*Full*

# TEST REPORT

## No. I18D00207-SRD05

*For*

| | | |
|---|---|---|
| **Client** | **:** | **Shanghai Sunmi Technology Co.,Ltd.** |
| **Production** | **:** | **Wireless data ordering system** |
| **Model Name** | **:** | **T7821** |
| **Brand Name** | **:** | **SUNMI** |
| **FCC ID** | **:** | **2AH25M2** |
| **Hardware Version** | **:** | **2DD021_V2.01** |
| **Software Version** | **:** | **M2_V1.8** |
| **Issued date** | **:** | **2019-02-19** |

**Note:**

The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of ECIT Shanghai.

**Test Laboratory:**

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**Revision Version**

| Report Number | Revision | Date | Memo |
|---|---|---|---|
| I18D00207-SRD05 | 00 | 2019-02-19 | Initial creation of test report |

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# 1. Test Laboratory

## 1.1. Testing Location

| | |
|---|---|
| Company Name: | ECIT Shanghai, East China Institute of Telecommunications |
| Address: | 7-8F, G Area, No. 668, Beijing East Road, Huangpu District, Shanghai, P. R. China |
| Postal Code: | 200001 |
| Telephone: | (+86)-021-63843300 |
| Fax: | (+86)-021-63843301 |
| FCC registration No | 958356 |

## 1.2. Testing Environment

| | |
|---|---|
| Normal Temperature: | 15-35℃ |
| Extreme Temperature: | -30/+50℃ |
| Relative Humidity: | 25-75% |

## 1.3. Project data

| | |
|---|---|
| Project Leader: | Chen Minfei |
| Testing Start Date: | 2018-10-22 |
| Testing End Date: | 2019-02-19 |

## 1.4. Signature

**Yang Dejun**
**(Prepared this test report)**

**Shi Hongqi**
**(Reviewed this test report)**

**Zheng Zhongbin**
**(Approved this test report)**

# 2. Client Information

## 2.1. Applicant Information

| | |
|---|---|
| Company Name: | Shanghai Sunmi Technology Co.,Ltd. |
| Address: | Room 505, KIC Plaza, No.388 Song Hu Road, Yang Pu District, Shanghai, China |
| Telephone: | 86-18721763396 |
| Postcode: | 200433 |

## 2.2. Manufacturer Information

| | |
|---|---|
| Company Name: | Shanghai Sunmi Technology Co.,Ltd. |
| Address: | Room 505, KIC Plaza, No.388 Song Hu Road, Yang Pu District, Shanghai, China |
| Telephone: | 86-18721763396 |
| Postcode: | 200433 |

# 3. Equipment Under Test (EUT) and Ancillary Equipment (AE)

## 3.1. About EUT

| | |
|---|---|
| EUT Description | Wireless data ordering system |
| Model name | T7821 |
| FCC ID | 2AH25M2 |
| GSM Frequency Band | GSM850/GSM900/GSM1800/GSM1900 |
| UMTS Frequency Band | Band 1/2/4/5 |
| CDMA Frequency Band | BC0/BC1 |
| LTE Frequency Band | Band 2/4/7/17/28 |
| Additional Communication Function | BT/BLE/2.4G WLAN 802.11 b/g/n20/n40/5G WLAN 802.11 a/n20/n40 |
| Extreme Temperature | -30/+50℃ |
| Nominal Voltage | 3.8V |
| Extreme High Voltage | 4.35V |
| Extreme Low Voltage | 3.6V |

Note: Photographs of EUT are shown in ANNEX A of this test report.

## 3.2. Internal Identification of EUT used during the test

| EUT ID* | Model Name | SN or IMEI | HW Version | SW Version | Date of receipt |
|---|---|---|---|---|---|
| N05 | T7821 | NA | 2DD021_V2.01 | M2_V1.8 | 2018-10-16 |
| N03 | T7821 | NA | 2DD021_V2.01 | M2_V1.8 | 2018-10-16 |

*EUT ID: is used to identify the test sample in the lab internally.

## 3.3. Internal Identification of AE used during the test

| AE ID* | Description | SN |
|---|---|---|
| AE1 | RF cable | --- |

*AE ID: is used to identify the test sample in the lab internally.

## 3.4. Statements

The T7821, supporting GPRS/EDGE/WCDMA/CDMA/LTE/BT/BLE/WLAN, manufactured by Shanghai Sunmi Technology Co.,Ltd. , which is a new product for testing.

ECIT has verified that the compliance of the tested device specified in section 5 of this test report is successfully evaluated according to the procedure and test methods as defined in type certification requirement listed in section 5 of this test report.

# 4. Reference Documents

## 4.1. Reference Documents for testing

The following documents listed in this section are referred for testing.

| Reference | Title | Version |
|---|---|---|
| FCC Part 2 | FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS | 2018/10/01 |
| FCC Part 22 | PUBLIC MOBILE SERVICES | 2018/10/01 |
| FCC Part 24 | PERSONAL COMMUNICATIONS SERVICES | 2018/10/01 |

# 5. SUMMARY OF TEST RESULTS

| Item | Test items | Clause in FCC rules | Clause in IC rules RSS-Gen and RSS- 130 | result |
|---|---|---|---|---|
| 1 | Output Power | 2.1046/22.913(a)/24.23 | / | Pass |
| 2 | Peak-to-Average | 24.232(d) | / | Pass |
| 3 | 99%Occupied | 2.1049(h)(i)/ 22.917(b) | / | Pass |
| 4 | -26dB Emission | 22.917(b)/§24.238(b) | / | Pass |
| 5 | Band Edge at antenna terminals | 22.917(a)/24.238(a) | / | Pass |
| 6 | Frequency stability | 2.1055/24.235 | / | Pass |
| 7 | Conducted Spurious mission | 2.1053/22.917(a)/24.23 | / | Pass |
| 8 | Emission Limit | 2.1051/22.917/24.238/ | / | Pass |

# 6. Test Equipment Utilized

**Climate chamber**

| No. | Equipment | Model | Serial Number | Manufacturer | Calibration date | Cal.interval |
|---|---|---|---|---|---|---|
| 1 | Climate chamber | SH-641 | 92012011 | ESPEC | 2017-12-25 | 2 Year |

**Radiated emission test system**

The test equipment and ancillaries used are as follows.

| No. | Equipment | Model | Serial Number | Manufacturer | Calibration date | Cal.interval |
|---|---|---|---|---|---|---|
| 1 | Universal Radio Communication Tester | CMU200 | 123123 | R&S | 2018-05-11 | 1 Year |
| 2 | EMI Test Receiver | ESU40 | 100307 | R&S | 2018-05-11 | 1 Year |
| 3 | TRILOG Broadband Antenna | VULB9163 | VULB9163-515 | Schwarzbeck | 2017-02-25 | 3 Year |
| 4 | Double-ridged Waveguide Antenna | ETS-3117 | 00135890 | ETS | 2017-01-11 | 3 Year |
| 5 | 2-Line V-Network | ENV216 | 101380 | R&S | 2018-05-11 | 1 Year |
| 6 | Substitution Antenna | ETS-3117 | 00135890 | ETS | 2017-01-11 | 3 Year |
| 7 | RF Signal Generator | SMF100A | 102314 | R&S | 2018-05-11 | 1 Year |
| 8 | Substitution Antenna | VUBA9117 | 9117-266 | Schwarzbeck | 2017-11-18 | 3 Year |
| 9 | Amplifier | SCU08 | 10146 | R&S | 2018-05-11 | 1 Year |

| | | | | | | |
|---|---|---|---|---|---|---|
| 10 | Anechoic Chamber | AMS-8500 | CT-001157-1219 | ETS | - | 1 Year |
| 11 | Test Software | EMQuest™ | REV 1.0.9 | ETS | - | 1 Year |
| 12 | Wireless communication tester | Agilent E5515C | MY48360957 | Key sight | 2017/12/17 | 1 Year |
| 13 | Spectrum Analyzer | FSP7 | 100012 | R&S | 2018/5/20 | - |
| 14 | EMCenter_Switch Control System | 7006/7001 | 00059957/MY42001152 | ETS | 2018/5/20 | 1 Year |
| 15 | Diagonal Dual Polarized Horn | ETS 3164-04 | 00062743 | ETS | 2018/5/20 | 1 Year |
| 16 | Communication TX/RX Antenna on ceiling | 3102 | 00058628 | ETS | 2018/5/20 | 1 Year |

**Conducted test system**

| No. | Name | Type | SN | Manufacture | Calibration date | Cal.interval |
|---|---|---|---|---|---|---|
| 1 | Spectrum Analyzer | FSQ26 | 101096 | R&S | 2018-05-11 | 1 Year |
| 2 | Universal Radio Communicat | CMU200 | 123123 | R&S | 2018-05-11 | 1 Year |
| 3 | DC Power Supply | ZUP60-14 | LOC-220Z006-0007 | TDL-Lambda | 2018-05-11 | 1 Year |

# 7. Test Environment

**Shielding Room1** (6.0 meters×3.0 meters×2.7 meters) did not exceed following limits along the conducted RF performance testing:

| | |
|---|---|
| Temperature | Min. = 15 ℃, Max. = 35 ℃ |
| Relative humidity | Min. = 20 %, Max. = 75 % |
| Shielding effectiveness | > 100 dB |
| Ground system resistance | < 0.5 Ω |

**Control room** did not exceed following limits along the EMC testing:

| | |
|---|---|
| Temperature | Min. = 15 ℃, Max. = 35 ℃ |
| Relative humidity | Min. =25 %, Max. = 75 % |
| Shielding effectiveness | > 100 dB |
| Electrical insulation | > 10 kΩ |
| Ground system resistance | < 0.5 Ω |

Fully-anechoic chamber1 (6.9 meters×10.9 meters×5.4 meters) did not exceed following limits along the EMC testing:

| | |
|---|---|
| Temperature | Min. = 15 ℃, Max. = 35 ℃ |
| Relative humidity | Min. = 25 %, Max. = 75 % |
| Shielding effectiveness | > 100 dB |
| Electrical insulation | > 10 kΩ |
| Ground system resistance | < 0.5 Ω |
| VSWR | Between 0 and 6 dB, from 1GHz to 18GHz |
| Site Attenuation Deviation | Between -4 and 4 dB,30MHz to 1GHz |
| Uniformity of field strength | Between 0 and 6 dB, from 80MHz to 3000 MHz |

# 8. Test Environment

Measurement uncertainty for all the testing in this report are within the limit specified in ECIT documents. The detailed measurement uncertainty to see the column, k=2

| Measurement Items | Range | Confidence Level | Calculated Uncertainty |
|---|---|---|---|
| Maximum Peak Output Power | 30MHz-3600MHz | 95% | ±0.544dB |
| EBW and VBW | 30MHz-3600MHz | 95% | ±62.04Hz |
| Transmitter Spurious Emission-Conducted | 30MHz-2GHz | 95% | ±0.90dB |
| Transmitter Spurious Emission-Conducted | 2GHz-3.6GHz | 95% | ±0.88dB |
| Transmitter Spurious Emission-Conducted | 3.6GHz-8GHz | 95% | ±0.96dB |
| Transmitter Spurious Emission-Conducted | 8GHz-20GHz | 95% | ±0.94dB |
| Transmitter Spurious Emission-Radiated | 9KHz-30MHz | 95% | ±5.66dB |
| Transmitter Spurious Emission-Radiated | 30MHz-1000MHz | 95% | ±4.98dB |
| Transmitter Spurious Emission-Radiated | 1000MHz -18000MHz | 95% | ±5.06dB |
| Transmitter Spurious Emission-Radiated | 18000MHz -40000MHz | 95% | ±5.20dB |
| Frequency stability | 1MHz-16GHz | 95% | ±62.04Hz |

# ANNEX A. MEASUREMENT RESULTS

## ANNEX A.1. OUTPUT POWER

### A.1.1. Summary

During the process of testing, the EUT was controlled Rhode & Schwarz Digital Radio. Communication tester (CMU-200) to ensure max power transmission and proper modulation. This result contains peak output power and EIRP measurements for the EUT. In all cases, output power is within the specified limits.

### A.1.2. Conducted

#### A.1.2.1. Method of Measurements

Method of measurements please refer to CFR47 (FCC) part 2.1046 and part 22.913.
The EUT was set up for the max output power with pseudo random data modulation.
The power was measured with Rhode & Schwarz Spectrum Analyzer FSQ(peak).
These measurements were done at 3 frequencies, 1850.2 MHz, 1880.0MHz and 1909.8MHz for PCS1900 band; 824.2MHz, 836.6MHz and 848.8MHz for GSM850 band. (bottom, middle and top of operational frequency range).
These measurements were done at 3 frequencies, 1852.4 MHz, 1880.0MHz and 1907.6MHz for WCDMA Band II; 826.4MHz, 836.6MHz and 846.6MHz for WCDMA Band V. (bottom, middle and top of operational frequency range).

**A.1.2.2 Test procedures:**

1. The transmitter output port was connected to base station.
2. Set the EUT at maximum power through base station.
3. Select lowest, middle, and highest channels for each band and different modulation.
4. Measure the maximum burst average power for GSM and maximum average power for other modulation signal.

**A.1.2.3 Limit:**

22.913(a) Mobile stations are limited to 7watts.
24.232(c) Mobile and portable stations are limited to 2 watts.

**A.1.2.4 Test Procedure:**

The transmitter output power was connected to calibrated attenuator, the other end of which was connected to signal analyzer. Transmitter output power was read off the power in dBm. The power outputs at the transmitter antenna port was determined by adding the value of attenuator to the signal analyzer reading.

**A.1.2.5 CDMA2000 Cellular Test Condition:**

| RBW | VBW | Sweep time | Span |
|---|---|---|---|

| | | | |
|---|---|---|---|
| 1MHz | 3MHz | 300ms | 10MHz |

**A.1.2.7 Measurement results:**

| CDMA2000 Cellular BC0 | | |
|---|---|---|
| Channel/fc(MHz) | Peak power (dBm) | AV power (dBm) |
| High 777/848.31 | 24.23 | 24.1 |
| Mid 384/836.52 | 24.07 | 23.92 |
| Low 1013/824.7 | 24.15 | 24.03 |

| CDMA2000 PCS BC1 | | |
|---|---|---|
| Channel/fc(MHz) | Peak power (dBm) | AV power (dBm) |
| Mid 600/1880.0 | 23.68 | 23.24 |
| Low 25/1851.25 | 23.79 | 23.31 |
| High 1175/1908.75 | 23.56 | 23.13 |

| 1xEV-DO BC0 Release 0 | | |
|---|---|---|
| Channel/fc(MHz) | Peak power (dBm) | AV power (dBm) |
| High 777/848.31 | 24.95 | 24.78 |
| Mid 384/836.52 | 24.90 | 24.71 |
| Low 1013/824.7 | 24.81 | 24.62 |

| 1xEV-DO BC1 Release 0 | | |
|---|---|---|
| Channel/fc(MHz) | Peak power (dBm) | AV power (dBm) |
| Mid 600/1880.0 | 23.97 | 23.68 |
| Low 25/1851.25 | 23.88 | 23.5 |
| High 1175/1908.75 | 23.54 | 23.14 |

| 1xEV-DO BC0 Release A |
|---|

| Channel/fc(MHz) | Peak power (dBm) | AV power (dBm) |
|---|---|---|
| High 777/848.31 | 24.38 | 24.34 |
| Mid 384/836.52 | 24.53 | 24.38 |
| Low 1013/824.7 | 24.56 | 24.45 |

| 1xEV-DO BC1 Release A | | |
|---|---|---|
| Channel/fc(MHz) | Peak power (dBm) | AV power (dBm) |
| Mid 600/1880.0 | 23.81 | 23.55 |
| Low 25/1851.25 | 23.41 | 23.52 |
| High 1175/1908.75 | 23.66 | 23.13 |

**Conclusion: PASS**

## ANNEX A.2. Peak-to-Average Power Ratio

Method of test measurements please refer to CFR47 (FCC) part 2.1046 and part 22.913.

### A.2.1 PAPR Limit

The peak-to-average power ratio (PAPR) of the transmission may not exceed 13dB

### A.2.2 Test procedures

1. The EUT was connected to the spectrum analyzer and system simulator via a power divider.
2. 
   1) Select the spectrum analyzer CCDF function.
   2) Set RBW≥signal's occupied bandwidth.
   3) Set the number of counts to a value that stabilizes the measured CCDF cure;
   4) Sweep time ≥ 1s.
3. Record the maximum PAPR level associated with a probability of 0.1%.

### A.2.3 Test results:

| CDMA2000 Cellular BC0 | | | |
|---|---|---|---|
| Channel | 384 | 777 | 1013 |
| Frequency (MHz) | 836.52 | 848.31 | 824.7 |
| PAPR(dB) | 3.04 | 2.44 | 3.43 |

| CDMA2000 PCS BC1 | | | |
|---|---|---|---|
| Channel | 25 | 600 | 1175 |
| Frequency (MHz) | 1851.25 | 1880.0 | 1908.75 |
| PAPR(dB) | 4.07 | 3.30 | 2.92 |

| 1xEV-DO BC0 Release 0 | | | |
|---|---|---|---|
| Channel | 384 | 777 | 1013 |
| Frequency (MHz) | 836.52 | 848.31 | 824.7 |
| PAPR(dB) | 5.04 | 4.94 | 4.89 |

| 1xEV-DO BC1 Release 0 | | | |
|---|---|---|---|
| Channel | 25 | 600 | 1175 |
| Frequency (MHz) | 1851.25 | 1880.0 | 1908.75 |
| PAPR(dB) | 5.09 | 4.87 | 4.99 |

| 1xEV-DO BC0 Release A | | | |
|---|---|---|---|
| Channel | 384 | 777 | 1013 |
| Frequency (MHz) | 836.52 | 848.31 | 824.7 |
| PAPR(dB) | 4.76 | 4.69 | 4.74 |

| 1xEV-DO BC1 Release A | | | |
|---|---|---|---|
| Channel | 25 | 600 | 1175 |
| Frequency (MHz) | 1851.25 | 1880.0 | 1908.75 |
| PAPR(dB) | 4.69 | 4.88 | 4.73 |

**Conclusion: PASS**

## ANNEX A.3. Occupied Bandwidth

Method of test please refer to CFR 47 (FCC) part 2.1049 and part 22 subpart .

