APPENDIX 2: Data of EMI test

Radiated Emission

DATA OF RADIATED EMISSION TEST

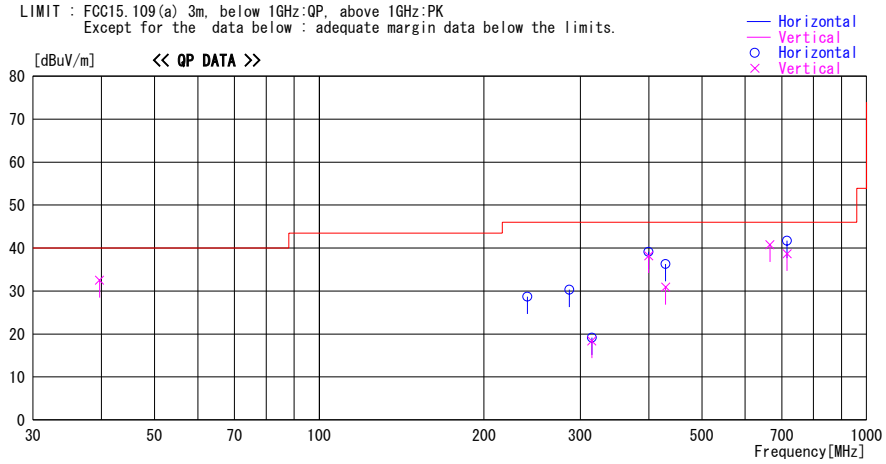
UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2009/12/17

Company : ALPS ELECTRIC CO.,LTD.
Kind of EUT : TPMS/Keyless Receiver
Model No. : TWD1U781
Serial No. : 20091211-2

Report No. : 30CE0077-HO-01
Power : DC 12.0V
Temp./Humi. : 22deg.C. / 33%
Engineer : Keisuke Kawamura

Mode / Remarks : TPMS Receivinging mode Worst-axis(Hor:X-axis, Ver:X-axis)

LIMIT : FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:PK
Except for the data below : adequate margin data below the limits.



Frequency [MHz]	Reading [dBuV]	DET	Antenna Factor [dB/m]	Loss& Gain [dB]	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
39.675	39.2	QP	15.1	-21.8	32.5	249	100	Vert.	40.0	7.5	
239.981	30.3	QP	17.8	-19.4	28.7	262	100	Hori.	46.0	17.3	
286.352	29.9	QP	19.5	-19.1	30.3	260	119	Hori.	46.0	15.7	
314.771	22.9	QP	15.3	-19.0	19.2	183	100	Hori.	46.0	26.8	
314.771	22.1	QP	15.3	-19.0	18.4	208	100	Vert.	46.0	27.6	
399.636	39.9	QP	18.0	-18.8	39.1	190	100	Hori.	46.0	6.9	
399.636	39.0	QP	18.0	-18.8	38.2	260	131	Vert.	46.0	7.8	
429.531	37.1	QP	18.1	-18.9	36.3	359	226	Hori.	46.0	9.7	
429.531	31.7	QP	18.1	-18.9	30.9	276	100	Vert.	46.0	15.1	
666.024	38.1	QP	20.8	-18.1	40.8	19	107	Vert.	46.0	5.2	
715.885	38.3	QP	21.3	-17.9	41.7	248	114	Hori.	46.0	4.3	
715.885	35.3	QP	21.3	-17.9	38.7	240	143	Vert.	46.0	7.3	

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 limit is rounded down to one decimal place.
*The test result is rounded off to one or two decimal places, so some differences might be observed.

