RADIO TEST REPORT

Test Report No. : 10004859H-A-R1

Applicant	:	**Mitsubishi Electric Corporation Himeji works**
Type of Equipment	:	**Keyless System LFU**
Model No.	:	**SKE134-01**
Type No.	:	**X1T661**
FCC ID	:	**WAZSKE13401**
Test regulation	:	**FCC Part 15 Subpart C: 2012** **Class II Permissive Change**
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.
6. This report is a revised version of 10004859H-A. 10004859H-A is replaced with this report.

Date of test: February 21 to March 5, 2013

Representative test engineer:
Takayuki Shimada
Engineer of WiSE Japan,
UL Verification Service

Approved by:
Masanori Nishiyama
Manager of WiSE Japan,
UL Verification Service

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

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REVISION HISTORY

Original Test Report No.: 10004859H-A

Revision	Test report No.	Date	Page revised	Contents
- (Original)	10004859H-A	March 28, 2013	-	-
1	10004859H-B-R1	April 1, 2013	P.14	Addition of "Reference *1)" and following sentence: *1) As the deviation of the field strength result value was within 3dB to the original one, the original value: 95dBuV/m was used for the application.
1	10004859H-A-R1	April 1, 2013	P.18	Deletion of "*2" of note *1).
1	10004859H-A-R1	April 1, 2013	P.18, 21, 24	Deletion of following sentence: *2) The train of pulses was exceeding 100msec, and that sampled 100msec was the worst case against the pulse train.

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SECTION 1: Customer information

Company Name	:	Mitsubishi Electric Corporation Himeji works
Address	:	840 Chiyoda-machi Himeji Hyogo, 670-8677, Japan
Telephone Number	:	+81-79-298-8994
Facsimile Number	:	+81-79-298-9929
Contact Person	:	Toshio Koga

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

2.1 Identification of E.U.T.

Type of Equipment	:	Keyless System LFU
Model No.	:	SKE134-01
Type No.	:	X1T661
Serial No.	:	Refer to Clause 4.2
Rating	:	DC 12.0V
Receipt Date of Sample	:	February 16, 2013
Country of Mass-production	:	Japan
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: SKE134-01 [Type No. X1T661] (referred to as the EUT in this report) is the Keyless System LFU.

Feature of EUT

The Keyless Entry System installed in vehicles.
The lock or unlock of the door push the switch on the door, the transmitter starts communication between LF control unit(LFU) and a receiver and opens and closes the key of the door, and the engine start is possible.
It can also lock or unlock the doors by operating the button on the transmitter.

General Specification

Clock frequency in the system	:	(CPU) 16MHz, (LF IC) 8MHz

Radio Specification

Radio Type	:	Transmitter
Frequency of Operation	:	125kHz
Modulation	:	ASK
Method of Frequency Genenration	:	Crystal
Antenna type	:	Inductive
Duty Cycle	:	Very Low
Operating temperature range	:	-40 to +85 deg. C

<Contents of the change from original model>
Original test report number of this report is 31BE0219-HO-04-A-R2.
The EUT is changed the specification from original model as below.
- Connector is change from 28 terminals to 24 terminals.
- The Print Circuit Board (PCB) is shrinks.
- Therefore, as for the PCB, a little pattern change and some parts are deleted.
- There is not the change of the LF circuit.
- There are not the connector installation screws on the PCB.

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification	:	Test specification: FCC Part 15 Subpart C: 2012, final revised on December 27, 2012 and effective January 28, 2013
Title	:	FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators Section 15.207 Conducted Emission Section 15.209 Radiated emission limits, general requirements

FCC 15.31 (e)
This test was performed with the New Battery (DC 12V) and the constant voltage was supplied to this EUT during the tests. 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.

3.2 Procedures and results

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	Conducted Emission	<FCC> ANSI C63.4:2003 7. AC powerline conducted emission measurements <IC> RSS-Gen 7.2.4	<FCC> Section 15.207 <IC> RSS-Gen 7.2.4	-	N/A *1)	N/A	N/A
2	Electric Field Strength of Fundamental Emission	<FCC> ANSI C63.4:2003 13. Measurement of intentional radiators <IC> RSS-Gen 4.8, 4.11	<FCC> Section 15.209 <IC> RSS-210 2.5.1 RSS-Gen 7.2.5	Radiated	N/A	12.9dB 0.12500MHz 0 deg. PK with Duty factor (Antenna F)	Complied
3	Electric Field Strength of Spurious Emission	<FCC> ANSI C63.4:2003 13. Measurement of intentional radiators <IC> RSS-Gen 4.9, 4.11	<FCC> Section 15.209 <IC> RSS-210 2.5.1 RSS-Gen 7.2.5	Radiated	N/A	15.6dB 176.445MHz, Vertical, QP (Antenna F)	Complied
4	-26dB Bandwidth	<FCC> ANSI C63.4:2003 13. Measurement of intentional radiators <IC> -	<FCC> Reference data <IC> -	Radiated	N/A *2)	N/A	N/A

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 is not the device that is designed to be connected to the public utility (AC) power line.
*2) The test was not performed for class 2 permissive change.

3.3 Addition to standard

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	4.3dB	5.0dB	5.1dB	4.9dB	5.8dB	4.4dB	4.3dB
No.2	4.3dB	5.2dB	5.1dB	5.0dB	5.7dB	4.3dB	4.2dB
No.3	4.6dB	5.0dB	5.1dB	5.0dB	5.7dB	4.5dB	4.2dB
No.4	4.8dB	5.2dB	5.0dB	5.0dB	5.7dB	5.2dB	4.2dB

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

Radiated emission test(3m)
[Electric Field Strength of Fundamental Emission]
The data listed in this report meets the limits unless the uncertainty is taken into consideration.

[Electric Field Strength of Spurious Emission]
The data listed in this test report has enough margin, more than the site margin.

3.5 Test Location

UL Japan, Inc. Head Office EMC Lab. *NVLAP Lab. code: 200572-0
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone : +81 596 24 8116 Facsimile : +81 596 24 8124

	FCC Registration Number	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	313583	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	655103	2973C-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 semi-anechoic chamber	148738	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	134570	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	4.75 x 5.4 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 4.5 x 2.8m	2.0 x 2.0m	-
No.10 measurement room	-	-	2.6 x 2.8 x 2.5m	2.4 x 2.4m	-
No.11 measurement room	-	-	3.1 x 3.4 x 3.0m	2.4 x 3.4m	-

* 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 mode	Remarks
Transmitting mode (Tx)	125kHz*

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

* As a result of preliminary test with Ant A and Ant B, the formal test was performed with Ant A, which had the maximum power.
As a result of preliminary test with Ant C, Ant D, Ant E and Ant F, the formal test was performed with Ant C and F, because Ant F had the maximum power and Ant C had the minimum power.

