



RADIO TEST REPORT


Test Report No. : 10519157H-A-R2

Applicant : OMRON Corporation
Type of Equipment : Radio Frequency Identification System (RFID System)
Model No. : V680S-HMD63-ETN
V680S-HMD63-EIP
Test regulation : FCC Part 15 Subpart C: 2015
FCC ID : E4EV680S63
Test Result : Complied

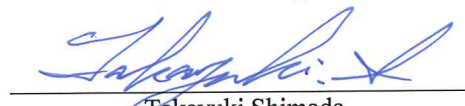
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6. This test report covers Radio technical requirements. It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
7. This report is a revised version of 10519157H-A-R1. 10519157H-A-R1 is replaced with this report.

Date of test: October 7 to 12, 2014

Representative test engineer:


Masatoshi Nishiguchi
Engineer
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Approved by:


Takayuki Shimada
Engineer
Consumer Technology Division

NVLAP[®]

NVLAP LAB CODE: 200572-0

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13-EM-F0429

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SECTION 1: Customer information

Company Name : OMRON Corporation
Address : 2-2-1, Nishikusatsu, Kusatsu-city, Shiga-pref., 525-0035, Japan
Telephone Number : +81-77-565-5287
Facsimile Number : +81-77-565-5569
Contact Person : Shuichi Matsui

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

2.1 Identification of E.U.T.

Type of Equipment : Radio Frequency Identification System (RFID System)
Model No. : V680S-HMD63-ETN (Tested model)
V680S-HMD63-EIP (Tested model)
V680S-HMD63-PNT (Variant model)
Serial No. : Refer to Section 4, Clause 4.2
Receipt Date of Sample : October 6, 2014
Country of Mass-production : Japan
Condition of EUT : Engineering 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

General Specification

Clock frequency(ies) in the system : CPU: 60MHz

Radio Specification

Radio Type : Transceiver
Frequency of Operation : 13.56MHz
Modulation : ASK
Power Supply (inner) : DC 5.0V
Antenna type : Loop Coil
Operating Temperature : -10 deg. C to +55 deg. C

Although three models have following difference, they are completely identical in EMC characteristics.

Model No.	Cable	Communications Protocol	Remarks
V680S-HMD63-ETN	Not included	Modbus TCP/IP	Tested model
V680S-HMD63-EIP	Included	EtherNet/IP	Tested model
V680S-HMD63- PNT	Included	PROFINET	- *1)

*1) The difference of Model No. V680S-HMD63-EIP and V680S-HMD63- PNT are only the Communications Protocol.

They are completely identical in RF characteristics.

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C: 2015, final revised on January 21, 2015

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.207 Conducted limits
Section 15.225 : Operation within the band 13.110-14.010MHz

* The revision on January 21, 2015 does not affect the test specification applied to the EUT.

* The EUT complies with FCC Part 15 Subpart B: 2014, final revised on August 15, 2014 and effective October 14, 2014.

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted emission	ANSI C63.4:2003 7. AC powerline conducted emission measurements	Section 15.207	[QP] 18.1dB 13.56000MHz, N	Complied	-
	<IC>RSS-Gen 7.2.2	<IC>RSS-Gen 7.2.2	[AV] 8.1dB 13.56000MHz, N		
Electric Field Strength of Fundamental Emission	ANSI C63.4:2003 13. Measurement of intentional radiators	Section 15.225(a)	57.1dB, 13.56000MHz, QP, 0deg.	Complied	Radiated
	<IC> RSS-Gen 4.8, 4.11	<IC>RSS-210 A2.6			
Spectrum Mask	ANSI C63.4:2003 13. Measurement of intentional radiators	Section 15.225(b)(c)	37.2dB, 13.56700MHz, QP, 0deg.	Complied	Radiated
	<IC>RSS-Gen 4.9, 4.11	<IC> RSS-210 A2.6			
20dB Bandwidth	ANSI C63.4:2003 13. Measurement of intentional radiators	Section15.215(c)	See data	Complied	Radiated
	<IC> -	<IC> -			
Electric Field Strength of Spurious Emission	ANSI C63.4:2003 13. Measurement of intentional radiators	Section15.209, Section 15.225 (d)	9.0dB 98.237MHz, Vertical, QP	Complied	Radiated
	<IC>RSS-Gen 4.9, 4.11	<IC>RSS-210 A2.6			
Frequency Tolerance	ANSI C63.4:2003 13. Measurement of intentional radiators	Section15.225(e)	See data	Complied	Radiated
	<IC>RSS-Gen 4.7	<IC> RSS-210 A2.6			

Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422

FCC 15.31 (e)

This EUT provides stable voltage (DC 5.0V) constantly to RF part regardless of input voltage. Therefore, this 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.

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3.3 Addition to standard

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	99% Occupied Band Width	RSS-Gen 4.6.1	RSS-Gen 4.6.1	Radiated	N/A	N/A	N/A

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)	Conducted emission (+dB)
	150kHz-30MHz
No.1	3.5dB
No.2	3.5dB
No.3	3.6dB
No.4	3.5dB

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

Frequency counter (+)	
Normal condition	Extreme condition
7×10^{-6}	9×10^{-6}

Conducted emission test

The data listed in this test report has enough margin, more than the site margin.

Radiated emission test (3m)

The data listed in this test report has enough margin, more than the site margin.

3.5 Test Location

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	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 Test set up, Data of EMI, and Test instruments

Refer to APPENDIX.

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

4.1 Operating Modes

The mode is used :

Mode	Remarks*
Transmitting mode (Tx 13.56MHz)	With Tag Without tag
The EUT was operated in a manner similar to typical use during the tests.	

Test Item	Operating mode
Conducted emission	Tx with Tag Tx without Tag
Electric Field Strength of Fundamental Emission	Tx without Tag *1)
Spectrum Mask	Tx without Tag *1)
20dB Bandwidth	Tx without Tag *1)
Electric Field Strength of Spurious Emission	Tx without Tag *1)
Frequency Tolerance	Tx without Tag *1)

*1) This EUT has two modes which Tag is attached to the EUT or not. The worst case was confirmed with and without Tag, as a result, the test without Tag was the worst case. Therefore the test without Tag was performed only.

Justification: The system was configured in typical fashion (as a customer would normally use it) for testing.

Frequency Tolerance:

Temperature : -30deg.C to +50deg.C Step 10deg.C (-30deg.C: Reference)
Voltage : Normal Voltage DC 24V
Maximum Voltage DC 27.6V
Minimum Voltage DC 20.4V (DC 24V ±15%)

*This EUT provides stable voltage (DC 5.0V) constantly to RF Part regardless of input voltage.

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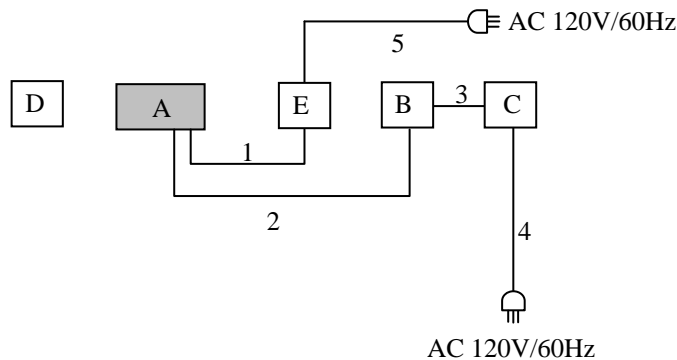
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4.2 Configuration and peripherals



*Cabling and setup were taken into consideration and test data was taken under worse case conditions.

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remark
A	RFID System	V680S-HMD63-ETN	39	OMRON Corporation	EUT
		V680S-HMD63-EIP			
B	Switching Hub	W4S1-05B	19612K	OMRON Corporation	-
C	Power Supply	S8VK-G03024	04614M	OMRON Corporation	-
D	RFID Tag	AJ292	24	OMRON Corporation	-
E	Power Supply	PAN35-5A	TK000746	KIKUSUI	*1)
		S8VK-G03024	04614M	OMRON Corporation	*2)

*1) Used for Conducted emission test only.

