

GSM1900 test report for RA-3

Report Date: September 09, 2004

Signatures:

Tested by:



Marko Turkkila Testing Engineer

Contents approved:



Tomi Nyberg Laboratory Manager

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1 LABORATORY INFORMATION

| | |
|---|--|
| Test Laboratory | NATLABS OY EMC Laboratory Koneenkatu 12 / K17 05830 Hyvinkää FINLAND Tel: +358 20 475 2600 Fax: +358 20 475 2719 e-mail: firstname.surname@ette.com |
| FCC registration number: IC file number: | 910391 (January 27, 2003) IC 4616 (May 14, 2003) |

2 CUSTOMER INFORMATION

| | |
|------------------------|--|
| Client | Nokia Corporation Keilalahdentie 2-4 02150 Espoo PL 226 00045 NOKIA GROUP Tel: 07180 08000 |
| Contact person: | Juha Tuominen Nokia Corporation / TCC Salo P.O. Box 86 (Joensuunkatu 7C) FIN -24101 SALO FINLAND Tel: +358 7180 08000 Fax: +358 7180 44123 |
| Receipt of EUT: | July 08, 2004 |
| Testing date: | July 08 – September 08, 2004 |
| Report date: | September 09, 2004 |

The tests listed in this report have been done to demonstrate compliance with the applicable requirements in FCC rules Part 24 and 2 and IC standard RSS-133.

3 SUMMARY OF TEST RESULTS

| Section in CFR 47 | Section in RSS-133 | Test | Result |
|----------------------------|--------------------|--|--------|
| §2.1046 (a) | 6.2 | Conducted RF output | - |
| §24.232 (b) | 6.2 | Radiated RF output | PASS |
| §2.1049 (h) | 5.6 | 99% occupied bandwidth | PASS |
| §24.238 (a) | 6.3 | Band-edge compliance | PASS |
| §24.238 (a), §2.1051 | 6.3 | Spurious emissions at antenna terminals | - |
| §24.238 (a), §2.1053 | 6.3 | Radiated spurious emissions | PASS |
| §24.235, §2.1055 (a)(1)(b) | 7 | Frequency stability, temperature variation | PASS |
| §24.235, §2.1055 (d)(1)(2) | 7 | Frequency stability, voltage variation | PASS |

PASS Pass

FAIL Fail

X Measured, but there is no applicable performance criteria

- Not done

4 EUT INFORMATION

The EUT and accessories used in the tests are listed below. Later in this report only EUT numbers are used as reference.

| | Device | Type | S/N | EUT number |
|--------------------|-----------------------|-------|--------------------|------------|
| EUT | GSM 1900 Mobile phone | RA-3 | 004400/49/175235/6 | 06301 |
| | GSM 1900 Mobile phone | RA-3 | 004400/49/175035/0 | 06302 |
| | GSM 1900 Mobile phone | RA-3 | 004400/49/175043/4 | 06303 |
| | | | | |
| Accessories | Battery | BP-5L | v.12 | 06304 |
| | | | | |

Notes:

EUT 06303 was equipped with antenna connector for conducted measurements

4.1 EUT description

EUT is a triple band (GSM850 / GSM 1800 / GSM 1900) mobile phone with edge, BT and WLAN functions.

The EUT was not modified during the tests.

5 EUT TEST SETUPS

For each test the EUT was exercised to find out the worst case of operation modes and device configuration.

The test setup photographs are in the document referenced in section 14.

6 APPLICABLE STANDARDS

The tests were performed in guidance of CFR 47 part 24, part 2, ANSI/TIA/EIA-603-A-2001 and RSS-133.

Deviations, modifications or clarifications (if any) to above mentioned documents are written in each section under "Test method" for each test case.

7 RADIATED RF OUTPUT POWER

| | | | |
|-------------------------------------|------------------------------|--------|---------|
| EUT | 06301 | | |
| Accessories | 06304 | | |
| Temp, Humidity, Air Pressure | 22 °C | 70 RH% | 992 hPa |
| Date of measurement | July 07 – September 08, 2004 | | |
| FCC rule part | §24.232 (b) | | |
| RSS-133 section | 6.2 | | |
| Measured by | Kimmo Aarnio, Jani Kiiski | | |

7.1 Test setup

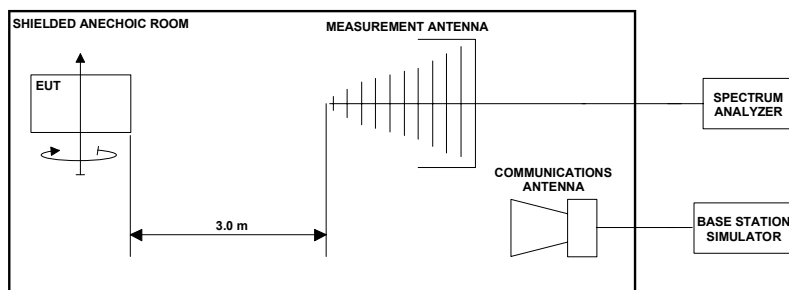
The EUT was set on a non-conductive turntable in a semi-anechoic chamber. In the corner of the chamber there was a communications antenna, which was connected to the BS simulator located outside the chamber.

The radiated power from the EUT was measured with an antenna fixed to an antenna tower. Antenna polarization and height can be changed remotely. The turntable is remotely controlled to turn the EUT

The EUT was set at 0.8m height. Measuring antenna was scanned 1 – 4 m in height.

The measured signal was routed from the measuring antenna to the spectrum analyzer.

The BS simulator was used to set the TX channel and power level and modulate the TX signal with different bit patterns.



Picture 1: Test setup for radiated RF output power measurement

7.2 Test method

1. Substitution method calibration was made for determining correction factors for horizontal and vertical polarization. In the calibration the EUT was substituted with a signal generator and antenna, which gain over isotropic and dipole radiator was known.
2. The maximum power level was searched by moving the turntable, by manipulating the EUT and by changing the measurement antenna polarization and height. The maximum measured level (P_{EUT}) was recorded.
3. The measured power from EUT was corrected with the correction factor in an automated test system to give the EUT EIRP.

