

TEST REPORT

For

HF/VHF/UHF ALL MODE TRANSCEIVER

In conformity with

FCC CFR 47 Part15 Subpart B (CSR)

Model : FT-991A

FCC ID : K6620575X50

Test Item : HF/VHF/UHF ALL MODE TRANSCEIVER

Report No. : ERY1606P23R1

Issue Date : 23 Jun. 2016

Prepared for

YAESU MUSEN CO., LTD.
Tennozu Parkside Building 2-5-8 Higashi-Shinagawa,
Shinagawa-ku, Tokyo 140-0002 JAPAN

Prepared by

SGS RF Technologies Inc.
3-5-23, Kiyatamata, Tsuzuki-ku, Yokohama, 224-0021, Japan
Telephone: +81+(0)45- 550-3520
FAX: +81+(0)45- 592-7506

This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at www.sgs.com/terms_and_conditions.htm and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at www.sgs.com/terms_e-document.htm. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

SGS RF Technologies Inc. is managed to ISO17025 and has the necessary knowledge and test facilities for testing according to the referenced standards. The test results in this report apply only to the sample tested.

Table of contents

1	General information.....	4
1.1	Product description	4
1.2	Test(s) performed/ Summary of test result	4
1.3	Test facility	5
1.4	Measurement uncertainty.....	5
1.5	Summary of test results.....	6
1.6	Setup of equipment under test (EUT)	6
1.6.1	Test configuration of EUT	6
1.6.2	Operating condition:	7
1.6.3	Setup diagram of tested system.....	7
1.7	Equipment modifications.....	7
1.8	Deviation from the standard	7
2	Test procedure and test data	8
2.1	Radiated emissions	8
2.2	Conducted emissions for receiver	18
2.3	AC power line conducted emissions.....	19
3	Test setup photographs	22
3.1	Radiated emissions	22
3.2	AC power line conducted emissions.....	23
4	List of utilized test equipment / calibration	24

History

Report No.	Date	Revisions	Issued By
ERY1606P17R1	17 Jun. 2016	Initial Issue	T.Kato
ERY1606P23R1	23 Jun. 2016	Revise the AC condition for DC power supply (Sec 1.1)	T.Kato

1 General information

1.1 Product description

Test item	: HF/VHF/UHF ALL MODE TRANSCEIVER
Manufacturer	: YAESU MUSEN CO., LTD.
Address	: 43 Utsuroda, Morijuku, Sukagawa-shi, Fukushima-ken 962-0001 JAPAN
Model	: FT-991A
FCC ID	: K6620575X50
Serial number	: 5M000001
Hardware Version	: ES02
Software Version	: Main V00-00 (2016-04-11-01) DSP V01-05 TFT V01-00 C4FM V04-10
Operating frequency range	: 0.03 - 56 MHz / 118 - 164 MHz / 420 - 470 MHz
Highest internal operating Freq.	: 539.449995 MHz
Receipt date of EUT	: 13 Jun. 2016
Nominal power source voltages	: DC 13.8 V (Supplied by DC Power Supply) AC 120V/60Hz (for DC Power Supply)

1.2 Test(s) performed/ Summary of test result

Test specification(s)	: FCC CFR 47 Part 15 Subpart B (01 Oct. 2015)
Test method(s)	: ANSI C63.4: 2014
Test(s) started	: 13 Jun. 2016
Test(s) completed	: 15 Jun. 2016
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
 EMC testing Department

Reviewer

: K. Onishi
K. Onishi
Manager
EMC testing Department

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, per October 1, 2015.

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: ± 1.0 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

1.5 Summary of test results

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

(*) The highest internal operating frequency is 539.449995 MHz

(**) This item was not tested, because any RF circuits is not changed from the original model FT-991 (Manufacturer's request).

1.6 Setup of equipment under test (EUT)

1.6.1 Test configuration of EUT

Equipment under test

No.	Equipment	Model name	S/N
1	HF/VHF/UHF ALL MODE TRANSCEIVER	FT-991A	5M000001
2	Hand Microphone	MH-31A8J	YTS30

Support Equipment

No.	Item	Manufacturer	Model Name	S/N
3	DC Power Supply	YAESU MUSEN CO., LTD.	FP-1030A	1412167017
4	Headphone	YAESU MUSEN CO., LTD.	YH-77STA	YTS03
5	External Speaker	YAESU MUSEN CO., LTD.	SP-2000	2D060
6	Remote Control Keypad	YAESU MUSEN CO., LTD.	FH-2	YTS02

