

**APPENDIX 2: Data of EMI test**

**Conducted emission**

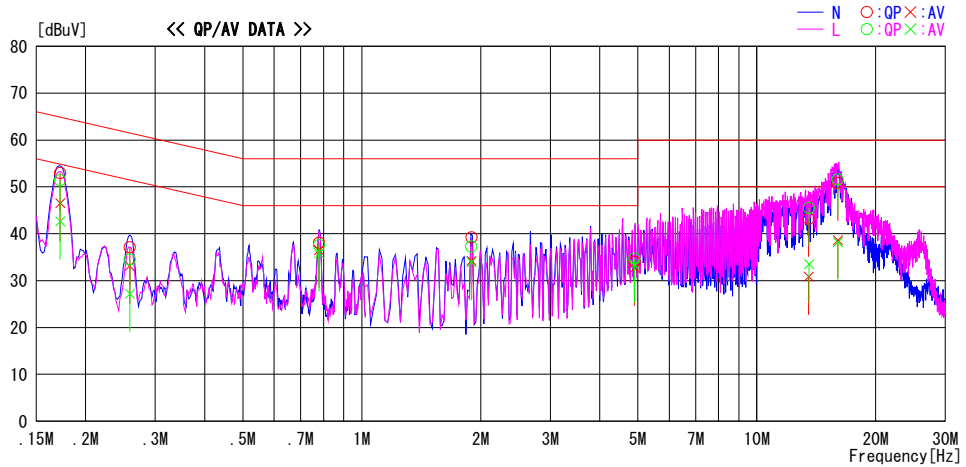
**DATA OF CONDUCTED EMISSION TEST**

UL Japan, Inc. Head Office EMC Lab. No.4 Semi Anechoic Chamber  
 Date : 2011/07/24

Report No. : 31FE0131-HO-01  
 Temp./Humi. : 25deg. C / 58% RH  
 Engineer : Takeshi Choda

Mode / Remarks : Transmitting (Tx and Rx) mode

LIMIT : FCC15.207 QP  
 FCC15.207 AV



Frequency [MHz]	Reading Level		Corr. Factor [dB]	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.17244	39.7	33.3	13.2	52.9	46.5	64.8	54.8	11.9	8.3	N	
0.25852	23.8	19.8	13.3	37.1	33.1	61.5	51.5	24.4	18.4	N	
0.77900	24.8	23.2	13.3	38.1	36.5	56.0	46.0	17.9	9.5	N	
1.89560	25.8	20.8	13.4	39.2	34.2	56.0	46.0	16.8	11.8	N	
4.90257	20.3	19.0	13.7	34.0	32.7	56.0	46.0	22.0	13.3	N	
13.52604	28.9	16.5	14.3	43.2	30.8	60.0	50.0	16.8	19.2	N	
16.03557	36.3	24.1	14.5	50.8	38.6	60.0	50.0	9.2	11.4	N	
0.17244	38.2	29.4	13.2	51.4	42.6	64.8	54.8	13.4	12.2	L	
0.25880	21.2	13.9	13.3	34.5	27.2	61.5	51.5	27.0	24.3	L	
0.77983	24.3	22.5	13.3	37.6	35.8	56.0	46.0	18.4	10.2	L	
1.89416	23.9	20.5	13.4	37.3	33.9	56.0	46.0	18.7	12.1	L	
4.90257	21.0	19.7	13.7	34.7	33.4	56.0	46.0	21.3	12.6	L	
13.56000	31.2	19.2	14.3	45.5	33.5	60.0	50.0	14.5	16.5	L	
16.03120	37.1	23.7	14.5	51.6	38.2	60.0	50.0	8.4	11.8	L	

CHART: WITH FACTOR, Peak hold data. CALCULATION: RESULT [dBuV] = READING [dBuV] + C. F [dB] (LISN LOSS + CABLE LOSS)  
 Except for the above table : adequate margin data below the limits.

