

Panasonic System Networks Evaluation Technology Co., Ltd. EMC Center



EMC TEST REPORT

REPORT NUMBER : ERJ13-20002R00FR

APPLICANT : Panasonic Corporation

PRODUCT : DECT repeater

MODEL NUMBER : KX-A407

STANDARD : FCC Rules and Regulations Part 15
Subpart B - Unintentional Radiators
ICES-003 Issue 6

Issue Date: January 27, 2020

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The test results only relate to the items tested.

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SECTION 1. GENERAL INFORMATION

1.1 Testing Laboratory

Name:	Panasonic System Networks Evaluation Technology Co., Ltd. EMC Center
Address:	1-62, 4-chome, Minoshima Hakata-ku, Fukuoka 812-8531, Japan
TEL:	092-477-3267 (+81-92-477-3267)
FAX:	092-477-1587 (+81-92-477-1587)
Test Site	Panasonic System Networks Evaluation Technology Co., Ltd. Fukuoka Site
Address:	1-62, 4-chome, Minoshima Hakata-ku, Fukuoka 812-8531, Japan

1.2 Detail of Applicant

Name:	Panasonic Corporation
Address:	1-62, 4-chome, Minoshima Hakata-ku, Fukuoka 812-8531, Japan
TEL:	050-3380-2671(+81-50-3380-2671)

1.3 Information about Test Item

Kind of Test Item:	DECT repeater
Model Number:	KX-A407
Trade Mark:	Panasonic
Type of Test Item:	Table-top, Wall hanging
Condition of Test Item:	Pre-Production
Serial Number:	S11CA000001
Rated Voltage/Frequency:	AC 120 V / 60 Hz (★)
Highest frequency (Note 1):	600 MHz (★)
Test Item Received Date:	January 8, 2020
Test Date:	January 14, 2020

Note 1: Highest frequency generated or used in the devices on which the device operates or tunes.

1.4 Regulation

Emission:	47 CFR Part 15 - Digital Devices Subpart A - General Subpart B - Unintentional Radiators (Class B) ICES-003 Issue 6 Section 6 Class B
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1.5 Test Procedure

General:	PSNET-EMC Procedure (EDC02), ANSI C63.4-2014 Section 6
ITE Measurement:	PSNET Procedure (EDX34), ANSI C63.4-2014 Section 11
Radiated Emission:	PSNET Procedure (EDX01,EDY01/02), ANSI C63.4-2014 Section 8 PSNET Procedure (EDX39), ICES-003 Issue 6 Section 3 (b), Section 5 (a)(ii), Section 5 (b)(ii)
Conducted Emission	PSNET Procedure (EDX02, EDY03), ANSI C63.4-2014 Section 7 PSNET Procedure (EDX39), ICES-003 Issue 6 Section 3 (b), Section 5 (a)(ii)

1.6 Notes

The results in this report apply only to the sample(s) tested.

The instruments used for the measurements were traceable to the national standards and foreign national standards laboratories.

The laboratory does not assume responsibility for the test results obtained from the Information provided by customers that may affect the validity of the test results. Those information are marked with (★) mark.

January 27, 2020

SECTION 2. SUMMARY OF RESULTS

2.1 General Remarks

The EUT under the test configuration (as shown section 4) was tested according to the requirements of the Regulation as shown section 1.4.

The worst margin of test results was as follows:

Test Item	Worst Margin	Frequency	Polarity	Detector	Reference
Radiated Emission 30 MHz - 1000 MHz	21.9 dB	56.775 MHz	Vertical	Quasi-peak	Page 5
Radiated Emission 1 GHz - 6 GHz	19.9 dB	3784.341 MHz	Vertical	Average	Page 6
	22.4 dB	3784.341 MHz	Vertical	Peak	Page 6
Conducted Emission	21.8 dB	0.37049 MHz	---	Quasi-peak	Page 7
	16.0 dB	0.37049 MHz	---	Average	Page 7

*Used Test Site up to 1 GHz:

■ Fukuoka No.1 Site (D=1.5 m Turn Table), □ ADOX No.2 Site (D=3.0 m Turn Table)

■ Measurement Distance 3.0 m, □ ADOX Site, Class A, Measurement Distance 10 m

*Used Test Site above 1 GHz:

■ Fukuoka No.1 Site (D=1.5 m Turn Table), □ ADOX No.2 Site (D=3.0 m Turn Table)

■ Measurement Distance 3.0 m

2.2 Final Judgment

The EUT fulfills the test requirements of the regulation as shown section 1.4.

