



Certificate #4312.01

FCC & ISED TEST REPORT

Product Name: SIP/Multicast Intercom Speaker
Trade Mark: GRANDSTREAM
Model No. / HVIN: GSC3506 V2
Report Number: 2401118882EMC-1
Test Standards: FCC 47 CFR Part 15 Subpart B
ICES-003 Issue 7
FCC ID: YZZGSC3506V2
Test Result: PASS
Date of Issue: February 4, 2024

Prepared for:

Grandstream Networks, Inc.
126 Brookline Ave., 3rd Floor Boston, MA 02215, USA

Prepared by:

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Version

Version No.	Date	Description
V1.0	February 4, 2024	Original



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1. GENERAL INFORMATION

1.1 CLIENT INFORMATION

Applicant:	Grandstream Networks, Inc.
Address of Applicant:	126 Brookline Ave., 3rd Floor Boston, MA 02215, USA
Manufacturer:	Grandstream Networks, Inc.
Address of Manufacturer:	126 Brookline Ave., 3rd Floor Boston, MA 02215, USA

1.2 EUT INFORMATION

1.2.1 General Description of EUT

Product Name:	SIP/Multicast Intercom Speaker
Model No. / HVIN:	GSC3506 V2
Trade Mark:	GRANDSTREAM
DUT Stage:	Production Unit
Rated Voltage:	DC 24V 3.5A or DC 44-57V , 1.5A by PoE
Classification of digital devices:	Class B
Highest Internal Frequency:	1.3 GHz
Software Version:	not provided
Hardware Version:	not provided
Sample Received Date:	January 11, 2024
Sample Tested Date:	January 17, 2024 to January 29, 2024

1.2.2 Description of Accessories

None.

1.3 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested with associated equipment below.

1) Support Equipment

Description	Manufacturer	Model No.	Serial Number	Supplied by
Standard POE Power supply	Social	TL-POE160SN/A	N/A	UnionTrust
IP Phone	GRANDSTREAM	GRP2615	N/A	UnionTrust

2) Support Cable

Cable No.	Description	Connector	Length (m)	Supplied by
1	Ethernet Cable	RJ45	1.5 Unshielded without ferrite	UnionTrust
2	Ethernet Cable	RJ45	2.0 Unshielded without ferrite	UnionTrust

1.4 TEST LOCATION

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: Unit D/E of 9/F and 16/F, Block A, Building 6, Baoneng science and technology park, Longhua district, Shenzhen, China

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1.5 TEST FACILITY

The test facility is recognized, certified, or accredited by the following organizations:

CNAS-Lab Code: L9069

The measuring equipment utilized to perform the tests documented in this report has been calibrated once a year or in accordance with the manufacturer's recommendations, and is traceable under the ISO/IEC 17025 to international or national standards. Equipment has been calibrated by accredited calibration laboratories.

A2LA-Lab Certificate No.: 4312.01

Shenzhen UnionTrust Quality and Technology Co., Ltd. has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

ISED Wireless Device Testing Laboratories

CAB identifier: CN0032

FCC Accredited Lab.

Designation Number: CN1194

Test Firm Registration Number: 259480

1.6 DEVIATION FROM STANDARDS

None.

1.7 ABNORMALITIES FROM STANDARD CONDITIONS

None.

1.8 OTHER INFORMATION REQUESTED BY THE CUSTOMER

None.

1.9 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

No.	Item	Measurement Uncertainty
1	Conducted emission 9KHz-150KHz	±3.2 dB
2	Conducted emission 150KHz-30MHz	±2.7 dB
3	Radiated emission 9KHz-30MHz	± 4.7 dB
4	Radiated emission 30MHz-1GHz	± 4.6 dB
5	Radiated emission 1GHz-18GHz	± 4.4 dB
6	Radiated emission 18GHz-26GHz	± 4.6 dB
7	Radiated emission 26GHz-40GHz	± 4.6 dB

2. TEST SUMMARY

FCC 47 CFR Part 15 Subpart B Test Cases			
Test Item	Test Requirement	Test Method	Result
Conducted Emission	FCC 47 CFR Part 15.107 ICES-003 Issue 7 Section 3.2.1	ANSI C63.4-2014	PASS
Radiated Emission	FCC 47 CFR Part 15.109 ICES-003 Issue 7 Section 3.2.2	ANSI C63.4-2014	PASS



3. EQUIPMENT LIST

Radiated Emission Test - 3M Chamber						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date	Cal. Due date
☒	3m Chamber & Accessory Equipment	ETS-Lindgren	3m	Euroshiedpn-CT001270-1317	11-Nov-2023	10-Nov-2026
☒	Broadband Antenna	ETS-Lindgren	3142E	00201566	30-Oct-2023	29-Oct-2024
☒	Pre-amplifier	ETS-Lindgren	118490	00204683	29-Dec-2023	28-Dec-2024
☒	Double-Ridged Waveguide Horn Antenna	ETS-Lindgren	3117	00164202	30-Oct-2023	29-Oct-2024
☒	Pre-amplifier	ETS-Lindgren	118385	00201874	31-Oct-2023	30-Oct-2024
☒	Double-Ridged Waveguide Horn Antenna	ETS-Lindgren	3116C	00200180	16-Apr-2023	15-Apr-2025
☒	Double-Ridged Waveguide Horn Antenna (Pre-amplifier)	ETS-Lindgren	3116C-PA	00202652	30-Oct-2023	29-Oct-2024
☒	Receiver	ROHDE & SCHWARZ	ESIB26	100114	27-Oct-2023	26-Oct-2024
☒	Pre-amplifier	HP	8447F	2805A02960	31-Oct-2023	30-Oct-2024
☒	Multi device Controller	ETS-Lindgren	7006-001	00160105	N/A	N/A
☒	Test Software	Audix	e3	Software Version: 9.160323		

Conducted Emission Test						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date	Cal. Due date
☒	LISN	R&S	ESH2-Z5	860014/024	27-Oct-2023	26-Oct-2024
☒	LISN	ETS-Lindgren	3816/2SH	00201088	27-Oct-2023	26-Oct-2024
☒	Receiver	R&S	ESR7	101181	27-Oct-2023	26-Oct-2024
☒	Shielding room	ETS-Lindgren	843	Euroshiedpn-CT001270-1246	5-Nov-2021	4-Nov-2024
☒	Test Software	EZ-EMC	EZ-CON	Software Version: EMC-CON 3A1.1		

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4. TEST CONFIGURATION

4.1 ENVIRONMENTAL CONDITIONS FOR TESTING

4.1.1 Normal or Extreme Test Conditions

Environment Parameter	Selected Values During Tests		
Test Condition	Ambient		
	Temperature (°C)	Voltage (V)	Relative Humidity (%)
NT/NV	+15 to +35	DC 24V 3.5A or DC 44-57V , 1.5A by PoE	20 to 75
Remark: 1) NV: Normal Voltage; NT: Normal Temperature			

4.1.2 Record of Normal Environment and Test Sample

Test Item	Temperature (°C)	Relative Humidity (%)	Pressure (Kpa)	Sample No.	Tested by
Conducted Emission	23.6	43.7	100.4	S202401112603-ZJA01/2	Linson Xie
Radiated Emission	22.6	53.9	100.6		Yana Zeng

4.2 TEST MODES

Test Item	EMI Test Modes
Radiated Emission	Test Mode 1: Talking Test Mode 2: Playing Audio Test Mode 3: Alarming(switch input) Test Mode 4: Alarming(level input)
Conducted Emission	Test Mode 1: Talking Test Mode 2: Playing Audio Test Mode 3: Alarming(switch input) Test Mode 4: Alarming(level input)
Remark: The above test modes in boldface were the worst cases	

