

RADIO TEST REPORT

No. 1300375-7 Ed. 5

RF performance

EQUIPMENT UNDER TEST

Equipment : Anti shoplifting system
Type / model : Controller AM with Prime AM antenna
Manufacturer : Gunnebo Gateway AB
Tested by request of : Gunnebo Gateway AB

SUMMARY

Referring to the emission limits and the operating mode during the tests specified in this report the equipment complies with the requirements according to

47 CFR Part 15, Subpart B, Unintentional radiators
47 CFR Part 15, Subpart C, Intentional radiators
ICES-001, Issue 4 (June 2006)
RSS-Gen, Issue 4 (Nov 2014)
RSS-210, Issue 8 (Dec 2010)

Test methods according to ANSI C63.10-2013

Date of issue: 2015-12-07

Tested by:


Åke Carlson

Approved by:


Stefan Andersson

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Intertek Semko AB

Torshamnsgatan 43, Box 1103, SE-164 22 Kista, Sweden

Telephone +46 8 750 00 00, Fax +46 8 750 60 30

www.intertek.se

Registered in Sweden: No: SE556024059901, Registered office: As address

Revision History

Edition	Date	Description
1	2013-07-08	First release
2	2014-03-14	Section 8, Occupied 99% bandwidth test is added
3	2014-09-19	Model name updated
4	2015-09-25	New edition where the test results are compared to current requirements (new edition of RSS-Gen). Update is made under project no. 1507653.
5	2015-12-07	Updated to ANSI C63.10-2013.

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1 CLIENT INFORMATION

The EUT has been tested by request of

Company: Gunnebo Gateway AB
Box 346
591 24 Motala
SVERIGE

Name of contact: Claes Kemmer

2 EQUIPMENT UNDER TEST (EUT)

2.1 Identification of the EUT according to the manufacturer/client declaration

Equipment: Anti shoplifting system
Type/Model: Controller AM with Prime AM antenna
Brand name: Gateway
Serial number: No serial number
Manufacturer: Gunnebo Gateway AB
Transmitter frequency range: 58 kHz
Highest clock frequency: 24 MHz
Frequency agile or hopping: ☐ Yes ☒ No
Antenna: ☒ Internal antenna ☐ External antenna
Antenna connector: ☒ None, internal antenna ☐ Yes, type
Temperature range: ☐ Category I (General): -20°C to +55°C
☐ Category II (Portable equipment): -10°C to +55°C
☒ Category III (Equipment for normal indoor use): +5°C to +35°C
☐ Other:
Transmitter stand by mode supported: ☐ Yes ☒ No

2.2 FCC ID and IC ID

The EUT is requested to be certified with the FCC ID: L3Z210019
The EUT is requested to be certified with the IC ID: 8083A-210019

2.3 Additional hardware information about the EUT

The EUT consists of the following units:

Unit	Type	Part number	Serial number
3 antennas	Prime AM	107045	No serial number
Electronic box	Controller AM	107030	No serial number
Alarm tag	A3 TAG AM	108036	No serial number

2.4 Modification during the tests

No modifications have been made during the tests.

3 TEST SPECIFICATIONS

3.1 Standards

47 CFR Part 15, Subpart B, Unintentional radiators
47 CFR Part 15, Subpart C, Intentional radiators
ICES-001, Issue 4 (June 2006)
RSS-Gen, Issue 4 (Nov 2014)
RSS-210, Issue 8 (Dec 2010)

Test methods in:

ANSI C63.10-2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

3.2 Additions, deviations and exclusions from standards

EUT is floor standing, but it is placed up to 10 cm above the ground plane during the measurements.

No other additions, deviations or exclusions have been made from standards.

