

EMI TEST REPORT

Test Report No. : 25BE0108-HO-1

Applicant : Calsonic Kansei Corp.

Type of Equipment : Hand Unit of Smart Keyless Entry System

Model No. : TS003

Test standard : FCC Part 15 2004
Subpart C Section 15.209, Section 15.231
(Certification)
FCC Part 15 Subpart B : 2004
Section 15.109 (Verification)

FCC ID : KBRTS003

Test Result : Complied

1. This test report shall not be reproduced in full or partial, without the written approval of UL Apex Co., Ltd.
2. The results in this report apply only to the sample tested.
3. This equipment is in compliance with above regulation. We hereby certify that the data contain a true representation of the EMC profile.
4. The test results in this report are traceable to the national or international standards.

Date of test:

October 8 and 9, 2004

Tested by:

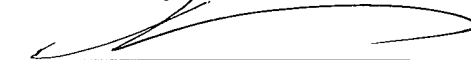


Mitsuru Fujimura
EMC Service



Kenichi Adachi
EMC Service

Approved by :



Naoki Sakamoto
Group Leader of
EMC Service

UL Apex Co., Ltd.

Head Office EMC Lab.

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SECTION 1: Client information

Company Name : Calsonic Kansei Corp.
Address : 8 Sakae-cho Sano-shi Tochigi, 327-0816 Japan
Telephone Number : +81-283-21-8409
Facsimile Number : +81-283-21-8547
Contact Person : Kenichiro Kobayashi

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

2.1 Identification of E.U.T.

Type of Equipment : Hand Unit of Smart Keyless Entry System
Model No. : TS003
Sample No. : 5
Country of Manufacture : Japan
Rating : DC3V
Receipt Date of Sample : October 4, 2004
Condition of EUT : Production prototype
(Not for Sale: This sample is equivalent to mass-produced items.)

2.2 Product Description

Clock frequency	CPU: 2.2MHz
-----------------	-------------

Equipment Type	Transmitter
Frequency of Operation	315MHz
Type of Modulation	FSK
Antenna Type	Pattern Antenna
Mode of Operation	Simplex
ITU code	F1D
Method of frequency generation	Resonator
Operating voltage (Inner)	DC 3V
Operating frequency range	-10 to +60deg.C.

Equipment Type	Receiver
Frequency of Operation	125kHz
Operating voltage (Inner)	DC 3V

FCC 15.31 (e)

This test was performed with the New Battery (DC 3.0V) 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.

FCC Part 15.111(b)

The receiving antenna is installed on the EUT, which is unremovable. Therefore, this EUT complies with the requirement in Section FCC Part 15.111(b).

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C 2004
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

Test Specification : FCC Part 15 Subpart B : 2004
Title : FCC 47CFR Part15 Radio Frequency Device
Subpart B Unintentional Radiators
Section 15.109 Radiated emission limits

3.2 Procedures and results

1) FCC Part 15 Subpart C: 2004

No.	Item	Test Procedure	Specification	Remarks	Worst margin*0)	Result
1	Automatically deactivate	ANSI C63.4:2003 13. Measurement of intentional radiators	FCC Section 15.231(a)(1)	Radiated	N/A	Complied
2	Electric Field Strength of Fundamental Emission	ANSI C63.4:2003 13. Measurement of intentional radiators	FCC Section 15.231(b)	Radiated	2.7dB QP 315MHz Horizontal	Complied
3	Electric Field Strength of Spurious Emission	ANSI C63.4:2003 13. Measurement of intentional radiators	FCC Section 15.205 FCC Section 15.209 FCC Section 15.231(b)	Radiated	5.2dB QP 630.125MHz Horizontal	Complied
4	-20dB Bandwidth	ANSI C63.4:2003 13. Measurement of intentional radiators	FCC Section 15.231(c)	Radiated	N/A	Complied
5	Conducted Emission	ANSI C63.4:2003 7. AC powerline conducted emission measurements	FCC Section 15.207(a)	AC Mains only*1)	N/A	N/A

Note: UL Apex's EMI Work procedures No. QPM05

*0) The result is rounded off to the second decimal place. Therefore, there may be 0.1 difference for the result.

