



EMI TEST REPORT

Test Report No. : 25BE0106-HO-1

Applicant : **Calsonic Kansei Corp.**
Type of Equipment : **Keyless Transmitter**
Model No. : **TS005**
Test standard : **FCC Part 15 2004**
Subpart C Section 15.209, Section 15.231
FCC ID : **KBRTS005**
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 27, 2004

Tested by:

K. Adachi

Kenichi Adachi
EMC Service

Approved by :

Naoki Sakamoto
Naoki Sakamoto
Group Leader of
EMC Service

UL Apex Co., Ltd.

Head Office EMC Lab.

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MF060b(10.04.03)

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SECTION 1: Client information

Company Name : Calsonic Kansei Corp.
Address : 8 Sakae-cho Sano-shi Tochigi, Japan, 327-0816
Telephone Number : +81-283-21-8407
Facsimile Number : +81-283-21-8547
Contact Person : Yutaka Suzuki

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

2.1 Identification of E.U.T.

Type of Equipment : Keyless Transmitter
Model No. : TS005
Serial No. : 2 (For Automatically deactivate test),
4 (For other tests)
Country of Manufacture : Japan
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

Model No: TS005 is the Transmitter of Keyless Entry System.
The clock frequency of EUT is 4MHz.

Equipment Type : Transmitter
Frequency operation : 315MHz + 65kHz, -40kHz
Type of modulation : ASK
Antenna Type : P.C.B. Pattern antenna
Power Supply : 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.

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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

3.2 Procedures and results

No.	Item	Test Procedure	Specification	Deviation	Worst margin	Results
1	Automatically Deactivate	ANSI C63.4:2003 13. Measurement of intentional radiators	Section 15.231(a)(1)	N/A	-	Complied
2	Electric Field Strength of Fundamental Emission	ANSI C63.4:2003 13. Measurement of intentional radiators	Section 15.231(b)	N/A	1.1dB 314.98MHz Horizontal	Complied
3	Electric Field Strength of Spurious Emission	ANSI C63.4:2003 13. Measurement of intentional radiators	Section 15.205 Section 15.209 Section 15.231(b)	N/A	2.2dB 2204.85MHz Horizontal	Complied
4	-20dB Bandwidth	ANSI C63.4:2003 13. Measurement of intentional radiators	Section 15.231(c)	N/A	-	Complied

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

3.3 Addition to standards

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	99% Occupied Band Width	RSS210(issue 5): 2001 + Amendment:2002 + Amendment2:2003 + Amendment3:2004	RSS210(issue 5): 2001 + Amendment:2002 + Amendment2:2003 + Amendment3:2004	Radiated	N/A	N/A	N/A

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3.4 Uncertainty

Radiated Emission Test

The measurement uncertainty (with a 95% confidence level) for this test using Biconical antenna is ± 4.5 dB.

The measurement uncertainty (with a 95% confidence level) for this test using Logperiodic antenna is ± 5.2 dB.

The measurement uncertainty (with a 95% confidence level) for this test using Horn Antenna is ± 6.6 dB.

*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.

3.5 Test Location

UL Apex Co., Ltd. Head Office EMC Lab. *NVLAP Lab. code: 200572-0

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	Listed date (for NVLAP)	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 measurement room.

3.6 Test set up, Test instruments and Data of EMI

Refer to APPENDIX 1 to 3.

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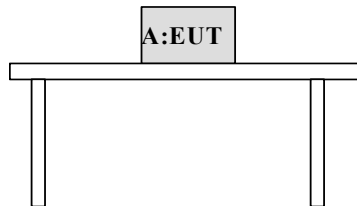
SECTION 4: Operation of E.U.T. during testing

4.1 Operating Modes

The mode is used : Transmitting mode

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

4.2 Configuration and peripherals



* Test data was taken under worse case conditions.

Description of EUT

No.	Item	Model number	Serial number	Manufacturer	FCC ID
A	Keyless Transmitter	TS005	2 (For automatically deactivate test), 4 (For other tests)	Calsonic Kansei Corp.	KBRTS005

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SECTION 5: Radiated emission (Fundamental and Spurious 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 platform of table size (0.5m x 0.5m x 0.8m) on the conducting ground plane.

