

Recognized by the
Federal Communications Commission
Anechoic chamber registration no.: 90462 (FCC)
Anechoic chamber registration no.: IC 3463A-1
TCB ID: DE 0001



Accredited by the
German Accreditation Council
DAR-Registration Number
DAT-P-176/94-D1



Accredited Bluetooth® Test Facility (BQTF)

| | | |
|-----------------------------|----------|---|
| Test report no. | : | 4-2783-01-06/07-B |
| Applicant | : | SIGMA Elektro GmbH |
| Type | : | STS-S-1 |
| Test Standard | : | 47 CFR FCC Part 15 RSS-210 Issue 7 |
| FCC ID | : | M5LSPD1STS |
| Certification No. IC | : | 7580A-SPD1STS |

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CETECOM ICT Services GmbH

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RSC-Laboratory

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Fax: -8484

Test report no.: 4-2783-01-06/07-B

Date: 2007-12-17

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1 General information


1.1 Administrative data of the test facility


1.1.1 Identification of the testing laboratory

| | |
|-------------------------------------|--|
| Company name: | Cetecom ICT Services GmbH |
| Address: | Untertürkheimerstr. 6-10 D-66117 Saarbruecken Germany |
| Laboratory accreditation: | DAR-Registration No. DAT-P-176/94-D1 Bluetooth Qualification Test Facility (BQTF) Federal Communications Commission (FCC) |
| Responsible for testing laboratory: | Identification/Registration No : 90462 Jakob Reschke Phone: +49 681 598 0 Fax: +49 681 598 9075 email: info@ict.cetecom.de |

1.2 Notes

The test results of this test report relate exclusively to the test item specified in 1.5. The CETECOM ICT Services GmbH does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. 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 CETECOM ICT Services GmbH.


.....
Responsible for testing laboratory
2007-12-17 - Michael Berg


.....
Responsible for test report
2007-12-17 - Jakob Reschke

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1.3 Details of Applicant

Name : SIGMA Elektro GmbH
Address : Dr.-Julius-Leber-Straße 15
City : D-67433 Neustadt/Weinstraße
Country : Germany
Phone : +49 (0) 6321 91 20-0
Fax : +49 (0) 6321 91 20-34
Contact : Jochen Piesciek
Phone : +49 6321 9120 112
Fax : +49 6321 9120 9 112
e-mail : jochen.piesciek@sigmasport.com

1.4 Application Details

Date of receipt of application : 2007-11-19
Date of receipt of test item : 2007-12-13
Date(s) of test : 2007-12-13 to 2007-12-14
Date of report : 2007-12-17

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1.5 Test Item

Type of equipment : Cyclometer
Model name : STS-S-1
Manufacturer : SIGMA Elektro GmbH
Address : Dr.-Julius-Leber-Straße 15
City : D-67433 Neustadt/Weinstraße
Country : Germany
Tested to Radio Standards Specification(RSS) No. : 210 Issue 7
Open Area Test Site Industry Canada Number : IC 3463A-1
Frequency Range (or fixed frequency) : 112 kHz
Field Strength (at what distance) : 11.70 dB μ V/m at 10 m
Type of Modulation : ASK
Antenna Information : Integrated antenna
Emission Designator (TRC-43) : 12K0A1D
Transmitter Spurious (worst case) : Nothing found (noise floor)
Receiver Spurious (worst case) : Nothing found (noise floor)
Extreme Conditions (Temperature/Voltage) : 21°C / 3 V DC by Battery
IC no. : 7580A-SPD1STS
FCC ID : M5LSPD1STS

ATTESTATION:

DECLARATION OF COMPLIANCE: I declare that the testing was performed or supervised by me; that the test measurements were made in accordance with the above-mentioned Industry Canada standard(s); and that the equipment identified in this application has been subjected to all the applicable test conditions specified in the Industry Canada standards and all of the requirements of the standard have been met.

