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
DAT–P–176/94-D1

Independent ETSI
compliance test house

Test report no.	**:**	**2-4040-01-02/05**
Applicant	**:**	**Icoms Communications SA**
Type	**:**	**TM60**
Test Standard	**:**	**FCC Part 15 / RSS210**
FCC ID	**:**	
Certification No. IC	**:**	

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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.

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.

Tester :

Date	Name	Signature
2005-09-30	Manfred Paschwitz	

Technical responsibility for area of testing :

Date	Name	Signature
2005-09-30	Dirk Hausknecht	

Test Report Cover Sheet/Performance Test Data

TEST REPORT NUMBER:	**2-4040-01-02/05**
EQUIPMENT MODEL NUMBER:	**TM60**
CERTIFICATION NO:	**5792A-GR14601**
MANUFACTURER :	**Icoms Communications SA Avenue Einstein 11/i 1348 Louvain-la-Neuve Belgium Mr. Paul FONSNY Tel. +32 10 45 14 40 Fax. +32 10 45 04 61**
TESTED TO RADIO STANDARDS SPECIFICATION NO. :	**RSS210 Issue 5**
OPEN AREA TEST SITE INDUSTRY CANADA NUMBER:	**3463**
FREQUENCY RANGE (or fixed frequency):	**24.125 GHz**
R.F. POWER IN WATTS:	**355 mW**
OCCUPIED BANDWIDTH (99% BW):	**10 MHz**
TYPE OF MODULATION:	**CW**
EMISSION DESIGNATOR (TRC-43):	**10M0N0N**
TRANSMITTER SPURIOUS (worst case):	**82,3dB µV/m @ 3m**
RECEIVER SPURIOUS (worst case):	**not applicable**
ANTENNA Type:	**Horn antenna**

ATTESTATION:
DECLARATION OF COMPLIANCE: I declare that the testing was performed or supervised by me; that the test measurements were made in accordance with the above-mentioned Industry Canada standard(s); and that the equipment identified in this application has been subjected to all the applicable test conditions specified in the Industry Canada standards and all of the requirements of the standard have been met.

Signature:

Date: 2005-09-30

Manfred Paschwitz

1.2. 7esting laboratory

CETECOM ICT Services GmbH
Untertürkheimerstraße 6–10
66117 Saarbrücken
Germany

P.O. Box 10 04 45
66004 Saarbrücken
Germany

Telephone : + 49 (0) 681 598–0
Fax : + 49 (0) 681 598–9075
e-mail : info@ict.cetecom.de
Internet : http://www.cetecom-ict.de

Accredited testing laboratory
Accredited by : Regulierungsbehörde für Telekommunikation und Post (RegTP)
Listed by : Federal Communications Commission (FCC)
Industry Canada

Authority	Identification/Registration No.
RegTP	DAT-P-176/94-D1
FCC	90462
IC	3463

Testing location, if different from CETECOM ICT Services GmbH: (Not applicable)

Name : (Not applicable)

1.3. Details of applicant

Name : Icoms Communications SA
Address : Avenue Einstein 11/i
City : 1348 Louvain-la-Neuve
Country : Belgium
Phone : +32 10 45 41 02
Fax : +32 10 45 04 61
Contact : Mr. Paul FONSNY
Phone : +32 10 45 14 40
Fax : +32 10 45 04 61
Email : info@icomscommunications.be

1.4. Application details

Date of receipt of application : 2005-09-14
Date of receipt of test item : 2005-09-15
Date(s) of test : 2005-09-23 to 2005-09-29
Date of report : 2005-09-30

1.5. Test Item

Type of equipment	:	**TM60**
Type name	:	24 GHz Radar System
Manufacturer	:	Icoms Communications SA
Address	:	Avenue Einstein 11/i
City	:	1348 Louvain-la-Neuve
Country	:	Belgium
Frequency band	:	24.075 - 24.175 GHz
Frequency	:	24.125 GHz
Type of modulation	:	10M0N0N (CW)
Number of channels	:	1
Antenna	:	Horn antenna (see Photo)
Power supply (normal)	:	110 V AC / 60 Hz
FCC ID	:	
Certification No. IC	:	
Open Area Test Site FCC No	:	90462
Open Area Test Site IC No.	:	3436
Standards	:	RSS210, Issue 5 FCC 15.245

1.5.1. Operation conditions

Operation: : As soon as the equipment is powered up, TX and RX start operating

1.5.2. Equipment under test

24 GHz Radar System
TM60

1.6. Test standards:

1.7. Code of Federal Regulations (CFR 47)

FCC Part 15

Section 15.209
Radiation emission limits, general requirements

Section 15.245
Operation within the band 24.075 - 24.175 GHz

Section 15.205
Restricted bands of operation.

1.8. Industry Canada Standards

RSS 210, Issue 5, November 2001

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 clause 2.5 were ascertained during tests

The test report :

[X] describes the first test

[ ] describes an additional test

[ ] is a verification of documents

[ ] is only valid with the test report no.

2.2. Test environment

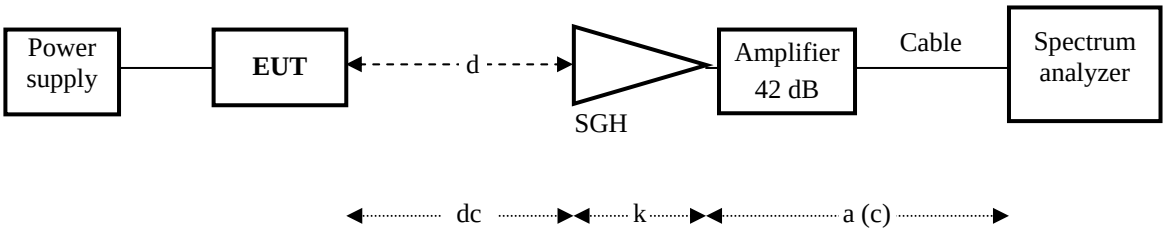
The environmental conditions are documented especially for each test.

2.3. Measurement and test set-up

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

2.4. Test equipment utilized and test set-up

2.4.1 Field strength and spurious radiation in the frequency range 4 GHz to 33 GHz with broadband amplifier



Frequency range [GHz]	Distance d [m]	Standard gain Horn ant. (SGH)	Antenna factor k [dB 1/m]	Amplifier gain g [dB]	Cable loss a [dB]
3.8 ... 6.0	3.0	narda 643	27.31	-42.0	1.5
5.3 ... 8.2	3.0	narda 642	30.06	-42.2	1.8
8.2 ... 12.4	3.0	narda 640	33.70	-42.0	2.0
12.4 ... 18.0	3.0	narda 639	33.97	-42.0	2.5
18 ... 26	1.0	narda 638	40.22	-42.0	3.0
26 ... 40	1.0	narda V637	44.00	-21.58	3.5

Calculation : Field strength = Analyser reading + Cable loss + Antenna factor + Ampl. gain

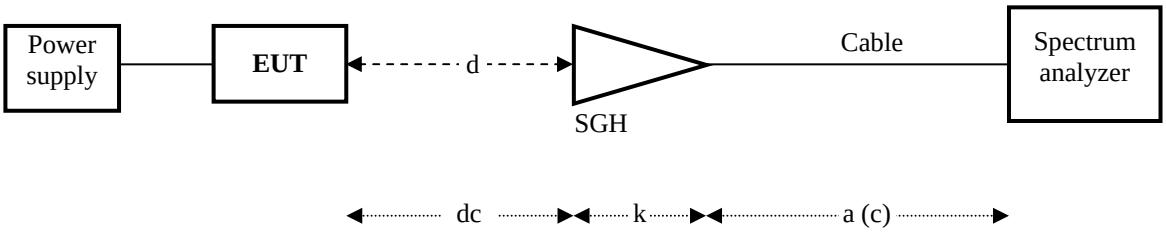
e = u + a + k + g

Test equipment	Manufacturer	Type	CETECOM reference
Spectrum Analyser	HP	HP 8565E	300001665
SGH 3.8 ... 6.0 GHz	narda	643	300002447
SGH 5.3 ... 8.2 GHz	narda	642	300000767
SGH 8.2 ... 12.4 GHz	narda	640	300002213
SGH 12.4 ... 18.0 GHz	narda	639	300000786
SGH 18 ... 27 GHz	narda	638	300002442
SGH 27 ... 40 GHz	narda	V637	300000510
SGH 27 ... 40 GHz	Thomson	COR 27_40	300000797a
Amplifier 0.5 ... 35 GHz	MITEC	U42	300003143
Power supply DC	HP	6032A	300002115
Power supply AC	Grundig	RT 5 A	300001263
RF-cable	HP	5061-5359	300002033
Power Supply	HP	6038A	300001174

