Test Report
Radio Frequency Devices – Intentional Radiators

Test Report – No.:	**2222267KAU-006**
Date of issue:	**2015-05-19**
Type:	GAT NET.Controller S 7000 F/ISO with GAT NET.Lock 7000
Description of the EUT:	Slave Controller with lock of the GAT NET.Controller System 7000
Serialnumber:	Controller: 1431000012
	Lock: 1435030910
Manufacturer and Applicant:	GANTNER Electronic GmbH
Address:	Montafonerstr. 8 6780 Schruns Österreich

Summary:

Referring to the emission limits and the operating mode during the tests specified in this report the equipment complies with the requirements according to

47 CFR Part 15, Subpart C, Intentional radiators, section 15.225 /
RSS-210, Issue 8 and RSS-GEN, Issue 3

Test methods according to ANSI C63.10-2009

Test Laboratory:

Intertek Deutschland GmbH, Innovapark 20, 87600 Kaufbeuren

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GANTNER / GAT NET.Controller S 7000 F/ISO with Lock 7000

Revision History

Edition	Date	Description
1	2015-05-19	First release

Details about Accreditation/ Acceptance

EMC/ Radio National

The Intertek Deutschland EMC- Lab is accredited of the Deutsche Akkreditierungsstelle GmbH (DAkkS)

Registration Number: **D-PL-12085-01-01**

International

The Intertek Deutschland EMC- Lab is accepted of the Worldwide System for Conformity Testing and Certification of Electrotechnical Equipment and Components (IECEE)

CB Test Laboratory: **TL118**

The Intertek Deutschland EMC- Lab is listed at the Federal Communications Commission (FCC)

Registration Number: **498399**

The Intertek Deutschland EMC- Lab is listed at Industry Canada

No.**8882A-1** (OATS) and **8882A-2** (3 m alternative test site)

Automotive

The Intertek Deutschland EMC- Lab is recognized technical Service of the Kraftfahrt-Bundesamtes (KBA)

Registration Number: **KBA-P 00046**

Table of Contents

1 Equipment under test (EUT)

1.1 Identification of the EUT according to the manufacturer/client declaration

Type/ Model: GAT NET.Controller S 7000 F/ISO with GAT NET.Lock 7000

Description of the EUT: Slave Controller with lock of the GAT NET.Controller System 7000

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: Transponder: AM

Temperature range: ☐ Category I (General): -20°C to +55°C
                                      ☐ Category II (Portable equipment): -10°C to +55°C
                                      ☐ Category III (Equipment for normal indoor use): +5°C to +35°C
                                      ☒ Other: 0°C to +60°C (Acc. to the manufacturer`s specification)

Power rating: Max. 200 mW

Transmitter stand by mode   ☒ Yes   ☐ No
supported:

1.2 Additional hardware information about the EUT

The EUT consists of the following units:

  See 2.4

1.3 Additional software information about the EUT

During the tests the EUT supported the following software:

Software	Version / Release
GAT NET.Controller S 7000 F/ISO	**1.5**
GAT NET.Lock 7000	**1.3**
GAT NET.Controller M 7000	**1.5**
GAT NET.Controller S 7000 B	**1.5**
GAT NET.Controller M7000 Test	**0.11**

1.4 Peripheral equipment

Peripheral equipment is defined as equipment needed for correct operation of the EUT during the tests, but not included as a part of the testing and evaluation of the EUT.

  See 2.4

1.5 Test signals

The radiated emission tests of the S 7000 F/ISO with lock were done with CW and with modulation.

1.6 Modification during the tests

No modifications have been made during the tests.

2 Test specifications

2.1 Standards

47 CFR Part 15, Subpart C, Intentional radiators, section 15.225 /
RSS-210, Issue 8 and RSS-GEN, Issue 3

Test methods in:

ANSI C63.10-2009: American National Standard for Testing Unlicensed Wireless Devices

2.2 Additions, deviations and exclusions from standards and accreditation

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

2.3 Test site

Measurements were performed at:

Intertek Deutschland GmbH, Innovapark 20, 87600 Kaufbeuren

Test sites:

Measurement Chamber	Type of chamber	IC Site filing #
OATS	10m	8882A-1
ANECHOIC CHAMBER 1	Semi-anechoic 3m	8882A-2

