

CETECOM ICT Services GmbH

Radio Satellite Communication

Untertürkheimer Straße 6-10 . D-66117 Saarbrücken

Telefon: +49 (0)681 598-9100

Telefax: -9075

RSC14

issue test report consist of 64 Pages

Page 1 (64)



TTI-P-G166/98-30

Accredited Bluetooth™ Test Facility (BQTF)

Test report no.: 2_2816-01-01/02

FCC Part 2, 15, 90 / RSS-119

U922K / U922xx

CETECOM – ICT Services GmbH

Untertürkheimerstr. 6-10

66117 Saarbrücken, Germany

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

Fax: + 49 (0) 681 / 9075

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

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 generalisations 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

Telefone : + 49 681 598 - 9100

Telefax : + 49 681 598 - 9075

E-mail : Michael.Berg@ict.cetecom.de

Internet : www.cetecom.de

Accredited testing laboratory

DAR-registration number : TTI-P-G 166/98-30

Accredited Bluetooth™ Test Facility (BQTF)

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

1.3 Details of applicant

Name : Ascom Tateco AB
Street : Grimbodalen 2, P.O.Box 8783
City : SE-40276 Göteborg
Country : Sweden
Telephone : +46 -31 - 559 302
Telefax : +46 -31 - 559 031
Contact : Mr. Thomas Harju
Telephone : +46 -31 - 559 302

1.4 Application details

Date of receipt of application : 14.02.2002
Date of receipt of test item : 18.02.2002
Date of test : 18.-.19.02.2002

1.5 Test item

Type of equipment : **Pocket alarm transceiver**
Type designation : **U922K / U922xx**
Manufacturer : applicant
Street :
City :
Country :
Serial number : 4719443; 4719442; 4719335
Additional information :
Frequency : 445 - 470 MHz
Type of modulation : 10K0F1D / 10K0F3E Channel separation: 12.5 kHz
Number of channels : 1
Antenna : Helix antenna
Power supply : 2,6V NiMH accu
Output power : Conducted: max. 46.6mW / ERP: 33.1mW
Type of equipment : Temperature range : -30°C - +60°C
Max. Frequency deviation : Speech: 2.11 kHz Data: 1.88 kHz

1.6 Test standards: FCC Part 2, 15, 90

2 Technical test

The radiated measurements were performed vertical and horizontal over the whole frequency range. We start at 1 m high with vertical receiving antenna and rotate the dish continuously. During rotation we use the antenna lift system to vary the high from 1 to 4 m. So we find maximum radiation output. At this points we do manual remeasurements. After this we do the same measurements in horizontal position of the receiving antenna. This (horizontal and vertical) is made for all the three planes of the test sample. We use the maximum received results.

The detector function and selection of bandwidth are according ANSI C63.2-1996 item 8.2.1 and ANSI C63.4-1992 Item 4.2.

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

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

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

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

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

2.1 Summary of test results

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

Final verdict : PASS

The Equipment meets also the requirements of the RSS-119 (Canada)

Technical responsibility for area of testing :

27.02.02 RSC 8411 Berg M.



Date	Section	Name	Signature
------	---------	------	-----------

Technical responsibility for area of testing :

27.02.02 RSC8414 Ames H.



Date	Section	Name	Signature
------	---------	------	-----------

2.2 Test report

TEST REPORT

Test report no. : 2_2816-01-01/02

TEST REPORT REFERENCE

LIST OF MEASUREMENTS

PARAMETER TO BE MEASURED		PAGE
RF Power Vs. DC Power Input	SUBCLAUSE § 2.993	7
OCCUPIED BANDWIDTH	§2.989	8
MAXIMUM PEAK OUTPUT POWER	SUBCLAUSE § 2.1046	17
CONDUCTED SPURIOUS EMISSIONS	§ 2.991	21
RADIATED SPURIOUS EMISSION	§2.993	25
FREQUENCY STABILITY Vs. TEMPERATURE	§ 2.995	32
FREQUENCY STABILITY Vs. VOLTAGE	§ 2.991	35
TRANSIENT FREQUENCY BEHAVIOR	§90.214	38
RECEIVER SPURIOUS RADIATION	§ 15.209	42
RECEIVER SPURIOUS EMISSIONS (radiated)	§ 15.209	43
RECEIVER SPURIOUS EMISSIONS (conducted)	§ 15.111	45
Conducted emissions	§ 15.107/207	48
TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS		50
Photographs of the equipment		52

Equipment under test : U922K / U922xx

Ambient temperature : 23.0°C

Relative humidity : 31%

RF Power Vs. DC Power Input

SUBCLAUSE § 2.993

Power (W)					
Frequency	445.0125 MHz	457.500 MHz	469.9875 MHz		
Power consumption	0.65	0.675	0.65		
Measurement uncertainty		± 3 %			

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

-

Equipment under test : U922K / U922xx

Ambient temperature : 23.0°C

Relative humidity : 31%

OCCUPIED BANDWIDTH

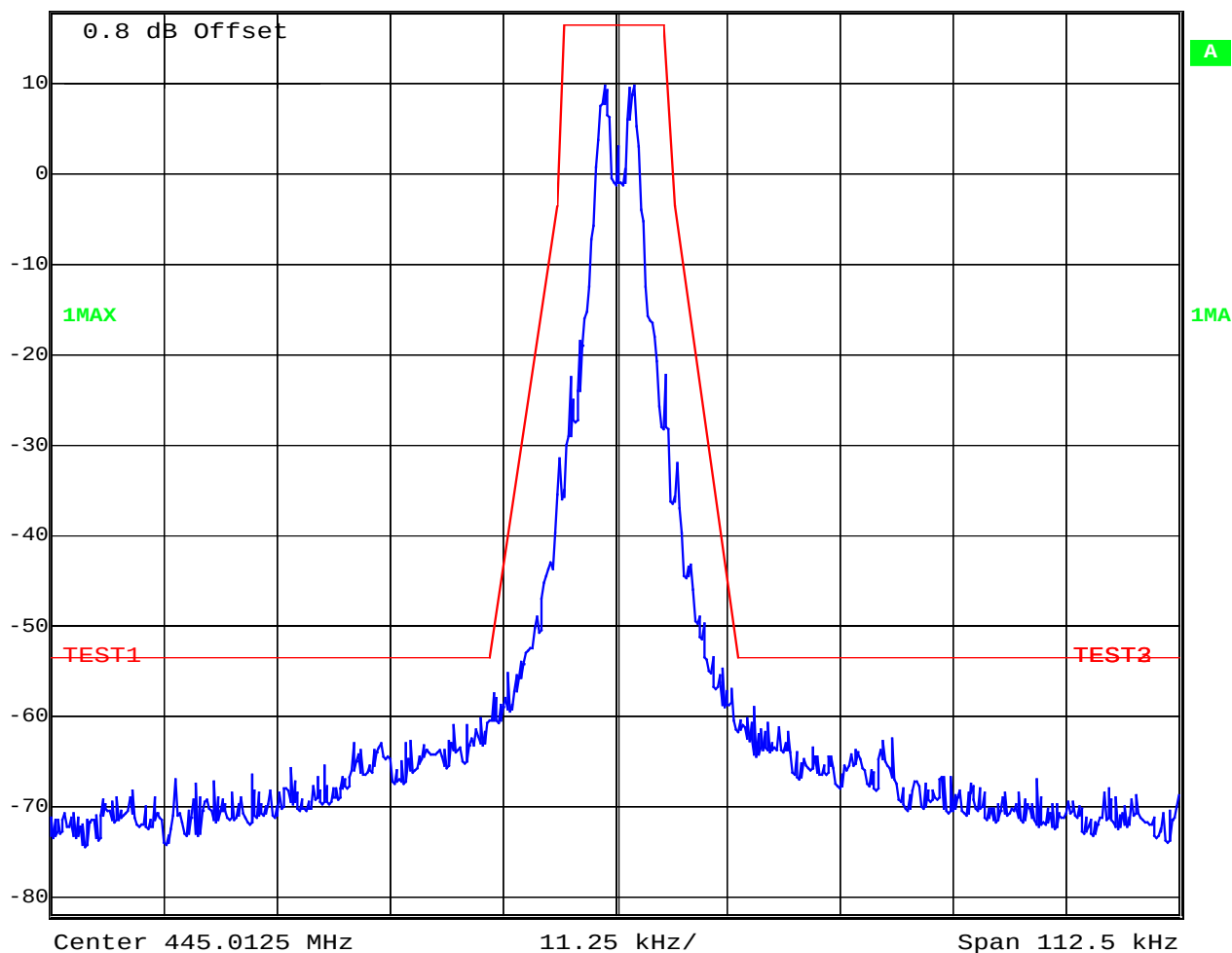
\$2.989

445.0125 MHz



Ref Lvl
18 dBm

RBW	100 Hz	RF Att	40 dB
VBW	100 Hz		
SWT	58 s	Unit	dBm



Date: 19.FEB.2002 13:29:59

measured with normal Test modulation : 16 dB greater than that required for 50% of full deviation with a noise signal and a the normal system subtone

LIMITS

SUBCLAUSE § 90.210

Emission Mask D – 12.5 kHz channel bandwidth

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

Equipment under test : U922K / U922xx

Ambient temperature : 23.0°C

Relative humidity : 31%

OCCUPIED BANDWIDTH

§2.989

445.0125MHz



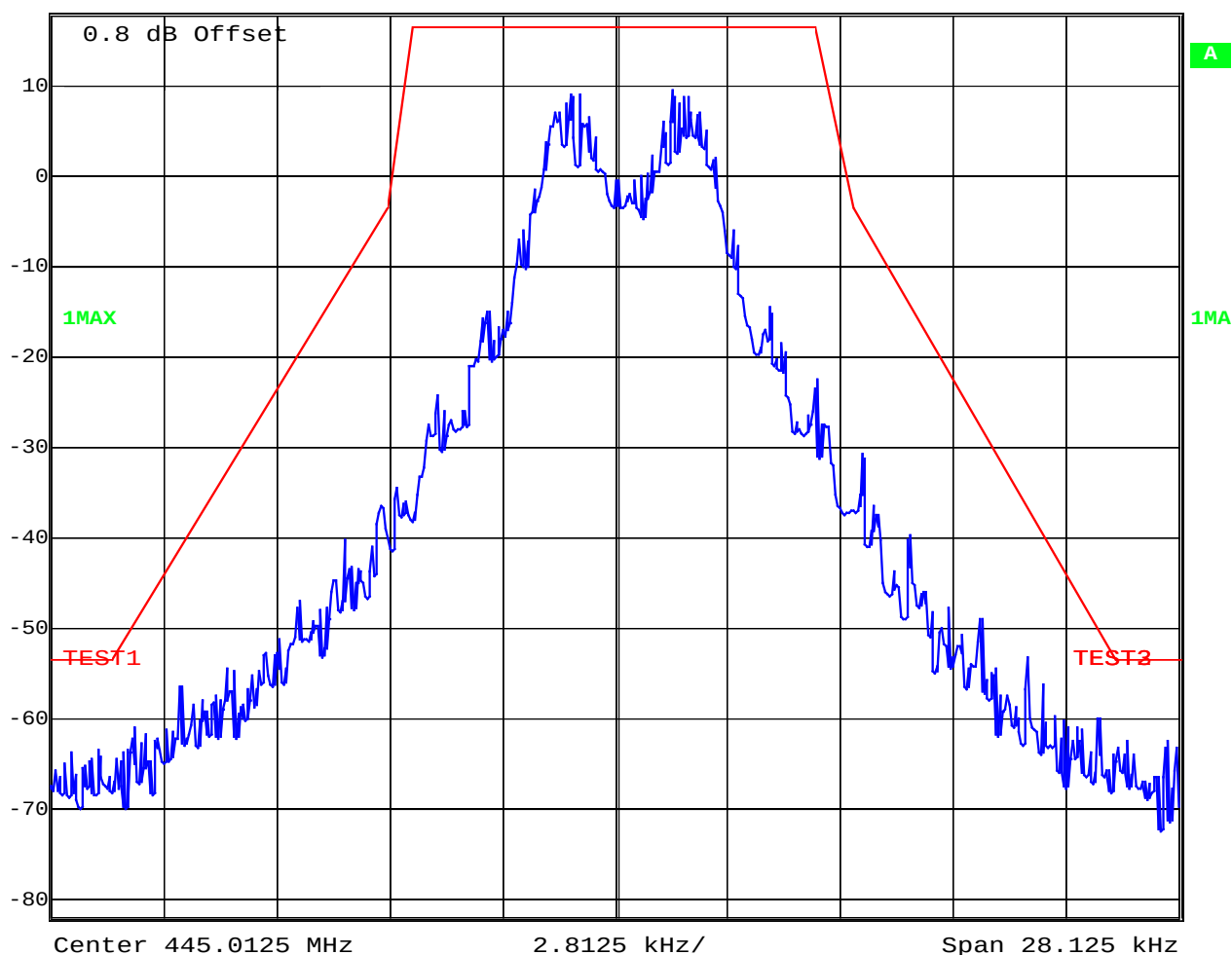
Ref Lvl

18 dBm

RBW 100 Hz RF Att 40 dB

VBW 100 Hz

SWT 14.5 s Unit dBm



Date: 19.FEB.2002 13:30:33

Frequency deviation : max 2.08 kHz

measured with normal Test modulation : 16 dB greater than that required for 50% of full deviation with a noise signal and a the normal system subtone

LIMITS

SUBCLAUSE § 90.210

Emission Mask D – 12.5 kHz channel bandwidth

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

(for reference numbers see test equipment listing)

17 - 24

Equipment under test : U922K / U922xx

Ambient temperature : 23.0°C

Relative humidity : 31%

OCCUPIED BANDWIDTH

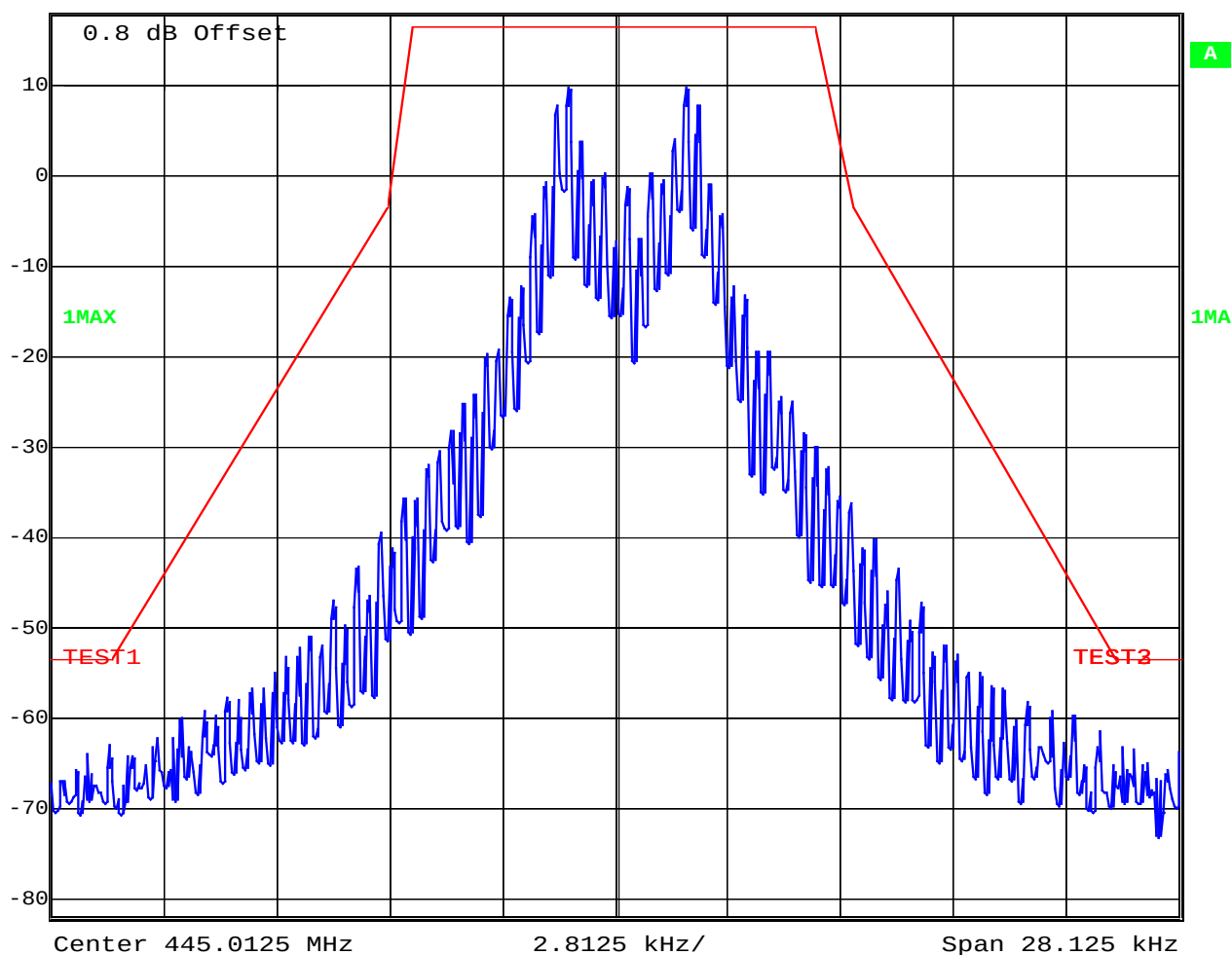
§2.989

445.0125 MHz



Ref Lvl
18 dBm

RBW	100 Hz	RF Att	40 dB
VBW	100 Hz		
SWT	14.5 s	Unit	dBm



Date: 19.FEB.2002 13:31:41

Frequency deviation : max 1.86 kHz
measured with the code modulation

LIMITS

SUBCLAUSE § 90.210

Emission Mask D – 12.5 kHz channel bandwidth

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

Equipment under test : U922K / U922xx

Ambient temperature : 23.0°C

Relative humidity : 31%

OCCUPIED BANDWIDTH

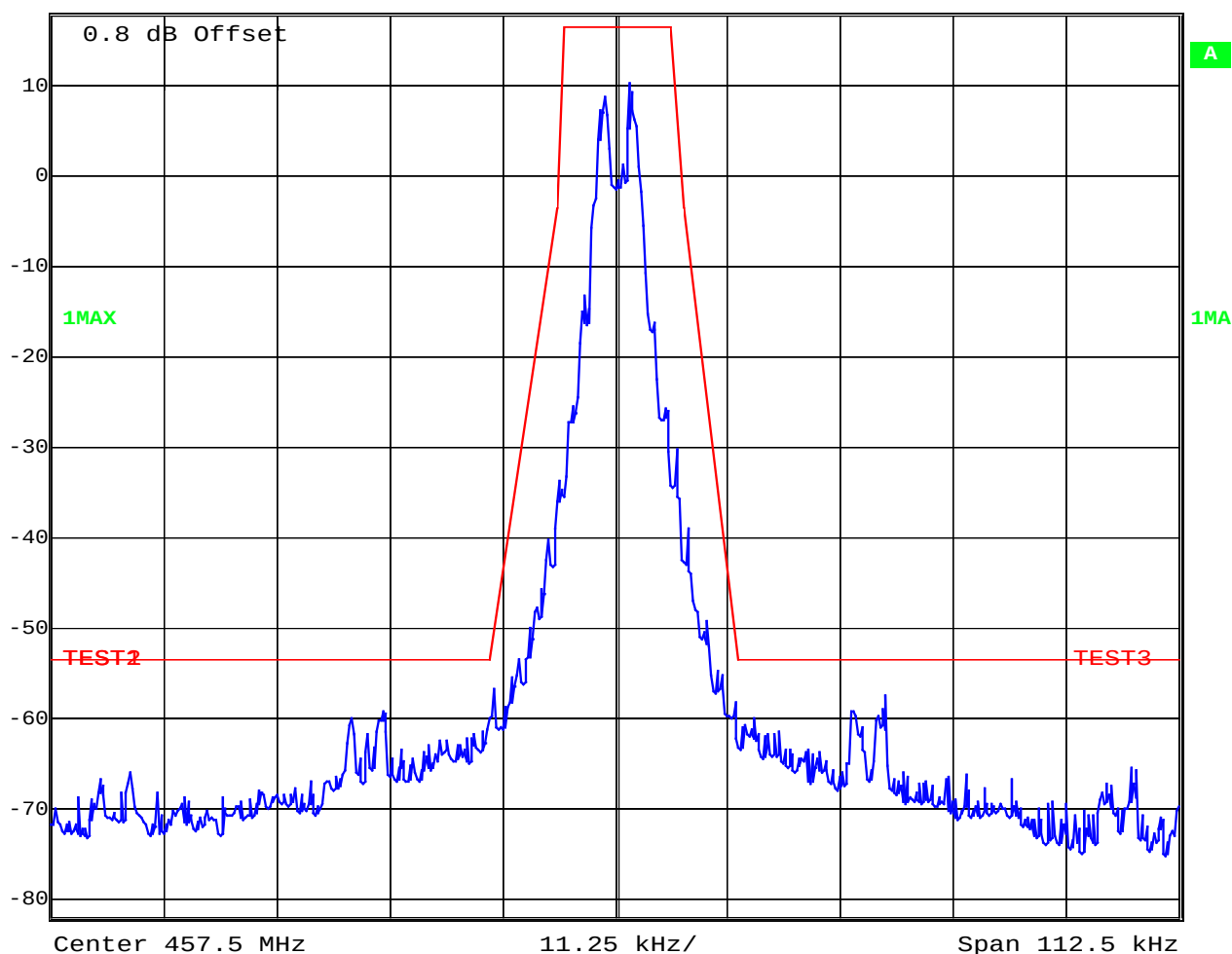
§2.989

457.5000 MHz



Ref Lvl
18 dBm

RBW	100 Hz	RF Att	40 dB
VBW	100 Hz		
SWT	58 s	Unit	dBm



Date: 19.FEB.2002 13:50:59

measured with normal Test modulation : 16 dB greater than that required for 50% of full deviation with a noise signal and a the normal system subtone