7.3 EUT operation mode

| | |
|---------------------------|-----------------------------------|
| EUT operation mode | TX on, 1 time slot transmission |
| EUT channel | 512, 661, 810 |
| EUT TX power level | GSM 0 (30dBm) EDGE E2 (+26dBm) |

7.4 Limit

| EIRP [W] | |
|-----------------|----------|
| FCC | ≤ 2 |
| IC | ≤ 2 |

7.5 Results

The formula below was used to calculate the EIRP of the EUT.

$$P_{EIRP[W]} = \frac{10^{(P_{EUT[dBm]} + (P_{Subst_RX[dBm]} - P_{Subst_TX[dBm]} + L_{Cable[dB]} - G_{Substitute_antenna[dBi]})) / 10}}{1000}$$

$$= \frac{10^{(P_{EUT[dBm]} + CF[dB]) / 10}}{1000}$$

where the variables are as follows:

| | |
|---------------------------------|--|
| P_{EUT} [dBm] | Measured power level (from step 2 in 7.2) from the EUT |
| P_{Subst_TX} [dBm] | Power (step 1 in 7.2) fed to the substituting antenna |
| P_{Subst_RX} [dBm] | Power (step 1 in 7.2) received with the spectrum analyzer |
| $G_{Substitute_antenna}$ [dBi] | Gain of the substitutive antenna over isotropic radiator |
| L_{Cable} [dB] | Loss of the cable between signal generator and the substituting antenna |
| CF [dB] | Correction factor combined from the P_{Subst_TX} [dBm], P_{Subst_RX} [dBm], $G_{Substitute_antenna}$ [dBi] and L_{Cable} [dB] used in the automated measurement system (step 3 in 7.2). |

In the tables below, the abbreviated column titles are:

| | |
|----------------|--|
| EUT H / H2 / V | EUT orientation, Horizontal / Horizontal 2 / Vertical |
| Pol H / V | Measuring antenna polarization, Horizontal / Vertical |
| Height [m] | Measuring antenna height from reference ground in meters |
| TT [deg] | Turn table angle in degrees |

Table 1: Radiated RF output power measurement results, GSM GMSK. Flip closed.

| EUT Channel | P _{EUT} [dBm] | CF [dB] | EIRP [dBm] | EIRP [W] | EUT H / V /H2 | Pol. H / V | Height [m] | TT [deg] |
|-------------|------------------------|---------|------------|----------|---------------|------------|------------|----------|
| 512 | -11.51 | 43.19 | 31.68 | 1.47 | H | H | 1.25 | 337.0 |
| 661 | -13.88 | 43.32 | 29.44 | 0.88 | H | H | 1.20 | 346.0 |
| 810 | -11.21 | 43.57 | 32.36 | 1.72 | H | H | 1.17 | 340.0 |

Table 2: Radiated RF output power measurement results, GSM GMSK, flip open.

| EUT Channel | P _{EUT} [dBm] | CF [dB] | EIRP [dBm] | EIRP [W] | EUT H / V /H2 | Pol. H / V | Height [m] | TT [deg] |
|-------------|------------------------|---------|------------|----------|---------------|------------|------------|----------|
| 512 | -12.95 | 43.19 | 30.24 | 1.06 | V | H | 1.20 | 4.0 |
| 661 | -13.50 | 43.32 | 29.82 | 0.96 | H | H | 1.00 | 243.0 |
| 810 | -14.33 | 43.57 | 29.24 | 0.84 | H | H | 1.23 | 237.0 |

Table 3: Radiated RF output power measurement results, flip closed, GSM EDGE 8 PSK modulation.

| EUT Channel | P _{EUT} [dBm] | CF [dB] | EIRP [dBm] | EIRP [W] | EUT H / V /H2 | Pol. H / V | Height [m] | TT [deg] |
|-------------|------------------------|---------|------------|----------|---------------|------------|------------|----------|
| 512 | -16.66 | 43.19 | 26.53 | 0.45 | H | H | 1.25 | 337.0 |
| 661 | -18.37 | 43.32 | 24.95 | 0.31 | H | H | 1.20 | 346.0 |
| 810 | -18.87 | 43.57 | 24.70 | 0.30 | H | H | 1.17 | 340.0 |

Table 4: Radiated RF output power measurement results, GSM GMSK modulation in GPRS 2 slot mode (2 uplink and 2 downlink slots).

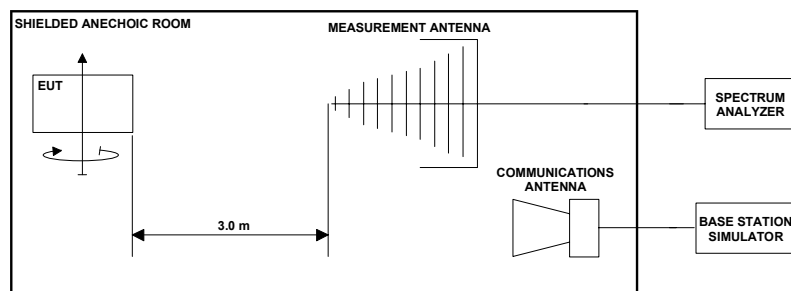
| EUT Channel | P _{EUT} [dBm] | CF [dB] | ERP [dBm] | ERP [W] | EUT H / V /H2 | Pol. H / V | Height [m] | TT [deg] |
|-------------|------------------------|---------|-----------|---------|---------------|------------|------------|----------|
| 512 | -14.48 | 43.19 | 28.71 | 0.74 | H | H | 1.25 | 337.0 |
| 661 | -14.70 | 43.32 | 28.62 | 0.73 | H | H | 1.20 | 346.0 |
| 810 | -17.24 | 43.57 | 26.33 | 0.43 | H | H | 1.17 | 340.0 |

8 99% OCCUPIED BANDWIDTH

| | | | |
|-------------------------------------|---------------|--------|---------|
| EUT | 06301 | | |
| Accessories | 06304 | | |
| Temp, Humidity, Air Pressure | 22 °C | 70 RH% | 992 hPa |
| Date of measurement | July 09, 2004 | | |
| FCC rule part | §2.1049 (h) | | |
| RSS-133 section | 5.6 | | |
| Measured by | Jani Kiiski | | |

8.1 Test setup

The BS simulator was used to set the TX channel and power level and modulate the TX signal with different bit patterns.



