

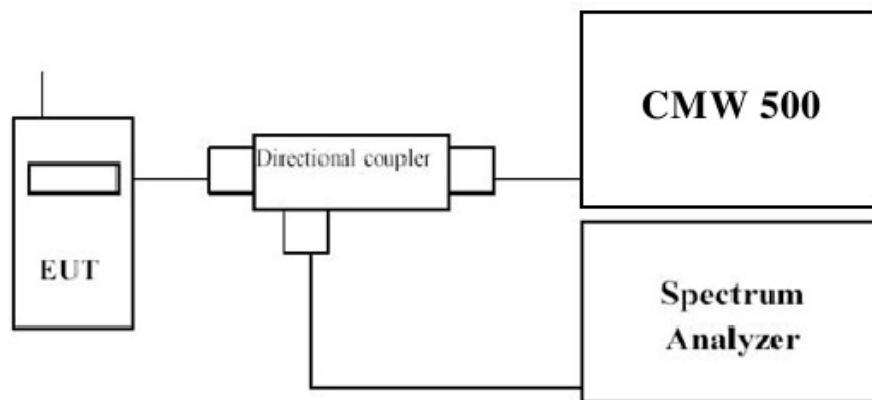
## 5. Peak To Average Ratio

### 5.1. Test Equipment

Peak To Average Ratio / SR10-H

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
Spectrum Analyzer	R&S	FSVA40	101455	2016/11/28	2017/11/27
Wideband Radio Communication Tester	R&S	CMW500	150246	2017/04/19	2018/04/18
Directional Coupler	Agilent	778D	20402	2016/10/07	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. Test Method

KDB 971168 D01 Power Meas License Digital Systems v03 sub-clause 5.7.2  
ANSI C63.26-2015 Sub-clause 5.2.3.4

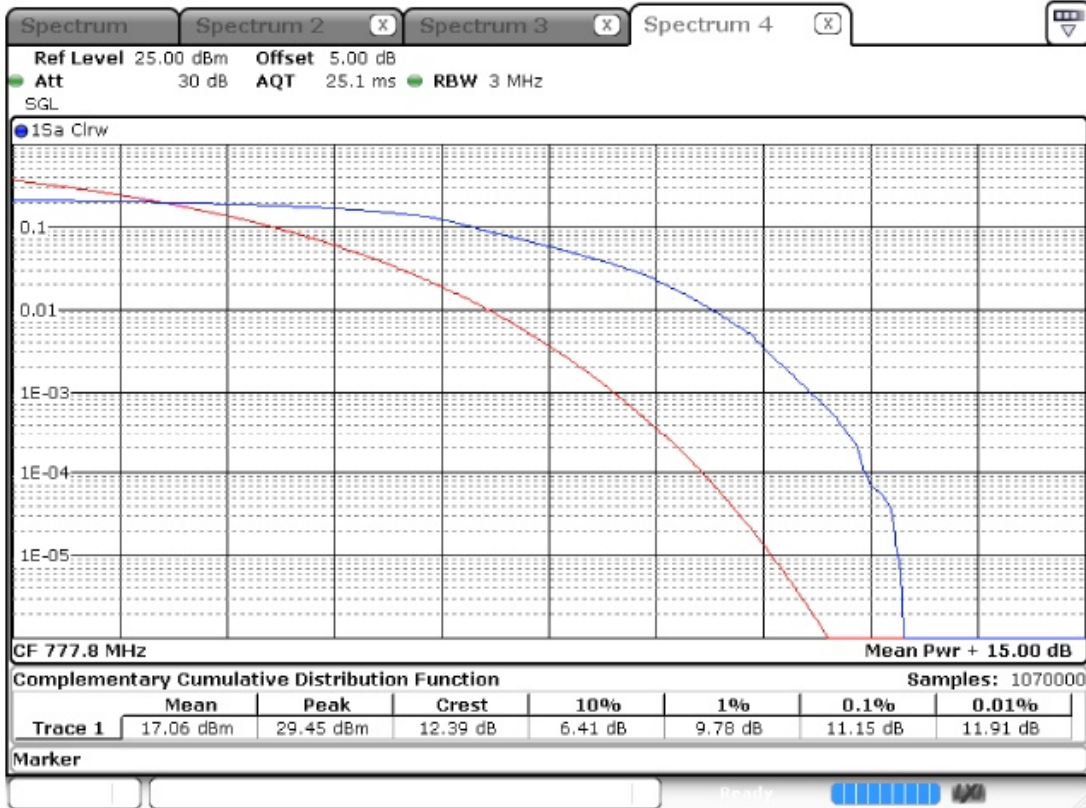
### 5.5. Uncertainty

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.

### 5.6. Test Result

Product	Module		
Test Item	Peak To Average Ratio		
Test Mode	Mode 1: LTE_Cat-M1_Band 13_Link		
Date of Test	2017/09/26	Test Site	SR10-H

777.7 MHz



Date: 26 SEP.2017 14:24:57

780.3 MHz



Date: 26 SEP.2017 13:40:04

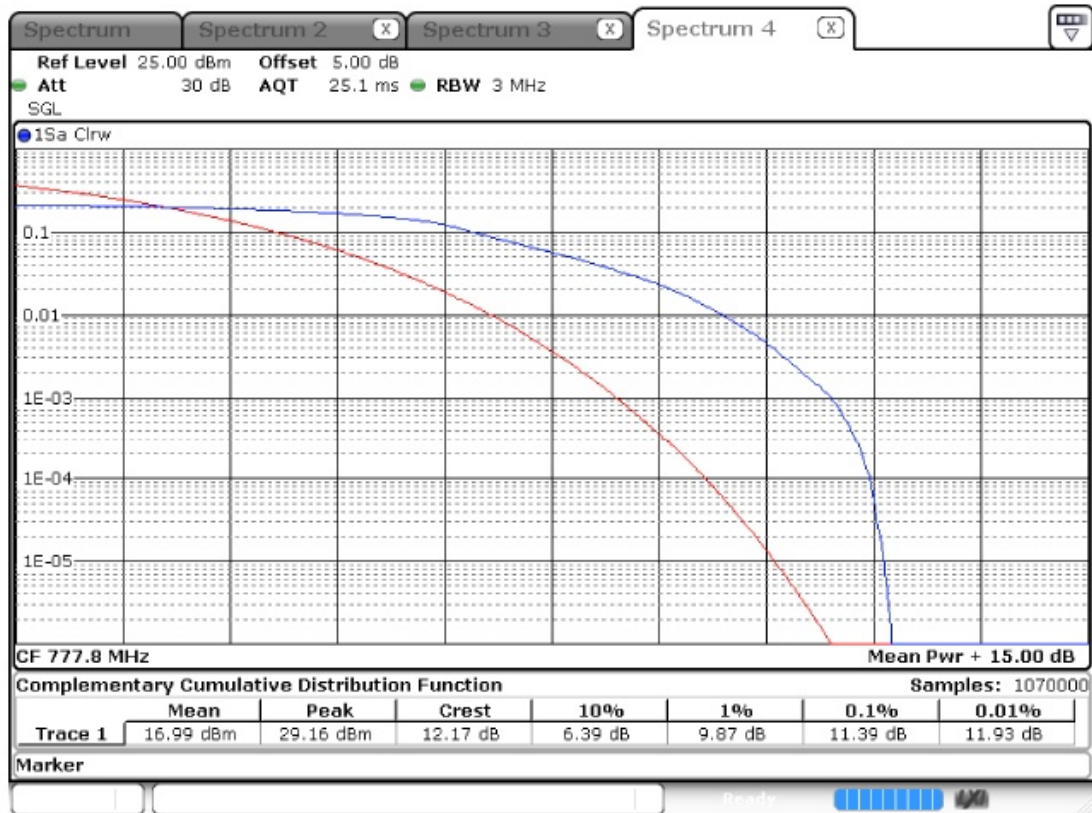
786.3MHz



Date: 26 SEP.2017 15:07:44

Product	Module		
Test Item	Peak To Average Ratio		
Test Mode	Mode 1: LTE_Cat-M1_Band 13_Link		
Date of Test	2017/09/26	Test Site	SR10-H