3.3 Test site

Measurements were performed at:

Intertek Semko AB.
Torshamnsgatan 43,
P.O. Box 1103
SE-164 22 Kista

Intertek Semko AB is a FCC listed test site with site registration number 90913
Intertek Semko AB is an Industry Canada listed test facility with IC assigned code 2042G

Measurement chambers

Measurement Chamber	Type of chamber	IC Site filing #
STORA HALLEN a.k.a. BIG CHAMBER	Semi-anechoic 10m	2042G-2

3.4 Test conditions

If not additionally specified, the tests were performed under the following environmental conditions:

Parameter	Normal	Extreme
Supplying voltage, V	120 V	102 – 138
Air temperature, °C	20 – 25	-

4 TEST SUMMARY

The results in this report apply only to the tested sample:

Test	Result	Section in report	Note
Standard test methods			
AC power-line conducted tests	Pass	5	
Radiated test below 30 MHz	Pass	6	
Radiated emissions measurements from 30 to 1000 MHz	Pass	7	Class A, 1
Determination of radiated and antenna conducted emissions above 1 GHz	NA		
Frequency Stability Test	NA		
Occupied bandwidth and band-edge tests	NA		
Output Power average symbol envelope power	NA		
Power Spectral Density < 40 GHz	NA		
Power Spectral Density > 40 GHz	NA		
In-situ measurements	NA		
Polar plot, main lobe and variation on radiated emissions test	NA		
99 % bandwidth (RSS Gen)	Pass	8	
Device-specific tests			
Measurement of cable locating equipment	NA		
Determining of cordless telephone handset security code	NA		
Determination of total input power	NA		
Procedure determining compliance for periodic operation [15.231, 15.240(b)]	NA		
Determining the average value of pulsed emissions per 15.35(c)	NA		
Comparison of limits per 15.231(b)(3)	NA		
Procedure to determine compliance of frequency pairing for 47 CFR 15.233(b)(2)	NA		
Determination of frequency hopping compliance per 47 CFR 15.247	NA		
Determination of digital modulation compliance per 47 CFR 15.247	NA		
Determination of peak conducted output unlicensed wireless device power [15.247(b), 15.255]	NA		
Determination of maximum conducted output power (15.247, 15-E)	NA		
Determination of MIMO compliance (2nd edition)	NA		
Determination of Smart antenna compliance (2nd edition)	NA		
Determination of antenna gains, including those emitting in multiple directions (15.247)	NA		
Determination of compliance with RF exposure limits	NA		
Millimeter wave test procedures for systems operating at 54GHz and greater	NA		
Determination of EIRP (15-F)	NA		
Determination Transmitter Etiquette FCC Part 15.255	NA		
Determination of Dynamic Frequency Selection (DFS) including Channel Move Time and In Service Monitoring	NA		
Determination of channel availability	NA		
Determination of Dynamic Frequency Selection including Channel Move Time	NA		
Determination of transmitter power control (TPC) (15-E)	NA		
Peak excursion measurement for UNII devices	NA		
Determination of UWB bandwidth	NA		
Determination of the center frequency, f_C , and highest radiated emissions, f_M (15-F)	NA		

NA = Not Applicable

Notes:

Intertek Semko AB

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Telephone +46 8 750 00 00, Fax +46 8 750 60 30

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Registered in Sweden: No: SE556024059901, Registered office: As address

1. The measured result is below the upper limit, but by a margin less than half of the uncertainty interval. It is therefore not possible to state compliance based on the 95% level of confidence. However, the result indicates that compliance is more probable than non-compliance.

5 AC LINE CONDUCTED EMISSION, 150 KHZ TO 30 MHZ

Date of test:	2013-06-03	Test location:	EMC Center
EUT Serial:	No serial	Ambient temp.	24 °C
Tested by:	Kajsa From	Relative humidity	60 %
Test result:	Pass	Margin:	18.4 dB

5.1 Requirement

Reference: FCC §15.107, Class B limit
FCC §15.207
RSS-Gen Table 3

Frequency MHz	Quasi-peak Limit dB μ V	Average Limit dB μ V
0.15 – 0.5	66 – 56	56 – 46
0.5 – 1.6	56	46
1.6 – 30	60	50

5.2 Test setup details

The mains terminal disturbance voltage was measured with the EUT placed on isolating material on the ground plane. The electronic box was placed 5 mm above the ground plane and the antennas was placed 100 mm above the ground plane. The EUT was connected to an artificial mains network (AMN). The AMN was placed on the ground plane 0.8 m from EUT. Amplitude measurements were performed with a quasi-peak detector. The EUT was supplied by 120 VAC (60 Hz) during the test.

