TEST REPORT

For

HF/50MHz TRANSCEIVER

In conformity with

FCC CFR 47 Part15 Subpart B (ITE)

Model : FT-891

FCC ID : K6620651X50

Test Item : HF/50MHz TRANSCEIVER

Report No. : ERY1603P24R2

Issue Date : 24 Mar. 2016

Prepared for

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

Prepared by

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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.

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History

Report No.	Date	Revisions	Issued By
ERY1602P26R2	26 Feb. 2016	Initial Issue	T.Kato
ERY1603P17R2	17 Mar. 2016	Add the photo of Radiated emission test (above 1 GHz)	T.Kato
ERY1603P24R2	24 Mar. 2016	Add the test result of Conducted emission	T.Kato

1 General information

1.1 Product description

Test item	: HF/50MHz TRANSCEIVER
Manufacturer	: YAESU MUSEN CO., LTD.
Address	: 43 Utsuroda, Morijuku, Sukagawa-shi, Fukushima-ken 962-0001 JAPAN
Model	: FT-891
FCC ID	: K6620651X50
Serial number	: ES01
Hardware version	: ES01
Software version	: ES01
Highest internal operating Freq.	: 125.4 MHz
Receipt date of EUT	: 13 Jan. 2016
Nominal power source voltages	: DC 13.8 V (This is supplied by a battery)

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 Jan. 2016
Test(s) completed	: 23 Mar. 2016
Purpose of test(s)	: Certification as the peripheral of class B personal computer
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
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;

Conducted emission: ± 3.4 dB (150 kHz - 30 MHz)
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 2000 MHz) (*)	15.109	Complied	2.1
AC power line conducted emissions	15.107	Complied	2.2

(*) The highest internal operating frequency is 125.4 MHz.

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	HF/50MHz TRANSCEIVER	YAESU MUSEN CO., LTD.	FT-891	ES01
-	-	-	-	-

Support Equipment(s)

No.	Item	Manufacture	Model No.	Serial No.
B	Hand Microphone	YAESU MUSEN CO., LTD.	MH-31A8J	YTS30
C	Remote Control Keypad	YAESU MUSEN CO., LTD.	FH-2	YTS02
D	External Speaker	YAESU MUSEN CO., LTD.	MLS-100	064
E	PC	HP	dm1-2002AU	CNF027047P
F	LAN Hub	NEC	PA-WR8700N-HP	87N1111286973B0
G	DC Power Supply	YAESU MUSEN CO., LTD.	FP-1030A	1108122610

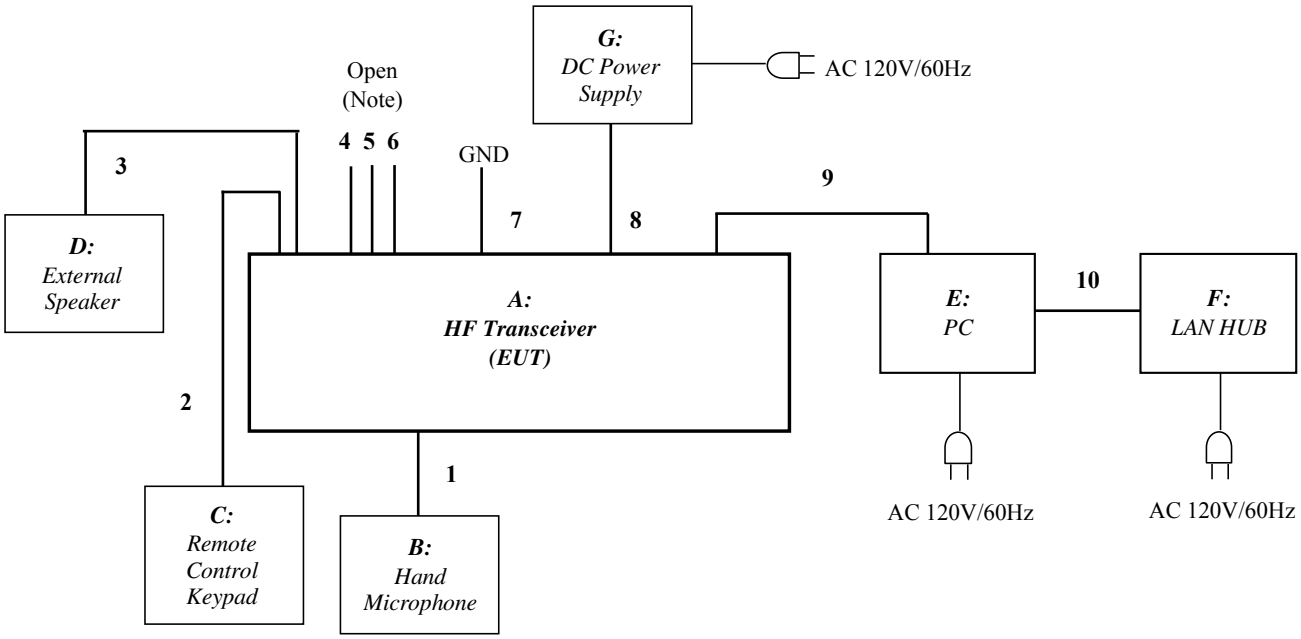
Connected cable(s)

