Member of RWTÜV Group

Recognized by the
Federal Communications Commission and Industry Canada
Anechoic chamber registration No.: 90462 (FCC)
Anechoic chamber registration No.: 3463 (IC)
TCB ID: DE0001

Accredited by the
German Accreditation Council
DAR-Registration Number
TTI-P-G 166/98

Independent ETSI
compliance test house

Accredited Bluetooth™ Test Facility (BQTF)

Test report No.	4-1139-01-02/03
Applicant:	PEMSTAR
Type:	PEMSTAR_ALVA MPO 5500
FCC – ID No:	RHP-MP05500

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1 General information

1.1 Notes

The test results of this test report relate exclusively to the test item specified in 1.5.

CETECOM ICT Services GmbH does not assume responsibility for any conclusions and generalisations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item.

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Test Laboratory Manager :

Date	Name	Signature
02.10.2003	Manfred Paschwitz	

Technical responsibility for area of testing :

Date	Name	Signature
02.10.2003	Klaus Kammerinke	

CETECOM
Cetecom ICT Services
Accredited Test Laboratory
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1.2 Testing laboratory

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State of accreditation:

The test laboratory is accredited according to	DIN EN ISO/IEC 17025.
DAR-registration number (RepTP Germany):	TTI-P-G 166/98-30
Federal Communication Commission (FCC):	90462
Industry Canada (IC):	3463

Testing location, if different from CETECOM ICT Services GmbH: not applicable

1.3 Details of applicant

Name	:	PEMSTAR
Street	:	Lelyweg 1
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Contact person

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1.4 Application details

Date of receipt of application	:	18.09.2003
Date of receipt of test item	:	18.09.2003
Date of test	:	26.09.2003 - 01-10.2003

1.5 Test item (EUT)

Description	:	Mobile phone for handicaped people
Type designation	:	PEMSTAR_ALVA MPO 5500
FCC – ID No.	:	RHP-MPO5500
Manufacturer	:	PEMSTAR NL - 7600EA Almelo Netherlands

1.6 Technical data

Frequency range	:	1850.20 MHz – 1909.80 MHz
Test frequencies	:	1850.2 MHz, 1880.0 MHz 1909.8 MHz
Number of channels	:	300
Output power (EIRP)	:	29.5 dBm
Duplex spacing	:	80.0 MHz
Type of modulation	:	300KGXW
Antenna	:	Fixed integral antenna
Normal power supply (U nom)	:	7.4 V DC
Extreme power supply (U min)	:	6.0 V DC
(U max)	:	8.4 V DC
Temperature range	:	-30.0 ° C to +60.0 ° C

1.6.1 Operation conditions

For 24 the substitution according to TIA/EIA 603 method is used.

All measurements in this report are done in GSM mode and Peak mode.

Remarks:
For AC-conducted measurements we used an AC-Adapter from FRIWO, type SDA 5515.
We also tested the phone with a data cable for USB.
Test setups :
Radiated measurements : Mobile with AC-adapter and data cable
Conducted measurements: Mobile with AC-adapter and data cable
Part15: Mobile with AC-adapter and data cable

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

1.6.2 Equipment under test

Type : PEMSTAR_ALVA MPO 5500

1.7 Test standards

	Code of Federal Regulations (CFR 47) Federal Communications Commission (FCC)
FCC Part 1	Practice and Procedure Sections 1.1307, 1.1310
FCC Part 2	General rules and regulations Sections 2.1046 through 2.1057
FCC Part 15	Radio frequency devices Sections 15.107, 15.109 and 15.207, 15.209
FCC Part 24	Personal communication services Subpart E Broadband PCS Sections 24.229, 24.232, 24.235, 24.236, 24.238

2 Technical test

2.1 Summary of test results

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

[ ] The deviations as specified in 2.5 were ascertained in the course of the performed tests.

2.2 Test environment

Extreme environmental conditions are documented especially for each test.

Normal conditions :	Temperature	+23.0 °C
	Humidity	55.0 %

2.3 Measurement uncertainties

The measurement and test set-up is defined in the technical specification.

2.4 Test equipment utilized and test set-up

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

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	Digital Radiocommunication Tester	CMD 55	Rohde & Schwarz	1050.9008.05

2.5 Test results

2.5.1 Test results overview

This test was performed :

☐ in addition to the test report no.

Verification of EUT :

☒ EUT is in accordance with the technical description

☐ EUT is not in accordance with the technical description

☒ The equipment is compliant to FCC requirement

2.5.2 List of Measurements page

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POWER OUTPUT Section 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	+30.0	± 2.0

Conducted Power Results:

Frequency (MHz)	Power Step	Peak Output Power (dBm)	Average Output Power (dBm)
1850.2	0	29.41	29.31
1880.0	0	29.42	29.32
1909.8	0	29.46	29.36
Measurement uncertainty		±0.5 dB	

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
64

Radiated Power Measurements (EIRP):

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."
Method of Measurement:
1. In an anechoic antenna test chamber, a half–wave dipole antenna for the frequency band of interest is placed at the reference center of the chamber. An RF Signal source for the frequency band of interest is connected to the dipole with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A known (measured) power (Pin) is applied to the input of the dipole, and the power received (Pr) at the chamber's probe antenna is recorded.
2. A "reference path loss" is established as Pin + 2.1 – Pr.
3. The EUT is substituted for the dipole at the reference centre of the chamber. The EUT is put into CW test mode and a scan is performed to obtain the radiation pattern.
4. From the radiation pattern, the co–ordinates where the maximum antenna gain occurs is identified.
5. The EUT is then put into pulse mode at ist maximum power level (Power Step 0).
6. "Gated mode" power measurements are performed with the receiving antenna placed at the co–ordinates determined in Step 3 to determine the output power as defined in FCC Rule 24.232 (b) and (c). The "reference path loss" from Step 1 is added to this result.
7. This value is EIRP since the measurement is calibrated using a half–wave dipole antenna of known gain (2.1 dBi) and known input power (Pin).
8. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP –2.1dBi.

Limits:

Power Step	Burst EIRP (dBm)
0	<33.0

Radiated Power Results (EIRP):

Frequency (MHz)	Power Step	BURST (dBm)		MODULATION AVERAGE (dBm)	
		EIRP	ERP	EIRP	ERP
1850.2	0	29.22	27.12	20.22	18.12
1880.0	0	28.30	27.20	19.30	17.2
1909.8	0	29.57	27.47	20.57	18.47
Measurement uncertainty		±3 dB			

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24, 64

FREQUENCY STABILITY Section 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 –30.0 °C.

3. With the mobile station, powered with 6.0 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 10.0 ° C increments from –30.0 ° C to +60.0 ° 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 7.4 Volts. Vary supply voltage from minimum 6.0 Volts to maximum 8.4 Volts, in 12 steps re–measuring carrier frequency at each voltage. Pause at 7.4 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 +60.0 ° C.

7. With the mobile station, powered with 7.4 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 10.0 °C increments from +60.0 °C to –30.0 °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 Section 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 6.0 V DC and 8.4 V DC, with a nominal voltage of 7.4 V DC.

Frequency Stability Results

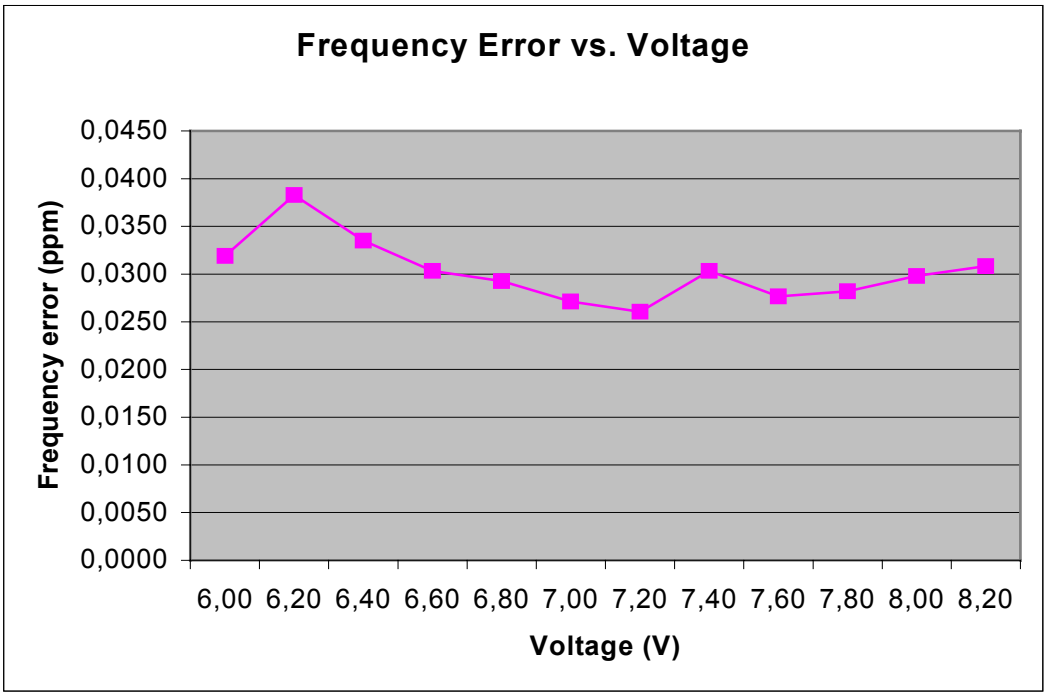
AFC FREQ ERROR vs. VOLTAGE

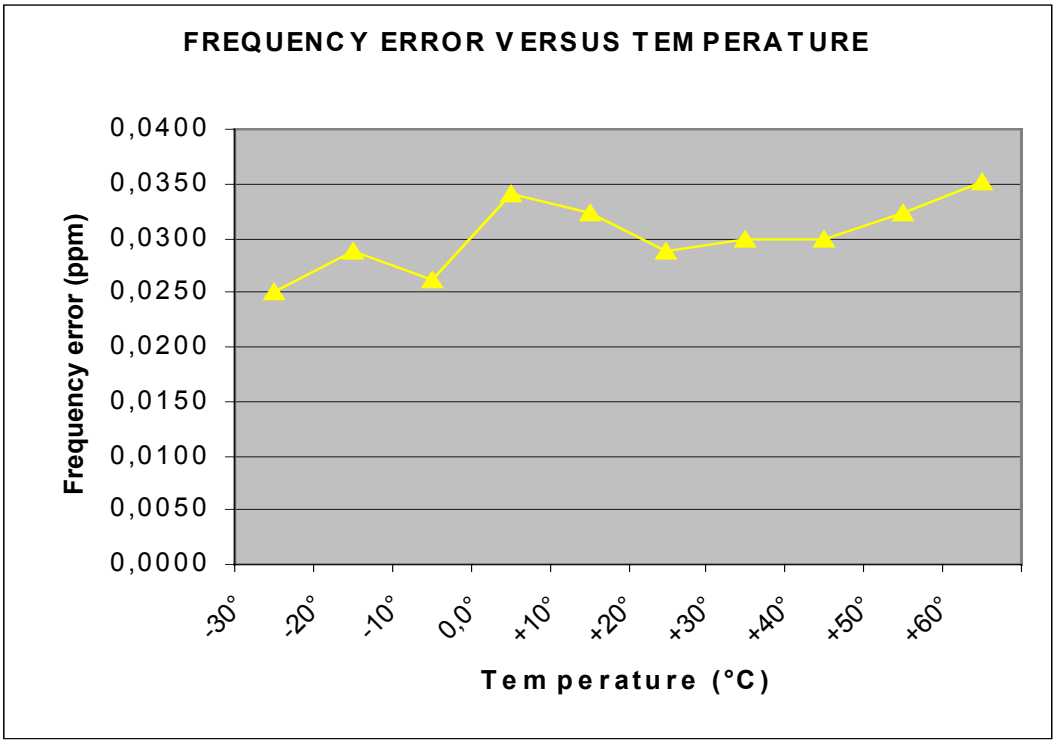
Voltage (V)	**Frequency Error (Hz)**	**Frequency Error (%)**	**Frequency Error (ppm)**
6.0	**61**	**0,00000324**	**0,0324**
6.2	**60**	**0,00000319**	**0,0319**
6.4	**72**	**0,00000383**	**0,0383**
6.6	**63**	**0,00000335**	**0,0335**
6.8	**57**	**0,00000303**	**0,0303**
7.0	**55**	**0,00000293**	**0,0293**
7.2	**51**	**0,00000271**	**0,0271**
7.4	**49**	**0,00000261**	**0,0261**
7.6	**57**	**0,00000303**	**0,0303**
7.8	**52**	**0,00000277**	**0,0277**
8.0	**53**	**0,00000282**	**0,0282**
8.2	**56**	**0,00000298**	**0,0298**
8.4	**58**	**0,00000309**	**0,0309**

AFC FREQ ERROR vs. TEMPERATURE

TEMPERATURE (°C)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
–30	**48**	0,00000250	0,0250
–20	**52**	0,00000287	0,0287
–10	**50**	0,00000261	0,0261
±0.0	**58**	0,00000340	0,0340
+10	**57**	0,00000324	0,0324
+20	**52**	0,00000287	0,0287
+30	**55**	0,00000298	0,0298
+40	**55**	0,00000298	0,0298
+50	**61**	0,00000324	0,0324
+60	**63**	0,00000351	0,0351

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
64, 16


Frequency Error vs. Voltage
Frequency error (ppm)
0,0450
0,0400
0,0350
0,0300
0,0250
0,0200
0,0150
0,0100
0,0050
0,0000
6,00 6,20 6,40 6,60 6,80 7,00 7,20 7,40 7,60 7,80 8,00 8,20
Voltage (V)


FREQUENCY ERROR VERSUS TEMPERATURE
Frequency error (ppm)
0,0400
0,0350
0,0300
0,0250
0,0200
0,0150
0,0100
0,0050
0,0000
-30° -20° -10° 0,0° +10° +20° +30° +40° +50° +60°
Temperature (°C)

EMISSION LIMITS Section 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 30.0 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier that can be as high as 1910.0 MHz. This was rounded up to 20.0 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 I MHz bandwidth. If the harmonic could not be detected above the noise floor, the ambient level was recorded.
e) Now each detected emission was substituted by the Substitution method, in accordance with the TIA/EIA 603.

Measurement Limit:
Section. 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.
With wanted emission P = 1.0 W (p = 30.0 dBm) at fundamental frequency, the specified minimum attenuation of unwanted emissions is 43 dBc,or expressed in absolute power level p = –13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dBc which again yields a limit of –13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

Measurement Results:
Radiated emissions measurements were made only at the upper, center, and lower carrier frequencies of the USPCS band (1850.2 MHz, 1880.0 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–Section 24.238:
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.

Radiated Spurious Emissions Result

CH 512			
f (MHz)	Power level (dBm)		Remark
1850.2	29.41		carrier
EMISSION LIMITATIONS			
Spurious frequency (MHz)	ERP / EIRP (dBm)	Spurious emission (dBc)	plot see page no
5558.131	–27.7	57.11	19

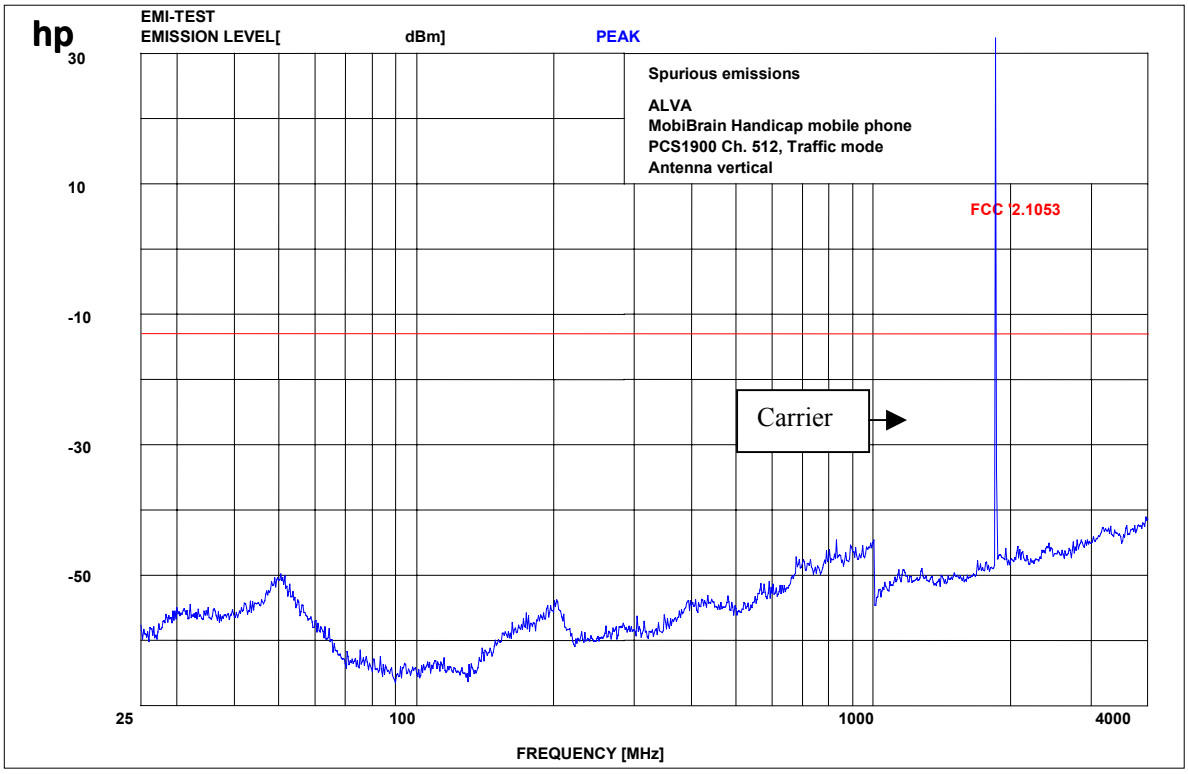
CH 661			
f (MHz)	Power level (dBm)		Remark
1880.0	29.42		carrier
EMISSION LIMITATIONS			
Spurious frequency (MHz)	ERP / EIRP (dBm)	Spurious emission (dBc)	plot see page no
5639.4	–25.4	54.82	22

CH 810			
f (MHz)	Power level (dBm)		Remark
1909.8	29.46		carrier
EMISSION LIMITATIONS			
Spurious frequency (MHz)	ERP / EIRP (dBm)	Spurious emission (dBc)	plot see page no
5738.1	–38.2	67.6	25

Measurement uncertainty	± 0.5dB

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24, 49, 09, 66,

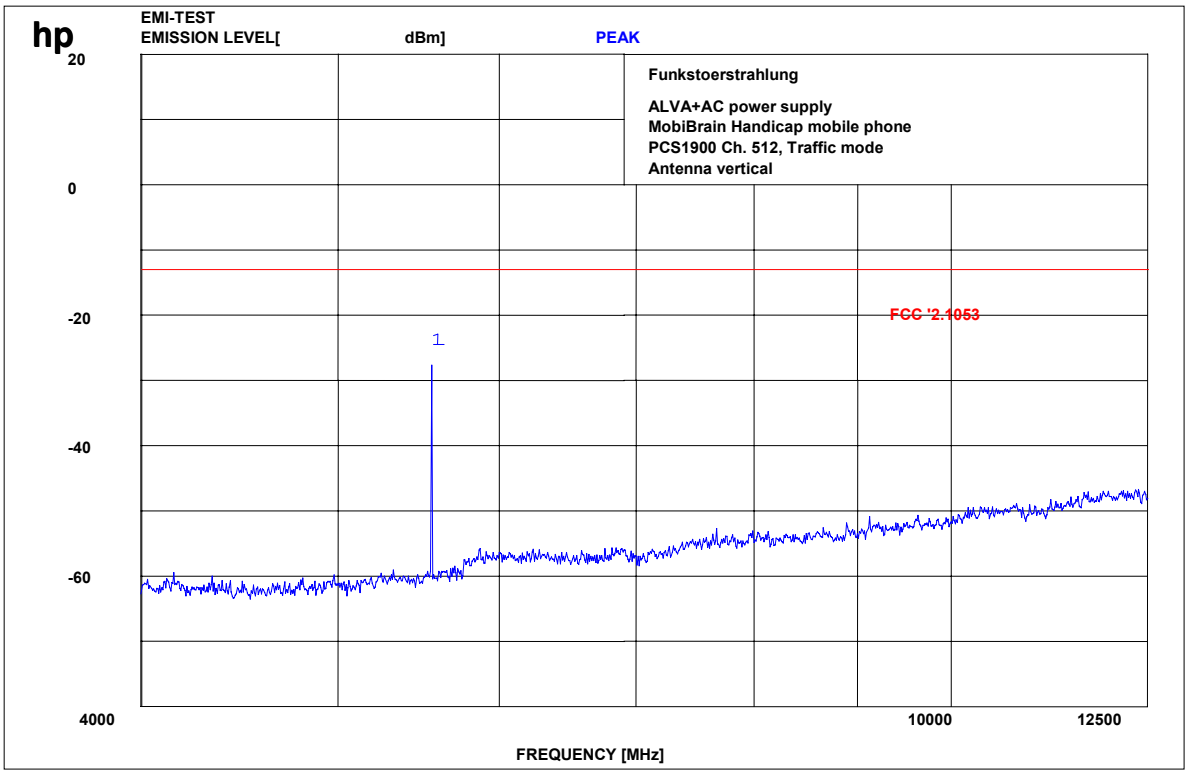
Channel 512 (up to 4 GHz)



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

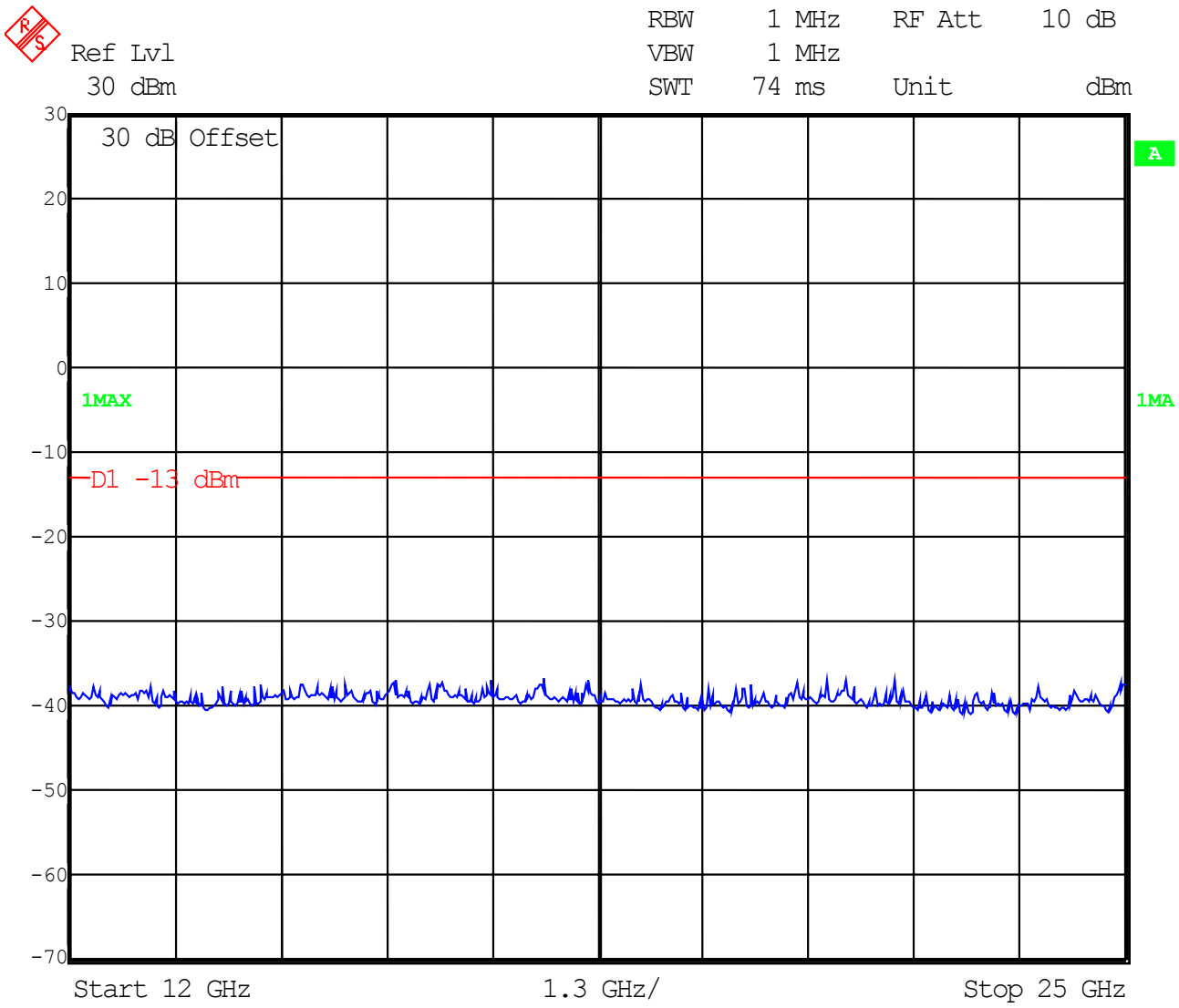
Channel 512 (from 4.0 to 12.75 GHz)



f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW / VBW 1 MHz

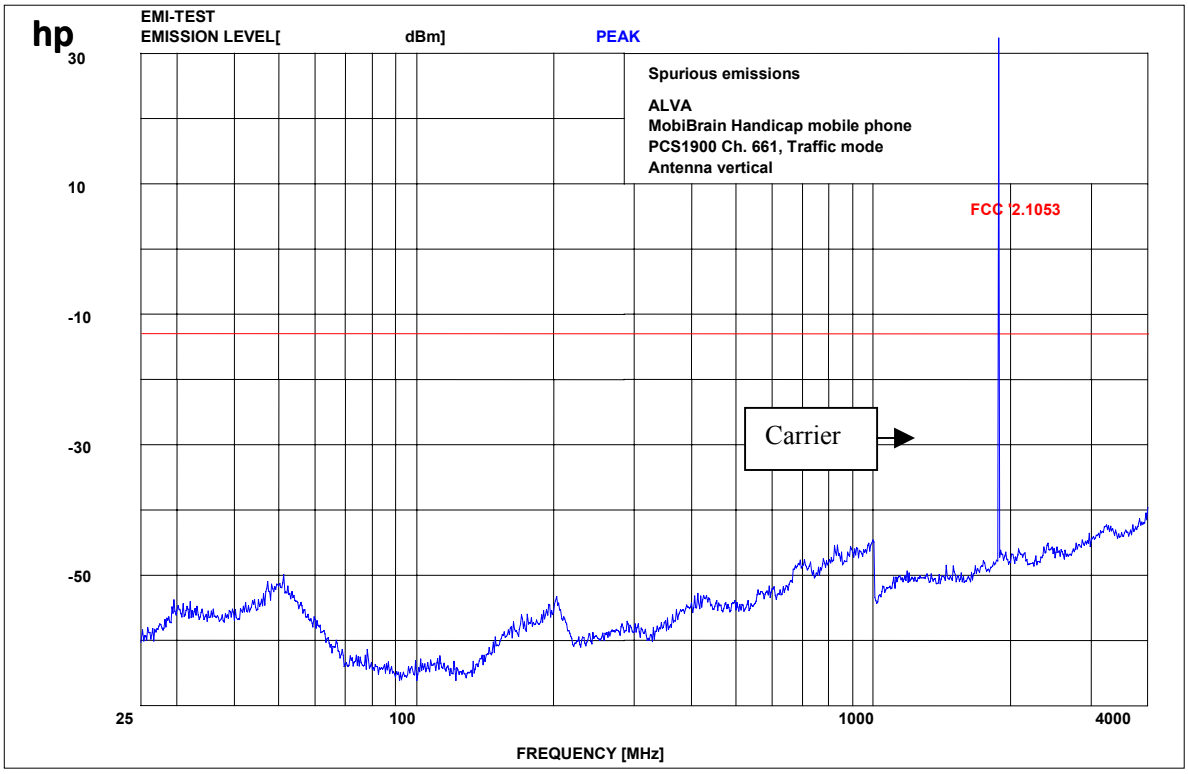
REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24