LIMITS

SUBCLAUSE § 90.210

Emission Mask D – 12.5 kHz channel bandwidth

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

(for reference numbers see test equipment listing)

Equipment under test : U922K / U922xx

Ambient temperature : 23.0°C

Relative humidity : 31%

OCCUPIED BANDWIDTH

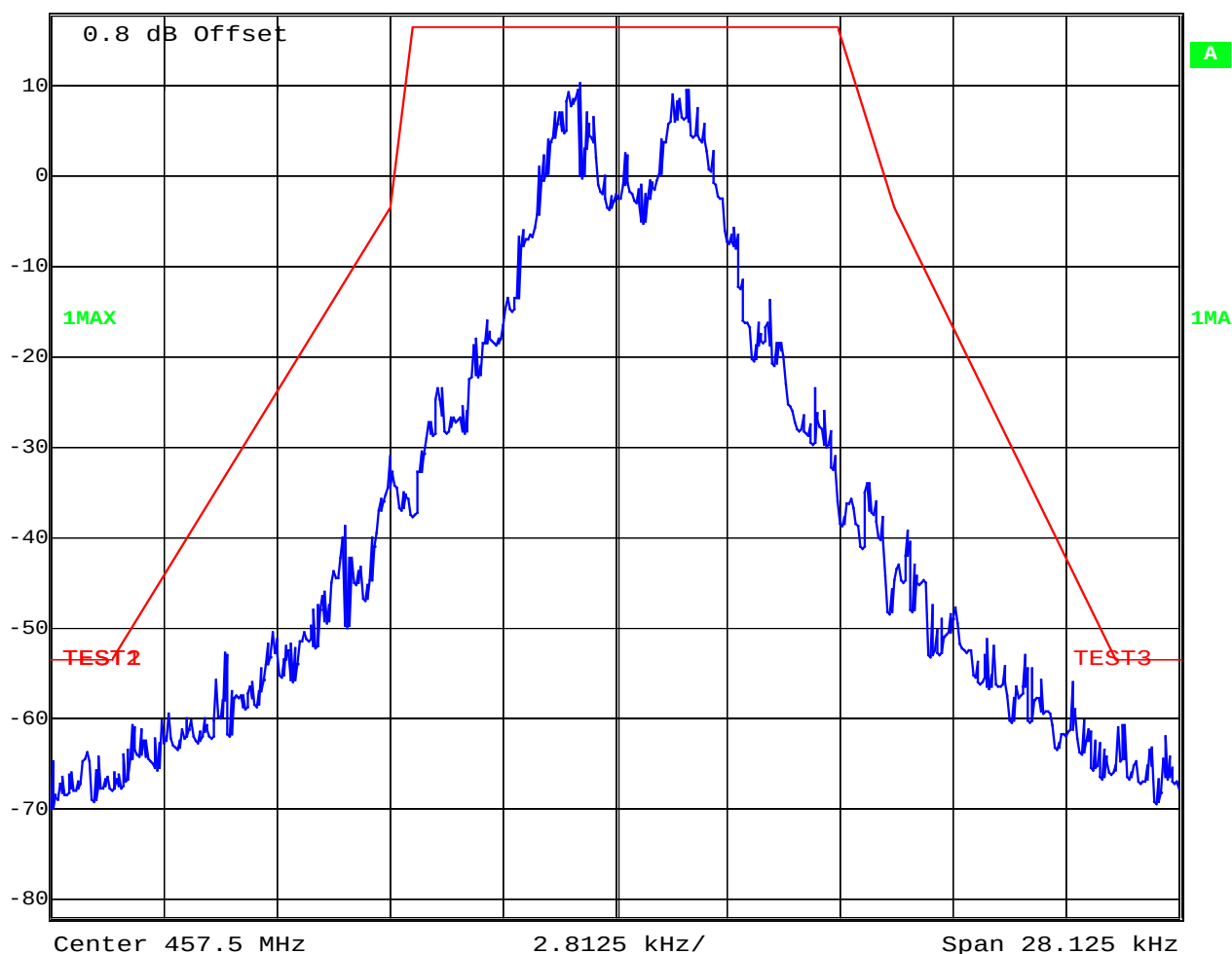
§2.989

457.5000 MHz



Ref Lvl
18 dBm

RBW	100 Hz	RF Att	40 dB
VBW	100 Hz		
SWT	14.5 s	Unit	dBm



Date: 19.FEB.2002 13:51:47

Frequency deviation : max 2.11 kHz

measured with normal Test modulation : 16 dB greater than that required for 50% of full deviation with a noise signal and a the normal system subtone

LIMITS

SUBCLAUSE § 90.210

Emission Mask D – 12.5 kHz channel bandwidth

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

(for reference numbers see test equipment listing)

17 - 24

Equipment under test : U922K / U922xx

Ambient temperature : 23.0°C

Relative humidity : 31%

OCCUPIED BANDWIDTH

§2.989

457.5000 MHz



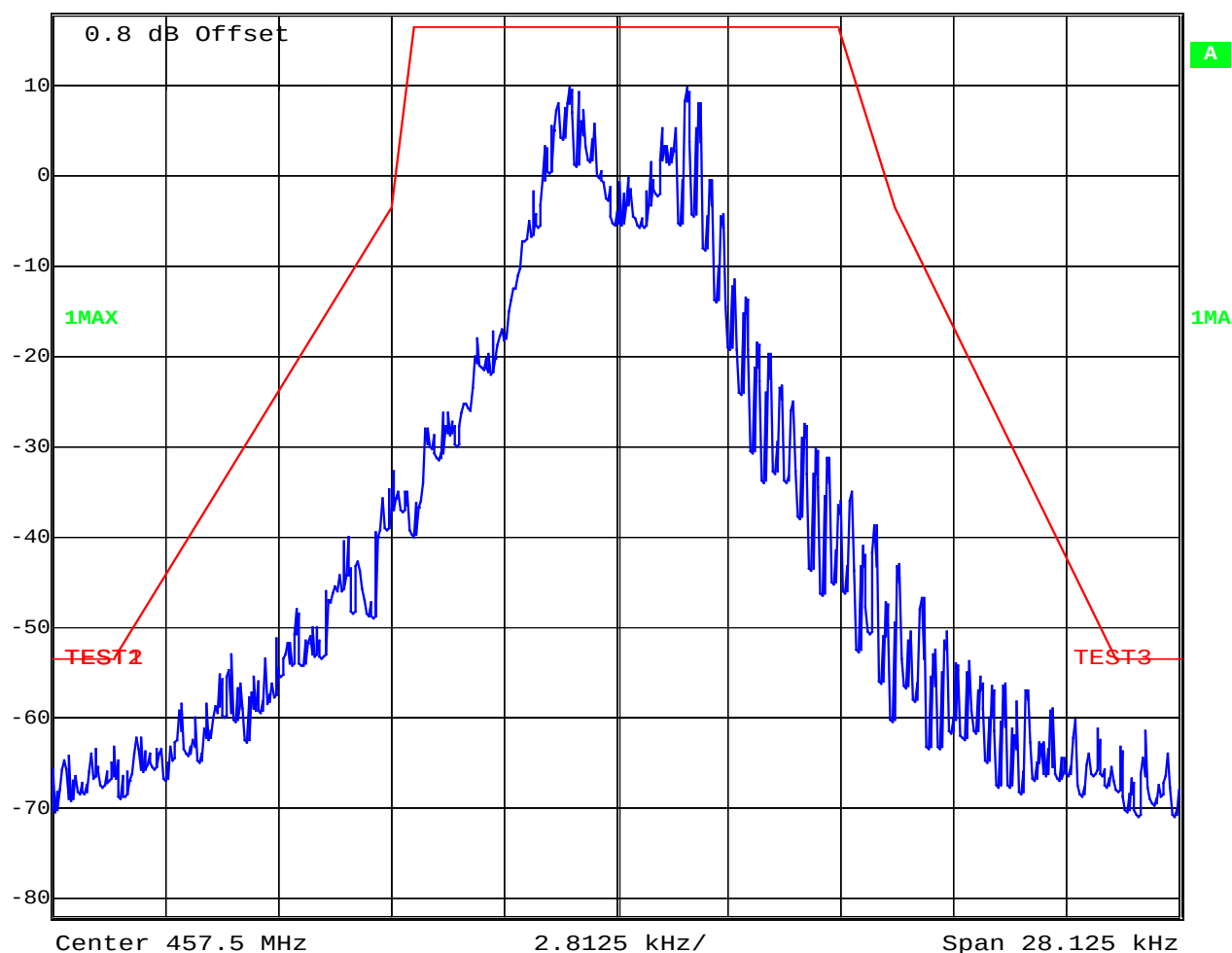
Ref Lvl

18 dBm

RBW 100 Hz RF Att 40 dB

VBW 100 Hz

SWT 14.5 s Unit dBm



Date: 19.FEB.2002 13:52:36

Frequency deviation : max 1.88 kHz

measured with code modulation

LIMITS

SUBCLAUSE § 90.210

Emission Mask D – 12.5 kHz channel bandwidth

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

(for reference numbers see test equipment listing)

17 - 24

Test report nr.: 2_2816-01-01/02 Issue Date: 2002-02-19 Page 14 (64)

Equipment under test : U922K / U922xx

Ambient temperature : 23.0°C

Relative humidity : 31%

OCCUPIED BANDWIDTH

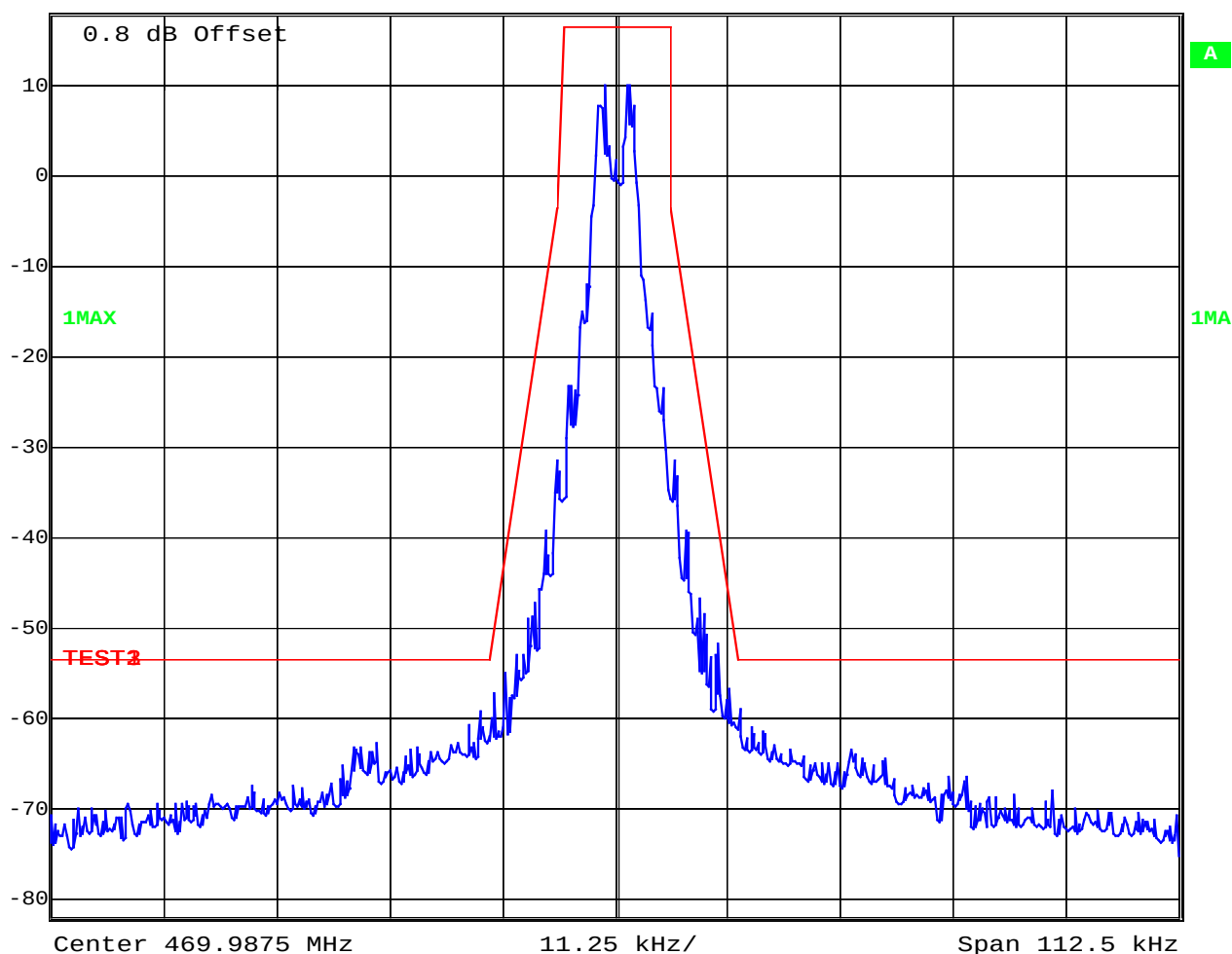
\$2.989

469.9875Hz



Ref Lvl
18 dBm

RBW	100 Hz	RF Att	40 dB
VBW	100 Hz		
SWT	58 s	Unit	dBm



Date: 19.FEB.2002 13:47:32

measured with normal Test modulation : 16 dB greater than that required for 50% of full deviation with a noise signal and a the normal system subtone

LIMITS

SUBCLAUSE § 90.210

Emission Mask D – 12.5 kHz channel bandwidth

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

(for reference numbers see test equipment listing)

17 - 24

Equipment under test : U922K / U922xx

Ambient temperature : 23.0°C

Relative humidity : 31%

OCCUPIED BANDWIDTH

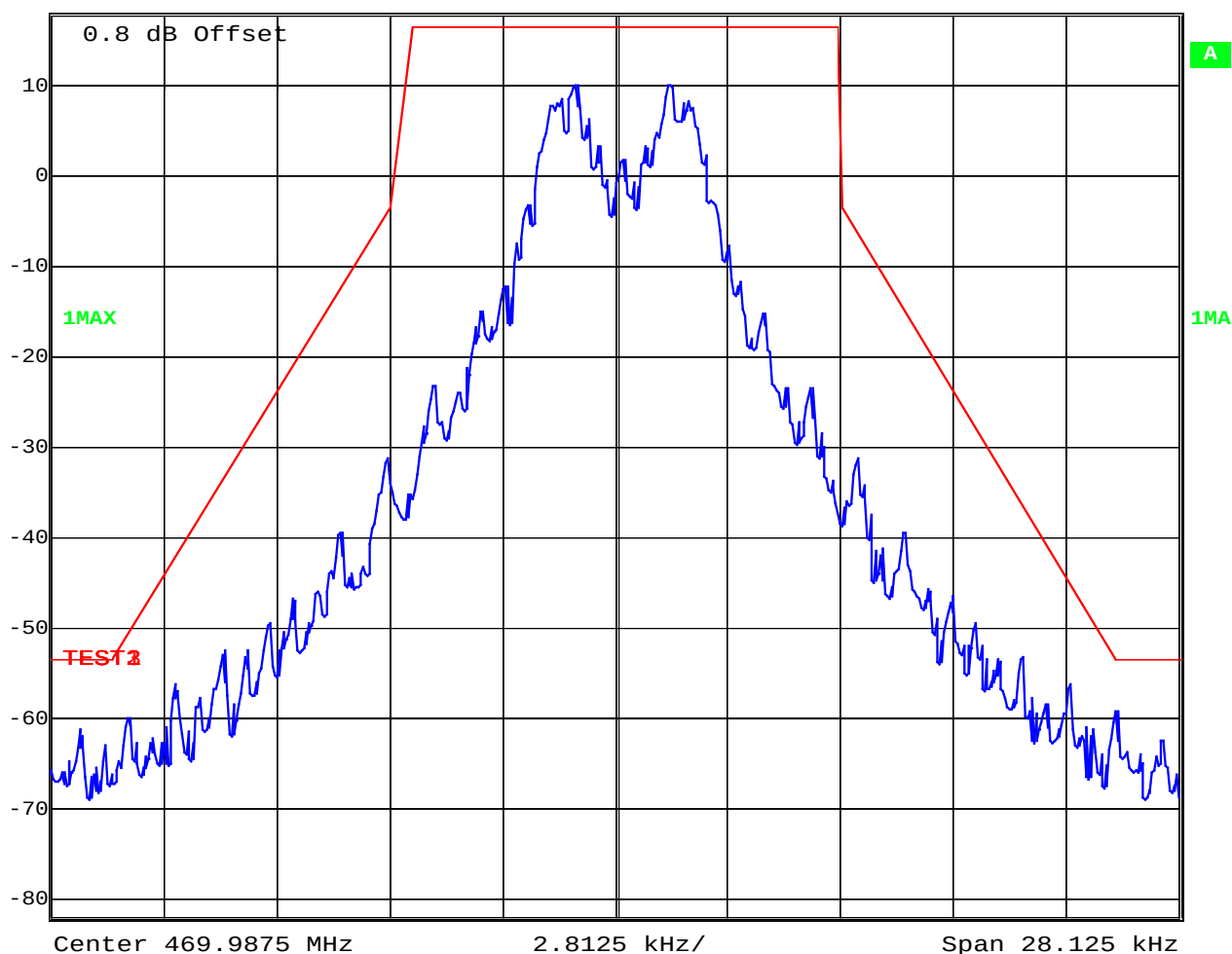
§2.989

469.9875Hz



Ref Lvl
18 dBm

RBW	100 Hz	RF Att	40 dB
VBW	100 Hz		
SWT	14.5 s	Unit	dBm



Date: 19.FEB.2002 13:43:34

Frequency deviation : max 2.05 kHz

measured with normal Test modulation : 16 dB greater than that required for 50% of full deviation with a noise signal and a the normal system subtone