2.3 Uncertainty

The measurements uncertainty, at time of test, and at least 95 % confidence, was estimated to be as follows:

Radiated Emission Measurements: +/- 3.84 dB (3 m) [30 MHz - 300 MHz],
 +/- 4.66 dB (3 m) [300 MHz - 1000 MHz]
 +/- 4.72 dB (3 m) [1 GHz - 6 GHz]

Conducted Emission Measurements: +/-2.38 dB [0.15 MHz - 30 MHz]

SECTION 3. TEST RESULTS

3.1 Radiated Emission 30 MHz - 1000 MHz

Model Name : DECT repeater
 Model No. : KX-A407
 Serial No. : S11CA000001
 Operator : S. Kitajima
 Points : 6
 Detector : QP
 RBW : 120 kHz

Test condition of instruments

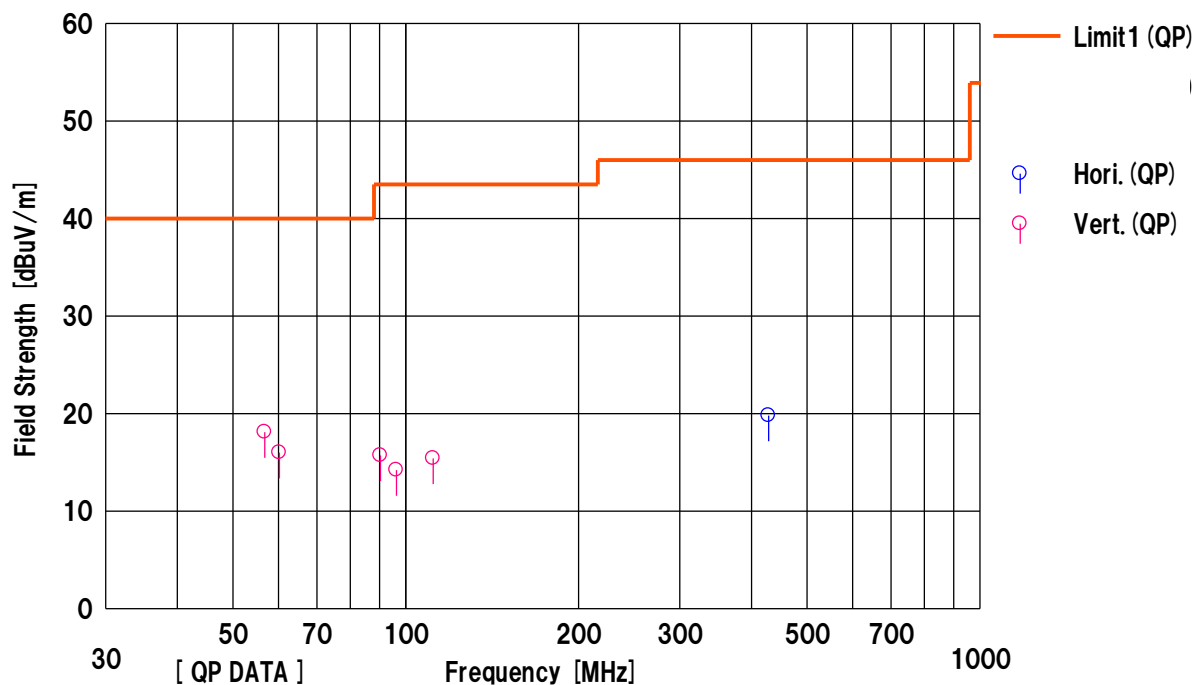
Date : 2020/01/14
 Temperature : 20 degree C
 Humidity : 34 % 1022 hPa
 EUT Warm-up Time : 30 minutes
 Distance : 3 m
 Test Mode : Link mode
 Comment : AC 120 V / 60 Hz

The measurement was conducted in the condition where maximum emission was detected by the preliminary test.