Laboratory Manager :

2007-12-17

Jakob Reschke

Date

Name



Signature

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1.6 Test Setup

Hardware : -.-
Software : -.-

1.7 Test Specifications

| | |
|-------------|-------------------------|
| FCC: | CFR Part 15.209 |
| IC: | RSS 210, Issue 7 |

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2 Statement of Compliance

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

2.1 Summary of Measurement Results

2.1.1 CFR 47 Part 15 Radio frequency devices

| Section in this Report | Test Name / Section FCC Part 15 | Test Name / Section RSS 210 Issue 7 | Measurement applicable | Verdict |
|------------------------|---|-------------------------------------|------------------------|---------|
| 4.1 | § 15.209 Field Strength of the Fundamental | 2.6 | YES | PASS |
| 4.2 | § 15.209 Field Strength of the Harmonics and Spurious | 2.6 | YES | PASS |
| 4.3 | § 15.109 Spurious Magnetics | 2.6 | YES | PASS |
| 4.4 | § 15.209 Spurious Emissions | 2.6 | YES | PASS |

3 Measurements and results

The radiated measurements are performed in vertical and horizontal plane in the frequency range from 9 kHz to 20 GHz in semi-anechoic chambers. The EUT is positioned on a non-conductive support with a height of 0.80 m above a conductive ground plane that covers the whole chamber.

The receiving antennas conform with specifications ANSI C63.2-1996 clause 15 and ANSI C63.4-2003 clause 4.1.5. These antennas can be moved over the height range between 1.0 m and 4.0 m in order to search for maximum field strength emitted from EUT. The measurement distances between EUT and receiving antennas are indicated in the test set-ups for the various frequency ranges. For each measurement, the EUT is rotated in all three axes until the maximum field strength is received.

The wanted and unwanted emissions are received by spectrum analysers where the detector modes and resolution bandwidths over various frequency ranges are set according to requirement ANSI C63.4-2003 clause 4.2.

Antennas conform with ANSI C63.2-1996 item 15.

150 kHz - 30 MHz: Quasi Peak measurement, 9kHz Bandwidth, passive loop antenna.

30 MHz - 200 MHz: Quasi Peak measurement, 120KHz Bandwidth, biconical antenna

200MHz - 1GHz: Quasi Peak measurement, 120KHz Bandwidth, log periodic antenna

>1GHz: Average, RBW 1MHz, VBW 10 Hz, wave guide horn

All measurement settings are according to FCC 15.109 and 15.209

4 FCC Part 15

4.1 Field Strength of the Fundamental

Reference

| | |
|------|-----------------------------|
| FCC: | CFR Part SUBCLAUSE § 15.209 |
| IC: | RSS 210, Issue 7, 2.6 |

MAXIMUM OUTPUT POWER (RADIATED)

| TEST CONDITIONS | | MAXIMUM POWER (dBµV/m) at 10 m | | |
|--|--------------------------------|--------------------------------|--|--|
| | | 112 kHz | | |
| T_{nom} 21 °C | V_{nom} 3.0V DC | 11.70* | | |
| Maximum deviation from output power under extreme test conditions (dBc) | | not applicable | | |
| Measurement uncertainty | | ±3dB | | |

