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## TEST REPORT

Test report no.: 1-2155/16-01-02



Deutsche  
Akkreditierungsstelle  
D-PL-12076-01-01

### Testing laboratory

**CETECOM ICT Services GmbH**

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#### Accredited Testing Laboratory:

The testing laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025 (2005) by the Deutsche Akkreditierungsstelle GmbH (DAkkS)

The accreditation is valid for the scope of testing procedures as stated in the accreditation certificate with the registration number: D-PL-12076-01-01

### Applicant

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### Manufacturer

**ddm Hopt+Schuler GmbH&Co.KG**

Königsberger Str. 12

78628 Rottweil / GERMANY

### Test standard/s

47 CFR Part 15	Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices
RSS - 210 Issue 8	Spectrum Management and Telecommunications Radio Standards Specification - Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment
RSS - Gen Issue 4	Spectrum Management and Telecommunications Radio Standards Specifications - General Requirements and Information for the Certification of Radio Apparatus

For further applied test standards please refer to section 3 of this test report.

### Test Item

**Kind of test item:** **RFID Reader 13.56 MHz**

**Model name:** **RFID Reader 881**

**FCC ID:** **2AJ4J-reader881**

**IC:** **22050-reader881**

Frequency: 13.56 MHz

Technology tested: RFID

Antenna: Integrated loop antenna

Power supply: 3.3 V DC by external power supply

Temperature range: -20°C to +50°C



This test report is electronically signed and valid without handwriting signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

### Test report authorized:

p.o.

Stefan Bös  
Lab Manager  
Radio Communications & EMC

### Test performed:

Marco Bertolino  
Lab Manager  
Radio Communications & EMC

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## 2 General information

### 2.1 Notes and disclaimer

The test results of this test report relate exclusively to the test item specified in this test report. CETECOM ICT Services GmbH does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item.

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This test report is electronically signed and valid without handwritten signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

### 2.2 Application details

Date of receipt of order:	2016-08-10
Date of receipt of test item:	2016-09-20
Start of test:	2016-09-26
End of test:	2016-09-29
Person(s) present during the test:	-/-

### 2.3 Test laboratories sub-contracted

None

### 3 Test standard/s and references

Test standard	Date	Description
47 CFR Part 15	-/-	Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices
RSS - 210 Issue 8	December 2010	Spectrum Management and Telecommunications Radio Standards Specification - Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment
RSS - Gen Issue 4	November 2014	Spectrum Management and Telecommunications Radio Standards Specifications - General Requirements and Information for the Certification of Radio Apparatus

Guidance	Version	Description
ANSI C63.4-2014	-/-	American national standard for methods of measurement of radio-noise emissions from low-voltage electrical and electronic equipment in the range of 9 kHz to 40 GHz
ANSI C63.10-2013	-/-	American national standard of procedures for compliance testing of unlicensed wireless devices

## 4 Test environment

Temperature :	$T_{\text{nom}}$	+20 °C during room temperature tests
	$T_{\text{max}}$	+50 °C during high temperature tests
	$T_{\text{min}}$	-20 °C during low temperature tests
Relative humidity content :		55 %
Barometric pressure :		1021 hpa
Power supply :	$V_{\text{nom}}$	3.3 V DC by external power supply
	$V_{\text{max}}$	3.6 V
	$V_{\text{min}}$	3.0 V

## 5 Test item

### 5.1 General description

Kind of test item :	RFID Reader 13.56 MHz
Type identification :	RFID Reader 881
HMN :	-/-
PMN :	RFID Reader 881
HVIN :	1-020064
FVIN :	-/-
S/N serial number :	-/-
HW hardware status :	1-020064
SW software status :	-/-
FW firmware version :	1.03
Frequency :	13.56 MHz
Type of radio transmission :	
Use of frequency spectrum :	modulated carrier
Type of modulation :	ASK
Number of channels :	1
Antenna :	Integrated loop antenna
Power supply :	3.3 V DC by external power supply
Temperature range :	-20 °C to +50 °C

### 5.2 Additional information

The content of the following annexes is defined in the QA. It may be that not all of the listed annexes are necessary for this report, thus some values in between may be missing.

Test setup- and EUT-photos are included in test report:

1-2155/16-01-01\_AnnexB  
1-2155/16-01-01\_AnnexD

## 6 Description of the test setup

Typically, the calibrations of the test apparatus are commissioned to and performed by an accredited calibration laboratory. The calibration intervals are determined in accordance with the DIN EN ISO/IEC 17025. In addition to the external calibrations, the laboratory executes comparison measurements with other calibrated test systems or effective verifications. Weekly chamber inspections and range calibrations are performed. Where possible, RF generating and signaling equipment as well as measuring receivers and analyzers are connected to an external high-precision 10 MHz reference (GPS-based or rubidium frequency standard).

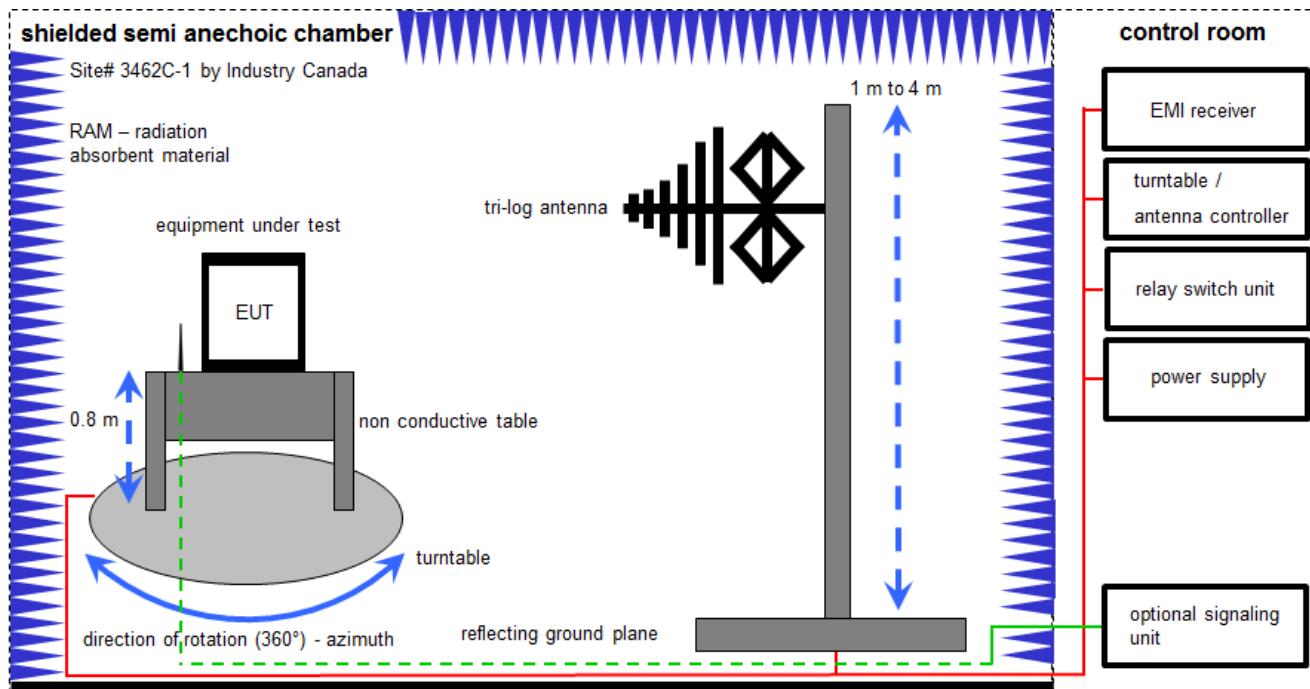
In order to simplify the identification of the equipment used at some special tests, some items of test equipment and ancillaries can be provided with an identifier or number in the equipment list below (Lab/Item).