Connected cable

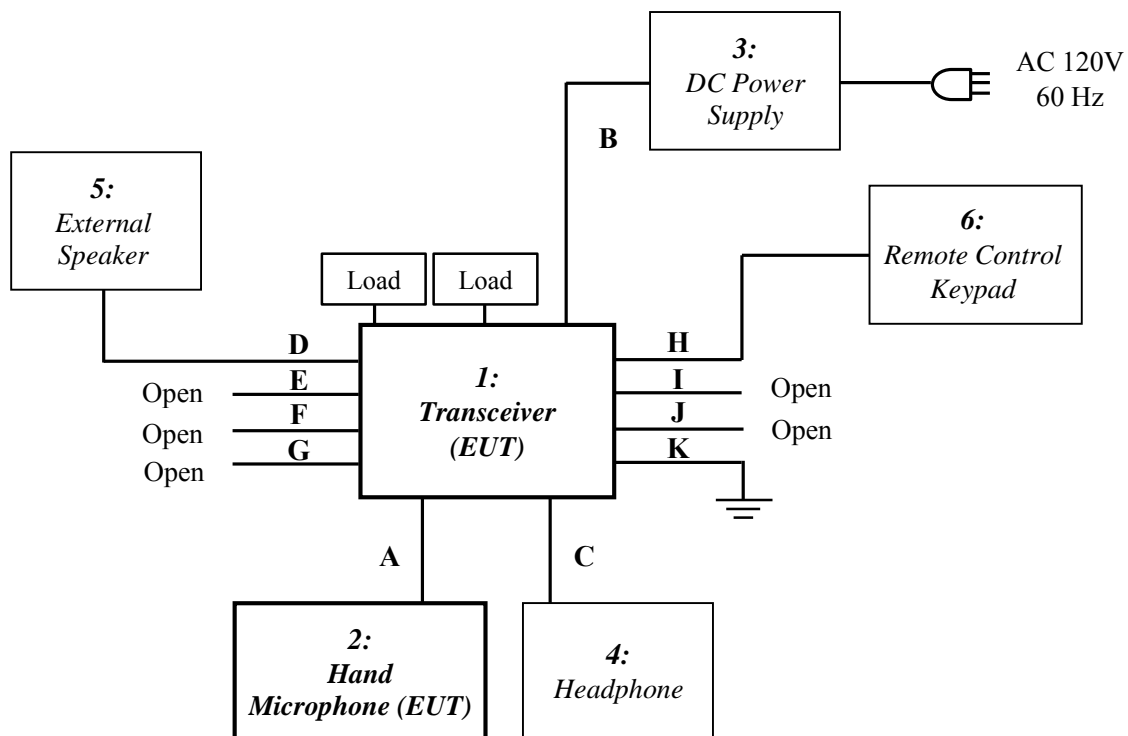
No.	Cable Name	From	To	Shielded	Ferrite	Length [m]
A	Mic. Cable	1	2	No	No	0.6
B	DC Cable	1	3	No	No	2.8
C	Phone Cable	1	4	No	No	1.8
D	EXT SPKR Cable	1	5	No	No	1.0
E	KEY Cable	1	OPEN	No	No	1.9
F	DATA Cable	1	OPEN	Yes	No	1.5
G	LINEAR Cable	1	OPEN	Yes	No	1.0
H	REM Cable	1	6	Yes	No	1.0
I	CAT Cable	1	OPEN	Yes	No	2.0
J	USB Cable	1	OPEN	Yes	No	1.4
K	GND Cable	1	GND	No	No	2.0

1.6.2 Operating condition:

- Rx 0.03 MHz (EUT is set to 0.03 MHz as low channel for HF band)
- Rx 30 MHz (Middle channel for HF band)
- Rx 55.99995 MHz (High channel for HF band)
- Rx 118 MHz (Low channel for VHF band)
- Rx 144 MHz (Middle channel for VHF band)
- Rx 163.99995 MHz (High channel for VHF band)
- Rx 420 MHz (Low channel for UHF band)
- Rx 430 MHz (Middle channel for UHF band)
- Rx 469.99995 MHz (High channel for UHF band)

Note: Operating frequency was selected by the manufacturer.

1.6.3 Setup diagram of tested system



Note: The signal cable E, F, G, I and J were connected to no AE by a request from the manufacturer. 50 ohm terminals were connected to the antenna terminals (HF / VHF & UHF).

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 placed 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)

AC01	TR06	CL11	PR15	BA07	CL30	CL38
PR12	DH01					

Test software used

EMI1 Ver. 4.2

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	214.914	45.8	11.7	8.7	29.9	36.3	43.5	7.2	Hori.
2	573.103	43.5	18.2	10.8	29.5	43.0	46.0	3.0	Hori.
3	60.450	44.5	10.2	7.3	30.2	31.8	40.0	8.2	Vert.
4	214.913	45.0	11.7	8.7	29.9	35.5	43.5	8.0	Vert.
5	573.102	40.4	18.2	10.8	29.5	39.9	46.0	6.1	Vert.
6	644.740	42.1	18.7	11.2	29.7	42.3	46.0	3.7	Vert.

Range: 1000 - 5000 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.
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-

Note: All emissions have more than 20 dB margin or under noise floor.

