

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



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



Independent ETSI  
compliance test house



## Accredited Bluetooth® Test Facility (BQTF)

|                             |          |                                               |
|-----------------------------|----------|-----------------------------------------------|
| <b>Test report no.</b>      | <b>:</b> | <b>2-4239-10-03/06</b>                        |
| <b>Applicant</b>            | <b>:</b> | <b>Sony Ericsson Mobile Communications AB</b> |
| <b>Type</b>                 | <b>:</b> | <b>AAD-3022021-BV</b>                         |
| <b>Test Standard</b>        | <b>:</b> | <b>FCC Part 15.247<br/>RSS-210</b>            |
| <b>FCC ID</b>               | <b>:</b> | <b>PY7AD022021</b>                            |
| <b>Certification No. IC</b> | <b>:</b> | <b>4170B-AD022021</b>                         |

*The Bluetooth word mark and logos are owned by the Bluetooth SIG, Inc. and any use of such marks by Cetecom ICT is under license*

## **Table of contents**

|                                                                                       |           |
|---------------------------------------------------------------------------------------|-----------|
| <b>1. ADMINISTRATIVE DATA .....</b>                                                   | <b>3</b>  |
| 1.1. ADMINISTRATIVE DATA OF THE TEST FACILITY .....                                   | 3         |
| 1.1.1 Identification of the testing laboratory .....                                  | 3         |
| 1.1.2 Organizational items.....                                                       | 3         |
| 1.1.3 Applicant's details .....                                                       | 4         |
| 1.2 ADMINISTRATIVE DATA OF MANUFACTURER / MEMBER .....                                | 4         |
| 1.3 DESCRIPTION OF THE EQUIPMENT UNDER TEST (EUT) .....                               | 5         |
| 1.3.1 EUT: Type, S/N etc. ....                                                        | 5         |
| 1.3.2 If RF component testing only, description of additional used HW/SW .....        | 5         |
| 1.3.3 Additional EUT information For IC Canada (appendix 2).....                      | 6         |
| 1.3.4 EUT operating modes .....                                                       | 7         |
| 1.3.5 Extreme conditions testing values.....                                          | 7         |
| <b>2. TESTSTANDARD &amp; SUMMARY LIST OF ALL PERFORMED TEST CASES .....</b>           | <b>8</b>  |
| <b>3. RF MEASUREMENT TESTING .....</b>                                                | <b>9</b>  |
| 3.1 DESCRIPTION OF TEST SET-UP .....                                                  | 9         |
| 3.1.1 Radiated measurements .....                                                     | 9         |
| 3.1.2 Conducted measurements .....                                                    | 9         |
| 3.2 REFERENCED DOCUMENTS.....                                                         | 10        |
| 3.3 ADDITIONAL COMMENTS .....                                                         | 10        |
| 3.4 ANTENNA GAIN .....                                                                | 10        |
| 3.5 CARRIER FREQUENCY SEPARATION §15.247(A1).....                                     | 11        |
| 3.6 NUMBER OF HOPPING CHANNELS §15.247(A1) .....                                      | 12        |
| 3.7 TIME OF OCCUPANCY (DWELL TIME) §15.247(A1 III) .....                              | 13        |
| 3.8 POWER SPECTRAL DENSITY (HYBRID SYSTEM IN INQUIRY MODE/PAGE SCAN) §15.247(D) ..... | 14        |
| 3.9 SPECTRUM BANDWIDTH OF A FHSS SYSTEM / 20dB BANDWITH §15.247(A1) .....             | 15        |
| 3.10 MAXIMUM OUTPUT POWER (CONDUCTED) § 15.247 (B) (1) .....                          | 17        |
| 3.11 MAX. PEAK OUTPUT POWER (RADIATED) § 15.247 (B) (1).....                          | 19        |
| 3.12 BAND-EDGE COMPLIANCE OF CONDUCTED EMISSIONS §15.247 (C) .....                    | 20        |
| 3.13 BAND-EDGE COMPLIANCE OF RADIATED EMISSIONS §15.205 .....                         | 23        |
| 3.14 SPURIOUS EMISSIONS - CONDUCTED (TRANSMITTER) § 15.247 (C) (1) .....              | 26        |
| 3.15 SPURIOUS EMISSIONS > 30 MHz- RADIATED (TRANSMITTER) § 15.247 (C) (1) .....       | 28        |
| 3.16 SPURIOUS EMISSIONS - RADIATED (RECEIVER) § 15.109 .....                          | 33        |
| 3.17 SPURIOUS EMISSIONS < 30 MHz - TRANSMITTER RADIATED § 15.209 .....                | 35        |
| 3.18 CONDUCTED EMISSIONS <30 MHz § 15.107/207 .....                                   | 36        |
| <b>4 PHOTOGRAPHS OF TEST SET-UP .....</b>                                             | <b>40</b> |
| <b>5 PHOTOGRAPHS OF EUT .....</b>                                                     | <b>40</b> |

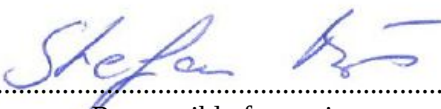
## **ANNEX 1: TECHNICAL PRODUCT DESCRIPTION**

## 1. Administrative data

### 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<br>D-66117 Saarbruecken<br>Germany                                    |
| Laboratory accreditation:           | DAR-Registration No. DAT-P-176/94-D1<br>Bluetooth Qualification Test Facility (BQTF)           |
| Responsible for testing laboratory: | Dirk Hausknecht<br>Phone: +49 681 598 0<br>Fax: +49 681 598 9075<br>email: info@ict.cetecom.de |

  
.....  
Responsible for testing  
(Stefan Bös)

#### 1.1.2 Organizational items

|                                  |                          |
|----------------------------------|--------------------------|
| Reference No.:                   | 2-4239-10-03/06          |
| Order No.:                       |                          |
| Receipt of EUT:                  | 2006-07-24               |
| Date(s) of test:                 | 2006-07-31 to 2006-08-07 |
| Date of report:                  | 2006-08-09               |
| Number of report pages:          | 54                       |
| Number of diagram pages (annex): |                          |
| -----                            |                          |
| Version of template:             | 1.8                      |

  
.....  
Responsible for laboratory  
(Dirk Hausknecht)

## Note:

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

During the test no hardware and software changes are allowed to be performed at the EUT.

### 1.1.3 Applicant's details

|                   |                                                                                                                 |
|-------------------|-----------------------------------------------------------------------------------------------------------------|
| Applicant's name: | Sony Ericsson Mobile Communications AB                                                                          |
| Address:          | Nya Vattentorget<br>S-22188 Lund<br>Sweden                                                                      |
| Contact person:   | Peter Lindeborg<br>Phone: +46 (0) 705757380<br>Fax: +46 (0) 46193295<br>email: Peter.lindeborg@sonyericsson.com |

### 1.2 Administrative data of manufacturer / member

|                      |                |
|----------------------|----------------|
| Manufacturer's name: | same as 1.1.3. |
| Address:             |                |

## 1.3 Description of the Equipment under test (EUT)

### 1.3.1 EUT: Type, S/N etc.

Product name : AAD-3022021-BV  
Product ID : AAD-3022021-BV  
Description : GSM Mobile Phone 900/1800/1900/UMTS with Bluetooth  
S/N serial number : CB5A003W4F (radiated)  
CB5A003VX9 (conducted)  
CB5A003W47 (conducted)  
HW hardware status : A  
SW software status :  
Frequency Band [MHz] : ISM 2400 – 2483.5  
Type of Modulation : FHSS  
Number of channels : 79  
Antenna : Integrated antenna  
Power Supply : 3.8 V AC by Li-Polymer battery  
Temperature Range : -20°C - +55°C  
  
Max. power radiated: -1.55 dBm  
Max. power conducted: +4.06 dBm

FCC ID: PY7AD022021  
IC: 4170B-AD022021

### 1.3.2 If RF component testing only, description of additional used HW/SW

|   | Product name | Product ID | Description | S/N<br>serial number | HW<br>hardware status | SW<br>software<br>status |
|---|--------------|------------|-------------|----------------------|-----------------------|--------------------------|
| 1 |              |            |             |                      |                       |                          |
| 2 |              |            |             |                      |                       |                          |
| 3 |              |            |             |                      |                       |                          |
| 4 |              |            |             |                      |                       |                          |

## 1.3.3 Additional EUT information For IC Canada (appendix 2)

|                                                       |                                                                                      |
|-------------------------------------------------------|--------------------------------------------------------------------------------------|
| Company Number:                                       | 4170B                                                                                |
| Model Name:                                           | AAD-3022021-BV                                                                       |
| Manufacturer (complete Address):                      | Sony Ericsson Mobile Communications AB<br>Nya vattentornet<br>S-22188 Lund<br>Sweden |
| Tested to Radio Standards Specification (RSS) No.:    | RSS-210                                                                              |
| Open Area Test Site Industry Canada Number:           | 3463                                                                                 |
| Frequency Range (or fixed frequency) [MHz]:           | 2400 – 2483.5 MHz                                                                    |
| RF: Power [W] (max):                                  | Rad. EIRP: 0.70 mW<br>Conducted : 2.55 mW                                            |
| Antenna Type:                                         | Integrated antenna                                                                   |
| Occupied Bandwidth (99% BW) [kHz]:                    | 878.00                                                                               |
| Type of Modulation:                                   | FSK                                                                                  |
| Emission Designator (TRC-43):                         | IM00FXD / 79M0FXD (FHSS)                                                             |
| Transmitter Spurious (worst case) [ $\mu$ V/m in 3m]: | 251 $\mu$ V/m                                                                        |
| Receiver Spurious (worst case) [ $\mu$ V/m in 3m]:    | 237 $\mu$ V/m                                                                        |

ATTESTATION: I attest that the testing was performed or supervised by me; that the test measurements were made in accordance with the above-mentioned departmental standard(s), and that the radio equipment identified in this application has been subject to all the applicable test conditions specified in the departmental standards and all of the requirements of the standards have been met.

Signature:



Date: 2006-08-09

Testengineer: Stefan Bös

### 1.3.4 EUT operating modes

| EUT operating mode no.*) | Description of operating modes | Additional information                         |
|--------------------------|--------------------------------|------------------------------------------------|
| Op. 0                    | Normal mode                    | Normal temperature and power source conditions |
| Op. 1                    |                                | low temperature, low power source conditions   |
| Op. 2                    |                                | low temperature, high power source conditions  |
| Op. 3                    |                                | high temperature, low power source conditions  |
| Op. 4                    |                                | high temperature, high power source conditions |

\*) EUT operating mode no. is used to simplify the testplan

### 1.3.5 Extreme conditions testing values

| Description                    | Shortcut          | Unit   | Value    |
|--------------------------------|-------------------|--------|----------|
| Nominal Temperature / humidity | T <sub>nom</sub>  | °C / % | +21 / 45 |
| Low Temperature                | T <sub>low</sub>  | °C     | -20      |
| High Temperature               | T <sub>high</sub> | °C     | +55      |
| Nominal Power Source           | V <sub>nom</sub>  | V      | 4.0      |
| Low Power Source               | V <sub>low</sub>  | V      | 3.4      |
| High Power Source              | V <sub>high</sub> | V      | 4.2      |

Type of powersource: V AC

Deviations from this values are reported in chapter 2

## 2. Teststandard & summary list of all performed test cases

| TC identifier | Description                          | verdict | date       | Remark |
|---------------|--------------------------------------|---------|------------|--------|
| RF-Testing    | FCC Part 15 §15.247 - CANADA RSS-210 | PASS    | 2006-08-09 |        |

| Test Specification Clause | Test Case                                                        | Pass | Fail | Not applicable | Not performed |
|---------------------------|------------------------------------------------------------------|------|------|----------------|---------------|
| None                      | Antenna Gain                                                     | Yes  |      |                |               |
| §15.247(a1)               | Carrier frequency separation                                     | Yes  |      |                |               |
| §15.247(a1)               | Number of hopping channels                                       | Yes  |      |                |               |
| §15.247(a)(1)(iii)        | Time of occupancy (dwell time)                                   | Yes  |      |                |               |
| §15.247(e)                | Power Spectral density (Hybrid system in Inquiry mode/Page scan) |      |      | Yes            |               |
| §15.247(a)(1)             | Spectrum Bandwidth of a FHSS System / 20dB Bandwidth             | Yes  |      |                |               |
| § 15.247 (b)(1)           | Maximum output power (conducted)                                 | Yes  |      |                |               |
| § 15.247 (b)(1)           | Max. peak output power (radiated)                                | Yes  |      |                |               |
| § 15.247 (d)              | Band-edge compliance of conducted emissions                      | Yes  |      |                |               |
| § 15.205                  | Band-edge compliance of radiated emissions                       | Yes  |      |                |               |
| § 15.247 (d)              | Spurious Emission - conducted (Transmitter)                      | Yes  |      |                |               |
| § 15.247 (d)              | Spurious Emission - radiated (Transmitter) >30 MHz               | Yes  |      |                |               |
| § 15.109                  | Spurious Emissions - radiated (Receiver)                         | Yes  |      |                |               |
| § 15.209                  | Spurious Emissions - radiated (Transmitter) <30 MHz              | Yes  |      |                |               |
| § 15.107/207              | Conducted Emissions <30 MHz                                      | Yes  |      |                |               |



## 3. RF measurement testing

### 3.1 Description of test set-up

#### 3.1.1 Radiated measurements

The radiated measurements are performed in vertical and horizontal plane in the frequency range from 9 kHz to 25 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 are conform with specifications ANSI C63.2-1987 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 setups 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 are conform with ANSI C63.2-1996 item 15.

9 kHz - 150 MHz: Quasi Peak measurement, 200 Hz Bandwidth, passive loop antenna.

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

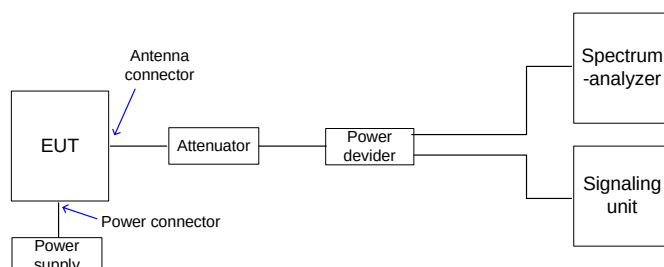
>1GHz: Average, RBW 1MHz, VBW 10 Hz, waveguide horn

All measurements are done in accordance with the Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems DA 00-705 and Appendix A "BLUETOOTH APPROVALS"

The EUT is powered by an external power supply with nominal voltage. The signaling is performed from outside the chamber with a signaling unit (CMU200 or other) by airlink using signaling antenna.

#### 3.1.2 Conducted measurements

The EUT's RF signal is coupled out by the antenna connector which is supplied by the manufacturer. The signal is first 10dB attenuated before it is power divided (~6dB loss per branch). One of the signal path is connected to the communication base Station (CMU200 or other), the other one is connected to the spectrum analyzer. The specific losses for both signal paths are first checked within a calibration. The measurement readings on the signaling unit/spectrum analyzer are corrected by the specific test set-up loss. The attenuator, power divider, signaling unit and the spectrum analyzer are impedance matched on 50 Ohm.