Picture 2: Test setup for band edge compliance measurement

99% occupied bandwidth measurements were made as radiated measurement similar to radiated power measurement. The worst turntable angle, antenna height and antenna polarisation found in radiated power measurements were used.

Base station simulator was used to set the EUT channel, modulation and power level.

8.2 EUT operation mode

| | |
|---------------------------|------------------------------------|
| EUT operation mode | TX on, 1 time slot transmission, |
| EUT channel | 512, 661, 810 |
| EUT TX power level | GSM 0 (+30dBm) EDGE E2 (+26dBm) |

8.3 Results

The 99% occupied bandwidth was calculated from spectrum analyzer measurements.

The measurement data was read from the analyzer to computer.

Software in computer calculated the total power from the measurement data and defined the frequency band containing 99% of the total power.

Markers in the spectrum analyzer were then placed between the calculated frequencies to show the calculated 99% power band in the screenshots.

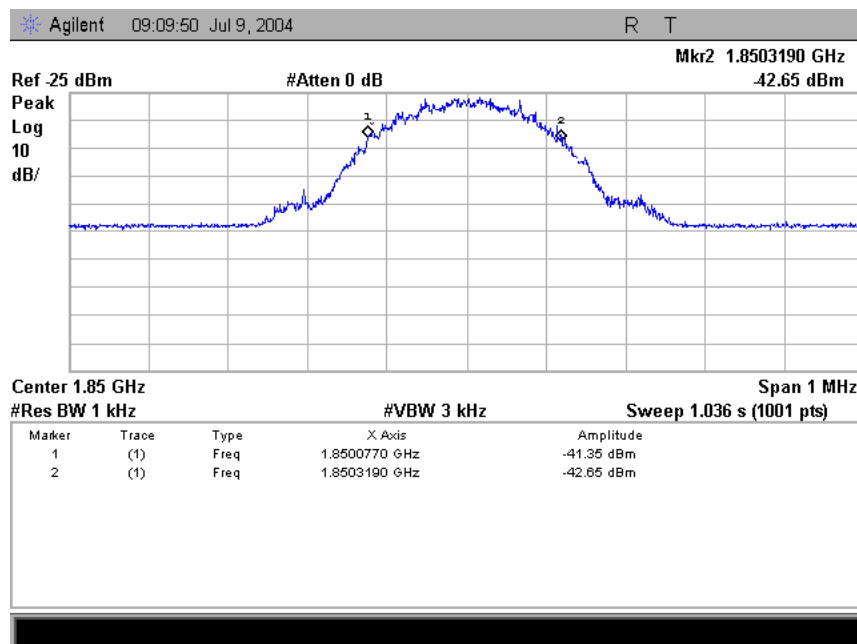
Table 5: 99% occupied bandwidth measurement results, GSM GMSK modulation

| EUT Channel | 99% occupied bandwidth [kHz] |
|--------------------|-------------------------------------|
| 512 | 243 |
| 661 | 243 |
| 810 | 243 |

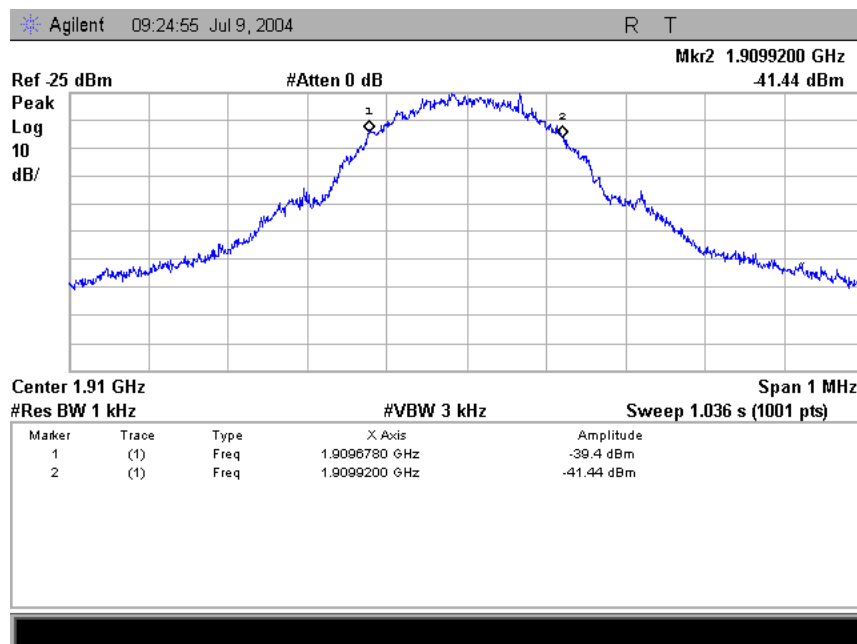
Table 6: 99% occupied bandwidth measurement results, GSM EDGE 8 PSK modulation

| EUT Channel | 99% occupied bandwidth [kHz] |
|--------------------|-------------------------------------|
| 512 | 236 |
| 661 | 237 |
| 810 | 238 |

