

GSM Test Report

Application Purpose : Original grant
Applicant Name: : TECNO MOBILE LIMITED
FCC ID : 2ADYY-M6
Equipment Type : Mobile Phone
Model Name : M6
Report Number : FCC15016717-1
Standard(S) : FCC Part 22H & 24E Rules
Date Of Receipt : January 16, 2015
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Report Revise Record

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1. Certification

| | |
|-----------------------------|---|
| Applicant | TECNO MOBILE LIMITED |
| Address | RMS 05-15, 13A/F., SOUTH TOWER, WORLD FINANCE CTR, HARBOUR CITY, KLN, HK. |
| Manufacturer | SHENZHEN SMARTTEL CO., LTD. |
| Address | 6th Floor, Block 15, shatoujiao Free TRADE Zone,Shenyan Road, Yantian District, Shenzhen, Guangdong, P.R.China |
| Equipment Type | Mobile Phone |
| Brand Name | TECNO |
| Test Model | M6 |
| Hardware version: | G335_MAIN_PCB_V1.1 |
| Software version: | V1.1 |
| Series Model | N/A |
| Difference description | N/A |
| Data of receipt | January 16, 2015 |
| Date of test | January 16, 2015 to January 27, 2015 |
| Deviation | None |
| Condition of Test Sample | Normal |

We hereby certify that:

All measurement facilities used to collect the measurement data are located at Building A, Baoshi Science & Technology Park, Baoshi Road, Bao'an District, Shenzhen, Guangdong, China. The data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C 63.4:2009 and TIA/EIA 603. The sample tested as described in this report is in compliance with the FCC Rules Part2, 22H and 24E. The test results of this report relate only to the tested sample identified in this report.

2. GENERAL INFORMATION

2.1 EUT DESCRIPTION

| | |
|--------------------------------|---|
| Equipment Type: | Mobile Phone |
| Hardware version: | G335_MAIN_PCB_V1.1 |
| Software version: | N/A |
| Frequency Bands: | <input checked="" type="checkbox"/> GSM 850 <input checked="" type="checkbox"/> PCS 1900 (U.S. Bands) <input checked="" type="checkbox"/> GSM 900 <input checked="" type="checkbox"/> DCS 1800 (Non-U.S. Bands) U.S. Bands: <input type="checkbox"/> UMTS FDD Band II <input type="checkbox"/> UMTS FDD Band V Non-U.S. Bands: <input checked="" type="checkbox"/> UMTS FDD Band I <input type="checkbox"/> UMTS FDD Band VIII |
| Antenna Type: | Internal Antenna |
| Antenna gain: | GSM850: -0.5dBm PCS1900: -0.7dBm |
| Battery information: | Model: BL-20AT Voltage: 3.8V Capacity: 2020mAh |
| Adapter Information: | Model: US-AH-1000 Input: AC 100-240 V, 50/60 Hz, 0.2A Output: DC 5V 1A |
| Dual Card: | Card 1: WCDMA Card Slot, Card 2: GSM Card Slot |
| Max power: | See note 3 |
| GPRS Class: | 12 |
| Extreme Vol. Limits: | DC3.5 V to 4.35 V (Normal: DC3.8 V) |
| Extreme Temp. Tolerance | -10°C to +50°C |

Note 1: The High Voltage DC4.35V and Low Voltage DC3.5V were declared by manufacturer, The EUT couldn't be operating normally with higher or lower voltage.

Note 2: Card 1 can't transmit with Card 2 simultaneously.

Note 3:**Card 1:**

| | Maximum ERP/EIRP (dBm) | Max. Conducted Power (dBm) | Max. Average Burst Power (dBm) |
|----------|---------------------------|-------------------------------|-----------------------------------|
| GSM 850 | 33.63 | 33.75 | 33.2 |
| PCS 1900 | 30.56 | 30.57 | 30.26 |

Card 2:

| | Maximum ERP/EIRP (dBm) | Max. Conducted Power (dBm) | Max. Average Burst Power (dBm) |
|----------|---------------------------|-------------------------------|-----------------------------------|
| GSM 850 | 33.50 | 33.76 | 33.16 |
| PCS 1900 | 30.43 | 30.74 | 30.17 |

3. TEST DESCRIPTION

3.1 TEST FACILITY

All measurement facilities used to collect the measurement data are located at World Standardization Certification & Testing CO., LTD.

Building A, Baoshi Science & Technology Park, Baoshi Road, Bao'an District, Shenzhen, Guangdong, China

3.2 EUT SYSTEM CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commission's requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

Fig. 2-1 Configuration of EUT System

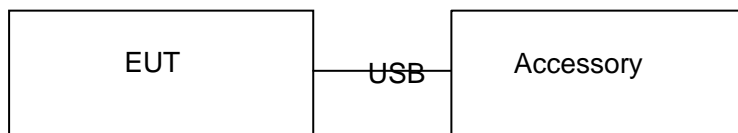


Table 2-1 Equipment Used in EUT System

| Item | Equipment | Model No. | ID or Specification | Note |
|------|--------------|------------|---------------------|-----------|
| 1 | Mobile Phone | M6 | FCC ID: 2ADYY-M6 | EUT |
| 2 | Adapter | US-AH-1000 | DC5V 1A | Accessory |
| 3 | Battery | BL-20AT | DC3.8V 2020mAh | Accessory |
| 4 | Earphone | M6 | N/A | Accessory |
| 5 | USB Cable | M6 | N/A | Accessory |

***Note: All the accessories have been used during the test. The following "EUT" in setup diagram means EUT system.

3.3 DESCRIPTION OF TEST CHANNELS AND TEST MODES

During the testing, the EUT was controlled via Rhode & Schwarz Digital Radio Communication Tester (CMU 200) to ensure max power transmission and proper modulation. Three channels (The top channel, the middle channel and the bottom channel) were chosen for testing on both GSM and PCS frequency band.

Test channels:

| Band | Channel | | Frequency (MHz) |
|--------|---------|-----|-----------------|
| GSM850 | Low | 128 | 824.2 |
| | Middle | 190 | 836.6 |
| | High | 251 | 848.8 |

| Band | Channel | | Frequency (MHz) |
|---------|---------|-----|-----------------|
| PCS1900 | Low | 512 | 1850.2 |
| | Middle | 661 | 1880 |
| | High | 810 | 1909.8 |

The worst condition was recorded in the test report if no other modes test data.

3.4 EQUIPMENT MODIFICATIONS

Not available for this EUT intended for grant.

4. SUMMARY OF TEST REQUIREMENTS AND RESULTS

For GSM850/GPRS850:

| Item Number | Item Description | | Test Channel | FCC Rules | Result |
|-------------|---------------------|-----------------------------|--------------|----------------------|--------|
| 1 | Output Power | Conducted Output Power | 128/190/251 | 2.1046/22.913(a) (2) | Pass |
| | | Radiated Output Power | 128/190/251 | | |
| 2 | Spurious Emission | Conducted Spurious Emission | 128/190/251 | 2.1051 / 22.917 | Pass |
| | | Radiated Spurious Emission | 128/190/251 | | |
| 3 | Frequency Stability | | 190 | 2.1055/22.355 | Pass |
| 4 | Occupied Bandwidth | | 128/190/251 | 2.1049 | Pass |
| 5 | Emission Bandwidth | | 128/190/251 | 22.917(a)(b) | Pass |
| 6 | Band Edge | | 128/190/251 | 22.917(a) | Pass |

For PCS1900/GPRS1900:

| Item Number | Item Description | | Test Channel | FCC Rules | Result |
|-------------|-----------------------|-----------------------------|--------------|--------------------|--------|
| 1 | Output Power | Conducted Output Power | 512/661/810 | 2.1046/24.232(c) | Pass |
| | | Radiated Output Power | 512/661/810 | | |
| 2 | Peak-to-Average Ratio | Peak-to-Average Ratio | 512/661/810 | 24.232(d) | Pass |
| 3 | Spurious Emission | Conducted Spurious Emission | 512/661/810 | 2.1051 / 24.238(a) | Pass |
| | | Radiated Spurious Emission | 512/661/810 | | |
| 4 | Frequency Stability | | 661 | 2.1055/24.235 | Pass |
| 5 | Occupied Bandwidth | | 512/661/810 | 2.1049 | Pass |
| 6 | Emission Bandwidth | | 512/661/810 | 24.238(a)(b) | Pass |
| 7 | Band Edge | | 512/661/810 | 24.238(a)(b) | Pass |

5. MEASUREMENT INSTRUMENTS

| NAME OF EQUIPMENT | MANUFACTURER | MODEL | SERIAL NUMBER | Calibration Date | Calibration Due. |
|--------------------------------------|------------------------------------|--------------------|---------------|------------------|------------------|
| EMI Test Receiver | R&S | ESCI | 100005 | 08/19/2014 | 08/18/2015 |
| ESPI Test Receiver | ROHDE&SCHWARZ | ESPI | 101139 | 08/19/2014 | 08/18/2015 |
| LISN | AFJ | LS16 | 16010222119 | 08/19/2014 | 08/18/2015 |
| LISN(EUT) | Mestec | AN3016 | 04/10040 | 08/19/2014 | 08/18/2015 |
| Universal Radio Communication Tester | R&S | CMU 200 | 1100.0008.02 | 08/19/2014 | 08/18/2015 |
| Coaxial cable | Megalon | LMR400 | N/A | 08/12/2014 | 08/11/2015 |
| GPIB cable | Megalon | GPIB | N/A | 08/12/2014 | 08/11/2015 |
| Spectrum Analyzer | R&S | FSU | 100114 | 08/19/2014 | 08/18/2015 |
| Pre Amplifier | H.P. | HP8447E | 2945A02715 | 10/13/2014 | 10/12/2015 |
| Pre-Amplifier | CDSI | PAP-1G18-38 | -- | 10/13/2014 | 10/12/2015 |
| Bi-log Antenna | SUNOL Sciences | JB3 | A021907 | 09/13/2014 | 09/12/2015 |
| 9*6*6 Anechoic | -- | -- | -- | 08/21/2014 | 08/20/2015 |
| Horn Antenna | COMPLIANCE ENGINEERING | CE18000 | -- | 09/13/2014 | 09/12/2015 |
| Horn Antenna | SCHWARZBECK | BBHA9120D | 9120D-631 | 08/23/2014 | 08/22/2015 |
| Cable | TIME MICROWAVE | LMR-400 | N-TYPE04 | 04/25/2014 | 04/24/2015 |
| System-Controller | CCS | N/A | N/A | N.C.R | N.C.R |
| Turn Table | CCS | N/A | N/A | N.C.R | N.C.R |
| Antenna Tower | CCS | N/A | N/A | N.C.R | N.C.R |
| RF cable | Murata | MXHQ87WA3000 | - | 08/21/2014 | 08/20/2015 |
| Loop Antenna | EMCO | 6502 | 00042960 | 08/22/2014 | 08/21/2015 |
| Horn Antenna | SCHWARZBECK | BBHA 9170 | 1123 | 08/19/2014 | 08/18/2015 |
| Three-way connector | Shaanxi Tianzhu Business Co., Ltd. | 1506A | A1213 | 08/19/2014 | 08/18/2015 |
| Attenuator | MCL | BW-N20W5+ | 1306 | 08/19/2014 | 08/18/2015 |
| Signal generator | Agilent | 8920B | VS36141817 | 08/19/2014 | 08/18/2015 |
| Power amplifier | rflight | NTWPA-00810150100E | 13103205 | 08/19/2014 | 08/18/2015 |
| Power amplifier | rflight | NTWPA-1060040E | 13104214 | 08/19/2014 | 08/18/2015 |
| Bi-log Antenna | A.H. Systems Inc. | SAS-522-3 | 1326 | 08/21/2014 | 08/20/2015 |

6. OUTPUT POWER

6.1 Conducted Output Power

6.1.1 MEASUREMENT METHOD

The EUT was setup for the max output power with pseudo random data modulation. Power was measured with Spectrum Analyzer. The measurements were performed on all modes (GSM/GPRS 850, GSM/GPRS1900) at 3 typical channels described in section 3.3 of this report for each band.