4.3 TEST SETUP

4.3.1 For Radiated Emissions test setup

Figure 1. 30MHz to 1GHz

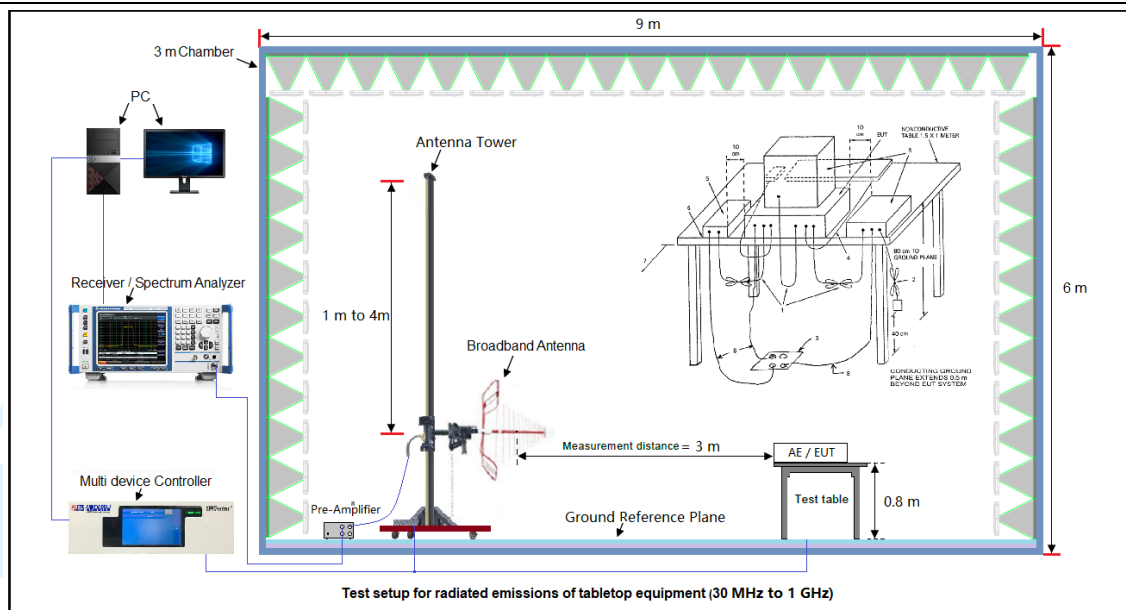
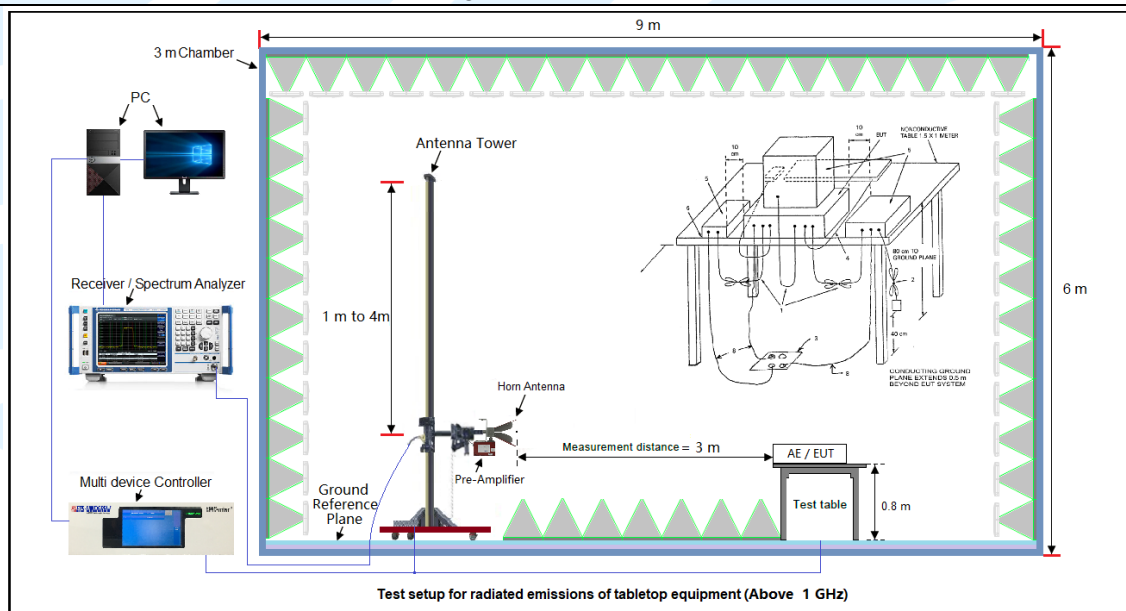
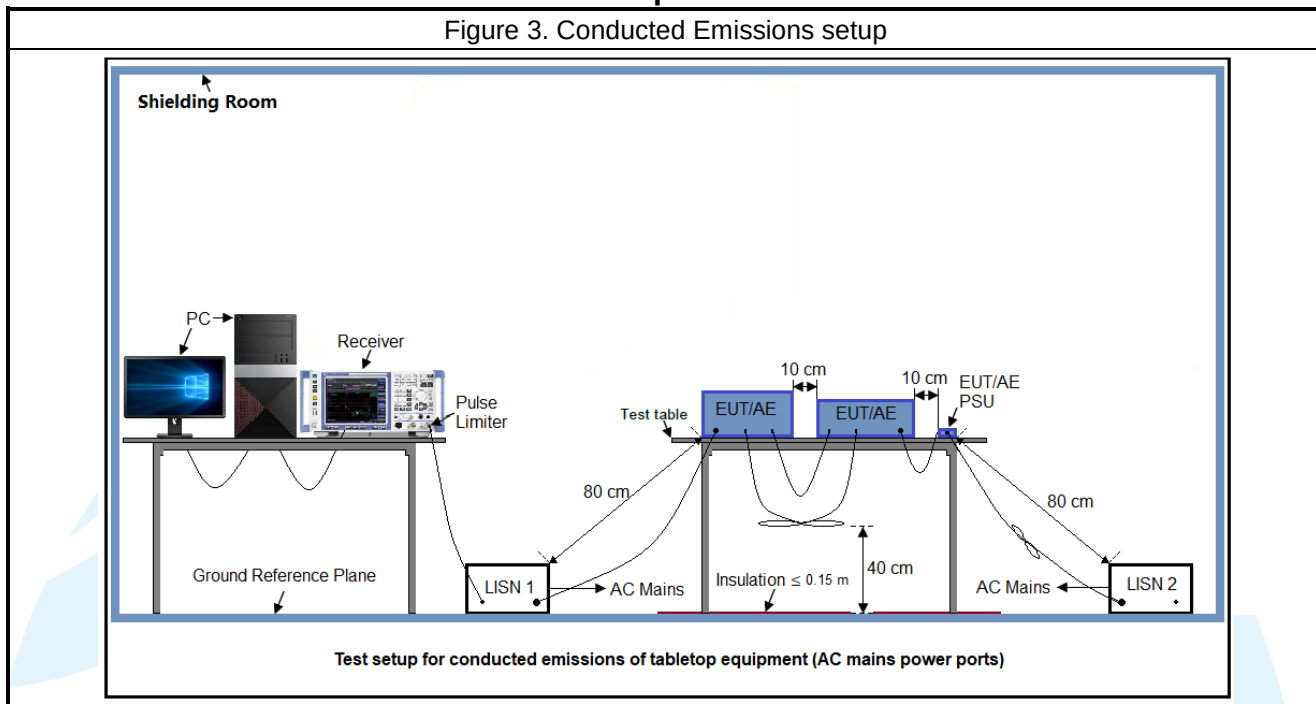


Figure 2. Above 1GHz



4.3.2 For Conducted Emissions test setup

Figure 3. Conducted Emissions setup



4.4 SYSTEM TEST CONFIGURATION

All readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance. Analyzer resolution is 100 kHz or greater for frequencies below 1000MHz. The resolution is 1 MHz or greater for frequencies above 1000MHz. The spurious emissions more than 20 dB below the permissible value are not reported.

Radiated emission measurement were performed from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic (according to KDB 896810 D02 SDoC FAQ v01r01) of the highest fundamental frequency or to 40 GHz, whichever is lower.

5. REFERENCE DOCUMENTS FOR TESTING

No.	Identity	Document Title
1	FCC 47 CFR Part15 Subpart B	Unintentional Radiators
2	ICES-003 Issue 7	Information Technology Equipment (Including Digital Apparatus)
3	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
4	KDB 174176 D01 Line Conducted FAQ v01r01	AC power-line conducted emission frequency asked questions
5	KDB 896810 D02 SDoC FAQ v01r02	Supplier's Declaration of Conformity frequency asked questions

6. EMC REQUIREMENTS SPECIFICATION

6.1 RADIATED EMISSION

Test Requirement: FCC 47 CFR Part 15.109
ICES-003 Issue 7 Clause 3.2.2

Test Method: ANSI C63.4-2014

Receiver Setup:

Frequency: (f) (MHz)	Detector type	Measurement receiver bandwidth	
		RBW	VBW
$30 \leq f \leq 1\,000$	Quasi Peak	120 kHz	300 kHz
$f \geq 1000$	Peak	1 MHz	3 MHz
	Average	1 MHz	3 MHz

Measured frequency range

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30.
1.705-108	1000.
108-500	2000.
500-1000	5000.
Above 1000	5th harmonic of the highest frequency or 40 GHz, whichever is lower.

Limits:

Limits for Class B devices

FCC 47 CFR Part 15 Subpart B

Frequency (MHz)	limits at 3m (dBμV/m)		
	QP Detector	PK Detector	AV Detector
30 – 88	40.0	--	--
88 – 216	43.5	--	--
216 – 960	46.0		
960 – 1000	54.0	--	--
Above 1000	--	74.0	54.0

ICES-003 Issue 7

Frequency (MHz)	limits at 3m (dBμV/m)		
	QP Detector	PK Detector	AV Detector
30 – 88	40.0	--	--
88 – 216	43.5	--	--
216 – 230	46.0		

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230 – 960	47.0	--	--
960 – 1000	54.0	--	--
Above 1000	--	74.0	54.0

Remark:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dB μ V/m) = 20 log Emission level (μ V/m).
3. For frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any condition of modulation.

Test Setup: Refer to section 4.3.1 for details.

