

APPENDIX 2: Data of EMI test

Fundamental emission and Spectrum Mask

DATA OF RADIATED EMISSION TEST

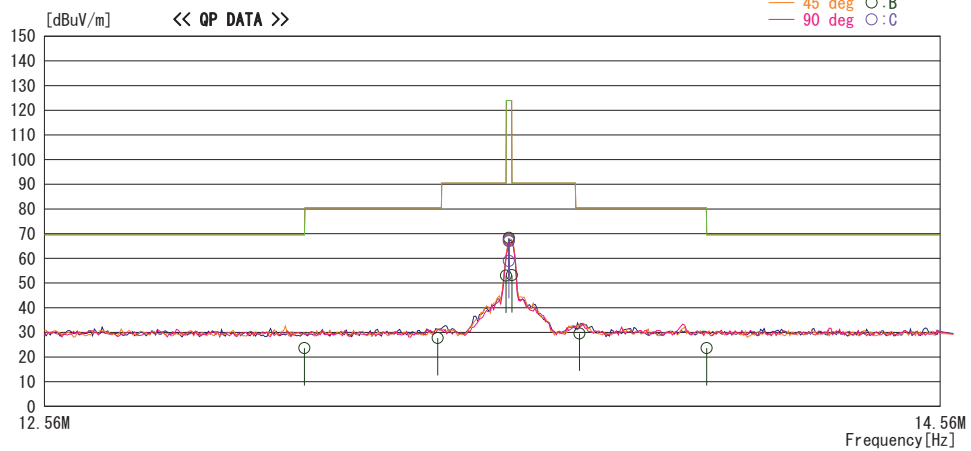
UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2011/08/23

Report No. : 31JE0097-HO-01

Temp. / Humi. : 21deg. C / 59% RH
Engineer : Satofumi Matsuyama

Mode / Remarks : Tx 13.56MHz, Modulation ON, Worst Axis(EUT:Y-axis), With Tag(Circle, Spacer: 45mm)

LIMIT : FCC15.225 3m, 9-90kHz:PK, 110-490kHz:PK, other:QP
FCC15.225 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]	[deg]	
13.11000	29.6	QP	19.3	6.9	32.2	23.6	69.5	45.9	45	B	136
13.40141	33.8	QP	19.3	6.9	32.2	27.8	80.5	52.7	45	B	136
13.55300	59.1	QP	19.3	6.9	32.2	53.1	90.4	37.3	45	B	136
13.56000	73.0	QP	19.3	6.9	32.2	67.0	123.9	56.9	90	C	84
13.56000	73.3	QP	19.3	6.9	32.2	67.3	123.9	56.6	135	C	13
13.56000	64.9	QP	19.3	6.9	32.2	58.9	123.9	65.0	0	C	176
13.56000	73.8	QP	19.3	6.9	32.2	67.8	123.9	56.1	0	A	168
13.56000	74.4	QP	19.3	6.9	32.2	68.4	123.9	55.5	45	B	136
13.56700	59.2	QP	19.3	6.9	32.2	53.2	90.4	37.2	45	B	136
13.71896	35.5	QP	19.3	7.0	32.2	29.6	80.5	50.9	45	B	136
14.01000	29.5	QP	19.3	7.0	32.2	23.6	69.5	45.9	45	B	136

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.)

Spurious emission

DATA OF RADIATED EMISSION TEST

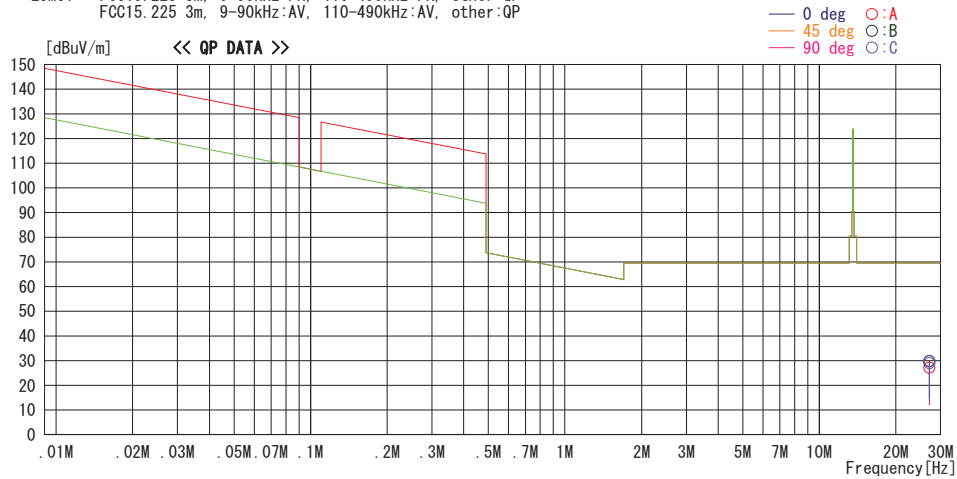
UL Japan, Inc. Head Office EMC Lab. No. 2 Semi Anechoic Chamber
Date : 2011/08/23