2.4 Test set-up

This is the principle block diagram. The serial numbers were different at the set-up of this test report. For the serial number of the equipment under test see first page.
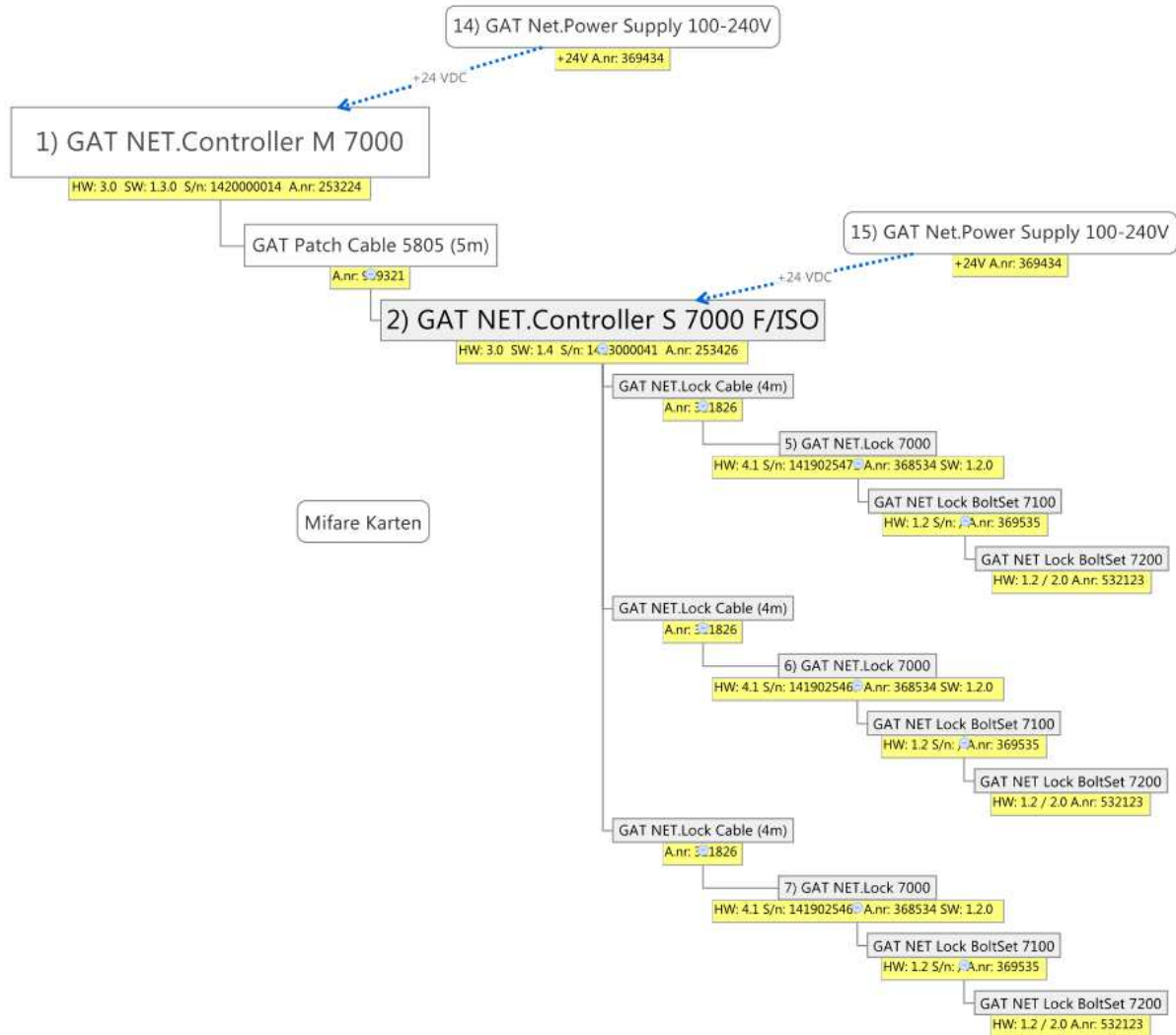
2.5 Test conditions

The radiated emission tests of the S 7000 F/ISO with lock were done with CW and with modulation. If not additionally specified, the tests were performed under the following environmental conditions:

Parameter	Normal
Supplying voltage	120 V/ 60 Hz
Nominal voltage range	100 V – 240 V

3 Test summary

The results in this report apply only to the tested sample:

Test	Result	Section in report	Note
Standard test methods			
AC power-line conducted tests	Pass	See EMC report	Class A
Radiated test below 30 MHz	Pass	4, 5	
Radiated emissions measurements from 30 to 150 MHz	Pass	6	
Determination of radiated and antenna conducted emissions above 1 GHz	NA		
Frequency Stability Test	Pass	7	
Occupied bandwidth test	Pass	8	
Output Power average symbol envelope power	NA		
Power Spectral Density < 40 GHz	NA		
Power Spectral Density > 40 GHz	NA		
In-situ measurements	NA		
Polar plot, main lobe and variation on radiated emissions test	NA		
Device-specific tests			
Measurement of cable locating equipment	NA		
Determining of cordless telephone handset security code	NA		
Determination of total input power	NA		
Procedure determining compliance for periodic operation [15.231, 15.240(b)]	NA		
Determining the average value of pulsed emissions per 15.35(c)	NA		
Comparison of limits per 15.231(b)(3)	NA		
Procedure to determine compliance of frequency pairing for 47 CFR 15.233(b)(2)	NA		
Determination of frequency hopping compliance per 47 CFR 15.247	NA		
Determination of digital modulation compliance per 47 CFR 15.247	NA		
Determination of peak conducted output unlicensed wireless device power [15.247(b), 15.255]	NA		
Determination of maximum conducted output power (15.247, 15-E)	NA		
Determination of MIMO compliance (2nd edition)	NA		
Determination of Smart antenna compliance (2nd edition)	NA		
Determination of antenna gains, including those emitting in multiple directions (15.247)	NA		
Determination of compliance with RF exposure limits	NA		
Millimeter wave test procedures for systems operating at 54GHz and greater	NA		
Determination of EIRP (15-F)	NA		
Determination Transmitter Etiquette FCC Part 15.255	NA		
Determination of Dynamic Frequency Selection (DFS) including Channel Move Time and In Service Monitoring	NA		
Determination of channel availability	NA		
Determination of Dynamic Frequency Selection including Channel Move Time	NA		
Determination of transmitter power control (TPC) (15-E)	NA		
Peak excursion measurement for UNII devices	NA		
Determination of UWB bandwidth	NA		
Determination of the center frequency, fC, and highest radiated emissions, fM (15-F)	NA		

NT = Not Tested, by request of the Client
NA = Not Applicable

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

Date of test:	2014-10-13	Test location:	Anechoic chamber 1
EUT Serial:	1431000012	Ambient temp.	22.5 °C
Tested by:	RDR	Relative humidity	47.6 %
Test result:	Pass	Margin:	> 50 dB

4.1 Requirement

Reference: FCC §15.225 (a) – (c) and IC RSS-210, Issue 8, section A2.6
Methods of measurement: ANSI C63.10, Clause 6.4 and RSS-Gen 4.9 / 7.2.5
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

4.2 Test setup details

Compliance with the spectrum mask is tested using a spectrum analyzer with resolution bandwidth set to a 1 kHz for the band 13.553 to 13.567 MHz and to 10 kHz outside this band. The video bandwidth shall be at least three times greater than the resolution bandwidth.
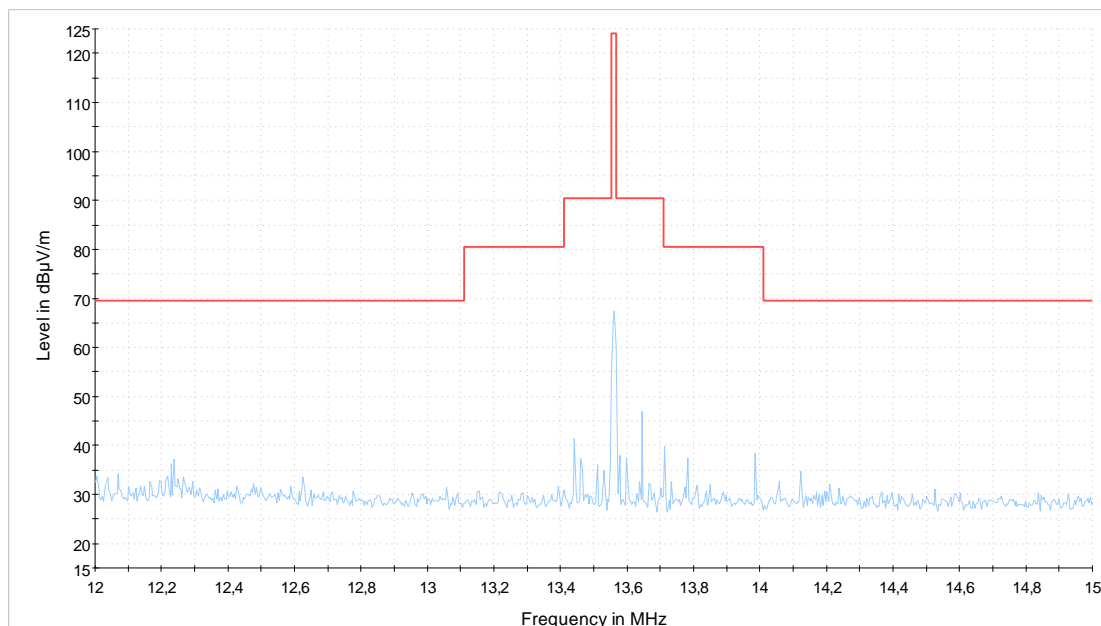The test was carried out automatically by the test receiver.
The EUT is a table-top EUT and was standing on a table made of Styrodur with a Pertinax plate on top and the dimensions 1.6 m x 1.0 m x 0.8 m (Length x Width x Height).