Test Procedures:

1. From 30 MHz to 1GHz test procedure as below:
 - 1) The Product was placed on the non-conductive turntable 0.8 m above the ground at a chamber.
 - 2) Set the spectrum analyzer/receiver in Peak detector, Max Hold mode, and 120 kHz RBW. Record the maximum field strength of all the pre-scan process in the full band when the antenna is varied between 1~4 m in both horizontal and vertical, and the turntable is rotated from 0 to 360 degrees.
 - 3) For each frequency whose maximum record was higher or close to limit, measure its QP value: vary the antenna's height and rotate the turntable from 0 to 360 degrees to find the height and degree where Product radiated the maximum emission, then set the test frequency analyzer/receiver to QP Detector and specified bandwidth with Maximum Hold Mode, and record the maximum value.
2. Above 1GHz test procedure as below:
 - 1) The Product was placed on the non-conductive turntable 0.8 m above the ground at a chamber.
 - 2) Set the spectrum analyzer/receiver in Peak detector, Max Hold mode, and 1MHz RBW. Record the maximum field strength of all the pre-scan process in the full band when the antenna is varied in both horizontal and vertical, and the turntable is rotated from 0 to 360 degrees.
 - 3) For each frequency whose maximum record was higher or close to limit, measure its AV value: rotate the turntable from 0 to 360 degrees to find the degree where Product radiated the maximum emission, then set the test frequency analyzer/receiver to AV value and specified bandwidth with Maximum Hold Mode, and record the maximum value.

Equipment Used: Refer to section 3 for details.

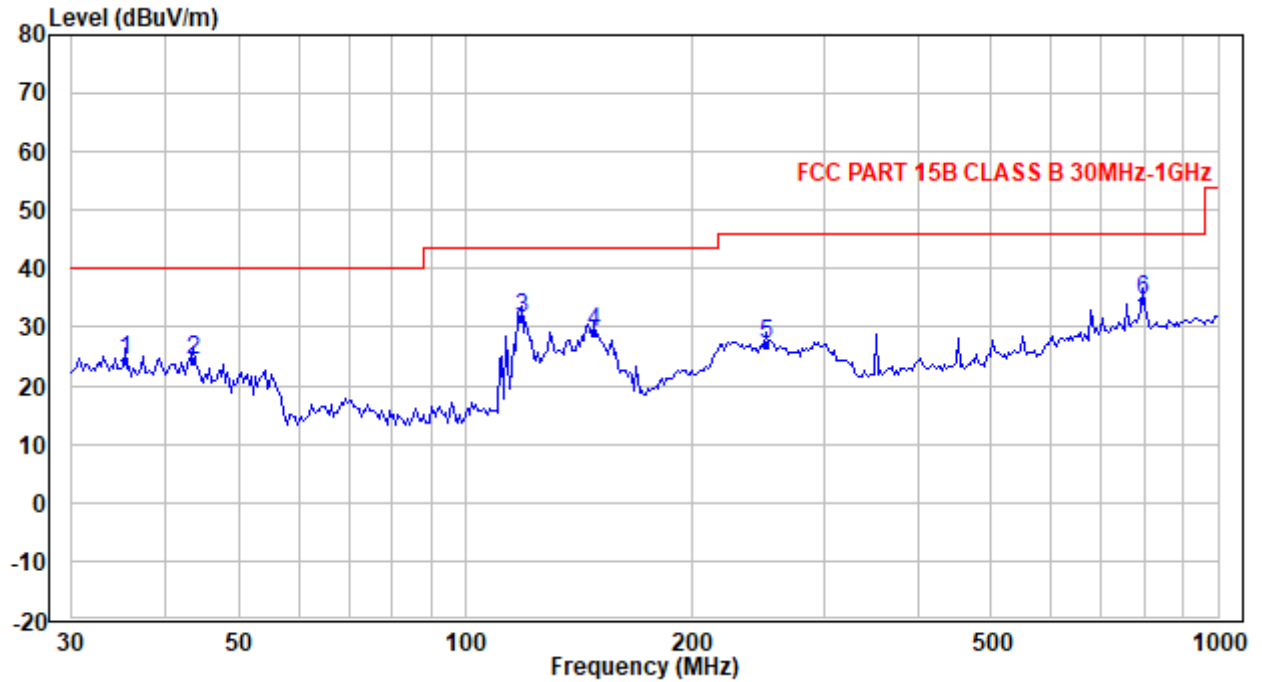
Test Result: Pass

The measurement data as follows:

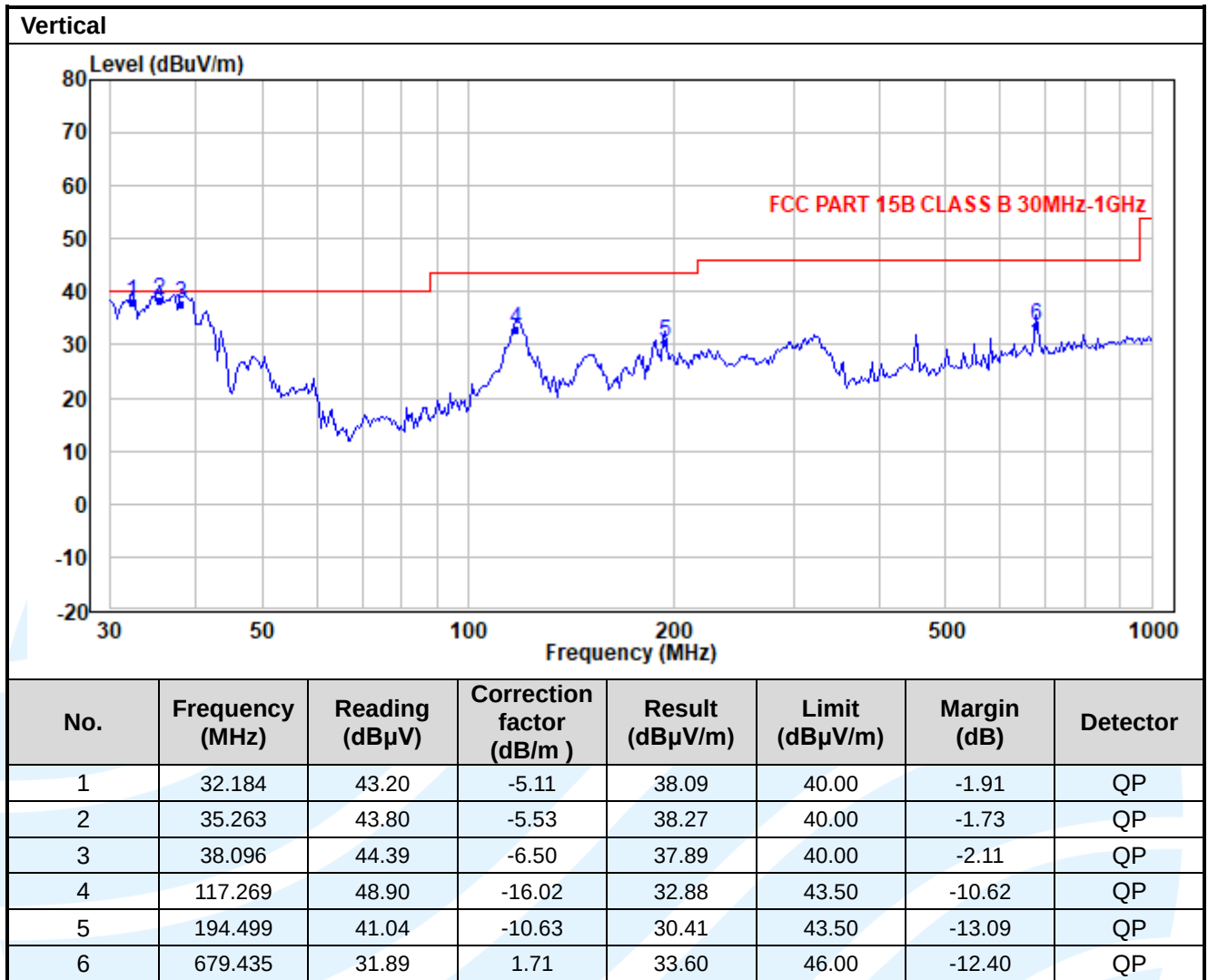
The measurement data for FCC 47 CFR Part 15 Subpart B as follows:

Below 1GHz (Quasi Peak):