The EUT was set on the center of the tabletop.

Test was made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna 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 : Tabletop
EUT operation mode : Transmitting

5.4 Test procedure

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 with the Test Receiver or the Spectrum Analyzer.

Frequency	Below 1GHz	Above 1GHz
Instrument used	Test Receiver	Spectrum Analyzer
IF Bandwidth	QP: 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 27, 2004

Tested by: Kenichi Adachi

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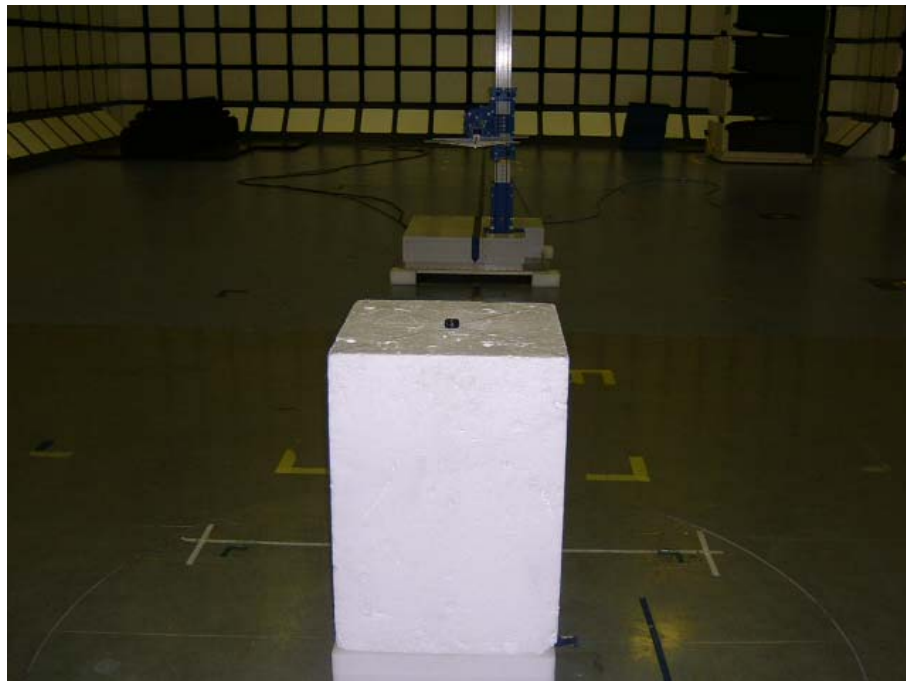
APPENDIX 1: Photographs of test setup

Radiated emission(Worst case position)

Front



Rear



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

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-01	Anechoic Chamber	TDK	Semi Anechoic Chamber 10m	1,2,3,4,5	2003/12/27 * 12
MTR-01	Test Receiver	Rohde & Schwarz	ESI40	1,2,3,4,5	2003/11/12 * 12
MCC-01	Coaxial Cable	Suhner/storm/Agilent/TSJ	-	1,2,3,4,5	2003/12/19 * 12
MPA-04	Pre Amplifier	Agilent	8447D	1,2,3,4,5	2004/05/25 * 12
MAT-06	Attenuator(6dB)	Weinschel Corp	2	1,2,3,4,5	2003/12/16 * 12
MBA-01	Biconical Antenna	Schwarzbeck	BBA9106	2	2004/10/14 * 12
MLA-01	Logperiodic Antenna	Schwarzbeck	USLP9143	1,2,3,4,5	2004/10/14 * 12
MCC-05	Microwave Cable	Storm	421-011	2	2004/01/06 * 12
MPA-05	Pre Amplifier	TSJ	TSJ 1-26.5GHz PreAmp	2	2004/06/12 * 12
MCC-23	Microwave Cable	Storm	-	2	2004/05/01 * 12
MHA-05	Horn Antenna	Schwarzbeck	BBHA9120D	2	2004/01/10 * 12

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

Test Item:

- 1: Fundamental Emission**
- 2: Spurious Emission**
- 3: -20dB Bandwidth**
- 4: Automatically Deactivate**
- 5: 99% Occupied Bandwidth**