*1) This test is not applicable since the EUT does not have AC power port.

Uncertainty:

*In case of the margin below the EMC Head Office's uncertainty.

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

Spurious Emission (Radiated)

The measurement uncertainty (with a 95% confidence level) for this test using Biconical antenna is $\pm 4.5\text{dB}(3\text{m})/\pm 4.7\text{dB}(10\text{m})$.

The measurement uncertainty (with a 95% confidence level) for this test using Logperiodic antenna is $\pm 5.2\text{dB}(3\text{m})/\pm 3.8\text{dB}(10\text{m})$.

The measurement uncertainty (with a 95% confidence level) for this test using Horn antenna is $\pm 6.6\text{dB}$.

Other test except Conducted Emission and Spurious Emission (Radiated)

The measurement uncertainty (with a 95% confidence level) for this test is $\pm 3.0\text{dB}$.

*These tests were performed without any deviations from test procedure except for additions or exclusions.

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2) FCC Part 15 Subpart B: 2004

No.	Item	Test Procedure	Specification	Deviation	Worst margin	Result
1	Radiated emission	ANSI C63.4:2003	FCC Section 15.109(a)	N/A	3.3dB QP 47.708MHz Vertical	Complied
2	Conducted Emission	ANSI C63.4:2003	FCC Section 15.107(a) and 207	N/A	N/A *1)	N/A

Note: UL Apex's EMI Work procedures No. QPM05

*1) This test is not applicable since the EUT does not have AC power port.

*These tests were performed without any deviations from test procedure except for additions or exclusions.

3.3 Addition to standards

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	99% Occupied Band Width	RSS-210(issue 5): 2001 + Amendment:2002 + Amendment2:2003 + Amendment3:2004 + Amendment4: 2004	RSS-210(issue 5): 2001 + Amendment:2002 + Amendment2:2003 + Amendment3:2004 + Amendment4: 2004	Conducted	N/A	N/A	N/A

3.4 Test Location

UL Apex Co., Ltd. Head Office EMC Lab. *NVLAP Lab. code: 200572-0
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	Listed date (for FCC)	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	February 01, 2002	313583	IC4247	19.2 x 11.2 x 7.7m	7.0 x 6.0m	Preparation room
No.2 semi-anechoic chamber	June 05, 2002	846015	IC4247-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 shielded room	-	-	-	4.7 x 7.5 x 2.7m	4.7 x 7.5m	-
No.4 measurement room	-	-	-	3.1 x 5.0 x 2.7m	N/A	-

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

3.5 Test set up, Test instruments and Data of EMI

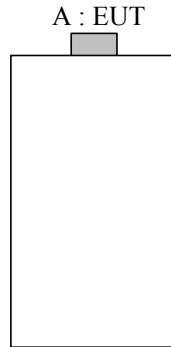
Refer to APPENDIX 1 to 3.

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

4.1 Operating Modes

Test mode is used : Continuous Transmitting mode (315MHz)
Continuous Receiving mode (125kHz)

4.2 Configuration and peripherals (Transmitting mode)



* Cabling was 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	FCC ID
A	Hand Unit of Smart Keyless Entry System	TS003	5	Calsonic Kansei Co.,Ltd.	KBRTS003

UL Apex Co., Ltd.

