Testing Laboratory
1163

FCC COMPLIANCE TEST REPORT

Technical Statement of Conformity

in accordance with 47 CFR Part 15 Subpart C

The product

Equipment Under Test	:	Tiris Proximity Tag CID/Data Read/Write Controller With SECS I/II Protocol
Model Number	:	HR4136-B1
Product Series	:	N/A
Report Number	:	HA225056-RA
Issue Date	:	18-May-2022
Test Result	:	Compliance

is produced by

HEART Tech Enterprise Co., Ltd.

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VCCI Registration No.: R-12156, C-12329, T-10219, G-10696

FCC Designation No.: TW1071, TW1163

TAF Accreditation No.: 1163

IC assigned Code: 11226A-2

ISED CAB identifier: TW1163

Caution :

The results in this report apply to the test sample(s) mentioned above at the time of the testing period only and are not to be used to indicate applicability to other similar products. This report does not imply that the production product(s) has met the criteria for certification. The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any government agencies.

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Release control Record

Report Version	**Description**	**Issued Date**
V00	Original release.	18-May-2022

Test Result Certification

Applicant	:	HEART Tech Enterprise Co., Ltd.
Address of Applicant	:	3F, No.501-17, Chung-Cheng Rd., Hsin-Tien District, New Taipei City, 23148, Taiwan
Manufacturer	:	HEART Tech Enterprise Co., Ltd.
Address of Manufacturer	:	3F, No.501-17, Chung-Cheng Rd., Hsin-Tien District, New Taipei City, 23148, Taiwan
Trade Name	:	N/A
Equipment Under Test	:	Tiris Proximity Tag CID/Data Read/Write Controller With SECS I/II Protocol
Model Number	:	HR4136-B1
Product Series	:	N/A
FCC ID	:	2AB67-HR4136-B1
Filing Type	:	Certification
Sample Received Date	:	15-April-2022
Test Standard	:	

☒ FCC Part 15 Subpart C §15.209

Deviations from standard test methods & any other specifications : NONE

Remark:

1. This report details the results of the test carried out on one sample.
2. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10 (2013) and the energy emitted by the sample EUT tested as described in this report is in compliance with the requirements of FCC Rules Part 15.203, 15.209.
3. This report applies to the above sample only and shall not be reproduced in part without written approval of HongAn Technology Co., Ltd.
4. Test Location: HongAn Technology Co., Ltd., No.15-1 Cweishuh Keng, Cweipin Village, Linkou Dist., New Taipei City, Taiwan, R.O.C. & 2F, NO.146, JIAN YI RD., CHUNG-HO DIST, NEW TAIPEI CITY, TAIWAN, R. O. C.; FCC Designation No.: TW1071, TW1163.

Tested by: Tony Huang **Date:** 2022-05-17

Tony Huang/ ENG. Dept. Staff

Approved by: Eason Hsieh **Date:** 2022-05-18

Eason Hsieh/ Authorized Report Reviewer

Summary of Test Result

	Test Item	Applicable Standard	Test Result
1	Antenna Requirement	FCC part 15 subpart C §203	Compliance
2	Conducted limits	FCC part 15 subpart C §207	Compliance
3	Radiated emission limits	FCC part 15 subpart C §209	Compliance
4	Emission Bandwidth	N/A	N/A

1 General Description

1.1 Description of EUT

Equipment Under Test	**:**	Tiris Proximity Tag CID/Data Read/Write Controller With SECS I/II Protocol
Model Number of EUT	**:**	HR4136-B1
Product Series	**:**	N/A
Power Supply	**:**	DC24V supply from power terminal
Frequency Range	**:**	134.2 kHz
Number of Channels	**:**	1
Antenna Specification	**:**	1. Coil Antenna with Rectangular housing 2. Coil Antenna with Stick housing
Modulation Technique	**:**	FSK
Specification	**:**	**Dimensions :** 120 mm (L) X 103 mm (W) X 30 mm (H) **Weight :** 450g **Function**：The EUT is a Tiris Proximity Tag CID/Data Read/Write Controller With SECS I/II Protocol. Its transmitting frequencies are 134.2 kHz. **※For more detail specification, please refer to the User Manual.**

1.2 Test Instruments

1.2.1. Instruments Used for Measurement

HA2

Instrument Name	Manufacture	Model Number	Serial Number	Last Cal. Date	Next Cal. Date
EMI Test Receiver	R&S	ESCI7	100931	04-Aug-2021	03-Aug-2022
Spectrum Analyzer	R&S	FSV 40	101296	06-Apr-2022	05-Apr-2023
Preamplifier	SCHAFFNER	CPA 9231A	0405	17-Dec-2021	16-Dec-2022
Preamplifier(1-18GHz)	EMCI	EMC051845SE	980692	06-Dec-2021	05-Dec-2022
Loop Antenna	EMCO	6502	9202-2717	06-Sep-2021	05-Sep-2022
Bilog Antenna(3m)	TESEQ	CBL6111D	47016	19-Jul-2021	18-Jul-2022
Bilog Antenna(10m)	TESEQ	CBL6111D	47016	19-Jul-2021	18-Jul-2022
Horn Antenna	EMCO	3115	9912-5992	24-Feb-2022	23-Feb-2023
Cable	HongAn	8D-FB	HA2-10MSite	20-Aug-2021	19-Aug-2022
RF Cable(1~18GHz)	EMCI	EMC104-SM-NM-1000	191104	05-Dec-2021	04-Dec-2022
RF Cable(1~18GHz)	EMCI	EMC104-SM-NM-8000	191103	09-Dec-2021	08-Dec-2022
Signal Generator	R&S	SMB100A	110549	06-Sep-2021	05-Sep-2022
Software	Audix	e3 (ver 6.101006a)	N/A	N/A	N/A

※ The test equipments used are calibrated and can be traced to National ITRI and International Standards.

HA5

Instrument Name	Manufacture	Model Number	Serial Number	Last Cal. Date	Next Cal. Date
EMI Test Receiver	R&S	ESCI	100615	30-Jun-2021	29-Jun-2022
LISN	EMCIS	LN2-16	LN04023	30-Jun-2021	29-Jun-2022
LISN	SCHWARZBECK	NSLK 8127	01019	19-Jul-2021	18-Jul-2022

LISN+Adapter	SCHWARZBECK	NSLK 8127	01019	19-Jul-2021	18-Jul-2022
ISN	TESEQ	ISN T800	30838	19-Jul-2021	18-Jul-2022
Cable	HARBOUR	RG 400	1.5m	08-Jul-2021	07-Jul-2022
Software	Audix	e3 (ver 6.101006e)	N/A	N/A	N/A

※ The test equipments used are calibrated and can be traced to National ITRI and International Standards.

1.3 Auxiliary Equipments

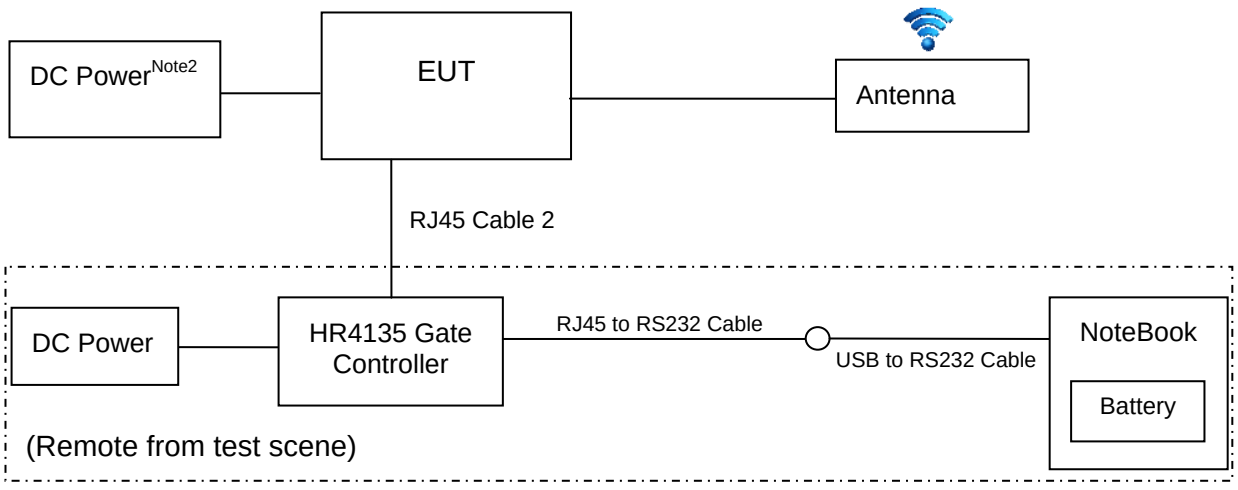
1.3.1. Provided by HongAn Technology Co., Ltd. for Emission Test.

No.	Equipment	Model No.	Serial No.	EMC Approved	Brand	Power Cord
01	NoteBook	X542U	HBN0CV11S783465	"CE Mark,	X542U	Adapter to Notebook Inptut：AC 100-240V~50/60Hz 1.6A Output：19V 3.42A Non-shielded, Un-detachable, 2.2m, W/O Core
02	Car Bettery	N/A	N/A	N/A	N/A	N/A
03	DC Power Supply	DPS-5050	L6000002860	BSMI	LOKO POWER	Power Cord: Non-shielded, Un-detachable, 1.2m Without Core

1.3.2. Provided by the Manufacturer

No.	Equipment	Model No.	Serial No.	EMC Approved	Brand	Power Cord
01	Gate Controller	HR4135	C130418-004-013-007	CE Mark	Heart	N/A
02	RJ45 Cable	N/A	N/A	N/A	N/A	N/A
03	RJ45 to RS232 Cable	N/A	N/A	N/A	N/A	N/A
04	USB to RS232 Cable	N/A	N/A	N/A	N/A	N/A

1.4 EUT SETUP



Note[1]: Main Test Sample: HR4136-B1

Note[2]: DC power supply for conduction test; Car battery for the rest tests.

1.5 Identifying the Final Test Mode

1. Mode 1: EUT connected with Rectangular Antenna. Transmitting 134.2 kHz Signal. Powered by Car battery.
2. Mode 2: EUT connected with Stick Antenna. Transmitting 134.2 kHz Signal. Powered by Car

battery.

3. Mode 3: EUT connected with Rectangular Antenna. Transmitting 134.2 kHz Signal. Powered by DC power supply.
4. EUT connected with Stick Antenna. Transmitting 134.2 kHz Signal. Powered by DC power supply.

Note:

1. During radiated emission pre-test, rotation of the EUT through three orthogonal axes has been evaluated.
2. After pre-test, we identified that the TX X Position was most likely to cause maximum disturbance. Therefore, the Final Assessment was performed for the worst case.
3. EUT connected with Both Antennas were chosen for full testing.
4. According to its specifications, the EUT must comply with the requirements of the Section 15.203 and 15.209 under the FCC Rules Part 15 Subpart C.
5. DC power supply was used during Conducted Emission Test; Fully charged DC24V Batteries were used during the rest tests.

