FCC 47 CFR PART 27

RF Test Report

Applicant	:	ATOP Technologies, INC.
Product Type	:	Industrial M2M Cellular Serial Gateway
Trade name	:	atop
Model No.	:	SE5901B-WW-www-XXX-x-Y-yy-bb MB5901B-WW-www-XXX-x-Y-yy-ZZ-bb PG5901B-WW-www-XXX-x-Y-yy-zzaa-zzaa-bb
Test Specification	:	FCC 47 CFR PART 27L ANSI/TIA-603-D 2010
Receive Date	:	Oct. 04, 2016
Test Period	:	Oct. 20 ~ Oct. 21, 2016
Issue Date	:	Dec. 30, 2016

Issue by

A Test Lab Techno Corp.
No. 140-1, Changan Street, Bade District,
Taoyuan City 33465, Taiwan (R.O.C)
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Taiwan Accreditation Foundation accreditation number: 1330

Revision History

Rev.	Issue Date	Revisions	Revised By
00	Dec. 05, 2016	Initial Issue	Snow Wang
01	Dec. 30, 2016	Revised report information.	Snow Wang

Verification of Compliance

Issued Date: Dec. 30, 2016

Applicant	:	ATOP Technologies, INC.
Product Type	:	Industrial M2M Cellular Serial Gateway
Trade Name	:	atop
Model Number	:	SE5901B-WW-www-XXX-x-Y-yy-bb MB5901B-WW-www-XXX-x-Y-yy-ZZ-bb PG5901B-WW-www-XXX-x-Y-yy-zzaa-zzaa-bb
FCC ID	:	RPV-SE-MB-PG5901B
EUT Rated Voltage	:	DC 9V ~ 48V, 0.8A
Test Voltage	:	DC 9V, DC12V, DC48V
Applicable Standard	:	FCC 47 CFR PART 27L ANSI/TIA-603-D 2010
Test Result	:	Complied
Performing Lab.	:	A Test Lab Techno Corp. No. 140-1, Changan Street, Bade District, Taoyuan City 33465, 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

A Test Lab Techno Corp. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by A Test Lab Techno Corp. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Approved By	:	Fly Lu	Reviewed By	:	Eric Ou Yang
(Manager)		(Fly Lu)	(Testing Engineer)		(Eric Ou Yang)

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1 General Information

1.1. EUT Description

Applicant	ATOP Technologies, INC. 1F, 30, R&D Rd. II, Science-Based Industrial Park, Hsinchu, Taiwan 30076
Manufacturer	ATOP Technologies, INC. 1F, 30, R&D Rd. II, Science-Based Industrial Park, Hsinchu, Taiwan 30076
Product Type	Industrial M2M Cellular Serial Gateway
Trade Name	atop
Model Number	SE5901B-WW-www-XXX-x-Y-yy-bb MB5901B-WW-www-XXX-x-Y-yy-ZZ-bb PG5901B-WW-www-XXX-x-Y-yy-zzaa-zzaa-bb

Model Different Description	WW =IO or Blank
	www =D3G or 4G or Blank
	XXX=GPS or Blank
	x = B or Blank
	Y = S or Blank
	yy = US or EU or TW
	ZZ =CT or Blank ;
	zz =00-99 or AA-ZZ or Blank;
	aa = SS,SM,ES or EC or Blank;
	bb=00-99 or AA-ZZ or aa-zz or Blank; (Customer Code)
	- WW can be IO or Blank, for COM port type.
	Blank: D-sub connector
	IO: Terminal Block with COM, relay and DI/O function
	
	- www can be D3G or 4G
	D3G: support 3G
	4G: support 4G
	Blank: No 3G or 4G function
	
	- XXX can be GPS or Blank, for GPS function
	GPS: Support GPS function
	Blank: no GPS function
	
	- x can be B or Blank, for Internal battery
	B: support internal battery
	Blank: no internal battery
	
	- Y can be S or Blank, for SD card
	S: support SD card
	Blank: no SD card
	
	- yy can be US or EU or TW, for country
	US: North America
	EU: Europe
	TW: Taiwan
	
	- ZZ can be CT or Blank, for software function
	CT: concentrator
	Blank: No concentrator
	- zz can be 00-99 or AA-ZZ or Blank, for software function
	- aa can be SS,SM,ES,EC or Blank, for software function
	- bb can be 00-99,AA-ZZ,aa-zz or Blank, for Customer Code

FCC ID		RPV-SE-MB-PG5901B			
IMEI No.		868323020000003			
Module use		QUECTEL, EC20			
Mode	WCDMA (RMC 12.2K)	Band	UL Frequency (MHz)	DL Frequency (MHz)	Modulation
		IV	1712.4 ~ 1752.6	2112.4 ~ 2152.6	QPSK
Antenna information		Ant No.	Model Number	Type	Max. Gain (dBi)
		1	59908151G	Whip Antenna	1.96
		2	59908151G	Whip Antenna	2.77

Frequency Band	Max. RF Output Power (W)	E.I.R.P. (W)	Occupied Bandwidth (MHz)	Emission Designator
WCDMA	0.378	0.229	4.1540	4M15F9W

1.2. Mode of Operation

In the test report use EUT model: SE5901B-IO-4G-GPS-B-S-US to operate testing.

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 IV 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.

Tested System Details

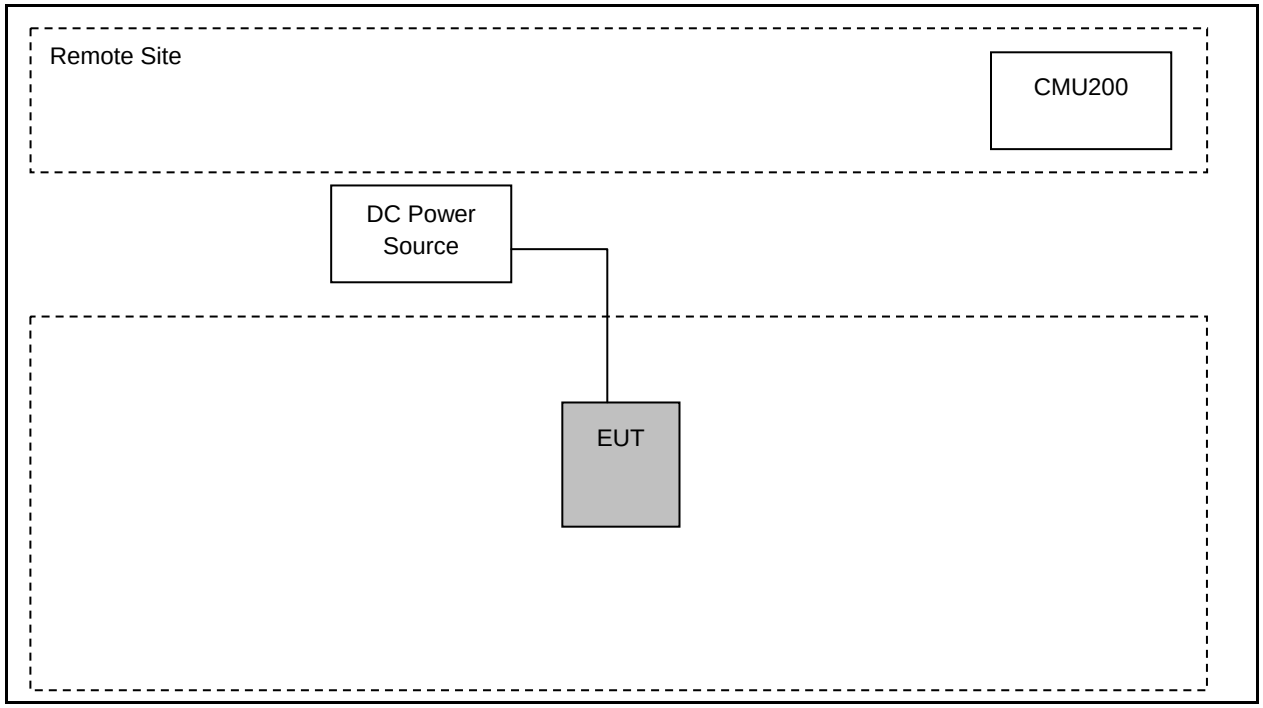
The types for all equipments, plus descriptions of all cables used in the tested system (including inserted cards) are:

	Product	Manufacturer	Model No.	Serial No.	Power Cord
1.	Universal Radio Communication Tester	R&S	CMU200	109369	N/A

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 60068-1)	Actual
Temperature (°C)	15-35	26
Humidity (%RH)	25-75	60
Barometric pressure (mbar)	860-1060	950

1.6. Summary of Test Result

FCC Rule	Description	Result
§2.1046	Conducted Output Average Power	Pass
§27. 50	Equivalent Isotropic Radiated Power / Equivalent Radiated Power	Pass
§2.1055 §27. 54	Frequency Stability	Pass
§2.1049	Emission Bandwidth & Occupied Bandwidth	Pass
§27.50	Peak to average ratio	Pass
§27.53	Band Edge	Pass
§2.1051 §27.53	Conducted Spurious Emissions	Pass
§2.1053 §27.53	Radiated Spurious Emissions	Pass

2 RF Output Power Test

■ Limit

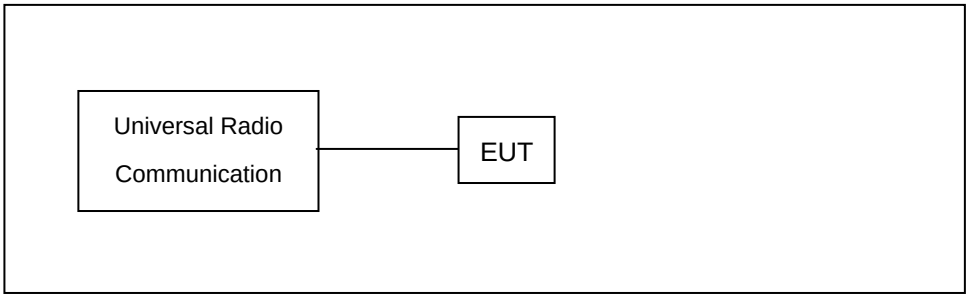
N/A

■ Test Instruments

Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Remark
Universal Radio Communication Tester	R & S	CMU200	112387	02/25/2016	1 year
Test Site	ATL	TE05	TE05	N.C.R.	-----

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

■ Test Setup



■ Test Procedure

a. The EUT was set up for the maximum power with simulator.

b. Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator.

■ Uncertainty

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

■ **Test Result**

Date of Test	10/20/2016					
Bands	Sub-Test	Frequency (MHz)	Average Power		Peak Power	
			(dBm)	(W)	(dBm)	(W)
WCDMA IV (RMC 12.2K)	-----	1712.4	22.56	0.180	**25.78**	**0.378**
		1732.6	22.47	0.177	25.69	0.371
		1752.6	22.33	0.171	25.57	0.361
HSDPA IV	1	1712.4	21.74	0.149	24.99	0.316
		1732.6	21.61	0.145	24.86	0.306
		1752.6	21.52	0.142	24.77	0.300
	2	1712.4	21.64	0.146	24.87	0.307
		1732.6	21.52	0.142	24.74	0.298
		1752.6	21.43	0.139	24.68	0.294
	3	1712.4	21.22	0.132	24.44	0.278
		1732.6	21.06	0.128	24.26	0.267
		1752.6	20.97	0.125	24.18	0.262
	4	1712.4	21.18	0.131	24.39	0.275
		1732.6	21.01	0.126	24.22	0.264
		1752.6	20.94	0.124	24.17	0.261
HSUPA IV	1	1712.4	21.08	0.128	24.29	0.269
		1732.6	20.92	0.124	24.15	0.260
		1752.6	20.84	0.121	24.06	0.255
	2	1712.4	19.06	0.081	22.30	0.170
		1732.6	18.87	0.077	22.08	0.161
		1752.6	18.77	0.075	22.01	0.159
	3	1712.4	20.05	0.101	23.28	0.213
		1732.6	19.88	0.097	23.12	0.205
		1752.6	19.77	0.095	23.02	0.200
	4	1712.4	19.02	0.080	22.25	0.168
		1732.6	18.84	0.077	22.07	0.161
		1752.6	18.72	0.074	21.92	0.156
	5	1712.4	20.92	0.124	24.14	0.259
		1732.6	20.74	0.119	23.97	0.249
		1752.6	20.64	0.116	23.88	0.244

Note: The testing result was used peak detector.

3 Effective Radiated Power / Equivalent Isotropic Radiated Power Test

■ Limit

For FCC Part 27.50(d)(2): The EIRP of mobile transmitters are limited to 1 watt for 1710~1755 MHz.

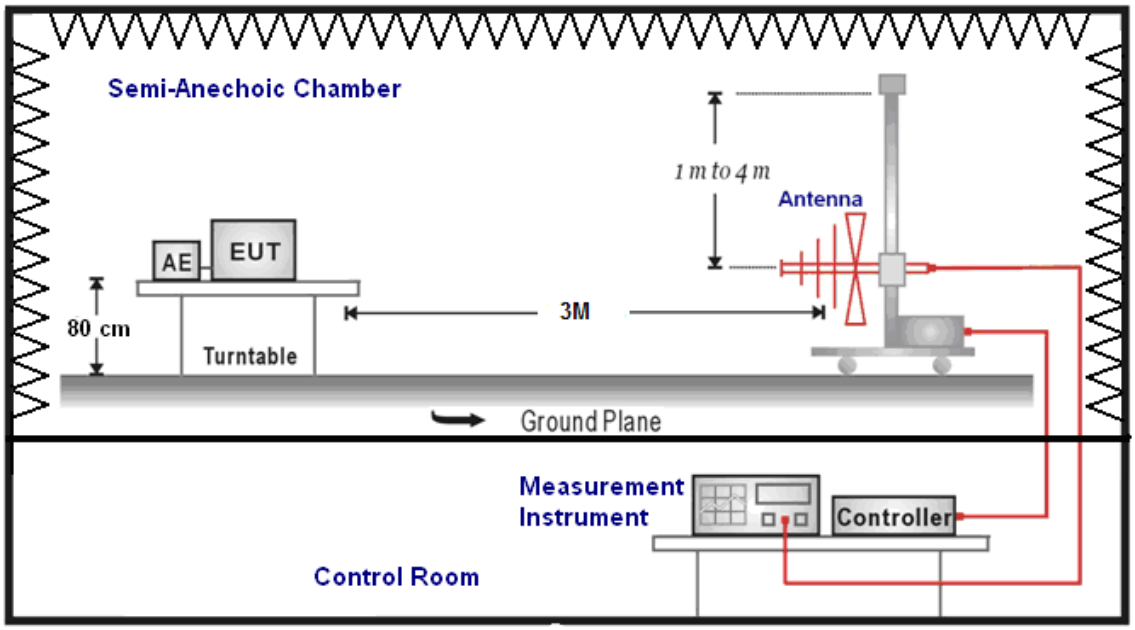
■ Test Instruments

3 Meter Chamber					
Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
RF Pre-selector	Agilent	N9039A	MY46520256	01/08/2016	1 year
Spectrum Analyzer	Agilent	E4446A	MY46180578	01/08/2016	1 year
Pre Amplifier	Agilent	8449B	3008A02237	10/11/2016	1 year
Pre Amplifier	Agilent	8447D	2944A11119	01/11/2016	1 year
Broadband Antenna (30MHz~1GHz)	SCHWARZBECK MESS-ELEKTRONIK	VULB9168	416	10/13/2016	1 year
Broadband Antenna (30MHz~1GHz)	SCHWARZBECK MESS-ELEKTRONIK	VULB 9168	419	11/03/2016	1 year
Horn Antenna (1~18GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA9120D	9120D-550	06/06/2016	1 year
Horn Antenna (18~40GHz)	ETS	3116	00086467	09/05/2016	1 year
Horn Antenna (18~40GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA9170	9170-320	07/18/2016	1 year
Microwave Cable	EMCI	EMC102-KM-KM -14000	151001	02/23/2016	1 year
Microwave Cable	EMCI	EMC-104-SM-S M-14000	140202	02/23/2016	1 year
Microwave Cable	EMCI	EMC104-SM-SM -600	140301	02/23/2016	1 year

