EUROFINS PRODUCT SERVICE GMBH

Testing Cert #1983.01

TEST- REPORT

Compliance Test Report

FCC PART 15 SUBPART C
IC RSS 210 ISSUE 7

LF RFID reader

LF-134-SER-P-V3.1
LF-134-SER-M-V3.0

TEST REPORT NUMBER: G0M21003-2977-P-15_REV01

Eurofins Product Service GmbH
Storkower Str. 38c, 15526 Reichenwalde,
Germany

Phone +49-33631-888 0
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1 General Information

1.1 Notes

The results of this test report relate exclusively to the item tested as specified in chapter "Description of test item" and are not transferable to any other test items.

Eurofins Product Service GmbH is not responsible for any generalisations and conclusions drawn from this report. Any modification of the test item can lead to invalidity of test results and this test report may therefore be not applicable to the modified test item.

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Operator:

Date	Eurofins-Lab.	Name	Signature
21.06.2010		W. Treffke	W. Treffke

Technical responsibility for area of testing:

Date	Eurofins	Name	Signature
21.06.2010		J. Zimmermann	J. Zimmermann

1.2 Testing laboratory

EUROFINS PRODUCT SERVICE GMBH
Storkower Strasse 38c
D-15526 Reichenwalde b. Berlin
Germany
Telefon : +49 33631 888 00
Telefax : +49 33631 888 660

DAR ACCREDITED TESTING LABORATORY
DAR-REGISTRATION NUMBER: DAT-P-268/08

RECOGNIZED NOTIFIED BODY EMC
REGISTRATION NUMBER: BNetzA-bS EMV-07/61

RECOGNIZED NOTIFIED BODY R&TTE
REGISTRATION NUMBER: BNetzA-bS-02/51-53

FCC FILED TEST LABORATORY
REG.-NO. 96970

A2LA ACCREDITED TESTING LABORATORY
CERTIFICATE NO. 1983.01

BLUETOOTH QUALIFICATION TEST FACILITY (BQTF)
ACCREDITED BY BLUETOOTH QUALIFICATION REVIEW BOARD

INDUSTRY CANADA FILED TEST LABORATORY
REG. NO. IC 3470

Test location, where different:

Name	: ./.
Street	: ./.
Town	: ./.
Country	: ./.
Telephone	: ./.
Fax	: ./.

1.3 Details of approval holder

Name	: Roth & Rau - Ortner GmbH
Street	: Manfred-von-Ardenne-Ring 7
Town	: 01099 Dresden
Country	: Germany
Telephone	: +49 351 888 6160
Fax	:
Contact	: Frau Dr. Nadja Erler-Lohse
Telephone	: +49 351 888 6160

1.4 Application details

Date of receipt of application	: 24.03.2010
Date of receipt of test item	: 24.03.2010
Date of test	: 24 – 30.03.2010

1.5 Test item

Description of test item	: LF RFID reader
Type identification, plastic enclosure	: LF-134-SER-P-V3.1
Type identification, metallic enclosure	: LF-134-SER-M-V3.0
Serial Number, plastic enclosure	: ORT301520 Rev 3.1
Serial Number, metallic enclosure	: ORT500471 Rev 3.0

Technical data

Frequency range	: 119 - 140kHz
Tested frequencies	: F_1 134.2kHz
Antenna	: removable connected to device via RF Tranmission line
Antenna models	: ANT08-65EB2000 & ANT04-35EB500
Power supply	: 24VDC
Additional information	: The device is manufactured with two different enclosures, plastic and metallic, and delivered with two different antenna models, ANT08-65EB2000 and ANT04-35EB500. Both EUT models are evaluated with both antennas but for conformance testing only the worst case combination, plastic enclosure with antenna ANT08-65EB2000 is reported.

Manufacturer:
(if applicable)

Name	: Roth & Rau - Ortner GmbH
Street	: Manfred-von-Ardenne-Ring 7
Town	: 01099 Dresden
Country	: Germany

1.6 Test standards

Technical standard	: **FCC PART 15 SUBPART C § 15.209, § 15.207** **IC RSS 210 ISSUE 7 / RSS-Gen ISSUE 2**

2 Technical test

2.1 Summary of test results

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

or

The deviations as specified in 2.4 were ascertained in the course of the tests performed. ☐

2.2 Test environment

Temperature	: 22	...	26°C
Relative humidity content	: 20	...	75%
Air pressure	: 86	...	103kPa

Extreme conditions parameters:

V_{nom} : 12VDC

T_{nom} : 25°C

2.3 Test equipment utilized

Measurement Equipment List			
No.	**Measurement device:**	**Type:**	**Manufacturer:**
ETS 0178	Open area test side	10m	Eurofins Product Service
ETS 0291	Loop antenna	HFH2-Z2	Rohde & Schwarz
ETS 0383	Spectrum Analyzer	FSU26	Rohde & Schwarz

2.4 Test results

☒ 1st test ☐ test after modification ☐ production test

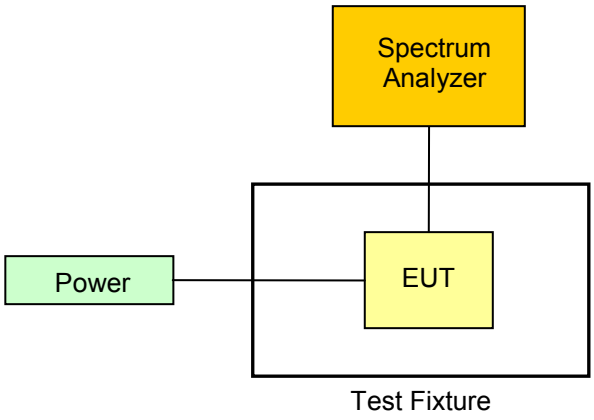
Test case	Subclause	Required	Test passed	Test failed
INFORMATIONAL TRANSMITTER PARAMETERS				
Occupied Bandwidth	IC RSS Gen. 4.6.1	☒		
TRANSMITTER PARAMETERS				
Radiated spurious emissions	FCC § 15.209 IC RSS 210 § 2.7	☒	☒	☐
POWER LINE PARAMETERS				
AC power line conducted emissions	FCC § 15.207 IC RSS Gen. 7.2.2	☒	☒	☐

3 Transmitter parameters

3.1 Occupied Bandwidth

The 99% emission bandwidth occupied by the modulated transmitted signal has to be reported as calculated or measured.

3.1.1 Measurement procedure



The eut is connected to a spectrum analyzer and set to transmission mode with maximum power under normal test conditions. The span of the analyzer is set wide enough to capture all significant emissions of the modulation spectrum. The resolutions bandwidth is set as close as possible to 1% of the selected span without being below 1%. The occupied bandwidth is than measured evaluated by an internal measurement procedure of the analyzer.

3.1.2 Results

Transmitter occupied bandwidth		
Measurement Conditions		
Nominal frequency :	134.2kHz	
Power occupation :	99%	
Lower edge frequency [kHz]	**Upper edge frequency [kHz]**	**Occupied Bandwidth [kHz]**
131.00	136.70	5.70
See attached diagram in Annex		
Verdict		**PASS**

3.2 Transmitter spurious emissions

The unwanted emissions of intentional operators have to comply with the field strength emission limits.

