



ETS  
PRODUCT SERVICE AG

# TEST - REPORT

**FCC RULES PARTS 15.247  
IC RADIO STANDARDS RSS-210 Annex 8**

**FCC ID: JYCS100**

**Model Name: S100**

**Test report no.: G5M206100081-P-15**



**Certificate 1983.01**

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## 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.

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#### Tester:

16.11.2006

M. Handrik



Date

ETS-Lab.

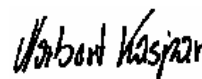
Name

Signature

#### Technical responsibility for area of testing:

16.11.2006

N. Kaspar



Date

ETS

Name

Signature

## **1.2 Testing laboratory**

### **1.2.1 Location**

ETS PRODUCT SERVICE AG (ETS)  
Storkower Straße 38c  
D-15526 Reichenwalde b. Berlin  
Germany  
Telephone : +49 33631 888 00  
Telefax : +49 33631 888 660

### **1.2.2 Details of accreditation status**

#### **ACCREDITED TESTING LABORATORY**

DAR-REGISTRATION NUMBER: DAT-P-201/96

#### **ACCREDITED COMPETENT BODY**

DAR-REGISTRATION NUMBER: BNETZA-zS-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 : Pantech Co., Ltd.  
 Street : Shinsong Center Bldg., 25-12, Yeouido-dong  
 Town : 150-711 Yeoungdeungpo-gu, Seoul  
 Country : Korea  
 Telephone : +82-2-3660-5862  
  
 Contact : Mr. B.W. Kim  
 E-Mail : bwkim@pantech.co.kr

### 1.4 Application details

Date of receipt of application : 09.11.2006  
 Date of receipt of test item : 09.11.2006  
 Date of test : 17.11.2006- 14.11.2006

### 1.5 Test item

Description of test item : Triple Band GSM 850/ DCS 1800/ PCS 1900 (with WAP & GPRS)  
  
 Type identification : S100  
  
 Serial number : without  
  
 Photos : See annex A.

#### Technical data

Frequency band : 2.4 - 2.4835 GHz  
 Frequency Ch A : 2402 MHz  
 Frequency Ch B : 2441 MHz  
 Frequency Ch C : 2480 MHz

| <b><u>Transmitter</u></b> | <b><u>Vnom</u></b>    | <b><u>Vnom -15 %</u></b> | <b><u>Vnom +15 %</u></b> |
|---------------------------|-----------------------|--------------------------|--------------------------|
| <b>Power (ch A)</b>       | : Conducted: 2.39 dBm | Conducted: 2.41 dBm      | Conducted: 2.43 dBm      |
| <b>Power (ch B)</b>       | : Conducted: 0.04 dBm | Conducted: 0.04 dBm      | Conducted: 0.03 dBm      |
| <b>Power (ch C)</b>       | : Conducted: 2.85 dBm | Conducted: 2.84 dBm      | Conducted: 2.85 dBm      |

Antenna Type : internal antenna  
Antenna Gain : -5 dBi  
Power supply : 4.0 V DC  
Operating mode : duplex  
Type of modulation : FHSS  
Host device : none

Classification :

|                                               |                                     |
|-----------------------------------------------|-------------------------------------|
| Fixed Device                                  | <input type="checkbox"/>            |
| Mobile Device (Human Body distance > 20 cm)   | <input type="checkbox"/>            |
| Portable Device (Human Body distance < 20 cm) | <input checked="" type="checkbox"/> |

**Manufacturer:**  
(if applicable)

Name : Pantech Co., Ltd.  
Street : Shinsong Center Bldg., 25-12, Yeouido-dong  
Town : 150-711 Yeoungdeungpo-gu, Seoul  
Country : Korea

Additional information: The test sample is designed as Bluetooth device. Its pseudorandom hopping scheme, authentication, receiver parameters, synchronization procedure and other parameters are determined by Bluetooth Core Specification.

According to attached declaration of manufacturer this device don't work in master inquiry mode.  
So we have only one frequency hopping system and the hopping sequence of the master inquiry mode is not verified.

## 1.6 Test standards

Technical standard: FCC Parts: 15.247  
IC Standards: RSS 210 Issue 6 Annex 8.1

## 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

Details of power supply : 4.0 V DC

Extreme conditions parameters: : test voltage - extreme    min.: 3.6 V DC ( $V_{nom} - 15\%$ )  
max: 4.2 V DC ( $V_{nom} + 15\%$ )

## 2.3 Test equipment utilized

| No.      | Test equipment                 | Type                  | Manufacturer       |
|----------|--------------------------------|-----------------------|--------------------|
| ETS 0001 | ESD Gun                        | SESD 30000            | Schlöder           |
| ETS 0002 | Test receiver                  | ESVP                  | R & S              |
| ETS 0003 | Diode Power Sensor             | NRV-Z2                | R & S              |
| ETS 0004 | Spektrum- and Network-Analyzer | FSMS 26               | R & S              |
| ETS 0005 | RF amplifier matrix            | RSU-ETS-CTR6          | ETS                |
| ETS 0006 | HP-Filter                      | H1G04G01              | Microwave          |
| ETS 0007 | Horn antenna                   | AT 4004               | ar                 |
| ETS 0008 | Antenna                        | Loop antenna          | Siemens            |
| ETS 0009 | Comb Generator Emitter         | CGE 02                | York EMC Services  |
| ETS 0011 | Antenna (van Veen/Frame)       | HM020Z3               | R & S              |
| ETS 0012 | Biconical Antenna              | HK 116                | R & S              |
| ETS 0013 | LPD Antenna                    | HL 223                | R & S              |
| ETS 0014 | Log Periodical Antenna         | HL 025                | R & S              |
| ETS 0015 | Log Periodical Antenna         | HL 025                | R & S              |
| 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 0020 | Antenna                        | DP 21                 | MEB                |
| ETS 0021 | Antenna                        | DP 3                  | MEB                |
| ETS 0022 | Antenna                        | SAS-200/ 521          | A.H. Systeme+D65   |
| ETS 0023 | Antenna                        | DP 1                  | MEB                |
| ETS 0024 | Antenna mast                   | AF 2                  | MEB                |
| ETS 0025 | Antenna mast                   | AF 2                  | MEB                |
| ETS 0026 | Tripod                         |                       | Heinrich Deisel    |
| ETS 0027 | Tripod                         |                       | Heinrich Deisel    |
| ETS 0028 | Tripod                         | STA 2                 | C. Lorenz AG       |
| ETS 0029 | Tripod                         |                       | Berlebach          |
| ETS 0030 | Biconical Antenna              | HK 116                | R & S              |
| ETS 0031 | Turn table                     | DS 412                | Heinrich Deisel    |
| ETS 0032 | Controller                     | HD 050                | Heinrich Deisel    |
| ETS 0033 | Calibr. Set CDN                | 3x Adaptor 50-150 Ohm | ETS                |
| ETS 0034 | RF Generator/ Amplifier        | SMLR                  | R & S              |
| ETS 0035 | RF Generator/ Amplifier        | SMLM                  | R & S              |
| 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                | R & S              |
| ETS 0040 | Artificial Mains Network       | ESH3-Z5               | R & S              |
| ETS 0041 | T-Artificial Mains Network     | ESH3-Z4               | R & S              |

