



RADIO TEST REPORT

Test Report No.: 32DE0235-HO-E

Applicant : SAMSUNG ELECTRONICS CO., LTD.
Type of Equipment : GSM/GPRS 1900 Phone with 802.11abgn, BT3.0 (EDR)
Model No. : SHW-M410K
Test standard : FCC Part 24 Subpart E: 2008
FCC ID : A3LSHWM410K
Test Result : Complied

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the above regulation.
4. The test results in this report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

Date of test: November 22 to 25, 2011

Representative test engineer:

Hironobu Ohnishi
Engineer of WiSE Japan,
UL Verification Service

Approved by:

Takahiro Hatakeda
Leader of WiSE Japan,
UL Verification Service



NVLAP LAB CODE: 200572-0

This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation.
*As for the range of Accreditation in NVLAP, you may refer to the WEB address,
<http://www.ul.com/japan/jpn/pages/services/emc/about/mark1/index.jsp#nvlap>

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SECTION 1: Customer information

Company Name : SAMSUNG ELECTRONICS CO., LTD.
 Address : 416, MAETAN 3-DONG, YEONGTONG-GU SUWON-CITY,
 GYEONGGI-DO 443-742, SOUTH KOREA

SECTION 2: Equipment under test (E.U.T.)

2.1 Identification of E.U.T.

Type of Equipment : GSM/GPRS 1900 Phone with 802.11abgn, BT3.0 (EDR)
 Model No. : SHW-M410K
 Serial No. : Refer to Section 4, Clause 4.2
 Rating : DC3.7V
 Receipt Date of Sample : November 21, 2011
 Modification of EUT : No Modification by the test lab

2.2 Product Description

Radio Specification

Bluetooth

Equipment Type	Transceiver
Frequency of Operation	2402-2480MHz
Type of Modulation	FHSS
Bandwidth & Channel spacing	1MHz & 1MHz
Antenna Gain	-11.5dBi

WLAN (IEEE802.11a/b/g/n-20)

Equipment Type	Transceiver	
Frequency of Operation	2412-2462MHz	5180-5240MHz 5260-5320MHz 5500-5640MHz 5745-5825MHz
Type of Modulation	DSSS, OFDM	OFDM
Bandwidth & Channel spacing	20MHz & 5MHz	20MHz & 20MHz
Antenna Gain	2.4G: -11.5dBi	5G: -11.5dBi

*EUT cannot operate in the frequency range from 5660 to 5700MHz

GSM

Equipment Type	Transceiver
Frequency of Operation	[Up Link] PCS: 1850 – 1910MHz [Down Link] PCS: 1930 – 1990MHz
Type of Modulation	GMSK
Antenna Gain	-3.93dBi

[Additional model]

EUT (SHW-M410K) has a variant model: SHW-M410S.

Difference between two models is only software version name to identify each model.

Basic		Additional	
Model	SHW-M410K	Model	SHW-M410S
HW version	REV 0.7	HW version	REV 0.7
SW version	M410K.002	SW version	M410S.000

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 24 Subpart E: 2008, final revised on May 2, 2008
Title : FCC 47CFR Part 24 Subpart E
Broadband PCS

3.2 Procedures and results

Item	Test Specification & Procedure	Remarks	Deviation	Worst margin	Results
RF Output Power(Conducted/ Radiated) (Conducted Output Power / Equivalent isotropic radiated power(EIRP))	FCC 2.1046 FCC 24.232(c)	Conducted/ Radiated	N/A	-	Complied
Peak to Average power Ratio	FCC 24.232(d)	Conducted	N/A	-	Complied
Emission Bandwidth, 99% Occupied Bandwidth	FCC 2.1049 FCC 24.238	Conducted	N/A	-	Complied
Band-Edge	FCC 2.1051 FCC 2.1053 FCC 24.238	Conducted/ Radiated	N/A	[Conducted] 3.81dB 1910.0205MHz [Radiated] 2.5dB 1910.02MHz, Vertical	Complied
Spurious Emission(Conducted)	FCC 2.1051 FCC 24.238	Conducted	N/A	-	Complied
Spurious Emission(Radiated)	FCC 2.1053 FCC 24.238	Radiated	N/A	15.5dB 3700.40MHz, Horizontal	Complied
Frequency Stability (Temperature Variation)	FCC 2.1055(a)(1)(b) FCC 24.235	Conducted	N/A	-	Complied
Frequency Stability (Voltage Variation)	FCC 2.1055(d)(1)(2) FCC 24.235	Conducted	N/A	-	Complied
Note: UL Japan's EMI Work Procedures No. 13-EM-W0420					

*These tests were also referred to ANSI/TIA 603-C-2004 " Land Mobile FM or PM Communications Equipment Measurement and Performance Standards."

*These tests were performed without any deviations from test procedure except for additions or exclusions.

3.3 Uncertainty

EMI

The following uncertainties have been calculated to provide a confidence level of 95% using a coverage factor k=2.

Radiated Emission (EUT height: 0.8m) (+dB)	
Measurement Distance 3m	
30MHz-300MHz	5.4dB
300MHz-1000MHz	4.0dB
1GHz-12.75GHz	4.4dB

Power meter (+dB)	
Below 1GHz	Above 1GHz
1.0dB	1.0dB

Antenna terminal conducted emission and Power density (+dB)			Antenna terminal conducted emission (+dB)		Channel power (+dB)
Below 1GHz	1GHz-3GHz	3GHz-18GHz	18GHz-26.5GHz	26.5GHz-40GHz	
1.0dB	1.1dB	2.7dB	3.2dB	3.3dB	1.5dB

Radiated emission test

The data listed in this report meets the limits unless the uncertainty is taken into consideration.