No.	Item	Identification (Manu.etc.)	Cable Shielded	Ferrite Core	Length [m]
1	Mic Cable	YAESU MUSEN CO., LTD.	No	No	0.6
2	Remote Cable	YAESU MUSEN CO., LTD.	No	No	1.0
3	Ext. SP Cable	YAESU MUSEN CO., LTD.	No	No	1.8
4	Key Cable	YAESU MUSEN CO., LTD.	No	No	2.0
5	RTTY/DATA Cable	YAESU MUSEN CO., LTD.	Yes	No	1.6
6	TUN/LIN Cable	YAESU MUSEN CO., LTD.	Yes	No	2.4
7	GND Cable	YAESU MUSEN CO., LTD.	No	No	2.0
8	DC Cable	YAESU MUSEN CO., LTD.	No	No	2.8
9	USB Cable	YAESU MUSEN CO., LTD.	Yes	No	1.7
10	LAN Cable	-	No	No	2.0

1.6.2 Operating condition:

ITE mode: The EUT is connected to PC using USB Cable.

1.6.3 Setup diagram of tested system



Note: The signal cable 4, 5, 6 were 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.

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)

AC01	TR06	CL11	PR15	BA07	CL29	CL30
PR12	DH01					

Test software used

EMI1 Ver. 3.2

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

