



# FCC Test Report

**Product Name: HSPA+ USB Stick**

**Model Number: E352LS-5**

**Report No: SYBH(Z-RF)008072011-2001**

**FCC ID: QISE352LS-5**

**Reliability Laboratory of Huawei Technologies Co., Ltd.**

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## Notice

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2. The laboratory has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements. The site recognition number is 97456.
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## Notice 2

Modification Information:

Table 1 Modification Information

|                             |   |                        |
|-----------------------------|---|------------------------|
| Modification<br>Information | 1 |                        |
|                             | 2 |                        |
|                             | 3 | <i>Not Applicable!</i> |
|                             | 4 |                        |
|                             | 5 |                        |
|                             | 6 |                        |
|                             | 7 |                        |



|                  |                               |
|------------------|-------------------------------|
| REGULATION       | FCC CFR47 Part 2: Subpart J;  |
|                  | FCC CFR47 Part 22: Subpart H; |
|                  |                               |
|                  |                               |
|                  |                               |
| START OF TEST    | Jun.24, 2011                  |
| END OF TEST      | Jun.27, 2011                  |
|                  |                               |
| Final Judgement: | Pass                          |

Approved By

Jul.07, 2011  
Date

Chen Xiaohong  
Name

Chen Xiaohong  
Signature

Reviewed By

Jul.07, 2011  
Date

Xu Guangyi  
Name

Xu Guangyi  
Signature

Operator By

Jul.07, 2011  
Date

Huang Qiuliang  
Name

Huang Qiuliang  
Signature



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## 1 Summary

The table below summarizes the measurements and results for the EUT. Detailed results and descriptions are shown in the following pages.

Table 2 Summary of results

| FCC Measurement Specification | FCC Limits Part(s) | Description                             | Result |
|-------------------------------|--------------------|-----------------------------------------|--------|
| 2.1046                        | 22.913             | Effective Radiated Power of Transmitter | PASS   |
| 2.1046                        | 22.913             | Conducted Power of Transmitter          | PASS   |
| 2.1047                        | /                  | Modulation Characteristics              | PASS   |
| 2.1049                        | /                  | Occupied Bandwidth                      | PASS   |
| 2.1051                        | 22.917             | Band Edges compliance                   | PASS   |
| 2.1051                        | 22.917             | Spurious Emission at Antenna Terminal   | PASS   |
| 2.1053                        | 22.917             | Radiated Spurious Emissions             | PASS   |
| 2.1055                        | 22.355             | Frequency Stability                     | PASS   |



## 2 Product Description

### 2.1 Production Information

#### 2.1.1 General Description

E352Ls-5 HSPA+/WCDMA/EDGE/GPRS/GSM dual bands USB Stick is subscriber equipment in the UMTS/GSM system. E352Ls-5 implement such functions as RF signal receiving/transmitting, HSPA+/WCDMA and EDGE/GPRS/GSM protocol processing, data service etc. Externally it provides USB interface (to connect to the notebook etc.), USIM card interface and Micro SD card interface. E352Ls-5 has an internal antenna as default.

#### 2.1.2 Support function and Service

The EUT support the function and service as follows:

Table 3 Service and Test mode List

| Service Name | Characteristic   | Corresponding Test Mode | Note     |
|--------------|------------------|-------------------------|----------|
| Data         | Modulation: GMSK | TM1                     | GPRS/GSM |
| Data         | Modulation: 8PSK | TM2                     | EDGE     |
| Data         | Modulation: QPSK | TM3                     | WCDMA    |
| Data         | Modulation: QPSK | TM4                     | HSDPA    |
| Data         | Modulation: QPSK | TM5                     | HSUPA    |

Note: \* The specified GPRS test conditions & settings are defined in 3GPP TS51.010 V5.4.0 and the EDGE test conditions & settings are defined in 3GPP TS51.010 V5.4.0. The WCDMA test condition & settings are defined in 3GPP TS 34.121 V8.8.0:2009.

### 2.2 Modification Information

For original equipment, following table is not application.

Table 4 Modification Information

| Model Number   | Board/Module | Original Version | New Version | Modify Information |
|----------------|--------------|------------------|-------------|--------------------|
| Not applicable |              |                  |             |                    |
|                |              |                  |             |                    |
|                |              |                  |             |                    |
|                |              |                  |             |                    |

### **3 Test Site Description**

The test site of:

***Huawei Technologies Co. Ltd.  
P.O. Box 518129  
Huawei base, Bantian,  
Longgang District, Shenzhen, China***

#### **3.1 Testing Period**

The test have been performed during the period of

**Jun.24, 2011 –Jun.27, 2011**

#### **3.2 General Set up Description**

**TM1:** GPRS/GSM Mode with GMSK Modulation

**TM2:** EDGE Mode with 8PSK Modulation

**TM3:** WCDMA Mode with QPSK Modulation

**TM4:** HSDPA Mode with QPSK Modulation

**TM5:** HSUPA Mode with QPSK Modulation



## 4 Product Description

### 4.1 Technical Characteristics

#### 4.1.1 Frequency Range

Table 5 Frequency Range

|                |                |
|----------------|----------------|
| Uplink band:   | 824 to 849 MHz |
| Downlink band: | 869 to 894 MHz |

#### 4.1.2 Channel Spacing / Separation

Table 6 Channel Spacing / Separation

|                  | EDGE/GPRS/GSM | WCDMA/HSPA |
|------------------|---------------|------------|
| Channel raster   | 200k Hz       | 200k Hz    |
| Channel spacing: | 200k Hz       | 5MHz       |

#### 4.1.3 Type of Emission

Table 7 Type of Emission

|                       | EDGE/GPRS/GSM | WCDMA/HSPA |
|-----------------------|---------------|------------|
| Emission Designation: | -             | -          |

According to CFR 47 (FCC) part 2, subpart C, section 2.201 and 2.202

#### 4.1.4 Environmental Requirements

Table 8 Environmental Requirements

|                      |          |
|----------------------|----------|
| Minimum temperature: | - 10 °C  |
| Maximum temperature: | + 55 °C  |
| Relative Humidity:   | 5%-95%RH |

#### 4.1.5 Power Source

Table 9 Power Source

|                     |                    |
|---------------------|--------------------|
| AC voltage nominal: | ~ 120 V            |
| AC voltage range    | ~ 100 V to ~ 240 V |
| AC current maximal: | 1 A                |

#### 4.1.6 Tune-up Procedure

According to CFR (FCC) part 2, subpart 2, section 2.1033(c) (9).

Please reference the document Tune-up Procedure in TCF.

#### 4.1.7 Applied DC Voltages and Currents

According to CFR (FCC) part 2, subpart 2, section 2.1033(c) (8).

The voltage and current in the final RF stage is:

Table 10 Applied RF module DC Voltages and Currents

|          |                                                                    |
|----------|--------------------------------------------------------------------|
| Voltage: | == +4.3V ~ +5.8V                                                   |
| Current: | 1A According to CFR (FCC) part 2, subpart 2, section 2.1033(c) (8) |



## 4.2 EUT Identification List

### 4.2.1 Board Information

Table 11 Board Information

|                                        |                  |  |
|----------------------------------------|------------------|--|
| HSPA+ USB Stick                        |                  |  |
| E352Ls-5                               |                  |  |
| Board and Module                       |                  |  |
| Equipment Designation /<br>Description | Serial Number    |  |
| MAINBOARD                              | E6P2A11161000143 |  |

### 4.2.2 FCC Identification

Grantee Code: QIS  
Product Code: E352Ls-5  
FCC Identification: QISE352LS-5

## 5 Main Test Instruments

Table 12 Main Test Equipments

| Equipment Description                | Manufacturer | Model                   | Serial Number | Calibrated until |
|--------------------------------------|--------------|-------------------------|---------------|------------------|
| Power supply                         | KEITHLEY     | 2303                    | 1288003       | Sep.27,2011      |
| Universal Radio Communication Tester | R&S          | CMU200                  | 105822        | Oct.24,2011      |
| Wireless Communication Test set      | Agilent      | N4010A                  | MY49081592    | Dec.14,2011      |
| Universal Radio Communication Tester | Agilent      | E5515C                  | MY50260239    | Aug.04,2011      |
| Signal Analyzer                      | R&S          | FSQ31                   | 200021        | Sep.27,2011      |
| Temperature Chamber                  | WEISS        | WKL64                   | 24600294      | Jan.25,2012      |
| Signal generator                     | Agilent      | E8257D                  | MY49281095    | Jul.09.2011      |
| Vector Signal Generator              | R&S          | SMU200A                 | 104162        | Sep.07,2011      |
| Test receiver                        | R&S          | ESU26                   | 36090302083   | Jun.24.2011      |
| EMI Test receiver                    | R&S          | FSQ43                   | 100048        | Jun.23,2011      |
| Tunable Dipole                       | Schwarzbeck  | D69250-UHAP/D69250-VHAP | 919/1009      | Dec.13,2011      |
| Tunable Dipole                       | Schwarzbeck  | D69250-UHAP/D69250-VHAP | 979/917       | Dec.13,2011      |
| Horn Antenna                         | R & S        | HF906                   | 359287/005    | May.07, 2012     |
| Horn Antenna                         | R & S        | HF906                   | 359287/006    | Apr.27, 2012     |
| Horn Antenna                         | R & S        | HF906                   | 100684        | Jun.28,2011      |
| Broadband Antenna                    | SCHAFFNER    | CBL 6112B               | 2536          | Sep.21, 2011     |
| Broadband Antenna                    | SCHAFFNER    | CBL 6112B               | 2941          | Jun.20, 2012     |
| Broadband Antenna                    | SCHAFFNER    | VULB 9163               | 9163-357      | Sep.28,2011      |
| Horn Antenna                         | ETS-LINDGREN | 3160                    | 60008         | Sep.20,2011      |
| Horn Antenna                         | ETS-LINDGREN | 3160                    | 91989         | Sep.28,2011      |

## 6 Transmitter Measurements

### 6.1 Effective Radiated Power of Transmitter (ERP)

#### 6.1.1 Test Conditions

Table 13 Test Conditions

|                      |                                              |
|----------------------|----------------------------------------------|
| Preconditioning:     | 0.5 hour                                     |
| Measured at:         | enclosure                                    |
| Ambient temperature: | 25 °C                                        |
| Relative humidity:   | 55%                                          |
| Test Configurations: | TM1/TM2/TM3 at frequency Bottom, Middle, Top |

#### 6.1.2 Test Specifications and Limits

##### 6.1.2.1 Specification

CFR 47 (FCC) part 2.1046 and part 22.913

##### 6.1.2.2 Supporting Standards

Table 14 Supporting Standards:

|                             |                                                                                                                                            |
|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| ANSI/TIA-603-C:2004         | Land Mobile FM or PM Communications Equipment Measurement and Performance Standards                                                        |
| 3GPP TS51.010 V5.4.0.0:2005 | Digital cellular telecommunications system Mobile Station (MS) conformance specification;                                                  |
| 3GPP TS 34.121 V8.7.0:2009  | Technical Specification Group Radio Access Network; User Equipment (UE) conformance specification; Radio transmission and reception (FDD); |

##### 6.1.2.3 Limits

Compliance with part 22.913, mobile/portable stations are limited to 7 watts ERP peak power.  
The calculated longitude ERP by following formula:  $ERP(dBm) = 10 \cdot \log(ERP_{in\ mwatts})$ .

Table 15 Limits

|                              |            |
|------------------------------|------------|
| Maximum Output Power (Watts) | < 7 Watts  |
| Maximum Output Power (dBm)   | < 38.5 dBm |

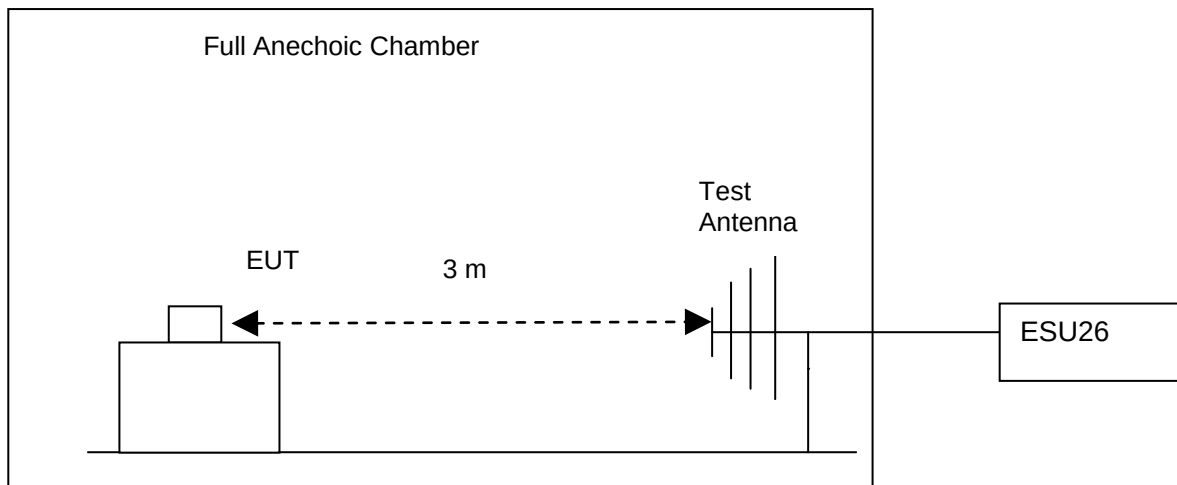
#### 6.1.3 Test Method and Setup

- For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, ERP shall be measured when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in 2.1033(c)(8). Connect the EUT to the wireless communication tester CMU200 via the air interface. The band class is set as GSM850M.
- Test the Radiated maximum output power by the CMU200 received from test antenna.

- (c) Use substitution method to verify the maximum output power. The EUT is substituted by a dipole antenna. The dipole is connected to a signal generator. And then adjust the output level of the signal generator to get the same received power recorded in step (b) on CMU200, and record the power level of Signal Generator. Of course, the cable loss at the test frequency should be compensated.

## Test setup

### Step 1: Pre-test



### Step 2: Substitution method to verify the maximum ERP

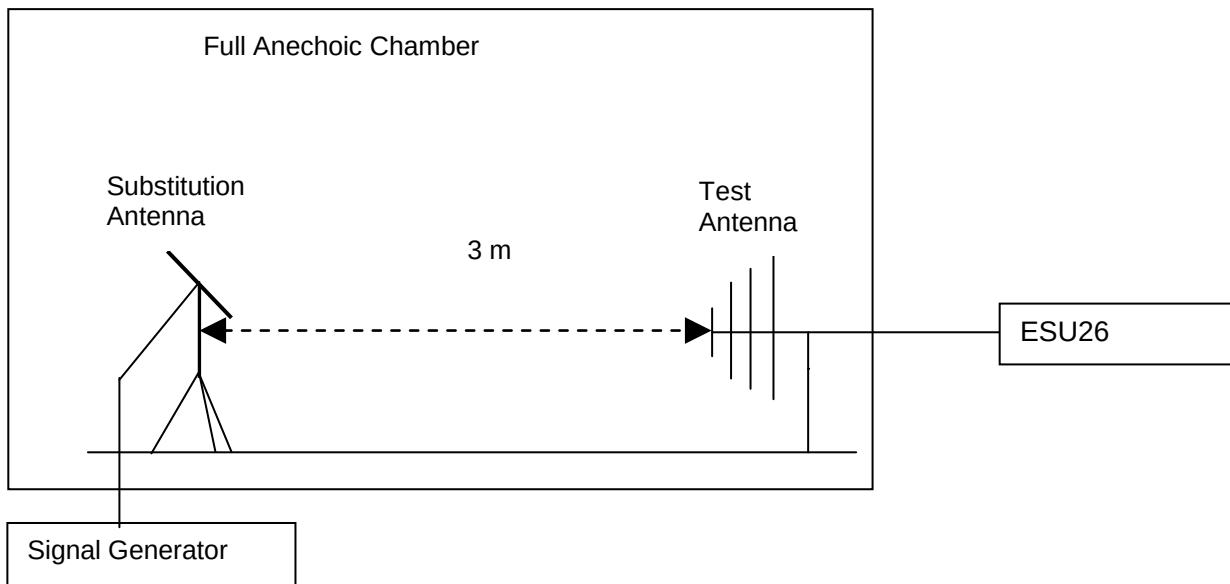


Figure 1. Test Set-up

NOTE: Effective radiated power (ERP) refers to the radiation power output of the EUT, assuming all emissions are radiated from half-wave dipole antennas.

ERP was measured using 1 host.

**BenQ Joy book S72**

## 6.1.4 Measurement Results

### 6.1.4.1 Pre-test Results

| RF Output Power (ERP)   |                             |       |                             |       |                             |       |
|-------------------------|-----------------------------|-------|-----------------------------|-------|-----------------------------|-------|
| TEST CONDITIONS         | Channel 128(B)<br>824.2MHz  |       | Channel 192(M)<br>837.0MHz  |       | Channel 251(T)<br>848.8MHz  |       |
|                         | dBm                         |       | dBm                         |       | dBm                         |       |
| Tnom (25 °C)/ Vnom (5V) | Measure<br>d                | Limit | Measured                    | Limit | Measure<br>d                | Limit |
| TM1                     | 33.04                       | 38.5  | 33.13                       | 38.5  | 33.27                       | 38.5  |
| TM2                     | 26.31                       | 38.5  | 26.24                       | 38.5  | 26.36                       | 38.5  |
| TEST CONDITIONS         | Channel 4132(B)<br>826.4MHz |       | Channel 4182(M)<br>836.4MHz |       | Channel 4233(T)<br>846.6MHz |       |
|                         | dBm                         |       | dBm                         |       | dBm                         |       |
| Tnom (25 °C)/ Vnom (5V) | Measure<br>d                | Limit | Measured                    | Limit | Measure<br>d                | Limit |
| TM3                     | 22.78                       | 38.5  | 22.94                       | 38.5  | 22.77                       | 38.5  |

### 6.1.4.2 Substitution Results

Table 16 Substitution Results

| Test Mode | Freq. [MHz] | Meas. Level [dBm] | Substitution Antenna Type | SGP [dBm] | Substitution Gain [dBd] | Cable Loss [dB] | Substitution Level (ERP) [dBm] | Limit [dBm] | Result |
|-----------|-------------|-------------------|---------------------------|-----------|-------------------------|-----------------|--------------------------------|-------------|--------|
| TM1       | 824.2       | 33.04             | Dipole Ant.               | 36.47     | -2.75                   | 0.6             | 33.12                          | 38.5        | Pass   |
| TM1       | 837.0       | 33.13             | Dipole Ant.               | 36.63     | -2.87                   | 0.6             | 33.16                          | 38.5        | Pass   |
| TM1       | 848.8       | 33.27             | Dipole Ant.               | 36.68     | -2.85                   | 0.6             | 33.23                          | 38.5        | Pass   |
| TM2       | 824.2       | 26.31             | Dipole Ant.               | 29.7      | -2.75                   | 0.6             | 26.35                          | 38.5        | Pass   |
| TM2       | 837.0       | 26.24             | Dipole Ant.               | 29.75     | -2.87                   | 0.6             | 26.28                          | 38.5        | Pass   |
| TM2       | 848.8       | 26.36             | Dipole Ant.               | 29.77     | -2.85                   | 0.6             | 26.32                          | 38.5        | Pass   |
| TM3       | 826.4       | 22.78             | Dipole Ant.               | 26.06     | -2.75                   | 0.6             | 22.71                          | 38.5        | Pass   |
| TM3       | 836.4       | 22.94             | Dipole Ant.               | 26.39     | -2.87                   | 0.6             | 22.92                          | 38.5        | Pass   |
| TM3       | 846.6       | 22.77             | Dipole Ant.               | 26.17     | -2.85                   | 0.6             | 22.72                          | 38.5        | Pass   |

Note: a, For get the ERP (Efficient Radiated Power) in substitution method, the following formula should take to calculate it,



---

$$\text{ERP [dBm]} = \text{SGP [dBm]} - \text{Cable Loss [dB]} + \text{Gain [dBd]}$$

NOTE: SGP- Signal Generator Level

b, A GSM signal with bandwidth of 200kHz signal with bandwidth of 5MHz is created by the vector generator R&S SMU200A.

c, RBW=10kHz, VBW=300kHz, and integrated by the instrument to 200kHz for TM1 and TM2 and 5M for TM3.

### 6.1.5 Conclusion

The equipment **PASSED** the requirement of this clause.



## 6.2 Conducted Power of Transmitter

### 6.2.1 Test Conditions

Table 17 Test Conditions

|                      |                                                      |
|----------------------|------------------------------------------------------|
| Preconditioning:     | 0.5 hour                                             |
| Measured at:         | Antenna connector                                    |
| Ambient temperature: | 25 °C                                                |
| Relative humidity:   | 55 %                                                 |
| Test Configurations: | TM1/TM2/TM3/TM4/TM5 at frequency Bottom, Middle, Top |

### 6.2.2 Test Specifications and Limits

#### 6.2.2.1 Specification

CFR 47 (FCC) part 2.1047 and part 22 subpart H

#### 6.2.2.2 Supporting Standards

Table 18 Supporting Standards:

|                             |                                                                                                                                            |
|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| ANSI/TIA-603-C:2004         | Land Mobile FM or PM Communications Equipment Measurement and Performance Standards                                                        |
| 3GPP TS51.010 V5.4.0.0:2005 | Digital cellular telecommunications system Mobile Station (MS) conformance specification;                                                  |
| 3GPP TS 34.121 V8.7.0:2009  | Technical Specification Group Radio Access Network; User Equipment (UE) conformance specification; Radio transmission and reception (FDD); |

#### 6.2.2.3 Limits

Compliance with part 22.913, in no any case may the peak power of a mobile station transmitter exceed 7 W. The calculated longitude ERP by following formula:

$$\text{ERP(dBm)} = 10 \cdot \log(\text{ERP}_{\text{in mwatts}}).$$

And for conducted power, we can use Antenna Gain to calculate the limit. So the conducted power:

$$\begin{aligned} P_{\text{cod}}(\text{dBm}) &= \text{ERP(dBm)} - \text{Gain(dBd)}. \\ \text{and Gain(dBd)} &= \text{Gain(dBi)} - 2.15\text{dB} \end{aligned}$$

Table 19 Limits

|                                      |                    |
|--------------------------------------|--------------------|
| Maximum Output Power (Watts)         | < 7 Watts(38.5dBm) |
| Antenna Gain(dBi):                   | 2.55               |
| Antenna Gain(dBd):                   | 0.40               |
| Maximum Conducted Output Power (dBm) | < 38.10            |

For HSDPA test mode, there are 4 sub-tests for different configuration.

Table 1 HSDPA conducted max power pre-scan

| Sub-test | c     | d     | d<br>(SF) | c/d   | HS<br>(Note1,<br>Note 2) | CM<br>(dB)<br>(Note<br>3) | MPR<br>(dB)<br>(Note<br>3) |
|----------|-------|-------|-----------|-------|--------------------------|---------------------------|----------------------------|
| 1        | 2/15  | 15/15 | 64        | 2/15  | 4/15                     | 0                         | 0                          |
| 2        | 12/15 | 15/15 | 64        | 12/15 | 24/15                    | 1                         | 0                          |
| 3        | 15/15 | 8/15  | 64        | 15/8  | 30/15                    | 1.5                       | 0.5                        |
| 4        | 15/15 | 4/15  | 64        | 15/4  | 30/15                    | 1.5                       | 0.5                        |

For HSUPA test mode, there are 5 sub-tests for different configuration.

Table 2 HSUPA conducted max power pre-scan

| Sub-test | $\beta_c$            | $\beta_d$            | $\beta_d$<br>(SF) | $\beta_c/\beta_d$    | $\beta_{HS}$<br>(Note1) | $\beta_{ec}$ | $\beta_{ed}$<br>(Note 5)<br>(Note 6)                 | $\beta_{ed}$<br>(SF) | $\beta_{ed}$<br>(Codes) | CM<br>(dB)<br>(Note<br>2) | MPR<br>(dB)<br>(Note<br>2) | AG<br>Index<br>(Note<br>6) | E-TFCI |
|----------|----------------------|----------------------|-------------------|----------------------|-------------------------|--------------|------------------------------------------------------|----------------------|-------------------------|---------------------------|----------------------------|----------------------------|--------|
| 1        | 11/15<br>(Note<br>3) | 15/15<br>(Note<br>3) | 64                | 11/15<br>(Note<br>3) | 22/15                   | 209/22<br>5  | 1309/22<br>5                                         | 4                    | 1                       | 1.0                       | 0.0                        | 20                         | 75     |
| 2        | 6/15                 | 15/15                | 64                | 6/15                 | 12/15                   | 12/15        | 94/75                                                | 4                    | 1                       | 3.0                       | 2.0                        | 12                         | 67     |
| 3        | 15/15                | 9/15                 | 64                | 15/9                 | 30/15                   | 30/15        | $\beta_{ed1}$ :<br>47/15<br>$\beta_{ed2}$ :<br>47/15 | 4<br>4               | 2                       | 2.0                       | 1.0                        | 15                         | 92     |
| 4        | 2/15                 | 15/15                | 64                | 2/15                 | 4/15                    | 2/15         | 56/75                                                | 4                    | 1                       | 3.0                       | 2.0                        | 17                         | 71     |
| 5        | 15/15<br>(Note<br>4) | 15/15<br>(Note<br>4) | 64                | 15/15<br>(Note<br>4) | 30/15                   | 24/15        | 134/15                                               | 4                    | 1                       | 1.0                       | 0.0                        | 21                         | 81     |

Note 1:  $\Delta_{ACK}$ ,  $\Delta_{NACK}$  and  $\Delta_{CQI} = 30/15$  with  $\beta_{HS} = 30/15 * \beta_c$ .

Note 2: CM = 1 for  $\beta_c/\beta_d = 12/15$ ,  $\beta_{HS}/\beta_c = 24/15$ . For all other combinations of DPDCH, DPCCH, HS-DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.

Note 3: For subtest 1 the  $\beta_c/\beta_d$  ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to  $\beta_c = 10/15$  and  $\beta_d = 15/15$ .

Note 4: For subtest 5 the  $\beta_c/\beta_d$  ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to  $\beta_c = 14/15$  and  $\beta_d = 15/15$ .

Note 5: In case of testing by UE using E-DPDCH Physical Layer category 1, Sub-test 3 is omitted according to TS25.306 Table 5.1g.

Note 6:  $\beta_{ed}$  can not be set directly, it is set by Absolute Grant Value.

## 6.2.3 Test Method and Setup

(a) For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, Conducted maximum power shall be measured when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in 2.1033(c)(8). Connect the EUT to the wireless communication tester CMU200 via the antenna connector. The band class is set as GSM850M.

(b) Test the Conducted maximum output power by the CMU200.

### Test setup

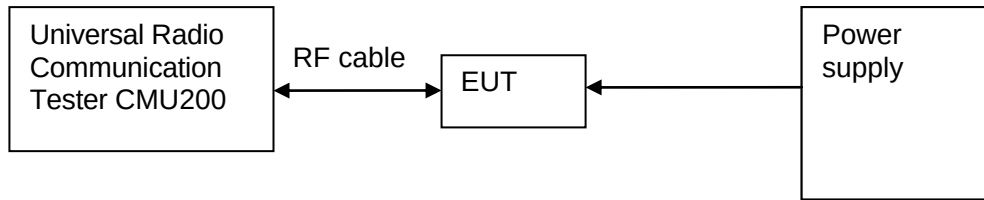


Figure 2. Test Set-up

## 6.2.4 Measurement Results

Table 3 Measurement Results

|                         |       | RF Output Power (Conducted) |       |                |       |                |       |
|-------------------------|-------|-----------------------------|-------|----------------|-------|----------------|-------|
| TEST CONDITIONS         |       | Channel128(B)               |       | Channel192(M)  |       | Channel251(T)  |       |
|                         |       | 824.2MHz                    |       | 837.0MHz       |       | 848.8MHz       |       |
|                         |       | dBm                         |       | dBm            |       | dBm            |       |
| Tnom (25 °C)/ Vnom (5V) |       | Measure d                   | Limit | Measured       | Limit | Measure d      | Limit |
| TM1                     |       | 32.64                       | 38.10 | 32.73          | 38.10 | 32.87          | 38.10 |
| TM2                     |       | 25.91                       | 38.10 | 25.84          | 38.10 | 25.96          | 38.10 |
| TEST CONDITIONS         |       | Channel4132(B)              |       | Channel4182(M) |       | Channel4233(T) |       |
|                         |       | 826.4MHz                    |       | 836.4MHz       |       | 846.6MHz       |       |
|                         |       | dBm                         |       | dBm            |       | dBm            |       |
| Tnom (25 °C)/ Vnom (5V) |       | Measure d                   | Limit | Measured       | Limit | Measure d      | Limit |
| TM3                     |       | 22.38                       | 38.10 | 22.54          | 38.10 | 22.37          | 38.10 |
| TM4                     | Case1 | 22.44                       | 38.10 | 22.41          | 38.10 | 22.34          | 38.10 |
|                         | Case2 | 22.25                       | 38.10 | 22.33          | 38.10 | 22.36          | 38.10 |
|                         | Case3 | 21.97                       | 38.10 | 22.01          | 38.10 | 21.86          | 38.10 |
|                         | Case4 | 22.04                       | 38.10 | 22.02          | 38.10 | 21.93          | 38.10 |
| TM5                     | Case1 | 21.75                       | 38.10 | 21.73          | 38.10 | 21.63          | 38.10 |
|                         | Case2 | 19.15                       | 38.10 | 19.27          | 38.10 | 19.17          | 38.10 |
|                         | Case3 | 20.03                       | 38.10 | 20.07          | 38.10 | 20.06          | 38.10 |
|                         | Case4 | 19.21                       | 38.10 | 19.31          | 38.10 | 19.22          | 38.10 |
|                         | Case5 | 21.65                       | 38.10 | 21.72          | 38.10 | 21.58          | 38.10 |



### 6.2.5 Conclusion

The equipment **PASSED** the requirement of this clause.

## 6.3 Modulation Characteristics

### 6.3.1 Test Conditions

Table 4 Test Conditions

|                      |                                 |
|----------------------|---------------------------------|
| Preconditioning:     | 0.5 hour                        |
| Measured at:         | Antenna connector               |
| Ambient temperature: | 25 °C                           |
| Relative humidity:   | 55 %                            |
| Test Configurations: | TM1/TM2/TM3 at frequency Middle |

### 6.3.2 Test Specifications and Limits

#### 6.3.2.1 Specification

CFR 47 (FCC) part 2.1047 and part 22 subpart H

#### 6.3.2.2 Supporting Standards

Table 5 Supporting Standards:

|                             |                                                                                                                                            |
|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| ANSI/TIA-603-C:2004         | Land Mobile FM or PM Communications Equipment Measurement and Performance Standards                                                        |
| 3GPP TS51.010 V5.4.0.0:2005 | Digital cellular telecommunications system Mobile Station (MS) conformance specification;                                                  |
| 3GPP TS 34.121 V8.7.0:2009  | Technical Specification Group Radio Access Network; User Equipment (UE) conformance specification; Radio transmission and reception (FDD); |

Table 6

#### 6.3.2.3 Limits

No specific modulation characteristics requirement limits in part 2.1047 and part 22 subpart H.

Table 7 Limits

|        |                |
|--------|----------------|
| Limits | Not applicable |
|--------|----------------|

### 6.3.3 Test Method and Setup

Connect the EUT to Wireless Communication Test Set R&S CMU200 via the antenna connector. The band class is set as GSM850M; the EUT's output is matched with 50  $\Omega$  loads, test method was according to 3GPP TS 51.010. The waveform quality and constellation of the EUT was tested.

