

# CETECOM ICT Services GmbH

Radio Satellite Communication

Untertürkheimer Straße 6-10 . D-66117 Saarbrücken

Telefon: +49 (0)681 598-9100

Telefax: -9075

RSC11

Issued test report consists of 72 pages

Page 1 (72)

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 084/94-D0**



Independent ETSI  
compliance test house



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

**Test report no.: 4\_1295-01-04/04**  
**FCC Part 24/15**  
**INNO 30**  
**FCC ID: RJAINNO30**

CETECOM – ICT Services GmbH  
Untertürkheimerstr. 6-10  
66117 Saarbrücken, Germany

Telephone: + 49 (0) 681 / 598-0  
Fax: + 49 (0) 681 / 598-9075

## 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](mailto:info@ict.cetecom.de)

Internet : [www.cetecom-ict.de](http://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

Anechoic chamber registration no.: 3463 (IC)

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

*BLUETOOTH™ is a trademark owned by Bluetooth SIG, Inc. and licensed to CETECOM*

## 1.3 Details of applicant

**Name** : INNOSTREAM Inc.  
**Street** : 6F, Daewoo Telecom Bldg., #265-3 Seohyeon-dong  
**City** : 463-769 Bundang-gu, Sungnam Si , Kyunggi-do  
**Country** : Korea  
**Telephone** : +82 31 707 3860  
**Telefax** : +82 31 707 7352  
**Contact** : Erin Cha  
**Telephone** : +82 31 707 3860  
**e-mail** : erin@innostream.com

## 1.4 Application details

**Date of receipt of application** : 2004-03-23  
**Date of receipt of test item** : 2004-04-19  
**Date of test** : 2004-04-19 –2004-04-21

## 1.5 Test item

**Type of equipment** : **Triple Band PCS Mobile Phone (PCS 900/1800/1900 MHz)**  
**Type designation** : INNO 30  
**Manufacturer** : Same as applicant

**Street** :  
**City** :  
**Country** :  
**Serial numbers** : IMEI :

### **Additional information :**

**Frequency** : 1850.2 – 1909.8 MHz  
**Type of modulation** : 300KGXW / 300KG7W  
**Number of channels** : 300 (PCS1900)  
**Antenna** : Integral antenna  
**Power supply** : 3,7V DC Li-ion Battery  
**Output power GSM 1900** : cond : 29.0 dBm Peak , ERP: 27.9 dBm (Burst);  
EIRP: 29.0 dBm (Burst)

**Type of equipment** : Temperature range : -30°C - +60°C  
**FCC – ID** :  
**IC** :  
**Hardware** : 0.3  
**Software** : 1.5

## 1.6 Test standards: FCC Part 24 FCC Part 15

**2 Technical test**

For Part 24/22 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:**

For AC-conducted measurements the AC chargers Type: TA-2KS-EU / TA-2KS-TW / TA-2KS-CN /TA-2KS-UK (all the same circuit, only the plug is different ) was used.

For radiated test two type of Headsets were used ( same result ): HC-MNO-INN005;  
HC-MYO-INN004

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 :

2004-04-23 RSC 8411 Berg M.

Date

Section

Name

Signature

Technical responsibility for area of testing :

2004-04-23 RSC8412 Hausknecht D.

Date

Section

Name

Signature

## **2.2 Test report**

### **TEST REPORT**

**Test report no. : 4\_1295-01-04/04**

## TEST REPORT REFERENCE

## LIST OF MEASUREMENTS

PARAMETER TO BE MEASURED	PAGE
<b><u>Part PCS 1900</u></b>	
<b>POWER OUTPUT      SUBCLAUSE § 24.232</b>	<b>7</b>
<b>FREQUENCY STABILITY      SUBCLAUSE § 24.235</b>	<b>10</b>
<b>AFC FREQ ERROR vs. VOLTAGE</b>	<b>11</b>
<b>AFC FREQ ERROR vs. TEMPERATURE</b>	<b>11</b>
<b>EMISSIONS LIMITS      §24.238</b>	<b>13</b>
<b>CONDUCTED SPURIOUS EMISSIONS</b>	<b>33</b>
<b>BLOCK EDGE COMPLIANCE FOR BLOCK A AND C</b>	<b>42</b>
<b>OCCUPIED BANDWIDTH      §2.989</b>	<b>44</b>
<b>CONDUCTED EMISSIONS      § 15.107/207</b>	<b>51</b>
<b>TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS</b>	<b>53</b>
<b>Test site</b>	<b>55</b>
<b>Photographs of the equipment</b>	<b>58</b>

**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 Output Power (dBm)
1850.2	0	29.6	29.5
1880.0	0	29.4	29.3
1909.8	0	29.5	29.4
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° 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	29.1	27.0	23.1	21.0
1880.0	0	29.2	27.1	23.2	21.1
1909.8	0	28.9	26.7	22.9	20.7
Measurement uncertainty		±3 dB			

## Sample calculation:

Freg	SA Reading	SG Setting	Ant. gain	Dipol gain	Cable loss	ERIP Result			
MHz	dBμV	dBm	dB	dBd	dB	dBm			
1880.0	121.6	24.1	8.4	0.0	3.3	29.2			

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

## 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 3.6 Volts, connected to the CMU 200 and in a simulated call on channel 661 (centre 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 3.8 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 3.8 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 3.4 V dc and 4.4 V dc, with a nominal voltage of 3.9 V dc.

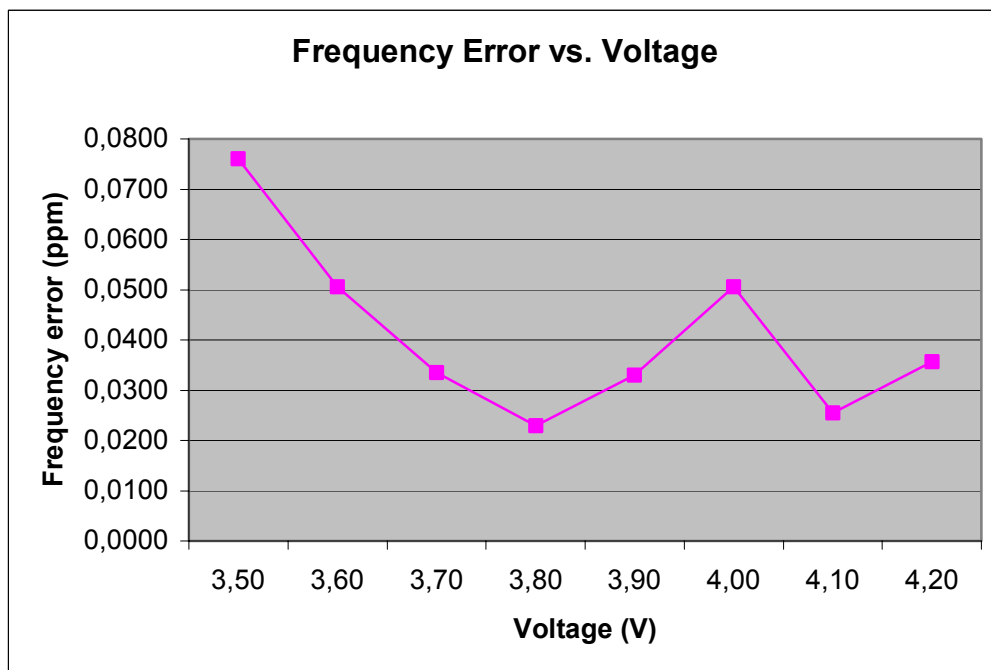
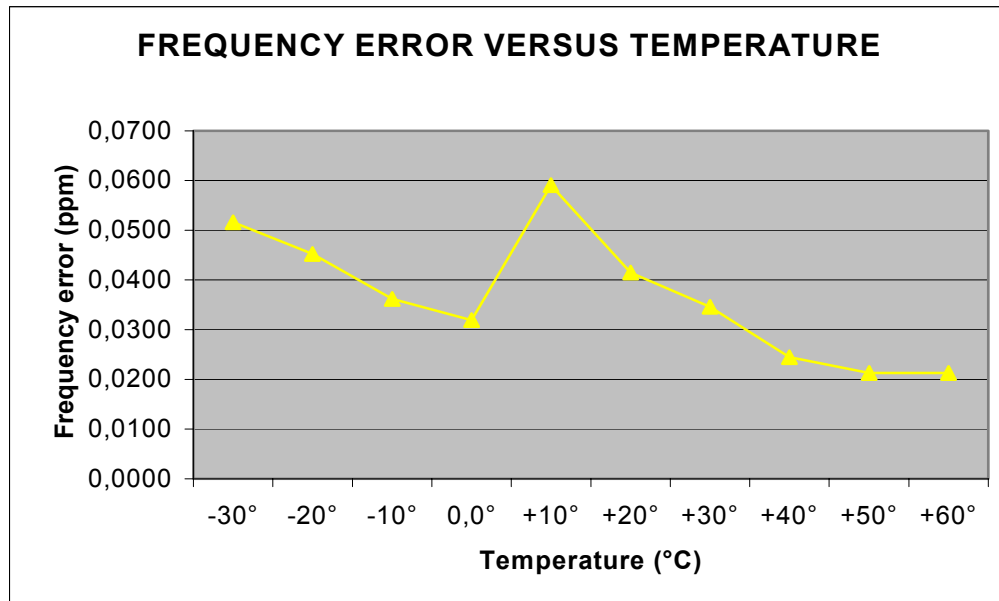
**AFC FREQ ERROR vs. VOLTAGE**

Voltage (V)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
3.5	+98	0,00000521	0,0521
3.6	+96	0,00000511	0,0511
3.7	+95	0,00000505	0,0505
3.8	+79	0,00000420	0,0420
3.9	+67	0,00000356	0,0356
4.0	+44	0,00000234	0,0234
4.1	+41	0,00000218	0,0218
4.2	+43	0,00000229	0,0229

**AFC FREQ ERROR vs. TEMPERATURE**

TEMPERATURE (°C)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
-30	+143	0,00000761	0,0761
-20	+95	0,00000505	0,0505
-10	+63	0,00000335	0,0335
±0.0	+43	0,00000229	0,0229
+10	+62	0,00000330	0,0330
+20	+95	0,00000505	0,0505
+30	+48	0,00000255	0,0255
+40	+67	0,00000356	0,0356
+50	+51	0,00000761	0,0761
+60	+66	0,00000505	0,0505

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 recognised 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.

EMISSION LIMITATIONS					
f (MHz)		amplitude of emission (dBm)	limit max. allowed emission power (dBm)	actual attenuation below frequency of operation (dBc)	results
CH 512					
1850.2		29.1	-13.0 (42.1 dBc)		carrier
5550.6		-44.1		73.2	complies
CH 661					
1880.0		29.2	-13.0 (42.29 dBc)		carrier
3760.0		-39.7		68.9	complies
5640.0		-37.9		67.1	complies
CH 810					
1909.8		28.9	-13.0 (41.9 dBc)		carrier
5729.4		-39.9		68.8	complies
Measurement uncertainty		± 0.5dB			

## Sample calculation:

Freg	SA Reading	SG Setting	Ant. gain	Dipol gain	Cable loss	ERIP Result			
MHz	dBμV	dBm	dB	dBd	dB	dBm			
1880.0	121.6	24.1	8.4	0.0	3.3	29.2			

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

## REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

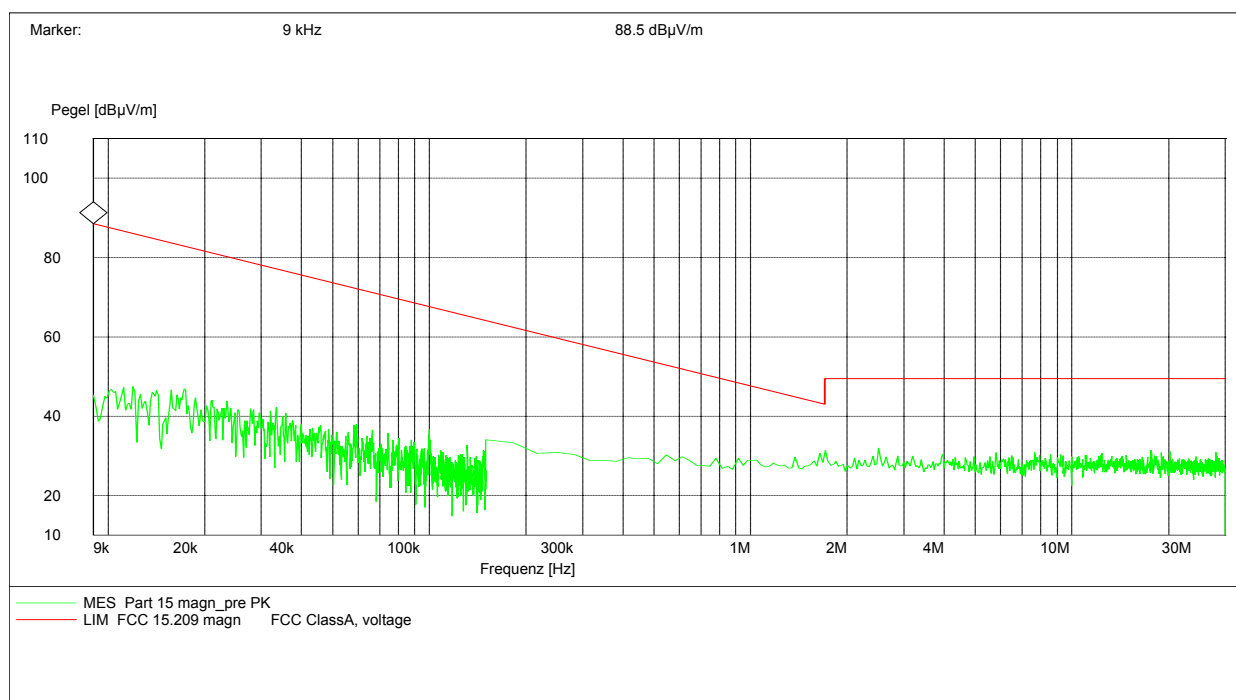
(for reference numbers see test equipment listing)

## Traffic-Mode (this is valid for all 3 channels up to 30 MHz )

### FCC Rule 47

### Part 15.209 Magnetics

EUT: INNO 30  
 Manufacturer: INNOSTREAM Inc.  
 Operating Condition: traffic mode  
 Test Site: Cetecom, Room 6  
 Operator: M.Berg  
 Test Specification: 15.209  
 Comment: 115V / 60 Hz  
 Start of Test: 22.04.04 / 07:11:24



For peak measurement we use 100 kHz RBW/VBW

For CISPR QP measurement we use 200 Hz from 9 kHz to 150kHz

9 kHz for 150 kHz to 30 MHz

### Limits

### SUBCLAUSE § 15.109

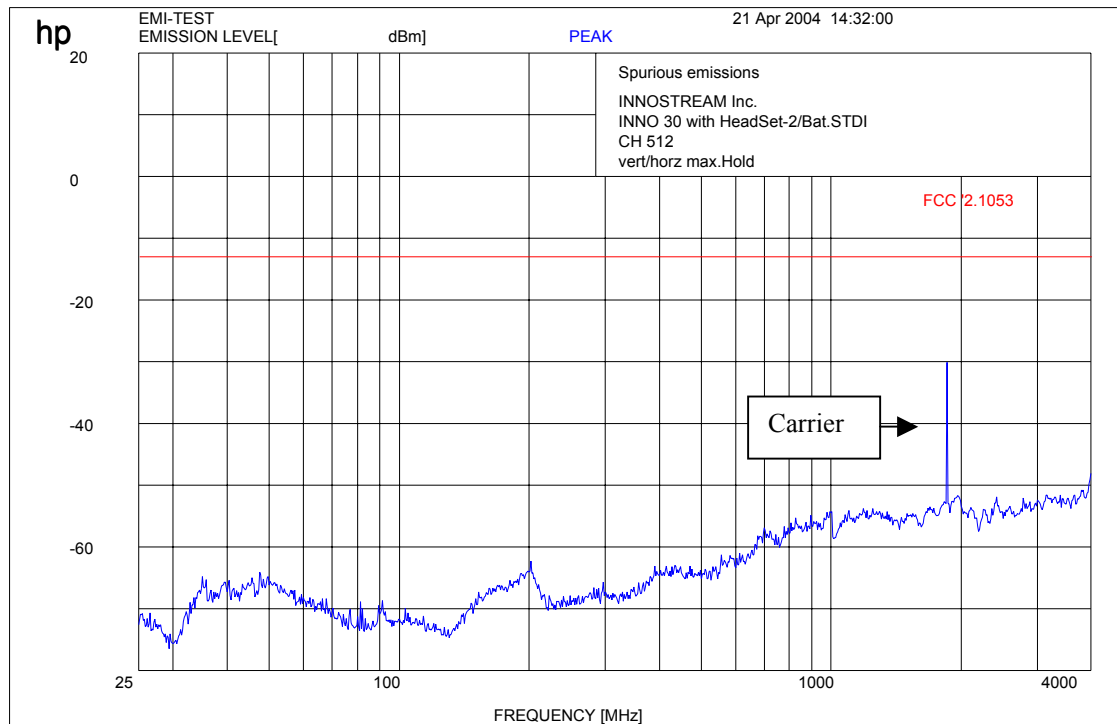
Frequency (MHz)	Field strength (µV/m)	Measurement distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30 / 29.5 dBµV/m	30

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

(for reference numbers see test equipment listing)

17 – 24; 64

## Channel 512 (up to 4 GHz)



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

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

**Carrier suppressed with a rejection filter**

The second peak at the right side of the carrier is the signal from the base station simulator.

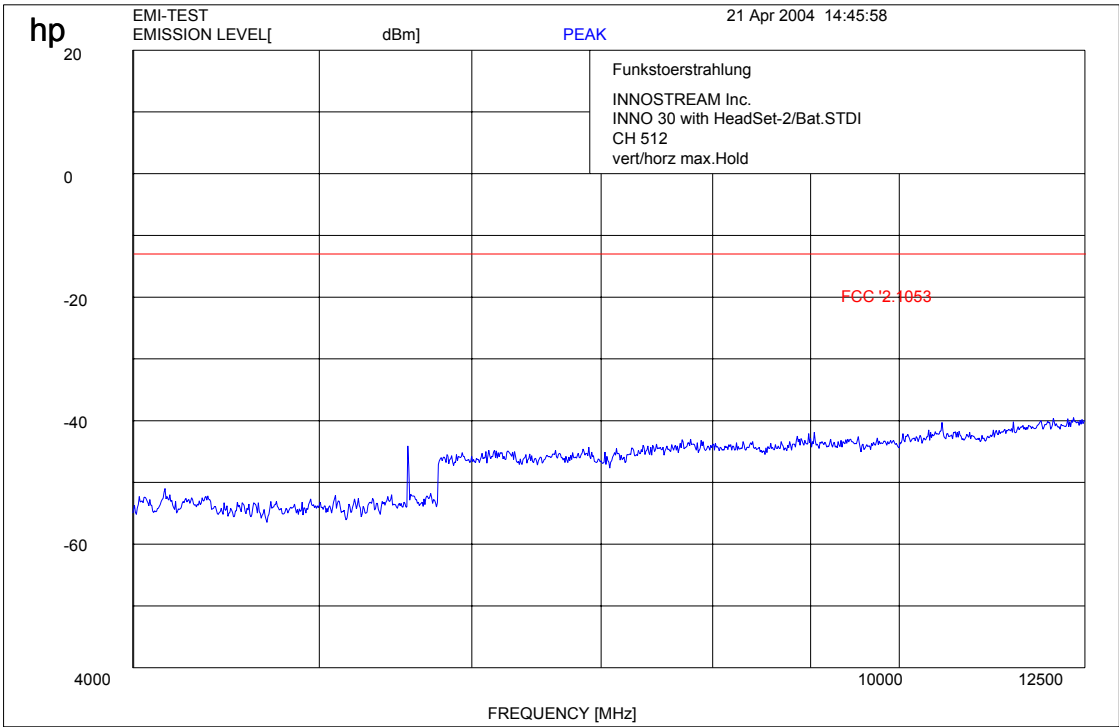
**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**

(for reference numbers see test equipment listing)

17 – 24; 64



Channel 512 (up to 12 GHz )



