

Gantner Electronic **TEST REPORT**

SCOPE OF WORK

RADIO TESTING FCC – GAT ECO.LOCK 7100 NW F/ISO

REPORT NUMBER

2230758KAU-012

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MODEL: GAT ECO.Lock 7100
TYPE: NW F/ISO
DESCRIPTION: Battery Powered RFID Lock with Bluetooth
SERIAL NO: 1744000002 / 1750040390

All measurement results refer to the equipment which was tested

MANUFACTURER: Gantner Electronic GmbH
CUSTOMER NAME: Gantner Electronic GmbH
ADDRESS (CUSTOMER): Montafonerstrasse 8
AT-6780 SCHRUNS
AUSTRIA

REPORT NO: 2230758KAU-012

TEST RESULT: The equipment complies to 47 CFR Part 15, Subpart C, Intentional radiators, section 15.225 / RSS-210, Issue 9 and RSS-GEN, Issue 4 (Referring to the operating modes specified in this report).

TEST LABORATORY: Intertek Deutschland GmbH
Innovapark 20, 87600 Kaufbeuren
Germany

FCC DESIGNATION NUMBER: DE0014

FCC TEST FIRM REGISTRATION NUMBER. 359260

INDUSTRY CANADA REGISTRATION. 8882A-1; 8882A-2


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Technical Manager EMC/ Radio

REVIEWER: U. Gronert
Senior Project Engineer







Details about Accreditations/Acceptances


EMC / Radio National

	<p>The Intertek Deutschland EMC-Lab is accredited by the Deutsche Akkreditierungsstelle GmbH (DAkKS)</p> <p>Registration Number (EMC general): D-PL-12085-01-01</p> <p>Registration Number (EMC Med): D-PL-12085-01-03</p>
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International

	<p>The Intertek Deutschland EMC-Lab is accepted to participate in the IECEE (IEC Conformity assessment for Electrotechnical Equipment and Components) CB-Scheme</p> <p>CB Test Laboratory: TL118</p>
	<p>The Intertek Deutschland EMC-Lab is listed at the Federal Communications Commission (FCC)</p> <p>Designation Number: DE0014</p> <p>Test Firm Registration Number: 359260</p>
	<p>The <i>Bundesnetzagentur</i> recognizes Intertek Deutschland GmbH as Conformity Assessment Body in the sector electromagnetic compatibility (EMC).</p>
	<p>The Intertek Deutschland EMC-Lab is listed at Industry Canada</p> <p>No. 8882A-1 (OATS) and 8882A-2 (3 m alternative test site)</p>

Automotive

 <p>Anerkennungsstelle</p> <p>Anerkannt unter KBA-P 00046-03</p>	<p>The Intertek Deutschland EMC-Lab is recognized as technical service of the Kraftfahrt-Bundesamt (KBA)</p> <p>Registration Number: KBA-P 00046-03</p>
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SECTION 2

MEASUREMENT AND TEST SPECIFICATION

47 CFR Part 15, Subpart C, Intentional radiators, section 15.225 /
RSS-210, Issue 9 and RSS-GEN, Issue 4

Test methods in:

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

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

The test results detailed in this report apply only to the GAT ECO.Lock 7100 NW F/ISO with the test setup described. Any modification such as a change, addition to or inclusion of another device into this product will require an additional evaluation.

The support equipment listed as part of the emission tests is required to properly exercise and test the device under test.

SECTION 3

GENERAL INFORMATION

Possible test case verdicts:

Test case does not apply to the test object: N/A (Not Applicable)

Test object does meet the requirement: P (Pass)

Test object does not meet the requirements: F (Fail)

Samples arrived: 2017-11-13

Testing: 2018-01-17 to 2018-02-12

Decimal separator: ☒ Point ☐ Comma

Environmental conditions during testing:

Temperature:	15 °C - 35 °C
Humidity:	20 % - 60 %
Atmospheric pressure:	900 mbar - 1000 mbar

If explicitly required by a basic standard the measured climatic conditions are documented in the corresponding test section.

Test sites:

Measurement Chamber	Type of chamber	IC Site filing #
ANECHOIC CHAMBER 1	Semi-anechoic 3 m	8882A-2

SECTION 4

SUMMARY OF TESTING

4.1 General annotation

The tests were performed in the order of the right column in the “Test Results – Overview” table.

4.2 Measurement uncertainty

For each test method, an uncertainty evaluation was carried out. The results of the evaluation can be provided upon request from Intertek Deutschland GmbH.