Channel 512 : (from 12.0 to 25.0 GHz)



REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24

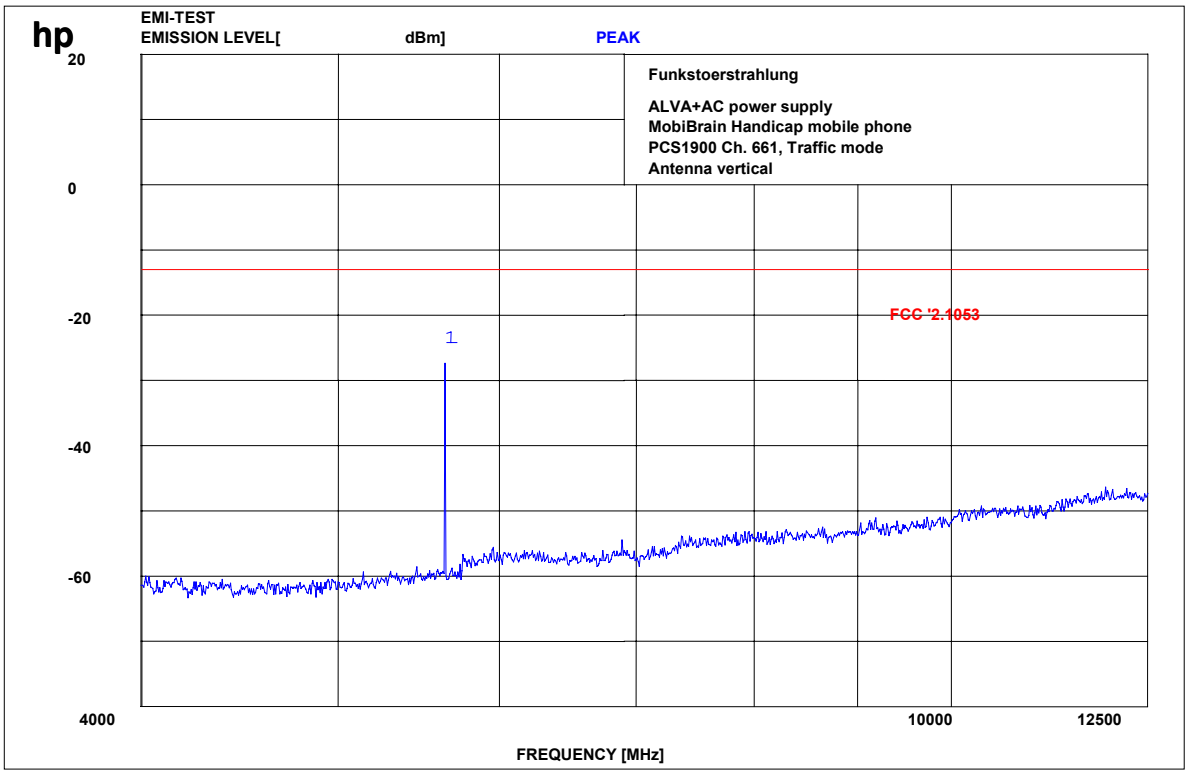
Channel 661 (up to 4 GHz)



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

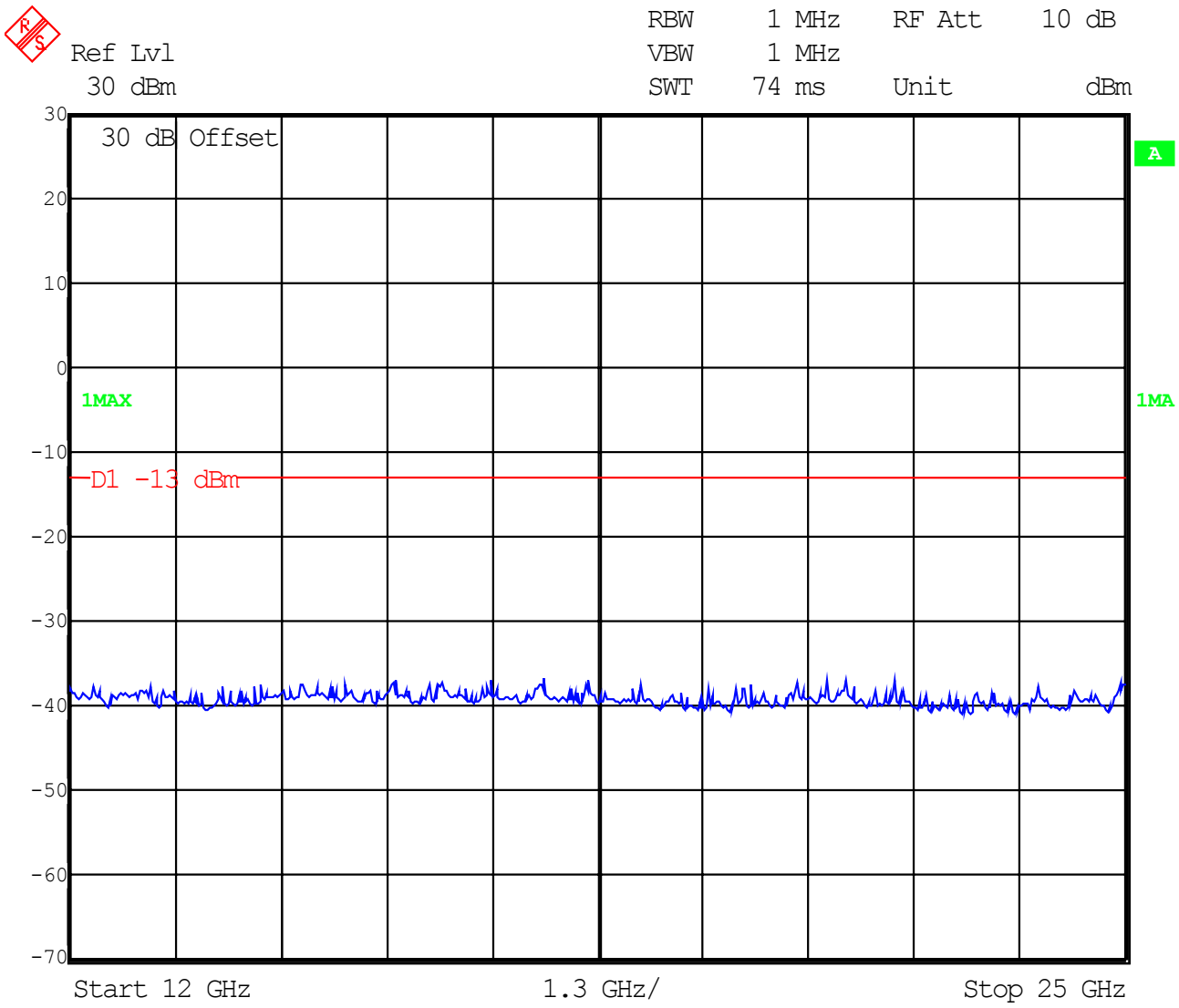
Channel 661 (from 4.0 to 12.75 GHz)



f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW / VBW 1 MHz

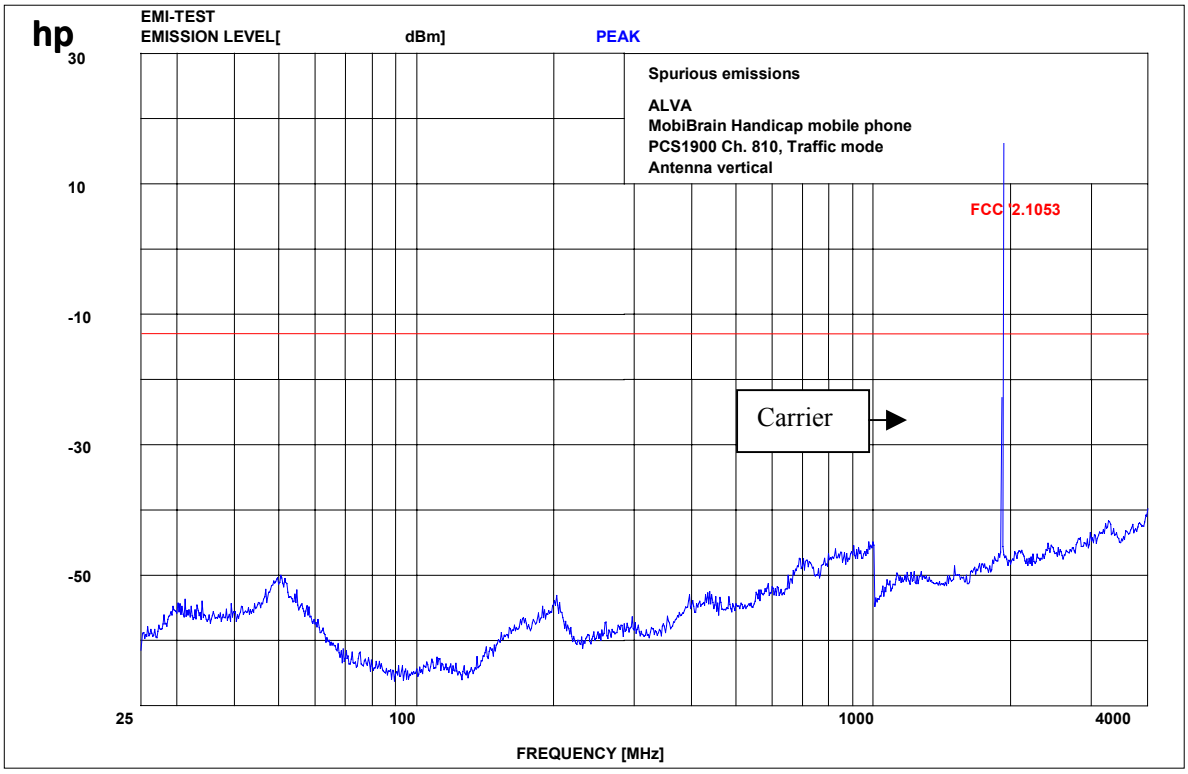
REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24

Channel 661 : (from 12.0 to 25.0 GHz)



REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24

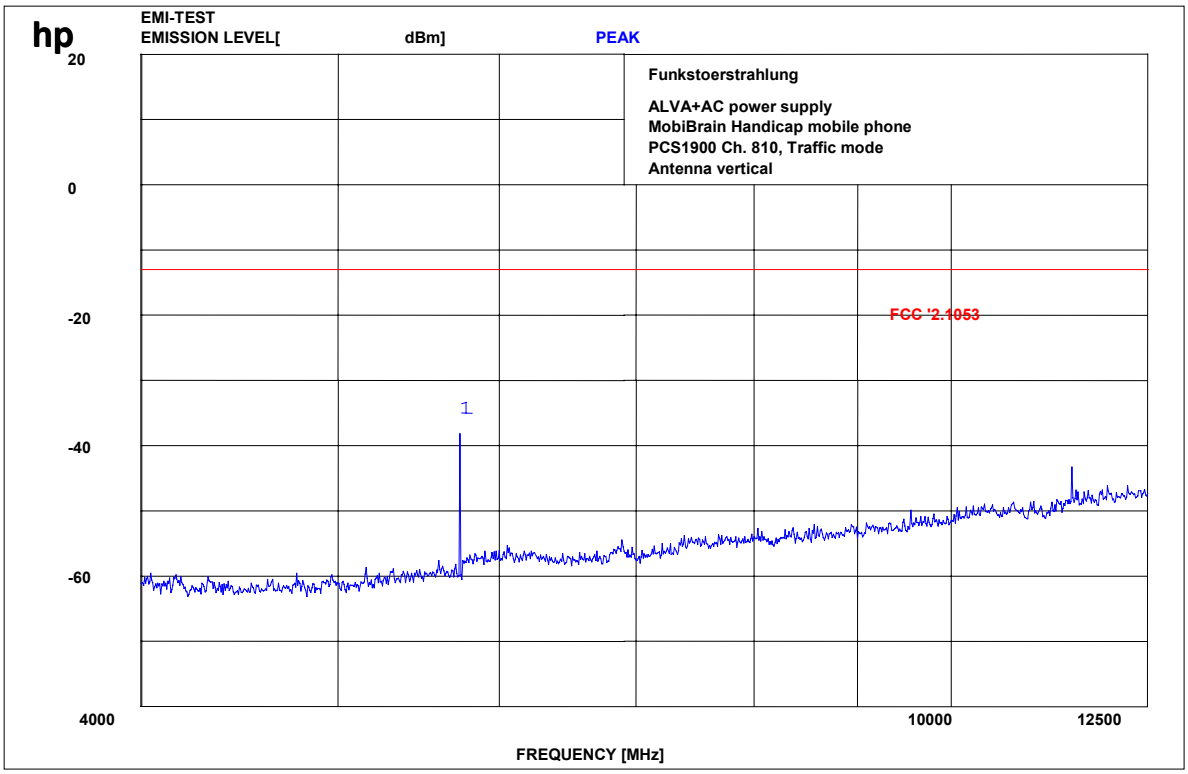
Channel 810 (up to 4 GHz)



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

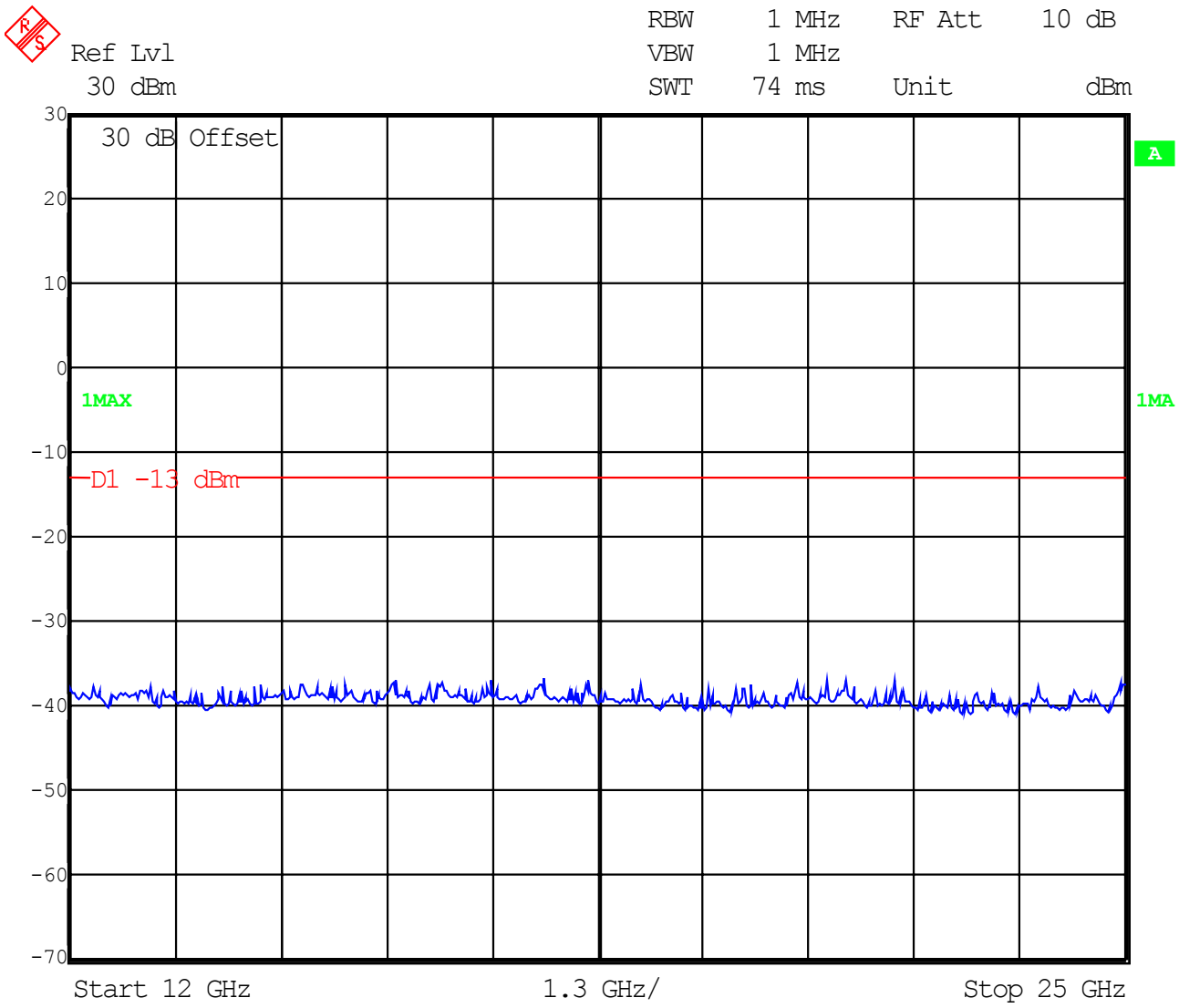
Channel 810 (from 4.0 to 12.75 GHz)



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

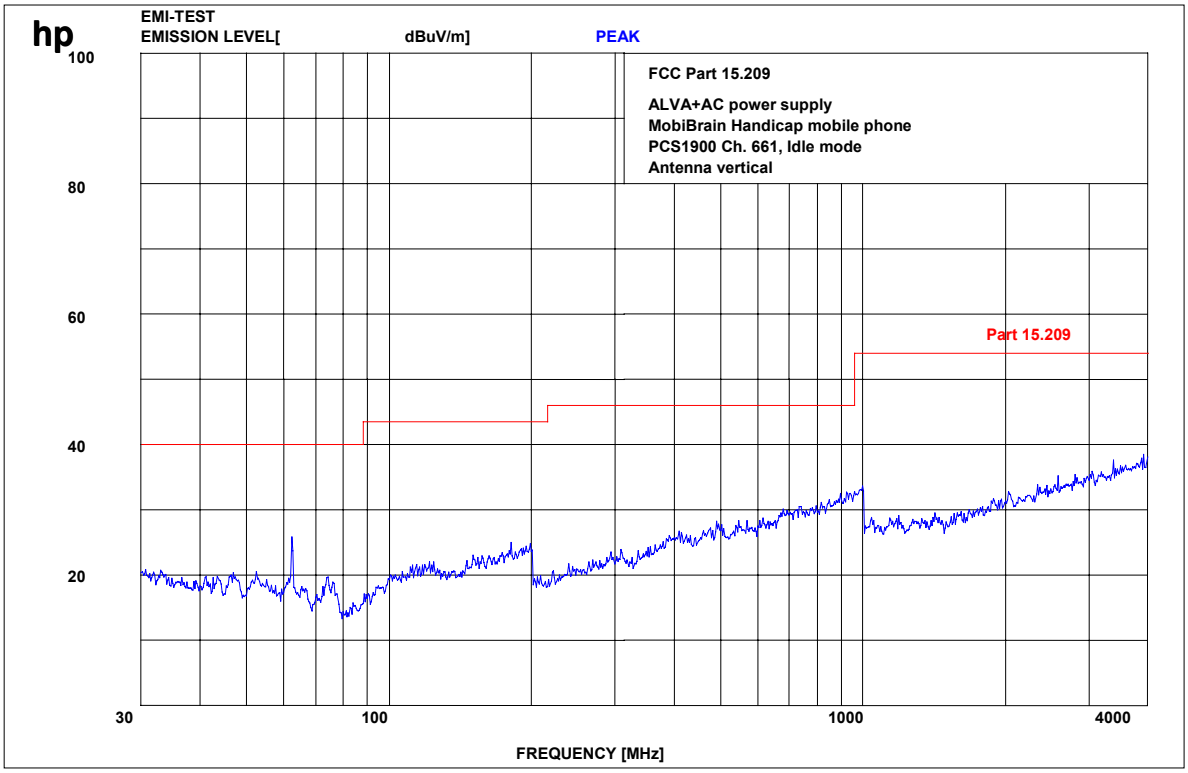
Channel 810 : (from 12.0 to 25.0 GHz)



REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24

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

no peak found

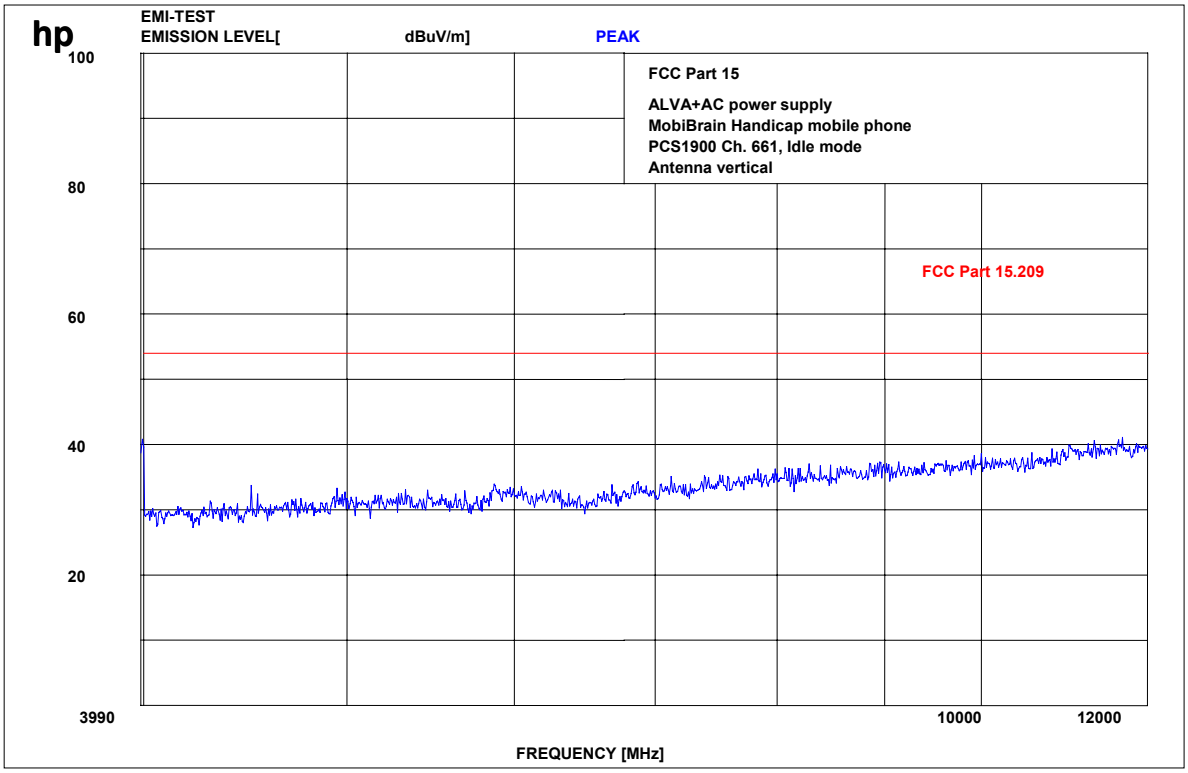


f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW/VBW 1 MHz

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24

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

no peak found

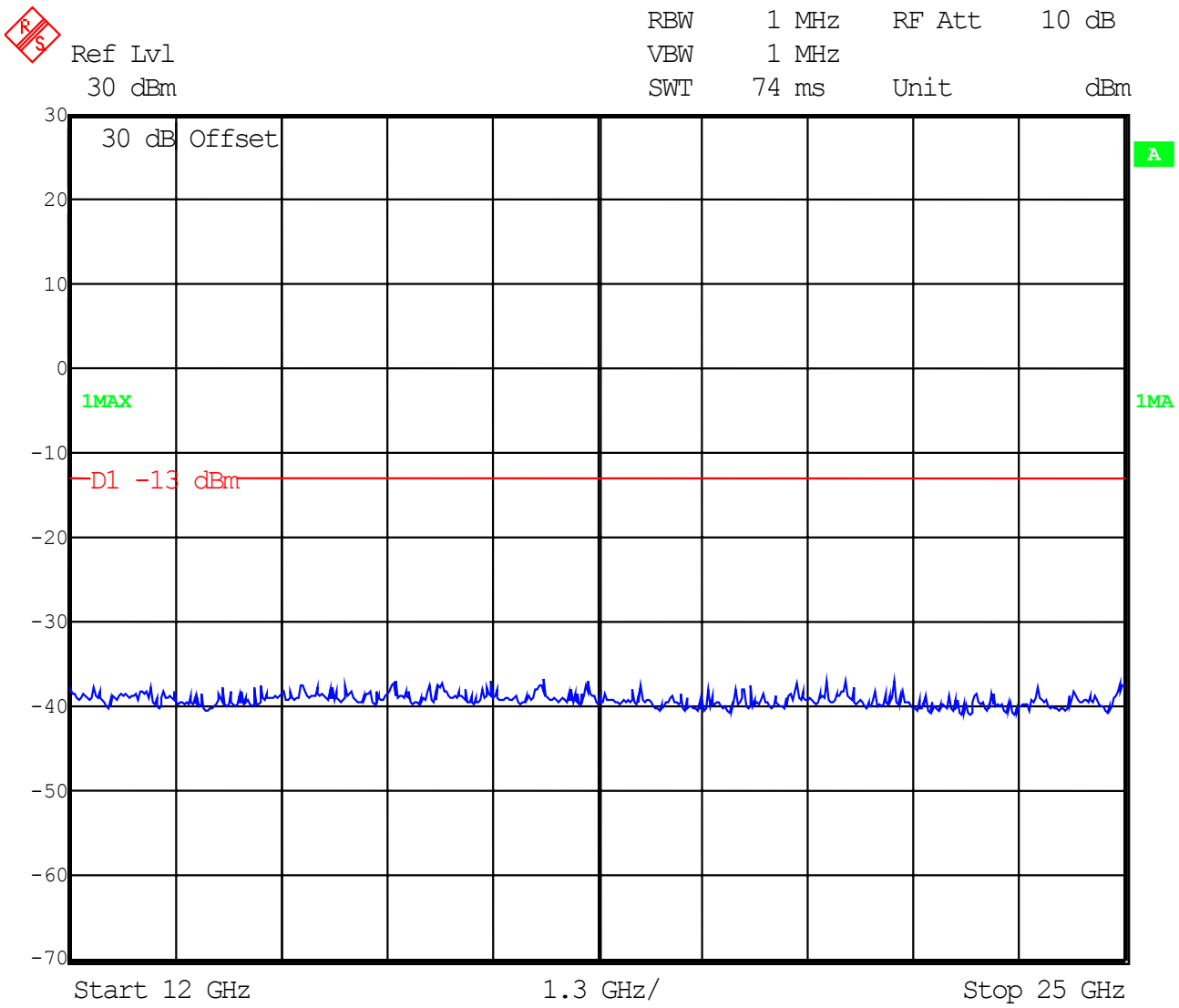


f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW/VBW 1 MHz

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24

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

no peak found



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

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 13.0 MHz to 19.1 GHz, data taken from 10.0 MHz to 20.0 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:

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

Conducted Spurious Emissions Result

CH 512			
f (MHz)	Power level (dBm)		Remark
1850.2	29.41		carrier
EMISSION LIMITATIONS			
Spurious frequency (MHz)	ERP / EIRP (dBm)	Spurious emission (dBc)	plot see page no
3698.3	–37.0	66.41	34
5536.6	–31.9	61.31	34

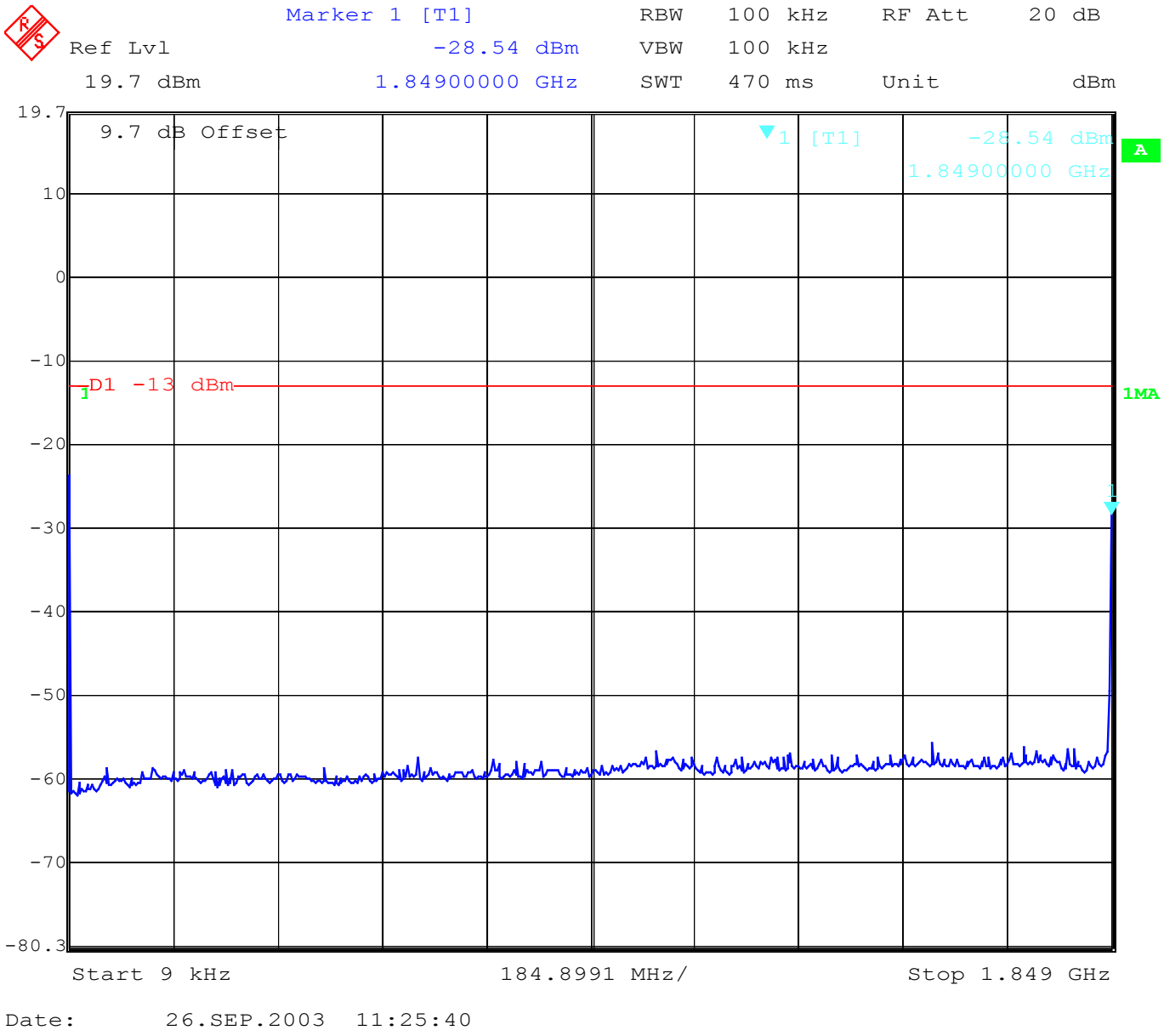
CH 661			
f (MHz)	Power level (dBm)		Remark
1880.0	29.42		carrier
EMISSION LIMITATIONS			
Spurious frequency (MHz)	ERP / EIRP (dBm)	Spurious emission (dBc)	plot see page no
3734.2	–40.7	70.12	36
5633.7	–29.9	59.32	36

CH 810			
f (MHz)	Power level (dBm)		Remark
1909.8	29.46		carrier
EMISSION LIMITATIONS			
Spurious frequency (MHz)	ERP / EIRP (dBm)	Spurious emission (dBc)	plot see page no
3608.0	–47.8	77.26	39
5705.1	–31.4	60.86	39

Measurement uncertainty	± 0.5dB

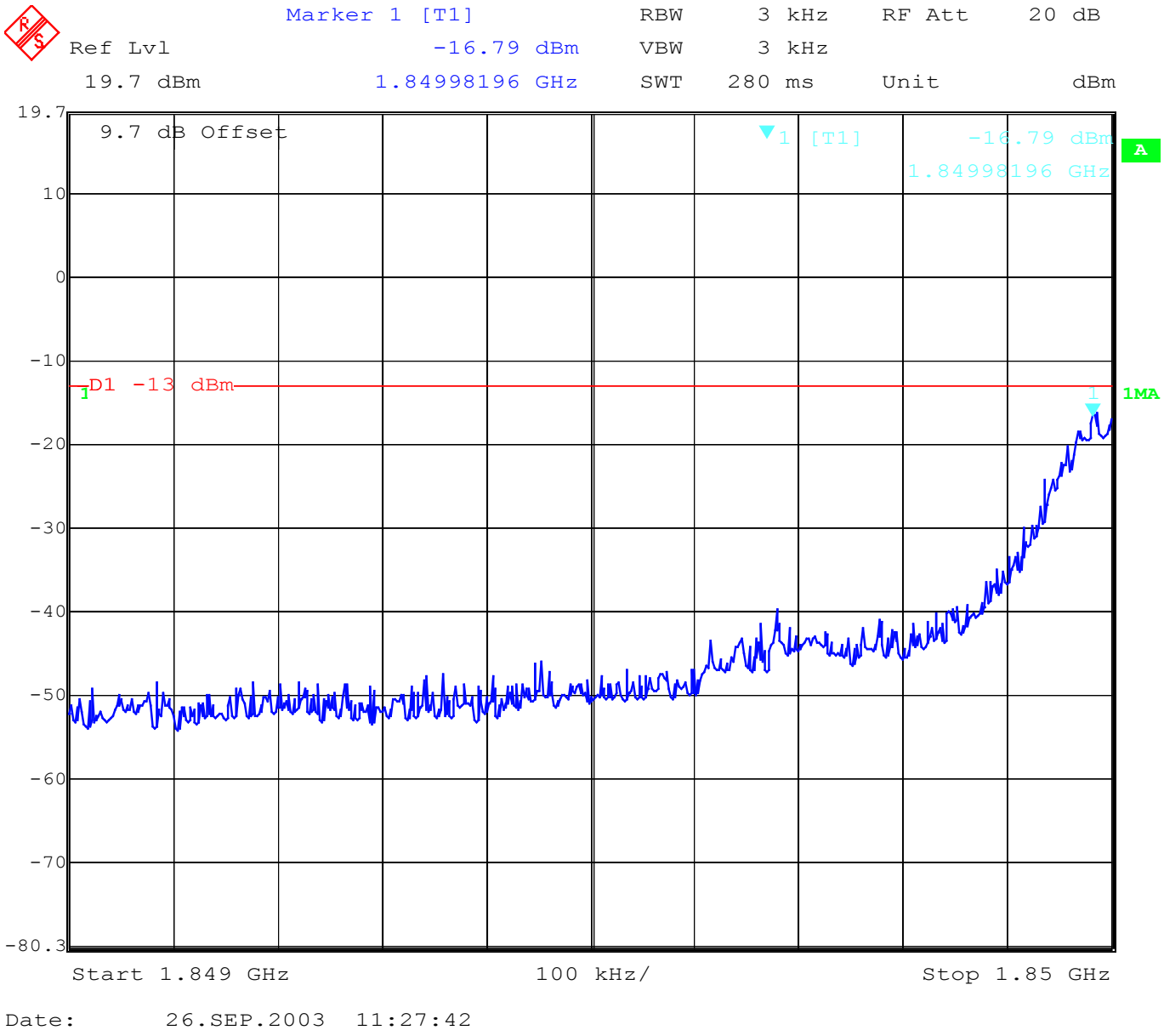
REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24

Channel: 512



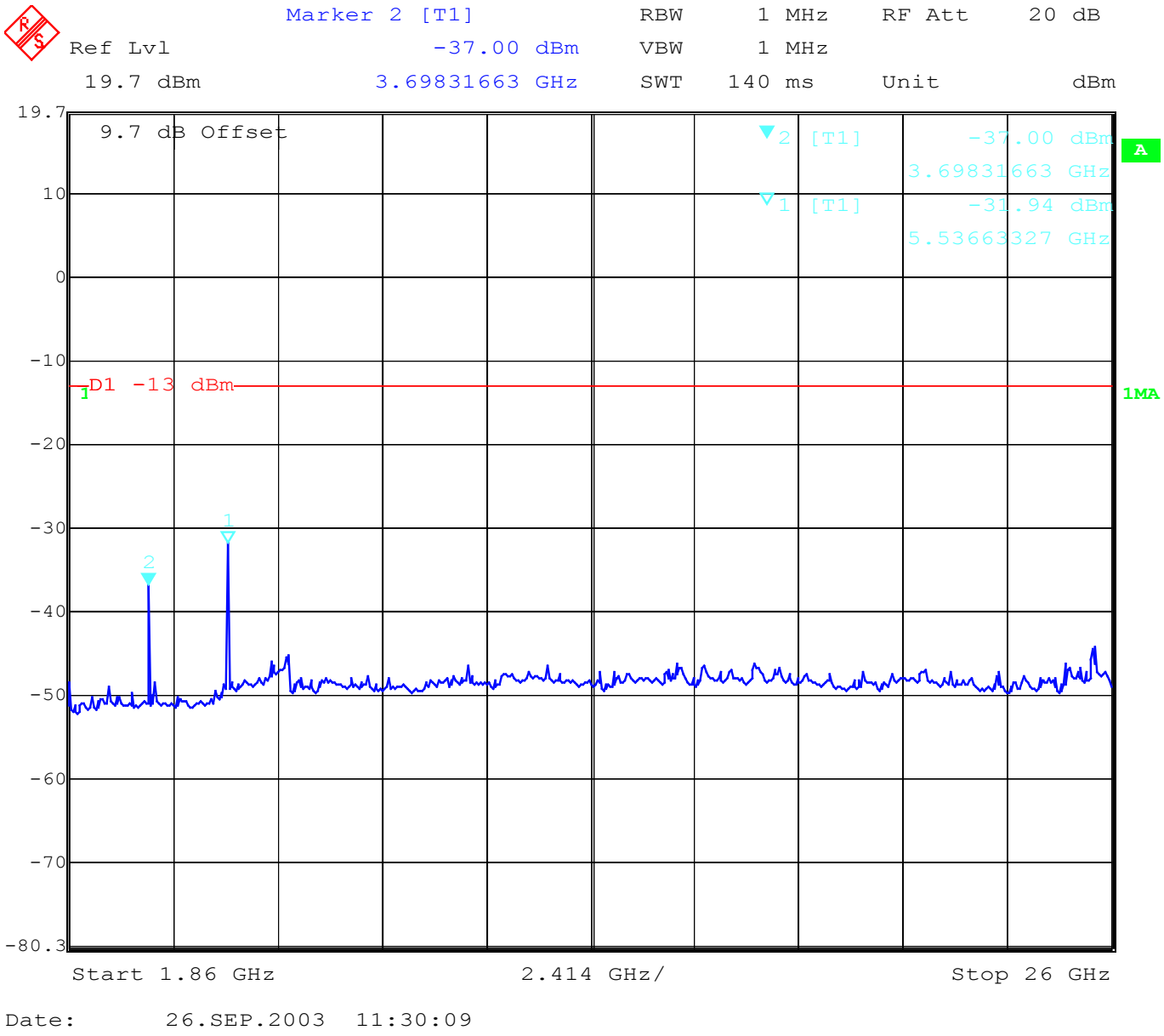
REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24

Channel 512



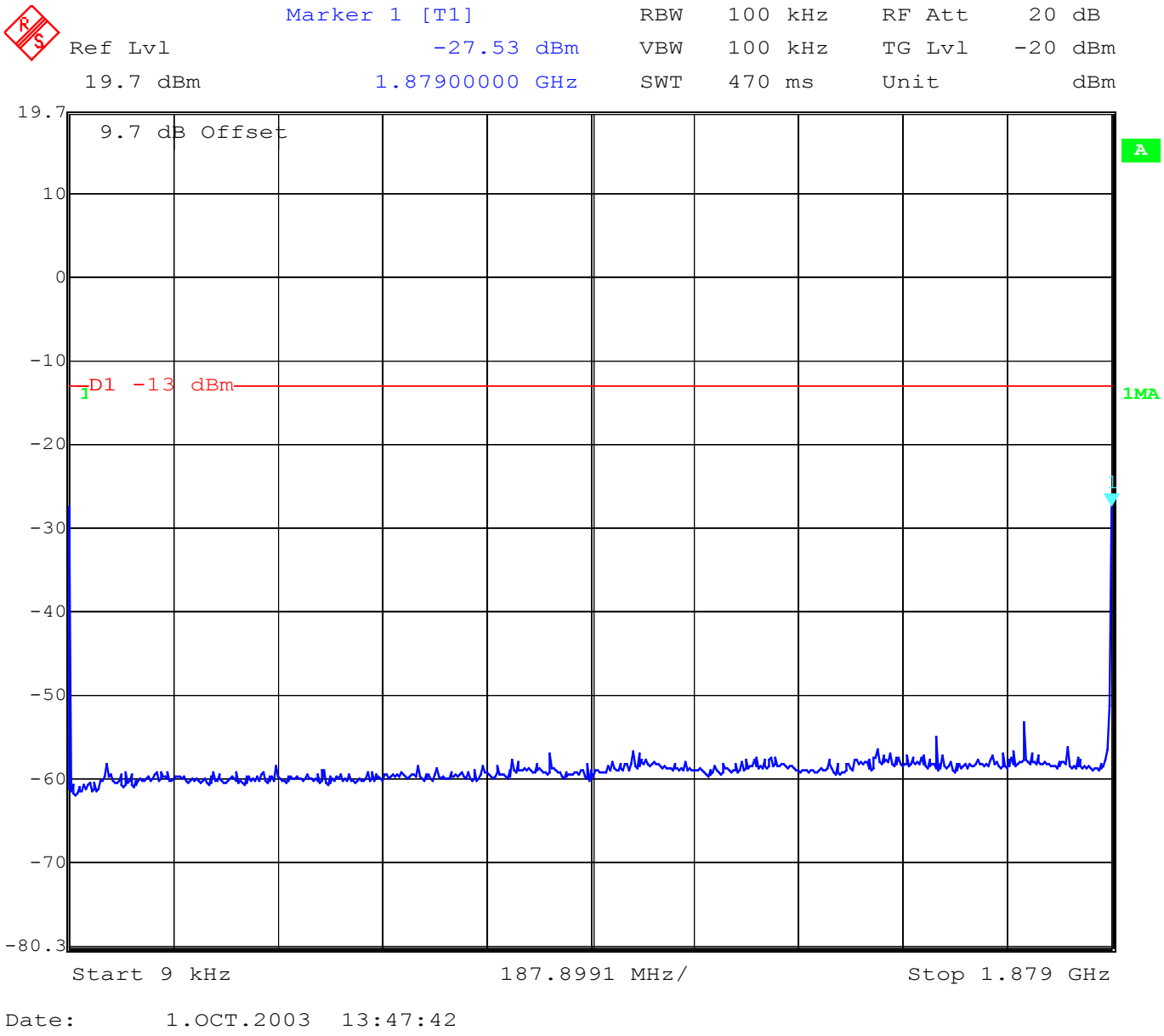
REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24

Channel 512



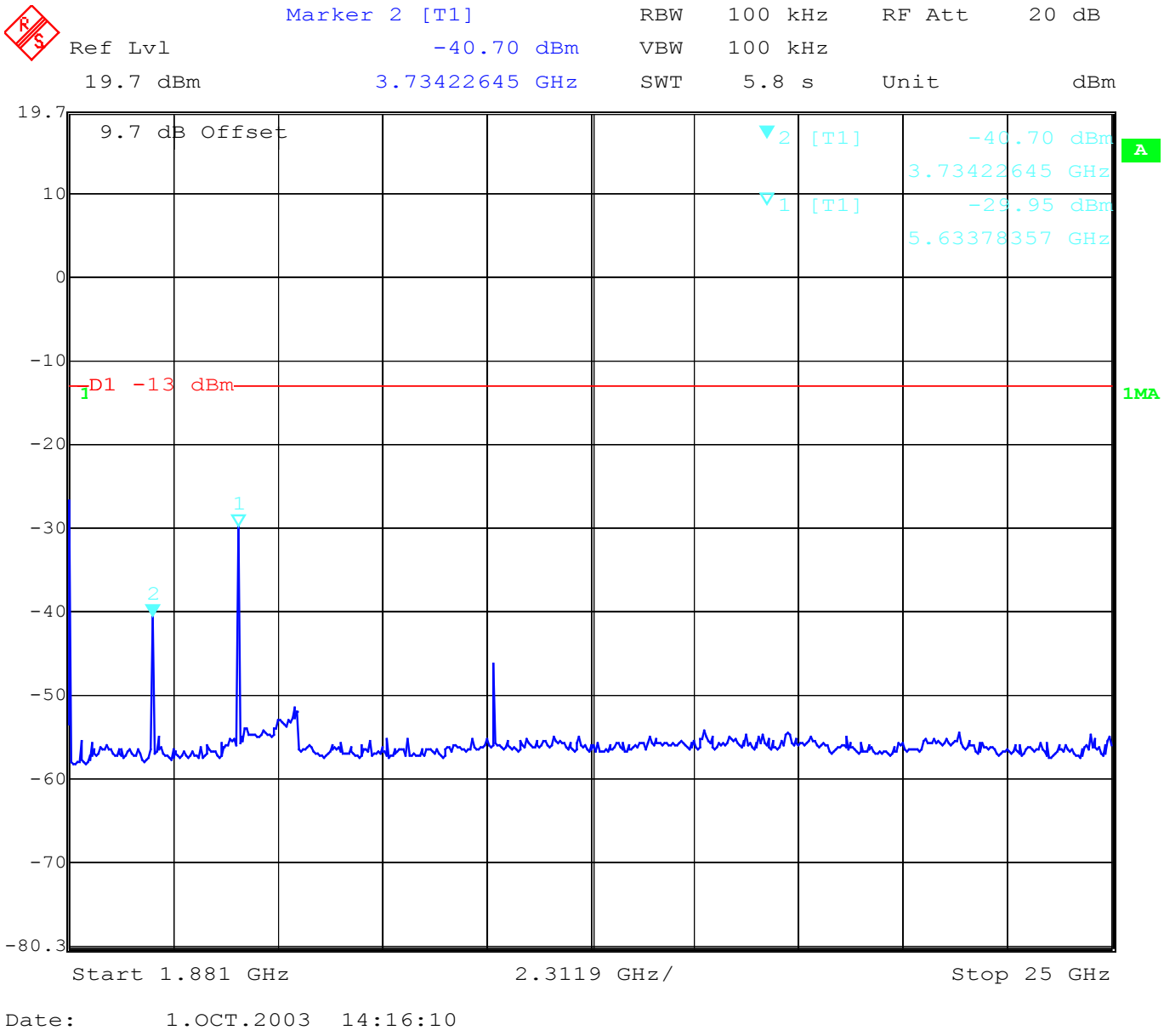
REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24

Channel 661



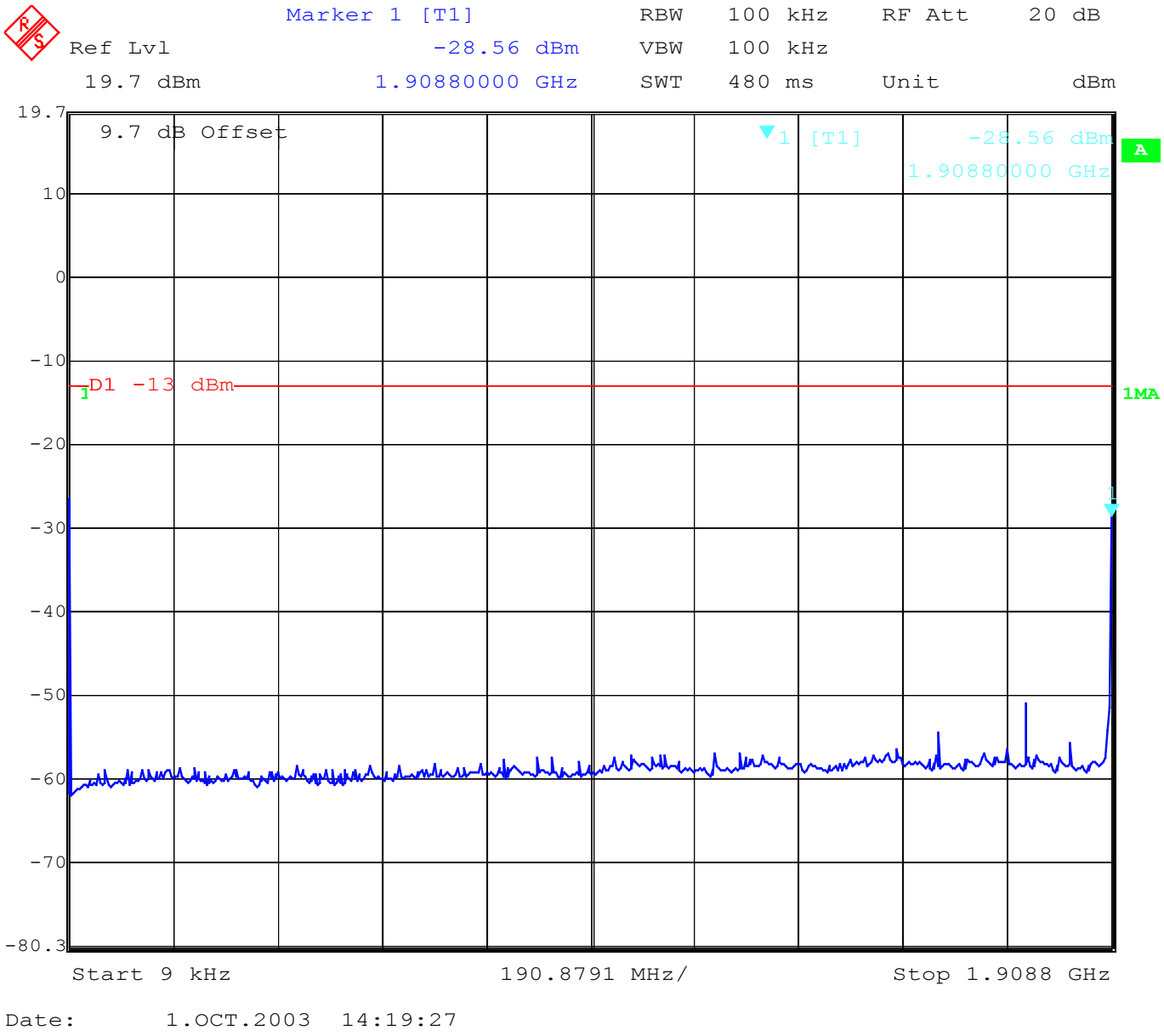
REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24