Level=Emission Level=Meter Reading+ Factor (Antenna + Cable + Preamp)

LIMIT: FCC Part 15 Class B (3 m)

: ICES-003 Class B (3 m)



Frequency [MHz]	Meter Reading (QP) [dBuV]	Antenna (Factor) [dB/m]	Cable Loss [dB]	Pre-AMP Gain [dB]	Result (QP) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	pola	Height [cm]	Angle [deg]
428.546	24.8	19.9	3.6	28.5	19.8	46.0	26.2	Hori.	100	321
56.775	30.5	14.8	1.1	28.3	18.1	40.0	21.9	Vert.	100	119
60.228	29.4	13.7	1.2	28.3	16.0	40.0	24.0	Vert.	100	0
90.361	27.9	14.5	1.5	28.2	15.7	43.5	27.8	Vert.	100	156
96.314	25.3	15.6	1.5	28.2	14.2	43.5	29.3	Vert.	100	360
111.583	24.0	17.9	1.6	28.1	15.4	43.5	28.1	Vert.	111	32

3.2 Radiated Emission 1 GHz - 6 GHz

Model Name : DECT repeater
 Model No. : KX-A407
 Serial No. : S11CA000001
 Operator : S. Kitajima
 Points : 7
 Detector : PK/AV
 RBW : 1 MHz

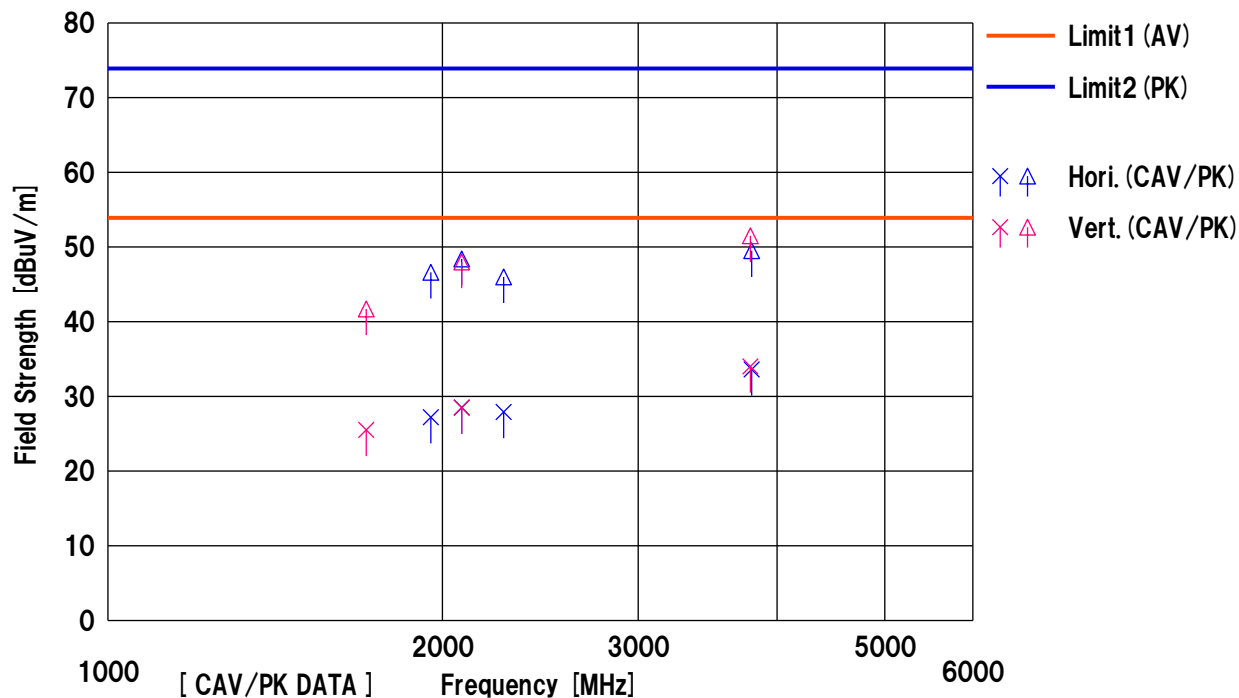
Test condition of instruments
 Date : 2020/01/14
 Temperature : 20 degree C
 Humidity : 34 % 1022 hPa
 EUT Warm-up Time : 30 minutes
 Distance : 3 m
 Test Mode : Link mode
 Comment : AC 120 V / 60 Hz

The measurement was conducted in the condition where maximum emission was detected by the preliminary test.