Operating mode: Rx 30 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	214.914	46.0	11.7	8.7	29.9	36.5	43.5	7.0	Hori.
2	358.190	43.0	15.1	9.7	29.9	37.9	46.0	8.1	Hori.
3	501.466	41.3	17.2	10.4	29.6	39.3	46.0	6.7	Hori.
4	573.104	43.9	18.2	10.8	29.5	43.4	46.0	2.6	Hori.
5	859.655	37.3	20.0	12.1	30.5	38.9	46.0	7.1	Hori.
6	60.450	45.3	10.2	7.3	30.2	32.6	40.0	7.4	Vert.
7	214.914	44.8	11.7	8.7	29.9	35.3	43.5	8.2	Vert.
8	573.103	39.9	18.2	10.8	29.5	39.4	46.0	6.6	Vert.
9	644.741	42.5	18.7	11.2	29.7	42.7	46.0	3.3	Vert.

Range: 1000 - 5000 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.
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-

Note: All emissions have more than 20 dB margin or under noise floor.

Operating mode: Rx 55.99995 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	214.913	45.8	11.7	8.7	29.9	36.3	43.5	7.2	Hori.
2	573.102	43.8	18.2	10.8	29.5	43.3	46.0	2.7	Hori.
3	60.450	44.4	10.2	7.3	30.2	31.7	40.0	8.3	Vert.
4	214.914	45.1	11.7	8.7	29.9	35.6	43.5	7.9	Vert.
5	573.102	40.4	18.2	10.8	29.5	39.9	46.0	6.1	Vert.
6	644.740	42.0	18.7	11.2	29.7	42.2	46.0	3.8	Vert.

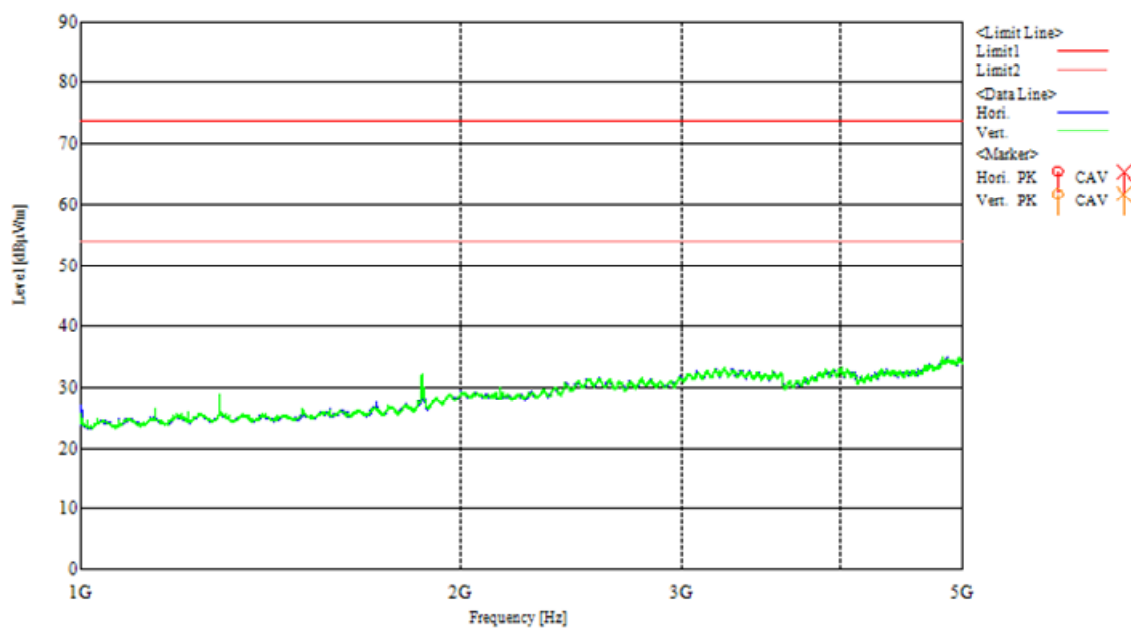
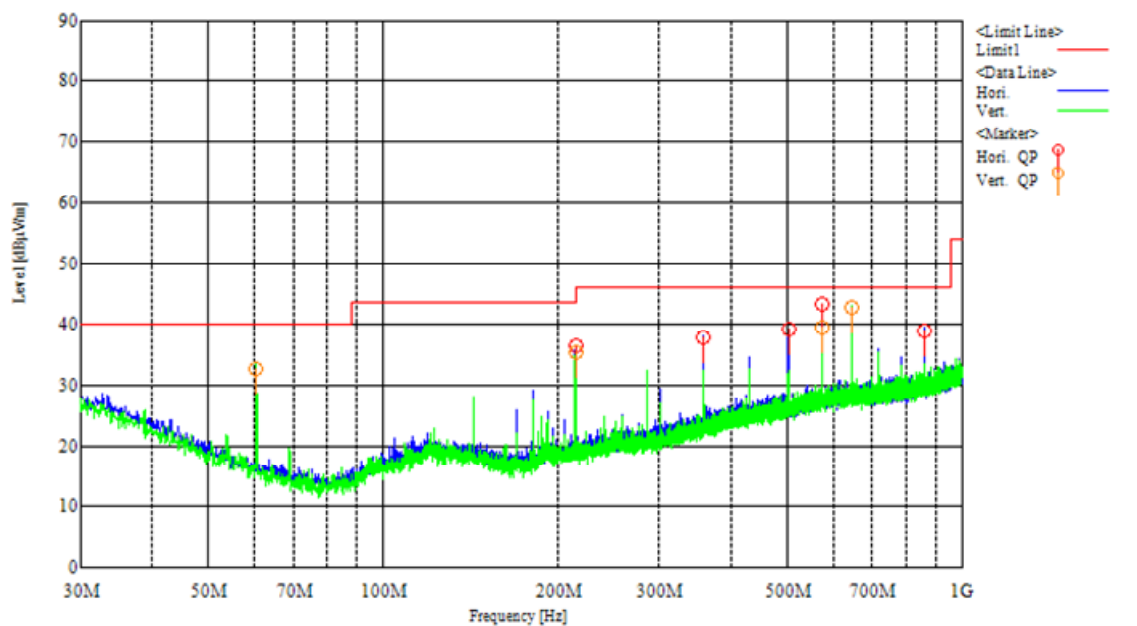
Range: 1000 - 5000 MHz