### 3.2 Referenced documents

none

### 3.3 Additional comments

Hardware / software changes during testing (only for pretesting)

| Setup revision | Description of change | Change referenced to setup revision | Already perf. testcases influenced yes (repeated) / no |
|----------------|-----------------------|-------------------------------------|--------------------------------------------------------|
| 1.0            | Start setup           | -                                   | -                                                      |
|                |                       |                                     |                                                        |
|                |                       |                                     |                                                        |
|                |                       |                                     |                                                        |
|                |                       |                                     |                                                        |
|                |                       |                                     |                                                        |
|                |                       |                                     |                                                        |
|                |                       |                                     |                                                        |
|                |                       |                                     |                                                        |
|                |                       |                                     |                                                        |
|                |                       |                                     |                                                        |

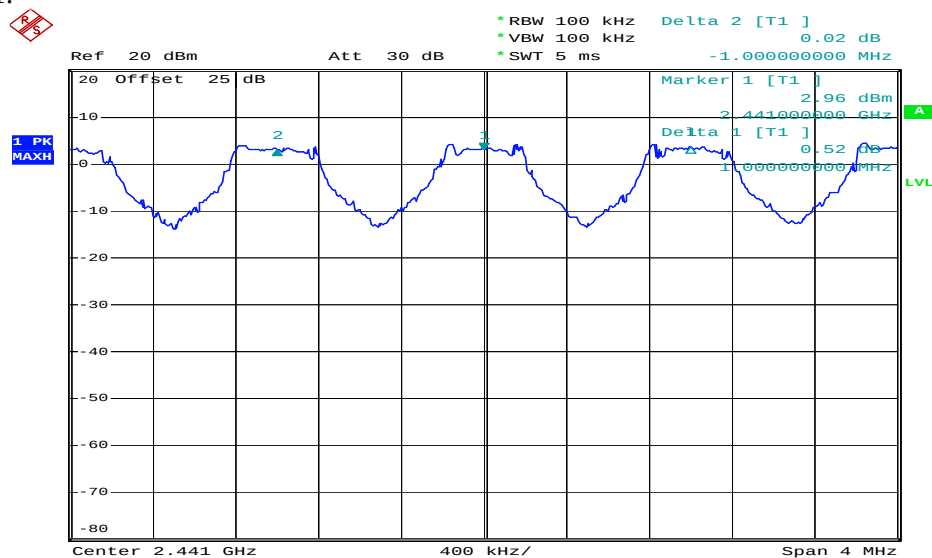
### 3.4 Antenna gain

The antenna gain of the complete system is calculated by the difference of radiated power in EIRP and the conducted power of the module.

|                       | low channel | mid channel | high channel |
|-----------------------|-------------|-------------|--------------|
| Conducted power [dBm] | 4.06        | 3.73        | 3.10         |
| Radiated power [dBm]  | -1.55       | -1.96       | -2.41        |
| Gain [dB]             | -5,61       | -5,69       | -5,51        |

## 3.5 Carrier frequency separation §15.247(a)(1)

Plot 1 of 1:



555

Date: 1.AUG.2006 16:33:05

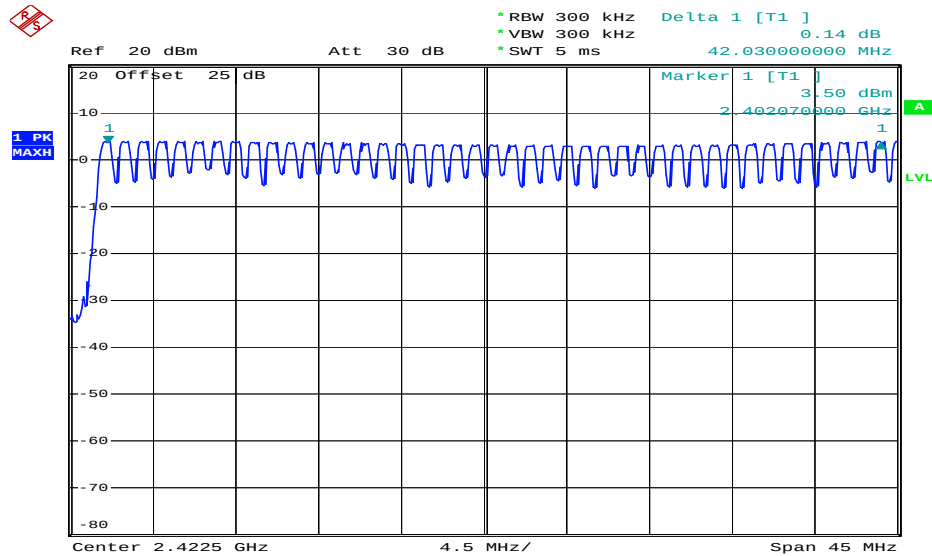
Result : Channel separation is: ~ 1 MHz

Limits :

|                                   |                                                         |
|-----------------------------------|---------------------------------------------------------|
| Under normal test conditions only | Minimum 25 kHz or 20 dB Bandwidth of the hopping system |
|-----------------------------------|---------------------------------------------------------|

### 3.6 Number of hopping channels §15.247(a)(1)

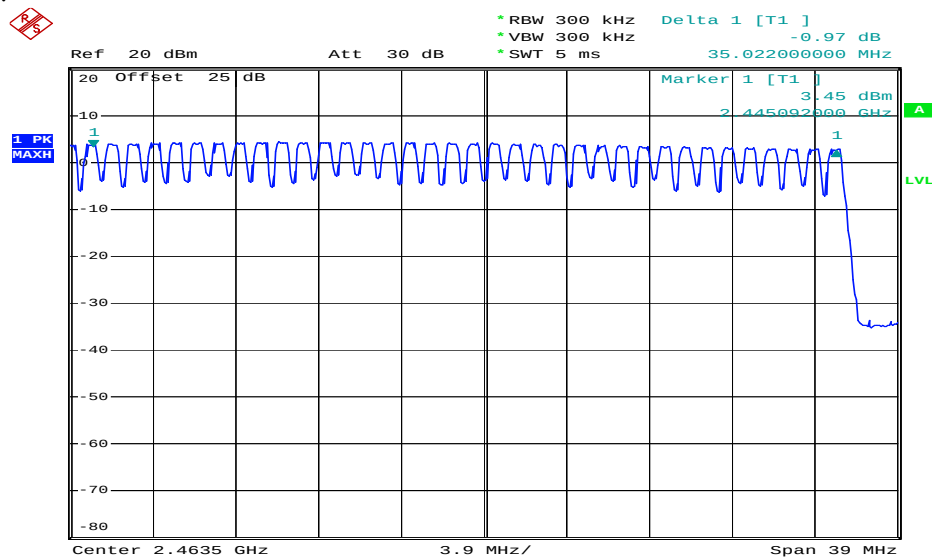
Plot 1 of 2:



555

Date: 1.AUG.2006 16:02:38

Plot 2 of 2:



555

Date: 1.AUG.2006 16:05:03

Result : The number of hopping channels is: 79

Limits :

|                                   |                                      |
|-----------------------------------|--------------------------------------|
| Under normal test conditions only | at least 15 non-overlapping channels |
|-----------------------------------|--------------------------------------|

## 3.7 Time of occupancy (dwell time) §15.247(a)(1)(iii)

For Bluetooth devices:

The dwell time of 0.4 s within a 31.6 second period in data mode is independent from the packet type (packet length).  
The calculation for a 31.6 second period is as follows:

Dwell time = time slot length \* hop rate / number of hopping channels \* 31.6 s

Example for a DH1 packet (with a maximum length of one time slot)

Dwell time =  $625 \mu\text{s} * 1600 \text{ 1/s} / 79 * 31.6 \text{ s} = 0.4 \text{ s}$  (in a 31.6 s period)

For multi-slot packet the hopping is reduced according to the length of the packet.

Example for a DH5 packet (with a maximum length of five time slots)

Dwell time =  $5 * 625 \mu\text{s} * 1600 * 1/5 * 1/s / 79 * 31.6 \text{ s} = 0.4 \text{ s}$  (in a 31.6 s period)

This is according to the Bluetooth Core Specification V 1.1 & V 1.2 (+ critical errata) for all Bluetooth devices.

Therefore, all Bluetooth devices comply with the FCC dwell time requirement in the data mode.

This was checked during the Bluetooth Qualification tests.

The Dwell time in hybrid mode is approximately 2.6 mS (in a 12.8s period)

## 3.8 Power Spectral density (Hybrid system in Inquiry mode/Page scan) §15.247(e)

### Not applicable

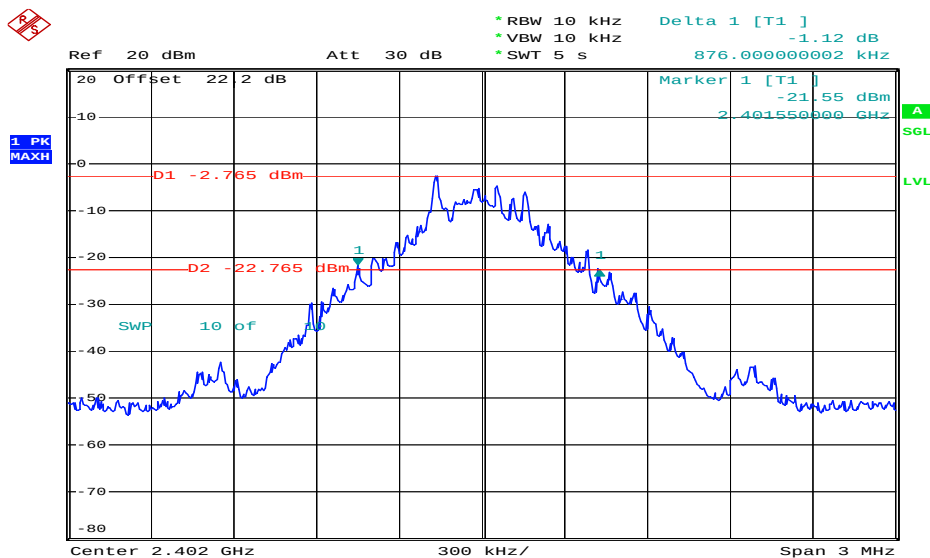
Result: Max. Power density : dBm/Hz = dBm / 3 KHz  
Correction factor from dBm/Hz to dBm/3KHz is +34,8 dB

Limits :

|                                   |                                                                                                                                                                                                                               |
|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Under normal test conditions only | For digitally modulated systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 KHz band during any time interval of continuous transmission |
|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## 3.9 Spectrum Bandwidth of a FHSS System / 20dB Bandwidth §15.247(a)(1)

Plot 1 of 3



555

Date: 2.AUG.2006 10:41:53

Plot 2 of 3



555

Date: 2.AUG.2006 10:44:23

Plot 3 of 3



555

Date: 2.AUG.2006 10:47:21

## Results:

| Test conditions         |                  | 20 dB BANDWIDTH [KHz] |      |      |
|-------------------------|------------------|-----------------------|------|------|
| Frequency [MHz]         |                  | 2402                  | 2441 | 2480 |
| T <sub>nom</sub>        | V <sub>nom</sub> | 876                   | 878  | 878  |
| Measurement uncertainty |                  | ±1kHz                 |      |      |

RBW / VBW as provided in the „Measurement Guidelines“ (DA 00-705, March 30, 2000)

RBW: 10 kHz / VBW 10 kHz

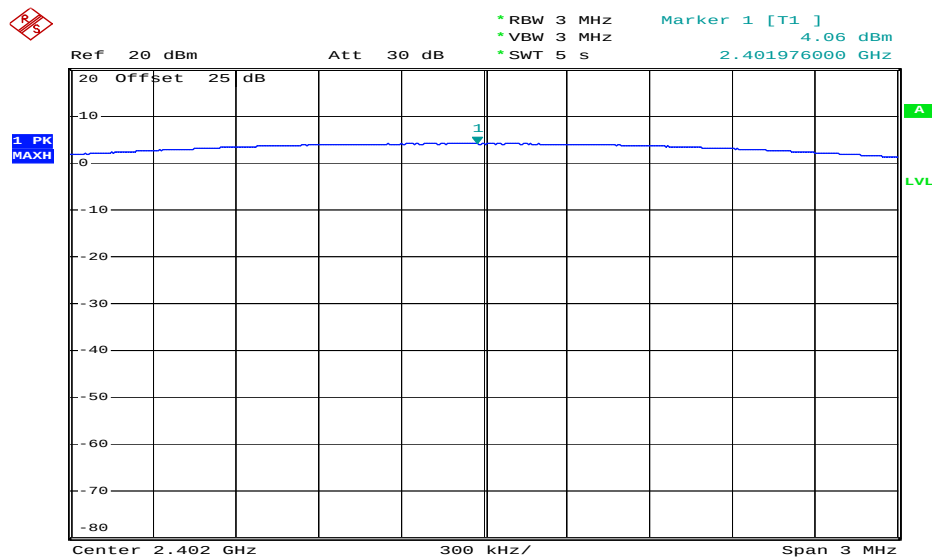
## Limits :

|                                   |            |
|-----------------------------------|------------|
| Under normal test conditions only | < 1000 KHz |
|-----------------------------------|------------|



## 3.10 Maximum output power (conducted) § 15.247 (b)(1)

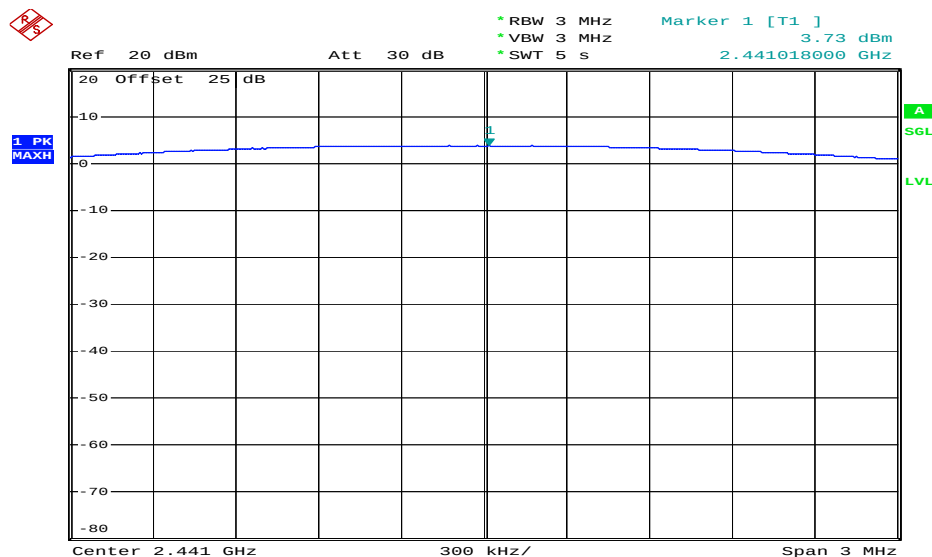
Plot 1 of 3



555

Date: 1.AUG.2006 15:51:06

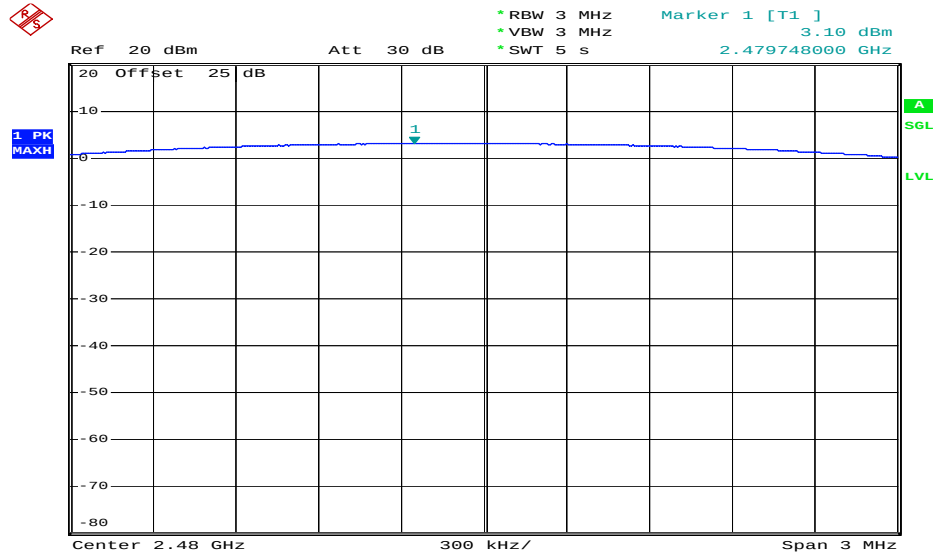
Plot 2 of 3



555

Date: 1.AUG.2006 15:53:09

Plot 3 of 3



555

Date: 1.AUG.2006 15:54:50

## Results:

| Test conditions         |                  | Max. peak output power [dBm] |      |      |      |      |      |
|-------------------------|------------------|------------------------------|------|------|------|------|------|
| Frequency [MHz]         |                  | 2402                         |      | 2442 |      | 2480 |      |
| T <sub>nom</sub>        | V <sub>nom</sub> | PK                           | 4.06 | PK   | 3.73 | PK   | 3.10 |
| Measurement uncertainty |                  | ±3dB                         |      |      |      |      |      |