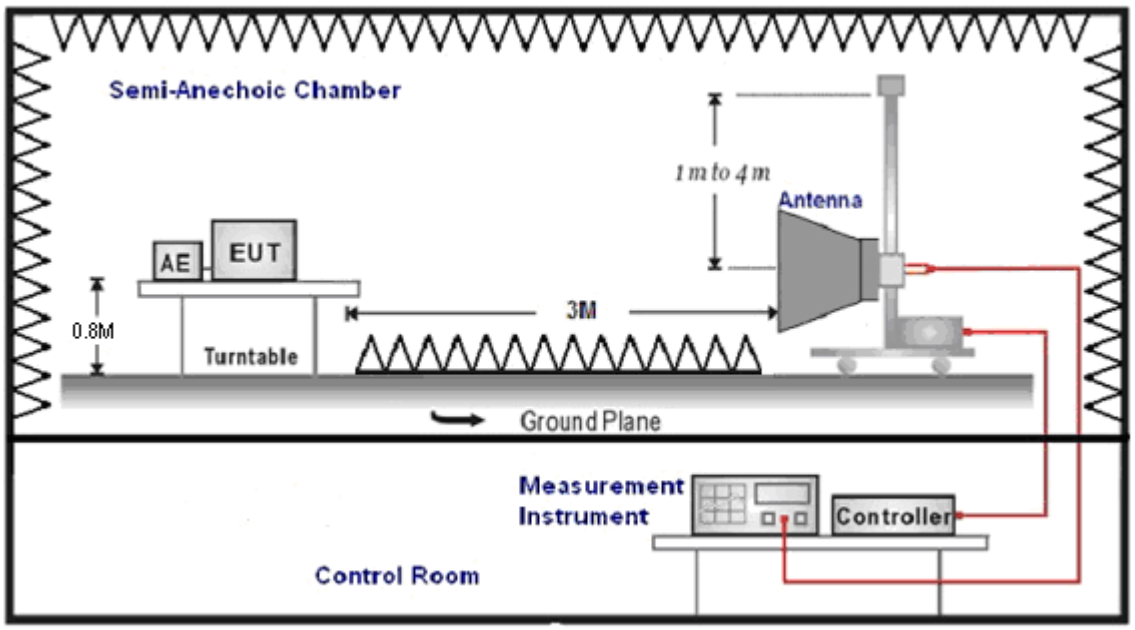
Note: N.C.R. = No Calibration Request.

■ **Test Setup**

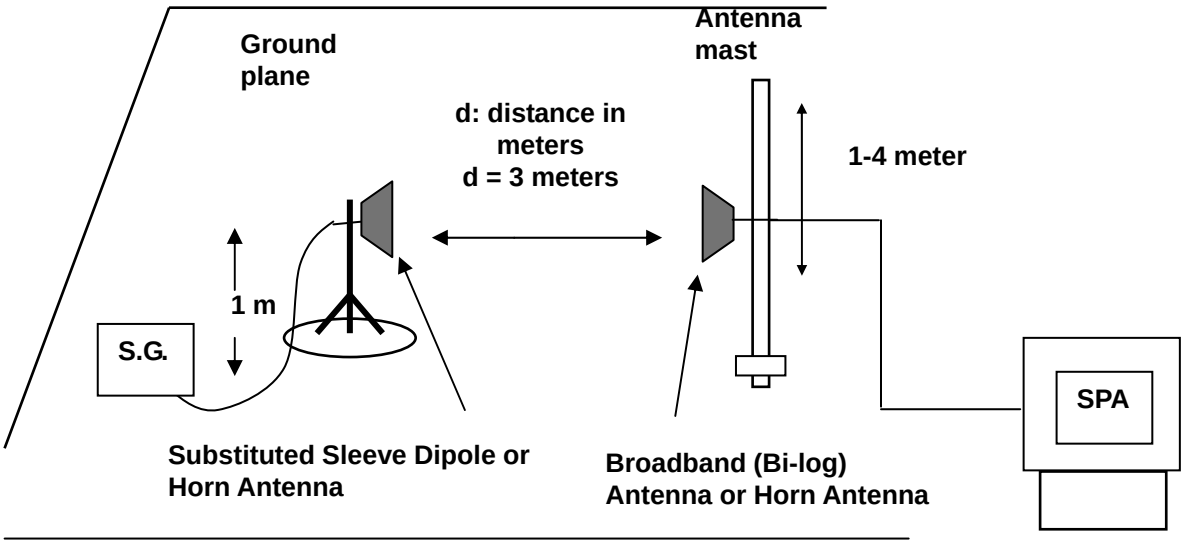
Below 1 GHz



Above 1 GHz



For Substituted Method Test Set-UP



■ Test Procedure

a. The EUT was set up for the maximum power with LTE link data modulation. The power was measured with Spectrum Analyzer. All measurements were done at 3 channels (low, middle and high operational frequency range).

b. Radiation Emission measurement. In the semi-anechoic chamber, EUT placed on the 0.8m height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum polar radiated power. The “Read Value” is the spectrum reading the maximum power value.

c. The substitution antenna (Note:2 & 3) is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a TX cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to “Read Value” of step a. Record the power level of S.G.

d. E.I.R.P. = Output power level of S.G - TX cable loss + Antenna gain of substitution horn

e. E.R.P. = E.I.R.P- 2.15 dB

Note: 1. For WCDMA and CDMA signals, a peak detector is used with RBW = VBW = 5MHz.

2. Below 1 GHz Substituted Method Test：Sleeve dipole antenna to Bi-Log Antenna

3. Above 1 GHz Substituted Method Test：Horn antenna to Horn Antenna

■ Uncertainty

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

■ **Test Result**

Date of Test	10/20/2016						
Bands	Frequency (MHz)	Ant. Polar.	Read Level (dBm)	Correction factor (dB)	E.IR.P.		Limit (W)
					(dBm)	(W)	
WCDMA IV (RMC 12.2K)	1712.4	H	11.52	9.01	20.53	0.113	< 1
		V	14.60	9.00	**23.60**	**0.229**	< 1
	1732.6	H	11.49	9.09	20.58	0.114	< 1
		V	14.01	9.09	23.10	0.204	< 1
	1752.6	H	11.13	9.16	20.29	0.107	< 1
		V	14.02	9.16	23.18	0.208	< 1

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

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

4 Peak to Average Ratio Test

■ Limit

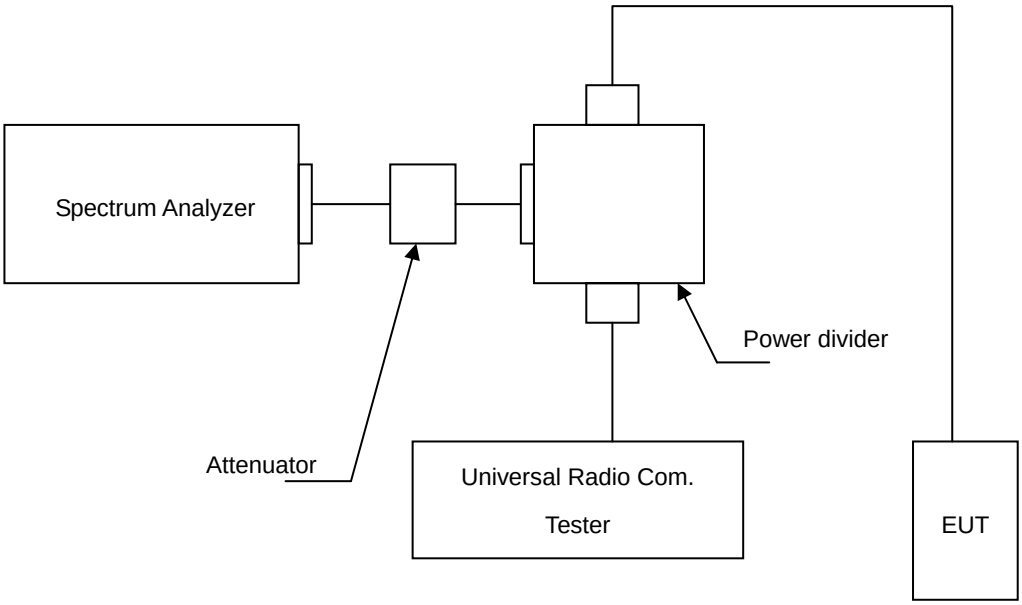
In measuring transmissions in this band using an average power technique, the peak to-average ratio (PAR) of the transmission may not exceed 13 dB.

■ Test Instruments

Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Remark
Universal Radio Communication Tester	R & S	CMU200	112387	02/25/2016	1 year
Spectrum Analyzer	Agilent	E4445A	MY45300744	12/15/2015	1 year
Spectrum Analyzer	Agilent	N9030A	MY53120541	12/14/2015	1 year
Attenuator	Woken	WK0602-10	001	06/06/2016	2 year
Power Divider	Agilent	87302C	3239A00760	N.C.R.	-----
Test Site	ATL	TE05	TE05	N.C.R.	-----

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

■ Setup



Test Procedure

The measurement is made according to FCC rules part 27:

a. Set resolution/measurement bandwidth signal's occupied bandwidth;

b. Set the number of counts to a value that stabilizes the measured CCDF curve;

c. Record the maximum PAPR level associated with a probability of 0.1%.

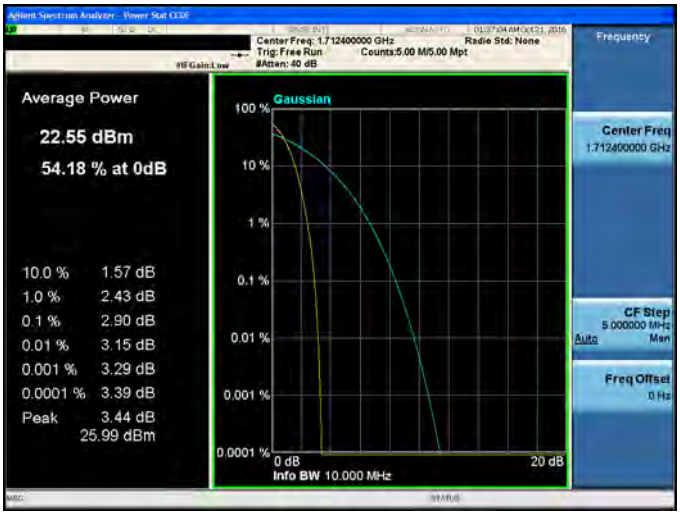
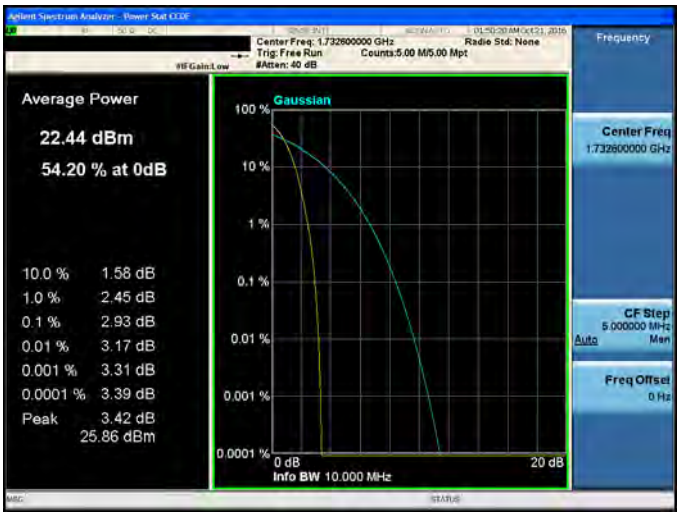
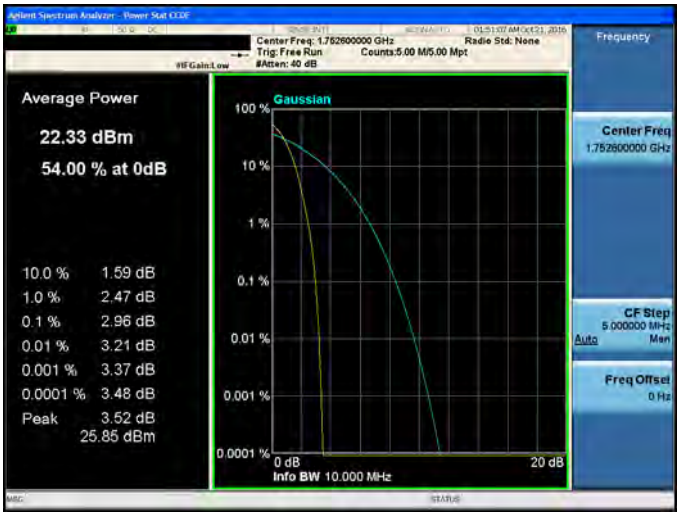
Uncertainty

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

Test Result

Date of Test	10/21/2016			
Bands	Channel	Frequency (MHz)	Peak to Average Ratio (dB)	Limit (dB)
WCDMA IV	1312	1712.4	2.90	< 13
	1413	1732.6	2.93	< 13
	1513	1752.6	2.96	< 13

■ **Test Graphs**

Mode 1	
1712.4 MHz	
1732.6 MHz	
1752.6 MHz	

5 Emission Bandwidth & Occupied Bandwidth Test

■ Limit

The Occupied Bandwidth Limit:

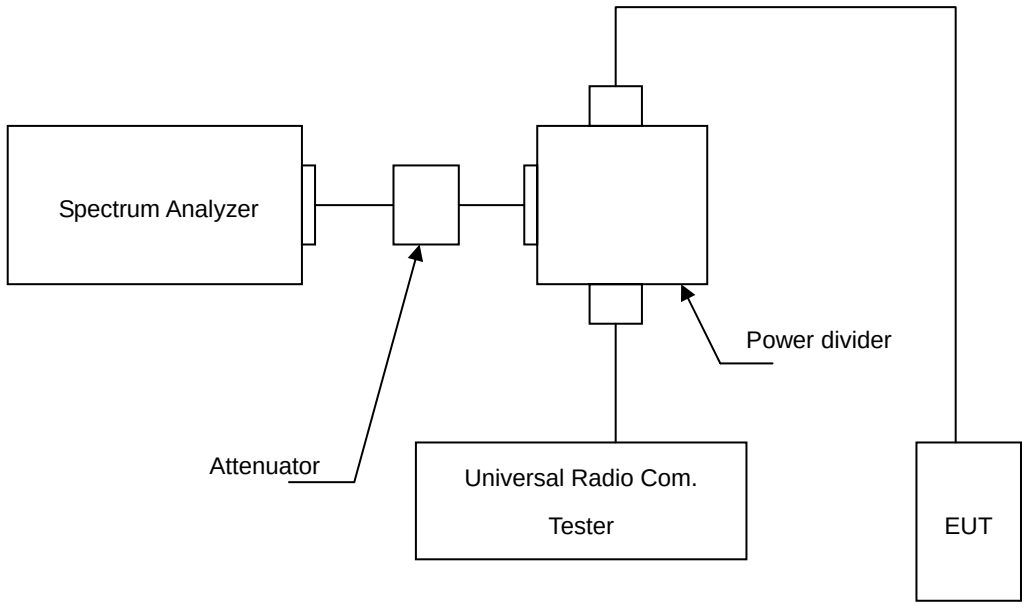
N/A.

