

FCC 47 CFR PART 22H and 24E

Test Report

Product Type : Wireless Mobile HotSpot
Applicant : Netgear Inc.
Address : 350 East Plumeria Drive, San Jose, CA 95134
Trade Name : Netgear
Model Number : AirCard 781S
Test Specification : FCC 47 CFR PART 22H: Oct, 2012
FCC 47 CFR PART 24E: Oct, 2012
ANSI/TIA-603-C-2004

Application Purpose : Original
Receive Date : Aug. 09, 2013
Test Period : Aug. 20 ~ Sep. 04, 2013
Issue Date : Sep. 17, 2013

Issue by

A Test Lab Techno Corp.
No. 140-1, Changan Street, Bade City,
Taoyuan County 334, Taiwan R.O.C.
Tel : +886-3-2710188 / Fax : +886-3-2710190



Taiwan Accreditation Foundation accreditation number: 1330

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Revision History

Rev.	Issue Date	Revisions	Revised By
00	Sep. 17, 2013	Initial Issue	

Verification of Compliance

Issued Date: 09/17/2013

Product Type : Wireless Mobile HotSpot

Applicant : Netgear Inc.

Address : 350 East Plumeria Drive, San Jose, CA 95134

Trade Name : Netgear

Model Number : AirCard 781S

FCC ID : PY3AirCard 781S

Applicable Standard : FCC 47 CFR PART 22H: Oct, 2012
FCC 47 CFR PART 24E: Oct, 2012
ANSI/TIA-603-C-2004

Application Purpose : Original

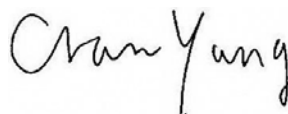
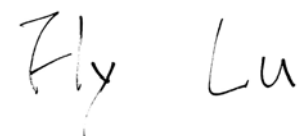
Test Result : Complied

Performing Lab. : A Test Lab Techno Corp.
No. 140-1, Changan Street, Bade City,
Taoyuan County 334, Taiwan R.O.C.
Tel : +886-3-2710188 / Fax : +886-3-2710190
Taiwan Accreditation Foundation accreditation number: 1330
<http://www.atl-lab.com.tw/e-index.htm>



The above equipment was tested by A Test Lab Techno Corp. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4: 2009 and the energy emitted by the sample tested as described in this report is in compliance with the requirements of FCC Rules Part 22H, Part 24E.

The test results of this report relate only to the tested sample identified in this report.

Approved By :  Reviewed By : 

(Manager) (Cran Yang) (Testing Engineer) (Fly Lu)

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1 General Information

1.1. EUT Description

Applicant		Netgear Inc.			
Applicant Address		350 East Plumeria Drive, San Jose, CA 95134			
Manufacturer		Netgear Inc.			
Manufacturer Address		350 East Plumeria Drive, San Jose, CA 95134			
Product Type		Wireless Mobile HotSpot			
Trade Name		Netgear			
Model Number		AirCard 781S			
FCC ID		PY3AirCard 781S			
Mode	WCDMA/ HSDPA/ HSUPA	Band	UL Frequency (MHz)	DL Frequency (MHz)	Modulation
		II	1852.4 ~ 1907.6	1932.4 ~ 1987.6	QPSK
		V	826.4 ~ 846.6	871.4 ~ 891.6	QPSK
Channel Control		Auto			
Type of Antenna		Hybrid dipole and monopole Antenan			
Antenna Gain (dBi)		WCDMA/ HSDPA/ HSUPA Band II		:	0.1 dBi
		WCDMA/ HSDPA/ HSUPA Band V		:	1.9 dBi
Max. RF Output power		WCDMA/ HSDPA/ HSUPA Band II		:	26.29 dBm / 0.426 W
		WCDMA/ HSDPA/ HSUPA Band V		:	26.44 dBm / 0.441 W
Max. ERP/EIRP		WCDMA Band II		:	22.92 dBm / 0.196 W
		WCDMA Band V		:	19.57 dBm / 0.091 W
Emission Designator		WCDMA Band II		:	4M17F9W
		WCDMA Band V		:	4M18F9W

1.2. Mode of Operation

ATL has verified the construction and function in typical operation. All the test modes were carried out with the EUT in normal operation, which was shown in this test report and defined as:

Test Mode
Mode 1: WCDMA Band II Link Mode
Mode 2: WCDMA Band V Link Mode

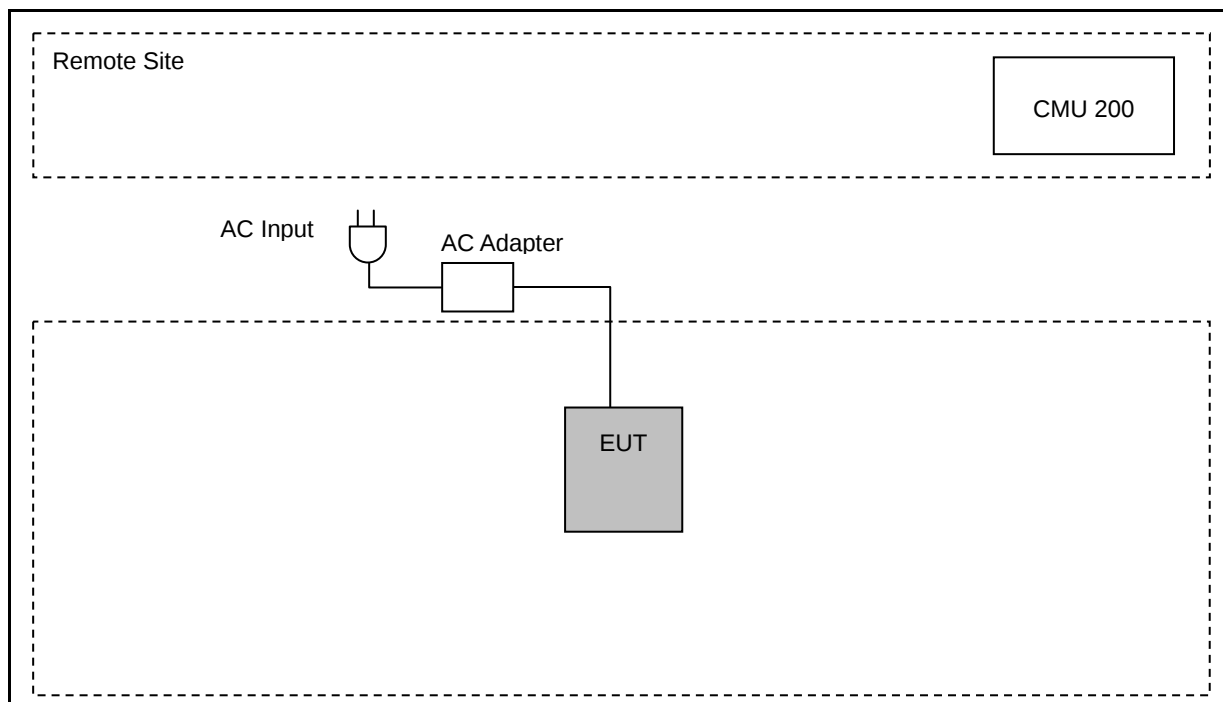
Note: Regards to the frequency band operation: the lowest, middle and highest frequency of channel were selected to perform the test, then shown on this report.

By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that "X axis" position was the worst, then the final test was executed the worst condition and test data were recorded in this report.

1.3. EUT Exercise Software

1	Setup the EUT and Base Station (CMU200) as shown on 1.4.
2	Turn on the power of all equipment.

1.4. Configuration of Test System Details



1.5. Test Site Environment

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	26
Humidity (%RH)	25-75	60
Barometric pressure (mbar)	860-1060	950

1.6. Summary of Test Result

Description	FCC Rule	IC Rule	Limit	Result
Conducted Output Power	§2.1046	N/A	N/A	Pass
Effective Radiated Power	§22.913(a)(2)	RSS-132(4.4) SRSP-503(5.1.3)	< 7 Watts for FCC (<6.3 Watts for IC)	Pass
Equivalent Isotropic Radiated Power	§24.232(c)	RSS-133 (6.4) SRSP-510(5.1.2)	< 2 Watts	Pass
Peak to average ratio	§24.232(d)	RSS-132 (5.4) RSS-133 (6.4)	< 13 dB	Pass
Occupied Bandwidth	§2.1049 §22.917(a) §24.238(a)	RSS-Gen (4.6.1)	N/A	Pass
Band Edge Measurement	§2.1051 §22.917(a) §24.238(a)	RSS-132 (4.5.1)RSS-133 (6.5.1)	< 43+10log ₁₀ (P[Watts])	Pass
Conducted Spurious Emission	§2.1051 §22.917(a) §24.238(a)	RSS-132 (4.5.1) RSS-133 (6.5.1)	< 43+10log ₁₀ (P[Watts])	Pass
Field Strength of Spurious Radiation	§2.1053 §22.917(a) §24.238(a)	RSS-132 (4.5.1) RSS-133 (6.5.1) RSS-Gen (4.10)	< 43+10log ₁₀ (P[Watts])	Pass
Frequency Stability for Temperature & Voltage	§2.1055 §22.355 §24.235	RSS-132(4.3) RSS-133(6.3)	< 2.5 ppm	Pass

2 RF Output Power Test

2.1. Limit

N/A

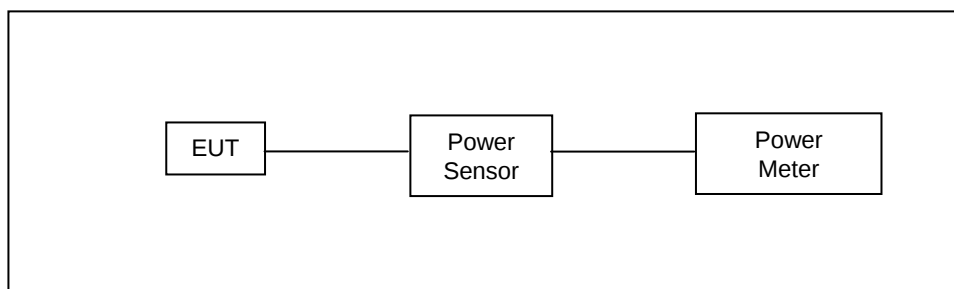
2.2. Test Instruments

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
Universal Radio Communication Tester	R & S	CMU200	112387	03/18/2013	(1)
Single Channel PK Power Sensor	Agilent	N1911A	MY45101619	12/19/2012	(1)
Wideband Power Meter	Agilent	N1921A	MY45241957	12/19/2012	(1)
Test Site	ATL	TE05	TE05	N.C.R.	-----

Remark: ⁽¹⁾ Calibration period 1 year. ⁽²⁾ Calibration period 2 years.

Note: N.C.R. = No Calibration Request.

2.3. Test Setup



2.4. Test Procedure

The measurement is made according to ANSI/TIA-603-C-2004 as follows:

1. The transmitter output was connected to power meter and base station through Power Divider.
2. Set base station for EUT at GSM 850: PCL=5 and PCS 1900: PCL=0.
3. Set base station for EUT at WCDMA Band V and WCDMA Band II, power level was set to maximum.
4. Select lowest, middle, and highest channels for each band.

