

## FCC Part 22/24/27 Compliance Test Report

|                                                         |                                                                                                                                                                                                                                                          |                                   |                                                                                         |
|---------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|-----------------------------------------------------------------------------------------|
| <b>Test Report no.:</b>                                 | Salo_FCC_0729_07.doc                                                                                                                                                                                                                                     | <b>Date of Report:</b>            | 26.07.2007                                                                              |
| <b>Number of pages:</b>                                 | 14                                                                                                                                                                                                                                                       | <b>Customer's Contact person:</b> | Marcus Göke                                                                             |
| <b>Testing laboratory:</b>                              | TCC Nokia Tampere Laboratory<br>P.O. Box 68<br>Sinitaival 5<br>FIN-33720 TAMPERE, FINLAND<br>Tel. +358 (0) 7180 46800<br>Fax. +358 (0) 7180 46880                                                                                                        | <b>Customer:</b>                  | Nokia Corporation<br>Rensingstrasse 15<br>44807 BOCHUM<br>GERMANY<br>Tel. +49 234 984 0 |
| <b>FCC listing no.:</b>                                 | 94436                                                                                                                                                                                                                                                    |                                   |                                                                                         |
| <b>IC recognition no.:</b>                              | 3608                                                                                                                                                                                                                                                     |                                   |                                                                                         |
| <b>Tested devices/ accessories:</b>                     | <b>GSM phone RM-179 / Battery BP-6MT, AC charger AC-5E, Audio adapter AD-54 , Headset HS-45, Dummy battery SD-25</b>                                                                                                                                     |                                   |                                                                                         |
| <b>FCC ID:</b>                                          | OW3RM-223                                                                                                                                                                                                                                                | <b>IC:</b>                        | 661AA-RM223                                                                             |
| <b>Supplement reports:</b>                              | -                                                                                                                                                                                                                                                        |                                   |                                                                                         |
| <b>Testing has been carried out in accordance with:</b> | <b>CFR 47, FCC rules Parts 22, 24 and 27, TIA-603-B-2002 and IC standards RSS-GEN, RSS-132 and RSS-133. Deviations, modifications or clarifications (if any) to above mentioned documents are written in each section under "Test method and limit".</b> |                                   |                                                                                         |
| <b>Documentation:</b>                                   | The test report must always be reproduced in full; reproduction of an excerpt only is subject to written approval of the testing laboratory. The documentation of the testing performed on the tested devices is archived for 15 years at TCC Nokia.     |                                   |                                                                                         |
| <b>Test Results:</b>                                    | <b>The EUT complies with the requirements in respect of all parameters subject to the test.</b><br>The test results relate only to devices specified in this document.                                                                                   |                                   |                                                                                         |
| <b>Date and signature for the contents:</b>             |                                                                                                                                                                                                                                                          |                                   |                                                                                         |
|                                                         | Anni Manninen, System Manager                                                                                                                                                                                                                            |                                   |                                                                                         |

## 1. Summary for FCC Part 22/24/27 Compliance Test Report

|                               |                                                         |
|-------------------------------|---------------------------------------------------------|
| Date of receipt               | 19.4.2007                                               |
| Testing completed             | 2.5.2007                                                |
| The customer's contact person | Marcus Göke                                             |
| Test Plan referred to         | T:\Projects\                                            |
| Notes                         | -                                                       |
| Document name                 | T:\Projects\RM-223\EMC\Results\FCC\Salo_FCC_0729_07.doc |

### 1.1. EUT and Accessory Information

The EUT is a 5-band (GSM850/900/1800/1900 and WCDMA Band I) mobile phone with GPRS, EGPRS, Bluetooth and WLAN. The EUT is tested with maximum rated TX power, modulated with pseudo random bit sequence (PRBS9).

| Product       | Type   | SN              | HW   | MV  | SW              | DUT   |
|---------------|--------|-----------------|------|-----|-----------------|-------|
| GSM phone     | RM-179 | 004401011016165 | 0304 | -   | V01.0712.1.0.11 | 41057 |
| GSM phone     | RM-179 | 004401011015522 | 0304 | -   | V01.0712.1.0.11 | 41058 |
| Battery       | BP-6MT | -               | -    | -   | -               | 41059 |
| Battery       | BP-6MT | -               | -    | -   | -               | 41060 |
| AC-Charger    | AC-5   | -               | -    | -   | -               | 41061 |
| Audio adapter | AD-54  | 45              | 0.5  | 1.5 | 0.1             | 41043 |
| Headset       | HS-45  | -               | -    | -   | -               | 41044 |
| Dummy Battery | SD-25  | v.2102          | -    | -   | -               | 41067 |