1.6 Final Test Mode

1. Radiated Emission (9kHz~30MHz): Mode 1 and 2
2. Radiated Emission (30~1000MHz): Mode 1 and 2
3. Conducted Emission: Mode 3 and 4.

1.7 Condition of Power Supply

DC power supply for Conducted Emission Test.

Car Battery for the rest Tests.

1.8 EUT Configuration

1. Setup the EUT as shown in Sec.1.4 Block Diagram.
2. Turn on the power of all equipments.
3. Activate the selected Final Test Mode.

1.9 Test Methodology

The tests documented in this report were performed in accordance with ANSI C63.10-2013 and FCC CFR 47 2.1046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055, 2.1057, 15.203, 15.205, 15.207, and 15.209.

1.10 General Test Procedures

Conducted Emissions

The EUT is set according to the requirements in Section 6.2 of ANSI C63.10 (2013).

Radiated Emissions

The EUT is set according to the requirements in Section 6.3 of ANSI C63.10 (2013).

1.11 Modification

N/A

1.12 FCC Part 15.205 restricted bands of operations

(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	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37635-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	([2])
13.36-13.41			

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

[2] Above 38.6

(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.

2 Power line Conducted Emission Measurement

2.1 Test Instruments

Refer to Sec. 1.2 Test Instruments.

2.2 Test Arrangement and Procedure

1. The EUT was placed on a table, which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

2.3 Limit (§ 15.207)

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 is listed as follows:

Frequency (MHz)	Limits (dBuV)	
	Q.P. (Quasi-Peak)	A.V. (Average)
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5.0	56	46
5.0 to 30	60	50

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

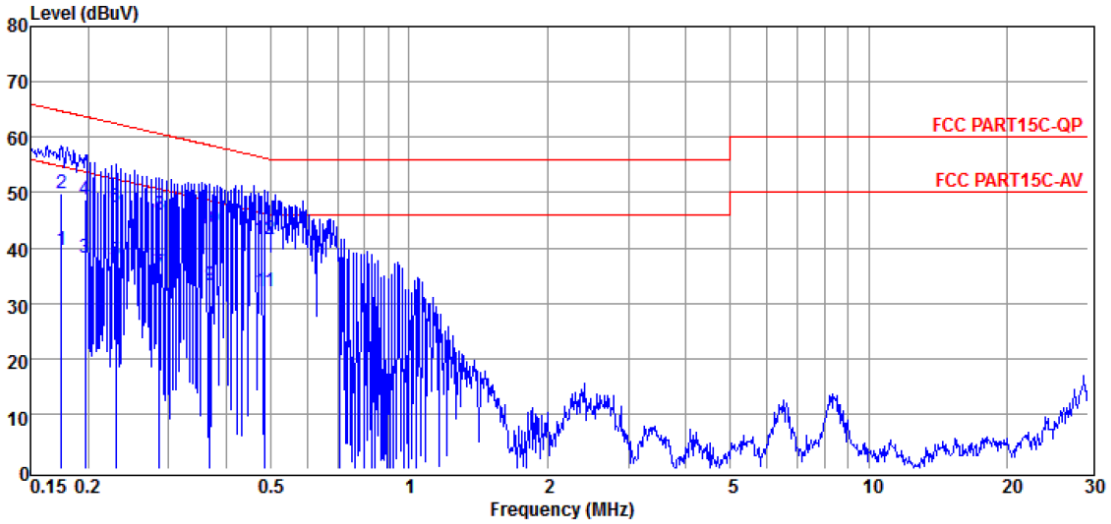
2.4 Test Result

Compliance.

The final test data are shown on the following page(s).

Power Line Conducted Emission Test Data

Temperature	:	25℃	Humidity	:	53%
Test Date	:	17-May-2022	Tested by	:	Tony Huang
Test Mode	:	Mode 3	Channel	:	134.2 kHz
Power Phase	:	Line	Test Site	:	HA5



No.	Freq MHz	Reading dBµV	C.F dB	Result dBµV	Limit dBµV	Margin dB	Power Line	Remark
1	0.175	39.49	0.06	39.55	54.72	-15.17	LINE	Average
2	0.175	49.63	0.06	49.69	64.72	-15.03	LINE	QP
3	0.198	38.15	0.06	38.21	53.71	-15.50	LINE	Average
4	0.198	48.64	0.06	48.70	63.71	-15.01	LINE	QP
5	0.230	37.58	0.06	37.64	52.44	-14.80	LINE	Average
6	0.230	47.37	0.06	47.43	62.44	-15.01	LINE	QP
7	0.286	35.50	0.06	35.56	50.63	-15.07	LINE	Average
8	0.286	45.98	0.06	46.04	60.63	-14.59	LINE	QP
9	0.369	33.22	0.06	33.28	48.52	-15.24	LINE	Average
10	0.369	43.50	0.06	43.56	58.52	-14.96	LINE	QP
11	0.486	31.98	0.07	32.05	46.23	-14.18	LINE	Average
12	0.486	41.34	0.07	41.41	56.23	-14.82	LINE	QP

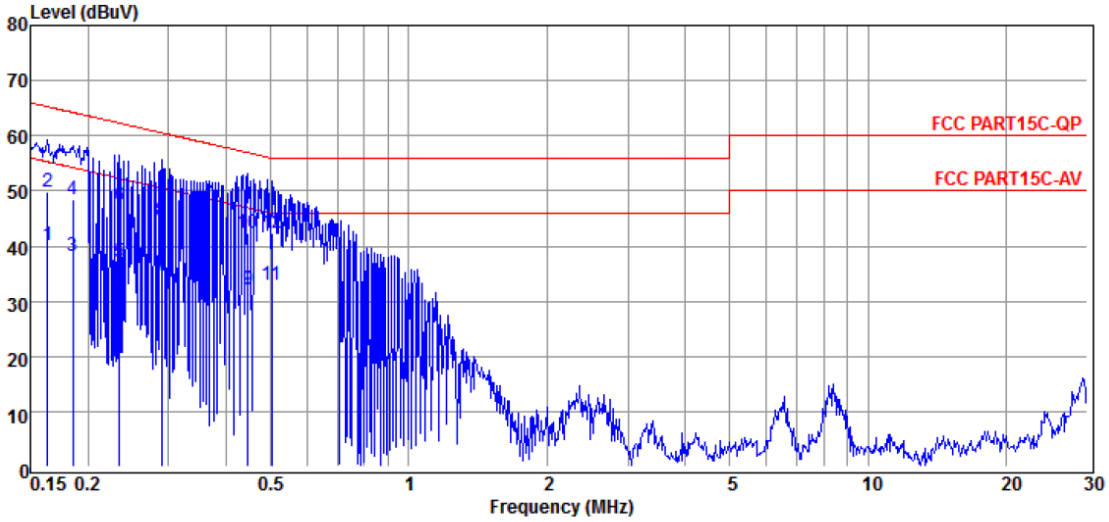
Remark：1. All readings are Quasi-Peak and Average values.

2. Result = Reading + C.F..

3. Margin = Result – Limit.

Power Line Conducted Emission Test Data

Temperature	:	25℃	Humidity	:	53%
Test Date	:	17-May-2022	Tested by	:	Tony Huang
Test Mode	:	Mode 3	Channel	:	134.2 kHz
Power Phase	:	Neutral	Test Site	:	HA5



No.	Freq MHz	Reading dBµV	C.F dB	Result dBµV	Limit dBµV	Margin dB	Power Line	Remark
1	0.163	39.94	0.06	40.00	55.30	-15.30	NEUTRAL	Average
2	0.163	49.77	0.06	49.83	65.30	-15.47	NEUTRAL	QP
3	0.185	38.01	0.06	38.07	54.24	-16.17	NEUTRAL	Average
4	0.185	48.25	0.06	48.31	64.24	-15.93	NEUTRAL	QP
5	0.234	37.02	0.06	37.08	52.30	-15.22	NEUTRAL	Average
6	0.234	47.40	0.06	47.46	62.30	-14.84	NEUTRAL	QP
7	0.289	34.65	0.06	34.71	50.54	-15.83	NEUTRAL	Average
8	0.289	44.57	0.06	44.63	60.54	-15.91	NEUTRAL	QP
9	0.447	32.12	0.06	32.18	46.93	-14.75	NEUTRAL	Average
10	0.447	42.21	0.06	42.27	56.93	-14.66	NEUTRAL	QP
11	0.502	32.96	0.07	33.03	46.00	-12.97	NEUTRAL	Average
12	0.502	42.34	0.07	42.41	56.00	-13.59	NEUTRAL	QP

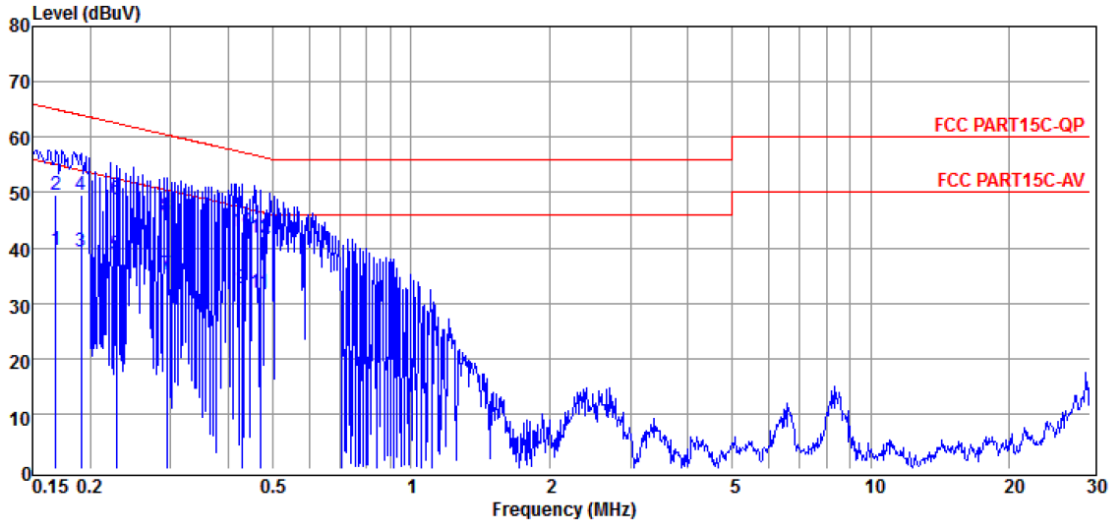
Remark：1. All readings are Quasi-Peak and Average values.