*2) Used for Radiated emission test only.

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	DC Cable	2.00 *1) 2.70 *2)	Unshielded	Unshielded	-
2	LAN Cable	2.00 *1) 2.70 *2)	Shielded	Shielded	-
3	DC Cable	0.30	Unshielded	Unshielded	-
4	AC Cable	1.85	Unshielded	Unshielded	-
5	AC Cable	2.00 *3)	Unshielded	Unshielded	-
		1.85 *4)			

*1) Used for Model No. V680S-HMD63-ETN.

*2) Used for Model No. V680S-HMD63-EIP.

*3) Used for Conducted emission test only.

*4) Used for Radiated emission test only.

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SECTION 5: Conducted emission

5.1 Operating environment

Test place : No.1 semi anechoic chamber
Temperature : See data
Humidity : See data

5.2 Test configuration

EUT was placed on a wooden platform of nominal size, 1.0m by 1.5m, raised 0.8m above the conducting ground plane. The rear of tabletop was located 40cm to the vertical conducting plane. The rear of EUT and its peripherals was aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80cm from any other grounded conducting surface. EUT was located 80cm from LISN/AMN and excess AC cable was bundled in center. I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30cm to 40cm long and were hanged at a 40cm height to the ground plane. Each EUT current-carrying power lead, except the ground (safety) lead, was individually connected through a LISN/ an AMN to the input power source. All unused 50ohm connectors of the LISN/ AMN were resistively terminated in 50ohm when not connected to the measuring equipment.

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT on a horizontal conducting plane 4.0 x 4.0m and a vertical conducting plane 2.0 x 2.0m in a semi Anechoic Chamber. Photographs of the set up are shown in Appendix 3.

5.3 Test conditions

Frequency range : 0.15MHz-30MHz
EUT position : Table top
EUT operation mode : Continuous Transmitting

5.4 Test procedure

The AC Mains Terminal Continuous disturbance Voltage had been measured with the EUT in the semi Anechoic Chamber.

The EUT was connected to a Line Impedance Stabilization Network (LISN)/ Artificial Mains Network (AMN).

An overview sweep with peak detection has been performed.

The measurements had been performed with a quasi-peak detector and if required, with an average detector.

The conducted emission measurements were made with the following detector function of the test receiver.

Detector Type : QP and CISPR AV
IF Bandwidth : 9kHz

5.5 Test result

Summary of the test results : Pass

SECTION 6: Radiated emission (Fundamental , Spurious Emission and Spectrum Mask)

Test Procedure

EUT was placed on a urethane platform of nominal size, 1.0m by 1.5m, raised 0.8m above the conducting ground plane.

The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

The height of the measuring antenna 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 (angle of loop antenna: 0deg., 45deg., 90deg., and 135 deg.) and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.

The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).

The test was made with the detector (RBW/VBW) in the following table.

When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

Test Antennas are used as below;

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

Frequency	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	
Instrument used	Test Receiver					Spectrum Analyzer	
Detector	PK/AV	QP	PK/AV	QP	QP	PK	AV
IF Bandwidth	200Hz	200Hz	9kHz	9kHz	120kHz	RBW: 1MHz VBW: 3MHz	RBW: 1MHz VBW: 10Hz
Test Distance	3m *1)	3m *1)	3m *1)	3m *2)	3m	3m	3m

*1) Distance Factor: $40 \times \log(3m/300m) = -80dB$

*2) Distance Factor: $40 \times \log(3m/30m) = -40dB$

Although these tests were performed other than open field test site, adequate comparison measurements were confirmed against 30 m open field test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 937606.

- The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT (Antenna and Module) to see the position of maximum noise, and the test was made at the position that has the maximum noise.

Measurement range : 0.009M-1GHz

Test data : APPENDIX

Test result : Pass

SECTION 7: Other test

Test	Span	RBW	VBW	Sweep	Detector	Trace	Instrument used
20dB Bandwidth	3MHz	30kHz	91kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99% Occupied Bandwidth	Enough width to display 20dB Bandwidth	1 to 3% of Span	Three times of RBW	Auto	Peak *1)	Max Hold *1)	Spectrum Analyzer
Frequency Tolerance	-	-	-	-	-	-	Frequency counter

*1) The measurement was performed with Peak detector, Max Hold since the duty cycle was not 100%.

Test data : APPENDIX

Test result : Pass

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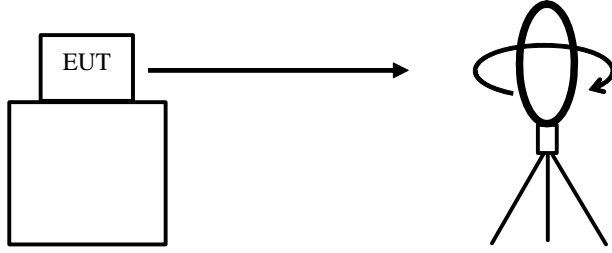
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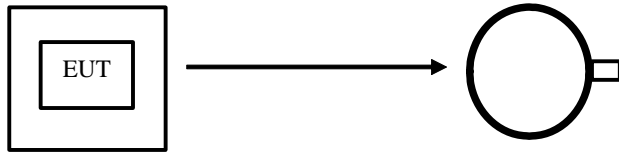
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Figure 1: Direction of the Loop Antenna

Side View (Vertical)

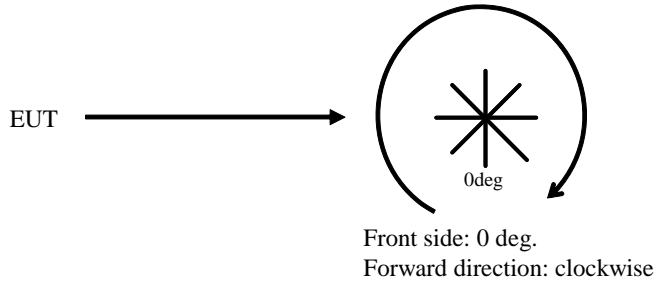


.....
Top View (Horizontal)



Antenna was not rotated.

.....
Top View (Vertical)



APPENDIX 1: Data of EMI test

**Conducted emission
(V680S-HMD63-ETN)**

DATA OF CONDUCTED EMISSION TEST

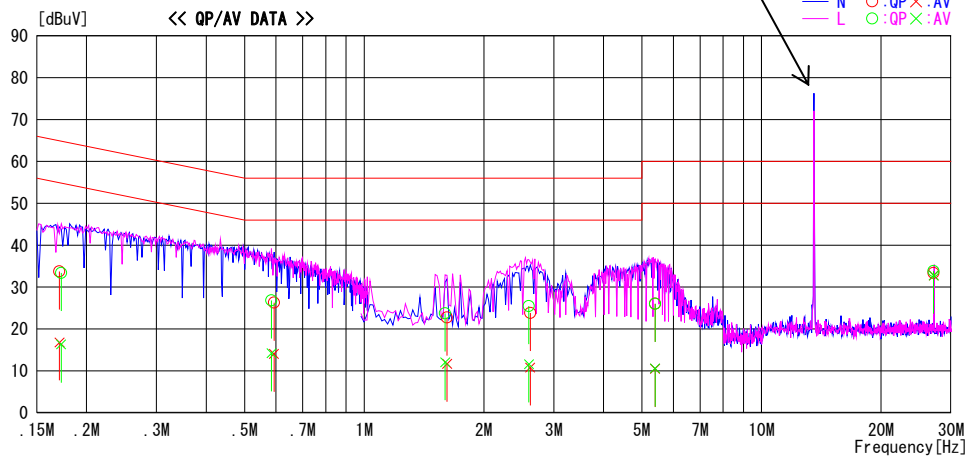
UL Japan, Inc. Ise EMC Lab. No.1 Semi Anechoic Chamber
Date : 2014/10/12

Report No. : 10519157H
 Temp./Humi. : 23deg. C / 55% RH
 Engineer : Masatoshi Nishiguchi