4.2 Configuration and peripherals

This page has been submitted for a separate exhibit.

SECTION 5: Radiated emission (Fundamental and Spurious Emission)

Test Procedure
The Radiated Electric Field Strength intensity has been measured on No 2 semi anechoic chamber with a ground plane and at a distance of 3m.

Frequency : From 9kHz to 30MHz at distance 3m
The EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.
The measurements were performed for vertical polarization (antenna angle: 0deg.,) and horizontal polarization.
*Refer to Figure 1 about Direction of the Loop Antenna.

Frequency : From 30MHz to 1GHz at distance 3m
The measuring antenna height varied between 1 and 4m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.
The measurements were performed for both vertical and horizontal antenna polarization.

Measurements were performed with a QP, PK, and AV detector.
The radiated emission measurements were made with the following detector function of the test receiver (below 1GHz).

	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
Detector Type	PK/AV	QP	PK/AV	QP	QP
IF Bandwidth	200Hz	200Hz	9kHz	9kHz	120kHz

*This EUT is to be installed in vehicles. The antenna of EUT is installed in Key cylinder, and the body of EUT is installed in the front part of vehicles. In the set-up configuration for the tests, the antenna and the body of EUT were set on three positions of X, Y, and Z axis respectively.

- 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.
With the position, the noise levels of all the frequencies were measured.

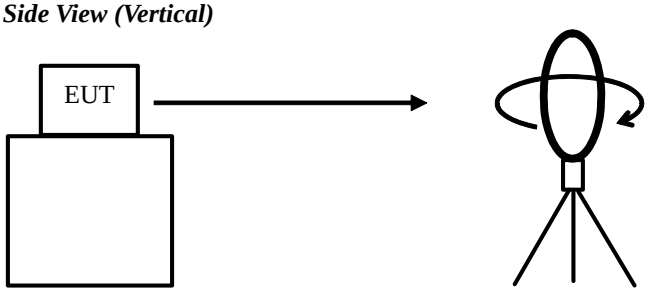
* Part 15 Section 15.31 (f)(2) (9kHz-30MHz)
[Limit at 3m]=[Limit at 300m]-40 x log (3[m]/300[m])
[Limit at 3m]=[Limit at 30m]-40 x log (3[m]/30[m])

Test data **: APPENDIX 1**
Test result **: Pass**

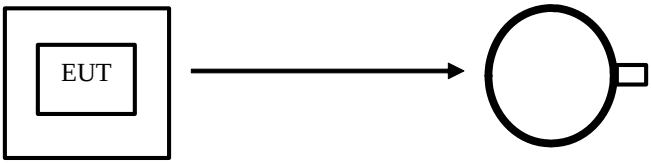
Date: February 21 and 22, 2013 Test engineer: Shinya Watanabe

Figure 1: Direction of the Loop Antenna

Side View (Vertical)

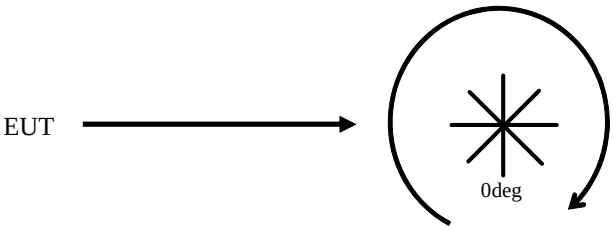


Top View (Horizontal)



Antenna was not rotated.

Top View (Vertical)



Front side: 0 deg.
Forward direction: clockwise

APPENDIX 1: Data of EMI test

Radiated Emission below 30MHz (Fundamental and Spurious Emission)

Antenna A

Test place	Head Office EMC Lab. No.2 Measurement Room
Order No.	10004859H
Date	02/21/2013
Temperature/ Humidity	21 deg. C / 22% RH
Engineer	Shinya Watanabe
Mode	Tx 125kHz Mod On

PK or QP

Ant Deg [deg] or Polarity [Hori/Vert]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0	0.12500	PK	112.2	19.2	6.0	32.2	-	105.2	125.1	19.9	Fundamental
0	0.25070	PK	84.0	19.1	6.1	32.2	-	77.0	119.0	42.0	
0	0.37598	PK	74.2	19.1	6.1	32.2	-	67.2	115.5	48.3	
0	0.50486	QP	53.9	19.0	6.1	32.2	-	46.8	73.0	26.2	
0	0.62644	QP	48.3	19.2	6.2	32.2	-	41.5	71.1	29.6	
0	0.75538	QP	39.6	19.2	6.2	32.2	-	32.8	69.5	36.7	
0	1.00000	QP	33.3	19.1	6.2	32.2	-	26.4	68.1	41.7	
0	1.12500	QP	33.1	19.1	6.2	32.2	-	26.2	66.9	40.7	
0	1.25000	QP	33.0	19.1	6.3	32.2	-	26.2	65.9	39.7	

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

PK with Duty factor

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0	0.12500	AV	112.2	19.2	6.0	32.2	-16.2	89.0	105.1	16.1	
0	0.25070	AV	84.0	19.1	6.1	32.2	-16.2	60.8	99.0	38.2	
0	0.37598	AV	74.2	19.1	6.1	32.2	-16.2	51.0	95.5	44.5	

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

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

Radiated Emission below 30MHz (Fundamental and Spurious Emission)

Antenna C

Test place	Head Office EMC Lab. No.2 Measurement Room
Order No.	10004859H
Date	02/21/2013
Temperature/ Humidity	21 deg. C / 22% RH
Engineer	Shinya Watanabe
Mode	Tx 125kHz Mod On

PK or QP

Ant Deg [deg] or Polarity [Hori/Vert]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0	0.12500	PK	108.1	19.2	6.0	32.2	-	101.1	125.1	24.0	Fundamental
0	0.25070	PK	73.8	19.1	6.1	32.2	-	66.8	119.0	52.2	
0	0.37598	PK	60.4	19.1	6.1	32.2	-	53.4	115.5	62.1	
0	0.50486	QP	49.6	19.0	6.1	32.2	-	42.5	73.0	30.5	
0	0.62644	QP	49.3	19.2	6.2	32.2	-	42.5	71.1	28.6	
0	0.75538	QP	49.4	19.2	6.2	32.2	-	42.6	69.5	26.9	
0	1.00000	QP	49.4	19.1	6.2	32.2	-	42.5	68.1	25.6	
0	1.12500	QP	49.3	19.1	6.2	32.2	-	42.4	66.9	24.5	
0	1.25000	QP	49.4	19.1	6.3	32.2	-	42.6	65.9	23.3	

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

PK with Duty factor

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0	0.12500	AV	108.1	19.2	6.0	32.2	-13.4	87.7	105.1	17.4	
0	0.25070	AV	73.8	19.1	6.1	32.2	-13.4	53.4	99.0	45.6	
0	0.37598	AV	60.4	19.1	6.1	32.2	-13.4	40.0	95.5	55.5	