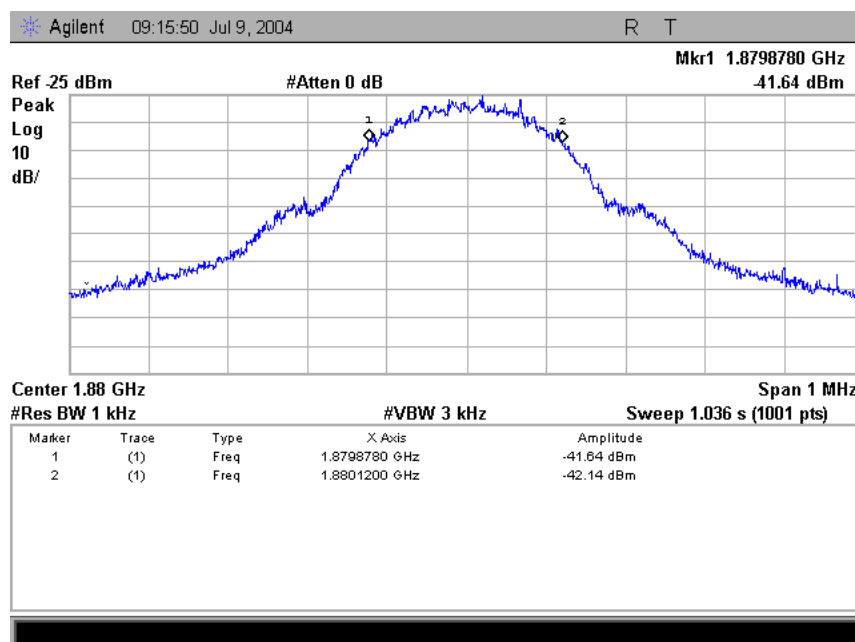
8.4 Screen shots



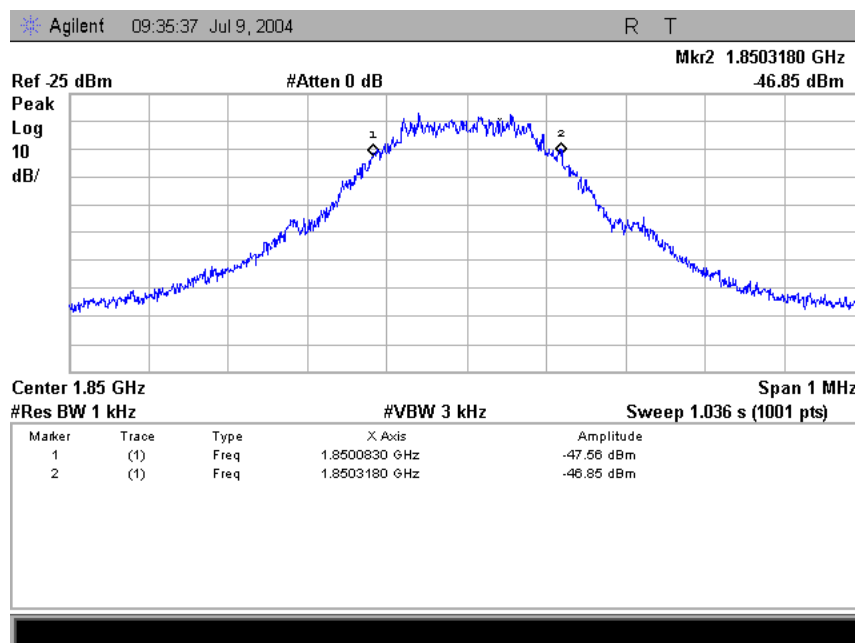
Picture 3: 99% occupied bandwidth, GSM GMSK, channel 512



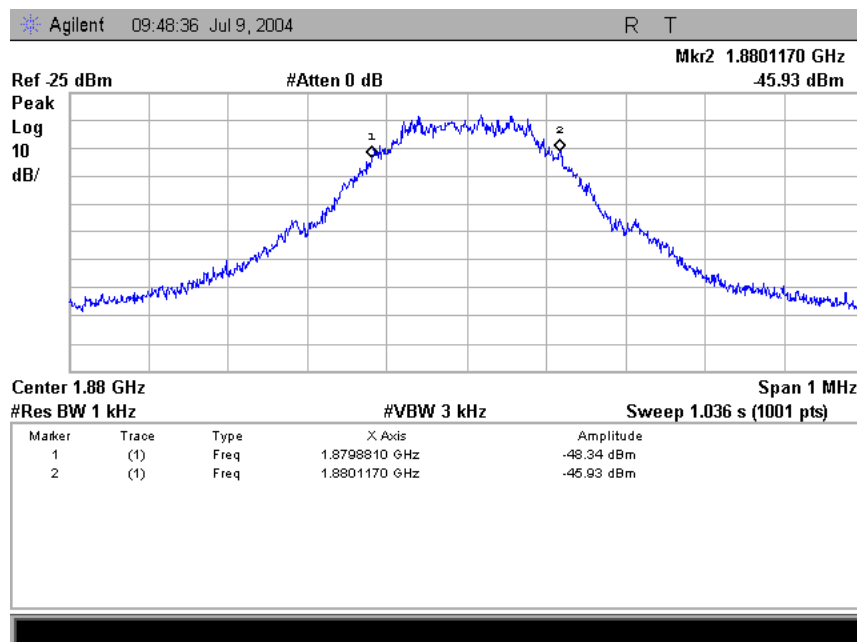
Picture 4: 99% occupied bandwidth, GSM GMSK, channel 661



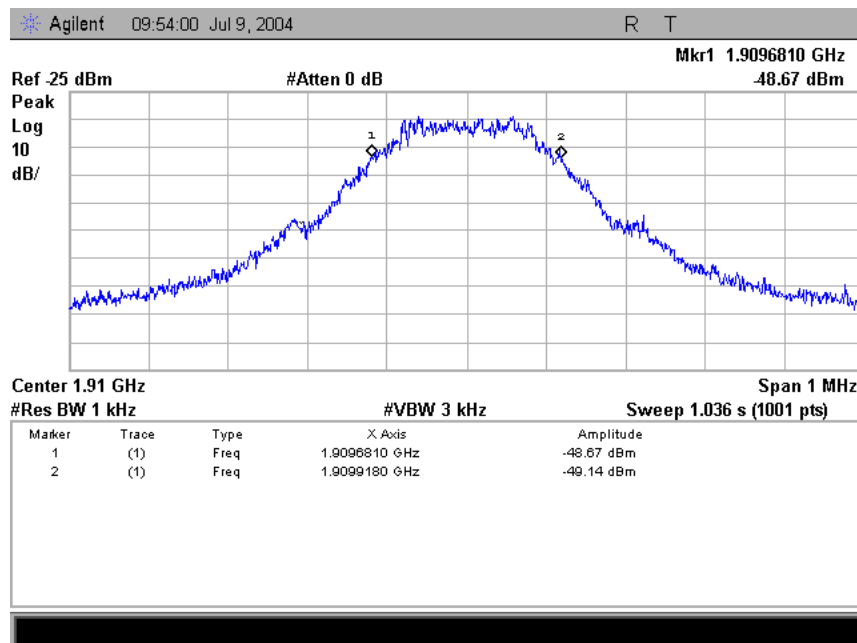
Picture 5: 99% occupied bandwidth, GSM GMSK, channel 810