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.
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-

Note: All emissions have more than 20 dB margin or under noise floor.

[Worst Chart in HF band operation]

Operating mode: Rx 30 MHz



Operating mode: Rx 118 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	214.914	45.7	11.7	8.7	29.9	36.2	43.5	7.3	Hori.
2	573.104	43.5	18.2	10.8	29.5	43.0	46.0	3.0	Hori.
3	60.450	44.3	10.2	7.3	30.2	31.6	40.0	8.4	Vert.
4	187.448	46.9	10.6	8.5	30.0	36.0	43.5	7.5	Vert.
5	214.912	45.0	11.7	8.7	29.9	35.5	43.5	8.0	Vert.
6	573.103	40.5	18.2	10.8	29.5	40.0	46.0	6.0	Vert.
7	644.741	42.0	18.7	11.2	29.7	42.2	46.0	3.8	Vert.

Range: 1000 - 5000 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	1124.700	58.0	56.0	-10.8	47.2	45.2	73.9	53.9	26.7	8.7	Hori.
2	1124.699	56.3	54.0	-10.8	45.5	43.2	73.9	53.9	28.4	10.7	Vert.
3	1687.050	49.6	44.1	-8.1	41.5	36.0	73.9	53.9	32.4	17.9	Vert.

Operating mode: Rx 144 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	213.450	44.0	11.7	8.7	29.9	34.5	43.5	9.0	Hori.
2	214.914	46.3	11.7	8.7	29.9	36.8	43.5	6.7	Hori.
3	573.103	43.4	18.2	10.8	29.5	42.9	46.0	3.1	Hori.
4	60.450	44.3	10.2	7.3	30.2	31.6	40.0	8.4	Vert.
5	213.450	44.1	11.7	8.7	29.9	34.6	43.5	8.9	Vert.
6	214.914	45.0	11.7	8.7	29.9	35.5	43.5	8.0	Vert.
7	644.741	41.9	18.7	11.2	29.7	42.1	46.0	3.9	Vert.

Range: 1000 - 5000 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.
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-

Note: All emissions have more than 20 dB margin or under noise floor.

Operating mode: Rx 163.99995 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	214.913	43.5	11.7	8.7	29.9	34.0	43.5	9.5	Hori.
2	358.189	43.0	15.1	9.7	29.9	37.9	46.0	8.1	Hori.
3	573.101	43.0	18.2	10.8	29.5	42.5	46.0	3.5	Hori.
4	60.451	43.4	10.2	7.3	30.2	30.7	40.0	9.3	Vert.
5	143.279	44.5	11.9	8.1	30.0	34.5	43.5	9.0	Vert.
6	573.103	40.5	18.2	10.8	29.5	40.0	46.0	6.0	Vert.
7	644.740	38.8	18.7	11.2	29.7	39.0	46.0	7.0	Vert.