2. Result = Reading + C.F..

3. Margin = Result – Limit.

Power Line Conducted Emission Test Data

Temperature	:	25℃	Humidity	:	53%
Test Date	:	17-May-2022	Tested by	:	Tony Huang
Test Mode	:	Mode 4	Channel	:	134.2 kHz
Power Phase	:	Line	Test Site	:	HA5



No.	Freq MHz	Reading dBµV	C.F dB	Result dBµV	Limit dBµV	Margin dB	Power Line	Remark
1	0.169	39.62	0.06	39.68	55.03	-15.35	LINE	Average
2	0.169	49.57	0.06	49.63	65.03	-15.40	LINE	QP
3	0.191	39.34	0.06	39.40	53.98	-14.58	LINE	Average
4	0.191	49.52	0.06	49.58	63.98	-14.40	LINE	QP
5	0.228	38.65	0.06	38.71	52.52	-13.81	LINE	Average
6	0.228	48.74	0.06	48.80	62.52	-13.72	LINE	QP
7	0.294	35.10	0.06	35.16	50.41	-15.25	LINE	Average
8	0.294	45.51	0.06	45.57	60.41	-14.84	LINE	QP
9	0.428	32.70	0.06	32.76	47.29	-14.53	LINE	Average
10	0.428	42.74	0.06	42.80	57.29	-14.49	LINE	QP
11	0.469	31.67	0.07	31.74	46.54	-14.80	LINE	Average
12	0.469	41.76	0.07	41.83	56.54	-14.71	LINE	QP

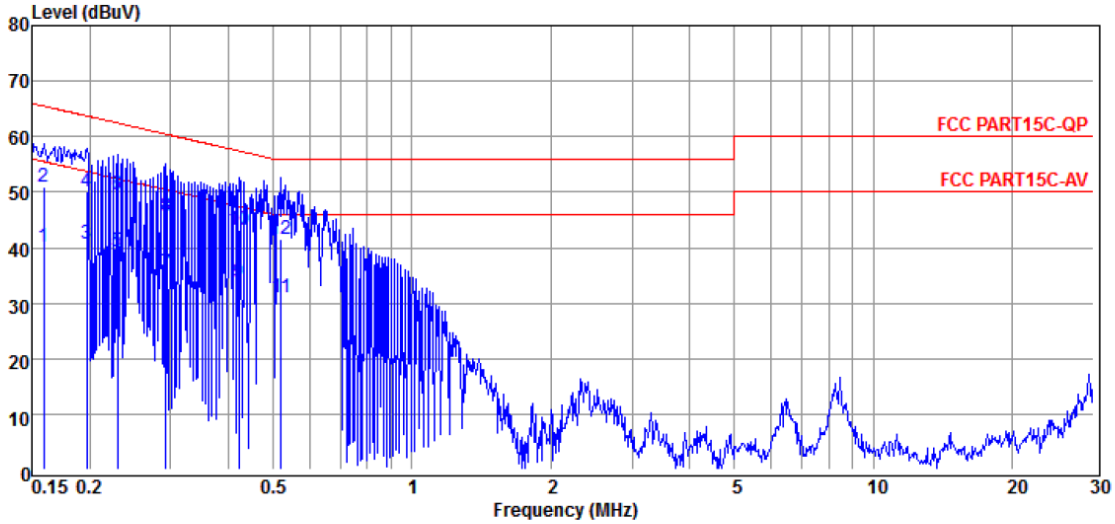
Remark：4. All readings are Quasi-Peak and Average values.

5. Result = Reading + C.F..

6. Margin = Result – Limit.

Power Line Conducted Emission Test Data

Temperature	:	25℃	Humidity	:	53%
Test Date	:	17-May-2022	Tested by	:	Tony Huang
Test Mode	:	Mode 4	Channel	:	134.2 kHz
Power Phase	:	Neutral	Test Site	:	HA5



No.	Freq MHz	Reading dBµV	C.F dB	Result dBµV	Limit dBµV	Margin dB	Power Line	Remark
1	0.159	40.17	0.06	40.23	55.52	-15.29	NEUTRAL	Average
2	0.159	50.91	0.06	50.97	65.52	-14.55	NEUTRAL	QP
3	0.198	40.67	0.06	40.73	53.71	-12.98	NEUTRAL	Average
4	0.198	50.11	0.06	50.17	63.71	-13.54	NEUTRAL	QP
5	0.230	39.25	0.06	39.31	52.44	-13.13	NEUTRAL	Average
6	0.230	49.55	0.06	49.61	62.44	-12.83	NEUTRAL	QP
7	0.292	35.26	0.06	35.32	50.46	-15.14	NEUTRAL	Average
8	0.292	45.50	0.06	45.56	60.46	-14.90	NEUTRAL	QP
9	0.421	33.72	0.06	33.78	47.42	-13.64	NEUTRAL	Average
10	0.421	43.11	0.06	43.17	57.42	-14.25	NEUTRAL	QP
11	0.521	31.07	0.07	31.14	46.00	-14.86	NEUTRAL	Average
12	0.521	41.45	0.07	41.52	56.00	-14.48	NEUTRAL	QP

Remark：4. All readings are Quasi-Peak and Average values.

5. Result = Reading + C.F..

6. Margin = Result – Limit.

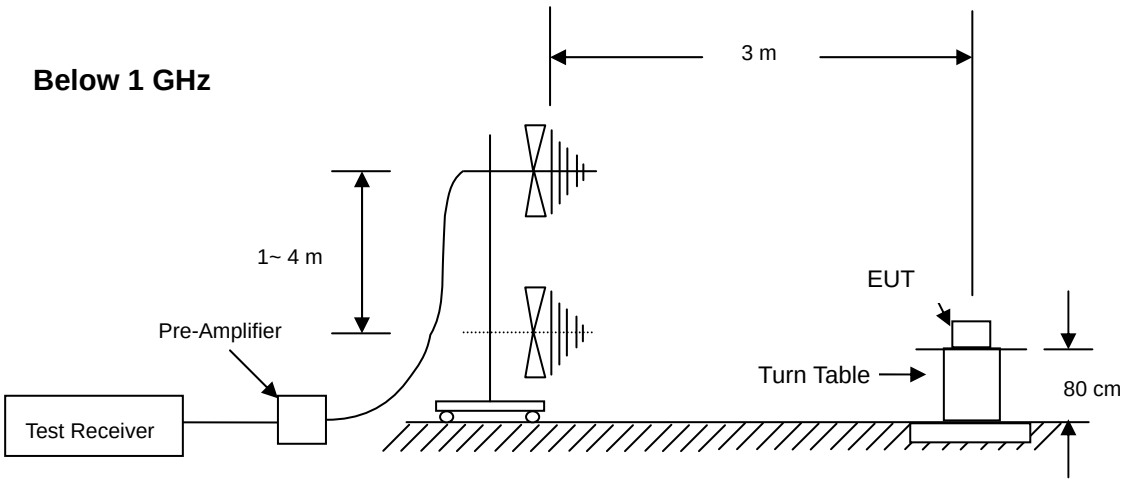
3 Radiated Emission Test

3.1 Test Instruments

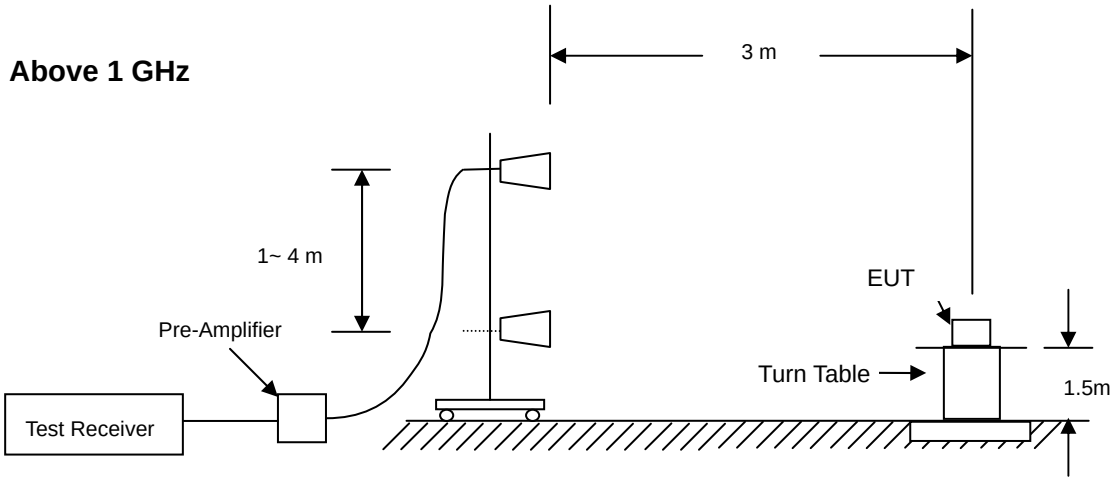
Refer to Sec. 1.2 Test Instruments.

3.2 Test Arrangement and Procedure

Below 1 GHz



Above 1 GHz



1. The EUT is placed on a turntable, which is 0.8m (below 1GHz) or 1.5 m (above 1GHz) above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3 m away from the receiving antenna, which is varied from 1 m to 4 m to find out the highest emissions.
4. Maxium procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Set the spectrum analyzer in the following setting as:
   (a) Below 1 GHz: RBW =100 kHz/ VBW = 300 kHz/ Sweep = AUTO.

(b) Above 1 GHz: Peak: RBW = VBW = 1MHz/ Sweep = AUTO

7. Repeat above procedures until the meausreemnts for all frequencies are complete.

3.3 Limit of Spurious Emission (§ 15.209)

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209, whichever is lesser attenuation.

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.§§ 15.231 and 15.241.

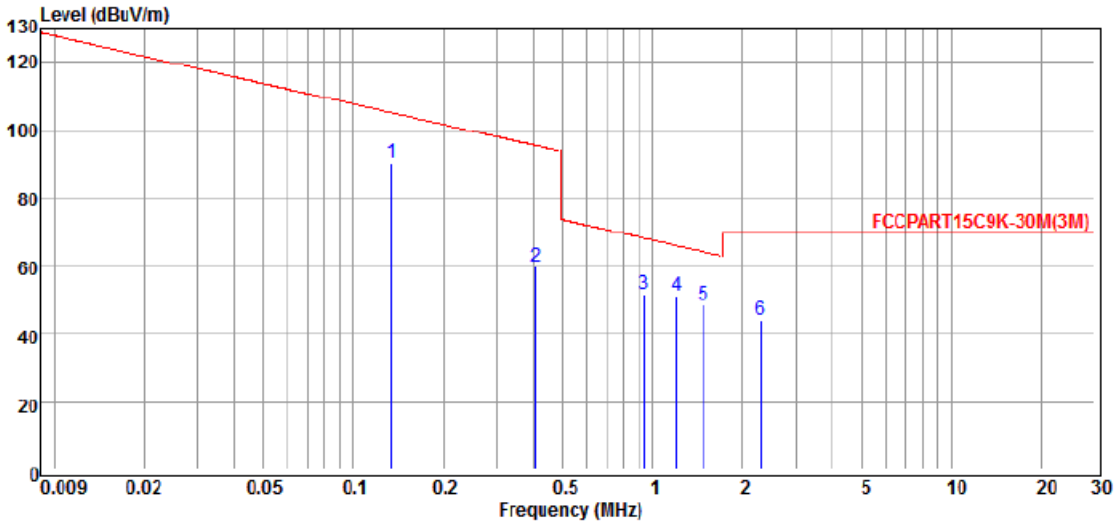
3.4 Test Result

Compliance

The final test data are shown on the following page(s).