3.4 Test Location

UL Japan, Inc. Head Office EMC Lab. *NVLAP Lab. code: 200572-0
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	FCC Registration Number	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms
No.1 semi-anechoic chamber	313583	2973C-1	19.2 x 11.2 x 7.7m	7.0 x 6.0m	No.1 Power source room
No.2 semi-anechoic chamber	655103	2973C-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 semi-anechoic chamber	148738	2973C-3	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.3 Preparation room
No.3 shielded room	-	-	4.0 x 6.0 x 2.7m	N/A	-
No.4 semi-anechoic chamber	134570	2973C-4	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.4 Preparation room
No.4 shielded room	-	-	4.0 x 6.0 x 2.7m	N/A	-
No.5 semi-anechoic chamber	-	-	6.0 x 6.0 x 3.9m	6.0 x 6.0m	-
No.6 shielded room	-	-	4.0 x 4.5 x 2.7m	4.75 x 5.4 m	-
No.6 measurement room	-	-	4.75 x 5.4 x 3.0m	4.75 x 4.15 m	-
No.7 shielded room	-	-	4.7 x 7.5 x 2.7m	4.7 x 7.5m	-
No.8 measurement room	-	-	3.1 x 5.0 x 2.7m	N/A	-
No.9 measurement room	-	-	8.0 x 4.5 x 2.8m	2.0 x 2.0m	-
No.10 measurement room	-	-	2.6 x 2.8 x 2.5m	2.4 x 2.4m	-
No.11 measurement room	-	-	3.1 x 3.4 x 3.0m	2.4 x 3.4m	-

* Size of vertical conducting plane (for Conducted Emission test) : 2.0 x 2.0m for No.1, No.2, No.3, and No.4 semi-anechoic chambers and No.3 and No.4 shielded rooms.

3.5 Test set up, Test instruments and Data of EMI

Refer to APPENDIX.

SECTION 4: Operation of E.U.T. during testing

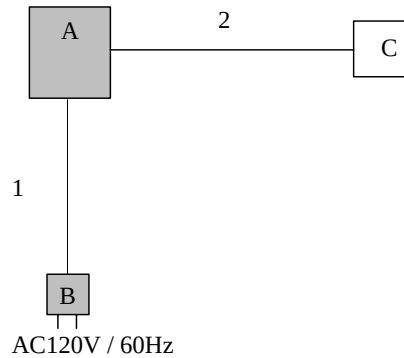
4.1 Operating Modes

<PCS1900>

Test	Operating mode	Power Control	Tested frequency	Channel
RF output Power(Conducted) Peak to Average power Ratio (Conducted)	Transmitting (Tx) (GSM, GMSK, 1slot) Transmitting (Tx) (GPRS, GMSK, 1slot, CS-1)	Max (PCL=0)	1850.2MHz 1880.0MHz 1909.8MHz	512 661 810
RF output Power(Radiated)	Transmitting (Tx) (GSM, GMSK, 1slot)	Max (PCL=0)	1850.2MHz 1880.0MHz 1909.8MHz	512 661 810
Emission Bandwidth, 99% Occupied bandwidth,	Transmitting (Tx) (GSM, GMSK, 1slot)	Max (PCL=0)	1880.0MHz	661
Band Edge(Conducted)	Transmitting (Tx) (GSM, GMSK, 1slot)	Max (PCL=0)	1850.2MHz 1909.8MHz	512 810
Band Edge(Radiated)	Transmitting (Tx) (GSM, GMSK, 1slot)	Max (PCL=0)	1850.2MHz 1909.8MHz	512 810
Spurious Emission(Conducted)	Transmitting (Tx) (GSM, GMSK, 1slot)	Max (PCL=0)	1850.2MHz 1880.0MHz 1909.8MHz	512 661 810
Spurious Emission(Radiated)	Transmitting (Tx) (GSM, GMSK, 1slot)	Max (PCL=0)	1850.2MHz 1880.0MHz 1909.8MHz	512 661 810
Frequency Stability (Temperature/Voltage Variation)	Transmitting (Tx) (GSM, GMSK)	Max (PCL=0)	1880.0MHz	661

*Single slot (1 slot) which had the highest frame power was tested as a representative.

4.2 Configuration and peripherals



* Cabling and setup(s) were taken into consideration and test data was taken under worse case conditions.

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	GSM/GPRS 1900 Phone with 802.11abgn, BT3.0 (EDR)	SHW-M410K	FI-294-A *1) FI-294-C *2)	SAMSUNG	EUT
B	AC Adapter	ETA0U10KBK	DK2B729TS/7-E	SAMSUNG	EUT
C	Ear phone	-	-	SAMSUNG	-

*1) Used for Antenna Terminal conducted test

*2) Used for Radiated Emission test

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	1.5	Unshielded	Unshielded	-
2	Ear phone Cable	1.2	Unshielded	Unshielded	-

SECTION 5: RF Output Power(Conducted/Radiated)

[Conducted: Conducted Output Power]

Test Procedure

The RF output power (conducted) was measured with a power meter and an attenuator at the antenna port.

Test data : **APPENDIX 1**
Test result : **Pass**

[Radiated: Equivalent isotropic radiated power(EIRP)]

Test Procedure

- 1) EUT was placed on a platform of nominal size, 0.5 by 1.0m, raised 80cm above the conducting ground plane. Test was made with the antenna positioned in both the horizontal and vertical planes of polarization. The Radiated Electric Field Strength intensity has been measured in a semi anechoic chamber with a ground plane and at a distance of 3m.
The measuring antenna height varied between 1 and 4m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.
- 2) Exchanged the EUT to the Substitution Antenna, the measurement was set for the same height as the EUT. The frequency above 1GHz of the Substitution antenna was used with Horn antenna calibrated with the Half wave dipole antenna, which is harmonized with the measured frequency in 1).
The Substitution Antenna was connected with the Signal Generator, and the polarized electromagnetic radiation of the Substitution Antenna was matched with the one of the measuring Antenna, which was set with the Signal Generator to the measured frequency in 1). Then, we set with the Output power (CW) of the Signal Generator where the measuring electromagnetic field is equal to the measured value in 1).
The measuring antenna height varied between 1 and 4m to obtain the maximum receiving level.
Its Output power of Signal Generator was recorded.
- 3) Equivalent isotropic radiated power(EIRP) was calculated by subtracting the cable loss and the attenuator loss connected between the Signal Generator and the Substitution Antenna from the Output power of the Signal Generator recorded in 2).