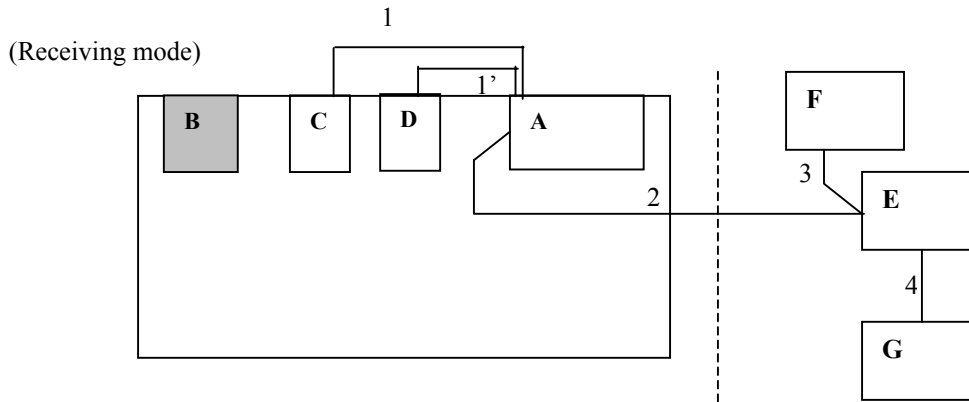
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* Cabling was taken into consideration and test data was taken under worse case conditions.

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	FCC ID
A	Control Unit	S64J3	5	Calsonic Kansei Co.,Ltd.	KBRS64J3
B	Hand Unit	TS003	5	Calsonic Kansei Co.,Ltd.	KBRTS003 (EUT)
C	Antenna	-	-	Calsonic Kansei Co.,Ltd.	-
D	Antenna	-	-	Calsonic Kansei Co.,Ltd.	-
E	Checker	-	-	Calsonic Kansei Co.,Ltd.	- *1)
F	BCM	-	-	Calsonic Kansei Co.,Ltd.	- *1)
G	Car Battery	40B19L	A030402	YUASA	- *1)

*1) As for the Measurement from 30MHz to 1GHz, E, F, and G were placed on the underground pit.

List of cables used

No.	Item	Length (m)	Shield	Backshell Material
1	Signal Cable	1.0	N	Polyvinyl chloride
1'	Signal Cable	1.0	N	Polyvinyl chloride
2	Signal Cable	3.0	N	Polyvinyl chloride
3	Signal Cable	0.6	N	Polyvinyl chloride
4	DC Cable	1.5	N	Polyvinyl chloride

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SECTION 5: Spurious Emission

5.1 Operating environment

Test place : No.1 and No.2 semi anechoic chamber
Temperature : See data
Humidity : See data

5.2 Test configuration

EUT was placed on a platform of nominal size, 0.5m by 0.5m (Transmitting mode) and 0.5m by 1.0m (Receiving mode), raised 80cm above the conducting ground plane.

The EUT was set on the center of the Polyurethane (Transmitting mode)/ Table top (Receiving mode).

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.

A drawing of the set up is shown in the photos of APPENDIX 1.

5.3 Test conditions

Frequency range : 30MHz - 3200MHz
Test distance : 3m
EUT position : Polyurethane (Transmitting mode)/ Table top (Receiving mode)
EUT operation mode : Transmitting mode

5.4 Test procedure

The Radiated Electric Field Strength intensity has been measured on No.1 and No.2 semi anechoic chamber with a ground plane and at a distance of 3m.

Measurements were performed with a QP, PK, and AV detector.

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 intensity.

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.

	Below 1GHz (T/R)	Above 1GHz (S/A)
Detector Type	QP	PK/AV
IF Bandwidth	BW 120kHz	PK: RBW:1MHz/VBW: 1MHz AV: RBW:1MHz/VBW:10Hz

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

5.5 Results

Summary of the test results: Pass

Date: October 8 and 9, 2004

Tested by: Mitsuru Fujimura and Kenichi Adachi

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SECTION 6: Automatically deactivate

Limit: A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

Date: October 8, 2004

Tested by: Mitsuru Fujimura

SECTION 7: -20dB Bandwidth

Limit: The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20dB down from the modulated carrier.