6.1.2 MEASUREMENT RESULT

| Conducted Output Power Limits for GSM850 band | | |
|--|--------------------|---------------|
| Mode | Nominal Peak Power | Tolerance(dB) |
| GSM | 33 dBm (2W) | +/- 1 |
| Conducted Output Power Limits for PCS1900 band | | |
| Mode | Nominal Peak Power | Tolerance(dB) |
| GSM | 30 dBm (1W) | +/- 1 |

GSM 850:**Card 1:**

| Mode | Frequency (MHz) | Peak Power (dBm) | Avg. Burst Power (dBm) | PAPR (dB) | Duty cycle Factor(dB) | Frame Power(dBm) |
|------------------|-----------------|------------------|------------------------|-----------|-----------------------|------------------|
| GSM850 | 824.2 | 33.75 | 33.20 | 0.55 | -9 | 24.2 |
| | 836.6 | 33.39 | 33.16 | 0.23 | -9 | 24.16 |
| | 848.8 | 33.32 | 33.09 | 0.23 | -9 | 24.09 |
| GPRS850 (1 Slot) | 824.2 | 33.44 | 33.19 | 0.25 | -9 | 24.19 |
| | 836.6 | 33.55 | 33.15 | 0.40 | -9 | 24.15 |
| | 848.8 | 33.59 | 33.11 | 0.48 | -9 | 24.11 |
| GPRS850 (2 Slot) | 824.2 | 30.31 | 30.02 | 0.29 | -6 | 24.02 |
| | 836.6 | 30.40 | 30.16 | 0.24 | -6 | 24.16 |
| | 848.8 | 30.71 | 30.21 | 0.50 | -6 | 24.21 |
| GPRS850 (3 Slot) | 824.2 | 28.58 | 28.09 | 0.49 | -4.26 | 23.83 |
| | 836.6 | 28.61 | 28.21 | 0.40 | -4.26 | 23.95 |
| | 848.8 | 28.83 | 28.33 | 0.50 | -4.26 | 24.07 |
| GPRS850 (4 Slot) | 824.2 | 27.72 | 27.33 | 0.39 | -3 | 24.33 |
| | 836.6 | 27.90 | 27.42 | 0.48 | -3 | 24.42 |
| | 848.8 | 27.72 | 27.39 | 0.33 | -3 | 24.39 |

Card 2:

| Mode | Frequency (MHz) | Peak Power (dBm) | Avg. Burst Power (dBm) | PAPR (dB) | Duty cycle Factor(dB) | Frame Power (dBm) |
|-------------------|-----------------|------------------|------------------------|-----------|-----------------------|-------------------|
| GSM1900 | 824.2 | 33.45 | 33.08 | 0.37 | -9 | 24.08 |
| | 836.6 | 33.59 | 33.10 | 0.49 | -9 | 24.10 |
| | 848.8 | 33.76 | 33.16 | 0.60 | -9 | 24.16 |
| GPRS1900 (1 Slot) | 824.2 | 33.42 | 33.07 | 0.35 | -9 | 24.07 |
| | 836.6 | 33.43 | 33.09 | 0.34 | -9 | 24.09 |
| | 848.8 | 33.67 | 33.14 | 0.53 | -9 | 24.14 |
| GPRS1900 (2 Slot) | 824.2 | 30.54 | 30.04 | 0.50 | -6 | 24.04 |
| | 836.6 | 30.51 | 30.14 | 0.37 | -6 | 24.14 |
| | 848.8 | 30.37 | 30.11 | 0.26 | -6 | 24.11 |
| GPRS1900 (3 Slot) | 824.2 | 28.57 | 28.10 | 0.47 | -4.26 | 23.84 |
| | 836.6 | 28.41 | 28.06 | 0.35 | -4.26 | 23.80 |
| | 848.8 | 28.79 | 28.21 | 0.58 | -4.26 | 23.95 |
| GPRS1900 (4 Slot) | 824.2 | 27.65 | 27.21 | 0.44 | -3 | 24.21 |
| | 836.6 | 27.44 | 27.19 | 0.25 | -3 | 24.19 |
| | 848.8 | 27.46 | 27.20 | 0.26 | -3 | 24.20 |

PCS 1900:**Card 1:**

| Mode | Frequency (MHz) | Peak Power (dBm) | Avg. Burst Power (dBm) | PAPR (dB) | Duty cycle Factor(dB) | Frame Power (dBm) |
|-------------------|-----------------|------------------|------------------------|-----------|-----------------------|-------------------|
| GSM1900 | 1850.2 | 30.24 | 30.01 | 0.23 | -9 | 21.01 |
| | 1880 | 30.48 | 30.13 | 0.35 | -9 | 21.13 |
| | 1909.8 | 30.52 | 30.25 | 0.27 | -9 | 21.25 |
| GPRS1900 (1 Slot) | 1850.2 | 30.54 | 30.03 | 0.51 | -9 | 21.03 |
| | 1880 | 30.43 | 30.12 | 0.31 | -9 | 21.12 |
| | 1909.8 | 30.57 | 30.26 | 0.31 | -9 | 21.26 |
| GPRS1900 (2 Slot) | 1850.2 | 28.56 | 28.31 | 0.25 | -6 | 22.31 |
| | 1880 | 28.80 | 28.22 | 0.58 | -6 | 22.22 |
| | 1909.8 | 28.71 | 28.19 | 0.52 | -6 | 22.19 |
| GPRS1900 (3 Slot) | 1850.2 | 27.59 | 27.34 | 0.25 | -4.26 | 23.08 |
| | 1880 | 27.42 | 27.16 | 0.26 | -4.26 | 22.90 |
| | 1909.8 | 27.81 | 27.26 | 0.55 | -4.26 | 23.00 |
| GPRS1900 (4 Slot) | 1850.2 | 26.98 | 26.44 | 0.54 | -3 | 23.44 |
| | 1880 | 26.58 | 26.30 | 0.28 | -3 | 23.30 |
| | 1909.8 | 26.56 | 26.29 | 0.27 | -3 | 23.29 |

Card 2:

| Mode | Frequency (MHz) | Peak Power (dBm) | Avg. Burst Power (dBm) | PAPR (dB) | Duty cycle Factor(dB) | Frame Power (dBm) |
|-------------------|-----------------|------------------|------------------------|-----------|-----------------------|-------------------|
| GSM1900 | 1850.2 | 30.57 | 30.1 | 0.47 | -9 | 21.10 |
| | 1880 | 30.56 | 30.06 | 0.50 | -9 | 21.06 |
| | 1909.8 | 30.59 | 30.16 | 0.43 | -9 | 21.16 |
| GPRS1900 (1 Slot) | 1850.2 | 30.36 | 30.13 | 0.23 | -9 | 21.13 |
| | 1880 | 30.34 | 30.04 | 0.30 | -9 | 21.04 |
| | 1909.8 | 30.74 | 30.17 | 0.57 | -9 | 21.17 |
| GPRS1900 (2 Slot) | 1850.2 | 28.76 | 28.32 | 0.44 | -6 | 22.32 |
| | 1880 | 28.81 | 28.41 | 0.40 | -6 | 22.41 |
| | 1909.8 | 28.61 | 28.27 | 0.34 | -6 | 22.27 |
| GPRS1900 (3 Slot) | 1850.2 | 27.55 | 27.17 | 0.38 | -4.26 | 22.91 |
| | 1880 | 27.45 | 27.09 | 0.36 | -4.26 | 22.83 |
| | 1909.8 | 27.77 | 27.22 | 0.55 | -4.26 | 22.96 |
| GPRS1900 (4 Slot) | 1850.2 | 26.71 | 26.46 | 0.25 | -3 | 23.46 |
| | 1880 | 26.82 | 26.41 | 0.41 | -3 | 23.41 |
| | 1909.8 | 26.84 | 26.3 | 0.54 | -3 | 23.30 |

6.2 RADIATED OUTPUT POWER

6.2.1 MEASUREMENT METHOD

The measurements procedures specified in TIA-603C-2004 were applied.

- 1 In an anechoic antenna test chamber, a half-wave dipole antenna for the frequency band of interest is placed at the reference centre of the chamber. An RF Signal source for the frequency band of interest is connected to the dipole with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A known (measured) power (P_{in}) is applied to the input of the dipole, and the power received (P_r) at the chamber's probe antenna is recorded.
- 2 The substitution method is used. Substitution values at each frequency are measured before and saved to the test software. A "reference path loss" is established as $AR_{pl} = P_{in} + 2.15 - P_r$. The AR_{pl} is the attenuation of "reference path loss", and including the gain of receive antenna, the cable loss and the air loss. The measurement results are obtained as described below: $Power = P_{Mea} + AR_{pl}$
- 3 The EUT is substituted for the dipole at the reference centre of the chamber and a scan is performed to obtain the radiation pattern.
- 4 From the radiation pattern, the co-ordinates where the maximum antenna gain occurs are identified.
- 5 The EUT is then put into continuously transmitting mode at its maximum power level.
- 6 Power mode measurements are performed with the receiving antenna placed at the coordinates determined in Step 3 to determine the output power as defined in Rule 24.232 (b) and (c). The "reference path loss" from Step1 is added to this result.
- 7 This value is EIRP since the measurement is calibrated using a half-wave dipole antenna of known gain (2.15 dBi) and known input power (P_{in}).
- 8 ERP can be calculated from EIRP by subtracting the gain of the dipole, $ERP = EIRP - 2.15dBi$.