Level=Emission Level=Meter Reading+ Factor (Antenna + Cable + Preamp)

LIMIT: FCC Part 15 Class B (3 m)

: ICES-003 Class B (3 m)



Frequency [MHz]	Meter Reading		Factor				Result		Limit		Margin		Pola.	Height [cm]	Angle [deg]
	(AV) [dBuV]	(PK) [dBuV]	Antenna [dB/m]	Loss [dB]	Gain [dB]	D	(AV) [dBuV/m]	(PK) [dBuV/m]	(AV) [dBuV/m]	(PK) [dBuV/m]	(AV) [dB]	(PK) [dB]			
1952.658	38.2	57.6	27.4	7.7	48.0	1.9	27.2	46.6	53.9	73.9	26.7	27.3	Hori.	284	276
2081.383	38.9	58.8	27.6	8.0	47.9	1.9	28.5	48.4	53.9	73.9	25.4	25.5	Hori.	100	276
2270.599	37.8	55.9	27.7	8.3	47.8	1.9	27.9	46.0	53.9	73.9	26.0	27.9	Hori.	151	275
3794.718	35.5	51.4	32.3	11.0	47.1	1.9	33.6	49.5	53.9	73.9	20.3	24.4	Hori.	147	252
1707.627	38.5	54.7	26.0	7.2	48.1	1.9	25.5	41.7	53.9	73.9	28.4	32.2	Vert.	112	332
2081.384	38.9	58.4	27.6	8.0	47.9	1.9	28.5	48.0	53.9	73.9	25.4	25.9	Vert.	100	244
3784.341	36.0	53.5	32.2	11.0	47.1	1.9	34.0	51.5	53.9	73.9	19.9	22.4	Vert.	100	228

D: Distance Factor

3.3 Conducted Emission

Model Name : DECT repeater
 Model No. : KX-A407
 Serial No. : S11CA000001
 Operator : S. Kitajima
 Points : 12
 Detector : QP/AV
 RBW : 9 kHz

Test condition of instruments

Date : 2020/01/14
 Temperature : 20 degree C
 Humidity : 29 % 1023 hPa
 EUT Warm-up Time : 30 minutes

Test Mode : Link mode

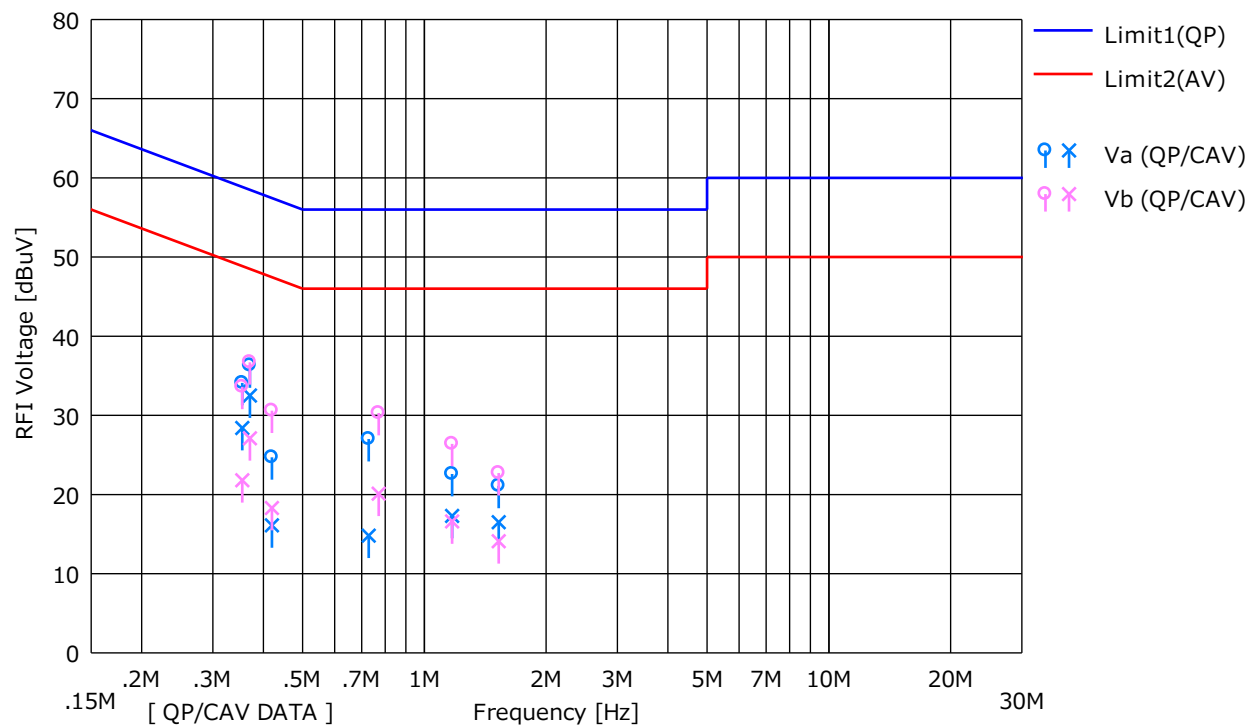
Comment : AC 120 V / 60 Hz

The measurement was conducted in the condition where maximum emission was detected by the preliminary test.