#### Test setup

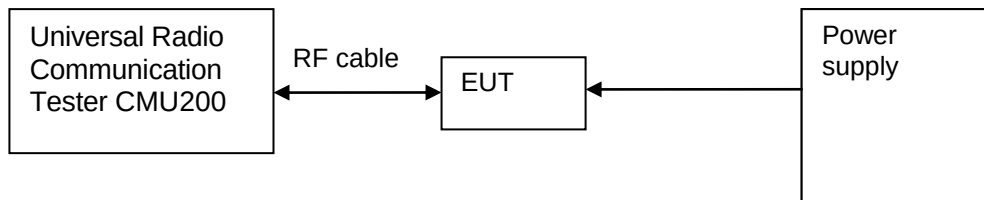


Figure 3. Test Set-up

### 6.3.4 Measurement Results

Table 8 Measurement Results

|                          |                       |                             |                     |
|--------------------------|-----------------------|-----------------------------|---------------------|
| TEST CONDITIONS          |                       | Modulation Characteristic   |                     |
|                          |                       | Channel 192(M)              |                     |
|                          |                       | Measured                    |                     |
|                          |                       | TM1                         | TM2                 |
| T <sub>nom</sub> (25 °C) | V <sub>nom</sub> (5V) | Refer to Appendix A         | Refer to Appendix A |
|                          |                       |                             |                     |
| TEST CONDITIONS          |                       | Modulation Characteristic   |                     |
|                          |                       | Channel 4182(M)<br>836.4MHz |                     |
|                          |                       | Measured                    |                     |
|                          |                       | TM3                         |                     |
| T <sub>nom</sub> (25 °C) | V <sub>nom</sub> (5V) | Refer to Appendix A         |                     |
|                          |                       |                             |                     |

### 6.3.5 Conclusion

The equipment **PASSED** the requirement of this clause.  
For the measurement results refer to appendix A.

## 6.4 Occupied Bandwidth

### 6.4.1 Test Conditions

Table 9 Test Conditions

|                      |                                              |
|----------------------|----------------------------------------------|
| Preconditioning:     | 0.5 hour                                     |
| Measured at:         | Antenna connector                            |
| Ambient temperature: | 25 °C                                        |
| Relative humidity:   | 55 %                                         |
| Test Configurations: | TM1/TM2/TM3 at frequency Bottom, Middle, Top |

### 6.4.2 Test Specifications and Limits

#### 6.4.2.1 Specification

CFR 47 (FCC) part 2.1049 and part 22 subpart H.

#### 6.4.2.2 Supporting Standards

Table 10 Supporting Standards:

|                             |                                                                                                                                            |
|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| ANSI/TIA-603-C:2004         | Land Mobile FM or PM Communications Equipment Measurement and Performance Standards                                                        |
| 3GPP TS51.010 V5.4.0.0:2005 | Digital cellular telecommunications system Mobile Station (MS) conformance specification;                                                  |
| 3GPP TS 34.121 V8.7.0:2009  | Technical Specification Group Radio Access Network; User Equipment (UE) conformance specification; Radio transmission and reception (FDD); |

#### 6.4.2.3 Limits

No specific occupied bandwidth requirement in part 22 subpart H, but the occupied bandwidth was defined in part 2.1049: the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured.

Table 11 Limits

|                               |                        |
|-------------------------------|------------------------|
| Upper /lower frequency limits | 0.5% of the mean power |
|-------------------------------|------------------------|

### 6.4.3 Test Method and Setup

The EUT was connected to the wireless signal analyzer R&S FSQ31 via the one RF connector. The band class is set as GSM850M; The EUT was controlled to transmit maximum power. Measure and record the occupied bandwidth of the EUT by the R&S FSQ31.

The OBW, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured under the following conditions as applicable:

Refer to 47CFR part2.1049 section (g) & (h).

(g) Transmitter in which the modulating base band comprises not more than three independent channels - when modulated by the full complement of signals for which the transmitter is rated. The level of modulation for each channel should be set to that prescribed in rule parts applicable to the services for which the transmitter is intended. If specific modulation levels are not set forth in the rules, the tests should provide the manufacturer's maximum rated condition.

(h) Transmitters employing digital modulation techniques - when modulated by an input signal such that its amplitude and symbol rate represent the maximum rated conditions under which the equipment will be operated. The signal shall be applied through any filter networks, pseudorandom generators or other devices required in normal service. Additionally, the occupied bandwidth shall be shown for operation with any devices used for modifying the spectrum when such devices are optional at discretion of the user.

For TM1/TM2 following RBW and VBW are employed:

Measurement bandwidth (RBW): 3 kHz (Resolution bandwidth)

Video bandwidth (VBW): 10 kHz

For TM3 following RBW and VBW are employed:

Measurement bandwidth (RBW): 50 kHz (Resolution bandwidth)

Video bandwidth (VBW): 500 kHz

### Test Set-up

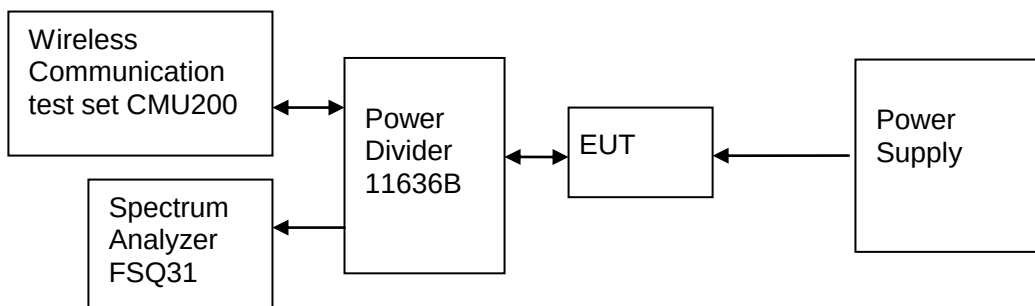


Figure 4. Test Set-up

## 6.4.4 Measurement Results

Table 12 Measurement Results

| TEST CONDITIONS           |     | Occupied Bandwidth |        |                 |        |                 |        |
|---------------------------|-----|--------------------|--------|-----------------|--------|-----------------|--------|
|                           |     | Channel 128(B)     |        | Channel 192(M)  |        | Channel 251(T)  |        |
| Center Frequency          |     | 824.2MHz           |        | 837.0MHz        |        | 848.8MHz        |        |
|                           |     | Measured           |        | Measured        |        | Measured        |        |
|                           |     | (kHz)              |        | (kHz)           |        | (kHz)           |        |
|                           |     | TM1                | TM2    | TM1             | TM2    | TM1             | TM2    |
| Tnom (25 °C)<br>Vnom (5V) | 99% | 243.59             | 248.40 | 243.59          | 246.79 | 246.79          | 240.38 |
|                           |     |                    |        |                 |        |                 |        |
|                           |     | Channel 4132(B)    |        | Channel 4182(M) |        | Channel 4233(T) |        |



| Center Frequency          |     | 826.4MHz | 836.4MHz | 846.6MHz |
|---------------------------|-----|----------|----------|----------|
|                           |     | Measured | Measured | Measured |
|                           |     | (MHz)    | (MHz)    | (MHz)    |
|                           |     | TM3      | TM3      | TM3      |
| Tnom (25 °C)<br>Vnom (5V) | 99% | 4.21     | 4.17     | 4.15     |

### 6.4.5 Conclusion

The equipment **PASSED** the requirement of this clause.  
For the measurement results refer to appendix B.

## 6.5 Band Edges Compliance

### 6.5.1 Test Conditions

Table 13 Test Conditions

|                      |                                      |
|----------------------|--------------------------------------|
| Preconditioning:     | 0.5 hour                             |
| Measured at:         | Antenna connector                    |
| Ambient temperature: | 25°C                                 |
| Relative humidity:   | 55 %                                 |
| Test Configurations: | TM1/TM2/TM3 at frequency Bottom, Top |

### 6.5.2 Test Specifications and Limits

#### 6.5.2.1 Specification

CFR 47 (FCC) part 2.1051 and part 22.917

#### 6.5.2.2 Supporting Standards

Table 14 Supporting Standards:

|                             |                                                                                                                                            |
|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| ANSI/TIA-603-C:2004         | Land Mobile FM or PM Communications Equipment Measurement and Performance Standards                                                        |
| 3GPP TS51.010 V5.4.0.0:2005 | Digital cellular telecommunications system Mobile Station (MS) conformance specification;                                                  |
| 3GPP TS 34.121 V8.7.0:2009  | Technical Specification Group Radio Access Network; User Equipment (UE) conformance specification; Radio transmission and reception (FDD); |

#### 6.5.2.3 Limits

Compliance with part 22.917, all spurious emission must be attenuated below the transmitter power by at least  $43 + 10 \log_{10} P(W)$ . (Whereas P is the rated power of the EUT in Watt).

Table 15 Limits

|                       | TM1                                        | TM2                                          |
|-----------------------|--------------------------------------------|----------------------------------------------|
| Rated Power:          | 33 dBm                                     | 27 dBm                                       |
| Required attenuation: | $43 + 10 \log(2) = 46$ ,<br>33 dBm - 46 dB | $43 + 10 \log(0.5) = 40$ ,<br>27 dBm - 40 dB |
| Absolute level        | - 13 dBm                                   | - 13 dBm                                     |

### 6.5.3 Test Method and Setup

The EUT was connected to the wireless signal analyzer R&S FSQ31 via the one RF connector, the band class is set as GSM850M. The EUT was controlled to transmit maximum power. Measure and record band edges compliance of the EUT by the R&S FSQ31.

The limit is -13dBm.

For TM1/TM2 following RBW and VBW are employed:

Measurement bandwidth (RBW): 3 kHz (Resolution bandwidth)

Video bandwidth (VBW): 10 kHz

For TM3 following RBW and VBW are employed:

Measurement bandwidth (RBW): 50 kHz (Resolution bandwidth)

Video bandwidth (VBW): 200 kHz

## Test Set-up

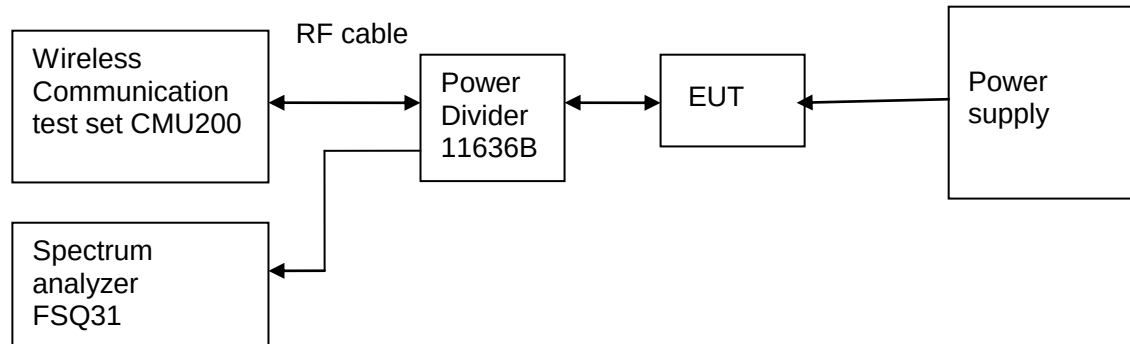


Figure 5. Test Set-up

## 6.5.4 Measurement Results

Table 16 Measurement Results outside Band Edges

| Band     | Frequency of Band edges [MHz]                               | Channel Number | Test Mode | Spurious Level measured [dBm] | FCC limit | Result |
|----------|-------------------------------------------------------------|----------------|-----------|-------------------------------|-----------|--------|
| Cellular | $T_{nom} (25\text{ }^{\circ}\text{C}), V_{nom} (5\text{V})$ |                |           |                               |           |        |
|          | 824.2                                                       | 128            | TM1       | <-13(See appendix C)          | - 13 dBm  | Pass   |
|          | 848.8                                                       | 251            | TM1       | <-13(See appendix C)          | - 13 dBm  | Pass   |
|          | 824.2                                                       | 128            | TM2       | <-13(See appendix C)          | - 13 dBm  | Pass   |
|          | 848.8                                                       | 251            | TM2       | <-13(See appendix C)          | - 13 dBm  | Pass   |
|          | 826.4                                                       | 4132           | TM3       | <-13(See appendix C)          | - 13 dBm  | Pass   |
|          | 846.6                                                       | 4233           | TM3       | <-13(See appendix C)          | - 13 dBm  | Pass   |

## 6.5.5 Conclusion

The equipment **PASSED** the requirement of this clause.

For the measurement results refer to appendix C.

## 6.6 Spurious Emission at Antenna Terminal

### 6.6.1 Test Conditions

Table 17 Test Conditions

|                      |                                              |
|----------------------|----------------------------------------------|
| Preconditioning:     | 0.5 hour                                     |
| Measured at:         | Antenna connector                            |
| Ambient temperature: | 25°C                                         |
| Relative humidity:   | 55 %                                         |
| Test Configurations: | TM1/TM2/TM3 at frequency Bottom, Middle, Top |

### 6.6.2 Test Specifications and Limits

#### 6.6.2.1 Specification

CFR 47 (FCC) part 2.1051 and part 22.917

#### 6.6.2.2 Supporting Standards

Table 18 Supporting Standards:

|                             |                                                                                                                                            |
|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| ANSI/TIA-603-C:2004         | Land Mobile FM or PM Communications Equipment Measurement and Performance Standards                                                        |
| 3GPP TS51.010 V5.4.0.0:2005 | Digital cellular telecommunications system Mobile Station (MS) conformance specification;                                                  |
| 3GPP TS 34.121 V8.7.0:2009  | Technical Specification Group Radio Access Network; User Equipment (UE) conformance specification; Radio transmission and reception (FDD); |

#### 6.6.2.3 Limits

Compliance with part 22.917, all spurious emission must be attenuated below the transmitter power by at least  $43 + 10 \log_{10} P$ . (Whereas P is the rated power of the EUT in Watt).

Table 19 Limits

|                       | TM1                                        | TM2                                          |
|-----------------------|--------------------------------------------|----------------------------------------------|
| Rated Power:          | 33dBm                                      | 27 dBm                                       |
| Required attenuation: | $43 + 10 \log(2) = 46$ ,<br>33 dBm - 46 dB | $43 + 10 \log(0.5) = 40$ ,<br>27 dBm - 40 dB |
| Absolute level        | - 13 dBm                                   | - 13 dBm                                     |

### 6.6.3 Test Method and Setup

The EUT was connected to the wireless signal analyzer R&S FSQ31 via the one RF connector, the band class is set as GSM850M. The EUT was controlled to transmit maximum power. Measure and record the Conducted Spurious Emission of the EUT by the R&S FSQ31.

According to part 22.917, the defined measurement bandwidth as following:

22.917 (b) Measurement procedure: Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater.

Measurement bandwidth (RBW) for 9 kHz up to 150 kHz: 1 kHz;  
Measurement bandwidth (RBW) for 150 kHz up to 30 MHz: 10 kHz;  
Measurement bandwidth (RBW) for 30 MHz up to 1 GHz: 100 kHz;  
Measurement bandwidth (RBW) for 1 GHz up to 12.75 GHz: 1 MHz;

## Test Set-up

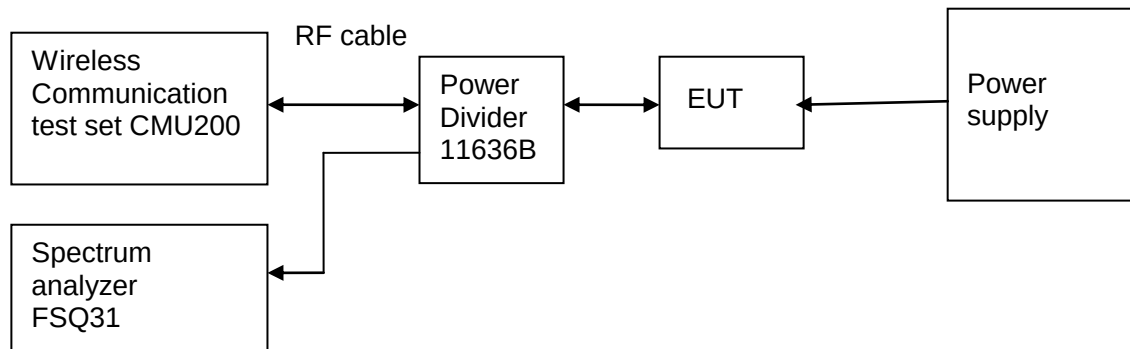


Figure 6. Test Set-up

## 6.6.4 Measurement Results

Table 20 Measurement Results

| Channel Number  | Test Mode | Test Range (Frequency) | Output Power [dBm] | Spurious Level measured [dBm] | FCC limit | Result |
|-----------------|-----------|------------------------|--------------------|-------------------------------|-----------|--------|
| Channel 128(B)  | TM1       | 9 kHz<br>~12.75GHz     | 33                 | <- 13 dBm<br>(See appendix D) | - 13 dBm  | Pass   |
|                 | TM2       | 9 kHz<br>~12.75GHz     | 27                 | <- 13 dBm<br>(See appendix D) | - 13 dBm  | Pass   |
| Channel 4132(B) | TM3       | 9 kHz<br>~12.75GHz     | 24                 | <- 13 dBm<br>(See appendix D) | - 13 dBm  | Pass   |
| Channel 192(M)  | TM1       | 9 kHz<br>~12.75GHz     | 33                 | <- 13 dBm<br>(See appendix D) | - 13 dBm  | Pass   |
|                 | TM2       | 9 kHz<br>~12.75GHz     | 27                 | <- 13 dBm<br>(See appendix D) | - 13 dBm  | Pass   |
| Channel 4182(M) | TM3       | 9 kHz<br>~12.75GHz     | 24                 | <- 13 dBm<br>(See appendix D) | - 13 dBm  | Pass   |



|                    |     |                    |    |                               |             |      |
|--------------------|-----|--------------------|----|-------------------------------|-------------|------|
| Channel<br>251(T)  | TM1 | 9 kHz<br>~12.75GHz | 33 | <- 13 dBm<br>(See appendix D) | - 13<br>dBm | Pass |
|                    | TM2 | 9 kHz<br>~12.75GHz | 27 | <- 13 dBm<br>(See appendix D) | - 13<br>dBm | Pass |
| Channel<br>4233(T) | TM3 | 9 kHz<br>~12.75GHz | 24 | <- 13 dBm<br>(See appendix D) | - 13<br>dBm | Pass |

### 6.6.5 Conclusion

The equipment **PASSED** the requirement of this clause.  
For the measurement results refer to appendix D.

## 6.7 Radiated Spurious Emissions

### 6.7.1 Test Conditions

Table 21 Test Conditions

|                      |                                 |
|----------------------|---------------------------------|
| Preconditioning:     | 0.5 hour                        |
| Measured at:         | enclosure                       |
| Ambient temperature: | 25°C                            |
| Relative humidity:   | 55%                             |
| Test Configurations: | TM1/TM2/TM3 at frequency Middle |

### 6.7.2 Test Specifications and Limits

#### 6.7.2.1 Specification

CFR 47 (FCC) part 2.1053 and part 22.917

#### 6.7.2.2 Supporting Standards

Table 22 Supporting Standards:

|                             |                                                                                                                                            |
|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| ANSI/TIA-603-C: 2004        | Land Mobile FM or PM Communications Equipment Measurement and Performance Standards                                                        |
| 3GPP TS51.010 V5.4.0.0:2005 | Digital cellular telecommunications system Mobile Station (MS) conformance specification;                                                  |
| 3GPP TS 34.121 V8.7.0:2009  | Technical Specification Group Radio Access Network; User Equipment (UE) conformance specification; Radio transmission and reception (FDD); |

#### 6.7.2.3 Limits

Compliance with part 22.917, all spurious emission must be attenuated below the transmitter power by at least  $43 + 10 \log_{10} P$ . (Whereas P is the rated power of the EUT).

Table 23 Limits

|                       |                                             |
|-----------------------|---------------------------------------------|
| Rated Power:          | 24 dBm                                      |
| Required attenuation: | $43 + 10 \log (0.25) = 37$ , 24 dBm – 37 dB |
| Absolute level        | - 13 dBm                                    |

### 6.7.3 Test Method and Setup

A test site fulfilling the requirements of ITU-R Recommendation SM329-11 was used. The EUT was placed on a non-conducting support in the anechoic chamber and was operated from a power source via an RF filter to avoid radiation from the power leads.

According to part 22.917, the defined measurement bandwidth as following:

22.917 (b) Measurement procedure: Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater.

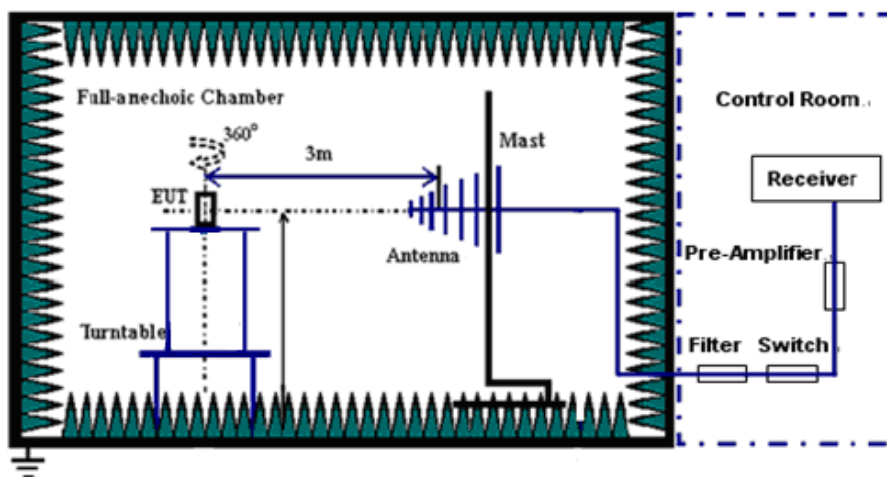
Measurement bandwidth (RBW) for 9 kHz up to 150 kHz: 10 kHz;  
Measurement bandwidth (RBW) for 150 kHz up to 30 MHz: 10 kHz;  
Measurement bandwidth (RBW) for 30MHz up to 1GHz: 100k Hz;  
Measurement bandwidth (RBW) for 1GHz up to 18GHz: 1MHz;

## Test Set-up

### Step 1:

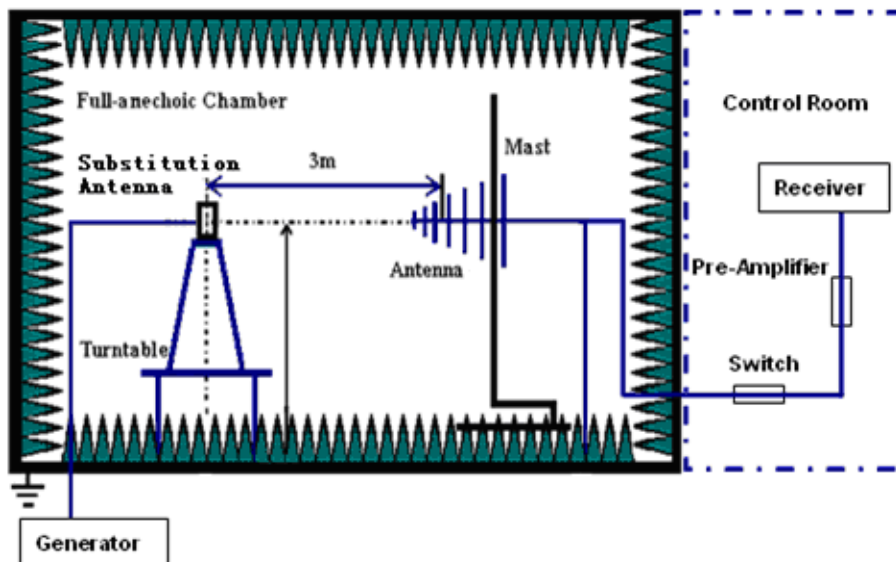
For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, EIRP shall be measured when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in 2.1033(c)(8). Connect the EUT to the BTS simulator via the air interface.

Test the Radiated maximum output power by the Test Receiver from test antenna.



### Step 2:

Use substitution method to verify the maximum output power. The EUT is substituted by a dipole antenna. The dipole is connected to a signal generator. And then adjust the output level of the signal generator to get the same received power recorded in step1 on Test Receiver, and record the power level of Signal Generator. Of course, the cable loss at the test frequency should be compensated.





Test should be performed in normal voltage condition.

No peak found in pre- test. All frequency points' margin is bigger than 20dB, so the substitution method isn't used.

Calculation Sample:

Table 24 Substitution Results

| Freq. [MHz] | Measure ment Value [dBm] | Substitution Antenna Type | Gain [dBd] | Cable Loss [dB] | Signal Generator Level [dBm] | Substitution Level [dBm] | FCC limit [dBm] | Result |
|-------------|--------------------------|---------------------------|------------|-----------------|------------------------------|--------------------------|-----------------|--------|
|             |                          |                           |            |                 |                              |                          |                 |        |

Note: For get the E.R.P. (Efficient Radiated Power) in substitution method, the following formula should take to calculate it,

$$\text{E.R.P. [dBm]} = \text{SGP [dBm]} - \text{Cable Loss [dB]} + \text{Gain [dBd]}$$

NOTE: SGP- Signal Generator Level

#### 6.7.4 Conclusion

The equipment **PASSED** the requirement of this clause.

For the measurement results refer to appendix\_E

## 6.8 Frequency Stability

### 6.8.1 Test Conditions

Table 25 Test Conditions

|                      |                                 |
|----------------------|---------------------------------|
| Preconditioning:     | 0.5 hour                        |
| Measured at:         | Antenna connector               |
| Ambient temperature: | See below                       |
| Relative humidity:   | 55 %                            |
| Test Configurations: | TM1/TM2/TM3 at frequency Middle |

### 6.8.2 Test Specifications and Limits

#### 6.8.2.1 Specification

CFR 47 (FCC) part 2.1055 and part 22.355

#### 6.8.2.2 Supporting Standards

Table 26 Supporting Standards:

|                            |                                                                                                                                            |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| ANSI/TIA-603-C:2004        | Land Mobile FM or PM Communications Equipment Measurement and Performance Standards                                                        |
| 3GPP TS51.010 V5.4.0       | Digital cellular telecommunications system; Mobile Station (MS) conformance specification;                                                 |
| 3GPP TS 34.121 V8.7.0:2009 | Technical Specification Group Radio Access Network; User Equipment (UE) conformance specification; Radio transmission and reception (FDD); |

#### 6.8.2.3 Limits

According to part 22.355, from 821MHz to 896MHz, for mobile device, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances 2.5ppm.

### 6.8.3 Test Method and Setup

The frequency stability shall be measured with variation of ambient temperature as follows:

- (1) From -30 ° to +50 ° centigrade for all equipment except that specified in subparagraphs
- (2) and (3) of paragraph 2.1055

(a) Frequency measurements shall be made at the extremes of the specified temperature range and at intervals of not more than 10° centigrade through the range. A period of time sufficient to stabilize all of the components of the oscillator circuit at each temperature level shall be allowed prior to frequency measurement. The short-term transient effects on the frequency of the transmitter due to keying (except for broadcast transmitters) and any heating element cycling normally occurring at each ambient temperature level also shall be shown. Only the portion or portions of the transmitter containing the frequency determining and stabilizing circuitry need be subjected to the temperature variation test.

(b) The frequency stability shall be measured with variation of primary supply voltage as follows:

- (1) Vary primary supply voltage from 95 to 115 percent of the nominal value for other than hand carried battery equipment.
- (2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery

operating end point, which shall be specified by the manufacturer.

(3) The supply voltage shall be measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided. Effects on frequency of transmitter keying (except for broadcast transmitters) and any heating element cycling at the nominal supply voltage and at each extreme also shall be shown.

(c) When deemed necessary, the Commission may require tests of frequency stability under conditions in addition to those specifically set out in paragraphs (a), (b), (c) of this section. (For example, measurements showing the effect of proximity to large metal objects, or of various types of antennas, may be required for portable equipment.)

## Test Set up

Connect the EUT to the Wireless Communication test set CMU200 via the connector. Then measure the frequency error by the Wireless Communication test set CMU200. The EUT's output is matched with a 50  $\Omega$  load.

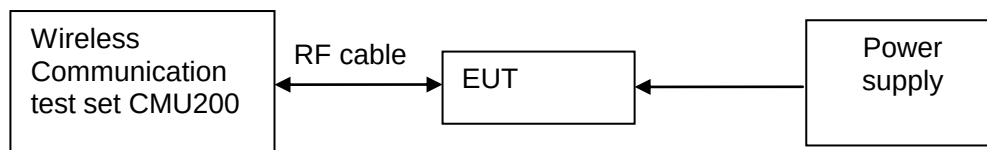


Figure 7. Test Set-up

## 6.8.4 Measurement Results

### 6.8.4.1 Measurement Results vs. Variation of Temperature

#### ● TM1,5V DC Channel No.192(837.0MHz)

Table 1 Measurement Results vs. Variation of Temperature – TM1

| Temperature | Nominal Frequency<br>(MHz) | Measured Frequency Error(Hz) | Result |
|-------------|----------------------------|------------------------------|--------|
| -30 °C      | 837.0                      | -28                          | Pass   |
| -20 °C      | 837.0                      | 15                           | Pass   |
| -10 °C      | 837.0                      | -12                          | Pass   |
| 0 °C        | 837.0                      | -14                          | Pass   |
| +10 °C      | 837.0                      | 8                            | Pass   |
| +20 °C      | 837.0                      | -14                          | Pass   |
| +30 °C      | 837.0                      | -7                           | Pass   |
| +40 °C      | 837.0                      | 9                            | Pass   |
| +50 °C      | 837.0                      | -18                          | Pass   |

Table 27

● **TM2,5V DC Channel No.192(837.0MHz)**

Table 2 Measurement Results vs. Variation of Temperature—TM2

| Temperature | Nominal Frequency<br>(MHz) | Measured<br>Frequency Error(Hz) | Result |
|-------------|----------------------------|---------------------------------|--------|
| -30 °C      | 837.0                      | -26                             | Pass   |
| -20 °C      | 837.0                      | 9                               | Pass   |
| -10 °C      | 837.0                      | -19                             | Pass   |
| 0 °C        | 837.0                      | -14                             | Pass   |
| +10 °C      | 837.0                      | 15                              | Pass   |
| +20 °C      | 837.0                      | -11                             | Pass   |
| +30 °C      | 837.0                      | 15                              | Pass   |
| +40 °C      | 837.0                      | -10                             | Pass   |
| +50 °C      | 837.0                      | 8                               | Pass   |

● **TM3,5V DC Channel No.4182(836.4MHz)**

Table 3 Measurement Results vs. Variation of Temperature—TM3

| Temperature | Nominal Frequency<br>(MHz) | Measured<br>Frequency Error(Hz) | Result |
|-------------|----------------------------|---------------------------------|--------|
| -30 °C      | 836.4                      | -30                             | Pass   |
| -20 °C      | 836.4                      | 10                              | Pass   |
| -10 °C      | 836.4                      | -12                             | Pass   |
| 0 °C        | 836.4                      | -11                             | Pass   |
| +10 °C      | 836.4                      | 12                              | Pass   |
| +20 °C      | 836.4                      | -10                             | Pass   |
| +30 °C      | 836.4                      | -11                             | Pass   |
| +40 °C      | 836.4                      | 6                               | Pass   |
| +50 °C      | 836.4                      | -19                             | Pass   |

**6.8.4.2 Measurement Results vs. Variation of Voltage**

● **TM1, 25 °C ,Channel No. 192(837.0MHz)**

Table 4 Measurement Results vs. Variation of Voltage—TM1

| Voltage | Nominal Frequency (MHz) | Measured Frequency Error(Hz) | Result |
|---------|-------------------------|------------------------------|--------|
| +5.8V   | 837.0                   | -21                          | Pass   |
| +5V     | 837.0                   | -26                          | Pass   |
| +4.3V   | 837.0                   | -23                          | Pass   |

● **TM2, 25 °C ,Channel No. 192(837.0MHz)**

Table 5 Measurement Results vs. Variation of Voltage – TM2

| Voltage | Nominal Frequency (MHz) | Measured Frequency Error(Hz) | Result |
|---------|-------------------------|------------------------------|--------|
| +5.8V   | 837.0                   | -32                          | Pass   |
| +5V     | 837.0                   | -35                          | Pass   |
| +4.3V   | 837.0                   | -28                          | Pass   |

● **TM3, 25 °C ,Channel No. 4182(836.4MHz)**

Table 6 Measurement Results vs. Variation of Voltage – TM3

| Voltage | Nominal Frequency (MHz) | Measured Frequency Error(Hz) | Result |
|---------|-------------------------|------------------------------|--------|
| +5.8V   | 836.4                   | 5                            | Pass   |
| +5V     | 836.4                   | -12                          | Pass   |
| +4.3V   | 836.4                   | -7                           | Pass   |

### 6.8.5 Conclusion

The equipment **PASSED** the requirement of this clause.