### A.3.1. Occupied Bandwidth

Similar to conducted emissions; occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of CDMA2000 Cellular, CDMA2000 PCS.

### A.3.2 Test Procedure:

1. The EUT output RF connector was connected with a short cable to the signal analyzer.
2. RBW was set to about 1% of emission BW, VBW >= 3 times RBW,.
3. 99% bandwidth were measured, the occupied bandwidth is delta frequency between the two points where the display line intersects the signal trace.

### A.3.3 Test result:

| CDMA2000 Cellular BC0 | | |
|---|---|---|
| Test channel | Frequency (MHz) | 99% Occupied Bandwidth(MHz) |
| High 777 | 848.31 | 1.298 |
| Mid 384 | 836.52 | 1.284 |
| Low 1013 | 824.7 | 1.279 |

**Conclusion: PASS**

**CDMA2000 Cellular**

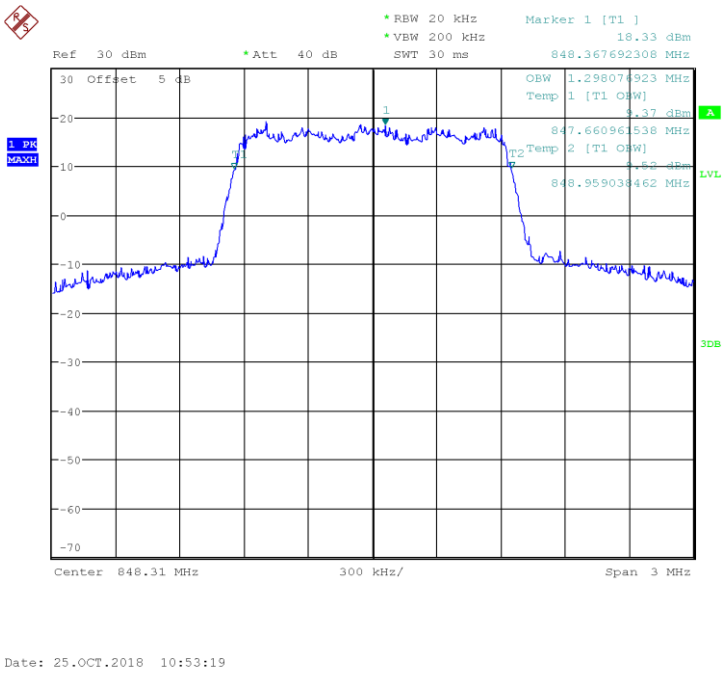


Fig.1 **Channel 777-Occupied Bandwidth (99%)**

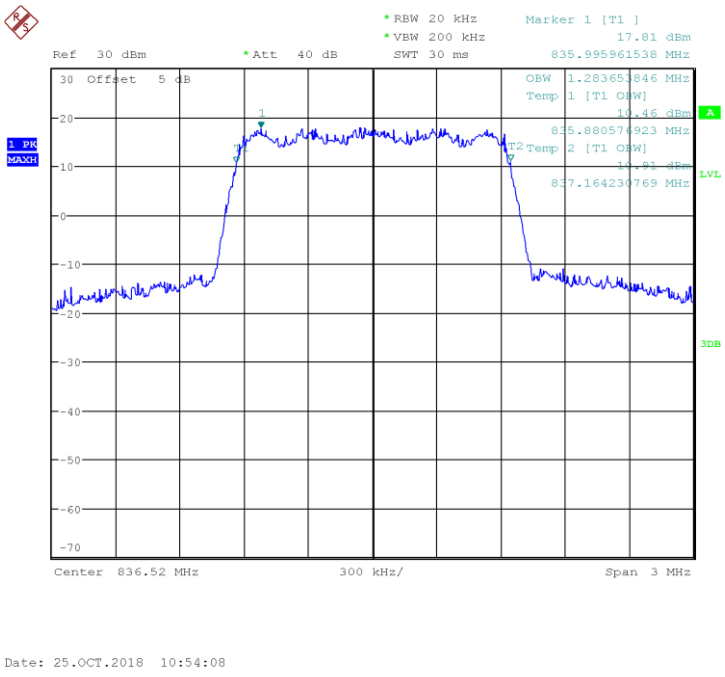


Fig.2 **Channel 384-Occupied Bandwidth (99%)**

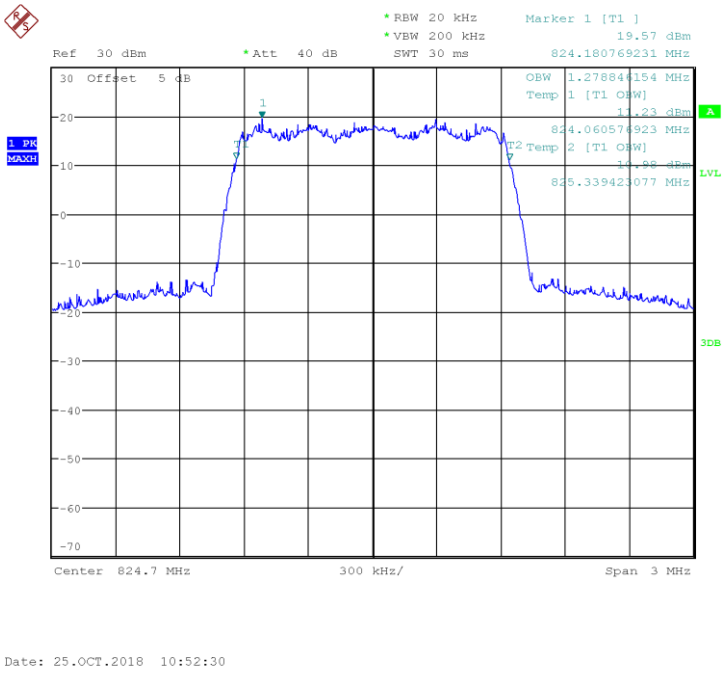


Fig.3 **Channel 1013-Occupied Bandwidth (99%)**

**Conclusion: PASS**

| **CDMA2000 PCS BC1** | | |
|---|---|---|
| Test channel | Frequency (MHz) | 99% Occupied Bandwidth(MHz) |
| Mid 600 | 1880.0 | 1.288 |

| | | |
|---|---|---|
| Low 25 | 1851.25 | 1.293 |
| High 1175 | 1908.75 | 1.293 |

**Conclusion: PASS**

**CDMA2000 PCS**

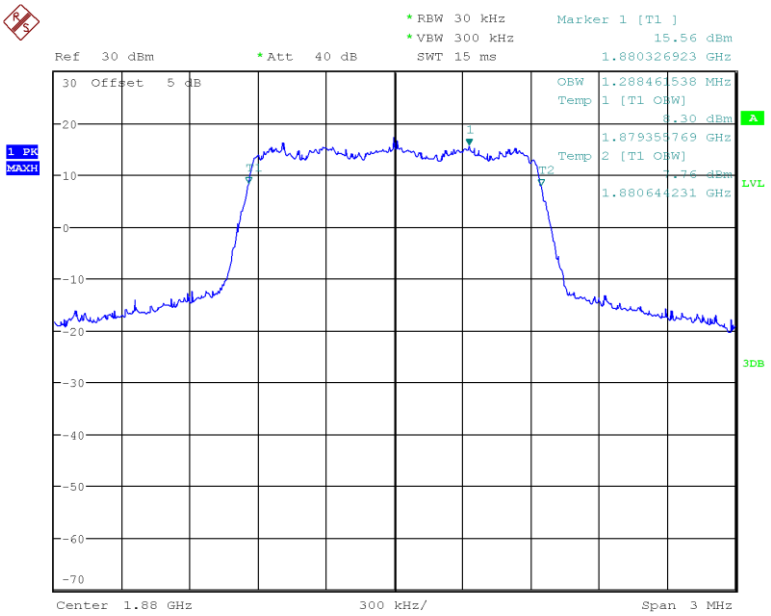


Fig.4 **Channel 600-Occupied Bandwidth**

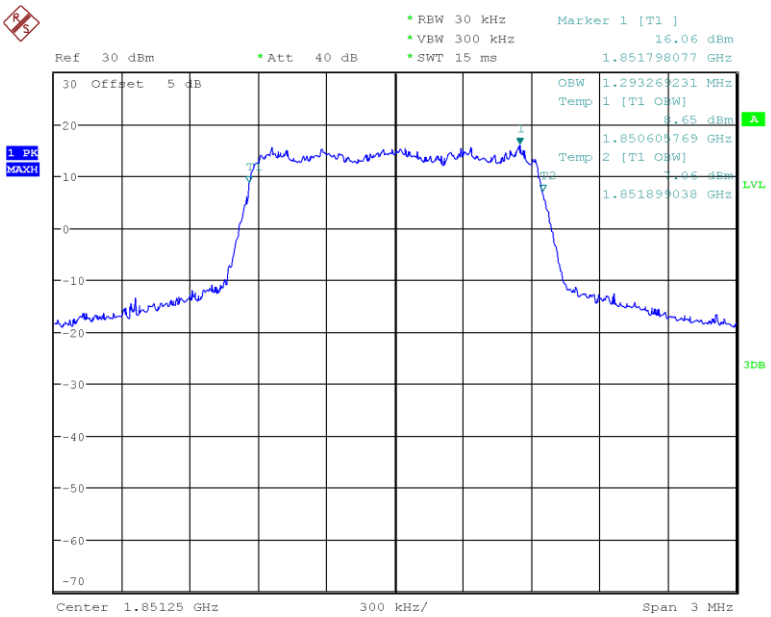


Fig.5 **Channel 25-Occupied Bandwidth**

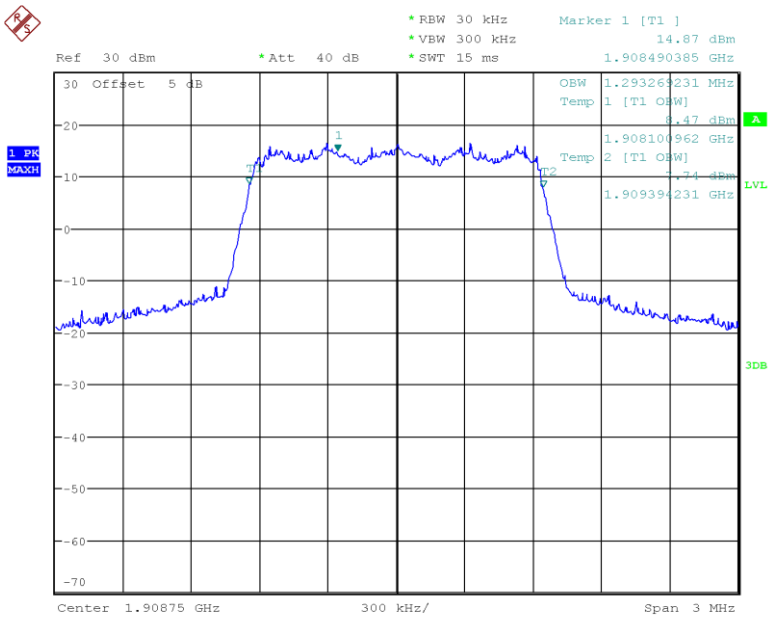


Fig.6 **Channel 1175-Occupied Bandwidth**

**Conclusion: PASS**

| **1xEV-DO BC0 Release 0** | | |
|---|---|---|
| Test channel | Frequency (MHz) | 99% Occupied Bandwidth(MHz) |
| High 777 | 848.31 | 1.332 |
| Mid 384 | 836.52 | 1.284 |
| Low 1013 | 824.7 | 1.279 |

**1xEV-DO BC0 Release 0**

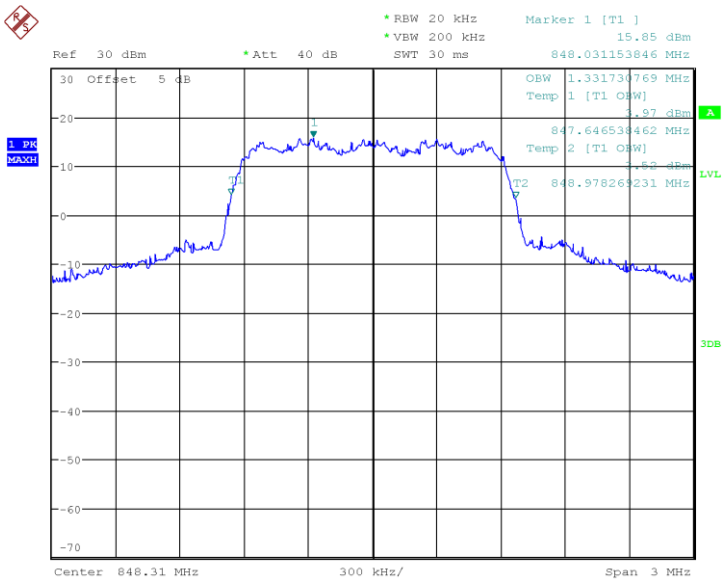


Fig.7 **Channel 777-Occupied Bandwidth (99%)**

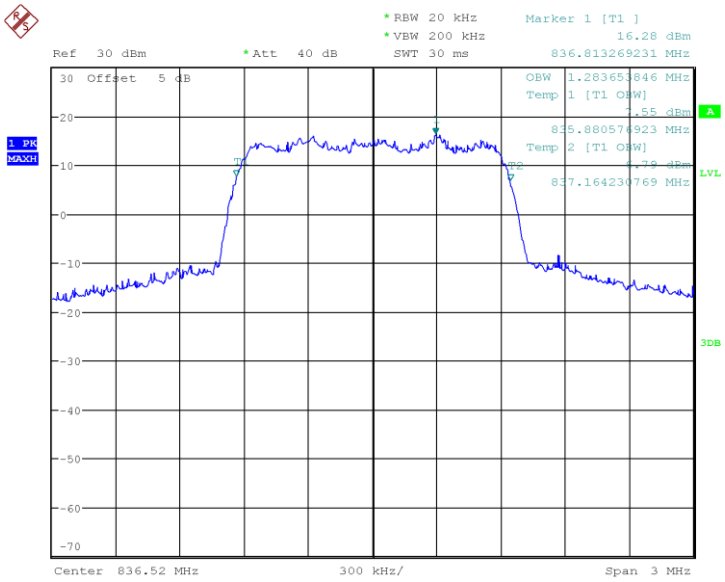


Fig.8 **Channel 384-Occupied Bandwidth (99%)**

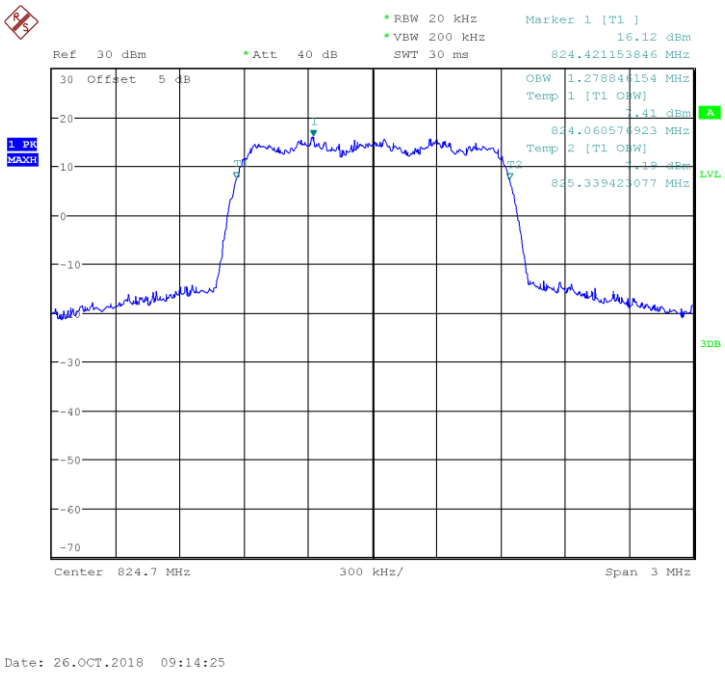


Fig.9 **Channel 1013-Occupied Bandwidth (99%)**

**Conclusion: PASS**

| **1xEV-DO BC1 Release 0** | | |
|---|---|---|
| Test channel | Frequency (MHz) | 99% Occupied Bandwidth(MHz) |
| Mid 600 | 1880.0 | 1.274 |
| Low 25 | 1851.25 | 1.269 |
| High 1175 | 1908.75 | 1.279 |

