

# Gantner Electronic GmbH

## TEST REPORT

**SCOPE OF WORK**

RADIO TESTING – RFID TERMINAL [GT7.3700]

**REPORT NUMBER**

2241159KAU-002

**ISSUE DATE**

03-September-2021

**PAGES**

41

**DOCUMENT CONTROL NUMBER**

R\_FCC 15-225\_18-01 (25-January-2018)

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**TYPE:** GT7.3700  
**DESCRIPTION:** RFID Terminal  
**SERIAL NO (EUT 1):** 2040000084  
**SERIAL NO (EUT 2)\*:** 2016000121

\*The antenna of the RFID module was replaced by a terminating resistor.  
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:** 2241159KAU-002

**TEST RESULT:** The equipment complies to 47 CFR Part 15, Subpart C, Intentional radiators, section 15.207 and 15.225 / RSS-210, Issue 10 and RSS-GEN, Issue 5 for 13.56 MHz RFID module (Referring to the operating modes specified in this report). The 125 kHz RFID module was documented in another test 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

**REVIEWER:** R. Dressler  
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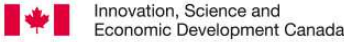


## Details about Accreditations/Acceptances


### EMC / Radio National

	<p>The Intertek Deutschland EMC-Lab is accredited by the Deutsche Akkreditierungsstelle GmbH (DAkKS)</p>
	<p>Registration Number (EMC general): <b>D-PL-12085-01-01</b></p>
	<p>Registration Number (EMC Med): <b>D-PL-12085-01-03</b></p>
	<p>Registration Number (EMC Canada): <b>D-PL-12085-01-04</b></p>
	<p>Registration Number (EMC FCC): <b>D-PL-12085-01-05</b></p>

### International

	<p>The Intertek Deutschland EMC-Lab is accepted to participate in the IECEE (IEC Conformity assessment for Electrotechnical Equipment and Components) CB-Scheme</p>
	<p>CB Test Laboratory: <b>TL118</b></p>
	<p>The Intertek Deutschland EMC-Lab is listed at the Federal Communications Commission (FCC)</p>
	<p>Designation Number: <b>DE0014</b> Test Firm Registration Number: <b>359260</b></p>
	<p>The <i>Bundesnetzagentur</i> recognizes Intertek Deutschland GmbH as Conformity Assessment Body in the sector electromagnetic compatibility (EMC).</p>
	<p>BNetzA-CAB-16/21-10</p>
	<p>The Intertek Deutschland EMC-Lab is accredited for Innovation, Science and Economic Development Canada (ISED)</p>
	<p>ISED CAB IDENTIFIER: <b>DE0014</b> ISED #: <b>24854</b></p>

### Automotive

	<p>The Intertek Deutschland EMC-Lab is recognized as technical service of the Kraftfahrt-Bundesamt (KBA)</p>
	<p>Registration Number: <b>KBA-P 00046-03</b></p>
<p>Anerkennungsstelle 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 GT7.3700 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: 2020-12-24 (EUT 1) and 2021-01-20 (EUT 2)

Testing: 2020-12-30 to 2021-08-09

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 site:

Measurement Chamber	Type of chamber	IC Site filing #
ANECHOIC CHAMBER 1	Semi-anechoic 3 m	24854

## 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 6 dB. A minimum margin of 3 - 6 dB is recommended for a serial production.

As a wish of the manufacturer/customer the 13.56 MHz RFID module is only measured in one operating mode (send mode). Therefore the RFID module was not measured in standby mode.

In practice, the 13.56 MHz RFID module, the 125 kHz RFID module, the WLAN module and the Bluetooth module never transmit at the same time. The WLAN module is only for service purposes.

#### 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.

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

GT7.3701

GT7.3700 Demo Kit

The differences are according to the manufacturer/customer:

The GT7.3701 is an GT7.3700 with a different housing. The housing materials are the same but in a slightly modified form.

The GT7.3700 Demo Kit is a GT7.3700 mounted on an Acrylic glass holder for presentation purposes.

GT7.3700 Demo Kit

#### 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 (see section 7.7).

#### 4.4 Document History

REVISION	DATE	REPORT	CHANGES	AUTHOR
Initial release	2021-09-03	2241159KAU-002	Initial issue	MBE

## SECTION 5

### TEST RESULTS – OVERVIEW

EMISSION	VERDICT	DATE	NO
Conducted emissions (0.15 MHz - 30 MHz)	P	2021-01-25 2021-05-29	6 7
Field strength (13.110 MHz – 14.010 MHz)	P	2020-12-30	3
Radiated emissions (< 30 MHz)	P	2020-12-30	2
Radiated emissions (30 MHz - 1 GHz)	P	2020-12-30	1
Frequency Stability Test	P	2020-01-13	4
20 dB bandwidth test	P	2021-08-09	8
Occupied bandwidth test	P	2021-01-18	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:

127.1 mm

151.1 mm

24.7 mm

Firmware version:

Special Firmware for EMC Testing

Hardware version:

4.1

EUT version:

Production

Prototype

Used

Description: The GT7.3700 is a Multi-functional RFID terminal with LEGIC advant, Proxy and iCLASS® Reader. It has a Color display with Touchscreen, Ethernet, PoE, 2 relay outputs, 1 status input, Wiegand, RS-232 and RS-485 interfaces.

The EUT has a WLAN module, Bluetooth module, 13.56 MHz RFID module and 125 kHz RFID module.

**6.1.1 Technical data of the 13.56 MHz-RFID module**

Transmitter frequency range: 13.56 MHz

Frequency agile or hopping:

Yes

No

Antenna:

Internal antenna

External antenna

Antenna connector:

None, internal antenna

Yes, type

Antenna type:

Internal PCB antenna

Antenna gain:

-

Power rating:

-

Channel spacing:

-

Receiving only mode supported:

Yes

No

## 6.1.2 Photo of the rating plate and of the EUT



## 6.2 Power interface

MODE	VOLTAGE (V)	FREQUENCY (Hz)	COMMENT
Rated	36-57	DC	PoE
1	120 V (AC) / 48 V (DC)	(60Hz)AC/DC	PoE Injector

## 6.3 Peripheral devices used for testing

DEVICE	MANUFACTURER	TYPE	SN	FCC ID
PoE Injector	tP-link	TL-POE150S	22040D6006214	-
Power supply for PoE Injector	tP-link	T480050-2C1	-	-
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 PoE Injector (see section 6.9).

