Certificate of Test

NCT CO., LTD. 211-71, Geumgok-ro, Hwaseong-si, Gyeonggi-do, 18511, Republic of Korea (Tel: +82-31-323-6070 / Fax: +82-31-323-6071)	Report No.: NW2410-F001-1 Page (1) / (25)	NCT

1. **Client**
   - ○ Name : CMITECH Co.,Ltd.
   - ○ Address : 4th floor office#417-419, 136, LS-ro, Dongan-gu, Anyang-si Gyeonggi-do Republic of Korea 14118
   - ○ Date of Receipt : 2024-08-28

2. **Use of Report :** FCC Approval

3. **Test Sample**
   - ○ Description / Model : IRIS CAMERA / EF-70-PI
   - ○ FCC ID : 2AJY5-EF-70-PI

4. **Place of Test :** ■ Fixed test □ Field test
   (Address:211-71, Geumgok-ro, Hwaseong-si, Gyeonggi-do, 18511, Republic of Korea)

5. **Date of Test :** 2024-09-05 ~ 2024-11-01

6. **Test method used :** FCC Part 15 Subpart C 15.225

7. **Testing Environment :**
   - ○ Temperature: (25 ± 5) °C, Humidity: Less than 75 % R.H.
   - * Unless specified otherwise in the individual methods, the tests were conducted on ambient conditions.

8. **Test Results :** Refer to the test results

The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
This Test Report cannot be reproduced, except in full
This test report is not related to KOLAS recognition and RRA designation.

Affirmation	**Tested by** Jiwon, Hong (signature)	**Technical Manager** Il-shin, Kim (signature)

Nov 01, 2024

NCT CO., LTD. (seal)

Contact us at report@nct.re.kr to confirm the authenticity of this report

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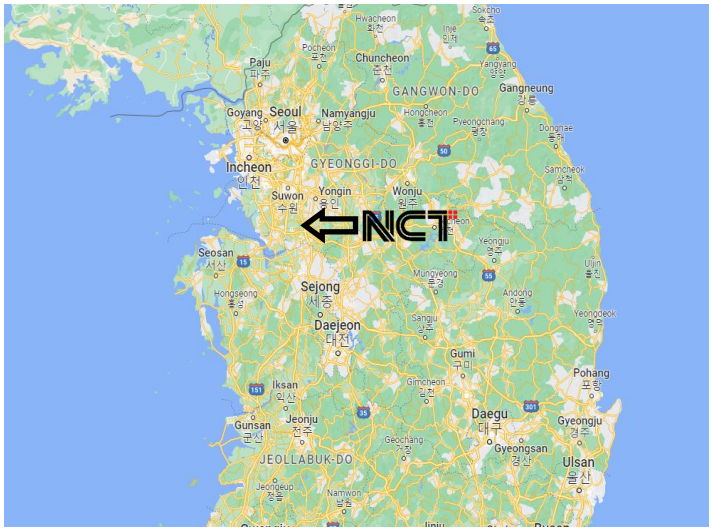
1. General Information's

1.1 Test Performed

Laboratory	:	NCT Co., Ltd.
Address	:	211-71, Geumgok-ro, Hwaseong-si, Gyeonggi-do, 18511, Korea
Telephone	:	+82-31-323-6070
Facsimile	:	+82-31-323-6071
FCC Designation No.	:	KR0166
FCC Registration Number	:	409631

1.2 Site Map



2. Information's about Test Item

2.1 Applicant Information

Company name	:	CMITECH Co.,Ltd.
Address	:	4th floor office#417-419, 136, LS-ro, Dongan-gu, Anyang-si Gyeonggi-do Republic of Korea 14118
Telephone	:	+82-70-8633-8459
Facsimile	:	+82-31-624-4490

2.2 Equipment Information

Equipment description	IRIS CAMERA
Model and/or type reference	EF-70-PI
Additional model name[see section 2.4]	EF-70-P, EF-70-I, FXT, EF-70
Serial number	Prototype
EUT condition	Pre-production, not damaged
Number of channels	13.56 MHz RFID: 1 ch
Modulation type	13.56 MHz RFID: ASK
EUT power source	DC 15.0 V(Adaptor) / DC 48.0 V(PoE)
Hardware version	V 1.0
Software version	V 1.00
Test software name(version)	-

2.3 Antenna Information

Type	Model name	Gain	Note.
PCB Loop Antenna	-	-	for RFID

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2.4 Model different description

Model Name		Difference
Basic Model	EF-70-PI	Include BLE/NFC/USIM/POE/HID HW License
Family Model ①	EF-70-P	Include BLE/NFC/USIM/POE Exclude HID HW License
Family Model ②	EF-70-I	Include BLE/NFC/USIM/HID HW License Exclude POE
Family Model ③	FXT	Eye Lock OEM Model It is identical to the EF-70-I model
Family Model ④	EF-70	Include BLE/NFC/USIM Exclude POE/HID HW License