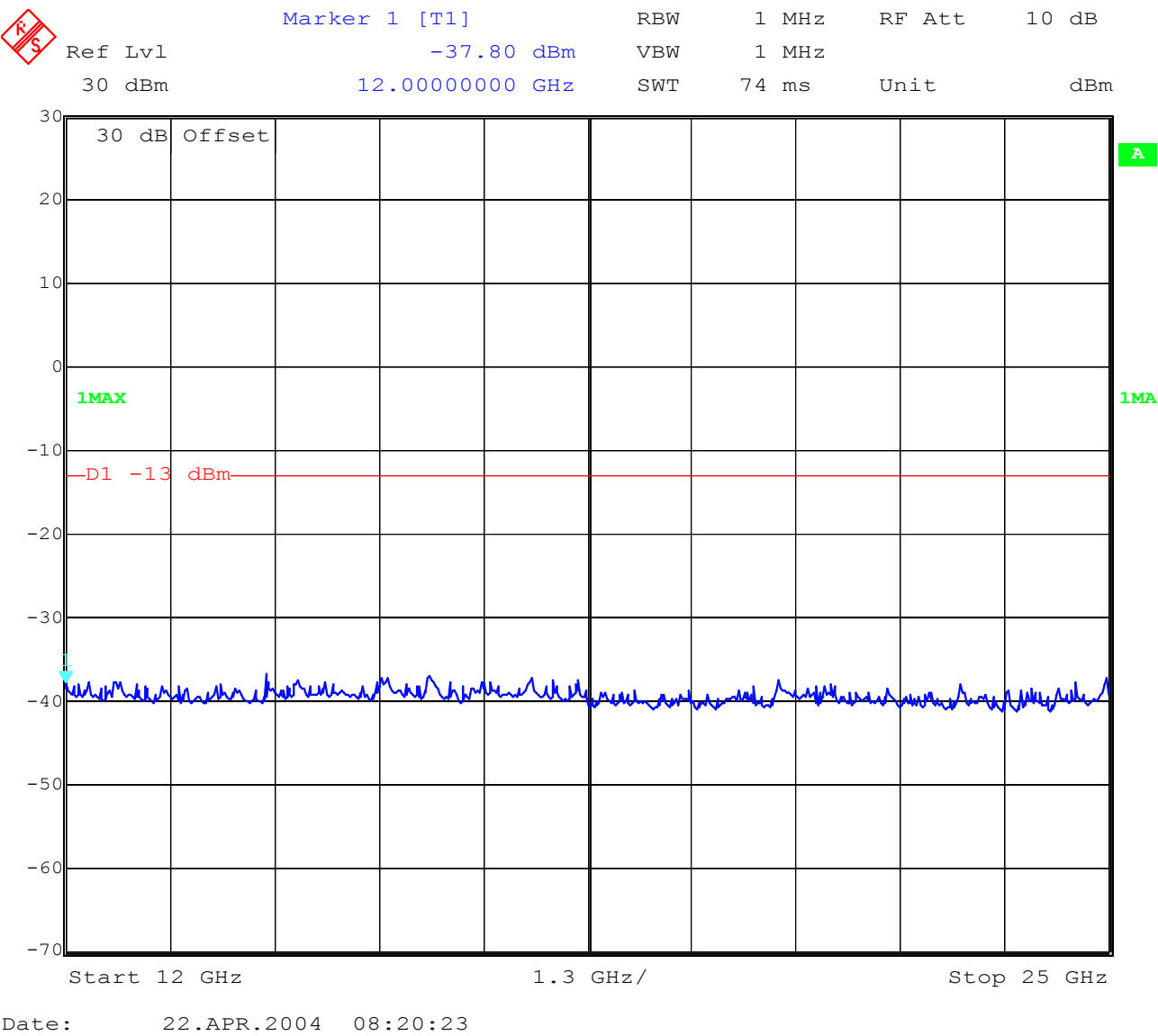
f < 1 GHz : RBW/VBW: 100 kHz

f ≥ 1GHz : RBW / VBW 1 MHz

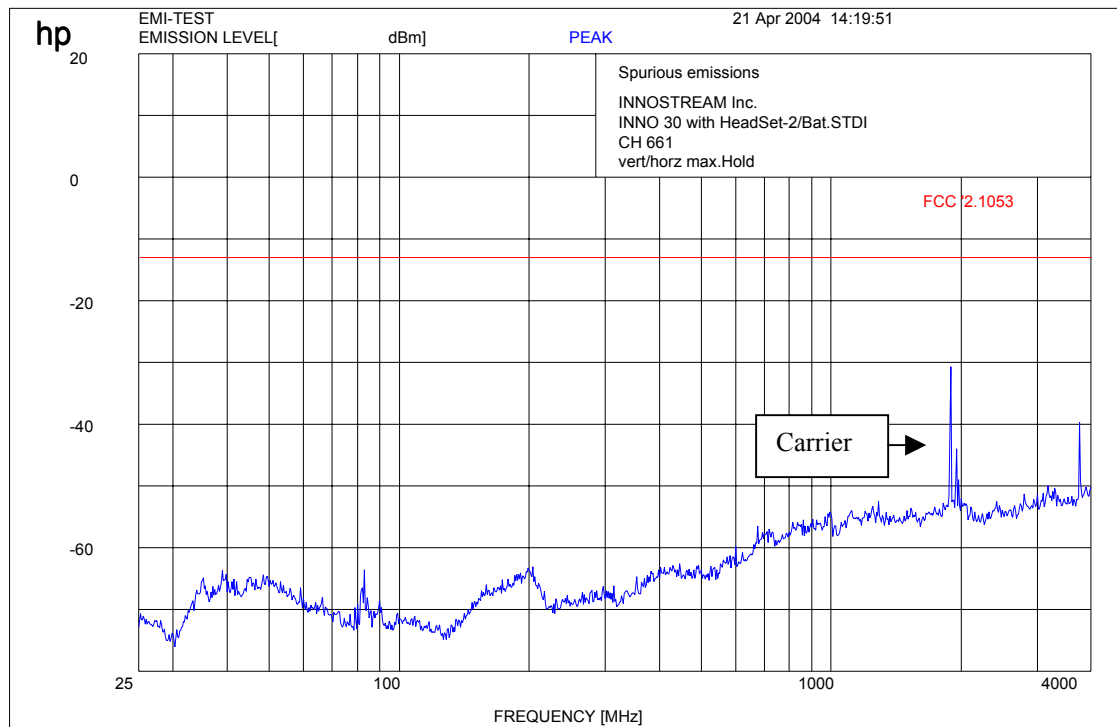
REFERENCE NUMBER(S) OF TEST EQUIPMENT USED  
(for reference numbers see test equipment listing)

17 – 24; 64

Channel 512 :- 25 GHz



## Channel 661 (up to 4 GHz )



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

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

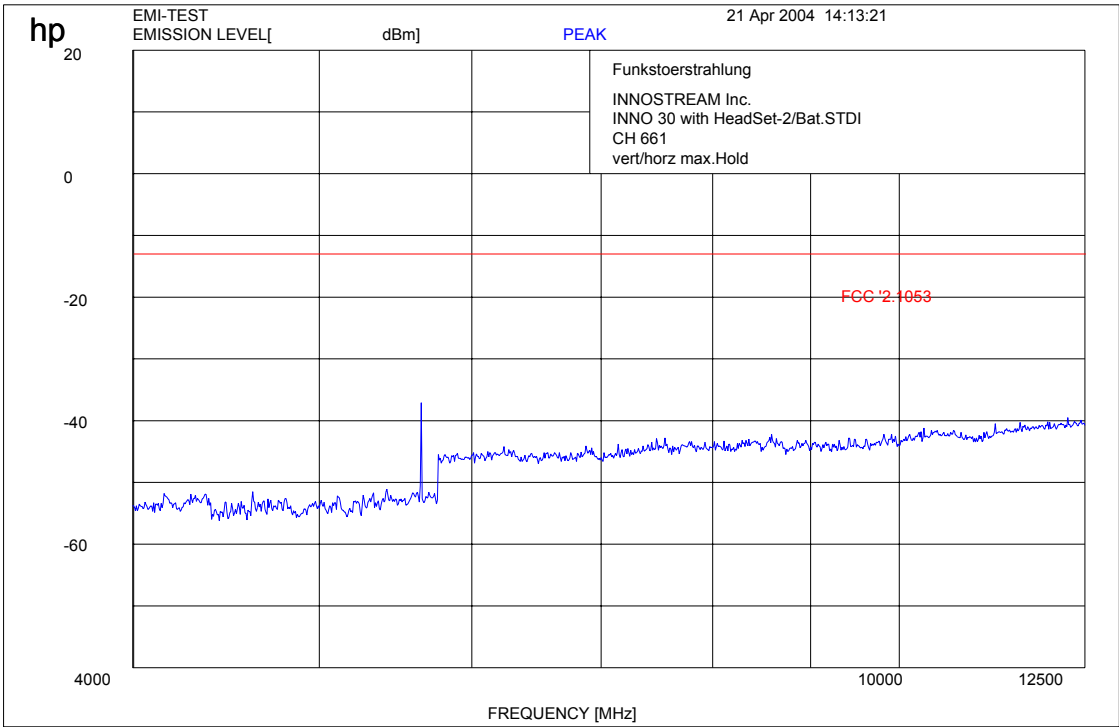
Carrier suppressed with a rejection filter.

The second peak at the right side of the carrier is the signal from the base station simulator.

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

17 – 24; 64

Channel 661 (up to 12 GHz )



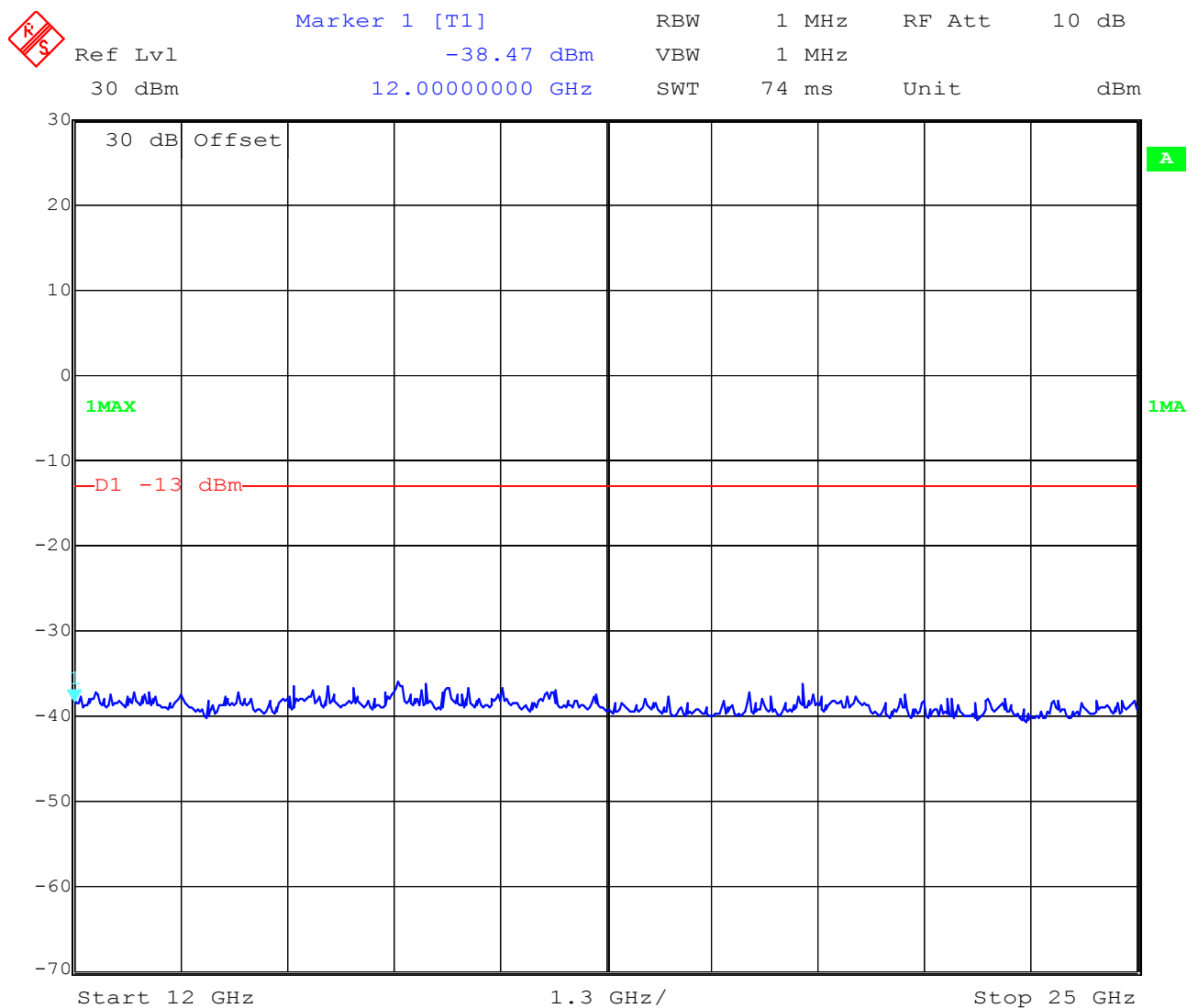
$f < 1 \text{ GHz}$  : RBW/VBW: 100 kHz

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

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

17 – 24; 64

## Channel 661 : -25 GHz



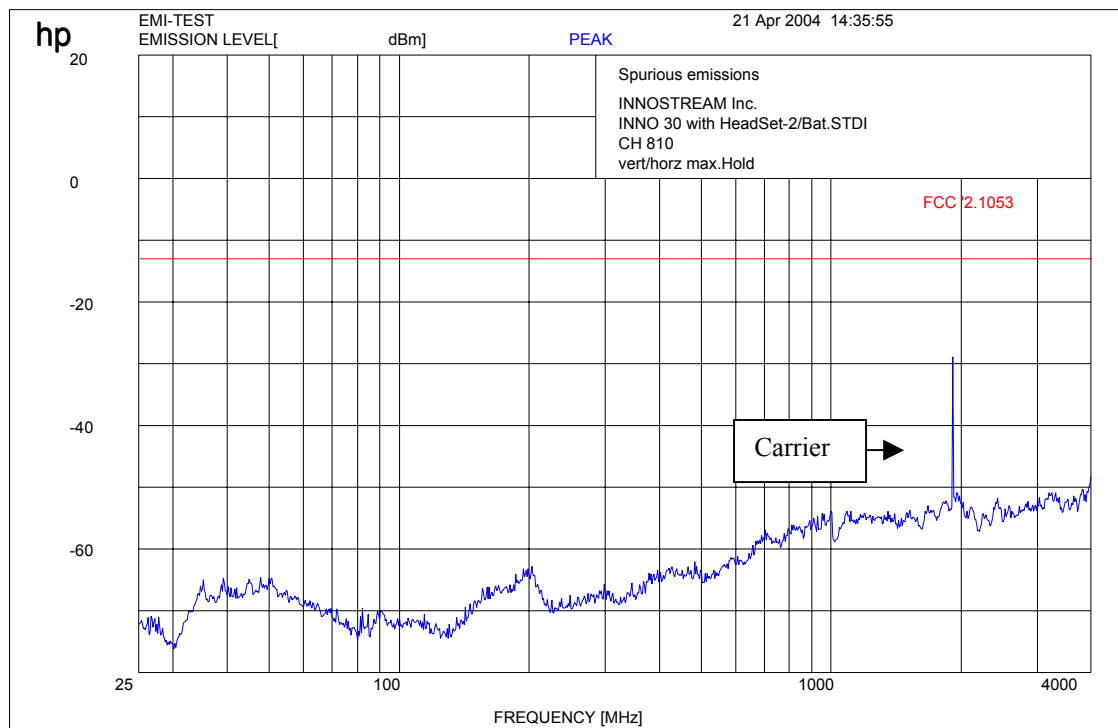
Date: 22.APR.2004 08:20:08

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

(for reference numbers see test equipment listing)

17 – 24; 64

## Channel 810 up to 4 GHz



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

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

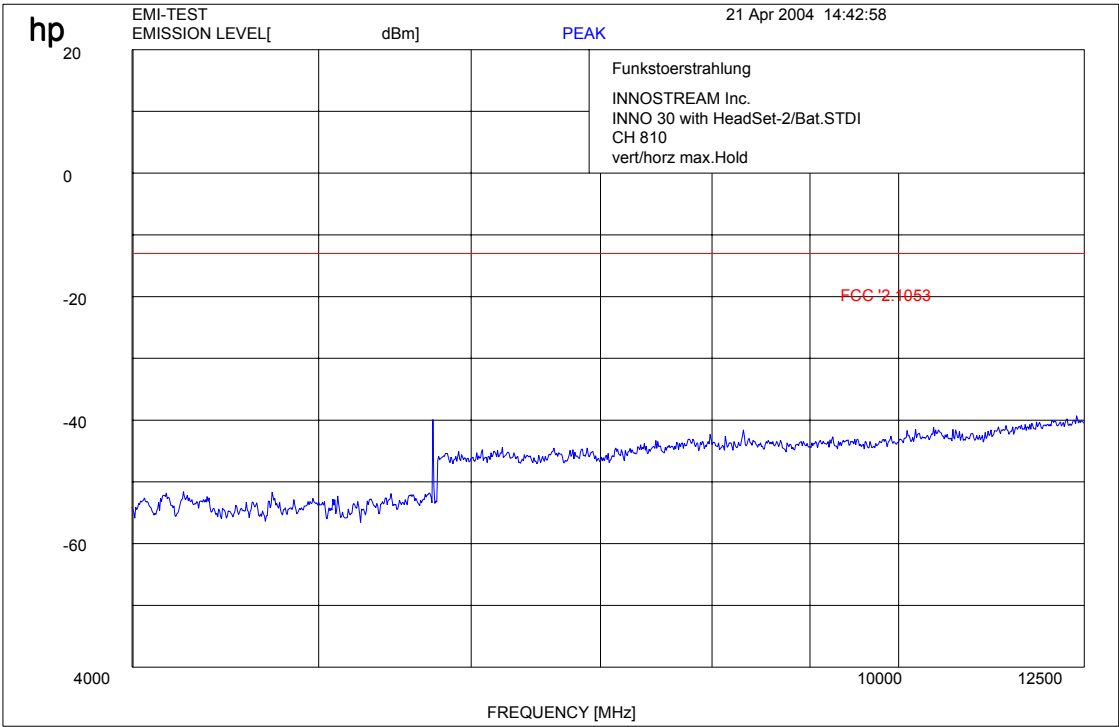
Carrier suppressed with a rejection filter

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

(for reference numbers see test equipment listing)

17 – 24, 64

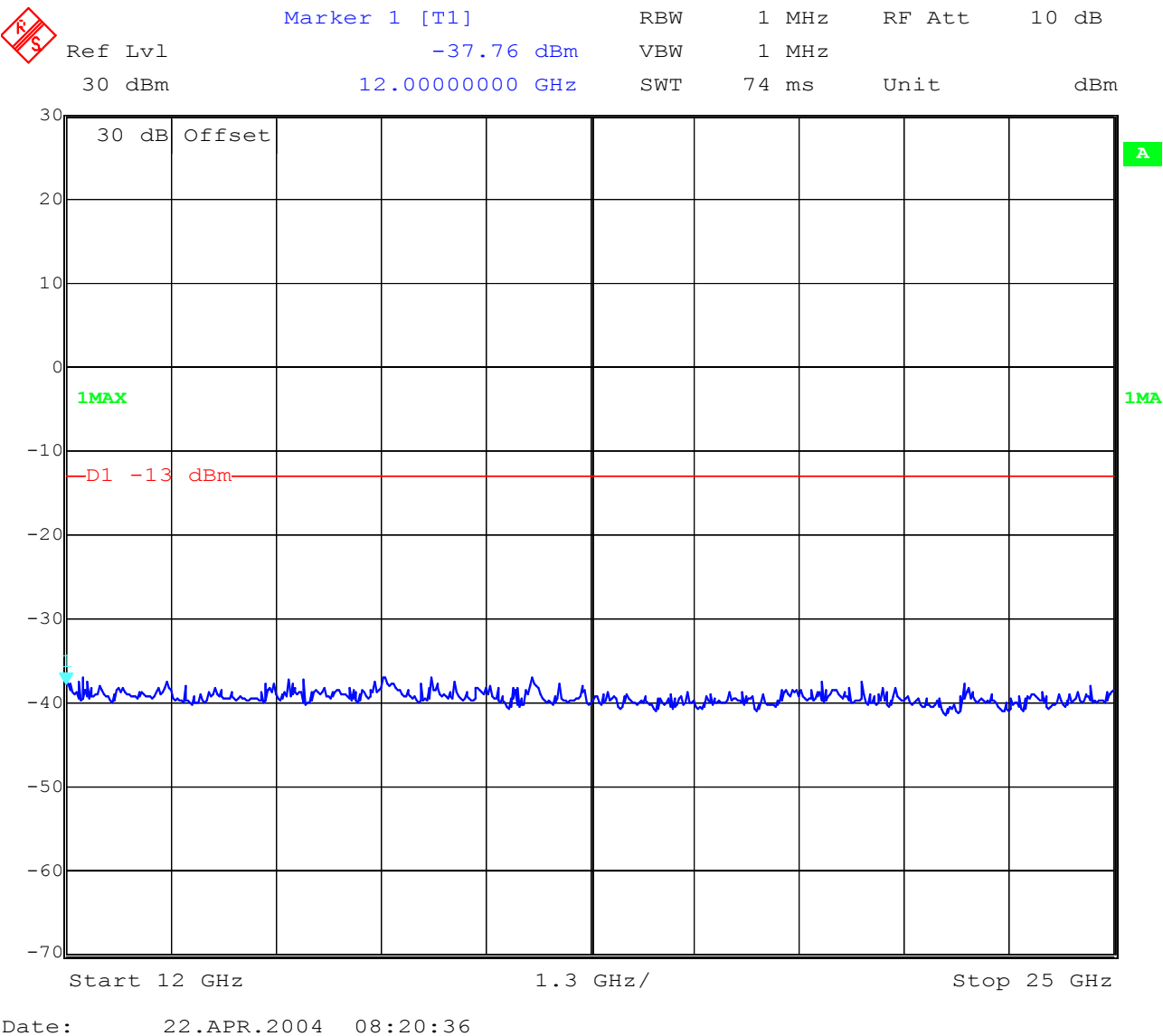
Channel 810 up to 12 GHz



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

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

Channel 810 : -25 GHz





**RECEIVER SPURIOUS RADIATION**  
**Radiated**

§ 15.109

SPURIOUS EMISSIONS LEVEL ( $\mu\text{V/m}$ )								
CH 512/661/810								
f (MHz)	Detector	Level ( $\mu\text{V/m}$ )	f (MHz)	Detector	Level ( $\mu\text{V/m}$ )	f (MHz)	Detector	Level ( $\mu\text{V/m}$ )
no traceable peak found								
Measurement uncertainty			$\pm 3 \text{ dB}$					