Channel 661



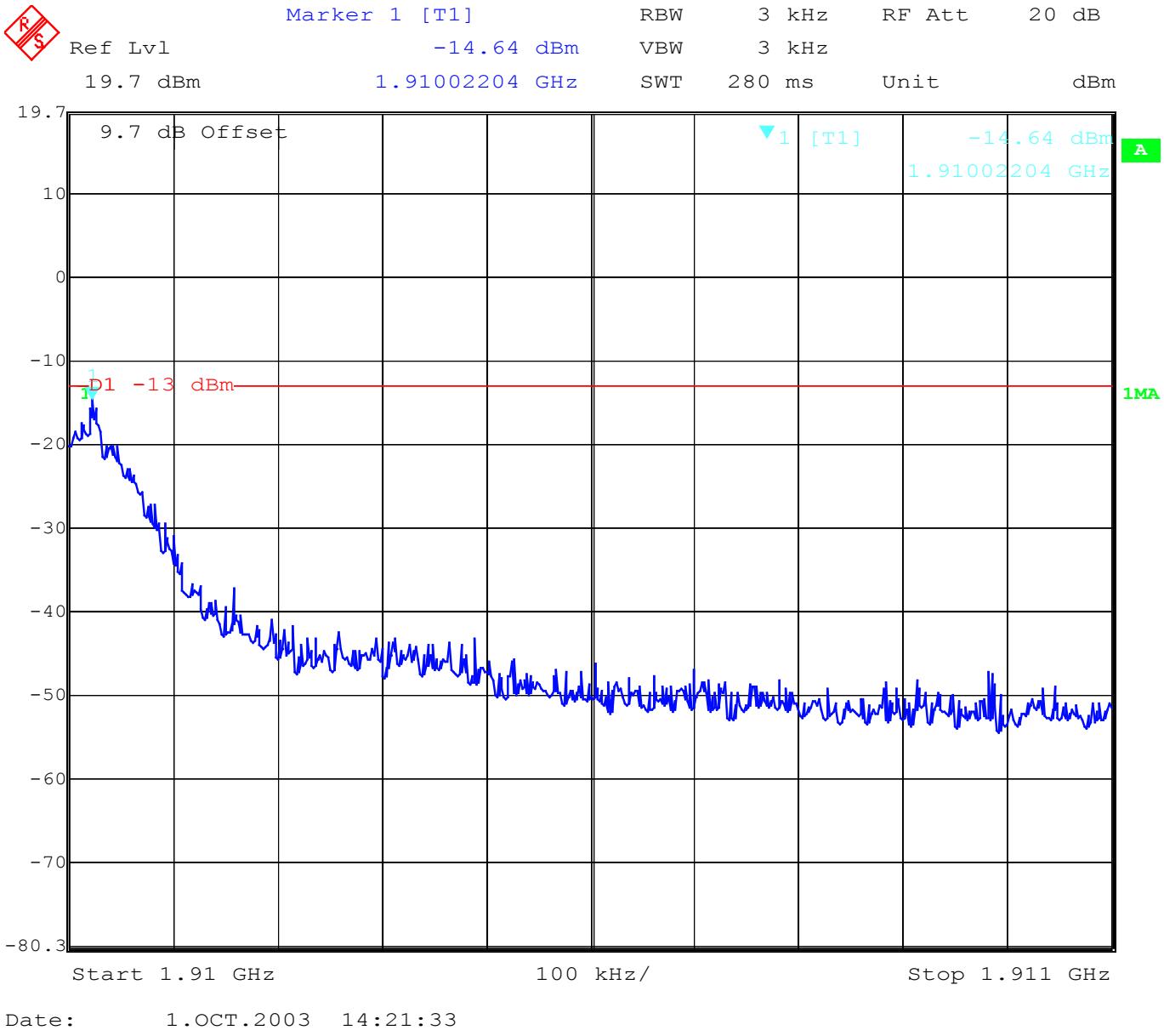
REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24

Channel 810



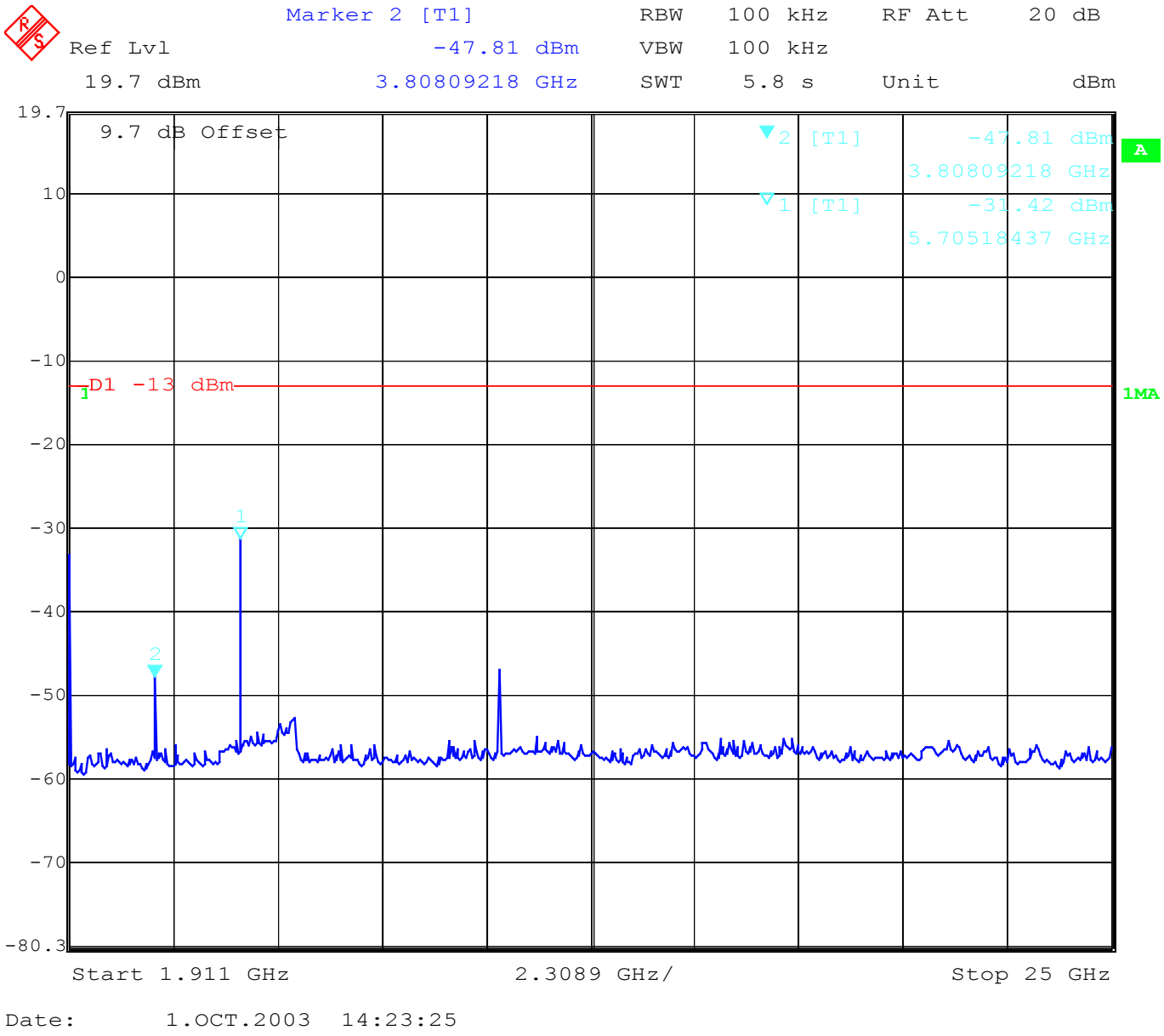
REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24

Channel 810



REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24

Channel 810

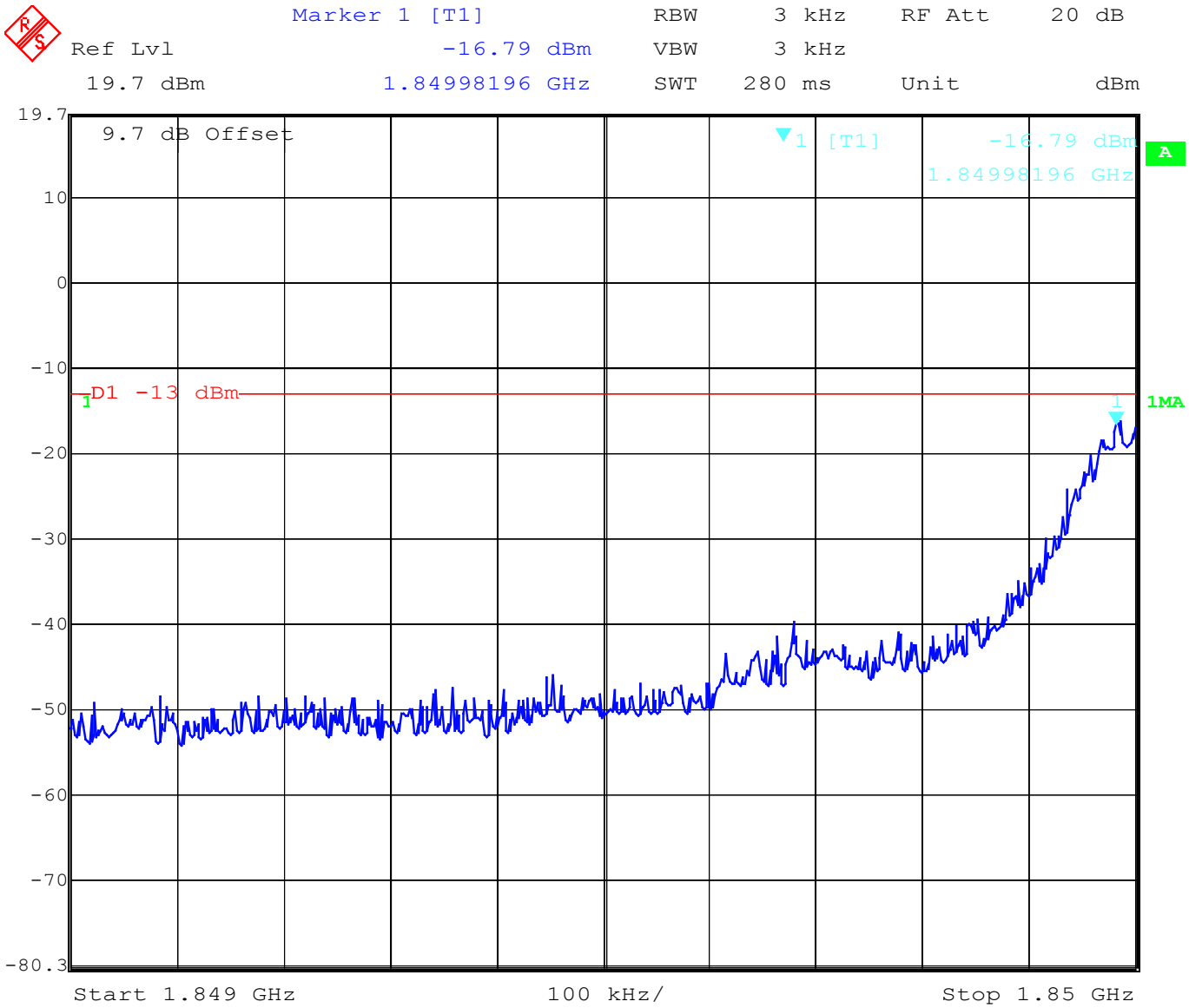


REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24

BLOCK EDGE COMPLIANCE FOR BLOCK A, B, C, D, E and F

Measurement Limit:
Section 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+10Log(P) dB. For all power levels +30 dBm to 0 dBm, this becomes a constant specification limit of -13 dBm.

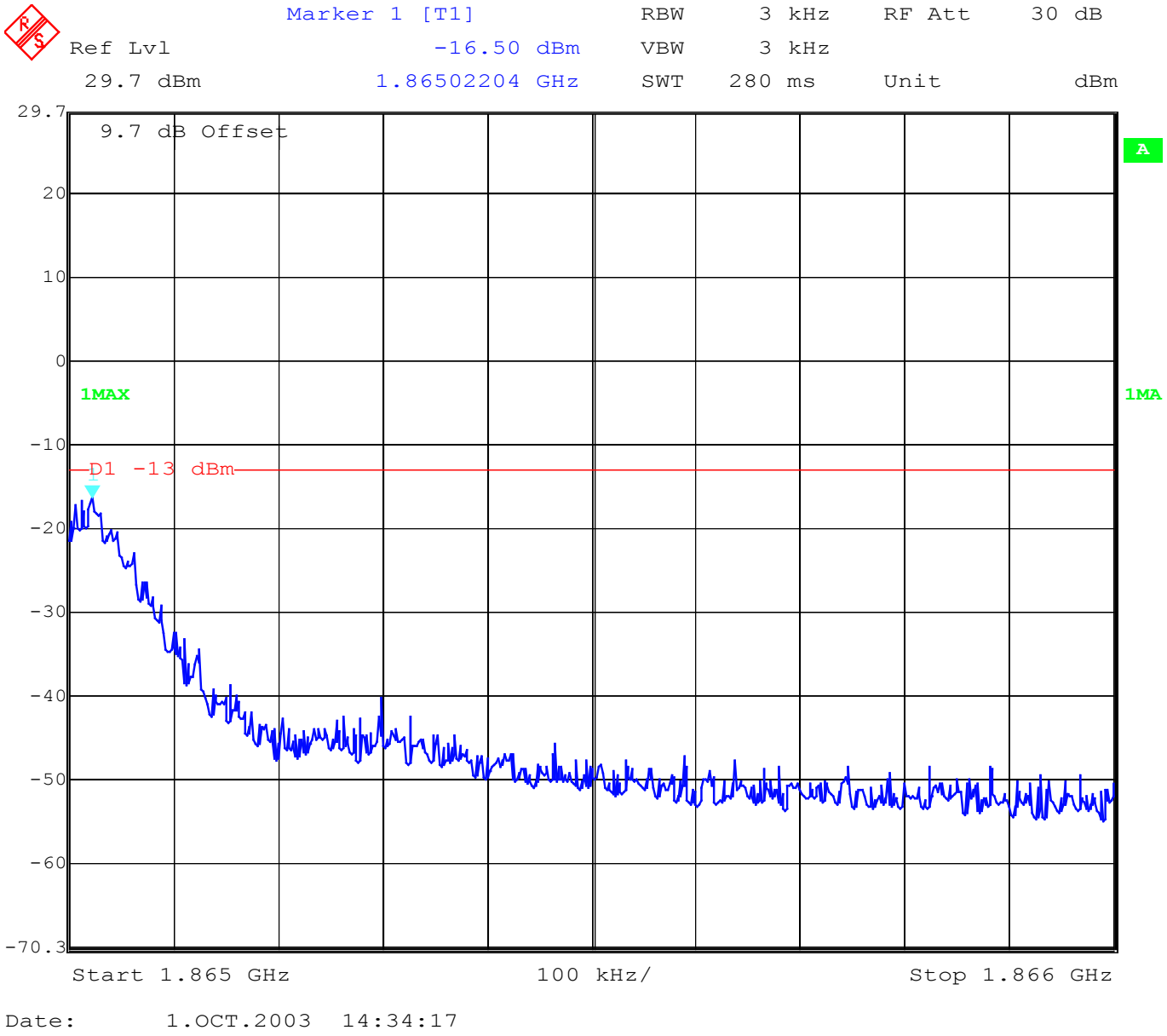
Block A
Channel 512



Date: 26.SEP.2003 11:27:42

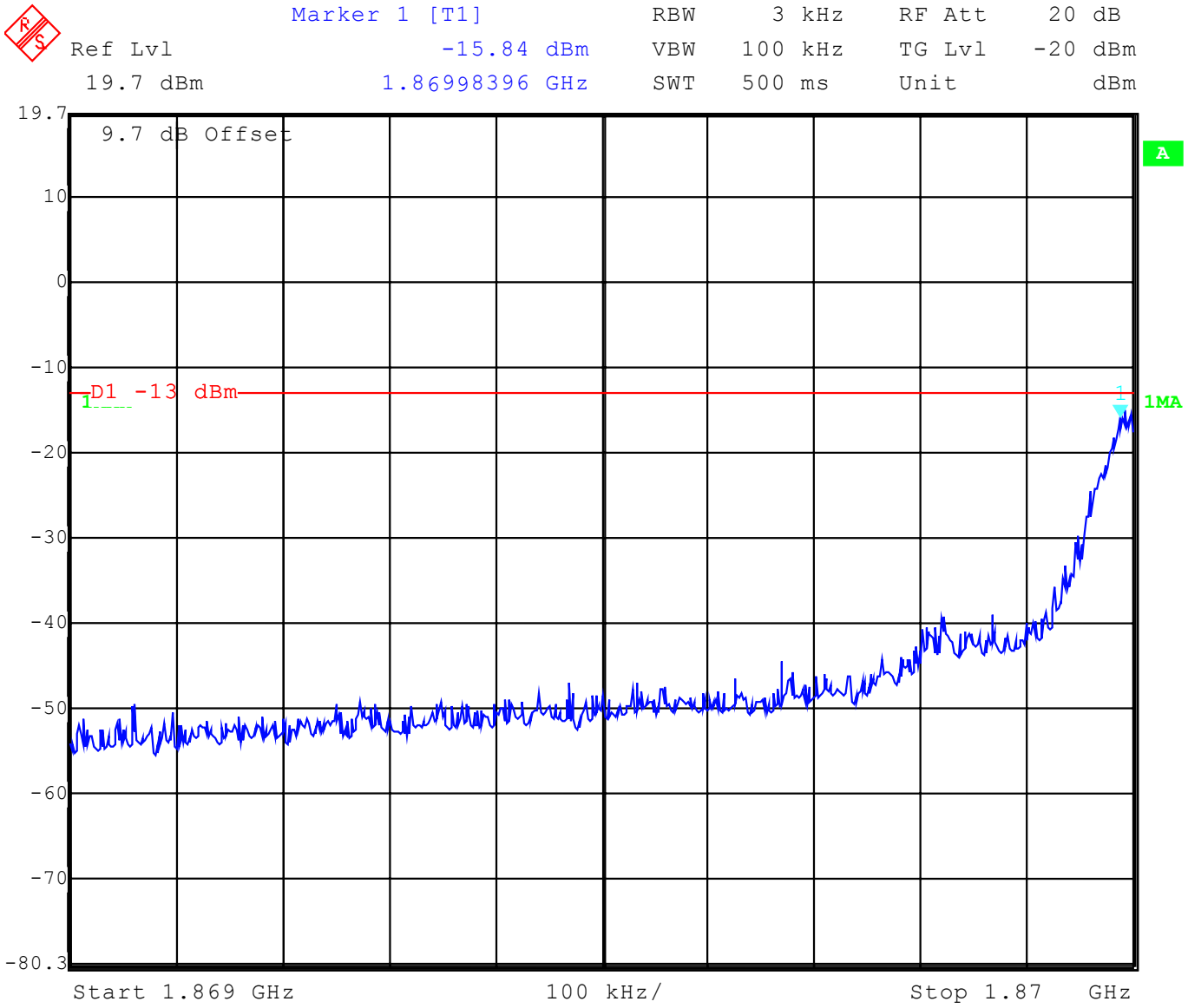
REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24

Block A Channel 585



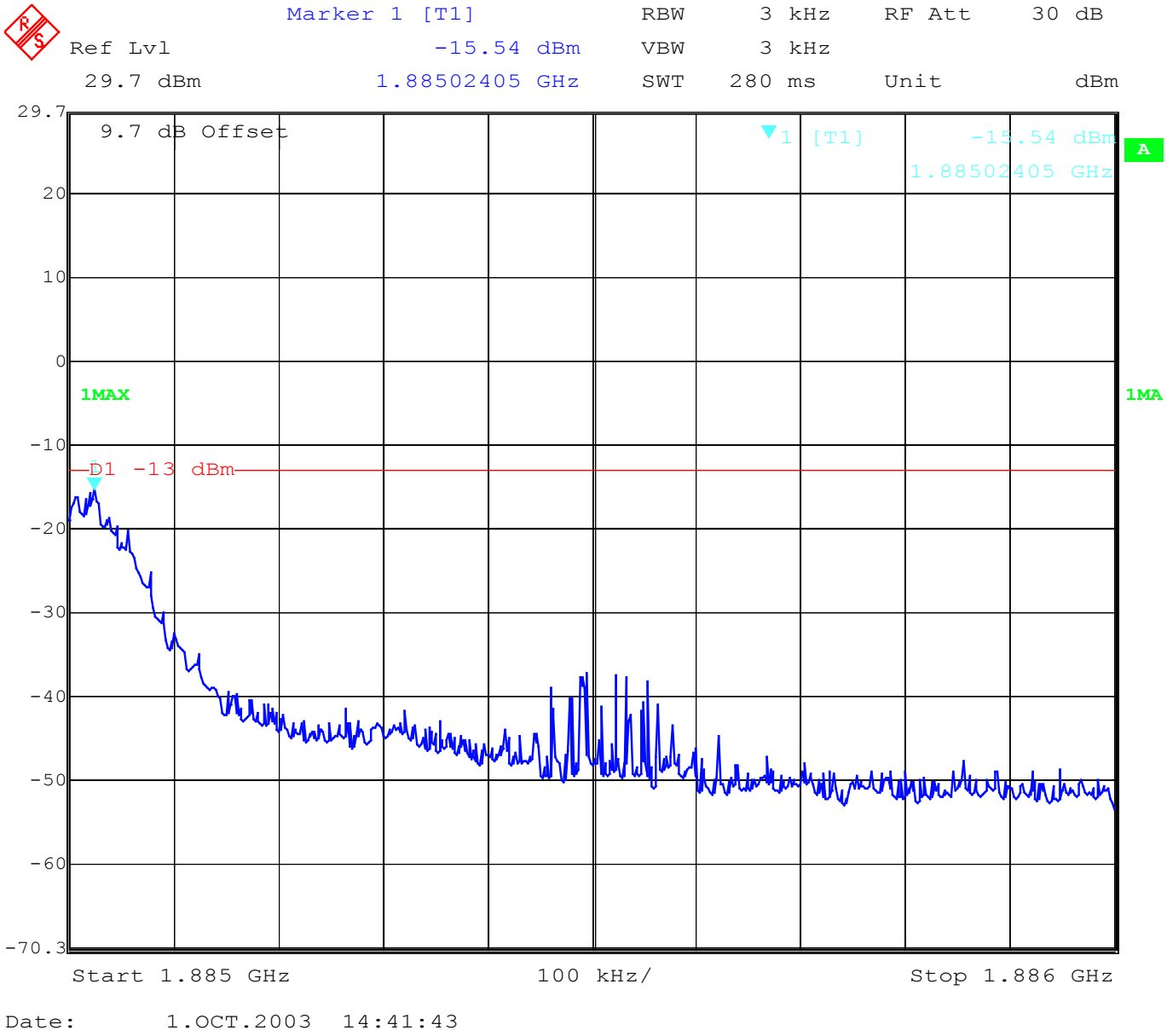
REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24