Report No. : 31JE0097-HO-01

Temp. / Humi. : 21deg. C / 59% RH
Engineer : Satofumi Matsuyama

Mode / Remarks : Tx 13.56MHz, Modulation ON, Worst Axis(EUT:Y-axis), With Tag(Circle, Spacer: 45mm)

LIMIT : FCC15.225 3m, 9-90kHz:PK, 110-490kHz:PK, other:QP
FCC15.225 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]	[deg]	
27.12000	31.8	QP	20.1	7.5	32.2	27.2	69.5	42.3	0	A	285
27.12000	34.4	QP	20.1	7.5	32.2	29.8	69.5	39.7	45	B	277
27.12000	34.3	QP	20.1	7.5	32.2	29.7	69.5	39.8	90	C	191
27.12000	33.5	QP	20.1	7.5	32.2	28.9	69.5	40.6	135	C	128

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.)

Spurious emission

DATA OF RADIATED EMISSION TEST

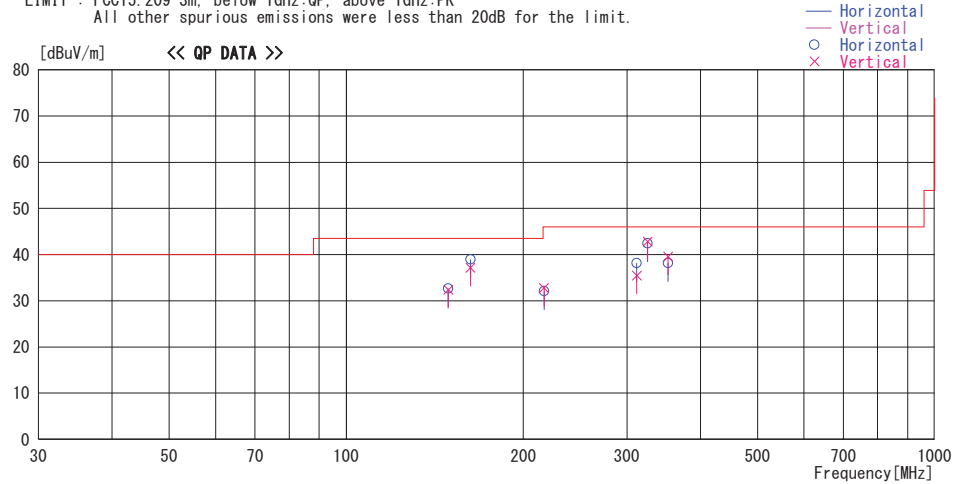
UL Japan, Inc. Head Office EMC Lab. No.1 Semi Anechoic Chamber
Date : 2011/08/25

Report No. : 31JE0097-HO-01

Temp./Humi. : 23deg. C / 65% RH
Engineer : Takumi Shimada

Mode / Remarks : Tx 13.56MHz, Modulation ON, with Tag(Circle 45mm), Axis(H:X, V:Y)