## 1.2. Summary of Test Results

### GSM 850:

| Section in CFR 47     | Section in RSS-GEN or RSS-132 | Name of the test                           | Result |
|-----------------------|-------------------------------|--------------------------------------------|--------|
| §2.1046(a), 22.913(a) | 4.6, 4.4                      | Conducted RF output power                  | NP     |
| §22.913(a)            | 4.6, 4.4                      | Radiated RF output power                   | NP     |
| §2.1049(h)            | 4.4.1                         | 99 % occupied bandwidth                    | PASSED |
| §22.917(a)            | 4.7, 4.5                      | Band edge compliance                       | NP     |
| §22.917(a), §2.1051   | 4.7, 4.5                      | Spurious emissions at antenna terminals    | NP     |
| §22.917(a), §2.1053   | 4.7, 4.5                      | Spurious radiated emissions                | PASSED |
| §2.1055(a)            | 4.5, 4.3                      | Frequency stability, temperature variation | PASSED |
| §2.1055(d)            | 4.5, 4.3                      | Frequency stability, voltage variation     | PASSED |

### GSM 1900:

| Section in CFR 47   | Section in RSS-133 | Name of the test                           | Result |
|---------------------|--------------------|--------------------------------------------|--------|
| §2.1046(a)          | 6.2                | Conducted RF output power                  | NP     |
| §24.232(b)          | 6.2                | Radiated RF output power                   | NP     |
| §2.1049(h)          | 5.6                | 99 % occupied bandwidth                    | PASSED |
| §24.238(a)          | 6.3                | Band edge compliance                       | NP     |
| §24.238(a), §2.1051 | 6.3                | Spurious emissions at antenna terminals    | NP     |
| §24.238(a), §2.1053 | 6.3                | Spurious radiated emissions                | PASSED |
| §2.1055(a)          | 7                  | Frequency stability, temperature variation | PASSED |
| §2.1055(d)          | 7                  | Frequency stability, voltage variation     | PASSED |

PASSED

The EUT complies with the essential requirements in the standard.

FAILED

The EUT does not comply with the essential requirements in the standard.

NP

The test was not performed by the TCC Nokia Tampere Laboratory.

*The test results of OW3RM-179 are re-used for certification of the OW3RM-223. The table above indicates the results, which will be re-used.*

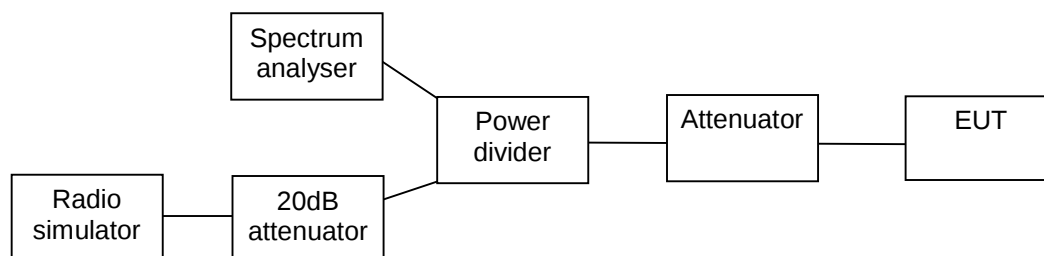
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## 2. 99 % occupied bandwidth (FCC §2.1049(h), RSS-GEN 4.4.1, RSS-133 5.6)

|                                                        |                                                    |
|--------------------------------------------------------|----------------------------------------------------|
| <b>EUT with DUT number</b>                             | RM-179 DUT 41058                                   |
| <b>Accessories with DUT numbers</b>                    | BP-6MT DUT 41060, HS-45 DUT 41044, AD-54 DUT 41043 |
| <b>Operation Voltage [V] / [Hz]</b>                    | Nominal                                            |
| <b>Result</b>                                          | PASSED                                             |
| <b>Remarks</b>                                         | -                                                  |
| <b>Temp [°C] / Humidity [%RH] / Air Pressure [kPa]</b> | 21/45/101.6                                        |
| <b>Date of measurements</b>                            | 23.4.2007                                          |
| <b>Measured by</b>                                     | Petteri Suni                                       |