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

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

Radiated Emission below 30MHz (Fundamental and Spurious Emission)

Antenna F

Test place	Head Office EMC Lab. No.2 Measurement Room
Order No.	10004859H
Date	02/21/2013
Temperature/ Humidity	21 deg. C / 22% RH
Engineer	Shinya Watanabe
Mode	Tx 125kHz Mod On

PK or QP

Ant Deg [deg] or Polarity [Hori/Vert]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0	0.12500	PK	112.6	19.2	6.0	32.2	-	105.6	125.1	19.5	Fundamental
0	0.25070	PK	81.4	19.1	6.1	32.2	-	74.4	119.0	44.6	
0	0.37598	PK	73.3	19.1	6.1	32.2	-	66.3	115.5	49.2	
0	0.50486	QP	57.3	19.0	6.1	32.2	-	50.2	73.0	22.8	
0	0.62644	QP	51.6	19.2	6.2	32.2	-	44.8	71.1	26.3	
0	0.75538	QP	49.7	19.2	6.2	32.2	-	42.9	69.5	26.6	
0	1.00000	QP	49.3	19.1	6.2	32.2	-	42.4	68.1	25.7	
0	1.12500	QP	49.1	19.1	6.2	32.2	-	42.2	66.9	24.7	
0	1.25000	QP	49.1	19.1	6.3	32.2	-	42.3	65.9	23.6	

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

PK with Duty factor

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0	0.12500	AV	112.6	19.2	6.0	32.2	-13.4	92.2	105.1	12.9	Reference *1)
0	0.25070	AV	81.4	19.1	6.1	32.2	-13.4	61.0	99.0	38.0	
0	0.37598	AV	73.3	19.1	6.1	32.2	-13.4	52.9	95.5	42.6	

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

*1) As the deviation of the field strength result value was within 3dB to the original one, the original value: 95dBuV/m was used for the application.

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

Radiated Emission above 30MHz (Spurious Emission)

Antenna A

DATA OF RADIATED EMISSION TEST

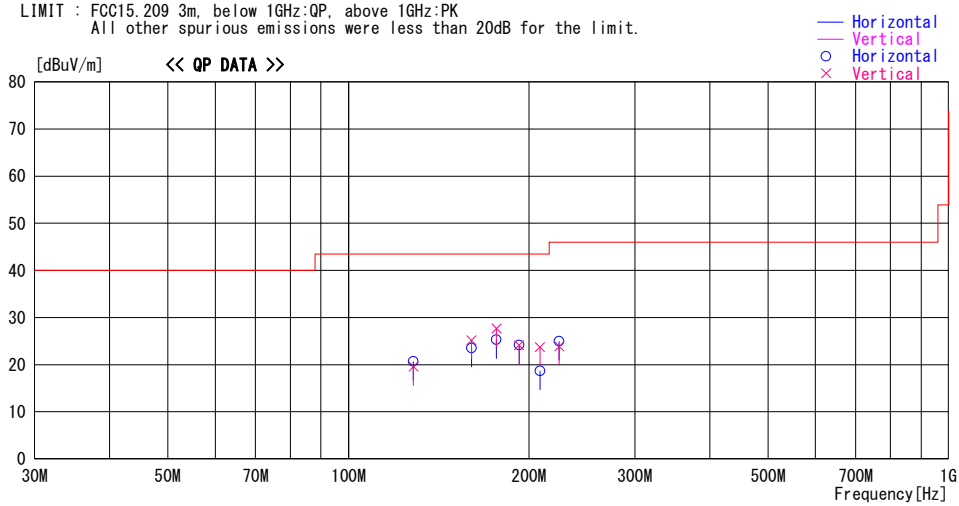
UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2013/02/22

Report No. : 10004859H

Temp./Humi. : 20deg. C / 32% RH
Engineer : Takayuki Shimada

Mode / Remarks : Tx 125kHz Ant.A Worst Axis (ECU Hor:Y Ver:Y,Ant Hori:Z Ver:Z)

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



Frequency	Reading	DET	Antenna Factor	Loss& Gain	Level	Angle	Height	Polar.	Limit	Margin	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
128.308	27.6	QP	13.6	-20.5	20.7	32	166	Hori.	43.5	22.8	
128.309	26.5	QP	13.6	-20.5	19.6	353	100	Vert.	43.5	23.9	
160.398	28.4	QP	15.3	-20.2	23.5	272	196	Hori.	43.5	20.0	
160.386	30.1	QP	15.3	-20.2	25.2	135	100	Vert.	43.5	18.3	
176.433	29.3	QP	16.0	-20.0	25.3	180	197	Hori.	43.5	18.2	
176.425	31.7	QP	16.0	-20.0	27.7	127	100	Vert.	43.5	15.8	
192.466	27.6	QP	16.4	-19.8	24.2	195	192	Hori.	43.5	19.3	
192.463	27.5	QP	16.4	-19.8	24.1	73	100	Vert.	43.5	19.4	
208.649	21.6	QP	16.7	-19.6	18.7	359	300	Hori.	43.5	24.8	
208.503	26.6	QP	16.7	-19.6	23.7	348	100	Vert.	43.5	19.8	
224.542	27.4	QP	16.9	-19.3	25.0	359	147	Hori.	46.0	21.0	
224.540	26.3	QP	16.9	-19.3	23.9	333	100	Vert.	46.0	22.1	

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

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

Radiated Emission above 30MHz (Spurious Emission)

Antenna C

DATA OF RADIATED EMISSION TEST

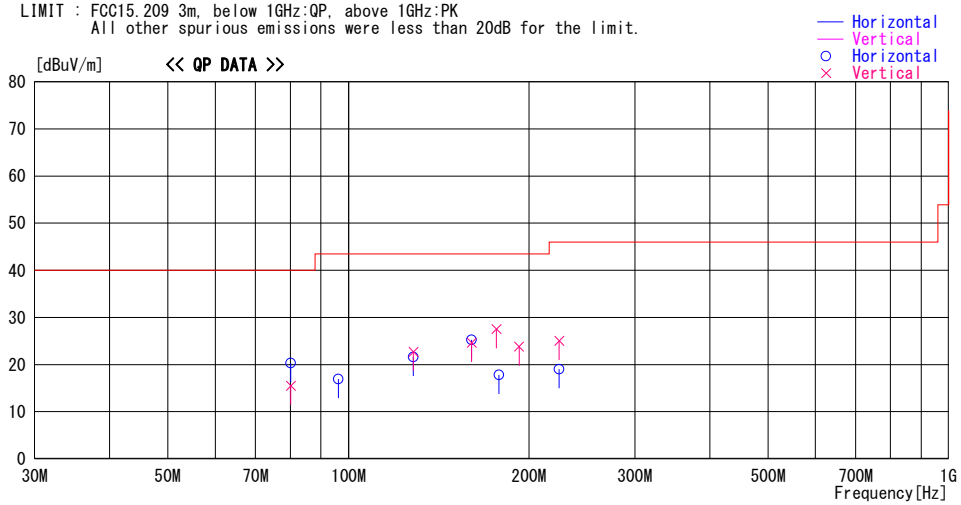
UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2013/02/22