Radiated Emission Test Data (9kHz~30MHz)

Temperature	:	25℃	Humidity	:	58%
Test Date	:	19-April-2022	Tested by	:	Tony Huang
Polarization	:	N/A	Channel	:	134.2 kHz
Test Mode	:	Mode 1	Test Site	:	HA2



No.	Freq	Reading	C.F	Result	Limit	Margin	Remark
	MHz	dBµV	dB/m	dBµV/m	dBµV/m	dB	
1	0.1342	80.12	10.08	90.20	105.05	-14.85	Peak
2	0.4040	49.03	10.69	59.72	95.47	-35.75	Peak
3	0.9390	40.81	10.83	51.64	68.15	-16.51	Peak
4	1.2080	40.69	10.80	51.49	65.96	-14.47	Peak
5	1.4800	37.90	10.75	48.65	64.20	-15.55	Peak
6	2.2930	33.62	10.59	44.21	69.54	-25.33	Peak

Note 1. C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain.

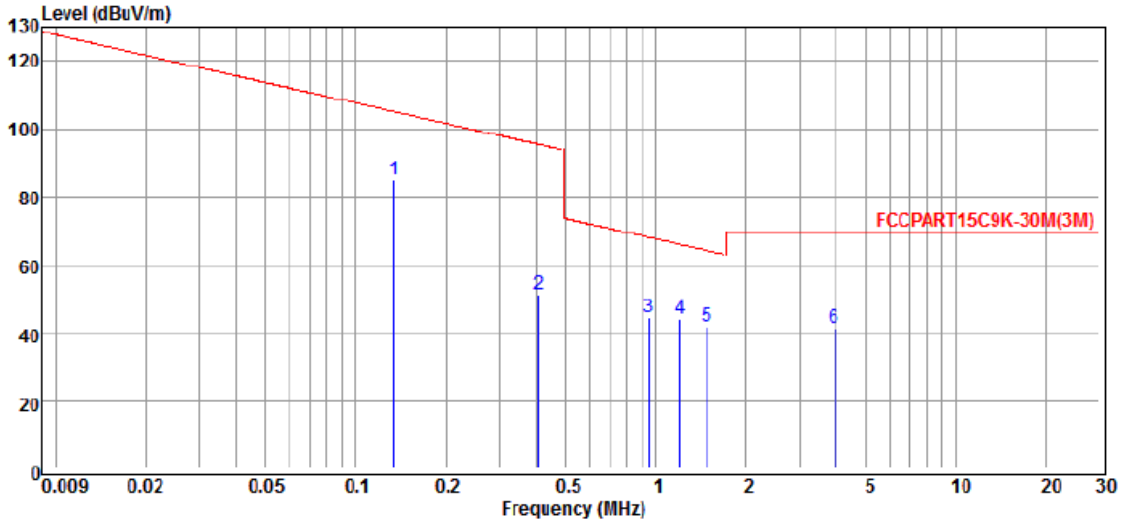
Note 2. Margin = Result - Limit ; Result = Reading + C.F.

Remark：

1. Measuring frequencies from 30 MHz to 1 GHz.
2. Measurements above show only up to 6 maximum emissions noted.
3. Radiated emissions measured in frequency range from 30 MHz to 1000 MHz were made with an instrument using Q.P. detector mode.
4. Data of measurement within this frequency range shown “---” in the table above means the reading of emissions are attenuated more than 20 dB below the permissible limits or the field strength is too small to be measured.
5. The IF bandwidth of SPA between 30 MHz to 1 GHz was 100 kHz.

Radiated Emission Test Data (9kHz~30MHz)

Temperature	:	25℃	Humidity	:	58%
Test Date	:	19-April-2022	Tested by	:	Tony Huang
Polarization	:	N/A	Channel	:	134.2 kHz
Test Mode	:	Mode 2	Test Site	:	HA2



No.	Freq	Reading	C.F	Result	Limit	Margin	Remark
	MHz	dBμV	dB/m	dBμV/m	dBμV/m	dB	
1	0.1342	74.90	10.08	84.98	105.05	-20.07	Peak
2	0.4040	40.44	10.69	51.13	95.47	-44.34	Peak
3	0.9470	33.72	10.83	44.55	68.08	-23.53	Peak
4	1.2080	33.46	10.80	44.26	65.96	-21.70	Peak
5	1.4800	31.05	10.75	41.80	64.20	-22.40	Peak
6	3.9160	30.87	10.55	41.42	69.54	-28.12	Peak

Note 1. C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain.

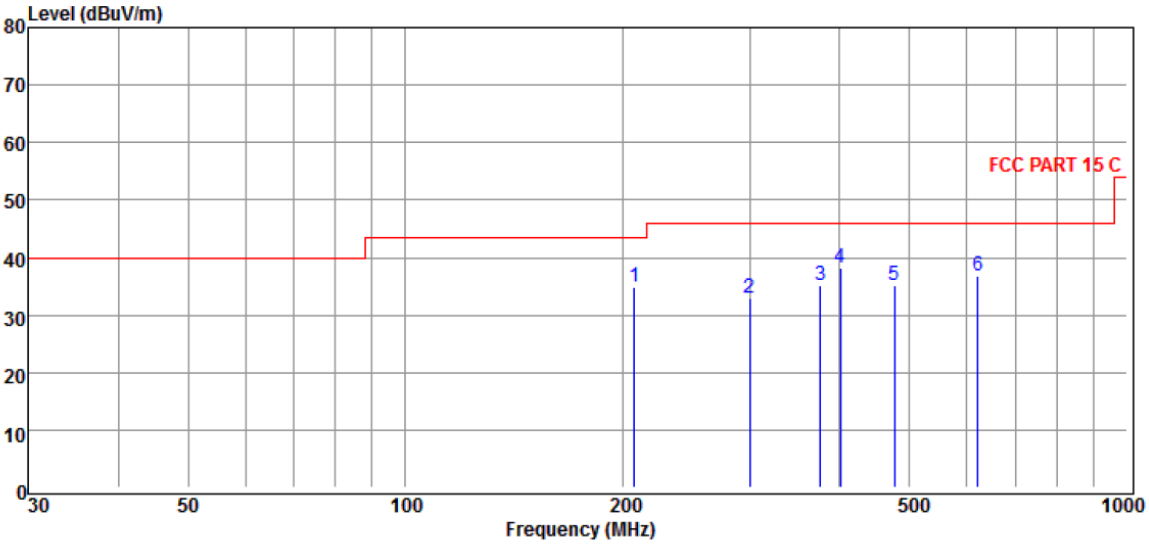
Note 2. Margin = Result - Limit ; Result = Reading + C.F.

Remark：

1. Measuring frequencies from 30 MHz to 1 GHz.
2. Measurements above show only up to 6 maximum emissions noted.
3. Radiated emissions measured in frequency range from 30 MHz to 1000 MHz were made with an instrument using Q.P. detector mode.
4. Data of measurement within this frequency range shown “---” in the table above means the reading of emissions are attenuated more than 20 dB below the permissible limits or the field strength is too small to be measured.
5. The IF bandwidth of SPA between 30 MHz to 1 GHz was 100 kHz.

Radiated Emission Test Data (30MHz~1GHz)

Temperature	:	25℃	Humidity	:	58%
Test Date	:	19-April-2022	Tested by	:	Tony Huang
Polarization	:	Horizontal	Channel	:	134.2 kHz
Test Mode	:	Mode 1	Test Site	:	HA2



No.	Freq	Reading	C.F	Result	Limit	Margin	Antenna	Remark
	MHz	dBµV	dB/m	dBµV/m	dBµV/m	dB	Pol.	
1	207.850	47.71	-12.91	34.80	43.50	-8.70	HORIZONTAL	Peak
2	300.367	42.38	-9.39	32.99	46.00	-13.01	HORIZONTAL	Peak
3	375.939	42.44	-7.19	35.25	46.00	-10.75	HORIZONTAL	Peak
4	400.432	44.46	-6.38	38.08	46.00	-7.92	HORIZONTAL	Peak
5	475.499	40.01	-4.83	35.18	46.00	-10.82	HORIZONTAL	Peak
6	620.710	39.06	-2.26	36.80	46.00	-9.20	HORIZONTAL	Peak

Note 1. C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain.

Note 2. Margin = Result - Limit ; Result = Reading + C.F.

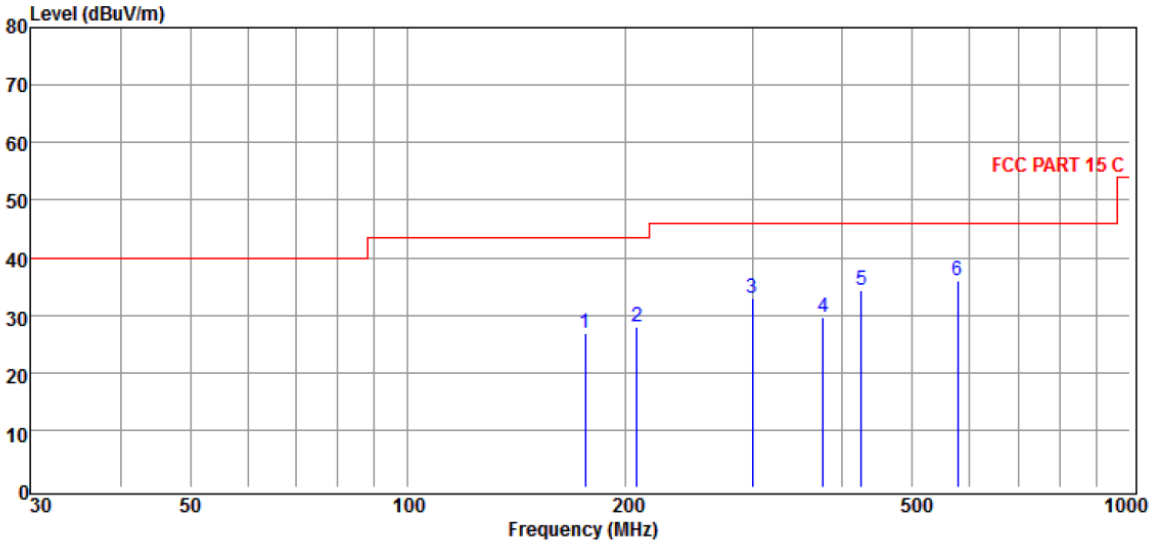
Remark：

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000 MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. All readings are Peak values. None of the peak value reading exceeds the A.V. limit. Hence, A.V. reading was not measured.
5. Spectrum setting:

   (a) Peak Setting 1GHz to 10th harmonics of fundamental, RBW = VBW = 1MHz, Sweep = AUTO.