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APPENDIX 3: Data of EMI test

Radiated Emission (Electric Field Strength of Fundamental and Spurious Emission)

COMPANY : Calsonic Kansei Corp.
EQUIPMENT : Keyless Transmitter
MODEL : TS005
S/N : 4
POWER : DC 3.0V
Mode : Continuous Transmitting
Axis : Hor.: X-axis, Ver.: Z-axis

UL Apex Co., Ltd.
Head Office EMC Lab. No.1 Semi Anechoic Chamber
REPORT NO : 25BE0106-HO
REGULATION : Fcc Part15 Subpart C 231(b) / 205
TEST DISTANCE : 3m
DATE : 10/27/2004
TEMPERATURE : 22 deg.C.
HUMIDITY : 39 %
ENGINEER : Kenichi Adachi

(Fundamental emission)

No.	FREQ [MHz]	T/R Reading : PK HOR VER [dBuV]		ANT Factor [dB/m]	Amp Gain [dB]	LOSS [dB]	Duty Factor [dB]	RESULT HOR VER [dBuV/m]		Limit [dBuV/m]	MARGIN HOR VER [dB]	
1	314.98	80.0	75.8	15.1	27.4	10.1	-3.3	74.5	70.3	75.6	1.1	5.3

(below 1GHz) **QP DETECT**

No.	FREQ [MHz]	T/R Reading : QP HOR VER [dBuV]		ANT Factor [dB/m]	Amp Gain [dB]	LOSS [dB]	Duty Factor [dB]	RESULT HOR VER [dBuV/m]		Limit [dBuV/m]	MARGIN HOR VER [dB]	
2	629.95	43.9	43.5	20.2	28.8	12.0	0.0	47.3	46.9	55.6	8.3	8.7
3	944.93	34.7	31.1	22.3	28.6	13.1	0.0	41.6	38.0	55.6	14.0	17.6

(above 1GHz)

PK DETECT (RBW: 1MHz, VBW: 1MHz)

No.	FREQ [MHz]	S/A Reading HOR VER [dBuV]		ANT Factor [dB/m]	Amp Gain [dB]	LOSS [dB]	Duty Factor [dB]	RESULT HOR VER [dBuV/m]		Limit [dBuV/m]	MARGIN HOR VER [dB]	
4	1259.83	58.0	55.7	23.3	39.8	3.9	0.0	45.4	43.1	74.0	28.6	30.9
5	1574.94	60.0	59.3	25.1	39.6	4.4	0.0	50.0	49.3	74.0	24.0	24.7
6	1889.98	56.9	56.5	28.9	39.4	4.9	0.0	51.4	51.0	74.0	22.6	23.0
7	2204.85	58.6	57.1	30.5	39.6	5.4	0.0	54.8	53.3	74.0	19.2	20.7
8	2519.84	49.6	50.7	30.9	40.1	5.7	0.0	46.0	47.1	74.0	28.0	26.9
9	2834.86	57.8	56.4	31.9	40.6	6.0	0.0	55.1	53.7	74.0	18.9	20.3
10	3149.77	53.1	52.0	32.0	40.9	6.3	0.0	50.6	49.5	74.0	23.4	24.5

AV DETECT (RBW: 1MHz, VBW: 10Hz)

No.	FREQ [MHz]	S/A Reading HOR VER [dBuV]		ANT Factor [dB/m]	Amp Gain [dB]	LOSS [dB]	Duty Factor [dB]	RESULT HOR VER [dBuV/m]		Limit [dBuV/m]	MARGIN HOR VER [dB]	
4	1259.83	52.6	50.6	23.3	39.8	3.9	0.0	40.0	38.0	54.0	14.0	16.0
5	1574.94	57.4	56.6	25.1	39.6	4.4	0.0	47.4	46.6	54.0	6.6	7.4
6	1889.98	53.0	52.3	28.9	39.4	4.9	0.0	47.5	46.8	54.0	6.5	7.2
7	2204.85	55.6	52.7	30.5	39.6	5.4	0.0	51.8	48.9	54.0	2.2	5.1
8	2519.84	37.1	37.0	30.9	40.1	5.7	0.0	33.5	33.4	54.0	20.5	20.6
9	2834.86	54.2	51.4	31.9	40.6	6.0	0.0	51.5	48.7	54.0	2.5	5.3
10	3149.77	44.3	42.9	32.0	40.9	6.3	0.0	41.8	40.4	54.0	12.2	13.6

