

APPENDIX 1: Data of Radio tests

DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2012/02/10

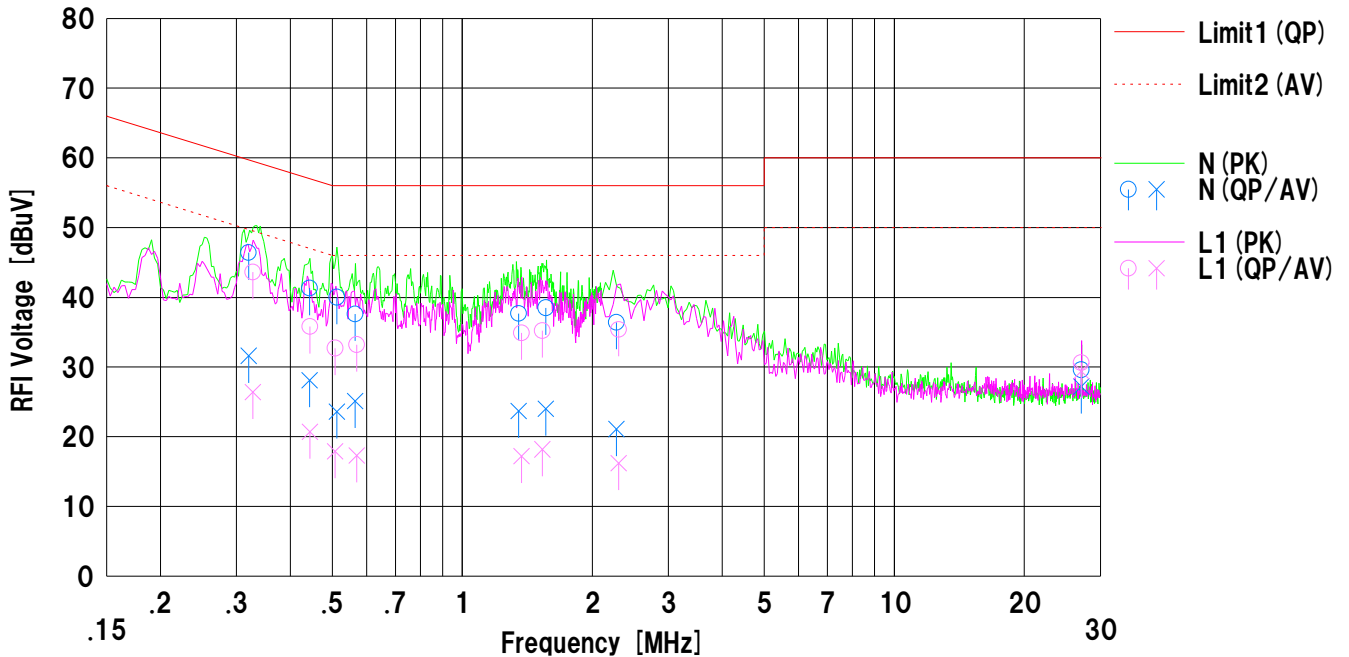
Company : YOSHIKAWA RF SYSTEM Co., Ltd
Kind of EUT : HF RW for SWS
Model No. : YRCRR12
Serial No. : RRS11106A0005

Mode : Transmitting, 13.56MHz (CH2)
Report No. : 31HE0194-HO-01-A
Power : AC120V/60Hz Single phase
Temp./Humi. : 22deg.C. / 20%RH