Test Mode3

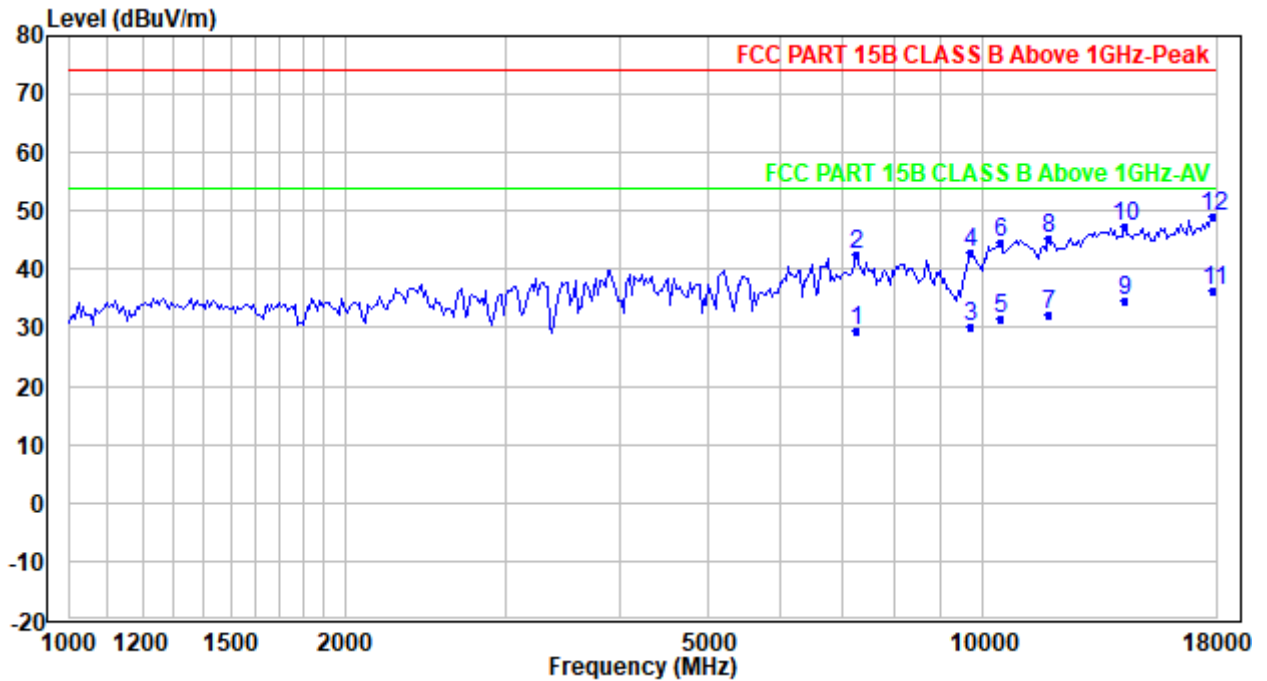


No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
1	35.263	29.76	-5.53	24.23	40.00	-15.77	QP
2	43.538	34.33	-10.09	24.24	40.00	-15.76	QP
3	118.929	46.96	-15.46	31.50	43.50	-12.00	QP
4	147.875	43.86	-14.87	28.99	43.50	-14.51	QP
5	250.486	35.73	-8.69	27.04	46.00	-18.96	QP
6	793.028	31.36	3.41	34.77	46.00	-11.23	QP



Above 1GHz (Peak & Average)

Test Mode 3



No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
1	7249.817	27.32	2.29	29.61	54.00	-24.39	Average
2	7249.817	40.32	2.29	42.61	74.00	-31.39	Peak
3	9685.139	23.72	6.29	30.01	54.00	-23.99	Average
4	9685.139	36.72	6.29	43.01	74.00	-30.99	Peak
5	10442.590	24.32	7.23	31.55	54.00	-22.45	Average
6	10442.590	37.32	7.23	44.55	74.00	-29.45	Peak
7	11793.300	24.04	8.14	32.18	54.00	-21.82	Average
8	11793.300	37.04	8.14	45.18	74.00	-28.82	Peak
9	14277.410	21.70	12.79	34.49	54.00	-19.51	Average
10	14277.410	34.70	12.79	47.49	74.00	-26.51	Peak
11	17896.040	20.22	15.99	36.21	54.00	-17.79	Average
12	17896.040	33.22	15.99	49.21	74.00	-24.79	Peak

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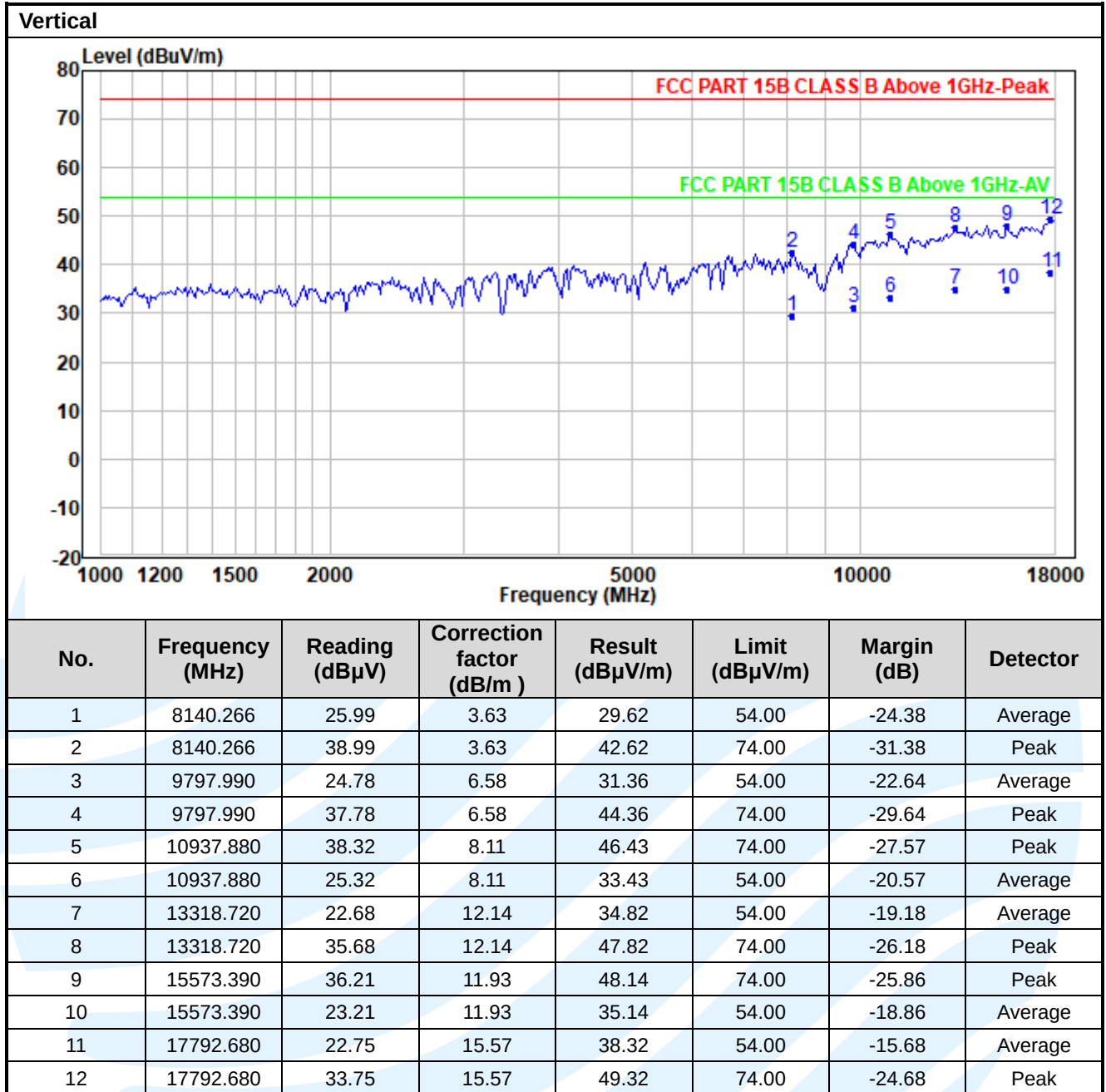
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Remark:

1. Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain, the value was added to Original Receiver Reading by the software automatically.
2. Result = Reading + Correct Factor.
3. Margin = Result – Limit
4. All possible modes of operation were investigated, and testing at two nominal voltages of 240V~50Hz and 120V~60Hz, only the worst-case emissions reported.
5. For Radiated Emission above 18GHz, there was not any unwanted emission detected.
6. As shown in this section, for frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. So, only the peak measurements were shown in the report.

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6.2 CONDUCTED EMISSION

Test Requirement: FCC 47 CFR Part 15.107
ICES-003 Issue 7 Section 3.2.1

Test Method: ANSI C63.4-2014

Limits:

Limits for Class B devices

Frequency range (MHz)	Limits (dB(μV))	
	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

Remark:

1. The lower limit shall apply at the transition frequencies.
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 to 0.50 MHz.

Test Setup: Refer to section 4.3.2 for details.

Test Procedures:

- 1) The Product was placed on a nonconductive table 0.8 m above the horizontal ground reference plane, and 0.4 m from the vertical ground reference plane, and connected to the main through Line Impedance Stability Network (L.I.S.N).
- 2) The RBW of the receiver was set at 9 kHz in 150 kHz ~ 30MHz with Peak and AVG detector in Max Hold mode. Run the receiver's pre-scan to record the maximum disturbance generated from Product in all power lines in the full band.
- 3) For each frequency whose maximum record was higher or close to limit, measure its QP and AVG values and record.

Equipment Used: Refer to section 3 for details.