## 7 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 as following:

Table 28 System Measurement Uncertainty

| Items                                           |                         | Extended Uncertainty |
|-------------------------------------------------|-------------------------|----------------------|
| Effective Radiated Power of Transmitter         | ERP (dBm)               | U=3dB; k=2           |
| Band Width                                      | Magnitude (%)           | U=0.2%; k=2          |
| Band Edge Compliance                            | Disturbance Power(dBm)  | U=2.0dB; k=2         |
| Conducted Spurious Emission at Antenna Terminal | Disturbance Power(dBm)  | U=2.0dB; k=2         |
| Frequency Stability                             | Frequency Accuracy(ppm) | U=0.21ppm; k=2       |
| Field Strength of Spurious Radiation            | ERP(dBm)                | U=2.2dB; k=2         |



## 8 Appendices

|            |                                                           |          |
|------------|-----------------------------------------------------------|----------|
| Appendix A | Measurement Results Modulation Characteristics            | 4 pages  |
| Appendix B | Measurement Results Occupied Bandwidth                    | 10Pages  |
| Appendix C | Measurement Results Band Edges                            | 7 Pages  |
| Appendix D | Measurement Results Spurious Emission at Antenna Terminal | 37 Pages |
| Appendix E | Measurement Results Radiated Spurious Emissions           | 16 Pages |
| Appendix F | Photos of Radiated Spurious Emissions                     | 4 Pages  |

(END OF REPORT)



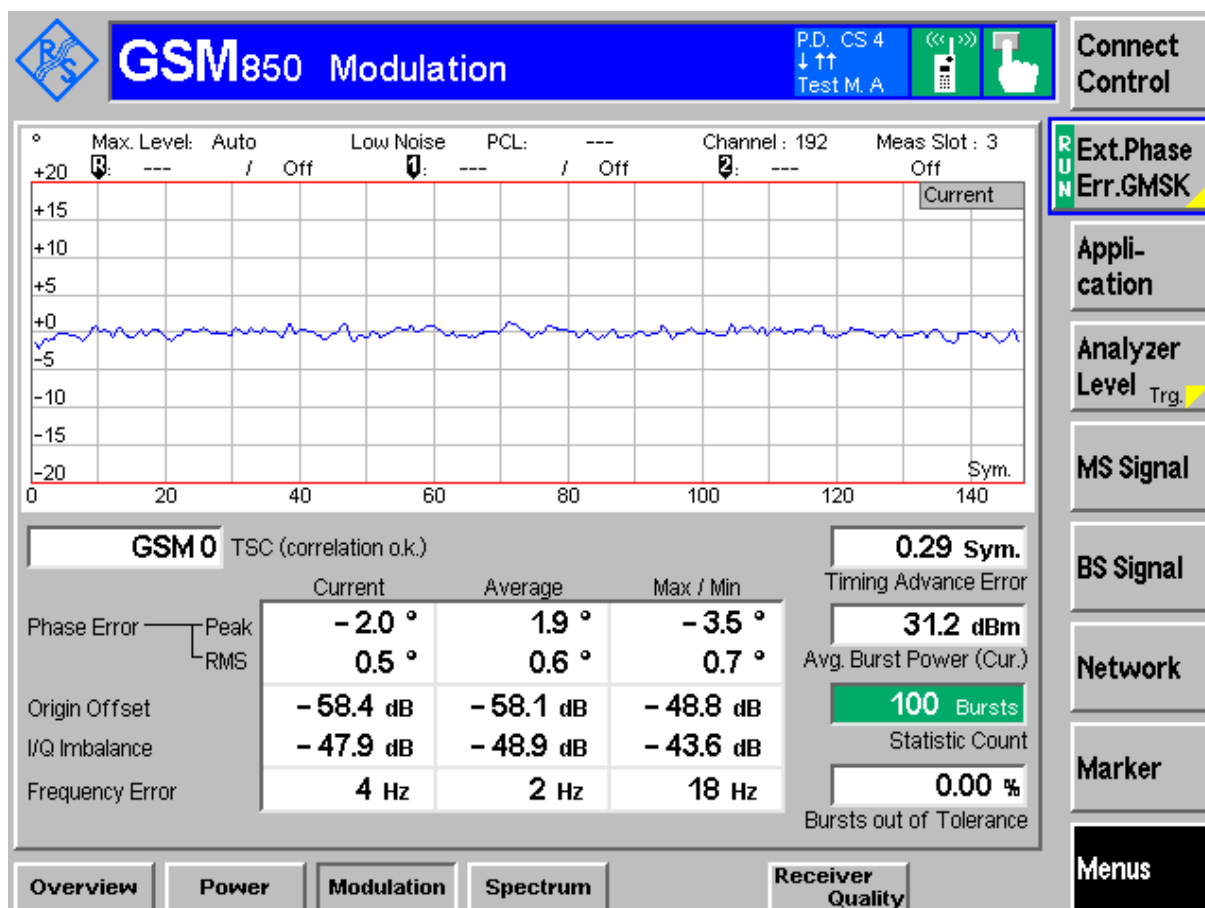
# **Appendix A**

## **Modulation Characteristics**

According to FCC Part 2.1047 & Part22 Subpart H

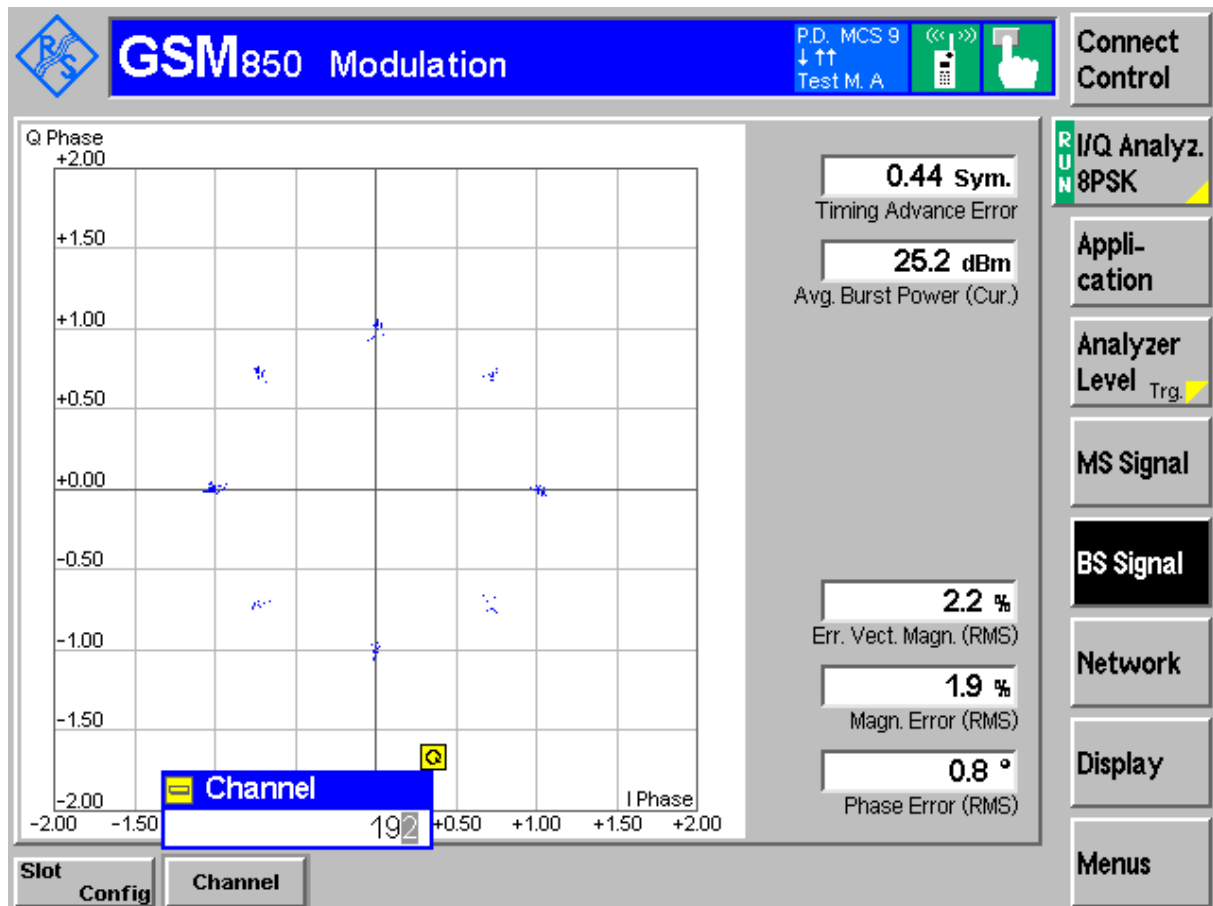


## TM1:GPRS/GSM Channel 192



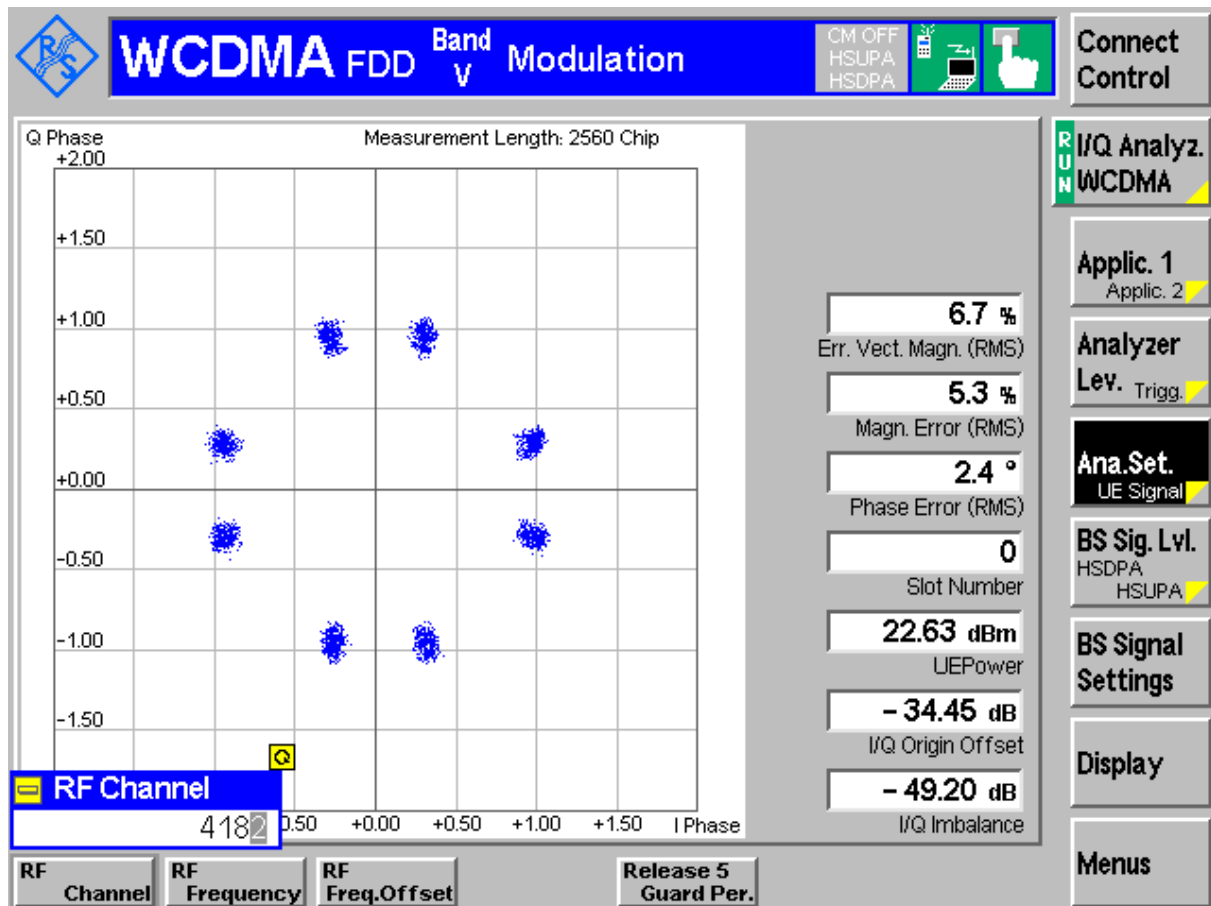


## TM2:EDGE Channel 192





## TM3:WCDMA Channel 4132



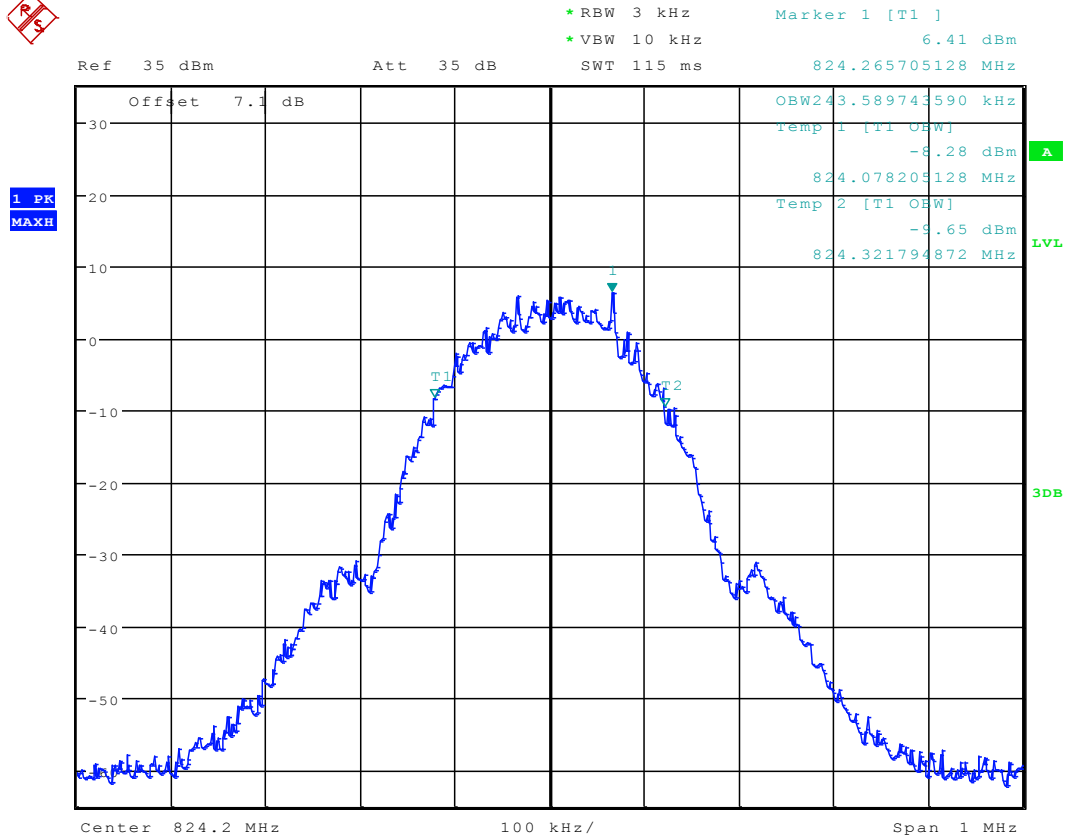


## **Appendix B**

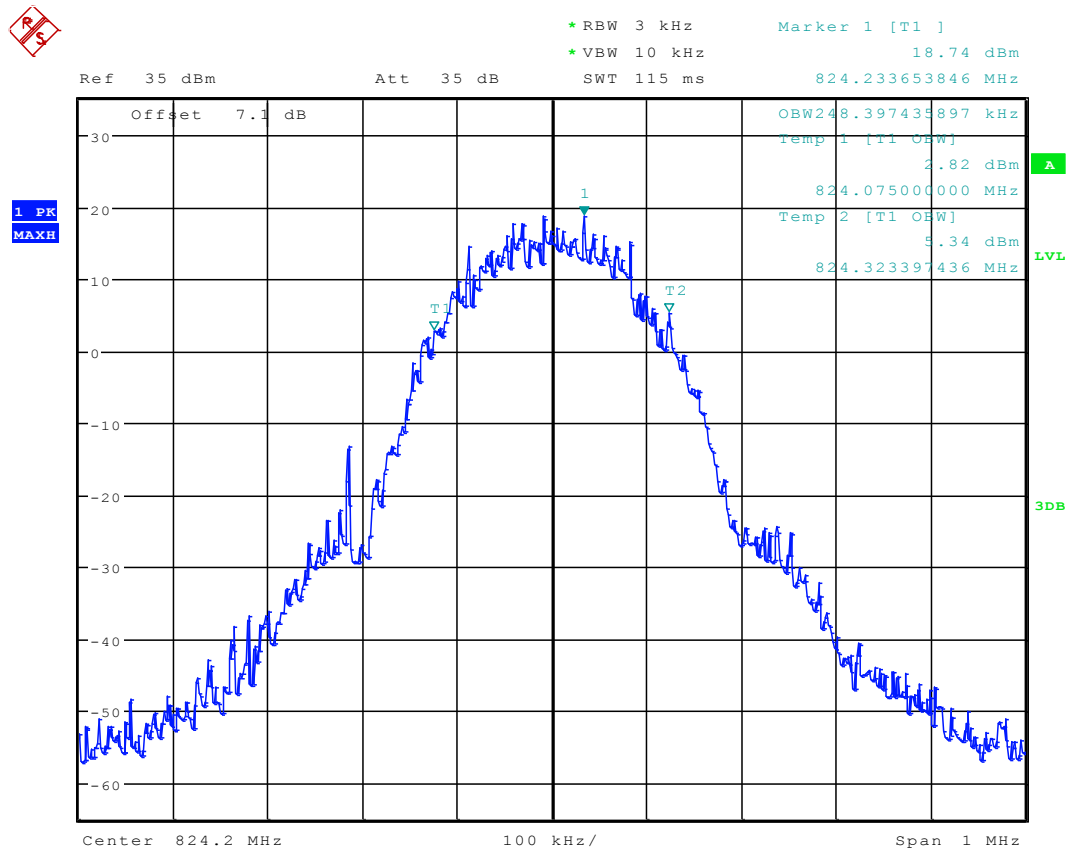
### **Occupied Bandwidth** According to FCC Part 2.1049 & Part 22 Subpart H