RBW / VBW : 3 MHz

## Limits:

|                                                                        |               |
|------------------------------------------------------------------------|---------------|
| Under normal test conditions only, for frequency range 2400-2483.5 MHz | Max. 1.0 Watt |
|------------------------------------------------------------------------|---------------|

## 3.11 Max. peak output power (radiated) § 15.247 (b)(1)

Results:

| Test conditions         |                  | Max. peak output power EIRP [dBm] |       |       |
|-------------------------|------------------|-----------------------------------|-------|-------|
| Frequency [MHz]         |                  | 2402                              | 2442  | 2480  |
| T <sub>nom</sub>        | V <sub>nom</sub> | -1.55                             | -1.96 | -2.41 |
| Measurement uncertainty |                  | ±3dB                              |       |       |

RBW / VBW : 3 MHz

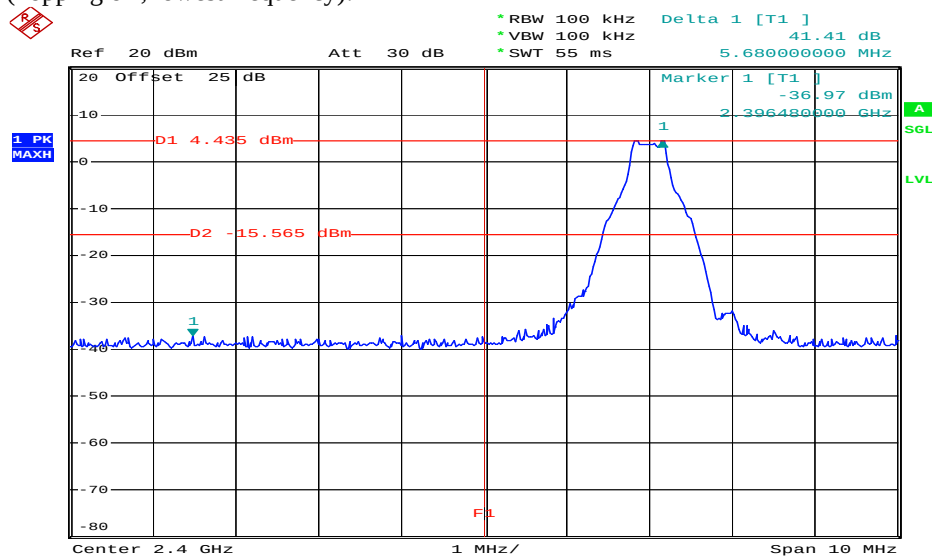
Measured at a distance of 3m

Limits:

|                                                                        |               |
|------------------------------------------------------------------------|---------------|
| Under normal test conditions only, for frequency range 2400-2483.5 MHz | Max. 1.0 Watt |
|------------------------------------------------------------------------|---------------|

## 3.12 Band-edge compliance of conducted emissions §15.247 (d)

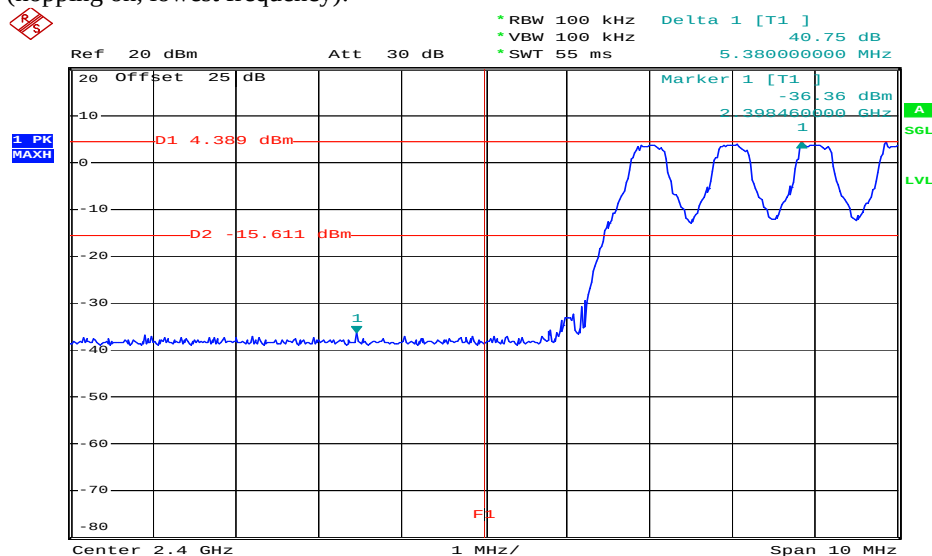
Plot 1 of 4 (hopping off, lowest frequency):



555

Date: 1.AUG.2006 16:22:22

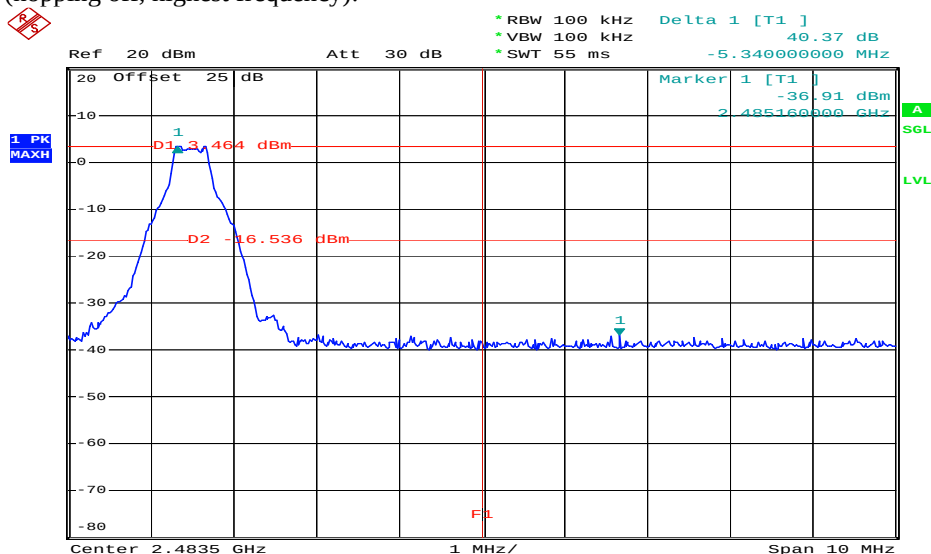
Plot 2 of 4 (hopping on, lowest frequency):



555

Date: 1.AUG.2006 16:26:02

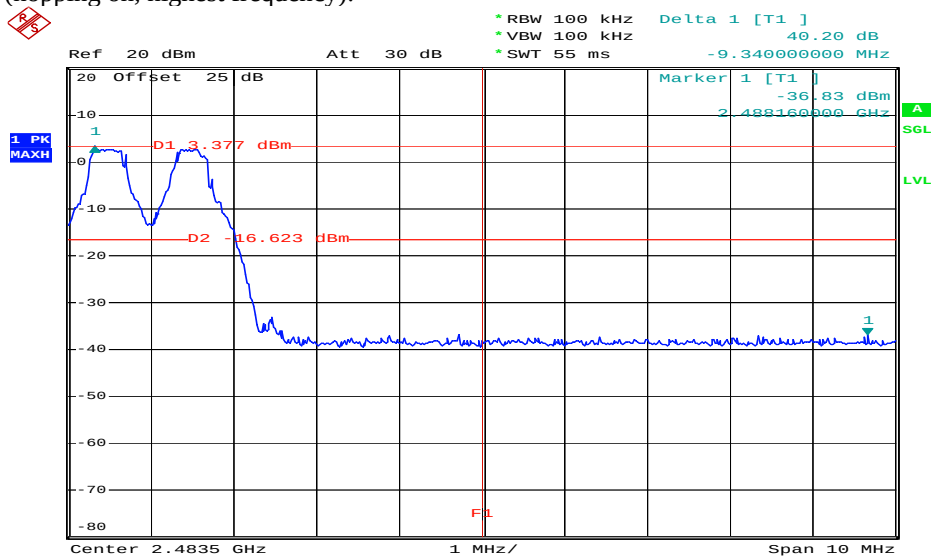
Plot 3 of 4 (hopping off, highest frequency):



555

Date: 1.AUG.2006 16:20:00

Plot 4 of 4 (hopping on, highest frequency):



555

Date: 1.AUG.2006 16:28:43

## Results:

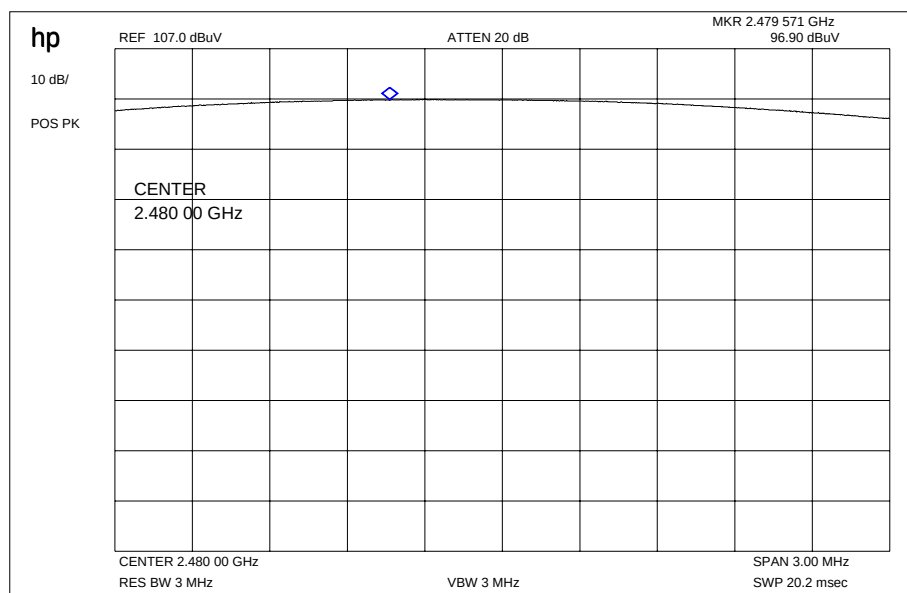
| SZENARIO                       | DELTA VALUE [DB] |
|--------------------------------|------------------|
| hopping off, lowest frequency  | 41.41            |
| hopping on, lowest frequency   | 40.75            |
| hopping off, highest frequency | 40.37            |
| hopping on, highest frequency  | 40.20            |
| Measurement uncertainty        | ±1.5dB           |

## Limits:

|                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Under normal test conditions only | 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. 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 5.205(c)). |
|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

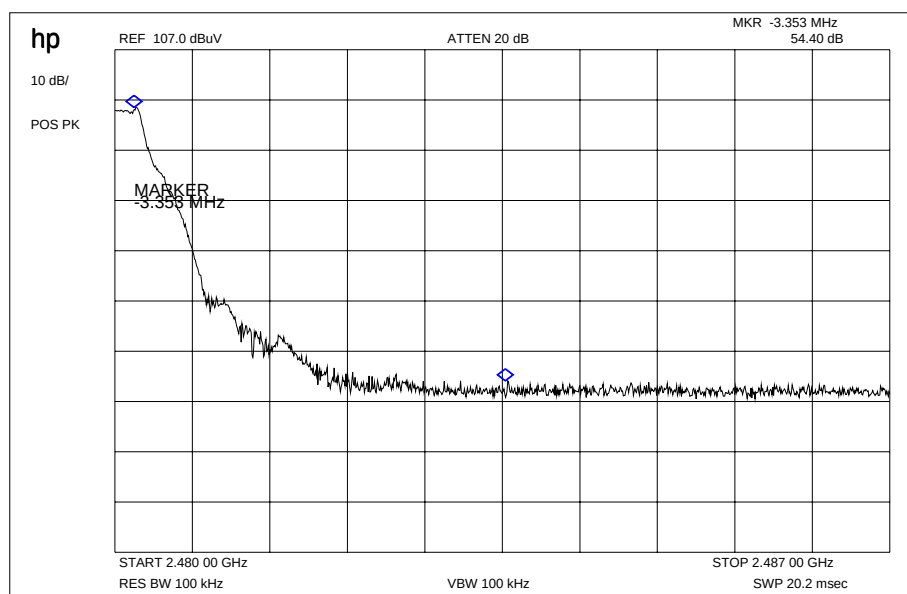
## 3.13 Band-edge compliance of radiated emissions §15.205

Plot 1 : Max field strength in 3m distance (single frequency)



Result: 96.90 dB $\mu$ V/m

Plot 2: Marker-Delta Method (single carrier)

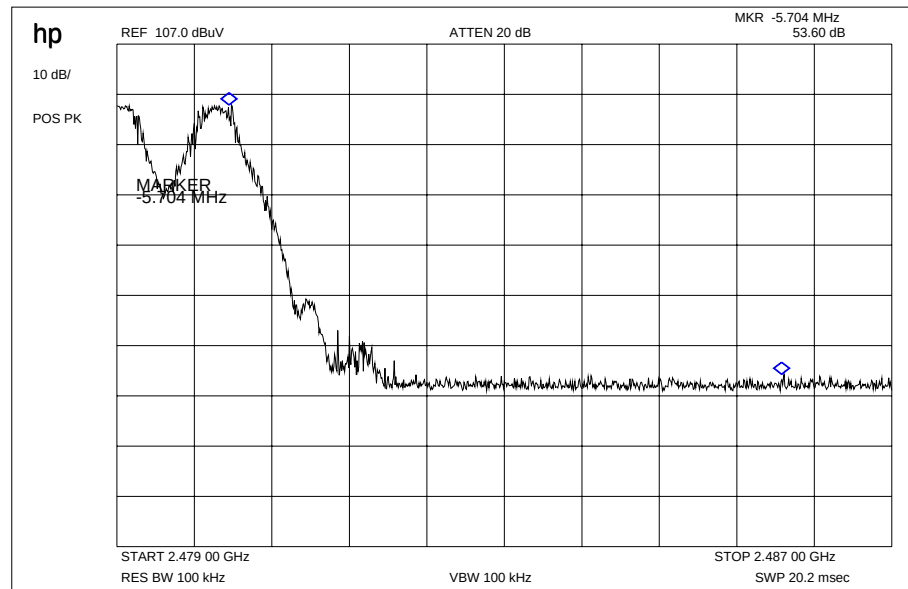


Result:

Marker-Delta-Value : 54.40 dB

This measurement was made to show that the behavior of the system is conform to FCC 15.205 (restricted bands)