- The carrier level and noise levels were confirmed at each position of X, Y and Z axis of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

Test data : **APPENDIX 1**
Test result : **Pass**

SECTION 6: Bandwidth (Conducted)

Test Procedure

The Emission Bandwidth and 99% Occupied Bandwidth was measured with a spectrum analyzer and attenuator connected to the antenna port.

Test data	:	APPENDIX 1
Test result	:	Pass

SECTION 7: Spurious Emission and Band-Edge (Conducted/Radiated)

[Conducted]

Test Procedure

The Spurious Emission and Band-Edge was measured with a spectrum analyzer and attenuator connected to the antenna port.

[Radiated]

Test Procedure

- 1) EUT was placed on a platform of nominal size, 0.5m by 1.0m, raised 80cm above the conducting ground plane. Test was made with the antenna positioned in both the horizontal and vertical planes of polarization. The Radiated Electric Field Strength intensity has been measured in a semi anechoic chamber with a ground plane and at a distance of 3m.
The measuring antenna height was varied between 1 to 4m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.
- 2) Exchanged the EUT to the Substitution Antenna, the antenna was set for the same height as EUT on the table.
The frequency below 1GHz of the Substitution antenna was used as the Half wave dipole antenna and Shorted dipole antenna calibrated with the Half wave dipole antenna, which is harmonized with the measured frequency in 1). The frequency above 1GHz of the Substitution antenna was used with Horn antenna calibrated with the Half wave dipole antenna.
The Substitution antenna was connected with the Signal Generator, and the polarized electromagnetic radiation of the Substitution antenna was matched with the one of the measuring antenna, which was set with the Signal Generator to the measured frequency in 1). Then, we set with the Output power (CW) of the Signal Generator where the measuring electromagnetic field is equal to the measured value in 1).
The measuring antenna height varied between 1 and 4m to obtain the maximum receiving level.
Its Output power of Signal Generator was recorded.
- 3) Equivalent isotropic radiated power was calculated by subtracting the cable loss and the attenuator loss connected between the Signal Generator and the Substitution Antenna from the Output power of the Signal Generator recorded in 2).

- The carrier level and noise levels were confirmed at each position of X, Y and Z axis of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

Test data	:	APPENDIX 1
Test result	:	Pass

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SECTION 8: Frequency Stability(Temperature/Voltage Variation)

Test Procedure

The Frequency Stability was measured with a Wireless Communication Test Set and attenuator connected to the antenna port.

The Frequency Drift was measured with the 10 deg. C. steps from -30 deg. C. to 50 deg. C., and it is presented as the ppm unit. The Frequency Drift was measured with the normal temperature (20 deg. C.) and Voltage tolerance (DC3.33V to DC4.07V), and it is presented as the ppm unit.

Temperature : -30deg.C to +50deg.C (10 deg. C. step)
Voltage : Vnom:DC3.7V, Vmin:DC3.33V, Vmax:DC4.07V

As the operating input voltage of the EUT is between DC3.33V to 4.07V (nominal voltage: DC3.7V), Frequency Stability test was performed under the above condition.

Test data : APPENDIX 1
Test result : Pass

APPENDIX 1: Data of EMI test

RF Output Power (Conducted) **Conducted Output Power**

Test place Head Office EMC Lab. No.6 Measurement Room
Report No. 32DE0235-HO-E
Date 11/22/2011
Temperature/ Humidity 21 deg.C / 35% RH
Engineer Katsunori Okai
Mode Tx GSM(GMSK), 1slot, PCL=0
Mode Tx GPRS(GMSK), 1slot, CS-1, PCL=0

Mode	Ch	Frequency [MHz]	Reading Average frame power [dBm]	Atten. + Cable Loss [dB]	Result [dBm]
GSM	512	1850.2	15.34	13.62	28.96
	661	1880.0	15.31	13.61	28.92
	810	1909.8	15.35	13.61	28.96
GPRS	512	1850.2	15.33	13.62	28.95
	661	1880.0	15.30	13.61	28.91
	810	1909.8	15.35	13.61	28.96

Results = Reading + Atten. + Cable Loss

RF Output Power (Radiated)
Equivalent Isotropically Radiated Power(EIRP)

Report No. 32DE0235-HO-E
Test place Head Office EMC Lab.
Semi Anechoic Chamber No.4
Date 11/22/2011
Temperature / Humidity 25 deg. C / 29 % RH
Engineer Hironobu Ohnishi
Mode Tx GSM(GMSK), 1slot, PCL=0

Frequency [MHz]	Rx SA/TR Reading [dBuV]		Tx SG Reading [dBm]		Tx Cable Loss [dB]	Tx Ant. Gain [dBi]	Tx Ant. Atten. Loss [dB]	Result (EIRP) [dBm]		Limit (EIRP) [dBm]	Margin [dB]		Horizontal Rx Ant. Height Table		Vertical Rx Ant. Height Table		Remarks
	HOR	VER	HOR	VER				HOR	VER		HOR	VER	[cm]	[deg.]	[cm]	[deg.]	
1850.20	93.1	97.0	17.6	19.4	3.2	10.2	0.0	24.5	26.3	33.0	8.5	6.7	196	247	170	201	
1880.00	94.6	97.5	19.0	20.3	3.2	10.3	0.0	26.0	27.3	33.0	7.0	5.7	193	245	166	203	
1909.80	94.8	98.1	19.5	21.8	3.3	10.4	0.0	26.6	28.9	33.0	6.4	4.1	189	244	161	205	

Calculation Result = SG Reading - Tx Cable Loss + Tx Antenna Gain - Tx Antenna Attenuator Loss

Rx-ANTENNA : Biconical Antenna(30M-300MHz), Logperiodic Antenna(300M-1000MHz), Horn Antenna(1G-40GHz)

Tx-ANTENNA : 120MHz tuned Dipole Antenna(30M-120MHz), Dipole Antenna(120M-1000MHz), Horn Antenna(1G-40GHz)

