

# CETECOM ICT Services GmbH

Radio Satellite Communication

Untertürkheimer Straße 6-10 . D-66117 Saarbrücken

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Test report No.: 2-3559-01-02/04

This test report consists of 67 pages

Page 1 (67)

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**

**TTI-P-G 081/94-D0**



Independent ETSI  
compliance test house



**Accredited Bluetooth™ Test Facility (BQTF)**

**Test report no.: 2-3559-01-02/04**

**Applicant: Sony Ericsson Mobile**

**Type: AAB-1021041-BV**

**FCC Part: 24 / 15**

**FCC ID: PY7A10221041**

**IC: 4170B-A1021041**

Table of Contents

- 1 General information
  - 1.1 Notes
  - 1.2 Testing laboratory
  - 1.3 Details of applicant
  - 1.4 Application details
  - 1.5 Test item
  - 1.6 Test standards
  
- 2 Technical test
  - 2.1 Summary of test results
  - 2.2 Test report

## 1 General information

### 1.1 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.**

### 1.2 Testing laboratory

CETECOM ICT Services GmbH

Untertürkheimer Straße 6 - 10

66117 Saarbrücken

Germany

Telephone : + 49 681 598 - 9100

Telefax : + 49 681 598 - 9075

E-mail : info@ict.cetecom.de

Internet : www.cetecom-ict.de

### Accredited testing laboratory

**The test laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025.**

**DAR registration number: TTI-P-G-081/94-D0**

**Listed by: Federal Communications Commission (FCC)**

**Identification/Registration No: 90462**

**Accredited Bluetooth™ Test Facility (BQTF)**

### 1.3 Details of applicant

**Name** : Sony Ericsson Mobile Communication

**Street** : Nya Vattentornett Albi

**City** : 221 88 Lund

**Country** : Sweden

**Telephone** : + 46 46 193242

**Telefax** : + 46 46 193295

**Contact** : Bo Johansson

**Telephone** : + 46 46 193242

**e-mail** : bo.johansson@sonyericsson.com

### 1.4 Application details

Date of test : 2004-04-05 to 2004-03-07

## 1.5 Test item

Type of equipment : GSM 900/1800/1900 mobile phone with Bluetooth  
Type designation : Sony Ericsson K700i  
Type: AAB-1021041-BV  
Manufacturer : applicant  
Street :  
City :  
Country :  
Serial numbers :

### Additional information: :

Frequency : 1850.2 – 1909.8 MHz  
Type of modulation : 300KGXW  
Number of channels : 300 (PCS1900)  
Antenna : Integral antenna  
Power supply (normal) : 3,7 V DC Li-Polymer Battery  
Power supply (extreme) : 3.3 V to 4.4 V  
Output power GSM 1900 : cond : 30.1 dBm Peak, ERP: 26.35 dBm (Burst);  
EIRP: 28.5 dBm (Burst)  
Type of equipment : Temperature range : -30°C - +60°C  
FCC – ID : PY7A1021041  
IC : 4170B-41021041  
Hardware : FP1  
Software : R2A002

## Test set-up

Mobile; S/N: A6101TWY2M  
Mobile; S/N: A6101TWY2Q  
Standard chargerCST-13 Type 4020073BV

**1.6 Test standards: FCC Part 24, 22  
FCC Part 15**

## 2 Technical test

For Part 24 we use the substitution method ( TIA/EIA 603).

All measurements in this report are done in GSM mode. Device is able to transmit data in GPRS mode also. But because the current measurements are performed in PEAK mode no other results from GPRS mode are possible. The only different is the modulation average power, which is 3 dB higher (by using 2 timeslots in the Up-link ).

### Remarks:

#### Test setup:

The radiated measurements were performed with an AC/DC charging unit

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

### FINAL VERDICT: PASS

#### Technical responsibility for area of testing :

2004-04-07 RSC 8431 Gillmann

Date Section Name

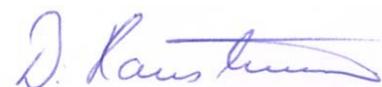


Signature

#### Technical responsibility for area of testing :

2004-04-07 RSC8412 Hausknecht D.

Date Section Name



Signature

## TEST REPORT REFERENCE

## LIST OF MEASUREMENTS

### PARAMETER TO BE MEASURED

### PAGE

#### PART PCS 1900

|   |                        |    |
|---|------------------------|----|
| POWER OUTPUT                                  | SUBCLAUSE § 24.232     | 7  |
| FREQUENCY STABILITY                           | SUBCLAUSE § 24.235     | 10 |
| AFC FREQ ERROR VS. VOLTAGE                    |                        | 11 |
| AFC FREQ ERROR VS. TEMPERATURE                |                        | 11 |
| EMISSIONS LIMITS                              | SUBCLAUSE §24.238      | 13 |
| RECEIVER SPURIOUS RADIATION                   | SUBCLAUSE § 15.109     | 24 |
| CONDUCTED SPURIOUS EMISSIONS                  |                        | 28 |
| BLOCK EDGE COMPLIANCE FOR BLOCK A AND C       |                        | 40 |
| OCCUPIED BANDWIDTH                            | SUBCLAUSE §2.989       | 42 |
| RADIATED EMISSIONS                            | SUBCLAUSE § 15.107/207 | 49 |
| CONDUCTED                                     | SUBCLAUSE § 15.209     | 50 |
| TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS |                        | 51 |
| TEST SITE AND PHOTOS OF EQUIPMENT             |                        | 53 |

**PART PCS 1900****POWER OUTPUT****SUBCLAUSE § 24.232****Summary:**

This paragraph contains both average , peak output powers and EIRP measurements for the mobile station. In all cases, the peak output power is within the required mask (this mask is specified in the JTC standards, TIA PN3389 Vol. 1 Chap 7, and is no FCC requirement).

**Method of Measurements:**

The mobile was set up for the max. output power with pseudo random data modulation.

The power was measured with R&S Signal Analyzer FSIQ 26 ( peak and average)

This measurements were done at 3 frequencies, 1850.2 MHz, 1880.0 MHz and 1909.8 MHz (bottom, middle and top of operational frequency range)

**Limits:**

| Power Step | Nominal Peak Output Power (dBm) | Tolerance (dB) |
|------------|---------------------------------|----------------|
| 0          | +30                             | ± 2            |

**Power Measurements:****Conducted:**

| Frequency (MHz)         | Power Step | Peak Output Power (dBm) | Average in the burst Output Power (dBm) |
|-------------------------|------------|-------------------------|---|
| 1850.2                  | 0          | 29.8                    | 29.7                                    |
| 1880.0                  | 0          | 30.1                    | 30.0                                    |
| 1909.8                  | 0          | 30.0                    | 29.9                                    |
| Measurement uncertainty |            | ±0.5 dB                 |   |

**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**

(for reference numbers see test equipment listing)

## EIRP Measurements

Description: This is the test for the maximum radiated power from the phone.

Rule Part 24.232(b) specifies that "Mobile/portable stations are limited to 2 watts e.i.r.p. peak power..." and 24.232(c) specifies that "Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage."

## Measuring the EIRP of Spurious/Harmonic Emissions using Substitution Method

- (a) The measurements was performed with full rf output power and modulation.
- (b) Test was performed at listed 3m test site (listed with FCC, IC).
- (c) The transmitter under test was placed at the specified height on a non-conducting turntable (80 cm height)
- (d) The BICONILOG antenna (20 MHz to 1 GHz) or HORN antenna (1 GHz to 18 GHz) was used for measuring.
- (e) Load an appropriate correction factors file in EMI Receiver for correcting the field strength reading level  
Total Correction Factor recorded in the EMI Receiver = Cable Loss + Antenna Factor  
 $E \text{ (dBuV/m)} = \text{Reading (dBuV)} + \text{Total Correction Factor (dB/m)}$
- (f) Set the EMI Receiver and #2 as follows:
  - Center Frequency: test frequency
  - Resolution BW: 100 kHz
  - Video BW: same
  - Detector Mode: positive
  - Average: off
  - Span: 3 x the signal bandwidth
- (g) The test antenna was lowered or raised from 1 to 4 meters until the maximum signal level was detected.
- (h) The transmitter was rotated through 360 o about a vertical axis until a higher maximum signal was received.
- (i) The test antenna was lowered or raised again from 1 to 4 meters until a maximum was obtained. This level was recorded.
- (j) The recorded reading was corrected to the true field strength level by adding the antenna factor, cable loss and subtracting the pre-amplifier gain.
- (k) The above steps were repeated with both transmitters' antenna and test receiving antenna placed in vertical and horizontal polarization. Both readings with the antennas placed in vertical and horizontal polarization shall be recorded.
- (l) Repeat for all different test signal frequencies

## Measuring the EIRP of Spurious/Harmonic Emissions using Substitution Method

- (a) Set the EMI Receiver (for measuring E-Field) and Receiver #2 (for measuring EIRP) as follows:
  - Center Frequency : equal to the signal source
  - Resolution BW : 10 kHz
  - Video BW : same
  - Detector Mode : positive
  - Average : off
  - Span : 3 x the signal bandwidth
- (b) Load an appropriate correction factors file in EMI Receiver for correcting the field strength reading level  
Total Correction Factor recorded in the EMI Receiver = Cable Loss + Antenna Factor  
 $E \text{ (dBuV/m)} = \text{Reading (dBuV)} + \text{Total Correction Factor (dB/m)}$
- (c) Select the frequency and E-field levels for ERP/EIRP measurements.
- (d) Substitute the EUT by a signal generator and one of the following transmitting antenna (substitution antenna):  
.DIPOLE antenna for frequency from 30-1000 MHz or .HORN antenna for frequency above 1 GHz }.

**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**  
**(for reference numbers see test equipment listing)**

- (e) Mount the transmitting antenna at 1.5 meter high from the ground plane.
- (f) Use one of the following antenna as a receiving antenna: .DIPOLE antenna for frequency from 30-1000 MHz or .HORN antenna for frequency above 1 GHz }.
- (g) If the DIPOLE antenna is used, tune it's elements to the frequency as specified in the calibration manual.
- (h) Adjust both transmitting and receiving antenna in a VERTICAL polarization.
- (i) Tune the EMI Receivers to the test frequency.
- (j) Lower or raise the test antenna from 1 to 4 meters until the maximum signal level was detected.
- (k) The transmitter was rotated through 360 o about a vertical axis until a higher maximum signal was received.
- (l) Lower or raise the test antenna from 1 to 4 meters until the maximum signal level was detected.
- (m) Adjust input signal to the substitution antenna until an equal or a known related level to that detected from the transmitter was obtained in the test receiver.
- (n) Record the power level read from the Average Power Meter and calculate the ERP/EIRP as follows:  
 $P = P1 - L1 = (P2 + L2) - L1 = P3 + A + L2 - L1$   
 $EIRP = P + G1 = P3 + L2 - L1 + A + G1$   
 $ERP = EIRP - 2.15 \text{ dB}$   
 Total Correction factor in EMI Receiver # 2 =  $L2 - L1 + G1$   
 Where: P: Actual RF Power fed into the substitution antenna port after corrected.  
 P1: Power output from the signal generator  
 P2: Power measured at attenuator A input  
 P3: Power reading on the Average Power Meter  
 EIRP: EIRP after correction  
 ERP: ERP after correction
- (o) Adjust both transmitting and receiving antenna in a HORIZONTAL polarization, then repeat step (k) to (o)
- (p) Repeat step (d) to (o) for different test frequency
- (q) Repeat steps (c) to (j) with the substitution antenna oriented in horizontal polarization.
- (r) Actual gain of the EUT's antenna is the difference of the measured EIRP and measured RF power at the RF port. Correct the antenna gain if necessary.

**Limits:**

| Power Step | Burst PEAK EIRP (dBm) |
|------------|-----------------------|
| 0          | <33                   |

**Power Measurements ( Radiated )**

| Frequency (MHz)         | Power Step | BURST PEAK EIRP (dBm) |       | MODULATION AVERAGE (dBm) |       |
|-------------------------|------------|-----------------------|-------|--------------------------|-------|
|                         |            | EIRP                  | ERP   | EIRP                     | ERP   |
| 1850.2                  | 0          | 28.5                  | 26.35 | 19.5                     | 17.35 |
| 1880.0                  | 0          | 28.5                  | 26.35 | 19.5                     | 17.35 |
| 1909.8                  | 0          | 28.3                  | 26.15 | 19.3                     | 17.15 |
| Measurement uncertainty |            | ±3 dB                 |       |                          |       |

**Sample calculation:**

| Freg   | SA Reading | SG Setting | Ant. gain | Dipol gain | Cable loss | ERIP Result |  |  |  |
|--------|------------|------------|-----------|------------|------------|-------------|--|--|--|
| MHz    | dBµV       | dBm        | dBi       | dBd        | dB         | dBm         |  |  |  |
| 1880.0 | 127.0      | 21.0       | 8.4       | 0.0        | 3.33       | 28.5        |  |  |  |
|        |            |            |           |            |            |             |  |  |  |

$EIRP = SG \text{ (dBm)} - \text{Cable Loss (dB)} + \text{Ant. gain (dBi)}$

**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**

(for reference numbers see test equipment listing)

## FREQUENCY STABILITY

## SUBCLAUSE § 24.235

### **Method of Measurement:**

In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the mobile station in a "call mode". This is accomplished with the use of a R&S CMU 200 DIGITAL RADIOCOMMUNICATION TESTER..

1. Measure the carrier frequency at room temperature.
2. Subject the mobile station to overnight soak at -30 C.
3. With the mobile station, powered with 3.7 Volts, connected to the CMU 200 and in a simulated call on channel 661 (center channel), measure the carrier frequency. These measurements should be made within 2 minutes of powering up the mobile station, to prevent significant self warming.
4. Repeat the above measurements at 10 C increments from -30 C to +60 C. Allow at least 1 1/2 hours at each temperature, un-powered, before making measurements.
5. Re-measure carrier frequency at room temperature with nominal 3.8 Volts. Vary supply voltage from minimum 3.3 Volts to maximum 4.4 Volts, in 12 steps re-measuring carrier frequency at each voltage. Pause at 3.7 V dc Volts for 1 1/2 hours un-powered, to allow any self heating to stabilize, before continuing.
6. Subject the mobile station to overnight soak at +60 C.
7. With the mobile station, powered with 3.7 Volts, connected to the CMU 200 and in a simulated call on channel 661 (center channel), measure the carrier frequency. These measurements should be made within 2 minutes of powering up the mobile station, to prevent significant self warming.
8. Repeat the above measurements at 10 C increments from +60 C to -30 C. Allow at least 1 1/2 hours at each temperature, un-powered, before making measurements.
9. At all temperature levels hold the temperature to +/- 0.5 C during the measurement procedure.

### **Measurement Limit:**

According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 24.235, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.. This transceiver is specified to operate with an input voltage of between 3.3 V dc and 4.4 V dc, with a nominal voltage of 3.7 V dc.

**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**  
(for reference numbers see test equipment listing)

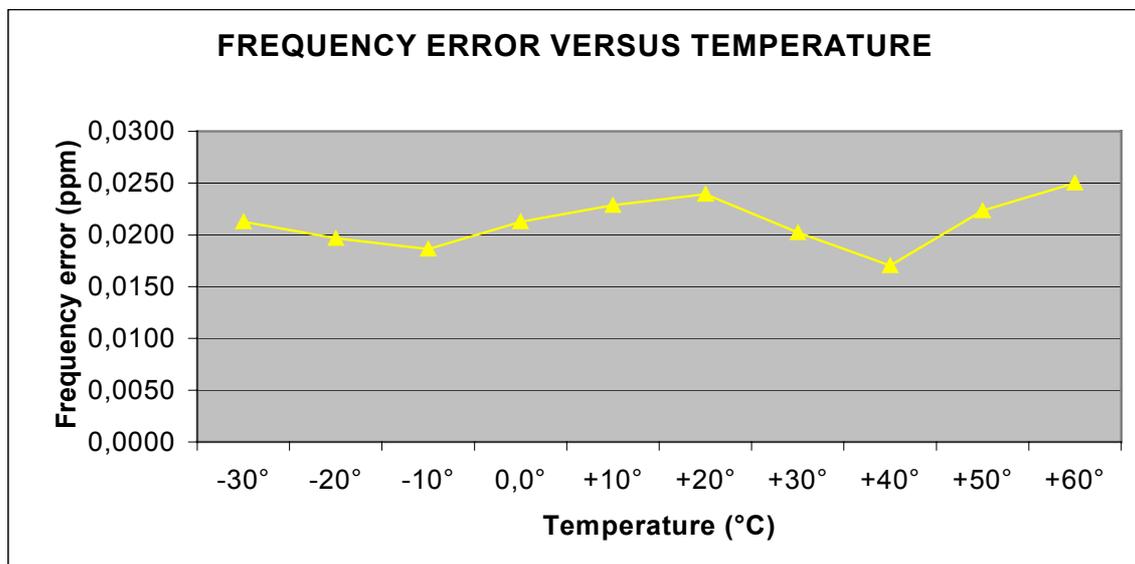
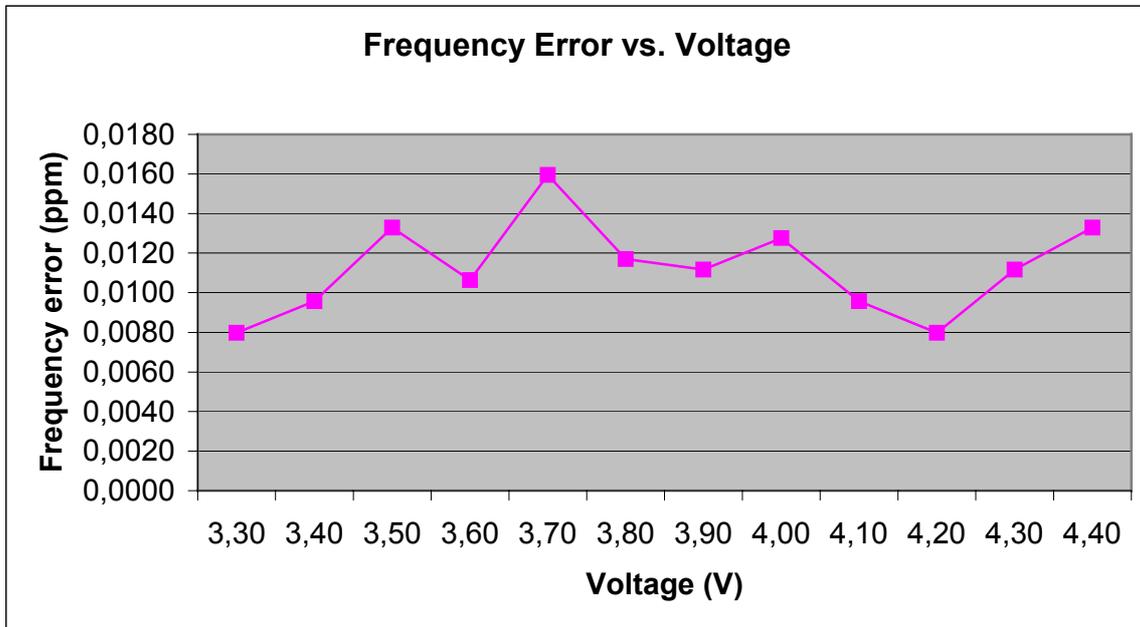
**AFC FREQ ERROR vs. VOLTAGE**

| <b>Voltage<br/>(V)</b> | <b>Frequency Error<br/>(Hz)</b> | <b>Frequency Error<br/>(%)</b> | <b>Frequency Error<br/>(ppm)</b> |
|------------------------|---------------------------------|--------------------------------|----------------------------------|
| 3.3                    | 15                              | 0,00000080                     | 0,0080                           |
| 3.4                    | 18                              | 0,00000096                     | 0,0096                           |
| 3.5                    | 25                              | 0,00000133                     | 0,0133                           |
| 3.6                    | 20                              | 0,00000106                     | 0,0106                           |
| 3.7                    | 30                              | 0,00000160                     | 0,0160                           |
| 3.8                    | 22                              | 0,00000117                     | 0,0117                           |
| 3.9                    | 21                              | 0,00000112                     | 0,0112                           |
| 4.0                    | 24                              | 0,00000128                     | 0,0128                           |
| 4.1                    | 18                              | 0,00000096                     | 0,0096                           |
| 4.2                    | 15                              | 0,00000080                     | 0,0080                           |
| 4.3                    | 21                              | 0,00000112                     | 0,0112                           |
| 4.4                    | 25                              | 0,00000133                     | 0,0133                           |

**AFC FREQ ERROR vs. TEMPERATURE**

| <b>TEMPERATURE<br/>(°C)</b> | <b>Frequency Error<br/>(Hz)</b> | <b>Frequency Error<br/>(%)</b> | <b>Frequency Error<br/>(ppm)</b> |
|-----------------------------|---------------------------------|--------------------------------|----------------------------------|
| -30                         | 40                              | 0,00000213                     | 0,0213                           |
| -20                         | 37                              | 0,00000197                     | 0,0197                           |
| -10                         | 35                              | 0,00000186                     | 0,0186                           |
| ±0.0                        | 40                              | 0,00000213                     | 0,0213                           |
| +10                         | 43                              | 0,00000229                     | 0,0229                           |
| +20                         | 45                              | 0,00000239                     | 0,0239                           |
| +30                         | 38                              | 0,00000202                     | 0,0202                           |
| +40                         | 32                              | 0,00000170                     | 0,0170                           |
| +50                         | 42                              | 0,00000223                     | 0,0223                           |
| +60                         | 47                              | 0,00000250                     | 0,0250                           |

**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**  
 (for reference numbers see test equipment listing)



REFERENCE NUMBER(S) OF TEST EQUIPMENT USED  
(for reference numbers see test equipment listing)

## **EMISSIONS LIMITS**

**§24.238**

### **Measurement Procedure:**

The following steps outline the procedure used to measure the radiated emissions from the mobile station. The site is constructed in accordance with ANSI C63.4 – 1992 requirements and is recognized by the FCC to be in compliance for a 3 and a 10 meter site. The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier that can be as high as 1910 MHz. This was rounded up to 20 GHz. The resolution bandwidth is set as outlined in Part 24.238. The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of the USPCS band.

