

Fundamental emission and Spectrum Mask

DATA OF RADIATED EMISSION TEST

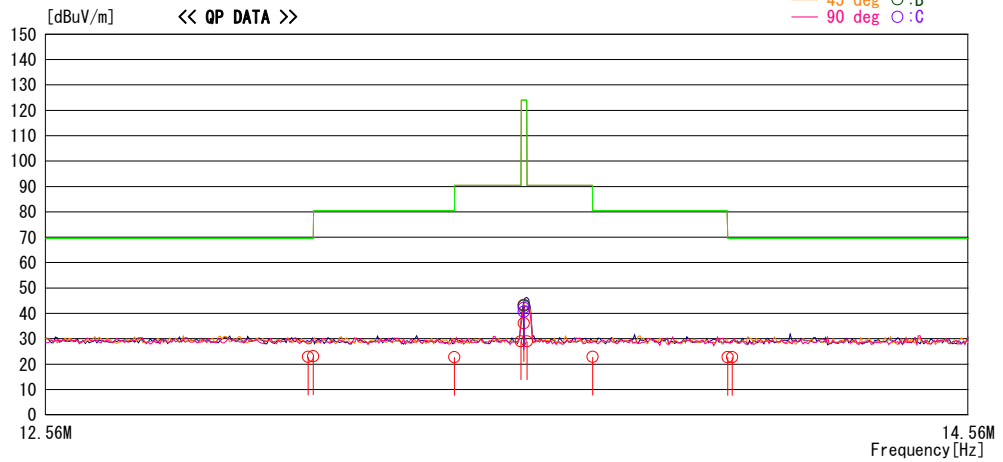
UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2011/03/23

Report No. : 31GE0106-HO-02

Temp. / Humi. : 22deg. C / 31% RH
Engineer : Hiroyuki Furutaka

Mode / Remarks : Tx 13.56MHz With Tag

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	28.2	QP	19.9	6.9	32.1	22.9	69.5	46.6	0	A	39
13.11000	28.3	QP	19.9	6.9	32.1	23.0	69.5	46.5	0	A	39
13.41000	28.1	QP	19.9	6.9	32.1	22.8	80.5	57.7	0	A	39
13.55300	34.3	QP	19.9	6.9	32.1	29.0	90.4	61.4	0	A	39
13.56000	48.6	QP	19.9	6.9	32.1	43.3	123.9	80.6	0	A	39 Worst
13.56000	48.3	QP	19.9	6.9	32.1	43.0	123.9	80.9	45	B	37
13.56000	45.9	QP	19.9	6.9	32.1	40.6	123.9	83.3	90	C	3
13.56000	47.4	QP	19.9	6.9	32.1	42.1	123.9	81.8	135	C	235
13.56000	41.4	QP	19.9	6.9	32.1	36.1	123.9	87.8	0	A	228 Hori
13.56700	34.2	QP	19.9	6.9	32.1	28.9	90.4	61.5	0	A	39
13.71000	28.1	QP	19.9	7.0	32.1	22.9	80.5	57.6	0	A	39
14.01000	28.0	QP	19.9	7.0	32.1	22.8	69.5	46.7	0	A	39
14.02000	27.9	QP	19.9	7.0	32.1	22.7	69.5	46.8	0	A	39

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.

