

TEST REPORT

For

UHF AMS TRANSCEIVER

In conformity with

FCC CFR 47 Part15 Subpart B (CSR)

Model : FTM-3207DR

FCC ID : K6620754X50

Test Item : UHF AMS TRANSCEIVER

Report No. : ERY1708P18R1

Issue Date : 18 Aug. 2017

Prepared for

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History

Report No.	Date	Revisions	Issued By
ERY1708P18R1	18 Aug. 2016	Initial Issue	T.Kato

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1 General information

1.1 Product description

Test item	: UHF AMS TRANSCEIVER
Manufacturer	: YAESU MUSEN CO., LTD.
Address	: 43 Utsuroda, Morijuku, Sukagawa-shi, Fukushima-ken 962-0001 JAPAN
Model	: FTM-3207DR
FCC ID	: K6620754X50
Serial number	: 7J000005
Hardware version	: SPP01
Software version	: 0.00(CPU) / 0.00 (DSP)
Operating frequency range	: 420 - 470 MHz
Highest internal operating Freq.	: 402.75 MHz
Receipt date of EUT	: 17 Aug. 2017
Nominal power source voltages	: DC 13.8 V (This is supplied by a battery)

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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	: 17 Aug. 2017
Test(s) completed	: 17 Aug. 2017
Purpose of test(s)	: Certification as the scanning receiver
Summary of test result	: <u>Complied</u>

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 in case that the margin is less than the measurement uncertainty in the Laboratory.

Test engineer

: T. Kato
T. Kato
(E&E Lab. EMC Testing)

Reviewer

: K. Onishi
K. Onishi
(Team Manager, E&E Lab. EMC Testing)

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1.3 Test facility

The Federal Communications Commission has reviewed the technical characteristics of the test facilities at SGS RF Technologies Inc., located in 472, Nippa-cho, Kohoku-ku, Yokohama, 223-0057, 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 319924 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 Industry Canada (IC): The registered facility number is as follows;
Test site No. 1 (Semi-Anechoic chamber 3m): 6974A-1

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 Federal Government.



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: ± 3.4 dB (150 kHz - 30 MHz)

RF conducted emission: ± 1.6 dB (30 MHz - 6 GHz)

Radiated emission (9 kHz - 30 MHz): ± 3.3 dB

Radiated emission (30 MHz - 200 MHz): ± 4.8 dB

Radiated emission (200 MHz - 1000 MHz): ± 6.1 dB

Radiated emission (1 GHz - 6 GHz): ± 4.5 dB

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1.5 Summary of test results

Requirement	Section in specification	Result	Section in this report
Radiated emissions (30 to 5000 MHz) (*1)	15.109	Complied	2.1
Conducted emission for receiver	15.111	Complied	2.2
AC power line conducted emissions	15.107	N/A(*2)	2.3
38 dB Rejection (cellular band)	15.121 (b)	- (*3)	-

(*1) The highest internal operating frequency is 402.75 MHz

(*2) The EUT is powered by battery.

(*3) 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.
A	UHF AMS TRANSCEIVER	YAESU MUSEN CO., LTD.	FTM-3207DR	7J000005
-	-	-	-	-

Support Equipment(s)

No.	Item	Manufacture	Model No.	Serial No.
B	Microphone	YAESU MUSEN CO., LTD.	MH-48A6JA	16G
C	External Speaker	YAESU MUSEN CO., LTD.	MLS-100	2D067

Connected cable(s)

No.	Item	Identification (Manu.etc.)	Cable Shielded	Ferrite Core	Length [m]
1	DC Power Cable	YAESU MUSEN CO., LTD.	No	No	2.8
2	Mic. Cable	YAESU MUSEN CO., LTD.	No	No	0.6
3	Ext. SP Cable	YAESU MUSEN CO., LTD.	No	No	1.8
4	USB Cable	YAESU MUSEN CO., LTD.	Yes	No	1.0

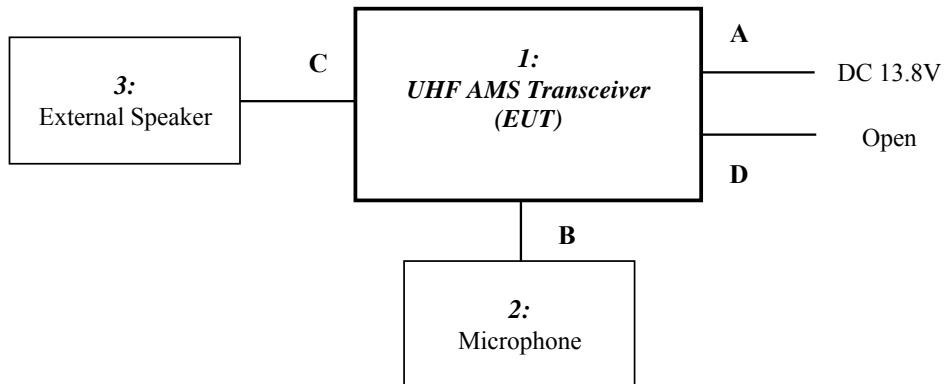
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1.6.2 Operating condition:

- Rx 420 MHz
- Rx 445 MHz
- Rx 470 MHz

1.6.3 Setup diagram of tested system



Note: The signal cable D was connected to no AE by a request from the manufacturer.

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.

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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 [μ V/m]	Measurement Distance [m]	Field Strength [dB μ V/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)

AC01	TR06	CL11	PR21	BA07	CL30	CL38
PR12	DH01					

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Test software used
 EMI1 Ver. 5.4

Calculation method

The Correction Factor and Result are calculated as followings.

$$\text{Correction Factor [dB/m]} = \text{Ant. Factor [dB/m]} + \text{Loss [dB]} - \text{Gain [dB]}$$

$$\text{Result [dB}\mu\text{V/m]} = \text{Reading [dB}\mu\text{V]} + \text{Correction Factor [dB/m]}$$

Test Data

Operating mode: Rx 420 MHz

Range: 30 - 1000 MHz

No.	Frequency [MHz]	Reading [dB μ V]	Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Ant.
1	372.750	38.7	15.5	9.9	30.2	33.9	46.0	12.1	Hori.
2	745.498	28.9	19.3	11.9	30.2	29.9	46.0	16.1	Hori.
3	372.750	35.6	15.5	9.9	30.2	30.8	46.0	15.2	Vert.
4	960.000	21.3	21.1	12.8	28.6	26.6	46.0	19.4	Vert.

Note: All other emissions were under noise floor.

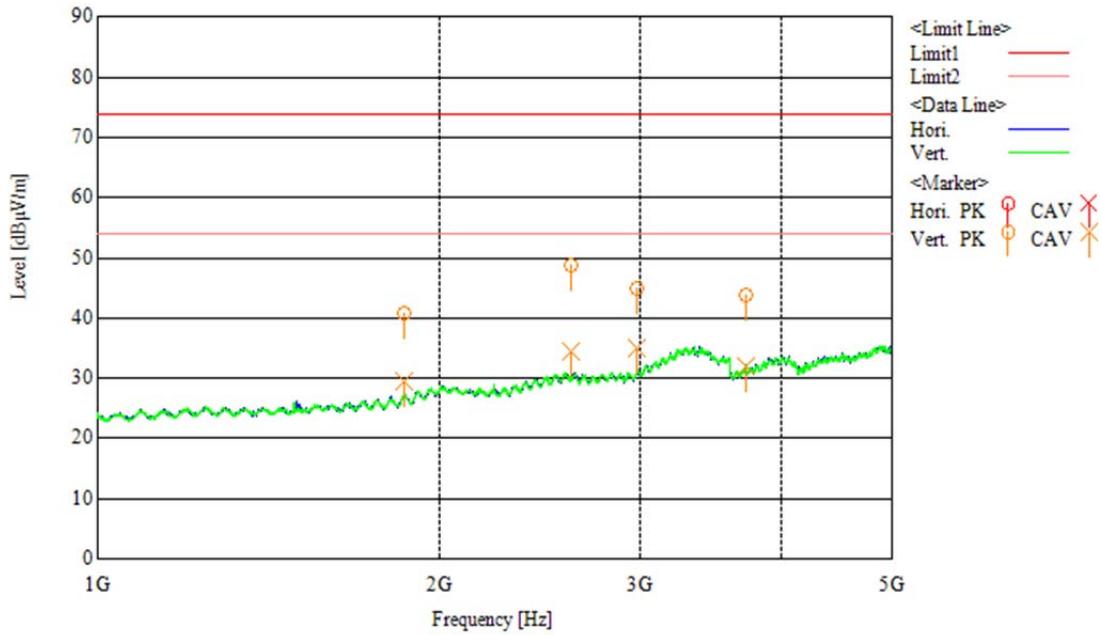
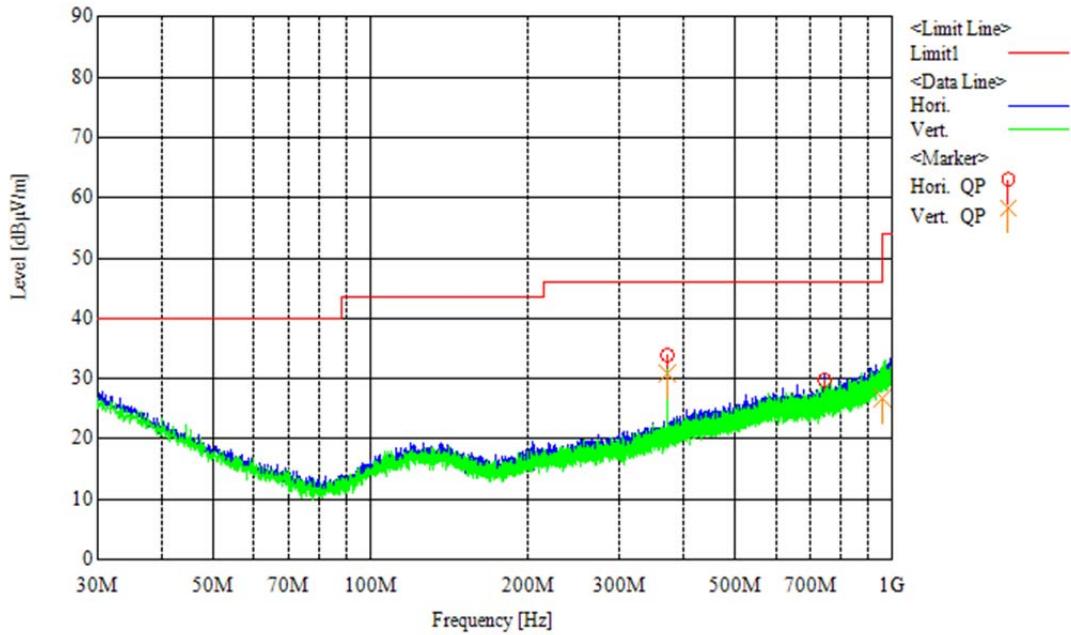
Range: 1000 - 5000 MHz