| No.       | Test equipment                   | Type            | Manufacturer          |
|-----------|----------------------------------|-----------------|-----------------------|
| ETS 0042  | Artificial Mains                 | ESH3-Z6         | R & S                 |
| ETS 0043  | Directional Coupler              | 1850            | KRYTAR                |
| ETS 0046  | Power supply                     | 2224.7          | Statron               |
| ETS 0047  | Power supply                     | 2224.7          | Statron               |
| ETS 0048  | Power supply                     | 2224.7          | Statron               |
| ETS 0049  | Power supply                     | 2228.1          | Statron               |
| ETS 0050  | Power supply                     | 2224.2          | Statron               |
| ETS 0051  | Oscilloscope                     | TDS 640A        | Tektronix             |
| ETS 0051a | Probe a                          | P6139A          | Tektronix             |
| ETS 0051b | Probe b                          | P6139A          | Tektronix             |
| ETS 0052  | Audio analyzer                   | UPA 4           | R & S                 |
| ETS 0056  | Ultra Compact Simulator          | UCS 500 M4      | EM Test               |
| ETS 0057  | Motor Variac                     | MV 2616         | EM Test               |
| ETS 0058  | Capacitive coupling clamp        | E 502 B         | Keytek/ EMC           |
| ETS 0059  | Kikusui amplifier                | PCR 2000L       | Keytek/ EMC           |
| ETS 0064  | CDN IEC 61000-4-6                |                 | Keytek/ EMC           |
| ETS 0066  | EM Injection Clamp               |                 | FCC/ EMC              |
| ETS 0067  | Calibration Fixture              | IEC 801-2031 CF | FCC/ EMC              |
| ETS 0068  | CDN IEC 1000-4-6                 | CDN             | FCC/ EMC              |
| ETS 0069  | EM Radiation Monitor             | EMR-20          | W & G                 |
| ETS 0070  | PC Transfer set EMR-20           | EMR-20          | W & G                 |
| ETS 0071  | Video camera system              | KMB012          | Kocom                 |
| ETS 0072  | Interphone system                | JS-1400         | Jiuh Sheng            |
| ETS 0073  | Audio noise meter                | GSM 2           | MKD/ RFT              |
| ETS 0075  | NF Generator                     | GF 22           | Präcitronic           |
| ETS 0076  | Feeding bridge A                 | SBA 1000        | ESP                   |
| ETS 0078  | LCR meter                        | SR 720          | SRS                   |
| ETS 0079  | Functional Generator             | MX-2020         | Maxcom                |
| ETS 0082  | PC Novell network system         | Novell          | Esotronic             |
| ETS 0085  | Shielded room                    | SR 1            | Frankonia             |
| ETS 0086  | Semi-Anechoic chamber            | AC 1            | Frankonia             |
| ETS 0087  | Climatic cell                    | HC 4033         | Heraeus               |
| ETS 0088  | Color TV pattern Generator       | PM 5518-TX VPS  | Philips               |
| ETS 0089  | Radio Communication tester       | CMS 54          | R & S                 |
| ETS 0091  | Signal Generator                 | SME 03          | R & S                 |
| ETS 0092  | Power Amplifier                  | 150W1000        | AR Amplifier Research |
| ETS 0093  | Attenuator                       | 57-20-33        | Weinschel             |
| ETS 0094  | Power Sensor                     | NRV-Z55         | R & S                 |
| ETS 0095  | DECT system controller           | PSMD            | R & S                 |
| ETS 0096  | DECT Signaling unit              | PSMD-B11        | R & S                 |
| ETS 0097  | Rack, 19", 36 HU                 | TS 89RA         | R & S                 |
| ETS 0098  | System engineering and software  | CS 893BE        | R & S                 |
| ETS 0099  | Extension unit for basic version | TS 8930B        | R & S                 |
| ETS 0100  | Signal Generator                 | SME-06          | R & S                 |
| ETS 0101  | Power Amplifier                  | 50W1000B        | AR Amplifier Research |
| ETS 0102  | CDN                              | M3-801/6        | MEB                   |

| No.      | Test equipment                                        | Type                    | Manufacturer       |
|----------|-------------------------------------------------------|-------------------------|--------------------|
| ETS 0103 | Magnetic field test set                               | MF1000                  | EMC-Partner        |
| ETS 0105 | RF Signal Generator (High power synthesizer/ sweeper) | SMP 02<br>(SMP 22 / 02) | R & S              |
| ETS 0106 | Antenna                                               | Vamp 9243               | Schwarzbeck        |
| ETS 0108 | DECT protocol tester TBR 22                           | TS 1220                 | R & S              |
| ETS 0110 | Real time Signaling unit                              | PSMD-B2                 | R & S              |
| ETS 0111 | PCM Real-time audio interface for PSM                 | PSMD-B3                 | R & S              |
| ETS 0112 | Synthesizer Module                                    | PSMD-B4                 | R & S              |
| ETS 0114 | RF step attenuator                                    | RSG                     | R & S              |
| ETS 0116 | Protokolltester                                       | PTW 70                  | R & S              |
| ETS 0117 | Insertion unit                                        | URV5-Z2                 | R & S              |
| ETS 0120 | RF step attenuator                                    | TRI-50-20               | INCO               |
| ETS 0123 | RF attenuator                                         | RBU                     | R & S              |
| ETS 0124 | Tripod                                                | STA 2                   | R & S              |
| ETS 0136 | Attenuator                                            | 33-6-34                 | Weinschel          |
| ETS 0140 | High voltage Generator                                | IP 6Wa                  | TPW                |
| ETS 0141 | Sliding bridge                                        | J 573                   | RFT                |
| ETS 0143 | Impedance converter                                   | TK 12                   | RFT                |
| ETS 0144 | Notch filter                                          | WRCT 24000/2497-80-20SS | Wainwright         |
| ETS 0145 | Coaxial Directional                                   | 3002-20                 | Narda              |
| ETS 0146 | Active Voltage Probe                                  | ESH2-Z2                 | R & S              |
| ETS 0148 | RF Current Probe                                      | F-65                    | FCC                |
| ETS 0149 | Power divider                                         | ZAPD-21                 | MCL                |
| ETS 0150 | Switcher                                              | HR07-720                | Wisi               |
| ETS 0151 | Interference pulse Generator                          | NSG 500C                | Schaffner          |
| ETS 0152 | Simulator for Load-Dump-Impulse                       | NSG 506C (I)            | Schaffner          |
| ETS 0153 | Simulator for Load-Dump-Impulse                       | NSG 506C (II)           | Schaffner          |
| ETS 0155 | Signal Generator                                      | SMG                     | R & S              |
| ETS 0159 | Programmable power supply                             | TOE 8815                | Toellner           |
| ETS 0160 | Amplifier                                             | AR 1W1000               | Amplifier Research |
| ETS 0161 | Harmonic / Flicker Analyzer                           | HFA 3000                | Schlöder           |
| 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 | Sound level calibrator                                | BK 4231                 | Brüel & Kjær       |
| ETS 0167 | Communication Analysis System                         | CAS TE I                | HEAD acoustics     |
| ETS 0168 | Acoustical test for DECT                              | CTR 10                  | HEAD acoustics     |
| ETS 0169 | Measurement - Front-end (analog)                      | 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     |