Remarks : -

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV

Engineer : Hikaru Shirasawa



No.	Freq. [MHz]	Reading		C.Fac [dB]	Results		Limit		Margin		Phase	Comment
		<QP>	<AV>		<QP>	<AV>	<QP>	<AV>	<QP>	<AV>		
		[dBuV]	[dBuV]		[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.32002	33.8	19.0	12.6	46.4	31.6	59.7	49.7	13.3	18.1	N	
2	0.44336	28.7	15.5	12.6	41.3	28.1	56.9	46.9	15.6	18.8	N	
3	0.51248	27.4	11.0	12.6	40.0	23.6	56.0	46.0	16.0	22.4	N	
4	0.56488	25.0	12.5	12.6	37.6	25.1	56.0	46.0	18.4	20.9	N	
5	1.35036	25.1	11.1	12.6	37.7	23.7	56.0	46.0	18.3	22.3	N	
6	1.56062	25.9	11.4	12.6	38.5	24.0	56.0	46.0	17.5	22.0	N	
7	2.27627	23.7	8.4	12.7	36.4	21.1	56.0	46.0	19.6	24.9	N	
8	27.12000	16.0	13.6	13.6	29.6	27.2	60.0	50.0	30.4	22.8	N	
9	0.32771	31.1	13.9	12.5	43.6	26.4	59.5	49.5	15.9	23.1	L1	
10	0.44393	23.2	8.1	12.6	35.8	20.7	56.9	46.9	21.1	26.2	L1	
11	0.50792	20.1	5.3	12.6	32.7	17.9	56.0	46.0	23.3	28.1	L1	
12	0.56937	20.6	4.7	12.6	33.2	17.3	56.0	46.0	22.8	28.7	L1	
13	1.37035	22.3	4.6	12.6	34.9	17.2	56.0	46.0	21.1	28.8	L1	
14	1.53187	22.6	5.6	12.6	35.2	18.2	56.0	46.0	20.8	27.8	L1	
15	2.30201	22.7	3.5	12.7	35.4	16.2	56.0	46.0	20.6	29.8	L1	
16	27.12000	17.0	15.8	13.6	30.6	29.4	60.0	50.0	29.4	20.6	L1	

Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN+Cable+ATT) [dB]
LISN: SLS-05

Data of Field Strength and Outside Filed Strength: FCC15.225(a)(b)(c)

UL Japan, Inc.
Shonan EMC Lab., No.3 Semi-Anechoic Chamber

Company: YOSHIKAWA RF SYSTEM Co., Ltd	Regulation: FCC Part15 SupartC 15.225
Equipment: HF RW for SWS	Test Distance: 3m
Model: YRCRR12	Date: February 10, 2012
Sample No.: RRS11106A0005	Temperature: 22deg.C
Power: AC120V/60Hz	Humidity: 20% RH
Mode: Transmitting 13.56MHz	ENGINEER: Hikaru Shirasawa
Worst Antenna: CH2	

Remarks: : Vertical polarization (antenna angle) of the worst case: 135deg

Field strength

No.	FREQ [MHz]	Test Receiver Reading		Antenna Factor [dB/m]	LOSS [dB]	AMP GAIN [dB]	RESULT		LIMIT (3m) [dBuV/m]	MARGIN	
		Hor [dBuV]	Ver [dBuV]				Hor [dBuV/m]	Ver [dBuV/m]		Hor [dB]	Ver [dB]
1	13.560	70.9	60.5	19.0	6.3	32.2	64.0	53.6	123.9	59.9	70.3

Calculation: Result[dBuV/m]=Reading[dBuV]+Ant.Fac[dB/m]+Loss(Cable+ATT)[dB]-Gain(AMP)[dB]

Field strength of 13.553MHz to 13.567MHz Limit(3m) = 83.9dBuV/m + 40log 30m/3m
= 123.9dBuV/m (FCC15.225(a))

Outside Field strength

No.	FREQ [MHz]	Test Receiver Reading		Antenna Factor [dB/m]	LOSS [dB]	AMP GAIN [dB]	RESULT		LIMIT (3m) [dBuV/m]	MARGIN	
		Hor [dBuV]	Ver [dBuV]				Hor [dBuV/m]	Ver [dBuV/m]		Hor [dB]	Ver [dB]
1	13.110	30.9	30.9	19.1	6.3	32.2	24.1	24.1	69.5	45.4	45.4
2	13.410	34.2	31.0	19.0	6.3	32.2	27.3	24.1	80.5	53.2	56.4
3	13.553	59.4	48.6	19.0	6.3	32.2	52.5	41.7	90.4	37.9	48.7
4	13.567	54.2	43.7	19.0	6.3	32.2	47.3	36.8	90.4	43.1	53.6
5	13.710	33.5	30.9	19.0	6.3	32.2	26.6	24.0	80.5	53.9	56.5
6	14.010	31.0	31.0	18.9	6.3	32.2	24.0	24.0	69.5	45.5	45.5

