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FCC TEST REPORT

FCC 47 CFR Part 15C
ISED RSS-210

License exempt radio equipment

Report Reference No. ..... :	G0M-1611-6094-TFC209LP-M-V01
Testing Laboratory ..... :	Eurofins Product Service GmbH
Address ..... :	Storkower Str. 38c 15526 Reichenwalde Germany
Accreditation ..... :	 A2LA Accredited Testing Laboratory, Certificate No.: 1983.01 FCC Filed Test Laboratory, Reg.-No.: 96970 IC OATS Filing assigned code: 3470A
Applicant's name ..... :	Fabmatics GmbH
Address ..... :	Zur Steinhöhe 1 01099 Dresden GERMANY
Test specification:	
Standard..... :	47 CFR Part 15C RSS-210, Issue 9, 2016-08
Test scope…….. ..... :	complete Radio compliance test
Equipment under test (EUT):	
Product description	LF RFID reader
Model No.	LF-134-SER-M-V4.0
Additional Model(s)	None
Brand Name(s)	None
Hardware version	4.0
Firmware / Software version	3.0.0
	FCC-ID: YTV-LF-134-SER-4 IC: None
Test result	**Passed**

Possible test case verdicts:

- neither assessed nor tested ..... : N/N
- required by standard but not appl. to test object ..... : N/A
- required by standard but not tested ..... : N/T
- not required by standard for the test object ..... : N/R
- test object does meet the requirement ..... : P (Pass)
- test object does not meet the requirement ..... : F (Fail)

Testing:

Test Lab Temperature ..... : 20 – 23 °C

Test Lab Humidity ..... : 32 – 38 %

Date of receipt of test item ..... : 2016-12-12

Date (s) of performance of tests ..... : 2016-12-22 - 2016-12-23

Compiled by ..... : Toralf Jahn

Tested by (+ signature) ..... : Toralf Jahn .....
(Responsible for Test)

Approved by (+ signature) ..... : Christian Weber .....
(Head of Lab)

Date of issue ..... : 2017-02-20

Total number of pages ..... : 22

General remarks:

The test results presented in this report relate only to the object tested.

The results contained in this report reflect the results for this particular model and serial number. It is the responsibility of the manufacturer to ensure that all production models meet the intent of the requirements detailed within this report.

Additional comments:

Version History

Version	Issue Date	Remarks	Revised by
01	2017-02-20	Initial Release	

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

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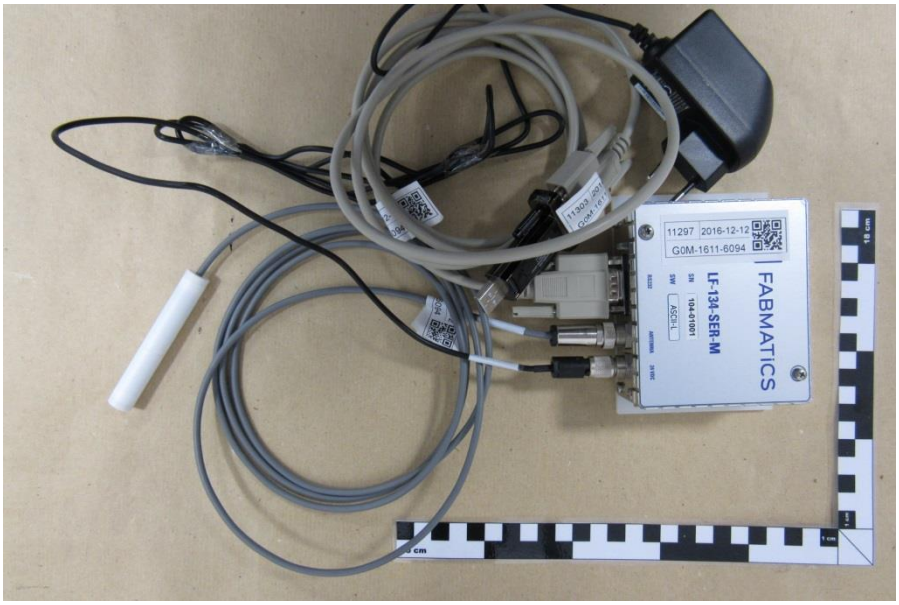
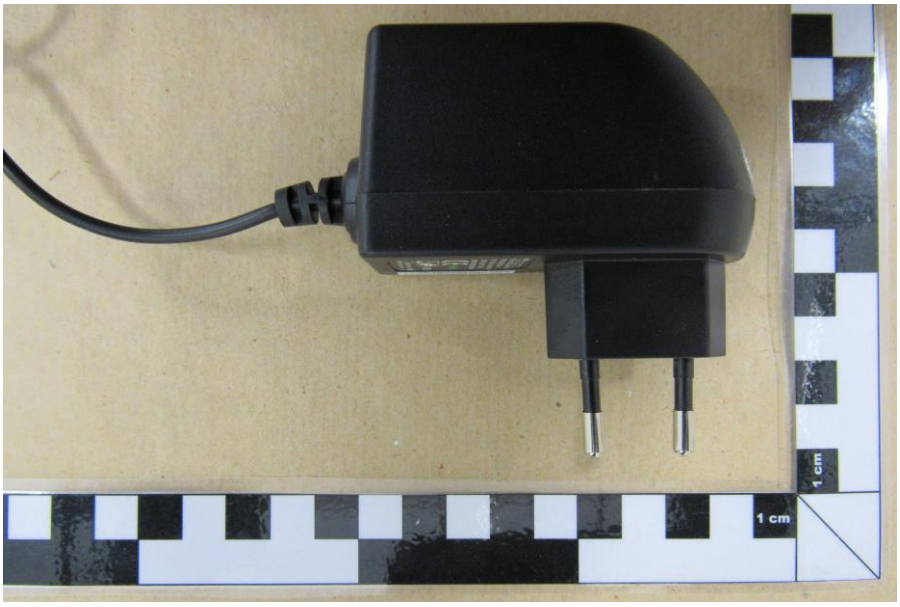
1 Equipment (Test item) Description

Description	LF RFID reader	
Model	LF-134-SER-M-V4.0	
Additional Model(s)	None	
Brand Name(s)	None	
Serial number	104-01001	
Hardware version	4.0	
Software / Firmware version	3.0.0	
PMN	N/A	
HVIN	N/A	
FVIN	N/A	
HMN	N/A	
FCC-ID	YTV-LF-134-SER-4	
IC	None	
Equipment type	End product	
Radio type	Transceiver	
Radio technology	RFID	
Operating frequency range	134.2 kHz	
Frequency range	F_{MID}	134.2 kHz
Modulations	FSK	
Number of channels	1	
Channel spacing	None	
Number of antennas	1	
Antenna	Type	external dedicated
	Model	inductive loop coil antenna ANT-08-65EM B/BF-2000
	Manufacturer	Fabmatics GmbH
	Gain	unspecified
Manufacturer	Fabmatics GmbH Zur Steinhöhe 1 01099 Dresden GERMANY	
Power supply	V_{NOM}	24.0 VDC (AC/DC adapter)
	V_{MIN}	N/A
	V_{MIN}	N/A
AC/DC-Adaptor	Model	SYS1308-2424-W2E
	Vendor	Sunny
	Input	100-240VAC
	Output	24VDC