2.5 Tested Frequency

RFID	Low frequency	Middle frequency	High frequency
Frequency (MHz)	-	13.56	-

3. Test Report

3.1 Test Summary

Applied	Test Items	Clause	Test Condition	Result
☒	Antenna Requirement	15.203	-	C
☒	20 dB Bandwidth	2.1049	Radiated	C
☒	In-Band Emissions (13.553 – 13.567 MHz)	15.225(a)		C
☒	In-Band Emissions (13.410 – 13.553 MHz, 13.567 – 13.710 MHz)	15.225(b)		C
☒	In-Band Emissions (13.110 – 13.410 MHz, 13.710 – 14.010 MHz)	15.225(c)		C
☒	Out-of-Band Emissions	15.225(d) 15.209		C
☒	Frequency Stability	15.225(e)	Temp & Humid Test Chamber	C
☒	Conducted Emissions	15.207	AC Line Conducted	C

Note 1: C=Complies NC=Not Complies NT=Not Tested NA=Not Applicable

Note 2: This test item was performed in each axis and the worst case data was reported.

The sample was tested according to the following specification: ANSI C63.10:2020

Compliance was determined by specification limits of the applicable standard according to customer requirements.

3.2 Test Report Version

Test Report No.	Date	Description
NW2410-F001	2024-10-28	Initial issue
NW2410-F001-1	2024-11-01	Add 3.3.5 Conducted Emission Test Result

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3.3 Transmitter Requirements

3.3.1 Antenna Requirement

Accoding to §15.203 An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

Accoding to §15.247(b)(4) e conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

3.3.1.1 Result

Complies
(The transmitter has a PCB Loop Antenna)

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3.3.2 20 dB Bandwidth

3.3.2.1 Test Setup

Refer to the APPENDIX I.

3.3.2.2 Limit

N/A

3.3.2.3 Test Procedure

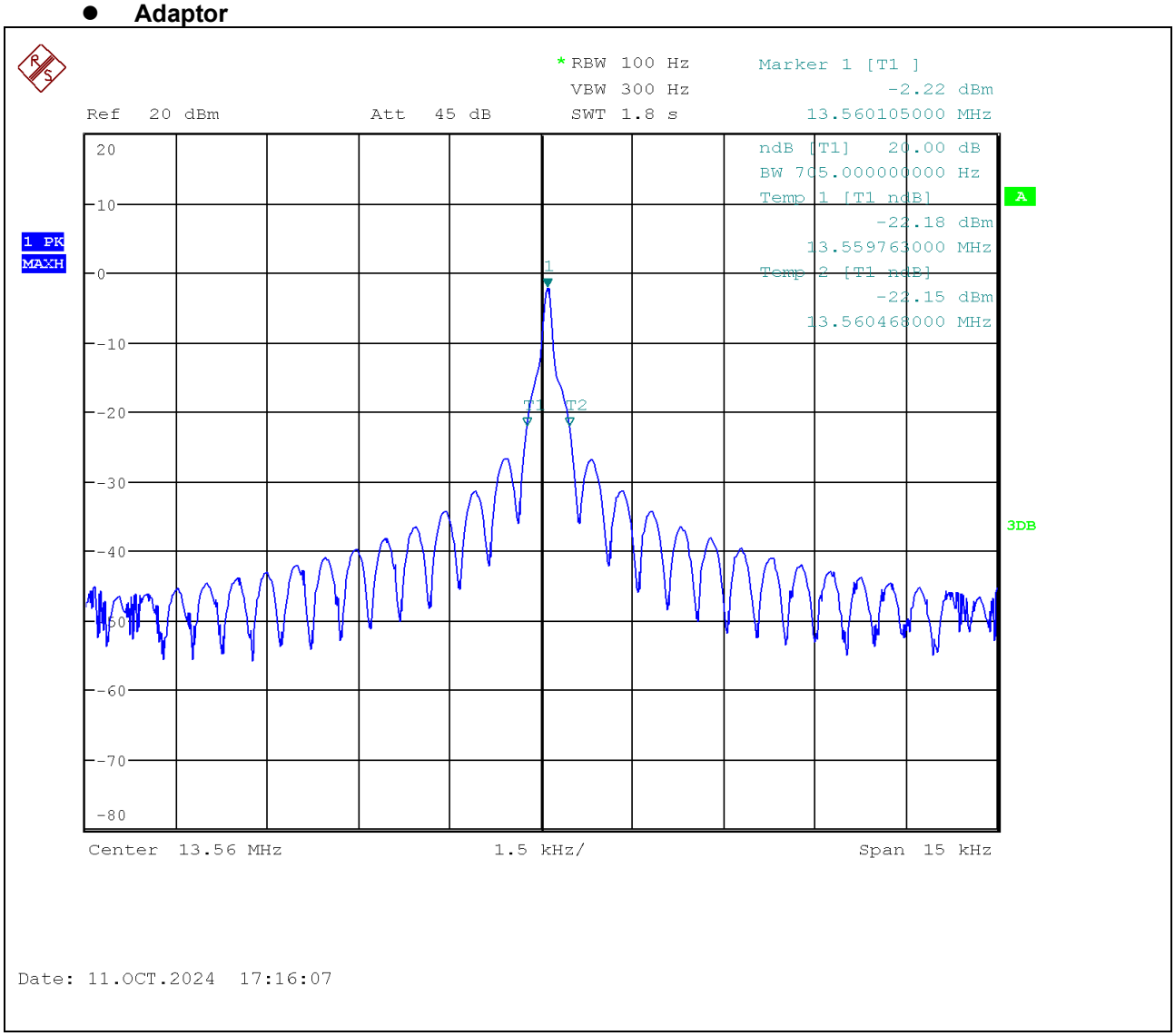
1. The 20 dB Bandwidth is measured with a spectrum analyzer connected via a receive antenna placed near the EUT while the EUT is operating in transmission mode.