No.	Frequency [MHz]	Reading PK [dB μ V]	Reading AVE [dB μ V]	C.Factor [dB/m]	Result PK [dB μ V/m]	Result AVE [dB μ V/m]	Limit PK [dB μ V/m]	Limit AVE [dB μ V/m]	Margin PK [dB]	Margin AVE [dB]	Ant.
1	1863.751	47.7	36.4	-7.0	40.7	29.4	73.9	53.9	33.2	24.5	Vert.
2	2609.252	52.1	37.9	-3.4	48.7	34.5	73.9	53.9	25.2	19.4	Vert.
3	2982.001	47.4	37.5	-2.4	45.0	35.1	73.9	53.9	28.9	18.8	Vert.
4	3727.501	44.6	33.0	-0.9	43.7	32.1	73.9	53.9	30.2	21.8	Vert.

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[Chart]



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Operating mode: Rx 445 MHz

Range: 30 - 1000 MHz

No.	Frequency [MHz]	Reading [dB μ V]	Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Ant.
1	397.750	45.8	16.2	10.1	30.3	41.8	46.0	4.2	Hori.
2	795.502	28.7	19.8	12.1	30.0	30.6	46.0	15.4	Hori.
3	397.750	39.9	16.2	10.1	30.3	35.9	46.0	10.1	Vert.
4	960.000	21.3	21.1	12.8	28.6	26.6	46.0	19.4	Vert.

Note: All other emissions were under noise floor.