**1xEV-DO BC1 Release 0**

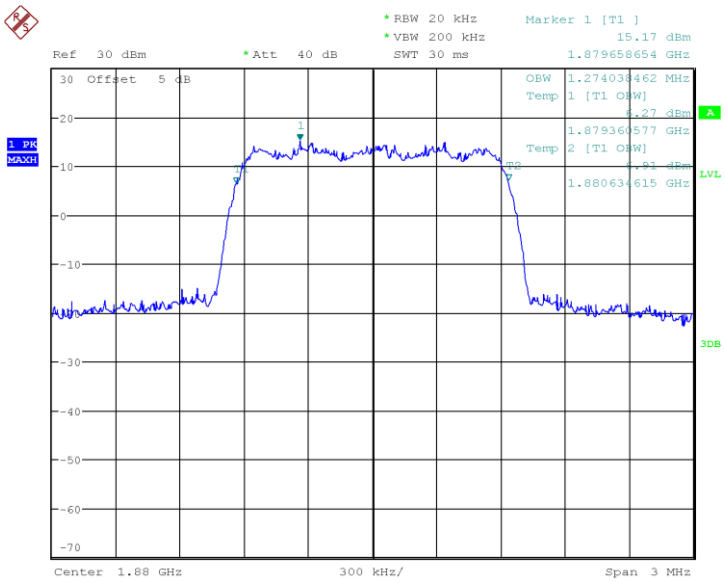


Fig.10 **Channel 600-Occupied Bandwidth**

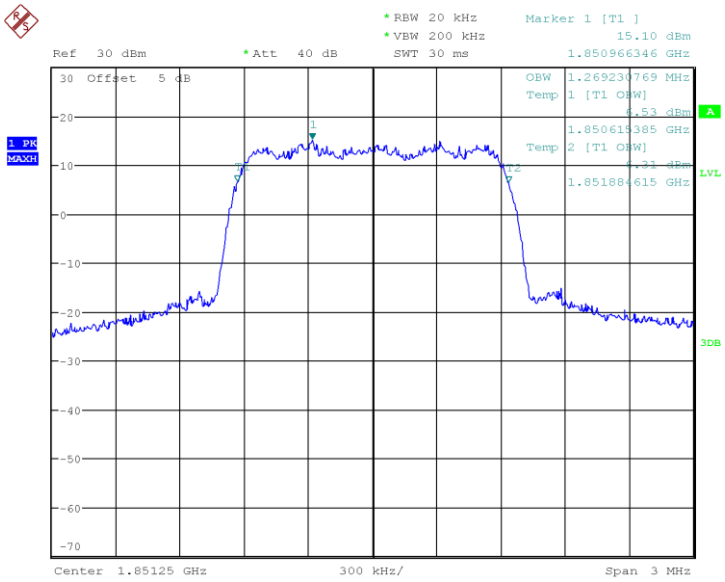


Fig.11 **Channel 25-Occupied Bandwidth**

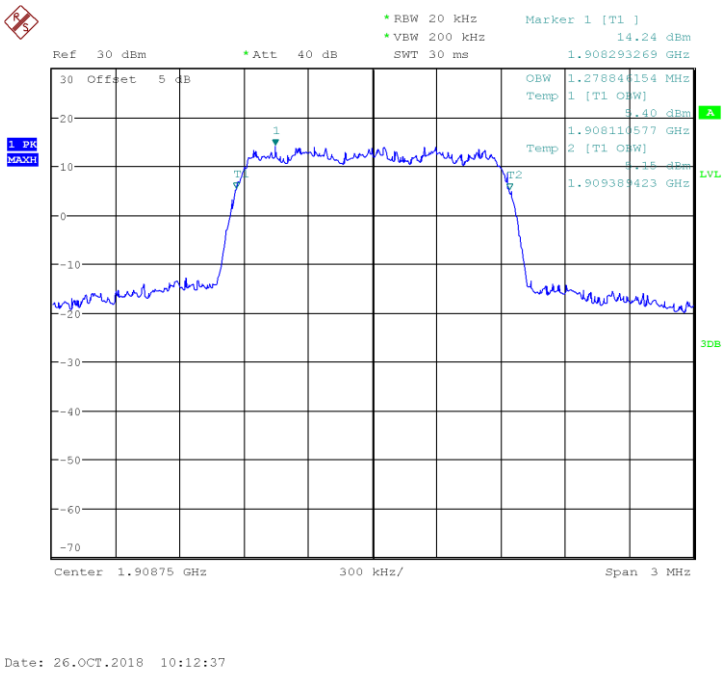


Fig.12 **Channel 1175-Occupied Bandwidth**

| **1xEV-DO BC0 Release A** | | |
|---|---|---|
| Test channel | Frequency (MHz) | 99% Occupied Bandwidth(MHz) |
| High 777 | 848.31 | 1.288 |
| Mid 384 | 836.52 | 1.279 |
| Low 1013 | 824.7 | 1.279 |

**1xEV-DO BC0 Release A**

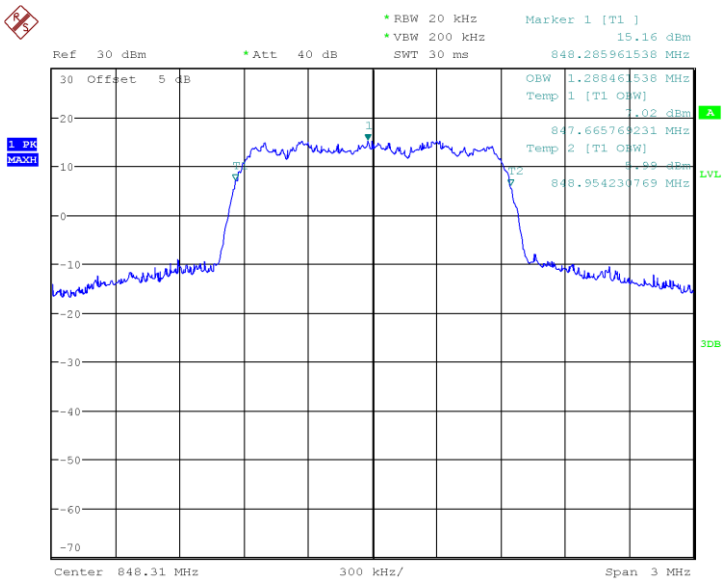


Fig.13 **Channel 777-Occupied Bandwidth (99%)**

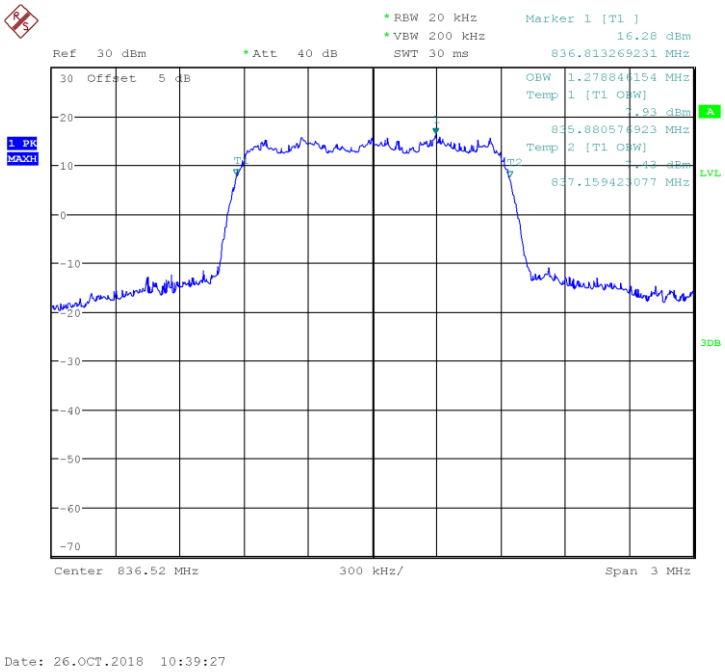


Fig.14 **Channel 384-Occupied Bandwidth (99%)**

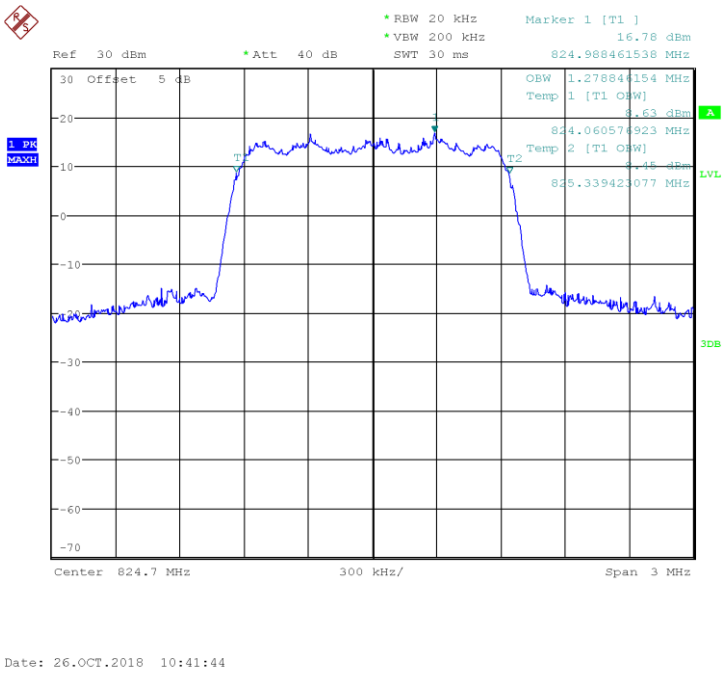


Fig.15 **Channel 1013-Occupied Bandwidth (99%)**

**Conclusion: PASS**

| **1xEV-DO BC1 Release A** | | |
|---|---|---|
| Test channel | Frequency (MHz) | 99% Occupied Bandwidth(MHz) |
| Mid 600 | 1880.0 | 1.327 |
| Low 25 | 1851.25 | 1.313 |
| High 1175 | 1908.75 | 1.337 |

**1xEV-DO BC1 Release A**

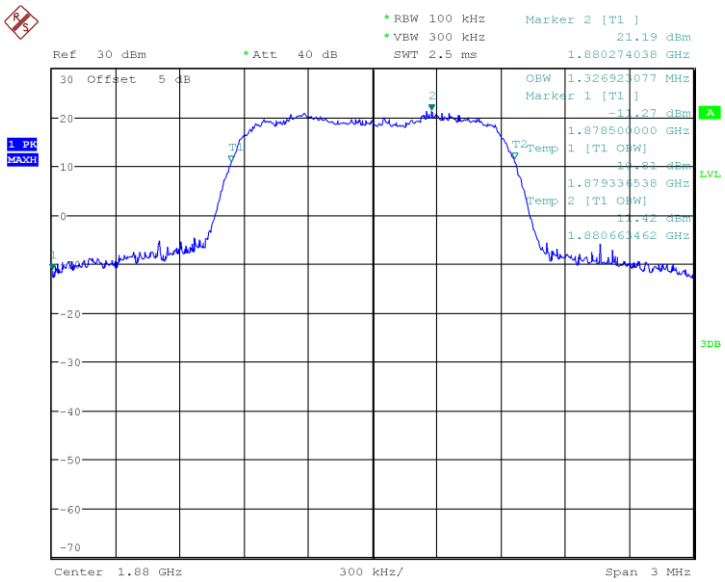


Fig.16 **Channel 600-Occupied Bandwidth**

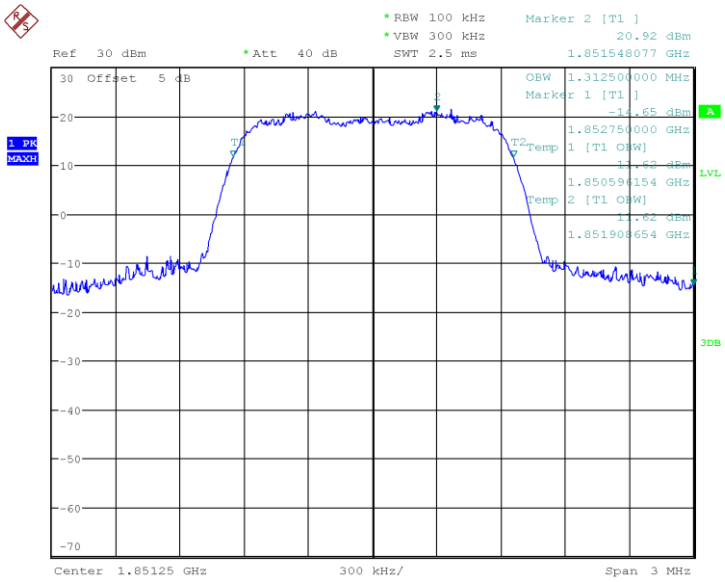


Fig.17 **Channel 25-Occupied Bandwidth**

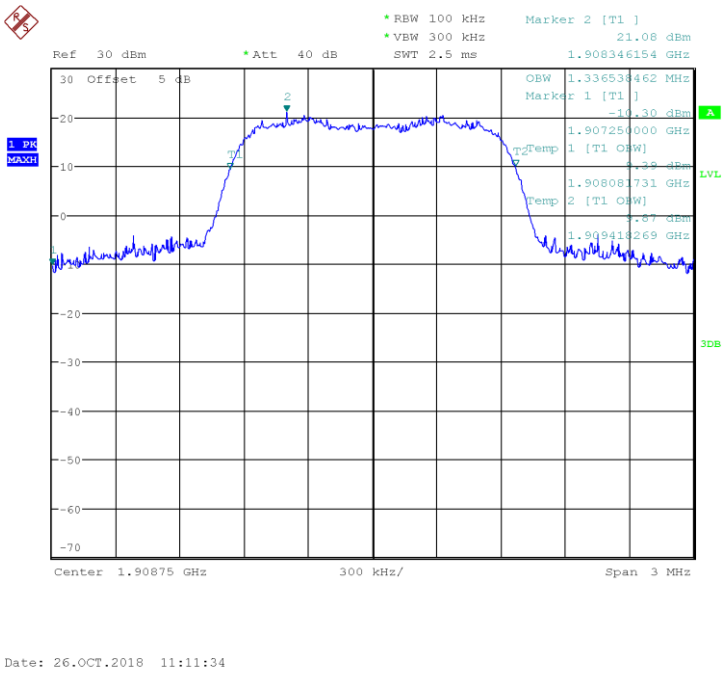


Fig.18 **Channel 1175-Occupied Bandwidth**

**Conclusion: PASS**

## ANNEX A.4. -26dB Emission Bandwidth

Method of test please refer to CFR 47 (FCC) part 2.1049 and part 22 subpart.

### A.4.1. -26dB Emission Bandwidth

Similar to conducted emissions; occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of CDMA2000 Cellular, CDMA2000 PCS.

### A.4.2 Test Procedure:

1. The EUT output RF connector was connected with a short cable to the signal analyzer.
2. RBW was set to about 1% of emission BW, VBW >= 3 times RBW,.
3. 26dB bandwidth were measured, the occupied bandwidth is delta frequency between the two points where the display line intersects the signal trace.

### A.4.3 Measurement methods:

For CDMA: signal analyzer setting as: RBW=20KHz;VBW=200KHz;Span=3MHz.

### A.4.4 Test results:

| CDMA2000 Cellular BC0 | | |
|---|---|---|
| Test channel | Frequency (MHz) | –26dBc Emission Bandwidth(MHz) |
| High 777 | 848.31 | 1.519 |
| Mid 384 | 836.52 | 1.447 |
| Low 1013 | 824.7 | 1.433 |

**Conclusion: PASS**

**CDMA2000 Cellular**

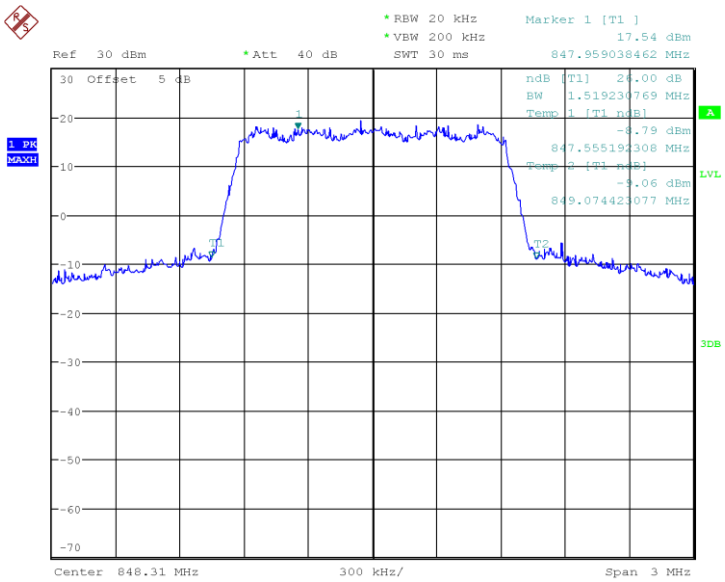


Fig.19 **Channel 777- Emission Bandwidth (-26dBc BW)**

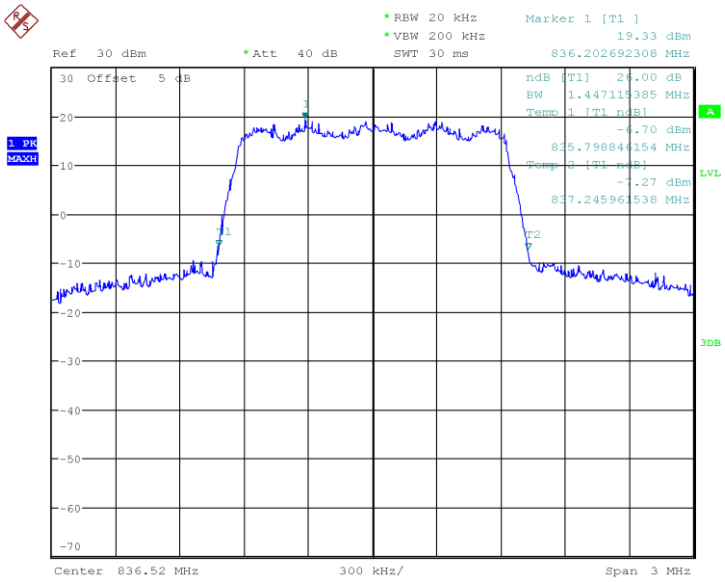


Fig.20 **Channel 384- Emission Bandwidth (-26dBc BW)**

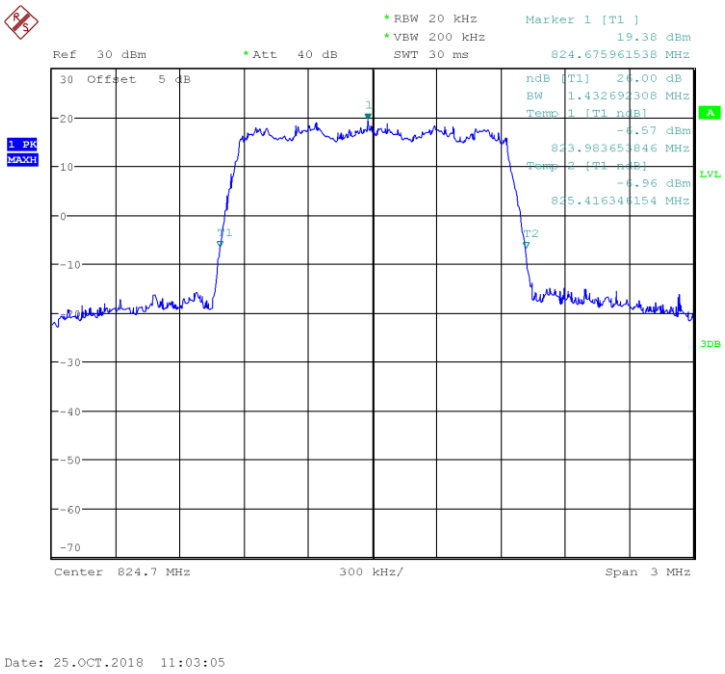


Fig.21 **Channel 1013- Emission Bandwidth (-26dBc BW)**

| **CDMA2000 PCS BC1** | | |
|---|---|---|
| Test channel | Frequency (MHz) | –26dBc Emission Bandwidth(MHz) |
| Mid 600 | 1880.0 | 1.481 |
| Low 25 | 1851.25 | 1.514 |
| High 1175 | 1908.75 | 1.505 |