Report No. : 10004859H

Temp./Humi. : 20deg. C / 32% RH
Engineer : Takayuki Shimada

Mode / Remarks : Tx 125kHz Ant.C Worst Axis (ECU Hori:Y Ver:Y Ant Hori:X Ver:X)

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



Frequency	Reading	DET	Antenna Factor	Loss& Gain	Level	Angle	Height	Polar.	Limit	Margin	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
80.202	35.1	QP	6.4	-21.2	20.3	348	215	Hori.	40.0	19.7	
80.202	30.3	QP	6.4	-21.2	15.5	338	100	Vert.	40.0	24.5	
96.242	28.4	QP	9.4	-20.9	16.9	174	305	Hori.	43.5	26.6	
128.323	29.6	QP	13.6	-20.5	22.7	355	100	Vert.	43.5	20.8	
128.323	28.5	QP	13.6	-20.5	21.6	207	201	Hori.	43.5	21.9	
160.404	30.1	QP	15.3	-20.2	25.2	189	270	Hori.	43.5	18.3	
160.403	29.5	QP	15.3	-20.2	24.6	33	100	Vert.	43.5	18.9	
176.444	31.5	QP	16.0	-20.0	27.5	131	100	Vert.	43.5	16.0	
178.049	21.7	QP	16.1	-20.0	17.8	0	300	Hori.	43.5	25.7	
192.484	27.2	QP	16.4	-19.8	23.8	101	100	Vert.	43.5	19.7	
224.565	27.4	QP	16.9	-19.3	25.0	180	100	Vert.	46.0	21.0	
224.399	21.4	QP	16.9	-19.3	19.0	0	300	Hori.	46.0	27.0	

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

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

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Radiated Emission above 30MHz (Spurious Emission)

Antenna F

DATA OF RADIATED EMISSION TEST

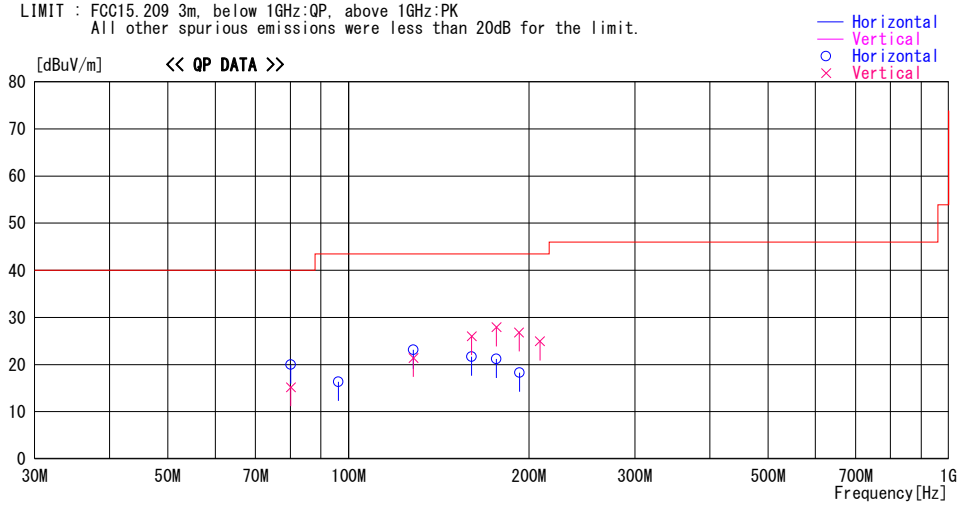
UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2013/02/22

Report No. : 10004859H

Temp./Humi. : 20deg. C / 32% RH
Engineer : Takayuki Shimada

Mode / Remarks : Tx 125kHz Ant.F Worst Axis (ECU Hori:Y Ver:Y, Ant Hori:Z Ver:Z)

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



Frequency	Reading	DET	Antenna Factor	Loss& Gain	Level	Angle	Height	Polar.	Limit	Margin	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
80.202	34.8	QP	6.4	-21.2	20.0	199	224	Hori.	40.0	20.0	
80.202	30.0	QP	6.4	-21.2	15.2	323	100	Vert.	40.0	24.8	
96.243	27.8	QP	9.4	-20.9	16.3	340	298	Hori.	43.5	27.2	
128.324	30.0	QP	13.6	-20.5	23.1	215	197	Hori.	43.5	20.4	
128.324	28.3	QP	13.6	-20.5	21.4	354	100	Vert.	43.5	22.1	
160.405	26.6	QP	15.3	-20.2	21.7	154	269	Hori.	43.5	21.8	
160.405	30.9	QP	15.3	-20.2	26.0	60	100	Vert.	43.5	17.5	
176.445	31.9	QP	16.0	-20.0	27.9	66	100	Vert.	43.5	15.6	
176.448	25.2	QP	16.0	-20.0	21.2	134	202	Hori.	43.5	22.3	
192.486	30.2	QP	16.4	-19.8	26.8	63	100	Vert.	43.5	16.7	
192.899	21.7	QP	16.4	-19.8	18.3	349	300	Hori.	43.5	25.2	
208.527	27.8	QP	16.7	-19.6	24.9	195	100	Vert.	43.5	18.6	

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

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

Duty Cycle

Antenna A

Test place	Head Office EMC Lab. No.2 Semi Anechoic Chamber
Report No.	10004859H
Date	03/05/2013
Temperature/ Humidity	23 deg. C / 32% RH
Engineer	Shinya Watanabe
Mode	Transmitting mode

Type	Times (in 22ms)	ON time(One pulse) [ms]	ON time(in 75.2ms) [ms]
A	38	0.160	6.080
B	18	0.284	5.107
C	1	0.415	0.415

ON time(in 75.2ms) = Times (in 22ms) * ON time(One pulse)