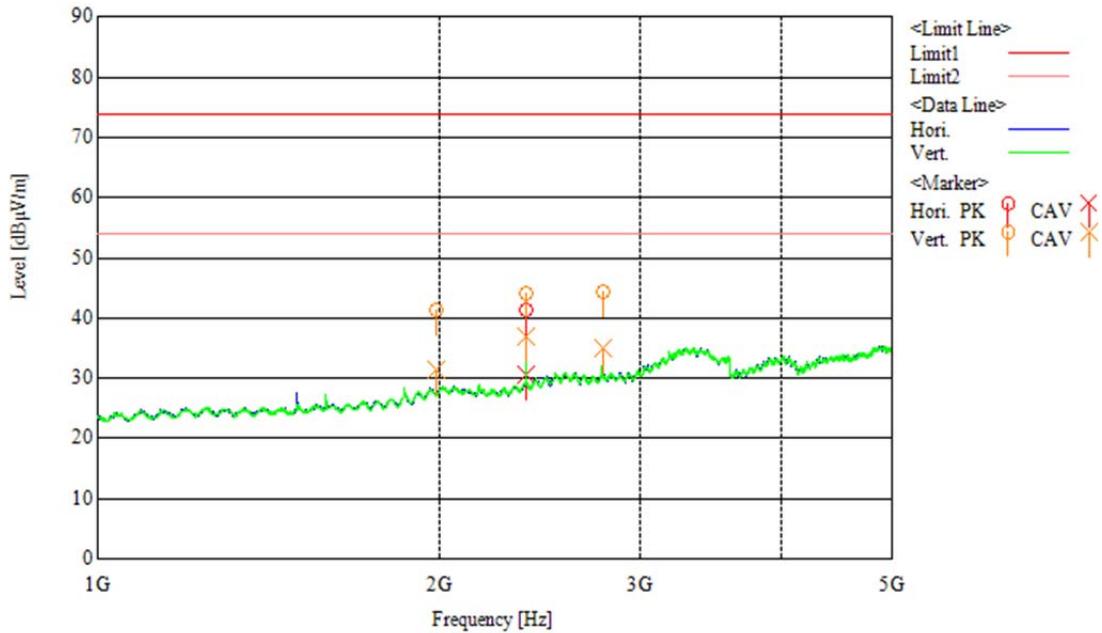
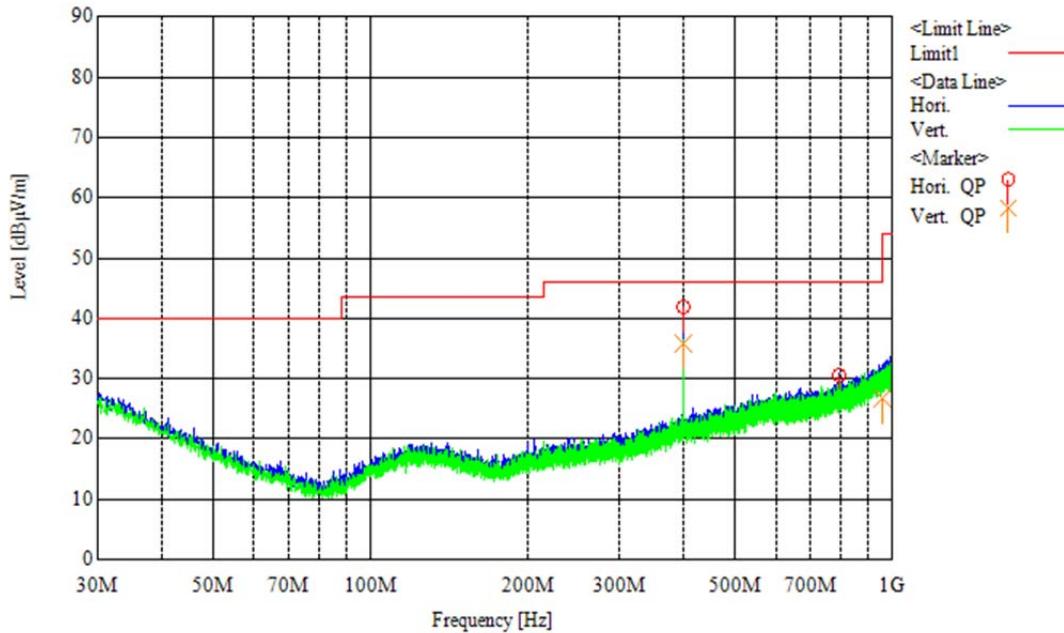
Range: 1000 - 5000 MHz

No.	Frequency [MHz]	Reading PK [dB μ V]	Reading AVE [dB μ V]	C.Factor [dB/m]	Result PK [dB μ V/m]	Result AVE [dB μ V/m]	Limit PK [dB μ V/m]	Limit AVE [dB μ V/m]	Margin PK [dB]	Margin AVE [dB]	Ant.
1	2386.500	45.8	35.2	-4.5	41.3	30.7	73.9	53.9	32.6	23.2	Hori.
2	1988.751	46.5	36.5	-5.2	41.3	31.3	73.9	53.9	32.6	22.6	Vert.
3	2386.501	48.5	41.4	-4.5	44.0	36.9	73.9	53.9	29.9	17.0	Vert.
4	2784.251	47.8	38.2	-3.3	44.5	34.9	73.9	53.9	29.4	19.0	Vert.