Block B
Channel 612



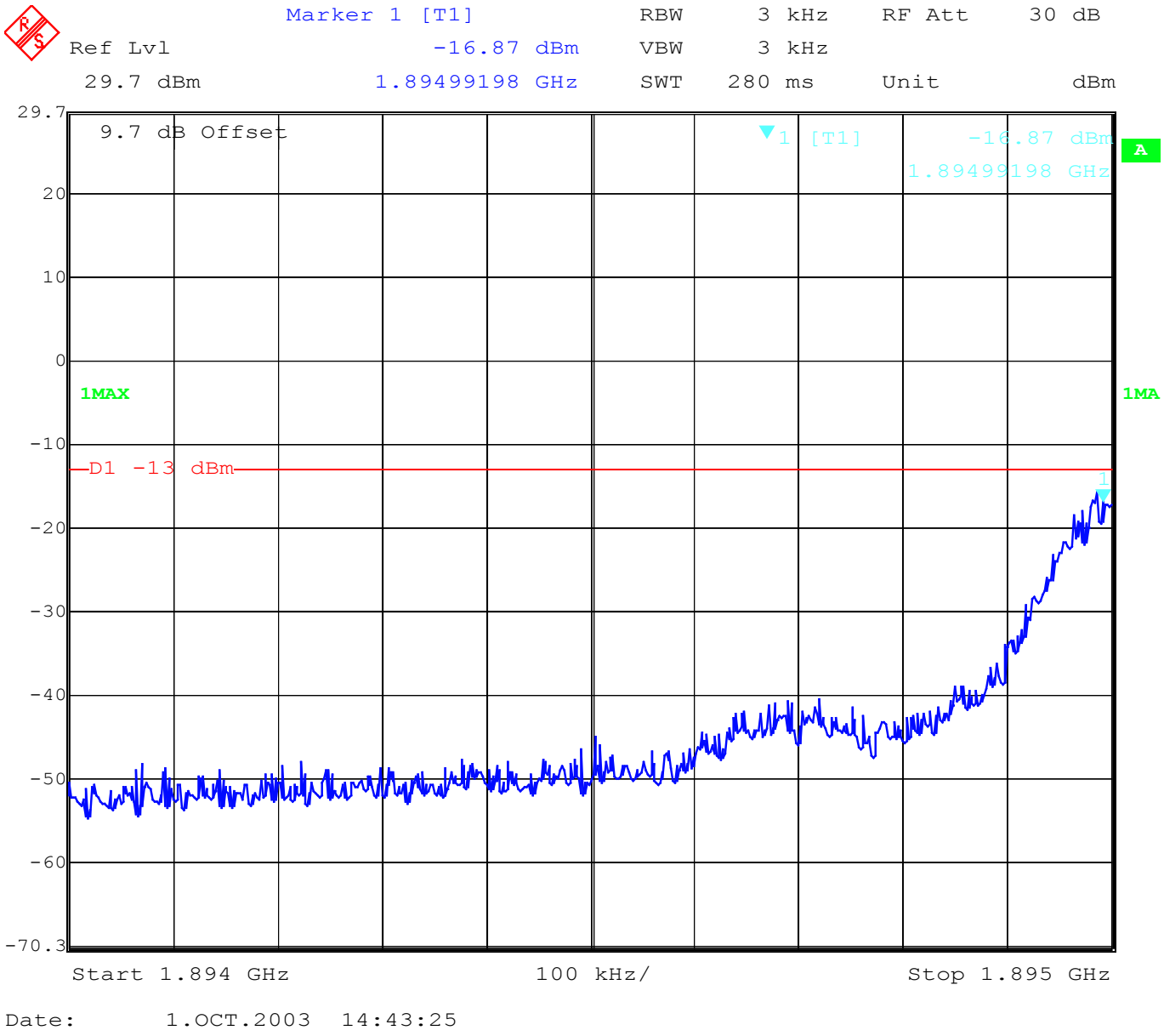
REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24

Block B Channel 685



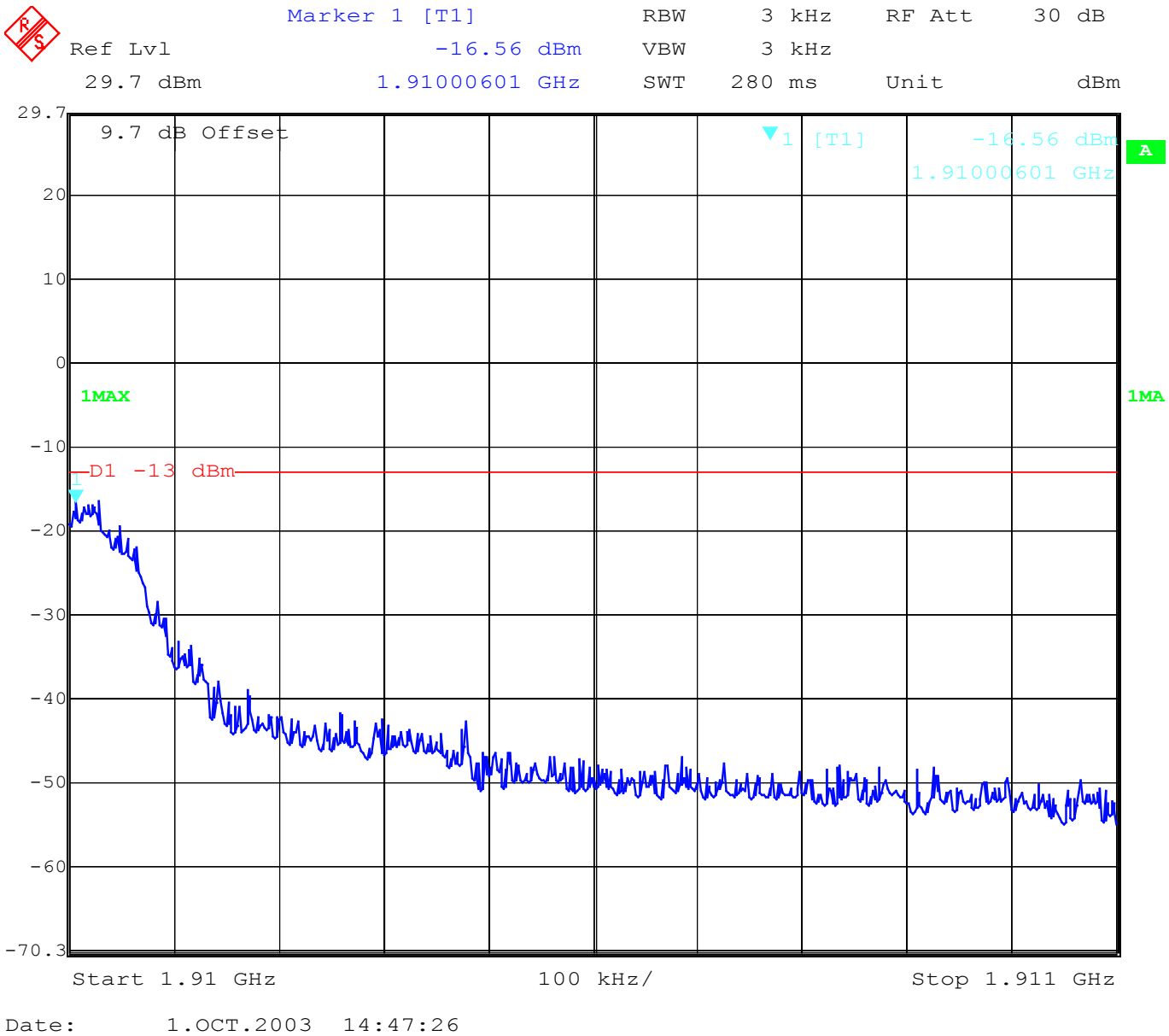
REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24

Block C
Channel 737



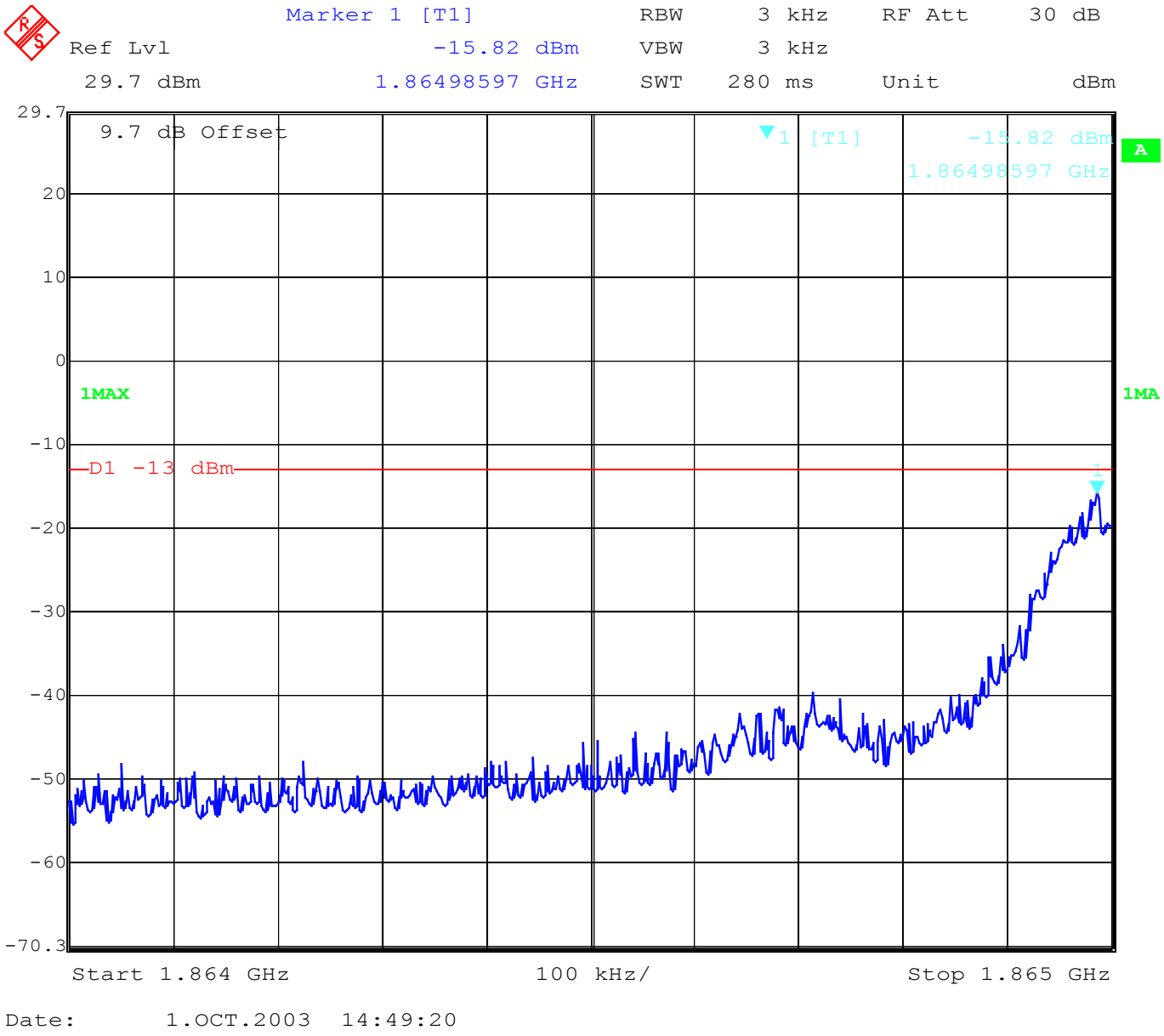
REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24

Block C Channel 810



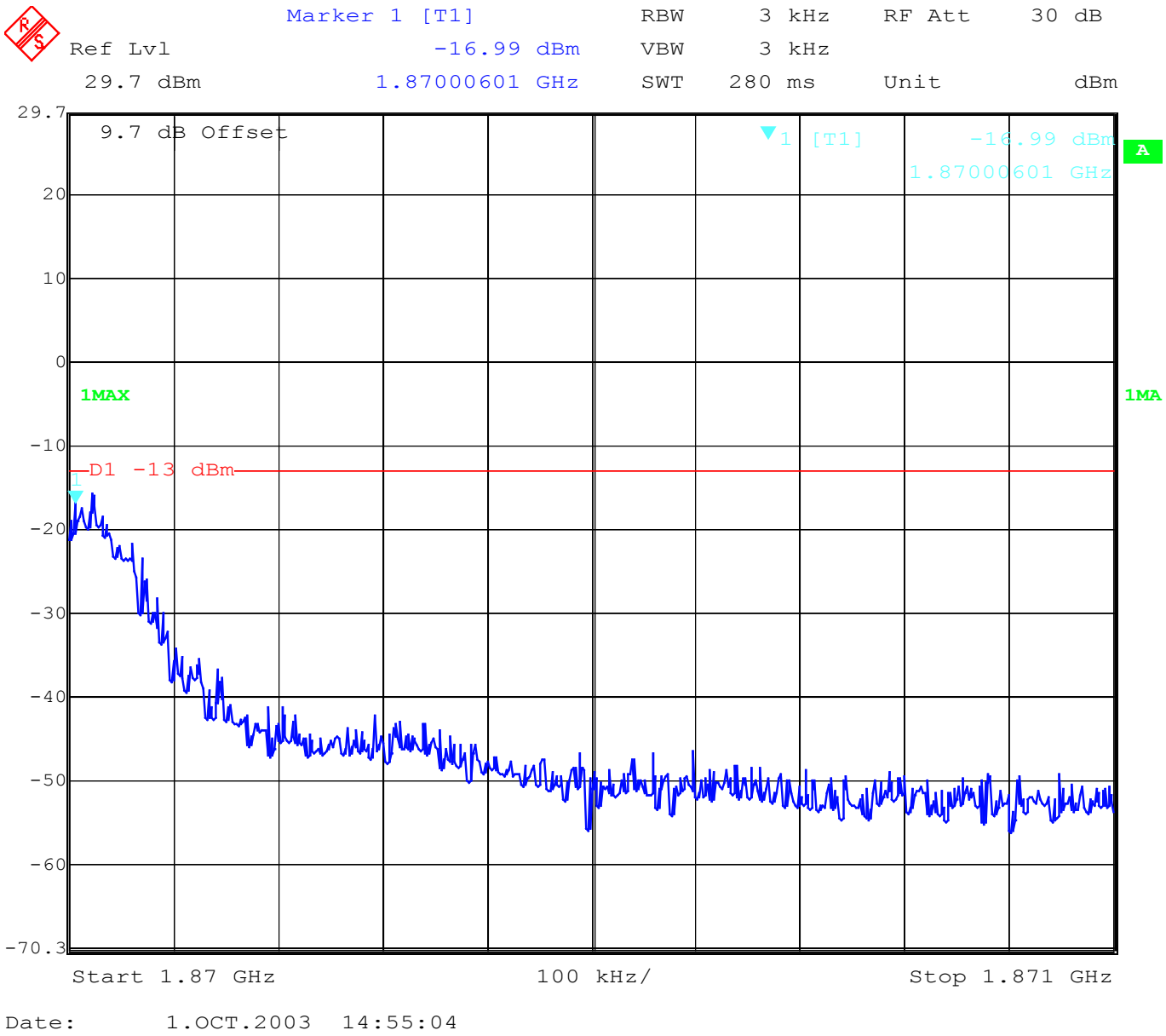
REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24

Block D
Channel 587



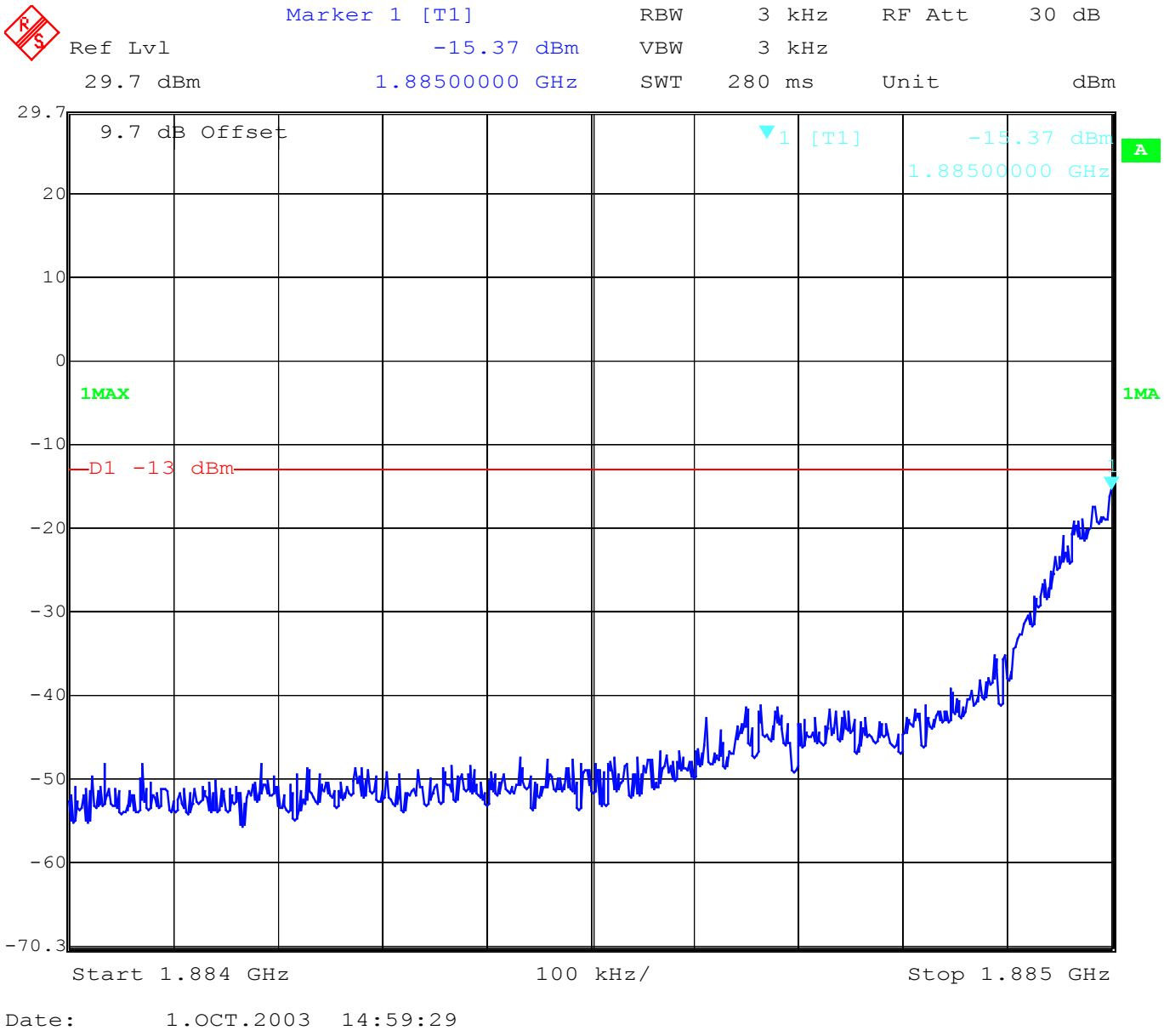
REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24

Block D Channel 610



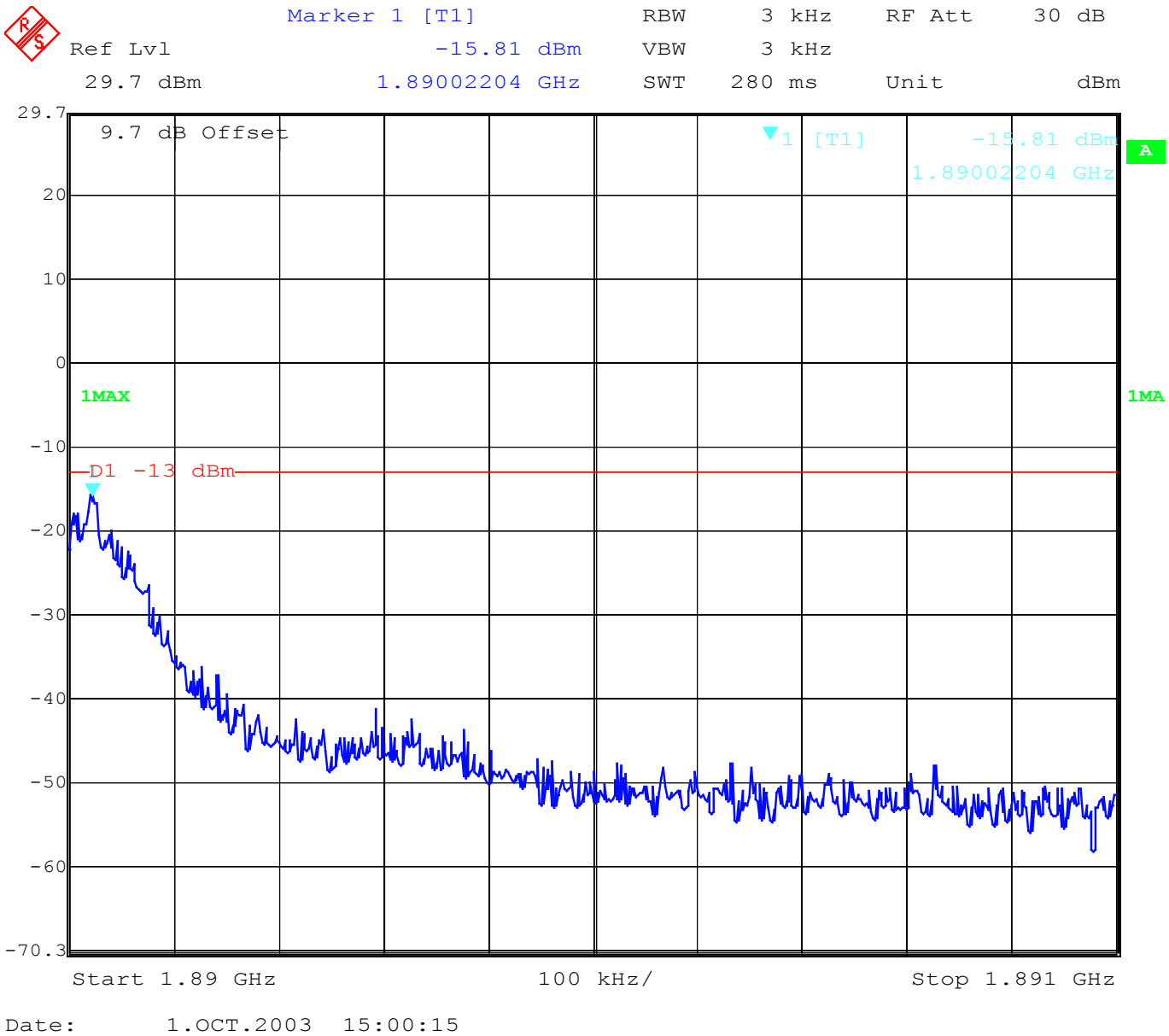
REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24