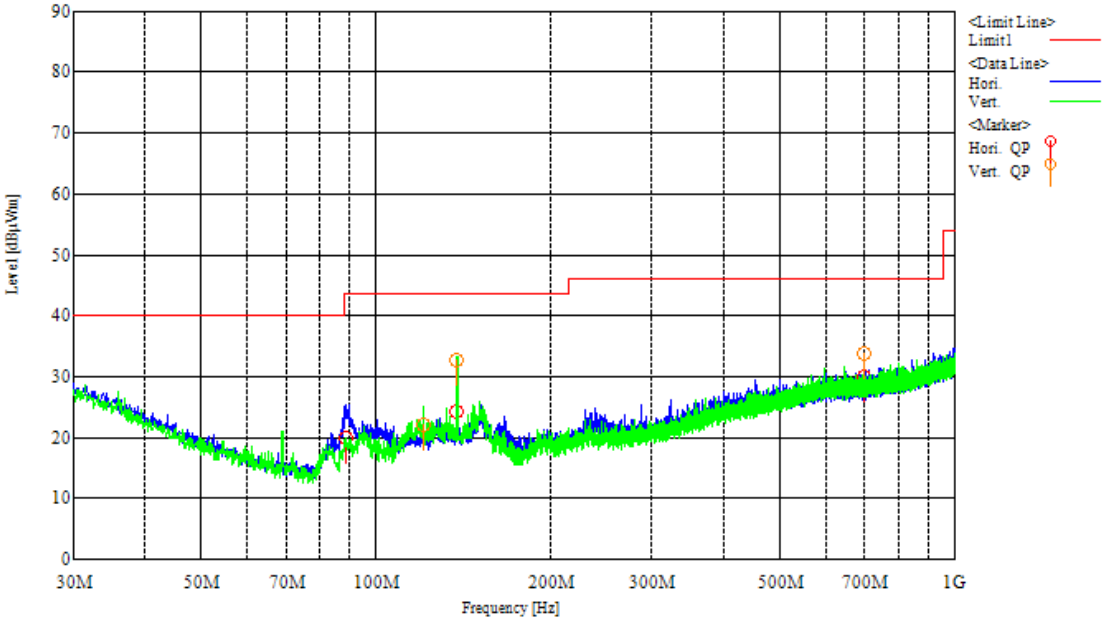
Range: 30 - 1000 MHz

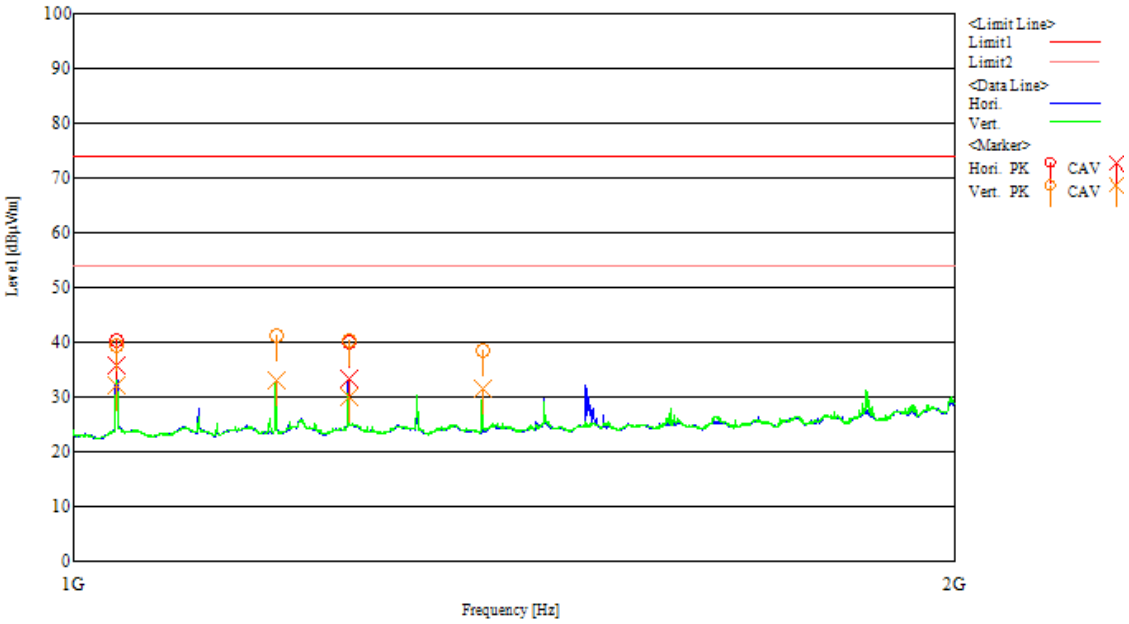
No.	Frequency [MHz]	Reading [dBµV]	Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Ant.
1	88.738	34.5	7.9	7.6	30.1	19.9	43.5	23.6	Hori.
2	138.000	33.9	12.3	8.0	30.0	24.2	43.5	19.3	Hori.
3	700.382	29.8	18.7	11.4	29.9	30.0	46.0	16.0	Hori.
4	121.056	31.8	12.4	7.9	30.1	22.0	43.5	21.5	Vert.
5	138.287	42.4	12.3	8.0	30.0	32.7	43.5	10.8	Vert.
6	700.384	33.5	18.7	11.4	29.9	33.7	46.0	12.3	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	1034.998	52.0	47.2	-11.6	40.4	35.6	73.9	53.9	33.5	18.3	Hori.
2	1242.000	49.9	43.3	-10.0	39.9	33.3	73.9	53.9	34.0	20.6	Hori.
3	1035.000	50.9	43.7	-11.6	39.3	32.1	73.9	53.9	34.6	21.8	Vert.
4	1173.000	51.8	43.6	-10.5	41.3	33.1	73.9	53.9	32.6	20.8	Vert.
5	1241.999	50.2	40.0	-10.0	40.2	30.0	73.9	53.9	33.7	23.9	Vert.
6	1379.999	48.0	41.1	-9.6	38.4	31.5	73.9	53.9	35.5	22.4	Vert.