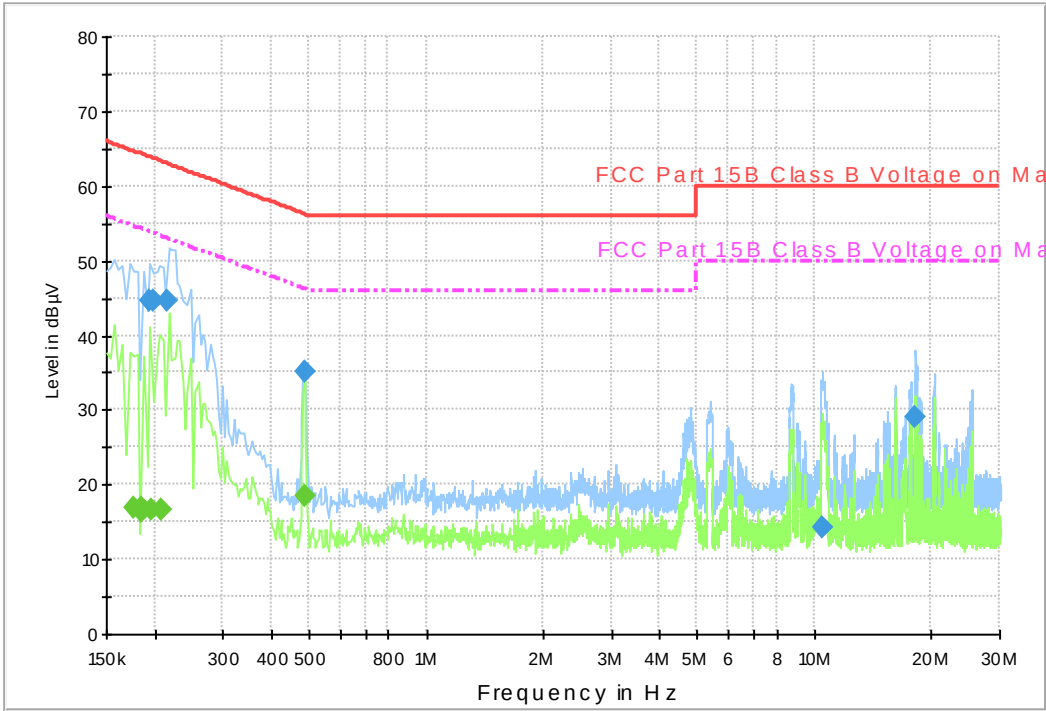
Test set-up photo:



5.3 Test data

Overview sweeps performed with peak and average detectors

FCC Part 15B Class B Voltage on Mains ESH 3-Z5



Frequency MHz	Quasi-Peak		
	Disturbance level dB μ V	Limit dB μ V	Margin dB
0.195	44.7	63.8	19.2
0.200	44.7	63.6	18.9
0.214	44.6	63.0	18.4
0.485	35.0	56.3	21.2
10.510	14.4	60.0	45.6
18.234	29.0	60.0	31.0

Frequency MHz	Average		
	Disturbance level dB μ V	Limit dB μ V	Margin dB
0.176	16.9	54.7	37.8
0.184	16.8	54.3	37.5
0.186	16.4	54.2	37.8
0.195	16.7	53.8	37.1
0.209	16.7	53.2	36.5
0.484	19.1	46.3	27.2

Measured level [dB μ V] = Analyser reading [dB μ V] + cable loss [dB] + LISN insertion loss [dB]

5.4 Test equipment

Equipment type	Manufacturer	Model	Inv. No.	Cal. due date
Measurement software	Rohde & Schwarz	EMC32 v8.51.0	--	--
Receiver	Rohde & Schwarz	ESCI	31686	July-2013
AMN / LISN	Rohde & Schwarz	ESH3-Z5	2727	July-2014
Puls limiter	Rohde & Schwarz	ESH3-Z2	32455	July-2013

6 RADIATED TEST BELOW 30 MHZ

Date of test:	2013-06-07	Test location:	Big Chamber / Parking Lot
EUT Serial:	No serial	Ambient temp.	22°C
Tested by:	Kajsa From	Relative humidity	41-46%
Test result:	Pass	Margin:	24.8 dB

6.1 Requirement

Reference: FCC §15.209, RSS-210 2.5, RSS-Gen Table 5

The limits below 30 MHz are given for different measurement distances. The limits below 30 MHz are converted to 10 m by using the extrapolation factor 40 dB/decade (according to §15.31)

The field strength limits below 30Mhz are converted to magnetic field units, dBμA/m, by subtracting with 51.5 dB (20*LOG(377)) since it is measured with a magnetic loop antenna.

