



EMI TEST REPORT

Test Report No. : 24JE0220-HO-4

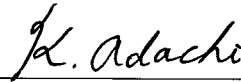
Applicant : AISIN SEIKI CO., LTD.
Type of Equipment : Door/Trunk oscillator
Model No. : ASAT6
Test standard : FCC Part 15 Subpart C
Section 15.209, Section 15.205 : 2004
FCC ID : PENASAT6
Test Result : Complied

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:

July 14 and 17 and August 28, 2004

Tested by:



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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MF060b(10.04.03)

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SECTION 1: Client information

Company Name	:	AISIN SEIKI CO., LTD.
Address	:	2-1 Asahi-machi, Kariya, Aichi, 448-8650 Japan
Telephone Number	:	+81-566-24-9430
Facsimile Number	:	+81-566-24-9084
Contact Person	:	Hideo Haneda

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

2.1 Identification of E.U.T.

Type of Equipment	:	Door/Trunk oscillator
Model No.	:	ASAT6
Serial No.	:	4L20
Rating	:	DC13.2V (* The Inner voltage of this EUT is DC5V regulated from the input voltage DC13.2V (maximum:13.2V / usually:12V) in EUT.)
Country of Manufacture	:	JAPAN
Receipt Date of Sample	:	June 24, 2004
Condition of EUT	:	Production model

2.2 Product Description

AISIN SEIKI CO., LTD., Model No: ASAT6 (referred to as the EUT in this report) is the Door/Trunk oscillator. Model ASAT6 is an oscillator for keyless entry systems. ASAT6 incorporated into doors and a trunk transmits signals to a key outside of the vehicle via radio waves. ASAT6 has several variations of a metal bracket that is used for installation to a vehicle.

Equipment Type	:	Transmitter
Frequency of operation	:	134.2kHz
Type of modulation	:	Pulse Width Modulation
Mode of operation	:	Simplex
Antenna Type	:	Bar Antenna(Integral)
Method of Frequency Generation	:	Crystal
Operating Temperature	:	-40 deg. C. -+85 deg. C.

FCC 15.31 (e)

This test was performed with the New Battery (DC 13.2V) 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

Bar Antenna (Tx section) is installed inside the vehicle door and the trunk and users cannot detach it from vehicle. 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 Part15 Subpart C : 2004

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.205 Restricted bands of operation : 2004
Section 15.209 Radiated emission limits, general requirements : 2004

3.2 Procedures and results

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	Electric Field Strength of Fundamental Emission	ANSI C63.4:2003 13. Measurement of intentional radiators	FCC Section 15.209	Radiated	N/A	28.3dB 134.2kHz 0 deg. AV 48.1dB 134.0kHz 0 deg. PK	Complied
2	Electric Field Strength of Spurious Emission	ANSI C63.4:2003 13. Measurement of intentional radiators	FCC Section 15.205 FCC Section 15.209	Radiated	N/A	7.3dB 286.043MHz, Horizontal	Complied
3	-20dB Bandwidth	ANSI C63.4:2003 13. Measurement of intentional radiators	Reference data	Radiated	N/A	N/A	N/A

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

Uncertainty:

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.

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	RSS-210(issue 5): 2001 + Amendment:2002 + Amendment2:2003 + Amendment3:2004	Radiated	N/A	N/A	N/A

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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.

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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.

Remarks:

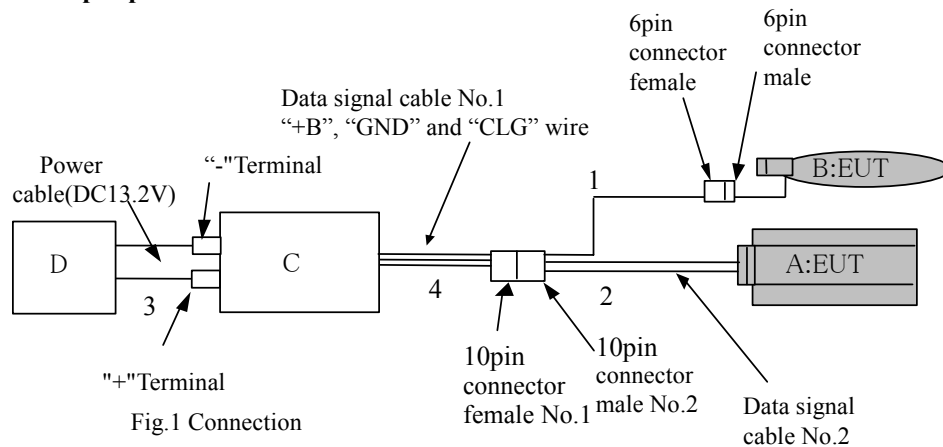
This EUT has the antennas for Door and Trunk.

The antennas for Door and Trunk are identical except for the form of Plastic case so that the test was made on the antenna for Door.

This EUT in actual use is set to have the maximum RF power that is supplied to Antenna.

The length of the antenna cable was set for the test in the worst condition (actual usage).

4.2 Configuration and peripherals



* 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	Door/Trunk Oscillator	ASAT6	4L20	AISIN SEIKI CO., LTD.	PENASAT6
B	Antenna	-	-	AISIN SEIKI CO., LTD.	PENASAT6
C	Code generator	-	-	AISIN SEIKI CO., LTD.	-
D	Car Battery	40B19L	-	YUASA	-

List of cables used

No.	Item	Length (m)	Shield	Backshell Material
1	Data signal and DC Power cable	0.6	N	Polyvinyl chloride
2	Data signal and DC Power Cable	0.3	N	Polyvinyl chloride
3	DC Power Cable	0.2	N	Polyvinyl chloride
4	Data signal cable No.1 & DC cable	3.0	N	Polyvinyl chloride

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SECTION 5: Radiated emission (Fundamental and Spurious Emission and –20dB Bandwidth)

[Radiated]

Test Procedure

The Radiated Electric Field Strength intensity has been measured on No.1 semi anechoic chamber with a ground plane and at a distance of 10m and on No 2 semi anechoic chamber with a ground plane and at a distance of 3m.

Frequency : From 9kHz to 30MHz at distance 10m

The EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.

The measurements were performed for each antenna angle 0deg. , 45deg. and 90deg.

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.

	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 Doorknob or Rear trunk, 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 axis 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 10m]=[Limit at 300m]-40 x log (10[m]/300[m])

[Limit at 10m]=[Limit at 30m]-40 x log (10[m]/30[m])

Test data : APPENDIX 3

Test result : Pass

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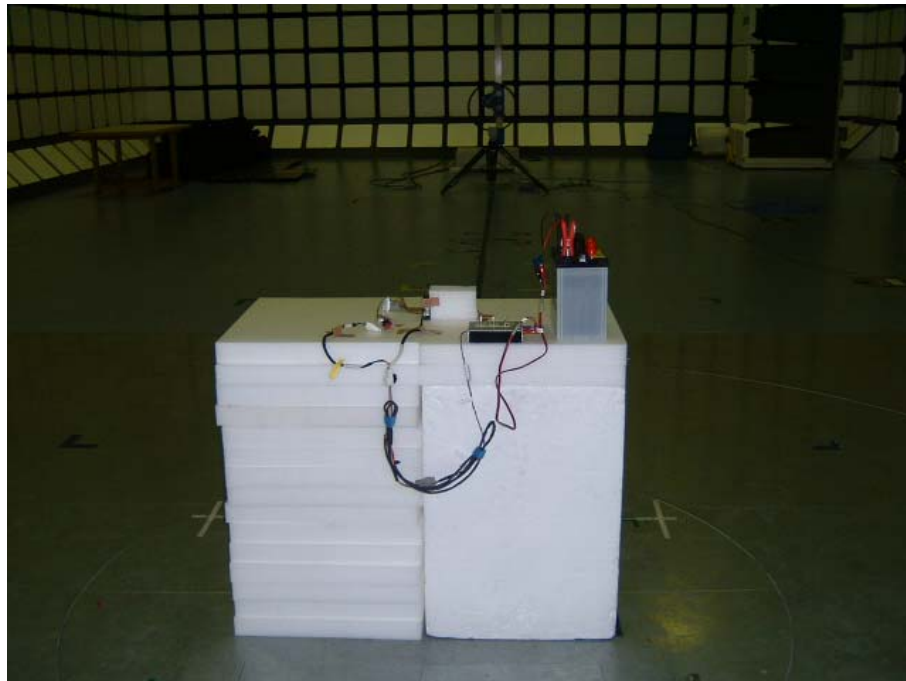
APPENDIX 1: Photographs of test setup