777.7 MHz



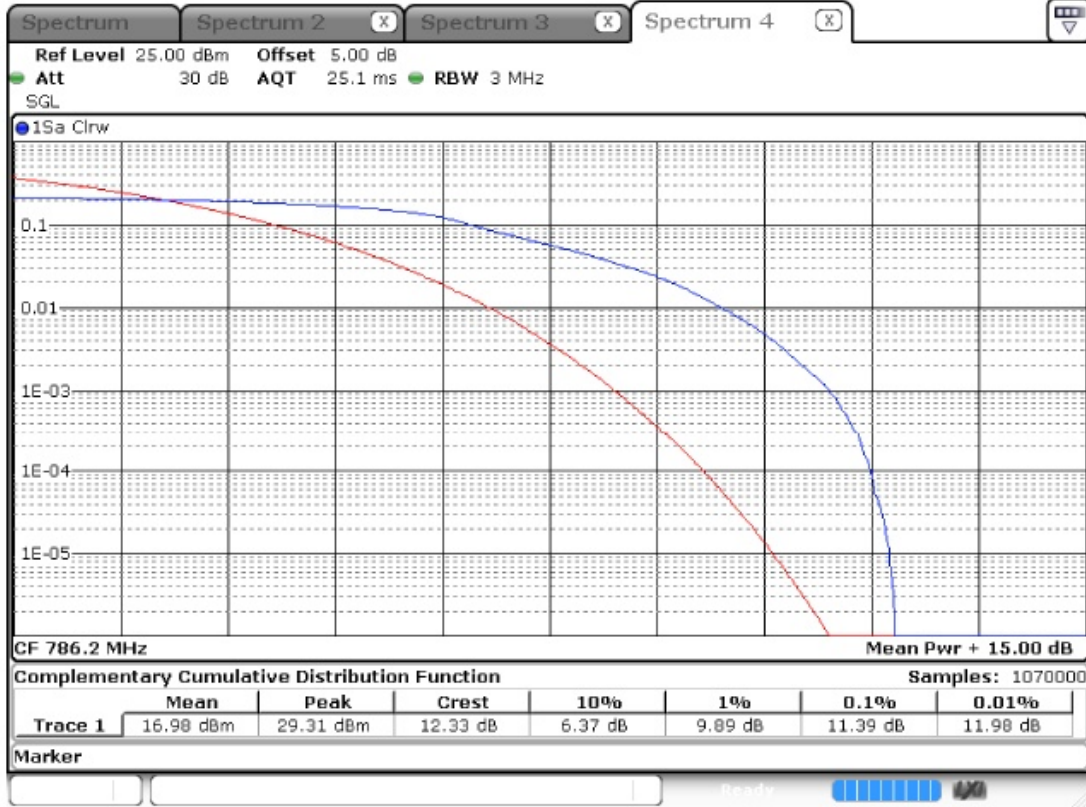
Date: 26.SEP.2017 14:29:30

780.3 MHz



Date: 26 SEP.2017 13:58:00

786.3 MHz



Date: 26 SEP.2017 15:09:33

## 6. Spurious Emissions

### 6.1. Test Equipment

Conducted Spurious Emission / SR10-H

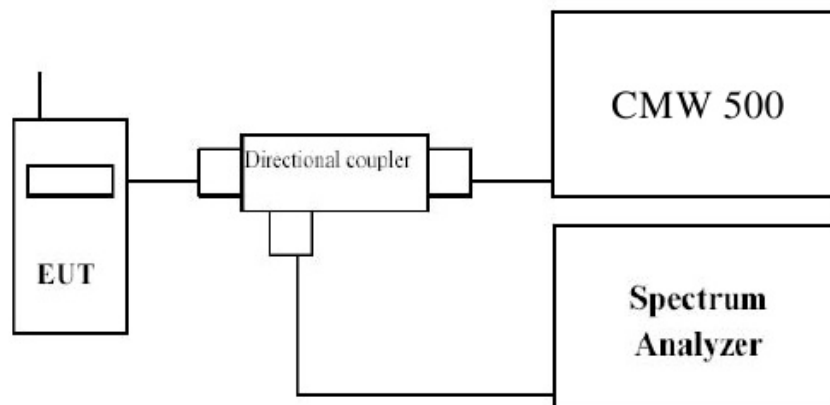
Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
Spectrum Analyzer	R&S	FSVA40	101455	2016/11/28	2017/11/27
Wideband Radio Communication Tester	R&S	CMW500	150246	2017/04/19	2018/04/18
Directional Coupler	Agilent	778D	20402	2016/10/07	2017/10/06

Radiated Spurious Emission / CB4-H

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
Spectrum Analyzer	R&S	FSVA40	101455	2016/11/28	2017/11/27
Signal & Spectrum Analyzer	R&S	FSV40	101049	2017/01/23	2018/01/22
EXA Signal Analyzer	Keysight	N9010A	MY51440132	2017/03/13	2018/03/12
Bilog Antenna	Teseq	CBL6112D	23191	2017/06/28	2018/06/27
Horn Antenna	Schwarzbeck	BBHA 9120D	639	2017/06/14	2018/06/13
Horn Antenna	Schwarzbeck	BBHA 9170	202	2017/02/15	2018/02/14
Pre-Amplifier	RF Bay Inc.	LNA-1330	12162511	2017/03/09	2018/03/08
Pre-Amplifier	EMCI	EMCI 1830I	980366	2017/01/23	2018/01/22
Pre-Amplifier	MITEQ	JS44-45-8P	2014754	2016/12/26	2017/12/25

