

Gantner Electronic GmbH

TEST REPORT

SCOPE OF WORK

RADIO TESTING – ACCESS READER [GAT SLR 7310]

REPORT NUMBER

2238979KAU-005

ISSUE DATE

23-November-2020

PAGES

35

DOCUMENT CONTROL NUMBER

R_FCC 15-225_18-01 (25-January-2018)

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TYPE: GAT SLR 7310
DESCRIPTION: Access reader
SERIAL NO: **2009000007**

All measurement results refer to the equipment which was tested

MANUFACTURER: Gantner Electronic GmbH
CUSTOMER NAME: Gantner Electronic GmbH
ADDRESS (CUSTOMER): Bundesstr. 12
AT-6714 Nüziders
AUSTRIA

REPORT NO: 2238979KAU-005

TEST RESULT: The equipment complies to 47 CFR Part 15, Subpart C, Intentional radiators, section 15.225 / RSS-210, Issue 10 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

TEST ENGINEER: M. Bensaid
Project Engineer


TEST ENGINEER: U. Gronert
Senior Project Engineer

REVIEWER: R. Dressler
Technical Manager EMC/ Radio







Details about Accreditations/Acceptances


EMC / Radio National

 <p>DAkKS Deutsche Akkreditierungsstelle D-PL-12085-01-01</p>	<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>

International

 <p>IECEE CB SCHEME</p>	<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>FCC Federal Communications Commission</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>Bundesnetzagentur BNetzA-CAB-16/21-10</p>	<p>The <i>Bundesnetzagentur</i> recognizes Intertek Deutschland GmbH as Conformity Assessment Body in the sector electromagnetic compatibility (EMC).</p>
 <p>Innovation, Science and Economic Development Canada</p>	<p>The Intertek Deutschland EMC-Lab is accredited for Innovation, Science and Economic Development Canada (ISED)</p>
	<p>ISED CAB IDENTIFIER: DE0014</p>
	<p>ISED #: 24854</p>

Automotive

 <p>KBA Anerkennungsstelle</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>
	<p>Anerkannt unter KBA-P 00046-03</p>

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SECTION 2

MEASUREMENT AND TEST SPECIFICATION

47 CFR Part 15, Subpart C, Intentional radiators, section 15.207 and section 15.225 /
RSS-210, Issue 10 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 SLR 7310 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: 2020-03-30 and 2020-10-08

Testing: 2020-08-11 to 2020-10-27

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 #
OATS	10 m	8882A-1
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 Identical types

The following variant models were not tested as part of this evaluation, but have been identified by the manufacturer as being electrically identical models to the model tested. Intertek does not make any claims of compliance for samples or variants which were not tested.

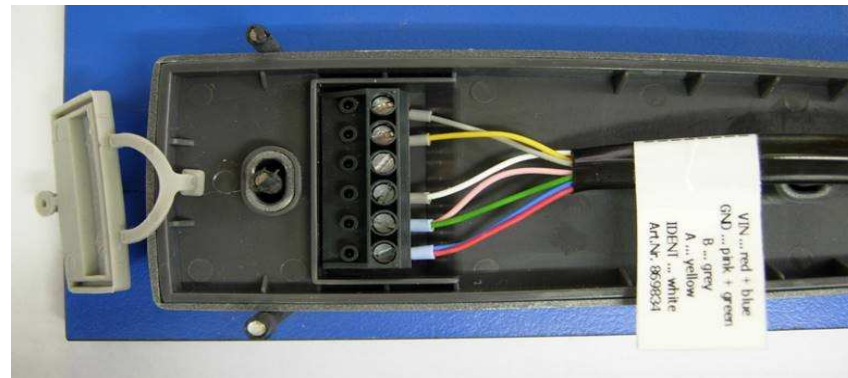
GAT SLR 7317

The differences are according to the manufacturer/customer:

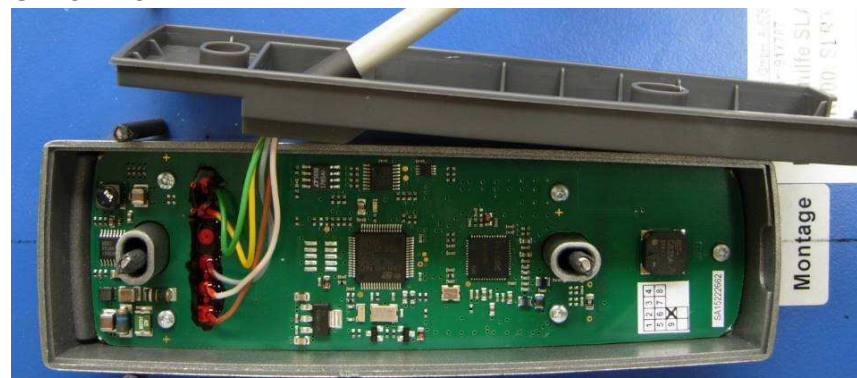
GAT SLR 7310: 13.56 MHz multitechnology-RFID reader, slim line wall mounted, PIN code keypad, RS485 interface. The connection cable is connected to a screw terminal.