Date: October 8, 2004

Tested by: Mitsuru Fujimura

UL Apex Co., Ltd.

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APPENDIX 1: Photographs of test setup
Spurious Emission (Transmitting)(Radiated)

Front



Rear



Spurious Emission (Receiving) (Radiated)

Front



Rear

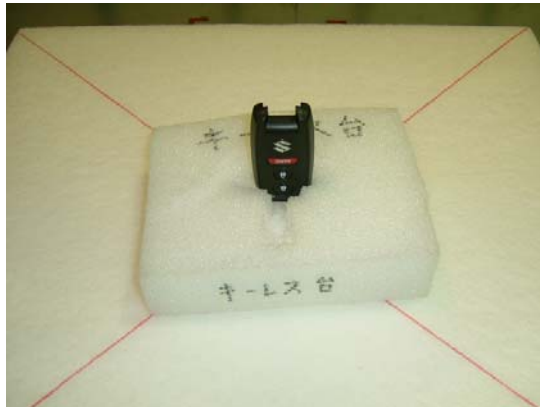


Worst Case Position (Transmitting) (X-axis:Horizontal / Y-axis:Vertical)

X-axis



Y-axis



Z-axis



APPENDIX 2:Test instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Test Item	Calibration Date * Interval(month)
MAEC-02	Anechoic Chamber	TDK	Semi Anechoic Chamber 3m	RE	2004/04/12 * 12
MTR-02	Test Receiver	Rohde & Schwarz	ESCS30	RE	2004/02/03 * 12
MRENT-09	Spectrum Analyzer	Advantest	R3273	RE	2004/02/18 * 12
MCC-12	Coaxial Cable	Fujikura/Agilent	-	RE	2004/02/24 * 12
MPA-06	Pre Amplifier	Hewlett Packard	8447D	RE	2004/08/29 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	RE	2003/12/16 * 12
MBA-02	Biconical Antenna	Schwarzbeck	BBA9106	RE	2003/10/15 * 12
MLA-02	Logperiodic Antenna	Schwarzbeck	USLP9143	RE	2003/10/15 * 12
MCC-04	Microwave Cable	Storm	421-011	RE	2004/01/06 * 12
MCC-29	Microwave Cable	Suhner	SUCOFLEX101	RE	2004/08/26 * 12
MCC-24	Microwave Cable	Storm	-	RE	2004/05/01 * 12
MHA-06	Horn Antenna	Schwarzbeck	BBHA9120D	RE	2004/01/10 * 12
MPA-03	Microwave System Power Amplifier	Agilent	83050A	RE	2004/06/12 * 12
MPA-01	Pre Amplifier	Agilent	8449B	RE	2004/02/06 * 12

All equipment is calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

Test Item:

RE: Radiated emission

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APPENDIX 3: Data of EMI test

Radiated Spurious Emission (Transmitting)

DATA OF RADIATED EMISSION TEST

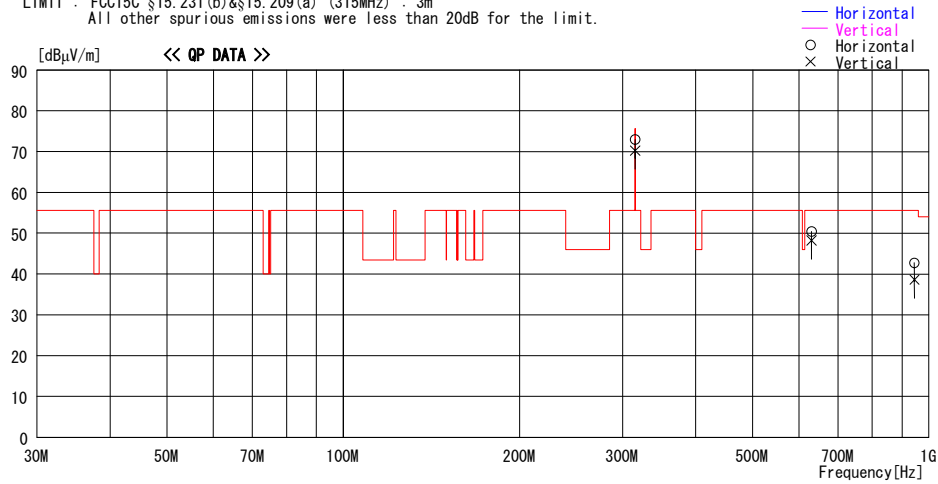
UL Apex Co., Ltd. Head Office EMC Lab. No.2 Semi Anechoic Chamber