Block E
Channel 687



REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24

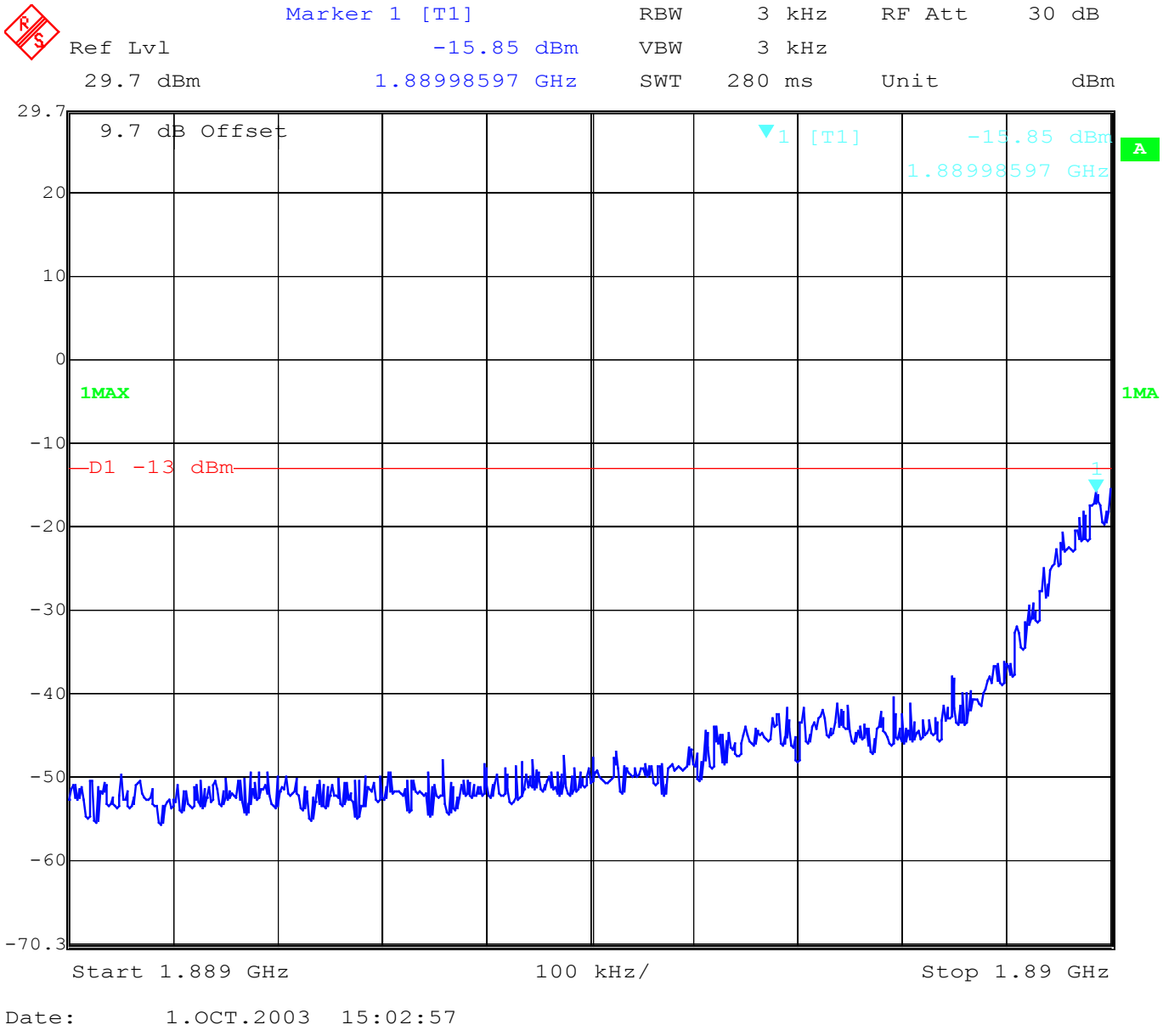
Block E Channel 710



Date: 1.OCT.2003 15:00:15

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24

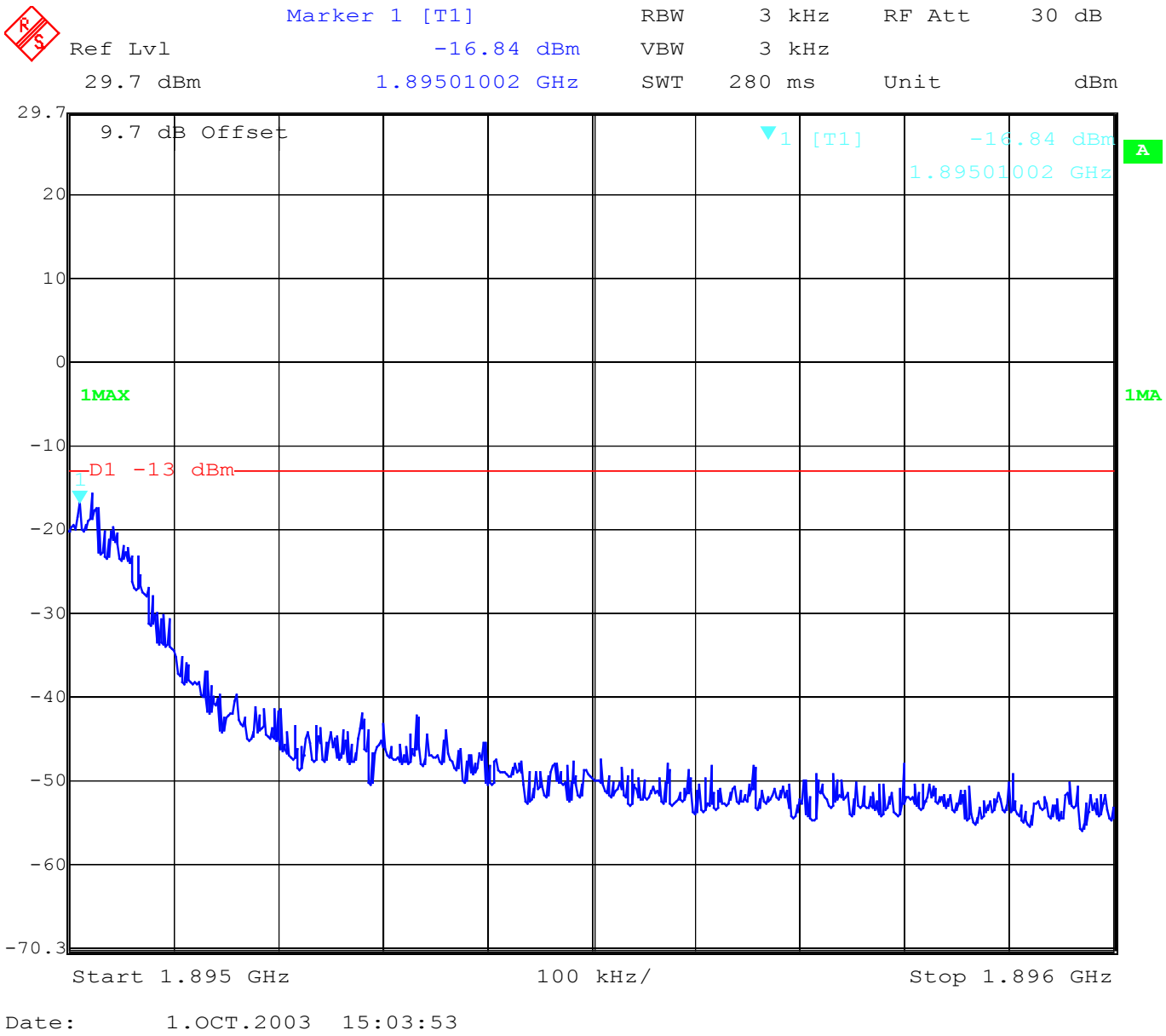
Block F
Channel 712



Date: 1.OCT.2003 15:02:57

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24

Block F Channel 735



REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24

OCCUPIED BANDWIDTH Section 2.1049

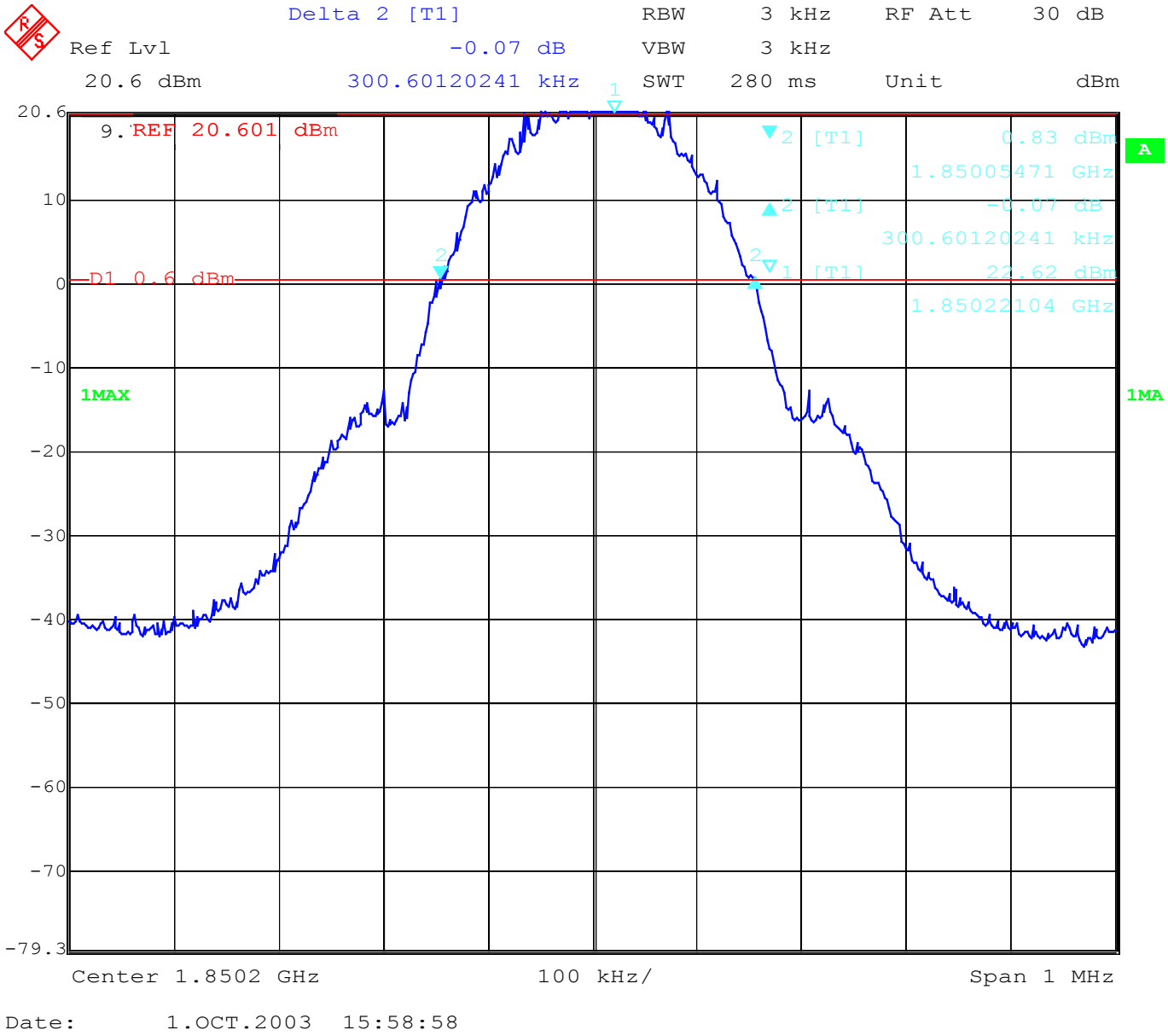
Similar to conducted emissions, occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of the USPCS frequency band. Table 8.2 below lists the measured 99% power and -26dBc occupied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

Occupied Bandwidth Results

Frequency (MHz)	99% Occupied Bandwidth (kHz)	-26 dBc Bandwidth (kHz)
1850.2	282.565	314.629
1880.0	280.561	316.633
1909.8	272.545	314.629

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

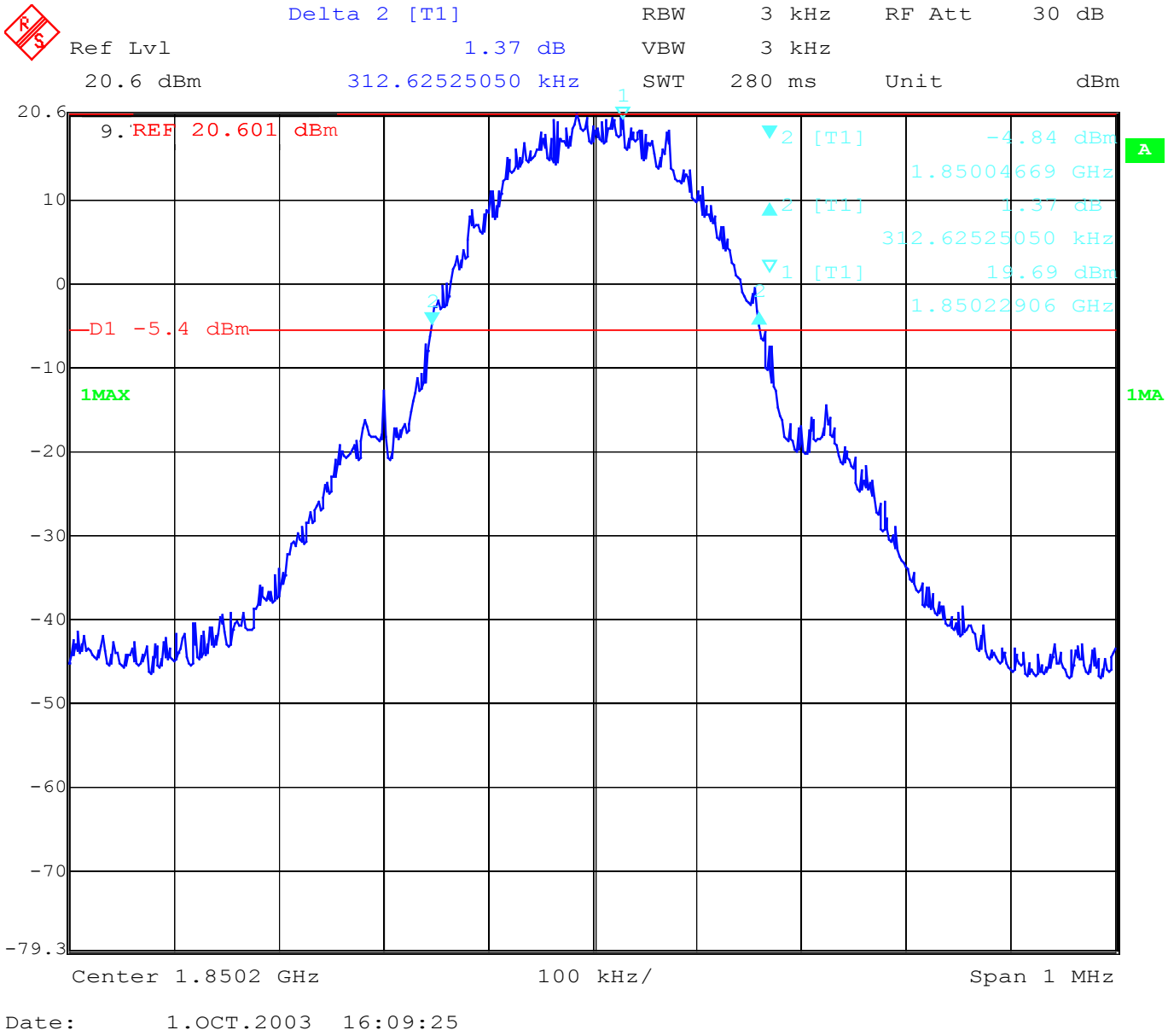
Channel 512
99% Occupied Bandwidth



Date: 1.OCT.2003 15:58:58

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24

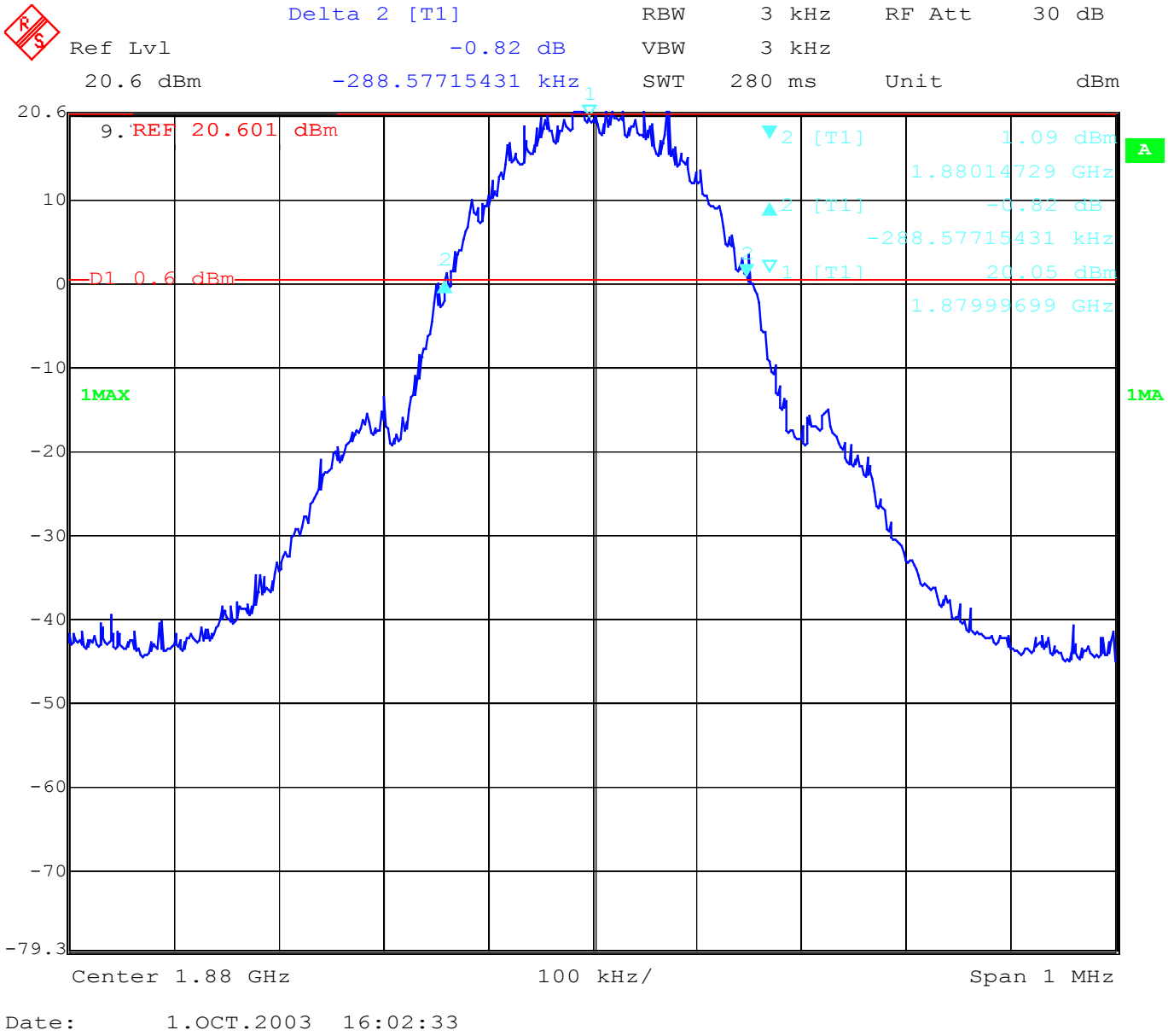
Channel 512
-26 dBc Bandwidth



Date: 1.OCT.2003 16:09:25

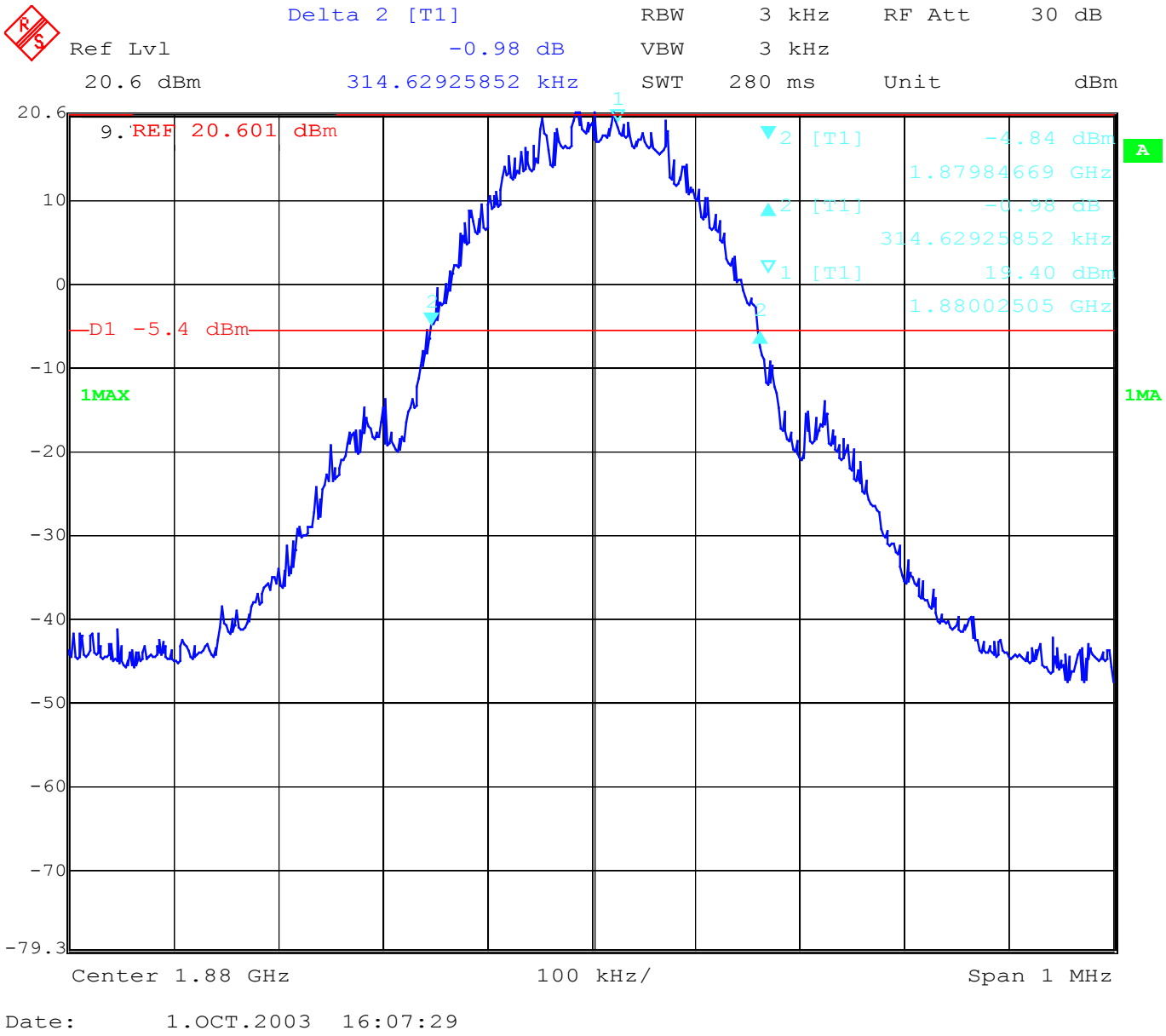
REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24

Channel 661
99% Occupied Bandwidth



REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24

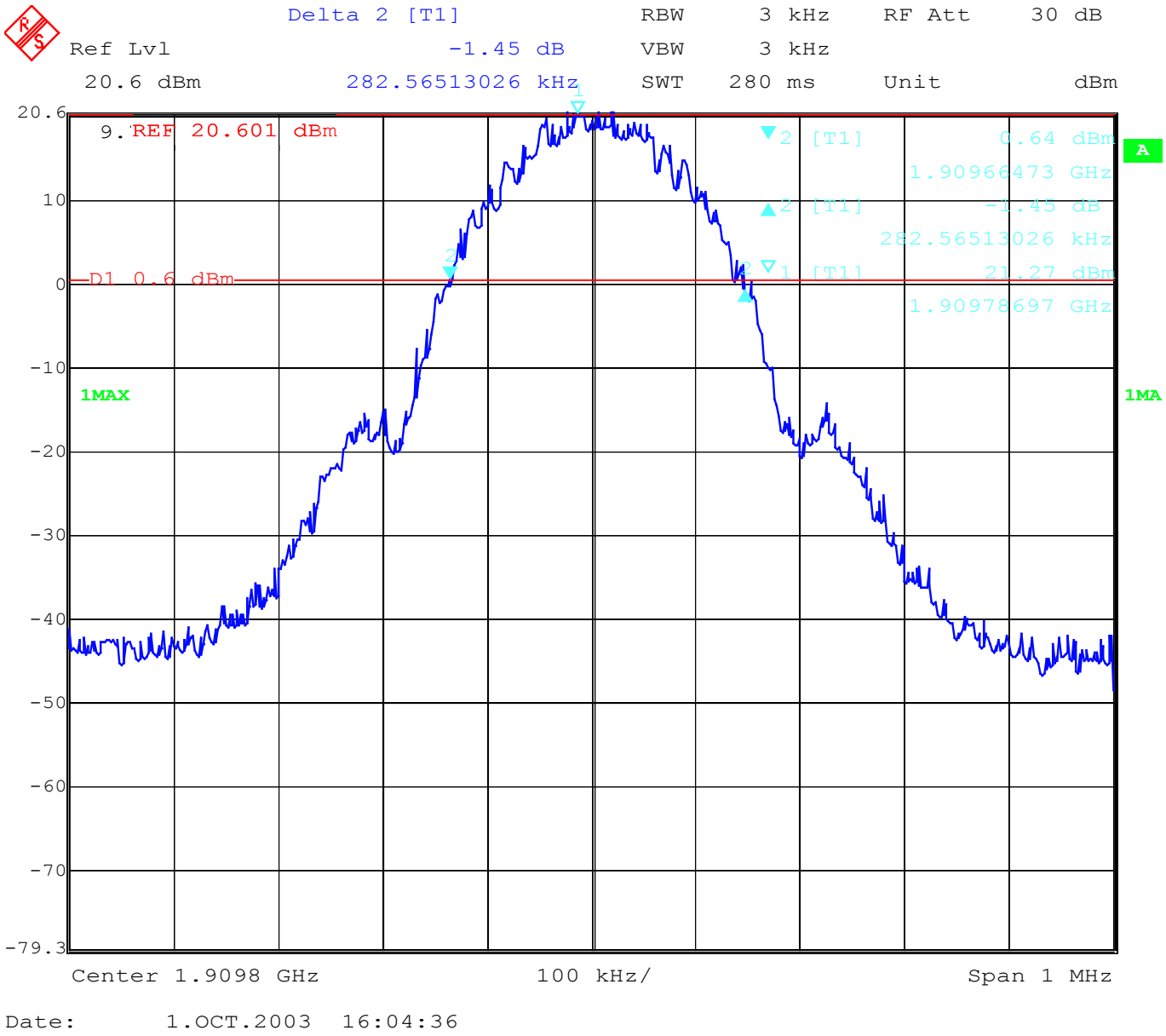
Channel 661
-26 dBc Bandwidth



Date: 1.OCT.2003 16:07:29

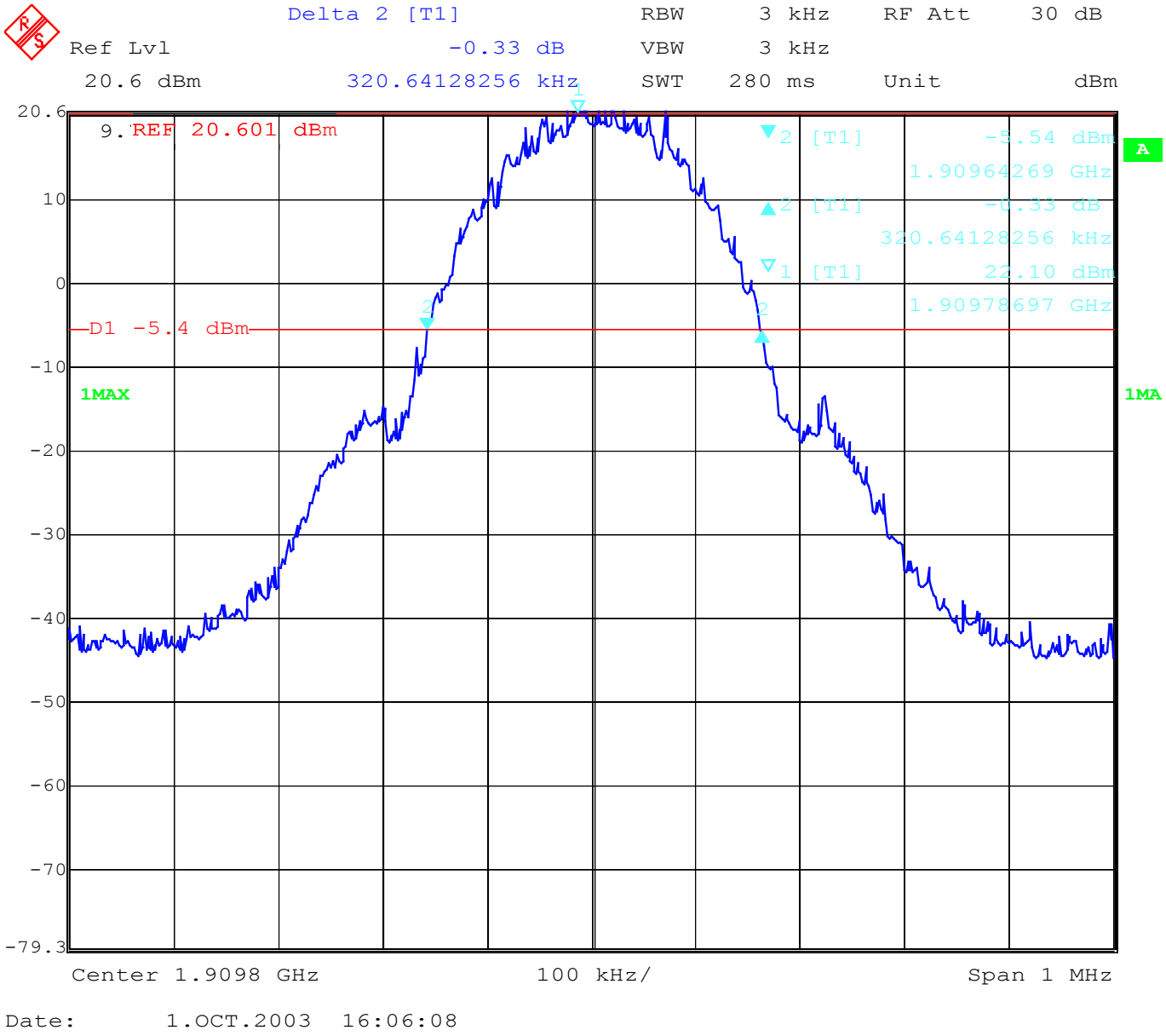
REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24