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

CALCULATION RESULT=Reading + ANT Factor - Amp Gain + LOSS (Cable+ ATTEN.)+Duty Factor

Duty cycle Factor Measurement : The duty cycle factor = $20 \log (\text{On: time} / 100 \text{ m sec.}) = -3.35 \text{ dB}$

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

*Except for the above table : All other spurious emissions were less than 20dB for the limit.

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.

*The duty was not used in the data above 1GHz, and the test was made with AV detector which is severer for the limit.

The test result was applied to the limit in Section 15.209.

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-20dB Bandwidth

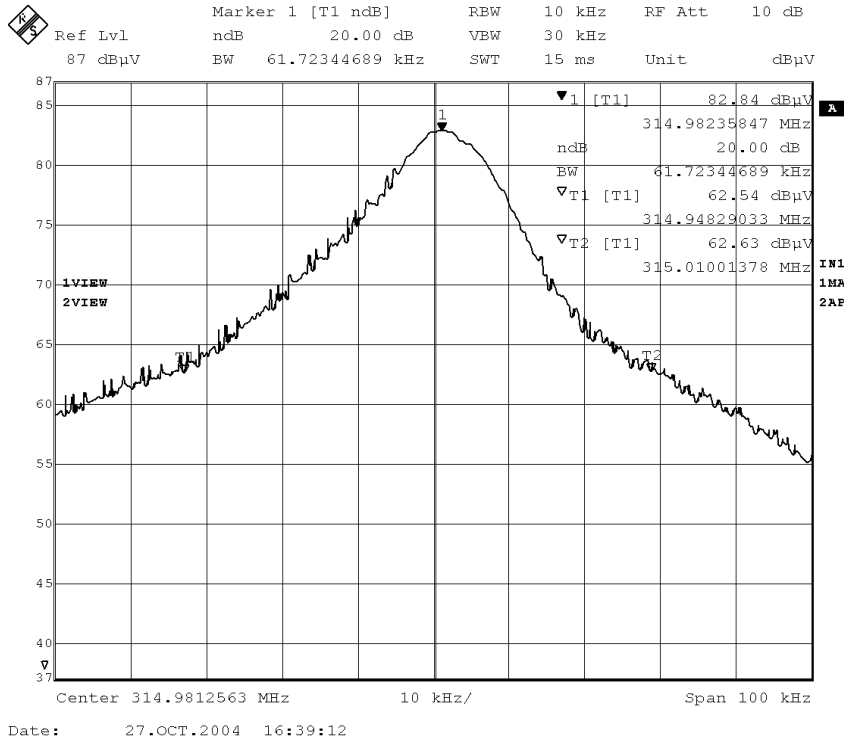
UL Apex Co., Ltd.
Head Office EMC Lab. No.1 Semi Anechoic Chamber

COMPANY : Calsonic Kansei Corp.
EQUIPMENT : Keyless Transmitter
MODEL : TS005
S/N : 4
POWER : DC 3.0V
Mode : Transmitting

REPORT NO : 25BE0106-HO
REGULATION : Fcc Part15 Subpart C 231(c)
TEST DISTANCE : 3m
DATE : 10/27/2004
TEMPERATURE : 22 deg.C.
HUMIDITY : 39 %
ENGINEER : Kenichi Adachi

Bandwidth Limit : Fundamental Frequency 315 MHz X 0.25% = 787.5 kHz

-20dB Bandwidth	Bandwidth Limit	Result	Margin
[kHz]	[kHz]		[kHz]
61.72	787.50	Pass	725.78