## 6.5 Operation mode

MODE	DESCRIPTION
1	Normal operation and the 13.56 MHz RFID module of the EUT was in continuous wave mode. The 125 kHz RFID module, the WLAN module and the Bluetooth module were off. The RFID tag was placed in front of the EUT.
2	Normal operation. The antenna of the 125 kHz RFID module and the antenna of the 13.56 MHz RFID module were replaced by a terminating resistor. The WLAN module and the Bluetooth module were off.
3	Normal operation. The 13.56 MHz RFID module was in transmission mode and the RFID tag was placed in front of the EUT. The 125 kHz RFID module, the WLAN module and the Bluetooth module were off.

## 6.6 Clock frequencies of the EUT

SOURCE	FREQUENCY
Processor module ICNova A20	PII Main Processor: up to 1 GHz; 3 Crystals: 25 MHz, 24 MHz and 32 kHz
Camera module TD5640	8Bit RGB, 24 MHz Clock supply
RFID Reader 13.56 MHz	SPI @ 2 MHz
RFID Reader 125 kHz	UART 112 kbit
Co-Processor STM32L0	Crystal: 32 kHz
TFT Display	24Bit RGB, 9 MHz
Capacitive Touch Panel	I2C @ 400 kHz
BLE	2402 GHz – 2480 GHz
WLAN	2412 GHz – 2462 GHz

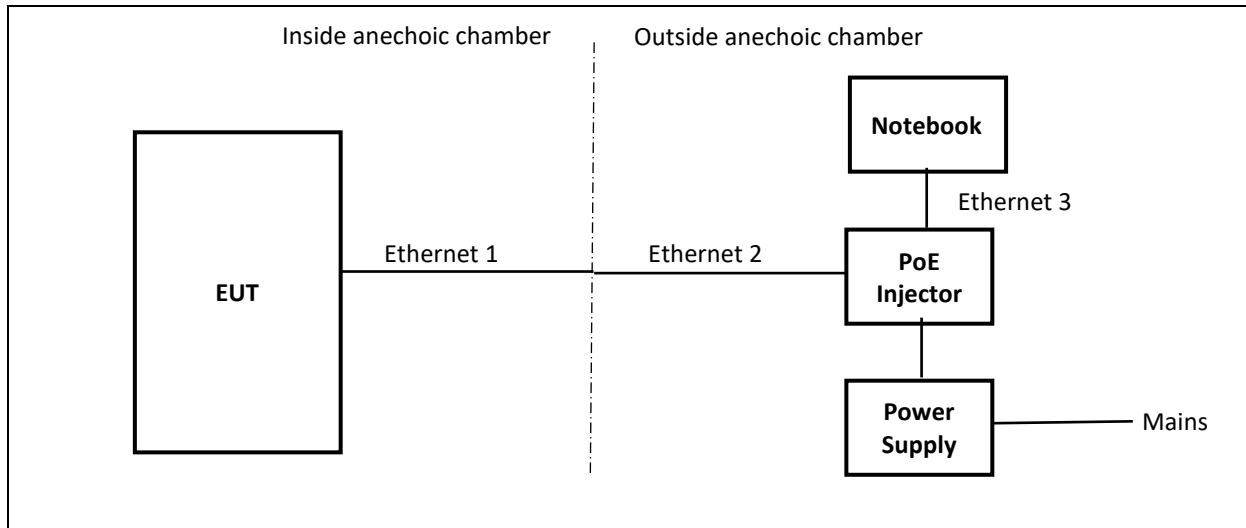
## 6.7 Supply and interconnecting cables used for testing

LINE	LENGTH (cm)	SHIELDING	FERRITE	TERMINATION
Ethernet 1	180	Y	N	-
Ethernet 2	100	Y	N	-
Ethernet 3	100	Y	N	-
Cable for power supply	160	N	N	-

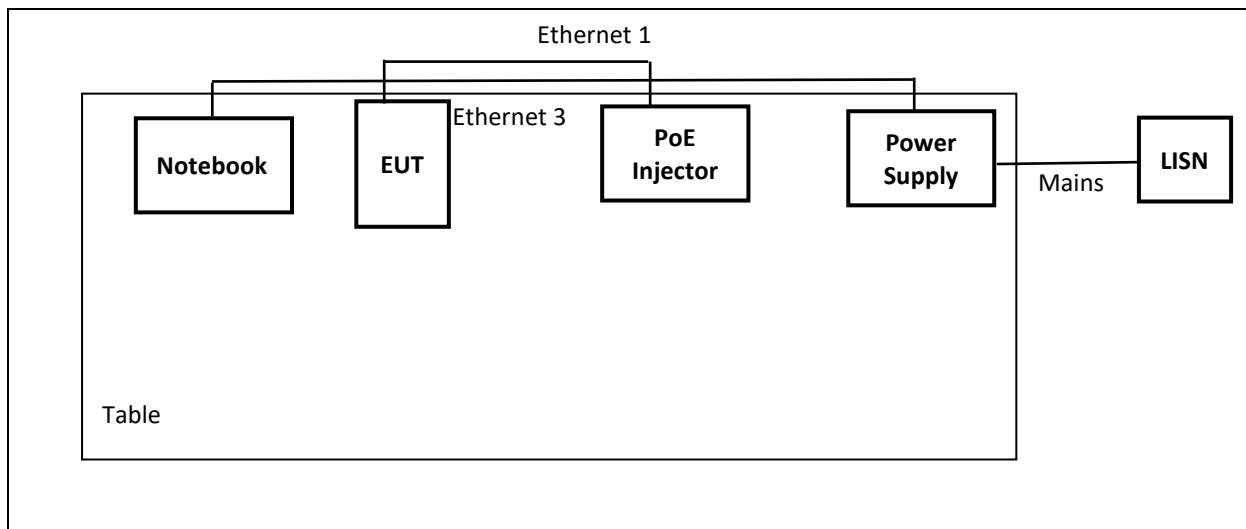
### 6.8 Antenna configuration

DESCRIPTION	
<input type="checkbox"/>	Equipment with an external antenna connector
<input checked="" type="checkbox"/>	Equipment without an external antenna connector (integral antenna)
<input type="checkbox"/>	Equipment with more than one antenna

