

EMISSION TEST REPORT

Test Report No. : 21LE0042-YW-1

Applicant: **Calsonic Kansei Corporation**

Type of Equipment: **Keyless Entry System (Transmitter)**

Model No.: **MSUB13**

FCC ID **KBRMSUB13**

Test standard: **FCC Part 15 Subpart C Section 15.231**

Test Result: **Complies**

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The results in this report apply only to the sample tested.

Date of test: July 13, 2001

Tested by:



Makoto Kosaka

Approved by:



Issued date: , October 18, 2001

Kazutoyo Nakanishi

Site Operation Manager of EMC section

Testing Laboratory

A-pex International Co., Ltd.

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1 GENERAL INFORMATION

APPLICANT : Calsonic Kansei Corporation

ADDRESS : 5-24-15 Minamidai, Nakano-ku, Tokyo
164-8602 Japan

Telephon Number : +81-3-5385-0111
Facsimile Number : +81-3-3383-1171

REGULATION(S) : FCC Part 15 Subpart C Section 15.231

MODEL NUMBER : MSUB13

FCC ID : KBRMSUB13

SERIAL NUMBER : Sample No.1

CONDITION OF EUT : Engineering Prototype

KIND OF EQUIPMENT : Keyless Entry System (Transmitter)

TESTED DATE : July 13, 2001

RECEIPT DATE OF SAMPLE : July 12, 2001

REPORT FILE NUMBER : 21LE0042-YW-1

TEST SITE : A-PEX Yokowa No.3 Open Test Site

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1.1 Product Description

Model: MSUB13 (referred to as the EUT in this report) is a Keyless Entry System (Transmitter).

The specification is as following :

Carrier Frequency : 314.85 MHz
Modulation : FSK
Other Clock Frequency : 8.18MHz
Information antenna : Integral / P.C.B pattern antenna
Operation Voltage : Lithium Battery DC 3.0V(CR1620)

1.2 Test Specification

Test Specification : FCC Part 15 Subpart C
Title : FCC 47CFR Part15 Radio Frequency Device
Subpart C Intentional Radiators
§ 15.231 Periodic operation in the band 40.66 – 40.70 MHz and above 70MHz

1.3 Methods & Procedures

No.	Item	Test Procedure	Specification	Remarks
1	Electric Field Strength of Fundamental Emission	ANSI C63.4:1992	§ 15.231	3m
2	Electric Field Strength of Spurious Emission	ANSI C63.4:1992	§ 15.205 § 15.209 § 15.231	3m
3	-20dB Bandwidth	ANSI C63.4:1992	§ 15.231	3m

1.4 Test Location

A-PEX International Co.,Ltd. Yokowa No.3 test site
108 Yokowa-cho, Ise-shi, Mie-ken 516-1106 Japan
Telephone number : +81-596-39-1485
Facsimile number : +81-596-39-0232

This site has been fully described in a report submitted to FCC office, and listed on September 12, 2000 (Registration number: 90412).

*NVLAP Lab. code : 200109-0

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2 SYSTEM TEST CONFIGURATION

2.1 Operation Environment

Temperature : See data

Humidity : See data

2.2 Justification

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

2.3 EUT Exercise Software

The EUT exercise program used during radiated testing was designed to exercise the various system components in a manner similar to typical use.

The sequence is used:

Operation Mode : Transmitting

2.4 Test Procedure

Tabletop Equipment Radiated Emissions

EUT was placed on a platform of nominal size, 1m by 1m, raised 80cm above the conducting ground plane.

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. The measurement distance was 3m.

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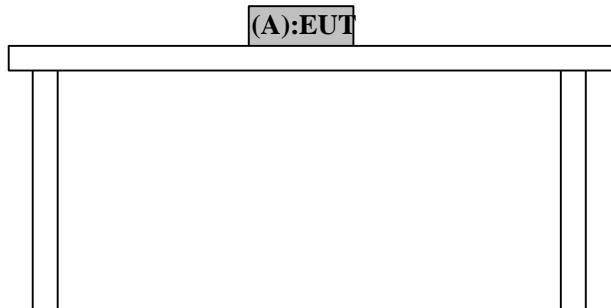
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Telephone: +81 596 39 1485

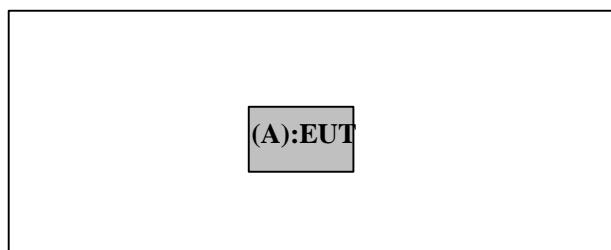
Facsimile: +81 596 39 0232

Figure2.1 Configuration of Tested System

Front View



Top View



*Test data was taken under worse case conditions.