GAT SLR 7317: 13.56 MHz multitechnology-RFID reader, slim line wall mounted, PIN code keypad, RS485 interface, Protection Type IP67 with 2.9 m cable. The connection cable is directly soldered to the PCB. The enclosure materials for both devices are identical.

GAT SLR 7310:



GAT SLR 7317:



4.3 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.

4.4 Document History

REVISION	DATE	REPORT	CHANGES	AUTHOR
Initial release	2020-11-23	2238979KAU-005	Initial issue	MBE

SECTION 5**TEST RESULTS – OVERVIEW**

EMISSION	VERDICT	DATE	NO
Conducted emissions (0.15 MHz - 30 MHz)	P	2020-10-27	6
Field strength (13.110 MHz – 14.010 MHz)	P	2020-08-12	2
Radiated emissions (< 30 MHz)	P	2020-08-12	3
Radiated emissions (30 MHz - 1 GHz)	P	2020-08-11	1
Frequency Stability Test	P	2020-08-19	4
Occupied bandwidth test	P	2020-10-26	5

SECTION 6

INFORMATION ABOUT THE EUT

6.1 Description of the EUT

Device tested as:

table-top EUT

floor-standing EUT

Dimensions:	Height:	Width:	Length:
	22.2 mm	44 mm	139.9 mm

Firmware version:	Special firmware for EMC Testing
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Hardware version:	2.0
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EUT version:	<input checked="" type="checkbox"/> Production	<input type="checkbox"/> Prototype	<input type="checkbox"/> Used
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Description: The GAT SLR 73xx is a multi-technology reader for all popular RFID technologies. The readers are used to identify people via contactless RFID data carriers and connect to an access controller through structured building cabling.

Transmitter frequency range: 13.56 MHz

Frequency agile or hopping: Yes No

Antenna: Internal antenna External antenna

Antenna connector: None, internal antenna Yes, type

Type of modulation: Amplitude modulation

Type of used TAG: Mifare chipcard

Temperature range: Customers specification of EUT: 0°C to +50°C

Power rating: 12 – 24 V DC 7 200 mA

Transmitter stand by mode supported: Yes No

6.1.1 Photo of the rating plate and of the EUT

Rating plate:



EUT:



6.2 Power interface

MODE	VOLTAGE (V)	FREQUENCY (Hz)	COMMENT
1	24	DC	Over the ISK 200 via RS 485

6.3 Peripheral devices used for testing

DEVICE	MANUFACTURER	TYPE	SN	FCC ID
Power supply	Gantner	ISK 200	07510300	-
Power supply	Gantner	ISK 200	1209447	-
Notebook	HP	HP ProBook 6560b	5CB20246BZ	QDS-BRCM 1043

6.4 Configuration mode

MODE	DESCRIPTION
1	The EUT was placed on the table and was connected to the ISK 200 (Section 6.9).
2	The EUT was placed in the climatic chamber and was connected to DC power supply.

6.5 Operation mode

MODE	DESCRIPTION
1	Normal operation and the RFID module of the EUT was in continuous wave mode.
2	Normal operation and transmission mode without RFID-tag.
3	Normal operation and transmission mode. The RFID-tag was placed in front of the push button.