6.2.2 PROVISIONS APPLICABLE

This is the test for the maximum radiated power from the EUT. Rule Part 24.232(b) specifies, "Mobile/portable stations are limited to 2 watts e.i.r.p. Peak power" and 24.232(c) specifies that "Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage." Rule Part 22.913(a) specifies "Maximum ERP. The effective radiated power (ERP) of base transmitters and cellular repeaters must not exceed 500 Watts. The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts."

| Mode | Nominal Peak Power |
|----------|-----------------------|
| GSM 850 | ≤ 38.45 dBm (7W) |
| PCS 1900 | ≤ 33 dBm (2W) |

6.2.3 MEASUREMENT RESULT

| Radiated Power (ERP) for GSM 850 MHZ | | | | |
|--------------------------------------|-----------|---------------------|--------------------------|------------|
| Mode | Frequency | Result | | Conclusion |
| | | Max. Peak ERP (dBm) | Polarization Of Max. ERP | |
| GSM850 | 824.2 | 33.49 | Horizontal | Pass |
| | 836.6 | 33.51 | Horizontal | Pass |
| | 848.8 | 33.63 | Horizontal | Pass |

| Radiated Power (E.I.R.P) for PCS 1900 MHZ | | | | |
|---|-----------|-------------------------|-------------------------------|------------|
| Mode | Frequency | Result | | Conclusion |
| | | Max. Peak E.I.R.P.(dBm) | Polarization Of Max. E.I.R.P. | |
| GSM 1900 | 1850.2 | 30.53 | Horizontal | Pass |
| | 1880.0 | 30.48 | Horizontal | Pass |
| | 1909.8 | 30.56 | Horizontal | Pass |

Note: Above is worst mode data.

6.3. Peak-to-Average Ratio

6.3.1 MEASUREMENT METHOD

The following steps outline the procedure used to measure the Peak-to-Average Ratio from the EUT.

1. The EUT was connected to Spectrum Analyzer and Base Station via power divider.
2. For GSM operating modes:
 - a. Set the RBW = 1MHz, VBW = 1MHz, Peak detector in spectrum analyzer.
 - b. Set EUT in maximum power output, and triggered the burst signal.
 - c. Measured respectively the Peak level and Mean level, and the deviation was recorded as Peak to Average Ratio.
3. For UMTS operating modes:
 - a. Set the CCDF (Complementary Cumulative Distribution Function) option in spectrum analyzer.
 - b. The highest RF powers were measured and recorded the maximum PAPR level associated with a probability of 0.1 %.

6.3.2 PROVISIONS APPLICABLE

Use one of the procedures presented in 5.1 to measure the total peak power and record as P_{Pk}. Use one of the applicable procedures presented 5.2 to measure the total average power and record as P_{Avg}. Both the peak and average power levels must be expressed in the same logarithmic units (e.g., dBm). Determine the PAPR from:

$$\text{PAPR (dB)} = P_{Pk} \text{ (dBm)} - P_{Avg} \text{ (dBm)}.$$

6.3.3 MEASUREMENT RESULT

ACCORDING to **KDB 971168** D01 5.7

“ If peak power or power density is used to demonstrate compliance, a PAPR measurement is not required.”

According to section 6.1.2, the PAPR is the difference value of peak power and average power, and it meets the value of the limit.

7. SPURIOUS EMISSION

7.1 CONDUCTED SPURIOUS EMISSION

7.1.1 MEASUREMENT METHOD

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 9 GHz.

2, Determine EUT transmit frequencies: the following typical channels were chosen to conducted emissions testing.

7.1.2 PROVISIONS APPLICABLE

On any frequency outside frequency band of the USPCS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least $43+10\text{Log}(P)$ dB. For all power levels +30 dBm to 0 dBm, this becomes a constant specification limit of -13 dBm.

7.1.3 MEASUREMENT RESULT

PLEASE REFER TO: APPENDIX I TEST PLOTS FOR CONDUCTED SPURIOUS EMISSION

Note: 1. Below 30MHZ no Spurious found and The GSM modes is the worst condition.

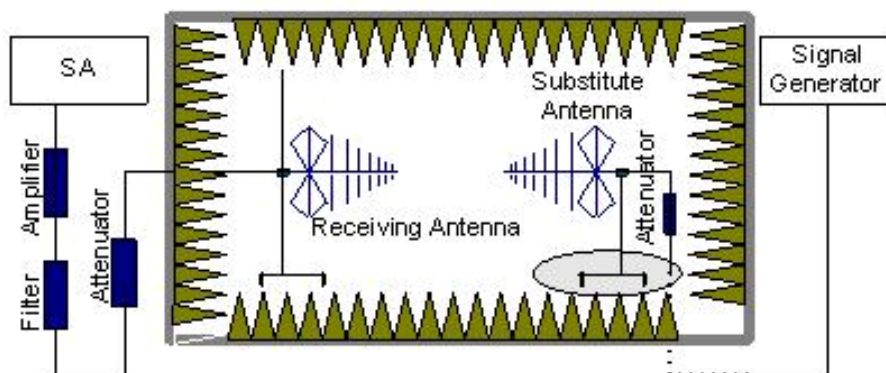
7.2 Radiated Spurious Emission

7.2.1 MEASUREMENT METHOD

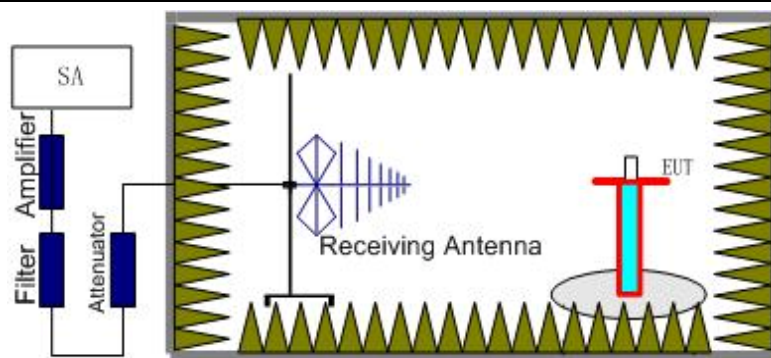
The measurements procedures specified in TIA-603C-2004 were used for testing. The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment. The resolution bandwidth is set 1MHz as outlined in Part 24.238. The measurements were performed on all modes(GPRS850, GPRS1900) at 3 typical channels(the Top Channel, the Middle Channel and the Bottom Channel) for each band.

The procedure of radiated spurious emissions is as follows:

a) Pre-calibration With pre-calibration method, the Radiated Spurious Emissions(RSE) is calculated as, $RSE = R_x (\text{dBuV}) + CL (\text{dB}) + SA (\text{dB}) + \text{Gain} (\text{dBi}) - 107 (\text{dBuV to dBm})$ The SA is calibrated using following setup.



b) EUT was placed on a 0.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the test item for emission measurements. The height of receiving antenna is 0.8m. The test setup refers to figure below. Detected emissions were maximized at each frequency by rotating the test item and adjusting the receiving antenna polarization. The radiated emission measurements of all non-harmonic and harmonics of the transmit frequency through the 10th harmonic were measured with peak detector and 1MHz bandwidth.



Radiated emissions measurements were made only at the upper, middle, and lower carrier frequencies of the PCS 1900 band (1850.2 MHz, 1880 MHz and 1909.8 MHz), GSM850 band (824.2MHz, 836.6MHz, 848.8MHz), . It was decided that measurements at these three carrier frequencies would be sufficient to demonstrate compliance with emissions limits because it was seen that all the significant spurs occur well outside the band and no radiation was seen from a carrier in one block of any band into any of the other blocks.

The substitution method is used. Substitution values at each frequency are measured before and saved to the test software. A "reference path loss" is established and the A_{Rpl} is the attenuation of "reference path loss", and including the gain of receive antenna, the gain of the preamplifier, the cable loss and the air loss. The measurement results are obtained as described below: $Power = P_{Mea} + A_{Rpl}$

7.2.2 PROVISIONS APPLICABLE

(a) On any frequency outside a licensee's frequency block (e.g. A, D, B, etc.) within the USPCS spectrum, the power of any emission shall be attenuated below the transmitter power (P , in Watts) by 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.

Note: only result the worst condition of each test mode:

7.2.3 MEASUREMENT RESULT**GSM 850:**

| The Worst Test Results for Channel 251/848.8 MHz | | | | | |
|---|------------|------------|-----------|-------------|------------|
| Frequency(MHz) | Power(dBm) | ARpl (dBm) | PMea(dBm) | Limit (dBm) | Polarity |
| 1697.6 | -40.90 | -4.99 | -35.91 | -13.00 | Horizontal |
| 2546.4 | -43.76 | -2.45 | -41.31 | -13.00 | Vertical |
| 3395.2 | -41.07 | 3.61 | -44.68 | -13.00 | Vertical |
| 4244.0 | -42.70 | 2.82 | -45.52 | -13.00 | Horizontal |

PCS 1900:

| The Worst Test Results for Channel 810/1909.8MHz | | | | | |
|---|------------|------------|-----------|-------------|------------|
| Frequency(MHz) | Power(dBm) | ARpl (dBm) | PMea(dBm) | Limit (dBm) | Polarity |
| 3819.6 | -37.58 | -3.21 | -34.37 | -13.00 | Horizontal |
| 5729.4 | -40.13 | 0.34 | -40.47 | -13.00 | Vertical |
| 7639.2 | -38.64 | 3.95 | -42.59 | -13.00 | Horizontal |
| 9549 | -35.28 | -2.26 | -33.02 | -13.00 | Vertical |

Note: Below 30MHZ no Spurious found and The GSM modes is the worst condition.

8. FREQUENCY STABILITY

8.1 MEASUREMENT METHOD

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 -10°C.
- 3 , With the EUT, powered via nominal voltage, connected to the CMU200 and in a simulated call on channel 661 for PCS 1900 band, channel 190 for GSM 850 band, 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°C increments from -10°C to +50°C. 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°C.
- 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°C to -10°C. Allow at least 1 1/2 hours at each temperature, unpowered, before making measurements.
- 9 , At all temperature levels hold the temperature to +/- 0.5°C during the measurement procedure.

8.2 PROVISIONS APPLICABLE

8.2.1 For Hand carried battery powered equipment

According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm 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. 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 6.3VDC and 8.5VDC, with a nominal voltage of 7.4VDC. 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 represent a tolerance of -10 % and +12.5 %. For the purposes of measuring frequency stability these voltage limits are to be used.

8.2.2 For equipment powered by primary supply voltage

According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm 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, the normal environment temperature is 20°C.