**Conclusion: PASS**

**CDMA2000 PCS BC1**

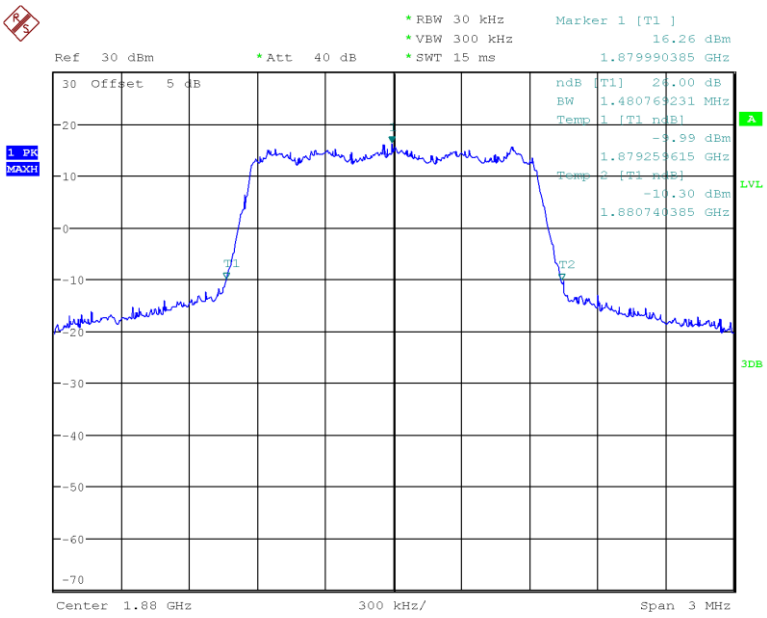


Fig.22 **Channel 600- Emission Bandwidth (-26dBc BW)**

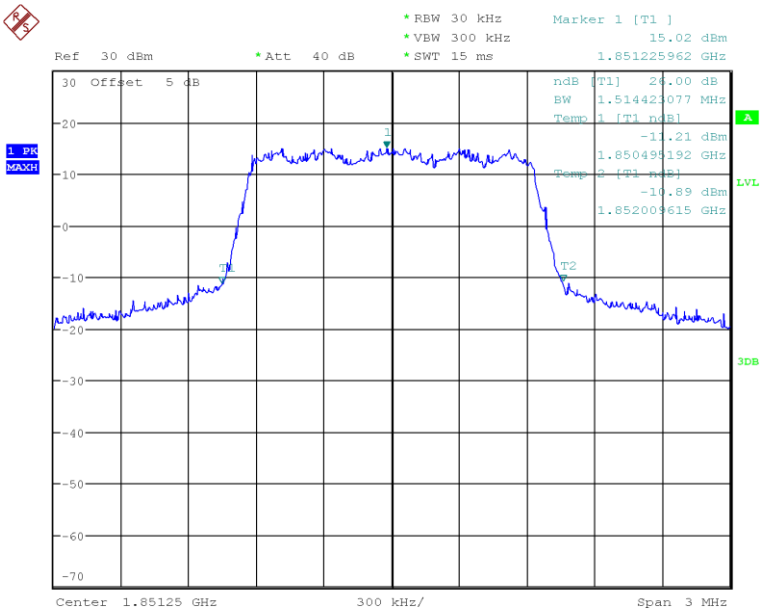


Fig.23 **Channel 25- Emission Bandwidth (-26dBc BW)**

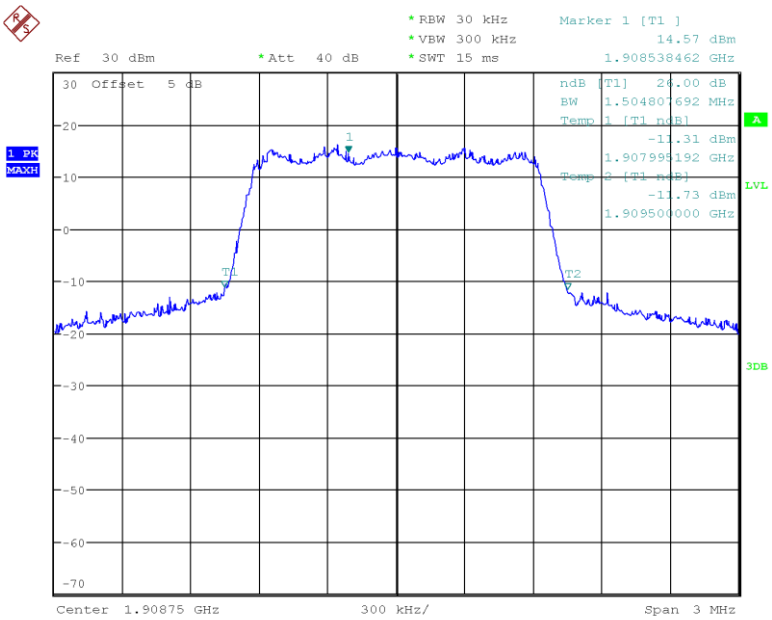


Fig.24 **Channel 1175- Emission Bandwidth (-26dBc BW)**

**Conclusion: PASS**

| **1xEV-DO BC0 Release 0** | | |
|---|---|---|
| Test channel | Frequency (MHz) | –26dBc Emission Bandwidth(MHz) |
| High 777 | 848.31 | 1.438 |
| Mid 384 | 836.52 | 1.462 |
| Low 1013 | 824.7 | 1.428 |

**Conclusion: PASS**

**1xEV-DO BC0 Release 0**

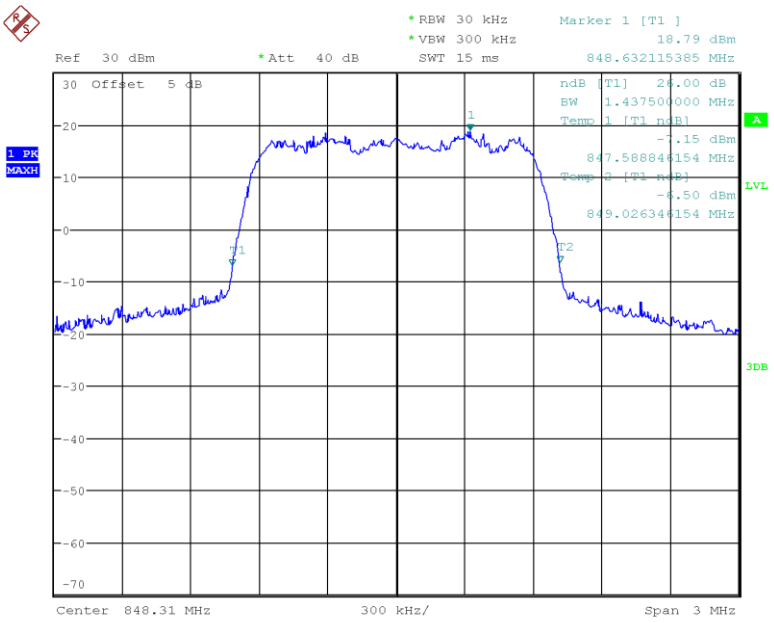


Fig.25 **Channel 777- Emission Bandwidth (-26dBc BW)**

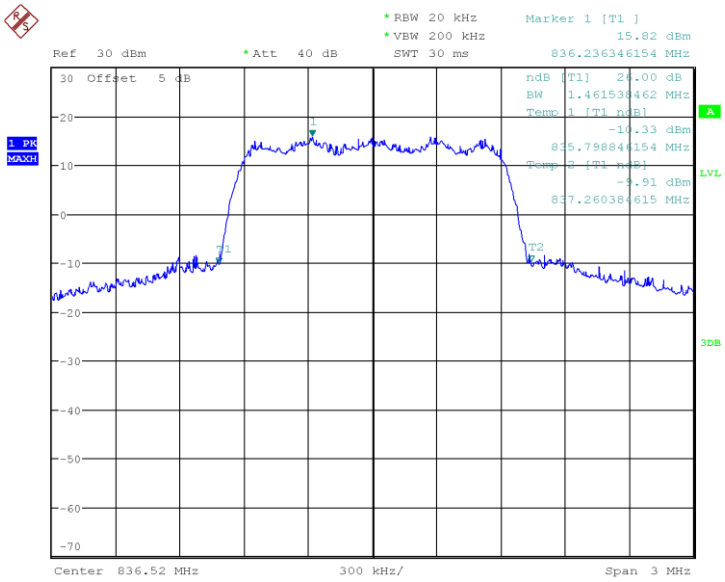


Fig.26 **Channel 384- Emission Bandwidth (-26dBc BW)**

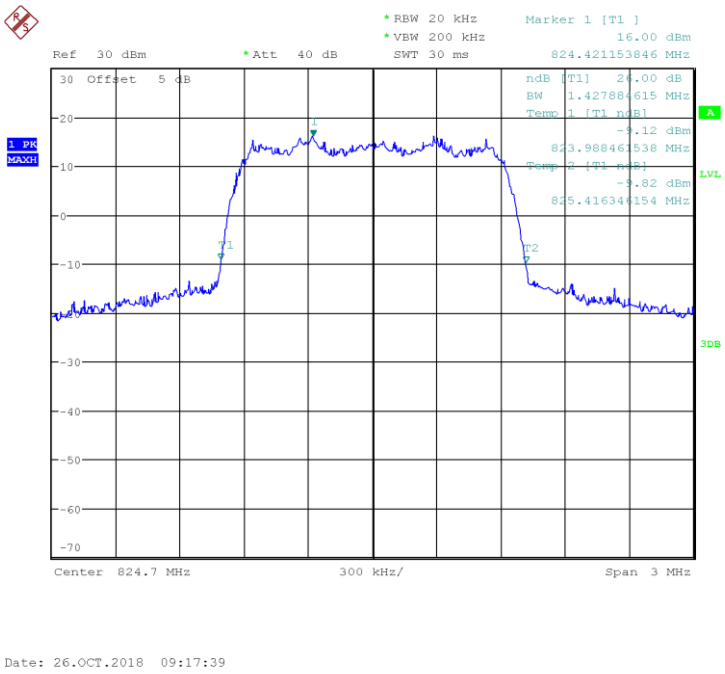


Fig.27 **Channel 1013- Emission Bandwidth (-26dBc BW)**

| **1xEV-DO BC1 Release 0** | | |
|---|---|---|
| Test channel | Frequency (MHz) | –26dBc Emission Bandwidth(MHz) |
| Mid 600 | 1880.0 | 1.438 |
| Low 25 | 1851.25 | 1.433 |
| High 1175 | 1908.75 | 1.438 |

**Conclusion: PASS**

**1xEV-DO BC0 Release 0**

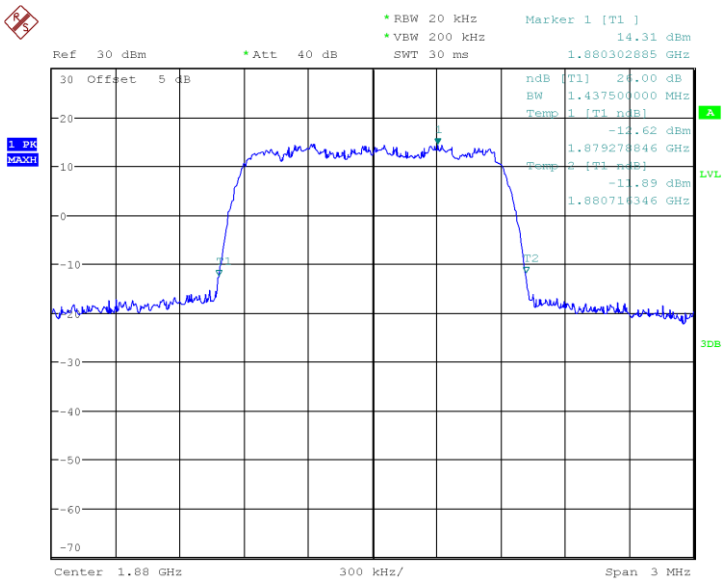


Fig.28 **Channel 600- Emission Bandwidth (-26dBc BW)**

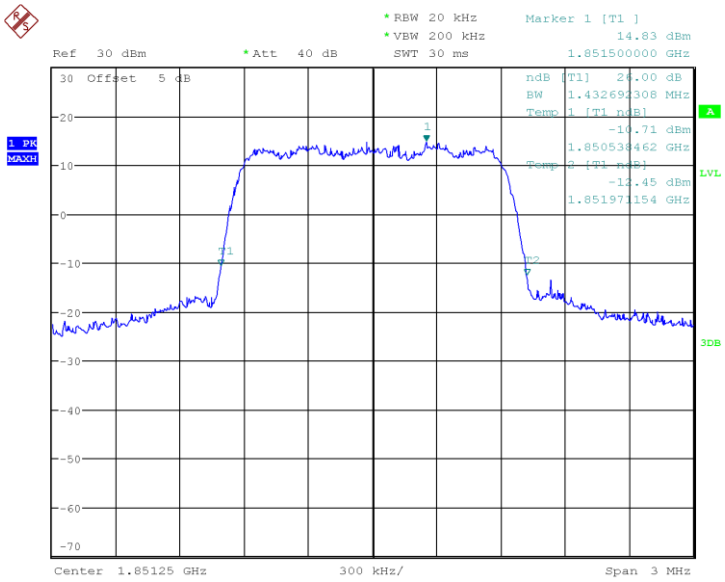


Fig.29 **Channel 25- Emission Bandwidth (-26dBc BW)**

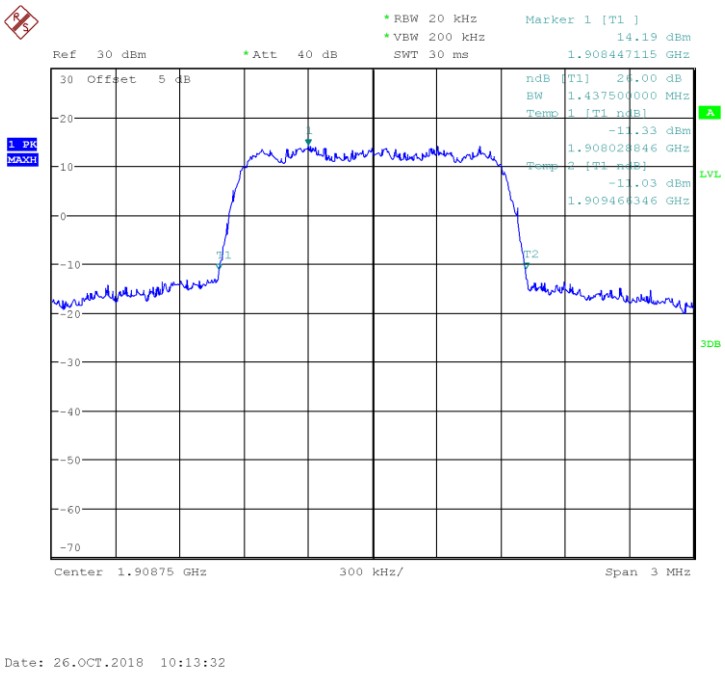


Fig.30 **Channel 1175- Emission Bandwidth (-26dBc BW)**

| **1xEV-DO BC0 Release A** | | |
|---|---|---|
| Test channel | Frequency (MHz) | –26dBc Emission Bandwidth(MHz) |
| High 777 | 848.31 | 1.500 |
| Mid 384 | 836.52 | 1.438 |
| Low 1013 | 824.7 | 1.423 |