■ Test Instruments

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Cal. Cycle
Spectrum Analyzer	Agilent	E4445A	MY45300744	12/15/2015	1 year
Spectrum Analyzer	Agilent	N9030A	MY53120541	12/14/2015	1 year
Universal Radio Communication Tester	R & S	CMU200	112387	02/25/2016	1 year
Attenuator	Woken	WK0602-10	001	06/06/2016	2 year
Power divider	Agilent	87302C	3239A00760	N.C.R.	-----
Test Site	ATL	TE05	TE05	N.C.R.	-----

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

■ Setup



■ Test Procedure

The measurement is made according to FCC rules part 27:

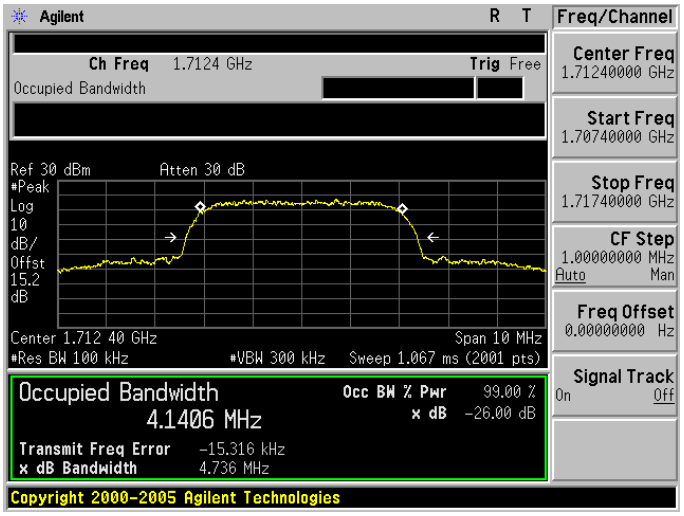
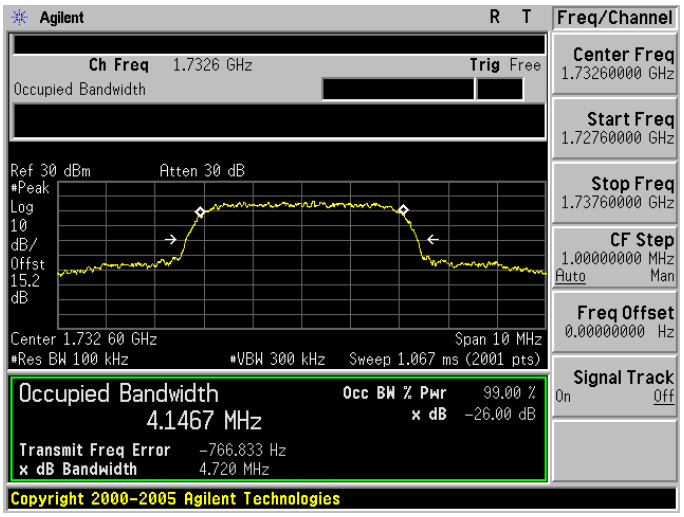
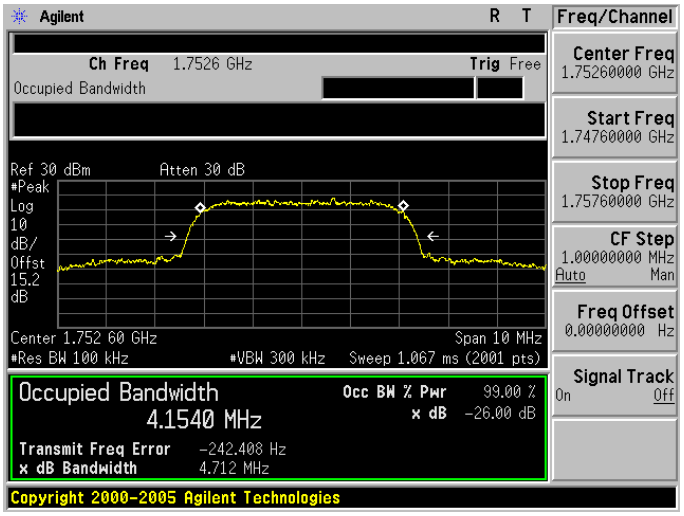
1. The EUT was connected to Spectrum Analyzer and Base Station via power divider.
2. The occupied bandwidth of middle channel for the highest and lowest RF powers was measured.

■ Uncertainty

The measurement uncertainty is defined as ± 10Hz

■ Test Result

Date of Test	10/20/2016				
Channel No.	Frequency (MHz)	-26dB Bandwidth (MHz)	99 % Bandwidth (MHz)	Limit	Note
1312	1712.4	4.736	4.1406	N/A	RBW:100kHz , VBW:300kHz
1413	1732.6	4.720	4.1467	N/A	RBW:100kHz , VBW:300kHz
1513	1752.6	4.712	4.1540	N/A	RBW:100kHz , VBW:300kHz

Mode 1	
1712.4 MHz	
1732.6 MHz	
1752.6 MHz	

6 Band Edge Test

■ Limit

The Band Edge Limit:

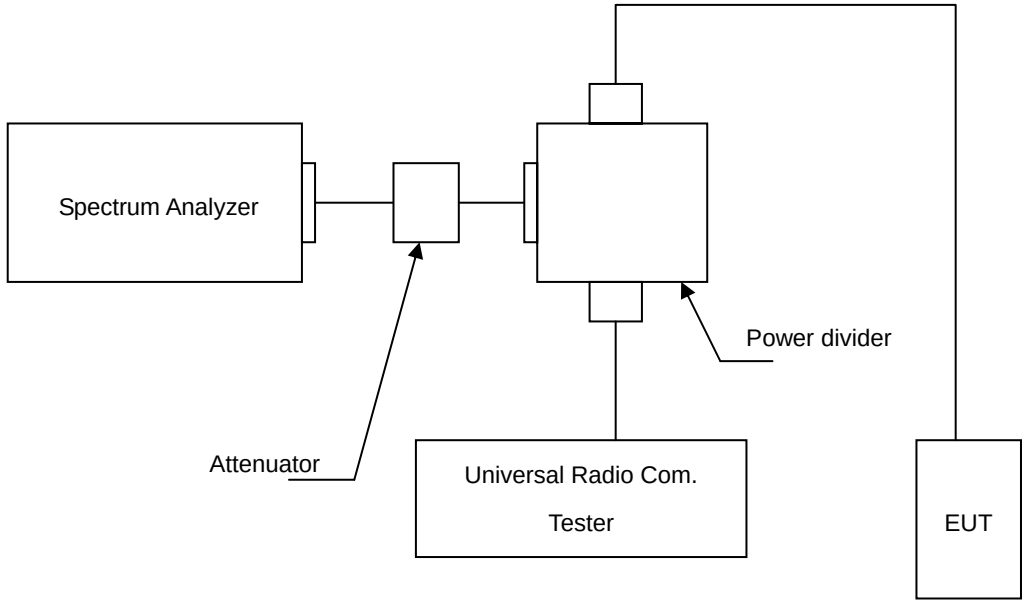
The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10log(P) dB.

■ Test Instruments

Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Remark
Universal Radio Communication Tester	R & S	CMU200	112387	02/25/2016	1 year
Spectrum Analyzer	Agilent	E4445A	MY45300744	12/15/2015	1 year
Spectrum Analyzer	Agilent	N9030A	MY53120541	12/14/2015	1 year
Attenuator	Woken	WK0602-10	001	06/06/2016	2 year
Power Divider	Agilent	87302C	3239A00760	N.C.R.	-----
Test Site	ATL	TE05	TE05	N.C.R.	-----

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

■ Setup



■ Test Procedure

The measurement is made according to FCC rules part 27:

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:RB=51 kHz; VB=160 kHz for WCDMA Band IV.

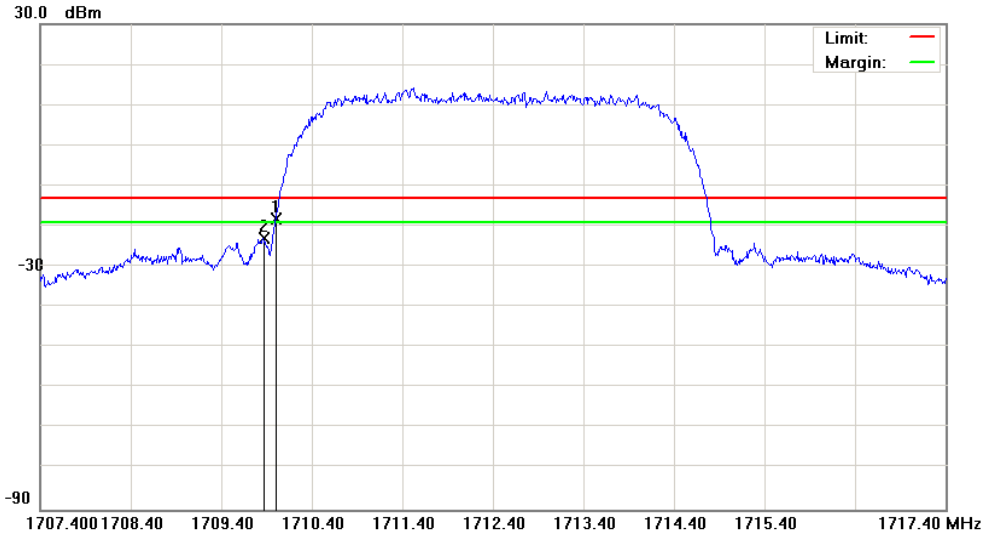
■ Uncertainty

The measurement uncertainty is defined as ± 10Hz

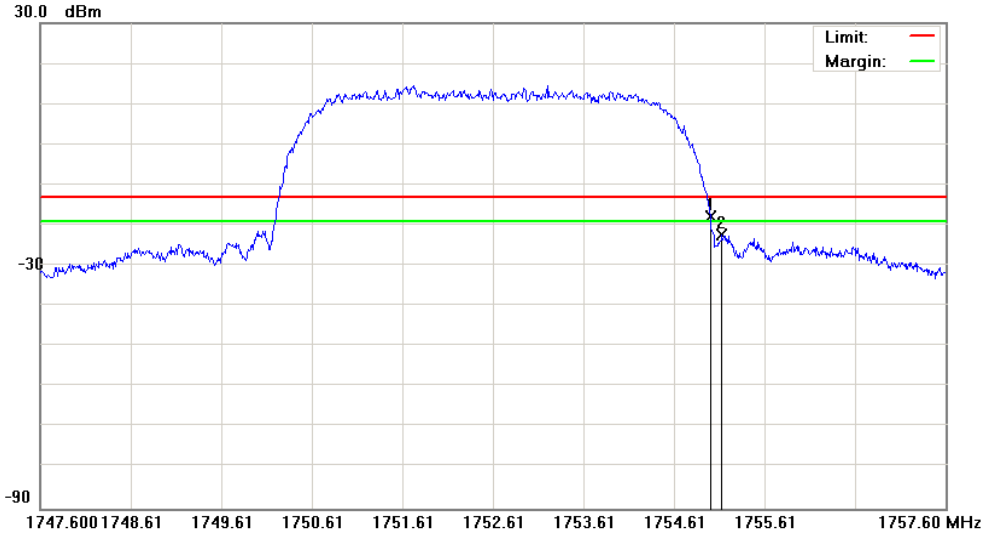
■ **Test Result**

Date of Test	10/20/2016				
Band	Channel	Frequency (MHz)	Band Edge (dBm)	Limit (dBm)	Result
Lower	1312	1710.00	-18.17	-13	Pass
Higher	1513	1755.00	-17.74	-13	Pass

Lower Band



Higher Band



7 Conducted Spurious Emission Test

■ 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 + 10log(P) dB.

