



ELECTRONIC TECHNOLOGY SYSTEMS  
DR. GENZ GMBH

# TEST - REPORT

**FCC RULES PARTS 22H and 24E  
IC RADIO STANDARDS RSS 132 and RSS 133**

**FCC ID: QIXMAMBO56  
IC: 5383A-MAMBO56**

**Model Name: Mambo56**

**Test report no.: G0M20603-0284-P-2224**



**Certificate 1983-01**



## TABLE OF CONTENTS

### **1 General information**

- 1.1 Notes
- 1.2 Testing laboratory
- 1.3 Details of approval holder
- 1.4 Application details
- 1.5 Test item
- 1.6 Test standards

### **2 Technical test**

- 2.1 Summary of test results
- 2.2 Test environment
- 2.3 Test equipment utilized
- 2.4 General test procedure
- 2.5 Test results

### **3 Transmitter parameters**

- 3.1 RF power output conducted
- 3.2 RF power output radiated (ERP, EIRP)
- 3.3 Occupied bandwidth, emission bandwidth
- 3.4 Frequency stability
- 3.5 Spurious emission conducted (antenna terminal)
- 3.6 Spurious emission radiated
- 3.7 Block edge compliance
- 3.8 AC power line conducted emission

### **4 Receiver parameters**

- 4.1 Radiated emission

## APPENDIX

## 1 General information

### 1.1 Notes

The purpose of conformity testing is to increase the probability of adherence to the essential requirements or conformity specifications, as appropriate.

The complexity of the technical specifications, however, means that full and thorough testing is impractical for both technical and economic reasons.

Furthermore, there is no guarantee that a test sample which has passed all the relevant tests conforms to a specification.

Neither is there any guarantee that such a test sample will interwork with other genuinely open systems.

The existence of the tests nevertheless provides the confidence that the test sample possesses the qualities as maintained and that its performance generally conforms to representative cases of communications equipment.

The test results of this test report relate exclusively to the item tested as specified in 1.5.

The test report may only be reproduced or published in full.

Reproduction or publication of extracts from the report requires the prior written approval of the ELECTRONIC TECHNOLOGY SYSTEMS DR. GENZ GMBH.

#### Tester:

23.06.2006

K. Damm



Date

ETS-Lab.

Name

Signature

#### Technical responsibility for area of testing:

23.06.2006

N. Kaspar



Date

ETS

Name

Signature

## 1.2 Testing laboratory

### 1.2.1 Location

ELECTRONIC TECHNOLOGY SYSTEM DR. GENZ GMBH (ETS)

Storkower Straße 38c

D-15526 Reichenwalde b. Berlin

Germany

Telephone : +49 33631 888 00

Telefax : +49 33631 888 66

### 1.2.2 Details of accreditation status

#### ACCREDITED TESTING LABORATORY

DAR-REGISTRATION NUMBER:

DAT-P-201/96

#### ACCREDITED COMPETENT BODY

DAR-REGISTRATION NUMBER:

BPT-ZE-026/96

#### FCC FILED TEST LABORATORY:

REG. NO.

96970

#### INDUSTRY CANADA FILED TEST LABORATORY

REG. NO.

IC 3470

#### A2LA ACCREDITED

CERTIFICATE NUMBER:

1983-01

#### BLUETOOTH QUALIFICATION TEST FACILITY (BQTF)

ACCREDITED BY: BLUETOOTH QUALIFICATION REVIEW BOARD (BQRF)

## 1.3 Details of approval holder

Name : Falcom Wireless Communications GmbH  
Street : Gewerbering 6  
Town : 98704 Langewiesen  
Country : Germany  
Telephone : +49(0)3677 8042-0  
Fax : +49(0)3677 8042-215

Contact : Herr Ralf Leipoldt  
E-Mail : +49(0)3677 8042-0

## 1.4 Application details

Date of receipt of application : 03.03.2006  
Date of receipt of test item : 03.03.2006  
Date of test : 27.04.2006

## 1.5 Test item

Description of test item : GSM/GPRS/GPS/Bluetooth-Personal-Tracker  
Type identification : Mambo56  
Serial number : without  
Photos : See annex A.

### Technical data

Frequency range Tx - GSM 850 : 824.2 - 848.80 MHz  
Frequency range Tx - PCS : 1850.2 - 1909.8 MHz  
Frequency range Rx - GSM 850 : 869.2 - 893.8 MHz  
Frequency range Rx - PCS : 1930.2 - 1989.8 MHz  
Antenna Type : internal antenna  
Antenna Gain : 1 dBi  
Power supply : 3,7 V DC  
Operating mode : duplex  
Type of modulation : GMSK (GSM modulation)  
Emission : GXW

### Manufacturer: (if applicable)

Name :  
Street :  
Town :  
Country :

## 1.6 Test standards

Technical standard :                      FCC Parts:      22H, 24E, 2, 15  
IC Standards:    RSS 132, RSS 133

Additional information:                      Because of using the GSM 850 as an alternative technology in 850 MHz band, not all test cases of FCC Part 22 are required.  
  
This device contains 1800 MHz not operational in U.S. Territories. This filing is only applicable for 850/1900 MHz operations.

## 2 Technical test

### 2.1 Summary of test results

No deviations from the technical specification(s) were ascertained in the course of the tests performed.



**or**

The deviations as specified in 2.5 were ascertained in the course of the tests performed.



### 2.2 Test environment

Temperature                                      : 25 °C

Relative humidity content                      : 20 ... 75 %

Air pressure                                        : 86 ... 103 kPa

### 2.3 Test equipment utilized

| No.      | Test equipment                | Type            | Manufacturer       |
|----------|-------------------------------|-----------------|--------------------|
| ETS 0002 | Test receiver                 | ESVP            | Rohde & Schwarz    |
| ETS 0003 | Diode power sensor            | NRV-Z2          | Rohde & Schwarz    |
| ETS 0004 | Spectrum and network analyzer | FSMS 26         | Rohde & Schwarz    |
| ETS 0007 | Horn antenna                  | AT 4004         | ar                 |
| ETS 0008 | Antenna                       | Loop antenna    | Siemens            |
| ETS 0009 | Antenna                       | ARA 2           | MEB                |
| ETS 0010 | Antenna                       | Loop antenna    | MEB                |
| ETS 0011 | Antenna                       | van Veen/ Frame | Rohde & Schwarz    |
| ETS 0012 | Antenna                       | HK 116          | Rohde & Schwarz    |
| ETS 0013 | Antenna                       | HL 223          | Rohde & Schwarz    |
| ETS 0014 | Antenna                       | HL 025          | Rohde & Schwarz    |
| ETS 0015 | Antenna                       | HL 025          | Rohde & Schwarz    |
| ETS 0016 | Precision antenna kit         | VHAP            | Schwarzbeck        |
| ETS 0017 | Precision antenna kit         | UHAP            | Schwarzbeck        |
| ETS 0018 | Horn antenna                  | BBHA 9120 D     | Schwarzbeck        |
| ETS 0019 | Horn antenna                  | BBHA 9120 D     | Schwarzbeck        |
| ETS 0026 | Tripod                        |                 | Heinrich Deisel    |
| ETS 0027 | Tripod                        |                 | Heinrich Deisel    |
| ETS 0028 | Tripod                        | STA 2           | C. Lorenz AG       |
| ETS 0029 | Tripod                        |                 | Berlebach          |
| ETS 0030 | Antenna                       | HK 116          | Rohde & Schwarz    |
| ETS 0031 | Turn table                    | DS 412          | Heinrich Deisel    |
| ETS 0032 | Controller                    | HD 050          | Heinrich Deisel    |
| ETS 0034 | RF generator/ Amplifier       | SMLR            | Rohde & Schwarz    |
| ETS 0035 | RF generator/ Amplifier       | SMLM            | Rohde & Schwarz    |
| ETS 0036 | Zirc. Antenna                 | 3102            | EMCO               |
| ETS 0037 | Zirc. Antenna                 | 3102L           | EMCO               |
| ETS 0038 | RF amplifier                  | 150L            | Amplifier Research |
| ETS 0039 | Absorbing clamp               | MDS 21          | Rohde & Schwarz    |
| ETS 0040 | Artificial mains Network      | ESH3-Z5         | Rohde & Schwarz    |
| ETS 0041 | Artificial mains              | ESH3-Z4         | Rohde & Schwarz    |
| ETS 0042 | Artificial mains              | ESH3-Z6         | Rohde & Schwarz    |
| ETS 0043 | Directional coupler           | 1850            | KRYTAR             |
| ETS 0044 | Artificial mains              | NNB 111         | MEB                |
| ETS 0045 | Stripe line                   | IEC 801-3       | ETS                |
| ETS 0046 | Power supply                  | LTS 006         | RFT                |
| ETS 0047 | Power supply                  | TG 20/ 1        | Statron            |
| ETS 0048 | Power supply                  | TG 20/ 1        | Statron            |
| ETS 0049 | Power supply                  | T 102           | TPW                |
| ETS 0050 | Power supply                  | T 101b          | TPW                |
| ETS 0051 | Oscilloscope                  | TDS 640A        | Tektronix          |
| ETS 0052 | Attenuator                    | 776B-10         | Narda              |
| ETS 0071 | Video camera system           | KMB012          | Kocom              |
| ETS 0072 | Interphone system             | JS-1400         | Jiuh Sheng         |
| ETS 0073 | Audio noise meter             | GSM 2           | MKD/ RFT           |