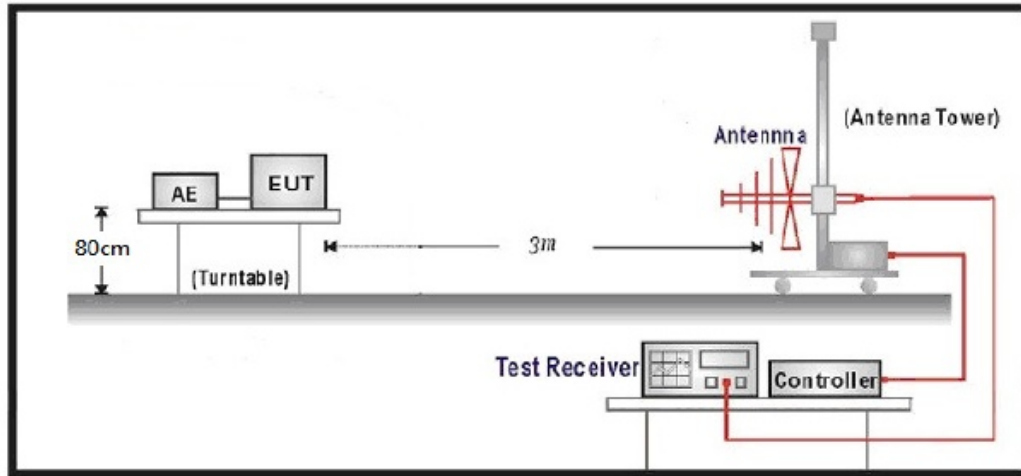
### 6.2. Test Setup

Conducted Spurious Measurement: below 1GHz

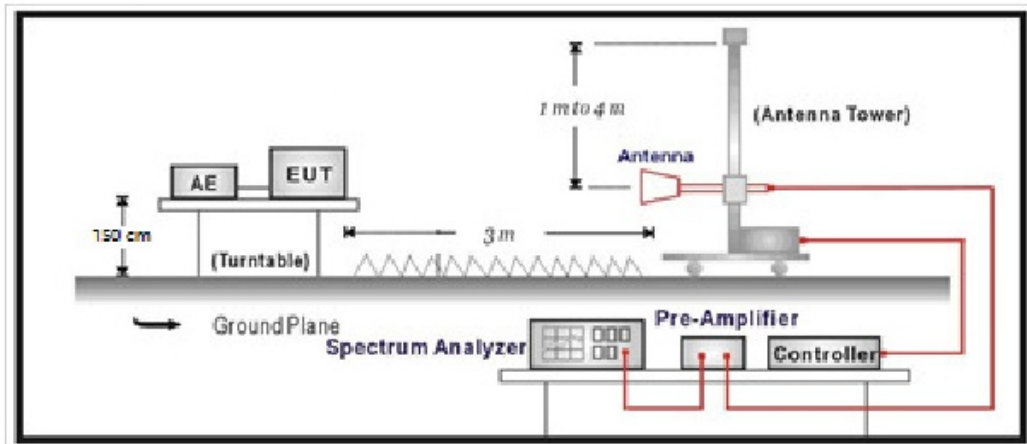




Radiated Spurious Measurement: below 1GHz



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 10<sup>th</sup> harmonic.

#### Radiated Spurious Measurement:

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

### 6.4. Test Method

#### Conducted Spurious Measurement:

KDB 971168 D01 Power Meas License Digital Systems v03 sub-clause6.1  
ANSI C63.26-2015 Sub-clause 5.7

#### Radiated Spurious Measurement:

KDB 971168 D01 Power Meas License Digital Systems v03 sub-clause5.8  
ANSI C63.26-2015 Sub-clause 5.5.3.2

## **6.5. Uncertainty**

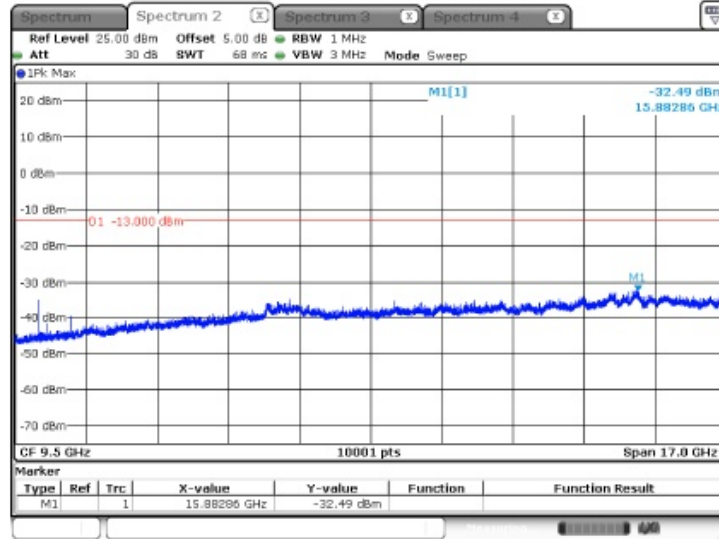
The measurement uncertainty is defined as  $\pm 1.27$  dB for Conducted Measurement.

The measurement uncertainty is defined as  $\pm 3.2$  dB for Radiated Measurement.

**6.6. Test Result**

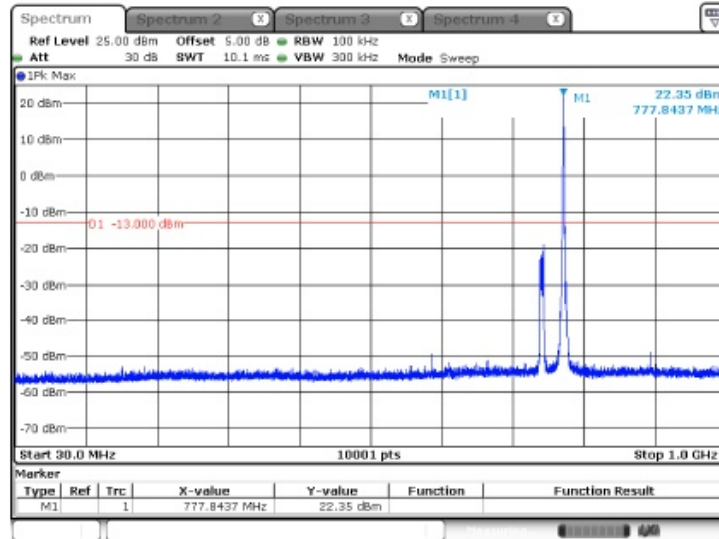
Product	Module		
Test Item	Conducted Spurious Emission		
Test Mode	Mode 1: LTE_Cat-M1_Band 13_Link		
Date of Test	2017/09/26	Test Site	SR10-H