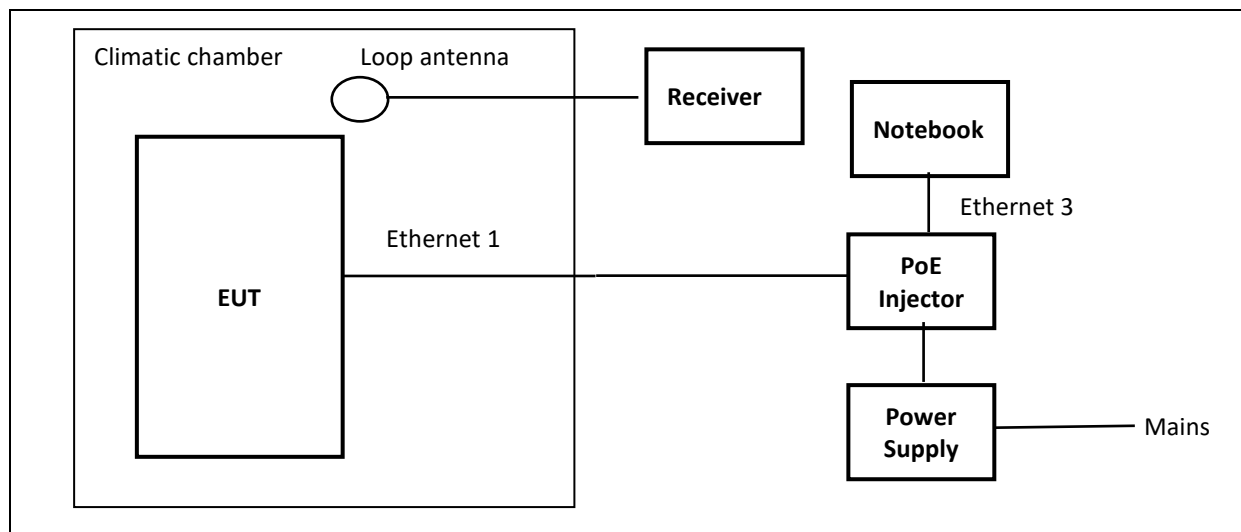
### 6.9 Block diagram of the test setup for radiated emissions



### 6.10 Block diagram of the test setup for conducted emissions



**6.11 Block diagram of the test setup for 20 dB bandwidth-,  
Occupied bandwidth- and Frequency Stability-test**



## 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 and 2
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	2020-12 (1 year)
Receiver 9 kHz - 7 GHz	Rohde & Schwarz	ESR7	101757	PM KF 3371	2020-04 (1 year) 2021-04 (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.

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## Measurement results – Conducted emissions:

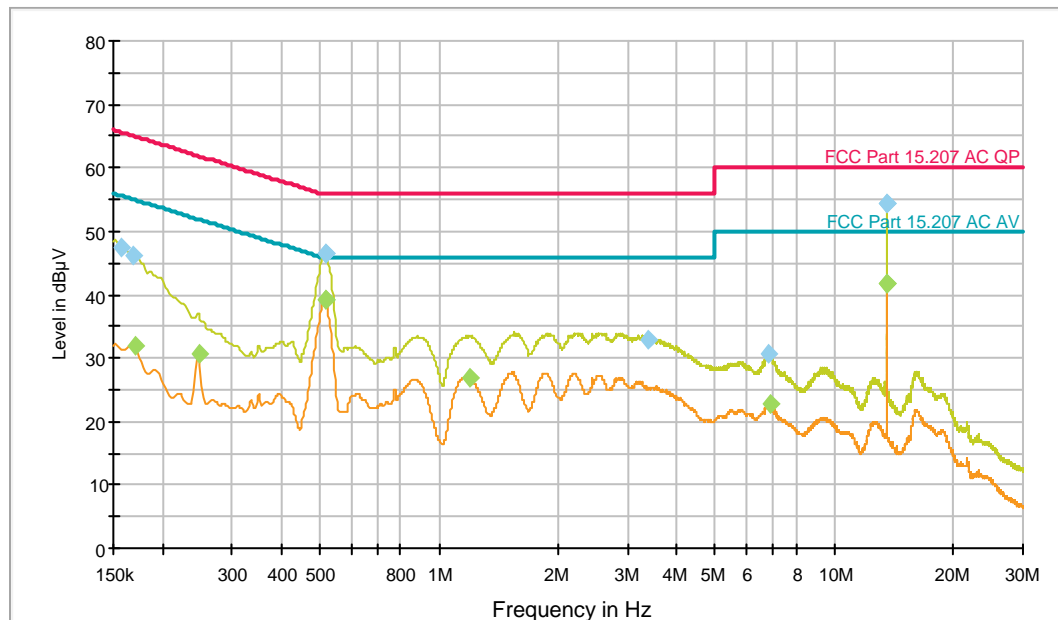
### Common Information

EUT: GT7.3700  
 Project No.: 41159  
 Test description: Conducted Emissions  
 Test standard: FCC 15 C  
 Tested port: Mains  
 Test verdict: Passed  
 Operating conditions:

Normal operation and the 13.56 MHz RFID module of the EUT was in continuous wave mode. The 125 kHz RFID module, the WLAN module and the Bluetooth module were off. The RFID tag was placed in front of the EUT.

Operator name: MBE

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 (dB)	Limit (dBµV)	Comment
0.156750	47.3	GND	N	10.2	18.3	65.6	
0.168000	46.3	GND	L1	10.2	18.8	65.1	
0.514500	46.5	GND	L1	10.2	9.5	56.0	
0.514500	46.5	GND	L1	10.2	9.5	56.0	
3.383250	33.0	GND	N	10.3	23.0	56.0	
6.805500	30.6	GND	N	10.4	29.4	60.0	
13.560000	54.3	GND	L1	10.9	5.7	60.0	
13.560000	54.3	GND	L1	10.9	5.7	60.0	

## Final Result 2

Frequency (MHz)	CAverage-ClearWrite (dBµV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.170250	31.8	GND	N	10.2	23.1	54.9	
0.246750	30.7	GND	L1	10.2	21.2	51.9	
0.514500	39.1	GND	N	10.2	6.9	46.0	
0.514500	39.1	GND	N	10.2	6.9	46.0	
1.191750	26.9	GND	L1	10.2	19.1	46.0	
6.891000	22.8	GND	N	10.4	27.2	50.0	
13.560000	41.7	GND	L1	10.9	8.3	50.0	
13.560000	41.7	GND	L1	10.9	8.3	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