Detector : Spectrum Analyzer Peak (RBW: 3MHz/VBW: 8MHz)

Peak to Average power Ratio (Conducted)

Report No. 32DE0235-HO-E
Test place Head Office EMC Lab. No.6 Shielded Room
Date 11/25/2011
Temperature / Humidity 18deg. C / 50% RH
Engineer Keisuke Kawamura
Mode Tx GSM(GMSK), 1slot, PCL=0
Tx GPRS(GMSK), 1slot, CS-1, PCL=0

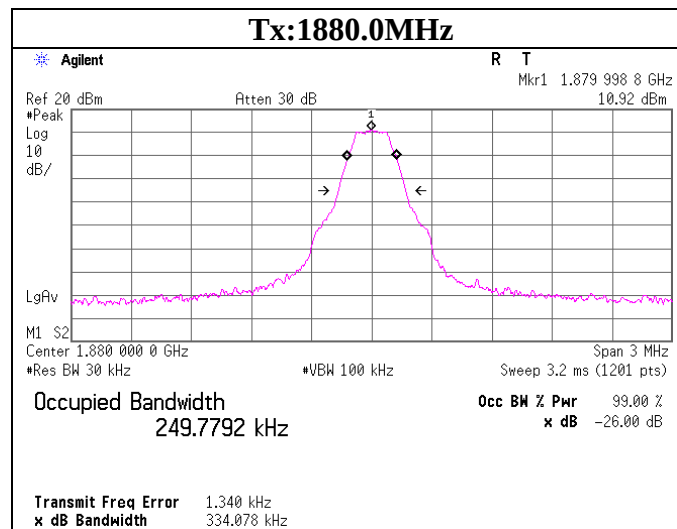
Mode	Channel	Frequency [MHz]	Peak to Average power Ratio [dB]	Limit [dB]
GSM	512	1850.20	0.071	13
	661	1880.00	0.010	13
	810	1909.80	0.036	13
GPRS	512	1850.20	0.007	13
	661	1880.00	0.023	13
	810	1909.80	0.038	13

*In order to decide the largest deviation between the average and the peak power of the EUT in a bandwidth greater than the emission bandwidth, an average and a peak trace were used on a spectrum analyzer .

Bandwidth(Conducted)

Test place Head Office EMC Lab. No.6 Shielded Room
Report No. 32DE0235-HO-E
Date 11/25/2011
Temperature/ Humidity 18deg. C / 50% RH
Engineer Keisuke Kawamura
Mode Tx GSM(GMSK), 1slot, PCL=0

CH	FREQ	26dB Bandwidth	99% OBW	Limit
	[MHz]	[kHz]	[kHz]	[kHz]
Mid	1880.0	334.078	249.7792	-



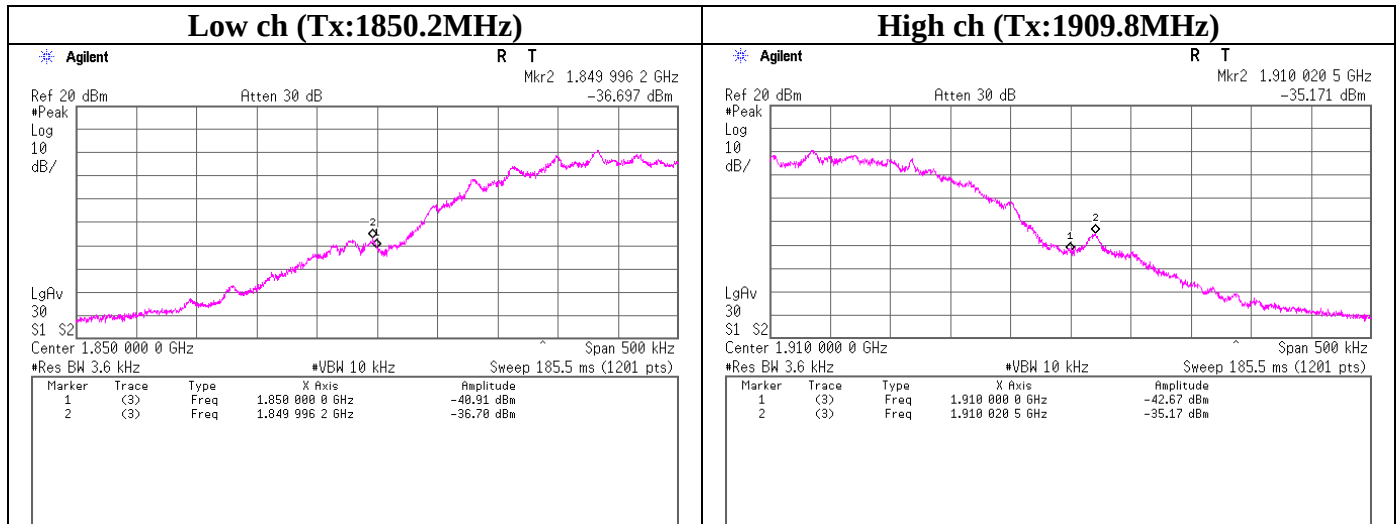
Band-Edge(Conducted)

Test place Head Office EMC Lab. No.6 Shielded Room
Report No. 32DE0235-HO-E
Date 11/25/2011
Temperature/ Humidity 18deg. C / 50% RH
Engineer Keisuke Kawamura
Mode Tx GSM(GMSK), 1slot, PCL=0

Frequency [MHz]	Reading [dBm]	Atten. [dB]	Cable Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
1849.9962	-36.70	10.07	8.29	-18.34	-13.0	5.34
1850.0000	-40.91	10.07	8.29	-22.55	-13.0	9.55
1910.0000	-42.67	10.07	8.29	-24.31	-13.0	11.31
1910.0205	-35.17	10.07	8.29	-16.81	-13.0	3.81

VIDEO AV 30 times

Sample Calculation : Result = Reading + Atten. + Cable Loss



Band-Edge (Radiated)