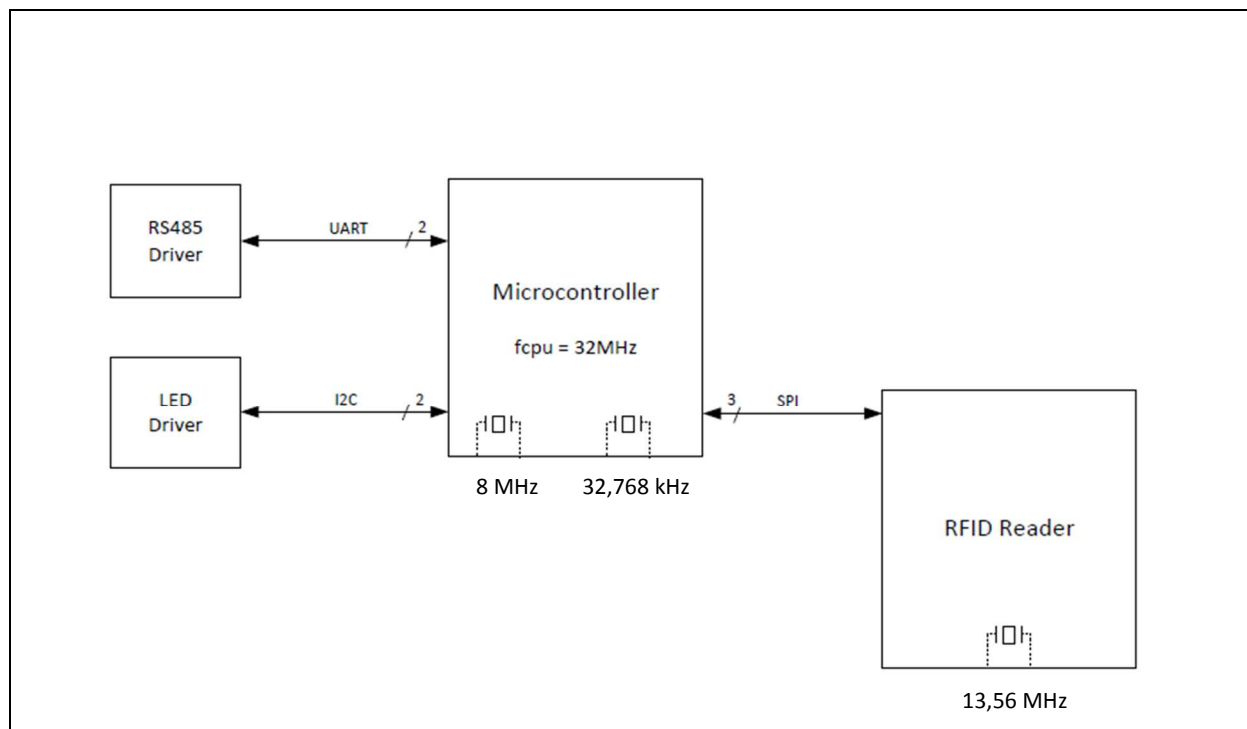
6.6 Clock frequencies of the EUT

SOURCE	FREQUENCY ()
Microcontroller	f_{cpu} : 32 MHz, 2 Crystals: 8 MHz, 32.768 kHz.
RFID reader	13.56 MHz

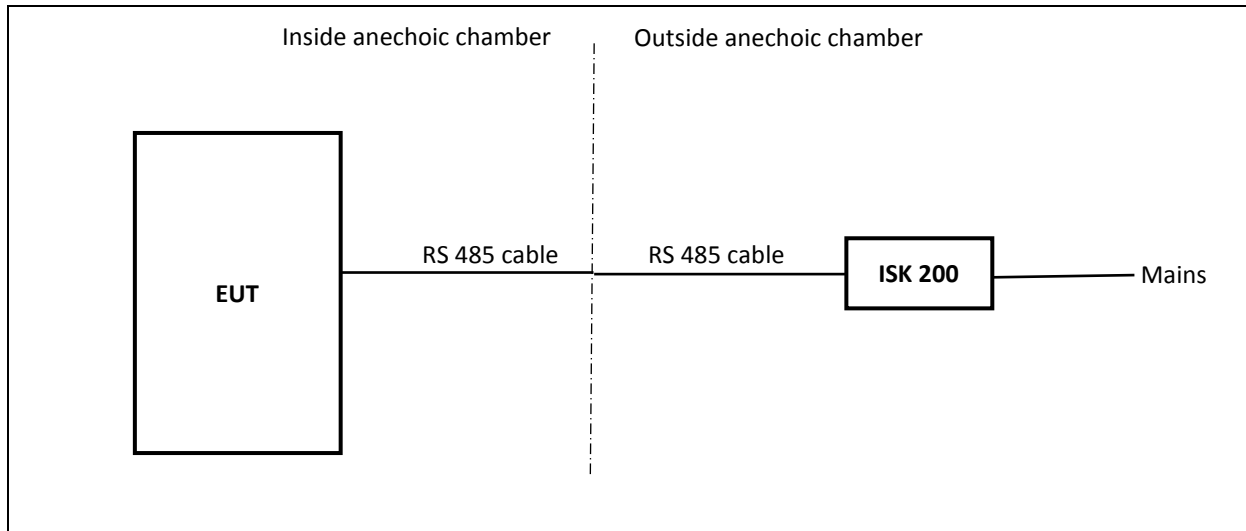
6.7 Supply and interconnecting cables used for testing

LINE	LENGTH (cm)	SHIELDING	FERRITE	TERMINATION
RS 485	300	Y	N	-
RS 485	50	Y	N	-

6.8 Block diagram of the EUT



6.9 Block diagram of the test setup



SECTION 7

7.1 Conducted emissions

NORMATIVE REFERENCES		RESULT
Limits according to:	FCC §15.207 RSS-210, Issue 10	P
Methods of measurement according to:	ANSI C63.10 RSS-Gen, Issue 5	
Equipment mode	Power interface	1
	EUT configuration mode	1
	Operation mode	1
Test requirements	Frequency range	150 kHz - 30 MHz
	Class	A

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	2020-01 (1 year)
Receiver 9 kHz - 7 GHz	Rohde & Schwarz	ESR7	101757	PM KF 3371	2020-04 (1 year)
V-Artificial mains- network, 2 Line	Rohde & Schwarz	ESH3-Z5	863367/018	PM KF 0142	2019-10 (2 years)
Test software	Rohde & Schwarz	EMC 32 V.8.54	-	PM KF 2983	-

