

FCC Part 27C Test Report

Product Name : Module
Trade Name : AirPrime
Model No. : MC7475
FCC ID : N7NMC7475

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

Date of Receipt : Mar. 09, 2017
Issued Date : Aug. 17, 2017
Report No. : 1730151R-HPUSP45V00-A
Report Version : V6.0

The test results relate only to the samples tested.

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Test Report Certification

Issued Date : Aug. 17, 2017

Report No. : 1730151R-HPUSP45V00-A

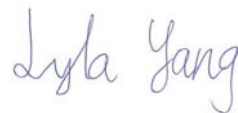


Product Name : Module
Applicant : Sierra Wireless Inc.
Address : 13811 Wireless Way, Richmond, BC, V6V 3A4 Canada
Manufacturer : Sierra Wireless Inc.
Address : 13811 Wireless Way, Richmond, BC, V6V 3A4 Canada
Model No. : MC7475
FCC ID : N7NMC7475
EUT Voltage : DC 3.3V
Testing Voltage : DC 3.3V
Trade Name : AirPrime
Applicable Standard : FCC CFR Title 47 Part 2, ANSI/TIA-603-D
FCC CFR Title 47 Part 27 Subpart C
ANSI/TIA-603-D-2010
Test Lab : Hsin Chu Laboratory
Test Result : Complied

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Documented By :



(Lyla Yang / Engineering Adm. Assistant)

Tested By :



(Max Chang / Engineer)

Approved By :



(Roy Wang / Director)

Laboratory Information

We, **DEKRA Testing and Certification Co., Ltd.**, are an independent RF consultancy that was established the whole facility in our laboratories. The test facility has been accredited/accepted (audited or listed) by the following related bodies in compliance with ISO 17025 specified testing scopes:

Taiwan R.O.C.	:	TAF, Accreditation Number: 3024
USA	:	FCC, Registration Number: 834100
Canada	:	IC, Submission No: 181665
		IC Registration Number: 22397-1 / 22397-2 / 22397-3

The related certificate for our laboratories about the test site and management system can be downloaded from DEKRA Testing and Certification Co., Ltd. Web Site:

<http://www.dekra.com.tw/english/about/certificates.aspx?bval=5>

The address and introduction of DEKRA Testing and Certification Co., Ltd. laboratories can be founded in our Web site : http://www.dekra.com.tw/index_en.aspx

If you have any comments, Please don't hesitate to contact us. Our contact information is as below:

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Revision History

Report No.	Version	Description	Issued Date
1730151R-HPUSP45V00-A	V6.0	Initial issue of report	Aug. 17, 2017

1. General Information

1.1. EUT Description

Product Name	Module
Model No.	MC7475
Trade Name	AirPrime
Tx Frequency Range/ Channel number	LTE Band 125: 2316.5 MHz
Rx Frequency Range/ Channel number	LTE Band 125: 2348.5 MHz
HW Version	V1.1
SW Version	HN_02_01_08_21
IMEI No.	001027000331977

Note:

This Module included LTE Band 125 transmitting and receiving function.

1.2. Mode of Operation

DEKRA 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: LTE Band 125_Link

Note:

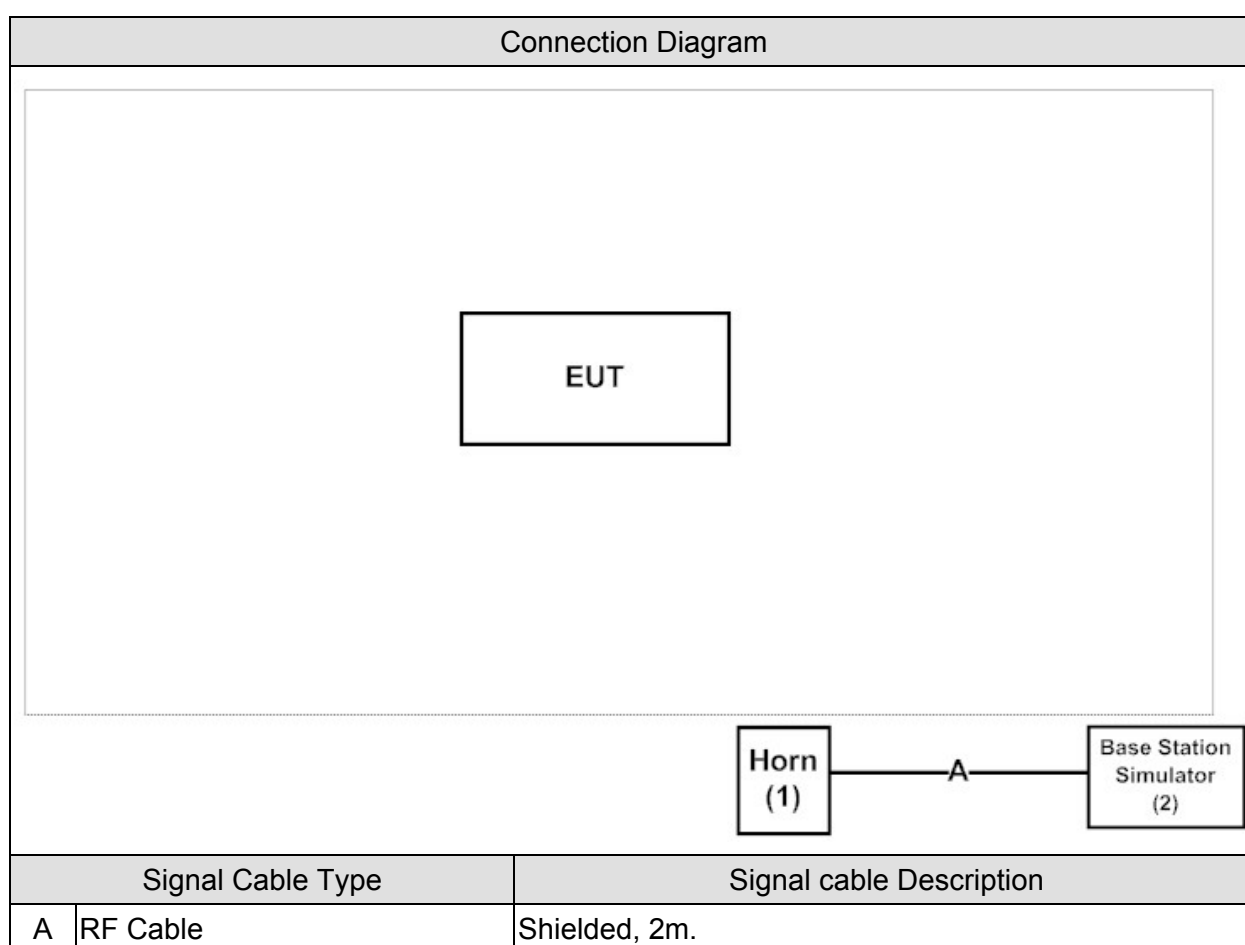
1. Regards to the frequency band operation: the lowest, middle and highest frequency of channel were selected to perform the test, then shown on this report.