1.1 Photos – Equipment External

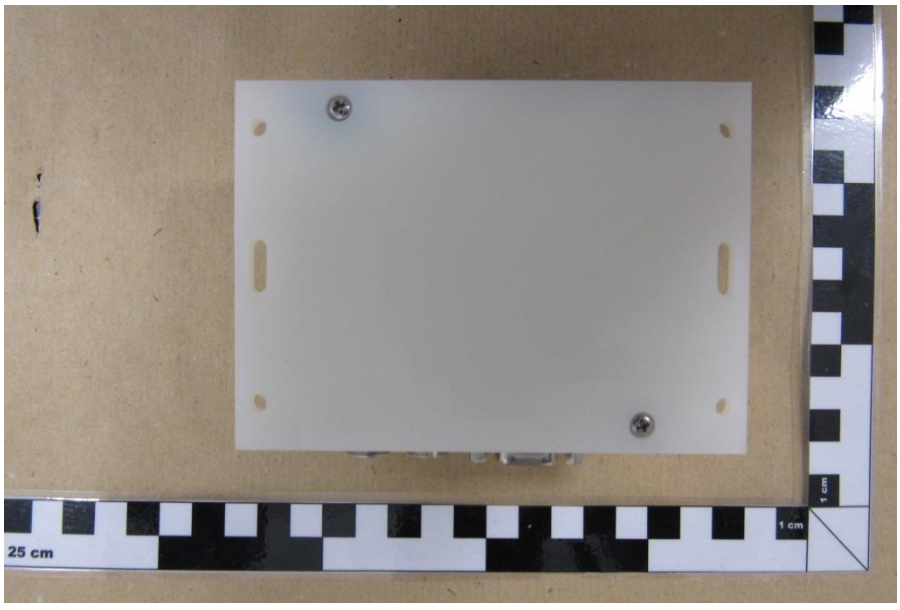
EUT


ANTENNA


AC/DC ADAPTOR


AC/DC ADAPTOR

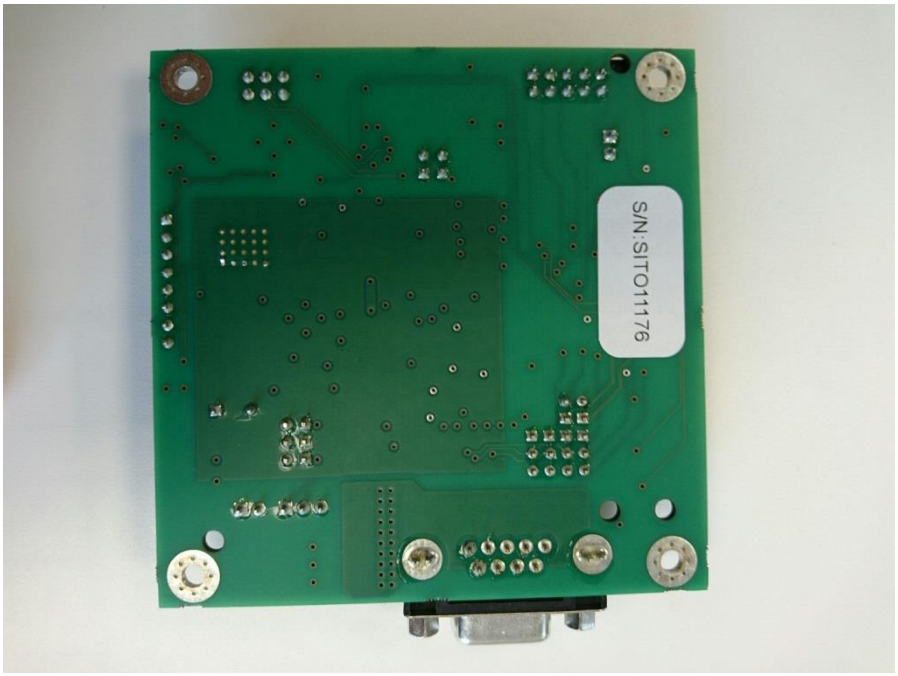

HOUSING


HOUSING


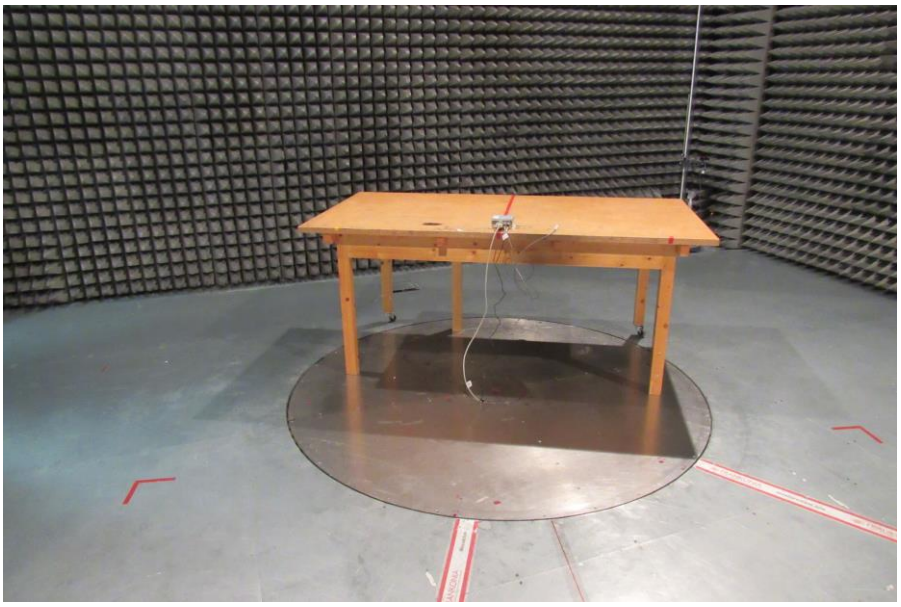
HOUSING


1.2 Photos – Equipment internal

PCB


PCB


1.3 Photos – Test setup

RADIATED EMISSION


1.4 Supporting Equipment Used During Testing

Product Type*	Device	Manufacturer	Model No.	Comments
AE	Laptop	Dell	E6430	with test software

***Note:** Use the following abbreviations:

AE : Auxiliary/Associated Equipment, or

SIM : Simulator (Not Subjected to Test)

CABL : Connecting cables

1.5 Test Modes

Mode #	Description	
MOD AC/DC	General conditions:	EUT powered by AC/DC adaptor
	Radio conditions:	Mode = standalone transmit Spreading = None Modulation = On Power level = Maximum

1.6 Test Equipment Used During Testing

Measurement Software			
Description	Manufacturer	Name	Version
EMC Test Software	Dare Instruments	Radimation	2015.2.4

Occupied Bandwidth					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum analyzer	R&S	FSW43	EF00896	2016-05	2016-12

Field strength emissions					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Anechoic chamber	Frankonia	AC 2	EF00196	-	-
Spectrum Analyzer	R&S	FSU3	EF00241	2016-04	2018-04
Loop Antenna	R&S	HFH2-Z2	EF00184	2016-12	2018-12

1.7 Sample emission level calculation

