



RADIO TEST REPORT

Test Report No. : 31KE0106-HO-01-A

Applicant : Fuji Heavy Industries Ltd.
Type of Equipment : Immobilizer
Model No. : SSPIMB02
FCC ID : Y8PSSPIMB02
Test regulation : FCC Part 15 Subpart C: 2010
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: June 15 and 20, 2011

Representative test engineer:

Keisuke Kawamura
Engineer of WiSE Japan,
UL Verification Service

Approved by:

Shinya Watanabe
Leader of WiSE Japan,
UL Verification Service



NVLAP LAB CODE: 200572-0

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<http://www.ul.com/japan/jpn/pages/services/emc/about/mark1/index.jsp#nvlap>

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13-EM-F0429

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SECTION 1: Customer information

Company Name : Fuji Heavy Industries Ltd.
Address : 1-1 SUBARU-CHO OTA GUNMA, 373-8555 Japan
Telephone Number : +81-276-26-2381
Facsimile Number : +81-276-26-2397
Contact Person : Takashi Nishida

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

2.1 Identification of E.U.T.

Type of Equipment : Immobilizer
Model No. : SSPIMB02
Serial No. : Refer to Section 4, Clause 4.2
Rating : DC 5.0V
Receipt Date of Sample : June 11, 2011
Condition of EUT : Production model
Modification of EUT : No Modification by the test lab

2.2 Product Description

Model: SSPIMB02 (referred to as the EUT in this test report) is the Immobilizer.

Radio Specification

Radio Type : Transmitter
Frequency of Operation : 134.2kHz
Modulation : ASK
Method of Frequency Generation : Oscillator circuit with Ceramic Resonator
Antenna type : Coil Antenna
Duty Cycle : up to 100 %

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C: 2010, final revised on December 6, 2010 and effective January 5, 2011

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.209 Radiated emission limits, general requirements

FCC 15.31 (e)

The RF part of EUT is constantly provided with voltage (DC 5.0V) through regulator. 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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3.2 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	21.0dB 0.13420MHz, 0 deg. AV	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	1.3dB 112.092MHz, Vertical, QP	Complied
4	-26dB Bandwidth	<FCC> ANSI C63.4:2003 13. Measurement of intentional radiators <IC> -	<FCC> Reference data <IC> -	Radiated	N/A	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.

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.

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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	3.5dB	5.1dB	5.2dB	4.8dB	5.1dB	4.4dB	4.3dB
No.2	4.0dB	5.1dB	5.2dB	4.8dB	5.0dB	4.3dB	4.2dB
No.3	4.2dB	4.7dB	5.2dB	4.8dB	5.0dB	4.5dB	4.2dB
No.4	4.0dB	5.0dB	5.1dB	4.8dB	5.0dB	5.1dB	4.2dB

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

Radiated emission test (3m)

[Electric Field Strength of Fundamental Emission]

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

[Electric Field Strength of Spurious Emission]

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

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3.5 Test Location

UL Japan, Inc. Head Office EMC Lab. *NVLAP Lab. code: 200572-0
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	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 Test set up, Data of EMI, and Test instruments

Refer to APPENDIX.

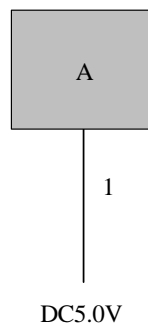
SECTION 4: Operation of E.U.T. during testing

4.1 Operating Modes

Test mode	Remarks
Transmitting (Tx) mode	134.2kHz

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

4.2 Configuration and peripherals



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

Description of EUT

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Immobilizer	SSPIMB02	001	-	EUT

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	3.3	Unshielded	Unshielded	-

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SECTION 5: Radiated emission (Fundamental and Spurious Emission)

Test Procedure

The Radiated Electric Field Strength intensity has been measured on No 3 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., 45deg., 90deg., 135 deg. and 180deg.) 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) and the spectrum analyzer (above 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

- 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 2

Test result : Pass

Date: June 15 and 20, 2011

Test engineer: Keisuke Kawamura

UL Japan, Inc.

Head Office EMC Lab.