Picture 6: 99% occupied bandwidth, GSM EDGE 8 PSK, channel 512



Picture 7: 99% occupied bandwidth, GSM EDGE 8 PSK, channel 661



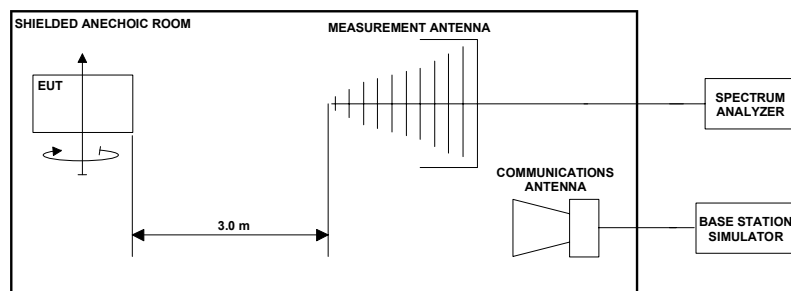
Picture 8: 99% occupied bandwidth, GSM EDGE 8 PSK, channel 810

9 BAND-EDGE COMPLIANCE

| | | | |
|-------------------------------------|--------------------|--------|---------|
| EUT | 06301 | | |
| Accessories | 06304 | | |
| Temp, Humidity, Air Pressure | 22 °C | 70 RH% | 992 hPa |
| Date of measurement | July 07 - 09, 2004 | | |
| FCC rule part | §24.238 (a) | | |
| RSS-133 section | 6.3 | | |
| Measured by | Jani Kiiski | | |

9.1 Test setup

The BS simulator was used to set the TX channel and power level and modulate the TX signal with different bit patterns.



Picture 9: Test setup for band edge compliance measurement

Band edge power measurements were made as radiated measurement similar to radiated power measurement. The worst turntable angle, antenna height and antenna polarisation found in radiated power measurements were used.

Base station simulator was used to set the EUT channel, modulation and power level.

Power level at the band edge was measured with spectrum analyzer. Measured reading was corrected in the spectrum analyzer by setting correction factor calculated in radiated power measurement section (7.5), as offset.

9.2 EUT operation mode

| | |
|---------------------------|------------------------------------|
| EUT operation mode | TX on, 1 time slot transmission |
| EUT channel | Channels listed in section 9.4 |
| EUT TX power level | GSM 0 (+30dBm) EDGE E2 (+26dBm) |

9.3 Limit

| Frequency [MHz] | Level [dBm] |
|-----------------|-------------|
| <1850 | -13 |
| >1910 | -13 |

9.4 Results

The line in the screen shots is the -13dBm limit line. The results were corrected with “offset” value described in test setup section.

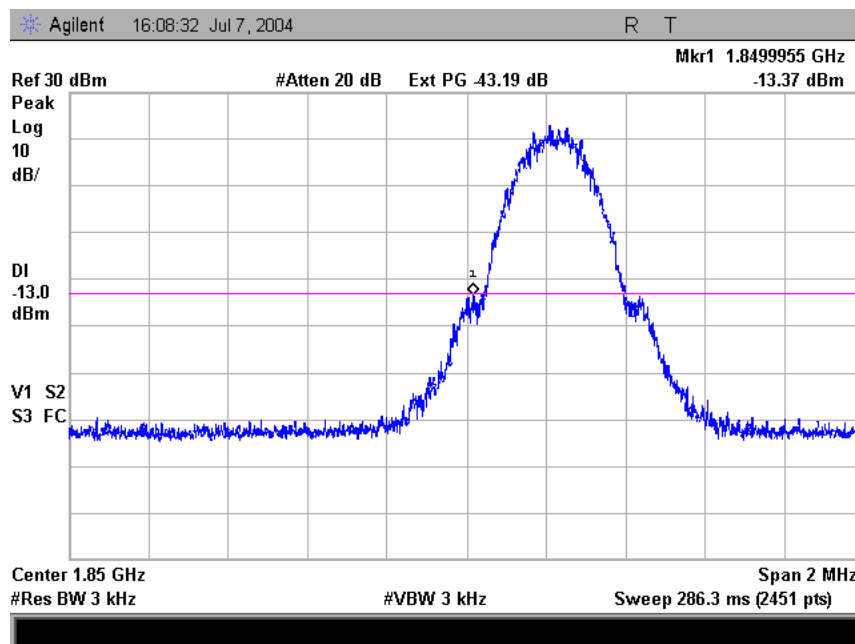
Table 7: Band edge compliance measurement results, GSM GMSK modulation. Flip closed.

| EUT Channel | Offset [dB] | Band edge power [dBm] | EUT Orient. | Antenna Pol. | Antenna Height | Turn table Angle |
|-------------|-------------|-----------------------|-------------|--------------|----------------|------------------|
| 512 | 43.19 | -13.37 | H | H | 1.25 | 337 |
| 810 | 43.57 | -13.86 | H | H | 1.17 | 340.0 |

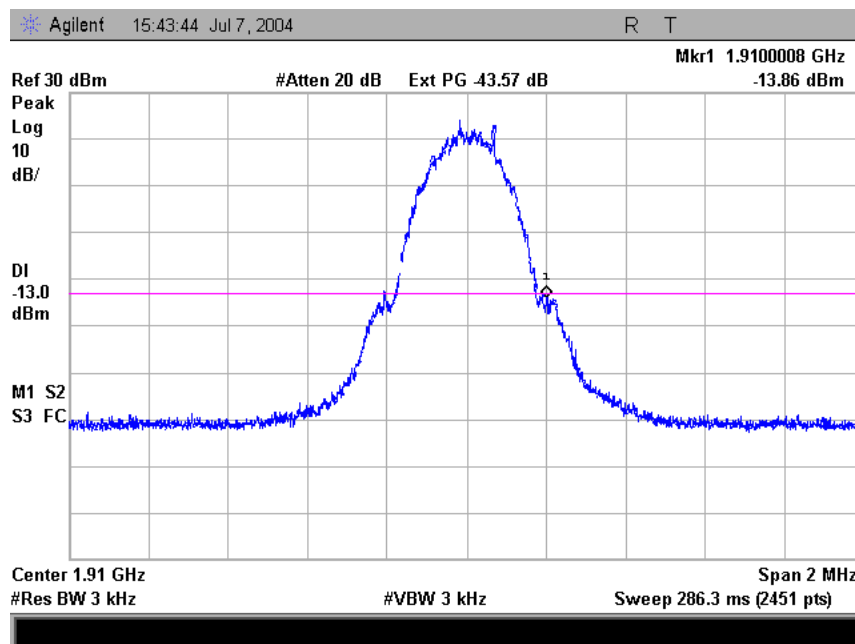
Table 8: Band edge compliance measurement results, GSM EDGE 8 PSK modulation