777.7 MHz \_ above 1G



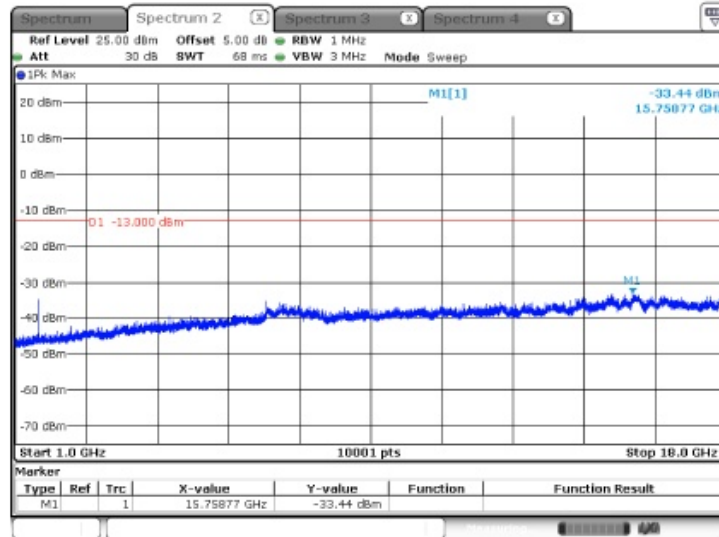
Date: 26 SEP 2017 14:43:17

777.7 MHz \_ under 1G



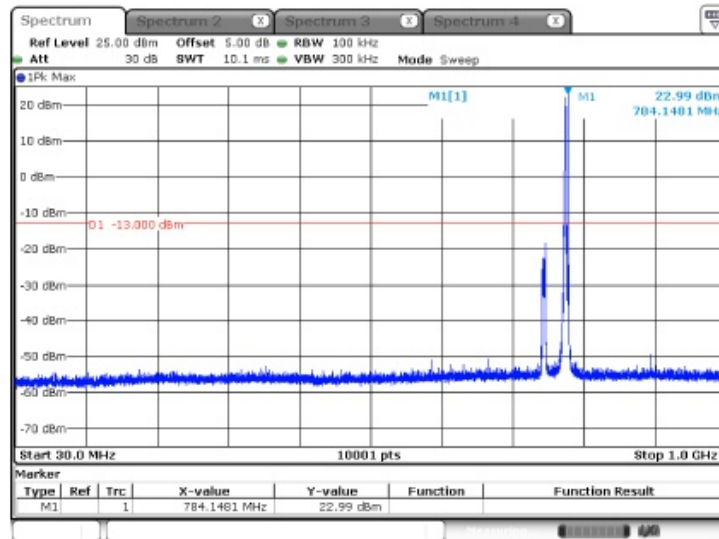
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780.3MHz \_above 1G



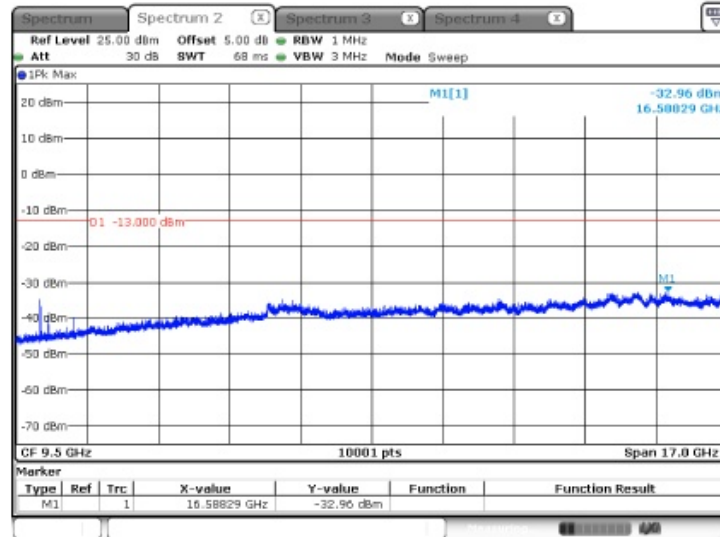
Date: 26 SEP 2017 13:45:40

780.3MHz \_under 1G



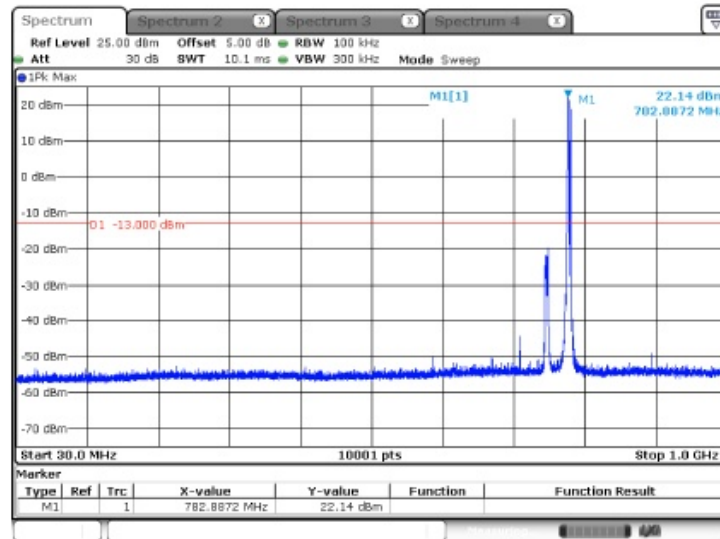
Date: 26 SEP 2017 13:44:03

786.3MHz \_above 1G



Date: 26 SEP 2017 14:53:23

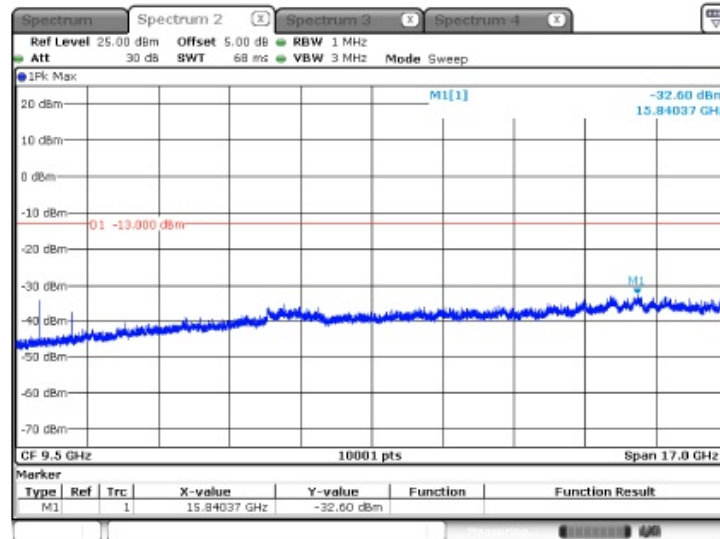
786.3MHz \_under 1G



Date: 26 SEP 2017 14:49:12

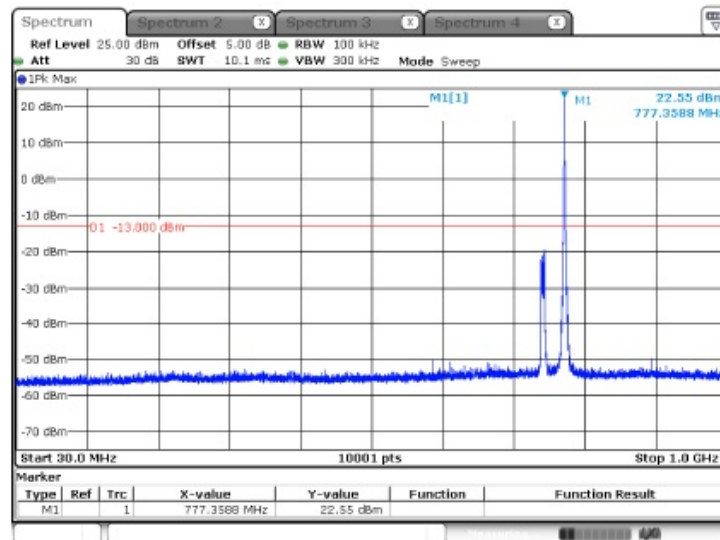
Product	Module		
Test Item	Conducted Spurious Emission		
Test Mode	Mode 1: LTE_Cat-M1_Band 13_Link		
Date of Test	2017/09/26	Test Site	SR10-H