LIMITS

SUBCLAUSE § 90.210

Emission Mask D – 12.5 kHz channel bandwidth

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

(for reference numbers see test equipment listing)

Equipment under test : U922K / U922xx

Ambient temperature : 23.0°C

Relative humidity : 31%

OCCUPIED BANDWIDTH

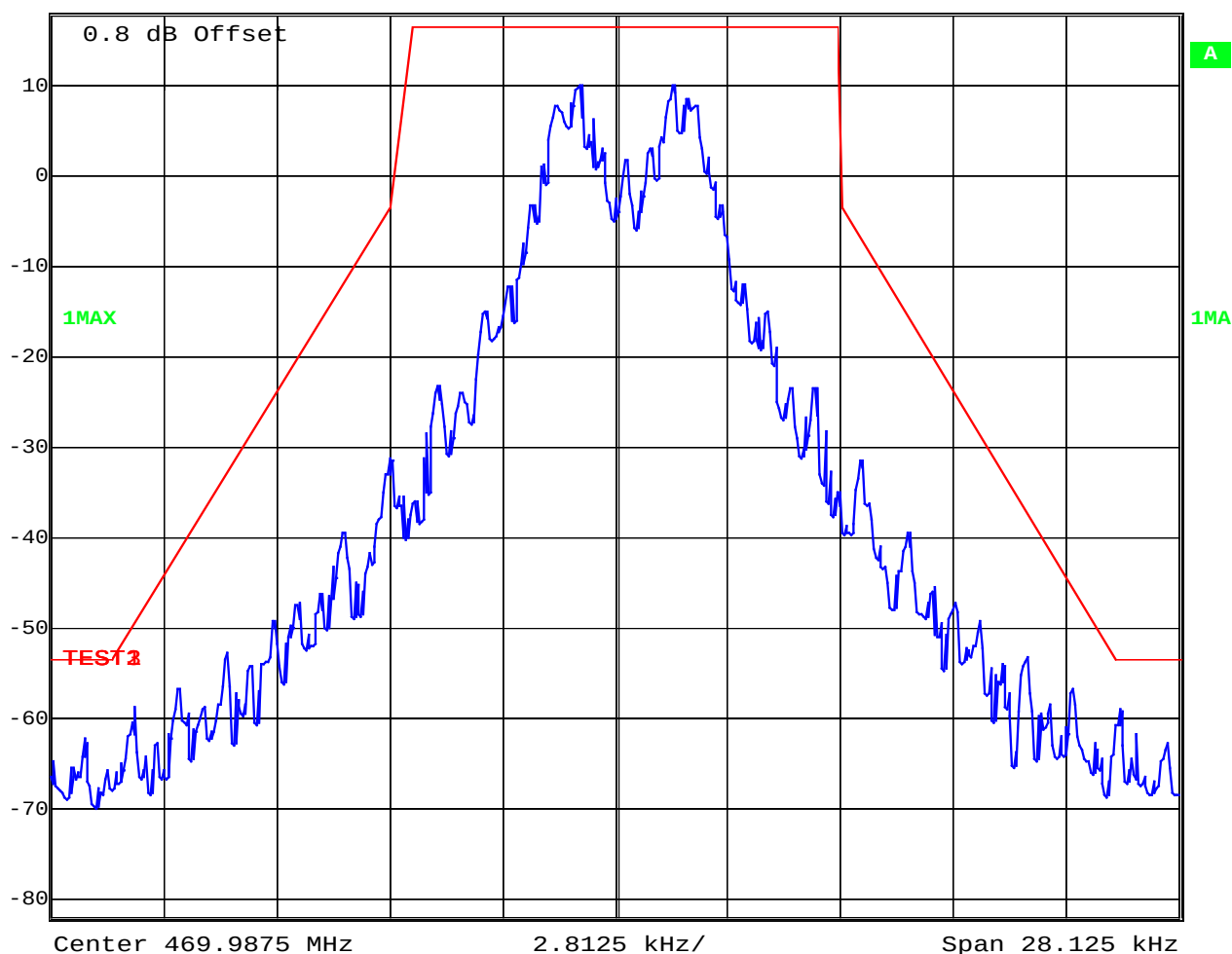
§2.989

469.9875Hz



Ref Lvl
18 dBm

RBW	100 Hz	RF Att	40 dB
VBW	100 Hz		
SWT	14.5 s	Unit	dBm



Date: 19.FEB.2002 13:38:27

Frequency deviation : max 1.85 kHz
measured with code modulation

LIMITS

SUBCLAUSE § 90.210

Emission Mask D – 12.5 kHz channel bandwidth

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

Equipment under test : U922K / U922xx

Ambient temperature : 23.0°C

Relative humidity : 31%

MAXIMUM PEAK OUTPUT POWER (conducted)

SUBCLAUSE § 2.1046

TEST CONDITIONS			MAXIMUM PEAK OUTPUT POWER (mW)				
Frequency (MHz)			445.0125	457.5000	469.9875		
T _{nom} (23)°C	V _{nom} (2.6)V		44.4	46.6	41.1		
Maximum deviation from output power under extreme test conditions (dBc)			not applicable		not applicable		not applicable
Measurement uncertainty			±3dB				

RBW / VBW : 100 kHz

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

Test report nr.: 2_2816-01-01/02

Issue Date: 2002-02-19

Page 18 (64)

Equipment under test : U922K / U922xx

Ambient temperature : 23.0°C

Relative humidity : 31%

MAXIMUM PEAK OUTPUT POWER (conducted)

SUBCLAUSE § 2.1046

445.0125 MHz



Marker 1 [T1]

RBW 100 kHz RF Att 40 dB

Ref Lvl 16.47 dBm

VBW 100 kHz

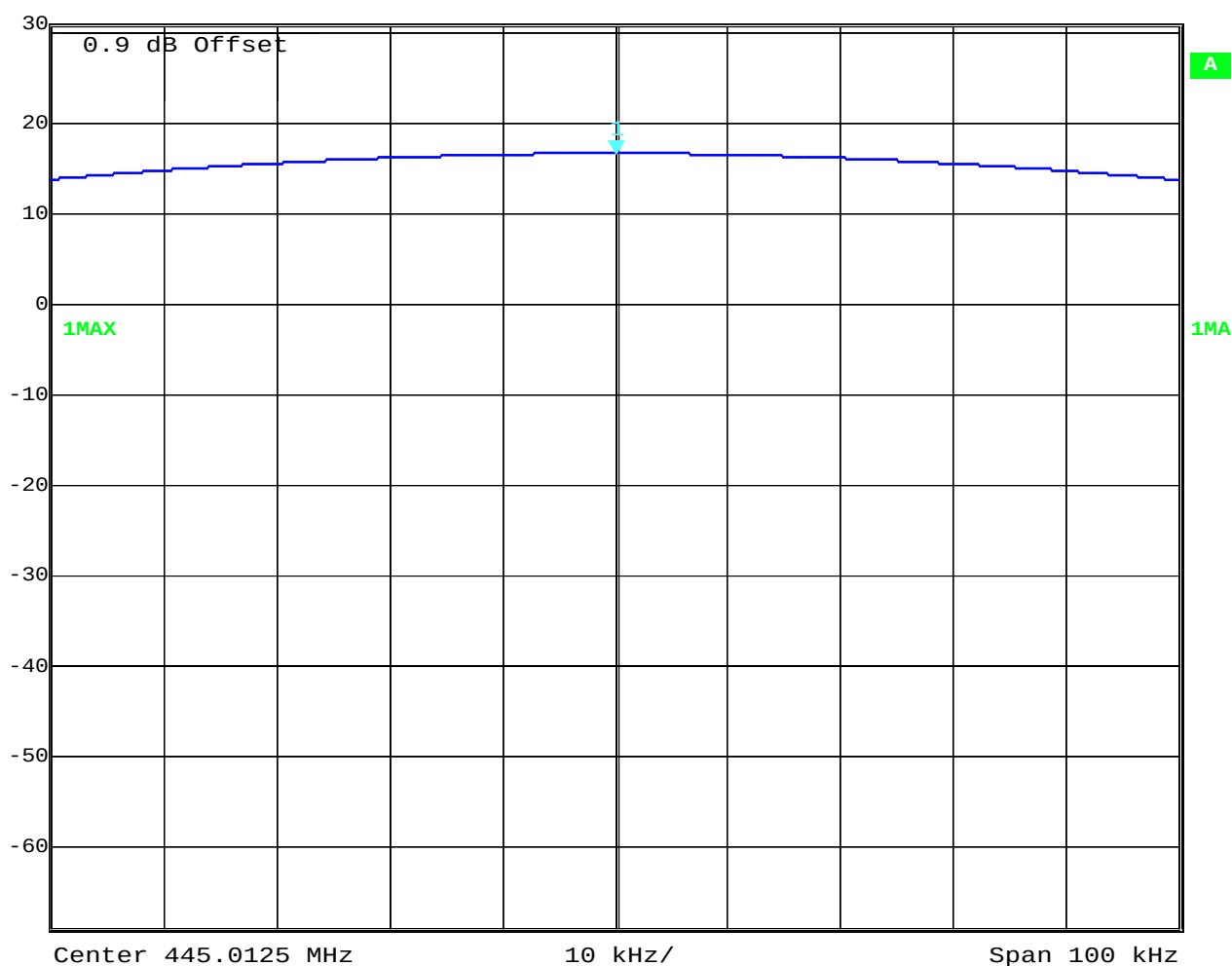
30.9 dBm

445.01260020 MHz

SWT 5 ms

Unit

dBm



Date: 18.FEB.2002 10:30:46

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

Equipment under test : U922K / U922xx

Ambient temperature : 23.0°C

Relative humidity : 31%

MAXIMUM PEAK OUTPUT POWER (conducted)

SUBCLAUSE § 2.1046

457.500 MHz



Marker 1 [T1]

RBW 100 kHz RF Att 40 dB

Ref Lvl 16.68 dBm

VBW 100 kHz

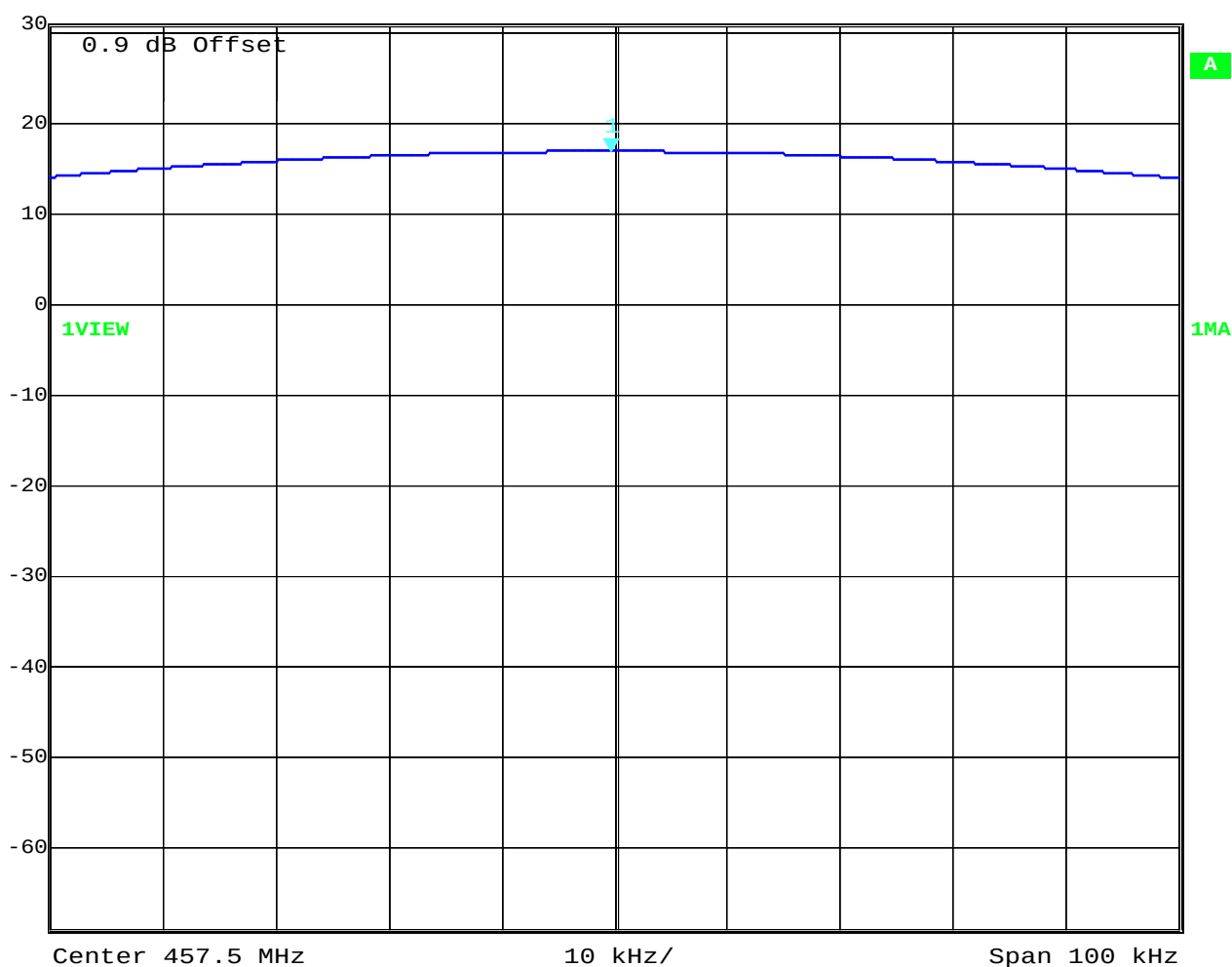
30.9 dBm

457.49969940 MHz

SWT 5 ms

Unit

dBm



Date: 18.FEB.2002 10:34:02

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

Test report nr.: 2_2816-01-01/02 Issue Date: 2002-02-19 Page 20 (64)

Equipment under test : U922K / U922xx

Ambient temperature : 23.0°C

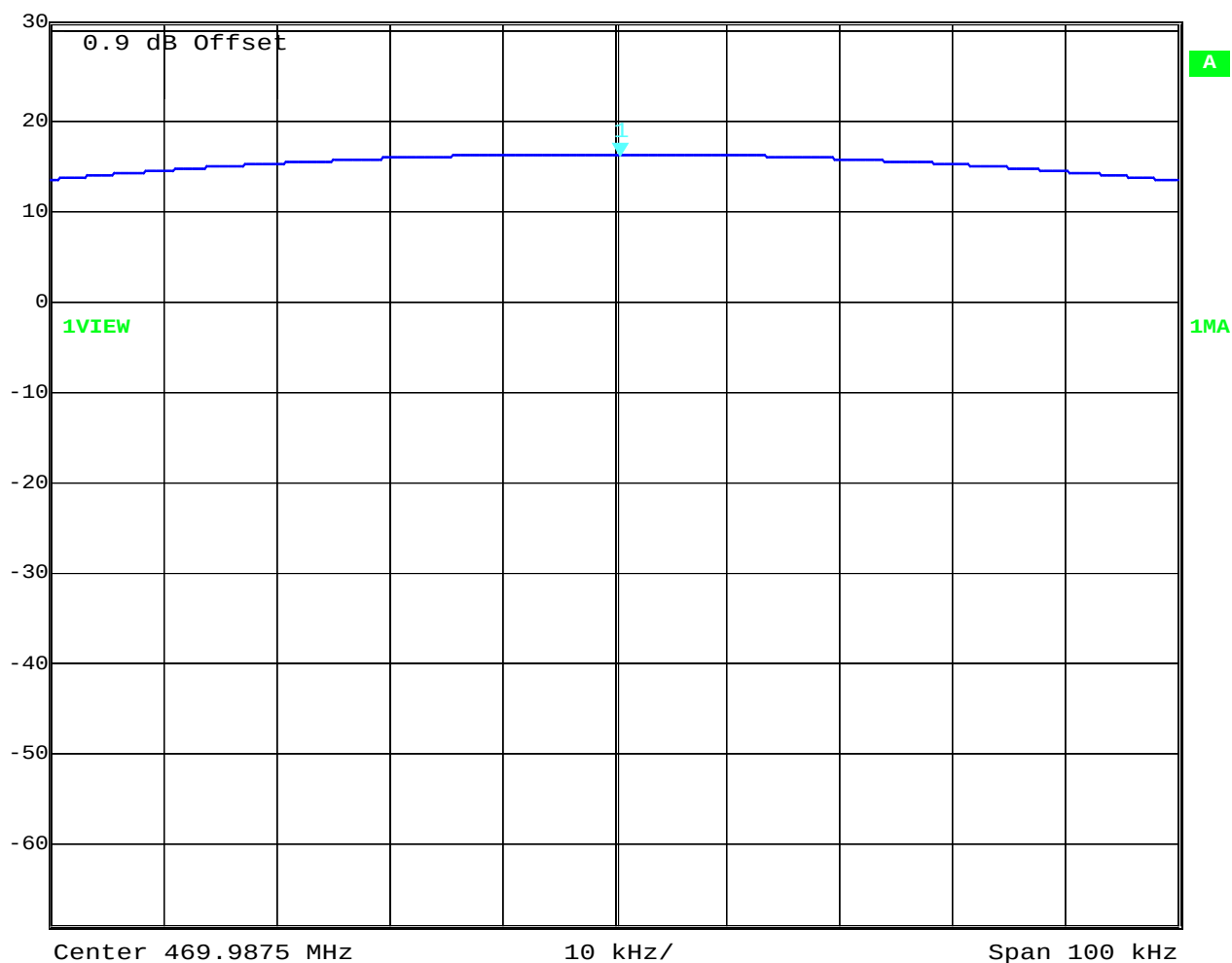
Relative humidity : 31%

MAXIMUM PEAK OUTPUT POWER (conducted)

SUBCLAUSE § 2.1046

469.9875 MHz

 Marker 1 [T1] RBW 100 kHz RF Att 40 dB
Ref Lvl 16.14 dBm VBW 100 kHz
30.9 dBm 469.98800100 MHz SWT 5 ms Unit dBm



Date: 18.FEB.2002 10:35:12

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

Equipment under test : U922K / U922xx

Ambient temperature : 23.0°C

Relative humidity : 31%

CONDUCTED SPURIOUS EMISSIONS

§ 2.991

EMISSION LIMITATIONS					
f (MHz)		amplitude of emission (dBm)	limit max. allowed emission power	actual attenuation below frequency of operation (dB)	results
See plots					
Measurement uncertainty		± 3dB			

RBW : 100 kHz VBW: 1 MHz

LIMITS

SUBCLAUSE § 2.991

Conducted spurious emissions shall be attenuated below the maximum level of emission of the carrier frequency in accordance with the following formula:

For 12.5 kHz channel bandwidth :

