TEST REPORT

For

HF/50MHz TRANSCEIVER

In conformity with

FCC CFR 47 Part15 Subpart B (CSR)

Model : FT-710

FCC ID : K6620801X50

Test Item : HF/50MHz TRANSCEIVER

Report No. : WE220124BC1-11

Issue Date : 04 Apr. 2022

Prepared for

YAESU MUSEN CO., LTD.
Tennozu Parkside Building 2-5-8 Higashi-Shinagawa,
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Prepared by

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History

Report No.	Date	Revisions	Issued By
WE220124BC1-11	04 Apr. 2022	Initial Issue	T. Kato

1 General information

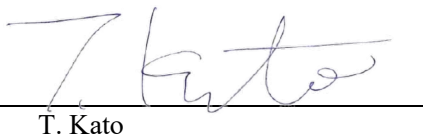
1.1 Product description from applicant

Test item	: HF/50MHz TRANSCEIVER
Manufacturer	: YAESU MUSEN CO., LTD.
Address	: 43 Utsuroda, Morijuku, Sukagawa-shi, Fukushima-ken 962-0001 JAPAN
Model	: FT-710
FCC ID	: K6620801X50
Serial number	: SPP1
Hardware version	: SPP1
Software version	: 2022-03-14-1 V00-56 (MAIN) : 2022-03-02 V00-39 (DISPLAY) : V00-21 (DSP) : V01-00 (SDR)
Operating frequency range	: 0.03 - 75 MHz
Highest internal operating Freq.	: 250 MHz
Receipt date of EUT	: 16 Mar. 2022
Nominal power source voltages	: DC 13.8 V (This is supplied by a DC power supply)

1.2 Test(s) performed/ Summary of test result

Test specification(s)	: FCC CFR 47 Part 15 Subpart B
Test method(s)	: ANSI C63.4: 2014
Test(s) started	: 30 Mar. 2022
Test(s) completed	: 30 Mar. 2022
Purpose of test(s)	: Certification as the scanning receiver
Summary of test result	: *Complied*

Note: The above judgment is only based on the measurement data and it does not include the measurement uncertainty. Accordingly, the statement below is applied to the test result.
The EUT complies with the limit required in the standard in case that the margin is not less than the measurement uncertainty in the Laboratory.
Compliance of the EUT is more probable than non-compliance is case that the margin is less than the measurement uncertainty in the Laboratory.

Test engineer : 
T. Kato
(Test Engineer, Wireless/Auto EMC, RF/EMC Lab.)

Reviewer : 
K. Onishi
(Testing Leader, Wireless/Auto EMC, RF/EMC Testing Lab.)

1.3 Test facility

The Federal Communications Commission has reviewed the technical characteristics of the test facilities at SGS Japan Inc., located in 3-5-23, Kitayamata, Tsuzuki-ku, Yokohama, 224-0021, Japan, and has found these test facilities to be in compliance with the requirements of 47 CFR Part 15, section 2.948. The description of the test facilities has been filed under registration number JP5001 at the Office of the Federal Communications Commission. The facility has been added to the list of laboratories performing these test services for the public on a fee basis.
The list of all public test facilities is available on the Internet at http://www.fcc.gov.

Registered by Innovation, Science and Economic Development Canada (ISED):
The registered CAB identifier is JP0009.

Accredited by **National Voluntary Laboratory Accreditation Program** (NVLAP) for the emission tests stated in the scope of the certificate under Certificate Number 200780-0

This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Government.

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1.4 Measurement uncertainty

The treatment of uncertainty is based on the general matters on the definition of uncertainty in “Guide to the expression of uncertainty in measurement (GUM)” published by ISO. The Lab’s uncertainty is determined by referring UKAS Publication LAB34: 2002 “The Expression of Uncertainty in EMC Testing” and CISPR16-4-2: 2011 “Uncertainty in EMC Measurements”.
The uncertainty of the measurement result in the level of confidence of approximately 95% (k=2) is as follows;

AC conducted emission (150 kHz - 30 MHz)	: ± 3.3 dB
RF conducted emission (30 MHz - 6 GHz)	: ± 1.3 dB
Radiated emission (30 MHz - 1000 MHz)	: ± 5.9 dB
Radiated emission (1 GHz - 6 GHz)	: ± 4.0 dB

1.5 Summary of test results

Requirement	Section in specification	Result	Section in this report
Radiated emissions (30 to 2000 MHz) (*1)	15.109	Complied	2.1
Conducted emission for receiver	15.111	Complied	2.2
AC power line conducted emissions	15.107	Complied	2.3
38 dB Rejection (cellular band)	15.121 (b)	- (*2)	-

(*1) The highest internal operating frequency is 250 MHz
(*2) This item was not tested in this report.

1.6 Setup of equipment under test (EUT)

1.6.1 Test configuration of EUT

Equipment(s) under test

No.	Item	Manufacture	Model No.	Serial No.
1	HF/50MHz TRANSCEIVER	YAESU MUSEN CO., LTD.	FT-710	SPP1
-	-	-	-	-

Support Equipment(s)

No.	Item	Manufacture	Model No.	Serial No.
2	Stereo Headphones	YAESU MUSEN CO., LTD.	YH-77STA	YTS03
3	Microphone	YAESU MUSEN CO., LTD.	SSM-75E	-
4	External Speaker	YAESU MUSEN CO., LTD.	SP-40	ES01
5	Remote Control Keypad	YAESU MUSEN CO., LTD.	FH-2	YTS02
6	Remote Control System	YAESU MUSEN CO., LTD.	SCU-LAN10	PP#01
7	USB Mouse	Dell	MO56UC	F0E01TU4
8	Monitor	EPSON	LD18W42S	-
9	DC Power Supply	YAESU MUSEN CO., LTD.	FP-1030A	1412167017