**Conclusion: PASS**

**1xEV-DO BC0 Release A**

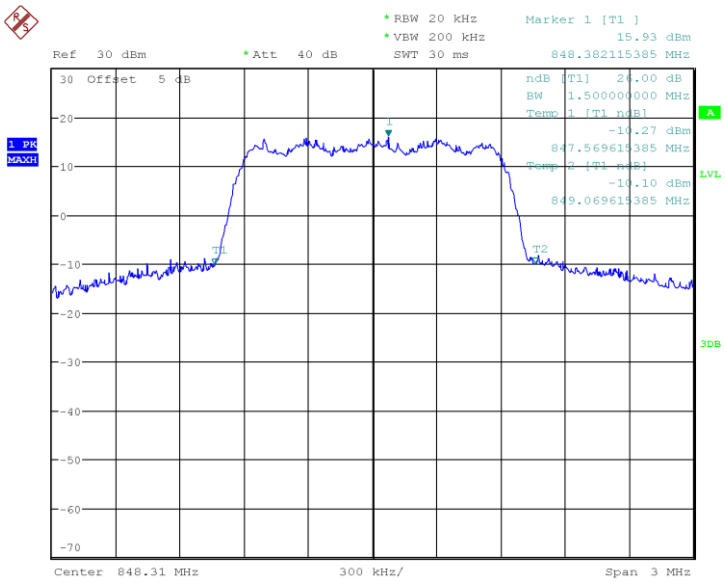


Fig.31 **Channel 777- Emission Bandwidth (-26dBc BW)**

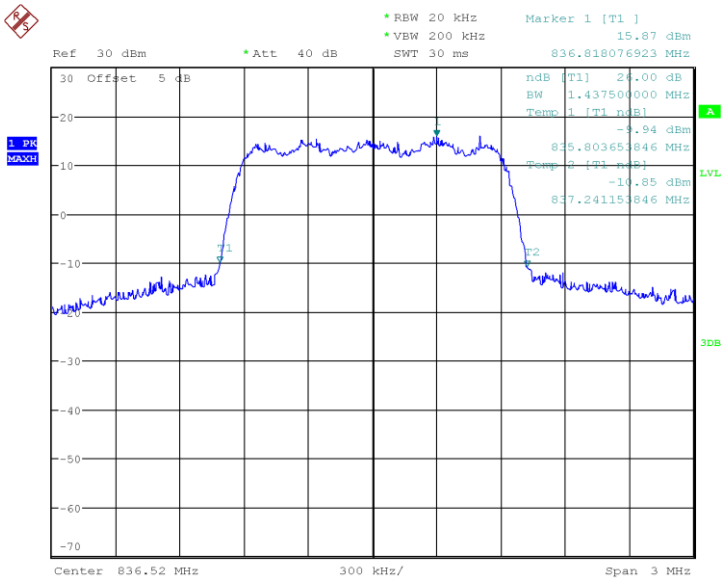


Fig.32 **Channel 384- Emission Bandwidth (-26dBc BW)**

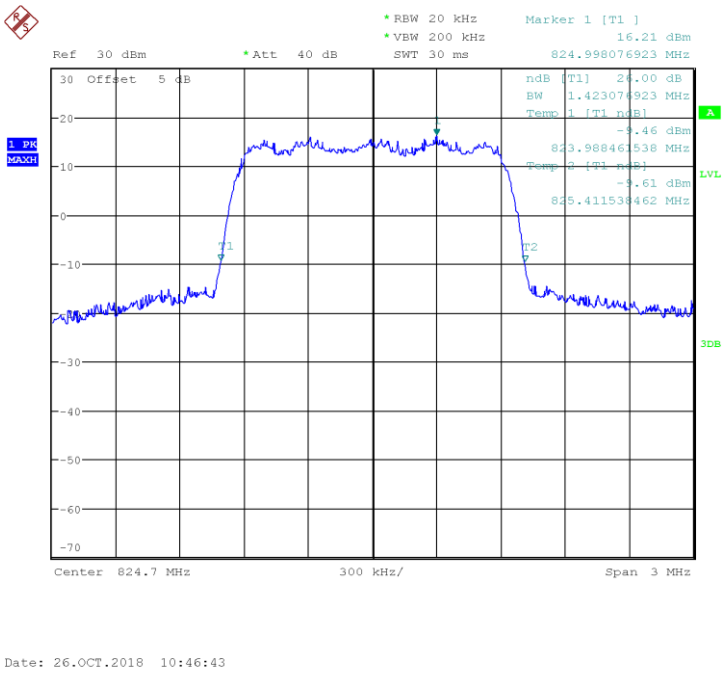


Fig.33 **Channel 1013- Emission Bandwidth (-26dBc BW)**

| **1xEV-DO BC1 Release A** | | |
|---|---|---|
| Test channel | Frequency (MHz) | –26dBc Emission Bandwidth(MHz) |
| Mid 600 | 1880.0 | 1.553 |
| Low 25 | 1851.25 | 1.423 |
| High 1175 | 1908.75 | 1.567 |

**Conclusion: PASS**

**1xEV-DO BC0 Release A**

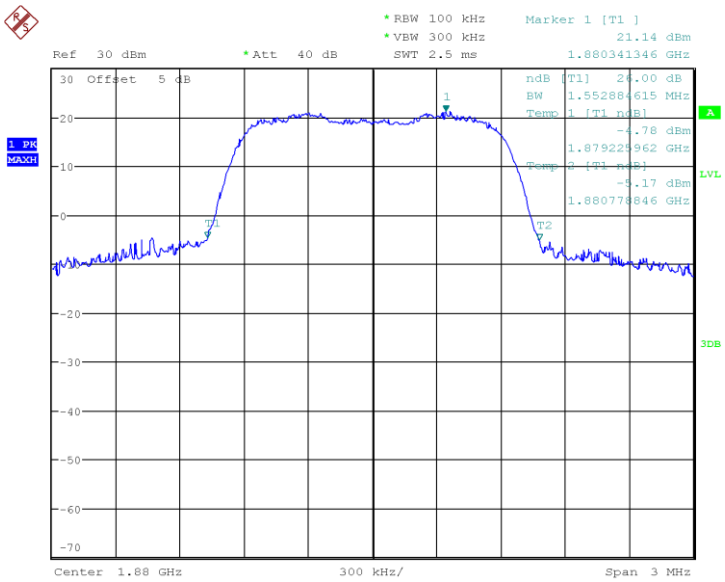


Fig.34 **Channel 600- Emission Bandwidth (-26dBc BW)**

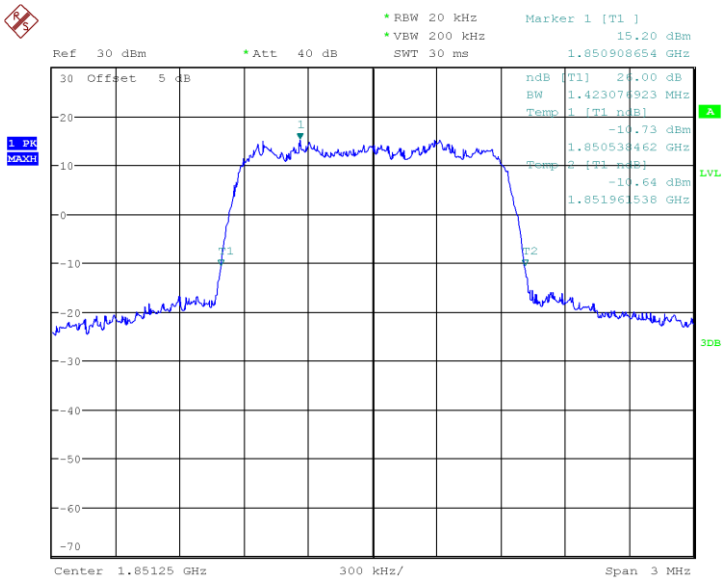


Fig.35 **Channel 25- Emission Bandwidth (-26dBc BW)**

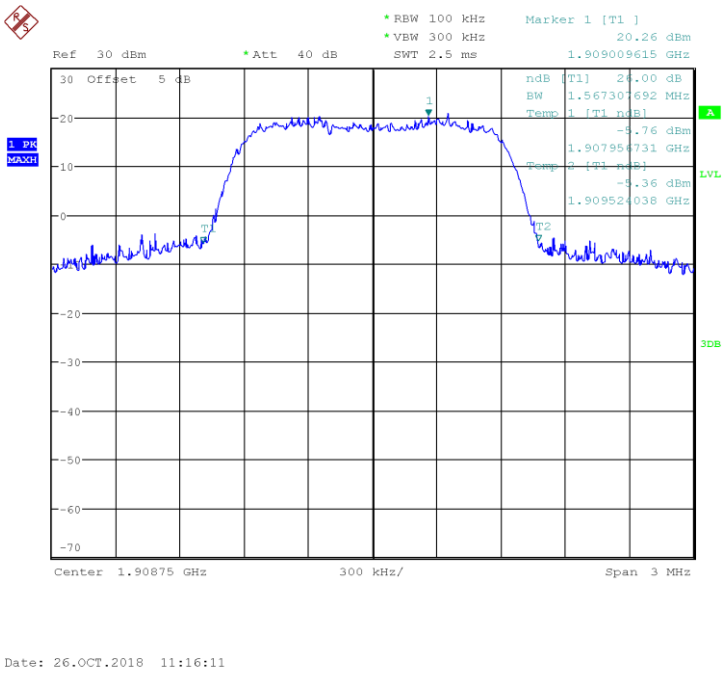


Fig.36 **Channel 1175- Emission Bandwidth (-26dBc BW)**

## ANNEX A.5. Band Edge at antenna terminals

Method of test measurements please refer to CFR 47 (FCC) part 2.1051 and part 22.917.

### A.5.1 Limit:

The magnitude of each spurious and harmonic emission that can be detected when the equipment is operated under the conditions specification in the instruction manual and/or alignment procedure, shall not be less than 43+10log (Mean power in watts) dBc below the mean power output outside a license's frequency block(-13dBm).

### A.5.2 Test procedure:

1. The RF output of the transceiver was connected to a signal analyzer through appropriate attenuation.
2. In the 1MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.
3. The RF fundamental frequency should be excluded against the limit line in the operating frequency band
4. The limit line is derived from 43+10log(P) Db below the transmitter power P(Watts)
   =P(W)-[43+10log(P)](Db)
   =[30+10log(P)](dBm)-[43+10log(P)](Db)
   =-13dBm

