FCC Test Report

FCC Part 22H

Product Name	:	Module
Model No.	:	HL7650
FCC ID	:	N7NHL7650

Applicant	:	Sierra Wireless Inc.
Address	:	13811 Wireless Way, Richmond, BC, V6V 3A4 Canada

Date of Receipt	:	Nov. 09, 2017
Test Date	:	Nov. 09, 2017~ Nov. 12, 2017
Issued Date	:	Nov. 12, 2017
Report No.	:	17B2041R-HP-US-P07V01
Report Version	:	V1.1

Test Report Certification

Issued Date : Nov. 12th, 2017
Report No. :17B2041R-HP-US-P07V01

Product Name	:	Module
Applicant	:	Sierra Wireless Inc.
Address	:	13811 Wireless Way, Richmond, BC, V6V 3A4 Canada
Manufacturer	:	Sierra Wireless Inc.
Address	:	13811 Wireless Way, Richmond, BC, V6V 3A4 Canada
Model No.	:	HL7650
FCC ID	:	N7NHL7650
EUT Voltage	:	Low: 3.2V, High: 4.5V, Normal: 3.7V
Brand Name	:	AirPrime
Applicable Standard	:	FCC CFR Title 47 Part 2 FCC CFR Title 47 Part 22 Subpart H KDB971168 ANSI 63.26: 2015
Test Result	:	Complied
Performed Location	:	DEKRA Testing and Certification (Suzhou) Co., Ltd. No.99 Hongye Rd., Suzhou Industrial Park, Suzhou,215006, Jiangsu,China TEL:+86-512-6251-5088 / FAX:+86-512-6251-5098 FCC Designation Number: CN1199
Documented By	:	Kitty Li

(Adm. Specialist: Kitty Li)

Reviewed By : Frank he

(Senior Engineer: Frank He)

Approved By : Harry Zhao

(Engineering Manager: Harry Zhao)

TABLE OF CONTENTS

History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
17B2041R-HP-US-P07V01	V1.0	Initial Issued Report	Nov. 12, 2017
17B2041R-HP-US-P07V01	V1.1	Page 17, Update HSUPA Conducted Power.	Nov. 12, 2017

1. General Information

1.1. EUT Description

Product Name	Module
Model No.	HL7650
Brand Name	AirPrime
EUT Voltage	Low: 3.2V, High: 4.5V, Normal: 3.7V
HW	1.0
SW	SWIMCB71XX-TIM3.04.01.164804.201612200000.01
3G	
Support Band	WCDMA Band 5
Uplink	WCDMA Band 5: 824~849MHz
Downlink	WCDMA Band 5: 869~894MHz
Type of modulation	QPSK for Uplink
Antenna Type	Dipole
Antenna Gain	Band 5: 5dBi
4G	
Support Band	LTE Band 5
Uplink	Band 5: 824-849MHz
Downlink	Band 5: 869-894MHz
Type of modulation	QPSK, 16QAM
Antenna Type	Dipole
Antenna Gain	Band 5: 5dBi

1.2. Mode of Operation

We have 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 5 Link
Mode 2 :LTE Band 5 Link
1. 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. 2. For the WCDMA band, we evaluate the different data rate, shown in the report is the worst data. 3. For the LTE band, we evaluate each channel of bandwidth, RB offset and modulation, we will choose the worst data shown on this report.

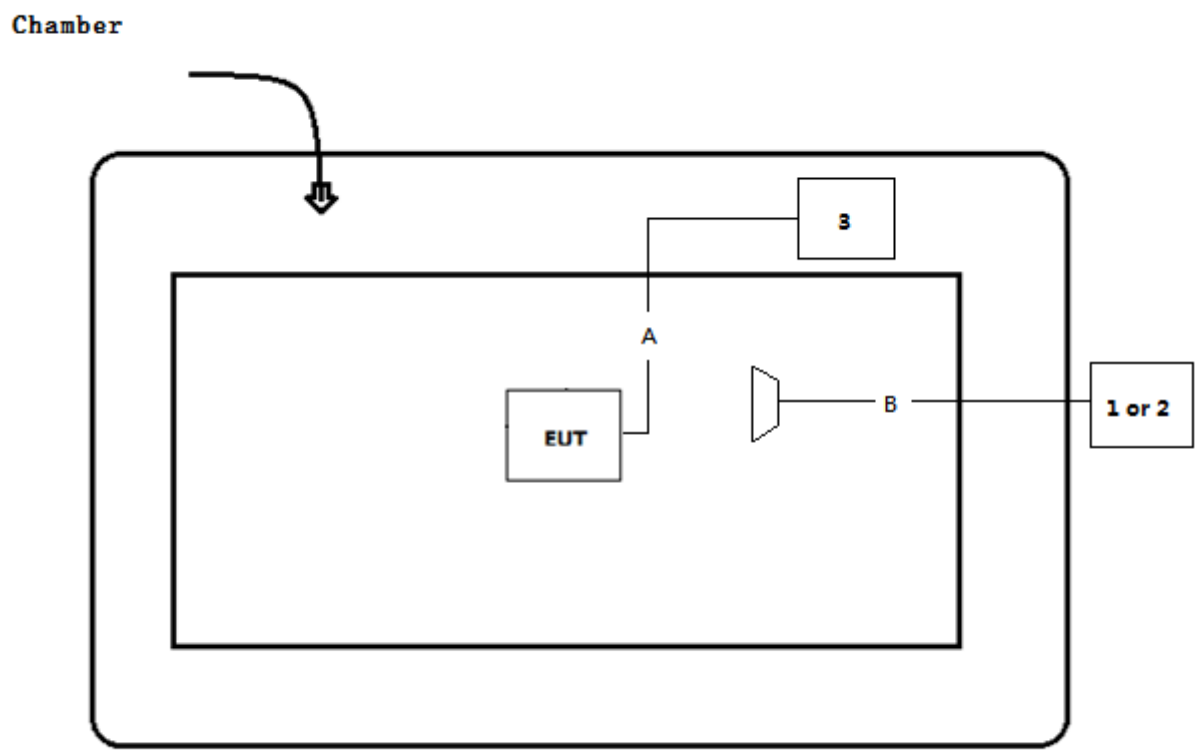
1.3. Tested System Details

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

Product		Manufacturer	Model No.	Serial No.	Power Cord
1	Radio Communication Tester	R&S	CMU 200	106388	N/A
2	Radio Communication Tester	Anritsu	MT8820C	6201181503	N/A
3	DC Power Supply	IDRC	CD-035-020PR	977272	N/A

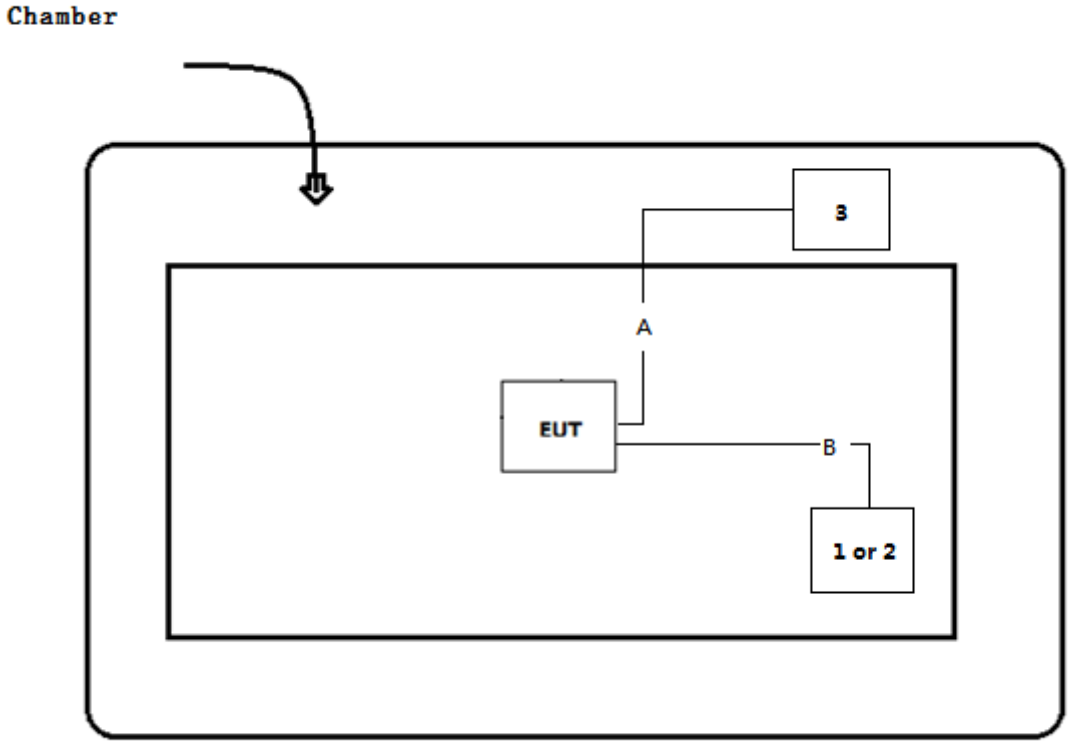
1.4. Configuration of Tested System

RadiatedConnection Diagram



Signal Cable Type		Signal cable Description
A	Control Cable	Non-Shielded,2m
B	Coaxial Cable	Shielded,>5m

Conducted Connection Diagram



Signal Cable Type		Signal cable Description
A	Control Cable	Non-Shielded,2m
B	Coaxial Cable	Shielded,>5m

1.5. EUT Exercise Software

1	Setup the EUT and simulators as shown on above.
2	Turn on the power of all equipment.
3	EUT Communicate with CMU 200/MT8820C, then select channel to test.