RBW/VBW : 100 kHz

*measured at 1 m and calculated to 10 m as specified in §15.31

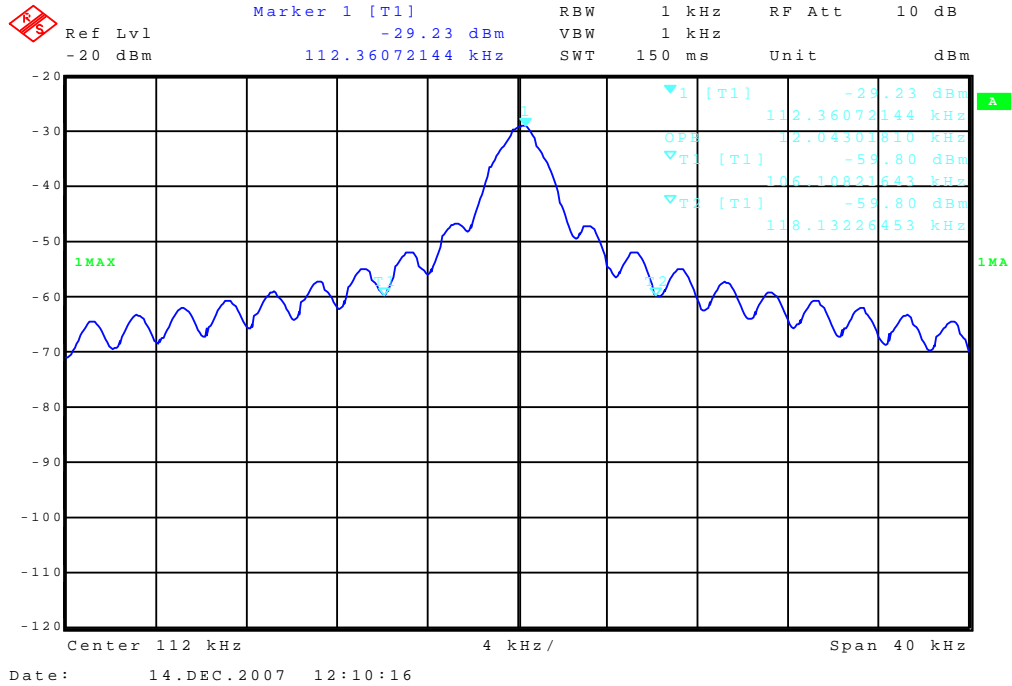
Limits

SUBCLAUSE § 15.209 (a)

| Frequency (MHz) | Field strength (µV/m) | Measurement Distance (meters) |
|-----------------|-----------------------|-------------------------------|
| 0.009-0.490 | 2400/F(kHz) | 300 |
| 0.490-1.705 | 24000/F(kHz) | 30 |
| 1.705-30.0 | 30 | 30 |
| 30-88 | 100 ** | 3 |
| 88-216 | 150 ** | 3 |
| 216-960 | 200 ** | 3 |
| Above 960 | 500 | 3 |

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Section 15.231 and 15.241.

4.2 Occupied Bandwidth



4.3 Field Strength of the Harmonics and Spurious

Reference

| | |
|------|-----------------------------|
| FCC: | CFR Part SUBCLAUSE § 15.209 |
| IC: | RSS 210, Issue 7, 2.6 |

| EMISSION LIMITATIONS | | | | | |
|-------------------------|--|---|------------------------------------|--|---------------------|
| f (kHz) | | amplitude of emission (dBµV/m) Average/QP/PK | limit max. allowed emmission power | actual attenuation below frequency of operation (dB) | results |
| 112 | | 11.70 (PK) | 86.60 dBµV/m* | | Operating frequency |
| No critical peaks found | | | | | |
| | | | | | |
| | | | | | |
| Measurement uncertainty | | | ± 3dB | | |

*Limit recalculated from 300m to 10m with a correctionfactor of 60 dB.