## Fundamental emission and Spectrum Mask

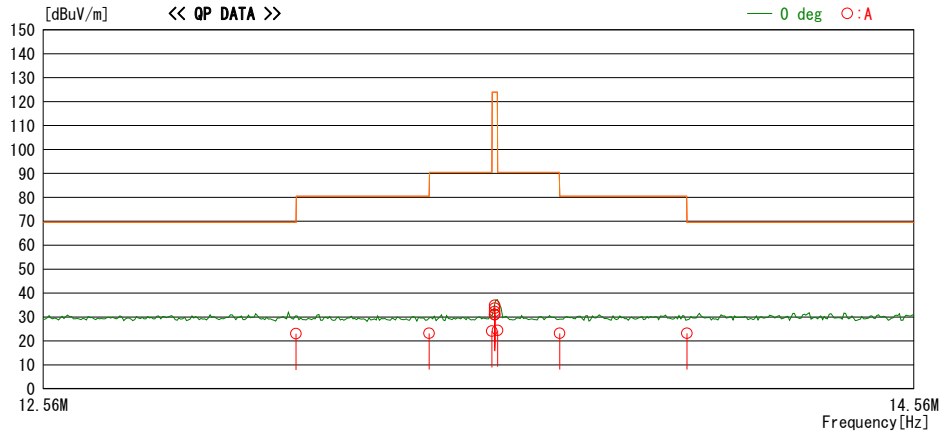
### DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No. 4 Semi Anechoic Chamber  
Date : 2011/07/23

Report No. : 31FE0131-HO-01  
 Temp./ Humi. : 23deg. C / 52% RH  
 Engineer : Hiroshi Kukita

Mode / Remarks : Transmitting (Tx and Rx) mode

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	29.4	QP	19.3	6.5	32.2	23.0	69.5	46.5	0	A	313
13.41000	29.6	QP	19.3	6.5	32.2	23.2	80.5	57.3	0	A	358
13.55300	30.5	QP	19.3	6.5	32.2	24.1	90.4	66.3	0	A	63
13.56000	41.2	QP	19.3	6.5	32.2	34.8	123.9	89.1	0	A	50
13.56000	40.0	QP	19.3	6.5	32.2	33.6	123.9	90.3	45	A	15
13.56000	37.5	QP	19.3	6.5	32.2	31.1	123.9	92.8	90	A	359
13.56000	38.7	QP	19.3	6.5	32.2	32.3	123.9	91.6	135	A	88
13.56000	37.3	QP	19.3	6.5	32.2	30.9	123.9	93.0	0	A	12
13.56700	30.8	QP	19.3	6.5	32.2	24.4	90.4	66.0	0	A	51
13.71000	29.6	QP	19.3	6.5	32.2	23.2	80.5	57.3	0	A	359
14.01000	29.6	QP	19.3	6.5	32.2	23.2	69.5	46.3	0	A	359

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

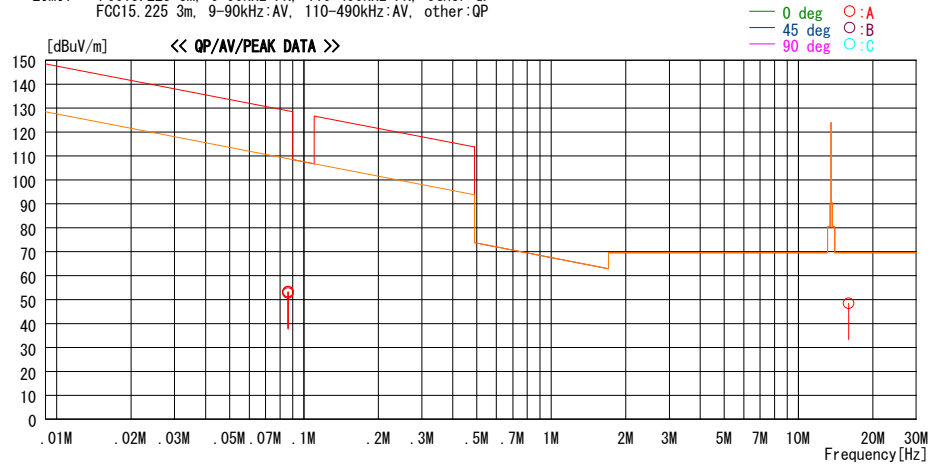
### DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No. 4 Semi Anechoic Chamber  
Date : 2011/07/23

Report No. : 31FE0131-HO-01  
 Temp. / Humi. : 23deg. C / 52% RH  
 Engineer : Hiroshi Kukita