Frequency (MHz)	Field strength (dBμV/m)	Field strength (dBμA/m)	Measurement distance (m)
0.009 – 0.490	107.6 – 72.9	56.1 – 21.4	10
0.490 – 1.705	52.9 – 42.1	1.4 – -9.4	10
1.705 – 30.0	48.6	-2.9	10

The carrier at 58 kHz was measured at 10 and 20 m distance and a new extrapolation factor was calculated (according to §15.31):

The difference between 10 and 20 m was measured to 17.3 dB

$$31.5 = 20 \cdot n \cdot \log(20/10) \Rightarrow n = 2.87$$

$$20 \cdot 3.0 \cdot \log(300/20) = 67.6 \text{ dB}$$

The limit at 58 kHz at 20 m distance is $20 \log(2400/58) + 67.6 = 99.9 \text{ dBuV/m}$
Converted to magnetic field: $99.9 - 51.5 = 48.4 \text{ dBuA/m}$

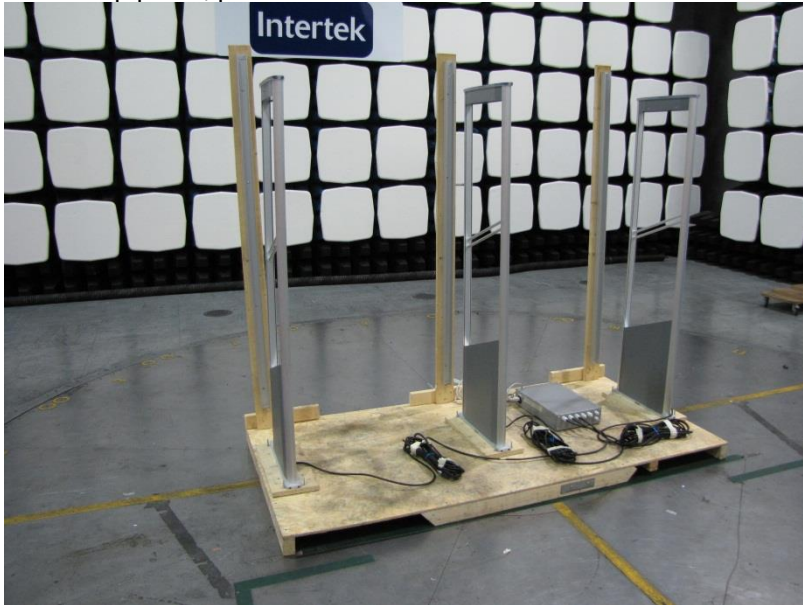
6.2 Test setup details

The radiated disturbance magnetic field intensity was pre-measured in a semi-anechoic chamber at a distance of 10 m. The final measurement was performed at an open area test site without a ground reference plane. The specified test mode was enabled. Test set-up photos are given below.

An overview sweep with peak detection of the electric field intensity was performed with the measurement receiver in max-hold and with the antenna placed 1 m above the floor. The antenna was placed in two orthogonal directions. The measurements were repeated with the EUT rotated in 90-degree steps.

At the frequencies where high disturbance levels were found a search for max disturbance level was performed. With the EUT and antenna in the worst-case configuration new measurements were carried out on a free-field test site without a ground reference plane.