Mode / Remarks : V680S-HMD63-ETN Tx 13.56MHz with Tag

LIMIT : FCC15.207 QP
FCC15.207 AV

13.56MHz Carrier



Frequency [MHz]	Reading Level		Corr. Factor [dB]	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.17092	20.6	3.7	13.1	33.7	16.8	64.9	54.9	31.2	38.1	N	
0.59285	13.2	1.0	13.1	26.3	14.1	56.0	46.0	29.7	31.9	N	
1.61617	9.6	-1.4	13.1	22.7	11.7	56.0	46.0	33.3	34.3	N	
2.61587	10.6	-2.4	13.2	23.8	10.8	56.0	46.0	32.2	35.2	N	
5.39686	12.7	-2.8	13.3	26.0	10.5	60.0	50.0	34.0	39.5	N	
27.12000	19.5	18.9	13.9	33.4	32.8	60.0	50.0	26.6	17.2	N	
0.17267	20.3	3.2	13.1	33.4	16.3	64.8	54.8	31.4	38.5	L	
0.58413	13.7	1.1	13.1	26.8	14.2	56.0	46.0	29.2	31.8	L	
1.59800	10.6	-1.0	13.1	23.7	12.1	56.0	46.0	32.3	33.9	L	
2.59769	12.3	-1.6	13.2	25.5	11.6	56.0	46.0	30.5	34.4	L	
5.39686	12.7	-2.7	13.3	26.0	10.6	60.0	50.0	34.0	39.4	L	
27.12000	19.9	18.9	13.9	33.8	32.8	60.0	50.0	26.2	17.2	L	

CHART: WITH FACTOR, Peak hold data. CALCULATION: RESULT [dBuV]=READING + C.F (LISN+ATTEN+CABLE)
Except for the above table : adequate margin data below the limits.

*The test result is rounded off to one or two decimal places, so some differences might be observed.

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Conducted emission
(V680S-HMD63-ETN)

DATA OF CONDUCTED EMISSION TEST

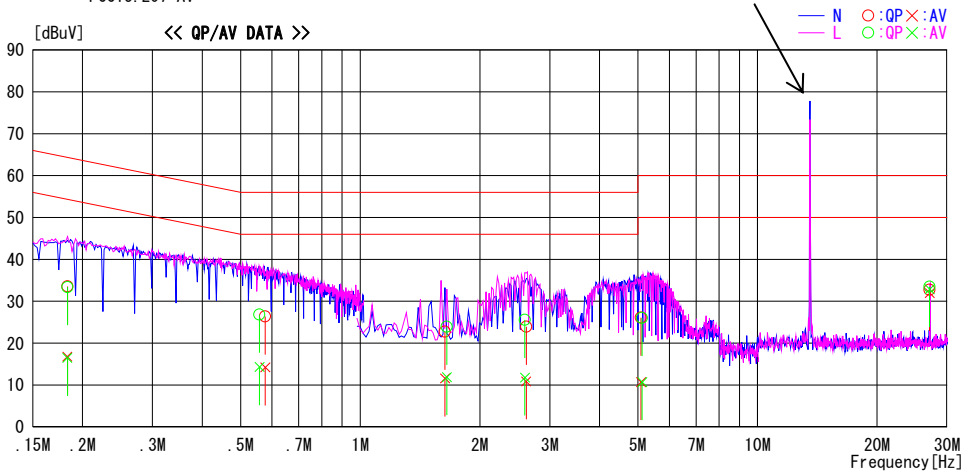
UL Japan, Inc. Ise EMC Lab. No.1 Semi Anechoic Chamber
 Date : 2014/10/12

Report No. : 10519157H
 Temp./Humi. : 23deg. C / 55% RH
 Engineer : Masatoshi Nishiguchi

Mode / Remarks : V680S-HMD63-ETN Tx 13.56MHz without Tag

LIMIT : FCC15.207 QP
 FCC15.207 AV

13.56MHz Carrier



Frequency [MHz]	Reading Level		Corr. Factor	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.18313	20.5	3.7	13.1	33.6	16.8	64.3	54.3	30.7	37.5	N	
0.57650	13.3	1.1	13.1	26.4	14.2	56.0	46.0	29.6	31.8	N	
1.63435	9.6	-1.5	13.1	22.7	11.6	56.0	46.0	33.3	34.4	N	
2.61587	10.7	-2.3	13.2	23.9	10.9	56.0	46.0	32.1	35.1	N	
5.08786	12.8	-2.6	13.3	26.1	10.7	60.0	50.0	33.9	39.3	N	
27.12000	18.8	18.1	13.9	32.7	32.0	60.0	50.0	27.3	18.0	N	
0.18313	20.3	3.4	13.1	33.4	16.5	64.3	54.3	30.9	37.8	L	
0.55750	13.7	1.2	13.1	26.8	14.3	56.0	46.0	29.2	31.7	L	
1.65252	10.8	-1.2	13.1	23.9	11.9	56.0	46.0	32.1	34.1	L	
2.59769	12.4	-1.4	13.2	25.6	11.8	56.0	46.0	30.4	34.2	L	
5.12422	12.7	-2.6	13.3	26.0	10.7	60.0	50.0	34.0	39.3	L	
27.12000	19.6	19.0	13.9	33.5	32.9	60.0	50.0	26.5	17.1	L	

CHART: WITH FACTOR, Peak hold data. CALCULATION: RESULT[dBuV]=READING + C.F(LISN+ATTEN+CABLE)
 Except for the above table : adequate margin data below the limits.

*The test result is rounded off to one or two decimal places, so some differences might be observed.

Conducted emission
(V680S-HMD63-ETN)

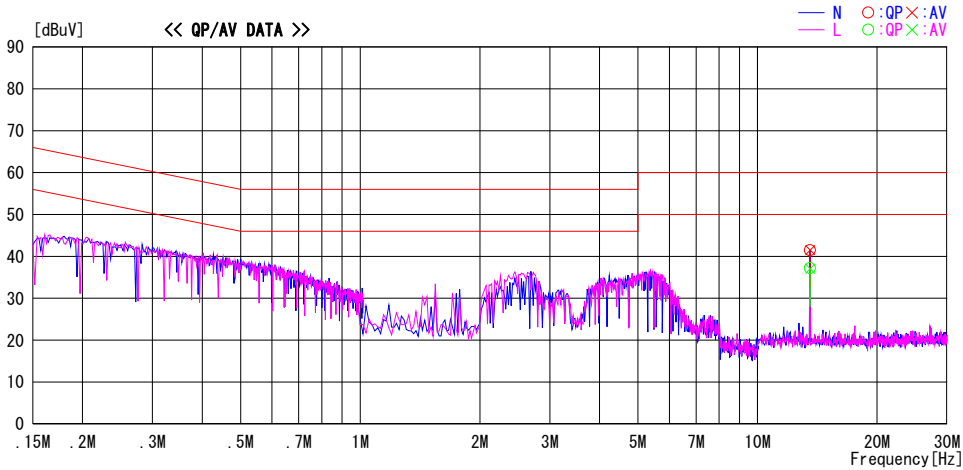
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.1 Semi Anechoic Chamber
 Date : 2014/10/12

Report No. : 10519157H
 Temp./Humi. : 23deg. C / 55% RH
 Engineer : Masatoshi Nishiguchi

Mode / Remarks : V680S-HMD63-ETN Tx 13.56MHz without Tag Antenna 50ohm terminated

LIMIT : FCC15.207 QP
 FCC15.207 AV



Frequency [MHz]	Reading Level		Corr. Factor [dB]	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
13.56000	28.0	28.0	13.5	41.5	41.5	60.0	50.0	18.5	8.5	N	
13.56000	23.7	23.6	13.5	37.2	37.1	60.0	50.0	22.8	12.9	L	

CHART: WITH FACTOR, Peak hold data. CALCULATION: RESULT[dBuV]=READING + C. F (LISN+ATTEN+CABLE)
 Except for the above table : adequate margin data below the limits.

*The test result is rounded off to one or two decimal places, so some differences might be observed.

