

**APPENDIX 2: Data of EMI test**

**Fundamental emission and Spectrum Mask**

**DATA OF RADIATED EMISSION TEST**

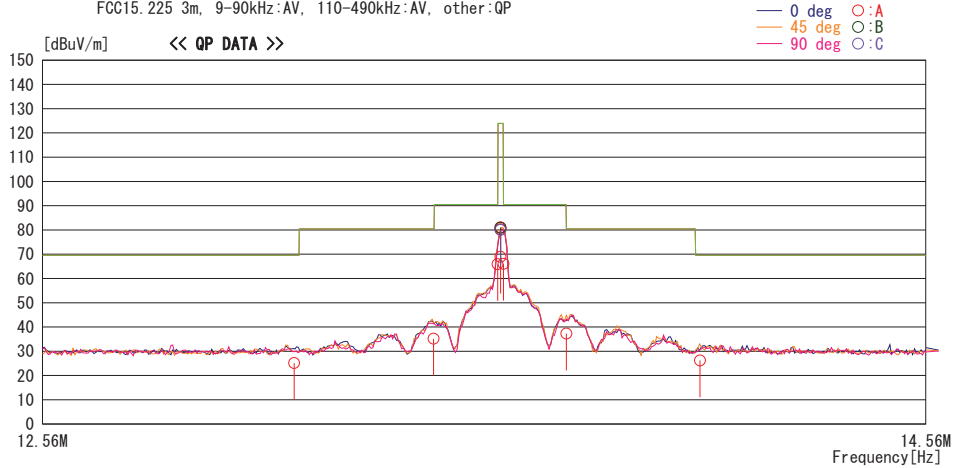
UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber  
Date : 2011/08/23

Report No. : 31JE0097-H0-01

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: 85mm)

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]	
13.10000	31.2	QP	19.3	6.9	32.2	25.2	69.5	44.3	135	A	10
13.40933	41.2	QP	19.3	6.9	32.2	35.2	80.5	45.3	135	A	10
13.55300	71.9	QP	19.3	6.9	32.2	65.9	90.4	24.5	135	A	10
13.56000	75.0	QP	19.3	6.9	32.2	69.0	123.9	54.9	0	A	171 Loop:Hor
13.56000	86.3	QP	19.3	6.9	32.2	80.3	123.9	43.6	0	A	1
13.56000	86.9	QP	19.3	6.9	32.2	80.9	123.9	43.0	45	B	142
13.56000	86.0	QP	19.3	6.9	32.2	80.0	123.9	43.9	90	C	82
13.56000	87.1	QP	19.3	6.9	32.2	81.1	123.9	42.8	135	A	10 Worst
13.56700	72.1	QP	19.3	6.9	32.2	66.1	90.4	24.3	135	A	10
13.71043	43.2	QP	19.3	7.0	32.2	37.3	80.5	43.2	135	A	10
14.02000	32.1	QP	19.3	7.0	32.2	26.2	69.5	43.3	135	A	10

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

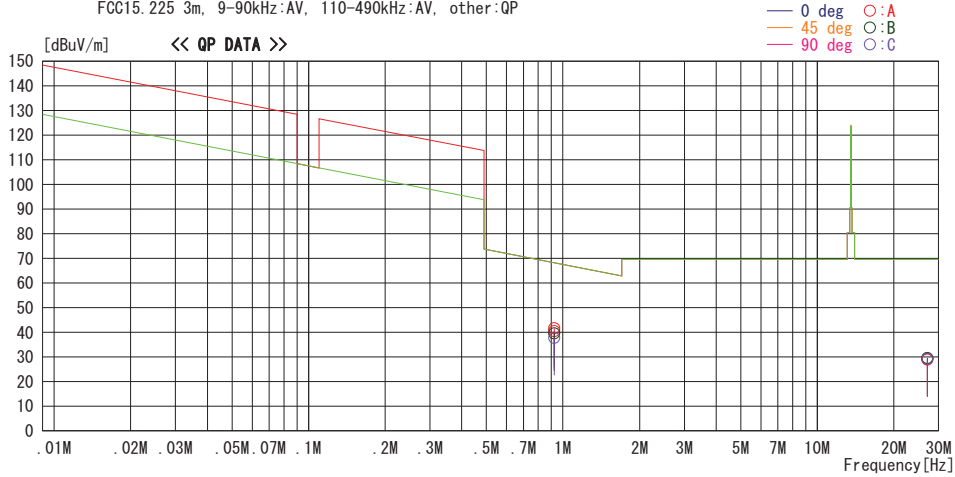
UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber  
 Date : 2011/08/23

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: 85mm)

LIMIT : FCC15.225 3m, 9-90kHz:PK, 110-490kHz:PK, other:QP  
 FCC15.225 3m, 9-90kHz:AV, 110-490kHz:AV, other:QP