Comment

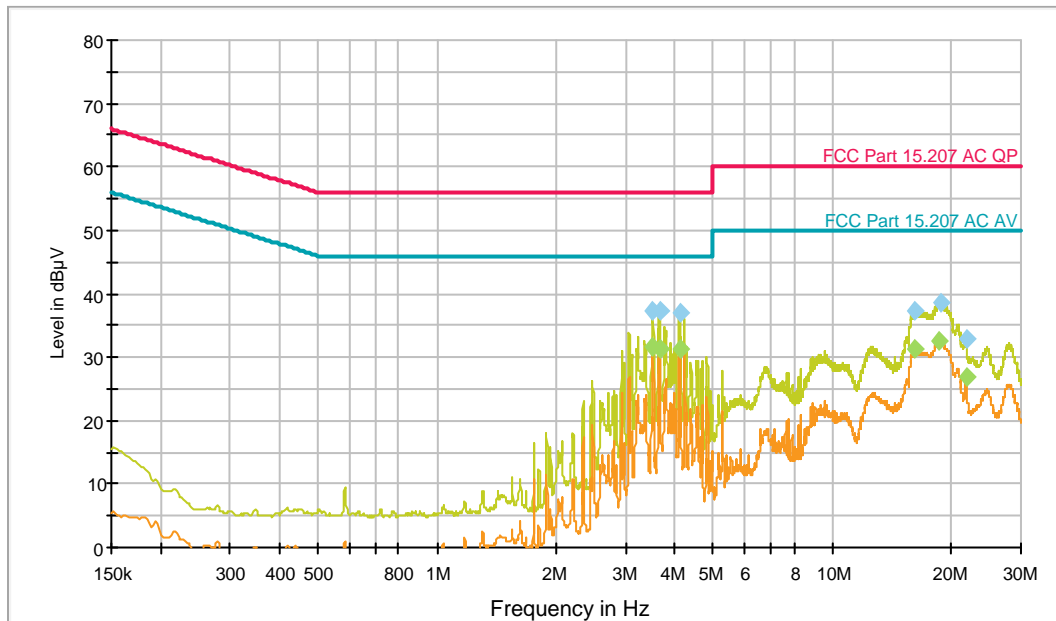
In the following diagram, the N and L line are merged.

Measurement results – Conducted emissions:

Common Information

EUT: GAT SLR 7310
 Project No.: 38979
 Test description: Conducted Emissions
 Test standard: FCC 15 C
 Tested port: Mains
 Test verdict: Passed
 Operating conditions: Continuous normal operation, 120 V, 60 Hz
 Operator name: MBE
 Date of testing: 27.10.2020

EN-CE-R32-LN01



- FCC Part 15.207 AC QP [..\EMI conducted\FCC Part 15 Subpart C\]
- FCC Part 15.207 AC AV [..\EMI conducted\FCC Part 15 Subpart C\]
- Preview Result 1-QPK [Preview Result 1.Result:1]
- Preview Result 2-CAV [Preview Result 2.Result:2]
- ◆ Final Result 1-QPK [Final Result 1.Result:1]
- ◆ Final Result 2-CAV [Final Result 2.Result:1]

Final Result 1

Frequency (MHz)	QuasiPeak-ClearWrite (dBµV)	PE	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV)	Comment
3.520500	37.4	GND	N	10.3	18.6	56.0	
3.657750	37.4	GND	N	10.3	18.6	56.0	
4.105500	36.9	GND	N	10.3	19.1	56.0	
16.116000	37.2	GND	N	10.8	22.8	60.0	
18.811500	38.6	GND	N	10.9	21.4	60.0	
21.885000	32.8	GND	N	11.0	27.2	60.0	

Final Result 2

Frequency (MHz)	CAverage-ClearWrite (dBµV)	PE	Line	Corr. (dB)	Margin - CAV (dB)	Limit - CAV (dBµV)	Comment
3.520500	31.5	GND	N	10.3	14.5	46.0	
3.655500	31.3	GND	N	10.3	14.7	46.0	
4.105500	31.3	GND	N	10.3	14.7	46.0	
16.084500	31.2	GND	N	10.8	18.8	50.0	
18.606750	32.6	GND	N	10.9	17.4	50.0	
21.790500	27.0	GND	N	11.0	23.0	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_EMK KF_Conducted Emission

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 10, 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	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.