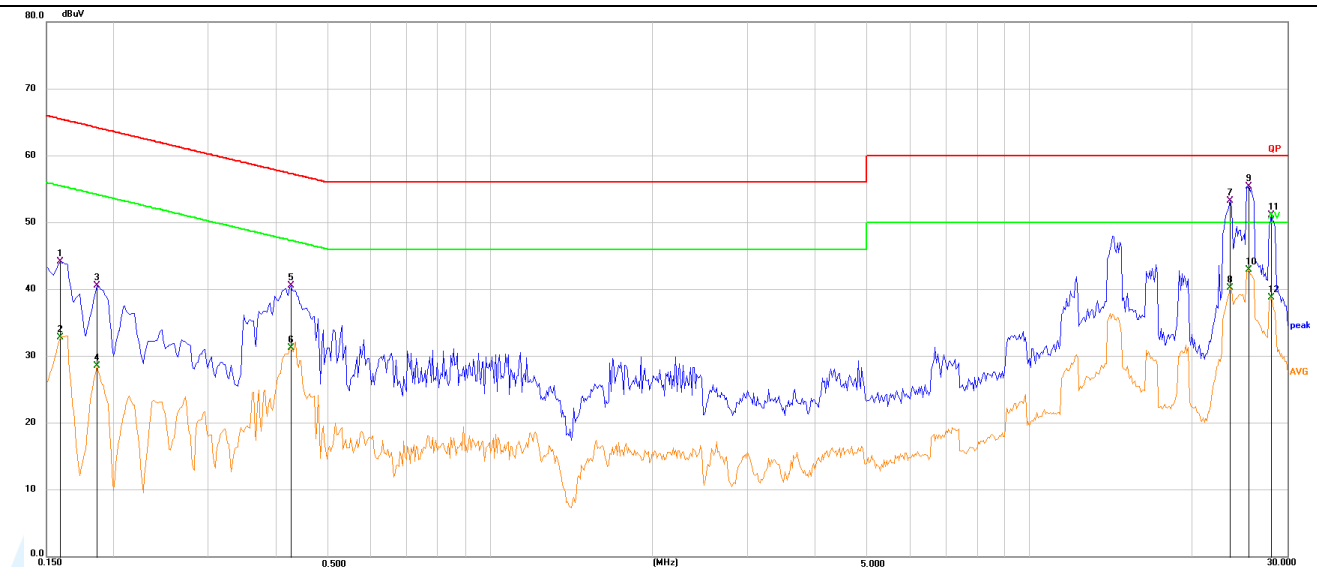
Test Result: Pass

The measurement data as follows:

Quasi Peak and Average:

Test Mode4

Live Line



No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB)	Result (dBμV)	Limit (dBμV)	Margin (dB)	Detector
1	0.1590	34.00	10.20	44.20	65.52	-21.32	QP
2	0.1590	22.65	10.20	32.85	55.52	-22.67	Average
3	0.1860	30.43	10.17	40.60	64.21	-23.61	QP
4	0.1860	18.33	10.17	28.50	54.21	-25.71	Average
5	0.4244	30.46	10.14	40.60	57.36	-16.76	QP
6	0.4244	21.16	10.14	31.30	47.36	-16.06	Average
7	23.5950	42.43	10.82	53.25	60.00	-6.75	QP
8	23.5950	29.45	10.82	40.27	50.00	-9.73	Average
9	25.5120	44.56	10.84	55.40	60.00	-4.60	QP
10	25.5120	32.12	10.84	42.96	50.00	-7.04	Average
11	28.1490	40.26	10.89	51.15	60.00	-8.85	QP
12	28.1490	27.88	10.89	38.77	50.00	-11.23	Average

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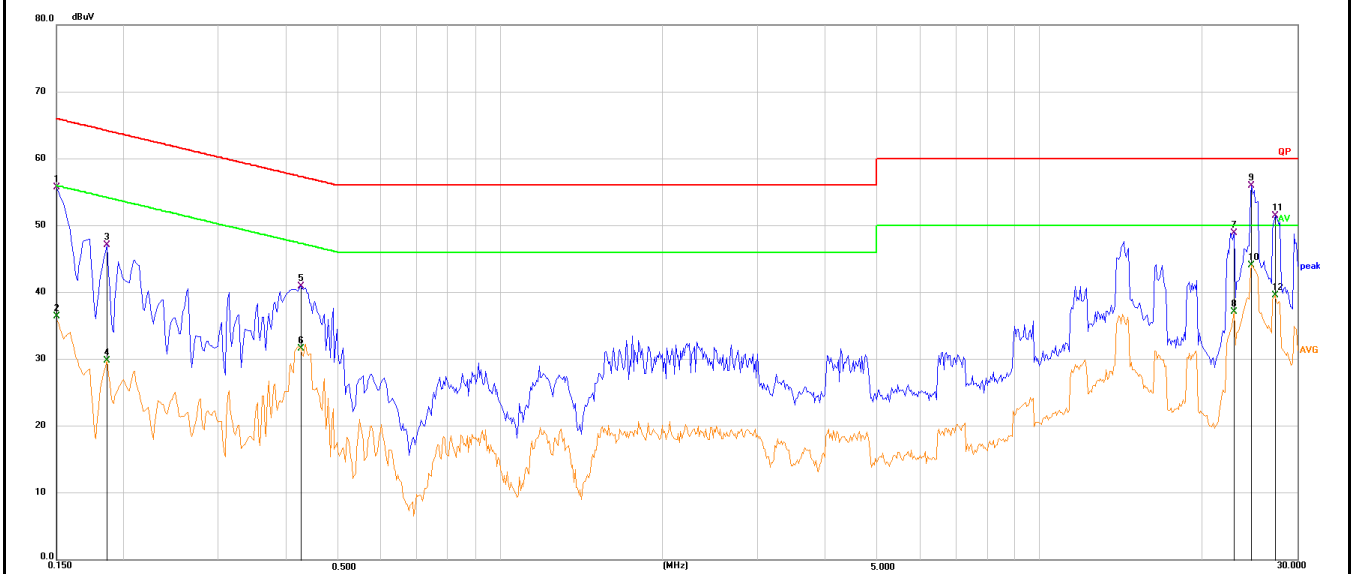
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Neutral Line



No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB)	Result (dBμV)	Limit (dBμV)	Margin (dB)	Detector
1	0.1500	45.56	10.19	55.75	66.00	-10.25	QP
2	0.1500	26.18	10.19	36.37	56.00	-19.63	Average
3	0.1860	37.03	10.08	47.11	64.21	-17.10	QP
4	0.1860	19.69	10.08	29.77	54.21	-24.44	Average
5	0.4243	30.73	10.21	40.94	57.36	-16.42	QP
6	0.4243	21.40	10.21	31.61	47.36	-15.75	Average
7	22.9830	38.15	10.77	48.92	60.00	-11.08	QP
8	22.9830	26.31	10.77	37.08	50.00	-12.92	Average
9	24.7605	45.11	10.79	55.90	60.00	-4.10	QP
10	24.7605	33.22	10.79	44.01	50.00	-5.99	Average
11	27.2713	40.59	10.84	51.43	60.00	-8.57	QP
12	27.2713	28.74	10.84	39.58	50.00	-10.42	Average

Remark:

1. Correct Factor = LISN Factor + Cable Loss + Pulse Limiter Factor, the value was added to Original Receiver Reading by the software automatically.
2. Result = Reading + Correct Factor.
3. Margin = Result - Limit
4. An initial pre-scan was performed on the Phase and neutral lines with peak detector. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.
5. All possible modes of operation were investigated, and testing at two nominal voltages of 240V~50Hz and 120V~60Hz, only the worst case emissions reported.

APPENDIX 1 PHOTOS OF TEST SETUP



Radiated emission Test Setup-2 (Above 1 GHz)