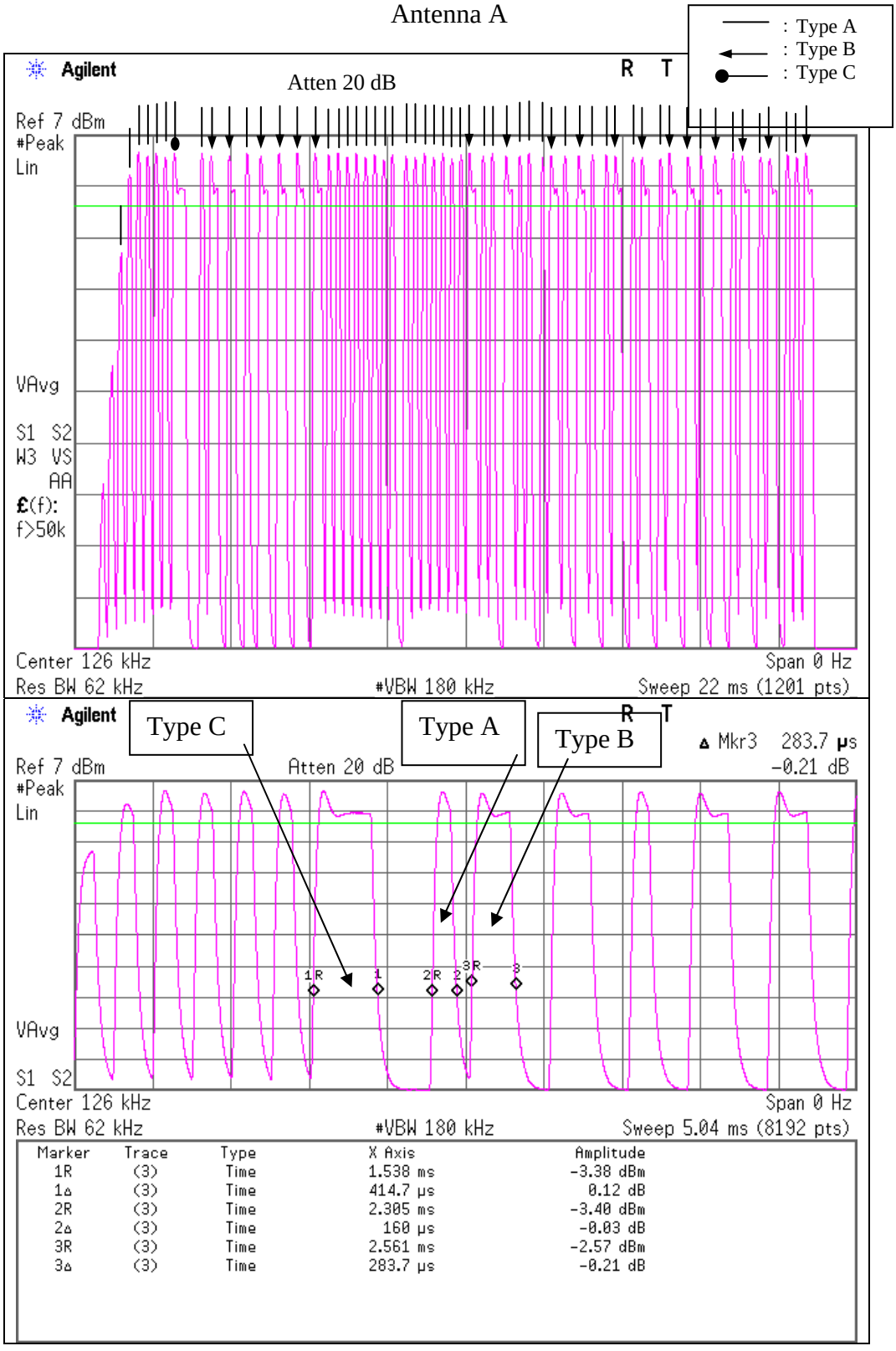
(Total)

ON time [ms]	Cycle [ms]	Duty (On time/Cycle)	Duty [dB]
11.601	75.20	0.1543	-16.23

ON time = Type A's ON time (in 75.2ms) + Type B's ON time (in 75.2ms) + Type C's ON time (in 75.2ms)
Duty = $20\log_{10}$(ON time/Cycle)

Duty Cycle

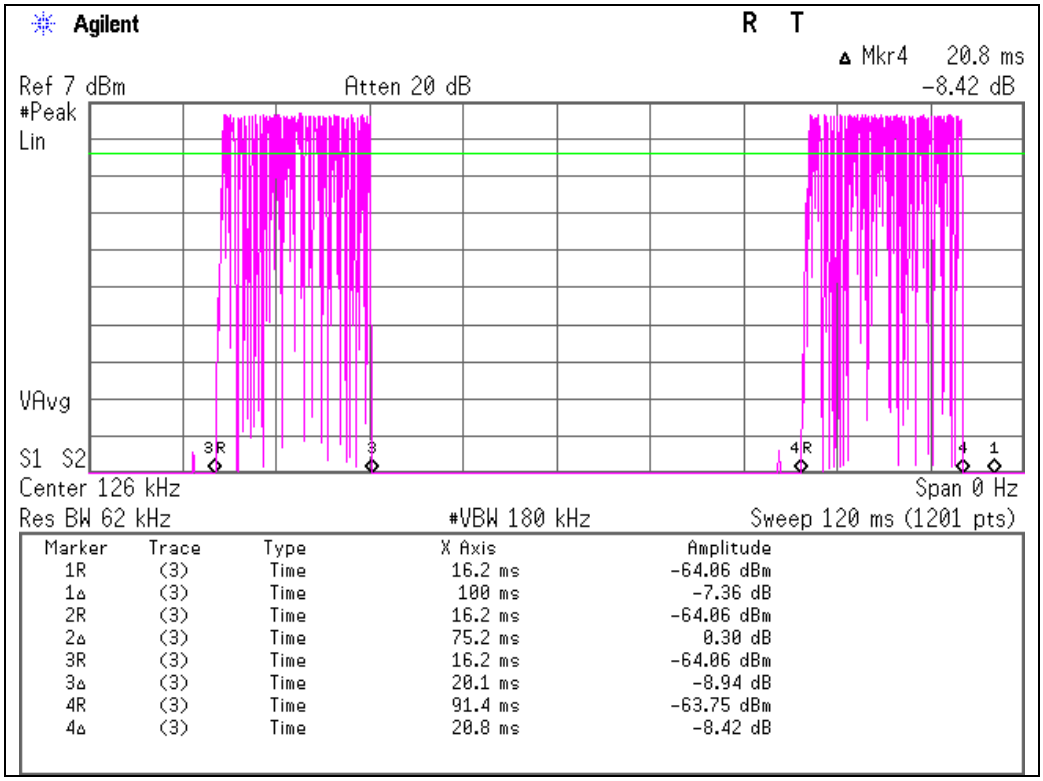
Antenna A



Marker	Trace	Type	X Axis	Amplitude
1R	(3)	Time	1.538 ms	-3.38 dBm
1Δ	(3)	Time	414.7 µs	0.12 dB
2R	(3)	Time	2.305 ms	-3.40 dBm
2Δ	(3)	Time	160 µs	-0.03 dB
3R	(3)	Time	2.561 ms	-2.57 dBm
3Δ	(3)	Time	283.7 µs	-0.21 dB