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 Horn	ELECTRO METRICS	EM-6961	103326	--
2 Wideband Radio Communication Tester	R&S	CMW500	106071	--

1.4. Configuration of Tested System



1.5. EUT Exercise Software

1	Setup the EUT and simulators as shown on 1.7.
2	Turn on the power of all equipment. Horn link with base station.
3	The EUT link with base station and it will continue receive the signal.
4	Repeat the above procedure.

2. Technical Test

2.1. Summary of Test Result

- ☒ No deviations from the test standards
- ☐ Deviations from the test standards as below description:

(FCC CFR Title 47 Part 27 Subpart C)

Performed Item	FCC Rule	Limit	Result
RF Output Power	FCC PART 2.1046 and PART 27.50(a)(2)	< 20 Watts EIRP	Pass
Occupied Bandwidth	FCC PART 2.1049	N/A	Pass
Peak To Average Ratio	FCC PART 27.50	< 13 dB	Pass
Spurious Emission at Antenna Terminal	FCC PART 2.1051 and PART 27.53(a)(3)	< -13 dBm	Pass
Frequency Stability Under Temperature & Voltage Variations	FCC PART 2.1055(a)(I) and PART 27.54	< 2.5 ppm	Pass

2.2. 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

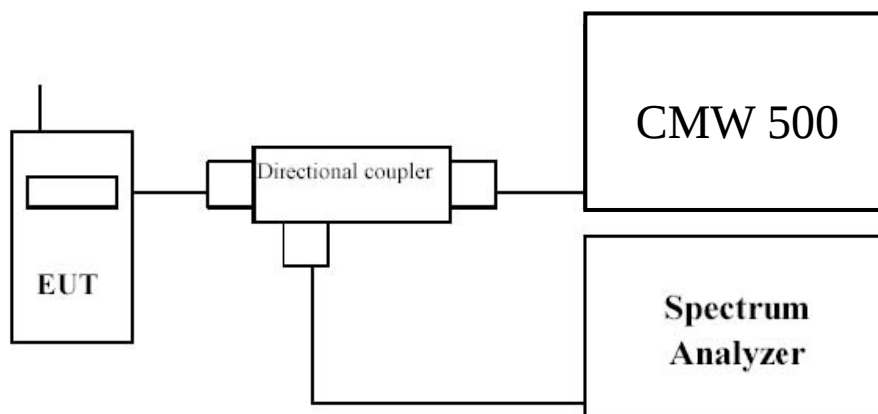
3. RF Power Output

3.1. Test Equipment

RF Power Output / SR10-H

Instrument	Manufacturer	Type No.	Serial No	Cali. Due Date
High Speed Peak Power Meter Dual Input	Anritsu	ML2496A	1602004	2018/02/08
Wideband Radio Communication Tester	R&S	CMW500	106071	2018/02/06
Directional coupler	Agilent	778D	20402	2017/10/06

3.2. Test Setup



3.3. Test Procedure

- The RF output of the transmitter was connected to base station simulator.
- 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..
- Set EUT at maximum average power by base station simulator.
- Measure lowest, middle, and highest channels for each bandwidth and different modulation.

3.4. Uncertainty

The measurement uncertainty is defined as for Conducted Power Measurement ± 1.2 dB, for Radiated Power Measurement ± 3.2 dB

3.5. Test Result

Product	Module		
Test Item	RF Power Output		
Test Mode	Mode 1: LTE Band 125_Link		
Date of Test	2017/04/12	Test Site	SR10-H

LTE Band125 _3M_ QPSK

Frequency (MHz)	Measure Level (dBm)		Limit (dBm)
	Average Power (dBm)	Peak Power (dBm)	
2316.5	13.330	20.290	43

LTE Band125 _3M_ 16-QAM

Frequency (MHz)	Measure Level (dBm)		Limit (dBm)
	Average Power (dBm)	Peak Power (dBm)	
2316.5	13.330	21.120	43

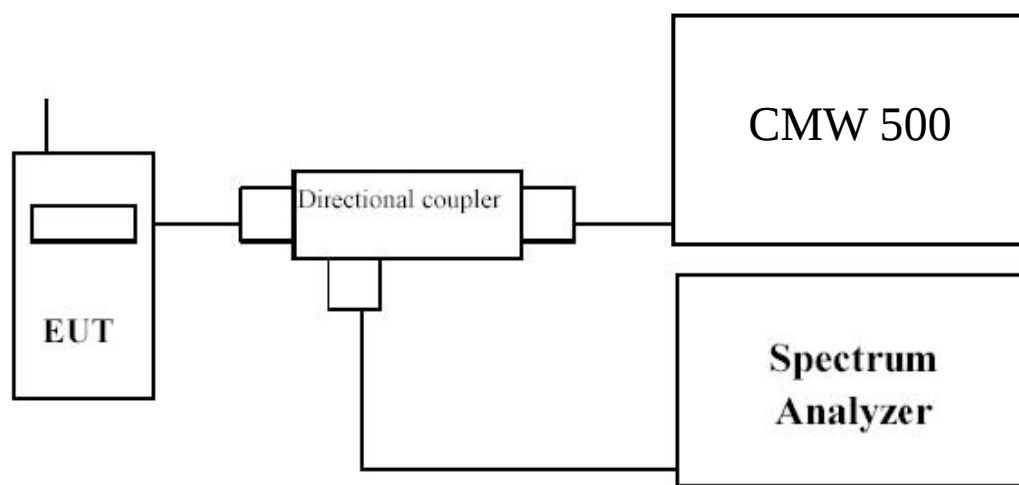
4. Occupied Bandwidth & 99% Bandwidth

4.1. Test Equipment

Occupied Bandwidth & 99% Bandwidth / SR10-H

Instrument	Manufacturer	Type No.	Serial No	Cali. Due Date
Signal & Spectrum Analyzer	R&S	FSVA40	101455	2017/11/27
Wideband Radio Communication Tester	R&S	CMW500	106071	2018/02/06
Directional coupler	Agilent	778D	20402	2017/10/06

4.2. Test Setup



4.3. Test Procedure

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 the low & middle & high channel for the highest RF powers were measured.