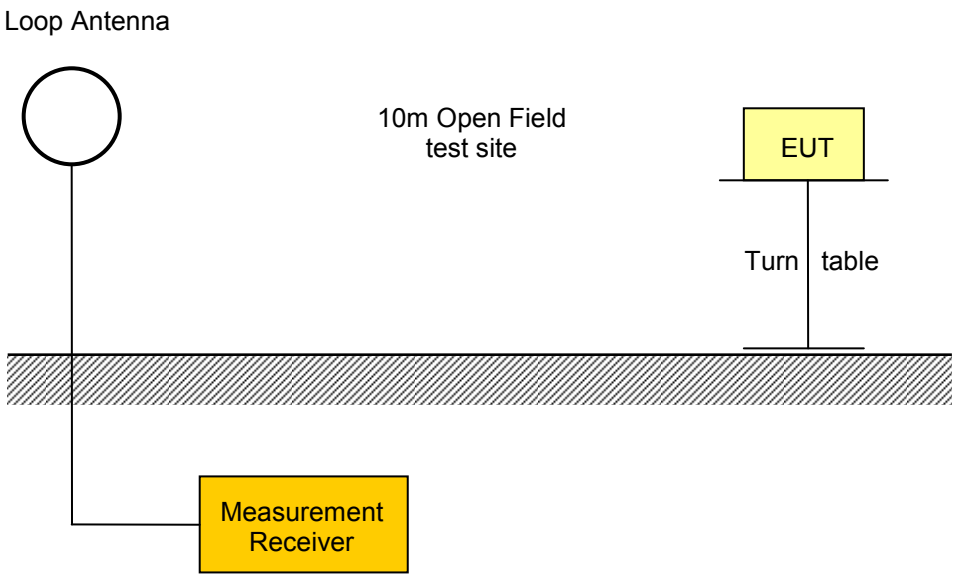
3.2.1 Limits

The following table lists all spurious emission limits in the frequency range of 9kHz to 30MHz.

Tranmitter spurious emission limits				
Tx-state	**Frequency range [MHz]**	**Limit [µV/m]**	**Calculated Limit [dBµV/m]**	**Measurement Distance [m]**
Operational	0.009 – 0.490	2400/F[kHz]	48.5 – 13.8	300
	0.490 – 1.705	2400/F[kHz]	33.8 - 23	30
	1.705 – 30.0	30	29.5	30
	30 – 88	100	40	3
	88 – 216	150	43.5	3
	216 – 960	200	46	3
	> 960	500	54	3

3.2.2 Measurement procedure

The spurious emission measurement is performed on a 10m open area test site.



The eut is placed on a non-metallic table. Any emission is received by a loop antenna and measured via a measurement receiver connected to the loop antenna. To obtain the maximum emission the eut is rortated through 360°.

Due to pratical reasons the spurious emission level check is first performed with a peak detector and the quasi-peak and average limits increased by 20dB.

If any emission is detected that gets close to the emission limit the detector is changed and the quasi-peak or average detector is used. Which detector is used is determined by the emission frequency. If pulsed transmission is used, averaging over the pulse train is used.

The measurement values are also corrected to obtain the field strength values at the defined measurement distances of the emission limits.

The measurement is performed over the frequency range of 9kHz to 30MHz.

3.2.3 Results

Transmitter spurious Emissions						
Measurement Conditions						
Nominal frequency :	134.2kHz					
Modulated :	☒ Yes ☐ No					
Pulsed :	☒ Yes ☐ No					
Emission Frequency [MHz]	**Measured Field Strength * [dBµV/m]**	**Limit Measurement Distance [m]**	**Detektor**	**Pol.**	**Limit [dBµV/m]**	**Margin [dB]**
0.1336	6.73	300	average	v	25	-18.3
36.1	35.0	3	peak	v	60	-25.0
47.4	37.6	3	peak	v	60	-22.4
47.7	35.3	3	peak	h	60	-24.7
See attached diagrams in Annex						
Verdict						**PASS**

*** IMPORTANT NOTE :** The measured field strength emission levels stated in the table above are taken from the plots given in annex. The limits stated in the table above and also the limit lines shown in the measurement plots correspond to the limits given in the FCC rules and in section 3.2.1 of this report. These emission levels are measured using the stated physical measurement distance in the measurement description of section 3.2.2. The physical measurement distance is also stated in the measurement plots. In order to provide the opportunity to directly compare the measured emission levels to the limits, the measured emission levels are mathematically corrected to reflect the emission levels at the measurement distance given for the limits. These corrected measurement results are shown in the plots. Hence, despite the fact that the plots indicate a measurement distance of 10m, all measurement results given in the measurement plots in annex are corrected to the measurement distance given for the limits (see section 3.2.1).

4 Power Line parameters

4.1 AC power line conducted emissions

For any intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits given below.

4.1.1 Limits

AC power line emission limits		
Frequency [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

4.1.2 Measurement procedure

The ac power line emissions are measured using a 50µH / 50Ω line impedance stabilization network (LINS). The radio frequency voltage between each power line and ground at the power terminal is measured.

4.1.3 Results

AC power line emissions	
Conducted emission level	
See attached Diagram	
Verdict	**PASS**

Annex A Photos

Metallic enclosure model

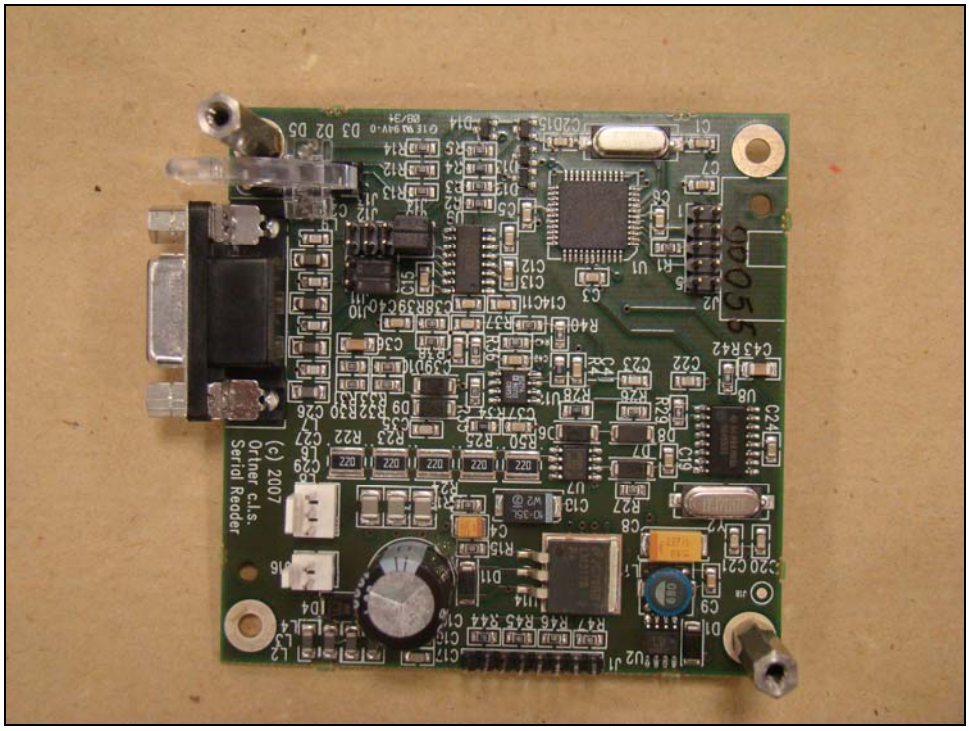
Plastic enclosure model


MODEL : LF-134-SER-P
SERIAL NO. : ORT301520
REVISION : 3.1
Roth & Rau – Ortner GmbH
Manfred-von-Ardenne-Ring 7, D – 01099 Dresden
TEL (+49 351) 888 61 0 – FAX (+49 351) 888 61 20

