

**APPENDIX 2: Data of EMI test**

**Conducted emission**

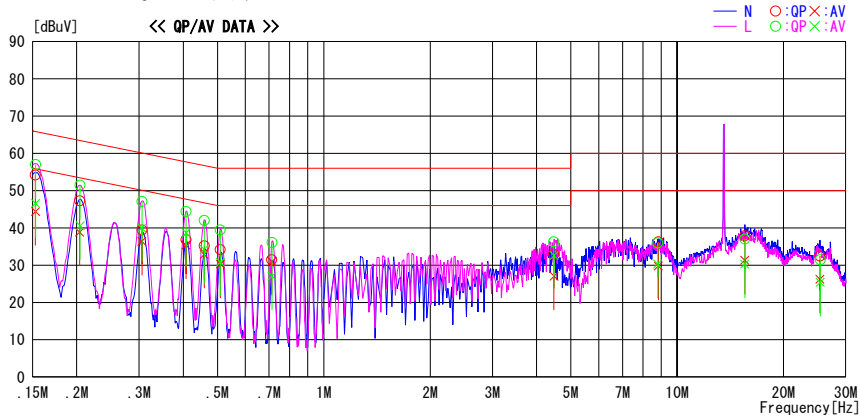
**DATA OF CONDUCTED EMISSION TEST**

UL Apex Co., Ltd. Head Office EMC Lab. No.1 Semi Anechoic Chamber  
 Date : 2006/07/20 13:24:49

Company : OMRON Corporation Report No. : 26KE0261-HO  
 Kind of EUT : Long-RangeRFID Reader/Writer, Antenna Power : AC 120V/ 60Hz (DC 24V)  
 Model No. : V720S-BC5D4A-US, V720-HS04 Temp./Humi. : 24 deg. C / 70%  
 Serial No. : SR060501, SA060501 Operator : Yutaka Yoshida

Mode / Remarks : Tx 13.56MHz (Two Gate Antenna) with antenna attached

LIMIT : FCC15C § 15.207 (QP) / RSS-Gen  
 FCC15C § 15.207 (AV) / RSS-Gen



Frequency [MHz]	Reading Level		Corr. Factor	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.15268	54.1	44.3	0.1	54.2	44.4	65.9	55.9	11.7	11.5	N	
0.20375	47.2	38.8	0.1	47.3	38.9	63.5	53.5	16.2	14.6	N	
0.30566	39.4	36.3	0.1	39.5	36.4	60.1	50.1	20.6	13.7	N	
0.40721	36.7	35.3	0.1	36.8	35.4	57.7	47.7	20.9	12.3	N	
0.45865	35.1	32.8	0.1	35.2	32.9	56.7	46.7	21.5	13.8	N	
0.50940	34.0	30.1	0.2	34.2	30.3	56.0	46.0	21.8	15.7	N	
0.71255	31.3	30.8	0.2	31.5	31.0	56.0	46.0	24.5	15.0	N	
4.48046	32.2	26.4	0.7	32.9	27.1	56.0	46.0	23.1	18.9	N	
8.84565	35.4	28.9	0.9	36.3	29.8	60.0	50.0	23.7	20.2	N	
15.53105	36.7	30.1	1.2	37.9	31.3	60.0	50.0	22.1	18.7	N	
25.35089	30.9	24.6	1.6	32.5	26.2	60.0	50.0	27.5	23.8	N	
0.15289	56.9	46.5	0.1	57.0	46.6	65.8	55.8	8.8	9.2	L	
0.20441	51.3	40.5	0.1	51.4	40.6	63.4	53.4	12.0	12.8	L	
0.30580	47.0	39.9	0.1	47.1	40.0	60.1	50.1	13.0	10.1	L	
0.40769	44.3	38.6	0.1	44.4	38.7	57.7	47.7	13.3	9.0	L	
0.45875	41.9	34.1	0.1	42.0	34.2	56.7	46.7	14.7	12.5	L	
0.50950	39.3	30.6	0.2	39.5	30.8	56.0	46.0	16.5	15.2	L	
0.71366	35.9	26.9	0.2	36.1	27.1	56.0	46.0	19.9	18.9	L	
4.48044	35.6	31.9	0.7	36.3	32.6	56.0	46.0	19.7	13.4	L	
8.80946	35.1	29.4	0.9	36.0	30.3	60.0	50.0	24.0	19.7	L	
15.53105	35.8	29.1	1.2	37.0	30.3	60.0	50.0	23.0	19.7	L	
25.39097	29.9	23.8	1.6	31.5	25.4	60.0	50.0	28.5	24.6	L	

CHART: WITH FACTOR, Peak hold data. Data is uncorrected. CALCULATION: RESULT=READING+C.F (L1SN LOSS+CABLE LOSS)  
 Except for the above table : adequate margin data below the limits.