2. Spectrum analyzer setting use following test procedure
   RBW = 1 % ~ 5 % OBW
   VBW ≥ 3 × RBW
   Span = Span = 2 ~ 5 times the OBW
   Sweep = Auto
   Detector = Peak
   Trace = Max hold
3. The trace was allowed to stabilize
4. Determine the reference value = Set the spectrum analyzer marker to the highest level of the displayed trace
5. Using the marker-delta function of the instrument, determine the "−xx dB down amplitude" using [(reference value) − xx].
6. Reset the marker-delta function and move the marker to the other side of the emission until the delta marker amplitude is at the same level as the reference marker amplitude. The marker-delta frequency reading at this point is the specified emission bandwidth.

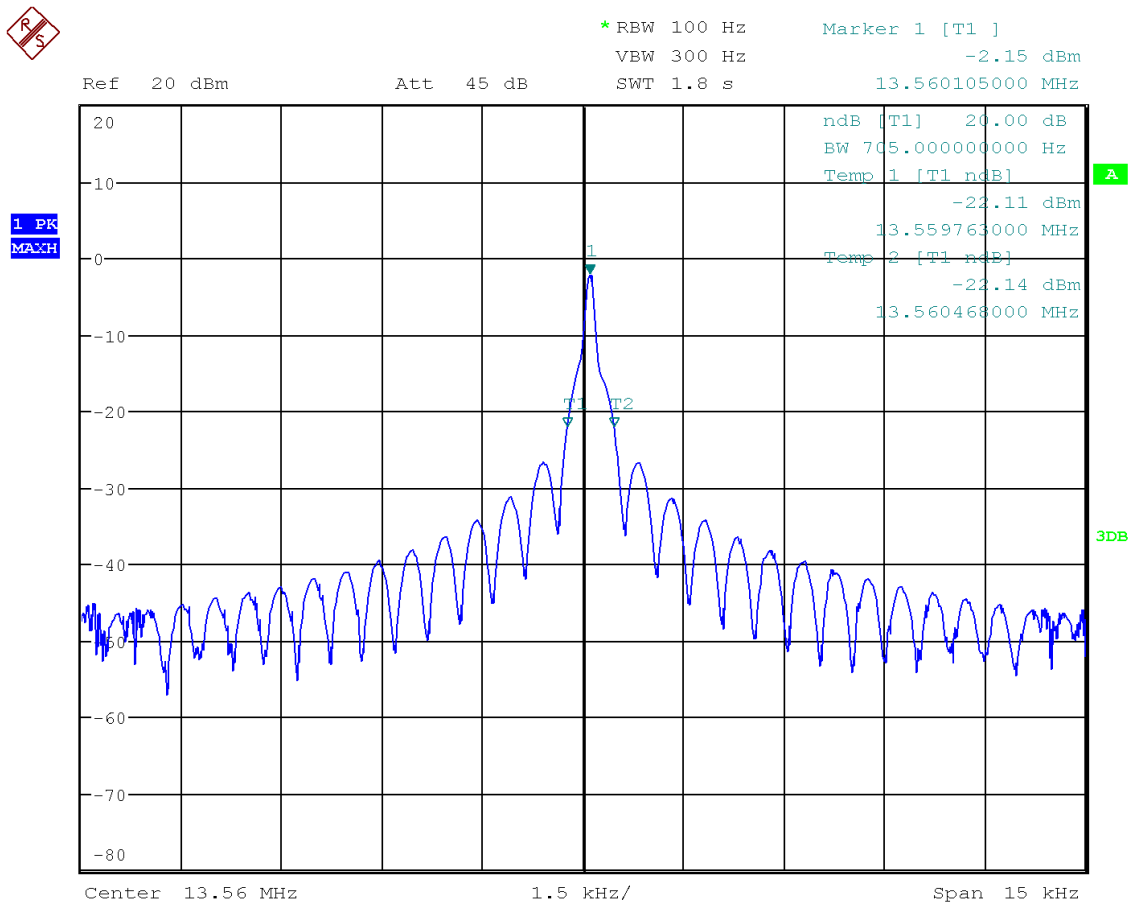
3.3.2.4 Test Result

- Measurement Data: Complies

- **Adaptor**



- **PoE**



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3.3.3 In-band Fundamental Emission, In-band and Out-band Spurious Emission

3.3.3.1 Test Setup

Refer to the APPENDIX I.

3.3.3.2 Limit

In-band Emission :

Frequency Band (MHz)	Limit at 30 m measurement distance	
	(μV/m)	(dBμV/m)
13.553-13.567	15.848	84.00
13.410-13.553 **13.567-13.710**	334	50.47
13.110-13.410 **13.710-14.010**	106	40.51

Part 15.209, 225(d)

FCC Part 15.209(a):

Frequency (MHz)	Limit (uV/m)	Measurement Distance (meter)
0.009 ~ 0.490	2400/F (kHz)	300
0.490 ~ 1705	24000/F (kHz)	30
1705 ~ 30.0	30	30
30 ~ 88	100 **	3
88 ~ 216	150 **	3
216 ~ 960	200 **	3
Above 960	500	3

** Except as provided in 15.209(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.

3.3.3.3 Test Procedure

The radiated emission was tested according to the section 6.4 of the ANSI C63.10-

The EUT was placed on a 0.8 m high non-conductive table and it was placed at 3m distance from the antenna.