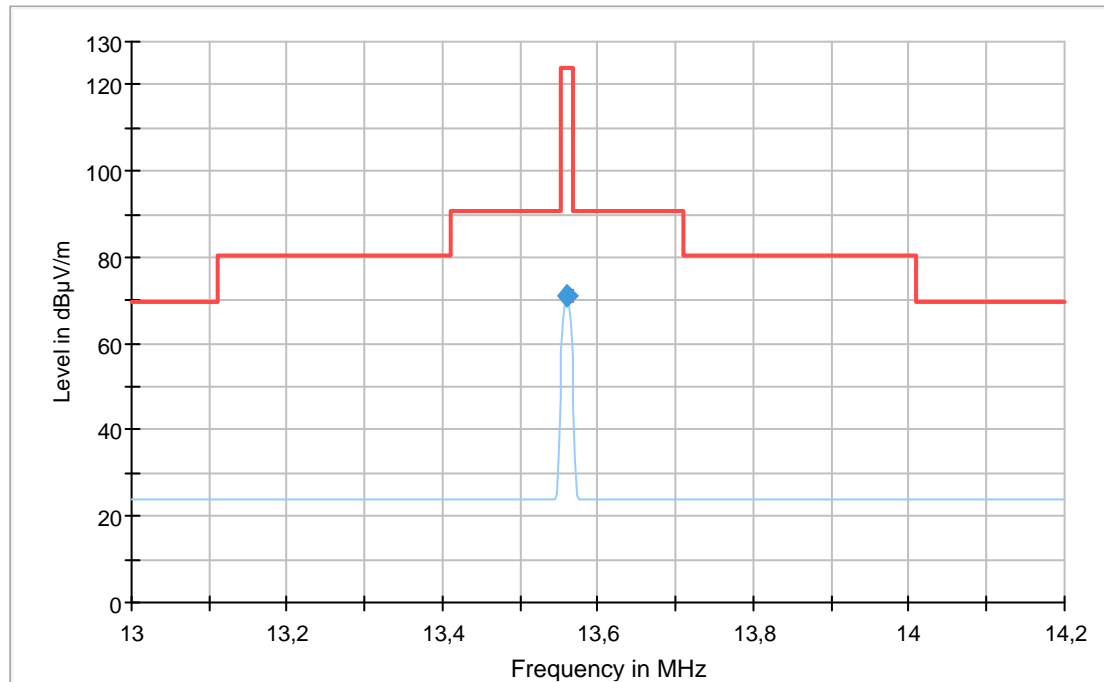
Test equipment

DESCRIPTION	MANUFACTURER	TYPE	SN	ASSET NO.	CALIBRATION
Semi-Anechoic chamber (30 – 1000 MHz)	Siepel	REF W460SLB	-	PM KF 1150-01	2019-12 (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	2020-04 (1 year)
Loop antenna 9 kHz- 30 MHz	Rohde & Schwarz	HFH2-Z2	881058/48	PM KF 1401	2019-10 (1 years)
Test software	Rohde & Schwarz	EMC 32 V.10.50.40	-	PM KF 2983-2	-

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

Common Information

EUT:	GAT SLR 7310
Test Verdict:	Pass
Test Description:	Field strength
Operating Conditions:	The RFID module was in continuous wave mode
Operator Name:	MBE
Project Number:	38979
Date:	12.08.2020



- 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 [.\v\F 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	71.13	---	124.00	52.87	1000.0	9.000	H	225.0

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

Frequency (MHz)	Corr. (dB/m)	Comment
13.560000	20	-

Comment

The RFID transmitter was operated in CW mode. Therefore, the bandwidth of the transmitting signal is smaller than the measuring bandwidth of the measuring receiver. Thus, a measurement with a larger measurement bandwidth was not necessary.

EMI Auto Test Template: EN-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 - 315 deg , Step Size = 45 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

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

$$E = U + AF + A$$

7.3 Radiated emissions < 30 MHz

NORMATIVE REFERENCES		RESULT
Limits according to:	FCC §15.225 (d), §15.209 RSS-210, Issue 10, 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
	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.