Level=Emission Level=Meter Reading+ Factor (Cable + LISN)

Limit: FCC Part 15 Class B (QP), ICES-003 Class B (QP),

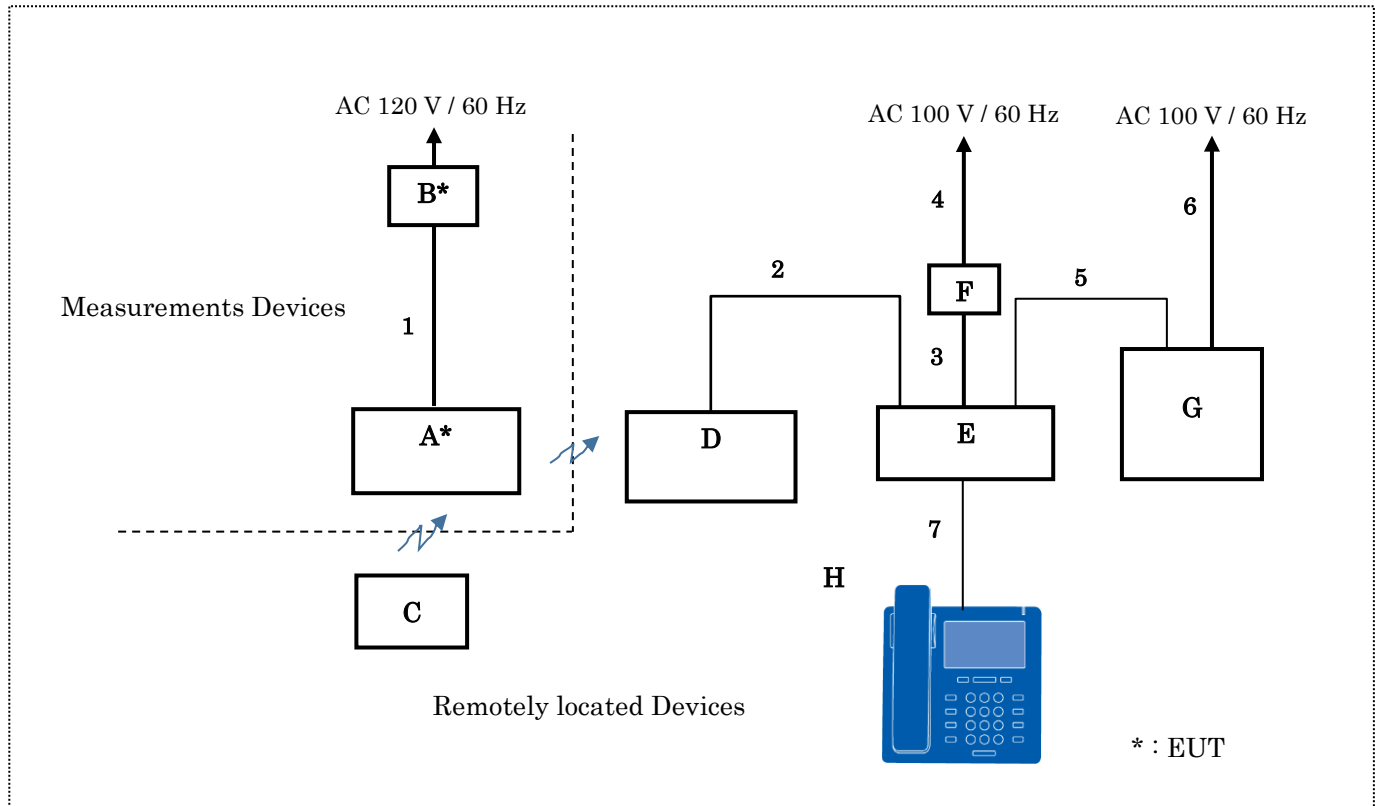
Limit: FCC Part 15 Class B (AV), ICES-003 Class B (AV)