### **The final open field emission ( here 10m semi-anechoic chamber listed by FCC) test procedure is as follows:**

- a) The test item was placed on a 0.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna.
- b) The antenna output was terminated in a 50 ohm load.
- c) A double ridged waveguide antenna was placed on an adjustable height antenna mast 3 meters from the test item for emission measurements.
- d) Detected emissions were maximized at each frequency by rotating the test item and adjusting the receive antenna height and polarization. The maximum meter reading was recorded. The radiated emission measurements of the harmonics of the transmit frequency through the 10th harmonic were measured with peak detector and 1 MHz bandwidth. If the harmonic could not be detected above the noise floor, the ambient level was recorded.
- e) Now each detected emissions were substituted by the Substitution method, in accordance with the TIA/EIA 603.

### **Measurement Limit:**

Sec. 24.238 Emission Limits.

(a) On any frequency outside a licensee' s frequency block (e.g. A, D, B, etc.) within the USPCS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least  $43+10\log(P)$  dB. The specification that emissions shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log (P)$  dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

### **REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**

(for reference numbers see test equipment listing)

**Measurement Results:**

Radiated emissions measurements were made only at the upper, center, and lower carrier frequencies of the USPCS band (1850.2 MHz, 1879.8 MHz and 1909.8 MHz). It was decided that measurements at these three carrier frequencies would be sufficient to demonstrate compliance with emissions limits because it was seen that all the significant spurs occur well outside the band and no radiation was seen from a carrier in one block of the USPCS band into any of the other blocks. The equipment must still, however, meet emissions requirements with the carrier at all frequencies over which it is capable of operating and it is the manufacturer's responsibility to verify this.

**RESULTS OF OPEN FIELD RADIATED TEST FOR FCC-24:**

The final open field radiated levels are presented on the next pages.

All measurements were done in horizontal and vertical polarization, the plots show the worst case.  
As can be seen from this data, the emissions from the test item were within the specification limit.

**RESULTS OF OPEN FIELD RADIATED TEST FOR FCC-24:**

| EMISSION LIMITATIONS           |  |                             |   |   |         |
|--------------------------------|--|-----------------------------|---|---|---------|
| f (MHz)                        |  | amplitude of emission (dBm) | limit max. allowed emission power (dBm) | actual attenuation below frequency of operation (dBc) | results |
| <b>CH 512</b>                  |  |                             |   |   |         |
| 1850.2                         |  | 28.5                        | -13.0<br>(41.5 dBc)                     | -   | carrier |
| -                              |  | -                           |   | -   | -       |
| -                              |  | -                           |   | -   | -       |
| <b>CH 661</b>                  |  |                             |   |   |         |
| 1880.0                         |  | 28.5                        | -13.0<br>(41.5 dBc)                     | -   | carrier |
| -                              |  | -                           |   | -   | -       |
| -                              |  | -                           |   | -   | -       |
| <b>CH 810</b>                  |  |                             |   |   |         |
| 1909.8                         |  | 28.3                        | -13.0<br>(41.3 dBc)                     | -   | carrier |
|                                |  |                             |   | -   | -       |
|                                |  |                             |   | -   | -       |
| <b>Measurement uncertainty</b> |  | <b>± 0.5dB</b>              |   |   |         |

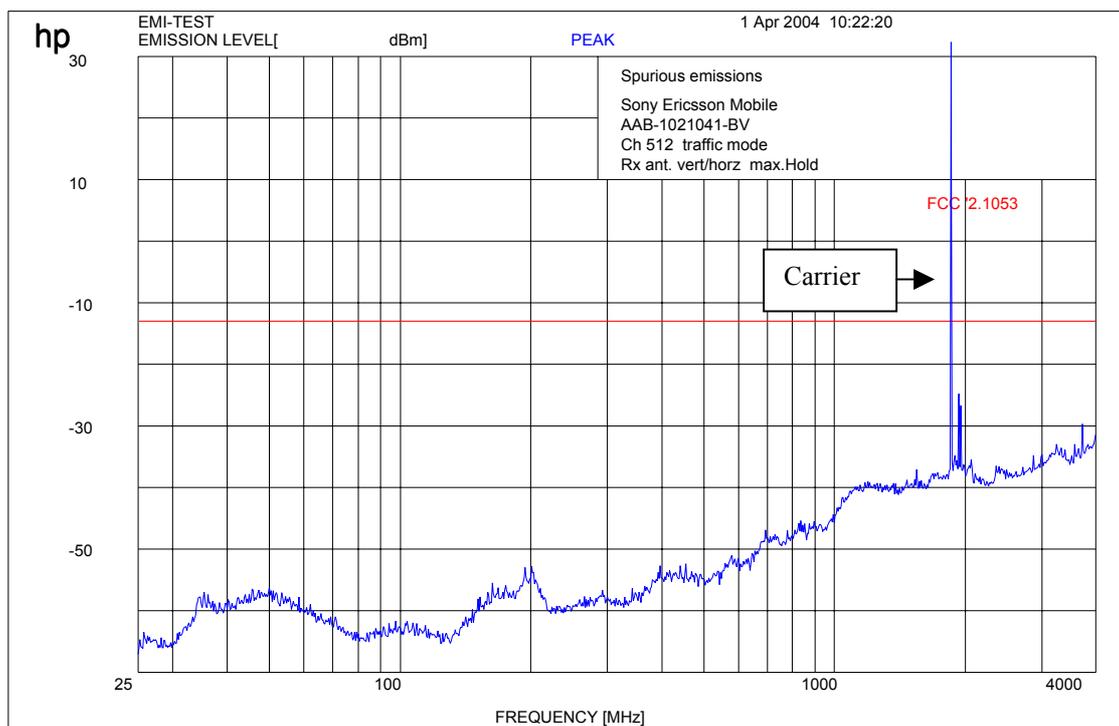
**Sample calculation:**

| Freg   | SA Reading | SG Setting | Ant. gain | Dipol gain | Cable loss | ERIP Result |  |  |  |
|--------|------------|------------|-----------|------------|------------|-------------|--|--|--|
| MHz    | dBμV       | dBm        | dBi       | dBd        | dB         | dBm         |  |  |  |
| 1880.0 | 122.0      | 26.7       | 8.4       | 0.0        | 3.33       | 28.5        |  |  |  |

$$EIRP = SG \text{ (dBm)} - \text{Cable Loss (dB)} + \text{Ant. gain (dBi)}$$

**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**  
(for reference numbers see test equipment listing)

## Channel 512 (up to 4 GHz)



$f < 1 \text{ GHz}$  : RBW/VBW: 100 kHz

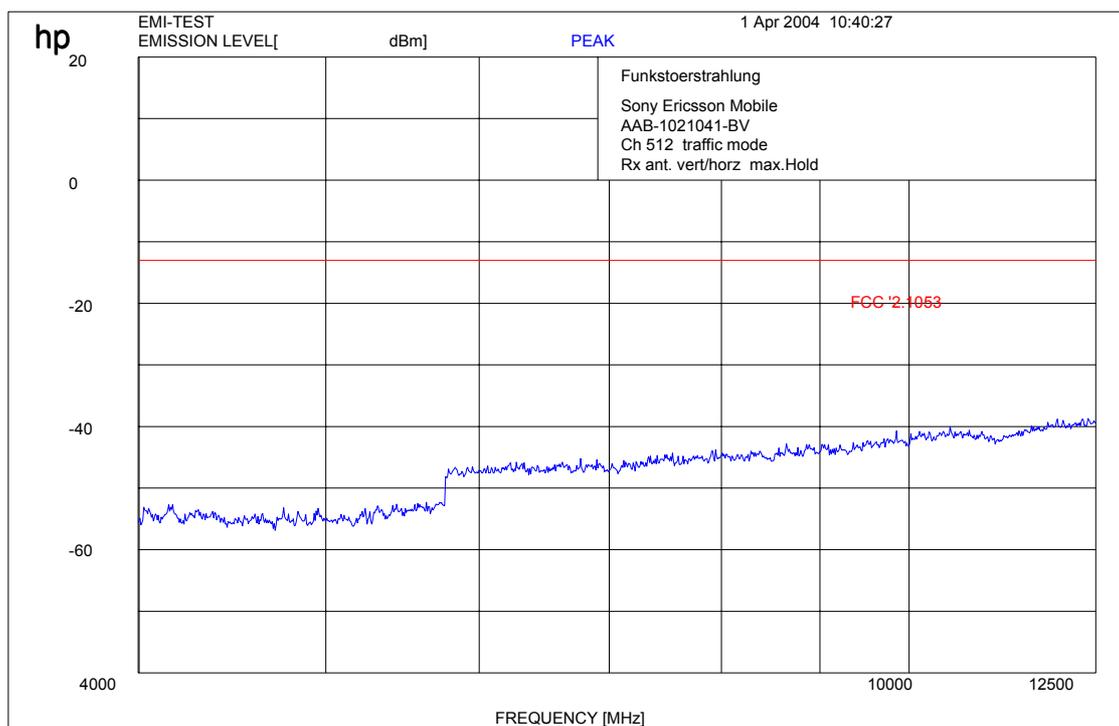
$f \geq 1 \text{ GHz}$  : RBW / VBW 1 MHz

**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**

(for reference numbers see test equipment listing)

17 – 24; 64

## Channel 512 (up to 12 GHz)



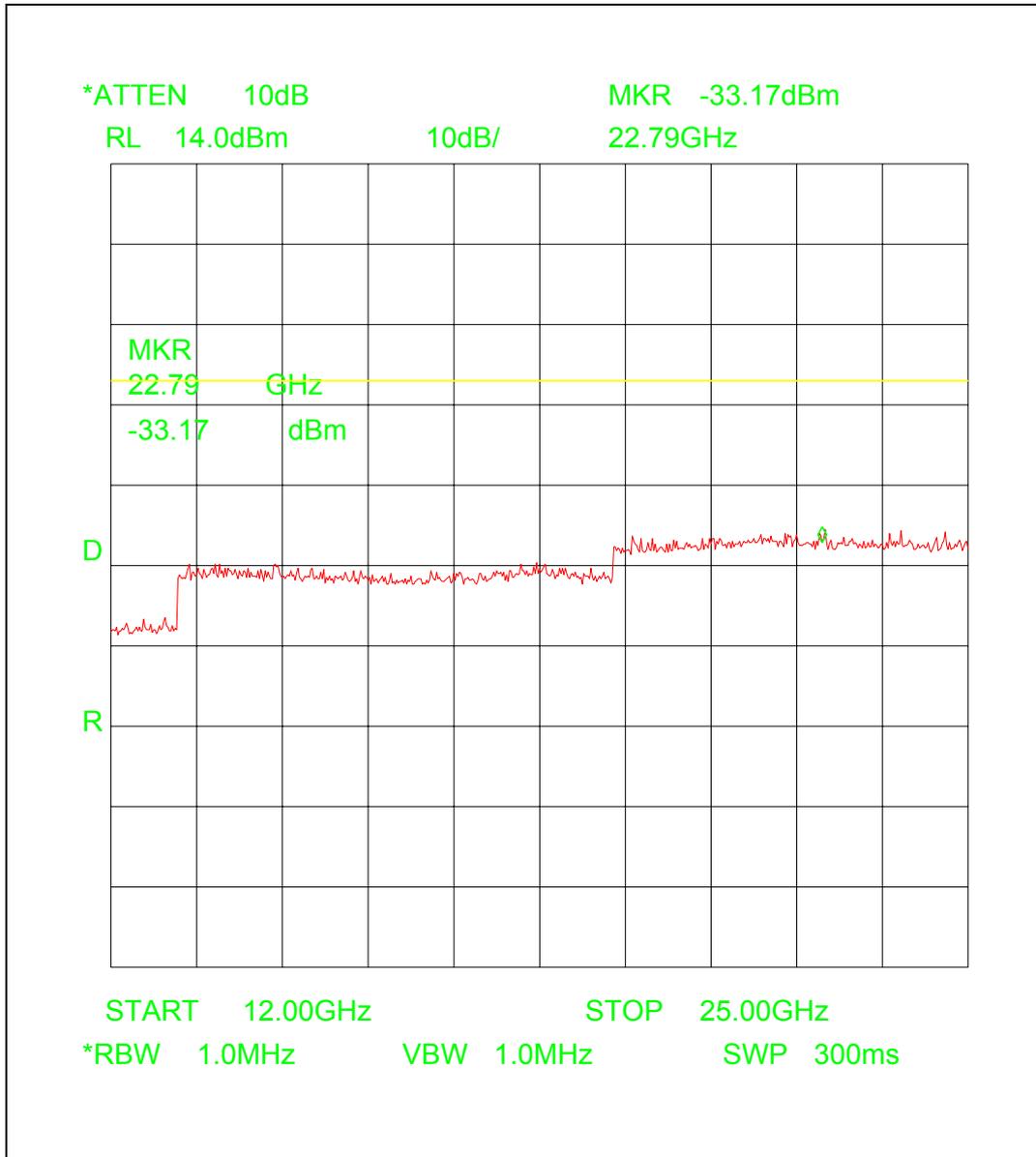
$f < 1 \text{ GHz}$  : RBW/VBW: 100 kHz

$f \geq 1 \text{ GHz}$  : RBW / VBW 1 MHz

**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**  
(for reference numbers see test equipment listing)

17 – 24; 64

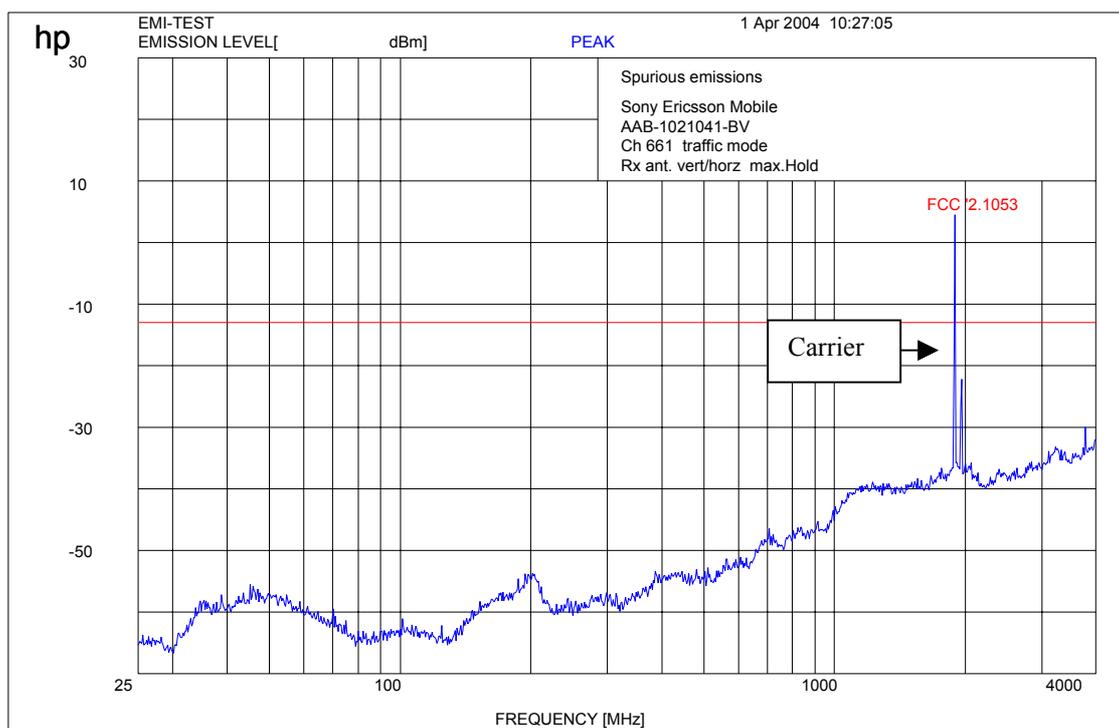
Channel 512 (up to 25 GHz)



REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

(for reference numbers see test equipment listing)