2. Summary Technical Test

2.1. Limit and Test Result

WCDMA Band 5/LTE Band 5			
FCC Part 22 Subpart H			
Test Item	FCC Reference section	FCC Limit	Result
Maximum Output Power	§2.1033 §2.1046 §22.913	<7 Watts	Pass
Equivalent Isotropic Radiated Power	§22.913	<7 Watts	Pass
Occupied Bandwidth	§2.1049	N/A	Pass
Conducted Band Edge Emissions	§22.917	<-13dBm	Pass
Spurious Radiation	§2.1053 §§22.917	<-13dBm	Pass
Frequency Stability Under Temperature & Voltage Variations	§2.1055 §22.335	< 2.5 ppm	Pass

2.2. Worst Data

For WCDMA/HSDPA/HSUPA

Test Item	WCDMA Band	Channel	Frequency	Value(dBm)
Maximum Output Power	5	4182	836.4	23.64

Test Item	WCDMA Band	Channel	Frequency	Value(dBm)
Equivalent Isotropic Radiated Power	5	4233	846.6	27.49

Test Item	WCDMA Band	Channel	Frequency	Value(kHz)
Occupied Bandwidth	5	4132	826.4	4075.3

Test Item	WCDMA Band	Channel	Frequency	Value(dBm)
Conducted Band Edge Emissions	5	4132	826.4	-30.13

Test Item	WCDMA Band	Channel	Frequency	Value(dBm)
Spurious Radiation(Conducted)	5	4132	826.4	-23.96
Spurious Radiation(Radiated)	5	4132	826.4	-36.87

Test Item	WCDMA Band	Channel	Frequency	Value(Hz)
Frequency Stability Under Temperature & Voltage Variations	5	4182	836.4	53

For LTE

Test Item	LTE Band	Bandwidth	Channel	Frequency	RB Size	RB Offset	Value(dBm)
Maximum Output Power	5	10M	20450	829	1	0	22.11
		5M	20425	826.5	1	0	22.01
		3M	20525	836.5	1	0	22.03
		1.4M	20643	848.3	1	0	22.02
Note: The modulation of the worst data is QPSK							

Test Item	LTE Band	Bandwidth	Channel	Frequency	RB Size	RB Offset	Value(dBm)
Equivalent Isotropic Radiated Power	5	10M	20450	829	1	0	27.49
		5M	20425	826.5	1	0	26.21
		3M	20525	836.5	1	0	26.23
		1.4M	20643	848.3	1	0	26.29
Note: The modulation of the worst data is QPSK							

Test Item	LTE Band	Bandwidth	Channel	Frequency	RB Size	RB Offset	Value(KHz)
Occupied Bandwidth	5	10M	20600	844	50	0	8933.4
		5M	20525	836.5	25	0	4464.8
		3M	20525	836.5	15	0	2682.1
		1.4M	20407	824.7	7	0	1084.8
Note: The modulation of the worst data is QPSK							

Test Item	LTE Band	Bandwidth	Channel	Frequency	RB Size	RB Offset	Value(dBm)
Conducted Band Edge Emissions	5	10M	20450	829	50	0	-37.032
		5M	20425	826.5	1	0	-37.337
		3M	20415	825.5	1	14	-27.983
		1.4M	20643	848.3	1	6	-40.575
Note: The modulation of the worst data is QPSK							

Test Item	LTE Band	Bandwidth	Channel	Frequency	RB Size	RB Offset	Value(dBm)
Spurious Radiation(Conducted)	5	10M	20600	844	1	0	-47.478
		5M	20525	836.5	1	0	-49.329
		3M	20415	825.5	1	0	-49.214
		1.4M	20525	836.5	1	0	-48.975
Spurious Radiation(Radiated)	5	10M	20600	844	1	0	-35.64
Note: The modulation of the worst data is QPSK							

Test Item	LTE Band	Bandwidth	Channel	Frequency	RB Size	RB Offset	Value(Hz)
Frequency Stability Under Temperature & Voltage Variations	5	10M	20525	836.5	1	0	63
Note: The modulation of the worst data is QPSK							

2.3. Test Environment

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	23
Humidity (%RH)	25-75	52
Barometric pressure (mbar)	860-1060	950-1000

2.4. Measurement Uncertainty

Items	Uncertainty
Maximum Output Power	±1.2 dB
Equivalent Isotropic Radiated Power	±3.2 dB
Occupied Bandwidth	±10 Hz
Conducted Band Edge Emissions	±1.2 dB
Field Strength of Spurious Radiation	±3.2 dB
Frequency Stability Under Temperature & Voltage Variations	±10 Hz

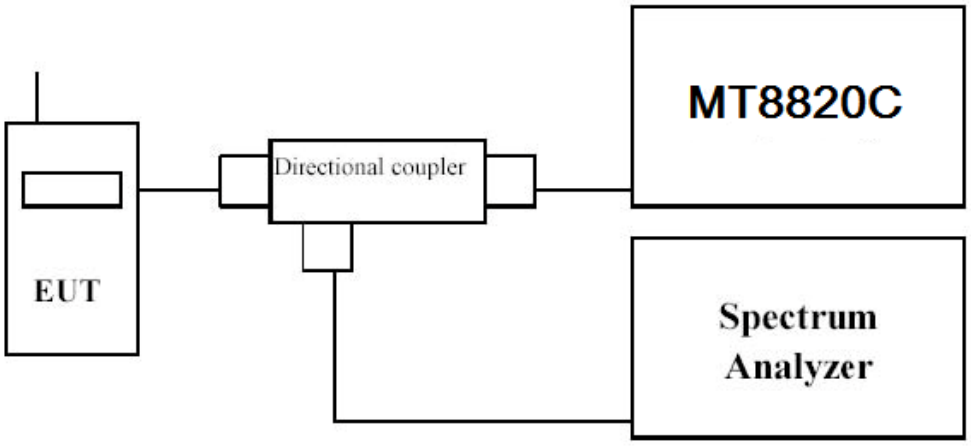
3. Maximum Output Power and Effective Isotropic Radiated Power Measurement

3.1. Test Equipment

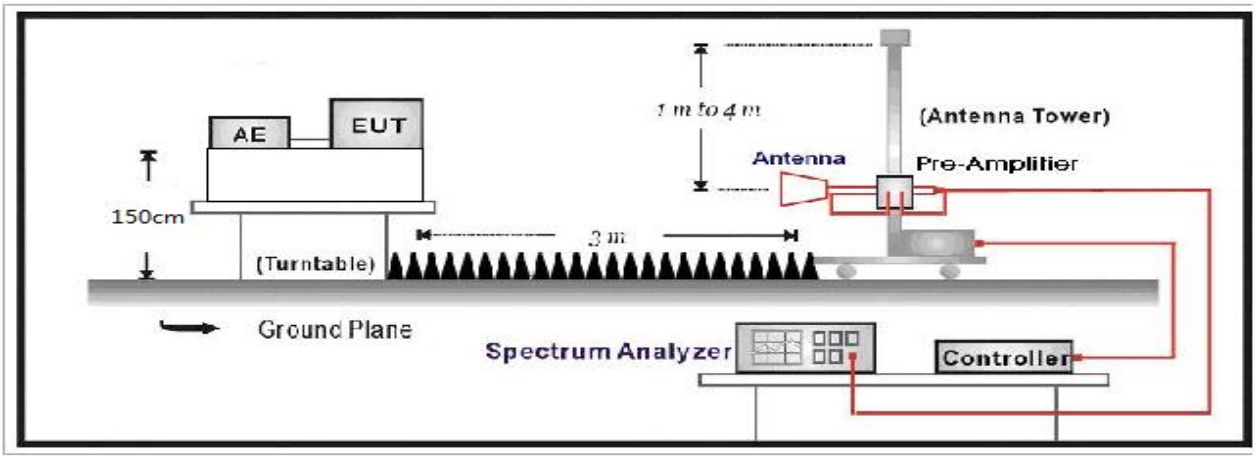
Maximum Output Power and Effective Isotropic Radiated Power Measurement / AC-5				
Instrument	Manufacturer	Type No.	Serial No	Cali. Due Date
PSA Series Spectrum Analyzer	Agilent	E4440A	MY49420184	2018.02.04
Radio Communication Tester	Anritsu	MT8820C	6201181503	2018.09.16
Dual Directional Coupler	Agilent	778D	20160	2018.02.04
10dB Coaxial Coupler	Agilent	87300C	MY44300299	2018.03.28
PSG Analog Signal Generator	Agilent	E8257D	MY44321116	2018.02.04
Preamplifier	QuieTek	AP-025C	CHM-0503006	2018.04.11
Preamplifier	Miteq	NSP1800-25	1364185	2018.05.03
Bilog Antenna	Teseq GmbH	CBL6112D	27612	2018.01.23
Half Wave Tuned Dipole Antenna	COM-POWER	AD-100	40137	2018.02.26
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	737	2018.03.06
DRG Horn	ETS-Lindgren	3117	00167055	2018.07.23
Temperature/Humidity Meter	Zhicheng	ZC1-2	AC5-TH	2018.01.05