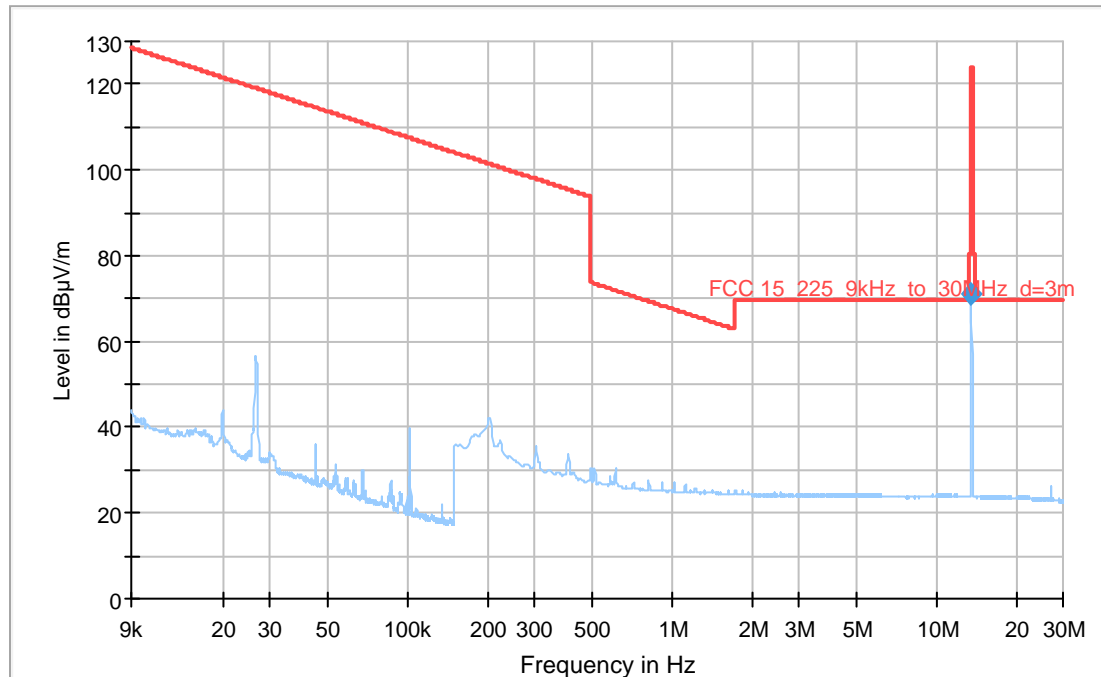
Test equipment

DESCRIPTION	MANUFACTURER	TYPE	SN	ASSET NO.	CALIBRATION
Semi-Anechoic chamber (30 – 1000 MHz)	Siepel	REF W460SLB	-	PM KF 1150-01	2019-12 (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	2020-04 (1 year)
Loop antenna 9 kHz- 30 MHz	Rohde & Schwarz	HFH2-Z2	881058/48	PM KF 1401	2019-10 (1 years)
Test software	Rohde & Schwarz	EMC 32 V.10.50.40	-	PM KF 2983-2	-

Measurement results – Radiated emissions < 30 MHz:

Common Information

EUT:	GAT SLR 7310
Test Verdict:	Pass
Test Description:	FCC C, 9 kHz – 30 MHz
Operating Conditions:	The RFID module was in continuous wave mode
Operator Name:	MBE
Project Number:	38979
Date:	12.08.2020



- 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	71.13	---	124.00	52.87	1000.0	9.000	H	225.0

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

Frequency (MHz)	Corr. (dB/m)	Comment
13.560000	20	The RFID module of the EUT was in continuous wave mode.

Comment

The RFID transmitter was operated in CW mode. Therefore, the bandwidth of the transmitting signal is smaller than the measuring bandwidth of the measuring receiver. Thus, a measurement with a larger measurement bandwidth was not necessary.

EMI Auto Test Template: EN-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 - 315 deg , Step Size = 45 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

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Test procedure

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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 10, 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	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.

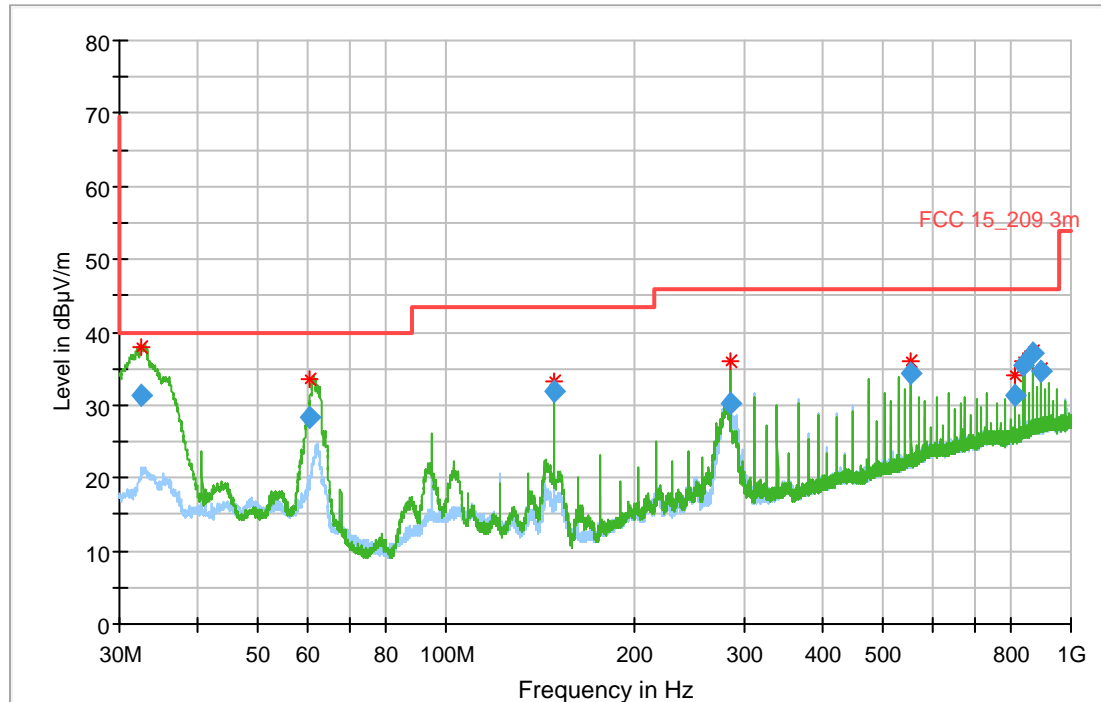
Test equipment

DESCRIPTION	MANUFACTURER	TYPE	SN	ASSET NO.	CALIBRATION
Semi-Anechoic chamber (30 – 1000 MHz)	Siepel	REF W460SLB	-	PM KF 1150-01	2019-12 (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	2020-04 (1 year)
Trilog broadband antenna	Schwarzbeck	VULB 9163	9163-974	PM KF 3196	2019-11 (1 year)
Test software	Rohde & Schwarz	EMC 32 V.10.50.40	-	PM KF 2983-2	-