No.	Item	Model number	Serial number	Manufacturer	FCC ID
A	Keyless Entry System (Transmitter)	MSUB13	Sample No.1	Calsonic Kansei Corp	KBRMSUB13

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3 RADIATED EMISSION DATA

The initial step in collecting radiated data was a spectrum analyzer peak scan of the measurement range (30MHz-3200MHz). The final data was reported in the worst-case emissions.

The minimum margin to the limit is as follows :

No	Ant Pol	Freq [MHz]	Reading [dB _i V]	Antenna Factor [dB]	Cable Loss [dB]	ATT [dB]	AMP Gain [dB]	Result [dB _i V/m]	Limit [dB _i V/m]	Margin [dB]	Remark
1	H	314.850	62.4	14.4	3.6	5.8	27.6	58.6	75.6	17.0	Fundamental
2	V	2519.288	43.6	31.6	7.2	-	34.5	47.9	54.0	7.7	Spurious

Remark

Below 1GHz: Test Receiver Setting : QP Detect / IF Band width 120kHz

Above 1GHz: Spectrum Analyzer Setting : PK Detect / RBW 1MHz, VBW 1MHz

3.1 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor, Cable Factor and Antenna Pad, and subtracting the Amplifier Gain from the measured reading. The sample calculation is as follows :

$$FS = RA + AF + CF + AT - AG$$

where FS = Field Strength

RA = Receiver Amplitude

AF = Antenna Factor

CF = Cable Factor

AT = Antenna Pad

AG = Amplifier Gain

Assume a receiver reading of 62.4 dB μ V is obtained. The antenna Factor of 14.4 dB, Cable Factor of 3.6 dB and Antenna Pad of 5.8 dB is added. The Amplifier Gain of 27.6 dB is subtracted, giving a field strength of 58.6 dB μ V/m.

$$FS = 62.4 + 14.4 + 3.6 + 5.8 - 27.6 = 58.6 \text{ dB } \mu \text{V/m}$$

3.2 -20dB Bandwidth

Bandwidth Limit: Fundamental Frequency 314.85MHz \times 0.25% = 787.125kHz

Bandwidth Limit	measurement data (20dB down) Center Freq: 314.9110MHz	Result
Upper frequency Limit (315.2435625MHz:393.5625kHz)	315.080MHz(169kHz)	Pass
Lower frequency Limit (314.4564375MHz:393.5625kHz)	314.736MHz(175kHz)	Pass
-20dB Bandwidth (787.125kHz)	Uf + Lf = 344kHz	Pass

* See Appendix A2 and A3

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3.3 Measurement Uncertainty

Radiated Emission Test

Measurement distance of 3m (30-1000MHz):

The measurement uncertainty (with a 95% confidence level) for this test using Biconical antenna is ± 4.4 dB.
The measurement uncertainty (with a 95% confidence level) for this test using Logperiodic antenna is ± 3.2 dB.

The data listed in this test report may exceed the test limit because it does not have enough margin.
The data listed in this test report has enough margin, more than site margin.

Measurement distance of 3m (1000-3200MHz):

The measurement uncertainty (with a 95% confidence level) for this test using Horn antenna is ± 5.8 dB.
The data listed in this test report may exceed the test limit because it does not have enough margin.
The data listed in this test report has enough margin, more than site margin.