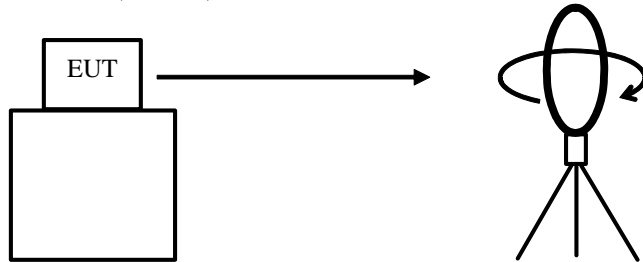
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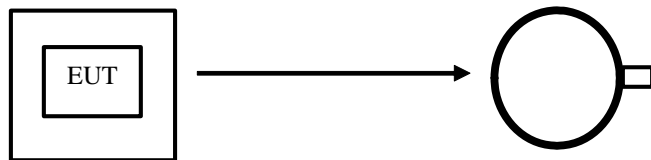
Facsimile : +81 596 24 8124

Figure 1: Direction of the Loop Antenna

Side View (Vertical)

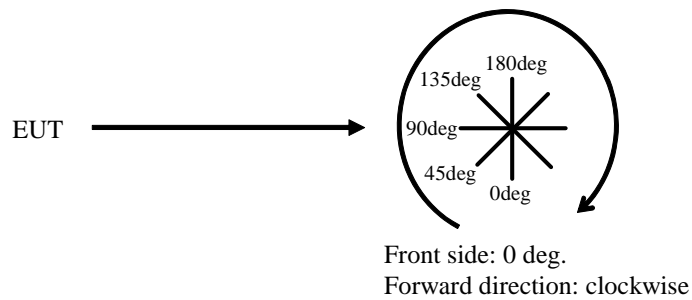


Top View (Horizontal)



Antenna was not rotated.

Top View (Vertical)



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SECTION 6: -26dB 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
-26dB Bandwidth	100kHz	1kHz	3kHz	Auto	Peak	Max Hold	Spectrum Analyzer

Test data : APPENDIX 2

Test result : Pass

SECTION 7: 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
99% Occupied Bandwidth	Enough width to display 20dB Bandwidth	1 % of Span	Three times of RBW	Auto	Peak *1)	Max Hold *1)	Spectrum Analyzer

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

Test data : APPENDIX 2

Test result : Pass

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APPENDIX 1: Photographs of test setup