Test set-up photo:

See 2222267KAU-006_Appendix_Photos

4.3 Test data

Overview sweeps performed with peak detectors

Frequency MHz	Disturbance Level dBµV/m	RBW kHz	Detector	Limit dBµV/m	Margin dB
13.56	67.5	100	Peak	124	56.5

4.4 Test equipment

Equipment type	Manufacturer	Model	Inv. No.	Cal. due date
Measurement software	Rohde & Schwarz	EMC 32	--	--
Receiver, 10 Hz- 7 GHz	Rohde & Schwarz	ESR 7	PM KF 2441	2015-06
Loop antenna, 9 kHz-30 MHz	Rohde & Schwarz	HFH2-Z2	PM KF 1401	2016-03

5 Radiated test below 30 MHz

Date of test:	2014-10-13	Test location:	Anechoic chamber 1
EUT Serial:	1431000012	Ambient temp.	22.5 °C
Tested by:	RDR	Relative humidity	47.6 %
Test result:	Pass	Margin:	8.5 dB

5.1 Requirement

Reference: FCC §15.225 (d)/ §15.209 and IC RSS-210, Issue 8, section A2.6
Methods of measurement: ANSI C63.10, Clause 6.4 and RSS-Gen 4.9 / 7.2.5
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.			

5.2 Test setup details

see 4.2

5.3 Test data
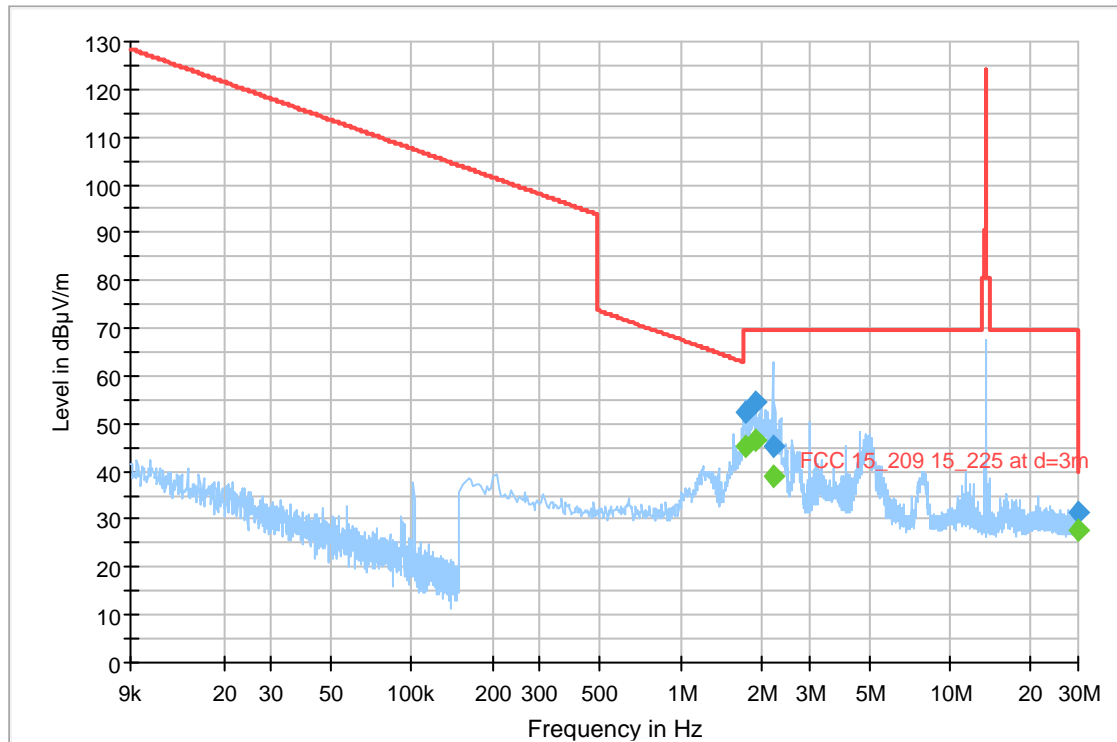
Final Result 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1.734000	52.5	5000.0	9.000	100.0	H	-28.0	20.2	17.0	69.5
1.898000	54.3	5000.0	9.000	100.0	V	249.0	20.2	15.2	69.5
2.198000	45.3	5000.0	9.000	100.0	V	244.0	20.2	24.2	69.5
30.000000	31.5	5000.0	9.000	100.0	H	240.0	19.7	8.5	40.0