8.3 MEASUREMENT RESULT (WORST)

Frequency Error Against Voltage for GSM850 band

| Voltage (V) | Frequency error(Hz) | Frequency error(ppm) |
|-------------|---------------------|----------------------|
| 3.5 | 43 | 0.051 |
| 3.8 | 42 | 0.050 |
| 4.35 | 38 | 0.045 |

Frequency Error Against Voltage for GSM850 band

| Temperature(°C) | Frequency error(Hz) | Frequency error(ppm) |
|-----------------|---------------------|----------------------|
| -10 | 44 | 0.053 |
| 0 | 35 | 0.042 |
| 10 | 48 | 0.057 |
| 20 | 46 | 0.055 |
| 30 | 32 | 0.038 |
| 40 | 47 | 0.056 |
| 50 | 40 | 0.048 |

Note: The EUT doesn't work below -10°C

| Frequency Error Against Voltage for PCS1900 band | | |
|--|---------------------|----------------------|
| Voltage (V) | Frequency error(Hz) | Frequency error(ppm) |
| 3.5 | 42 | 0.022 |
| 3.8 | 40 | 0.021 |
| 4.35 | 38 | 0.020 |

| Frequency Error Against Temperature for PCS1900 band | | |
|--|---------------------|----------------------|
| Temperature(°C) | Frequency error(Hz) | Frequency error(ppm) |
| -10 | 49 | 0.026 |
| 0 | 36 | 0.019 |
| 10 | 41 | 0.022 |
| 20 | 38 | 0.020 |
| 30 | 39 | 0.021 |
| 40 | 43 | 0.023 |
| 50 | 45 | 0.024 |

Note: The EUT doesn't work below -10°C

9. OCCUPIED BANDWIDTH

9.1 MEASUREMENT METHOD

The test set up and general procedure is similar to conducted peak output power test. Only different for setting the measurement configuration of the measuring instrument of Spectrum Analyzer.

9.2 PROVISIONS APPLICABLE

The emission bandwidth is defined as two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26dB below the transmitter power.

9.3 MEASUREMENT RESULT

| Occupied Bandwidth (99%) for GSM850 band | | |
|---|----------------|--------------------------------|
| Mode | Frequency(MHz) | Occupied Bandwidth (99%)(kHz) |
| Low Channel | 824.2 | 243.59 |
| Middle Channel | 836.6 | 246.79 |
| High Channel | 848.8 | 243.59 |

| Occupied Bandwidth (99%) for PCS1900 band | | |
|--|----------------|--------------------------------|
| Mode | Frequency(MHz) | Occupied Bandwidth (99%)(kHz) |
| Low Channel | 1850.2 | 245.19 |
| Middle Channel | 1880.0 | 241.99 |
| High Channel | 1909.8 | 248.40 |

10. EMISSION BANDWIDTH

10.1 MEASUREMENT METHOD

The test set up and general procedure is similar to conducted peak output power test. Only different for setting the measurement configuration of the measuring instrument of Spectrum Analyzer.

10.2 PROVISIONS APPLICABLE

The emission bandwidth is defined as two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26dB below the transmitter power

10.3 MEASUREMENT RESULT

| Emission Bandwidth (-26dBc) for GSM850 band | | |
|---|----------------|-----------------------------------|
| Mode | Frequency(MHz) | Emission Bandwidth (-26dBc)(kHz) |
| Low Channel | 824.2 | 314.10 |
| Middle Channel | 836.6 | 312.50 |
| High Channel | 848.8 | 315.71 |

| Emission Bandwidth (-26dBc) for PCS1900 band | | |
|--|----------------|-----------------------------------|
| Mode | Frequency(MHz) | Emission Bandwidth (-26dBc)(kHz) |
| Low Channel | 1850.2 | 315.71 |
| Middle Channel | 1880.0 | 312.50 |
| High Channel | 1909.8 | 309.29 |

11. BAND EDGE

11.1 MEASUREMENT METHOD

The test set up and general procedure is similar to conducted peak output power test. Only different for setting the measurement configuration of the measuring instrument of Spectrum Analyzer.

11.2 PROVISIONS APPLICABLE

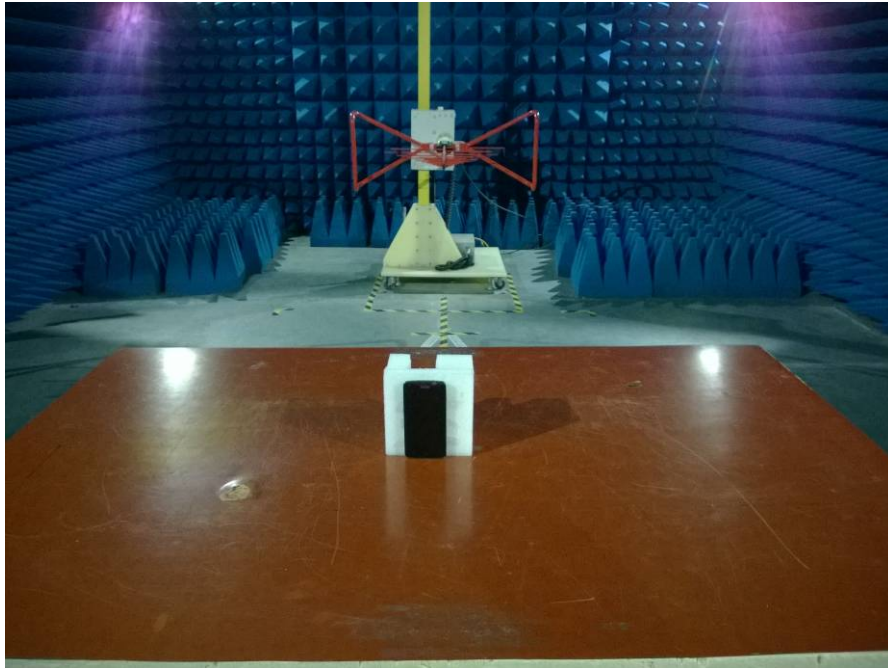
As Specified in FCC rules of 22.917(a) and 24.238(a)

11.3 MEASUREMENT RESULT

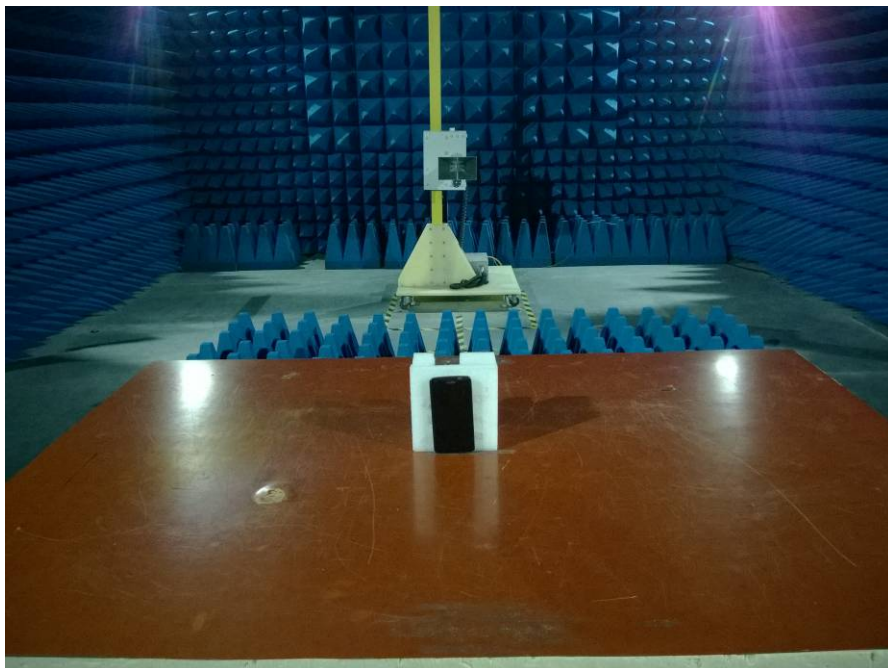
Please refers to Appendix D for compliance test plots for band edges

