

Test Report Radio Frequency Devices – Intentional Radiators

Test Report – No.: 2227660KAU-006a

Date of issue: 2017-01-17

Type: SCR708

Description of the EUT: MFP RFID Reader

Serialnumber:
05E343075025
05D243075029

Manufacturer and Applicant: Inepro BV

Address:
Pondweg 7
2153 PK Nieuw-Vennep
The Netherlands

Summary:

The EUT supports all RFID card technologies in the 13.56 MHz and the 125 kHz range. This report applies to the 13.56 MHz RF part.

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 9 and RSS-GEN, Issue 4

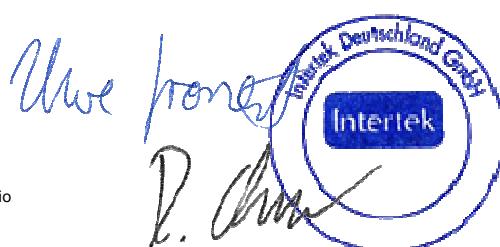
Test methods according to ANSI C63.10-2013

Test Laboratory:

Intertek Deutschland GmbH, Innovapark 20, 87600 Kaufbeuren

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A handwritten signature of 'Uwe Gronert' is written over a circular blue stamp. The stamp contains the text 'Intertek Deutschland GmbH' around the top edge and 'Intertek' in the center.

This test report consists of 20 pages. All measurement results exclusively refer to the equipment, which was tested. Reproduction of this report except in its entirety is not permitted without written approval of Intertek Deutschland GmbH.

Revision History

Edition	Date	Description
1	2017-01-17	First release

Details about Accreditation/ Acceptance

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**

International



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

CB Test Laboratory: **TL118**



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

Designation Number: **DE0014**

Test Firm Registration Number: **359260**



BNetza-CAB-16/21-10

The *Bundesnetzagentur* recognizes Intertek Deutschland GmbH as Conformity Assessment Body in the sector electromagnetic compatibility (EMC).



The Intertek Deutschland EMC-Lab is listed at Industry Canada

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

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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1 Equipment under test (EUT)

1.1 Description of the EUT

The purpose of the Slim Card Reader is to read the unique ID contained in 13.56 MHz and 125 kHz card and tags that are presented to the reader. In most cases this data will be the card serial number. To facilitate this a variety of card reader software modules have been developed. The SCR708 transfers the read-out identifier and transfer this to terminals and Multi-Functional printers (MDP) via a standard USB interface. By default the SCR708 will act as a standard HID device.

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

Type/ Model: SCR708

Description of the EUT: MFP RFID Reader

Transmitter frequency range: 13.56 MHz (and 125 kHz documented in the test report 2227660KAU-006a)

Frequency agile or hopping: Yes No

Antenna: Internal antenna External antenna

Antenna connector: None, internal antenna Yes, type

Type of modulation: Transponder: ASK

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:

Power rating: 0.5 A (power supply via USB)

Transmitter stand by mode supported: Yes No

1.3 Additional hardware information about the EUT

The EUT consists of the following units:

See 2.4

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 SCR708 were done 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 9 and RSS-GEN, Issue 4

Test methods in:

ANSI C63.10-2013: 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:

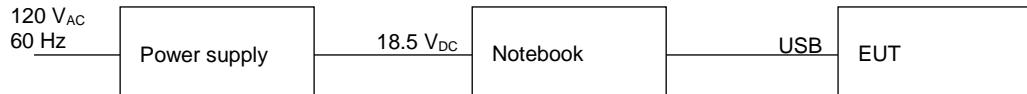
Intertek Deutschland GmbH, Innovapark 20, 87600 Kaufbeuren

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.



Power supply: PPP009H, HP Part No: 608425-002, S/N: F12921101316298

Notebook: HP, Compaq6730b, S/N: CNU9462Z4H

Tag: According to the manufacturer the field strength of the carrier of the EUT is identical whether a tag is used or not. The tests were done without tag.

2.5 Test conditions

The radiated emission tests of the SCR708 were done with modulation.