Applicant : CalsonicKansei Corp.
Kind of EUT : Hand Unit of Smart Keyless Entry System
Model No. : TS003
Serial No. : 5

Report No. : 25BE0108-HO
Power : DC3.0V
Temp/°C/Humi% : 25 / 62%
Operator : Mitsuru Fujimura

Mode / Remarks : Transmitting : Max-axis (Hor:X-axis Ver:Y-axis)

LIMIT : FCC15C §15.231(b)&§15.209(a) (315MHz) : 3m
All other spurious emissions were less than 20dB for the limit.



No.	FREQ [MHz]	READING QP [dBμV]	ANT FACTOR [dB/m]	LOSS [dB]	GAIN [dB]	RESULT [dBμV/m]	LIMIT [dBμV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	315.065	76.8	14.6	8.4	26.9	72.9	75.6	2.7	100	259
2	630.125	48.9	19.8	9.9	28.2	50.4	55.6	5.2	142	137
3	945.184	37.2	22.2	11.0	27.7	42.7	55.6	12.9	100	228
----- Vertical -----										
4	315.069	74.1	14.6	8.4	26.9	70.2	75.6	5.4	158	279
5	630.124	46.7	19.8	9.9	28.2	48.2	55.6	7.4	100	215
6	945.182	33.1	22.2	11.0	27.7	38.6	55.6	17.0	109	300

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)

DATA OF RADIATED EMISSION TEST

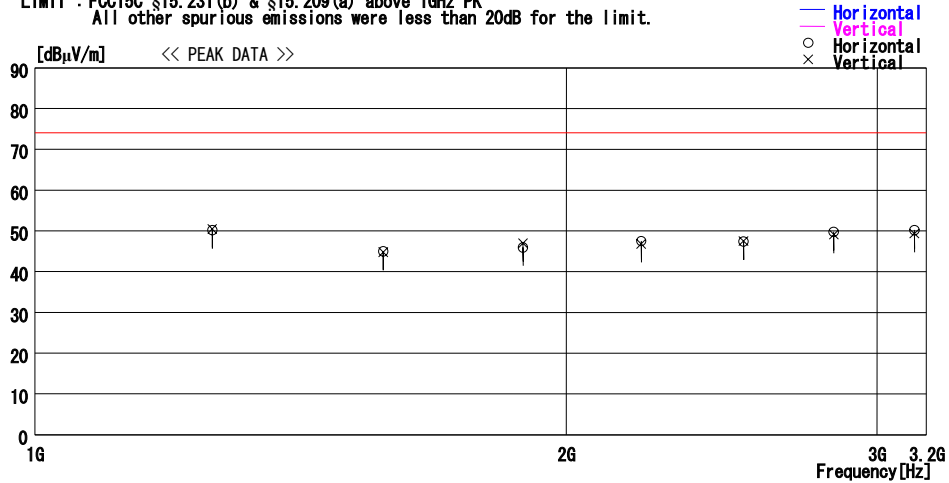
UL Apex Co., Ltd. Head Office EMC Lab. No. 2 Semi Anechoic Chamber
Date : 2004/10/09 01:06:25

Applicant : CalsonicKansei Corp.
Kind of EUT : Hand Unit of Smart Keyless Entry System
Model No. : TS003
Serial No. : 5

Report No. : 25BE0108-HO
Power : DC3.0V
Temp/C/Humi% : 25 / 62%
Operator : Mitsuru Fujimura

Mode / Remarks: Transmitting : Max-axis (Hor:X-axis, Ver:Y-axis)

LIMIT : FCC15C §15.231(b) & §15.209(a) above 1GHz PK
All other spurious emissions were less than 20dB for the limit.