Measurement uncertainty

Test parameter	Measurement uncertainty
Power supply	±0.1 V
Temperature	±0.2 °C
Frequency	±0.01 ppm
Field strength	±1.4 dB

2.4.2 Field strength and spurious radiation in the frequency range 4 GHz to 40 GHz



Frequency range [GHz]	Distance d [m]	Standard gain Horn ant. (SGH)	Antenna factor k [dB 1/m]	Distance corr. dc (3m/Xm) [dB]	Cable loss a [dB]
3.8 ... 6.0	1.0	narda 643	27.31	-9.54	1.5
5.3 ... 8.2	0.5	narda 642	30.06	-15.56	1.8
8.2 ... 12.4	0.5	narda 640	33.70	-15.56	2.0
12.4 ... 18.0	3.0	narda 639	33.97	n.a.	2.5
18.0 ... 27.0	3.0	narda 638	40.22	n.a.	3.0
24.108	3.0	narda 638	33.97	n.a.	2.9
27.0 ... 40.0	3.0	narda V637	44.00	n.a.	3.5

Calculation : Field strength = Analyser reading + Cable loss + Antenna factor + distance corr.

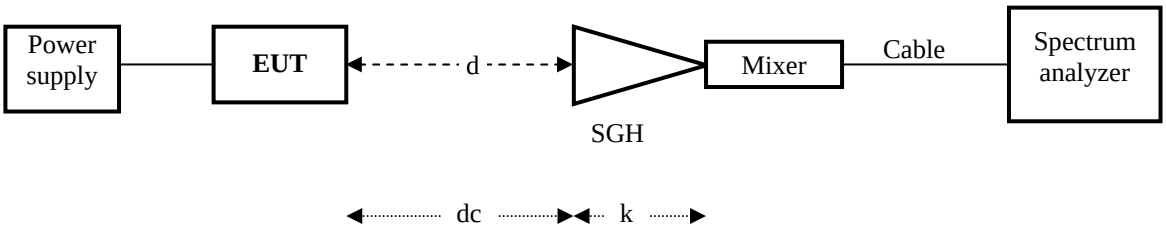
e = u + a + k + dc

Test equipment	Manufacturer	Type	CETECOM reference
Spectrum Analyser	HP	HP 8565E	300001665
SGH 3.8 ... 6.0 GHz	narda	643	300002447
SGH 5.3 ... 8.2 GHz	narda	642	300000767
SGH 8.2 ... 12.4 GHz	narda	640	300002213
SGH 12.4 ... 18.0 GHz	narda	639	300000786
SGH 18 ... 27 GHz	narda	638	300002442
SGH 27 ... 40 GHz	narda	V637	300000510
SGH 27 ... 40 GHz	Thomson	COR 27_40	300000797a
Power supply DC	HP	6032A	300002115
Power supply AC	Grundig	RT 5 A	300001263
RF-cable	HP	5061-5359	300002033
Power Supply	HP	6038A	300001174

Measurement uncertainty

Test parameter	Measurement uncertainty
Power supply	±0.1 V
Temperature	±0.2 °C
Frequency	±0.01 ppm
Field strength	±1.4 dB

2.4.3 Field strength and spurious radiation in the frequency range 33 GHz to 110 GHz



Frequency range [GHz]	Distance d [m]	Distance correction dc (3 m/Xm) [dB]	Antenna factor k [dB 1/m]
33.0 ..... 50.0	3.0	n.a.	39.10
50.0 ..... 75.0	0.25	-21.58	40.67
75.0 ... 110.0	0.125	-27.60	45.07

Calculation : Field strength = Analyser reading + Cable loss + Antenna factor + Distance correction

e = u + a + k + dc

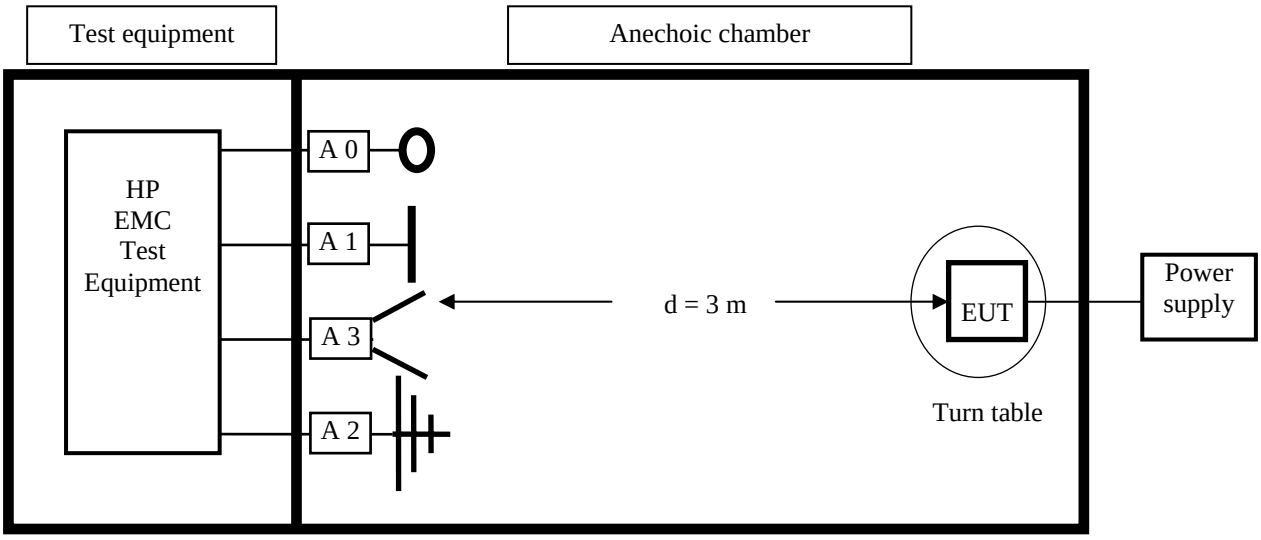
Test equipment	Manufacturer	Type	CETECOM reference
Spectrum Analyser	HP	HP 8565E	300001665
Power supply	HP	6032A	300002115
SGH 33 ... 50 GHz	Thomson	COR 33_50	300000812
Mixer 33 ... 50 GHz	HP	11970Q	300000781j
SGH 50 ... 75 GHz	Thomson	COR 50_75	300000789k
Mixer 50 ... 75 GHz	HP	11970V	300000871o
SGH 75 ... 110 GHz	Thomson	COR 75_110	300000789m
Mixer 75 ... 110 GHz	HP	11970W	300000871v
Power Supply	HP	6038A	300001174

Measurement uncertainty

Test parameter	Measurement uncertainty
Power supply	±0.1 VDC
Temperature	±0.2 °C
Frequency	±0.01 ppm
Field strength <50 GHz	±1.0 dB
Field strength >50 GHz	±3.0 dB

2.4.4 Field strength and spurious radiation in the frequency range 9 kHz to 4 GHz

Set-up for radiated measurements



Test equipment	Manufacturer	Type	Serial No.
Spectrum analyser	HP	HP 85660B	2478A05306
Analyser display	HP	HP 85662A	2816A16541
Quasi peak adapter	HP	HP 85650A	2811A01131
RF-preselector	HP	HP 85685A	2833A00768
Loop Antenna A 0	R&S	HFH 2–Z2	881 058/42
Biconical antenna A 1	Emco	3104	3758
Log.-per.-antenna A 2	Emco	3146	2304
Double ridge horn ant. A 3	Emco	3115	3007
Relay switch	R&S	RSU	375 339/002
High pass filter	FSY Microwave	HM 985955	001
Amplifier	Tron-Tech	P42-GA29	B2302
Power supply	HP	HP 6038A	2848A07027
RF-cable	HP	5061-5359	P36303

Measurement uncertainties

Performance	Measurement uncertainty
Input power (DC)	±0.1 V
Temperature	±0.2 °C
Frequency	±0.01 ppm
Field strength	±1.4 dB

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 Part 15 and RSS 210 requirement

2.5.2 Summary of test set up

The EUT is positioned in a non-conductive pole and can be rotated in all angles at the horizontal polarization.