If not additionally specified, the tests were performed under the following environmental conditions:

Parameter	Normal
Supplying voltage via USB port	5 V _{DC}
Nominal voltage range	5 V _{DC}
Permitted input voltage:	5 V _{DC}

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	NA	See EMC report	Class A
Radiated test below 30 MHz	Pass	4, 5	
Radiated emissions measurements from 30 to 1000 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, f_C , and highest radiated emissions, f_M (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:	2016-09-06	Test location:	Anechoic chamber 1
EUT Serial:	05D243075029	Ambient temp.	26.6 °C
Tested by:	UGR	Relative humidity	41 %
Test result:	Pass	Margin:	> 40 dB

4.1 Requirement

Reference: FCC §15.225 (a) – (c) and IC RSS-210, Issue 9, section B4

Methods of measurement: ANSI C63.10, Clause 6.4 and RSS-Gen 6.13 / 8.9

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 (μ V/m)	Field strength (dB μ V/m)	Measurement distance (m)	Field strength (dB μ V/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

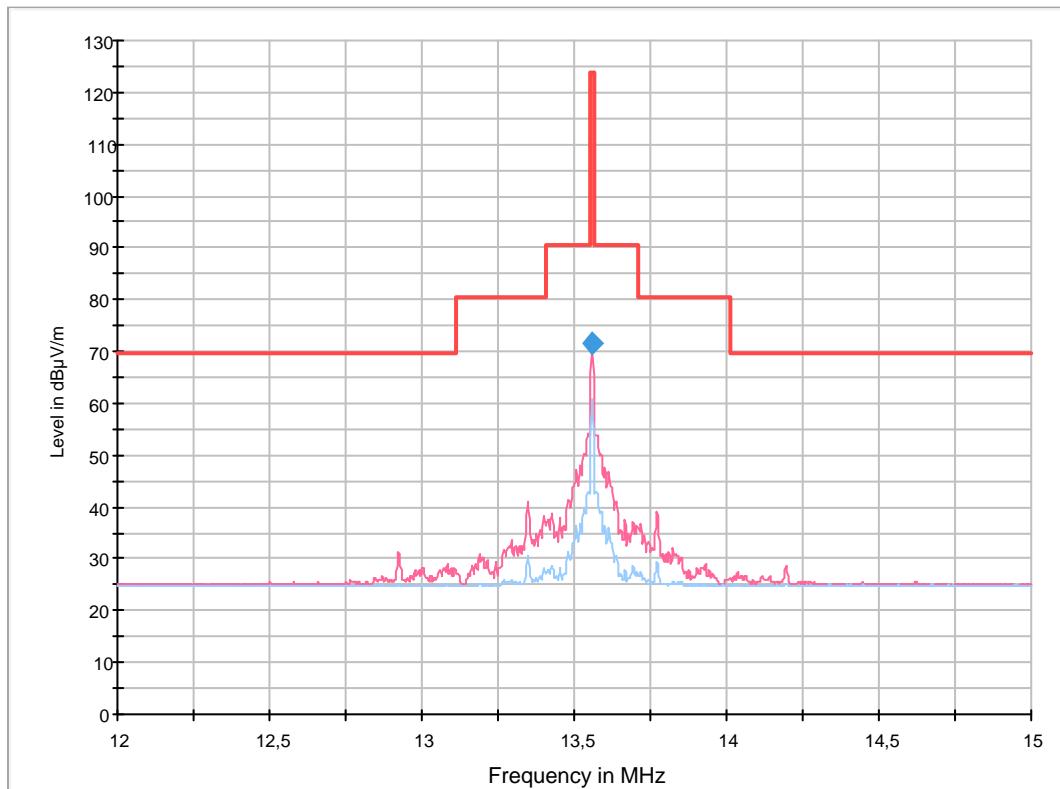
Compliance with the spectrum mask is tested using a spectrum analyzer with resolution bandwidth set to 10 kHz or 9 kHz CISPR. The video bandwidth shall be at least three times greater than the resolution bandwidth.

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).