Report No. 32DE0235-HO-E
Test place Head Office EMC Lab.
Semi Anechoic Chamber No.4
Date 11/22/2011
Temperature / Humidity 25 deg. C / 29 % RH
Engineer Hironobu Ohnishi
Mode Tx GSM(GMSK), 1slot, PCL=0

Frequency [MHz]	Rx SA/TR Reading [dBuV]		Tx SG Reading [dBm]		Tx Cable Loss [dB]	Tx Ant. Gain [dBi]	Tx Ant. Atten. Loss [dB]	Result (EIRP) [dBm]		Limit (EIRP) [dBm]	Margin [dB]		Horizontal		Vertical		Remarks
	HOR	VER	HOR	VER				HOR	VER		HOR	VER	Rx Ant. Height [cm]	Turn Table [deg.]	Rx Ant. Height [cm]	Turn Table [deg.]	
1850.00	49.8	52.0	-25.9	-25.8	3.2	10.2	0.0	-19.0	-18.9	-13.0	6.0	5.9	196	247	170	201	
1910.00	50.0	53.1	-25.5	-23.3	3.3	10.4	0.0	-18.4	-16.2	-13.0	5.4	3.2	189	244	161	205	
1910.02	51.1	53.8	-24.4	-22.6	3.3	10.4	0.0	-17.3	-15.5	-13.0	4.3	2.5	189	244	161	205	

Calculation Result = SG Reading - Tx Cable Loss + Tx Antenna Gain - Tx Antenna Attenuator Loss

Rx-ANTENNA : Biconical Antenna(30M-300MHz), Logperiodic Antenna(300M-1000MHz), Horn Antenna(1G-40GHz)

Tx-ANTENNA : 120MHz tuned Dipole Antenna(30M-120MHz), Dipole Antenna(120M-1000MHz), Horn Antenna(1G-40GHz)

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

NS : No signal detect.

Detector : Spectrum Analyzer Peak (RBW: 3.6kHz/VBW: 10kHz)

Spurious Emission (Conducted)

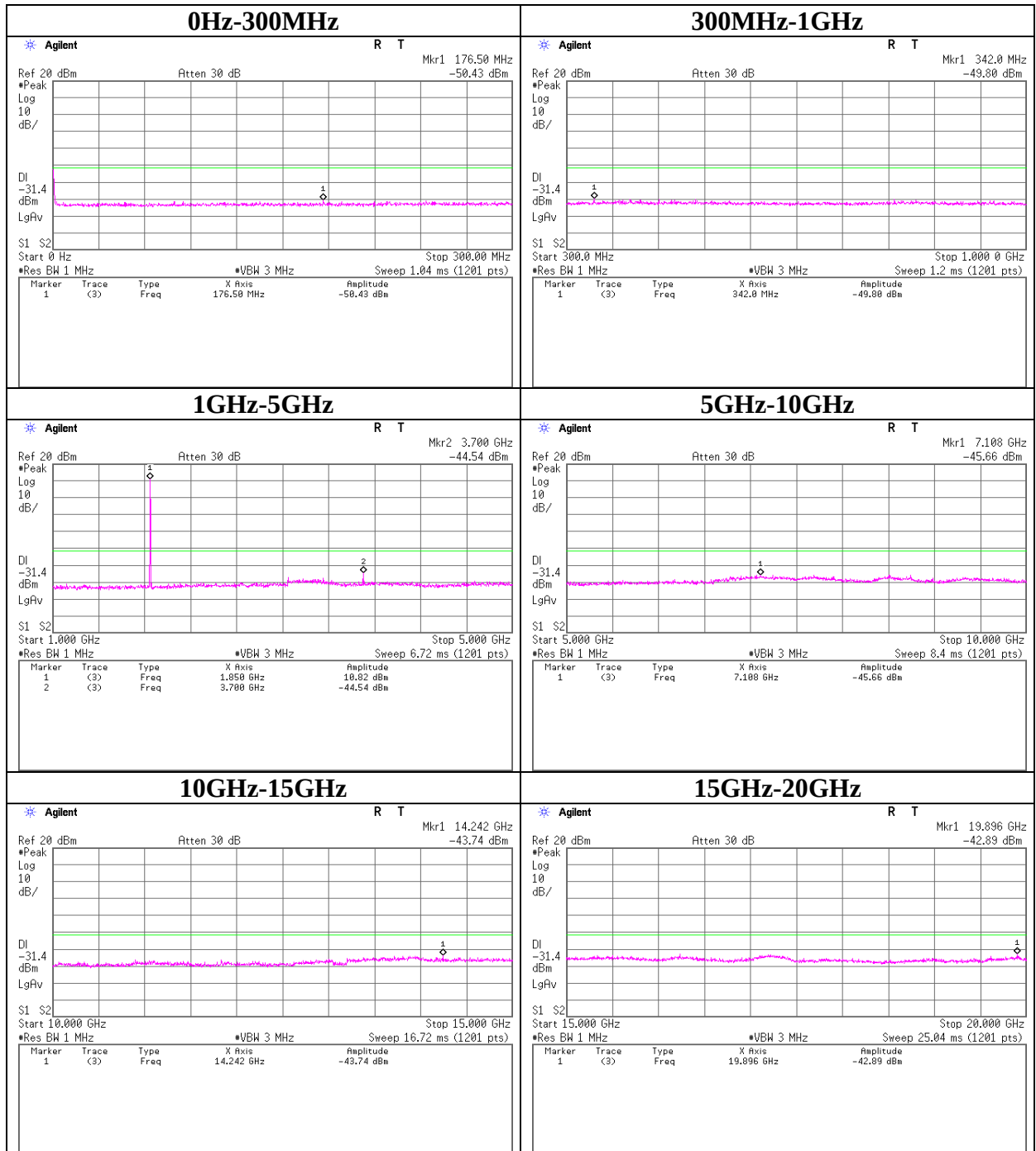
Test place Head Office EMC Lab. No.6 Shielded Room
Report No. 32DE0235-HO-E
Date 11/25/2011
Temperature/ Humidity 18deg. C / 50% RH
Engineer Keisuke Kawamura
Mode Tx GSM(GMSK), 1slot, PCL=0