## Channel 661 (up to 4 GHz)



$f < 1 \text{ GHz} : \text{RBW/VBW: } 100 \text{ kHz}$

$f \geq 1 \text{ GHz} : \text{RBW / VBW } 1 \text{ MHz}$

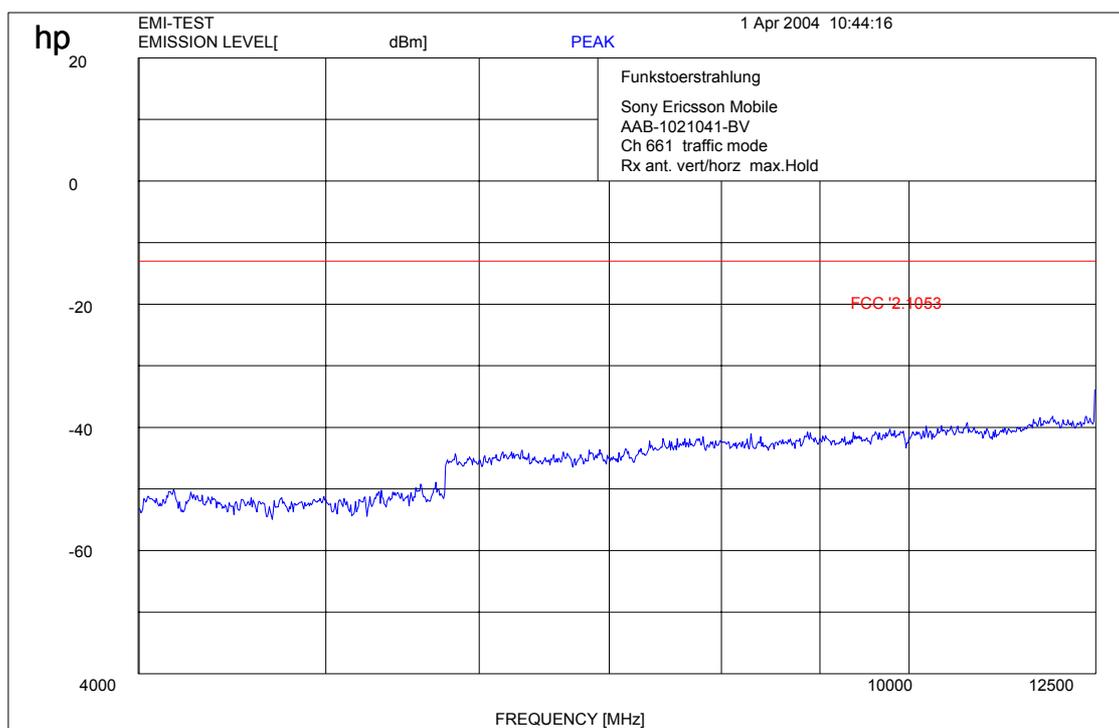
**Carrier suppressed with a rejection filter.**

**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**

(for reference numbers see test equipment listing)

17 – 24, 64

## Channel 661 (up to 12 GHz)



$f < 1 \text{ GHz} : \text{RBW/VBW: } 100 \text{ kHz}$

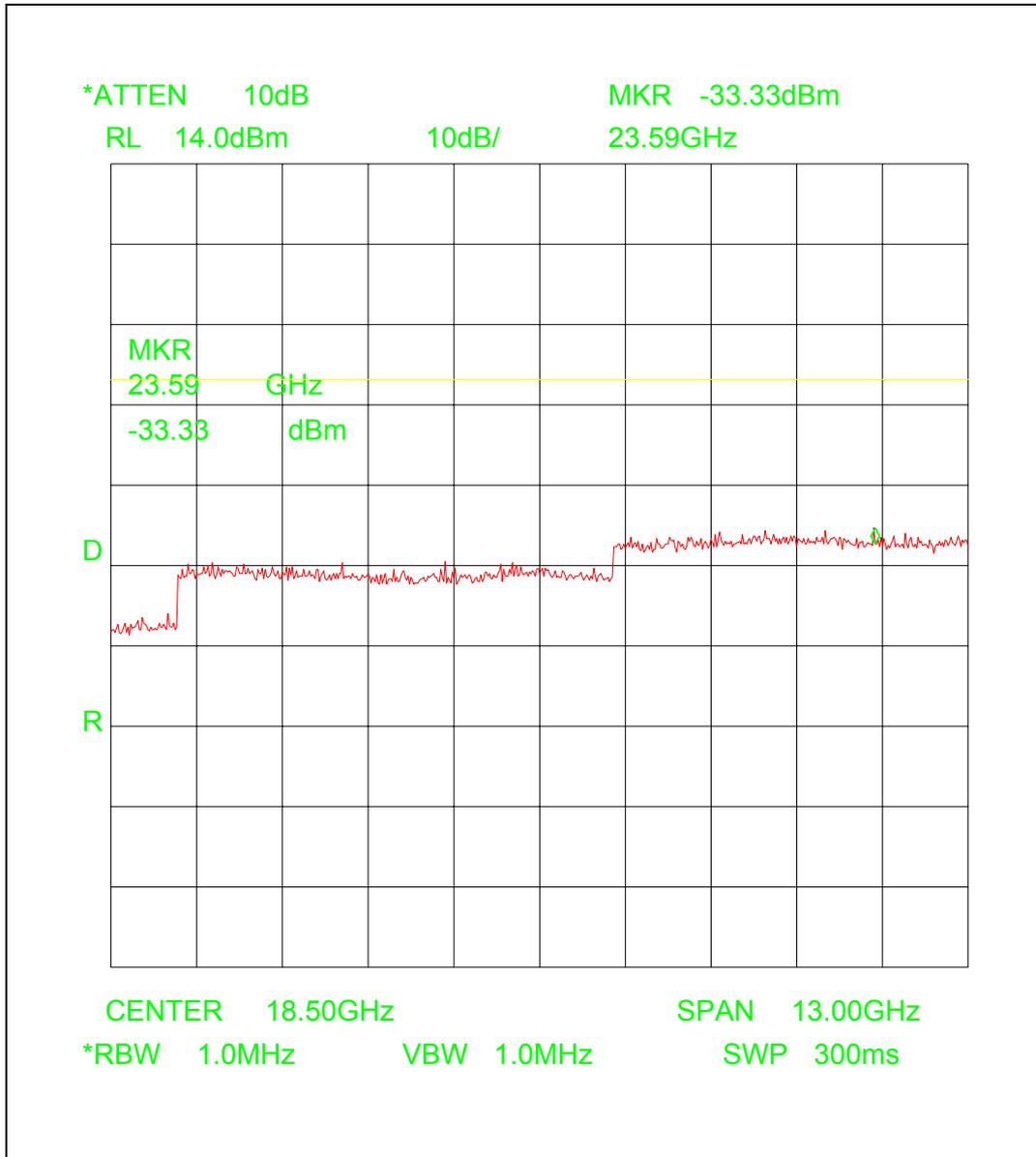
$f \geq 1 \text{ GHz} : \text{RBW / VBW } 1 \text{ MHz}$

**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**

(for reference numbers see test equipment listing)

17 – 24, 64

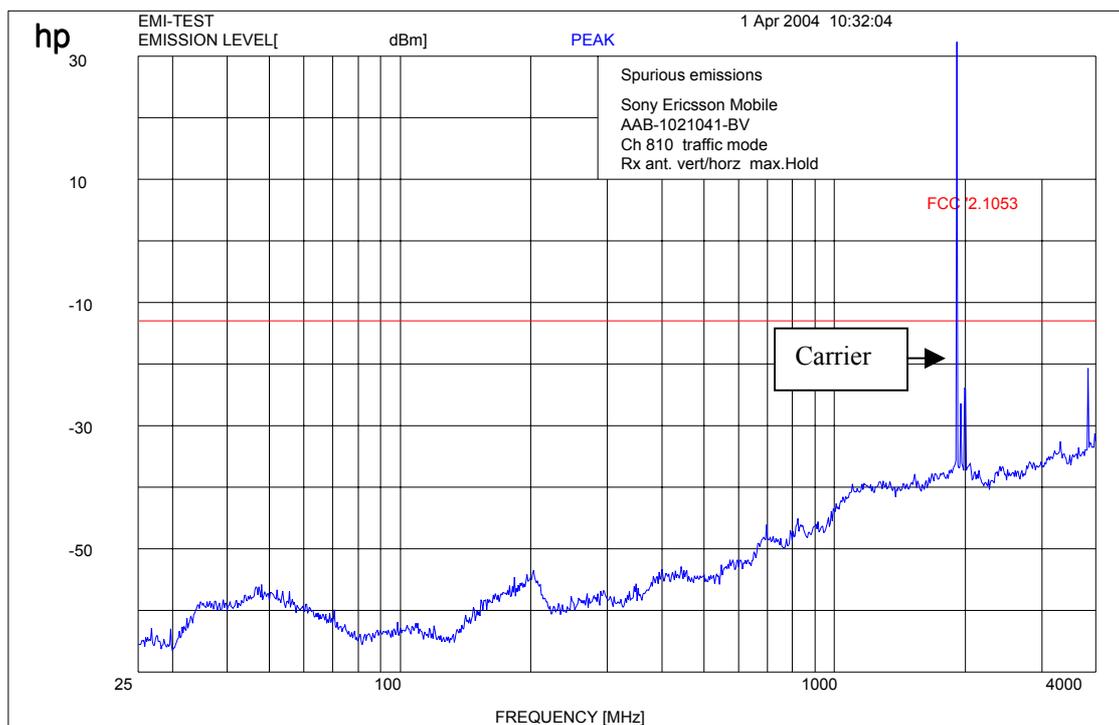
Channel 661 (up to 25 GHz)



REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

(for reference numbers see test equipment listing)

## Channel 810 (up to 4 GHz)



$f < 1 \text{ GHz} : \text{RBW/VBW: } 100 \text{ kHz}$

$f \geq 1 \text{ GHz} : \text{RBW / VBW } 1 \text{ MHz}$

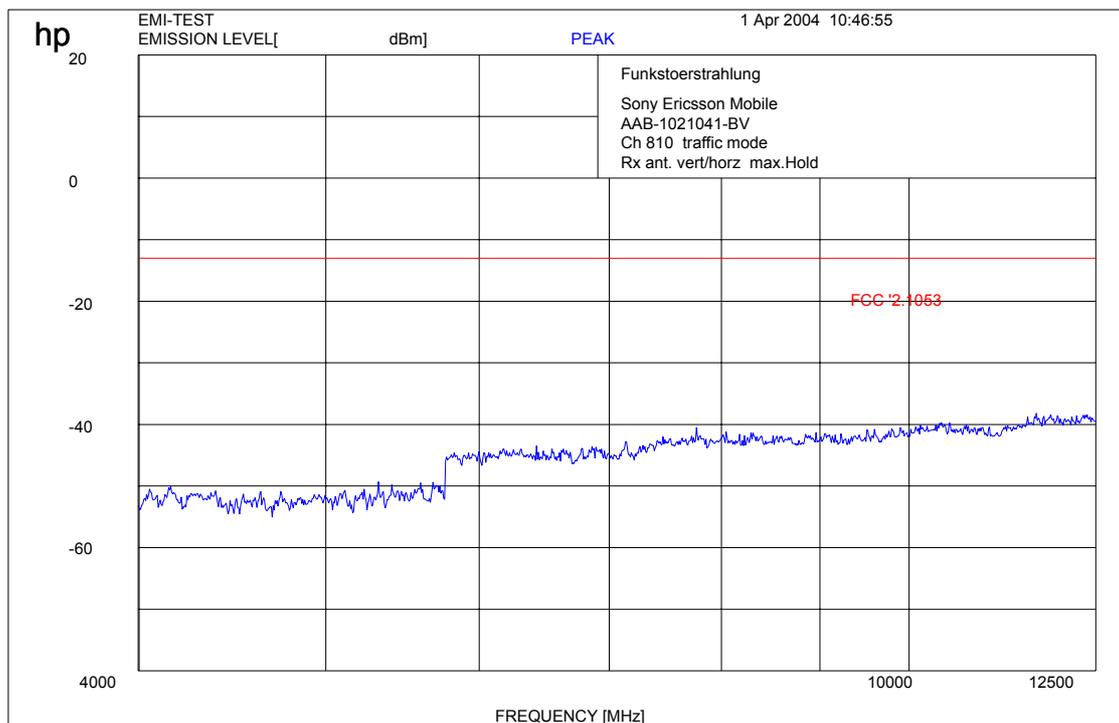
**Carrier suppressed with a rejection filter**

**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**

(for reference numbers see test equipment listing)

17 – 24, 64

## Channel 810 (up to 12 GHz)



$f < 1 \text{ GHz}$  : RBW/VBW: 100 kHz

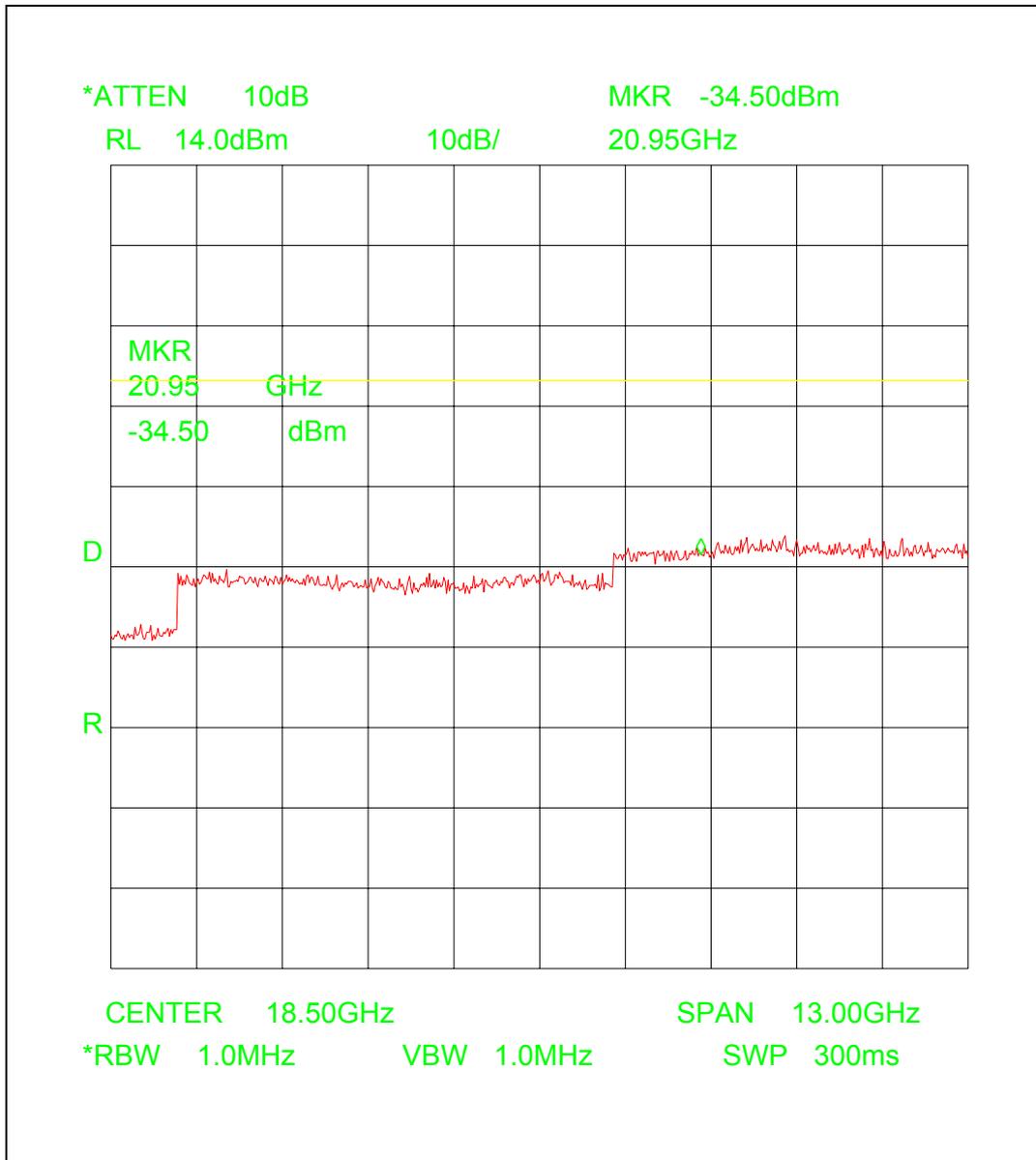
$f \geq 1 \text{ GHz}$  : RBW/VBW 1 MHz

**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**

(for reference numbers see test equipment listing)

17 – 24, 64

Channel 810 (up to 25 GHz)

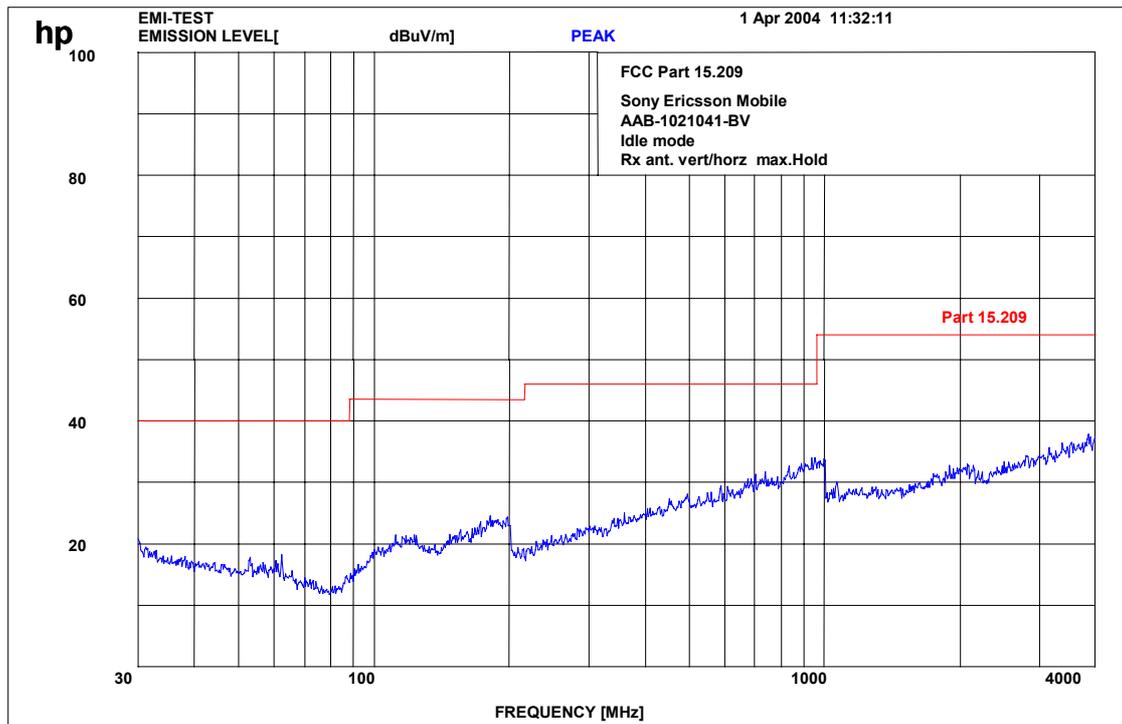


REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

(for reference numbers see test equipment listing)