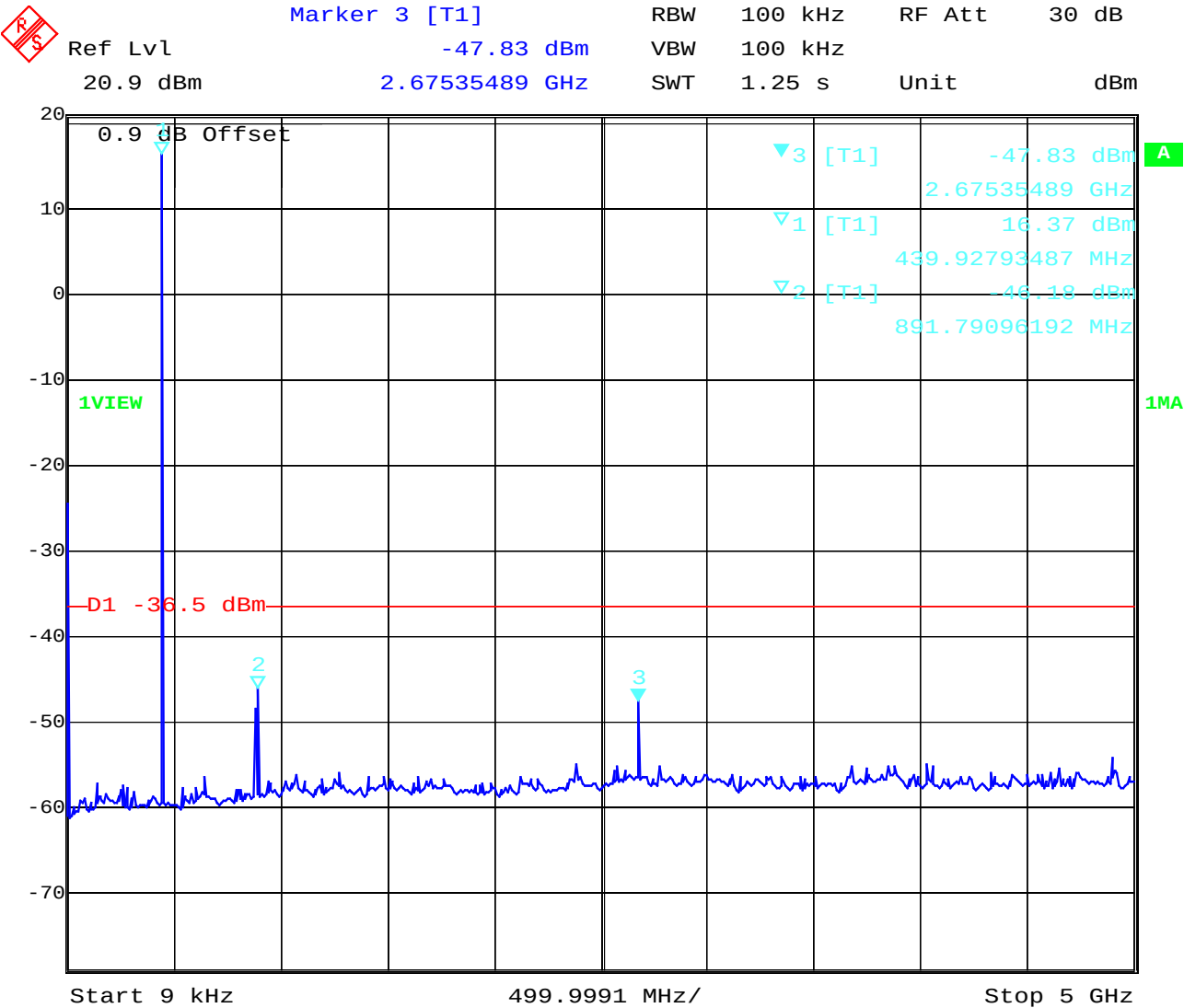
Spurious attenuation in dB = $50 + 10 \log_{10}$ (Power output in watt)

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

Equipment under test : U922K / U922xx
Ambient temperature : 23.0°C
Relative humidity : 31%

CONDUCTED SPURIOUS EMISSIONS § 2.991

445.0125 MHz



Date: 18.FEB.2002 10:50:46

Equipment under test : U922K / U922xx

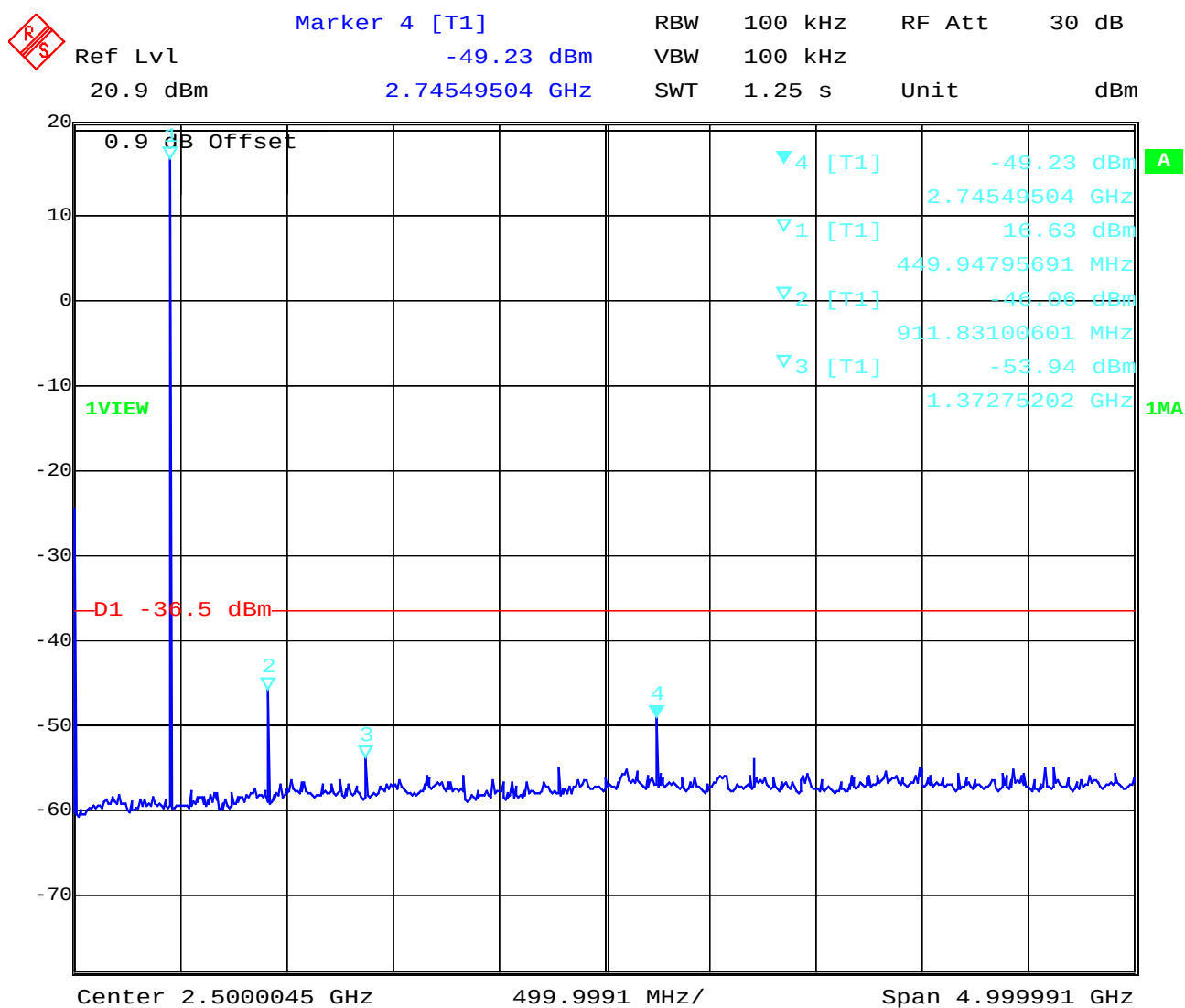
Ambient temperature : 23.0°C

Relative humidity : 31%

CONDUCTED SPURIOUS EMISSIONS

§ 2.991

457.500 MHz



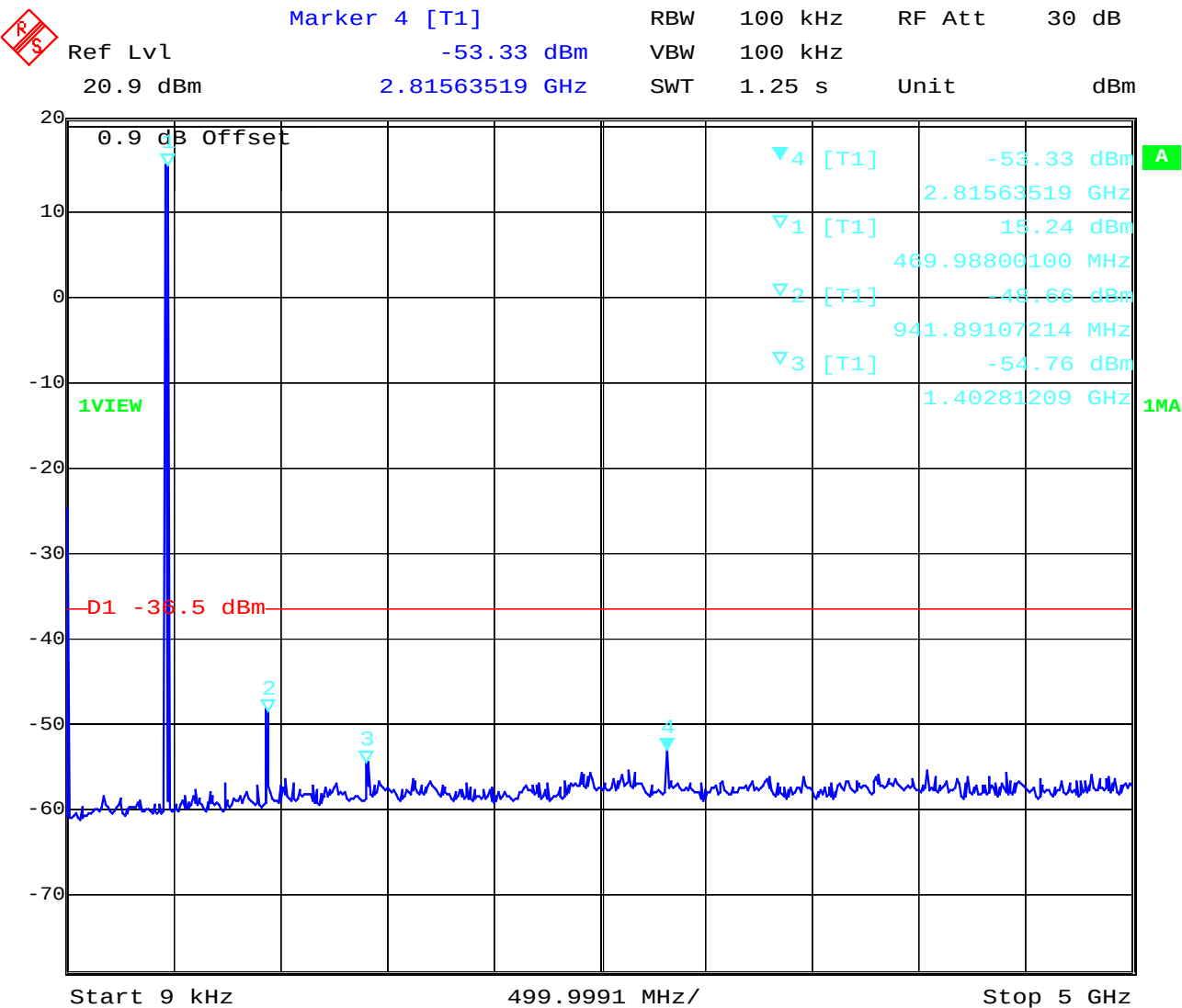
Date: 18.FEB.2002 10:49:14

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

Equipment under test : U922K / U922xx
Ambient temperature : 23.0°C
Relative humidity : 31%

CONDUCTED SPURIOUS EMISSIONS § 2.991

469.9875 MHz



Date: 18.FEB.2002 10:47:47

Test report nr.: 2_2816-01-01/02 Issue Date: 2002-02-19 Page 25 (64)

Equipment under test : U922K / U922xx

Ambient temperature : 23.0°C

Relative humidity : 31%

RADIATED SPURIOUS EMISSION

§2.993

EMISSION LIMITATIONS					
f (MHz)	polarization	amplitude of emission (dBµV/m) QUASIPeAK	amplitude of emission (dBµV/m) average	limit max. allowed emission power (dBµV/m)	results
445.0125 MHz					
932.1	V	33.0		46	complies
1335.04	V		39.6	54	complies
1780.05	V		46.1	54	complies
457.500 MHz					
915.0	V	43.5		46	complies
1372.5	V		35.1	54	complies
3202.5	V		37.8	54	complies
4575.0	V		46.4	54	complies
5032.5	V		40.6	54	complies
5947.5	V		40.5	54	complies
6405.0	V		44.0	54	complies
469.9875 MHz					
939.98	V	45.7			complies
1409.96	V		44.2		complies
1879.95	V		40.8		complies
4699.88	V		49.6		complies
5169.86	V		40.4		complies
5639.85	V		43.3		complies
6108.84	V		35.7		complies
6579.83	V		38.5		complies
Measurement uncertainty		± 3dB			

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

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

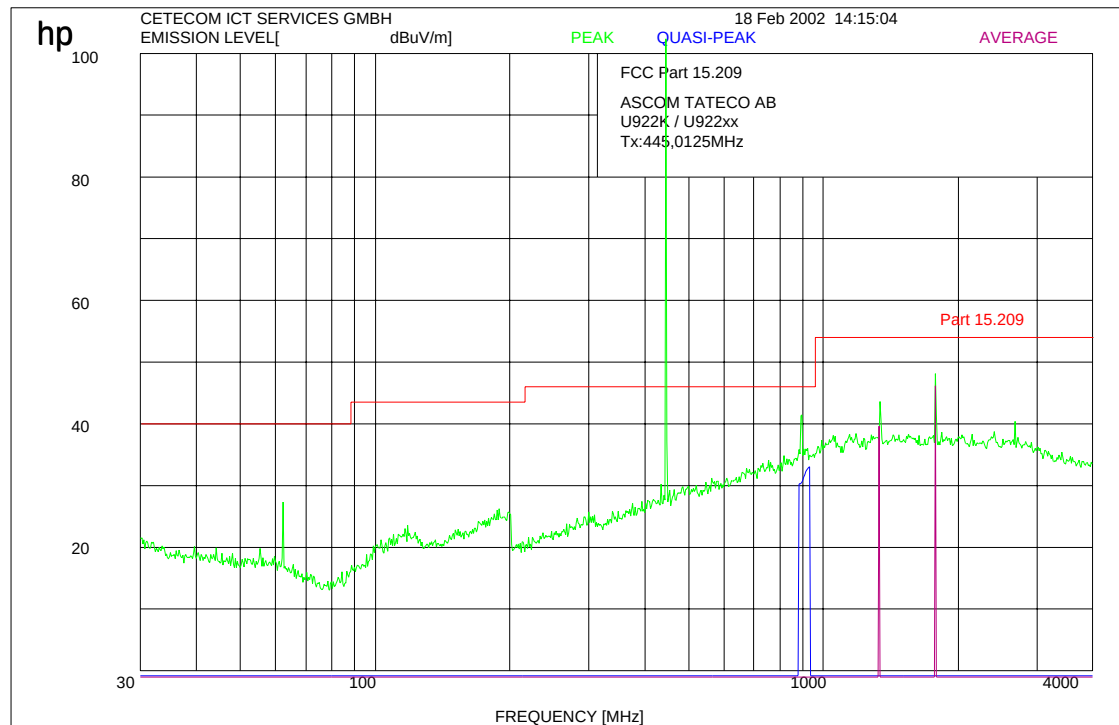
Equipment under test : U922K / U922xx

Ambient temperature : 23.0°C

Relative humidity : 31%

RADIATED SPURIOUS EMISSIONS

445.0125 MHz



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

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

LIMITS

SUBCLAUSE § 15.209

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

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

(for reference numbers see test equipment listing)

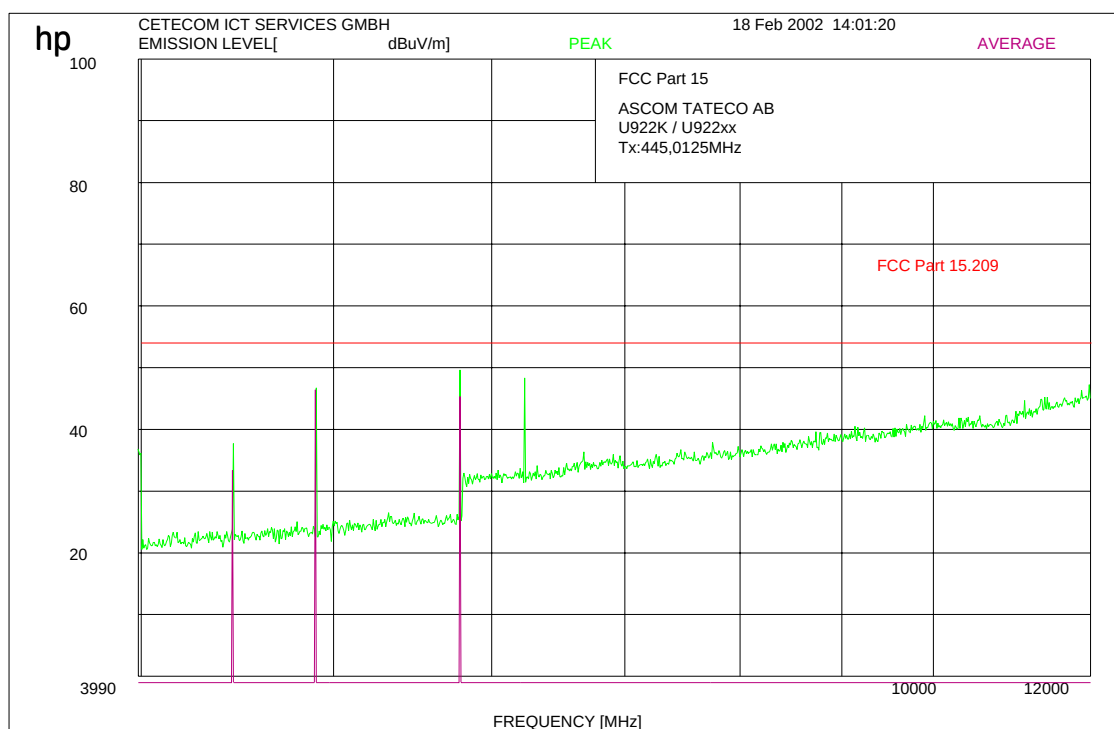
Equipment under test : U922K / U922xx

Ambient temperature : 23.0°C

Relative humidity : 31%

RADIATED SPURIOUS EMISSIONS

445.0125 MHz



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

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

LIMITS

SUBCLAUSE § 15.209

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

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

(for reference numbers see test equipment listing)