Radiated Emission

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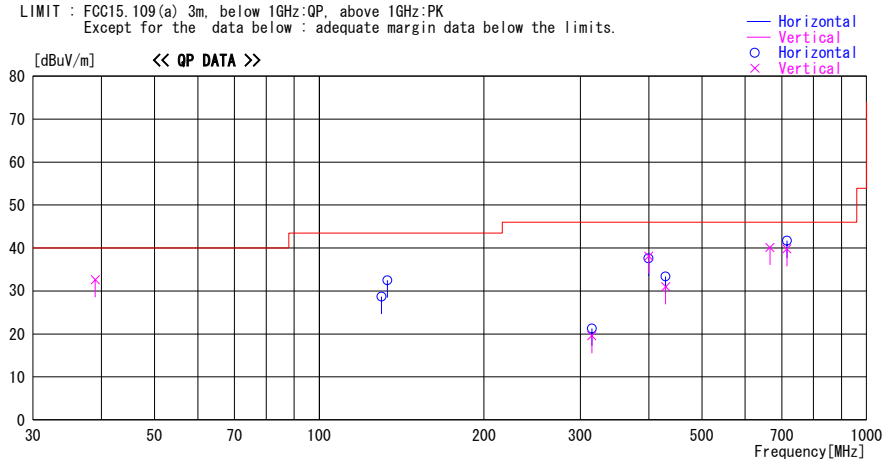

Frequency [MHz]	Reading [dBuV]	DET	Antenna Factor [dB/m]	Loss& Gain [dB]	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
38.975	39.1	QP	15.4	-21.9	32.6	199	100	Vert.	40.0	7.4	
129.964	35.0	QP	14.4	-20.7	28.7	109	162	Hori.	43.5	14.8	
133.222	38.6	QP	14.6	-20.7	32.5	212	133	Hori.	43.5	11.0	
314.771	25.0	QP	15.3	-19.0	21.3	264	100	Hori.	46.0	24.7	
314.771	23.3	QP	15.3	-19.0	19.6	181	100	Vert.	46.0	26.4	
399.636	38.4	QP	18.0	-18.8	37.6	292	100	Hori.	46.0	8.4	
399.636	38.9	QP	18.0	-18.8	38.1	206	132	Vert.	46.0	7.9	
429.531	34.2	QP	18.1	-18.9	33.4	359	226	Hori.	46.0	12.6	
429.531	31.8	QP	18.1	-18.9	31.0	253	100	Vert.	46.0	15.0	
666.024	37.4	QP	20.8	-18.1	40.1	25	107	Vert.	46.0	5.9	
715.885	38.3	QP	21.3	-17.9	41.7	247	100	Hori.	46.0	4.3	
715.335	36.4	QP	21.3	-17.9	39.8	243	143	Vert.	46.0	6.2	

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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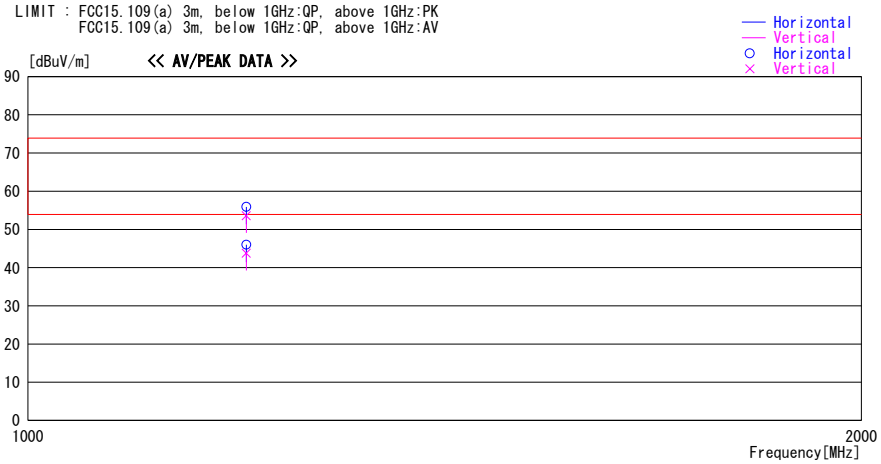
FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:AV