### 2.1. Test setup



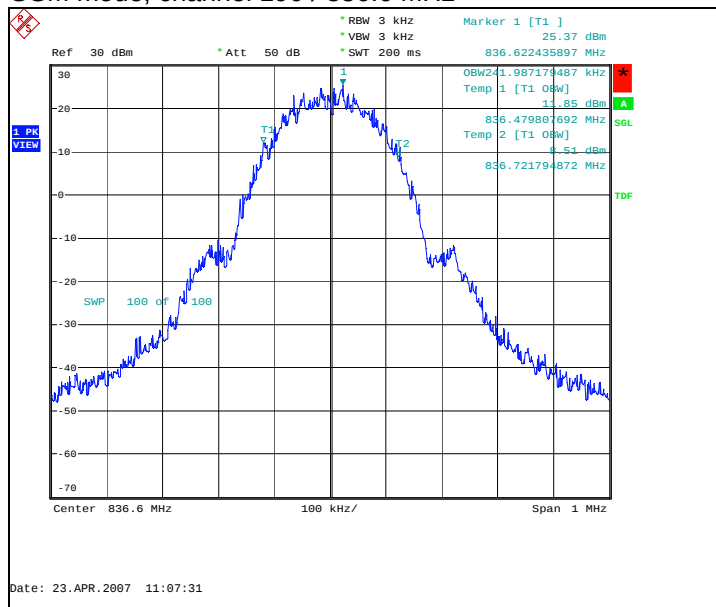
### 2.2. Test method and limit

The measurement is made according to FCC rules part 22, 24 and 27 and IC standards RSS-GEN and RSS-133.

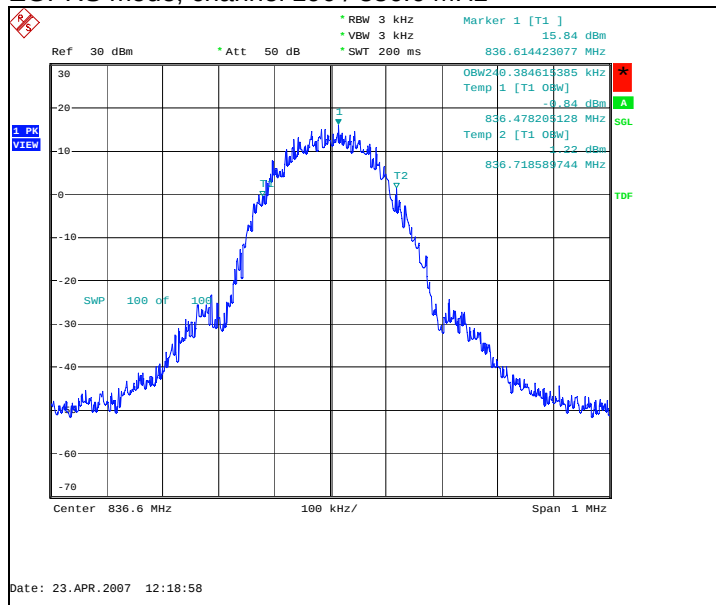
## 2.3. GSM 850 Test results

| Operation mode (TX on) | 99% occupied bandwidth [kHz] |
|------------------------|------------------------------|
| GSM                    | 241.987                      |
| EGPRS                  | 240.385                      |