Freq. [MHz]	Reading [dBuV]	DET	Ant. Fac [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Antenna [deg]	Table	Comment
										[deg]	
0.92443	48.3	QP	19.4	6.2	32.2	41.7	68.3	26.6	0	A	170
0.92443	46.2	QP	19.4	6.2	32.2	39.6	68.3	28.7	45	B	163
0.92443	44.3	QP	19.4	6.2	32.2	37.7	68.3	30.6	90	C	277
0.92443	47.0	QP	19.4	6.2	32.2	40.4	68.3	27.9	135	A	202
27.12000	33.9	QP	20.1	7.5	32.2	29.3	69.5	40.2	0	A	59
27.12000	34.1	QP	20.1	7.5	32.2	29.5	69.5	40.0	45	B	223
27.12000	33.9	QP	20.1	7.5	32.2	29.3	69.5	40.2	90	C	180
27.12000	33.5	QP	20.1	7.5	32.2	28.9	69.5	40.6	135	A	105

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**

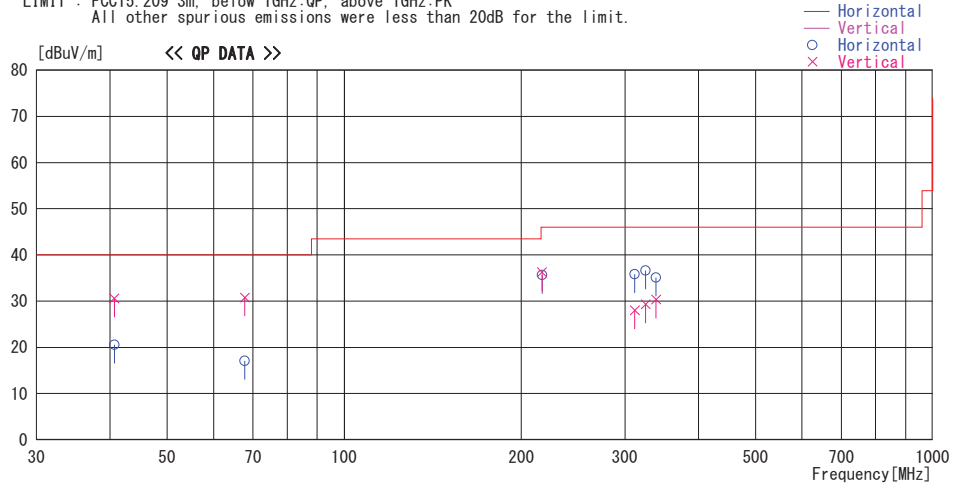
UL Japan, Inc. Head Office EMC Lab. No.1 Semi Anechoic Chamber  
Date : 2011/08/26

Report No. : 31JE0097-HO-01

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

Mode / Remarks : Tx 13.56MHz, Modulation ON, with Tag(Rect Omm), 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.



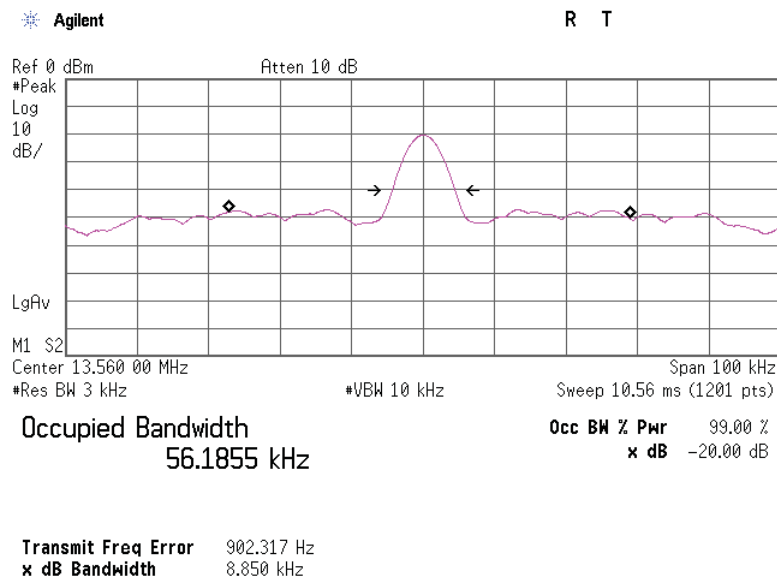
Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level	Angle	Height	Polar.	Limit	Margin	Comment
			Factor	Gain							
			[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
40.681	37.1	QP	14.2	-30.8	20.5	87	236	Hori.	40.0	19.5	
40.681	47.2	QP	14.2	-30.8	30.6	295	100	Vert.	40.0	9.4	
67.799	40.8	QP	6.8	-30.5	17.1	265	267	Hori.	40.0	22.9	
67.799	54.5	QP	6.8	-30.5	30.8	180	100	Vert.	40.0	9.2	
216.957	47.6	QP	16.8	-28.7	35.7	269	300	Hori.	46.0	10.3	
216.957	48.2	QP	16.8	-28.7	36.3	94	100	Vert.	46.0	9.8	
311.883	48.5	QP	15.1	-27.8	35.8	253	100	Hori.	46.0	10.2	
311.883	40.7	QP	15.1	-27.8	28.0	283	155	Vert.	46.0	18.0	
325.437	48.8	QP	15.6	-27.7	36.7	267	100	Hori.	46.0	9.3	
325.437	41.4	QP	15.6	-27.7	29.3	219	150	Vert.	46.0	16.7	
339.000	46.5	QP	16.1	-27.5	35.1	107	100	Hori.	46.0	10.9	
339.000	41.8	QP	16.1	-27.5	30.4	237	150	Vert.	46.0	15.7	