The radiated measurements are performed in vertical and horizontal plane in the frequency range from 9 kHz to 20 GHz in semi-anechoic chambers. The EUT is positioned on a non-conductive support with a height of 0.80 m above a conductive ground plane that covers the whole chamber.
The receiving antennas are conform with specifications ANSI C63.2-1996 clause 15 and ANSI C63.4-2003 clause 4.1.5. These antennas can be moved over the height range between 1.0 m and 4.0 m in order to search for maximum field strength emitted from EUT. The measurement distances between EUT and receiving antennas are indicated in the test set-ups for the various frequency ranges. For each measurement, the EUT is rotated in all three axes until the maximum field strength is received.
The wanted and unwanted emissions are received by spectrum analysers where the detector modes and resolution bandwidths over various frequency ranges are set according to requirement ANSI C63.4-2003 clause 4.2.
Antennas are conform with ANSI C63.2-1996 item 15.

9 kHz - 150 MHz: Quasi Peak measurement, 200 Hz Bandwidth, passive loop antenna.
150 kHz - 30 MHz: Quasi Peak measurement, 9kHz Bandwidth, passive loop antenna.
30 MHz - 200 MHz: Quasi Peak measurement, 120KHz Bandwidth, biconical antenna
200MHz - 1GHz: Quasi Peak measurement, 120KHz Bandwidth, log periodic antenna
>1GHz: Average, RBW 1MHz, VBW 10 Hz, wave guide horn

All measurement settings are according to FCC 15.209 and 15.207

2.5.3 Test results in details

EUT : TM60
Ambient temperature : 23 °C
Relative humidity : 55 %

TRANSMITTER PARAMETERS SECTION 15.245

TEST CONDITIONS		TRANSMITTER FIELD STRENGTH			
EUT operating: TX on and RX on AC power supply		Frequency [GHz]	S.A. u [dBµV]	E [µV/m]	See plot no.:
T nom = 23.0°C	V nom = 115.0 V	24.14	78,7	123.0	1

REFERENCE OF TEST EQUIPMENT USED : see test set-up on page 8

LIMITS: SECTION 15.245

Section	Frequency range [GHz]	Measurement distance [m]	Field strength e [dBµV/m] @ 3 m	Field strength E [mV/m]
15.245	24.075 to 24.175	3.0	128.	2500

Verdict :	Field strength limits 15.245 are kept

EUT : TM60
Ambient temperature : 23 °C
Relative humidity : 55 %

TRANSMITTER PARAMETERS SECTION 15.209
SPURIOUS FREQUENCIES

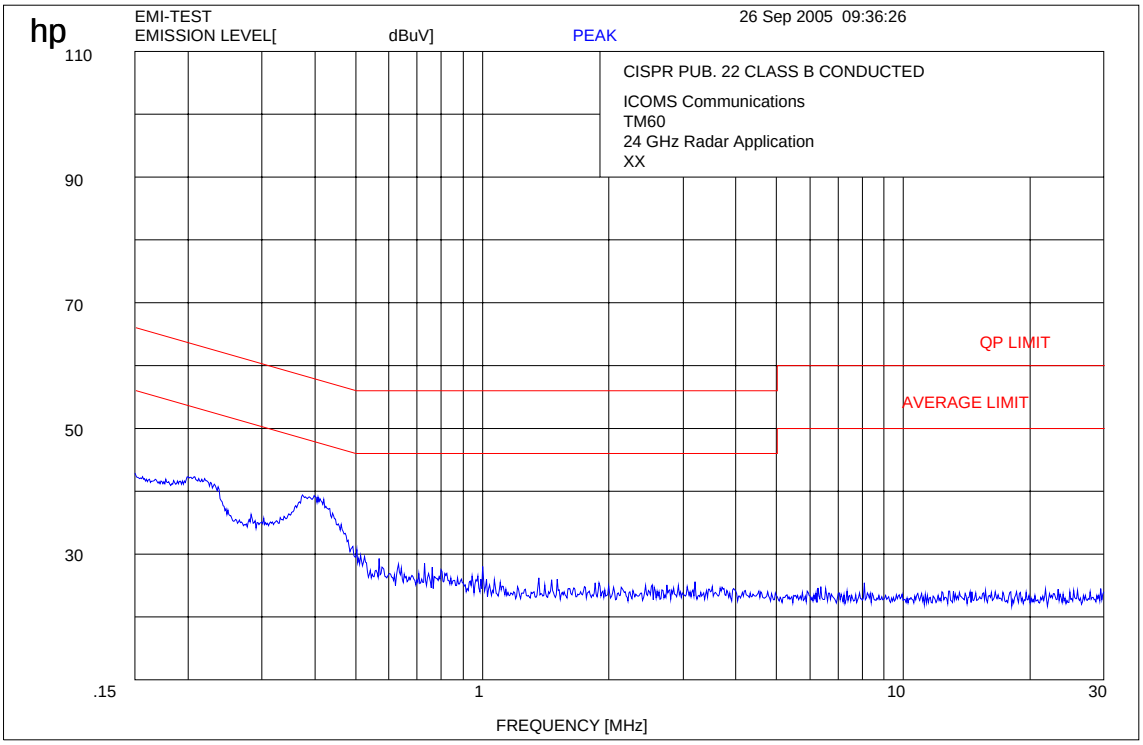
	TRANSMITTER SPURIOUS FIELD STRENGTH			
Frequency range Frequency [GHz]	Spurious frequencies [GHz]	S A u [dBmV]	E [µV/m]	See plot no.:
0.009 – 30.000 MHz (h + v)	Noise	< limit	< limit	2
0.030 – 4.000 (h + v)	Noise	< limit	< limit	3
4.000 – 12.000 (h + v)	Noise	- 34.9	17.9	4
12.000 – 18.000 (h + v)	Noise	- 27.0	23.6	5
18.000 – 24.075 (h + v)	Noise	- 23.3	74.3	6
24.175 – 33.000 (h + v)	Noise	- 21.6	156.6	7
33.000 - 50.000 (h + v)	Noise	- 22.0	48.0	8
48.226 (h + v)	Noise	- 24.8	216.2	9
50.000 – 75.000 (h + v)	Noise	- 27.8	183.4	10
75.000 – 110.000 (h + v)	Noise	- 24.5	445.1	11

LIMITS: SECTION 15.209
2nd and 3rd harmonics: 7.5 mV/m@3m
all others: FCC 15.209 apply

CONDUCTED LIMITS SECTION 15.207/15.107

CISPR 22

```
EUT:                  TM60
Manufacturer:         ICOMS Communications
Operating Condition:  Transmitting Mode
Test Site:            CETECOM ICT Services Room 006
Operator:             Paschwitz
Test Specification:   EN 55022 / CISPR 22
Power Supply:         115 V AC
Start of Test:        26. Sept. 2005
```



We measured L1 and N floating and grounded, max value was hold.