777.7MHz \_above 1G



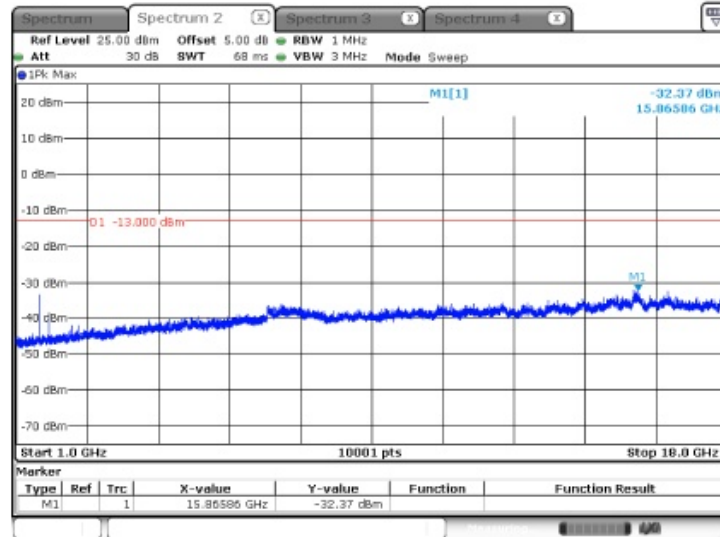
Date: 26 SEP 2017 14:40:11

777.7MHz \_under 1G



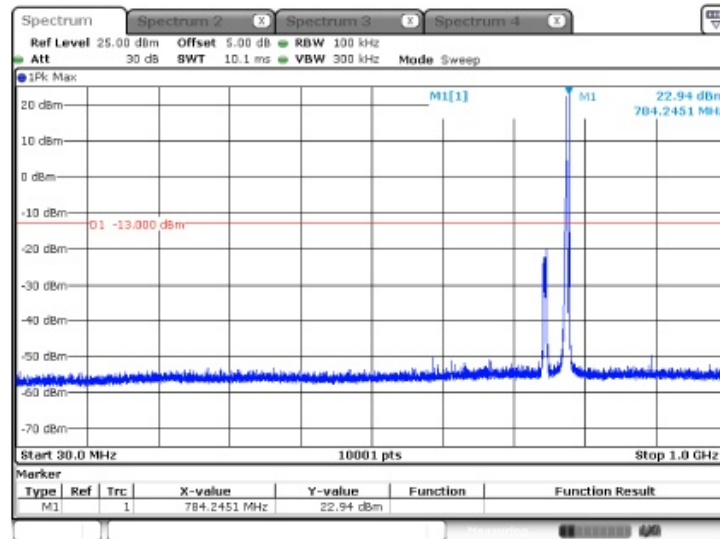
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### 780.3MHz \_above 1G



Date: 26 SEP 2017 13:46:56

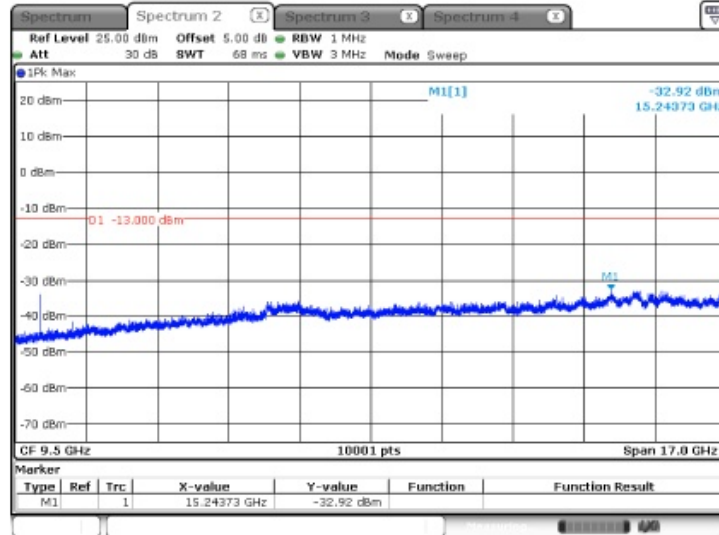
### 780.3MHz \_under 1G



Date: 26 SEP 2017 13:48:10

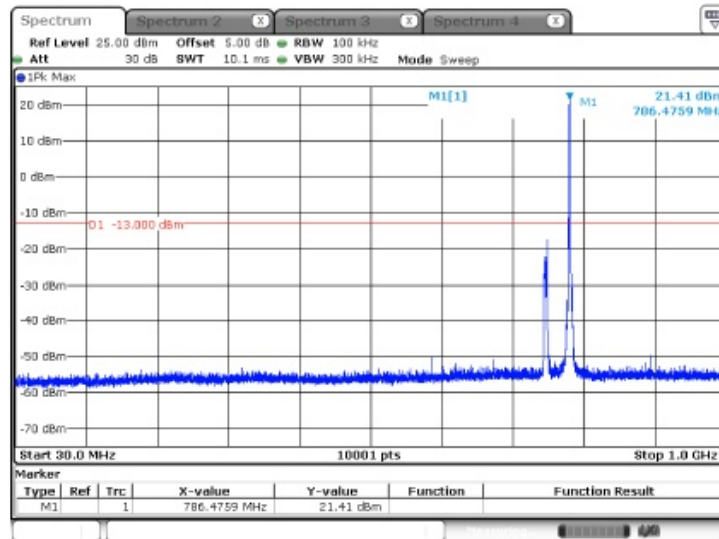


786.3MHz \_above 1G



Date: 26 SEP 2017 15:21:16

786.3MHz \_under 1G



Date: 26 SEP 2017 15:19:58

Product	Module		
Test Item	Radiated Spurious Emission		
Test Mode	Mode 1: LTE_Cat-M1_Band 13_Link		
Date of Test	2017/09/26	Test Site	CB4-H

### LTE\_Band13\_QPSK\_5M\_Link

Frequency (MHz)	SA Reading (dBm)	Ant. Pol. (H/V)	SG Level (dBm)	Cable Loss (dB)	Ant. Gain (dBi)	Test Result (dBm)	Limit (dBm) EIRP	Margin (dB)
Low Channel 23205								
1555.64	-50.550	H	-55.632	2.706	8.467	-49.871	-13	-36.871
2333.41	-60.530	H	-62.446	3.341	10.333	-55.453	-13	-42.453
1555.60	-47.880	V	-54.401	2.706	8.467	-48.640	-13	-35.640
2333.29	-53.110	V	-56.124	3.341	10.333	-49.131	-13	-36.131
Middle Channel 23230								
1560.61	-48.580	H	-53.708	2.710	8.482	-47.936	-13	-34.936
2340.91	-57.810	H	-59.773	3.346	10.345	-52.773	-13	-39.773
1560.95	-44.570	V	-51.126	2.710	8.483	-45.354	-13	-32.354
2340.70	-55.150	V	-58.194	3.346	10.345	-51.195	-13	-38.195
High Channel 23255								
1572.47	-47.630	H	-52.867	2.721	8.517	-47.071	-13	-34.071
2358.45	-57.550	H	-59.622	3.358	10.374	-52.607	-13	-39.607
1572.49	-45.450	V	-52.083	2.721	8.517	-46.286	-13	-33.286
2358.62	-56.330	V	-59.449	3.358	10.374	-52.433	-13	-39.433