Test setup photo, pre-scan in semi-anechoic chamber



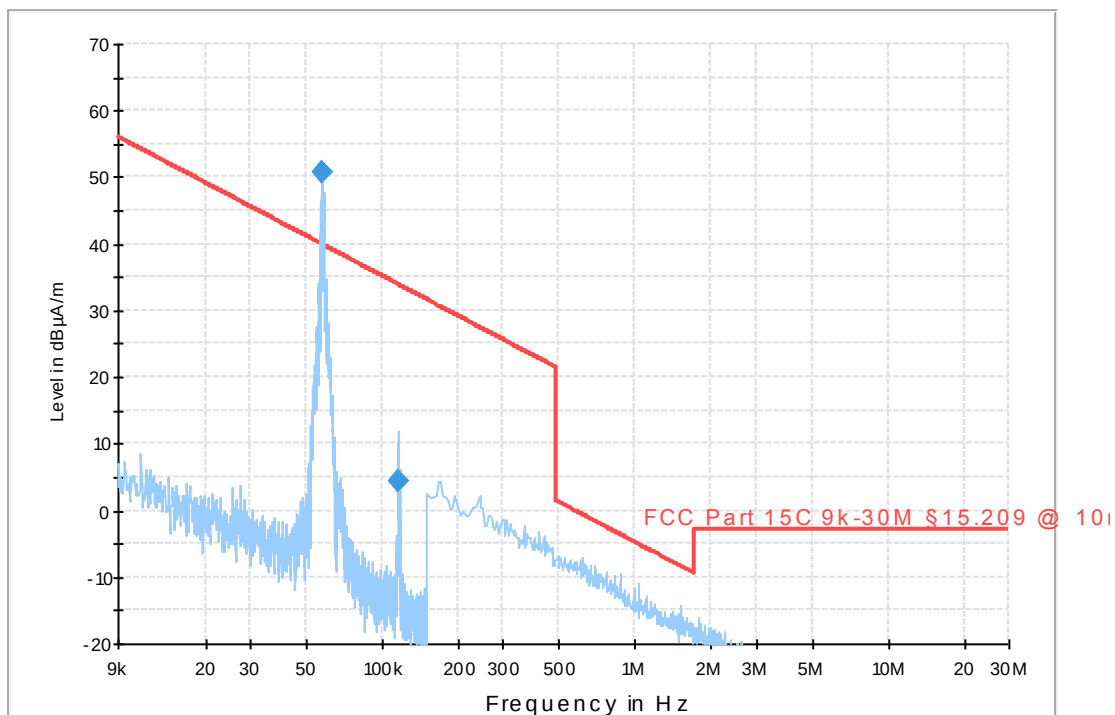
Test setup photo, final measurement at open area test site



6.3 Test data

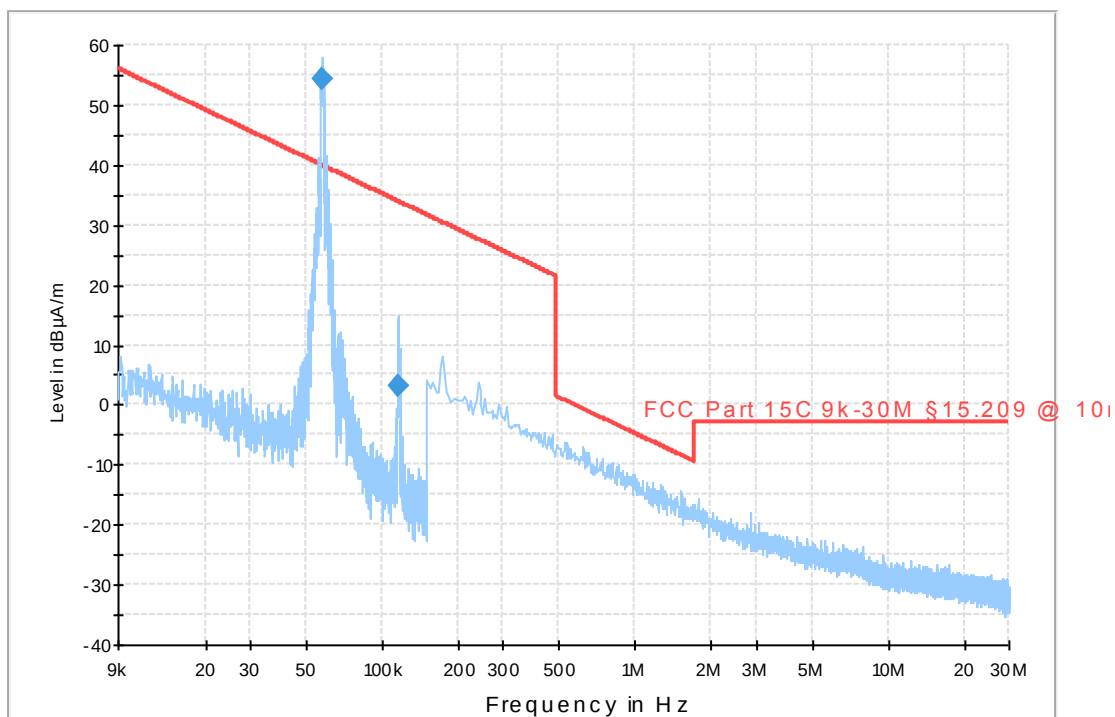
Overview sweep performed with peak detector at a distance of 10m, antenna in x-position.