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

H = Horizontal ; V= Vertical

Measurement distance see table

Limits

SUBCLAUSE § 15.109

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	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
above 960	500	3

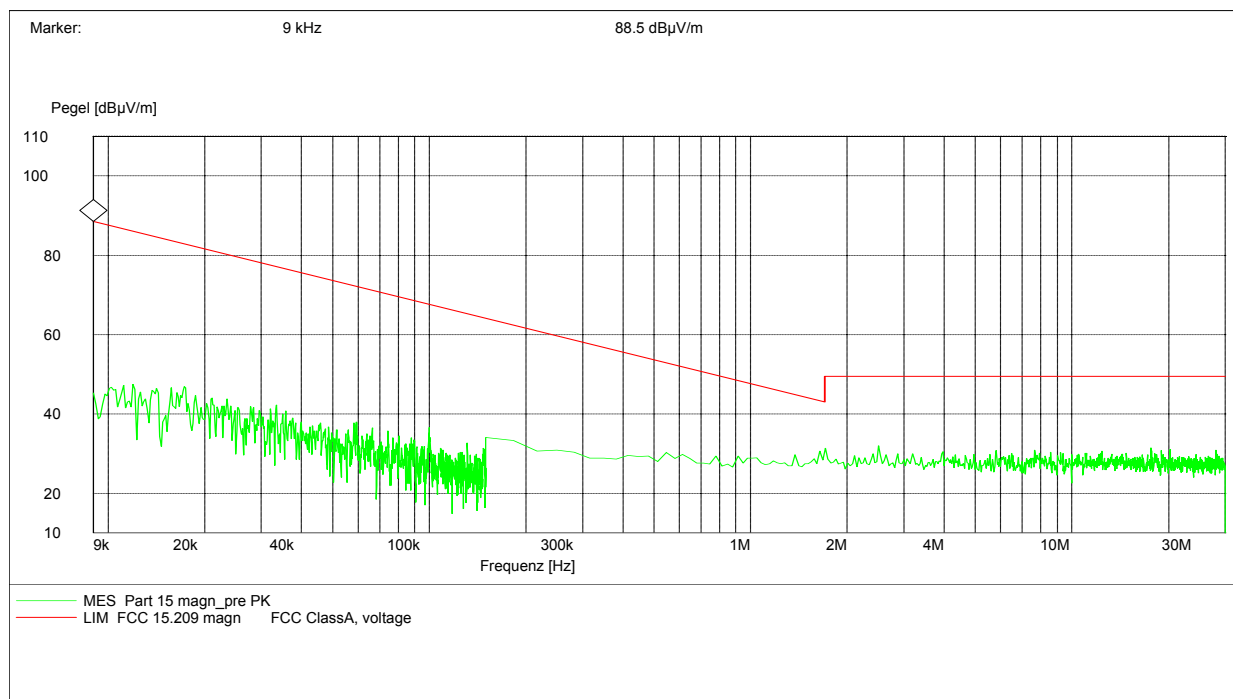
REFERENCE NUMBER(S) OF TEST EQUIPMENT USED  
 (for reference numbers see test equipment listing)

17 – 24, 64

## Idle-Mode (this is valid for all 3 channels up to 30 MHz )

### Part 15.209 Magnetics

EUT: INNO 30  
 Manufacturer: INNOSTREAM Inc.  
 Operating Condition: Idle mode  
 Test Site: Cetecom, Room 6  
 Operator: M. Berg  
 Test Specification: 15.209  
 Comment: 115V / 60 Hz  
 Start of Test: 22.04.04 / 07:05:30



For peak measurement we use 100 kHz RBW/VBW

For CISPR QP measurement we use 200 Hz from 9 kHz to 150kHz

9 kHz for 150 kHz to 30 MHz

## Limits

## SUBCLAUSE § 15.109

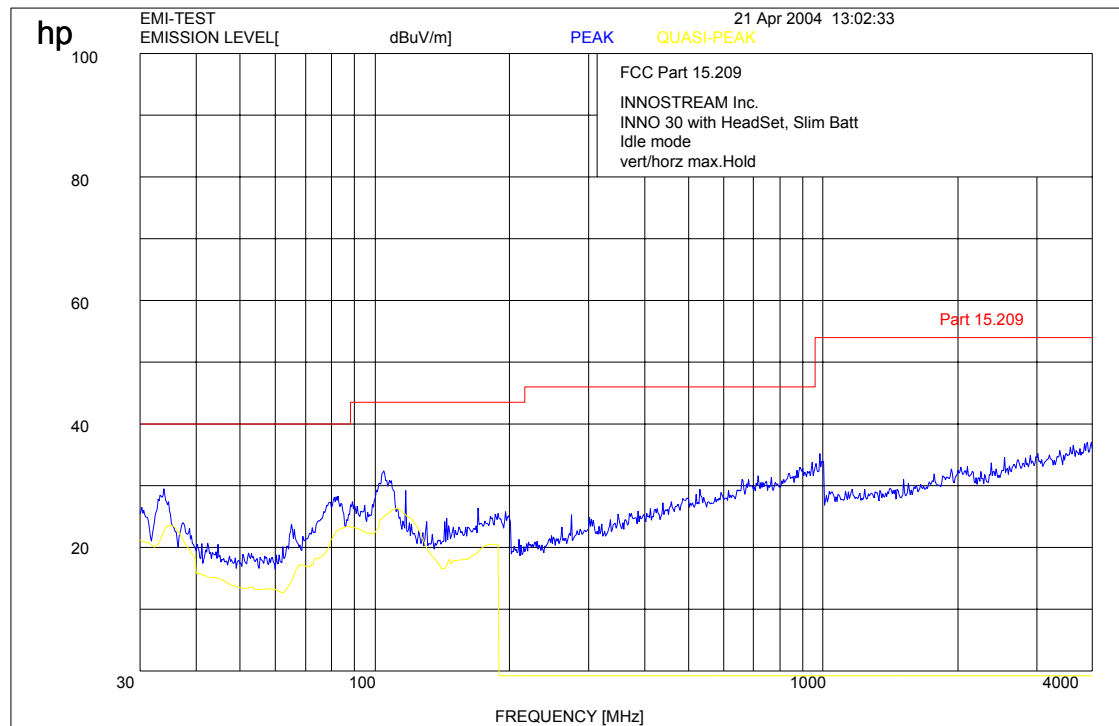
Frequency (MHz)	Field strength (µV/m)	Measurement distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
above 960	500	3

## REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

(for reference numbers see test equipment listing)

17 – 24, 64

**Idle-Mode (this is valid for all 3 channels and up to 4 GHz)**



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

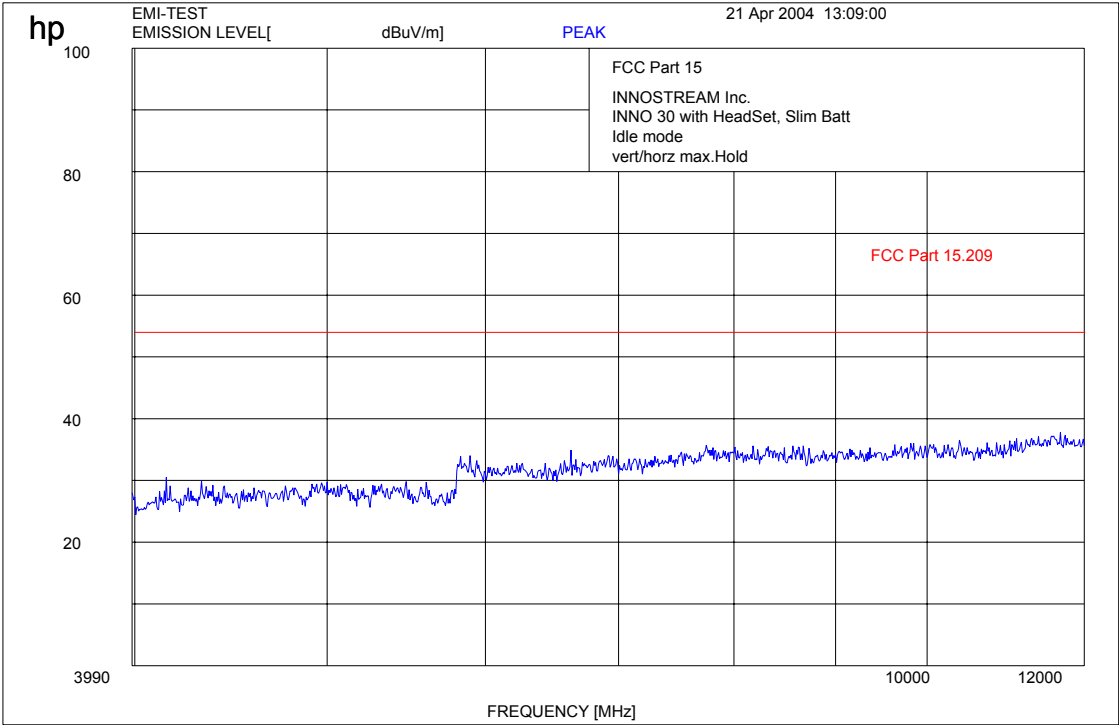
$f \geq 1 \text{ GHz}$  : RBW/VBW 1 MHz

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

(for reference numbers see test equipment listing)

17 – 24, 64

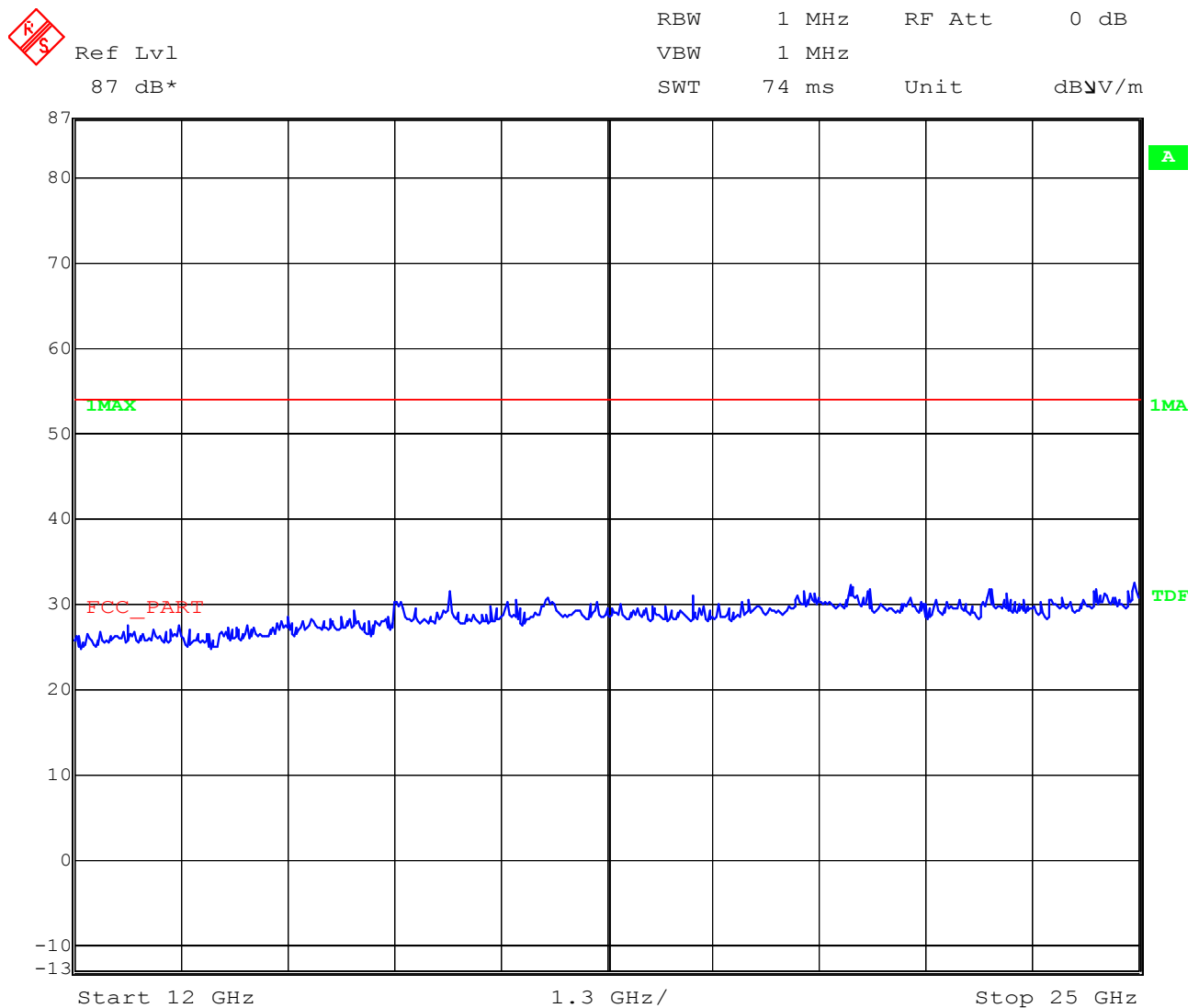
Idle-Mode (this is valid for all 3 channels and up to 12 GHz)



f < 1 GHz : RBW/VBW: 100 kHz

f ≥ 1GHz : RBW/VBW 1 MHz

**Idle-Mode (this is valid for all 3 channels and up to 25 GHz)**



Date: 22.APR.2004 08:23:16

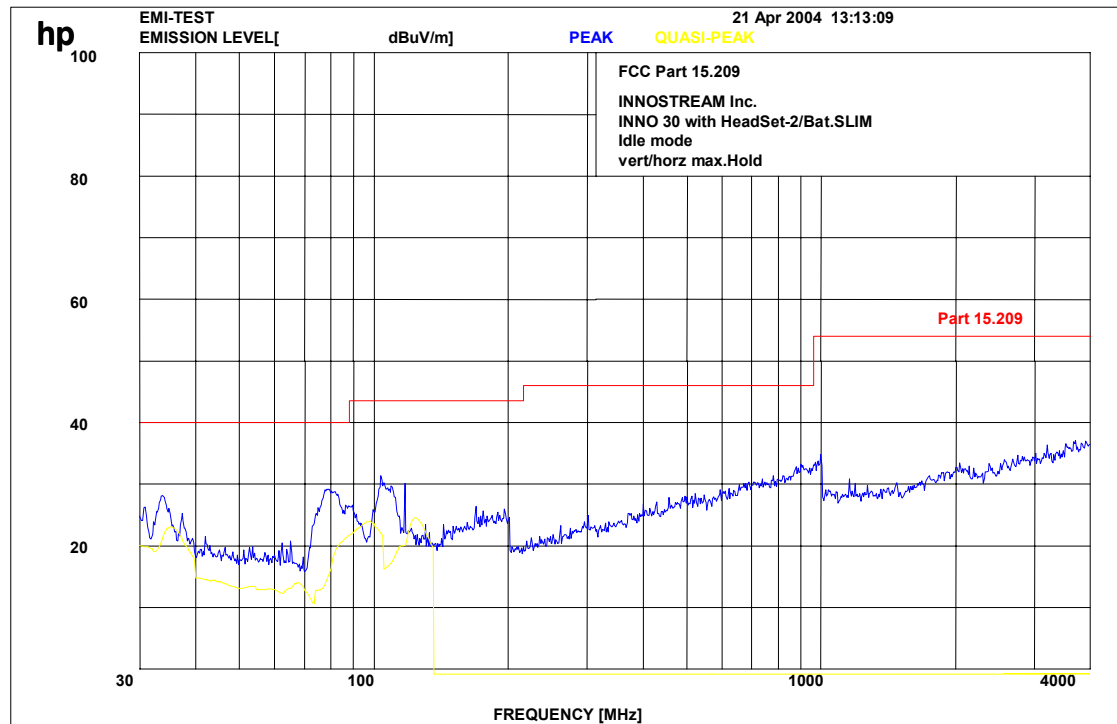
**For this measurement we used a special wideband horn antenna and a low noise preamp.**

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

(for reference numbers see test equipment listing)

17 – 24, 64

**Idle-Mode with second Headset (HC-MYO-INNO004) and second Battery (INNO 30(SLIM))**  
 (this is valid for all 3 channels and up to 4 GHz)



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

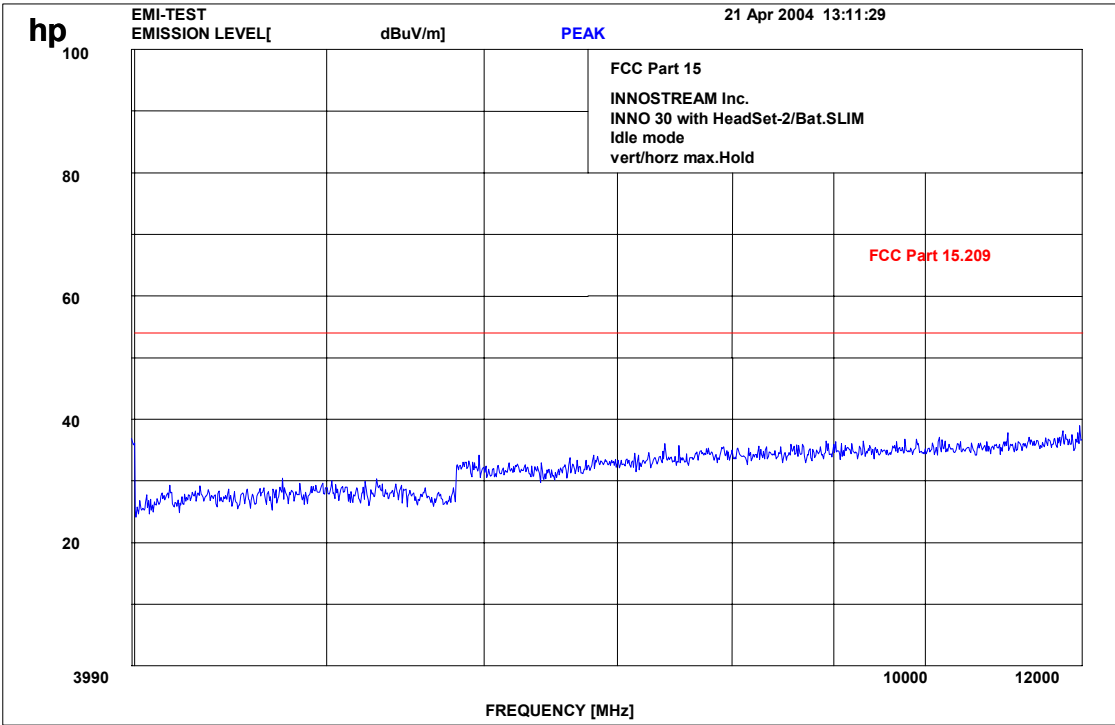
$f \geq 1 \text{ GHz}$  : RBW/VBW 1 MHz

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

(for reference numbers see test equipment listing)

17 – 24, 64

Idle-Mode with second Headset (HC-MYO-INNO004) and second Battery (INNO 30(SLIM))  
(this is valid for all 3 channels and up to 12 GHz)