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4 Test EQUIPMENT USED

Instrument	Mfr.	Model No.	Control No.	Test Item	Calibration Date / Interval
Pre Amplifier	Hewlett Packard	8447D	AF-01	RE	March 31, 2001 / 1 year
Pre Amplifier	Hewlett Packard	8449B	AF-04	RE	November 5, 2000 / 1 year
Attenuator	Anritsu	MP721B	AT-06	RE	March 31, 2001 / 1 year
Biconical Antenna	Schwarzbeck	BBA9106	BA-03	RE	May 1, 2001 / 1 year
Logperiodic Antenna	Schwarzbeck	UHALP9108-A	LA-06	RE	May 1, 2001 / 1 year
Horn Antenna	A.H. Systems	SAS200/571	HA-01	RE	May 20, 2001 / 1 year
Spectrum Analyzer	Hewlett Packard	8567A	SA-04	RE	March 31, 2001 / 1 year
Spectrum Analyzer	Advantest	R3271	SA-05	RE	February 01, 2001 / 1 year
Test Receiver	Rohde & Schwarz	ESCS30	TR-07	RE	August 08, 2000 / 1 year
Yokowa No.3 Open Test Site	JSE	3m	YOATS-03	RE	May 1, 2001 / 1 year
Yokowa No.3 Open Coaxial (0.01-1000MHz)	A-PEX	CC-31~37, SW-31, 32	CC-3ORC	RE	March 31, 2001 / 1 year

* Test Item ; RE: Radiated emission

*All measurement equipment are traceable to national or international standard.

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5 RADIATED MEASUREMENT PHOTOS

5.1 Radiated Measurement Photos



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APPENDIX

A : Test Data

Radiated emissions and -20dB Bandwidth

A1 – A3

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DATA OF RADIATION TEST(30MHz-3.2GHz)

A-PEX INTERNATIONAL CO., LTD.
YOKOWA NO.3 OPEN SITE

COMPANY : Calsonic Kansei Corporation
 EQUIPMENT : keyless Entry System (Transmitter)
 MODEL : MSUB13
 POWER : DC3.0V(CR1620)
 Mode : Transmitting
 Serial No. : sample No.1
 Temperature : 24°C
 Humidity : 42%

REPORT NO : 21LE0042-YW-1
 REGULATION : FCC15.231(b)/15.205
 TEST DISTANCE : 3m
 DATE : 2001/7/13
 FCC ID : KBRMSUB13


ENGINEER : Makoto Kosaka

Below 1GHz QP DETECT(Test Receiver: BW 120kHz)

Above 1GHz PK DETECT (Spectrum Analyzer : RBW 1MHz and VBW 1MHz)

No.	FREQ [MHz]	READING		ANT Factor [dB]	ATTEN [dB]	CABLE LOSS [dB]	AMP GAIN [dB]	RESULT		LIMIT dB μ V/m	MARGIN	
		HOR	VER					HOR	VER		HOR	VER
		[dB μ V]						[dB μ V/m]			[dB]	[dB]
1	314.850	62.4	39.7	14.4	5.8	3.6	27.6	58.6	35.9	75.6	17.0	39.7
2	629.700	24.8	23.4	19.3	5.9	5.4	27.3	28.1	26.7	55.6	27.5	28.9
3	944.550	19.2	19.5	22.8	5.9	7.1	26.7	28.3	28.6	55.6	27.3	27.0
4	1574.551	43.0	43.4	27.8	0.0	5.5	34.6	41.7	42.1	54.0	12.3	11.9
5	1889.467	43.8	43.7	29.7	0.0	6.2	34.5	45.2	45.1	55.6	10.4	10.5
6	2204.376	42.5	42.4	30.8	0.0	6.7	34.4	45.6	45.5	54.0	8.4	8.5
7	2519.288	43.0	43.6	31.6	0.0	7.2	34.5	47.3	47.9	55.6	8.3	7.7

REMARKS

ANTENNA TYPE: 30-300MHz Biconical / 300-1000MHz Logperiodic / 1-3.2GHz DRG Horn

CALCULATION(30MHz to 1000MHz) : READING + ANT Factor + ATTEN + Cable Loss - AMP Gain