Radiated Emission



Photo 1

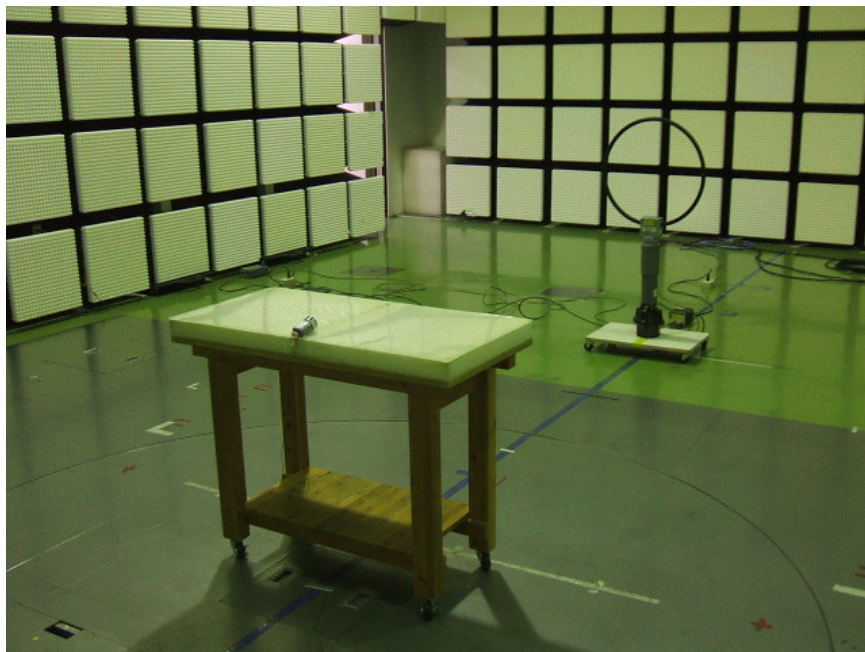


Photo 2

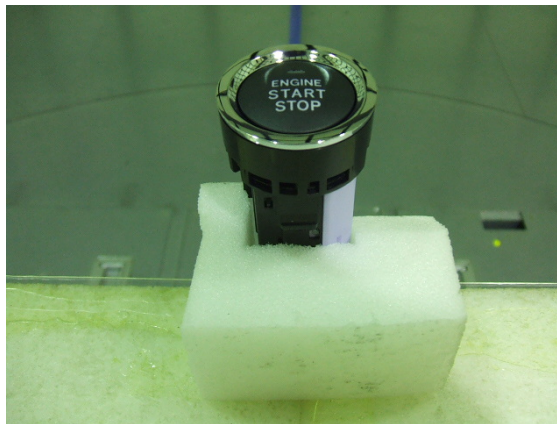
Worst Case Position

**Below 30MHz Z-axis
Above 30MHz Hori:Z-axis / Vert:Z-axis**

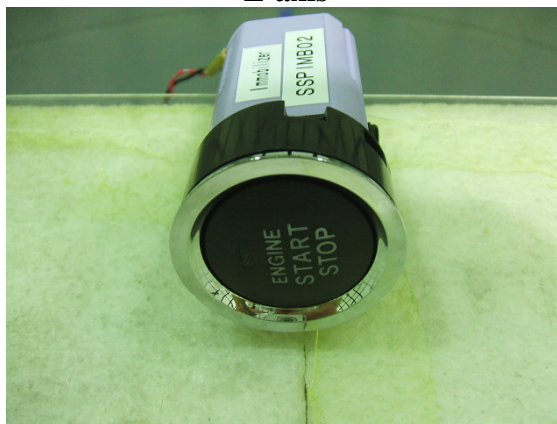
X-axis



Y-axis



Z-axis



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APPENDIX 2: Data of EMI test

Radiated Emission below 30MHz (Fundamental and Spurious Emission)

DATA OF RADIATED EMISSION TEST

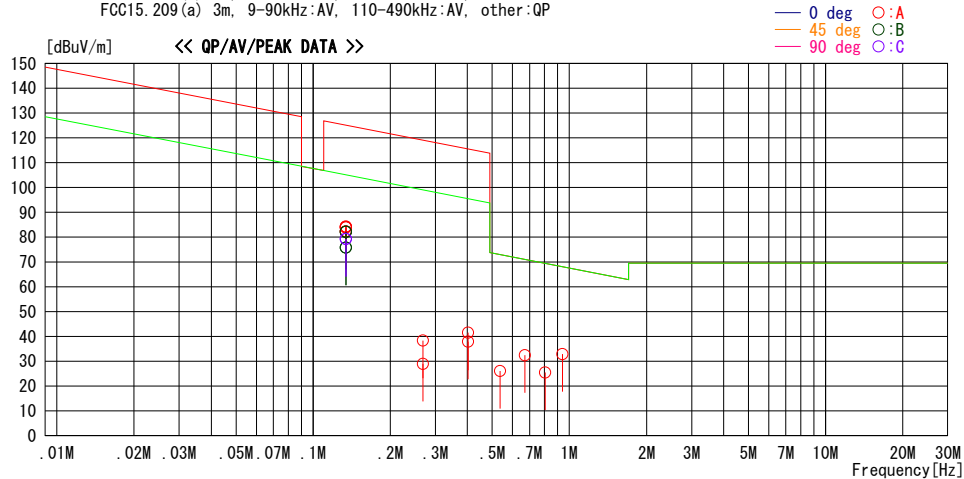
UL Japan, Inc. Head Office EMC Lab. No. 3 Semi Anechoic Chamber
Date : 2011/06/15