Spurious Emission (Radiated)

Front



Rear



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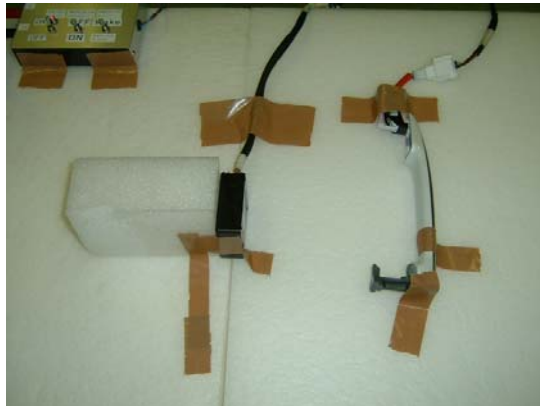
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Worst Case Position (Y-axis:Horizontal / Y-axis:Vertical)

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-01	Anechoic Chamber	TDK	Semi Anechoic Chamber 10m	1,2,3,4,5	2003/12/27 * 12
MTR-02	Test Receiver	Rohde & Schwarz	ESCS30	1,2,3,4,5	2004/02/03 * 12
MCC-03	Coaxial Cable	Fujikura/Suhner/ Agilent/TSJ	-	1,2,4,5	2003/12/24 * 12
MPA-04	Pre Amplifier	Agilent	8447D	1,2,3,4,5	2004/05/25 * 12
MCC-08	coaxial cable	-	-	1,2,4,5	2004/01/26 * 12
MCC-07	coaxial cable	-	-	1,2,4,5	2004/01/26 * 12
MAT-06	Attenuator(6dB)	Weinschel Corp	2	1,2,3,4,5	2003/12/16 * 12
MLPA-01	Loop Antenna	Rohde & Schwarz	HFH2-Z2	1,2,4,5	2004/01/08 * 12
MCC-01	Coaxial Cable	Suhner/storm/Agilent/ TSJ	-	3	2003/12/19 * 12
MBA-01	Biconical Antenna	Schwarzbeck	BBA9106	3	2003/10/15 * 12
MLA-01	Logperiodic Antenna	Schwarzbeck	USLP9143	3	2003/10/15 * 12
MCB-03	Car Battery	YUASA	40B19L	1,2,3,4,5	Pre Check
MTR-01	Test Receiver	Rohde & Schwarz	ESI40	1,2,3,4,5	2003/11/12 * 12

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

Test Item:

Fundamental emission (134.2kHz) : 1
Spurious emission (9k-30MHz) : 2
Spurious emission (30M-1GHz) : 3
-20dB Bandwidth : 4
99% Occupied Bandwidth : 5

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APPENDIX 3: Data of EMI test

Radiated emission (Fundamental and Spurious Emission)