### Agenda: Kind of Calibration

k	calibration / calibrated	EK	limited calibration
ne	not required (k, ev, izw, zw not required)	zw	cyclical maintenance (external cyclical maintenance)
ev	periodic self verification	izw	internal cyclical maintenance
Ve	long-term stability recognized	g	blocked for accredited testing
vlkl!	Attention: extended calibration interval	*)	next calibration ordered / currently in progress
NK!	Attention: not calibrated		

## 6.1 Shielded semi anechoic chamber

The radiated measurements are performed in vertical and horizontal plane in the frequency range from 9 kHz to 1 GHz in semi-anechoic chambers. The EUT is positioned on a non-conductive support with a height of 0.80 m above a conductive ground plane that covers the whole chamber. The receiving antennas are confirmed with specifications ANSI C63. These antennas can be moved over the height range between 1.0 m and 4.0 m in order to search for maximum field strength emitted from EUT. The measurement distances between EUT and receiving antennas are indicated in the test setups for the various frequency ranges. For each measurement, the EUT is rotated in all three axes until the maximum field strength is received. The wanted and unwanted emissions are received by spectrum analyzers where the detector modes and resolution bandwidths over various frequency ranges are set according to requirement ANSI C63.



Measurement distance: tri-log antenna 10 meter

$$FS = UR + CL + AF$$

(FS-field strength; UR-voltage at the receiver; CL-loss of the cable; AF-antenna factor)

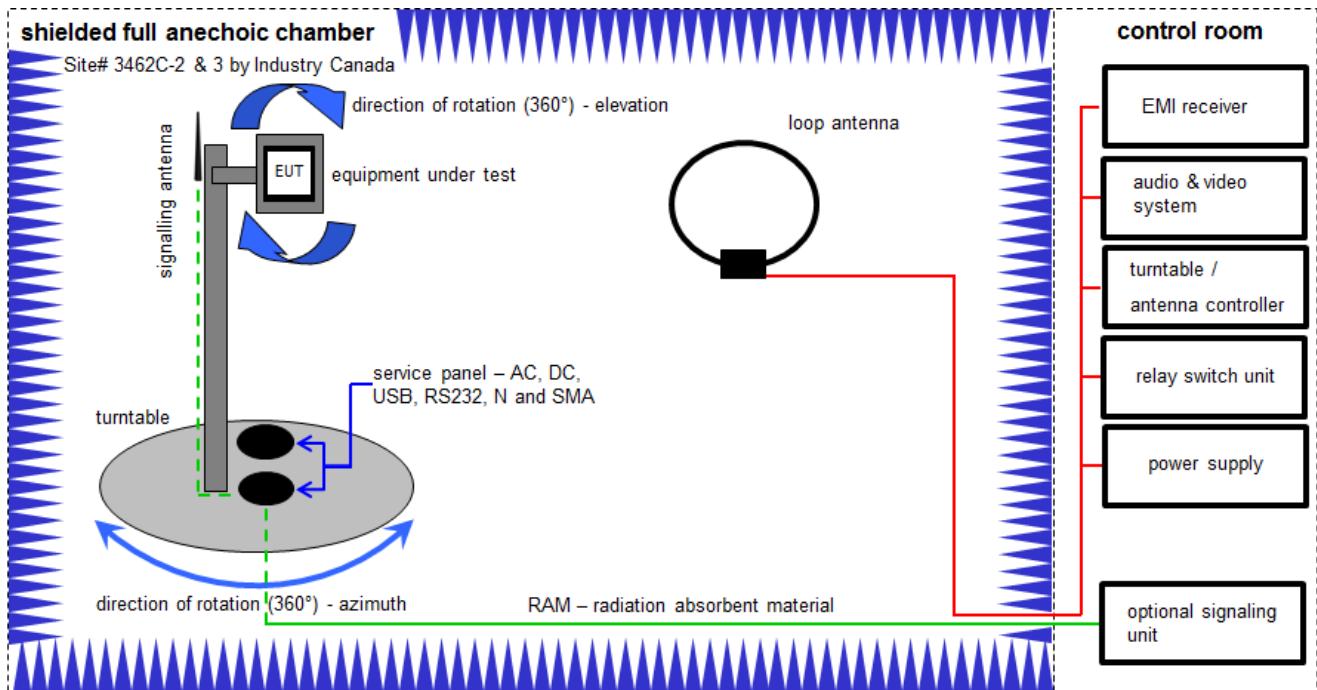
Example calculation:

$$FS [dB\mu V/m] = 12.35 [dB\mu V/m] + 1.90 [dB] + 16.80 [dB/m] = 31.05 [dB\mu V/m] (35.69 \mu V/m)$$

Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	A	Switch-Unit	3488A	HP	2719A14505	300000368	ev	-/-	-/-
2	A	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP	2920A04466	300000580	ne	-/-	-/-
3	A	EMI Test Receiver	ESCI 3	R&S	100083	300003312	k	08.03.2016	08.03.2017
4	A	Antenna Tower	Model 2175	ETS-Lindgren	64762	300003745	izw	-/-	-/-
5	A	Positioning Controller	Model 2090	ETS-Lindgren	64672	300003746	izw	-/-	-/-
6	A	Turntable Interface-Box	Model 105637	ETS-Lindgren	44583	300003747	izw	-/-	-/-

## 6.2 Shielded fully anechoic chamber



Measurement distance: loop antenna 3 meter

FS = UR + CA + AF

(FS-field strength; UR-voltage at the receiver; CA-loss of the signal path; AF-antenna factor)

Example calculation:

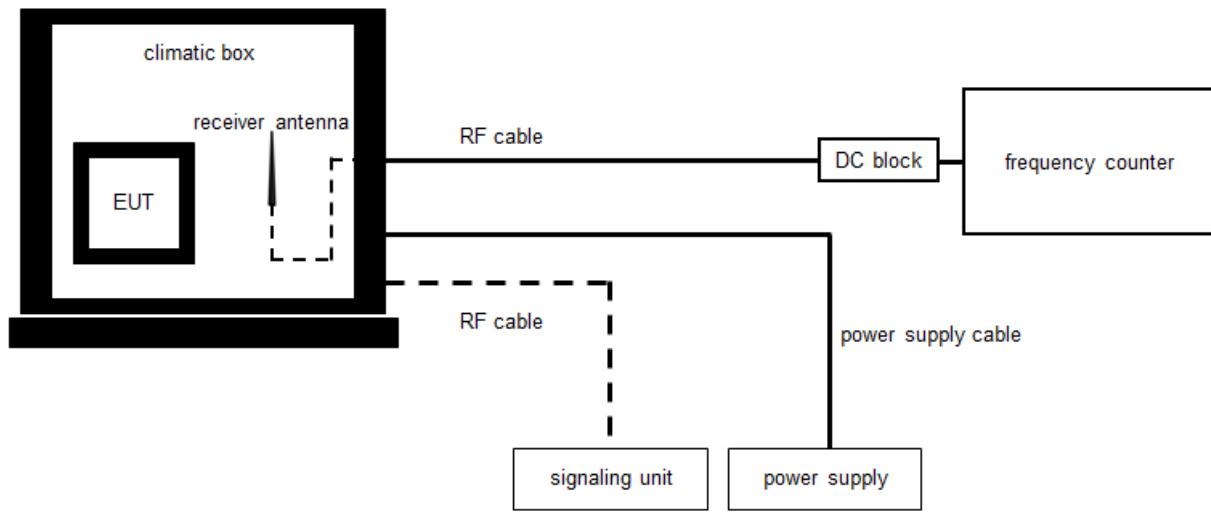
$$FS [\text{dB}\mu\text{V/m}] = 40.0 [\text{dB}\mu\text{V/m}] + (-35.8) [\text{dB}] + 32.9 [\text{dB}/\text{m}] = 37.1 [\text{dB}\mu\text{V/m}] (71.61 \mu\text{V/m})$$

### Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	A	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP	2818A03450	300001040	Ve	20.01.2015	20.01.2018
2	A	Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996	ev	-/-	-/-
3	A	Switch / Control Unit	3488A	HP	*	300000199	ne	-/-	-/-
4	A	Active Loop Antenna 10 kHz to 30 MHz	6502	EMCO/2	8905-2342	300000256	k	24.06.2015	24.06.2017
5	A	Amplifier	js42-00502650-28-5a	Parzich GMBH	928979	300003143	ne	-/-	-/-
6	A	4U RF Switch Platform	L4491A	Agilent Technologies	MY50000037	300004509	ne	-/-	-/-

### 6.3 Frequency error

#### frequency error

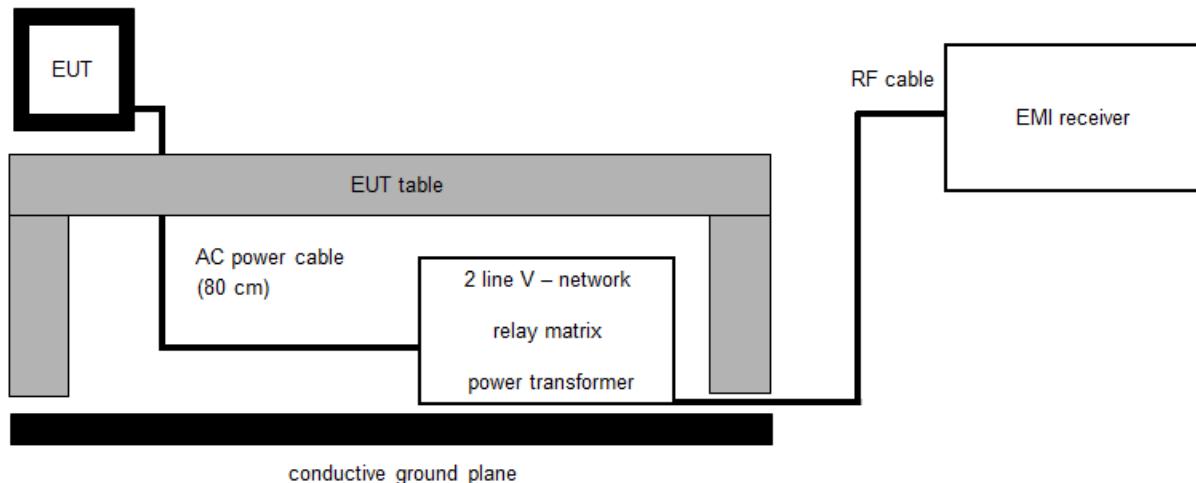


#### Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	A, B	Switch / Control Unit	3488A	HP	2719A15013	300000151	ne	-/-	-/-
2	A	Temperature Test Chamber	VT 4002	Heraeus Voetsch	521/83761	300002326	ev	03.09.2015	03.09.2017
3	A, B	Signal Analyzer 40 GHz	FSV40	R&S	101042	300004517	k	21.01.2016	21.01.2017
4	A, B	Power Supply 0-20V, 0-5A	6632B	Agilent Technologies	GB42110541	400000562	viKI!	26.01.2016	26.01.2019
5	A, B	RF-Cable	ST18/SMAm/SMAm/72	Huber & Suhner	Batch no. 699714	400001184	ev	-/-	-/-
6	A, B	DC-Blocker 0.1-40 GHz	8141A	Inmet	Batch no. 699714	400001185	ev	-/-	-/-

## 6.4 AC conducted

### AC conducted



FS = UR + CF + VC

(FS-field strength; UR-voltage at the receiver; CR-loss of the cable and filter; VC-correction factor of the ISN)

#### Example calculation:

$$FS [\text{dB}\mu\text{V/m}] = 37.62 [\text{dB}\mu\text{V/m}] + 9.90 [\text{dB}] + 0.23 [\text{dB}] = 47.75 [\text{dB}\mu\text{V/m}] (244.06 \mu\text{V/m})$$

#### Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	A	Two-line V-Network (LISN) 9 kHz to 30 MHz	ESH3-Z5	R&S	893045/004	300000584	k	02.02.2016	02.02.2017
2	A	RF-Filter-section	85420E	HP	3427A00162	300002214	k	27.11.2006	-/-
3	A	Hochpass 150 kHz	EZ-25	R&S	100010	300003798	ev	08.04.2008	-/-
4	A	MXE EMI Receiver 20 Hz to 26,5 GHz	N9038A	Agilent Technologies	MY51210197	300004405	k	16.08.2016	16.08.2017
5	A	Analyzer-Reference-System (Harmonics and Flicker)	ARS 16/1	SPS	A3509 07/0 0205	300003314	Ve	02.02.2016	02.02.2018

## 7 Sequence of testing

### 7.1 Sequence of testing radiated spurious 9 kHz to 30 MHz

#### Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- If the EUT is a tabletop system, a 2-axis positioner with 1.5 m height is used.
- If the EUT is a floor standing device, it is placed directly on the turn table.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measurement distance is 3 m (see ANSI C 63.4) – see test details.
- EUT is set into operation.