Antenna: ANT08-65EB2000

Antenna: ANT04-35EB500

PCB pictures



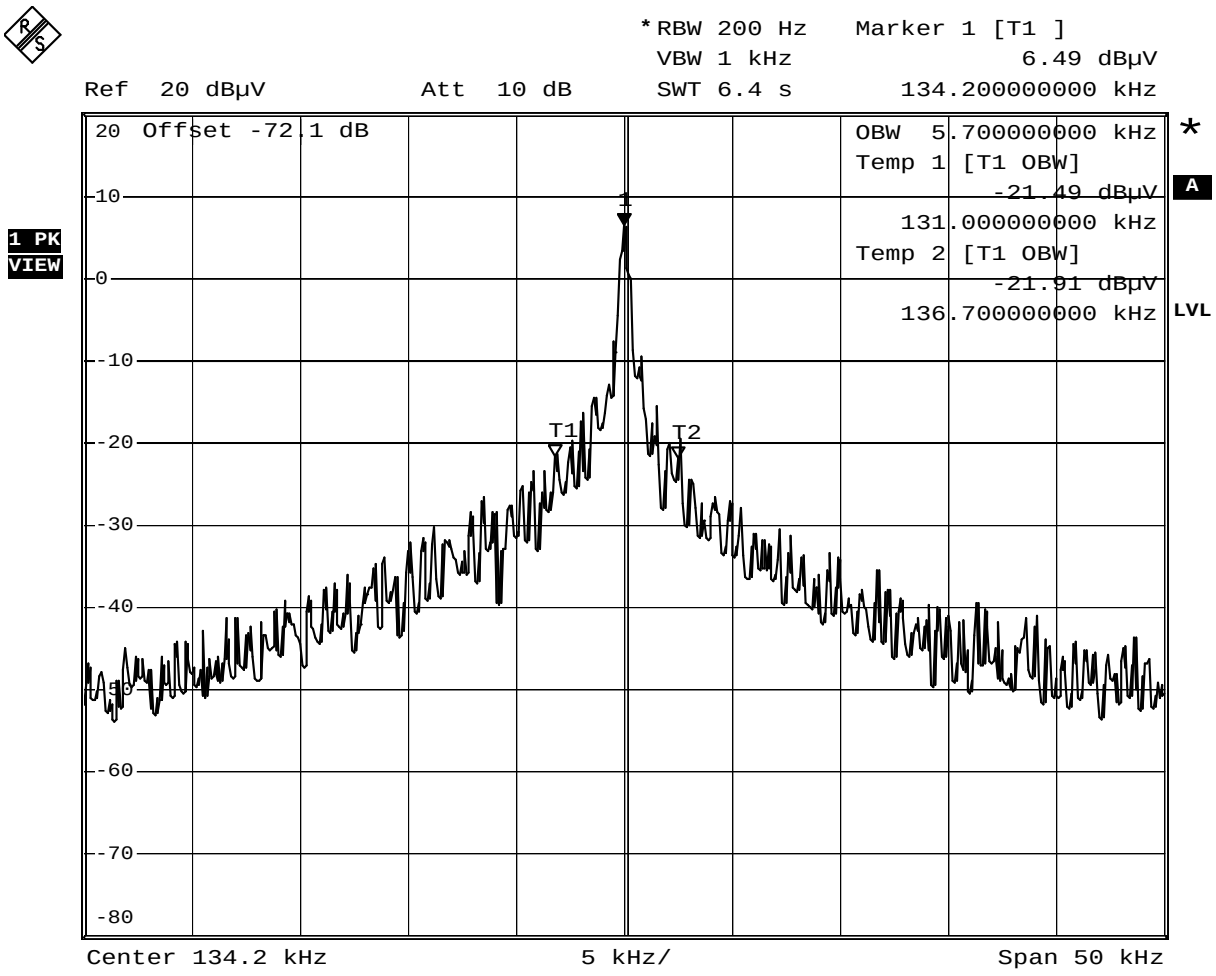
Conducted emission test setup

Radiated emission test setup

Annex B Transmitter Occupied Bandwidth

FCC
Occupied Bandwidth

EUT	LF RFID Reader
Model	LF-134-SER-P-V3.1
Approval Holder	Roth & Rau - Ortner GmbH
Temperature / Voltage	23°C / Vnom
Test Site / Operator	Eurofins Product Service GmbH / Mr. Treffke
Test Specification	4.4.1 Occupied Bandwidth
Comment 1	Channel.: 134.2 KHz
Comment 2	A spectrum analyzer with an integrated 99% power bandwidth function is used