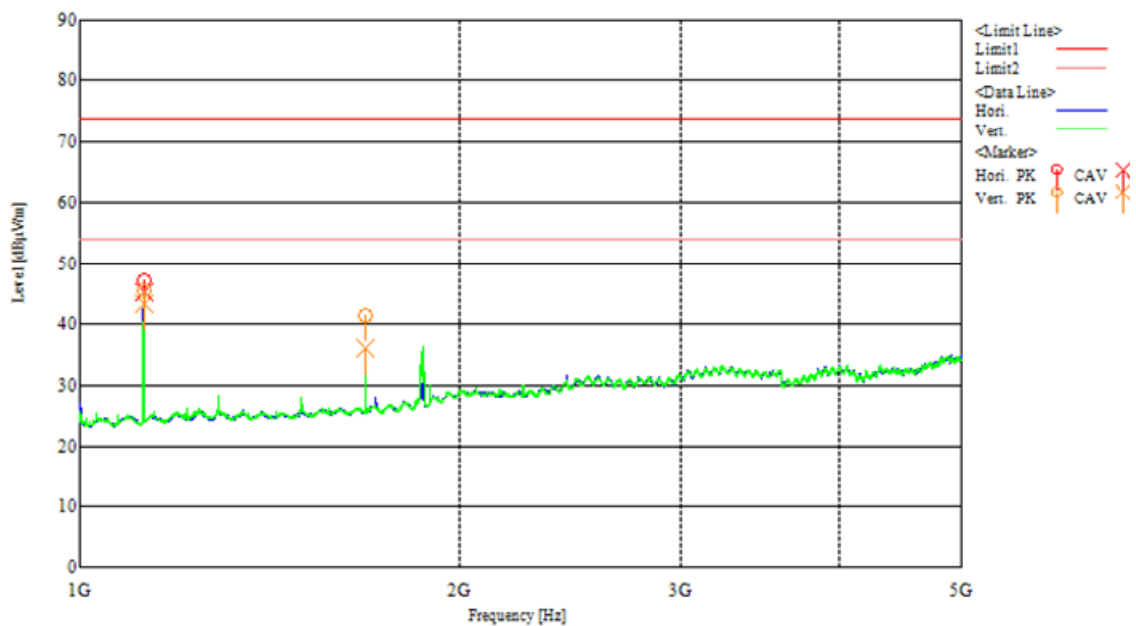
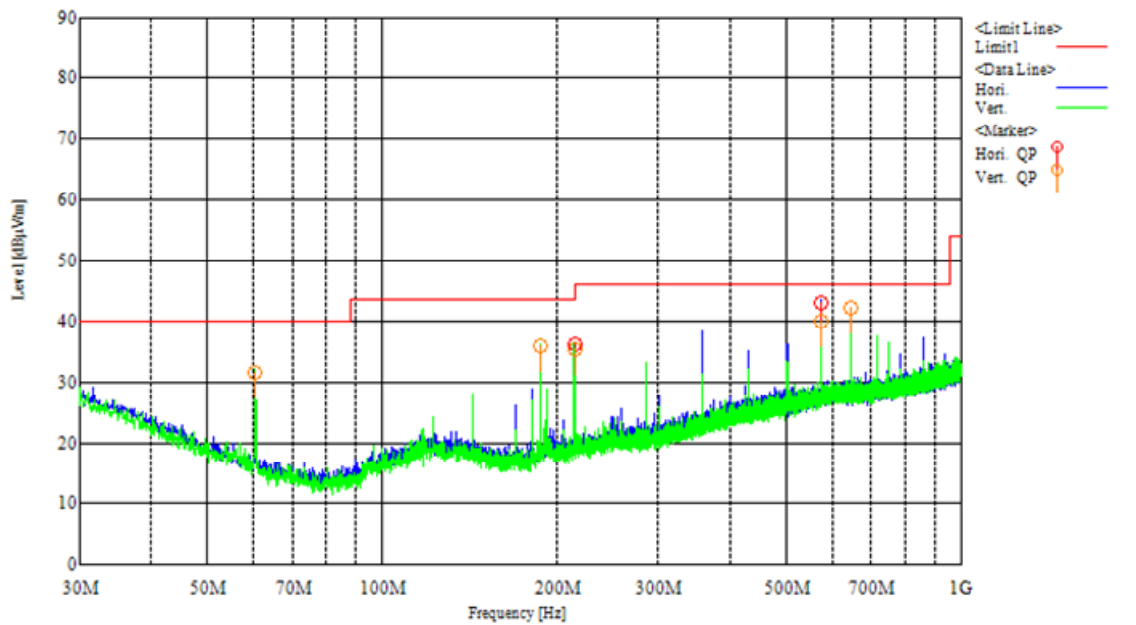
Range: 1000 - 5000 MHz

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.
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-

Note: All emissions have more than 20 dB margin or under noise floor.

[Worst Chart in VHF band operation]

Operating mode: Rx 118 MHz



Operating mode: Rx 420 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	214.913	43.5	11.7	8.7	29.9	34.0	43.5	9.5	Hori.
2	573.103	43.4	18.2	10.8	29.5	42.9	46.0	3.1	Hori.
3	978.900	40.6	20.9	12.6	30.2	43.9	53.9	10.0	Hori.
4	60.450	43.3	10.2	7.3	30.2	30.6	40.0	9.4	Vert.
5	143.275	44.7	11.9	8.1	30.0	34.7	43.5	8.8	Vert.
6	214.914	42.0	11.7	8.7	29.9	32.5	43.5	11.0	Vert.
7	573.101	40.5	18.2	10.8	29.5	40.0	46.0	6.0	Vert.
8	644.740	38.8	18.7	11.2	29.7	39.0	46.0	7.0	Vert.
9	978.899	38.8	20.9	12.6	30.2	42.1	53.9	11.8	Vert.

Range: 1000 - 5000 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	1468.352	50.4	44.2	-9.3	41.1	34.9	73.9	53.9	32.8	19.0	Hori.
2	2447.250	50.6	46.5	-3.8	46.8	42.7	73.9	53.9	27.1	11.2	Hori.
3	1468.350	52.1	48.0	-9.3	42.8	38.7	73.9	53.9	31.1	15.2	Vert.
4	1957.798	48.6	41.8	-5.5	43.1	36.3	73.9	53.9	30.8	17.6	Vert.
5	2447.248	48.5	43.0	-3.8	44.7	39.2	73.9	53.9	29.2	14.7	Vert.