#### Premeasurement

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna height is 1.5 m.
- At each turntable position the analyzer sweeps with positive-peak detector to find the maximum of all emissions.

#### Final measurement

- Identified emissions during the premeasurement are maximized by the software by rotating the turntable from 0° to 360°. In case of the 2-axis positioner is used the elevation axis is also rotated from 0° to 360°.
- The final measurement is done in the position (turntable and elevation) causing the highest emissions with quasi-peak (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. A plot with the graph of the premeasurement and the limit is stored.

## 7.2 Sequence of testing radiated spurious 30 MHz to 1 GHz

### Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.
- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measurement distance is 10 m or 3 m (see ANSI C 63.4) – see test details.
- EUT is set into operation.

### Premereasurement

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height changes from 1 m to 3 m.
- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

### Final measurement

- The final measurement is performed for at least six highest peaks according to the requirements of the ANSI C63.4.
- Based on antenna and turntable positions at which the peak values are measured the software maximize the peaks by changing turntable position  $\pm 45^\circ$  and antenna height between 1 and 4 m.
- The final measurement is done with quasi-peak detector (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit are recorded. A plot with the graph of the premeasurement with marked maximum final results and the limit is stored.

## 8 Measurement uncertainty

Measurement uncertainty	
Test case	Uncertainty
Occupied bandwidth	± used RBW
Field strength of the fundamental	± 3 dB
Field strength of the harmonics and spurious	± 3 dB
Receiver spurious emissions and cabinet radiations	± 3 dB
Conducted limits	± 2.6 dB

## 9 Summary of measurement results

<input checked="" type="checkbox"/>	No deviations from the technical specifications were ascertained
<input type="checkbox"/>	There were deviations from the technical specifications ascertained
<input type="checkbox"/>	This test report is only a partial test report. The content and verdict of the performed test cases are listed below.

TC Identifier	Description	Verdict	Date	Remark
RF-Testing	CFR Part 15 RSS 210 Issue 8 RSS Gen Issue 4	See table!	2016-11-23	-/-

Test specification clause	Test case	Temperature conditions	Power source conditions	C	NC	NA	NP	Remark
RSS Gen Issue 4	Occupied bandwidth	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-/-
§ 15.225 (a)	Field strength of the fundamental	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-/-
§ 15.209 & § 15.225 (b-d)	Field strength of the harmonics and spurious	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-/-
§ 15.109	Receiver spurious emissions and cabinet radiations	Nominal	Nominal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No stand-alone receiver.
§15.107 §15.207	Conducted limits	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-/-
§ 15.225 (a)	Frequency tolerance	Normal & extreme conditions	Normal & extreme conditions	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-/-

### Note:

- C Compliant
- NC Not compliant
- NA Not applicable
- NP Not performed

## 10 Additional comments

Reference documents: None

Special test descriptions: None

Configuration descriptions: None

## 11 Measurement results

### 11.1 Occupied bandwidth

#### Measurement:

The emission bandwidth (x dB) is defined as the frequency range between two points, one above and one below the carrier frequency, at which the spectral density of the emission is attenuated x dB below the maximum in-band spectral density of the modulated signal.

Measurement parameters	
Detector:	Peak
Resolution bandwidth:	1 % – 5 % of the occupied bandwidth
Video bandwidth:	≥ 3x RBW
Trace mode:	Max hold
Analyzer function:	99 % power function
Used equipment:	See chapter 6.3 - A
Measurement uncertainty:	See chapter 8

#### Limit:

IC
for RSP-100 test report coversheet only

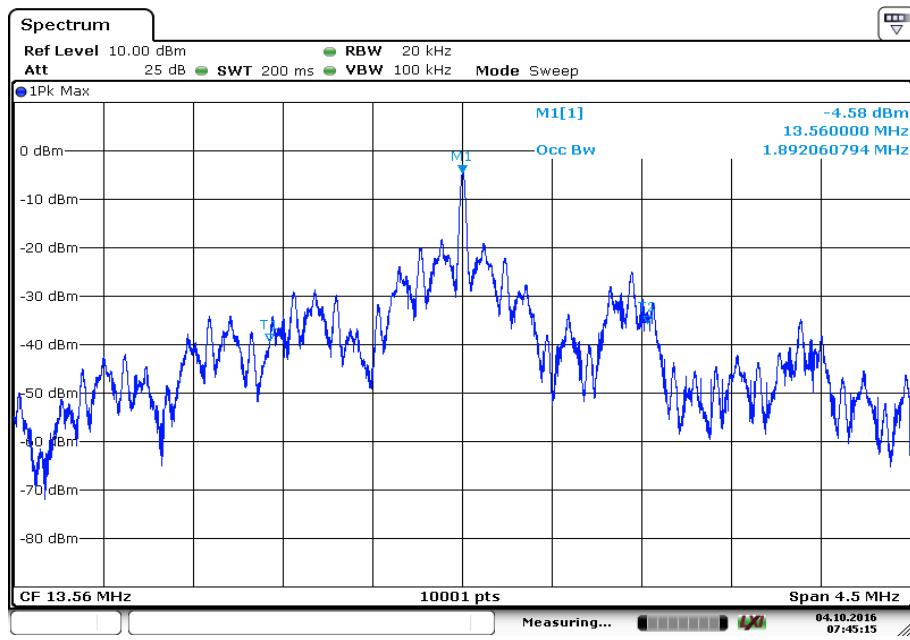
#### Result:

##### 99% emission bandwidth

1892 kHz

**Plot:**

**Plot 1: 99 % emission bandwidth**



Date: 4.OCT.2016 07:45:15

## 11.2 Field strength of the fundamental

### Measurement:

The maximum detected field strength for the carrier signal.

Measurement parameters	
Detector:	Quasi peak / peak (worst case)
Resolution bandwidth:	120 kHz
Video bandwidth:	≥ 3x RBW
Trace mode:	Max hold
Used equipment:	See chapter 6.2 - A
Measurement uncertainty:	See chapter 8

### Limit:

FCC & IC		
Frequency (MHz)	Field strength ( $\mu$ V/m)	Measurement distance (m)
13.553 to 13.567	15,848 (84 dB $\mu$ V/m)	30

### Recalculation:

According to ANSI C63.10		
Frequency	Formula	Correction value
13.56 MHz	$FS_{limit} = FS_{max} - 40 \log\left(\frac{d_{nearfield}}{d_{measure}}\right) - 20 \log\left(\frac{d_{limit}}{d_{nearfield}}\right)$	-21.39

### According to ANSI C63.10

### Result:

Field strength of the fundamental		
Frequency	13.56 MHz	
Distance	@ 3 m	@ 30 m
Measured / calculated value	52.0 dB $\mu$ V/m	30.6 dB $\mu$ V/m

### 11.3 Field strength of the harmonics and spurious

#### Measurement:

The maximum detected field strength for the harmonics and spurious.