Limits

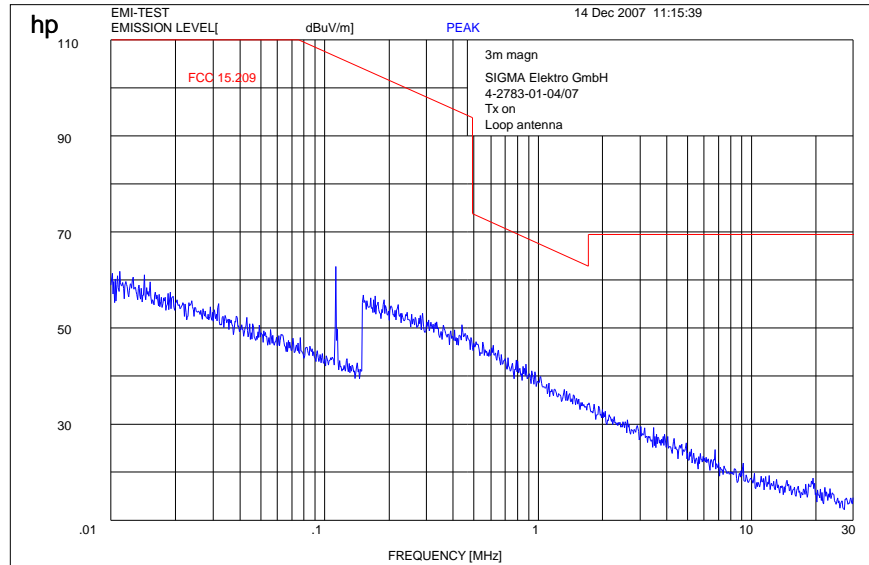
SUBCLAUSE § 15.209 (a)

| Frequency (MHz) | Field strength (µV/m) | Measurement Distance (meters) |
|-----------------|-----------------------|-------------------------------|
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4.4 Part 15.109 Spurious Magnetics

Plot 1: Tx Magnetic
9 kHz – 30 MHz



(to convert the measuring distance from 3m to 30m and 30 to 300m a correction factor from 40 dB/decade was used.)

Measurement distance 3m

This measurement was done in 3 polarisation's, the plot shows the worst case

Limits

SUBCLAUSE § 15.209 (a)

| Frequency (MHz) | Field strength (µV/m) | Measurement Distance (meters) |
|-----------------|-----------------------|-------------------------------|
| 0.009-0.490 | 2400/F(kHz) | 300 |
| 0.490-1.705 | 24000/F(kHz) | 30 |
| 1.705-30.0 | 30 | 30 |
| 30-88 | 100 ** | 3 |
| 88-216 | 150 ** | 3 |
| 216-960 | 200 ** | 3 |
| Above 960 | 500 | 3 |

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Section 15.231 and 15.241.

4.5 Part 15.209 Spurious Emissions

Information

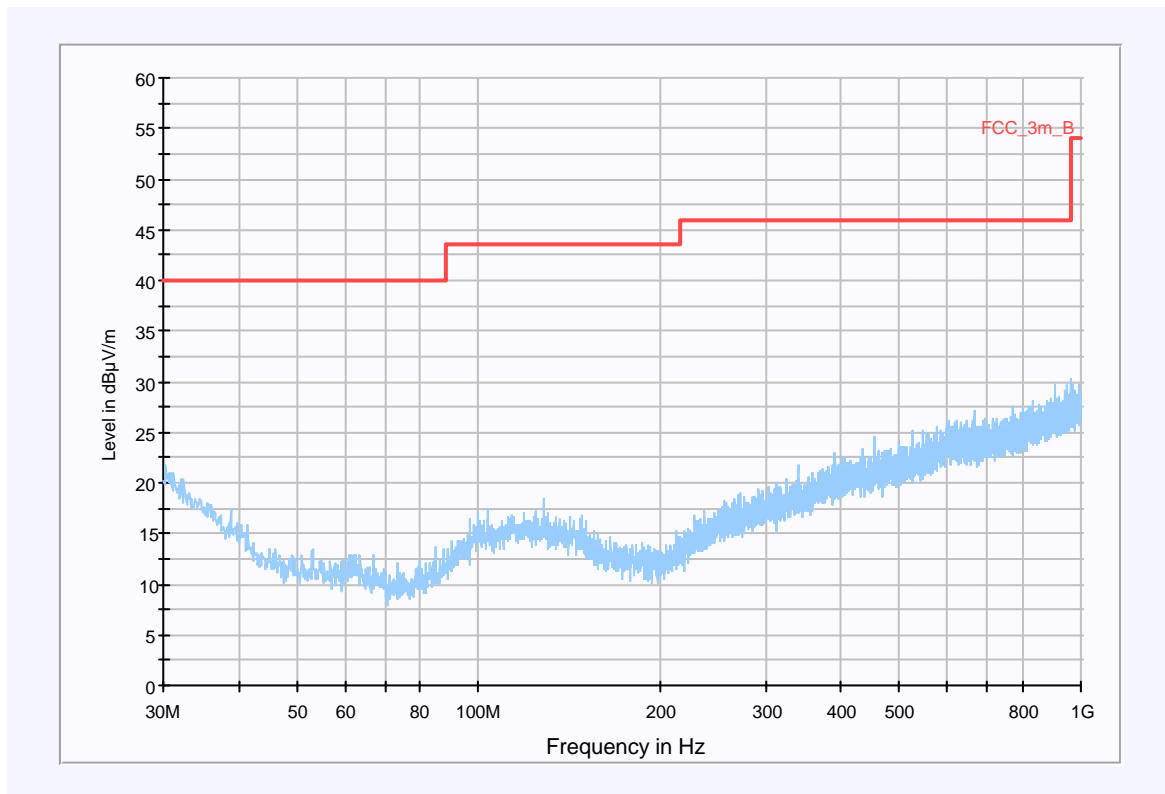
| | |
|-----------------------|-----------------------------|
| EUT: | SIGMA SPEED TX + MOD5 RX |
| Serial Number: | TX: sample 1 RX: Sample 1 |
| Test Description: | FCC Part 15.209 |
| Operating Conditions: | transmitting-receiving mode |
| Operator Name: | Kraus |
| Comment: | testet with CDC (testbox) |