Calculation: Result[dBuV/m]=Reading[dBuV]+Ant.Fac[dB/m]+Loss(Cable+ATT)[dB]-Gain(AMP)[dB]

Outside filed strength frequencies

- filed strength band $F_c \pm 7\text{kHz}$: 13.553MHz to 13.567MHz
 - Outside filde strength $F_c \pm 150\text{kHz}$: 13.410MHz to 13.710MHz
 - Outside filde strength $F_c \pm 450\text{kHz}$: 13.110MHz to 14.010MHz
- $F_c = 13.56\text{MHz}$

Limits (3m)

- 13.410MHz to 13.553MHz and 13.567MHz to 13.710MHz : $50.5\text{dBuV/m} + 40\log 30\text{m}/3\text{m} = 90.5\text{dBuV/m}$ (FCC15.225(b))
- 13.110MHz to 14.010MHz and 13.710MHz to 14.010MHz : $40.5\text{dBuV/m} + 40\log 30\text{m}/3\text{m} = 80.5\text{dBuV/m}$ (15.225(c))
- Below 13.110MHz and Above 14.010MHz : $29.5\text{dBuV/m} + 40\log 30\text{m}/3\text{m} = 69.5\text{dBuV/m}$ (FCC15.225(d)and FCC15.209)

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Radiated Emission

UL Japan, Inc.
Shonan EMC Lab., No.3 Semi-Anechoic Chamber

Company: YOSHIKAWA RF SYSTEM Co., Ltd
Equipment: HF RW for SWS
Model: YRCRR12
Sample No.: RRS11106A0005
Power: AC120V/60Hz
Mode: Transmitting 13.56MHz
Below 30MHz (Worst Antenna: CH2)
Above 30MHz (Worst Antenna: CH1)

Regulation: FCC Part15 SupartC 15.225
Test Distance 3m
Date: February 10, 2012
Temperature: 22deg.C
Humidity: 20% RH
ENGINEER: Hikaru Shirasawa

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	27.12	QP	31.6	19.3	6.5	32.2	25.2	69.5	44.3	-	0	
Hori.	284.75	QP	46.8	18.5	8.5	32.0	41.8	46.0	4.2	174	169	
Hori.	311.87	QP	50.0	14.3	8.7	31.9	41.1	46.0	4.9	204	172	
Hori.	569.50	QP	44.5	18.6	9.7	31.9	40.9	46.0	5.1	100	187	
Vert.	27.12	QP	30.5	19.3	6.5	32.2	24.1	69.5	45.4	-	345	
Vert.	135.59	QP	47.6	14.0	7.4	32.1	36.9	43.5	6.6	100	283	
Vert.	162.72	QP	51.3	15.3	7.8	32.0	42.4	43.5	1.1	100	89	
Vert.	189.83	QP	45.2	15.9	7.8	32.0	36.9	43.5	6.6	100	0	
Vert.	284.75	QP	47.2	18.5	8.5	32.0	42.2	46.0	3.8	100	174	
Vert.	796.14	QP	34.3	21.1	10.4	31.6	34.2	46.0	11.8	100	168	

Result = Reading + Ant Factor + Loss (Cable+Attenuator) - Gain(Amplifier)

*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).

Data of Frequency Tolerance: FCC 15.225(e) (1/3)

UL Japan, Inc.
Shonan EMC Lab. No.5 Shielded room

Company: YOSHIKAWA RF SYSTEM Co., Ltd
Equipment: HF RW for SWS
Model: YRCRR12
Sample No.: RRS11106A0005
Power: AC120V/60Hz
Mode: Transmitting 13.56MHz
Worst Antenna: CH2

Regulation: FCC Part15 SupartC 15.225
Date: February 13, 2012
Temperature: 23deg.C
Humidity: 31%RH
ENGINEER: Hikaru Shirasawa