| No.      | Test equipment                     | Type           | Manufacturer              |
|----------|------------------------------------|----------------|---------------------------|
| ETS 0074 | RF Millivoltmeter                  | QRV 2          | MKD/ RFT                  |
| ETS 0075 | NF generator                       | GF 22          | Präcitronic               |
| ETS 0079 | Functional generator               | MX-2020        | Maxcom                    |
| ETS 0080 | EMI Software                       | ES-K1          | Rohde & Schwarz           |
| ETS 0081 | EMI Software                       | ES-K10         | Rohde & Schwarz           |
| ETS 0085 | Shielded room                      | SR 1           | Frankonia                 |
| ETS 0086 | Anechoic chamber                   | AC 1           | Frankonia                 |
| ETS 0087 | Climatic cell                      | HC 4033        | Heraeus                   |
| ETS 0089 | Radio communication tester         | CMS 54         | Rohde & Schwarz           |
| ETS 0091 | RF signal generator                | SME 03         | Rohde & Schwarz           |
| ETS 0093 | Attenuator                         | 57-20-33       | Weinschel                 |
| ETS 0094 | Power sensor                       | NRV-Z55        | Rohde & Schwarz           |
| ETS 0100 | RF signal generator                | SME-06         | Rohde & Schwarz           |
| ETS 0102 | CDN                                | M3-801/6       | MEB                       |
| ETS 0105 | High power synthesizer/ sweeper    | SMP 22 / 02    | Rohde & Schwarz           |
| ETS 0106 | Antenna                            | VAMP 9443      | Schwarzbeck Meßelektronik |
| ETS 0117 | Insertion unit                     | URV-Z2         | Rohde & Schwarz           |
| ETS 0118 | Mixer                              | MFC 1000       | Avcom                     |
| ETS 0119 | Mixer                              | MFC 2000       | Avcom                     |
| ETS 0120 | RF step attenuator                 | TRI-50-20      | INCO                      |
| ETS 0121 | Oscilloscope                       | EO 147A        | Serute                    |
| ETS 0122 | Oscilloscope                       | 5201           | Dagatron                  |
| ETS 0123 | RF step attenuator                 | RBU            | Rohde & Schwarz           |
| ETS 0132 | Frequency doubler                  | TR-0616        | EMG                       |
| ETS 0136 | Attenuator                         | 33-6-34        | Weinschel                 |
| ETS 0137 | Multimeter                         | YX-360TRA      | Mastech                   |
| ETS 0138 | Multimeter                         | DT-9410        | Diditec                   |
| ETS 0139 | Multimeter                         | ST-9202        | Standard                  |
| ETS 0146 | Active RF probe                    | ESH2-Z2        | Rohde & Schwarz           |
| ETS 0147 | Probe                              | TK 103         | MEB                       |
| ETS 0148 | RF Current Probe                   | F-65           | FCC                       |
| ETS 0149 | Power divider                      | ZAPD-21        | MCL                       |
| ETS 0150 | Switcher                           | HR07-720       | Wisi                      |
| ETS 0155 | Signal generator                   | SMG            | Rohde & Schwarz           |
| ETS 0156 | Adjacent channel power meter       | NKS            | Rohde & Schwarz           |
| ETS 0159 | Programmable power supply          | TOE 8815       | Toellner                  |
| ETS 0162 | Acoustic chamber                   | 403-A          | IAC                       |
| ETS 0163 | Test head                          | BK 4602        | Brüel & Kjær              |
| ETS 0164 | Simulator ear                      | BK 4185        | Brüel & Kjær              |
| ETS 0165 | Simulator mouth                    | BK 4227        | Brüel & Kjær              |
| ETS 0166 | Acoustic calibrator                | BK 4231        | Brüel & Kjær              |
| ETS 0167 | Communication Analysis System      | CAS TE I       | HEAD acoustics            |
| ETS 0169 | Measurement - Front-end (analogue) | MFE III        | HEAD acoustics            |
| ETS 0170 | Measurement - Front-end (digital)  | MFE IV         | HEAD acoustics            |
| ETS 0171 | Electronic test cradle             | TEH            | HEAD acoustics            |
| ETS 0172 | Noise generator                    | HNG III.1      | HEAD acoustics            |
| ETS 0173 | Speaker                            | Canton S Pluss | HEAD acoustics            |
| ETS 0174 | Measurement - Front-end line       | MFE V          | HEAD acoustics            |

| No.      | Test equipment                            | Type       | Manufacturer       |
|----------|-------------------------------------------|------------|--------------------|
|          | interface                                 |            |                    |
| ETS 0175 | Software line interface (analogue)        | COPTZV5    | HEAD acoustics     |
| ETS 0176 | Acoustic volt meter                       | COP 4      | HEAD acoustics     |
| ETS 0178 | Open area test side                       | 10m        | ETS                |
| ETS 0179 | Open area test side                       | 3m         | ETS                |
| ETS 0182 | Power supply                              | MX-9300    | Maxcom             |
| ETS 0183 | Frequency counter                         | MX-9300    | Maxcom             |
| ETS 0184 | Function generator                        | MX-9300    | Maxcom             |
| ETS 0185 | Digital multimeter                        | MX-9300    | Maxcom             |
| ETS 0186 | Power supply                              | DF 1730    | WJG                |
| ETS 0187 | Power supply                              |            | TPW/RFT            |
| ETS 0189 | Spectrum analyzer                         | FSEB       | Rohde & Schwarz    |
| ETS 0190 | Function generator                        | MX 2020    | Maxcom             |
| ETS 0191 | Sweep function generator                  | 7202       | Dagatron           |
| ETS 0192 | Audio generator                           | 7101       | Dagatron           |
| ETS 0194 | Digital multimeter                        | PMM 208    | Dagatron           |
| ETS 0195 | Thermo hygro recorder                     |            | Amarell            |
| ETS 0196 | Digital thermometer                       | AK-688     | KD                 |
| ETS 0197 | Digital thermometer                       |            | Prima              |
| ETS 0198 | Digital thermometer                       | ad 170th   | ama-digit          |
| ETS 0199 | Digital thermometer                       | ad 31th    | ama-digit          |
| ETS 0200 | Digital thermometer / hygro meter         | ad 90h     | ama-digit          |
| ETS 0201 | Digital thermometer / hygro meter         | 37950-10   | Cole Parmer        |
| ETS 0202 | Digital thermometer                       | ad 15th    | ama-digit          |
| ETS 0204 | Digital thermometer                       | ad 20th    | ama-digit          |
| ETS 0218 | RF probe                                  | URV5-Z7    | Rohde & Schwarz    |
| ETS 0219 | Power sensor                              | NRV-Z2     | Rohde & Schwarz    |
| ETS0224A | Millivoltmeter                            | URV5       | Rohde & Schwarz    |
| ETS0224B | Diode Power Sensor                        | NRV-Z1     | Rohde & Schwarz    |
| ETS0224C | Programmable high resolution time counter | PM6654G    | Philips            |
| ETS0224D | RF Step Attenuator                        | RSP        | Rohde & Schwarz    |
| ETS 0228 | Climatic chamber                          | VT 4010    | Vötsch             |
| ETS 0229 | Radio communication tester                | CMT 54     | Rohde & Schwarz    |
| ETS 0230 | Radio communication tester                | CMD 65     | Rohde & Schwarz    |
| ETS 0232 | Radiation test source                     | VSQ 1      | MEB                |
| ETS 0233 | Direction coupler                         | RK 100     | MEB                |
| ETS 0234 | Power meter                               | NRVD       | Rohde & Schwarz    |
| ETS 0235 | RF network-analyzer                       | 8752 C     | Hewlett Packard    |
| ETS 0236 | RF amplifier                              | 100A100    | Amplifier Research |
| ETS 0237 | RF amplifier                              | 100W1000M1 | Amplifier Research |
| ETS 0238 | Field strong meter                        | FM 2000    | Amplifier Research |
| ETS 0243 | AC-clamp 1000 A                           | 80i 1000s  | Fluke              |
| ETS 0253 | Spectrum analyzer                         | FSIQ       | Rohde & Schwarz    |
| ETS 0254 | RF generator                              | SMIQ 03    | Rohde & Schwarz    |
| ETS 0255 | RF generator                              | SMIQ 03    | Rohde & Schwarz    |
| ETS 0256 | RF generator                              | SMP 03     | Rohde & Schwarz    |
| ETS 0257 | Step attenuator                           | RSP        | Rohde & Schwarz    |
| ETS 0258 | Rubidium standard                         | RSTU       | DATUM GmbH         |