Radiated Emission Test Data (30MHz~1GHz)

Temperature	:	25℃	Humidity	:	58%
Test Date	:	19-April-2022	Tested by	:	Tony Huang
Polarization	:	Vertical	Channel	:	134.2 kHz
Test Mode	:	Mode 1	Test Site	:	HA2



No.	Freq	Reading	C.F	Result	Limit	Margin	Antenna	Remark
	MHz	dBµV	dB/m	dBµV/m	dBµV/m	dB	Pol.	
1	176.269	40.87	-13.89	26.98	43.50	-16.52	VERTICAL	Peak
2	207.850	40.86	-12.91	27.95	43.50	-15.55	VERTICAL	Peak
3	300.367	42.28	-9.39	32.89	46.00	-13.11	VERTICAL	Peak
4	375.939	36.75	-7.19	29.56	46.00	-16.44	VERTICAL	Peak
5	425.028	39.99	-5.61	34.38	46.00	-11.62	VERTICAL	Peak
6	576.644	39.10	-3.08	36.02	46.00	-9.98	VERTICAL	Peak

Note 1. C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain.

Note 2. Margin = Result - Limit ; Result = Reading + C.F.

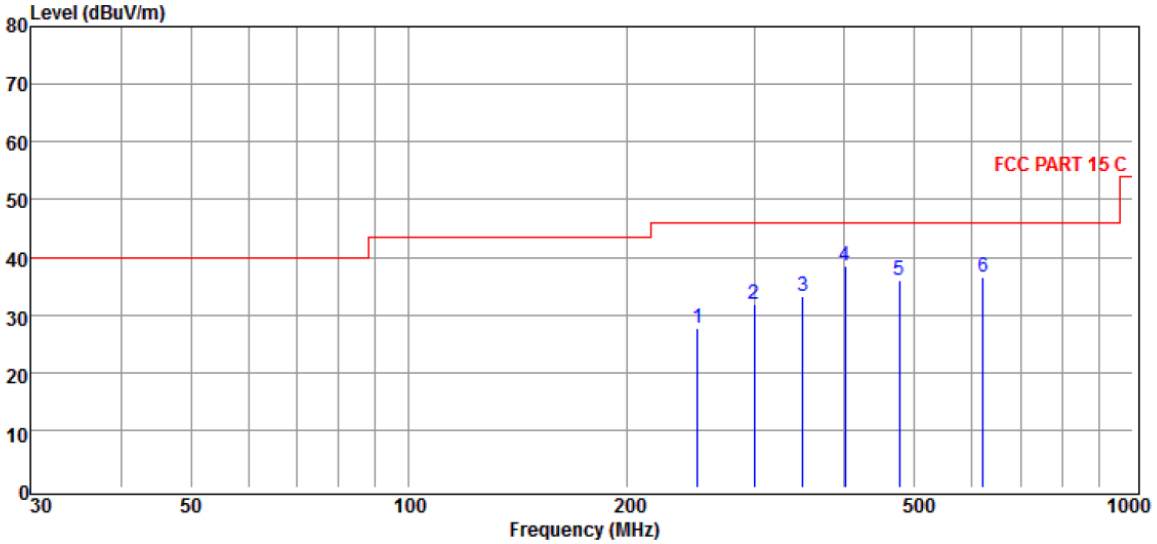
Remark：

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000 MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. All readings are Peak values. None of the peak value reading exceeds the A.V. limit. Hence, A.V. reading was not measured.
5. Spectrum setting:

   (a) Peak Setting 1GHz to 10th harmonics of fundamental, RBW = VBW = 1MHz, Sweep = AUTO.

Radiated Emission Test Data (30MHz~1GHz)

Temperature	:	25℃	Humidity	:	58%
Test Date	:	19-April-2022	Tested by	:	Tony Huang
Polarization	:	Horizontal	Channel	:	134.2 kHz
Test Mode	:	Mode 2	Test Site	:	HA2



No.	Freq	Reading	C.F	Result	Limit	Margin	Antenna	Remark
	MHz	dBµV	dB/m	dBµV/m	dBµV/m	dB	Pol.	
1	250.301	38.18	-10.47	27.71	46.00	-18.29	HORIZONTAL	Peak
2	300.367	41.10	-9.39	31.71	46.00	-14.29	HORIZONTAL	Peak
3	350.477	40.83	-7.72	33.11	46.00	-12.89	HORIZONTAL	Peak
4	400.432	44.73	-6.38	38.35	46.00	-7.65	HORIZONTAL	Peak
5	475.499	40.94	-4.83	36.11	46.00	-9.89	HORIZONTAL	Peak
6	620.710	38.68	-2.26	36.42	46.00	-9.58	HORIZONTAL	Peak

Note 1. C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain.

Note 2. Margin = Result - Limit ; Result = Reading + C.F.

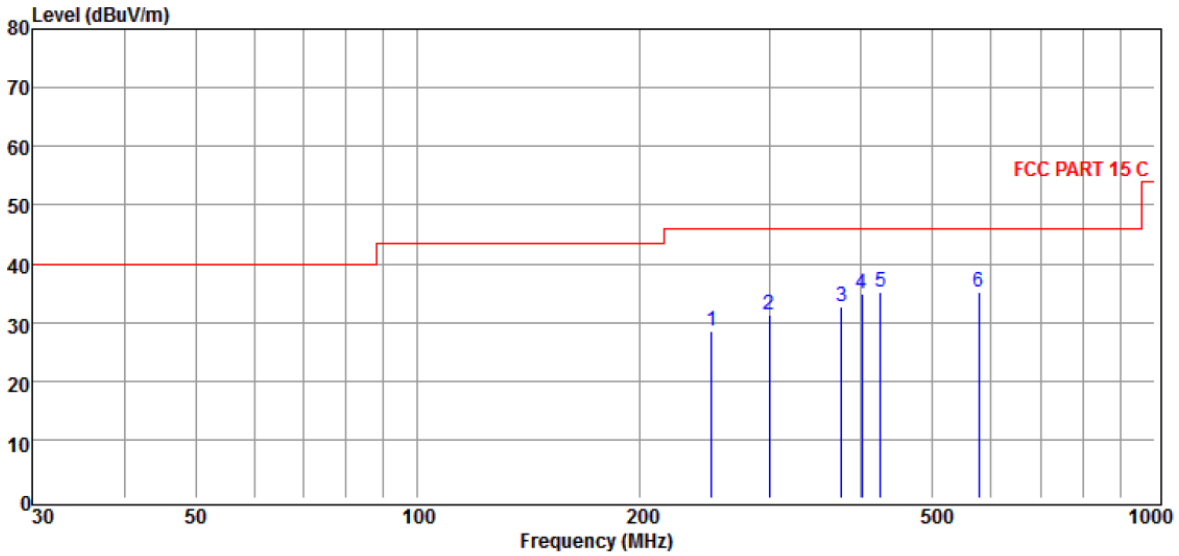
Remark：

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000 MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. All readings are Peak values. None of the peak value reading exceeds the A.V. limit. Hence, A.V. reading was not measured.
5. Spectrum setting:

   (a) Peak Setting 1GHz to 10th harmonics of fundamental, RBW = VBW = 1MHz, Sweep = AUTO.

Radiated Emission Test Data (30MHz~1GHz)

Temperature	:	25℃	Humidity	:	58%
Test Date	:	19-April-2022	Tested by	:	Tony Huang
Polarization	:	Vertical	Channel	:	134.2 kHz
Test Mode	:	Mode 2	Test Site	:	HA2



No.	Freq	Reading	C.F	Result	Limit	Margin	Antenna	Remark
	MHz	dBµV	dB/m	dBµV/m	dBµV/m	dB	Pol.	
1	250.301	38.93	-10.47	28.46	46.00	-17.54	VERTICAL	Peak
2	300.367	40.78	-9.39	31.39	46.00	-14.61	VERTICAL	Peak
3	375.939	39.90	-7.19	32.71	46.00	-13.29	VERTICAL	Peak
4	400.432	41.19	-6.38	34.81	46.00	-11.19	VERTICAL	Peak
5	425.028	40.80	-5.61	35.19	46.00	-10.81	VERTICAL	Peak
6	576.644	38.26	-3.08	35.18	46.00	-10.82	VERTICAL	Peak

Note 1. C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain.

Note 2. Margin = Result - Limit ; Result = Reading + C.F.

Remark：

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000 MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. All readings are Peak values. None of the peak value reading exceeds the A.V. limit. Hence, A.V. reading was not measured.
5. Spectrum setting:

   (a) Peak Setting 1GHz to 10th harmonics of fundamental, RBW = VBW = 1MHz, Sweep = AUTO.

4 20 dB Bandwidth

4.1 Test Instruments

Refer to Sec. 1.2 Test Instruments.

4.2 Test Arrangement and Procedure

1. Test Configuration refer to section 1.4.
2. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 10kHz RBW and 30kHz VBW. Measured the -20 dB bandwidth and plotted the graph.

4.3 Limit

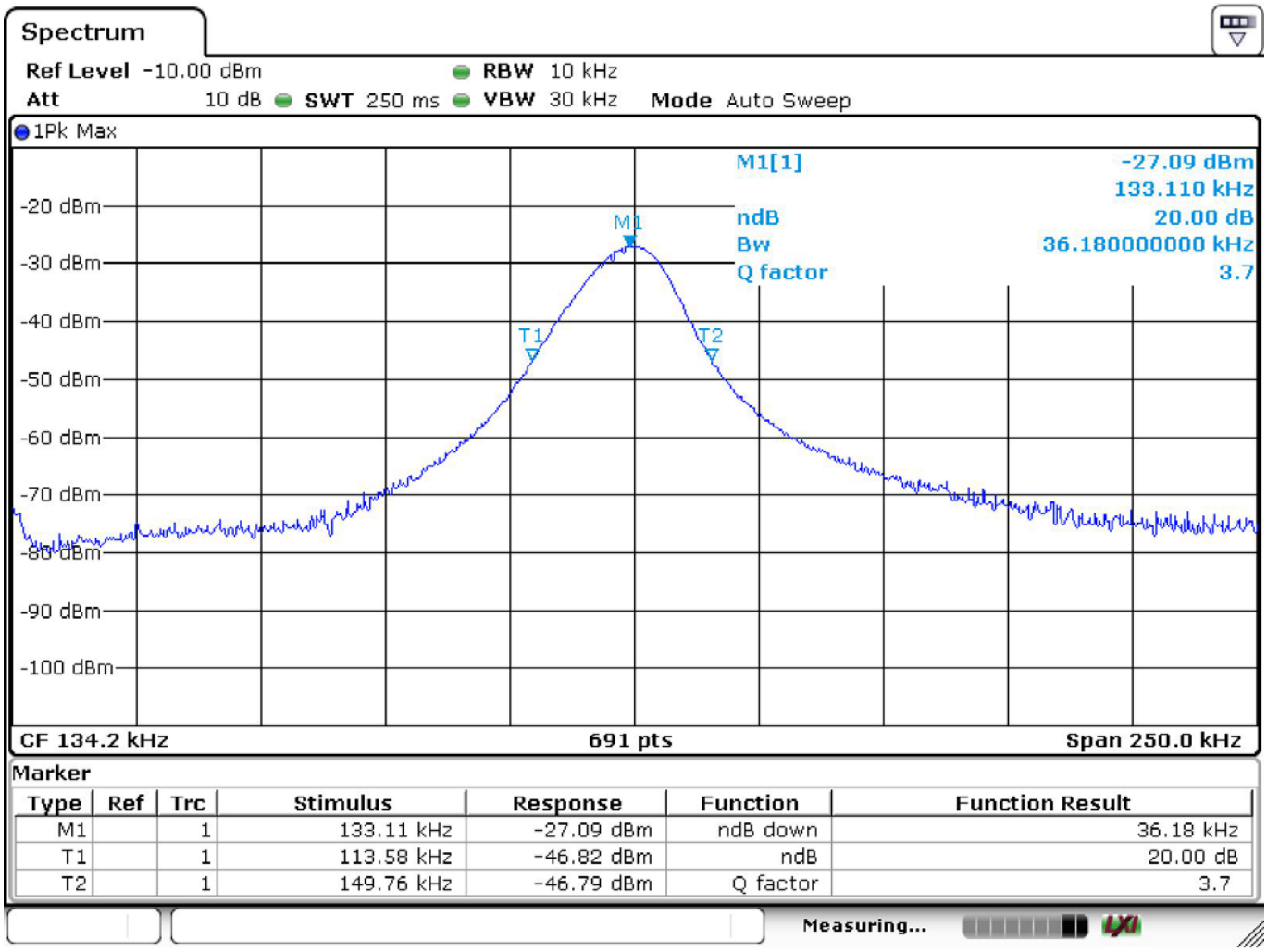
None; For report purpose only.

