TCC Nokia

NOKIA

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# FCC Part 22/24/27 Compliance Test Report

| | | | |
|---|---|---|---|
| **Test Report no.:** | FCC22&24_RM-781_15.docx | **Date of Report:** | 21-Sep-2011 |
| **Number of pages:** | 9 | **Customer's Contact person:** | Kill-Tollnek Vivian |
| **Testing laboratory:** | TCC Nokia Salo Laboratory<br>P.O.Box(86)<br>Joensuunkatu 7H / Kiila 1B<br>FIN-24101 SALO, FINLAND<br>Tel. +358 (0) 7180 08000<br>Fax. +358 (0) 7180 45220 | **Customer:** | Nokia Corporation<br>Lise Meitner Strasse 10<br>89081 ULM<br>GERMANY<br>Tel. +49 731 1754 0<br>Fax. +49 731 1754 6800 |
| **FCC listing no.:**<br>**IC recognition no.:** | 533467<br>661V-1 | | |
| **Tested devices/ accessories:** | **Phone RM-781 / Battery BL-4U** | | |
| **FCC ID:** | PPIRM-781 | **IC:** | 661U-RM781 |
| **Supplement reports:** | - | | |
| **Testing has been carried out in accordance with:** | **CFR 47, FCC rules Parts 22, 24 and 27, TIA-603-C-2004 and IC standards RSS-GEN (Issue 2, June 2007), RSS-132 (Issue 2, September 2005), RSS-133 (Issue 5, February 2009) and RSS-139 (Issue 2, February 2009). Deviations, modifications or clarifications (if any) to above mentioned documents are written in each section under "Test method and limit".** | | |
| **Documentation:** | 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. | | |
| **Test Results:** | **The EUT complies with the requirements in respect of all parameters subject to the test.**<br>The test results relate only to devices specified in this document. | | |
| **Date and signature for the contents:** | Kalle Hannila<br>Digitally signed by Kalle Hannila<br>DN: cn=Kalle Hannila, o=DRD/DQD/DCO/CMCL, ou=TCC Nokia, email=EXT-kalle.t.hannila@nokia.com, c=FI<br>Date: 2011.09.21 15:24:20 +03'00' | | |

**Kalle Hannila, Engineer, EMC**

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

| | |
|---|---|
| **Date of receipt** | - |
| **Testing completed** | 21-Sep-2011 |
| **The customer's contact person** | Kill-Tollnek Vivian |
| **Test Plan referred to** | T:\Projects\RM-781\TestPlan\RS_testplan_RM-781_CR_HW0310_0320.xls |
| **Notes** | - |
| **Document name** | FCC22&24_RM-781_15.docx |

## 1.1. EUT and Accessory Information

The EUT is a 10-band mobile phone:
GSM850/900/1800/1900/GPRS/EGPRS/Monopole without GND reflector (GSM/WCDMA)
WCDMA I/II(1900)/V(850)/VIII/HSDPA/HSUPA/Monopole without GND reflector (GSM/WCDMA)
Bluetooth
The EUT is tested with maximum rated TX power, modulated with pseudo random bit sequence (PRBS9).

| Product | Type | SN | HW | MV | SW | DUT |
|---|---|---|---|---|---|---|
| Phone | RM-781 | 358630040018196 | 0310 | - | win6.89ssc | 15761 |
| Battery | BL-4U | 49554011170201402 45;0670560 | - | - | - | 15932 |

## 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) | 4.4 | Conducted RF output power | NP |
| §22.913(a) | 4.4 | Radiated RF output power | PASSED |
| §2.1049(h) | *4.6.1* | 99 % occupied bandwidth | NP |
| §22.917(a) | 4.5 | Band edge compliance | NP |
| §22.917(a), §2.1051 | 4.5 | Spurious emissions at antenna terminals | NP |
| §22.917(a), §2.1053 | 4.5 | Spurious radiated emissions | NP |
| §2.1055(a) | 4.3 | Frequency stability, temperature variation | NP |
| §2.1055(d) | 4.3 | Frequency stability, voltage variation | NP |

