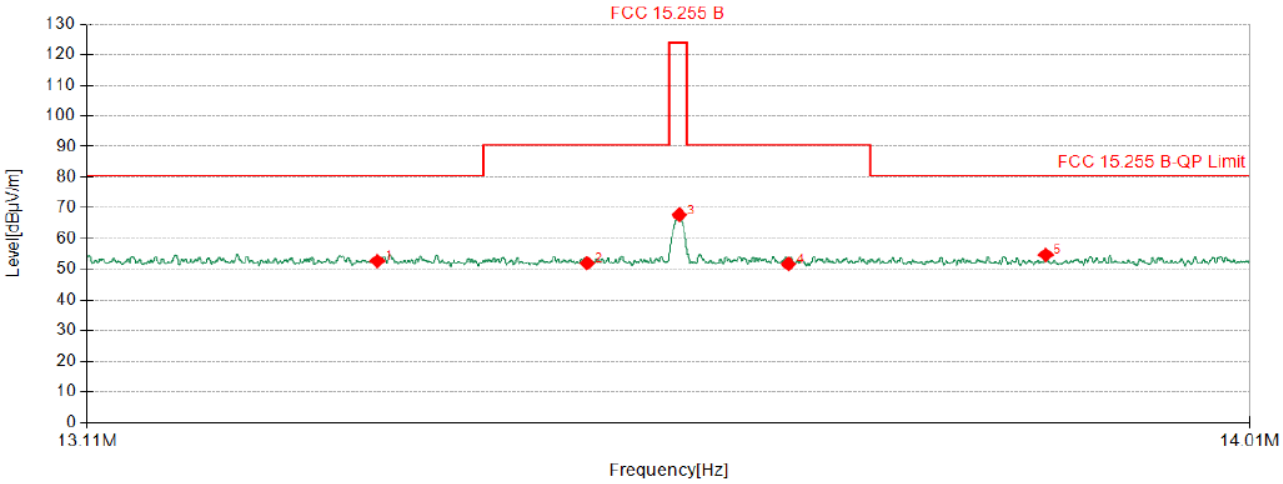


QP Detector

Suspected Data List							
NO.	Freq. [MHz]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	70.740	24.79	40.00	15.21	300	52	Horizontal
2	162.89	28.03	43.50	15.47	300	295	Horizontal
3	270.56	31.37	46.50	15.13	100	78	Horizontal
4	460.68	30.86	46.50	15.64	100	317	Horizontal
5	759.44	41.31	46.50	5.19	100	29	Horizontal
6	868.08	40.10	46.50	6.40	100	83	Horizontal

5.2.7. In-Band Emission (13.110-14.010 MHz)

Temperature	24.5℃	Humidity	56%
Test Engineer	Anna Hu	Configurations	Normal Working
Test Date	2021/03/28		



◆ QP Detector

Suspected Data List							
NO.	Freq. [MHz]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	13.329	52.67	80.50	27.83	100	37	Vertical
2	13.489	51.96	90.50	38.54	100	258	Vertical
3	13.561	67.74	124.00	56.26	100	329	Vertical
4	13.646	51.70	90.50	38.80	100	234	Vertical
5	13.847	54.71	80.50	25.79	100	321	Vertical

Note:

The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.

Distance extrapolation factor = 40 log (specific distance / test distance) (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor.

5.3. 20dB Bandwidth Emissions

§FCC 15.215 (c)

5.3.1. Limit

(c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. In the case of intentional radiators operating under the provisions of subpart E, the emission bandwidth may span across multiple contiguous frequency bands identified in that subpart. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