Frequency [MHz]	Line	Meter Reading (QP) [dBuV]	Meter Reading (AV) [dBuV]	Factor [dB]	Result (QP) [dBuV]	Result (AV) [dBuV]	Limit (QP) [dBuV]	Limit (AV) [dBuV]	Margin (QP) [dB]	Margin (AV) [dB]
0.35474	Va	23.5	17.8	10.6	34.1	28.4	58.9	48.9	24.8	20.5
0.37049	Va	25.7	21.9	10.6	36.3	32.5	58.5	48.5	22.2	16.0
0.41999	Va	14.1	5.5	10.6	24.7	16.1	57.4	47.4	32.7	31.3
0.72822	Va	16.3	4.1	10.7	27.0	14.8	56.0	46.0	29.0	31.2
1.17146	Va	11.9	6.6	10.7	22.6	17.3	56.0	46.0	33.4	28.7
1.52694	Va	10.4	5.8	10.7	21.1	16.5	56.0	46.0	34.9	29.5
0.35474	Vb	23.0	11.2	10.6	33.6	21.8	58.9	48.9	25.3	27.1
0.37049	Vb	26.1	16.5	10.6	36.7	27.1	58.5	48.5	21.8	21.4
0.41999	Vb	20.0	7.7	10.6	30.6	18.3	57.4	47.4	26.8	29.1
0.77097	Vb	19.6	9.4	10.7	30.3	20.1	56.0	46.0	25.7	25.9
1.17146	Vb	15.7	5.9	10.7	26.4	16.6	56.0	46.0	29.6	29.4
1.52694	Vb	12.0	3.4	10.7	22.7	14.1	56.0	46.0	33.3	31.9

SECTION 4. DESCRIPTION OF EUT

4.1 Construction of EUT



Symbol or number assigned to equipment or cables on this diagram is used on tables in section 4.2 and 4.3

4.2 EUT and Support Equipment Used

The EUT was supported by the following equipment during the test. Indication in the following left side column corresponds to section 4.1.

Symbol	Item	Model No.	[Manufacturer]	Serial No.	FCC ID
A	DECT repeater [EUT]	KX-A407	[Panasonic]	S11CA000001	ACJ96NKX-A407
B	AC Adapter for DECT repeater (2 Wires) [EUT]	PNLV236	[Panasonic]	---	---
C	SIP Cordless Handset	KX-TPA73	[Panasonic]	S11CA000042	ACJ96NKX-TPA73
D	Base Unit for SIP Cordless Phone	KX-TGP700	[Panasonic]	S11CA000008	ACJ96NKX-TGP700
E	Hub	GS108PEv3	[NETGEAR]	3UJ1535500F2F	---
F	AC Adaptor for Hub	AD8190LF	[NETGEAR]	3115041911031708KT	---
G	IP PBX	KX-NS1000	[Panasonic]	4EACJ002521	---
H	IP Proprietary Telephone	KX-NT630NE	[Panasonic]	S21CA000138	---

4.3 Cable(s) Used

The following cable(s) was used for the test. Indication number in the following left side column corresponds to section 4.1

No.	Name	Length	Shield/ Unshielded	Connector	Ferrite Core
1	DC Cable for Base Unit	1.8 m	Unshielded	Plastic	None
2	LAN Cable	1.0 m	Unshielded	Plastic	None
3	DC Cable for PoE Hub	1.5 m	Unshielded	Plastic	None
4	AC Cable for PoE Hub (3 Wires)	2.0 m	Unshielded	Plastic	None
5	LAN Cable	1.25 m	Unshielded	Plastic	None
6	AC Cable (3 Wires)	2.1 m	Unshielded	Plastic	None
7	LAN Cable	1.0 m	Unshielded	Plastic	None

4.4 Operating Condition(s)

The EUT was operated under the following condition during the test.

Mode S : Standby mode

Mode A : Link mode

KX-TPA73 -> KX-A407 (EUT) -> KX-TGP700 -> HUB -> KX-NS1000
-> HUB -> KX-NT630NE

4.5 Any Deviations from, Additions to or Exclusions from the Test Method

No deviation

4.6 Modifications to EUT

No modification was performed by the test laboratory during the test.