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[Chart]



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Operating mode: Rx 470 MHz

Range: 30 - 1000 MHz

No.	Frequency [MHz]	Reading [dB μ V]	Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Ant.
1	422.751	39.8	16.5	10.2	30.2	36.3	46.0	9.7	Hori.
2	845.498	30.4	20.1	12.3	29.8	33.0	46.0	13.0	Hori.
3	422.749	40.0	16.5	10.2	30.2	36.5	46.0	9.5	Vert.
4	845.502	27.3	20.1	12.3	29.8	29.9	46.0	16.1	Vert.
5	960.000	21.3	21.1	12.8	28.6	26.6	46.0	19.4	Vert.

Note: All other emissions were under noise floor.

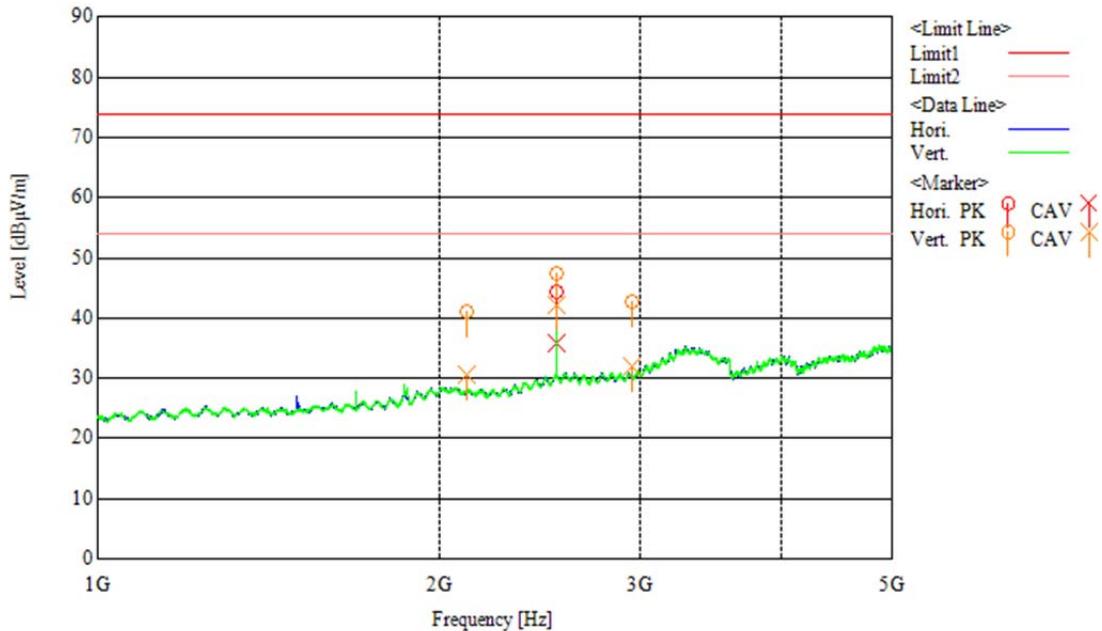
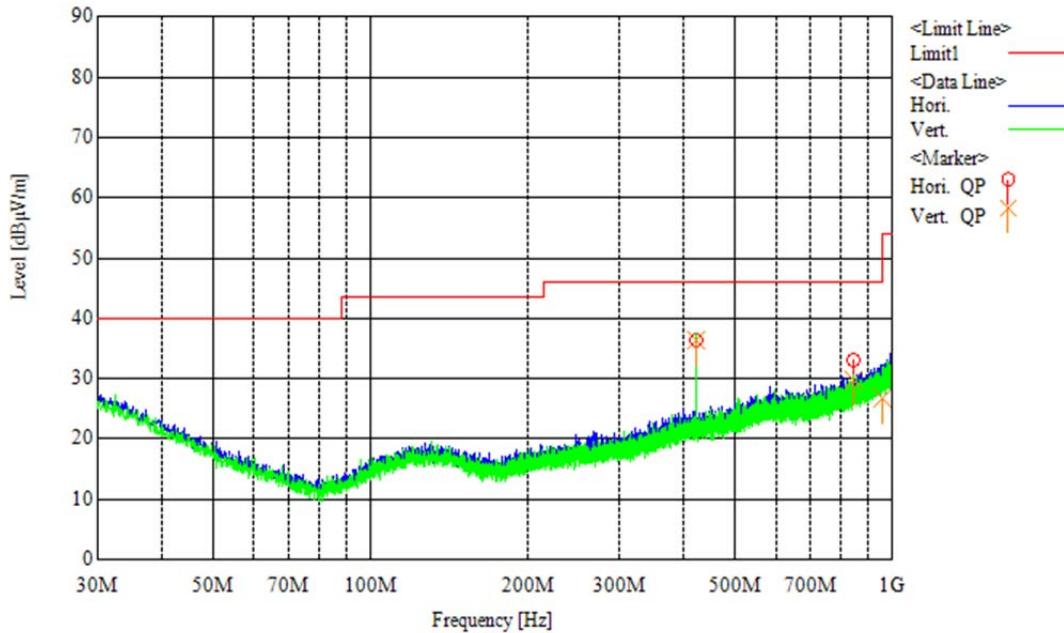
Range: 1000 - 5000 MHz