Final Result 2

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Comment
1.734000	45.2	5000.0	9.000	100.0	H	-28.0	20.2	
1.898000	46.4	5000.0	9.000	100.0	V	249.0	20.2	
2.198000	38.9	5000.0	9.000	100.0	V	244.0	20.2	
30.000000	27.6	5000.0	120.000	100.0	H	240.0	19.7	

5.4 Test equipment

Equipment type	Manufacturer	Model	Inv. No.	Cal. due date
Measurement software	Rohde & Schwarz	EMC 32	--	--
Receiver, 10 Hz- 7 GHz	Rohde & Schwarz	ESR 7	PM KF 2441	2015-06
Loop antenna, 9 kHz-30 MHz	Rohde & Schwarz	HFH2-Z2	PM KF 1401	2016-03

6 Radiated emissions measurements from 30 MHz to 150 MHz

Date of test:	2014-10-13	Test location:	Anechoic chamber 1
EUT Serial:	1431000012	Ambient temp.	22.5 °C
Tested by:	RDR	Relative humidity	47.6 %
Test result:	Pass	Margin:	5.5 dB

6.1 Requirement

Reference: FCC §15.225 (d)/ §15.209 and IC RSS-210, Issue 8, section A2.6
Methods of measurement: ANSI C63.10, Clause 6.5 and RSS-Gen 4.9 / 7.2.5

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

6.2 Test setup details

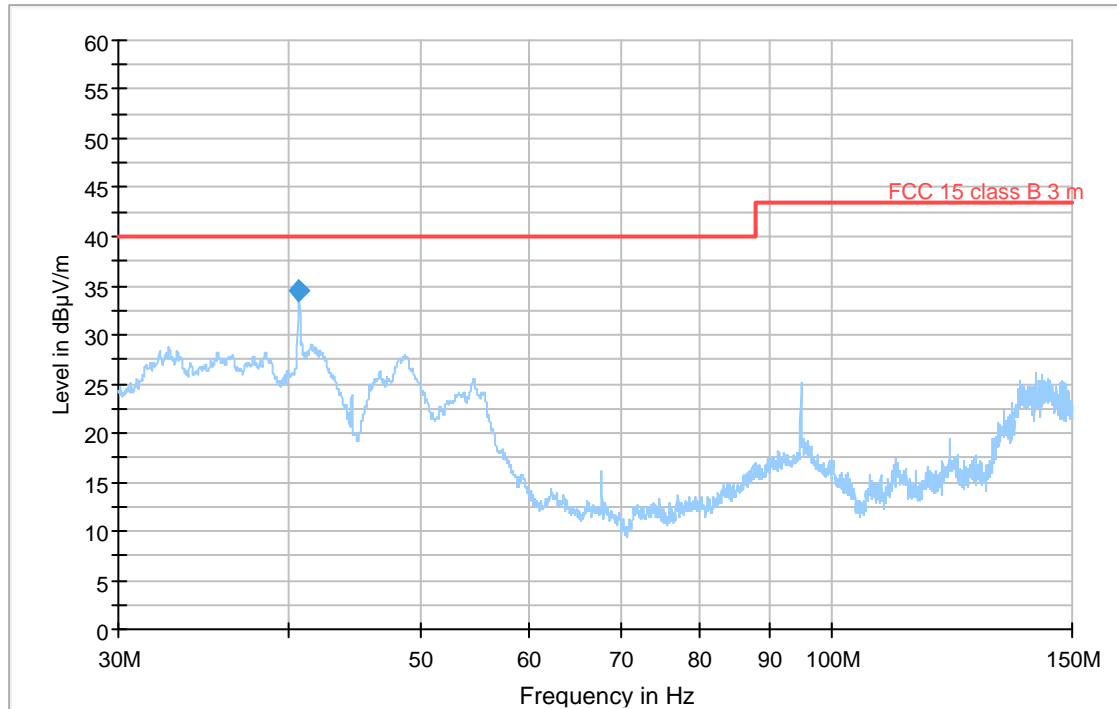Because just the spurious emissions were relevant at this test, the cable to the lock was bundled.