## Conducted emission

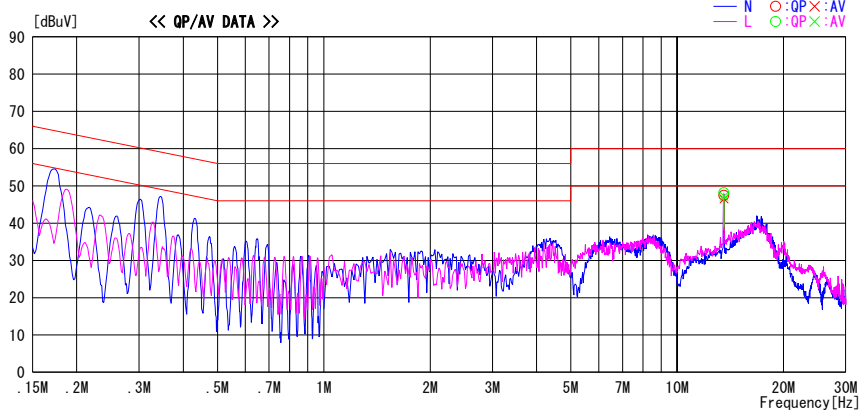
### DATA OF CONDUCTED EMISSION TEST

UL Apex Co., Ltd. Head Office EMC Lab. No.1 Semi Anechoic Chamber  
Date : 2006/07/20 14:34:24

Company : OMRON Corporation  
 Kind of EUT : Long-RangeRFID Reader/Writer, Antenna  
 Model No. : V720S-BC5D4A-US, V720-HS04  
 Serial No. : SR060501, SA060501  
 Report No. : 26KE0261-HO  
 Power : AC 120V/ 60Hz (DC 24V)  
 Temp./Humi. : 24 deg. C / 70%  
 Operator : Yutaka Yoshida

Mode / Remarks : Tx 13.56MHz (Two Gate Antenna) antenna unattached

LIMIT : FCC15C § 15.207 (QP) / RSS-Gen  
 FCC15C § 15.207 (AV) / RSS-Gen



Frequency [MHz]	Reading Level		Corr. Factor	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
13.55985	46.3	45.3	1.2	47.5	46.5	60.0	50.0	12.5	3.5	N	
13.55985	47.0	46.0	1.2	48.2	47.2	60.0	50.0	11.8	2.8	L	

CHART:WITH FACTOR, Peak hold data. Data is uncorrected. CALCURATION: RESULT=READING+C.F (L ISN LOSS+CABLE LOSS)  
 Except for the above table : adequate margin data below the limits.

**Radiated emission(Fundamental emission and Spectrum Mask)**

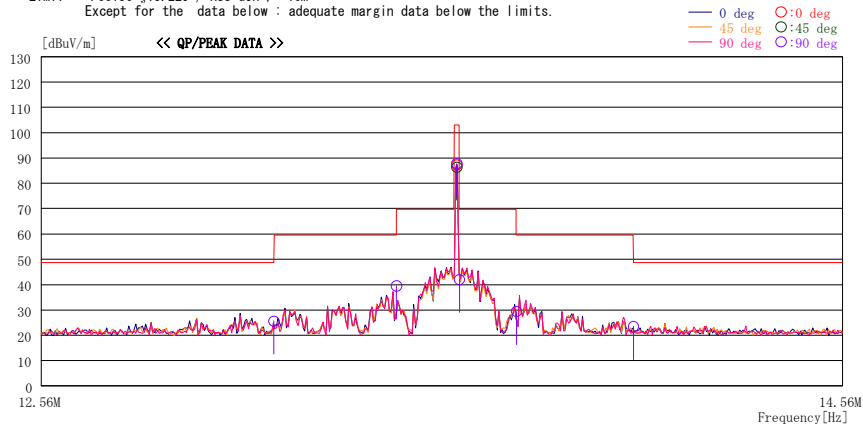
**DATA OF MAGNETIC RADIATED EMISSION TEST**