Mode / Remarks : Transmitting (Tx and Rx) mode

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]	
0.08616	59.2	QP	20.0	5.9	32.3	52.8	-	-	0	A	250 *1)
0.08616	59.8	PEAK	20.0	5.9	32.3	53.4	128.9	75.5	0	A	250 *1)
0.08616	59.6	AV	20.0	5.9	32.3	53.2	108.9	55.7	0	A	250 *1)
15.93860	54.6	QP	19.4	6.7	32.2	48.5	69.5	21.0	0	A	41 *1)

CHART: WITH FACTOR, ANT TYPE: LOOP Except for the data below : adequate margin data below the limits.  
 CALCULATION : RESULT = READING + ANT FACTOR + LOSS (CABLE + ATTN.) - GAIN (AMP.)

\*1) Spurious emissions is not related to the transceiver but is from the digital device – with the transceiver powered off the signal remained unchanged.

**Spurious emission**

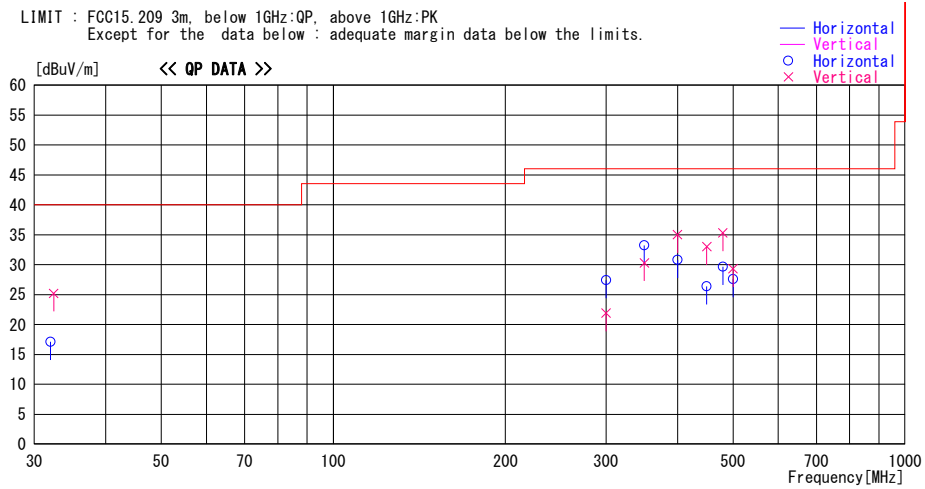
**DATA OF RADIATED EMISSION TEST**

UL Japan, Inc. Head Office EMC Lab. No.4 Semi Anechoic Chamber  
Date : 2011/07/23

Report No. : 31FE0131-HO-01  
Temp./Humi. : 23deg. C / 52% RH  
Engineer : Hiroshi Kukita

Mode / Remarks : Transmitting (Tx and Rx) mode

LIMIT : FCC15.209 3m, below 1GHz:QP, above 1GHz:PK  
Except for the data below : adequate margin data below the limits.



Frequency [MHz]	Reading [dBuV]	DET	Antenna		Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
			Factor [dB/m]	Loss& Gain [dB]							
32.020	25.0	QP	17.3	-25.2	17.1	46	400	Hori.	40.0	22.9	
32.440	33.2	QP	17.2	-25.2	25.2	56	100	Vert.	40.0	14.8	
350.001	38.5	QP	16.7	-22.0	33.2	0	100	Hori.	46.0	12.8	
350.001	35.6	QP	16.7	-22.0	30.3	316	112	Vert.	46.0	15.7	
400.000	35.0	QP	17.5	-21.7	30.8	301	198	Hori.	46.0	15.2	
400.001	39.2	QP	17.5	-21.7	35.0	354	100	Vert.	46.0	11.0	*1)
450.000	29.4	QP	18.4	-21.4	26.4	332	110	Hori.	46.0	19.6	
450.001	36.0	QP	18.4	-21.4	33.0	183	100	Vert.	46.0	13.0	
480.002	31.9	QP	18.9	-21.2	29.6	31	196	Hori.	46.0	16.4	
480.002	37.6	QP	18.9	-21.2	35.3	0	100	Vert.	46.0	10.7	*1)
500.001	29.5	QP	19.2	-21.1	27.6	32	154	Hori.	46.0	18.4	
500.001	31.2	QP	19.2	-21.1	29.3	355	100	Vert.	46.0	16.7	
300.001	28.6	QP	15.7	-22.4	21.9	172	198	Vert.	46.0	24.1	
300.001	34.1	QP	15.7	-22.4	27.4	248	100	Hori.	46.0	18.6	