Report No. : 31KE0106-HO-01

Temp. / Humi. : 22deg. C / 55% RH
Engineer : Keisuke Kawamura

Mode / Remarks : Tx 134.2KHz, Worst Axis Z

LIMIT : FCC15.209(a) 3m, 9-90kHz:PK, 110-490kHz:PK, other:QP
FCC15.209(a) 3m, 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]	
0.13420	88.5	PEAK	19.9	6.0	32.2	82.2	125.1	42.9	45	B	143
0.13420	88.5	AV	19.9	6.0	32.2	82.2	105.1	22.9	45	B	143
0.13420	90.5	PEAK	19.9	6.0	32.2	84.2	125.1	40.9	0	A	182 Worst
0.13420	90.4	AV	19.9	6.0	32.2	84.1	105.1	21.0	0	A	182 Worst
0.13420	88.6	PEAK	19.9	6.0	32.2	82.3	125.1	42.8	135	A	203
0.13420	88.6	AV	19.9	6.0	32.2	82.3	105.1	22.8	135	A	203
0.13420	82.1	PEAK	19.9	6.0	32.2	75.8	125.1	49.3	0	B	141 Hori
0.13420	82.1	AV	19.9	6.0	32.2	75.8	105.1	29.3	0	B	141 Hori
0.13420	85.5	PEAK	19.9	6.0	32.2	79.2	125.1	45.9	90	C	88
0.13420	85.5	AV	19.9	6.0	32.2	79.2	105.1	25.9	90	C	88
0.13420	90.3	PEAK	19.9	6.0	32.2	84.0	125.1	41.1	180	A	184
0.13420	90.3	AV	19.9	6.0	32.2	84.0	105.1	21.1	180	A	184
0.26840	44.8	PEAK	19.6	6.1	32.2	38.3	119.0	80.7	0	A	165
0.26840	35.5	AV	19.6	6.1	32.2	29.0	99.0	70.0	0	A	165
0.40260	48.2	PEAK	19.5	6.1	32.3	41.5	115.5	74.0	0	A	181
0.40260	44.6	AV	19.5	6.1	32.3	37.9	95.5	57.6	0	A	181
0.53680	32.8	QP	19.5	6.1	32.3	26.1	73.0	46.9	0	A	159
0.67100	39.2	QP	19.4	6.1	32.2	32.5	71.1	38.6	0	A	178
0.80520	32.2	QP	19.4	6.1	32.2	25.5	69.5	44.0	0	A	172
0.93940	39.6	QP	19.4	6.1	32.2	32.9	68.1	35.2	0	A	183

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.) - 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)

DATA OF RADIATED EMISSION TEST

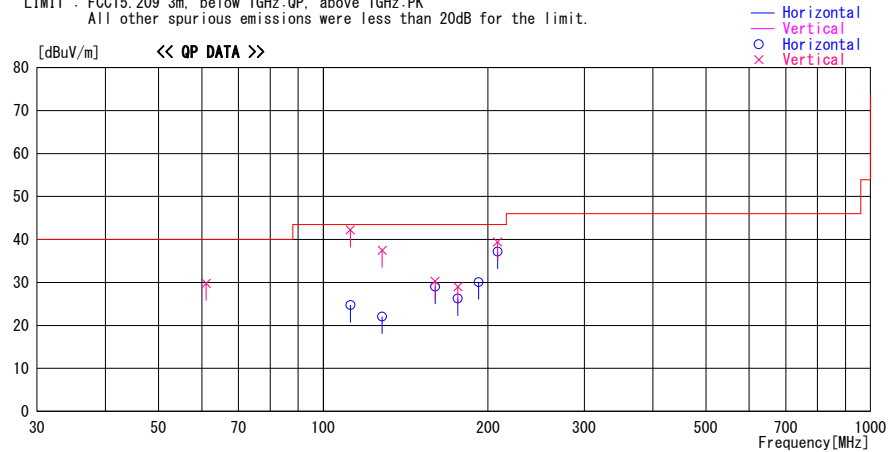
UL Japan, Inc. Head Office EMC Lab. No. 3 Semi Anechoic Chamber
Date : 2011/06/20

Report No. : 31KE0106-HO-01

Temp./Humi. : 22deg.C / 65 % RH
Engineer : Keisuke Kawamura

Mode / Remarks : Tx 134.2kHz, Worst-Axis(Hori:Z, Vert:Z)

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	Loss&	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
			Factor [dB/m]	Gain [dB]							
61.091	46.2	QP	8.1	-24.5	29.8	359	100	Vert.	40.0	10.2	
112.092	54.2	QP	11.8	-23.8	42.2	359	100	Vert.	43.5	1.3	
112.092	36.7	QP	11.8	-23.8	24.7	105	147	Hori.	43.5	18.8	
128.108	32.3	QP	13.5	-23.7	22.1	103	300	Hori.	43.5	21.4	
128.108	47.7	QP	13.5	-23.7	37.5	250	100	Vert.	43.5	6.0	
160.049	38.1	QP	15.4	-23.2	30.3	345	100	Vert.	43.5	13.2	
160.137	36.8	QP	15.4	-23.2	29.0	107	188	Hori.	43.5	14.5	
176.149	33.7	QP	15.7	-23.1	26.3	118	180	Hori.	43.5	17.2	
176.149	36.4	QP	15.7	-23.1	29.0	359	100	Vert.	43.5	14.5	
192.159	36.8	QP	16.3	-23.0	30.1	298	165	Hori.	43.5	13.4	
208.175	43.2	QP	16.8	-22.8	37.2	149	158	Hori.	43.5	6.3	
208.199	45.4	QP	16.8	-22.8	39.4	319	100	Vert.	43.5	4.1	

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.