## Idle-Mode (up to 4 GHz)



$f < 1 \text{ GHz}$  : RBW/VBW: 100 kHz

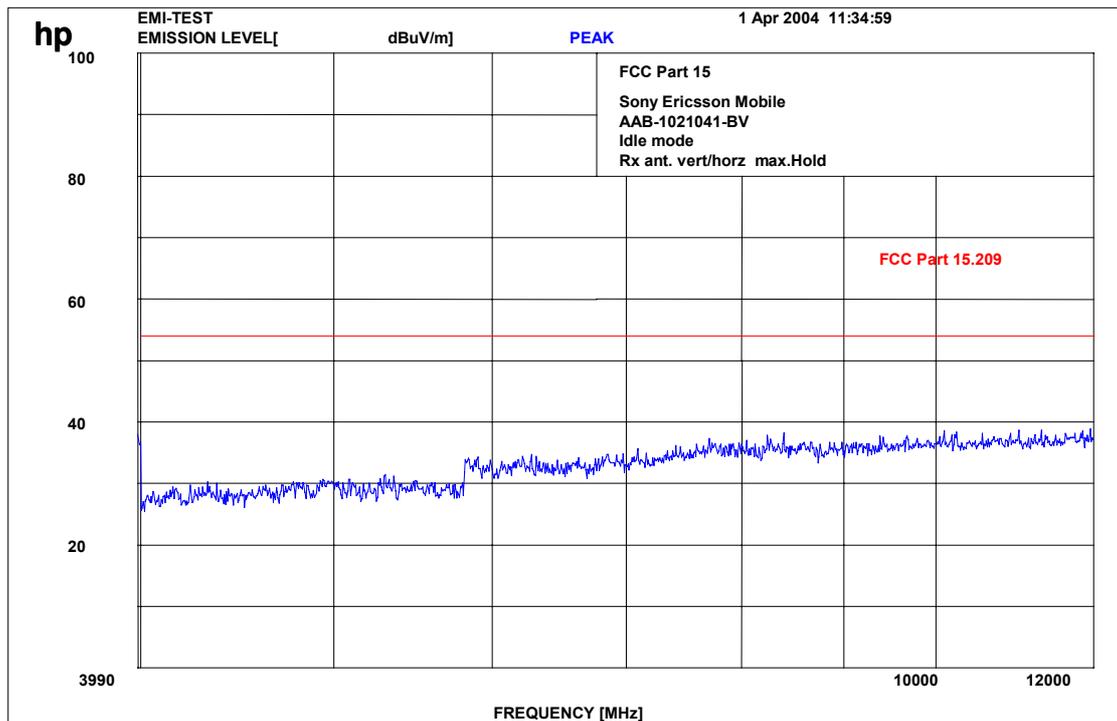
$f \geq 1 \text{ GHz}$  : RBW/VBW 1 MHz

**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**

(for reference numbers see test equipment listing)

17 – 24, 64

## Idle-Mode (up to 12 GHz)



$f < 1 \text{ GHz} : \text{RBW/VBW: } 100 \text{ kHz}$

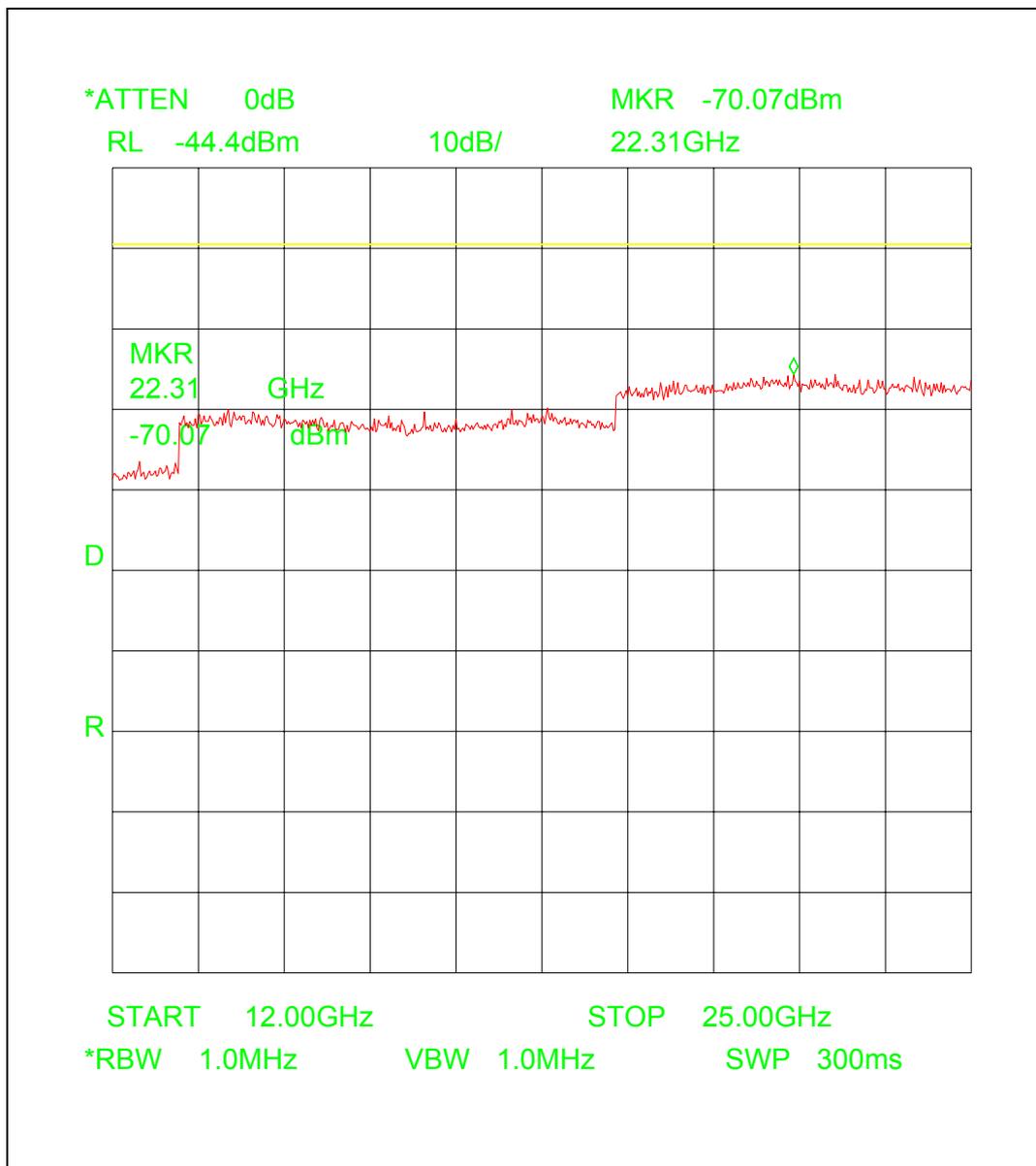
$f \geq 1 \text{ GHz} : \text{RBW/VBW } 1 \text{ MHz}$

**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**

(for reference numbers see test equipment listing)

17 – 24, 64

## Idle-Mode (up to 25 GHz)



**For this measurement we used a special wideband horn antenna and a low noise preamp.**

### REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

(for reference numbers see test equipment listing)

## CONDUCTED SPURIOUS EMISSIONS

### Measurement Procedure:

The following steps outline the procedure used to measure the conducted emissions from the mobile station.

1. Determine frequency range for measurements: From CFR 2.1057 the spectrum should be investigated from the lowest radio frequency generated in the equipment up to at least the 10th harmonic of the carrier frequency.

For the mobile station equipment tested, this equates to a frequency range of 13 MHz to 19.1 GHz, data taken from 10 MHz to 20 GHz.

2. Determine mobile station transmit frequencies: below outlines the band edge frequencies pertinent to conducted emissions testing.

### USPCS Transmitter

#### Channel Frequency

512 1850.2 MHz

661 1880.0 MHz

810 1909.8 MHz

### Measurement Limit:

Sec. 24.238 Emission Limits.

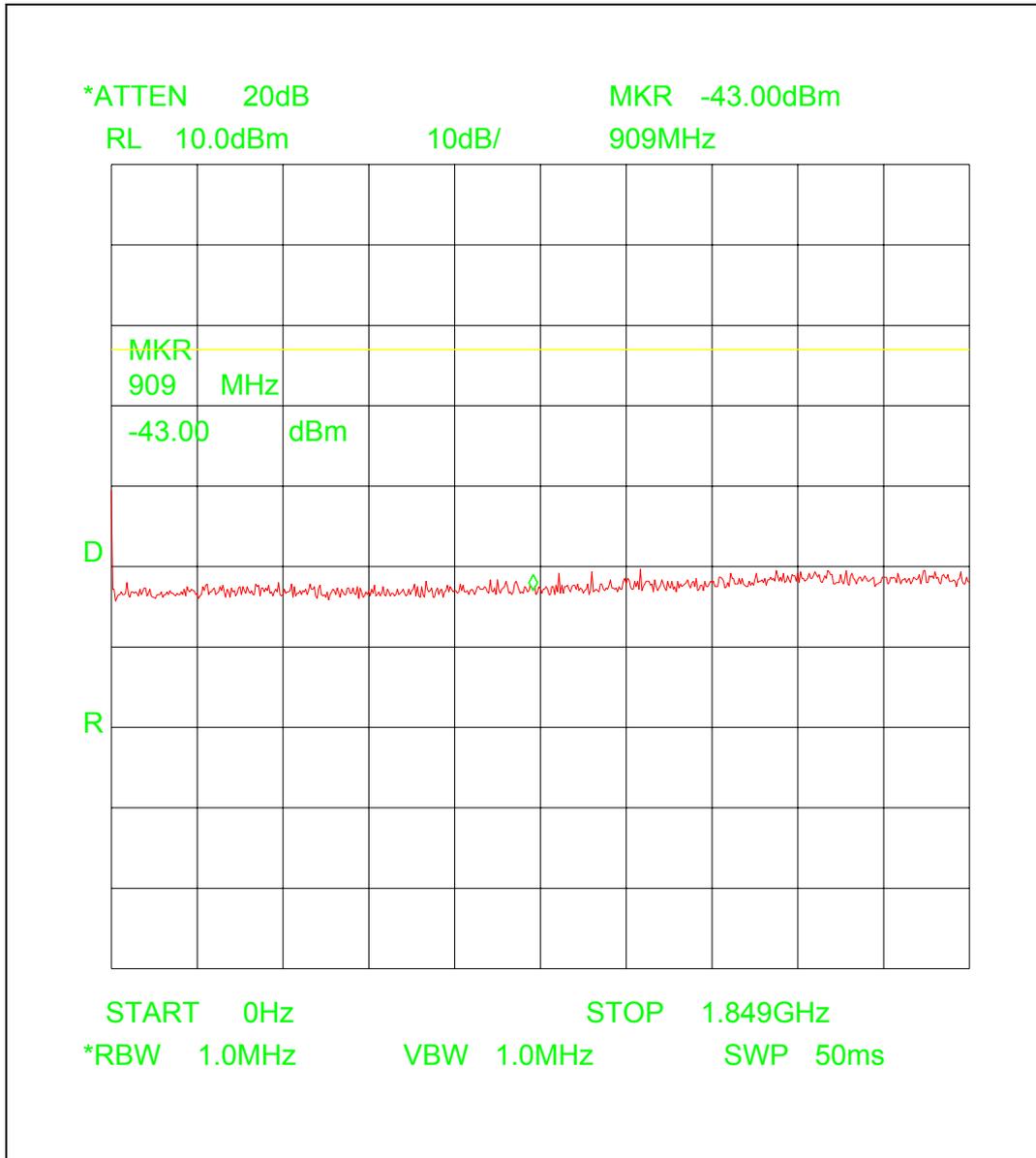
(a) On any frequency outside frequency band of the USPCS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least  $43+10\text{Log}(P)$  dB. For all power levels +30 dBm to 0 dBm, this becomes a constant specification limit of -13 dBm.

| EMISSION LIMITATIONS           |  |                             |   |   |                 |
|--------------------------------|--|-----------------------------|---|---|-----------------|
| f (MHz)                        |  | amplitude of emission (dBm) | limit max. allowed emission power (dBm) | actual attenuation below frequency of operation (dBc) | results         |
| <b>CH 512</b>                  |  |                             |   |   |                 |
| <b>1 850.2</b>                 |  | <b>29.8</b>                 | <b>-13.0</b><br><b>(42.8 dBc)</b>       |   | <b>carrier</b>  |
|                                |  |                             |   |   | <b>carrier</b>  |
|                                |  |                             |   |   | <b>complies</b> |
| <b>CH 661</b>                  |  |                             |   |   |                 |
| <b>1 880.0</b>                 |  | <b>30.1</b>                 | <b>-13.0</b><br><b>(43.1 dBc)</b>       |   | <b>carrier</b>  |
|                                |  |                             |   |   | <b>complies</b> |
| <b>CH 810</b>                  |  |                             |   |   |                 |
| <b>1 909.8</b>                 |  | <b>30.0</b>                 | <b>-13.0</b><br><b>(43.0 dBc)</b>       |   | <b>carrier</b>  |
|                                |  |                             |   |   | <b>carrier</b>  |
| <b>Measurement uncertainty</b> |  |                             | <b>± 0.5dB</b>                          |   |                 |

**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**  
(for reference numbers see test equipment listing)

Measurements:

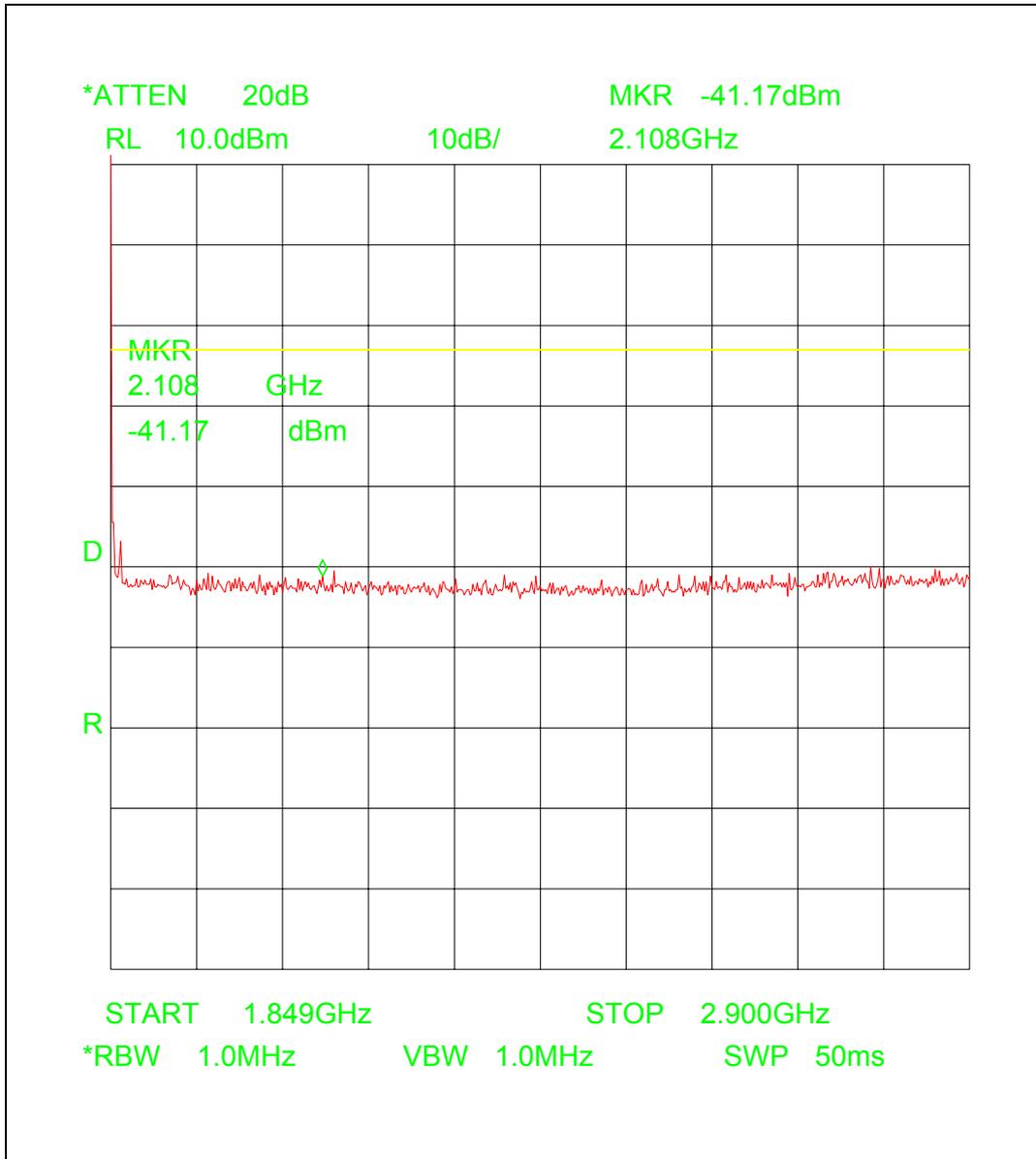
Channel: 512



REFERENCE NUMBER(S) OF TEST EQUIPMENT USED  
(for reference numbers see test equipment listing)