No.	FREQ [MHz]	READING PK [dBμV]	ANT FACTOR [dB/m]	LOSS [dB]	GAIN [dB]	RESULT [dBμV/m]	LIMIT [dBμV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
Horizontal										
1	1260.213	49.6	23.2	4.5	27.1	50.2	74.0	23.8	120	75
2	1575.217	42.3	25.0	5.0	27.3	45.0	74.0	29.0	100	270
3	1890.230	38.9	28.9	5.6	27.5	45.9	74.0	28.1	120	30
4	2205.665	38.3	30.5	6.2	27.5	47.5	74.0	26.5	100	95
5	2520.520	37.1	31.1	6.6	27.4	47.4	74.0	26.6	100	0
6	2835.657	38.1	31.9	7.0	27.2	49.8	74.0	24.2	100	0
7	3150.442	37.9	32.0	7.4	27.1	50.2	74.0	23.8	135	0
Vertical										
8	1260.272	49.9	23.2	4.5	27.1	50.5	74.0	23.5	145	0
9	1575.272	42.1	25.0	5.0	27.3	44.8	74.0	29.2	105	0
10	1890.328	40.0	28.9	5.6	27.5	47.0	74.0	27.0	120	0
11	2205.495	37.6	30.5	6.2	27.5	46.8	74.0	27.2	100	0
12	2520.520	37.2	31.1	6.6	27.4	47.5	74.0	26.5	100	0
13	2835.585	37.4	31.9	7.0	27.2	49.1	74.0	24.9	100	0
14	3150.650	37.1	32.0	7.4	27.1	49.4	74.0	24.6	100	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)

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DATA OF RADIATED EMISSION TEST

UL Apex Co., Ltd. Head Office EMC Lab. No.2 Semi Anechoic Chamber

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Kind of EUT : Hand Unit of Smart Keyless Entry System
Model No. : TS003
Serial No. : 5

Report No. : 25BE0108-HO
Power : DC3.0V
Temp/C/Humi% : 25 / 62%
Operator : Mitsuru Fujimura

Mode / Remarks: Transmitting : Max-axis (Hor:X-Axis, Ver:Y-axis)

LIMIT : FCC15C §15.231(b) & §15.209(a)

All other spurious emissions were less than 20dB for the limit.