| No.      | Test equipment               | Type      | Manufacturer    |
|----------|------------------------------|-----------|-----------------|
| ETS 0259 | Power meter                  | NRVD      | Rohde & Schwarz |
| ETS 0260 | Power sensor                 | NRVD-Z1   | Rohde & Schwarz |
| ETS 0261 | Power sensor                 | NRVD-Z1   | Rohde & Schwarz |
| ETS 0262 | Switching unit               | SSCU      | Rohde & Schwarz |
| ETS 0264 | Spectrum analyzer            | F 1048    | HAMEG           |
| ETS 0265 | Loop antenna                 | HFRA 9150 | Schwarzbeck     |
| ETS 0267 | RF signal generator          | SMT 03    | Rohde & Schwarz |
| ETS 0268 | RF signal generator          | SMP 02    | Rohde & Schwarz |
| ETS 0269 | RF bridge 50 Ohm             | 86205 A   | Aglient         |
| ETS 0270 | RF signal generator          | SMP 04    | Rohde & Schwarz |
| ETS 0271 | Spectrum analyzer            | FSEK30    | Rohde & Schwarz |
| ETS 0272 | RF signal generator          | SME 03    | Rohde & Schwarz |
| ETS 0273 | RF signal generator          | SME 03    | Rohde & Schwarz |
| ETS 0274 | RF signal generator          | SMY 01    | Rohde & Schwarz |
| ETS 0275 | Power sensor                 | NRV-Z51   | Rohde & Schwarz |
| ETS 0276 | Audio analyzer               | UPL       | Rohde & Schwarz |
| ETS 0277 | Power sensor                 | NRV-Z1    | Rohde & Schwarz |
| ETS 0278 | Power sensor                 | NRV-Z31   | Rohde & Schwarz |
| ETS 0279 | Step attenuator              | RSP       | Rohde & Schwarz |
| ETS 0280 | Power meter                  | NRVD      | Rohde & Schwarz |
| ETS 0281 | Spectrum analyzer            | FSM       | Rohde & Schwarz |
| ETS 0287 | Test receiver                | ESHS 10   | Rohde & Schwarz |
| ETS 0288 | Artificial mains             | ESH2-Z5   | Rohde & Schwarz |
| ETS 0289 | Audio generator              | TAG 101   | Troneer         |
| ETS 0290 | Audio generator              | TAG 101   | Troneer         |
| ETS 0291 | Loop antenna                 | HFH2-Z2   | Rohde & Schwarz |
| ETS 0292 | RF generator                 | SMHU      | Rohde & Schwarz |
| ETS 0293 | Artificial mains             | NNBM 8125 | Schwarzbeck     |
| ETS 0294 | Biconical antenna            | HK 116    | Rohde & Schwarz |
| ETS 0295 | LPD antenna                  | HL 223    | Rohde & Schwarz |
| ETS 0301 | Relay switch unit            | RSU       | Rohde & Schwarz |
| ETS 0304 | Test receiver                | ESHS 10   | Rohde & Schwarz |
| ETS 0305 | Test receiver                | ESVS 10   | Rohde & Schwarz |
| ETS 0306 | Function generator           | HP 33120A | Hewlett Packard |
| ETS 0308 | Spectrum analyzer            | R 3361A   | Advantest       |
| ETS 0309 | Anechoic chamber             | AC 2      | Frankonia       |
| ETS 0310 | Anechoic chamber             | AC 3      | Frankonia       |
| ETS 0311 | Anechoic chamber             | AC 4      | Frankonia       |
| ETS 0312 | Climatic chamber             | VC 0033   | Vötsch          |
| ETS 0313 | Power sensor                 | NRV-Z51   | Rohde & Schwarz |
| ETS 0314 | LPD antenna                  | HL 223    | Rohde & Schwarz |
| ETS 0315 | Biconical antenna            | HK 116    | Rohde & Schwarz |
| ETS 0319 | Opto link                    | GPIB 140  | NI              |
| ETS 0320 | Opto link                    | GPIB 140  | NI              |
| ETS 0322 | Insertion unit               | URV5-Z4   | Rohde & Schwarz |
| ETS 0333 | Turn table                   | DE 350    | Heinrich Deisel |
| ETS 0334 | Controller                   | HD 100    | Heinrich Deisel |
| ETS 0336 | LPD Antenna                  | HL 223    | Rohde & Schwarz |
| ETS 0337 | Professional Power Amplifier | SE-1200   | Wharfedale Pro  |

| No.      | Test equipment                | Type              | Manufacturer    |
|----------|-------------------------------|-------------------|-----------------|
| ETS 0340 | Thermometer                   |                   | Proficell       |
| ETS 0341 | Thermometer                   |                   | Proficell       |
| ETS 0342 | Thermometer                   |                   | Proficell       |
| ETS 0343 | Thermometer                   |                   | Proficell       |
| ETS 0344 | Thermometer                   |                   | Proficell       |
| ETS 0345 | Thermometer                   |                   | Proficell       |
| ETS 0346 | Thermometer                   |                   | Proficell       |
| ETS 0347 | Current Probe                 | EZ-17             | Rohde & Schwarz |
| ETS 0348 | RF Millivoltmeter             | URV 55            | Rohde & Schwarz |
| ETS 0349 | Temperature / humidity logger | OPUS10 THI        | LUFFT           |
| ETS 0350 | Horn Antenna                  | BBHA 9120-C       | Schwarzbeck     |
| ETS 0351 | RF amplifier                  | DWT-1857          | Microwave       |
| ETS 0354 | RF amplifier                  | DBS-0408N423      | Microwave       |
| ETS 0355 | high pass                     | H03G12G3          | Microwave       |
| ETS 0356 | high pass                     | H03G12G3          | Microwave       |
| ETS 0357 | high pass                     | H08G18G3          | Microwave       |
| ETS 0358 | RF amplifier                  | AFD3-010040-15-ln | MITEQ           |
| ETS 0359 | RF amplifier                  | M/N AM-1331       | MITEQ           |
| ETS 0360 | RF amplifier                  | DBS-0408N423      | Microwave       |
| ETS 0361 | RF amplifier                  | DBS 1826N515      | Microwave       |
| ETS 0362 | high pass                     | H03G12G3          | Microwave       |
| ETS 0363 | high pass                     | H08G18G3          | Microwave       |
| ETS 0364 | high pass                     | H08G18G3          | Microwave       |
| ETS 0365 | Notch filter 2.4 GHz          | WRCT2.40/248      | Wain Wright     |
| ETS 0366 | high pass                     | H08G18G3          | Microwave       |
| ETS 0367 | high pass                     | H03G12G3          | Microwave       |
| ETS 0368 | Notch filter 0.5-1 GHz        | BN86883           | Schomandl       |
| ETS 0369 | Notch filter 210-500 MHz      | BN86882           | Schomandl       |
| ETS 0370 | Notch filter 15-90 MHz        | BN86880           | Schomandl       |
| ETS 0371 | Notch filter 85-250 MHz       | BN86881           | Schomandl       |
| ETS 0372 | Direction coupler             | RK 100            | MEB             |
| ETS 0373 | Direction coupler             | DC3001            | EMV             |
| ETS 0374 | Power Supply                  | NGSM32            | Rohde & Schwarz |
| ETS 0375 | Vector Signal Generator       | SMIQ03B           | Rohde & Schwarz |
| ETS 0376 | Signal Generator              | SMP22             | Rohde & Schwarz |
| ETS 0382 | Vector Signal Generator       | SMIQ03B           | Rohde & Schwarz |
| ETS 0383 | Spectrum Analyzer             | FSU26             | Rohde & Schwarz |
| ETS 0386 | Power meter                   | NRVD              | Rohde & Schwarz |
| ETS 0387 | Power sensor                  | NRV-Z1            | Rohde & Schwarz |
| ETS 0388 | Power sensor                  | NRV-Z1            | Rohde & Schwarz |
| ETS 0391 | Rubidium Frequency Standard   | DATUM 8040        | DATUM GmbH      |
| ETS 0392 | RF Distribution               | DATUM 6502        | DATUM GmbH      |
| ETS 0393 | Insertion unit                | URV5-Z4           | Rohde & Schwarz |
| ETS 0403 | RF Current Probe              | F-140             | Rohde & Schwarz |
| ETS 0406 | Signal Generator              | SML02             | Rohde & Schwarz |
| ETS 0409 | Stripline                     | DC220             | Schwarzbeck     |
| ETS 0410 | BAN                           | 1                 | ETS             |
| ETS 0418 | High pass filter 4-8GHz       |                   | Microwave       |
| ETS 0419 | High pass filter 8-18 GHz     |                   | Microwave       |

