Nemko

COMLAB
Accredited Testing and Certification
EMC, Radio and Telecommunications

www.nemko.com

Test report no. : 71006/8

Item tested : RA-7203

Type of equipment : VHF Receiver

FCC ID : RA9RA-7203

Client : Jotron AS

FCC Part 15, subpart B
(VHF receiver)

09 July 2007

Authorized by : .....
Egil Hauger
Technical Verificator

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1 GENERAL INFORMATION

1.1 Testhouse Info

Name :	Nemko Comlab
Address :	Gåsevikveien 8, Box 96 N-2027 Kjeller, NORWAY
Telephone :	+47 64 84 57 00
Fax :	+47 64 84 57 05
E-mail:	comlab@nemko.com
FCC test firm registration # :	994405
IC OATS registration # :	4443
Total Number of Pages:	29

1.2 Client Information

Name :	Jotron AS
Address :	P.O.Box 54, Kirkestian 1, 3280 Tjodalyng
Telephone :	+47 33 13 97 14
Fax :	--

Contact:

Name :	Eirik Storjordet
Telephone :	+47 33 13 97 14
E-mail :	eirik.storjordet@jotron.com

1.3 Manufacturer (if other than client)

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2 Test Information

2.1 Tested Item

Name :	Jotron
Model/version :	RX: RA-7203
Serial number :	RX: 03
Hardware identity and/or version:	RX: X84506:R0549, X82411:R0552
Software identity and/or version :	RX: April 2007
Frequency Range :	118 – 136.975 MHz
Tunable Bands :	None
Emission designator:	6K00A3E
Number of Channels :	3
Operating Modes :	RX (Simplex)
Channel separation:	25kHz
Type of Modulation :	AM
User Frequency Adjustment :	Yes
Rated maximum audio output:	+10 dBm at 600 ohm line
Type of Power Supply :	100 – 260 AC mains or 21 - 36VDC
Antenna Connector :	50 Ohm N-connector

Description of Test Item

The Jotron TA 7600 series VHF radios are designed for ground to air communications on air port traffic control centers. The units are rack mounted. And the transmitter and receiver are separate units and have their own built in power supplies. These radios can be operated locally as well as remotely. The remote control ports are LAN, RS-485 and RS-232.

Theory of Operation

A simple AM modulated ground to air VHF aeronautical radio receiver.

2.2 Test Environment

Temperature:	20 – 25 °C
Relative humidity:	30 – 50 %
Normal test voltage:	120 V AC & 12 – 36 DC

The values are the limit registered during the test period.

2.3 Test Period

Item received date: 2007-07-06

Test period : from 2007-07-05 to 2007-07-09

2.4 Test Engineer(s)

G.Suhanthakumar, Jan Ericsson (DC power line conducted emission)

2.5 Test Equipment

See list of test equipment in clause 7.

2.6 Other Comments

All tests were performed with all ports populated and operating.

3 TEST REPORT SUMMARY

3.1 General

Manufacturer: Jotron AS

Model No.: RA-7203

Serial No.: 03

All measurements are traceable to national standards.

All tests were performed is accordance with ANSI C63.4-2003 where applicable. Radiated emissions are made in a 10m semi-anechoic chamber. A description of the test facility is on file with the FCC and Industry Canada.

THIS TEST REPORT APPLIES ONLY TO THE ITEM(S) AND CONFIGURATIONS TESTED.

Deviations from, additions to, or exclusions from the test specifications are described in "Summary of Test Data".

TEST REPORT NO: 71006/8

TESTED BY : _____ **DATE: 09-07-07**

G.Suhanthakumar, Test Engineer

3.2 Test Summary

Name of test	FCC CFR 47 Paragraph #	Verdict
Power Line Conducted Emission	15.107(a)	Complies
Spurious Emissions (Radiated)	15.109(a)	Complies
Antenna power conduction limits for receivers	15.111	Complies

3.3 Description of modification for Modification Filing

Not applicable.

3.4 Comments

The measurements were done with the EUT powered by 120 V AC & 36 Vdc. It was checked that power variations between 85% and 115% did not have any influence on the measurements.

All ports were populated during spurious emission measurements.

3.5 Family List Rational

Not Applicable.

4 TEST RESULTS

4.1 Power Line Conducted Emissions

Para. No.: 15.107 (a)

Test Performed By: G.Suhanthakumar , Jan Ericsson	**Date of Test: 2007.03.30 & 05.07.2007**

Measurement procedure: **ANSI C63.4-2003 using 50 μH/50 ohms LISN.**

Test Results: **Complies**

Measurement Data: **See attached graphs, (Peak detector).**

AC mains

Highest measured value (L1 and N):

Operating

Frequency	Detector	Measured value	Limit	Margin
KHz	**Peak/QP/AV**	**dBμV**	**dBμV**	**dB**
204	QP	43,4	63.3	19.9
204	AV	41,4	53.3	11.9
307,5	QP	36,1	59.8	23.7
307,5	AV	36,4	49,8	13.4
1023	QP	22	56	34
1023	AV	24,8	46	21.2
1407	QP	18,6	56	37,4
1407	AV	10,6	46	35.4

Standby

Frequency	Detector	Measured value	Limit	Margin
KHz	**Peak/QP/AV**	**dBμV**	**dBμV**	**dB**
204	QP	44,6	63.3	18.7
204	AV	43,8	53.3	9.5
303	QP	34,5	59.9	25.4
303	AV	35	49.9	14.9
2166	QP	14,6	56	41.4
2166	AV	5	46	41

DC power

Positive/negative pole

Frequency	Detector	Measured value	Limit	Margin
KHz	Peak/QP/AV	dBµV	dBµV	dB
984,380	QP	45,2	56	10,8
984,380	AV	46,0	46	0

4.2 Spurious Emissions (Radiated)

Para. No.: 15.109

Test Performed By: G.Suhanthakumar	**Date of Test: 09.07.2007**

Measurement Procedure:

FCC 15.109

Test Results:

Radiated emission 10 kHz-30 MHz.

Measuring distance 10 m, measured with Peak detector.

No component detected.

Limit is converted to 10m using 40 dB/decade according to 15.31 (f) (2).

Radiated Emissions 30 - 1500 MHz.

Detector: Quasi-Peak

Measuring distance 3 m.

The EUT were rotated 360 degrees and the antenna height varied between 1 and 4 m on all found frequencies.

The centre frequencies are low (118MHz), middle (128MHz) and high (136.975MHz).

Only the worst case is given below in the table.

Receiver active, Maximum radiation detected at vertical polarization, Q-peak detector is used.

Frequency	Distance correction factor	Field strength, 3 m	Limit	Margin
MHz	dB	dBμV/m	dBμV/m	dB
60,25	0	17	40	23
147,5	0	22	44	24
159,75	0	26	44	18
184,35	0	18	44	26
200	0	10	44	34
249,95	0	25	46	21
299,95	0	28	46	18

The spectrum was searched from 30 to 1500 MHz.

The RF port was terminated with 50 ohm load and all ports were terminated with respective loads.

4.3 Antenna power conduction limits for receivers

Para. No.: 15.111 (a)

Test Performed By: G.Suhanthakumar	**Date of Test: 06.07.2007**

Measurement procedure: **FCC 15 .111(a)**

Test Results: **Complies**

Measurement Data: **See attached graph for scan from 10 MHz to 1.5GHz , (Peak detector).**

Peak detector is used

Frequency	Channel	RBW	Measured radiation at 50hm	Limit	Margin
MHz	MHz	kHz	dBm	dBm	dB
163.004	118.000	100	-74.73	-57	17.73
173.013	128.000	100	-76.53	-57	19.53
181.920	136.975	100	-78.30	-57	21.3

5 GRAPHS

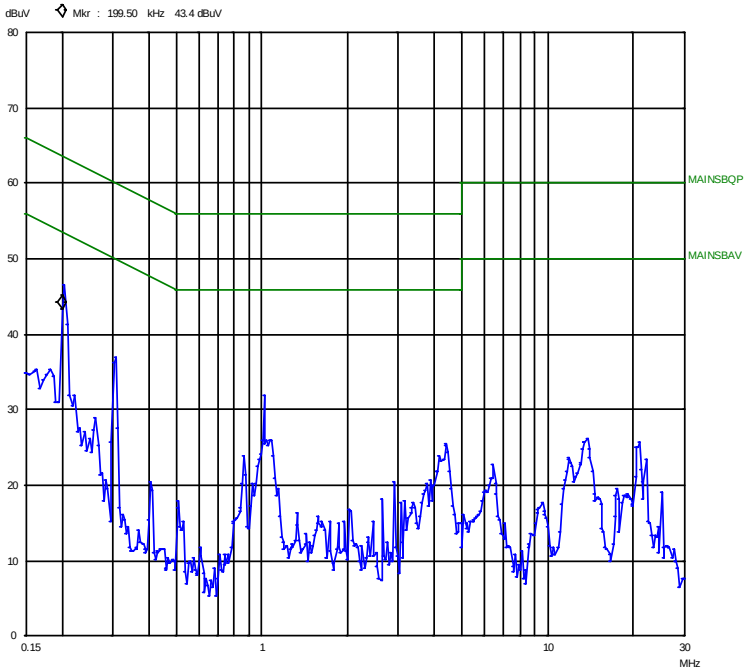
NEMKO COMLAB 05. Jul 07 13:02

Peak

Operator: gns
Comment: Jotron RX
AC mains 115V 60Hz
L1
operating mode

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150k	30M	4.5k	9k	PK	50ms	AUTO	LN OFF	60dB



AC mains – L1 – Operating mode

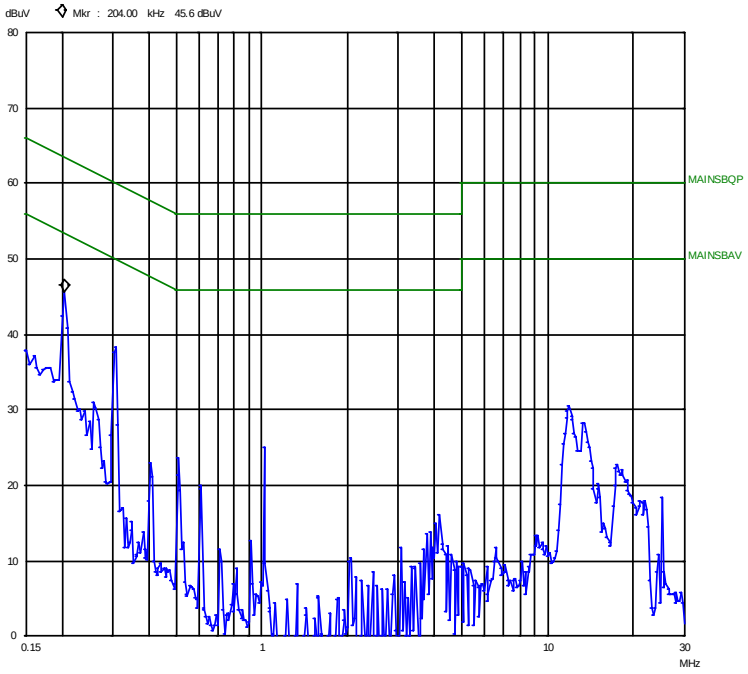
NEMKO COMLAB 05. Jul 07 13:22

Peak

Operator: gns
Comment: Jotron RX
AC mains 115V 60Hz
N
Standby mode

Scan Settings (1 Range)

Frequencies			Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150k	30M	4.5k	9k	PK	50ms	AUTO	LN OFF	60dB



AC mains – N- Operating mode

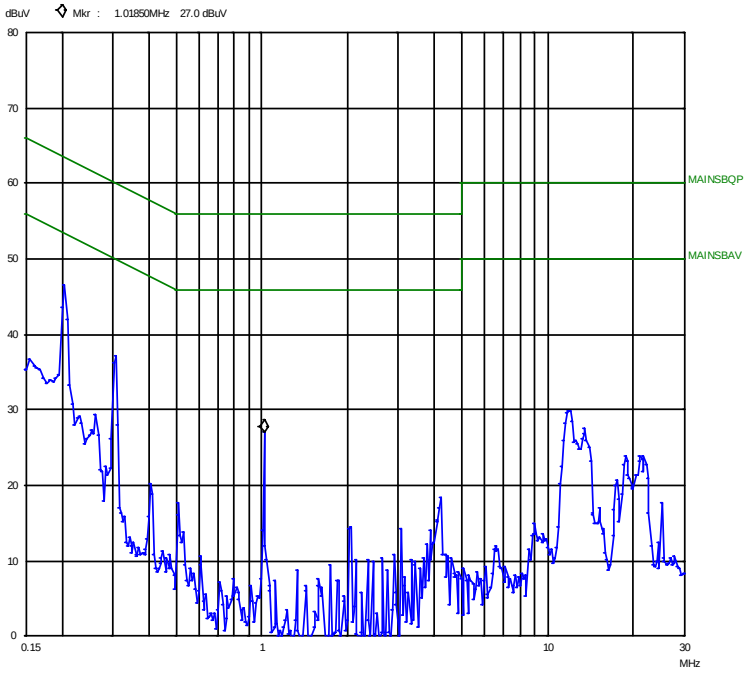
NEMKO COMLAB 05. Jul 07 13:10

Peak

Operator: gns
Comment: Jotron RX
AC mains 115V 60Hz
L1
Standby mode

Scan Settings (1 Range)

Frequencies			Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150k	30M	4.5k	9k	PK	50ms	AUTO	LN OFF	60dB



AC mains – L1 – Standby mode

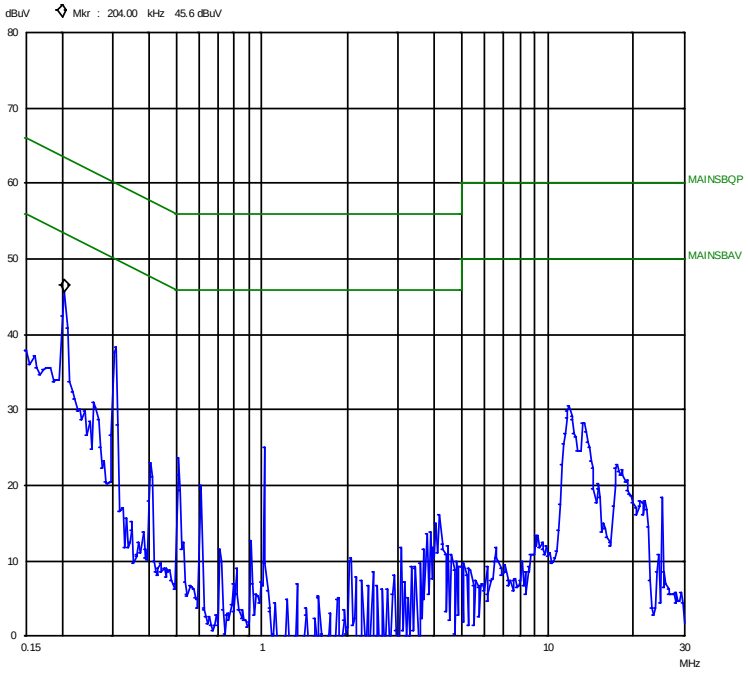
NEMKO COMLAB 05. Jul 07 13:22

Peak

Operator: gns
Comment: Jotron RX
AC mains 115V 60Hz
N
Standby mode

Scan Settings (1 Range)

Frequencies			Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150k	30M	4.5k	9k	PK	50ms	AUTO	LN OFF	60dB



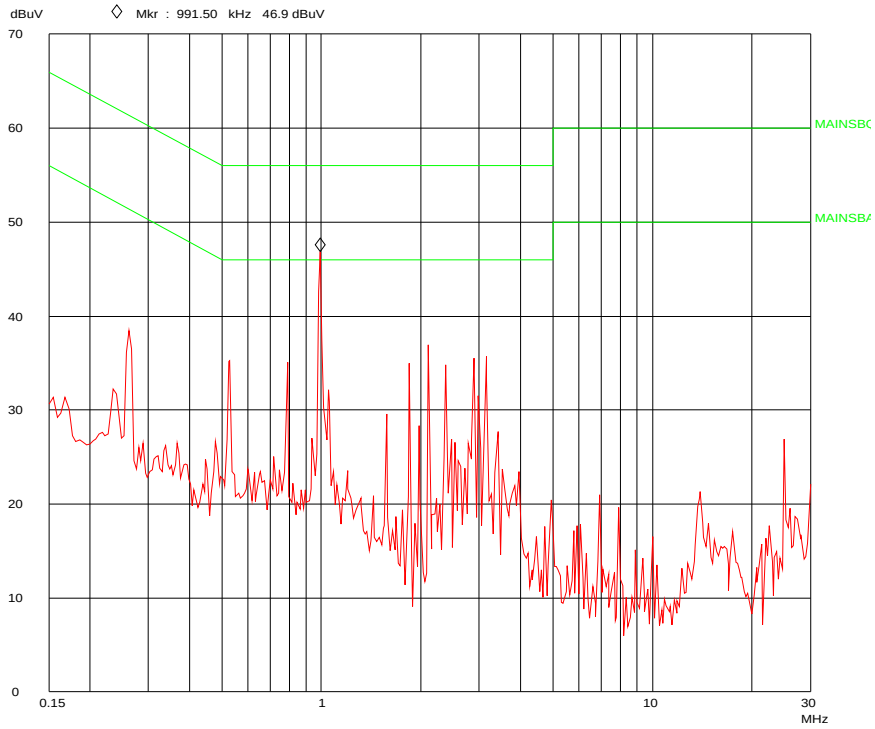
AC mains – N- Standby mode

NEMKO COMLAB
Peak

14. Feb 07 15:24

Operator: jge
Comment: Jotron TA 7610 Rx
DC mains

Scan Settings (1 Range)
|--------- Frequencies ----------||---------- Receiver Settings ----------|
Start Stop Step IF BW Detector M-Time Atten Preamp OpRge
150k 30M 4.5k 9k PK 50ms AUTO LN OFF 60dB



DC mains – positive pole

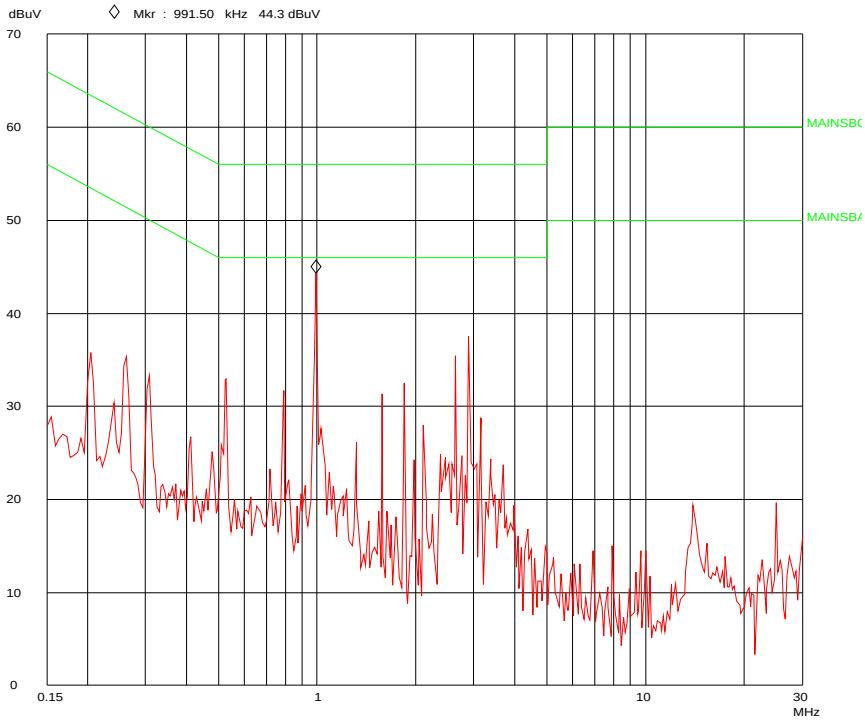
NEMKO COMLAB
Peak

14. Feb 07 16:16

Operator: jge
Comment: Jotron TA 7610 Rx
DC mains
Minus

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150k	30M	4.5k	9k	PK	50ms	AUTO	LN OFF	60dB



DC mains – Negative pole

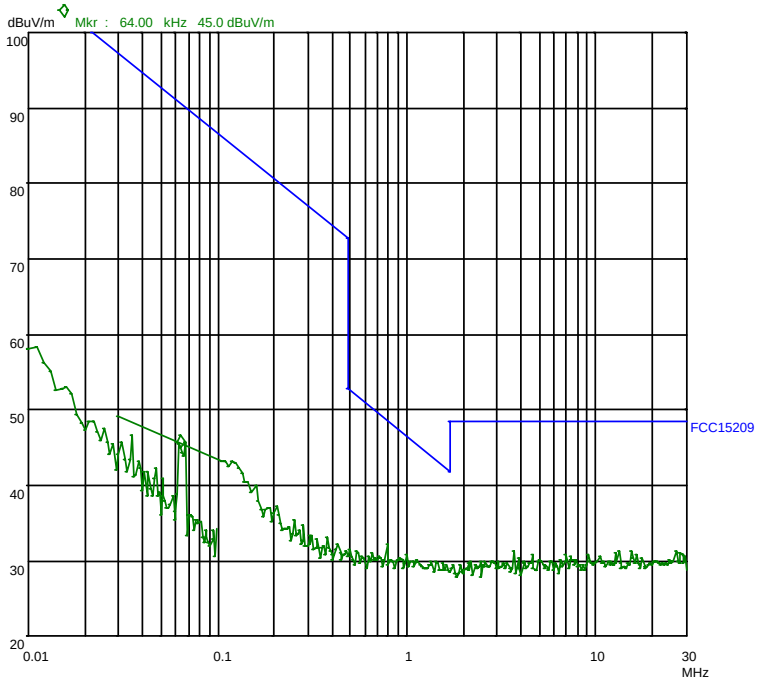
NEMKO COMLAB 09. Juli 07 09:07
PK

Operator: gns
Comment RX
Jotron As
10m
FCC part 15

Scan Settings (4 Ranges)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
10k	100k	1k	1k	PK	20ms	0dB	LN OFF	60dB
20k	20k	5k	9k	PK	20ms	AUTO	LN ON	60dB
20k	10M	5k	9k	PK	20ms	AUTO	LN OFF	60dB
10M	30M	5k	9k	PK	20ms	AUTO	LN OFF	60dB

Transducer No.	Start	Stop	Name
13	10k	30M	HFH2Z2



10kHz - 30MHz radiated plot

Nemko Comlab 09. Jul 07 08:19

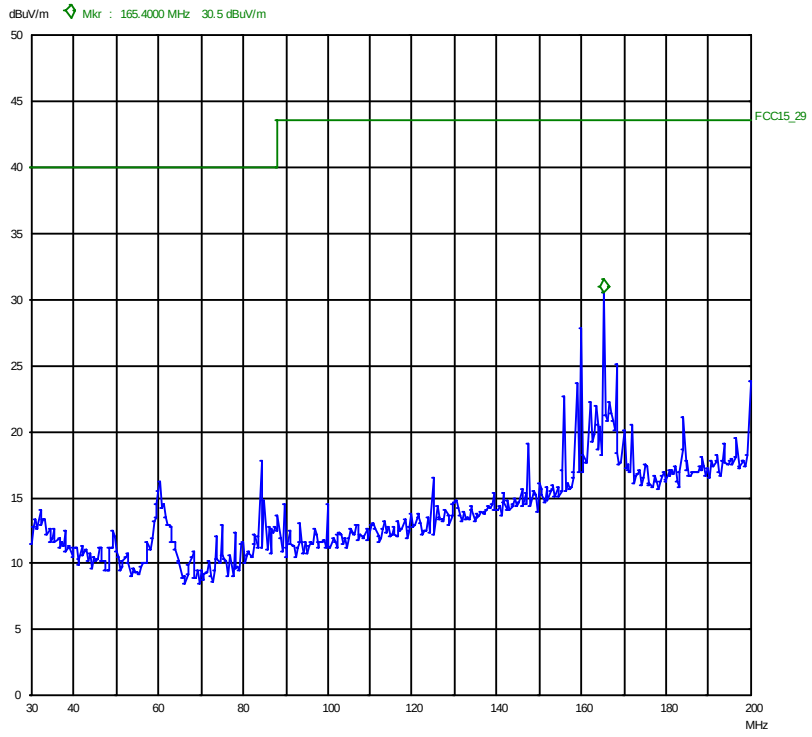
PK

EUT: RX 7203
Manuf: Jotron
Op Cond: vp 1m
Operator: gns
Test Spec: FCC part 15 B

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
30M	200M	50k	120k	PK	50ms	AUTO	LN ON	60dB

Transducer No.	Start	Stop	Name
20	30M	200M	HK116



Radiated spurious scan , VP 30- 200MHz

Nemko Comlab 09. Jul 07 08:25

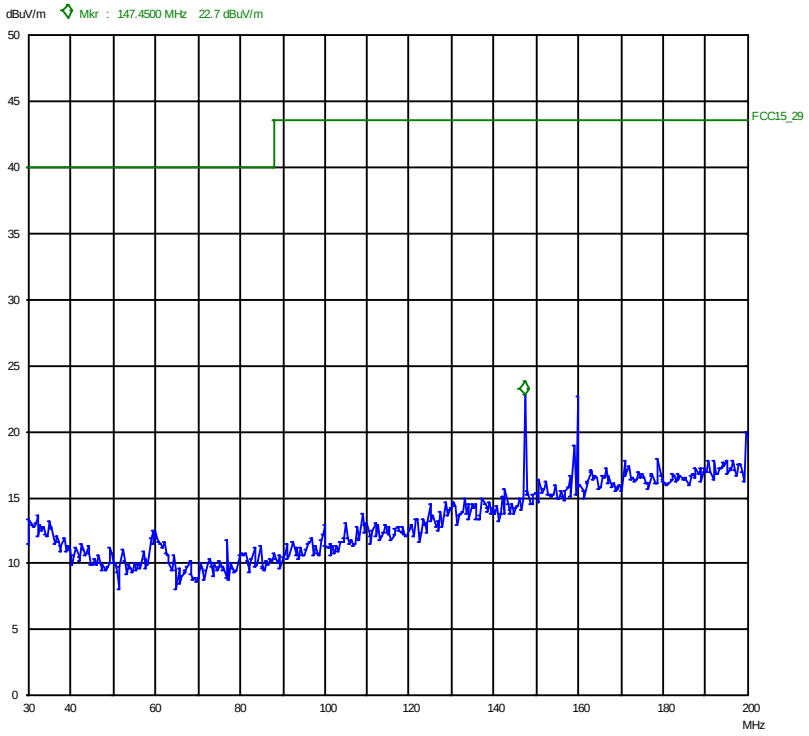
PK

EUT: RX 7203
Manuf: Jotron
Op Cond: hp 4m
Operator: gns
Test Spec: FCC part 15 B

Scan Settings (1 Range)

Frequencies			Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
30M	200M	50k	120k	PK	50ms	AUTO	LN ON	60dB

Transducer No.	Start	Stop	Name
20	30M	200M	HK116



Radiated spurious scan , HP 30- 200MHz

Nemko Comlab 09. Jul 07 08:38

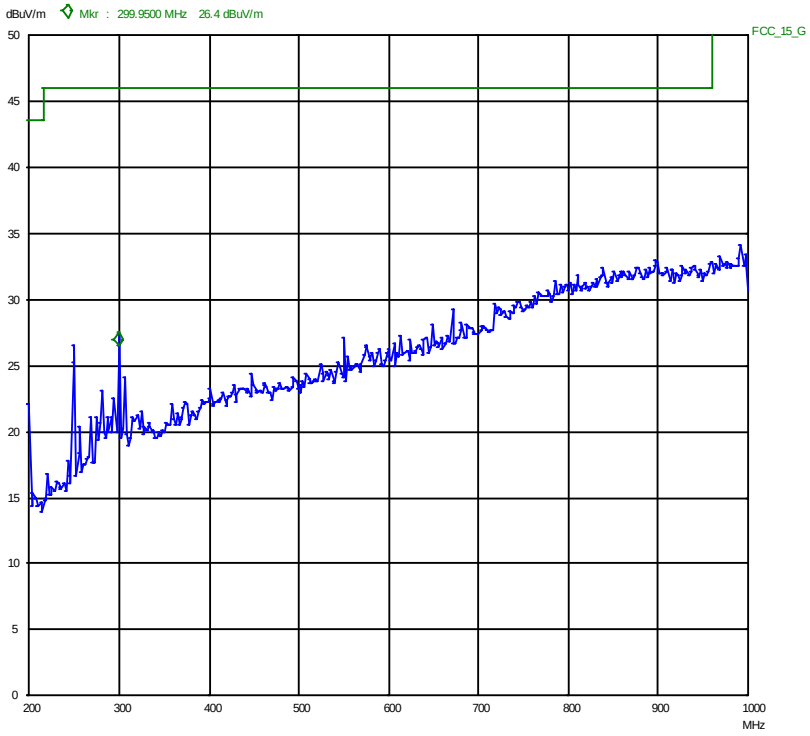
PK

EUT: RX 7203
Manuf: Jotron
Op Cond: vp 1m
Operator: gns
Test Spec: FCC part 15 B

Scan Settings (1 Range)

Frequencies			Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
200M	1000M	50k	120k	PK	50ms	AUTO	LN ON	60dB

Transducer No.	Start	Stop	Name
21	200M	1000M	HL223



Radiated spurious scan , VP 200- 1000MHz

Nemko Comlab 09. Jul 07 08:54

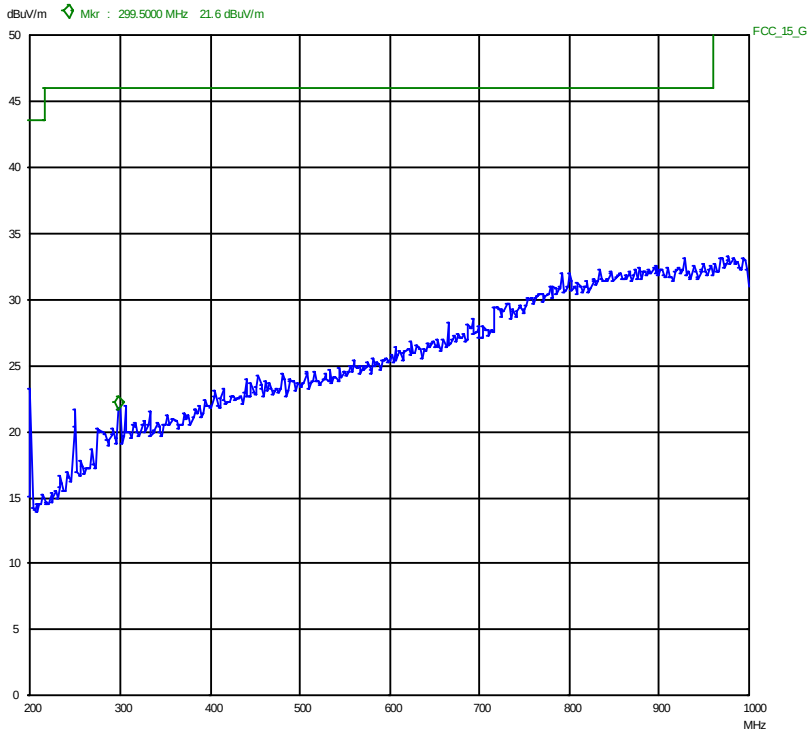
PK

EUT: RX 7203
Manuf: Jotron
Op Cond: hp 4m
Operator: gns
Test Spec: FCC part 15 B

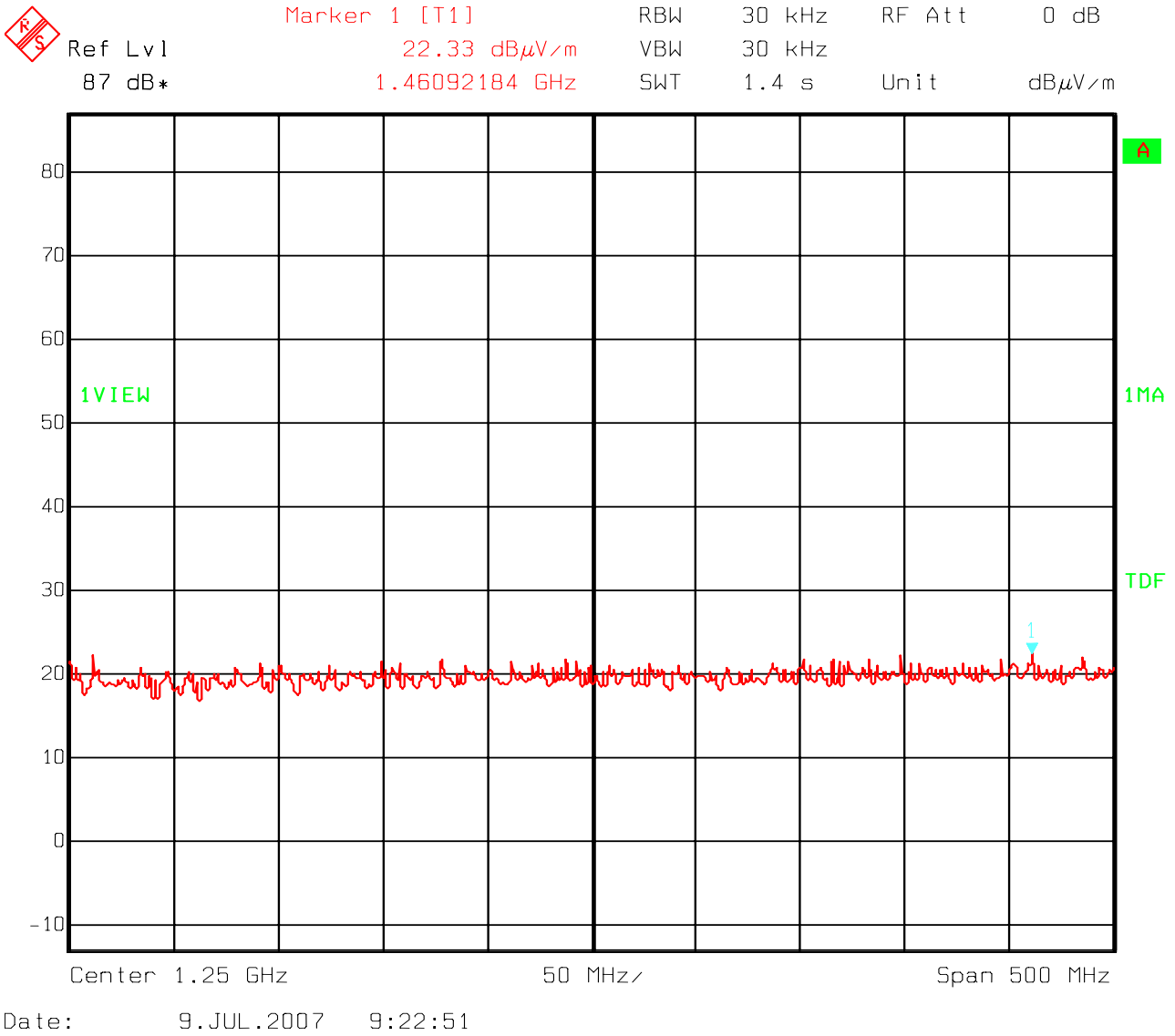
Scan Settings (1 Range)

Frequencies			Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
200M	1000M	50k	120k	PK	50ms	AUTO	LN ON	60dB

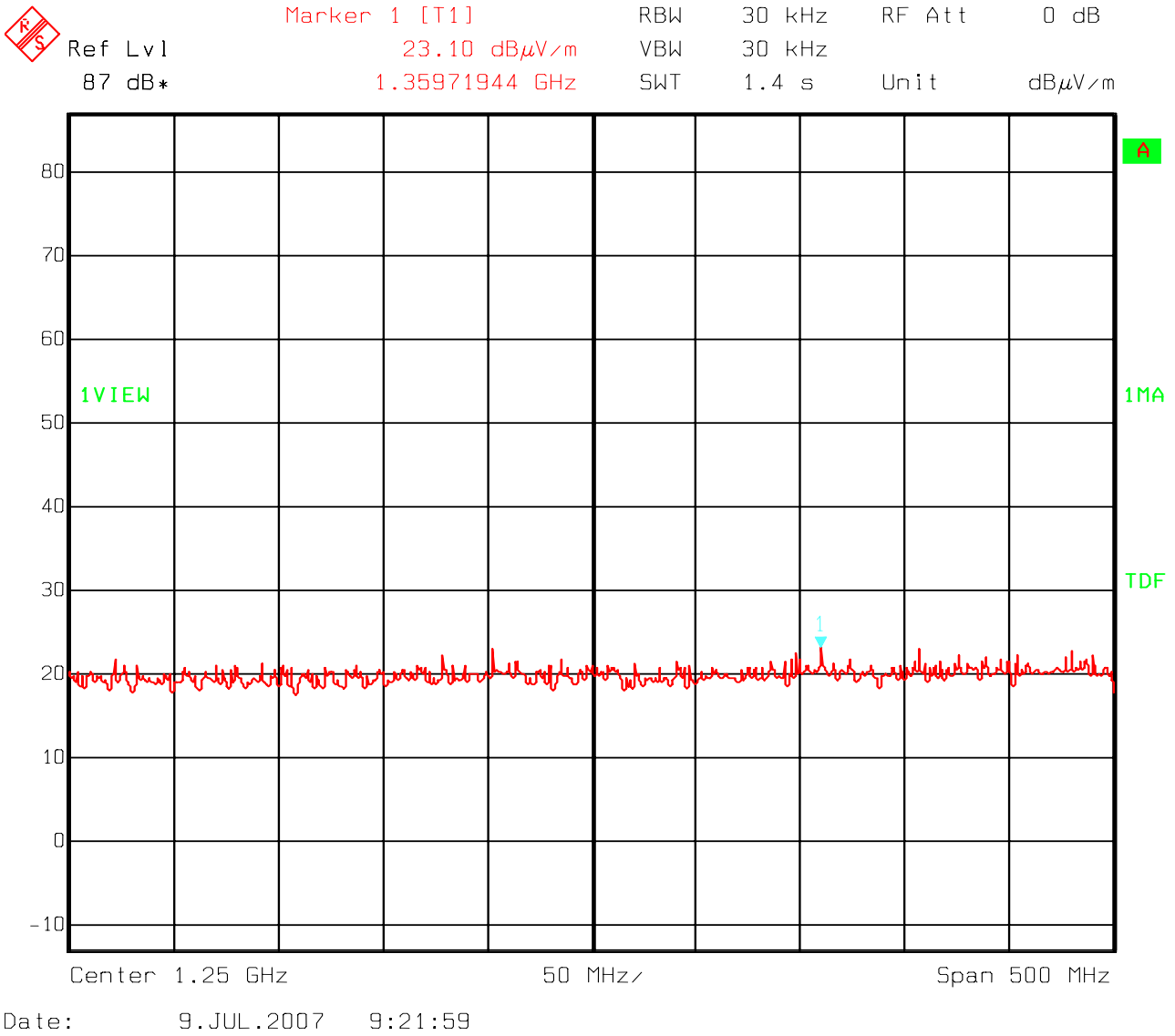
Transducer No.	Start	Stop	Name
21	200M	1000M	HL223



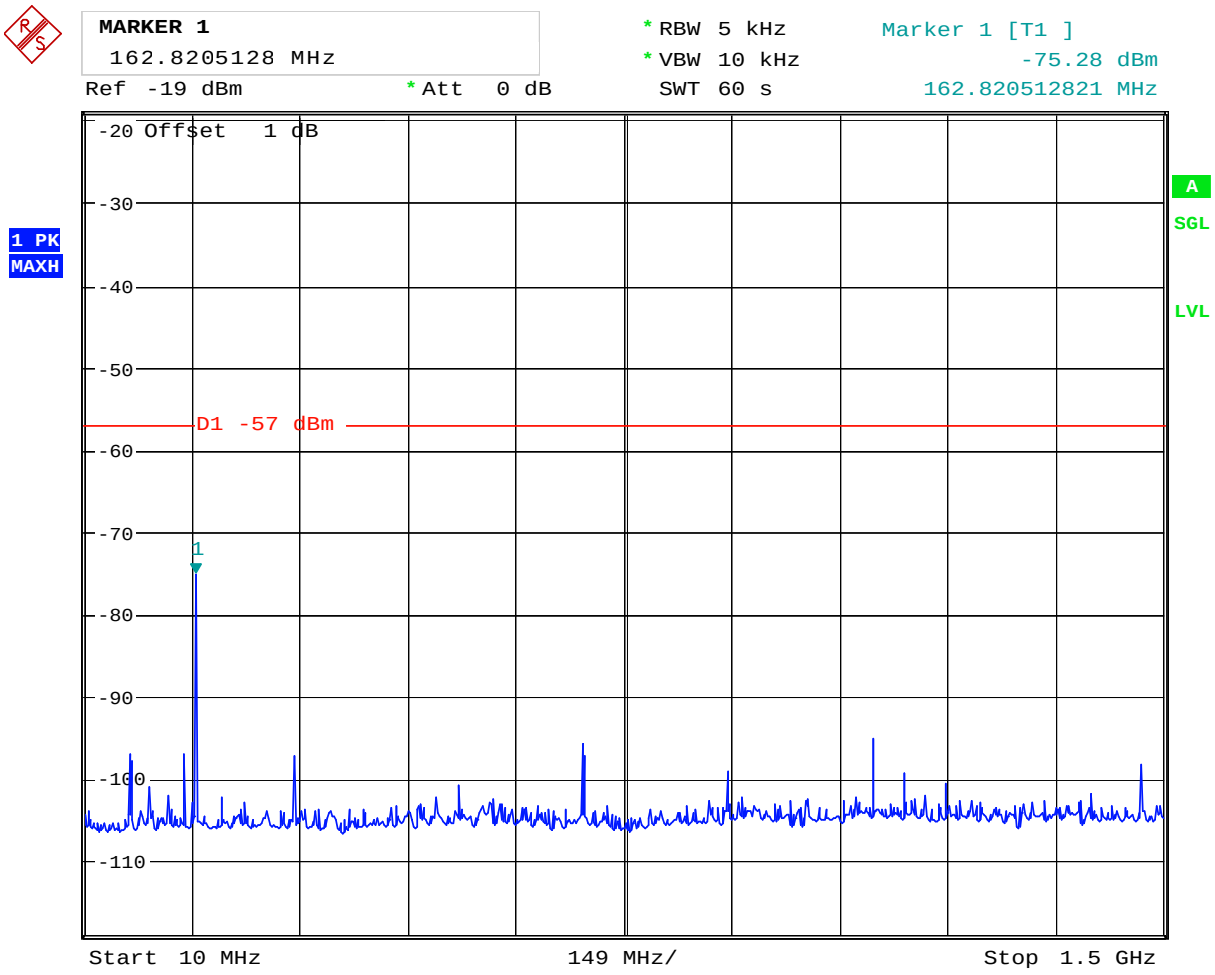
Radiated spurious scan , HP 200- 1000MHz



Radiated spurious scan , VP 1000 - 1500MHz

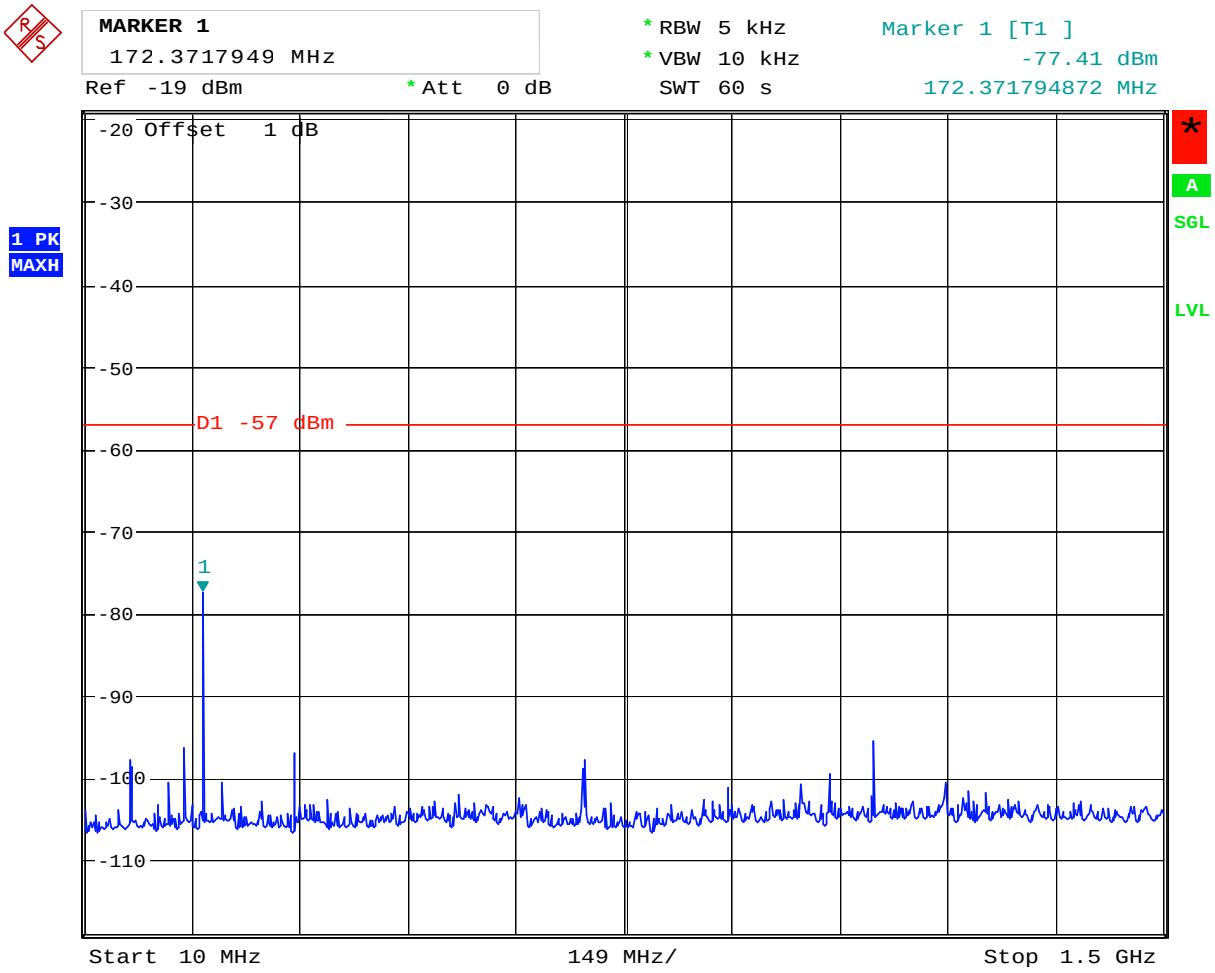


Radiated spurious scan , HP 1000 - 1500MHz



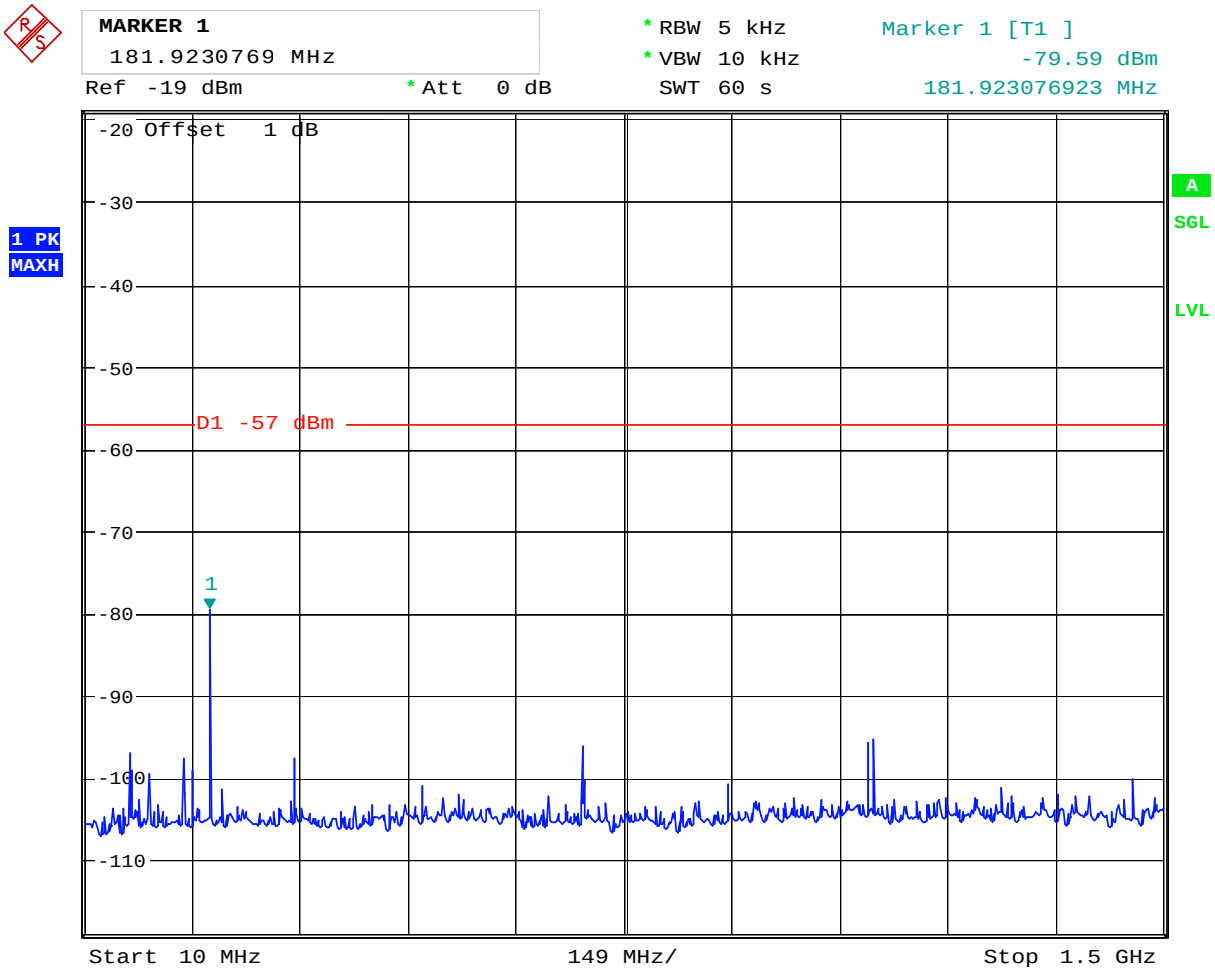
Date: 6.JUL.2007 12:09:31

Conducted radiation – channel tuned to 118MHz



Date: 6.JUL.2007 12:07:29

Conducted radiation – channel tuned to 128MHz

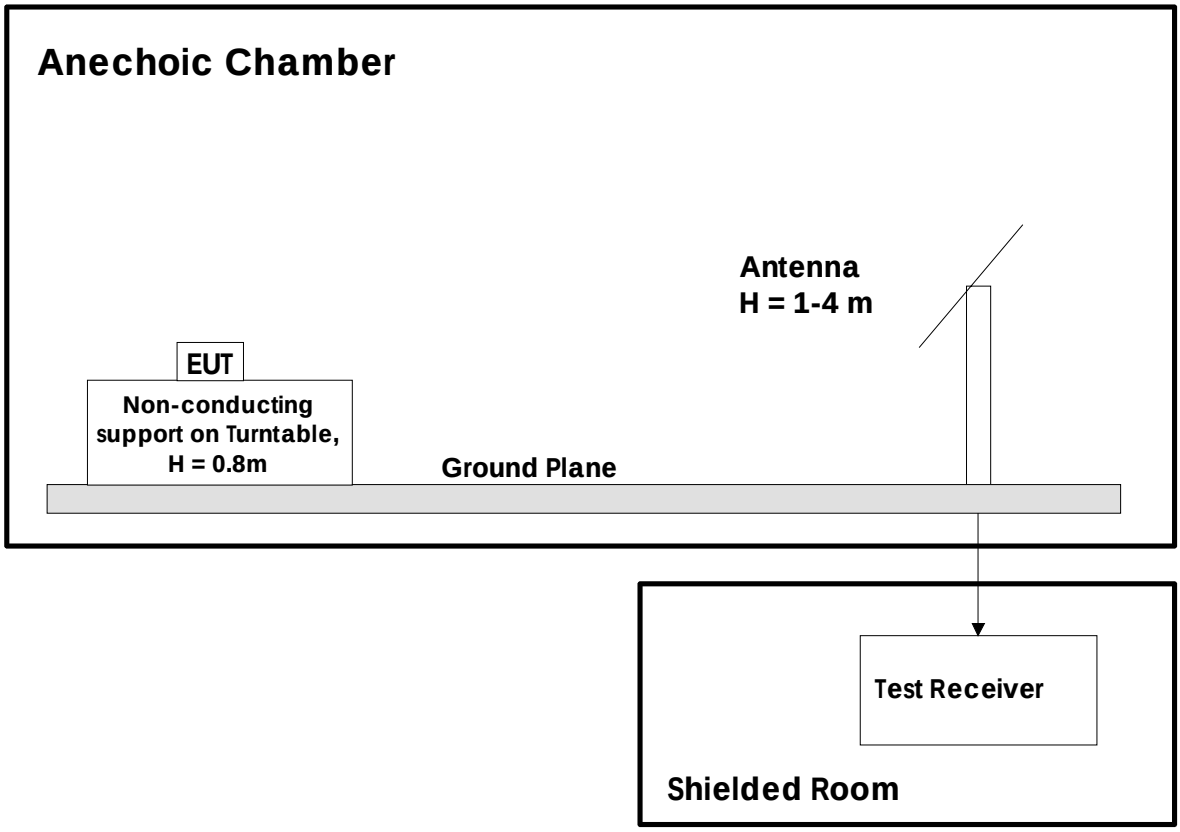


Date: 6.JUL.2007 12:11:16

Conducted radiation – channel tuned to 138.975MHz

6 Test Setups

6.1 Radiated Emissions Test

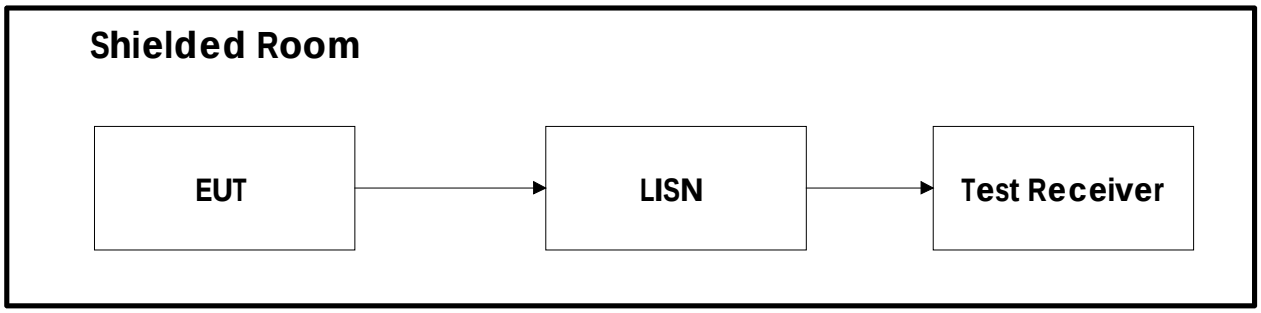


Test equipment: 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 12

Test Set-Up 1

This test setup is used for all radiated emissions tests. For frequencies below 30 MHz the measuring distance is 10 m, for all other frequencies it is 3m or 1m. Emissions above 1 GHz were measured with a Spectrum Analyzer and Horn Antenna and with the preamplifier after the antenna. For measurements above 18 GHz the test receiver is moved inside the anechoic chamber and located next to the antenna to minimize the cable loss.

6.2 Power Line Conducted Emissions Test



Test equipment: 6, 13, 14

Test Set-Up 2

7 Test Equipment Used

To facilitate inclusion on each page of the test equipment used for related tests, each item of test equipment and ancillaries are identified (numbered) by the Testhouse.

No.	Instrument/ancillary	Type of instrument/ancillary	Manufacturer	Ref. no.
1	FSEK30	Spectrum Analyzer	Rohde & Schwarz	LR 1337
2	SMP04	Signal generator	Rohde & Schwarz	LR 1336
3	8449B	Preamplifier	Hewlett Packard	LR 1322
4	4HC3000/18000	High-pass filter	Trilithic	S.No.: 9849045
5	ESVS30	Measuring Receiver	Rohde & Schwarz	LR 1101
6	ESN	Measuring Receiver	Rohde & Schwarz	LR 1237
7	ESAI	Measuring Receiver	Rohde & Schwarz	LR 1090
8	6810.17B	Attenuator	Narda	LR1212
9	3115	Horn Antenna	EMCO	LR 1226
10	HL223	Log-period Antenna	Rohde & Schwarz	LR 1261
11	HK116	Biconical Antenna	Rohde & Schwarz	LR 1260
12	HFH2-Z2	Loop Antenna	Rohde & Schwarz	LR 285
13	ESH3-Z5	Two Line V-Network	Rohde & Schwarz	LR 1076
14	80S	Signal Generator	Powertron	LT 502
15	FSU26	Spectrum Analyzer	Rohde & Schwarz	LR 1504