Fundamental emission and Spectrum Mask

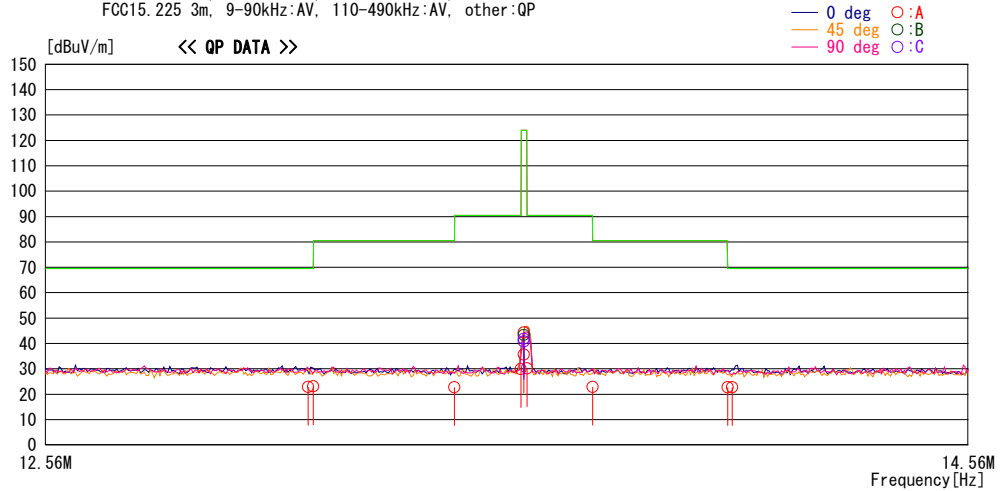
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2011/03/23

Report No. : 31GE0106-HO-02
Temp. / Humi. : 22deg. C / 31% RH
Engineer : Hiroyuki Furutaka

Mode / Remarks : Tx 13.56MHz Without Tag

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	28.2	QP	19.9	6.9	32.1	22.9	69.5	46.6	0	A	65
13.11000	28.3	QP	19.9	6.9	32.1	23.0	69.5	46.5	0	A	65
13.41000	28.1	QP	19.9	6.9	32.1	22.8	80.5	57.7	0	A	65
13.55300	35.2	QP	19.9	6.9	32.1	29.9	90.4	60.5	0	A	65
13.56000	48.6	QP	19.9	6.9	32.1	43.3	123.9	80.6	45	B	24
13.56000	46.1	QP	19.9	6.9	32.1	40.8	123.9	83.1	90	C	326
13.56000	47.2	QP	19.9	6.9	32.1	41.9	123.9	82.0	135	C	350
13.56000	49.5	QP	19.9	6.9	32.1	44.2	123.9	79.7	0	A	65 Worst
13.56000	41.0	QP	19.9	6.9	32.1	35.7	123.9	88.2	0	A	222 Hori
13.56700	35.5	QP	19.9	6.9	32.1	30.2	90.4	60.2	0	A	65
13.71000	28.1	QP	19.9	7.0	32.1	22.9	80.5	57.6	0	A	65
14.01000	27.9	QP	19.9	7.0	32.1	22.7	69.5	46.8	0	A	65
14.02000	27.9	QP	19.9	7.0	32.1	22.7	69.5	46.8	0	A	65

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

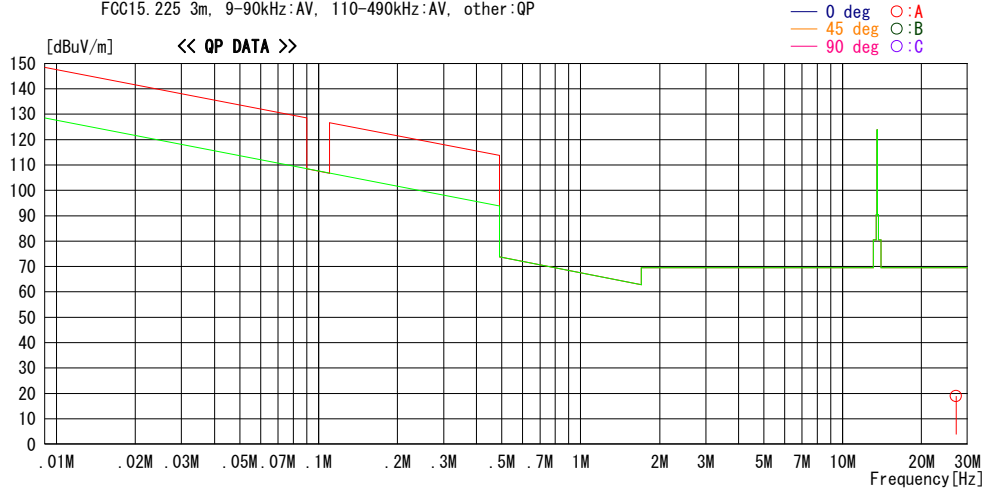
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Engineer : Hiroyuki Furutaka