Limits: § 15.107 / 15.207

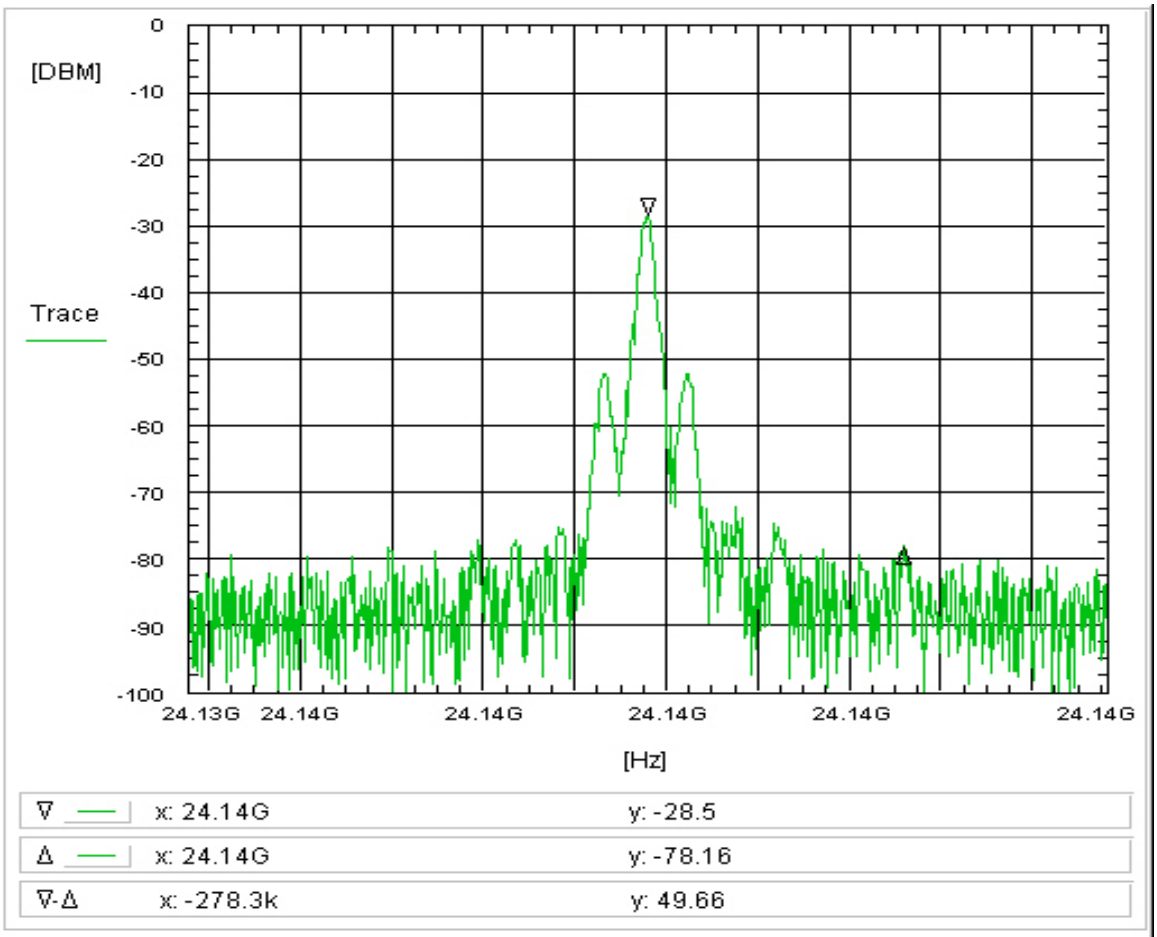
Frequency of Emission (MHz)	Conducted Limit (dBµV)	
	Quasi-peak	Average
0.15 – 0.5	66 to 56 *	56 to 46 *
0.5 – 5	56	46
5 - 30	60	50

* Decreases with the logarithm of the frequency

Verdict :	Conducted limits are kept

3. Plots, graphs and data sheets

Plot 1



Start [Hz]	Center [Hz]	Stop [Hz]
24.13G	24.14G	24.14G
Input Attenuation [dB]	**Resolution bandwidth**	**Video bandwidth [Hz]**
10	10k	10k

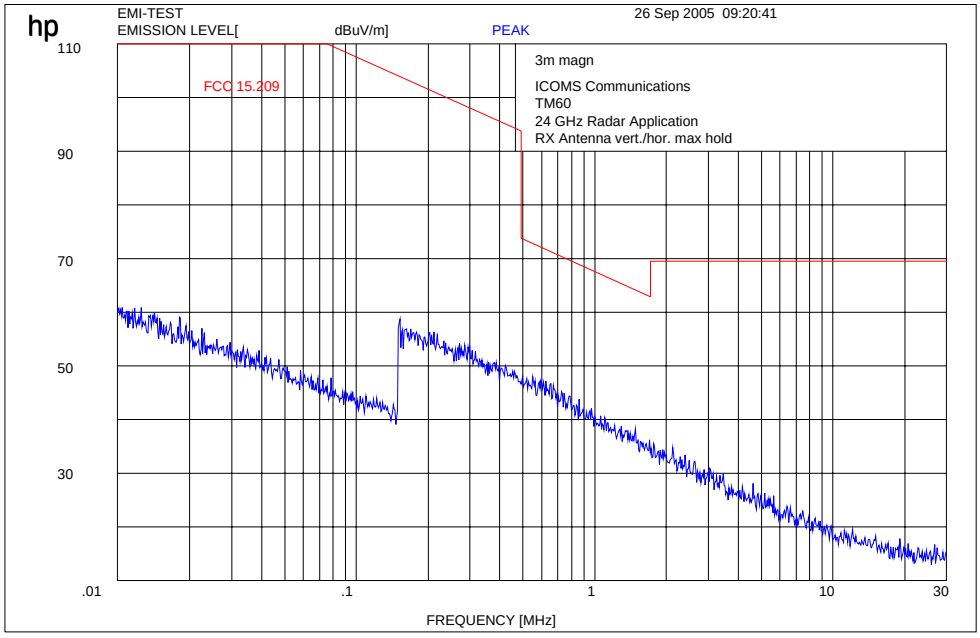
Measurement distance d	=	3.0 m
Calculation : Field strength	=	Analyser reading - Ant. gain + cable loss + path loss
p	=	- 28.5 dBm -17.0 dB+ 2 dB +69.0 dB
p	=	+ 25.5 dBm
e	=	17 +p – 20*log (d)
e	=	25.5 +97.5
e	=	123,0 dBµV/m (at 3m)

Plot 2

FCC Rule 47

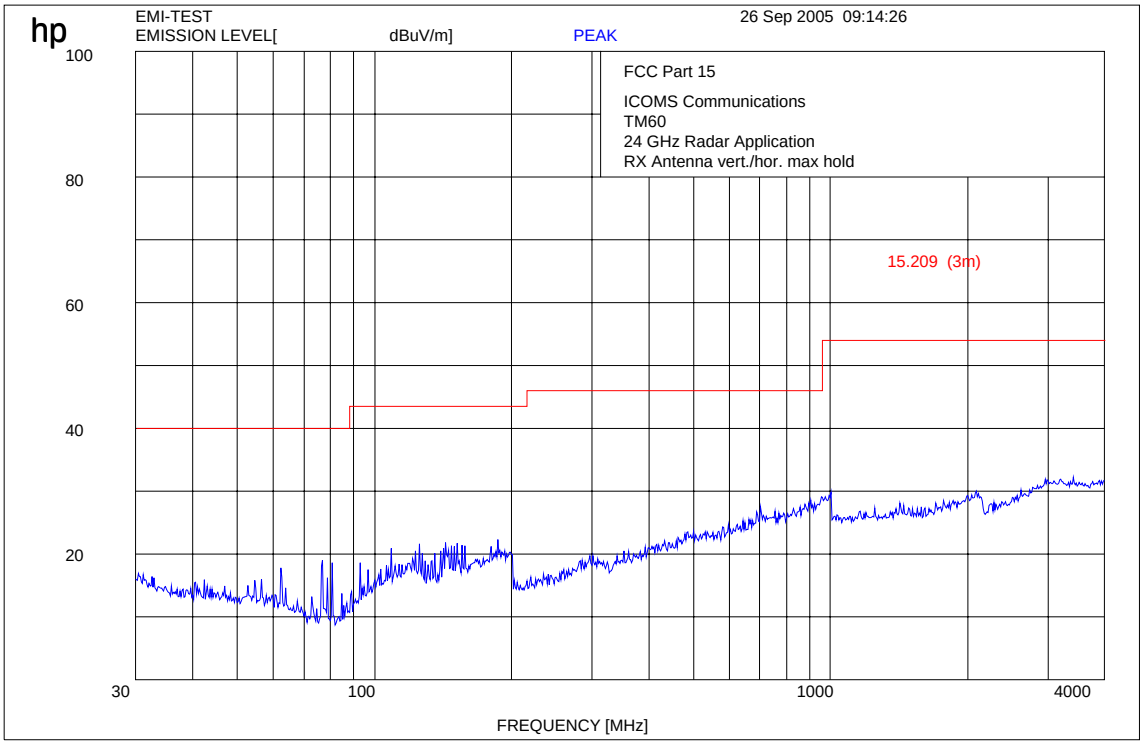
Part 15 Magnetics

EUT:	TM60
Manufacturer	ICOMS Communications
Operating Condition:	TX on
Test Site:	Cetecom, Room 6
Operator:	Paschwitz
Test Specification:	15.209
Comment:	115 V AC
Start of Test:	2005-09-26