## TM1:GPRS/GSM Channel 128

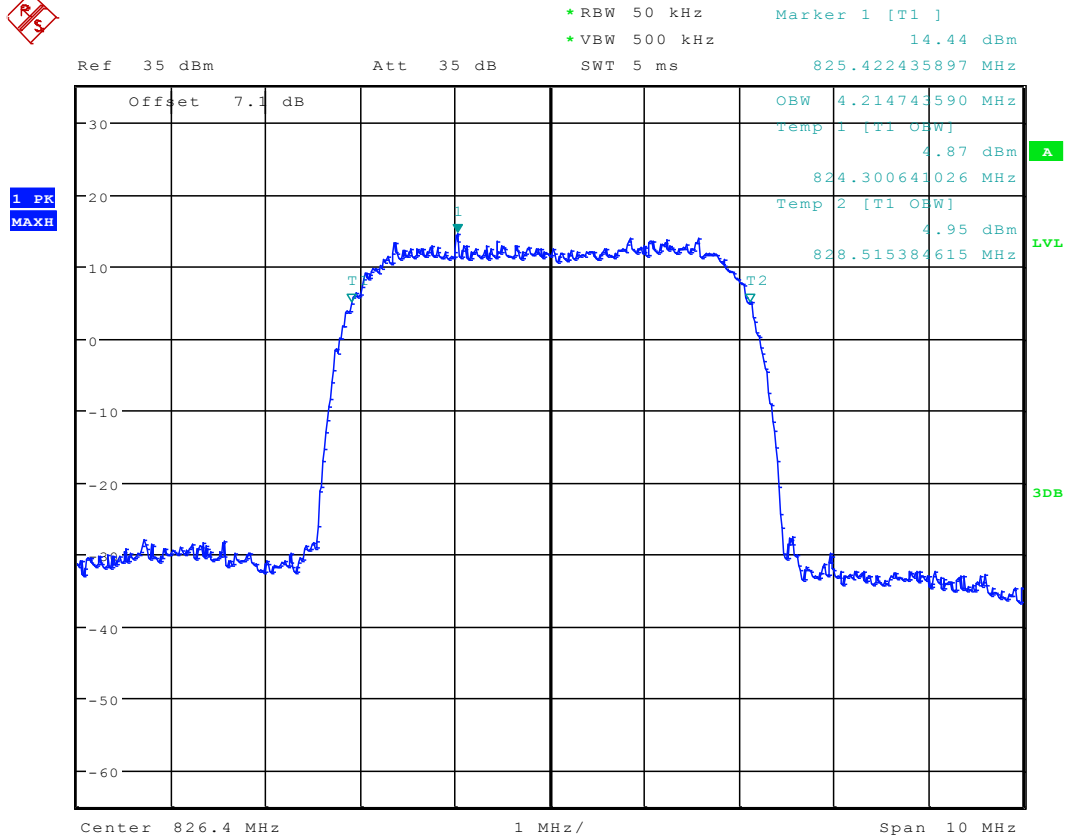


TM2:EDGE  
Channel 128



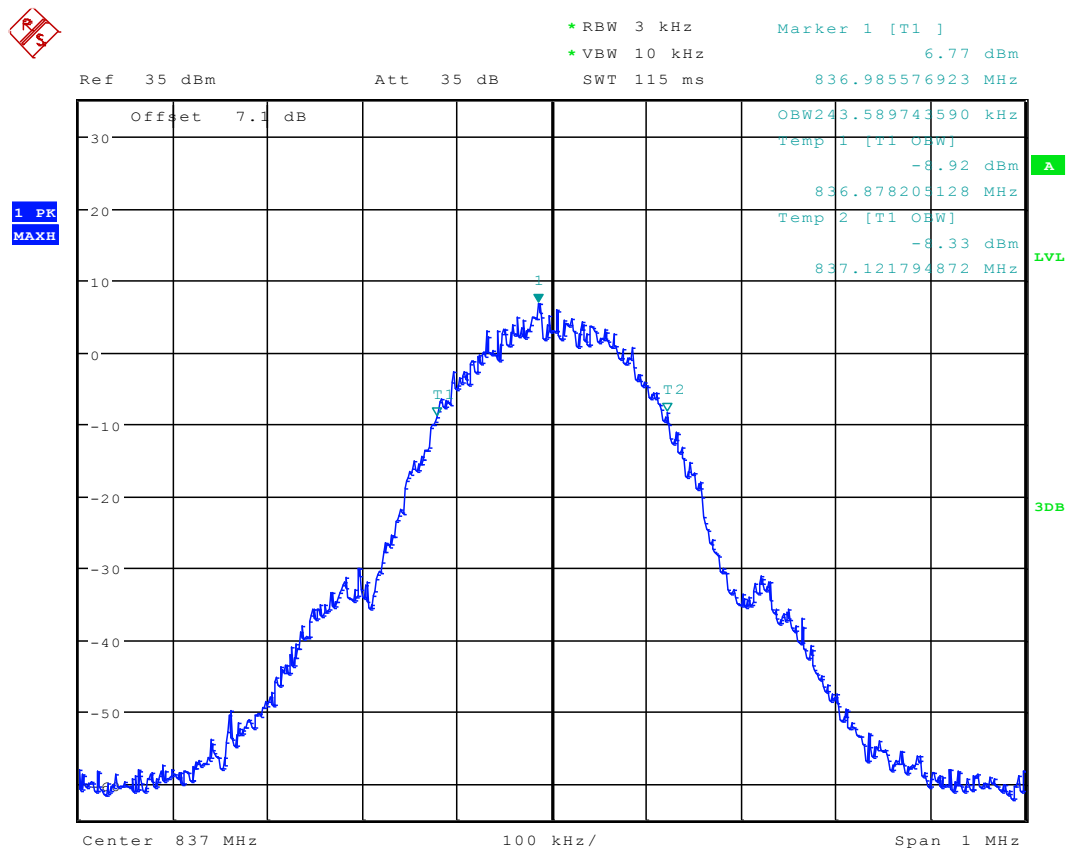


## TM3: WCDMA Channel 4132



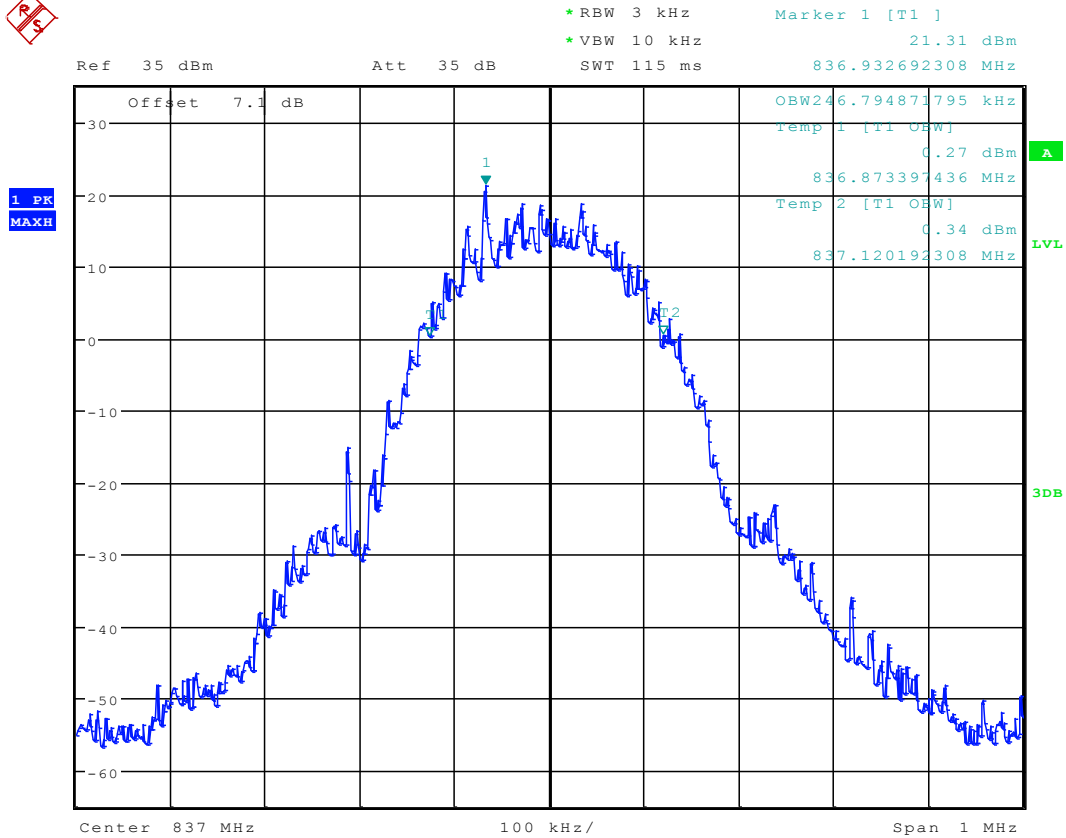


TM1:GPRS/GSM  
Channel 192



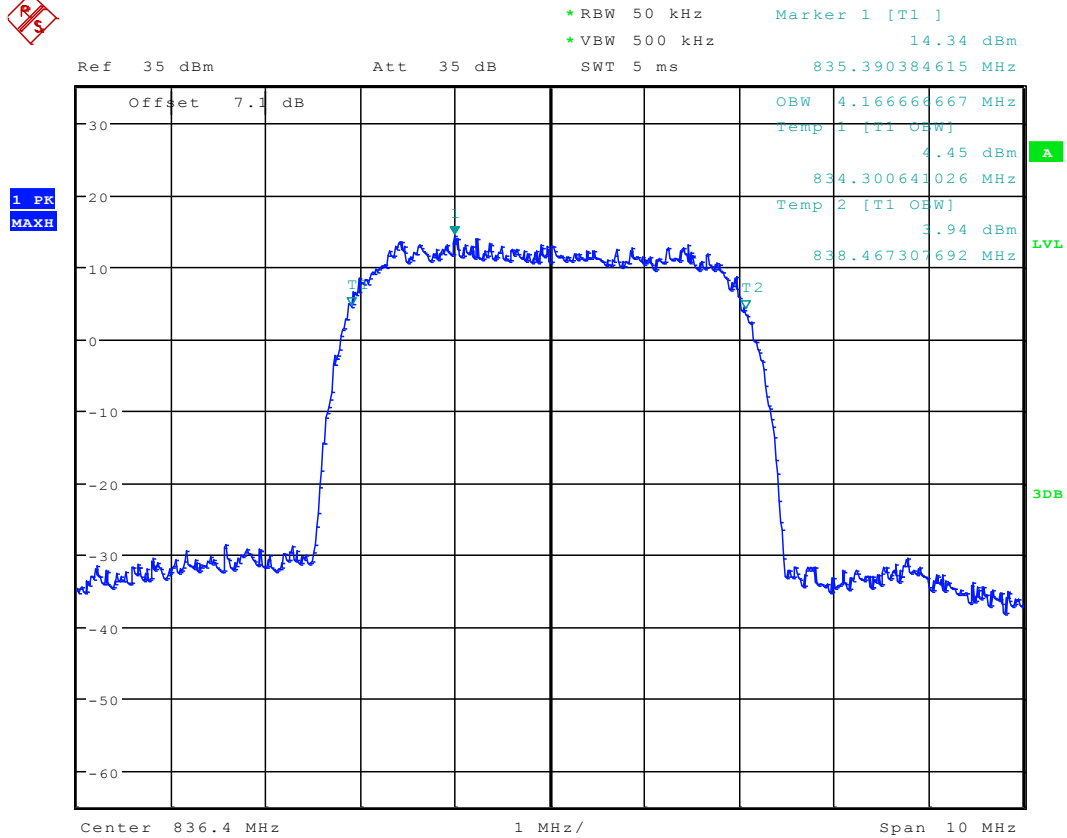


## TM2:EDGE Channel 192



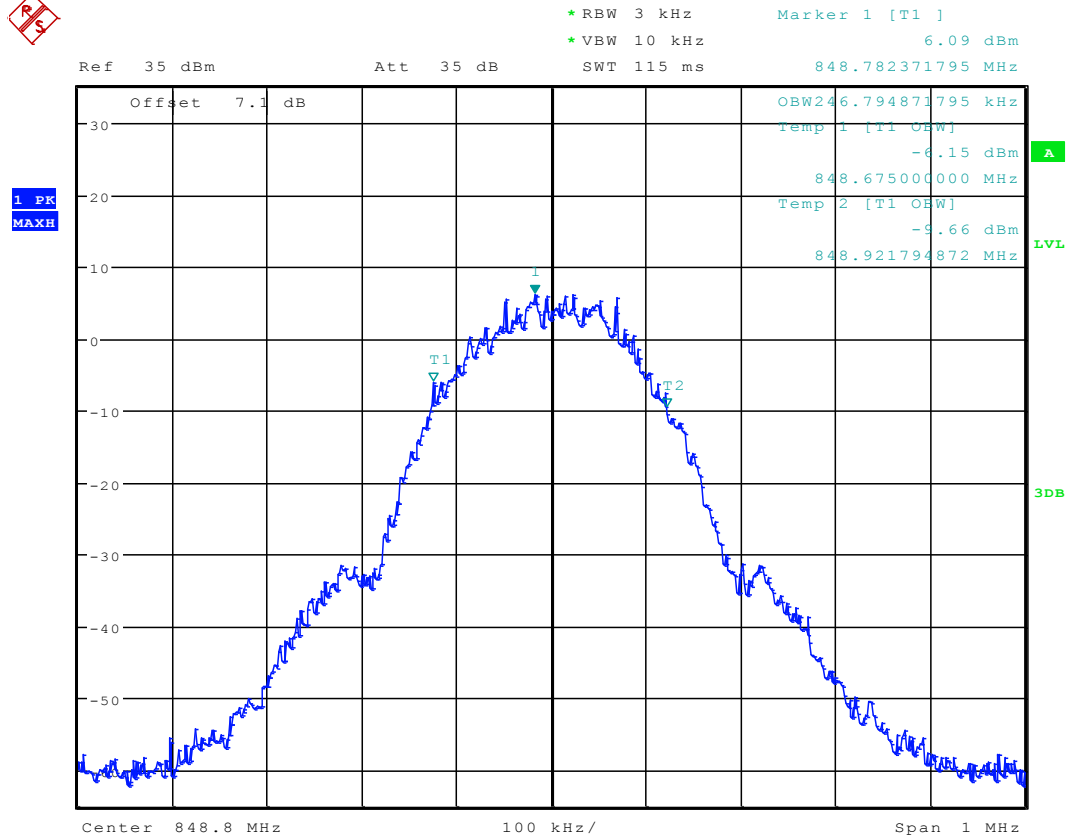


## TM3: WCDMA Channel 4182



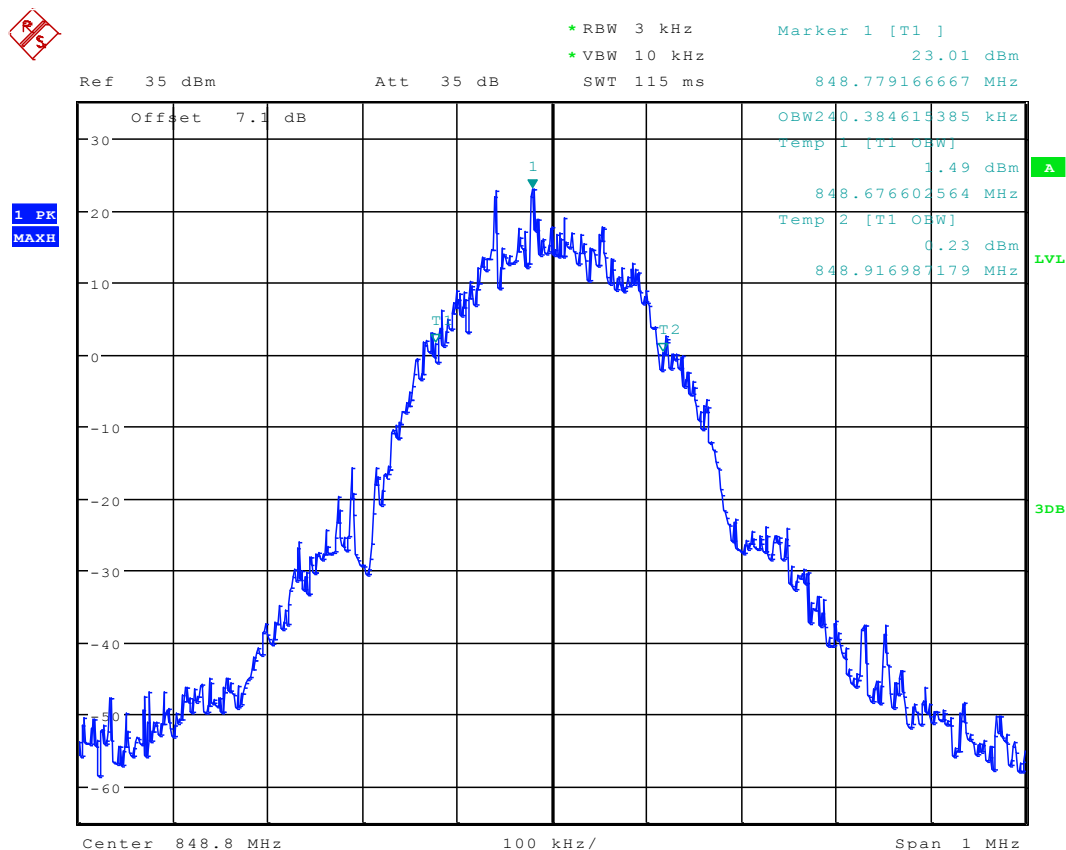


## TM1:GPRS/GSM Channel 251



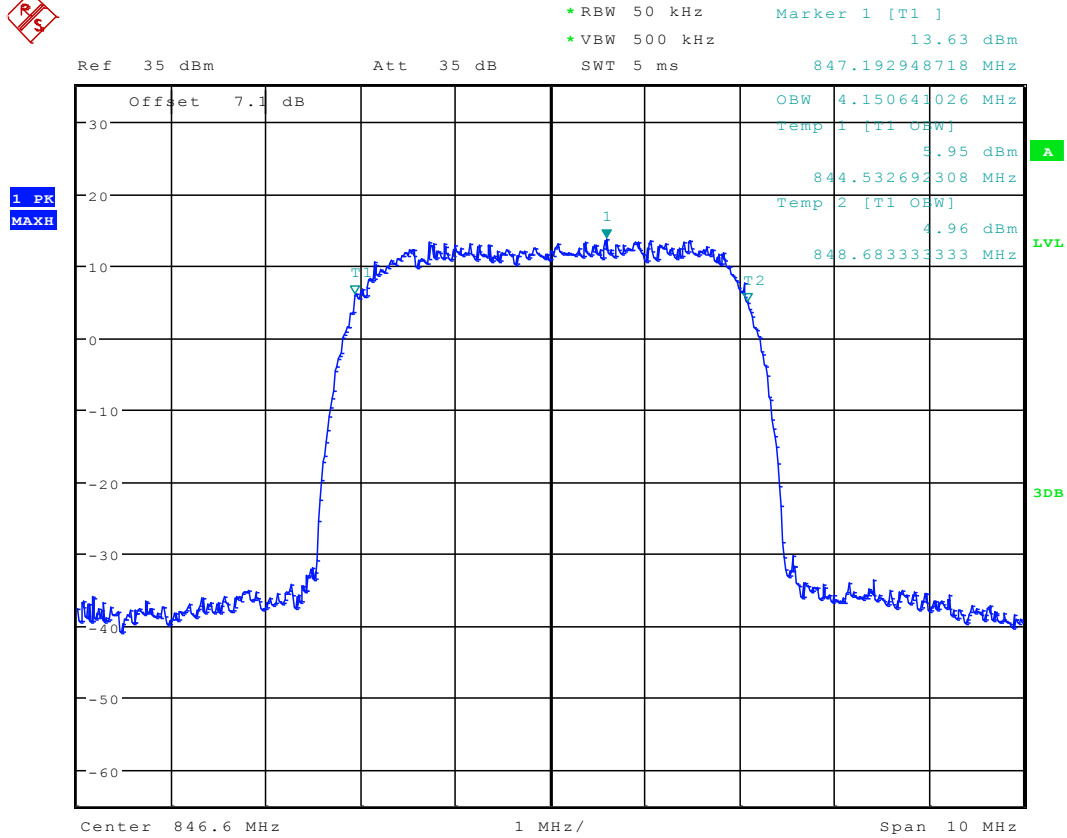


TM2:EDGE  
Channel 251





## TM3: WCDMA Channel 4233





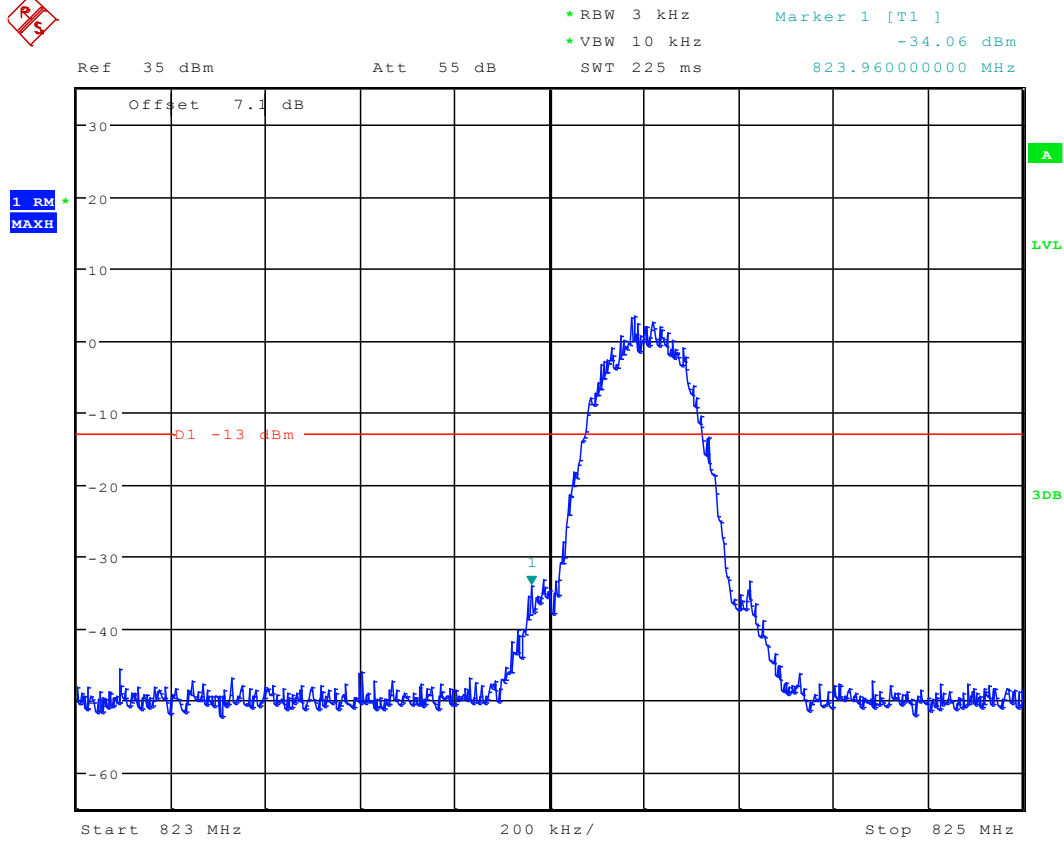
## Appendix C

### Band Edges Compliance According to FCC Part 2.1051 & 22.917



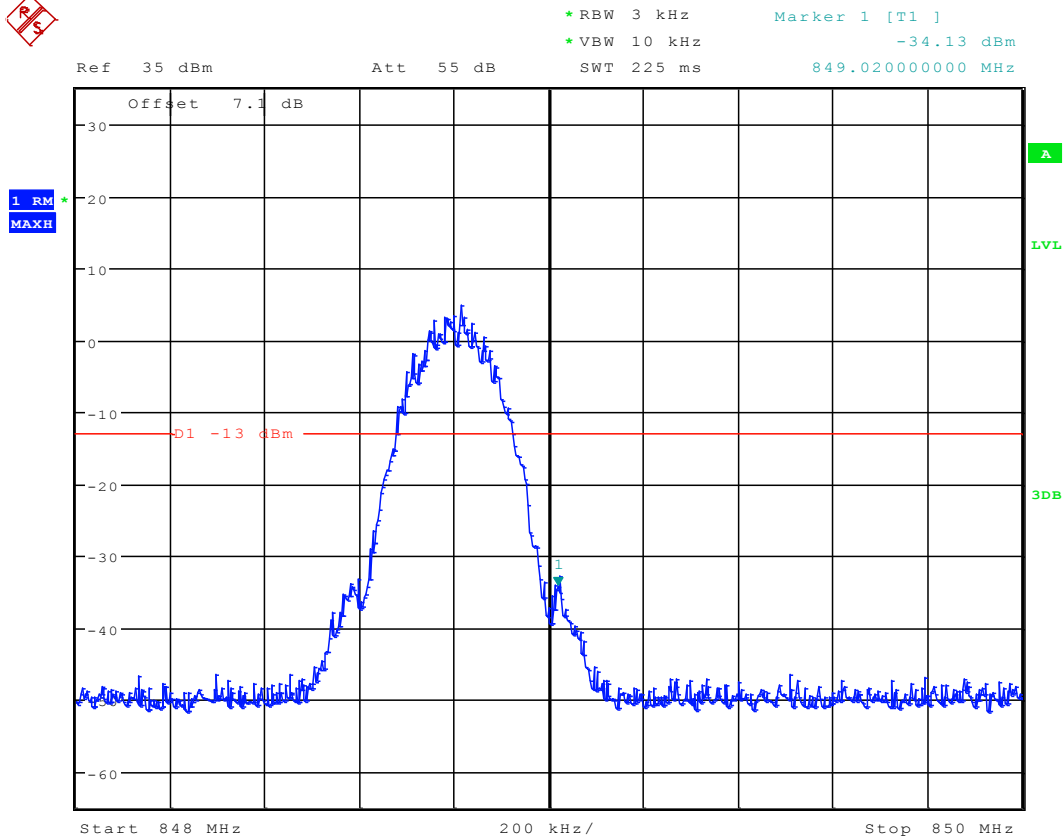
## TM1:GPRS/GSM

### Left Edge Channel 128



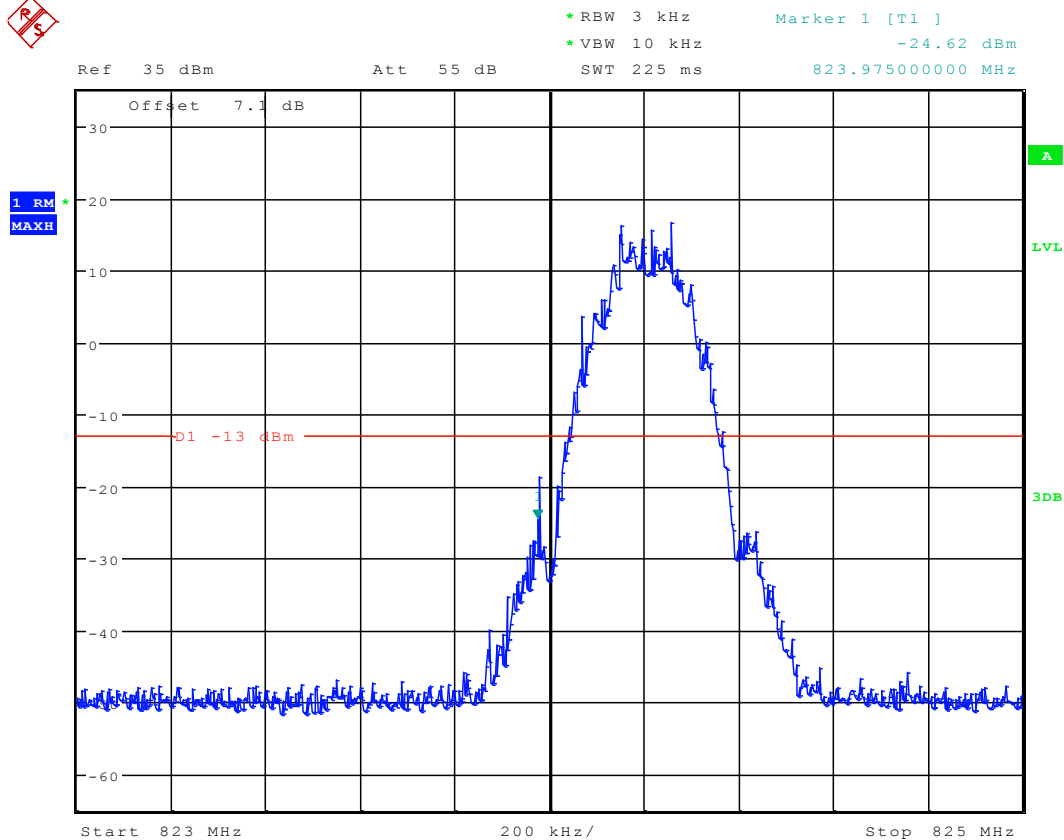


## Right Edge Channel 251



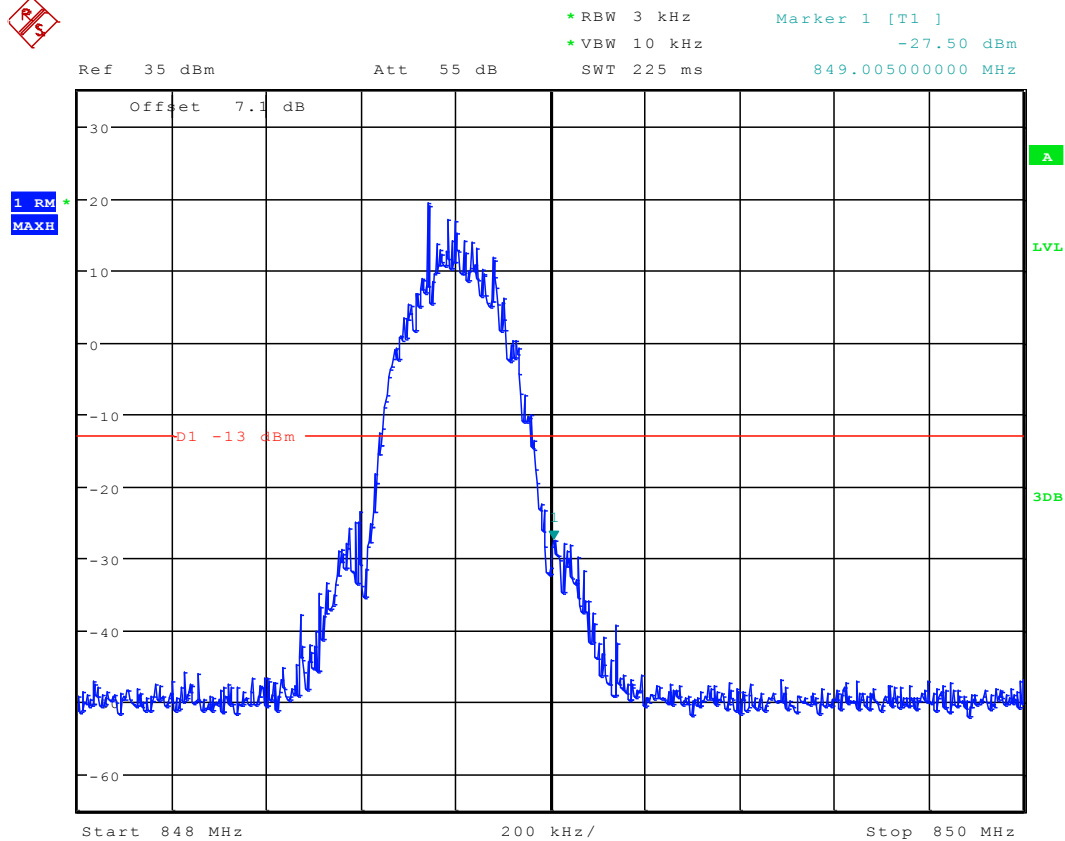


## TM2:EDGE Left Edge Channel 128





## Right Edge Channel 251

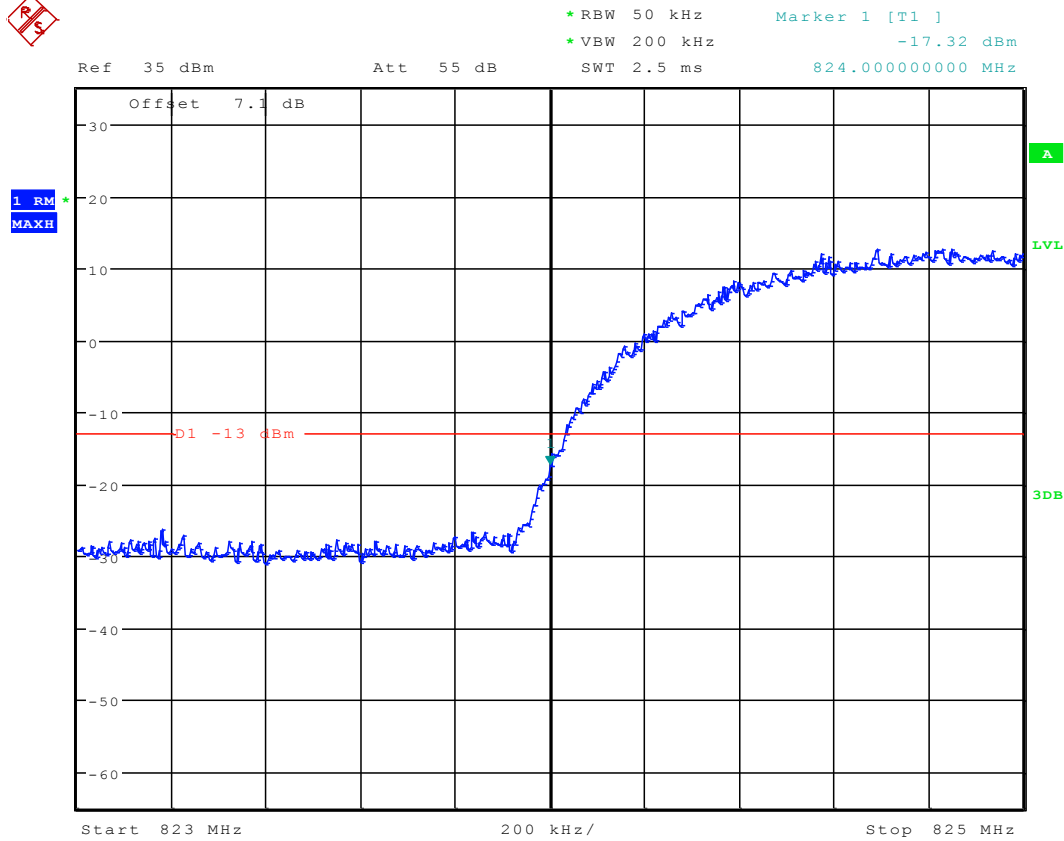




## TM3: WCDMA

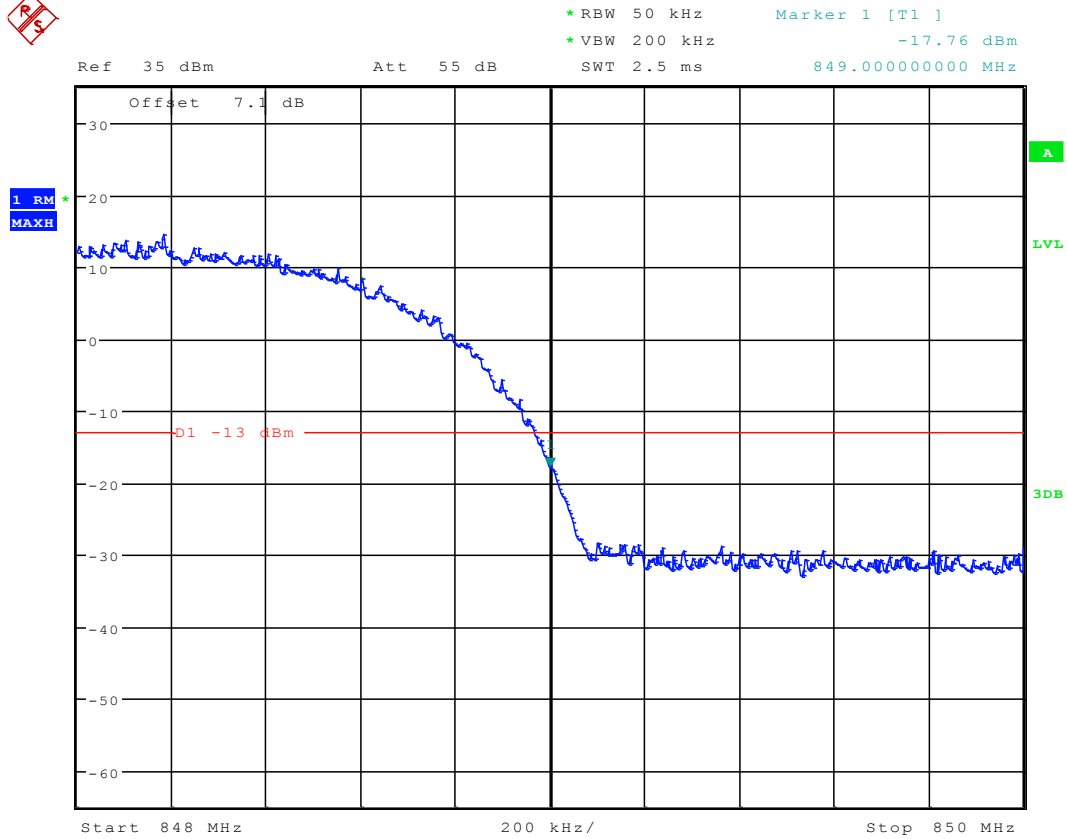
### Left dge

### Channel 4132





## Right Edge Channel 4233





## **Appendix D**

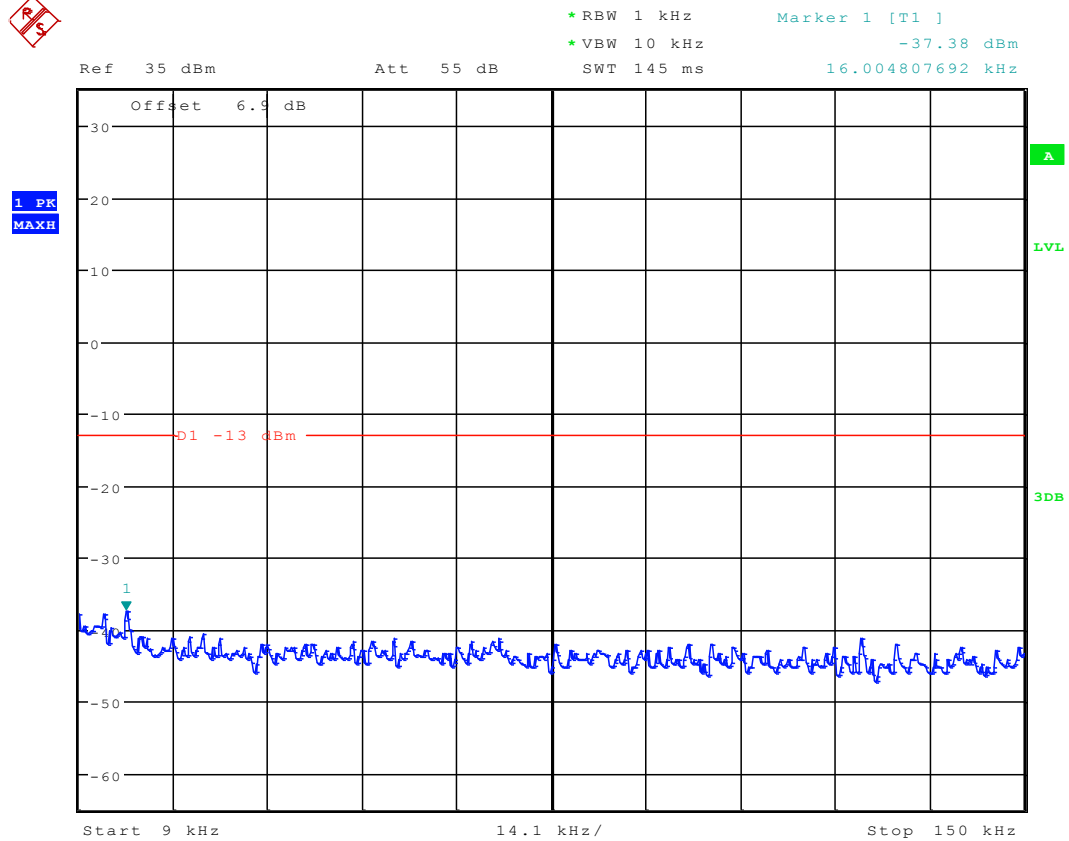
# Spurious Emission at Antenna Terminal

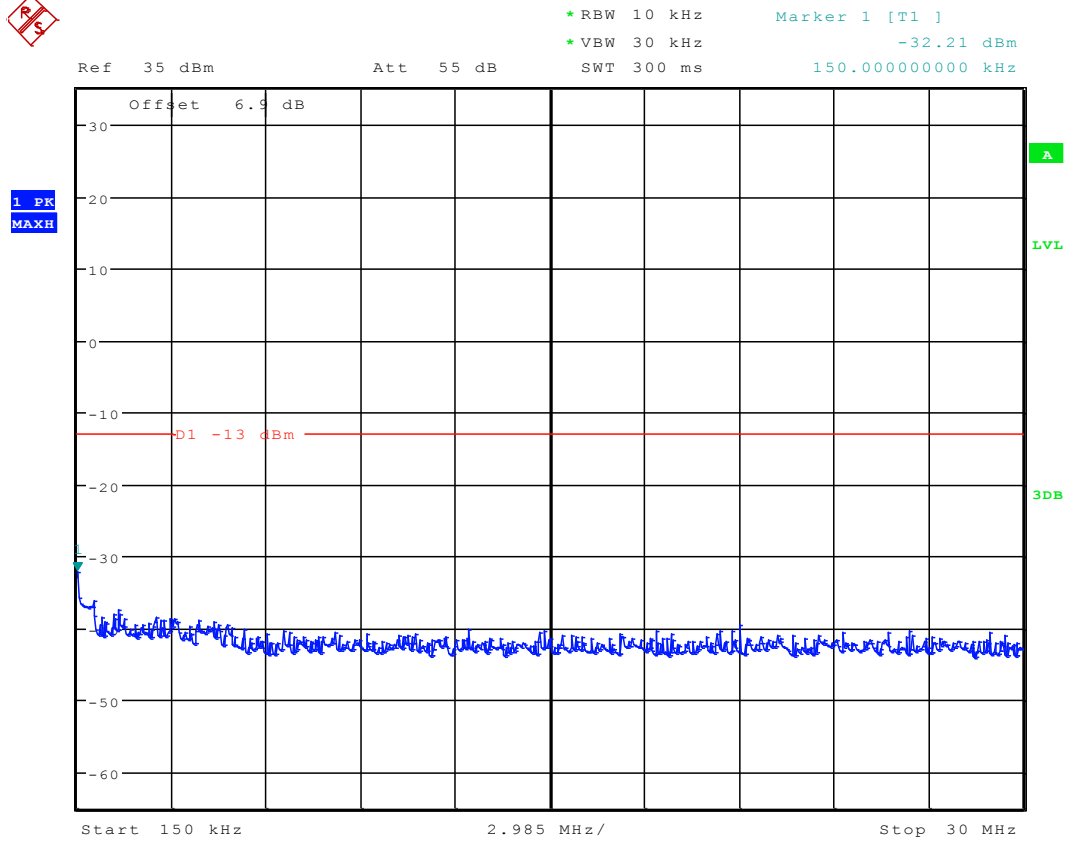
According to FCC Part 2.1051 & 22.917



## TM1:GPRS/GSM

### Channel 128

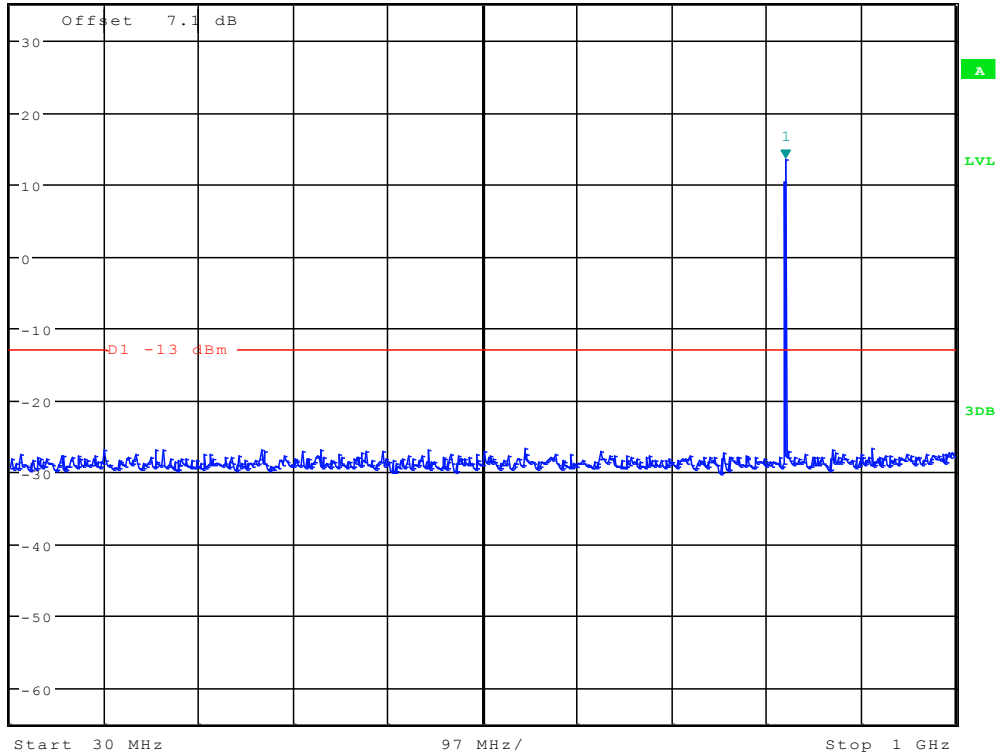






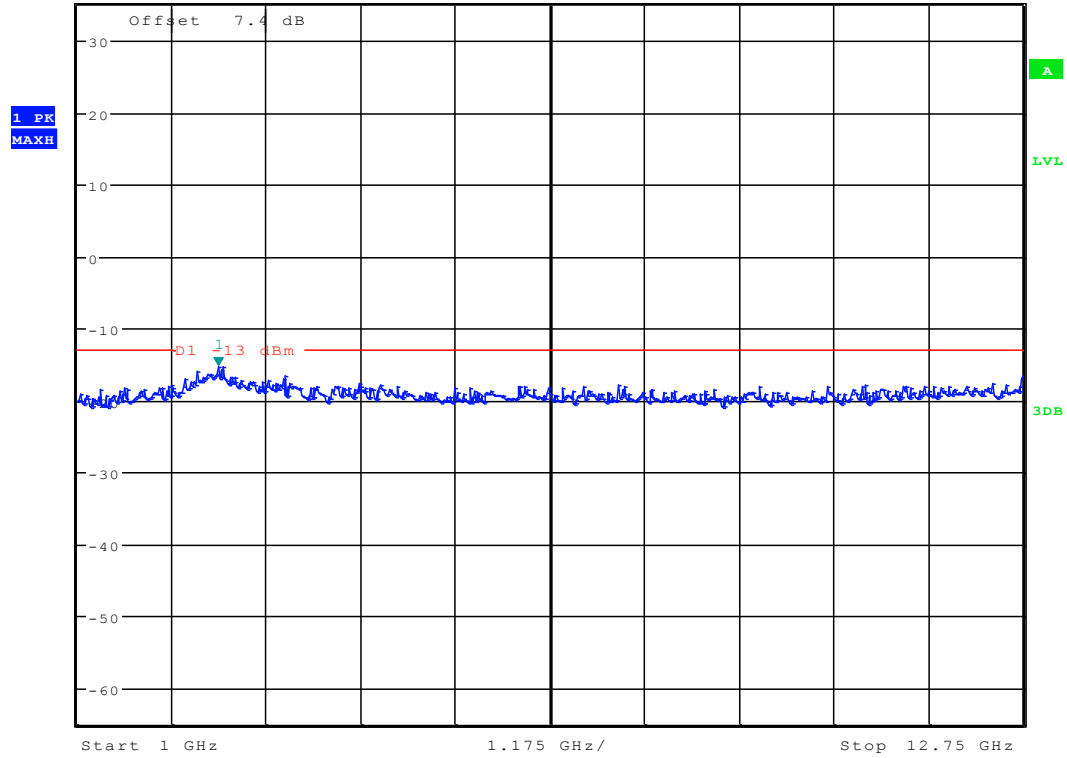
\* RBW 100 kHz      Marker 1 [T1 ]  
\* VBW 300 kHz      13.51 dBm  