Measurement parameters	
Detector:	Quasi peak / average or peak (worst case – pre-scan)
Resolution bandwidth:	F < 150 kHz: 200 Hz 150 kHz < F < 30 MHz: 9 kHz 30 MHz < F < 1 GHz: 120 kHz
Video bandwidth:	F < 150 kHz: 1 kHz 150 kHz < F < 30 MHz: 100 kHz 30 MHz < F < 1 GHz: 300 kHz
Trace mode:	Max hold
Used equipment:	See chapter 6.1 - A; 6.2 - A; 6.3 - B
Measurement uncertainty:	See chapter 8

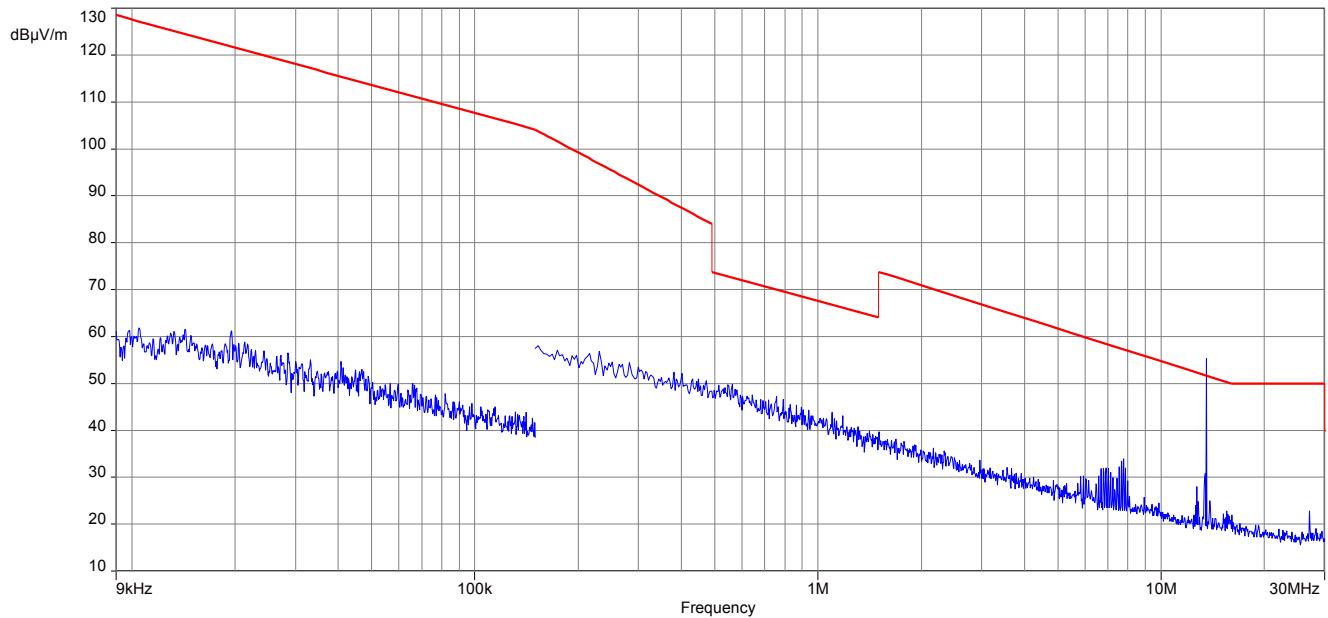
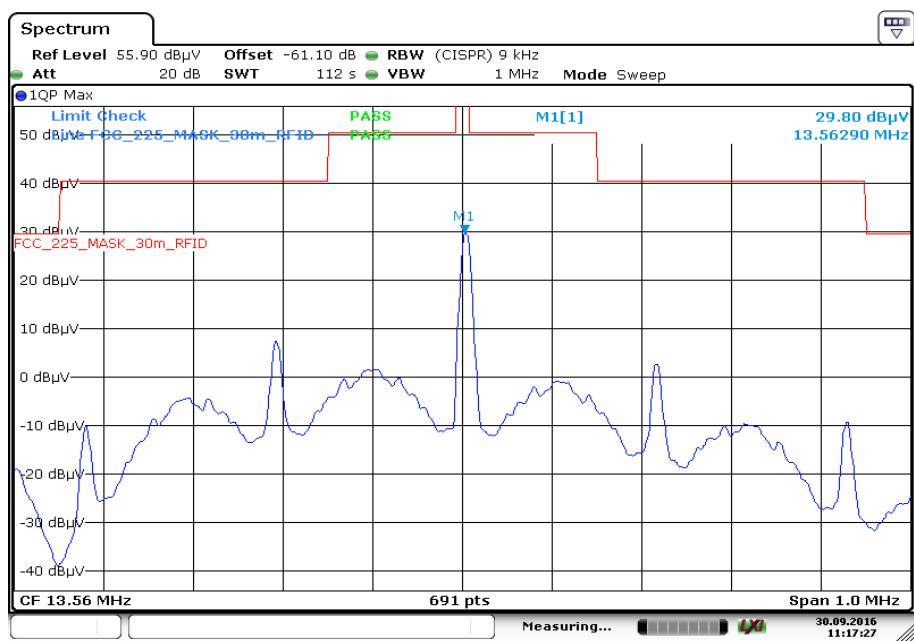
#### Limit:

FCC & IC		
Frequency (MHz)	Field strength (dB $\mu$ V/m)	Measurement distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30	30 (29.5 dB $\mu$ V/m)	30
30 – 88	100 (40 dB $\mu$ V/m)	3
88 – 216	150 (43.5 dB $\mu$ V/m)	3
216 – 960	200 (46 dB $\mu$ V/m)	3