Conducted emission
(V680S-HMD63-EIP)

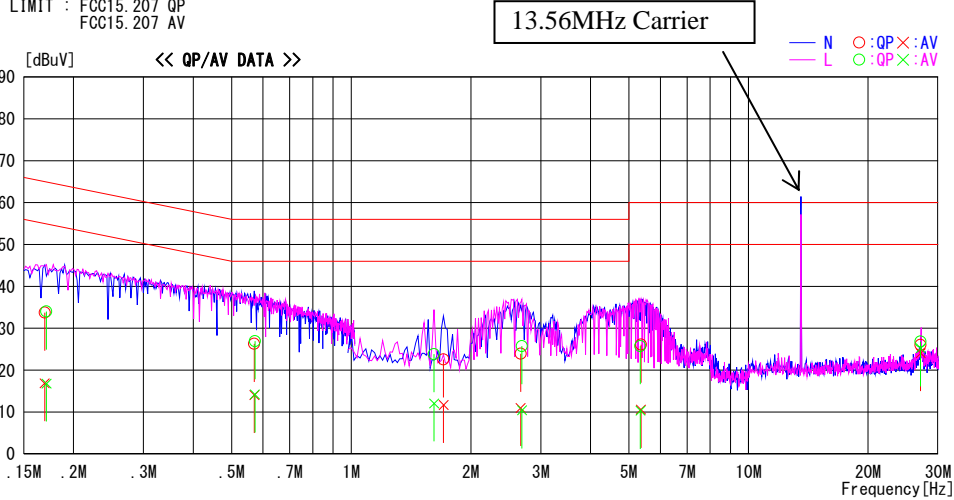
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.1 Semi Anechoic Chamber
 Date : 2014/10/12

Report No. : 10519157H
 Temp./Humi. : 23deg. C / 55% RH
 Engineer : Masatoshi Nishiguchi

Mode / Remarks : V680S-HMD63-EIP Tx 13.56MHz with Tag

LIMIT : FCC15.207 QP
 FCC15.207 AV



Frequency [MHz]	Reading Level		Corr. Factor	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.16918	20.6	3.8	13.1	33.7	16.9	65.0	55.0	31.3	38.1	N	
0.57018	13.2	1.0	13.1	26.3	14.1	56.0	46.0	29.7	31.9	N	
1.70705	9.5	-1.4	13.1	22.6	11.7	56.0	46.0	33.4	34.3	N	
2.67040	10.7	-2.2	13.2	23.9	11.0	56.0	46.0	32.1	35.0	N	
5.36051	12.8	-2.7	13.3	26.1	10.6	60.0	50.0	33.9	39.4	N	
27.12000	12.1	10.2	13.9	26.0	24.1	60.0	50.0	34.0	25.9	N	
0.17092	20.9	3.7	13.1	34.0	16.8	64.9	54.9	30.9	38.1	L	
0.57193	13.8	1.1	13.1	26.9	14.2	56.0	46.0	29.1	31.8	L	
1.61617	10.7	-1.0	13.1	23.8	12.1	56.0	46.0	32.2	33.9	L	
2.68857	12.5	-2.8	13.2	25.7	10.4	56.0	46.0	30.3	35.6	L	
5.34233	12.4	-3.0	13.3	25.7	10.3	60.0	50.0	34.3	39.7	L	
27.12000	12.9	11.3	13.9	26.8	25.2	60.0	50.0	33.2	24.8	L	

CHART: WITH FACTOR, Peak hold data. CALCULATION: RESULT[dBuV]=READING + C.F(LISN+ATTEN+CABLE)
 Except for the above table : adequate margin data below the limits.

*The test result is rounded off to one or two decimal places, so some differences might be observed.

Conducted emission
(V680S-HMD63-EIP)

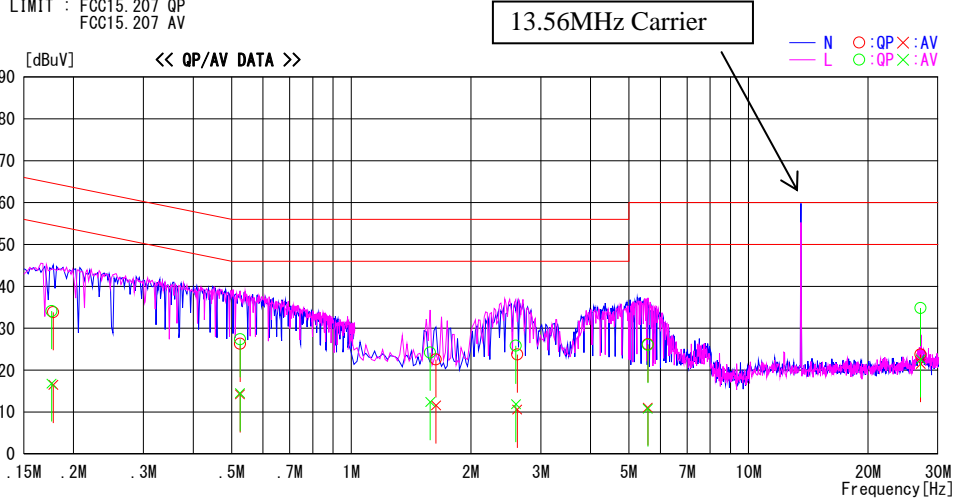
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.1 Semi Anechoic Chamber
Date : 2014/10/12

Report No. : 10519157H
Temp./Humi. : 23deg. C / 55% RH
Engineer : Masatoshi Nishiguchi

Mode / Remarks : V680S-HMD63-EIP Tx 13.56MHz without Tag

LIMIT : FCC15.207 QP
FCC15.207 AV



Frequency [MHz]	Reading Level		Corr. Factor	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.17790	20.7	3.4	13.1	33.8	16.5	64.6	54.6	30.8	38.1	N	
0.52485	13.2	1.1	13.1	26.3	14.2	56.0	46.0	29.7	31.8	N	
1.63435	9.5	-1.5	13.1	22.6	11.6	56.0	46.0	33.4	34.4	N	
2.61587	10.5	-2.6	13.2	23.7	10.6	56.0	46.0	32.3	35.4	N	
5.57863	12.8	-2.3	13.4	26.2	11.1	60.0	50.0	33.8	38.9	N	
27.12000	9.8	7.6	13.9	23.7	21.5	60.0	50.0	36.3	28.5	N	
0.17615	21.0	3.7	13.1	34.1	16.8	64.7	54.7	30.6	37.9	L	
0.52485	14.3	1.4	13.1	27.4	14.5	56.0	46.0	28.6	31.5	L	
1.57982	11.1	-0.7	13.1	24.2	12.4	56.0	46.0	31.8	33.6	L	
2.59769	12.6	-1.3	13.2	25.8	11.9	56.0	46.0	30.2	34.1	L	
5.57863	12.6	-2.6	13.4	26.0	10.8	60.0	50.0	34.0	39.2	L	
27.12000	20.9	8.7	13.9	34.8	22.6	60.0	50.0	25.2	27.4	L	

CHART: WITH FACTOR, Peak hold data. CALCULATION: RESULT[dBuV]=READING + C.F(LISN+ATTEN+CABLE)
Except for the above table : adequate margin data below the limits.

*The test result is rounded off to one or two decimal places, so some differences might be observed.