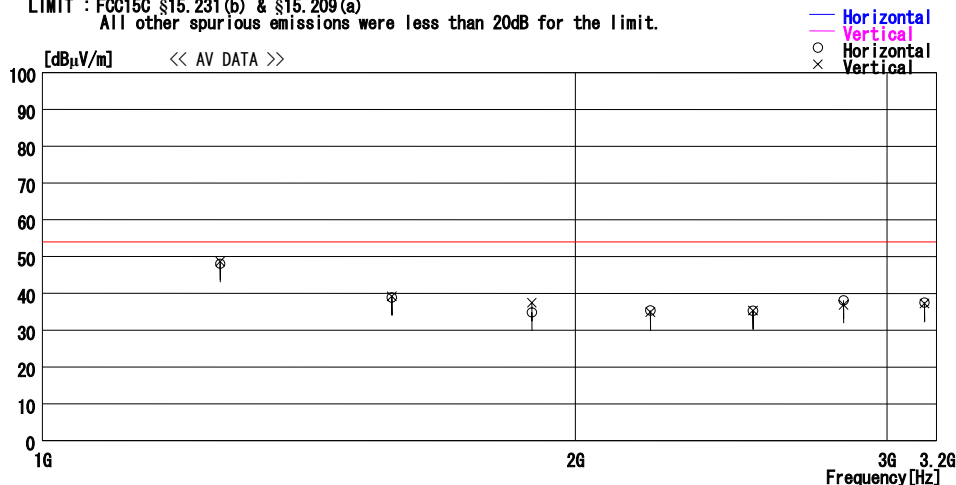


CHART:WITH FACTOR ANT TYPE : -30MHz LOOP, 30-300MHz BICONICAL, 300MHz-1000MHz LOGPERIODIC, 1000MHz- HORN
CALCULATION: RESULT = READING + ANT FACTOR + LOSS (CABLE+ATTEN.) - GAIN (AMP)

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Radiated Spurious Emission (Receiving)

DATA OF RADIATED EMISSION TEST

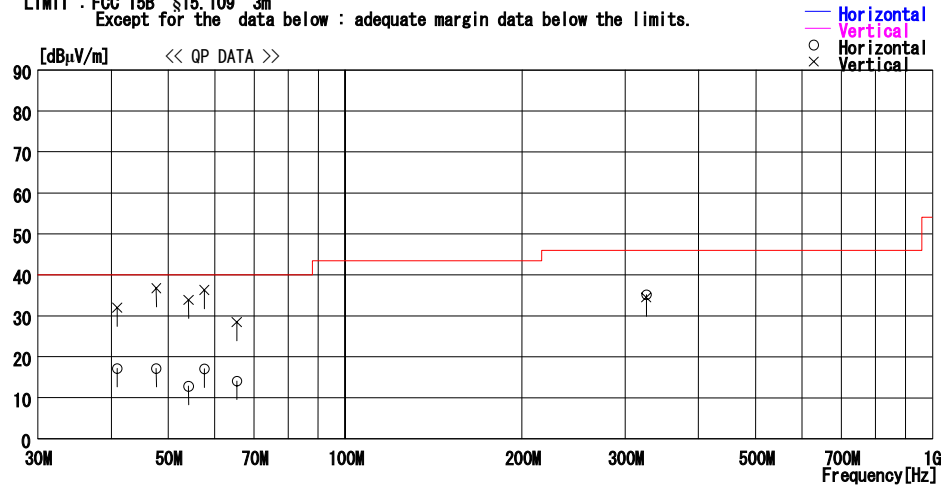
UL Apex Co., Ltd. Head Office EMC Lab. No.1 Semi Anechoic Chamber

Applicant : CalsonicKansei Corp.
Kind of EUT : Smart Keyless Entry System (Hand Unit& Control Unit)
Model No. : TS003, S64J3
Serial No. : 5, 5
Mode / Remarks : 125KHz Receiving / EUT Max-axis

Report No. : 25BE0108-HO
Power : DC 3V (TS003), DC 12V (S64J3)
Temp./Humi. : 22 deg. C. / 46%
Operator : Kenichi Adachi

LIMIT : FCC 15B §15.109 3m

Except for the data below : adequate margin data below the limits.



Frequency	Reading	DET	Antenna Factor	Loss & Gain	Level	Angle	Height	Polar.	Limit	Margin
[MHz]	[dBμV]		[dB/m]	[dB]	[dBμV/m]	[Deg]	[cm]		[dBμV/m]	[dB]
40.941	24.5	QP	13.5	-20.8	17.2	0	250	Hori.	40.0	22.8
40.941	39.3	QP	13.5	-20.8	32.0	311	100	Vert.	40.0	8.0
47.708	46.7	QP	10.8	-20.8	36.7	0	100	Vert.	40.0	3.3
47.708	27.2	QP	10.8	-20.8	17.2	0	275	Hori.	40.0	22.8
54.137	44.7	QP	9.4	-20.2	33.9	129	100	Vert.	40.0	6.1
54.137	23.6	QP	9.4	-20.2	12.8	232	147	Hori.	40.0	27.2
57.809	28.6	QP	8.8	-20.3	17.1	193	117	Hori.	40.0	22.9
57.809	47.8	QP	8.8	-20.3	36.3	187	100	Vert.	40.0	3.7
65.408	41.0	QP	7.6	-20.1	28.5	180	100	Vert.	40.0	11.5
65.428	26.6	QP	7.6	-20.1	14.1	178	310	Hori.	40.0	25.9
325.740	37.1	QP	15.6	-17.5	35.2	308	100	Hori.	48.0	10.8
325.740	36.4	QP	15.6	-17.5	34.5	158	100	Vert.	48.0	11.5