FCC H-field 9 kHz - 30 MHz 10m



Overview sweep performed with peak detector at a distance of 10m, antenna in y-position.

FCC H-field 9 kHz - 30 MHz 10m



Frequency MHz	Disturbance Level dB μ A/m	RBW kHz	Detector QP / AVG / Peak	Measurement distance m	Limit dB μ A/m	Margin dB
0.058	23.6	0.200	AVG	20	48.4	24.8
0.116	-2.2	0.200	AVG	10	30.7	32.9

Measured level [dB μ A/m] = Analyser reading [dB μ V] + cable loss [dB] + antenna factor [dB(S/m)]

The field strength from the carrier shall not exceed the limits when the supply voltage is varied between 85% and 115% of nominal voltage.

Voltage	Transmitter power (relative)
120 V	0 dB
102 V	-0.4 dB
138 V	+0.1 dB

6.4 Test equipment

Equipment type	Manufacturer	Model	Inv. No.	Cal. due date
Measurement software	Rohde & Schwarz	EMC 32 v8.51.0	--	--
Receiver	Rohde & Schwarz	ESU 8	12866	April-2014
Loop antenna	EMCO	6502	8853	August-2015
Pulse limiter	Rohde & Schwarz	ESH3-Z2	32454	July-2013
Receiver	Rohde & Schwarz	ESCI	12798	July-2013

7 RADIATED EMISSIONS MEASUREMENTS FROM 30 MHZ TO 1000MHZ

Date of test:	2013-05-27	Test location:	Big Chamber
EUT Serial:	-	Ambient temp.	22 °C
Tested by:	Kajsa From	Relative humidity	46 %
Test result:	Pass	Margin:	1.8 dB

7.1 Requirement

Reference: FCC §15.109, Class A equipment

Frequency (MHz)	Field strength (dB μ V/m)	Measurement distance (m)
30 – 88	39.0	10
88 – 216	43.5	10
216 – 960	46.4	10
960 –	49.5	10

Reference: ICES-001, Class A

Frequency (MHz)	Field strength (dB μ V/m)	Measurement distance (m)
30 – 230	40.0	10
230 – 1000	47.0	10

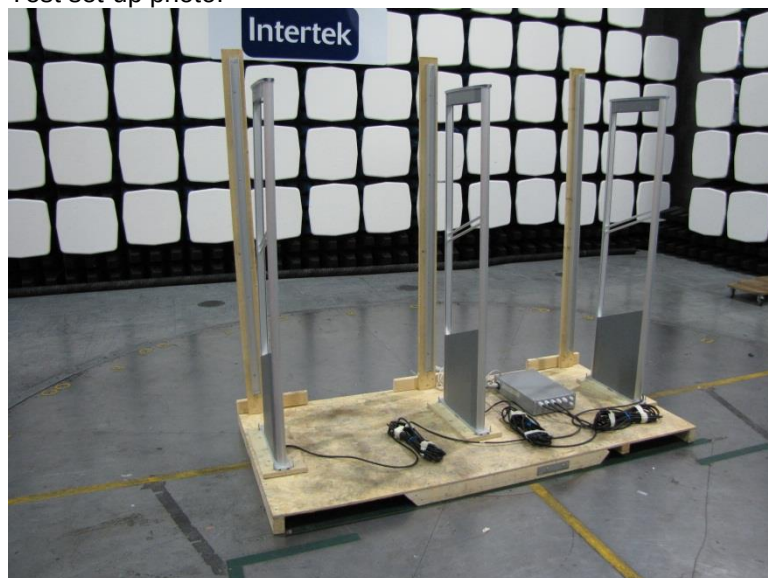
7.2 Test setup details

The radiated disturbance electric field intensity was measured in a semi-anechoic chamber at a distance of 10 m. Test set-up photo is given below.