**CDMA2000 Cellular BC0**

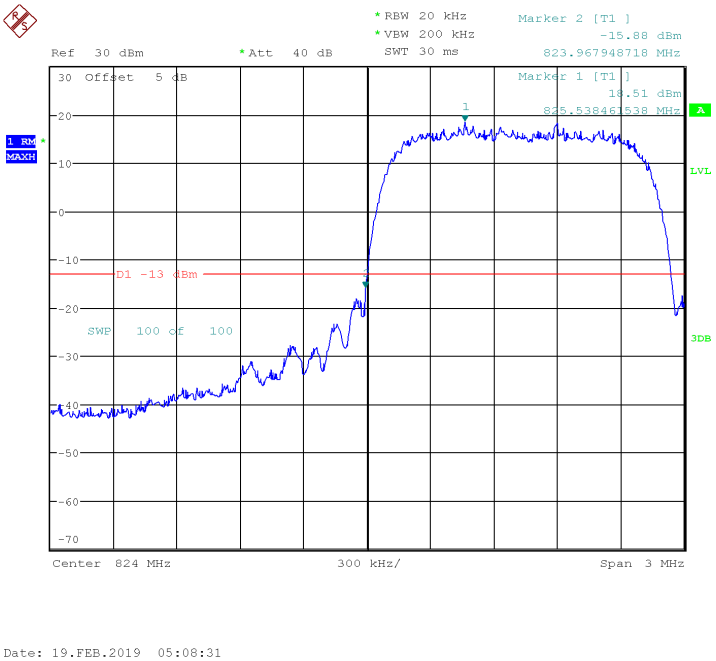


Fig.37 **Channel 1013- LOW BAND EDGE BLOCK**

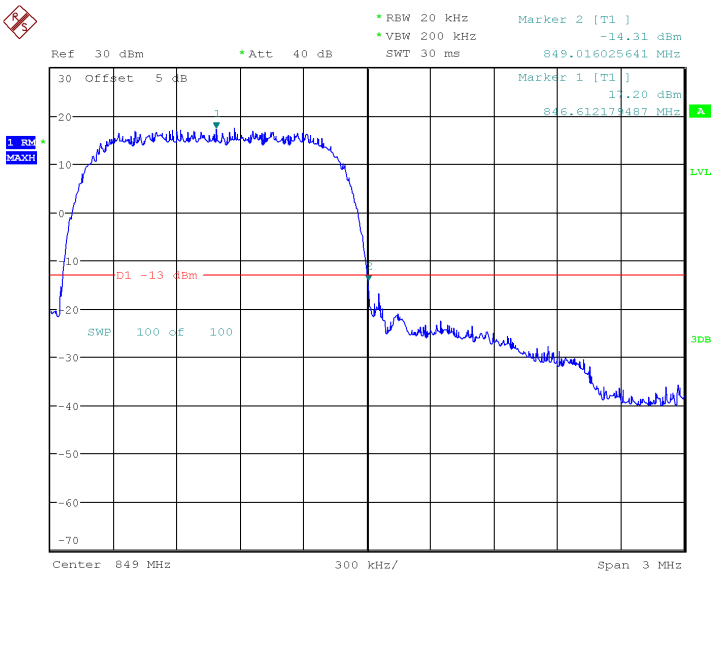


Fig.38 **Channel 777- HIGH BAND EDGE BLOCK**

**CDMA2000 PCS BC1**

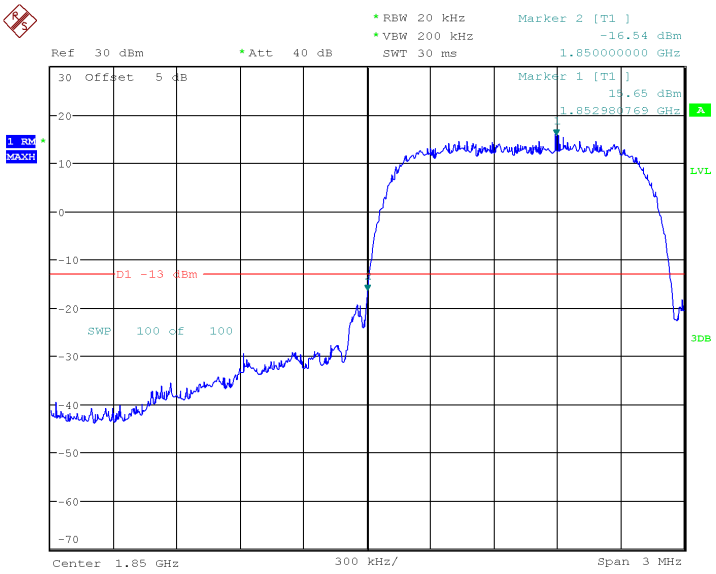


Fig.39 **Channel 25- LOW BAND EDGE BLOCK**

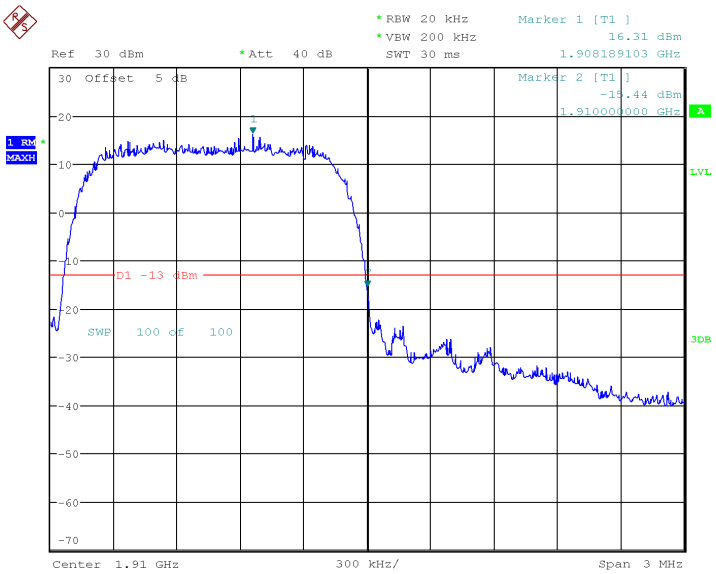


Fig.40 **Channel 1175- HIGH BAND EDGE BLOCK**

**Conclusion: PASS**

**1xEV-DO BC0 Release 0**

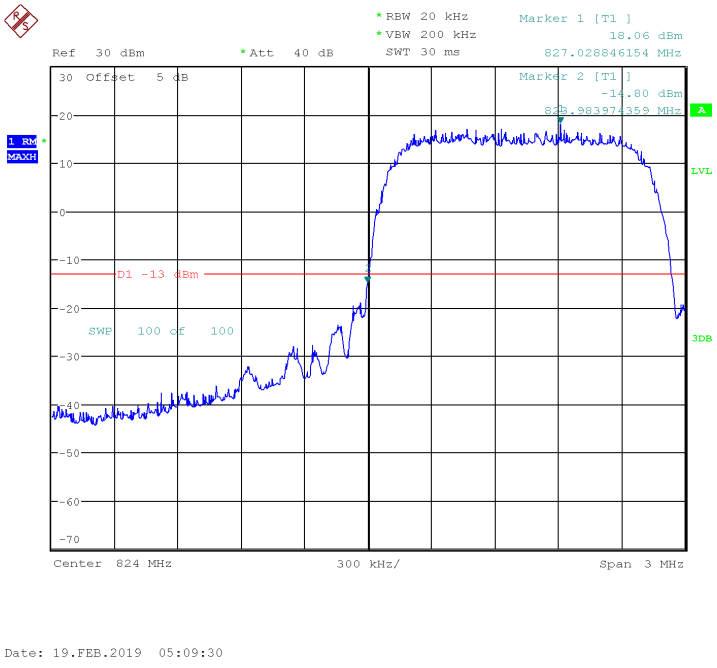


Fig.41 **Channel 1013- LOW BAND EDGE BLOCK**

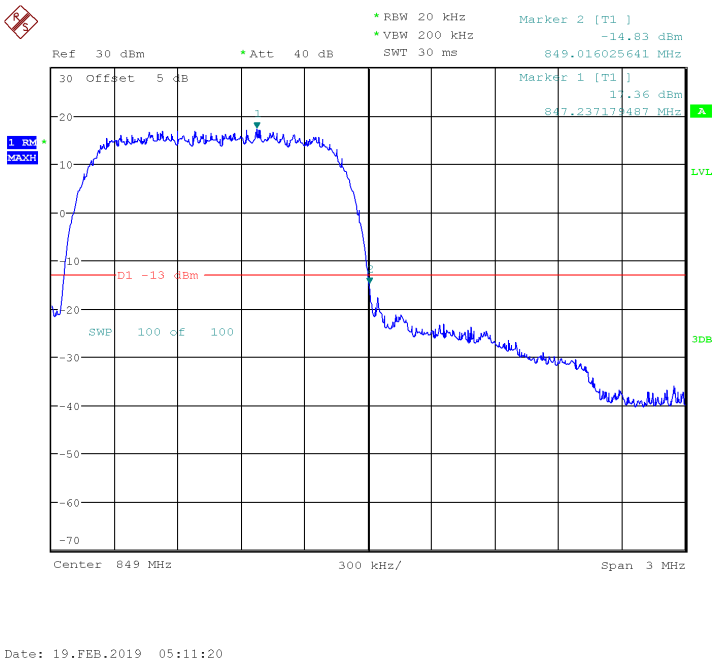


Fig.42 **Channel 777- LOW BAND EDGE BLOCK**

**Conclusion: PASS**

**1xEV-DO BC1 Release 0**

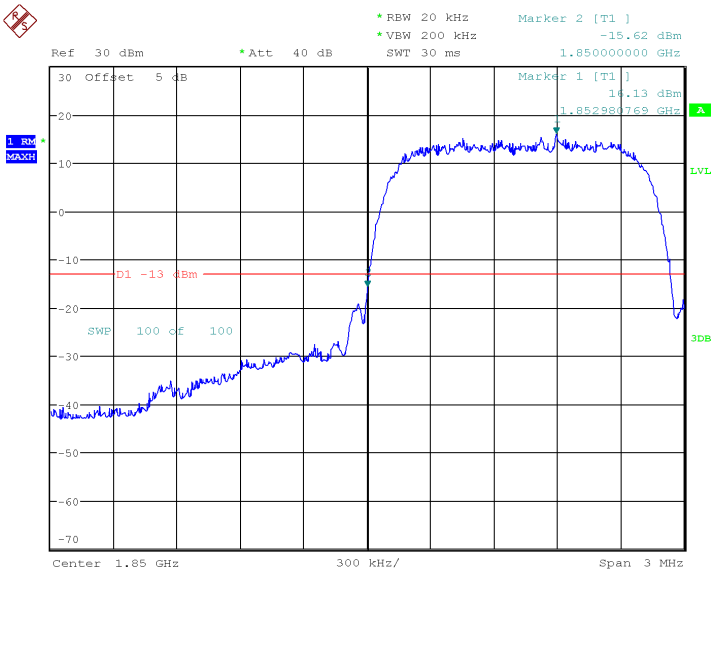


Fig.43 **Channel 25- LOW BAND EDGE BLOCK**

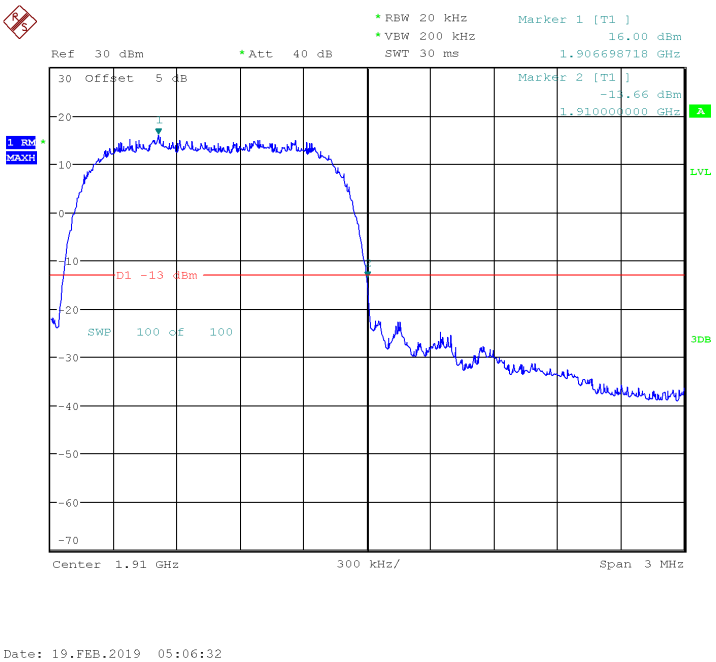


Fig.44 **Channel 1175- LOW BAND EDGE BLOCK**

**Conclusion: PASS**

**1xEV-DO BC0 Release A**

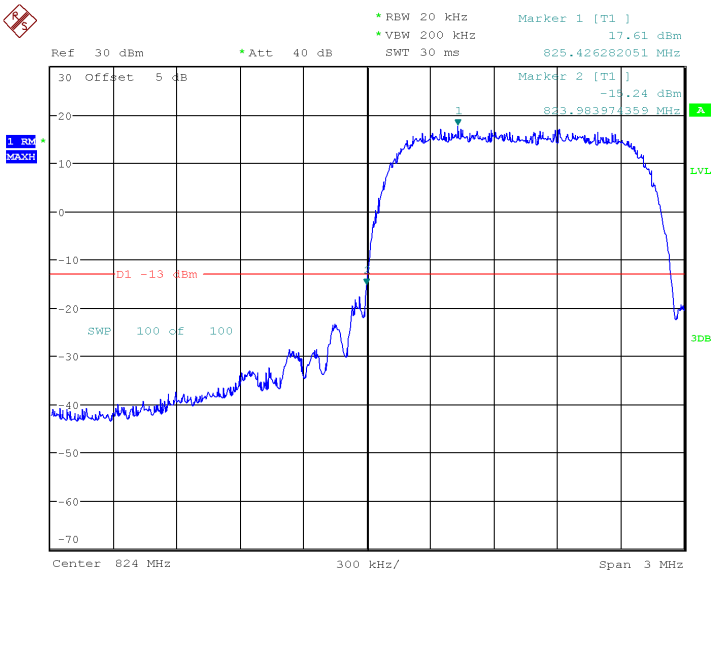


Fig.45 **Channel 1013- LOW BAND EDGE BLOCK**

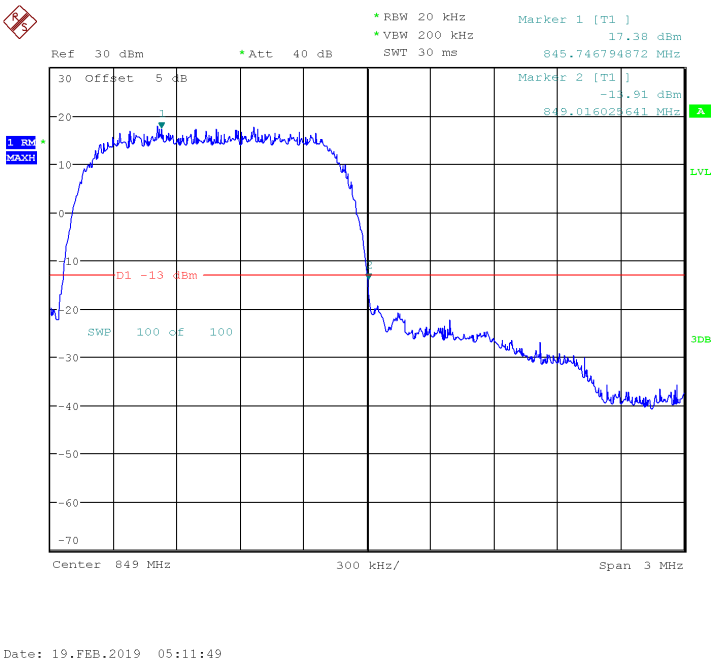


Fig.46 **Channel 777- LOW BAND EDGE BLOCK**

**Conclusion: PASS**

**1xEV-DO BC1 Release A**

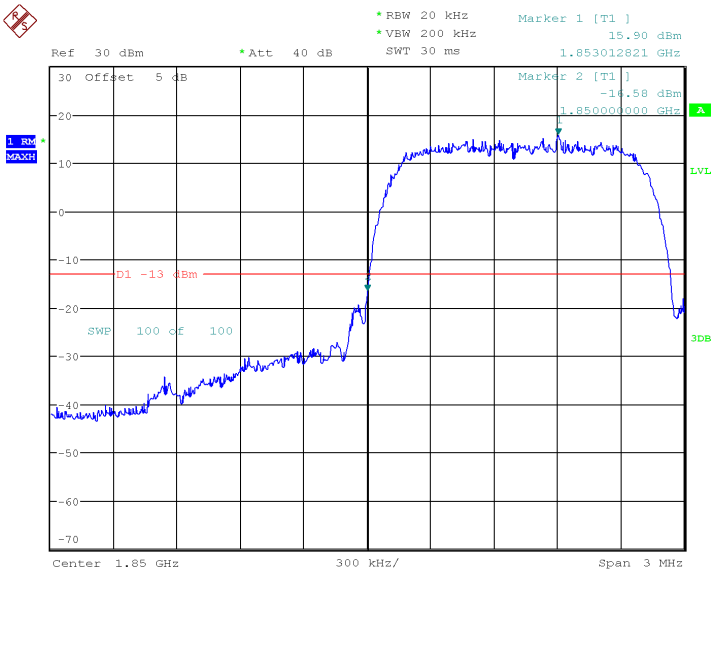


Fig.47 **Channel 25- LOW BAND EDGE BLOCK**

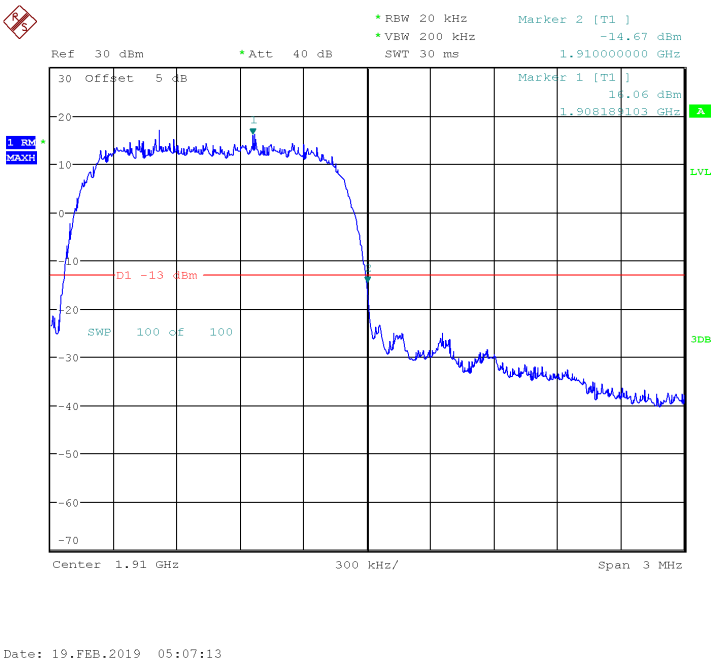


Fig.48 **Channel 1175- LOW BAND EDGE BLOCK**

**Conclusion: PASS**

## ANNEX A.6. FREQUENCY STABILITY

Method of test measurements please refer to CFR47 (FCC) part 2.1055 and part 22.355.

### A.5.1.Method of Measurement and test procedures

In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the EUT in a “call mode”. This is accomplished with the use of R&S CMU200 DIGITAL RADIO COMMUNICATION TESTER.

1. Measure the carrier frequency at room temperature.
2. Subject the EUT to overnight soak at -30℃.
3. With the EUT, powered via nominal voltage, connected to the CMU200 and in a simulated call on mid channel of GSM850, PCS1900, WCDMA BANDII and WCDMA BANDV, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.
4. Repeat the above measurements at 10℃ increments from -30℃ to +50℃. Allow at least 1 1/2 hours at each temperature, unpowered, before making measurements.
5. Re-measure carrier frequency at room temperature with nominal voltage. Vary supply voltage from minimum voltage to maximum voltage, in 0.1Volt increments re-measuring carrier frequency at each voltage. Pause at nominal voltage for 1 1/2 hours unpowered, to allow any self-heating to stabilize, before continuing.
6. Subject the EUT to overnight soak at +50℃.
7. With the EUT, powered via nominal voltage, connected to the CMU200 and in a simulated call on the centre channel, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.
8. Repeat the above measurements at 10 C increments from +50℃ to -30℃. Allow at least 1.5 hours at each temperature, unpowered, before making measurements.
9. At all temperature levels hold the temperature to +/- 0.5℃ during the measurement procedure.

### A.5.2. Measurement Limit

#### A.5.2.1. For Hand carried battery powered equipment

According to the JTC standard the GSM frequency stability of the carrier shall be accurate to within 0.1ppm of the received frequency from the base station. And the WCDMA is 2.5ppm. This accuracy is sufficient to meet Sec.24.235, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. As this transceiver is considered "Hand carried, battery powered equipment" Section 2.1055(d)(2) applies. This requires that the lower voltage for frequency stability testing be specified by the manufacturer. This transceiver is specified to operate with an input voltage of between 3.6VDC and 4.35VDC, with a nominal voltage of 3.8VDC. Operation above or below these voltage limits is prohibited by transceiver software in order to prevent improper operation as well as to protect components from overstress. These voltages was varied from 85% to 115%.

**A.5.2.2. For equipment powered by primary supply voltage**

According to the JTC standard the CDMA frequency stability of the carrier shall be accurate to within 0.1ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec.24.235, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. For this EUT section 2.1055(d)(1) applies. This requires varying primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

**A.5.3 Test results**

**CDMA2000 Cellular BC0 Mid Channel/fc(MHz) 384/836.52**

**Frequency Error VS Temperature**

| Power Supply (VDc) | Environment Temperature(℃) | Frequency error(Hz) | Limit (Hz) |
|---|---|---|---|
| 3.8 | -30 | -4.54 | 84 |
| 3.8 | -20 | -3.89 | 84 |
| 3.8 | -10 | -3.77 | 84 |
| 3.8 | 0 | -4.28 | 84 |
| 3.8 | 10 | -4.10 | 84 |
| 3.8 | 20 | -2.99 | 84 |
| 3.8 | 30 | -3.19 | 84 |
| 3.8 | 40 | -2.88 | 84 |
| 3.8 | 50 | -4.58 | 84 |

**Frequency Error VS Voltage**

| Power Supply (VDc) | Environment Temperature(℃) | Frequency error(Hz) | Limit (Hz) |
|---|---|---|---|
| 3.6 | 25 | -3.27 | 84 |
| 3.8 | 25 | -4.08 | 84 |
| 4.35 | 25 | -3.76 | 84 |

**CDMA2000 PCS BC1 Mid Channel/fc(MHz) 600/1880**

**Frequency Error VS Temperature**

| Power Supply (VDc) | Environment Temperature(℃) | Frequency error(Hz) | Limit (Hz) |
|---|---|---|---|
| 3.8 | -30 | -4.55 | 196 |
| 3.8 | -20 | -3.96 | 196 |
| 3.8 | -10 | -2.99 | 196 |
| 3.8 | 0 | -2.67 | 196 |
| 3.8 | 10 | -2.58 | 196 |
| 3.8 | 20 | -4.07 | 196 |
| 3.8 | 30 | -3.23 | 196 |
| 3.8 | 40 | -2.79 | 196 |
| 3.8 | 50 | -3.74 | 196 |

**Frequency Error VS Voltage**

| Power Supply (VDc) | Environment Temperature(℃) | Frequency error(Hz) | Limit (Hz) |
|---|---|---|---|
| 3.6 | 25 | -3.57 | 196 |
| 3.8 | 25 | -4.01 | 196 |
| 4.35 | 25 | -3.58 | 196 |

**Conclusion: PASS**

**1xEV-DO BC0 Release 0 Mid Channel/fc(MHz) 384/836.52**

**Frequency Error VS Temperature**

| Power Supply (VDc) | Environment Temperature(℃) | Frequency error(Hz) | Limit (Hz) |
|---|---|---|---|
| 3.8 | -30 | -0.27 | 84 |
| 3.8 | -20 | -0.69 | 84 |
| 3.8 | -10 | -0.17 | 84 |
| 3.8 | 0 | -1.36 | 84 |
| 3.8 | 10 | -1.37 | 84 |
| 3.8 | 20 | -0.08 | 84 |

| | | | |
|---|---|---|---|
| 3.8 | 30 | -0.66 | 84 |
| 3.8 | 40 | -0.28 | 84 |
| 3.8 | 50 | -1.37 | 84 |

**Frequency Error VS Voltage**

| Power Supply (VDc) | Environment Temperature(℃) | Frequency error(Hz) | Limit (Hz) |
|---|---|---|---|
| 3.6 | 25 | -0.63 | 84 |
| 3.8 | 25 | -0.95 | 84 |
| 4.35 | 25 | -0.24 | 84 |

**Conclusion: PASS**

**1xEV-DO BC1 Release 0 Mid Channel/fc(MHz) 600/1880**

**Frequency Error VS Temperature**

| Power Supply (VDc) | Environment Temperature(℃) | Frequency error(Hz) | Limit (Hz) |
|---|---|---|---|
| 3.8 | -30 | -0.67 | 196 |
| 3.8 | -20 | -0.49 | 196 |
| 3.8 | -10 | -1.66 | 196 |
| 3.8 | 0 | -1.98 | 196 |
| 3.8 | 10 | -0.29 | 196 |
| 3.8 | 20 | -0.11 | 196 |
| 3.8 | 30 | -1.23 | 196 |
| 3.8 | 40 | -0.27 | 196 |
| 3.8 | 50 | -0.19 | 196 |

**Frequency Error VS Voltage**

| Power Supply (VDc) | Environment Temperature(℃) | Frequency error(Hz) | Limit (Hz) |
|---|---|---|---|
| 3.6 | 25 | -1.26 | 196 |
| 3.8 | 25 | -0.37 | 196 |
| 4.35 | 25 | -0.51 | 196 |

**1xEV-DO BC0 Release A Mid Channel/fc(MHz) 384/836.52**

**Frequency Error VS Temperature**

| Power Supply (VDc) | Environment Temperature(℃) | Frequency error(Hz) | Limit (Hz) |
|---|---|---|---|
| 3.8 | -30 | -2.37 | 84 |
| 3.8 | -20 | -1.99 | 84 |
| 3.8 | -10 | -0.28 | 84 |
| 3.8 | 0 | -1.76 | 84 |
| 3.8 | 10 | -0.97 | 84 |
| 3.8 | 20 | -1.27 | 84 |
| 3.8 | 30 | -1.46 | 84 |
| 3.8 | 40 | -2.09 | 84 |
| 3.8 | 50 | -1.77 | 84 |

**Frequency Error VS Voltage**

| Power Supply (VDc) | Environment Temperature(℃) | Frequency error(Hz) | Limit (Hz) |
|---|---|---|---|
| 3.6 | 25 | -1.28 | 84 |
| 3.8 | 25 | -1.45 | 84 |
| 4.35 | 25 | -1.38 | 84 |

**Conclusion: PASS**

**1xEV-DO BC1 Release A Mid Channel/fc(MHz) 600/1880**

**Frequency Error VS Temperature**

| Power Supply (VDc) | Environment Temperature(℃) | Frequency error(Hz) | Limit (Hz) |
|---|---|---|---|
| 3.8 | -30 | -2.03 | 196 |
| 3.8 | -20 | -2.11 | 196 |
| 3.8 | -10 | -1.98 | 196 |
| 3.8 | 0 | -1.68 | 196 |
| 3.8 | 10 | -2.06 | 196 |

| | | | |
|---|---|---|---|
| 3.8 | 20 | -1.74 | 196 |
| 3.8 | 30 | -1.93 | 196 |
| 3.8 | 40 | -2.03 | 196 |
| 3.8 | 50 | -2.17 | 196 |

**Frequency Error VS Voltage**

| Power Supply (VDc) | Environment Temperature(℃) | Frequency error(Hz) | Limit (Hz) |
|---|---|---|---|
| 3.6 | 25 | -1.98 | 196 |
| 3.8 | 25 | -1.47 | 196 |
| 4.35 | 25 | -2.06 | 196 |

**Conclusion: PASS**

## ANNEX A.7. CONDUCTED SPURIOUS EMISSION

### A.7.1. GSM Measurement Method and test procedures

The following steps outline the procedure used to measure the conducted emissions from the EUT.