Measurements were performed for each of the three antenna orientations. (ie. parallel, perpendicular, and ground-parallel)
Also, measurements were performed with the EUT oriented in 3 orthogonal axis and rotated 360 degrees to determine worst-case orientation for maximum emissions.

The EUT was tested from 9 kHz up to the 1 GHz excluding the band 13.110-14.010 MHz.
For measurements below 30MHz were performed for each of the three antenna orientations.(ie. parallel, perpendicular, and ground-parallel)
For measurements above 30MHz were performed for each of the both horizontal and vertical polarizations.

RBW = As specified in below table
VBW ≥ 3 x RBW
Sweep = Auto
Detector = Peak
Trace mode = Max Hold until the trace stabilizes.

Frequency	RBW
9-150 kHz	200-300 Hz
0.15-30 MHz	9-10 kHz
30-1000 MHz	100-120 kHz
>1 000 MHz	1 MHz

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3.3.3.4 Test Result

- Test Frequency: **13.56** MHz
- Test Mode: 9 kHz ~ 30 MHz
- Measurement Distance: **3 m**

- **Adaptor**

Frequency [MHz]	Detector	Note	Pol [V/H]	Reading [dBuV]	Factor [dB]	Result at 3m [dBuV/m]	Result at 30m [dBuV/m]	Limit at 30m [dBuV/m]	Margin [dB]
0.815 7	QP	S	P	16.39	20.40	36.79	-3.21	29.37	32.58
1.648 5	QP	S	V	10.24	20.40	30.64	-9.36	23.26	32.62
13.560 5	QP	F	P	35.42	20.80	56.22	16.22	84.00	67.78
13.559 2	QP	F	V	28.57	20.80	49.37	9.37	84.00	74.63

- **PoE**

Frequency [MHz]	Detector	Note	Pol [V/H]	Reading [dBuV]	Factor [dB]	Result at 3m [dBuV/m]	Result at 30m [dBuV/m]	Limit at 30m [dBuV/m]	Margin [dB]
0.812 7	QP	S	P	16.89	20.40	37.29	-2.71	29.41	32.12
1.624 6	QP	S	V	9.17	20.40	29.57	-10.43	23.39	33.82
13.559 9	QP	F	P	35.19	20.8	55.99	15.99	84.00	68.01
13.560 5	QP	F	V	31.07	20.8	51.87	11.87	84.00	72.13