| EUT Channel | Offset [dB] | Band edge power [dBm] | EUT Orient. | Antenna Pol. | Antenna Height | Turn table Angle |
|-------------|-------------|-----------------------|-------------|--------------|----------------|------------------|
| 512 | 43.19 | -14.5 | H | H | 1.25 | 337.0 |
| 810 | 43.57 | -14.67 | H | H | 1.17 | 340.0 |

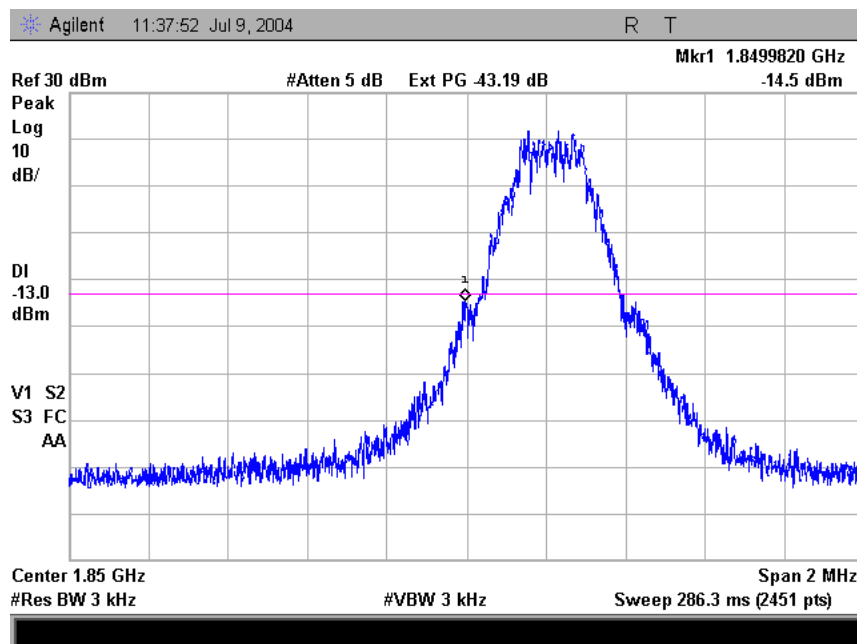
9.5 Screen shots



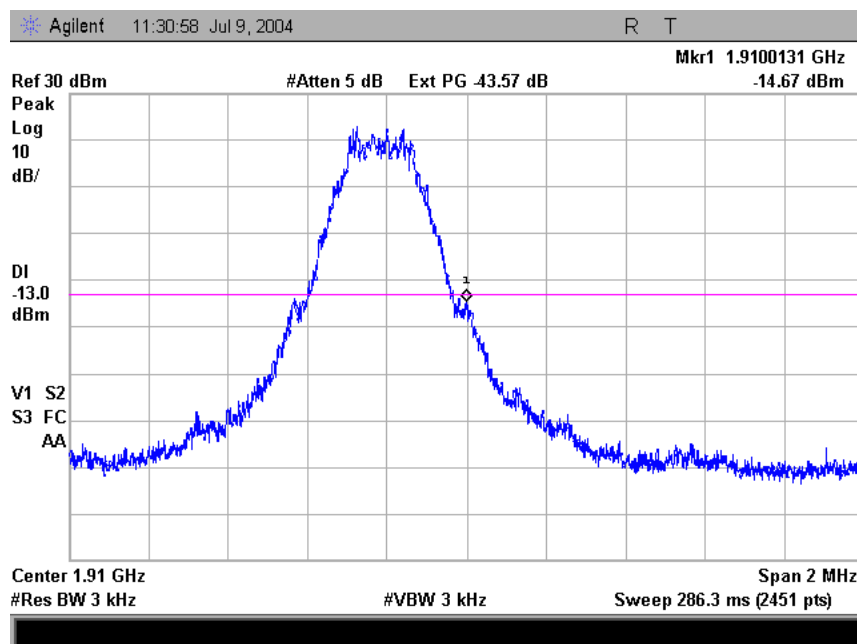
Picture 10: GSM GMSK, channel 512



Picture 11: GSM GMSK, channel 810



Picture 12: GSM EDGE 8 PSK, channel 512



Picture 13: GSM EDGE 8 PSK, channel 810

10 RADIATED SPURIOUS EMISSIONS

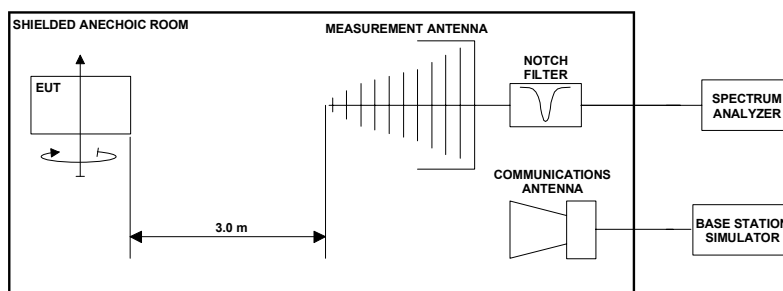
| | | | |
|-------------------------------------|---------------------------|--------|----------|
| EUT | 06302 | | |
| Accessories | 06304 | | |
| Temp, Humidity, Air Pressure | 22 °C | 45 RH% | 1013 hPa |
| Date of measurement | July 16, 2004 | | |
| FCC rule part | §24.238 (a), §2.1053 | | |
| RSS-133 section | 6.3 | | |
| Measured by | Kimmo Aarnio, Jani Kiiski | | |

10.1 Test setup

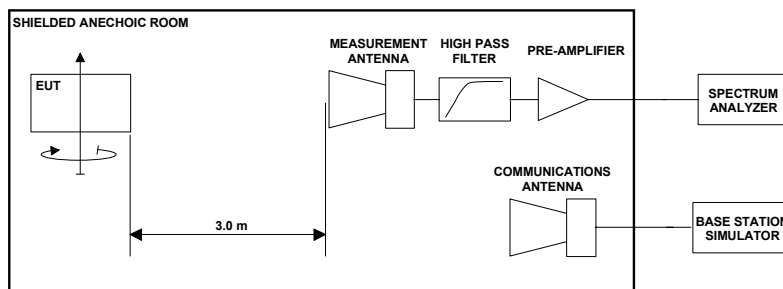
Band reject and high pass filters was used to prevent overloading the spectrum analyzer and preamplifier.