UL Apex Co., Ltd. Head Office EMC Lab. No.1 Semi Anechoic Chamber  
 Date : 2006/07/20 11:24:50

Company : OMRON Corporation Report No. : 26KE0261-HO  
 Kind of EUT : Long-RangeRFID Reader/Writer.Antenna Power : AC120V / 60Hz (DC 24V)  
 Model No. : V720S-BC5D4A-US, V720-HS04 Temp./Humi. : 24deg. C / 70%  
 Serial No. : SR060501, SA060501 Operator : Yutaka Yoshida

Mode / Remarks : Tx 13.56MHz (Two Gate Antenna) With Tag

LIMIT : FCC15C §15.225 / RSS-Gen . 10m  
 Except for the data below : adequate margin data below the limits.



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]	
13.11000	29.1	PEAK	20.4	4.0	27.9	25.6	48.6	23.0	90deg	88	RBW=1k, VBW=3k
13.41000	43.1	PEAK	20.4	4.0	27.9	39.6	59.6	20.0	90deg	88	RBW=1k, VBW=3k
13.55984	89.7	QP	20.5	4.1	27.9	86.4	103.1	16.7	45deg	120	
13.55985	90.6	QP	20.5	4.1	27.9	87.3	103.1	15.8	0deg	359	
13.55993	91.1	QP	20.5	4.1	27.9	87.8	103.1	15.3	90deg	88	MAX ANT. ANGLE
13.56700	45.3	PEAK	20.5	4.1	27.9	42.0	69.6	27.6	90deg	88	RBW=1k, VBW=3k
13.71000	32.8	PEAK	20.5	4.1	27.9	29.5	59.6	30.1	90deg	88	RBW=1k, VBW=3k
14.01000	26.8	PEAK	20.5	4.1	27.9	23.5	48.6	25.1	90deg	88	RBW=1k, VBW=3k

CHART : WITH FACTOR ANT TYPE : LOOP  
 CALCULATION : READING + ANT FACTOR + LOSS ( CABLE + ATTEN. -AMP. )

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**Radiated emission (Spurious emission : below 30MHz)**

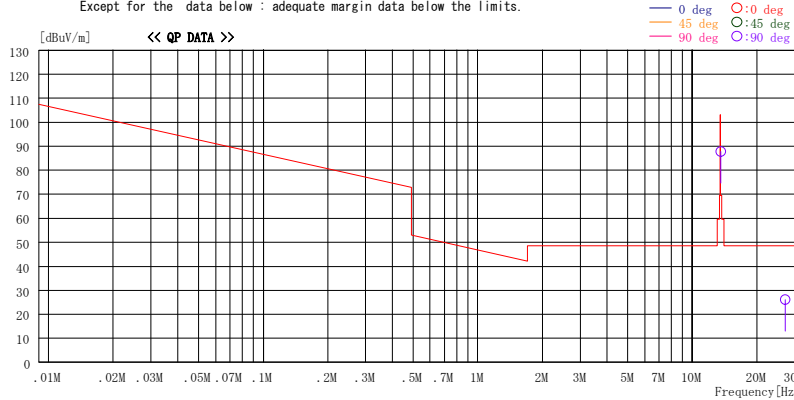
**DATA OF MAGNETIC RADIATED EMISSION TEST**

UL Apex Co., Ltd. Head Office EMC Lab. No.1 Semi Anechoic Chamber  
 Date : 2006/07/20 12:02:13

Company : OMRON Corporation Report No. : 26KE0261-HO  
 Kind of EUT : Long-RangeRFID Reader/Writer, Antenna Power : AC120V / 60Hz (DC 24V)  
 Model No. : V720S-BC5D4A-US, V720-HS04 Temp./Humi. : 24deg. C / 70%  
 Serial No. : SR060501, SA060501 Operator : Yutaka Yoshida

Mode / Remarks : Tx 13.56MHz (Two Gate Antenna) With Tag

LIMIT : FCC15C §15.225 / RSS-Gen . 10m  
 Except for the data below : adequate margin data below the limits.