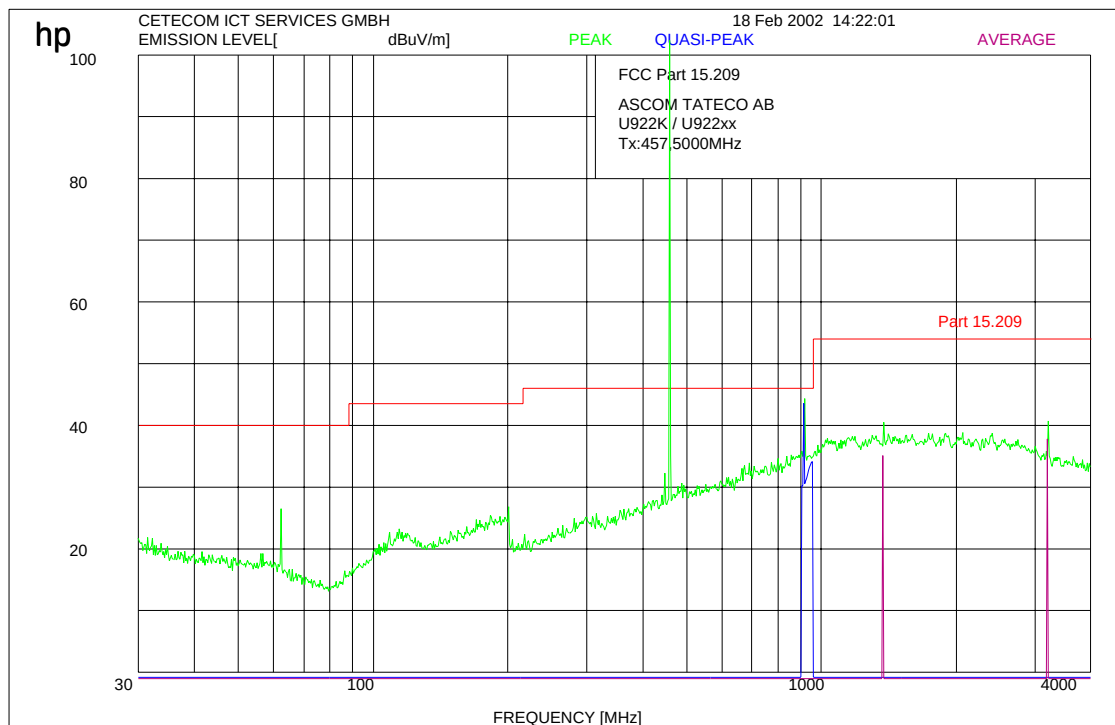
Equipment under test : U922K / U922xx

Ambient temperature : 23.0°C

Relative humidity : 31%

RADIATED SPURIOUS EMISSIONS

457.500 MHz



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

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

LIMITS

SUBCLAUSE § 15.209

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

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

(for reference numbers see test equipment listing)

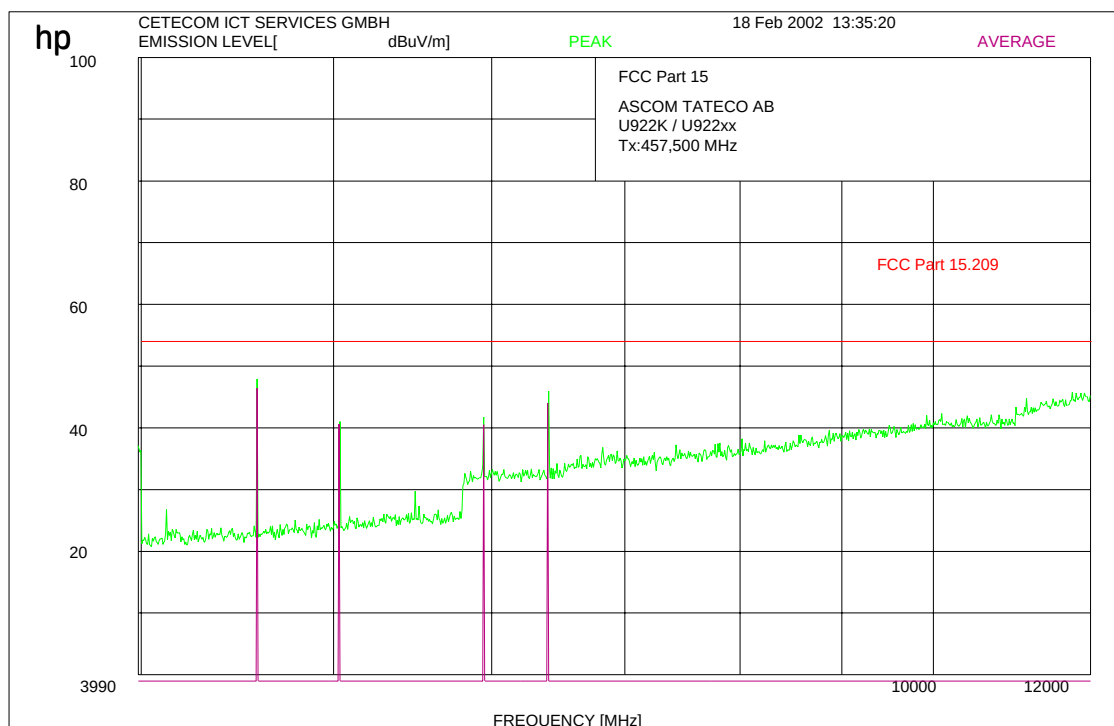
Equipment under test : U922K / U922xx

Ambient temperature : 23.0°C

Relative humidity : 31%

RADIATED SPURIOUS EMISSIONS

457.500 MHz



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

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

LIMITS

SUBCLAUSE § 15.209

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

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

(for reference numbers see test equipment listing)

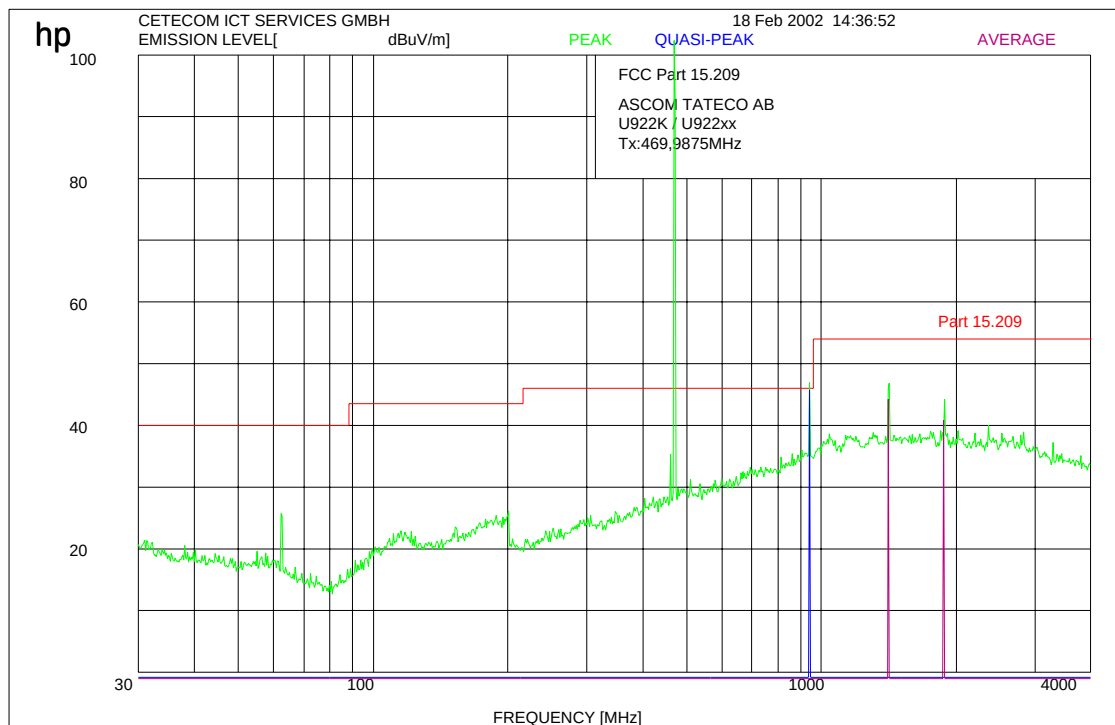
Equipment under test : U922K / U922xx

Ambient temperature : 23.0°C

Relative humidity : 31%

RADIATED SPURIOUS EMISSIONS

469.9875 MHz



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

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

LIMITS

SUBCLAUSE § 15.209

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

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

(for reference numbers see test equipment listing)

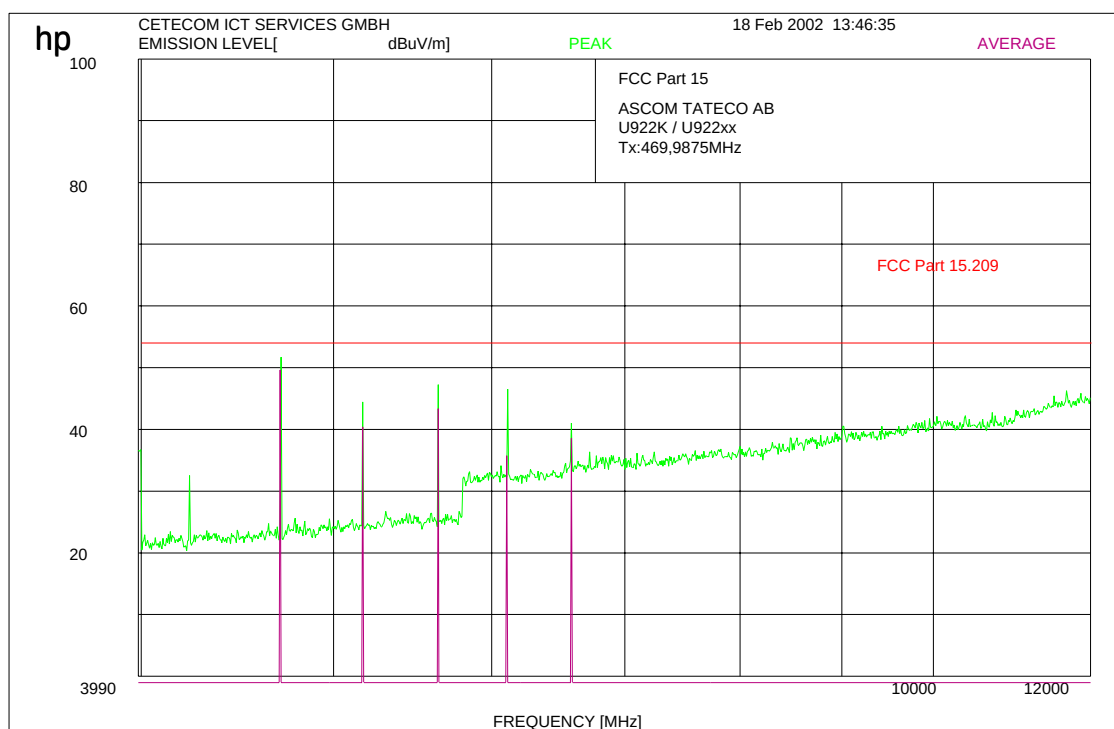
Equipment under test : U922K / U922xx

Ambient temperature : 23.0°C

Relative humidity : 31%

RADIATED SPURIOUS EMISSIONS

469.9875 MHz



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

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

LIMITS

SUBCLAUSE § 15.209

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

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

(for reference numbers see test equipment listing)

Equipment under test : U922K / U922xx

Ambient temperature : 23.0°C

Relative humidity : 31%

FREQUENCY STABILITY Vs. TEMPERATURE

§ 2.995

Temperature [°C]	Frequency error [Hz]	Frequency [MHz]	Error in %	Error in PPM
-30°	-720	445.013	-0.00016179	-1.6179
-20°	-10	445.013	-0.00000225	-0.0225
-10°	540	445.013	0.00012134	1.2134
0.0°	740	445.013	0.00016629	1.6629
+10°	480	445.013	0.00010786	1.0786
+20°	90	445.013	0.00002022	0.2022
+30°	-270	445.013	-0.00006067	-0.6067
+40°	-680	445.013	-0.00015280	-1.5280
+50°	-850	445.013	-0.00019101	-1.9101
+60°	-920	445.013	-0.00020674	-2.0674

Temperature [°C]	Frequency error [Hz]	Frequency [MHz]	Error in %	Error in PPM
-30°	-1110	457.500	-0.00024262	-2.4262
-20°	380	457.500	0.00008306	0.8306
-10°	960	457.500	0.00020984	2.0984
0.0°	890	457.500	0.00019454	1.9454
+10°	280	457.500	0.00006120	0.6120
+20°	-440	457.500	-0.00009617	-0.9617
+30°	-730	457.500	-0.00015956	-1.5956
+40°	-105	457.500	-0.00002295	-0.2295
+50°	-990	457.500	-0.00021639	-2.1639
+60°	-50	457.500	-0.00001093	-0.1093

Temperature [°C]	Frequency error [Hz]	Frequency [MHz]	Error in %	Error in PPM
-30°	-1140	469.988	-0.00024256	-2.4256
-20°	-1160	469.988	-0.00024682	-2.4682
-10°	-180	469.988	-0.00003830	-0.3830
0.0°	330	469.988	0.00007021	0.7021
+10°	240	469.988	0.00005107	0.5107
+20°	-120	469.988	-0.00002553	-0.2553
+30°	-470	469.988	-0.00010000	-1.0000
+40°	-740	469.988	-0.00015745	-1.5745
+50°	-450	469.988	-0.00009575	-0.9575
+60°	-230	469.988	-0.00004894	-0.4894

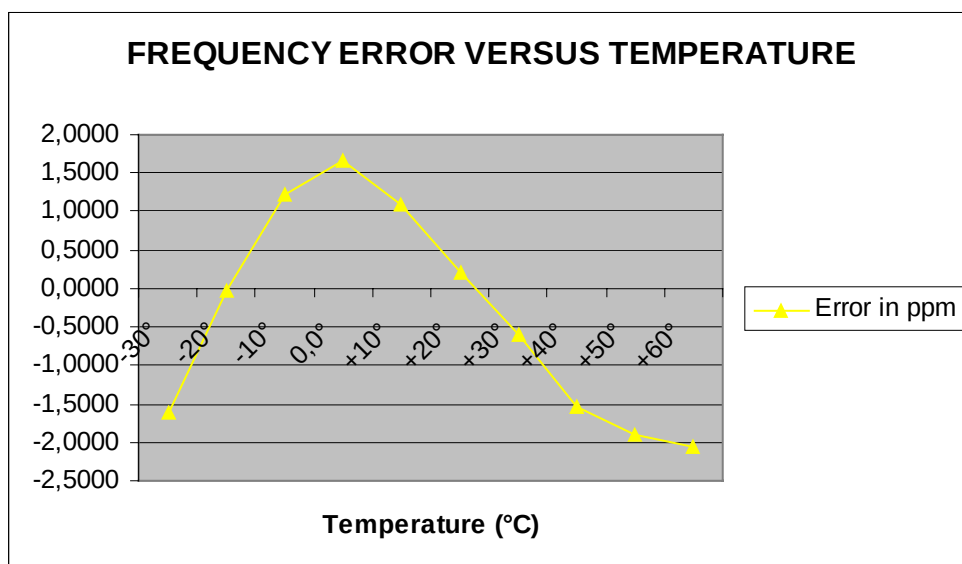
REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)

Equipment under test : U922K / U922xx

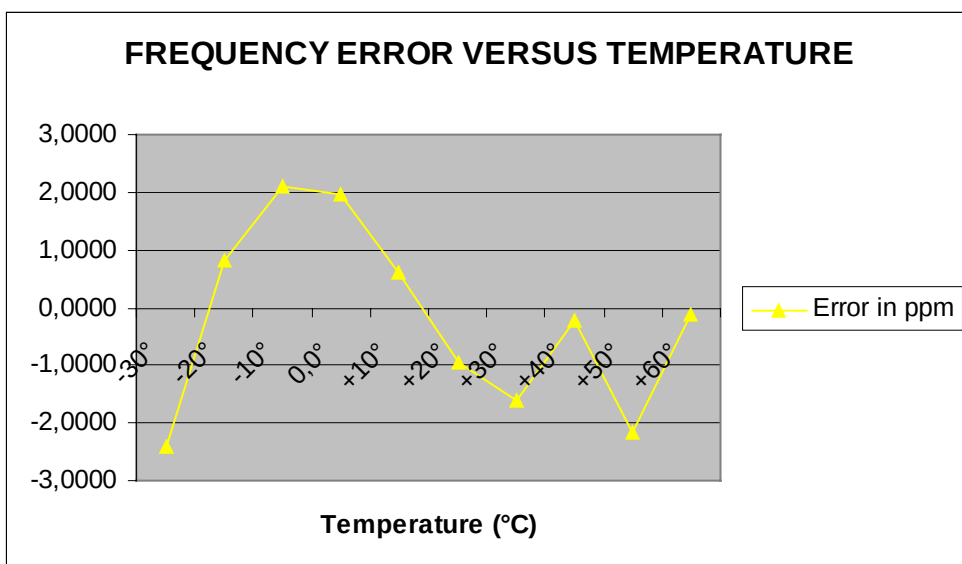
Ambient temperature : 23.0°C

Relative humidity : 31%

445.0125 MHz



457.500 MHz

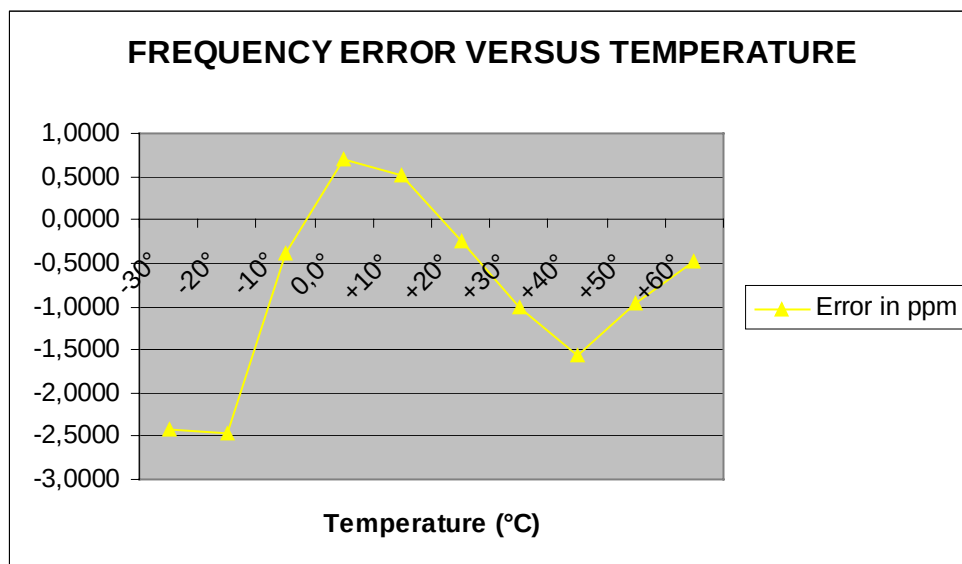


Equipment under test : U922K / U922xx

Ambient temperature : 23.0°C

Relative humidity : 31%

469.9875 MHz



LIMITS

SUBCLAUSE § 90.213

Temperature – Frequency Stability of 2.5 ppm from –30 to +60 °C

Equipment under test : U922K / U922xx**Ambient temperature : 23.0°C****Relative humidity : 31%****FREQUENCY STABILITY Vs. VOLTAGE****§ 2.991**

nom. Voltage	nom. Voltage	Voltage [V]	Frequency error [Hz]	Frequency [MHz]	Error in %	Error in PPM
2.6 V		2.20	30	445.0125	0.00000674	0.0674
		2.30	30	445.0125	0.00000674	0.0674
		2.40	30	445.0125	0.00000674	0.0674
		2.50	20	445.0125	0.00000449	0.0449
		2.60	10	445.0125	0.00000225	0.0225
		2.70	0	445.0125	0.00000000	0.0000
		2.80	0	445.0125	0.00000000	0.0000
		2.90	0	445.0125	0.00000000	0.0000

nom. Voltage	nom. Voltage	Voltage [V]	Frequency error [Hz]	Frequency [MHz]	Error in %	Error in PPM
2.6 V		2.20	60	457.500	0.00000001	0.0001
		2.30	40	457.500	0.00000001	0.0001
		2.40	40	457.500	0.00000001	0.0001
		2.50	30	457.500	0.00000001	0.0001
		2.60	20	457.500	0.00000000	0.0000
		2.70	10	457.500	0.00000000	0.0000
		2.80	0	457.500	0.00000000	0.0000
		2.90	-10	457.500	0.00000000	0.0000

nom. Voltage	nom. Voltage	Voltage [V]	Frequency error [Hz]	Frequency [MHz]	Error in %	Error in PPM
2.6 V		2.20	-60	469.9875	-0.00001277	-0.1277
		2.30	-50	469.9875	-0.00001064	-0.1064
		2.40	-50	469.9875	-0.00001064	-0.1064
		2.50	-40	469.9875	-0.00000851	-0.0851
		2.60	-30	469.9875	-0.00000638	-0.0638
		2.70	-30	469.9875	-0.00000638	-0.0638
		2.80	-10	469.9875	-0.00000213	-0.0213
		2.90	0	469.9875	0.00000000	0.0000