Note 1: Loop antenna orientation
"P": Parallel, "V": Perpendicular, "G": Ground-parallel
Note 2: "F" : Fundamental, "S" : Spurious
Note 3: According to §15.31 (f)(2);
Result at 30m[dBμV/m] = Result at 3m[dBμV/m] - 40*log(30/3)[dBμV/m]
Result at 300m[dBμV/m] = Result at 3m[dBμV/m] - 40*log(300/3)[dBμV/m]
Note 4: Sample Calculation.
Margin = Limit – Result at 30m / Result at 3m : Reading + Ant factor + Cable loss
Factor = Ant factor + Cable loss

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3.3.3.5 Test Result

- Test Frequency: **13.56** MHz
- Test Mode: 30 MHz ~ 1 GHz
- Measurement Distance: **3 m**

- **Adaptor**

Frequency [MHz]	Detector	Note	Pol [V/H]	Reading [dBuV]	Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]
40.670	QP	S	V	59.69	-23.10	36.59	40.00	3.41
54.250	QP	S	V	59.42	-23.30	36.12	40.00	3.88
176.276	QP	S	H	62.58	-24.80	37.78	43.50	5.72
296.944	QP	S	H	60.66	-23.00	37.66	46.00	8.34

- **PoE**

Frequency [MHz]	Detector	Note	Pol [V/H]	Reading [dBuV]	Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]
40.670	QP	S	V	58.35	-23.10	35.25	40.00	4.75
54.153	QP	S	V	47.62	-23.30	24.32	40.00	15.68
176.276	QP	S	H	62.45	-24.80	37.65	43.50	5.85
728.982	QP	S	V	53.09	-13.30	39.79	46.00	6.21

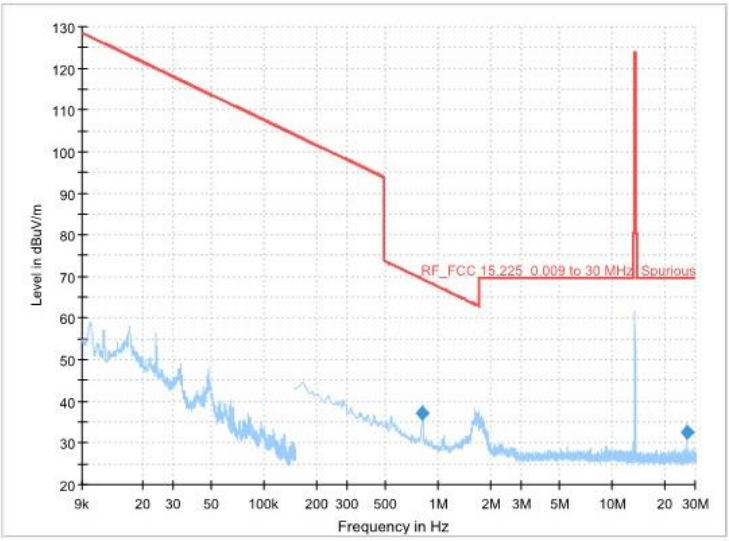
Note 1: The radiated emissions were inverstigated 9 kHz to 1 ㎓. And no other spurious and harmonic emissions were found above listed frequencies.

Note 2: Bilog antenna polarization (above 30 MHz)
"H": Horizontal, "V": Vertical

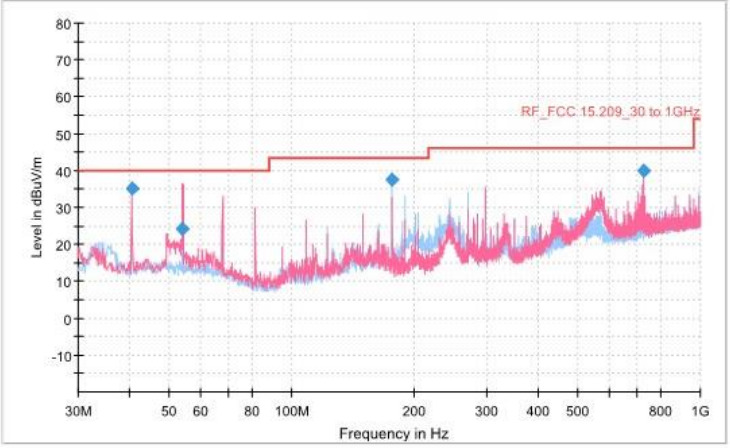
Note 3: Sample Calculation.
Margin = Limit – Result
Result = Reading + Factor
Factor = Cable loss - Amp gain + Ant factor

3.3.3.6 Test Plot

-Below 30 MHz_Worst case



-Below 1 GHz_Worst case



3.3.4 Frequency Stability

3.3.4.1 Limit

The frequency tolerance of the carrier signal shall be maintained within ±0.01 % of the operating frequency.