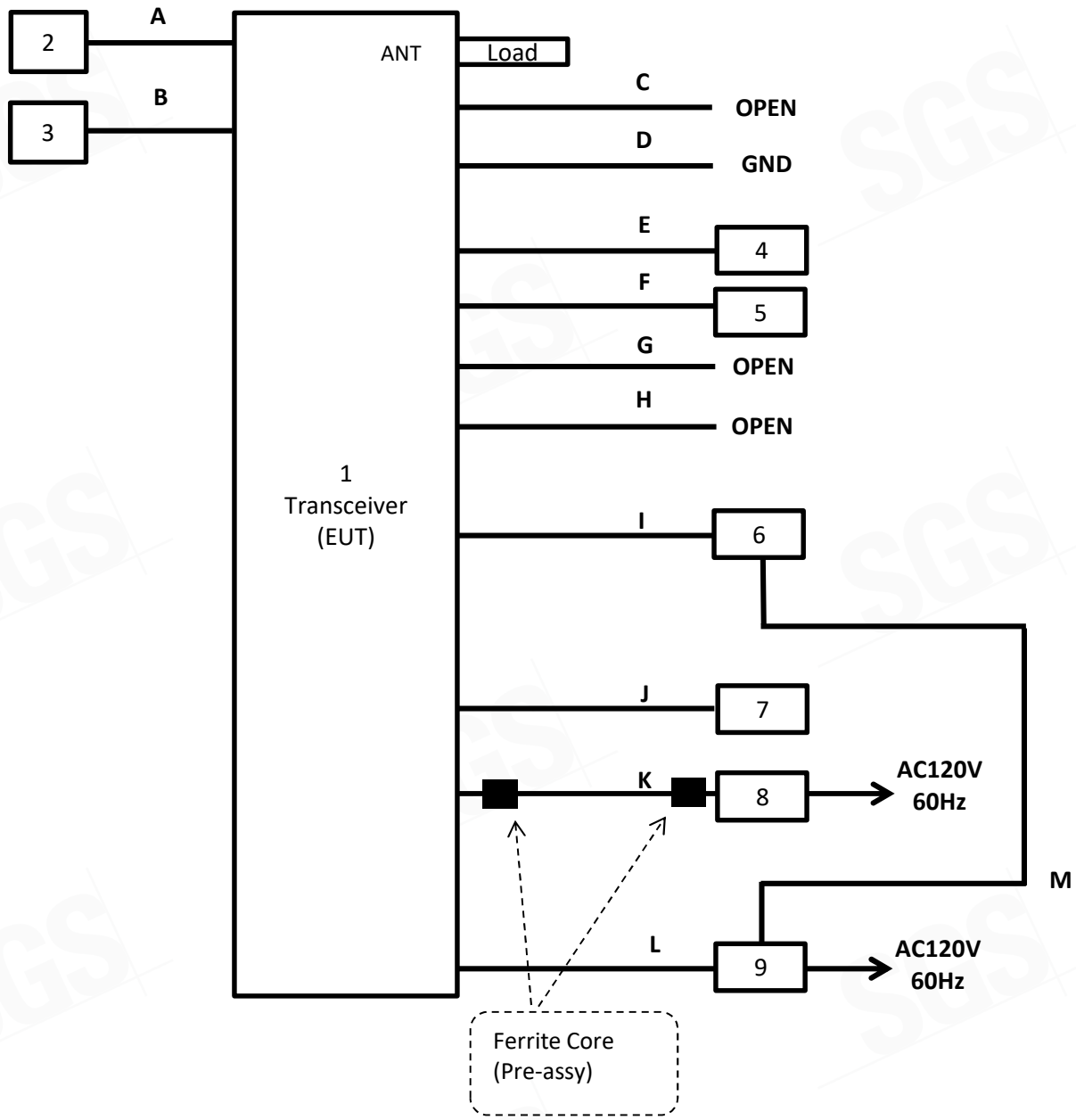
Connected cable(s)

No.	Item	From	To	Cable Shielded	Ferrite Core	Length [m]
A	Headphone Cable	1	2	No	No	1.8
B	MIC Cable	1	3	No	No	0.5
C	TUNER Cable	1	OPEN	No	No	1.0
D	GND Cable	1	GND	No	No	2.0
E	Speaker Cable	1	4	No	No	1.0
F	REM Cable	1	5	No	No	1.0
G	Key Cable	1	OPEN	No	No	1.6
H	RTTY/DATA Cable	1	OPEN	No	No	1.6
I	USB Cable	1	6	No	No	1.8
J	Mouse Cable	1	7	Yes	No	1.8
K	DVI Cable	1	8	Yes	Yes (Pre-assy)	1.9
L	DC Cable 1	1	9	No	No	2.8
M	DC Cable 2	6	9	No	No	1.5

1.6.2 Operating condition:

- Rx 0.03 MHz
- Rx 28 MHz
- Rx 75 MHz

1.6.3 Setup diagram of tested system



1.7 Equipment modifications

No modifications have been made to the equipment in order to achieve compliance with the applicable standards described in clause 1.2.

1.8 Deviation from the standard

No deviations from the standards described in clause 1.2.

2 Test procedure and test data

2.1 Radiated emissions

Test setup

Test setup was implemented according to the method of ANSI C63.4 clause 6 “General requirements for EUT equipment arrangements and operation”, clause 8.2 and Annex H.3 “Radiated emission measurements setup”.

Test procedure

Measurement procedures were implemented according to the method of ANSI C63.4 clauses 8.2.
The EUT is place on a non-conducted table which is 0.8 m height from a ground plane and the measurement antenna to EUT distance is 3 meters. The turn table is rotated for 360 degrees to determine the maximum emission level.
The antenna height scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations.
The spectrum analyzer and receiver are set to the followings;

RBW=100 kHz (up to 1000 MHz) or 1 MHz (above 1000 MHz) ,
VBW= 300 kHz (up to 1000 MHz) or 3 MHz (above 1000 MHz)
Final measurement is carried out with a receiver RBW of 120 kHz (up to 1000 MHz), or 1 MHz (above 1000 MHz).

Applicable rule and limitation

FCC 15.109 Radiated emissions limits

Frequency [MHz]	Field Strength [μV/m]	Measurement Distance [m]	Field Strength [dBμV/m]
30 – 88	100	3	40.0
88 –216	150	3	43.5
216 – 960	200	3	46.0
Above 960	500	3	53.9

In the emission table above, the tighter limit applies at the band edges.
The emission limits shown in the above table are based on measurements employing a QP detector (up to 1000 MHz) or AVE/PEAK detector (above 1000 MHz).