4.4. Uncertainty

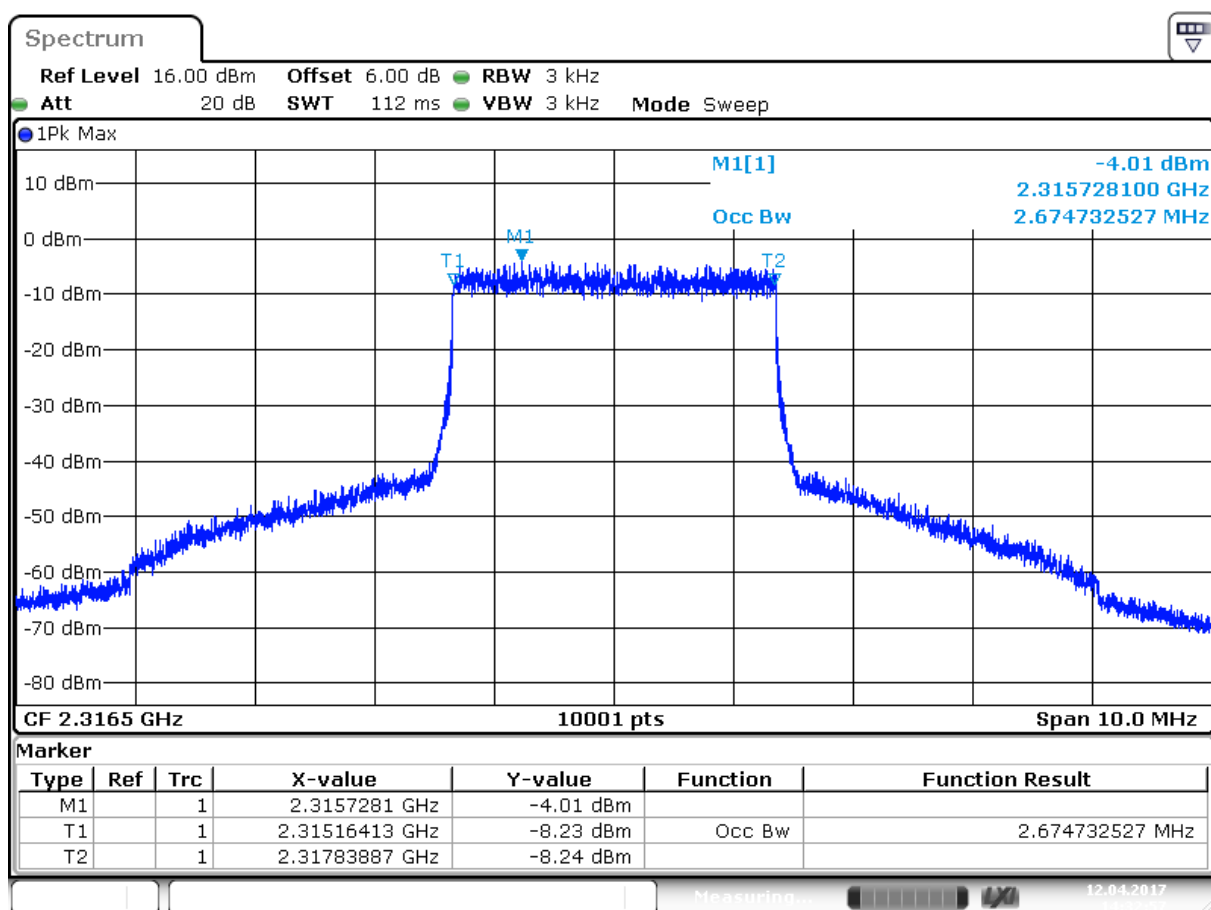
The measurement uncertainty is defined as ± 10 Hz

4.5. Test Result

Product	Module		
Test Item	99% Bandwidth		
Test Mode	Mode 1: LTE Band 125_Link		
Date of Test	2017/04/12	Test Site	SR10-H

LTE Band125_3M_QPSK

Frequency (MHz)	Measure Level (MHz)	Limit (MHz)
2316.5	2.675	N/A

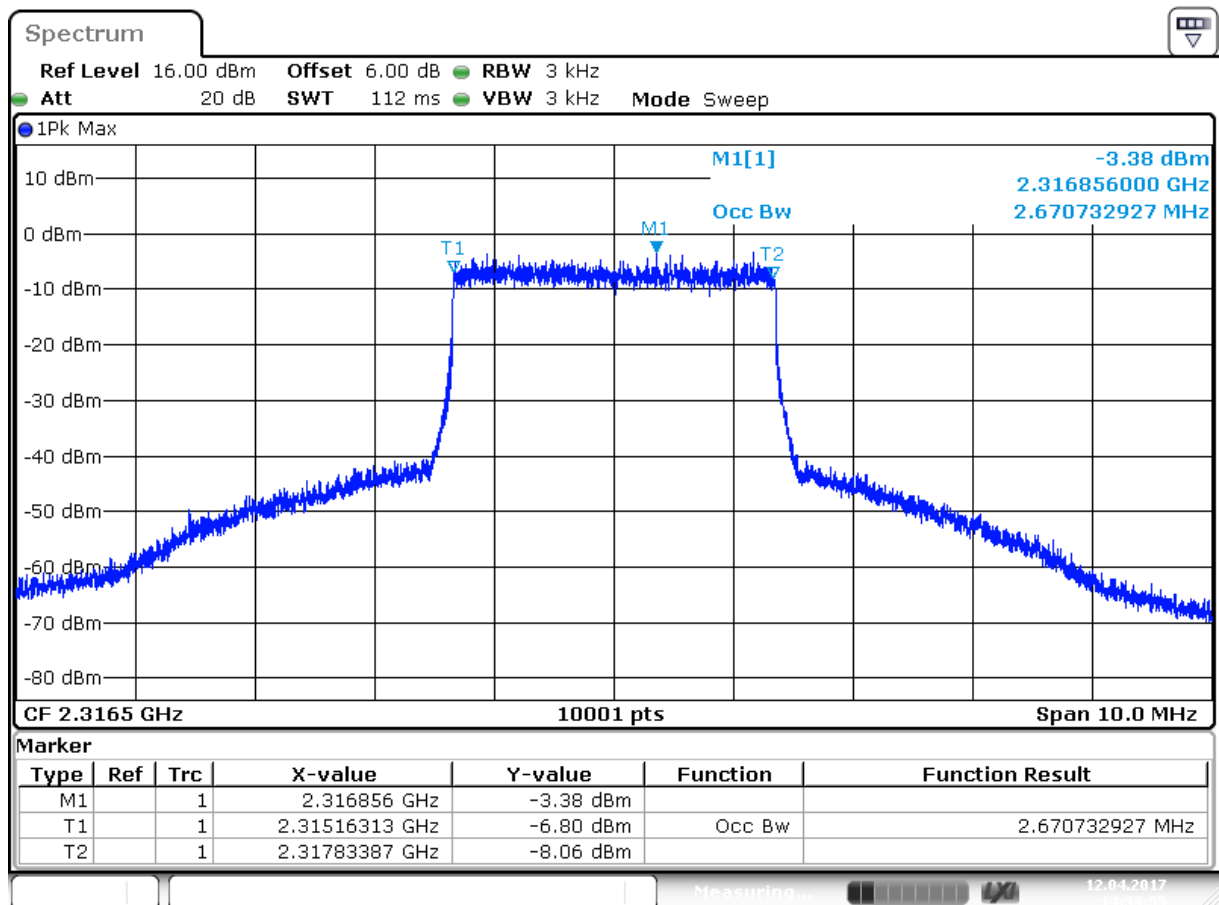


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Product	Module		
Test Item	99% Bandwidth		
Test Mode	Mode 1: LTE Band 125_Link		
Date of Test	2017/04/12	Test Site	SR10-H