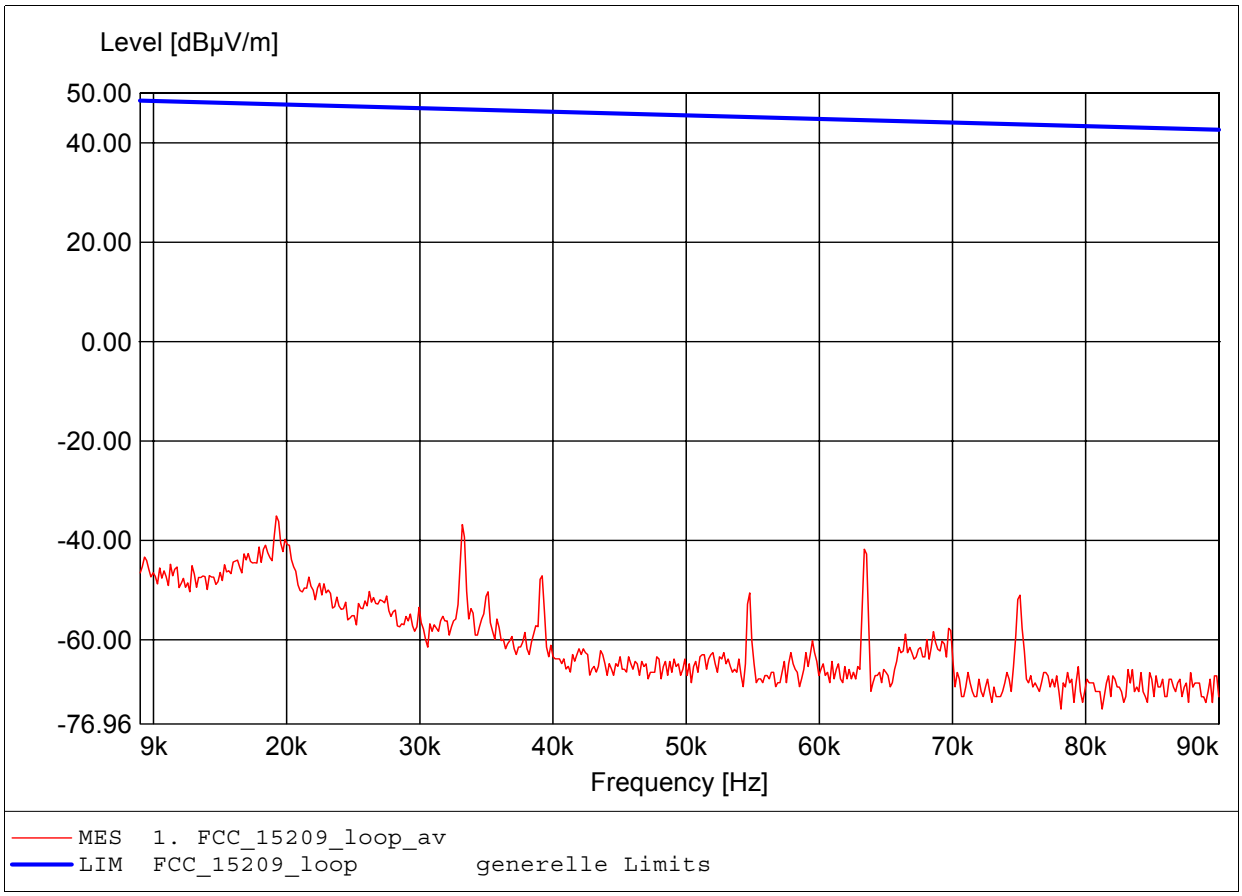
Date: 30.MAR.2010 14:47:54

Annex C Transmitter Spurious Emissions

Spurious emissions Field Strength Tx

FCC RULES PART 15, SUBPART C

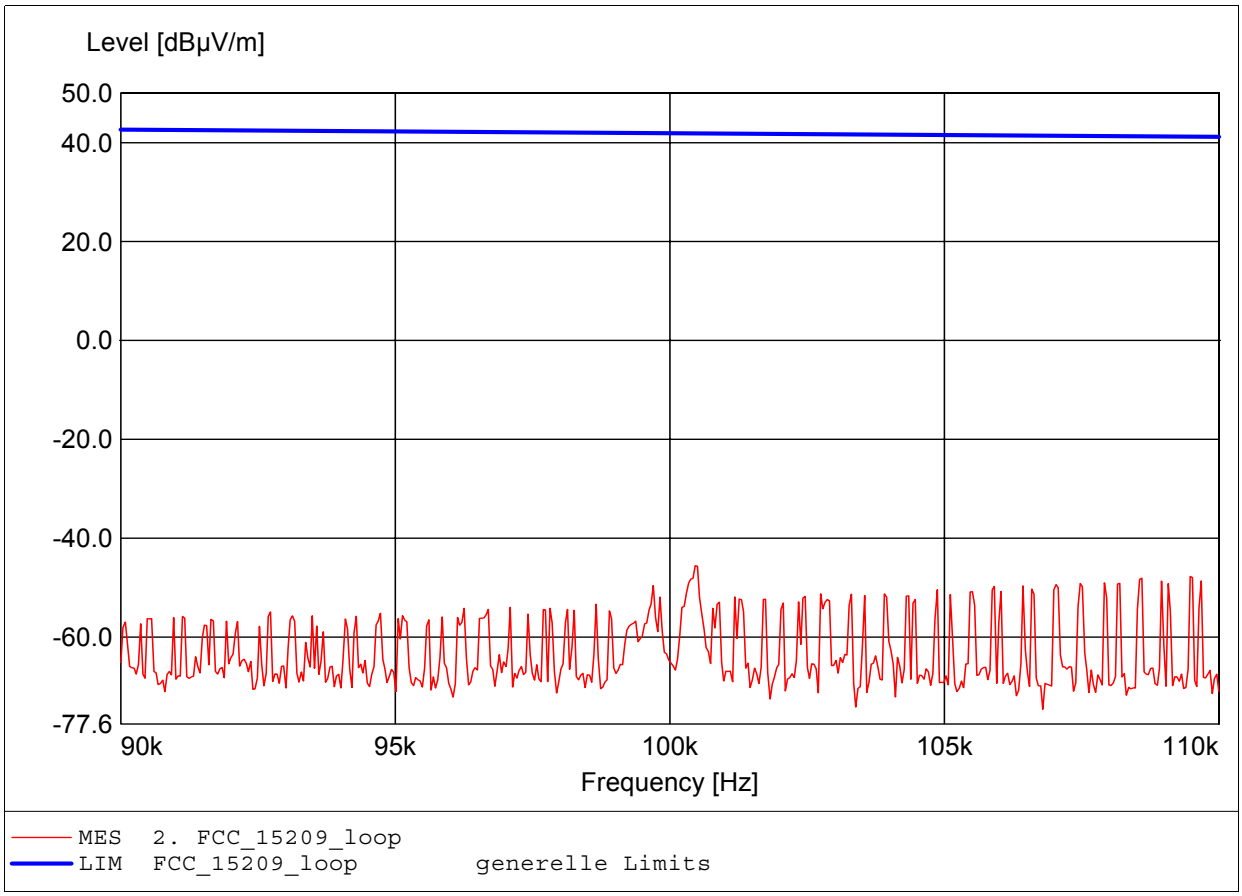
```
Approval Holder:     Roth & Rau - Ortner GmbH  /  Ord.: G0M21003-2977
EUT:                 LF RFID Reader
Model:               LF-134-SER-P-V3.1   /  ANT08-65EB2000
Operator:            Eurofins Product Service GmbH   /   Mr. Treffke
Test Conditions:     Tnom: 23°C / Unom.: 230 V AC (adaptor)
Test Specification: according to §15.209, average detector
Comment 1:           Dist.: 10m, Ant.: HFH2-Z2
Comment 2:           Freq: 19.226kHz, Emax: -35.09dBµV/m, RBW: 200Hz
```



Spurious emissions Field Strength Tx

FCC RULES PART 15, SUBPART C

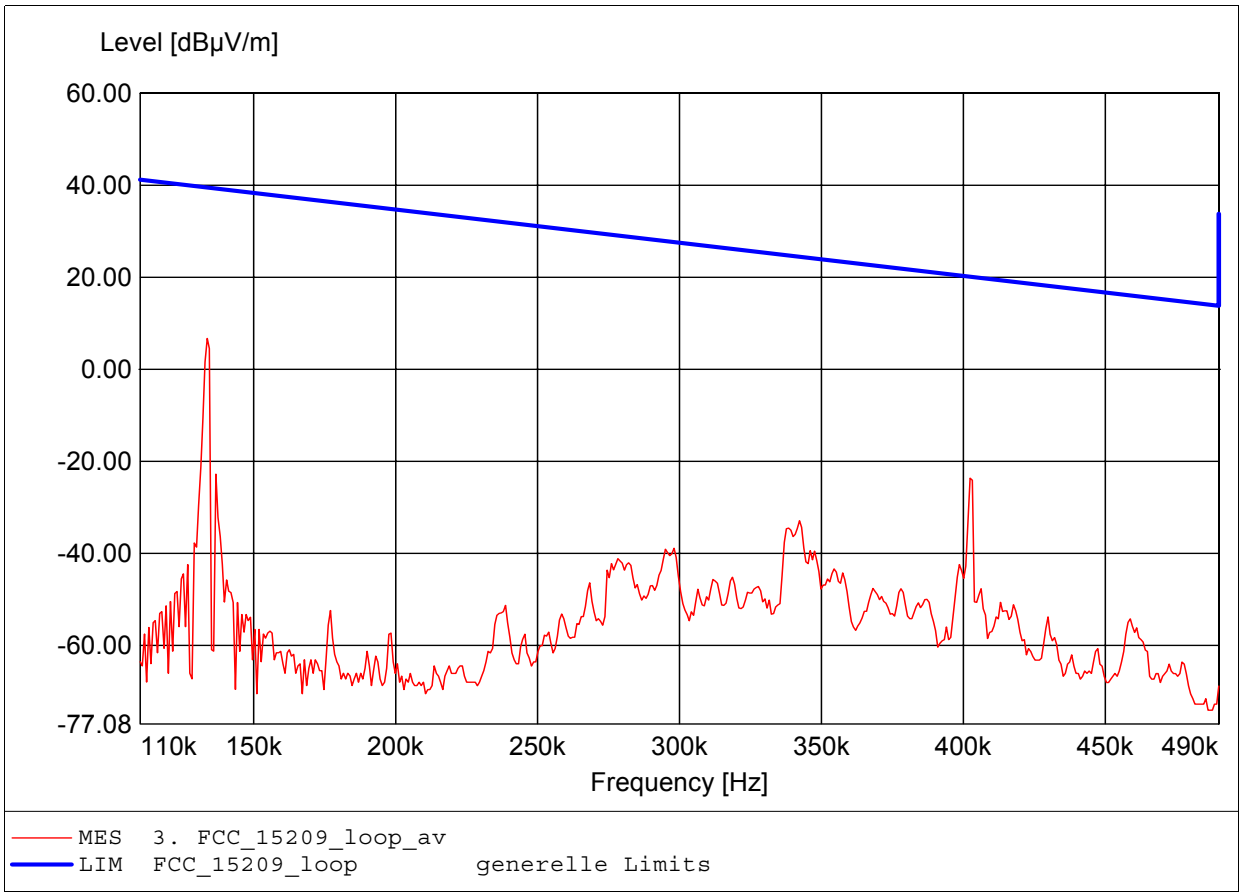
```
Approval Holder:     Roth & Rau - Ortner GmbH  /  Ord.: G0M21003-2977
EUT:                 LF RFID Reader
Model:               LF-134-SER-P-V3.1   /  ANT08-65EB2000
Operator:            Eurofins Product Service GmbH   /   Mr. Treffke
Test Conditions:     Tnom: 23°C / Unom.: 230 V AC (adaptor)
Test Specification: according to §15.209, peak detector
Comment 1:           Dist.: 10m, Ant.: HFH2-Z2
Comment 2:           Freq: 100.461kHz, Emax: -45.58dBµV/m, RBW: 200Hz
```