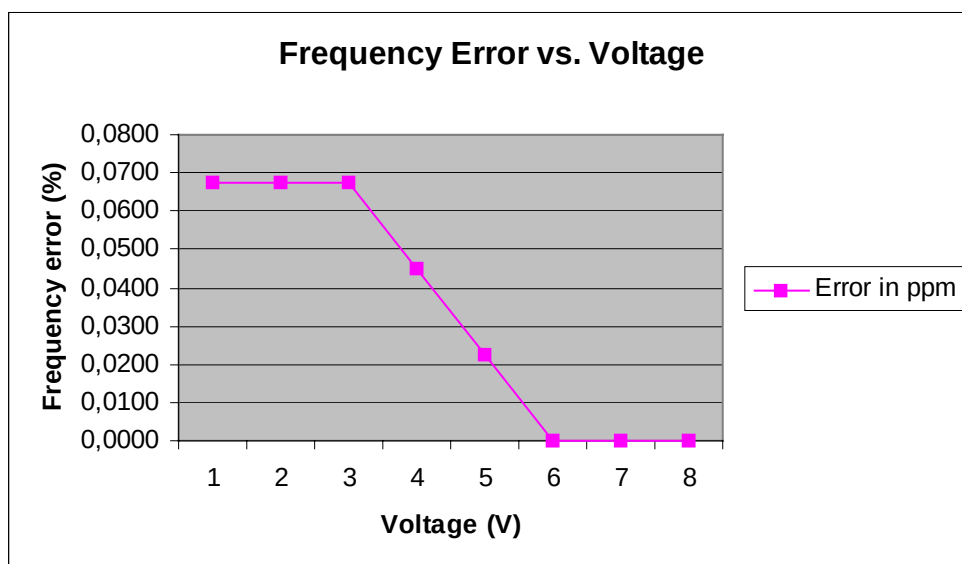
REFERENCE NUMBER(S) OF TEST EQUIPMENT USED**(for reference numbers see test equipment listing)****07, 64 , 66 -68**

Equipment under test : U922K / U922xx

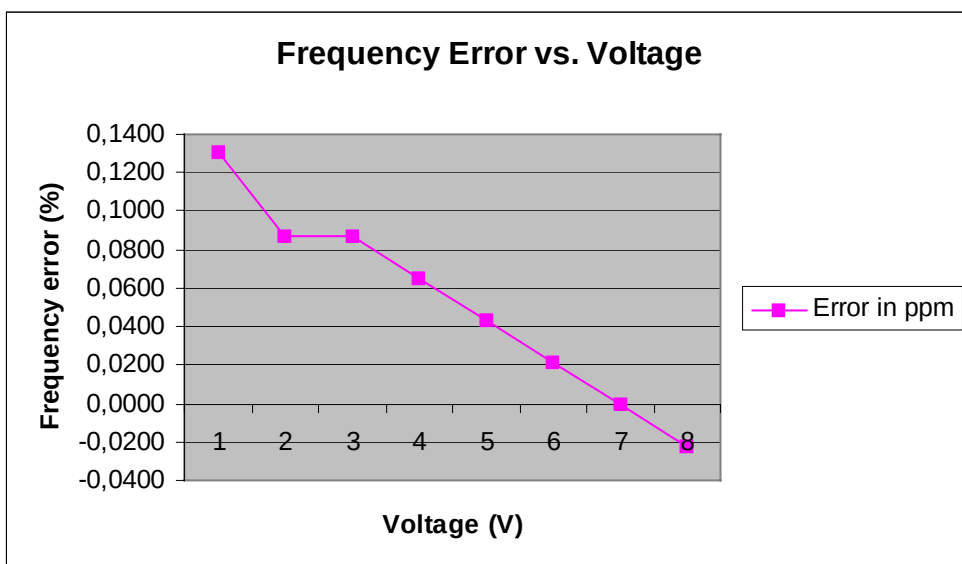
Ambient temperature : 23.0°C

Relative humidity : 31%

445.0125 MHz



457.5000 MHz



REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

(for reference numbers see test equipment listing)

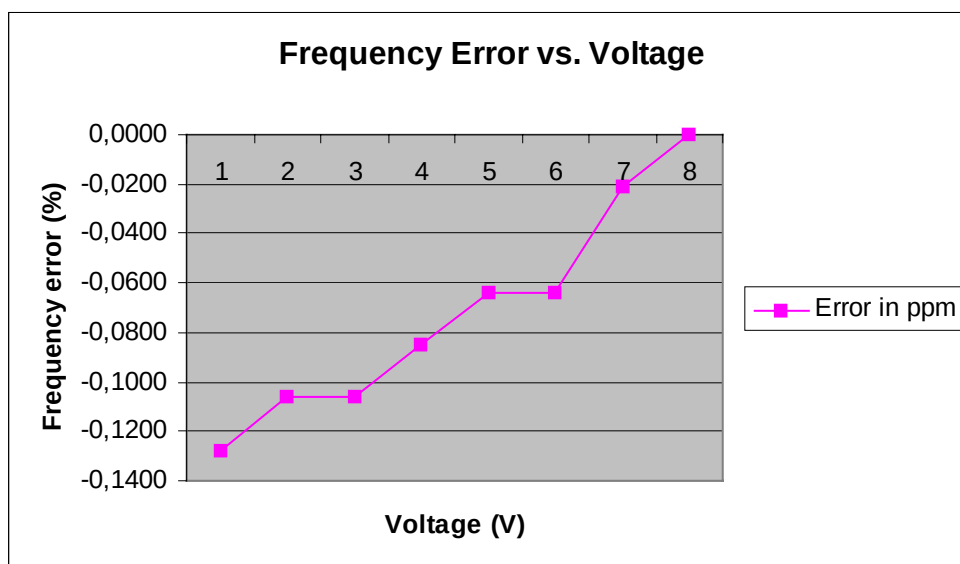
07, 64 , 66 -68

Equipment under test : U922K / U922xx

Ambient temperature : 23.0°C

Relative humidity : 31%

469.9875 MHz



LIMITS

SUBCLAUSE § 90.213

Power Supply Voltage – Frequency Stability of 2.5 ppm from 85% to 115% of nominal voltage

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

(for reference numbers see test equipment listing)

07, 64 , 66 -68

Equipment under test : U922K / U922xx

Ambient temperature : 23.0°C

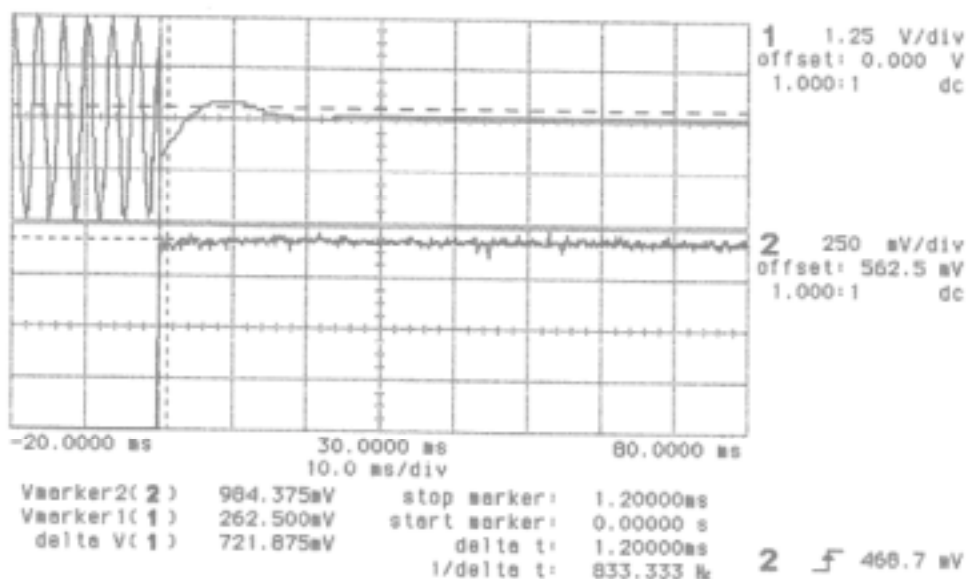
Relative humidity : 31%

TRANSIENT FREQUENCY BEHAVIOR

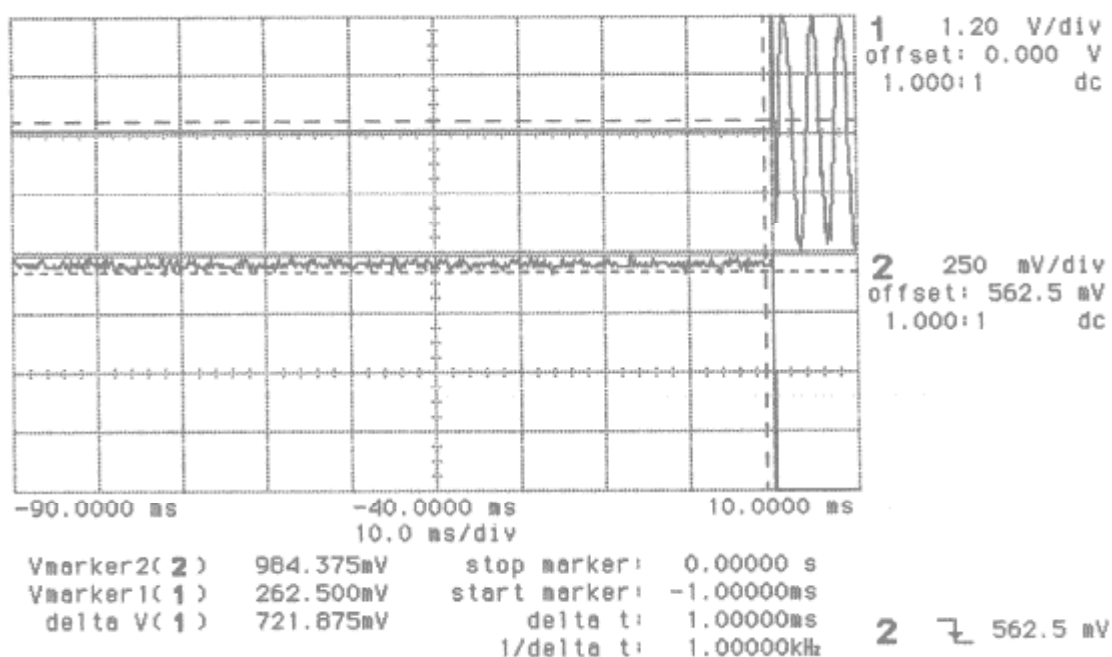
§90.214

445.0125 MHz

hp awaiting trigger



hp awaiting trigger



REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

(for reference numbers see test equipment listing)

07, 64 , 66 -68

Equipment under test : U922K / U922xx

Ambient temperature : 23.0°C

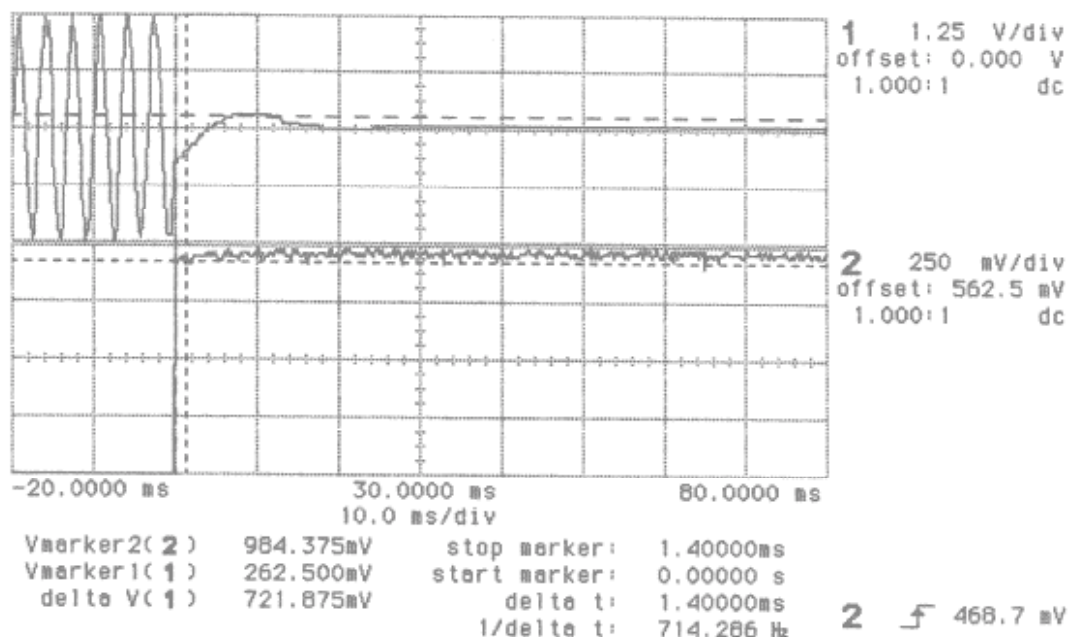
Relative humidity : 31%

TRANSIENT FREQUENCY BEHAVIOR

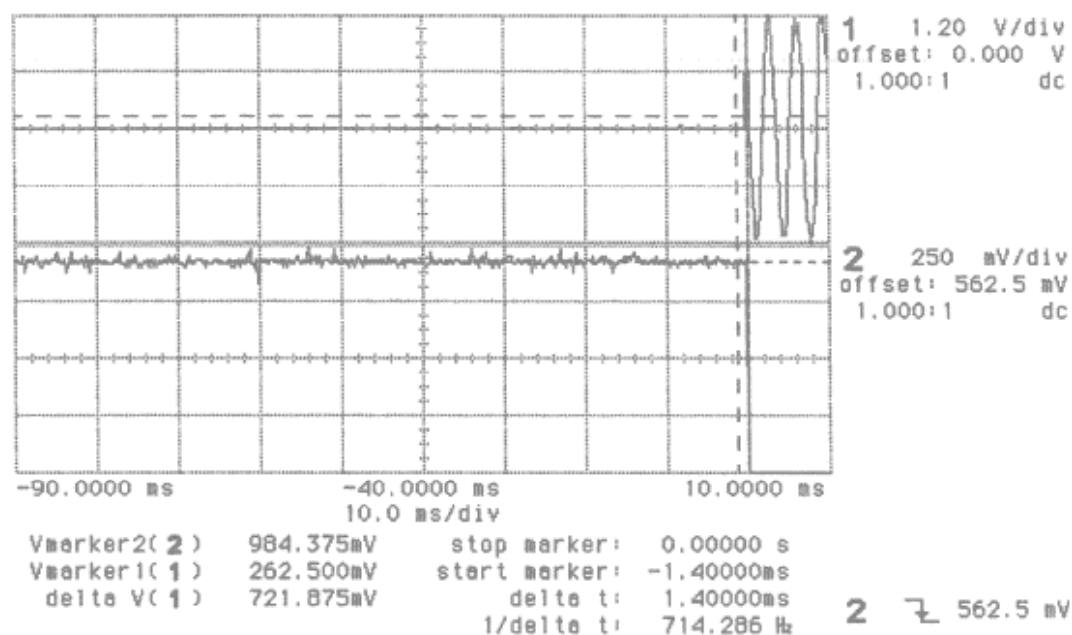
§90.214

457.500 MHz

hp awaiting trigger



hp awaiting trigger



REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

(for reference numbers see test equipment listing)

07, 64 , 66 -68

Equipment under test : U922K / U922xx

Ambient temperature : 23.0°C

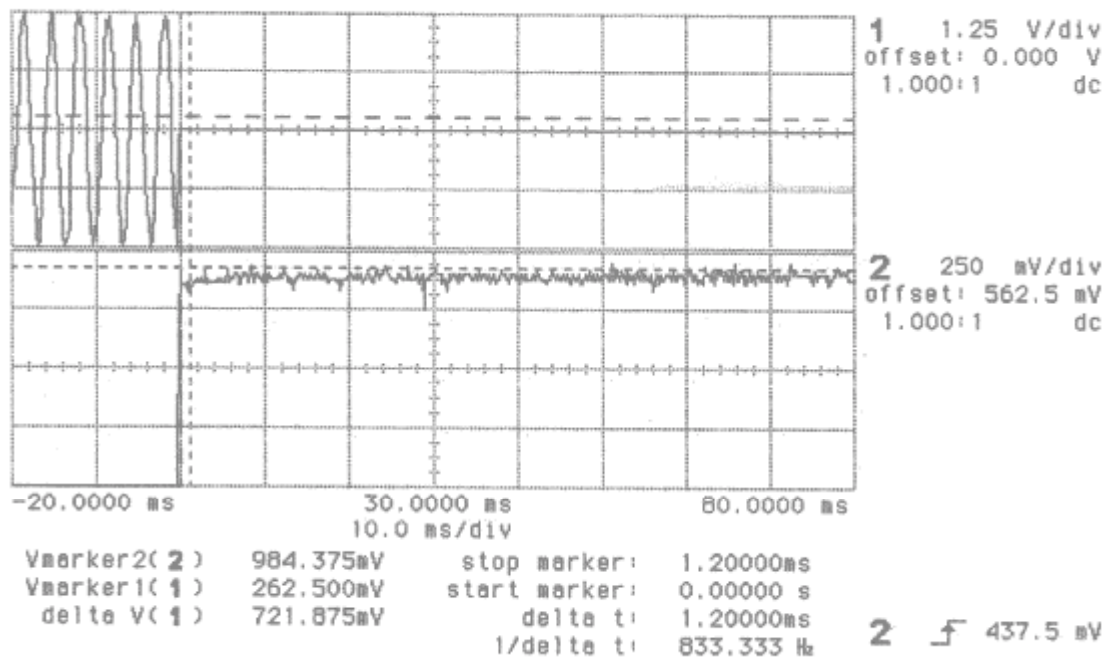
Relative humidity : 31%

TRANSIENT FREQUENCY BEHAVIOR

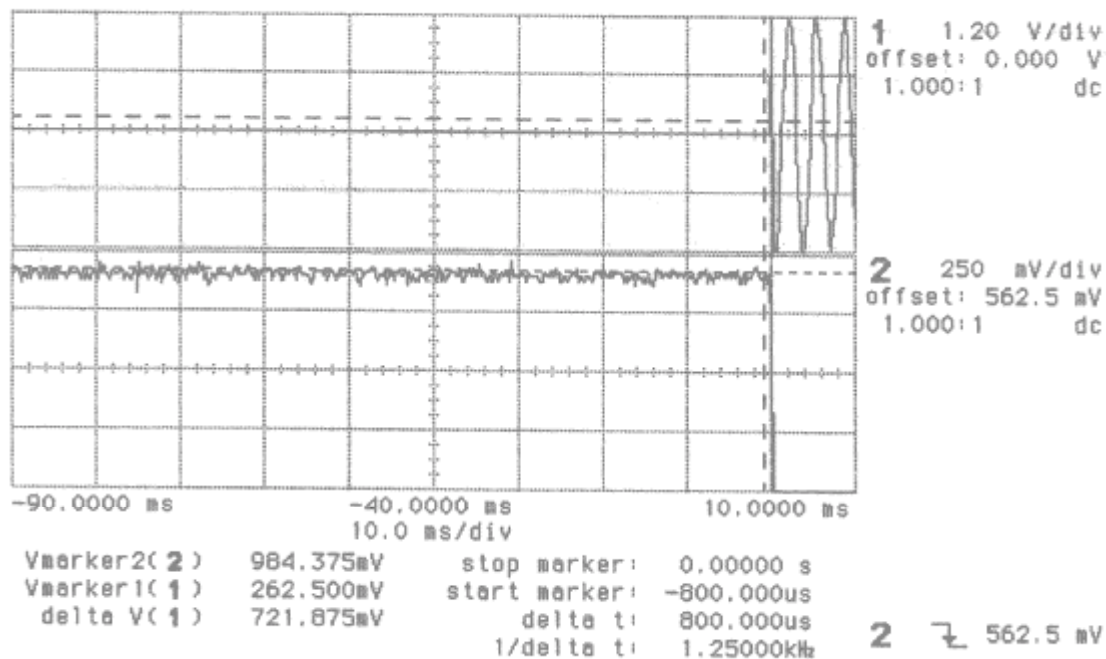
§90.214

469.9875 MHz

hp awaiting trigger



hp awaiting trigger



REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

(for reference numbers see test equipment listing)

07, 64 , 66 -68

Equipment under test : U922K / U922xx

Ambient temperature : 23.0°C

Relative humidity : 31%

Remark: channel 1 : frequency difference
(100 mV conforms to 1kHz)

channel 2 : transmitter output power
(100 mV conforms to 10 dB)

This measurements are done in accordance with TEST SET-UP PROCEDURES used for Submitted Data.(2.2.19 of the TIA/EIA 603, specifically the triggering level was set in a different manner, as described in the TEST SET-UP PROCEDURES used for Submitted Data).