-26dB Bandwidth and 99% Occupied Bandwidth

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Head Office EMC Lab. No.3 Semi Anechoic Chamber

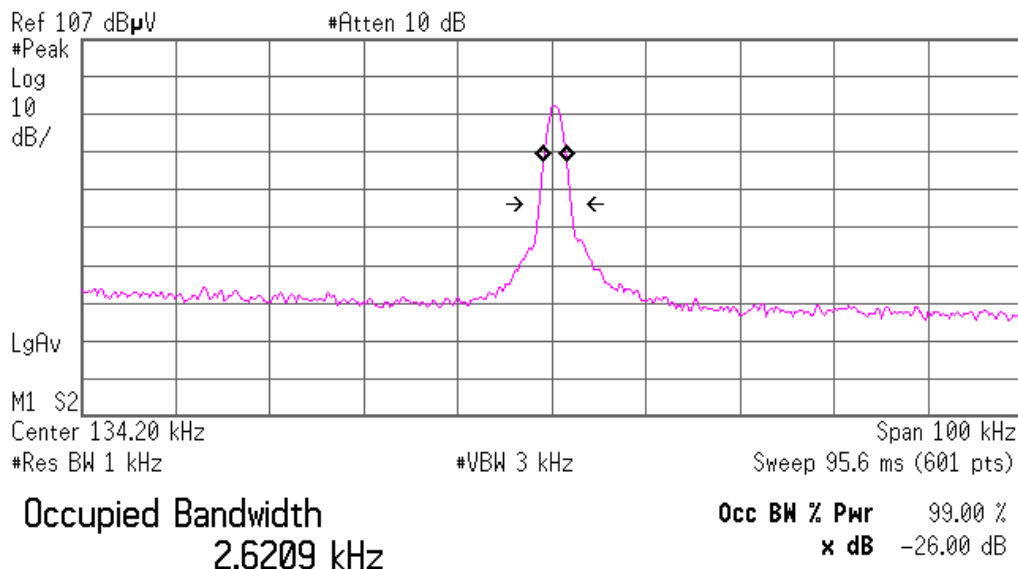
COMPANY : Fuji Heavy Industries Ltd.
EQUIPMENT : Immobilizer
MODEL : SSPIMB02
S/N : 001
POWER : DC 5V
MODE : Tx
: 134.2kHz

REPORT NO : 31KE0106-HO-01
REGULATION : Reference data
TEST DISTANCE : 3m
DATE : 06/20/2011
TEMPERATURE : 22 deg.C
HUMIDITY : 65 % RH
Engineer : Keisuke Kawamura

	FREQ	-26dB Bandwidth	99% Occupied Bandwidth
	[kHz]	[kHz]	[kHz]
	134.2	3.552	2.621

Agilent

R T



Transmit Freq Error 351.527 Hz

x dB Bandwidth 3.552 kHz

APPENDIX 3: 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	2011/02/22 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	-	RE	2011/02/23 * 12
MJM-15	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MTR-08	Test Receiver	Rohde & Schwarz	ESCI	100767	RE	2010/08/23 * 12
MLPA-01	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100017	RE	2010/10/15 * 12
MCC-112	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W(10m) /SFM141(3m) /sucoform141-PE(1m) /421-010(1.5m) /RFM-E321(Switcher)	-/00640	RE	2010/07/23 * 12
MCC-31	Coaxial cable	UL Japan	-	-	RE	2010/07/20 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2011/03/04 * 12
MAT-09	Attenuator(6dB)	Weinschel Corp	2	BK7973	RE	2010/11/05 * 12
MSA-10	Spectrum Analyzer	Agilent	E4448A	MY4618065 5	RE	2011/02/15 * 12
MBA-03	Biconical Antenna	Schwarzbeck	BBA9106	1915	RE	2010/10/11 * 12
MLA-03	Logperiodic Antenna	Schwarzbeck	USLP9143	174	RE	2010/10/11 * 12
MCC-51	Coaxial cable	UL Japan	-	-	RE	2010/07/06 * 12

The expiration date of the calibration is the end of the expired month.

All equipment is calibrated with traceable calibrations. Each calibration 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

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