Spurious emissions Field Strength Tx

FCC RULES PART 15, SUBPART C

Approval Holder:	Roth & Rau - Ortner GmbH / Ord.: G0M21003-2977
EUT:	LF RFID Reader
Model:	LF-134-SER-P-V3.1 / ANT08-65EB2000
Operator:	Eurofins Product Service GmbH / Mr. Treffke
Test Conditions:	Tnom: 23°C / Unom.: 230 V AC (adaptor)
Test Specification:	according to §15.209, average detector
Comment 1:	Dist.: 10m, Ant.: HFH2-Z2
Comment 2:	Freq: 133.607kHz, Emax: 6.73dBµV/m, RBW: 200Hz



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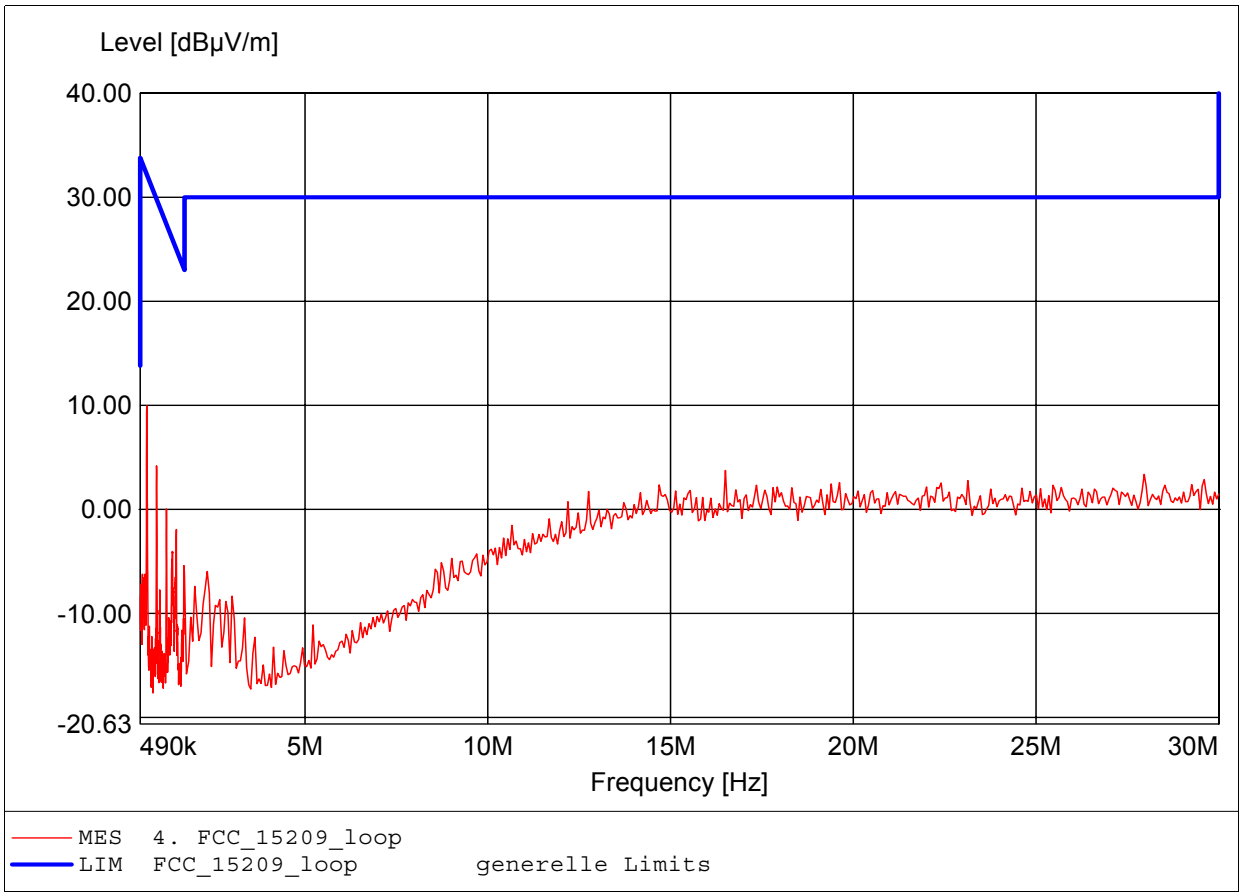
Spurious emissions Field Strength Tx

FCC RULES PART 15, SUBPART C

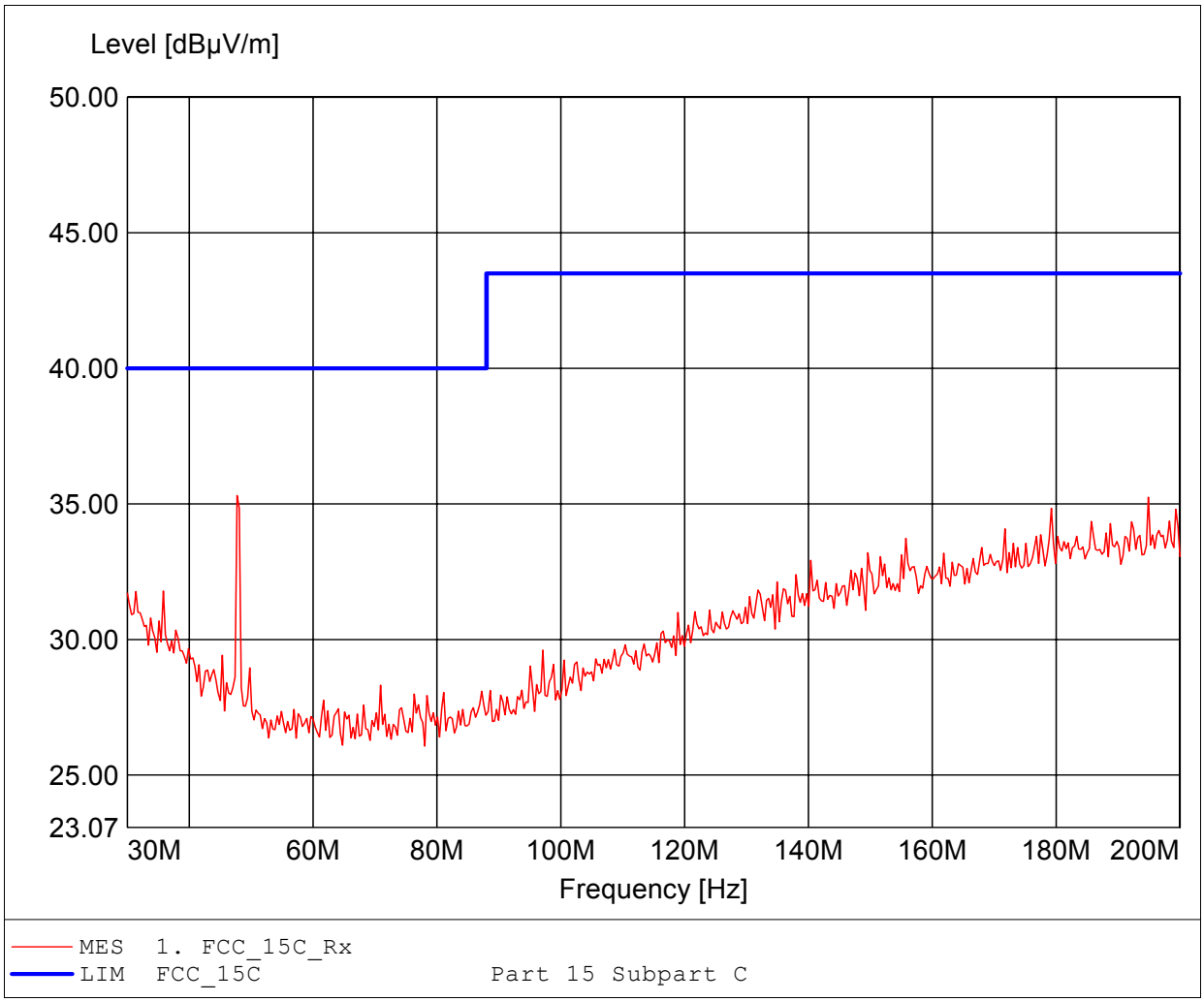
Approval Holder:	Roth & Rau - Ortner GmbH / Ord.: G0M21003-2977
EUT:	LF RFID Reader
Model:	LF-134-SER-P-V3.1 / ANT08-65EB2000
Operator:	Eurofins Product Service GmbH / Mr. Treffke
Test Conditions:	Tnom: 23°C / Unom.: 230 V AC (adaptor)
Test Specification:	according to §15.209, peak detector
Comment 1:	Dist.: 10m, Ant.: HFH2-Z2
Comment 2:	Freq: 671.864kHz, Emax: 9.96dBµV/m, RBW: 10kHz