SECTION 6. TEST INSTRUMENTS LIST

6.1 Radiated Emission (30 MHz - 1000 MHz)

No.	Apparatus	Model No. (Manufacturer)	Specification	Calibration		Serial No.
				Date	Interval	
1*	Power Supply	ES2000S (NF)	50 Hz / 60 Hz 2 kVA 264 V	---	---	437064
2*	Antenna	VHA9103/BBA9106 UHALP9108-A (Schwarzbeck)	30 MHz - 300 MHz 300 MHz - 1000 MHz	2018/05/29 2018/05/29	2 years 2 years	VHA91032274 0620
3*	Pre-Amplifier	8447D (HP)	0.1 MHz - 1300 MHz	2019/12/19	1 year	2944A11033
4*	EMI Test Receiver	ESU8 (R&S)	20 Hz - 8 GHz	2019/09/25	1 year	100184
5*	Personal Computer	OptiPlex 3060 (DELL)	---	---	---	5RMS0W2
6*	Measurement Software	TEPTO-DV-RE (tsj)	---	---	---	V.2.6.0208
7*	3 dB Attenuator	CFA-01 (TME)	3 dB DC - 1 GHz	2018/05/29	2 years	EMF-683
8*	6 dB Attenuator	MP721B (Anritsu)	6 dB DC - 12 GHz	2018/05/29	2 years	M45998
9*	SW Box	NS4903N (TOYO)	---	2019/04/11	1 year	EMF-372
10*	Cables	---	30 MHz - 1000 MHz	2019/04/11	1 year	EMF-524
11*	Semi-Anechoic Chamber	3 m method (NSA) (RIKEN)	30 MHz - 1000 MHz	2019/07/28	1 year	ELF-002

* Used for final test

6.2 Radiated Emission (1 GHz - 6 GHz)

No.	Apparatus	Model No. (Manufacturer)	Specification	Calibration		Serial No.
				Date	Interval	
1*	Power Supply	ES2000S (NF)	50 Hz / 60 Hz 2 kVA 264 V	---	---	437064
2*	Antenna	3115 (EMCO)	1 GHz - 18 GHz	2019/10/16	2 years	9402-4220
3*	Pre-Amplifier	MLA-0118-J02 (HP)	1 GHz - 18 GHz	2019/11/12	1 year	19325
4*	EMI Test Receiver	ESU8 (R&S)	20 Hz - 8 GHz	2019/09/25	1 year	100184
5*	Personal Computer	OptiPlex 3060 (DELL)	---	---	---	5RMS0W2
6*	Measurement Software	TEPTO-DV-RE (tsj)	---	---	---	V.2.6.0208
7*	Absorber	PFP30 (RIKEN)	---	---	---	---
8*	Cables	SUCOFLEX 102A (HUBER+SUHNER)	1 GHz - 6 GHz	2019/02/06	1 year	EMF-587
9*	SW Box	NS4903N (TOYO)	---	2019/02/06	1 year	EMF-372
10*	Band Rejection Filter (DECT 1.9 GHz)	BRC20053 (MICRO-TRONICS)	1 GHz - 5 GHz	2019/08/23	2 years	001
11*	1.9 GHz HPF	SHP-121 (TAMAGAWA)	2.4 GHz - 10.0 GHz Fc = 1.9 GHz	2018/01/26	2 years	1006803
12*	Semi-Anechoic Chamber	3m method (Svswr) (RIKEN)	1 GHz - 6 GHz	2019/05/18	1 year	ELF-002

* Used for final test

6.3 Conducted Emission

No.	Apparatus	Model No. (Manufacturer)	Specification	Calibration		Serial No.
				Date	Interval	
1*	Power Supply	ES040ES (NF)	50 Hz / 60 Hz 4 kVA 264 V	---	---	9244357
2*	AMN	KNW-407 (Kyoritsu)	250 V / 15 A 0.15 MHz - 30 MHz	2019/10/30	2 years	8-1345-3
3*	AMN	KNW-242C (Kyoritsu)	9 kHz - 30 MHz	2018/09/05	2 years	8-1312-2
4*	Attenuator	6910.01.A (HUBER+SUHNER)	10 dB 0.15 MHz - 30 MHz	2019/10/30	2 years	EMF-050-3
5*	EMI Test Receiver	ESR26 (R&S)	9 kHz - 26.5 GHz	2019/10/30	1 year	101243
6*	Personal Computer	ProDesk 600 G2 SFF (hp)	---	---	---	JPH642HK9Q
7*	Measurement Software	TEPTO-DV/RE (tsj)	---	---	---	Ver.3.1.0029
8*	RF Fuse	MP612A (Anritsu)	---	2019/09/24	1 year	EMF-389
9*	Cable	---	0.15 MHz - 30 MHz	2019/09/24	1 year	EMF-532
10*	50 ohm Terminator	65 N-50-0-1/133 (SUHNER)	50 ohm	2019/07/30	2 years	EMF-658
11*	Shielded Room	--- (RIKEN)	0.15 MHz - 30 MHz	---	---	ELF-001

* Used for final test

SECTION 7. TEST PROCEDURE(s)

7.1 Radiated Emission

7.1.1 Measurement system

Equipment Set-up (Refer to section 4 and 5)

Tabletop Equipment

The EUT is placed on the table of size, 0.5 m(d) by 1.5 m(w), raised 0.8 m above the metal ground plane (turn table). The table is made of styrene foam.