| No.      | Test equipment                           | Type                 | Manufacturer          |
|----------|------------------------------------------|----------------------|-----------------------|
| ETS 0420 | Amplifier 0.1-1 GHz                      | M/N AM-1331          | MITEC                 |
| ETS 0421 | Amplifier 1-4 GHz                        | AFD3-010040-15-LN    | MITEC                 |
| ETS 0422 | Amplifier 4-8 GHz                        | DBS-0408N423         | Narda                 |
| ETS 0423 | Amplifier 8-18 GHz                       | DWT-18057            | Narda                 |
| ETS 0424 | Amplifier 18-26.5 GHz                    | DBS-1826N515         | Narda                 |
| ETS 0427 | Power sensor                             | NRV-Z6               | Rohde & Schwarz       |
| ETS 0429 | Current probe test Jig                   | SW14 7LY             | Chase                 |
| ETS 0430 | RF signal generator                      | SML02                | R&S                   |
| ETS 0435 | HP-Filter                                | H1G04G01             | Microwave             |
| ETS 0436 | HP-Filter                                | H1G04G01             | Microwave             |
| ETS 0437 | HP-Filter                                | H0G408G1             | Microwave             |
| ETS 0438 | HP-Filter                                | H0G408G1             | Microwave             |
| ETS 0439 | Amplifier                                | DBS-1826N515         | Narda-DBS-Microwave   |
| ETS 0440 | Amplifier                                | AM-1331              | MITEQ                 |
| ETS 0445 | RF attenuator 6dB                        | 50FH-006-300         | JFK                   |
| ETS 0446 | RF attenuator 30dB                       | 50FH-030-300         | JFK                   |
| ETS 0448 | RF power amplifier                       | AR 60S1G3            | AR Amplifier Research |
| ETS 0466 | Directional coupler                      | HP 87300B            |                       |
| ETS 0470 | Amplifier                                | AM-1300-1103         | MITEQ                 |
| ETS 0472 | Antenna                                  | BTA-H                | Frankonia             |
| ETS 0474 | EMI test receiver                        | ESCS30               | Rohde & Schwarz       |
| ETS 0475 | Amplifier                                | AFS4-00101800-U      | MITEQ                 |
| ETS 0476 | Test receiver                            | ESCS 30              | Rohde & Schwarz       |
| ETS 0477 | GPS system (active GPS antenna)          | 4490                 | HOPF                  |
| ETS 0478 | Crystal filter                           | MQF 127.50-2400/F    | Vectron International |
| ETS 0480 | Validation dipole                        | DB 3                 | EMCO                  |
| ETS 0481 | 40 GHz standard gain horn with amplifier | 22240-25 CBL26402075 | Flann Microwave       |
| ETS 0482 | 40 GHz high gain antenna                 | AT4560               | Amplifier research    |
| ETS 0483 | Amplifier                                | AFD3010040-15-LN     | MITEQ                 |
| ETS 0485 | Radio Communication Tester               | CMU 200              | Rohde & Schwarz       |

## 2.4 General test procedure

**POWER LINE CONDUCTED INTERFERENCE:** The procedure used was ANSI STANDARD C63.4-2003 5.2 using a 50  $\mu$ H LISN (if necessary). Both lines were observed. The bandwidth of the spectrum analyzer was 10 kHz with an appropriate sweep speed.

**RADIATION INTERFERENCE:** The test procedure used was ANSI STANDARD C63.4-2003 6.4 using a spectrum analyzer. The resolution bandwidth of the spectrum analyzer was 100 kHz for measurements below 1 GHz and RBW 1 MHz was used above 1 GHz. The analyzer was calibrated in dB above a microvolt at the output of the antenna.

**FORMULA OF CONVERSION FACTORS for Field strength:** The Field Strength at 3 m was established by adding the meter reading of the spectrum analyzer (which is set to read in units of dB $\mu$ V) to the antenna correction factor supplied by the antenna manufacturer. The antenna correction factors are stated in terms of dB.

Example:

|             |                                                          |
|-------------|----------------------------------------------------------|
| Freq. (MHz) | METER READING + ACF + CABLE LOSS (to the receiver) = FS  |
| 33          | 20 dB $\mu$ V + 10.36 dB + 6 dB = 36.36 dB $\mu$ V/m @3m |

**ANSI STANDARD C63.4-2003 6.2.1 MEASUREMENT PROCEDURES:** The UUT was placed on a table 80 cm high and with dimensions of 1m by 1.5 m (non metallic table). The UUT was placed in the center of the table. The table used for radiated measurements is capable of continuous rotation. The spectrum was scanned from 30 MHz to at least 10<sup>th</sup> harmonic of the fundamental.

Peak readings were taken in three (3) orthogonal planes and the highest readings.

Measurements were made by ETS Dr. Genz GmbH at the registered open field test site located at Storkower Str. 38c, 15526 Reichenwalde, Germany.

When an emission was found, the table was rotated to produce the maximum signal strength. At this point, the antenna was raised and lowered from 1 m to 4 m. The antenna was placed in both the horizontal and vertical planes.

**ANTENNA & GROUND:**

This unit uses external antennas.

## 2.5 Test results

☒ 1<sup>st</sup> test

☐ test after modification

☐ production test

| SECT. | TEST CASE                                            | FCC<br>47 CFR PART               | IC<br>RSS-                       | Required                            | Test<br>passed                      | Test<br>failed           |
|-------|------------------------------------------------------|----------------------------------|----------------------------------|-------------------------------------|-------------------------------------|--------------------------|
| 3     | <i>TRANSMITTER PARAMETERS</i>                        |                                  |                                  |                                     |                                     |                          |
| 3.1   | RF power output<br>conducted                         | 2.1046<br>22.913(a)<br>24.232(c) | Gen §4.6<br>132 §4.4<br>133 §4.3 | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 3.2   | RF power output<br>radiated (ERP, EIRP)              | 22.913(a)<br>24.232(c)           | 132 §4.4<br>133 §4.3             | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 3.3   | Occupied bandwidth                                   | 2.1049                           | Gen §4.4.1                       | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 3.3   | Emission bandwidth                                   | 22.917(b)<br>24.238(b)           | -                                | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 3.4   | Frequency stability                                  | 2.1055<br>22.355<br>24.235       | Gen §4.5<br>132 §4.3<br>133 §4.2 | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 3.5   | Spurious emission<br>conducted<br>(antenna terminal) | 2.1051<br>22.917<br>24.238       | Gen §4.7<br>132 §4.5<br>133 §4.4 | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 3.6   | Spurious emission<br>radiated                        | 2.1053<br>22.917<br>24.238       | Gen §4.7<br>132 §4.5<br>133 §4.4 | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 3.7   | Block edge compliance                                | 22.917(b)<br>24.238(b)           | 132<br>§4.5.1.1<br>133 §4.4      | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 3.8   | AC power line<br>conducted emissions                 | 15.207                           | -                                | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/> |
| 4     | <i>RECEIVER PARAMETERS</i>                           |                                  |                                  |                                     |                                     |                          |
| 4.1   | Radiated emissions                                   | 2.1053<br>15.109                 | Gen 4.8<br>132 §4.6<br>133 §4.5  | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

### 3 Transmitter parameters

#### 3.1 RF power output, conducted,

##### Reference

|            | <b>Cellular telephone 850 MHz</b>              | <b>PCS 1900 MHz</b>                            |
|------------|------------------------------------------------|------------------------------------------------|
| <b>FCC</b> | CFR part 22.913(a), 2.1046                     | CFR part 24.232(c), 2.1046                     |
| <b>IC</b>  | RSS-132 Issue 2, §4.4<br>RSS-Gen Issue 1, §4.6 | RSS-133 Issue 3, §4.3<br>RSS-Gen Issue 1, §4.6 |

##### Method of measurement

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

An HP power meter was also used to measure the RF power.

Tests were performed at three frequencies (low, middle, and high channels) and on all power levels, which can be set-up on the transmitters.

##### Limits

|            | <b>Cellular telephone 850 MHz</b> | <b>PCS 1900 MHz</b>    |
|------------|-----------------------------------|------------------------|
| <b>FCC</b> | 38,5 dBm (7 Watts), ERP           | 33 dBm (2 Watts), EIRP |
| <b>IC</b>  | 38 dBm (6.3 Watts), ERP           | 33 dBm (2 Watts), EIRP |

**Test results**

|                                   | Frequency channel | Peak output power | AVG output power |
|-----------------------------------|-------------------|-------------------|------------------|
| <b>Cellular telephone 850 MHz</b> | 128               | 32.40 dBm         | --               |
|                                   | 188               | 32.41 dBm         | --               |
|                                   | 251               | 32.73 dBm         | --               |
| <b>PCS 1900 MHz</b>               | 512               | 30.05 dBm         | --               |
|                                   | 661               | 29.69 dBm         | --               |
|                                   | 810               | 29.46 dBm         | --               |

See attached diagrams

**Test equipment:**

ETS 0413, ETS 0416, ETS 0484

### 3.2 RF power output, radiated,

#### Reference

|     | Cellular telephone 850 MHz | PCS 1900 MHz          |
|-----|----------------------------|-----------------------|
| FCC | CFR part 22.913(a)         | CFR part 24.232(c)    |
| IC  | RSS-132 Issue 2, §4.4      | RSS-133 Issue 3, §4.3 |

#### Method of measurement

The EUT was positioned on a non-conductive turntable, 0.8m above the ground plane on an open test site. The radiated emission at the fundamental frequency was measured at 3m distance with a test antenna and spectrum analyzer.