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

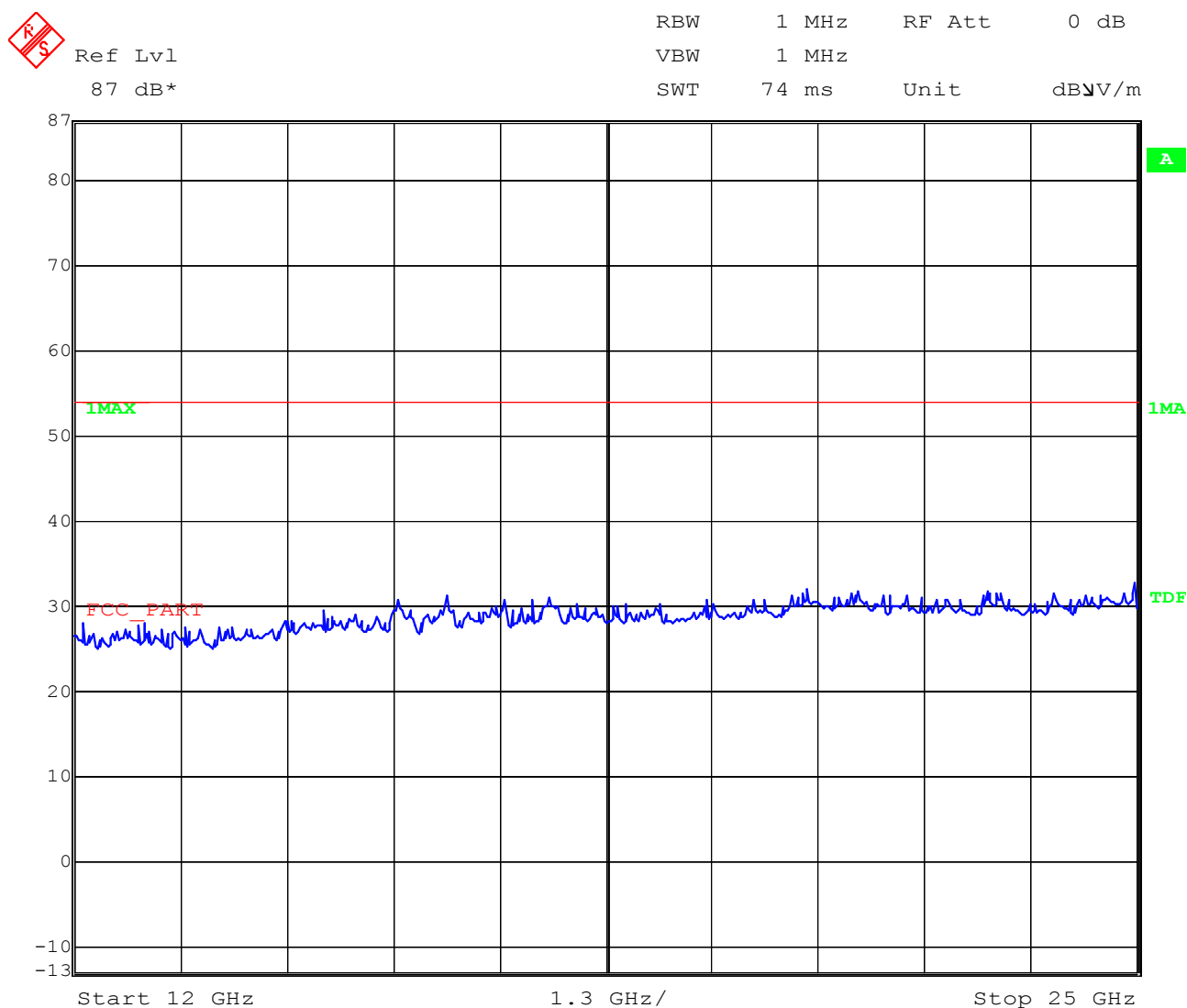
$f \geq 1 \text{ GHz}$  : RBW/VBW 1 MHz

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

(for reference numbers see test equipment listing)

17 – 24, 64

**Idle-Mode with second Headset (HC-MYO-INNO004) and second Battery (INNO 30(SLIM))  
(this is valid for all 3 channels and up to 25 GHz)**



Date: 22.APR.2004 08:23:36

**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)

17 – 24, 64



## 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.

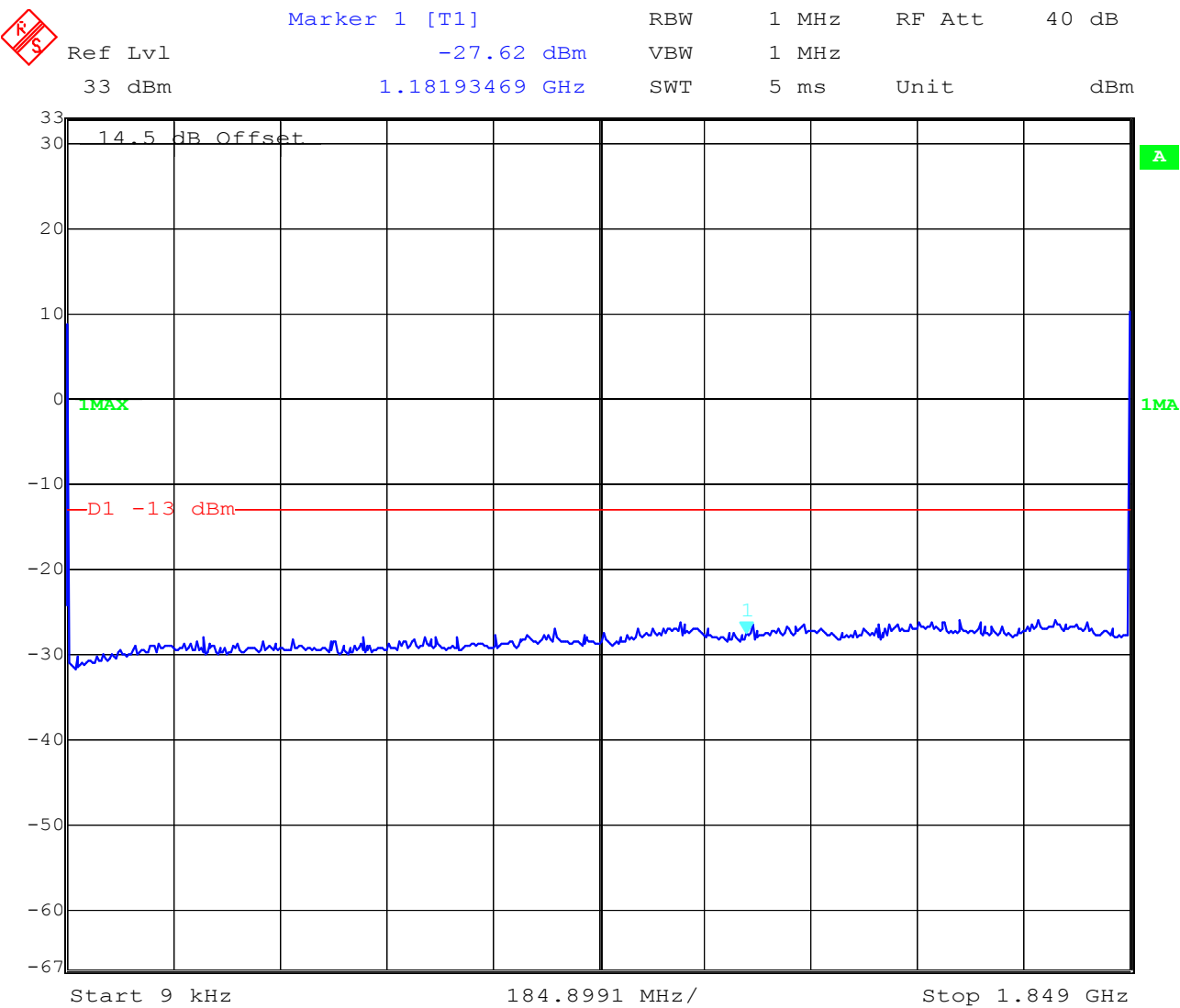
(a) On any frequency outside frequency band of the USPCS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least  $43+10\log(P)$  dB. For all power levels +30 dBm to 0 dBm, this becomes a constant specification limit of -13 dBm.

EMISSION LIMITATIONS					
f (MHz)		amplitude of emission (dBm)	limit max. allowed emission power (dBm)	actual attenuation below frequency of operation (dBc)	results
CH 512					
1850.2		29.6	-13.0 (42.6 dBc)		carrier
1849.98		-16.87		46.47	complies
12660.58		-27.16		56.76	complies
CH 661					
1880.0		29.4	-13.0 (42.4 dBc)		carrier
6977.37		-26.38		55.78	complies
CH 810					
1909.8		29.5	-13.0 (42.5 dBc)		carrier
1910.02		-16.50		46.0	complies
Measurement uncertainty		± 0.5dB			

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

Measurements:

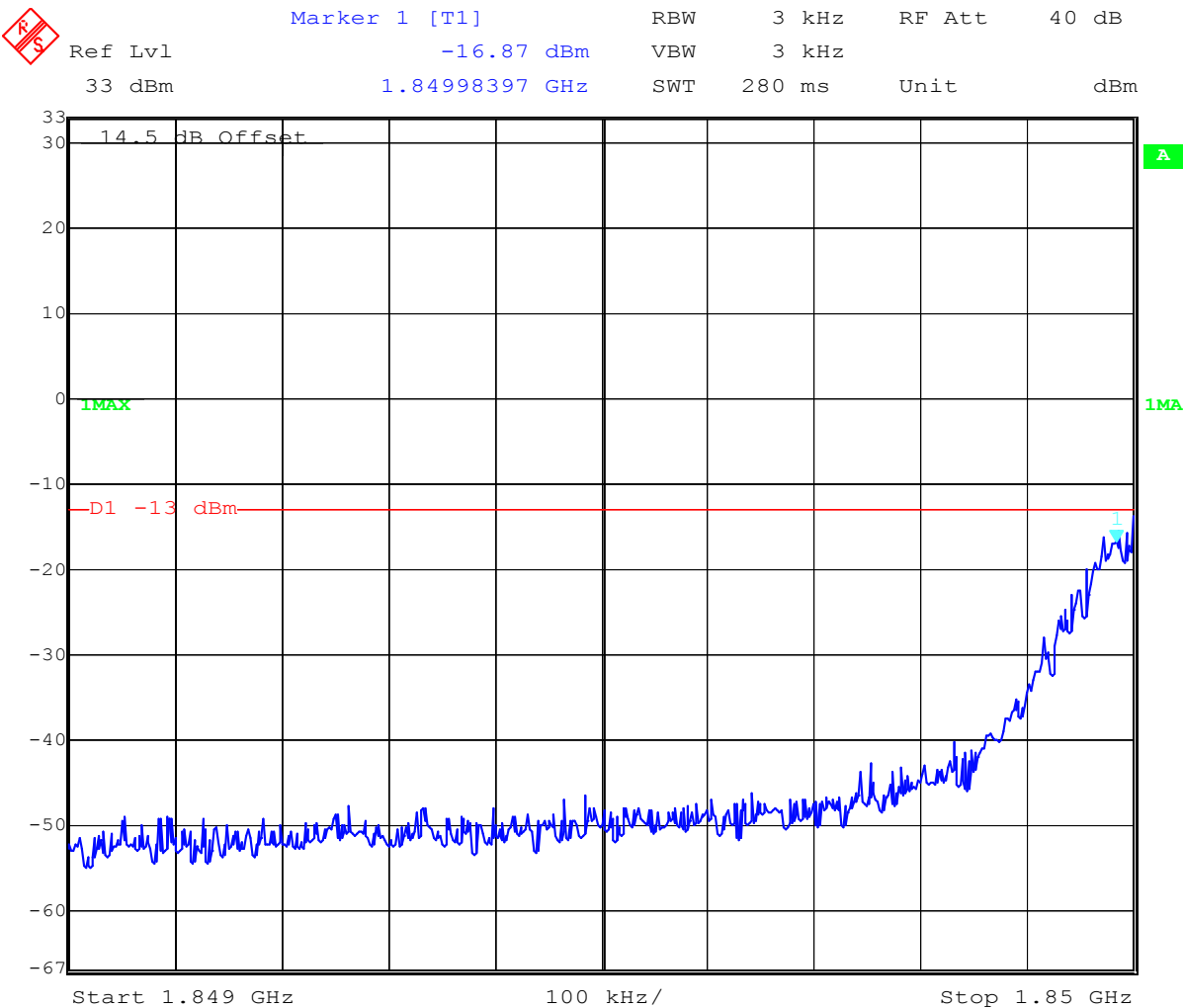
Channel: 512



Date: 22.APR.2004 08:39:02

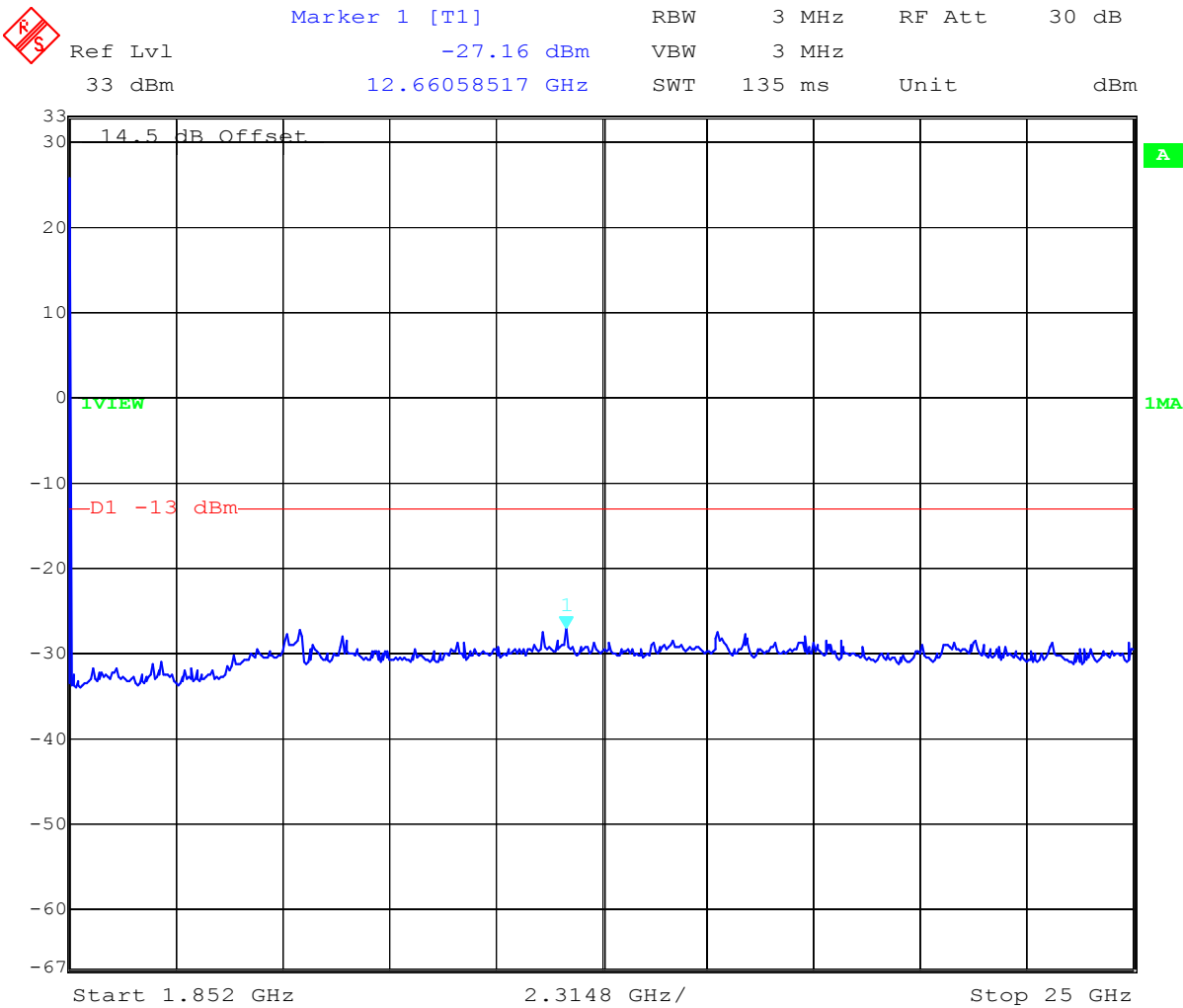
REFERENCE NUMBER(S) OF TEST EQUIPMENT USED  
(for reference numbers see test equipment listing)

Channel 512




Date:            22.APR.2004    08:41:38

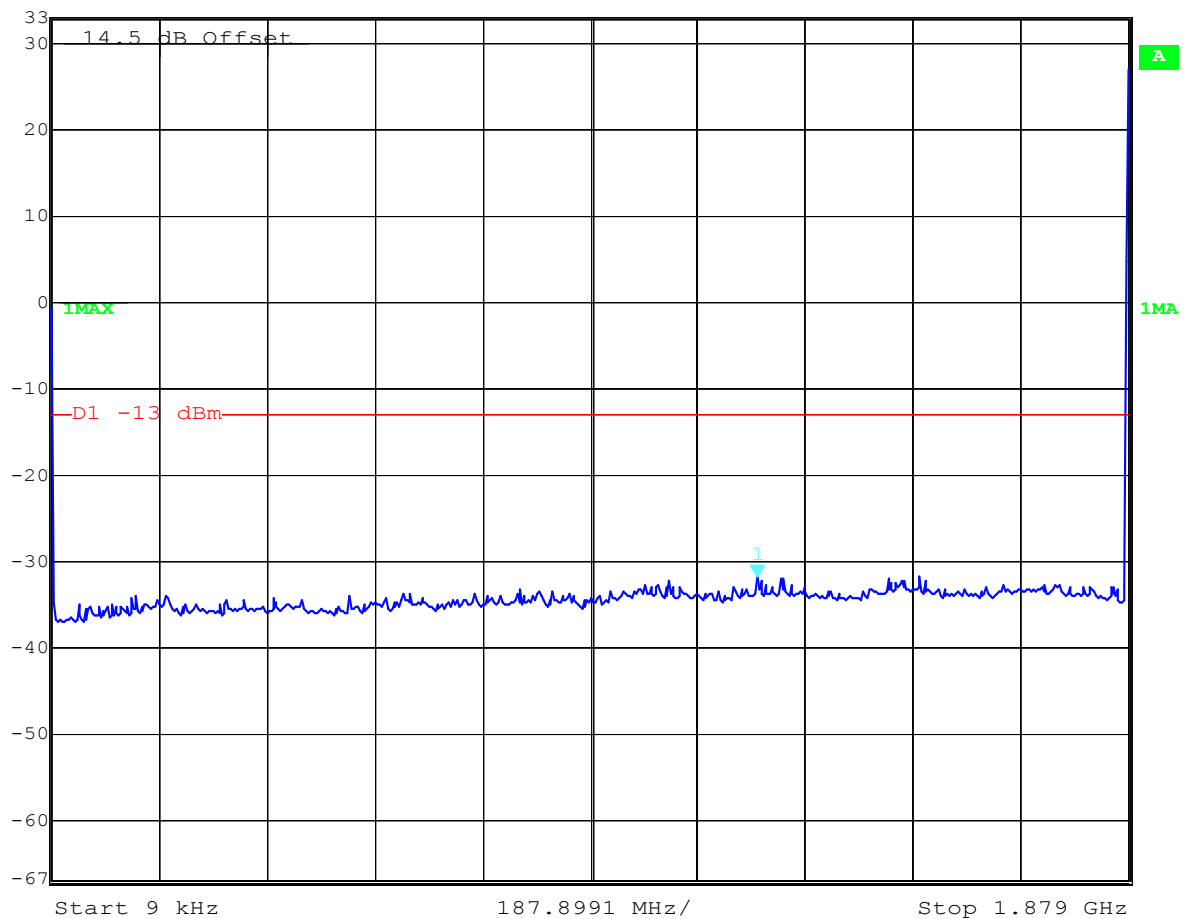
Channel 512



Date: 22.APR.2004 08:42:51

## Channel 661

	Marker 1 [T1]	RBW	3 MHz	RF Att	30 dB
	Ref Lvl	-31.96 dBm	VBW	3 MHz	
	33 dBm	1.23133176 GHz	SWT	5 ms	Unit dBm