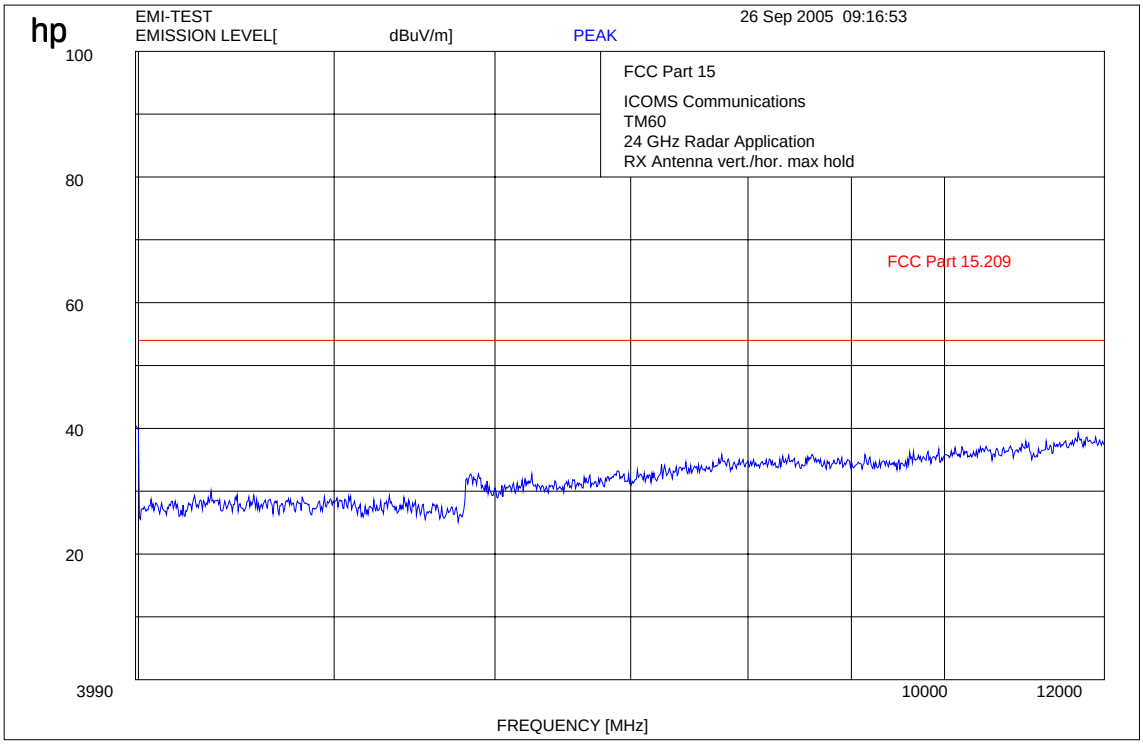
Settings:	Peak	
	9 kHz – 150 kHz	RBW / VBW 200 Hz
	150 kHz – 30 MHz	RBW / VBW 9.0 kHz
	QP	
	9 kHz – 150 kHz	RBW / VBW 200 Hz
	150 kHz – 30 MHz	RBW / VBW 9.0 kHz

Plot 3



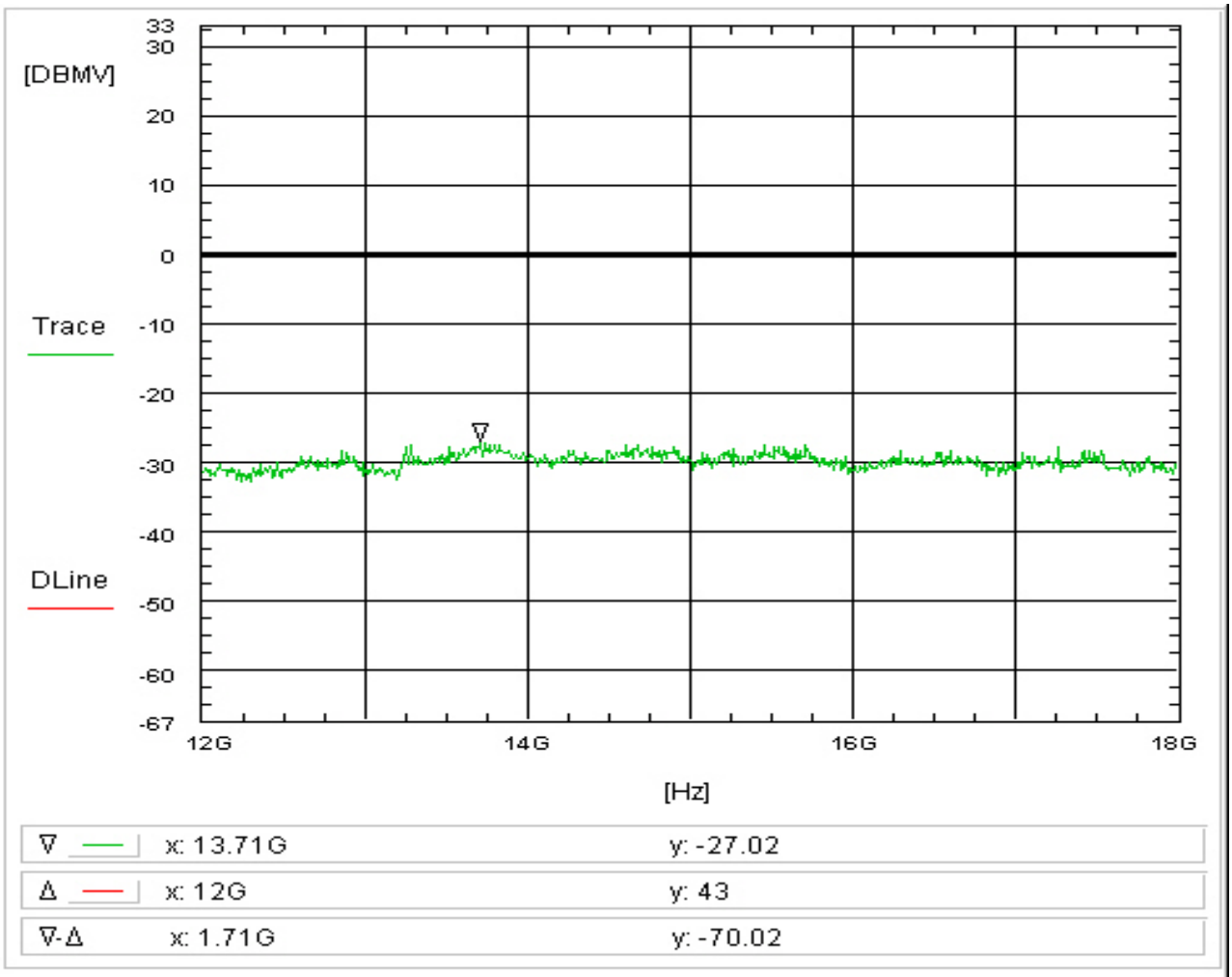
f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW / VBW 1 MHz

Plot 4



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

Plot 5



Start [Hz]	Center [Hz]	Stop [Hz]
12G	15G	18G
Input Attenuation [dB]	**Resolution bandwidth**	**Video bandwidth [Hz]**
0	1M	1M

Measurement distance d = 3.0 m

Calculation : Field strength = Analyser reading + Antenna factor + amplifier + cable loss