2.5. Uncertainty

The measurement uncertainty is defined as for RF output power measurement is 1.2 dB.

2.6. Test Result

Model Number	AirCard 781S						
Test Item	RF Output Power						
Date of Test	08/20/2013			Test Site		TE05	
Bands	Modulation Type	Sub-Test	Frequency (MHz)	Burst Average Power		Peak Power	
				(dBm)	(W)	(dBm)	(W)
WCDMA Band II	QPSK	-----	1852.4	22.99	0.199	26.29	0.426
			1880.0	22.92	0.196	26.21	0.418
			1907.6	22.87	0.194	26.14	0.411
HSDPA Band II	QPSK	1	1852.4	21.95	0.157	25.22	0.333
			1880.0	21.80	0.151	25.09	0.323
			1907.6	21.77	0.150	25.06	0.321
		2	1852.4	21.93	0.156	25.20	0.331
			1880.0	21.79	0.151	25.07	0.321
			1907.6	21.74	0.149	25.05	0.320
		3	1852.4	21.48	0.141	24.76	0.299
			1880.0	21.35	0.136	24.63	0.290
			1907.6	21.32	0.136	24.59	0.288
		4	1852.4	21.46	0.140	24.75	0.299
			1880.0	21.34	0.136	24.62	0.290
			1907.6	21.30	0.135	24.60	0.288
HSUPA Band II	QPSK	1	1852.4	21.81	0.152	25.08	0.322
			1880.0	20.99	0.126	24.29	0.269
			1907.6	20.73	0.118	25.11	0.324
		2	1852.4	19.85	0.097	23.10	0.204
			1880.0	19.05	0.080	22.34	0.171
			1907.6	18.78	0.076	23.16	0.207
		3	1852.4	20.84	0.121	24.11	0.258
			1880.0	20.03	0.101	23.35	0.216
			1907.6	19.78	0.095	24.13	0.259
		4	1852.4	19.83	0.096	23.09	0.204
			1880.0	19.04	0.080	22.31	0.170
			1907.6	18.76	0.075	23.14	0.206
		5	1852.4	21.79	0.151	25.05	0.320
			1880.0	20.96	0.125	24.26	0.267
			1907.6	20.71	0.118	25.09	0.323

Note: The peak power testing result was used peak detector.

Model Number	AirCard 781S						
Test Item	RF Output Power						
Date of Test	08/20/2013			Test Site		TE05	
Bands	Modulation Type	Sub-Test	Frequency (MHz)	Burst Average Power		Peak Power	
				(dBm)	(W)	(dBm)	(W)
WCDMA Band V	QPSK	-----	826.4	22.89	0.195	26.34	0.431
			836.6	22.93	0.196	26.38	0.435
			846.6	23.00	0.200	26.44	0.441
HSDPA Band V	QPSK	1	826.4	21.28	0.134	24.74	0.298
			836.6	21.24	0.133	24.68	0.294
			846.6	21.40	0.138	24.82	0.303
		2	826.4	21.27	0.134	24.72	0.296
			836.6	21.23	0.133	24.66	0.292
			846.6	21.37	0.137	24.79	0.301
		3	826.4	20.81	0.121	24.24	0.265
			836.6	20.79	0.120	24.24	0.265
			846.6	20.92	0.124	24.32	0.270
		4	826.4	20.80	0.120	24.23	0.265
			836.6	20.76	0.119	24.21	0.264
			846.6	20.90	0.123	24.32	0.270
HSUPA Band V	QPSK	1	826.4	20.33	0.108	23.77	0.238
			836.6	20.67	0.117	24.11	0.258
			846.6	20.63	0.116	24.05	0.254
		2	826.4	18.35	0.068	21.79	0.151
			836.6	18.72	0.074	22.13	0.163
			846.6	18.63	0.073	22.06	0.161
		3	826.4	19.38	0.087	22.81	0.191
			836.6	19.72	0.094	23.13	0.206
			846.6	19.65	0.092	23.06	0.202
		4	826.4	18.34	0.068	21.79	0.151
			836.6	18.70	0.074	22.11	0.163
			846.6	18.63	0.073	22.04	0.160
		5	826.4	20.30	0.107	23.70	0.234
			836.6	20.66	0.116	24.10	0.257
			846.6	20.60	0.115	24.02	0.252

Note: The peak power testing result was used peak detector.

3 Effective Radiated Power / Equivalent Isotropic Radiated Power Test

3.1. Limit

For FCC Part 22.913(a)(2): The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

For FCC Part 24.232(b): The EIRP of mobile transmitters and auxiliary test transmitters must not exceed 2 Watts.

3.2. Test Instruments

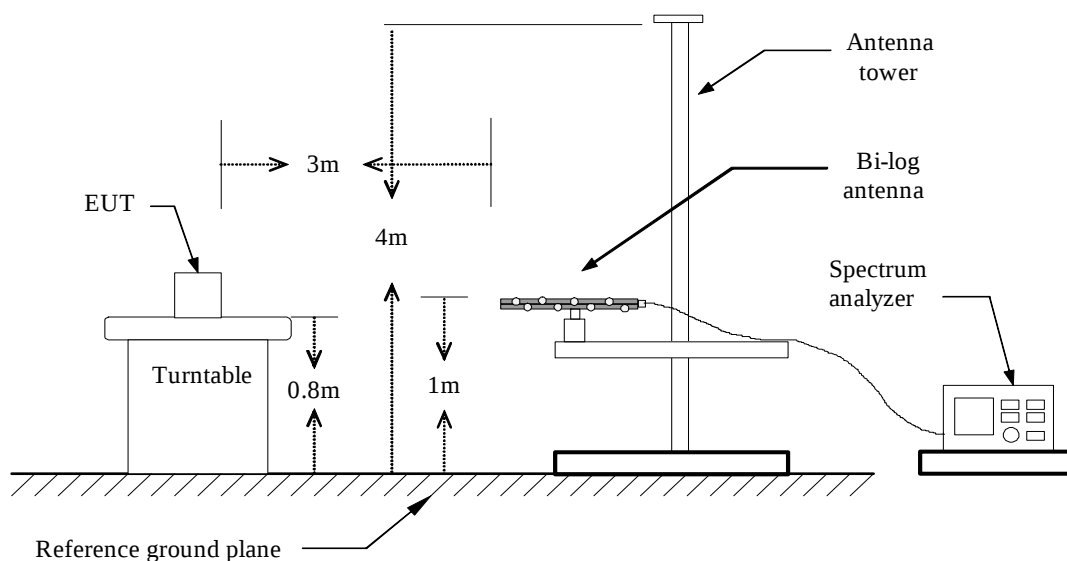
3 Meter Chamber					
Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
RF Pre-selector	Agilent	N9039A	MY46520256	01/21/2013	(2)
Spectrum Analyzer	Agilent	E4446A	MY46180578	01/21/2013	(1)
Pre Amplifier	Agilent	8449B	3008A02237	02/21/2013	(1)
Pre Amplifier	Agilent	8447D	2944A10961	02/21/2013	(1)
Broadband Antenna (30MHz~1GHz)	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	9163-270	07/01/2013	(1)
Horn Antenna (1~18GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA9120D	9120D-550	06/10/2013	(1)
Horn Antenna (18~40GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA9170	9170-320	06/13/2013	(1)
Test Site	ATL	TE01	888001	08/28/2012	(1)

Remark: ⁽¹⁾ Calibration period 1 year. ⁽²⁾ Calibration period 2 years.

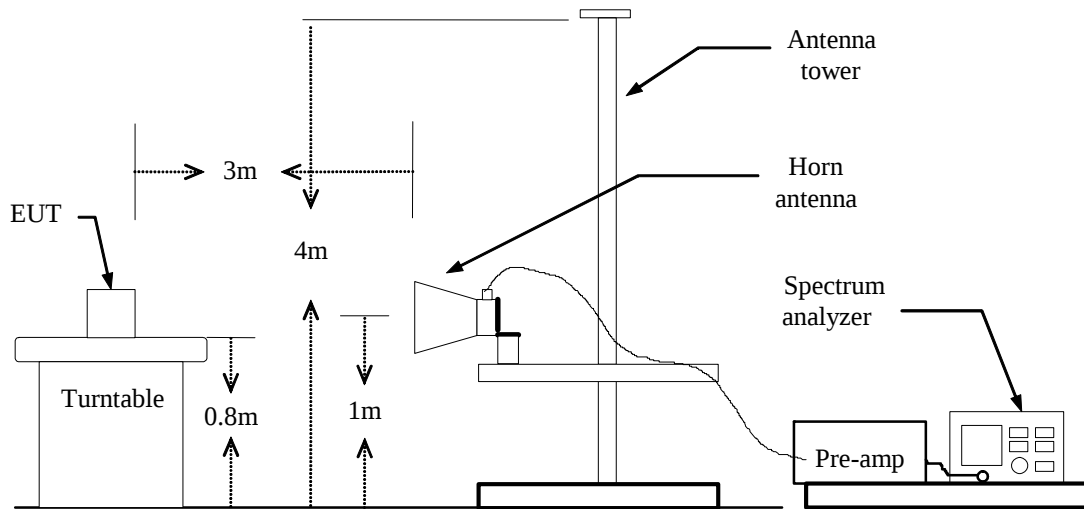
Note: N.C.R. = No Calibration Request.

3.3. Setup

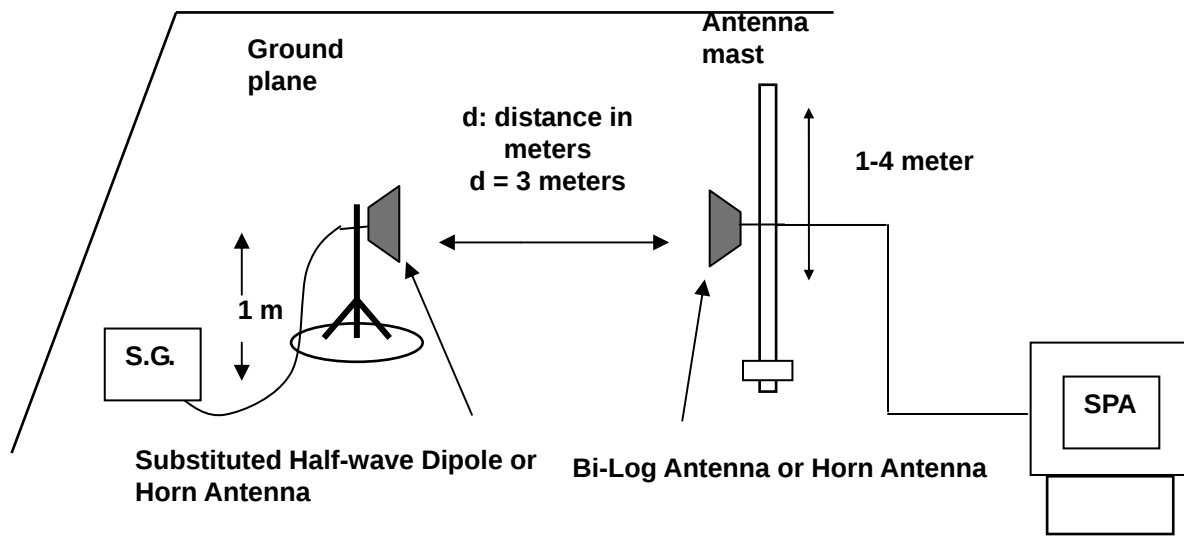
Below 1 GHz



Above 1 GHz



For Substituted Method Test Set-UP



3.4. Test Procedure

The measurement is made according to ANSI/TIA-603-C-2004 as follows:

The EUT was placed on a non-conductive turntable using a non-conductive support. The radiated emission at the fundamental frequency was measured at 3 m with a test antenna and EMI spectrum analyzer.

