

APPENDIX 2: Data of EMI test

Radiated Emission below 30MHz (Fundamental and Spurious Emission)

DATA OF RADIATED EMISSION TEST

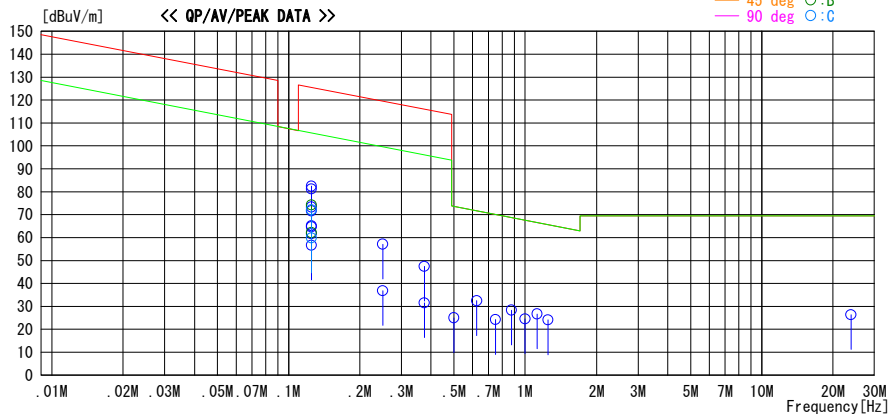
UL Japan, Inc. Head Office EMC Lab. No. 4 Semi Anechoic Chamber
Date : 2010/12/08

Report No. : 31DE0293-HO-02
Temp./ Humi. : 25deg. C. / 30%
Engineer : Tomotaka Sasagawa

Mode / Remarks : Transmitting mode (125KHz)

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

— 0 deg ○:A
— 45 deg ○:B
— 90 deg ○:C



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]	[deg]	
0.12500	88.7	PEAK	19.9	6.0	32.1	82.5	125.6	43.1	0	A	120
0.12500	78.3	PEAK	19.9	6.0	32.1	72.1	125.6	53.5	90	C	266
0.12500	80.5	PEAK	19.9	6.0	32.1	74.3	125.6	51.3	45	B	2
0.12500	77.9	PEAK	19.9	6.0	32.1	71.7	125.6	53.9	135	A	211
0.12500	87.5	PEAK	19.9	6.0	32.1	81.3	125.6	44.3	180	A	234
0.12500	71.4	AV	19.9	6.0	32.1	65.2	105.7	40.5	0	A	120
0.12500	66.1	AV	19.9	6.0	32.1	59.9	105.7	45.8	90	C	266
0.12500	68.3	AV	19.9	6.0	32.1	62.1	105.7	43.6	45	B	2
0.12500	67.9	AV	19.9	6.0	32.1	61.7	105.7	44.0	135	A	211
0.12500	70.9	AV	19.9	6.0	32.1	64.7	105.7	41.0	180	A	234
0.12500	79.5	PEAK	19.9	6.0	32.1	73.3	125.6	52.3	0	A	300
0.12500	62.9	AV	19.9	6.0	32.1	56.7	105.7	49.0	0	A	300
0.25000	63.4	PEAK	19.7	6.1	32.1	57.1	119.6	62.5	0	A	221
0.25000	43.2	AV	19.7	6.1	32.1	36.9	99.6	62.7	0	A	243
0.37500	53.9	PEAK	19.6	6.1	32.1	47.5	116.1	68.6	0	A	212
0.37500	37.9	AV	19.6	6.1	32.1	31.5	96.1	64.6	0	A	241
0.50000	31.5	QP	19.5	6.1	32.1	25.0	73.6	48.6	0	A	198
0.62500	38.9	QP	19.5	6.1	32.1	32.4	71.7	39.3	0	A	202
0.75000	30.7	QP	19.4	6.1	32.0	24.2	70.1	45.9	0	A	221
0.87500	34.8	QP	19.4	6.1	32.0	28.3	68.7	40.4	0	A	212
1.00000	31.0	QP	19.4	6.1	32.0	24.5	67.6	43.1	0	A	234
1.12500	33.1	QP	19.4	6.2	32.0	26.7	66.5	39.8	0	A	251
1.25000	30.5	QP	19.4	6.2	32.0	24.1	65.6	41.5	0	A	240
23.85090	31.2	QP	20.4	6.9	32.1	26.4	69.5	43.1	0	A	221