4.4 Test Result

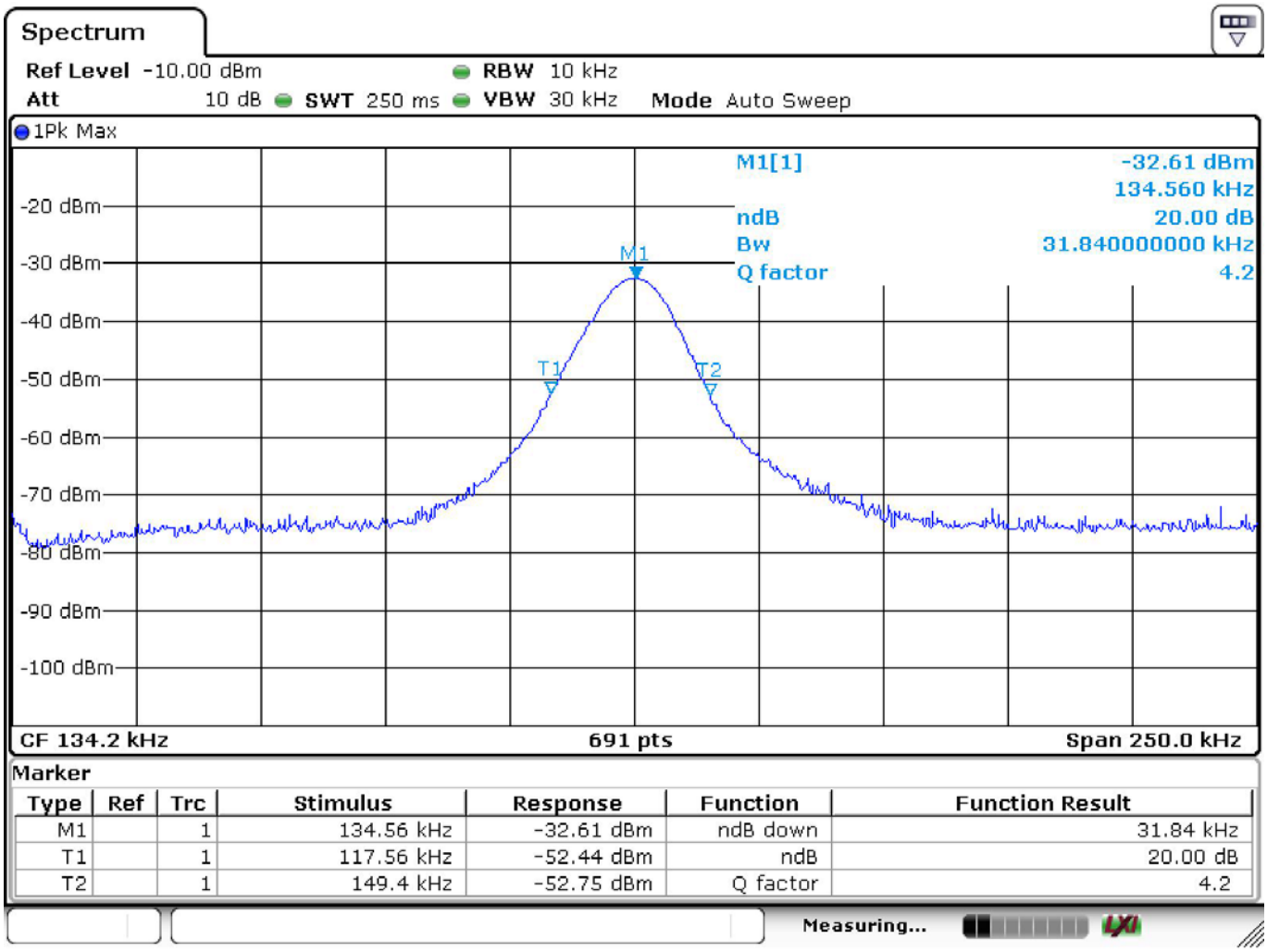
No non-compliance noted.

The final test data are shown on the following page(s).

Temperature	:	25℃	Humidity	:	58%
Test Date	:	19-April-2022	Tested by	:	Tony Huang
Test Mode	:	Mode 1	Channel	:	134.2 kHz



Temperature	:	25℃	Humidity	:	58%
Test Date	:	19-April-2022	Tested by	:	Tony Huang
Test Mode	:	Mode 2	Channel	:	134.2 kHz



5 Antenna requirement

5.1 Limit (§ 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 uniue 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. This requirement does not apply to carrier current devices or to devices operated under the provisions of § 15.211, § 15.213, § 15.217, § 15.219, or § 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with § 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

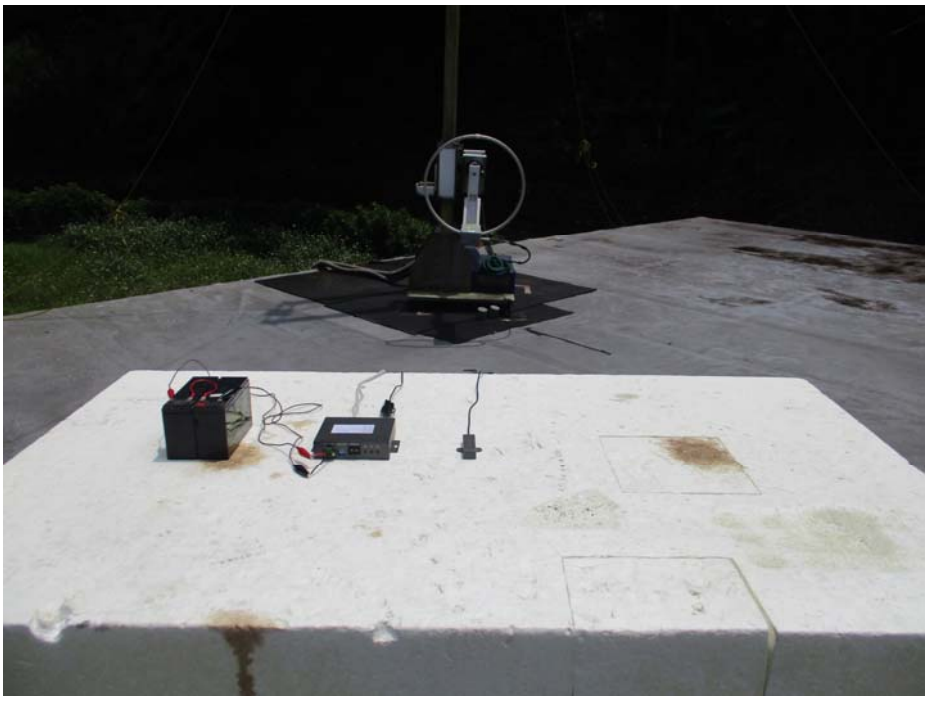
5.2 Test Result

Compliance.

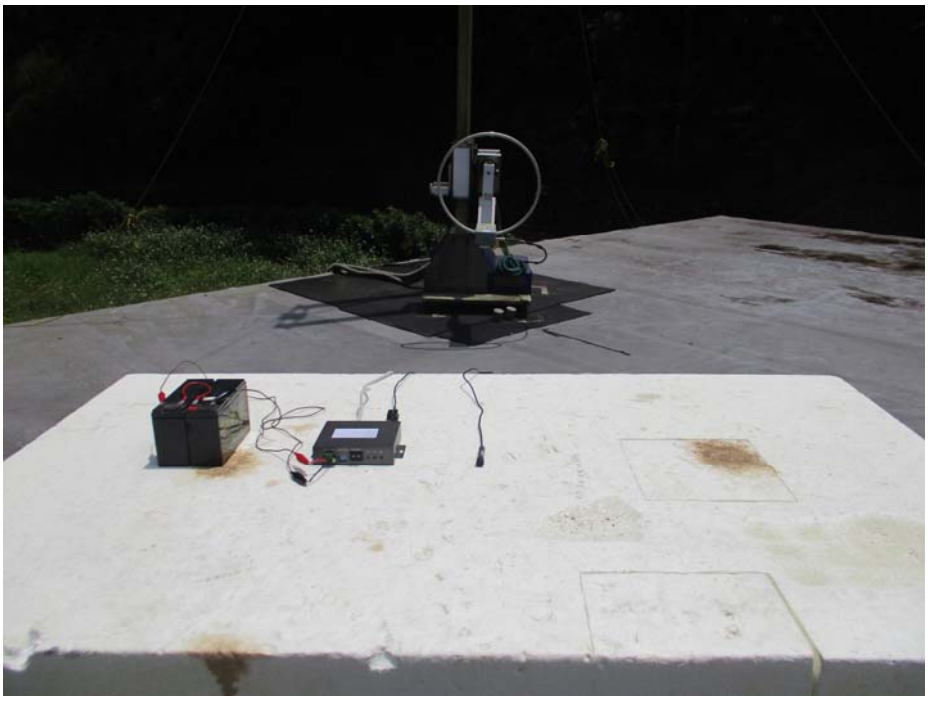
The EUT side of Antenna port applies special RP-TNC connector (female body with male inner pin). The connector of the antenna cable applies special RP-TNC connector (male body with female inner pin).