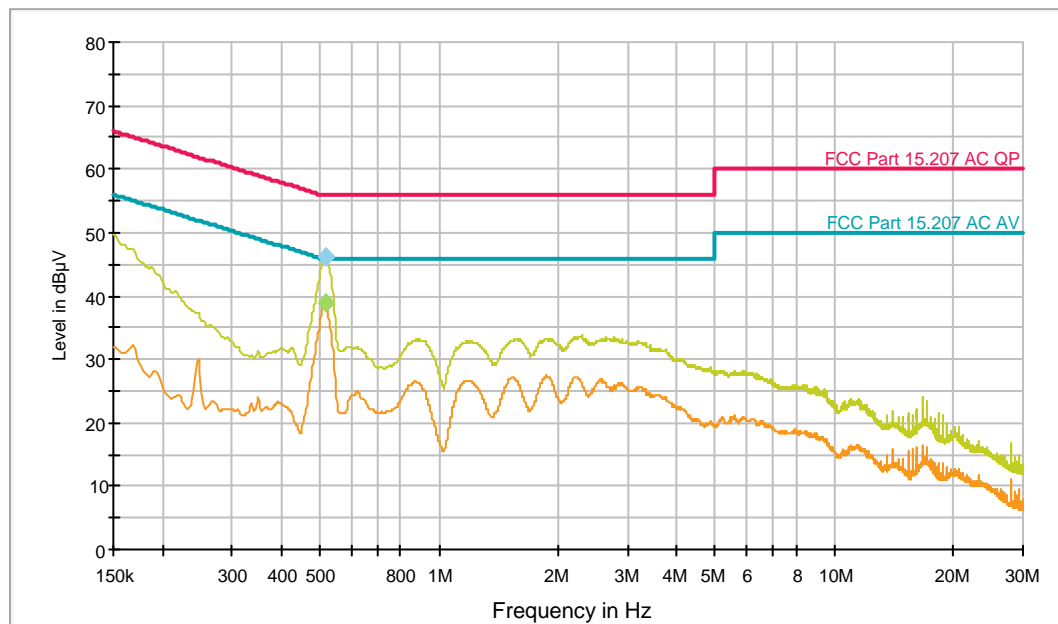


## Common Information

EUT: GT7.3700  
 Project No.: 41159  
 Test description: Conducted Emissions  
 Test standard: FCC 15 C  
 Tested port: Mains  
 Test verdict: Passed  
 Operating conditions: Normal operation. The antenna of the 125 kHz RFID module and the antenna of the 13.56 MHz RFID module were replaced by a terminating resistor. The Bluetooth module and the WLAN module were off.

Operator name: MBE  
 Date of testing: 25.01.2021

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 (dB)	Limit (dBµV)	Comment
0.516750	46.1	GND	N	10.2	9.9	56.0	

## Final Result 2

Frequency (MHz)	CAverage-ClearWrite (dBµV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.514500	38.8	GND	N	10.2	7.2	46.0	

## 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 $\mu$ V - 80 dB $\mu$ 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.

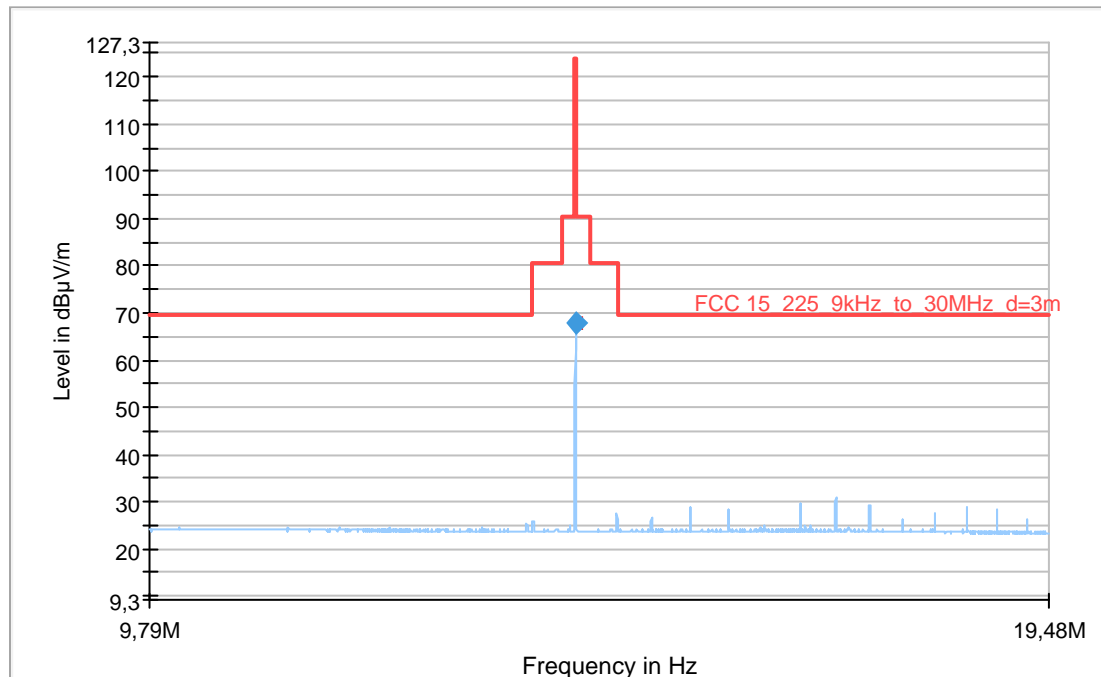
### Test equipment

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	2020-08 (1 years)
Test software	Rohde & Schwarz	EMC 32 V.10.50.40	-	PM KF 2983-2	-

## Common Information

EUT: GT7.3700  
 Test Verdict: Passed  
 Test Description: FCC Part 15 C, 9 kHz - 30 MHz  
 Operating Conditions: Normal operation and the 13.56 MHz RFID module of the EUT was in continuous wave mode. The 125 kHz RFID module, the WLAN module and the Bluetooth module were off.

Operator Name: MBE  
 Project Number: 41159  
 Date: 30.12.2020



- 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	67.99	---	124.00	56.01	1000.0	9.000	V	176.0

(continuation of the "Final\_Result" table from column 14 ...)

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

### Comment

The 13.56 MHz 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: 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