GSM mode, channel 190 / 836.6 MHz



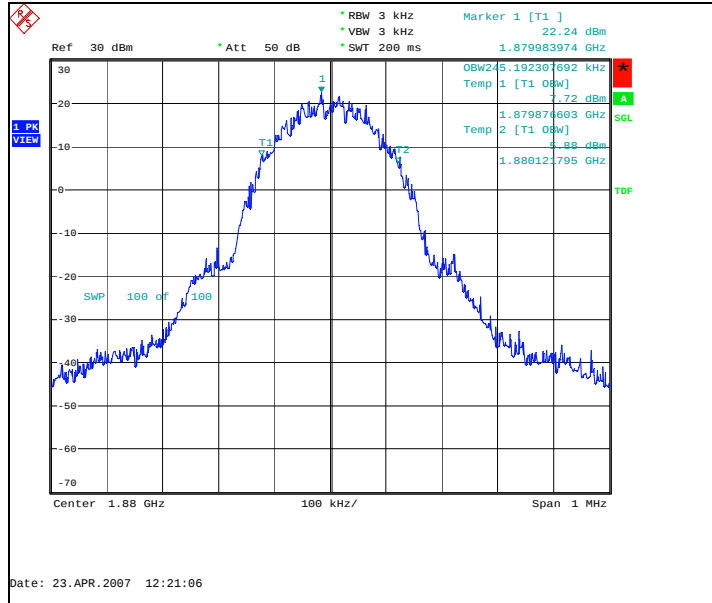
EGPRS mode, channel 190 / 836.6 MHz



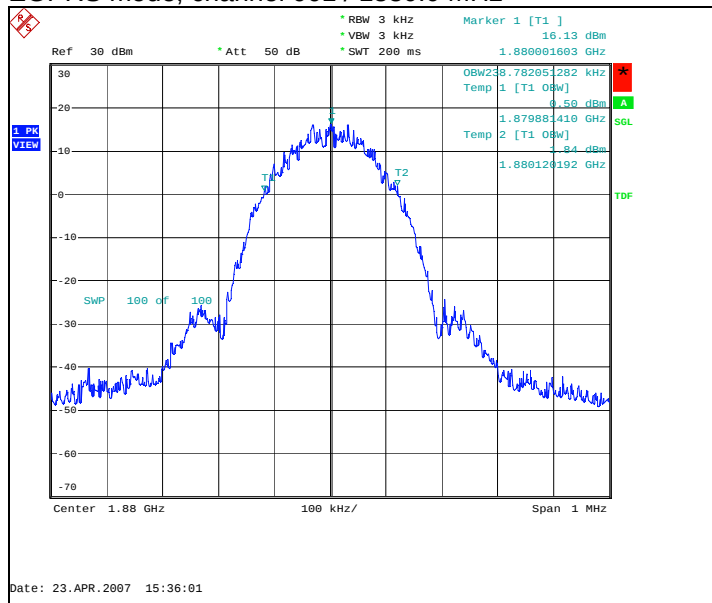
## 2.4. GSM 1900 Test results

| Operation mode (TX on) | 99% occupied bandwidth [kHz] |
|------------------------|------------------------------|
| GSM                    | 245.192                      |
| EGPRS                  | 238.782                      |

GSM mode, channel 661 / 1880.0 MHz



EGPRS mode, channel 661 / 1880.0 MHz

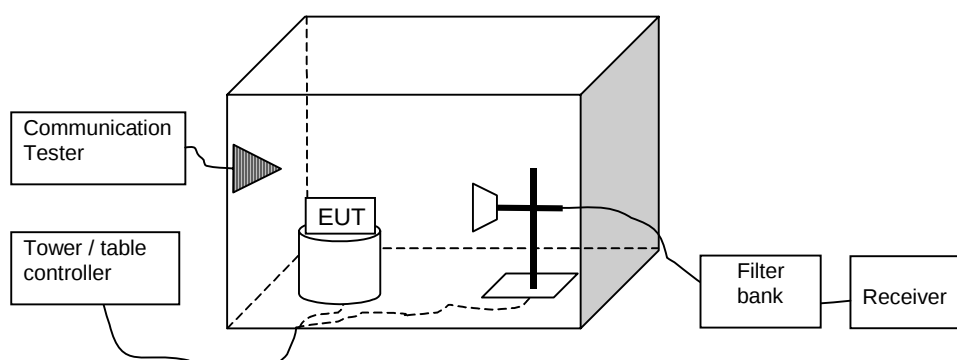


### 3. Spurious radiated emissions

(FCC §22.917(a), §24.238(a), §27.53(g), §2.1053, RSS-GEN 4.7, RSS-132 4.5, RSS-133 6.3)