Worst case emission was recorded with the rotation of the turntable and the raising and lowering of the test antenna.

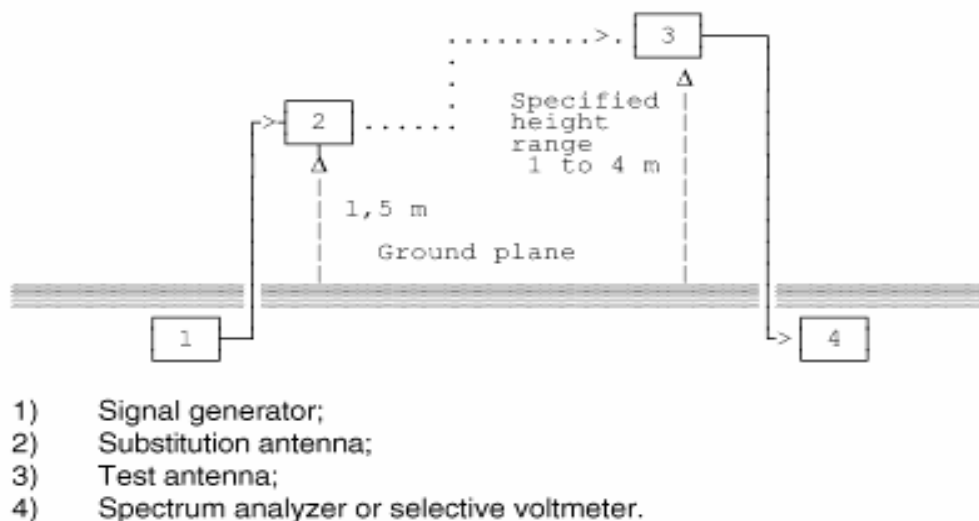
ERP in frequency band 824.2 - 848.8 MHz, and EIRP in frequency band 1850.2 - 1909.8 MHz were measured using a substitution method. The EUT was replaced by half-wave dipole (824.2 - 848.8 MHz) or horn antenna (1850.2 - 1909.8 MHz) connected to a signal generator.

#### Substitution RF power measurement at ETS Dr Genz GmbH

General:

The applied substitution method follows ANSI/TIA/EIA-603, ANSI/TIA/EIA-102.CAAA or the appropriate ETSI rules respectively.

The actual signal generated by the EUT can be determined by means of a substitution measurement in which a known signal source replaces the device to be measured.



The substitution antenna replaces the transmitter antenna at the same position and in vertical polarization. The frequency of the signal generator shall be adjusted to the measurement frequency. The test antenna shall be raised or lowered, if necessary, to ensure that the maximum signal is still received. The input signal to the substitution antenna shall be adjusted in level until an equal or a known related level to that detected from the transmitter is obtained in the measurement receiver.

If a fully anechoic chamber is used as test site in order to provide free space conditions there is no need to change the height of the antenna.

The measurement will be repeated in horizontal position.

#### **Calibration:**

In order to make this kind of measurement more effective and to avoid subjective measurement faults ETS has installed automatic computer controlled measurement procedures.

With the above described substitution method a test site is calibrated over the full frequency range which is used in suitable frequency steps. For a certain power level on the substitution antenna the received power over the whole frequency range is documented. All necessary antenna gains, cable losses, filter losses and amplifications of preamplifiers are taken in consideration. The summary of this calibration measurement performs a transducer factor that is related to the considered test site and a certain measurement distance. Differences of the radiated power levels of different test samples are determined by internal attenuation of the measurement receiver. The proper function of such test site will be maintained by short term plausibility checks and periodical re-calibration.

#### **Testing:**

The test sample is put on the table at the defined position and the measurement receiver receives and documents the radiated power. On test sites with ground plane the measurement antenna will be lowered and raised to maximum values at significant frequencies.

For peak power measurements the sample is turned by the turntable over 360 degree in order to find the direction with the maximum radiation or to document the max reading with the MAXHOLD function during the rotation.

#### **Limits**

|            | <b>Cellular telephone 850 MHz</b> | <b>PCS 1900 MHz</b>    |
|------------|-----------------------------------|------------------------|
| <b>FCC</b> | 38,5 dBm (7 Watts), ERP           | 33 dBm (2 Watts), EIRP |
| <b>IC</b>  | 38 dBm (6.3 Watts), ERP           | 33 dBm (2 Watts), EIRP |

## Test Results

|                                       | Frequency<br>channel | Radiated power<br>ERP | Radiated power<br>EIRP |
|---------------------------------------|----------------------|-----------------------|------------------------|
| <b>Cellular telephone<br/>850 MHz</b> | 128                  | 27.21 dBm             | --                     |
|                                       | 188                  | 28.37 dBm             | --                     |
|                                       | 251                  | 27.89 dBm             | --                     |
| <b>PCS<br/>1900 MHz</b>               | 512                  | --                    | 20.57 dBm              |
|                                       | 661                  | --                    | 18.50 dBm              |
|                                       | 810                  | --                    | 17.72 dBm              |

See attached diagrams

### Test equipment:

ETS 0014, ETS 0281, ETS 0295, ETS 0310, ETS 0416, ETS 0484

### 3.3 Occupied bandwidth, emission bandwidth

#### Reference

|            | <b>Cellular telephone 850 MHz</b> | <b>PCS 1900 MHz</b>        |
|------------|-----------------------------------|----------------------------|
| <b>FCC</b> | CFR part 22.917(b), 2.1049        | CFR part 24.238(b), 2.1049 |
| <b>IC</b>  | RSS-Gen Issue 1, §4.4.1           | RSS-Gen Issue 1, §4.4.1    |

#### Method of measurement

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power.

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

The RF output of the transceiver was connected to the input of the spectrum analyzer through sufficient attenuation.

Occupied Bandwidth was measured with a occupied bandwidth function of the analyzer.

To find the Emission Bandwidth (-26 dB) the delta markers were set -26 dB below transmitter power.

## Test results

|                                       | Frequency channel | Occupied bandwidth | Emission bandwidth |
|---------------------------------------|-------------------|--------------------|--------------------|
| <b>Cellular telephone<br/>850 MHz</b> | 128               | 250.501 kHz        | 316.633 kHz        |
|                                       | 188               | 248.497 kHz        | 316.633 kHz        |
|                                       | 251               | 248.497 kHz        | 318.637 kHz        |
| <b>PCS<br/>1900 MHz</b>               | 512               | 248.497 kHz        | 316.633 kHz        |
|                                       | 661               | 248.497 kHz        | 316.633 kHz        |
|                                       | 810               | 248.497 kHz        | 314.629 kHz        |

See attached diagrams

## Test equipment:

ETS 0413, ETS 0416, ETS 0484

### 3.4 Frequency stability

#### Reference

|            | <b>Cellular telephone 850 MHz</b>              | <b>PCS 1900 MHz</b>                            |
|------------|------------------------------------------------|------------------------------------------------|
| <b>FCC</b> | CFR part 22.355, 2.1055                        | CFR part 24.235, 2.1055                        |
| <b>IC</b>  | RSS-132 Issue 2, §4.3<br>RSS-Gen Issue 1, §4.5 | RSS-133 Issue 3, §4.2<br>RSS-Gen Issue 1, §4.5 |

#### Method of measurement

The equipment under test was connected to an external DC power supply and the RF output was connected to a frequency counter via feed through attenuators. The EUT was placed inside the temperature chamber. The DC leads and RF output cable, exited the chamber through an opening made for that purpose.

After the temperature stabilized the frequency output was recorded from the counter.