Conducted emission
(V680S-HMD63-EIP)

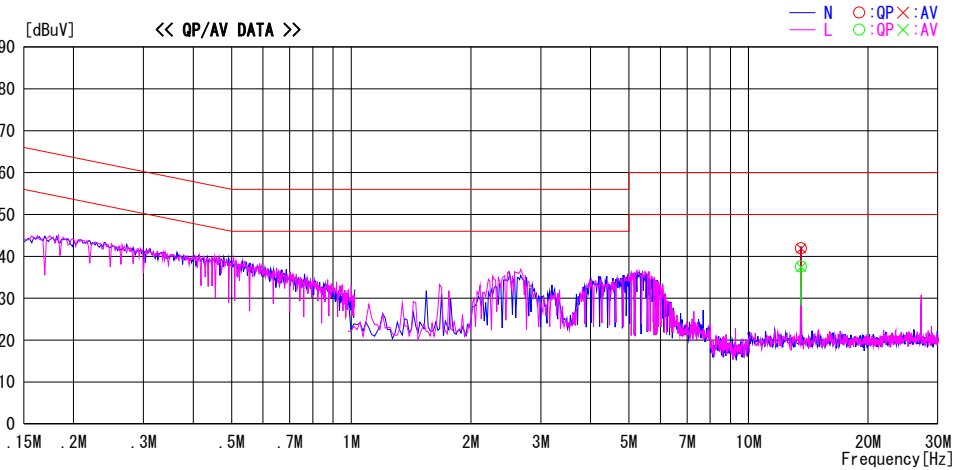
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.1 Semi Anechoic Chamber
 Date : 2014/10/12

Report No. : 10519157H
 Temp./Humi. : 23deg. C / 55% RH
 Engineer : Masatoshi Nishiguchi

Mode / Remarks : V680S-HMD63-EIP Tx 13.56MHz without Tag Antenna 50ohm terminated

LIMIT : FCC15.207 QP
 FCC15.207 AV



Frequency [MHz]	Reading Level		Corr. Factor [dB]	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
13.56000	28.4	28.4	13.5	41.9	41.9	60.0	50.0	18.1	8.1	N	
13.56000	24.1	23.9	13.5	37.6	37.4	60.0	50.0	22.4	12.6	L	

CHART: WITH FACTOR, Peak hold data. CALCULATION: RESULT[dBuV]=READING + C. F (LISN+ATTEN+CABLE)
 Except for the above table : adequate margin data below the limits.

*The test result is rounded off to one or two decimal places, so some differences might be observed.

Fundamental emission and Spectrum Mask
(V680S-HMD63-ETN)

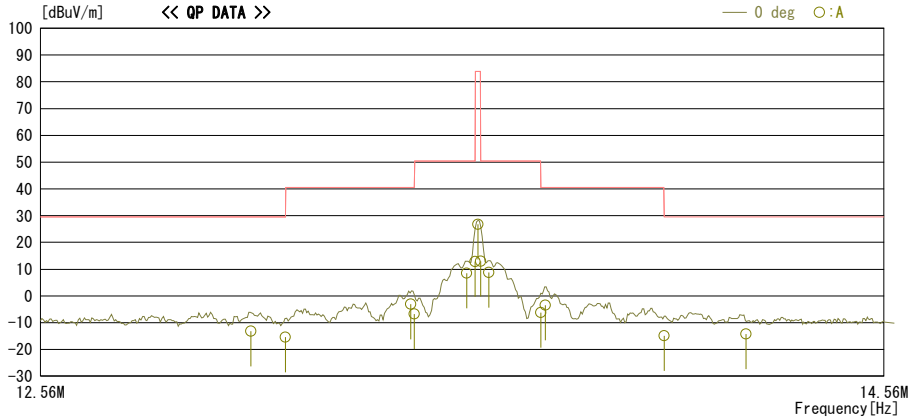
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2014/10/09

Report No. : 10519157H
Temp. / Humi. : 23deg. C / 64% RH
Engineer : Keisuke Kawamura

Mode / Remarks : V680S-HMD63-ETN Tx 13.56MHz Worst Axis Z Without Tag

LIMIT : FCC15_225_PKQP, 9-90kHz:PK, 110-490kHz:PK, other:QP
FCC15_225_AVQP, 9-90kHz:AV, 110-490kHz:AV, other:QP



Freq.	Reading	DET	Ant. Fac	Loss	Gain	Result	Limit	Margin	Antenna	Table	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[deg]	[deg]	
13.03167	32.7	QP	19.8	-33.5	32.2	-13.2	29.5	42.7	0	A	358
13.11000	30.5	QP	19.8	-33.5	32.2	-15.4	29.5	44.9	0	A	358
13.40160	42.9	QP	19.8	-33.5	32.2	-3.0	40.5	43.5	0	A	358
13.41000	39.1	QP	19.8	-33.5	32.2	-6.8	40.5	47.3	0	A	358
13.53355	54.4	QP	19.8	-33.5	32.2	8.5	50.4	41.9	0	A	358
13.55300	58.7	QP	19.8	-33.5	32.2	12.8	50.4	37.6	0	A	358
13.56000	72.6	QP	19.8	-33.4	32.2	26.8	83.9	57.1	0	A	358
13.56700	58.8	QP	19.8	-33.4	32.2	13.0	50.4	37.4	0	A	358
13.58588	54.5	QP	19.8	-33.4	32.2	8.7	50.4	41.7	0	A	358
13.71000	39.6	QP	19.8	-33.4	32.2	-6.2	40.5	46.7	0	A	358
13.72140	42.3	QP	19.8	-33.4	32.2	-3.5	40.5	44.0	0	A	358
14.01000	30.9	QP	19.8	-33.4	32.2	-14.9	29.5	44.4	0	A	358
14.21196	31.6	QP	19.8	-33.4	32.2	-14.2	29.5	43.7	0	A	358

CHART: WITH FACTOR , ANT TYPE: LOOP Except for the data below : adequate margin data below the limits.
CALCULATION : RESULT = READING + ANT FACTOR + LOSS(CABLE + ATTEN + D.FACTOR) - GAIN(AMP)

Result of the fundamental emission at 3m without Distance factor

Ant Deg [deg]	Frequency	Detector	Reading	Ant Factor	Loss	Gain	Result	Limit	Margin	Remark
	[MHz]		[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
0	13.56000	QP	72.6	19.8	6.6	32.2	66.8	-	-	Fundamental

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

UL Japan, Inc.

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Fundamental emission and Spectrum Mask
(V680S-HMD63-EIP)

DATA OF RADIATED EMISSION TEST

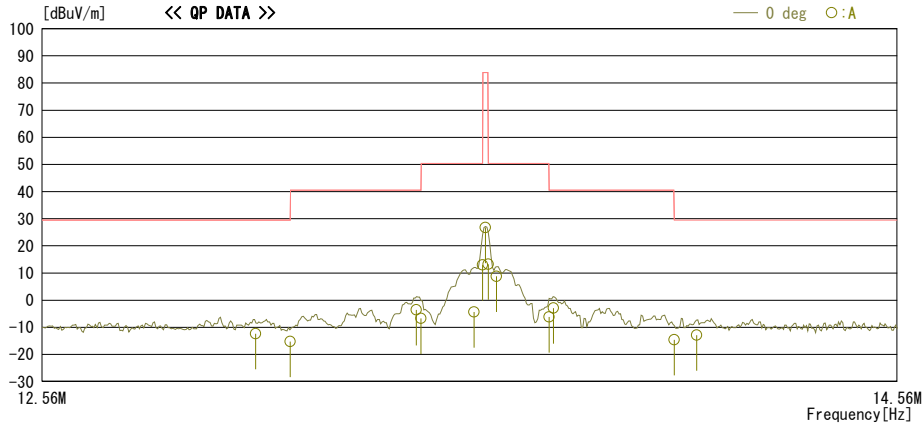
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2014/10/09

Report No. : 10519157H

Temp. / Humi. : 23deg. C / 64% RH
Engineer : Keisuke Kawamura

Mode / Remarks : V680S-HMD63-EIP, Tx 13.56MHz Worst Axis Z Without Tag

LIMIT : FCC15_225_PKQP, 9-90kHz:PK, 110-490kHz:PK, other:QP
FCC15_225_AVQP, 9-90kHz:AV, 110-490kHz:AV, other:QP