4.3 Test data

Overview sweeps performed with peak detectors



Frequency MHz	Disturbance Level dB μ V/m	RBW kHz	Detector	Limit dB μ V/m	Margin dB
13.56	75.9	9	Peak	124	48.1

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	2017-08
Loop antenna, 9 kHz- 30 MHz	Rohde & Schwarz	HFH2-Z2	PM KF 1401	2017-09

5 Radiated test below 30 MHz

Date of test:	2016-09-06	Test location:	Anechoic chamber 1
EUT Serial:	05D243075029	Ambient temp.	26.6 °C
Tested by:	UGR	Relative humidity	41 %
Test result:	Pass	Margin:	>30 dB

5.1 Requirement

Reference: FCC §15.225 (d)/ §15.209 and IC RSS-210, Issue 9, section B4

Methods of measurement: ANSI C63.10, Clause 6.4 and RSS-Gen 6.13 / 8.9

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)

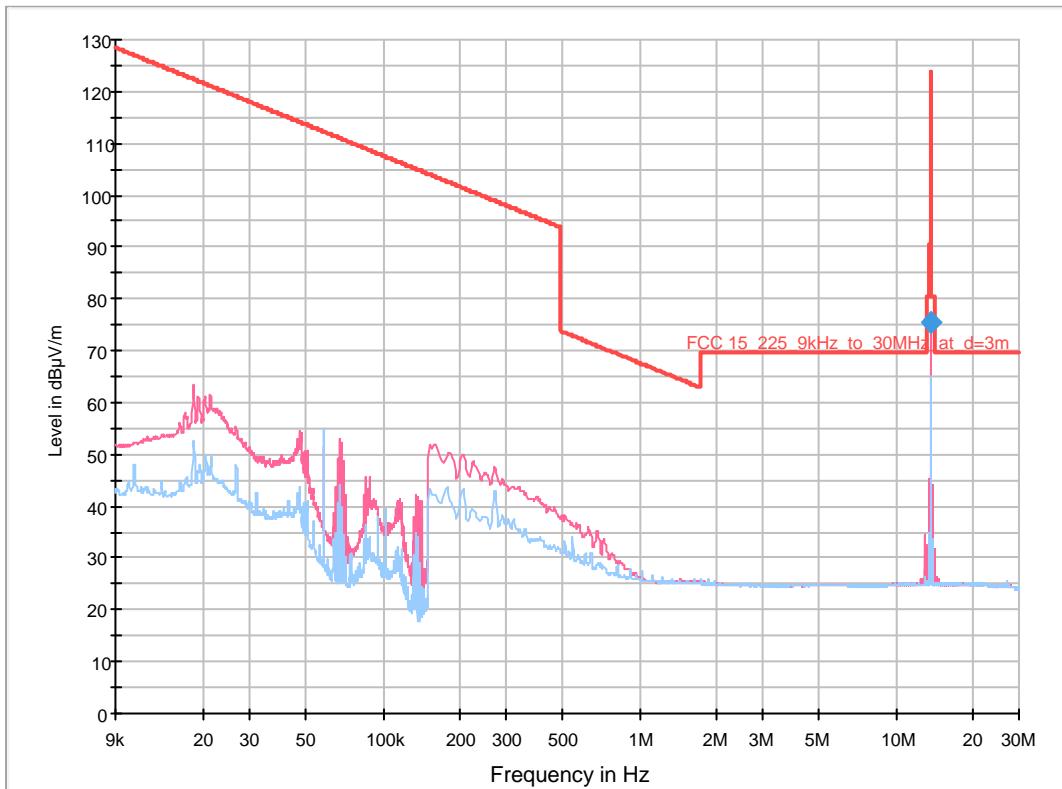
Frequency (MHz)	Field strength (μ V/m)	Field strength (dB μ V/m)	Measurement distance (m)
0.009 - 0.490	$2400/F(\text{kHz})$	$67.6 - 20 \cdot \log(F(\text{kHz}))$	300
0.490 - 1.705	$24000/F(\text{kHz})$	$87.6 - 20 \cdot \log(F(\text{kHz}))$	30
1.705 - 13.110	30	29.5	30
14.010 - 30.000	30	29.5	30

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-ClearWrite (dB μ V/m)	Polarization	Azimuth (deg)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dB μ V/m)	Comment
13.560000	75.4	V	135.0	20.7	48.6	124.0	PK: 75.4 dB μ V/m

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	2017-08
Loop antenna, 9 kHz- 30 MHz	Rohde & Schwarz	HFH2-Z2	PM KF 1401	2017-09