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]	
13.55993	91.1	QP	20.5	4.1	27.9	87.8	103.1	15.3	90deg	88	
27.12000	28.3	QP	21.3	4.6	28.0	26.2	48.6	22.4	90deg	359	

CHART : WITH FACTOR ANT TYPE : LOOP  
 CALCULATION : READING + ANT FACTOR + LOSS ( CABLE + ATTEN. -AMP.)

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**Radiated emission (Spurious emission: above 30MHz)**

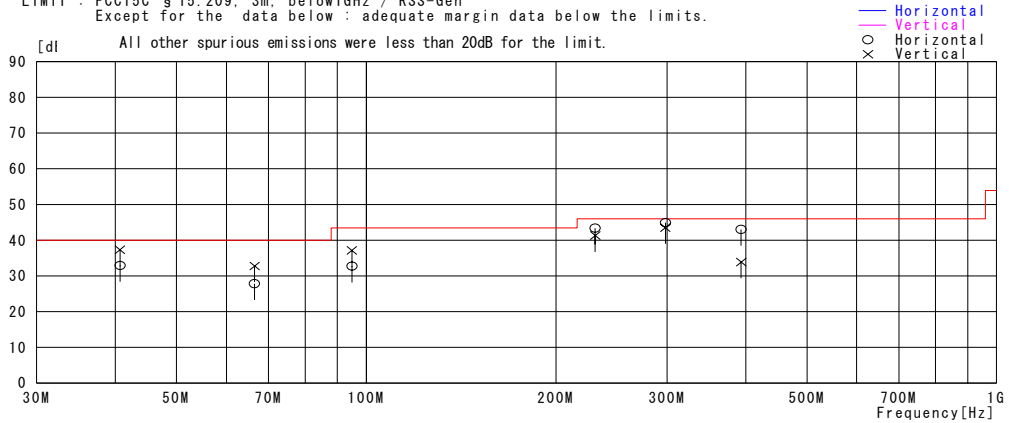
**DATA OF RADIATED EMISSION TEST**

UL Apex Co., Ltd. Head Office EMC Lab. No.1 Semi Anechoic Chamber  
 Date : 2006/07/19 00:28:49

Company : OMRON Corporation Report No. : 26KE0261-HO  
 Kind of EUT : Long-RangeRFID Reader/Writer, Antenna Power : AC120V/60Hz (DC 24V)  
 Model No. : V720S-BC5D4A-US, V720-HS04 Temp./Humi. : 24deg.C / 62%  
 Serial No. : SR060501, SA060501 Operator : Yasuyuki Fukui

Mode / Remarks : Tx 13.56MHz (Tow Gate Antenna) With Tag

LIMIT : FCC15C § 15.209, 3m, below1GHz / RSS-Gen  
 Except for the data below : adequate margin data below the limits.



Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss &	Level	Angle	Height	Polar.	Limit	Margin
			Factor	Gain						
			[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]
40.681	39.7	OP	13.7	-20.4	33.0	178	300	Hori.	40.0	7.0
40.681	44.0	OP	13.7	-20.4	37.3	92	100	Vert.	40.0	2.7
66.488	40.0	OP	7.5	-19.7	27.8	30	315	Hori.	40.0	12.2
66.488	45.0	OP	7.5	-19.7	32.8	71	100	Vert.	40.0	7.2
94.914	42.3	OP	9.6	-19.2	32.7	210	198	Hori.	43.5	10.8
94.914	46.7	OP	9.6	-19.2	37.1	41	100	Vert.	43.5	6.4
230.741	43.3	OP	17.2	-17.2	43.3	224	140	Hori.	46.0	2.7
230.741	41.3	OP	17.2	-17.2	41.3	319	100	Vert.	46.0	4.7
298.319	41.3	OP	20.4	-16.7	45.0	192	113	Hori.	46.0	1.0
298.319	39.9	OP	20.4	-16.7	43.6	217	100	Vert.	46.0	2.5
393.234	42.0	OP	17.5	-16.5	43.0	308	110	Hori.	46.0	3.0
393.234	32.9	OP	17.5	-16.5	33.9	179	100	Vert.	46.0	12.1