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	8.85	56.19



## Frequency Tolerance

Test place : Head Office EMC Lab. No.6 measurement room  
Report No. : 31JE0097-HO-01  
Date : 09/02/2011  
Temperature/ Humidity : 24 deg.C/ 51% RH  
Engineer : Kazuya Yoshioka  
Mode : Tx Mod on

Test Condition		Test Timing	Measured freq [MHz]	Freq error [MHz]	Result [ppm]	Limit (+/- 0.01%) [+/- ppm]	Margin [ppm]
deg.C	Volts						
20deg.C	20.4V	Power on	13.56000160	0.00000160	0.12	100.00	99.88
		on 2min.	13.55999820	-0.00000180	-0.13	100.00	99.87
		on 5min.	13.55999630	-0.00000370	-0.27	100.00	99.73
		on 10min.	13.55999460	-0.00000540	-0.40	100.00	99.60
	24V	Power on	13.56001880	0.00001880	1.39	100.00	98.61
		on 2min.	13.56000520	0.00000520	0.38	100.00	99.62
		on 5min.	13.56000300	0.00000300	0.22	100.00	99.78
		on 10min.	13.56000040	0.00000040	0.03	100.00	99.97
	27.6V	Power on	13.55999570	-0.00000430	-0.32	100.00	99.68
		on 2min.	13.55999460	-0.00000540	-0.40	100.00	99.60
		on 5min.	13.55999380	-0.00000620	-0.46	100.00	99.54
		on 10min.	13.55999290	-0.00000710	-0.52	100.00	99.48
50deg.C.	24V	Power on	13.55999020	-0.00000980	-0.72	100.00	99.28
on 2min.		13.55999800	-0.00000200	-0.15	100.00	99.85	
on 5min.		13.56001070	0.00001070	0.79	100.00	99.21	
on 10min.		13.56002220	0.00002220	1.64	100.00	98.36	
40deg.C.		Power on	13.55999510	-0.00000490	-0.36	100.00	99.64
		on 2min.	13.55999020	-0.00000980	-0.72	100.00	99.28
		on 5min.	13.55999400	-0.00000600	-0.44	100.00	99.56
		on 10min.	13.55999810	-0.00000190	-0.14	100.00	99.86
30deg.C.		Power on	13.56000110	0.00000110	0.08	100.00	99.92
		on 2min.	13.55999740	-0.00000260	-0.19	100.00	99.81
		on 5min.	13.55999150	-0.00000850	-0.63	100.00	99.37
		on 10min.	13.55999000	-0.00010000	-7.37	100.00	92.63
20deg.C.		Power on	13.56001880	0.00001880	1.39	100.00	98.61
		on 2min.	13.56000520	0.00000520	0.38	100.00	99.62
		on 5min.	13.56000300	0.00000300	0.22	100.00	99.78
		on 10min.	13.56000040	0.00000040	0.03	100.00	99.97
10deg.C.		Power on	13.56002540	0.00002540	1.87	100.00	98.13
		on 2min.	13.56001700	0.00001700	1.25	100.00	98.75
		on 5min.	13.56000850	0.00000850	0.63	100.00	99.37
		on 10min.	13.56000290	0.00000290	0.21	100.00	99.79
0deg.C.		Power on	13.56002160	0.00002160	1.59	100.00	98.41
		on 2min.	13.56002800	0.00002800	2.06	100.00	97.94
		on 5min.	13.56002450	0.00002450	1.81	100.00	98.19
		on 10min.	13.56002010	0.00002010	1.48	100.00	98.52
-10deg.C.	Power on	13.56000719	0.00000719	0.53	100.00	99.47	
	on 2min.	13.56003232	0.00003232	2.38	100.00	97.62	
	on 5min.	13.56003500	0.00003500	2.58	100.00	97.42	
	on 10min.	13.56003401	0.00003401	2.51	100.00	97.49	
-20deg.C.	Power on	13.55996440	-0.00003560	-2.63	100.00	97.37	
	on 2min.	13.56000429	0.00000429	0.32	100.00	99.68	
	on 5min.	13.56000913	0.00000913	0.67	100.00	99.33	
	on 10min.	13.56003384	0.00003384	2.50	100.00	97.50	
-30deg.C.	Power on	13.55987697	-0.00012303	-9.07	100.00	90.93	
	on 2min.	13.55989566	-0.00010434	-7.69	100.00	92.31	
	on 5min.	13.55991360	-0.00008640	-6.37	100.00	93.63	
	on 10min.	13.55992539	-0.00007461	-5.50	100.00	94.50	

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**

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