Field Strength under normal conditions

FCC RULES PART 15, SUBPART C

Approval Holder:	Roth & Rau - Ortner GmbH / Ord.: G0M21003-2977
EUT:	LF RFID Reader / with ferrit WE74271132 on antenna line
Model:	LF-134-SER-P-V3.1 / ANT08-65EB2000
Test Site / Operator:	Eurofins Product Service GmbH / Mr. Treffke
Test Condition:	Tnom: 23°C / Unom.: 230 V AC (adaptor)
Test Specification:	according to §15.209
Comment 1:	Dist.: 3m, Ant.: HK 116
Comment 2:	Freq: 47.715MHz, Emax: 35.31dBµV/m, RBW: 100kHz



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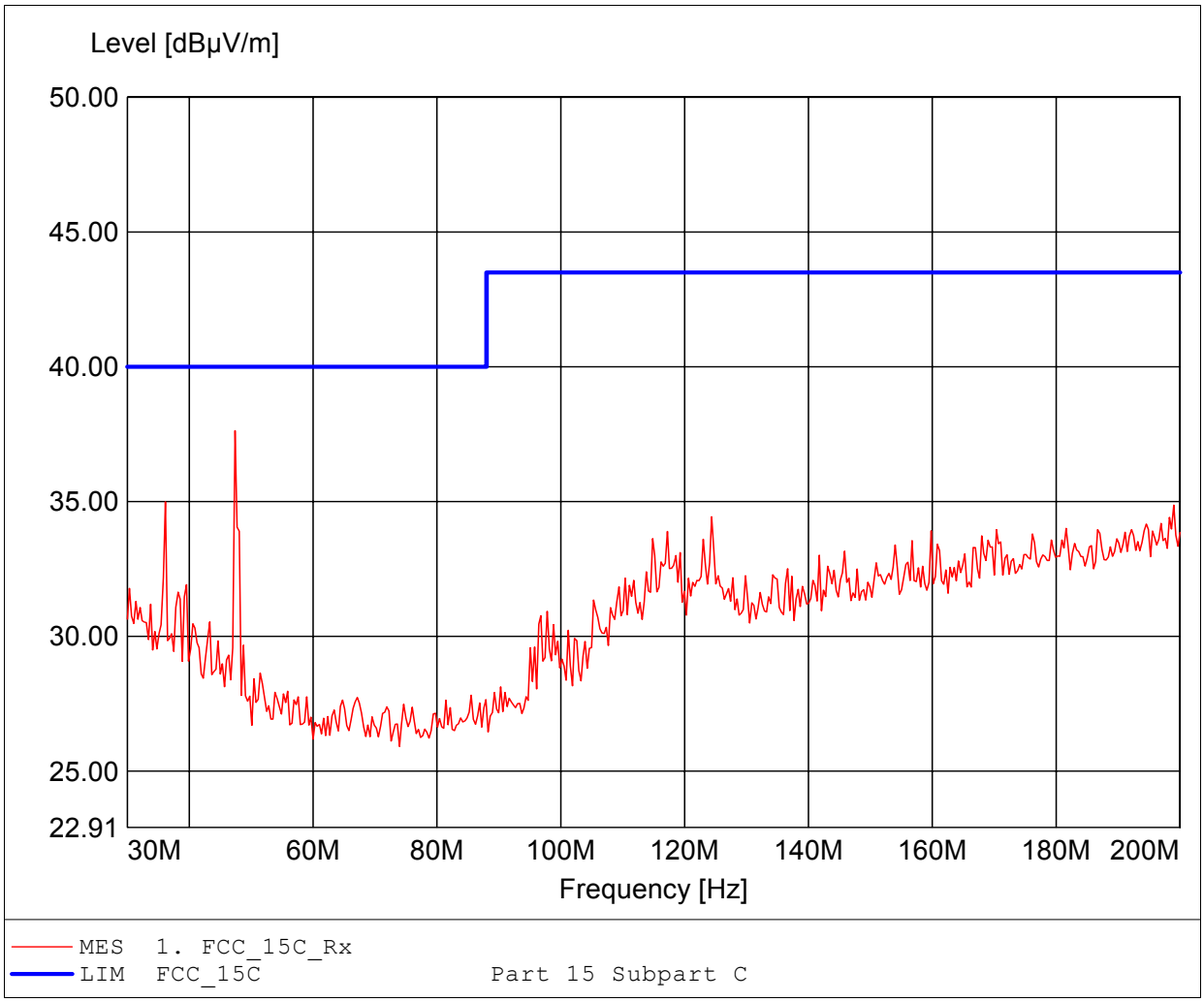
Field Strength under normal conditions