3.2. Test Setup

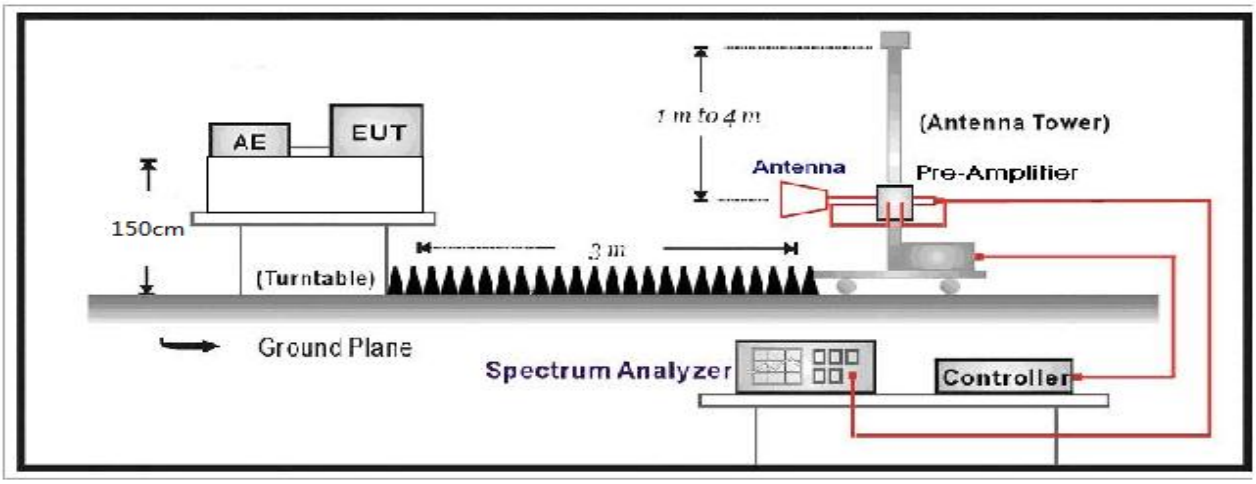
Conducted Power Measurement:



Radiated Power Measurement (Below 1G):



Radiated Power Measurement (Above 1G):



3.3. Test Procedure

Test Method for conducted power
a) The RF output of the transmitter was connected to base station simulator.
b) The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
c) Set EUT at maximum average power by base station simulator.
d) Measure lowest, middle, and highest channels for each bandwidth and different modulation.
Test For Effective Isotropic Radiated Power Measurement:
a) The EUT was placed on a turntable with 1.5 meter height in a fully anechoic chamber.
b) The EUT was set at 3 meters from the receiving antenna, which was mounted on the antenna tower
c) LTE operating modes: use channel power function to test
d) The table was rotated 360 degrees to determine the position of the highest radiated power.
e) The height of the receiving antenna is adjusted to look for the maximum EIRP.
f) The maximum EIRP shall be record.
g) A dipole antenna was substituted in place of the EUT and was driven by a signal generator.
h) The conducted power at the terminal of the dipole antenna is measured.
i) Repeat step c) to step h) to get the maximum EIRP of the substitution antenna.
j) EIRP = Ps + Et －Es + Gs = Ps + Rt－Rs + Gs.
k) Ps (dBm)：Input power to substitution antenna
l) Gs (dBi or dBd)：Substitution antenna Gain.
m) Et = Rt + AF
n) Es = Rs + AF
o) AF (dB/m)：Receive antenna factor
p) Rt：The highest received signal in spectrum analyzer for EUT.
q) Rs：The highest received signal in spectrum analyzer for substitution antenna.

3.4. Test Result

Product	Module	Test Site	AC-5
Test Item	Maximum Output Power	Date of Test	2017/11/11
Test Mode	Mode 1: WCDMA Band 5 Link	Test engineer	Scott

Mode	3GPP Subtset	Maximum Average Power [dBm]		
		Low Ch. / Freq.	Mid Ch. / Freq.	High Ch. / Freq.
Channel		4132	4182	4233
Frequency		826.4	836.4	846.6
WCDMA R99	1	23.55	23.64	23.59
Rel5 HSDPA	1	23.47	23.59	23.51
	2	23.43	23.55	23.48
	3	23.01	23.04	23.03
	4	22.96	23.01	22.99
Rel6 HSUPA	1	23.34	23.37	23.29
	2	21.28	21.30	21.21
	3	22.29	22.31	22.24
	4	21.26	21.28	21.19
	5	23.31	23.35	23.27

Product	Module	Test Site	AC-5
Test Item	Maximum Output Power	Date of Test	2017/11/11
Test Mode	Mode 2: LTE Band 5 Link	Test engineer	Scott

BW [MHz]	RB Size	RB Offset	Mod	Maximum Average Power[dBm]		
				Low Ch. / Freq.	Mid Ch. / Freq.	High Ch. / Freq.
Channel				20450	20525	20600
Frequency				829	836.5	844
10	1	0	QPSK	22.11	22.04	22.09
10	1	24		21.96	21.95	22.01
10	1	49		21.93	21.97	21.95
10	25	0		20.84	20.91	20.91
10	25	12		20.73	20.83	20.92
10	25	24		20.72	20.85	20.81
10	50	0		20.84	20.87	20.91
10	1	0	16-QAM	21.23	21.27	21.19
10	1	24		21.06	21.15	21.18
10	1	49		21.04	21.25	21.16
10	25	0		19.92	20.07	19.94
10	25	12		19.81	19.93	20.01
10	25	24		19.83	19.93	19.93
10	50	0		19.92	19.92	19.92
Channel				20425	20525	20625
Frequency				826.5	836.5	846.5
5	1	0	QPSK	22.01	21.99	22.08
5	1	12		21.95	21.94	22.02
5	1	24		21.82	21.84	22.03
5	12	0		20.94	20.84	21.01
5	12	6		20.83	20.85	20.98
5	12	11		20.81	20.87	20.94
5	25	0		20.85	20.82	20.93
5	1	0	16-QAM	21.21	21.14	21.22
5	1	12		21.12	21.13	21.13
5	1	24		20.90	21.05	21.21
5	12	0		20.01	19.97	20.01
5	12	6		19.91	19.91	20.04

5	12	11		19.82	19.91	20.03
5	25	0		19.85	19.93	20.02
Channel				**20415**	**20525**	**20635**
Frequency				**825.5**	**836.5**	**847.5**
3	1	0		22.03	22.04	22.09
3	1	7		21.98	21.93	22.02
3	1	14		21.91	21.91	22.07
3	8	0	QPSK	20.94	20.92	21.01
3	8	4		20.95	20.83	21.03
3	8	7		20.86	20.84	21.02
3	15	0		20.94	20.87	21.01
3	1	0		21.24	21.17	21.27
3	1	7		21.23	21.13	21.25
3	1	14		21.06	21.12	21.31
3	8	0	16-QAM	20.03	19.99	20.14
3	8	4		20.02	19.95	20.15
3	8	7		19.91	20.01	20.11
3	15	0		20.07	20.03	20.12
Channel				20407	20525	20643
Frequency				**824.7**	**836.5**	**848.3**
1.4	1	0		22.02	21.86	22.11
1.4	1	2		21.93	21.81	22.05
1.4	1	5		21.81	21.87	22.04
1.4	3	0	QPSK	20.94	20.82	21.03
1.4	3	1		20.82	20.81	20.91
1.4	3	2		20.87	20.84	20.92
1.4	6	0		20.81	20.82	20.97
1.4	1	0		21.21	21.13	21.22
1.4	1	2		21.11	21.13	21.19
1.4	1	5		20.92	21.07	21.23
1.4	3	0	16-QAM	20.01	19.95	20.02
1.4	3	1		19.91	19.91	20.01
1.4	3	2		19.83	19.93	20.04
1.4	6	0		19.87	19.92	20.09