3.3.4.2 Test Procedure

Part 15.225 requires that devices operating in the 13.553 – 13.567 MHz shall maintain the carrier frequency within 0.01 % of the operating frequency over the temperature variation of -20 degrees to + 50 degrees C at normal supply voltage.

3.3.4.3 Test Result

- **Adaptor**

Voltage		Temp	Frequency	Deviation	
(%)	(Vdc)	(℃)	(Hz)	(Hz)	(%)
100	15.00	-20	13 560 365	365	0.002 7
100		-10	13 560 343	343	0.002 5
100		0	13 560 320	320	0.002 4
100		10	13 560 291	291	0.002 1
100		+20	13 560 092	92	0.000 7
100		30	13 560 127	127	0.000 9
100		40	13 560 105	105	0.000 8
100		50	13 560 059	59	0.000 4
115	17.25	20	13 560 090	90	0.000 7
85	12.75	20	13 560 089	89	0.000 7

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- **PoE**

Voltage		Temp	Frequency	Deviation	
(%)	(Vdc)	(℃)	(Hz)	(Hz)	(%)
100	48.00	-20	13 560 366	366	0.002 7
100		-10	13 560 347	347	0.002 6
100		0	13 560 324	324	0.002 4
100		10	13 560 278	278	0.002 1
100		+20	13 560 170	170	0.001 3
100		30	13 560 124	124	0.000 9
100		40	13 560 121	121	0.000 9
100		50	13 560 058	58	0.000 4
115	55.20	20	13 560 132	132	0.001 0
85	40.80	20	13 560 143	143	0.001 1

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3.3.5 Conducted Emission

3.3.5.1 Test Setup

See test photographs for the actual connections between EUT and support equipment.

3.3.5.2 Limit

According to §15.207(a) for an intentional radiator that 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 the limits in the following table, as measured using a 50 uH/50 ohm line impedance stabilization network (LISN).
Compliance with the provision of this paragraph shall on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower applies at the boundary between the frequency ranges.

Frequency Range (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	**Average**
0.15 ~ 0.5	66 to 56 *	56 to 46 *
0.5 ~ 5	56	46
5 ~ 30	60	50

* Decreases with the logarithm of the frequency

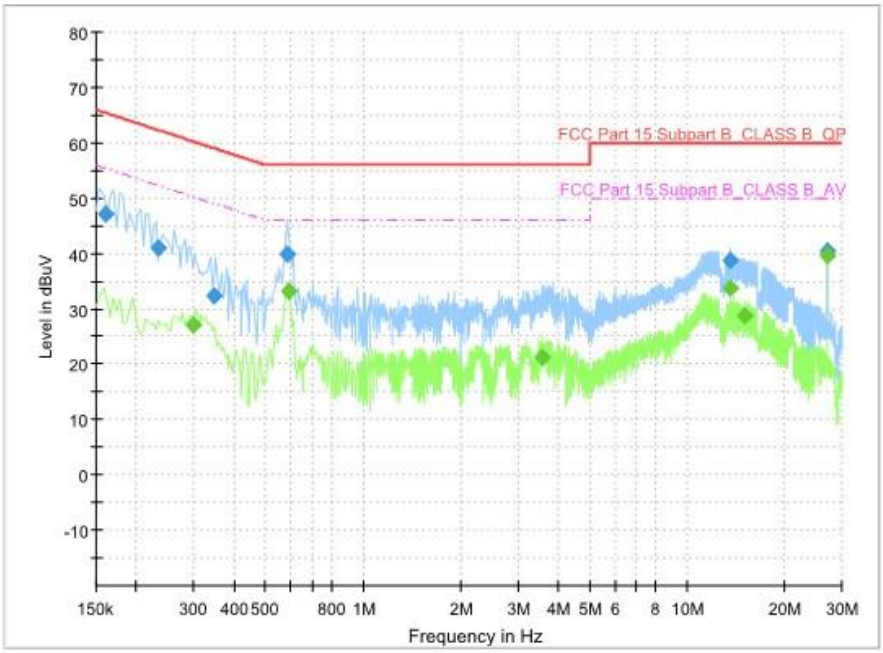
3.3.5.3 Test Procedure

Conducted emissions from the EUT were measured according to the ANSI C63.10.

1. The test procedure is performed in a 6.5 m × 3.5 m × 3.5 m (L × W × H) shielded room. The EUT along with its peripherals were placed on a 1.0 m (W) × 1.5 m (L) and 0.8 m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane.
2. The EUT was connected to power mains through a line impedance stabilization network (LISN) which provides 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room.
3. All peripherals were connected to the second LISN and the chassis ground also bounded to the horizontal ground plane of shielded room.
4. The excess power cable between the EUT and the LISN was bundled. The power cables of peripherals were unbundled. All connecting cables of EUT and peripherals were moved to find the maximum emission.