Limit Line

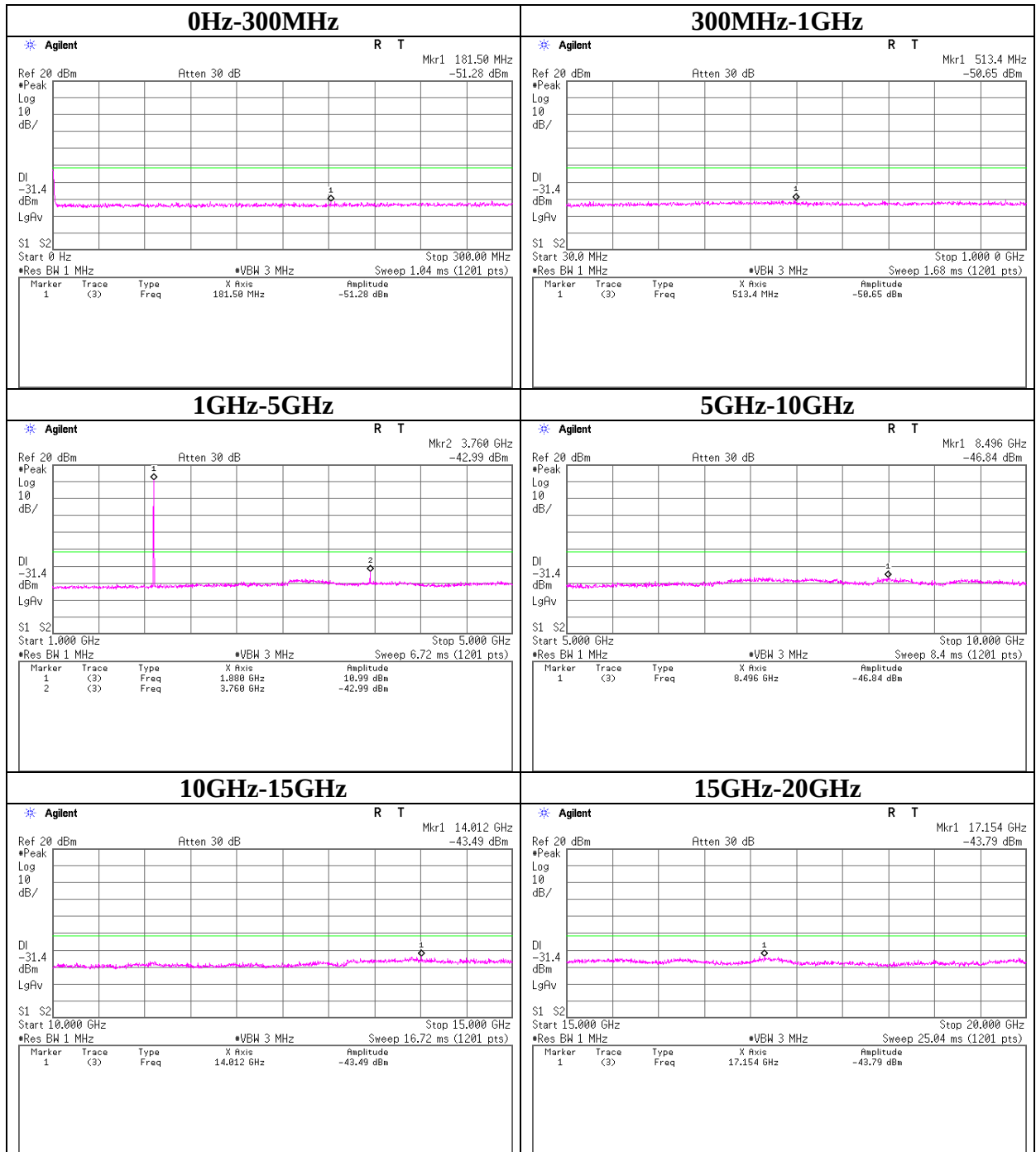
Tx Frequency [MHz]	Limit [dBm]	Atten. [dB]	Cable Loss [dB]	Limit Line [dBm]
1850.2	-13.0	10.07	8.29	-31.4
1880.0	-13.0	10.07	8.29	-31.4
1909.8	-13.0	10.07	8.29	-31.4