Product	Module	Test Site	AC-5
Test Item	Effective Isotropic Radiated Power	Date of Test	2017/11/11
Test Mode	Mode 2: LTE Band 5 Link	Test engineer	Scott

WCDMA Band 5 Radiated Power ERP				
WCDMA Band	**Modulation**	**Channel**	**Freq. (MHz)**	**EIRP (dBm)**
5	QPSK	Low	826.4	27.33
5	QPSK	Mid	836.4	27.21
5	QPSK	High	846.6	27.49

Product	Module	Test Site	AC-5
Test Item	Effective Isotropic Radiated Power	Date of Test	2017/11/11
Test Mode	Mode 2: LTE Band 5 Link	Test engineer	Scott

LTE Band	Channel BW (MHz)	Modulation	RB Configuration		Channel	Freq. (MHz)	ERP (dBm)
			RB Size	RB Offset			
5	10	QPSK	1	0	Low	829	26.21
5	10	QPSK	1	0	Mid	836.5	26.12
5	10	QPSK	1	0	High	844	26.11
5	10	16QAM	1	0	Low	829	25.25
5	10	16QAM	1	0	Mid	836.5	25.29
5	10	16QAM	1	0	High	844	25.12
5	5	QPSK	1	0	Low	826.5	26.23
5	5	QPSK	1	0	Mid	836.5	26.14
5	5	QPSK	1	0	High	846.5	26.24
5	5	16QAM	1	0	Low	826.5	25.26
5	5	16QAM	1	0	Mid	836.5	25.29
5	5	16QAM	1	0	High	846.5	25.27
5	3	QPSK	1	0	Low	825.5	26.21
5	3	QPSK	1	0	Mid	836.5	26.29
5	3	QPSK	1	0	High	847.5	26.23
5	3	16QAM	1	0	Low	825.5	25.34
5	3	16QAM	1	0	Mid	836.5	25.28
5	3	16QAM	1	0	High	847.5	25.39
5	1.4	QPSK	1	0	Low	824.7	26.19
5	1.4	QPSK	1	0	Mid	836.5	25.97
5	1.4	QPSK	1	0	High	848.3	26.32
5	1.4	16QAM	1	0	Low	824.7	25.51
5	1.4	16QAM	1	0	Mid	836.5	25.49
5	1.4	16QAM	1	0	High	848.3	25.37
Note: For EIRP test, we have evaluated all the and RB size and Offset in each channel, we choose the worst data shown in the report.							

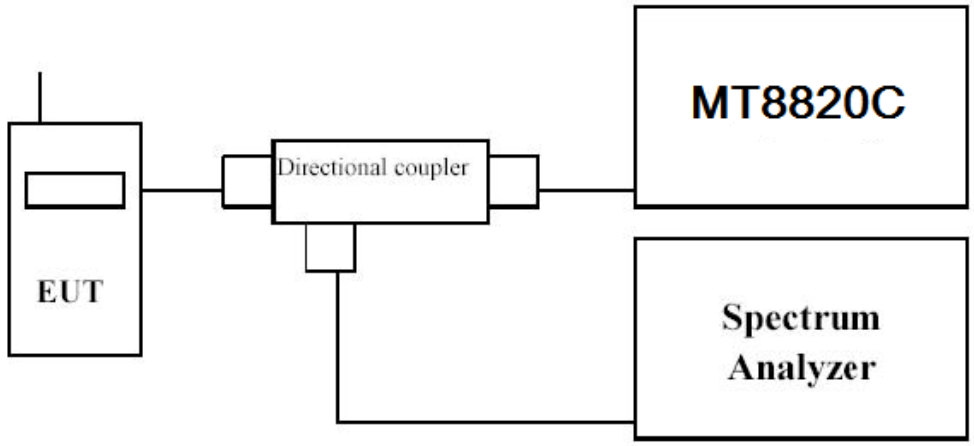
4. Occupied Bandwidth

4.1. Test Equipment

Occupied Bandwidth / TR-8				
Instrument	Manufacturer	Type No.	Serial No	Cali. Due Date
PSA Series Spectrum Analyzer	Agilent	E4440A	MY49420184	2018.02.04
Radio Communication Tester	Anritsu	MT8820C	6201181503	2018.09.16
Dual Directional Coupler	Agilent	778D	20160	2018.02.04
10dB Coaxial Coupler	Agilent	87300C	MY44300299	2018.03.28
Temperature/Humidity Meter	Zhicheng	ZC1-2	AC6-TH	2018.01.05

4.2. Test Setup

Conducted Power Measurement:



4.3. Test Procedure

Test Method for conducted test

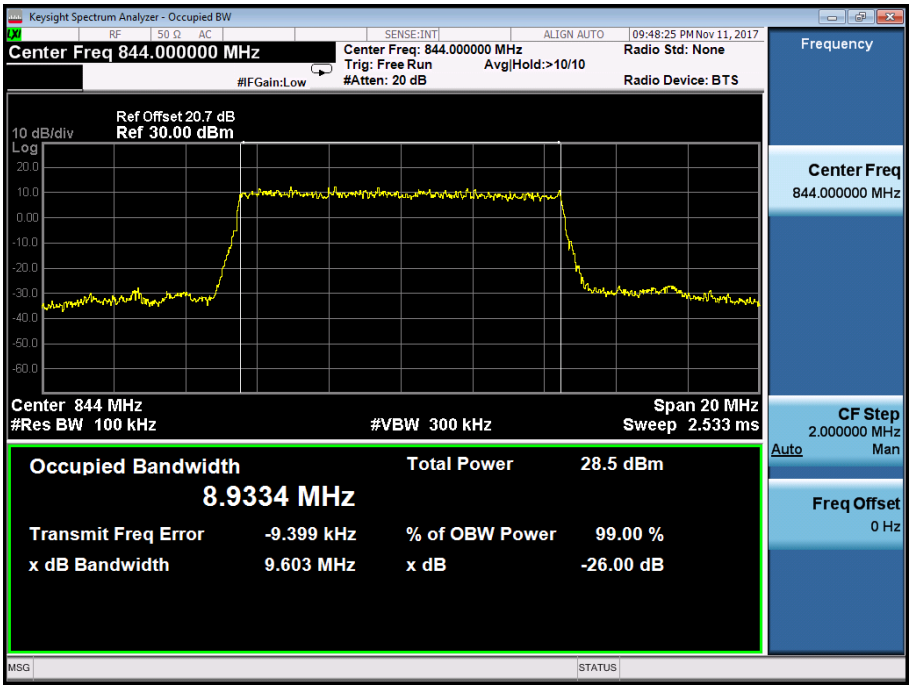
1. The EUT was connected to Spectrum Analyzer and Base Station via power divider.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. The 99% occupied bandwidth and 26 dB bandwidth of themiddle channel for the highest RF powers were measured.

4.4. Test Result

Product	Module	Test Site	TR-8
Test Item	Occupied Bandwidth	Date of Test	2017/11/11
Test Mode	Mode 1-2(QPSK)	Test engineer	Scott

Mode	Bandwidth (MHz)	Channel No.	Frequency (MHz)	99% Occupied Bandwidth (kHz)	-26dBOccupied Bandwidth (kHz)
WCDMA Band 5	5	4132	826.4	4075.3	4620
		4182	836.4	4068.8	4627
		4233	846.6	4064.8	4625
LTE Band 5	10	20450	829	8923.3	9623
		20525	836.5	8923.6	9627
		20600	844	8933.4	9603
	5	20425	826.5	4462.7	4903
		20525	836.5	4464.8	4895
		20625	846.5	4461.8	4857
	3	20415	825.5	2683.9	2921
		20525	836.5	2682.1	2923
		20635	847.5	2681.2	2922
	1.4	20407	824.7	1084.8	1238
		20525	836.5	1081.6	1241
		20643	848.3	1080.7	1251
Note1: The worst case as below:					