Test set-up photo:

See 2222267KAU-006_Appendix_Photos

6.3 Test data

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

FCC Class B QP 30-1000MHz

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
40.680000	34.5	1000.0	120.000	100.0	V	294.0	15.0	5.5	40.0

All other harmonics had a margin of more than 20 dB.

6.4 Test equipment

Equipment type	Manufacturer	Model	Inv. No.	Cal. due date
Measurement software	Rohde & Schwarz	EMC 32	--	--
Receiver, 10 Hz- 7 GHz	Rohde & Schwarz	ESR 7	PM KF 2441	2015-06
Antenna, 30-3000 MHz	Rohde & Schwarz	HL 562	PM KF 1123	2016-01

7 Frequency stability measurements

Date of test:	2014-10-13/ 2015-05-19	Test location:	Anechoic chamber 1
EUT Serial:	1431000012	Ambient temp.	22.5 °C
Tested by:	RDR	Relative humidity	47.6 %
Test result:	Pass		

7.1 Requirement

Reference: FCC §15.225 (e) and IC RSS-210, Issue 8, section A2.6/ RSS-Gen Issue 3, section 4.7
Methods of measurement: ANSI C63.10, Clause 6.5

Limit:	The frequency tolerance of the carrier signal shall be maintained within ± 0.01 % (±100 ppm) of the carrier frequency under nominal conditions.
Temperature range:	0°C to +60°C (at normal supply voltage)
Voltage range:	85% to 115% of the rated supply voltage (at a temperature of +20°C)

7.2 Test data

Test Conditions		Frequency	
Temperature °C	Voltage V AC	Carrier MHz	Error kHz
60	Normal supply voltage = 120	13.56	0.0
50		13.56	0.0
40		13.56	0.0
30		13.56	0.0
20		13.56	0.0
10		13.56	0.0
0		13.56	0.0
-10		13.56	0.0
-20		13.56	0.0
-30		13.56	0.0
+20°C	85% of lower rated supply voltage = 85	13.56	0.0
	Rated supply voltage = 100 - 240	13.56	0.0
	115% of upper rated supply voltage = 276	13.56	0.0

At a temperature of 60°C the carrier level was reduced for 1.0 dB and at 50°C the carrier level was reduced for 0.7 dB in comparison to the carrier level at 20°C.
At a temperature of -10°C the carrier level was reduced for 0.1 dB, at -20°C the carrier level was reduced for 0.13 dB and at -30°C the carrier level was reduced for 0.22 dB in comparison to the carrier level at 20°C.

7.3 Test equipment

Equipment type	Manufacturer	Model	Inv. No.	Cal. due date
Receiver, 10 Hz- 7 GHz	Rohde & Schwarz	ESR 7	PM KF 2441	2015-06
Near field probe set, 901-6 cm Loop probe	EMCO	7405	PM KF 2441	-/-
Temperature chamber	Heraeus-Vötsch	HT4010	PM KF 1402	2014-11

8 Occupied Bandwidth

Date of test:	2014-12-16	Test location:	Anechoic chamber 1
EUT Serial:	1431000012	Ambient temp.	23.1 °C
Tested by:	RDR	Relative humidity	32.8 %
Test result:	Pass		

8.1 Requirement

Reference: RSS-Gen, Issue 3, 4.6.1

8.2 Test setup details

The test setup was identical to the test setup at the radiated tests below 30 MHz.