Note: All emissions have more than 20 dB margin or under noise floor.

Operating mode: Rx 430 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	214.914	46.2	11.7	8.7	29.9	36.7	43.5	6.8	Hori.
2	499.450	40.6	17.2	10.4	29.6	38.6	46.0	7.4	Hori.
3	573.103	43.4	18.2	10.8	29.5	42.9	46.0	3.1	Hori.
4	998.900	41.9	21.0	12.7	30.1	45.5	53.9	8.4	Hori.
5	60.450	44.7	10.2	7.3	30.2	32.0	40.0	8.0	Vert.
6	214.914	44.9	11.7	8.7	29.9	35.4	43.5	8.1	Vert.
7	499.450	39.3	17.2	10.4	29.6	37.3	46.0	8.7	Vert.
8	644.741	42.0	18.7	11.2	29.7	42.2	46.0	3.8	Vert.
9	998.900	40.1	21.0	12.7	30.1	43.7	53.9	10.2	Vert.

Range: 1000 - 5000 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	1498.350	52.1	48.1	-9.2	42.9	38.9	73.9	53.9	31.0	15.0	Hori.
2	1498.351	52.2	47.9	-9.2	43.0	38.7	73.9	53.9	30.9	15.2	Vert.

Note: All emissions have more than 20 dB margin or under noise floor.

Operating mode: Rx 469.99995 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	214.914	43.7	11.7	8.7	29.9	34.2	43.5	9.3	Hori.
2	358.189	42.7	15.1	9.7	29.9	37.6	46.0	8.4	Hori.
3	573.103	43.2	18.2	10.8	29.5	42.7	46.0	3.3	Hori.
4	60.450	43.1	10.2	7.3	30.2	30.4	40.0	9.6	Vert.
5	143.276	44.6	11.9	8.1	30.0	34.6	43.5	8.9	Vert.
6	214.913	41.8	11.7	8.7	29.9	32.3	43.5	11.2	Vert.
7	539.450	41.0	17.8	10.6	29.5	39.9	46.0	6.1	Vert.
8	573.102	40.6	18.2	10.8	29.5	40.1	46.0	5.9	Vert.
9	644.739	39.2	18.7	11.2	29.7	39.4	46.0	6.6	Vert.

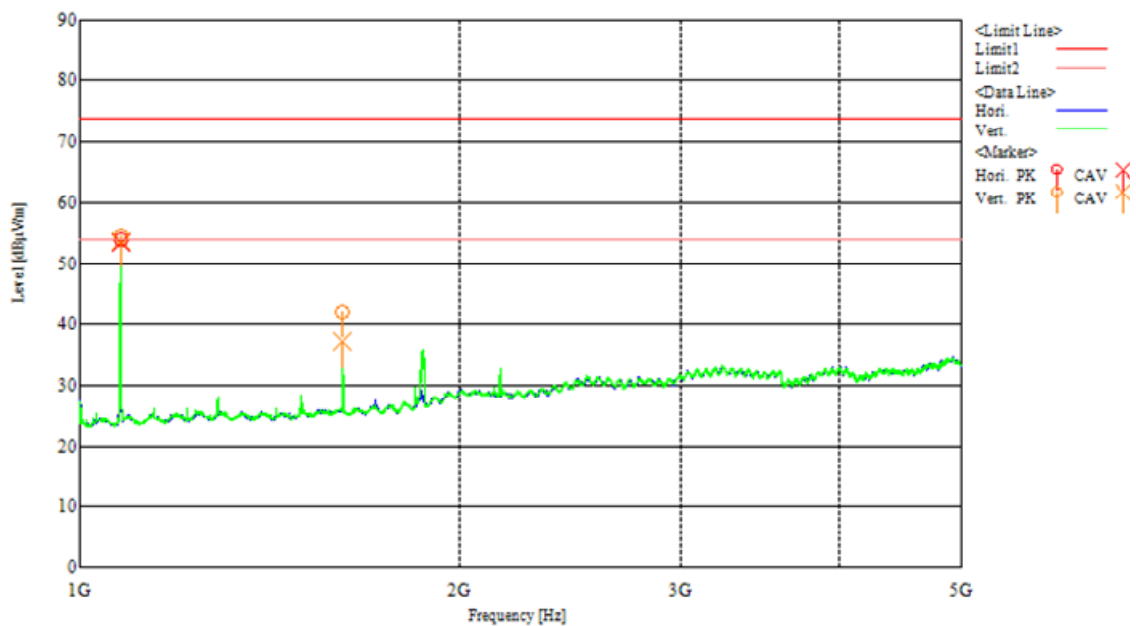
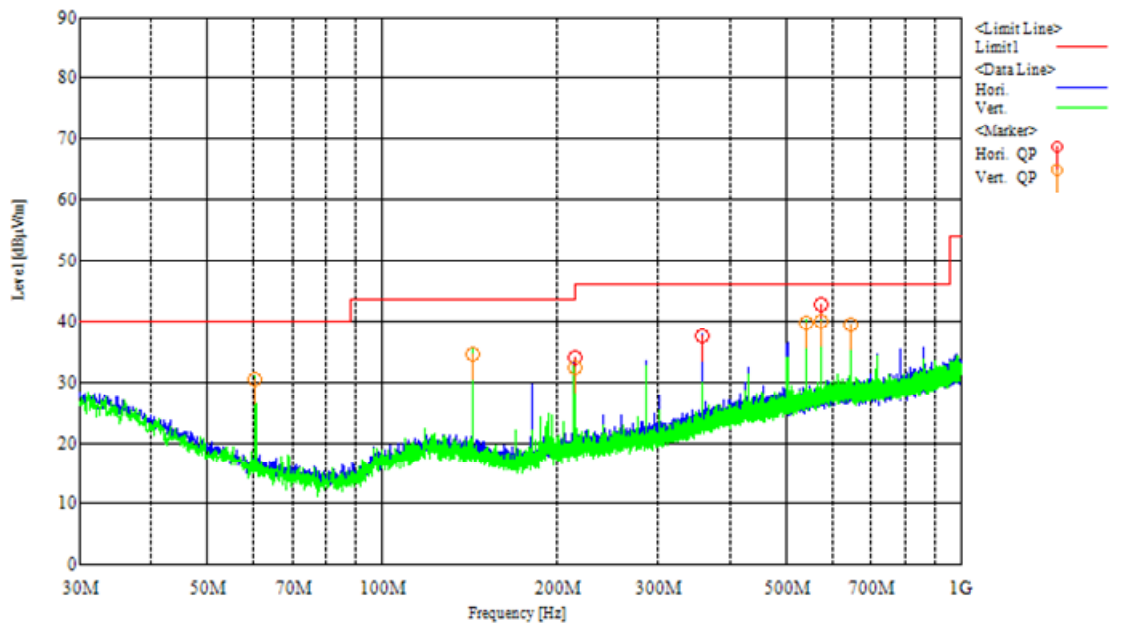
Range: 1000 - 5000 MHz