| No.       | Test equipment                             | Type           | Manufacturer          |
|-----------|--------------------------------------------|----------------|-----------------------|
| ETS 0173  | Speaker                                    | Canton S Pluss | HEAD acoustics        |
| ETS 0174  | Measurement - Front-end line interface     | MFE V          | HEAD acoustics        |
| ETS 0175  | Software Line interface (analog)           | COPTZV5        | HEAD acoustics        |
| ETS 0176  | Acoustic volt meter                        | COP 4          | HEAD acoustics        |
| ETS 0177  | Feeding bridge B                           | SBB 1000       | ESP                   |
| ETS 0178  | Open area test side                        | 10m            | ETS                   |
| ETS 0179  | Open area test side                        | 3 m            | ETS                   |
| ETS 0186  | Power supply                               | DF 1730        | WJG                   |
| ETS 0189  | Spectrum Analyzer                          | FSEB           | R & S                 |
| ETS 0191  | Sweep function Generator                   | 7202           | Dagatron              |
| ETS 0218  | RF probe                                   | URV5-Z7        | R & S                 |
| ETS 0219  | Power sensor                               | NRV-Z2         | R & S                 |
| ETS 0221  | ISDN-S0-Analyzer                           | K1403          | Siemens               |
| ETS 0222  | ISDN Protocol Analyzer                     | TE965          | Tekelec Teleco.       |
| ETS 0223  | GSM/ PCN/ PCS-Simul.                       | TS8916B        | R & S                 |
|           | Radio Channel Simulator                    | SOFI 05        | Sofimation            |
| ETS 0224A | Millivolt meter                            | URV5           | R & S                 |
| ETS 0224B | Diode Power Sensor                         | NRV-Z1         | R & S                 |
| ETS 0224C | Programmable high resolution timer counter | PM6654G        | Philips               |
| ETS 0224D | RF Stepp Attenuator                        | RSP            | R & S                 |
| ETS 0224E | Signal Generator                           | SMG            | R & S                 |
| ETS 0225  | SIM Simulator                              |                | Orga                  |
| ETS 0226  | SIM Editor                                 |                | Orga                  |
| ETS 0227  | Vibration table                            | TIRA vib       | GenRad                |
|           | Accelerator                                | PCB M353B33    | PCB Piezotronics Inc. |
| ETS 0228  | Climatic chamber                           | VT 4010        | Vötsch                |
| ETS 0229  | Radio Communication. Tester                | CMT 54         | R & S                 |
| ETS 0230  | Radio Communication. Tester                | CMD 65         | R & S                 |
| ETS 0232  | Radiation test source                      | VSQ 1          | MEB                   |
| ETS 0233  | Direction coupler                          | RK 100         | MEB                   |
| ETS 0234  | Power meter                                | NRVD           | R & S                 |
| ETS 0235  | RF-network-Analyzer                        | 8752 C         | HP                    |
| ETS 0236  | RF-amplifier                               | 100A100        | ar                    |
| ETS 0237  | RF-amplifier                               | 100W1000M1     | ar                    |
| ETS 0238  | Field strong meter                         | FM 2000        | ar                    |
| ETS 0239  | Isotropic field probe 40 GHz               | FP 2080 Kit    | ar                    |
| ETS 0240  | Isotropic field probe 1 GHz                | FP 2000 Kit    | ar                    |
| ETS 0241  | Pulse Generator                            | 4050           | PicoSecond PL         |
| ETS 0244  | Ultra Compact Simulator                    | UCS 200 M      | EM-Test               |
| ETS 0245  | Load dump Generator                        | LD 200 B1      | EM-Test               |
| ETS 0246  | Voltage drop simulator                     | VDS 200        | EM-Test               |
| ETS 0247  | Calibration adaptor                        | KW50           | EM-Test               |
| ETS 0248  | Calibration adaptor                        | KW1000         | EM-Test               |
| ETS 0251  | Climatic chamber                           | VT 4004        | Vötsch                |
| ETS 0252  | System controller                          | PSM 12         | R & S                 |
| ETS 0253  | Spectrum Analyzer                          | FSIQ 26        | R & S                 |

| No.      | Test equipment        | Type      | Manufacturer |
|----------|-----------------------|-----------|--------------|
| ETS 0254 | RF Generator          | SMIQ 03   | R & S        |
| ETS 0255 | RF Generator          | SMIQ 03   | R & S        |
| ETS 0256 | RF Generator          | SMR 27    | R & S        |
| ETS 0257 | Step attenuator       | RSP       | R & S        |
| ETS 0258 | Rubidium standard     | RSTU      | DATUM GmbH   |
| ETS 0259 | Power meter           | NRVD      | R & S        |
| ETS 0260 | Power sensor          | NRV-Z1    | R & S        |
| ETS 0261 | Power sensor          | NRV-Z1    | R & S        |
| ETS 0262 | Switching unit        | SSCU      | R & S        |
| ETS 0263 | Signaling unit        | PTW 60    | R & S        |
| ETS 0265 | Loop antenna          | HFRA 9150 | Schwarzbeck  |
| ETS 0266 | Messadapter 1:100     | 50 Ohm    |              |
| ETS 0267 | RF Signal Generator   | SMT 03    | R & S        |
| ETS 0268 | Signal Generator      | SMP 02    | R & S        |
| ETS 0269 | RF bridge 50 Ohm      | 86205 A   | Agilent      |
| ETS 0270 | Signal Generator      | SMP 04    | R & S        |
| ETS 0271 | Spectrum Analyzer     | FSEK 30   | R & S        |
| ETS 0272 | Signal Generator      | SME 03    | R & S        |
| ETS 0273 | Signal Generator      | SME 03    | R & S        |
| ETS 0274 | Signal Generator      | SMY 01    | R & S        |
| ETS 0275 | Power sensor          | NRV-Z51   | R & S        |
| ETS 0276 | Audio Analyzer        | UPL 16    | R & S        |
| ETS 0277 | Power sensor          | NRV-Z1    | R & S        |
| ETS 0278 | Power sensor          | NRV-Z31   | R & S        |
| ETS 0279 | Step attenuator       | RSP       | R & S        |
| ETS 0280 | Power meter           | NRVD      | R & S        |
| ETS 0281 | Spectrum Analyzer     | FSM       | R & S        |
| ETS 0282 | RF bridge 75 Ohm      | 86207 A   | HP           |
| ETS 0283 | RF bridge 50 Ohm      | 86205 A   | HP           |
| ETS 0284 | Field probe           | 11940 A   | HP           |
| ETS 0285 | Field probe           | 11941 A   | HP           |
| ETS 0286 | Limithier             | 11867 A   | HP           |
| ETS 0287 | EMI Test receiver     | ESHS10    | R & S        |
| ETS 0288 | Artificial mains      | ESH2-Z5   | R & S        |
| ETS 0289 | Audio Generator       | TAG 101   | Troneer      |
| ETS 0290 | Audio Generator       | TAG 101   | Troneer      |
| ETS 0291 | Loop antenna          | HFH2-Z2   | R & S        |
| ETS 0292 | RF Generator          | SMHU      | R & S        |
| ETS 0293 | Artificial mains      | NNBM 8125 | Schwarzbeck  |
| ETS 0294 | Biconical antenna     | HK 116    | R & S        |
| ETS 0295 | LPD antenna           | HL 223    | R & S        |
| ETS 0296 | GTEM cell             | GTEM 500  | Schaffner    |
| ETS 0297 | Power pulse Generator | IGUF 2910 | Schwarzbeck  |
| ETS 0299 | DECT protocol tester  | TS 1220   | R & S        |
| ETS 0300 | RF amplifier          | 75 A 250  | ar           |
| ETS 0301 | Relay switch unit     | RSU       | R & S        |
| ETS 0302 | Data line CDN         | CM-I/O CD | Keytek       |