The following is a description of terms and a sample calculation, as appears in the radiated emissions data table. The numbers used in the calculation are for example only. There is no direct correlation to the specific data taken for the product described in this document:

Reading:

This is the reading obtained on the spectrum analyzer in dBµV. Any external preamplifiers used are taken into account through internal analyzer settings.

A.F.:

This is the antenna factor for the receiving antenna. It is a conversion factor, which converts electric fields strengths to voltages, which can be measured directly on the spectrum analyzer. It is treated as a loss in dB. Cable losses have been included with the A.F. to simplify the calculations. The antenna factor is used in calculations as follows:

Reading on Analyzer (dBµV) + A.F. (dB) = Net field strength (dBµV/m)

Net:

This is the net field strength measurement (as shown above).

Limit:

This is the FCC Class B radiated emission limit (in units of dBµV/m). The FCC limits are given in units of µV/m. The following formula is used to convert the units of µV/m to dBµV/m:

Limit (dBµV/m) = 20*log (µV/m)

Margin:

This is the margin of compliance below the FCC limit. The units are given in dB. A negative margin indicates the emission was below the limit. A positive margin indicates that the emission exceeds the limit.

Example only:

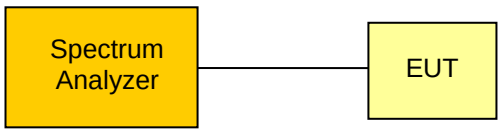
Reading	+	AF	=	Net Reading	:	Net reading - FCC limit	= Margin
21.5 dBµV	+	26 dB	=	47.5 dBµV/m	:	47.5 dBµV/m - 57.0 dBµV/m	= -9.5 dB