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)

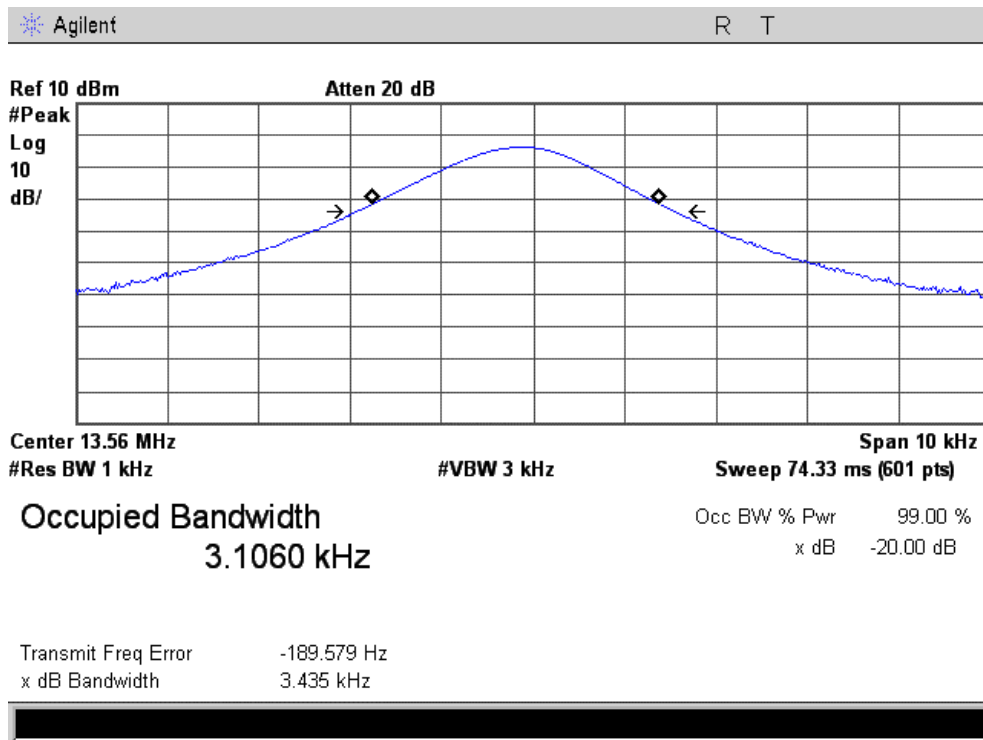
**-20dB Bandwidth**

UL Apex Co., Ltd.  
Head Office EMC Lab. No.7 Measurement Room

COMPANY : OMRON Corporation  
EQUIPMENT : Long-RangeRFID Reader/Writer  
MODEL : V720S-BC5D4A  
S/ N : SR060501  
POWER : AC120V/60Hz (DC24V)  
MODE : Tx 13.56MHz

REPORT NO : 26KE0261-HO  
REGULATION : FCC 15.225  
TEST DISTANCE : -  
DATE : 08/01/2006  
TEMPERATURE : 26 deg.C.  
HUMIDITY : 60 %  
ENGINEER : Hiroka.Umeyama

