

APPENDIX 2: Data of EMI test

Radiated Emission below 30MHz (Fundamental and Spurious Emission)

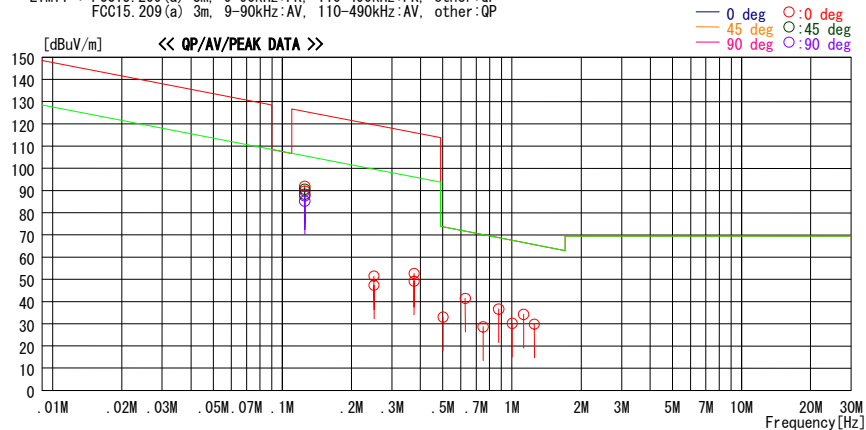
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.3 Semi Anechoic Chamber
Date : 2008/05/08

Company : Alps Electric Co., Ltd.
Kind of EUT : Immobilizer Antenna
Model No. : TWK1A002
Serial No. : 001
Report No. : 28HE0033-HO-01
Power : DC 12.0V
Temp. / Humi. : 22 deg.C. / 50 %
Operator : Kazufumi Nakai

Mode / Remarks : Tx 125kHz, Worst-axis:X

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]	
0.12510	103.9	PEAK	20.3	0.1	32.3	92.0	125.6	33.6	0deg	1	Worst
0.12510	102.5	PEAK	20.3	0.1	32.3	90.6	125.6	35.0	45deg	149	
0.12510	99.5	PEAK	20.3	0.1	32.3	87.6	125.6	38.0	90deg	103	
0.12510	101.7	AV	20.3	0.1	32.3	89.8	105.7	15.9	0deg	1	Worst
0.12510	100.2	AV	20.3	0.1	32.3	88.3	105.7	17.4	45deg	149	
0.12510	97.2	AV	20.3	0.1	32.3	85.3	105.7	20.4	90deg	103	
0.25084	63.5	PEAK	20.2	0.2	32.3	51.6	119.6	68.0	0deg	359	
0.25084	59.3	AV	20.2	0.2	32.3	47.4	99.6	52.2	0deg	359	
0.37529	64.6	PEAK	20.2	0.2	32.2	52.8	116.1	63.3	0deg	2	
0.37529	61.1	AV	20.2	0.2	32.2	49.3	96.1	46.8	0deg	2	
0.50054	44.9	QP	20.2	0.2	32.2	33.1	73.6	40.5	0deg	356	
0.62554	53.5	QP	20.1	0.2	32.2	41.6	71.7	30.1	0deg	0	
0.75044	40.5	QP	20.1	0.2	32.2	28.6	70.1	41.5	0deg	145	
0.87567	48.6	QP	20.1	0.2	32.2	36.7	68.7	32.0	0deg	20	
1.00049	41.9	QP	20.1	0.3	32.2	30.1	67.6	37.5	0deg	149	
1.12578	46.0	QP	20.1	0.3	32.2	34.2	66.5	32.3	0deg	189	
1.25049	41.7	QP	20.1	0.3	32.2	29.9	65.6	35.7	0deg	178	

CHART: WITH FACTOR, ANT TYPE: LOOP, Except for the data below: adequate margin data below the limits.
CALCULATION: RESULT[dBuV] = READING[dBuV] + ANT FACTOR[dB] + LOSS[dB] (CABLE + ATTEN. - 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

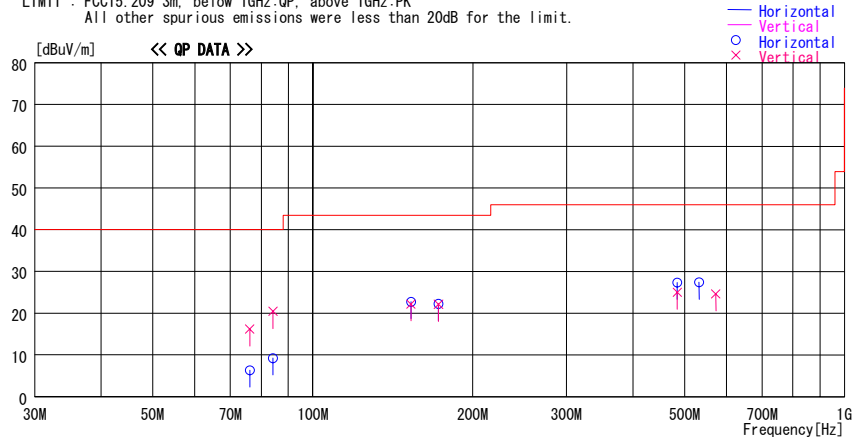
UL Japan, Inc. Head Office EMC Lab. No.3 Semi Anechoic Chamber
Date : 2008/05/08