e = -27.0 dB(mV) + 33.97 dB(1/m) + (- 42.00 dB) + 2.5 dB

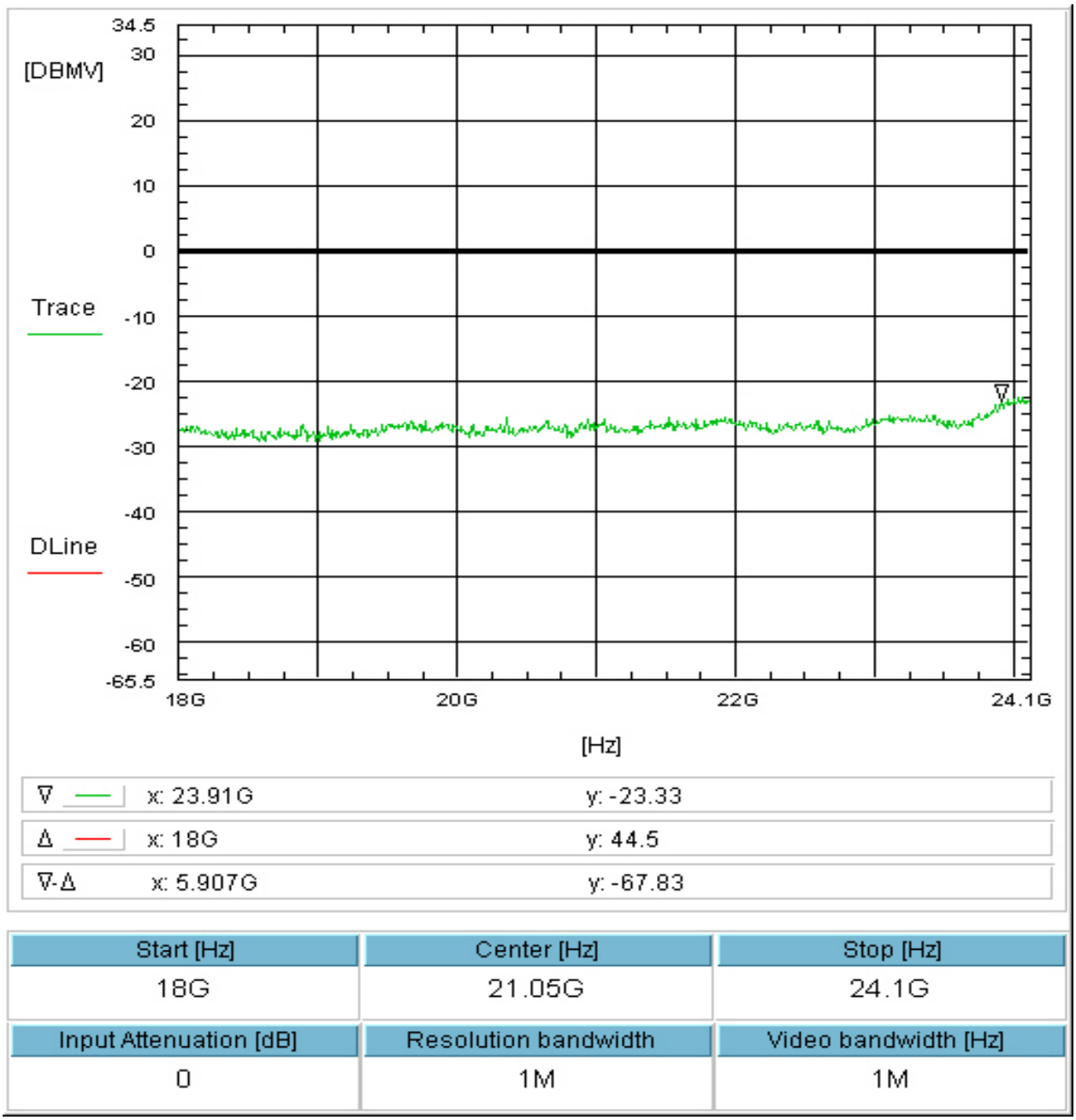
e = -32.53 dB(mV/m)

E = 0.023 mV/m

E = 23.63 µV/m @3m (noise)

Limit: = 500.0 µV/m @3m

Plot 6



Measurement distance d = 3.0 m

Calculation : Field strength = Analyser reading + Antenna factor + amplifier + cable loss

e = -23.3 dB(mV) + 40.22 dB(1/m) + (- 42.00 dB) + 2.5 dB

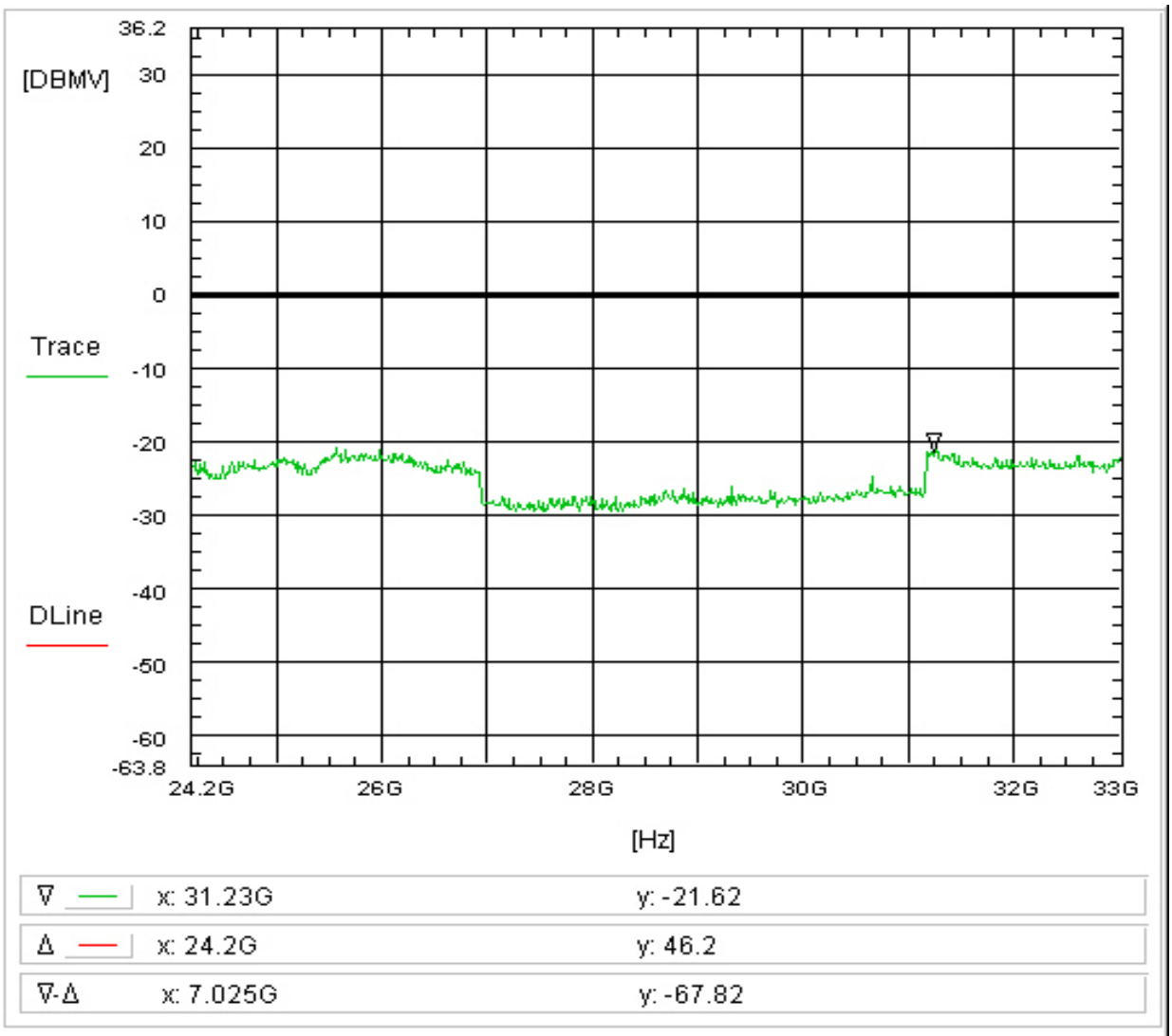
e = -22.58 dB(mV/m)

E = 0.074 mV/m

E = 74.3 µV/m @3m (noise)

Limit: = 500.0 µV/m @3m

Plot 7



Start [Hz]	Center [Hz]	Stop [Hz]
24.2G	28.6G	33G
Input Attenuation [dB]	**Resolution bandwidth**	**Video bandwidth [Hz]**
0	1M	1M