CHART: WITH FACTOR, ANT TYPE: LOOP, Except for the data below: adequate margin data below the limits.
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)

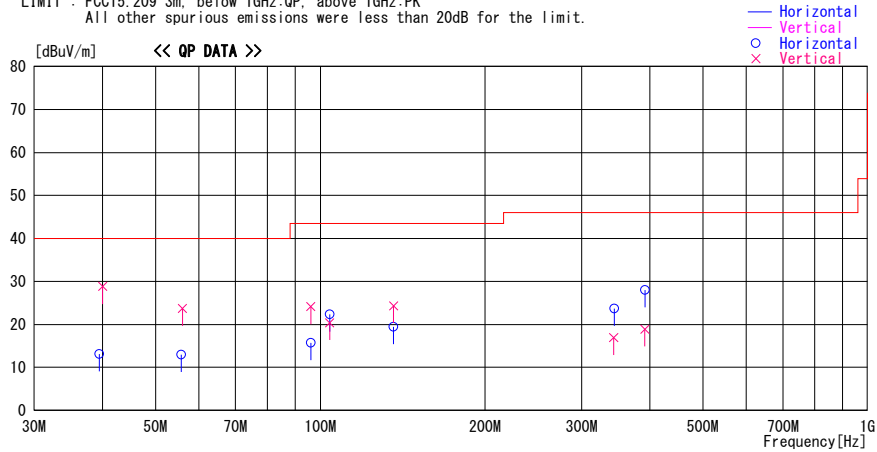
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No. 4 Semi Anechoic Chamber
Date : 2010/12/08

Report No. : 31DE0293-HO-02
Temp. / Humi. : 23deg.C / 42%
Engineer : Tomotaka Sasagawa

Mode / Remarks : Transmitter mode (125kHz)

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



Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level	Angle	Height	Polar.	Limit	Margin	Comment
			Factor	Gain							
			[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
39.450	23.2	QP	14.8	-24.9	13.1	349	233	Hori.	40.0	26.9	
40.016	39.1	QP	14.6	-24.9	28.8	333	100	Vert.	40.0	11.2	
104.029	33.5	QP	10.9	-24.0	20.4	345	100	Vert.	43.5	23.2	
55.684	27.8	QP	9.6	-24.5	12.9	223	234	Hori.	40.0	27.1	
56.029	38.7	QP	9.5	-24.5	23.7	341	100	Vert.	40.0	16.3	
96.044	30.2	QP	9.6	-24.1	15.7	6	271	Hori.	43.5	27.8	
96.046	38.6	QP	9.6	-24.1	24.1	127	100	Vert.	43.5	19.4	
104.046	35.4	QP	10.9	-24.0	22.3	300	343	Hori.	43.5	21.2	
136.065	33.6	QP	14.3	-23.6	24.3	0	100	Vert.	43.5	19.2	
136.066	28.7	QP	14.3	-23.6	19.4	340	294	Hori.	43.5	24.1	
344.194	29.1	QP	16.6	-22.0	23.7	0	100	Hori.	46.0	22.3	
343.401	22.3	QP	16.6	-22.0	16.9	2	100	Vert.	46.0	29.1	
392.197	32.2	QP	17.4	-21.6	28.0	45	100	Hori.	46.0	18.0	
391.702	23.1	QP	17.4	-21.6	18.9	33	100	Vert.	46.0	27.1	