| No.      | Test equipment                         | Type              | Manufacturer       |
|----------|----------------------------------------|-------------------|--------------------|
| ETS 0303 | Telecom line CDN                       | CM-TEL CD         | Keytek             |
| ETS 0306 | Function Generator                     | HP 33120A         | HP                 |
| ETS 0307 | Commu. Sign. Analyzer                  | CSA 803 A         | Tektronix          |
| 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 0313 | Power sensor                           | NRV-Z51           | R & S              |
| ETS 0314 | LPD antenna                            | HL 223            | R & S              |
| ETS 0315 | Biconical antenna                      | HK 116            | R & S              |
| ETS 0316 | Switcher                               | Hr 07-720         | WISI               |
| ETS 0318 | Dial pulse/ DTMF tester                | 210               | HE                 |
| ETS 0319 | Opto link                              | GPIB 140          | NI                 |
| ETS 0320 | Opto link                              | GPIB 140          | NI                 |
| ETS 0322 | Insertion unit                         | URV5-Z4           | R & S              |
| ETS 0328 | ELF Field Strenght Measurement System  | HI-3604           | Holaday Ind., INC. |
| ETS 0329 | VDT / VLF Radiation Measurement System | HI-3603           | Holaday Ind., INC. |
| ETS 0330 | Fiber Optic Remote Control             | HI-3616           | Holaday Ind., INC. |
| ETS 0331 | TS 1220                                |                   |                    |
| ETS 0332 | PSM                                    |                   |                    |
| ETS 0333 | Turn table                             | DE 350            | Heinrich Deisel    |
| ETS 0334 | Controller                             | HD 100            | Heinrich Deisel    |
| ETS 0336 | LPD antenna                            | HL 223            | R & S              |
| ETS 0338 | Coupling network                       | KN002             | ETS                |
| ETS 0339 | Isolating Transformer                  | KN003             | ETS                |
| ETS 0347 | Current Probe                          | EZ-17             | R & S              |
| ETS 0348 | RF Millivolt meter                     | URV 55            | R & S              |
| ETS 0349 |                                        |                   |                    |
| ETS 0350 | Horn Antenna                           | BBHA 9120-C       | Schwarzbeck        |
| ETS 0351 | RF amplifier                           | DWT-18057         | Microwave          |
| ETS 0352 | RF amplifier                           |                   |                    |
| ETS 0353 | Hochpassfilter                         |                   |                    |
| 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          |

| No.      | Test equipment                                     | Type                       | Manufacturer |
|----------|----------------------------------------------------|----------------------------|--------------|
| 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                     | EMC          |
| ETS 0374 | DC Power Supply                                    | NGSM32                     | R & S        |
| ETS 0375 | Vector Signal Gener.                               | SMIQ03B                    | R & S        |
| ETS 0376 | Signal Generator                                   | SMP22                      | R & S        |
| ETS 0377 | Advanced Signal Conditioning Unit                  | ASCU850                    | R & S        |
| ETS 0378 | Advanced Signal Conditioning Unit                  | ASCU190                    | R & S        |
| ETS 0379 | Advanced Signal Conditioning Unit                  | ASCU180                    | R & S        |
| ETS 0380 | Advanced Signal Conditioning Unit                  | ASCU900                    | R & S        |
| ETS 0381 | Ethernet HUB                                       | CS-HUB                     | R & S        |
| ETS 0382 | Vector Signal Gener.                               | SMIQ03B                    | R & S        |
| ETS 0383 | Spectrum Analyzer                                  | FSU26                      | R & S        |
| ETS 0384 | Main Frame Signal and Conditioning Unit            | SSCU-GW                    | R & S        |
| ETS 0385 | Protocol Slave                                     | CRTU-RU (CRTU-G)           | R & S        |
| ETS 0386 | Power meter                                        | NRVD                       | R & S        |
| ETS 0387 | Power Sensor                                       | NRV-Z1                     | R & S        |
| ETS 0388 | Power Sensor                                       | NRV-Z1                     | R & S        |
| ETS 0389 | Fading Simulator                                   | ABFS                       | R & S        |
| ETS 0390 | System PC PC3600                                   | TS-PC36                    | R & S        |
| ETS 0391 | Rubidium Frequency Standard                        | DATUM 8040                 | DATUM GmbH   |
| ETS 0392 | RF Distribution                                    | DATUM 6502                 | DATUM GmbH   |
| ETS 0393 | Insertion unit                                     | URV5-Z4                    | R & S        |
| ETS 0394 | Advanced Signal Conditioning Unit                  | ASCUFDD-WCDMA              | R & S        |
| ETS 0395 | Universal Protocol Tester                          | CRTU-G                     | R & S        |
| ETS 0396 | Protocol Slave                                     | CRTU-S                     | R & S        |
| ETS 0397 | Protocol Slave                                     | CRTU-S                     | R & S        |
| ETS 0398 | Fading Simulator                                   | ABFS                       | R & S        |
| ETS 0399 | Univ. Protocol Tester (Protocol Unit) (Radio Unit) | CRTU-W (CRTU-PU) (CRTU-RU) | R & S        |
| ETS 0400 | Univ. Protocol Tester (Protocol Unit) (Radio Unit) | CRTU-W (CRTU-PU) (CRTU-RU) | R & S        |
| ETS 0401 | MPEG2 Generator                                    | DVG                        | R & S        |
| ETS 0402 | TV Messenger                                       | SFQ                        | R & S        |
| ETS 0403 | RF Current Probe                                   | F-140                      | FCC          |
| ETS 0404 | Exposure Level Tester                              | ELT-400                    | Narda        |
| ETS 0405 | Magnetic Field Probe 100 cm <sup>2</sup>           | 2300/90.10                 | Narda        |
| ETS 0406 | Signal Generator                                   | SML 02                     | R & S        |
| ETS 0407 | EMC Emission tester                                | Harmonics 1000             | EMC Partner  |

| No.      | Test equipment               | Type              | Manufacturer          |
|----------|------------------------------|-------------------|-----------------------|
| ETS 0408 | Transient 2000               | TRA1Z191N         | EMC Partner           |
| ETS 0409 | Stripline                    | DC220             | Schwarzbeck           |
| ETS 0410 | BAN                          | 1                 | ETS                   |
| ETS 0411 | Universal Protocol Tester    | CRTU-G            | R & S                 |
| ETS 0412 | Spectrum Analyzer            | FSU 3             | R & S                 |
| ETS 0413 | Signal Analyzer              | FSIQ 26           | R & S                 |
| ETS 0416 | Power Supply                 | EX752M            | TTi                   |
| ETS 0417 | Beacon Tester                | BT100S            | WS Tech. Inc.         |
| ETS 0418 | High pass filter 4 - 8 G     |                   | Microwave             |
| ETS 0419 | High pass filter 8 - 18 G    |                   | Microwave             |
| ETS 0420 | Amplifier 0.1-1 GHz          | M/N AM-1331       | MITEQ                 |
| ETS 0421 | Amplifier 1-4 GHz            | AFD3-010040-15-LN | MITEQ                 |
| 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 0425 | T-Artificial Mains Network   | ESH3-Z4           | R & S                 |
| ETS 0426 | CDN                          | T4 HF             | MEB                   |
| ETS 0427 | Power sensor                 | NRV-Z6            | R & S                 |
| ETS 0428 | 4-WIRE ISN with B1           | ENY41             | R & S                 |
| ETS 0429 | Current Probe Test Jig       | SW14 7LY          | Chase                 |
| ETS 0430 | Signal Generator             | SML02             | R&S                   |
| ETS 0431 | AC Mains Adaptor             | BS5733            | Travel Emporium       |
| ETS 0432 | RF amplifier matrix          | RSU-ETS-BT        | ETS                   |
| ETS 0433 | RF amplifier matrix          | RSU-ETS-CTR6      | ETS                   |
| ETS 0434 | Reserviert Tre               | RSU-ETS-GSM       |                       |
| ETS 0435 | HP-Filter                    | H1G04G01          | Microwave             |
| ETS 0436 | HP-Filter                    | H1G04G01          | Microwave             |
| ETS 0437 | HP-Filter                    | H04G08G1          | Microwave             |
| ETS 0438 | HP-Filter                    | H0G408G1          | Microwave             |
| ETS 0439 | Amplifier                    | DBS-1826N515      | Narda-DBS-Microwave   |
| ETS 0440 | Amplifier                    | AM-1331           | MITEQ                 |
| ETS 0441 | Bluetooth Protocol Tester    | PTW 60            | R & S                 |
| ETS 0445 | RF-Attenuator 6dB            | 50FH-006-300      | JFK                   |
| ETS 0446 | RF-Attenuator 30dB           | 50FH-030-300      | JFK                   |
| ETS 0447 | Artificial Mains Network     | LN-KFZ/200        | Heine                 |
| ETS 0448 | RF Power Amplifier           | AR 60S1G3         | AR Amplifier Research |
| ETS 0449 | Stäubli Robot                | RX90B L           | Stäubli               |
| ETS 0450 | Stäubli Robot Controller     | CS/MBs&p          | Stäubli               |
| ETS 0451 | DASY 4 Measurement Server    |                   | Schmid & Partner      |
| ETS 0452 | Control Pendant              |                   | Stäubli               |
| ETS 0453 | Compaq Computer              | Pentium IV, 2GHz  | Schmid & Partner      |
| ETS 0454 | Data Acquisition Electronics | DAE3V1            | Schmid & Partner      |
| ETS 0455 | Dummy Probe                  |                   | Schmid & Partner      |
| ETS 0456 | Dosimetric E-Field Probe     | ET3DV6            | Schmid & Partner      |
| ETS 0457 | Dosimetric E-Field Probe     | ET3DV6            | Schmid & Partner      |
| ETS 0458 | Dosimetric H-Field Probe     | H3DV6             | Schmid & Partner      |
| ETS 0459 | System Validation Kit        | D900V2            | Schmid & Partner      |