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	1078.901	65.2	64.4	-11.1	54.1	53.3	73.9	53.9	19.8	0.6	Hori.
2	1078.899	65.5	64.8	-11.1	54.4	53.7	73.9	53.9	19.5	0.2	Vert.
3	1618.350	50.5	45.4	-8.4	42.1	37.0	73.9	53.9	31.8	16.9	Vert.

Note: All emissions have more than 20 dB margin or under noise floor.

[Worst Chart in UHF band operation]

Operating mode: Rx 469.99995 MHz



[Test condition]

Date 1

Tested Date: 13 Jun. 2016
Humidity: 55 %

Temperature: 21 degC
Atmos. Press: 1002 hPa

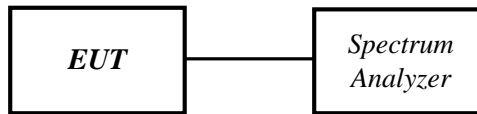
Date 2

Tested Date: 15 Jun. 2016
Humidity: 65 %

Temperature: 24 degC
Atmos. Press: 1011 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)

-	-	-
---	---	---

Test results - *This item was not tested.*

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]
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-

[Test condition]

Tested Date: - Temperature: - degC
Humidity: - % Atmos. Press: - hPa

[Chart]

Operating mode: -

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)

TR06	CL18	LN05
------	------	------

Test software used

EMI1 Ver. 4.2

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	0.15000	23.5	2.5	10.3	33.8	12.8	66.0	56.0	32.2	43.2	Va
2	0.15187	23.1	2.2	10.3	33.4	12.5	65.9	55.9	32.5	43.4	Vb

Note: All other emissions are under noise floor.

Operating mode: Rx 30 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	0.15459	23.0	2.1	10.3	33.3	12.4	65.7	55.7	32.4	43.3	Va
2	0.15323	23.4	2.2	10.3	33.7	12.5	65.8	55.8	32.1	43.3	Vb

Note: All other emissions are under noise floor.

Operating mode: Rx 55.99995 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	0.15136	24.0	2.4	10.3	34.3	12.7	65.9	55.9	31.6	43.2	Va
2	0.15561	23.1	2.1	10.3	33.4	12.4	65.7	55.7	32.3	43.3	Vb

Note: All other emissions are under noise floor.

Operating mode: Rx 118 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	0.15034	23.9	2.4	10.3	34.2	12.7	66.0	56.0	31.8	43.3	Va
2	0.15136	23.7	2.3	10.3	34.0	12.6	65.9	55.9	31.9	43.3	Vb

Note: All other emissions are under noise floor.

Operating mode: Rx 144 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	0.15051	23.6	2.3	10.3	33.9	12.6	66.0	56.0	32.1	43.4	Va
2	0.15017	23.6	2.3	10.3	33.9	12.6	66.0	56.0	32.1	43.4	Vb

Note: All other emissions are under noise floor.