**GSM 1900:**

| Section in CFR 47 | Section in *RSS-GEN* or RSS-133 | Name of the test | Result |
|---|---|---|---|
| §2.1046(a) | 6.4 | Conducted RF output power | NP |
| §24.232(b) | 6.4 | Radiated RF output power | PASSED |
| §2.1049(h) | *4.6.1* | 99 % occupied bandwidth | NP |
| §24.238(a) | 6.5 | Band edge compliance | NP |
| §24.238(a), §2.1051 | 6.5 | Spurious emissions at antenna terminals | NP |
| §24.238(a), §2.1053 | 6.5 | Spurious radiated emissions | NP |
| §2.1055(a) | 6.3 | Frequency stability, temperature variation | NP |
| §2.1055(d) | 6.3 | Frequency stability, voltage variation | NP |

**WCDMA 850 (Band V):**

| Section in CFR 47 | Section in *RSS-GEN* or RSS-132 | Name of the test | Result |
|---|---|---|---|
| §2.1046(a), 22.913(a) | 4.4 | Conducted RF output power | NP |
| §22.913(a) | 4.4 | Radiated RF output power | PASSED |
| §2.1049(h) | *4.6.1* | 99 % occupied bandwidth | NP |
| §22.917(a) | 4.5 | Band edge compliance | NP |
| §22.917(a), §2.1051 | 4.5 | Spurious emissions at antenna terminals | NP |
| §22.917(a), §2.1053 | 4.5 | Spurious radiated emissions | NP |
| §2.1055(a) | 4.3 | Frequency stability, temperature variation | NP |
| §2.1055(d) | 4.3 | Frequency stability, voltage variation | NP |

**WCDMA 1900 (Band II):**

| Section in CFR 47 | Section in *RSS-GEN* or RSS-133 | Name of the test | Result |
|---|---|---|---|
| §2.1046(a) | 6.4 | Conducted RF output power | NP |
| §24.232(b) | 6.4 | Radiated RF output power | PASSED |
| §2.1049(h) | *4.6.1* | 99 % occupied bandwidth | NP |
| §24.238(a) | 6.5 | Band edge compliance | NP |
| §24.238(a), §2.1051 | 6.5 | Spurious emissions at antenna terminals | NP |
| §24.238(a), §2.1053 | 6.5 | Spurious radiated emissions | NP |
| §2.1055(a) | 6.3 | Frequency stability, temperature variation | NP |
| §2.1055(d) | 6.3 | Frequency stability, voltage variation | NP |

| | |
|---|---|
| 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. |

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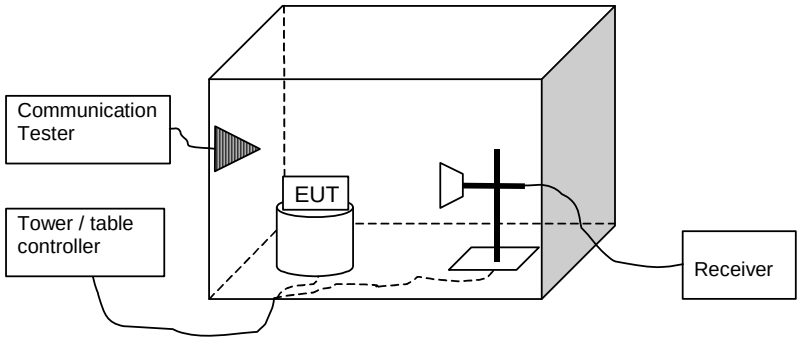
# 3. Radiated RF output power

**(FCC §22.913(a), §24.232(b), §27.50(d)(2), RSS-132 4.4, RSS-133 6.4, RSS-139 6.4)**

| | |
|---|---|
| **EUT with DUT number** | RM-781, DUT 15935 |
| **Accessories with DUT numbers** | BL-4U, DUT 15932 |
| **Operation Voltage [V] / [Hz]** | 115 / 60 |
| **Result** | PASSED |
| **Remarks** | - |
| **Temp [°C] / Humidity [%RH] / Air Pressure [kPa]** | 21 / 57 / 101.4 |
| **Date of measurements** | 20-Sep-2011 |
| **Measured by** | Kalle Hannila |

## 3.1. Test setup




## 3.2. Test method and limit

The measurement is made according to TIA-603-C-2004 as follows:

The measurement is performed in the Anechoic Chamber with absorbers on the floor and measuring antenna at fixed height using 2-axis EUT position system. The turntable is rotated 360 degrees and this is repeated for both horizontal and vertical receive antenna polarizations.

The EUT is placed on a nonconductive plate at 170 cm height.

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 and substitution correction ($A_{TOT} = L_{CABLES} + A_{SUBST}$).