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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	24.4	QP	19.2	7.5	32.1	19.0	69.5	50.5	0	A	214

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

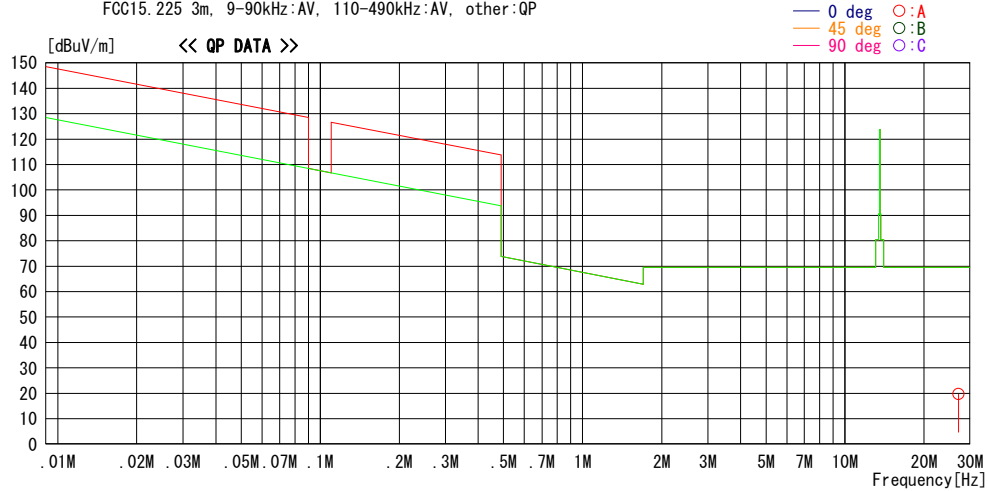
UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber
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Freq.	Reading	DET	Ant. Fac	Loss	Gain	Result	Limit	Margin	Antenna	Table	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[deg]	[deg]	
27.12000	25.1	QP	19.2	7.5	32.1	19.7	69.5	49.8	0	A	45

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

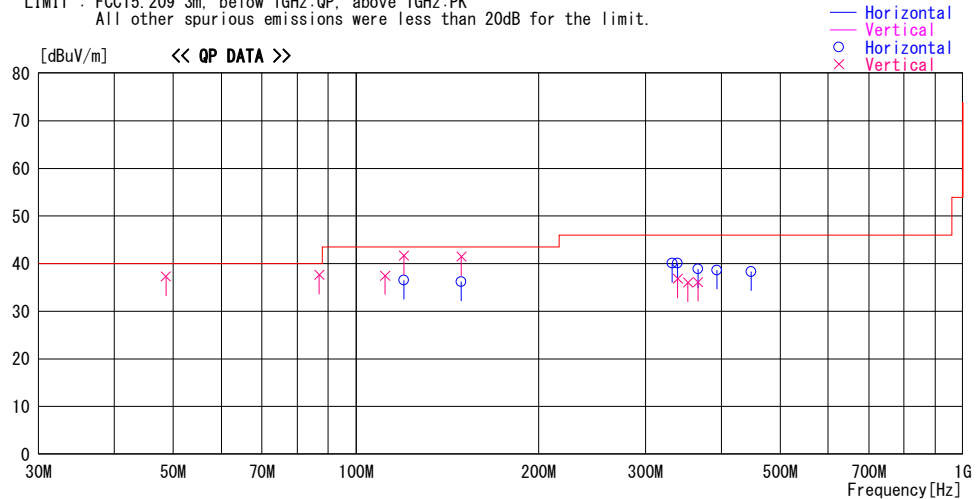
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Date : 2011/03/23