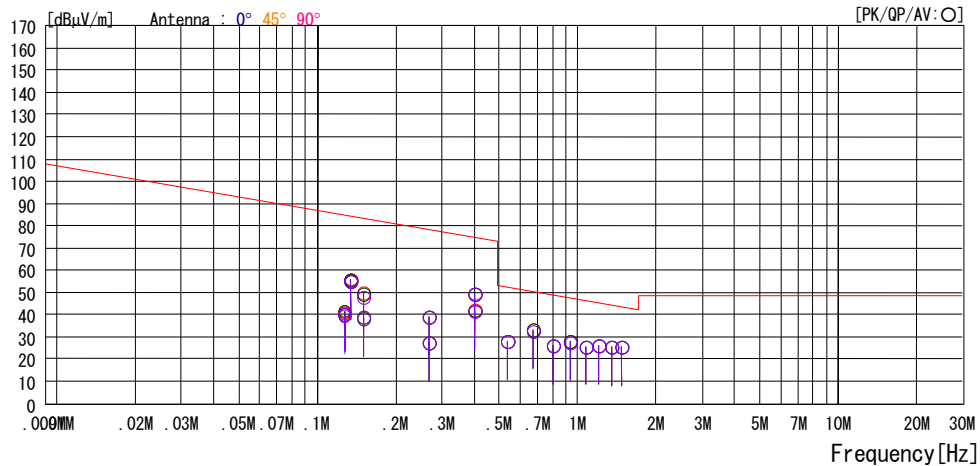
DATA OF MAGNETIC RADIATED EMISSION TEST

UL Apex Co., LTD. Head Office EMC Lab. No.1 Semi Anechoic Chamber
Date : 2004/08/28 00:47:28

Applicant : AISIN SEIKI CO., LTD. Report No. : 24JE0220-HO
Kind of EUT : Door / Trunk Qssillator Power : DC 13.2V (Car battery)
Model No. : ASAT6 Temp°C/Humi% : 24 / 60
Serial No. : 4L20 Operator : Kenichi Adachi

Mode / Remarks : Transmitting / EUT-Axis: Y-Axis (MAX-Axis)

LIMIT : FCC15C §15.209(a) 10m
Except for the data below : adequate margin data below the limits.



No.	FREQ [MHz]	READING QP [dBμV]	ANT FACTOR [dB/m]	LOSS [dB]	RESULT [dBμV/m]	LIMIT [dBμV/m]	MARGIN [dB]	ANTENNA TABLE [DEG]	
1	0.127	41.5	19.9	-19.8	41.6	104.6	63.0	0°	PK, BW:200Hz
2	0.127	40.5	19.9	-19.8	40.6	84.6	44.0	0°	AV, BW:200Hz
3	0.134	56.2	19.9	-20.1	56.0	104.1	48.1	0°	PK, BW:200Hz (Carrier)
4	0.134	56.0	19.9	-20.1	55.8	84.1	28.3	0°	AV, BW:200Hz (Carrier)
5	0.150	50.7	19.9	-21.0	49.6	103.2	53.6	0°	PK, BW: 9KHz
6	0.150	39.9	19.9	-21.0	38.8	83.2	44.4	0°	AV, BW: 9KHz
7	0.268	40.1	19.9	-21.0	39.0	98.1	59.1	0°	PK, BW: 9KHz
8	0.268	28.5	19.9	-21.0	27.4	78.1	50.7	0°	AV, BW: 9KHz
9	0.403	50.6	19.9	-21.1	49.4	94.6	45.2	0°	PK, BW: 9KHz
10	0.403	43.4	19.9	-21.1	42.2	74.6	32.4	0°	AV, BW: 9KHz
11	0.537	29.0	19.9	-21.1	27.8	52.1	24.3	0°	QP, BW: 9KHz
12	0.671	34.8	19.8	-21.3	33.3	50.1	16.8	0°	QP, BW: 9KHz
13	0.805	27.6	19.8	-21.4	26.0	48.6	22.6	0°	QP, BW: 9KHz
14	0.939	29.5	19.8	-21.4	27.9	47.2	19.3	0°	QP, BW: 9KHz
15	1.074	27.2	19.8	-21.4	25.6	46.1	20.5	0°	QP, BW: 9KHz
16	1.208	27.5	19.8	-21.4	25.9	45.0	19.1	0°	QP, BW: 9KHz
17	1.342	27.0	19.8	-21.4	25.4	44.1	18.7	0°	QP, BW: 9KHz
18	1.476	26.9	19.8	-21.4	25.3	43.3	18.0	0°	QP, BW: 9KHz
19	0.127	41.6	19.9	-19.8	41.7	104.6	62.9	45°	PK, BW:200Hz
20	0.127	40.2	19.9	-19.8	40.3	84.6	44.3	45°	AV, BW:200Hz
21	0.134	55.8	19.9	-20.1	55.6	104.1	48.5	45°	PK, BW:200Hz (Carrier)
22	0.134	55.4	19.9	-20.1	55.2	84.1	28.9	45°	AV, BW:200Hz (Carrier)
23	0.150	50.2	19.9	-21.0	49.1	103.2	54.1	45°	PK, BW: 9KHz
24	0.150	39.5	19.9	-21.0	38.4	83.2	44.8	45°	AV, BW: 9KHz
25	0.268	40.2	19.9	-21.0	39.1	98.1	59.0	45°	PK, BW: 9KHz
26	0.268	28.4	19.9	-21.0	27.3	78.1	50.8	45°	AV, BW: 9KHz
27	0.403	50.4	19.9	-21.1	49.2	94.6	45.4	45°	PK, BW: 9KHz
28	0.403	42.9	19.9	-21.1	41.7	74.6	32.9	45°	AV, BW: 9KHz
29	0.537	29.0	19.9	-21.1	27.8	52.1	24.3	45°	QP, BW: 9KHz
30	0.671	34.5	19.8	-21.3	33.0	50.1	17.1	45°	QP, BW: 9KHz