Measurement distance d = 3.0 m

Calculation : Field strength = Analyser reading + Antenna factor + amplifier + cable loss

e = -21.6 dB(mV) + 44.0 dB(1/m) + (-42.0 dB) + 3.5 dB

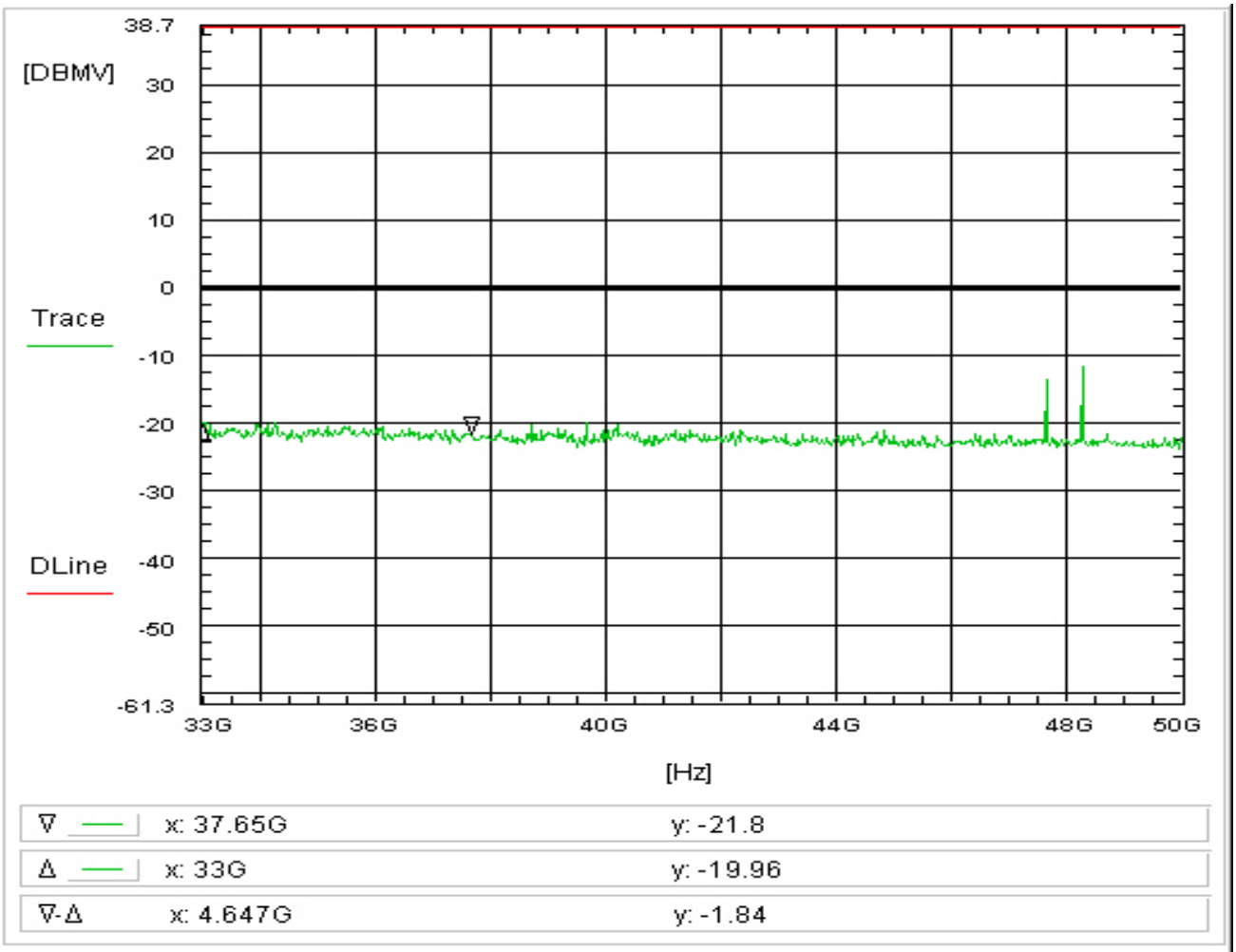
e = -16.1 dB(mV/m)

E = 0.156 mV/m

E = 156.67 µV/m (noise)

Limit: = 500.0 µV/m @3m

Plot 8



Start [Hz]	Center [Hz]	Stop [Hz]
33G	41.5G	50G
Input Attenuation [dB]	**Resolution bandwidth**	**Video bandwidth [Hz]**
10	1M	1M

Measurement distance d = 1,0 m

Calculation : Field strength = Analyser reading + Antenna factor + amplifier + dist. corr.

e = - 22,0 dB(mV) + 39.1 dB(1/m) + (- 34 dB) – 9.5 dB

e = - 26.4 dB(mV/m)

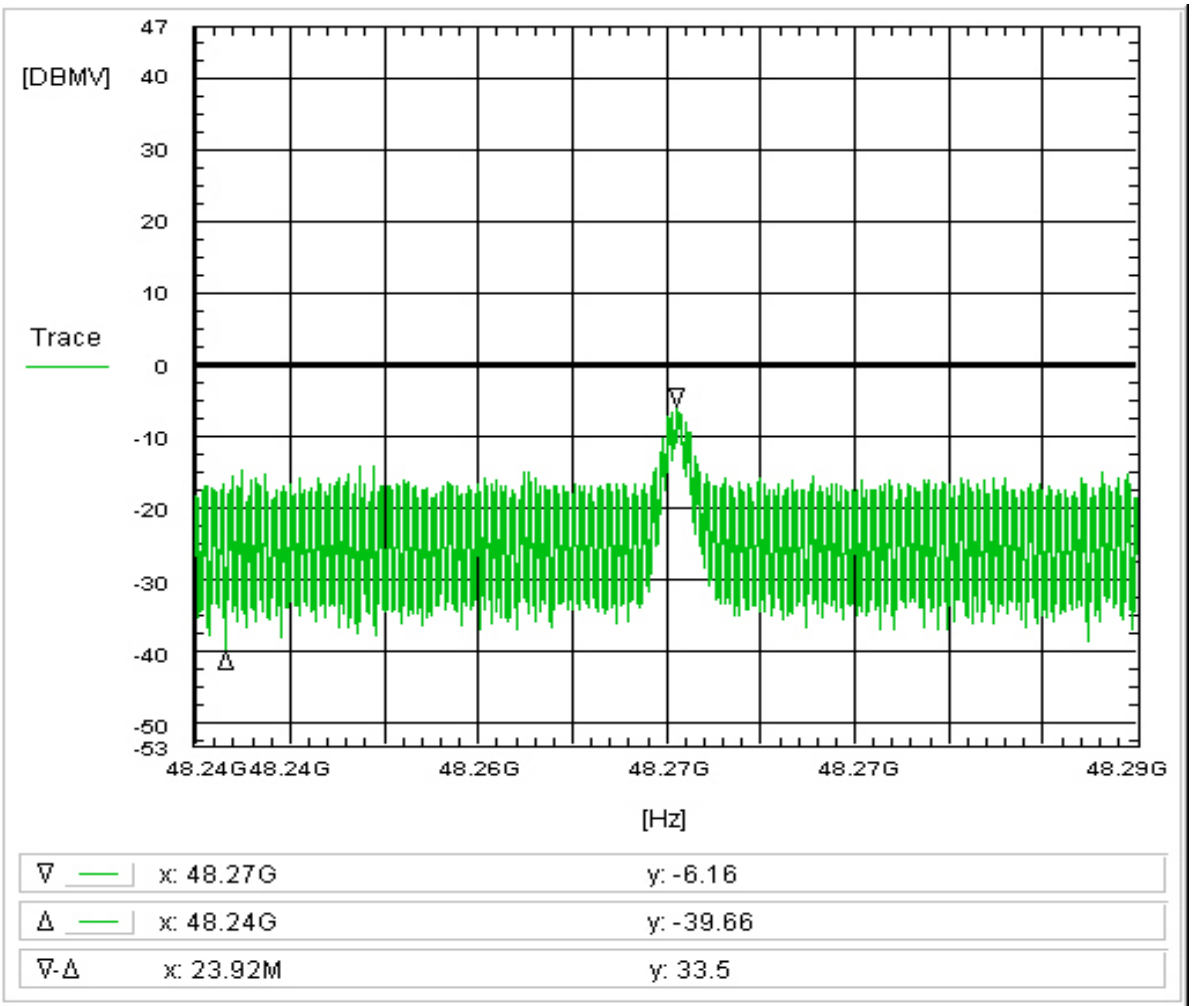
E = 0.048 mV/m

E = 48 µV/m @3m (noise)

Limit: = 500.0 µV/m @3m

48,2 GHz is the 1. harmonic; the other peaks are not real (ghosts)

Plot 9



Start [Hz]	Center [Hz]	Stop [Hz]
48.24G	48.26G	48.29G
Input Attenuation [dB]	**Resolution bandwidth**	**Video bandwidth [Hz]**
10	1M	1M

Measurement distance d = 1.m

Calculation : Field strength = Analyser reading + Antenna factor + distance corr.