The BS simulator was used to set the TX channel and power level and modulate the TX signal with different bit patterns.

The test was done using an automated test system, where the measurement equipment was controlled by a computer.



Picture 14: Test setup for radiated spurious emissions measurement on below 3 GHz frequencies



Picture 15: Test setup for radiated spurious emissions measurement on 3 GHz and above frequencies

10.2 Test method

1. The emissions were searched and maximized by moving the turntable, changing the measuring antenna polarization and height and manipulating the EUT.
2. Levels of suspicious signals and levels of EUT transmitter harmonics were recorded.
3. The recorded levels were corrected in the automated test system with the correction factor given by a substitution calibration made before the measurements. The calibration is made separately for vertical and horizontal polarization and the system uses different correction factors depending on the measuring antenna polarization.
4. The corrected values, giving the EUT radiated spurious emission levels as e.i.r.p, are reported.

10.3 EUT operation mode

| | |
|---------------------------|------------------------------------|
| EUT operation mode | TX on, 1 time slot transmission, |
| EUT channel | 661 |
| EUT TX power level | GSM 0 (+30dBm) EDGE E2 (+26dBm) |

10.4 Limit

| Frequency [MHz] | Level [dBm] |
|------------------------|--------------------|
| 30 – 19100 | -13 |

10.5 Results

The formula below was used to calculate the EIRP of the spurious emissions.

$$\begin{aligned} P_{\text{Emission[dBm]}} &= P_{\text{Measured[dBm]}} + (P_{\text{SubstRX[dBm]}} - P_{\text{SubstTX[dBm]}} + L_{\text{Cable[dB]}} - G_{\text{Antenna[dBi]}}) \\ &= P_{\text{Measured[dBm]}} + CF_{\text{[dB]}} \end{aligned}$$

where the variables are as follows:

| | |
|------------------------------|---|
| $P_{\text{Measured [dBm]}}$ | Measured emission level (from step 2 in 10.2) |
| $P_{\text{Subst_TX [dBm]}}$ | Signal generator power (from step 4 in 10.2) fed to the substituting antenna |
| $P_{\text{Subst_RX [dBm]}}$ | Measured power (from step 4 in 10.2) in the substitution calibration |
| $L_{\text{Cable [dB]}}$ | Loss of the cable between antenna and signal generator (from step 4 in 10.2) |
| $G_{\text{Antenna [dBi]}}$ | Gain of the substitutive antenna over isotropic radiator |
| $CF_{\text{[dB]}}$ | Correction factor combined from the $P_{\text{Subst_TX [dBm]}}$, $L_{\text{Cable [dB]}}$ and $G_{\text{Antenna [dBi]}}$ used in the automated test software |

Measurement system noise level was least 15 dB below the spurious emission limit. Only levels of suspicious signals and transmitter harmonic frequencies, which were above the measurement system noise, are reported.

In the tables below, the abbreviated column titles are:

| | |
|------------|--|
| f [MHz] | Measured frequency |
| EUT V | EUT orientation, Vertical |
| Pol H / V | Measuring antenna polarization, Horizontal / Vertical |
| Height [m] | Measuring antenna height from reference ground in meters |
| TT [deg] | Turn table angle in degrees |

Table 9: Radiated spurious emission levels, GSM GMSK, Channel 661, Flip closed

| f [MHz] | P_{Measured} [dBm] | CF [dB] | P_{Emission} [dBm] | EUT V | Pol. H / V | Height [m] | TT [deg] |
|--------------|--------------------------------|--------------|--------------------------------|----------|---------------|---------------|-------------|
| 3760 | -50.8 | -1.7 | -52.5 | V | | 1.3 | 268 |
| 5640 | -46.5 | 4.1 | -42.4 | V | | 1.5 | 179 |
| 7520 | -49.0 | 10.1 | -38.9 | V | -- | 1.2 | 143 |
| 9400 | -41.6 | 9.4 | -32.3 | V | | 1.5 | 174 |

Table 10: Radiated spurious emission levels, GSM GMSK, Channel 661 Flip open

| f [MHz] | P_{Measured} [dBm] | CF [dB] | P_{Emission} [dBm] | EUT V | Pol. H / V | Height [m] | TT [deg] |
|--------------|--------------------------------|--------------|--------------------------------|----------|---------------|---------------|-------------|
| 3760 | -51.3 | -1.7 | -53.0 | V | | 1.5 | 186 |
| 5640 | -48.4 | 4.1 | -44.3 | V | | 1 | 162 |
| 7520 | -49.2 | 10.1 | -39.1 | V | -- | 1.4 | 136 |
| 9400 | -43.8 | 9.4 | -34.4 | V | | 1.5 | 174 |

Table 11: Radiated spurious emission levels, GSM EDGE 8 PSK, Channel 661, Flip closed