|                                                        |                                                                    |
|--------------------------------------------------------|--------------------------------------------------------------------|
| <b>EUT with DUT number</b>                             | RM-179 DUT 41057                                                   |
| <b>Accessories with DUT numbers</b>                    | BP-6MT DUT 41059, AC-5 DUT 41061, AD-54 DUT 41043, HS-45 DUT 41044 |
| <b>Operation Voltage [V] / [Hz]</b>                    | 115 / 60                                                           |
| <b>Result</b>                                          | PASSED                                                             |
| <b>Remarks</b>                                         | Slide open/close                                                   |
| <b>Temp [°C] / Humidity [%RH] / Air Pressure [kPa]</b> | 22 / 46 / 100.7                                                    |
| <b>Date of measurements</b>                            | 2.5.2007                                                           |
| <b>Measured by</b>                                     | Jari Jantunen                                                      |

#### 3.1. Test setup



#### 3.2. Test method and limit

The measurement is made according to TIA-603-B-2002 as follows:

The measurement is divided into the Preliminary Measurement and the Final Measurement.

The suspected frequencies are searched for in Preliminary Measurement with absorbers on the floor and measuring antenna at fixed height using 2-axis EUT position system.

The Final Measurement is performed in the Semi-Anechoic Chamber with conducting metal floor, if the Preliminary Measurement results are closer than 20 dB to the permissible value.

The EUT is placed at nonconductive plate at the turntable center.

For each suspected frequency, the turntable is rotated 360 degrees and antenna is scanned from 1 to 4 m. This is repeated for both horizontal and vertical receive antenna polarizations.

The emissions less than 20 dB below the permissible value are reported.  
The substitution method is used. Substitution values at each frequencies are measured beforehand and saved to the test software.

The substitution corrections are obtained as described below:

$$A_{SUBST} = P_{SUBST\_TX} - P_{SUBST\_RX} - L_{SUBST\_CABLES} + G_{SUBST\_TX\_ANT}$$

Where  $A_{SUBST}$  is the final substitution correction including receive antenna gain.  $P_{SUBST\_TX}$  is signal generator level,  $P_{SUBST\_RX}$  is receiver level,  $L_{SUBST\_CABLES}$  is cable losses including both TX and RX cables and  $G_{SUBST\_TX\_ANT}$  is substitution antenna gain.

The measurement results are obtained as described below:

$$P [dBm] = P_{MEAS} + A_{TOT}$$

Where  $P_{MEAS}$  is receiver reading in dBm and  $A_{TOT}$  is total correction factor including cable loss, preamplifier gain and substitution correction ( $A_{TOT} = L_{CABLES} - G_{PREAMP} + A_{SUBST}$ ).

Limits for spurious radiated emissions measurements

| Operation band                     | Frequency range [MHz] | Limit [dBm] |
|------------------------------------|-----------------------|-------------|
| GSM 850 / WCDMA 850                | 30 - 8500             | -13         |
| GSM 1900 / WCDMA 1700 / WCDMA 1900 | 30 - 18000            | -13         |

### 3.3. GSM 850 Test results

GSM mode, Slide open, channel 190 / 836.6 MHz

| Frequency [MHz] | P [dBm] | P [μW]  | P <sub>MEAS</sub> [dBm] | A <sub>TOT</sub> [dB] | Polarisation | Result |
|-----------------|---------|---------|-------------------------|-----------------------|--------------|--------|
| 1673.143287     | -26.20  | 2.39883 | - 20.40                 | - 5.80                | HORIZONTAL   | PASSED |
| 2509.820641     | -21.80  | 6.60693 | - 23.50                 | 1.70                  | VERTICAL     | PASSED |
| 3346.189379     | -29.80  | 1.04713 | - 33.60                 | 3.80                  | VERTICAL     | PASSED |
| 4182.864729     | -29.90  | 1.02329 | - 36.10                 | 6.20                  | HORIZONTAL   | PASSED |
| 5855.715431     | -36.90  | 0.20417 | - 45.70                 | 8.80                  | VERTICAL     | PASSED |