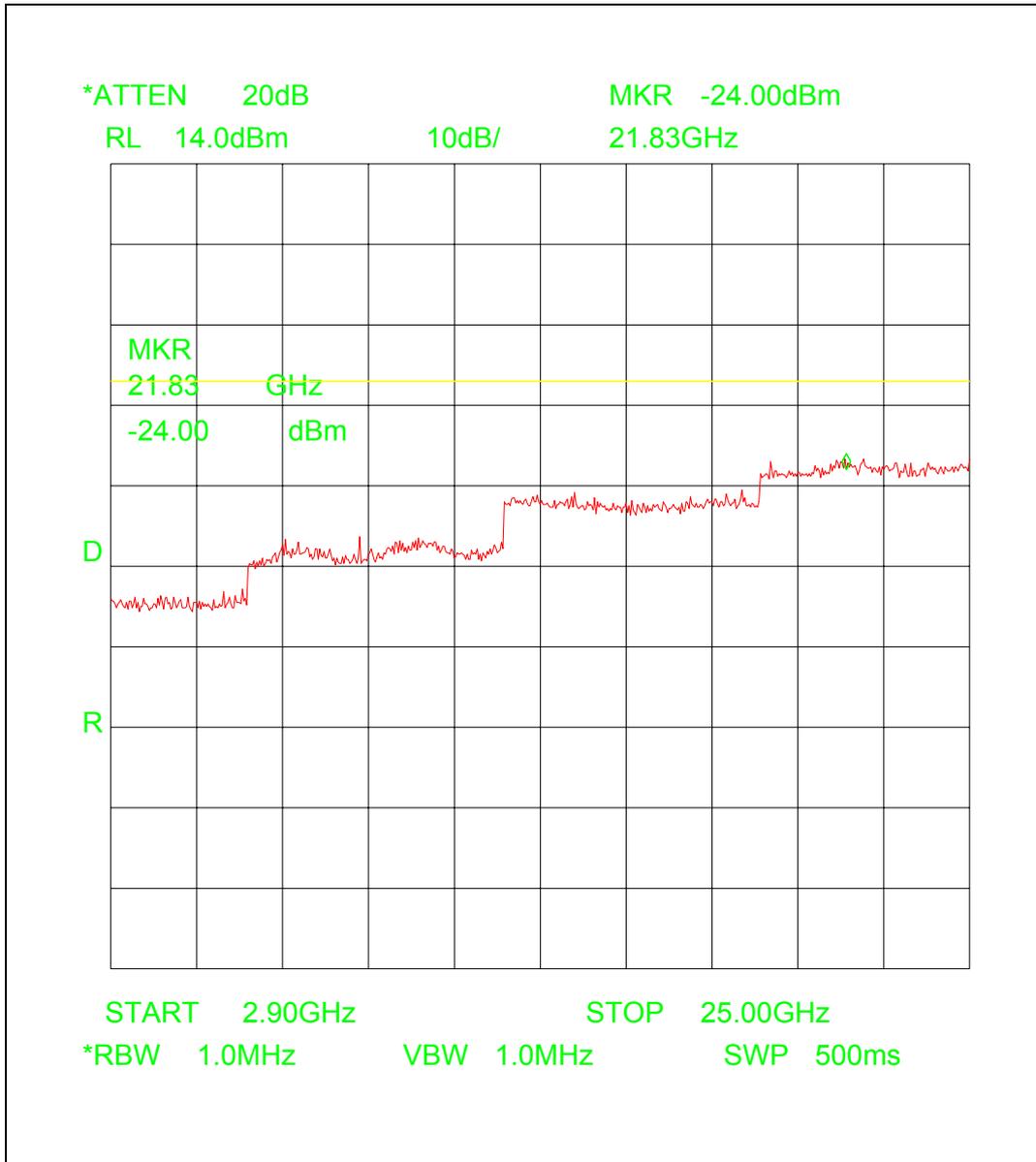


Channel 512



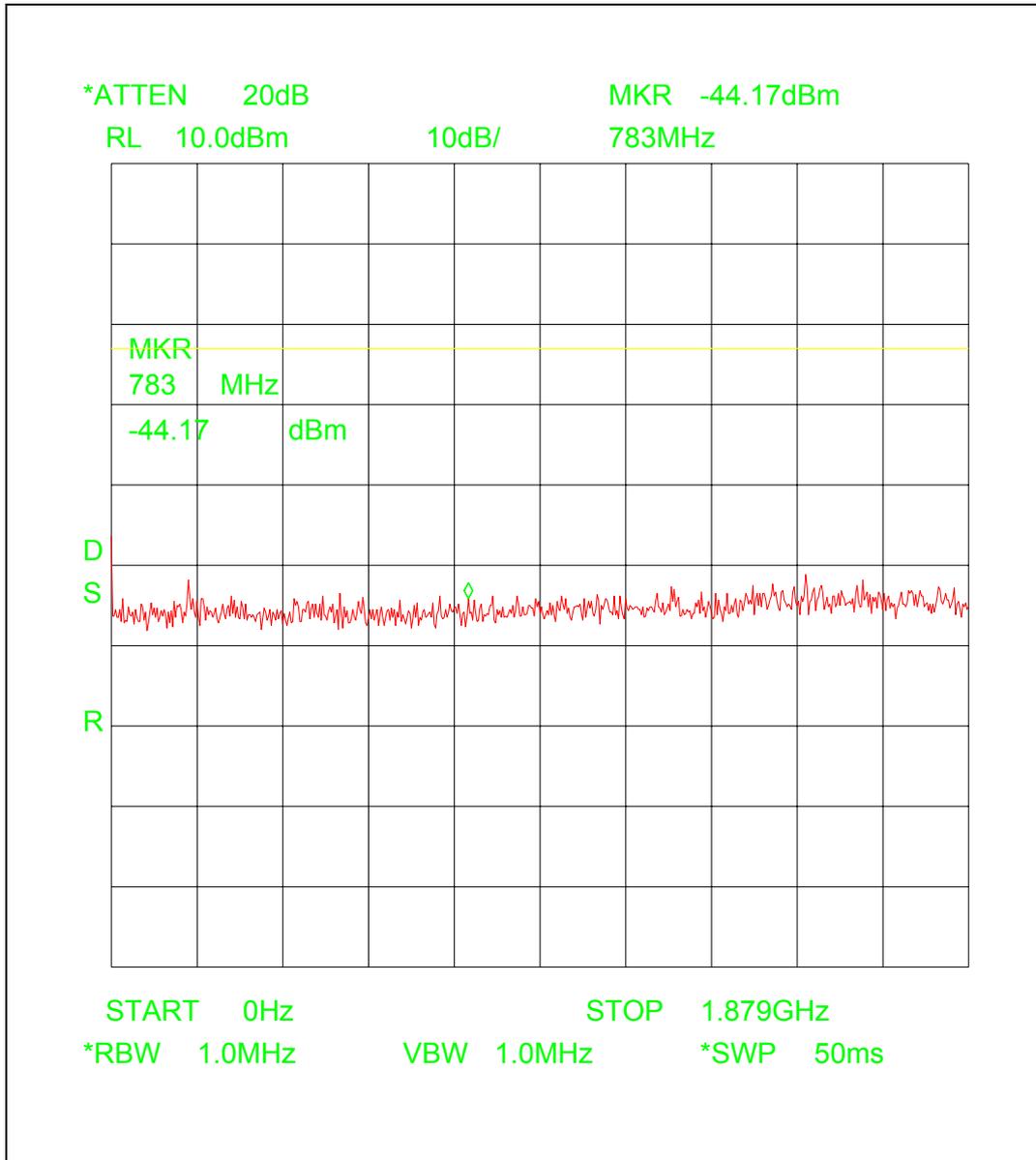
REFERENCE NUMBER(S) OF TEST EQUIPMENT USED  
(for reference numbers see test equipment listing)

Channel 512



REFERENCE NUMBER(S) OF TEST EQUIPMENT USED  
(for reference numbers see test equipment listing)

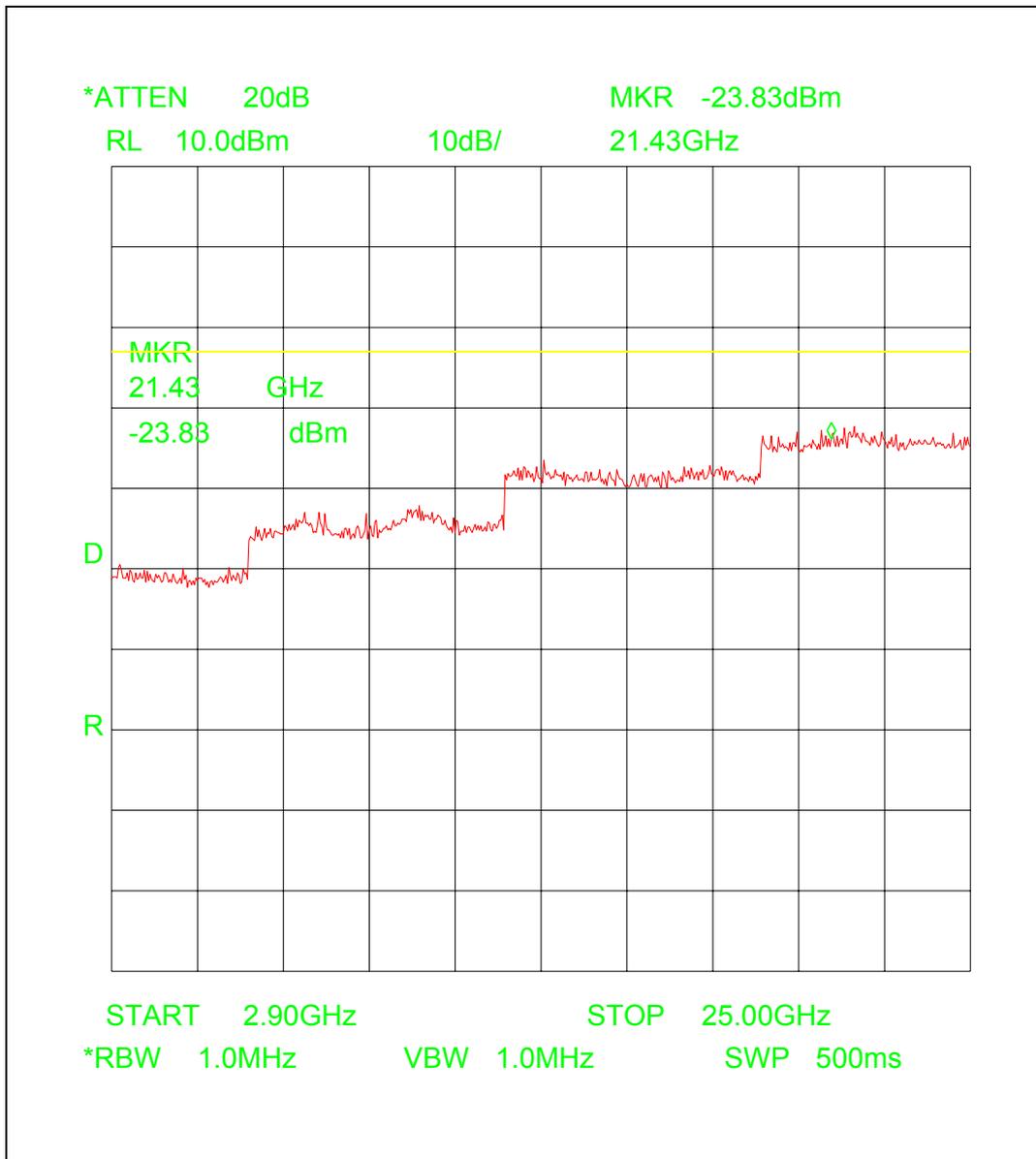
Channel 661



REFERENCE NUMBER(S) OF TEST EQUIPMENT USED  
(for reference numbers see test equipment listing)

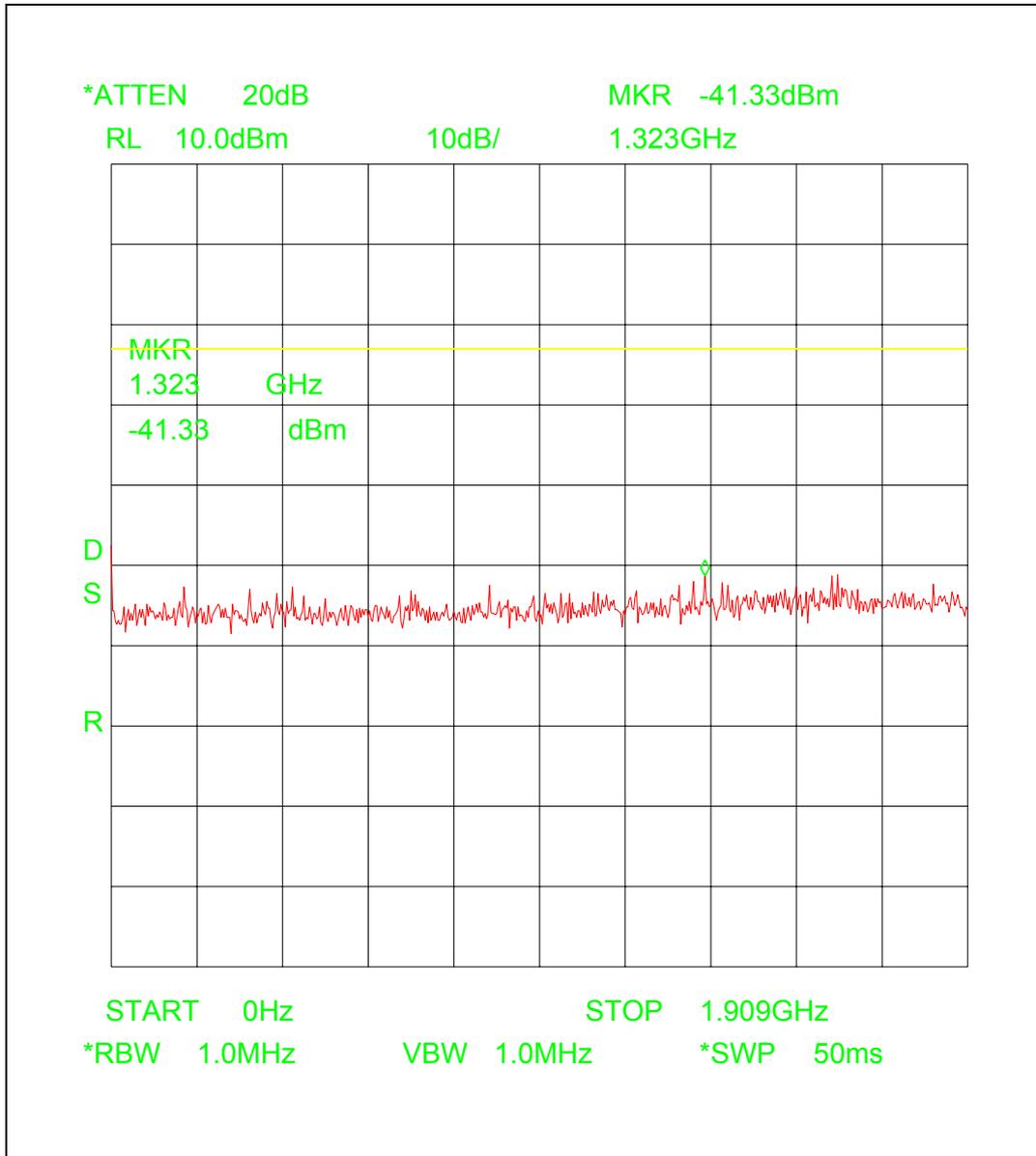


## Channel 661



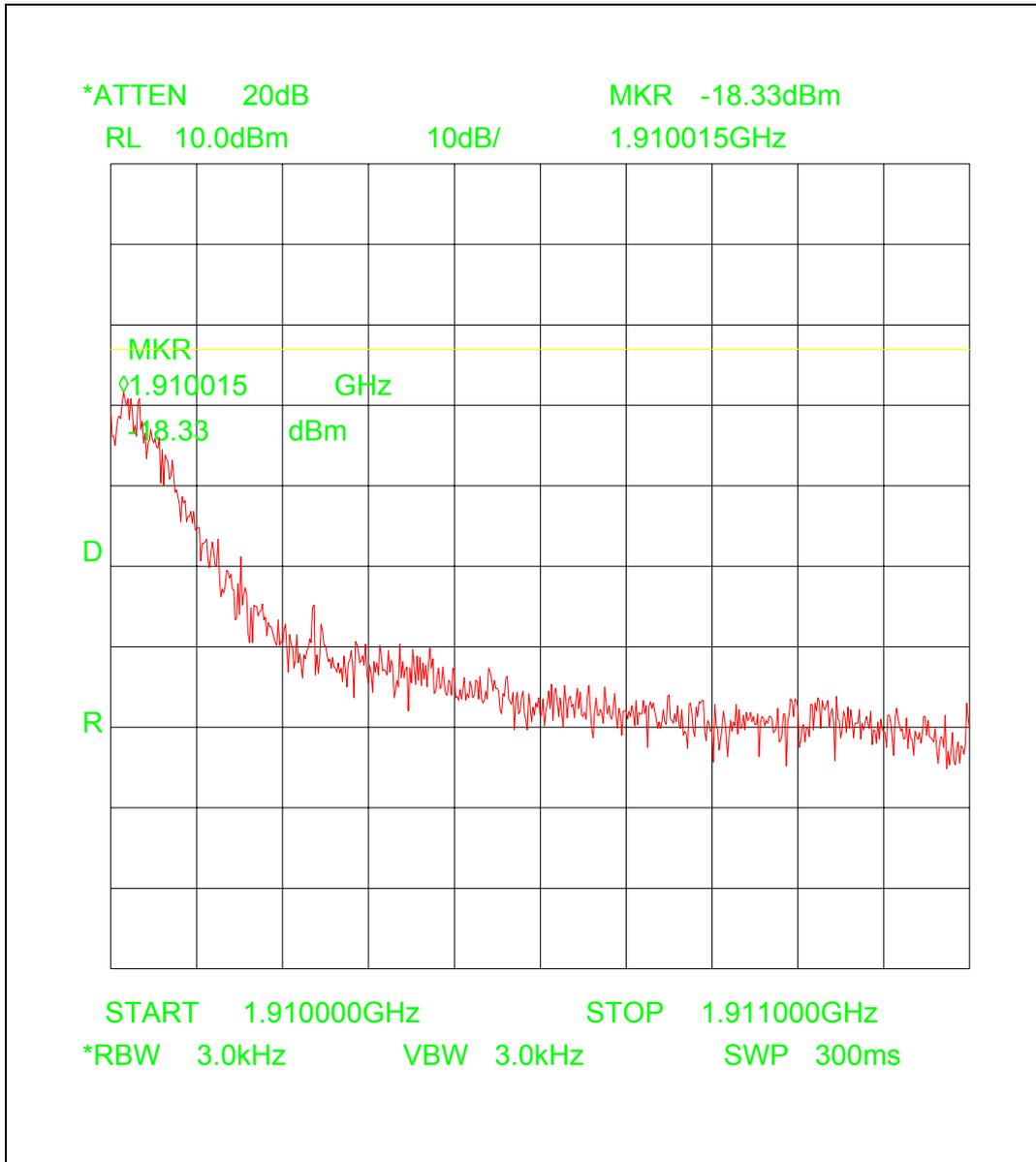
REFERENCE NUMBER(S) OF TEST EQUIPMENT USED  
(for reference numbers see test equipment listing)

Channel 810



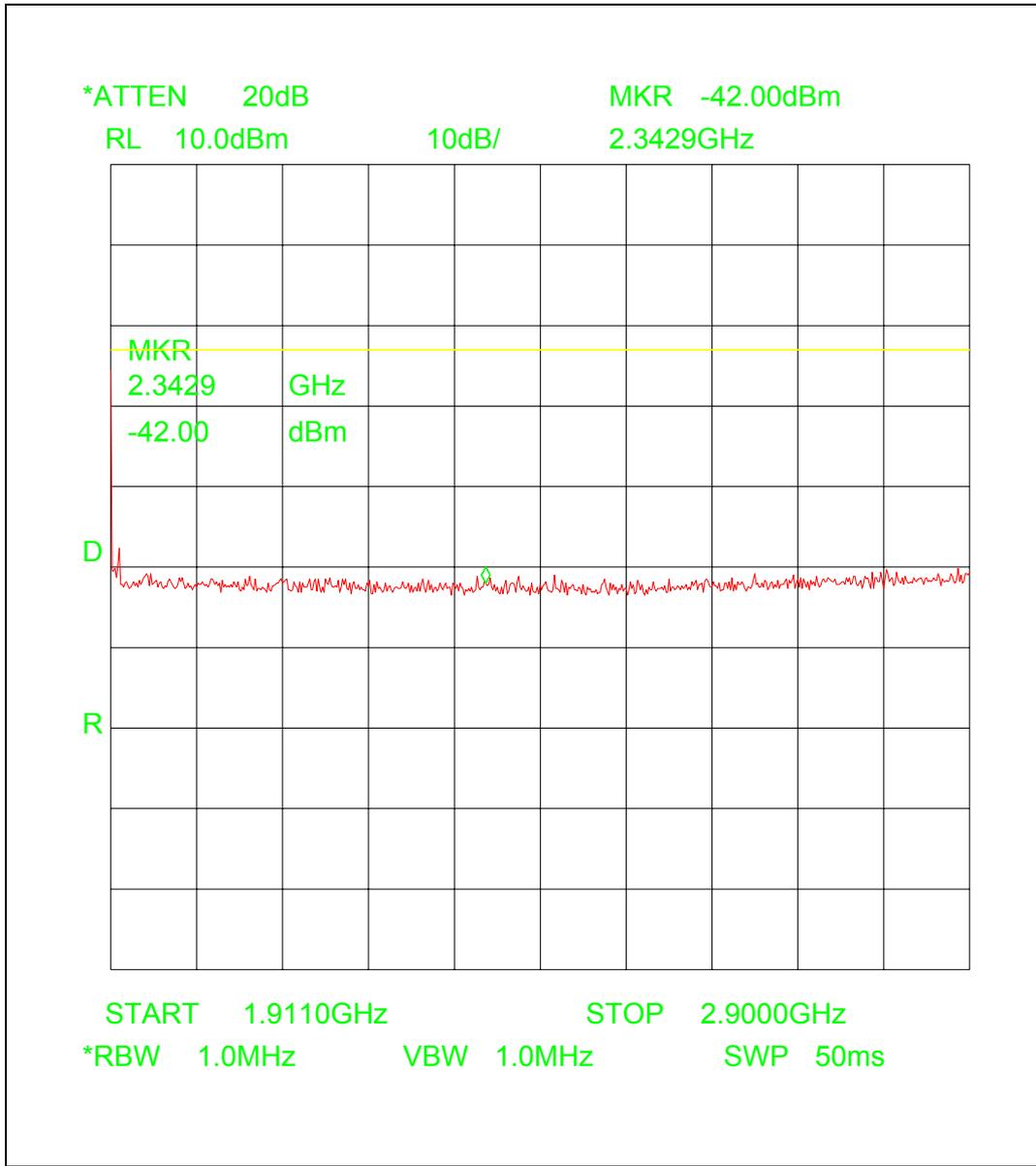
REFERENCE NUMBER(S) OF TEST EQUIPMENT USED  
(for reference numbers see test equipment listing)