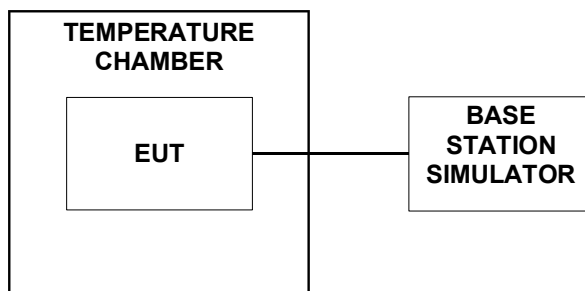
| f [MHz] | P_{Measured} [dBm] | CF [dB] | P_{Emission} [dBm] | EUT V | Pol. H / V | Height [m] | TT [deg] |
|--------------|--------------------------------|--------------|--------------------------------|----------|---------------|---------------|-------------|
| 3760 | -54.6 | -1.7 | -56.3 | V | | 1 | 180 |
| 5640 | -56.1 | 4.1 | -52.0 | V | | 1 | 199 |
| 7520 | -52.5 | 10.1 | -42.4 | V | -- | 1.3 | 261 |
| 9400 | -54.1 | 9.4 | -44.8 | V | | 1.5 | 167 |

11 FREQUENCY STABILITY, TEMPERATURE VARIATION

| | | | |
|-------------------------------------|----------------------------|-------|-------|
| EUT | 06303 | | |
| Accessories | 06304 | | |
| Temp, Humidity, Air Pressure | - °C | - RH% | - hPa |
| Date of measurement | July 19, 2004 | | |
| FCC rule part | §24.235, §2.1055 (a)(1)(b) | | |
| RSS-133 section | 7 | | |
| Measured by | Matti Virkki | | |

11.1 Test setup

The BS simulator was used to set the TX channel and power level and modulate the TX signal with different bit patterns.



11.2 EUT operation mode

| | |
|---------------------------|---------------------------------|
| EUT operation mode | TX on, 1 time slot transmission |
| EUT channel | 661 |
| EUT TX power level | GSM 0 (+30dBm) |

11.3 Limit

| Frequency deviation [ppm] |
|----------------------------------|
| ± 2.5 |

11.4 Test method

1. The climate chamber temperature was set to the maximum value and the temperature was allowed to stabilize
2. The EUT was placed in the chamber power off
3. The EUT temperature was allowed to stabilize for 45 minutes
4. The EUT was turned on and set to transmit
5. The maximum of transmit frequency error during one minute period was measured from BS simulator
6. The steps 3 - 5 were repeated for each temperature

11.5 Results

Table 12: Frequency stability over temperature measurement results

| Temperature [°C] | Deviation [Hz] | Deviation [ppm] |
|------------------|----------------|-----------------|
| -30 | *** | *** |
| -20 | 19.6 | 0.010 |
| -10 | 25.6 | 0.014 |
| 0 | 27.1 | 0.014 |
| 10 | 23.1 | 0.012 |
| 20 | 21.1 | 0.011 |
| 30 | 21.6 | 0.011 |
| 40 | 16.8 | 0.009 |
| 50 | 13.6 | 0.007 |

*** The phone doesn't start.

12 FREQUENCY STABILITY, VOLTAGE VARIATION

| | | | |
|-------------------------------------|----------------------------|--------|---------|
| EUT | 17003 | | |
| Accessories | 17004 | | |
| Temp, Humidity, Air Pressure | 22 °C | 48 RH% | 1006hPa |
| Date of measurement | June 12, 2004 | | |
| FCC rule part | §24.235, §2.1055 (d)(1)(2) | | |
| RSS-133 section | 7 | | |
| Measured by | Marko Turkkila | | |

12.1 Test setup

The BS simulator was used to set the TX channel and power level and modulate the TX signal with different bit patterns.



Picture 16: Test setup for frequency deviation over voltage variation measurement

12.2 EUT operation mode

| | |
|---------------------------|--|
| EUT operation mode | TX on, 1 time slot transmission, PRBS 2E9-1 modulation |
| EUT channel | 661 |
| EUT TX power level | GSM 0 (+30dBm) |

12.3 Limit

| Frequency deviation [ppm] |
|----------------------------------|
| ± 2.5 |

12.4 Test method

The EUT battery was replaced with an adjustable power supply. The frequency stability was measured at nominal voltage and at the battery cut-off point.

12.5 Results

Table 13: Frequency stability over voltage variation measurement results

| Level | Voltage [V] | Deviation [Hz] | Deviation [ppm] |
|-----------------------|-------------|----------------|-----------------|
| Nominal | 3.7 | 20 | 0,011 |
| Battery cut-off point | *** | | |

*** The EUT did not operate below the nominal voltage.

13 TEST EQUIPMENT

All testing and measurement equipment has been calibrated once a year, except the antennas which are calibrated every two years.

13.1 Conducted measurements

| Equipment | Manufacturer | Model |
|----------------------------|-------------------|-----------|
| Spectrum Analyzer | Agilent | E7405A |
| GSM Base station simulator | Anritsu | MT8820A |
| Signal Generator | Rohde & Schwarz | SMR27 |
| Attenuator 3 dB | Narda | 779-3 |
| Power splitter | Mini Circuits | ZFSC-2-4 |
| Power splitter | Narda | 4426-2 |
| Temperature chamber | Finero | LK 540 |
| DC power supply | Delta Elektronika | SM 120-13 |
| Multimeter | Fluke | 179 |

13.2 Radiated measurements

| Equipment | Manufacturer | Model |
|--------------------------------------|------------------------|-----------------------------|
| Spectrum Analyzer | Agilent | E7405A |
| GSM Base station simulator | Anritsu | MT8820A |
| Antenna | Chase | CBL 6140 |
| Antenna | Schwarzbeck | BBHA 9120D |
| Antenna | Chase | CBL 6141 |
| Antenna | EMCO | 3115 |
| Signal Generator | Rohde & Schwarz | SMR27 |
| Tunable notch filter | Wainwright Instruments | WRCD 1700/2000-0.2/40-10EEK |
| Tunable notch filter | Wainwright Instruments | WRCT 800/960-0.2/40-8EEK |
| High pass filter | Wainwright Instruments | WHK3/18GST |
| High pass filter | Wainwright Instruments | WHK 2.1/18GST |
| Band Reject filter | Wainwright instruments | WRCT2400/2483-45/10EE |
| Pre-amplifier | JCA | 118-400 |
| Pre-amplifier | Agilent | 87405B |
| Turn table / antenna mast controller | EMCO | 2090 |
| Antenna mast | EMCO | 2075-2 |

14 TEST SETUP PHOTOGRAPHS

Test setup photographs can be found in a separate document

T04-063B-EMC_PHOTOS.doc