Temperature Variation: 50deg.C

Test Conditions	Original Frequency (MHz)	Measured Frequency (MHz)	Frequency Error (MHz)	Frequency Tolerance (%)	Limit (%)
startup	13.56	13.559346	-0.000654	-0.00482	0.01
after 2minutes	13.56	13.559338	-0.000662	-0.00488	0.01
after 5minutes	13.56	13.559337	-0.000663	-0.00489	0.01
after 10minutes	13.56	13.559336	-0.000664	-0.00490	0.01

Temperature Variation: 40deg.C

Test Conditions	Original Frequency (MHz)	Measured Frequency (MHz)	Frequency Error (MHz)	Frequency Tolerance (%)	Limit (%)
startup	13.56	13.559375	-0.000625	-0.00461	0.01
after 2minutes	13.56	13.559362	-0.000638	-0.00471	0.01
after 5minutes	13.56	13.559358	-0.000642	-0.00473	0.01
after 10minutes	13.56	13.559356	-0.000644	-0.00475	0.01

Temperature Variation: 30deg.C

Test Conditions	Original Frequency (MHz)	Measured Frequency (MHz)	Frequency Error (MHz)	Frequency Tolerance (%)	Limit (%)
startup	13.56	13.559406	-0.000594	-0.00438	0.01
after 2minutes	13.56	13.559395	-0.000605	-0.00446	0.01
after 5minutes	13.56	13.559391	-0.000609	-0.00449	0.01
after 10minutes	13.56	13.559388	-0.000612	-0.00451	0.01

Temperature Variation: 20deg.C

Test Conditions	Original Frequency (MHz)	Measured Frequency (MHz)	Frequency Error (MHz)	Frequency Tolerance (%)	Limit (%)
startup	13.56	13.559447	-0.000553	-0.00408	0.01
after 2minutes	13.56	13.559433	-0.000567	-0.00418	0.01
after 5minutes	13.56	13.559427	-0.000573	-0.00423	0.01
after 10minutes	13.56	13.559425	-0.000575	-0.00424	0.01

Data of Frequency Tolerance: FCC 15.225(e) (2/3)

UL Japan, Inc.

Shonan EMC Lab. No.5 Shielded room

Company: YOSHIKAWA RF SYSTEM Co., Ltd
Equipment: HF RW for SWS
Model: YRCRR12
Sample No.: RRS11106A0005
Power: AC120V/60Hz
Mode: Transmitting 13.56MHz
Worst Antenna: CH2

Regulation: FCC Part15 SupartC 15.225

Date: February 13, 2012

Temperature: 23deg.C

Humidity: 31%RH

ENGINEER: Hikaru Shirasawa

Temperature Variation: 10deg.C

Test Conditions	Original Frequency (MHz)	Measured Frequency (MHz)	Frequency Error (MHz)	Frequency Tolerance (%)	Limit (%)
startup	13.56	13.559477	-0.000523	-0.00386	0.01
after 2minutes	13.56	13.559465	-0.000535	-0.00395	0.01
after 5minutes	13.56	13.559461	-0.000539	-0.00397	0.01
after 10minutes	13.56	13.559459	-0.000541	-0.00399	0.01

Temperature Variation: 0deg.C

Test Conditions	Original Frequency (MHz)	Measured Frequency (MHz)	Frequency Error (MHz)	Frequency Tolerance (%)	Limit (%)
startup	13.56	13.559490	-0.000510	-0.00376	0.01
after 2minutes	13.56	13.559487	-0.000513	-0.00378	0.01
after 5minutes	13.56	13.559485	-0.000515	-0.00380	0.01
after 10minutes	13.56	13.559484	-0.000516	-0.00381	0.01

Temperature Variation: -10deg.C

Test Conditions	Original Frequency (MHz)	Measured Frequency (MHz)	Frequency Error (MHz)	Frequency Tolerance (%)	Limit (%)
startup	13.56	13.559479	-0.000521	-0.00384	0.01
after 2minutes	13.56	13.559488	-0.000512	-0.00378	0.01
after 5minutes	13.56	13.559489	-0.000511	-0.00377	0.01
after 10minutes	13.56	13.559490	-0.000510	-0.00376	0.01