Test Result (EIRP) = SG Level - Cable Loss + Antenna Gain

Product	Module		
Test Item	Radiated Spurious Emission		
Test Mode	Mode 1: LTE_Cat-M1_Band 13_Link		
Date of Test	2017/09/26	Test Site	CB4-H

**LTE\_Band13\_16-QAM\_5M\_Link**

Frequency (MHz)	SA Reading (dBm)	Ant. Pol. (H/V)	SG Level (dBm)	Cable Loss (dB)	Ant. Gain (dBi)	Test Result (dBm)	Limit (dBm) EIRP	Margin (dB)
Low Channel 23205								
1555.34	-48.750	H	-53.830	2.705	8.466	-48.069	-13	-35.069
2332.92	-59.520	H	-61.432	3.340	10.333	-54.440	-13	-41.440
1555.34	-46.020	V	-52.540	2.705	8.466	-46.779	-13	-33.779
2332.92	-54.860	V	-57.872	3.340	10.333	-50.880	-13	-37.880
Middle Channel 23230								
1560.34	-47.500	H	-52.625	2.710	8.481	-46.854	-13	-33.854
2340.52	-52.570	H	-54.530	3.346	10.345	-47.531	-13	-34.531
1560.34	-45.500	V	-52.052	2.710	8.481	-46.281	-13	-33.281
2340.52	-54.757	V	-57.800	3.346	10.345	-50.801	-13	-37.801
High Channel 23255								
1572.20	-45.890	H	-51.125	2.721	8.517	-45.329	-13	-32.329
2358.29	-54.850	H	-56.921	3.358	10.373	-49.906	-13	-36.906
1572.20	-43.380	V	-50.011	2.721	8.517	-44.215	-13	-31.215
2358.29	-56.644	V	-59.761	3.358	10.373	-52.746	-13	-39.746

Test Result (EIRP) = SG Level - Cable Loss + Antenna Gain

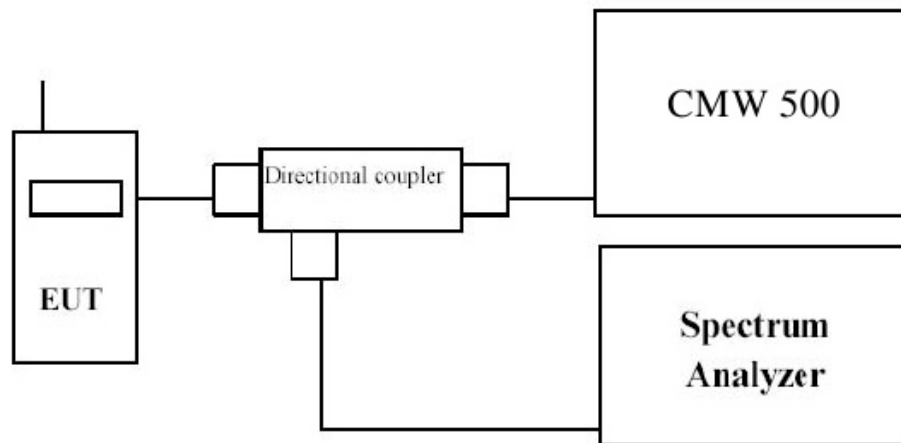
## 7. Spurious Emissions at Antenna Terminals

### 7.1. Test Equipment

Spurious Emissions at Antenna Terminals / SR10-H

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
Spectrum Analyzer	R&S	FSVA40	101455	2016/11/28	2017/11/27
Wideband Radio Communication Tester	R&S	CMW500	150246	2017/04/19	2018/04/18
Directional Coupler	Agilent	778D	20402	2016/10/07	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 1 MHz, sufficient scans were taken to show the out of band Emission if any up to 10th harmonic.

### **7.4. Test Method**

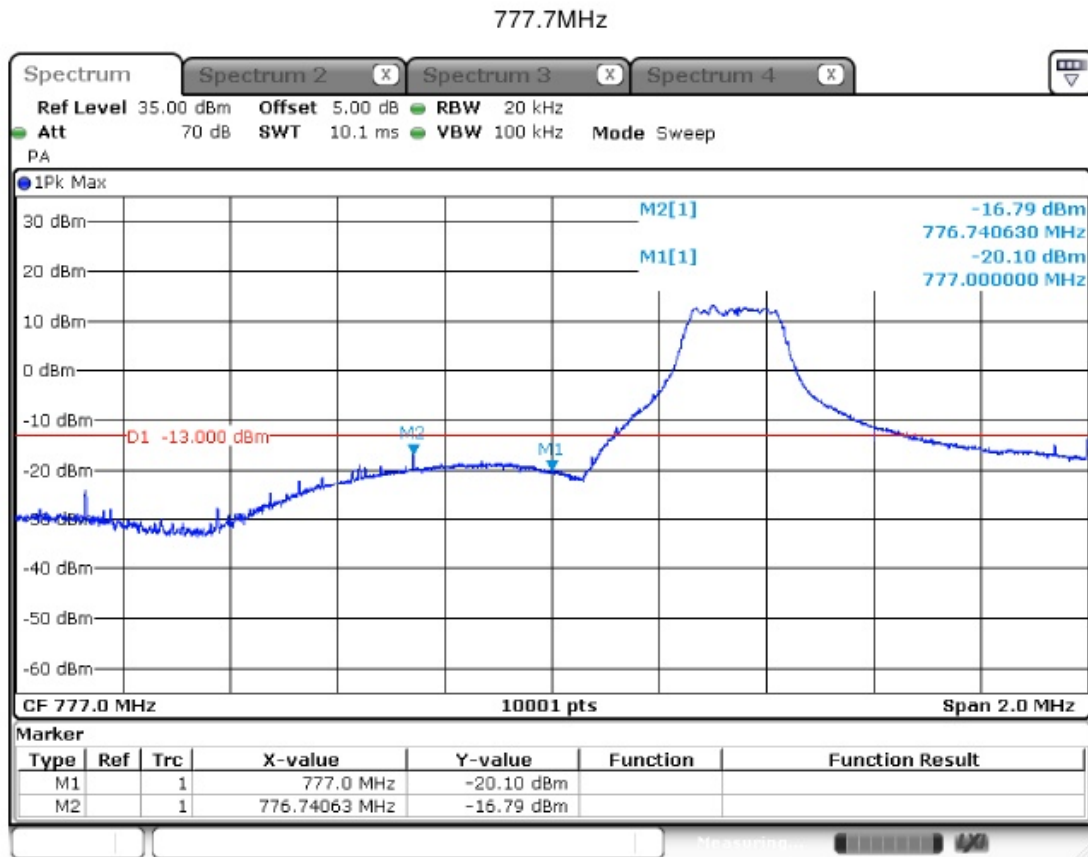
KDB 971168 D01 Power Meas License Digital Systems v03 sub-clause 6.1  
ANSI C63.26-2015 Sub-clause 5.7

### **7.5. Uncertainty**

The measurement uncertainty is defined as  $\pm 3.2$  dB.