LTE Band125_3M_16-QAM

Frequency (MHz)	Measure Level (MHz)	Limit (MHz)
2316.5	2.671	N/A



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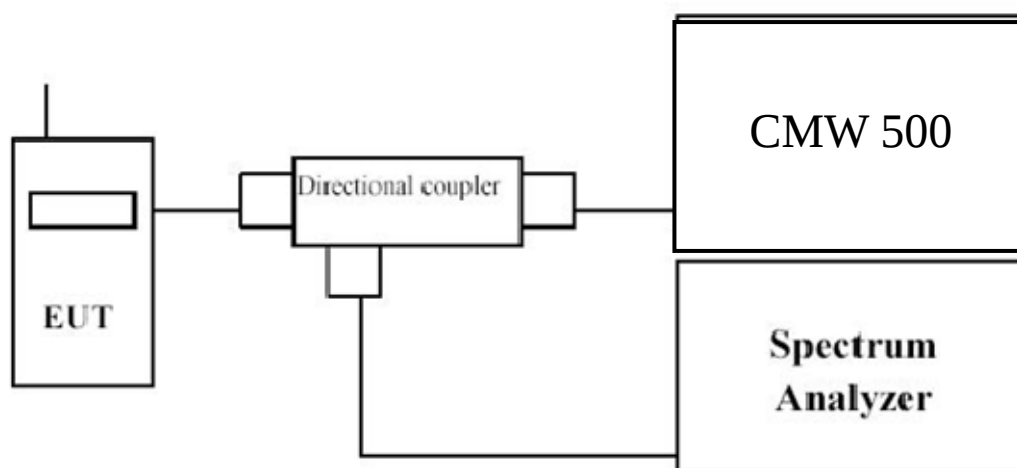
5. Peak To Average Ratio

5.1. Test Equipment

Peak To Average Ratio / SR10-H

Instrument	Manufacturer	Type No.	Serial No	Cali. Due Date
Signal & Spectrum Analyzer	R&S	FSVA40	101455	2017/11/27
Wideband Radio Communication Tester	R&S	CMW500	106071	2018/02/06
Directional coupler	Agilent	778D	20402	2017/10/06

5.2. Test Setup



5.3. Test Procedure

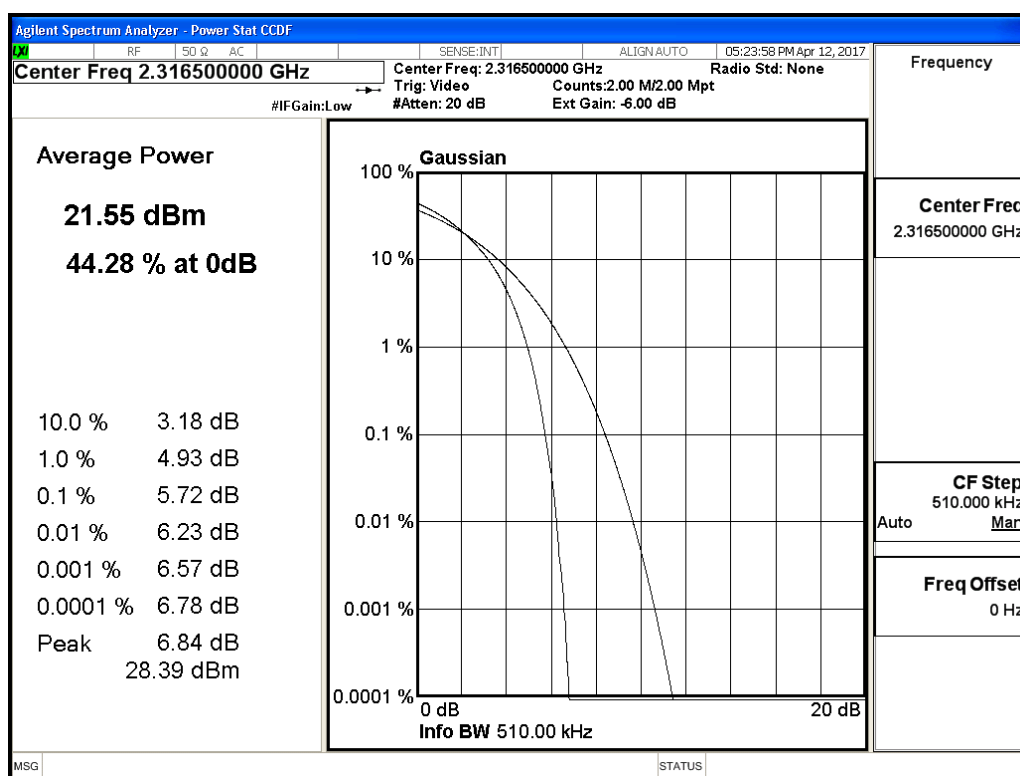
1. Set resolution/measurement bandwidth $\geq$ signal's occupied bandwidth.
2. Set the number of counts to a value that stabilizes the measured CCDF curve.
3. Record the maximum PAPR level associated with a probability of 0.1 %.

5.4. Uncertainty

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.

5.5. Test Result

Product	Module		
Test Item	Peak To Average Ratio		
Test Mode	Mode 1: LTE Band 125_Link		
Date of Test	2017/4/12	Test Site	SR10-H



6. Spurious Emissions

6.1. Test Equipment

Conducted Spurious Emission / SR10-H

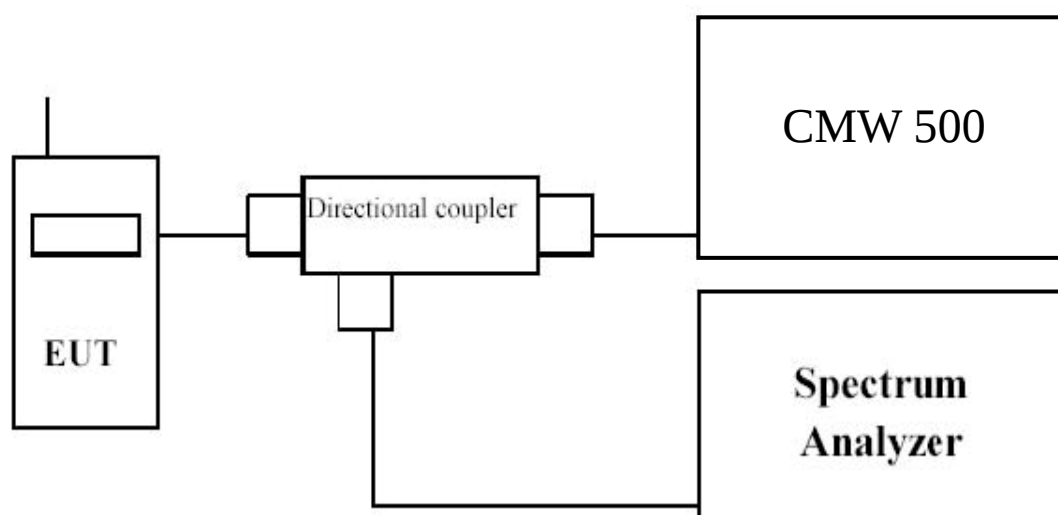
Instrument	Manufacturer	Type No.	Serial No	Cali. Due Date
Signal & Spectrum Analyzer	R&S	FSVA40	101455	2017/11/27
Wideband Radio Communication Tester	R&S	CMW500	106071	2018/02/06
Directional coupler	Agilent	778D	20402	2017/10/06