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



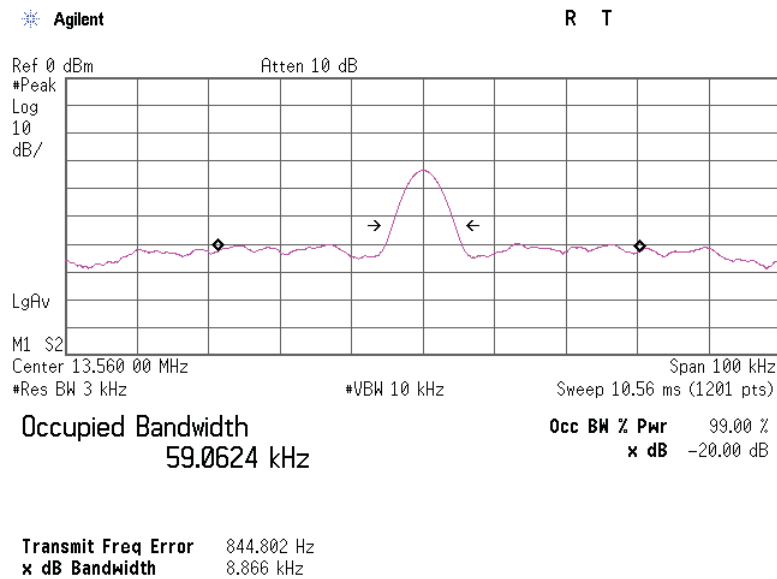
Frequency	Reading	DET	Antenna	Loss&	Level	Angle	Height	Polar.	Limit	Margin	Comment
			Factor	Gain							
[MHz]	[dBuV]		[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
149.159	47.8	QP	14.5	-29.6	32.7	248	214	Hori.	43.5	10.9	
149.159	47.5	QP	14.5	-29.6	32.4	274	100	Vert.	43.5	11.1	
162.705	51.2	QP	15.4	-29.4	37.2	223	100	Vert.	43.5	6.3	
162.705	53.0	QP	15.4	-29.4	39.0	246	299	Hori.	43.5	4.5	
216.960	44.0	QP	16.8	-28.7	32.1	221	155	Hori.	46.0	13.9	
216.960	44.7	QP	16.8	-28.7	32.8	226	100	Vert.	46.0	13.2	
311.881	50.8	QP	15.1	-27.8	38.1	94	100	Hori.	46.0	7.9	
311.881	48.2	QP	15.1	-27.8	35.5	26	170	Vert.	46.0	10.6	
325.445	54.9	QP	15.6	-27.7	42.8	58	149	Vert.	46.0	3.2	
325.445	54.5	QP	15.6	-27.7	42.4	105	100	Hori.	46.0	3.6	
352.560	48.9	QP	16.5	-27.3	38.1	261	100	Hori.	46.0	7.9	
352.560	50.4	QP	16.5	-27.3	39.6	15	152	Vert.	46.0	6.4	

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)

20dB Bandwidth and 99% Occupied Bandwidth

Test place Head Office EMC Lab. No.2 Semi Anechoic Chamber
Report No. 31JE0097-HO
Date 08/23/2011
Temperature/ Humidity 21 deg.C / 59% RH
Engineer Satofumi Matsuyama
Mode Tx Mod on with Tag

FREQ [MHz]	20dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
13.56	8.87	59.06



Frequency Tolerance

Test place Head Office No.6 Semi Anechoic Chamber
Report No. 31JE0097-HO-01
Date 09/01/2011
Temperature/ Humidity 23 deg.C/ 53% RH
Engineer Hisayoshi Sato
Mode Tx Mod on