6 Photographs of the Tests

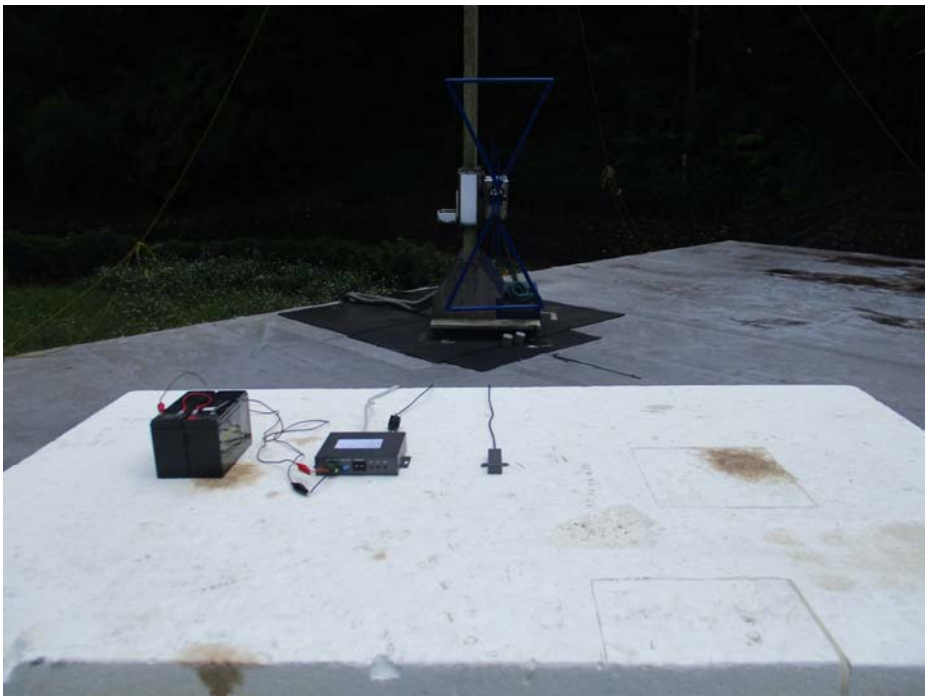
6.1 Radiated Disturbances Emission Test (9kHz~30MHz) and (30MHz~1 GHz)



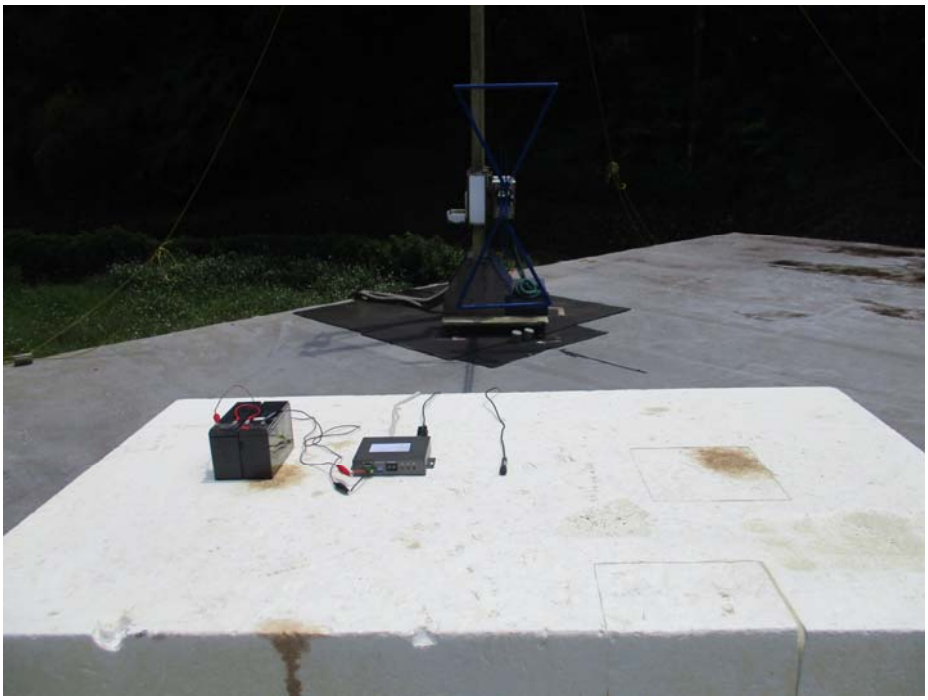
Front View of Mode 1 (with Rectangular Antenna)



Front View of Mode 2 (with Stick Antenna)

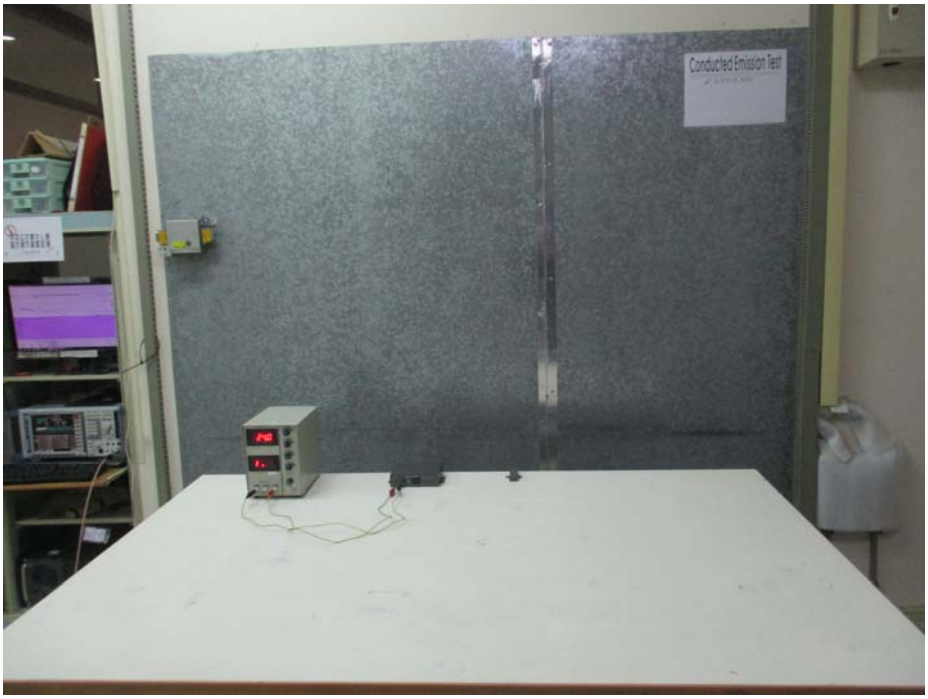


Front View of Mode 1 (with Rectangular Antenna)



Front View of Mode 2 (with Stick Antenna)

6.2 Power Line Conducted Emission Test



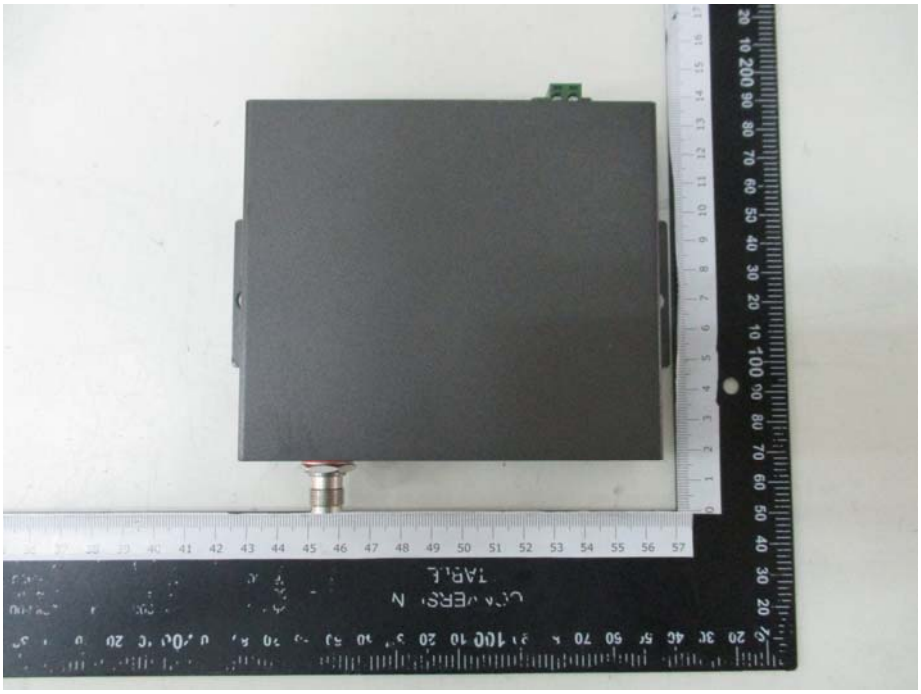
Front View of Mode 3 (with Rectangular Antenna)

Rear View of Mode 3 (with Rectangular Antenna)

Front View of Mode 4 (with Stick Antenna)

Rear View of Mode 4 (with Stick Antenna)