LTE Band 5 BW10M Channel 20600 50RB0

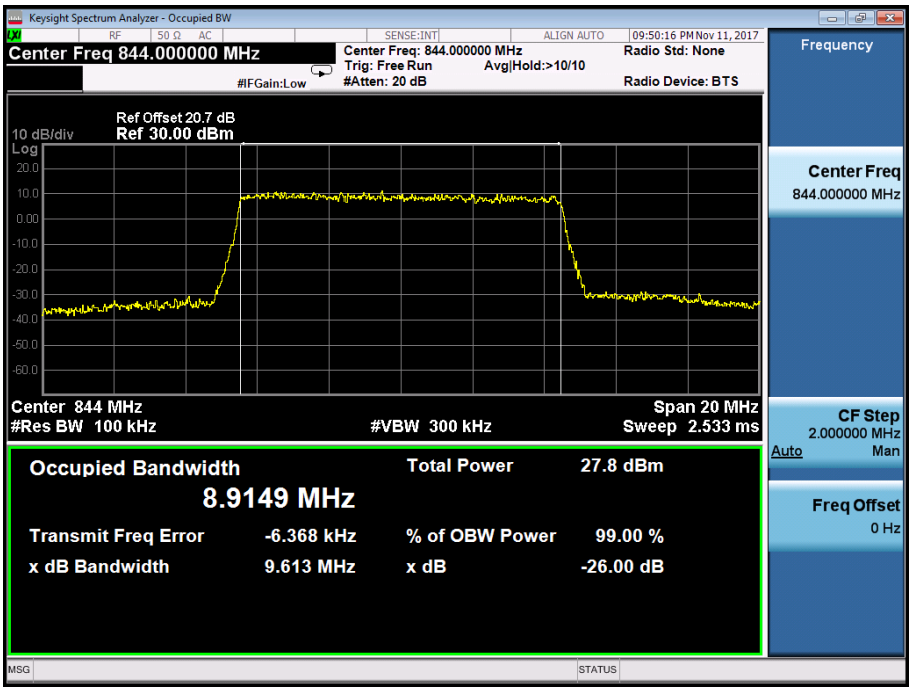


Product	Module	Test Site	TR-8
Test Item	Occupied Bandwidth	Date of Test	2017/11/11
Test Mode	Mode 2(16QAM)	Test engineer	Scott

Mode	Bandwidth (MHz)	Channel No.	Frequency (MHz)	99% Occupied Bandwidth (kHz)	-26dBOccupied Bandwidth (kHz)
LTE Band 5	10	20450	829	8912.7	9607
		20525	836.5	8913.4	9608
		20600	844	8914.9	9613
	5	20425	826.5	4462.5	4905
		20525	836.5	4465.4	4896
		20625	846.5	4461.3	4854
	3	20415	825.5	2681.7	2923
		20525	836.5	2682.3	2922
		20635	847.5	2687.6	2921
	1.4	20407	824.7	1084.9	1234
		20525	836.5	1073.8	1241
		20643	848.3	1074.9	1253

Note1: The worst case as below:

LTE Band 5 BW10M Channel 20600 50RB0

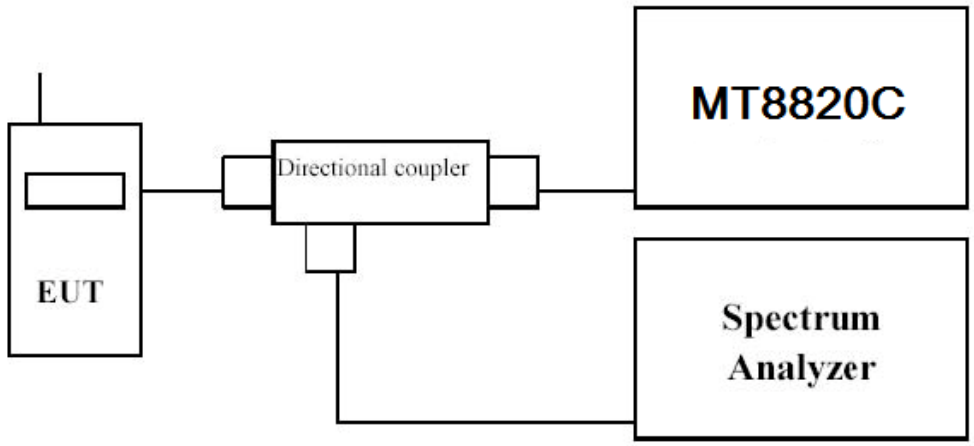


5. Conducted Band Edge

5.1. Test Equipment

Conducted Band Edge / TR-8				
Instrument	Manufacturer	Type No.	Serial No	Cali. Due Date
PSA Series Spectrum Analyzer	Agilent	E4440A	MY49420184	2018.02.04
Radio Communication Tester	Anritsu	MT8820C	6201181503	2018.09.16
Dual Directional Coupler	Agilent	778D	20160	2018.02.04
10dB Coaxial Coupler	Agilent	87300C	MY44300299	2018.03.28
Temperature/Humidity Meter	Zhicheng	ZC1-2	AC6-TH	2018.01.05

Conducted Power Measurement:



5.2. Test Procedure

Test Method for conducted test

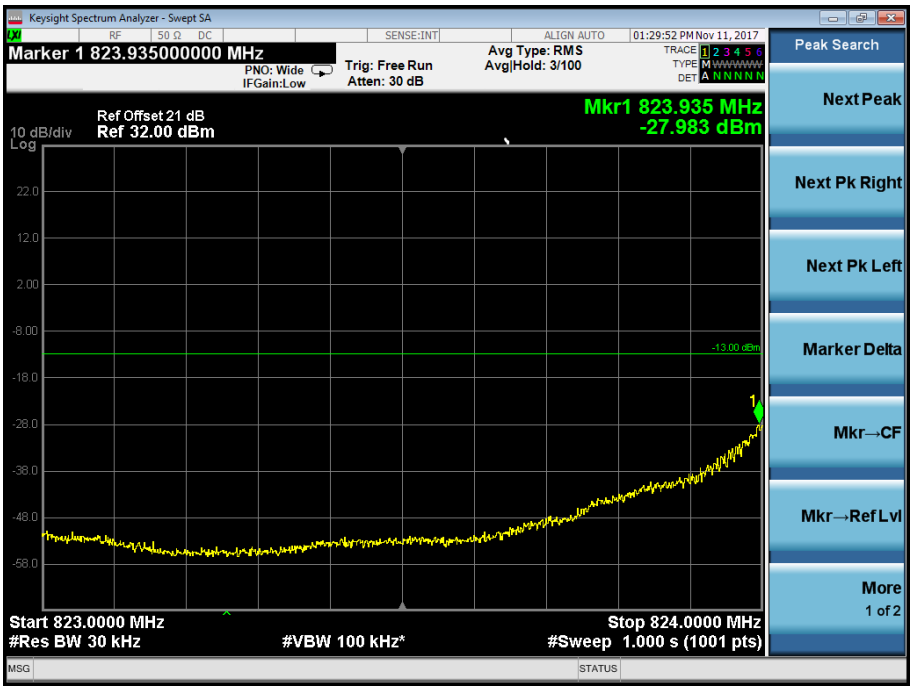
1. The EUT was connected to spectrum analyzer and System Simulator via power divider.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. The conducted spurious emission for the whole frequency range was taken.

5.3. Test Result

Product	Module	Test Site	TR-8
Test Item	Conducted Band Edge	Date of Test	2017/11/11
Test Mode	Mode 1-2(QPSK)	Test engineer	Scott

Mode	Bandwidth	Channel	Test Frequency (MHz)	RB	Measure Level (dBm)	Limit (dBm)	Result
WCDM Band 5	5M	4132	826.4	--	-30.13	< -13	Pass
		4233	846.6	--	-33.69	< -13	Pass
LTE Band 5	10M	20450	829	1RB0	-37.513	< -13	Pass
				50RB0	-37.032	< -13	Pass
		20600	844	1RB49	-39.652	< -13	Pass
				50RB0	-40.519	< -13	Pass
	5M	20425	826.5	1RB0	-30.337	< -13	Pass
				25RB0	-37.309	< -13	Pass
		20625	846.5	1RB24	-30.414	< -13	Pass
				25RB0	-37.146	< -13	Pass
	3M	20415	825.5	1RB0	-27.983	< -13	Pass
				15RB0	-32.917	< -13	Pass
		20635	847.5	1RB14	-28.674	< -13	Pass
				15RB0	-34.615	< -13	Pass
	1.4M	20407	824.7	1RB0	-41.939	< -13	Pass
				7RB0	-40.717	< -13	Pass
		20643	848.3	1RB6	-40.575	< -13	Pass
				7RB0	-42.532	< -13	Pass
Note: The worst case as below:							