6 Radiated emissions measurements from 30 MHz to 1000 MHz

2015-06-29	2016-09-05	Test location:	Anechoic chamber 1
EUT Serial:	05E343075025	Ambient temp.	25.1 °C
Tested by:	UGR	Relative humidity	44 %
Test result:	Pass	Margin:	7.1 dB

6.1 Requirement

Reference: FCC §15.225 (d)/ §15.209 and IC RSS-210, Issue 9, section B4

Methods of measurement: ANSI C63.10, Clause 6.5 and RSS-Gen 6.13 / 8.9

Frequency (MHz)	Field strength (μ V/m)	Field strength (dB μ V/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

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 procedure

The test site is an anechoic chamber suitable for radiated emission measurements in the frequency range of 30 MHz – 18 GHz (26 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.

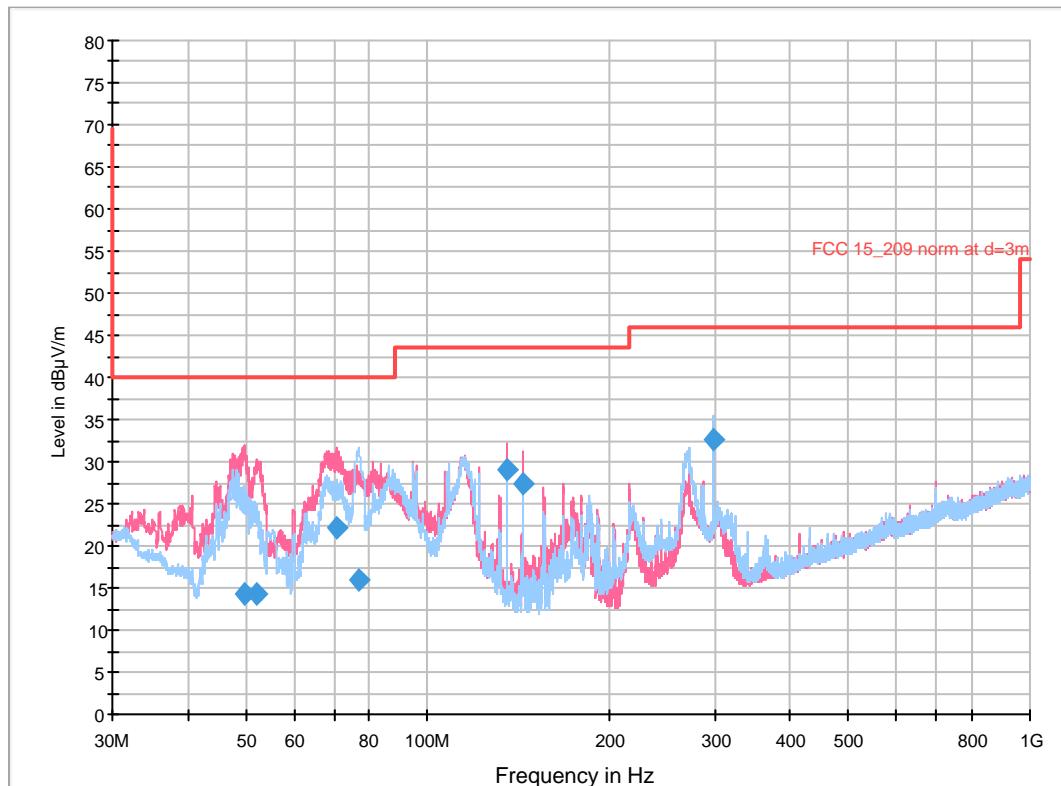
As example consider the following input values and result:

Frequency (MHz)	Receiver reading U (dB μ V)	Antenna factor AF (dB/m)	Cable attenuation A (dB)	Correction antenna + cable (dB)	Radiated field strength E (dB μ V/m)
30.0	20	19,1	0.7	19,8	39,8

$$E = U + AF + A$$

6.3 Test data

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



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)
49.800000	14.3	1000.0	120.000	100.0	V	341.0	8.7	25.7	40.0
51.990000	14.3	1000.0	120.000	100.0	V	327.0	7.1	25.8	40.0
70.590000	22.2	1000.0	120.000	135.0	V	220.0	10.3	17.8	40.0
76.920000	16.1	1000.0	120.000	236.1	H	223.0	11.3	23.9	40.0
135.600000	28.9	1000.0	120.000	135.0	V	111.0	11.5	14.6	43.5
144.000000	27.4	1000.0	120.000	123.0	V	113.0	11.0	16.1	43.5
298.320000	32.5	1000.0	120.000	122.1	H	111.0	13.7	13.5	46.0