FREQ [MHz]	-20dB Bandwidth [kHz]
13.56	3.44



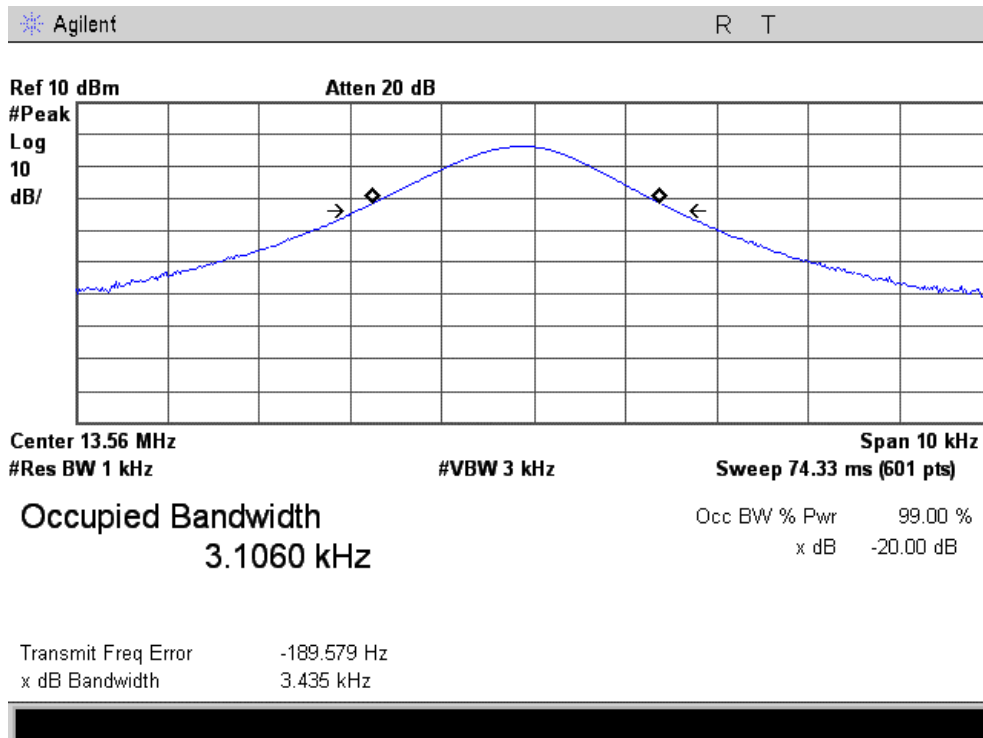
### 99% Occpied Bandwidth

UL Apex Co., Ltd.  
Head Office EMC Lab. No.7 Measurement Room

COMPANY : OMRON Corporation  
EQUIPMENT : Long-RangeRFID Reader/Writer  
MODEL : V720S-BC5D4A  
S/ N : SR060501  
POWER : AC120V/60Hz (DC24V)  
MODE : Tx 13.56MHz

REPORT NO : 26KE0261-HO  
REGULATION : RSS-Gen 4.4.1  
TEST DISTANCE : -  
DATE : 08/01/2006  
TEMPERATURE : 26 deg.C.  
HUMIDITY : 60 %  
ENGINEER : Hiroka.Umeyama

FREQ [MHz]	99% Occpied Bandwidth [kHz]
13.56	3.11



**Frequency Tolerance**

UL Apex Co., Ltd.  
Head Office EMC Lab. No.7 Measurement Room

COMPANY : OMRON Corporation  
EQUIPMENT : Long-RangeRFID Reader/Writer  
MODEL : V720S-BC5D4A  
S/N : SR060501  
POWER : AC120V/60Hz (DC24V)  
MODE : Tx 13.56MHz

REPORT NO : 26KE0261-HO  
REGULATION : FCC 15.225 (e)  
TEST DISTANCE : -  
DATE : 08/01/2006  
TEMPERATURE : 26 deg.C.  
HUMIDITY : 60 %  
ENGINEER : Hiroka.Umeyama