12. EUT TEST PHOTO

RADIATED EMISSION TEST



RADIATED EMISSION TEST



13. EUT PHOTO

Appearance photograph of EUT



Appearance photograph of EUT



Appearance photograph of EUT



Appearance photograph of EUT



Appearance photograph of EUT



Appearance photograph of EUT



Appearance photograph of EUT



Appearance photograph of EUT



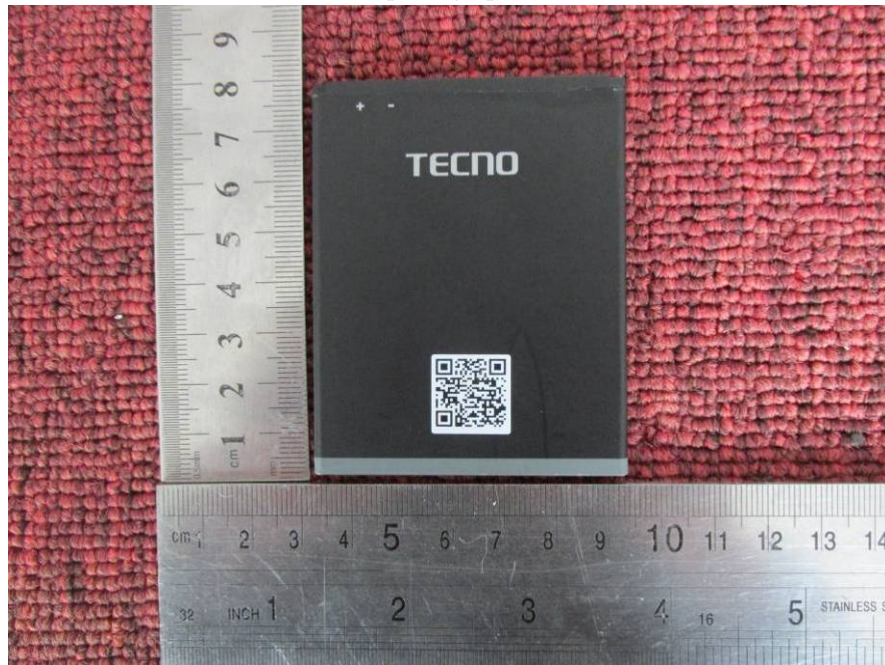
Internal photograph of EUT



Internal photograph of EUT



Internal photograph of EUT



Internal photograph of EUT



Internal photograph of EUT



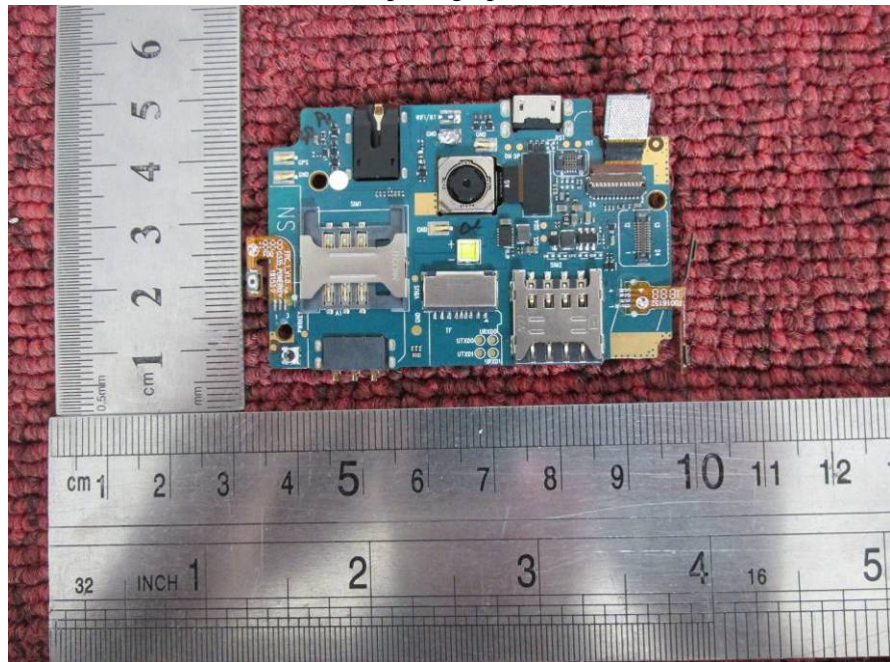
Internal photograph of EUT



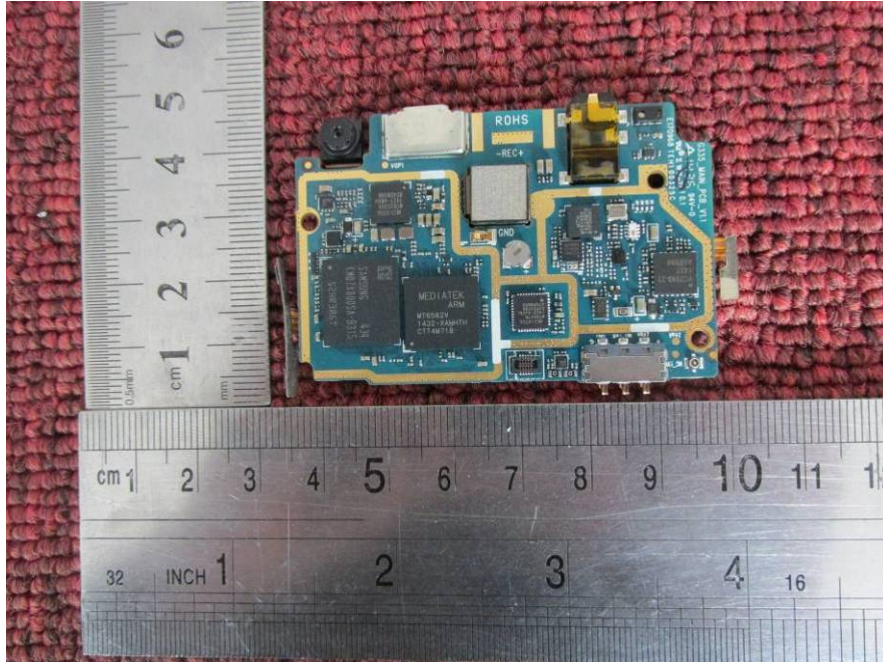
Internal photograph of EUT



Internal photograph of EUT

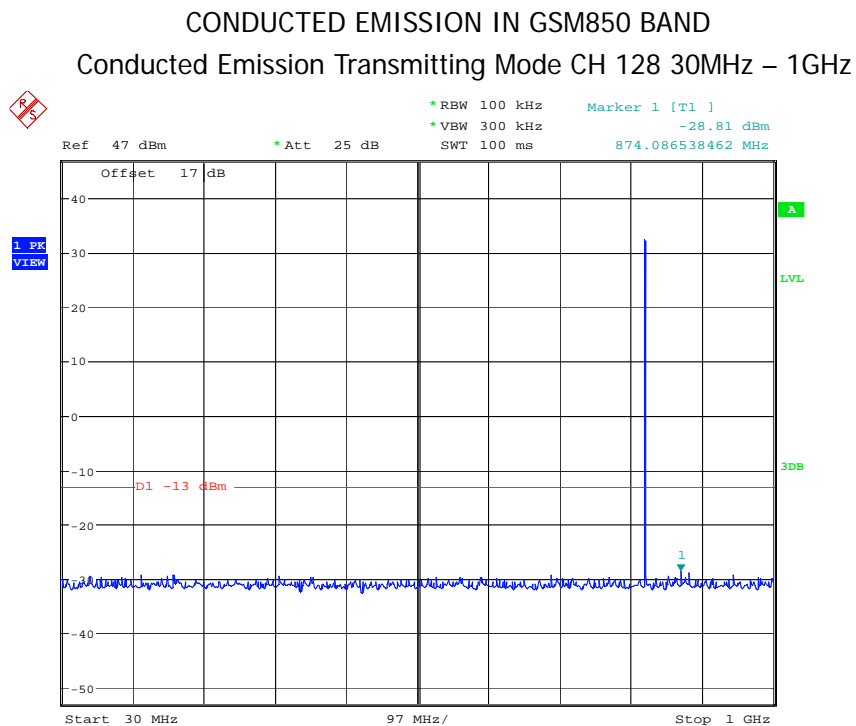


Internal photograph of EUT

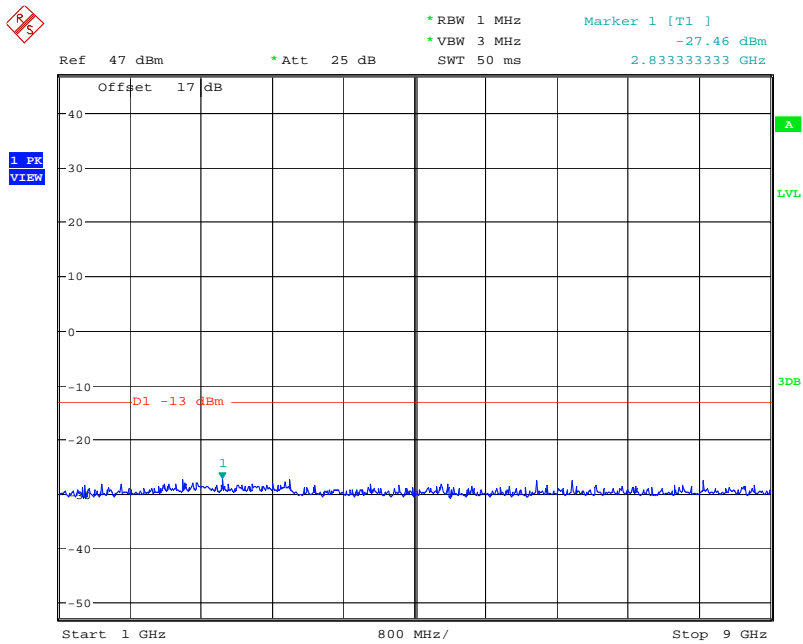


Note: The EUT and CMU200, frequency analyser are connected by three-way connector. There procedure loss, like three-way connector loss, attenuator loss, RF cable loss. The offset is compensation.

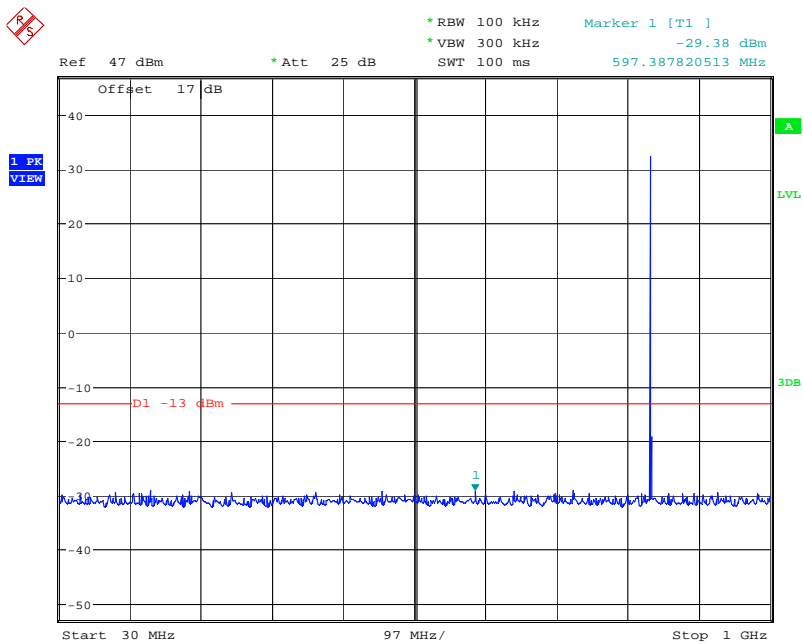
APPENDIX A: TEST PLOTS FOR CONDUCTED SPURIOUS EMISSION



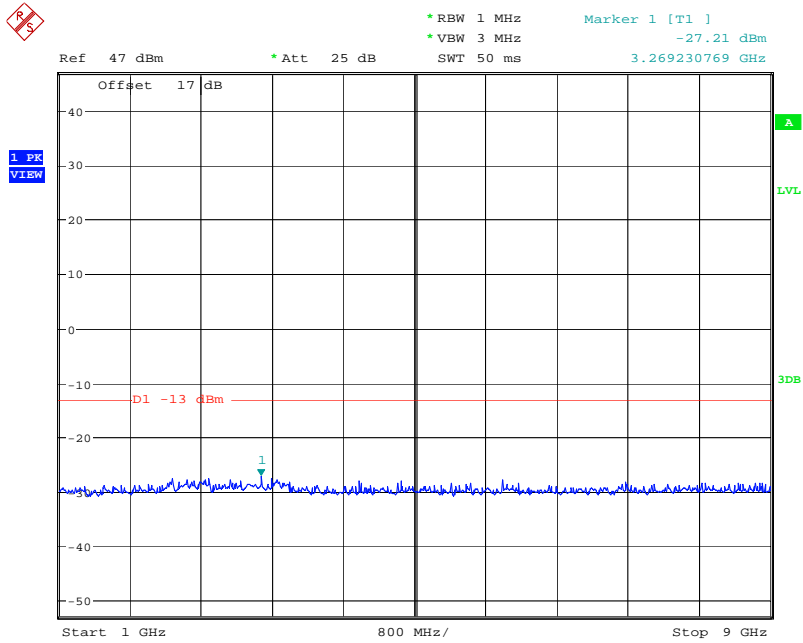
Conducted Emission Transmitting Mode CH 128 1GHz – 9GHz



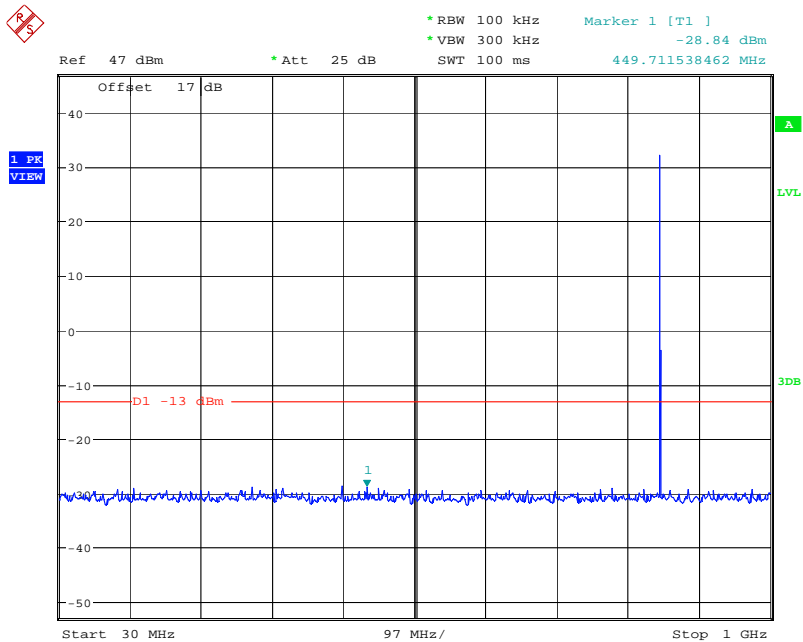
Conducted Emission Transmitting Mode CH 190 30MHz – 1GHz



