RADIO TEST REPORT

Test Report No. : 10329809H-A

Applicant	:	**Panasonic Corporation**
Type of Equipment	:	**FOB**
Model No.	:	**EMU470102**
Test regulation	:	**FCC Part 15 Subpart C: 2014**
FCC ID	:	**ACJ932U01**
Test Result	:	**Complied**

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with above regulation.
4. The test results in this report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

Date of test: July 3 to 10, 2014

Representative test engineer:
Masatoshi Nishiguchi
Engineer
Consumer Technology Division

Approved by:
Motoya Imura
Engineer
Consumer Technology Division

NVLAP LAB CODE: 200572-0

This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation.
*As for the range of Accreditation in NVLAP, you may refer to the WEB address, http://www.ul.com/japan/jpn/pages/services/emc/about/mark1/index.jsp#nvlap

REVISION HISTORY

Original Test Report No.: 10329809H-A

Revision	Test report No.	Date	Page revised	Contents
- (Original)	10329809H-A	August 25, 2014	-	-

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SECTION 1: Customer information

Company Name	:	Panasonic Corporation
Address	:	1006 Kadoma, Kadoma City, Osaka 571-8506, Japan
Telephone Number	:	+81-6-6906-4726
Contact Person	:	Hirohumi Oosawa

SECTION 2: Equipment under test (E.U.T.)

2.1 Identification of E.U.T.

Type of Equipment	:	FOB
Model No.	:	EMU470102
Serial No.	:	Refer to Clause 4.2
Rating	:	DC 3.0V
Receipt Date of Sample	:	May 21, 2014
Country of Mass-production	:	Thailand
Condition of EUT	:	Production prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT	:	No Modification by the test lab

2.2 Product Description

Model No: EMU470102 (referred to as the EUT in this report) are the Passive Entry and Start System for Vehicles.

General Specification

Clock frequency(ies) in the system	:	CPU: 2MHz (Internal CR oscillation of IC)
Operating temperature	:	-20 to +60 deg. C

Radio Specification

[Transmitter part]

Radio Type	:	Transmitter
Frequency of Operation	:	433.92MHz
Modulation	:	FSK
Power Supply (radio part input)	:	DC 3.0V (CR2032)
Antenna type	:	Loop antenna (pattern antenna)
Antenna gain	:	-20dBi

[Receiver part]

Radio Type	:	Receiver
Frequency of Operation	:	125KHz
Modulation	:	ASK
Power Supply (radio part input)	:	DC 3.0V (CR2032)
Antenna type	:	Loop antenna (pattern antenna)

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification	:	FCC Part 15 Subpart C: 2014, final revised on May 1, 2014 and effective June 2, 2014
Title	:	FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators Section 15.231 Periodic operation in the band 40.66 - 40.70MHz and above 70MHz

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted emission	**FCC:** ANSI C63.4:2003 7. AC powerline conducted emission measurements	**FCC:** Section 15.207	N/A	N/A *1)	-
	IC: RSS-Gen 7.2.4	**IC:** RSS-Gen 7.2.4			
Automatically Deactivate	**FCC:** ANSI C63.4:2003 13. Measurement of intentional radiators	**FCC:** Section 15.231(a)(1)	N/A	Complied	Radiated
	IC: -	**IC:** RSS-210 A1.1.1			
Electric Field Strength of Fundamental Emission	**FCC:** ANSI C63.4:2003 13. Measurement of intentional radiators	**FCC:** Section 15.231(b)	0.7dB, 433.920MHz, Vertical, PK with Duty factor	Complied	Radiated
	IC: RSS-Gen 4.8	**IC:** RSS-210 A1.1.2			
Electric Field Strength of Spurious Emission	**FCC:** ANSI C63.4:2003 13. Measurement of intentional radiators	**FCC:** Section 15.205 Section 15.209 Section 15.231(b)	0.3dB, 3905.280MHz/ 4339.200MHz, Horizontal, PK with Duty factor	Complied	Radiated
	IC: RSS-Gen 4.9	**IC:** RSS-210 A1.1.2, 2.5.1 RSS-Gen 7.2.5			
-20dB Bandwidth	**FCC:** ANSI C63.4:2003 13. Measurement of intentional radiators	**FCC:** Section 15.231(c)	N/A	Complied	Radiated
	IC: -	**IC:** Reference data			
Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422. *1) The test is not applicable since the EUT does not have AC Mains.					