| No.      | Test equipment                          | Type                    | Manufacturer             |
|----------|-----------------------------------------|-------------------------|--------------------------|
| ETS 0460 | System Validation Kit                   | D1800V2                 | Schmid & Partner         |
| ETS 0461 | System Validation Kit                   | D1900V2                 | Schmid & Partner         |
| ETS 0462 | System Validation Kit                   | D2450V2                 | Schmid & Partner         |
| ETS 0463 | Probe Alignment Unit                    | LBV2                    | Schmid & Partner         |
| ETS 0464 | SAM Twin phantom                        | V 4.0                   |                          |
| ETS 0465 | Mounting Device                         | V 3.1                   |                          |
| ETS 0466 | Directional Coupler                     | HP 87300B               | HP                       |
| ETS 0467 | Oval flat phantom                       | ELI 4                   | Schmid & Partner         |
| ETS 0468 | Isotropic E-Field Probe                 | ER3DV6                  | Schmid & Partner         |
| ETS 0469 | Dielectric Probe Kit                    | 85070D                  | Agilent                  |
| ETS 0470 | Amplifier                               | AM-1300-1103            | withEQ                   |
| ETS 0472 | Antenna                                 | BTA-H                   | Frankonia                |
| ETS 0473 | GSM / UMTS System Simulator             | TS 8950                 | R&S                      |
| ETS 0474 | EMI Test Receiver                       | ESCS 30                 | R&S                      |
| ETS 0475 | Amplifier                               | AFS4-00101800-U         | withEQ                   |
| ETS 0476 | EMI Test receiver                       | ESCS 30                 | R&S                      |
| ETS 0477 | GPS-System (active GPS-antenne)         | 4490                    | HOPF                     |
| ETS 0478 | Crystal filter                          | MQF 127.50-2400/F       | Vectron International    |
| ETS 0479 | System Validation Dipoles               | D300V3                  | Schmid & Partner         |
| ETS 0480 | System Validation Dipoles               | D450V3                  | Schmid & Partner         |
| ETS 0481 | 40GHz Standard Gain Horn with Amplifier | 22240-25<br>CBL26402075 | Flann Microwave          |
| ETS 0482 | 40GHz High Gain Antenna                 | AT4560                  | Amplifier research       |
| ETS 0483 | Amplifier                               | AFD3010040-15-LN        | MITEQ                    |
| ETS 0484 | Radio Communication Tester              | CMU 200                 | R&S                      |
| ETS 0485 | Radio Communication Tester              | CMU 200                 | R&S                      |
| ETS 0486 | Circular polarized antenna              | 3101L                   | EMCO                     |
| ETS 0487 | Torso simulator                         |                         | ETS                      |
| ETS 0488 | EMI Test Receiver                       | ESHS10                  | R & S                    |
| ETS 0489 | Rubidium Frequency Standard             | MFS                     | DATUM                    |
| ETS 0490 | Rubidium Frequency Standard             | 8040                    | DATUM                    |
| ETS 0491 | RF Distribution                         | DATUM 6502              | DATUM                    |
| ETS 0492 | Industrial Controller                   | PSM12                   | R & S                    |
| ETS 0493 | Protokoll Tester                        | PTW60                   | R & S                    |
| ETS 0494 | Switching unit                          | SSCU                    | R & S                    |
| ETS 0495 | RF Step Attenuator                      | RSP                     | R & S                    |
| ETS 0496 | Spectrum Analyzer                       | FSP                     | R & S                    |
| ETS 0497 | Power Meter                             | NRVD                    | R & S                    |
| ETS 0498 | Diode Power Sensor                      | NRV-Z1                  | R & S                    |
| ETS 0499 | Diode Power Sensor                      | NRV-Z1                  | R & S                    |
| ETS 0500 | Signal Generator                        | SMIQ03                  | R & S                    |
| ETS 0501 | Signal Generator                        | SMIQ03                  | R & S                    |
| ETS 0502 | Power Splitter                          | DS-808-4                | Macom                    |
| ETS 0503 | Directional Coupler                     | IAW                     | Microwave Filter Company |
| ETS 0504 | AMTS-Simulator A                        | Feeding Bridge A        | Emmerich                 |
| ETS 0505 | Diode Power Sensor                      | NRV-Z1                  | R & S                    |
| ETS 0506 | Diode Power Sensor                      | NRV-Z6                  | R & S                    |

| No.      | Test equipment         | Type       | Manufacturer     |
|----------|------------------------|------------|------------------|
| ETS 0507 | Power Divider          | PS-Z101-4S | UMCC             |
| ETS 0508 | Power Divider          | T-1000     | Macom            |
| ETS 0509 | Power Divider          | T-1000     | Macom            |
| ETS 0510 | Power Divider          | T-1000     | Macom            |
| ETS 0511 | Power Divider          | DS-409-4   | Anzac            |
| ETS 0512 | Log Periodical Antenna | HL 025     | R & S            |
| ETS 0513 | Flat Phantom           | V4.4       | Schmid & Partner |

## 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 @ 3 m |

**ANSI STANDARD C63.4-2003 6.2.1 MEASUREMENT PROCEDURES:** The UUT was placed on a table 80 cm high and with dimensions of 1 m 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 Product Service AG 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.

### RF Exposure Compliance Requirements

According to FCC OET Bulletin 65 Edition 97-01 Supplement C and RSS-102 § 2.5, this spread spectrum transmitter is categorically excluded from routine environmental evaluation because of the low power level, where there is a high likelihood of compliance with RF exposure standards.

The antenna used for this transceiver must not be co-located or operating in conjunction with any other antenna or transmitter.