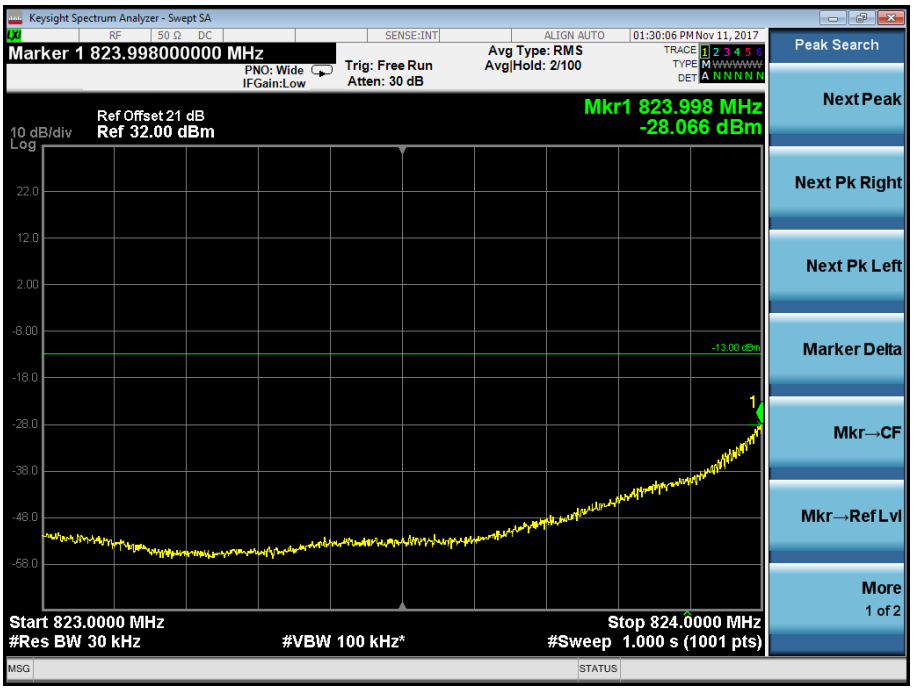
LTE Band 5 BW 3M Channel 20415 1RB0



Product	Module	Test Site	TR-8
Test Item	Conducted Band Edge	Date of Test	2017/11/11
Test Mode	Mode 2(16QAM)	Test engineer	Scott

Mode	Bandwidth	Channel	Test Frequency (MHz)	RB	Measure Level (dBm)	Limit (dBm)	Result
LTE Band 5	10M	20450	829	1RB0	-38.613	< -13	Pass
				50RB0	-37.025	< -13	Pass
		20600	844	1RB49	-40.534	< -13	Pass
				50RB0	-40.841	< -13	Pass
	5M	20425	826.5	1RB0	-30.633	< -13	Pass
				25RB0	-36.819	< -13	Pass
		20625	846.5	1RB24	-29.328	< -13	Pass
				25RB0	-37.724	< -13	Pass
	3M	20415	825.5	1RB0	-28.066	< -13	Pass
				15RB0	-32.813	< -13	Pass
		20635	847.5	1RB14	-28.128	< -13	Pass
				15RB0	-33.046	< -13	Pass
	1.4M	20407	824.7	1RB0	-42.053	< -13	Pass
				7RB0	-41.217	< -13	Pass
		20643	848.3	1RB6	-41.369	< -13	Pass
				7RB0	-43.014	< -13	Pass
Note: The worst case as below:							

LTE Band 5 BW3M Channel 20415 1RB0



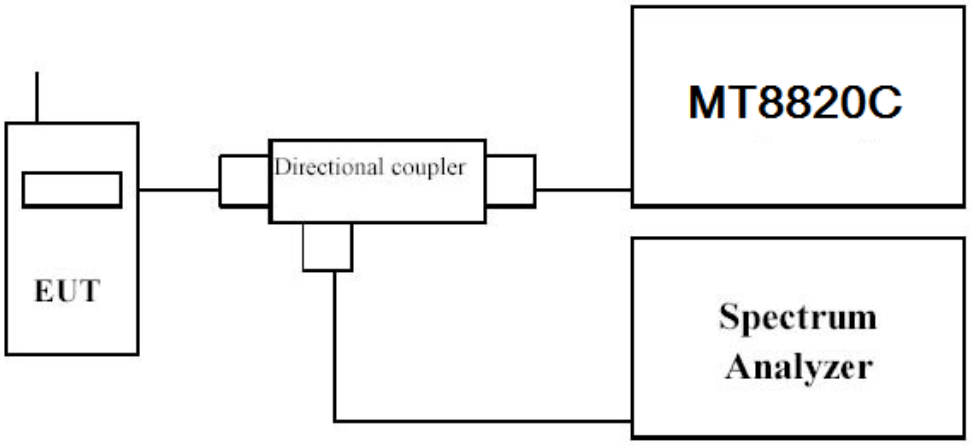
6. Spurious Emission

6.1. Test Equipment

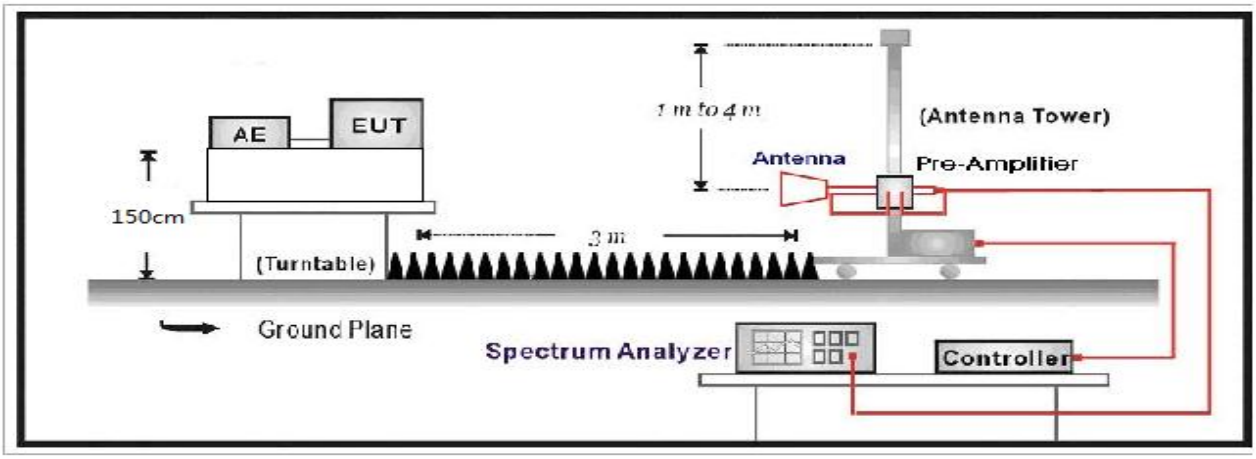
Spurious Emission / AC-5				
Instrument	Manufacturer	Type No.	Serial No	Cali. Due Date
PSA Series Spectrum Analyzer	Agilent	E4440A	MY49420184	2018.02.04
Radio Communication Tester	Anritsu	MT8820C	6201181503	2018.09.16
Dual Directional Coupler	Agilent	778D	20160	2018.02.04
10dB Coaxial Coupler	Agilent	87300C	MY44300299	2018.03.28
PSG Analog Signal Generator	Agilent	E8257D	MY44321116	2018.02.04
Preamplifier	QuieTek	AP-025C	CHM-0503006	2018.04.11
Preamplifier	Miteq	NSP1800-25	1364185	2018.05.03
Bilog Antenna	Teseq GmbH	CBL6112D	27612	2018.01.23
Half Wave Tuned Dipole Antenna	COM-POWER	AD-100	40137	2018.02.26
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	737	2018.03.06
DRG Horn	ETS-Lindgren	3117	00167055	2018.07.23
Temperature/Humidity Meter	Zhicheng	ZC1-2	AC5-TH	2018.01.05

6.2. Test Setup

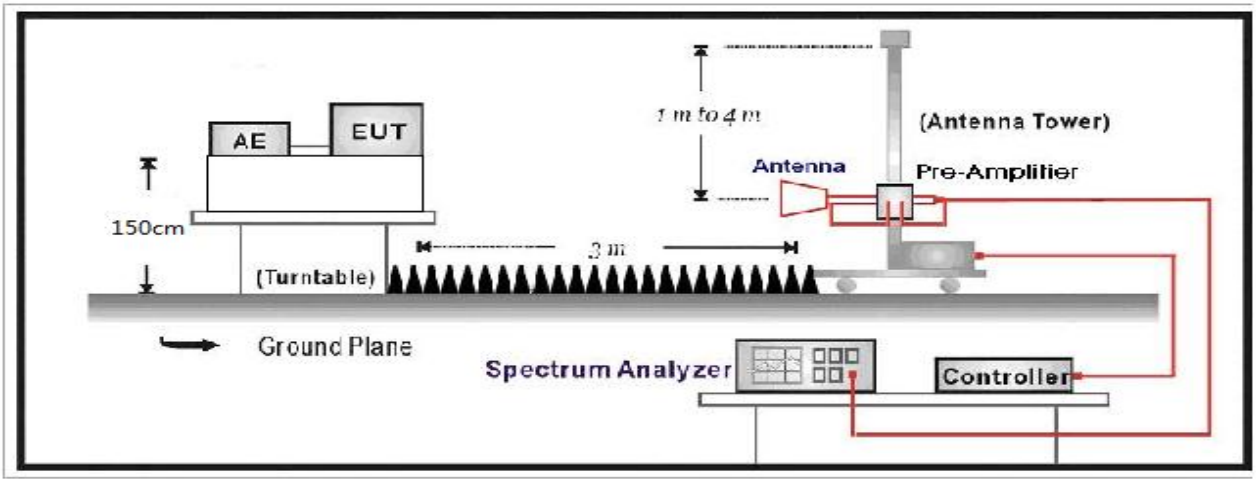
Conducted Power Measurement:



Radiated Power Measurement (Below 1G):



Radiated Power Measurement (Above 1G):



6.3. Test Procedure

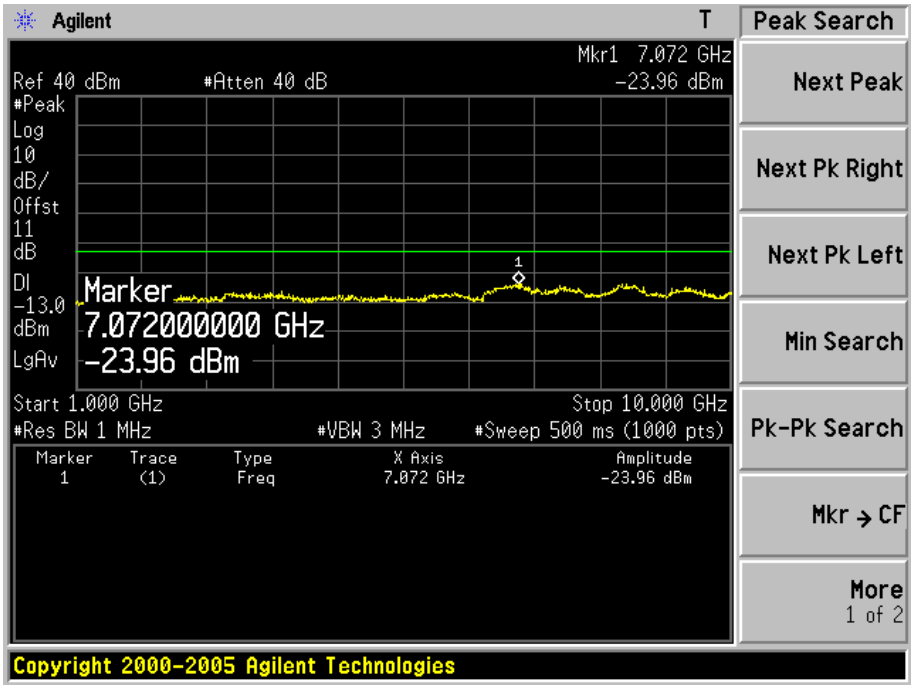
Test Method for conducted power
a) The RF output of the transmitter was connected to base station simulator. b) The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement. c) Set EUT at maximum average power by base station simulator. d) Measure lowest, middle, and highest channels for each bandwidth and different modulation.
Test For Effective Isotropic Radiated Power Measurement:
a) The EUT was placed on a turntable with 1.5 meter height in a fully anechoic chamber. b) The EUT was set at 3 meters from the receiving antenna, which was mounted on the antenna tower c) LTE operating modes: use channel power function to test d) The table was rotated 360 degrees to determine the position of the highest radiated power. e) The height of the receiving antenna is adjusted to look for the maximum EIRP. f) The maximum EIRP shall be record. g) A dipole antenna was substituted in place of the EUT and was driven by a signal generator. h) The conducted power at the terminal of the dipole antenna is measured. i) Repeat step c) to step h) to get the maximum EIRP of the substitution antenna. j) EIRP = Ps + Et －Es + Gs = Ps + Rt－Rs + Gs. k) Ps (dBm)：Input power to substitution antenna l) Gs (dBi or dBd)：Substitution antenna Gain. m) Et = Rt + AF n) Es = Rs + AF o) AF (dB/m)：Receive antenna factor p) Rt：The highest received signal in spectrum analyzer for EUT. q) Rs：The highest received signal in spectrum analyzer for substitution antenna.

6.4. Test Result

Product	Module	Test Site	AC-5
Test Item	Conducted Spurious Emission	Date of Test	2017/11/11
Test Mode	Mode 1-2(QPSK)	Test engineer	Scott

Mode	Bandwidth	Channel	Test Frequency (MHz)	RB	Measure Level (dBm)	Limit (dBm)	Result
WCDM Band 5	5M	4132	826.4	--	-23.96	< -13	Pass
		4182	836.4	--	-23.98	< -13	Pass
		4233	846.6	--	-24.82	< -13	Pass
LTE Band 5	10M	20450	829	1RB0	-49.914	< -13	Pass
		20525	836.5	1RB0	-48.694	< -13	Pass
		20600	844	1RB0	-48.478	< -13	Pass
	5M	20425	826.5	1RB0	-49.499	< -13	Pass
		20525	836.5	1RB0	-49.329	< -13	Pass
		20625	846.5	1RB0	-49.464	< -13	Pass
	3M	20415	825.5	1RB0	-49.214	< -13	Pass
		20525	836.5	1RB0	-49.333	< -13	Pass
		20635	847.5	1RB0	-49.646	< -13	Pass
	1.4M	20407	824.7	1RB0	-50.055	< -13	Pass
		20525	836.5	1RB0	-48.975	< -13	Pass
		20643	848.3	1RB0	-49.046	< -13	Pass
Note: The worst case as below:							

WCDMA Band 5 Channel 4132

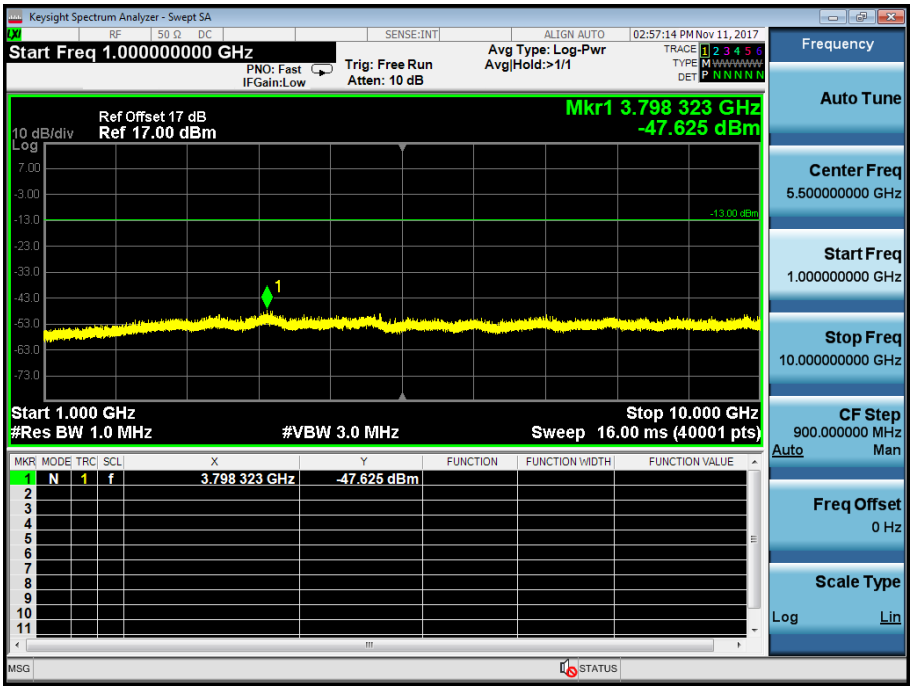


Product	Module	Test Site	AC-5
Test Item	Conducted Spurious Emission	Date of Test	2017/11/11
Test Mode	Mode 2(16QAM)	Test engineer	Scott

Mode	Bandwidth	Channel	Test Frequency (MHz)	RB	Measure Level (dBm)	Limit (dBm)	Result
LTE Band 5	10M	20450	829	1RB0	-48.082	< -13	Pass
		20525	836.5	1RB0	-49.543	< -13	Pass
		20600	844	1RB0	-50.136	< -13	Pass
	5M	20425	826.5	1RB0	-50.041	< -13	Pass
		20525	836.5	1RB0	-48.737	< -13	Pass
		20625	846.5	1RB0	-49.652	< -13	Pass
	3M	20415	825.5	1RB0	-50.341	< -13	Pass
		20525	836.5	1RB0	-49.458	< -13	Pass
		20635	847.5	1RB0	-48.917	< -13	Pass
	1.4M	20407	824.7	1RB0	-48.969	< -13	Pass
		20525	836.5	1RB0	-47.931	< -13	Pass
		20643	848.3	1RB0	-47.625	< -13	Pass

Note: The worst case as below:

LTE Band 5 BW1.4M Channel 20643 1RB0



Product	Module	Test Site	AC-5
Test Item	Radiated Spurious Emission	Date of Test	2017/11/11
Test Mode	Mode1: WCDMA Band 5	Test engineer	Scott