No.	Frequency [MHz]	Reading PK [dB μ V]	Reading AVE [dB μ V]	C.Factor [dB/m]	Result PK [dB μ V/m]	Result AVE [dB μ V/m]	Limit PK [dB μ V/m]	Limit AVE [dB μ V/m]	Margin PK [dB]	Margin AVE [dB]	Ant.
1	2536.500	48.0	39.5	-3.6	44.4	35.9	73.9	53.9	29.5	18.0	Hori.
2	2113.750	46.1	35.7	-5.1	41.0	30.6	73.9	53.9	32.9	23.3	Vert.
3	2536.502	50.9	45.9	-3.6	47.3	42.3	73.9	53.9	26.6	11.6	Vert.
4	2959.251	45.3	34.6	-2.6	42.7	32.0	73.9	53.9	31.2	21.9	Vert.

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[Chart]



[Test condition]

Tested Date: 17 Aug. 2017
 Humidity: 60 %

Temperature: 20 degC
 Atmos. Press: 1011 hPa

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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)

TR06	CL38	
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Test results - Complied with requirement

Test Data

[The maximum spurious level at antenna port]

Operating freq. [MHz]	Frequency range 30 - 1000 MHz		Frequency range 1000 - 5000 MHz	
	Freq. [MHz]	Level [dBm]	Freq. [MHz]	Level [dBm]
420	372.701	-78.3	- (Note)	- (Note)
445	397.727	-76.0	- (Note)	- (Note)
470	422.850	-71.9	- (Note)	- (Note)

Note: No emission above noise floor was found.

[Test condition]

Tested Date: 17 Aug. 2017
Humidity: 60 %

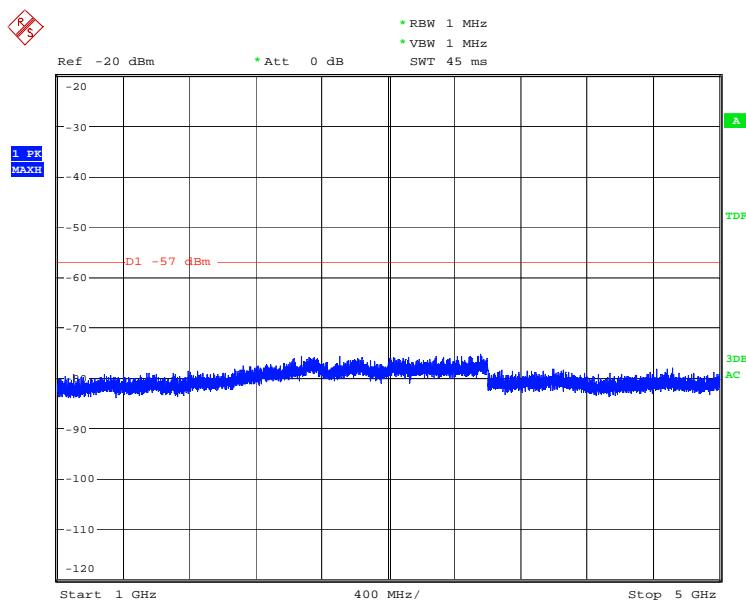
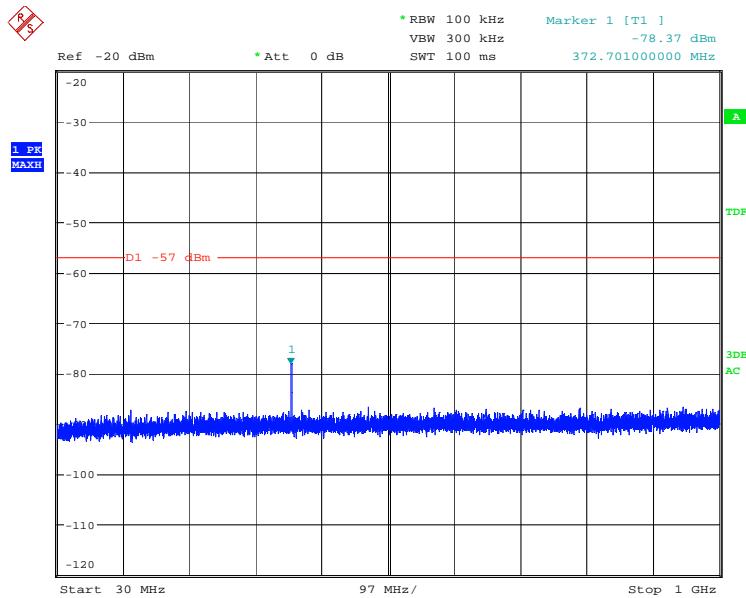
Temperature: 20 degC
Atmos. Press: 1011 hPa