## 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

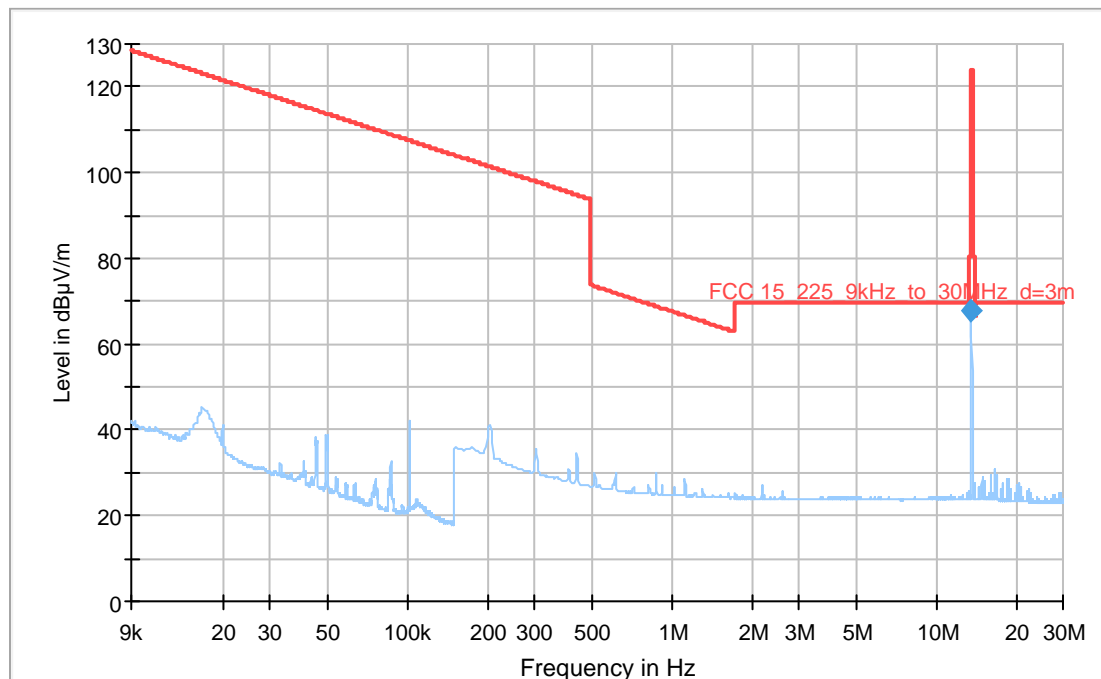
DESCRIPTION	MANUFACTURER	TYPE	SN	ASSET NO.	CALIBRATION
Semi-Anechoic chamber (30 – 1000 MHz)	Siepel	REF W460SLB	-	PM KF 1150-01	2019-12 (3 years)
Turntable	Inn-Co	-	-	PM KF 2949-04	-
Tower	Inn-Co	MA4484-XPET	-	PM KF 2949-03	-
Controller	Inn-Co	CO 3000	4970815	PM KF 2949	-
Receiver 9 kHz - 7 GHz	Rohde & 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	2020-08 (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: GT7.3700  
 Test Verdict: Passed  
 Test Description: FCC Part 15 C, 9 kHz - 30 MHz  
 Operating Conditions: Normal operation and the 13.56 MHz RFID module of the EUT was in continuous wave mode. The 125 kHz RFID module, the WLAN module and the Bluetooth module were off.

Operator Name: MBE  
 Project Number: 41159  
 Date: 30.12.2020



- 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	67.99	---	124.00	56.01	1000.0	9.000	V	176.0

(continuation of the "Final\_Result" table from column 14 ...)

Frequency (MHz)	Corr. (dB/m)	Comment
13.560000	20	16:20:37 - 30.12.2020

#### Comment

The 13.56 MHz 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: 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 $\mu$ V/m - 130 dB $\mu$ V/m

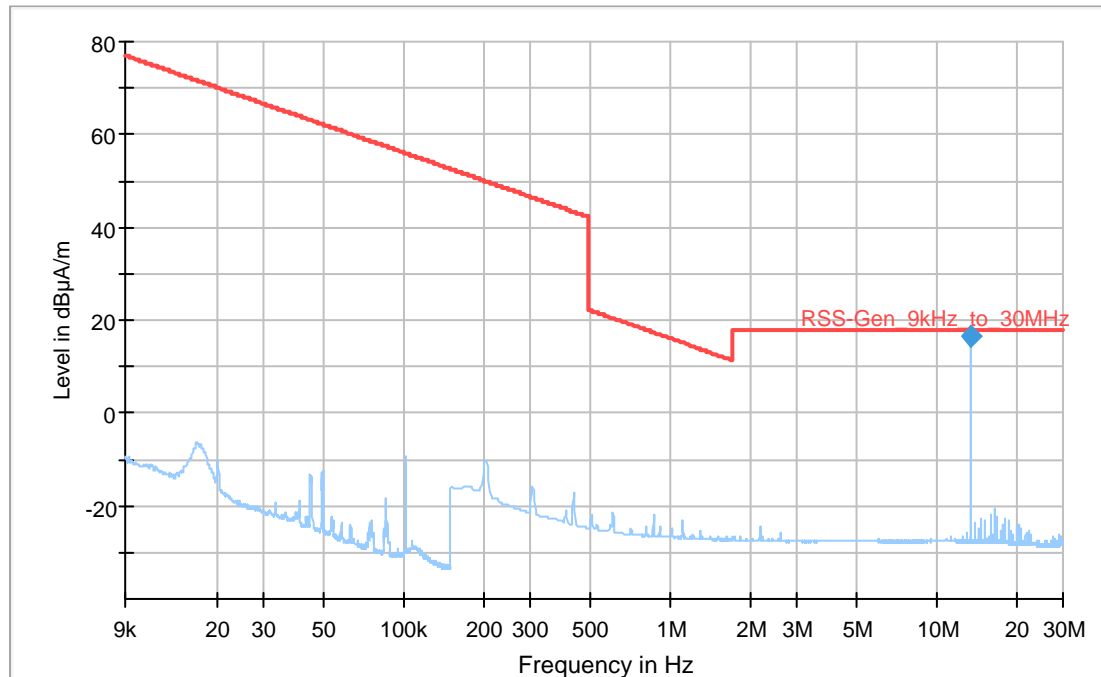
Preview Measurements:  
 Antenna height: 0 - 1000 cm , Step Size = 0 cm , Positioning Speed = 1  
 Polarization: H + V  
 Turntable position: 0 - 352 deg , Step Size = 22 deg , Positioning Speed = 8  
 Scan Test Template: EN-RE-R12-AN23\_PRE

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

## Common Information

EUT: GT7.3700  
 Test Verdict: Passed  
 Test Description: RSS-Gen, 9 kHz - 30 MHz  
 Operating Conditions: Normal operation and the 13.56 MHz RFID module of the EUT was in continuous wave mode. The 125 kHz RFID module, the WLAN module and the Bluetooth module were off.

Operator Name: MBE  
 Project Number: 41159  
 Date: 30.12.2020



- Preview Result 1-QPK [Preview Result 1.Result:1]
- RSS-Gen\_9kHz\_to\_30MHz [.\zF radiated\RSS-Gen]
- \* QPK [Critical\_Freqs.Result:4]
- \* AVG [Critical\_Freqs.Result:5]
- ◆ Final\_Result QPK [Final\_Result.Result:4]
- ◆ Final\_Result AVG [Final\_Result.Result:5]

## Final\_Result

Frequency (MHz)	QuasiPeak (dBµA/m)	Average (dBµA/m)	Limit (dBµA/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Pol	Azimuth (deg)
13.560000	16.49	---	-	-	1000.0	9.000	V	176.0

(continuation of the "Final\_Result" table from column 14 ...)

Frequency (MHz)	Corr. (dB/m)	Comment
13.560000	20.0	30.12.2020 16:20

## EMI Auto Test Template: EN-RE-R17-AN24

Hardware Setup: EN-RE-R12-AN24  
 Measurement Type: Open-Area-Test-Site (SAC/FAR)  
 Frequency Range: 9 kHz - 30 MHz  
 Graphics Level Range: -40 dBµA/m - 80 dBµA/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-AN24\_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

$$E = U + AF + A$$

## 7.4 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

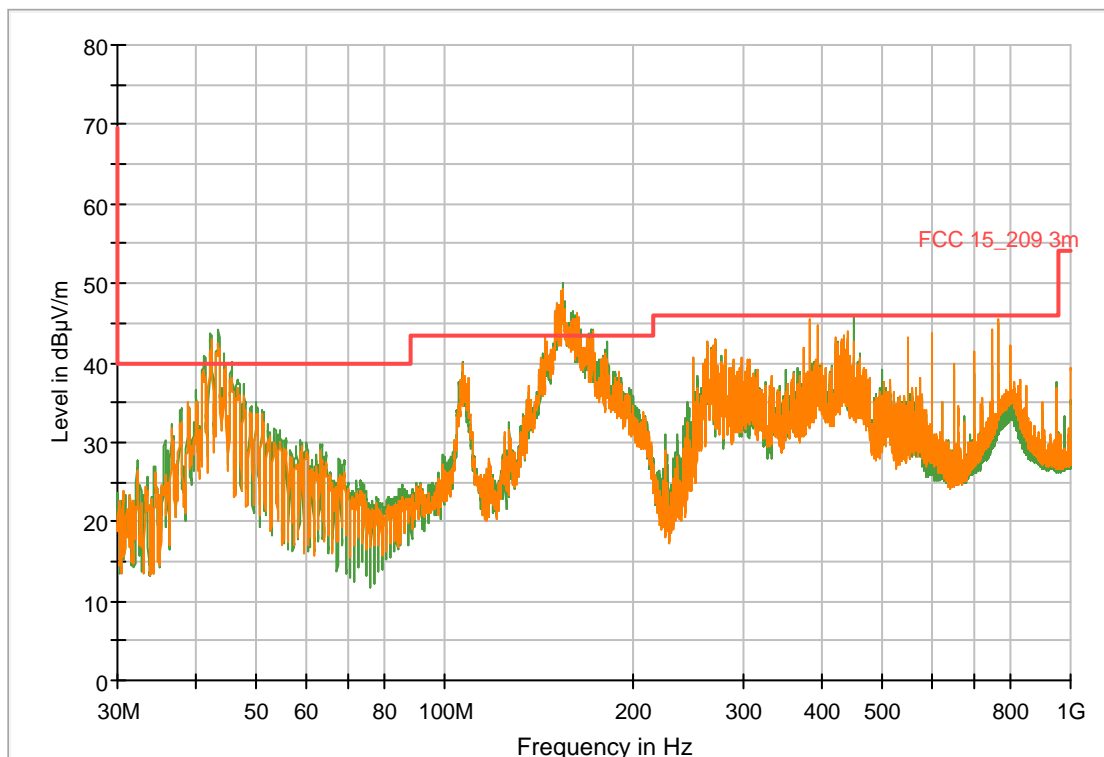
DESCRIPTION	MANUFACTURER	TYPE	SN	ASSET NO.	CALIBRATION
Semi-Anechoic chamber (30 – 1000 MHz)	Siepel	REF W460SLB	-	PM KF 1150-01	2019-12 (3 years)
Turntable	Inn-Co	-	-	PM KF 2949-04	-
Tower	Inn-Co	MA4484-XPET	-	PM KF 2949-03	-
Controller	Inn-Co	CO 3000	4970815	PM KF 2949	-
Receiver 9 kHz - 7 GHz	Rohde & Schwarz	ESR7	101757	PM KF 3371	2020-04 (1 year)
Trilog broadband antenna	Schwarzbeck	VULB 9163	9163-974	PM KF 3196	2019-01 (2 years)
Test software	Rohde & Schwarz	EMC 32 V.10.50.40	-	PM KF 2983-2	-

Comparison activated and deactivated 13.56 RFID transmitter:

# Radiated Emissions Test Report

## Common Information

EUT:	GT7.3700
Test Verdict:	Failed
Test Description:	FCC Part 15 C, 30 MHz - 1 GHz
Operating Conditions:	Deactivated 13.56 RFID transmitter
Operator Name:	MBE
Project Number:	41159
Date:	30.12.2020
Comment:	



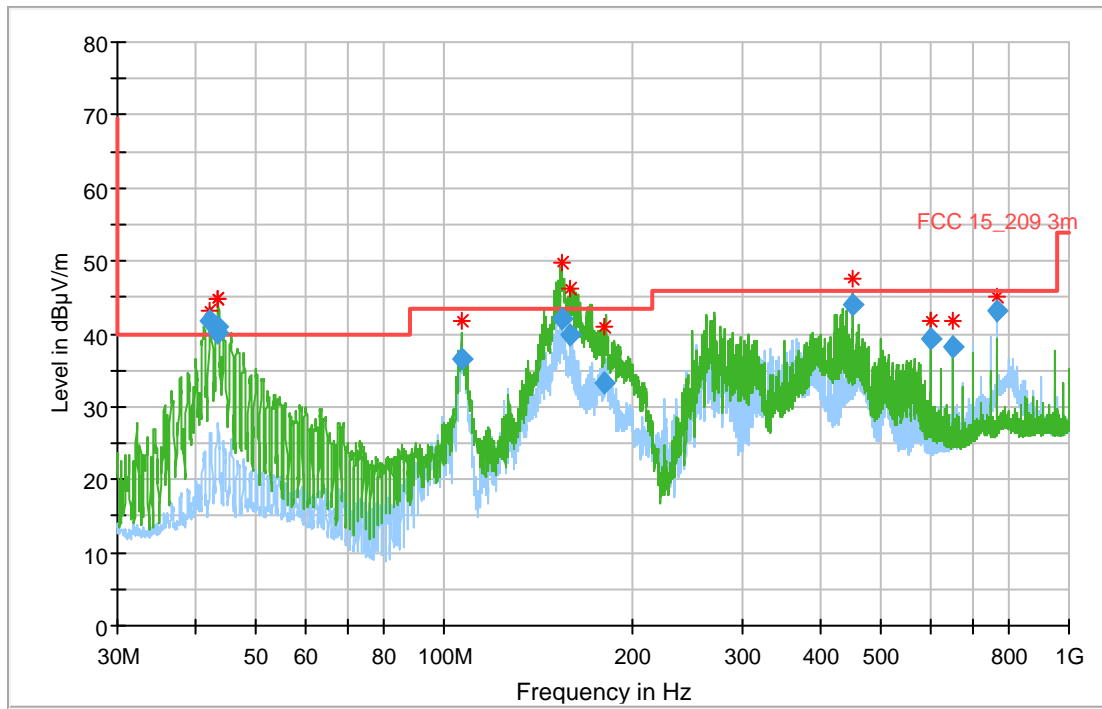
— RFID transmitter activated PK [Preview Result 1.Result:1]  
— RFID transmitter deactivated PK [Preview Result 1.Result:1]  
— FCC 15\_209 3m [..\EMI radiated\FCC Part 15C]