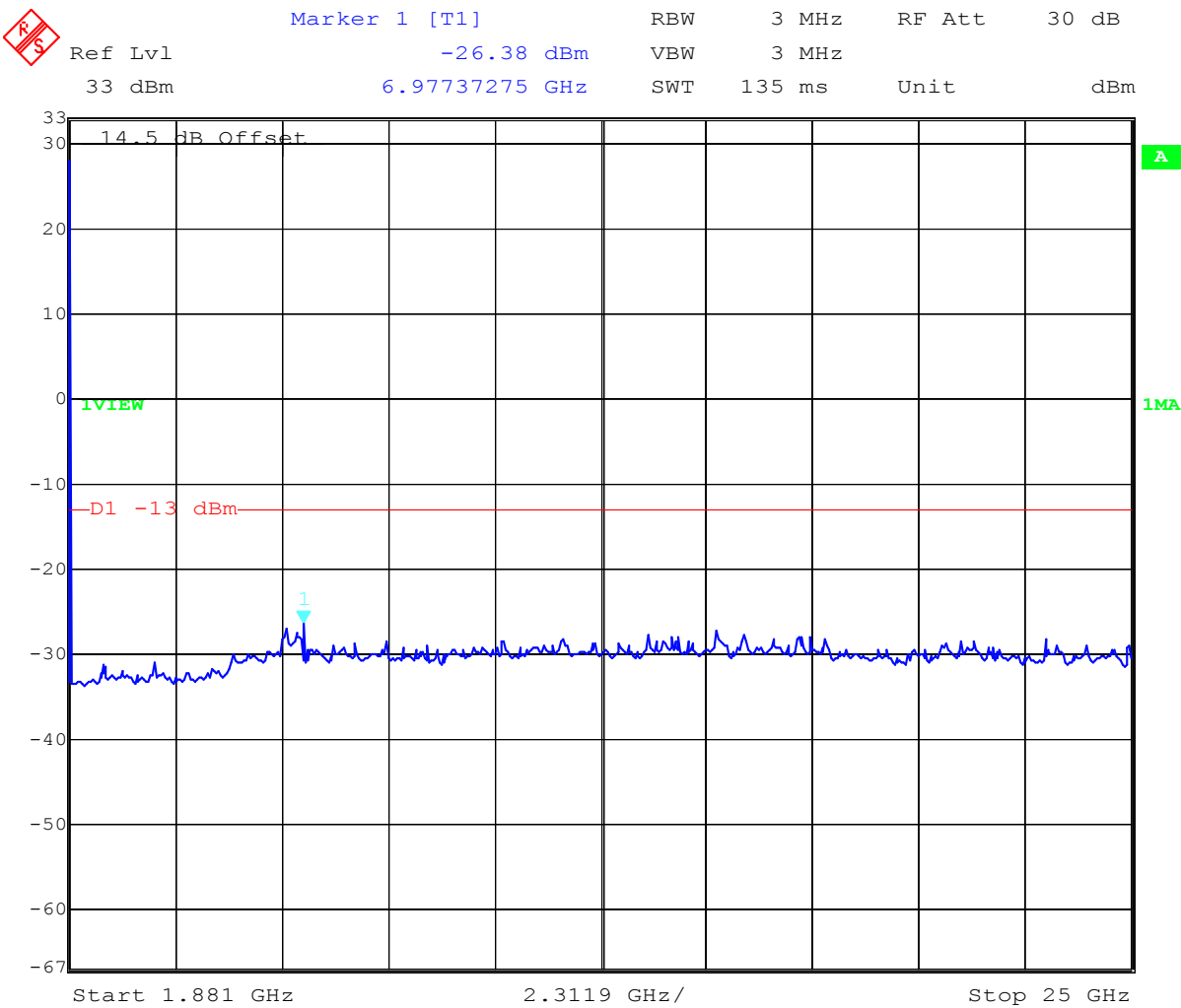


Date: 22.APR.2004 08:46:12

## REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

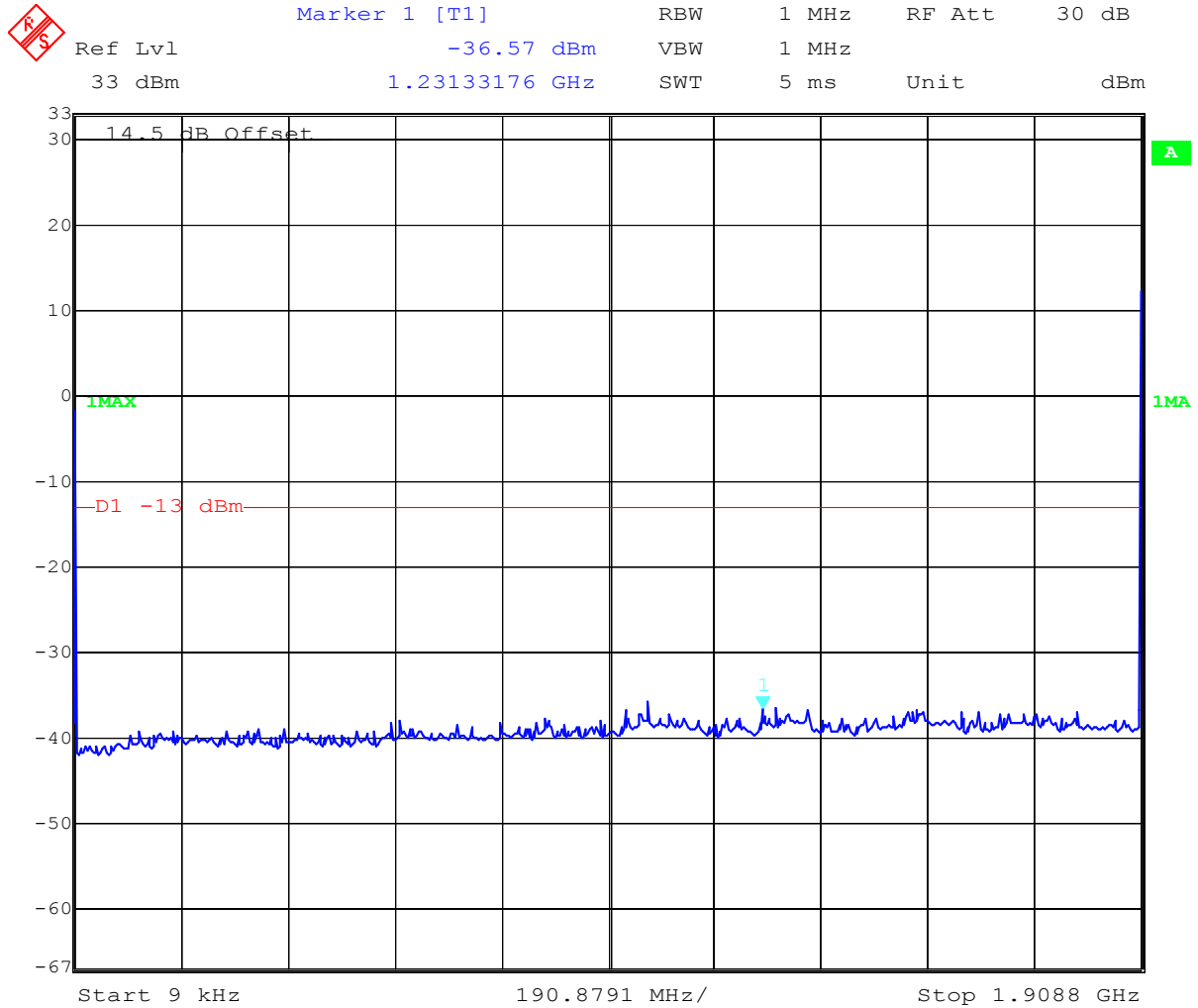
(for reference numbers see test equipment listing)

Channel 661



Date: 22.APR.2004 08:45:06

## Channel 810



Date: 22.APR.2004 08:47:39

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

(for reference numbers see test equipment listing)

## Channel 810



Marker 1 [T1]

RBW 3 kHz RF Att 30 dB

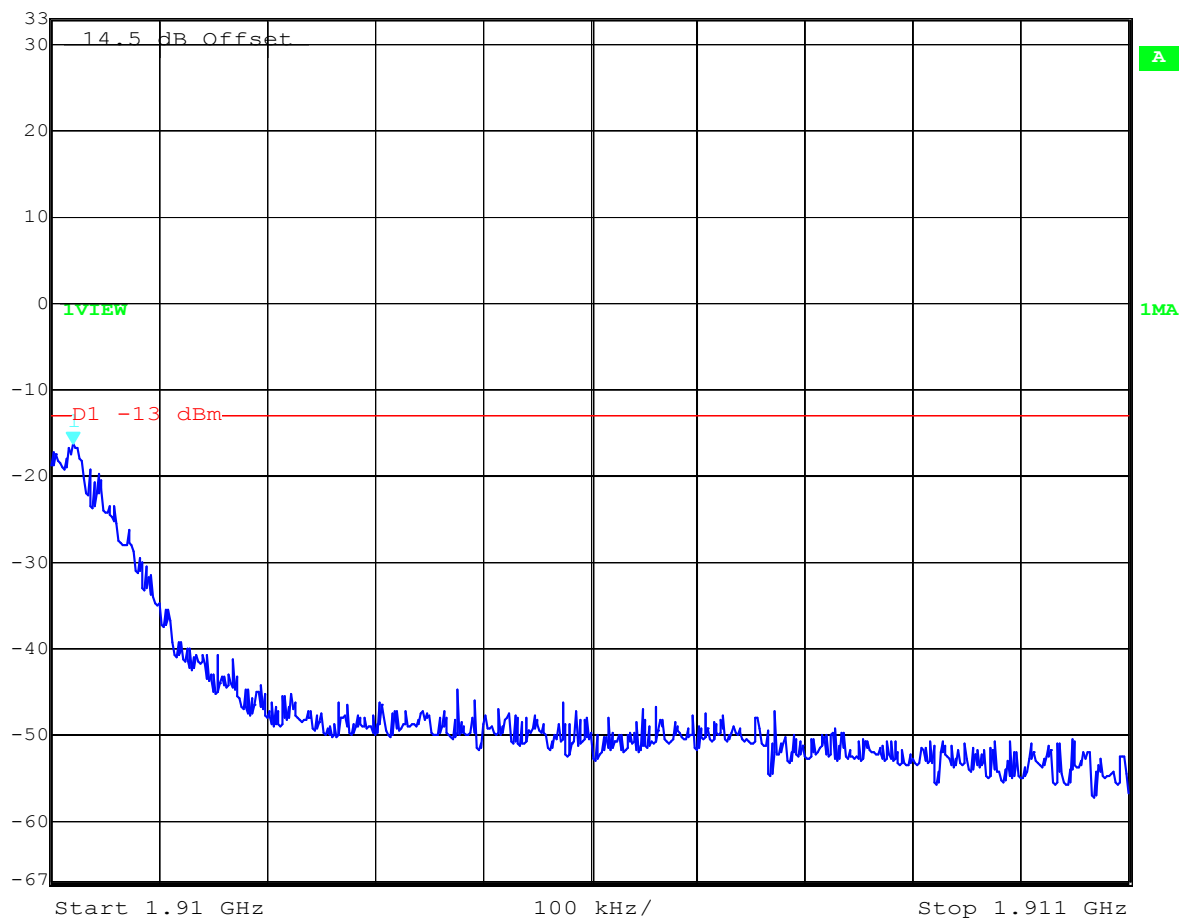
Ref Lvl -16.50 dBm

VBW 3 kHz

33 dBm 1.91002004 GHz

SWT 280 ms

Unit dBm



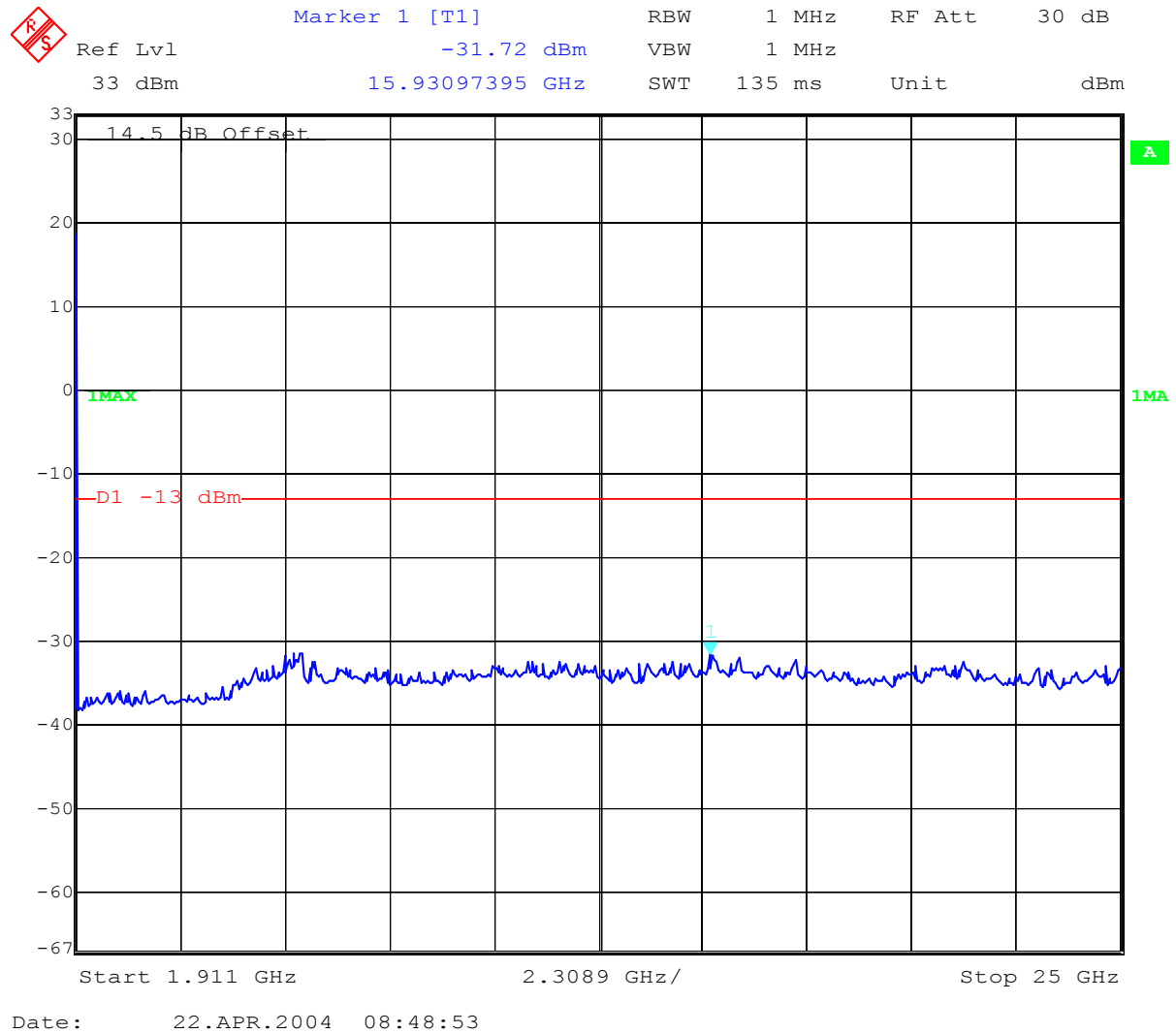
Date: 22.APR.2004 08:51:06

### 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 EDGE COMPLIANCE FOR BLOCK A AND C

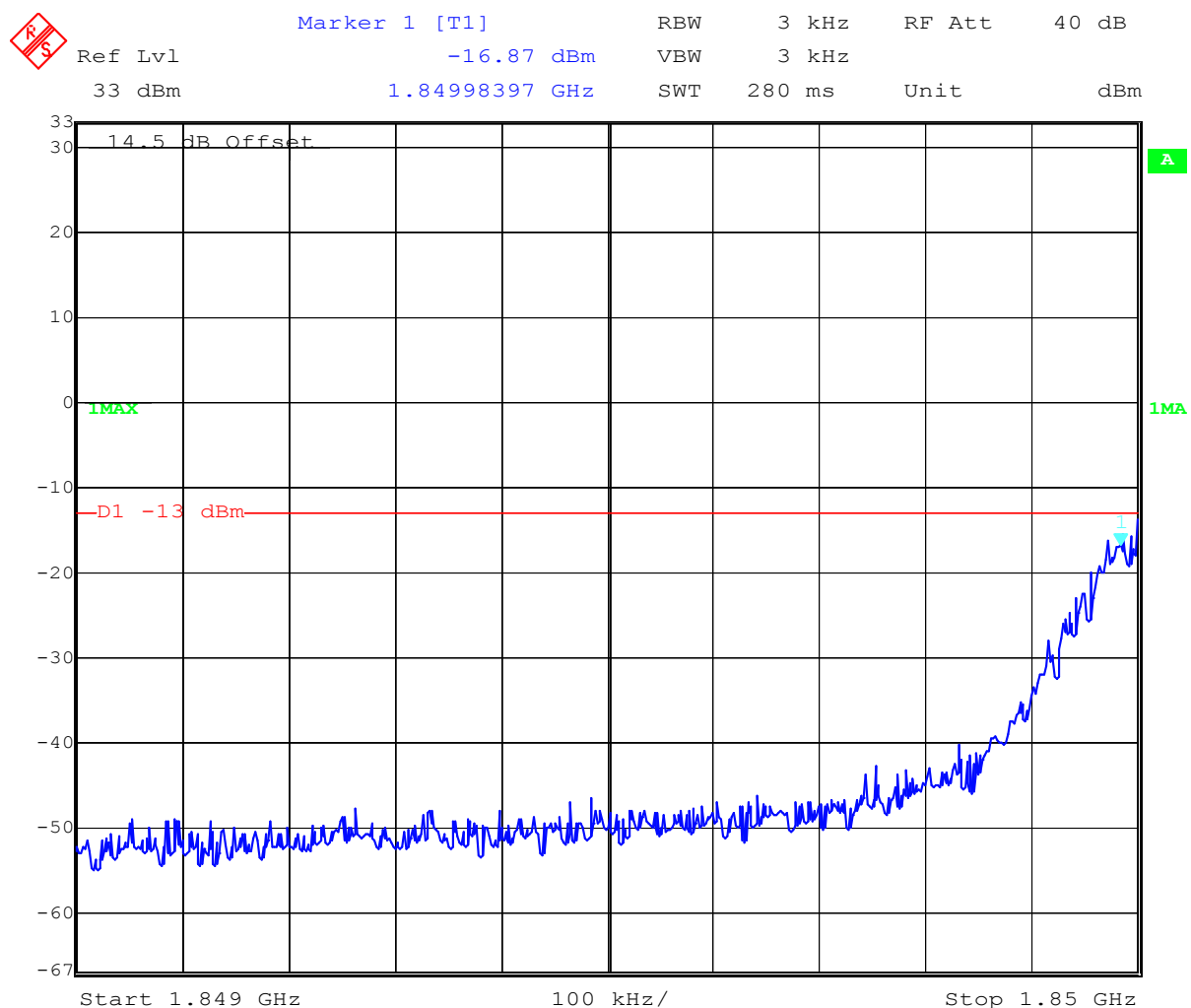
### Measurement Limit:

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  $43+10\log(P)$  dB. For all power levels +30 dBm to 0 dBm, this becomes a constant specification limit of -13 dBm.

### Measurements:

#### Block A Channel 512

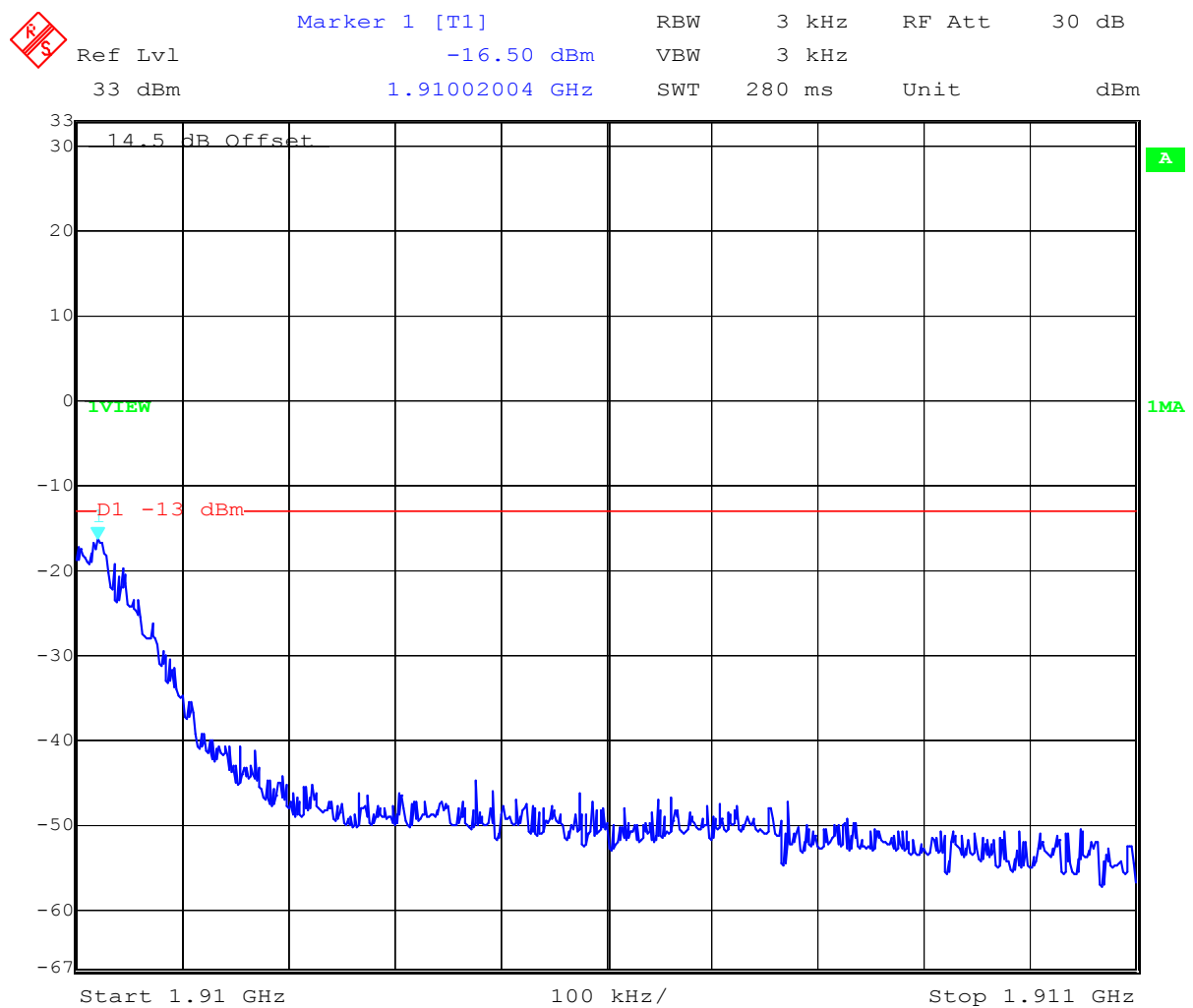


Date: 22.APR.2004 08:41:38

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

(for reference numbers see test equipment listing)