Freq.	Reading	DET	Ant. Fac	Loss	Gain	Result	Limit	Margin	Antenna	Table	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[deg]	[deg]	
13.03234	33.5	QP	19.8	-33.5	32.2	-12.4	29.5	41.9	0	A	358
13.11000	30.6	QP	19.8	-33.5	32.2	-15.3	29.5	44.8	0	A	358
13.39920	42.3	QP	19.8	-33.5	32.2	-3.6	40.5	44.1	0	A	358
13.41000	39.2	QP	19.8	-33.5	32.2	-6.7	40.5	47.2	0	A	358
13.53298	41.5	QP	19.8	-33.5	32.2	-4.4	50.4	54.8	0	A	358
13.55300	58.9	QP	19.8	-33.5	32.2	13.0	50.4	37.4	0	A	358
13.56000	72.6	QP	19.8	-33.4	32.2	26.8	83.9	57.1	0	A	358
13.56700	59.0	QP	19.8	-33.4	32.2	13.2	50.4	37.2	0	A	358
13.58588	54.6	QP	19.8	-33.4	32.2	8.8	50.4	41.6	0	A	358
13.71000	39.6	QP	19.8	-33.4	32.2	-6.2	40.5	46.7	0	A	358
13.72080	42.9	QP	19.8	-33.4	32.2	-2.9	40.5	43.4	0	A	358
14.01000	31.2	QP	19.8	-33.4	32.2	-14.6	29.5	44.1	0	A	358
14.06370	32.9	QP	19.8	-33.4	32.2	-12.9	29.5	42.4	0	A	358

CHART: WITH FACTOR , ANT TYPE: LOOP Except for the data below : adequate margin data below the limits.
CALCULATION : RESULT = READING + ANT FACTOR + LOSS(CABLE + ATTEN + D.FACTOR) - GAIN(AMP)

Result of the fundamental emission at 3m without Distance factor

Ant Deg [deg]	Frequency	Detector	Reading	Ant Factor	Loss	Gain	Result	Limit	Margin	Remark
	[MHz]		[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
0	13.56000	QP	72.6	19.8	6.6	32.2	66.8	-	-	Fundamental

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

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Spurious emission
(Below 30MHz)
(V680S-HMD63-ETN)

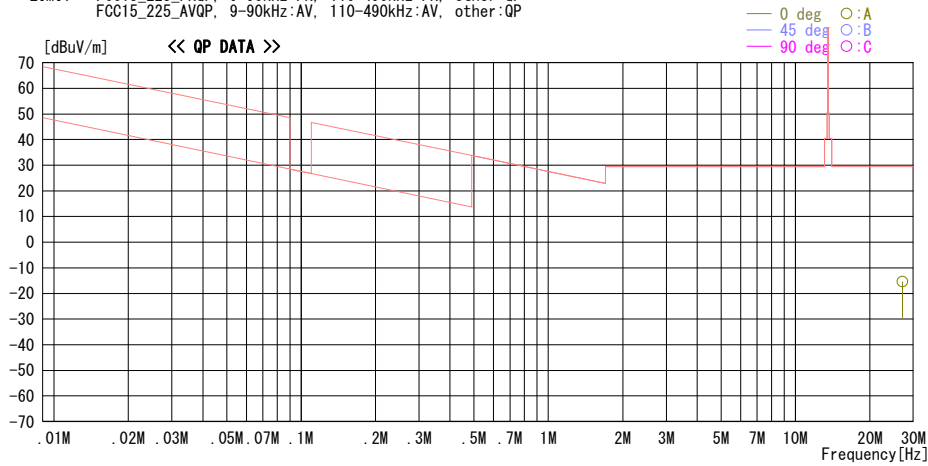
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
 Date : 2014/10/09

Report No. : 10519157H
 Temp./ Humi. : 23deg.C / 64% RH
 Engineer : Keisuke Kawamura

Mode / Remarks : V680S-HMD63-ETN Tx 13.56MHz Worst Axis Z Without Tag

LIMIT : FCC15_225_PKQP, 9-90kHz:PK, 110-490kHz:PK, other:QP
 FCC15_225_AVQP, 9-90kHz:AV, 110-490kHz:AV, other:QP



Freq.	Reading	DET	Ant. Fac	Loss	Gain	Result	Limit	Margin	Antenna	Table	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[deg]	[deg]	
27.12000	29.7	QP	20.3	-33.2	32.2	-15.4	29.5	44.9	0	A	358

CHART: WITH FACTOR , ANT TYPE: LOOP Except for the data below : adequate margin data below the limits.
 CALCULATION : RESULT = READING + ANT FACTOR + LOSS(CABLE + ATTN + D.FACTOR) - GAIN(AMP)

Spurious emission
(Below 30MHz)
(V680S-HMD63-EIP)

DATA OF RADIATED EMISSION TEST

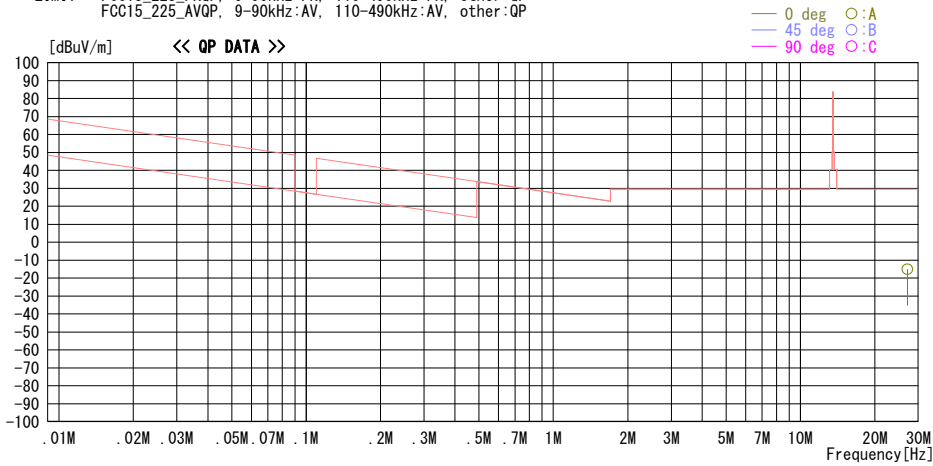
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
 Date : 2014/10/09

Report No. : 10519157H

Temp./ Humi. : 23deg.C / 64% RH
 Engineer : Keisuke Kawamura

Mode / Remarks : V680S-HMD63-EIP, Tx 13.56MHz Worst Axis Z Without Tag

LIMIT : FCC15_225_PKQP, 9-90kHz:PK, 110-490kHz:PK, other:QP
 FCC15_225_AVQP, 9-90kHz:AV, 110-490kHz:AV, other:QP



Freq.	Reading	DET	Ant. Fac	Loss	Gain	Result	Limit	Margin	Antenna	Table	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[deg]	[deg]	
27.12000	29.9	QP	20.3	-33.2	32.2	-15.2	29.5	44.7	0	A	358

CHART: WITH FACTOR , ANT TYPE: LOOP Except for the data below : adequate margin data below the limits.
 CALCULATION : RESULT = READING + ANT FACTOR + LOSS(CABLE + ATTN + D.FACTOR) - GAIN(AMP)

Spurious emission
(Above 30MHz)
(V680S-HMD63-ETN)

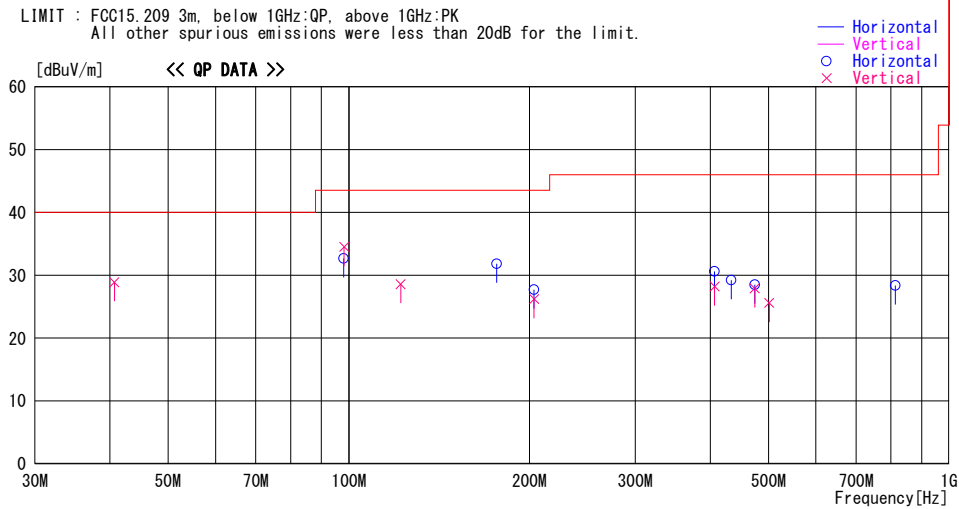
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.1 Semi Anechoic Chamber
 Date : 2014/10/11

Report No. : 10519157H
 Temp./Humi. : 22deg. C / 53% RH
 Engineer : Keisuke Kawamura

Mode / Remarks : V680S-HMD63-ETN Tx 13.56MHz Worst axis Hori:Z axis, Ver:Z axis Without Tag

LIMIT : FCC15.209 3m, below 1GHz:QP, above 1GHz:PK
 All other spurious emissions were less than 20dB for the limit.