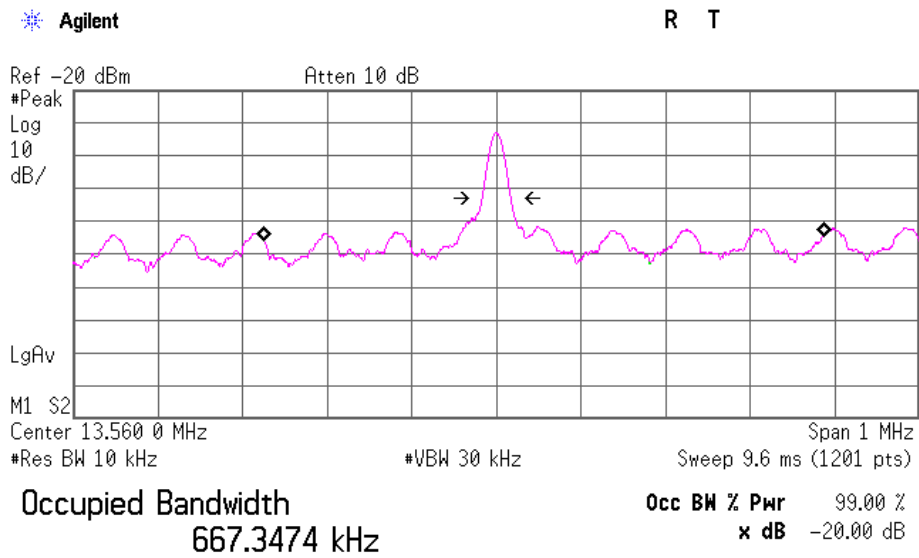
CHART:WITH FACTOR ANT TYPE: -30MHz:LOOP, 30-300MHz:BICONICAL, 300MHz-1000MHz:LOGPERIODIC, 1000MHz-:HORN  
CALCULATION:RESULT = READING + ANT FACTOR + LOSS(CABLE+ATTEN.) - GAIN(AMP)

\*1) Spurious emissions is not related to the transceiver but is from the digital device – with the transceiver powered off the signal remained unchanged.

## 20dB Bandwidth

Test place	Head Office EMC Lab. No.6 Shielded Room
Report No.	31FE0131-HO
Date	07/24/2011
Temperature/ Humidity	25 deg. C / 72% RH
Engineer	Takeshi Choda
Mode	Transmitting (Tx and Rx) mode