Channel 810



REFERENCE NUMBER(S) OF TEST EQUIPMENT USED  
(for reference numbers see test equipment listing)

Channel 810

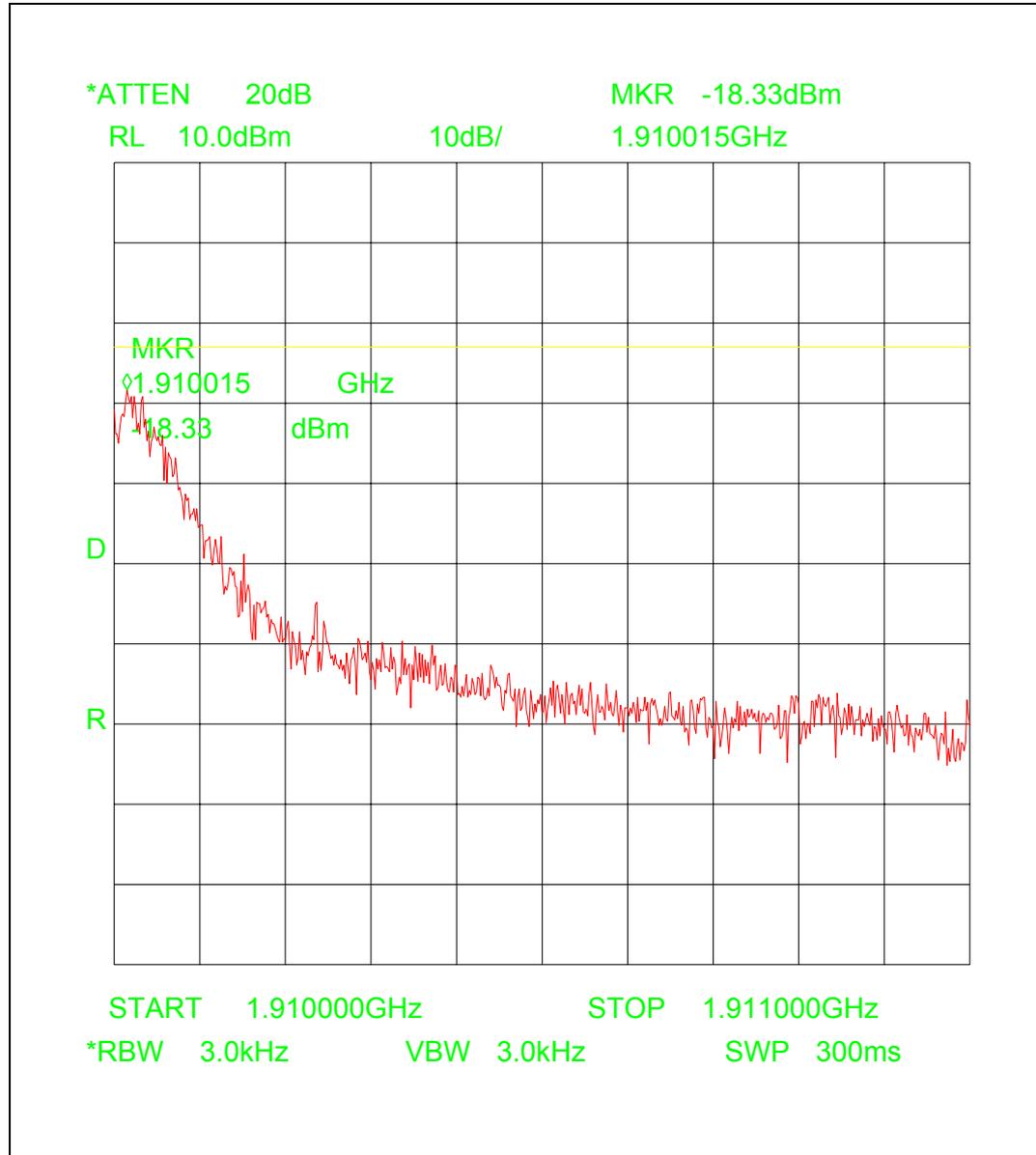


REFERENCE NUMBER(S) OF TEST EQUIPMENT USED  
(for reference numbers see test equipment listing)





Block C Channel 810



REFERENCE NUMBER(S) OF TEST EQUIPMENT USED  
(for reference numbers see test equipment listing)

## **OCCUPIED BANDWIDTH**

**§2.989**

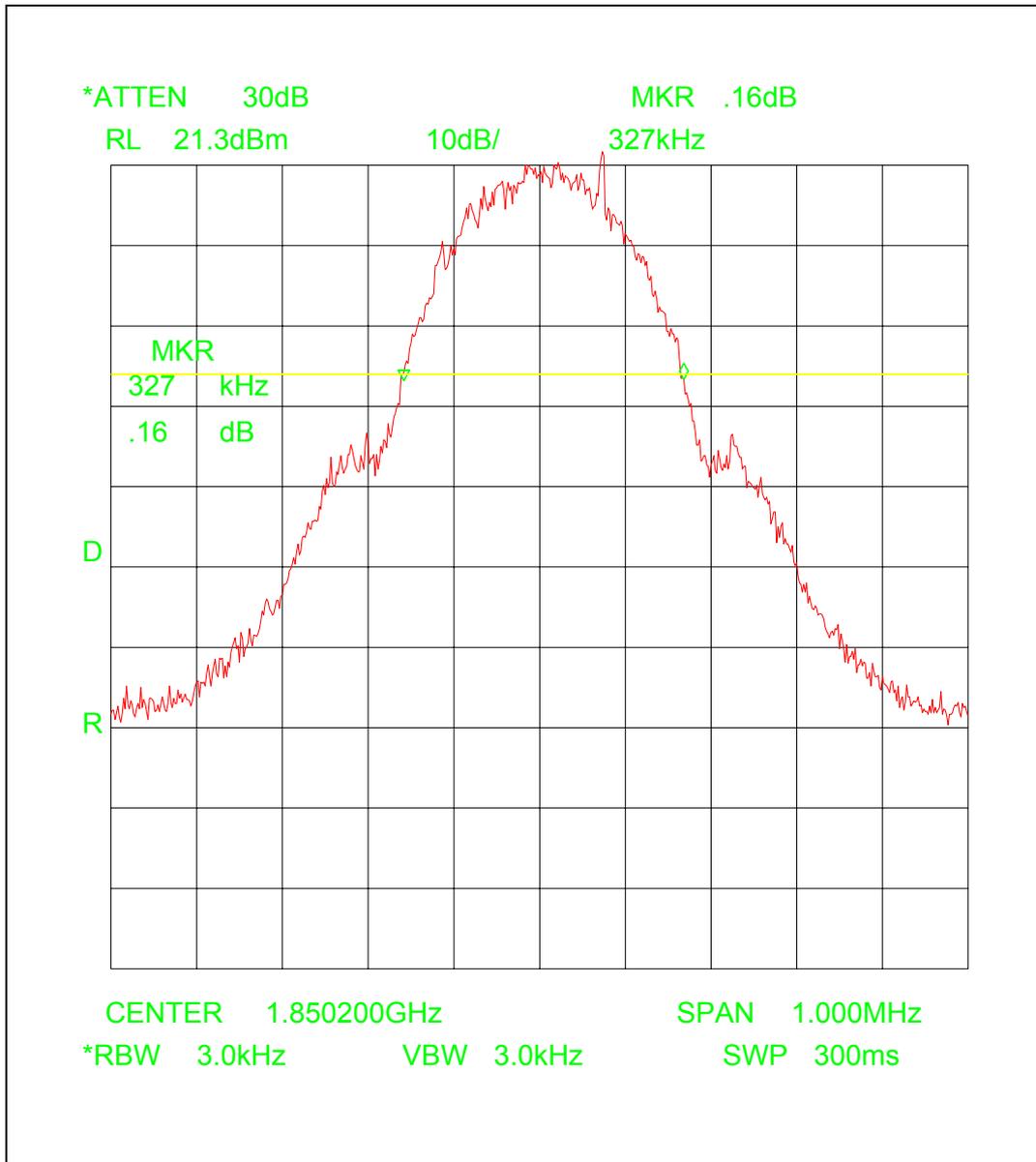
### **Occupied Bandwidth Results**

Similar to conducted emissions, occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of the USPCS frequency band. Table 8.2 below lists the measured 99% power and -26dBc occupied bandwidths. Spectrum analyzer plots are included on the following pages.

| <b>Frequency</b>  | <b>99% Occupied Bandwidth</b> | <b>-26 dBc Bandwidth</b> |
|-------------------|-------------------------------|--------------------------|
| <b>1850.2 MHz</b> | <b>297.000</b>                | <b>327.000</b>           |
| <b>1880.0 MHz</b> | <b>285.000</b>                | <b>322.000</b>           |
| <b>1909.8 MHz</b> | <b>290.000</b>                | <b>328.000</b>           |

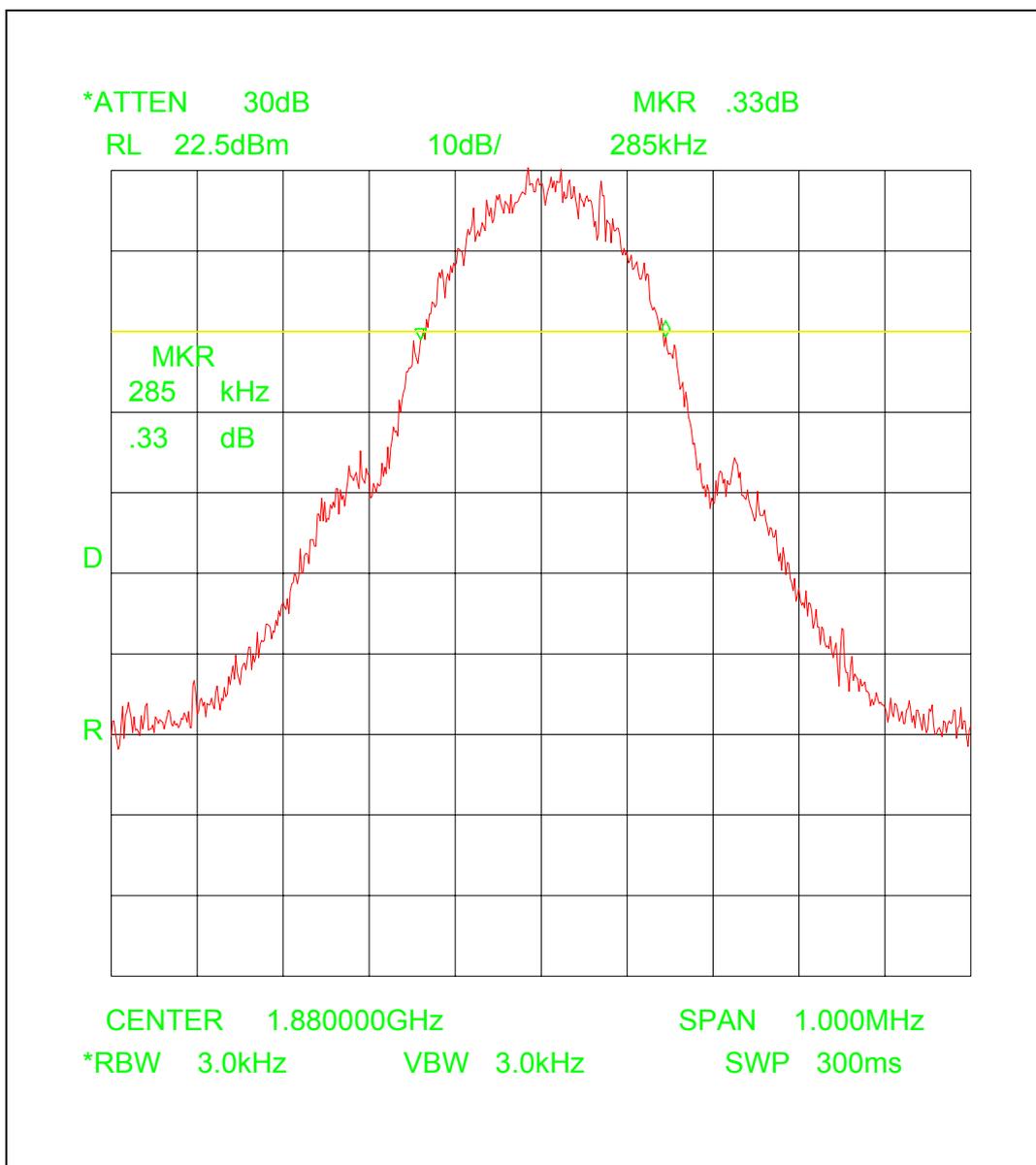
Part 24.238 (a) requires a measurement bandwidth of at least 1% of the occupied bandwidth. For ca. 300.0 kHz, this equates to a resolution bandwidth of at least 3.0 kHz. For this testing, a resolution bandwidth 3.0 kHz was used.