Radiated Spurious Emission / CB4-H

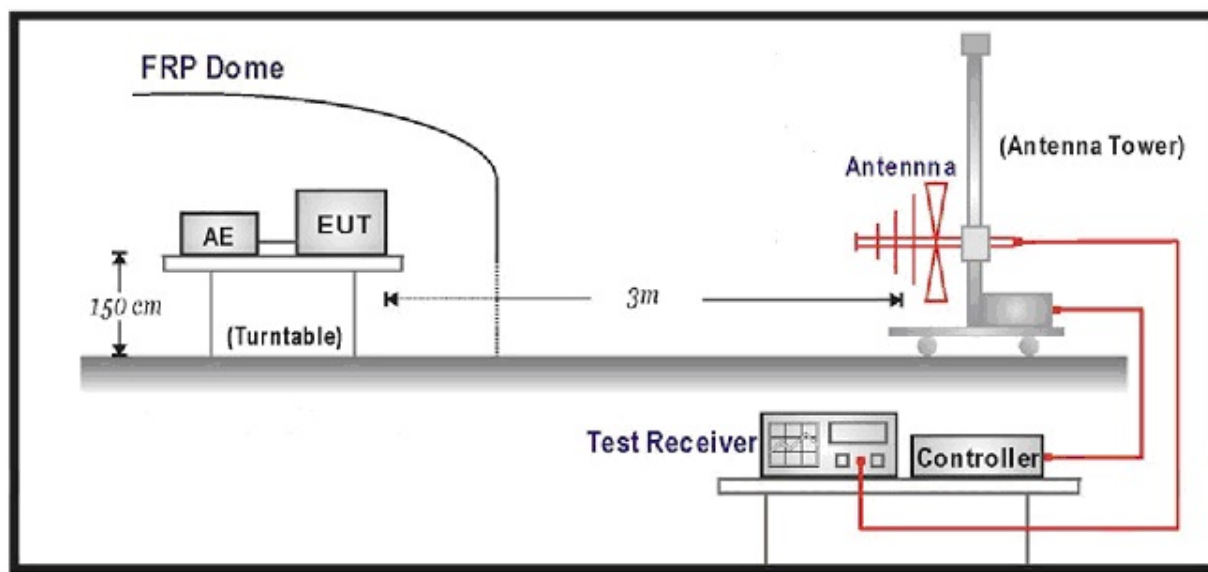
Instrument	Manufacturer	Type No.	Serial No	Cali. Due Date
Test Receiver	R&S	ESCS 30	836858/022	2018/01/14
Wideband Radio Communication Tester	R&S	CMW500	106071	2018/02/06
Signal & Spectrum Analyzer	R&S	FSVA40	101455	2017/11/27
Pre-Amplifier	DEKRA	AP-025C	CHM-0706049	2017/12/18
Bilog Antenna	Schaffner	CBL6112B	2797	2017/08/14
Pre-Amplifier	EMCI	EMC0031835	980233	2018/02/02
Horn Antenna	Schwarzbeck	BBHA 9120	D639	2017/06/29

6.2. Test Setup

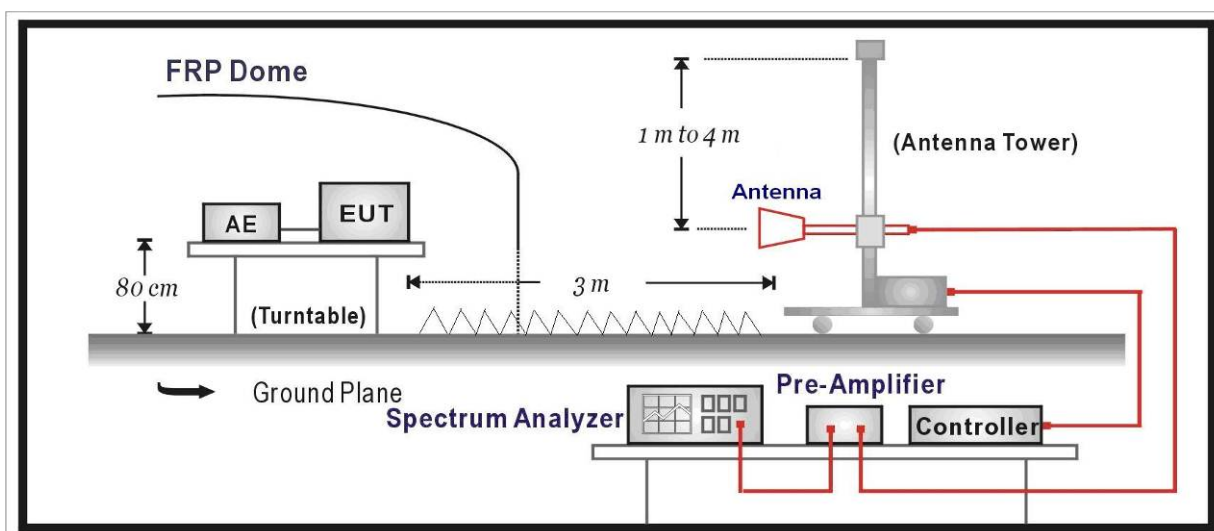
Conducted Spurious Measurement: below 1GHz



Radiated Spurious Measurement: below 1GHz



Radiated Spurious Measurement: above 1GHz



6.3. Test Procedure

Conducted Spurious Measurement:

- a) Place the EUT on a bench and set it in transmitting mode.
- b) Connect a low loss RF cable from the antenna port to a spectrum analyzer and CMW500 by a Directional Couple.
- c) EUT Communicate with CMW500, then select a channel for testing.
- d) Add a correction factor to the display of spectrum, and then test.
- e) The resolution bandwidth of the spectrum analyzer was set at 1 MHz, sufficient scans were taken to show the out of band Emission if any up to 10th harmonic.

Radiated Spurious Measurement:

- f) The EUT was placed on a rotatable wooden table with 1.5 meter above ground.
- g) The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower.
- h) The table was rotated 360 degrees to determine the position of the highest spurious emission.
- i) The height of the receiving antenna is varied between one meter and four meters to search the maximum spurious emission for both horizontal and vertical polarizations.
- j) Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 1MHz, Sweep 500ms, Taking the record of maximum spurious emission.
- k) A horn antenna was substituted in place of the EUT and was driven by a signal generator.
- l) Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.
- m) Taking the record of output power at antenna port
- n) Repeat step 7 to step 8 for another polarization.
- o) $EIRP = SG - \text{Cable loss} + \text{Antenna Gain}$