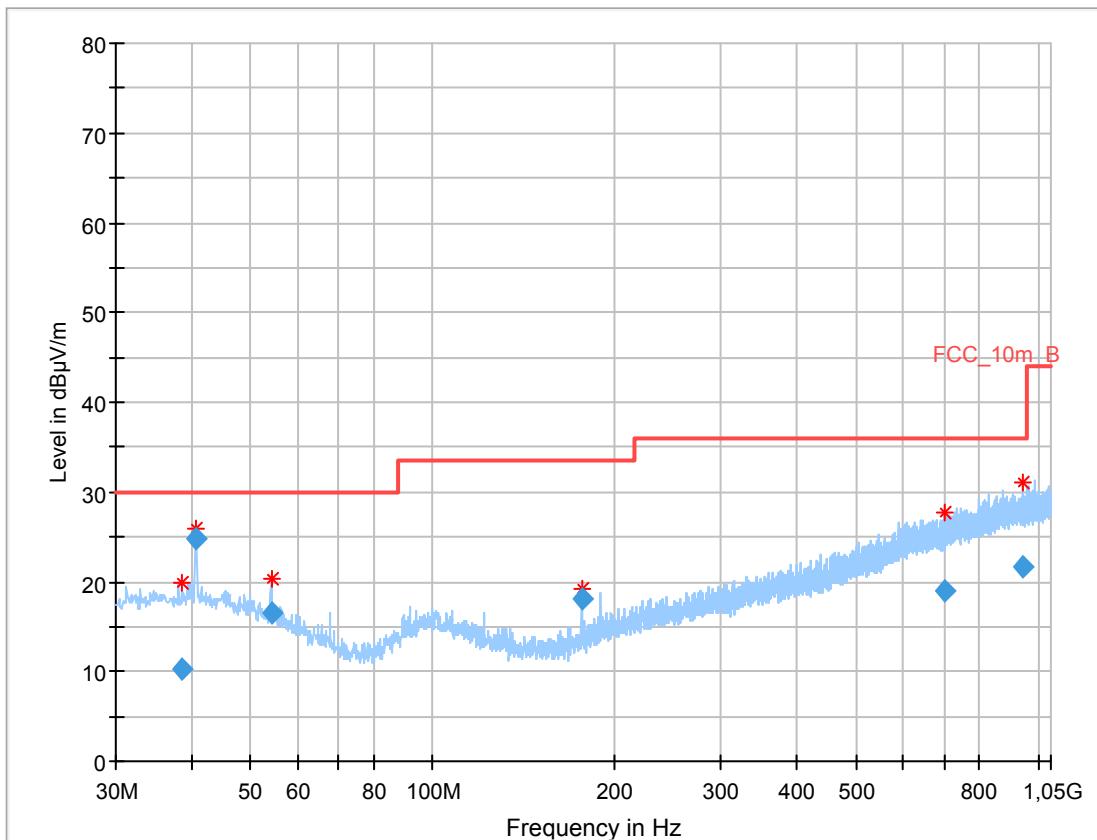
**Note:** For a reduced measurement distance, please take a look at the limit line and the ANSI C63.10-2013 sub clause 6.4 radiated emissions from unlicensed wireless devices below 30 MHz.

#### Result:

Detected emissions			
Frequency (MHz)	Detector	Resolution bandwidth (kHz)	Detected value
27.122	Peak	9	22.8

**Plots:****Plot 1: 9 kHz – 30 MHz, magnetic emissions****Plot 2: Spectrum mask (the limits are recalculated according to the ANSI C63.10-2013 sub clause 6.4)**

Plot 3: 30 MHz – 1 GHz, vertical and horizontal polarization

**Final\_Result:**

Frequency (MHz)	QuasiPeak (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
38.563350	10.29	30.00	19.71	1000.0	120.000	101.0	V	164.0	14.0
40.697250	24.77	30.00	5.23	1000.0	120.000	100.0	V	247.0	14.0
54.233250	16.58	30.00	13.42	1000.0	120.000	101.0	V	293.0	12.0
176.308800	18.04	33.50	15.46	1000.0	120.000	98.0	V	286.0	10.1
700.311750	19.06	36.00	16.94	1000.0	120.000	98.0	V	4.0	21.5
941.724150	21.62	36.00	14.38	1000.0	120.000	98.0	H	319.0	24.2

## 11.4 Conducted limits

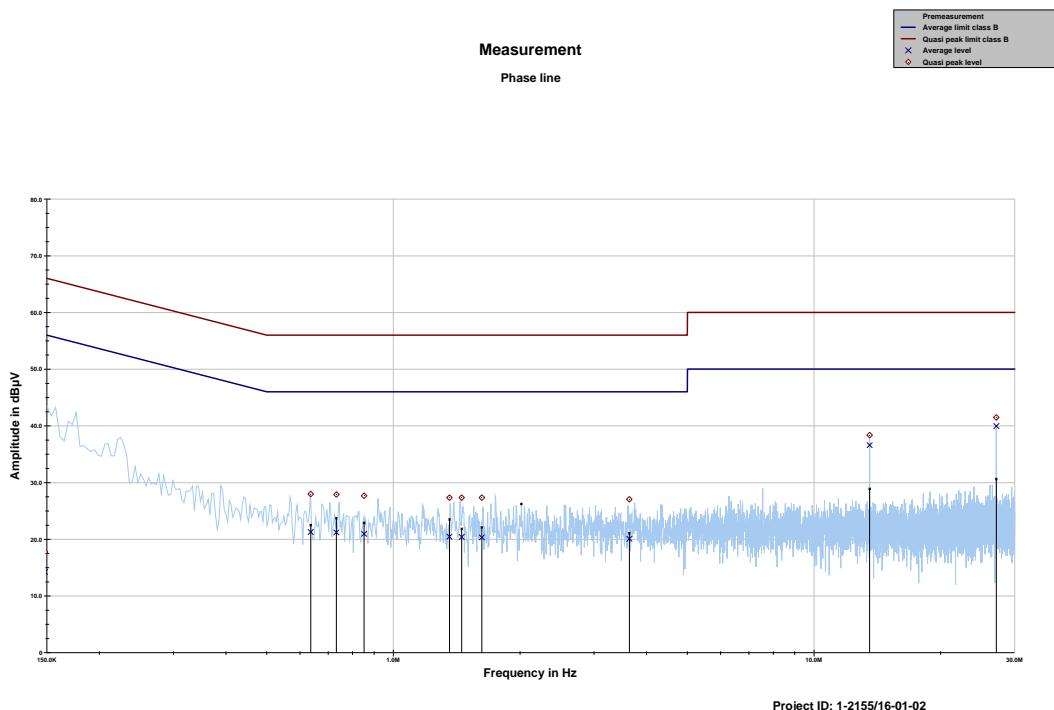
### Measurement:

Measurement of the conducted spurious emissions for an intentional radiator that is designed to be connected to the public utility (AC) power line.

Measurement parameters	
Detector:	Quasi peak / average or peak (worst case – pre-scan)
Resolution bandwidth:	F < 150 kHz: 200 Hz F > 150 kHz: 9 kHz
Video bandwidth:	F < 150 kHz: 1 kHz F > 150 kHz: 100 kHz
Trace mode:	Max hold
Used equipment:	See chapter 6.4 - A
Measurement uncertainty:	See chapter 8