Duty Cycle

Antenna A



Duty Cycle

Antenna C

Test place	Head Office EMC Lab. No.2 Semi Anechoic Chamber
Report No.	10004859H
Date	03/05/2013
Temperature/ Humidity	23 deg. C / 32% RH
Engineer	Shinya Watanabe
Mode	Transmitting mode

Type	Times (in 27ms)	ON time(One pulse) [ms]	ON time(in 75.08ms) [ms]
A	44	0.153	6.719
B	17	0.279	4.740
C	1	0.407	0.407
D	1	4.107	4.107

ON time(in 75.08ms) = Times (in 27ms) * ON time(One pulse)

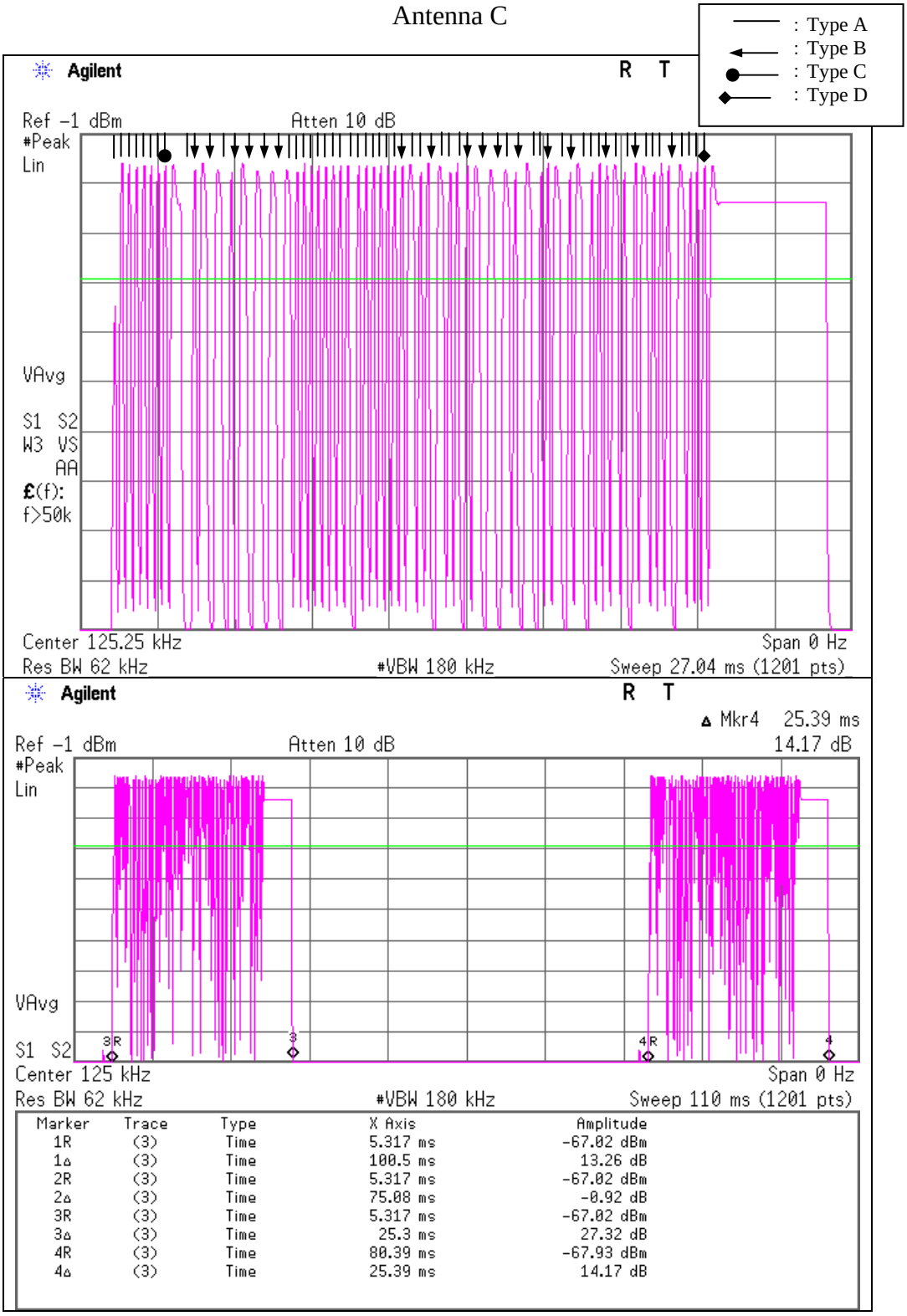
(Total)

ON time [ms]	Cycle [ms]	Duty (On time/Cycle)	Duty [dB]
15.972	75.08	0.2127	-13.44

ON time = Type A's ON time (in 75.08ms) + Type B's ON time (in 75.08ms) + Type C's ON time (in 75.08ms)
Duty = $20\log_{10}$(ON time/Cycle)