LIMITS

SUBCLAUSE § 90.214

Transient Frequency Behavior for Equipment Designed to Operate on 12.5 kHz Channels			
	Maximum frequency difference	150 to 174 MHz	421 to 512 MHz
t ₁	±12.5 kHz	5.0 ms	10.0 ms
t ₂	±6.25 kHz	20.0 ms	25.0 ms
t ₃	±12.5 kHz	5.0 ms	10.0ms

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

(for reference numbers see test equipment listing)

07, 64 , 66 -68

Equipment under test : U922K / U922xx

Ambient temperature : 23.0°C

Relative humidity : 31%

RECEIVER SPURIOUS RADIATION

§ 15.209

Radiated

EMISSION LIMITATIONS					
f (MHz)	polarization	amplitude of emission (dBμV/m) QUASIPeAK	amplitude of emission (dBμV/m) average	limit max. allowed emission power (dBμV/m)	results
445.0125 MHz					
462.285	V	24.2		46	complies
2311.43	V		34.2	54	complies
3236.0	V		36.8	54	complies
4449.1	V		30.6	54	complies
4895.9	V		31.8	54	complies
Measurement uncertainty		± 3dB			

f < 1 GHz : RBW/VBW: 100 kHz

f ≥ 1GHz : RBW/VBW: 1 MHz

Measurement distance see table

Limits

SUBCLAUSE § 15.209

Frequency (MHz)	Field strength (μV/m)	Measurement distance (m)
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)

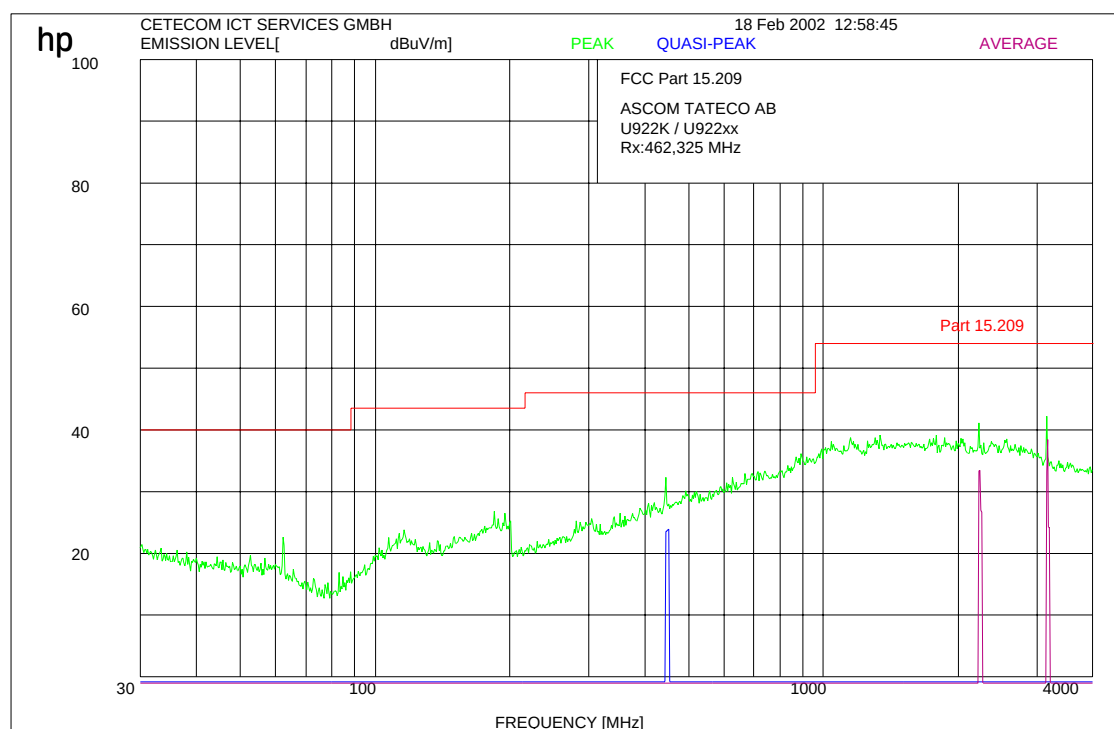
Equipment under test : U922K / U922xx

Ambient temperature : 23.0°C

Relative humidity : 31%

RECEIVER SPURIOUS EMISSIONS (radiated) 462.325 MHz

§ 15.209



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

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

Limits

SUBCLAUSE § 15.209

Frequency (MHz)	Field strength ($\mu\text{V/m}$)	Measurement distance (m)
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)

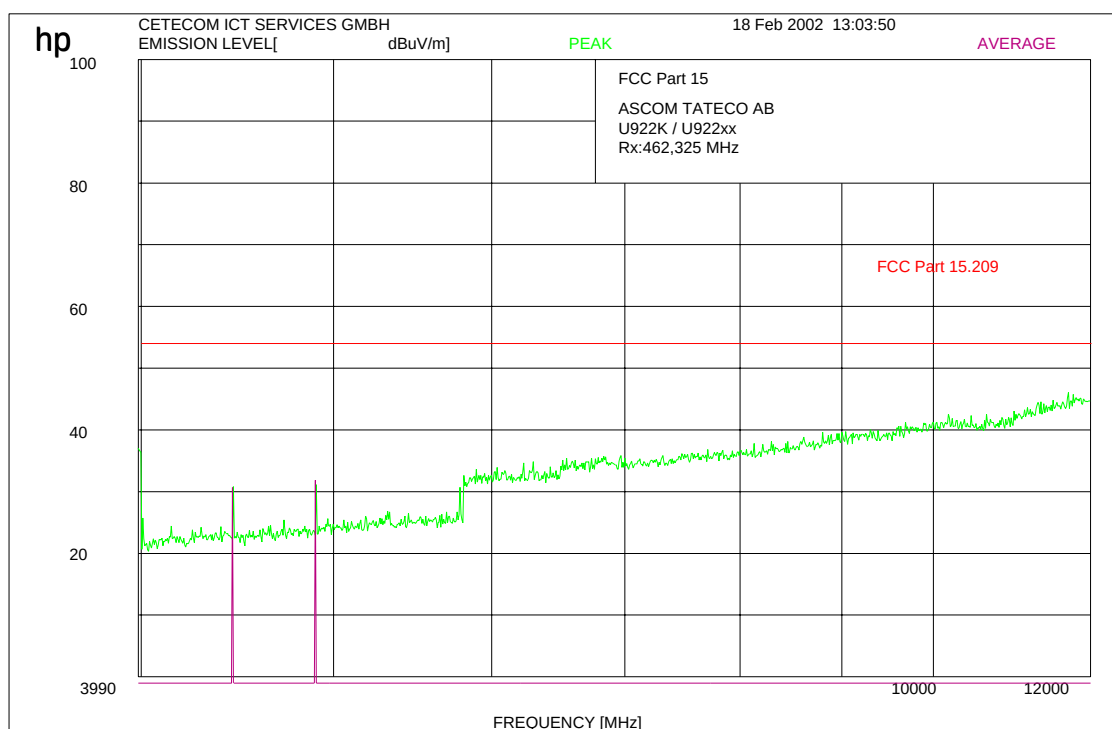
Equipment under test : U922K / U922xx

Ambient temperature : 23.0°C

Relative humidity : 31%

RECEIVER SPURIOUS EMISSIONS (radiated) 462.325 MHz

§ 15.209



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

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

Limits

SUBCLAUSE § 15.209

Frequency (MHz)	Field strength ($\mu\text{V/m}$)	Measurement distance (m)
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)

Test report nr.: 2_2816-01-01/02 Issue Date: 2002-02-19 Page 45 (64)

Equipment under test : U922K / U922xx

Ambient temperature : 23.0°C

Relative humidity : 31%

RECEIVER SPURIOUS EMISSIONS (conducted)
462.325 MHz

§ 15.111

SPURIOUS EMISSIONS LEVEL (µV/m)								
f (MHz)	ResBW	Level (dBm)	f (MHz)	ResBW	Level (dBm)	f (MHz)	ResBW	Level (dBm)
445	100	-67.40						
890	100	-67.80						
1250	100	-70.90						
1392	100	-64.00						
2219	100	-66.00						
3144	100	-65.50						
5292	100	-69.20						
Measurement uncertainty			±3 dB					

Limits

SUBCLAUSE § 15.111

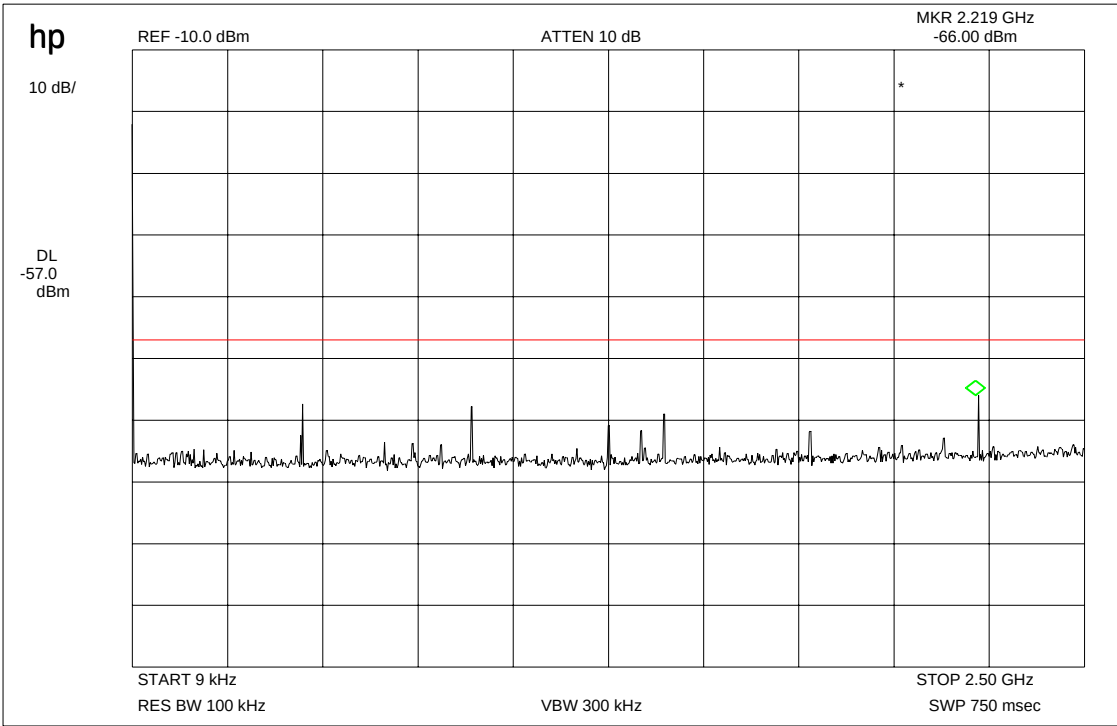
9 kHz – 5 GHz	2 nW / -57 dBm
---------------	----------------

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

Equipment under test : U922K / U922xx
Ambient temperature : 23.0°C
Relative humidity : 31%

RECEIVER SPURIOUS EMISSIONS (conducted)
462.325 MHz

§ 15.111



RBW/VBW: 100 kHz

Limits

SUBCLAUSE § 15.111

9 kHz – 5 GHz	2 nW / -57 dBm
----------------------	-----------------------

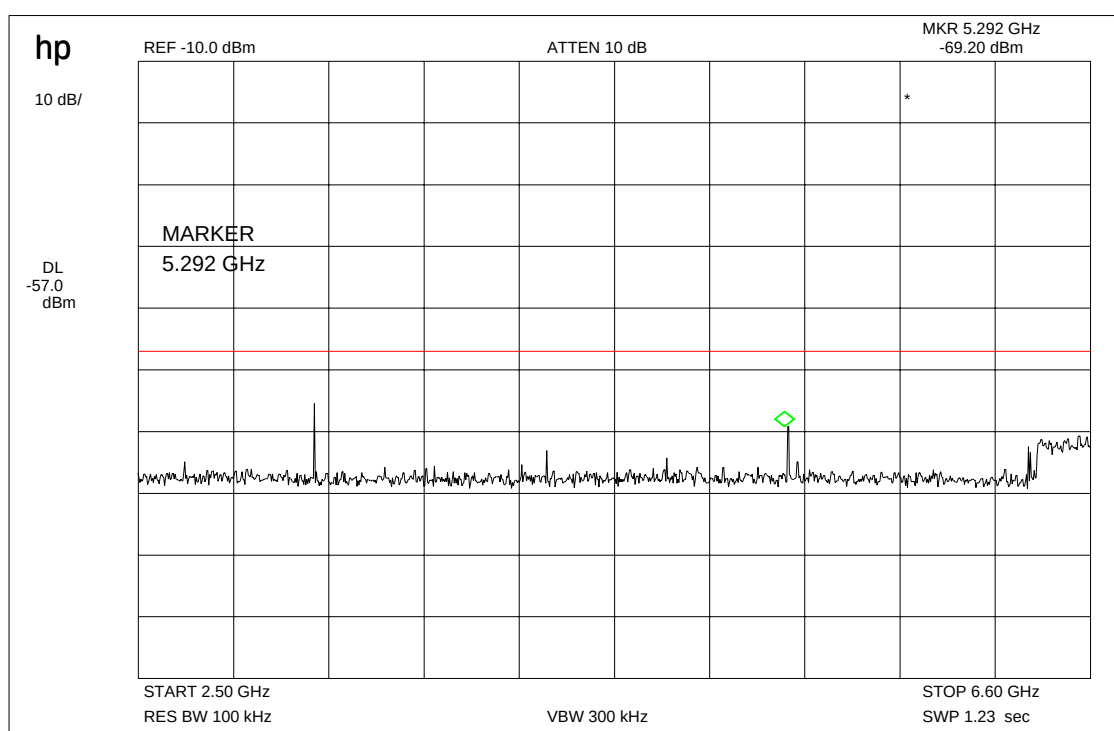
Equipment under test : U922K / U922xx

Ambient temperature : 23.0°C

Relative humidity : 31%

RECEIVER SPURIOUS EMISSIONS (conducted)
462.325 MHz

§ 15.111



RBW/VBW: 100 kHz

Limits

SUBCLAUSE § 15.111

9 kHz – 5 GHz	2 nW / -57 dBm
----------------------	-----------------------

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

17 – 20; 55

Equipment under test : U922K / U922xx

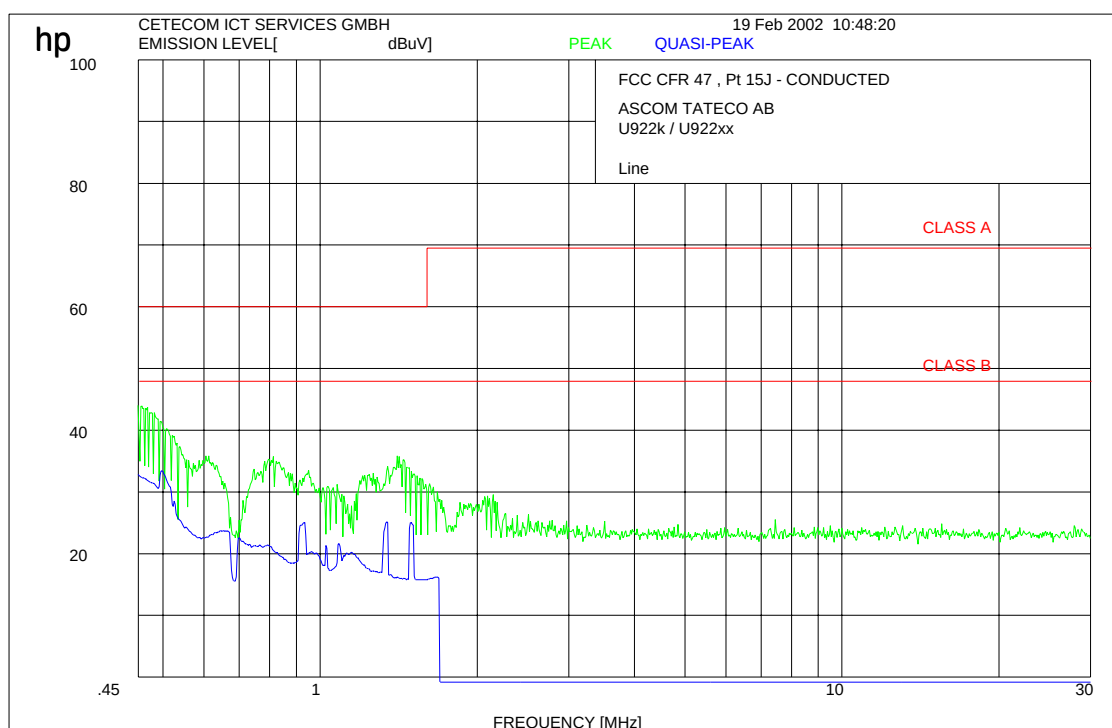
Ambient temperature : 23.0°C

Relative humidity : 31%

Conducted emissions

§ 15.107/207

Line



0.9338 MHz 25.0 dB μ V QP

1.345 MHz 25.1 dB μ V QP

1.494 MHz 25.0 dB μ V QP

Limits

SUBCLAUSE § 15.107 / 207

Frequency (MHz)	Conducted Limits (μ V)
0.45 – 1.705	1000 / 60 dB μ V (Class A)
1.705 – 30.0	3000 / 69.5 dB μ V (Class A)
0.45 – 30.0	250 / 48 dB μ V (Class B)