Temperature Variation: -20deg.C

Test Conditions	Original Frequency (MHz)	Measured Frequency (MHz)	Frequency Error (MHz)	Frequency Tolerance (%)	Limit (%)
startup	13.56	13.559434	-0.000566	-0.00417	0.01
after 2minutes	13.56	13.559462	-0.000538	-0.00397	0.01
after 5minutes	13.56	13.559468	-0.000532	-0.00392	0.01
after 10minutes	13.56	13.559470	-0.000530	-0.00391	0.01

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Data of Frequency Tolerance: FCC 15.225(e) (3/3)

UL Japan, Inc.
Shonan EMC Lab. No.5 Shielded room

Company: YOSHIKAWA RF SYSTEM Co., Ltd
Equipment: HF RW for SWS
Model: YRCRR12
Sample No.: RRS11106A0005
Power: AC120V/60Hz
Mode: Transmitting 13.56MHz
Worst Antenna: CH2

Regulation: FCC Part15 SupartC 15.225
Date: February 13, 2012
Temperature: 23deg.C
Humidity: 31%RH
ENGINEER: Hikaru Shirasawa

Input Voltage:AC102V (85%)

Temperature Variation: 20deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency Tolerance (%)	Limit (%)
startup	13.56	13.559438	-0.000562	-0.00414	0.01
after 2minutes	13.56	13.559427	-0.000573	-0.00423	0.01
after 5minutes	13.56	13.559425	-0.000575	-0.00424	0.01
after 10minutes	13.56	13.559423	-0.000577	-0.00426	0.01

Input Voltage:AC138V (115%)

Temperature Variation: 20deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency Tolerance (%)	Limit (%)
startup	13.56	13.559438	-0.000562	-0.00414	0.01
after 2minutes	13.56	13.559427	-0.000573	-0.00423	0.01
after 5minutes	13.56	13.559424	-0.000576	-0.00425	0.01
after 10minutes	13.56	13.559423	-0.000577	-0.00426	0.01

20dB bandwidth & 99% Occupied bandwidth: FCC 15.215 / RSS-Gen

UL Japan, Inc.

Shonan EMC Lab. No.5 Shielded room

Company: YOSHIKAWA RF SYSTEM Co., Ltd
Equipment: HF RW for SWS
Model: YRCRR12
Sample No.: RRS11106A0005
Power: AC120V/60Hz
Mode: Transmitting 13.56MHz
Worst Antenna: CH2