Sample Calculation : Limit Line = Limit - Atten. - Cable Loss

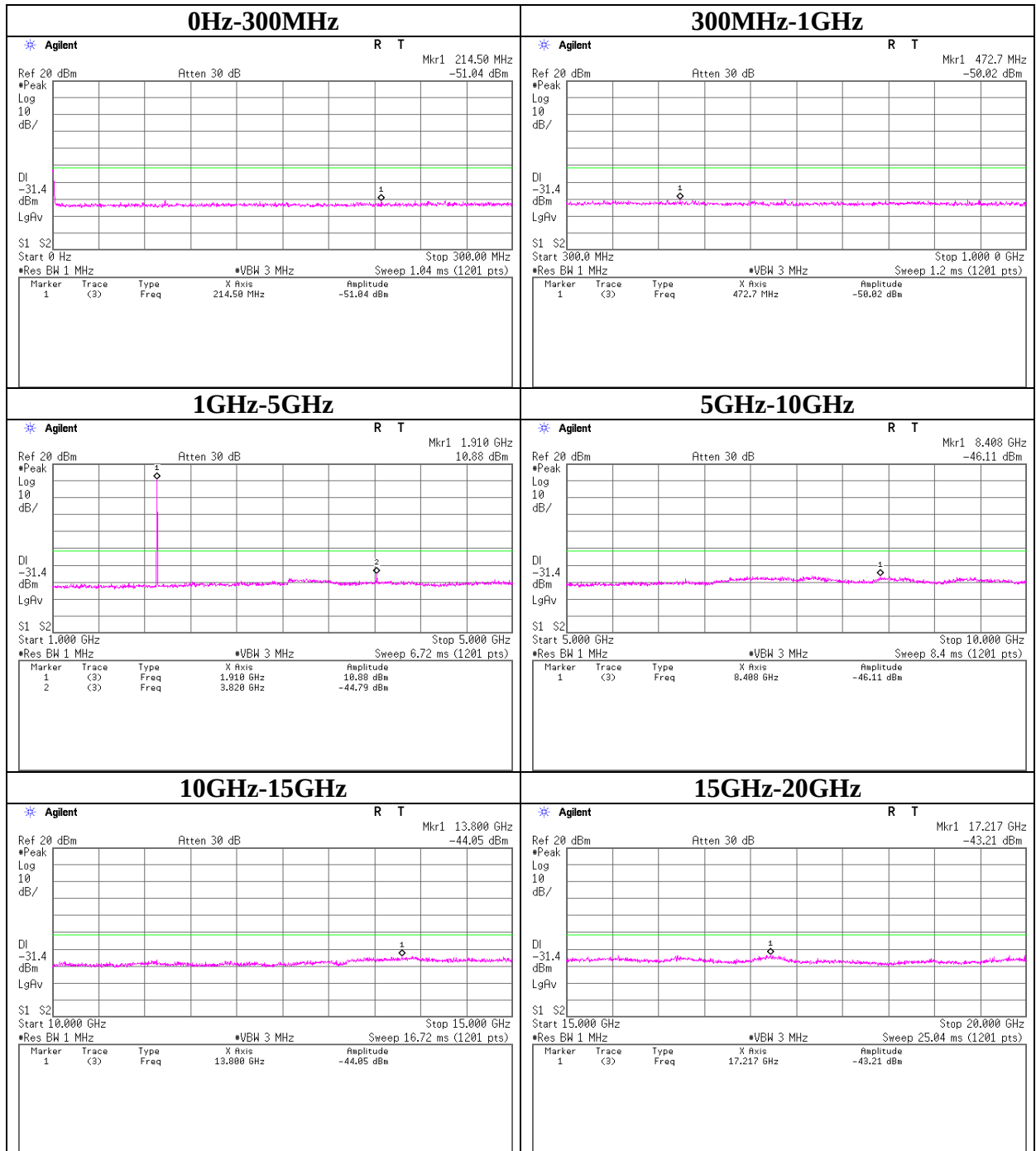
Spurious Emission (Conducted)
Tx:1850.2MHz



Spurious Emission (Conducted)
Tx:1880.0MHz



Spurious Emission (Conducted)
Tx:1909.8MHz



Spurious Emission (Radiated)

Report No.	32DE0235-HO-E		
Test place	Head Office EMC Lab.		
Semi Anechoic Chamber	No.4	No.4	No.2
Date	11/22/2011	11/22/2011	11/23/2011
Temperature / Humidity	25 deg. C / 29 % RH	25 deg. C / 29 % RH	21 deg. C / 33 % RH
Engineer	Hironobu Ohnishi	Katsunori Okai	Hironobu Ohnishi
	(1-10GHz)	(10-20GHz)	(Below 1GHz)
Mode	Tx GSM(GMSK), 1slot, PCL=0		

Tx 1850.2MHz

Frequency [MHz]	Rx SA/TR Reading [dBuV]		Tx SG Reading [dBm]		Tx Cable Loss [dB]	Tx Ant. Gain [dBi]	Tx Ant. Atten. Loss [dB]	Result (EIRP) [dBm]		Limit (EIRP) [dBm]	Margin [dB]		Horizontal		Vertical		Remarks
	HOR	VER	HOR	VER				HOR	VER		HOR	VER	Rx Ant. Height [cm]	Turn Table [deg.]	Rx Ant. Height [cm]	Turn Table [deg.]	
3700.40	64.9	62.2	-36.6	-40.8	4.6	12.7	0.0	-28.5	-32.7	-13.0	15.5	19.7	110	199	306	115	
5550.60	51.6	55.2	-48.2	-45.6	5.6	13.8	0.0	-40.1	-37.5	-13.0	27.1	24.5	107	319	100	330	

Calculation Result = SG Reading - Tx Cable Loss + Tx Antenna Gain - Tx Antenna Attenuator Loss

Rx-ANTENNA : Biconical Antenna(30M-300MHz), Logperiodic Antenna(300M-1000MHz), Horn Antenna(1G-40GHz)

Tx-ANTENNA : 120MHz tuned Dipole Antenna(30M-120MHz), Dipole Antenna(120M-1000MHz), Horn Antenna(1G-40GHz)

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

Detector : Spectrum Analyzer Peak (RBW: 1MHz/VBW: 3MHz)

Tx 1880MHz

Frequency [MHz]	Rx SA/TR Reading [dBuV]		Tx SG Reading [dBm]		Tx Cable Loss [dB]	Tx Ant. Gain [dBi]	Tx Ant. Atten. Loss [dB]	Result (EIRP) [dBm]		Limit (EIRP) [dBm]	Margin [dB]		Horizontal		Vertical		Remarks
	HOR	VER	HOR	VER				HOR	VER		HOR	VER	Rx Ant. Height [cm]	Turn Table [deg.]	Rx Ant. Height [cm]	Turn Table [deg.]	
3760.00	59.3	57.7	-43.6	-46.0	4.6	12.7	0.0	-35.6	-38.0	-13.0	22.6	25.0	110	197	113	304	
5640.00	55.1	56.2	-43.6	-44.1	5.6	13.8	0.0	-35.4	-35.9	-13.0	22.4	22.9	108	289	100	330	

Calculation Result = SG Reading - Tx Cable Loss + Tx Antenna Gain - Tx Antenna Attenuator Loss

Rx-ANTENNA : Biconical Antenna(30M-300MHz), Logperiodic Antenna(300M-1000MHz), Horn Antenna(1G-40GHz)

Tx-ANTENNA : 120MHz tuned Dipole Antenna(30M-120MHz), Dipole Antenna(120M-1000MHz), Horn Antenna(1G-40GHz)