Scan Setup: STAN_Fin [EMI radiated]

| | |
|-----------------|-----------------------------------|
| Hardware Setup: | EMI radiated\Electric Field (NOS) |
| Level Unit: | dB μ V/m |

| Subrange | Detectors | IF Bandwidth | Meas. Time | Receiver |
|--------------|-----------|--------------|------------|----------|
| 30MHz - 1GHz | QuasiPeak | 120kHz | 15s | Receiver |

FCC_3m_Fast_1GHz (B)



Hardware Setup: EMI radiated\Electric Field (NOS) - [EMI radiated]

Subrange 1

Frequency Range: 30MHz - 2GHz

Receiver: Receiver [ESCI 3]

@ GPIB0 (ADR 20), SN 100083/003, FW 3.32, CAL 07.01.2009

Signal Path: without Notch

FW 1.0

Antenna: Chase Broadband BiLog Antenna CBL 6112

SN 2110, FW A, CAL 07.01.2009

Correction Table (vertical): Chase Broadband BiLog Antenna CBL 6112

Correction Table (horizontal): Chase Broadband BiLog Antenna CBL 6112

Correction Table: Cabel with switch (1007)

Antenna Tower: Tower [EMCO 2090 Antenna Tower]

@ GPIB0 (ADR 8), FW REV 3.12

Turntable: Turntable [EMCO Turntable]

@ GPIB0 (ADR 9)

5 Testequipment

To simplify the identification on each page of the test equipment used, on each page of the test report, each item of test equipment and ancillaries such as cables are identified (numbered) by the Test Laboratory, below.

Anechoic chamber C:

| No | Equipment/Type | Manuf. | Serial Nr. | Inv. No. Cetecom | Last Calibration | Frequency (months) | Next Calibration |
|----|----------------------------------|------------|------------------|------------------|------------------------------------|--------------------|------------------|
| 1 | Anechoic chamber | MWB | 87400/02 | 300000996 | Monthly verification | | |
| 2 | System-Rack 85900 | HP I.V. | * | 300000222 | n.a. | | |
| 3 | Measurement System 1 | | | | | | |
| 4 | Spektrum Analyzer 8566B | HP | 2747A05306 | 300001000 | 05.10.2006 | 24 | 05.10.2008 |
| 5 | Spektrum Analyzer Display 85662A | HP | 2816A16541 | 300002297 | 05.10.2006 | 24 | 05.10.2008 |
| 6 | Quasi-Peak-Adapter 85650A | HP | 2811A01131 | 300000999 | 05.10.2006 | 24 | 05.10.2008 |
| 7 | RF-Preselector 85685A | HP | 2837A00779 | 300000218 | 08.11.2006 | 24 | 08.11.2008 |
| 8 | PC Vectra VL | HP | | 300001688 | n.a. | | |
| 9 | Software EMI | HP | | 300000983 | n.a. | | |
| 10 | Measurement System 2 | | | | | | |
| 11 | FSP 30 | R&S | 100623 | ICT 300003464 | 05.10.2007 | 24 | 15.10.2009 |
| 12 | PC | F+W | | | n.a. | | |
| 13 | TILE | TILE | | | n.a. | | |
| 14 | Biconical antenna | EMCO | S/N: 860 942/003 | | Monthly verification (System cal.) | | |
| 15 | Log. Period. Antenna 3146 | EMCO | 2130 | 300001603 | Monthly verification (System cal.) | | |
| 16 | Double Ridged Antenna HP 3115P | EMCO | 3088 | 300001032 | Monthly verification (System cal.) | | |
| 17 | Active Loop Antenna 6502 | EMCO | 2210 | 300001015 | Monthly verification (System cal.) | | |
| 18 | Power Supply 6032A | HP | 2818A03450 | 300001040 | 12.05.2007 | 36 | 12.05.2010 |
| 19 | Busisolator | Kontron | | 300001056 | n.a. | | |
| 20 | Leitungsteiler 11850C | HP | | 300000997 | Monthly verification (System cal.) | | |
| 21 | Power attenuator 8325 | Byrd | 1530 | 300001595 | Monthly verification (System cal.) | | |
| 22 | Band reject filter WRCG1855/1910 | Wainwright | 7 | 300003350 | Monthly verification (System cal.) | | |
| 23 | Band reject filter WRCG2400/2483 | Wainwright | 11 | 300003351 | Monthly verification (System cal.) | | |

Anechoic chamber F:

| No. | Instrument/Ancillary | Manufacturer | Type | Serial-No. | Internal identification |
|---|---|-------------------------|-----------------------------|--------------------|-------------------------|
| <u>Radiated emission in chamber F</u> | | | | | |
| F-1 | Control Computer | F+W | | FW0502032 | 300003303 |
| F-2 | Bilog antenna | Chase | CBL 6112A | 2110 | 300000573 |
| F-3a | Amplifier | Veritech Microwave Inc. | 0518C-138 | - / - | - / - |
| F-4b | Switch | HP | 3488A | - / - | 300000368 |
| F-5 | EMI Test receiver | R&S | ESCI | 100083 | 300003312 |
| F-6 | Turntable Controller | EMCO | 1061 3M | 1218 | 300000661 |
| F-7 | Tower Controller | EMCO | 1051 Controller | 1262 | 300000625 |
| F-8 | Tower | EMCO | 1051 Tower | 1262 | 300000625 |
| F-9 | Ultra Notch-Filter Rejected band Ch. 62 | WRCD | | 9 | |
| <u>Radiated immunity in chamber F</u> | | | | | |
| F-10 | Control Computer | F+W | | FW0502032 | 300003303 |
| F-11 | Signal Generator | R&S | SML 03 | 102519 | 300003407 |
| F-12 | RF-Amplifier | ar | 50W1000 | 12932 | 300001438 |
| F-13 | Directional Coupler | ar | DC 3010 | 12708 | 300001428 |
| F-14 | Logper Antenna | R&S | HL023A1 | 323704/016 | 300001476 |
| F-15 | RF-Amplifier | ar | 60S1G3 | 313649 | 300003410 |
| F-16 | Directional Coupler | ar | DC7144A | 312786 | 300003411 |
| F-17 | Horn Antenna | ar | AT 4002 | 19739 | 300000633 |
| F-18 | Power Meter | R&S | NRV | 860327/024 | F033 |
| F-19 | Power sensor | R&S | URV5-Z2 | 839080/005 | 300002844.02 |
| F-20 | Power sensor | R&S | URV5-Z2 | 830755/057 | F032 |
| <u>Harmonics and flicker in front of chamber F</u> | | | | | |
| F-21 | Flicker and Harmonics Test System | Spitzenberger & Spies | PHE4500/B I PHE4500/B II | B5983 B5984 | 300000210 |
| F-22 | Control Unit | Spitzenberger & Spies | STE | B5980 | 300000210 |
| F-23 | Power Amplifier | Spitzenberger & Spies | EP 4500/B | B5976 | 300000210 |
| F-24 | Conect Panel | Spitzenberger & Spies | Conect panel | B5982 | 300000210 |
| F-25 | Power Supply | Spitzenberger & Spies | NT-EP 4500 | B3977 | 300000210 |
| F-26 | Additional transformer | Spitzenberger & Spies | UT-EP 4500 | B5978 | 300000210 |
| F-27 | Analyzer Reference System | Spitzenberger & Spies | ARS 16/1 | A3509 07/0 0205 | 300003314 |
| F-26 | Power Supply | Hewlett Packard | 6032 A | 2920 A 04466 | 300000580 |