## Plot 3: Marker-Delta Method (hopping)

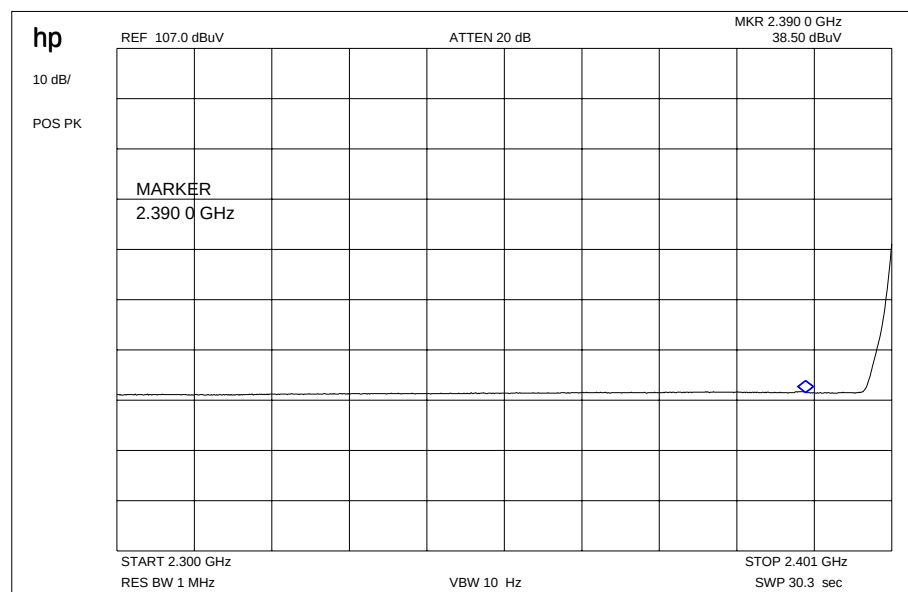


Result:

Marker-Delta-Value : 53.60 dB

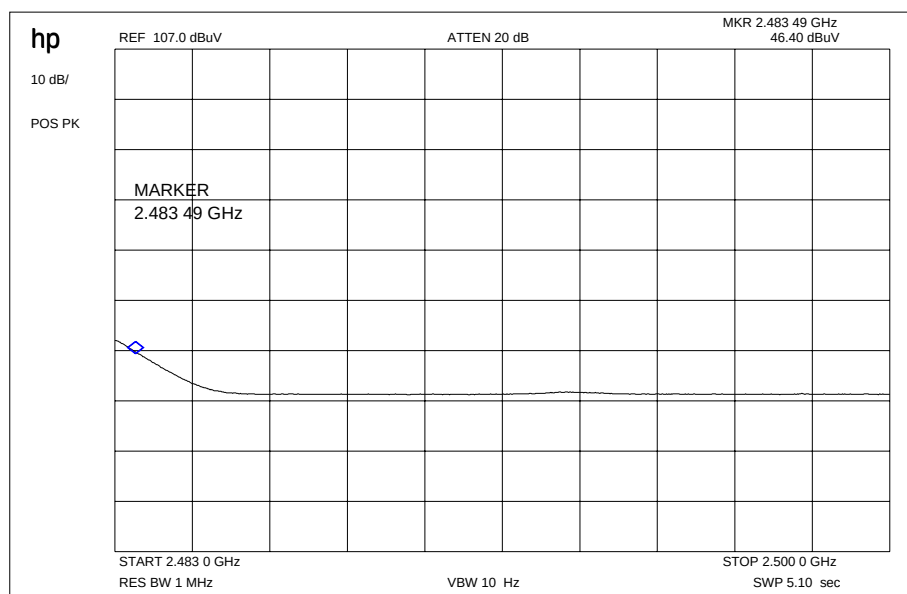
This measurement was made to show that the behavior of the system is conform to FCC 15.205 (restricted bands)

## Plot 4: Restricted Bands low





## Plot 5: Restricted Bands high



## Results & Limits:

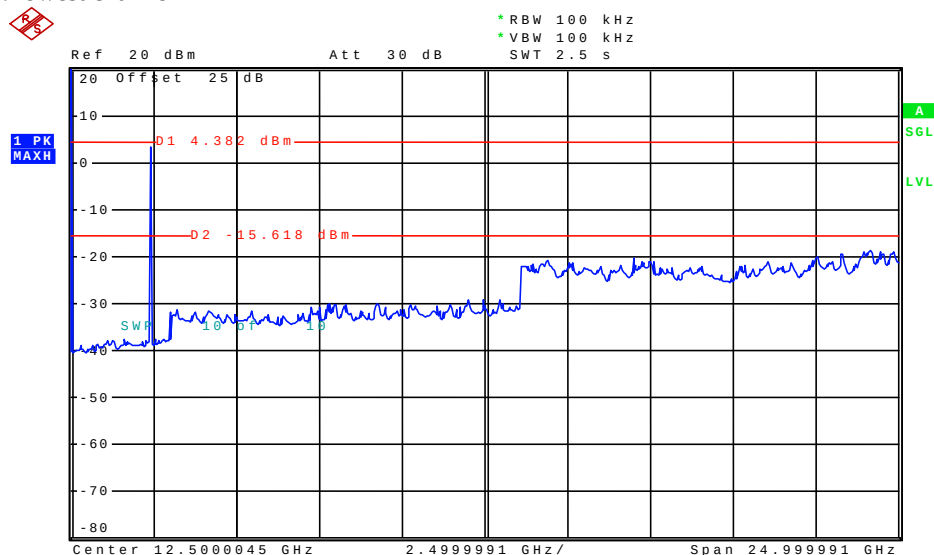
### Radiated field strength

The field strength was measured with an EMI measuring receiver and 1 MHz RBW / VBW for peak and with 1MHz RBW / 10Hz VBW for average at a distance of 3m.

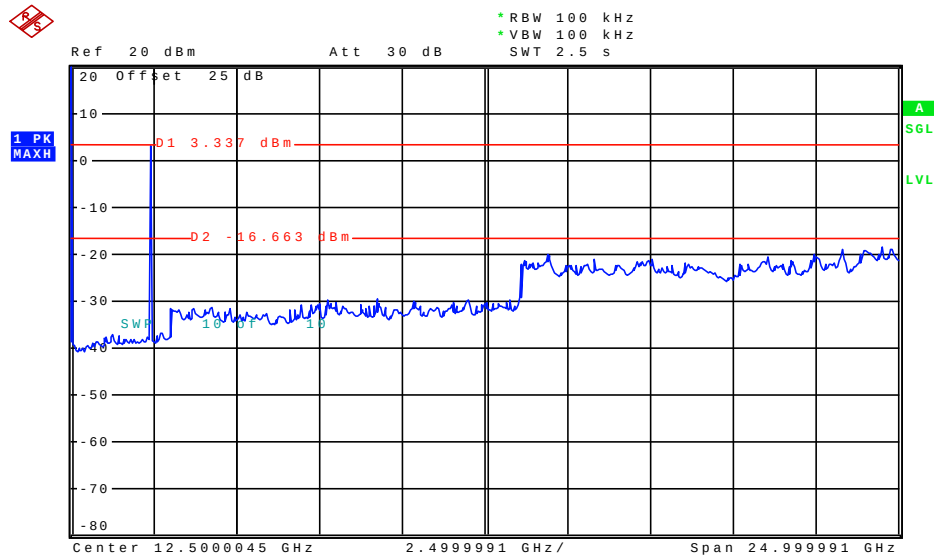
| high channel       | setup                                        | measured value (3m)                                  | correction factor (3m)                                   | calculated value (3m)                                                    |
|--------------------|----------------------------------------------|------------------------------------------------------|----------------------------------------------------------|--------------------------------------------------------------------------|
| Max. peak value    | 1 MHz RBW<br>1 MHz VBW                       | 96.90 dB $\mu$ V/m                                   | --                                                       | 96.90 dB $\mu$ V/m                                                       |
| Max. average value | Calculated with duty cycle correction factor | 96.90 dB $\mu$ V/m peak                              | -1.07dB<br>duty cycle correction factor (worst case DH5) | 95.83 dB $\mu$ V/m                                                       |
| Delta value        | Peak<br>30 kHz<br>RBW/VBW                    | 54.40 dB (single carrier)<br>53.60 dB (hopping mode) | -                                                        | -                                                                        |
| Value at band edge | limit 54 dB $\mu$ V/m                        |                                                      |                                                          | 41.43 dB $\mu$ V/m (single carrier)<br>42.23 dB $\mu$ V/m (hopping mode) |
| Statement:         |                                              |                                                      |                                                          | Complies                                                                 |

## 3.14 Spurious Emissions - conducted (Transmitter) § 15.247 (c)(1)

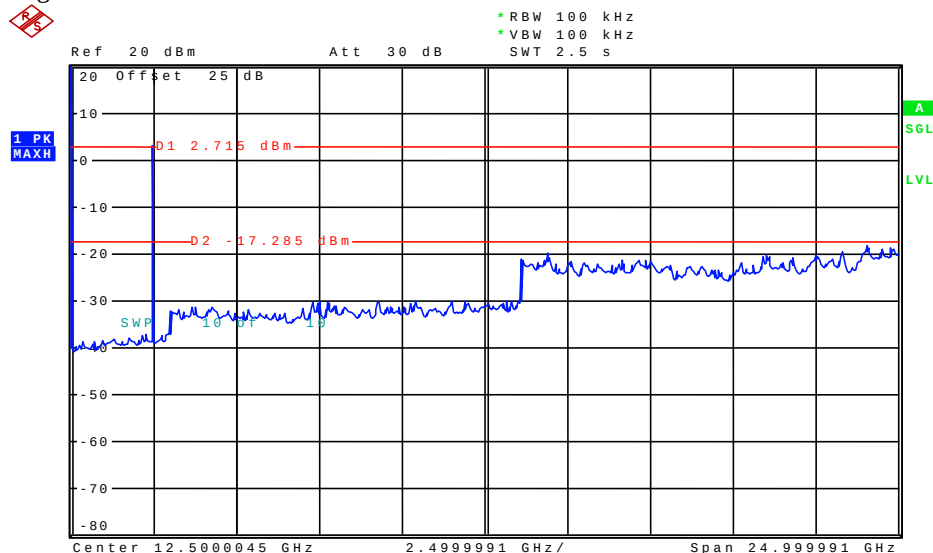
Plot 1 of 3: lowest channel



Plot 2 of 3: middle channel



Plot 3 of 3: highest channel



## Result & Limits:

| Emission Limitations    |  |                             |                                   |                                                      |                     |
|-------------------------|--|-----------------------------|-----------------------------------|------------------------------------------------------|---------------------|
| f [MHz]                 |  | amplitude of emission [dBm] | limit max. allowed emission power | actual attenuation below frequency of operation [dB] | results             |
| 2402                    |  | 4.38                        | 30 dBm                            |                                                      | Operating frequency |
|                         |  |                             | -20 dBc                           |                                                      | complies            |
|                         |  |                             |                                   |                                                      | complies            |
| 2441                    |  | 3.34                        | 30 dBm                            |                                                      | Operating frequency |
|                         |  |                             | -20 dBc                           |                                                      | complies            |
|                         |  |                             |                                   |                                                      | complies            |
| 2480                    |  | 2.71                        | 30 dBm                            |                                                      | Operating frequency |
|                         |  |                             | -20 dBc                           |                                                      | complies            |
|                         |  |                             |                                   |                                                      | complies            |
| Measurement uncertainty |  | ± 3dB                       |                                   |                                                      |                     |

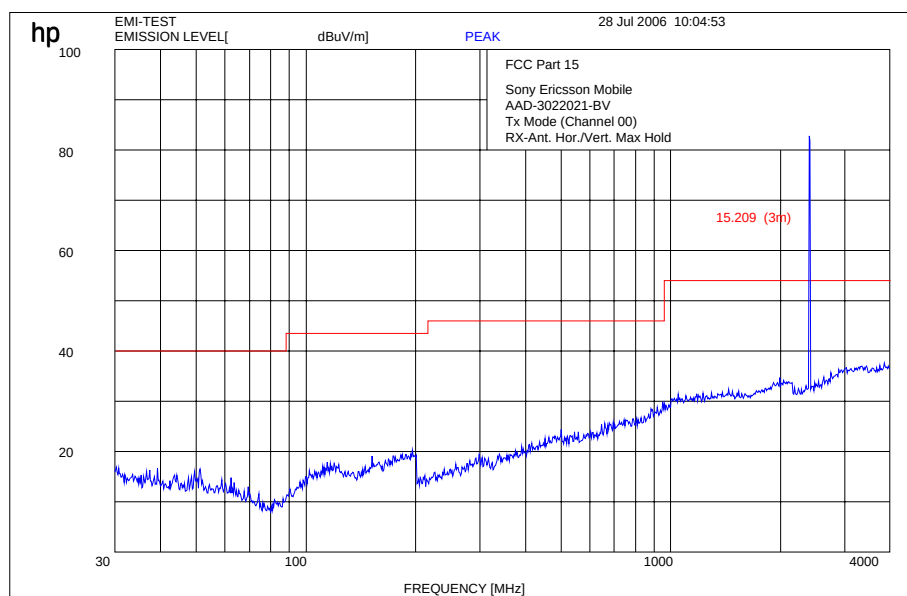
RBW : 100 kHz VBW: 100 MHz

|                                   |                                                                                                                                                                                                                                                                                                            |
|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Under normal test conditions only | In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)). |
|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

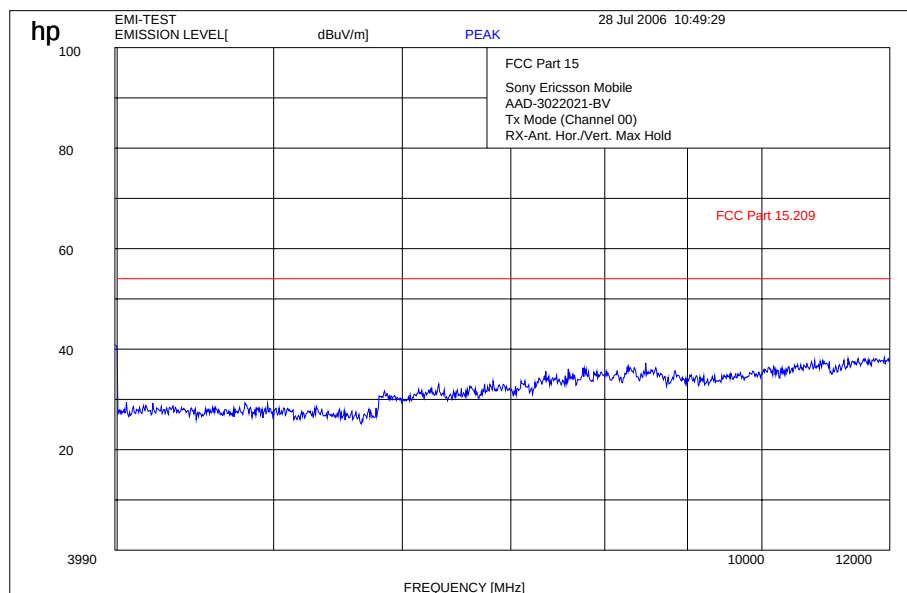
Note: For emissions that fall into restricted bands you find the radiated emissions later in the report.