Ref 35 dBm      Att 55 dB      SWT 100 ms      825.897435897 MHz

1 PR  
MAXH



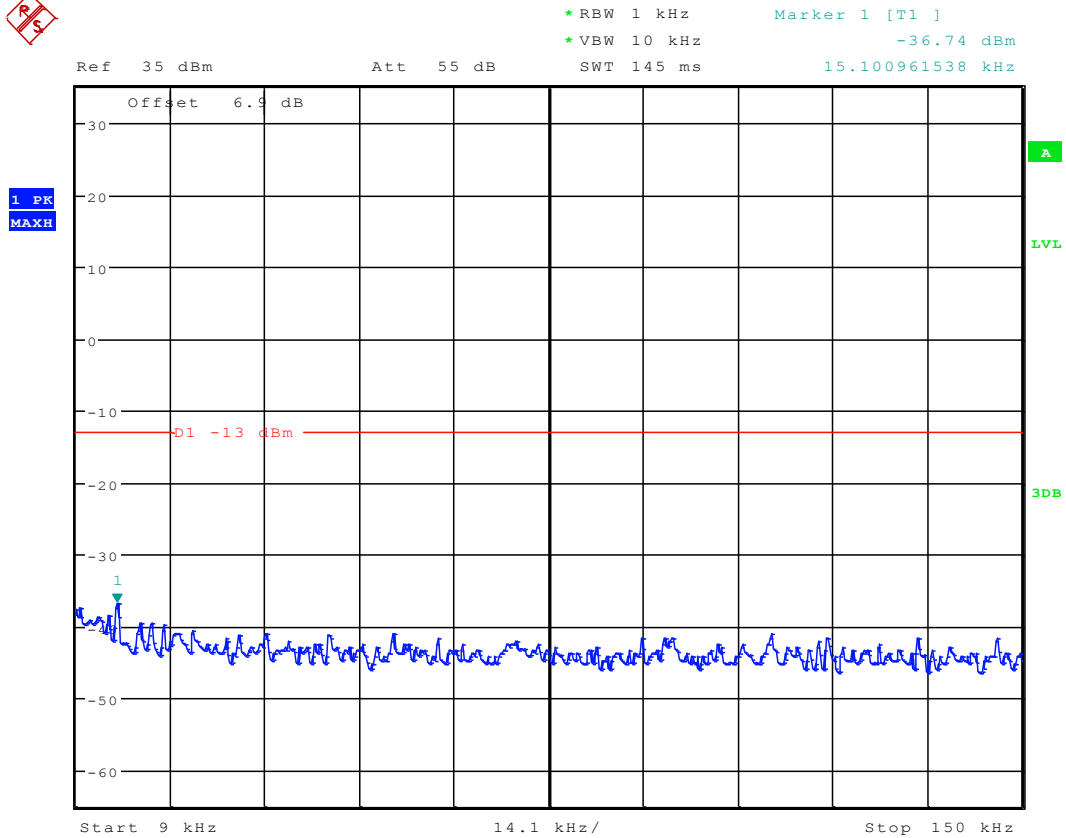


\* RBW 1 MHz      Marker 1 [T1 ]  
\* VBW 3 MHz      -15.25 dBm  
Ref 35 dBm      Att 55 dB      SWT 70 ms      2.751201923 GHz



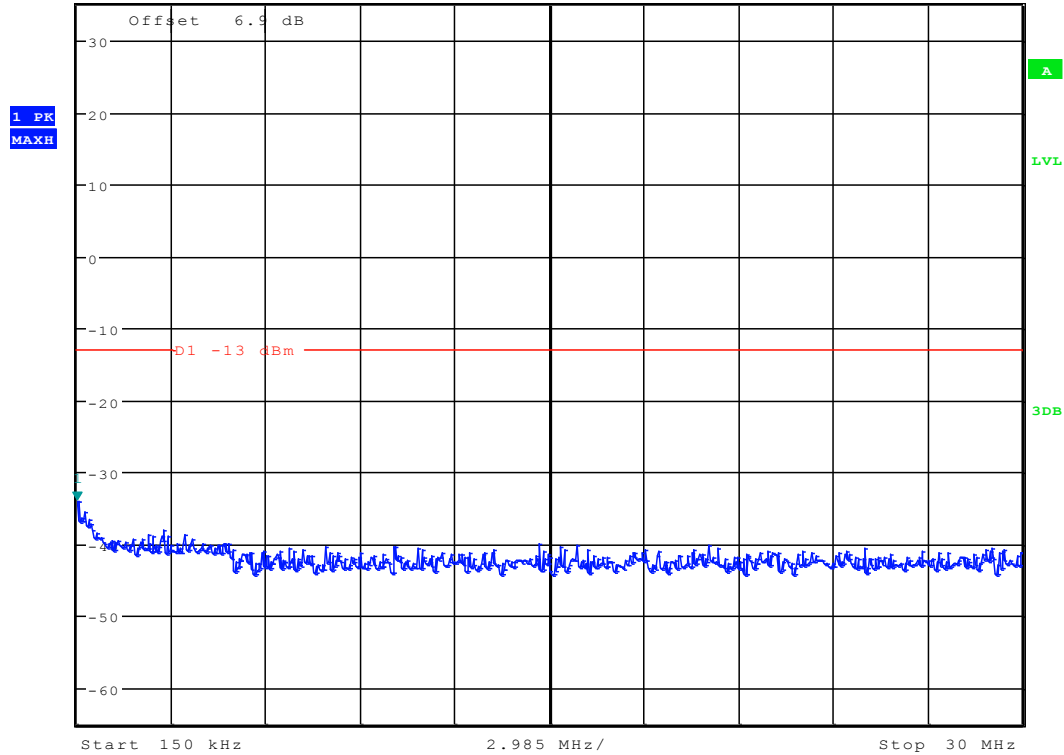


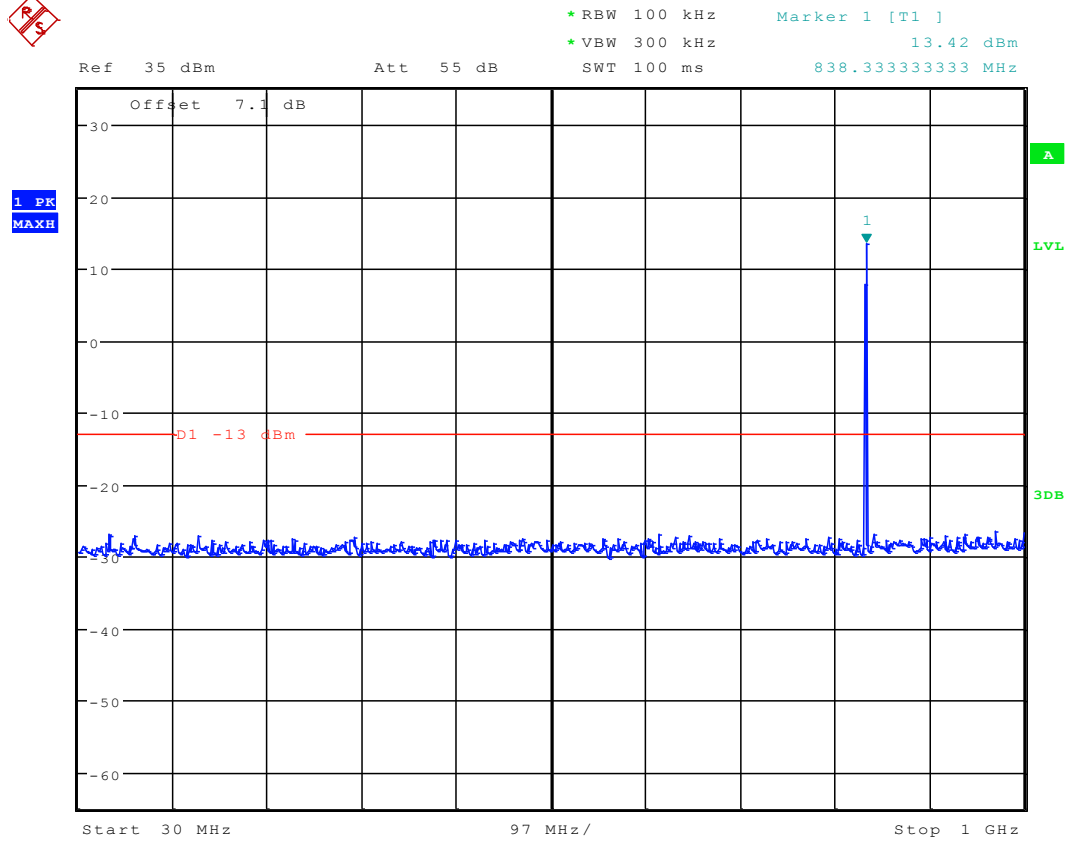
## Channel 192





\*RBW 10 kHz      Marker 1 [T1 ]  
\*VBW 30 kHz      -34.02 dBm  
Ref 35 dBm      Att 55 dB      SWT 300 ms      150.000000000 kHz

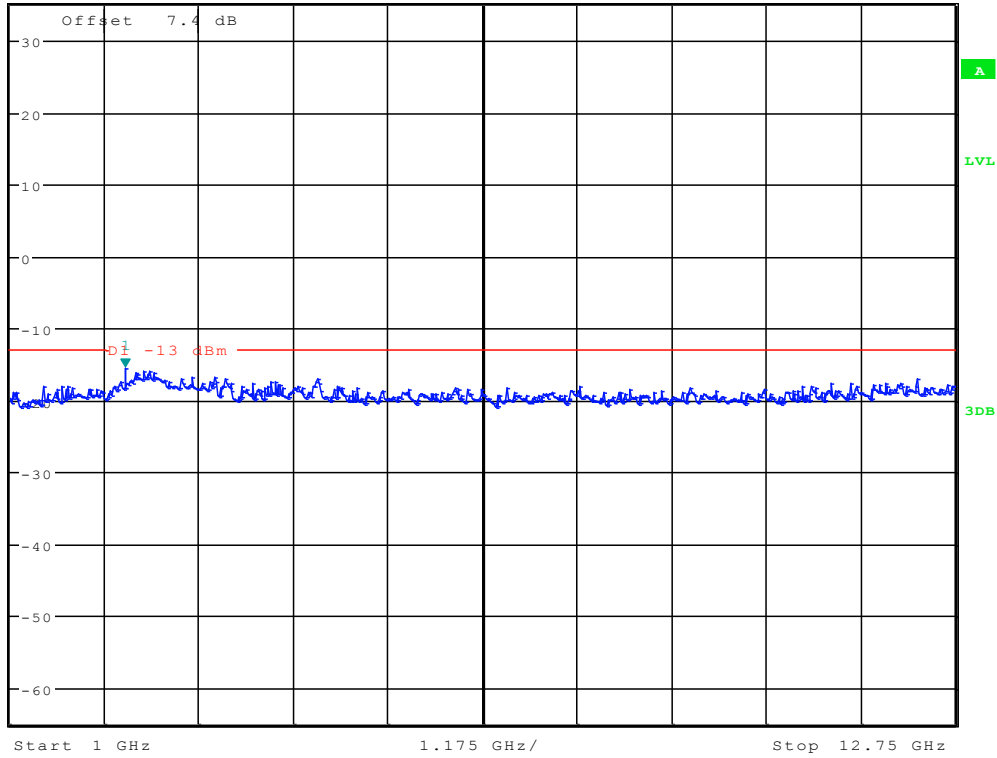






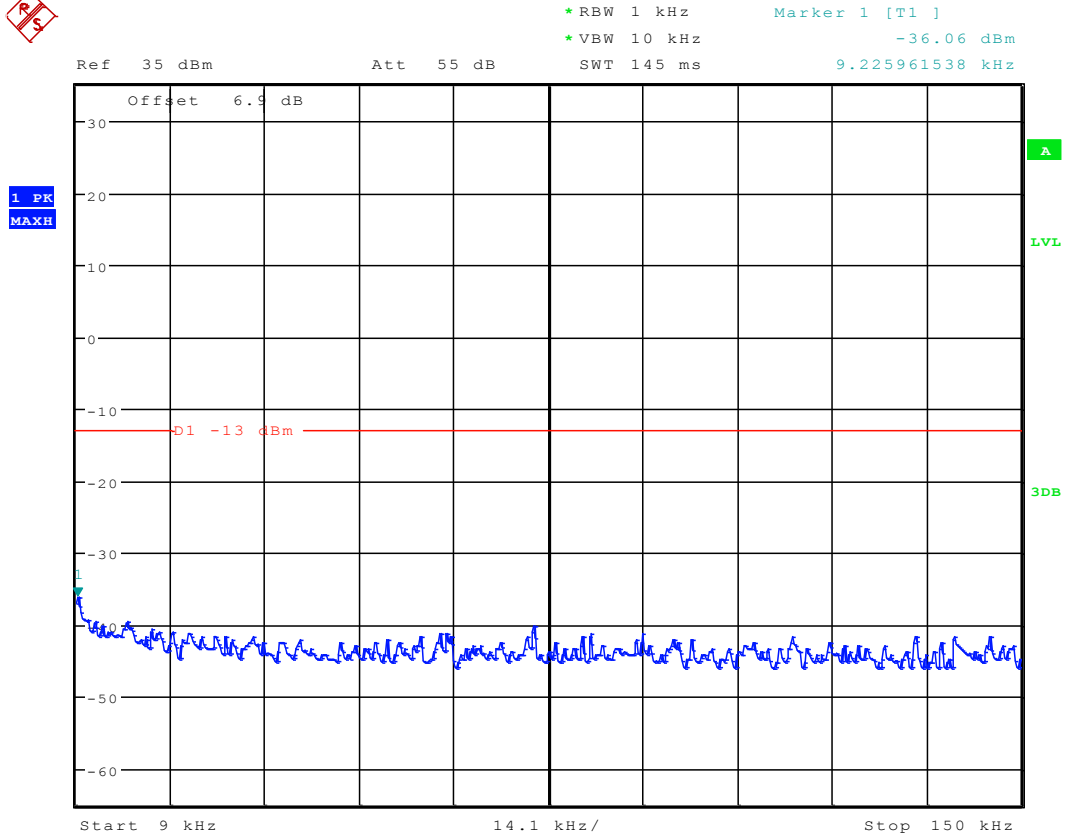
\* RBW 1 MHz      Marker 1 [T1 ]  
\* VBW 3 MHz      -15.61 dBm  
Ref 35 dBm      Att 55 dB      SWT 70 ms      2.431089744 GHz

1 PK  
MAXH





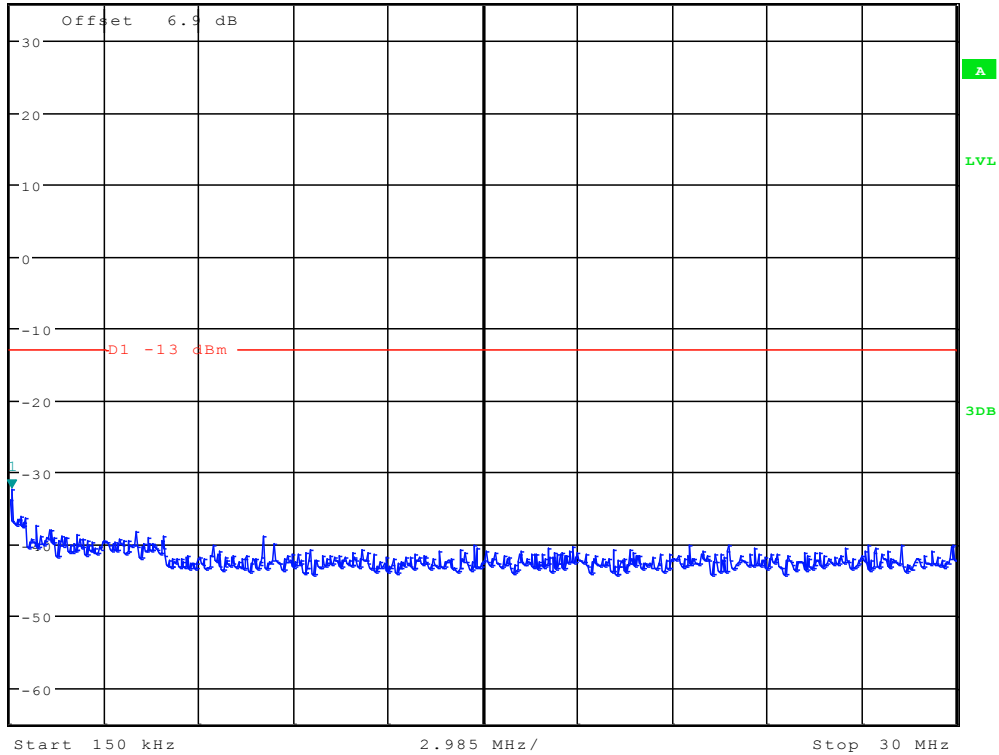
## Channel 251

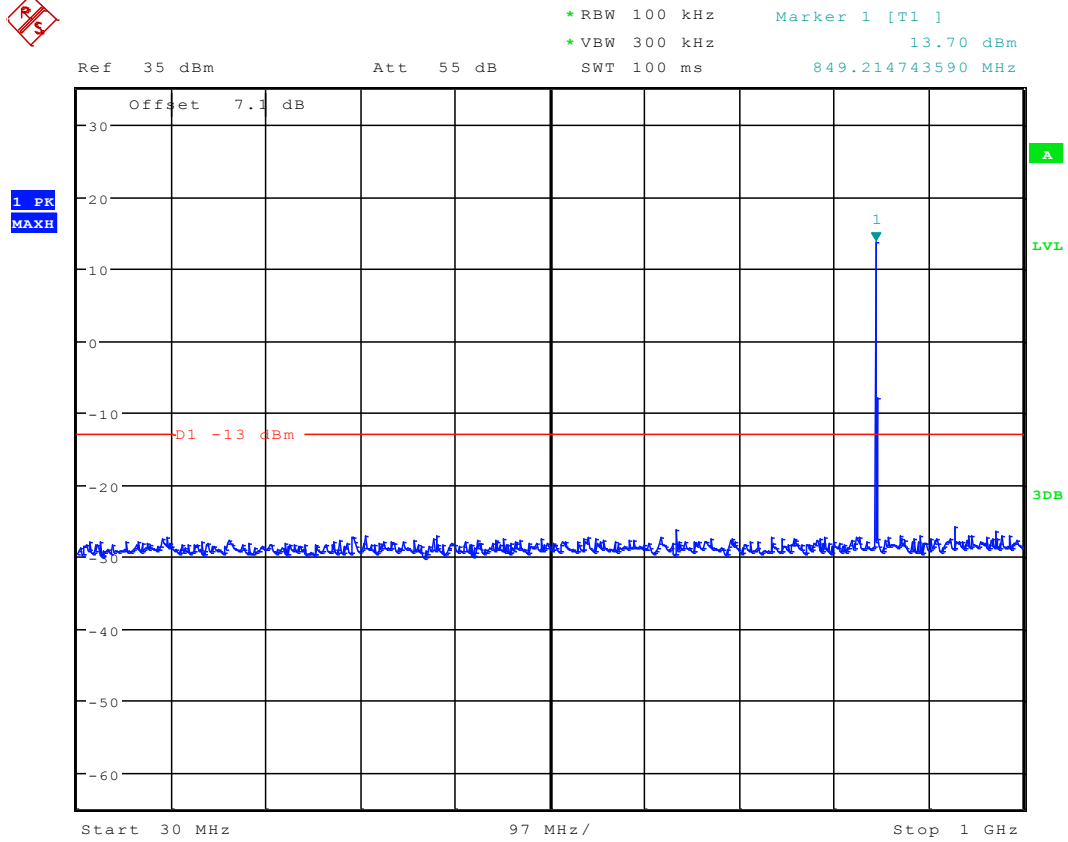




\* RBW 10 kHz      Marker 1 [T1 ]  
\* VBW 30 kHz      -32.32 dBm  
Ref 35 dBm      Att 55 dB      SWT 300 ms      197.836538462 kHz

1 PR  
MAXH



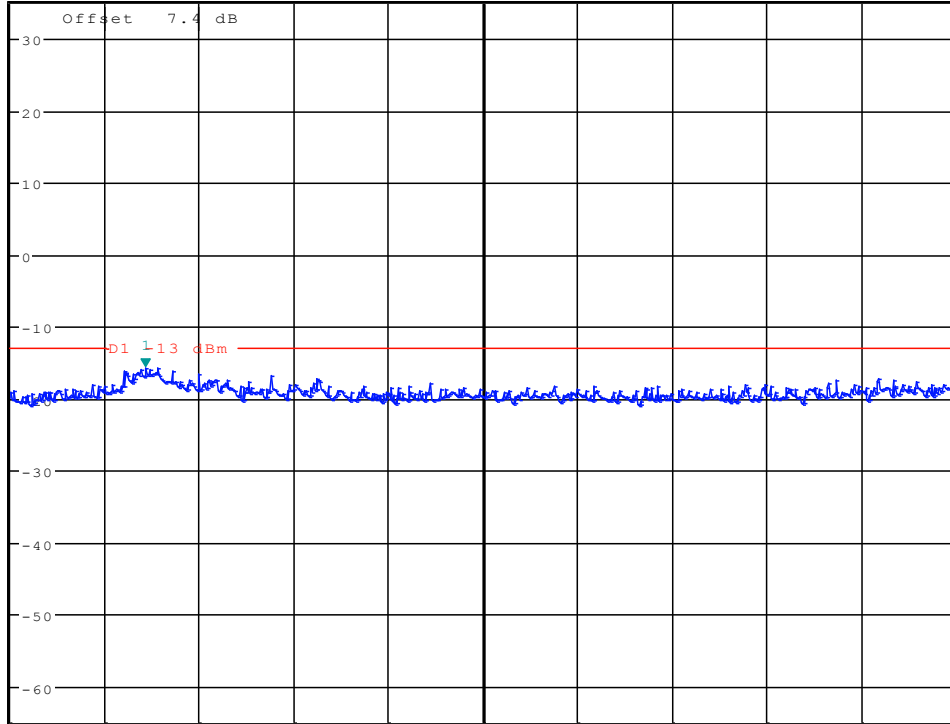




\* RBW 1 MHz      Marker 1 [T1 ]  
\* VBW 3 MHz      -15.67 dBm  
SWT 70 ms      2.675881410 GHz

Ref 35 dBm

Att 55 dB



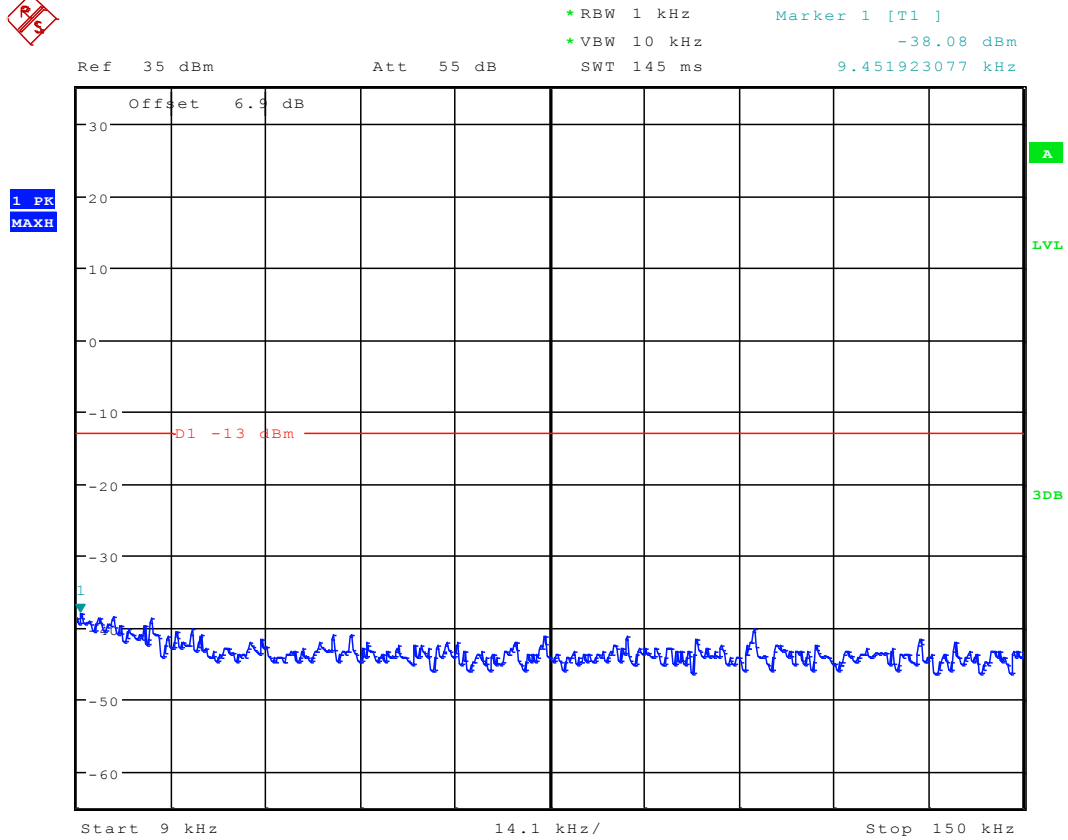
Start 1 GHz

1.175 GHz/

Stop 12.75 GHz



## TM2:EDGE Channel 128



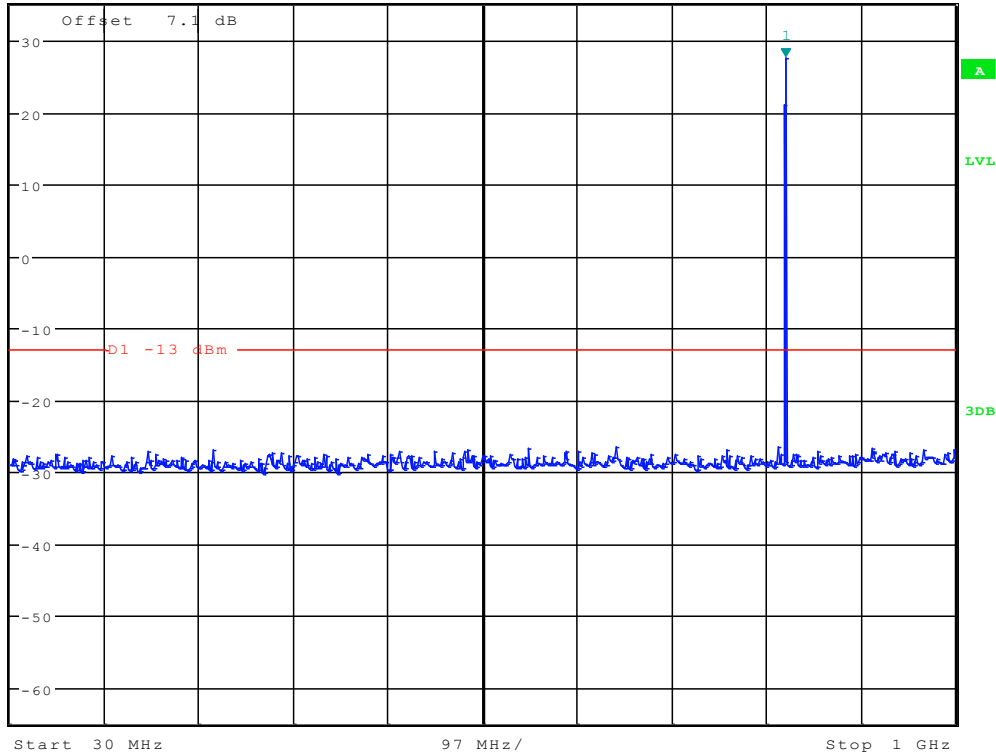


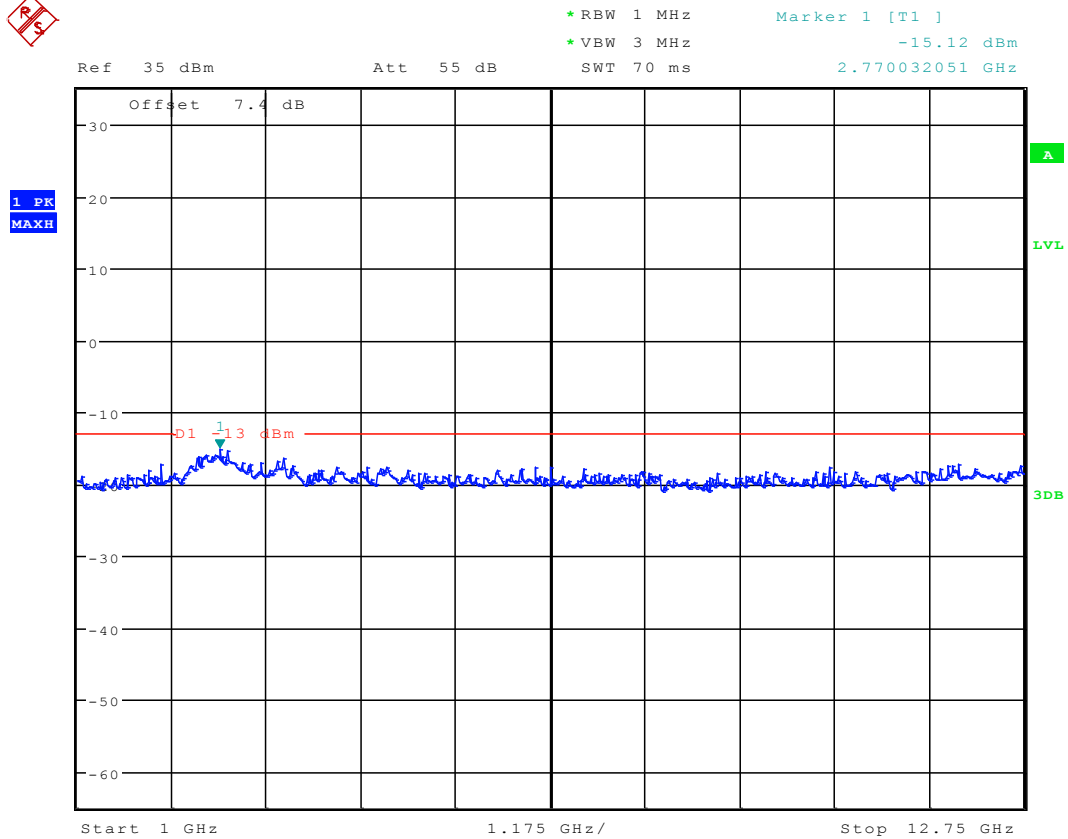
197.836538462 kHz



\* RBW 100 kHz      Marker 1 [T1 ]  
\* VBW 300 kHz      27.59 dBm  
Ref 35 dBm      Att 55 dB      SWT 100 ms      825.897435897 MHz