Test Condition deg.C Volts		Test Timing	Measured freq [MHz]	Freq error [MHz]	Result [ppm]	Limit (+/- 0.01%) [+/- ppm]	Margin [ppm]
20deg.C	20.4	Power on	13.56001023	0.00001023	0.75	100.00	99.25
		on 2min.	13.56001070	0.00001070	0.79	100.00	99.21
		on 5min.	13.56001098	0.00001098	0.81	100.00	99.19
		on 10min.	13.56001160	0.00001160	0.86	100.00	99.14
	24V	Power on	13.55998448	-0.00001552	-1.14	100.00	98.86
		on 2min.	13.55998966	-0.00001034	-0.76	100.00	99.24
		on 5min.	13.55999619	-0.00000381	-0.28	100.00	99.72
		on 10min.	13.56000239	0.00000239	0.18	100.00	99.82
	27.6	Power on	13.56001283	0.00001283	0.95	100.00	99.05
		on 2min.	13.56001374	0.00001374	1.01	100.00	98.99
		on 5min.	13.56001429	0.00001429	1.05	100.00	98.95
		on 10min.	13.56001445	0.00001445	1.07	100.00	98.93
50deg.C.		Power on	13.56010494	0.00010494	7.74	100.00	92.26
		on 2min.	13.56010503	0.00010503	7.75	100.00	92.25
		on 5min.	13.56010441	0.00010441	7.70	100.00	92.30
		on 10min.	13.56010406	0.00010406	7.67	100.00	92.33
40deg.C.		Power on	13.56004082	0.00004082	3.01	100.00	96.99
		on 2min.	13.56004173	0.00004173	3.08	100.00	96.92
		on 5min.	13.56004173	0.00004172	3.08	100.00	96.92
		on 10min.	13.56004183	0.00004183	3.08	100.00	96.92
30deg.C.		Power on	13.56002024	0.00002024	1.49	100.00	98.51
		on 2min.	13.56001998	0.00001998	1.47	100.00	98.53
		on 5min.	13.56001977	0.00001977	1.46	100.00	98.54
		on 10min.	13.56001976	0.00001976	1.46	100.00	98.54
20deg.C.		Power on	13.55998448	-0.00001552	-1.14	100.00	98.86
		on 2min.	13.55998966	-0.00001034	-0.76	100.00	99.24
		on 5min.	13.55999619	-0.00000381	-0.28	100.00	99.72
		on 10min.	13.56000239	0.00000239	0.18	100.00	99.82
10deg.C.		Power on	13.55998403	-0.00001597	-1.18	100.00	98.82
		on 2min.	13.55998402	-0.00001598	-1.18	100.00	98.82
		on 5min.	13.55998407	-0.00001593	-1.17	100.00	98.83
		on 10min.	13.55998412	-0.00001588	-1.17	100.00	98.83
0deg.C.		Power on	13.55999996	-0.00000004	0.00	100.00	100.00
		on 2min.	13.55999884	-0.00000116	-0.09	100.00	99.91
		on 5min.	13.55999881	-0.00000119	-0.09	100.00	99.91
		on 10min.	13.55999877	-0.00000123	-0.09	100.00	99.91
-10deg.C.		Power on	13.56008211	0.00008211	6.06	100.00	93.94
		on 2min.	13.56008230	0.00008230	6.07	100.00	93.93
		on 5min.	13.56008273	0.00008273	6.10	100.00	93.90
		on 10min.	13.56008325	0.00008325	6.14	100.00	93.86
-20deg.C		Power on	13.56001588	0.00001588	1.17	100.00	98.83
		on 2min.	13.56001593	0.00001593	1.17	100.00	98.83
		on 5min.	13.56001598	0.00001598	1.18	100.00	98.82
		on 10min.	13.56001604	0.00001604	1.18	100.00	98.82
-30deg.C		Power on	13.56000616	0.00000616	0.45	100.00	99.55
		on 2min.	13.56000653	0.00000652	0.48	100.00	99.52
		on 5min.	13.56000659	0.00000659	0.49	100.00	99.51
		on 10min.	13.56000664	0.00000664	0.49	100.00	99.51

Limit : 13.56 13.56 MHz +/-0.01 % (+/- 100ppm) = +/- 0.001356 MHz

APPENDIX 3: Test instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-01	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 10m	DA-06881	RE	2011/07/10 * 12
MOS-01	Digital Humidity Indicator	N.T	NT-1800	MOS01	RE	2011/02/23 * 12
MJM-01	Measure	KDS	ES19-55	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MTR-01	Test Receiver	Rohde & Schwarz	ESI40	100084	RE	2010/12/07 * 12
KBA-05	Biconical Antenna	Schwarzbeck	BBA9106	2513	RE	2010/10/15 * 12
KLA-04	Logperiodic Antenna	Schwarzbeck	USLP9143	361	RE	2011/08/17 * 12
MAT-08	Attenuator(6dB)	Weinschel Corp	2	BK7971	RE	2010/11/05 * 12
MCC-01	Coaxial Cable 0.1-3000MHz	Suhner/storm/Agilent/T SJ	-	-	RE	2010/10/14 * 12
MPA-19	Pre Amplifier	MITEQ	MLA-10K01-B01-35	1237616	RE	2011/02/28 * 12
MCH-04	Temperature and Humidity Chamber	Tabai Espec	PL-2KP	14015723	RE	2011/08/22 * 12
EST-45	Universal Counter	Agilent	53132A	MY40008906	RE	2011/08/17 * 12
MOS-14	Thermo-Hygrometer	Custom	CTH-201	-	RE	2011/02/23 * 12
EST-09	Universal Counter	Agilent	53131A	KR01204716	RE	2011/05/11 * 12
MAEC-02	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	RE	2010/09/01 * 12
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	RE	2011/02/23 * 12
MJM-14	Measure	KOMELON	KMC-36	-	RE	-
MSA-10	Spectrum Analyzer	Agilent	E4448A	MY46180655	RE	2011/02/15 * 12
MTR-03	Test Receiver	Rohde & Schwarz	ESCI	100300	RE	2011/04/15 * 12
MLPA-01	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100017	RE	2010/10/15 * 12
MCC-13	Coaxial Cable	Fujikura	3D-2W(12m)/5D-2W(5m)/5D-2W(0.8m)/5D-2W(1m)	-	RE	2011/02/18 * 12
MCC-31	Coaxial cable	UL Japan	-	-	RE	2011/07/28 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2011/03/04 * 12

The expiration date of the calibration is the end of the expired month.

All equipment is calibrated with valid calibrations. Each measurement data 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

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