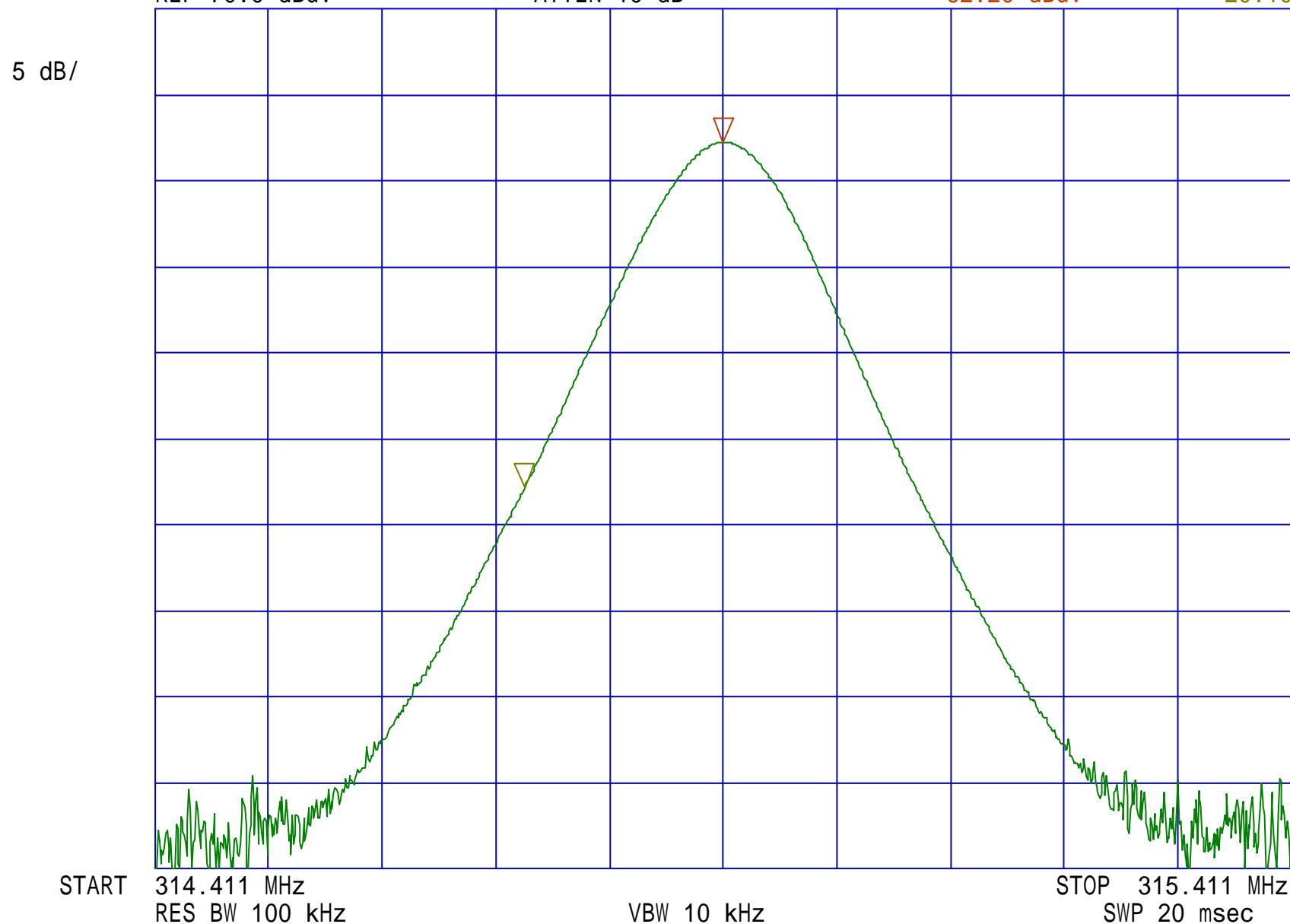
CALCULATION(1.0GHz to 3.3GHz) : READING + ANT Factor + Cable Loss - AMP Gain

*Except for the above table : All other spurious emissions are more than 20dB below the limit

CALSONIC KANSEI / MSUB13 / FCC ID: KBRMSUB13
-20dB Bandwidth(Hor) 15.231(c) / Page A2
REF 70.0 dBuV ATTEN 10 dB

MAKER
314.9110 MHz
62.20 dBuV

MAKER
-175.0000 kHz
-20.10 dBuV



CALSONIC KANSEI / MSUB13 / FCC ID: KBRMSUB13
-20dB Bandwidth(Hor) 15.231(c) / Page A3
REF 70.0 dBuV ATTEN 10 dB

MAKER
314.9110 MHz
62.20 dBuV

MAKER
169.0000 kHz
-20.10 dBuV