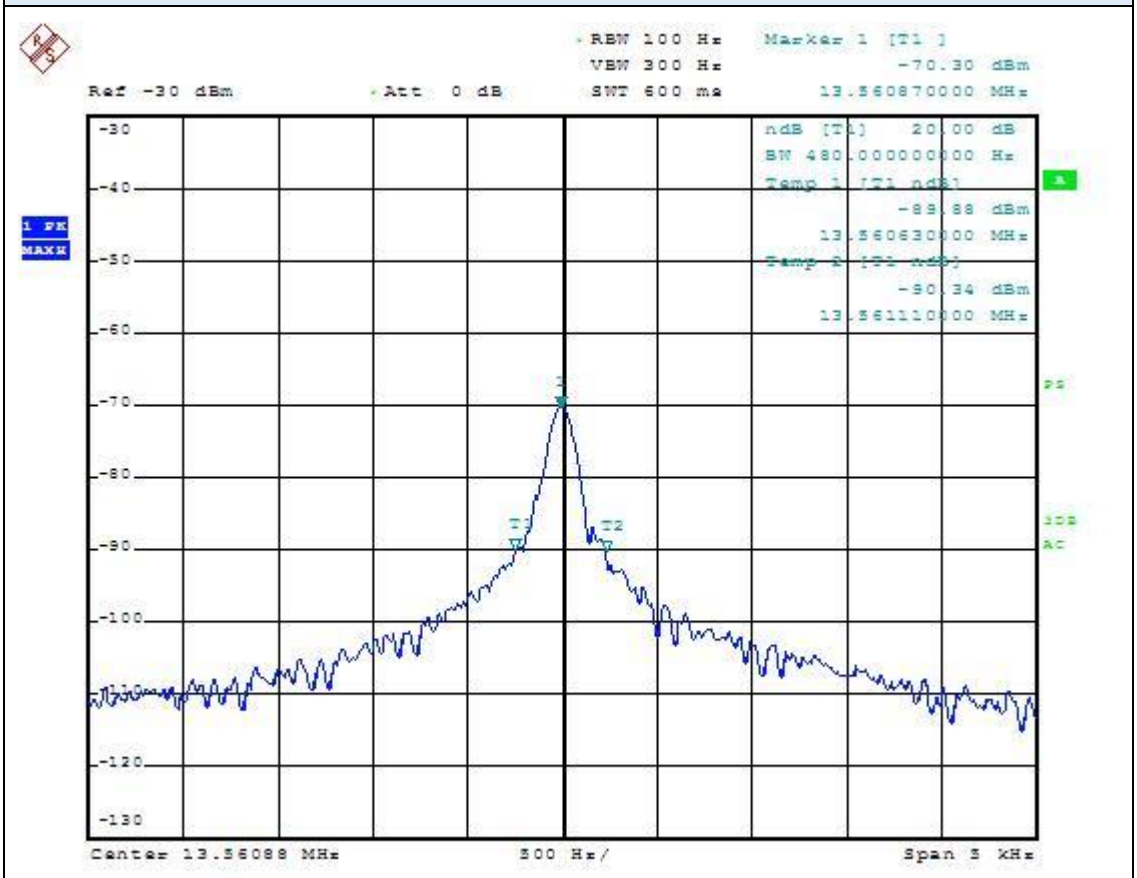
5.3.2. Test Procedure

With the EUT's antenna attached, the EUT's 20dB Bandwidth power was received by the test antenna which was connected to the spectrum analyzer with the START and STOP frequencies set to the EUT's operation band.

5.3.1. Test Data

Mode	Freq. (MHz)	20dB Bandwidth (Hz)	Limit (kHz)	Conclusion
Tx Mode	13.56	480	/	PASS

Test Plot


RBW 100 Hz
VBW 300 Hz
SWT 600 ms
Marker 1 [T1]
-70.30 dBm
13.560870000 MHz
Ref -30 dBm
Att 0 dB
ndB [T1] 20.00 dB
BW 480.000000000 Hz
Temp 1 [T1 ndB]
-89.88 dBm
13.560630000 MHz
Temp 2 [T1 ndB]
-90.34 dBm
13.561110000 MHz
1 PK
MAXH
-30
-40
-50
-60
-70
-80
-90
-100
-120
-130
T1
T2
Center 13.56088 MHz
500 Hz/
Span 5 kHz

5.4. Frequency Tolerance

§FCC 15.225 (e)

5.4.1. Limit

(e) The frequency tolerance of the carrier signal shall be maintained within ±0.01% of the operating frequency over a temperature variation of −20 degrees to + 50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

5.4.2. Test Procedure

a) Supply the EUT with a nominal ac voltage or install a new or fully charged battery in the EUT. If possible, a dummy load shall be connected to the EUT because an antenna near the metallic walls of an environmental test chamber could affect the output frequency of the EUT. If the EUT is equipped with a permanently attached, adjustable-length antenna, then the EUT shall be placed in the center of the chamber with the antenna adjusted to the shortest length possible. Turn ON the EUT and tune it to one of the number of frequencies shown in 5.6.