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[Chart]

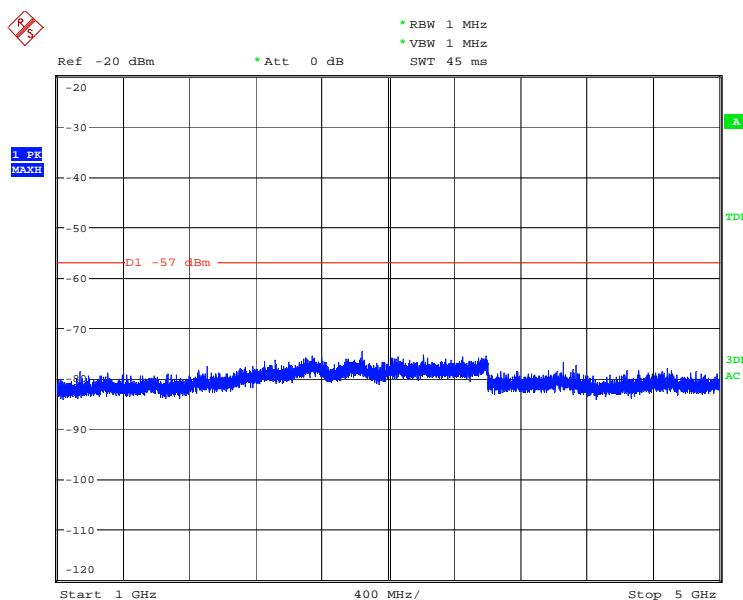
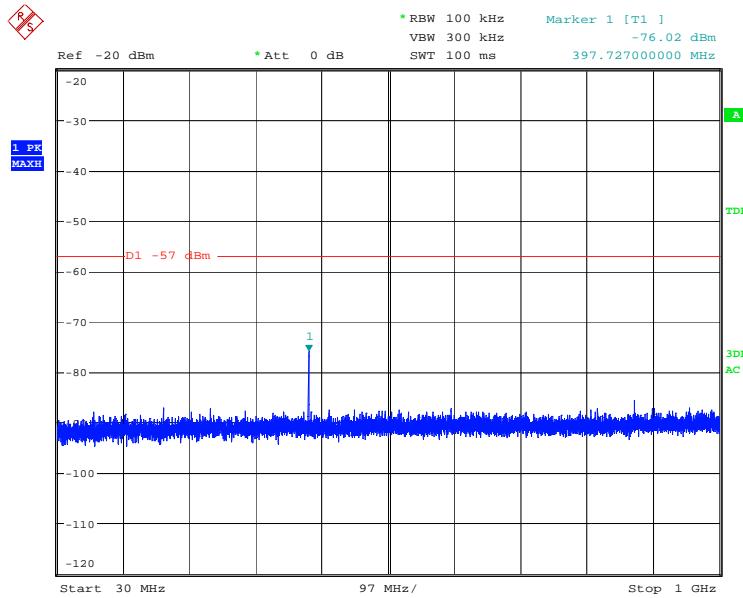
Operating mode: Rx 420 MHz