FCC 15.31 (e)
This test was performed with the New Battery (DC 3.0V) and the constant voltage was supplied to the EUT during the tests. Therefore, the EUT complies with the requirement.

FCC Part 15.203 Antenna requirement
It is impossible for end users to replace the antenna, because the antenna is mounted inside of the EUT. Therefore, the equipment complies with the antenna requirement of Section 15.203.

3.3 Addition to standard

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99% Occupied Bandwidth	**IC:** RSS-Gen 4.6.1	**IC:** RSS-Gen 4.6.1	N/A	Complied	Radiated

Other than above, no addition, exclusion nor deviation has been made from the standard.

3.4 Uncertainty

EMI

The following uncertainties have been calculated to provide a confidence level of 95% using a coverage factor k=2.

Test room (semi-anechoic chamber)	**Radiated emission**						
	(3m*)(±dB)				**(1m*)(±dB)**		**(0.5m*)(±dB)**
	9kHz -30MHz	30MHz -300MHz	300MHz -1GHz	1GHz -10GHz	10GHz -18GHz	18GHz -26.5GHz	26.5GHz -40GHz
No.1	4.0dB	5.1dB	5.0dB	5.1dB	6.0dB	4.9dB	4.3dB
No.2	3.9dB	5.2dB	5.0dB	4.9dB	5.9dB	4.7dB	4.2dB
No.3	4.3dB	5.1dB	5.2dB	5.2dB	6.0dB	4.8dB	4.2dB
No.4	4.6dB	5.2dB	5.0dB	5.2dB	6.0dB	5.7dB	4.2dB

*3m/1m/0.5m = Measurement distance

Radiated emission test(3m)

The data listed in this report meets the limits unless the uncertainty is taken into consideration.

3.5 Test Location

UL Japan, Inc. Ise EMC Lab. *NVLAP Lab. code: 200572-0
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone : +81 596 24 8999 Facsimile : +81 596 24 8124

	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms
No.1 semi-anechoic chamber	2973C-1	19.2 x 11.2 x 7.7m	7.0 x 6.0m	No.1 Power source room
No.2 semi-anechoic chamber	2973C-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 semi-anechoic chamber	2973C-3	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.3 Preparation room
No.3 shielded room	-	4.0 x 6.0 x 2.7m	N/A	-
No.4 semi-anechoic chamber	2973C-4	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.4 Preparation room
No.4 shielded room	-	4.0 x 6.0 x 2.7m	N/A	-
No.5 semi-anechoic chamber	-	6.0 x 6.0 x 3.9m	6.0 x 6.0m	-
No.6 shielded room	-	4.0 x 4.5 x 2.7m	4.0 x 4.5 m	-
No.6 measurement room	-	4.75 x 5.4 x 3.0m	4.75 x 4.15 m	-
No.7 shielded room	-	4.7 x 7.5 x 2.7m	4.7 x 7.5m	-
No.8 measurement room	-	3.1 x 5.0 x 2.7m	N/A	-
No.9 measurement room	-	8.0 x 4.6 x 2.8m	2.4 x 2.4m	-
No.11 measurement room	-	6.2 x 4.7 x 3.0m	4.8 x 4.6m	-

* Size of vertical conducting plane (for Conducted Emission test) : 2.0 x 2.0m for No.1, No.2, No.3, and No.4 semi-anechoic chambers and No.3 and No.4 shielded rooms.

3.6 Data of EMI, Test instruments, and Test set up.

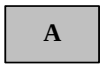
Refer to APPENDIX.