Limits for radiated RF output power measurements

| Frequency range [MHz] | Limit [W] | Limit [dBm] |
|---|---|---|
| 824 - 849 | 7 | 38.5 |
| 1710 - 1755 | 1 | 30 |
| 1850 - 1910 | 2 | 33 |

## 3.3. GSM 850 Test results

GSM mode

| Channel / $f_C$ [MHz] | ERP [dBm] | ERP [W] | $P_{MEAS}$ [dBm] | $P_{SUBST\ TX}$ [dBm] | $P_{SUBST\ RX}$ [dBm] | $G_{SUBST\ TX\ ANT}$ [dBd] | $L_{SUBST\ CABLE}$ [dB] | Polarisation | Result |
|---|---|---|---|---|---|---|---|---|---|
| 128 / 824.2 | 23.09 | 0.204 | -12.02 | -10 | -52.1 | -3.39 | 3.6 | HORIZONTAL | PASSED |
| 190 / 836.6 | 25.63 | 0.366 | -8.66 | -10 | -51.53 | -3.54 | 3.7 | HORIZONTAL | PASSED |
| 251 / 848.8 | 26.78 | 0.476 | -6.46 | -10 | -50.56 | -3.62 | 3.7 | HORIZONTAL | PASSED |

EGPRS mode, 1 TX Slot

| Channel / $f_C$ [MHz] | ERP [dBm] | ERP [W] | $P_{MEAS}$ [dBm] | $P_{SUBST\ TX}$ [dBm] | $P_{SUBST\ RX}$ [dBm] | $G_{SUBST\ TX\ ANT}$ [dBd] | $L_{SUBST\ CABLE}$ [dB] | Polarisation | Result |
|---|---|---|---|---|---|---|---|---|---|
| 128 / 824.2 | 19.69 | 0.093 | -15.42 | -10 | -52.1 | -3.39 | 3.6 | HORIZONTAL | PASSED |
| 190 / 836.6 | 22.82 | 0.191 | -11.47 | -10 | -51.53 | -3.54 | 3.7 | HORIZONTAL | PASSED |
| 251 / 848.8 | 24.22 | 0.264 | -9.02 | -10 | -50.56 | -3.62 | 3.7 | HORIZONTAL | PASSED |

## 3.4. GSM 1900 Test results

GSM mode

| Channel / $f_C$ [MHz] | EIRP [dBm] | EIRP [W] | $P_{MEAS}$ [dBm] | $P_{SUBST\ TX}$ [dBm] | $P_{SUBST\ RX}$ [dBm] | $G_{SUBST\ TX\ ANT}$ [dBi] | $L_{SUBST\ CABLE}$ [dB] | Polarisation | Result |
|---|---|---|---|---|---|---|---|---|---|
| 512 / 1850.2 | 30.16 | 1.038 | -15.94 | -10 | -51.3 | 10.4 | 5.6 | HORIZONTAL | PASSED |
| 661 / 1880 | 30.49 | 1.119 | -15.64 | -10 | -51.43 | 10.4 | 5.7 | HORIZONTAL | PASSED |
| 810 / 1909.8 | 30.35 | 1.084 | -15.89 | -10 | -51.54 | 10.4 | 5.7 | HORIZONTAL | PASSED |

EGPRS mode, 1 TX Slot

| Channel / $f_C$ [MHz] | EIRP [dBm] | EIRP [W] | $P_{MEAS}$ [dBm] | $P_{SUBST\ TX}$ [dBm] | $P_{SUBST\ RX}$ [dBm] | $G_{SUBST\ TX\ ANT}$ [dBi] | $L_{SUBST\ CABLE}$ [dB] | Polarisation | Result |
|---|---|---|---|---|---|---|---|---|---|
| 512 / 1850.2 | 29.22 | 0.836 | -16.88 | -10 | -51.3 | 10.4 | 5.6 | HORIZONTAL | PASSED |
| 661 / 1880 | 28.35 | 0.684 | -17.78 | -10 | -51.43 | 10.4 | 5.7 | HORIZONTAL | PASSED |
| 810 / 1909.8 | 28.04 | 0.637 | -18.2 | -10 | -51.54 | 10.4 | 5.7 | HORIZONTAL | PASSED |