FCC RULES PART 15, SUBPART C

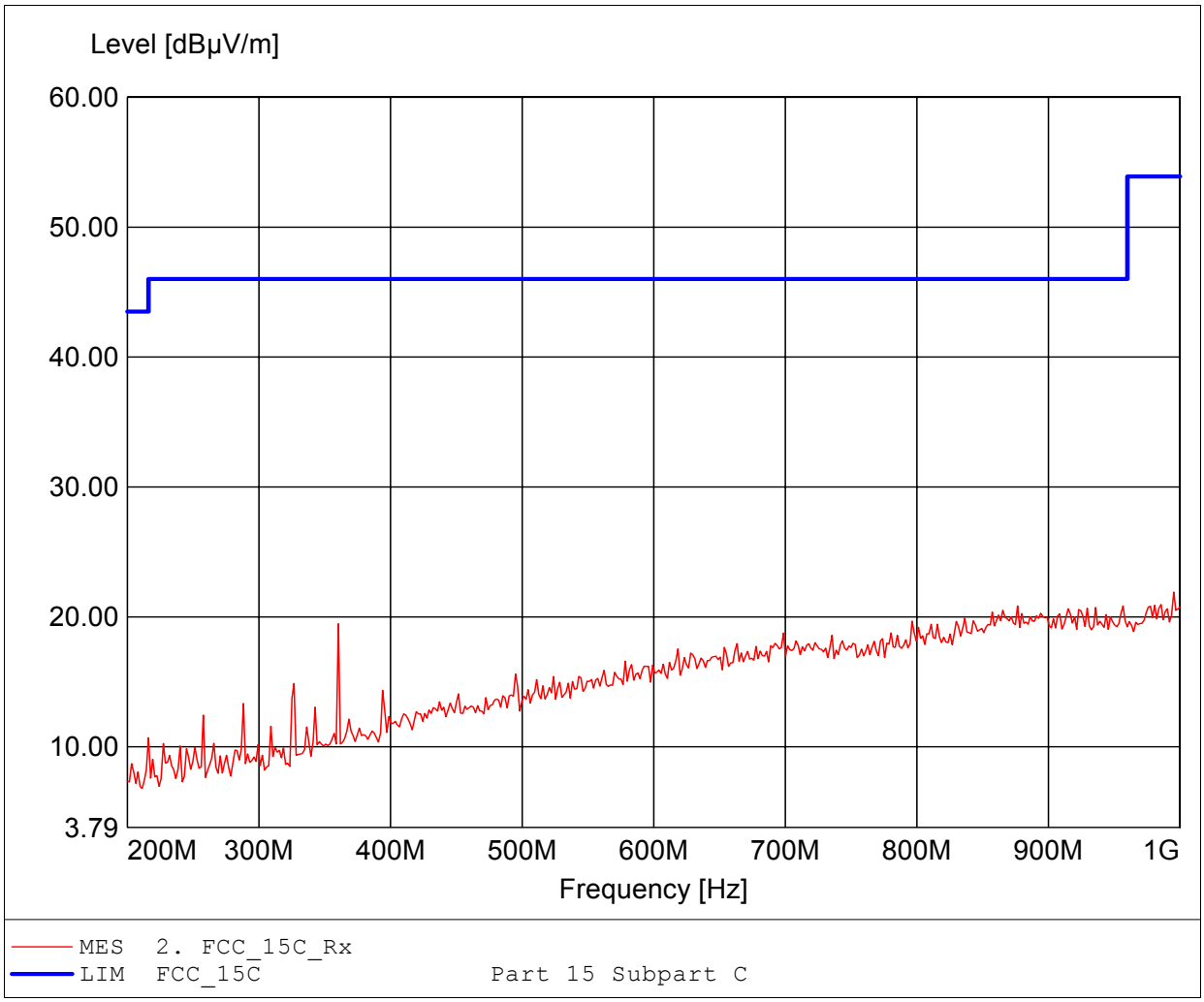
Approval Holder:	Roth & Rau - Ortner GmbH / Ord.: G0M21003-2977
EUT:	LF RFID Reader / with ferrit WE74271132 on antenna line
Model:	LF-134-SER-P-V3.1 / ANT08-65EB2000
Test Site / Operator:	Eurofins Product Service GmbH / Mr. Treffke
Test Condition:	Tnom: 23°C / Unom.: 230 V AC (adaptor)
Test Specification:	according to §15.209
Comment 1:	Dist.: 3m, Ant.: HK 116
Comment 2:	Freq: 47.375MHz, Emax: 37.63dBµV/m, RBW: 100kHz



Field Strength under normal conditions

FCC RULES PART 15, SUBPART C

Approval Holder:	Roth & Rau - Ortner GmbH / Ord.: G0M21003-2977
EUT:	LF RFID Reader / with ferrit WE74271132 on antenna line
Model:	LF-134-SER-P-V3.1 / ANT08-65EB2000
Test Site / Operator:	Eurofins Product Service GmbH / Mr. Treffke
Test Condition:	Tnom: 23°C / Unom.: 230 V AC (adaptor)
Test Specification:	according to §15.209
Comment 1:	Dist.: 3m, Ant.: HL 223, ampl.
Comment 2:	Freq: 995.190MHz, Emax: 21.90dBµV/m, RBW: 100kHz



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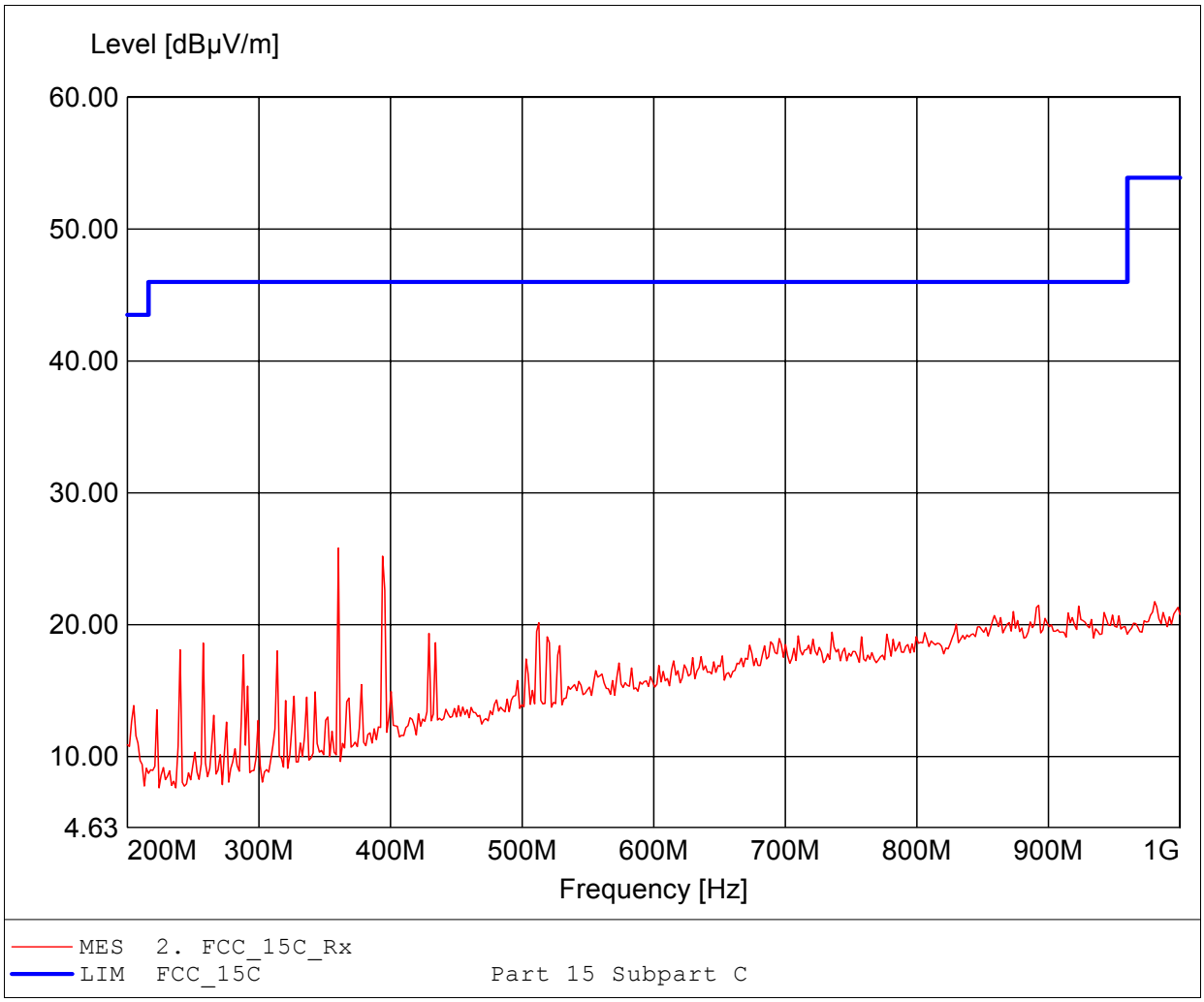
Field Strength under normal conditions

FCC RULES PART 15, SUBPART C

Approval Holder:	Roth & Rau - Ortner GmbH / Ord.: G0M21003-2977
EUT:	LF RFID Reader / with ferrit WE74271132 on antenna line
Model:	LF-134-SER-P-V3.1 / ANT08-65EB2000
Test Site / Operator:	Eurofins Product Service GmbH / Mr. Treffke
Test Condition:	Tnom: 23°C / Unom.: 230 V AC (adaptor)
Test Specification:	according to §15.209
Comment 1:	Dist.: 3m, Ant.: HL 223, ampl.
Comment 2:	Freq: 360.321MHz, Emax: 25.82dBµV/m, RBW: 100kHz