## Measurement results – Radiated emissions 30 MHz to 1 GHz:

### Common Information

EUT: GT7.3700  
 Test Verdict: Pass  
 Test Description: FCC Part 15 C, 30 MHz - 1 GHz  
 Operating Conditions: Normal operation and the 13.56 MHz RFID module of the EUT was in continuous wave mode. The 125 kHz RFID module, the WLAN module and the Bluetooth module were off.

Operator Name: MBE  
 Project Number: 41159  
 Date: 30.12.2020



- 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)
42.240000	41.74	1)	1)	1000.0	120.000	100.0	V	-19.0
43.500000	41.08	1)	1)	1000.0	120.000	104.0	V	36.0
43.530000	40.18	1)	1)	1000.0	120.000	109.0	V	-12.0
107.010000	36.60	1)	1)	1000.0	120.000	341.0	H	246.0
153.960000	41.99	1)	1)	1000.0	120.000	100.0	V	88.0
159.420000	39.96	1)	1)	1000.0	120.000	100.0	V	-8.0
180.990000	33.34	1)	1)	1000.0	120.000	100.0	V	25.0
450.000000	43.86	1)	1)	1000.0	120.000	98.0	V	-15.0
600.000000	39.18	1)	1)	1000.0	120.000	102.0	V	338.0
649.980000	38.12	1)	1)	1000.0	120.000	245.0	H	15.0
767.970000	43.21	1)	1)	1000.0	120.000	100.0	H	175.0

1) The source of the frequencies are the non radio part of the device and of the 13.56 MHz RFID module, see diagram “Deactivated 13.56 RFID transmitter” (see page 30). The frequencies are excluded from evaluation according to FCC Part 15C and must be evaluated according to FCC Part 15B, class A and ICES-003, class A.

## 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 $\mu$ V/m - 80 dB $\mu$ 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	0,1 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 - 200 MHz	40 kHz	QPK	120 kHz	1 s	20 dB
200 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	3

### Limits

Limit:	The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ ( $\pm 100$ ppm) of the carrier frequency under nominal conditions.
Temperature range for the RFID module:	-20 degree to + 50 degree
Voltage range:	0.85 x 48 V and 1.15*48 V and 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	2019-03 (1 year)
Receiver 10 Hz - 40 GHz	Rohde & Schwarz	FSV40	101400	PM KF 2783	2019-08 (1 year)
Loop antenna	Rohde & Schwarz	HZ-10	100055	PM KF 0965	2017-05 (3 year)

### Comment

The power supply was provided with the EUT and has DC-output voltage of 48 V

**Measurement results – Frequency stability measurement:**

Temperature °C	Carrier at 20°C MHz	Upper limit: 13.561356 MHz
		Lower limit: 13.558644 MHz
Measured frequency under temperature influence and the nominal voltage (120 V):		
+50	13.55987	13.56010
+40		13.55984
+30		13.55984
+20		13.55987
+10		13.55998
0		13.56000
-10		13.56003
-20		13.56009

**Comment**

The DC voltage was varied from 40.8 to 55.2 V.

In the second test, the EUT was supplied with the power supply unit.

The AC supply voltage was varied from 102 to 138 V.

The voltage variations had no influence on the transmission level.

Voltage V	Temperature	Upper limit: 13.561356 MHz
		Lower limit: 13.558644 MHz
Measured frequency under DC voltage variation:		
55.2	20°C	13.559938
40.8		13.559938

Voltage V	Temperature	Upper limit: 13.561356 MHz
		Lower limit: 13.558644 MHz
Measured frequency under AC supply voltage variation:		
102	20°C	13.55988
138		13.55987

## 7.6 20 dB bandwidth

NORMATIVE REFERENCES		RESULT
Limits according to:	FCC §15.115 (c)	P
Methods of measurement according to:	RSS-Gen, Issue 5, 6.7	
Equipment mode	Power interface	1
	EUT configuration mode	2
	Operation mode	3

### Limits

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

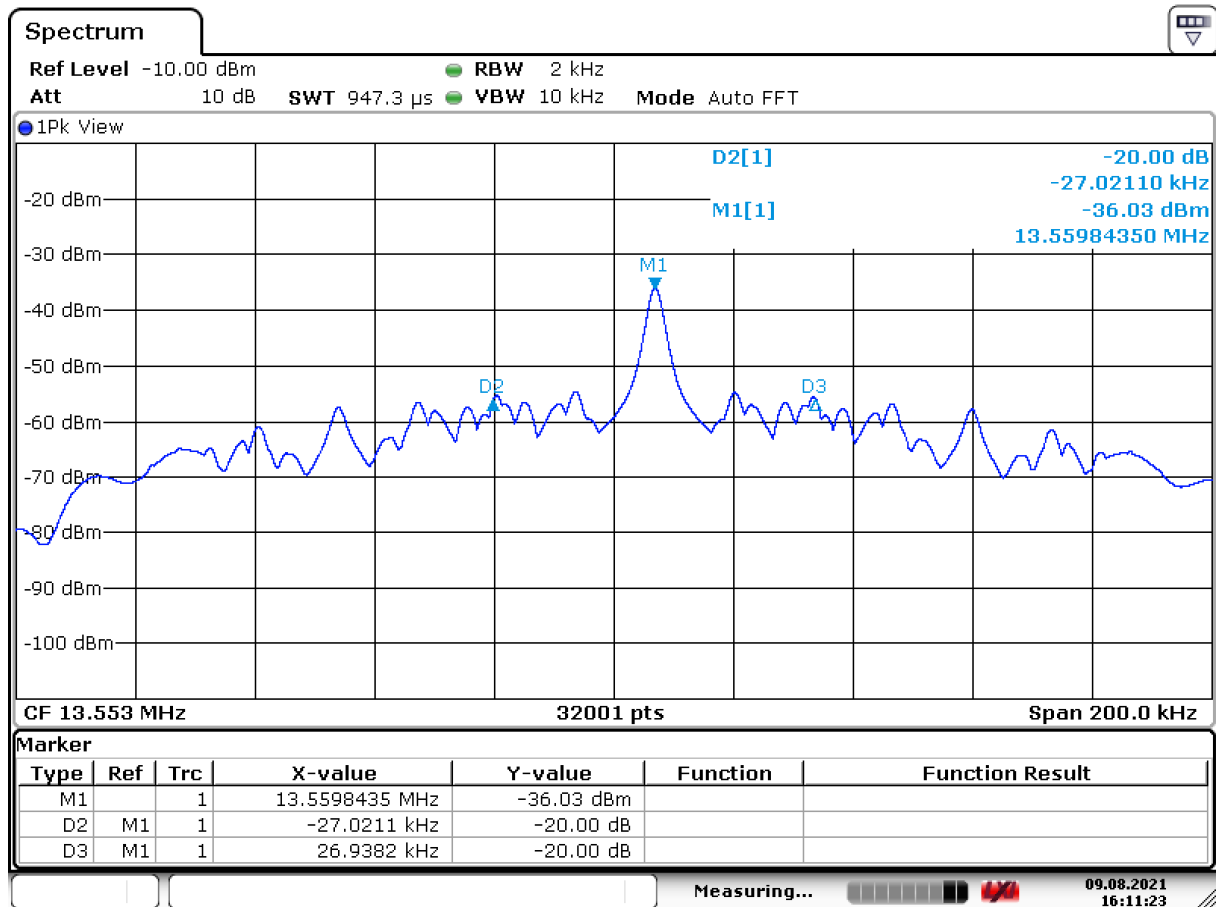
### Test equipment

DESCRIPTION	MANUFACTURER	TYPE	SN	ASSET NO.	CALIBRATION
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 20-bandwidth is 53.959 kHz.

## Measurement results – 20 dB bandwidth:



Date: 9.AUG.2021 16:11:23

## 7.7 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

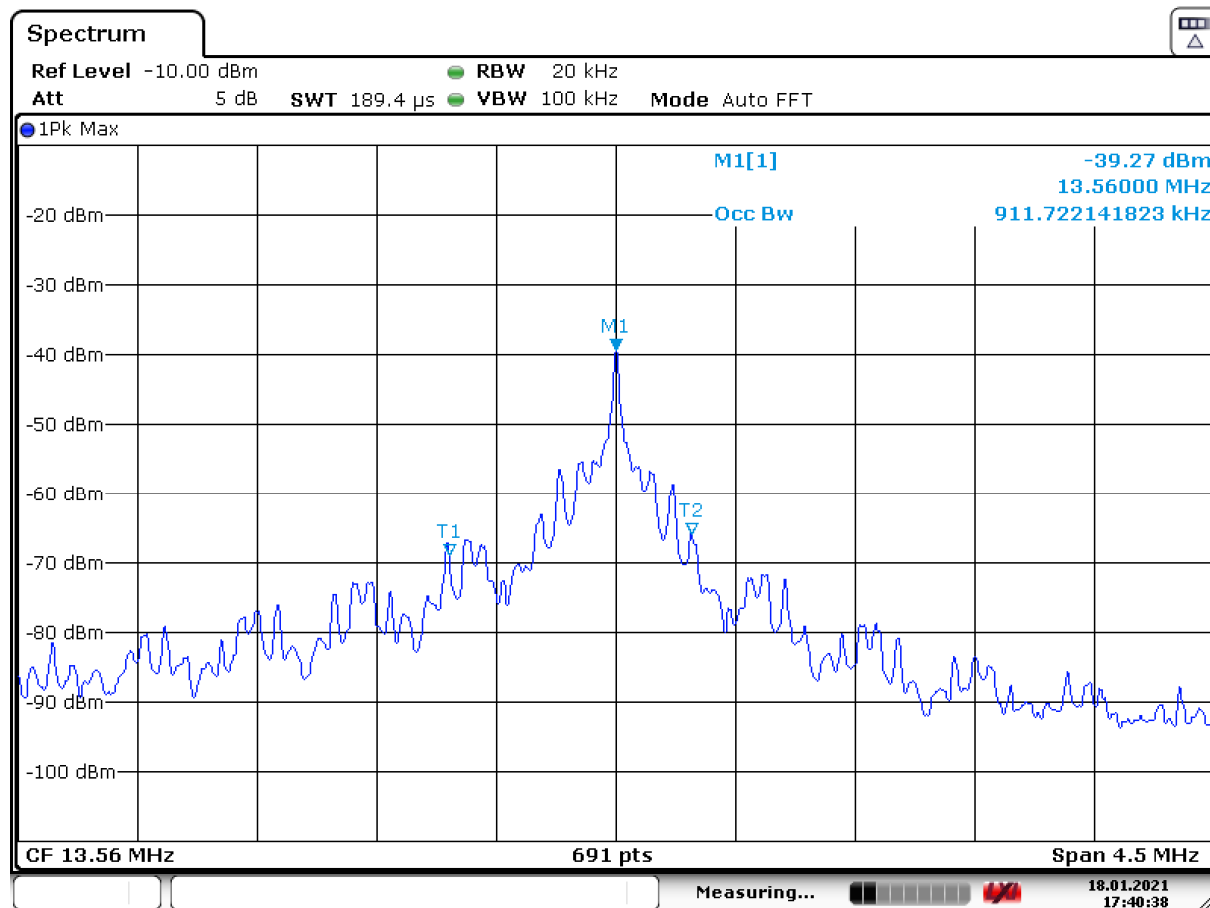
DESCRIPTION	MANUFACTURER	TYPE	SN	ASSET NO.	CALIBRATION
Temperature Chamber	HT4010	Heraeus-Vötsch	45021	PM KF 1402	2020-03 (1 year)
Receiver 10 Hz - 40 GHz	Rohde & Schwarz	FSV40	101400	PM KF 2783	2020-08 (1 year)
Loop antenna	Rohde & Schwarz	HZ-10	100055	PM KF 0965	2020-05 (3 year)

### Comment

The 99% occupied bandwidth is 911.72 kHz.

---

## Measurement results – 99% occupied bandwidth:



Date: 18.JAN.2021 17:40:39

## 7.8 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 <sup>-8</sup>



**End of test report**