### ANTENNA & GROUND:

This unit uses internal antennas.

## 2.5 Test results

☒ 1<sup>st</sup> test

☐ test after modification

☐ production test

| SECT. | TEST CASE                         | FCC<br>47CFR PART | IC<br>RSS- | Required                            | Test<br>passed                      | Test failed              |
|-------|-----------------------------------|-------------------|------------|-------------------------------------|-------------------------------------|--------------------------|
| 3     | <i>TRANSMITTER PARAMETERS</i>     |                   |            |                                     |                                     |                          |
| 3.1   | RF power output conducted         | 15.247 (b)        | 210 A8.4   | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 3.2   | RF power output radiated (EIRP)   | 15.247 (b)        | 210 A8.4   | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/> |
| 3.3   | 20dB bandwidth                    | 15.247 (a)(1)     | 210 A8.1   | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 3.4   | Time of occupancy (dwell time)    | 15.247 (a)(1)     | 210 A8.1   | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 3.5   | Number of hopping channels        | 15.247 (a)(1)     | 210 A8.1   | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 3.6   | Carrier frequency separation      | 15.247 (a)(1)     | 210 A8.1   | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 3.7   | Spurious emission conducted       | 15.247 (d)        | 210 A8.5   | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/> |
| 3.8   | Spurious emission radiated        | 15.247 (d)        | 210 A8.5   | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 3.9   | Band-edge compliance              | 15.247 (d)        | 210 A8.5   | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 3.10  | AC power line conducted emissions | 15.207            | Gen 7.2.2  | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 4     | <i>RECEIVER PARAMETERS</i>        |                   |            |                                     |                                     |                          |
| 4.1   | Radiated emissions                | 15.107            | Gen 7.2.3  | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

### 3 Transmitter parameters

#### 3.1 RF power output, conducted

##### Reference

|            |                        |
|------------|------------------------|
| <b>FCC</b> | 47 CFR part 15.247 (b) |
| <b>IC</b>  | RSS-210 A 8.4          |

##### Method of measurement

This measurement applies to equipment with an integral antenna and to equipment with an antenna connector and equipped with an antenna as declared by the applicant.

The power was measured with modulation (declared by the applicant).

##### Limits

| <b>Frequency band</b> | <b>FCC and IC</b>                                                                                                                                                    |
|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5725 - 5850 MHz       | 1 Watt (30 dBm) for systems with $\geq 75$ hopping channels                                                                                                          |
| 2400 - 2483.5 MHz     | 1 Watt (30 dBm) for systems with $\geq 75$ non - overlapping hopping channels<br>0.125 Watt (21 dBm) for all other hopping systems, but at least 15 hopping channels |
| 902 - 928 MHz         | 1 Watt (30 dBm) for systems with $\geq 50$ hopping channels<br>0.25 Watt (24 dBm) for all other hopping systems, but at least 25 hopping channels                    |

##### Test results

| <b>Test conditions</b>                       | <b>Channel A</b> | <b>Channel B</b> | <b>Channel C</b> |
|----------------------------------------------|------------------|------------------|------------------|
|                                              | [dBm]            | [dBm]            | [dBm]            |
| $T_{nom} = 25^{\circ}C$<br>$V_{nom} = 4.0 V$ | 2.39             | 0.04             | 2.85             |
| $T_{nom} = 25^{\circ}C$<br>$V_{min} = 3.6 V$ | 2.41             | 0.04             | 2.84             |
| $T_{nom} = 25^{\circ}C$<br>$V_{max} = 4.2 V$ | 2.43             | 0.03             | 2.85             |
| Measurement uncertainty                      | < 3 dB           |                  |                  |

See attached diagrams

**Test equipment:** ETS 0253, ETS 0271

### 3.2 RF power output, radiated

#### Reference

|            |                        |
|------------|------------------------|
| <b>FCC</b> | 47 CFR part 15.247 (b) |
| <b>IC</b>  | RSS-210 A8.4           |

#### Method of measurement

This measurement applies to equipment with an integral antenna and to equipment with an antenna connector and equipped with an antenna as declared by the applicant.

The power was measured with modulation (declared by the applicant).

#### Limits

| Frequency band    | FCC and IC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5725 - 5850 MHz   | 4 Watt (36 dBm) for systems with $\geq 75$ hopping channels.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 2400 - 2483.5 MHz | 4 Watt (36 dBm) for systems with $\geq 75$ non – overlapping hopping channels<br>0.631 Watt (28 dBm) for all other hopping systems, but at least 15 hopping channels                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 902 - 928 MHz     | 4 Watt (36 dBm) for systems with $\geq 50$ hopping channels<br>1.585 Watt (32 dBm) for all other hopping systems, but at least 25 hopping channels                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>FCC</b>        | The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.                                                                                                                                  |
| <b>IC</b>         | Systems in the 2400 - 2483.5 MHz and 5725 - 5850 MHz which have an e.i.r.p. above 4 W are permitted only for point-to-point systems (i.e. point-to-multipoint systems and multiple co-located transmitters transmitting the same information are prohibited from exceeding 4 W e.i.r.p.). Point-to-point systems in these two bands may use higher e.i.r.p. as necessary for satisfactory operation provided that the higher e.i.r.p. is achieved by employing higher gain directional antennas and not higher transmitter output powers. However, remote stations of point-to-multipoint systems shall be allowed to operate under the same condition as point-to-point systems. |

## Test Results

| Test conditions                                                    | Channel A  | Channel B  | Channel C  |
|--------------------------------------------------------------------|------------|------------|------------|
|                                                                    | EIRP [dBm] | EIRP [dBm] | EIRP [dBm] |
| $T_{\text{nom}} = 25\text{ °C}$<br>$V_{\text{nom}} = 4.0\text{ V}$ | --         | --         | --         |
| Measurement uncertainty                                            | < 3 dB     |            |            |

**Test equipment:** ETS 0012, ETS, 0013, ETS, 0015, ETS 0018, ETS 0253, ETS 0271, ETS 0311

### 3.3 20 dB bandwidth

#### Reference

|            |                        |
|------------|------------------------|
| <b>FCC</b> | CFR part 15.247 (a)(1) |
| <b>IC</b>  | RSS-210 A8.1           |

#### Method of measurement

The 20 dB bandwidth is measured on the lowest, middle and highest hopping channel. Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400 - 2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

#### Limits

| Frequency band    | FCC and IC                                                                                                                                                                                          |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5725 - 5850 MHz   | $\leq 1$ MHz                                                                                                                                                                                        |
| 2400 - 2483.5 MHz | $\leq$ carrier frequencies separation for hopping systems with max cond. power of 1 Watt<br>$\leq 1.5$ of the carrier frequencies separation for hopping systems with max cond. power of 0.125 Watt |
| 902 - 928 MHz     | $< 250$ kHz for systems with $\geq 50$ hopping channels<br>$250 \text{ kHz} \leq 500 \text{ kHz}$ for all other hopping systems                                                                     |

#### Test results

| Test conditions                                                                    | Channel A         | Channel B | Channel C |
|------------------------------------------------------------------------------------|-------------------|-----------|-----------|
|                                                                                    | kHz               | kHz       | kHz       |
| $T_{\text{nom}} = 25 \text{ }^{\circ}\text{C}$<br>$V_{\text{nom}} = 4.0 \text{ V}$ | 930.21643         | 930.22525 | 930.22525 |
| Measurement uncertainty                                                            | $< 10 \text{ Hz}$ |           |           |

#### System receiver input bandwidth:

The manufacturer declares that the receiver input bandwidth matches to the bandwidth of the transmitter signal.