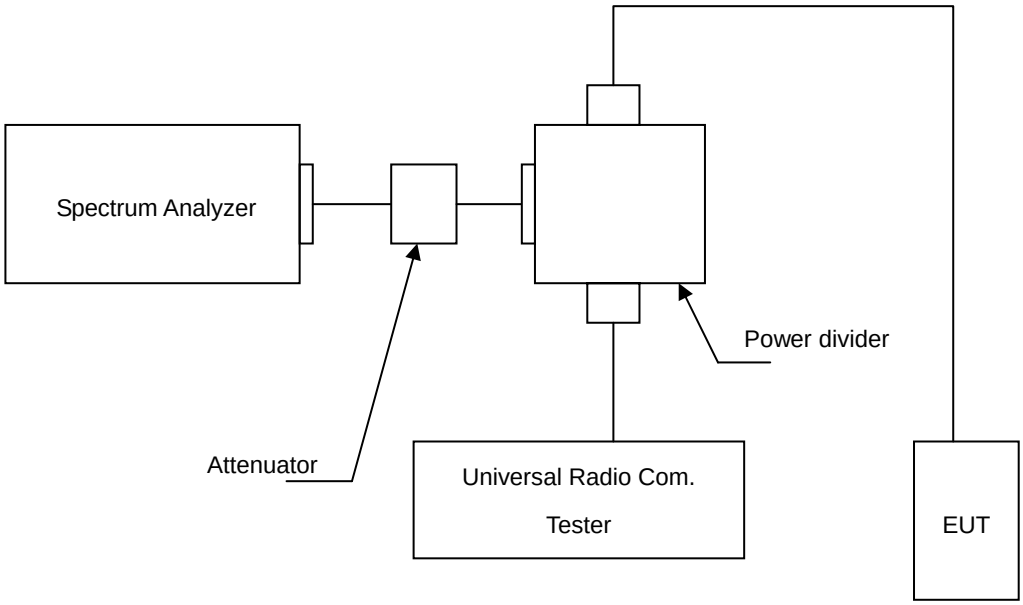
■ Test Instruments

Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Remark
Universal Radio Communication Tester	R & S	CMU200	112387	02/25/2016	1 year
Spectrum Analyzer	Agilent	E4445A	MY45300744	12/15/2015	1 year
Spectrum Analyzer	Agilent	N9030A	MY53120541	12/14/2015	1 year
Attenuator	Woken	WK0602-10	001	06/06/2016	2 year
Power Divider	Agilent	87302C	3239A00760	N.C.R.	-----
Test Site	ATL	TE02	TE02	N.C.R.	-----

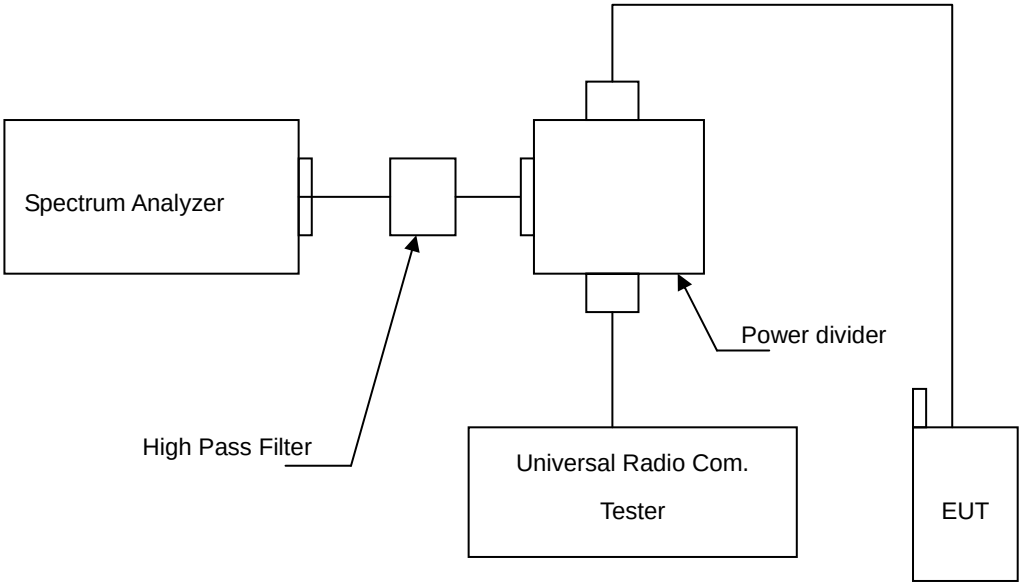
Note: N.C.R. = No Calibration Request.

■ Setup

Below 2.8GHz



Above 2.8GHz



■ 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 WCDMA Band IV RB=1MHz, VB=1MHz.

■ Uncertainty

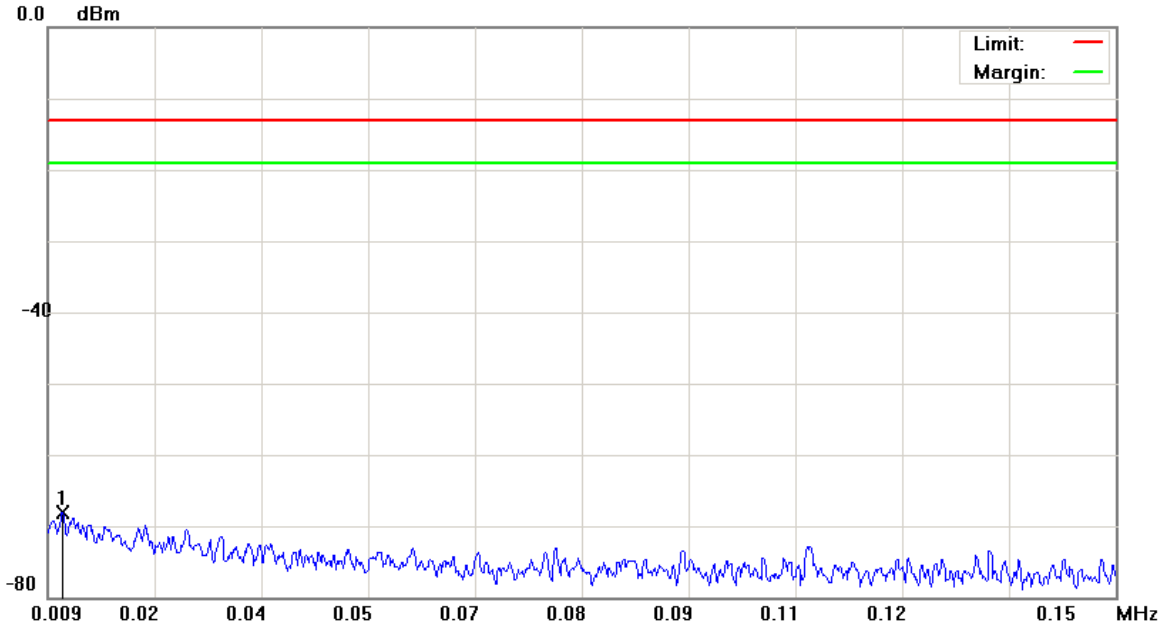
The measurement uncertainty is evaluated as ± 2.24 dB.

■ Test Result

Test Mode	Mode 1
Date of Test	10/20/2016~10/21/2016

Conducted Spurious Emissions

File :Module_EC20-A(CH1312) Data :#1 Date: 2016/10/20 Time: 下午 02:29:35



Site: site #1
Limit: FCC Part 27 conducted(9k-26.5G)
EUT: Industrial M2M Cellular Serial Gateway
M/N: SE5901B-IO-4G-GPS-B-S-US
Mode: WCDMA Band IV
Note:

Polarization: ***Conducted***
Power: DC 12V
Distance:

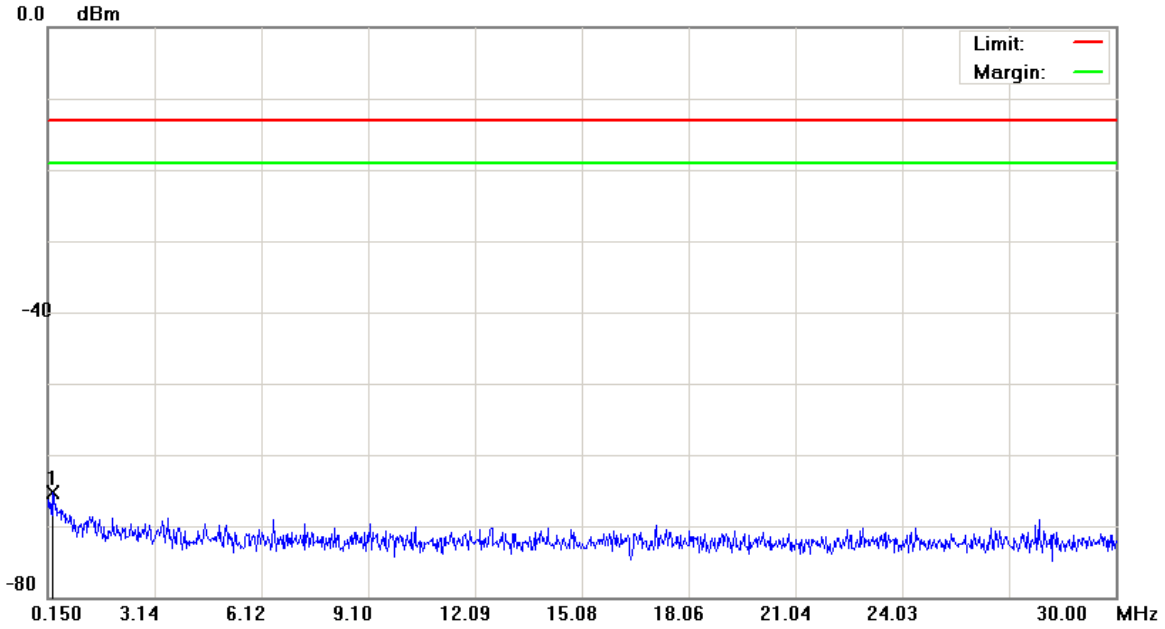
Temperature: 26 ℃
Humidity: 55 %
RBW: 1 KHz VBW: 3 KHz

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBm	dB	dBm	dBm	dB	Detector	cm	degree	Comment
1	*	0.0110	-79.47	11.35	-68.12	-13.00	-55.12	peak			

*:Maximum data x:Over limit !:over margin

Conducted Spurious Emissions

File :Module_EC20-A(CH1312) Data :#2 Date: 2016/10/20 Time: 下午 02:29:59



Site: site #1
Limit: FCC Part 27 conducted(9k-26.5G)
EUT: Industrial M2M Cellular Serial Gateway
M/N: SE5901B-IO-4G-GPS-B-S-US
Mode: WCDMA Band IV
Note:

Polarization: ***Conducted***
Power: DC 12V
Distance:

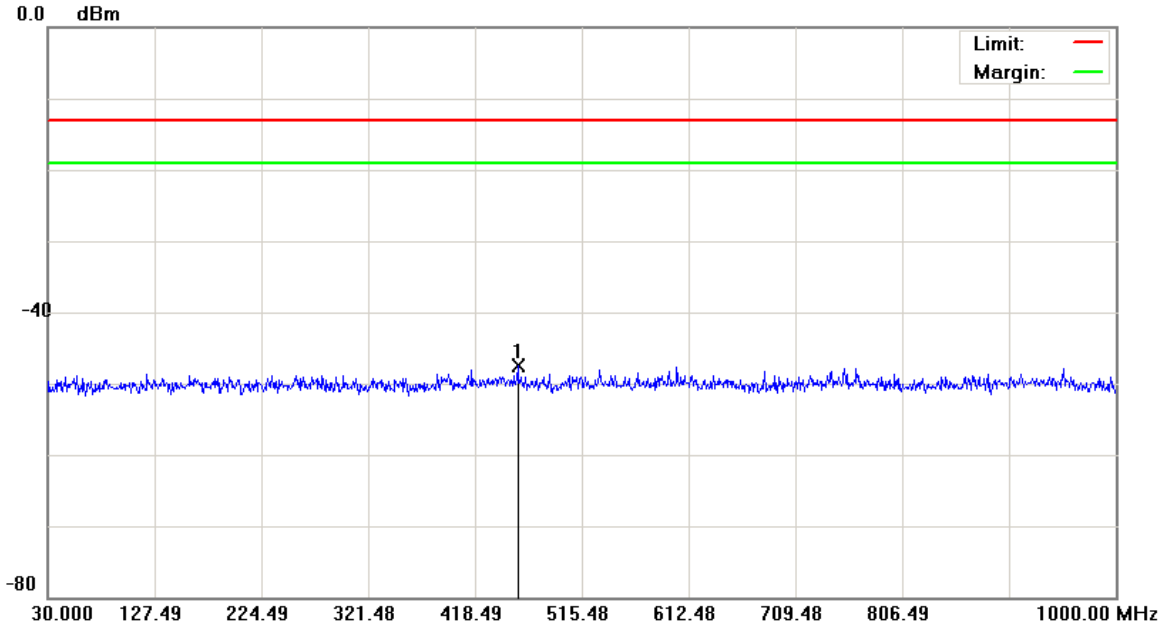
Temperature: 26 ℃
Humidity: 55 %
RBW: 10 KHz VBW: 30 KHz

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBm	dB	dBm	dBm	dB	Detector	cm	degree	Comment
1	*	0.2694	-77.86	12.56	-65.30	-13.00	-52.30	peak			

*:Maximum data x:Over limit !:over margin

Conducted Spurious Emissions

File :Module_EC20-A(CH1312) Data :#3 Date: 2016/10/20 Time: 下午 02:30:23



Site: site #1
Limit: FCC Part 27 conducted(9k-26.5G)
EUT: Industrial M2M Cellular Serial Gateway
M/N: SE5901B-IO-4G-GPS-B-S-US
Mode: WCDMA Band IV
Note:

Polarization: ***Conducted***
Power: DC 12V
Distance:

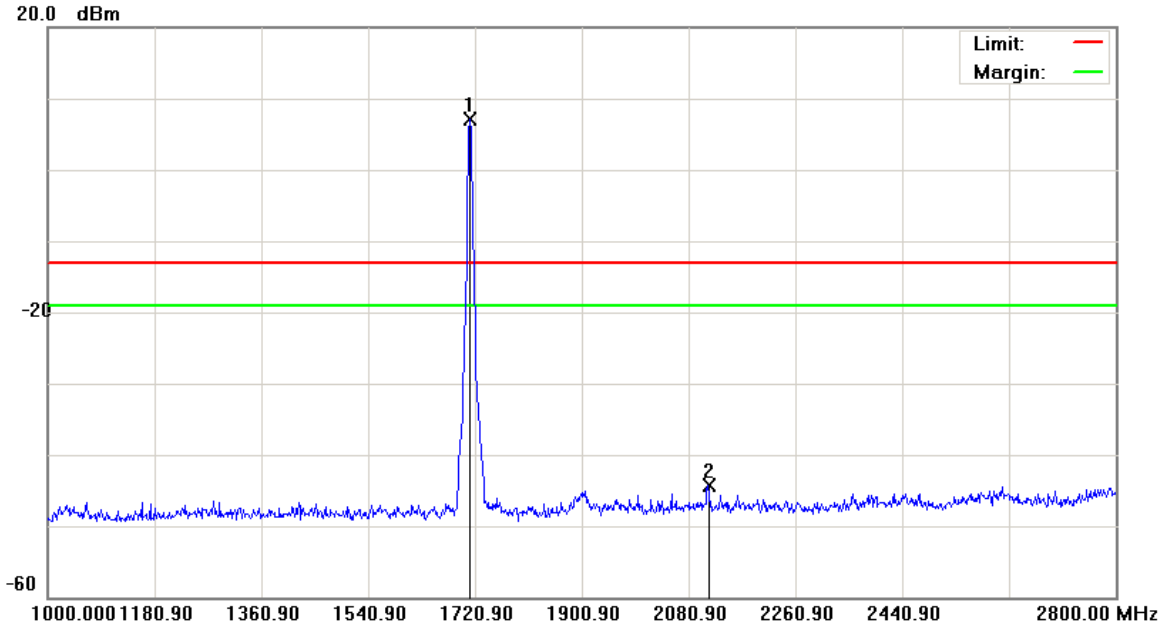
Temperature: 26 ℃
Humidity: 55 %
RBW: 100 KHz VBW: 300 KHz