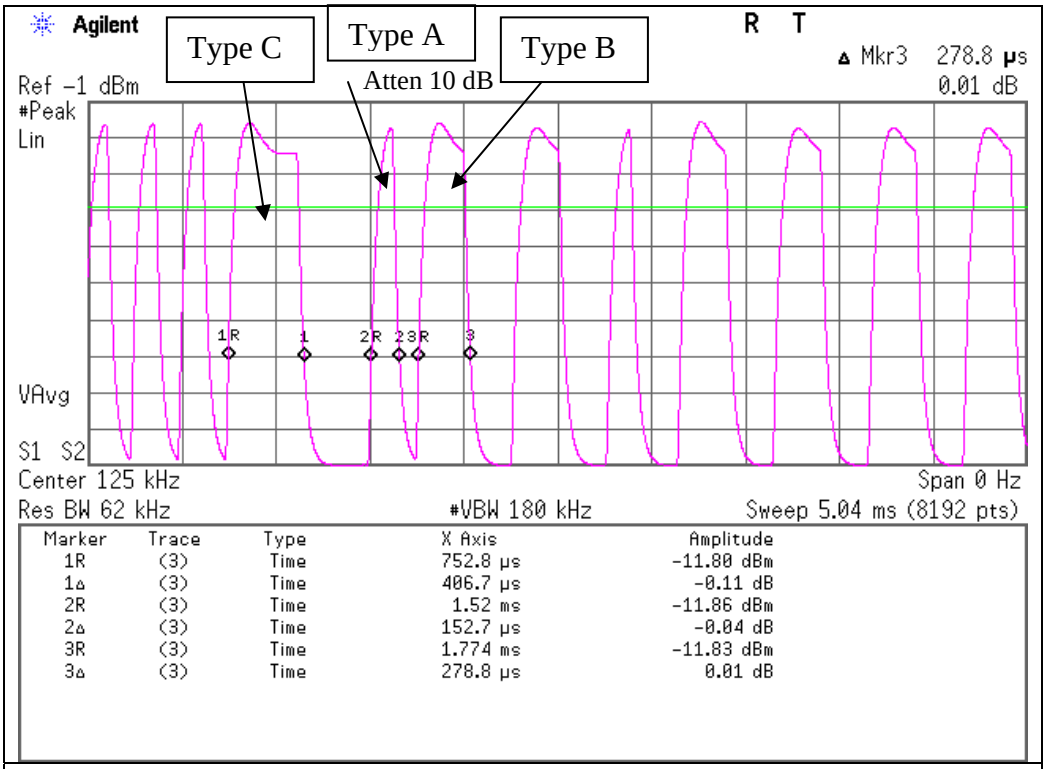
Duty Cycle

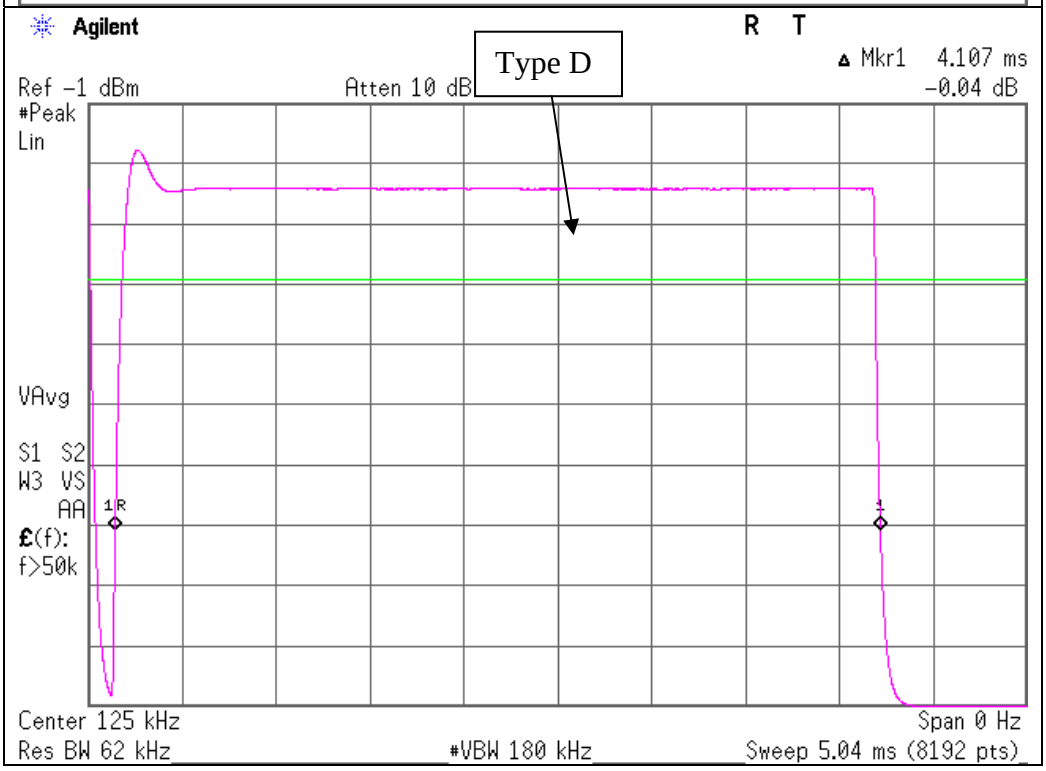
Antenna C



Duty Cycle

Antenna C





Duty Cycle

Antenna F

Test place	Head Office EMC Lab. No.2 Semi Anechoic Chamber
Report No.	10004859H
Date	03/05/2013
Temperature/ Humidity	23 deg. C / 32% RH
Engineer	Shinya Watanabe
Mode	Transmitting mode

Type	Times (in 27ms)	ON time(One pulse) [ms]	ON time(in 75.11ms) [ms]
A	44	0.154	6.767
B	17	0.281	4.770
C	1	0.408	0.408
D	1	4.110	4.110

ON time(in 75.11ms) = Times (in 27ms) * ON time(One pulse)

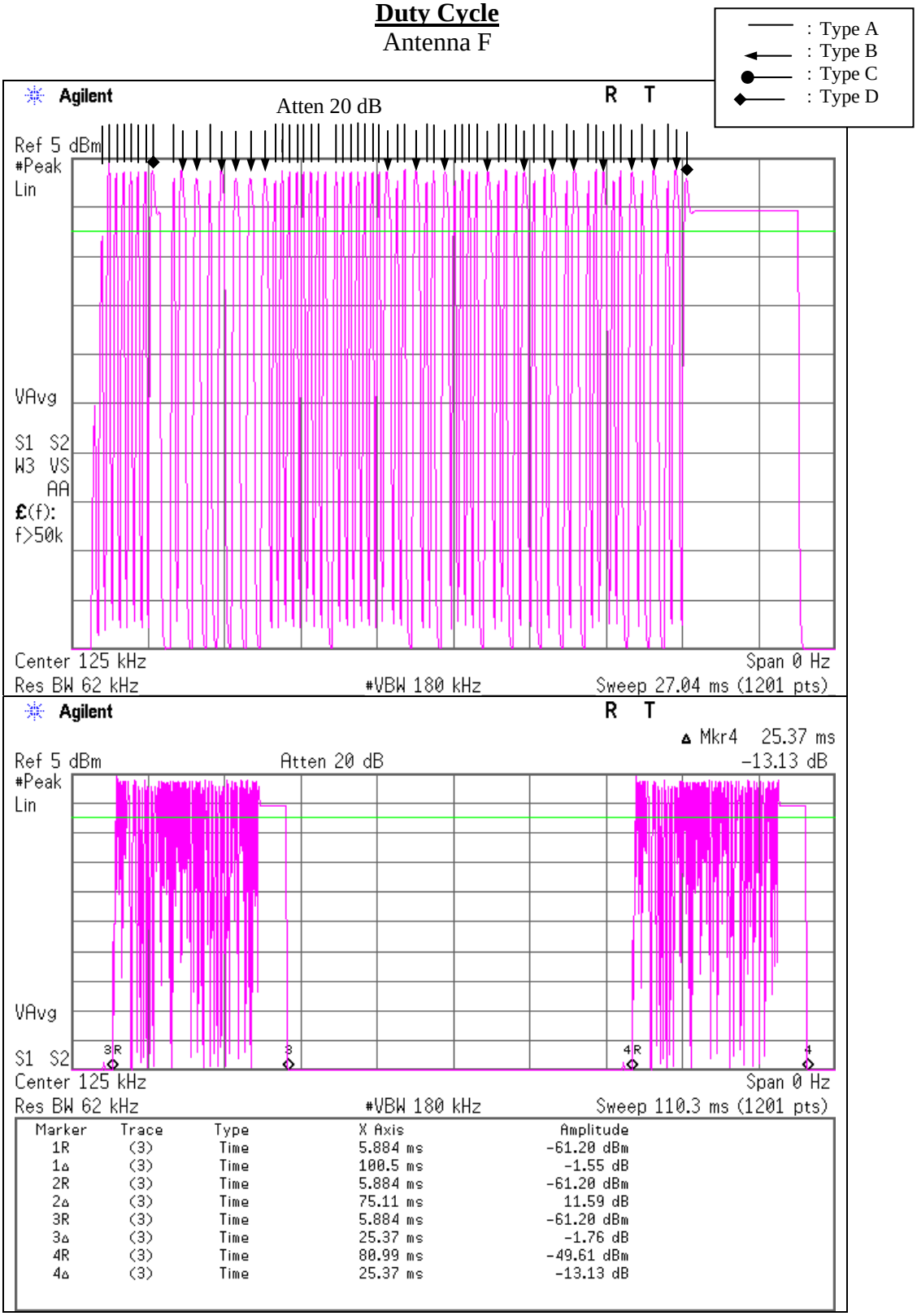
(Total)