See attached diagrams

**Test equipment:** ETS 0271

### 3.4 Time of occupancy (dwell time)

#### Reference

|            |                        |
|------------|------------------------|
| <b>FCC</b> | CFR part 15.247 (a)(1) |
| <b>IC</b>  | RSS-210 A8.1           |

#### Method of measurement

The EUT has its hopping function enabled.

Spectrum analyzer settings:

Span: zero span, centered on hopping channel

RBW: 1 MHz

VBW: > RBW

Sweep: as necessary to capture the entire dwell time per hopping channel

Detector: peak

Trace: max hold

#### Limits

| Frequency band    | FCC and IC                                                                                                                                                             |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5725 - 5850 MHz   | $\leq 0,4$ s at measurement period of 30 seconds                                                                                                                       |
| 2400 - 2483.5 MHz | $\leq 0.4$ s multiplied by the number of hopping channels employed                                                                                                     |
| 902 - 928 MHz     | $\leq 0,4$ s at measurement period of 20 seconds for max 250 kHz 20 dB BW allowed<br>$\leq 0,4$ s at measurement period of 10 seconds for max 500 kHz 20 dB BW allowed |

#### Test results

| Test conditions                                                          | Operating mode      | Measurement period | Time of occupancy |
|--------------------------------------------------------------------------|---------------------|--------------------|-------------------|
|                                                                          |                     | [s]                | [ms]              |
| $T_{\text{nom}} = 25^{\circ}\text{C}$<br>$V_{\text{nom}} = 4.0\text{ V}$ | normal transmitting | 31,6               | 182.2             |
|                                                                          | inquiry mode        | --                 | --                |
| Measurement uncertainty                                                  | $< 1\ \mu\text{s}$  |                    |                   |

**Test equipment:** ETS 0271

### 3.5 Number of hopping channels

#### Reference

|            |                        |
|------------|------------------------|
| <b>FCC</b> | CFR part 15.247 (a)(1) |
| <b>IC</b>  | RSS-210 A8.1           |

#### Method of measurement

According to FCC rules part 15 subpart C §15.247 frequency hopping systems operating in the 2400 - 2483.5 MHz and 5725 - 5850 MHz bands shall use at least 75 hopping frequencies.

According to FCC 00-312 appendix B systems in the 2400 - 2483,5 MHz band may utilize hopping channels whose 20 dB bandwidth is greater than 1 MHz provide the systems use at least 15 non-overlapping channels.

#### Limits

| Frequency band    | FCC and IC                                                                                       |
|-------------------|--------------------------------------------------------------------------------------------------|
| 5725 - 5850 MHz   | $\geq 75$ hopping channels                                                                       |
| 2400 - 2483.5 MHz | $\geq 75$ hopping channels for $>0.125$ Watt<br>$\geq 15$ hopping channels for $\leq 0.125$ Watt |
| 902 - 928 MHz     | $\geq 50$ hopping channels for $>0.25$ Watt<br>$\geq 25$ hopping channels for $\leq 0.25$ Watt   |

#### Test results

| Test conditions                               | Operating mode      | Number of channel |
|-----------------------------------------------|---------------------|-------------------|
|                                               |                     |                   |
| $T_{\text{nom}} = 25\text{ }^{\circ}\text{C}$ | Normal transmitting | 79                |
| $V_{\text{nom}} = 4.0\text{ V}$               | Inquiry mode        | --                |

See attached diagrams

**Test equipment:** ETS 0271

### 3.6 Carrier frequency separation

#### Reference

|            |                        |
|------------|------------------------|
| <b>FCC</b> | CFR part 15.247 (a)(1) |
| <b>IC</b>  | RSS-210 A8.1           |

#### Method of measurement

Carrier frequency separation was measured with modulation (declared by manufacturer)

#### Limits

| Frequency band    | FCC and IC                                                                                                                                                                                                        |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5725 - 5850 MHz   | minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater, but $\leq 1$ MHz                                                                                                           |
| 2400 - 2483.5 MHz | minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater<br>minimum of 25 kHz or 2/3 of the 20 dB bandwidth of the hopping channel, whichever is greater, for $P_{out} \leq 0.125$ W |
| 902 - 928 MHz     | minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater                                                                                                                             |

#### Test results

| Test conditions                                                    | Channel B | Channel Separation |
|--------------------------------------------------------------------|-----------|--------------------|
|                                                                    | [GHz]     | [kHz]              |
| $T_{nom} = 25\text{ }^{\circ}\text{C}$<br>$V_{nom} = 4.0\text{ V}$ | 2.441     | 1005.2104          |
| Measurement uncertainty                                            | < 10 Hz   |                    |

See attached diagram

**Test equipment:** ETS 0271

### 3.7 Spurious emission conducted

#### Reference

|            |                     |
|------------|---------------------|
| <b>FCC</b> | CFR part 15.247 (d) |
| <b>IC</b>  | RSS-210 A8.5        |

#### Method of measurement

The EUT is connected to the spectrum analyzer via a low loss cable. If the EUT is not equipped with an antenna connector, a temporary antenna connector has to be installed. The EUT is switched on, the hopping function is disabled.

The analyzer setting was as following:

| Frequency range | RES bandwidth |         | Video bandwidth |         |
|-----------------|---------------|---------|-----------------|---------|
|                 | Pk            | Avg     | Pk              | Avg     |
| f < 1 GHz       | 100 kHz       | 100 kHz | 100 kHz         | 100 kHz |
| f > 1 GHz       | 1 MHz         | 1 MHz   | 1 MHz           | 1 MHz   |

#### Limits

|            |                               |
|------------|-------------------------------|
| <b>FCC</b> | 20 dB below peak output power |
| <b>IC</b>  | 20 dB below peak output power |

#### Test results

| Frequency | Result [dBm] | Limit [dBm] | Margin [dB] | Reference level [dBm] |
|-----------|--------------|-------------|-------------|-----------------------|
| --        | --           | --          | --          | --                    |
| --        | --           | --          | --          | --                    |
| --        | --           | --          | --          | --                    |
| --        | --           | --          | --          | --                    |
| --        | --           | --          | --          | --                    |

### 3.8 Spurious emission radiated

#### Reference

|            |                                           |
|------------|-------------------------------------------|
| <b>FCC</b> | CFR part 15.247(d), 15.205, 15.209, 15.35 |
| <b>IC</b>  | RSS-210 A8.5, RSS-210 2.7                 |

#### Method of measurement

Spurious emission was measured with modulation (declared by manufacturer).

According to 47 CFR 15, Part 15.247 (d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required.

In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

#### Calculation of Limit:

All results are updated by an automatic measuring system in accordance to point 2.3

Limit = max. reading (because peak detector is used)

97.67 dB $\mu$ V/m

Limit = Max. reading - 20 dB (because average detector is used)

97.67 dB $\mu$ V/m - 20 dB = 77.67 dB $\mu$ V/m

## Limits for restricted bands

|          |                                                                                                                                                                                                                                 |                              |                                |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|--------------------------------|
| FCC & IC | 20 dB below peak output power, emissions which fall in the restricted bands (15.205(a)) / (RSS-210 2.7) must comply the following limits:<br>Frequencies below 1GHz:                                                            |                              |                                |
|          | Frequency of emission                                                                                                                                                                                                           | Field strength               | Field strength                 |
|          | [MHz]                                                                                                                                                                                                                           | [ $\mu\text{V} / \text{m}$ ] | [dB $\mu\text{V} / \text{m}$ ] |
|          | 30 - 88                                                                                                                                                                                                                         | 100                          | 40.0                           |
|          | 88 - 216                                                                                                                                                                                                                        | 150                          | 43.5                           |
|          | 216 - 960                                                                                                                                                                                                                       | 200                          | 46.0                           |
|          | Above 960                                                                                                                                                                                                                       | 500                          | 54.0                           |
|          | For frequencies above 1 GHz (Avg measurements): 54.0 dB $\mu\text{V} / \text{m}$<br>For frequencies above 1 GHz (Pk measurements):<br>Limit + 20 dB = 54.0 dB $\mu\text{V} / \text{m}$ + 20 dB = 74 dB $\mu\text{V} / \text{m}$ |                              |                                |

## Calculation of test results:

Such factors like antenna correction, cable loss, external attenuation etc. are already included in the provided measurement results.