Interconnecting Cables

The cables that hang closer than 40 cm to the ground plane is folded back and forth forming bundle 30 to 40 cm long, hanging in the middle between the ground plane and the table approximately.

The measurement is conducted the worst emissions condition.

Turn Table

The turn table is capable for EUT weight and rotatable 0 to 360 degree horizontally by remote control in the measurement room.

Antenna Mast

The antenna mast is attachable to all antennas described on section 6 and antenna height is adjustable 1 to 4 meters continuously by remote control at the measurement room, and antenna polarization is also changed by the remote control. Especially for 1 GHz to 40 GHz measurement antenna tilt angle is adjustable by remote control at the measurement room to keep the antenna in the “cone of radiation” of EUT.

Test Equipment (refer to section 6.1 and 6.2)

Test Facilities (30 MHz to 1 GHz)

The radiated emission test site is validated by measurements of the attenuation of signals propagated over the site and compared with theoretical attenuation of signals propagated over an ideal site. Horizontally and vertically polarized attenuation measurements are made over the frequency range of 30 MHz to 1 GHz. These measurements are made in accordance with the procedures of D.2 and/or D.3, as applicable of Annex D in the ANSI C63.4-2014 standard, and the results are normalized for comparison with the theoretical attenuation values.

Test Facilities (1 GHz to 40 GHz)

The test site complies with the S_{VSWR} requirements specified in 8.3.2 of CISPR 16-1-4:2010-04 over the frequency range of 1 GHz to 18 GHz, when tested in accordance with the site validation procedures requirements specified in 8.3.3 of CISPR 16-1-4:2010-04. Additionally, the RF absorbing materials used on the reference ground plane have a maximum height (thickness) of 30 cm (12 in) and have a minimum-rated attenuation of 20 dB (at normal incidence) at all frequencies from 1 GHz to 18 GHz.

7.1.2 Test Procedure

7.1.2.1 Preliminary Measurement

The EUT is tested on all operating conditions.

The spectrum analyzer is set max-hold mode and swept during turntable is rotated 0 to 360 degree and antenna is moving 1 to 4 meter height. Then spectrum chart is plotted out to detect the worst conditions in configuration, operating mode and/or ambient noise notation.

7.1.2.2 Final Measurement

The EUT is operated in the condition where maximum emission is detected by the preliminary test.

EMI Test Receiver is used for final measurement. The turntable azimuth (EUT direction) and antenna height are adjusted the position so that maximum field strength is obtained for each frequency spectrum to be measured. Especially for 1 GHz to 40 GHz measurement antenna tilt angle are adjusted to obtain the maximum field strength.

The equipment and cables are arranged or manipulated within the range of the test standard in the above condition.

7.2 Conducted Emission

7.2.1 Measurement system

Equipment Set-up (Refer to section 4 and 5)

Tabletop Equipment

EUT is placed on EUT table of size, 1.0m(d) by 1.5m(w), raised 0.8m above the metal ground plane and 0.4 m from vertical metal plane.

Interconnecting Cables

Excess part of the interconnecting cables longer than 1 meter are bundled in the center.

Cables that hang closer than 40 cm to the ground plane are folded back and forth forming bundle 30 to 40 cm long, hanging approx. in the middle between ground plane and table.

The measurement was conducted the worst emissions condition.

AC Power Cord

AC power cord for the EUT is connected to one LISN which is placed on the ground plane. The LISN is placed in 80 cm from the nearest part of EUT chassis.

The excess power cable is bundled in the center, or shortened to appropriate length.

AC cables except from the EUT are connected second LISN.

LISN

The chassis of the LISN is placed on the metal ground plane maintaining the direct current resistance of less than or equal to 2.5m ohm. The lead to be tested is selectable by switch, and the terminals which are not connected to the EUT are terminated in 50 ohm resistor termination.

Test Equipment (refer to section 6.3)

7.2.2 Test Procedure

7.2.2.1 Preliminary Measurement

The EUT is tested on all operating conditions.

The spectrum analyzer is set max-hold mode and swept till no variation. Then spectrum chart is plotted out to detect the worst conditions in configuration and/or operating mode. All cables except for safety grounded are tested.

7.2.2.2 Final Measurement

The EUT is operated in the condition where maximum emission is detected by the preliminary test.

EMI Test Receiver is used for final measurement. The equipment and cables are arranged or manipulated within the range of the test standard in the above condition.