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBm	dB	dBm	dBm	dB	Detector	cm	degree	Comment
1	*	457.2850	-60.71	13.21	-47.50	-13.00	-34.50	peak			

*:Maximum data x:Over limit !:over margin

Conducted Spurious Emissions

File :Module_EC20-A(CH1312) Data :#4 Date: 2016/10/20 Time: 下午 02:35:40



Site: site #1
Limit: FCC Part 27 conducted(9k-26.5G)
EUT: Industrial M2M Cellular Serial Gateway
M/N: SE5901B-IO-4G-GPS-B-S-US
Mode: WCDMA Band IV
Note:

Polarization: ***Conducted***
Power: DC 12V
Distance:

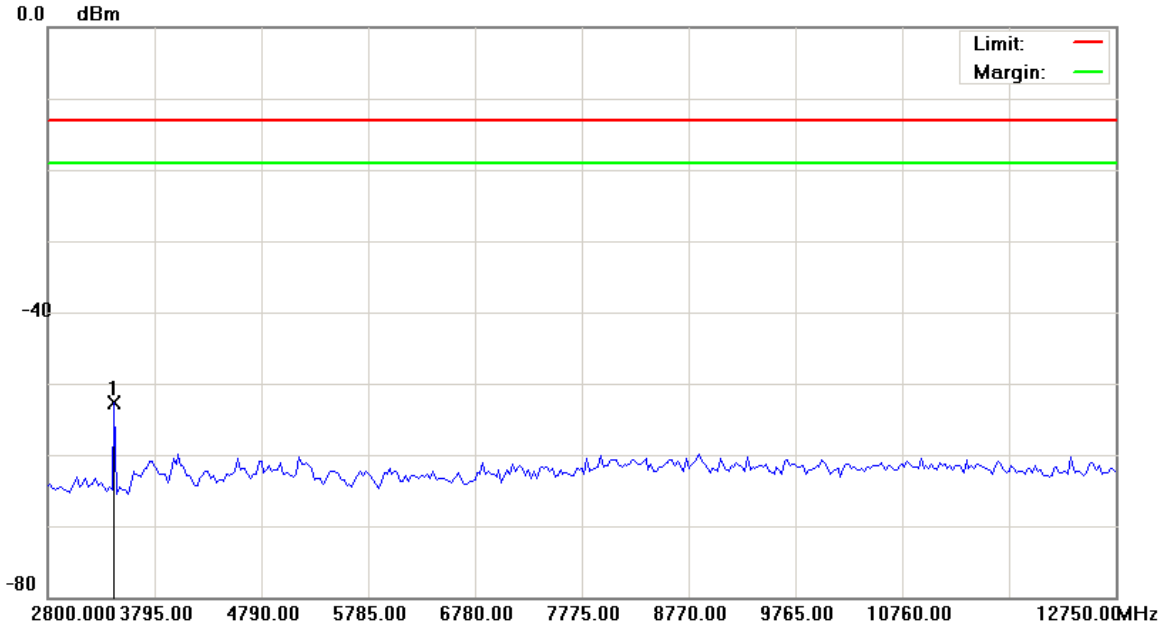
Temperature: 26 ℃
Humidity: 55 %
RBW: 1000 KHz VBW: 3000 KHz

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBm	dB	dBm	dBm	dB	Detector	cm	degree	Comment
1	*	1711.000	2.75	4.35	7.10	-13.00	20.10	peak			
2		2113.300	-49.10	4.72	-44.38	-13.00	-31.38	peak			

*:Maximum data x:Over limit !:over margin

Conducted Spurious Emissions

File :Module_EC20-A(CH1312) Data :#5 Date: 2016/10/21 Time: 下午 05:07:37



Site: site #1
Limit: FCC Part 27 conducted(9k-26.5G)
EUT: Industrial M2M Cellular Serial Gateway
M/N: SE5901B-IO-4G-GPS-B-S-US
Mode: WCDMA Band IV
Note:

Polarization: ***Conducted***
Power: DC 12V
Distance:

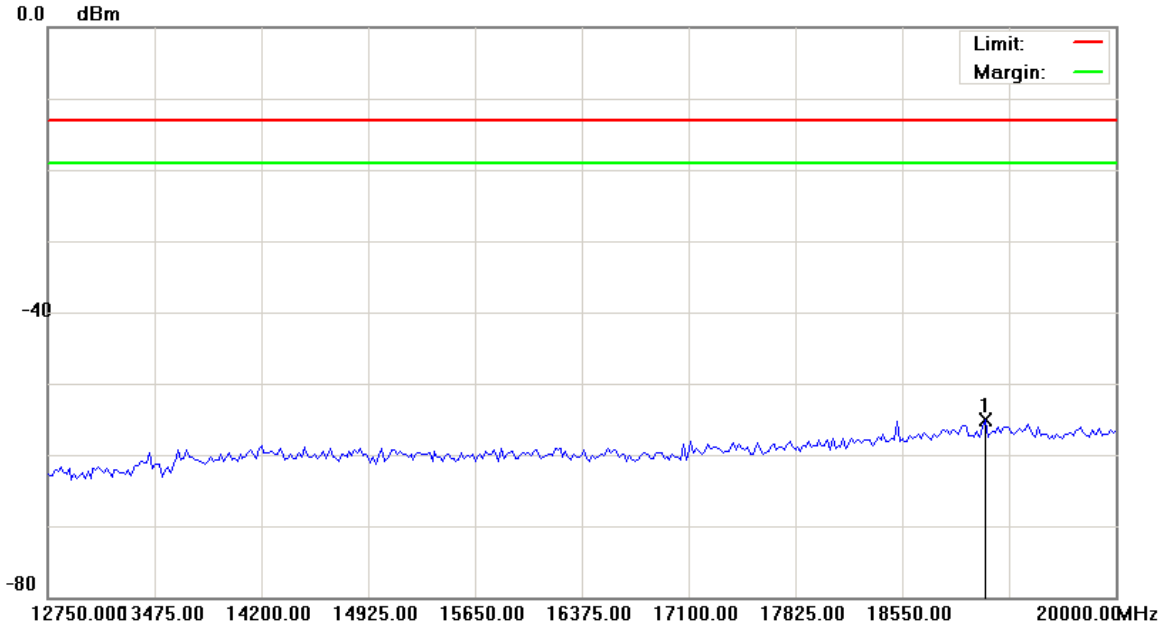
Temperature: 26 ℃
Humidity: 55 %
RBW: 1000 KHz VBW: 3000 KHz

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBm	dB	dBm	dBm	dB	Detector	cm	degree	Comment
1	*	3421.875	-57.85	5.06	-52.79	-13.00	-39.79	peak			

*:Maximum data x:Over limit !:over margin

Conducted Spurious Emissions

File :Module_EC20-A(CH1312) Data :#6 Date: 2016/10/21 Time: 下午 05:07:56



Site: site #1
Limit: FCC Part 27 conducted(9k-26.5G)
EUT: Industrial M2M Cellular Serial Gateway
M/N: SE5901B-IO-4G-GPS-B-S-US
Mode: WCDMA Band IV
Note:

Polarization: ***Conducted***
Power: DC 12V
Distance:

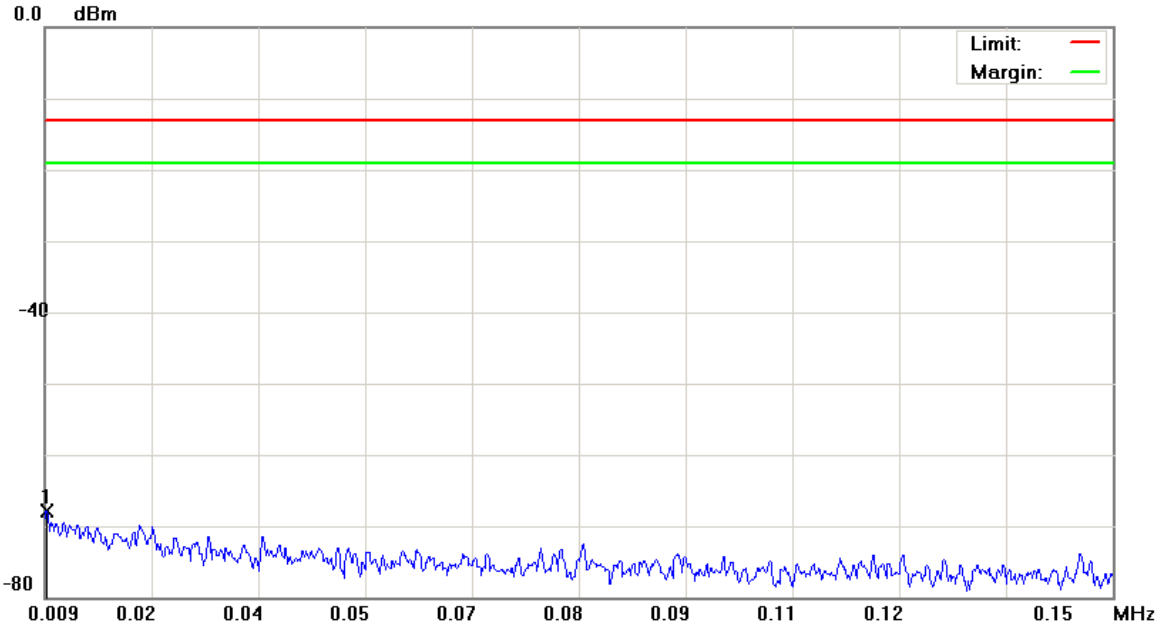
Temperature: 26 ℃
Humidity: 55 %
RBW: 1000 KHz VBW: 3000 KHz

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBm	dB	dBm	dBm	dB	Detector	cm	degree	Comment
1	*	19111.875	-62.34	7.19	-55.15	-13.00	-42.15	peak			

*:Maximum data x:Over limit !:over margin

Conducted Spurious Emissions

File :Module_EC20-A(CH1413) Data :#1 Date: 2016/10/20 Time: 下午 02:31:22



Site: site #1
Limit: FCC Part 27 conducted(9k-26.5G)
EUT: Industrial M2M Cellular Serial Gateway
M/N: SE5901B-IO-4G-GPS-B-S-US
Mode: WCDMA Band IV
Note:

Polarization: ***Conducted***
Power: DC 12V
Distance:

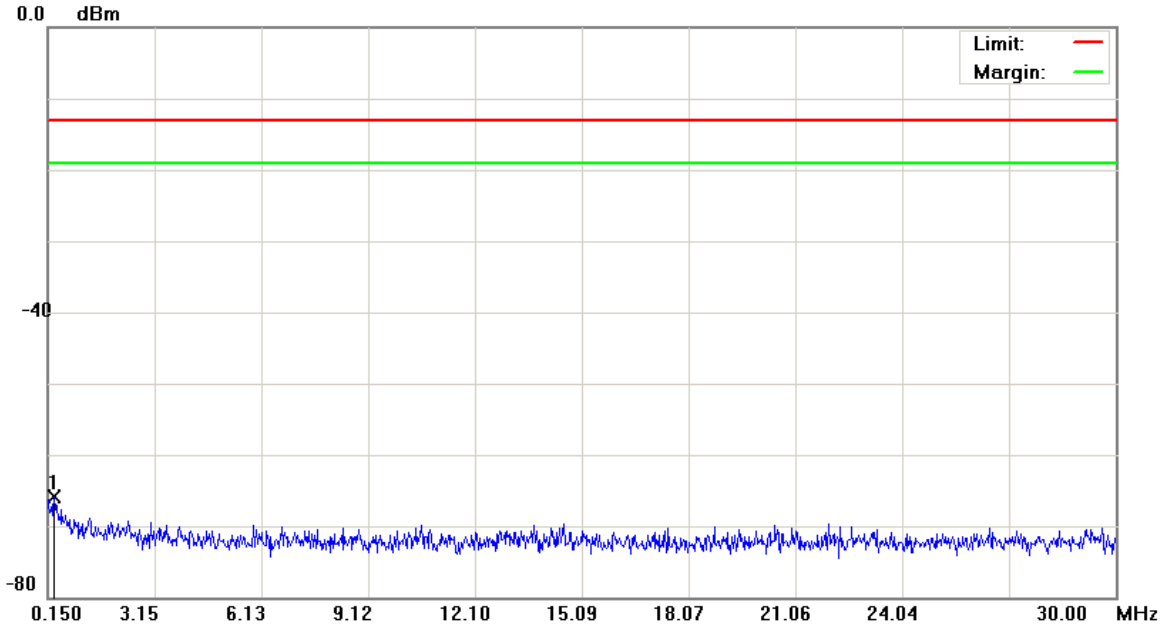
Temperature: 26 ℃
Humidity: 55 %
RBW: 1 KHz VBW: 3 KHz

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBm	dB	dBm	dBm	dB	Detector	cm	degree	Comment
1	*	0.0092	-79.14	11.32	-67.82	-13.00	-54.82	peak			

*:Maximum data x:Over limit !:over margin

Conducted Spurious Emissions

File :Module_EC20-A(CH1413) Data :#2 Date: 2016/10/20 Time: 下午 02:31:46



Site: site #1
Limit: FCC Part 27 conducted(9k-26.5G)
EUT: Industrial M2M Cellular Serial Gateway
M/N: SE5901B-IO-4G-GPS-B-S-US
Mode: WCDMA Band IV
Note:

Polarization: ***Conducted***
Power: DC 12V
Distance:

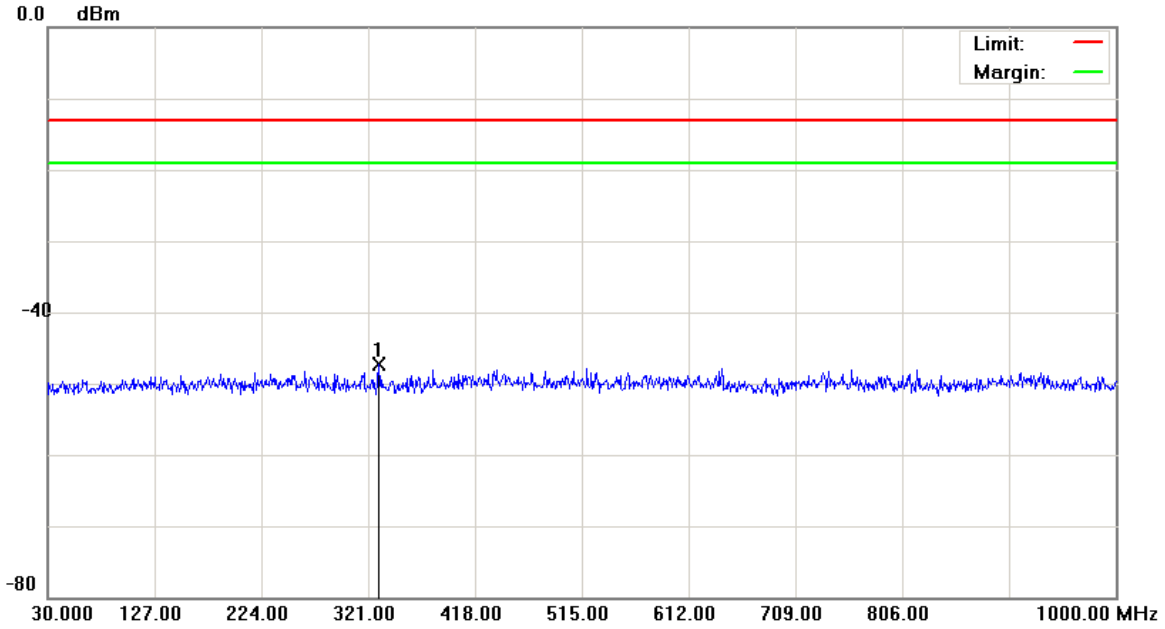
Temperature: 26 ℃
Humidity: 55 %
RBW: 10 KHz VBW: 30 KHz