During the measurement of the EUT, the resolution bandwidth was set to 3MHz and the average bandwidth was set to 3MHz. The highest emission was recorded with the rotation of the turntable and the lowering of the test antenna.

The reading was recorded and the field strength (E in dBuV/m) was calculated.

ERP in frequency band 824-849MHz, and EIRP in frequency band 1851.25 –1910MHz were measured using a substitution method. The EUT was replaced by half-wave dipole (824-849MHz) or horn antenna (1851.25-1910MHz) connected to a signal generator. The spectrum analyzer reading was recorded and ERP/EIRP was calculated as follows:

ERP = S.G. output (dBm) + Antenna Gain (dBd) – Cable (dB)

EIRP = S.G. output (dBm) + Antenna Gain (dBi) – Cable (dB)

3.5. Uncertainty

The measurement uncertainty is defined as for Field Strength of Spurious Radiation measurement is ± 3.072 dB.

3.6. Test Result

Model Number	AirCard 781S							
Test Item	ERP/EIRP							
Date of Test	08/26/2013					Test Site	TE01	
Bands	Modulation Type	Frequency (MHz)	Ant. Polar.	Read Level (dBm)	Correction Factor (dBm)	EIRP		Limit
						(dBm)	(W)	
WCDMA Band II	QPSK	1852.4	H	14.58	8.34	22.92	0.196	< 2W
			V	13.39	8.36	21.75	0.150	< 2W
		1880.0	H	12.35	10.51	22.86	0.193	< 2W
			V	14.13	8.57	22.70	0.186	< 2W
		1907.6	H	11.45	10.52	21.97	0.157	< 2W
			V	14.08	8.78	22.86	0.193	< 2W

Model Number	AirCard 781S							
Test Item	ERP/EIRP							
Date of Test	08/26/2013					Test Site	TE01	
Bands	Modulation Type	Frequency (MHz)	Ant. Polar.	Read Level (dBm)	Correction Factor (dBm)	ERP		Limit
						(dBm)	(W)	
WCDMA Band V	QPSK	826.4	H	-1.62	11.97	10.35	0.011	< 7W
			V	8.14	11.31	19.45	0.088	< 7W
		836.6	H	0.36	12.08	12.44	0.018	< 7W
			V	8.23	11.34	19.57	0.091	< 7W
		846.6	H	-0.44	12.36	11.92	0.016	< 7W
			V	7.29	11.42	18.71	0.074	< 7W

Note: 1. ERP/EIRP = Read Level + Correction factor.

2. For WCDMA signals, a peak detector is used with RBW = VBW = 5MHz.

3. For AMPS, GSM, and NADC TDMA signals, a peak detector is used, with RBW = VBW= 1 MHz.

4 Peak to Average Ratio Test

4.1. Limit

In measuring transmissions in this band using an average power technique, the peak to-average ratio (PAR) of the transmission may not exceed 13 dB.

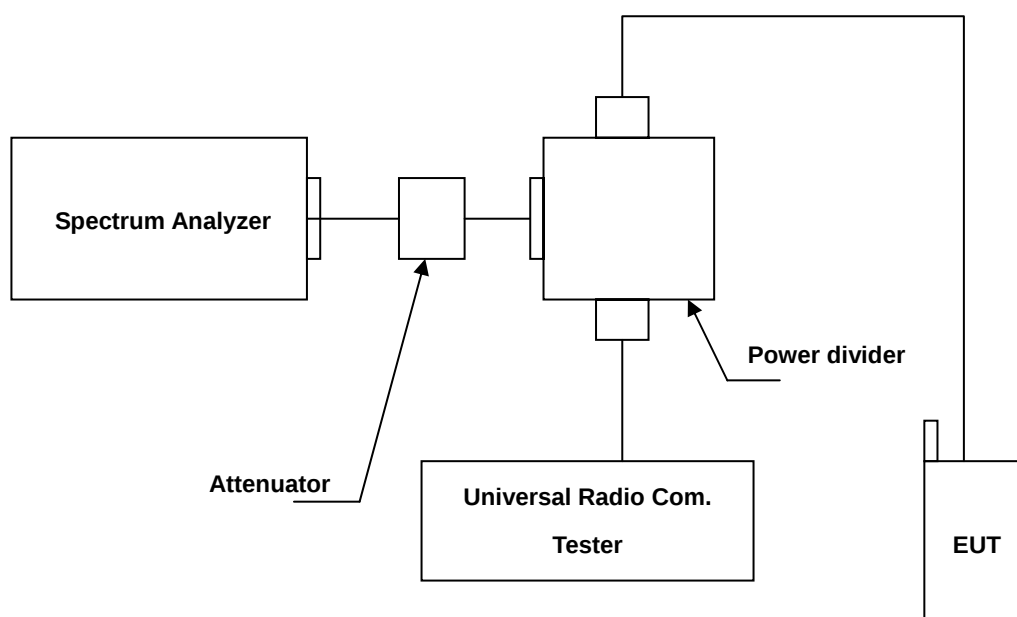
4.2. Test Instruments

Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Remark
Spectrum Analyzer	Agilent	E4445A	MY46181986	05/16/2013	(1)
Universal Radio Communication Tester	R & S	CMU200	112387	03/18/2013	(1)
Attenuator	RADIAL	R41572000	0603033073	N.C.R.	-----
Power divider	Agilent	87302C	3239A00760	N.C.R.	-----
Test Site	ATL	TE05	TE05	N.C.R.	-----

Remark: ⁽¹⁾ Calibration period 1 year. ⁽²⁾ Calibration period 2 years.

Note: N.C.R. = No Calibration Request.

4.3. Setup



4.4. Test Procedure

The measurement is made according to FCC rules part 24:

- Set resolution/measurement bandwidth signal's occupied bandwidth;
- Set the number of counts to a value that stabilizes the measured CCDF curve;
- Record the maximum PAPR level associated with a probability of 0.1%.

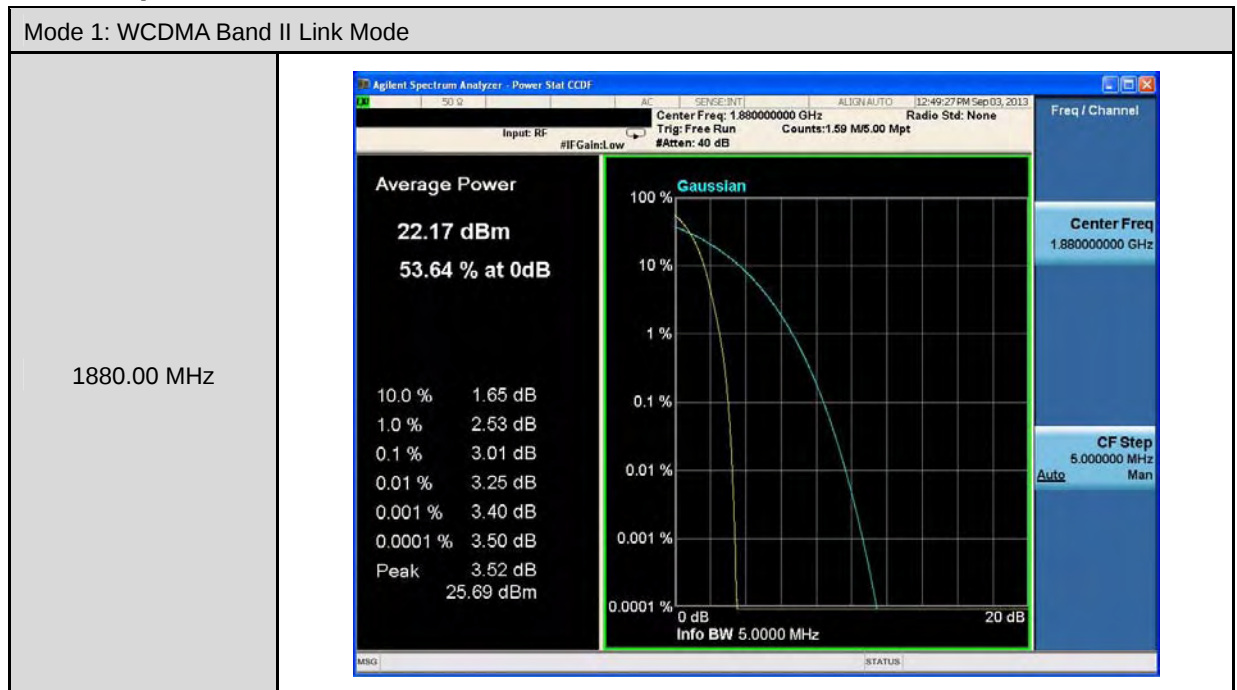
4.5. Uncertainty

The measurement uncertainty is defined as for Conducted Power measurement is 1.2 dB.

4.6. Test Result

Product	LTE Modem			
Test Item	Peak to Average Ratio			
Date of Test	09/04/2012			Test Site TE05
Bands	Channel	Frequency (MHz)	Peak to Average Ratio (dB)	Limit (dB)
WCDMA Band II	9400	1880.0	3.01	< 13

4.7. Test Graphs



5 Occupied Bandwidth Test

5.1. Limit

The Occupied Bandwidth Limit:

N/A.