Company : Alps Electric Co., Ltd.
Kind of EUT : Immobilizer Antenna
Model No. : TWK1A002
Serial No. : 001

Report No. : 28HE0033-HO-01
Power : DC 12.0V
Temp./Humi. : 22deg. C / 50%
Operator : Kazufumi Nakai

Mode / Remarks : Tx 125kHz, Worst-axis:X

LIMIT : FCC15.209 3m, below 1GHz:QP, above 1GHz:PK
All other spurious emissions were less than 20dB for the limit.



Frequency	Reading	DET	Antenna Factor	Loss	Level	Angle	Height	Polar.	Limit	Margin	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
76.147	24.1	QP	6.4	-24.2	6.3	234	211	Hori.	40.0	33.7	
76.152	34.0	QP	6.4	-24.2	16.2	156	100	Vert.	40.0	23.8	
84.142	37.4	QP	7.1	-24.1	20.4	197	100	Vert.	40.0	19.6	
84.153	26.2	QP	7.1	-24.1	9.2	202	221	Hori.	40.0	30.8	
152.964	31.1	QP	15.0	-23.4	22.7	3	242	Hori.	43.5	20.8	
153.008	30.6	QP	15.0	-23.4	22.2	75	100	Vert.	43.5	21.3	
172.299	29.3	QP	16.0	-23.2	22.1	77	100	Vert.	43.5	21.4	
172.305	29.4	QP	16.0	-23.2	22.2	134	300	Hori.	43.5	21.3	
484.861	27.9	QP	18.0	-20.9	25.0	253	100	Vert.	46.0	21.0	
484.863	30.2	QP	18.0	-20.9	27.3	234	100	Hori.	46.0	18.7	
532.942	29.6	QP	18.5	-20.7	27.4	136	118	Hori.	46.0	18.6	
573.005	26.1	QP	18.9	-20.4	24.6	280	100	Vert.	46.0	21.4	

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.

Radiated Emission above 30MHz (Spurious Emission)

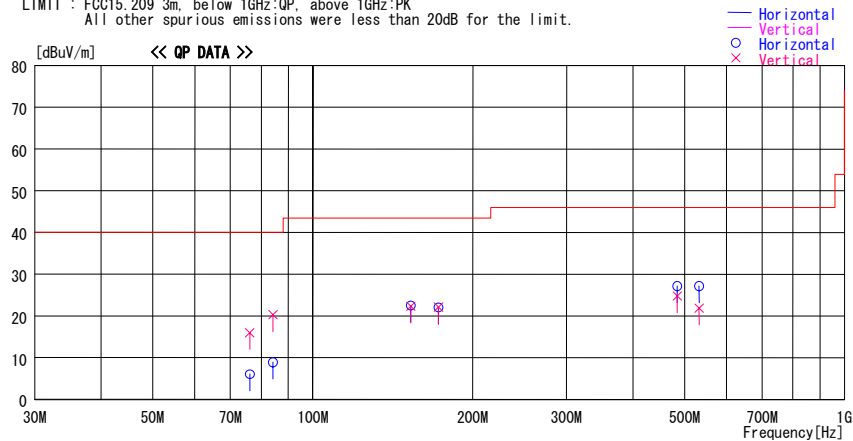
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.3 Semi Anechoic Chamber
Date : 2008/05/08

Company : Alps Electric Co., Ltd.
Kind of EUT : Immobilizer Antenna
Model No. : TWK1A002
Serial No. : 001
Report No. : 28HE0033-HO-01
Power : DC 12.0V
Temp./Humi. : 22deg. C / 50%
Operator : Kazufumi Nakai

Mode / Remarks : Communication 125kHz with Transponder, Worst-axis:X

LIMIT : FCC15.209 3m, below 1GHz:QP, above 1GHz:PK
All other spurious emissions were less than 20dB for the limit.



Frequency	Reading	DET	Antenna	Loss	Level	Angle	Height	Polar.	Limit	Margin	Comment
[MHz]	[dBuV]		Factor	Gain	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
76.137	33.7	QP	6.5	-24.2	16.0	171	100	Vert.	40.0	24.0	
76.141	23.9	QP	6.4	-24.2	6.1	227	234	Hori.	40.0	33.9	
84.146	25.9	QP	7.1	-24.1	8.9	222	217	Hori.	40.0	31.1	
84.147	37.3	QP	7.1	-24.1	20.3	202	100	Vert.	40.0	19.7	
152.863	30.7	QP	15.0	-23.4	22.3	67	100	Vert.	43.5	21.2	
152.916	30.9	QP	15.0	-23.4	22.5	11	301	Hori.	43.5	21.0	
172.304	29.3	QP	16.0	-23.2	22.1	78	100	Vert.	43.5	21.4	
172.308	29.3	QP	16.0	-23.2	22.1	147	276	Hori.	43.5	21.4	
484.851	27.7	QP	18.0	-20.9	24.8	277	100	Vert.	46.0	21.2	
484.862	30.1	QP	18.0	-20.9	27.2	234	100	Hori.	46.0	18.8	
532.938	24.1	QP	18.5	-20.7	21.9	187	100	Vert.	46.0	24.1	
532.947	29.4	QP	18.5	-20.7	27.2	141	100	Hori.	46.0	18.8	

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.