3.3.5.4 Test Result

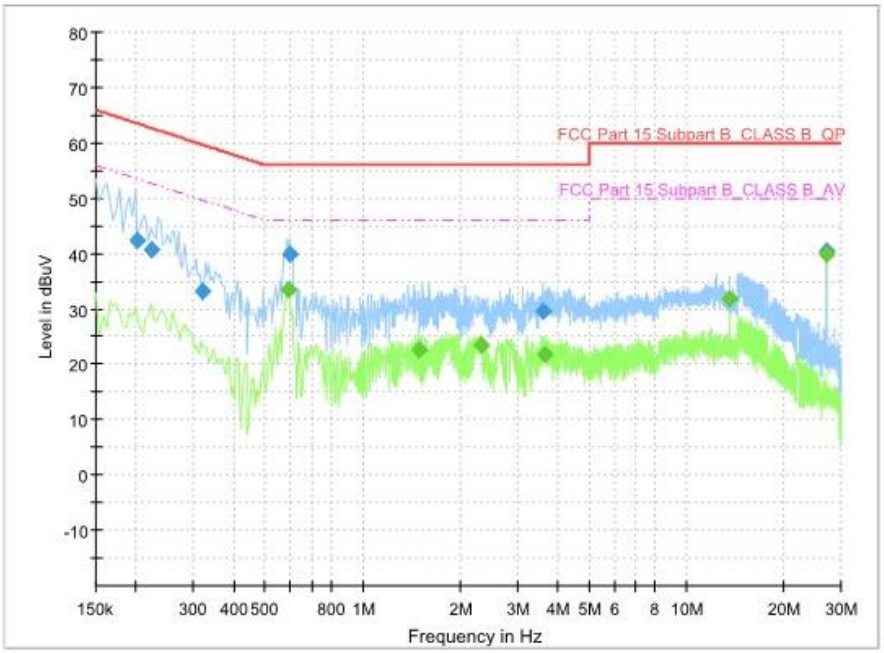
-LINE



Final Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.160000	47.12	---	65.46	18.34	1000.0	9.000	L1	9.8
0.232000	41.02	---	62.38	21.36	1000.0	9.000	L1	9.8
0.300000	---	26.99	50.24	23.25	1000.0	9.000	L1	9.8
0.348000	32.44	---	59.01	26.57	1000.0	9.000	L1	9.8
0.584000	39.92	---	56.00	16.08	1000.0	9.000	L1	10.0
0.590000	---	33.25	46.00	12.75	1000.0	9.000	L1	10.0
3.556000	---	21.17	46.00	24.83	1000.0	9.000	L1	10.2
13.560000	---	33.86	50.00	16.14	1000.0	9.000	L1	10.7
13.560000	38.69	---	60.00	21.31	1000.0	9.000	L1	10.7
14.966000	---	28.76	50.00	21.24	1000.0	9.000	L1	10.7
27.120000	---	39.74	50.00	10.26	1000.0	9.000	L1	11.0
27.120000	40.57	---	60.00	19.43	1000.0	9.000	L1	11.0

-NEUTRAL



Final Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.202000	42.52	---	63.53	21.01	1000.0	9.000	N	9.8
0.224000	40.66	---	62.67	22.01	1000.0	9.000	N	9.8
0.320000	33.25	---	59.71	26.46	1000.0	9.000	N	9.8
0.592000	---	33.41	46.00	12.59	1000.0	9.000	N	10.0
0.596000	39.94	---	56.00	16.06	1000.0	9.000	N	10.0
1.488000	---	22.66	46.00	23.34	1000.0	9.000	N	10.2
2.316000	---	23.49	46.00	22.51	1000.0	9.000	N	10.1
3.628000	29.67	---	56.00	26.33	1000.0	9.000	N	10.1
3.670000	---	21.82	46.00	24.18	1000.0	9.000	N	10.1
13.560000	---	31.89	50.00	18.11	1000.0	9.000	N	10.6
27.120000	---	40.02	50.00	9.98	1000.0	9.000	N	11.0
27.120000	40.43	---	60.00	19.57	1000.0	9.000	N	11.0