1. Determine frequency range for measurements: From CFR 2.1057 the spectrum should be investigated from the lowest radio frequency generated in the equipment up to at least the 10th harmonic of the carrier frequency. For the equipment of PCS1900 band, this equates to a frequency range of 30 MHz to 19.1 GHz, data taken from 30 MHz to 20 GHz. For GSM850, data taken from 30 MHz to 10 GHz.
2. The sweep time is set automatically by instrument itself. That should be the optimal sweep time for the span and the RBW. If the sweep time is too short, that is sweep is too fast, the sweep result is not accurate; If the sweep time is too long, that is sweep is too low, some frequency components may be lost. The instrument will give a optimal sweep time according the selected span and RBW.
3. The procedure to get the conducted spurious emission is as follows:
The trace mode is set to MaxHold to get the highest signal at each frequency;
Wait 25 seconds;Get the result.
4. Determine EUT transmit frequencies: below outlines the band edge frequencies pertinent to conducted emissions testing.

**CDMA2000 Cellular Transmitter**

| Channel | Frequency(MHz) |
|---|---|
| 384 | 848.31 |

| | |
|---|---|
| 777 | 836.52 |
| 1013 | 824.7 |

**CDMA2000 PCS Transmitter**

| Channel | Frequency(MHz) |
|---|---|
| 25 | 1851.25 |
| 600 | 1880.0 |
| 1175 | 1908.75 |

**1xEV-DO Cellular Transmitter Release 0**

| Channel | Frequency(MHz) |
|---|---|
| 384 | 848.31 |
| 777 | 836.52 |
| 1013 | 824.7 |

**1xEV-DO PCS Transmitter Release 0**

| Channel | Frequency(MHz) |
|---|---|
| 25 | 1851.25 |
| 600 | 1880.0 |
| 1175 | 1908.75 |

**1xEV-DO Cellular Transmitter Release A**

| Channel | Frequency(MHz) |
|---|---|
| 384 | 848.31 |
| 777 | 836.52 |
| 1013 | 824.7 |

**1xEV-DO PCS Transmitter Release A**

| Channel | Frequency(MHz) |
|---|---|
| 25 | 1851.25 |
| 600 | 1880.0 |
| 1175 | 1908.75 |

### A.7.1.1. Measurement Limit

Part 24.238 and Part 22.917 specify that the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

The specification that emissions shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