Conducted Emission Test Setup-3

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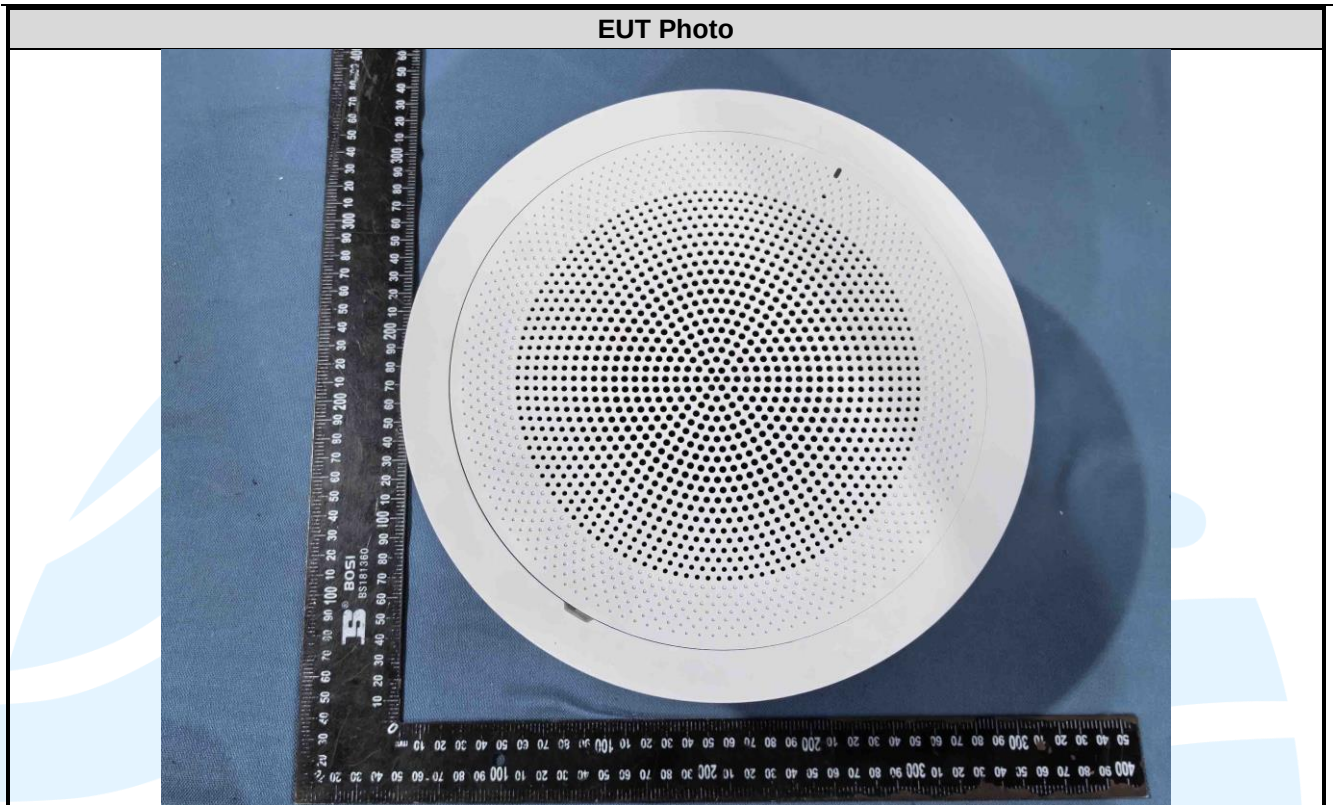
E-mail: info@uttlab.com