4.3 Document History

REVISION	DATE	REPORT	CHANGES	AUTHOR
Initial release	2018-02-09	2230758KAU-012	Initial issue	RDR

SECTION 5

TEST RESULTS – OVERVIEW

EMISSION	VERDICT	DATE	NO
Field strength (13.110 MHz – 14.010 MHz)	P	2018-01-17	3
Radiated emissions (< 30 MHz)	P	2018-01-17	2
Radiated emissions (30 MHz - 1 GHz)	P	2018-01-17	1
Frequency Stability Test	P	2018-02-05	4
Occupied bandwidth test	P	2018-02-12	5

Omission of tests:

Conducted emissions is not applicable, because the EUT is battery operated.

SECTION 6

INFORMATION ABOUT THE EUT

6.1 Description of the EUT

<input checked="" type="checkbox"/> table-top EUT		<input type="checkbox"/> floor-standing EUT	
Dimensions:	Height:	Width:	Length:
	109 mm	109 mm	33 mm
Software version:	A special test firmware was written for the EMC/Radio tests, to have a continuous transmission with a 100 ms interval. In reality the RFID and Bluetooth modules are just transmitting, when the lock button is pushed. They are never transmitting at the same time.		
Product version:	4.2		
<p>Description: With the GAT ECO.Lock 7xxx (NW) F/ISO, lockers and depot boxes can be electronically locked and unlocked. The user simply presses the lock button in using their data carrier while the locker door is closed. This action activates the lock electronics and the authorization of the user's data carrier is checked. If the authorization is valid, the locker door is locked or unlocked by the GAT ECO.Lock 7xxx F/ISO accordingly.</p> <p>System users are identified at the lock using contactless RFID data carriers (Radio Frequency Identification).</p>			
Transmitter frequency range: 13.56 MHz			
Frequency agile or hopping:	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	
Antenna:	<input checked="" type="checkbox"/> Internal antenna	<input type="checkbox"/> External antenna	
Antenna connector:	<input checked="" type="checkbox"/> None, internal antenna	<input type="checkbox"/> Yes, type	
Type of modulation:			
Type of used TAG:			
EUT - Temperature range:	Type 7100:	0°C to +60°C	
	Type 7150 (PCB with lacquer):	-25°C to +60°C	
Transmitter stand by mode supported:	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	

6.1.1 Photo/ Sketch of the rating plate



6.2 Power interface

MODE	VOLTAGE (V)	FREQUENCY (Hz)	COMMENT
1	3x 1.5 V	DC	Battery, Mignon AA

Power sources/associated test equipment

DEVICE	MANUFACTURER	TYPE	SN	ASSET NO.
Alkaline Battery	Duracell	AA, Industrial	-	-

6.3 Configuration mode

MODE	DESCRIPTION
1	A tag card was placed in front of the RFID reader

6.4 Operation mode

MODE	DESCRIPTION
1	The transmit interval was 100 ms, the measurement time was set to 150 ms

6.5 Peripheral devices used for testing

DEVICE	MANUFACTURER	TYPE	SN	FCC ID
GAT Testcard	Gantner	Mifare	999999999	-

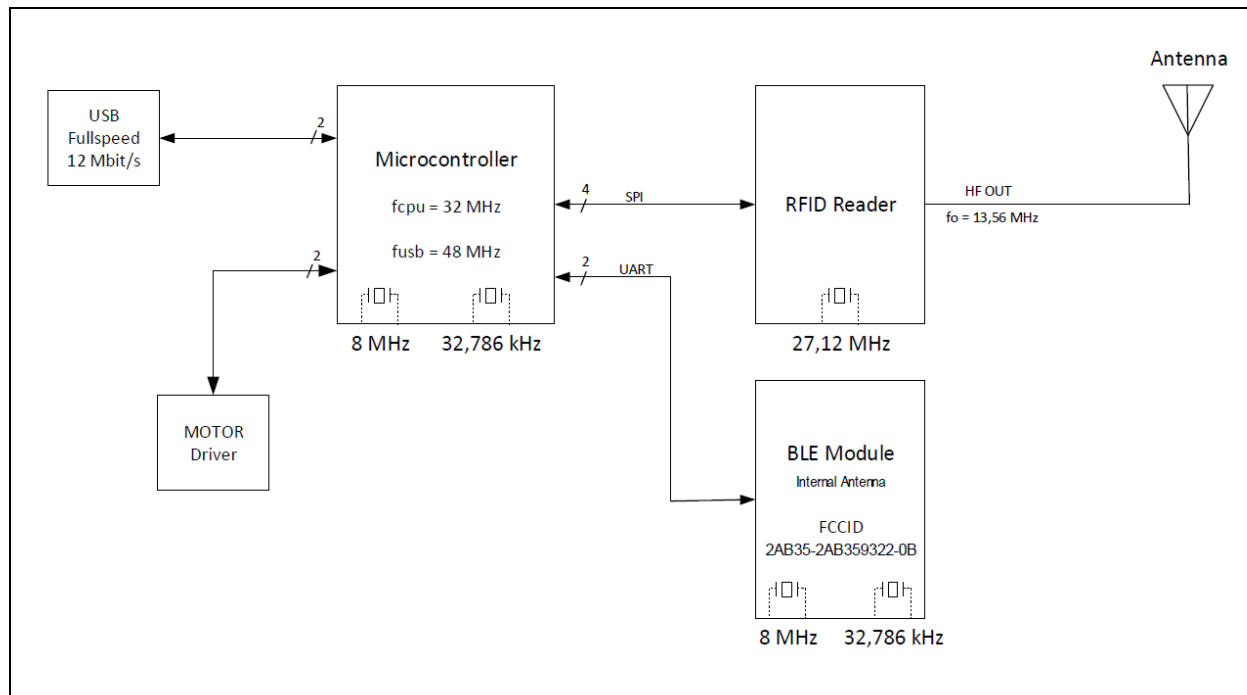
6.6 Supply and interconnecting cables used for testing

LINE	LENGTH (cm)	SHIELDING
none		

6.7 Clock frequencies of the EUT

SOURCE	FREQUENCY ()
see next page	

6.8 Block diagram of the EUT



SECTION 7

7.1 Field strength 13.110 MHz – 14.010 MHz (Emission Mask)

NORMATIVE REFERENCES			RESULT
Limits according to:	FCC §15.225 (a) – (c) RSS-210, Issue 9, section B4		P
Methods of measurement according to:	ANSI C63.10, section 6.3, 6.4 RSS-Gen 6.13, 8.9		
Equipment mode	Power interface	1	
	EUT configuration mode	1	
	Operation mode	1	
Test requirements	Frequency range	13.110 MHz – 14.010 MHz	
	Measurement time	150 ms	
	Class	B	
	Antenna height	1 m	

Limits

The limits below 30 MHz are given for different measurement distances. The limits below 30 MHz are converted to 3 m by using the extrapolation factor 40 dB/decade (according to §15.31).

Frequency (MHz)	Field strength (µV/m)	Field strength (dBµV/m)	Measurement distance (m)	Field strength (dBµV/m)	Measurement distance (m)
13.110 - 13.410	106	40.5	30	80.5	3
13.410 - 13.553	334	50.5	30	90.5	3
13.553 - 13.567	15848	84.0	30	124.0	3
13.567 - 13.710	334	50.5	30	90.5	3
13.710 - 14.010	106	40.5	30	80.5	3

Test setup details

Compliance with the spectrum mask is tested using a spectrum analyzer with resolution bandwidth set to 10 kHz or 9 kHz CISPR. The video bandwidth shall be at least three times greater than the resolution bandwidth.

The test was carried out automatically by the test receiver.

The EUT is a table-top EUT and was standing on a table made of Styrodur with a Pertinax plate on top and the dimensions 1.6 m x 1.0 m x 0.8 m (Length x Width x Height).

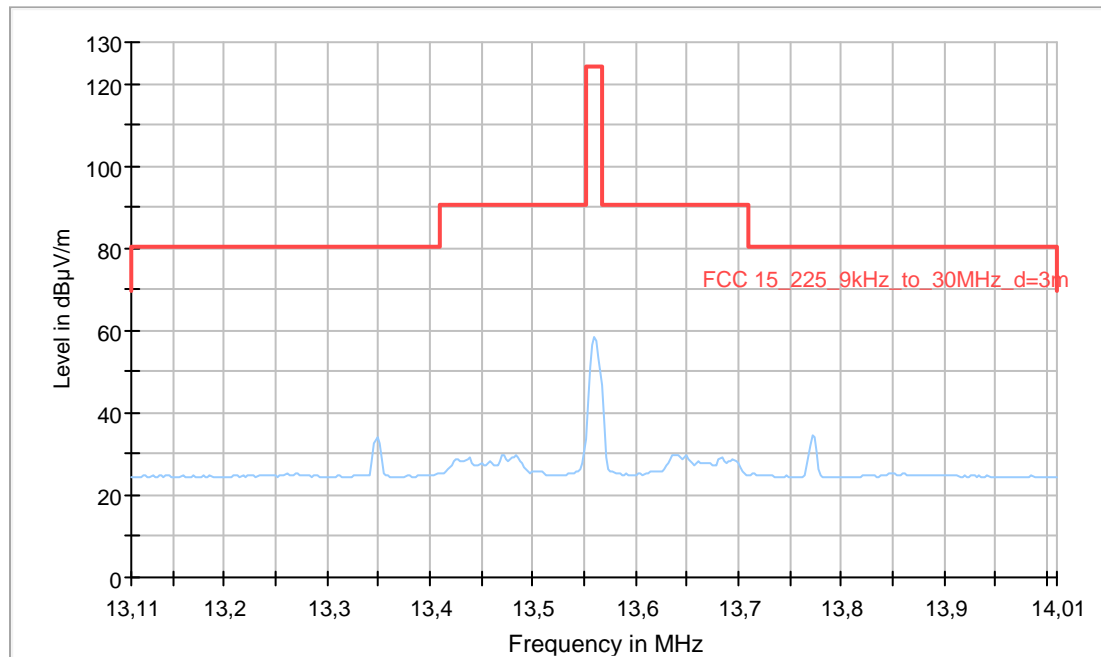
The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector.

Test equipment

DESCRIPTION	MANUFACTURER	TYPE	SN	ASSET NO.	CALIBRATION
Semi-Anechoic chamber	Siepel	REF W460SLB	-	PM KF 1150-01	2016-12 (3 years)
Turntable	Inn-Co	-	-	PM KF 2949-04	-
Receiver 10 Hz - 7 GHz	Rohde & Schwarz	ESR7	101095	PM KF 2441	2017-10 (1 year)
Loop antenna 9 kHz- 30 MHz	Rohde & Schwarz	HFH2-Z2	881058/48	PM KF 1401	2017-10 (2 years)
Test software	Rohde & Schwarz	EMC 32 V.10.01.00	-	PM KF 2983-2	-

Measurement results – Field strength 13.110 MHz – 14.010 MHz (Emission Mask):

EUT: GAT ECO Lock 7100 NW F/ISO
Test Verdict: pass
Test Description: Radiated emissions, FCC, Part 15.225 / RSS-210, RSS-Gen
Operating Conditions: pulse mode with tag card
Operator Name: RDR
Project Number: 30758
Date: 2018-01-17
Comment: SNr.: 1744000002



Preview Result 2-AVG [Preview Result 2.Result:2]
Preview Result 1-QPK [Preview Result 1.Result:1]
* Critical_Freqs AVG [Critical_Freqs.Result:5]
* Critical_Freqs QPK [Critical_Freqs.Result:4]
FCC 15_225_9kHz_to_30MHz_d=3m [.\zF radiated\FCC Part 15C]
◆ Final_Result QPK [Final_Result.Result:4]
◆ Final_Result AVG [Final_Result.Result:5]

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)
13.56	59	124	65	1000	9

EMI Auto Test Template: zf-FCC-RE-R12-AN23

Hardware Setup: EN-RE-R12-AN23
Measurement Type: Open-Area-Test-Site
Frequency Range: 13,11 MHz - 14,01 MHz
Graphics Level Range: 0 dB μ V/m - 130 dB μ V/m

Preview Measurements:
Antenna height: 0 - 1000 cm , Step Size = 0 cm , Positioning Speed = 1
Polarization: H + V
Turntable position: 0 - 352 deg , Step Size = 22 deg , Positioning Speed = 8
Scan Test Template: zF-FCC-RE-R12-AN23_PRE

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
Receiver: [ESR 7]					
9 kHz - 90 kHz	50 Hz	AVG	200 Hz	1 s	0 dB
90 kHz - 110 kHz	50 Hz	QPK	200 Hz	1 s	0 dB
110 kHz - 150 kHz	50 Hz	AVG	200 Hz	1 s	0 dB
150 kHz - 490 kHz	2,25 kHz	AVG	9 kHz	1 s	0 dB
490 kHz - 30 MHz	2,25 kHz	QPK	9 kHz	1 s	0 dB

7.2 Radiated emissions < 30 MHz

NORMATIVE REFERENCES			RESULT
Limits according to:	FCC §15.225 (d), §15.209 RSS-210, Issue 9, section B4		P
Methods of measurement according to:	ANSI C63.10, section 6.3, 6.4 RSS-Gen 6.13, 8.9		
Equipment mode	Power interface	1	
	EUT configuration mode	1	
	Operation mode	1	
Test requirements	Frequency range	9 kHz - 30 MHz	
	Class	B	
	Antenna height	1 m	

Limits

The limits below 30 MHz are given for different measurement distances. The limits below 30 MHz are converted to 3 m by using the extrapolation factor 40 dB/decade (according to §15.31).

Frequency (MHz)	Field strength (μV/m)	Field strength (dBμV/m)	Measurement distance (m)
0.009 - 0.490	2400/F(kHz)	67.6 - 20 · log(F(kHz))	300
0.490 - 1.705	24000/F(kHz)	87.6 - 20 · log(F(kHz))	30
1.705 - 13.110	30	29.5	30
14.010 - 30.000	30	29.5	30
Additionally, the level of any unwanted emissions shall not exceed the level of the fundamental emission.			

Test setup details

Compliance with the spectrum mask is tested using a spectrum analyzer with resolution bandwidth set to 10 kHz or 9 kHz CISPR. The video bandwidth shall be at least three times greater than the resolution bandwidth.

The test was carried out automatically by the test receiver.

The EUT is a table-top EUT and was standing on a table made of Styrodur with a Pertinax plate on top and the dimensions 1.6 m x 1.0 m x 0.8 m (Length x Width x Height).

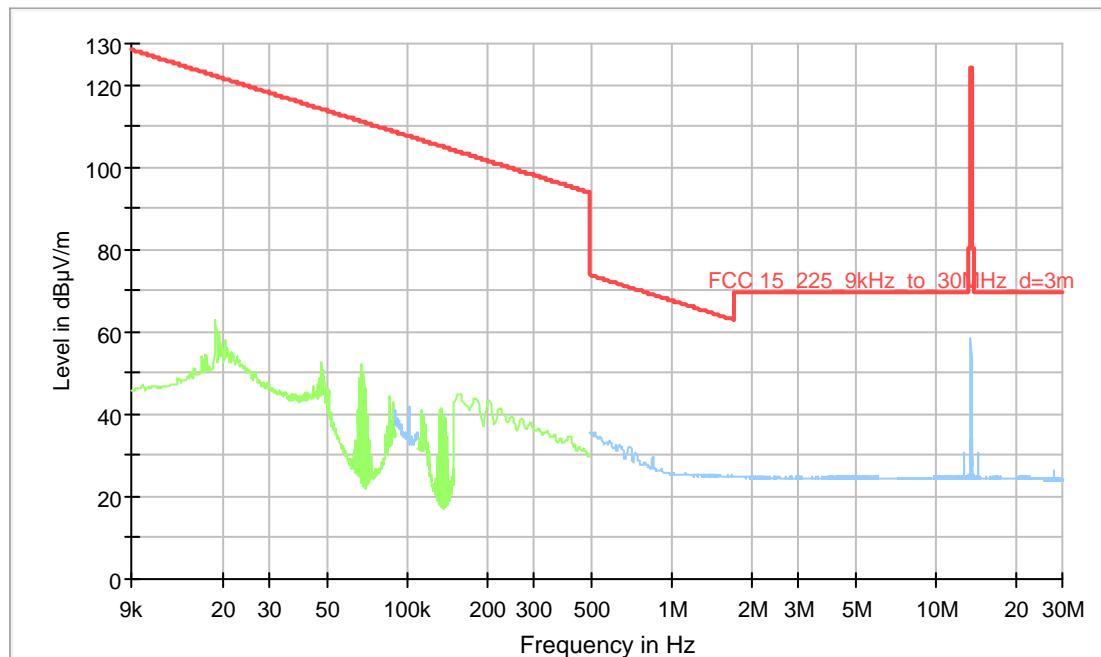
The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

Test equipment

DESCRIPTION	MANUFACTURER	TYPE	SN	ASSET NO.	CALIBRATION
Semi-Anechoic chamber	Siepel	REF W460SLB	-	PM KF 1150-01	2016-12 (3 years)
Turntable	Inn-Co	-	-	PM KF 2949-04	-
Receiver 10 Hz - 7 GHz	Rohde & Schwarz	ESR7	101095	PM KF 2441	2017-10 (1 year)
Loop antenna 9 kHz- 30 MHz	Rohde & Schwarz	HFH2-Z2	881058/48	PM KF 1401	2017-10 (2 years)
Test software	Rohde & Schwarz	EMC 32 V.10.01.00	-	PM KF 2983-2	-

Measurement results – Radiated emissions < 30 MHz:

EUT:	GAT ECO Lock 7100 NW F/ISO
Test Verdict:	pass
Test Description:	Radiated emissions, FCC, Part 15.225 / RSS-210, RSS-Gen
Operating Conditions:	pulse mode with tag card
Operator Name:	RDR
Project Number:	30758
Date:	2018-01-17
Comment:	SNr.: 1744000002



- Preview Result 2-AVG [Preview Result 2.Result:2]
- Preview Result 1-QPK [Preview Result 1.Result:1]
- * Critical_Freqs AVG [Critical_Freqs.Result:5]
- * Critical_Freqs QPK [Critical_Freqs.Result:4]
- FCC 15_225_9kHz_to_30MHz_d=3m [..\\zF radiated\\FCC Part 15C\\]
- ◆ Final_Result QPK [Final_Result.Result:4]
- ◆ Final_Result AVG [Final_Result.Result:5]

EMI Auto Test Template: zf-FCC-RE-R12-AN23

Hardware Setup: EN-RE-R12-AN23
Measurement Type: Open-Area-Test-Site
Frequency Range: 9 kHz - 30 MHz
Graphics Level Range: 0 dBµV/m - 130 dBµV/m

Preview Measurements:

Antenna height: 0 - 1000 cm , Step Size = 0 cm , Positioning Speed = 1
Polarization: H + V
Turntable position: 0 - 352 deg , Step Size = 22 deg , Positioning Speed = 8
Scan Test Template: zF-FCC-RE-R12-AN23_PRE

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
Receiver: [ESR 7]					
9 kHz - 90 kHz	50 Hz	AVG	200 Hz	1 s	0 dB
90 kHz - 110 kHz	50 Hz	QPK	200 Hz	1 s	0 dB
110 kHz - 150 kHz	50 Hz	AVG	200 Hz	1 s	0 dB
150 kHz - 490 kHz	2,25 kHz	AVG	9 kHz	1 s	0 dB
490 kHz - 30 MHz	2,25 kHz	QPK	9 kHz	1 s	0 dB

7.3 Radiated emissions 30 MHz to 1 GHz

NORMATIVE REFERENCES			RESULT
Limits according to:	FCC §15.225 (d), §15.209 RSS-210, Issue 9, section B4		P
Methods of measurement according to:	ANSI C63.10, section 6.3, 6.5 RSS-Gen 6.13, 8.9		
Equipment mode	Power interface	1	
	EUT configuration mode	1	
	Operation mode	1	
Test requirements	Frequency range	150 kHz - 30 MHz	
	Class	B	
	Antenna height	1 m	

Limits

Frequency (MHz)	Field strength (μV/m)	Field strength (dBμV/m)	Measurement distance (m)
30 – 88	100	40.0	3
88 – 216	150	43.5	3
216 – 960	200	46.0	3
Above 960	500	54.0	3

Test setup details

The EUT is a table-top EUT and was standing on a table made of Styrodur with a Pertinax plate on top and the dimensions 1.6 m x 1.0 m x 0.8 m (Length x Width x Height).

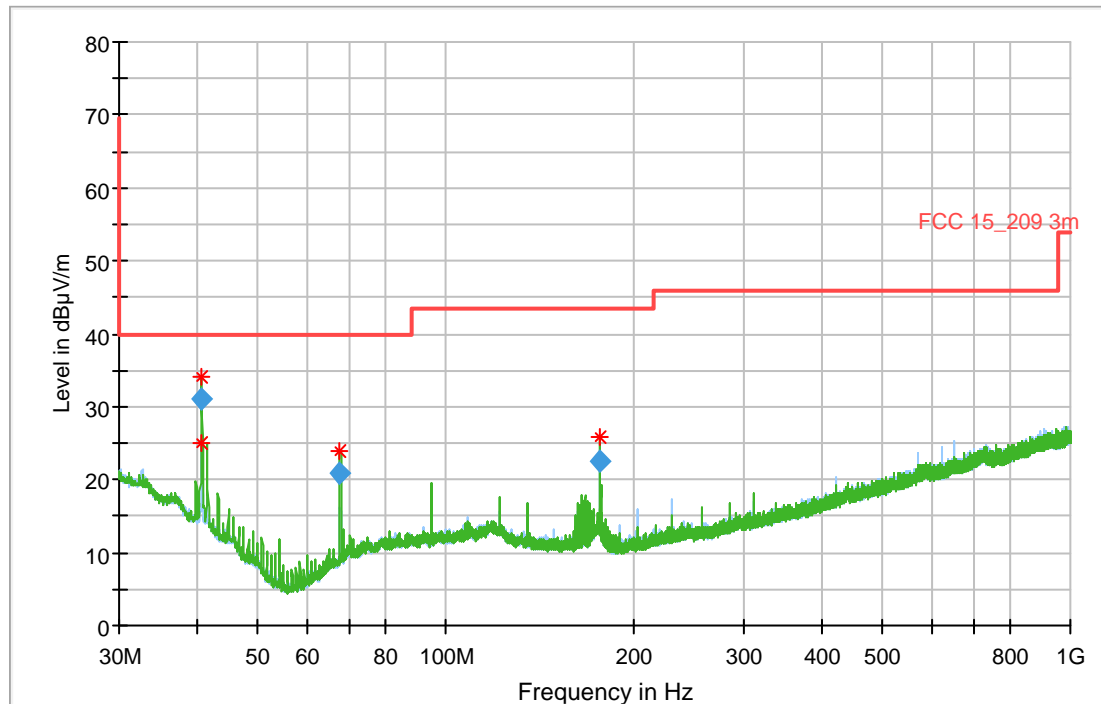
Overview sweeps performed with peak detectors and final measurement with quasi-peak detectors. The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector.

Test equipment

DESCRIPTION	MANUFACTURER	TYPE	SN	ASSET NO.	CALIBRATION
Semi-Anechoic chamber	Siepel	REF W460SLB	-	PM KF 1150-01	2016-12 (3 years)
Turntable	Inn-Co	-	-	PM KF 2949-04	-
Receiver 10 Hz - 7 GHz	Rohde & Schwarz	ESR7	101095	PM KF 2441	2017-10 (1 year)
Antenna 30 MHz - 3GHz	Rohde & Schwarz	HL 562	100354	PM KF 1123	2016-02 (2 years)
Test software	Rohde & Schwarz	EMC 32 V.10.01.00	-	PM KF 2983-2	-

Measurement results – Radiated emissions 30 MHz to 1 GHz:

EUT:	GAT ECO Lock 7100 NW F/ISO
Test Verdict:	pass
Test Description:	Radiated emissions, FCC, Part 15.209 / RSS-210, RSS-Gen
Operating Conditions:	pulse mode with tag card
Operator Name:	RDR
Project Number:	30758
Date:	2018-01-17
Comment:	SNr.: 1744000002



— Preview Result 1H-PK+ [Preview Result 1H.Result:2]
 — Preview Result 1V-PK+ [Preview Result 1V.Result:2]
 * Critical_Freqs PK+ [Critical_Freqs.Result:4]
 — FCC 15_209 3m [..\EMI radiated\FCC Part 15C\
 ◆ Final_Result QPK [Final_Result.Result:4]

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
40.680000	31.09	40.00	8.91	1000.0	120.000	99.0	V	78.0	14.4
67.800000	20.94	40.00	19.06	1000.0	120.000	138.0	V	81.0	9.1
176.280000	22.68	43.52	20.84	1000.0	120.000	101.0	V	64.0	12.6

EMI Auto Test Template: FCC-RE-R12-AN08

Hardware Setup: EN-RE-R12-AN08
Measurement Type: Open-Area-Test-Site
Frequency Range: 30 MHz - 1 GHz
Graphics Level Range: 0 dB μ V/m - 80 dB μ V/m

Preview Measurements:
Antenna height: 100 - 355 cm , Step Size = 85 cm , Positioning Speed = 8
Polarization: H + V
Turntable position: 0 - 352 deg , Step Size = 22 deg , Positioning Speed = 8
Graphics Display: Show separate traces for horizontal and vertical polarization
Scan Test Template: EN-RE-R12-AN08_PRE

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
Receiver: [ESR 7]					
30 MHz - 1 GHz	30 kHz	PK+	120 kHz	0,15 s	20 dB
1 GHz - 3 GHz	250 kHz	PK+	1 MHz	0,1 s	20 dB

Frequency Zoom:
Zoom Scan Template: EN-RE-R12-AN08_ZOOM

Adjustment:
Antenna height: Range = 90 cm , Measuring Speed = 3
Turntable position: Range = 30 deg , Measuring Speed = 3
Template for Single Meas.: EN-RE-R12-AN08_MAX

Final Measurements:
Template for Single Meas.: EN-RE-R12-AN08_FIN

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
Receiver: [ESR 7]					
30 MHz - 1 GHz	40 kHz	QPK	120 kHz	1 s	20 dB
1 GHz - 3 GHz	40 kHz	QPK	1 MHz	1 s	20 dB

7.4 Frequency stability measurement

NORMATIVE REFERENCES			RESULT
Limits according to:	FCC §15.225 (e) RSS-210, Issue 9, section B6 RSS-Gen Issue 4, section 6.11		P
Methods of measurement according to:	ANSI C63.10, section 9.14		
Equipment mode	Power interface	1	
	EUT configuration mode	1	
	Operation mode	1	

Limits

Limit:	The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ (± 100 ppm) of the carrier frequency under nominal conditions.
Temperature range:	-30°C to 60°C
Voltage range:	Each of the three batteries was reduced from 1.5 V DC to 1.275 V DC by a power supply.

Test equipment

DESCRIPTION	MANUFACTURER	TYPE	SN	ASSET NO.	CALIBRATION
Temperature chamber	Heraeus-Vötsch	HT4010	45021	PM KF 1402	2017-02 (1 year)
Spectrum analyser	Rohde & Schwarz	FSH8	102048	PM KF 1575	2017-09 (2 years)
Loop antenna	Rohde & Schwarz	HZ-10	100055	PM KF 0965	2017-04 (3 years)

Measurement results – Frequency stability measurement:

Temperature °C	Carrier MHz	Upper limit: 13.696 MHz
		Lower limit: 13.424 MHz
		Measured value under temperature influence:
60	13.56	13.561
50	13.56	13.561
20	13.56	13.561
0	13.56	13.561
-20	13.56	13.561
-25	13.56	13.561
-30	13.56	13.561

Comment

The DC voltage reduction from 1.5 V to 1.275 V per battery at a temperature of 20°C had no influence on the frequency of the carrier, but the level of the carrier was reduced for 0.469 dB.

7.5 Occupied bandwidth

NORMATIVE REFERENCES			RESULT
Limits according to:	RSS-Gen, Issue 4, 6.6		P
Methods of measurement according to:	RSS-Gen, Issue 4, 6.6		
Equipment mode	Power interface	1	
	EUT configuration mode	1	
	Operation mode	1	

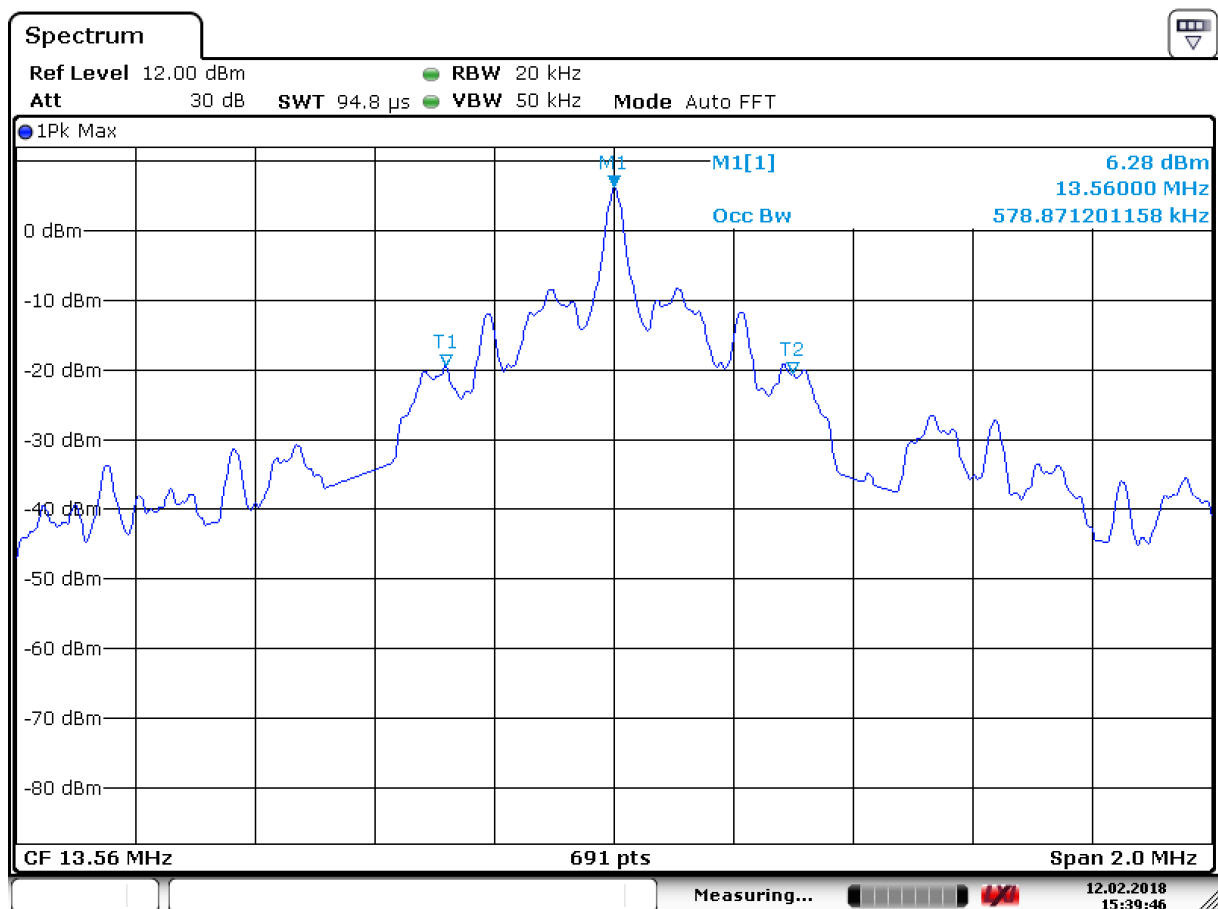
Test equipment

DESCRIPTION	MANUFACTURER	TYPE	SN	ASSET NO.	CALIBRATION
Spectrum analyser	Rohde & Schwarz	FSV40	837356/012	PM KF 2783	2017-09 (1 year)
Near field probes	EMCO	EMCO 7405	1405	PM KF 0139	2017-12 (1 year)

Comment

The 99% occupied bandwidth is 578.87 kHz.

Measurement results – 99% occupied bandwidth:



Date: 12.FEB.2018 15:39:47

End of test report