SECTION 4: Operation of E.U.T. during testing

4.1 Operating Modes

Test Item*	Mode
Automatically Deactivate	Normal use mode
Electric Field Strength of Fundamental Emission Electric Field Strength of Spurious Emission -20dB & 99% Occupied Bandwidth Duty Cycle	Transmitting mode (Tx) *1)
* The system was configured in typical fashion (as a customer would normally use it) for testing. *1) The software of this mode is the same as one of normal product, except that EUT continues to transmit when transmitter button is being pressed (For Normal use mode, EUT stops to transmit in a given time, even if transceiver button is being pressed.) End users cannot change the settings of the output power of the product.	

4.2 Configuration and peripherals



* Test data was taken under worse case conditions.

Description of EUT

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	FOB	EMU470102	654	Panasonic Corporation	EUT

SECTION 5: Radiated emission (Electric Field Strength of Fundamental and Spurious Emission)

Test Procedure and conditions

EUT was placed on a urethane platform of nominal size, 0.5m by 1.0m, raised 0.8m above the conducting ground plane.
The EUT was set on the center of the tabletop.
Test was made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna was varied in height above the conducting ground plane to obtain the maximum signal strength.
Photographs of the set up are shown in Appendix 3.

[Transmitting mode]

(Below 30MHz)
The noise level was checked by moving a search-coil (Loop Antenna) close to the EUT.

(Above 30MHz)
The Radiated Electric Field Strength has been measured on Semi anechoic chamber with a ground plane and at a distance of 3m.
The measuring antenna height was varied between 1 and 4m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.
The measurements were performed for both vertical and horizontal antenna polarization.
The radiated emission measurements were made with the following detector function of the test receiver/spectrum analyzer.
- The carrier level (or, noise levels) was (or were) measured at each position of all three axes X, Y and Z, and the position that has the maximum noise was determined. Noise levels of all the frequencies were measured at the position.

*The result is rounded off to the second decimal place, so some differences might be observed.

Test Antennas are used as below;

Frequency	Below 30MHz	30MHz to 300MHz	300MHz to 1GHz	Above 1GHz
Antenna Type	Loop	Biconical	Logperiodic	Horn

	From 9kHz to 90kHz and From 110kHz to 150kHz	From 90kHz to 110kHz	From 150kHz to 490kHz	From 490kHz to 30MHz	From 30MHz to 1GHz	Above 1GHz
Detector Type	Peak	Peak	Peak	Peak	Peak and Peak with Duty factor	Peak and Peak with Duty factor
IF Bandwidth	200Hz	200Hz	9.1kHz	9.1kHz	120kHz	PK: S/A:RBW 1MHz, VBW:3MHz

This EUT has two modes which mechanical key is inserted or not. The worst case was confirmed with and without mechanical key, as a result, the test without mechanical key was the worst case. Therefore the test without mechanical key was performed only.

SECTION 6: Automatically deactivate

Test Procedure

The measurement was performed with Electric field strength using a spectrum analyzer.

Test data : APPENDIX
Test result : Pass

SECTION 7: -20dB and 99% Occupied Bandwidth

Test Procedure

The measurement was performed in the antenna height to gain the maximum of Electric field strength.

Test	Span	RBW	VBW	Sweep	Detector	Trace	Instrument used
20dB Bandwidth	1MHz	10kHz	30kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99% Occupied Bandwidth	Enough width to display 20dB Bandwidth	1 % of Span	Three times of RBW	Auto	Peak	Max Hold	Spectrum Analyzer