APPENDIX I

TEST SETUP

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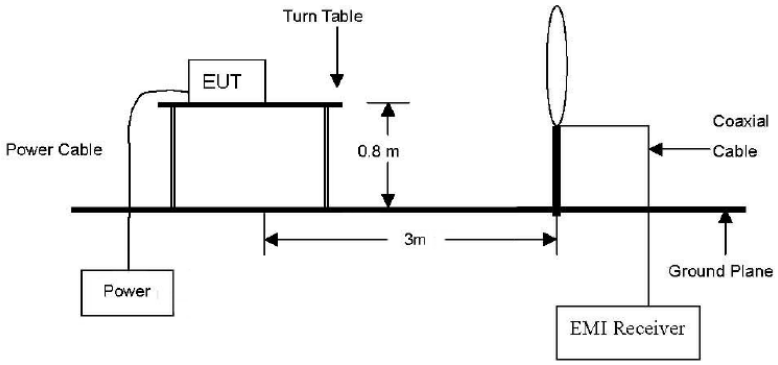
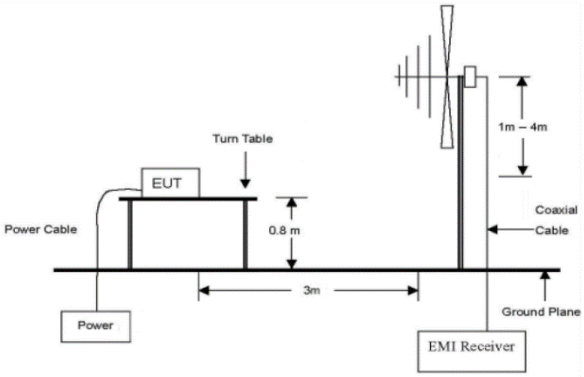
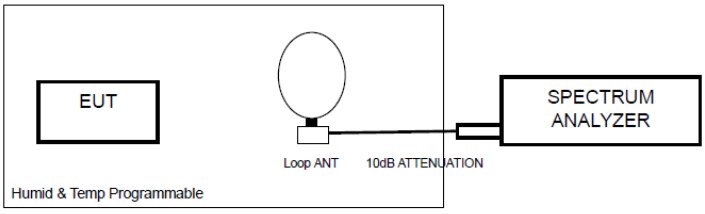
- Radiated Measurement

below 30 MHz	
below 1 ㎓	

- Temp & Humid Chamber Measurement

Frequency Stability	

APPENDIX II

TEST EQUIPMENT USED FOR TESTS

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	Description	Manufacturer	Serial No.	Model No.	Cal. Date	Next Cal. Date
1	SPECTRUM ANALYZER	R&S	100250	FSU26	2024-07-17	2025-07-17
2	Triple Output DC Power Supply	Agilent	MY40038816	E3631A	2024-02-27	2025-02-27
3	DC power supply	KIKUSUI	MH002327	PWR400L	2024-03-07	2025-03-07
4	Bench-top Type Temperature & Humidity Chamber	ESPEC	92006813	SH-241	2024-07-18	2025-07-18
5	Vector SG	R&S	255563	SMBV100A	2024-02-27	2025-02-27
6	8360B SERIES SWEPT SIGNAL GENERATOR	HP	3614A00312	83640B	2024-07-17	2025-07-17
7	Humi./Baro/Temp. data recorder	Lutron	89503	MHB-382SD	2024-07-22	2025-07-22
8	TRILOG Broadband Antenna	Schwarzbeck	01027	VULB 9168	2023-05-23	2025-05-23
9	TRILOG Broadband Antenna	Schwarzbeck	01029	VULB 9168	2023-05-03	2025-05-03
10	Double Ridged Broadband Horn Antenna	Schwarzbeck	02087	BBHA 9120 D	2024-04-24	2025-04-24
11	Double Ridged Broadband Horn Antenna	Schwarzbeck	02086	BBHA 9120 D	2024-05-24	2025-05-24
12	Broadband Horn Antenna	Schwarzbeck	00938	BBHA 9170	2024-05-24	2025-05-24
13	Broadband Horn Antenna	Schwarzbeck	00937	BBHA 9170	2024-05-24	2025-05-24
14	LOOP-ANTENNA	Schwarzbeck	00124	FMZB1519 B	2023-05-25	2025-05-25
15	Amplifier	TESTEK	190008-L	TK-PA1840H	2024-05-04	2025-05-04
16	Amplifier	TESTEK	190007-L	TK-PA18H	2024-05-21	2025-05-22
17	Amplifier	TESTEK	190009-L	TK-PA01S	2024-05-21	2025-05-22
18	EMI Test Receiver	ROHDE&SCHWARZ	102138	ESR	2024-05-21	2025-05-21
19	High Pass Filter	Mini-Circuits	1741	VHF-3100+	2024-07-17	2025-07-17
20	LISN	Schwarzbeck	00984	NSLK 8127	2024-05-22	2025-05-22
21	EMI Test Receiver	ROHDE&SCHWARZ	102116	ESRP3	2024-05-21	2025-05-21
22	TRUE RMS MULTIMETER	FLUKE	42120033	175	2024-02-01	2025-02-01