2 Result Summary

FCC 47 CFR Part 15C, ISED RSS-210				
Product Specific Standard Section	**Requirement – Test**	**Reference Method**	**Result**	**Remarks**
RSS-Gen 6.6	Occupied Bandwidth	RSS-Gen 6.6	N/R	Informational only
FCC 15.209 ISED RSS-210 4.3, 4.4	Field strength emissions	ANSI C63.10	PASS	
ISED RSS-210 3.1 ISED RSS-Gen 7.1	Receiver radiated spurious emissions	ANSI C63.10	PASS	
Remarks:				

3 Test Conditions and Results

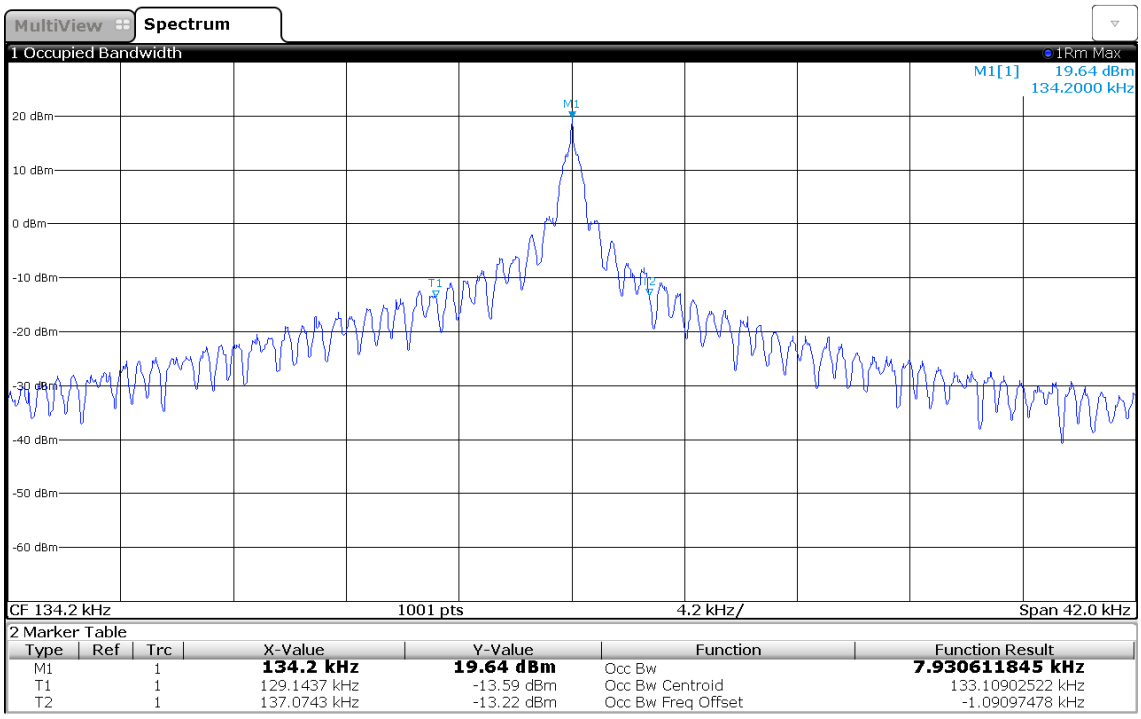
3.1 Test Conditions and Results – Occupied Bandwidth

Occupied Bandwidth acc. to ISED RSS-Gen		**Verdict: PASS**
Test according to measurement reference	Reference Method	
	RSS-Gen 6.6	
Test frequency range	Tested frequencies	
	F_{MID}	
EUT test mode	MOD AC/DC	
Limits		
None (Informational only)		
Test setup		
		
Test procedure		
1. EUT set to test mode (Communication tester is used if needed) 2. Span set to at least twice the emission spectrum 3. Resolution bandwidth set to 1% to 5% of Ocupied Bandwidth 4. Occupied Bandwidth (99 %) measurement with spectrum analyzer built in measurement function		
Test results		
Channel	Frequency [kHz]	Occupied Bandwidth [kHz]
F_{MID}	134.2	7.9
Comments: Measurement is applicable to all variants		