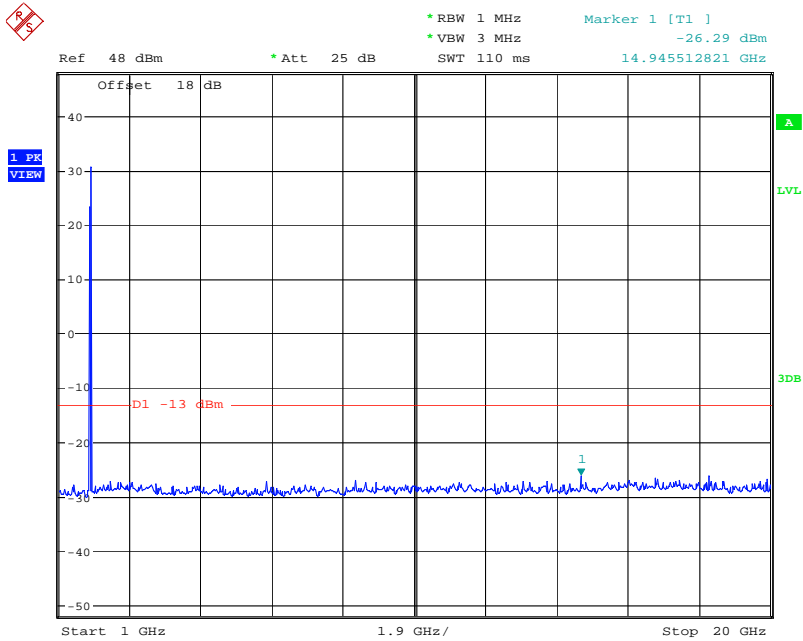
Conducted Emission Transmitting Mode CH 190 1GHz – 9GHz



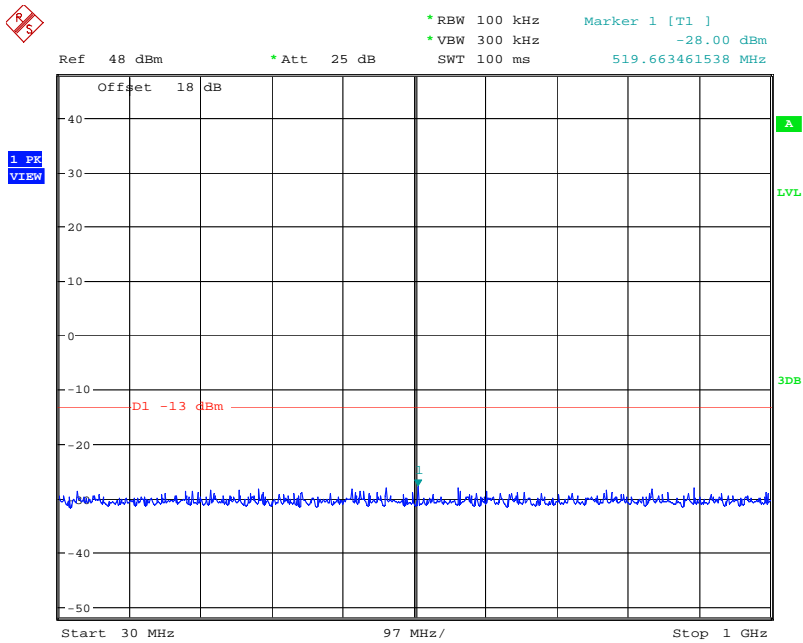
Conducted Emission Transmitting Mode CH 251 30MHz – 1GHz



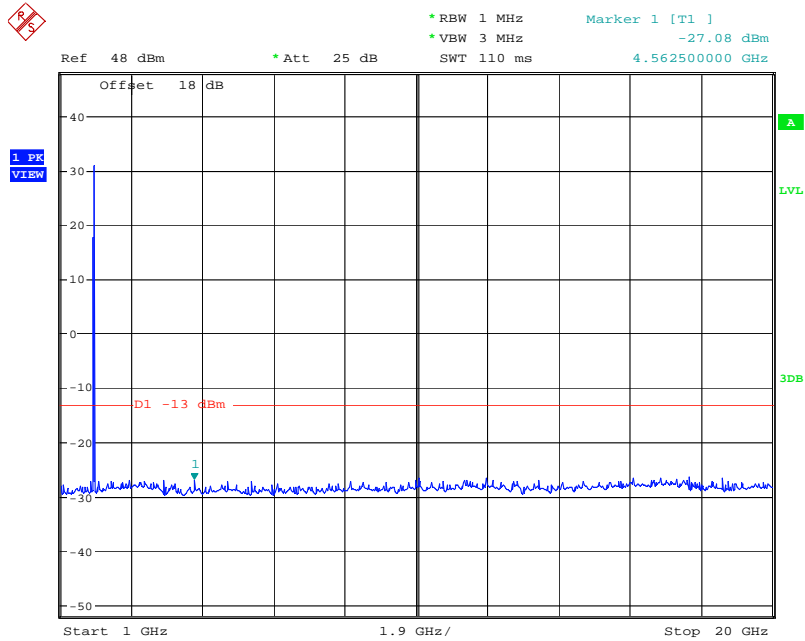
Conducted Emission Transmitting Mode CH 512 1GHz – 20GHz



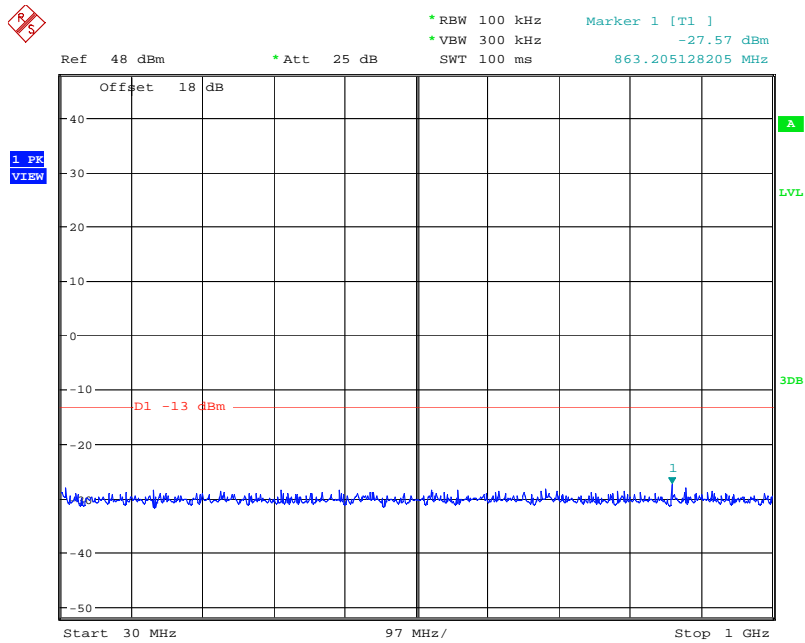
Conducted Emission Transmitting Mode CH 661 30MHz – 1GHz



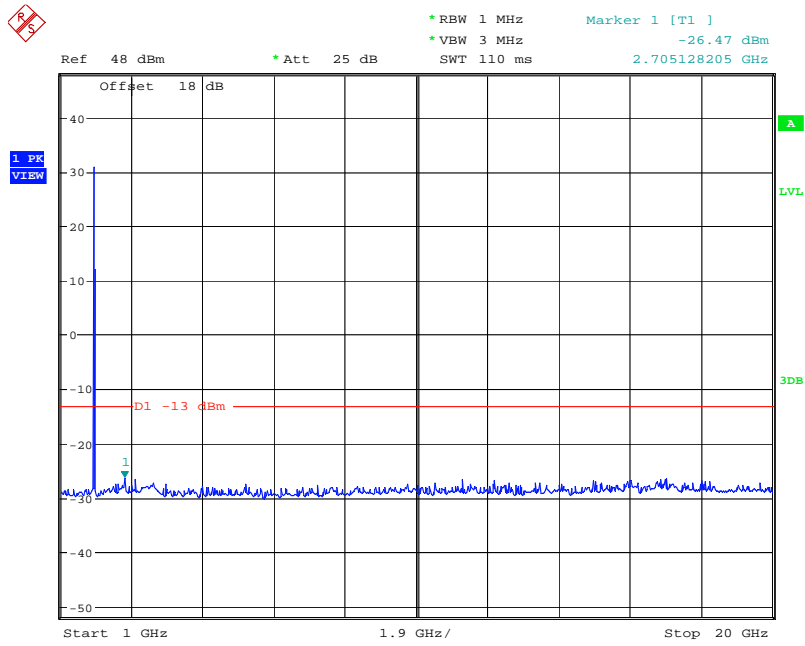
Conducted Emission Transmitting Mode CH 661 1GHz – 20GHz