Regulation: FCC Part15 Subpart C 15.215

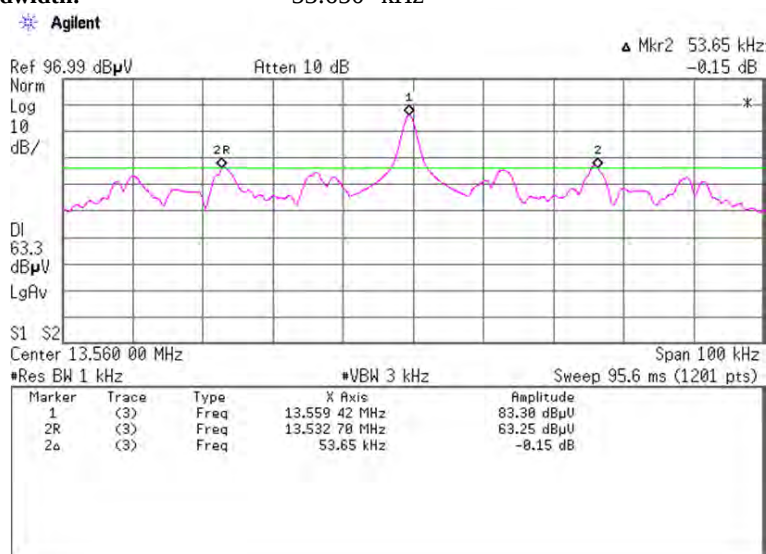
Date: February 13, 2012

Temperature: 23deg.C

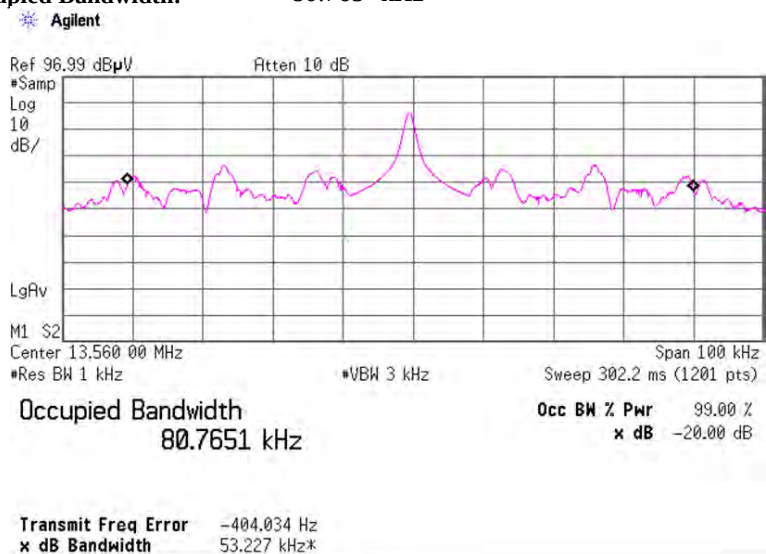
Humidity: 31%RH

ENGINEER: Hikaru Shirasawa

20dB Bandwidth: 53.650 kHz



99% Occupied Bandwidth: 80.765 kHz



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APPENDIX 2

Test Instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SAF-03	Pre Amplifier	SONOMA	310N	290213	RE	2011/02/17 * 12
SAT6-03	Attenuator	JFW	50HF-006N	-	RE	2011/02/17 * 12
SBA-03	Biconical Antenna	Schwarzbeck	BBA9106	91032666	RE	2011/10/23 * 12
SCC-C1/C2/C3/C4/C5/C10/SRSE-03	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-271 (RF Selector)	RE	2011/04/28 * 12
SLA-03	Logperiodic Antenna	Schwarzbeck	UHALP9108A	UHALP 9108-A 0901	RE	2011/10/23 * 12
SOS-05	Humidity Indicator	A&D	AD-5681	4062518	RE	2012/02/06 * 12
STR-01	Test Receiver	Rohde & Schwarz	ESU40	100093	RE	2011/10/22 * 12
SJM-10	Measure	PROMART	SEN1935	-	RE	-
SAEC-03(NSA)	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	RE	2011/09/23 * 12
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE,RF,IMF)	-	RE	-
SLP-02	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100218	RE	2011/10/19 * 12
SAT6-07	Attenuator	JFW	50HF-006N	-	RE	2011/02/17 * 12
SCC-C9/C10/SRSE-03	Coaxial Cable&RF Selector	Suhner/Suhner/TOYO	RG223U/141PE/NS4906	-/0901-271 (RF Selector)	CE	2011/04/28 * 12
SLS-05	LISN	Rohde & Schwarz	ENV216	100516	CE(EUT)	2011/02/23 * 12
SAT3-06	Attenuator	JFW	50HF-003N	-	CE	2011/02/17 * 12
SOS-06	Humidity Indicator	A&D	AD-5681	4062118	CE	2011/03/02 * 12
SLS-04	LISN	Rohde & Schwarz	ENV216	100514	CE(AE)	2011/02/23 * 12
STM-04	Terminator	TME	CT-01 BP	-	CE	2012/01/05 * 12
SSA-03	Spectrum Analyzer	Agilent	E4448A	MY48250152	FT	2011/12/05 * 12
SFC-01	Microwave Counter	Agilent	53151A	US40511493	FT	2011/03/01 * 12
SCH-01	Temperature and Humidity Chamber	Espec	PL-1KT	14020837	FT	2011/04/06 * 12
SOS-09	Humidity Indicator	A&D	AD-5681	4061484	FT	2011/03/02 * 12
SSP-01	Search Probe	Nisshin Electric	NSP-01	-	FT	-

The expiration date of the calibration is the end of the expired month .
 As for some calibrations performed after the tested dates , those test equipment have been controlled by means of an unbroken chains of calibrations .

All equipment is calibrated with valid calibrations . Each measurement data is traceable to the national or international standards .

Test Item :

CE: Conducted emission ,
 RE: Radiated emission ,
 FT: Frequency Tolerance ,