## 3.5. WCDMA 850 Test results

Peak Detector

| Channel / $f_C$ [MHz] | ERP [dBm] | ERP [W] | $P_{MEAS}$ [dBm] | $P_{SUBST\ TX}$ [dBm] | $P_{SUBST\ RX}$ [dBm] | $G_{SUBST\ TX\ ANT}$ [dBd] | $L_{SUBST\ CABLE}$ [dB] | Polarisation | Result |
|---|---|---|---|---|---|---|---|---|---|
| 4132 / 826.4 | 23.59 | 0.229 | -11.08 | -10 | -51.67 | -3.4 | 3.6 | VERTICAL | PASSED |
| 4183 / 836.6 | 23.6 | 0.229 | -10.28 | -10 | -51.08 | -3.5 | 3.7 | VERTICAL | PASSED |
| 4233 / 846.6 | 23.8 | 0.240 | -9.45 | -10 | -50.45 | -3.5 | 3.7 | VERTICAL | PASSED |

RMS Detector

| Channel / $f_C$ [MHz] | ERP [dBm] | ERP [W] | $P_{MEAS}$ [dBm] | $P_{SUBST\ TX}$ [dBm] | $P_{SUBST\ RX}$ [dBm] | $G_{SUBST\ TX\ ANT}$ [dBd] | $L_{SUBST\ CABLE}$ [dB] | Polarisation | Result |
|---|---|---|---|---|---|---|---|---|---|
| 4132 / 826.4 | 20.21 | 0.105 | -14.46 | -10 | -51.67 | -3.4 | 3.6 | VERTICAL | PASSED |
| 4183 / 836.6 | 20.35 | 0.108 | -13.53 | -10 | -51.08 | -3.5 | 3.7 | VERTICAL | PASSED |
| 4233 / 846.6 | 19.97 | 0.099 | -13.28 | -10 | -50.45 | -3.5 | 3.7 | VERTICAL | PASSED |

## 3.6. WCDMA 1900 Test results

Peak Detector

| Channel / $f_C$ [MHz] | EIRP [dBm] | EIRP [W] | $P_{MEAS}$ [dBm] | $P_{SUBST\ TX}$ [dBm] | $P_{SUBST\ RX}$ [dBm] | $G_{SUBST\ TX\ ANT}$ [dBi] | $L_{SUBST\ CABLE}$ [dB] | Polarisation | Result |
|---|---|---|---|---|---|---|---|---|---|
| 9262 / 1852.4 | 24.43 | 0.277 | -21.51 | -10 | -51.5 | 10.04 | 5.6 | HORIZONTAL | PASSED |
| 9400 / 1880 | 24.73 | 0.297 | -21.04 | -10 | -51.43 | 10.04 | 5.7 | HORIZONTAL | PASSED |
| 9538 / 1907.6 | 24.28 | 0.268 | -21.63 | -10 | -51.57 | 10.04 | 5.7 | HORIZONTAL | PASSED |

RMS Detector

| Channel / $f_C$ [MHz] | EIRP [dBm] | EIRP [W] | $P_{MEAS}$ [dBm] | $P_{SUBST\ TX}$ [dBm] | $P_{SUBST\ RX}$ [dBm] | $G_{SUBST\ TX\ ANT}$ [dBi] | $L_{SUBST\ CABLE}$ [dB] | Polarisation | Result |
|---|---|---|---|---|---|---|---|---|---|
| 9262 / 1852.4 | 21.49 | 0.141 | -24.45 | -10 | -51.5 | 10.04 | 5.6 | HORIZONTAL | PASSED |
| 9400 / 1880 | 21.71 | 0.148 | -24.06 | -10 | -51.43 | 10.04 | 5.7 | HORIZONTAL | PASSED |
| 9538 / 1907.6 | 21.07 | 0.128 | -24.84 | -10 | -51.57 | 10.04 | 5.7 | HORIZONTAL | PASSED |