Occupied Bandwidth - F_{MID}

Occupied Bandwidth according to RSS-Gen

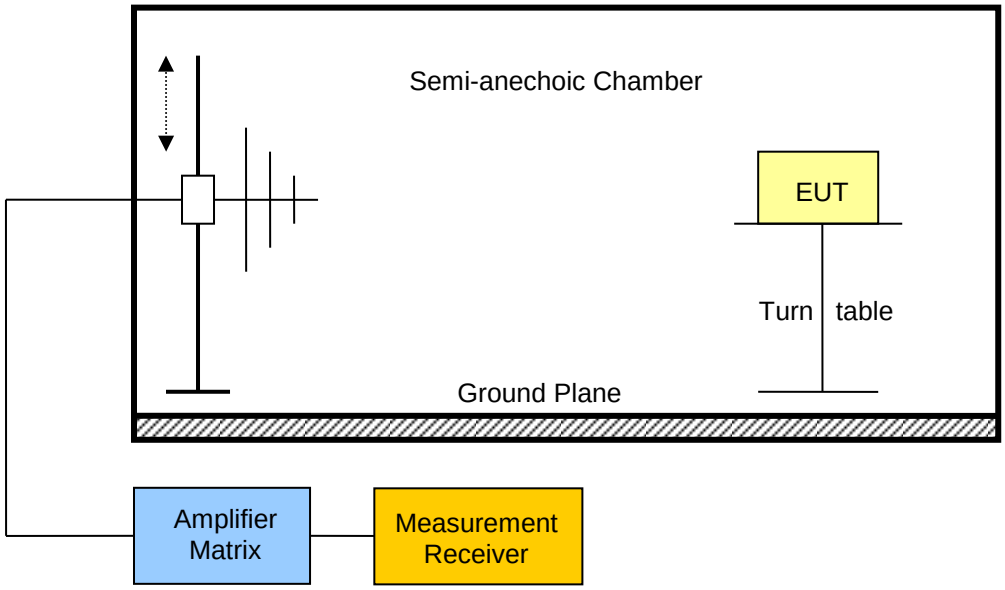
Project Number:	G0M-1611-6094
Applicant	Fabmatics GmbH
Model Description	LF RFID reader
Model:	LF-134-SER-M-V4.0
Test Sample ID:	SN 104-01001
Operator:	T. Jahn
Test Site:	Eurofins Product Service GmbH
Test Date:	2016-12-23



3.2 Test Conditions and Results – Fundamental field strength emissions

Field strength emissions acc. to FCC 47 CFR 15.209 / ISED RSS-210				**Verdict: PASS**
Test according referenced standards		Reference Method		
		FCC 15.209 / ISED RSS-210 4.3, 4.4		
Test according to measurement reference		Reference Method		
		ANSI C63.10		
Test frequency range		Tested frequencies		
		9 kHz – 10th Harmonic		
EUT test mode		MOD AC/DC		
Limits				
Frequency range [MHz]	Detector	Limit [µV/m]	Limit [dBµV/m]	Limit Distance [m]
0.009 – 0.490	Quasi-Peak	2400/F[kHz]	48.5 – 13.8	300
0.490 – 1.705	Quasi-Peak	2400/F[kHz]	13.8 – 1.4	30
1.705 – 30	Quasi-Peak	30	29.5	30
30 – 88	Quasi-Peak	100	40	3
88 – 216	Quasi-Peak	150	43.5	3
216 – 960	Quasi-Peak	200	46	3
960 – 1000	Quasi-Peak	500	54	3
> 1000	Average	500	54	3
The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.				

Test setup



Test procedure

1. EUT set to test mode
2. Span it set according to measurement range
3. Resolution bandwidth below 1 GHz is set according to CISPR 16 with peak/quasi-peak detector and RBW of 1 MHz with peak/average detector is used above 1 GHz
4. Markers are set to maximum emission levels

Test results

Channel	Nominal Frequency [kHz]	Emission [kHz]	Level [dBµV/m]	Detector	Limit [dBµV/m]	Measurement distance [m]*	Margin [dB]
F_{MID}	134.2	133.104	-4	pk	25.1	3	-29.1

Comments: * Physical distance between EUT and measurement antenna.