## 3.15 Spurious Emissions > 30 MHz- radiated (Transmitter) § 15.247 (c)(1)

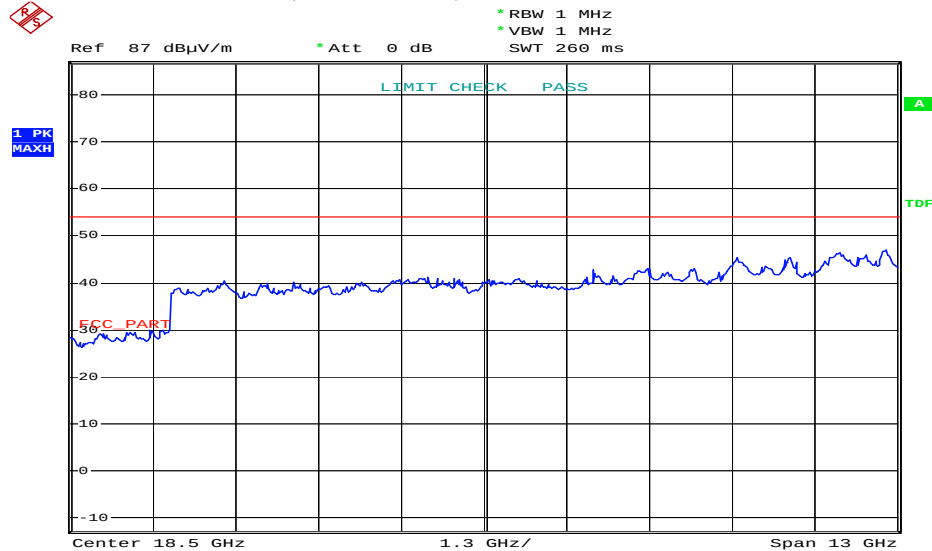
Plot : 0.03 - 4 GHz vertical/horizontal (lowest channel)



Plot : 4- 12 GHz vertical/horizontal (lowest channel)



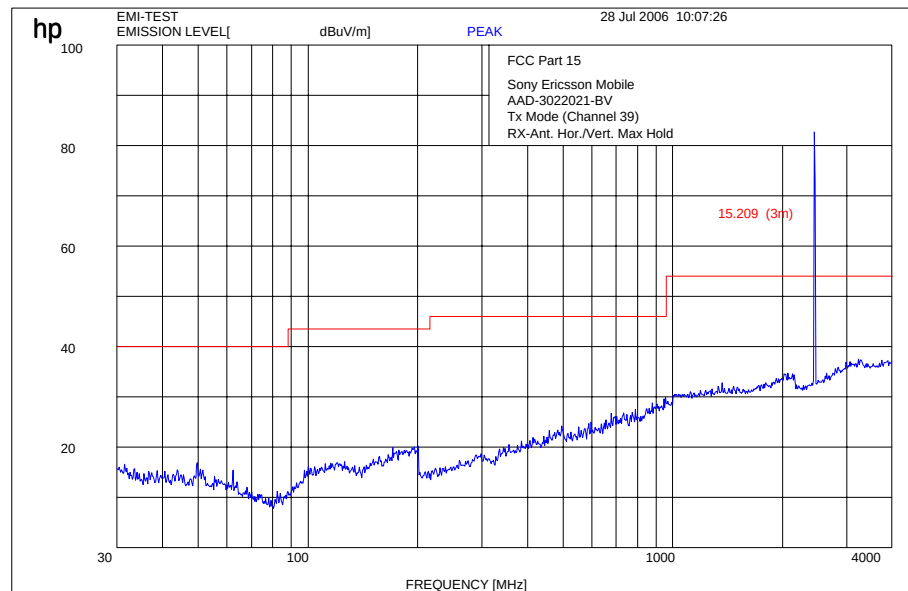
Plot : 12- 25 GHz vertical/horizontal (lowest channel)



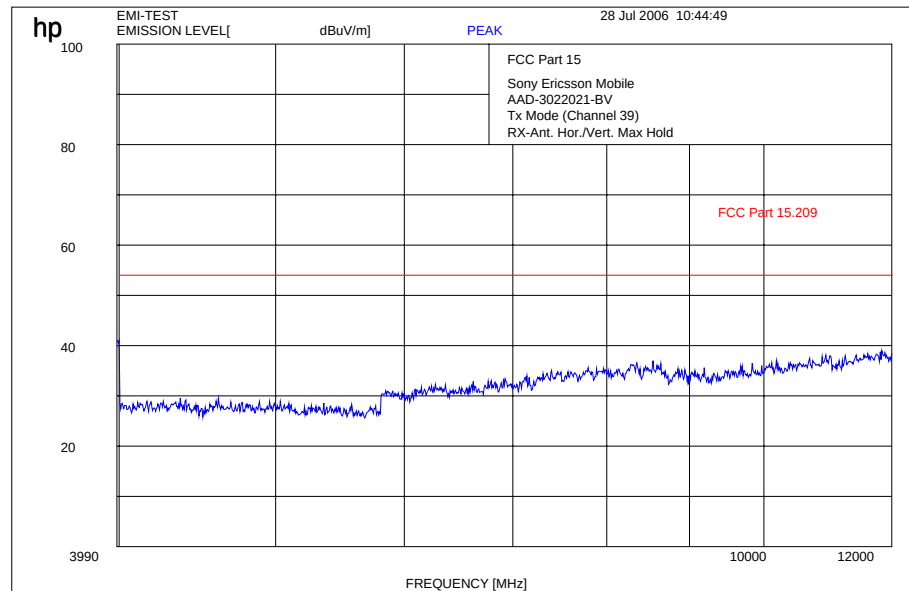
555

Date: 2.AUG.2006 11:29:27

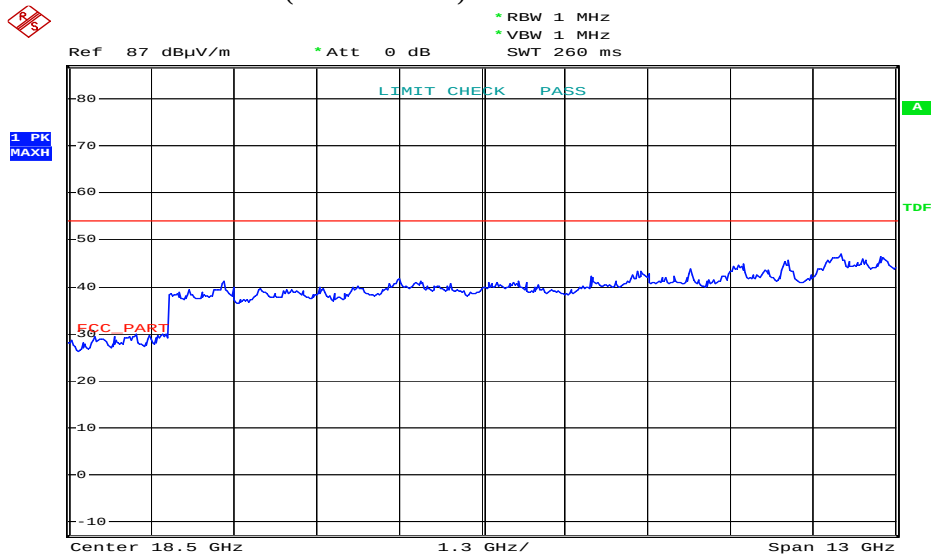
Plot : 0.03 - 4 GHz vertical/horizontal (middle channel)



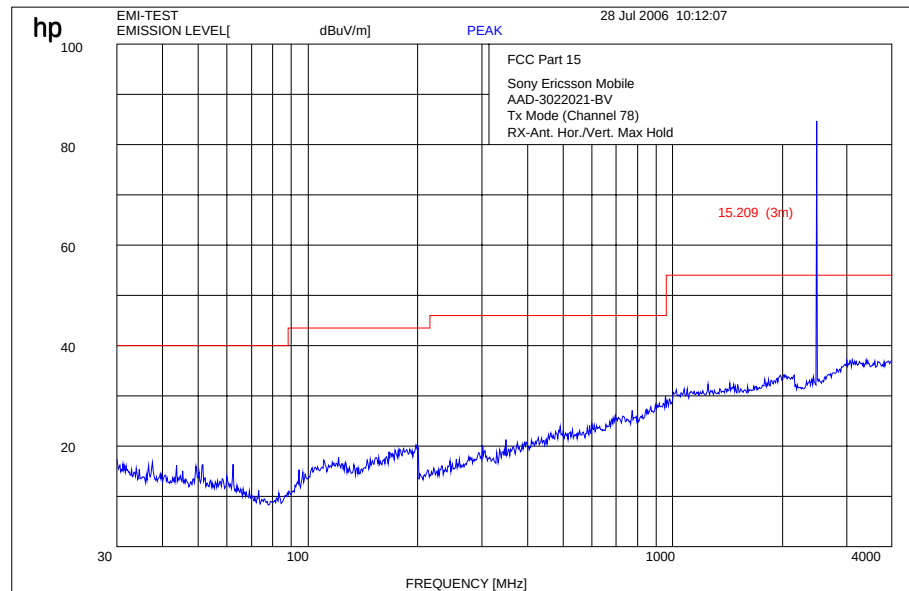
Plot : 4- 12 GHz vertical/horizontal (middle channel)



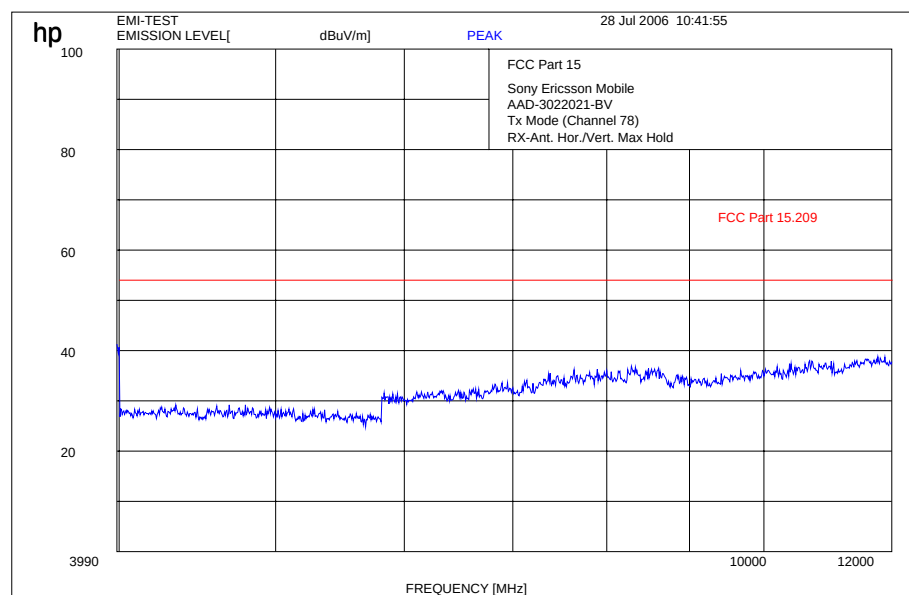
Plot : 12- 25 GHz vertical/horizontal (middle channel)



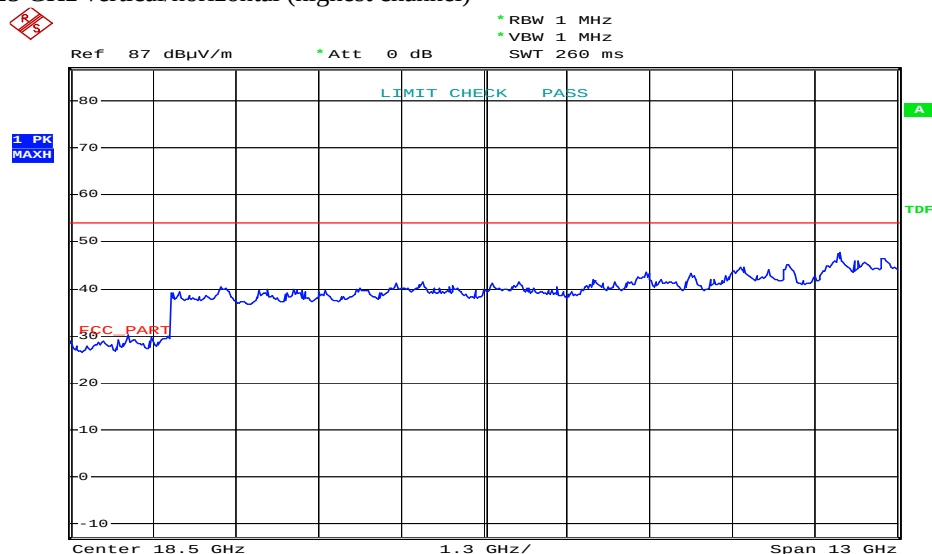
Plot : 0.03 - 4 GHz vertical/horizontal (highest channel)



Plot : 4- 12 GHz vertical/horizontal (highest channel)



Plot : 12- 25 GHz vertical/horizontal (highest channel)



555

Date: 2.AUG.2006 11:26:10

Results:

| SPURIOUS EMISSIONS LEVEL (dB $\mu$ V/m) |          |                      |                         |          |                      |                         |                      |                    |
|-----------------------------------------|----------|----------------------|-------------------------|----------|----------------------|-------------------------|----------------------|--------------------|
| 2402 MHz                                |          |                      | 2441 MHz                |          |                      | 2480 MHz                |                      |                    |
| F [MHz]                                 | Detector | Level [dB $\mu$ V/m] | F [MHz]                 | Detector | Level [dB $\mu$ V/m] | F [MHz]                 | Level [dB $\mu$ V/m] | Level [ $\mu$ V/m] |
| No critical peaks found                 |          |                      | No critical peaks found |          |                      | No critical peaks found |                      |                    |
|                                         |          |                      |                         |          |                      |                         |                      |                    |
|                                         |          |                      |                         |          |                      |                         |                      |                    |
|                                         |          |                      |                         |          |                      |                         |                      |                    |
|                                         |          |                      |                         |          |                      |                         |                      |                    |
|                                         |          |                      |                         |          |                      |                         |                      |                    |
| Measurement uncertainty                 |          |                      | $\pm 3$ dB              |          |                      |                         |                      |                    |

 $f < 1$  GHz : RBW/VBW: 100 kHz $f \geq 1$ GHz : RBW/VBW: 1 MHz

Limits: § 15.247 (c)

In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

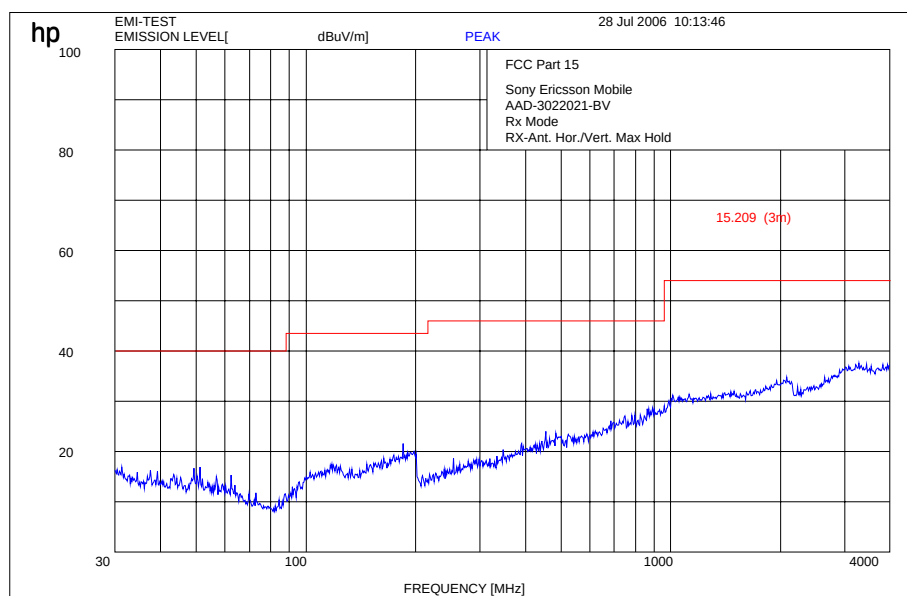
Limits: § 15.209

| Frequency [MHz] | Field strength [ $\mu$ V/m] | Measurement distance (m) |
|-----------------|-----------------------------|--------------------------|
| 30 - 88         | 100 (40 dB $\mu$ V/m)       | 3                        |
| 88 - 216        | 150 (43.5 dB $\mu$ V/m)     | 3                        |
| 216 - 960       | 200 (46 dB $\mu$ V/m)       | 3                        |
| above 960       | 500 (54 dB $\mu$ V/m)       | 3                        |