Report No. : 31GE0106-HO-02

Temp./Humi. : 22deg. C / 31% RH
Engineer : Hiroyuki Furutaka

Mode / Remarks : Tx 13.56MHz With Tag

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 Factor	Loss & Gain	Level	Angle	Height	Polar.	Limit	Margin	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
48.612	48.0	QP	11.0	-21.7	37.3	183	100	Vert.	40.0	2.7	
86.998	51.0	QP	7.7	-21.1	37.6	201	100	Vert.	40.0	2.4	
111.712	46.4	QP	12.0	-20.9	37.5	4	100	Vert.	43.5	6.0	
120.001	44.0	QP	13.2	-20.7	36.5	17	264	Hori.	43.5	7.0	
120.003	49.2	QP	13.2	-20.7	41.7	349	100	Vert.	43.5	1.8	
149.156	46.9	QP	15.0	-20.4	41.5	54	100	Vert.	43.5	2.0	
149.172	41.6	QP	15.0	-20.4	36.2	219	226	Hori.	43.5	7.3	
332.076	43.2	QP	15.8	-18.9	40.1	184	100	Hori.	46.0	5.9	
339.005	43.1	QP	15.9	-18.9	40.1	29	100	Hori.	46.0	5.9	
339.009	39.8	QP	15.9	-18.9	36.8	76	153	Vert.	46.0	9.2	
352.564	38.6	QP	16.3	-18.9	36.0	63	145	Vert.	46.0	10.0	
366.120	41.2	QP	16.6	-18.9	38.9	184	100	Hori.	46.0	7.1	
366.122	38.4	QP	16.6	-18.9	36.1	94	137	Vert.	46.0	9.9	
393.237	40.5	QP	17.1	-19.0	38.6	139	100	Hori.	46.0	7.4	
447.483	39.8	QP	17.6	-19.1	38.3	210	100	Hori.	46.0	7.7	

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)

Spurious emission

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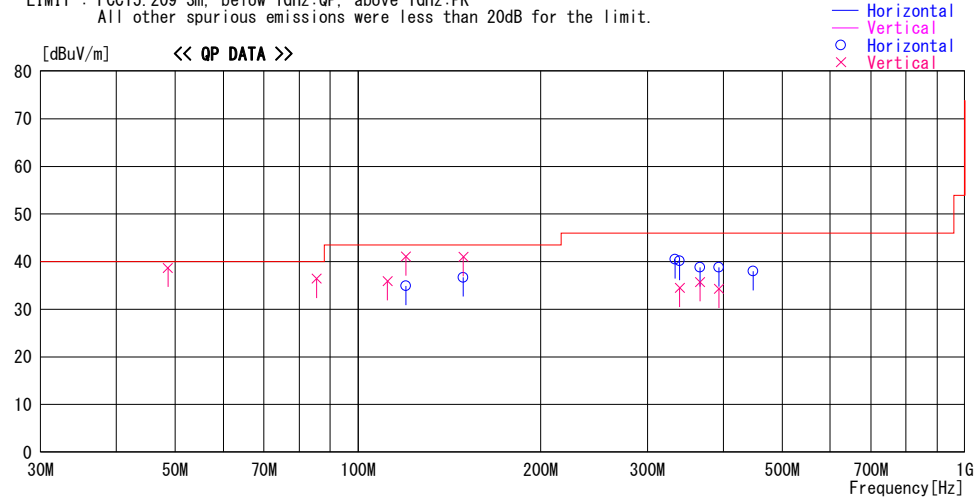
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Temp./Humi. : 22deg. C / 31% RH
Engineer : Hiroyuki Furutaka