#### Limits

|            | <b>Cellular telephone 850 MHz</b> | <b>PCS 1900 MHz</b>                             |
|------------|-----------------------------------|-------------------------------------------------|
| <b>FCC</b> | $\pm 2.5$ ppm                     | Must stay within the authorized frequency block |
| <b>IC</b>  | $\pm 2.5$ ppm                     | $\pm 2.5$ ppm                                   |

## Test results

### Frequency stability vs. temperature

|                               | $\vartheta$ / °C | Frequency error (Hz) | Frequency error (ppm) |
|-------------------------------|------------------|----------------------|-----------------------|
| Cellular telephone<br>850 MHz | 50,00            | 27                   | 0,01436               |
|                               | 40,00            | 27                   | 0,01436               |
|                               | 30,00            | 28                   | 0,01489               |
|                               | 20,00            | -17                  | -0,01436              |
|                               | 10,00            | -28                  | -0,01489              |
|                               | 0,00             | -31                  | -0,01649              |
|                               | -10,00           | -29                  | -0,01543              |
|                               | -20,00           | -27                  | -0,01436              |
|                               | -30,00           | -30                  | -0,01596              |

|                 | $\vartheta$ / °C | Frequency error (Hz) | Frequency error (ppm) |
|-----------------|------------------|----------------------|-----------------------|
| PCS<br>1900 MHz | 50,00            | 36                   | 0,04305               |
|                 | 40,00            | 36                   | 0,04305               |
|                 | 30,00            | 37                   | 0,04425               |
|                 | 20,00            | 34                   | 0,04066               |
|                 | 10,00            | 32                   | 0,03827               |
|                 | 0,00             | 33                   | 0,03946               |
|                 | -10,00           | 31                   | 0,03707               |
|                 | -20,00           | 32                   | 0,03827               |
|                 | -30,00           | 27                   | 0,03229               |

### Frequency stability vs. voltage

|                               | $U_B$ / V | Frequency error (Hz) | Frequency error (ppm) |
|-------------------------------|-----------|----------------------|-----------------------|
| Cellular telephone<br>850 MHz | 3,70      | 34                   | 0,04066               |
|                               | 3,50      | 37                   | 0,04425               |
|                               | 3,30      | 36                   | 0,04305               |

|                 | $U_B$ / V | Frequency error (Hz) | Frequency error (ppm) |
|-----------------|-----------|----------------------|-----------------------|
| PCS<br>1900 MHz | 3,70      | -27                  | -0,01436              |
|                 | 3,50      | -29                  | -0,01543              |

### Test equipment:

ETS 0251, ETS 0416, ETS 0484

### 3.5 Spurious emission conducted (antenna terminal)

#### Reference

|            | <b>Cellular Telephone 850 MHz</b>              | <b>PCS 1900 MHz</b>                            |
|------------|------------------------------------------------|------------------------------------------------|
| <b>FCC</b> | CFR part 22.917, 2.1051                        | CFR part 24.238, 2.1051                        |
| <b>IC</b>  | RSS-132 Issue 2, §4.5<br>RSS-Gen Issue 1, §4.7 | RSS-133 Issue 3, §4.4<br>RSS-Gen Issue 1, §4.7 |

#### Method of measurement

The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission. The magnitude of spurious emission which are attenuated more than 20 dB below the permissible value need not be specified. Tests are performed for lowest, middle and highest transmitter block frequency.

#### Limits

|            | <b>Cellular telephone 850 MHz</b>     | <b>PCS 1900 MHz</b>                   |
|------------|---------------------------------------|---------------------------------------|
| <b>FCC</b> | $P_c - (43 + 10 \log (P) \text{ dB})$ | $P_c - (43 + 10 \log (P) \text{ dB})$ |
| <b>IC</b>  | $P_c - (43 + 10 \log (P) \text{ dB})$ | $P_c - (43 + 10 \log (P) \text{ dB})$ |

**Test results**

|                                           | Harmonic | TCX<br>128<br>[MHz] | Level<br>[dBm] | TCX<br>188<br>[MHz] | Level<br>[dBm] | TCX<br>251<br>[MHz] | Level<br>[dBm] |
|-------------------------------------------|----------|---------------------|----------------|---------------------|----------------|---------------------|----------------|
| <b>Cellular<br/>telephone<br/>850 MHz</b> | 1        | --                  | --             | --                  | --             | --                  | --             |
|                                           | 2        | --                  | --             | --                  | --             | --                  | --             |
|                                           | 3        | --                  | --             | --                  | --             | --                  | --             |
|                                           | 4        | --                  | --             | --                  | --             | --                  | --             |
|                                           | 5        | --                  | --             | --                  | --             | --                  | --             |
|                                           | 6        | --                  | --             | --                  | --             | --                  | --             |
|                                           | 7        | --                  | --             | --                  | --             | --                  | --             |
|                                           | 8        | --                  | --             | --                  | --             | --                  | --             |
|                                           | 9        | --                  | --             | --                  | --             | --                  | --             |
|                                           | 10       | --                  | --             | --                  | --             | --                  | --             |

|                         | Harmonic | TCX<br>512<br>[MHz] | Level<br>[dBm] | TCX<br>661<br>[MHz] | Level<br>[dBm] | TCX<br>810<br>[MHz] | Level<br>[dBm] |
|-------------------------|----------|---------------------|----------------|---------------------|----------------|---------------------|----------------|
| <b>PCS<br/>1900 MHz</b> | 1        | --                  | --             | --                  | --             | --                  | --             |
|                         | 2        | --                  | --             | --                  | --             | --                  | --             |
|                         | 3        | --                  | --             | --                  | --             | --                  | --             |
|                         | 4        | --                  | --             | --                  | --             | --                  | --             |
|                         | 5        | --                  | --             | --                  | --             | --                  | --             |
|                         | 6        | --                  | --             | --                  | --             | --                  | --             |
|                         | 7        | --                  | --             | --                  | --             | --                  | --             |
|                         | 8        | --                  | --             | --                  | --             | --                  | --             |
|                         | 9        | --                  | --             | --                  | --             | --                  | --             |
|                         | 10       | --                  | --             | --                  | --             | --                  | --             |

See attached diagrams

**Test equipment:**

ETS 0375, ETS 0376, ETS 0377, ETS 0378, ETS 0379, ETS 0380, ETS 0382, ETS 0383,  
ETS 0384, ETS 0385, ETS 0386, ETS 0390, ETS 0394, ETS 0473

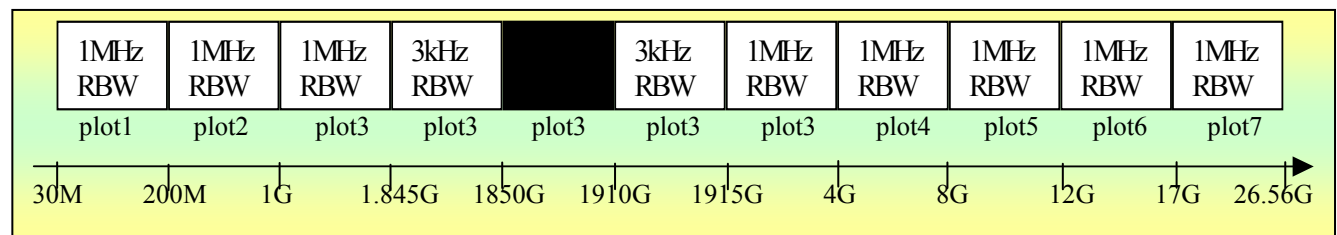
### 3.6 Spurious emission radiated

#### Reference

|            | Cellular telephone 850 MHz                     | PCS 1900 MHz                                   |
|------------|------------------------------------------------|------------------------------------------------|
| <b>FCC</b> | CFR part 22.917, 2.1053                        | CFR part 24.238, 2.1053                        |
| <b>IC</b>  | RSS-132 Issue 2, §4.5<br>RSS-Gen Issue 1, §4.7 | RSS-133 Issue 3, §4.4<br>RSS-Gen Issue 1, §4.7 |

#### Method of measurement

The EUT was positioned on a non-conductive turntable, 0.8m above the ground plane. The radiated emission at the fundamental frequency was measured at 3 m distance with a test antenna and spectrum analyzer.



Worst case emission was recorded with the rotation of the turntable and the raising and lowering of the test antenna.

ERP was measured using a substitution method. The EUT was replaced by horn antenna connected to a signal generator.

The frequency range up to tenth harmonic was investigated.

The tests of spurious radiated emission have been carried out with the EKS-Software from Rohde & Schwarz.

The analyzer gives automatic the measurements of spectral plots to the EKS software.

In the 1<sup>st</sup> 1 MHz band outside the band edge nearest the channel of interest a 3 kHz res. BW is used. The measurements from 30 MHz to 1845 GHz and 1915 GHz to 26.56 GHz were performed with a measurement bandwidth of 1 MHz.

Calculation of test results:

Such factors like antenna correction, cable loss, external attenuation etc. are already included in the provided measurement results. This is done by using validated test software and calibrated test system according the accreditation requirements.

The peak and average spurious emission plots was measured with the average limits.  
In the Table being listed the critical peak and average value an exhibit the compliance with the above calculated Limits.