[Chart]





[Test condition]

Tested Date:	13 Jan. 2016	Temperature:	15 degC
Humidity:	36 %	Atmos. Press:	1016 hPa

2.2 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 [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	CL18	LN05	LN06

Test software used

EMI1 Ver. 3.2

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]

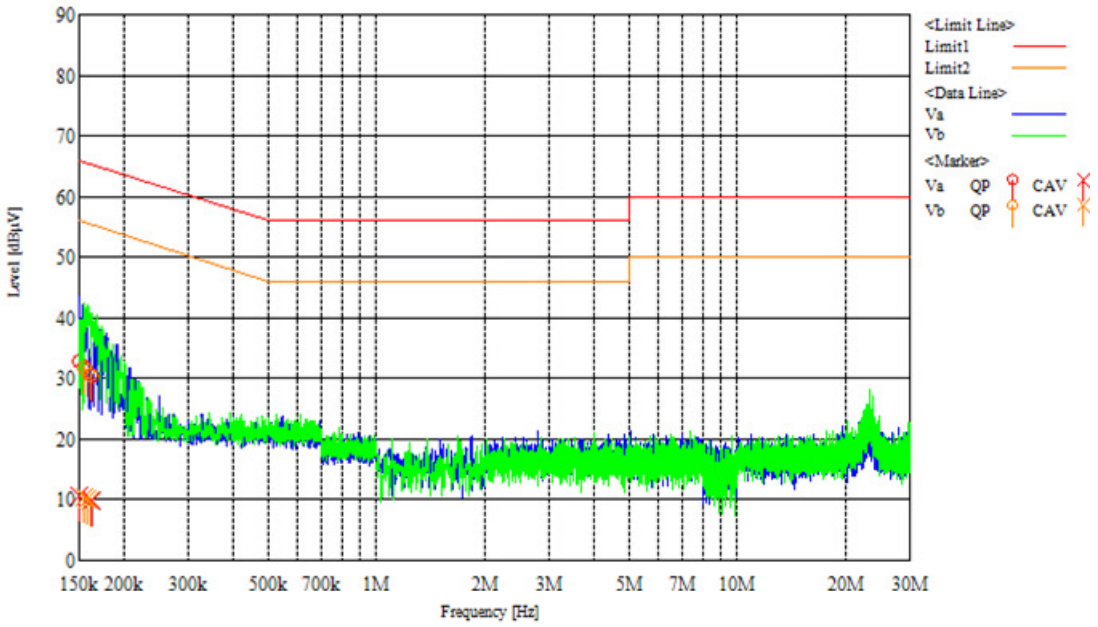
Test results - *Complied with reqyirement*

Test Data

[Emission level]

	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	0.15001	22.6	0.4	10.2	32.8	10.6	66.0	56.0	33.2	45.4	Va
2	0.15442	21.8	0.1	10.2	32.0	10.3	65.8	55.8	33.8	45.5	Va
3	0.16292	20.1	-0.4	10.2	30.3	9.8	65.3	55.3	35.0	45.5	Va
4	0.15510	21.6	0.1	10.2	31.8	10.3	65.7	55.7	33.9	45.4	Vb
5	0.15850	20.9	-0.2	10.2	31.1	10.0	65.5	55.5	34.4	45.5	Vb
6	0.16037	20.5	-0.3	10.2	30.7	9.9	65.4	55.4	34.7	45.5	Vb

[Chart]



[Test condition]

Tested Date:	23 Mar. 2016	Temperature:	16 degC
Humidity:	47 %	Atmos. Press:	1019 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	-	2015/4/18	2016/4/30
AC01(EG)	Anechoic Chamber (1st test room)	JSE	203397C	-	2015/11/3	2016/11/30
BA07	Bilogical Antenna	TESEQ	CBL6143A	26670	2016/1/25	2017/1/31
CL11	RF Cable for RE	RFT	-	-	2015/3/13	2016/3/31
CL18	RF Cable for CE	RFT	-	-	2015/5/1	2016/5/31
CL29	RF Cable 2 m	SUHNER	SUCOFLEX104PE	94709	2015/8/25	2016/8/31
CL30	RF Cable 5 m	SUHNER	SUCOFLEX104PE	MY3599	2015/8/25	2016/8/31
CL31	RF Cable 1 m	Junkosha	MWX221	1303S118	2015/11/24	2016/11/30
DH01	DRG Horn Antenna	A.H. Systems	SAS-571	785	2016/1/26	2018/1/31
LN05	LISN	Kyoritsu	KNW-407F	8-1773-2	2015/6/2	2016/6/30
LN06	LISN	Kyoritsu	KNW-407F	8-1773-3	2015/5/28	2016/5/31
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
TR09	Test Receiver (F/W : 4.43 SP3)	Rohde & Schwarz	ESU8	100386	2016/2/2	2017/2/28

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.