Test results - *Complied with requirement*

Test equipment used (refer to List of utilized test equipment)

AC11	TR06	CL71	PR15	BA10	CL38	CL39
PR12	DH07					

Test software used

EMI1 Ver. 6.1

Calculation method

The Correction Factor and Result are calculated as followings.

Correction Factor [dB/m] = Ant. Factor [dB/m] + Loss [dB] – Gain [dB]
Result [dBµV/m] = Reading [dBµV] + Correction Factor [dB/m]

Test Data

Operating mode: Rx 0.03 MHz

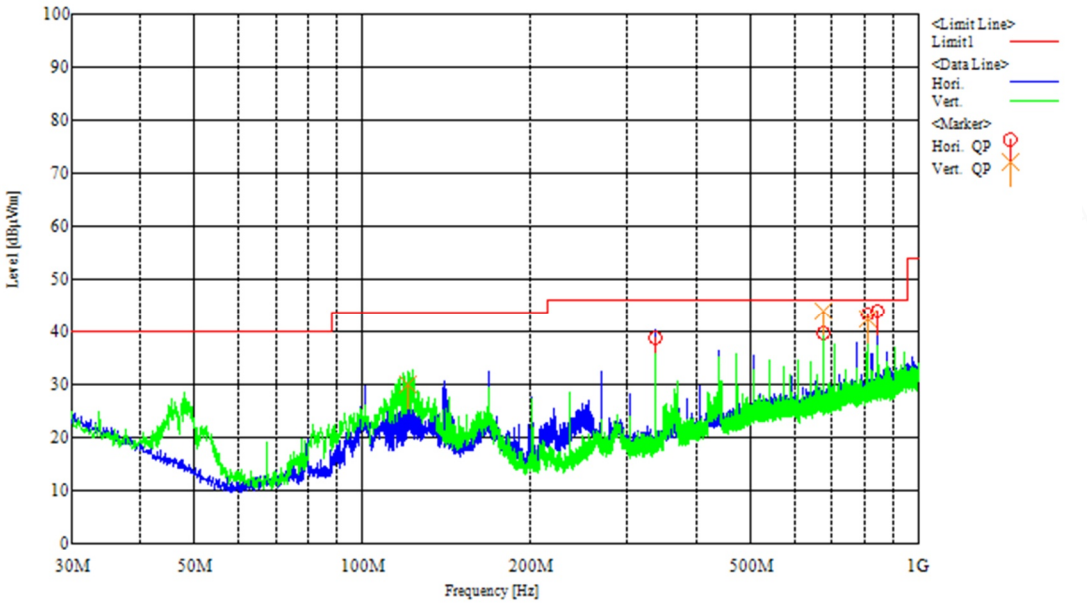
Range: 30 - 1000 MHz

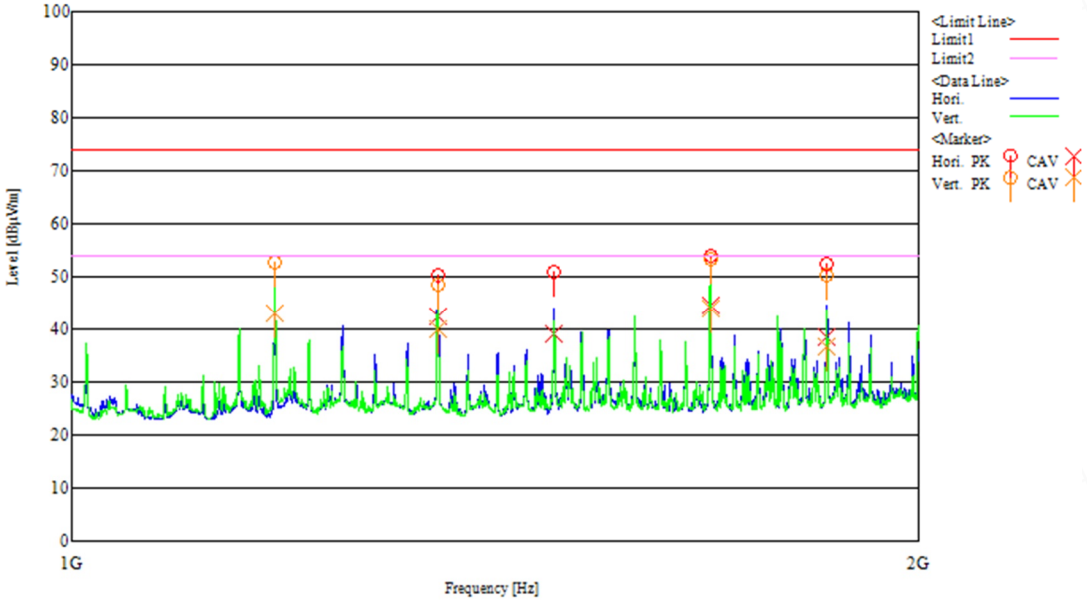
No.	Frequency [MHz]	Reading [dBµV]	Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Ant.
1	337.529	47.0	14.0	7.8	29.9	38.9	46.0	7.1	Hori.
2	675.058	40.3	20.4	8.6	29.7	39.6	46.0	6.4	Hori.
3	810.070	42.4	22.3	8.9	30.3	43.3	46.0	2.7	Hori.
4	843.823	42.2	23.0	9.0	30.4	43.8	46.0	2.2	Hori.
5	120.783	41.5	11.8	6.9	30.1	30.1	43.5	13.4	Vert.
6	675.059	44.5	20.4	8.6	29.7	43.8	46.0	2.2	Vert.
7	810.071	41.6	22.3	8.9	30.3	42.5	46.0	3.5	Vert.

Range: 1000 - 2000 MHz

No.	Frequency [MHz]	Reading PK [dBµV]	Reading AVE [dBµV]	C.Factor [dB/m]	Result PK [dBµV/m]	Result AVE [dBµV/m]	Limit PK [dBµV/m]	Limit AVE [dBµV/m]	Margin PK [dB]	Margin AVE [dB]	Ant.
1	1350.112	59.7	51.8	-9.3	50.4	42.5	73.9	53.9	23.5	11.4	Hori.
2	1485.124	60.1	48.1	-9.1	51.0	39.0	73.9	53.9	22.9	14.9	Hori.
3	1687.640	62.7	53.3	-8.9	53.8	44.4	73.9	53.9	20.1	9.5	Hori.
4	1856.406	60.3	46.5	-8.0	52.3	38.5	73.9	53.9	21.6	15.4	Hori.
5	1181.348	62.7	53.0	-9.9	52.8	43.1	73.9	53.9	21.1	10.8	Vert.
6	1350.112	57.9	49.2	-9.3	48.6	39.9	73.9	53.9	25.3	14.0	Vert.
7	1687.640	62.2	52.7	-8.9	53.3	43.8	73.9	53.9	20.6	10.1	Vert.
8	1856.406	58.3	44.5	-8.0	50.3	36.5	73.9	53.9	23.6	17.4	Vert.