Frequency (MHz)	SA Reading (dBm)	Ant.Pol. (H/V)	SG Reading (dBm)	Cable Loss (dB)	Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)
Low Channel 4132 (826.40MHz)								
1654.50	-50.90	V	-61.65	3.28	9.75	-55.18	-13.00	-42.18
2479.20	-51.48	V	-60.03	4.10	10.48	-53.65	-13.00	-40.65
1654.50	-52.53	H	-63.27	3.28	9.75	-56.80	-13.00	-43.80
2479.00	-47.75	H	-56.25	4.10	10.48	-49.87	-13.00	-36.87
Middle Channel 4182 (836.40MHz)								
1671.50	-52.07	V	-63.02	3.32	9.95	-56.39	-13.00	-43.39
2513.00	-48.08	V	-56.51	4.31	10.62	-50.20	-13.00	-37.20
1671.50	-50.90	H	-57.53	3.32	9.95	-50.90	-13.00	-37.90
2513.00	-51.48	H	-57.79	4.31	10.62	-51.48	-13.00	-38.48
High Channel 4233 (846.60MHz)								
1697.00	-48.19	V	-59.13	3.35	10.06	-52.42	-13.00	-39.42
2539.80	-48.63	V	-57.17	3.91	10.33	-50.75	-13.00	-37.75
1697.00	-45.77	H	-56.58	4.19	10.68	-50.09	-13.00	-37.09
2538.50	-46.64	H	-56.52	4.33	10.79	-50.06	-13.00	-37.06

Product	Module	Test Site	AC-5
Test Item	Radiated Spurious Emission	Date of Test	2017/11/11
Test Mode	Mode1: LTE Band 5 QPSK/16QAM 10MHz	Test engineer	Scott

Frequency (MHz)	SA Reading (dBm)	Ant.Pol. (H/V)	SG Reading (dBm)	Cable Loss (dB)	Gain (dBi)	EIRP (dBm)	Limit (dBm)	Over Limit (dB)
Low Channel 20450 (829MHz) BW10MHz 1RB0								
1658.00	-52.29	V	-63.02	3.31	9.76	-56.57	-13.00	-43.57
2487.00	-47.91	V	-56.39	4.13	10.49	-50.03	-13.00	-37.03
1658.00	-49.45	H	-60.28	3.31	9.76	-53.83	-13.00	-40.83
2487.00	-46.23	H	-56.01	4.13	10.49	-49.65	-13.00	-36.65
Middle Channel 20525 (836.5MHz) BW10MHz 1RB0								
1673.00	-51.54	V	-62.27	3.27	9.73	-55.81	-13.00	-42.81
2509.50	-49.17	V	-57.67	4.09	10.47	-51.29	-13.00	-38.29
1673.00	-50.31	H	-61.12	3.27	9.73	-54.66	-13.00	-41.66
2509.50	-46.73	H	-56.53	4.09	10.47	-50.15	-13.00	-37.15
High Channel 20600 (844MHz) BW10MHz 1RB0								
1688.00	-51.02	V	-62.06	3.29	10.06	-55.29	-13.00	-42.29
2532.00	-46.52	V	-54.87	4.08	10.31	-48.64	-13.00	-35.64
1688.00	-50.24	H	-61.37	3.29	10.06	-54.60	-13.00	-41.60
2532.00	-46.76	H	-56.40	4.08	10.31	-50.17	-13.00	-37.17
Note: We have evaluated all bandwidth and channels by modulation of QPSK and 16QAM, shown in the report are worst data.								

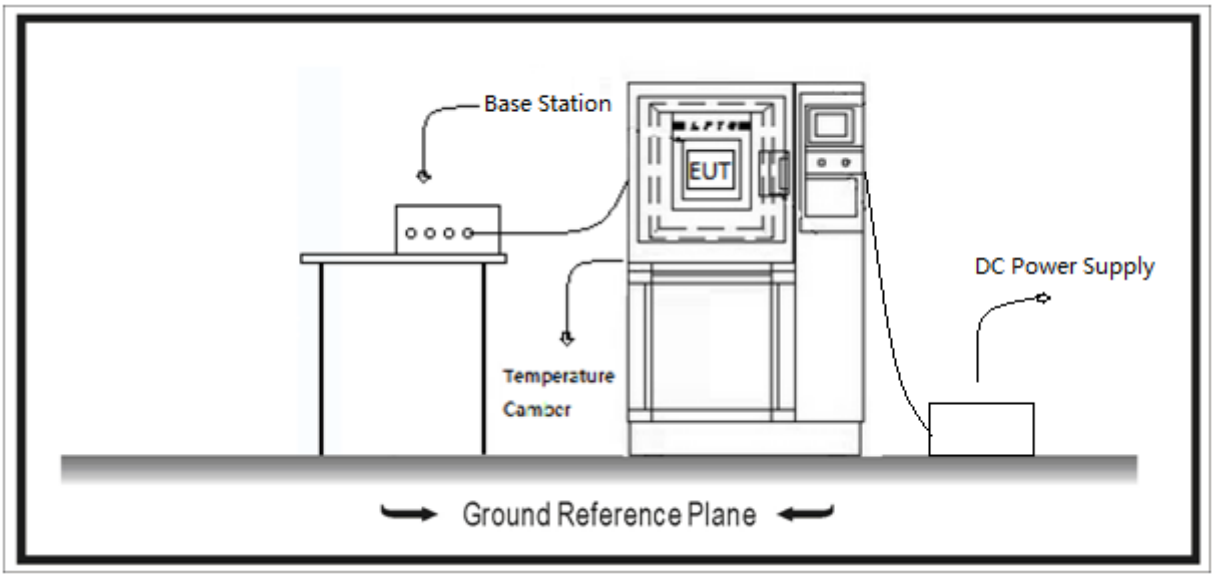
7. Frequency Stability Under Temperature & Voltage Variations

7.1. Test Equipment

Frequency Stability Under Temperature & Voltage Variations/TR-7				
Instrument	Manufacturer	Type No.	Serial No	Cali. Due Date
PSA Series Spectrum Analyzer	Agilent	E4440A	MY49420184	2018.02.04
Radio Communication Tester	Anritsu	MT8820C	6201181503	2018.09.16
Dual Directional Coupler	Agilent	778D	20160	2018.02.04
10dB Coaxial Coupler	Agilent	87300C	MY44300299	2018.03.28
DC Power Supply	IDRC	CD-035-020PR	977272	2018.09.16
Temperature & Humidity Chamber	Gaoyu	TH-1P-B	WIT-05121302	2018.01.04
Temperature/Humidity Meter	Zhicheng	ZC1-2	AC6-TH	2018.01.05

7.2. Test Setup

For Conducted Measurement



7.3. Test Procedure

Frequency Stability Under Temperature Variations:
The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 20℃ operating frequency as reference frequency. Turn EUT off and set the chamber temperature to -30℃. After the temperature stabilized for approximately 30 minutes recorded the frequency. Repeat step measure with 10℃ increased per stage until the highest temperature of +50℃ reached.
Frequency Stability Under Voltage Variations:
Set chamber temperature to 20℃. Use a variable AC power supply / DC power source to power the EUT and set the voltage to rated voltage. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency. Reduce the input voltage to specify extreme voltage variation (±15%) and endpoint, record the maximum frequency change.

7.4. Test Result

Product	Module	Test Site	TR-7
Test Item	Frequency Stability Under Temperature & Voltage Variations	Date of Test	2017/11/11
Test Mode	Mode1: WCDMA Band 5	Test engineer	Scott

Frequency Stability under Temperature

Temperature Interval (℃)	Test Frequency (MHz)	Deviation (Hz)	Limit (Hz)
-30	836.4	52	± 4331.3
-20	836.4	48	± 4331.3
-10	836.4	33	± 4331.3
0	836.4	31	± 4331.3
10	836.4	-39	± 4331.3
20	836.4	-47	± 4331.3
30	836.4	53	± 4331.3
40	836.4	52	± 4331.3
50	836.4	42	± 4331.3

Frequency Stability under Voltage

DC Voltage (V)	Test Frequency (MHz)	Deviation (Hz)	Limit (Hz)
4.5	836.4	41	± 4331.3
3.7	836.4	-39	± 4331.3
3.2	836.4	41	± 4331.3

Product	Module	Test Site	TR-7
Test Item	Frequency Stability Under Temperature & Voltage Variations	Date of Test	2017/11/11
Test Mode	Mode 2: LTE Band 5 Link(QPSK/16QAM)	Test engineer	Scott

Frequency Stability under Temperature

Temperature Interval(℃)	Test Frequency (MHz)	Deviation (Hz)	Test Result
-30	836.5	-33	PASS
-20	836.5	42	PASS
-10	836.5	-48	PASS
0	836.5	-63	PASS
10	836.5	39	PASS
20	836.5	-43	PASS
30	836.5	-46	PASS
40	836.5	63	PASS
50	836.5	52	PASS

Frequency Stability under Voltage

DC Voltage (V)	Test Frequency (MHz)	Deviation (Hz)	Limit (Hz)
4.5	836.5	44	PASS
3.7	836.5	37	PASS
3.2	836.5	-45	PASS

The End