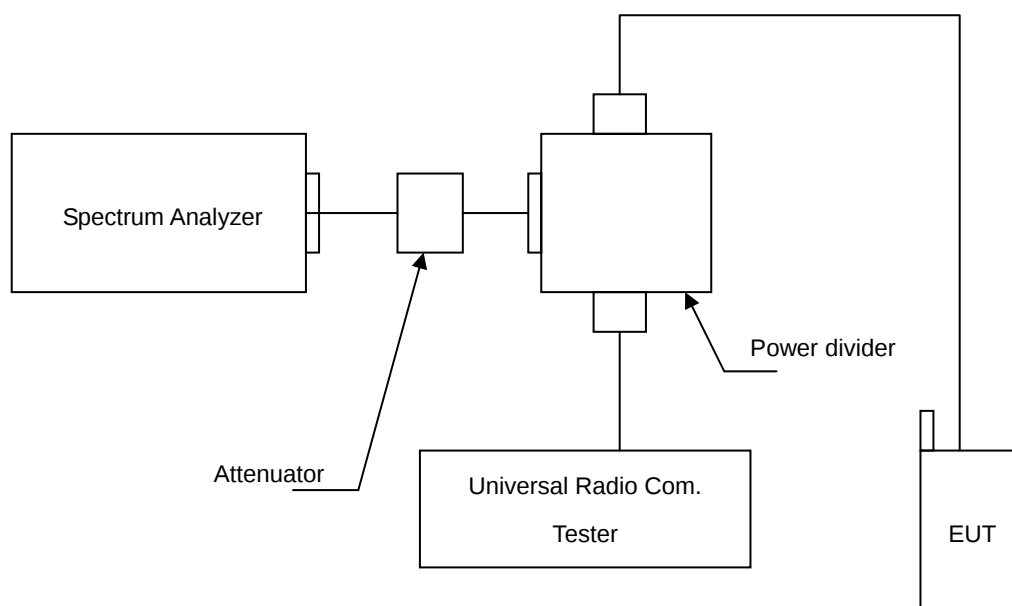
5.2. Test Instruments

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
Universal Radio Communication Tester	R & S	CMU200	112387	03/18/2013	(1)
Spectrum Analyzer	Agilent	E4445A	MY46181986	05/16/2013	(1)
Attenuator	RADIALL	R41572000	0603033073	N.C.R.	-----
Power Divider	Agilent	87302C	3239A00760	N.C.R.	-----
Test Site	ATL	TE05	TE05	N.C.R.	-----

Remark: ⁽¹⁾ Calibration period 1 year. ⁽²⁾ Calibration period 2 years.

Note: N.C.R. = No Calibration Request.

5.3. Setup



5.4. Test Procedure

The measurement is made according to FCC rules part 22 and 24:

1. The EUT was connected to Spectrum Analyzer and Base Station via Power Divider.
2. The occupied bandwidth of middle channel for the highest and lowest RF powers was measured.

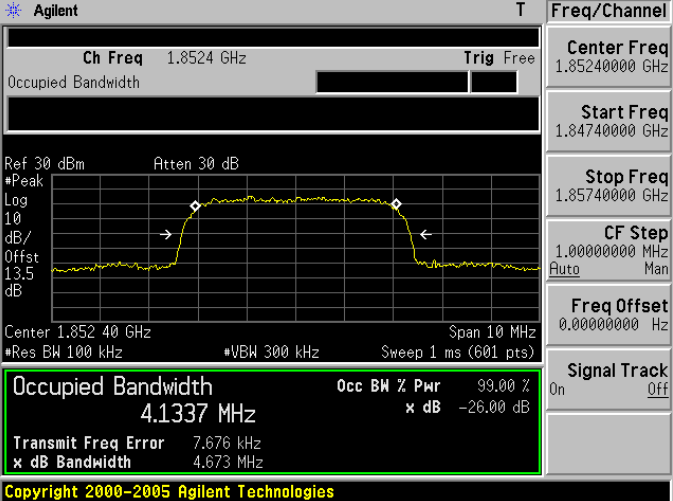
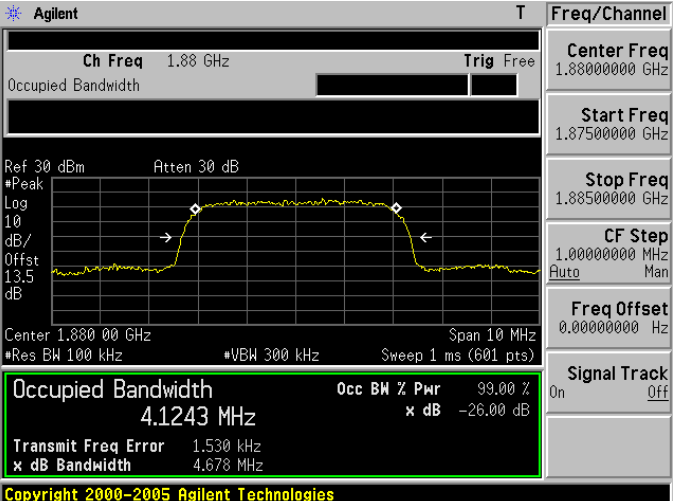
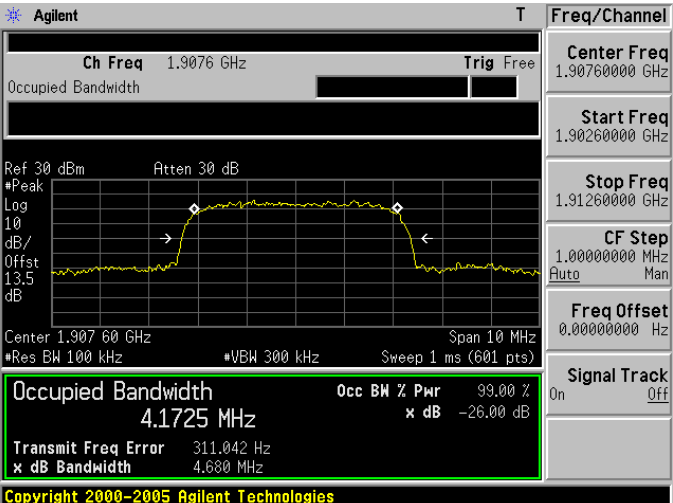
5.5. Uncertainty

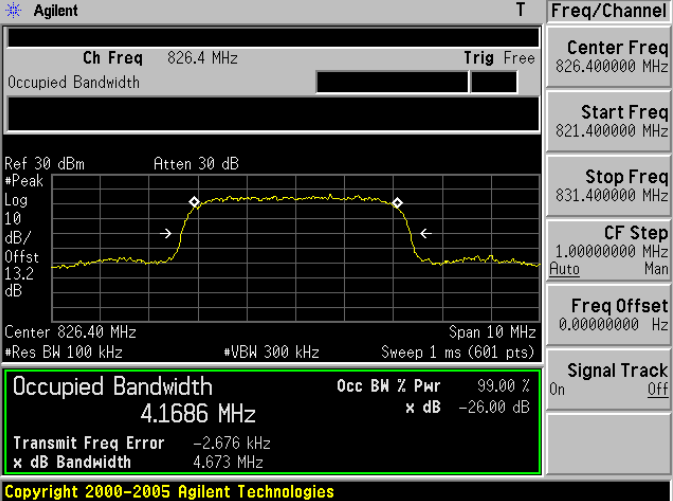
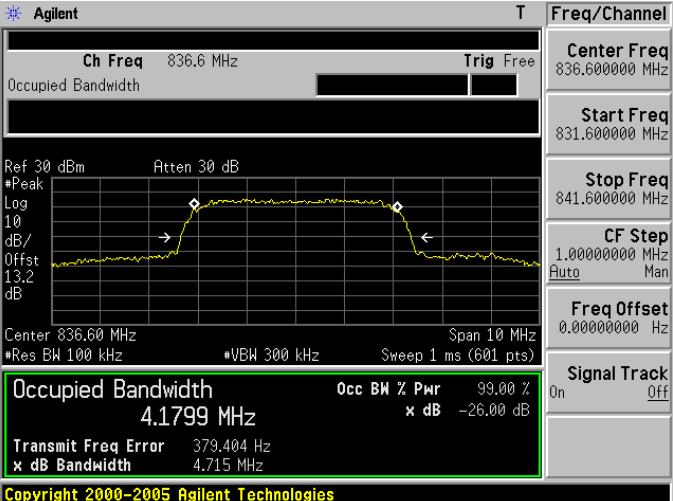
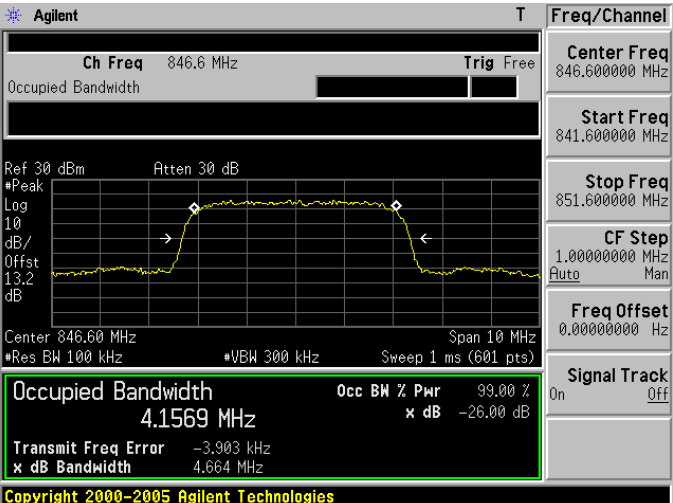
The measurement uncertainty is defined as $\pm 10\text{Hz}$

5.6. Test Result

Model Number	AirCard 781S			
Test Item	Occupied Bandwidth			
Date of Test	08/20/2013			Test Site TE05
Bands	Channel	Frequency (MHz)	99% Bandwidth (MHz)	Note
WCDMA Band II	9262	1852.4	4.1337	RBW:100KHz , VBW:300KHz
	9400	1880.0	4.1243	RBW:100KHz , VBW:300KHz
	9538	1907.6	4.1725	RBW:100KHz , VBW:300KHz
WCDMA Band V	4132	826.4	4.1686	RBW:100KHz , VBW:300KHz
	4183	836.6	4.1799	RBW:100KHz , VBW:300KHz
	4233	846.6	4.1569	RBW:100KHz , VBW:300KHz

5.7. Test Graphs

Mode 1: WCDMA Band II Link Mode	
1850.20 MHz	 Agilent T Freq/Channel Ch Freq 1.8524 GHz Trig Free Center Freq 1.85240000 GHz Start Freq 1.84740000 GHz Stop Freq 1.85740000 GHz CF Step 1.00000000 MHz Auto Man Freq Offset 0.00000000 Hz Signal Track On Off Ref 30 dBm Atten 30 dB Peak 10 dB/Offst 13.5 dB Center 1.852 40 GHz Span 10 MHz *Res BW 100 kHz *VBW 300 kHz Sweep 1 ms (601 pts) Occupied Bandwidth 4.1337 MHz Occ BW % Pwr 99.00 % x dB -26.00 dB Transmit Freq Error 7.676 kHz x dB Bandwidth 4.673 MHz Copyright 2000-2005 Agilent Technologies
1880.00 MHz	 Agilent T Freq/Channel Ch Freq 1.88 GHz Trig Free Center Freq 1.88000000 GHz Start Freq 1.87500000 GHz Stop Freq 1.88500000 GHz CF Step 1.00000000 MHz Auto Man Freq Offset 0.00000000 Hz Signal Track On Off Ref 30 dBm Atten 30 dB Peak 10 dB/Offst 13.5 dB Center 1.880 00 GHz Span 10 MHz *Res BW 100 kHz *VBW 300 kHz Sweep 1 ms (601 pts) Occupied Bandwidth 4.1243 MHz Occ BW % Pwr 99.00 % x dB -26.00 dB Transmit Freq Error 1.530 kHz x dB Bandwidth 4.678 MHz Copyright 2000-2005 Agilent Technologies
1909.80 MHz	 Agilent T Freq/Channel Ch Freq 1.9076 GHz Trig Free Center Freq 1.90760000 GHz Start Freq 1.90260000 GHz Stop Freq 1.91260000 GHz CF Step 1.00000000 MHz Auto Man Freq Offset 0.00000000 Hz Signal Track On Off Ref 30 dBm Atten 30 dB Peak 10 dB/Offst 13.5 dB Center 1.907 60 GHz Span 10 MHz *Res BW 100 kHz *VBW 300 kHz Sweep 1 ms (601 pts) Occupied Bandwidth 4.1725 MHz Occ BW % Pwr 99.00 % x dB -26.00 dB Transmit Freq Error 311.042 Hz x dB Bandwidth 4.680 MHz Copyright 2000-2005 Agilent Technologies