### Limits

|            | <b>Cellular telephone 850 MHz</b>     | <b>PCS 1900 MHz</b>                   |
|------------|---------------------------------------|---------------------------------------|
| <b>FCC</b> | $P_c - (43 + 10 \log (P) \text{ dB})$ | $P_c - (43 + 10 \log (P) \text{ dB})$ |
| <b>IC</b>  | $P_c - (43 + 10 \log (P) \text{ dB})$ | $P_c - (43 + 10 \log (P) \text{ dB})$ |

### Test results

|                                   | <b>Frequency channel</b> | <b>Frequency marker indication [MHz]</b> | <b>Worst case emission level [dBm]</b> | <b>Compliance limit [dBm]</b> | <b>Results</b> |
|-----------------------------------|--------------------------|------------------------------------------|----------------------------------------|-------------------------------|----------------|
| <b>Cellular telephone 850 MHz</b> | 128                      | 46,693                                   | -30,43                                 | -13                           | -17,43         |
|                                   |                          | 54,870                                   | -35,29                                 | -13                           | -22,29         |
|                                   |                          | 823,990                                  | -25,21                                 | -13                           | -12,21         |
|                                   |                          | 823,990                                  | -20,48                                 | -13                           | -7,48          |
|                                   |                          | 3.904,000                                | -29,39                                 | -13                           | -16,39         |
|                                   |                          | 1.649,000                                | -27,12                                 | -13                           | -14,12         |
|                                   |                          | 7.527,000                                | -42,51                                 | -13                           | -29,51         |
|                                   |                          | 8.000,000                                | -39,92                                 | -13                           | -26,92         |
|                                   |                          | 11.992,000                               | -37,43                                 | -13                           | -24,43         |
|                                   |                          | 10.709,000                               | -35,33                                 | -13                           | -22,33         |

See attached diagrams

|                                   | Frequency channel | Frequency marker indication [MHz] | Worst case emission level [dBm] | Compliance limit [dBm] | Results |
|-----------------------------------|-------------------|-----------------------------------|---------------------------------|------------------------|---------|
| <b>Cellular telephone 850 MHz</b> | 188               | 47,034                            | -30,87                          | -13                    | -17,87  |
|                                   |                   | 53,848                            | -35,17                          | -13                    | -22,17  |
|                                   |                   | 875,944                           | -40,24                          | -13                    | -27,24  |
|                                   |                   | 868,337                           | -27,94                          | -13                    | -14,94  |
|                                   |                   | 1.673,000                         | -27,69                          | -13                    | -14,69  |
|                                   |                   | 1.673,000                         | -18,75                          | -13                    | -5,75   |
|                                   |                   | 7.992,000                         | -43,05                          | -13                    | -30,05  |
|                                   |                   | 8.000,000                         | -39,77                          | -13                    | -26,77  |
|                                   |                   | 11.992,000                        | -37,44                          | -13                    | -24,44  |
|                                   |                   | 10.782,000                        | -35,19                          | -13                    | -22,19  |

|                                   | Frequency channel | Frequency marker indication [MHz] | Worst case emission level [dBm] | Compliance limit [dBm] | Results |
|-----------------------------------|-------------------|-----------------------------------|---------------------------------|------------------------|---------|
| <b>Cellular telephone 850 MHz</b> | 251               | 46,353                            | -30,65                          | -13                    | -17,87  |
|                                   |                   | 54,529                            | -34,96                          | -13                    | -21,96  |
|                                   |                   | 849,020                           | -26,07                          | -13                    | -13,07  |
|                                   |                   | 849,020                           | -21,86                          | -13                    | -8,86   |
|                                   |                   | 1.697,000                         | -28,91                          | -13                    | -15,91  |
|                                   |                   | 1.697,000                         | -22,38                          | -13                    | -9,38   |
|                                   |                   | 7.527,000                         | -42,86                          | -13                    | -29,86  |
|                                   |                   | 8.000,000                         | -39,39                          | -13                    | -26,39  |
|                                   |                   | 10.782,000                        | -38,01                          | -13                    | -25,01  |
|                                   |                   | 10.685,000                        | -34,84                          | -13                    | -21,84  |

See attached diagrams

|                         | Frequency channel | Frequency marker indication [MHz] | Worst case emission level [dBm] | Compliance limit [dBm] | Results |
|-------------------------|-------------------|-----------------------------------|---------------------------------|------------------------|---------|
| <b>PCS<br/>1900 MHz</b> | 512               | 60,321                            | -59,72                          | -13                    | -46,72  |
|                         |                   | 31,703                            | -59,81                          | -13                    | -46,81  |
|                         |                   | 272,144                           | -41,89                          | -13                    | -28,89  |
|                         |                   | 272,144                           | -44,19                          | -13                    | -31,19  |
|                         |                   | 3.967,000                         | -29,68                          | -13                    | -16,68  |
|                         |                   | 1,85                              | -27,49                          | -13                    | -14,49  |
|                         |                   | 5.547,000                         | -37,53                          | -13                    | -24,53  |
|                         |                   | 5.547,000                         | -38,44                          | -13                    | -25,44  |
|                         |                   | 10.196,000                        | -37,88                          | -13                    | -24,88  |
|                         |                   | 10.709,000                        | -37,36                          | -13                    | -24,36  |
|                         |                   | 17.916,000                        | -27,56                          | -13                    | -14,56  |
|                         |                   | 17.808,000                        | -27,99                          | -13                    | -14,99  |
|                         |                   | 18.511,000                        | -32,35                          | -13                    | -19,35  |
|                         |                   | 18.903,000                        | -32,51                          | -13                    | -19,51  |

|                         | Frequency channel | Frequency marker indication [MHz] | Worst case emission level [dBm] | Compliance limit [dBm] | Results |
|-------------------------|-------------------|-----------------------------------|---------------------------------|------------------------|---------|
| <b>PCS<br/>1900 MHz</b> | 661               | 61,683                            | -56,25                          | -13                    | -43,25  |
|                         |                   | 60,661                            | -57,92                          | -13                    | -44,92  |
|                         |                   | 273,747                           | -41,18                          | -13                    | -28,18  |
|                         |                   | 216,032                           | -43,82                          | -13                    | -30,82  |
|                         |                   | 1.944,000                         | -29,21                          | -13                    | -16,21  |
|                         |                   | 3.933,000                         | -29,23                          | -13                    | -16,23  |
|                         |                   | 5.643,000                         | -40,17                          | -13                    | -27,17  |
|                         |                   | 5.643,000                         | -39,35                          | -13                    | -26,35  |
|                         |                   | 10,758                            | -38,15                          | -13                    | -25,15  |
|                         |                   | 10,83                             | -37,38                          | -13                    | -24,38  |
|                         |                   | 17.892,000                        | -28,04                          | -13                    | -15,04  |
|                         |                   | 17,88                             | -27,64                          | -13                    | -14,64  |
|                         |                   | 18.426,000                        | -32,25                          | -13                    | -19,25  |
|                         |                   | 18.443,000                        | -32,55                          | -13                    | -19,55  |

See attached diagrams

|                         | Frequency channel | Frequency marker indication [MHz] | Worst case emission level [dBm] | Compliance limit [dBm] | Results |
|-------------------------|-------------------|-----------------------------------|---------------------------------|------------------------|---------|
| <b>PCS<br/>1900 MHz</b> | <b>810</b>        | 60,661                            | -55,18                          | -13                    | -42,18  |
|                         |                   | 58,958                            | -57,32                          | -13                    | -44,32  |
|                         |                   | 272,144                           | -41,29                          | -13                    | -28,29  |
|                         |                   | 224,048                           | -44,19                          | -13                    | -31,19  |
|                         |                   | 1.944,000                         | -27,66                          | -13                    | -14,66  |
|                         |                   | 1,91                              | -26,51                          | -13                    | -13,51  |
|                         |                   | 5.731,000                         | -38,55                          | -13                    | -25,55  |
|                         |                   | 7.976,000                         | -41,19                          | -13                    | -28,19  |
|                         |                   | 11.118,000                        | -37,26                          | -13                    | -24,26  |
|                         |                   | 10.741,000                        | -36,9                           | -13                    | -23,9   |
|                         |                   | 17.904,000                        | -27,52                          | -13                    | -14,52  |
|                         |                   | 17.868,000                        | -27,28                          | -13                    | -14,28  |
|                         |                   | 18.903,000                        | -32,78                          | -13                    | -19,78  |
|                         |                   | 18.477,000                        | -32,85                          | -13                    | -19,85  |

See attached diagrams

### Test equipment:

ETS 0014, ETS 0294, ETS 0295, ETS 0310, ETS 0416, ETS 0484

### 3.7 Block edge compliance

#### Reference

|            | <b>Cellular telephone 850 MHz</b> | <b>PCS 1900 MHz</b>   |
|------------|-----------------------------------|-----------------------|
| <b>FCC</b> | CFR part 22.917(b)                | CFR part 24.238(b)    |
| <b>IC</b>  | RSS-132 Issue 2, §4.5.1.1         | RSS-133 Issue 3, §4.4 |

#### Method of measurement

In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth.