Mode / Remarks : Tx 13.56MHz Without Tag

LIMIT : FCC15.209 3m, below 1GHz:QP, above 1GHz:PK
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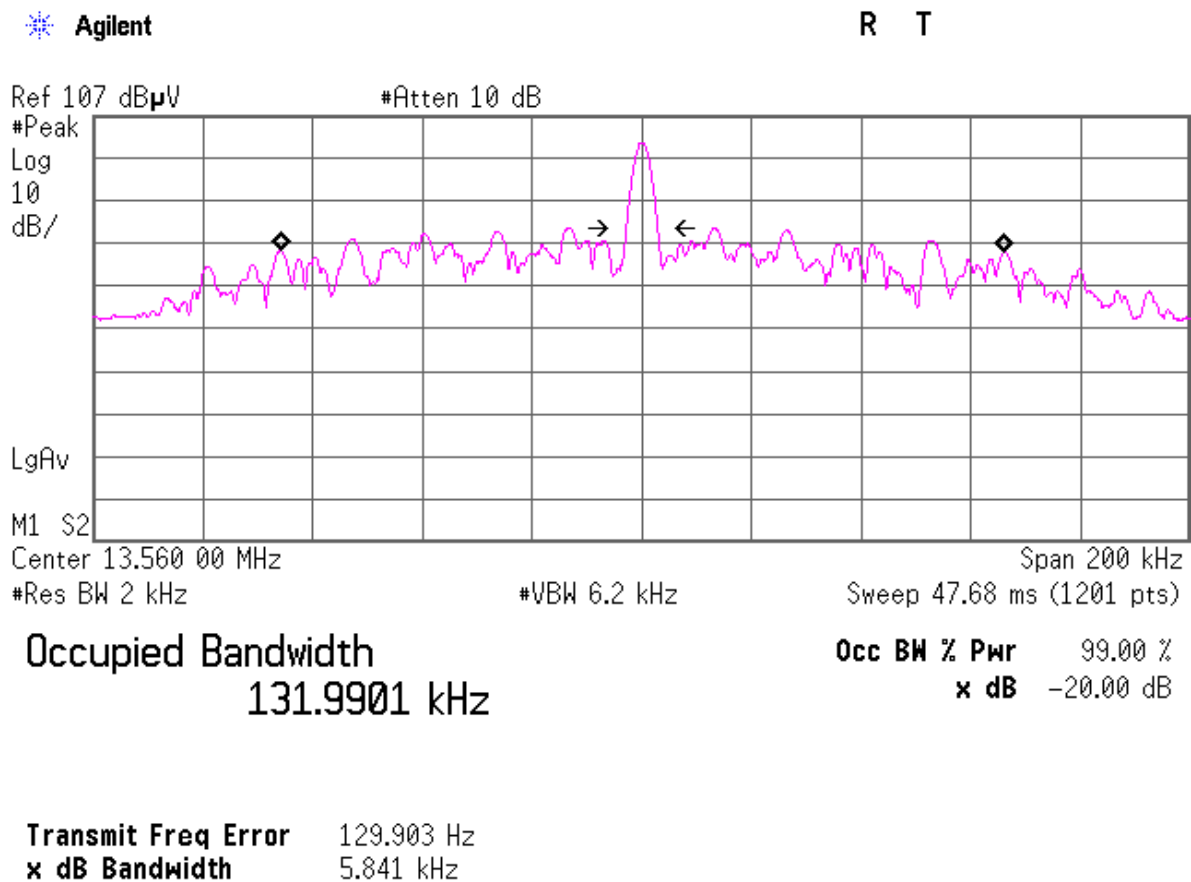
Frequency	Reading	DET	Antenna Factor	Loss & Gain	Level	Angle	Height	Polar.	Limit	Margin	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
119.998	42.4	QP	13.2	-20.7	34.9	18	297	Hori.	43.5	8.6	
149.163	42.1	QP	15.0	-20.4	36.7	230	220	Hori.	43.5	6.8	
332.884	43.6	QP	15.8	-18.9	40.5	184	100	Hori.	46.0	5.5	
339.003	43.2	QP	15.9	-18.9	40.2	26	100	Hori.	46.0	5.8	
366.122	41.1	QP	16.6	-18.9	38.8	182	100	Hori.	46.0	7.2	
393.245	40.7	QP	17.1	-19.0	38.8	148	100	Hori.	46.0	7.2	
447.483	39.5	QP	17.6	-19.1	38.0	219	100	Hori.	46.0	8.0	
48.637	49.4	QP	11.0	-21.7	38.7	6	100	Vert.	40.0	1.3	
85.511	50.2	QP	7.4	-21.2	36.4	168	100	Vert.	40.0	3.6	
111.854	44.8	QP	12.0	-20.9	35.9	349	100	Vert.	43.5	7.6	
120.001	48.6	QP	13.2	-20.7	41.1	10	100	Vert.	43.5	2.4	
149.162	46.4	QP	15.0	-20.4	41.0	74	100	Vert.	43.5	2.5	
339.001	37.5	QP	15.9	-18.9	34.5	87	100	Vert.	46.0	11.5	
366.127	38.0	QP	16.6	-18.9	35.7	96	134	Vert.	46.0	10.3	
393.240	36.2	QP	17.1	-19.0	34.3	109	134	Vert.	46.0	11.7	