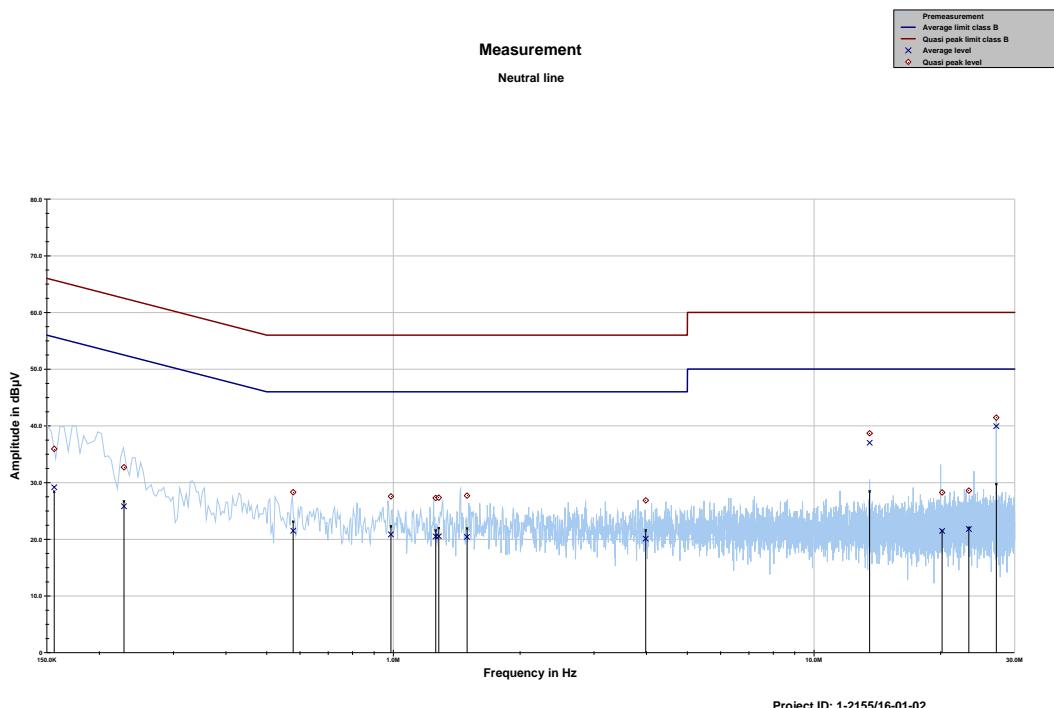
### Limit:

FCC & IC		
Frequency (MHz)	Quasi-peak (dB $\mu$ V/m)	Average (dB $\mu$ V/m)
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 – 30.0	60	50

**Plots:**
**Plot 1:** 150 kHz to 30 MHz, phase line


Frequency	Quasi peak level	Margin quasi peak	Limit QP	Average level	Margin average	Limit AV
MHz	dBμV	dB	dBμV	dBμV	dB	dBμV
0.636007	27.98	28.02	56.000	21.28	24.72	46.000
0.732123	27.90	28.10	56.000	21.21	24.79	46.000
0.852212	27.66	28.34	56.000	20.96	25.04	46.000
1.359046	27.34	28.66	56.000	20.47	25.53	46.000
1.453003	27.33	28.67	56.000	20.42	25.58	46.000
1.622846	27.34	28.66	56.000	20.33	25.67	46.000
3.639420	27.05	28.95	56.000	20.08	25.92	46.000
13.562283	38.37	21.63	60.000	36.59	13.41	50.000
27.122391	41.49	18.51	60.000	39.96	10.04	50.000

Plot 2: 150 kHz to 30 MHz, neutral line



Frequency	Quasi peak level	Margin quasi peak	Limit QP	Average level	Margin average	Limit AV
MHz	dBμV	dB	dBμV	dBμV	dB	dBμV
0.156222	35.94	29.73	65.662	29.17	26.65	55.822
0.228804	32.71	29.78	62.493	25.82	27.93	53.748
0.577770	28.31	27.69	56.000	21.51	24.49	46.000
0.986481	27.57	28.43	56.000	20.85	25.15	46.000
1.260656	27.29	28.71	56.000	20.50	25.50	46.000
1.281853	27.33	28.67	56.000	20.53	25.47	46.000
1.496931	27.69	28.31	56.000	20.42	25.58	46.000
3.980476	26.86	29.14	56.000	20.11	25.89	46.000
13.561063	38.70	21.30	60.000	37.03	12.97	50.000
20.167104	28.25	31.75	60.000	21.45	28.55	50.000
23.340345	28.59	31.41	60.000	21.81	28.19	50.000
27.122124	41.45	18.55	60.000	39.94	10.06	50.000

## 11.5 Frequency tolerance

### Measurement:

The maximum detected field strength for the spurious.

Measurement parameters	
Detector:	Peak detector
Resolution bandwidth:	10 Hz / 100 Hz
Video bandwidth:	> RBW
Trace mode:	Max hold
Used equipment:	See chapter 6.3 - A
Measurement uncertainty:	See chapter 8

### Limit:

#### FCC

The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. ( $\pm 1.356$  kHz)

### Result: Temperature variation

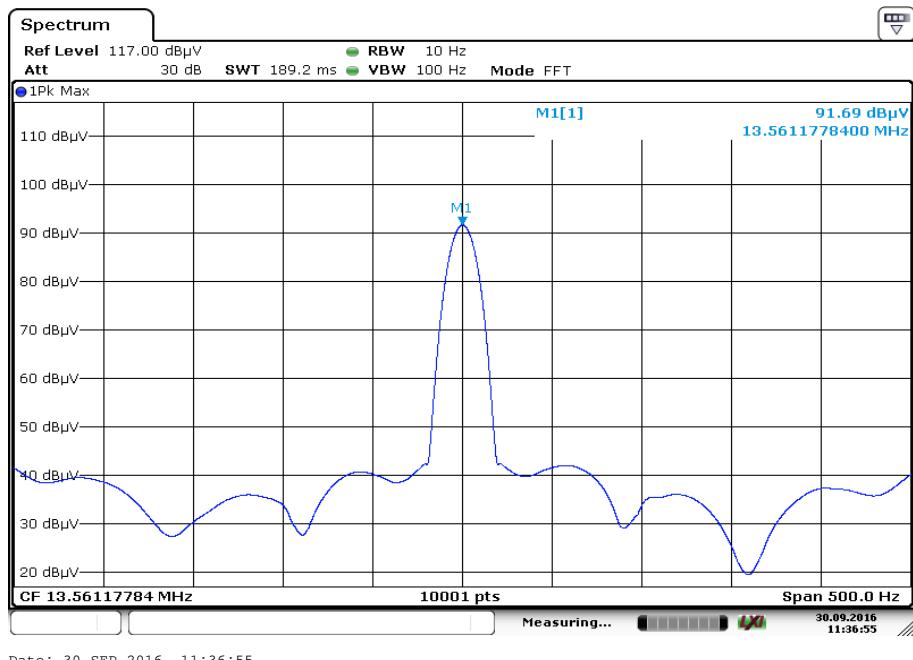
Frequency tolerance		
Measured frequency (MHz)	Conditions	Result
13.561188440	-20 °C & 100% voltage	compliant
13.561223900	-10 °C & 100% voltage	compliant
13.561236920	0 °C & 100% voltage	compliant
13.561223900	+10 °C & 100% voltage	compliant
13.561181930	+20 °C & 100% voltage	compliant
13.561176860	+30 °C & 100% voltage	compliant
13.561160950	+40 °C & 100% voltage	compliant
13.561157330	+50 °C & 100% voltage	compliant