e = - 6,2 dB(mV) + 39,0dB + 10,5 dB

e = 22,3 dB(mV/m) at 3m

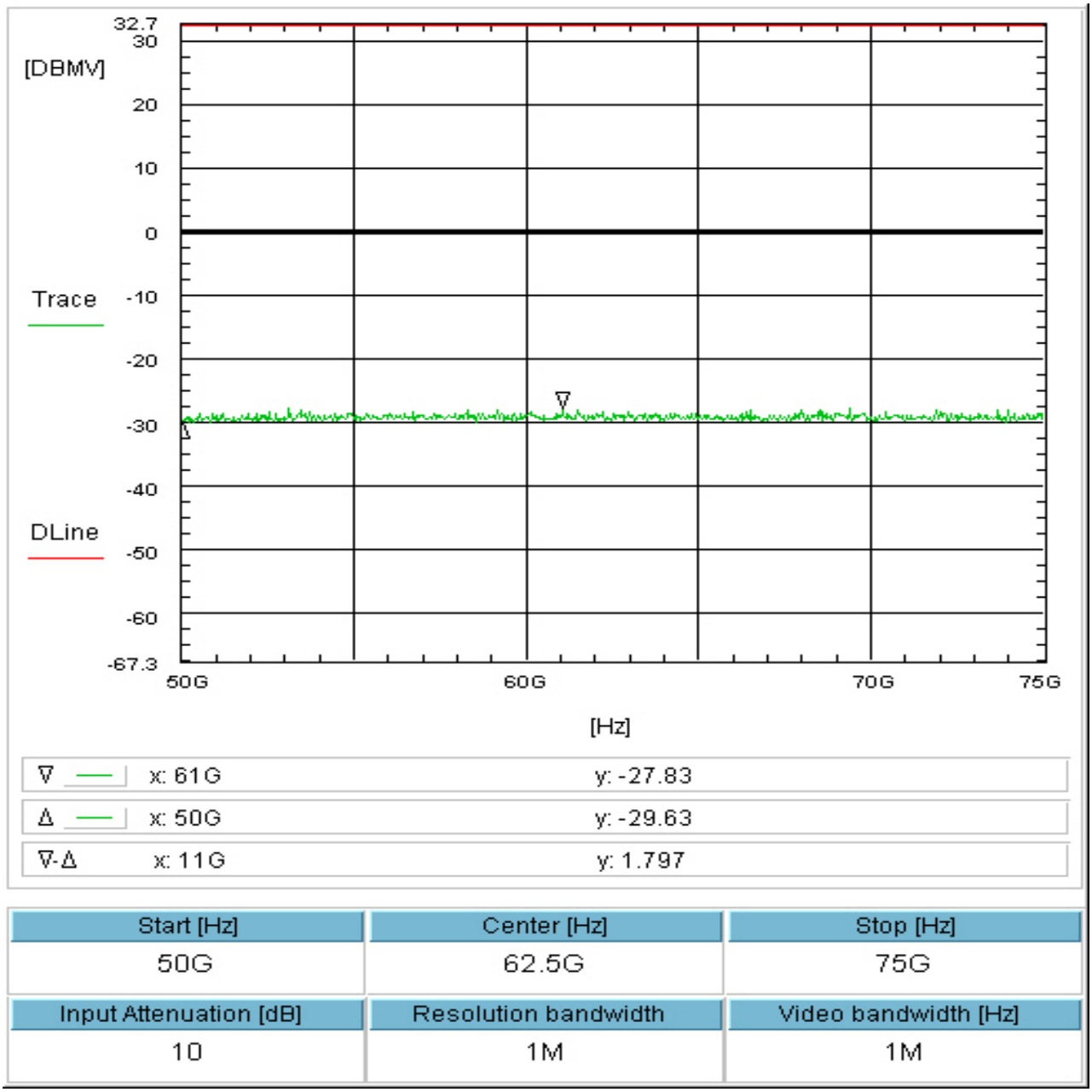
13,0mV/m at 3m = 13 000µV/m

E = 13,0 mV/m

E = 82,3 dBµV/m at 3m

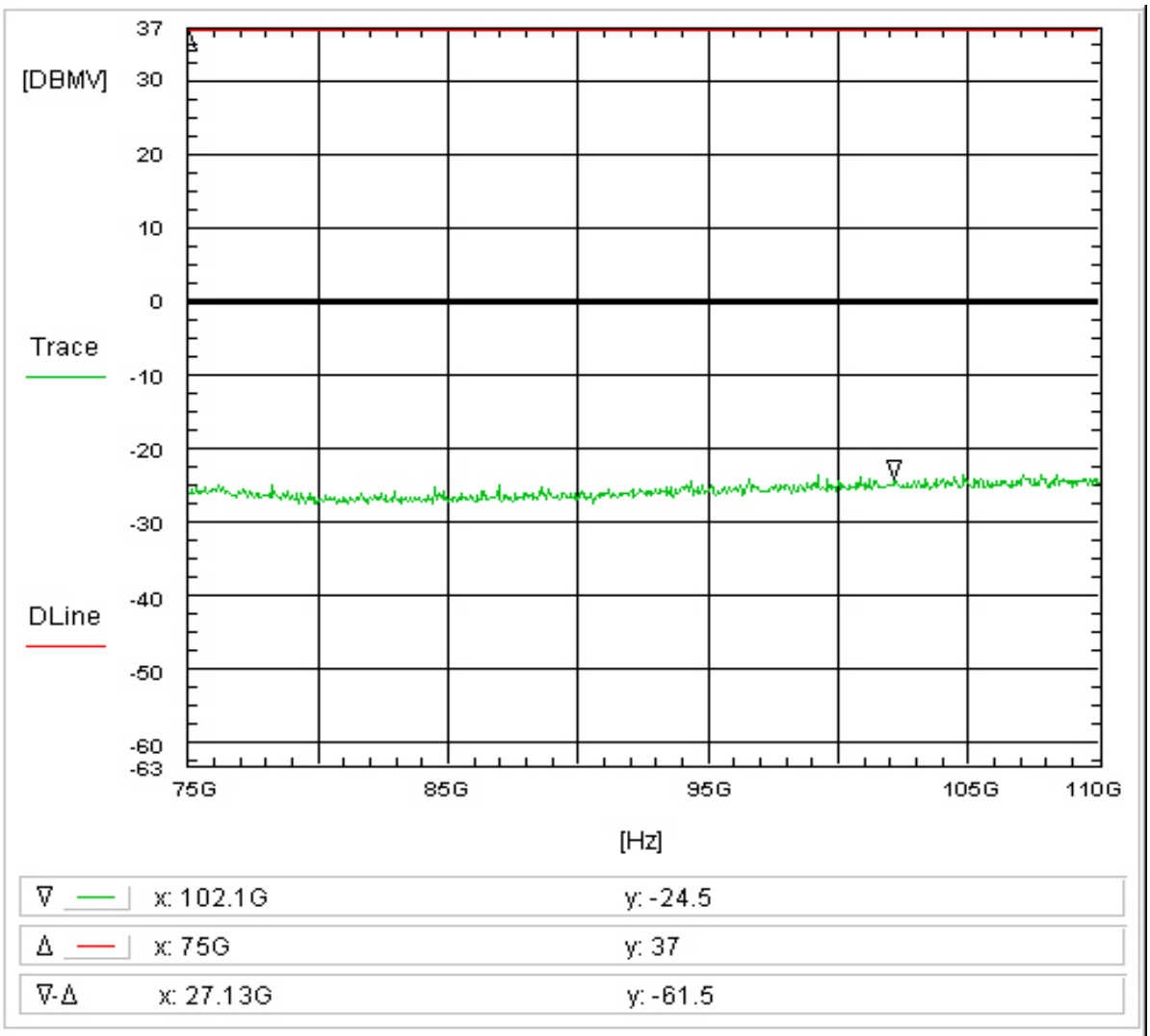
Limit: = 88.0 dBµV/m @3m

Plot 10



Measurement distance d	=	0.25 m
Calculation : Field strength	=	Analyser reading + Antenna factor + distance corr.
e	=	-27.8 dB(mV) + 40.67 dB(1/m) + (- 21.6 dB)
e	=	-8.73 dB(mV/m)
E	=	0.367 mV/m
E	=	367 µV/m @3m (noise)
Limit:	=	500.0 µV/m @3m

Plot 11



Start [Hz]	Center [Hz]	Stop [Hz]
75G	92.5G	110G
Input Attenuation [dB]	**Resolution bandwidth**	**Video bandwidth [Hz]**
10	1M	1M

Measurement distance d = 0.125 m

Calculation : Field strength = Analyser reading + Antenna factor + distance corr.

e = -24.5 dB(mV) + 45.07 dB(1/m) + (- 27.6 dB)

e = -7.0 dB(mV/m)

E = 0.445 mV/m

E = 445.14 µV/m @3m (noise)

Limit: = 500.0 µV/m @3m