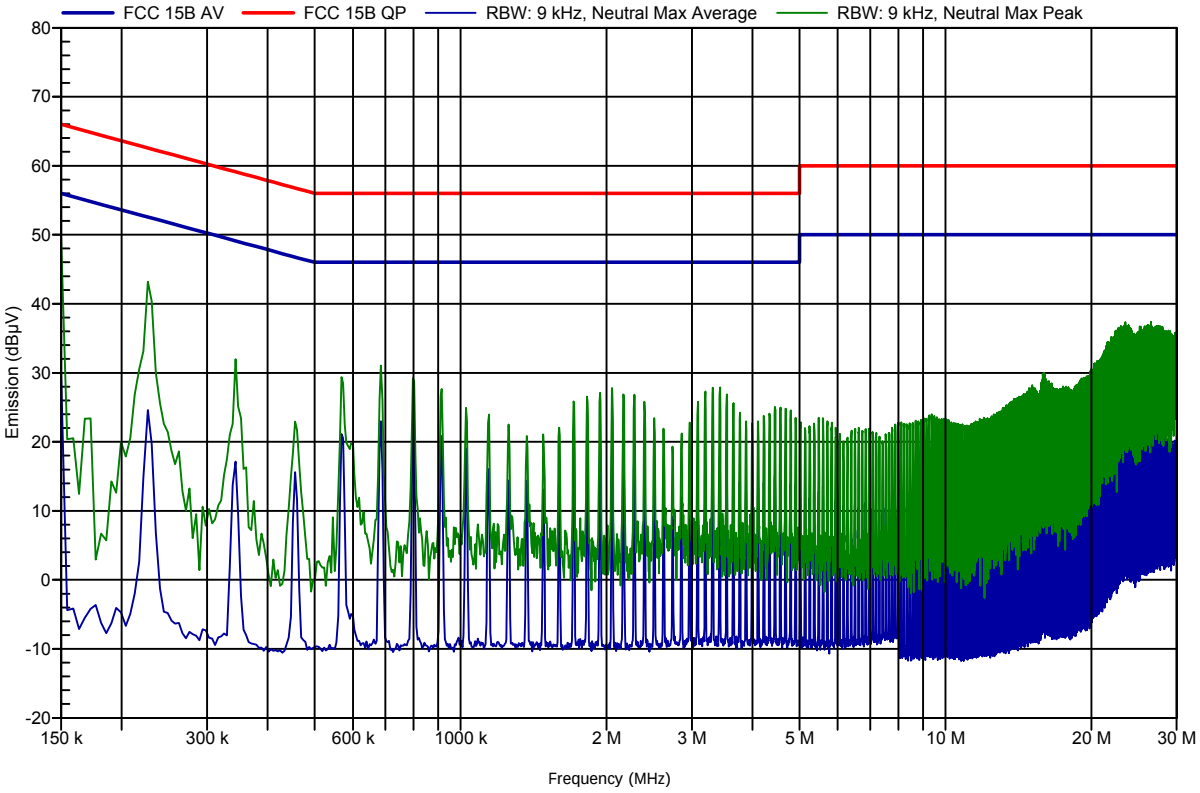


Annex D AC Power Line Conducted Emissions

EMI voltage test in the ac-mains according to FCC Part 15B

Ordernumber: G0M21003-2977

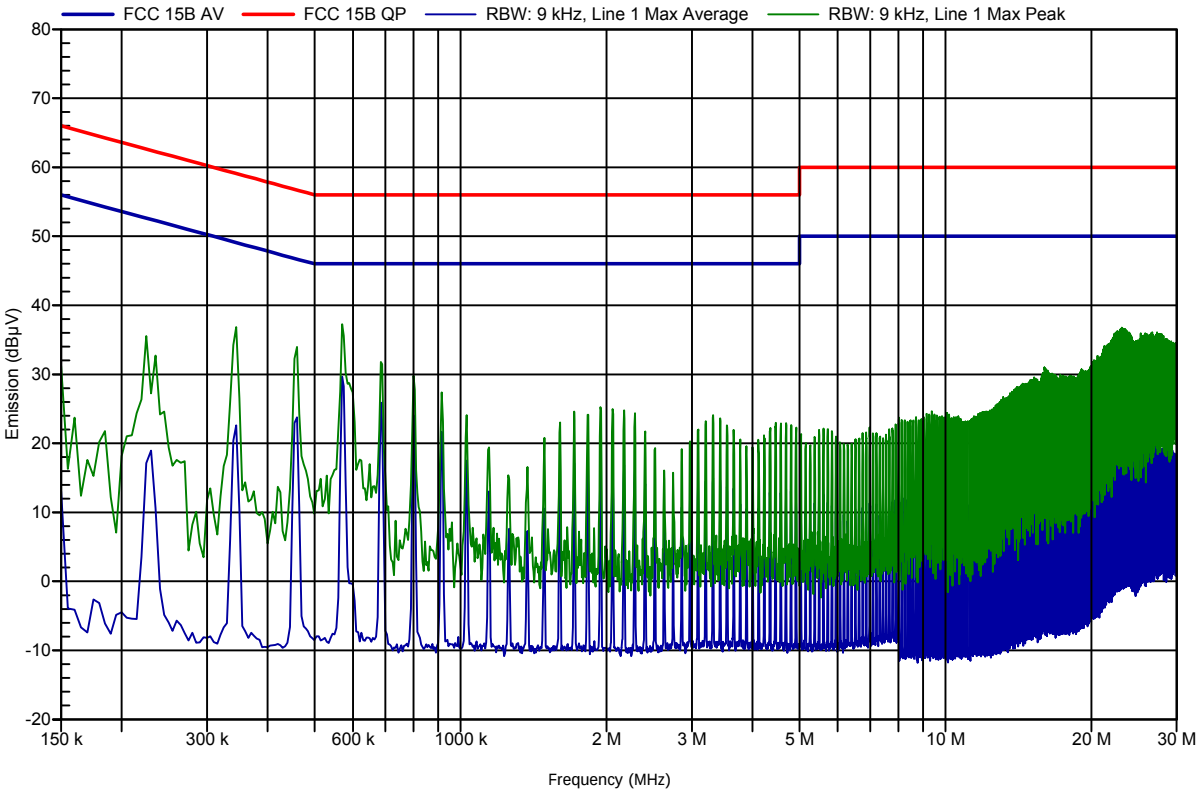
Manufacturer:	Roth & Rau - Ortner GmbH
EUT Name:	LF RFID Reader
Model:	LF-134-SER-P-V3.1
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Klein
Test Conditions:	Tnom: 23°C, Unom: 120 VAC (AC/DC - Adapter)
LISN:	ESH2-Z5 N
Mode:	with Acer TravelMade 292LCi
Test Date:	25.03.2010



EMI voltage test in the ac-mains according to FCC Part 15B

Ordernumber: G0M21003-2977

Manufacturer:	Roth & Rau - Ortner GmbH
EUT Name:	LF RFID Reader
Model:	LF-134-SER-P-V3.1
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Klein
Test Conditions:	Tnom: 23°C, Unom: 120 VAC (AC/DC - Adapter)
LISN:	ESH2-Z5 L
Mode:	with Acer TravelMade 292LCi
Test Date:	25.03.2010



Revision History

Revision	Issue Date	Revision		Revised by
01	21.06.2010	Replaced document:: Replaced by: Reason: • Page 11: Spurious emission at 47.7MHz corrected • Page 11: Explanation of spurious emission measurement refined	G0M21003-2977-P-15 G0M21003-2977-P-15_Rev01	C. Weber