## Channel 512 99% Occupied Bandwidth

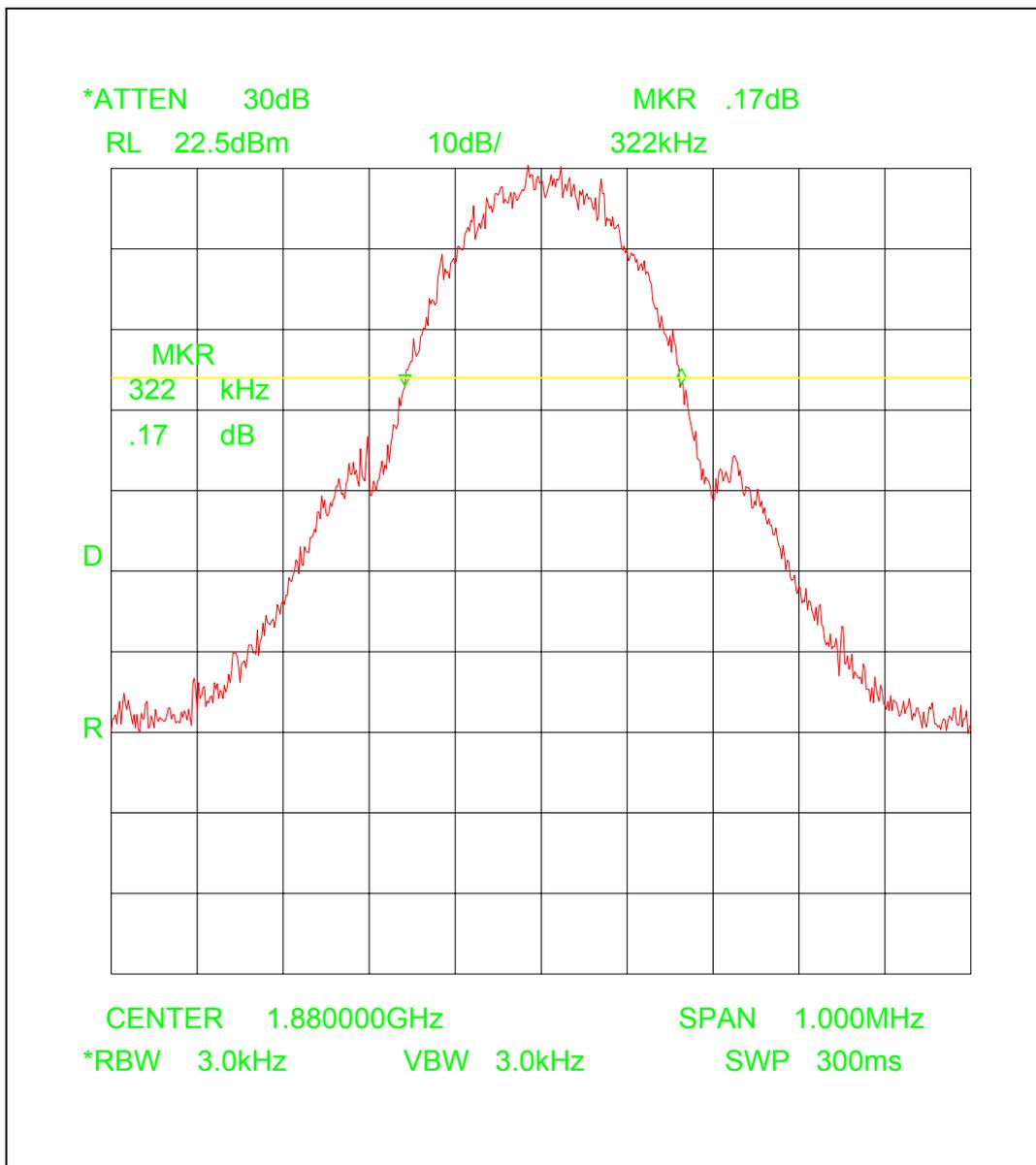




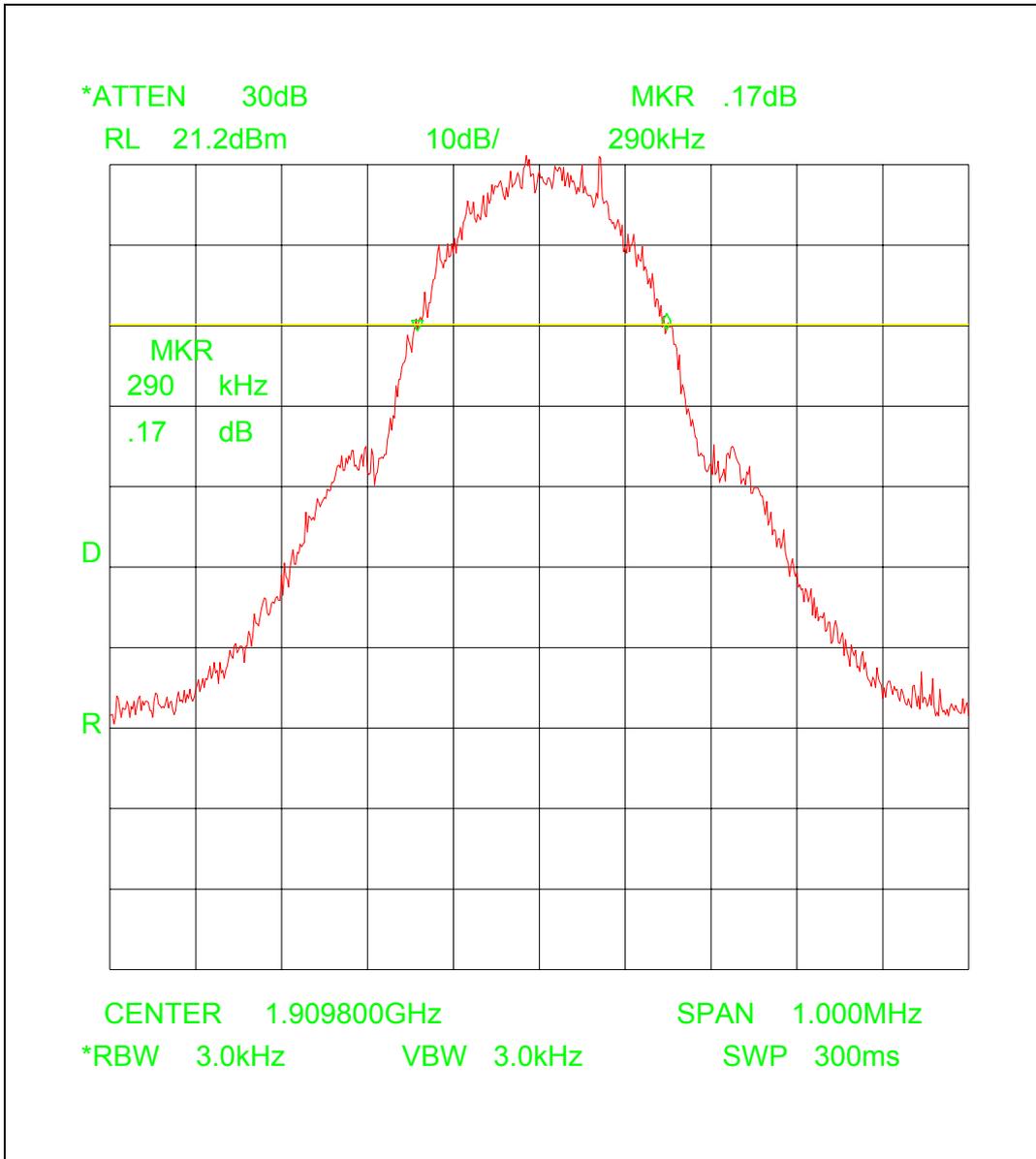
## Channel 661 99% Occupied Bandwidth



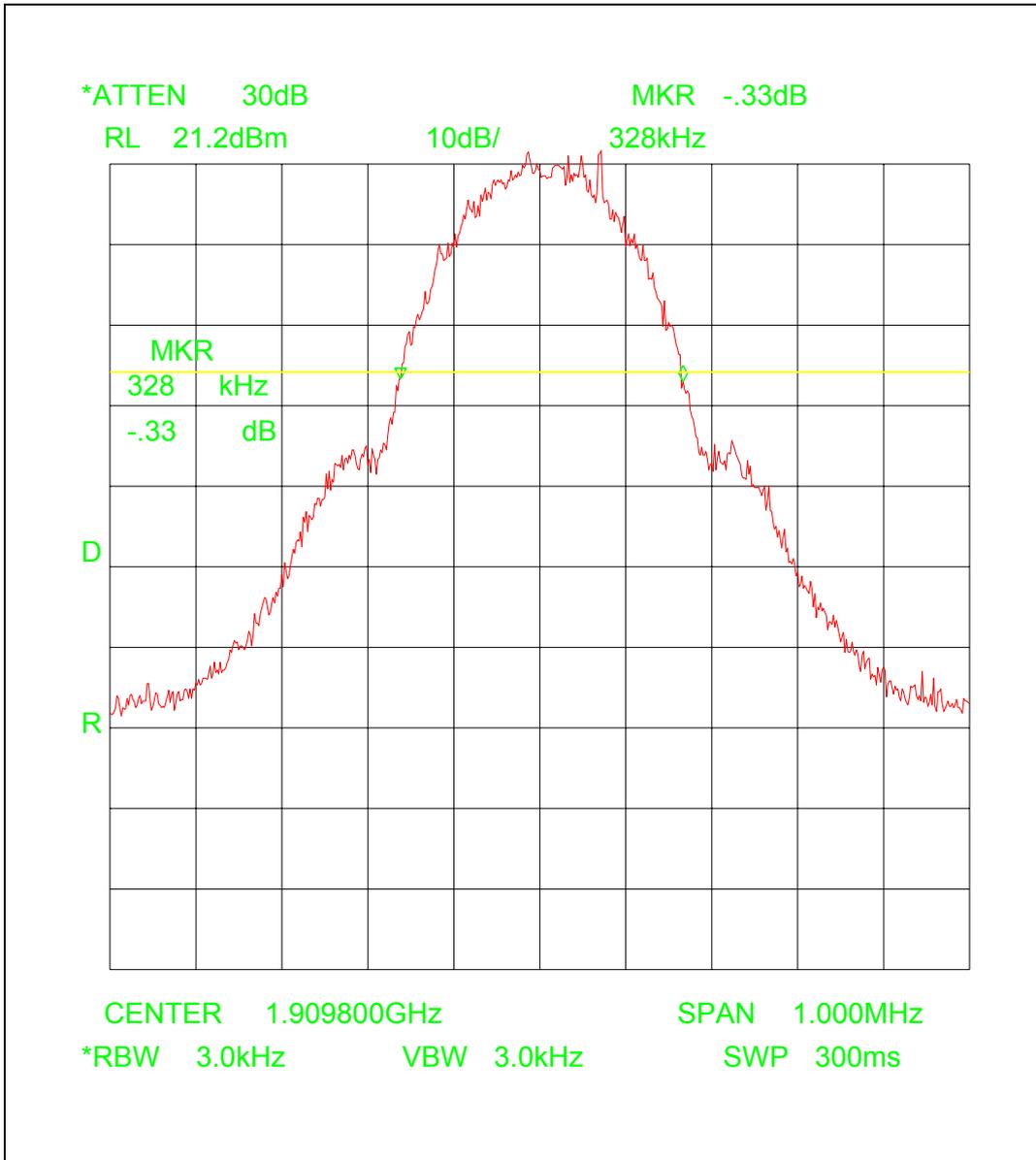
## Channel 661 -26 dBc Bandwidth



**Channel 810**  
**99% Occupied Bandwidth**



## Channel 810 -26 dBc Bandwidth

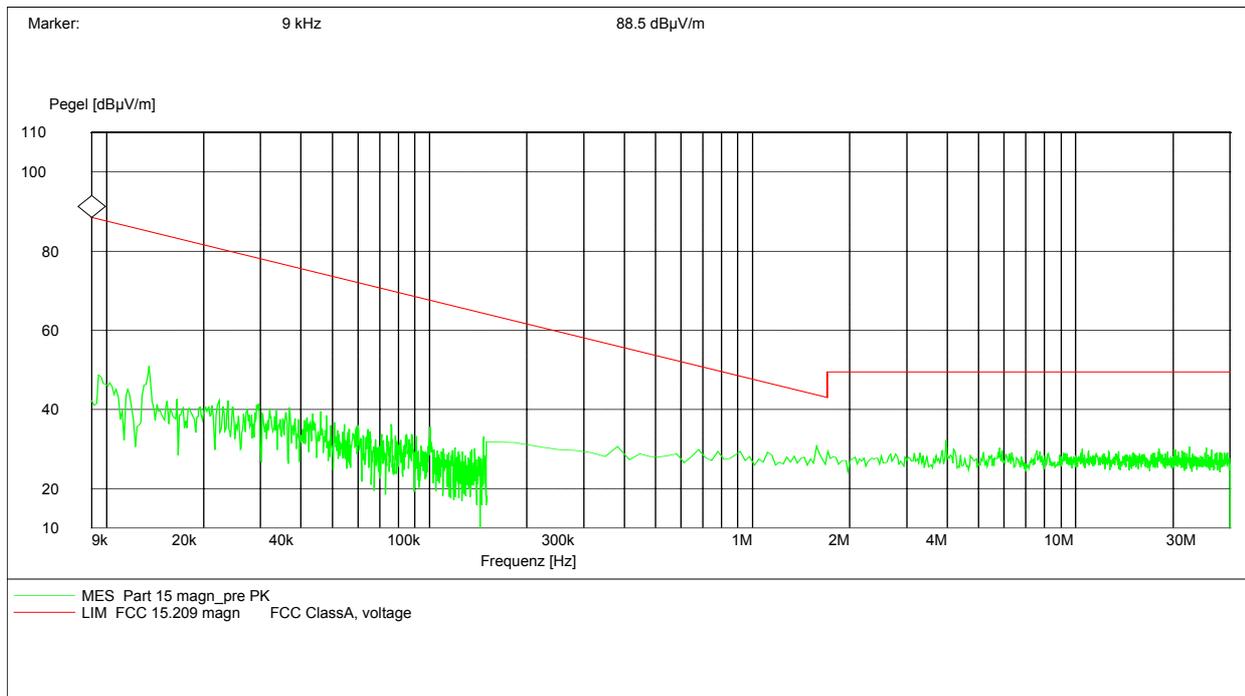


## Section 15.209 Radiated emission limits

### FCC Rule 47

### Part 15 Magnetics

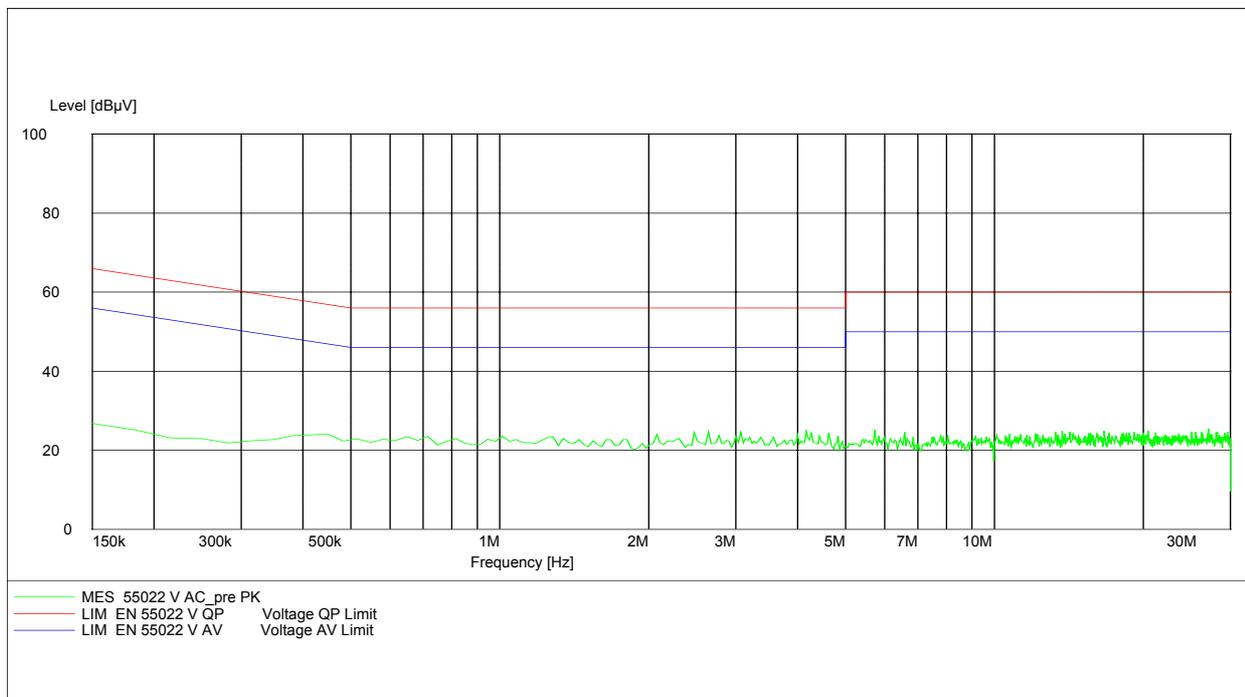
EUT: AAB-1021041-BV  
Manufacturer: Sony Ericsson Mobile  
Operating Condition: Traffic and Idle mode (max Hold)  
Test Site: Cetecom, Room 6  
Operator: Gillmann  
Comment: 110V AC/ 60 Hz, pass



## ETSI 301 489-1, -7

### CISPR22

EUT: AAB-1021041-BV  
Manufacturer: Sony Ericsson Mobile  
Operating Condition: Traffic and Idle mode, max hold  
Test Site: CETECOM ICT Services GmbH, Room 006  
Operator: Gillmann  
Test Specification: Cispr22, 110V AC / 60Hz  
Comment: pass



## TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

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.

| No | Instrument/Ancillary         | Type      | Manufacturer    | Serial No.  |
|----|------------------------------|-----------|-----------------|-------------|
| 01 | Spectrum Analyzer            | 8566 A    | Hewlett-Packard | 1925A00257  |
| 02 | Analyzer Display             | 8566 A    | Hewlett-Packard | 1925A00860  |
| 03 | Oscilloscope                 | 7633      | Tektronix       | 230054      |
| 04 | Radio Communication Analyzer | CMTA 54   | Rohde & Schwarz | 894 043/010 |
| 05 | System Power Supply          | 6038 A    | Hewlett-Packard | 2848A07027  |
| 06 | Signal Generator             | 8111 A    | Hewlett-Packard | 2215G00867  |
| 07 | Signal Generator             | 8662 A    | Hewlett-Packard | 2224A01012  |
| 08 | Function Generator           | AFGU      | Rohde & Schwarz | 862 480/032 |
| 09 | Regulating Transformer       | MPL       | Erfi            | 91350       |
| 10 | LISN                         | NNLA 8120 | Schwarzbeck     | 8120331     |
| 11 | Relay-Matrix                 | PSU       | Rohde & Schwarz | 893 285/020 |
| 12 | Power-Meter                  | 436 A     | Hewlett-Packard | 2101A12378  |
| 13 | Power-Sensor                 | 8484 A    | Hewlett-Packard | 2237A10156  |
| 14 | Power-Sensor                 | 8482 A    | Hewlett-Packard | 2237A00616  |
| 15 | Modulation Meter             | 9008      | Racal-Dana      | 2647        |
| 16 | Frequency Counter            | 5340 A    | Hewlett-Packard | 1532A03899  |
| 17 | Anechoic Chamber             | ---       | MWB             | 87400/002   |
| 18 | Spectrum Analyzer            | 85660 B   | Hewlett-Packard | 2747A05306  |
| 19 | Analyzer Display             | 85662 A   | Hewlett-Packard | 2816A16541  |
| 20 | Quasi Peak Adapter           | 85650 A   | Hewlett-Packard | 2811A01131  |
| 21 | RF-Preselector               | 85685 A   | Hewlett-Packard | 2833A00768  |
| 22 | Biconical Antenna            | 3104      | Emco            | 3758        |
| 23 | Log. Per. Antenna            | 3146      | Emco            | 2130        |
| 24 | Double Ridged Horn           | 3115      | Emco            | 3088        |
| 25 | EMI-Testreceiver             | ESAI      | Rohde & Schwarz | 863 180/013 |
| 26 | EMI-Analyzer-Display         | ESAI-D    | Rohde & Schwarz | 862 771/008 |
| 27 | Biconical Antenna            | HK 116    | Rohde & Schwarz | 888 945/013 |
| 28 | Log. Per. Antenna            | HL 223    | Rohde & Schwarz | 825 584/002 |
| 29 | Relay-Switch-Unit            | RSU       | Rohde & Schwarz | 375 339/002 |
| 30 | Highpass                     | HM985955  | FSY Microwave   | 001         |
| 31 | Amplifier                    | P42-GA29  | Tron-Tech       | B 23602     |
| 32 | Anechoic Chamber             |           | Frankonia       |             |
| 33 | Control Computer             | PSM 7     | Rohde & Schwarz | 834 621/004 |
| 34 | EMI Test Receiver            | ESMI      | Rohde & Schwarz | 827 063/010 |
| 35 | EMI Test Receiver            | Display   | Rohde & Schwarz | 829 808/010 |

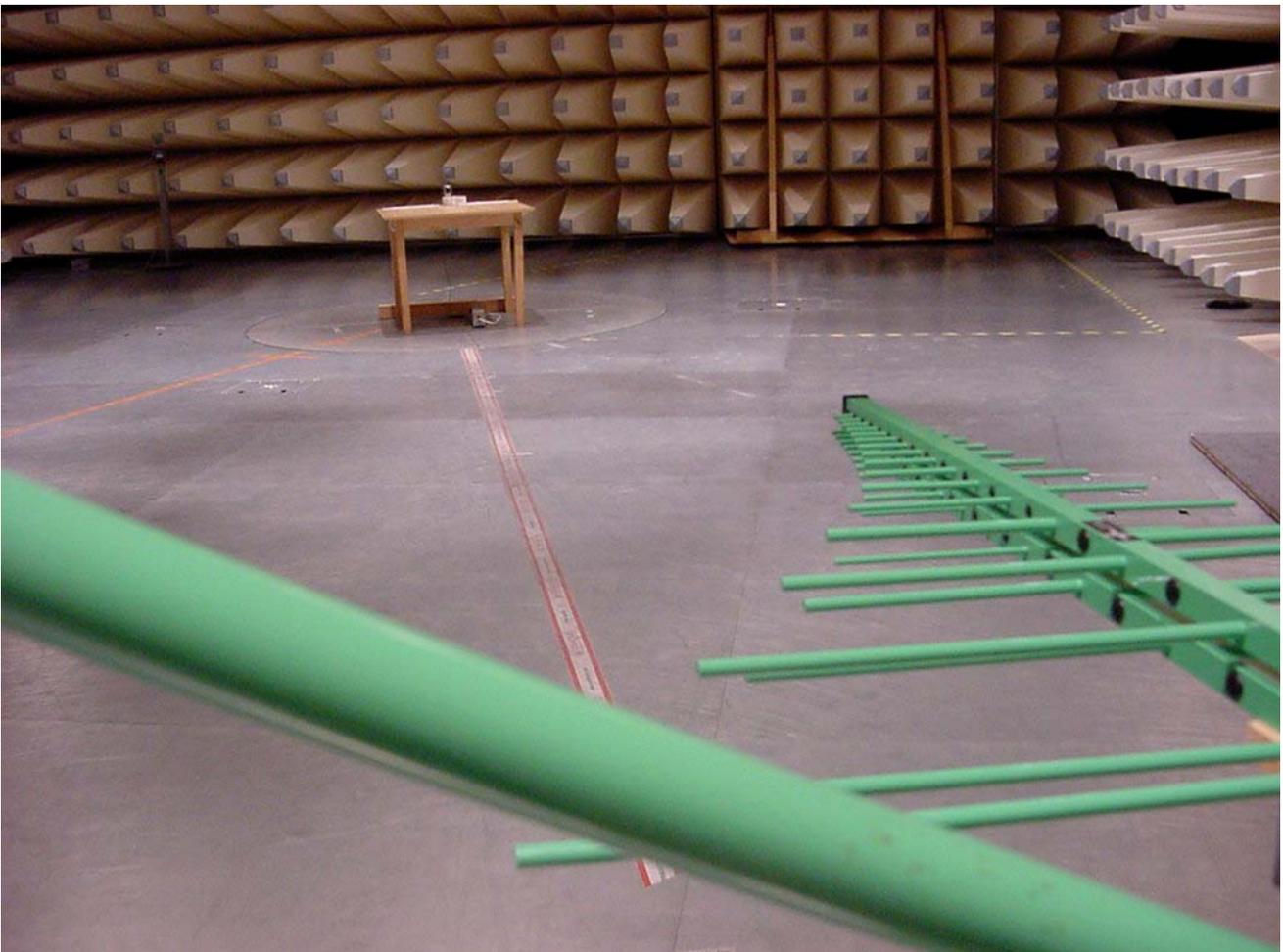
## TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