Mode 2: WCDMA Band V Link Mode	
826.4 MHz	 Agilent T Ch Freq 826.4 MHz Trig Free Occupied Bandwidth Ref 30 dBm Atten 30 dB *Peak Log 10 dB/ Offset 13.2 dB Center 826.40 MHz Span 10 MHz *Res BW 100 kHz *VBW 300 kHz Sweep 1 ms (601 pts) Occupied Bandwidth 4.1686 MHz Occ BW % Pwr 99.00 % x dB -26.00 dB Transmit Freq Error -2.676 kHz x dB Bandwidth 4.673 MHz Copyright 2000-2005 Agilent Technologies Freq/Channel Center Freq 826.400000 MHz Start Freq 821.400000 MHz Stop Freq 831.400000 MHz CF Step 1.00000000 MHz Auto Man Freq Offset 0.00000000 Hz Signal Track On Off
836.6 MHz	 Agilent T Ch Freq 836.6 MHz Trig Free Occupied Bandwidth Ref 30 dBm Atten 30 dB *Peak Log 10 dB/ Offset 13.2 dB Center 836.60 MHz Span 10 MHz *Res BW 100 kHz *VBW 300 kHz Sweep 1 ms (601 pts) Occupied Bandwidth 4.1799 MHz Occ BW % Pwr 99.00 % x dB -26.00 dB Transmit Freq Error 379.404 Hz x dB Bandwidth 4.715 MHz Copyright 2000-2005 Agilent Technologies Freq/Channel Center Freq 836.600000 MHz Start Freq 831.600000 MHz Stop Freq 841.600000 MHz CF Step 1.00000000 MHz Auto Man Freq Offset 0.00000000 Hz Signal Track On Off
846.6 MHz	 Agilent T Ch Freq 846.6 MHz Trig Free Occupied Bandwidth Ref 30 dBm Atten 30 dB *Peak Log 10 dB/ Offset 13.2 dB Center 846.60 MHz Span 10 MHz *Res BW 100 kHz *VBW 300 kHz Sweep 1 ms (601 pts) Occupied Bandwidth 4.1569 MHz Occ BW % Pwr 99.00 % x dB -26.00 dB Transmit Freq Error -3.903 kHz x dB Bandwidth 4.664 MHz Copyright 2000-2005 Agilent Technologies Freq/Channel Center Freq 846.600000 MHz Start Freq 841.600000 MHz Stop Freq 851.600000 MHz CF Step 1.00000000 MHz Auto Man Freq Offset 0.00000000 Hz Signal Track On Off

6 Band Edge Test

6.1. Limit

The Band Edge Limit:

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10\log(P)$ dB.

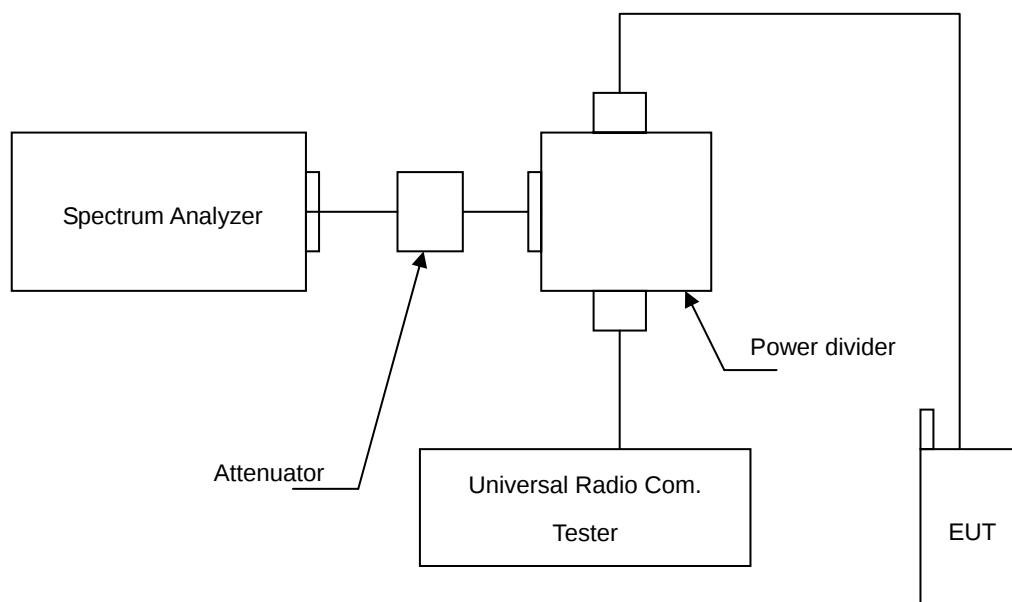
6.2. Test Instruments

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
Universal Radio Communication Tester	R & S	CMU200	112387	03/18/2013	(1)
Spectrum Analyzer	Agilent	E4445A	MY46181986	05/16/2013	(1)
Attenuator	RADIALL	R41572000	0603033073	N.C.R.	-----
Power Divider	Agilent	87302C	3239A00760	N.C.R.	-----
Test Site	ATL	TE05	TE05	N.C.R.	-----

Remark: ⁽¹⁾ Calibration period 1 year. ⁽²⁾ Calibration period 2 years.

Note: N.C.R. = No Calibration Request.

6.3. Setup



6.4. Test Procedure

The measurement is made according to FCC rules part 22 and 24:

1. The EUT was connected to Spectrum Analyzer and Base Station via Power Divider.
2. The band edge of low and high channels for the highest RF powers within the transmitting frequency band were measured. Setting RBW as roughly BW/100.
3. The band edge setting:
 - a. RB=10 kHz; VB=30 kHz for GSM 850 and PCS 1900.
 - b. RB=100 kHz; VB=300 kHz for WCDMA Band V and WCDMA Band II.