EGPRS mode, channel 190 / 836.6 MHz

| Frequency [MHz] | P [dBm] | P [μW]  | P <sub>MEAS</sub> [dBm] | A <sub>TOT</sub> [dB] | Polarisation | Result |
|-----------------|---------|---------|-------------------------|-----------------------|--------------|--------|
| 1673.143287     | -47.80  | 0.01660 | - 42.00                 | - 5.80                | HORIZONTAL   | PASSED |
| 2509.820641     | -54.60  | 0.00347 | - 56.30                 | 1.70                  | VERTICAL     | PASSED |
| 3340.689379     | -60.00  | 0.00100 | - 63.70                 | 3.70                  | VERTICAL     | PASSED |

### 3.4. GSM 1900 Test results

GSM mode, Slide closed, channel 661 / 1880.0 MHz

| Frequency [MHz] | P [dBm] | P [ $\mu$ W] | P <sub>MEAS</sub> [dBm] | A <sub>TOT</sub> [dB] | Polarisation | Result |
|-----------------|---------|--------------|-------------------------|-----------------------|--------------|--------|
| 3760.023046     | -34.20  | 0.38019      | - 42.50                 | 8.30                  | HORIZONTAL   | PASSED |
| 5640.282565     | -38.30  | 0.14791      | - 49.30                 | 11.00                 | HORIZONTAL   | PASSED |
| 5652.798597     | -51.80  | 0.00661      | - 62.70                 | 10.90                 | VERTICAL     | PASSED |
| 7520.042084     | -41.00  | 0.07943      | - 56.00                 | 15.00                 | HORIZONTAL   | PASSED |

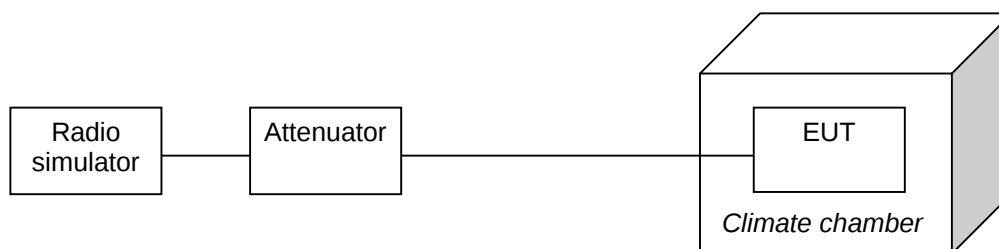
EGPRS mode, channel 661 / 1880.0 MHz

| Frequency [MHz] | P [dBm] | P [ $\mu$ W] | P <sub>MEAS</sub> [dBm] | A <sub>TOT</sub> [dB] | Polarisation | Result |
|-----------------|---------|--------------|-------------------------|-----------------------|--------------|--------|
| 3760.023046     | -37.20  | 0.19055      | - 45.50                 | 8.30                  | HORIZONTAL   | PASSED |
| 5640.282565     | -46.40  | 0.02291      | - 57.40                 | 11.00                 | HORIZONTAL   | PASSED |
| 5652.798597     | -51.90  | 0.00646      | - 62.80                 | 10.90                 | VERTICAL     | PASSED |
| 7520.042084     | -46.00  | 0.02512      | - 61.00                 | 15.00                 | HORIZONTAL   | PASSED |

#### 4. Frequency stability, temperature variation (FCC §2.1055(a), §2.1055(a), RSS-GEN 4.5, RSS-132 4.3, RSS-133 7)

|                                                        |                                                    |
|--------------------------------------------------------|----------------------------------------------------|
| <b>EUT with DUT number</b>                             | RM-179 DUT 41058                                   |
| <b>Accessories with DUT numbers</b>                    | BP-6MT DUT 41060, HS-45 DUT 41044, AD-54 DUT 41043 |
| <b>Operation Voltage [V] / [Hz]</b>                    | Nominal                                            |
| <b>Result</b>                                          | PASSED                                             |
| <b>Remarks</b>                                         | -                                                  |
| <b>Temp [°C] / Humidity [%RH] / Air Pressure [kPa]</b> | 21/45/101.6                                        |
| <b>Date of measurements</b>                            | 23.4.2007                                          |
| <b>Measured by</b>                                     | Petteri Suni                                       |

##### 4.1. Test setup



##### 4.2. Test method and limit

The measurement is made according to FCC rules part 22, 24 and 27 and IC standards RSS-GEN, RSS-132 and RSS-133 as follows:

- The climate chamber temperature is set to the maximum value and the temperature is allowed to stabilize.
- The EUT is placed in the chamber.
- The EUT is set in idle mode for 15 minutes.
- The EUT is set to transmit.
- The transmit frequency error was measured immediately.
- The steps c - e were repeated for each temperature.