Channel 810
99% Occupied Bandwidth



REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24

Channel 810
-26 dBc Bandwidth



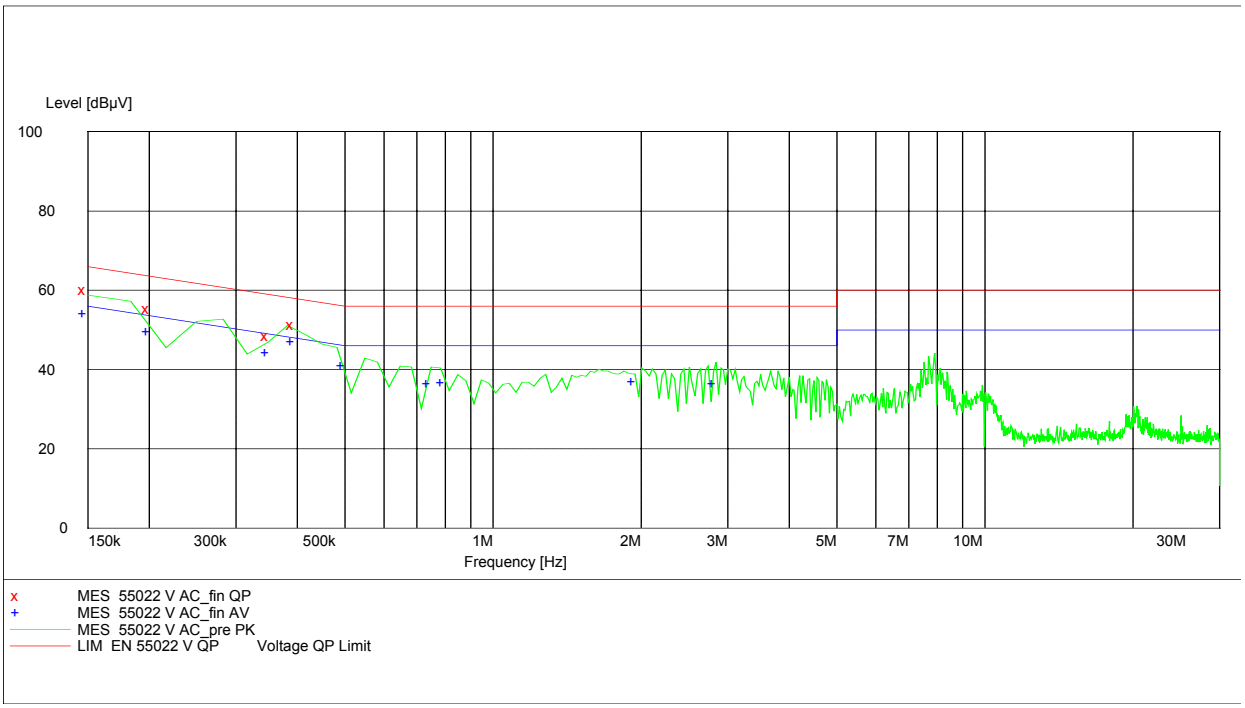
REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24

CONDUCTED EMISSION Section 15.107 / 15.207

EUT PEMSTAR_ALVA MPO 5500 with power supply 230 V AC and Data cable

Test mode Traffic mode

CISPR 22



MEASUREMENT RESULT: "QP"

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.150000	60.00	11.7	66	6.0	L1	FLO
0.202500	55.30	11.1	64	8.3	L1	FLO
0.352500	48.50	10.7	59	10.5	L1	FLO
0.397500	51.20	10.6	58	6.7	L1	FLO

MEASUREMENT RESULT: " AV"

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.150000	54.00	11.7	56	2.0	L1	FLO
0.202500	49.50	11.1	54	4.1	L1	FLO
0.352500	44.30	10.7	49	4.7	L1	FLO
0.397500	47.00	10.6	48	0.9	L1	FLO
0.502500	41.10	10.4	46	4.9	N	FLO
0.750000	36.40	10.4	46	9.6	N	GND
0.802500	36.60	10.4	46	9.4	N	GND
1.957500	36.90	10.4	46	9.1	L1	FLO
2.857500	36.50	10.4	46	9.5	L1	GND

MEASUREMENT RESULT: "CISPR22 AC_fin AV"

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.435000	28.70	10.5	47	18.5	L1	FLO
1.222500	27.60	10.3	46	18.4	L1	GND

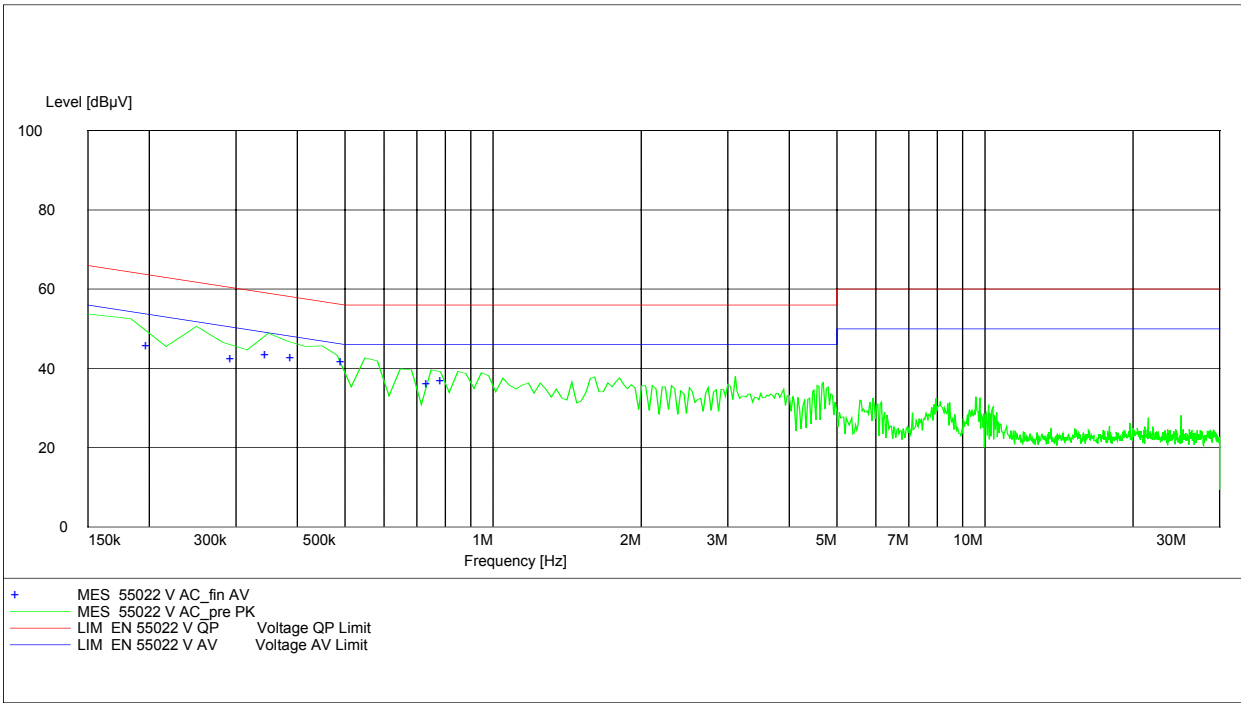
Limits Section 15.207

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.

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24

EUT PEMSTAR_ALVA MPO 5500 with power supply 230 V AC and data cable
Test mode Idle mode
CISPR 22



MEASUREMENT RESULT: " AV"

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.202500	45.70	11.1	54	7.9	N	GND
0.300000	42.40	10.7	50	7.8	N	GND
0.352500	43.40	10.7	49	5.6	L1	GND
0.397500	42.60	10.6	48	5.3	L1	GND
0.502500	41.60	10.4	46	4.4	L1	GND
0.750000	36.20	10.4	46	9.8	L1	FLO
0.802500	36.80	10.4	46	9.2	L1	FLO

Limits Section 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

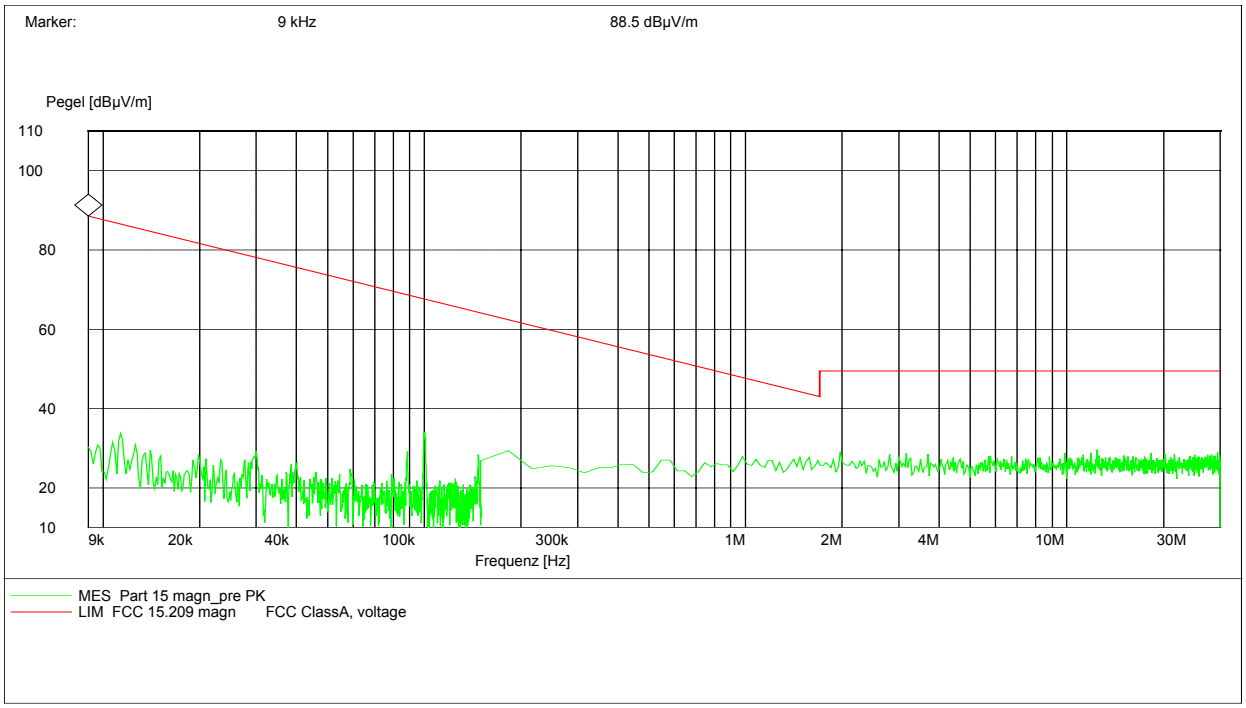
* Decreases with the logarithm of the frequency.

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24

RADIATED EMISSION LIMITS Section 15.209

EUT PEMSTAR_ALVA MPO 5500 with power supply 230 V AC and Data cable

Test mode Traffic mode



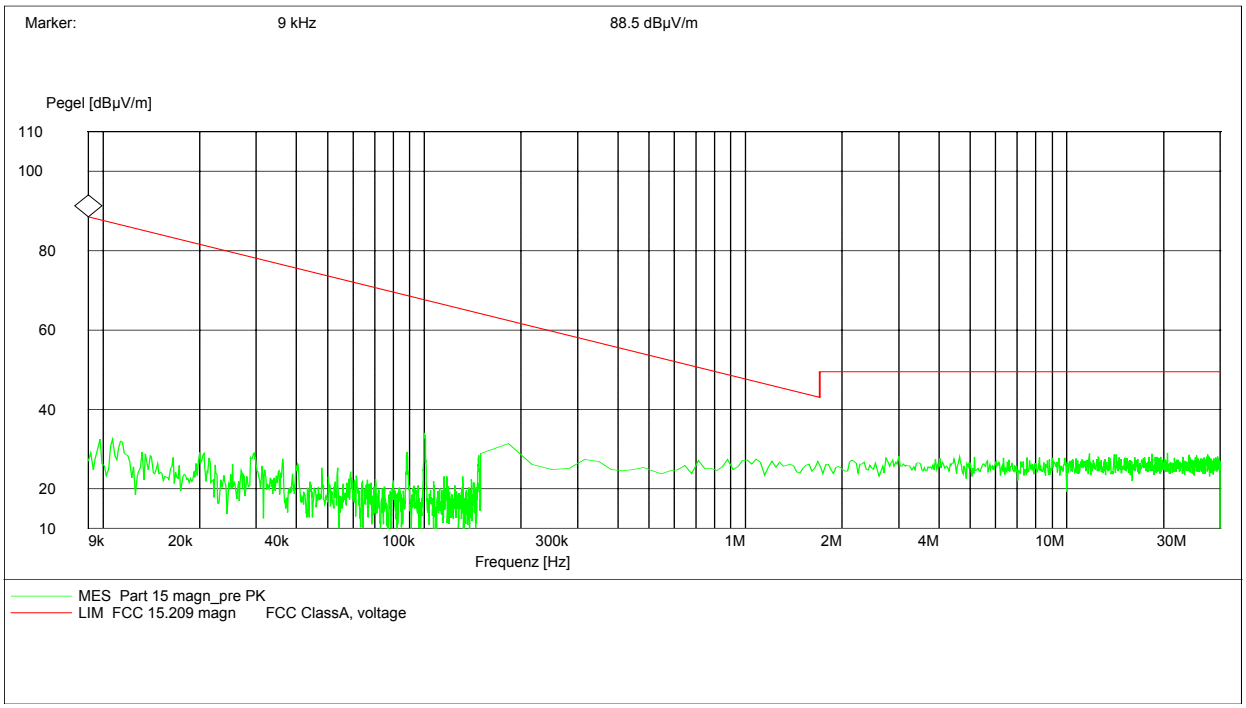
Limits Section 15.209

Frequency range (MHz)	Measurement distance [m]	Field strength e [dBµV/m] @ 3 m	Field strength E [µV/m]
0.009 – 0.490	300	88.5 ... 53.8	2400/F(kHz)
0.490 – 1.705	30	53.8 ... 43.0	24000/F(kHz)
1.705 – 30.0	30	49.5	30

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24

EUT PEMSTAR_ALVA MPO 5500 with power supply 230 V AC and Data cable

Test mode Idle mode



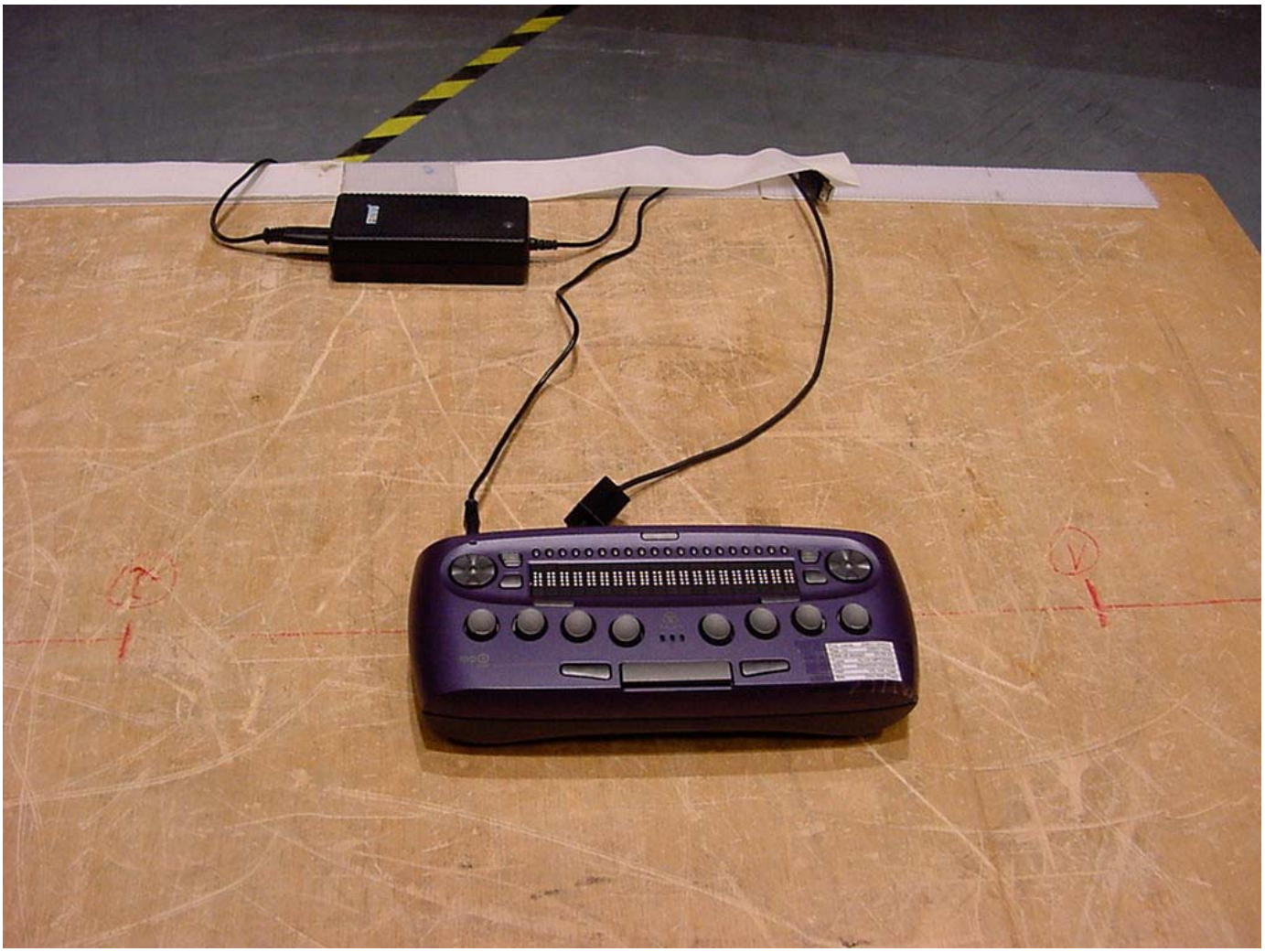
Limits Section 15.209

Frequency range (MHz)	Measurement distance [m]	Field strength e [dBµV/m] @ 3 m	Field strength E [µV/m]
0.009 – 0.490	300	88.5 ... 53.8	2400/F(kHz)
0.490 – 1.705	30	53.8 ... 43.0	24000/F(kHz)
1.705 – 30.0	30	49.5	30

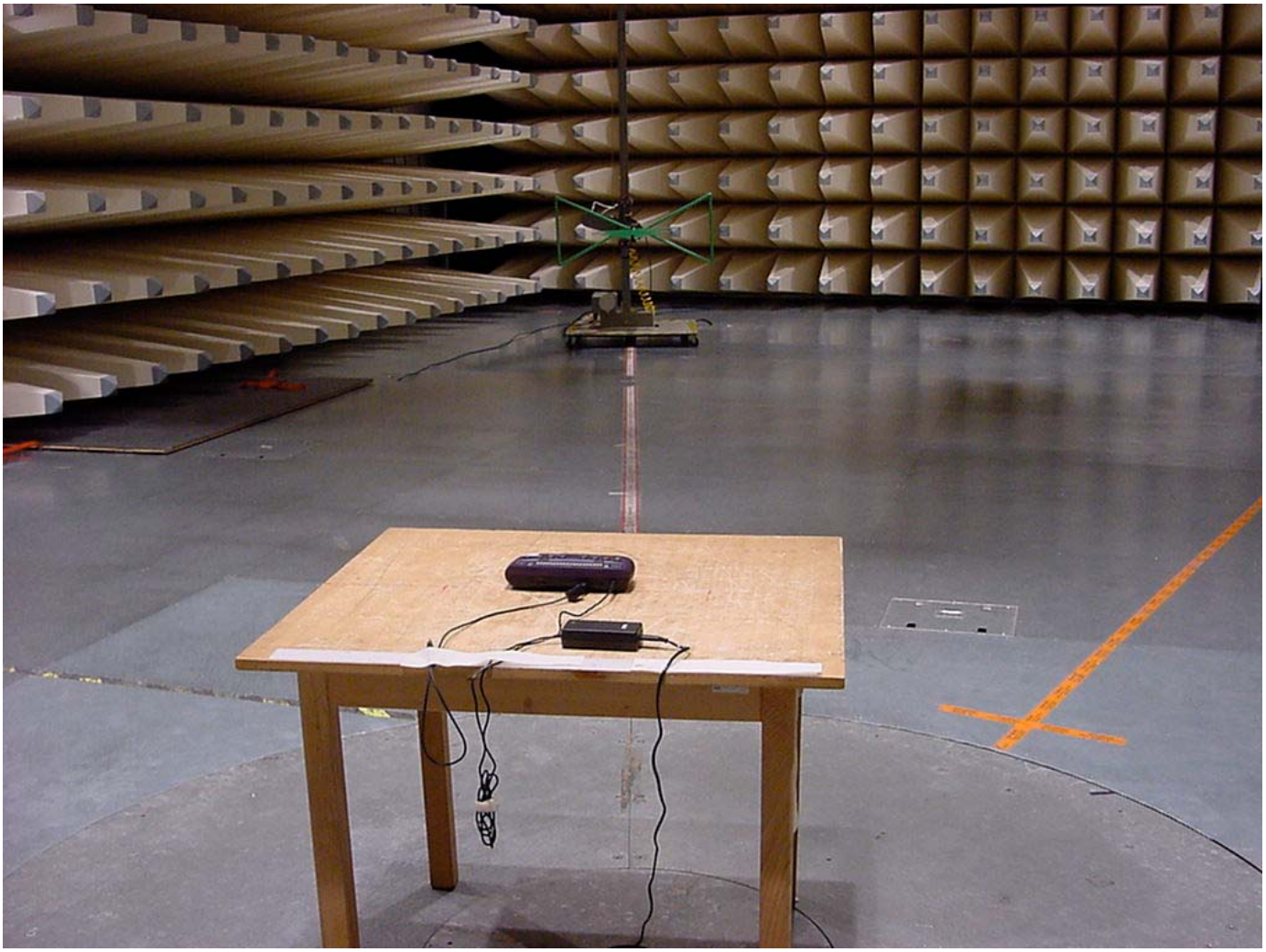
REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24