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. 31GE0106-HO-02
Date 03/23/2011
Temperature/ Humidity 22 deg.C./ 31% RH
Engineer Keisuke Kawamura
Mode Tx With Tag

FREQ [MHz]	20dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
13.56	5.84	131.99



* The test was performed with a model with Tag as a representative since the model with Tag had had the worst level in pre-check.

Frequency Tolerance

Test place Head Office EMC Lab. No.6 Measurement Room
Report No. 31GE0106-HO-02
Date 03/26/2011
Temperature/ Humidity 23 deg.C./ 34%
Engineer Hiroyuki Furutaka
Mode Tx Mod off

Test Condition deg.C Volts		Test Timing	Measured freq [MHz]	Freq error [MHz]	Result [ppm]	Limit (+/- 0.01%) [+/- ppm]	Margin [ppm]
20deg.C	138V	Power on	13.56006245	0.00006245	4.61	100.00	95.39
		on 2min.	13.56005605	0.00005605	4.13	100.00	95.87
		on 5min.	13.56005458	0.00005458	4.02	100.00	95.98
		on 10min.	13.56004776	0.00004776	3.52	100.00	96.48
	120V	Power on	13.56007828	0.00007828	5.77	100.00	94.23
		on 2min.	13.56006939	0.00006939	5.12	100.00	94.88
		on 5min.	13.56006212	0.00006212	4.58	100.00	95.42
		on 10min.	13.56005764	0.00005764	4.25	100.00	95.75
	102V	Power on	13.56005084	0.00005084	3.75	100.00	96.25
		on 2min.	13.56004697	0.00004697	3.46	100.00	96.54
		on 5min.	13.56004597	0.00004597	3.39	100.00	96.61
		on 10min.	13.56004479	0.00004479	3.30	100.00	96.70
50deg.C.	120V	Power on	13.56000391	0.00000391	0.29	100.00	99.71
		on 2min.	13.55999518	-0.00000482	-0.36	100.00	99.64
		on 5min.	13.55999206	-0.00000794	-0.59	100.00	99.41
		on 10min.	13.55999004	-0.00000996	-0.73	100.00	99.27
Power on		13.56002825	0.00002825	2.08	100.00	97.92	
on 2min.		13.56001570	0.00001570	1.16	100.00	98.84	
on 5min.		13.56000961	0.00000961	0.71	100.00	99.29	
on 10min.		13.56000620	0.00000620	0.46	100.00	99.54	
Power on		13.56005795	0.00005795	4.27	100.00	95.73	
on 2min.		13.56004270	0.00004270	3.15	100.00	96.85	
on 5min.		13.56003554	0.00003554	2.62	100.00	97.38	
on 10min.		13.56003050	0.00003050	2.25	100.00	97.75	
Power on		13.56007828	0.00007828	5.77	100.00	94.23	
on 2min.		13.56006939	0.00006939	5.12	100.00	94.88	
on 5min.		13.56006212	0.00006212	4.58	100.00	95.42	
on 10min.		13.56005764	0.00005764	4.25	100.00	95.75	
10deg.C.	120V	Power on	13.56010963	0.00010963	8.08	100.00	91.92
		on 2min.	13.56010065	0.00010065	7.42	100.00	92.58
		on 5min.	13.56009676	0.00009676	7.14	100.00	92.86
		on 10min.	13.56009074	0.00009074	6.69	100.00	93.31
0deg.C.	120V	Power on	13.56011124	0.00011124	8.20	100.00	91.80
		on 2min.	13.56011655	0.00011655	8.59	100.00	91.41
		on 5min.	13.56011398	0.00011398	8.41	100.00	91.59
		on 10min.	13.56011312	0.00011312	8.34	100.00	91.66
-10deg.C.	120V	Power on	13.56008550	0.00008550	6.30	100.00	93.70
		on 2min.	13.56010899	0.00010899	8.04	100.00	91.96
		on 5min.	13.56011471	0.00011471	8.46	100.00	91.54
		on 10min.	13.56011665	0.00011665	8.60	100.00	91.40
-20deg.C	120V	Power on	13.56004557	0.00004557	3.36	100.00	96.64
		on 2min.	13.56007526	0.00007526	5.55	100.00	94.45
		on 5min.	13.56008870	0.00008870	6.54	100.00	93.46
		on 10min.	13.56009764	0.00009764	7.20	100.00	92.80
-30deg.C	120V	Power on	13.55998647	-0.00001353	-1.00	100.00	99.00
		on 2min.	13.56003264	0.00003264	2.41	100.00	97.59
		on 5min.	13.56005069	0.00005069	3.74	100.00	96.26
		on 10min.	13.56005821	0.00005821	4.29	100.00	95.71
Limit : 13.56		13.56 MHz +/-0.01 % (+/- 10ppm) = +/-0.001356 MHz					