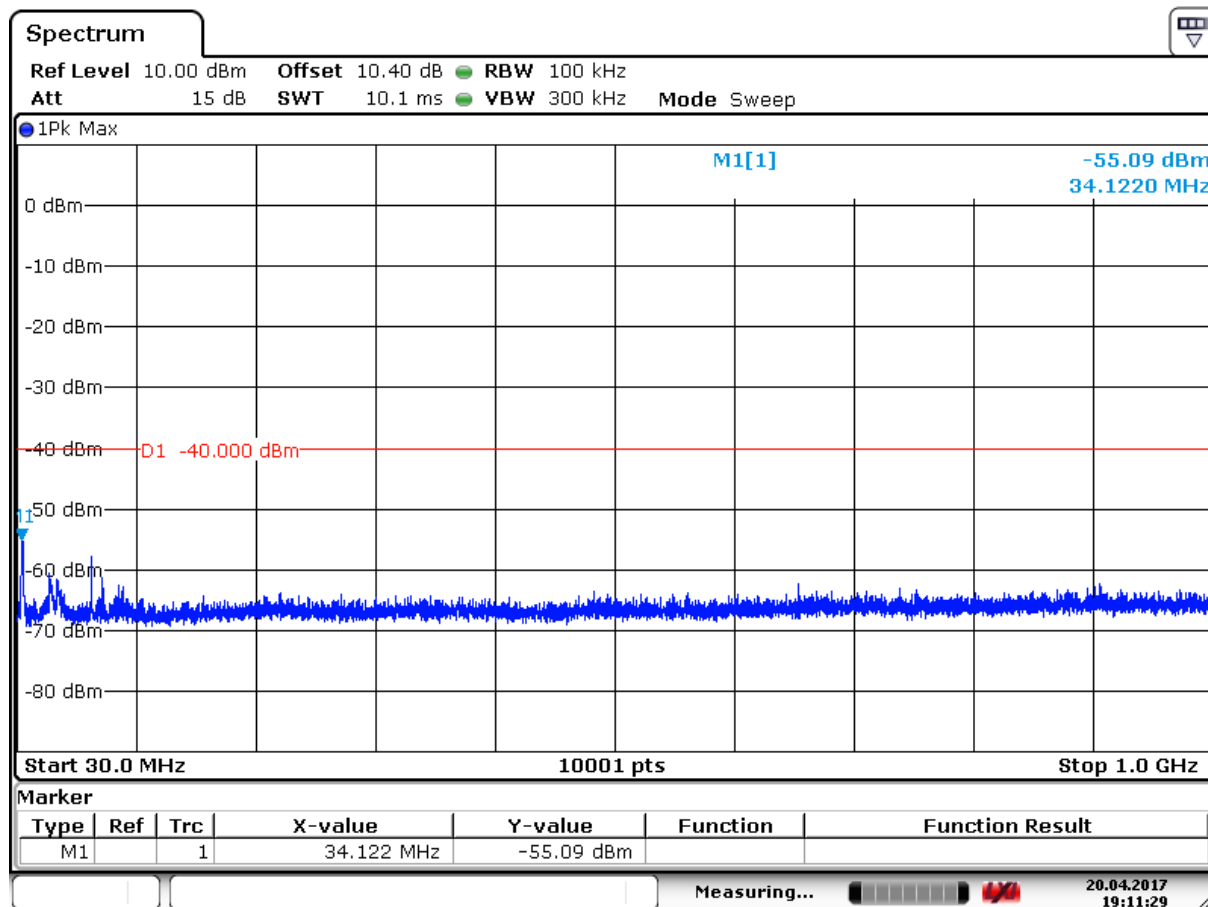
6.4. Uncertainty

The measurement uncertainty is defined as 3.2 dB for Radiated Power Measurement.

6.5. Test Result

Product	Module		
Test Item	Conducted Spurious Emission		
Test Mode	Mode 1: LTE Band 125_Link		
Date of Test	2017/04/20	Test Site	SR10-H

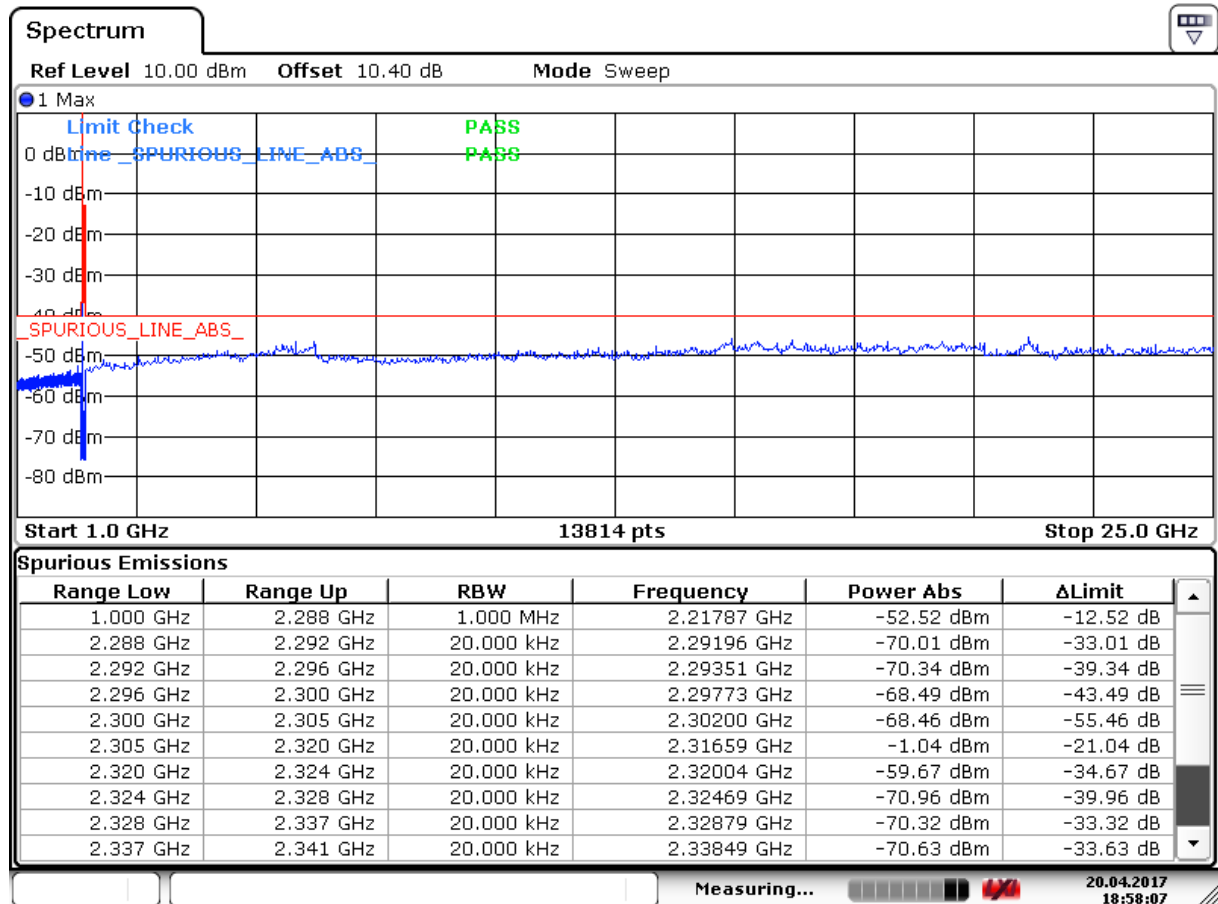
under 1G



Date: 20 APR.2017 19:11:28

Product	Module		
Test Item	Conducted Spurious Emission		
Test Mode	Mode 1: LTE Band 125_Link		
Date of Test	2017/04/20	Test Site	SR10-H

above 1G



Date: 20 APR 2017 18:58:08

Product	Module		
Test Item	Radiated Spurious Emission		
Test Mode	Mode 1: LTE Band 125_Link		
Date of Test	2016/4/20	Test Site	CB4-H

Frequency (MHz)	SA Reading (dBm)	Ant.Pol. (H/V)	SG Reading (dBm)	Cable Loss (dB)	Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)
4633.0	-68.060	H	-53.244	4.902	11.780	-46.366	-13.00	-33.366
6949.5	-73.960	H	-51.643	5.740	11.790	-45.593	-13.00	-32.593
4633.0	-66.480	V	-51.017	4.902	11.780	-44.139	-13.00	-31.139
6949.5	-73.010	V	-52.156	5.740	11.790	-46.106	-13.00	-33.106