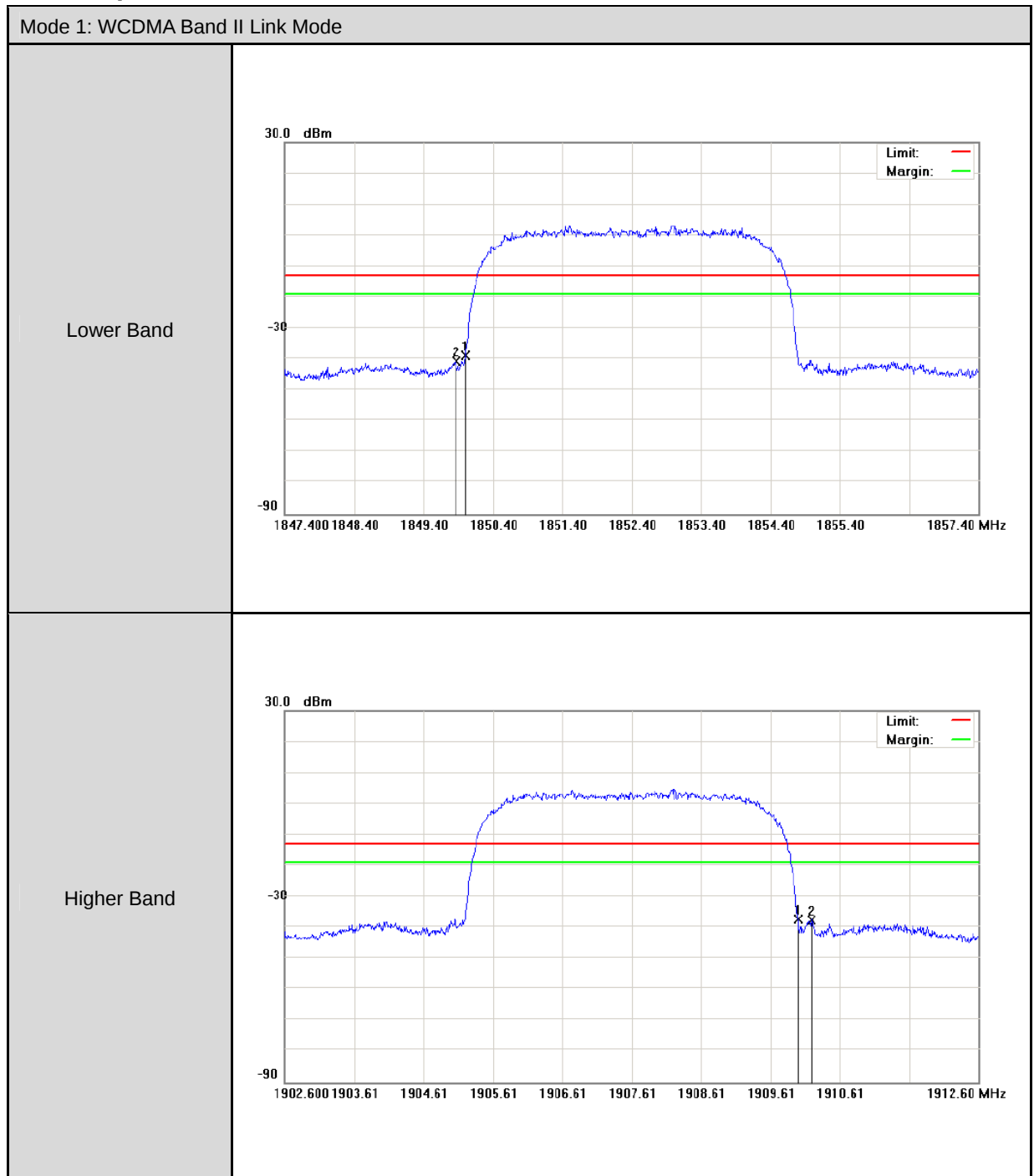
6.5. Uncertainty

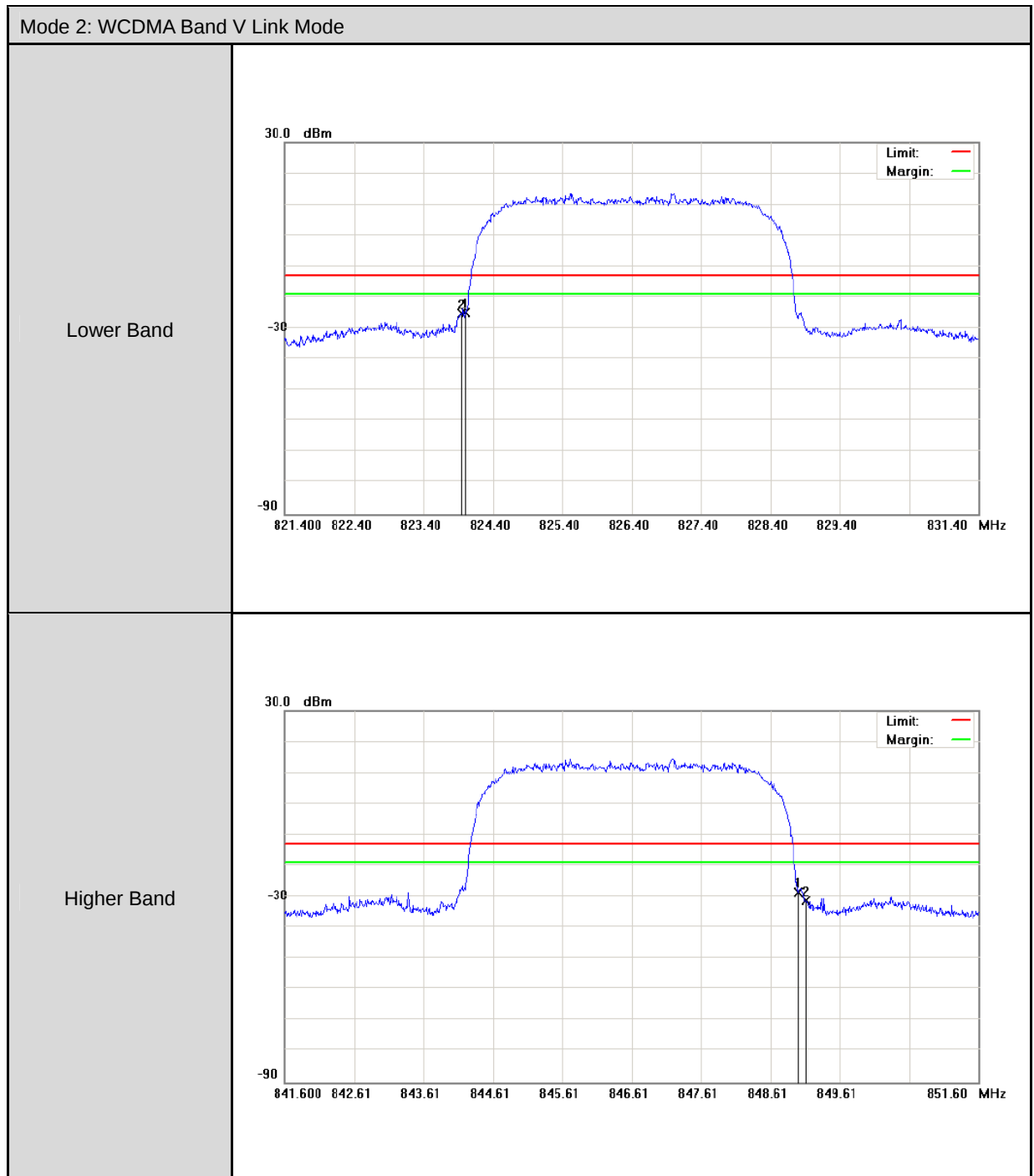
The measurement uncertainty is defined as $\pm 10\text{Hz}$

6.6. Test Result

Model Number		AirCard 781S				
Test Item		Band Edge				
Date of Test		08/20/2013			Test Site	TE05
Bands		Channel	Frequency (MHz)	Bandwidth (dBm)	Limit (dBm)	Result
WCDMA Band II	Lower	9262	1850.000	-38.85	-13	Pass
	Higher	9538	1910.000	-37.34	-13	Pass
WCDMA Band V	Lower	4132	824.0000	-24.96	-13	Pass
	Higher	4233	849.0000	-28.74	-13	Pass

6.7. Test Graphs





7 Conducted Spurious Emission Test

7.1. Limit

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10\log(P)$ dB.

7.2. Test Instruments

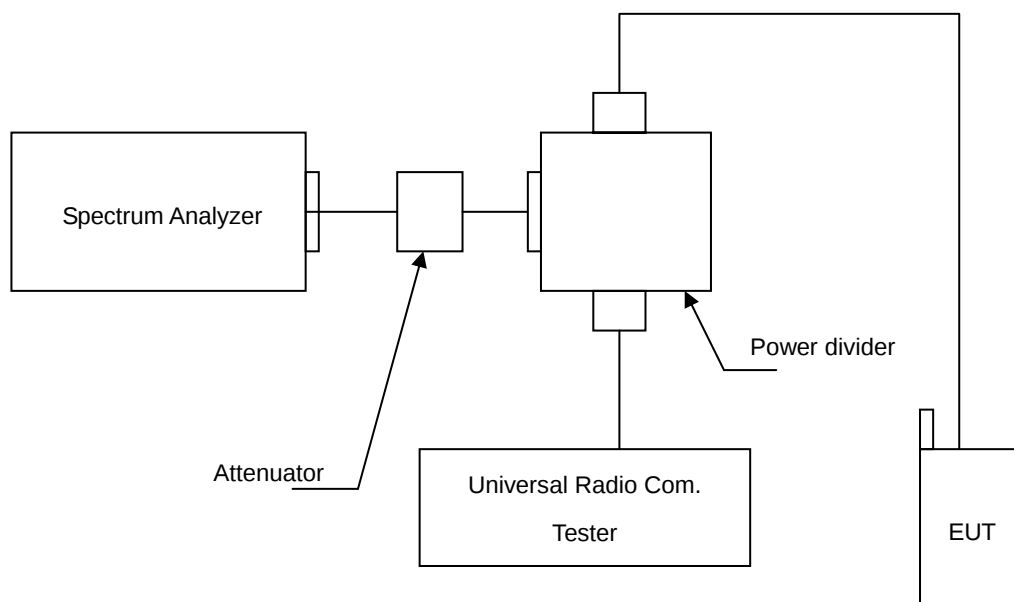
Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
Universal Radio Communication Tester	R & S	CMU200	112387	03/18/2013	(1)
Spectrum Analyzer	Agilent	E4445A	MY46181986	05/16/2013	(1)
Attenuator	RADIALL	R41572000	0603033073	N.C.R.	-----
Power Divider	Agilent	87302C	3239A00760	N.C.R.	-----
Test Site	ATL	TE05	TE05	N.C.R.	-----

Remark: ⁽¹⁾ Calibration period 1 year. ⁽²⁾ Calibration period 2 years.

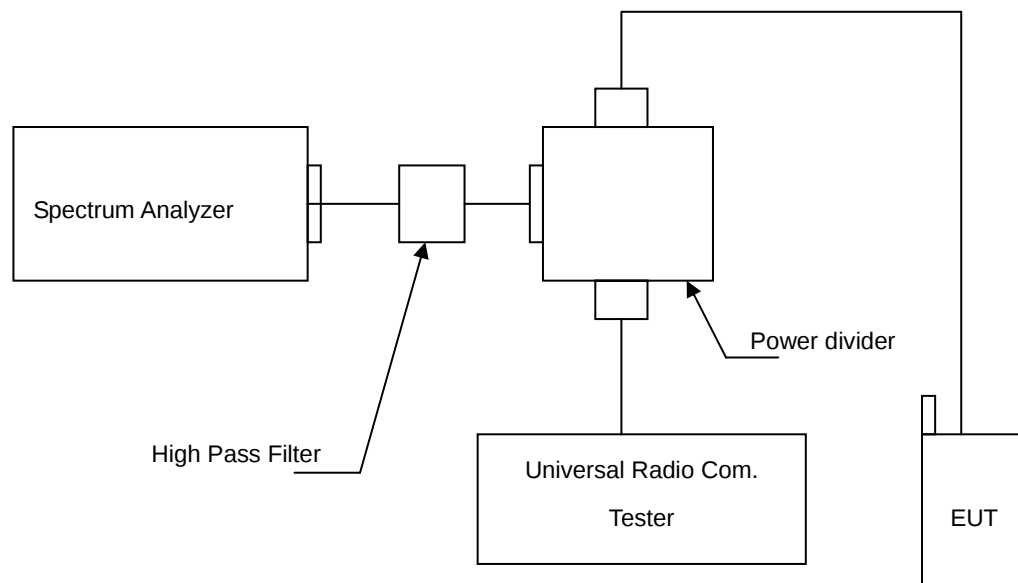
Note: N.C.R. = No Calibration Request.

7.3. Setup

Below 2.8GHz



Above 2.8GHz



7.4. Test Procedure

1. The EUT was connected to Spectrum Analyzer and Base Station via Power Divider.
2. The middle channel for the highest RF power within the transmitting frequency was measured.
3. The conducted spurious emission for the whole frequency range was taken.
4. Test setting at GSM 850 RB>100 kHz, VB>100 kHz; PCS 1900 RB>1MHz, VB>1MHz.

7.5. Uncertainty

The measurement uncertainty is evaluated as ± 2.24 dB.

7.6. Test Result

Model Number	AirCard 781S		
Test Item	Conducted Spurious Emission		
Test Mode	Mode 1 / Mode 2		
Date of Test	08/20/2013	Test Site	TE05

8 Field Strength of Spurious Radiation Test

8.1. Limit

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10\log(P)$ dB.

It is measured by means of a calibrated spectrum analyzer and scanned from 30 MHz up to a frequency including its 10th harmonic.