1 PR  
MAXH



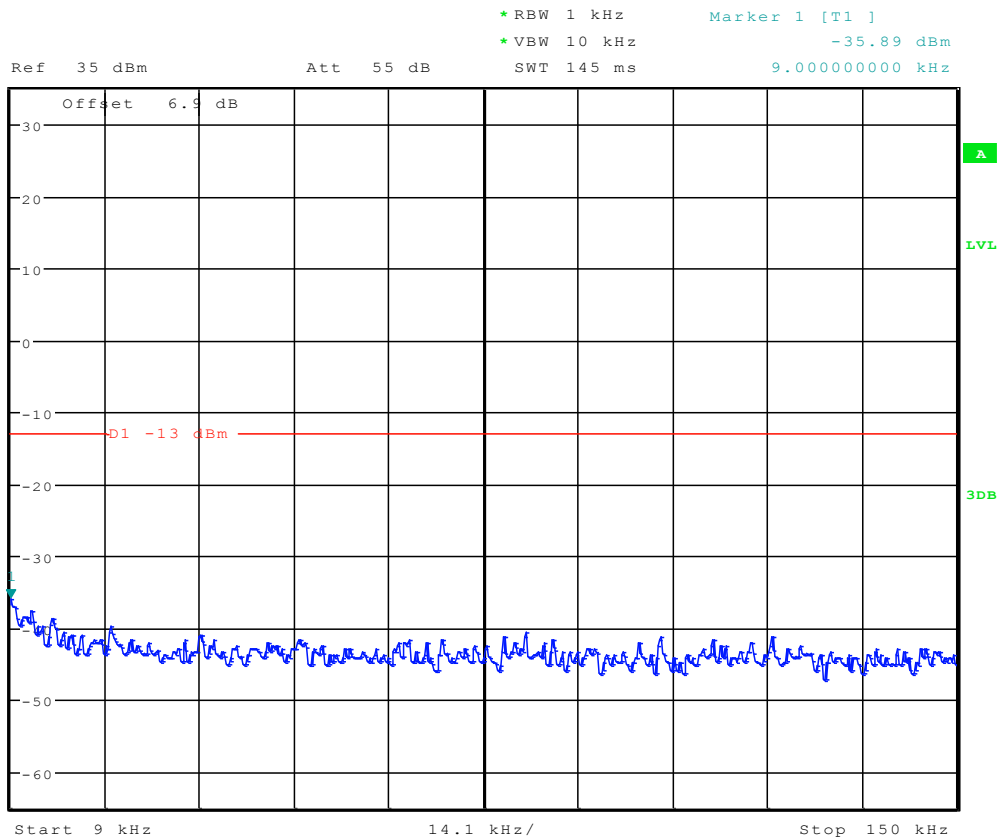




## Channel 192



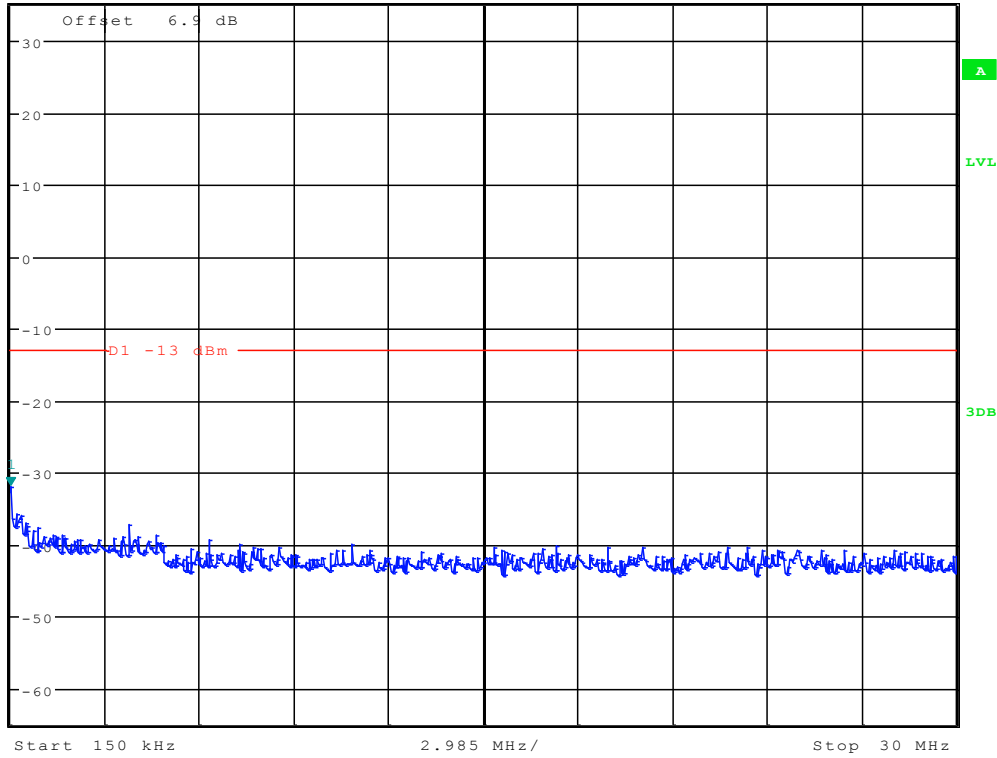
1 PR  
MAXH





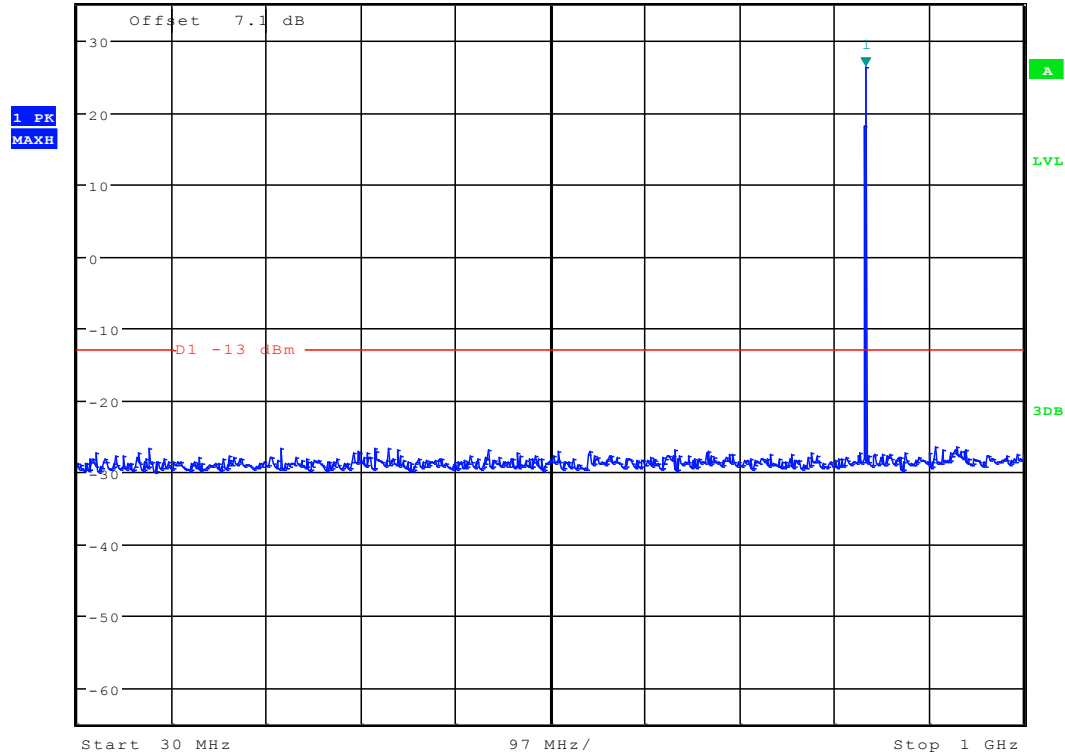
\* RBW 10 kHz      Marker 1 [T1 ]  
\* VBW 30 kHz      -31.90 dBm  
Ref 35 dBm      Att 55 dB      SWT 300 ms      150.000000000 kHz

1 PK  
MAXH





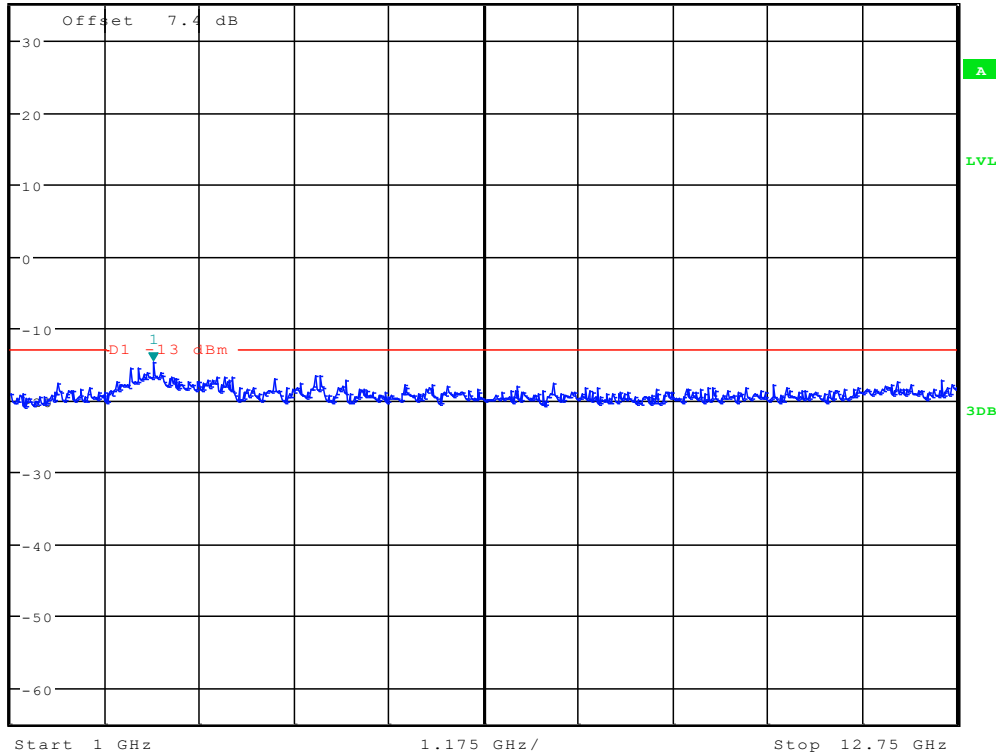
\* RBW 100 kHz      Marker 1 [T1 ]  
\* VBW 300 kHz      26.28 dBm  
Ref 35 dBm      Att 55 dB      SWT 100 ms      838.333333333 MHz





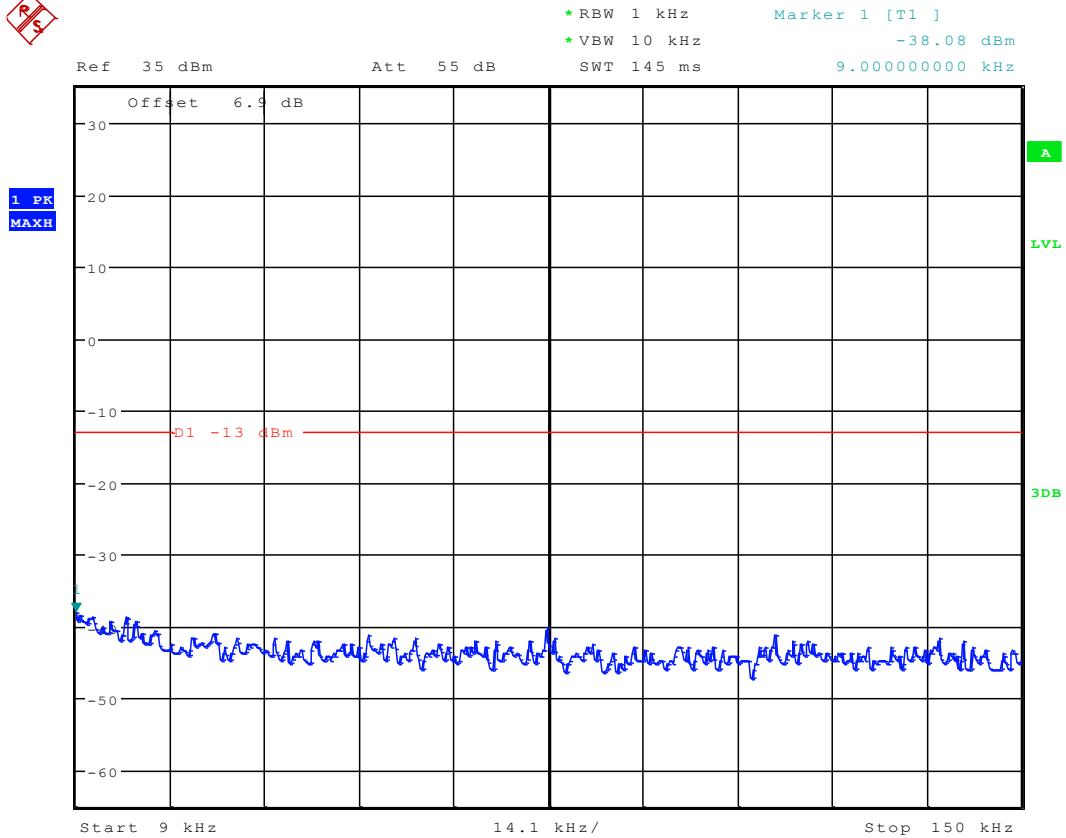
\* RBW 1 MHz      Marker 1 [T1 ]  
\* VBW 3 MHz      -14.79 dBm  
Ref 35 dBm      Att 55 dB      SWT 70 ms      2.770032051 GHz

1 PR  
MAXH





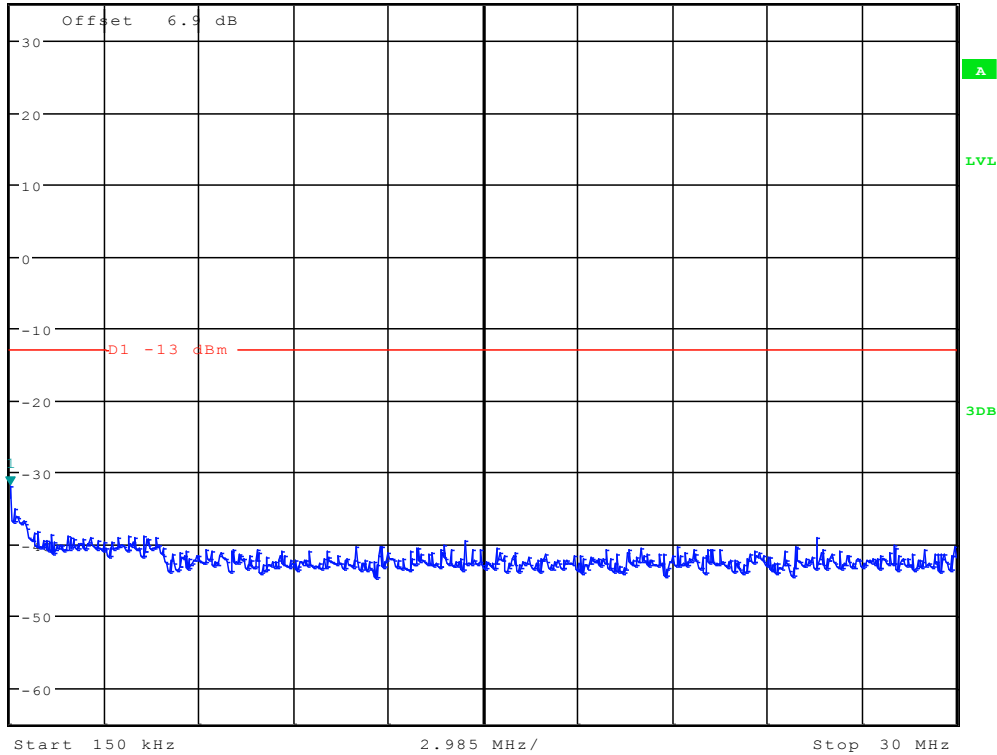
## Channel 251

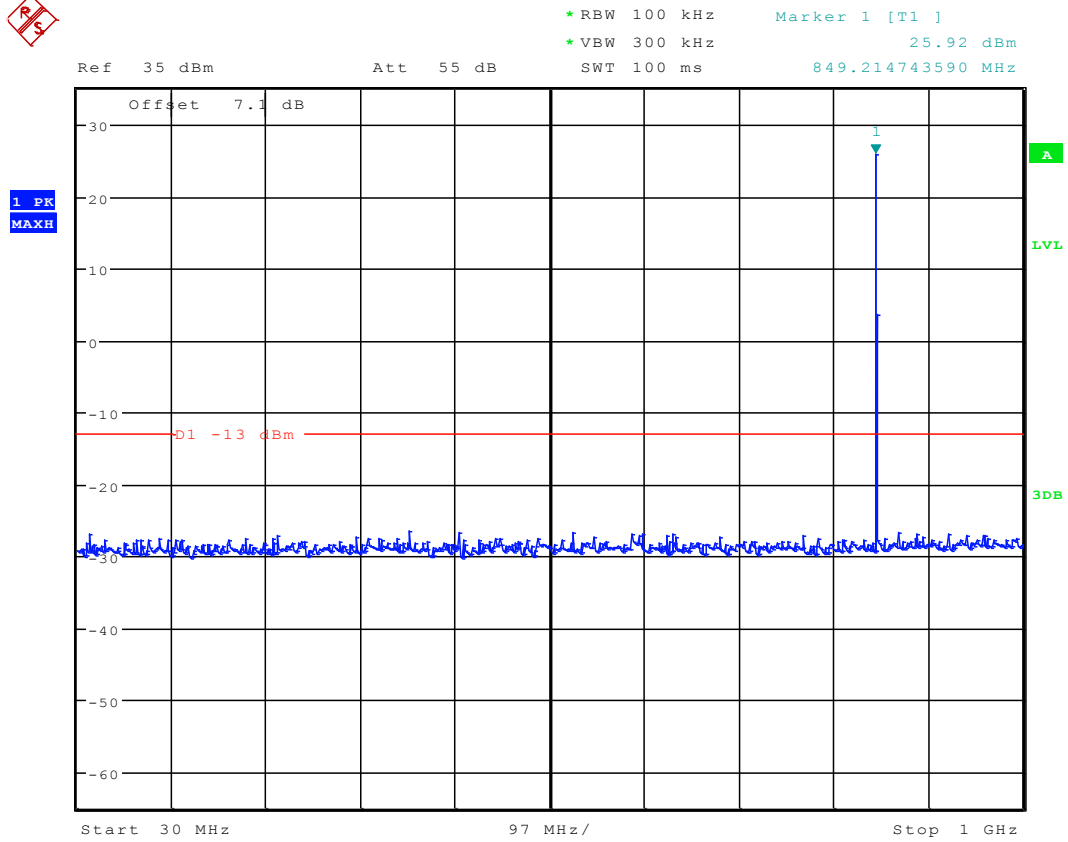


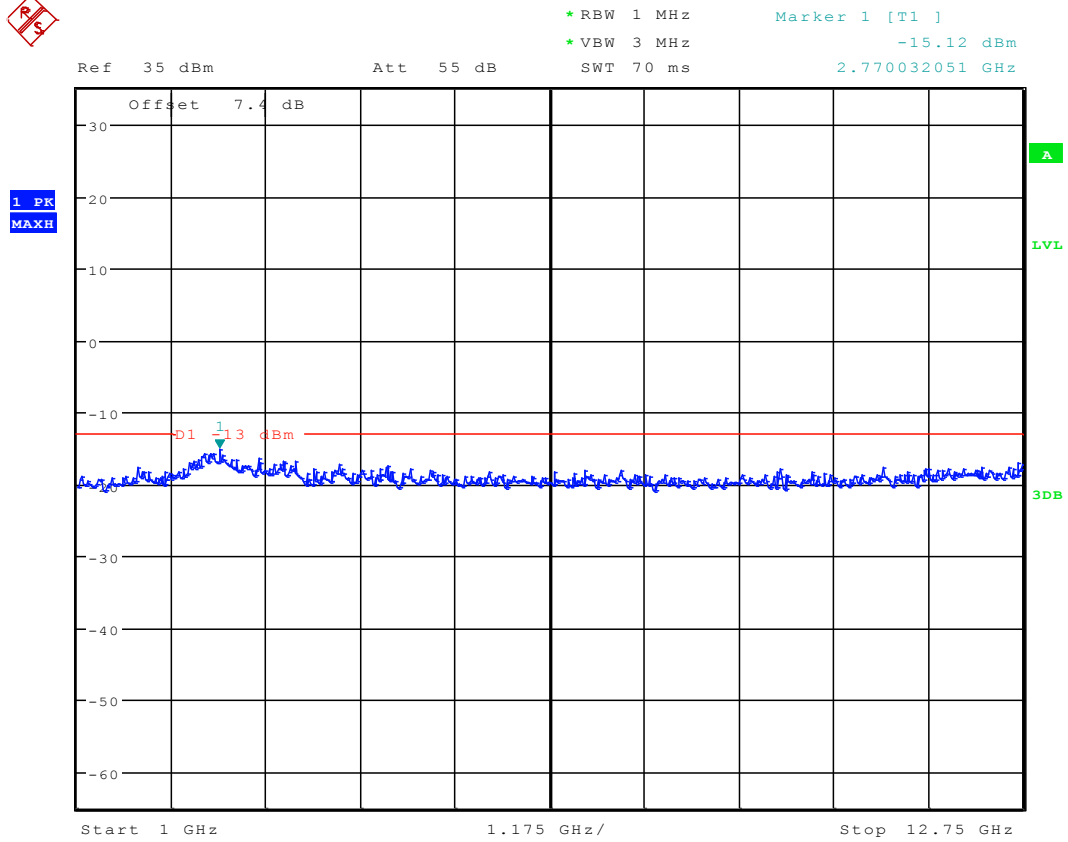


\* RBW 10 kHz      Marker 1 [T1 ]  
\* VBW 30 kHz      -31.95 dBm  
Ref 35 dBm      Att 55 dB      SWT 300 ms      150.000000000 kHz

1 PK  
MAXH

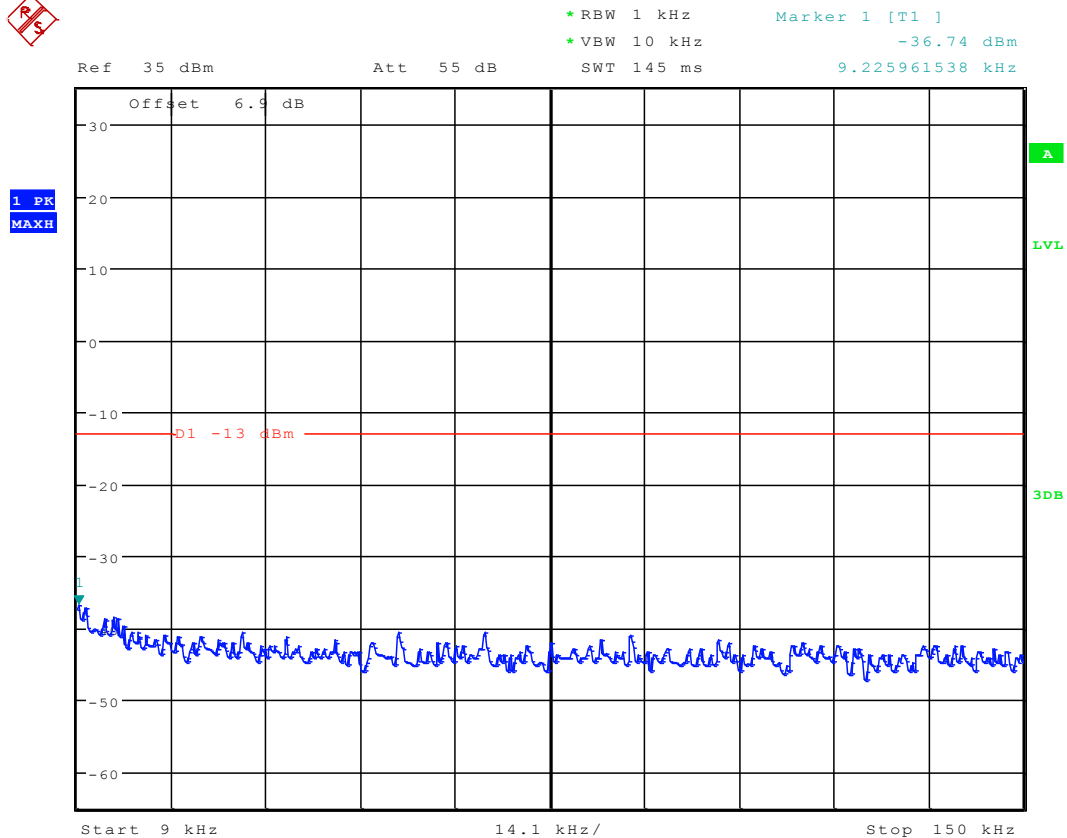






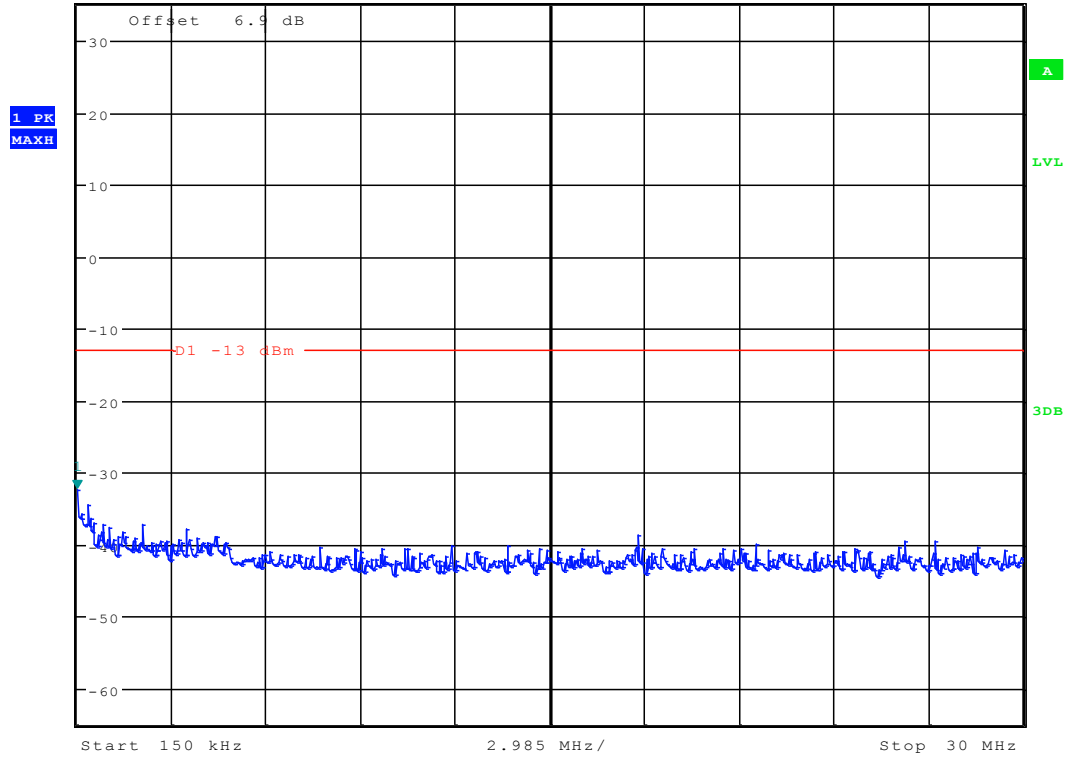


## TM3: WCDMA Channel 4132



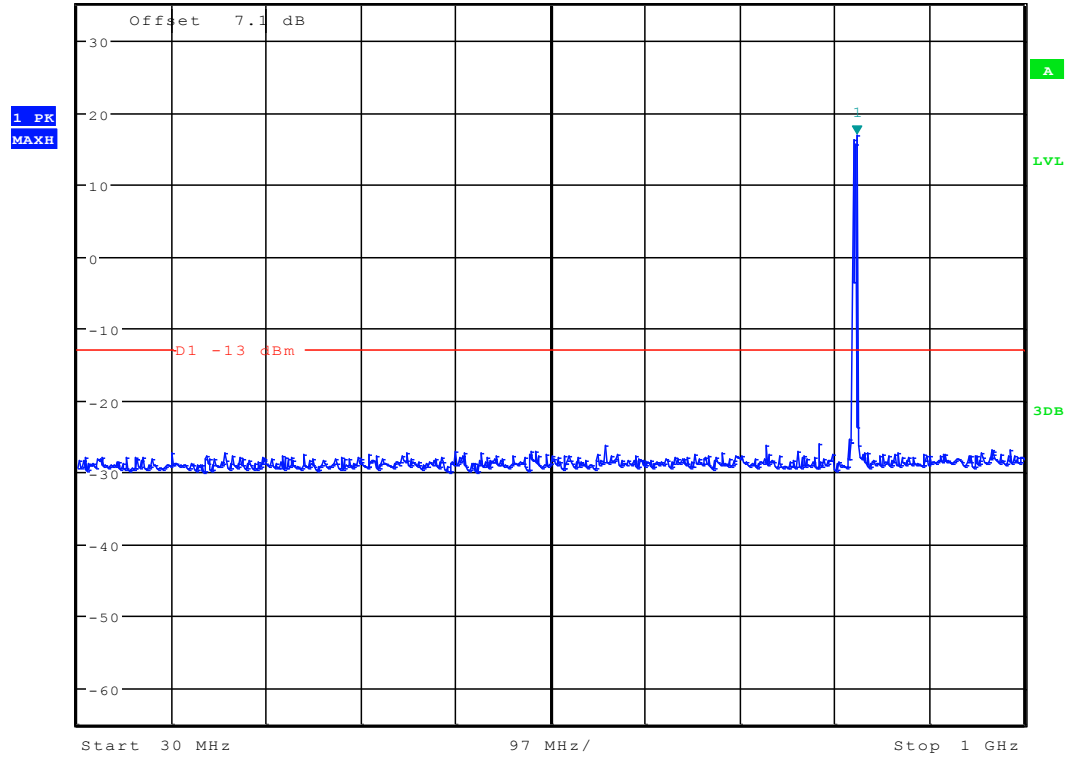


\* RBW 10 kHz      Marker 1 [T1 ]  
\* VBW 30 kHz      -32.27 dBm  
Ref 35 dBm      Att 55 dB      SWT 300 ms      150.000000000 kHz