CHART : WITH FACTOR ANT TYPE : LOOP
CALCULATION : READING + ANT FACTOR + LOSS (CABLE + ATTEN. -AMP.)

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No.	FREQ [MHz]	READING QP [dBμV]	ANT FACTOR [dB/m]	LOSS [dB]	RESULT [dBμV/m]	LIMIT [dBμV/m]	MARGIN [dB]	ANTENNA	TABLE [DEG]	
31	0.805	27.6	19.8	-21.4	26.0	48.6	22.6	45°	131	QP, BW: 9kHz
32	0.939	29.4	19.8	-21.4	27.8	47.2	19.4	45°	131	QP, BW: 9kHz
33	1.074	27.2	19.8	-21.4	25.6	46.1	20.5	45°	131	QP, BW: 9kHz
34	1.208	27.4	19.8	-21.4	25.8	45.0	19.2	45°	131	QP, BW: 9kHz
35	1.342	27.0	19.8	-21.4	25.4	44.1	18.7	45°	131	QP, BW: 9kHz
36	1.476	26.9	19.8	-21.4	25.3	43.3	18.0	45°	131	QP, BW: 9kHz
37	0.127	40.3	19.9	-19.8	40.4	104.6	64.2	90°	82	PK, BW: 200Hz
38	0.127	39.5	19.9	-19.8	39.6	84.6	45.0	90°	82	AV, BW: 200Hz
39	0.134	55.3	19.9	-20.1	55.1	104.1	49.0	90°	82	PK, BW: 200Hz (Carrier)
40	0.134	55.0	19.9	-20.1	54.8	84.1	29.3	90°	82	AV, BW: 200Hz (Carrier)
41	0.150	49.0	19.9	-21.0	47.9	103.2	55.3	90°	82	PK, BW: 9kHz
42	0.150	40.0	19.9	-21.0	38.9	83.2	44.3	90°	82	AV, BW: 9kHz
43	0.268	40.1	19.9	-21.0	39.0	98.1	59.1	90°	82	PK, BW: 9kHz
44	0.268	28.4	19.9	-21.0	27.3	78.1	50.8	90°	82	AV, BW: 9kHz
45	0.403	50.2	19.9	-21.1	49.0	94.6	45.6	90°	82	PK, BW: 9kHz
46	0.403	42.7	19.9	-21.1	41.5	74.6	33.1	90°	82	AV, BW: 9kHz
47	0.537	29.0	19.9	-21.1	27.8	52.1	24.3	90°	82	QP, BW: 9kHz
48	0.671	34.2	19.8	-21.3	32.7	50.1	17.4	90°	82	QP, BW: 9kHz
49	0.805	27.6	19.8	-21.4	26.0	48.6	22.6	90°	82	QP, BW: 9kHz
50	0.939	29.0	19.8	-21.4	27.4	47.2	19.8	90°	82	QP, BW: 9kHz
51	1.074	27.2	19.8	-21.4	25.6	46.1	20.5	90°	82	QP, BW: 9kHz
52	1.208	27.4	19.8	-21.4	25.8	45.0	19.2	90°	82	QP, BW: 9kHz
53	1.342	27.0	19.8	-21.4	25.4	44.1	18.7	90°	82	QP, BW: 9kHz
54	1.476	26.9	19.8	-21.4	25.3	43.3	18.0	90°	82	QP, BW: 9kHz