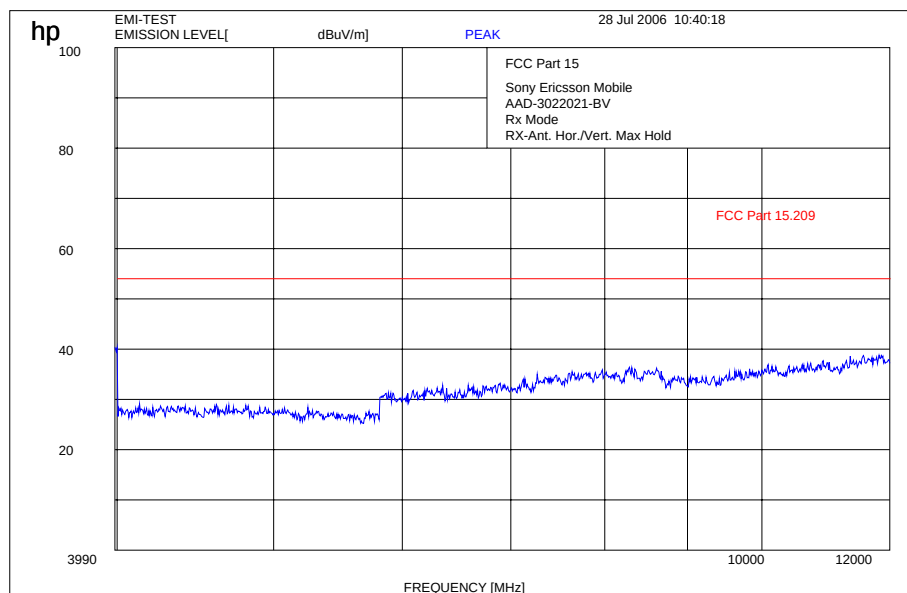


## 3.16 Spurious Emissions - radiated (Receiver) § 15.109

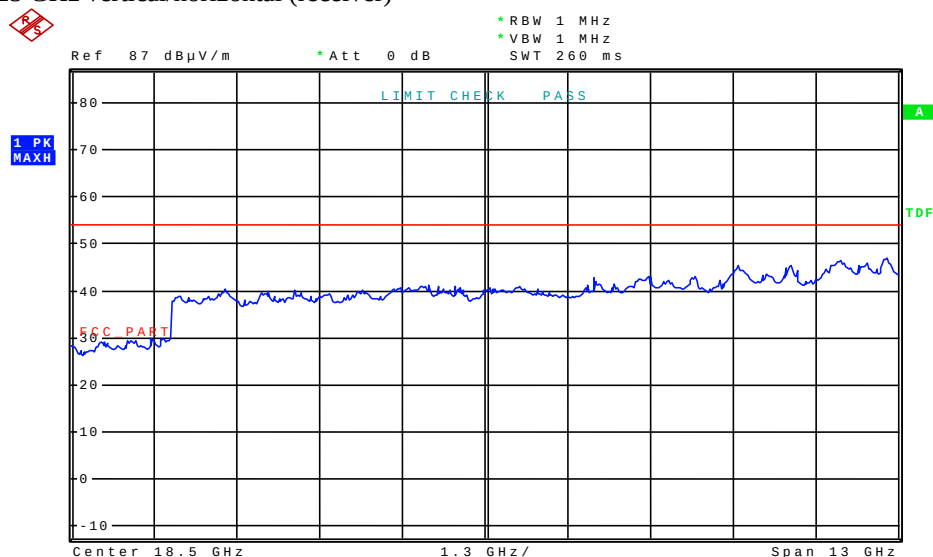
Plot : 0.03 - 4 GHz vertical/horizontal (receiver)



Plot : 4- 12 GHz vertical/horizontal (receiver)



Plot : 12- 25 GHz vertical/horizontal (receiver)



| Spurious Emissions level [dBμV/m] |          |                |        |          |                |        |          |                |
|-----------------------------------|----------|----------------|--------|----------|----------------|--------|----------|----------------|
| Receiving Mode                    |          |                |        |          |                |        |          |                |
| f[MHz]                            | Detector | Level [dBμV/m] | f[MHz] | Detector | Level [dBμV/m] | f[MHz] | Detector | Level [dBμV/m] |
| No critical peaks found           |          |                |        |          |                |        |          |                |
|                                   |          |                |        |          |                |        |          |                |
|                                   |          |                |        |          |                |        |          |                |
|                                   |          |                |        |          |                |        |          |                |
|                                   |          |                |        |          |                |        |          |                |
|                                   |          |                |        |          |                |        |          |                |
|                                   |          |                |        |          |                |        |          |                |
| Measurement uncertainty           |          |                | ±3 dB  |          |                |        |          |                |

f < 1 GHz : RBW/VBW: 100 kHz  
see above plots

f ≥ 1GHz : RBW/VBW: 1 MHz

Measurement distance see table

Limits : § 15.109

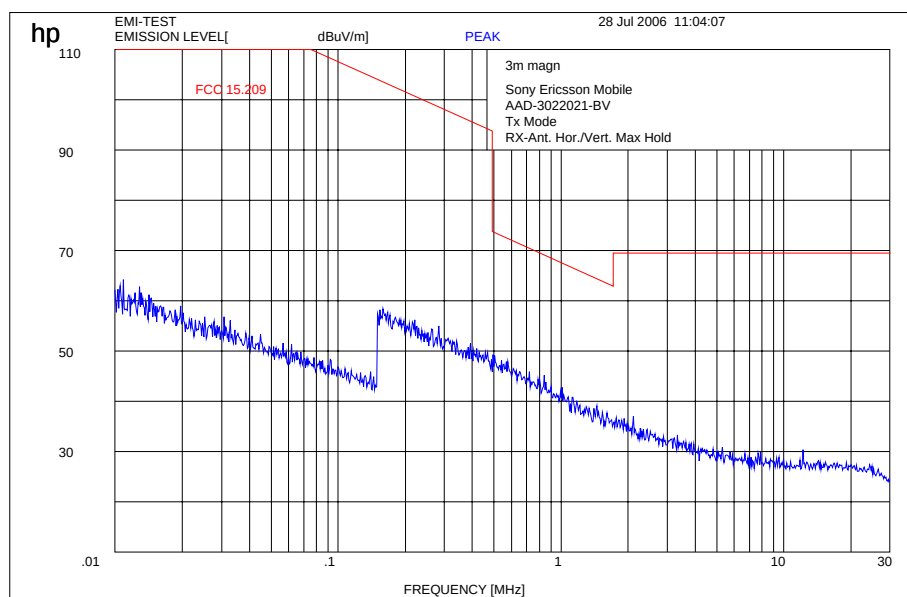
| Frequency (MHz) | Field strength (μV/m) | Measurement distance (m) |
|-----------------|-----------------------|--------------------------|
| 30 - 88         | 100 (40 dBμV/m)       | 3                        |
| 88 - 216        | 150 (43.5 dBμV/m)     | 3                        |
| 216 - 960       | 200 (46 dBμV/m)       | 3                        |
| above 960       | 500 (54 dBμV/m)       | 3                        |

## 3.17 Spurious Emissions < 30 MHz - Transmitter radiated § 15.209

Measured at 10 m distance.

Values recalculated with 40 dB/decade according to FCC rules.

Plot 1:



Limits:

| Frequency (MHz) | Field strength ( $\mu\text{V/m}$ ) | Measurement distance (m) |
|-----------------|------------------------------------|--------------------------|
| 0.009 – 0.490   | 2400/F(kHz)                        | 300                      |
| 0.490 – 1.705   | 24000/F(kHz)                       | 30                       |
| 1.705 – 30.0    | 30 / 29.5 dB $\mu\text{V/m}$       | 30                       |

## 3.18 Conducted Emissions <30 MHz § 15.107/207

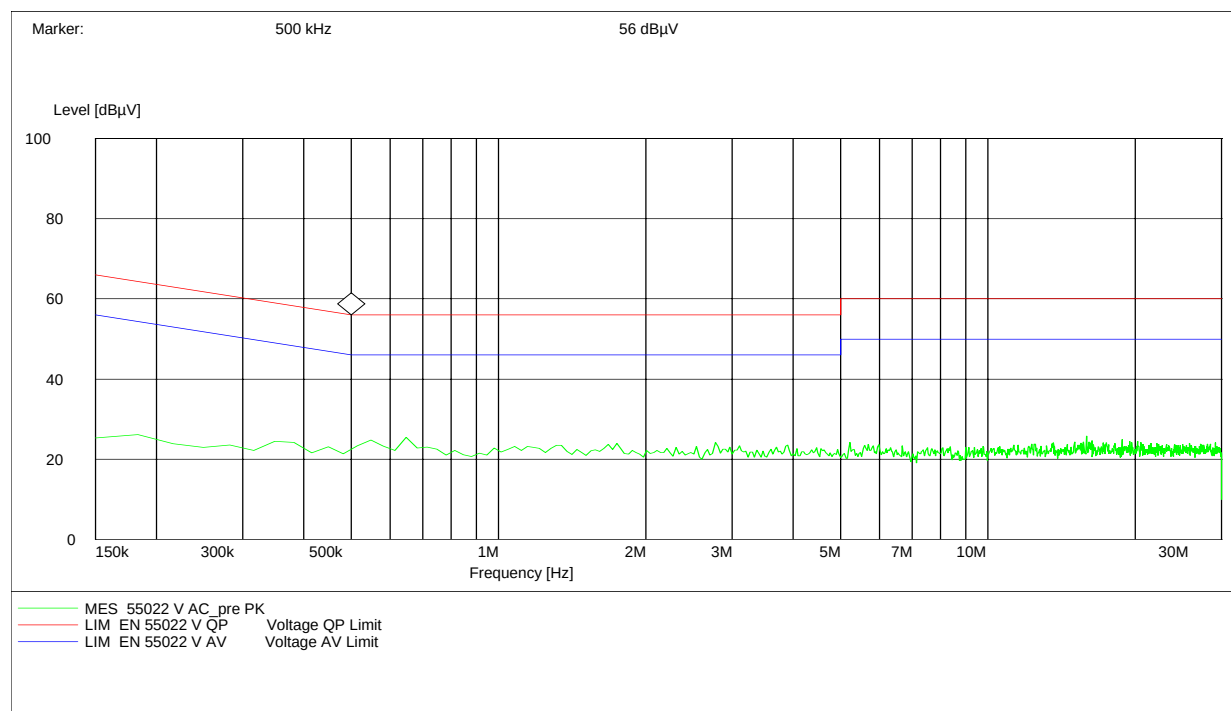
Plot 1:

### EN 55022 V AC Class B

EUT: AAD-3022021  
Manufacturer: Sony Ericsson Mobile Communications  
Operating Condition: Bluetooth Idle mode  
Test Site: CETECOM ICT Services Room 006  
Operator: Stefan Bös  
Power Supply: AC 110V  
Line: L1, N  
Start of Test: 07.08.2006 / 12:10:33

### SCAN TABLE: "EN 55022 V"

Short Description: Voltage Mains 1.60  
Start Stop Step Detector Meas. IF Transducer  
Frequency Frequency Width Time Bandw.  
150.0 kHz 30.0 MHz 7.5 kHz MaxPeak 100.0 ms 10 kHz ESH3-Z5 L1 1458  
Average



Test report no.: 2-4239-10-03/06

Date: 2006-08-09

Page 37 of 54

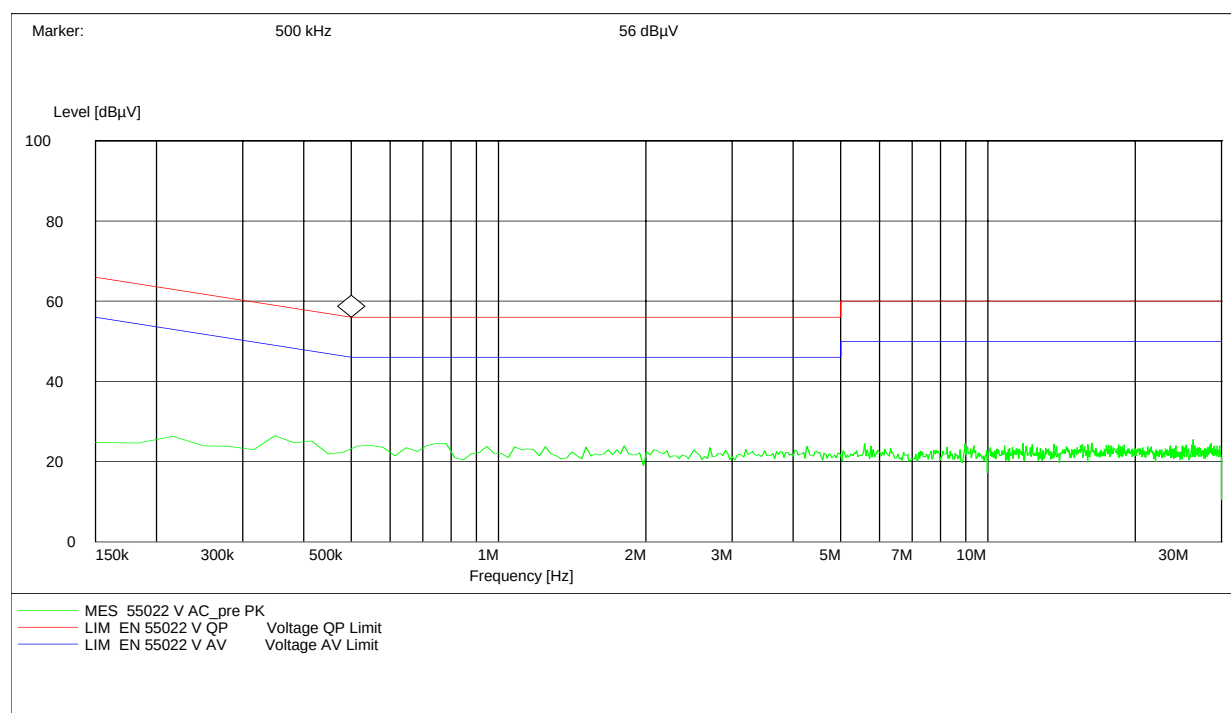
Plot 2:

## EN 55022 V AC Class B

EUT: AAD-3022021  
Manufacturer: Sony Ericsson Mobile Communications  
Operating Condition: Bluetooth Traffic mode  
Test Site: CETECOM ICT Services Room 006  
Operator: Stefan Bös  
Power Supply: AC 110V  
Line: L1, N  
Start of Test: 07.08.2006 / 12:06:02

## SCAN TABLE: "EN 55022 V"

Short Description: Voltage Mains 1.60  
Start Stop Step Detector Meas. IF Transducer  
Frequency Frequency Width Time Bandw.  
150.0 kHz 30.0 MHz 7.5 kHz MaxPeak 100.0 ms 10 kHz ESH3-Z5 L1 1458  
Average



Limits :

|                                   |           |
|-----------------------------------|-----------|
| Under normal test conditions only | See plots |
|-----------------------------------|-----------|