[Chart]





Operating mode: Rx 28 MHz

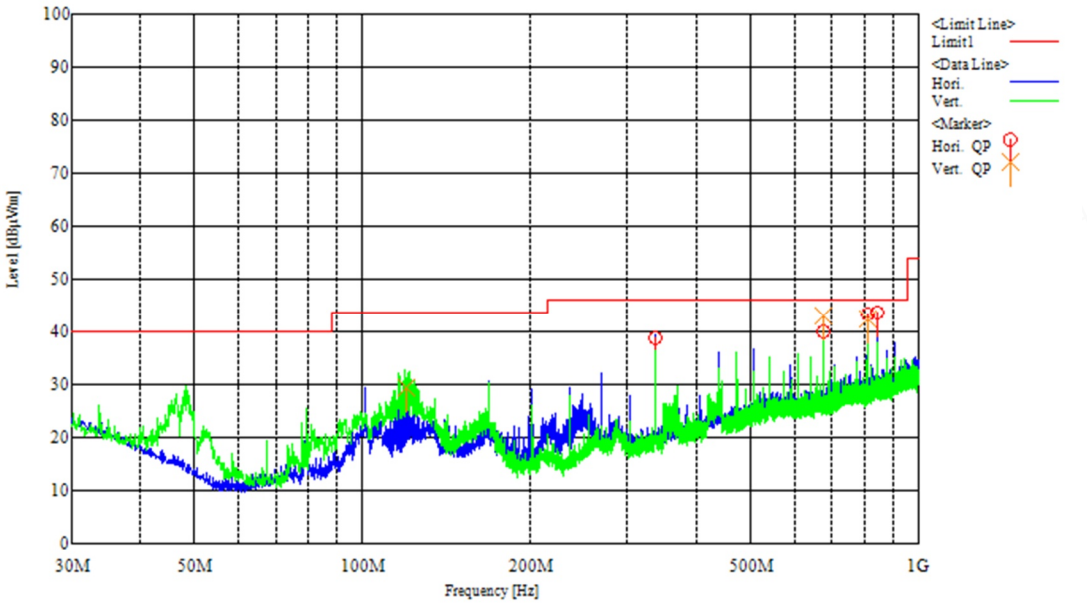
Range: 30 - 1000 MHz

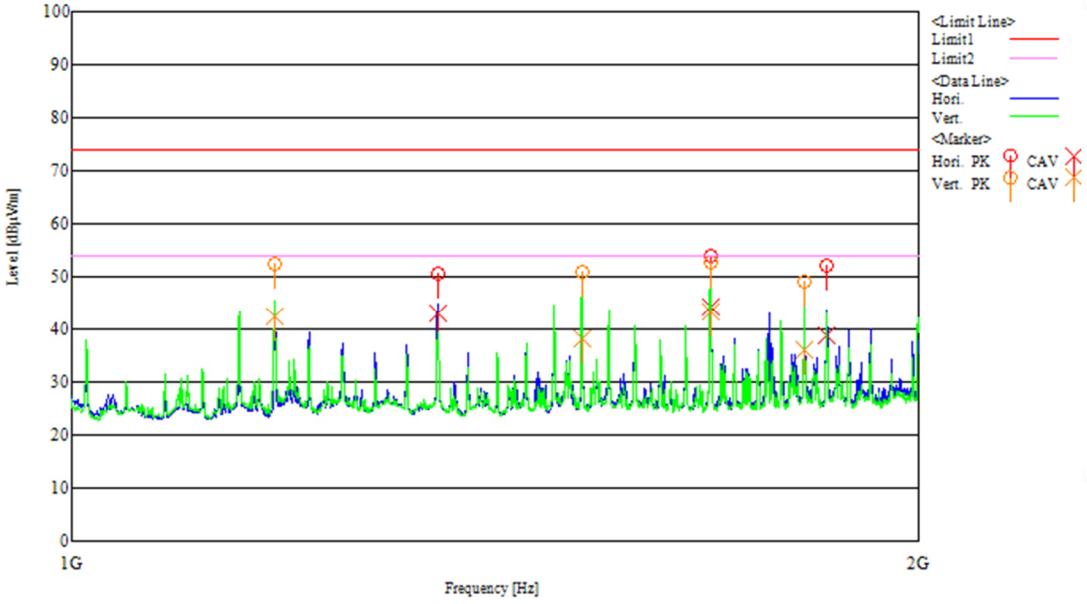
No.	Frequency [MHz]	Reading [dBµV]	Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Ant.
1	337.528	46.9	14.0	7.8	29.9	38.8	46.0	7.2	Hori.
2	675.057	40.6	20.4	8.6	29.7	39.9	46.0	6.1	Hori.
3	810.068	42.3	22.3	8.9	30.3	43.2	46.0	2.8	Hori.
4	843.821	42.0	23.0	9.0	30.4	43.6	46.0	2.4	Hori.
5	119.831	40.9	11.7	6.9	30.1	29.4	43.5	14.1	Vert.
6	675.057	43.7	20.4	8.6	29.7	43.0	46.0	3.0	Vert.
7	810.068	41.4	22.3	8.9	30.3	42.3	46.0	3.7	Vert.

Range: 1000 - 2000 MHz

No.	Frequency [MHz]	Reading PK [dBµV]	Reading AVE [dBµV]	C.Factor [dB/m]	Result PK [dBµV/m]	Result AVE [dBµV/m]	Limit PK [dBµV/m]	Limit AVE [dBµV/m]	Margin PK [dB]	Margin AVE [dB]	Ant.
1	1350.116	59.9	52.2	-9.3	50.6	42.9	73.9	53.9	23.3	11.0	Hori.
2	1687.646	62.8	53.2	-8.9	53.9	44.3	73.9	53.9	20.0	9.6	Hori.
3	1856.410	60.2	46.7	-8.0	52.2	38.7	73.9	53.9	21.7	15.2	Hori.
4	1181.351	62.4	52.4	-9.9	52.5	42.5	73.9	53.9	21.4	11.4	Vert.
5	1518.879	60.0	47.3	-9.1	50.9	38.2	73.9	53.9	23.0	15.7	Vert.
6	1687.644	61.6	52.1	-8.9	52.7	43.2	73.9	53.9	21.2	10.7	Vert.
7	1822.686	57.2	44.3	-8.2	49.0	36.1	73.9	53.9	24.9	17.8	Vert.

[Chart]





Operating mode: Rx 75 MHz

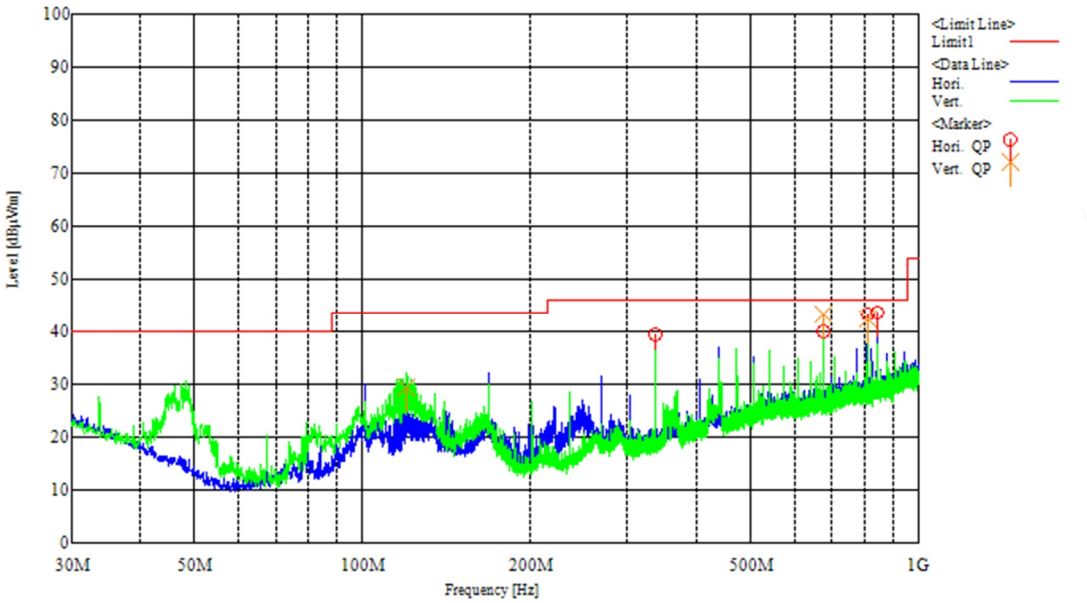
Range: 30 - 1000 MHz

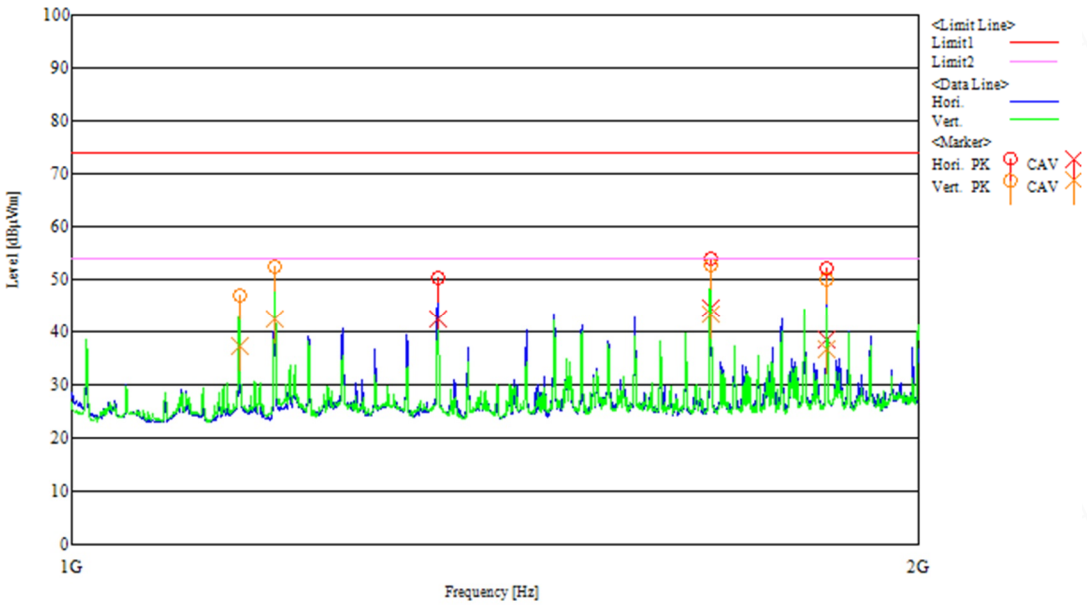
No.	Frequency [MHz]	Reading [dBµV]	Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Ant.
1	337.528	47.5	14.0	7.8	29.9	39.4	46.0	6.6	Hori.
2	675.056	40.7	20.4	8.6	29.7	40.0	46.0	6.0	Hori.
3	810.067	42.5	22.3	8.9	30.3	43.4	46.0	2.6	Hori.
4	843.820	42.0	23.0	9.0	30.4	43.6	46.0	2.4	Hori.
5	119.931	41.0	11.7	6.9	30.1	29.5	43.5	14.0	Vert.
6	675.056	43.9	20.4	8.6	29.7	43.2	46.0	2.8	Vert.
7	810.067	41.5	22.3	8.9	30.3	42.4	46.0	3.6	Vert.

Range: 1000 - 2000 MHz

No.	Frequency [MHz]	Reading PK [dBµV]	Reading AVE [dBµV]	C.Factor [dB/m]	Result PK [dBµV/m]	Result AVE [dBµV/m]	Limit PK [dBµV/m]	Limit AVE [dBµV/m]	Margin PK [dB]	Margin AVE [dB]	Ant.
1	1350.114	59.6	51.7	-9.3	50.3	42.4	73.9	53.9	23.6	11.5	Hori.
2	1687.642	62.9	53.3	-8.9	54.0	44.4	73.9	53.9	19.9	9.5	Hori.
3	1856.406	60.1	46.5	-8.0	52.1	38.5	73.9	53.9	21.8	15.4	Hori.
4	1147.597	57.1	47.6	-10.2	46.9	37.4	73.9	53.9	27.0	16.5	Vert.
5	1181.349	62.4	52.4	-9.9	52.5	42.5	73.9	53.9	21.4	11.4	Vert.
6	1687.641	61.7	52.2	-8.9	52.8	43.3	73.9	53.9	21.1	10.6	Vert.
7	1856.406	58.1	44.5	-8.0	50.1	36.5	73.9	53.9	23.8	17.4	Vert.

[Chart]



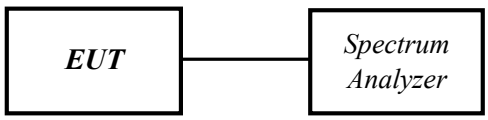


[Test condition]

Tested Date:	30 Mar. 2022	Temperature:	16 degC
Humidity:	42 %	Atmos. Press:	1021 hPa

2.2 Conducted emissions for receiver

Test setup



Applicable rule and limitation

§15.111 (b) Antenna power conducted limit : 2 nW (= -57 dBm)

Test equipment used (refer to List of utilized test equipment)

TR09	CL31	

Test results - *Complied with requirement*

Test Data

Operating mode: Rx 0.03 MHz

No.	Frequency [MHz]	Result [dBm]	Limit [dBm]	Margin [dB]
1	607.538	-81.1	-57.0	24.1
2	2000.000	-70.0	-57.0	13.0

Operating mode: Rx 28 MHz

No.	Frequency [MHz]	Result [dBm]	Limit [dBm]	Margin [dB]
1	607.538	-80.4	-57.0	23.4
2	2000.000	-70.2	-57.0	13.2

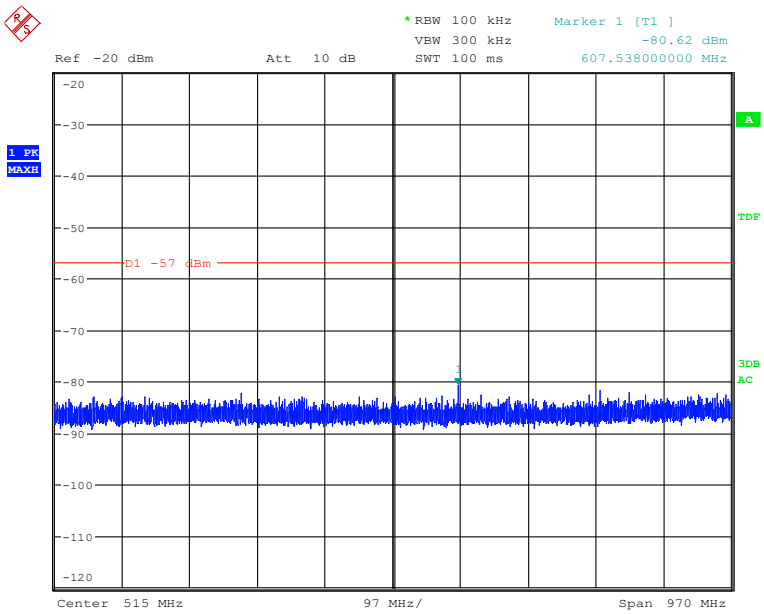
Operating mode: Rx 75 MHz

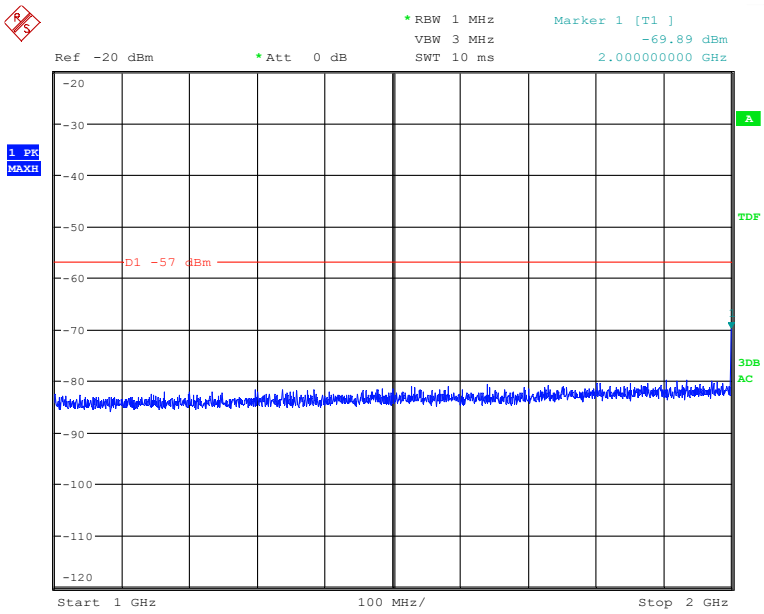
No.	Frequency [MHz]	Result [dBm]	Limit [dBm]	Margin [dB]
1	607.538	-80.6	-57.0	23.6
2	2000.000	-69.9	-57.0	12.9

[Test condition]

Tested Date:	30 Mar. 2022	Temperature:	21 degC
Humidity:	54 %	Atmos. Press:	1015 hPa

[Chart (Worst)] Rx 75 MHz





2.3 AC power line conducted emissions

Test setup

Test setup was implemented according to the method of ANSI C63.4 clause 6 “General requirements for EUT equipment arrangements and operation” and Annex H.1 “AC power line conducted emission measurements setup”.

Test procedure

Measurement procedures were implemented according to the method of ANSI C63.4 clauses 7, clause 13.1.3 and Annex H.2 “AC power line conducted emission measurements”.
Exploratory measurements were used the spectrum analyzer to identify the frequency of the emission that has the highest amplitude relative to the limit by operating the EUT in a range of typical modes of operation, cable positions, and with a typical system equipment configuration and arrangement.
Final ac power line conducted emission measurements were performed based on the exploratory tests.
The EUT cable configuration and arrangement and mode of operation that produced the emission with the highest amplitude relative to the limit are selected for the final measurement.
When the measurement value is greater than average limitation the average detection measurements were performed.

Applicable rule and limitation

§15.107 (b) AC power line conducted limits

Frequency of Emission [MHz]	Conducted emissions Limit [dBµV]	
	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. The lower limit applies at the band edges.

Test equipment used (refer to List of utilized test equipment)

TR09	LN13	CL72	LN17

Test software used

EMI1 Ver. 6.1

Calculation method

The Correction Factor and Result are calculated as followings.

Correction Factor [dB] = ISN Factor [dB] + Loss [dB]
Result [dBµV] = Reading [dBµV] + Correction Factor [dB]

Test results - *Complied with requirement*

Test Data

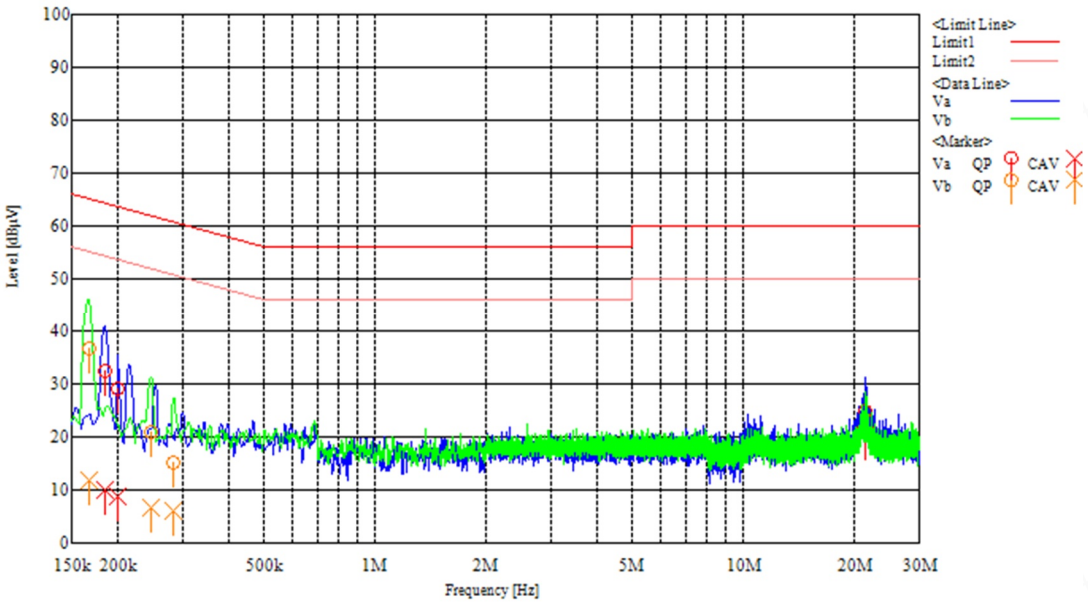
[Emission level]

Operating mode: Rx 0.03 MHz

	Freq. [MHz]	Reading QP [dBµV]	Reading Ave [dBµV]	Factor [dB]	Result QP [dBµV]	Result Ave [dBµV]	Limit QP [dBµV]	Limit Ave [dBµV]	Margin QP [dB]	Margin Ave [dB]	Line
1	0.18545	22.1	-0.2	10.2	32.3	10.0	64.2	54.2	31.9	44.2	Va
2	0.20121	18.9	-1.3	10.2	29.1	8.9	63.6	53.6	34.5	44.7	Va
3	21.58968	14.4	9.8	10.5	24.9	20.3	60.0	50.0	35.1	29.7	Va
4	0.16773	26.4	1.7	10.2	36.6	11.9	65.1	55.1	28.5	43.2	Vb
5	0.24651	10.9	-3.3	10.1	21.0	6.8	61.9	51.9	40.9	45.1	Vb
6	0.28393	5.1	-4.1	10.1	15.2	6.0	60.7	50.7	45.5	44.7	Vb

[Chart]

Operating mode: Rx 0.03 MHz

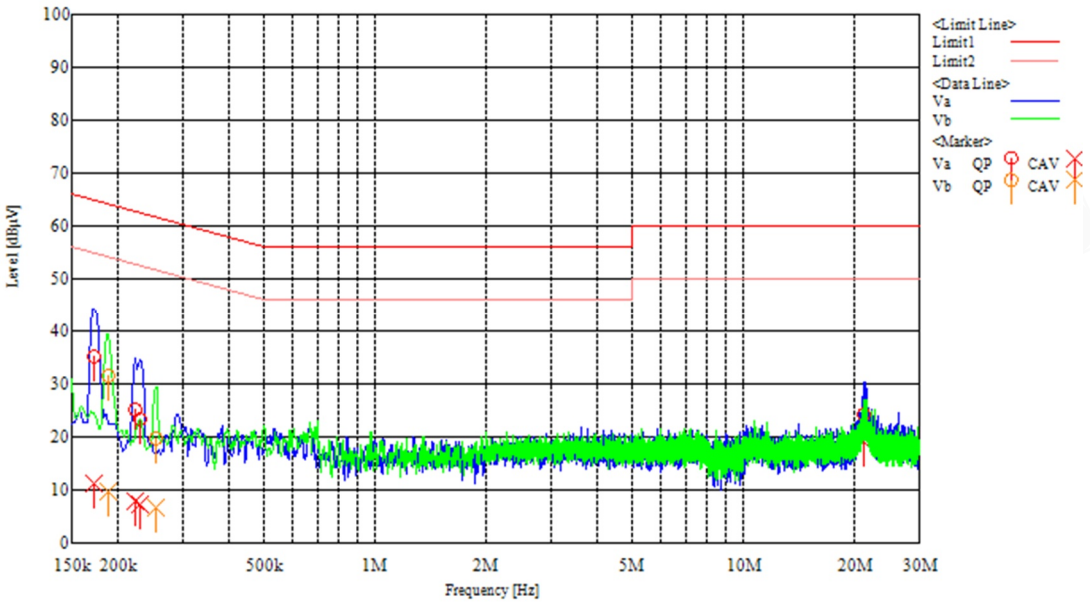


Operating mode: Rx 28 MHz

	Freq. [MHz]	Reading QP [dBµV]	Reading Ave [dBµV]	Factor [dB]	Result QP [dBµV]	Result Ave [dBµV]	Limit QP [dBµV]	Limit Ave [dBµV]	Margin QP [dB]	Margin Ave [dB]	Line
1	0.17364	24.8	1.0	10.2	35.0	11.2	64.8	54.8	29.8	43.6	Va
2	0.22288	14.8	-2.4	10.2	25.0	7.8	62.7	52.7	37.7	44.9	Va
3	0.23075	13.3	-2.8	10.1	23.4	7.3	62.4	52.4	39.0	45.1	Va
4	21.25465	13.6	8.6	10.5	24.1	19.1	60.0	50.0	35.9	30.9	Va
5	0.18939	21.4	-0.5	10.2	31.6	9.7	64.1	54.1	32.5	44.4	Vb
6	0.25439	9.7	-3.5	10.1	19.8	6.6	61.6	51.6	41.8	45.0	Vb

[Chart]

Operating mode: Rx 28 MHz

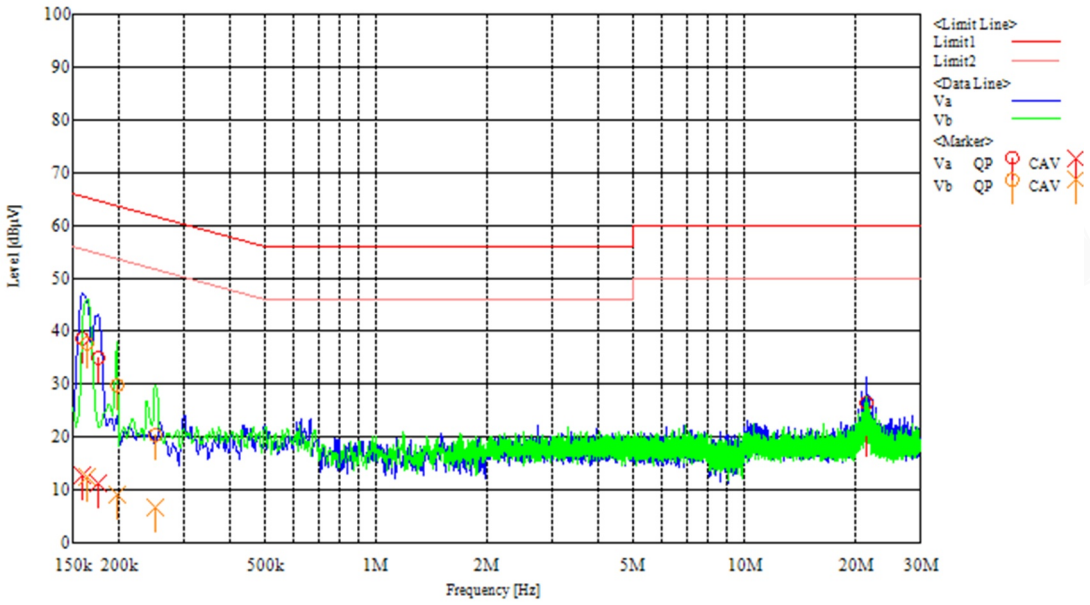


Operating mode: Rx 75 MHz

	Freq. [MHz]	Reading QP [dBµV]	Reading Ave [dBµV]	Factor [dB]	Result QP [dBµV]	Result Ave [dBµV]	Limit QP [dBµV]	Limit Ave [dBµV]	Margin QP [dB]	Margin Ave [dB]	Line
1	0.15985	28.2	2.6	10.2	38.4	12.8	65.5	55.5	27.1	42.7	Va
2	0.17560	24.5	0.9	10.2	34.7	11.1	64.7	54.7	30.0	43.6	Va
3	21.58823	15.9	10.5	10.5	26.4	21.0	60.0	50.0	33.6	29.0	Va
4	0.16379	27.5	2.3	10.2	37.7	12.5	65.3	55.3	27.6	42.8	Vb
5	0.19924	19.6	-1.1	10.2	29.8	9.1	63.6	53.6	33.8	44.5	Vb
6	0.25242	10.1	-3.3	10.1	20.2	6.8	61.7	51.7	41.5	44.9	Vb

[Chart]

Operating mode: Rx 75 MHz



[Test condition]

Tested Date:	30 Mar. 2022	Temperature:	21 degC
Humidity:	54 %	Atmos. Press:	1015 hPa

4 List of utilized test equipment / calibration

ID No.	Kind of Equipment	Manufacturer	Model No.	Serial Number	Cal. Date	Cal. until
AC11(EM)	Anechoic Chamber	TDK	-	-	2021/8/10	2022/8/31
AC11(EG)	Anechoic Chamber	TDK	-	-	2021/7/31	2022/7/31
BA10	Bilogical Antenna	TESEQ	CBL6111D	32342	2021/6/15	2022/6/30
CL71	RF Cable for RE	RFT	-	-	2022/1/14	2023/1/31
CL72	RF Cable for CE	RFT	-	-	2022/1/11	2023/1/31
DH07	DRG Horn Antenna	A.H. Systems	SAS-571	1939	2021/2/27	2023/2/28
LN13	LISN	Kyoritsu	KNW-407F	8-2003-3	2021/8/2	2022/8/31
LN17	LISN	Kyoritsu	TNW-407F2	12-15-53	2021/4/9	2022/4/30
PR15	Pre. Amplifier	Anritsu	MH648A	6201156141	2021/6/15	2022/6/30
CL31	RF Cable 1 m	Junkosha	MWX221	1303S118	2022/1/14	2023/1/31
CL38	RF Cable 2 m	Junkosha	MWX221	1603S626	2022/1/14	2023/1/31
CL39	RF Cable 5 m	SUHNER	SUCOFLEX126E	523222	2022/1/14	2023/1/31
PR12	Pre. Amplifier (1-26G)	Agilent Technologies	8449B	3008A02513	2022/1/14	2023/1/31
TR06	Test Receiver (F/W : 4.73 SP4)	Rohde & Schwarz	ESU26	100002	2021/10/4	2022/10/31
TR09	Test Receiver (F/W : 4.43 SP3)	Rohde & Schwarz	ESU8	100386	2021/7/8	2022/7/31

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.