DATA OF RADIATED EMISSION TEST

UL Apex Co., Ltd. Head Office EMC Lab. No.1 Semi Anechoic Chamber
Date : 2004/07/14 18:26:36

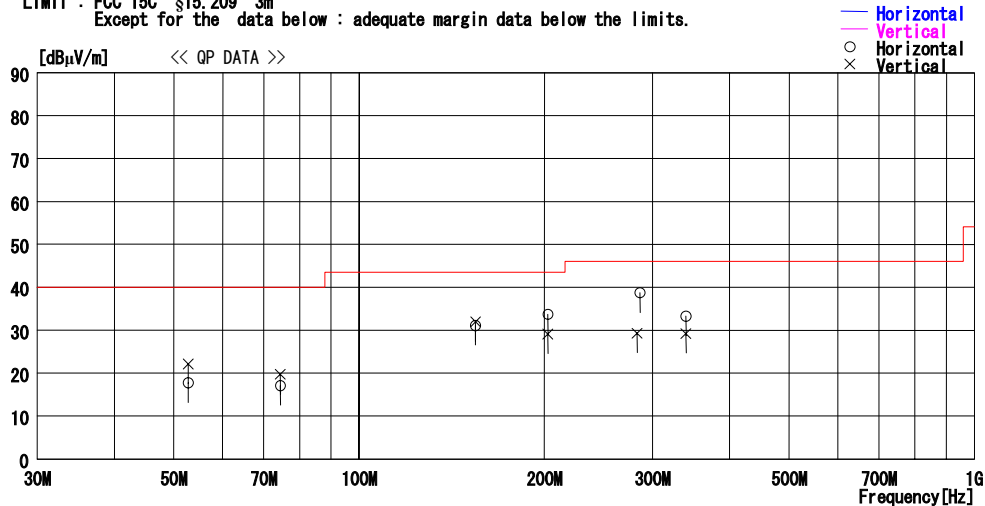
Applicant : AISIN SEIKI CO.,LTD.
Kind of EUT : Door/Trunk Oscillator
Model No. : ASAT6
Serial No. : 4L20

Report No. : 24JE0220-HO
Power : DC 13.2V (Car battery)
Temp°C/Humi% : 24deg.C / 61%
Operator : Kenichi Adachi

Mode / Remarks : Transmitting / EUT-Axis: Y axis (MAX-Axis)

LIMIT : FCC 15C §15.209 3m

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



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	52.745	28.4	9.7	7.3	27.7	17.7	40.0	22.3	364	11
2	74.494	30.8	6.5	7.4	27.6	17.1	40.0	22.9	269	111
3	154.623	34.8	15.0	8.7	27.4	31.1	43.5	12.4	100	224
4	202.679	34.6	16.9	9.3	27.1	33.7	43.5	9.8	168	86
5	286.043	36.2	19.7	10.0	27.2	38.7	46.0	7.3	122	186
6	339.874	34.8	15.8	10.2	27.5	33.3	46.0	12.7	100	42
Vertical										
7	52.745	32.8	9.7	7.3	27.7	22.1	40.0	17.9	100	0
8	74.496	33.4	6.5	7.4	27.6	19.7	40.0	20.3	106	314
9	154.626	35.7	15.0	8.7	27.4	32.0	43.5	11.5	100	302
10	202.679	30.0	16.9	9.3	27.1	29.1	43.5	14.4	100	163
11	283.095	27.1	19.5	9.9	27.2	29.3	46.0	16.7	149	268
12	339.857	30.7	15.8	10.2	27.5	29.2	46.0	16.8	181	203

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

Page:

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MF060b(10.04.03)

-20dB Bandwidth

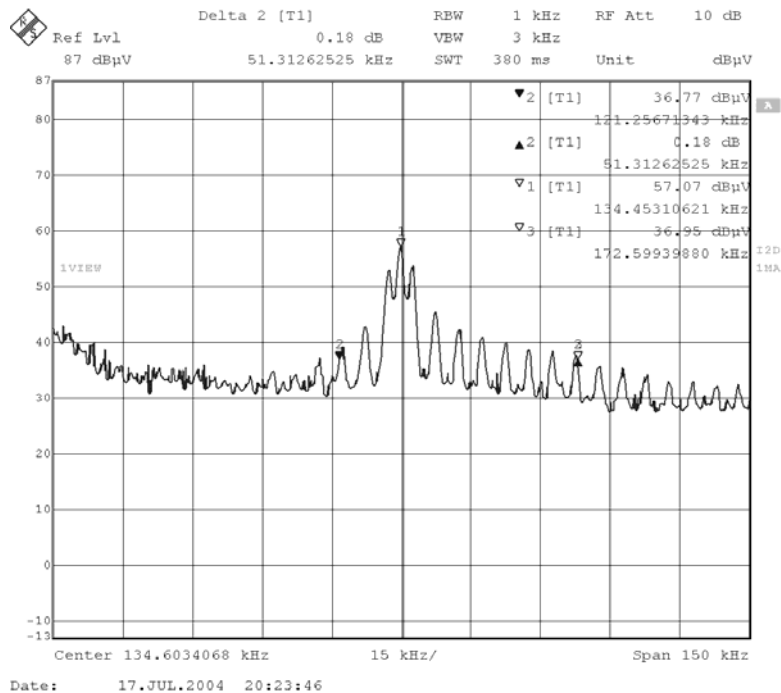
UL Apex Co., Ltd.
No1 SEMI ANECHOIC CHAMBER

COMPANY : AISIN SEIKI CO.,LTD.
EQUIPMENT : Door/Trunk Oscillator
MODEL : ASAT6
S/ N : 4L20
POWER : DC 13.2V (Car battery)
MODE : Transmitting 134.2kHz

REPORT NO : 24JE0220-HO
REGULATION : N/A
TEST DISTANCE : 10m
DATE : 07/17/2004
TEMPERATURE : 22 deg. C
HUMIDITY : 60%

ENGINEER : Kenichi Adachi

FREQ [kHz]	-20dB Bandwidth [kHz]
134.2	51.31



99% Occupied Bandwidth

UL Apex Co., Ltd.
No1 SEMI ANECHOIC CHAMBER

COMPANY : AISIN SEIKI CO.,LTD.
EQUIPMENT : Door/Trunk Oscillator
MODEL : ASAT6
S/ N : 4L20
POWER : DC 13.2V (Car battery)
MODE : Transmitting 134.2kHz

REPORT NO : 24JE0220-HO
REGULATION : RSS210
TEST DISTANCE : 10m
DATE : 07/17/2004
TEMPERATURE : 22 deg. C
HUMIDITY : 60%

ENGINEER : Kenichi Adachi

FREQ [kHz]	99% Occupied Bandwidth [kHz]
134.2	139.78