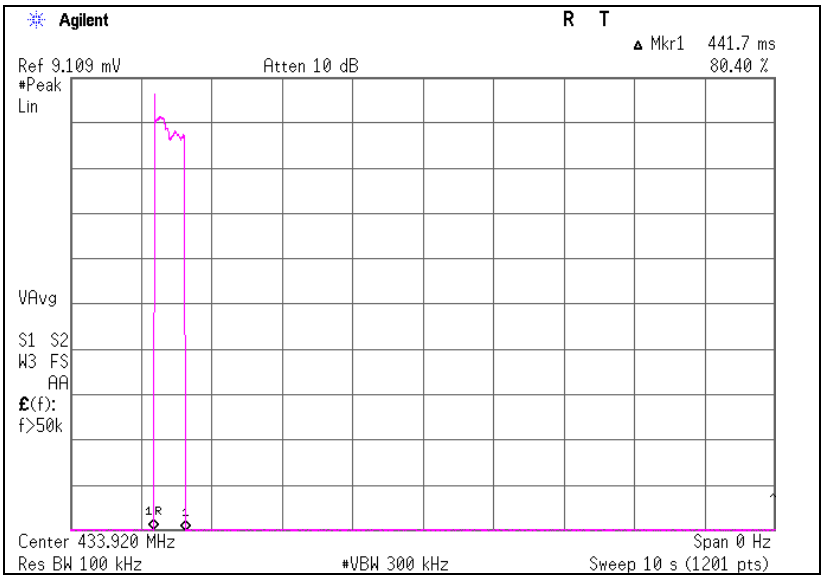
Test data : APPENDIX
Test result : Pass

APPENDIX 1: Data of EMI test

Automatically deactivate

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	10329809H
Date	07/10/2014
Temperature/ Humidity	24 deg. C / 66% RH
Engineer	Masatoshi Nishiguchi
Mode	Normal use mode

Time of Transmitting [sec]	Limit [sec]	Result
0.4417	5.00	Pass



Radiated Emission (Electric Field Strength of Fundamental and Spurious Emission)

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber	
Report No.	10329809H	
Date	07/03/2014	07/07/2014
Temperature / Humidity	24deg. C / 45% RH	22deg. C / 60% RH
Engineer	Masatoshi Nishiguchi	Masatoshi Nishiguchi
Mode	Transmitting mode	

PK

Frequency	Detector	Reading [dBuV]		Ant Factor	Loss	Gain	Duty Factor	Result [dBuV/m]		Limit	Margin [dB]		Remark Inside or Outside
[MHz]		Hor	Ver	[dB/m]	[dB]	[dB]	[dB]	Hor	Ver	[dBuV/m]	Hor	Ver	of Restricted Bands
433.920	PK	83.4	83.6	17.7	10.8	32.0	-	79.9	80.1	100.8	20.9	20.7	Carrier
867.840	PK	42.3	37.3	22.2	13.1	31.1	-	46.5	41.5	80.8	34.3	39.3	Outside
1301.760	PK	47.4	48.6	24.9	1.9	34.5	-	39.7	40.9	73.9	34.2	33.0	Inside
1735.680	PK	50.7	51.2	25.8	2.1	33.5	-	45.1	45.6	80.8	35.7	35.2	Outside
2169.600	PK	55.1	54.2	26.4	2.4	32.9	-	51.0	50.1	80.8	29.8	30.7	Outside
2603.520	PK	60.4	56.5	27.0	2.6	32.6	-	57.4	53.5	80.8	23.4	27.3	Outside
3037.440	PK	52.5	52.8	27.4	2.8	32.4	-	50.3	50.6	80.8	30.5	30.2	Outside
3471.360	PK	57.3	51.7	27.8	3.0	32.2	-	55.9	50.3	80.8	24.9	30.5	Outside
3905.280	PK	53.8	53.3	28.7	3.2	32.1	-	53.6	53.1	73.9	20.3	20.8	Inside
4339.200	PK	52.5	49.2	29.6	3.4	31.9	-	53.6	50.3	73.9	20.3	23.6	Inside

Result = Reading + Ant Factor + Loss (Cable+Attenuator) - Gain(Amprifier)