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.

If in the column's correction factor states a value then the max. Field strength in the same row is corrected by a value gained from the "Marker-Delta-Method" or the „Duty-Cycle Correction Factor“.

### 15.35 (c) Duty cycle correction average value

When the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds.

Duty cycle correction =  $20 \log (\text{dwell time} / 100 \text{ ms or less})$

### DA 00-705 Duty cycle correction **peak value**

The analyzer setting was as following:

| Frequency range | RES bandwidth |         | Video bandwidth |       |
|-----------------|---------------|---------|-----------------|-------|
|                 | Pk            | Avg     | Pk              | Avg   |
| f < 1GHz        | 100 kHz       | 100 kHz | 10 Hz           | 10 Hz |
| f > 1GHz        | 1 MHz         | 1 MHz   | 10 Hz           | 10 Hz |

Set the VBW to 10 Hz, while maintaining all of the other instrument settings. This peak level, once corrected, must comply with the limit specified in Section 15.209. If the dwell time per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a “duty cycle correction factor”, derived from  $20 \log (\text{dwell time} / 100 \text{ ms})$ , in an effort to demonstrate compliance with the 15.209 limit. Submit this data.

If the intentional radiator operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

### Test results

#### Summary table with radiated data of the test plots

| Freq. | Used Ch. | Frequency Marker [GHz] | Polarization | $\Delta$ corrections dB | Max. Field Strength [dB $\mu$ V/m] | Compliance Limit [dB $\mu$ V/m] | Detector | BW [MHz] | Margin [dB] |
|-------|----------|------------------------|--------------|-------------------------|------------------------------------|---------------------------------|----------|----------|-------------|
|       |          |                        |              |                         |                                    |                                 |          |          |             |
|       |          |                        |              |                         |                                    |                                 |          |          |             |

#### Freq. - Frequency Range:

|    |     |   |          |
|----|-----|---|----------|
| 1: | 30  | – | 200 MHz  |
| 2: | 200 | – | 1000 MHz |
| 3: | 1   | – | 4 GHz    |
| 4: | 4   | – | 8 GHz    |
| 5: | 8   | – | 12 GHz   |
| 6: | 12  | – | 17 GHz   |
| 7: | 17  | – | 26,5 GHz |

All other not noted test plots do not contain significant test results in relation to the limits.

See attached diagrams. No emissions were found near by limit.

**Test equipment:** ETS 0012, ETS 0013, ETS 0015, ETS 0018, ETS 0271, ETS 0253, ETS 0311

### 3.9 Band edge compliance

#### Reference

|            |                     |
|------------|---------------------|
| <b>FCC</b> | CFR part 15.247 (d) |
| <b>IC</b>  | RSS-210 A8.5        |

#### Method of measurement

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required.

In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

#### Limits

|            |                               |
|------------|-------------------------------|
| <b>FCC</b> | 20 dB below peak output power |
| <b>IC</b>  | 20 dB below peak output power |

#### Test results

| Test conditions                                                    | Single frequency (hopping disabled) |                 |
|--------------------------------------------------------------------|-------------------------------------|-----------------|
|                                                                    | Lower band-edge                     | Upper band-edge |
| $T_{\text{nom}} = 25\text{ °C}$<br>$V_{\text{nom}} = 4.0\text{ V}$ | 39.10 dB                            | 40.92 dB        |
| Measurement uncertainty                                            | < 100 Hz                            |                 |

| Test conditions                                                    | Hopping frequency (hopping enabled) |                 |
|--------------------------------------------------------------------|-------------------------------------|-----------------|
|                                                                    | Lower band-edge                     | Upper band-edge |
| $T_{\text{nom}} = 25\text{ °C}$<br>$V_{\text{nom}} = 4.0\text{ V}$ | 37.92 dB                            | 39.62 dB        |
| Measurement uncertainty                                            | < 100 Hz                            |                 |

See attached diagrams

**Test equipment:** ETS 0271

### 3.10 AC power line conducted emissions

#### Reference

|            |                 |
|------------|-----------------|
| <b>FCC</b> | CFR part 15.207 |
| <b>IC</b>  | RSS-Gen 7.2.2   |

#### 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>FCC &amp; IC</b> | Frequency of emission | Conducted limit field strength [dB $\mu$ V] |         |
|---------------------|-----------------------|---------------------------------------------|---------|
|                     | [MHz]                 | Quasi Peak                                  | Avg     |
|                     | 0.15 - 0.5            | 66 to 56                                    | 56 - 46 |
|                     | 0.5 - 5               | 56                                          | 46      |
|                     | 5 - 30                | 60                                          | 50      |

#### Test results

| Frequency | Level            |                  |
|-----------|------------------|------------------|
|           | Quasi-peak       | Average          |
| 150 kHz   | Lower limit line | Lower limit line |

See attached diagrams

**Test equipment:** ETS 0288, ETS 0474

## 4 Receiver parameters

### 4.1 Radiated emissions

#### Reference

|            |               |
|------------|---------------|
| <b>FCC</b> | Part 15.109   |
| <b>IC</b>  | RSS-Gen 7.2.3 |

#### Method of measurement

The compliance of the EUT Receiver with the Limits of spurious emissions was performed according to the radiated measurement method.

The spectrum analyzer RBW was set to 100 kHz for measurements below 100 kHz and 1.0 MHz above 1.0 GHz. The measurement results are evaluated according to the procedure described in section 2.4 of this test report.

#### Limits

|                     | Spurious frequency | Field strength         |
|---------------------|--------------------|------------------------|
|                     | MHz                | microvolt/m at 3 meter |
| <b>FCC &amp; IC</b> | 30 - 88            | 100                    |
|                     | 88 - 216           | 150                    |
|                     | 216 - 960          | 200                    |
|                     | above 960          | 500                    |

#### Test Results

| Device<br>Frequency<br>2441 MHz | Frequency<br>marker<br>indication<br>[MHz] | Antenna<br>polarization | Worst case<br>emission level<br>[μV/m] | Compliance<br>limit<br>[μV/M] | Results<br>[μV/M] |
|---------------------------------|--------------------------------------------|-------------------------|----------------------------------------|-------------------------------|-------------------|
|                                 |                                            |                         |                                        |                               |                   |
|                                 |                                            |                         |                                        |                               |                   |
|                                 |                                            |                         |                                        |                               |                   |
|                                 |                                            |                         |                                        |                               |                   |

See attached diagrams. No emissions were found near by limit.

**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 (EIRP)   |
| D | 20 dB bandwidth                   |
| E | Time of occupancy (dwell time)    |
| F | Number of hopping frequencies     |
| G | Carrier frequency separation      |
| H | Spurious emission conducted       |
| I | Spurious emission radiated        |
| J | Band-edge compliance              |
| K | AC power line conducted emissions |
| L | Receiver radiated emissions       |