ANNEX A Transmitter Field Strength Emissions

Spurious emissions according to FCC 15.209

Project number: G0M-1611-6094

Applicant:	Fabmatics GmbH
EUT Name:	RFID Reader
Model:	LF-134-SER-M-V4.0
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Jahn
Test Conditions:	Tnom: 20°C, Vnom: 24VDC
Antenna:	Rohde & Schwarz HFH 2-Z2
Measurement distance:	3 m converted to 300 m
Mode:	TX; Tx
Test Date:	2016-12-22
Note:	LF-134-SER-M-V4.0

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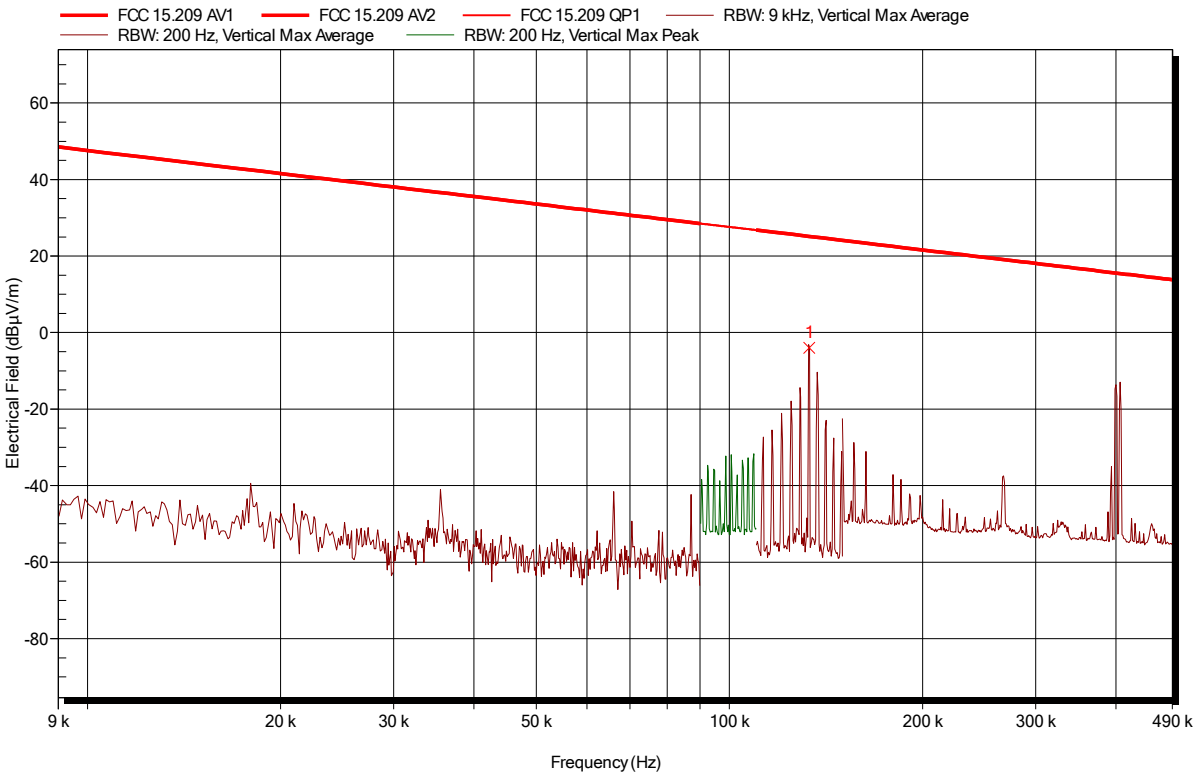

Frequency	Average	Average Limit	Average Difference	Average Status
133.104 kHz	-4 dBµV/m	25.1 dBµV/m	-29.16 dB	Pass

Spurious emissions according to FCC 15.209

Project number: G0M-1611-6094

Applicant:	Fabmatics GmbH
EUT Name:	RFID Reader
Model:	LF-134-SER-M-V4.0
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Jahn
Test Conditions:	Tnom: 20°C, Vnom: 24VDC
Antenna:	Rohde & Schwarz HFH 2-Z2
Measurement distance:	3 m converted to 30 m
Mode:	TX; Tx
Test Date:	2016-12-22
Note:	LF-134-SER-M-V4.0

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