3 Photographs

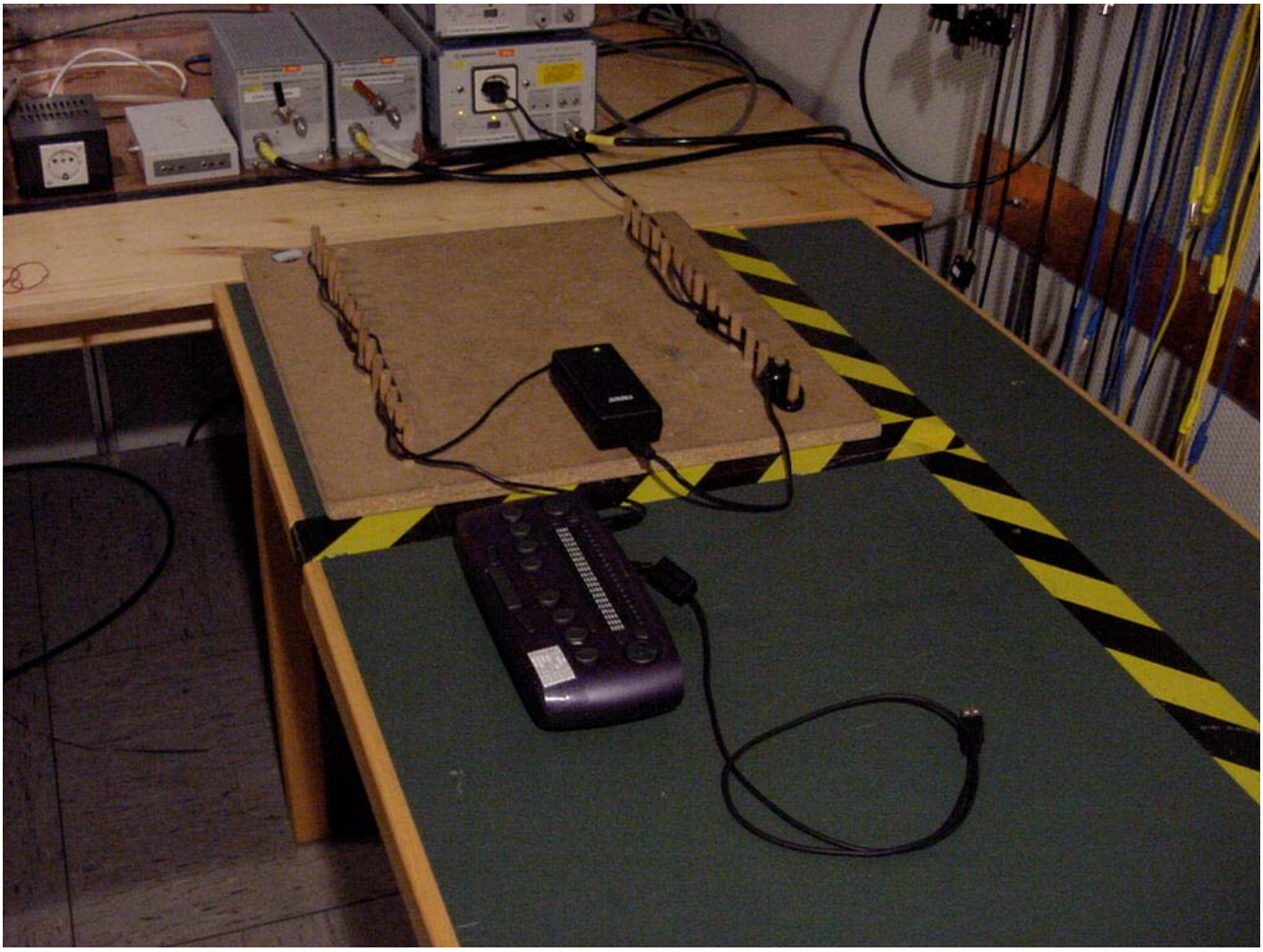
Radiated test site



Radiated test site



AC-conducted test site

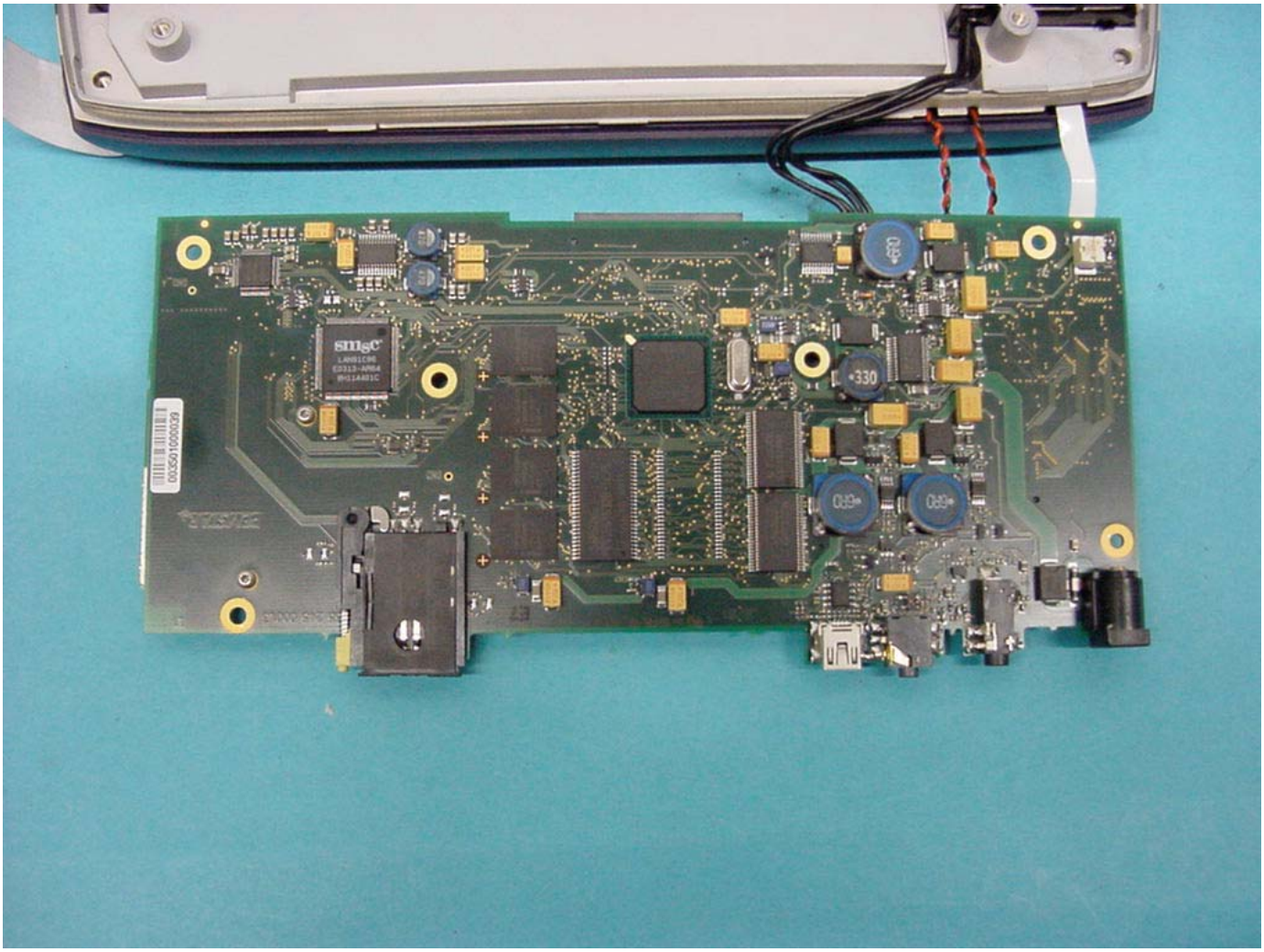


Photografs of the test sample.

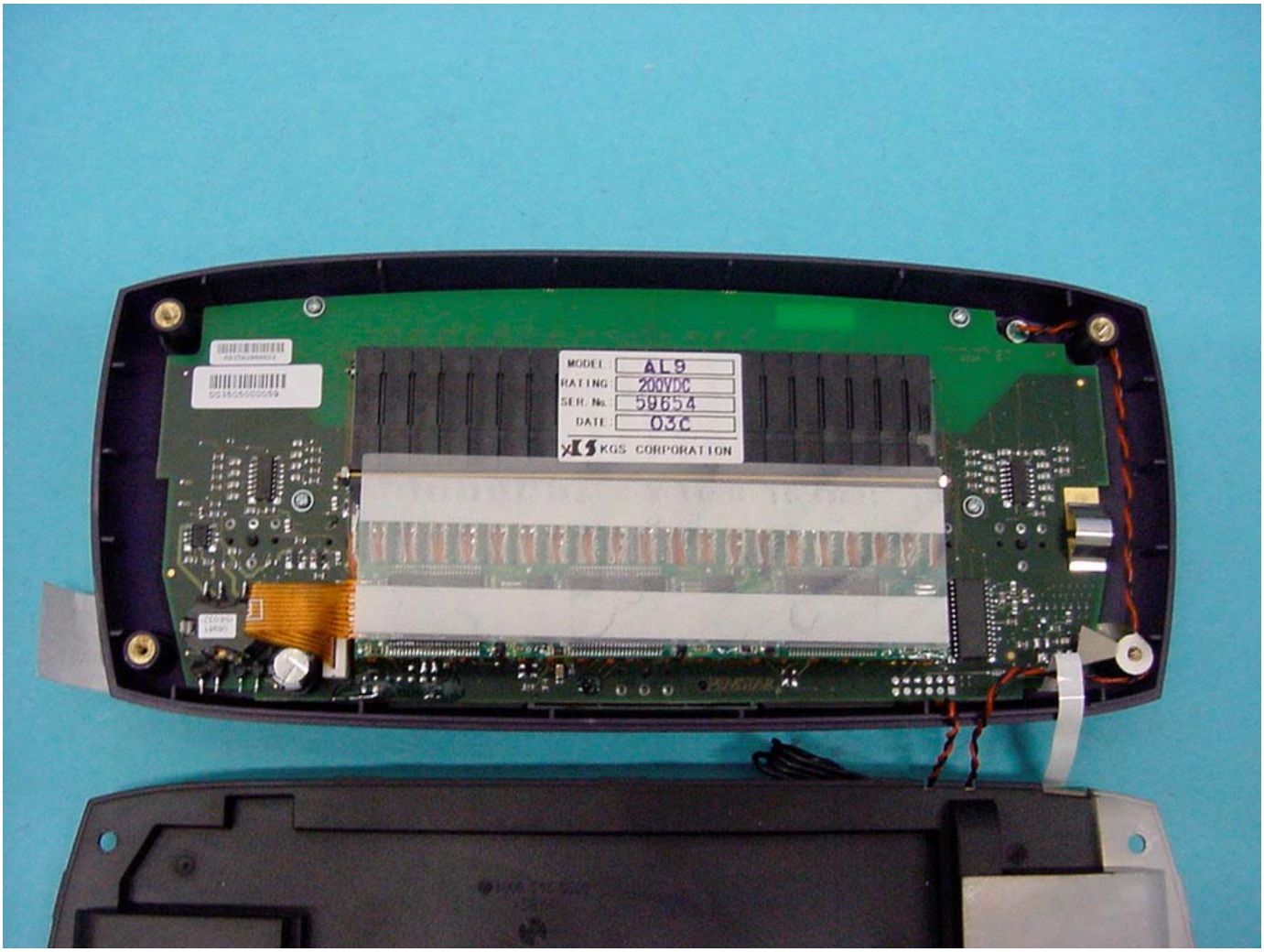
Photografs of the test sample.

Photografs of the test sample.

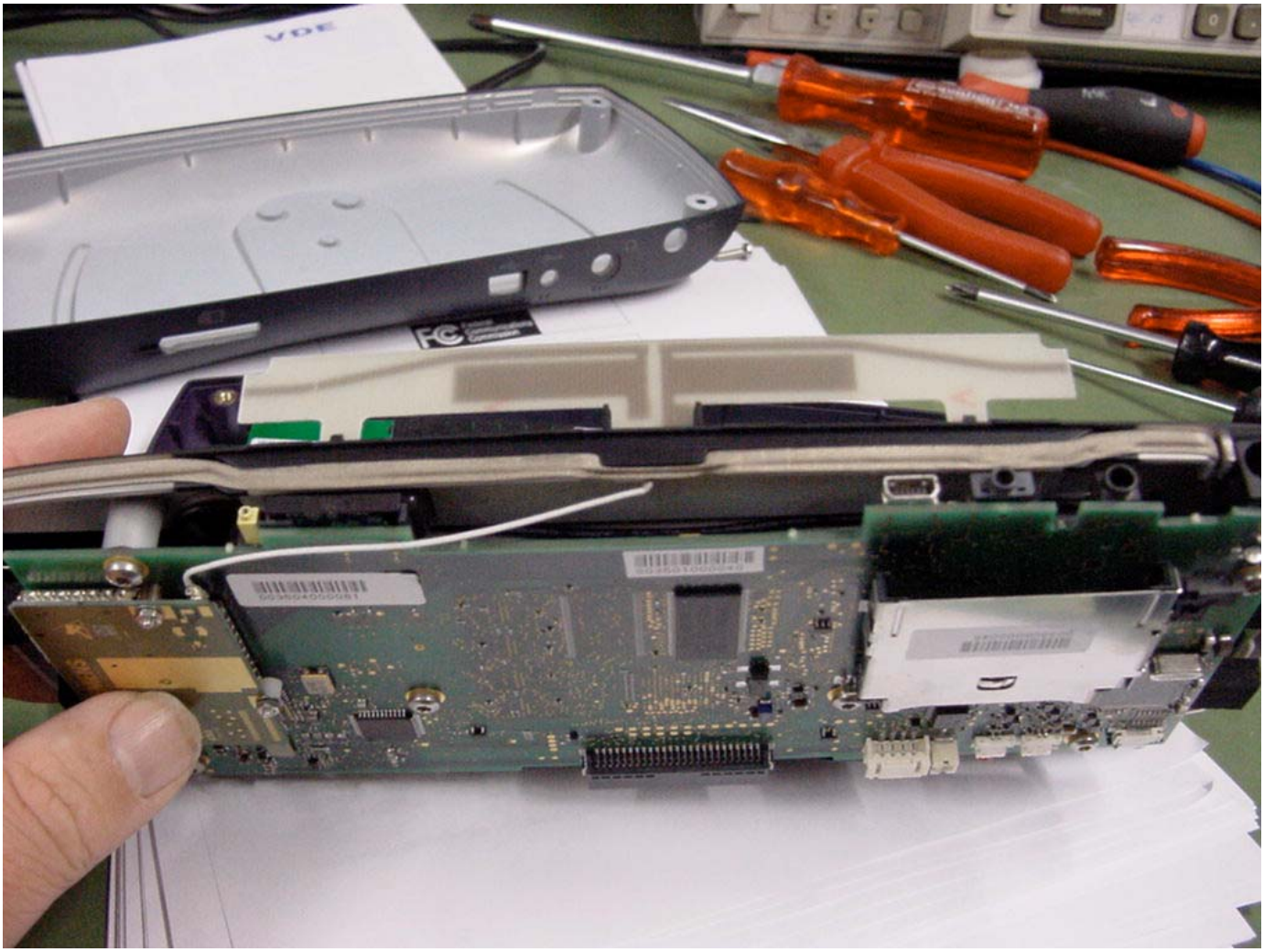
Photografs of the test sample.



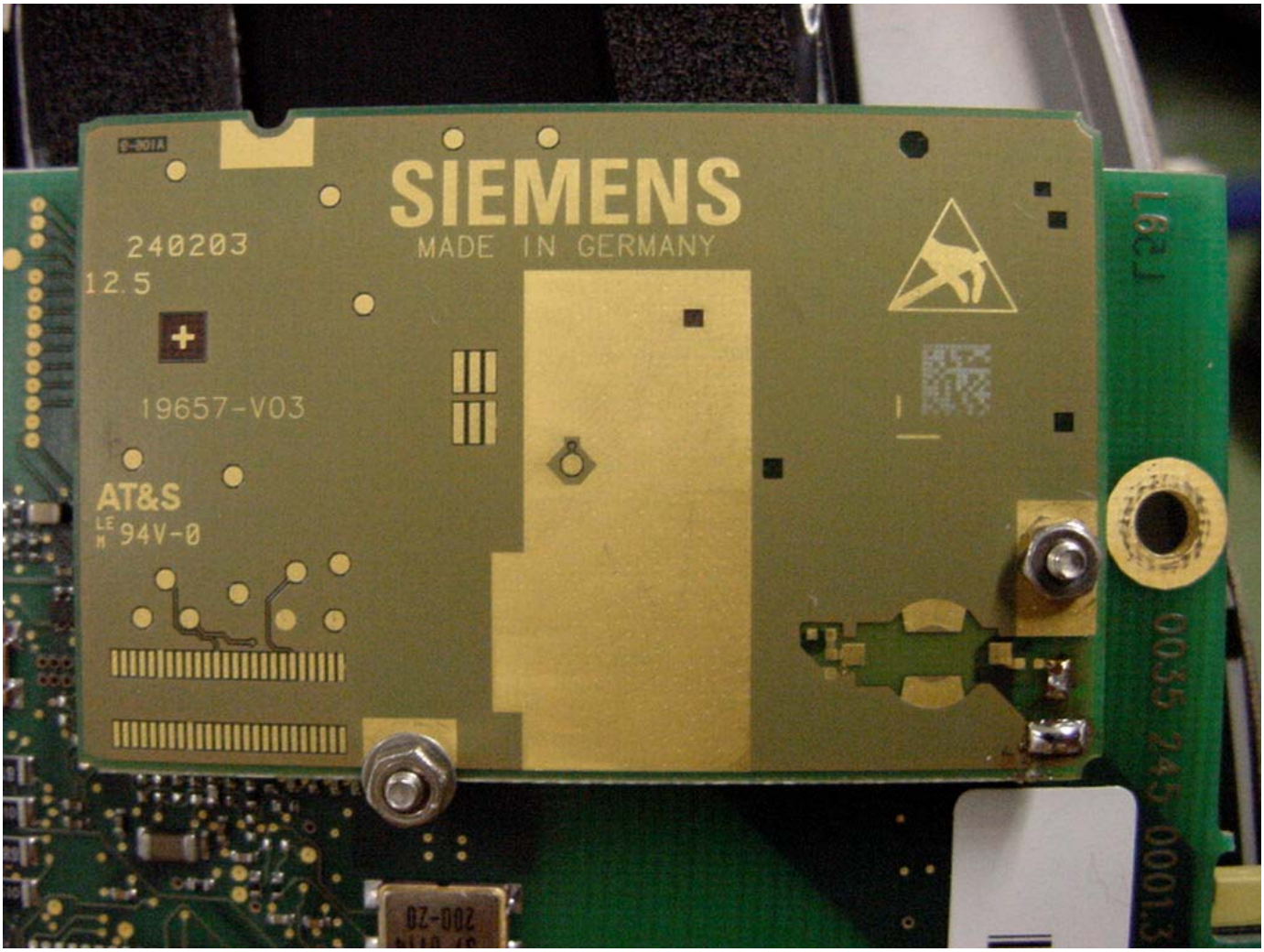
Photografs of the test sample.



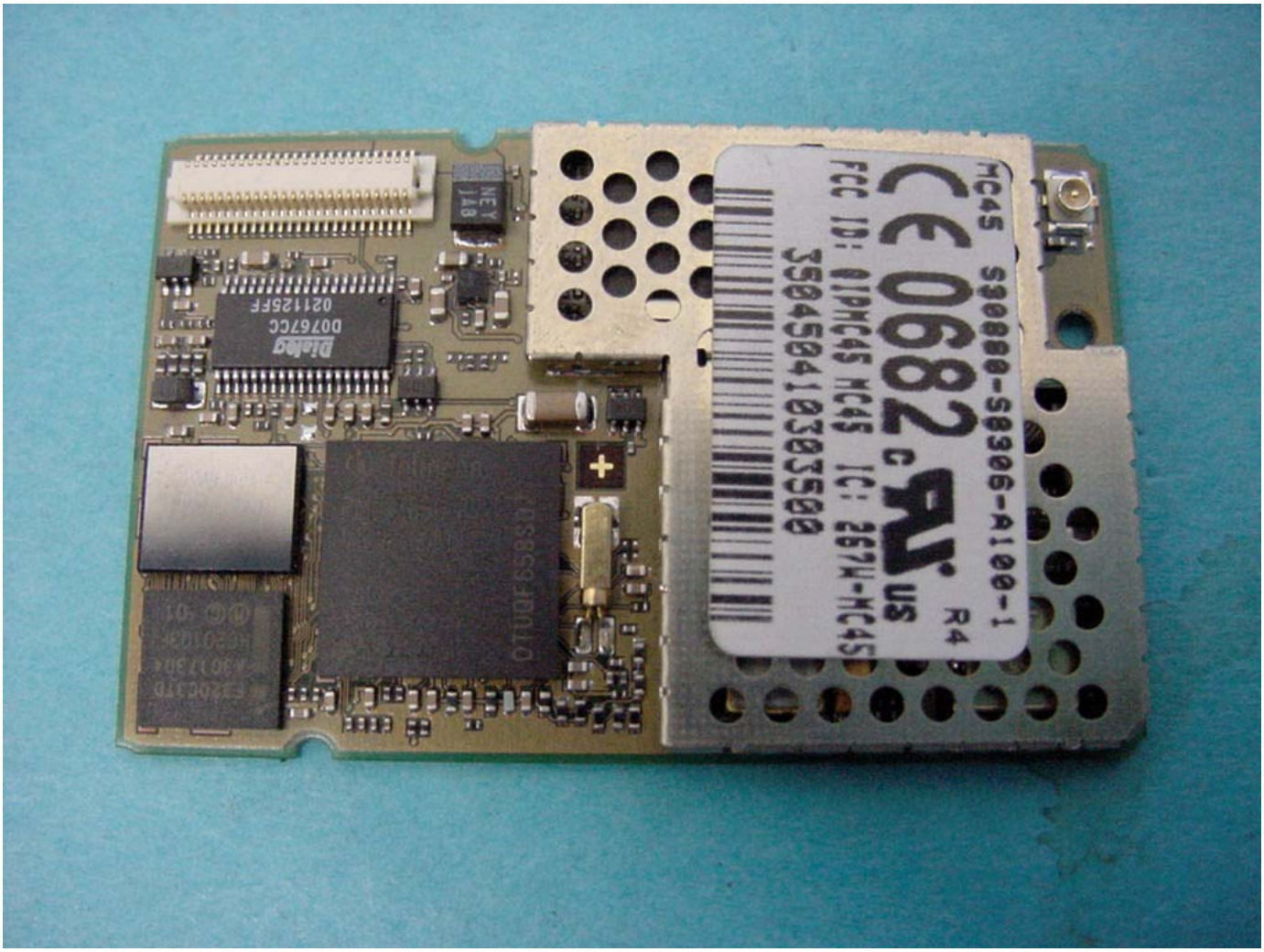
Photografs of the test sample.



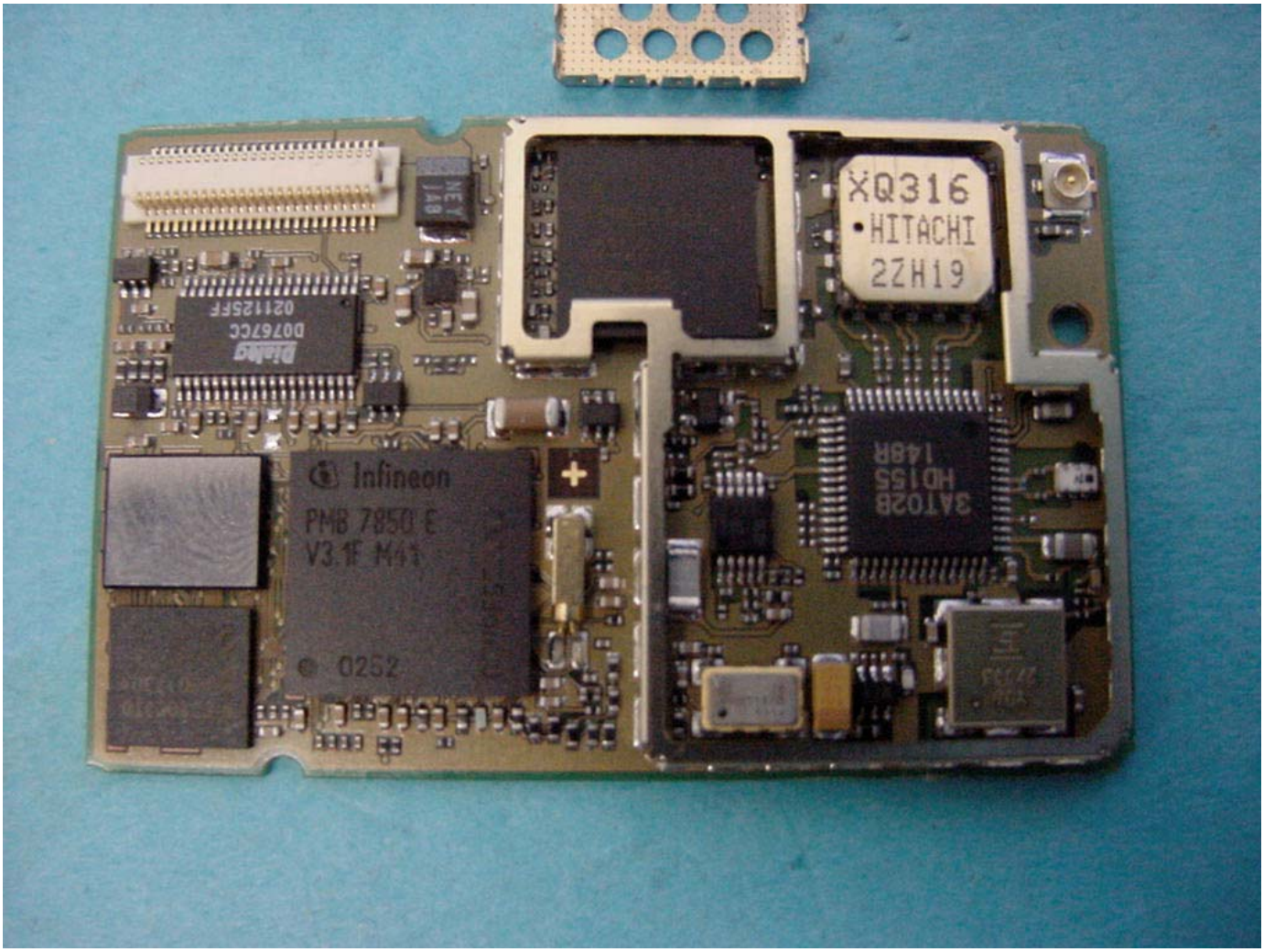
Photografs of the test sample.



Photografs of the test sample.



Photografs of the test sample.



Photografs of the test sample.

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