FREQ [MHz]	20dB Bandwidth [kHz]
13.56	35.08

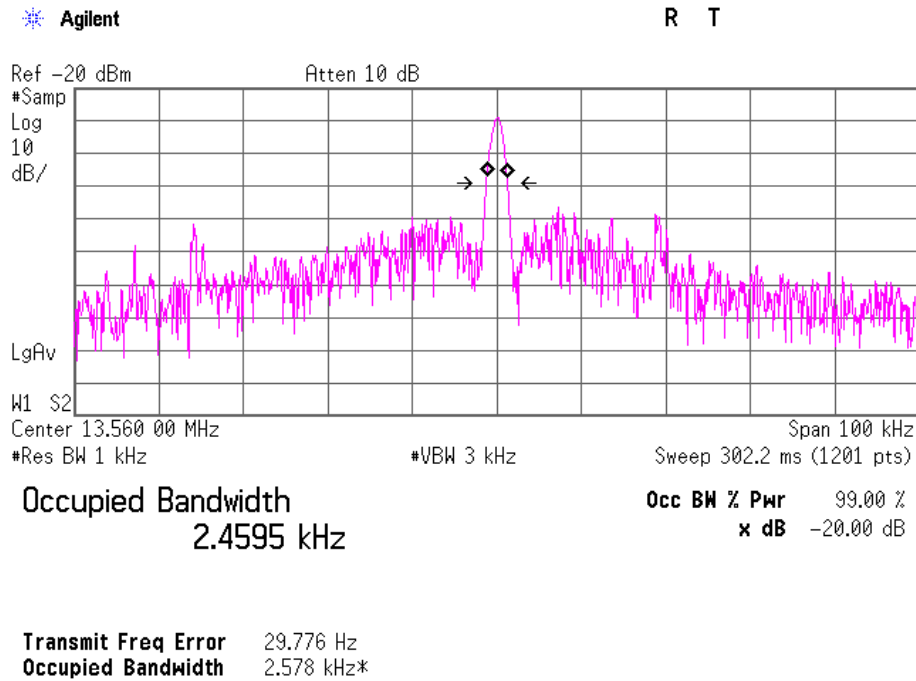


**Transmit Freq Error**      57.045 kHz  
**x dB Bandwidth**            35.079 kHz

### 99% Occupied Bandwidth

Test place	Head Office EMC Lab. No.6 Shielded Room
Report No.	31FE0131-HO
Date	07/24/2011
Temperature/ Humidity	25 deg. C / 72% RH
Engineer	Takeshi Choda
Mode	Transmitting (Tx and Rx) mode

FREQ [MHz]	99% Occupied Bandwidth [kHz]
13.56	2.46



## Frequency Tolerance

Test place : Head Office EMC Lab. No.6 Shielded Room  
Report No. : 31FE0131-HO  
Date : 07/24/2011  
Temperature/ Humidity : 25 deg. C / 72% RH  
Engineer : Takeshi Choda  
Mode : Transmitting (Tx and Rx) mode, Mod off

Test Condition		Test Timing	Measured frequency	Frequency error	Result	Limit (+/- 0.01%)	Margin
deg. C	Volts		[MHz]	[MHz]	[ppm]	[+/- ppm]	[ppm]
20deg. C	276V	Power on	13.56002815	0.00002815	2.08	100.00	97.92
		on 2min.	13.56002673	0.00002673	1.97	100.00	98.03
		on 5min.	13.56002597	0.00002597	1.92	100.00	98.08
		on 10min.	13.56002554	0.00002554	1.88	100.00	98.12
	138V	Power on	13.56003071	0.00003071	2.26	100.00	97.74
		on 2min.	13.56002831	0.00002831	2.09	100.00	97.91
		on 5min.	13.56002762	0.00002762	2.04	100.00	97.96
		on 10min.	13.56002697	0.00002697	1.99	100.00	98.01
	120V	Power on	13.56004782	0.00004782	3.53	100.00	96.47
		on 2min.	13.56003598	0.00003598	2.65	100.00	97.35
		on 5min.	13.56003081	0.00003081	2.27	100.00	97.73
		on 10min.	13.56002916	0.00002916	2.15	100.00	97.85
	102V	Power on	13.56002691	0.00002691	1.98	100.00	98.02
		on 2min.	13.56002575	0.00002575	1.90	100.00	98.10
		on 5min.	13.56002518	0.00002518	1.86	100.00	98.14
		on 10min.	13.56002458	0.00002458	1.81	100.00	98.19
85V	Power on	13.56002670	0.00002669	1.97	100.00	98.03	
	on 2min.	13.56002537	0.00002537	1.87	100.00	98.13	
	on 5min.	13.56002457	0.00002457	1.81	100.00	98.19	
	on 10min.	13.56002424	0.00002424	1.79	100.00	98.21	
50deg. C	120V	Power on	13.56002555	0.00002555	1.88	100.00	98.12
on 2min.		13.56001193	0.00001193	0.88	100.00	99.12	
on 5min.		13.56001003	0.00001002	0.74	100.00	99.26	
on 10min.		13.56000899	0.00000899	0.66	100.00	99.34	
40deg. C		Power on	13.56001928	0.00001927	1.42	100.00	98.58
on 2min.		13.56001512	0.00001512	1.11	100.00	98.89	
on 5min.		13.56001153	0.00001153	0.85	100.00	99.15	
on 10min.		13.56000972	0.00000972	0.72	100.00	99.28	
30deg. C		Power on	13.56002155	0.00002154	1.59	100.00	98.41
on 2min.		13.56001562	0.00001562	1.15	100.00	98.85	
on 5min.		13.56001647	0.00001647	1.21	100.00	98.79	
on 10min.		13.56001742	0.00001742	1.28	100.00	98.72	
20deg. C		Power on	13.56004782	0.00004782	3.53	100.00	96.47
on 2min.		13.56003598	0.00003598	2.65	100.00	97.35	
on 5min.		13.56003081	0.00003081	2.27	100.00	97.73	
on 10min.		13.56002916	0.00002916	2.15	100.00	97.85	
10deg. C		Power on	13.56005060	0.00005060	3.73	100.00	96.27
on 2min.		13.56004844	0.00004844	3.57	100.00	96.43	
on 5min.		13.56005140	0.00005140	3.79	100.00	96.21	
on 10min.		13.56005651	0.00005651	4.17	100.00	95.83	
0deg. C		Power on	13.56008708	0.00008708	6.42	100.00	93.58
on 2min.		13.56008035	0.00008035	5.93	100.00	94.07	
on 5min.		13.56008146	0.00008146	6.01	100.00	93.99	
on 10min.		13.56008239	0.00008239	6.08	100.00	93.92	
-10deg. C	Power on	13.56009878	0.00009878	7.28	100.00	92.72	
on 2min.	13.56009711	0.00009711	7.16	100.00	92.84		
on 5min.	13.56009717	0.00009717	7.17	100.00	92.83		
on 10min.	13.56009827	0.00009827	7.25	100.00	92.75		
-20deg. C	Power on	13.56009969	0.00009969	7.35	100.00	92.65	
on 2min.	13.56010047	0.00010047	7.41	100.00	92.59		
on 5min.	13.56010023	0.00010023	7.39	100.00	92.61		
on 10min.	13.56009899	0.00009898	7.30	100.00	92.70		
-30deg. C	Power on	13.56003424	0.00003424	2.52	100.00	97.48	
on 2min.	13.56006055	0.00006055	4.47	100.00	95.53		
on 5min.	13.56006635	0.00006635	4.89	100.00	95.11		
on 10min.	13.56006760	0.00006760	4.99	100.00	95.01		