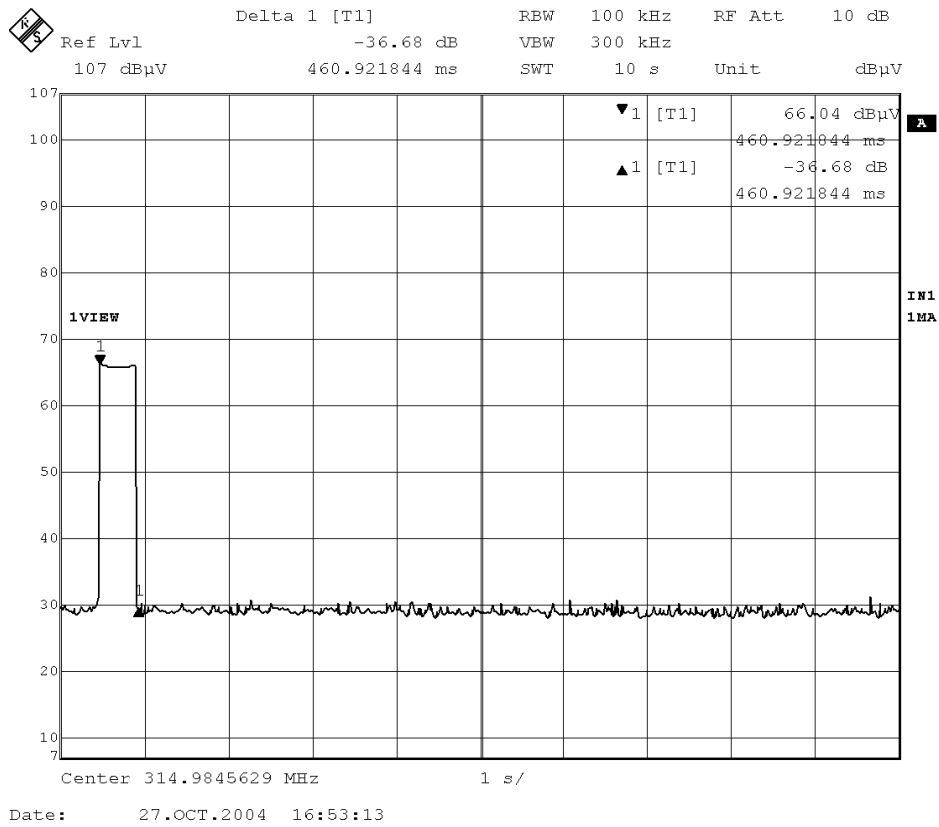
Automatically deactivate

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COMPANY : Calsonic Kansei Corp.
EQUIPMENT : Keyless Transmitter
MODEL : TS005
S/N : 2
POWER : DC 3.0V
Mode : Transmitting

REPORT NO : 25BE0106-HO
REGULATION : Fcc Part15 Subpart C 231(a)
TEST DISTANCE : -
DATE : 10/27/2004
TEMPERATURE : 22 deg.C.
HUMIDITY : 39 %
ENGINEER : Kenichi Adachi