## Block C Channel 810



Date: 22.APR.2004 08:51:06

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

(for reference numbers see test equipment listing)

**OCCUPIED BANDWIDTH****§2.989****Occupied Bandwidth Results**

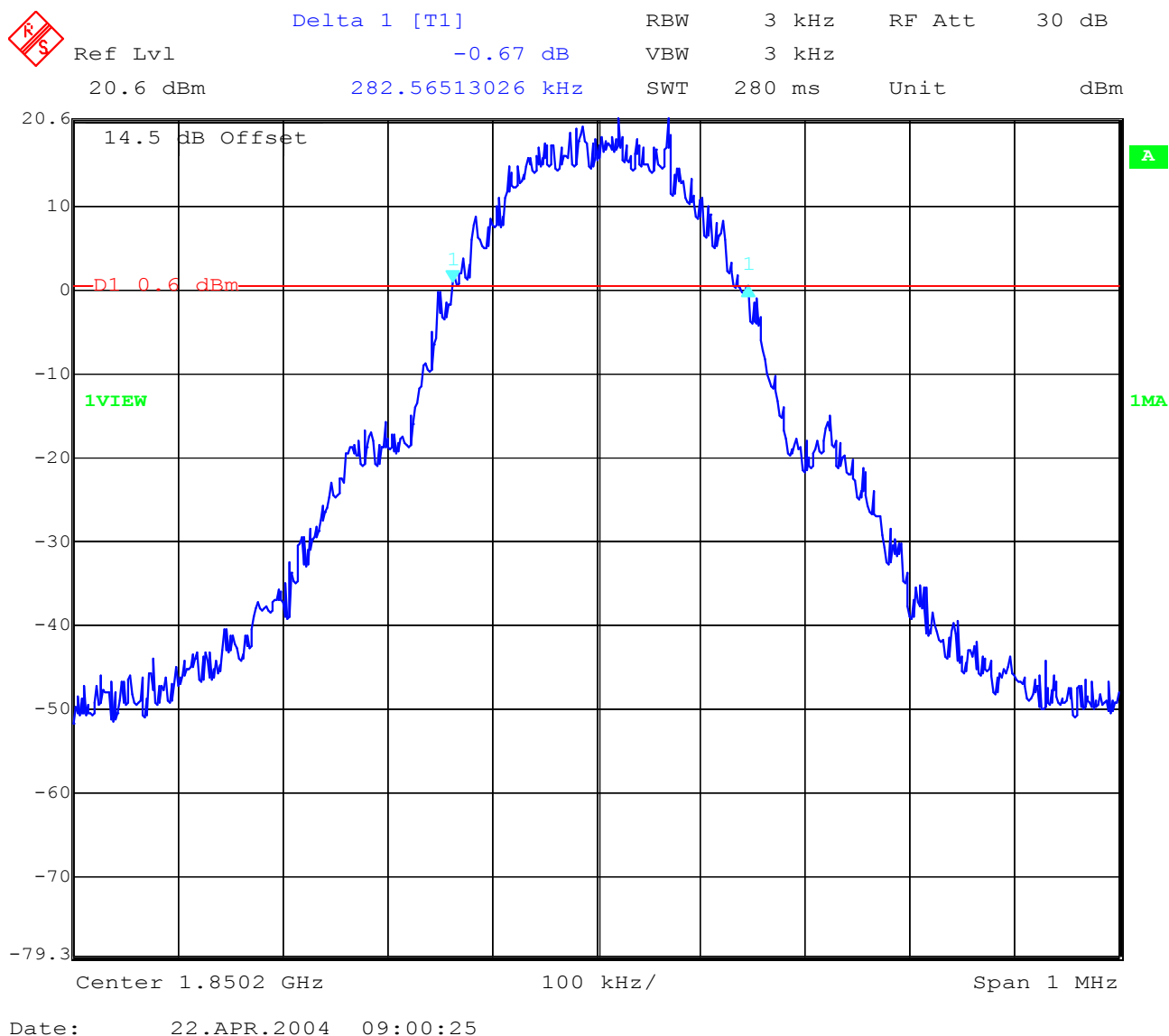
Similar to conducted emissions, occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of the USPCS frequency band. Table 8.2 below lists the measured 99% power and -26dBC occupied 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>282.565</b>	<b>316.633</b>
<b>1880.0 MHz</b>	<b>272.545</b>	<b>314.629</b>
<b>1909.8 MHz</b>	<b>278.557</b>	<b>314.629</b>

Part 24.238 (a) requires a measurement bandwidth of at least 1% of the occupied bandwidth. For ca. 281 kHz, this equates to a resolution bandwidth of at least 2.81 kHz. For this testing, a resolution bandwidth 3.0 kHz was used.

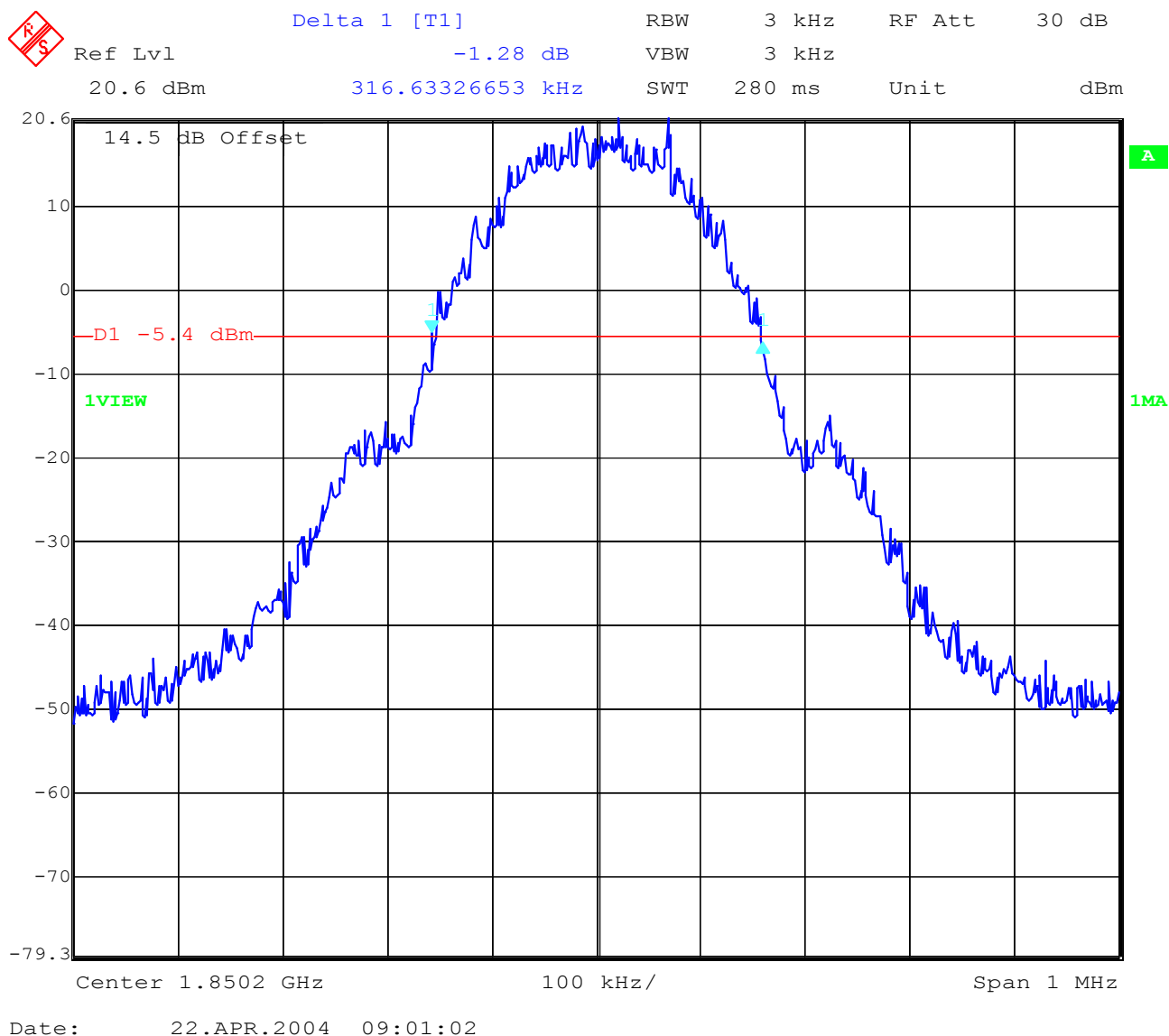
## Channel 512

## 99% Occupied Bandwidth



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

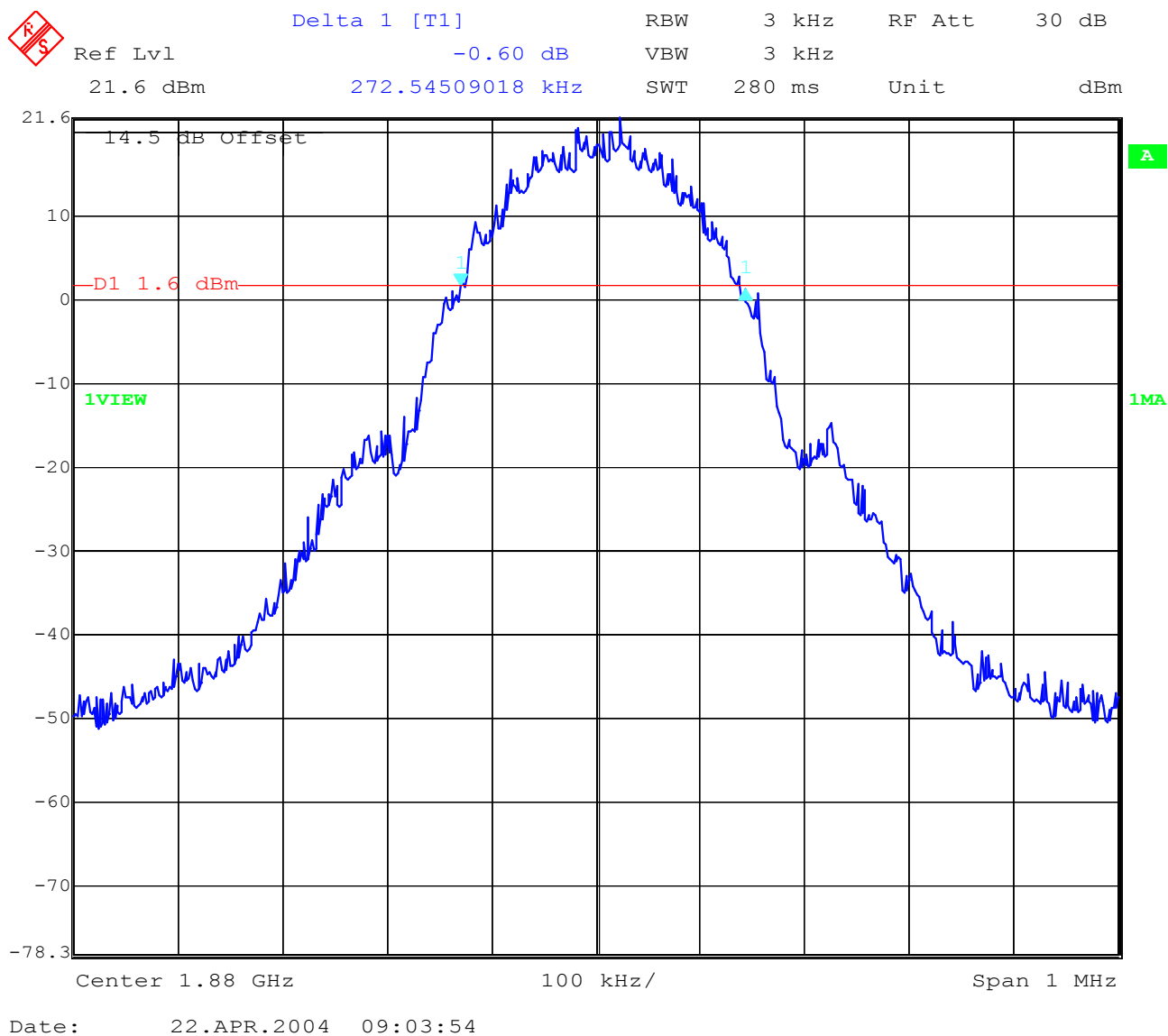
## Channel 512 -26 dBc Bandwidth



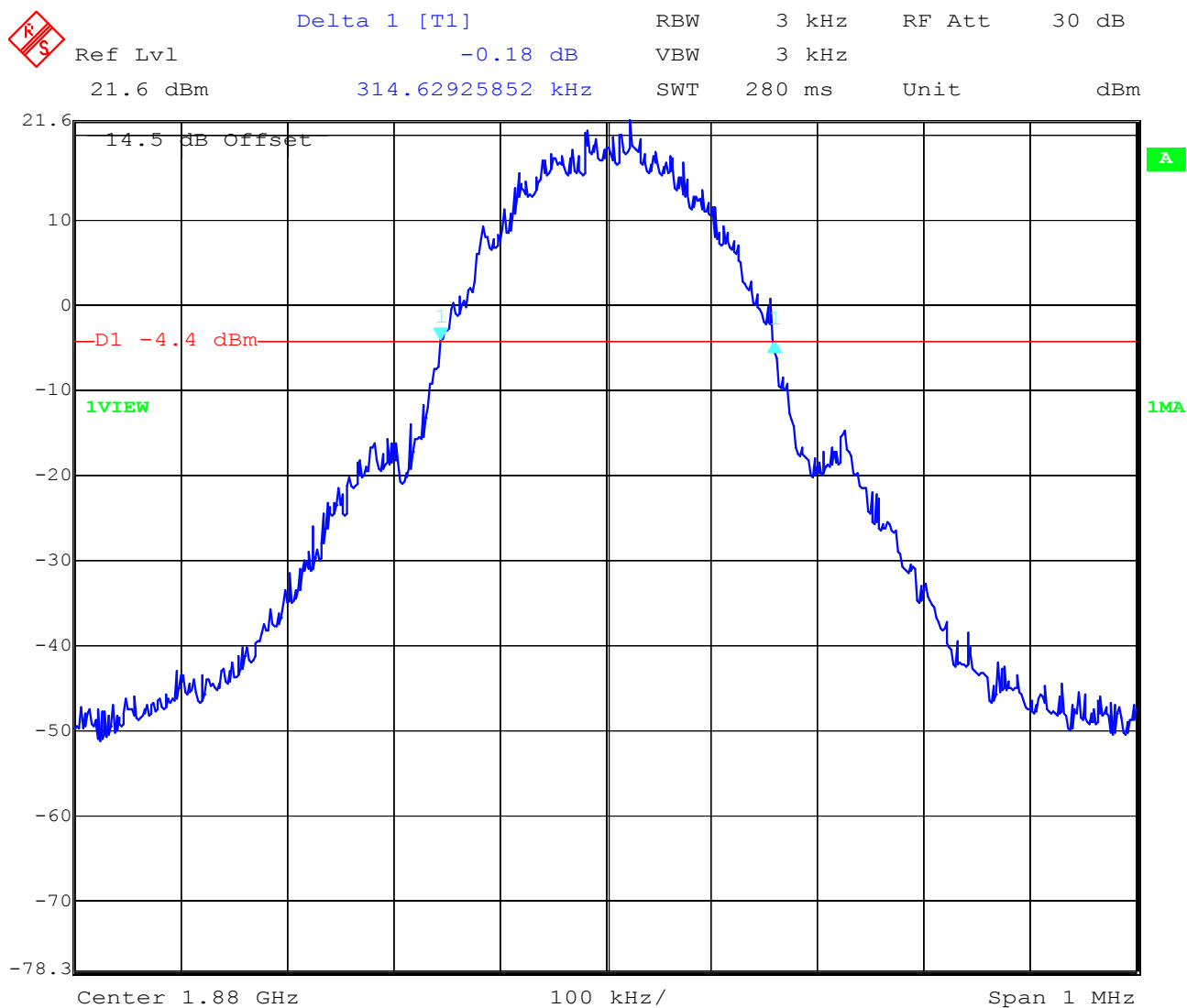
REFERENCE NUMBER(S) OF TEST EQUIPMENT USED  
(for reference numbers see test equipment listing)