### 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	CE/RE	2011/03/01 * 12
MOS-15	Thermo-Hygrometer	Custom	CTH-180	-	CE/RE	2011/02/23 * 12
MJM-07	Measure	PROMART	SEN1955	-	CE/RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	CE/RE	-
MSA-05	Spectrum Analyzer	Advantest	R3273	160400285	CE	2010/11/18 * 12
MTR-07	Test Receiver	Rohde & Schwarz	ESCI	100635	CE/RE	2010/10/27 * 12
MLS-06	LISN(AMN)	Schwarzbeck	NSLK8127	8127363	CE(EUT)	2011/02/20 * 12
MLS-07	LISN(AMN)	Schwarzbeck	NSLK8127	8127364	CE(AE)	2011/02/22 * 12
MTA-31	Terminator	TME	CT-01	-	CE	2011/01/05 * 12
MAT-67	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	CE	2011/02/22 * 12
MCC-113	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W(10m)/SFM141(5m)/421-010(1m)/sucoform141-PE(1m)/RFM-E121(Switcher)	-/04178	CE	2011/07/04 * 12
MSA-04	Spectrum Analyzer	Agilent	E4448A	US44300523	FT	2011/04/08 * 12
MCC-66	Microwave Cable 1G-40GHz	Suhner	SUCOFLEX102	28636/2	FT	2011/04/22 * 12
MCC-114	Microwave Cable 1G-26.5GHz	Suhner	SUCOFLEX104	290212/4	FT	2010/08/05 * 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	2011/03/25 * 12
MAT-51	Attenuator(6dB)	Weinschel	2	AS3557	RE	2011/01/14 * 12
MPA-14	Pre Amplifier	SONOMA INSTRUMENT	310	260833	RE	2011/03/04 * 12
MLPA-01	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100017	RE	2010/10/15 * 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 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: CE: Conducted Emission  
RE: Radiated Emission  
FT: Frequency Tolerance

**UL Japan, Inc.**

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