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)

UL Apex Co., Ltd.

Head Office EMC Lab.

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MF060b(10.04.03)

99% Occupied Bandwidth and -20dB Bandwidth

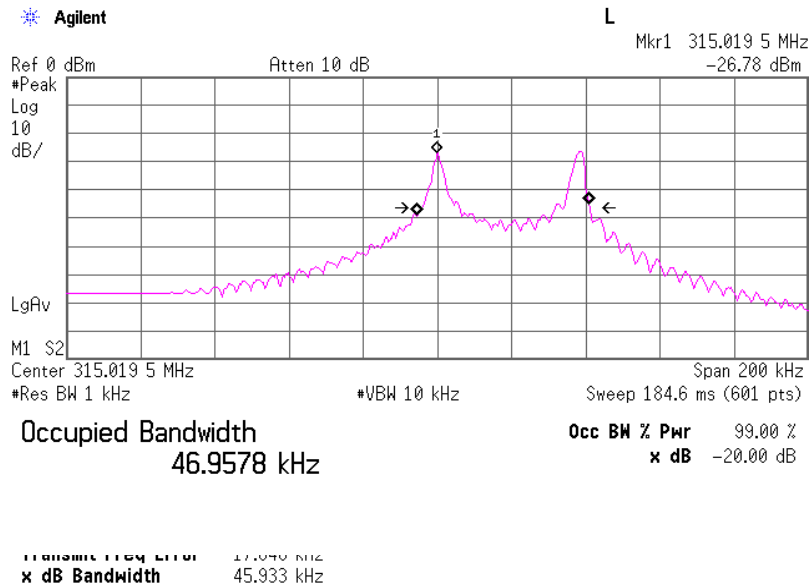
UL Apex Co., Ltd.
Head Office EMC Lab. No.2 Semi Anechoic Chamber

COMPANY : Calsonic Kansei Corp.
EQUIPMENT : Hand Unit of Smart Keyless Entry System
MODEL : TS003
S/ N : 5
POWER : DC 3V
MODE : Transmitting

REPORT NO. : 25BE0108-HO
REGULATION : FCC 15.231(c)
TEST DISTANCE : 3m
DATE : 10/08/2004
TEMPERATURE : 25°C
HUMIDITY : 62%
ENGINEER : Mitsuru Fujimura

-20dB Bandwidth	Bandwidth Limit	Result
[kHz]	[kHz]	
45.933	787.50	Pass

99% Bandwidth	Bandwidth Limit	Result
[kHz]	[kHz]	
46.958	-	Pass



Automatically deactivate

UL Apex Co., Ltd.
Head Office EMC Lab. No.2 Semi Anechoic Chamber

COMPANY : Calsonic Kansei Corp.
EQUIPMENT : Hand Unit of Smart Keyless Entry System
MODEL : TS003
S/ N : 5
POWER : DC 3V
MODE : Transmitting

REPORT NO. : 25BE0108-HO
REGULATION : FCC 15.231 (a) (1)
TEST DISTANCE : 3m
DATE : 10/08/2004
TEMPERATURE : 25°C
HUMIDITY : 62%
ENGINEER : Mitsuru Fujimura

Time of Transmitting [msec]	Limit [msec]
455	5000