An overview sweep with peak detection of the electric field intensity was performed with the measurement receiver in max-hold and with the antenna placed 1,5 , 2,5 , and 3,5 m above the floor. The measurements were repeated with the EUT rotated in 90-degree steps.

At the frequencies where high disturbance levels were found a search for max disturbance level was performed. With the EUT and antenna in the worst-case configuration new measurements were carried out.

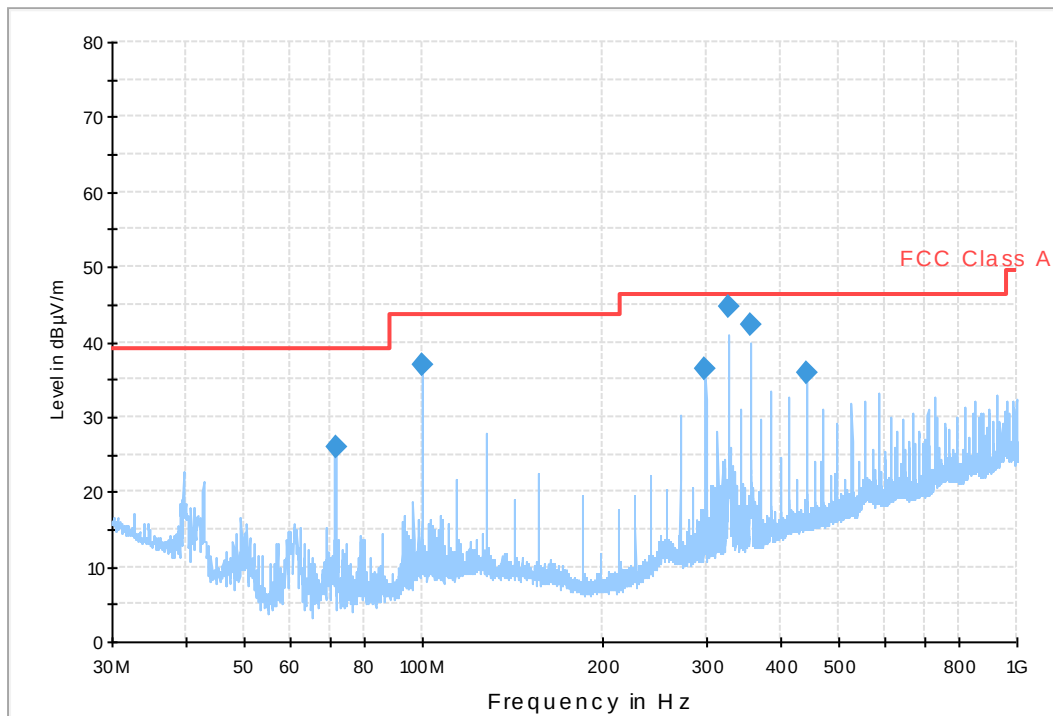
Test set-up photo:



7.3 Test data

Overview sweep performed with peak detector

FCC 30 - 1000 MHz FCC class A 10m



Freq. MHz	Disturbance Level dBµV/m	RBW kHz	Detector QP / AVG / Peak	FCC Limit dBµV/m	IC Limit dBµV/m	Pol.	Azimuth deg	Antenna height cm	Margin dB
71.26	26.0	120	QP	39.0	40	V	160.0	139.0	13.0
99.74	37.0	120	QP	43.5	40	V	305.0	133.0	3.0
299.21	36.4	120	QP	46.4	47	V	-34.0	100.0	10.0
327.70	44.6	120	QP	46.4	47	V	241.0	300.0	1.8
356.21	42.2	120	QP	46.4	47	H	234.0	400.0	4.2
441.72	35.8	120	QP	46.4	47	V	-21.0	100.0	10.6

Measured level [dBµV/m] = Analyser reading [dBµV] + cable loss [dB] – preamplifier gain [dB] + antenna factor [dB/m]

7.4 Test equipment

Equipment type	Manufacturer	Model	Inv. No.	Cal. due date
Measurement software	Rohde & Schwarz	EMC 32 v8.51.0	--	--
Receiver	Rohde & Schwarz	ESU 8	12866	July-2014
Logperiodic antenna	Chase	CBL 6111A	971	Sept.-2015
Preamplifier	Semko	AM-1331	7992	July-2013