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBm	dB	dBm	dBm	dB	Detector	cm	degree	Comment
1	*	0.3291	-78.59	12.67	-65.92	-13.00	-52.92	peak			

*:Maximum data x:Over limit !:over margin

Conducted Spurious Emissions

File :Module_EC20-A(CH1413) Data :#3 Date: 2016/10/20 Time: 下午 02:32:10



Site: site #1
Limit: FCC Part 27 conducted(9k-26.5G)
EUT: Industrial M2M Cellular Serial Gateway
M/N: SE5901B-IO-4G-GPS-B-S-US
Mode: WCDMA Band IV
Note:

Polarization: ***Conducted***
Power: DC 12V
Distance:

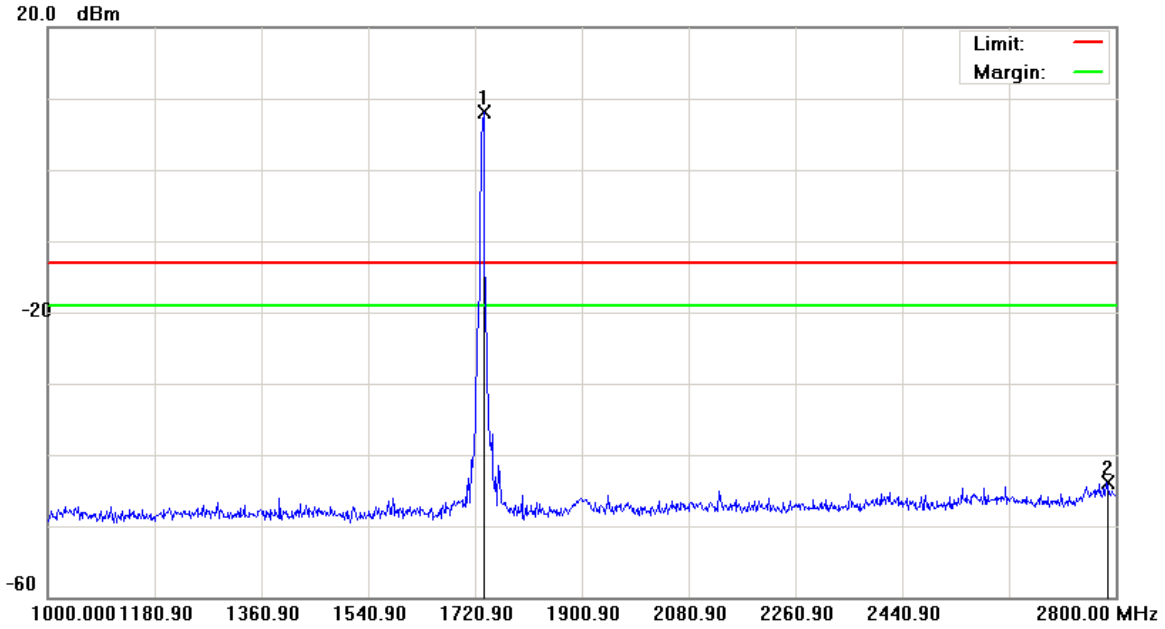
Temperature: 26 ℃
Humidity: 55 %
RBW: 100 KHz VBW: 300 KHz

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBm	dB	dBm	dBm	dB	Detector	cm	degree	Comment
1	*	330.7000	-60.53	13.16	-47.37	-13.00	-34.37	peak			

*:Maximum data x:Over limit !:over margin

Conducted Spurious Emissions

File :Module_EC20-A(CH1413) Data :#4 Date: 2016/10/20 Time: 下午 02:36:58



Site: site #1
Limit: FCC Part 27 conducted(9k-26.5G)
EUT: Industrial M2M Cellular Serial Gateway
M/N: SE5901B-IO-4G-GPS-B-S-US
Mode: WCDMA Band IV
Note:

Polarization: ***Conducted***
Power: DC 12V
Distance:

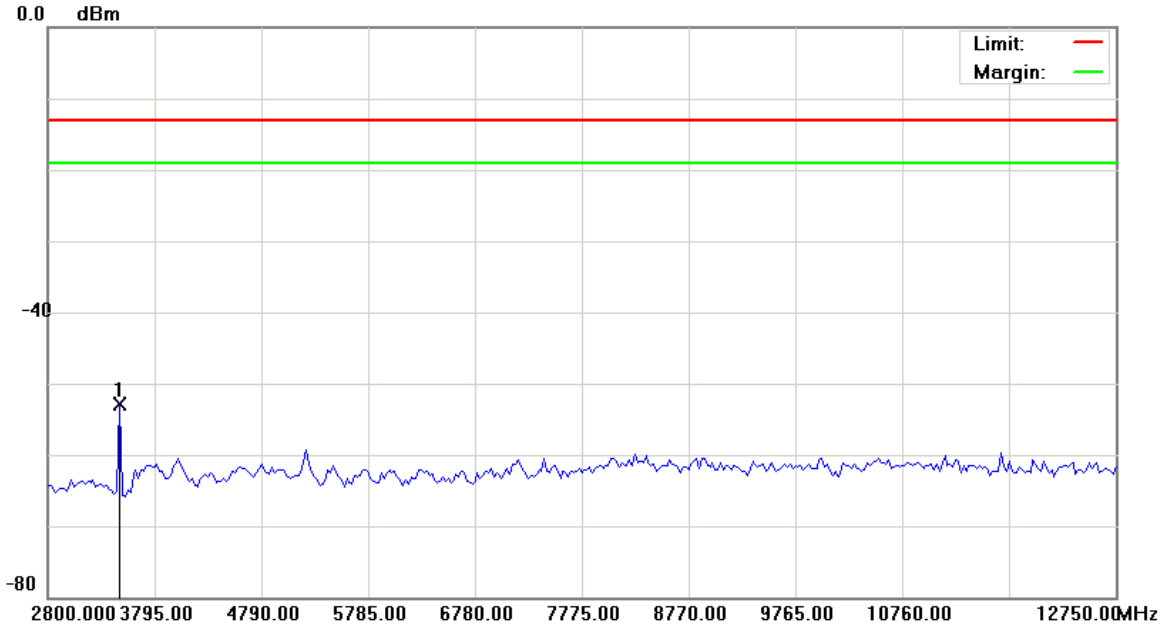
Temperature: 26 ℃
Humidity: 55 %
RBW: 1000 KHz VBW: 3000 KHz

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBm	dB	dBm	dBm	dB	Detector	cm	degree	Comment
1	*	1734.400	3.59	4.60	8.19	-13.00	21.19	peak			Tx
2		2784.700	-49.70	5.89	-43.81	-13.00	-30.81	peak			

*:Maximum data x:Over limit !:over margin

Conducted Spurious Emissions

File :Module_EC20-A(CH1413) Data :#5 Date: 2016/10/21 Time: 下午 05:08:57



Site: site #1
Limit: FCC Part 27 conducted(9k-26.5G)
EUT: Industrial M2M Cellular Serial Gateway
M/N: SE5901B-IO-4G-GPS-B-S-US
Mode: WCDMA Band IV
Note:

Polarization: ***Conducted***
Power: DC 12V
Distance:

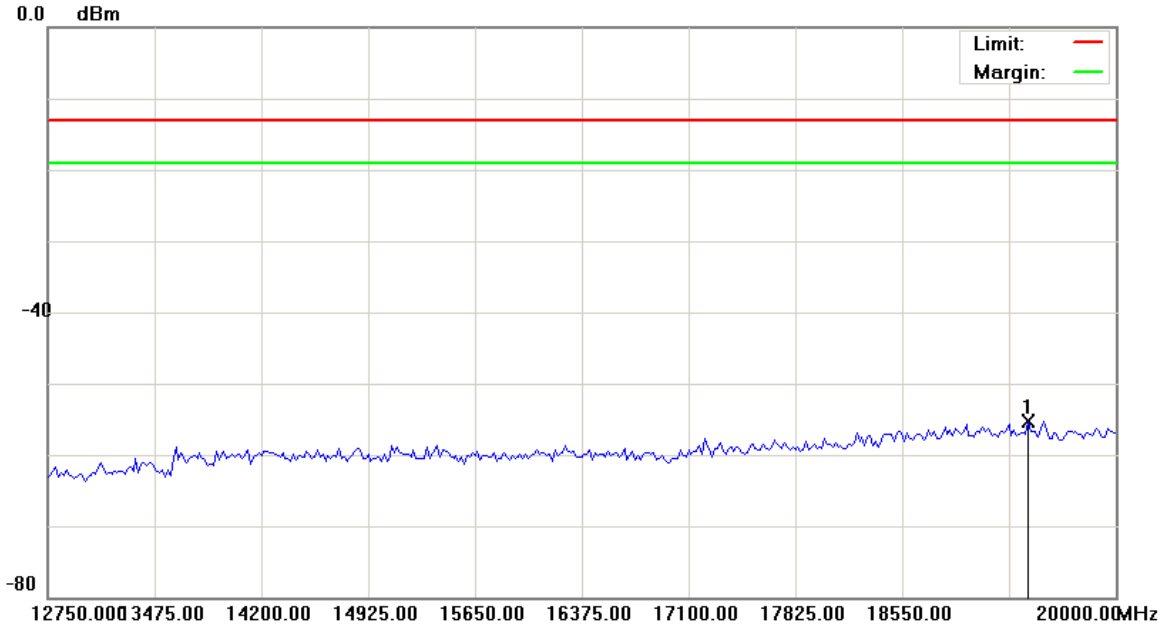
Temperature: 26 ℃
Humidity: 55 %
RBW: 1000 KHz VBW: 3000 KHz

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBm	dB	dBm	dBm	dB	Detector	cm	degree	Comment
1	*	3471.625	-57.83	5.03	-52.80	-13.00	-39.80	peak			

*:Maximum data x:Over limit !:over margin

Conducted Spurious Emissions

File :Module_EC20-A(CH1413) Data :#6 Date: 2016/10/21 Time: 下午 05:09:16



Site: site #1
Limit: FCC Part 27 conducted(9k-26.5G)
EUT: Industrial M2M Cellular Serial Gateway
M/N: SE5901B-IO-4G-GPS-B-S-US
Mode: WCDMA Band IV
Note:

Polarization: ***Conducted***
Power: DC 12V
Distance:

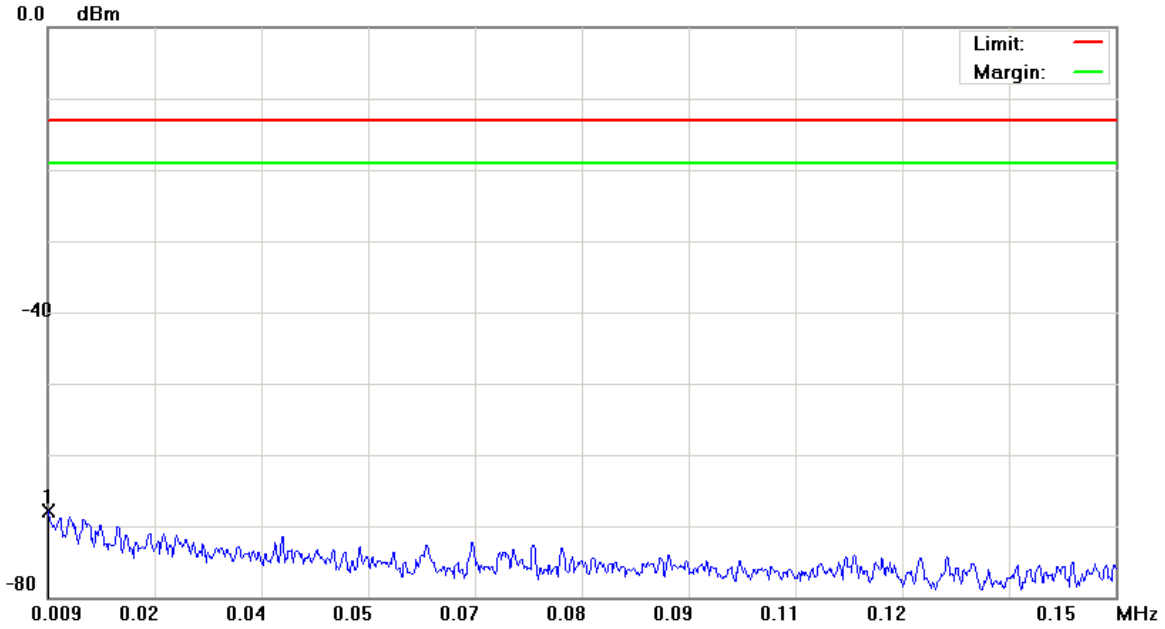
Temperature: 26 ℃
Humidity: 55 %
RBW: 1000 KHz VBW: 3000 KHz

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBm	dB	dBm	dBm	dB	Detector	cm	degree	Comment
1	*	19401.875	-62.54	7.27	-55.27	-13.00	-42.27	peak			

*:Maximum data x:Over limit !:over margin

Conducted Spurious Emissions

File :Module_EC20-A(CH1513) Data :#1 Date: 2016/10/20 Time: 下午 02:33:02



Site: site #1
Limit: FCC Part 27 conducted(9k-26.5G)
EUT: Industrial M2M Cellular Serial Gateway
M/N: SE5901B-IO-4G-GPS-B-S-US
Mode: WCDMA Band IV
Note:

Polarization: ***Conducted***
Power: DC 12V
Distance:

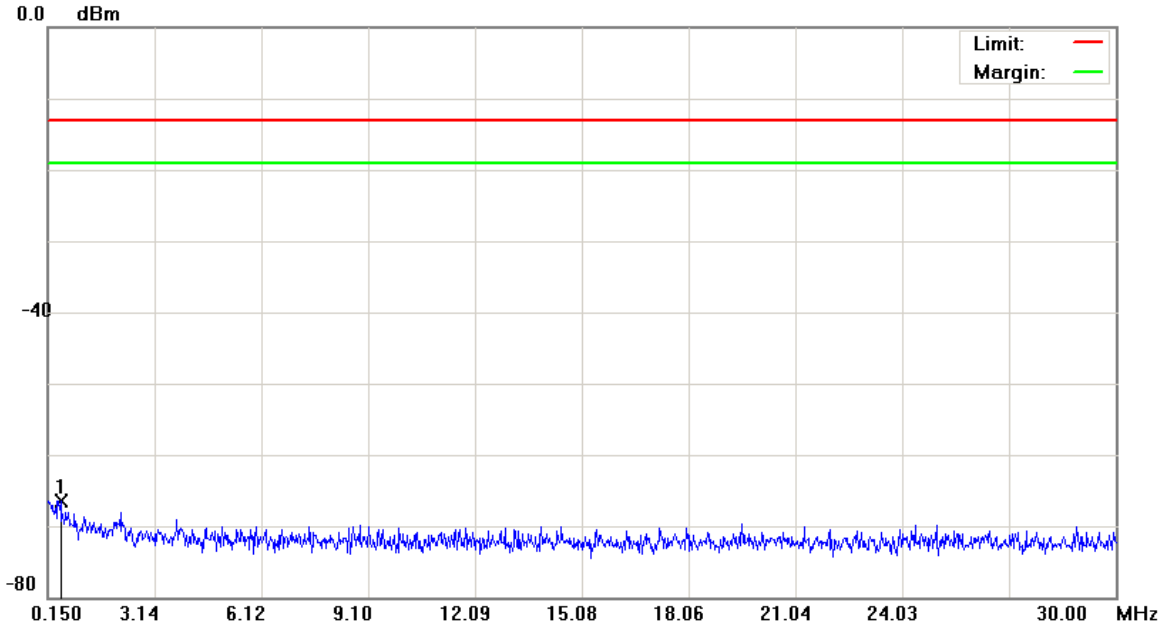
Temperature: 26 ℃
Humidity: 55 %
RBW: 1 KHz VBW: 3 KHz

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBm	dB	dBm	dBm	dB	Detector	cm	degree	Comment
1	*	0.0090	-79.31	11.32	-67.99	-13.00	-54.99	peak			

*:Maximum data x:Over limit !:over margin

Conducted Spurious Emissions

File :Module_EC20-A(CH1513) Data :#2 Date: 2016/10/20 Time: 下午 02:33:26



Site: site #1
Limit: FCC Part 27 conducted(9k-26.5G)
EUT: Industrial M2M Cellular Serial Gateway
M/N: SE5901B-IO-4G-GPS-B-S-US
Mode: WCDMA Band IV
Note:

Polarization: ***Conducted***
Power: DC 12V
Distance:

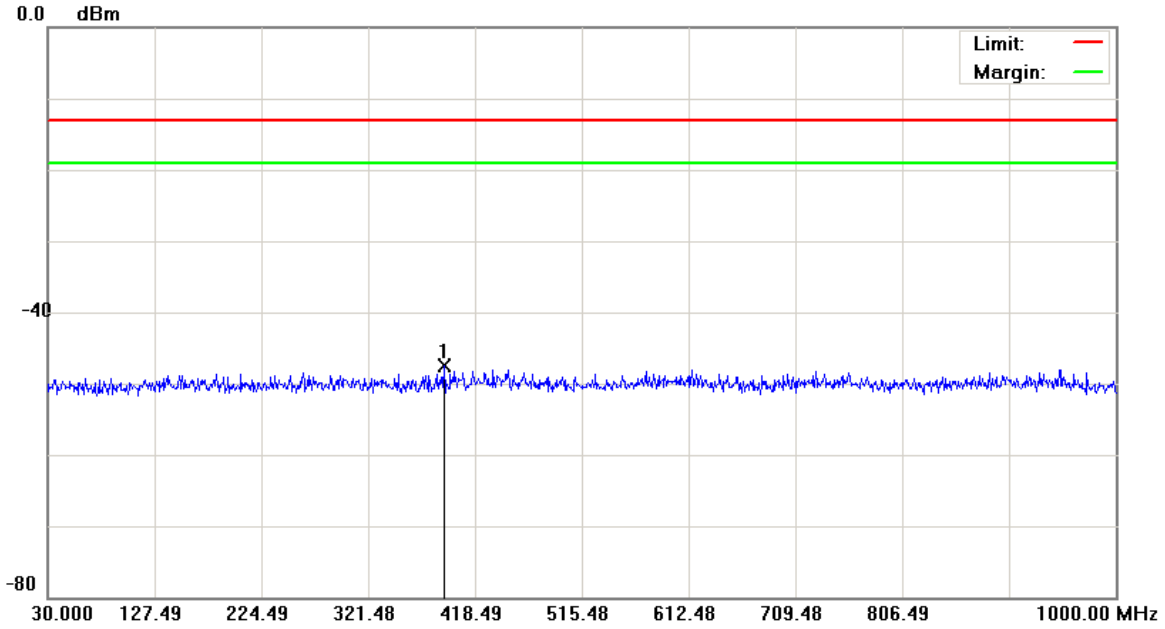
Temperature: 26 ℃
Humidity: 55 %
RBW: 10 KHz VBW: 30 KHz

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBm	dB	dBm	dBm	dB	Detector	cm	degree	Comment
1	*	0.5082	-79.28	12.80	-66.48	-13.00	-53.48	peak			

*:Maximum data x:Over limit !:over margin

Conducted Spurious Emissions

File :Module_EC20-A(CH1513) Data :#3 Date: 2016/10/20 Time: 下午 02:33:50



Site: site #1
Limit: FCC Part 27 conducted(9k-26.5G)
EUT: Industrial M2M Cellular Serial Gateway
M/N: SE5901B-IO-4G-GPS-B-S-US
Mode: WCDMA Band IV
Note:

Polarization: ***Conducted***
Power: DC 12V
Distance:

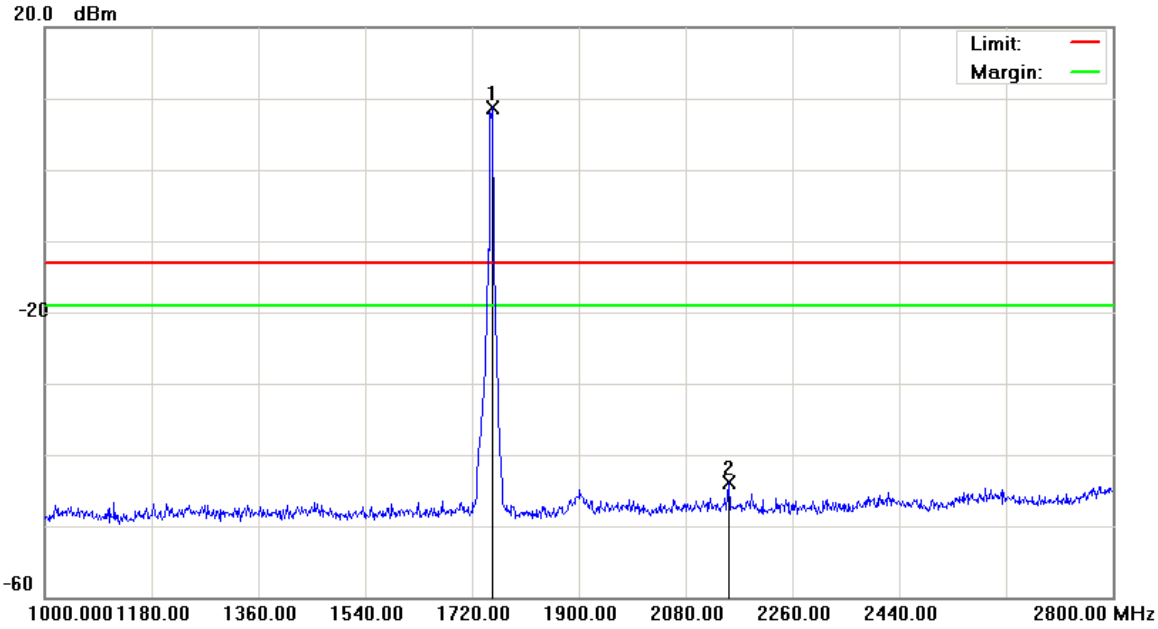
Temperature: 26 ℃
Humidity: 55 %
RBW: 100 KHz VBW: 300 KHz

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBm	dB	dBm	dBm	dB	Detector	cm	degree	Comment
1	*	389.8700	-60.79	13.22	-47.57	-13.00	-34.57	peak			

*:Maximum data x:Over limit !:over margin

Conducted Spurious Emissions

File :Module_EC20-A(CH1513) Data :#4 Date: 2016/10/20 Time: 下午 02:38:18



Site: site #1
Limit: FCC Part 27 conducted(9k-26.5G)
EUT: Industrial M2M Cellular Serial Gateway
M/N: SE5901B-IO-4G-GPS-B-S-US
Mode: WCDMA Band IV
Note:

Polarization: ***Conducted***
Power: DC 12V
Distance:

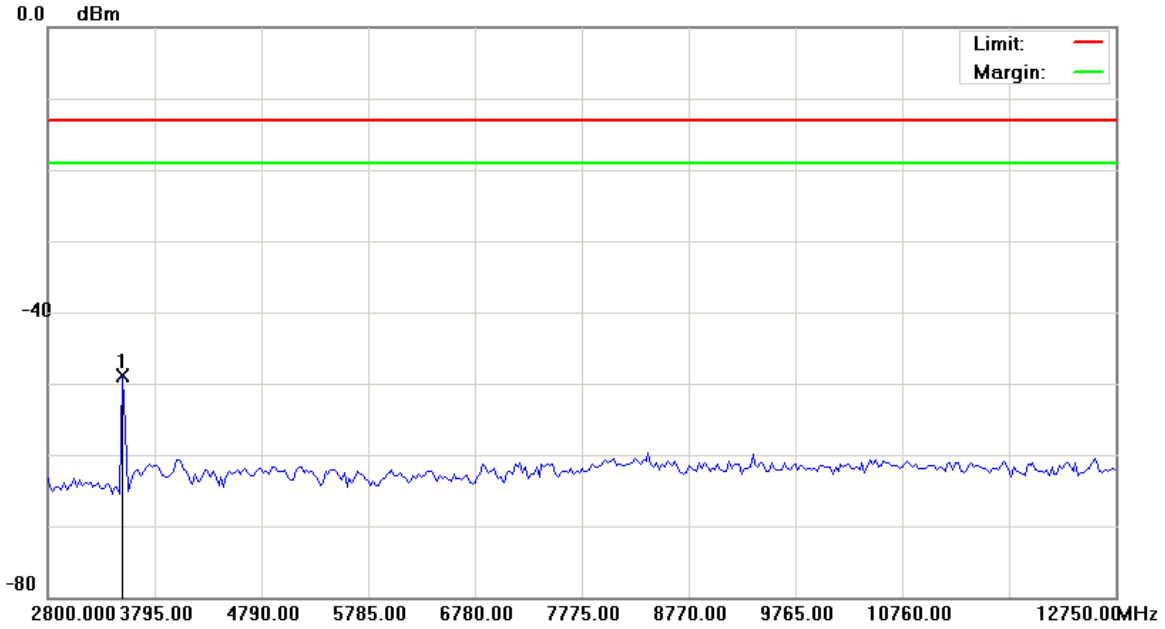
Temperature: 26 ℃
Humidity: 55 %
RBW: 1000 KHz VBW: 3000 KHz

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBm	dB	dBm	dBm	dB	Detector	cm	degree	Comment
1	*	1754.200	4.09	4.62	8.71	-13.00	21.71	peak			Tx
2		2153.800	-48.50	4.60	-43.90	-13.00	-30.90	peak			

*:Maximum data x:Over limit !:over margin

Conducted Spurious Emissions

File :Module_EC20-A(CH1513) Data :#5 Date: 2016/10/21 Time: 下午 05:10:02



Site: site #1
Limit: FCC Part 27 conducted(9k-26.5G)
EUT: Industrial M2M Cellular Serial Gateway
M/N: SE5901B-IO-4G-GPS-B-S-US
Mode: WCDMA Band IV
Note:

Polarization: ***Conducted***
Power: DC 12V
Distance:

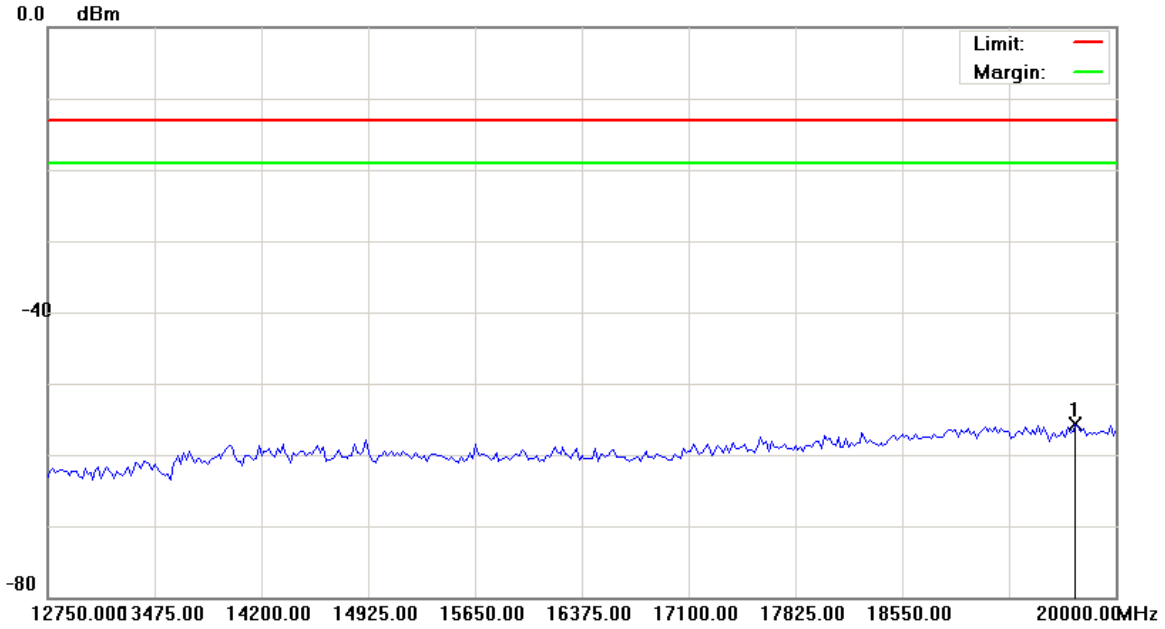
Temperature: 26 ℃
Humidity: 55 %
RBW: 1000 KHz VBW: 3000 KHz

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBm	dB	dBm	dBm	dB	Detector	cm	degree	Comment
1	*	3496.500	-53.78	4.97	-48.81	-13.00	-35.81	peak			

*:Maximum data x:Over limit !:over margin

Conducted Spurious Emissions

File :Module_EC20-A(CH1513) Data :#6 Date: 2016/10/21 Time: 下午 05:10:21



Site: site #1
Limit: FCC Part 27 conducted(9k-26.5G)
EUT: Industrial M2M Cellular Serial Gateway
M/N: SE5901B-IO-4G-GPS-B-S-US
Mode: WCDMA Band IV
Note:

Polarization: ***Conducted***
Power: DC 12V
Distance:

Temperature: 26 ℃
Humidity: 55 %
RBW: 1000 KHz VBW: 3000 KHz

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBm	dB	dBm	dBm	dB	Detector	cm	degree	Comment
1	*	19728.125	-62.98	7.36	-55.62	-13.00	-42.62	peak			

*:Maximum data x:Over limit !:over margin

8 Field Strength of Spurious Radiation Test

■ 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 + 10log(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.