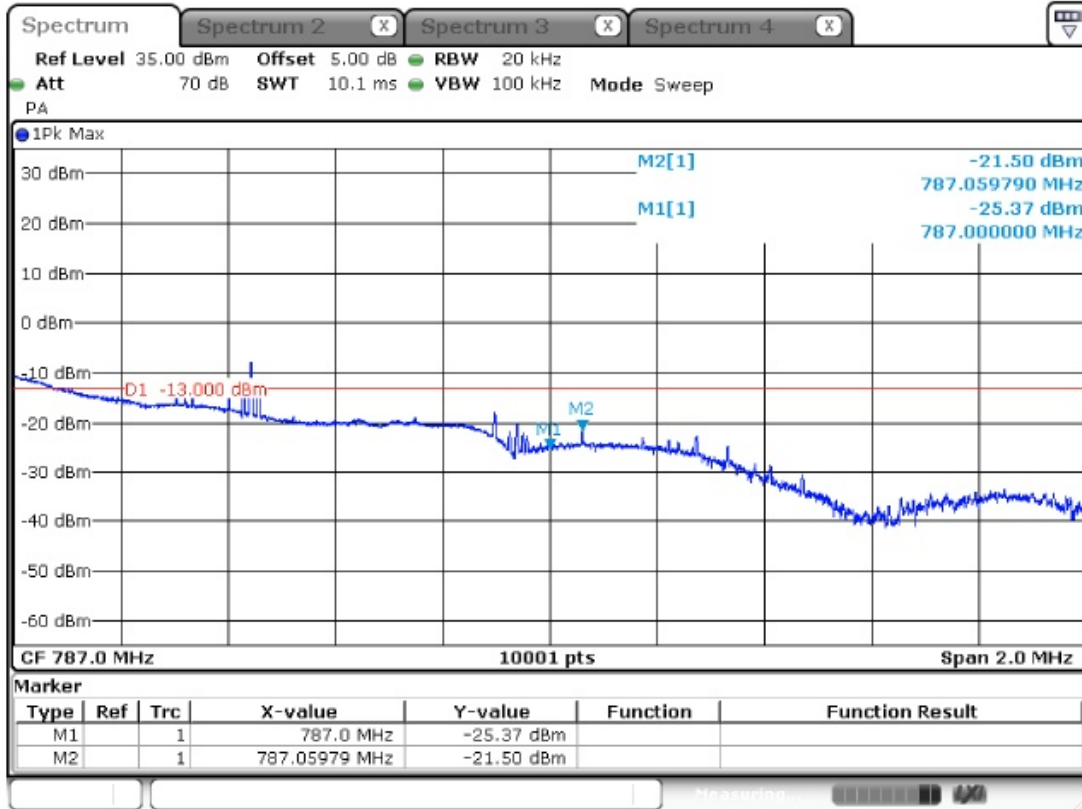
### 7.6. Test Result

Product	Module		
Test Item	Spurious Emissions at Antenna Terminals		
Test Mode	Mode 1: LTE_Cat-M1_Band 13_Link		
Date of Test	2017/09/26	Test Site	SR10-H