Measurement results – Radiated emissions 30 MHz to 1 GHz:

Common Information

EUT:	GAT SLR 7310
Test Verdict:	Pass
Test Description:	FCC 15 C, 30 MHz - 1 GHz
Operating Conditions:	The RFID module was in continuous wave mode
Operator Name:	MBE
Project Number:	38979
Date:	11.08.2020



- 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)	Corr. (dB/m)
32.640000	31.23	40.00	8.77	1000.0	120.000	100.0	V	121.0	11
60.510000	28.34	40.00	11.66	1000.0	120.000	103.0	V	346.0	13
149.160000	31.96	43.52	11.56	1000.0	120.000	103.0	V	110.0	9
284.760000	30.23	46.02	15.79	1000.0	120.000	103.0	H	94.0	15
555.960000	34.29	46.02	11.73	1000.0	120.000	100.0	V	172.0	20
813.600000	31.42	46.02	14.60	1000.0	120.000	151.0	V	-5.0	24
840.720000	35.49	46.02	10.53	1000.0	120.000	112.0	V	188.0	24
867.840000	37.20	46.02	8.82	1000.0	120.000	112.0	V	195.0	25
894.960000	34.76	46.02	11.26	1000.0	120.000	112.0	V	219.0	25

EMI Auto Test Template: FCC-RE-R17-AN34

Hardware Setup: EN-RE-R17-AN34
 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-R17-AN34_PRE

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

Frequency Zoom:
 Zoom Scan Template: EN-RE-R17-AN34_ZOOM

Adjustment:
 Antenna height: Range = 180 cm , Measuring Speed = 1
 Turntable position: Range = 60 deg , Measuring Speed = 2
 Template for Single Meas.: EN-RE-R17-AN34_ADJ

Final Measurements:
 Template for Single Meas.: EN-RE-R17-AN34_FIN_15s

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	400 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 10, section B4 RSS-Gen Issue 5, section 6.11	P
Methods of measurement according to:	ANSI C63.10, section 9.14	
Equipment mode	Power interface	1
	EUT configuration mode	2
	Operation mode	2 and 3

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 and 1.15*120 V

Test equipment

DESCRIPTION	MANUFACTURER	TYPE	SN	ASSET NO.	CALIBRATION
Temperature Chamber	HT4010	Heraeus-Vötsch	45021	PM KF 1402	2020-03 (1 year)
Receiver 10 Hz - 40 GHz	Rohde & Schwarz	FSV40	101400	PM KF 2783	2019-09 (1 year)
Loop antenna	Rohde & Schwarz	HZ-10	100055	PM KF 0965	2020-05 (3 year)

Measurement results – Frequency stability measurement:

Operation mode 2

Temperature °C	Carrier at 20°C MHz	Upper limit:	13.561356 MHz
		Lower limit:	13.558644 MHz
		Measured frequency under temperature influence:	
		+50	13.55980
+40	13.55983		
+30	13.55983		
+20	13.55989		
+10	13.55997		
0	13.55999		
-10	13.56001		
-20	13.56000		

Comment

The EUT was supplied with the ISK 200 power supply unit, serial number 07510300.
The AC supply voltage was varied from 102 V (0.85 * 120 V) to 138 V (1.15 * 120 V).
The voltage variations had no influence on the transmission frequency and the transmission level.

Voltage V	Temperature 20°C	Upper limit:	13.561356 MHz
		Lower limit:	13.558644 MHz
		Measured frequency under AC supply voltage variation:	
		102	13.55988
120	13.55988		
138	13.55988		

Operation mode 3

Temperature °C	Carrier at 20°C MHz	Upper limit: 13.561356 MHz
		Lower limit: 13.558644 MHz
		Measured frequency under temperature influence:
+50	13.55988	13.55981
+40		13.55981
+30		13.55984
+20		13.55988
+10		13.55993
0		13.55997
-10		13.56000
-20		13.56001

Comment

The EUT was supplied with the ISK 200 power supply unit, serial number 07510300.
The AC supply voltage was varied from 102 V (0.85 * 120 V) to 138 V (1.15 * 120 V).
The voltage variations had no influence on the transmission frequency and the transmission level.