6 Annex B: Photographs of Test site

Photo 1 (Radiated Emissions):



Photo 2 (Radiated Emissions):

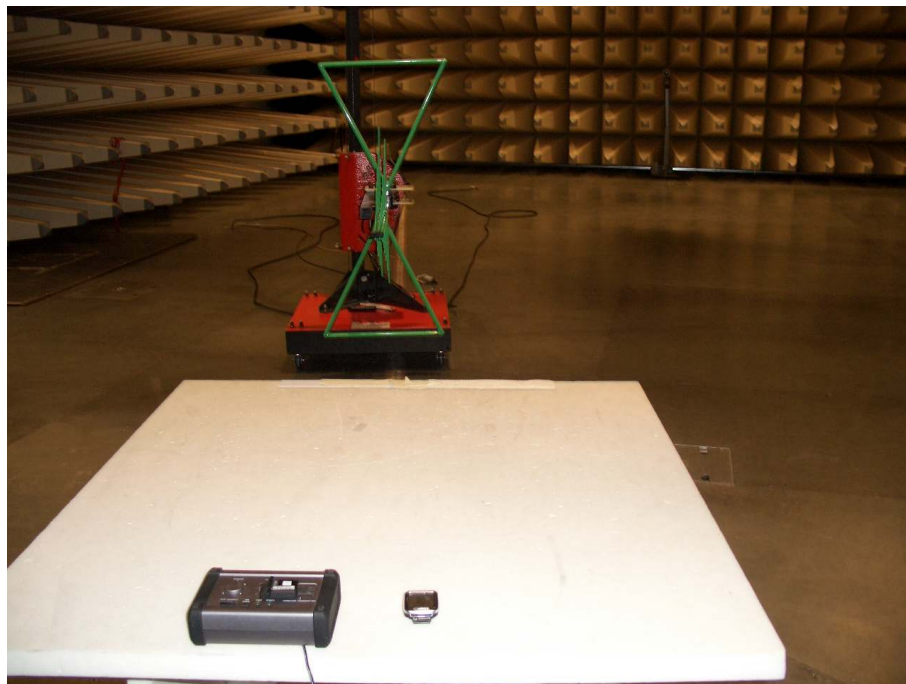


Photo 3 (Radiated Emissions):



7 Annex C: External Photographs of the Equipment

Photo 1:



Plot 2:



8 Annex D: INTERNAL PHOTOGRAPHS OF THE EQUIPMENT

Photo 3:

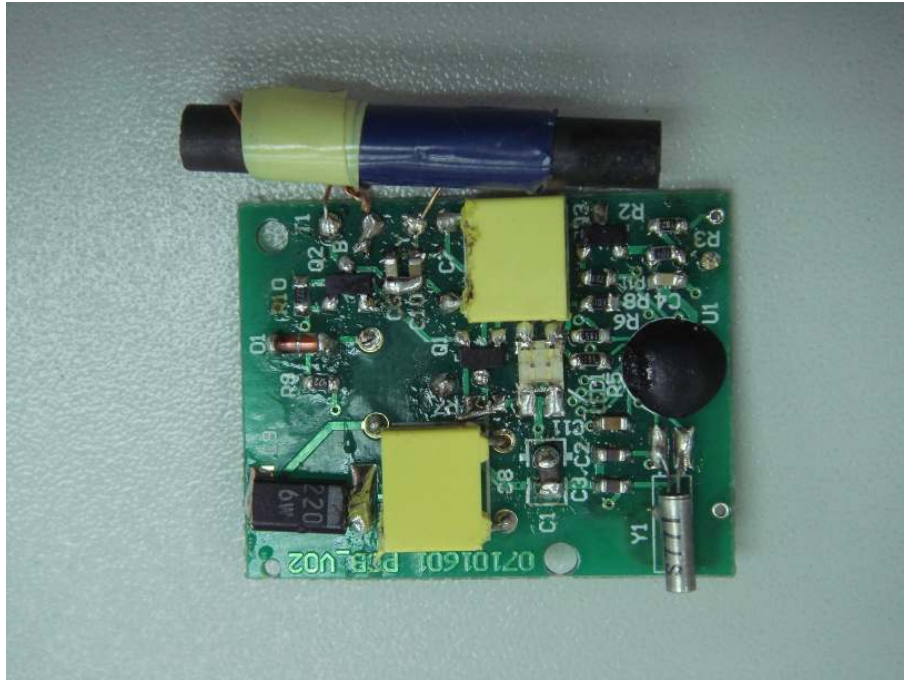


Photo 4:

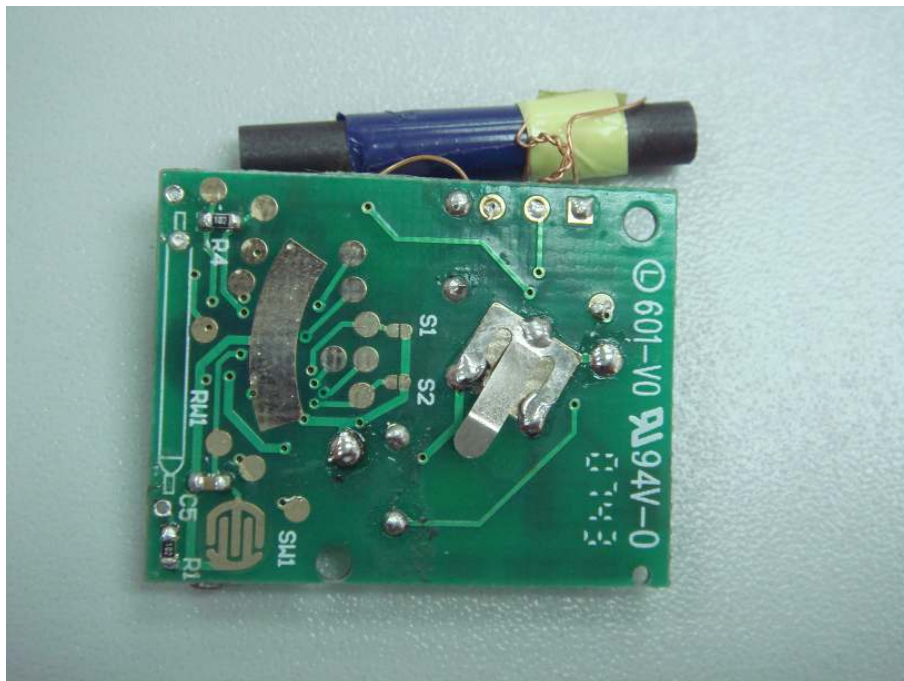


Photo 5:



Photo 6:

