



Test report no. : 96806/6

Item tested : RFID Transceiver

Type of equipment : RFID transponder for animal identification

FCC ID : VW2-HHR3000PRO-2

Client : BioControl AS

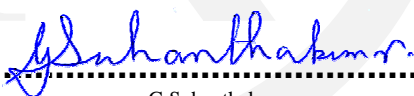
FCC Part 15.209

Inductive transmitter 134.2 kHz

RSS-210 Issue 7 & RSS Gen Issue 2

Inductive transmitter 134.2 kHz

11 February 2007

Authorized by : 
.....
G.Suhanthakumar
Technical Verificator

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1 GENERAL INFORMATION

1.1 Testhouse Info

Name : Nemko Comlab
Address : Gåsevikeien 8, Box 96
N-2027 Kjeller, NORWAY
Telephone : +47 64 84 57 00
Fax : +47 64 84 57 05
E-mail : post@comlab.no
FCC test firm
registration # : 994405
IC OATS
registration # : 4443
Total Number of Pages: 33

1.2 Client Information

Name : BioControl AS
Address : Grimstad Gård, NO-1890 Rakkestad, NORWAY
Telephone : +47 6922 3813

Contact:

Name : Raymond Solem
Telephone : +47 6922 3813
E-mail : Raymond.solem@biocontrol.no

1.3 Manufacturer (if other than client)

Same as above.

2 TEST INFORMATION

2.1 Test Item

Name :	RFID Transponder
Model/version :	HHR3000PRO
FCC ID :	VW2-HHR3000PRO-V2
Serial number :	/
Hardware identity and/or version:	V2
Software identity and/or version :	/
Operating frequency:	134.2 kHz
Switching range:	None
Transmitter data rate:	/
Tuneable Bands :	None
Emissions Designator :	/
Number of Channels :	1
Operating Modes :	Inductive loop transponder
Channel spacing:	None
Channel bandwidth:	-20 dB, 80 Hz
Type of Modulation :	PSK
User Frequency Adjustment :	None
Type of Power Supply :	Internal battery, Charger Model: Mascot 2126
Antenna Connector :	Yes, Note 1)
Antenna Diversity Supported :	No

Note 1) The tested equipment can use four different type of antennas with unique coupling made by BioControl, see fig 1 to 4.

Theory of Operation

EUT is at inductive loop transponder on 134.2 kHz for animal identification.

Description of Test Item

The EUT has internal battery and all measurement was done with a fully charged battery.

All radiated measurements were performed on three axes.

2.2 Test Environment

2.2.1 Normal test condition

Temperature: 20 - 22 °C
Relative humidity: 30 - 40 %
Normal test voltage: AC/DC converter, 115 V AC

The values are the limit registered during the test period.

2.3 Test Period

Item received date: 2007-11-30
Test period : 2007-11-30 to 2007-12-14

3 TEST REPORT SUMMARY

3.1 General

Manufacturer: BioControl AS
Model No.: RFID Transponder
Serial No.: /

All measurements are traceable to national standards.

The tests were conducted for the purpose of demonstrating compliance with FCC CFR 47 Part 15.209 and Industry Canada RSS-210 Issue 7.

Radiated tests were conducted in accordance with ANSI C63.4-2003. The radiated tests were made in a semi-anechoic chamber at measuring distances of 10 metres.

- | | |
|---|---|
| <input checked="" type="checkbox"/> New Submission | <input checked="" type="checkbox"/> Production Unit |
| <input type="checkbox"/> Class II Permissive Change | <input type="checkbox"/> Pre-production Unit |
| DCD Equipment Code | <input type="checkbox"/> Family Listing |

THIS TEST REPORT RELATES 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 #: 96806/6

TESTED BY: Egil Hauger
Egil Hauger, Test engineer

DATE: 18.12.2007

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3.2 Test Summary

Name of test	FCC Part 15 reference	RSS210 Issue 7 & RSS Gen Issue 2	Result
Supply Voltage Variations	15.31(e)	4.5	Complies ²
Transmitter frequency stability	15.31(m)	7.2.4	Complies ⁴
Antenna Requirement	15.203	7.1.4	Complies ³
Power-Line Conducted Emission	15.207(c)	7.2.2	Complies
Bandwidth	15.215	-	NA
Peak Power Output	15.249(a)(c)	A2.9	NA
Band edge Emissions	15.249(d)	A.2.9	NA
Spurious Emissions (Radiated), Transmitter active	15.209 (a)	A2.9 & 4.3	Complies
Spurious Emissions (Antenna Conducted) ¹	15.249	7.2.3.1	NA
Receiver Spurious Emissions (Radiated) (Standby mode)	15.209 (a)	6	Complies

¹ The EUT has only integral antenna.

² Internal battery, measured with fully charged battery.

³ Unique antenna coupling

⁴ No requirement <160 kHz

RSS Gen issue 2 covers section 6 & 7

RSS 210 issue 6 covers section A2.9

3.3 Description of modification for Modification Filing

Not applicable.

3.4 Comments

The EUT has only one channel on 134.2 kHz.

EUT can be delivered with four types of antennas:

- 50007
- 50008
- 50009
- 50010

See manufacturer documentation and external photos.

3.5 Family List Rational

Not Applicable.

4 TEST RESULTS

4.1 Power-Line Conducted Emissions

Para. No.: 15.207 (a)

Test Performed By: Egil Hauger	Date of Test: 12.12.2007
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Measurement procedure: ANSI C63.4-2003 using 50 µH/50 ohms LISN.

Test Results: **Complies**

Measured in charging mode with USB communication.

TX not operating in charging mode.

Highest measured value (L1 and N):

Frequency	Detector	Measured value Phase L1	Measured value Phase N	Limit	Margin L1/N
MHz	QP/AV	dBµV	dBµV	dBµV	dB
0.162	QP	47.2	46.9	65.3	18.1/18.4
0.162	AV	37.2	36.9	55.3	18.1/18.4
0.249	QP	50.3	50.3	61.7	11.7/11.7
0.249	AV	45.6	45.6	51.7	6.1/6.1
0.280	QP	44.1	44.4	60.7	16.6/16.3
0.280	AV	42.6	43.0	50.7	8.1/7.7

See the attached graphs 28 and 28 for peak scan. The measured peak values are also within the requirements.

Test instrument used: 2, 4, 5.

4.2 Transmitter Frequency Stability

Para. No.: None

Test Performed By: Egil Hauger	Date of Test: 5.12.2007
--------------------------------	-------------------------

Measurement Data:

Temperature	Channel nr.	Given Frequency (kHz)	Measured value (kHz)	Deviation (Hz)
20 °C	1	134.2	134.212	12

See fig 29.

Comment:

For information only:

There are no requirements to frequency tolerance for low power devices below 160 kHz according to 15.209 or RSS 210 Issue 7.

Instrument used: 3.

4.3 Spurious Emissions (Radiated)

Para. No.: 15.209 (a)

Test Performed By: Egil Hauger	Date of Test: 29.11 to 14.12 2007
--------------------------------	-----------------------------------

Test Results: Complies

Measurement Data:

Radiated emission 9 kHz - 1000 MHz, see attached table

Duty Cycle Correction Factor Calculation:

RF duty cycle Correction Factor: Calculation according to RF burst Para 15.35 (c):

Measured duty cycle: ON+OFF time 100 ms, OFF time: 5.4 ms (see attached graphs)

$$-20 \cdot \log (100 / (100 - 5.4)) = 0.48 \text{ dB}$$

Maximum duty cycle according to Para 15.35 (b): **20 dB**

This value is used for calculating the Peak limit for spurious emissions and for calculating the Spurious Emissions value with Average Detector when measuring with Peak Detector.

Radiated spurious emissions are performed from 9 kHz to 1000 MHz

Example of frequency graph of radiated emission is also attached.

Antenna factor, amplifier gain and cable loss are included in Test receiver "Transducer factor".

Radiated Emission 10 kHz – 1000 MHz, Transmitting mode

Measured with Peak Detector

The maximum emission is obtained at vertical polarization (worst case).

Freq.	Operational condition	Measuring bandwidth kHz	Detector	Antenna Type	Field strength	Measuring distance	Limit FCC15.209	Margin
MHz					dB μ V/m	metres	dB μ V/m	dB
0.01	Transmitting	0.2	Peak	50007	< 45.5	10	107.6	>62.1
0.1342	Transmitting	0.2	Peak	50007	83.6	10	84.6	1.0
0.1342	Transmitting	0.2	AV	50007	83.1	10	84.1	1.0
0.1342	Transmitting	0.2	Peak	50008	80.0	10	84.6	4.6
0.1342	Transmitting	0.2	AV	50008	79.5	10	84.1	4.6
0.1342	Transmitting	0.2	Peak	50009	81.0	10	84.6	3.6
0.1342	Transmitting	0.2	AV	50009	80.5	10	84.1	3.6
0.1342	Transmitting	0.2	Peak	50010	83.5	10	84.6	1.1
0.1342	Transmitting	0.2	AV	50010	83.0	10	84.1	1.1
255.0	Transmitting	120	QP	50007	6.0	10	35.6	29.6
330.15	Transmitting	120	QP	50007	15.3	10	35.6	20.3
330.15	Transmitting	120	QP	50008	13.8	10	35.6	21.8
330.15	Transmitting	120	QP	50009	12.5	10	35.6	23.1
330.15	Transmitting	120	QP	50010	12.6	10	35.6	23

See fig 11 to 15 and 23, 24.

Radiated Emission 10 kHz – 1000 MHz, Standby mode

Measured with Quasi-Peak Detector

The maximum emission is obtained at vertical polarization (worst case).

Freq.	Operational condition	Measuring bandwidth kHz	Detector	Antenna Type	Field strength	Measuring distance	Limit FCC15.209	Margin
MHz					$\text{dB}\mu\text{V/m}$	metres	$\text{dB}\mu\text{V/m}$	dB
0.01	Standby	0.2	QP	50007	<45.5	10	107.6	>62.1
0.15	Standby	9	QP	50010	<39.2	10	83.2	>44
10	Standby	9	QP	50010	<29.5	10	48.6	>19.1
33.0	Standby	120	QP	50007	27.6	10	29.5	1.9
48.0	Standby	120	QP	50007	26.6	10	29.5	2.9
51.6	Standby	120	QP	50007	20.4	10	29.5	9.1
84.0	Standby	120	QP	50007	21.5	10	29.5	8
108.0	Standby	120	QP	50007	25.2	10	33.1	7.9
120.0	Standby	120	QP	50007	32.5	10	33.1	0.6
144.0	Standby	120	QP	50007	29.2	10	33.1	3.9
480.1	Standby	120	QP	50007	22.3	10	35.6	13.3
39.5	Standby	120	QP	50008	21.8	10	29.5	7.7
48.0	Standby	120	QP	50008	28.9	10	29.5	0.6
51.2	Standby	120	QP	50008	23.8	10	29.5	5.7
120.0	Standby	120	QP	50008	28.8	10	33.1	4.3
144.0	Standby	120	QP	50008	27.4	10	33.1	5.7
480.1	Standby	120	QP	50008	21.7	10	35.6	13.9
36.8	Standby	120	QP	50009	23.4	10	29.5	6.1
48.0	Standby	120	QP	50009	27.4	10	29.5	2.1
51.5	Standby	120	QP	50009	22.0	10	29.5	7.5
120.0	Standby	120	QP	50009	28.8	10	33.1	4.3
144.0	Standby	120	QP	50009	28.5	10	33.1	4.6
480.1	Standby	120	QP	50009	21.0	10	35.6	14.6
30.0	Standby	120	QP	50010	29.4	10	29.5	0.1
42.3	Standby	120	QP	50010	14.9	10	29.5	14.6
48.0	Standby	120	QP	50010	26.2	10	29.5	3.3
70.5	Standby	120	QP	50010	19.8	10	29.5	9.7
84.0	Standby	120	QP	50010	18.4	10	29.5	11.1
120.0	Standby	120	QP	50010	31.3	10	33.1	1.8

Freq.	Operational condition	Measuring bandwidth kHz	Detector	Antenna Type	Field strength	Measuring distance	Limit FCC15.209	Margin
MHz					dB μ V/m	metres	dB μ V/m	dB
144,0	Standby	120	QP	50010	29,5	10	33,1	3,6
480,1	Standby	120	QP	50010	21,2	10	35,6	14,4

See fig 16, 17, 21 and 22.

Instrument used: 1, 2, 3, 6, 7, 8, 9, 10, 11.

5 LIST OF TEST EQUIPMENT

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 Test Laboratory.

No.	Instrument/ancillary	Type of instrument/ancillary	Manufacturer	Ref. no.
1	FSEK30	Spectrum Analyzer	Rohde & Schwarz	LR 1337
2	ESN	EMI Reciever	Rohde & Schwarz	LR 1237
3	ESAI	EMI Receiver	Rohde & Schwarz	LR 1089
4	ESH3-Z2	Puls limiter	Rohde & Schwarz	LR 1074
5	ESH3-Z3	LISN	Rohde & Schwarz	LR 1076
6	-	Shielded room	ETS	LR 1410
7	HFH2-Z2	Antenna loop	Rohde and Schwarz	LR 285
8	10855A	Amplifier	Hewlett Packard	LR 1445
9	HL223	Antenna log.per	Rohde & Schwarz	LR 1261
10	HK116	Antenna biconic	Rohde & Schwarz	LR 1260
11	ESVS 30	Test Receiver	Rohde & Schwarz	LR 1101

6 TEST SETUPS

6.1 Test Site Conducted Emission

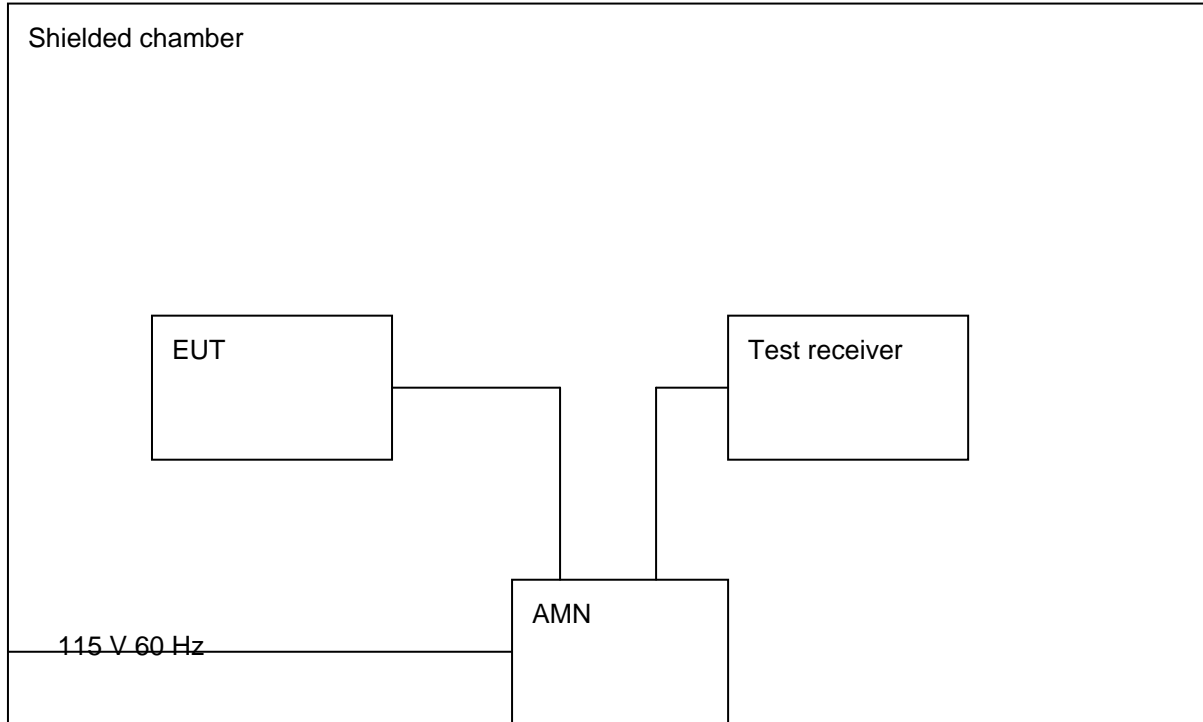


Fig. 6 Test set-up, Power-Line Conducted Emissions

6.2 Test Site Radiated Emission

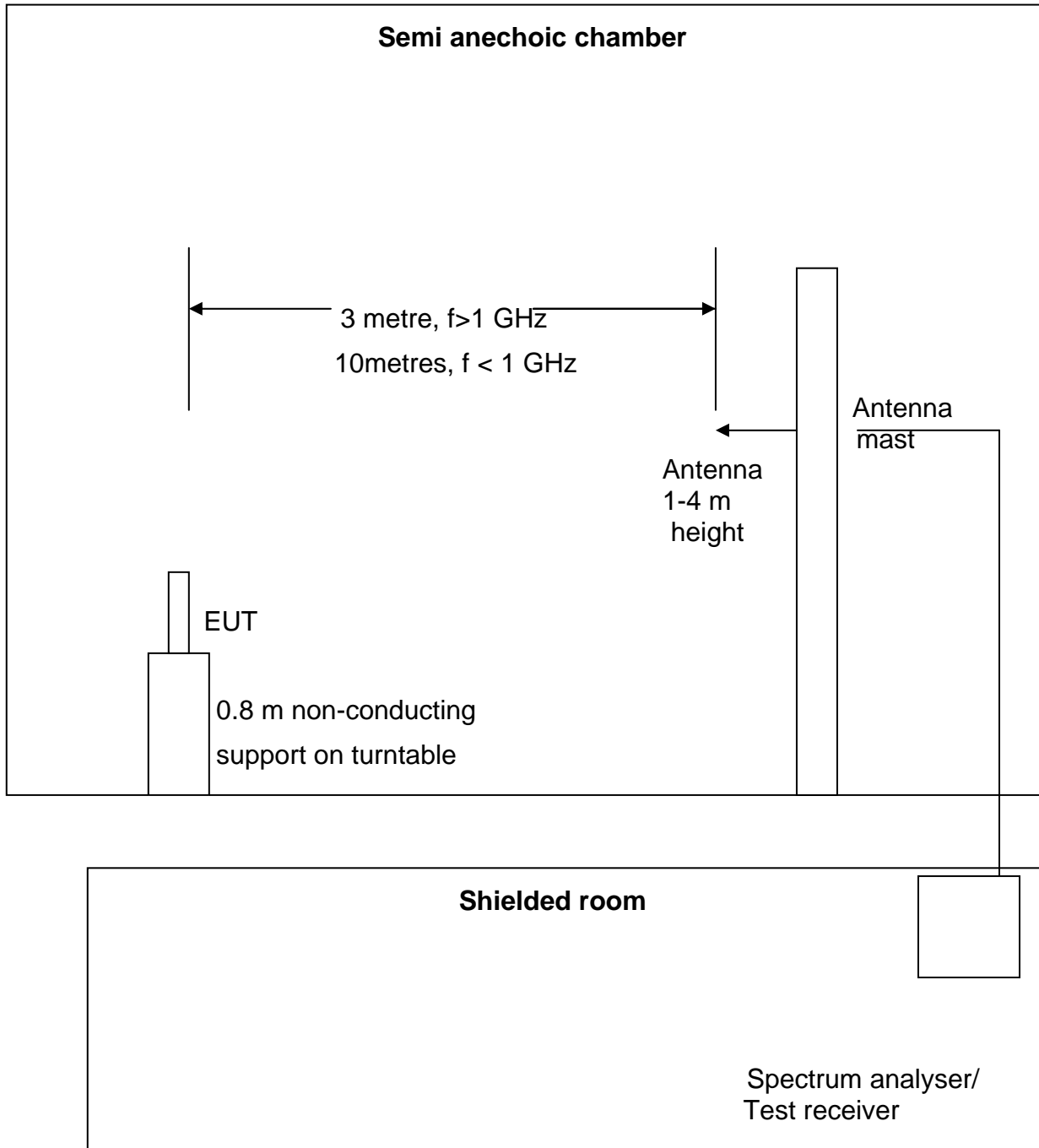


Fig. 8 Test set-up, Radiated Emissions

7 DIAGRAMS

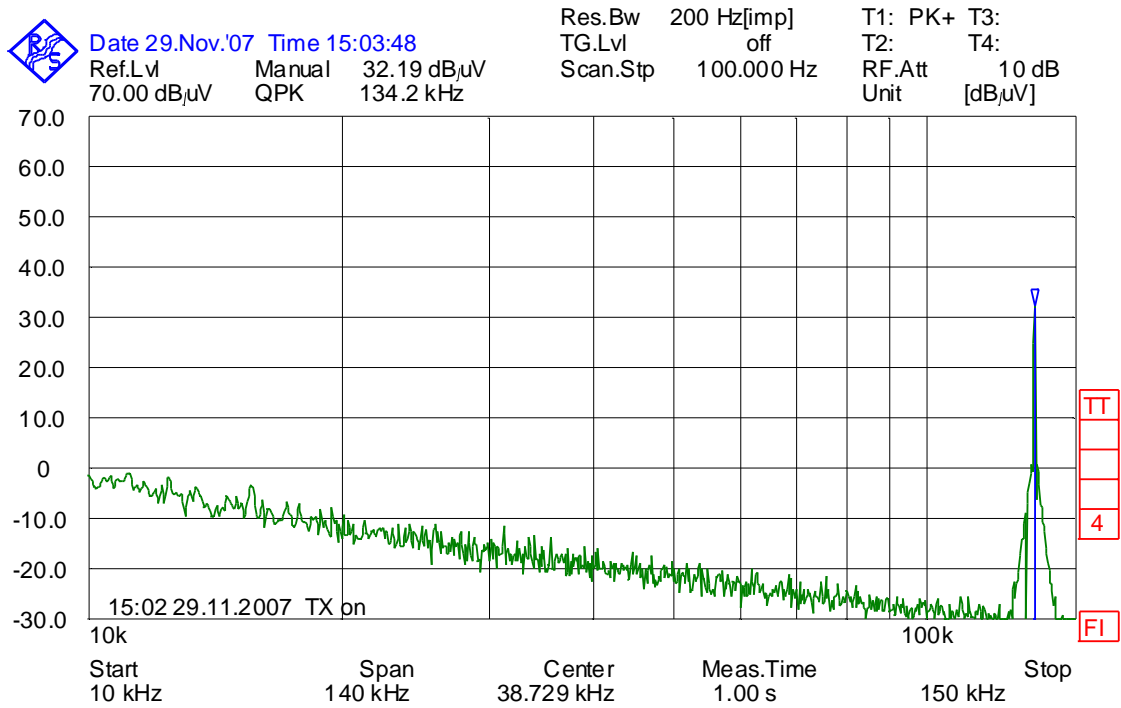


Fig 11 Radiated Emissions TX on, 10 -150 kHz, scale dB μ A/m

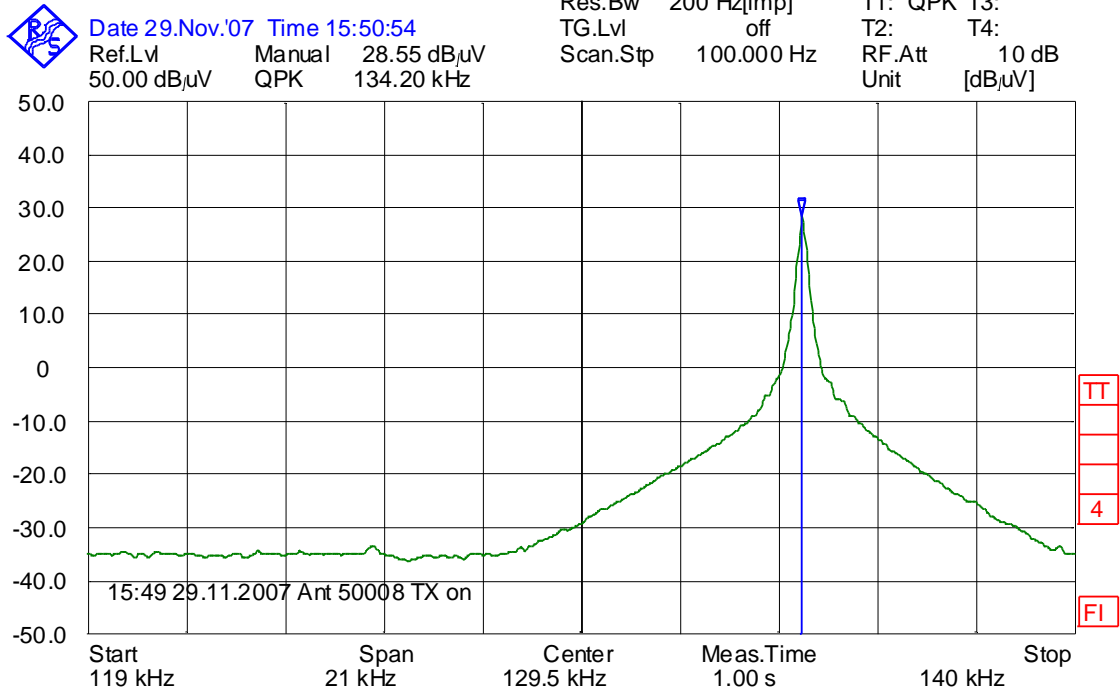


Fig 12 Transmitter Antenna 50008, scale dB μ A/m

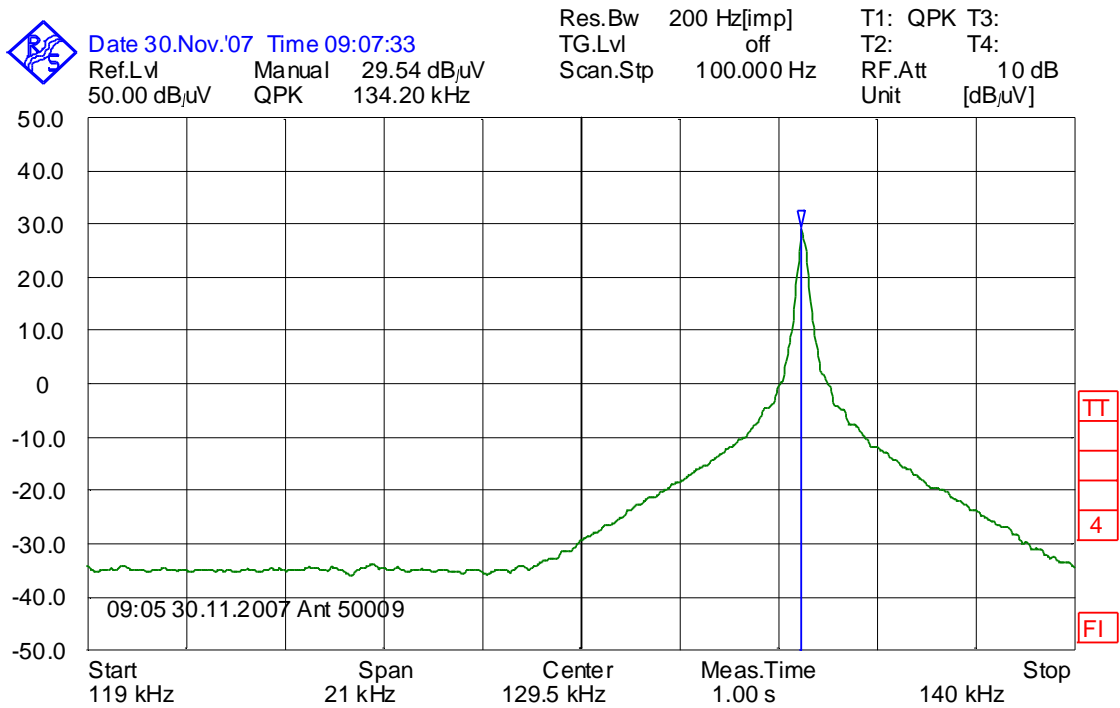


Fig 13 Transmitter Antenna 50009, scale dB μ A/m

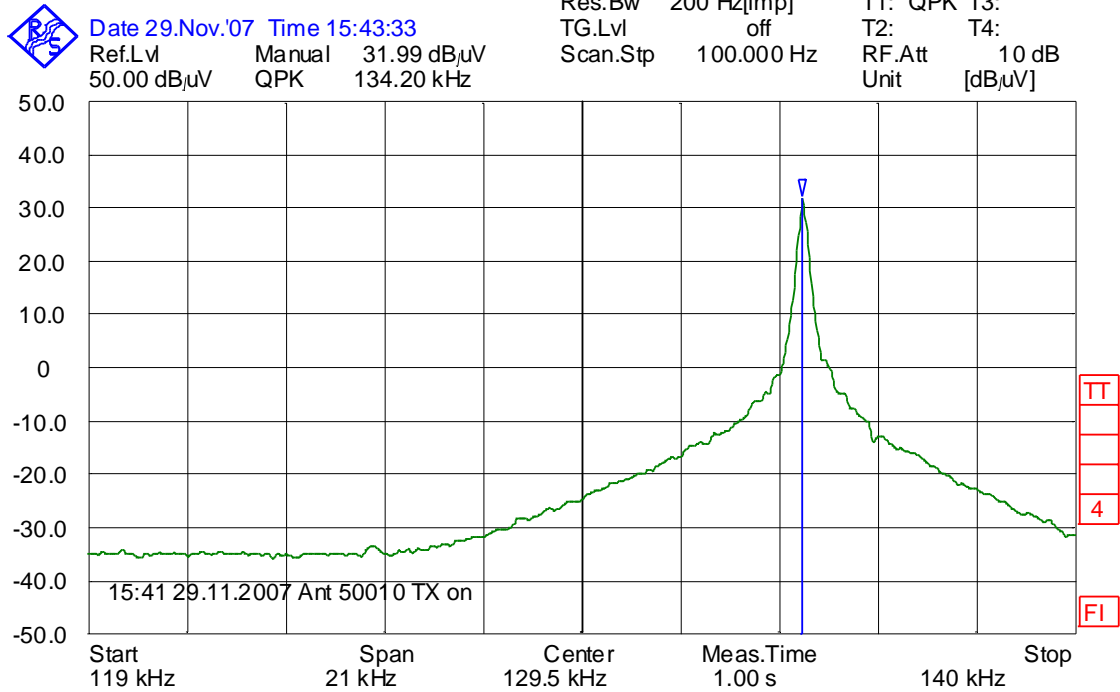


Fig 14 Transmitter Antenna 50010, scale dB μ A/m

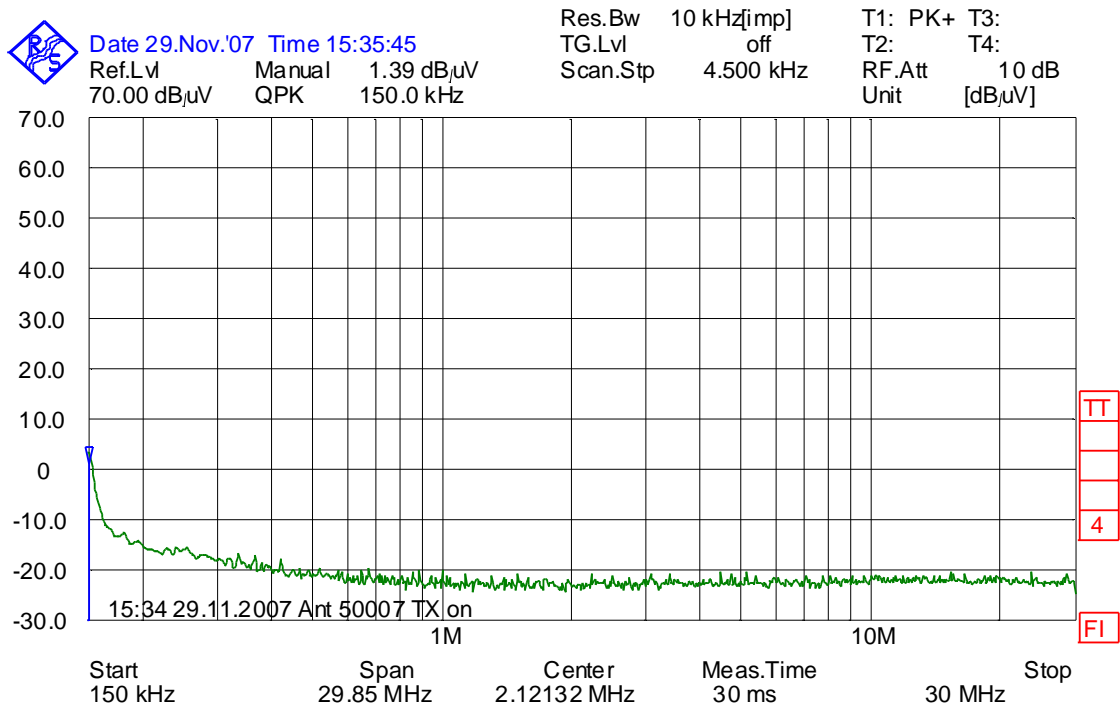


Fig 15 Radiated Emissions TX ON, Antenna 50007, 0,15-30 MHz, scale dB μ A/m

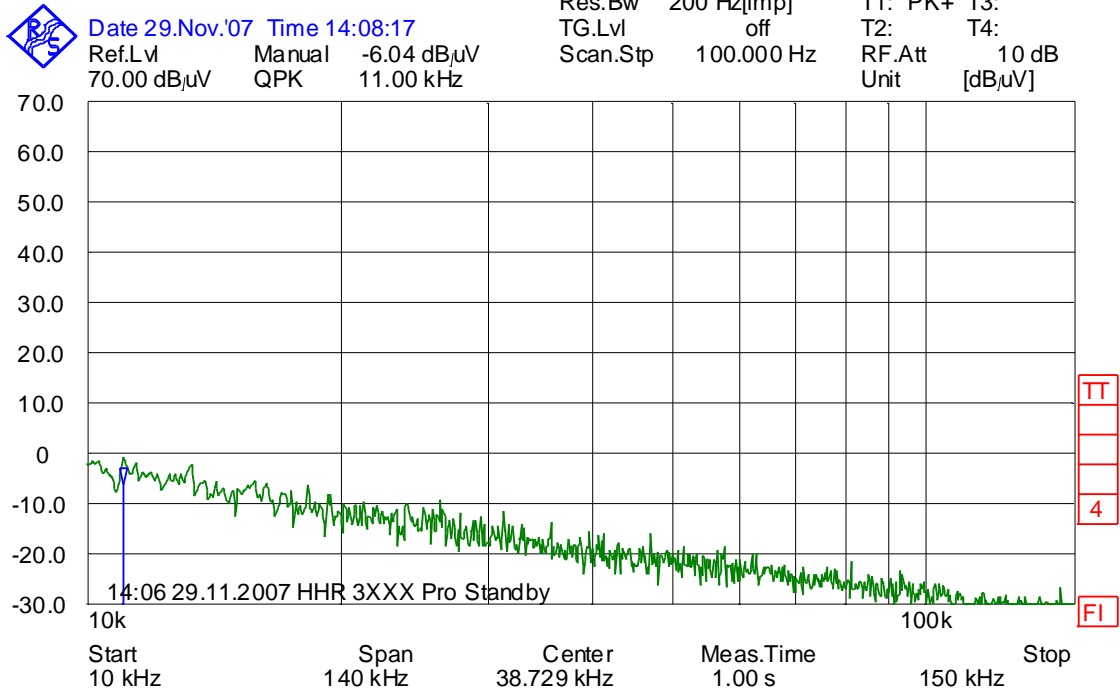


Fig 16 Radiated Emissions 10-150 kHz Standby, scale dBµA/m

NEMKO COMLAB

14. Dec 07 17:45

Peak

Operator: Egh
 Comment: BioControl RFID Transponder
 Charging USB communicatyon
 FCC 15.209
 10 m test distance
 Antenna 50010

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

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

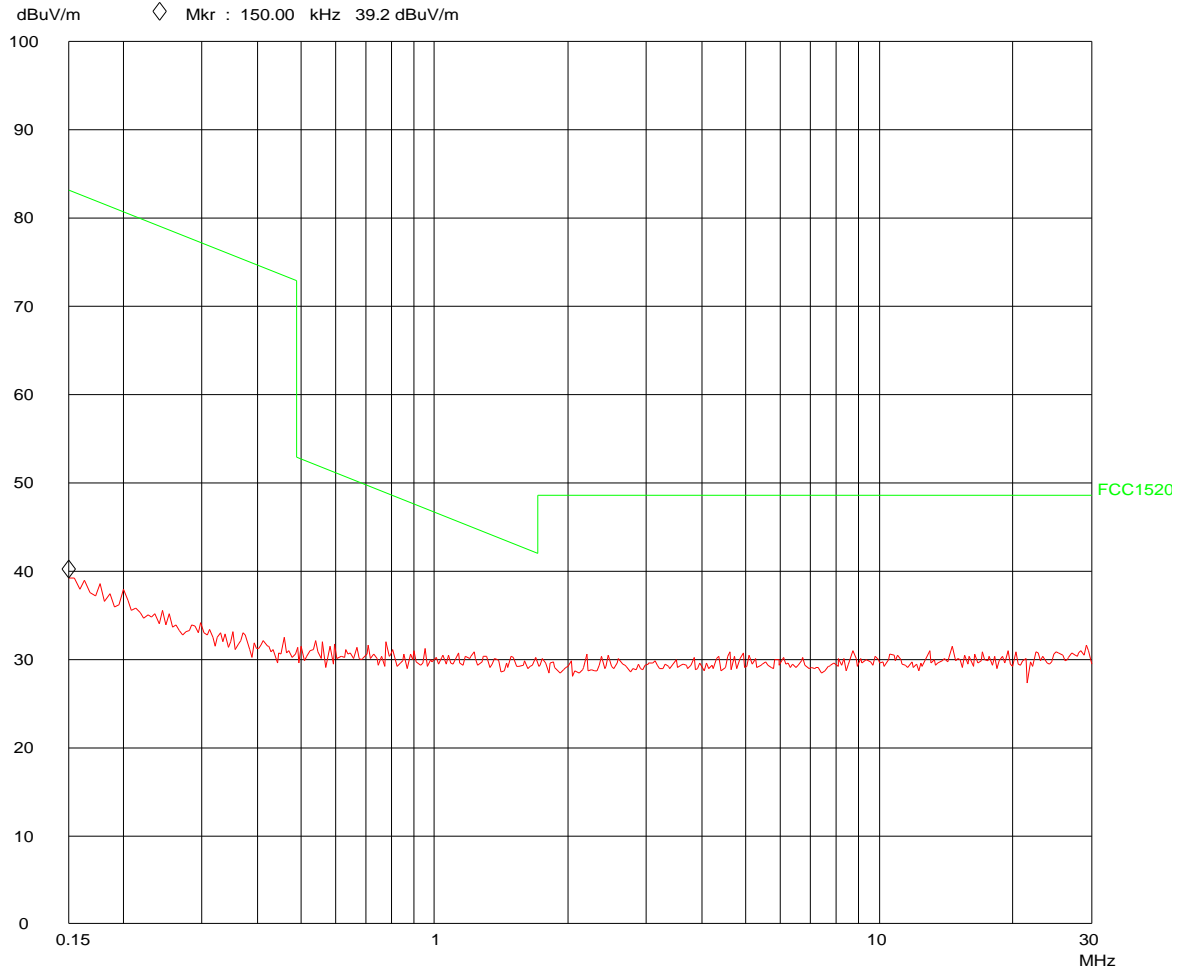


Fig 17 Radiated Emissions 0.15-30 MHz, Standby

Nemko Comlab
 Peak

14. Dec 07 15:09

EUT: RFID Transponder
 Manuf: BioControl
 Op Cond: 1 m VP, 10 m test distance
 Operator: EGH
 Test Spec: FCC part 15.209
 Comment: Standby, USB com.
 Antenna 50007

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
30M	200M	50k	120k	PK	50ms	0dBLN	ON	60dB

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

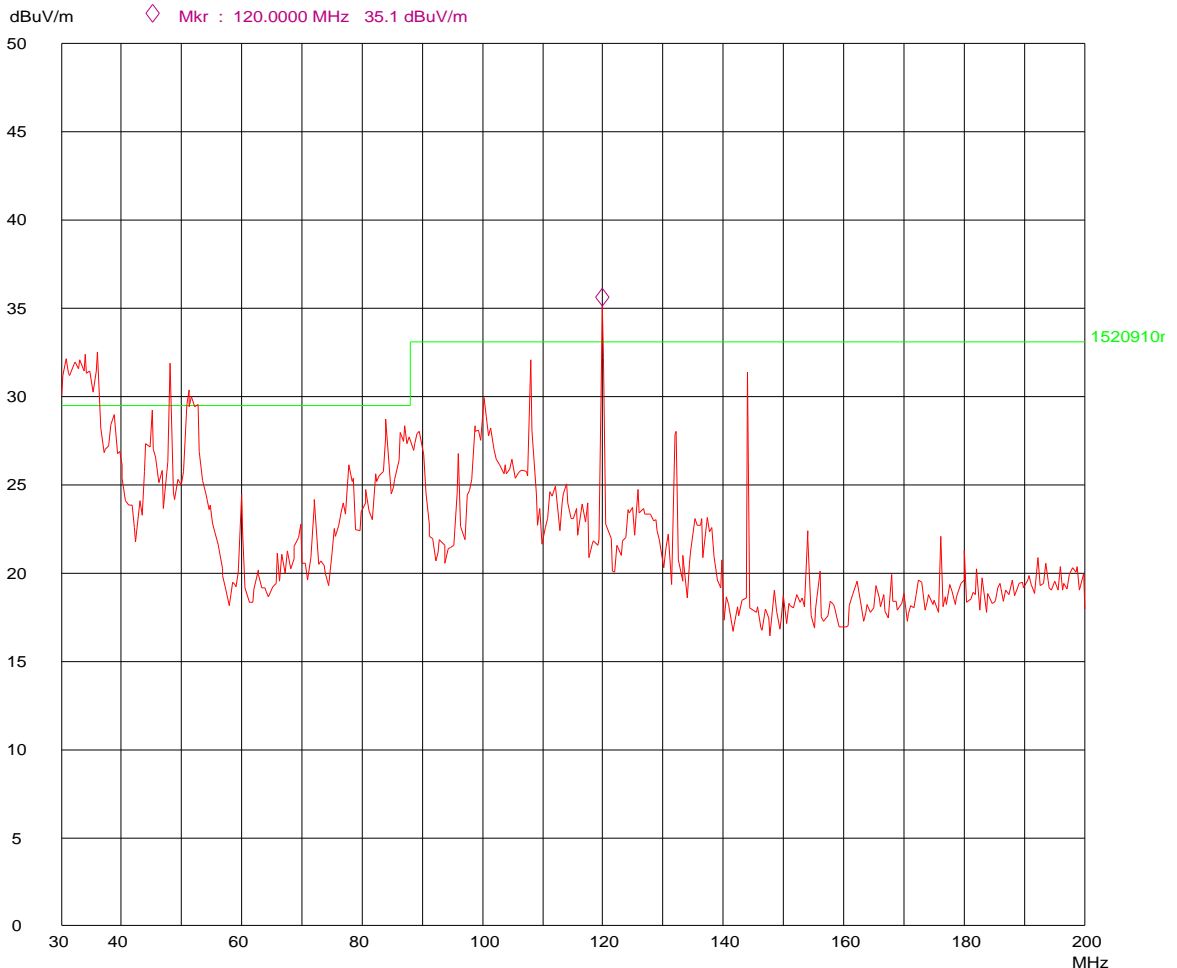


Fig 18 Radiated Emissions 30-200 MHz, Standby, antenna 50007

Nemko Comlab
 Peak

14. Dec 07 14:35

EUT: RFID Transponder
 Manuf: BioControl
 Op Cond: 1 m VP, 10 m test distance
 Operator: EGH
 Test Spec: FCC part 15.209
 Comment: Standby, USB com.
 Antenna 50008

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
30M	200M	50k	120k	PK	50ms	0dBLN	ON	60dB

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

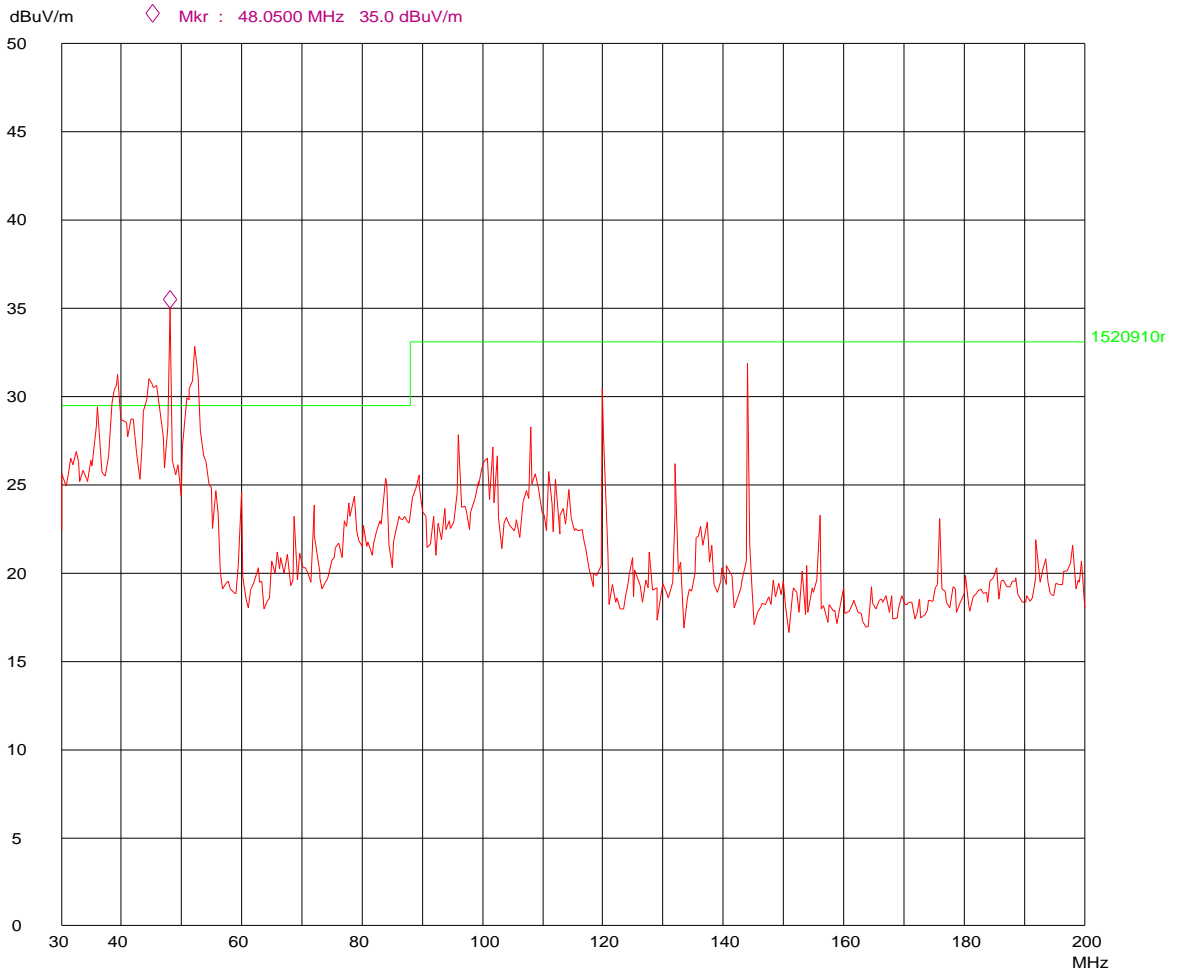


Fig 19 Radiated Emissions 30-200 MHz, Standby, antenna 50008

Nemko Comlab
 Peak

14. Dec 07 14:45

EUT: RFID Transponder
 Manuf: BioControl
 Op Cond: 1 m VP, 10 m test distance
 Operator: EGH
 Test Spec: FCC part 15.209
 Comment: Standby, USB com.
 Antenna 50009

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
30M	200M	50k	120k	PK	50ms	0dB	LN ON	60dB

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

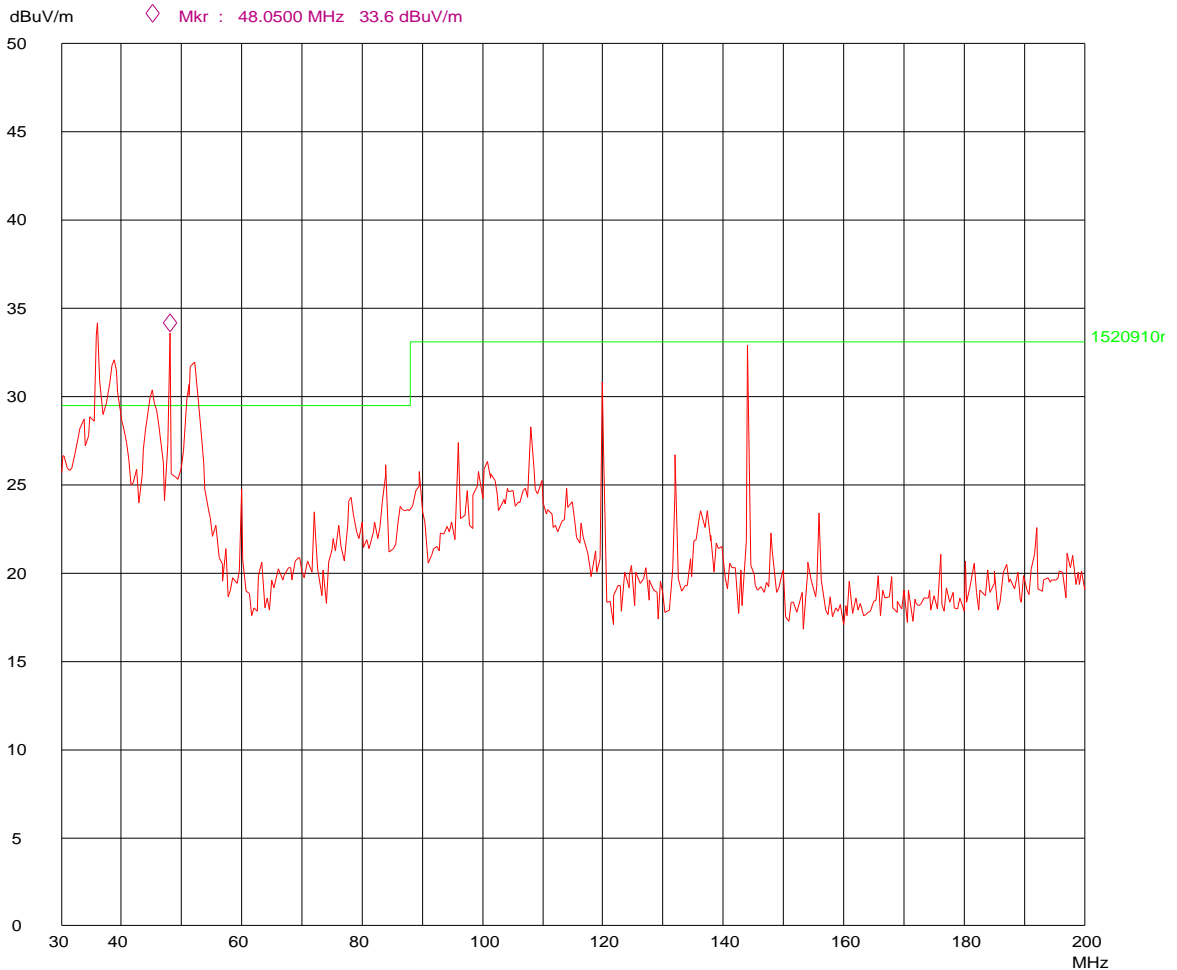


Fig 20 Radiated Emissions 30-200 MHz, Standby, antenna 50009

Nemko Comlab
 Peak

14. Dec 07 14:54

EUT: RFID Transponder
 Manuf: BioControl
 Op Cond: 1 m VP, 10 m test distance
 Operator: EGH
 Test Spec: FCC part 15.209
 Comment: Standby, USB com.
 Antenna 50010

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
30M	200M	50k	120k	PK	50ms	0dBLN	ON	60dB

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

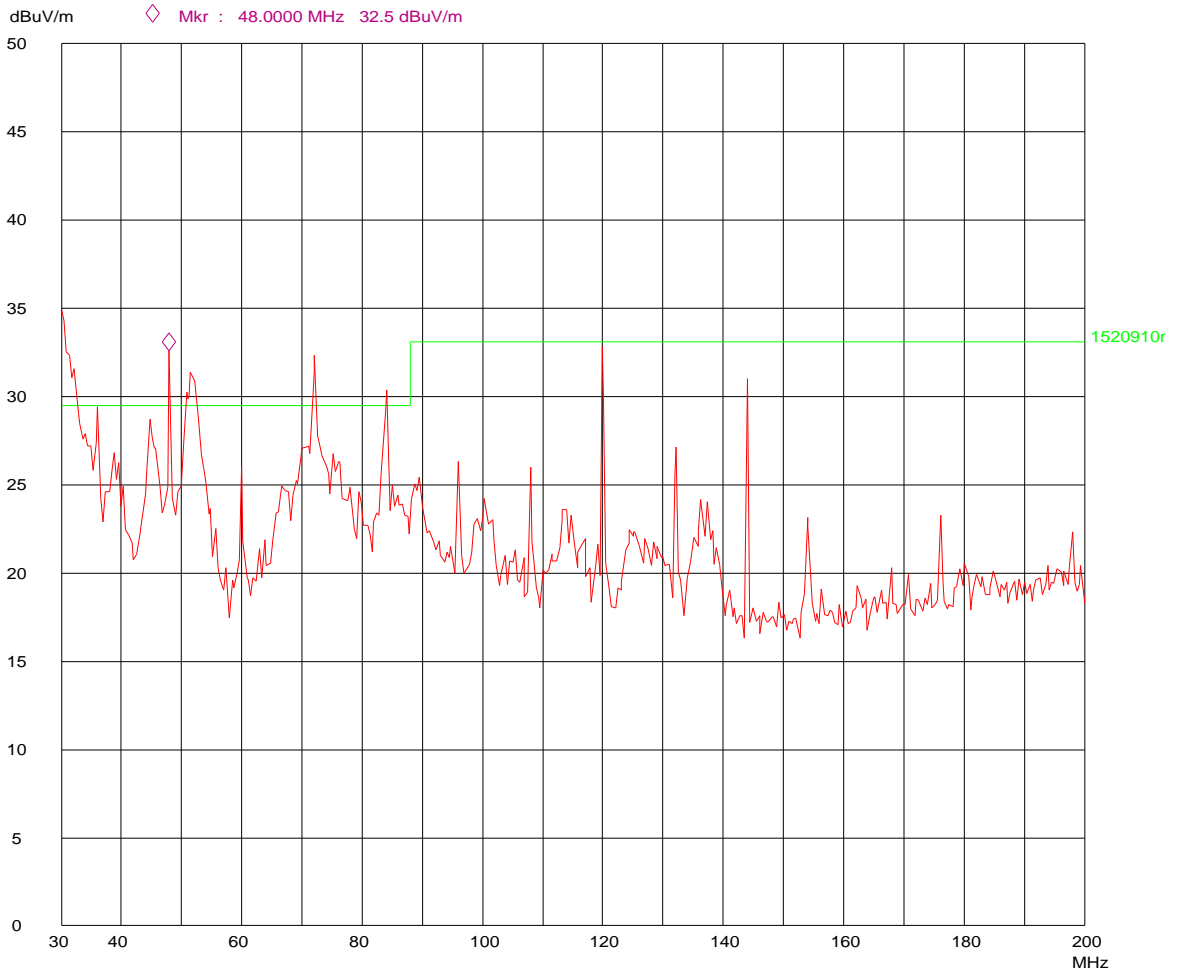


Fig 21 Radiated Emissions 30-200 MHz, Standby, antenna 50010

Nemko Comlab
 Peak

14. Dec 07 15:38

EUT: RFID Transponder
 Manuf: BioControl
 Op Cond: 1 m VP, 10 m test distance
 Operator: EGH
 Test Spec: FCC part 15.209
 Comment: Standby, USB com.
 Antenna 50007

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
22	200M	1000M	HL223HP

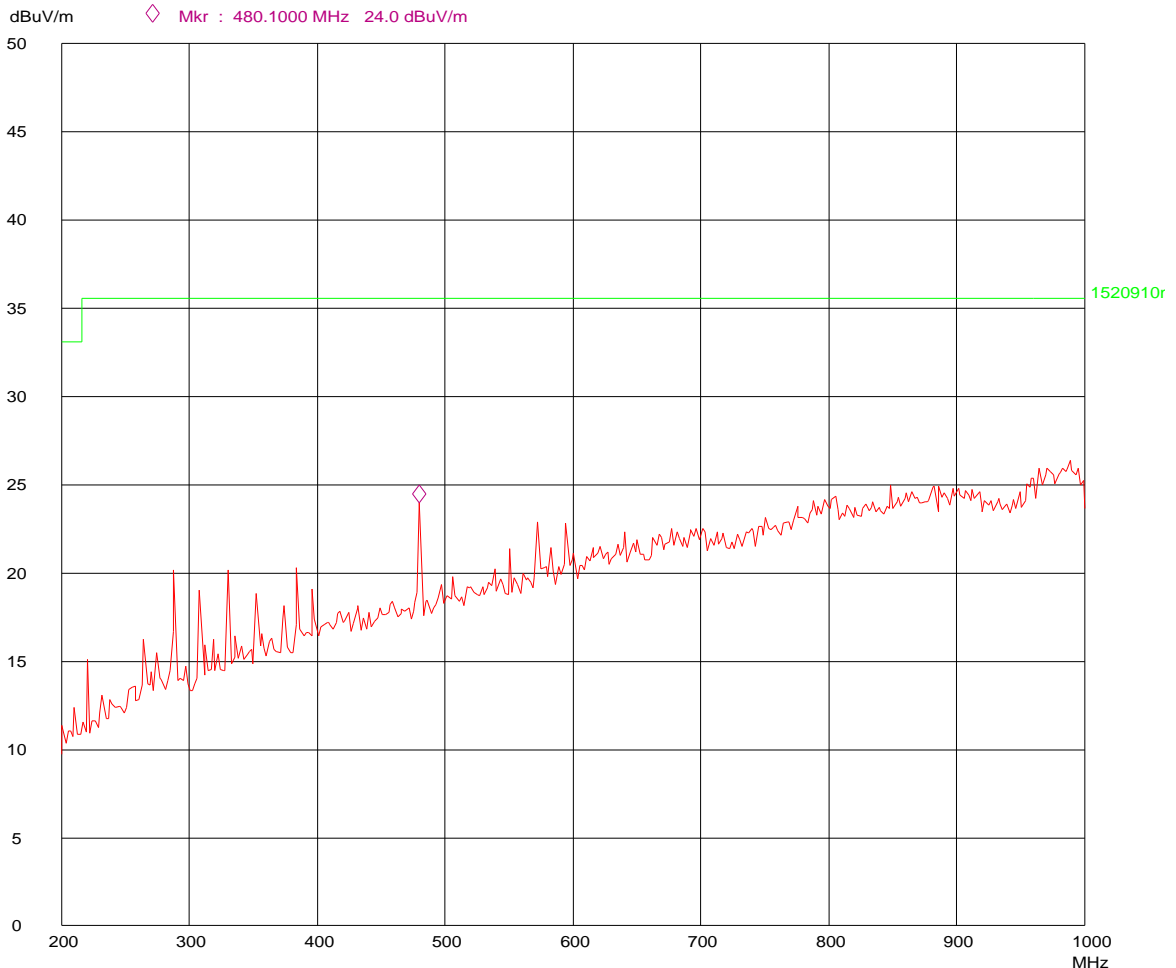


Fig 22 Radiated Emissions 200-1000 MHz, Standby, antenna 50007

Nemko Comlab
 Peak

14. Dec 07 13:29

EUT: RFID Transponder
 Manuf: BioControl
 Op Cond: 1 m VP, 10 m test distance
 Operator: EGH
 Test Spec: FCC part 15.209
 Comment: TX active

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
30M	200M	50k	120k	PK	50ms	0dBLN	ON	60dB

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

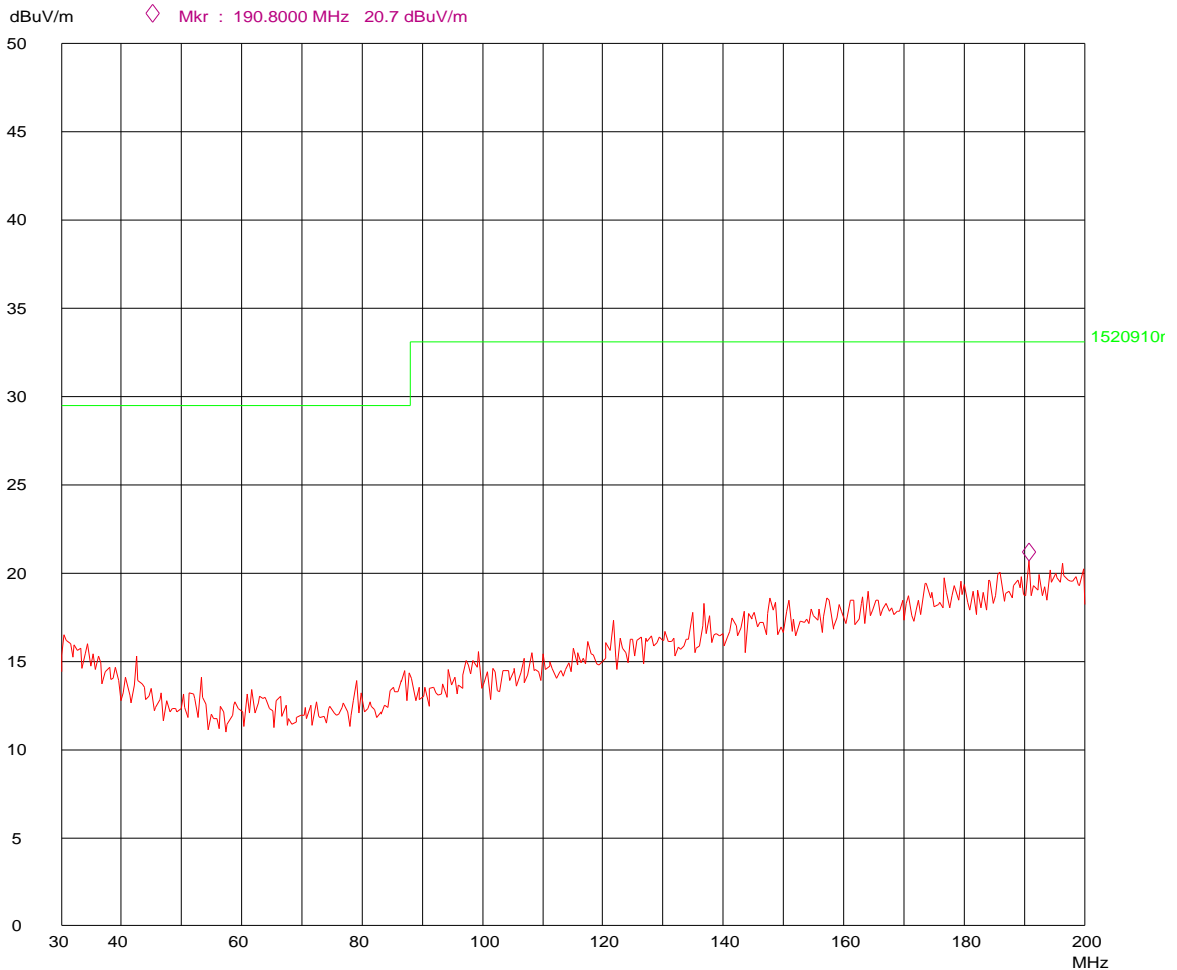


Fig 23 Radiated Emissions 30-200 MHz TX ON, antenna 50007

Nemko Comlab
 Peak

14. Dec 07 17:07

EUT: RFID Transponder
 Manuf: BioControl
 Op Cond: 1 m VP, 10 m test distance
 Operator: EGH
 Test Spec: FCC part 15.209
 Comment: TX active
 Antenna 50007

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
22	200M	1000M	HL223HP

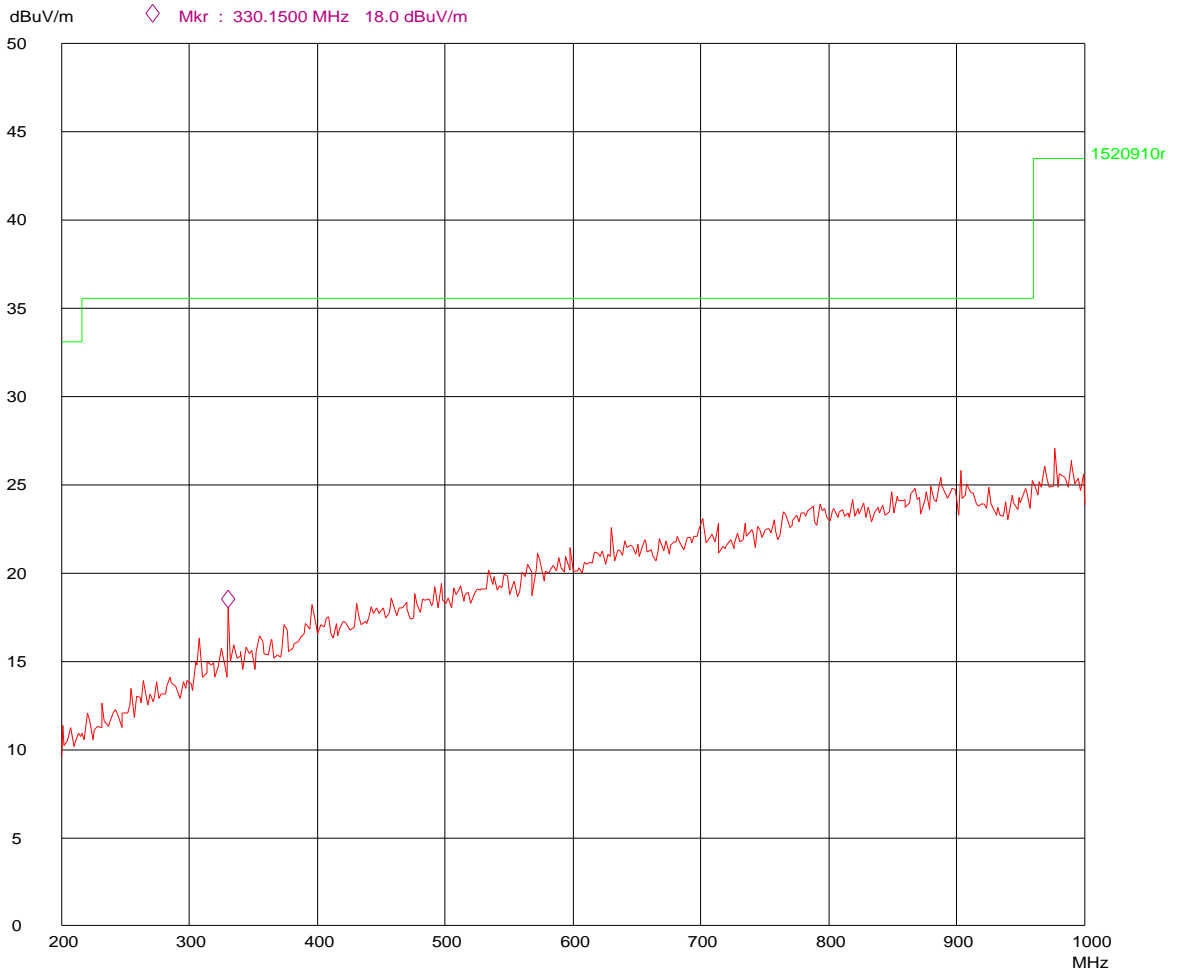
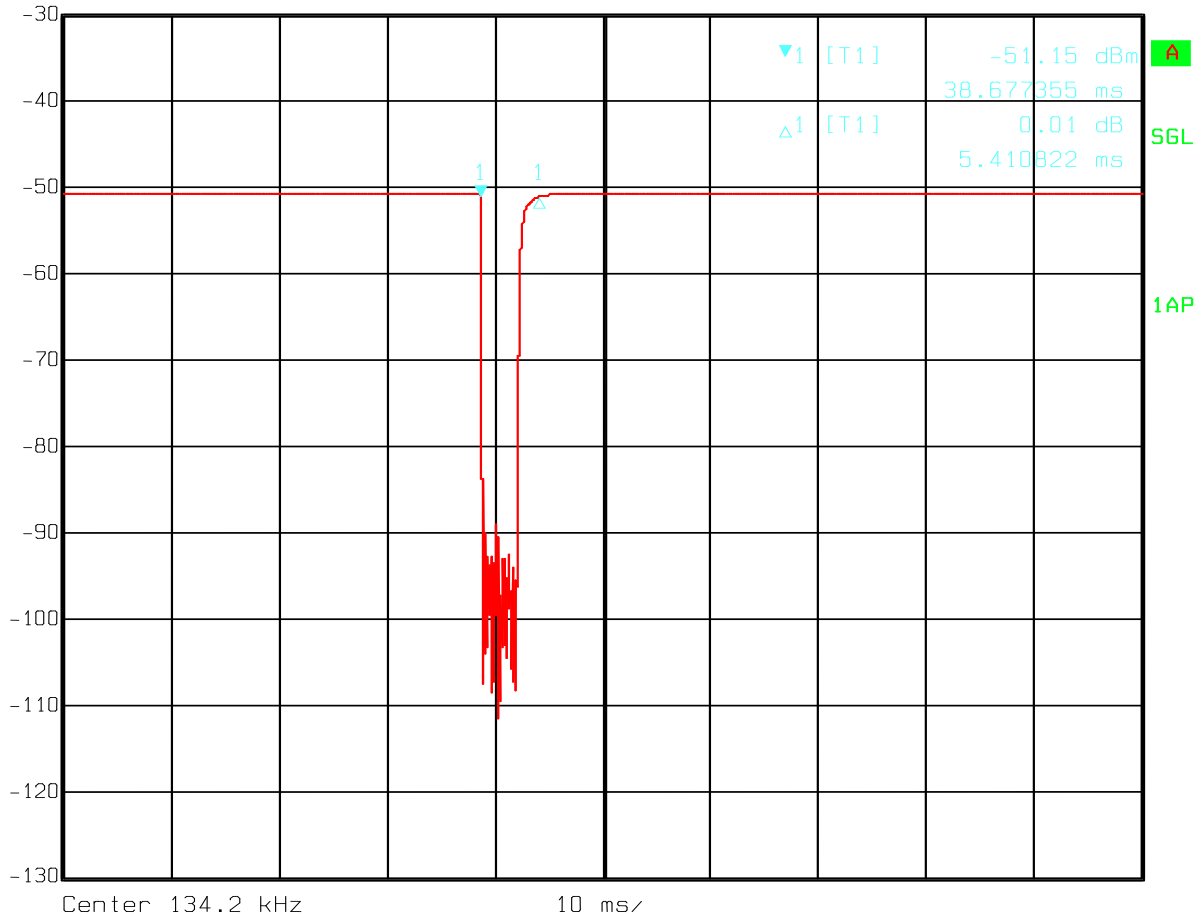


Fig 24 Radiated Emissions 200-1000, TX ON antenna 50007

	Ref Lvl	Marker 1 [T1]	RBW	10 kHz	RF Att	10 dB
	-30 dBm	-51.15 dBm	VBW	10 kHz		
		38.677355 ms	SWT	100 ms	Unit	dBm



Date: 14.DEC.2007 15:34:11

Fig 25 Duty Cycle, 0.1s measuring interval

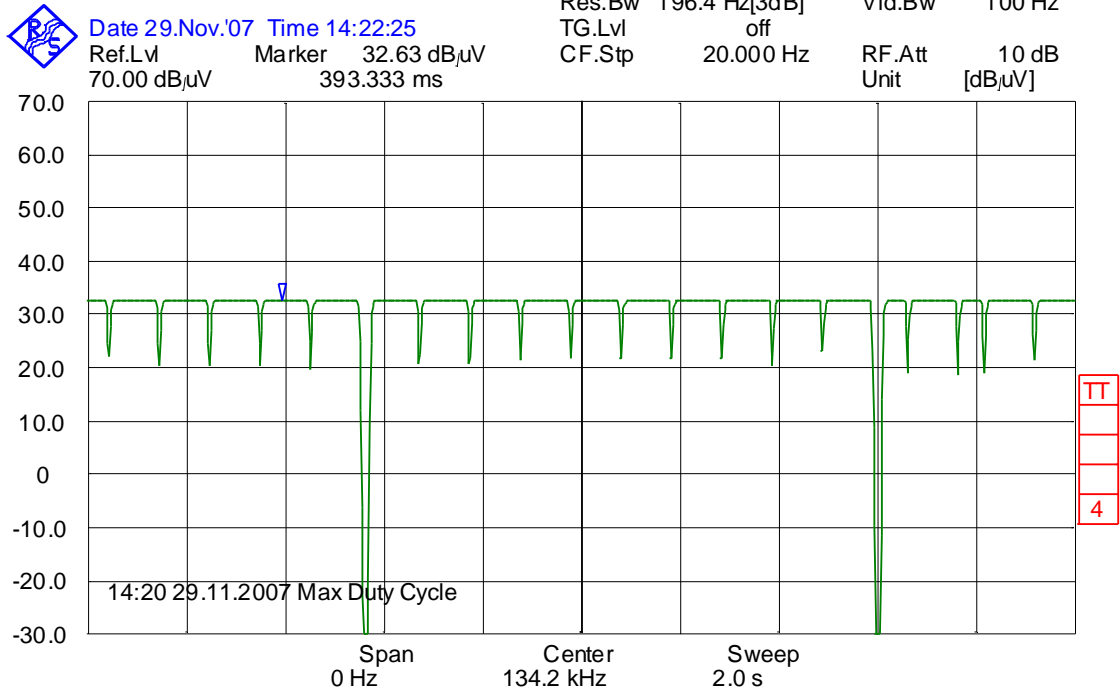


Fig 26, Duty cycle

NEMKO COMLAB
Peak

12. Dec 07 16:26

Operator: Eg
 Comment: BioControl RFID Transponder
 Charging USB
 115 V ac 60 Hz
 FCC 15.207
 Charger Mascot type 2126
 Phase N

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

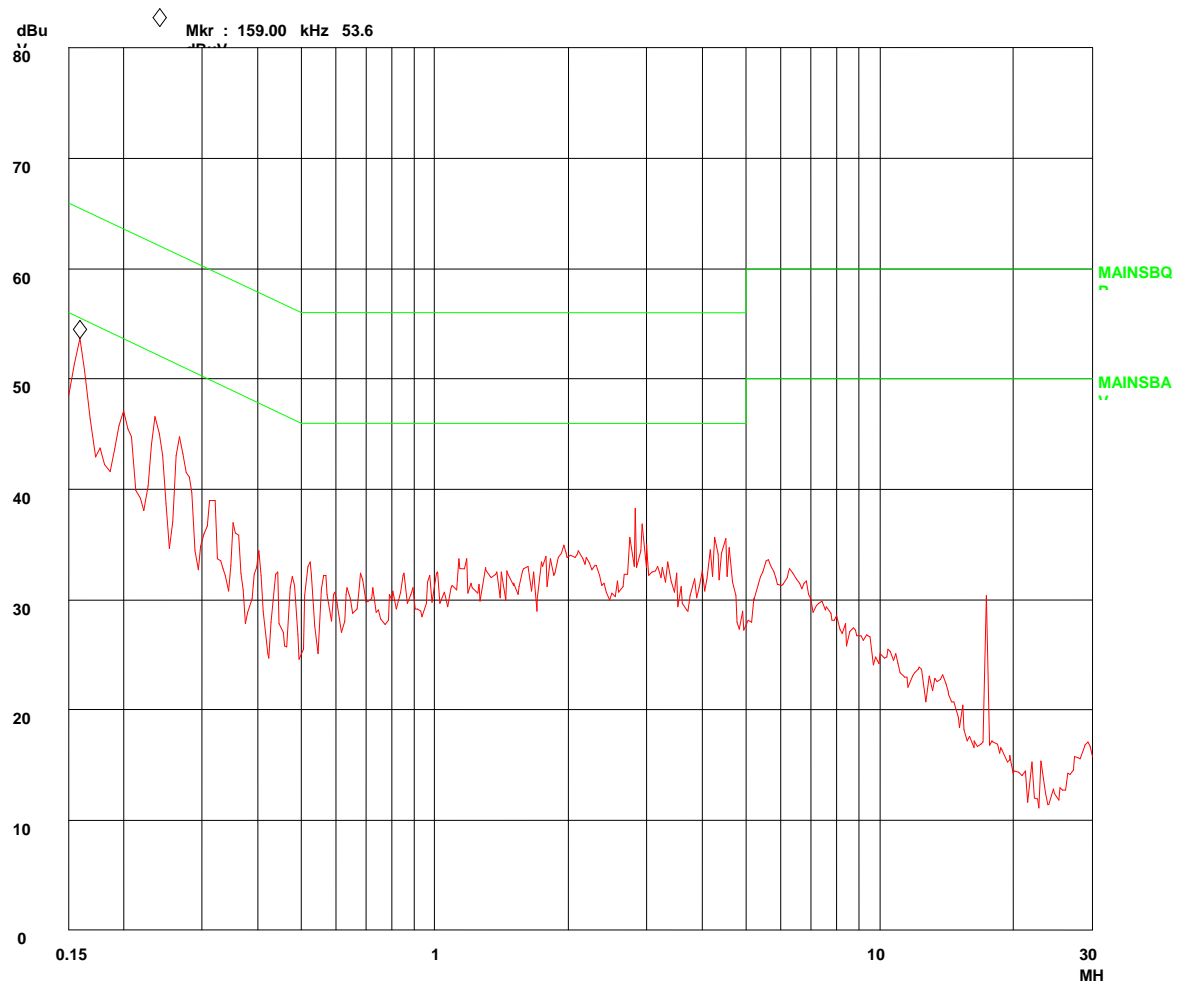


Fig 27 Conducted Emissions 115 V 60 Hz Phase N

NEMKO COMLAB

12. Dec 07 16:39

Peak

Operator: Eg
 Comment: BioControl RFID Transponder
 Charging USB
 115 V ac 60 Hz
 FCC 15.207
 Charger Mascot type 2126
 Phase 1

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

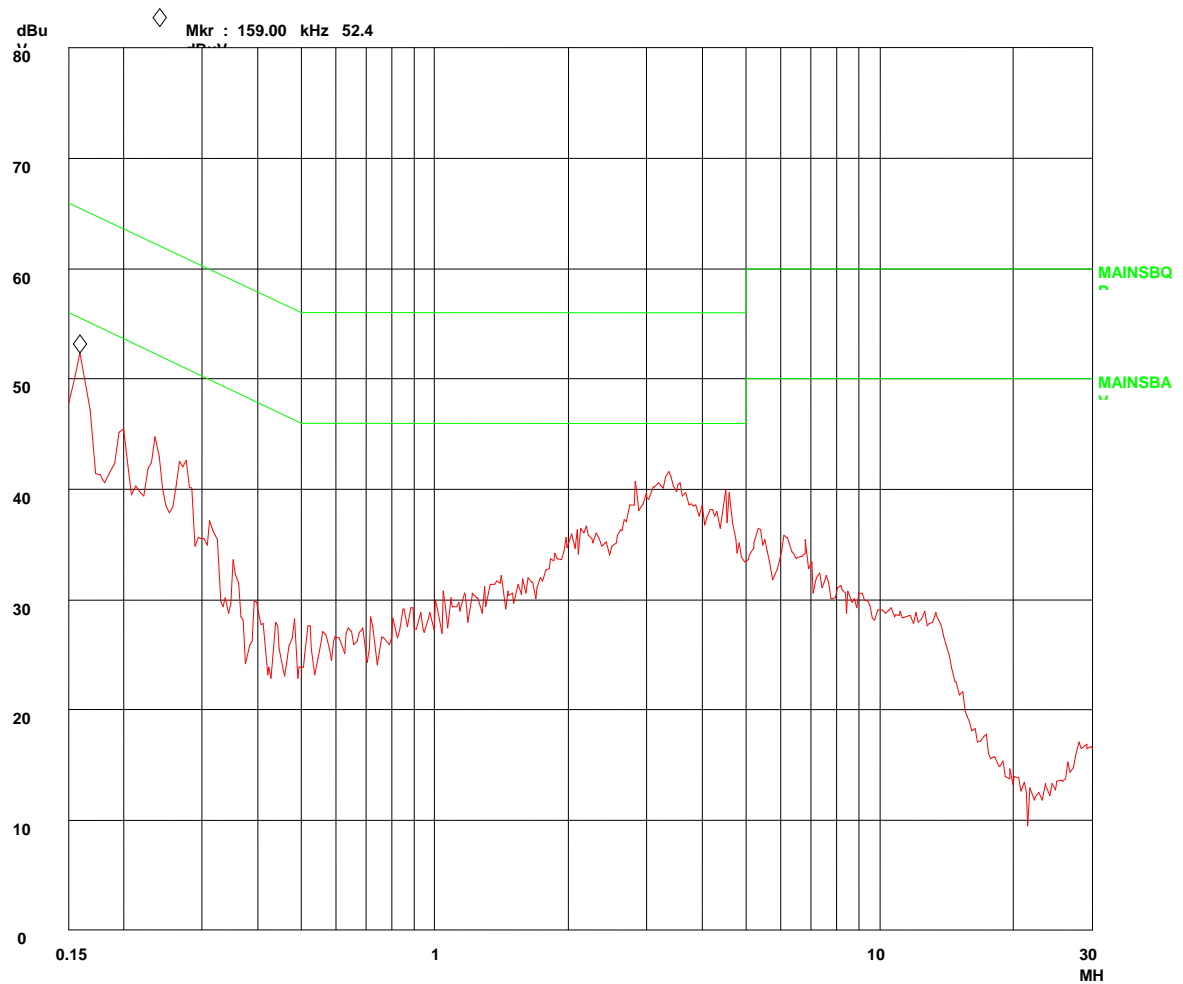


Fig 28 Conducted Emissions 115 V 60 Hz Phase L1

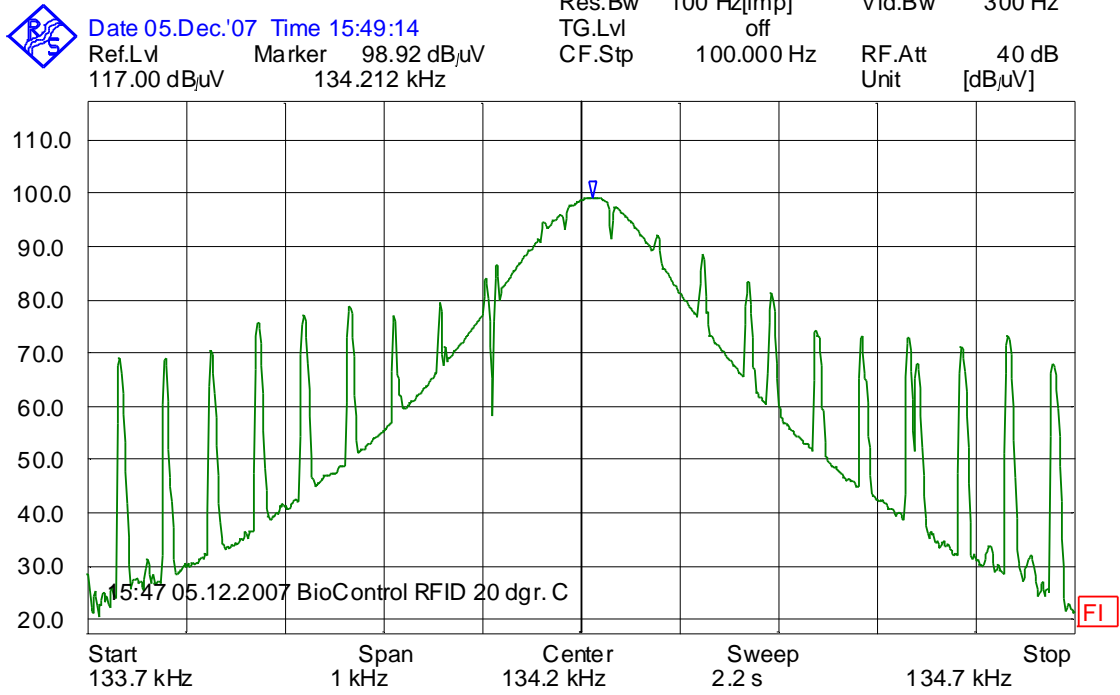


Fig 29 Transmitter frequency, relative measurement near field