Frequency [MHz]	Reading [dBuV]	DET	Antenna		Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
			Factor [dB/m]	Loss& Gain [dB]							
40.676	46.1	QP	14.0	-31.2	28.9	0	100	Vert.	40.0	11.1	
98.237	55.1	QP	9.8	-30.4	34.5	0	100	Vert.	43.5	9.0	
98.015	53.4	QP	9.7	-30.4	32.7	207	317	Hori.	43.5	10.8	
122.044	45.7	QP	13.1	-30.2	28.6	64	100	Vert.	43.5	14.9	
176.283	45.5	QP	16.0	-29.7	31.8	359	188	Hori.	43.5	11.7	
203.506	39.3	QP	16.4	-29.5	26.2	10	100	Vert.	43.5	17.3	
203.403	40.8	QP	16.4	-29.5	27.7	214	154	Hori.	43.5	15.8	
406.805	38.0	QP	17.2	-27.0	28.2	311	156	Vert.	46.0	17.8	
406.801	40.4	QP	17.2	-27.0	30.6	321	100	Hori.	46.0	15.4	
433.919	38.5	QP	17.5	-26.8	29.2	315	100	Hori.	46.0	16.8	
474.603	36.5	QP	17.9	-26.5	27.9	342	147	Vert.	46.0	18.1	
474.590	37.1	QP	17.9	-26.5	28.5	56	100	Hori.	46.0	17.5	
501.721	33.8	QP	18.1	-26.3	25.6	159	124	Vert.	46.0	20.4	
813.598	30.9	QP	22.0	-24.5	28.4	211	202	Hori.	46.0	17.6	

CHART:WITH FACTOR ANT TYPE: -30MHz:LOOP, 30-300MHz:BICONICAL, 300MHz-1000MHz:LOGPERIODIC, 1000MHz-:HORN
 CALCULATION : RESULT = READING + ANT FACTOR + LOSS(CABLE + ATTEN + D.FACTOR) - GAIN(AMP)

Spurious emission
(Above 30MHz)
(V680S-HMD63-EIP)

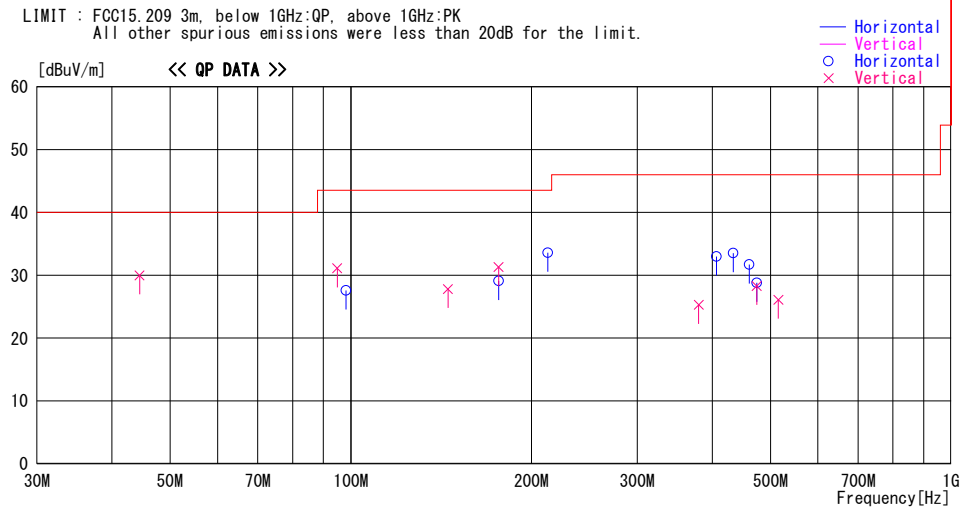
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.1 Semi Anechoic Chamber
 Date : 2014/10/11

Report No. : 10519157H
 Temp./Humi. : 22deg. C / 53% RH
 Engineer : Keisuke Kawamura

Mode / Remarks : V680S-HMD63-EIP Tx 13.56MHz Worst axis Hori:Z axis, Ver:Z axis Without Tag

LIMIT : FCC15.209 3m, below 1GHz:QP, above 1GHz:PK
 All other spurious emissions were less than 20dB for the limit.



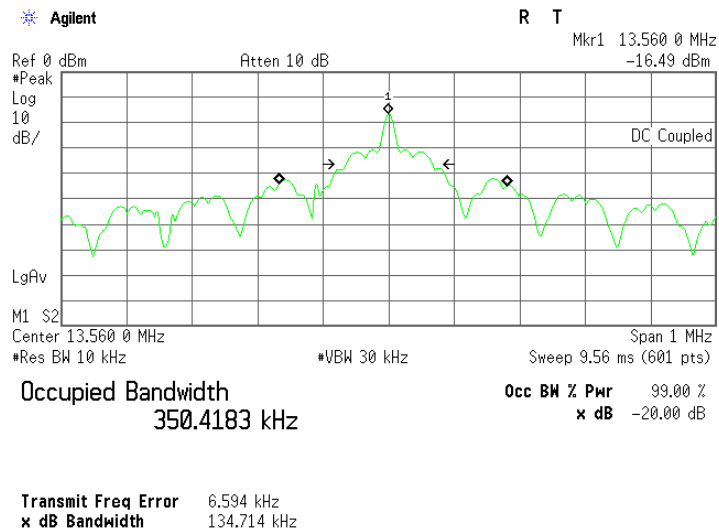
Frequency [MHz]	Reading [dBuV]	DET	Antenna		Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
			Factor [dB/m]	Loss& Gain [dB]							
44.474	48.8	QP	12.3	-31.1	30.0	271	100	Vert.	40.0	10.0	
94.920	52.3	QP	9.2	-30.4	31.1	267	100	Vert.	43.5	12.4	
98.237	48.2	QP	9.8	-30.4	27.6	205	320	Hori.	43.5	15.9	
145.152	43.0	QP	14.7	-29.9	27.8	298	100	Vert.	43.5	15.7	
176.280	42.8	QP	16.0	-29.7	29.1	359	175	Hori.	43.5	14.4	
212.885	46.4	QP	16.6	-29.4	33.6	359	185	Hori.	43.5	9.9	
176.286	45.0	QP	16.0	-29.7	31.3	0	100	Vert.	43.5	12.2	
406.802	42.8	QP	17.2	-27.0	33.0	203	100	Hori.	46.0	13.0	
379.675	36.1	QP	16.6	-27.4	25.3	197	184	Vert.	46.0	20.7	
433.919	42.8	QP	17.5	-26.8	33.5	208	100	Hori.	46.0	12.5	
474.598	36.9	QP	17.9	-26.5	28.3	26	131	Vert.	46.0	17.7	
461.040	40.5	QP	17.8	-26.6	31.7	206	100	Hori.	46.0	14.3	
474.594	37.4	QP	17.9	-26.5	28.8	65	100	Hori.	46.0	17.2	
515.267	34.0	QP	18.3	-26.2	26.1	168	128	Vert.	46.0	19.9	