7 Photographs of the EUT



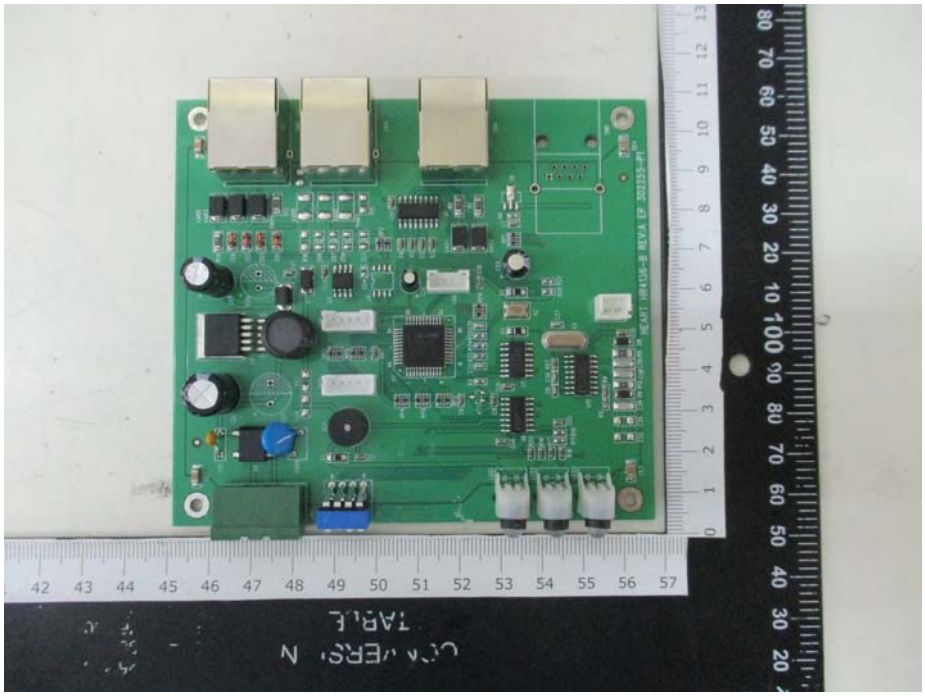
Front View of the EUT

Rear View of the EUT

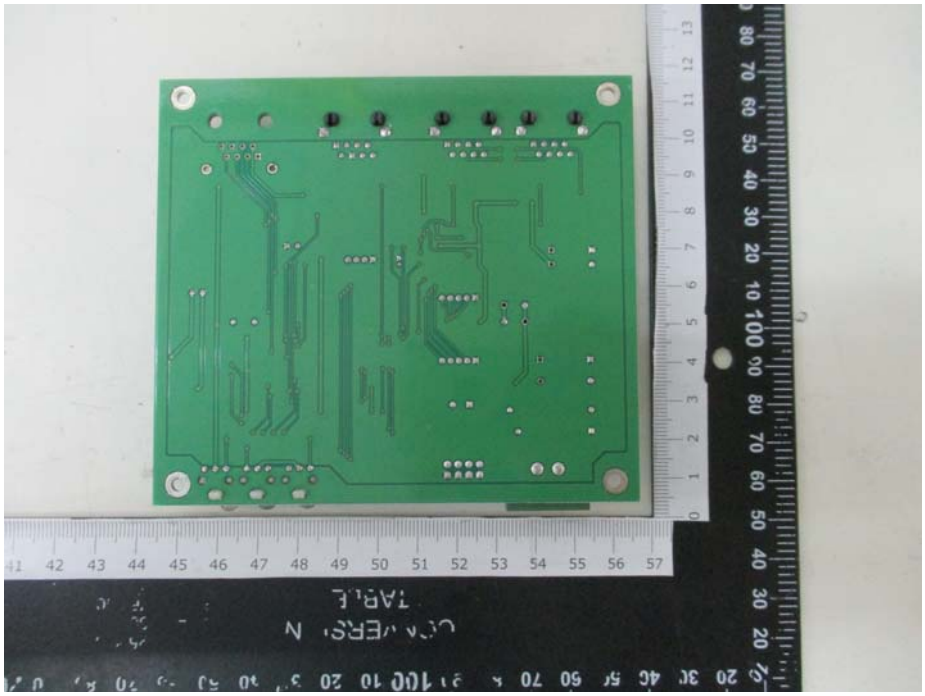
Side View of the EUT

Side View of the EUT

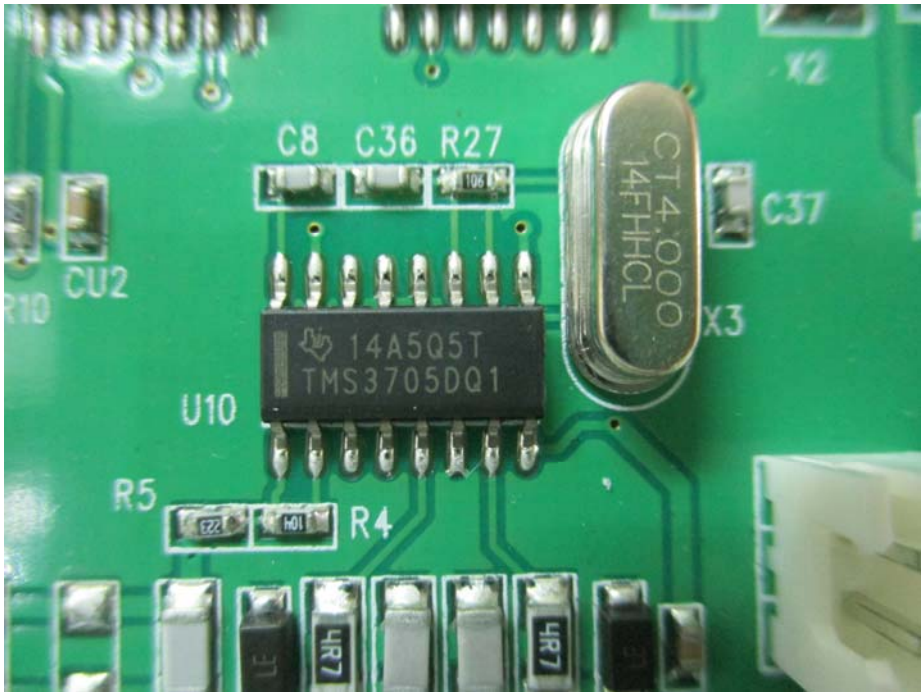
Inside View of the EUT



Front View of the PCB



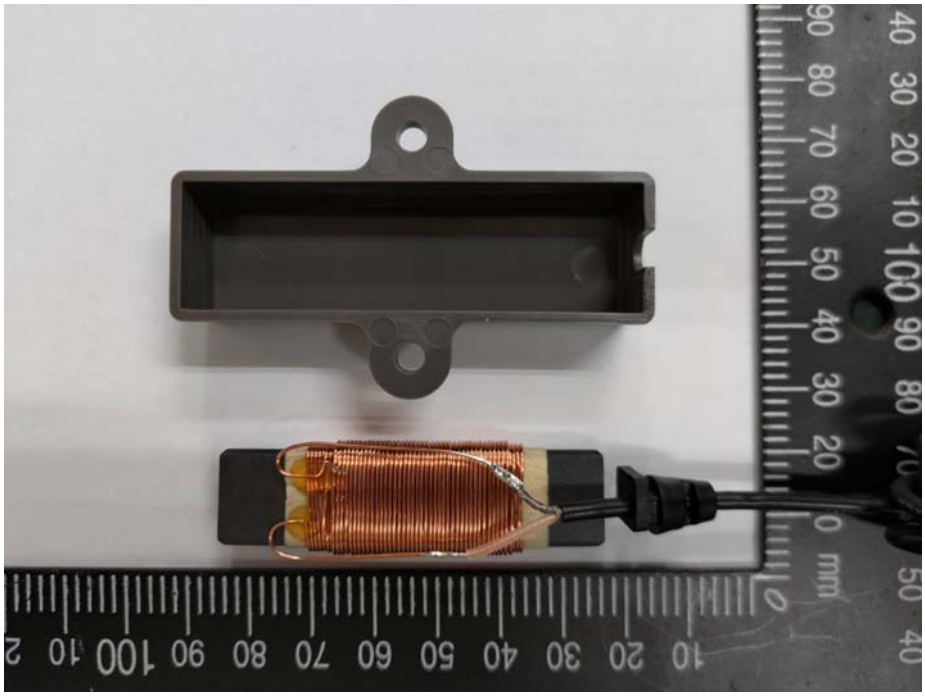
Rear View of the PCB



Front closer view of the Clock

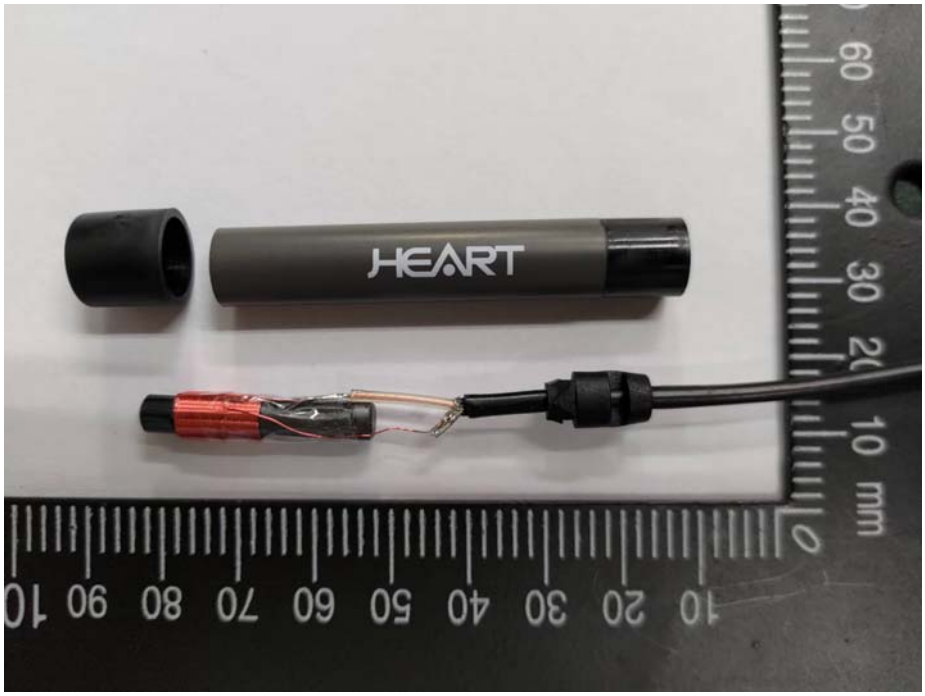
Rear closer view of the antenna port & connector of the antenna

Front view of the Rectangular Antenna



Inside view of the Rectangular housing and Coil Antenna

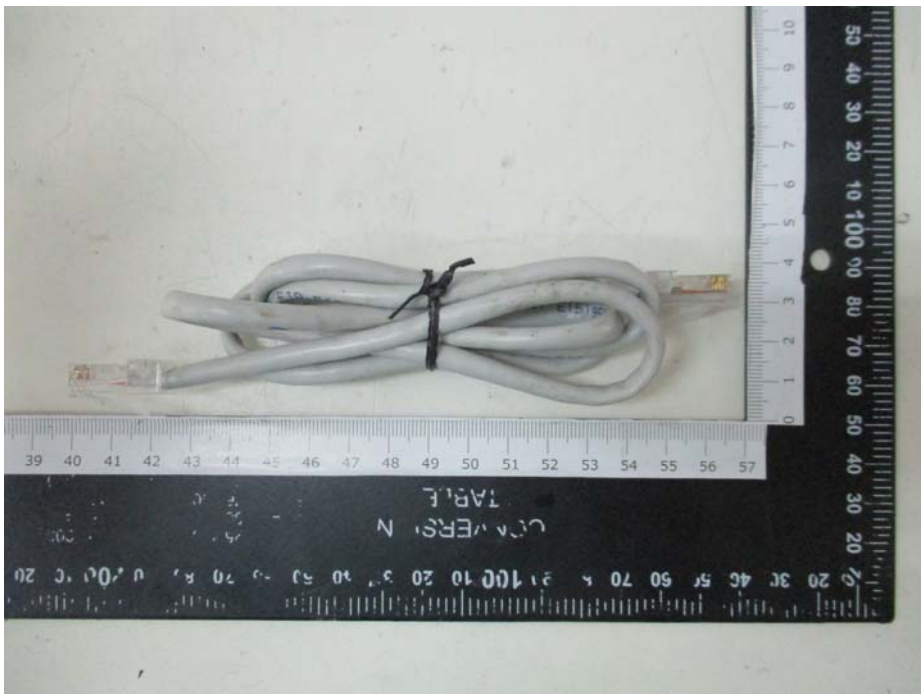
Front view of the Stick Antenna



Inside view of the Stick housing and Coil Antenna

Closer view of the Label

Front view of RJ45 Cable 1



Front view of RJ45 Cable 2