Operating mode: Rx 163.999995 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	0.15493	22.8	2.0	10.3	33.1	12.3	65.7	55.7	32.6	43.4	Va
2	0.15459	22.8	2.0	10.3	33.1	12.3	65.7	55.7	32.6	43.4	Vb

Note: All other emissions are under noise floor.

Operating mode: Rx 420 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	0.15289	22.9	2.1	10.3	33.2	12.4	65.8	55.8	32.6	43.4	Va
2	0.15000	23.5	2.5	10.3	33.8	12.8	66.0	56.0	32.2	43.2	Vb

Note: All other emissions are under noise floor.

Operating mode: Rx 430 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	0.15986	21.8	1.6	10.3	32.1	11.9	65.5	55.5	33.4	43.6	Va
2	0.15085	23.3	2.2	10.3	33.6	12.5	66.0	56.0	32.4	43.5	Vb

Note: All other emissions are under noise floor.

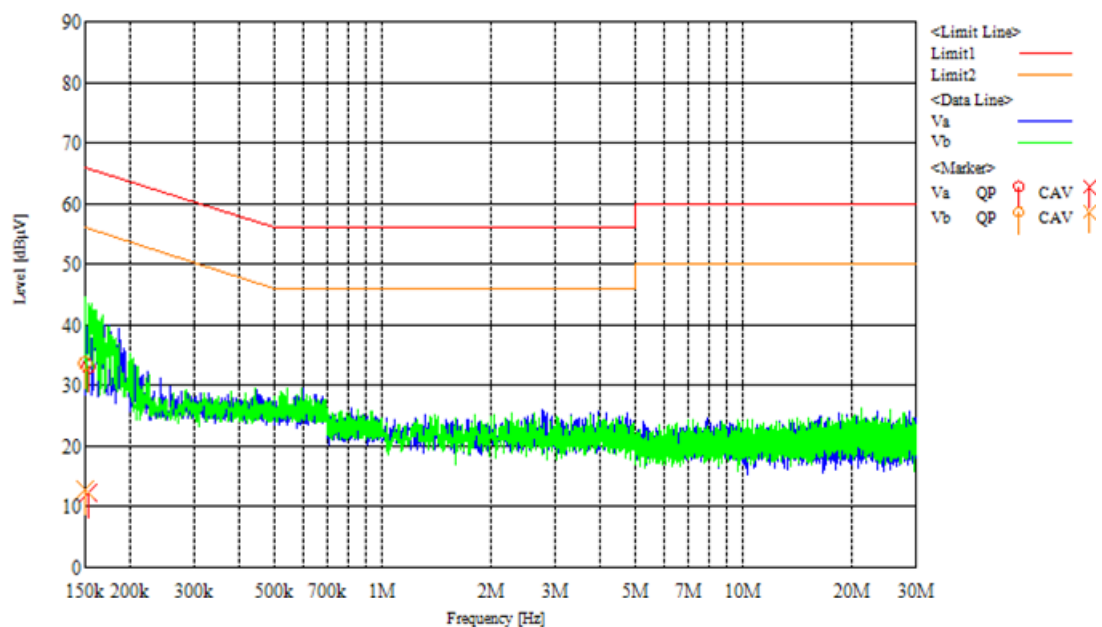
Operating mode: Rx 469.99995 MHz

	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	0.15017	23.8	2.4	10.3	34.1	12.7	66.0	56.0	31.9	43.3	Va
2	0.15578	22.4	1.9	10.3	32.7	12.2	65.7	55.7	33.0	43.5	Vb

Note: All other emissions are under noise floor.

[Worst Chart]

Operating mode: Rx 420 MHz



[Test condition]

Tested Date: 15 Jun. 2016
Humidity: 57 %

Temperature: 25 degC
Atmos. Press: 1011 hPa

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	-	2016/4/23	2017/4/30
AC01(EG)	Anechoic Chamber (1st test room)	JSE	203397C	-	2016/3/26	2017/3/31
BA07	Biological Antenna	TESEQ	CBL6143A	26670	2016/1/25	2017/1/31
CL11	RF Cable for RE	RFT	-	-	2016/3/14	2017/3/31
CL18	RF Cable for CE	RFT	-	-	2016/3/14	2017/3/31
CL30	RF Cable 5 m	SUHNER	SUCOFLEX104PE	MY3599	2015/8/25	2016/8/31
CL38	RF Cable 2 m	Junkosha	MWX221	1603S626	2016/4/5	2017/4/30
DH01	DRG Horn Antenna	A.H. Systems	SAS-571	785	2016/1/26	2018/1/31
LN05	LISN	Kyoritsu	KNW-407F	8-1773-2	2016/5/13	2017/5/31
PR12	Pre. Amplifier (1-26G)	Agilent Technologies	8449B	3008A02513	2016/1/29	2017/1/31
PR15	Pre. Amplifier	Anritsu	MH648A	6201156141	2015/6/13	2016/6/30
TR06	Test Receiver (F/W : 3.93 SP2)	Rohde & Schwarz	ESU26	100002	2015/9/28	2016/9/30

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.