## 3.19 Used Testequipment

### Anechoic chamber C:

| Device                    | Manufacturer | Type      | S/N Number | Inv. No. Cetecom |
|---------------------------|--------------|-----------|------------|------------------|
| Spektrum Analyser         | HP           | 8566B     | 2747A05306 | 300001000        |
| Spektrum Analyser Display | HP           | 85662A    | 2816A16541 | 300002297        |
| Quasi-Peak-Adapter        | HP           | 85650A    | 2811A01131 | 300000999        |
| Power Supply              | HP           | 6032A     | 2818A03450 | 300001040        |
| Power Attenuator          | Byrd         | 8325      | 1530       | 300001595        |
| Biconical Antenna         | EMCO         | 3104      | 3758       | 300001602        |
| Log. Period. Antenna      | EMCO         | 3146      | 2130       | 300001603        |
| Double Ridged Antenna     | EMCO         | HP 3115P  | 3088       | 300001032        |
| Active Loop Antenna       | EMCO         | 6502      | 2210       | 300001015        |
| Antenna VDE/FCC           |              | HP11965B  |            | 300002298        |
| SRM-Drive                 | HP           | 9144A     | 2823e46556 | 300001044        |
| Software                  | HP           | EMI       |            | 300000983        |
| Busisolator               | Kontron      |           |            | 300001056        |
| Absorberhalle             | MWB          |           | 87400/02   | 300000996        |
| Salzsäule                 | Kontron      |           |            | 300001055        |
| Antenna                   | R&S          | HMO20     | 832211/003 | 300002243        |
| Indukt. Tast Antenna      | R&S          | HFH 2 Z4  | 881468/026 | 300001464        |
| System-Rack               | HP I.V.      | 85900     | *          | 300000222        |
| Spectrum Analyzer         | HP           | 8566B     | 2747A05275 | 300000219        |
| Quasi-Peak-Adapter        | HP           | 85650A    | 2811A01135 | 300000216        |
| RF-Preselector            | HP           | 85685A    | 2837A00779 | 300000218        |
| Rahmen Antenne            | R&S          | HFH2-Z2   | 891847-35  | 300001169        |
| Leitungsteiler            | HP           | 11850C    |            | 300000997        |
| Breitband-Hornantenne EMI | HP           | 35155P    |            | 300002300        |
| PC                        | HP           | Vectra VL |            | 300001688        |
| VHF Meßantenne            | Schwarzbeck  | VHA 9103  |            | 300001778        |
| Spectrum Analyzer Display | HP           | 85662A    | 2816A16497 | 300001690        |
| VHF Meßantenna            | Schwarzbeck  | VHA 9103  |            | 300001780        |
| Biconical Antenna         | EMCO         | 3104 C    | 9909-4868  | 300002590        |

SRD Laboratory: (Bluetooth System)

| No | Equipment/Type                  | Manufact. | Serial Nr.    | Inv. No. Cetecom |
|----|---------------------------------|-----------|---------------|------------------|
| 1  | System Controller PSM 12        | R&S       | 835259/007    | 3000002681       |
| 2  | Memory Extension PSM-K10        | R&S       | To 1          | 3000002681       |
| 3  | Operating Software PSM-B2       | R&S       | To 1          | 3000002681       |
| 4  | 19'' Monitor                    |           | 22759020-ED   | 3000002681       |
| 5  | Mouse                           |           | LZE 0095/6639 | 3000002681       |
| 6  | Keyboard                        |           | G00013834L461 | 3000002681       |
| 7  | Spectrum Analyser FSIQ 26       | R&S       | 835540/018    | 3000002681       |
| 8  | Tracking Generator FSIQ-B10     | R&S       | 835107/015    | 3000002681       |
| 10 | RF-Generator SMIQ03 (B1 Signal) | R&S       | 835541/056    | 3000002681       |
| 11 | Modulation Coder SMIQ-B20       | R&S       | To 10         | 3000002681       |
| 12 | Data Generator SMIQ-B11         | R&S       | To 10         | 3000002681       |
| 13 | RF Rear Connection SMIQ-B19     | R&S       | To 10         | 3000002681       |
| 14 | Fast CPU SM-B50                 | R&S       | To 10         | 3000002681       |
| 15 | FM Modulator SM-B5              | R&S       | 835676/033    | 3000002681       |
| 16 | RF-Generator SMIQ03 (B2 Signal) | R&S       | 835541/055    | 3000002681       |

|    |                                             |     |                |            |
|----|---------------------------------------------|-----|----------------|------------|
| 17 | Modulation Coder SMIQ-B20                   | R&S | To 16          | 3000002681 |
| 18 | Data Generator SMIQ-B11                     | R&S | To 16          | 3000002681 |
| 19 | RF Rear Connection SMIQ-B19                 | R&S | To 16          | 3000002681 |
| 20 | Fast CPU SM-B50                             | R&S | To 16          | 3000002681 |
| 21 | FM Modulator SM-B5                          | R&S | 836061/022     | 3000002681 |
| 22 | RF-Generator SMP03 (B3 Signal)              | R&S | 835133/011     | 3000002681 |
| 23 | Attenuator SMP-B15                          | R&S | 835136/014     | 3000002681 |
| 24 | RF Rear Connection SMP-B19                  | R&S | 834745/007     | 3000002681 |
| 25 | Power Meter NRVD                            | R&S | 835430/044     | 3000002681 |
| 26 | Power Sensor NRVD-Z1                        | R&S | 833894/012     | 3000002681 |
| 27 | Power Sensor NRVD-Z1                        | R&S | 833894/011     | 3000002681 |
| 28 | Rubidium Standard RUB                       | R&S | 6197           | 3000002681 |
| 29 | Switching and Signal Conditioning Unit SSCU | R&S | 338864/003     | 3000002681 |
| 30 | Laser Printer HP Deskjet 2100               | HP  | N/A            | 3000002681 |
| 31 | 19'' Rack                                   | R&S | 11138363000004 | 3000002681 |
| 32 | RF-cable set                                | R&S | N/A            | 3000002681 |
| 33 | IEEE-cables                                 | R&S | N/A            | 3000002681 |
| 34 | Sampling System FSIQ-B70                    | R&S | 835355/009     | 3000002681 |
| 35 | RSP programmable attenuator                 | R&S | 834500/010     | 3000002681 |
| 36 | Signalling Unit                             | R&S | 838312/011     | 3000002681 |
| 37 | NGPE programmable Power Supply for EUT      | R&S | 192.033.41     | 3000002681 |

## SRD Laboratory:

| Device         | Manufacturer   | Type             | S/N Number  | Inv. No. Cetecom |
|----------------|----------------|------------------|-------------|------------------|
| Climatic box   | Heraeus Vötsch | VT 4002          | --          | 300003019        |
| Signaling Unit | R&S            | CMU200           | 832221/0055 | 300002862        |
| Power Splitter | Inmet Corp.    | 6005-3           | none        | 300002841        |
| SMA Cables     | Insulated Wire | SPS-1151-985-SPS | different   | different        |

## 4 Photographs of Test Set-up

Photo 1 (Radiated Emissions):

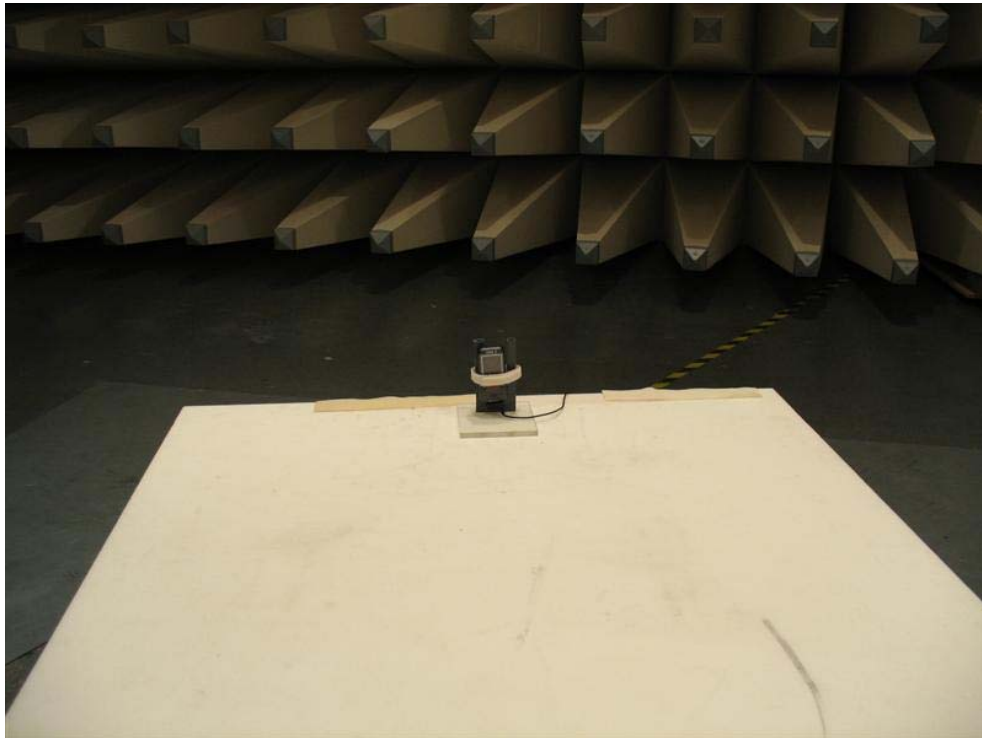




Photo 2 (Radiated Emissions):

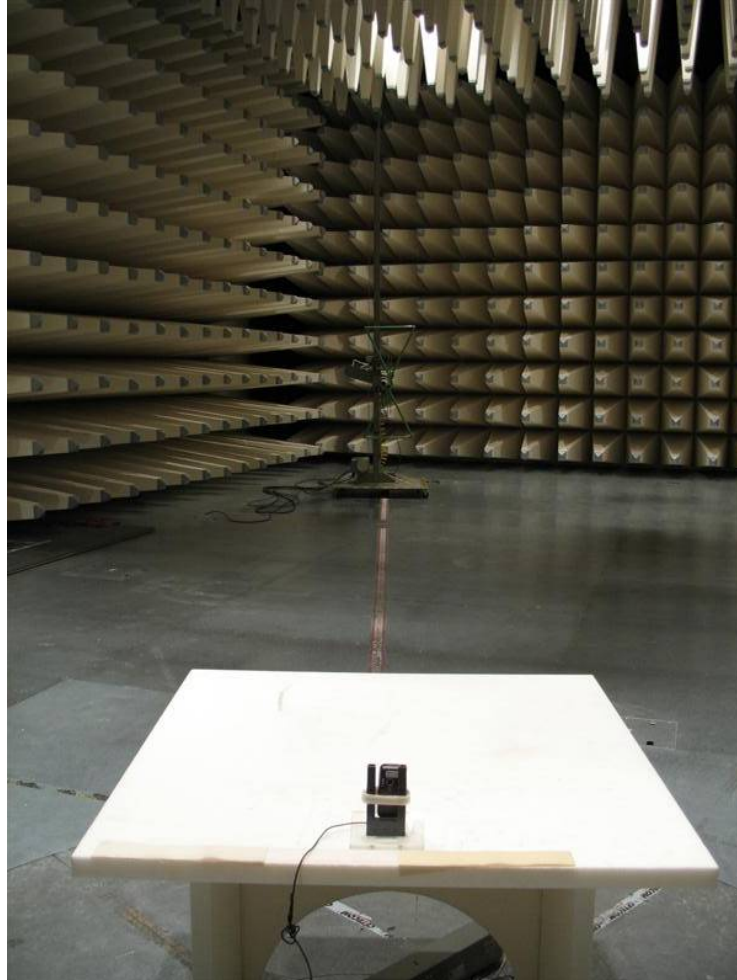


Photo 3 (Radiated Emissions):



Photo 4 (Conducted Emissions):





## 5 Photographs of EUT

Photo 1:



Photo 2:



Photo 3:



Photo 4:



Photo 5:



Photo 6:





Photo 7:



Photo 8:



Photo 9:

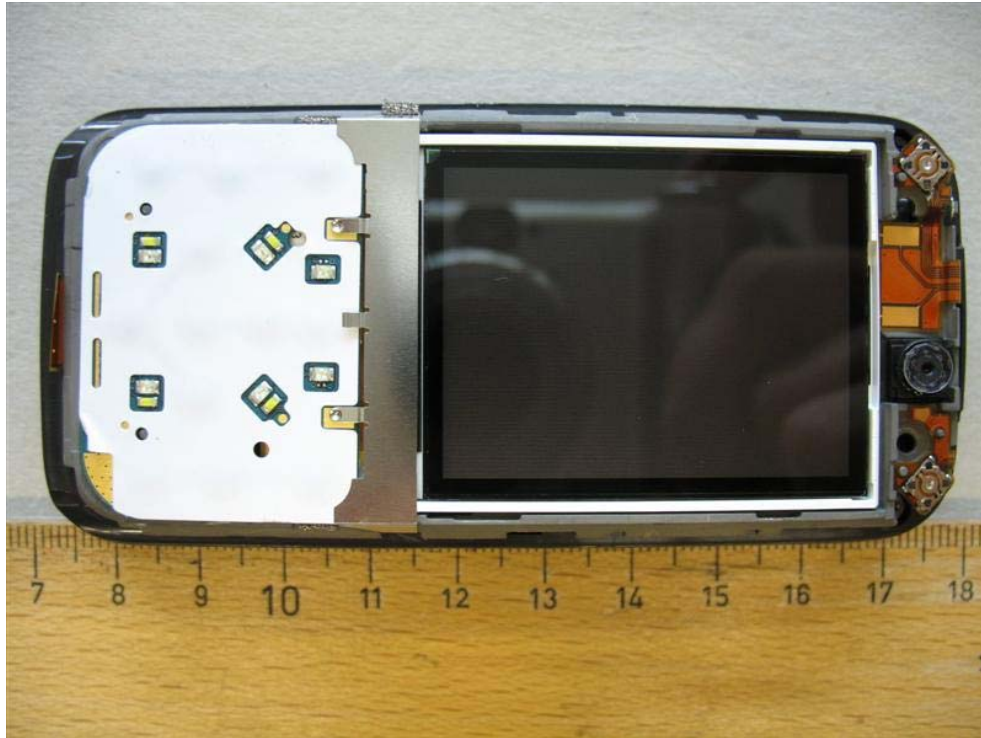


Photo 10:





Photo 11:



Photo 12:

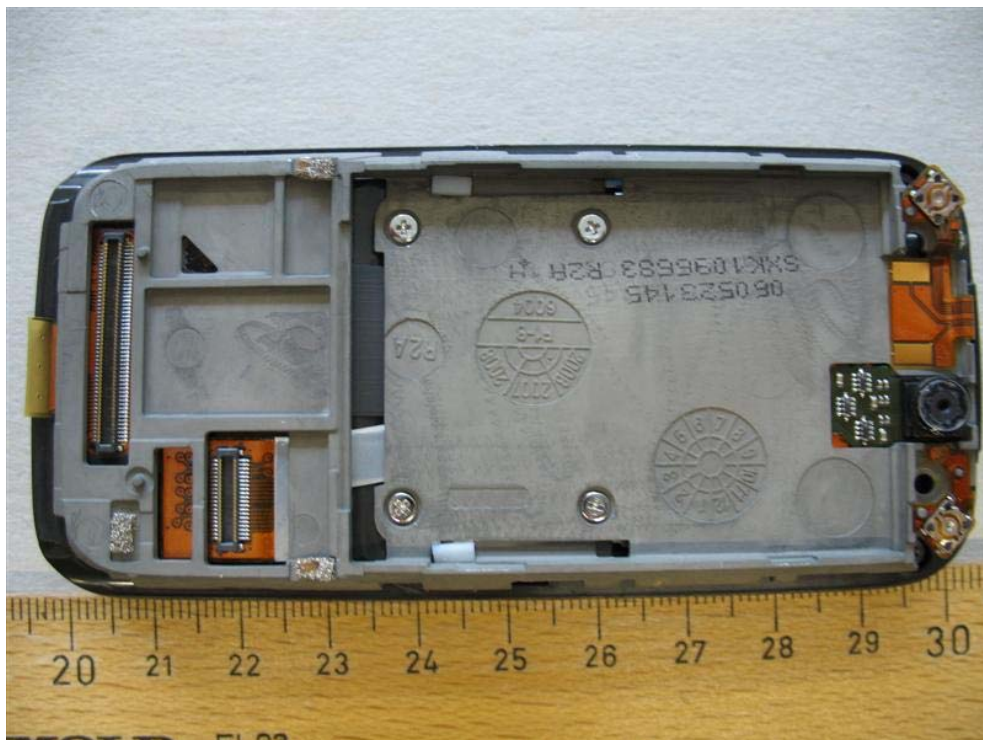


Photo 13:

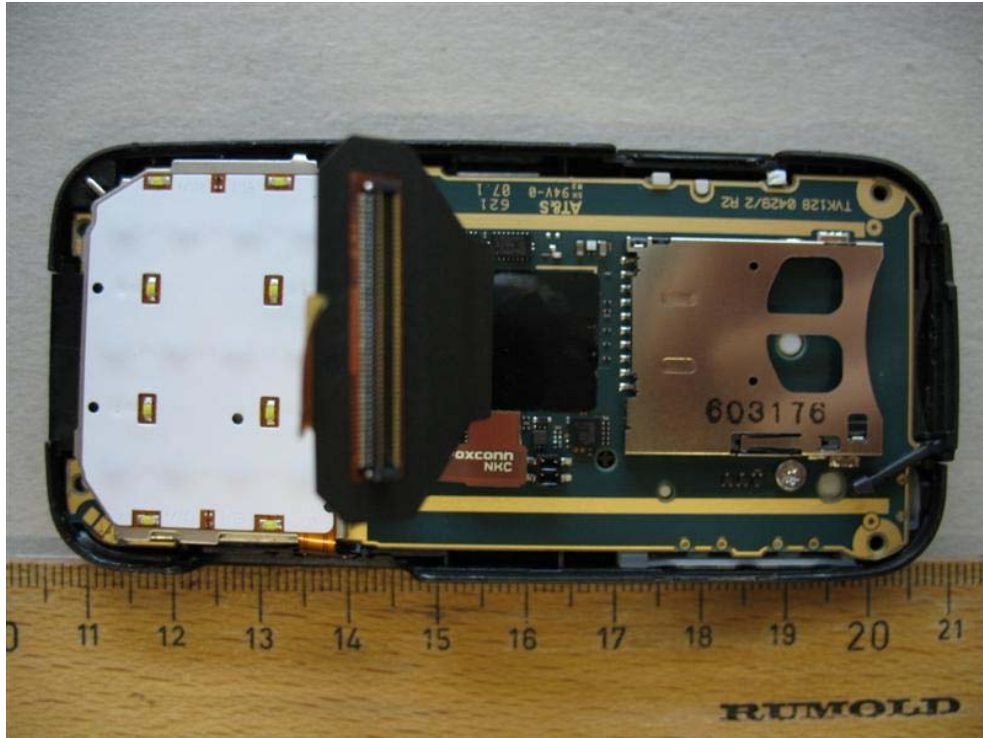


Photo 14:

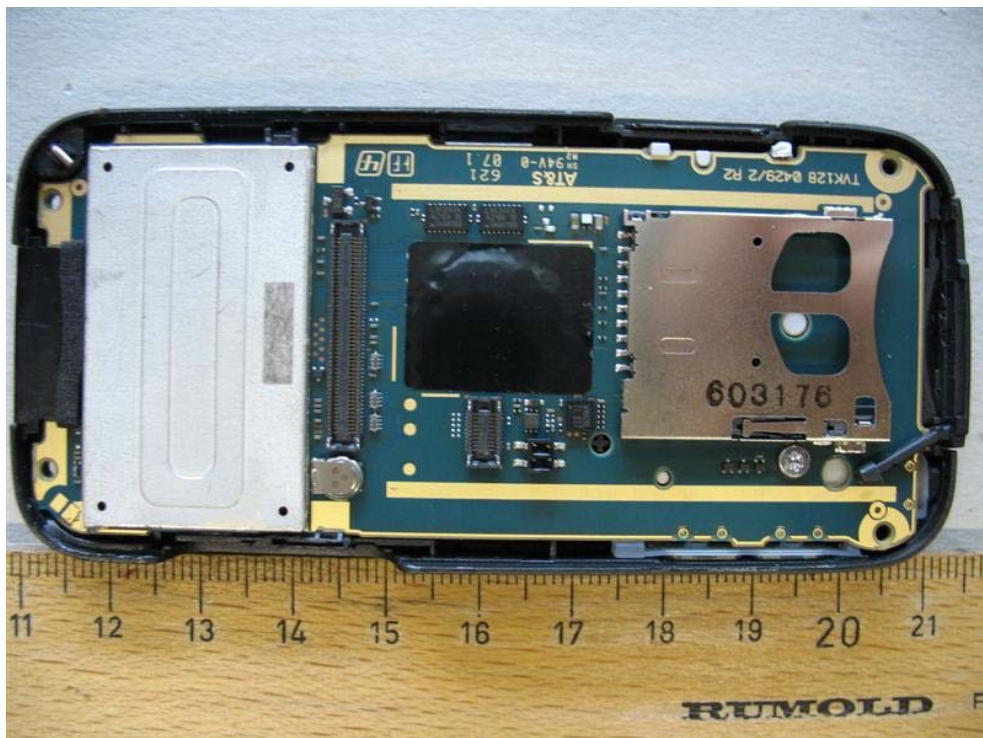




Photo 15:

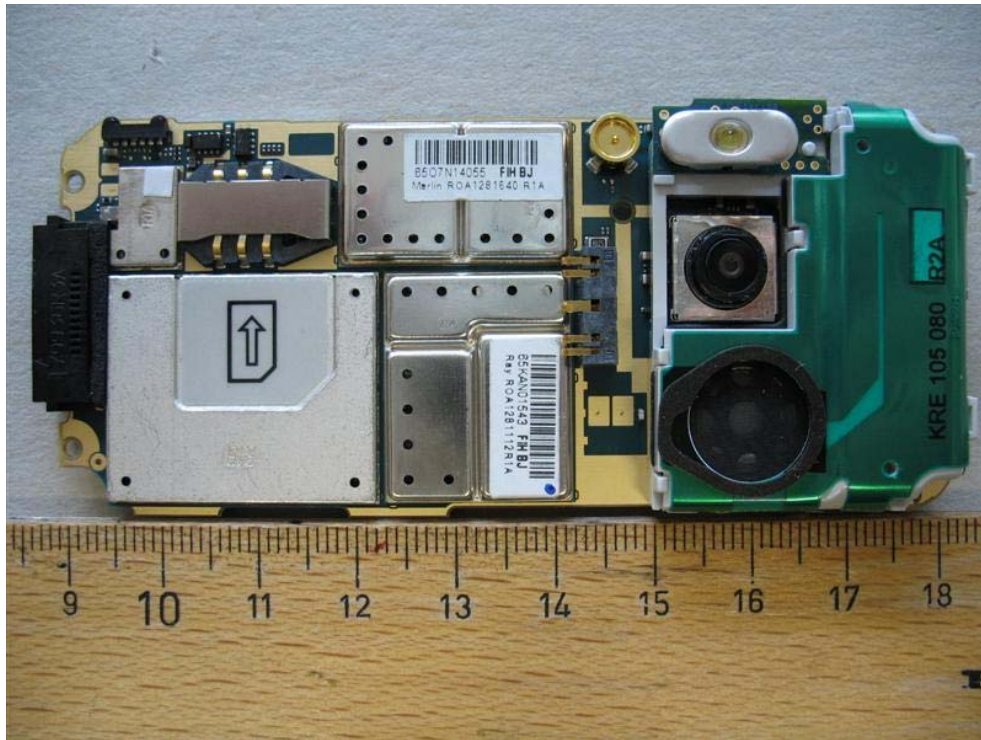


Photo 16:



Photo 17:

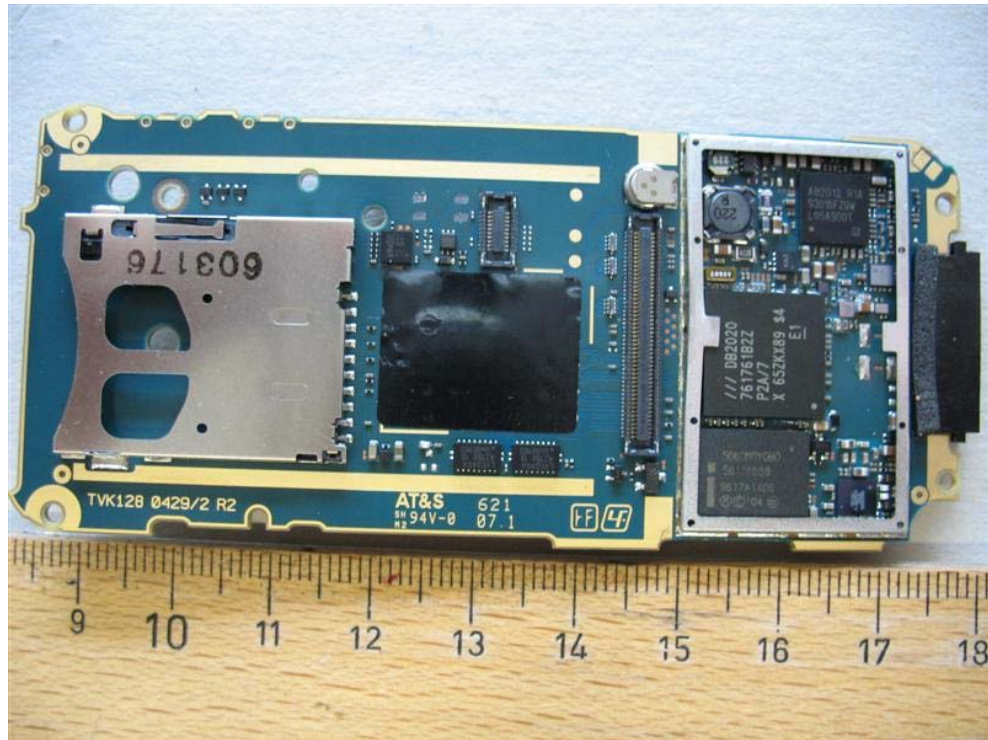


Photo 18:





Photo 19:

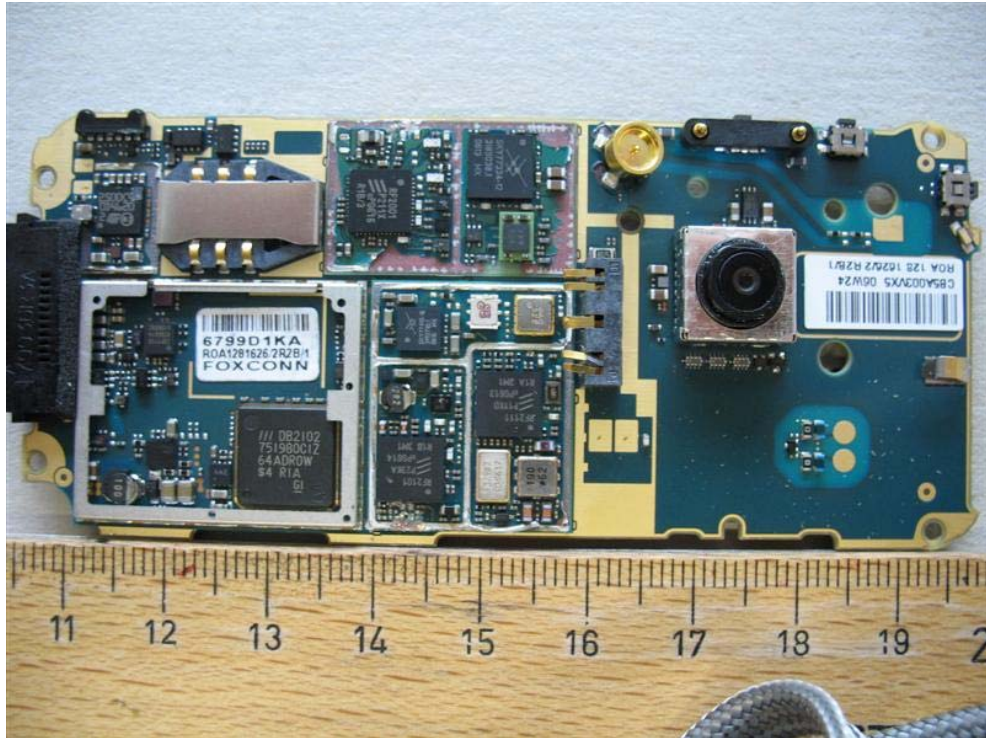


Photo 20:

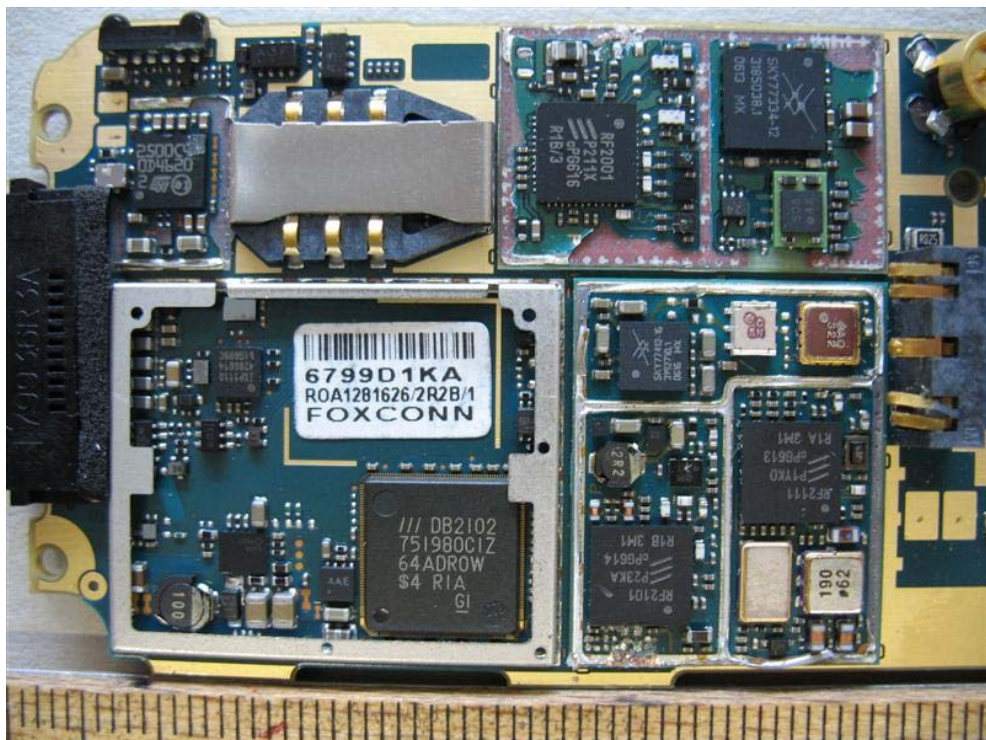


Photo 21:



Photo 22:

