

Gantner Electronic GmbH

TEST REPORT

SCOPE OF WORK

RADIO TESTING – GAT NET.Controller S 7020 F/ISO

REPORT NUMBER

2236259KAU-001

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DOCUMENT CONTROL NUMBER

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TYPE: GAT NET.Controller S 7020 F/ISO
DESCRIPTION: SUB-Control unit for electronic locker locks
SERIAL NO: 1848000002 (without Smart Card Adaptor: GAT-RM620)

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
Österreich

REPORT NO: 2236259KAU-001

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 5 (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

ISED CAB IDENTIFIER: DE0014

ISED #: 24854

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Details about Accreditations/Acceptances

EMC / Radio National

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

	The Intertek Deutschland EMC-Lab is accepted to participate in the IECEE (IEC Conformity assessment for Electrotechnical Equipment and Components) CB-Scheme CB Test Laboratory: TL118
	The Intertek Deutschland EMC-Lab is accredited for the Federal Communications Commission (FCC) Designation Number: DE0014 Test Firm Registration Number: 359260
	The <i>Bundesnetzagentur</i> recognizes Intertek Deutschland GmbH as Conformity Assessment Body in the sector electromagnetic compatibility (EMC).
	The Intertek Deutschland EMC-Lab is accredited for Innovation, Science and Economic Development Canada (ISED) ISED CAB IDENTIFIER: DE0014 ISED #: 24854

Automotive

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

MEASUREMENT AND TEST SPECIFICATION

47 CFR Part 15, Subpart C, Intentional radiators, section 15.207 and section 15.225 /
RSS-210, Issue 9 and RSS-GEN, Issue 5

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 NET.Controller S 7020 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: 2019-04-18

Testing: 2019-04-18 to 2019-06-04

Decimal separator: ☒ Point ☐ Comma

	Temperature:	15 °C - 35 °C
	Humidity:	20 % - 60 %
	Atmospheric pressure:	900 mbar - 1000 mbar
Environmental conditions during testing:	If explicitly required by a basic standard the measured climatic conditions are documented in the corresponding test section.	

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.

At least at one emission test the margin to the limit is less than 3 dB. A minimum margin of 3 - 6 dB is recommended for a serial production.

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 Identical types

The manufacturer/customer declared the following type identical to the tested type:

The GAT NET.Controller S 7020 F/ISO Light is the “light” version of the GAT NET.Controller S 7020 F/ISO. Only 12 locks can be connected to the light version.

4.4 Document History

REVISION	DATE	REPORT	CHANGES	AUTHOR
Initial release	2019-06-06	2236259KAU-001	Initial issue	RDR

SECTION 5

TEST RESULTS – OVERVIEW

EMISSION	REQUESTED	VERDICT	DATE	NO
Conducted emissions (AC power-line, 0.15 MHz - 30 MHz)	see 7.1	P	2019-05-13	4
Field strength (13.110 MHz – 14.010 MHz)	see 7.2	P	2019-05-08	2
Radiated emissions (< 30 MHz)	see 7.3	P	2019-05-08	3
Radiated emissions (30 MHz - 1 GHz)	see 7.4	P	2019-04-18 2019-04-30 2019-05-06	1
Frequency Stability Test	see 7.5	P	2019-05-23	5
Occupied bandwidth test	see 7.6	P	2019-06-04	6

SECTION 6

INFORMATION ABOUT THE EUT

6.1 Description of the EUT

☒ table-top EUT		☐ floor-standing EUT	
Dimensions:	Height:	Width:	Length:
	42 mm	133 mm	310 mm
Hardware version:	Locks: 3.0	Master Controller: 1.0	SUB Controller F/ISO: 1.5

Description: The GAT NET.Controller S 7020 F/ISO (sub controller) unit is used to connect and control GANTNER's latest generation of innovative electronic locker locks - the GAT NET.Lock 7020. The controllers can operate in online or standalone mode. In online mode, the controllers communicate with a host PC/server. The master controller serves as the communication bridge between the host PC/server and the sub controllers. In standalone mode, a master controller is not needed; the sub controller and connected locks operate autonomously according to their configuration.

The GAT NET.Controller S 7020 F_ISO Light is the "light" version of the GAT NET.Controller S 7020 F/ISO. Only 12 locks can be connected to the light version.

Transmitter frequency 13.56 MHz range:

Frequency agile or hopping:	☐ Yes	☒ No
Antenna:	☒ Internal antenna	☐ External antenna
Antenna connector:	☒ None	☐ Yes, type
Type of modulation:		
Type of used TAG:	GAT Chip Card 210 ISO (Test Card ISO)	
Temperature range:	☒ FCC requirement: -20°C to +50°C ☒ Customers specification of EUT: 0°C to +60°C ☒ Testing range: -20°C to +60°C	

6.1.1 Photo of the rating plate





Gantner Electronic GmbH, 6780 Schruns / Austria	
Model: GAT NET.Controller S 7020 F/ISO	
U (in):	24 VDC
I (in):	4,17 A max.
IC:	11873A-1190143A
FCC ID:	NC4-GEA1190143A
SN: 1848000002	AN: 1100388

Without the internal Smart Card Adaptor: GAT-RM620 it is a GAT NET.Controller S 7020 F/ISO

6.2 Power interface

MODE	VOLTAGE (V)	FREQUENCY (Hz)	COMMENT
1	120	60	Power supply: Dongguan Dongsong Electronic
2	120	60	Power supply: Adapter Tech.

Power sources/associated test equipment

DEVICE	MANUFACTURER	TYPE	SN	ASSET NO.
4 quadrant amplifier	Spitzenberger & Spies	PAS 5000	826149/005	PM KF 2555
Power supply	Dongguan Dongsong Electronic	DYS404-240166W	-	-
Power supply	Adapter Tech.	ATS090-P240	-	-

6.3 Configuration mode

MODE	DESCRIPTION
1	Three locks were connected to the sub controller unit (sockets: 1, 12, 24)
2	One lock was connected to the controller
3	One lock (GAT NET.Lock 7020 USB P) was connected to the controller

6.4 Operation mode

MODE	DESCRIPTION
	General: Pulse transmission with an interval of 250 ms. In 250 ms each lock was transmitting after each other first with 13.56 MHz and secondly with 125 kHz (at the lock versions with "P"). The locks are closed and locked. With a different card (other card number)

it was tried to open the lock continuously with the card placed in front of the lock.
This way the RFID part is transmitting continuously.

- 1 Pulse transmission (normal mode) with an interval of 250ms; 13.56 MHz Card
- 2 Pulse transmission (normal mode) with an interval of 250ms; Dummy load in lieu of the antenna
- 3 Pulse transmission (normal mode) with an interval of 250ms

6.5 Peripheral devices used for testing

See power supplies under 6.2

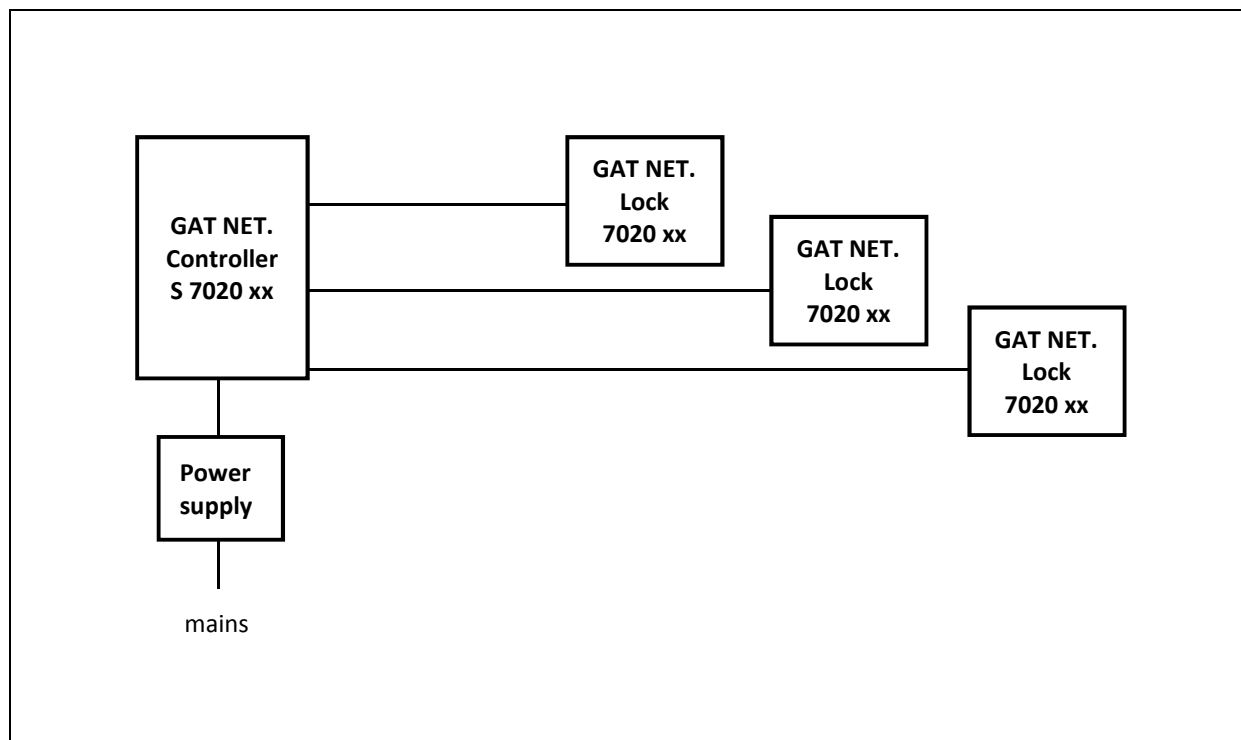
6.6 Supply and interconnecting cables used for testing

LINE	LENGTH (cm)	SHIELDING
Cable between controller and lock	500	Y
Cable between power supply (Type: ATS090-P240) and controller	100	N
Cable between power supply (Type: DYS404-240166W) and controller	35	N
Mains cable	150	N

6.7 Clock frequencies of the EUT

SOURCE	FREQUENCY (MHz)
Processor	24

6.8 Block diagram of the test setup at the radio tests



SECTION 7

CONFORMANCE REQUIREMENTS

7.1 Conducted emissions

NORMATIVE REFERENCES			RESULT
Limits according to:	FCC §15.207 RSS-Gen, Section 8.8		P
Methods of measurement according to:	ANSI C63.4		
Equipment mode	Power interface	1	
	EUT configuration mode	2	
	Operation mode	1, 2	
Test requirements	Frequency range	150 kHz - 30 MHz	

Test equipment

DESCRIPTION	MANUFACTURER	TYPE	SN	ASSET NO.	CALIBRATION
Shielded cabin	ETS LINDGREN	RFSD 100	3598	PM KF 2955-2	-
Pulse Limiter 10 dB 9 kHz - 200 MHz	Schwarzbeck	VTSD 9561-F N	9561-F N242	PM KF 3059	2019-01 (1 year)
Receiver 9 kHz - 7 GHz	Rohde & Schwarz	ESR7	101095	PM KF 2441	2018-10 (1 year)
V-Artificial mains- network, 2 Line	Rohde & Schwarz	ESH3-Z5	863367/018	PM KF 0142	2017-10 (2 years)
RF-Cable	Schwarzbeck	AK 9513	95956	PM-KF-2056	2018-10 (2 years)
RF-Cable	Schwarzbeck	RG 58 C/U	-	PM-KF-1103	2018-07 (2 years)
Test software	Rohde & Schwarz	EMC 32 V.8.54	-	PM KF 2983	-

Comment

The conducted emission tests were performed in all different lock combinations according to the table in section 8 with the hereon following measurement diagrams (8.2 and 8.3).

In the conducted emission diagrams, the N and L line are merged.

According to KDB 174176 D01 the conducted emission tests were done in two modes:

1. within the transmitter's fundamental emission band with a dummy load in lieu of the antenna (according to the e-mail of 2019-05-06) and 2. outside the transmitter's fundamental emission band.

The two additional controller were added to terminate the interfaces of the EUT for the EMC tests according to FCC, Part 15 B and is described in detail in the appropriate EMC test report.

7.2 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 B6		P
Methods of measurement according to:	ANSI C63.10, section 6.3, 6.4 RSS-Gen 6.13, 8.9		
Equipment mode	Power interface	2	
	EUT configuration mode	1	
	Operation mode	1	
Test requirements	Frequency range	13.110 MHz – 14.010 MHz	
	Measurement time	1 s	
	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	-
Tower	Inn-Co	MA4484-XPET	-	PM KF 2949-03	-
Controller	Inn-Co	CO 3000	4970815	PM KF 2949	-
Receiver 9 kHz- 7 GHz	Rohde & Schwarz	ESR7	101757	PM KF 3371	2019-04 (1 year)
Loop antenna 9 kHz- 30 MHz	Rohde & Schwarz	HFH2-Z2	881058/48	PM KF 1401	2017-10 (2 years)
RF-cable	Rohde & Schwarz	HFU2-Z5	11673862	PM KF 1646	2018-12 (1 year)
DC power supply for HFH2-Z2	Rohde & Schwarz	HZ-9	101865	PM KF 3455	-
RF-cable Kabel Micro-Coax UTIFLEX	Rosenberger	LA3-020-5500	010-1788635	PM-KF-3187	2018-06 (1 years)
RF-cable Kabel Micro-Coax UTIFLEX	Rosenberger	LA2-001-7200	010-1786350	PM-KF-3188	2019-03 (1 years)
Test software	Rohde & Schwarz	EMC 32 V.10.01.00	-	PM KF 2983-2	-

Comment

The field strength tests were performed in all different lock combinations according to the table in section 8 with the hereon following measurement diagrams (8.4).

For photos of the test setup see section 7.3 of this test report.

7.3 Radiated emissions < 30 MHz

NORMATIVE REFERENCES		RESULT
Limits according to:	FCC §15.225 (d), §15.209 RSS-210, Issue 9, section B6	P
Methods of measurement according to:	ANSI C63.10, section 6.3, 6.4 RSS-Gen 6.13, 8.9	
Equipment mode	Power interface	2
	EUT configuration mode	1
	Operation mode	1
Test requirements	Frequency range	9 kHz - 30 MHz
	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	-
Tower	Inn-Co	MA4484-XPET	-	PM KF 2949-03	-
Controller	Inn-Co	CO 3000	4970815	PM KF 2949	-
Receiver 9 kHz- 7 GHz	Rohde & Schwarz	ESR7	101757	PM KF 3371	2019-04 (1 year)
Loop antenna 9 kHz- 30 MHz	Rohde & Schwarz	HFH2-Z2	881058/48	PM KF 1401	2017-10 (2 years)
DC power supply for HFH2-Z2	Rohde & Schwarz	HZ-9	101865	PM KF 3455	-
RF-cable	Rohde & Schwarz	HFU2-Z5	11673862	PM KF 1646	2018-12 (1 year)
RF-cable Kabel Micro-Coax UTIFLEX	Rosenberger	LA3-020-5500	010-1788635	PM-KF-3187	2018-06 (1 years)
RF-cable Kabel Micro-Coax UTIFLEX	Rosenberger	LA2-001-7200	010-1786350	PM-KF-3188	2019-03 (1 years)
Test software	Rohde & Schwarz	EMC 32 V.10.01.00	-	PM KF 2983-2	-

Comment

The radiated emission tests < 30 MHz were performed in all different lock combinations as according to the table in section 8 with the hereon following measurement diagrams (8.5).

Anechoic chamber

Test procedure

The test site is an anechoic chamber suitable for radiated emission measurements in the frequency range of 9 kHz – 30 MHz. It includes automatic turntable of radius 2 m. It enables manual and fully automatic measurements.

To find the highest level of radiation

- the height of the antenna is 1m with antenna in horizontal and vertical polarization;
- the turntable is rotated in range from 0° to 360°.

The system was configured for testing in a typical worst case fashion (as a customer may use it). All interface cables were moved to determine the position which resulted in the highest emission levels.

Correction factors

The field strength is calculated by adding the antenna factor and cable attenuation.

The calculations are performed automatically by the measurement software EMC 32.

As example consider the following input values and result:

FREQUENCY (MHZ)	RECEIVER READING U (dBμV)	ANTENNA FACTOR AF (dB/m)	CABLE ATTENUATION A (dB)	CORRECTION ANTENNA + CABLE (dB)	RADIATED FIELD STRENGTH E (dBμV/m)
30.0	20	20.6	0.8	21.4	41.4

$$E = U + AF + A$$

7.4 Radiated emissions 30 MHz to 1 GHz

NORMATIVE REFERENCES			RESULT
Limits according to:	FCC §15.225 (d), §15.209 RSS-210, Issue 9, section B6		P
Methods of measurement according to:	ANSI C63.10, section 6.3, 6.5 RSS-Gen 6.13, 8.9		
Equipment mode	Power interface	2	
	EUT configuration mode	1	
	Operation mode	1	
Test requirements	Frequency range	30 MHz - 1 GHz	

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	-
Tower	Inn-Co	MA4484-XPET	-	PM KF 2949-03	-
Controller	Inn-Co	CO 3000	4970815	PM KF 2949	-
Receiver 9 kHz- 7 GHz	Rohde & Schwarz	ESR7	101757	PM KF 3371	2019-04 (1 year)
Antenna 30 MHz - 3GHz	Rohde & Schwarz	HL 562	100354	PM KF 1123	2018-03 (2 years)
RF-cable	Rohde & Schwarz	HFU2-Z5	11673862	PM KF 1646	2018-12 (1 year)
RF-cable Kabel Micro-Coax UTFIFLEX	Rosenberger	LA3-020-5500	010-1788635	PM-KF-3187	2018-06 (1 years)
RF-cable Kabel Micro-Coax UTFIFLEX	Rosenberger	LA2-001-7200	010-1786350	PM-KF-3188	2019-03 (1 years)
Test software	Rohde & Schwarz	EMC 32 V.10.01.00	-	PM KF 2983-2	-

Comment

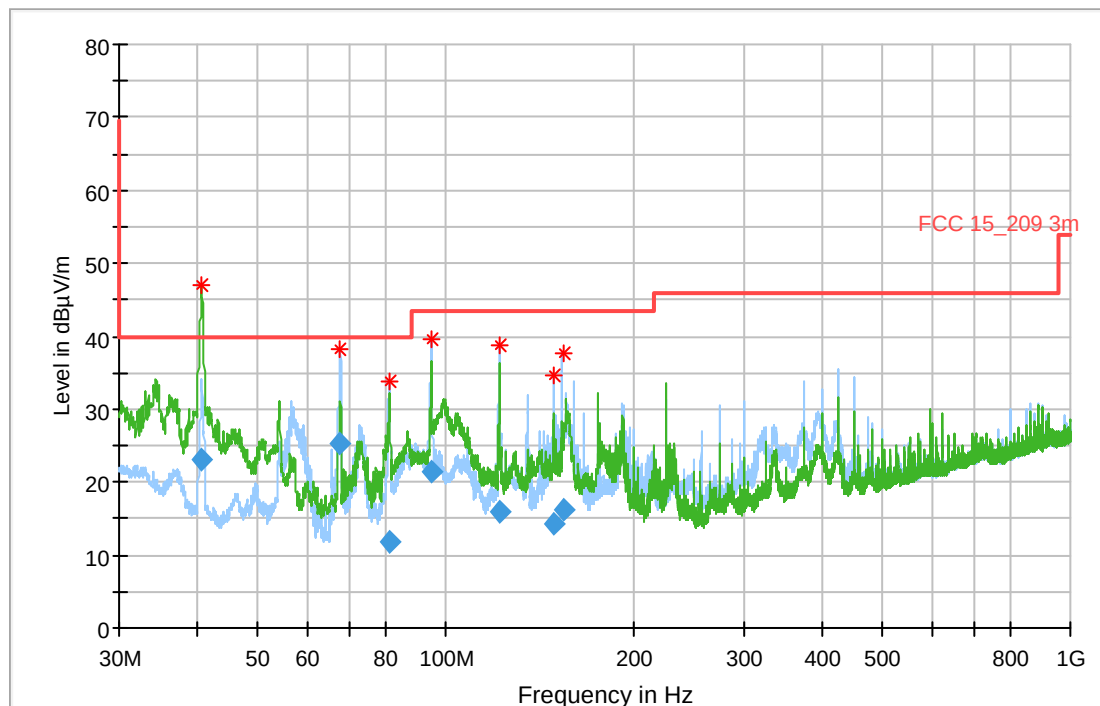
The radiated emission test from 30 MHz to 1 GHz was performed in all different lock combinations as peak pre-measurements according to the table in section 8 with the hereon following measurement diagrams (8.6).

The complete final measurement was done with the lock GAT NET.Lock 7020 USB P with the diagram on the following page as the worst case result.

Measurement results – Radiated emissions 30 MHz to 1 GHz:

Overview sweeps performed with peak detectors and final measurement with quasi-peak detectors.

EUT: GAT NET.Controller S 7020 F/ISO with 3x Lock 7020 USB P
Test Verdict: pass
Test Description: Spurious Emissions, 30-1000MHz
Operating Conditions: Pulse transmission (normal mode) with an interval of 250ms
Operator Name: RDR
Project Number: 36259
Date: 2019-05-06
Comment: --



— 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]

Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
40.680000	23.10	40.00	16.90	1000.0	120.000	105.0	V	103.0
67.770000	25.39	40.00	14.61	1000.0	120.000	225.0	H	95.0
81.330000	11.72	40.00	28.28	1000.0	120.000	317.0	H	103.0
94.920000	21.32	43.52	22.20	1000.0	120.000	145.0	H	100.0
122.040000	16.04	43.52	27.48	1000.0	120.000	270.0	H	98.0
149.160000	14.16	43.52	29.36	1000.0	120.000	200.0	H	89.0
154.350000	16.19	43.52	27.33	1000.0	120.000	171.0	H	279.0

(continuation of the "Final_Result" table from column 15 ...)

Frequency (MHz)	Corr. (dB/m)	Comment
40.680000	14	20:10:59 - 06.05.2019
67.770000	9	20:04:20 - 06.05.2019
81.330000	11	20:09:12 - 06.05.2019
94.920000	12	19:58:52 - 06.05.2019
122.040000	13	20:07:29 - 06.05.2019
149.160000	10	20:00:32 - 06.05.2019
154.350000	10	20:02:19 - 06.05.2019

EMI Auto Test Template: FCC-RE-R17-AN08

Hardware Setup: EN-RE-R12-AN08
Measurement Type: Open-Area-Test-Site (SAC/FAR)
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	0,3 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

Anechoic chamber

Test procedure

The test site is an anechoic chamber suitable for radiated emission measurements in the frequency range of 30 MHz – 18 GHz (40 GHz). It includes automatic antenna mast of height 4 m and turntable of radius 2 m. It enables both manual and fully automatic measurements. To find the highest level of radiation

- the height of the antenna is scanned in range 1m to 4 m with antenna in horizontal and vertical polarization;
- the turntable is rotated in range from 0° to 360°.

The system was configured for testing in a typical worst case fashion (as a customer may use it). All interface cables were moved to determine the position which resulted in the highest emission levels.

Correction factors

The field strength is calculated by adding the antenna factor and cable attenuation. The calculations are performed automatically by the measurement software EMC 32. As example consider the following input values and result:

FREQUENCY (MHZ)	RECEIVER READING U (dBμV)	ANTENNA FACTOR AF (dB/m)	CABLE ATTENUATION A (dB)	CORRECTION ANTENNA + CABLE (dB)	RADIATED FIELD STRENGTH E (dBμV/m)
30.0	20	20.6	0.8	21.4	41.4

$$E = U + AF + A$$

7.5 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	2	
	EUT configuration mode	2	
	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:	-20 degree to +60 degree
Voltage range:	0,85 x 120 V
	1,15 x 120 V

Test equipment

DESCRIPTION	MANUFACTURER	TYPE	SN	ASSET NO.	CALIBRATION
Temperature chamber	Heraeus-Vötsch	HT4010	45021	PM KF 1402	2019-03 (1 year)
Spectrum analyser	Rohde & Schwarz	FSL6	100463	PM KF 3027	2018-02 (2 years)
Loop antenna	Rohde & Schwarz	HZ-10	100055	PM KF 0965	2017-04 (3 year)

Measurement results – Frequency stability measurement:

Temperature °C	Carrier at 20°C MHz	Upper limit:	13.561923 MHz
		Lower limit:	13.559211 MHz
		Measured frequency under temperature influence:	
+60	13.560567	13.560767	
+50		13.560767	
+40		13.560767	
+30		13.560700	
+20		13.560567	
+10		13.560767	
0		13.560767	
-10		13.560767	
-20		13.560767	

Comment

The frequency stability under temperature influence remains in the tolerance of $\pm 0.01\%$ (± 100 ppm).

The DC voltage variation from 102 V to 138 V had no influence on the frequency and the level of the carrier.

The test was just done with one lock type (GAT NET.Lock 7020 USB P), because the lock type has no influence on the results. It's a matter of the RFID part inside of the controller.

7.6 Occupied bandwidth

NORMATIVE REFERENCES			RESULT
Limits according to:	RSS-Gen, Issue 5, 6.7		P
Methods of measurement according to:	RSS-Gen, Issue 5, 6.7		
Equipment mode	Power interface	1	
	EUT configuration mode	2	
	Operation mode	3	

Test equipment

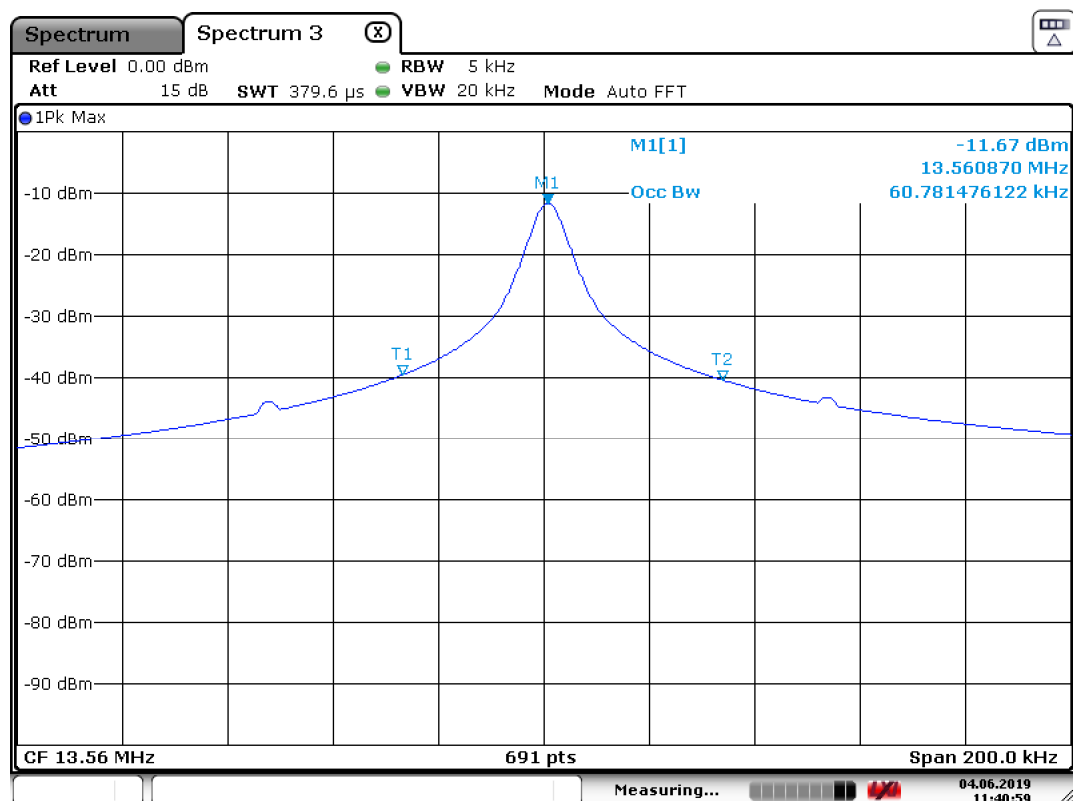
DESCRIPTION	MANUFACTURER	TYPE	SN	ASSET NO.	CALIBRATION
Spectrum analyser	Rohde & Schwarz	FSV40	837356/012	PM KF 2783	2018-09 (1 year)
Loop antenna	Rohde & Schwarz	HZ-10	100055	PM KF 0965	2017-04 (3 year)

Comment

The 99% occupied bandwidth is 60.781 kHz at the 13.56 MHz RFID.

The test was just done with one lock type (GAT NET.Lock 7020 USB P), because the lock type has no influence on the results. It's a matter of the RFID part inside of the controller.

Measurement results - 99% occupied bandwidth:



Date: 4.JUN.2019 11:40:59

SECTION 8

SELECTION OF THE LOCK TYPE FOR FINAL TESTING

8.1 Emission tests with all different lock combinations and test diagram No.

Sub Controller Unit: GAT NET.Controller S 7020 F/ISO	Frequency Range				
	CE 150 kHz- 30 MHz		Field Strength	RE 9 kHz- 30 MHz	RE 30 MHz- 1 GHz Pre-tests (Pk)
	out***	in**			
GAT NET.Lock 7020 Serial No.: 1913000003, 1913000004, 1913000006	1	5	9	13 ^{A)}	17
GAT NET.Lock 7020 USB Serial No.: 1913000003, 1913000004, 1913000006	2	6	10	14	18
GAT NET.Lock 7020 P* Serial No.: 1913100001, 1913100002, 1913100003	3	7	11	15	19
GAT NET.Lock 7020 USB P* Serial No.: 1913100001, 1913100002, 1913100003	4	8	12	16 ^{B)}	20 ^{C)}

 Worst case result of four different lock combinations

A) Worst case result at 13.56 MHz

B) Worst case result at 125 kHz

C) Worst case result at 40.68 MHz -> for final measurement of this combination see chapter 7.4

* Comment:

Comparison measurements between the 13.56 MHz tag card and the 125 kHz tag card in front of the lock showed the 13.56 MHz card to be the worst case situation. Therefore all measurements were done with the 13.56 MHz card. At the CE tests no difference between the card frequencies were detectable.

** within the transmitter's fundamental emission band

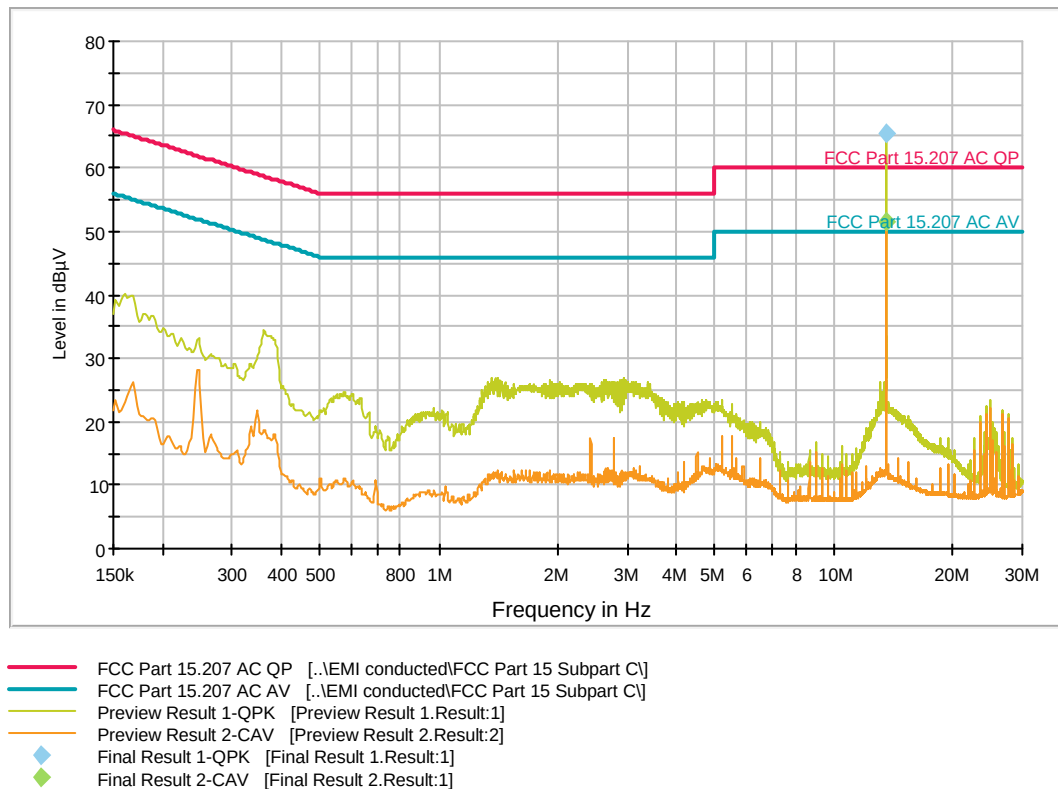
*** outside the transmitter's fundamental emission band (spurious emissions)

The USB unit can be connected or disconnected. Therefore the Lock has the same serial number if a USB unit is connected or not.

8.2 Diagrams conducted spurious emission tests

1 EUT: GAT NET.Controller S 7020 FISO with **Lock 7020**
Project No.: 36259
Test description: Conducted Emissions,
outside the transmitter's fundamental emission band
Test standard: FCC Part 15 Subpart B, § 15.207
Tested port: Mains, 120 V/ 60 Hz
Test verdict: Pass
Operating conditions: Pulse transmission (normal mode) with an interval of 250ms;
13.56 MHz Card
Operator name: RDR
Date of testing: 2019-05-13

EN-CE-R32-LN01



Final Result 1

Frequency (MHz)	QuasiPeak-ClearWrite (dBμV)	PE	Line	Corr. (dB)	Comment
13.560000	65.4	GND	N	10.8	Result not relevant, because it's the transmitter's fundamental emission band

Final Result 2

Frequency (MHz)	CAverage-ClearWrite (dBμV)	PE	Line	Corr. (dB)	Comment
13.560000	51.6	GND	N	10.8	Result not relevant, because it's the transmitter's fundamental emission band

EMI Auto Test Template: EN-CE-R32-LN01

Hardware Setup: EN-CE-R32-LN01
Measurement Type: 2 Line LISN
Frequency Range: 150 kHz - 30 MHz
Graphics Level Range: 0 dB μ V - 80 dB μ V

Preview Measurements:
Scan Test Template: EN-CE-R32-LN01_PRE

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
9 kHz - 150 kHz	50 Hz	QPK; CAV	200 Hz	1 s	20 dB
150 kHz - 30 MHz	2.25 kHz	QPK; CAV	9 kHz	1 s	0 dB

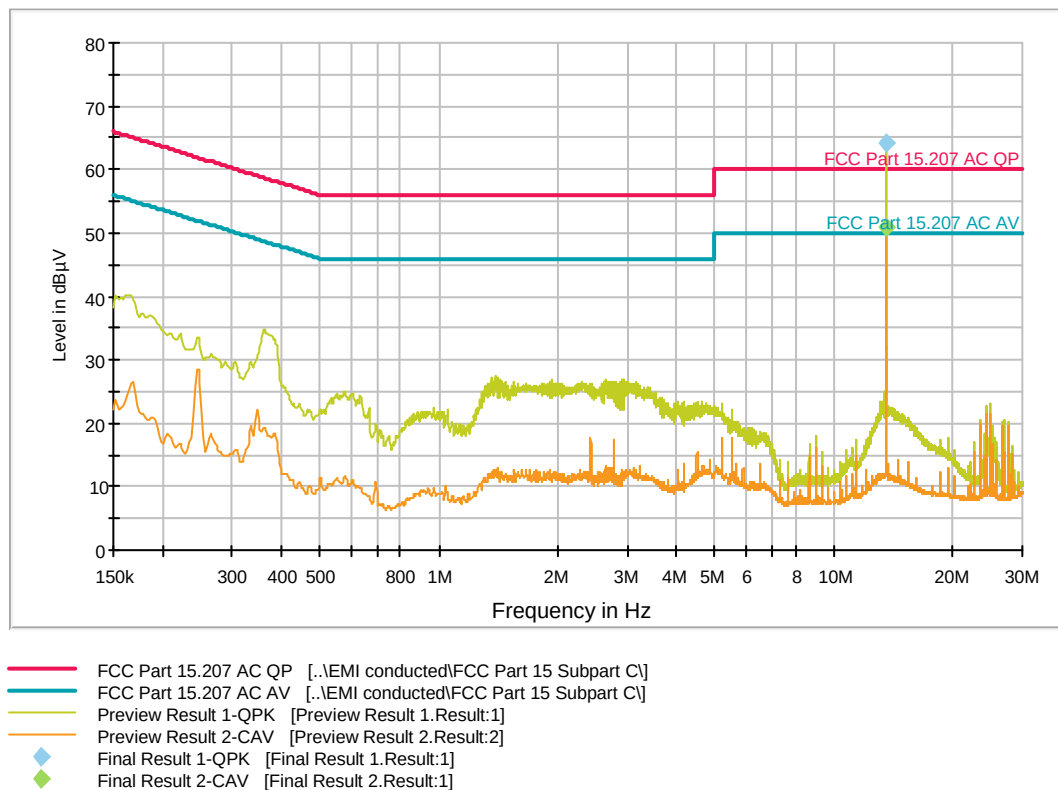
Receiver: [ESR 7]

Data Reduction:
Limit Line #1: FCC Part 15.207 AC QP
Limit Line #2: FCC Part 15.207 AC AV
Peak Search: 6 dB , Maximum Results: 10
Subrange Maxima: 10 Subranges , Maxima per Subrange: 1
Acceptance Offset: -10 dB
Maximum Number of Results: 20
After Data Reduction: Interactive data reduction

Report Settings:
Report Template: Standard Report_EMC KF_Conducted Emission

2 EUT: GAT NET.Controller S 7020 FISO with **Lock 7020 USB**
Project No.: 36259
Test description: Conducted Emissions,
outside the transmitter's fundamental emission band
Test standard: FCC Part 15 Subpart B, § 15.207
Tested port: Mains
Test verdict: Pass
Operating conditions: Pulse transmission (normal mode) with an interval of 250ms;
13.56 MHz Card
Operator name: RDR
Date of testing: 2019-05-13

EN-CE-R32-LN01



Final Result 1

Frequency (MHz)	QuasiPeak-ClearWrite (dBμV)	PE	Line	Corr. (dB)	Comment
13.560000	64.1	GND	N	10.8	Result not relevant, because it's the transmitter's fundamental emission band

Final Result 2

Frequency (MHz)	CAverage-ClearWrite (dBμV)	PE	Line	Corr. (dB)	Comment
13.560000	51.0	GND	N	10.8	Result not relevant, because it's the transmitter's fundamental emission band

EMI Auto Test Template: EN-CE-R32-LN01

Hardware Setup: EN-CE-R32-LN01
Measurement Type: 2 Line LISN
Frequency Range: 150 kHz - 30 MHz
Graphics Level Range: 0 dB μ V - 80 dB μ V

Preview Measurements:
Scan Test Template: EN-CE-R32-LN01_PRE

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
9 kHz - 150 kHz	50 Hz	QPK; CAV	200 Hz	1 s	20 dB
150 kHz - 30 MHz	2.25 kHz	QPK; CAV	9 kHz	1 s	0 dB

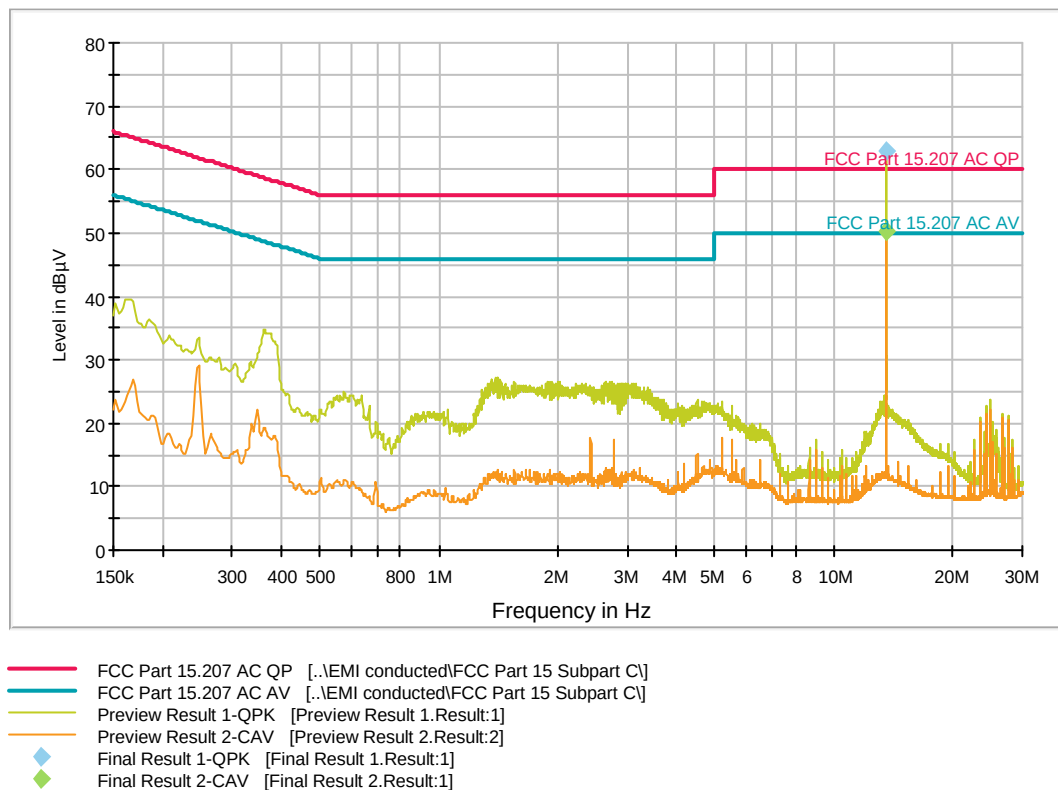
Receiver: [ESR 7]

Data Reduction:
Limit Line #1: FCC Part 15.207 AC QP
Limit Line #2: FCC Part 15.207 AC AV
Peak Search: 6 dB , Maximum Results: 10
Subrange Maxima: 10 Subranges , Maxima per Subrange: 1
Acceptance Offset: -10 dB
Maximum Number of Results: 20
After Data Reduction: Interactive data reduction

Report Settings:
Report Template: Standard Report_EMC KF_Conducted Emission

3 EUT: GAT NET.Controller S 7020 FISO with **Lock 7020 P**
 Project No.: 36259
 Test description: Conducted Emissions,
outside the transmitter's fundamental emission band
 Test standard: FCC Part 15 Subpart B, § 15.207
 Tested port: Mains, 120 V/ 60 Hz
 Test verdict: Pass
 Operating conditions: Pulse transmission (normal mode) with an interval of 250ms;
 13.56 MHz Card
 Operator name: RDR
 Date of testing: 2019-05-13

EN-CE-R32-LN01



Final Result 1

Frequency (MHz)	QuasiPeak-ClearWrite (dBµV)	PE	Line	Corr. (dB)	Comment
13.560000	62.8	GND	N	10.8	Result not relevant, because it's the transmitter's fundamental emission band

Final Result 2

Frequency (MHz)	CAverage-ClearWrite (dBµV)	PE	Line	Corr. (dB)	Comment
13.560000	50.4	GND	N	10.8	Result not relevant, because it's the transmitter's fundamental emission band

EMI Auto Test Template: EN-CE-R32-LN01

Hardware Setup: EN-CE-R32-LN01
Measurement Type: 2 Line LISN
Frequency Range: 150 kHz - 30 MHz
Graphics Level Range: 0 dBμV - 80 dBμV

Preview Measurements:
Scan Test Template: EN-CE-R32-LN01_PRE

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
9 kHz - 150 kHz	50 Hz	QPK; CAV	200 Hz	1 s	20 dB
150 kHz - 30 MHz	2.25 kHz	QPK; CAV	9 kHz	1 s	0 dB

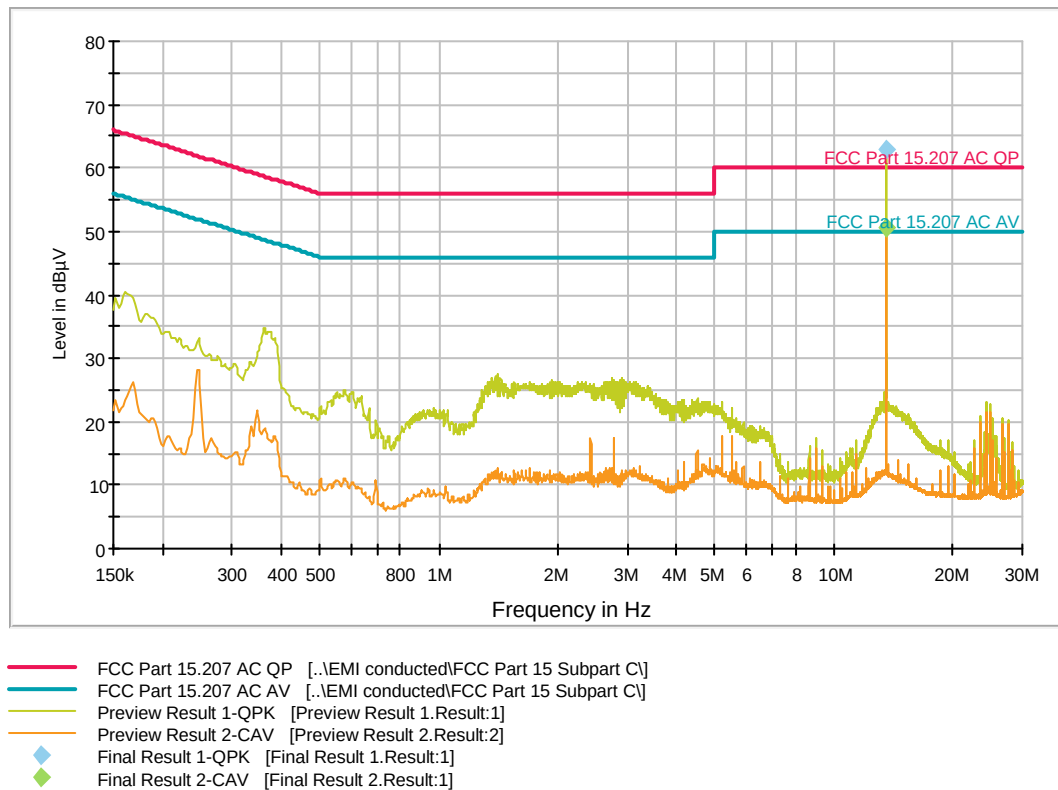
Receiver: [ESR 7]

Data Reduction:
Limit Line #1: FCC Part 15.207 AC QP
Limit Line #2: FCC Part 15.207 AC AV
Peak Search: 6 dB , Maximum Results: 10
Subrange Maxima: 10 Subranges , Maxima per Subrange: 1
Acceptance Offset: -10 dB
Maximum Number of Results: 20
After Data Reduction: Interactive data reduction

Report Settings:
Report Template: Standard Report_EMC KF_Conducted Emission

4 EUT: GAT NET.Controller S 7020 FISO with **Lock 7020 USB P**
Project No.: 36259
Test description: Conducted Emissions,
outside the transmitter's fundamental emission band
Test standard: FCC Part 15 Subpart B, § 15.207
Tested port: Mains, 120 V/ 60 Hz
Test verdict: Pass
Operating conditions: Pulse transmission (normal mode) with an interval of 250ms;
13.56 MHz Card
Operator name: RDR
Date of testing: 2019-05-13

EN-CE-R32-LN01



Final Result 1

Frequency (MHz)	QuasiPeak-ClearWrite (dBμV)	PE	Line	Corr. (dB)	Comment
13.560000	62.8	GND	N	10.8	Result not relevant, because it's the transmitter's fundamental emission band

Final Result 2

Frequency (MHz)	CAverage-ClearWrite (dBμV)	PE	Line	Corr. (dB)	Comment
13.560000	50.5	GND	N	10.8	Result not relevant, because it's the transmitter's fundamental emission band

EMI Auto Test Template: EN-CE-R32-LN01

Hardware Setup: EN-CE-R32-LN01
Measurement Type: 2 Line LISN
Frequency Range: 150 kHz - 30 MHz
Graphics Level Range: 0 dBμV - 80 dBμV

Preview Measurements:
Scan Test Template: EN-CE-R32-LN01_PRE

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
9 kHz - 150 kHz	50 Hz	QPK; CAV	200 Hz	1 s	20 dB
150 kHz - 30 MHz	2.25 kHz	QPK; CAV	9 kHz	1 s	0 dB

Receiver: [ESR 7]

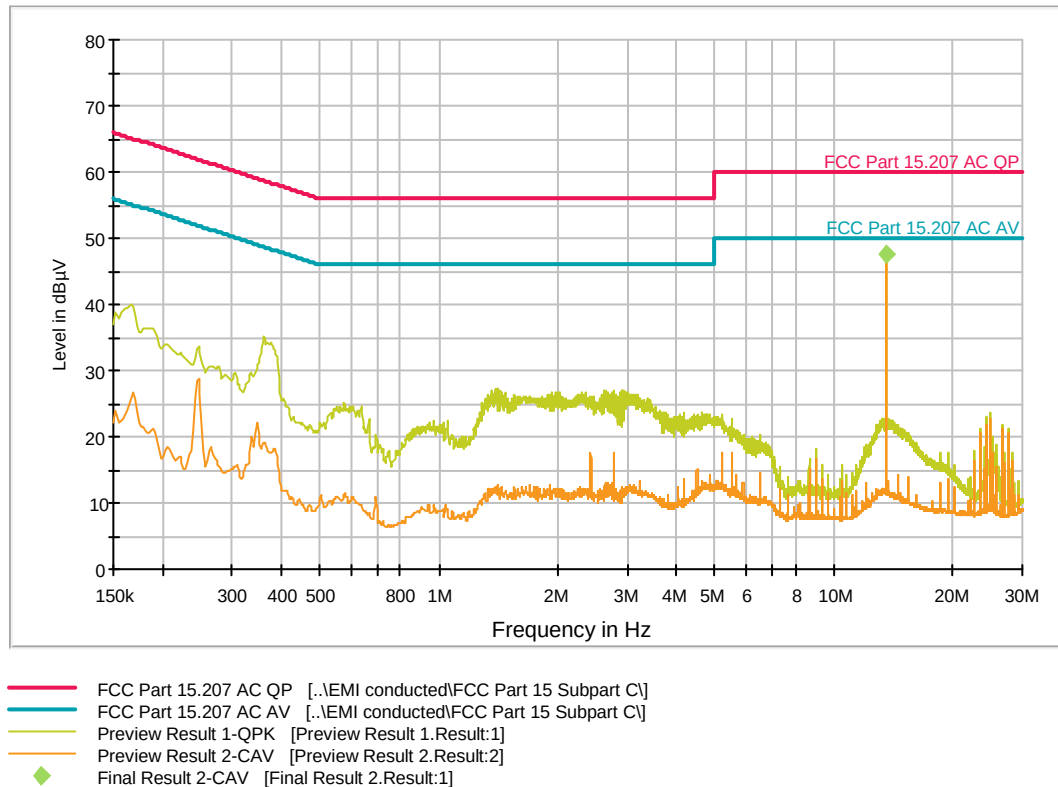
Data Reduction:
Limit Line #1: FCC Part 15.207 AC QP
Limit Line #2: FCC Part 15.207 AC AV
Peak Search: 6 dB , Maximum Results: 10
Subrange Maxima: 10 Subranges , Maxima per Subrange: 1
Acceptance Offset: -10 dB
Maximum Number of Results: 20
After Data Reduction: Interactive data reduction

Report Settings:
Report Template: Standard Report_EMK KF_Conducted Emission

8.3 Diagrams conducted tests with a dummy load

5 EUT: GAT NET.Controller S 7020 FISO with **Lock 7020**
Project No.: 36259
Test description: Conducted Emissions,
within the transmitter's fundamental emission band
Test standard: FCC Part 15 Subpart B, § 15.207
Tested port: Mains, 120 V/ 60 Hz
Test verdict: Passed
Operating conditions: Pulse transmission (normal mode) with an interval of 250ms
Dummy load in lieu of the antenna
Operator name: RDR
Date of testing: 2019-05-13

EN-CE-R32-LN01



Final Result 2

Frequency (MHz)	CAverage-ClearWrite (dBµV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
13.560000	47.6	GN	L1	11.0	2.4	50.0	

EMI Auto Test Template: EN-CE-R32-LN01

Hardware Setup: EN-CE-R32-LN01
Measurement Type: 2 Line LISN
Frequency Range: 150 kHz - 30 MHz
Graphics Level Range: 0 dB μ V - 80 dB μ V

Preview Measurements:
Scan Test Template: EN-CE-R32-LN01_PRE

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
9 kHz - 150 kHz	50 Hz	QPK; CAV	200 Hz	1 s	20 dB
150 kHz - 30 MHz	2.25 kHz	QPK; CAV	9 kHz	1 s	0 dB

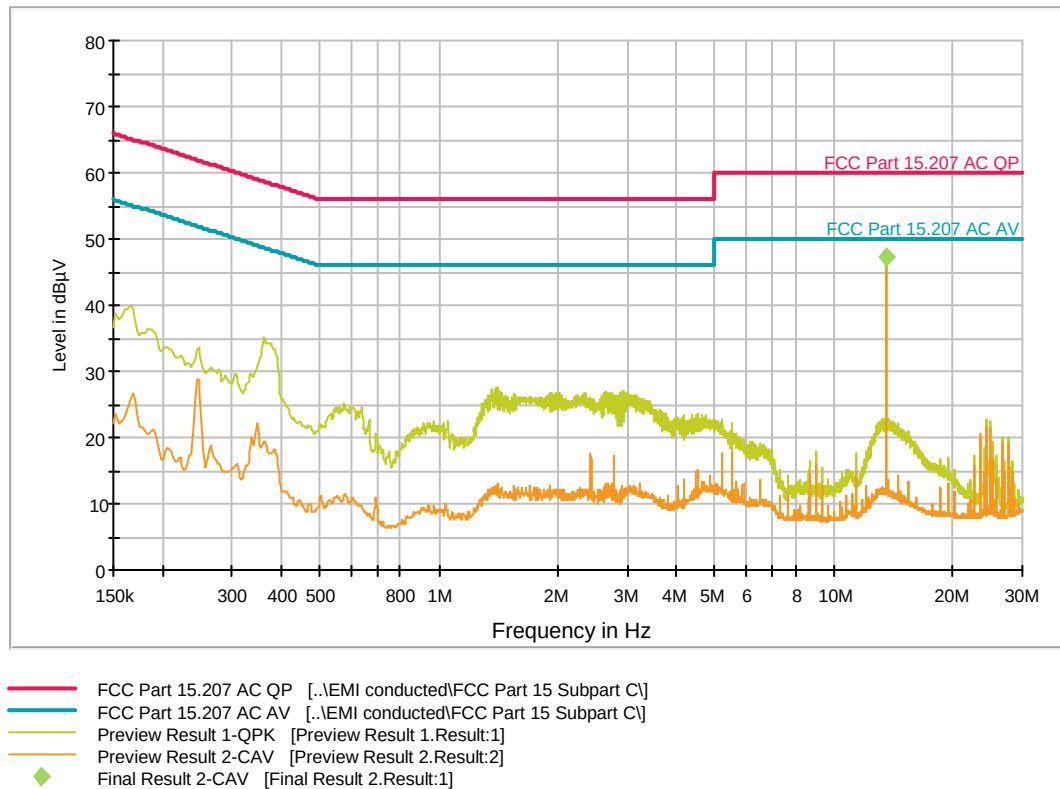
Receiver: [ESR 7]

Data Reduction:
Limit Line #1: FCC Part 15.207 AC QP
Limit Line #2: FCC Part 15.207 AC AV
Peak Search: 6 dB , Maximum Results: 10
Subrange Maxima: 10 Subranges , Maxima per Subrange: 1
Acceptance Offset: -10 dB
Maximum Number of Results: 20
After Data Reduction: Interactive data reduction

Report Settings:
Report Template: Standard Report_EMC KF_Conducted Emission

6 EUT: GAT NET.Controller S 7020 FISO with **Lock 7020 USB**
Project No.: 36259
Test description: Conducted Emissions,
within the transmitter's fundamental emission band
Test standard: FCC Part 15 Subpart B, § 15.207
Tested port: Mains, 120 V/ 60 Hz
Test verdict: Passed
Operating conditions: Pulse transmission (normal mode) with an interval of 250ms
Dummy load in lieu of the antenna
Operator name: RDR
Date of testing: 2019-05-13

EN-CE-R32-LN01



Final Result 2

Frequency (MHz)	CAverage-ClearWrite (dBµV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
13.560000	47.2	GN	N	10.8	2.8	50.0	

EMI Auto Test Template: EN-CE-R32-LN01

Hardware Setup: EN-CE-R32-LN01
Measurement Type: 2 Line LISN
Frequency Range: 150 kHz - 30 MHz
Graphics Level Range: 0 dBμV - 80 dBμV

Preview Measurements:
Scan Test Template: EN-CE-R32-LN01_PRE

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
9 kHz - 150 kHz	50 Hz	QPK; CAV	200 Hz	1 s	20 dB
150 kHz - 30 MHz	2.25 kHz	QPK; CAV	9 kHz	1 s	0 dB

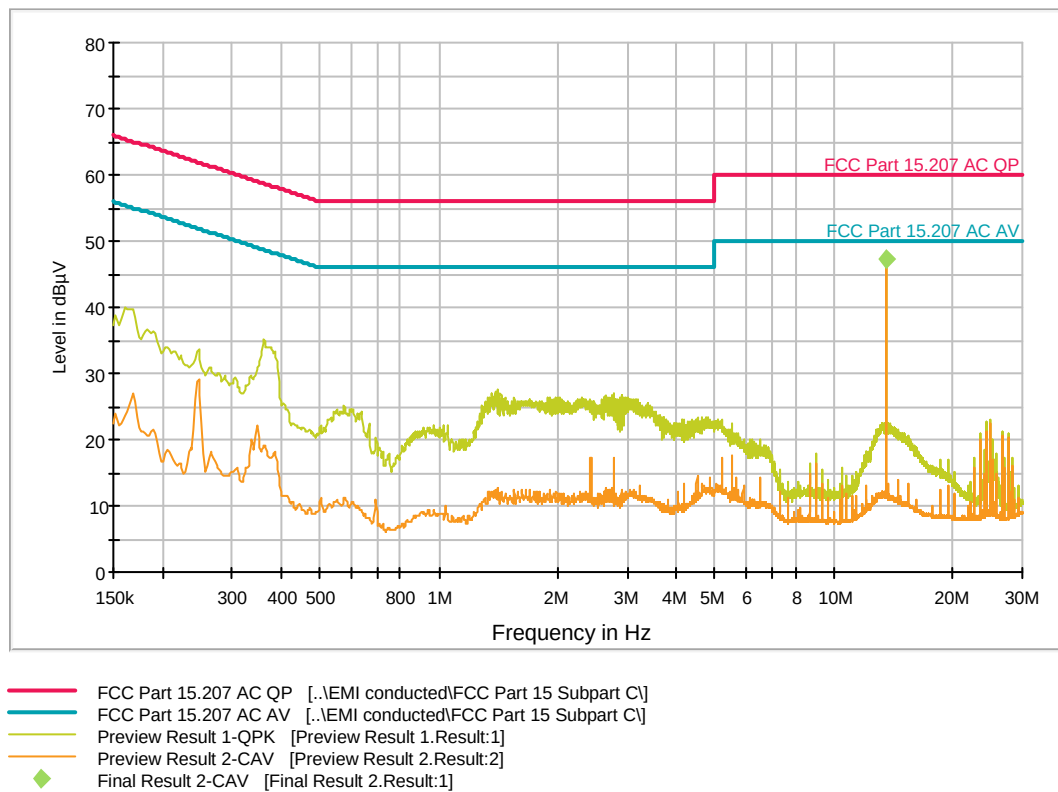
Receiver: [ESR 7]

Data Reduction:
Limit Line #1: FCC Part 15.207 AC QP
Limit Line #2: FCC Part 15.207 AC AV
Peak Search: 6 dB , Maximum Results: 10
Subrange Maxima: 10 Subranges , Maxima per Subrange: 1
Acceptance Offset: -10 dB
Maximum Number of Results: 20
After Data Reduction: Interactive data reduction

Report Settings:
Report Template: Standard Report_EMC KF_Conducted Emission

7 EUT: GAT NET.Controller S 7020 FISO with **Lock 7020 P**
Project No.: 36259
Test description: Conducted Emissions,
within the transmitter's fundamental emission band
Test standard: FCC Part 15 Subpart B, § 15.207
Tested port: Mains
Test verdict: Passed
Operating conditions: Pulse transmission (normal mode) with an interval of 250ms
Dummy load in lieu of the antenna
Operator name: RDR
Date of testing: 2019-05-13

EN-CE-R32-LN01



Final Result 2

Frequency (MHz)	CAverage-ClearWrite (dBµV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
13.560000	47.2	GN	N	10.8	2.8	50.0	

EMI Auto Test Template: EN-CE-R32-LN01

Hardware Setup: EN-CE-R32-LN01
Measurement Type: 2 Line LISN
Frequency Range: 150 kHz - 30 MHz
Graphics Level Range: 0 dBμV - 80 dBμV

Preview Measurements:
Scan Test Template: EN-CE-R32-LN01_PRE

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
9 kHz - 150 kHz	50 Hz	QPK; CAV	200 Hz	1 s	20 dB
150 kHz - 30 MHz	2.25 kHz	QPK; CAV	9 kHz	1 s	0 dB

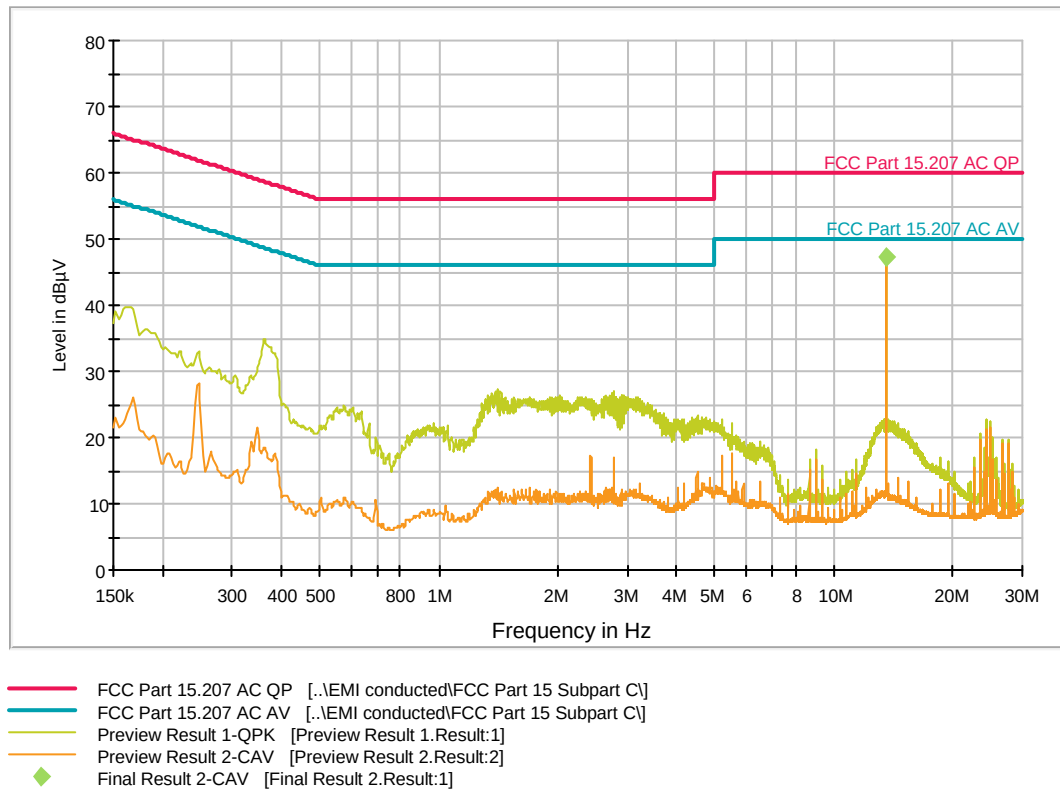
Receiver: [ESR 7]

Data Reduction:
Limit Line #1: FCC Part 15.207 AC QP
Limit Line #2: FCC Part 15.207 AC AV
Peak Search: 6 dB , Maximum Results: 10
Subrange Maxima: 10 Subranges , Maxima per Subrange: 1
Acceptance Offset: -10 dB
Maximum Number of Results: 20
After Data Reduction: Interactive data reduction

Report Settings:
Report Template: Standard Report_EMC KF_Conducted Emission

8 EUT: GAT NET.Controller S 7020 FISO with **Lock 7020 USB P**
Project No.: 36259
Test description: Conducted Emissions,
within the transmitter's fundamental emission band
Test standard: FCC Part 15 Subpart B, § 15.207
Tested port: Mains, 120 V/ 60 Hz
Test verdict: Passed
Operating conditions: Pulse transmission (normal mode) with an interval of 250ms
Dummy load in lieu of the antenna
Operator name: RDR
Date of testing: 2019-05-13

EN-CE-R32-LN01



Final Result 2

Frequency (MHz)	CAverage-ClearWrite (dBµV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
13.560000	47.2	GN	N	10.8	2.8	50.0	

EMI Auto Test Template: EN-CE-R32-LN01

Hardware Setup: EN-CE-R32-LN01
Measurement Type: 2 Line LISN
Frequency Range: 150 kHz - 30 MHz
Graphics Level Range: 0 dB μ V - 80 dB μ V

Preview Measurements:
Scan Test Template: EN-CE-R32-LN01_PRE

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
9 kHz - 150 kHz	50 Hz	QPK; CAV	200 Hz	1 s	20 dB
150 kHz - 30 MHz	2.25 kHz	QPK; CAV	9 kHz	1 s	0 dB

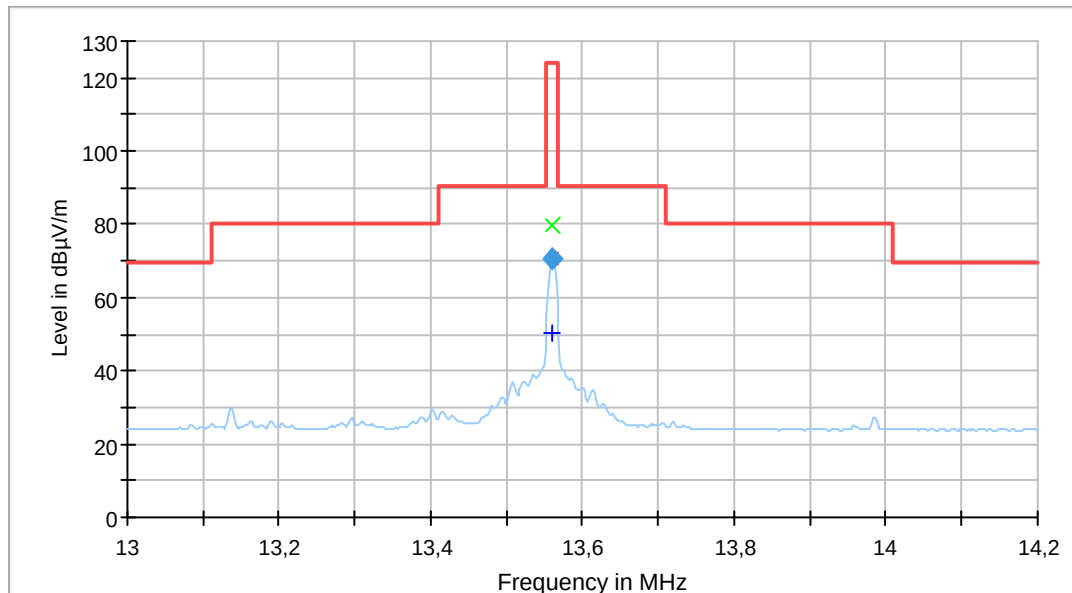
Receiver: [ESR 7]

Data Reduction:
Limit Line #1: FCC Part 15.207 AC QP
Limit Line #2: FCC Part 15.207 AC AV
Peak Search: 6 dB , Maximum Results: 10
Subrange Maxima: 10 Subranges , Maxima per Subrange: 1
Acceptance Offset: -10 dB
Maximum Number of Results: 20
After Data Reduction: Interactive data reduction

Report Settings:
Report Template: Standard Report_EMC KF_Conducted Emission

8.4 Field strength 13.110 MHz – 14.010 MHz

9 EUT: GAT NET.Controller S 7020 F/ISO with 3x Lock 7020
Test Verdict: pass
Test Description: Field Strength, 13 MHz- 14.2 MHz
Operating Conditions: Pulse transmission (normal mode) with an interval of 250ms
Operator Name: RDR
Project Number: 36259
Date: 08.05.2019
Comment: Card 13.56 MHz



- 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]
- × QuasiPeak-QPK (Single) [Result Table_Single.Result:2]
- + Average-AVG (Single) [Result Table_Single.Result:3]
- × MaxPeak-PK+ (Single) [Result Table_Single.Result:1]

Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Pol	Azimuth (deg)
13.560000	70.53	---	124.00	53.47	1000.0	9.000	V	242.0

(continuation of the "Final_Result" table from column 14 ...)

Frequency (MHz)	Corr. (dB/m)	Comment
13.560000	20	Pk: 79.5

EMI Auto Test Template: FCC-RE-R17-AN23

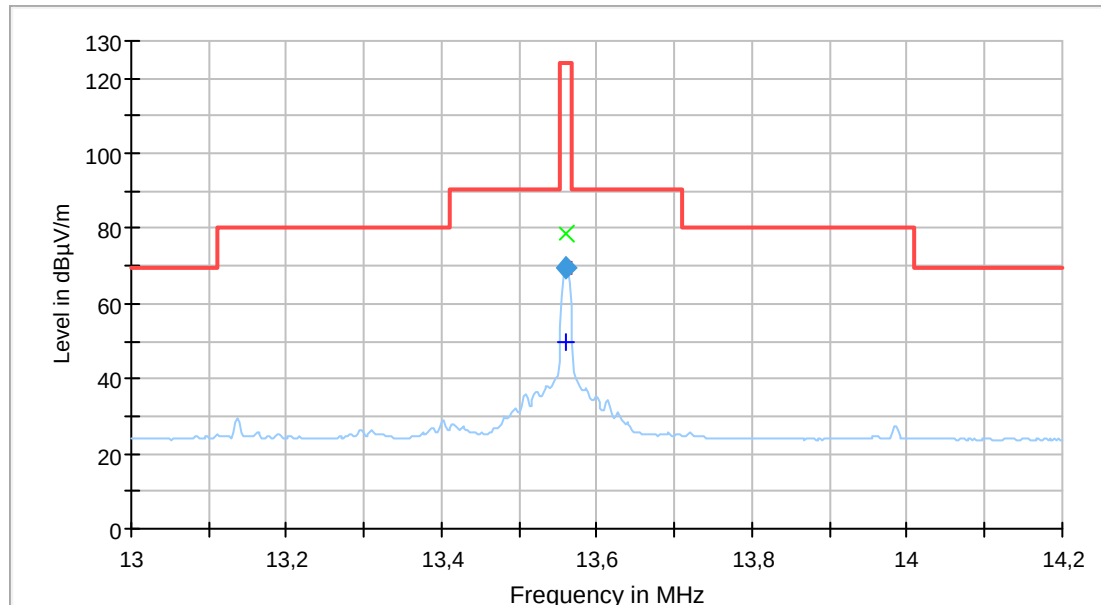
Hardware Setup: EN-RE-R12-AN23
Measurement Type: Open-Area-Test-Site (SAC/FAR)
Frequency Range: 9 kHz - 30 MHz
Graphics Level Range: 0 dB μ V/m - 130 dB μ V/m

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: EN-RE-R12-AN23_PRE

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

10 EUT: GAT NET.Controller S 7020 F/ISO with 3x Lock 7020 USB
Test Verdict: pass
Test Description: Field Strength, 13 MHz- 14.2 MHz
Operating Conditions: Pulse transmission (normal mode) with an interval of 250ms
Operator Name: RDR
Project Number: 36259
Date: 08.05.2019
Comment: Card 13.56 MHz



- 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]
- × QuasiPeak-QPK (Single) [Result Table_Single.Result:2]
- + Average-AVG (Single) [Result Table_Single.Result:3]
- × MaxPeak-PK+ (Single) [Result Table_Single.Result:1]

Final_Result

Frequency (MHz)	QuasiPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Pol	Azimuth (deg)
13.560000	69.81	---	124.00	54.19	1000.0	9.000	V	242.0

(continuation of the "Final_Result" table from column 14 ...)

Frequency (MHz)	Corr. (dB/m)	Comment
13.560000	20	Pk: 78,79

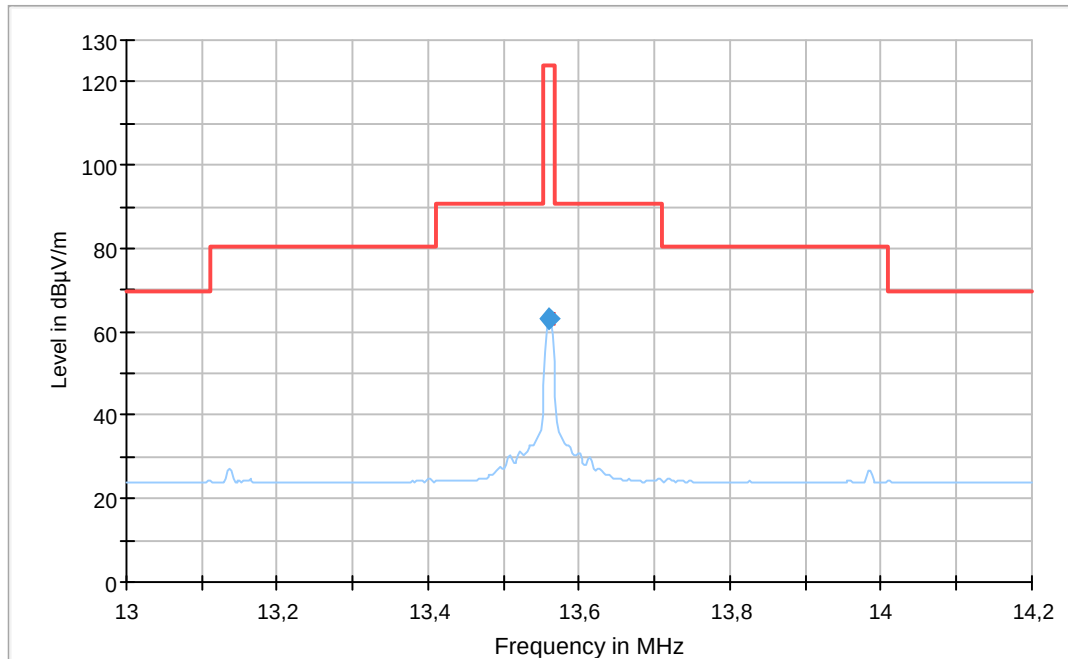
EMI Auto Test Template: FCC-RE-R17-AN23

Hardware Setup: EN-RE-R12-AN23
Measurement Type: Open-Area-Test-Site (SAC/FAR)
Frequency Range: 9 kHz - 30 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: EN-RE-R12-AN23_PRE

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

11 EUT: GAT NET.Controller S 7020 F/ISO with 3x Lock 7020 P
Test Verdict: pass
Test Description: Field Strength, 13 MHz- 14.2 MHz
Operating Conditions: Pulse transmission (normal mode) with an interval of 250ms
Operator Name: RDR
Project Number: 36259
Date: 08.05.2019
Comment: Card 13.56 MHz



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]

Final Result

Frequency (MHz)	QuasiPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Pol	Azimuth (deg)
13.560000	63.34	---	124.00	60.66	1000.0	9.000	V	110.0

(continuation of the "Final_Result" table from column 14 ...)

Frequency (MHz)	Corr. (dB/m)	Comment
13.560000	20	14:49:23 - 08.05.2019

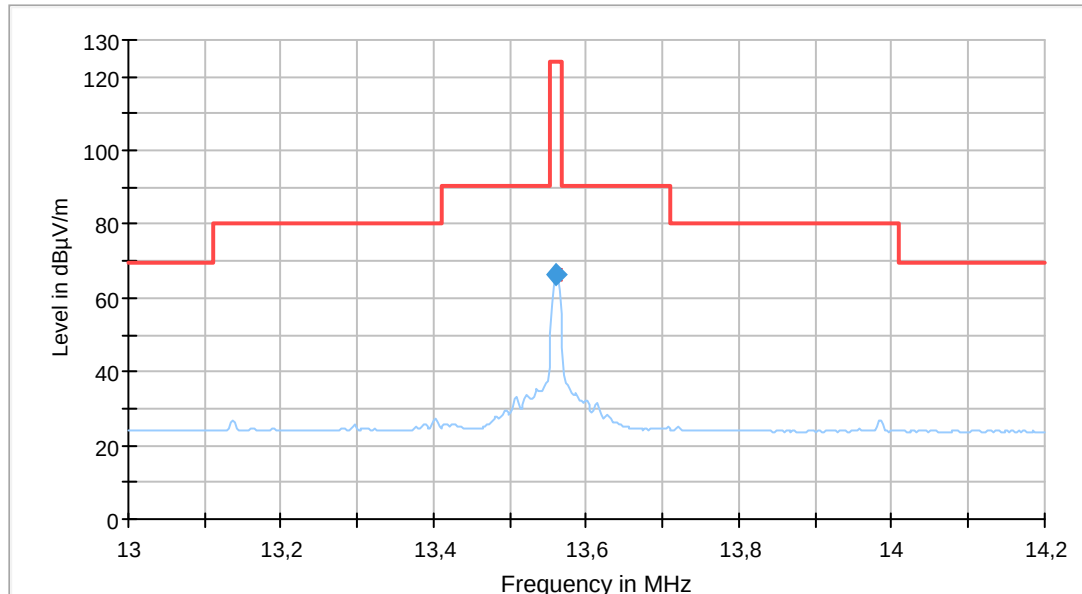
EMI Auto Test Template: FCC-RE-R17-AN23

Hardware Setup: EN-RE-R12-AN23
Measurement Type: Open-Area-Test-Site (SAC/FAR)
Frequency Range: 9 kHz - 30 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: EN-RE-R12-AN23_PRE

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

12 EUT: GAT NET.Controller S 7020 F/ISO with 3x Lock 7020 USB P
 Test Verdict: pass
 Test Description: Field Strength, 13 MHz- 14.2 MHz
 Operating Conditions: Pulse transmission (normal mode) with an interval of 250ms
 Operator Name: RDR
 Project Number: 36259
 Date: 08.05.2019
 Comment: Card 13.56 MHz



- 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]
- × QuasiPeak-QPK (Single) [Result Table_Single.Result:2]
- + Average-AVG (Single) [Result Table_Single.Result:3]
- × MaxPeak-PK+ (Single) [Result Table_Single.Result:1]

Final_Result

Frequency (MHz)	QuasiPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Pol	Azimuth (deg)
13.560000	66.25	---	124.00	57.75	---	---	V	242.0

(continuation of the "Final_Result" table from column 14 ...)

Frequency (MHz)	Corr. (dB/m)	Comment
13.560000	20	Pk: 76.2 / 125 kHz Card: 75.3

EMI Auto Test Template: FCC-RE-R17-AN23

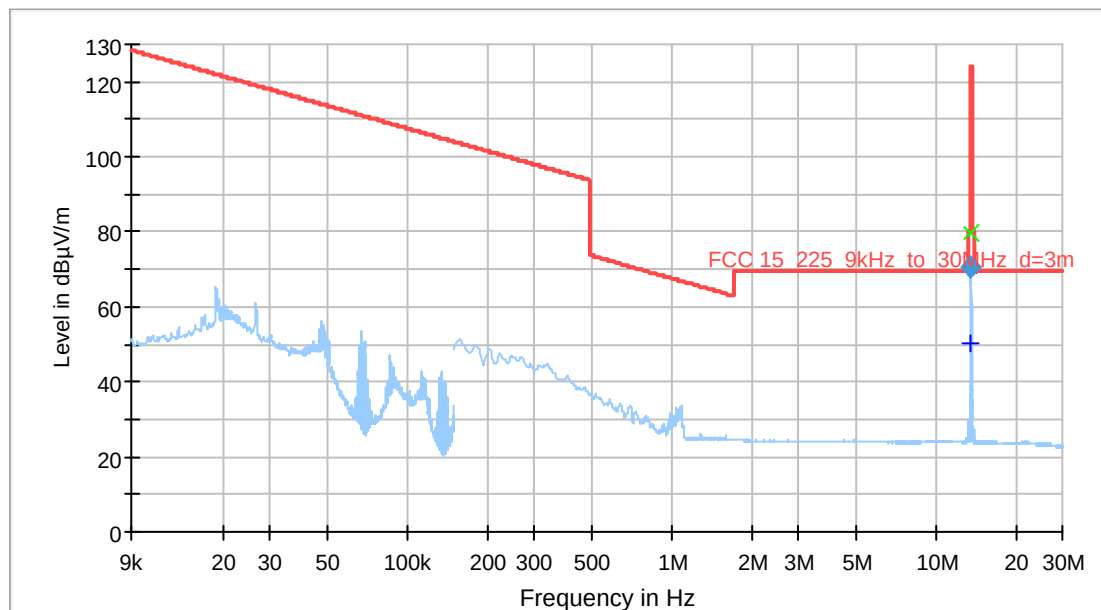
Hardware Setup: EN-RE-R12-AN23
Measurement Type: Open-Area-Test-Site (SAC/FAR)
Frequency Range: 9 kHz - 30 MHz
Graphics Level Range: 0 dB μ V/m - 130 dB μ V/m

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: EN-RE-R12-AN23_PRE

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

8.5 Diagrams radiated emissions < 30 MHz

13 EUT: GAT NET.Controller S 7020 F/ISO with 3x **Lock 7020**
Test Verdict: pass
Test Description: Spurious Emissions, 9kHz-30MHz
Operating Conditions: Pulse transmission (normal mode) with an interval of 250ms
Operator Name: RDR
Project Number: 36259
Date: 08.05.2019
Comment: Card 13.56 MHz



- 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]
- x QuasiPeak-QPK (Single) [Result Table_Single.Result:2]
- + Average-AVG (Single) [Result Table_Single.Result:3]
- x MaxPeak-PK+ (Single) [Result Table_Single.Result:1]

Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Pol	Azimuth (deg)
13.560000	70.53	---	124.00	53.47	1000.0	9.000	V	242.0

(continuation of the "Final_Result" table from column 14 ...)

Frequency (MHz)	Corr. (dB/m)	Comment
13.560000	20	Pk: 79.5

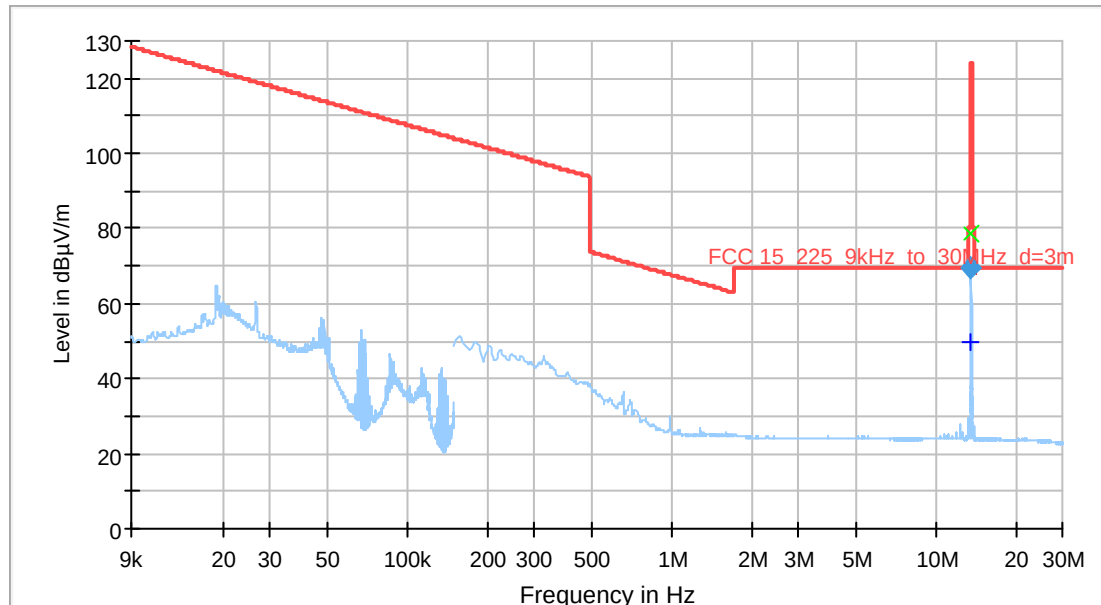
EMI Auto Test Template: FCC-RE-R17-AN23

Hardware Setup: EN-RE-R12-AN23
Measurement Type: Open-Area-Test-Site (SAC/FAR)
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: EN-RE-R12-AN23_PRE

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

14 EUT: GAT NET.Controller S 7020 F/ISO with 3x **Lock 7020 USB**
Test Verdict: pass
Test Description: Spurious Emissions, 9kHz-30MHz
Operating Conditions: Pulse transmission (normal mode) with an interval of 250ms
Operator Name: RDR
Project Number: 36259
Date: 08.05.2019
Comment: Card 13.56 MHz



- 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]
- × QuasiPeak-QPK (Single) [Result Table_Single.Result:2]
- + Average-AVG (Single) [Result Table_Single.Result:3]
- × MaxPeak-PK+ (Single) [Result Table_Single.Result:1]

Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Pol	Azimuth (deg)
13.560000	69.81	---	124.00	54.19	1000.0	9.000	V	242.0

(continuation of the "Final_Result" table from column 14 ...)

Frequency (MHz)	Corr. (dB/m)	Comment
13.560000	20	Pk: 78,79

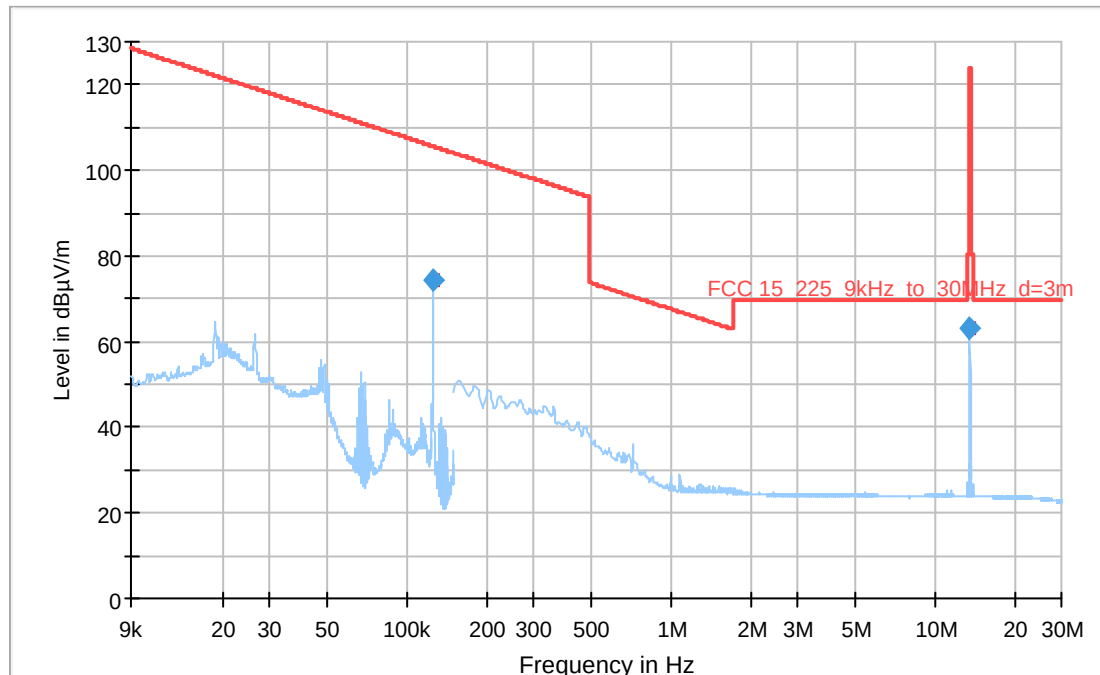
EMI Auto Test Template: FCC-RE-R17-AN23

Hardware Setup: EN-RE-R12-AN23
Measurement Type: Open-Area-Test-Site (SAC/FAR)
Frequency Range: 9 kHz - 30 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: EN-RE-R12-AN23_PRE

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

15 EUT: GAT NET.Controller S 7020 F/ISO with 3x **Lock 7020 P**
Test Verdict: pass
Test Description: Spurious Emissions, 9kHz-30MHz
Operating Conditions: Pulse transmission (normal mode) with an interval of 250ms
Operator Name: RDR
Project Number: 36259
Date: 08.05.2019
Comment:



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]

Final Result

Frequency (MHz)	QuasiPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Pol	Azimuth (deg)
0.125000	74.14	---	105.66	31.52	1000.0	0.200	H	154.0
13.560000	63.34	---	124.00	60.66	1000.0	9.000	V	110.0

(continuation of the "Final_Result" table from column 14 ...)

Frequency (MHz)	Corr. (dB/m)	Comment
0.125000	20	14:49:23 - 08.05.2019
13.560000	20	14:49:23 - 08.05.2019

EMI Auto Test Template: FCC-RE-R17-AN23

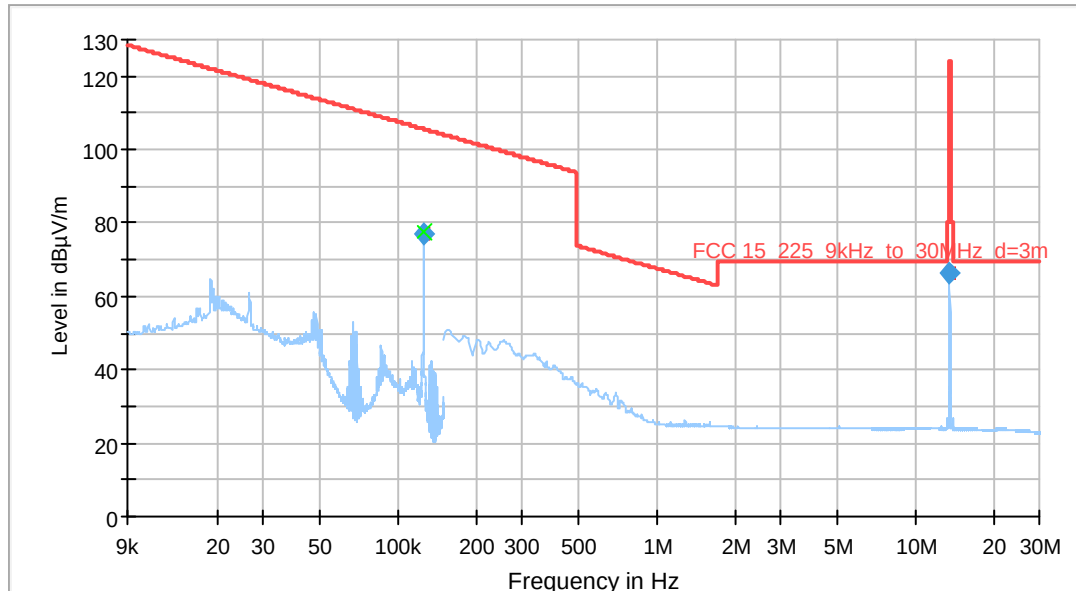
Hardware Setup: EN-RE-R12-AN23
Measurement Type: Open-Area-Test-Site (SAC/FAR)
Frequency Range: 9 kHz - 30 MHz
Graphics Level Range: 0 dB μ V/m - 130 dB μ V/m

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: EN-RE-R12-AN23_PRE

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

16 EUT: GAT NET.Controller S 7020 F/ISO with 3x Lock 7020 USB P
Test Verdict: pass
Test Description: Spurious Emissions, 9kHz-30MHz
Operating Conditions: Pulse transmission (normal mode) with an interval of 250ms
Operator Name: RDR
Project Number: 36259
Date: 08.05.2019
Comment:



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]
+ QuasiPeak-QPK (Single) [Result Table_Single.Result:2]
+ Average-AVG (Single) [Result Table_Single.Result:3]
x MaxPeak-PK+ (Single) [Result Table_Single.Result:1]

Final_Result

Frequency (MHz)	QuasiPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Pol	Azimuth (deg)
0.125000	76.99	---	105.66	28.67	---	---	H	132.0
13.560000	66.25	---	124.00	57.75	---	---	V	242.0

(continuation of the "Final_Result" table from column 14 ...)

Frequency (MHz)	Corr. (dB/m)	Comment
0.125000	20	Pk: 82.9 / 125 kHz Card: 81.5
13.560000	20	Pk: 76.2 / 125 kHz Card: 75.3

EMI Auto Test Template: FCC-RE-R17-AN23

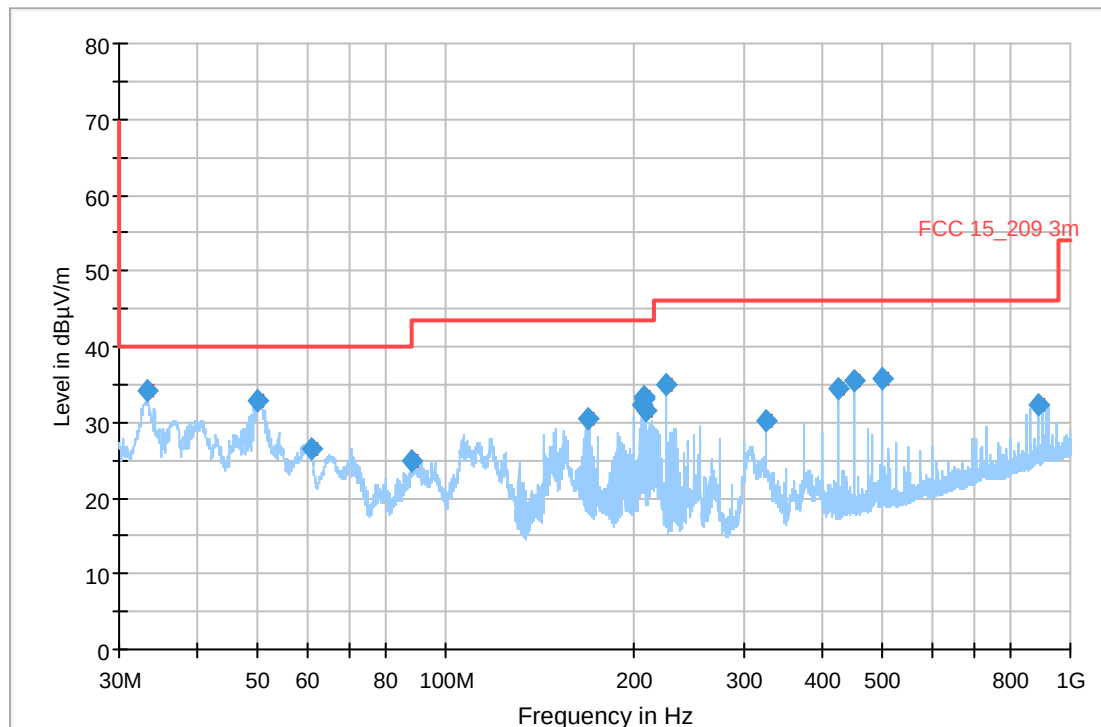
Hardware Setup: EN-RE-R12-AN23
Measurement Type: Open-Area-Test-Site (SAC/FAR)
Frequency Range: 9 kHz - 30 MHz
Graphics Level Range: 0 dBμV/m - 130 dBμV/m

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: EN-RE-R12-AN23_PRE

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

8.6 Diagrams radiated emissions 30 MHz to 1 GHz (Pk, Pre-tests)

17 EUT: GAT NET.Controller S 7020 F/ISO with 3x Lock 7020
Test Verdict: Pass
Test Description: FCC Part 15 Subpart C
Operating Conditions: Pulse transmission (normal mode) with an interval of 100 ms
Operator Name: RDR/ MBE
Project Number: 36259
Date: 2019-04-30
Comment: Because it is a Pre-test this measurement was done with Pk detector.
The limit is for QP, therefore it's not relevant if the Pk values are over the limit line in this diagram.



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

Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
33.300000	34.15	40.00	5.85	150.0	120.000	100.0	V	225.0
50.040000	32.79	40.00	7.21	150.0	120.000	140.0	V	45.0
60.720000	26.61	40.00	13.39	150.0	120.000	140.0	V	225.0
87.960000	25.02	40.00	14.98	150.0	120.000	100.0	V	180.0
168.180000	30.56	43.52	12.96	150.0	120.000	100.0	V	180.0
206.310000	32.41	43.52	11.11	150.0	120.000	100.0	H	0.0
207.060000	33.25	43.52	10.27	150.0	120.000	100.0	V	225.0
207.870000	33.01	43.52	10.51	150.0	120.000	100.0	V	225.0
208.680000	31.53	43.52	11.99	150.0	120.000	100.0	V	225.0
225.000000	35.05	46.02	10.97	150.0	120.000	100.0	H	225.0
324.990000	30.20	46.02	15.82	150.0	120.000	100.0	H	90.0
425.010000	34.56	46.02	11.46	150.0	120.000	100.0	H	135.0
450.000000	35.50	46.02	10.52	150.0	120.000	100.0	V	225.0
499.980000	35.81	46.02	10.21	150.0	120.000	100.0	H	315.0
888.030000	32.38	46.02	13.64	150.0	120.000	100.0	H	315.0

(continuation of the "Final_Result" table from column 15 ...)

Frequency (MHz)	Corr. (dB/m)	Comment
33.300000	18	11:36:07 - 30.04.2019
50.040000	7	11:36:07 - 30.04.2019
60.720000	5	11:36:07 - 30.04.2019
87.960000	11	11:36:07 - 30.04.2019
168.180000	11	11:36:07 - 30.04.2019
206.310000	10	11:36:07 - 30.04.2019
207.060000	10	11:36:07 - 30.04.2019
207.870000	10	11:36:07 - 30.04.2019
208.680000	10	11:36:07 - 30.04.2019
225.000000	11	11:36:07 - 30.04.2019
324.990000	14	11:36:07 - 30.04.2019
425.010000	16	11:36:07 - 30.04.2019
450.000000	17	11:36:07 - 30.04.2019
499.980000	18	11:36:07 - 30.04.2019
888.030000	23	11:36:07 - 30.04.2019

EMI Auto Test Template: zF-EN-RE-R17-AN08

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

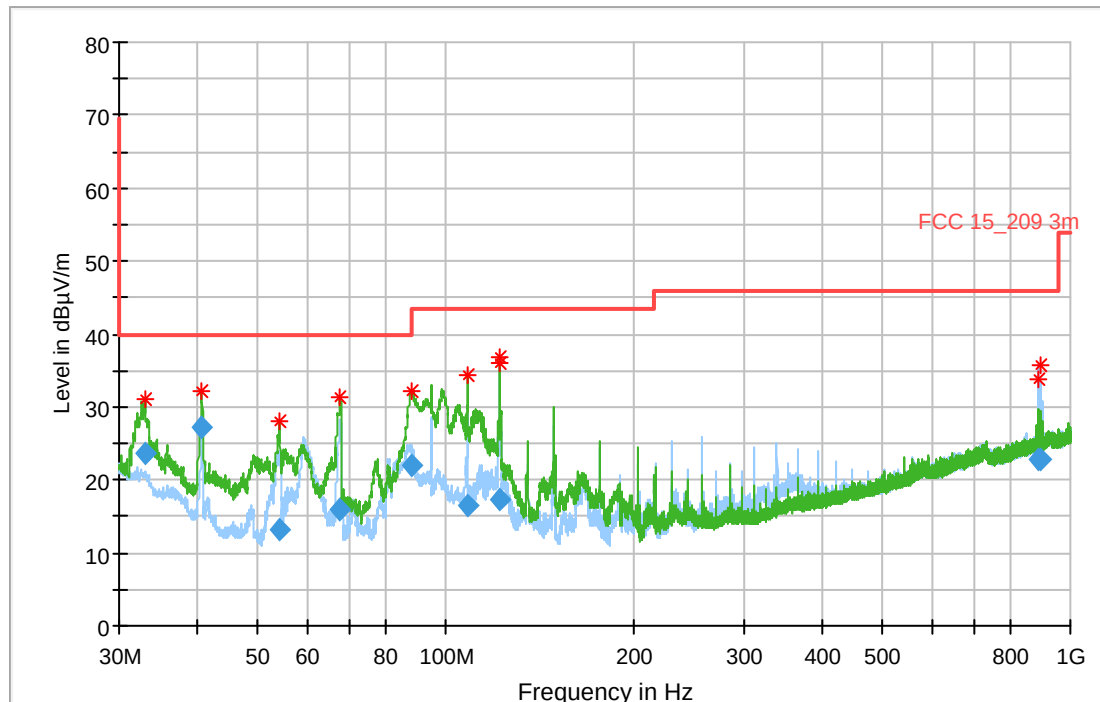
Preview Measurements:

Antenna height: 0 - 0 cm , Step Size = 0 cm , Positioning Speed = 8
Turntable position: 0 - 315 deg , Step Size = 45 deg , Positioning Speed = 8
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

18 EUT: GAT NET.Controller S 7020 F/ISO with 3x Lock 7020 USB
Test Verdict: Pass
Test Description: Spurious Emissions, 30-1000MHz
Operating Conditions: Pulse transmission (normal mode) with an interval of 100 ms
Operator Name: RDR
Project Number: 36259
Date: 2019-04-18
Comment: Because it is a Pre-test this measurement was done with Pk detector.
The limit is for QP, therefore it's not relevant if the Pk values are over the limit line in this diagram.



— 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]

Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
33.000000	23.59	40.00	16.41	1000.0	120.000	108.0	V	161.0
40.680000	27.32	40.00	12.68	1000.0	120.000	104.0	V	86.0
54.210000	13.16	40.00	26.84	1000.0	120.000	106.0	V	249.0
67.740000	16.04	40.00	23.96	1000.0	120.000	128.0	V	104.0
88.470000	22.02	43.52	21.50	1000.0	120.000	106.0	V	76.0
108.420000	16.36	43.52	27.16	1000.0	120.000	119.0	V	103.0
122.010000	17.40	43.52	26.12	1000.0	120.000	100.0	V	205.0
891.480000	22.84	46.02	23.18	1000.0	120.000	355.0	H	242.0
892.110000	22.81	46.02	23.21	1000.0	120.000	230.0	H	235.0

(continuation of the "Final_Result" table from column 15 ...)

Frequency (MHz)	Corr. (dB/m)	Comment
33.000000	18	10:51:37 - 18.04.2019
40.680000	14	10:45:37 - 18.04.2019
54.210000	5	10:56:09 - 18.04.2019
67.740000	8	10:50:00 - 18.04.2019
88.470000	11	10:47:03 - 18.04.2019
108.420000	12	10:48:27 - 18.04.2019
122.010000	12	10:53:11 - 18.04.2019
891.480000	23	10:43:24 - 18.04.2019
892.110000	23	10:42:06 - 18.04.2019

EMI Auto Test Template: FCC-RE-R17-AN08

Hardware Setup: EN-RE-R12-AN08
Measurement Type: Open-Area-Test-Site (SAC/FAR)
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

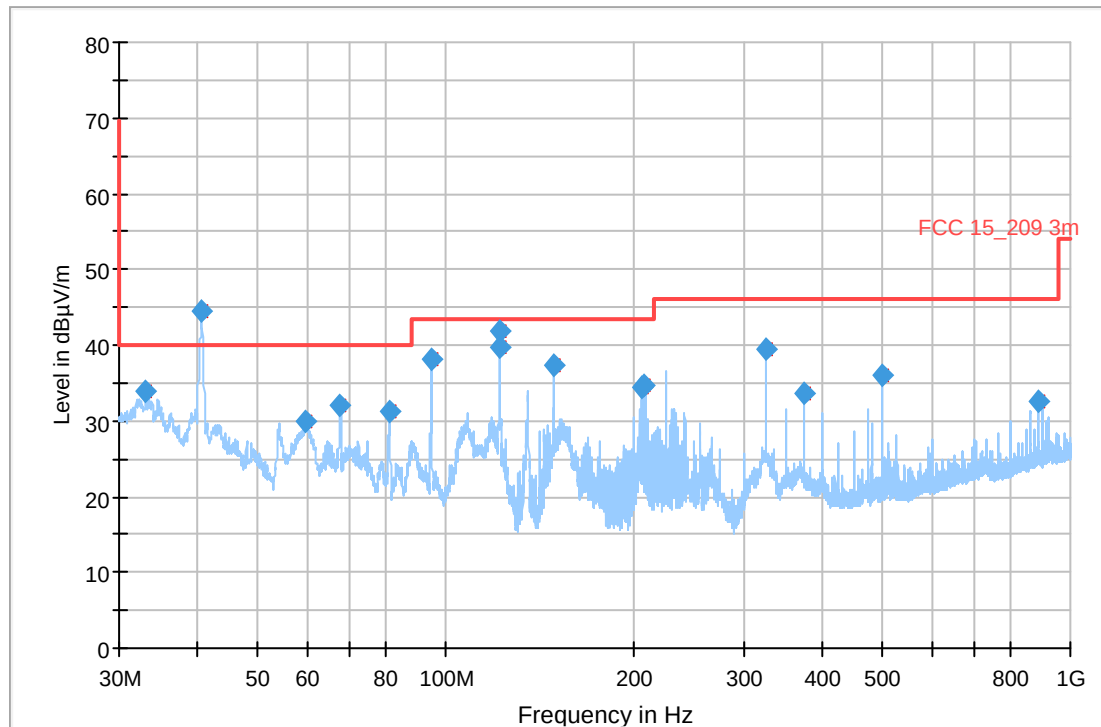
Frequency Zoom:
Zoom Scan Template: EN-RE-R12-AN08_ZOOM

Adjustment:
Antenna height: Range = 90 cm , Measuring Speed = 2
Turntable position: Range = 30 deg , Measuring Speed = 2
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

19 EUT:
Test Verdict: Pass
Test Description: FCC Part 15 Subpart C
Operating Conditions: Pulse transmission (normal mode) with an interval of 250ms
Operator Name: RDR
Project Number: 36259
Date: 2019-04-30
Comment: Because it is a Pre-test this measurement was done with Pk detector. The limit is for QP, therefore it's not relevant if the Pk values are over the limit line in this diagram.



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

Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
33.090000	33.78	40.00	6.22	300.0	120.000	100.0	V	90.0
40.650000	44.42	40.00	-4.42	300.0	120.000	100.0	V	135.0
59.700000	29.92	40.00	10.08	300.0	120.000	140.0	V	225.0
67.800000	32.09	40.00	7.91	300.0	120.000	100.0	V	180.0
81.330000	31.38	40.00	8.62	300.0	120.000	100.0	V	135.0
94.920000	38.08	43.52	5.44	300.0	120.000	100.0	V	135.0
121.950000	39.68	43.52	3.84	300.0	120.000	100.0	V	45.0
122.040000	41.95	43.52	1.57	300.0	120.000	100.0	V	45.0
148.800000	37.32	43.52	6.20	300.0	120.000	160.0	H	225.0
206.340000	34.32	43.52	9.20	300.0	120.000	160.0	H	270.0
207.180000	34.75	43.52	8.77	300.0	120.000	100.0	V	225.0
324.990000	39.53	46.02	6.49	300.0	120.000	100.0	H	270.0
375.000000	33.70	46.02	12.32	300.0	120.000	100.0	H	270.0
499.980000	36.12	46.02	9.90	300.0	120.000	100.0	H	315.0
888.030000	32.61	46.02	13.41	300.0	120.000	100.0	H	315.0

(continuation of the "Final_Result" table from column 15 ...)

Frequency (MHz)	Corr. (dB/m)	Comment
33.090000	18	14:04:09 - 30.04.2019
40.650000	14	14:04:09 - 30.04.2019
59.700000	5	14:04:09 - 30.04.2019
67.800000	8	14:04:09 - 30.04.2019
81.330000	11	14:04:09 - 30.04.2019
94.920000	11	14:04:09 - 30.04.2019
121.950000	12	14:04:09 - 30.04.2019
122.040000	12	14:04:09 - 30.04.2019
148.800000	11	14:04:09 - 30.04.2019
206.340000	10	14:04:09 - 30.04.2019
207.180000	10	14:04:09 - 30.04.2019
324.990000	14	14:04:09 - 30.04.2019
375.000000	15	14:04:09 - 30.04.2019
499.980000	18	14:04:09 - 30.04.2019
888.030000	23	14:04:09 - 30.04.2019

EMI Auto Test Template: zF-EN-RE-R17-AN08

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

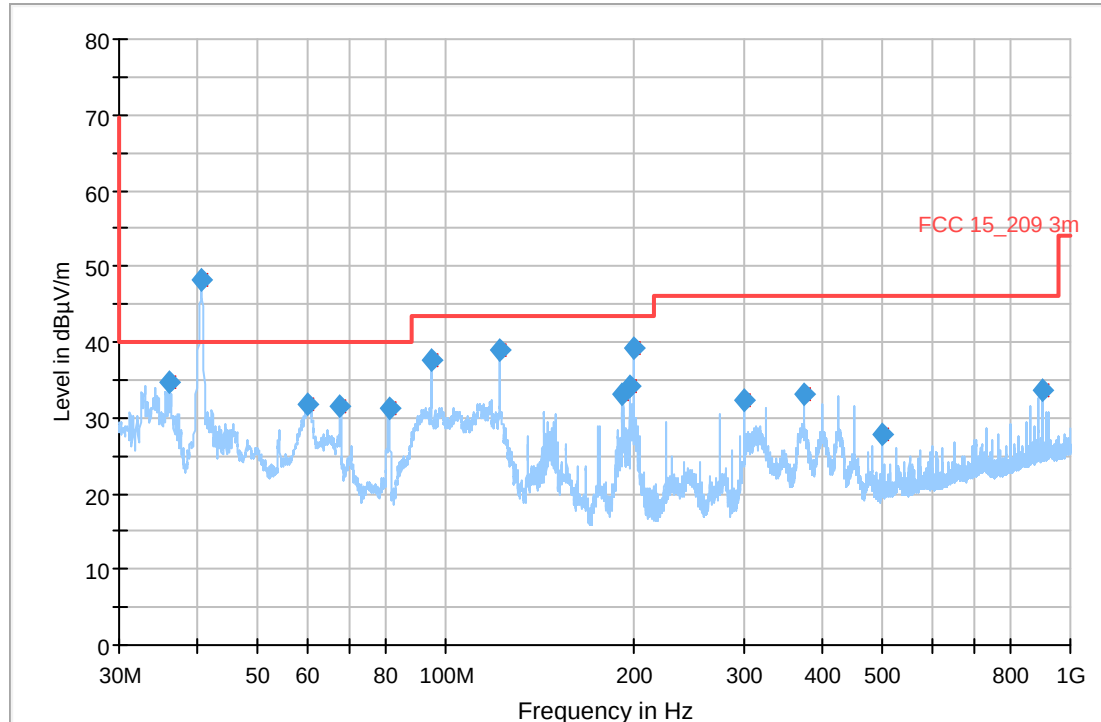
Preview Measurements:

Antenna height: 0 - 0 cm , Step Size = 0 cm , Positioning Speed = 8
Turntable position: 0 - 315 deg , Step Size = 45 deg , Positioning Speed = 8
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	0,3 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

20 EUT:
Test Verdict: Pass
Test Description: FCC Part 15 Subpart C
Operating Conditions: Pulse transmission (normal mode) with an interval of 250ms
Operator Name: RDR
Project Number: 36259
Date: 2019-04-30
Comment: Because it is a Pre-test this measurement was done with Pk detector. The limit is for QP, therefore it's not relevant if the Pk values are over the limit line in this diagram.



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

Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
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(continuation of the "Final_Result" table from column 15 ...)

Frequency (MHz)	Corr. (dB/m)	Comment
35.970000	17	14:31:40 - 30.04.2019
40.650000	14	14:31:40 - 30.04.2019
60.150000	5	14:31:40 - 30.04.2019
67.770000	8	14:31:40 - 30.04.2019
81.330000	11	14:31:40 - 30.04.2019
94.920000	11	14:31:40 - 30.04.2019
122.040000	13	14:31:40 - 30.04.2019
192.030000	10	14:31:40 - 30.04.2019
196.800000	10	14:31:40 - 30.04.2019
200.010000	10	14:31:40 - 30.04.2019
300.000000	13	14:31:40 - 30.04.2019
375.000000	15	14:31:40 - 30.04.2019
500.010000	18	14:31:40 - 30.04.2019
900.000000	24	14:31:40 - 30.04.2019

EMI Auto Test Template: zF-EN-RE-R17-AN08

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

Preview Measurements:
Antenna height: 0 - 0 cm , Step Size = 0 cm , Positioning Speed = 8
Turntable position: 0 - 315 deg , Step Size = 45 deg , Positioning Speed = 8
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	0,3 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

SECTION 9

MEASUREMENT UNCERTAINTY EVALUATION

Measurement uncertainty for radiated magnetic field, 9 kHz – 30 MHz	± 3.2 dB
Measurement uncertainty for radiated emission, 30 MHz - 1000 MHz	
Uncertainty for the frequency range 30 to 300 MHz using a biconical or a combination antenna at 3 m	± 4.9 dB
Uncertainty for the frequency range 300 to 1000 MHz using a logperiodic or a combination antenna at 3 m	± 4.7 dB
Measurement uncertainty for radiated emission 1 to 26 GHz	
Uncertainty for the frequency range 1 to 18 GHz	± 6.1 dB
Uncertainty for the frequency range 18 to 26,5 GHz	± 6.5 dB
Measurement uncertainty for conducted disturbances at the antenna port on radio equipment	
Frequency range 9 kHz - 1 GHz	± 1.9 dB
Frequency range 1 GHz - 18 GHz	± 3.0 dB
Frequency range 18 GHz -26,5 GHz	± 3.6 dB
Measurement uncertainty for Frequency error	± 1 x 10 ⁻⁸
Measurement uncertainty for Output power (Conducted), 9 kHz - 18 GHz	± 1.0 dB
Measurement uncertainty for RF Power density	
Frequency range 9 kHz - 1 GHz	± 1.9 dB
Frequency range 1 GHz - 18 GHz	± 3.0 dB
Frequency range 18 GHz -26,5 GHz	± 3.6 dB
Measurement uncertainty for humidity	± 4 %
Measurement uncertainty for temperature	± 0.5 °C
Measurement uncertainty for voltage	
DC	± 0.1 %
AC up to 10 kHz	± 1.8 %
Measurement uncertainty for time	± 0.058 %
Measurement uncertainty for conducted emissions, LISN, 150 kHz -30 MHz	± 2.3 dB
Measurement uncertainty for OBW	± 4.3 %
601 points resolution (Spectrum analyzer)	± 0.83 %
30000 points resolution (Spectrum analyzer)	± 0.016 %

End of test report