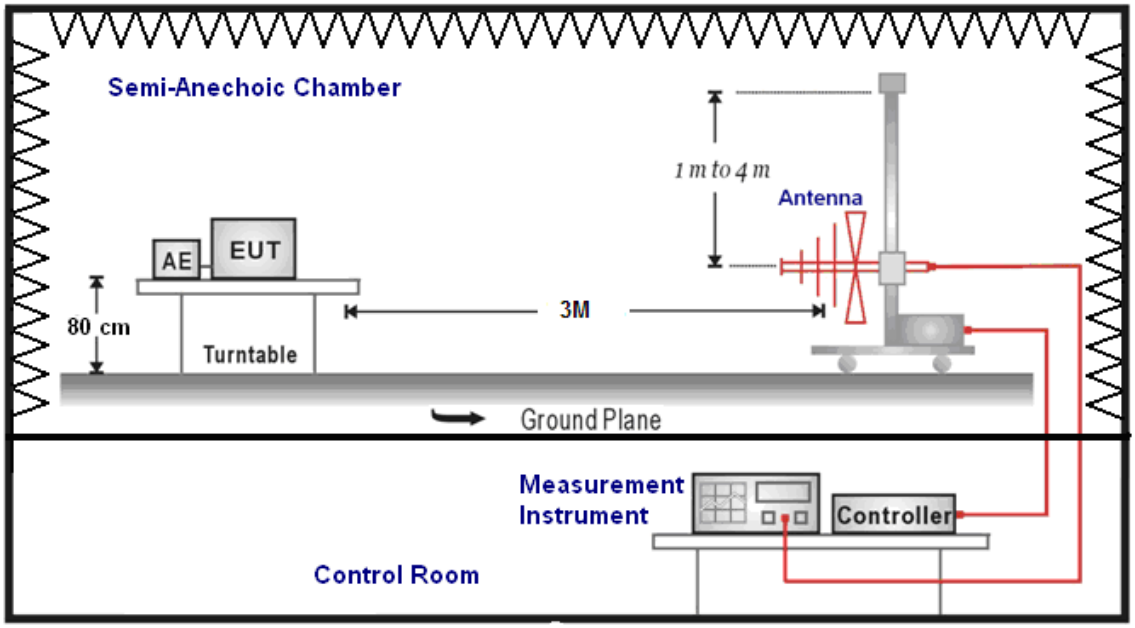
■ Test Instruments

3 Meter Chamber					
Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
RF Pre-selector	Agilent	N9039A	MY46520256	01/08/2016	1 year
Spectrum Analyzer	Agilent	E4446A	MY46180578	01/08/2016	1 year
Pre Amplifier	Agilent	8449B	3008A02237	10/11/2016	1 year
Pre Amplifier	Agilent	8447D	2944A11119	01/11/2016	1 year
Broadband Antenna (30MHz~1GHz)	SCHWARZBECK MESS-ELEKTRONIK	VULB9168	416	10/13/2016	1 year
Broadband Antenna (30MHz~1GHz)	SCHWARZBECK MESS-ELEKTRONIK	VULB 9168	419	11/03/2016	1 year
Horn Antenna (1~18GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA9120D	9120D-550	06/06/2016	1 year
Horn Antenna (18~40GHz)	ETS	3116	00086467	09/05/2016	1 year
Horn Antenna (18~40GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA9170	9170-320	07/18/2016	1 year
Microwave Cable	EMCI	EMC102-KM-KM-14000	151001	02/23/2016	1 year
Microwave Cable	EMCI	EMC-104-SM-SM-14000	140202	02/23/2016	1 year
Microwave Cable	EMCI	EMC104-SM-SM-600	140301	02/23/2016	1 year
Signal Generator	Agilent	E8257D	MY44320425	02/25/2016	1 year
Test Site	ATL	TE01	888001	08/29/2016	1 year

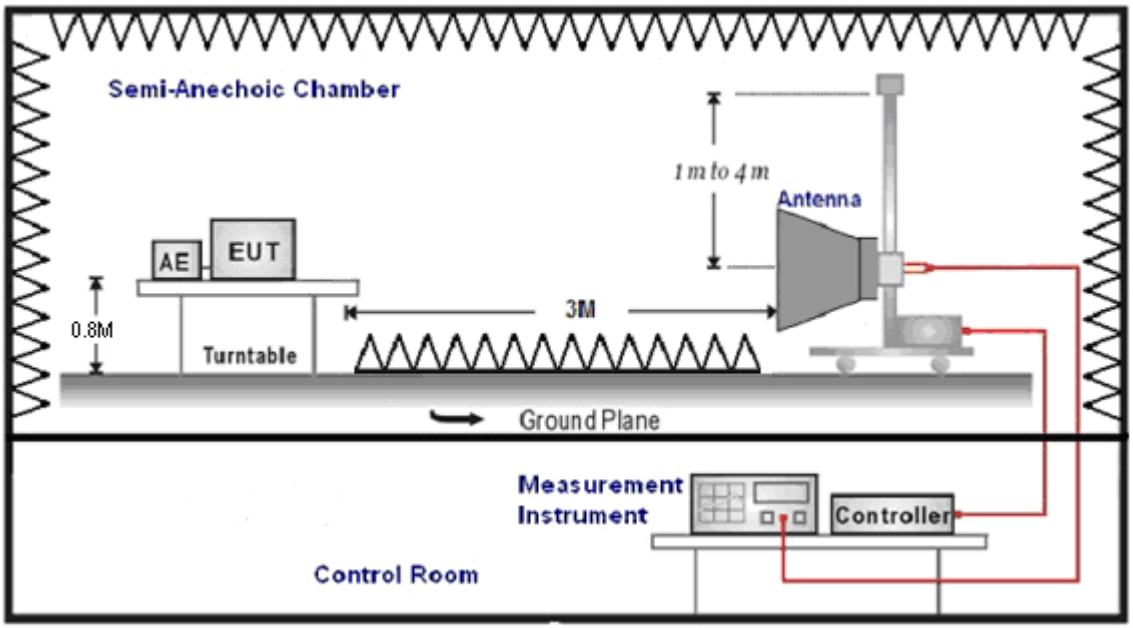
Note: N.C.R. = No Calibration Request.

■ **Setup**

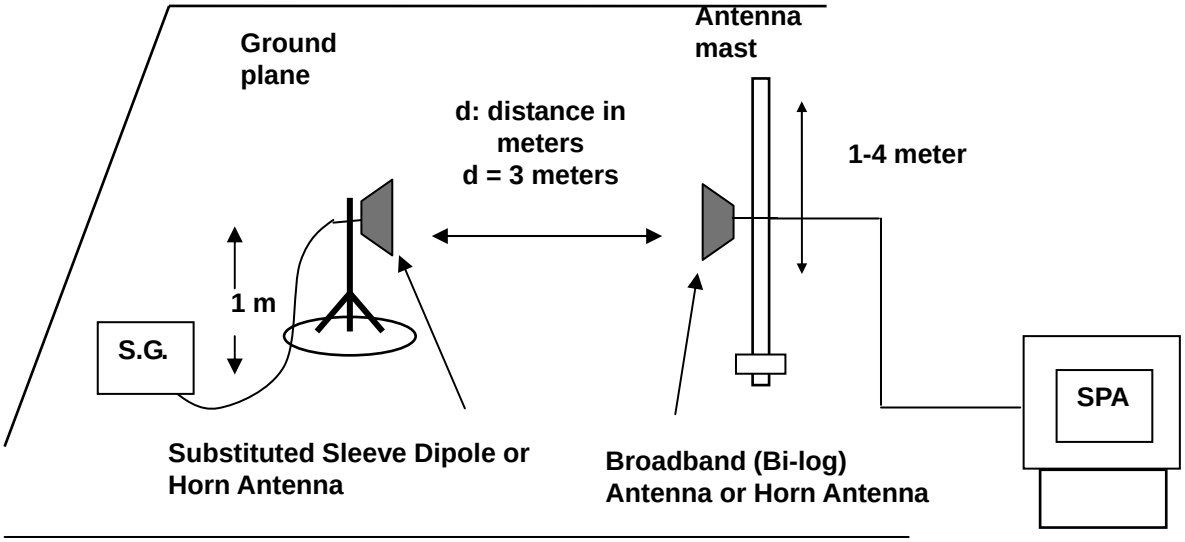
Below 1GHz



Above 1GHz



For Substituted Method Test Set-UP



■ Test Procedure

a. The EUT was set up for the maximum power with LTE link data modulation. The power was measured with Spectrum Analyzer. All measurements were done at 3 channels (low, middle and high operational frequency range). RWB and VBW is 1MHz.

b. Radiation Emission measurement. In the semi-anechoic chamber, EUT placed on the 0.8m height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum polar radiated power. The “Read Value” is the spectrum reading the maximum power value.

c. The substitution antenna (Note:1 & 2) is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a TX cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to “Read Value” of step a. Record the power level of S.G.

d. E.I.R.P. = Output power level of S.G - TX cable loss + Antenna gain of substitution horn

e. E.R.P. = E.I.R.P- 2.15 dB

Note: 1. Below 1 GHz Substituted Method Test：Sleeve dipole antenna to Bi-Log Antenna

2. Above 1 GHz Substituted Method Test：Horn antenna to Horn Antenna

■ Uncertainty

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

■ **Test Result**

Standard:	FCC Part 27	Test Distance:	3m
Test item:	Radiated Emission	Power:	AC 120V/60Hz
Mode:	1	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Frequency:	1712.4 MHz	Date:	10/20/2016

Frequency (MHz)	Reading (dBm)	Correct Factor (dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Remark	Ant.Polar. H / V
7492.000	-60.45	11.90	-48.55	-13.00	-35.55	peak	H
6316.000	-57.90	7.58	-50.32	-13.00	-37.32	peak	V

Standard:	FCC Part 27	Test Distance:	3m
Test item:	Radiated Emission	Power:	AC 120V/60Hz
Mode:	1	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Frequency:	1732.6 MHz	Date:	10/20/2016

Frequency (MHz)	Reading (dBm)	Correct Factor (dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Remark	Ant.Polar. H / V
9196.000	-64.86	14.25	-50.61	-13.00	-37.61	peak	H
6316.000	-58.06	7.58	-50.48	-13.00	-37.48	peak	V

Standard:	FCC Part 27	Test Distance:	3m
Test item:	Radiated Emission	Power:	AC 120V/60Hz
Mode:	1	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Frequency:	1752.6 MHz	Date:	10/20/2016

Frequency (MHz)	Reading (dBm)	Correct Factor (dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Remark	Ant.Polar. H / V
7828.000	-61.95	12.83	-49.12	-13.00	-36.12	peak	H
5572.000	-58.26	5.17	-53.09	-13.00	-40.09	peak	V

9 Frequency Stability (Temperature & Voltage Variation) Test

■ Limit

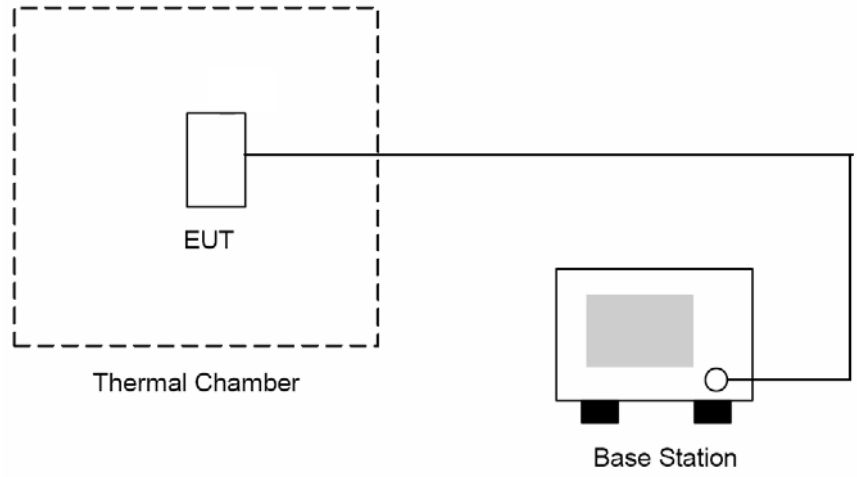
The frequency stability shall be measured by variation of ambient temperature and variation of primary supply voltage to ensure that the fundamental emission stays within the authorized frequency block. The frequency stability of the transmitter shall be maintained within ±0.00025% (±2.5ppm) of the center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

■ Test Instruments

Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Remark
Universal Radio Communication Tester	R & S	CMU200	112387	02/25/2016	1 year
Temperature & Humidity Chamber	TAICHY	MHU-225LA	980729	04/18/2016	1 year
Test Site	ATL	TE05	TE05	N.C.R.	-----

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

■ Setup



■ Test Procedure

The measurement is made according to FCC rules part 27:

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℃ 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℃ 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±5 ℃ 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.

■ Uncertainty

The measurement uncertainty is defined as for Frequency Stability (Temperature Variation) measurement is ± 10Hz.

■ Test Result

Date of Test	10/20/2016					
Level	Voltage [Vdc]	Temperature (℃)	Deviation (Hz)	Deviation (ppm)	Limit (ppm)	Result
Normal	12	0	-9.87	-0.006	±2.5	Pass
Normal	12	10	12.18	0.007	±2.5	Pass
Battery full point	48	20	13.5	0.008	±2.5	Pass
Normal	12	20	-9.79	-0.006	±2.5	Pass
Battery cut-off point	9	20	-0.77	0.000	±2.5	Pass
Normal	12	30	11.26	0.006	±2.5	Pass
Normal	12	40	-3.64	-0.002	±2.5	Pass
Normal	12	50	3.72	0.002	±2.5	Pass