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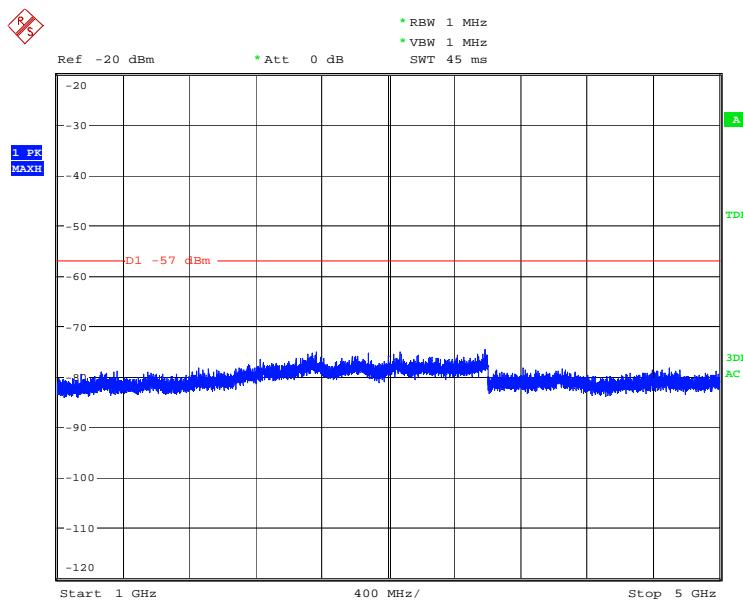
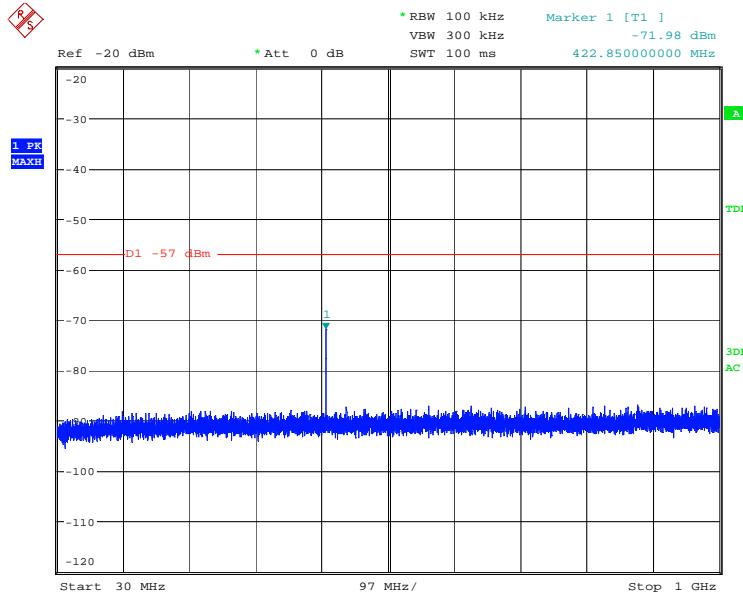
Operating mode: Rx 445 MHz



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Operating mode: Rx 470 MHz



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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 grater 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 [dB μ V]	
	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)



Test software used

EMI1 Ver. 5.4

Calculation method

The Correction Factor and Result are calculated as followings.

$$\begin{aligned} \text{Correction Factor [dB]} &= \text{ISN Factor [dB]} + \text{Loss [dB]} \\ \text{Result [dB}\mu\text{V]} &= \text{Reading [dB}\mu\text{V]} + \text{Correction Factor [dB]} \end{aligned}$$

Test results - This item was not tested.

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Test Data

[Emission level]

Operating mode: -

	Freq. [MHz]	Reading QP [dB μ V]	Reading Ave [dB μ V]	Factor [dB]	Result QP [dB μ V]	Result Ave [dB μ V]	Limit QP [dB μ V]	Limit Ave [dB μ V]	Margin QP [dB]	Margin Ave [dB]	Line
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-

[Chart]

Operating mode: -

[Test condition]

Tested Date: -
 Humidity: - %

Temperature: - degC
 Atmos. Press: - hPa

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4 List of utilized test equipment / calibration

RFT ID No.	Kind of Equipment and Precision	Manufacturer	Model No.	Serial Number	Calibration Date	Calibrated until
AC01(EM)	Anechoic Chamber (1st test room)	JSE	203397C	-	2017/4/22	2018/4/30
AC01(EG)	Anechoic Chamber (1st test room)	JSE	203397C	-	2017/3/18	2018/3/31
BA07	Biological Antenna	TESEQ	CBL6143A	26670	2016/12/20	2017/12/31
CL11	RF Cable for RE	RFT	-	-	2017/3/22	2018/3/31
CL30	RF Cable 5 m	SUHNER	SUCOFLEX104PE	MY3599	2017/4/26	2018/4/30
CL38	RF Cable 2 m	Junkosha	MWX221	1603S626	2017/4/26	2018/4/30
DH01	DRG Horn Antenna	A.H. Systems	SAS-571	785	2016/1/26	2018/1/31
PR12	Pre. Amplifier (1-26G)	Agilent Technologies	8449B	3008A02513	2017/1/18	2018/1/31
PR21	Pre. Amplifier	Anritsu	MH648A	6200467119	2016/12/20	2017/12/31
TR06	Test Receiver (F/W : 3.93 SP2)	Rohde & Schwarz	ESU26	100002	2016/9/29	2017/9/30

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.

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