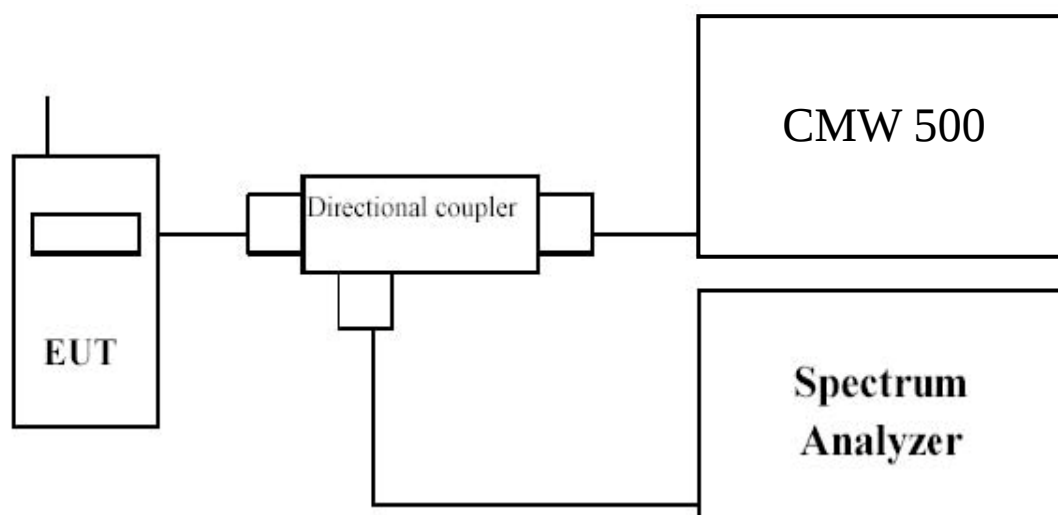
7. Spurious Emissions at Antenna Terminals

7.1. Test Equipment

Spurious Emissions at Antenna Terminals / SR10-H

Instrument	Manufacturer	Type No.	Serial No	Cali. Due Date
Signal & Spectrum Analyzer	R&S	FSVA40	101455	2017/11/27
Wideband Radio Communication Tester	R&S	CMW500	106071	2018/02/06
Directional coupler	Agilent	778D	20402	2017/10/06

7.2. Test Setup



7.3. Test Procedure

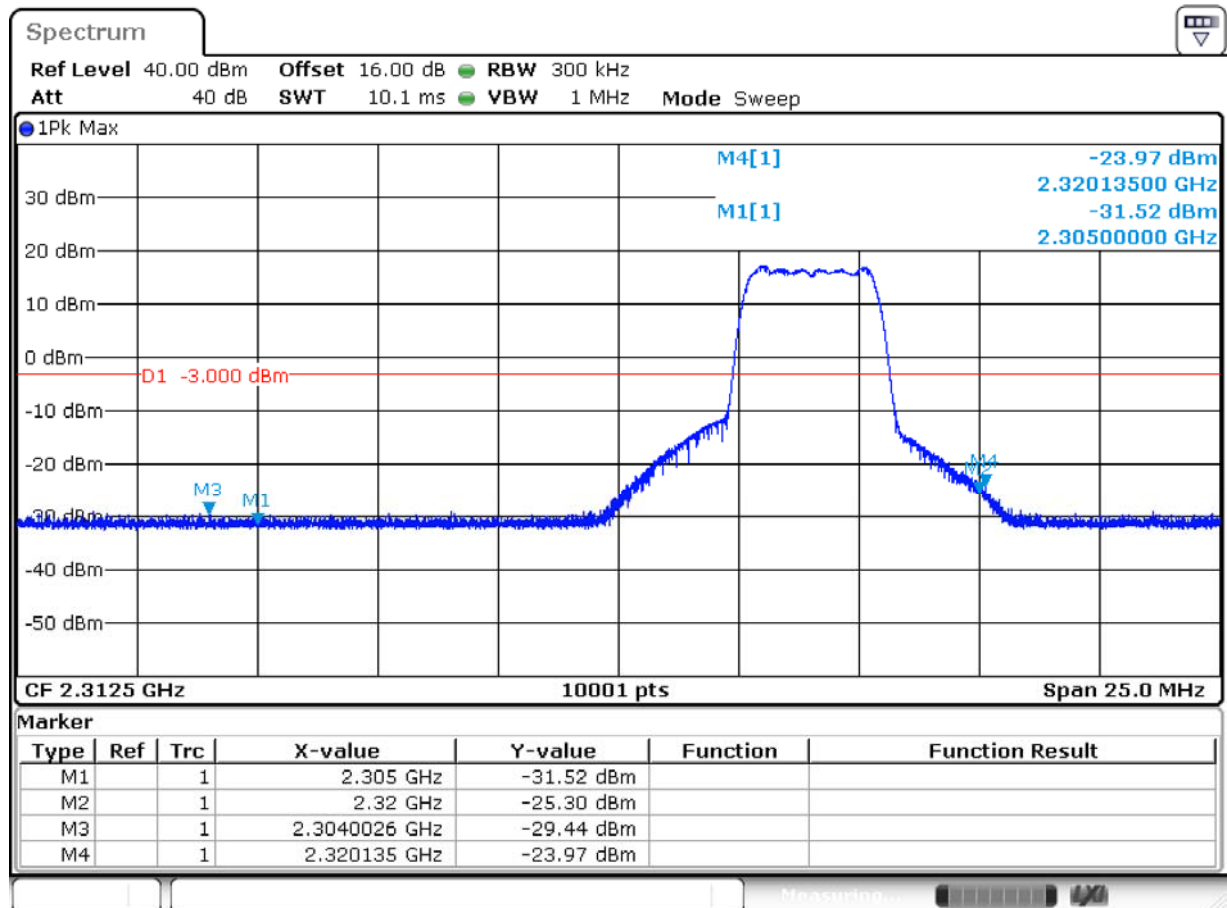
- a) Place the EUT on a bench and set it in transmitting mode.
- b) Connect a low loss RF cable from the antenna port to a spectrum analyzer and CMW500 by a Directional Couple.
- c) EUT Communicate with CMW500, then select a channel for testing.
- d) Add a correction factor to the display of spectrum, and then test.
- e) The resolution bandwidth of the spectrum analyzer was set at 300 kHz, sufficient scans were taken to show the out of band Emission if any up to 10th harmonic.

7.4. Uncertainty

The measurement uncertainty is defined as ± 1.2 dB for Conducted Measurement.