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-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-05	Measure	PROMART	SEN1955	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE/CE	-
MTR-03	Test Receiver	Rohde & Schwarz	ESCI	100300	RE	2010/04/19 * 12
MLPA-02	Loop Antenna	Rohde & Schwarz	HFH2-Z2	836553/009	RE	2010/12/08 * 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	2010/07/20 * 12
MPA-14	Pre Amplifier	SONOMA INSTRUMENT	310	260833	RE	2011/03/04 * 12
MBA-02	Biconical Antenna	Schwarzbeck	BBA9106	VHA91032008	RE	2010/10/11 * 12
MLA-02	Logperiodic Antenna	Schwarzbeck	USLP9143	201	RE	2010/10/11 * 12
MCC-12	Coaxial Cable	Fujikura/Agilent	-	-	RE	2011/02/18 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	BK7970	RE	2010/11/05 * 12
MPA-09	Pre Amplifier	Agilent	8447D	2944A10845	RE	2010/09/09 * 12
MSA-03	Spectrum Analyzer	Agilent	E4448A	MY44020357	RE	2010/11/30 * 12
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	CE	2011/02/22 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	-	CE	2011/02/23 * 12
MJM-06	Measure	PROMART	SEN1955	-	CE	-
MSA-09	Spectrum Analyzer	Advantest	R3273	95090115	CE	2010/11/18 * 12
MTR-08	Test Receiver	Rohde & Schwarz	ESCI	100767	CE	2010/08/23 * 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
MCC-112	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W(10m)/SFM141(3m)/sucoform141-PE(1m)/421-010(1.5m)/RFM-E321(Switcher)	-/00640	CE	2010/07/23 * 12
MAT-66	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	CE	2011/02/22 * 12
MOS-14	Thermo-Hygrometer	Custom	CTH-201	-	FT	2011/02/23 * 12
MCH-04	Temperature and Humidity Chamber	Tabai Spec	PL-2KP	14015723	FT	2010/08/03 * 12
EST-45	Universal Counter	Agilent	53132A	MY40008906	FT	2010/08/09 * 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: CE: Conducted Emission
RE: Radiated Emission
FT: Frequency Tolerance

UL Japan, Inc.

Head Office EMC Lab.

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