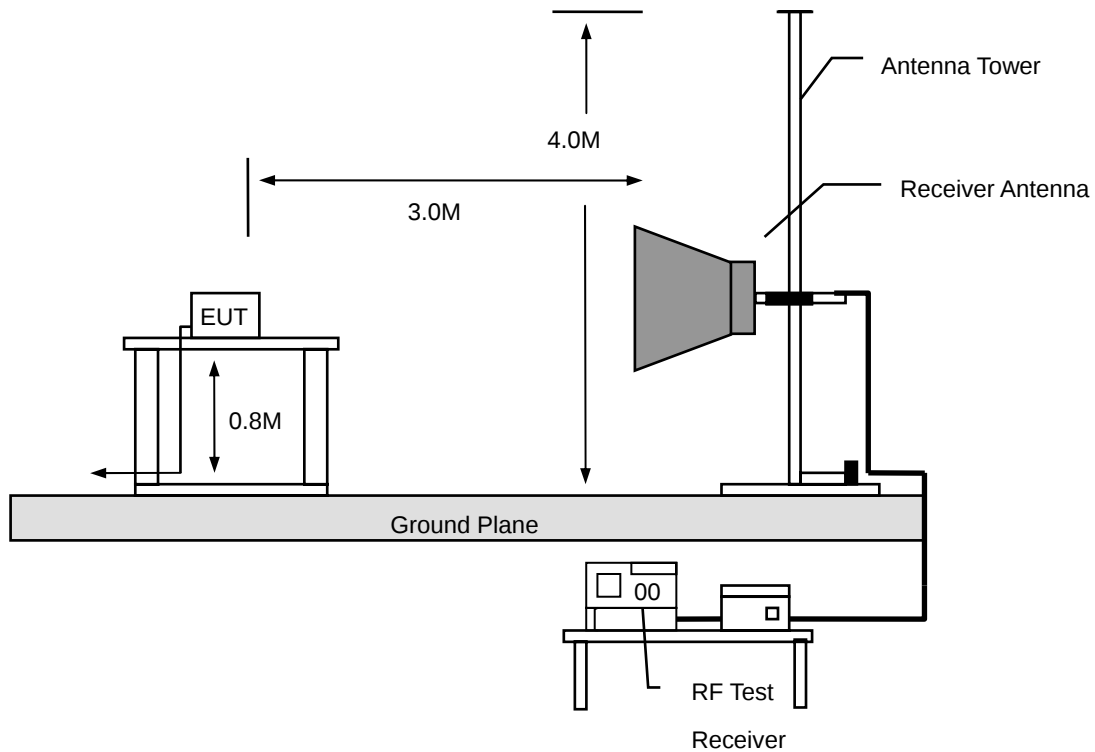
8.2. Test Instruments

3 Meter Chamber					
Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
RF Pre-selector	Agilent	N9039A	MY46520256	01/21/2013	(2)
Spectrum Analyzer	Agilent	E4446A	MY46180578	01/21/2013	(1)
Pre Amplifier	Agilent	8449B	3008A02237	02/21/2013	(1)
Pre Amplifier	Agilent	8447D	2944A10961	02/21/2013	(1)
Broadband Antenna (30MHz~1GHz)	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	9163-270	07/01/2013	(1)
Horn Antenna (1~18GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA9120D	9120D-550	06/10/2013	(1)
Horn Antenna (18~40GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA9170	9170-320	06/13/2013	(1)
Test Site	ATL	TE01	888001	08/28/2012	(1)

Remark: ⁽¹⁾ Calibration period 1 year. ⁽²⁾ Calibration period 2 years.

Note: N.C.R. = No Calibration Request.

8.3. Setup



8.4. Test Procedure

Final radiation measurements were made on a three-meter, Semi Anechoic Chamber. The EUT system was placed on a nonconductive turntable which is 0.8 meters height, top surface 1.0 x 1.5 meter. The spectrum was examined from 250 MHz to 2.5 GHz in order to cover the whole spectrum below 10th harmonic which could generate from the EUT. During the test, EUT was set to transmit continuously & Measurements spectrum range from 30 MHz to 26.5 GHz is investigated.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, and then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

A nonconductive material surrounded the EUT to supporting the EUT for standing on three orthogonal planes. At each condition, the EUT was rotated 360 degrees, and the antenna was raised and lowered from one to four meters to find the maximum emission levels. Measurements were taken using both horizontal and vertical antenna polarization.

SCHWARZBECK MESS-ELEKTRONIK Biconilog Antenna (mode VULB9163) at 3 Meter and the SCHWARZBECK Double Ridged Guide Antenna (model BBHA9120D&9170) was used in frequencies 1 – 26.5 GHz at a distance of 1 meter. All test results were extrapolated to equivalent signal at 3 meters utilizing an inverse linear distance extrapolation Factor (20dB/decade).

For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

Appropriate preamplifiers were used for improving sensitivity and precautions were taken to avoid overloading or desensitizing the spectrum analyzer. No post – detector video filters were used in the test.

The spectrum analyzer's 6 dB bandwidth was set to 1 MHz, and the analyzer was operated in the peak detection mode, for frequencies both below and up 1 GHz. The average levels were obtained by subtracting the duty cycle correction factor from the peak readings.

The following procedures were used to convert the emission levels measured in decibels referenced to 1 microvolt (dBuV) into field intensity in micro volts per meter (uV/m).

The actual field intensity in decibels referenced to 1 microvolt in to field intensity in micro volts per meter (dBuV/m). The actual field intensity in decibels referenced to 1 microvolt per meter (dBuV/m) is determined by algebraically adding the measured reading in dBuV, the antenna factor (dB), and cable loss (dB) and Subtracting the gain of preamplifier (dB) is auto calculate in spectrum analyzer.

(1) $\text{Amplitude (dBuV/m)} = \text{FI (dBuV)} + \text{AF (dBuV)} + \text{CL (dBuV)} - \text{Gain (dB)}$

FI= Reading of the field intensity.

AF= Antenna factor.

CL= Cable loss.

P.S Amplitude is auto calculate in spectrum analyzer.

(2) $\text{Actual Amplitude (dBuV/m)} = \text{Amplitude (dBuV)} - \text{Dis(dB)}$

The FCC specified emission limits were calculated according the EUT operating frequency and by following linear interpolation equations:

(a) For fundamental frequency : Transmitter Output < +30dBm

(b) For spurious frequency : Spurious emission limits = fundamental emission limit /10

8.5. Uncertainty

The measurement uncertainty is defined as for Field Strength of Spurious Radiation measurement is ± 3.072 dB.

8.6. Test Result

Standard:	FCC Part 24	Test Distance:	3m
Test item:	Radiated Emission	Power:	AC 120V/60Hz
Model Number:	AirCard 781S	Temp.(°C)/Hum.(%RH):	26(°C)/60%RH
Mode:	1	Date:	08/26/2013
Frequency:	1852.4 MHz	Test By:	Fly Lu

Frequency (MHz)	Reading (dBm)	Correct Factor (dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Remark	Ant.Polar. H / V
92.5000	-71.29	-0.43	-71.72	-13.00	-58.72	peak	H
209.0000	-80.33	0.86	-79.47	-13.00	-66.47	peak	H
366.5000	-81.10	0.29	-80.81	-13.00	-67.81	peak	H
514.0000	-80.72	7.46	-73.26	-13.00	-60.26	peak	H
666.5000	-80.41	7.11	-73.30	-13.00	-60.30	peak	H
824.5000	-81.65	11.96	-69.69	-13.00	-56.69	peak	H
2800.000	-70.63	17.24	-53.39	-13.00	-40.39	peak	H
5296.000	-72.46	25.11	-47.35	-13.00	-34.35	peak	H
7792.000	-72.60	33.72	-38.88	-13.00	-25.88	peak	H
131.5000	-75.50	13.57	-61.93	-13.00	-48.93	peak	V
202.5000	-77.22	9.85	-67.37	-13.00	-54.37	peak	V
345.5000	-81.49	1.53	-79.96	-13.00	-66.96	peak	V
498.0000	-80.78	2.71	-78.07	-13.00	-65.07	peak	V
628.0000	-81.19	8.79	-72.40	-13.00	-59.40	peak	V
771.0000	-80.10	11.13	-68.97	-13.00	-55.97	peak	V
2620.000	-70.23	17.49	-52.74	-13.00	-39.74	peak	V
5356.000	-72.89	27.63	-45.26	-13.00	-32.26	peak	V
7648.000	-72.36	30.89	-41.47	-13.00	-28.47	peak	V

Standard:	FCC Part 24	Test Distance:	3m
Test item:	Radiated Emission	Power:	AC 120V/60Hz
Model Number:	AirCard 781S	Temp.(°C)/Hum.(%RH):	26(°C)/60%RH
Mode:	1	Date:	08/26/2013
Frequency:	1880.0 MHz	Test By:	Fly Lu

Frequency (MHz)	Reading (dBm)	Correct Factor (dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Remark	Ant.Polar. H / V
92.5000	-71.29	-0.43	-71.72	-13.00	-58.72	peak	H
201.5000	-79.38	2.61	-76.77	-13.00	-63.77	peak	H
382.0000	-81.07	0.95	-80.12	-13.00	-67.12	peak	H
541.0000	-79.89	8.23	-71.66	-13.00	-58.66	peak	H
666.5000	-80.41	7.11	-73.30	-13.00	-60.30	peak	H
832.5000	-80.96	12.03	-68.93	-13.00	-55.93	peak	H
2644.000	-70.28	16.84	-53.44	-13.00	-40.44	peak	H
5296.000	-73.74	25.11	-48.63	-13.00	-35.63	peak	H
7708.000	-72.49	33.73	-38.76	-13.00	-25.76	peak	H
160.0000	-74.25	12.68	-61.57	-13.00	-48.57	peak	V
202.5000	-77.22	9.85	-67.37	-13.00	-54.37	peak	V
345.5000	-81.49	1.53	-79.96	-13.00	-66.96	peak	V
523.5000	-80.37	3.30	-77.07	-13.00	-64.07	peak	V
700.0000	-81.27	10.19	-71.08	-13.00	-58.08	peak	V
863.0000	-81.80	11.50	-70.30	-13.00	-57.30	peak	V
2908.000	-70.61	19.57	-51.04	-13.00	-38.04	peak	V
5308.000	-72.19	27.56	-44.63	-13.00	-31.63	peak	V
7804.000	-72.90	30.67	-42.23	-13.00	-29.23	peak	V

Standard:	FCC Part 24	Test Distance:	3m
Test item:	Radiated Emission	Power:	AC 120V/60Hz
Model Number:	AirCard 781S	Temp.(°C)/Hum.(%RH):	26(°C)/60%RH
Mode:	1	Date:	08/26/2013
Frequency:	1907.6 MHz	Test By:	Fly Lu

Frequency (MHz)	Reading (dBm)	Correct Factor (dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Remark	Ant.Polar. H / V
92.5000	-71.29	-0.43	-71.72	-13.00	-58.72	peak	H
201.5000	-79.38	2.61	-76.77	-13.00	-63.77	peak	H
398.5000	-81.94	2.42	-79.52	-13.00	-66.52	peak	H
541.0000	-79.89	8.23	-71.66	-13.00	-58.66	peak	H
718.0000	-81.37	7.44	-73.93	-13.00	-60.93	peak	H
869.5000	-81.76	13.10	-68.66	-13.00	-55.66	peak	H
2656.000	-68.93	16.87	-52.06	-13.00	-39.06	peak	H
5344.000	-73.18	25.34	-47.84	-13.00	-34.84	peak	H
7708.000	-72.71	33.73	-38.98	-13.00	-25.98	peak	H
131.5000	-75.50	13.57	-61.93	-13.00	-48.93	peak	V
202.5000	-77.22	9.85	-67.37	-13.00	-54.37	peak	V
368.5000	-82.02	2.08	-79.94	-13.00	-66.94	peak	V
589.5000	-80.96	6.65	-74.31	-13.00	-61.31	peak	V
729.5000	-80.64	10.68	-69.96	-13.00	-56.96	peak	V
829.5000	-81.46	11.31	-70.15	-13.00	-57.15	peak	V
2812.000	-70.29	18.88	-51.41	-13.00	-38.41	peak	V
5404.000	-72.60	27.72	-44.88	-13.00	-31.88	peak	V
7696.000	-72.34	30.82	-41.52	-13.00	-28.52	peak	V