ON time [ms]	Cycle [ms]	Duty (On time/Cycle)	Duty [dB]
16.055	75.11	0.2138	-13.40

ON time = Type A's ON time (in 75.11ms) + Type B's ON time (in 75.11ms) + Type C's ON time (in 75.11ms)
Duty = $20\log_{10}$(ON time/Cycle)

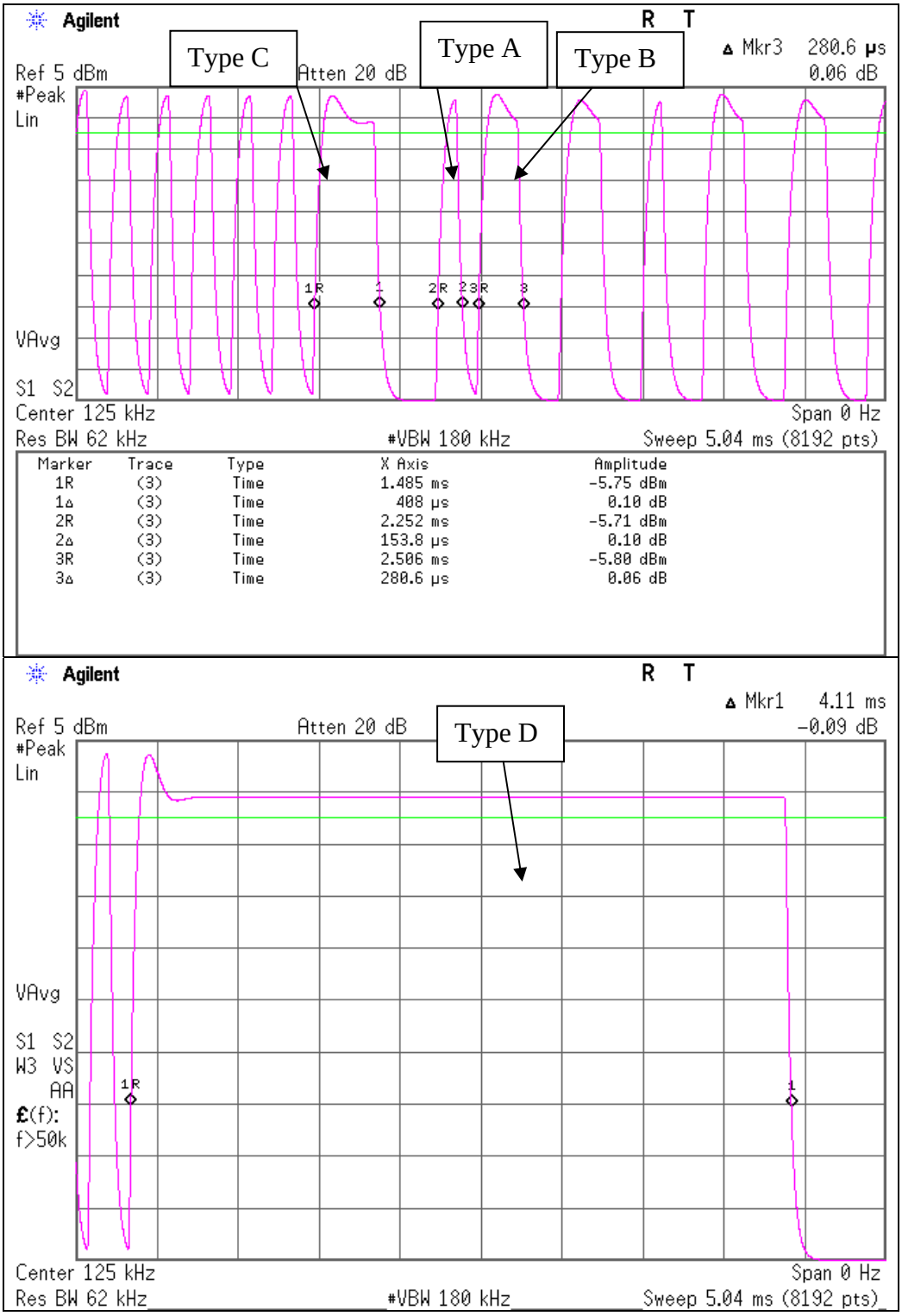
Duty Cycle

Antenna F



Duty Cycle

Antenna F



APPENDIX 2: Test instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-02	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	RE	2012/06/29 * 12
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	RE	2012/02/06 * 12
MJM-14	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MRENT-95	Spectrum Analyzer	Agilent	E4440A	MY46185823	RE	2012/06/19 * 12
MTR-03	Test Receiver	Rohde & Schwarz	ESCI	100300	RE	2012/04/03 * 12
MLPA-01	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100017	RE	2012/10/12 * 12
MCC-13	Coaxial Cable	Fujikura	3D-2W(12m)/5D-2W(5m)/5D-2W(0.8m)/5D-2W(1m)	-	RE	2013/02/06 * 12
MCC-143	Coaxial Cable	UL Japan	-	-	RE	2012/07/27 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2012/03/16 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	BK7970	RE	2012/11/06 * 12
MBA-02	Biconical Antenna	Schwarzbeck	BBA9106	VHA91032008	RE	2012/10/08 * 12
MLA-02	Logperiodic Antenna	Schwarzbeck	USLP9143	201	RE	2012/10/08 * 12
MCC-12	Coaxial Cable	Fujikura/Agilent	-	-	RE	2013/02/06 * 12
MPA-09	Pre Amplifier	Agilent	8447D	2944A10845	RE	2012/09/11 * 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: Spurious emission