#### Limits

|            | <b>Cellular telephone 850 MHz</b>     | <b>PCS 1900 MHz</b>                   |
|------------|---------------------------------------|---------------------------------------|
| <b>FCC</b> | $P_c - (43 + 10 \log (P) \text{ dB})$ | $P_c - (43 + 10 \log (P) \text{ dB})$ |
| <b>IC</b>  | $P_c - (43 + 10 \log (P) \text{ dB})$ | $P_c - (43 + 10 \log (P) \text{ dB})$ |

## Test results

|                               | Frequency<br>channel | RBW<br>kHz | Worst case<br>emission level<br>dBm |
|-------------------------------|----------------------|------------|-------------------------------------|
| Cellular telephone<br>850 MHz | 128                  | 3 kHz      | 32.41                               |
|                               | 251                  | 3 kHz      | 32.77                               |
| PCS<br>1900 MHz               | 512                  | 3 kHz      | 30.06                               |
|                               | 810                  | 3 kHz      | 29.70                               |

See attached diagrams

## Test equipment:

ETS 0413, ETS 0416, ETS 0484

### 3.8 AC power line conducted emissions

#### Reference

|            | <b>Cellular telephone 850 MHz</b> | <b>PCS 1900 MHz</b> |
|------------|-----------------------------------|---------------------|
| <b>FCC</b> | CFR part 15.207                   | CFR part 15.207     |
| <b>IC</b>  | Not applicable                    | Not applicable      |

#### Method of measurement

For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits. Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminals.

This measurement was transact first with instrumentation using an average and peak detector and a 10 kHz bandwidth. If the peak detector achieves a calculated level, the measurement is repeated by an instrumentation using a quasi-peak detector.

#### Limits

|            | <b>Cellular telephone 850 MHz</b> | <b>PCS 1900 MHz</b>                   |         |
|------------|-----------------------------------|---------------------------------------|---------|
|            | Frequency of emission<br>[MHz]    | Conducted limit field strength [dBμV] |         |
|            |                                   | Quasi Peak                            | Average |
| <b>FCC</b> | 0.15 – 0.5                        | 66 to 56                              | 56 - 46 |
|            | 0.5 – 5                           | 56                                    | 46      |
|            | 5 – 30                            | 60                                    | 50      |
| <b>IC</b>  | Not applicable                    |                                       |         |

## Test results

|                                           | Frequency<br>marker indication<br>[MHz] | Detector | Worst case<br>emission level<br>[dBm] | Compliance<br>limit<br>[dBm] | Result<br>[dBm] |
|-------------------------------------------|-----------------------------------------|----------|---------------------------------------|------------------------------|-----------------|
| <b>Cellular<br/>telephone<br/>850 MHz</b> | --                                      | --       | --                                    | --                           | --              |
|                                           | --                                      | --       | --                                    | --                           | --              |
|                                           | --                                      | --       | --                                    | --                           | --              |
|                                           | --                                      | --       | --                                    | --                           | --              |
|                                           | --                                      | --       | --                                    | --                           | --              |
|                                           | --                                      | --       | --                                    | --                           | --              |
|                                           | --                                      | --       | --                                    | --                           | --              |
|                                           | --                                      | --       | --                                    | --                           | --              |
|                                           | --                                      | --       | --                                    | --                           | --              |
|                                           | --                                      | --       | --                                    | --                           | --              |
|                                           | --                                      | --       | --                                    | --                           | --              |

|                         | Frequency<br>marker indication<br>[MHz] | Detector | Worst case<br>emission level<br>[dBm] | Compliance<br>limit<br>[dBm] | Result<br>[dBm] |
|-------------------------|-----------------------------------------|----------|---------------------------------------|------------------------------|-----------------|
| <b>PCS<br/>1900 MHz</b> | --                                      | --       | --                                    | --                           | --              |
|                         | --                                      | --       | --                                    | --                           | --              |
|                         | --                                      | --       | --                                    | --                           | --              |
|                         | --                                      | --       | --                                    | --                           | --              |
|                         | --                                      | --       | --                                    | --                           | --              |
|                         | --                                      | --       | --                                    | --                           | --              |
|                         | --                                      | --       | --                                    | --                           | --              |
|                         | --                                      | --       | --                                    | --                           | --              |
|                         | --                                      | --       | --                                    | --                           | --              |
|                         | --                                      | --       | --                                    | --                           | --              |
|                         | --                                      | --       | --                                    | --                           | --              |

Comment: Not tested.

**Test equipment:**

ETS 0059, ETS 0085, ETS 0288, ETS 0476

## 4 Receiver parameters

### 4.1 Radiated emissions

#### Reference

|            | <b>Cellular telephone 850 MHz</b>             | <b>PCS 1900 MHz</b>                            |
|------------|-----------------------------------------------|------------------------------------------------|
| <b>FCC</b> | CFR part 15.109, 2.1053                       | CFR part 15.109, 2.1053                        |
| <b>IC</b>  | RSS-132 Issue 2, 4.6<br>RSS-Gen Issue 1, §4.8 | RSS-133 Issue 3, §4.5<br>RSS-Gen Issue 1, §4.8 |

#### Method of measurement

The receiver shall be operated in the normal receive mode near the mid-point of the band(s) over which the receiver is designed to operate.

The measurement method is the radiated emission measurement. The measurement starts at 30 MHz and ends at least 3 times the highest tunable local oscillator frequency (6 GHz).

#### Limits

|            | <b>Cellular telephone 850 MHz</b> | <b>PCS 1900 MHz</b>                       |
|------------|-----------------------------------|-------------------------------------------|
|            | Spurious frequency<br>[MHz]       | Field strength<br>microvolt/m at 3 meters |
| <b>FCC</b> | 30 – 88                           | 100                                       |
|            | 88 – 216                          | 150                                       |
|            | 216 – 960                         | 200                                       |
|            | above 960                         | 500                                       |
| <b>IC</b>  | Not applicable                    |                                           |

## Test Results

|                                           | Frequency<br>marker indication<br>[MHz] | Antenna<br>polarization | Worst case<br>emission level<br>[dBm] | Compliance<br>limit<br>[dBm] | Results<br>[dBm] |
|-------------------------------------------|-----------------------------------------|-------------------------|---------------------------------------|------------------------------|------------------|
| <b>Cellular<br/>telephone<br/>850 MHz</b> | 190.802                                 | Vertical                | 29.85                                 | 150                          | -120.15          |
|                                           | 190.461                                 | Horizontal              | 30.80                                 | 150                          | -119.20          |
|                                           | 876.553                                 | Vertical                | 28.77                                 | 200                          | -171.23          |
|                                           | 979.158                                 | Horizontal              | 11.10                                 | 500                          | -488.90          |
|                                           | [GHz]                                   |                         |                                       |                              |                  |
|                                           | 3.844                                   | Vertical                | 224.91                                | 500                          | -275.09          |
|                                           | 3.946                                   | Horizontal              | 234.15                                | 500                          | -265.85          |
|                                           | 7.455                                   | Vertical                | 183.45                                | 500                          | 316.55           |
|                                           | 7.303                                   | Horizontal              | 182.35                                | 500                          | -317.65          |
|                                           | 11.912                                  | Vertical                | 161.25                                | 500                          | -338.75          |
|                                           | 11.888                                  | Horizontal              | 149.80                                | 500                          | -350.20          |
|                                           | 14.275                                  | Vertical                | 269.77                                | 500                          | -230.23          |
|                                           | 15.066                                  | Horizontal              | 236.87                                | 500                          | -263.13          |

|                         | Frequency<br>marker indication<br>[MHz] | Antenna<br>polarization | Worst case<br>emission level<br>[μV/m] | Compliance<br>limit<br>[μV/m] | Results<br>[μV/m] |
|-------------------------|-----------------------------------------|-------------------------|----------------------------------------|-------------------------------|-------------------|
| <b>PCS<br/>1900 MHz</b> | 119.940                                 | Vertical                | 33.24                                  | 150                           | -116.76           |
|                         | 189.780                                 | Horizontal              | 31.74                                  | 150                           | -118.26           |
|                         | 395.591                                 | Vertical                | 27.06                                  | 200                           | -172.94           |
|                         | 615.230                                 | Horizontal              | 25.00                                  | 200                           | -175              |
|                         | [GHz]                                   |                         |                                        |                               |                   |
|                         | 3.868                                   | Vertical                | 50.30                                  | 500                           | -449.70           |
|                         | 3.952                                   | Horizontal              | 50.58                                  | 500                           | -449.42           |
|                         | 7.992                                   | Vertical                | 47.65                                  | 500                           | -452.35           |
|                         | 7.800                                   | Horizontal              | 47.40                                  | 500                           | -452.60           |
|                         | 11.984                                  | Vertical                | 46.46                                  | 500                           | -453.54           |
|                         | 11.944                                  | Horizontal              | 46.76                                  | 500                           | -453.24           |
|                         | 14.224                                  | Vertical                | 50.72                                  | 500                           | -449.28           |
|                         | 14.265                                  | Horizontal              | 50.61                                  | 500                           | -449.39           |

See attached diagrams

### Test equipment:

ETS 0014, ETS 0294, ETS 0295, ETS 0310, ETS 0416, ETS 0484

## **Appendix**

- A Pictures
- B RF power output conducted
- C RF power output radiated
- D Occupied bandwidth, emission bandwidth
- E Frequency stability
- F Spurious emission conducted (antenna terminal)
- G Spurious emission radiated
- H Block edge compliance
- I AC power line conducted emissions
- J Receiver radiated emissions