<http://www.uttlab.com>

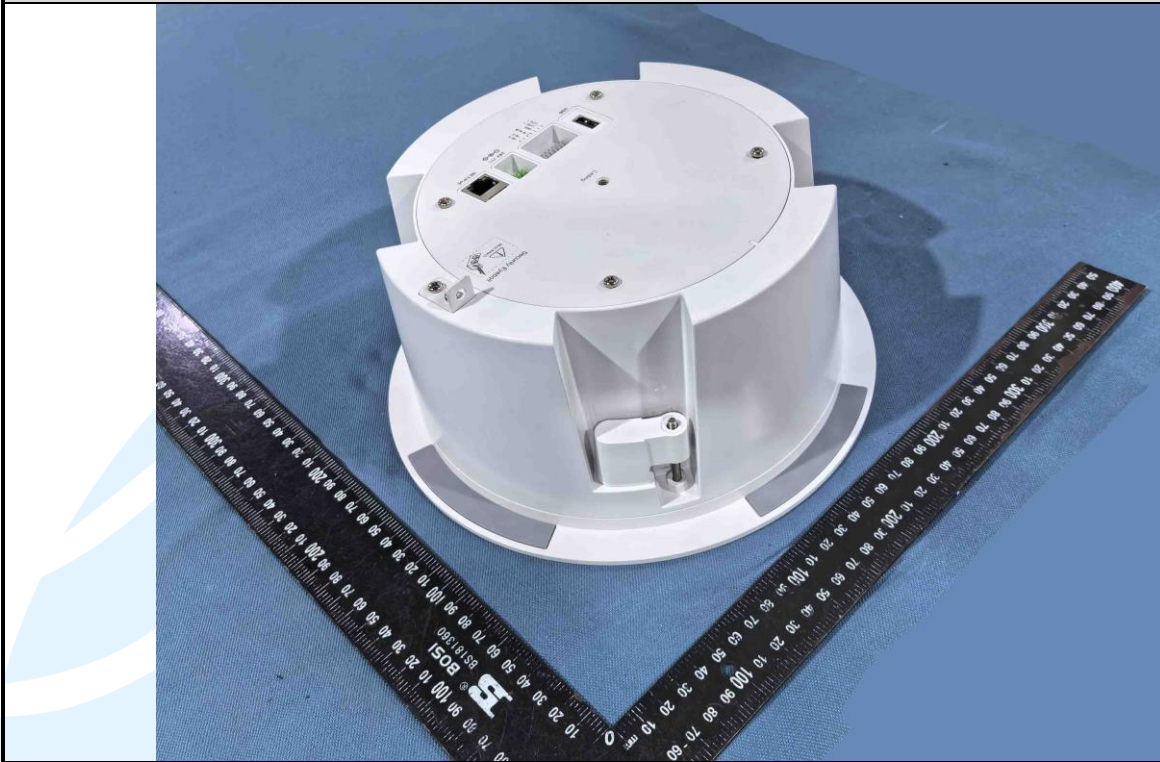
UTTR-EMC-ICES003-V1.2

APPENDIX 2 PHOTOS OF EUT CONSTRUCTIONAL DETAILS

EUT EXTERNAL PHOTOS



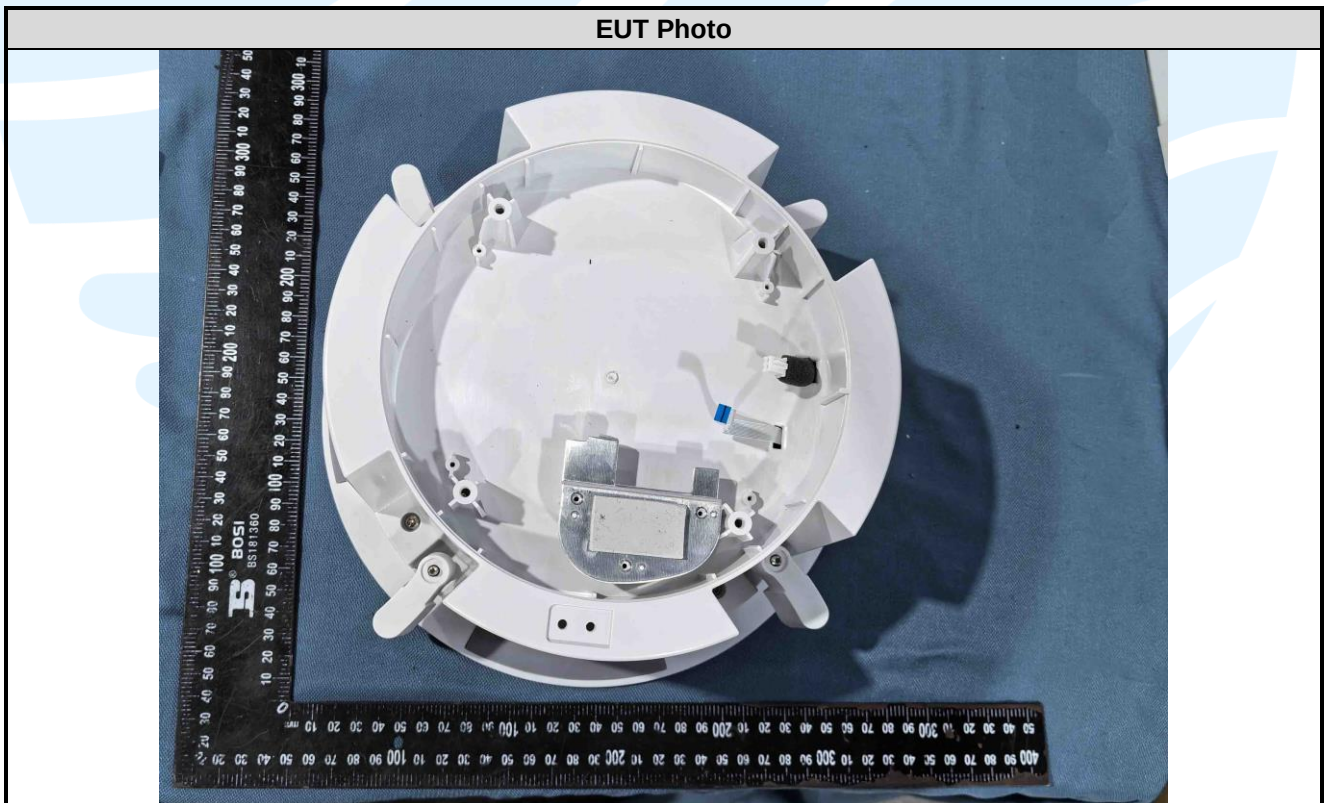
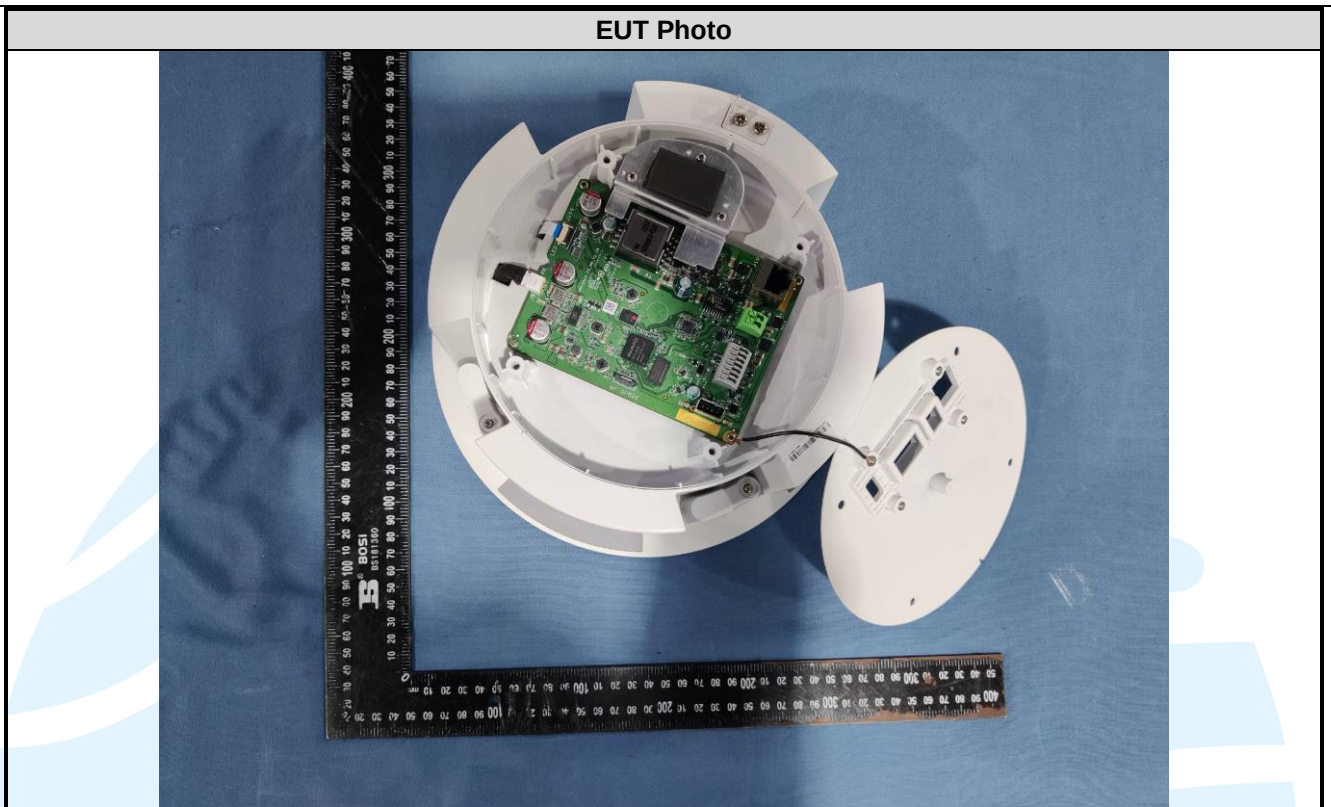
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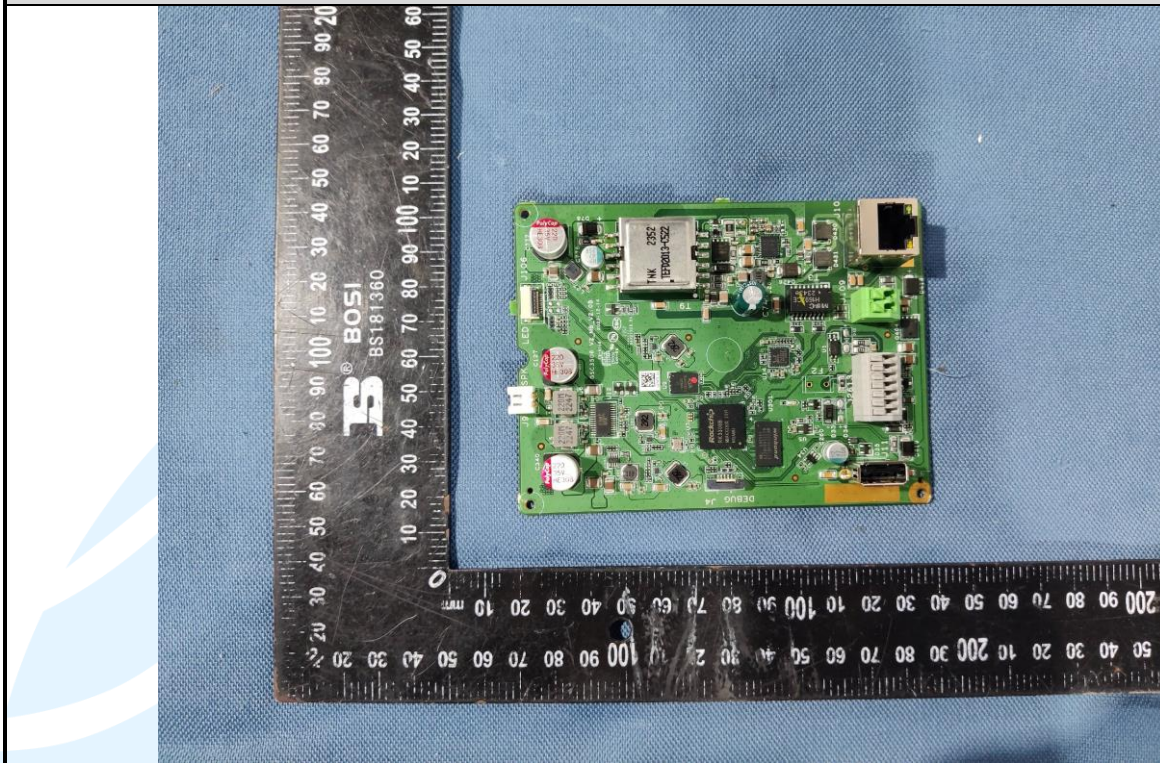
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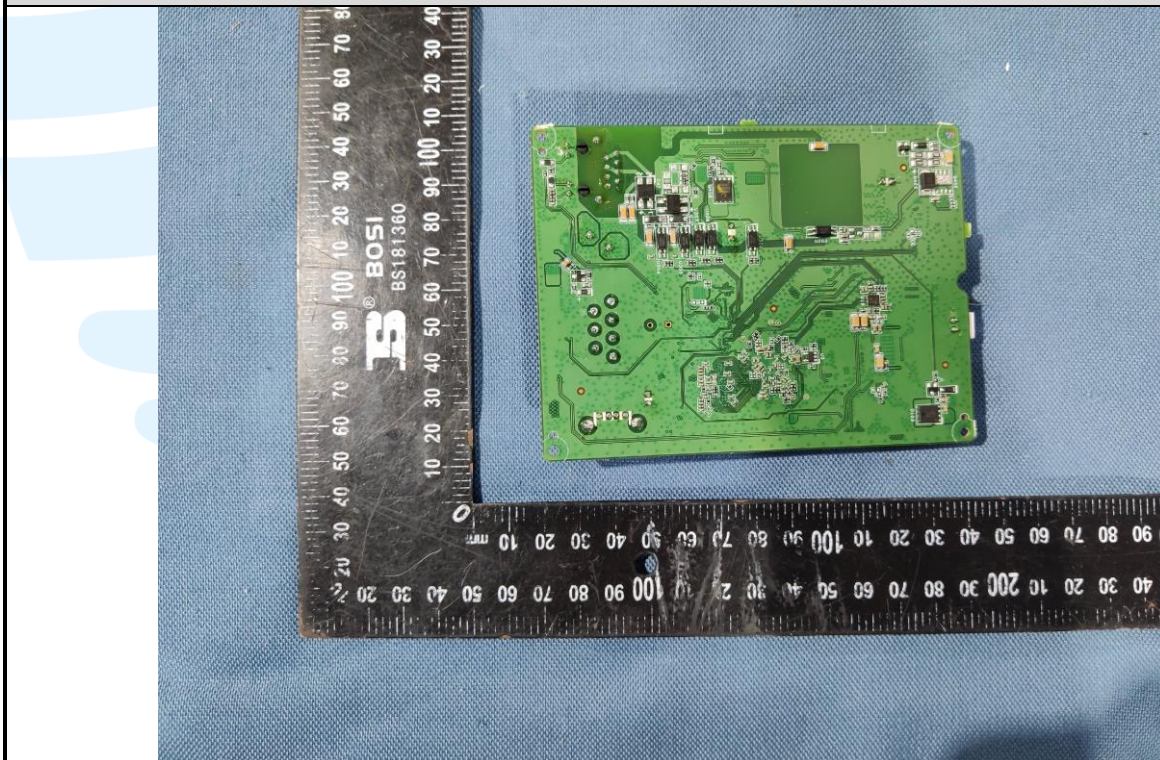
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EUT Photo