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	2017-08
Antenna, 30-3000 MHz	Rohde & Schwarz	HL 562	PM KF 1123	2018-02

7 Frequency stability measurements

Date of test:	2016-09-08	Test location:	Test place 4
EUT Serial:	05E343075025	Ambient temp.	25.3 °C
Tested by:	UGR	Relative humidity	47 %
Test result:	Pass		

7.1 Requirement

Reference: FCC §15.225 (e) and IC RSS-210, Issue 9, section B4 / RSS-Gen Issue 4, section 6.11
 Methods of measurement: ANSI C63.10, Clause 9.14

Limit:	The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ (± 100 ppm) of the carrier frequency under nominal conditions.
Temperature range:	-30°C to +50°C (at normal supply voltage)
Voltage range:	5 V (nominal voltage of power supply via USB)

7.2 Test data

Temperature °C	Carrier MHz	Power supplied via USB	
		Frequency deviation	
		Hz	%
-30	13.560011	11	0.00008
-20	13.560015	15	0.00011
-10	13.560021	21	0.00016
0	13.560008	8	0.00006
20	13.559981	-19	-0.00014
30	13.559937	-63	-0.00047
40	13.559934	-66	-0.00048
50	13.559919	-81	-0.00060
55	13.559918	-82	-0.00060

At a temperature of 50°C the carrier level was reduced for 1.3 dB (minimum value).

At -30°C the carrier level was increased for 0.2 dB (maximum value).

7.3 Test equipment

Equipment type	Manufacturer	Model	Inv. No.	Cal. due date
Spectrum analyser, 10Hz- 40 GHz	Rohde & Schwarz	FSV 40	PM KF 2783	2016-10
Magnetic Field Pickup Coil	Rohde & Schwarz	HZ10	PM KF 0965	2016-10
Temperature chamber	Heraeus-Vötsch	HT4010	PM KF 1402	2017-02

8 Occupied Bandwidth

Date of test:	2017-01-09	Test location:	Test place 4
EUT Serial:	05E343075025	Ambient temp.	25.2 °C
Tested by:	UGR	Relative humidity	50 %
Test result:	Pass		