Test Condition	Test Timing	Measured freq [MHz]	Freq error [MHz]	Result [ppm]	Limit (+/- 0.01%) [+/- ppm]	Margin [ppm]
T nom 20deg.C Vmax AC138V (115%)	Power on	13.55986700	-0.00013300	-9.81	100.00	90.19
	on 2min.	13.55986600	-0.00013400	-9.88	100.00	90.12
	on 5min.	13.55986200	-0.00013800	-10.18	100.00	89.82
	on 10min.	13.55985100	-0.00014900	-10.99	100.00	89.01
T nom 20deg.C Vnom AC120V (100%)	Power on	13.55986900	-0.00013100	-9.66	100.00	90.34
	on 2min.	13.55986800	-0.00013200	-9.73	100.00	90.27
	on 5min.	13.55986100	-0.00013900	-10.25	100.00	89.75
	on 10min.	13.55985200	-0.00014800	-10.91	100.00	89.09
T nom 20deg.C Vmin AC102V (85%)	Power on	13.55987100	-0.00012900	-9.51	100.00	90.49
	on 2min.	13.55986700	-0.00013300	-9.81	100.00	90.19
	on 5min.	13.55986000	-0.00014000	-10.32	100.00	89.68
	on 10min.	13.55985000	-0.00015000	-11.06	100.00	88.94
T max 50°C Vnom AC120V (100%)	Power on	13.55985200	-0.00014800	-10.91	100.00	89.09
	on 2min.	13.55985200	-0.00014800	-10.91	100.00	89.09
	on 5min.	13.55984300	-0.00015700	-11.58	100.00	88.42
	on 10min.	13.55984200	-0.00015800	-11.65	100.00	88.35
T min -20deg.C Vnom AC120V (100%)	Power on	13.56005900	0.00005900	4.35	100.00	95.65
	on 2min.	13.56006000	0.00006000	4.42	100.00	95.58
	on 5min.	13.56005100	0.00005100	3.76	100.00	96.24
	on 10min.	13.56004900	0.00004900	3.61	100.00	96.39
T min -30deg.C Vnom AC120V (100%) *(IC only)	Power on	13.56001100	0.00001100	0.81	100.00	99.19
	on 2min.	13.56004300	0.00004300	3.17	100.00	96.83
	on 5min.	13.56005900	0.00005900	4.35	100.00	95.65
	on 10min.	13.56006200	0.00006200	4.57	100.00	95.43

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

\* For IC application (RSS-Gen 4.5 requirement)



### **APPENDIX 3: Test instruments**

#### **EMI test equipment**

<b>Control No.</b>	<b>Instrument</b>	<b>Manufacturer</b>	<b>Model No</b>	<b>Test Item</b>	<b>Calibration Date * Interval(month)</b>
MAEC-01	Anechoic Chamber	TDK	Semi Anechoic Chamber 10m	RE/CE/ME	2005/11/14 * 12
MOS-01	Digital Humidity Indicator	N.T	NT-1800	RE/CE/ME	2004/11/25 * 24
MSTW-14	EMI measurement program	TSJ	TEPTO-DV	RE/CE/ME	-
MTR-01	Test Receiver	Rohde & Schwarz	ESI40	RE/CE/ME	2005/11/10 * 12
MBA-01	Biconical Antenna	Schwarzbeck	BBA9106	RE	2005/10/10 * 12
MLA-01	Logperiodic Antenna	Schwarzbeck	USLP9143	RE	2005/10/14 * 12
MAT-06	Attenuator(6dB)	Weinschel Corp	2	RE	2005/12/16 * 12
MCC-01	Coaxial Cable 0.1-3000MHz	Suhner/storm/Agilent/TSJ	-	RE	2006/02/20 * 12
MPA-04	Pre Amplifier	Agilent	8447D	RE/ME	2006/05/27 * 12
MOS-02	Digital Humidity Indicator	N.T	NT-1800	RE/CE/ME	2004/11/25 * 24
MLPA-02	Loop Antenna	Rohde & Schwarz	HFH2-Z2	ME	2005/12/06 * 12
MAT-02	Attenuator(3dB)	Weinschel Corp	2	ME	2005/12/16 * 12
MCC-03	Coaxial Cable	Fujikura/Suhner/Agilent/TSJ	-	CE/ME	2005/12/18 * 12
MCC-30	coaxial cable	ULApex	-	ME	2006/05/29 * 12
MLS-02	LISN(AMN)	Schwarzbeck	NSLK8127	CE(EUT)	2006/06/01 * 12
MLS-03	LISN(AMN)	Schwarzbeck	NSLK8127	CE(AE)	2006/06/01 * 12
MTA-08	Terminator	NMC	TE-782	CE	2006/02/06 * 12
MSA-06	Spectrum Analyzer	Agilent	E4407B	BW/FT	2006/05/24 * 12
MAT-16	Attenuator(40dB)_9k-12.4GHz_N	Weinschel Corp	MODEL 1	BW/FT	2006/01/10 * 12
MCH-01	Temperature and Humidity Chamber	Tabai Espec	PL-2KP	FT	2005/12/19 * 12

All equipment is calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

#### **Test Item:**

- CE : Conducted emission**
- RE : Radiated emission**
- FT : Frequency Tolerance**
- BW : -20dB Bandwidth and 99% Occupied Bandwidth**

**UL Apex Co., Ltd.**

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MF060b(14.06.06)