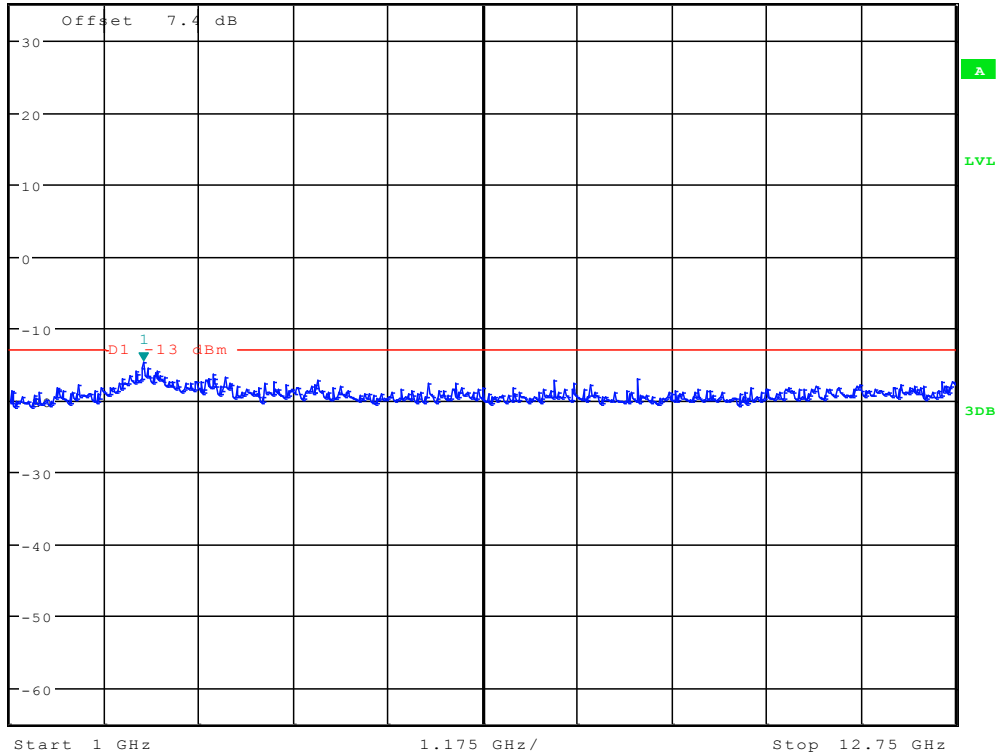
Ref 35 dBm Att 55 dB \*RBW 100 kHz Marker 1 [T1 ]  
\*VBW 300 kHz 16.80 dBm  
SWT 100 ms 829.006410256 MHz





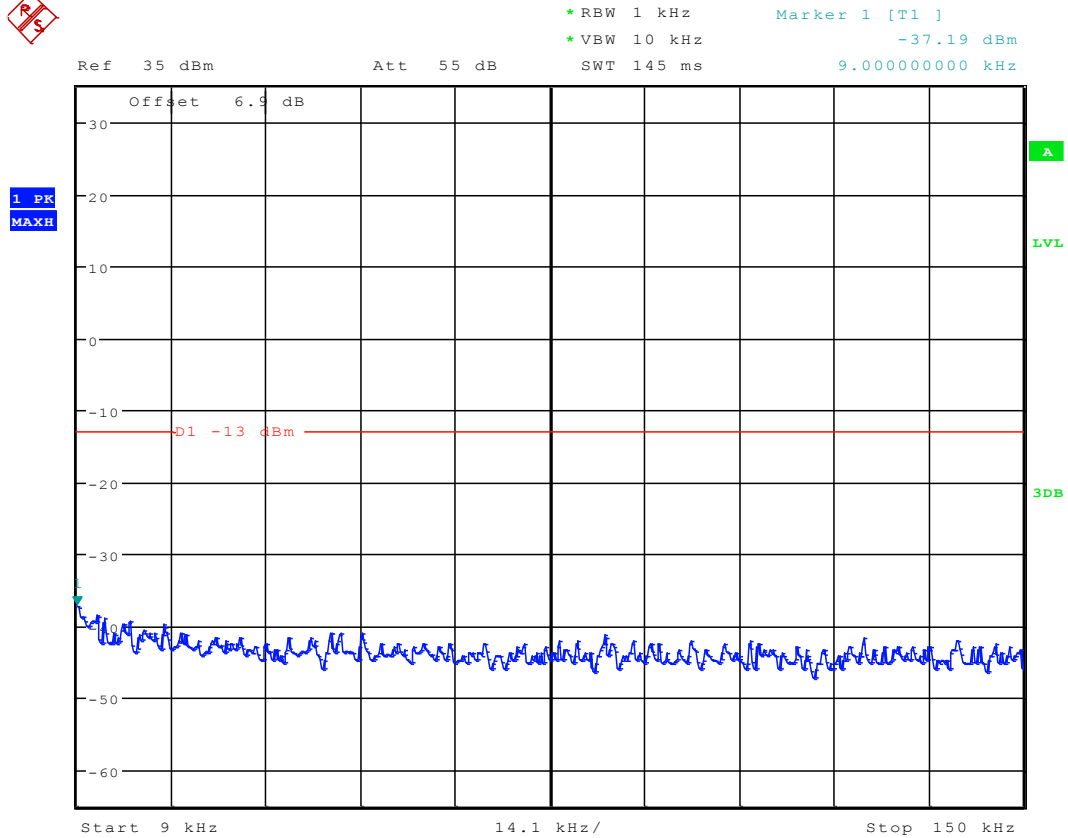
\* RBW 1 MHz      Marker 1 [T1 ]  
\* VBW 3 MHz      -14.64 dBm  
Ref 35 dBm      Att 55 dB      SWT 70 ms      2.657051282 GHz

1 PK  
MAXH





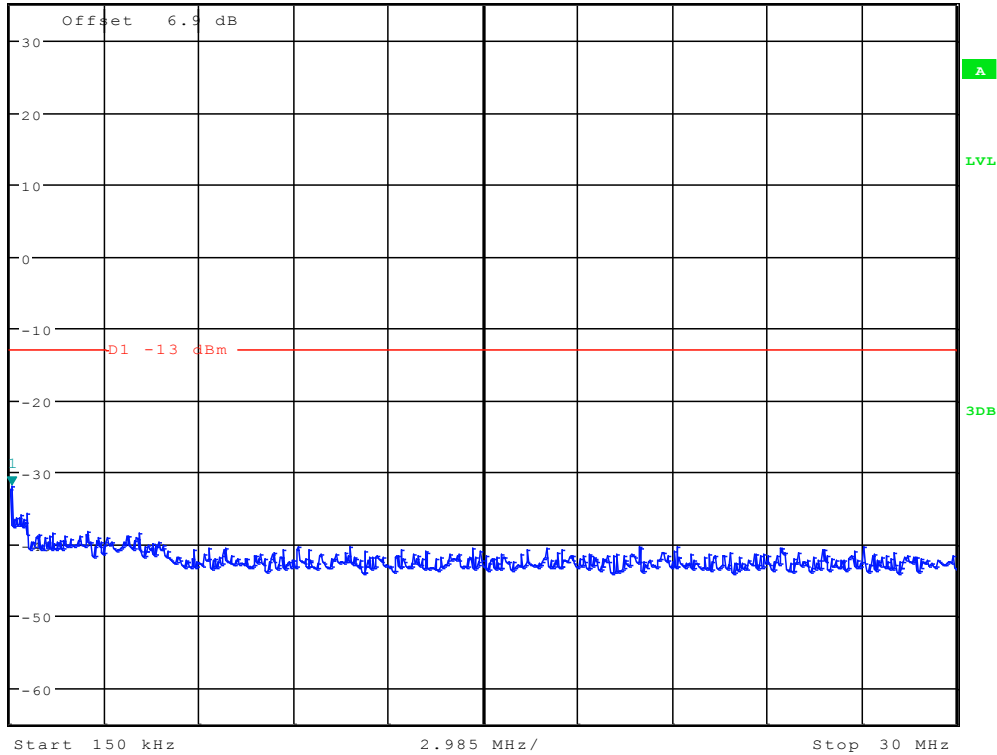
## Channel 4182

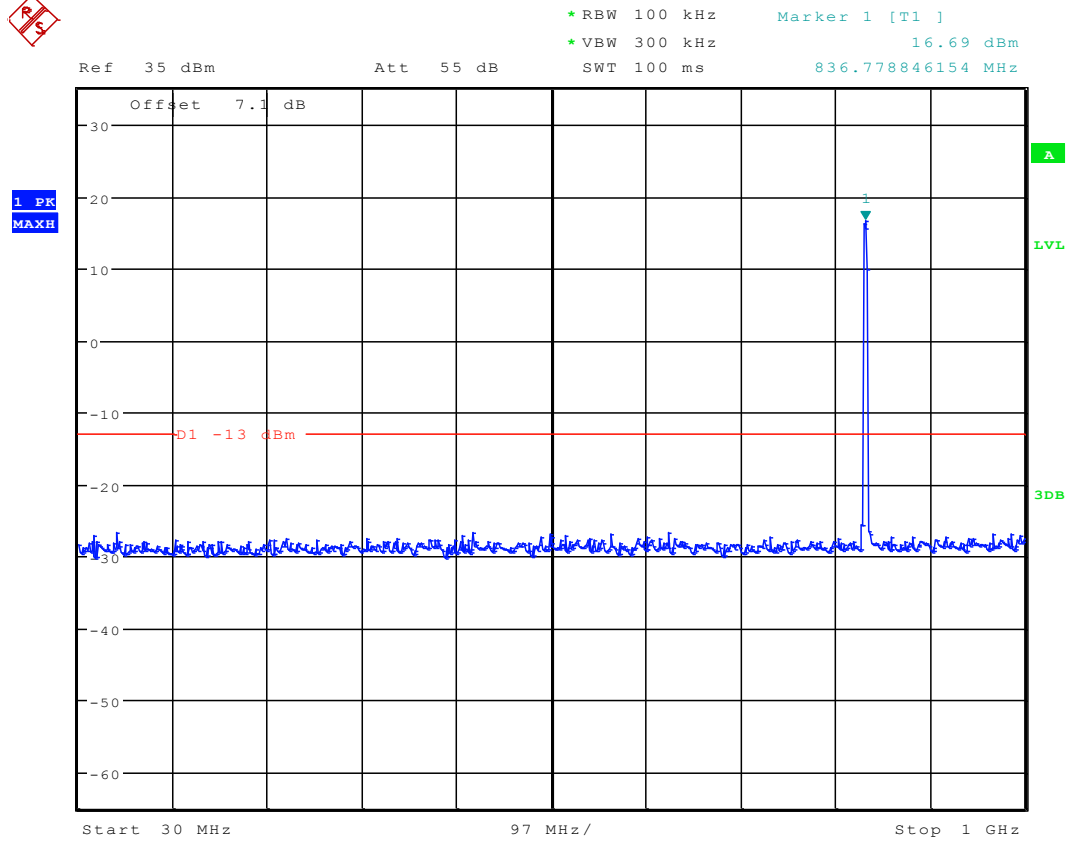




\* RBW 10 kHz      Marker 1 [T1 ]  
\* VBW 30 kHz      -31.90 dBm  
Ref 35 dBm      Att 55 dB      SWT 300 ms      197.836538462 kHz

1 PK  
MAXH







\* RBW 1 MHz      Marker 1 [T1 ]  
\* VBW 3 MHz      -15.91 dBm  
2.694711538 GHz

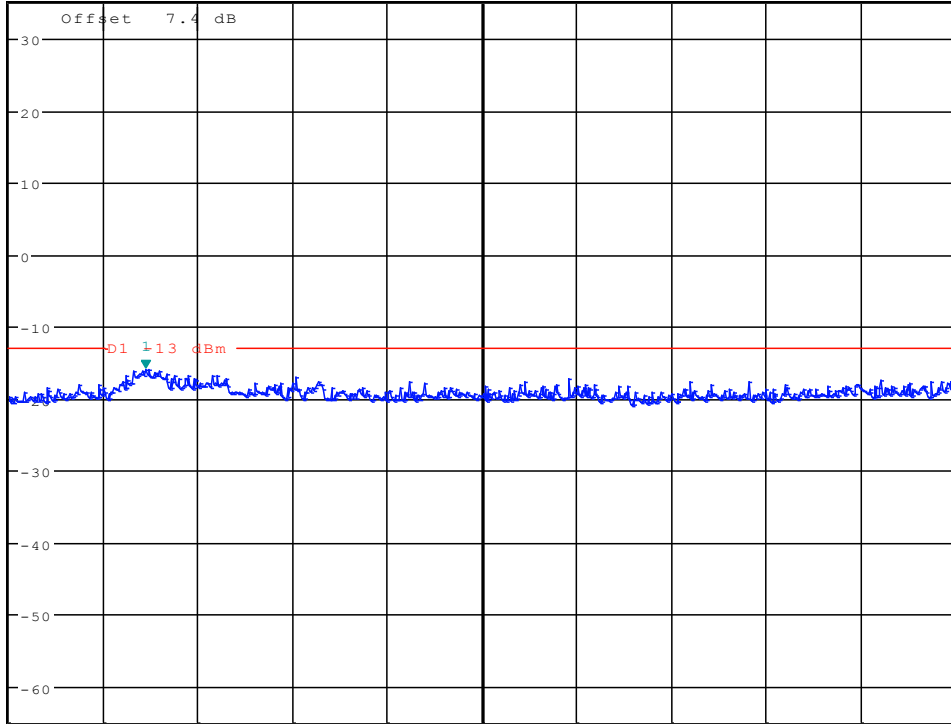
Ref 35 dBm

Att 55 dB

SWT 70 ms

Offset 7.4 dB

1 PK  
MAXH



Start 1 GHz

1.175 GHz/

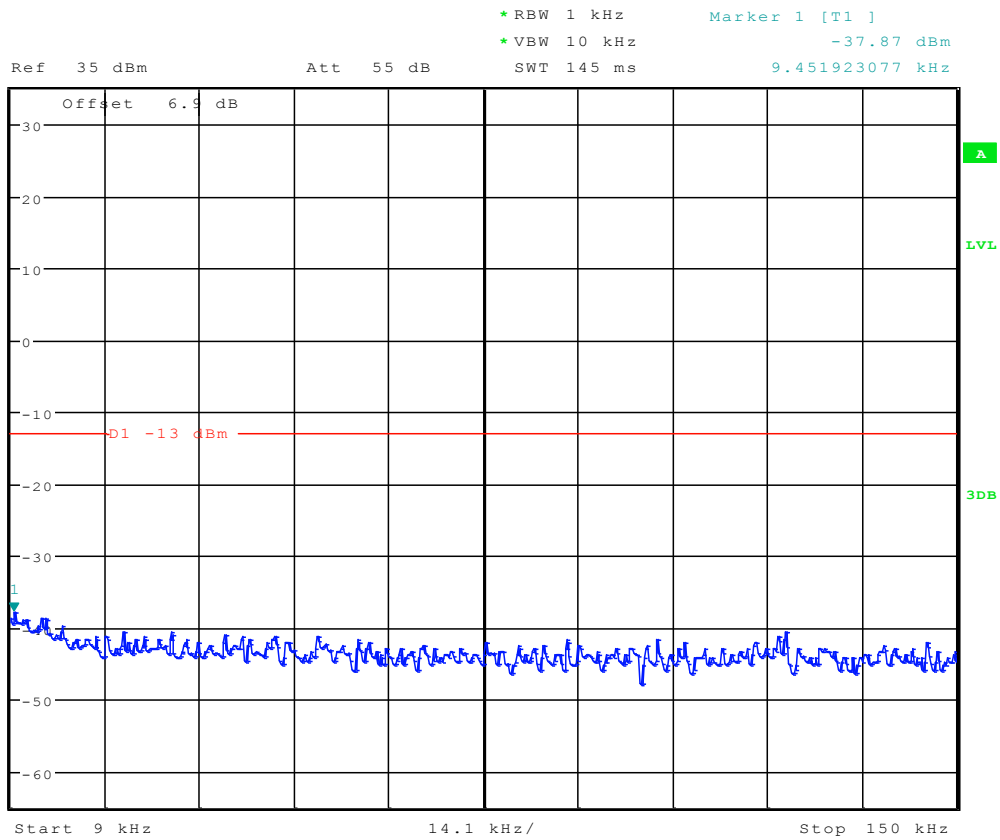
Stop 12.75 GHz

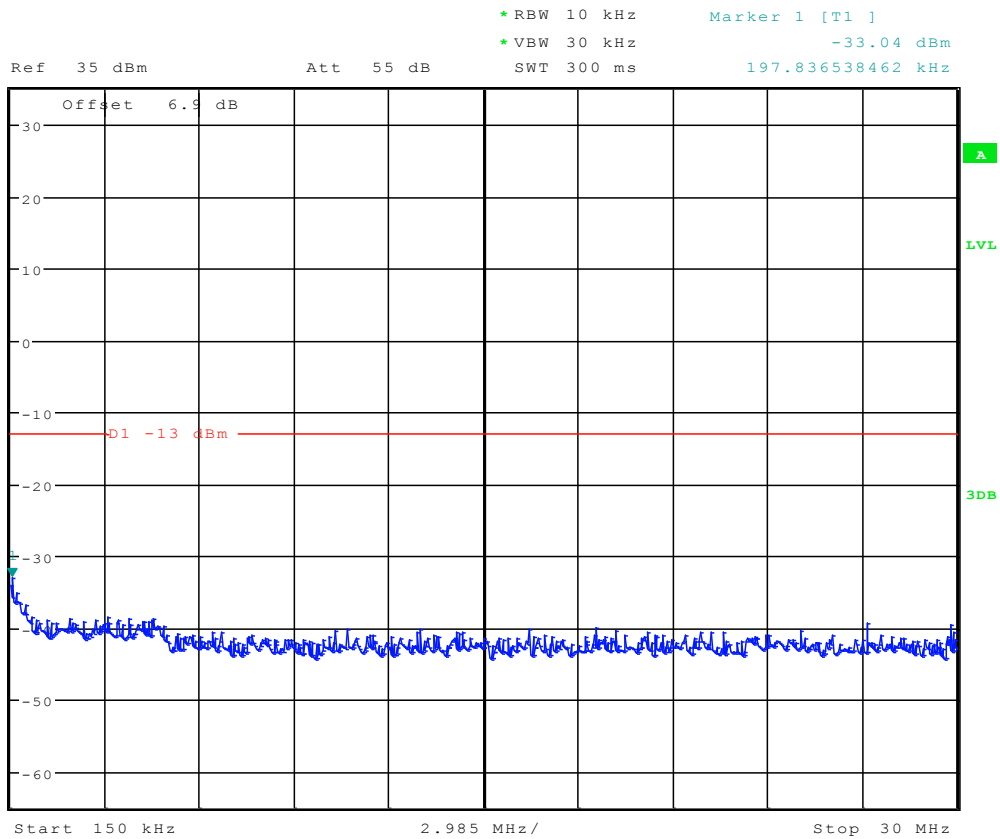


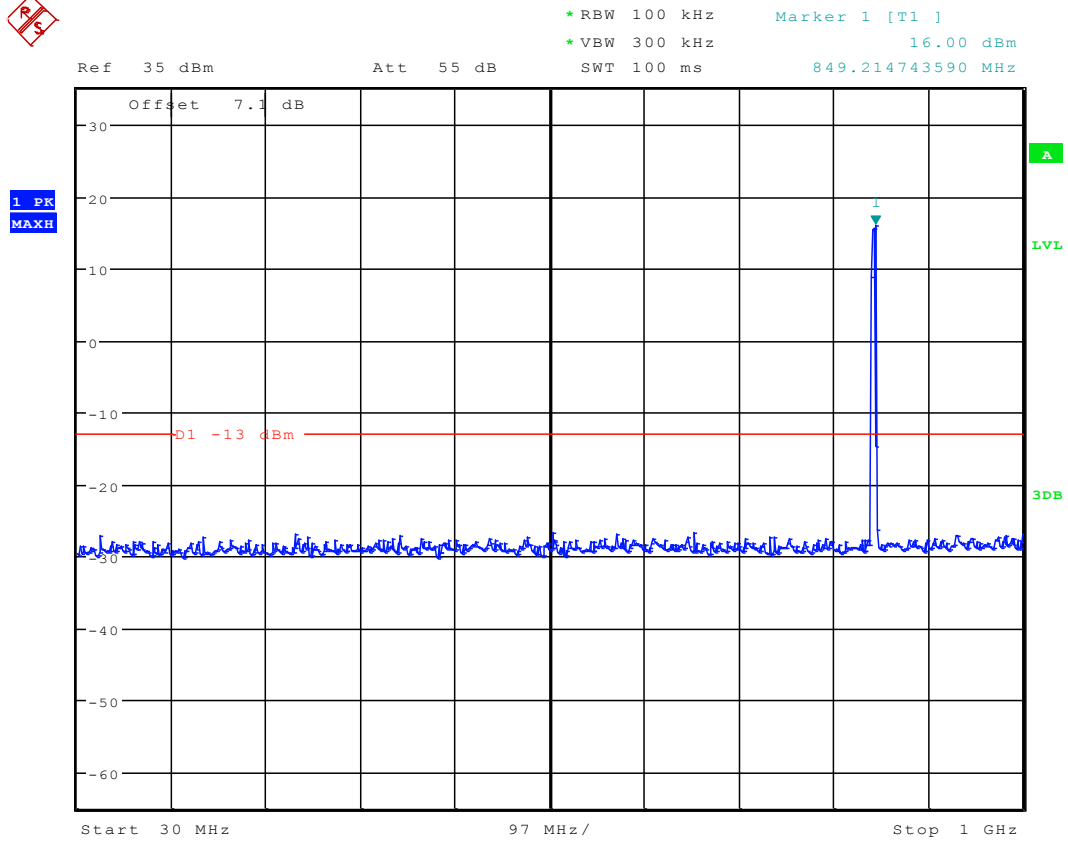
## Channel 4233

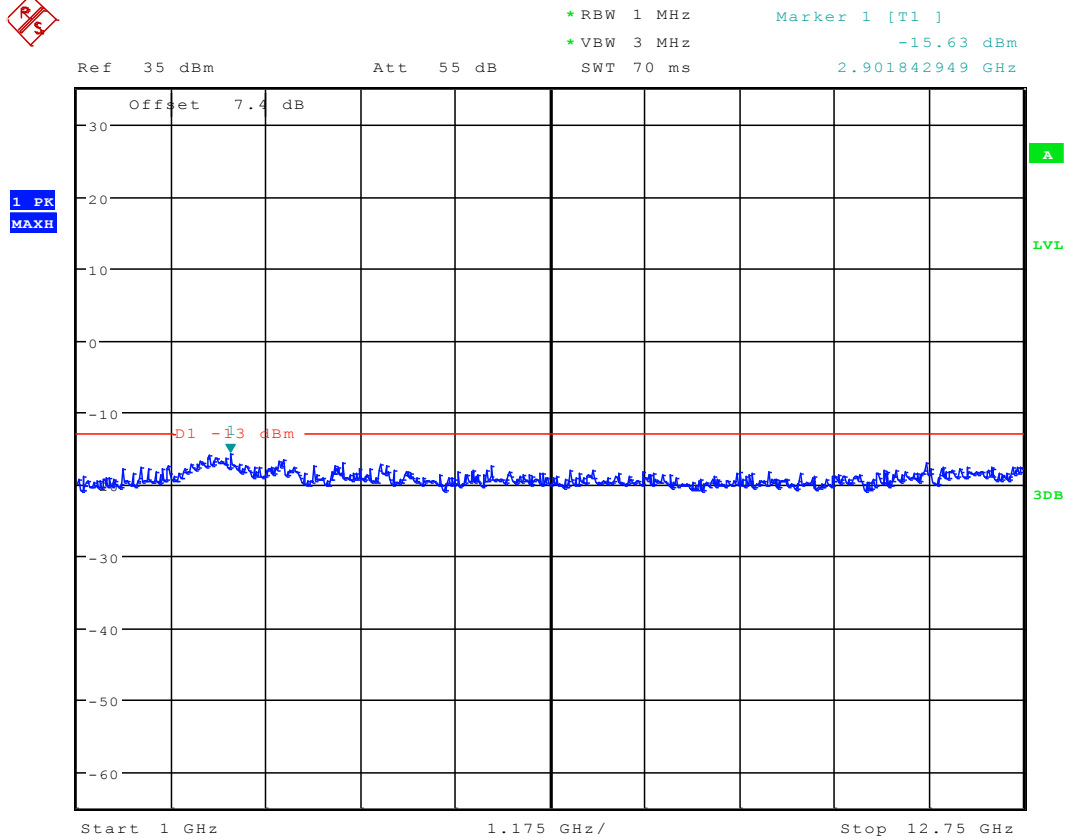


1 PR  
MAXH











# **Appendix E**

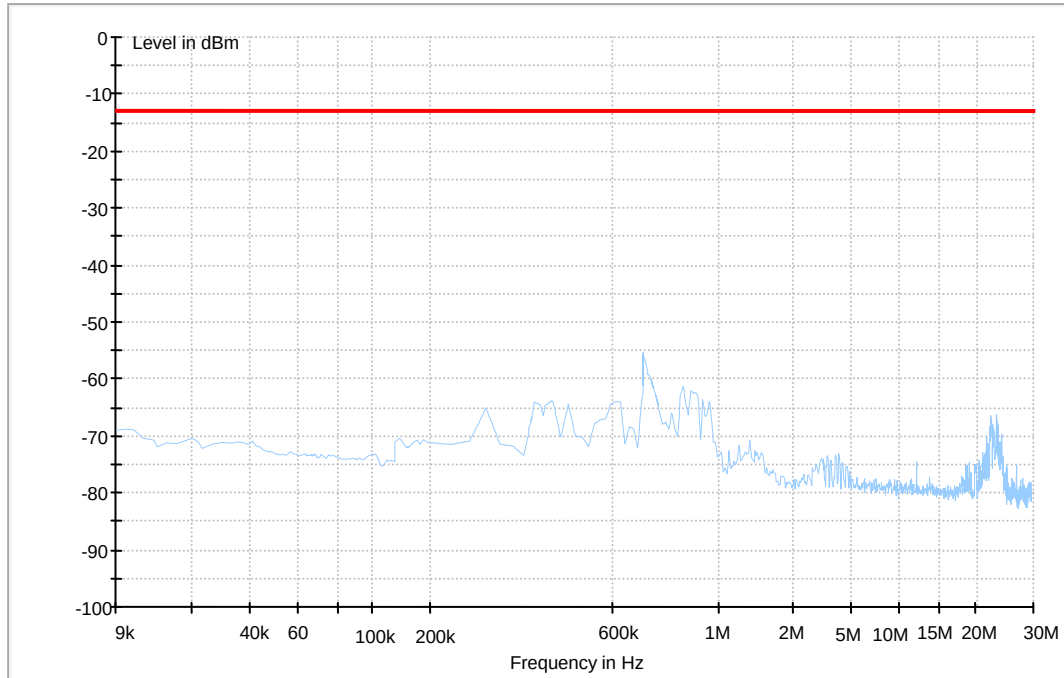
## **Radiated spurious emission**

According to FCC Part 2.1053& Part 22.917



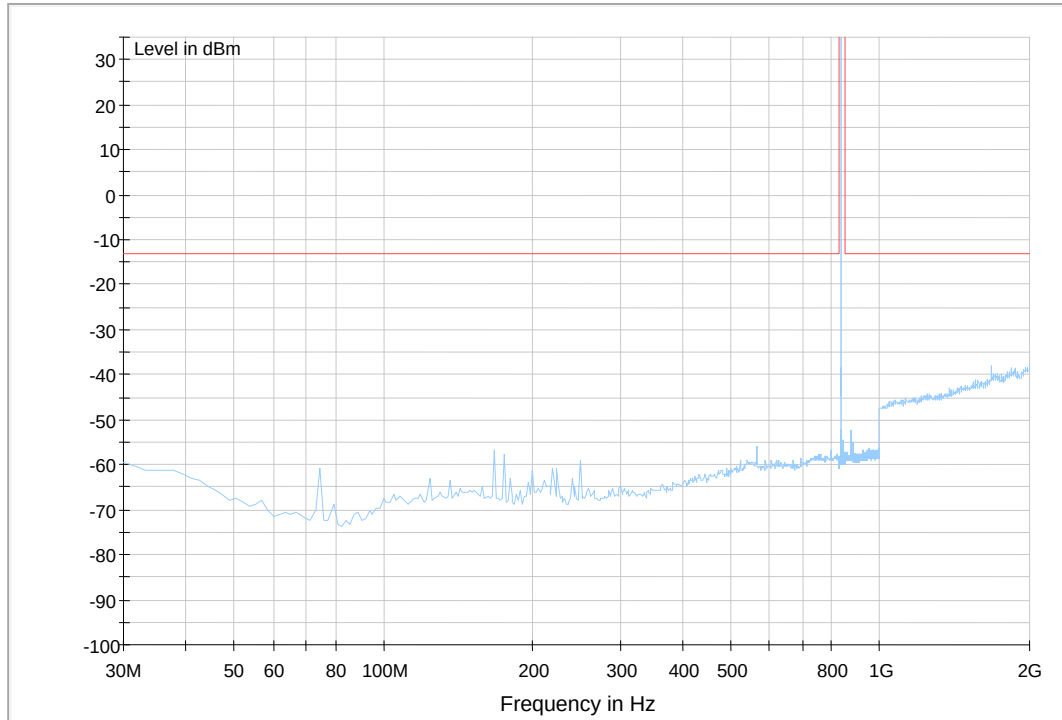
## GPRS850

(9kHz~30MHz)