b) Couple the unlicensed wireless device output to the measuring instrument by connecting an antenna to the measuring instrument with a suitable length of coaxial cable and placing the measuring antenna near the EUT (e.g., 15 cm away), or by connecting a dummy load to the measuring instrument, through an attenuator if necessary.
NOTE—An instrument that has an adequate level of accuracy as specified by the procuring or regulatory agency is the recommended measuring instrument.

c) Adjust the location of the measurement antenna and the controls on the measurement instrument to obtain a suitable signal level (i.e., a level that will not overload the measurement instrument but is strong enough to allow measurement of the operating or fundamental frequency of the EUT).

d) Turn the EUT OFF and place it inside the environmental temperature chamber. For devices that have oscillator heaters, energize only the heater circuit.

e) Set the temperature control on the chamber to the highest specified in the regulatory requirements for the type of device and allow the oscillator heater and the chamber temperature to stabilize.

f) While maintaining a constant temperature inside the environmental chamber, turn the EUT ON and record the operating frequency at startup, and at 2 minutes, 5 minutes, and 10 minutes after the EUT is energized. Four measurements in total are made.

g) Measure the frequency at each of frequencies specified in 5.6.

h) Switch OFF the EUT but do not switch OFF the oscillator heater.

i) Lower the chamber temperature by not more that 10 °C, and allow the temperature inside the chamber to stabilize.

j) Repeat step f) through step i) down to the lowest specified temperature.

5.4.3. Test Result

F_0 =13.56MHz				
Power Supply(V_{DC})	Temperature (℃)	Measured Frequency(MHz)	FrequencyError (%)	Limit
3.85	-20	13.5599018	-0.00072	±0.01%
	-10	13.5598155	-0.00136	±0.01%
	0	13.5594854	-0.00379	±0.01%
	10	13.5590608	-0.00693	±0.01%
	20	13.5592266	-0.00570	±0.01%
	30	13.5589769	-0.00754	±0.01%
	40	13.5588550	-0.00844	±0.01%
	50	13.5590863	-0.00674	±0.01%
3.27	20	13.5596235	-0.00278	±0.01%
4.40	20	13.5599018	-0.00072	±0.01%

5.5. Antenna Requirement

5.5.1. Standard Applicable

§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.

This EUT uses an external antenna, and maximum antenna gain is 0dBi;

5.5.2. Result

Compliant.

6. LIST OF MEASURING EQUIPMENTS

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
1	MXA Signal Analyzer	Keysight	N9020A	MY52091623	2021/1/4	2022/1/3
2	Power Sensor	Agilent	U2021XA	MY5365004	2021/1/4	2022/1/3
3	Power Meter	Agilent	U2531A	TW53323507	2021/1/4	2022/1/3
4	Wideband Antenna	schwarzbeck	VULB 9163	958	2019/11/16	2022/11/15
5	Horn Antenna	schwarzbeck	9120D-1141	1574	2019/11/16	2022/11/15
6	EMI Test Receiver	R&S	ESCI	100849/003	2021/1/4	2022/1/3
7	Controller	MF	MF7802	N/A	N/A	N/A
8	Amplifier	schwarzbeck	BBV 9743	209	2021/1/4	2022/1/3
9	Amplifier	Tonscend	TSAMP-0518SE	--	2021/1/4	2022/1/3
10	RF Cable(below 1GHz)	HUBER+SUHNER	RG214	N/A	2021/1/4	2022/1/3
11	RF Cable(above 1GHz)	HUBER+SUHNER	RG214	N/A	2021/1/4	2022/1/3
12	EMI Test Software	ROHDE & SCHWARZ	ESK1	V1.71	N/A	N/A
13	RE test software	Tonscend	JS32-RE	V2.0.2.0	N/A	N/A
14	Test Software	Tonscend	JS1120-2	V2.5.77.0418	N/A	N/A
15	Climate Chamber	KRUOMR	KRM-1000	KRM16072901	2021/1/4	2022/1/3

7. TEST SETUP Photographs of EUT

Please refer to separated files for Test Setup Photos of the EUT.

8. Exterior Photographs of the EUT

Please refer to separated files for External Photos of the EUT.

9. INTERIOR Photographs of the EUT

Please refer to separated files for Internal Photos of the EUT.

----------THE END OF REPORT----------