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

Detector : Spectrum Analyzer Peak (RBW: 1MHz/VBW: 3MHz)

Tx 1909.8MHz

Frequency [MHz]	Rx SA/TR Reading [dBuV]		Tx SG Reading [dBm]		Tx Cable Loss [dB]	Tx Ant. Gain [dBi]	Tx Ant. Atten. Loss [dB]	Result (EIRP) [dBm]		Limit (EIRP) [dBm]	Margin [dB]		Horizontal		Vertical		Remarks
	HOR	VER	HOR	VER				HOR	VER		HOR	VER	Rx Ant. Height [cm]	Turn Table [deg.]	Rx Ant. Height [cm]	Turn Table [deg.]	
3819.60	55.4	54.1	-47.9	-50.6	4.7	12.6	0.0	-39.9	-42.6	-13.0	26.9	29.6	121	305	133	337	
5729.40	54.0	53.0	-44.6	-48.0	5.6	13.8	0.0	-36.4	-39.8	-13.0	23.4	26.8	100	110	108	332	

Calculation Result = SG Reading - Tx Cable Loss + Tx Antenna Gain - Tx Antenna Attenuator Loss

Rx-ANTENNA : Biconical Antenna(30M-300MHz), Logperiodic Antenna(300M-1000MHz), Horn Antenna(1G-40GHz)

Tx-ANTENNA : 120MHz tuned Dipole Antenna(30M-120MHz), Dipole Antenna(120M-1000MHz), Horn Antenna(1G-40GHz)

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

Detector : Spectrum Analyzer Peak (RBW: 1MHz/VBW: 3MHz)

Frequency Stability (Temperature/Voltage Variation)

Tx:1880.0MHz

Test place Head Office EMC Lab. No.6 Shielded Room
Report No. 32DE0235-HO-E
Date 11/25/2011
Temperature/ Humidity 18deg. C / 50% RH
Engineer Keisuke Kawamura
Mode Tx GSM(GMSK), 1slot, PCL=0

Temp. [deg.C]	Volt. [V]	Frequency Reading [MHz]	Frequency Error [Hz]	Frequency Error [ppm]	Limit [ppm]
-30.0	3.7	1879.9999450	22.20	0.0118	2.5
-20.0	3.7	1879.9999663	0.90	0.0005	2.5
-10.0	3.7	1879.9999483	18.90	0.0101	2.5
0.0	3.7	1879.9999536	13.60	0.0072	2.5
10.0	3.7	1879.9999460	21.20	0.0113	2.5
20.0	3.7	1879.9999672	0.00	0.0000	Reference
30.0	3.7	1879.9999652	2.00	0.0011	2.5
40.0	3.7	1879.9999693	2.10	0.0011	2.5
50.0	3.7	1879.9999663	0.90	0.0005	2.5

Temp. [deg.C]	Volt. [V]	Frequency Reading [MHz]	Frequency Error [Hz]	Frequency Error [ppm]	Limit [ppm]
20.0	4.07	1879.9999528	14.40	0.0077	2.5
20.0	3.7	1879.9999672	0.00	0.0000	Reference
20.0	3.33	1879.9995439	423.30	0.2252	2.5

APPENDIX 2: 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	RE	2011/03/01 * 12
MOS-15	Thermo-Hygrometer	Custom	CTH-180	-	RE	2011/02/23 * 12
MJM-07	Measure	PROMART	SEN1955	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MRENT-95	Spectrum Analyzer	Agilent	E4440A	US44302652	RE	2011/06/30 * 12
MHA-21	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	9120D-557	RE	2011/08/11 * 12
MCC-133	Microwave Cable	HUBER+SUHNER	SUCOFLEX104	336164/4(1m) / 340640(5m)	RE	2011/09/07 * 12
MPA-12	MicroWave System Amplifier	Agilent	83017A	MY39500780	RE	2011/03/10 * 12
MHF-06	High Pass Filter 3.5-24GHz	TOKIMEC	TF323DCA	601	RE	2011/05/16 * 12
KSG-05	Signal Generator	Rohde & Schwarz	SMR40	100137	RE	2011/08/30 * 12
MCC-130	Microwave Cable(1-33GHz)	HUBER+SUHNER	SF103/11PC3.5-31/11PC3.5-31/8.0m	54308/3	RE	2011/01/20 * 12
MHA-20	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	258	RE	2011/05/23 * 12
MAEC-02	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	RE	2011/06/21 * 12
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	RE	2011/02/23 * 12
MJM-14	Measure	KOMELON	KMC-36	-	RE	-
MSA-04	Spectrum Analyzer	Agilent	E4448A	US44300523	RE	2011/04/08 * 12
MBA-02	Biconical Antenna	Schwarzbeck	BBA9106	VHA91032008	RE	2011/10/23 * 12
MLA-02	Logperiodic Antenna	Schwarzbeck	USLP9143	201	RE	2011/10/23 * 12
MCC-12	Coaxial Cable	Fujikura/Agilent	-	-	RE	2011/02/18 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	BK7970	RE	2011/11/02 * 12
MPA-09	Pre Amplifier	Agilent	8447D	2944A10845	RE	2011/09/26 * 12
MOS-14	Thermo-Hygrometer	Custom	CTH-201	-	AT	2011/02/23 * 12
MCH-04	Temperature and Humidity Chamber	Tabai Espec	PL-2KP	14015723	AT	2011/08/22 * 12
MSA-03	Spectrum Analyzer	Agilent	E4448A	MY44020357	AT	2010/11/30 * 12
MCC-67	Microwave Cable 1G-40GHz	Suhner	SUCOFLEX102	28635/2	AT	2011/04/22 * 12
MAT-23	Attenuator(10dB) 1-18GHz	Orient Microwave	BX10-0476-00	-	AT	2011/03/14 * 12
MPD-02	Power Divider DC-12.4GHz	SUHNER	4901.19.A	-	AT	2011/05/23 * 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

AT: Antenna Terminal Conducted test

UL Japan, Inc.

Head Office EMC Lab.

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