### A7.1.2. Measurement result

**Spurious emission limit -13dBm.**

**Note: peak above the limit line is the carrier frequency.**

### A7.1.2.1. CDMA2000 Cellular BC0

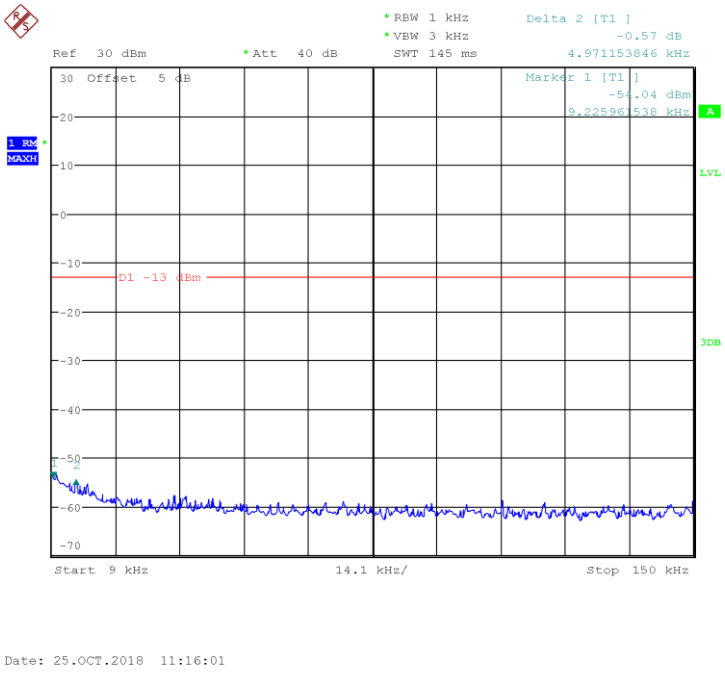


Fig.49 **Channel 384: 9KHz~150KHz**

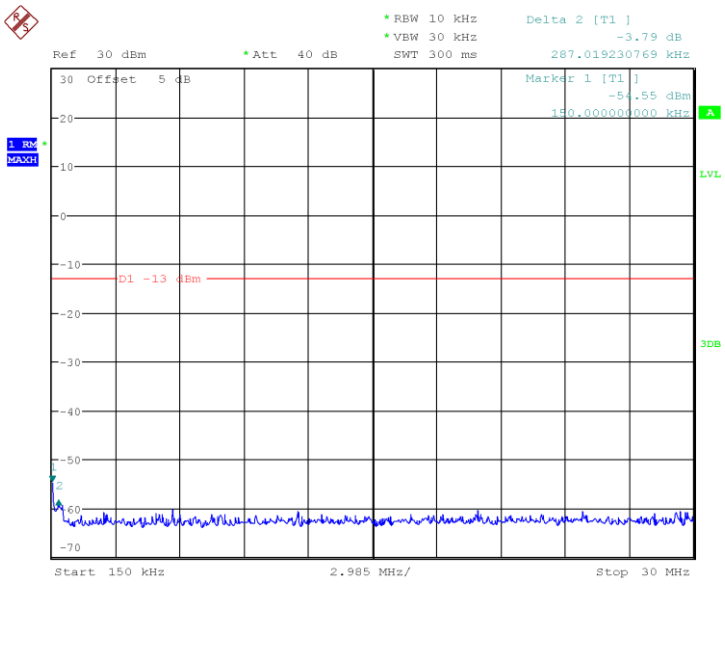


Fig.50 **Channel 384: 150KHz~30MHz**

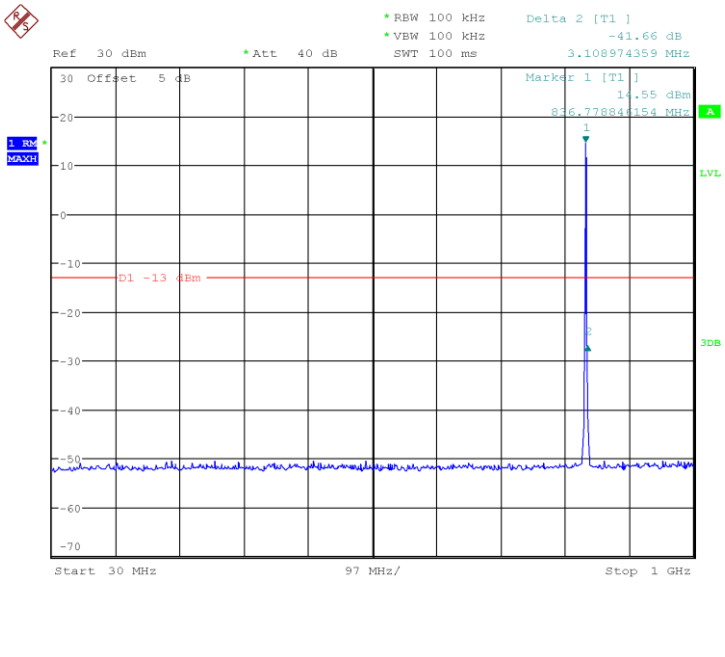


Fig.51 **Channel 384: 30MHz~1GHz**

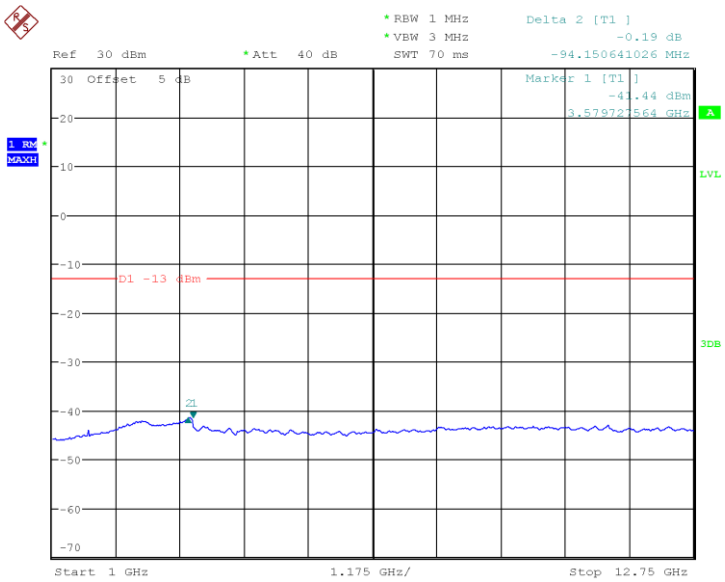


Fig.52 **Channel 384: 1GHz~12.75GHz**

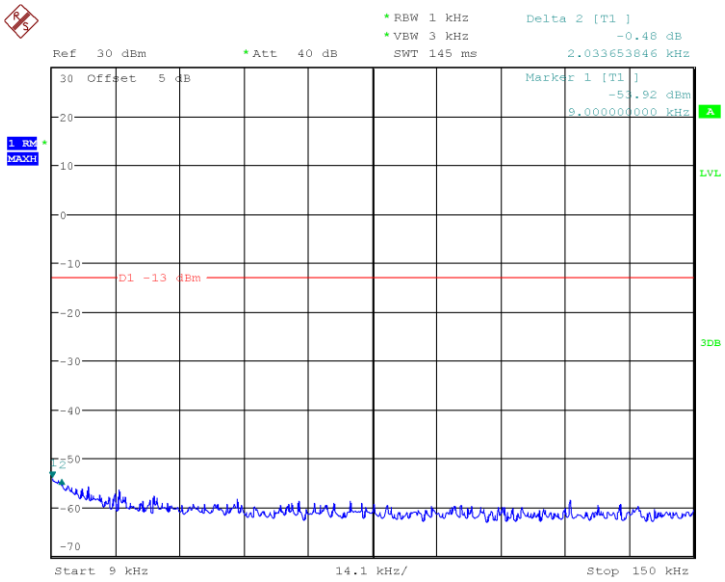


Fig.53 **Channel 777: 9KHz~150KHz**

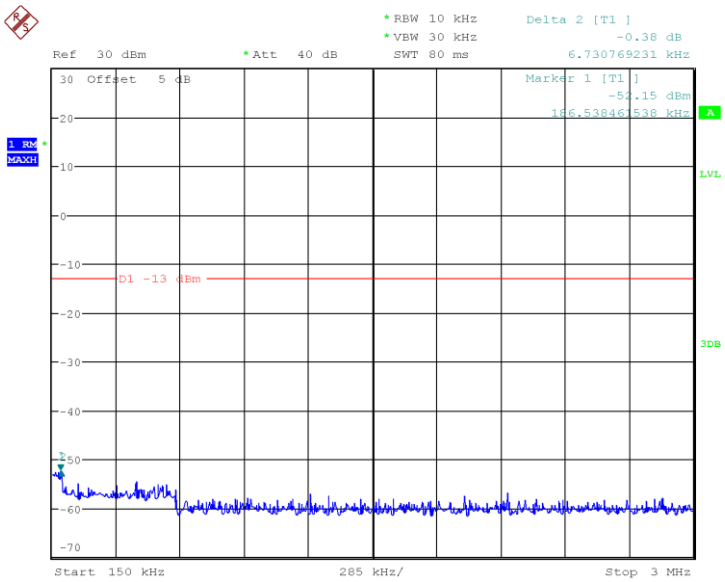


Fig.54 **Channel 777: 150KHz~30MHz**

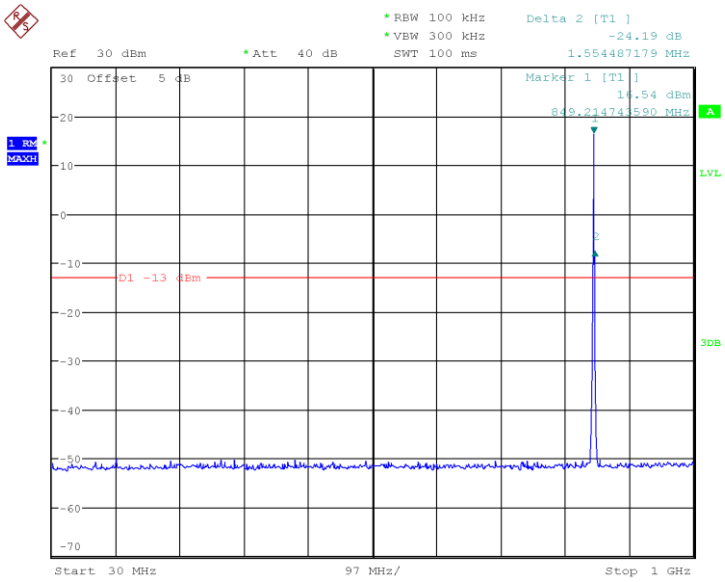


Fig.55 **Channel 777: 30MHz~1GHz**

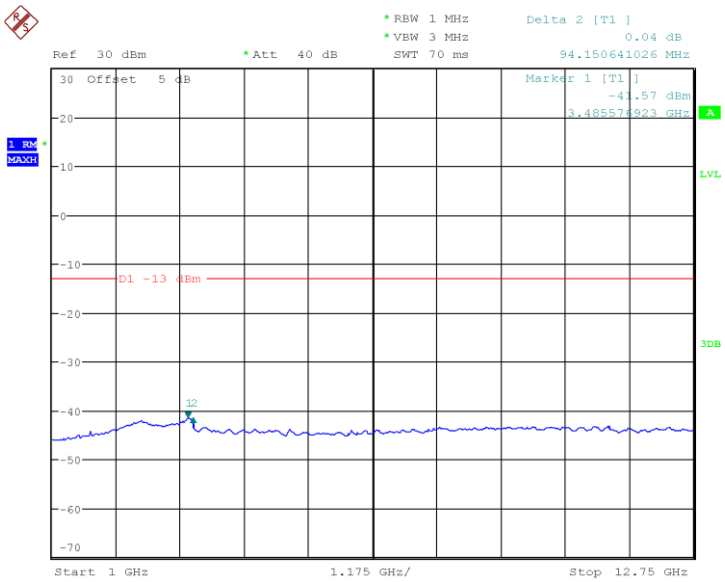


Fig.56 **Channel 777: 1GHz~12.75GHz**

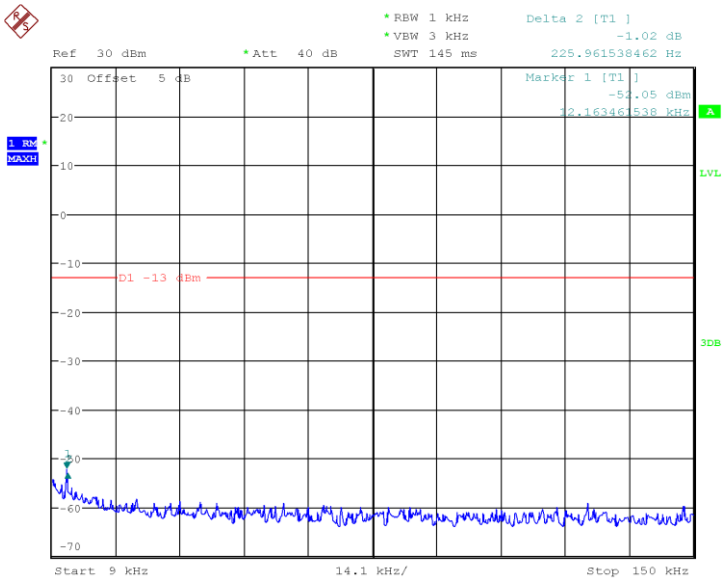


Fig.57 **Channel 1013: 9KHz~150KHz**

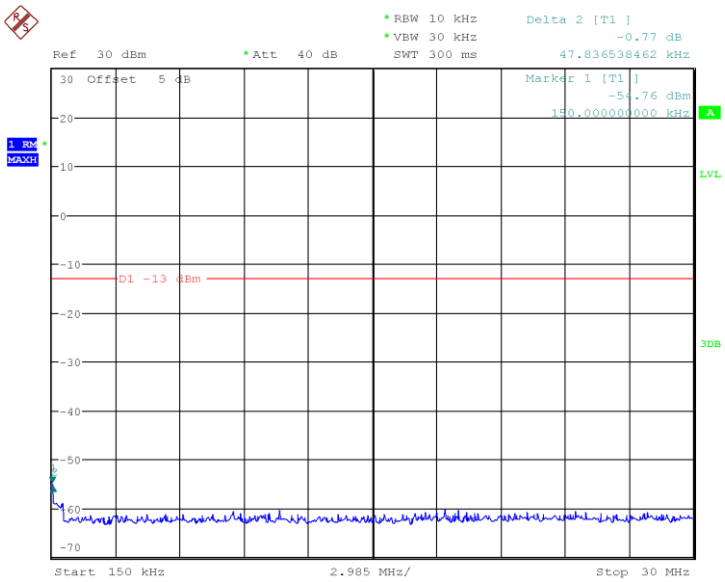


Fig.58 **Channel 1013: 150KHz~30MHz**

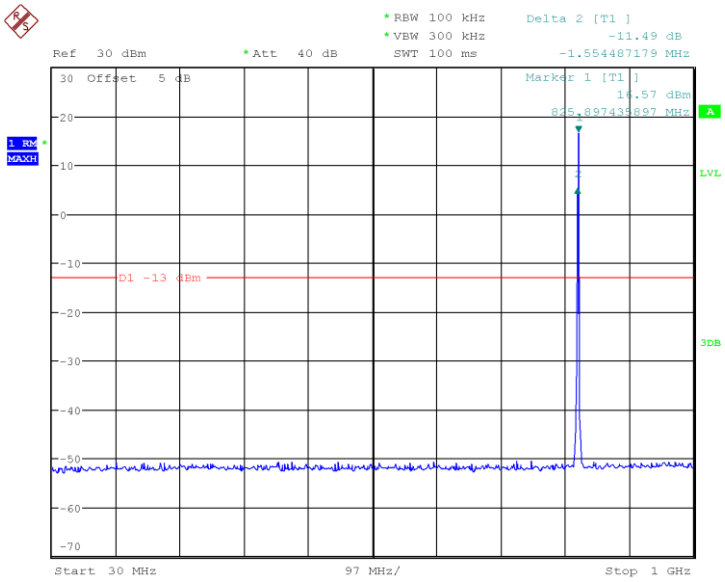


Fig.59 **Channel 1013: 30MHz~1GHz**

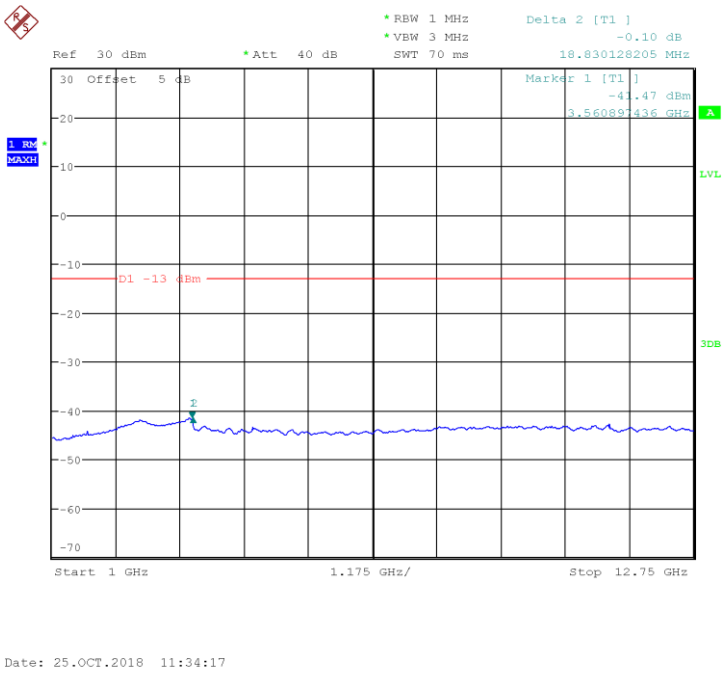


Fig.60 **Channel 1013: 1GHz~12.75GHz**

### A7.1.2.2. CDMA2000 PCS BC1

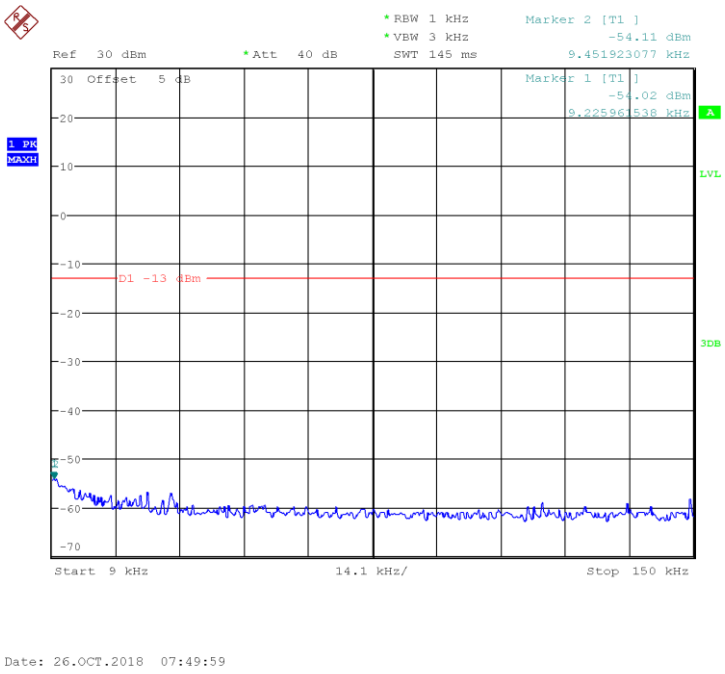


Fig.61 **Channel 25: 9KHz~150KHz**

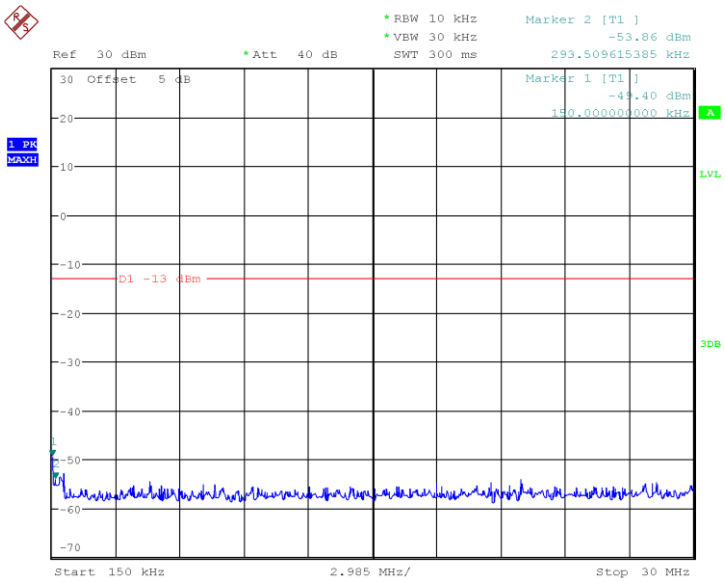


Fig.62 **Channel 25: 150KHz~30MHz**

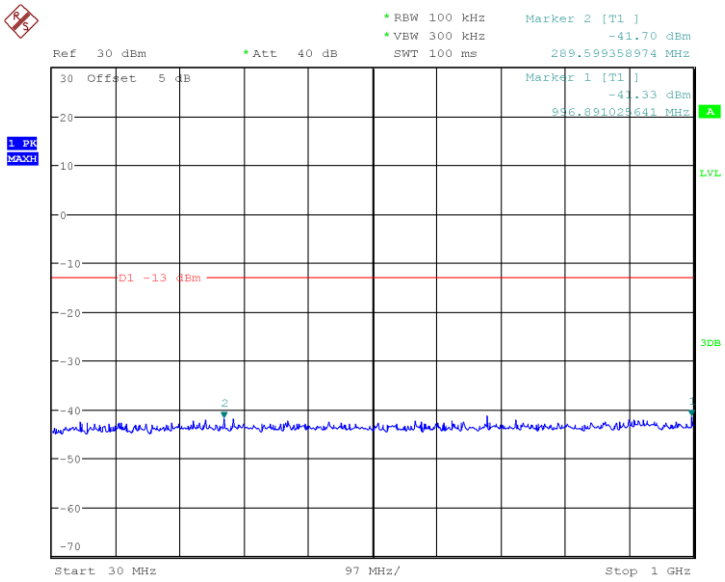


Fig.63 **Channel 25: 30MHz~1GHz**

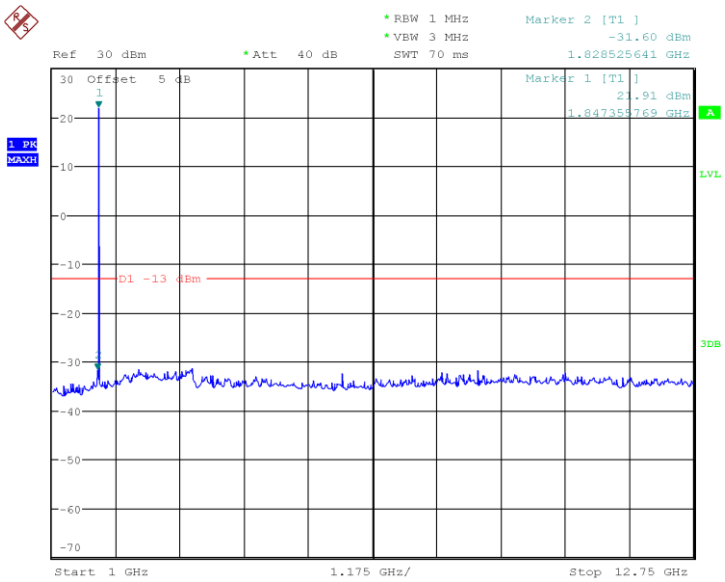


Fig.64 **Channel 25: 1GHz~12.75GHz**

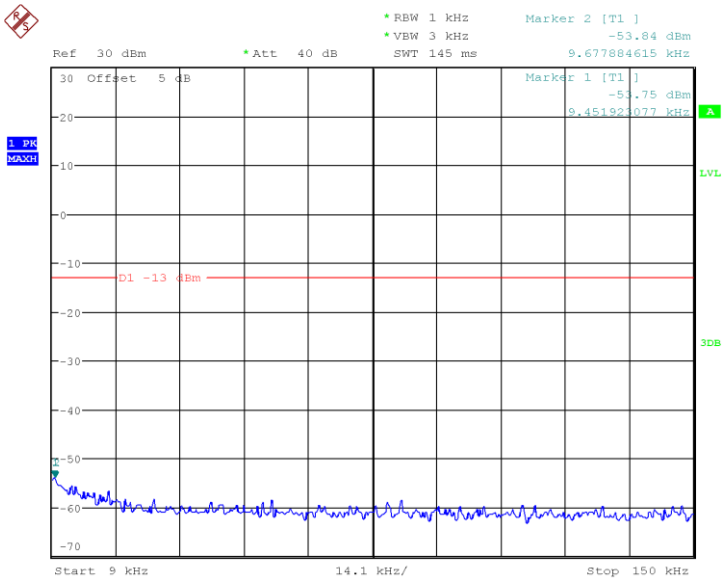


Fig.65 **Channel 600: 9KHz~150KHz**

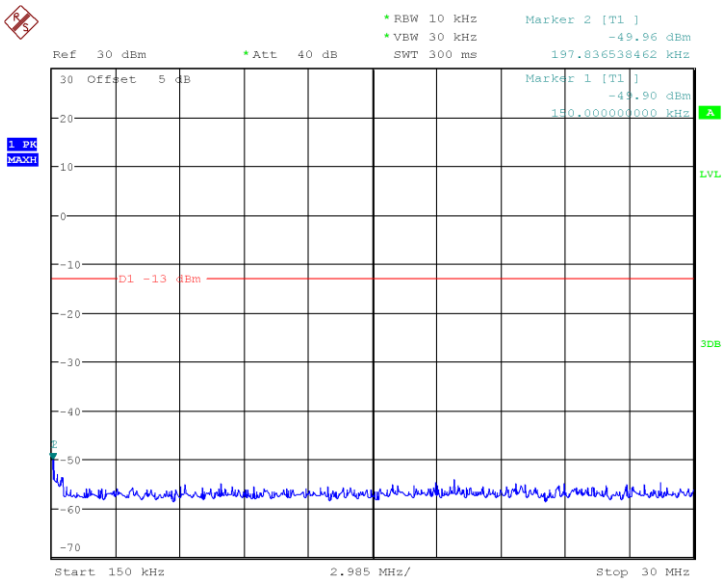


Fig.66 **Channel 600: 150KHz~30MHz**

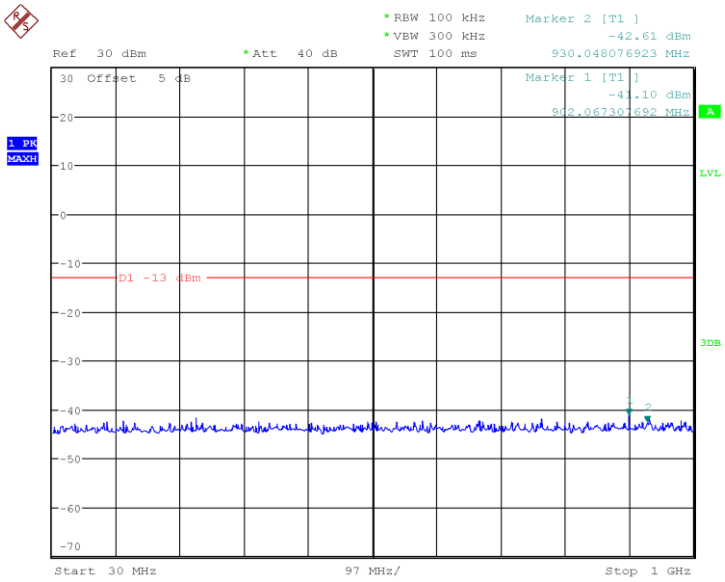


Fig.67 **Channel 600: 30MHz~1GHz**

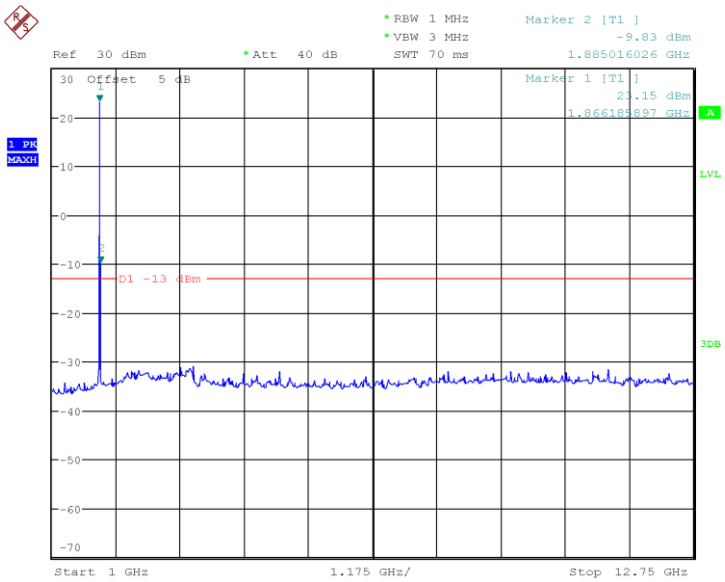


Fig.68 **Channel 600: 1GHz~12.75GHz**

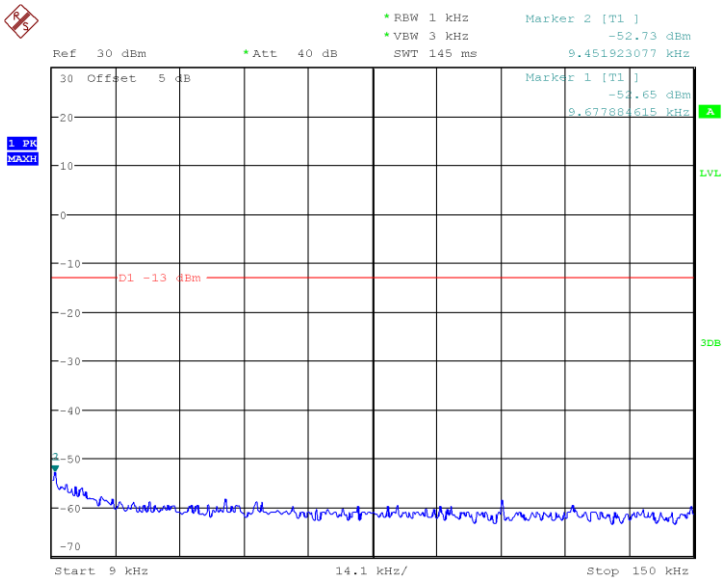


Fig.69 **Channel 1175: 9KHz~150KHz**

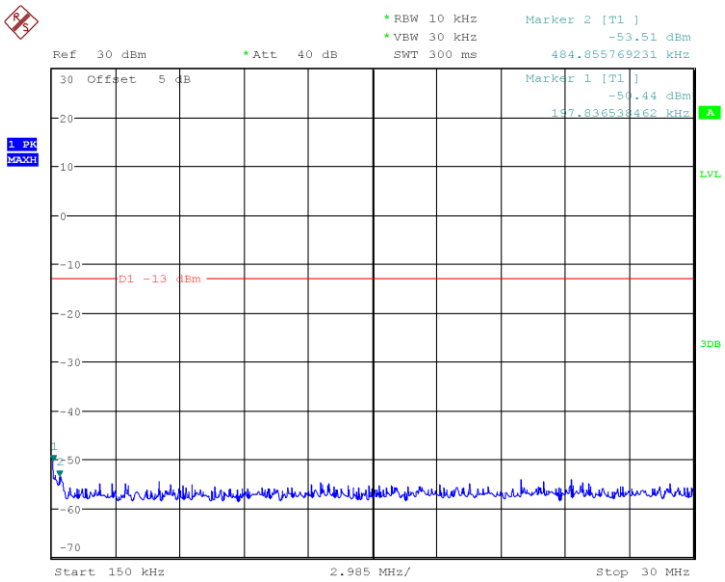


Fig.70 **Channel 1175: 150KHz~30MHz**

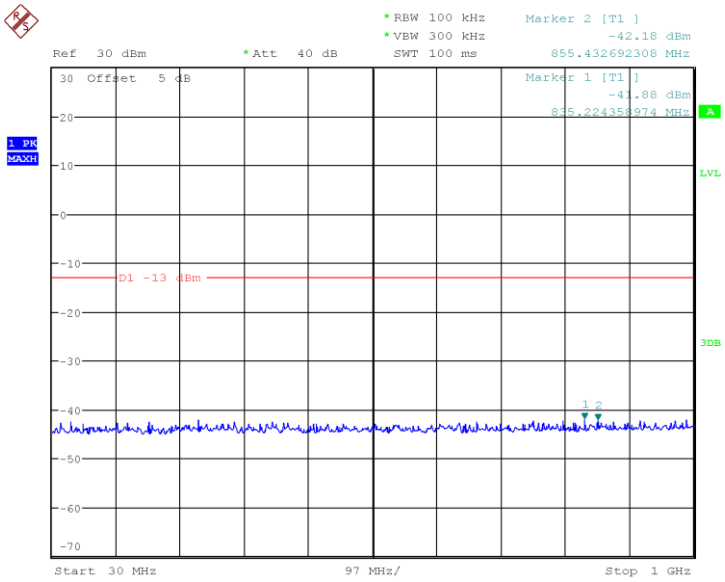


Fig.71 **Channel 1175: 30MHz~1GHz**