Voltage V	Temperature 20°C	Upper limit: 13.561356 MHz
		Lower limit: 13.558644 MHz
		Measured frequency under AC supply voltage variation:
102		13.55988
120		13.55988
138		13.55988

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

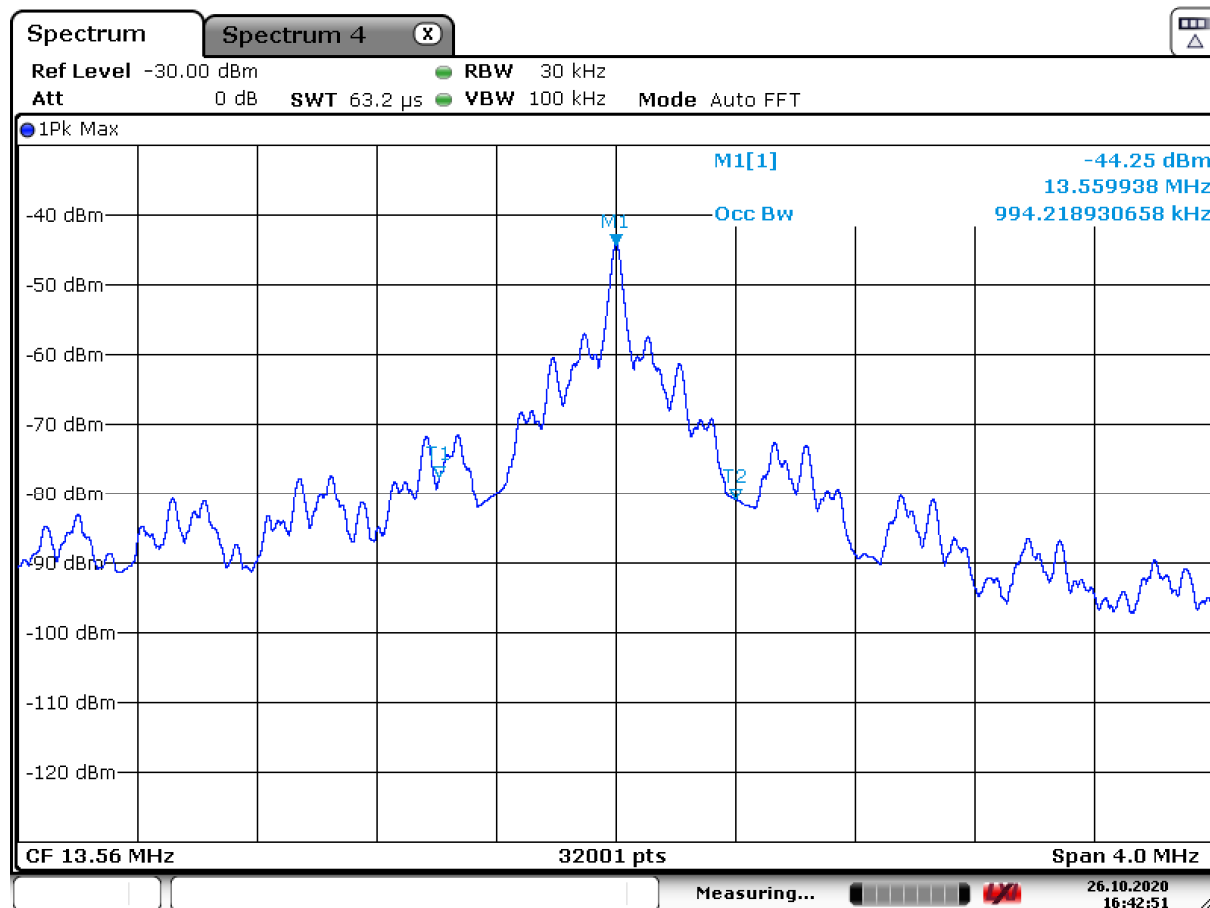
Test equipment

DESCRIPTION	MANUFACTURER	TYPE	SN	ASSET NO.	CALIBRATION
Temperature Chamber	HT4010	Heraeus-Vötsch	45021	PM KF 1402	2020-03 (1 year)
Receiver 10 Hz - 40 GHz	Rohde & Schwarz	FSV40	101400	PM KF 2783	2020-08 (1 year)
Loop antenna	Rohde & Schwarz	HZ-10	100055	PM KF 0965	2020-05 (3 year)

Comment

The 99% occupied bandwidth is 994,22 kHz.

Measurement results – 99% occupied bandwidth:



Date: 26.OCT.2020 16:42:51

7.7 Measurement uncertainty evaluation

Measurement uncertainty for conducted emissions, LISN, 150 kHz -30 MHz	± 2.3 dB
Measurement uncertainty for radiated magnetic field, 9 kHz – 30 MHz	± 4.9 dB
Measurement uncertainty for radiated emission, 30 MHz - 1000 MHz	± 5.9 dB
Measurement uncertainty for OBW	± 4.3 %
601 points resolution (Spectrum analyzer)	± 0.83 %
30000 points resolution (Spectrum analyzer)	± 0.016 %
Measurement uncertainty for Frequency error	± 1 x 10 ⁻⁸

End of test report