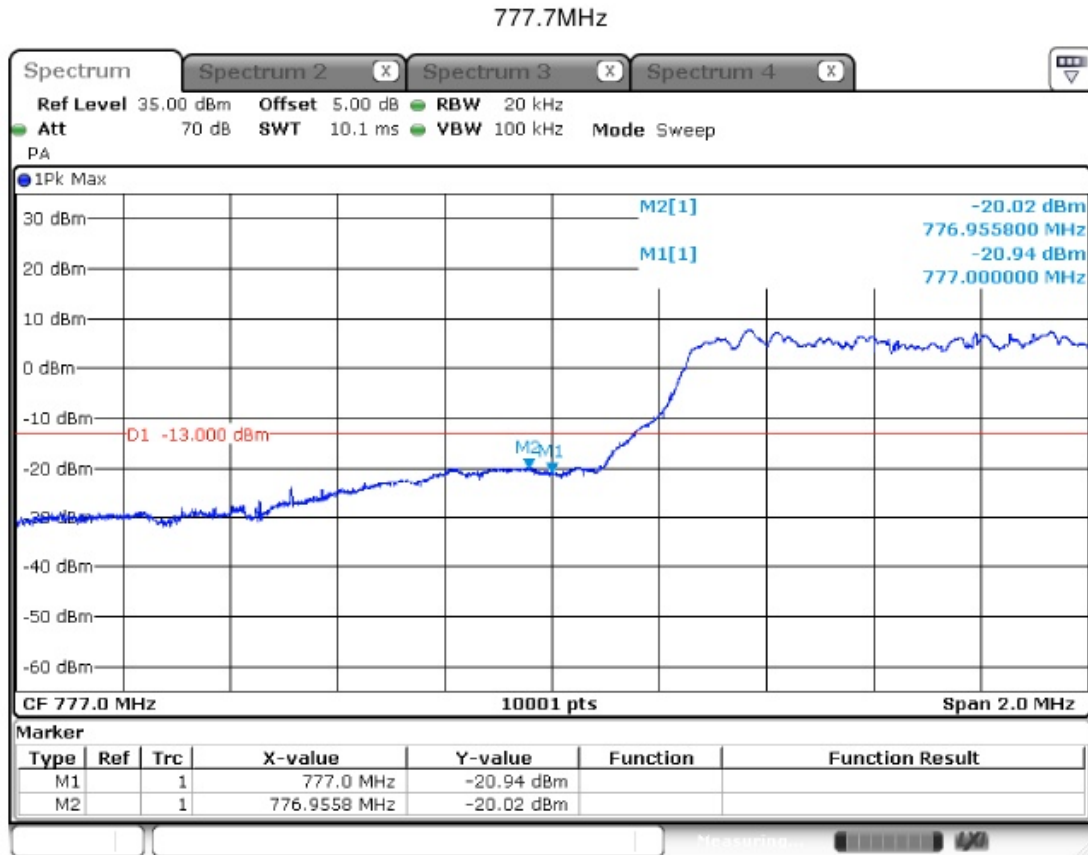
Date: 26.SEP.2017 14:21:24

786.3MHz



Date: 26.SEP.2017 15:01:44

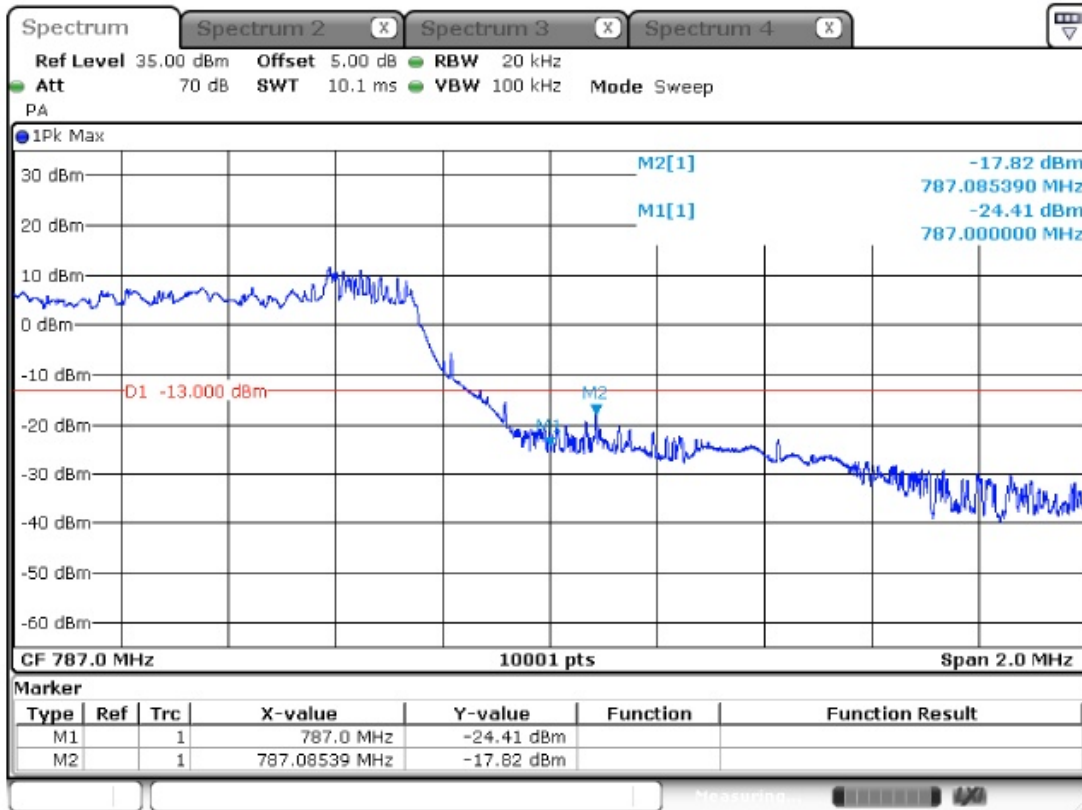
Product	Module		
Test Item	Spurious Emissions at Antenna Terminals		
Test Mode	Mode 1: LTE_Cat-M1_Band 13_Link		
Date of Test	2017/09/26	Test Site	SR10-H



Date: 26.SEP.2017 14:18:39



786.3MHz



Date: 26.SEP.2017 14:59:02

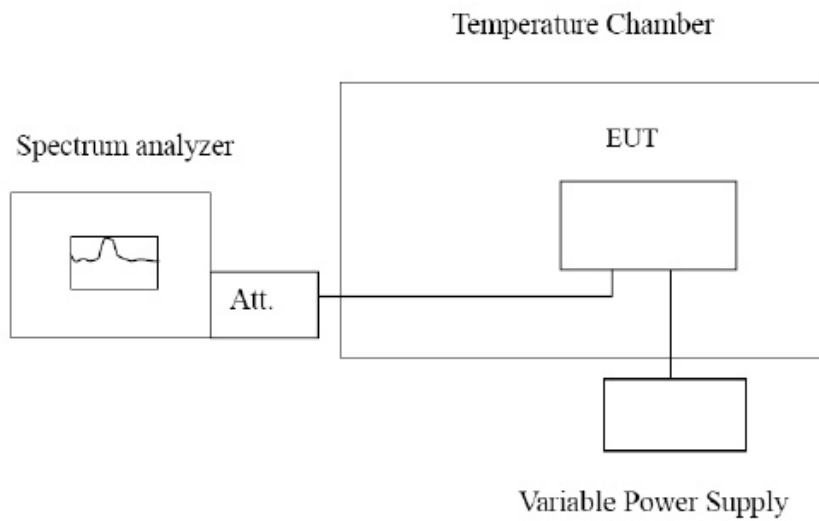
## 8. Frequency Stability

### 8.1. Test Equipment

Frequency Stability Under Temperature & Voltage Variations / SR10-H

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
Spectrum Analyzer	R&S	FSVA40	101455	2016/11/28	2017/11/27
Wideband Radio Communication Tester	R&S	CMW500	150246	2017/04/19	2018/04/18
Directional Coupler	Agilent	778D	20402	2016/10/07	2017/10/06

### 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. Test Method

KDB 971168 D01 Power Meas License Digital Systems v03 sub-clause 9  
ANSI C63.26-2015 Sub-clause 5.6

### 8.5. Uncertainty

The measurement uncertainty is defined as  $\pm 10$  Hz.

## 8.6. Test Result

Product	Module		
Test Item	Frequency Stability Under Temperature & Voltage Variations		
Test Mode	Mode 1: LTE_Cat-M1_Band 13_Link		
Date of Test	2017/09/27	Test Site	SR10-H

777.7 MHz

Voltage

Voltage (VDC)	Frequency Error(Hz)	Frequency Error(ppm)
4.2	8	-0.0106
3.7	11	-0.0140
3.4	9	-0.0121

Temperature

TEMPERATURE	Frequency Error(Hz)	Frequency Error (ppm)
-30	-14	0.0175
-20	-14	0.0182
-10	-19	0.0242
0	-17	0.0215
+10	-7	0.0087
+20	16	-0.0206
+30	19	-0.0242
+40	19	-0.0246
+50	19	-0.0245

Product	Module		
Test Item	Frequency Stability Under Temperature & Voltage Variations		
Test Mode	Mode 1: LTE_Cat-M1_Band 13_Link		
Date of Test	2017/09/27	Test Site	SR10-H

780.3 MHz

Voltage

Voltage (VDC)	Frequency Error(Hz)	Frequency Error(ppm)
4.2	6	-0.0077
3.7	-4	0.0050
3.4	5	-0.0065

Temperature

TEMPERATURE	Frequency Error(Hz)	Frequency Error (ppm)
-30	5	-0.0062
-20	5	-0.0061
-10	5	-0.0063
0	-3	0.0040
+10	0	0.0000
+20	4	-0.0048
+30	-4	0.0056
+40	4	-0.0048
+50	-4	0.0050

Product	Module		
Test Item	Frequency Stability Under Temperature & Voltage Variations		
Test Mode	Mode 1: LTE_Cat-M1_Band 13_Link		
Date of Test	2017/09/27	Test Site	SR10-H

786.3 MHz

Voltage

Voltage (VDC)	Frequency Error(Hz)	Frequency Error(ppm)
4.2	-8	0.0097
3.7	-9	0.0120
3.4	-9	0.0121

Temperature

TEMPERATURE	Frequency Error(Hz)	Frequency Error (ppm)
-30	12	-0.0150
-20	19	-0.0236
-10	21	-0.0263
0	-21	0.0267
+10	10	-0.0126
+20	-14	0.0172
+30	-17	0.0221
+40	-18	0.0233
+50	-19	0.0244