PK with Duty factor

Frequency	Detector	Reading [dBuV]		Ant Factor	Loss	Gain	Duty Factor	Result [dBuV/m]		Limit	Margin [dB]		Remark
[MHz]		Hor	Ver	[dB/m]	[dB]	[dB]	[dB]	Hor	Ver	[dBuV/m]	Hor	Ver	
433.920	PK	83.4	83.6	17.7	10.8	32.0	0.0	79.9	80.1	80.8	0.9	0.7	Carrier
867.840	PK	42.3	37.3	22.2	13.1	31.1	0.0	46.5	41.5	60.8	14.3	19.3	Outside
1301.760	PK	47.4	48.6	24.9	1.9	34.5	0.0	39.7	40.9	53.9	14.2	13.0	Inside
1735.680	PK	50.7	51.2	25.8	2.1	33.5	0.0	45.1	45.6	60.8	15.7	15.2	Outside
2169.600	PK	55.1	54.2	26.4	2.4	32.9	0.0	51.0	50.1	60.8	9.8	10.7	Outside
2603.520	PK	60.4	56.5	27.0	2.6	32.6	0.0	57.4	53.5	60.8	3.4	7.3	Outside
3037.440	PK	52.5	52.8	27.4	2.8	32.4	0.0	50.3	50.6	60.8	10.5	10.2	Outside
3471.360	PK	57.3	51.7	27.8	3.0	32.2	0.0	55.9	50.3	60.8	4.9	10.5	Outside
3905.280	PK	53.8	53.3	28.7	3.2	32.1	0.0	53.6	53.1	53.9	0.3	0.8	Inside
4339.200	PK	52.5	49.2	29.6	3.4	31.9	0.0	53.6	50.3	53.9	0.3	3.6	Inside

Result = Reading + Ant Factor + Loss (Cable+Attenuator) - Gain(Amprifier) + Duty factor (Refer to Duty factor data sheet)

*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).

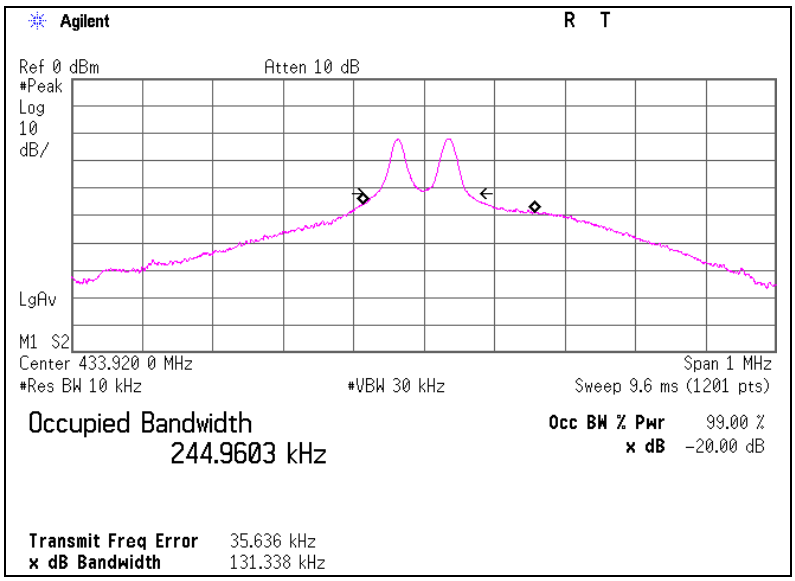
-20dB and 99% Occupied Bandwidth

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	10329809H
Date	07/10/2014
Temperature/ Humidity	24 deg. C / 66% RH
Engineer	Masatoshi Nishiguchi
Mode	Transmitting mode