## Channel 661

### 99% Occupied Bandwidth



## Channel 661 -26 dBc Bandwidth



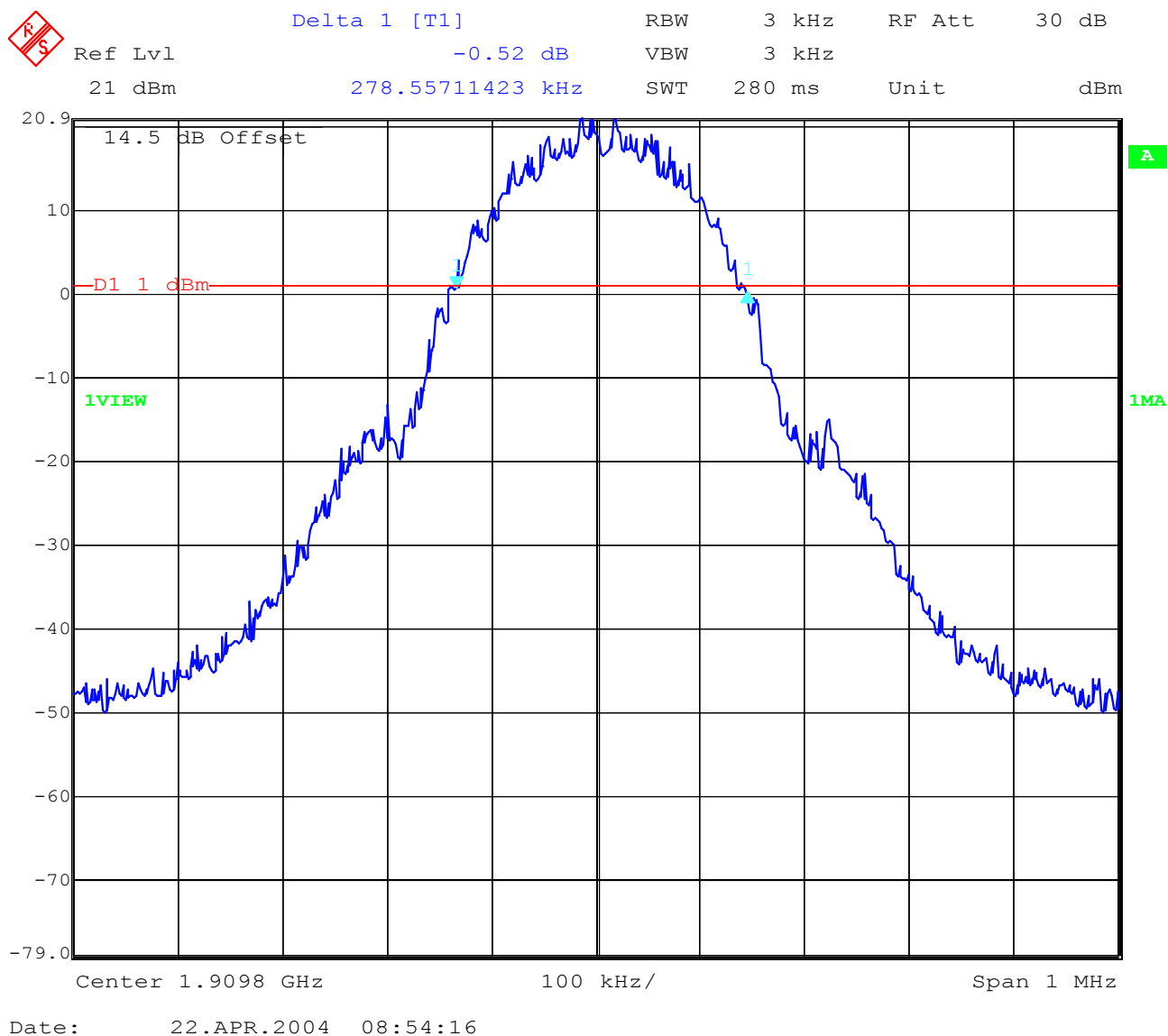
Date: 22.APR.2004 09:04:27

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



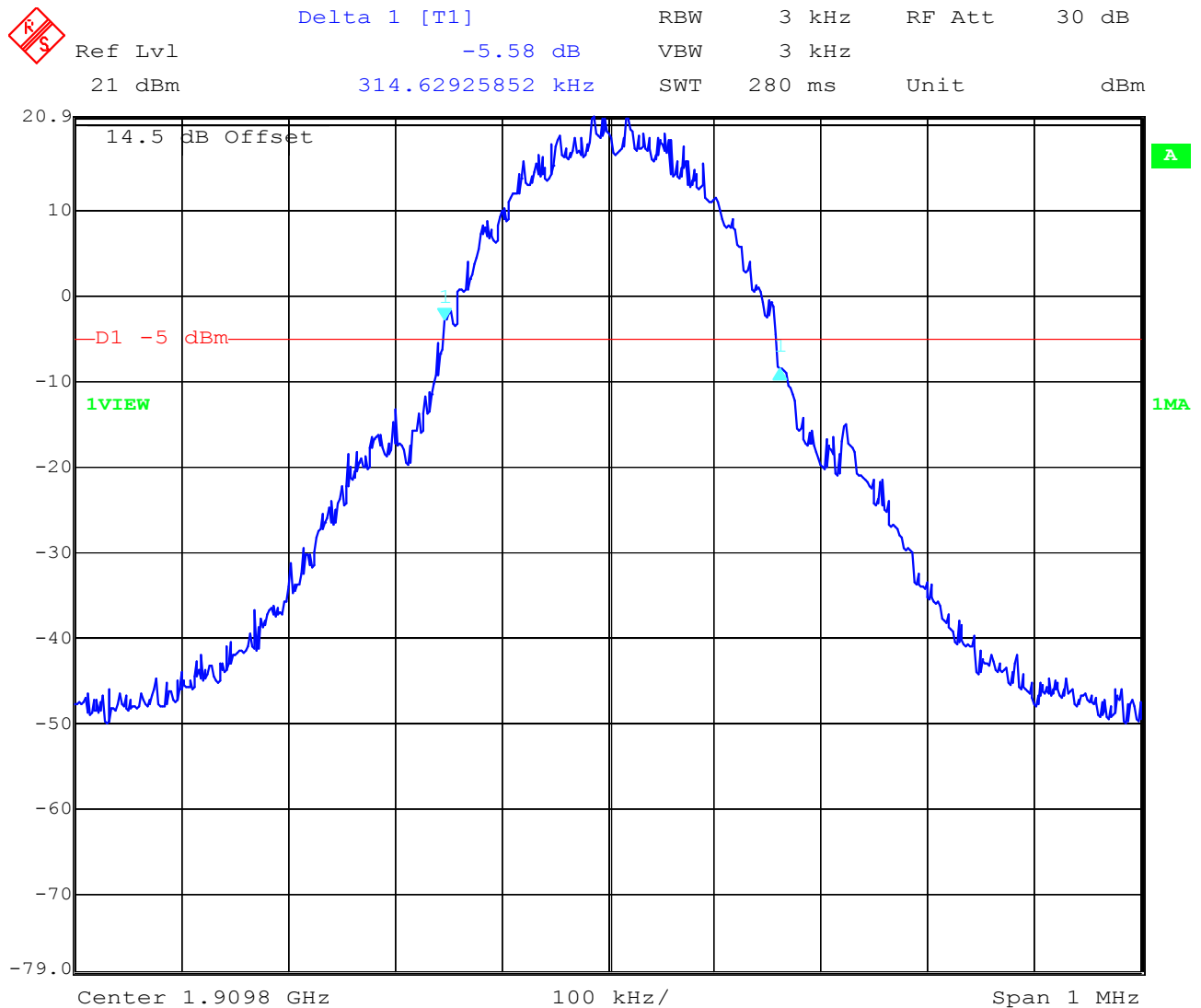
## Channel 810

### 99% Occupied Bandwidth



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

## Channel 810 -26 dBc Bandwidth



Date: 22.APR.2004 08:54:50

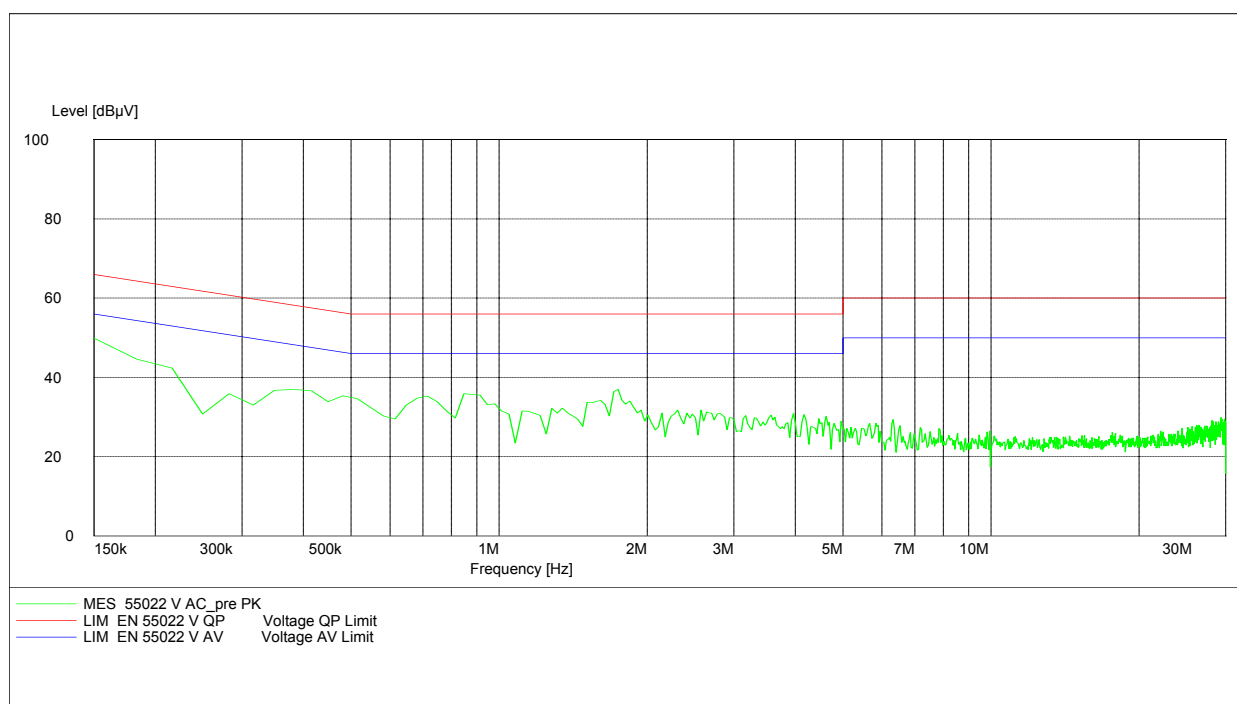
REFERENCE NUMBER(S) OF TEST EQUIPMENT USED  
(for reference numbers see test equipment listing)

## CONDUCTED EMISSIONS

§ 15.107/207

### CISPR 22

EUT: INNO 30  
 Manufacturer: INNOSTREAM Inc.  
 Operating Condition: Traffic mode  
 Test Site: Room 006 (Shielded chamber)  
 Operator: Berg M.  
 Test Specification: CISPR22 (EN 55022)  
 Comment: 115V / 60 Hz  
 Start of Test: 22.04.04 / 07:16:34

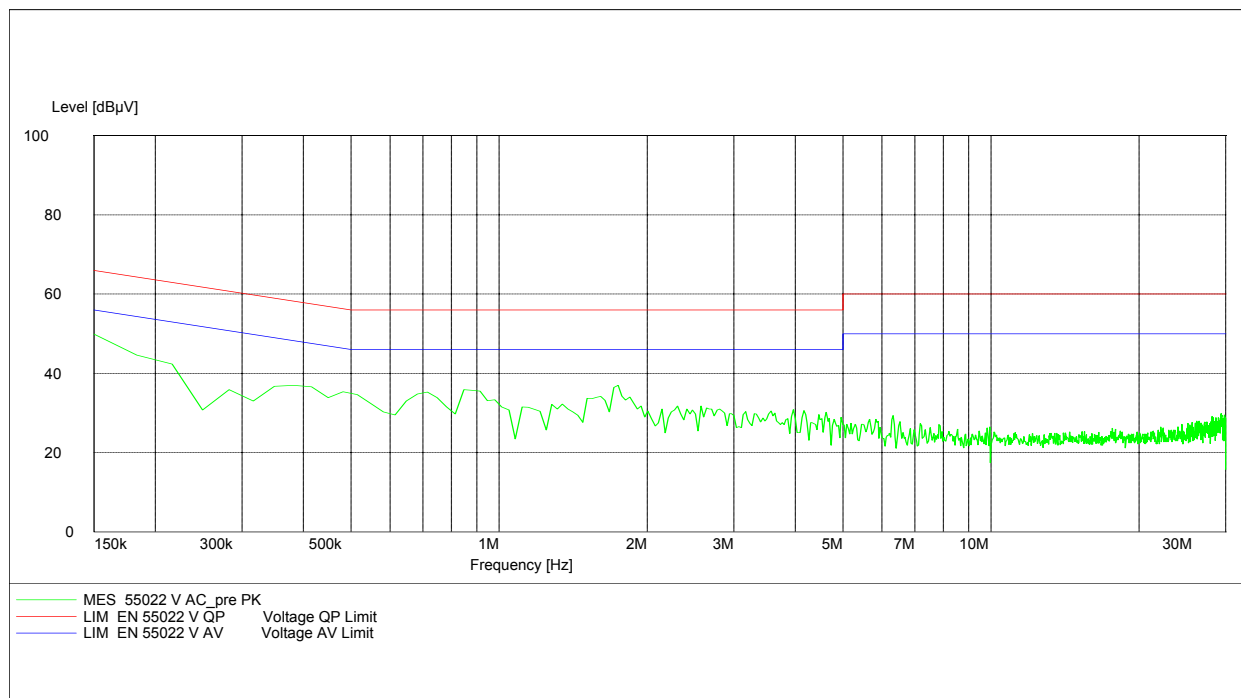


### Limit § 15.207

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

\* Decreases with the logarithm of the frequency.

EUT: INNO 30  
 Manufacturer: INNOSTREAM Inc.  
 Operating Condition: Traffic mode  
 Test Site: Room 006 (Shielded chamber)  
 Operator: Berg M.  
 Test Specification: CISPR22 (EN 55022)  
 Comment: 115V / 60 Hz  
 Start of Test: 22.04.04 / 07:16:34



## Limit § 15.207

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

\* Decreases with the logarithm of the frequency.

**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.

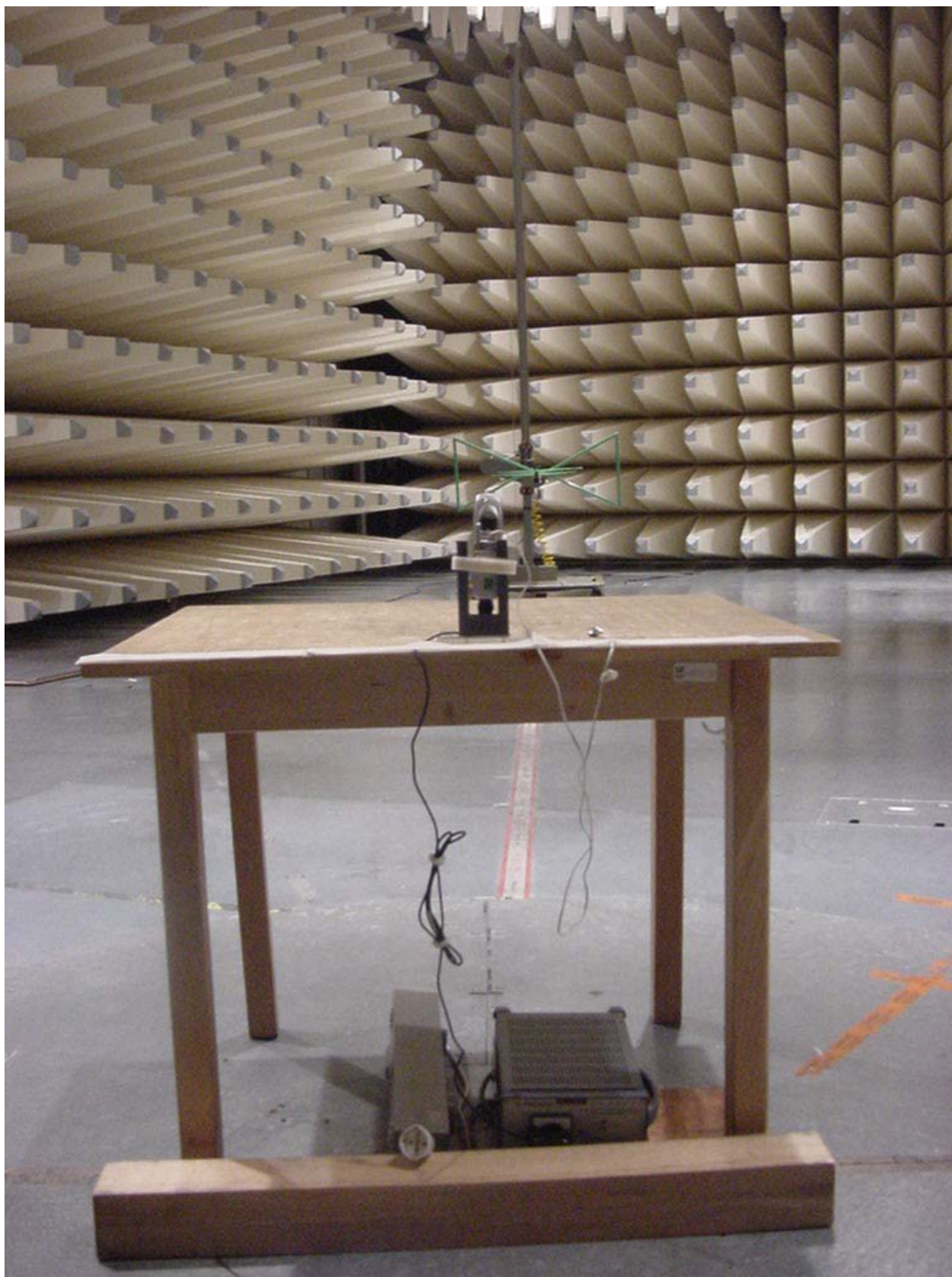
No	Instrument/Ancillary	Type	Manufacturer	Serial No.
01	Spectrum Analyzer	8566 A	Hewlett-Packard	1925A00257
02	Analyzer Display	8566 A	Hewlett-Packard	1925A00860
03	Oscilloscope	7633	Tektronix	230054
04	Radio Communication Analyzer	CMTA 54	Rohde & Schwarz	894 043/010
05	System Power Supply	6038 A	Hewlett-Packard	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	Erft	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**