8.3 Test data
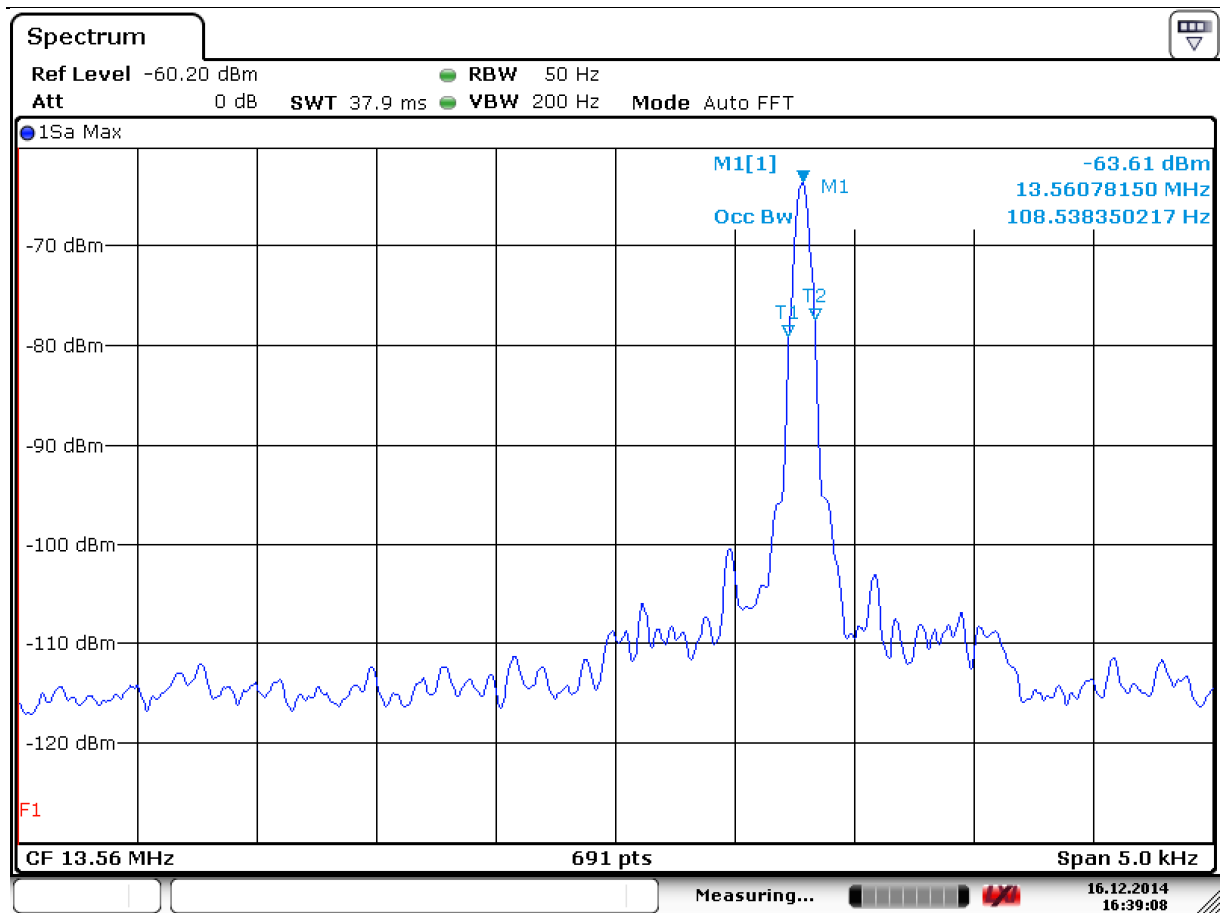
Date: 16.DEC.2014 16:39:08

Test result: The occupied bandwidth is 108.5 Hz.

8.4 Test equipment

Equipment type	Manufacturer	Model	Inv. No.	Cal. due date
Spectrum analyzer, 10 Hz- 40 GHz	Rohde & Schwarz	FSV 40	PM KF 2783	2015-09
Loop antenna, 9 kHz- 30 MHz	Rohde & Schwarz	HFH2-Z2	PM KF 1401	2016-03

9 Photos of the EUT

See 2222267KAU-006_Appendix_Photos