CHART:WITH FACTOR ANT TYPE: -30MHz:LOOP, 30-300MHz:BICONICAL, 300MHz-1000MHz:LOGPERIODIC, 1000MHz-:HORN
 CALCULATION : RESULT = READING + ANT FACTOR + LOSS(CABLE + ATTEN + D.FACTOR) - GAIN(AMP)

20dB Bandwidth and 99% Occupied Bandwidth

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	10519157H
Date	10/09/2014
Temperature/ Humidity	23 deg.C / 64% RH
Engineer	Keisuke Kawamura
Mode	Tx Mod on Without Tag

FREQ [MHz]	20dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
13.56	134.71	350.42



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Frequency Tolerance

Test place : Ise EMC Lab. No.11 measurement room
Report No. : 10519157H
Date : 10/07/2014
Temperature/ Humidity : 21 deg. C / 46% RH
Engineer : Masatoshi Nishiguchi
Mode : Tx 13.56MHz CW Without Tag

Test Condition deg.C	Volts	Test Timing	Measured freq [MHz]	Freq error [MHz]	Result [ppm]	Limit (+/- 0.01%) [+/- ppm]	Margin [ppm]
20deg.C	20.4V	Power on	13.55998300	-0.00001700	-1.25	100.00	98.75
		on 2min.	13.55999600	-0.00000400	-0.29	100.00	99.71
		on 5min.	13.55999700	-0.00000300	-0.22	100.00	99.78
		on 10min.	13.55999900	-0.00000100	-0.07	100.00	99.93
	24V	Power on	13.55999800	-0.00000200	-0.15	100.00	99.85
		on 2min.	13.56000100	0.00000100	0.07	100.00	99.93
		on 5min.	13.55999900	-0.00000100	-0.07	100.00	99.93
		on 10min.	13.56000200	0.00000200	0.15	100.00	99.85
	27.6V	Power on	13.55998000	-0.00002000	-1.47	100.00	98.53
		on 2min.	13.56001000	0.00001000	0.74	100.00	99.26
		on 5min.	13.56003000	0.00003000	2.21	100.00	97.79
		on 10min.	13.56002000	0.00002000	1.47	100.00	98.53
50deg.C	24V	Power on	13.56003300	0.00003300	2.43	100.00	97.57
on 2min.		13.56002900	0.00002900	2.14	100.00	97.86	
on 5min.		13.56002000	0.00002000	1.47	100.00	98.53	
on 10min.		13.56000800	0.00000800	0.59	100.00	99.41	
40deg.C		Power on	13.56001300	0.00001300	0.96	100.00	99.04
on 2min.		13.56001000	0.00001000	0.74	100.00	99.26	
on 5min.		13.56000800	0.00000800	0.59	100.00	99.41	
on 10min.		13.56000900	0.00000900	0.66	100.00	99.34	
30deg.C		Power on	13.56000700	0.00000700	0.52	100.00	99.48
on 2min.		13.56000800	0.00000800	0.59	100.00	99.41	
on 5min.		13.56001200	0.00001200	0.88	100.00	99.12	
on 10min.		13.56001400	0.00001400	1.03	100.00	98.97	
20deg.C		Power on	13.56000600	0.00000600	0.44	100.00	99.56
on 2min.		13.56001100	0.00001100	0.81	100.00	99.19	
on 5min.		13.56001300	0.00001300	0.96	100.00	99.04	
on 10min.		13.56001400	0.00001400	1.03	100.00	98.97	
10deg.C		Power on	13.56000800	0.00000800	0.59	100.00	99.41
on 2min.		13.56001000	0.00001000	0.74	100.00	99.26	
on 5min.		13.56000900	0.00000900	0.66	100.00	99.34	
on 10min.		13.56001100	0.00001100	0.81	100.00	99.19	
0deg.C		Power on	13.56001400	0.00001400	1.03	100.00	98.97
on 2min.		13.56001900	0.00001900	1.40	100.00	98.60	
on 5min.		13.56002000	0.00002000	1.47	100.00	98.53	
on 10min.		13.56001400	0.00001400	1.03	100.00	98.97	
-10deg.C	Power on	13.56001300	0.00001300	0.96	100.00	99.04	
on 2min.	13.56001700	0.00001700	1.25	100.00	98.75		
on 5min.	13.56002100	0.00002100	1.55	100.00	98.45		
on 10min.	13.56001900	0.00001900	1.40	100.00	98.60		
-20deg.C	Power on	13.55999800	-0.00000200	-0.15	100.00	99.85	
on 2min.	13.56000900	0.00000900	0.66	100.00	99.34		
on 5min.	13.56000400	0.00000400	0.29	100.00	99.71		
on 10min.	13.56000800	0.00000800	0.59	100.00	99.41		
-30deg.C	Power on	13.55998700	-0.00001300	-0.96	100.00	99.04	
on 2min.	13.55999400	-0.00000600	-0.44	100.00	99.56		
on 5min.	13.55999000	-0.00001000	-0.74	100.00	99.26		
on 10min.	13.55999600	-0.00000400	-0.29	100.00	99.71		

Limit : 13.56 13.56 MHz +/-0.01 % (+/- 100ppm) = +/- 0.001356 MHz

*The test was begun from 50 deg.C and the temperature was lowered each 10 deg.C.

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APPENDIX 2: Test instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MLS-25	LISN(AMN)	Schwarzbeck	NSLK8127	8127-731	CE(EUT)	2014/07/09 * 12
MLS-26	LISN(AMN)	Schwarzbeck	NSLK8127	8127-732	CE(AE)	2014/07/09 * 12
MTA-30	Terminator	TME	CT-01	-	CE	2014/01/20 * 12
MCC-64	Coaxial Cable	UL Japan	-	-	CE	2014/03/28 * 12
MAT-64	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	CE	2014/01/29 * 12
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
MJM-16	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MTR-08	Test Receiver	Rohde & Schwarz	ESCI	100767	RE	2014/08/19 * 12
LP-01	Loop Antenna	Rohde & Schwarz	HFH2-Z2	829425/014	RE	2014/02/25 * 12
MCC-112	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W(10m)/ SFM141(3m)/ suciform141-PE(1m)/ 421-010(1.5m)/ RFM-E321(Switcher)	-/00640	RE	2014/07/14 * 12
MCC-143	Coaxial Cable	UL Japan	-	-	RE	2014/07/28 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2014/03/14 * 12
MAT-70	Attenuator(6dB)	Agilent	8491A-006	MY52460153	RE	2014/04/14 * 12
MSA-03	Spectrum Analyzer	Agilent	E4448A	MY44020357	RE	2014/04/08 * 12
MAEC-01	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 10m	DA-06881	RE/CE	2014/09/01 * 12
MOS-27	Thermo-Hygrometer	CUSTOM	CTH-201	A08Q26	RE/CE	2014/02/20 * 12
MJM-21	Measure	KOMELON	KMC-36	-	RE/CE	-
MTR-09	EMI Test Receiver	Rohde & Schwarz	ESU26	100412	RE/CE	2014/06/06 * 12
KBA-05	Biconical Antenna	Schwarzbeck	BBA9106	2513	RE	2013/11/24 * 12
KLA-04	Logperiodic Antenna	Schwarzbeck	USLP9143	361	RE	2013/11/24 * 12
MAT-08	Attenuator(6dB)	Weinschel Corp	2	BK7971	RE	2013/11/26 * 12
MCC-02	Coaxial Cable	Suhner/storm/Agilent/TSJ	-	-	RE	2014/09/12 * 12
MPA-19	Pre Amplifier	MITEQ	MLA-10K01-B01-35	1237616	RE	2014/02/17 * 12
MOS-19	Thermo-Hygrometer	Custom	CTH-201	0001	FT	2013/12/17 * 12
MFC-01	Microwave Counter	Advantest	R5373	120100309	FT	2014/08/11 * 12
MLPA-07	Loop Antenna	UL Japan	-	-	FT	Pre Check
MCH-05	Temperature and Humidity Chamber	Tabai Espec	PL-1KP	14019569	FT	2014/05/19 * 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: CE: Conducted Emission, RE: Radiated Emission, FT: Frequency Tolerance

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