8.1 Requirement

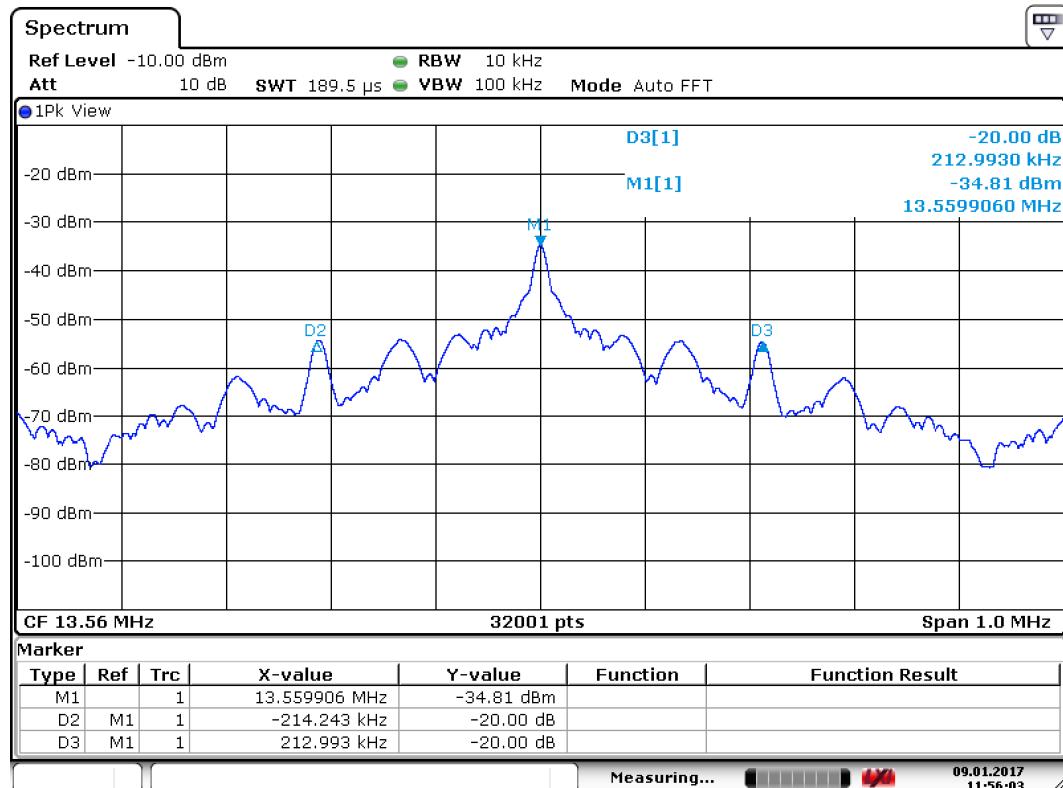
Reference: RSS-Gen, Issue 4, 6.6

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

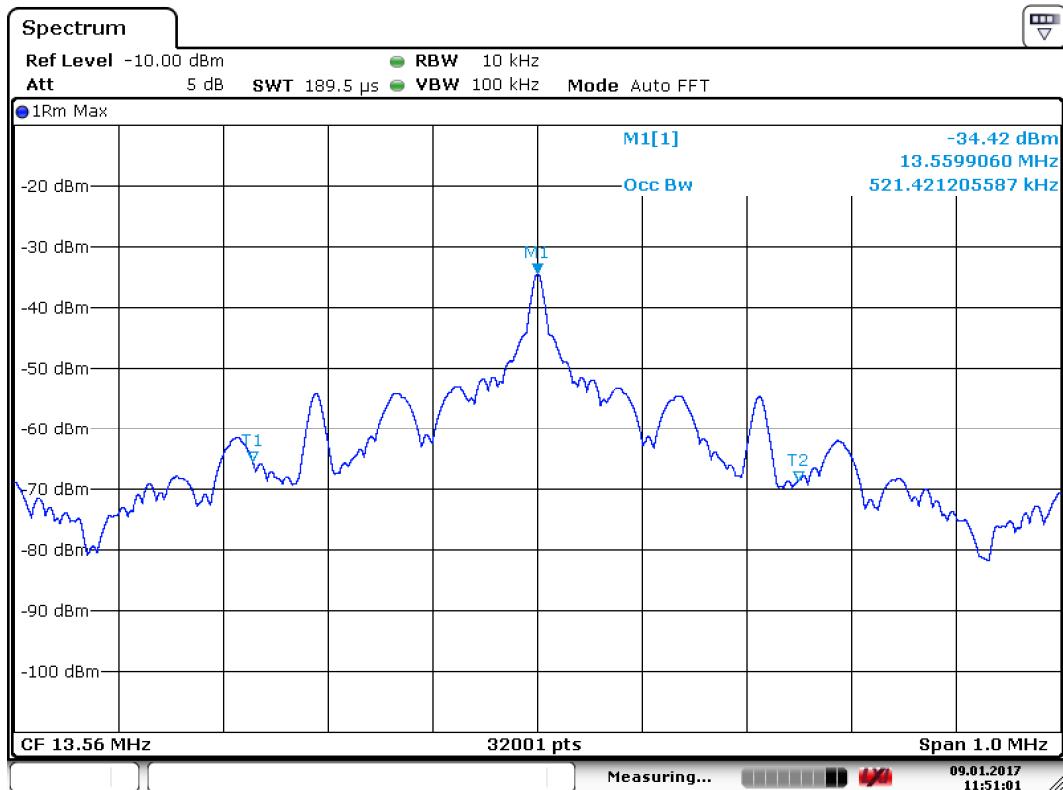
Occupied bandwidth (20 dB)



Date: 9.JAN.2017 11:56:02

Test result: The occupied bandwidth is 427 kHz

Occupied bandwidth (99%)



Date: 9.JAN.2017 11:51:01

Test result: The occupied bandwidth is 521 kHz

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	2017-09
Magnetic Field Pickup Coil	Rohde & Schwarz	HZ10	PM KF 0965	2019-09

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