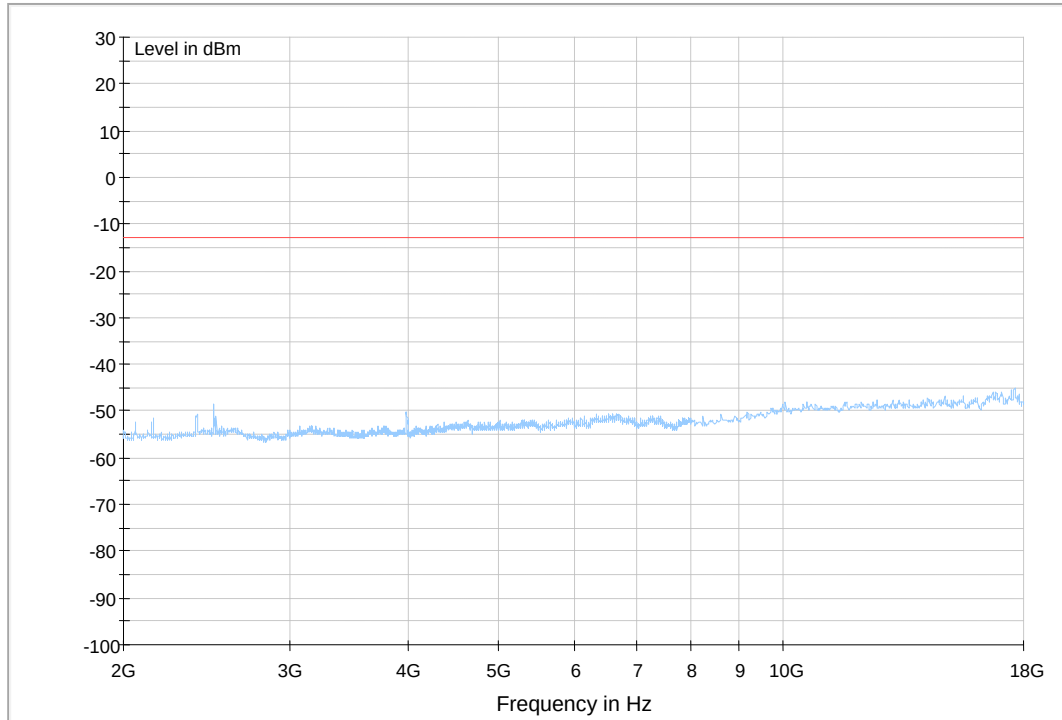


(30MHz~2GHz)





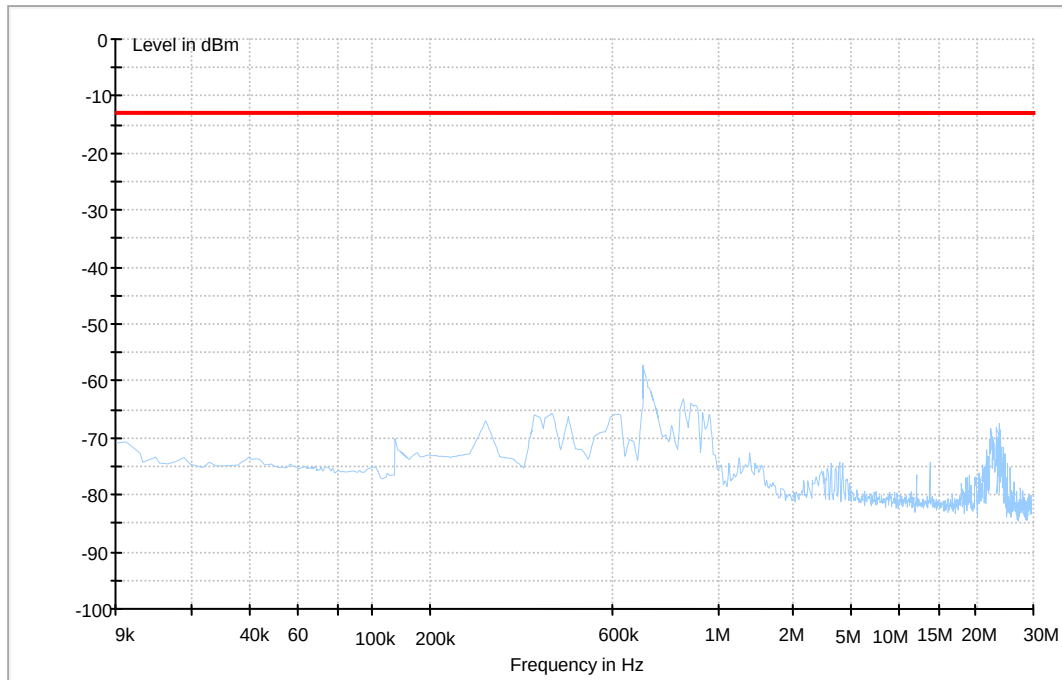
(2GHz~18GHz)





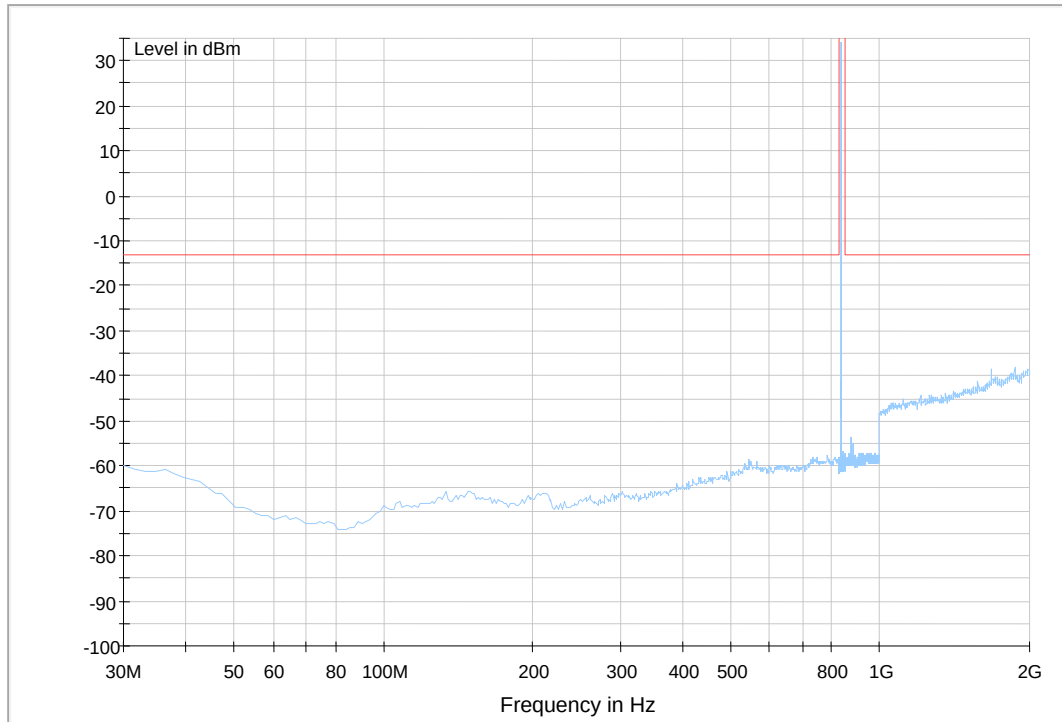
## EDGE 850

(9kHz~30MHz)



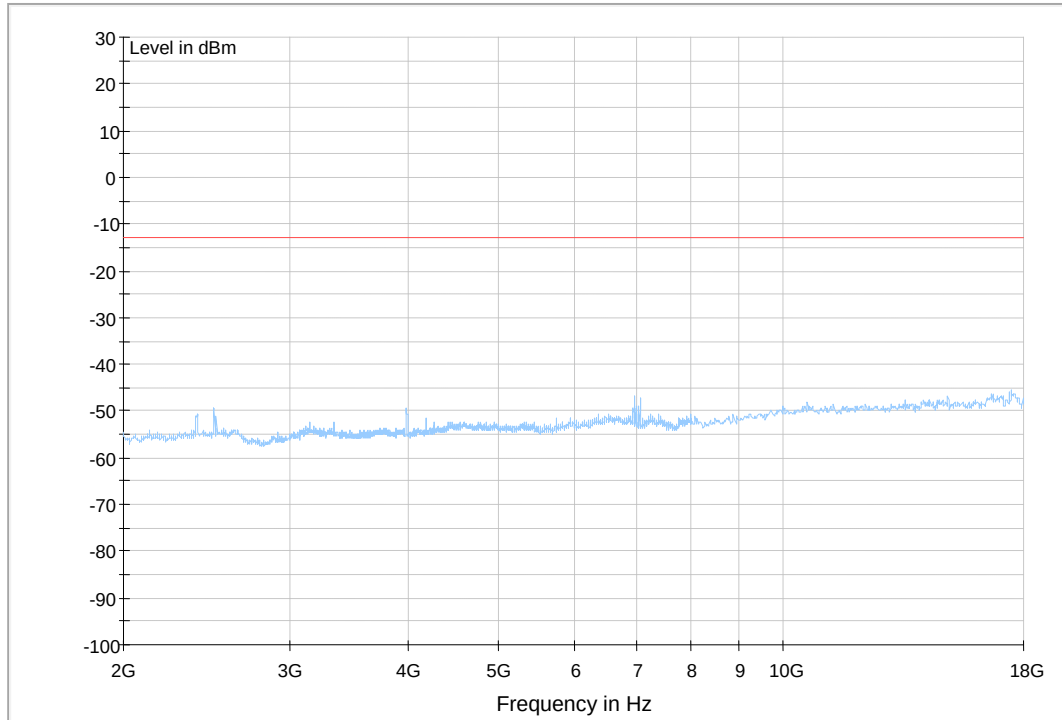


(30MHz~2GHz)





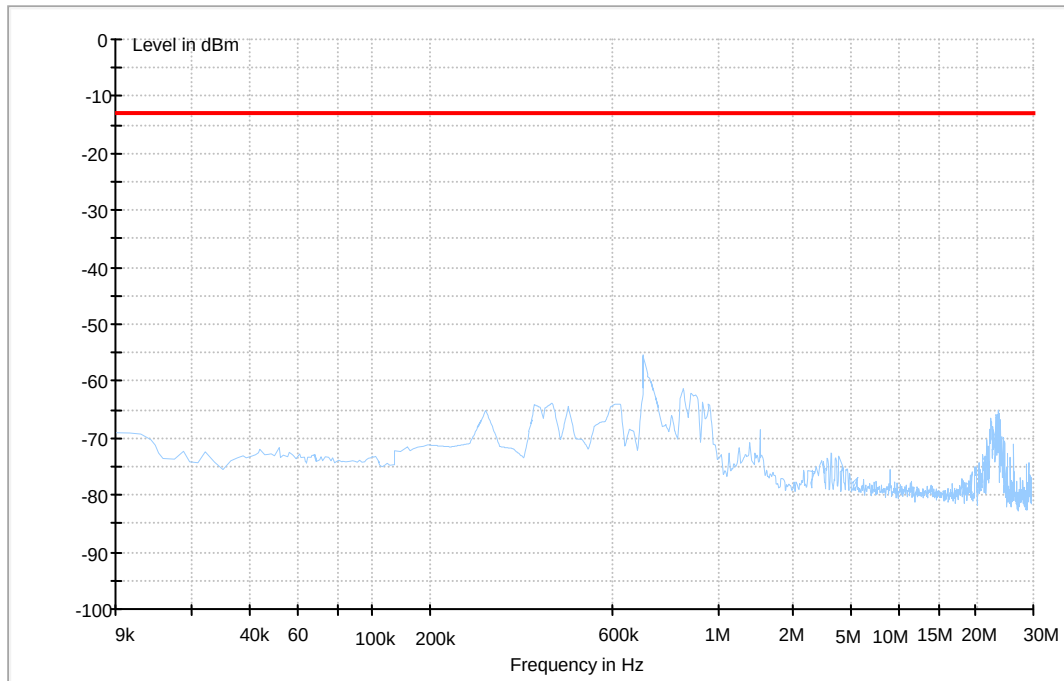
(2GHz~18GHz)





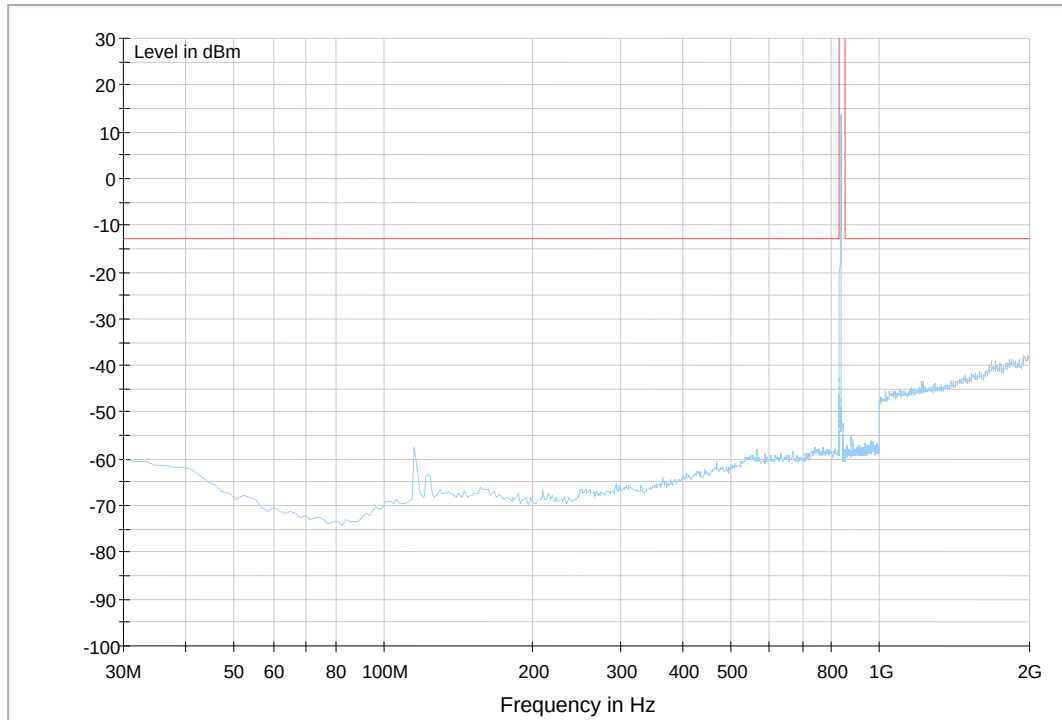
## WCDMA Band V

(9KHz~30MHz)



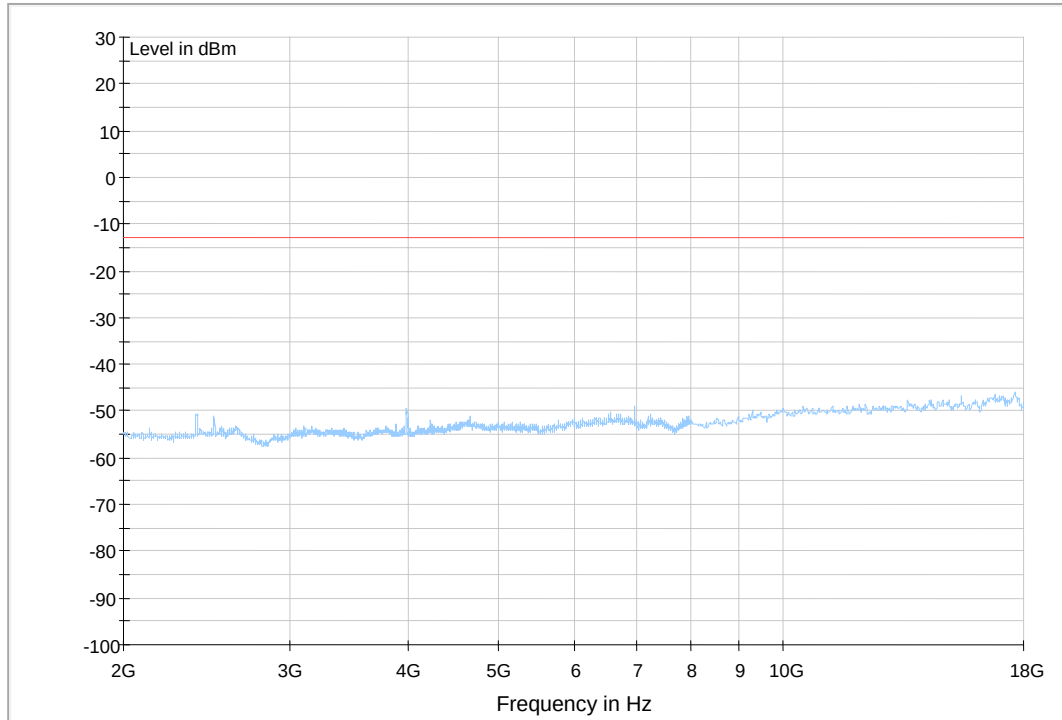


(30MHz~2GHz)





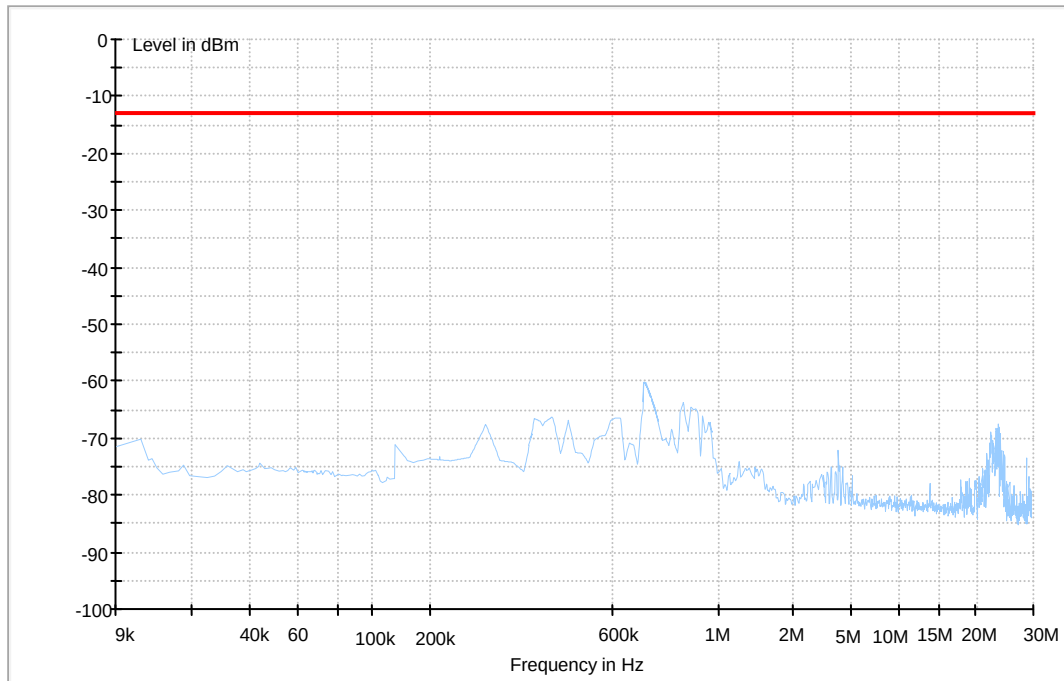
(2GHz~18GHz)





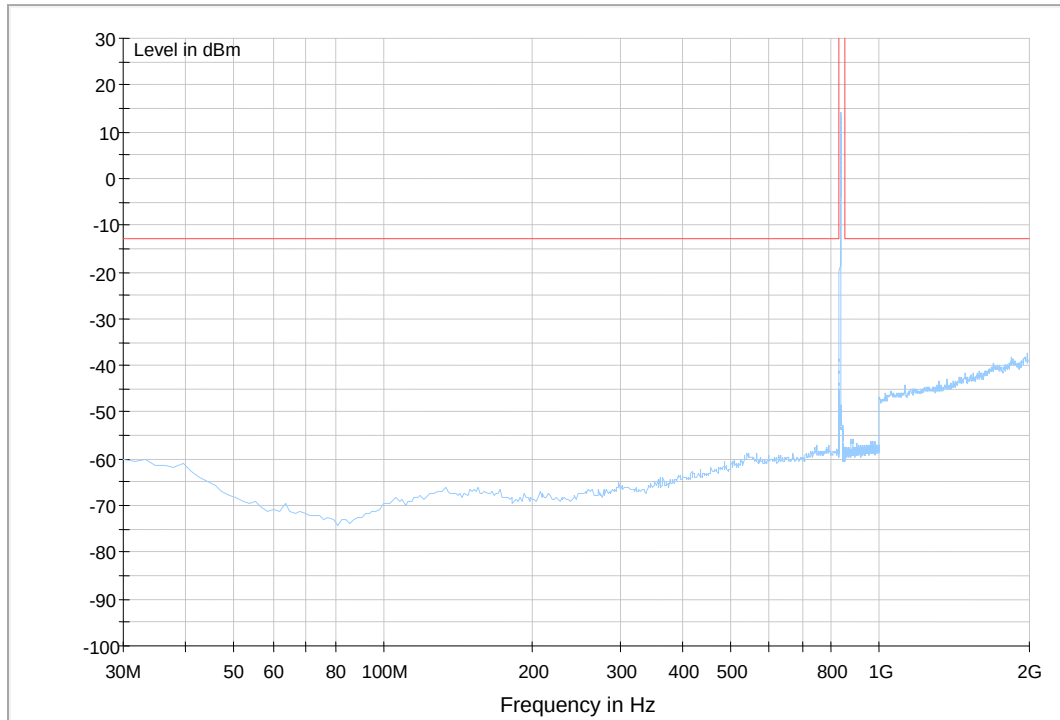
## HSDPA Band V

(9KHz~30MHz)



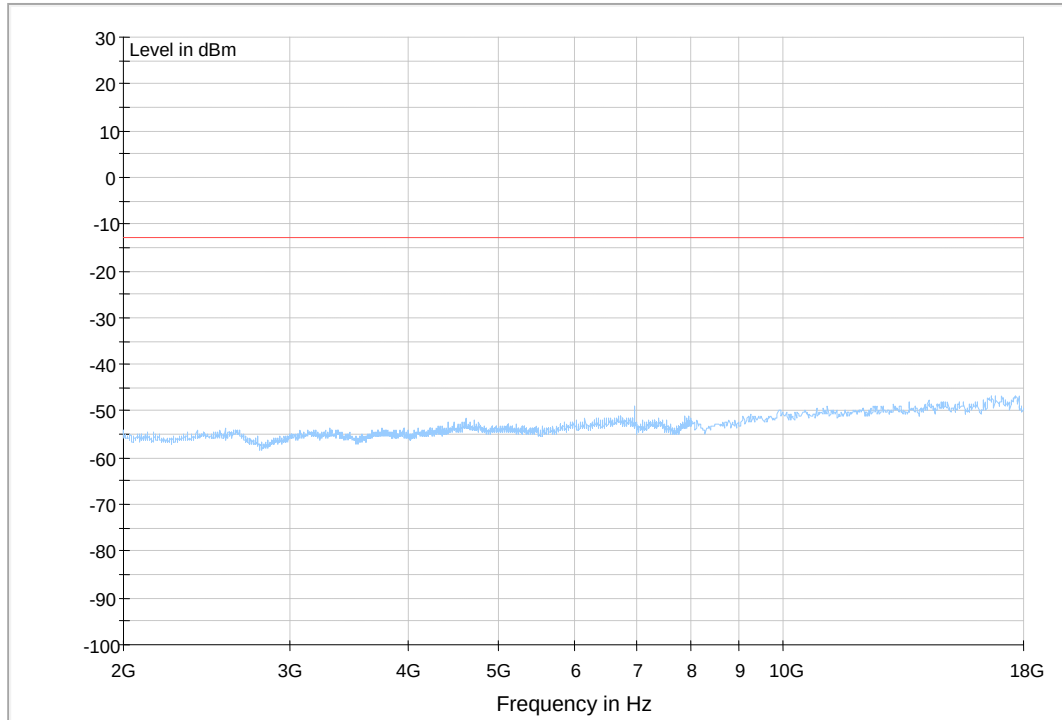


(30MHz~2GHz)





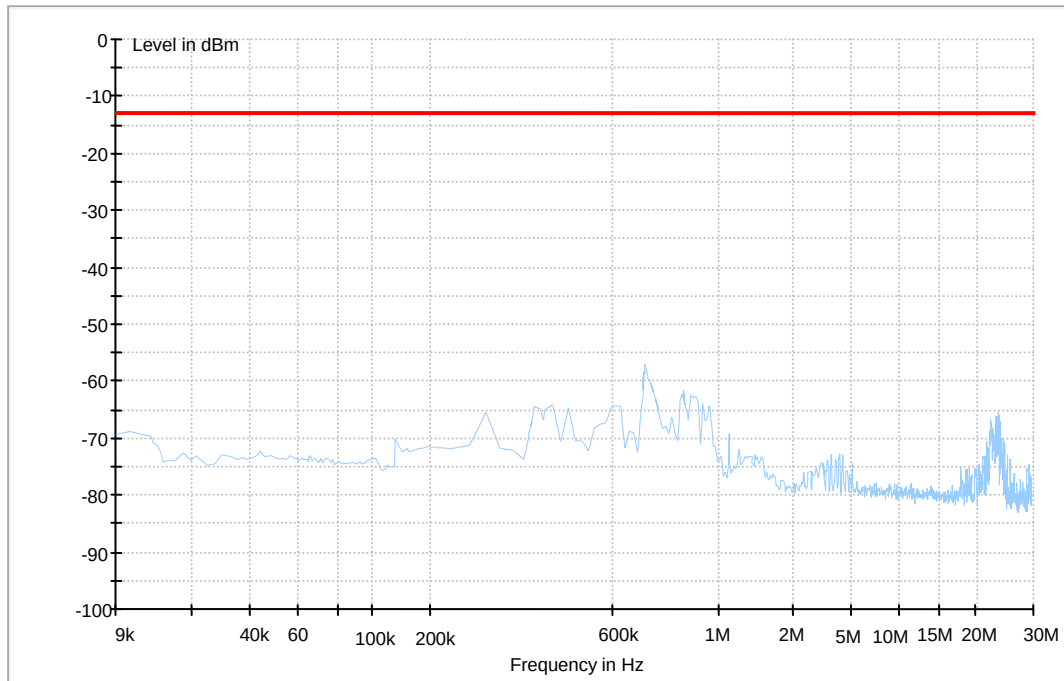
(2GHz~18GHz)





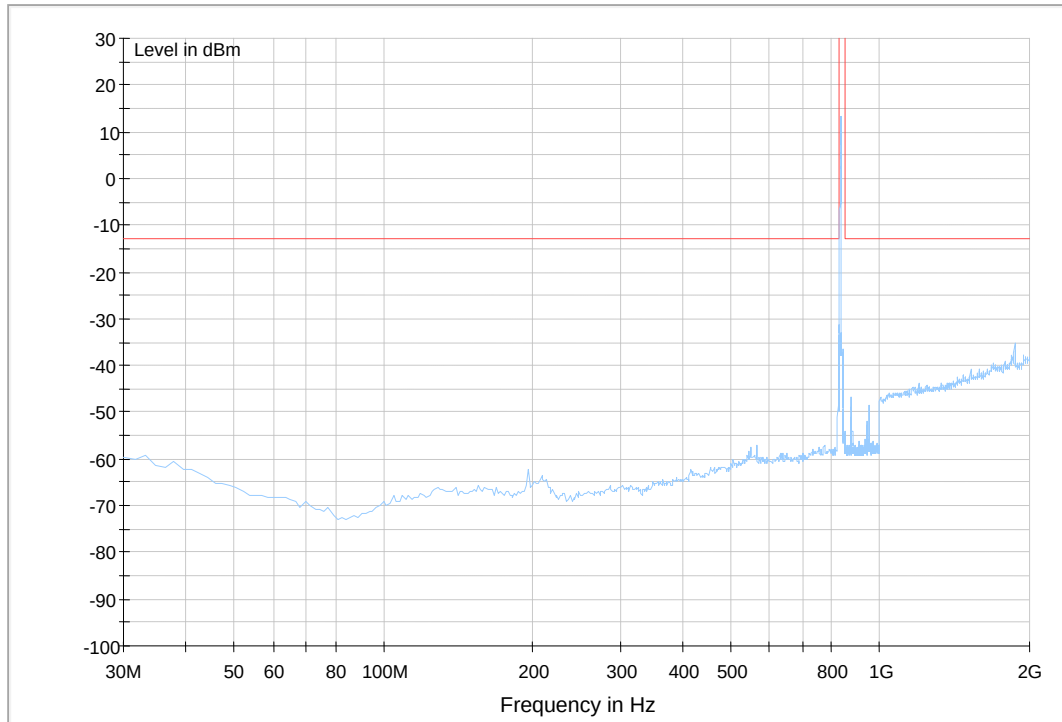
## HSUPA Band V

(9KHz~30MHz)



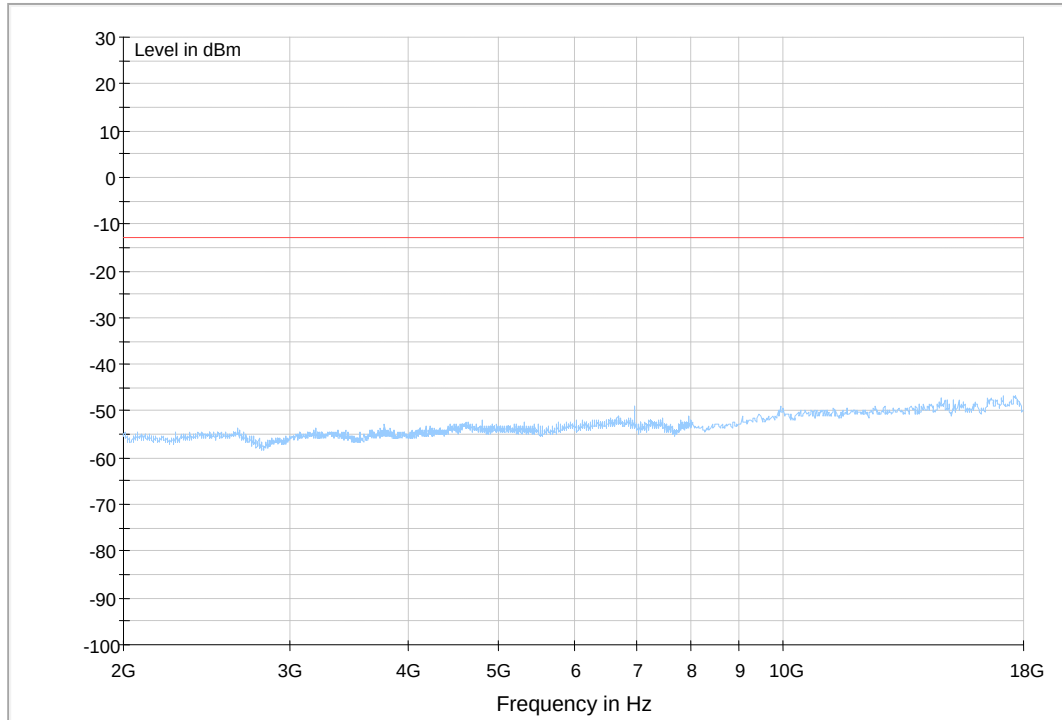


(30MHz~2GHz)





(2GHz~18GHz)





## **Appendix F**

# Photos of Radiated Spurious Emissions



## Photos of Test Setup



## 1 Radiated Spurious Emissions



Radiated Spurious Emission (below 2GHz)



Radiated Spurious Emission (2GHz to18GHz)