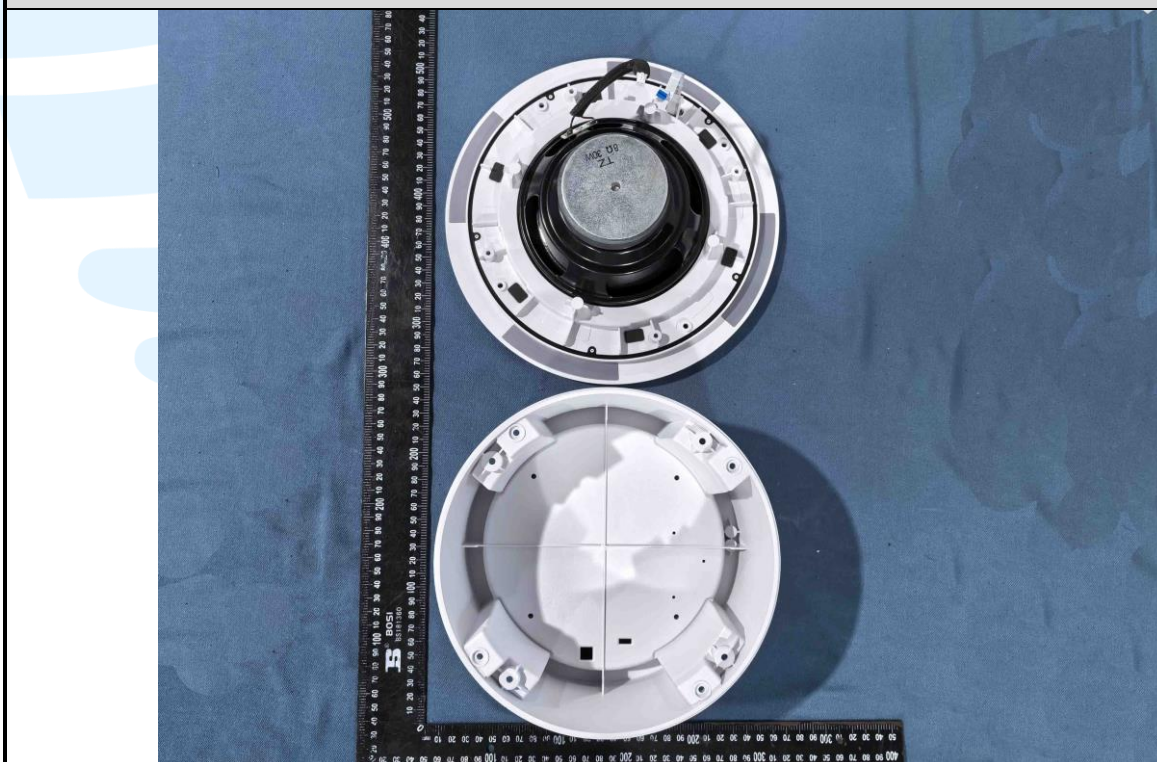
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EUT Photo



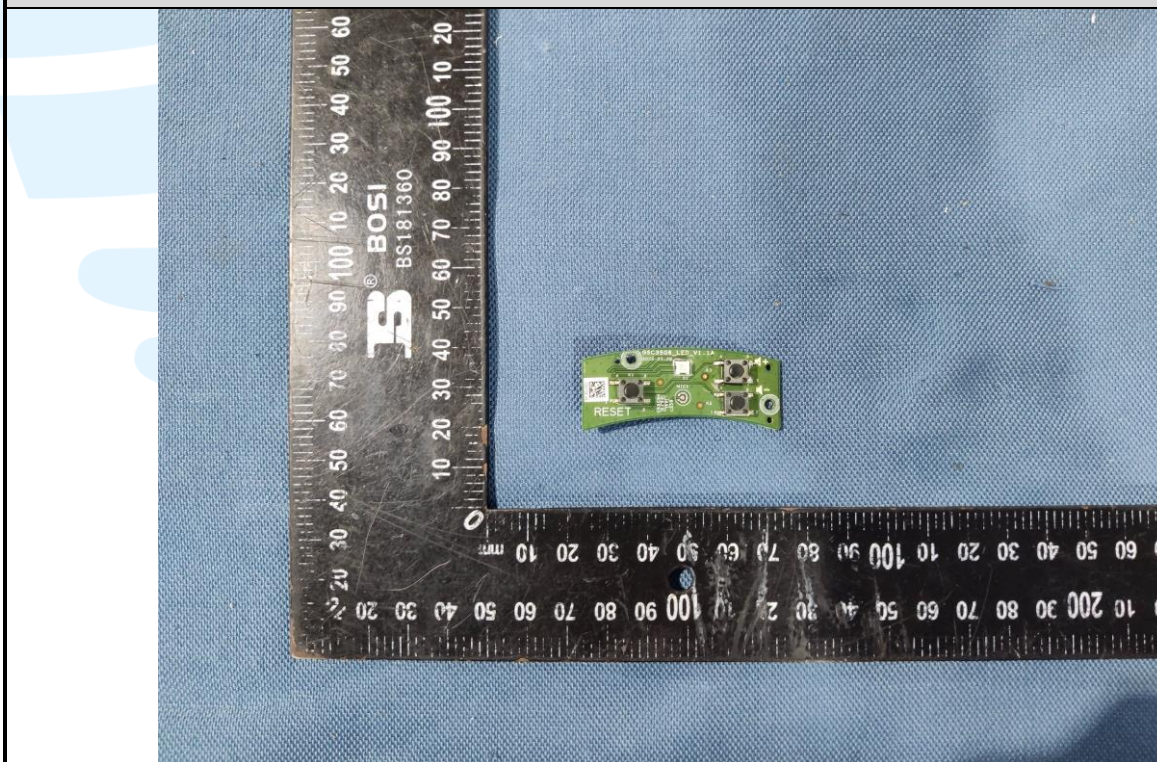
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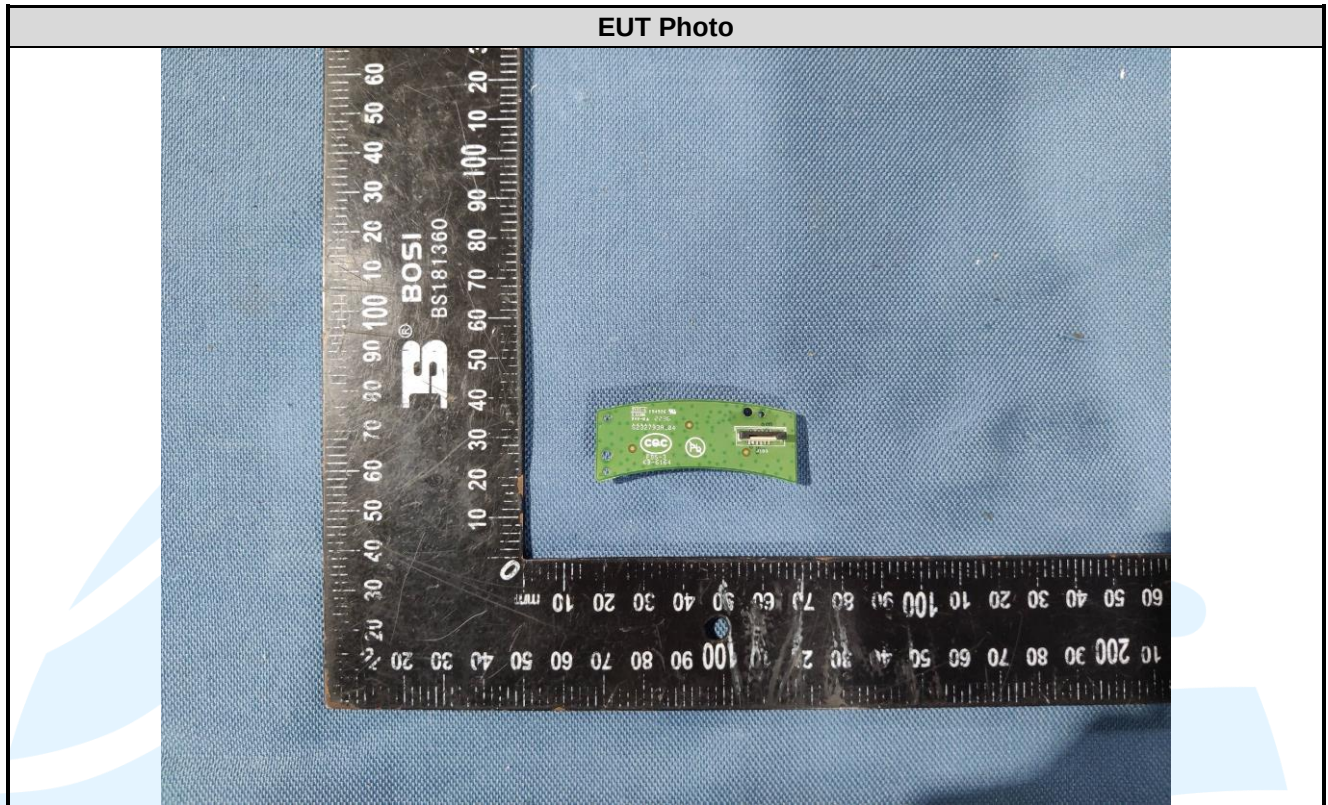


EUT Photo



EUT Photo





***** End of Report *****

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