Frequency	Reading	DET	Antenna Factor	Loss& Gain	Level	Angle	Height	Polar.	Limit	Margin	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
1198.993	62.3	PK	24.9	-31.3	55.9	232	100	Hori.	73.9	18.0	
1198.993	60.0	PK	24.9	-31.3	53.6	223	100	Vert.	73.9	20.3	
1198.993	50.2	AV	24.9	-31.3	43.8	223	100	Vert.	53.9	10.1	
1198.993	52.4	AV	24.9	-31.3	46.0	232	100	Hori.	53.9	7.9	

CHART:WITH FACTOR ANT TYPE: -30MHz:LOOP, 30-300MHz:BICONICAL, 300MHz-1000MHz:LOGPERIODIC, 1000MHz-:HORN
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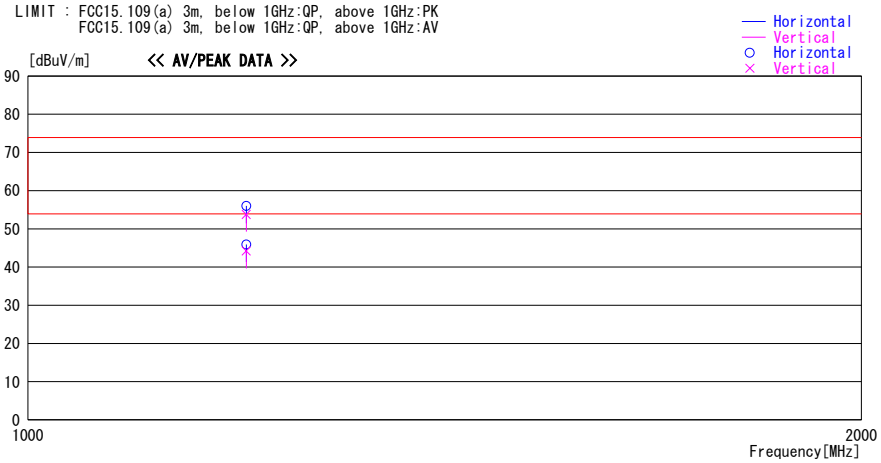
LIMIT : FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:PK
FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:AV



Frequency [MHz]	Reading [dBuV]	DET	Antenna Factor [dB/m]	Loss& Gain [dB]	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
1198.993	62.4	PK	24.9	-31.3	56.0	232	100	Hori.	73.9	17.9	
1198.993	60.2	PK	24.9	-31.3	53.8	225	100	Vert.	73.9	20.1	
1198.993	50.6	AV	24.9	-31.3	44.2	225	100	Vert.	53.9	9.7	
1198.993	52.3	AV	24.9	-31.3	45.9	232	100	Hori.	53.9	8.0	

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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APPENDIX 3: Test instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-02	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	RE	2009/08/17 * 12
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	RE	2009/02/05 * 12
MJM-05	Measure	PROMART	SEN1955	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MSA-03	Spectrum Analyzer	Agilent	E4448A	MY44020357	RE	2009/11/20 * 12
MTR-03	Test Receiver	Rohde & Schwarz	ESCI	100300	RE	2009/04/14 * 12
MBA-02	Biconical Antenna	Schwarzbeck	BBA9106	VHA910320 08	RE	2009/10/05 * 12
MLA-02	Logperiodic Antenna	Schwarzbeck	USLP9143	201	RE	2009/10/05 * 12
MCC-12	Coaxial Cable	Fujikura/Agilent	-	-	RE	2009/02/16 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	BK7970	RE	2009/11/12 * 12
MPA-09	Pre Amplifier	Agilent	8447D	2944A10845	RE	2009/09/02 * 12
MHA-06	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	254	RE	2009/01/31 * 12
MCC-47	Microwave Cable 1G-26.5GHz	Suhner	SUCOFLEX104	295123(5m) / 287573(1m)	RE	2009/11/19 * 12
MPA-10	Pre Amplifier	Agilent	8449B	3008A02142	RE	2009/09/14 * 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: Radiated emission