Limits for frequency stability, temperature variation measurements

| Frequency deviation [ppm] |
|---------------------------|
| $\pm 2.5$                 |

#### 4.3. GSM 850 Test results

GSM mode, channel 190 / 836.6 MHz

| Temperature [°C] | Deviation [Hz] | Deviation [ppm] |
|------------------|----------------|-----------------|
| 50               | 22             | 0.0263          |
| 40               | -19            | - 0.0227        |
| 30               | 19             | 0.0227          |
| 20               | 12             | 0.0143          |
| 10               | -18            | - 0.0215        |
| 0                | -16            | - 0.0191        |
| -10              | -16            | - 0.0191        |
| -20              | -16            | - 0.0191        |
| -30              | -16            | - 0.0191        |

#### 4.4. GSM 1900 Test results

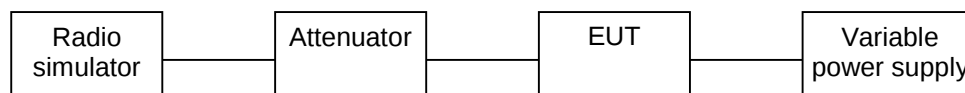
GSM mode, channel 661 / 1880.0 MHz

| Temperature [°C] | Deviation [Hz] | Deviation [ppm] |
|------------------|----------------|-----------------|
| 50               | -47            | - 0.0250        |
| 40               | -42            | - 0.0223        |
| 30               | -52            | - 0.0277        |
| 20               | -58            | - 0.0309        |
| 10               | -64            | - 0.0340        |
| 0                | -47            | - 0.0250        |
| -10              | -45            | - 0.0239        |
| -20              | -57            | - 0.0303        |
| -30              | -54            | - 0.0287        |

## 5. Frequency stability, voltage variation (FCC §2.1055(d), RSS-GEN 4.5, RSS-132 4.3, RSS-133 7)

|                                                 |                       |
|-------------------------------------------------|-----------------------|
| EUT with DUT number                             | RM-179 DUT 41058      |
| Accessories with DUT numbers                    | SD-25 DUT 41067       |
| Operation Voltage [V] / [Hz]                    | 4.10 VDC and 3.45 VDC |
| Result                                          | PASSED                |
| Remarks                                         | -                     |
| Temp [°C] / Humidity [%RH] / Air Pressure [kPa] | 21/45/101.9           |
| Date of measurements                            | 24.4.2007             |
| Measured by                                     | Petteri Suni          |

### 5.1. Test setup



### 5.2. Test method and limit

The measurement is made according to FCC rules part 22, 24 and 27 and IC standards RSS-GEN, RSS-132 and RSS-133 as follows:

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.

Limits for frequency stability, voltage variation measurements

| Frequency deviation [ppm] |
|---------------------------|
| $\pm 2.5$                 |

### 5.3. GSM 850 Test results

GSM mode, channel 190 / 836.6 MHz

| Voltage level [V]            | Deviation [Hz] | Deviation [ppm] |
|------------------------------|----------------|-----------------|
| Battery cut-off point / 3.45 | 13             | 0.0155          |
| Nominal / 4.10               | 15             | 0.0179          |

### 5.4. GSM 1900 Test results

GSM mode, channel 661 / 1880.0 MHz

| Voltage level [V]            | Deviation [Hz] | Deviation [ppm] |
|------------------------------|----------------|-----------------|
| Battery cut-off point / 3.45 | -53            | - 0.0282        |
| Nominal / 4.10               | -50            | - 0.0266        |