Conducted Emission Transmitting Mode CH 810 30MHz – 1GHz

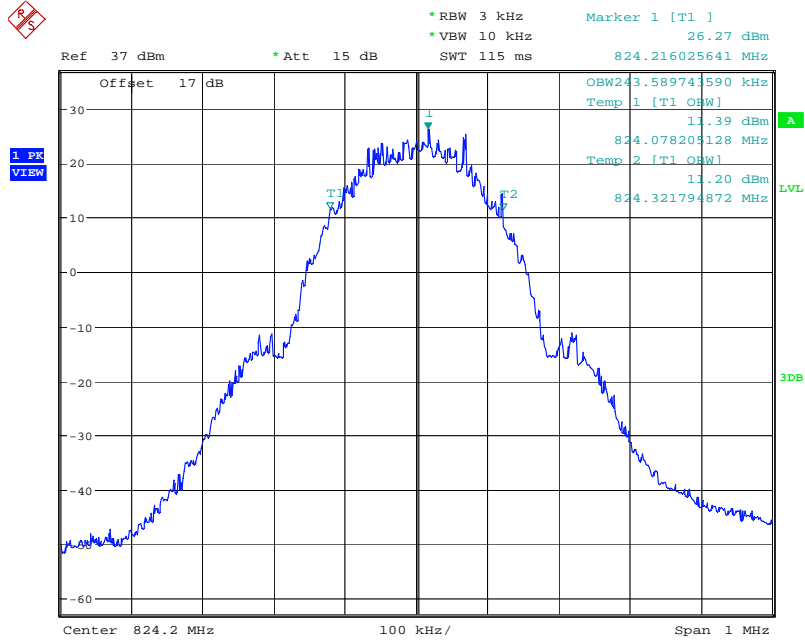


Conducted Emission Transmitting Mode CH 810 1GHz – 20GHz

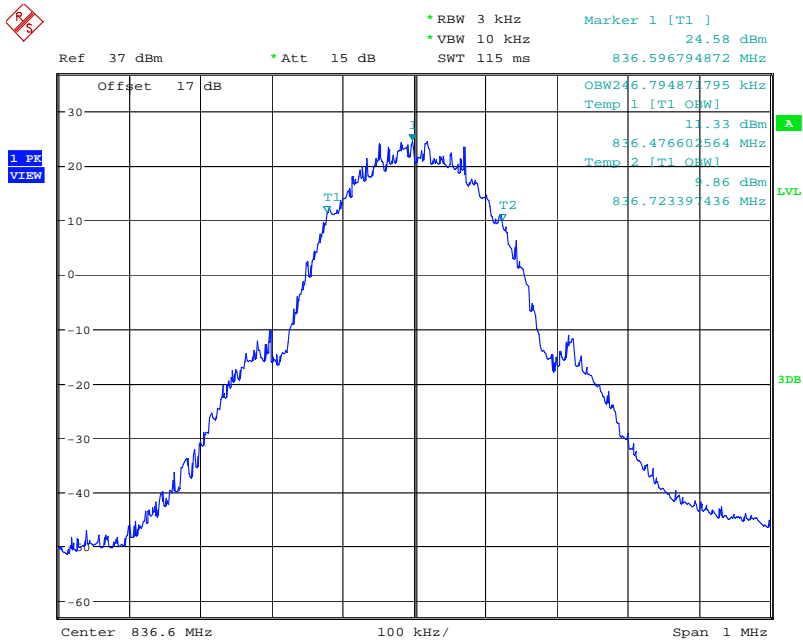


APPENDIX B: TEST PLOTS FOR OCCUPIED BANDWIDTH (99%)

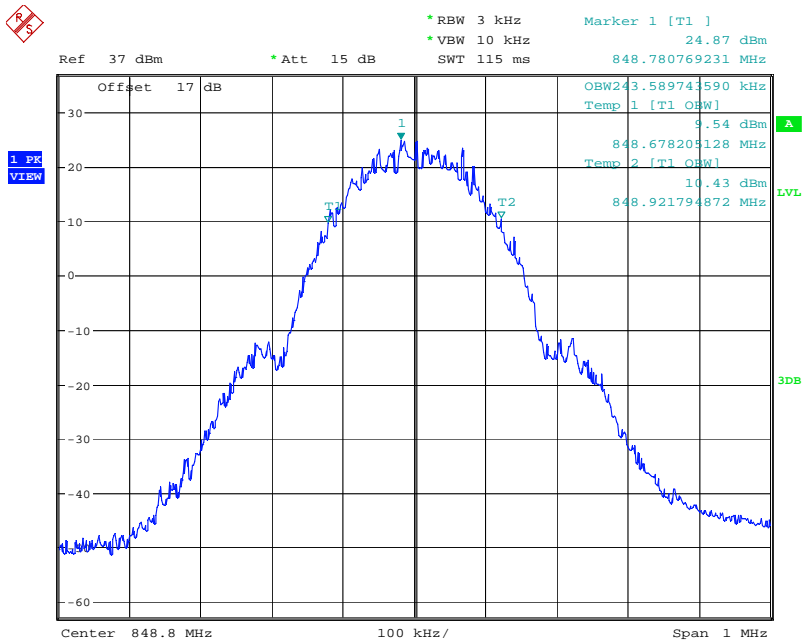
Occupied Bandwidth (99%) GSM 850 BAND CH 128



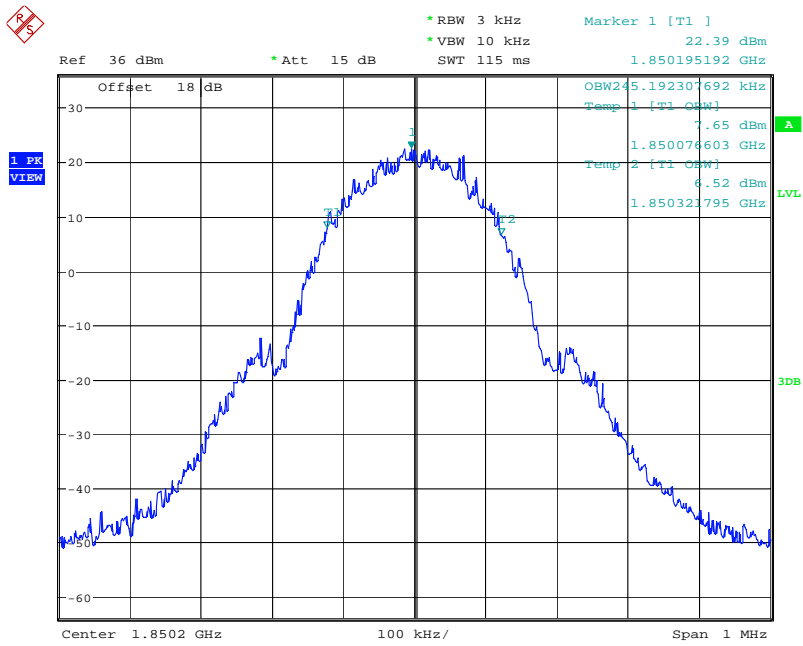
Occupied Bandwidth (99%) GSM 850 BAND CH 190



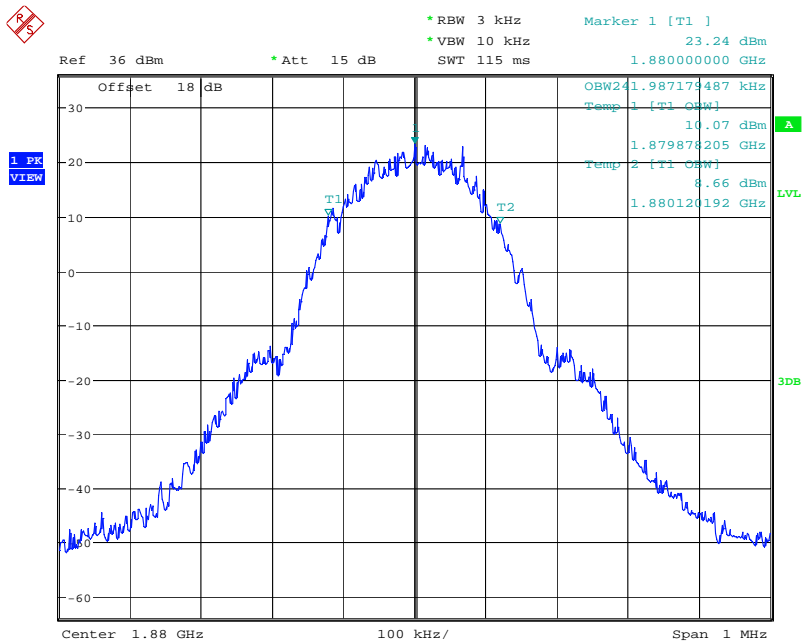
Occupied Bandwidth (99%) GSM 850 BAND CH 251



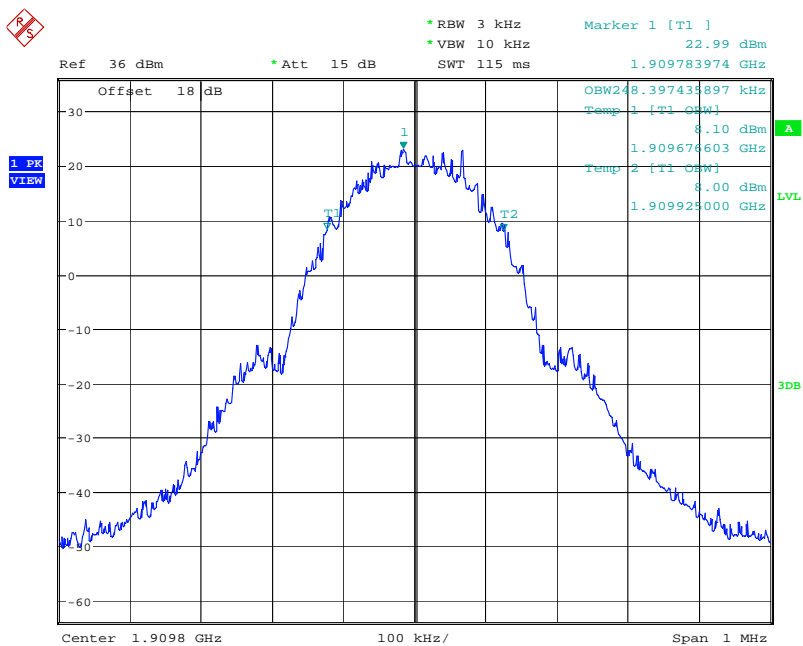
Occupied Bandwidth (99%) PCS 1900 BAND CH 512