Time of Transmitting [sec]	Limit [sec]	Result	Margin [sec]
0.46	5.00	Pass	4.54



99% Occupied Bandwidth

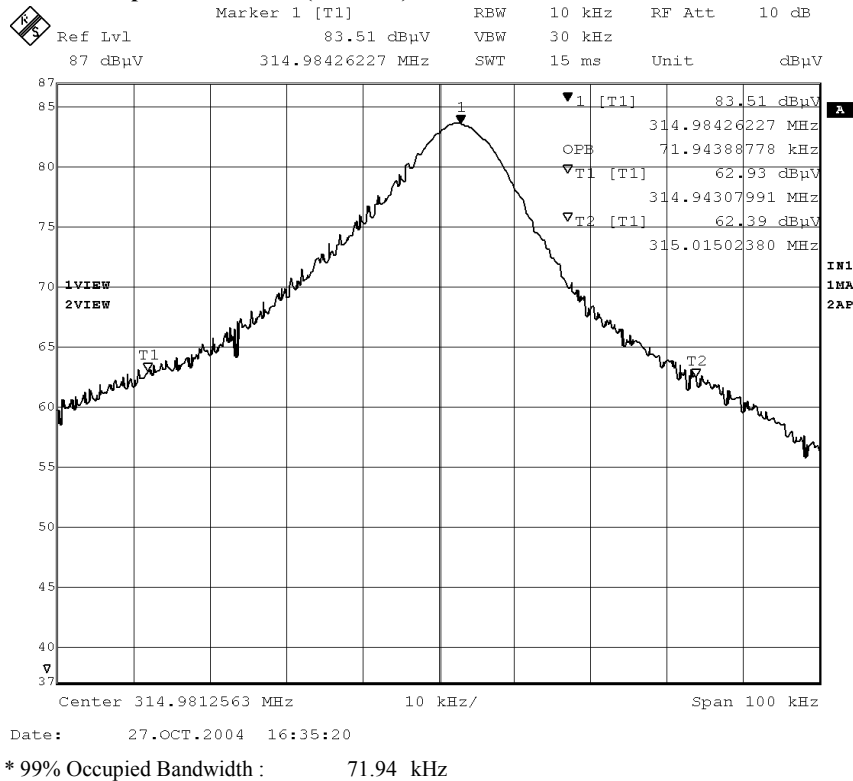
UL Apex Co., Ltd.
Head Office EMC Lab. No.1 Semi Anechoic Chamber

COMPANY : Calsonic Kansei Corp.
EQUIPMENT : Keyless Transmitter
MODEL : TS005
S/N : 4
POWER : DC 3.0V
Mode : Transmitting

REPORT NO : 25BE0106-HO
REGULATION : RSS-210
TEST DISTANCE : 3m
DATE : 10/27/2004
TEMPERATURE : 22 deg.C.
HUMIDITY : 39 %

ENGINEER : Kenichi Adachi

99% Occupied Bandwidth (RSS-210)



Duty cycle

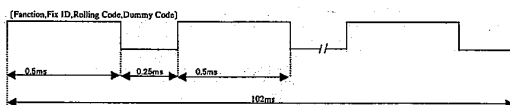
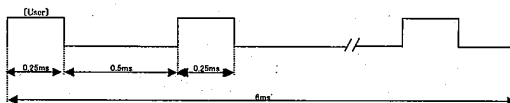
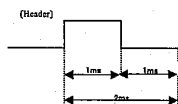
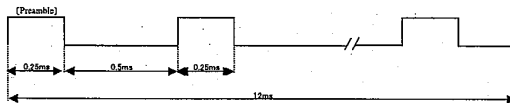
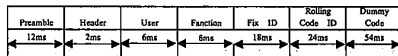
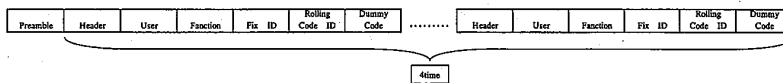
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COMPANY : Calsonic Kansei Corp.
EQUIPMENT : Keyless Transmitter
MODEL : TS005
S/N : -
POWER : DC 3.0V
Mode : Transmitting

REPORT NO : 25BE0106-HO
REGULATION : Fcc Part15 Subpart C 231(b)
TEST DISTANCE : -
DATE : -
TEMPERATURE : -
HUMIDITY : -
ENGINEER : -

Time of Transmitting [ms]	1 cycle time or 100ms [ms]	Duty cycle	Duty Factor [dB]
68.00	100.00	0.68	-3.35

Data Timing of Transmitter



$$\text{Duty}=1/3$$

$$1/3\text{Duty} \times 12\text{ms}=8\text{ms}$$

Duty Cycle=1/3

$$\text{(ON Time)}$$

$$\text{Duty}=1/2$$

$$1/2\text{Duty} \times 2\text{ms}=1\text{ms}$$

$$\text{Duty}=1/3$$

$$1/3\text{Duty} \times 6\text{ms}=2\text{ms}$$

$$\text{(ON Time (Worst))}$$

$$\text{Duty}=2/3$$

$$2/3\text{Duty} \times 102\text{ms}=68\text{ms}$$

$$\text{Duty}=1/3(\text{Worst})$$

$$(1+2+68)/(2+6+102)=0.65$$

Duty Cycle=2/3