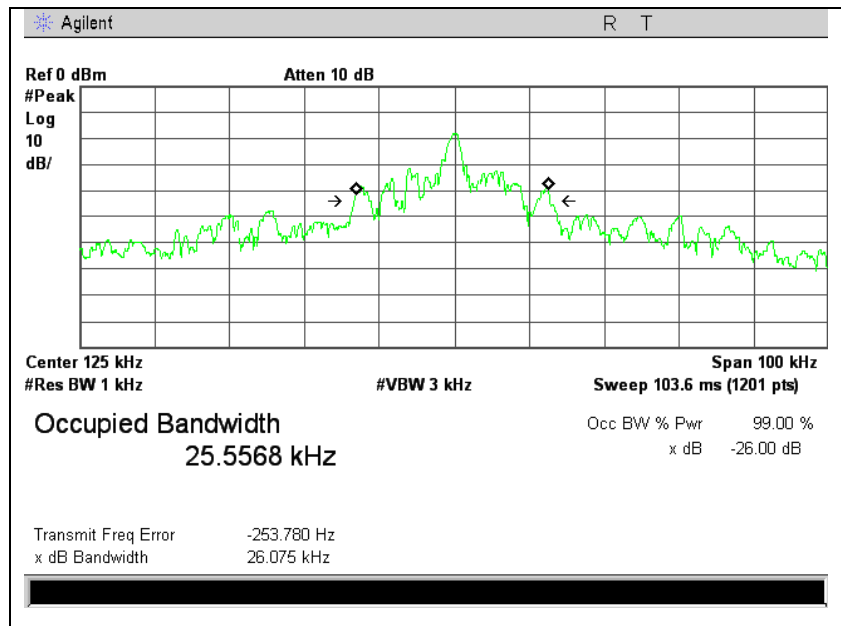
CHART: WITH FACTOR ANT TYPE: -30MHz: LOOP, 30-300MHz: BICONICAL, 300MHz-1000MHz: LOGPERIODIC, 1000MHz-: HORN
CALCULATION: RESULT = READING + ANT FACTOR + LOSS (CABLE+ATTEN.) - GAIN (AMP)

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

-26dB Bandwidth

Test place	Head Office EMC Lab. No.4 Semi Anechoic Chamber
Report No.	31DE0293-HO-02
Date	12/08/2010
Temperature/ Humidity	22 deg.C./ 39%
Engineer	Tomotaka Sasagawa
Mode	Transmitting 125kHz

FREQ [kHz]	-26dB Bandwidth [kHz]
125	26.075



APPENDIX 3: Test instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-04	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2010/02/02 * 12
MOS-15	Thermo-Hygrometer	Custom	CTH-180	-	RE	2010/02/09 * 12
MJM-07	Measure	PROMART	SEN1955	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MSA-05	Spectrum Analyzer	Advantest	R3273	160400285	RE	2010/11/18 * 12
MTR-07	Test Receiver	Rohde & Schwarz	ESCI	100635	RE	2010/10/27 * 12
MBA-05	Biconical Antenna	Schwarzbeck	BBA9106	1302	RE	2010/10/11 * 12
MLA-08	Logperiodic Antenna	Schwarzbeck	UKLP9140-A	N/A	RE	2010/10/11 * 12
MCC-50	Coaxial cable	UL Japan	-	-	RE	2010/03/18 * 12
MAT-51	Attenuator(6dB)	Weinschel	2	AS3557	RE	2010/01/20 * 12
MPA-14	Pre Amplifier	SONOMA INSTRUMENT	310	260833	RE	2010/03/05 * 12
MLPA-01	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100017	RE	2010/10/15 * 12
MCC-113	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W(10m)/SFM141(5m)/421-010(1m)/sucoform141-PE(1m)/RFM-E121(Switcher)	-/04178	RE	2010/07/21 * 12
MCC-31	Coaxial cable	UL Japan	-	-	RE	2010/07/20 * 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

UL Japan, Inc.

Head Office EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124