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.

| No | Instrument/Ancillary                  | Type      | Manufacturer    | Serial No.   |
|----|---------------------------------------|-----------|-----------------|--------------|
| 36 | Control Computer                      | HD 100    | Deisel          | 100/322/93   |
| 37 | Relay Matrix                          | PSN       | Rohde & Schwarz | 829 065/003  |
| 38 | Control Unit                          | GB 016 A2 | Rohde & Schwarz | 344 122/008  |
| 39 | Relay Switch Unit                     | RSU       | Rohde & Schwarz | 316 790/001  |
| 40 | Power Supply                          | 6032A     | Hewlett Packard | 2846A04063   |
| 41 | Spectrum Monitor                      | EZM       | Rohde & Schwarz | 883 720/006  |
| 42 | Measuring Receiver                    | ESH 3     | Rohde & Schwarz | 890 174/002  |
| 43 | Measuring Receiver                    | ESVP      | Rohde & Schwarz | 891 752/005  |
| 44 | Bicon Ant. 20-300MHz                  | HK 116    | Rohde & Schwarz | 833 162/011  |
| 45 | Logper Ant. 0.3-1 GHz                 | HL 223    | Rohde & Schwarz | 832 914/010  |
| 46 | Amplifier 0.1-4 GHz                   | AFS4      | Miteq Inc.      | 206461       |
| 47 | Logper Ant. 1-18 GHz                  | HL 024 A2 | Rohde & Schwarz | 342 662/002  |
| 48 | Polarisation Network                  | HL 024 Z1 | Rohde & Schwarz | 341 570/002  |
| 49 | Double Ridged Horn Antenna 1-26.5 GHz | 3115      | EMCO            | 9107-3696    |
| 50 | Microw. Sys. Amplifier 0.5- 26.5 GHz  | 8317A     | Hewlett Packard | 3123A00105   |
| 51 | Audio Analyzer                        | UPD       | Rohde & Schwarz | 1030.7500.04 |
| 52 | Controler                             | PSM 7     | Rohde & Schwarz | 883 086/026  |
| 53 | DC V-Network                          | ESH3-Z6   | Rohde & Schwarz | 861 406/005  |
| 54 | DC V-Network                          | ESH3-Z6   | Rohde & Schwarz | 893 689/012  |
| 55 | AC 2 Phase V-Network                  | ESH3-Z5   | Rohde & Schwarz | 861 189/014  |
| 56 | AC 2 Phase V-Network                  | ESH3-Z5   | Rohde & Schwarz | 894 981/019  |
| 57 | AC-3 Phase V-Network                  | ESH2-Z5   | Rohde & Schwarz | 882 394/007  |
| 58 | Power Supply                          | 6032A     | Rohde & Schwarz | 2933A05441   |
| 59 | RF-Test Receiver                      | ESVP.52   | Rohde & Schwarz | 881 487/021  |
| 60 | Spectrum Monitor                      | EZM       | Rohde & Schwarz | 883 086/026  |
| 61 | RF-Test Receiver                      | ESH3      | Rohde & Schwarz | 881 515/002  |
| 62 | Relay Matrix                          | PSU       | Rohde & Schwarz | 882 943/029  |
| 63 | Relay Matrix                          | PSU       | Rohde & Schwarz | 828 628/007  |
| 64 | Spectrum Analyzer                     | FSIQ 26   | Rohde & Schwarz | 119.6001.27  |
| 65 | Spectrum Analyzer                     | HP 8565E  | Hewlett Packard | 3473A00773   |
| 66 |                                       |           |                 |              |
| 67 |                                       |           |                 |              |
| 68 |                                       |           |                 |              |

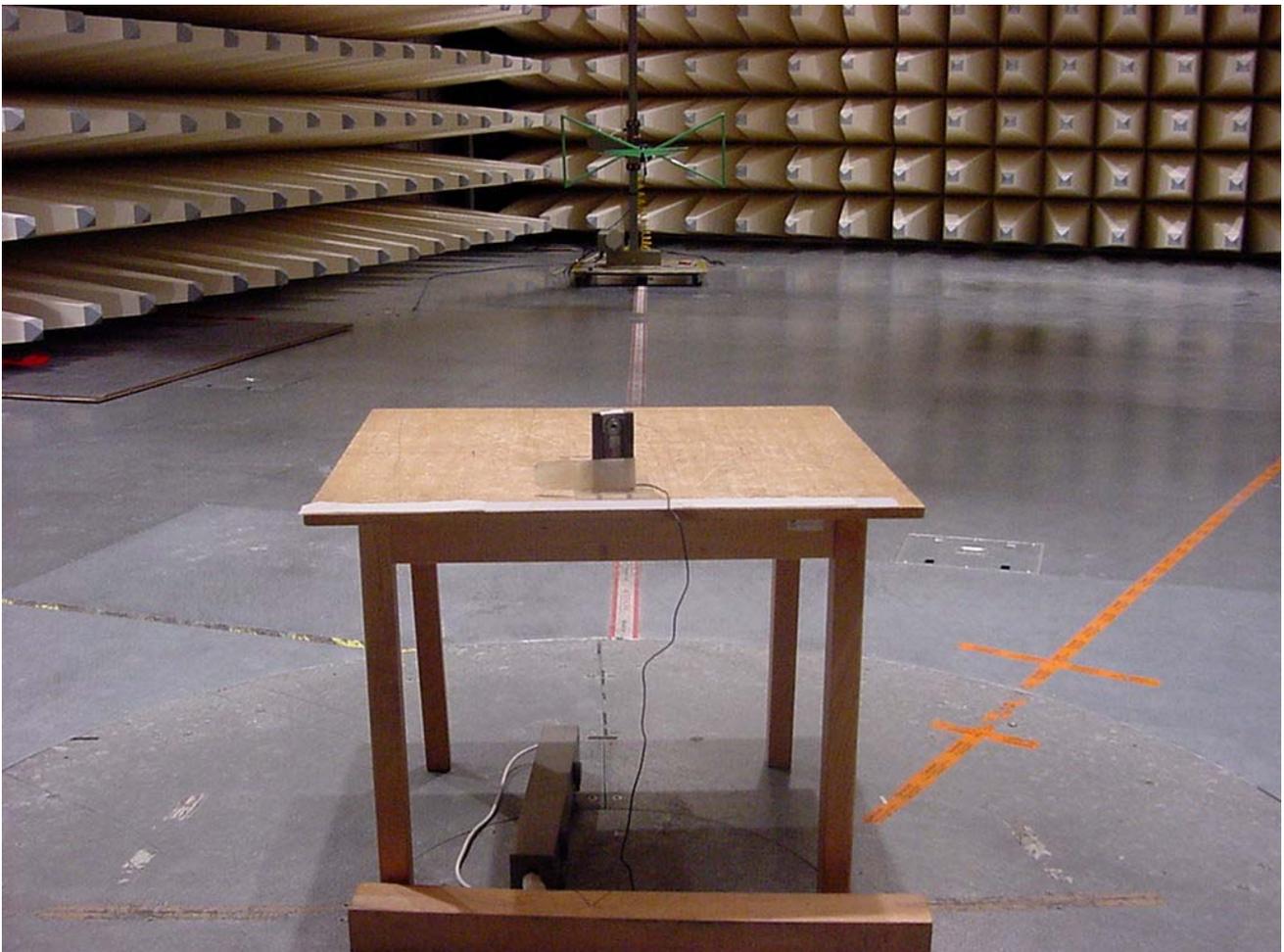
**Test site**

**Photo No.: 01**



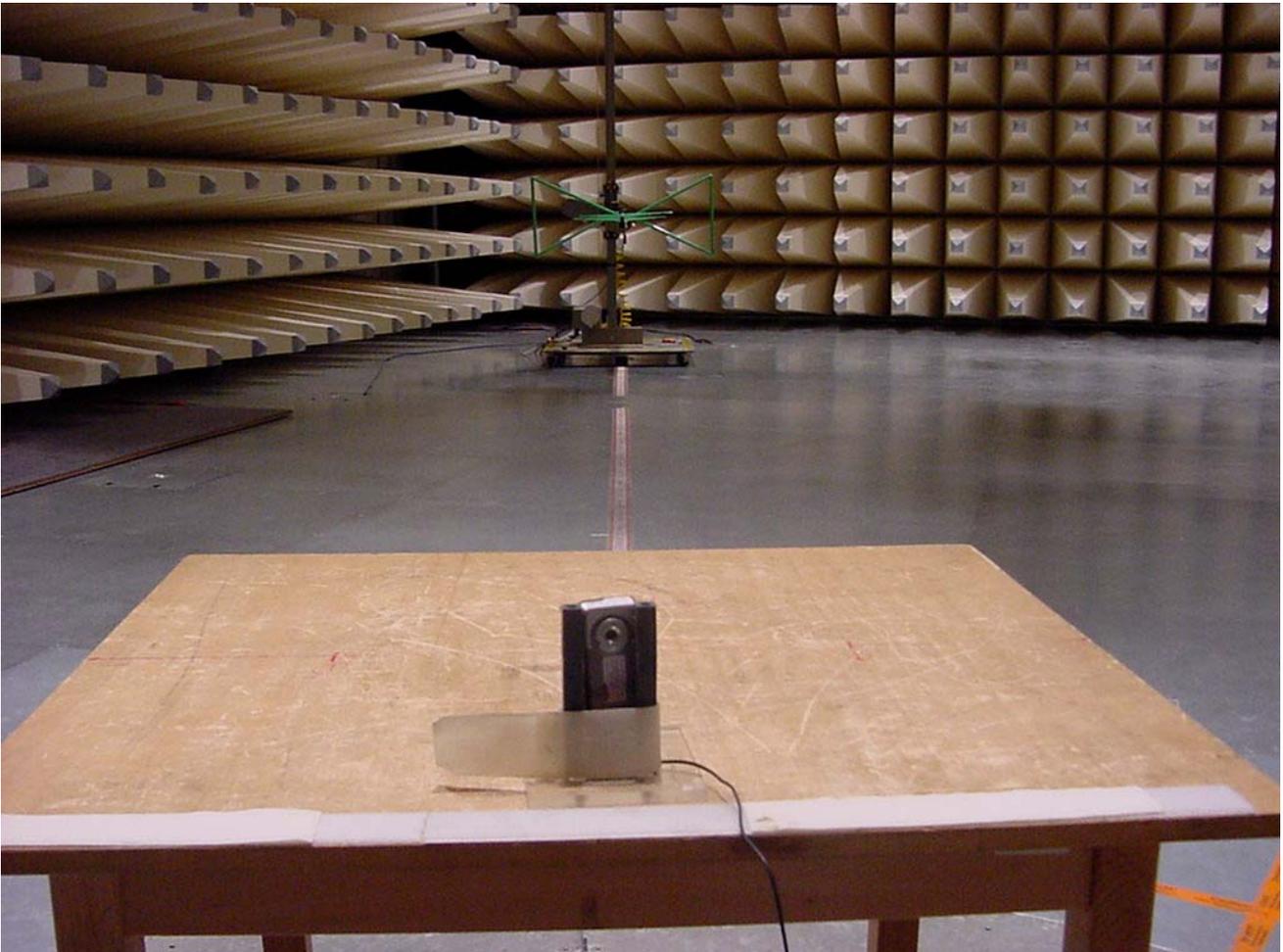
**Test site**

**Photo No.: 02**



**Test site**

**Photo No.: 03**



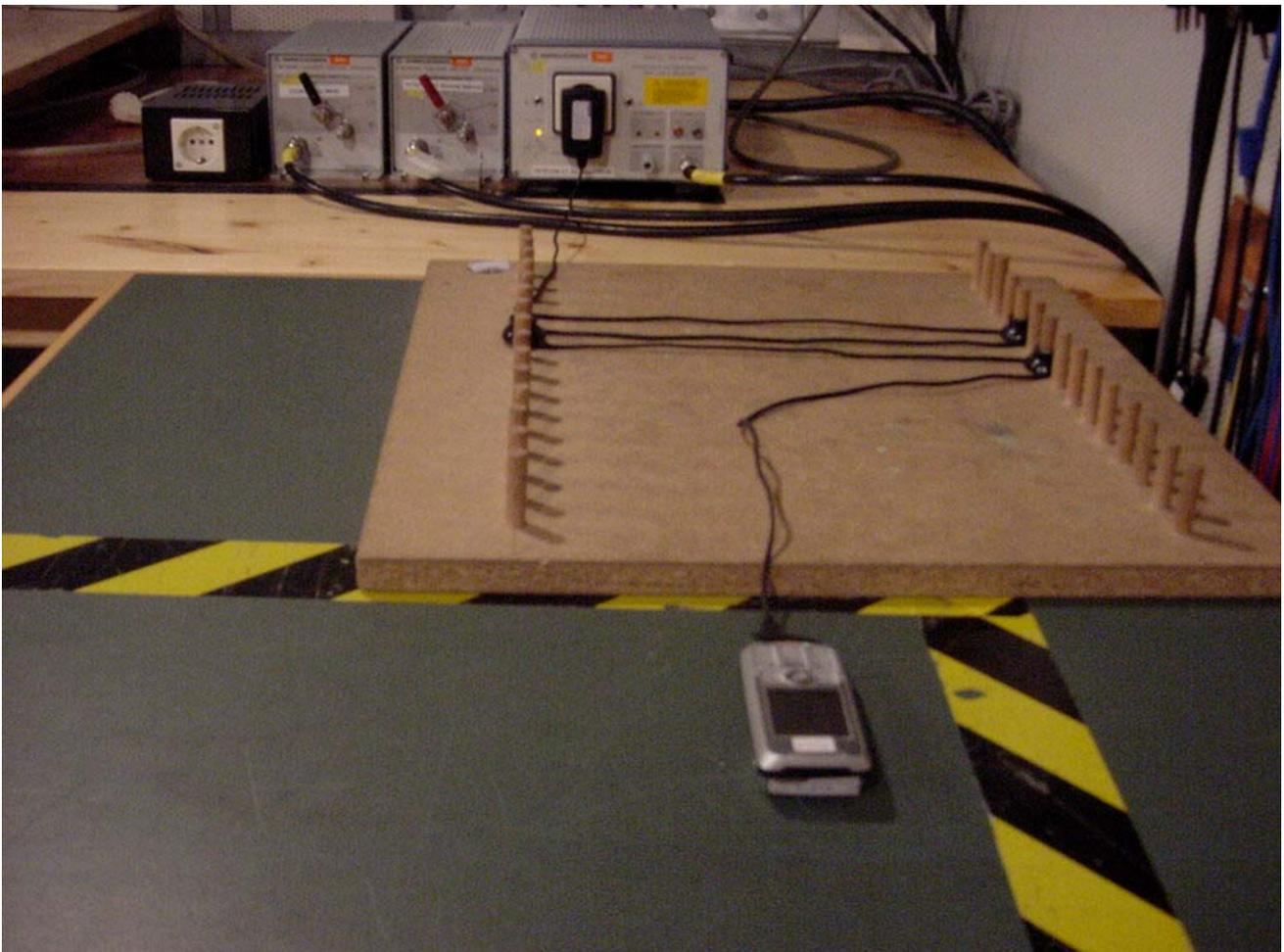
**Test site**

**Photo No.: 04**



**Test site**

**Photo No.: 05**



**Photos of EUT**

**Photo No.: 06**



Photo No.: 07



Photo No.: 08



Photo No.: 09



Photo No.: 10



**Photo No.: 11**



**Photo No.: 12**

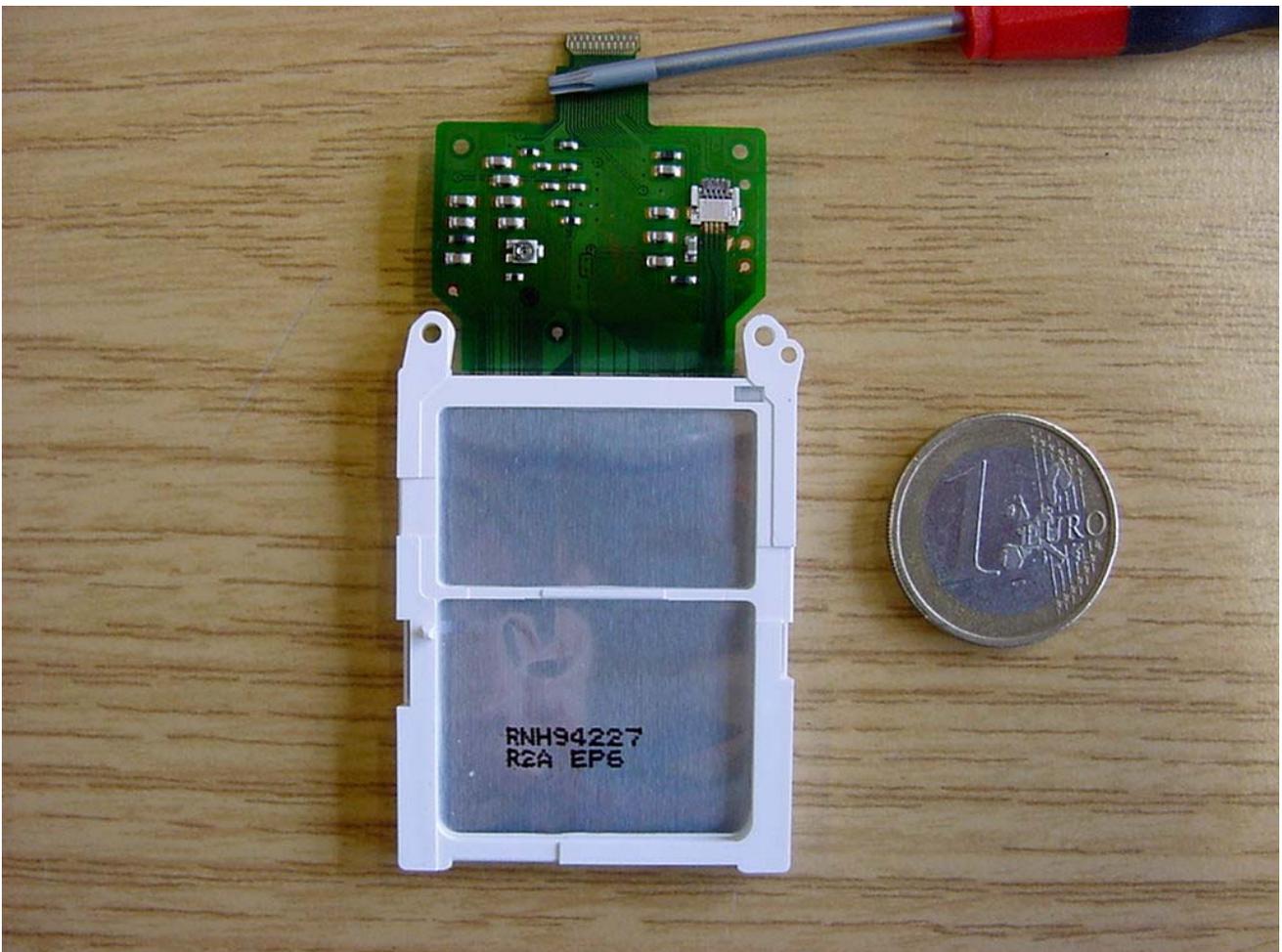


Photo No.: 13





Photo No.: 15