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

(for reference numbers see test equipment listing)

17 – 20; 55

Equipment under test : U922K / U922xx

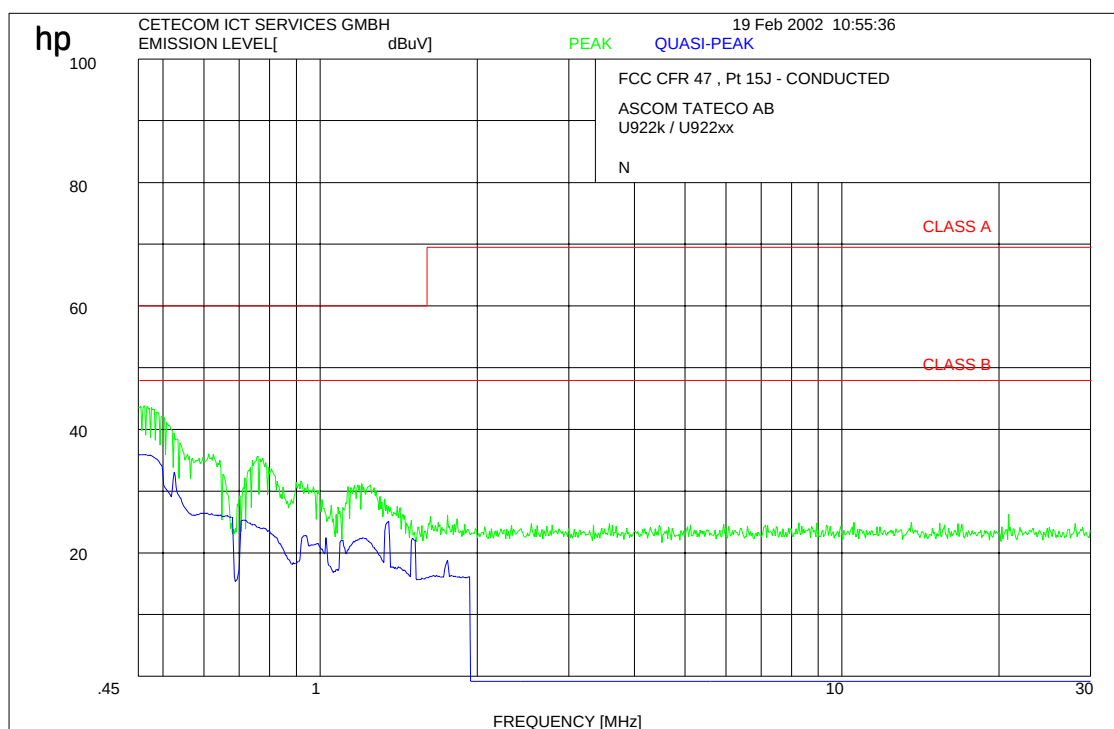
Ambient temperature : 23.0°C

Relative humidity : 31%

Conducted emissions

§ 15.107/207

N



0.719 MHz 25.3 dB μ V QP

1.357 MHz 25.1 dB μ V QP

1.507 MHz 22.3 dB μ V QP

Limits

SUBCLAUSE § 15.107 / 207

Frequency (MHz)	Conducted Limits (μ V)
0.45 – 1.705	1000 / 60 dB μ V (Class A)
1.705 – 30.0	3000 / 69.5 dB μ V (Class A)
0.45 – 30.0	250 / 48 dB μ V (Class B)

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

(for reference numbers see test equipment listing)

17 – 20; 55

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 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	Funktionsgenerator	AFGU	Rohde & Schwarz	862 480/032
09	Regeltrenntrafo	MPL	Erft	91350
10	Netznachbildung	NNLA 8120	Schwarzbeck	8120331
11	Relais-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	Modulationsmeter	9008	Racal-Dana	2647
16	Frequenzzähler	5340 A	Hewlett-Packard	1532A03899
17	Absorber Schirmkabine	---	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 Antenne	3104	Emco	3758
23	Log. Per. Antenne	3146	Emco	2130
24	Double Ridge 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 Antenne	HK 116	Rohde & Schwarz	888 945/013
28	Log. Per. Antenne	HL 223	Rohde & Schwarz	825 584/002
29	Relais-Switch-Unit	RSU	Rohde & Schwarz	375 339/002
30	Highpass	HM985955	FSY Microwave	001
31	Amplifier	P42-GA29	Tron-Tech	B 23602
32	Absorber Schirmkabine		Frankonia	
33	Steuerrechner	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	Controler	HD 100	Deisel	100/322/93
37	Relais Matrix	PSN	Rohde & Schwarz	829 065/003
38	Control Unit	GB 016 A2	Rohde & Schwarz	344 122/008
39	Relais Switch Unit	RSU	Rohde & Schwarz	316 790/001
40	Power Supply	6032A	Hewlett Packard	2846A04063
41	Spektrum Monitor	EZM	Rohde & Schwarz	883 720/006
42	Meßempfänger	ESH 3	Rohde & Schwarz	890 174/002
43	Meßempfänger	ESVP	Rohde & Schwarz	891 752/005
44	Biconi 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	Polarisationsnetzwerk	HL 024 Z1	Rohde & Schwarz	341 570/002
49	Double Ridge G Horn Antenne 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	Steuerrechner	PSM 7	Rohde & Schwarz	883 086/026
53	DC V-Netzwerk	ESH3-Z6	Rohde & Schwarz	861 406/005
54	DC V-Netzwerk	ESH3-Z6	Rohde & Schwarz	893 689/012
55	AC 2 Phasen V-Netzwerk	ESH3-Z5	Rohde & Schwarz	861 189/014
56	AC 2 Phasen V-Netzwerk	ESH3-Z5	Rohde & Schwarz	894 981/019
57	AC-3 Phasen V-Netzwerk	ESH2-Z5	Rohde & Schwarz	882 394/007
58	Stromversorgung	6032A	Rohde & Schwarz	2933A05441
59	HF-Test Empfänger	ESVP.52	Rohde & Schwarz	881 487/021
60	Spectrum Monitor	EZM	Rohde & Schwarz	883 086/026
61	HF-Test Empfänger	ESH3	Rohde & Schwarz	881 515/002
62	Relais Matrix	PSU	Rohde & Schwarz	882 943/029
63	Relais 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	Bidirektionalkoppler	DC 3010	Amplifier res.	12306
67	Oscilloscope	54502A	HP	2934A01917
68	Radiocommunic.Analyz.	4040	Schlumberger	1725117

Photographs of the equipment

telePROTECT U922K / U922xx
Photograph no.: 1



PHOTOGRAPHS OF THE EQUIPMENT

telePROTECT U922K / U922xx

Photograph no.: 2



PHOTOGRAPHS OF THE EQUIPMENT

telePROTECT U922K / U922xx

Photograph no.: 3



PHOTOGRAPHS OF THE EQUIPMENT

telePROTECT U922K / U922xx

Photograph no.: 4



PHOTOGRAPHS OF THE EQUIPMENT

telePROTECT U922K / U922xx

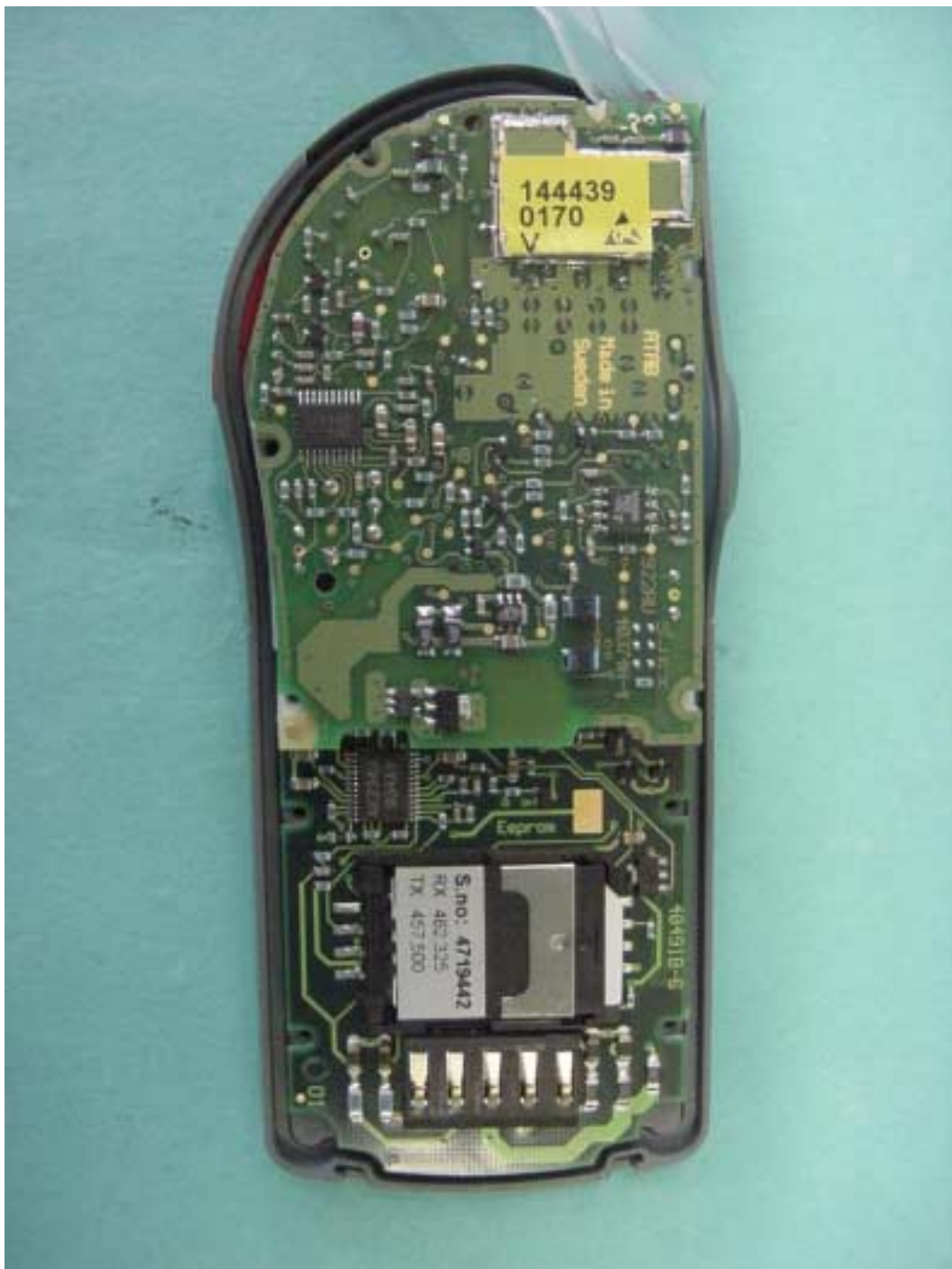
Photograph no.: 5



PHOTOGRAPHS OF THE EQUIPMENT

telePROTECT U922K / U922xx

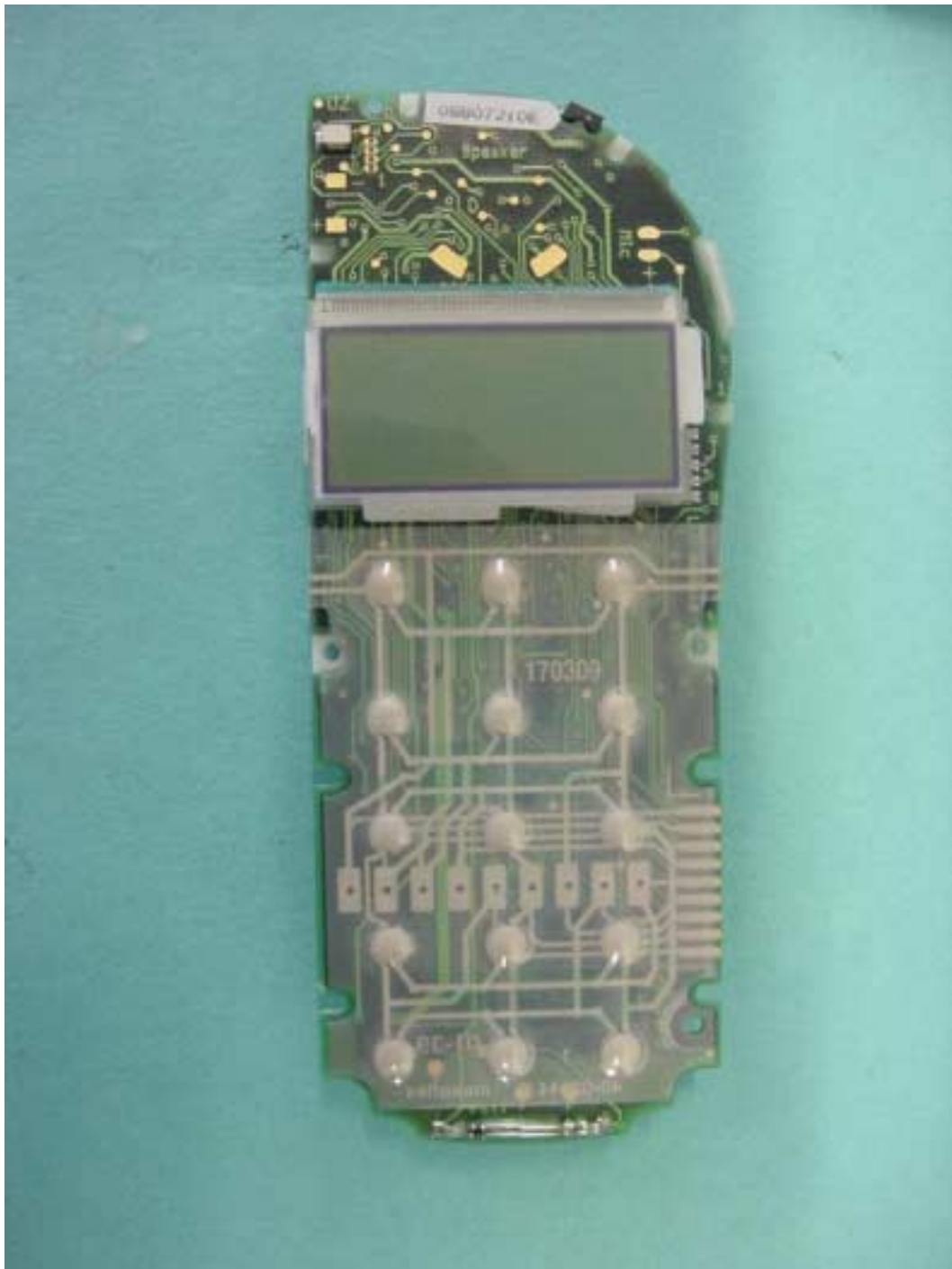
Photograph no.: 6



PHOTOGRAPHS OF THE EQUIPMENT

telePROTECT U922K / U922xx

Photograph no.: 7



PHOTOGRAPHS OF THE EQUIPMENT

telePROTECT U922K / U922xx

Photograph no.: 8



PHOTOGRAPHS OF THE EQUIPMENT

telePROTECT U922K / U922xx

Photograph no.: 9



PHOTOGRAPHS OF THE EQUIPMENT

telePROTECT U922K / U922xx

Photograph no.: 10



PHOTOGRAPHS OF THE EQUIPMENT

telePROTECT U922K / U922xx

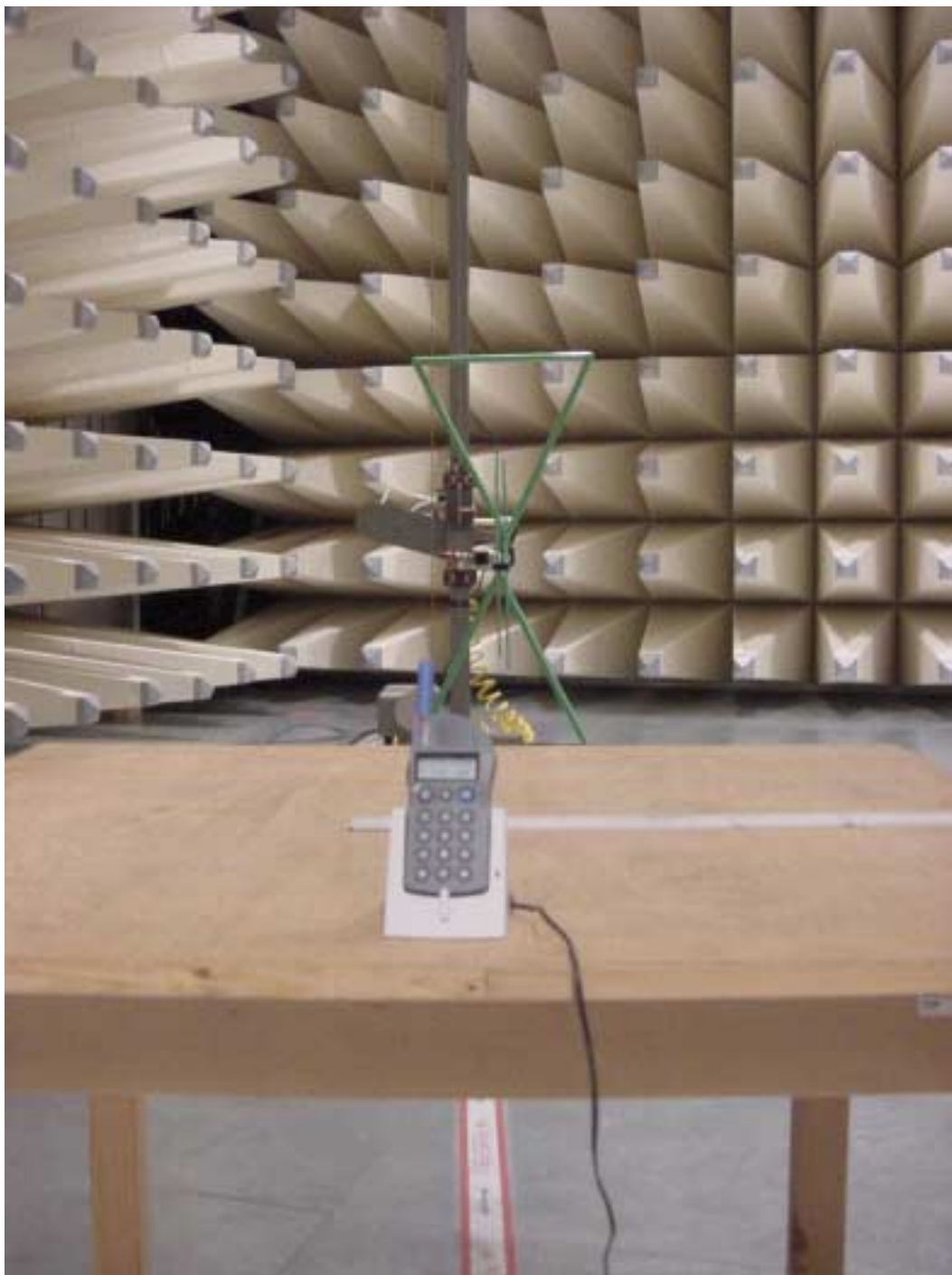
Photograph no.: 11



PHOTOGRAPHS OF THE EQUIPMENT

Test site

Photograph no.: 12



Test site

Photograph no.: 13