Standard:	FCC Part 22	Test Distance:	3m
Test item:	Radiated Emission	Power:	AC 120V/60Hz
Model Number:	AirCard 781S	Temp.(°C)/Hum.(%RH):	26(°C)/60%RH
Mode:	2	Date:	08/26/2013
Frequency:	826.4 MHz	Test By:	Fly Lu

Frequency (MHz)	Reading (dBm)	Correct Factor (dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Remark	Ant.Polar. H / V
92.5000	-71.15	-0.43	-71.58	-13.00	-58.58	peak	H
207.5000	-79.39	1.22	-78.17	-13.00	-65.17	peak	H
352.5000	-80.68	-0.17	-80.85	-13.00	-67.85	peak	H
518.5000	-80.21	7.59	-72.62	-13.00	-59.62	peak	H
662.0000	-80.49	7.14	-73.35	-13.00	-60.35	peak	H
754.0000	-82.33	8.83	-73.50	-13.00	-60.50	peak	H
2692.000	-70.07	16.96	-53.11	-13.00	-40.11	peak	H
5428.000	-73.80	25.73	-48.07	-13.00	-35.07	peak	H
7684.000	-72.82	33.73	-39.09	-13.00	-26.09	peak	H
162.5000	-72.99	10.32	-62.67	-13.00	-49.67	peak	V
201.0000	-79.24	10.04	-69.20	-13.00	-56.20	peak	V
331.5000	-80.94	1.13	-79.81	-13.00	-66.81	peak	V
468.5000	-81.19	2.00	-79.19	-13.00	-66.19	peak	V
574.5000	-81.31	5.50	-75.81	-13.00	-62.81	peak	V
722.5000	-82.18	10.81	-71.37	-13.00	-58.37	peak	V
2476.000	-70.58	16.43	-54.15	-13.00	-41.15	peak	V
4684.000	-72.29	26.53	-45.76	-13.00	-32.76	peak	V
7552.000	-73.25	31.01	-42.24	-13.00	-29.24	peak	V

Standard:	FCC Part 22	Test Distance:	3m
Test item:	Radiated Emission	Power:	AC 120V/60Hz
Model Number:	AirCard 781S	Temp.(°C)/Hum.(%RH):	26(°C)/60%RH
Mode:	2	Date:	08/26/2013
Frequency:	836.6 MHz	Test By:	Fly Lu

Frequency (MHz)	Reading (dBm)	Correct Factor (dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Remark	Ant.Polar. H / V
92.5000	-71.73	-0.43	-72.16	-13.00	-59.16	peak	H
204.5000	-77.43	1.92	-75.51	-13.00	-62.51	peak	H
336.5000	-81.32	-0.62	-81.94	-13.00	-68.94	peak	H
506.5000	-79.98	7.20	-72.78	-13.00	-59.78	peak	H
621.5000	-81.42	7.65	-73.77	-13.00	-60.77	peak	H
765.0000	-80.99	9.36	-71.63	-13.00	-58.63	peak	H
2812.000	-69.38	17.28	-52.10	-13.00	-39.10	peak	H
5332.000	-72.84	25.28	-47.56	-13.00	-34.56	peak	H
7552.000	-72.89	33.77	-39.12	-13.00	-26.12	peak	H
130.5000	-74.91	14.10	-60.81	-13.00	-47.81	peak	V
201.5000	-81.07	9.97	-71.10	-13.00	-58.10	peak	V
369.5000	-82.19	2.05	-80.14	-13.00	-67.14	peak	V
493.5000	-80.31	2.63	-77.68	-13.00	-64.68	peak	V
613.5000	-80.56	8.42	-72.14	-13.00	-59.14	peak	V
701.5000	-81.44	10.24	-71.20	-13.00	-58.20	peak	V
2908.000	-70.29	19.57	-50.72	-13.00	-37.72	peak	V
5380.000	-72.37	27.67	-44.70	-13.00	-31.70	peak	V
7396.000	-72.22	30.98	-41.24	-13.00	-28.24	peak	V

Standard:	FCC Part 22	Test Distance:	3m
Test item:	Radiated Emission	Power:	AC 120V/60Hz
Model Number:	AirCard 781S	Temp.(°C)/Hum.(%RH):	26(°C)/60%RH
Mode:	2	Date:	08/26/2013
Frequency:	846.6 MHz	Test By:	Fly Lu

Frequency (MHz)	Reading (dBm)	Correct Factor (dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Remark	Ant.Polar. H / V
92.5000	-71.36	-0.43	-71.79	-13.00	-58.79	peak	H
201.0000	-79.46	2.73	-76.73	-13.00	-63.73	peak	H
354.5000	-81.02	-0.12	-81.14	-13.00	-68.14	peak	H
486.5000	-80.81	6.13	-74.68	-13.00	-61.68	peak	H
610.5000	-80.07	7.82	-72.25	-13.00	-59.25	peak	H
729.0000	-80.52	7.81	-72.71	-13.00	-59.71	peak	H
2596.000	-69.69	16.71	-52.98	-13.00	-39.98	peak	H
5380.000	-73.57	25.50	-48.07	-13.00	-35.07	peak	H
7684.000	-72.08	33.73	-38.35	-13.00	-25.35	peak	H
156.5000	-69.80	11.00	-58.80	-13.00	-45.80	peak	V
203.5000	-79.11	9.73	-69.38	-13.00	-56.38	peak	V
304.5000	-82.31	2.33	-79.98	-13.00	-66.98	peak	V
448.0000	-80.96	1.55	-79.41	-13.00	-66.41	peak	V
555.0000	-80.60	4.34	-76.26	-13.00	-63.26	peak	V
646.5000	-80.78	8.87	-71.91	-13.00	-58.91	peak	V
2860.000	-70.62	19.22	-51.40	-13.00	-38.40	peak	V
5296.000	-72.97	27.54	-45.43	-13.00	-32.43	peak	V
7684.000	-72.61	30.83	-41.78	-13.00	-28.78	peak	V

9 Frequency Stability (Temperature & Voltage Variation) Test

9.1. Limit

The frequency stability shall be measured by variation of ambient temperature and variation of primary supply voltage to ensure that the fundamental emission stays within the authorized frequency block. The frequency stability of the transmitter shall be maintained within $\pm 0.00025\%$ ($\pm 2.5\text{ppm}$) of the center frequency.

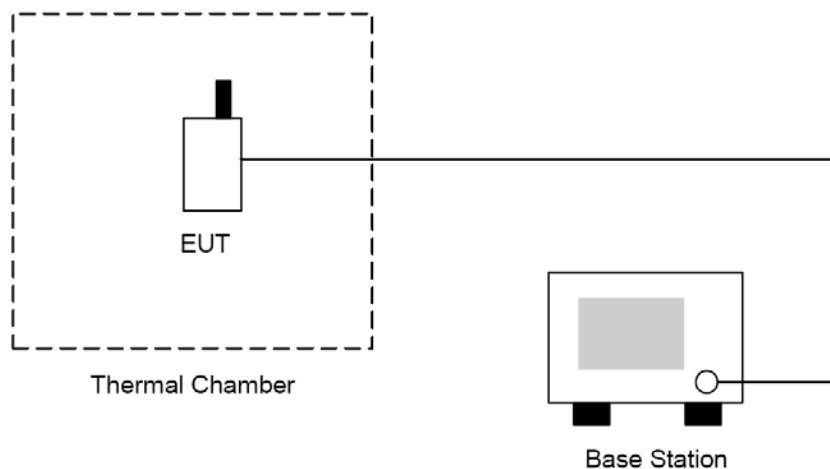
9.2. Test Instruments

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
Universal Radio Communication Tester	R & S	CMU200	112387	03/18/2013	(1)
Temperature & Humidity Chamber	TAICHY	MHU-225LA	980729	08/07/2013	(1)
Test Site	ATL	TE05	TE05	N.C.R.	-----

Remark: ⁽¹⁾ Calibration period 1 year. ⁽²⁾ Calibration period 2 years.

Note: N.C.R. = No Calibration Request.

9.3. Setup



9.4. Test Procedure

The measurement is made according to FCC rules part 22 and 24:

1. The EUT and test equipment were set up as shown on the following section.
2. With all power removed, the temperature was decreased to -30°C and permitted to stabilize for three hours. Power was applied and the maximum change in frequency was note within one minute.
3. With power OFF, the temperature was raised in 10°C steps. The sample was permitted to stabilize at each step for at least one-half hour. Power was applied and the maximum frequency change was noted within one minute.
4. The EUT was placed in a temperature chamber at $25 \pm 5^{\circ}\text{C}$ and connected as the following section.
5. The power supply voltage to the EUT was varied from BEP to 115% of the nominal value measured at the input to the EUT.
6. The temperature tests were performed for the worst case.
7. Test data was recorded.

9.5. Uncertainty

The measurement uncertainty is defined as for Frequency Stability (Temperature Variation) measurement is $\pm 10\text{Hz}$.

9.6. Test Result

Model Number	AirCard 781S					
Test Item	Frequency Stability (Temperature & Voltage Variation)					
Test Mode	Mode 1					
Date of Test	08/21/2013				Test Site	TE05
Level	Voltage [Vdc]	Temperature (°C)	Deviation (Hz)	Deviation (ppm)	Limit (ppm)	Result
Normal	3.70	-30	-13	-0.007	±2.5	Pass
Normal	3.70	-20	-8	-0.004	±2.5	Pass
Normal	3.70	-10	-9	-0.005	±2.5	Pass
Normal	3.70	0	12	0.006	±2.5	Pass
Normal	3.70	10	-7	-0.004	±2.5	Pass
Battery full point	4.25	20	-13	-0.007	±2.5	Pass
Normal	3.70	20	5	0.003	±2.5	Pass
Battery cut-off point	3.50	20	11	0.006	±2.5	Pass
Normal	3.70	30	-6	-0.003	±2.5	Pass
Normal	3.70	40	9	0.005	±2.5	Pass
Normal	3.70	50	12	0.006	±2.5	Pass

Model Number	AirCard 781S					
Test Item	Frequency Stability (Temperature & Voltage Variation)					
Test Mode	Mode 2					
Date of Test	08/21/2013				Test Site	TE05
Level	Voltage [Vdc]	Temperature (°C)	Deviation (Hz)	Deviation (ppm)	Limit (ppm)	Result
Normal	3.70	-30	-4	-0.005	±2.5	Pass
Normal	3.70	-20	6	0.007	±2.5	Pass
Normal	3.70	-10	9	0.011	±2.5	Pass
Normal	3.70	0	11	0.013	±2.5	Pass
Normal	3.70	10	12	0.014	±2.5	Pass
Battery full point	4.25	20	-5	-0.006	±2.5	Pass
Normal	3.70	20	-3	-0.004	±2.5	Pass
Battery cut-off point	3.50	20	6	0.007	±2.5	Pass
Normal	3.70	30	-15	-0.018	±2.5	Pass
Normal	3.70	40	-7	-0.008	±2.5	Pass
Normal	3.70	50	-3	-0.004	±2.5	Pass