8 OCCUPIED 99% BANDWIDTH TEST

Date of test:	2014-03-14	Test location:	Big Chamber
EUT Serial:	-	Ambient temp.	21 °C
Tested by:	Kajsa From	Relative humidity	40 %
Test result:	Pass	Margin:	1.8 dB

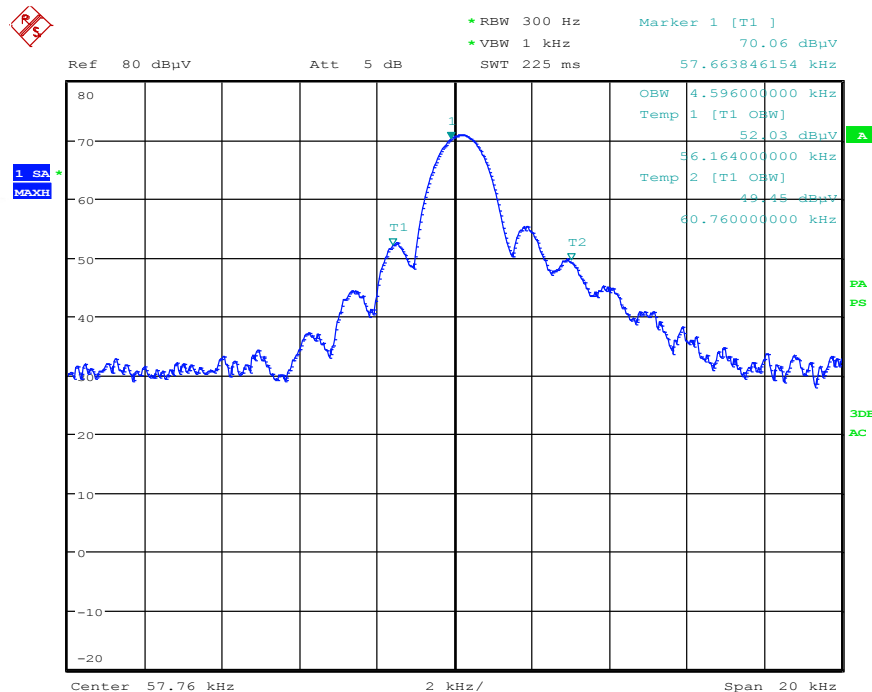
8.1 Measurement set-up

Signal analyser's power bandwidth function was used to calculate 99% bandwidth

8.2 Test protocol

Date of test: 2014-01-27

99% BW = 4.60 kHz



Date: 27.JAN.2014 13:29:29

8.3 Test equipment

Equipment type	Manufacturer	Model	Inv. No.	Cal. due date
Receiver	Rohde & Schwarz	ESU 8	12866	July-2014
Antenna Loop	EMCO	6502	4070	Sept -2015

9 UNCERTAINTIES SUMMARY

The measurement uncertainty describes the overall uncertainty of the given measured value during operation of the EUT.

Measurement uncertainty is calculated in accordance with EA-4/02-1997.

The measurement uncertainty is given with a confidence of 95% ($k=2$).

Radiated disturbance, field strength, 30 MHz - 1000 MHz

30 to 300 MHz at 10 m

$\pm 4,6$ dB

200 to 1000 MHz at 10 m

$\pm 4,6$ dB

Radiated emission with loop antenna, magnetic field, 9 kHz - 30 MHz

$\pm 3,2$ dB

10 PHOTO OF THE EUT

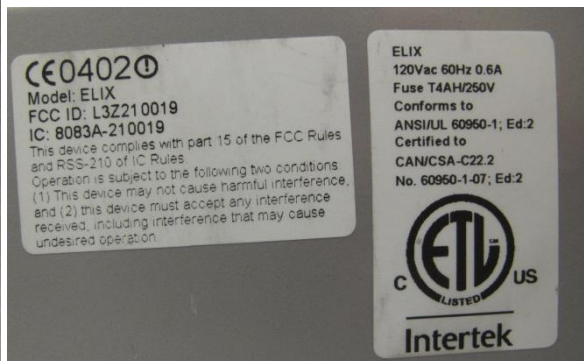
Antenna



Electronic box



Label on box



Tag

**-- END OF REPORT --**