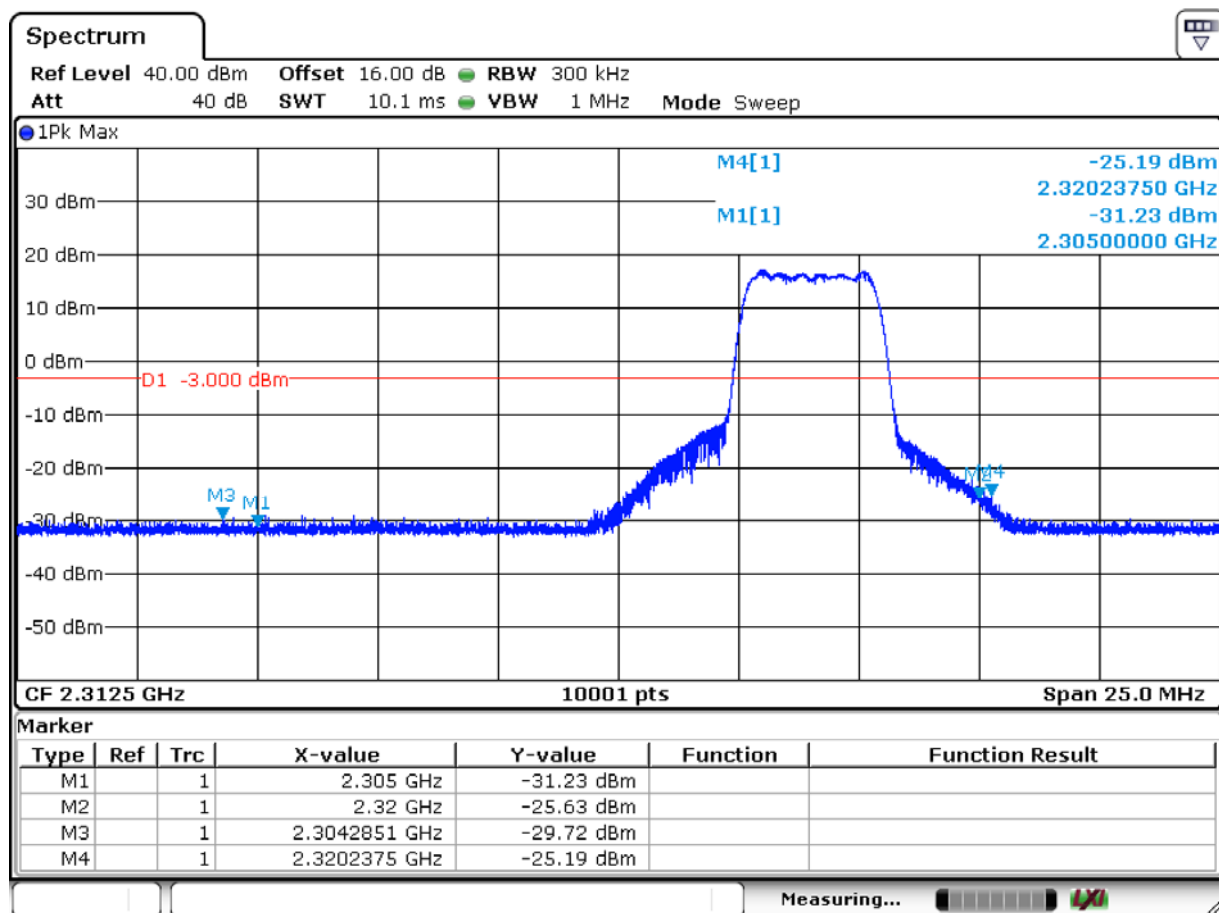
7.5. Test Result

Product	Module		
Test Item	Spurious Emissions at Antenna Terminals		
Test Mode	Mode 1: LTE Band 125_Link (3M_16-QAM_2316.5MHz)		
Date of Test	2017/08/17	Test Site	SR10-H



Date: 12.APR.2017 15:01:56

Product	Module		
Test Item	Spurious Emissions at Antenna Terminals		
Test Mode	Mode 1: LTE Band 125_Link (3M_QPSK_2316.5MHz)		
Date of Test	2017/08/17	Test Site	SR10-H



Date: 12.APR.2017 14:59:49

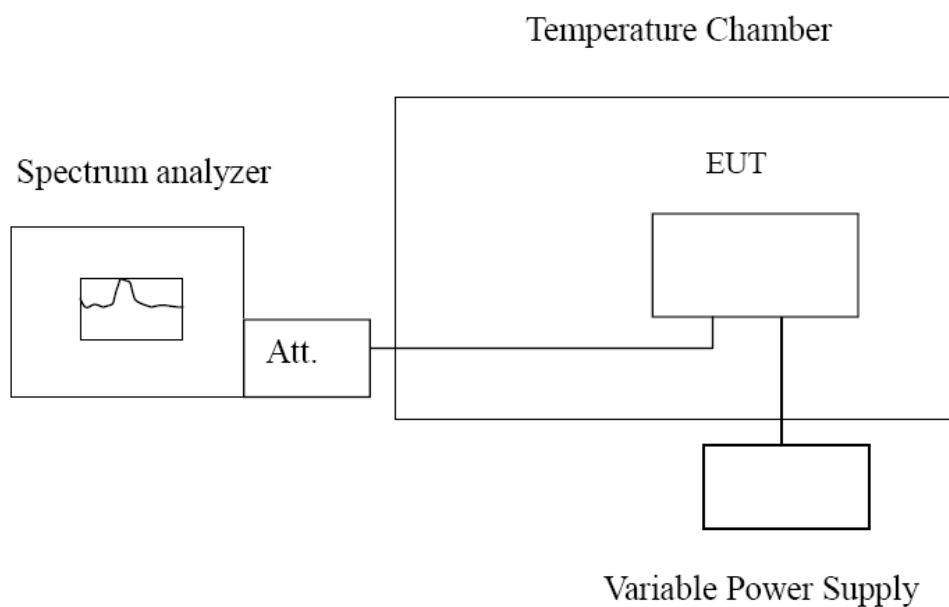
8. Frequency Stability

8.1. Test Equipment

Frequency Stability Under Temperature & Voltage Variations / SR10-H

Instrument	Manufacturer	Type No.	Serial No	Cali. Due Date
Signal & Spectrum Analyzer	R&S	FSV40	101049	2018/01/22
Wideband Radio Communication Tester	R&S	CMW500	106071	2018/02/06
Temperature & Humidity Chamber	WIT	TH-1S-B	1082101	2018/01/18

8.2. Test Setup



8.3. 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°C operating frequency as reference frequency. Turn EUT off and set the chamber temperature to -30°C. After the temperature stabilized for approximately 30 minutes recorded the frequency. Repeat step measure with 10°C increased per stage until the highest temperature of +50°C reached.

Frequency Stability Under Voltage Variations:

Set chamber temperature to 20°C. 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 ($\pm 15\%$) and endpoint, record the maximum frequency change.

8.4. Uncertainty

The measurement uncertainty is defined as ± 10 Hz.

8.5. Test Result

Product	Module		
Test Item	Frequency Stability Under Temperature & Voltage Variations		
Test Mode	Mode 1: LTE Band 125_Link		
Date of Test	2017/04/13	Test Site	SR10-H

2316.5MHz

Voltage

Voltage (VDC)	Frequency Error(Hz)	Frequency Error(ppm)
4.2	16	-0.0069
3.7	14	-0.0061
3.4	9	-0.0038

Temperature

TEMPERATURE	Frequency Error(Hz)	Frequency Error (ppm)
-30	18	-0.0078
-20	27	-0.0117
-10	15	-0.0064
0	10	-0.0042
+10	22	-0.0094
+20	18	-0.0077
+30	20	-0.0086
+40	20	-0.0084
+50	19	-0.0083

_____ The End _____