Occupied Bandwidth (99%) PCS 1900 BAND CH 661

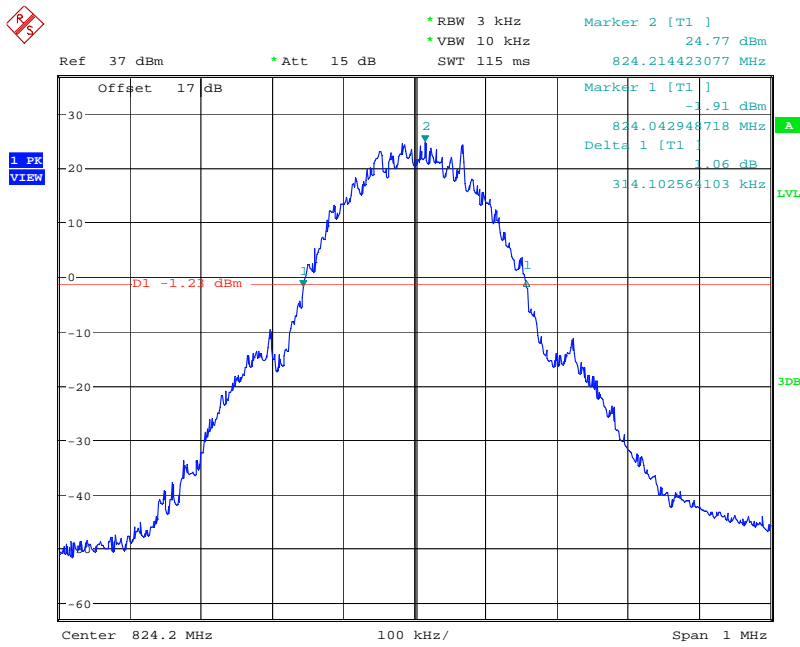


Occupied Bandwidth (99%) PCS 1900 BAND CH 810

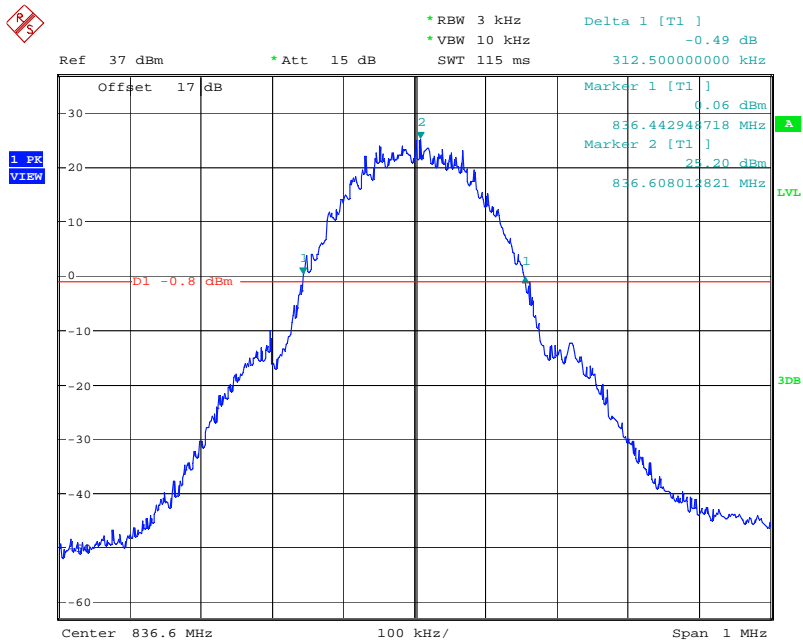


APPENDIX C: EMISSION BANDWIDTH (-26dBc)

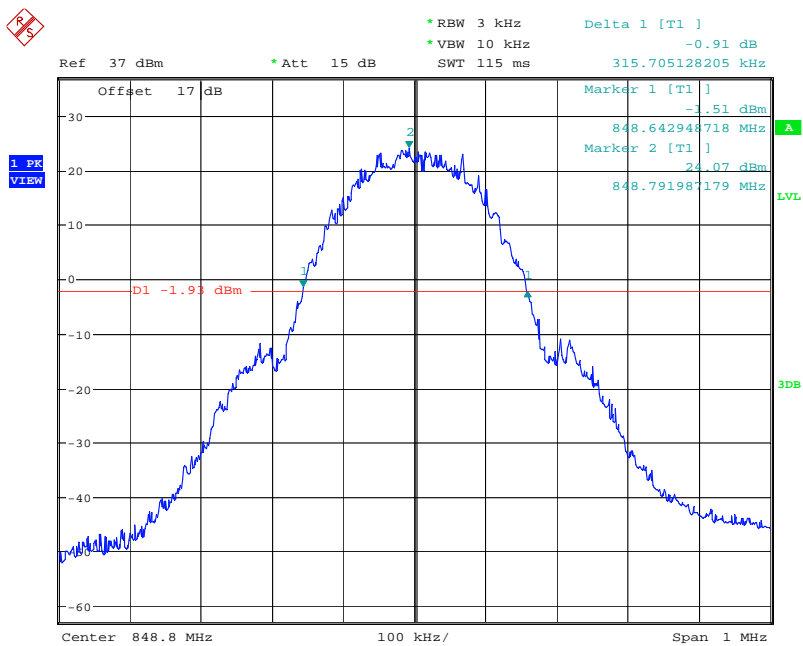
Occupied Bandwidth (-26dBc) GSM 850 BAND CH 128



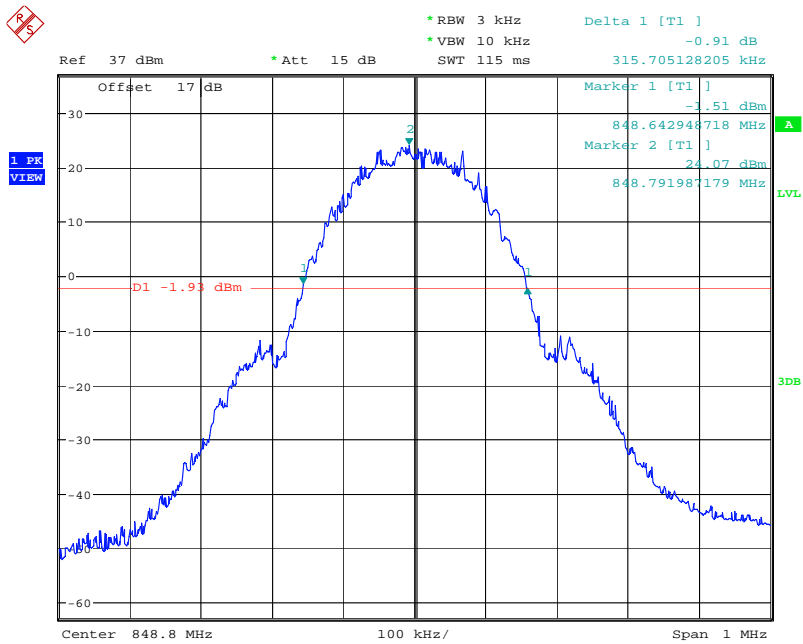
Occupied Bandwidth (-26dBc) GSM 850 BAND CH 190



Occupied Bandwidth (-26dBc) GSM 850 BAND CH 251

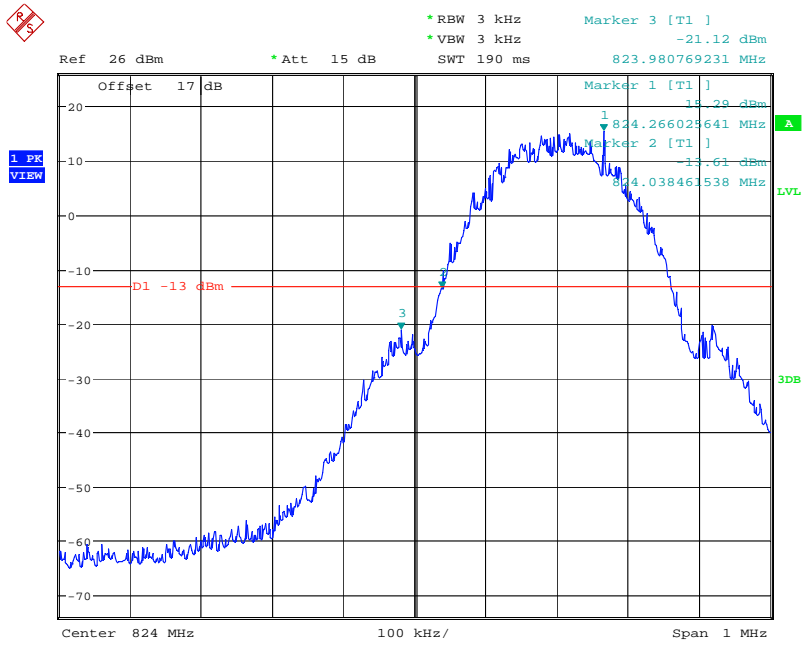


Occupied Bandwidth (-26dBc) PCS 1900 BAND CH 512

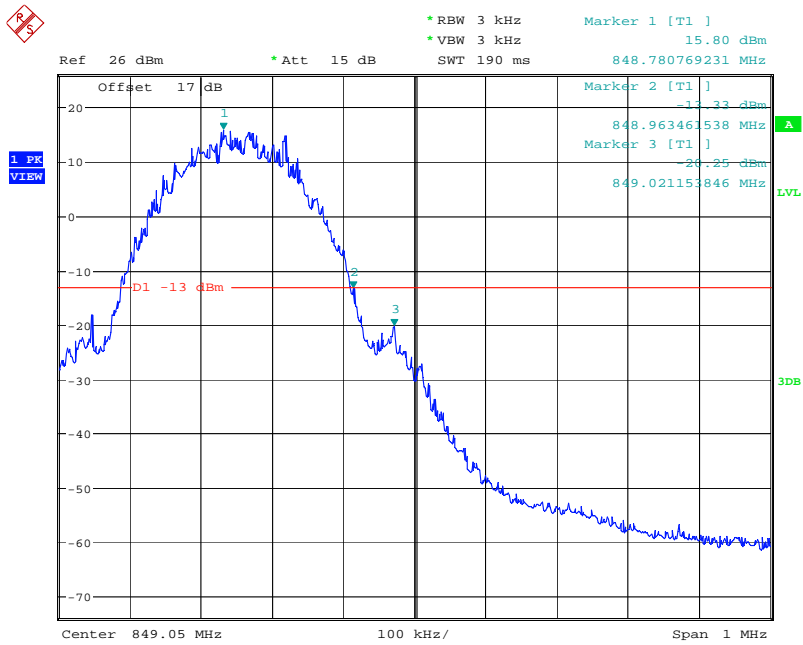


APPENDIX D: TEST PLOTS FOR BAND EDGES

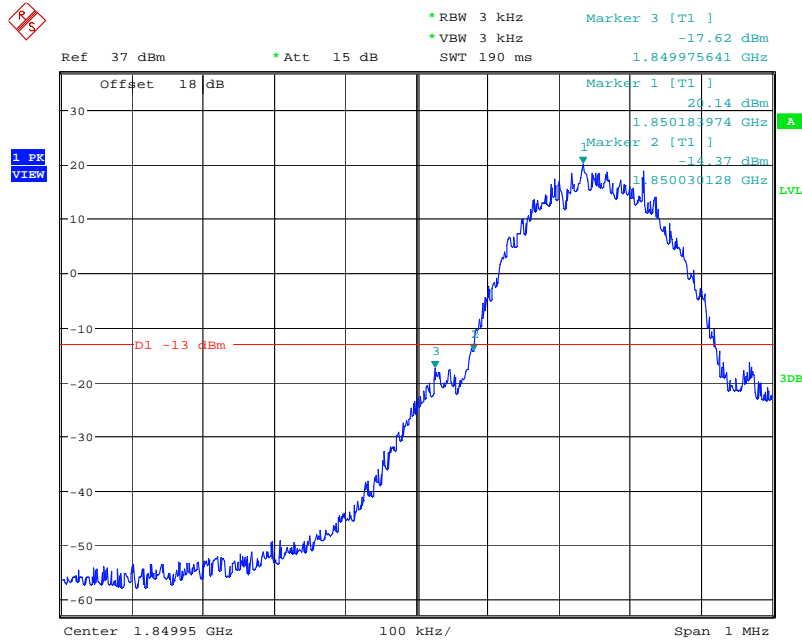
Low Band Edge GSM 850 BAND CH 128



High Band Edge GSM 850 BAND CH 251



Low Band Edge PCS 1900 BAND CH 512



High Band Edge PCS 1900 BAND CH 810