# 4. Test Equipment

## 4.1. Salo Radiated measurements

| Eq. No | Equipment | Type | Manufacturer | Used in |
|---|---|---|---|---|
| 1917 | Communication Tester | CMTA84 | R&S | 15B |
| 1984 | Antenna | BBHA 9120 D | Schwarzbeck | 22/24/27, 15C, 15B |
| 1986 | GPS Antenna | AMHP10-15R/390 | European Antenna | 15C, 15B |
| 1988 | Antenna | HL562 | R&S | 22/24/27, 15C, 15B |
| 1989 | Relay Switch Unit | TS-RSP | R&S | 22/24/27, 15C, 15B |
| 2009 | Signal Generator | SMP 22 | R&S | 22/24/27, 15C, 15B |
| 2027 | CDN | M2 (modified) DC1 | MEB | 22/24/27, 15C, 15B |
| 2028 | CDN | M3 (modified) DC2 | MEB | 22/24/27, 15C, 15B |
| 2029 | Power Supply | PL330 | Thurlby | 22/24/27, 15C |
| 2043 | Band Reject Filter | WRCA824/849-0,2-6SS | Wainwright | 22 |
| 2047 | Band Reject Filter | WRCC1800/2000-0.2-10SS | Wainwright | 24 |
| 2051 | High Pass Filter | 4HC1700-1-KK | R&S | 22 |
| 2109 | Power Supply | PL330QMD | Thurlby | 22/24/27, 15C, 15B |
| 2116 | Controller | EMCO 2090 | ETS | 22/24/27, 15C, 15B |
| 2135 | CDN | CDN 801-M3 | Lüthi | 22/24/27, 15C, 15B |
| 2140 | Antenna | EMCO93110B | EMCO | 22/24/27, 15C |
| 2142 | Antenna | 3146 | EMCO | 22/24/27, 15C |
| 2150 | High Pass Filter | F-15041 | RLC | 22/24/27, 15C |
| 2156 | Communication Tester | CMU200 | R&S | 22/24/27, 15C, 15B |
| 2176 | CDN | CDN 801-M3 | Lüthi | 22/24/27, 15C, 15B |
| 2180 | Communication Tester | CMU200 | R&S | 22/24/27, 15C, 15B |
| 2188 | Preamplifier | AFS4-00100300-20-23P-6 | Miteq | 22/24/27, 15C, 15B |
| 2347 | Communication Tester | CMU200 | R&S | 22/24/27, 15C, 15B |
| 2348 | Controller | G-1000DXC | Yaesu | 22/24/27, 15C, 15B |
| 2349 | Computer Controller | GS-232B | Yaesu | 22/24/27, 15C, 15B |
| 2350 | Preamplifier | AMF-6D-020180-29-20P | Miteq | 22/24/27, 15C, 15B |
| 2353 | Receiver | ESIB26 | R&S | 22/24/27, 15C, 15B |
| 2357 | Band Reject Filter | WRCG2400/2483-2390/2493-35/10SS | Wainwright | 15C |
| 2361 | Anechoic Chamber | 3 m Semi / Full Anechoic Chamber | Euroshield | 22/24/27, 15C, 15B |
| 2364 | Band Reject Filter | WRCG1877/1883 - 1870/1890-40/6SS | Wainwright | 24 |
| 2366 | Relay Switch Unit | TS-RSP | R&S | 22/24/27, 15C, 15B |
| 2384 | Band Reject Filter | WRCG832/838-825/845-40/5SS | Wainwright | 22 |
| 2388 | Bluetooth Tester | CBT | R&S | 15B |
| 2389 | Signal Generator | SMJ 100A | R&S | 15B |
| 2391 | Band Reject Filter | WRCG1729.4/1735.4-1722.4/1742.4-40/6SS | Wainwright | 27 |
| 6009 | GPS Antenna | SA-700 | Chronos | 15C |
| 6010 | GPS Network amplifier | NLA20FPDC | GPS Networking, Inc | 15C |
| 6011 | GPS signal Splitter | LDCBS1x4 | GPS Networking, Inc | 15C |
| 6014 | Substitute Calibration Cable | Sucoflex 104PB | Suhner | - |
| 6017 | Antenna | SBA 9113 | Schwarzbeck | 22 / 24 / 27 |
| - | BT / WLAN Antenna | SPA 2400/75/9/0/V | Huber-Suhner | 15C, 15B |
| - | BT / WLAN Antenna | SPA 2400/75/9/0/V | Huber-Suhner | 15C, 15B |
| - | RF Emission Software | ES-K1 v.1.71 | R&S | 22/24/27, 15C, 15B |

| Eq. No | Equipment | Type | Manufacturer | Used in |
|---|---|---|---|---|
| - | RF immunity / Emission Software | EMC32 | R&S | 22/24/27, 15C, 15B |
| 6037 | Data Logger | 175-H2 | Testo | 23/24/27, 15C, 15B |
| 6038 | Data Logger | Testo 580 | Testo | 23/24/27, 15C, 15B |
| 6039 | USB Interface | 5541765 | Testo | 23/24/27, 15C, 15B |