## 6. Test Equipment

### 6.1. Conducted measurements

| Eq. No  | Equipment                  | Type      | Manufacturer    | Used in    |
|---------|----------------------------|-----------|-----------------|------------|
| TM37610 | Spectrum analyzer          | FSU       | R&S             | 22/24, 15C |
| TM37678 | Radio communication tester | CMU-200   | R&S             | 22/24, 15C |
|         | Attenuator 10 dB           | 6251.17.A | Huber+Suhner AG | 22/24, 15C |
| TM37499 | Power splitter             | 11667A    | Agilent         | 22/24, 15C |
|         | Temperature chamber        | VT4002    | Vötsch          | 22/24, 15C |
| TM38112 | DC power supply            | 6632A     | Agilent         | 22/24, 15C |
| TM38111 | Multimeter                 | 34401A    | Agilent         | 22/24, 15C |
|         | EMI Test receiver          | ESPC      | R&S             | 15C, 15B   |
| TM37773 | Radio communication tester | CMU-200   | R&S             | 15C, 15B   |
| TM38631 | Signal generator           | 83640L    | Agilent         | 15C, 15B   |
| TM38114 | DC power supply            | 6632A     | Agilent         | 15C, 15B   |
| TM22835 | Multimeter                 | 87        | Fluke           | 15C, 15B   |
| TM30600 | Pulse Limiter              | ESH3-Z2   | R&S             | 15C, 15B   |
| TM26490 | LISN 50 µH                 | ESH3-Z5/  | R&S             | 15C, 15B   |
| TM30636 | LISN 50 µH                 | L2-16/    | PMM             | 15C, 15B   |

### 6.2. Radiated measurements

| Eq. No  | Equipment                       | Type                          | Manufacturer | Used in         |
|---------|---------------------------------|-------------------------------|--------------|-----------------|
| TM30599 | 3m semi-anechoic chamber        |                               | TDK          | 22/24, 15C, 15B |
| TM38845 | EMI receiver                    | ESI 40                        | R&S          | 22/24, 15C, 15B |
| TM37498 | Preamplifier                    | AMF-5D-020180-26-10P          | MITEQ        | 22/24, 15C, 15B |
| TM37523 | Preamplifier                    | AMF-4D-10M-3G-25-20P          | MITEQ        | 22/24, 15C, 15B |
| TM37516 | Biconilog antenna               | HL562                         | R&S          | 22/24, 15C, 15B |
| TM26496 | Double ridged waveguide antenna | 3115                          | EMCO         | 22/24, 15C, 15B |
| TM39158 | Horn antenna                    | 3116                          | EMCO         | 22/24, 15C, 15B |
| TM26492 | Reference dipole set            | UHAP/VHAP                     | Schwarzbeck  | 22/24, 15C, 15B |
| TM37501 | Dipole antenna                  | 3125-870                      | EMCO         | 22/24           |
| TM37502 | Dipole antenna                  | 3125-1880                     | EMCO         | 22/24           |
| TM37773 | Radio communication tester      | CMU-200                       | R&S          | 22/24, 15C, 15B |
| TM38631 | Signal generator                | 83640L                        | Agilent      | 22/24, 15C, 15B |
| TM38066 | High pass filter                | 4HC3000/18000-3-KK            | Trilithic    | 22/24, 15C, 15B |
|         | High pass filter                | WHK2010-10SS                  | Trilithic    | 22/24, 15C, 15B |
|         | Low pass filter                 | WLK1750-10SS                  | Trilithic    | 22/24, 15C, 15B |
| TM26511 | Tunable notch filter            | WRCA870                       | Wainwright   | 22/24           |
| TM38215 | Tunable notch filter            | WRCD1850/1910-0.2/40          | Wainwright   | 22/24           |
| TM38214 | Band reject filter              | WRCT 2402/2480-2400/2483.5-30 | Wainwright   | 15C             |
| TM30642 | Turntable controller            | HD-100                        | Deisel       | 22/24, 15C, 15B |
| TM26500 | Turntable                       | DS412                         | Deisel       | 22/24, 15C, 15B |
| TM38842 | Antenna mast controller         | 2090                          | EMCO         | 22/24, 15C, 15B |
| TM38843 | Antenna mast                    | 2075                          | EMCO         | 22/24, 15C, 15B |
| TM38114 | DC power supply                 | 6632A                         | Agilent      | 22/24, 15C, 15B |
| TM22835 | Multimeter                      | 87                            | Fluke        | 22/24, 15C, 15B |