Bandwidth Limit : Fundamental Frequency **433.92** MHz x 0.25% = 1084.80 kHz

-20dB Bandwidth [kHz]	Bandwidth Limit [kHz]	Result
131.34	1084.80	Pass

99% Occupied Bandwidth [kHz]	Bandwidth Limit [kHz]	Result
244.96	1084.80	Pass

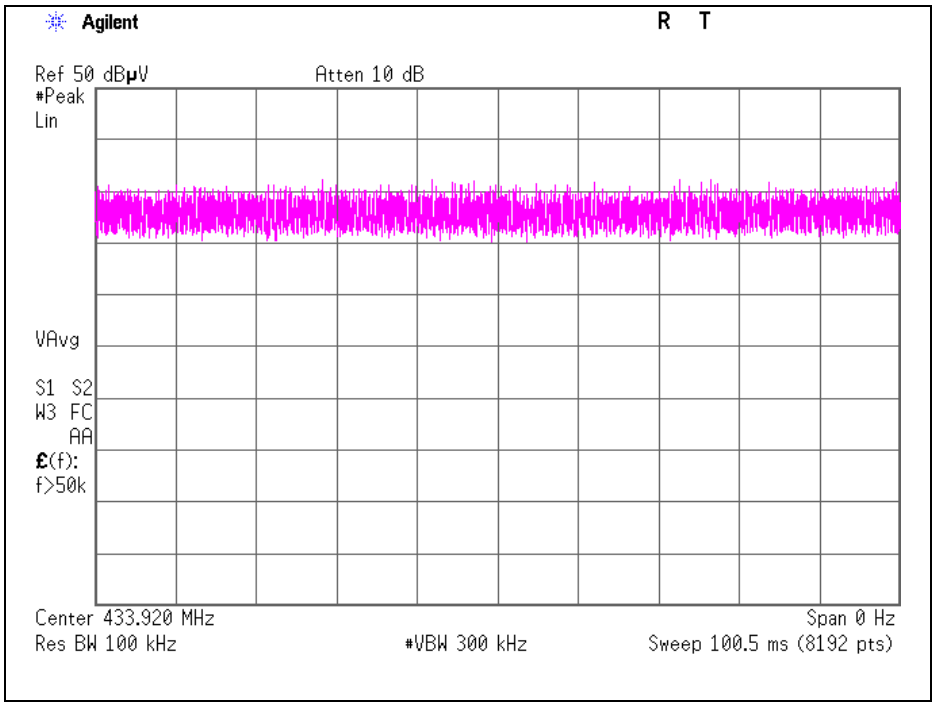


Duty Cycle

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	10329809H
Date	07/10/2014
Temperature/ Humidity	24 deg. C / 66% RH
Engineer	Masatoshi Nishiguchi
Mode	Transmitting mode

ON time [ms]	Cycle [ms]	Duty (On time/Cycle)	Duty [dB]
100.00	100.00	1.00	0.0

*) Duty = 20log10(ON time/Cycle)



APPENDIX 2: Test Instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2014/02/27 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	1301	RE	2014/02/20 * 12
MRENT-114	Spectrum Analyzer	Agilent	E4440A	MY46187105	RE	2013/11/11 * 12
MTR-08	Test Receiver	Rohde & Schwarz	ESCI	100767	RE	2013/08/20 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2014/03/14 * 12
MBA-03	Biconical Antenna	Schwarzbeck	BBA9106	1915	RE	2013/10/13 * 12
MLA-03	Logperiodic Antenna	Schwarzbeck	USLP9143	174	RE	2013/10/13 * 12
MCC-51	Coaxial cable	UL Japan	-	-	RE	2013/07/23 * 12
MPA-03	Microwave System Power Amplifier	Agilent	83050A	3950M00205	RE	2014/06/30 * 12
MJM-16	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MHA-20	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	258	RE	2014/05/26 * 12
MCC-167	Microwave Cable	Junkosha	MWX221	1404S374(1m) / 1405S074(5m)	RE	2014/05/26 * 12
MPA-11	MicroWave System Amplifier	Agilent	83017A	MY39500779	RE	2014/03/24 * 12

The expiration date of the calibration is the end of the expired month.
All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.

As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.

Test Item:
RE: Radiated emission, 99% Occupied Bandwidth, -20dB bandwidth , Automatically deactivate and Duty cycle tests