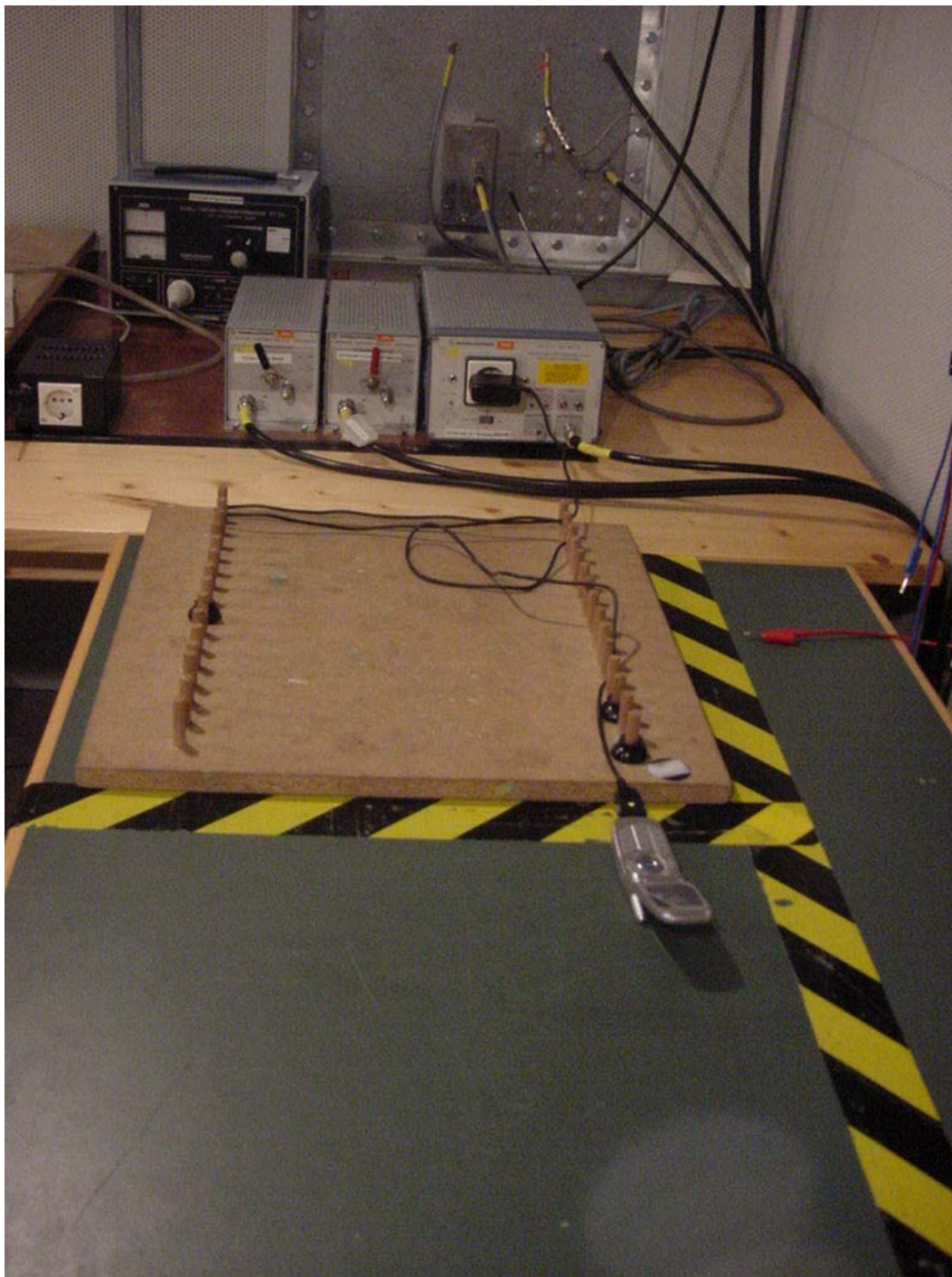


**Test site**





Test site



**Photographs of the equipment**





**Photographs of the equipment**



**Photographs of the equipment**



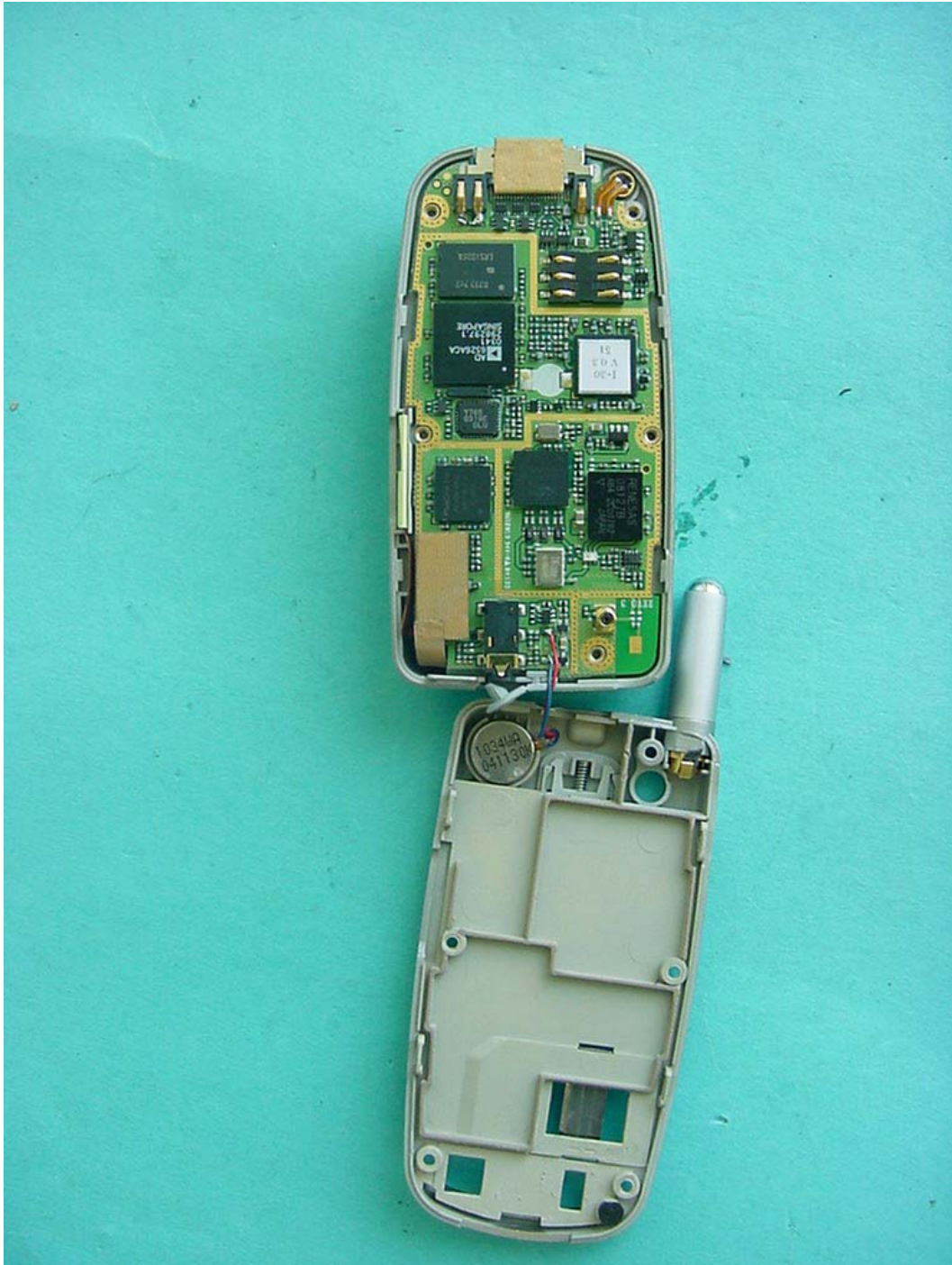


Photographs of the equipment

**Battery INNO 30(SLIM)**

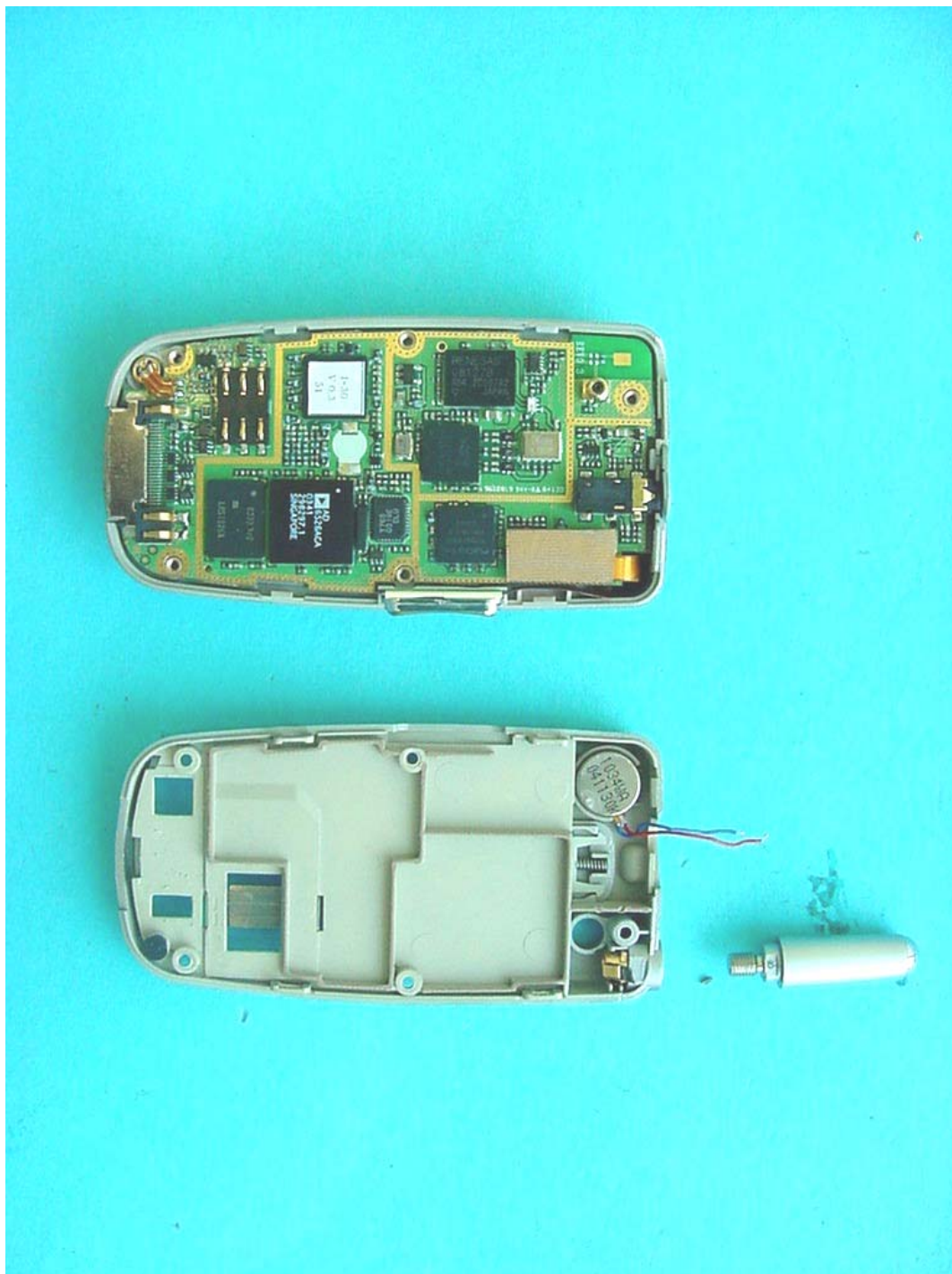


**Photographs of the equipment**

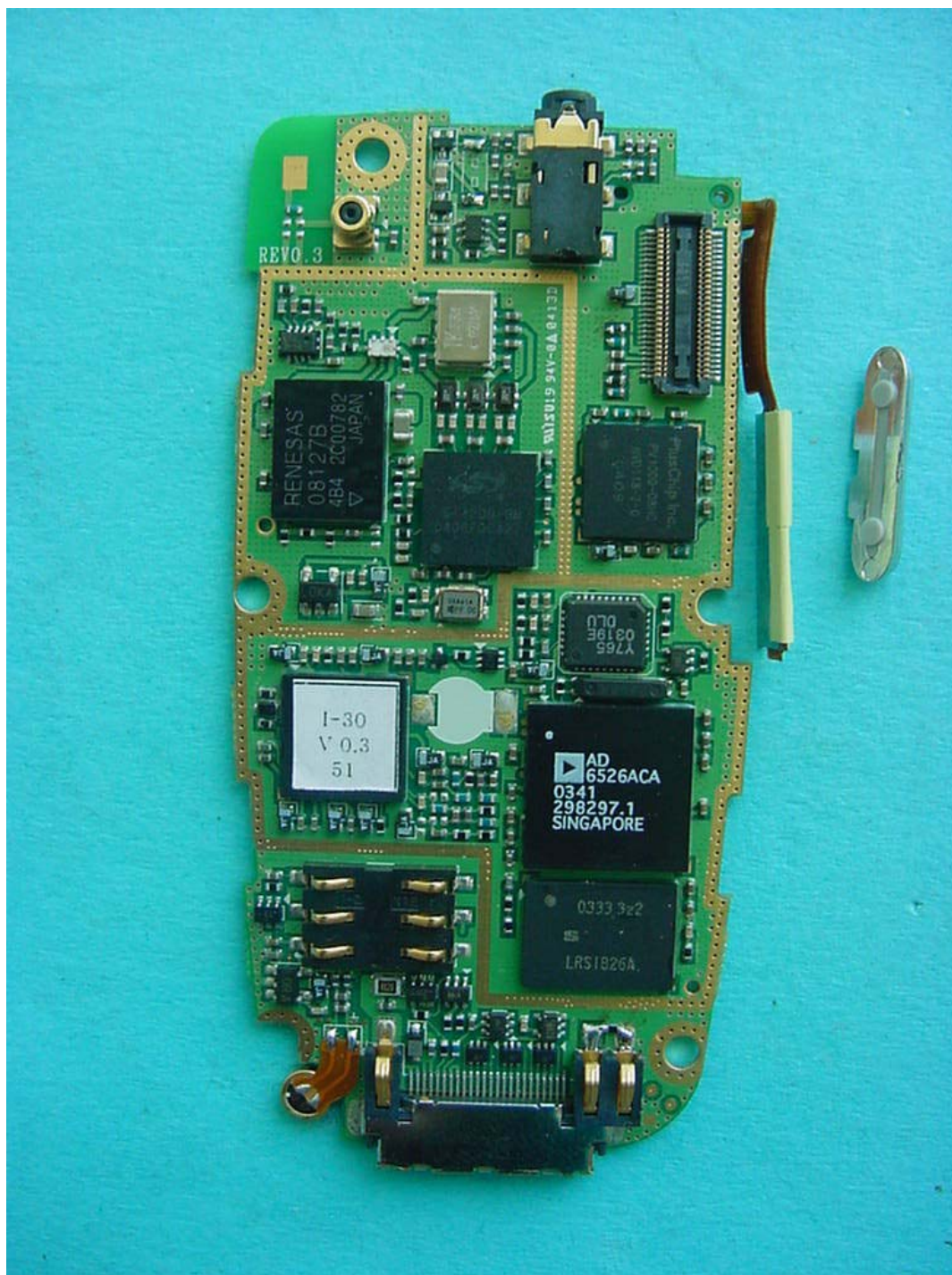




**Photographs of the equipment**

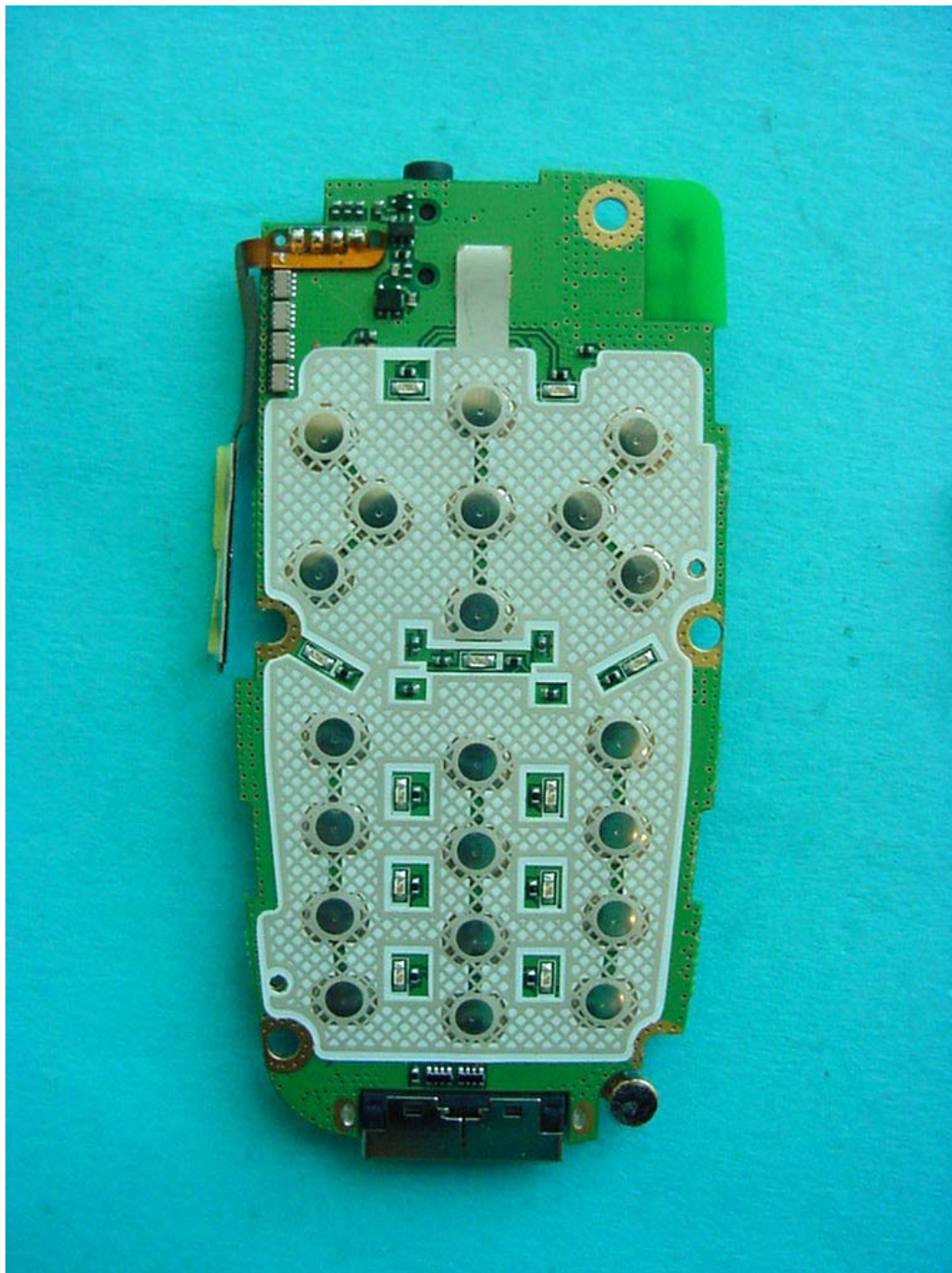


**Photographs of the equipment**

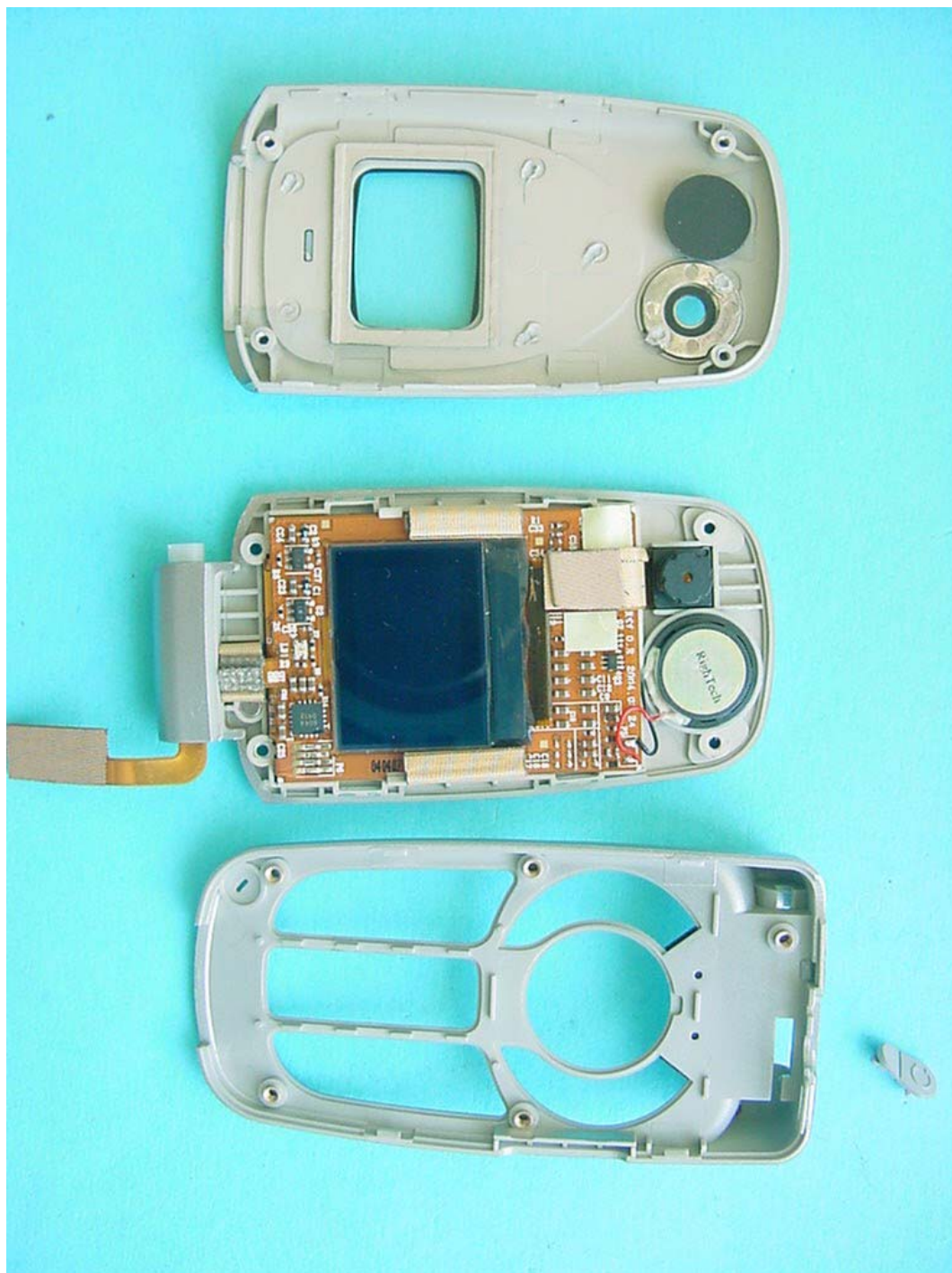




**Photographs of the equipment**



**Photographs of the equipment**





**Photographs of the equipment**



**Photographs of the equipment**



**Photographs of the equipment**

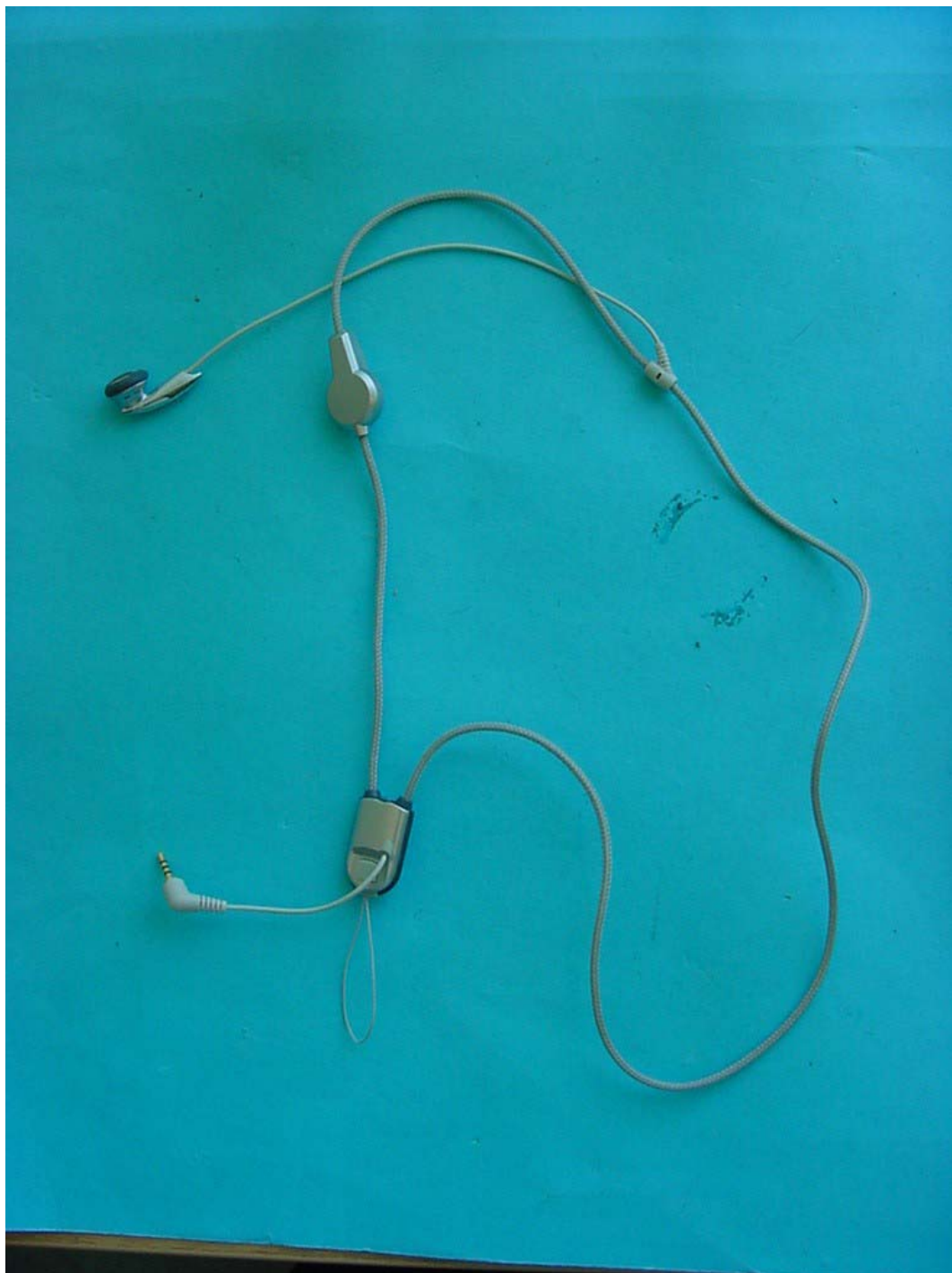
**Headset HC-MYO-INN004**





**Photographs of the equipment**

**Headset HC-MNO-INN005**



**Photographs of the equipment**

TA-2KS-EU / TA-2KS-TW / TA-2KS-CN /TA-2KS-UK



**Photographs of the equipment**