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-26dB Bandwidth

UL Japan, Inc.
Head Office EMC Lab. No.3 Semi Anechoic Chamber

COMPANY : Alps Electric Co., Ltd.
EQUIPMENT : Immobilizer Antenna
MODEL : TWK1A002
S/ N : 001
POWER : DC 12V
MODE : Tx
: Ant-Max

REPORT NO : 28HE0033-HO-01
REGULATION : Reference data
TEST DISTANCE : 3m
DATE : 05/08/2008
TEMPERATURE : 22 deg.C
HUMIDITY : 50 %
Engineer : Kazufumi Nakai

FREQ	-26dB Bandwidth
[kHz]	[kHz]
125.0	26.7



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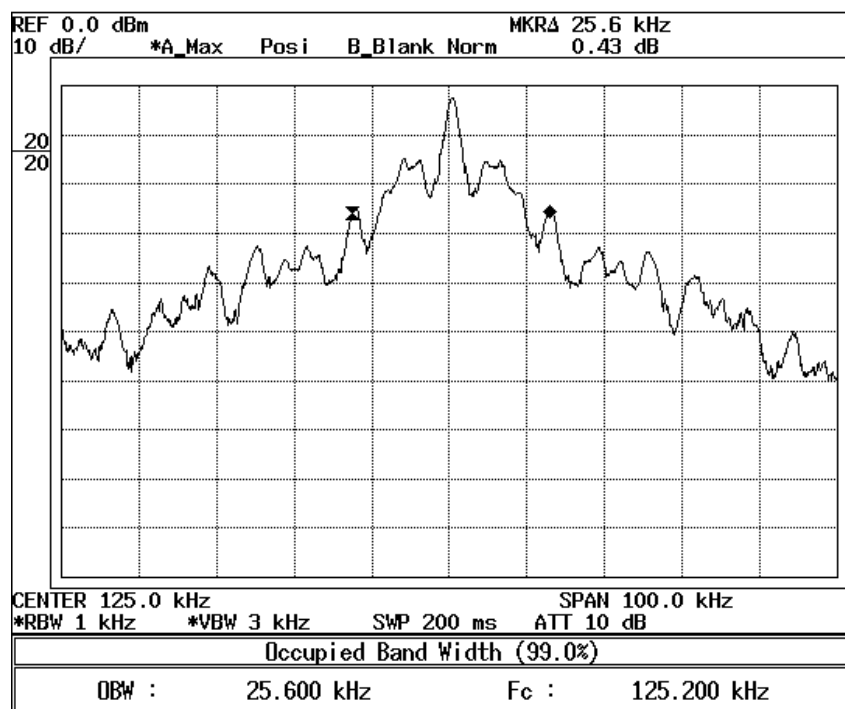
99% Occupied Bandwidth

UL Japan, Inc.
Head Office EMC Lab. No.3 Semi Anechoic Chamber

COMPANY : Alps Electric Co., Ltd.
EQUIPMENT : Immobilizer Antenna
MODEL : TWK1A002
S/ N : 001
POWER : DC 12V
MODE : Tx
: Ant-Max

REPORT NO : 28HE0033-HO-01
REGULATION : RSS-Gen 4.6.1
TEST DISTANCE : 3m
DATE : 05/08/2008
TEMPERATURE : 22 deg.C
HUMIDITY : 50 %
Engineer : Kazufumi Nakai

FREQ	99% Occupied Bandwidth
[kHz]	[kHz]
125.0	25.6



APPENDIX 3: Test instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Test Item	Calibration Date * Interval(month)
MAEC-03	Anechoic Chamber	TDK	Semi Anechoic Chamber 3m	RE	2008/03/25 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	RE	2008/01/10 * 12
MJM-06	Measure	PROMART	SEN1955	RE	-
MSTW-14	EMI measurement program	TSJ	TEPTO-DV	RE	-
MSA-09	Spectrum Analyzer	Advantest	R3273	RE	2007/12/21 * 12
MTR-02	Test Receiver	Rohde & Schwarz	ESCS30	RE	2008/02/20 * 12
MLPA-01	Loop Antenna	Rohde & Schwarz	HFH2-Z2	RE	2007/11/06 * 12
MCC-51	Coaxial cable	UL Japan	-	RE	2007/07/26 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	RE	2008/03/06 * 12
MBA-03	Biconical Antenna	Schwarzbeck	BBA9106	RE	2008/01/12 * 12
MLA-03	Logperiodic Antenna	Schwarzbeck	USLP9143	RE	2008/01/12 * 12
MAT-30	Attenuator(6dB)	TME	UFA-01	RE	2008/03/10 * 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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