### Result: Voltage variation

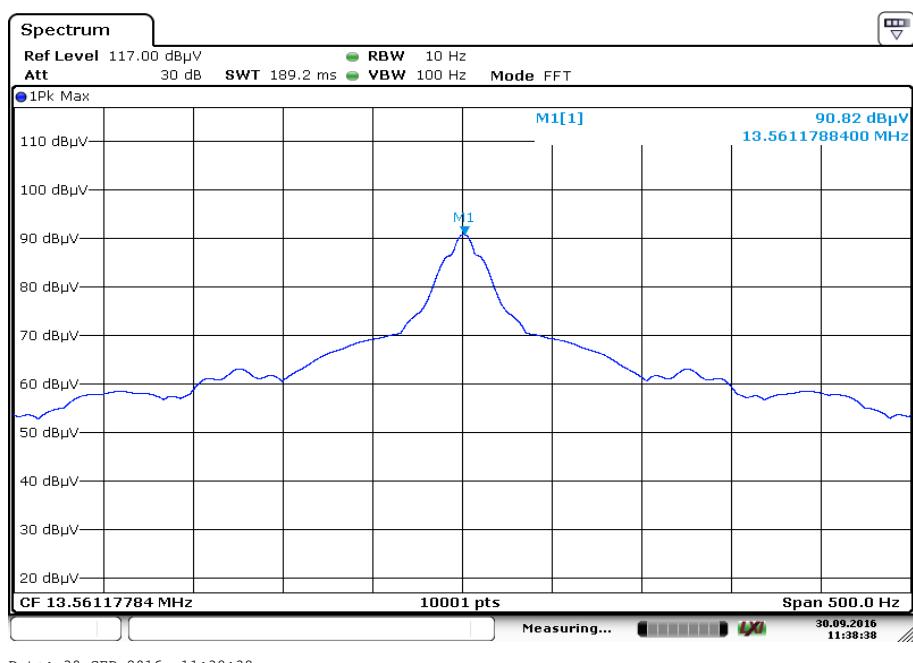
Frequency tolerance		
Measured frequency (MHz)	Temperature	Result
13.561181210	+20 °C & 85% voltage	compliant
13.561181930	+20 °C & 100% voltage	compliant
13.561182650	+20 °C & 115% voltage	compliant

**Plots:**

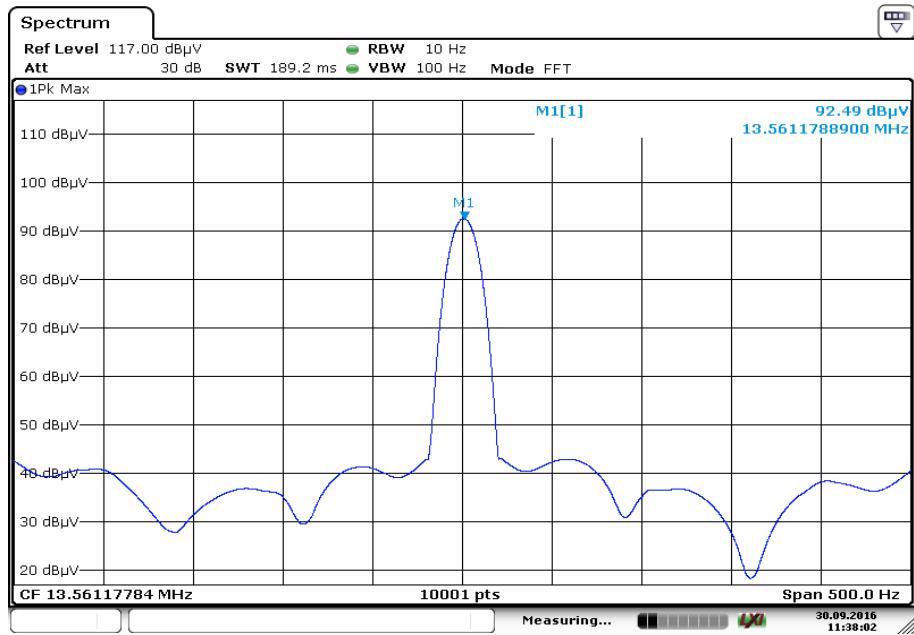
**Plot 1: 100% voltage; 20°C**



**Plot 2: 85% voltage; 20°C**



Plot 3: 115% voltage; 20°C



Date: 30.SEP.2016 11:38:02

## 12 Observations

No observations except those reported with the single test cases have been made.

## Annex A Document history

Version	Applied changes	Date of release
	Initial release	2016-11-23

## Annex B Further information

### Glossary

AVG	-	Average
DUT	-	Device under test
EMC	-	Electromagnetic Compatibility
EN	-	European Standard
EUT	-	Equipment under test
ETSI	-	European Telecommunications Standard Institute
FCC	-	Federal Communication Commission
FCC ID	-	Company Identifier at FCC
HW	-	Hardware
IC	-	Industry Canada
Inv. No.	-	Inventory number
N/A	-	Not applicable
PP	-	Positive peak
QP	-	Quasi peak
S/N	-	Serial number
SW	-	Software
PMN	-	Product marketing name
HMN	-	Host marketing name
HVIN	-	Hardware version identification number
FVIN	-	Firmware version identification number

## Annex C Accreditation Certificate

Front side of certificate



Deutsche Akkreditierungsstelle GmbH

Befiehene gemäß § 8 Absatz 1 AkkStelleG i.V.m. § 1 Absatz 1 AkkStelleGBV  
Unterzeichnerin der Multilateralen Abkommen  
von EA, ILAC und IAF zur gegenseitigen Anerkennung

**Akkreditierung**

Die Deutsche Akkreditierungsstelle GmbH bestätigt hiermit, dass das Prüflaboratorium

CETECOM ICT Services GmbH  
Untertürkheimer Straße 6-10, 66117 Saarbrücken

die Kompetenz nach DIN EN ISO/IEC 17025:2005 besitzt, Prüfungen in folgenden Bereichen  
durchzuführen:

Funk  
Mobilefunk (GSM / DCS) + OTA  
Elektromagnetische Verträglichkeit (EMV)  
Produktsicherheit  
SAR / EMF  
Umwelt  
Smart Card Technology  
Bluetooth®  
Automotive  
Wi-Fi-Services  
Kanadische Anforderungen  
US-Anforderungen  
Akustik  
Near Field Communication (NFC)

Die Akkreditierungskunde gilt nur in Verbindung mit dem Bescheid vom 04.05.2016 mit der  
Akkreditierungsnr. D-PL-12076-01, und ist gültig bis 17.01.2018. Sie besteht aus diesem Deckblatt,  
der Rückseite des Deckblatts und der folgenden Anlage mit insgesamt 63 Seiten.

Registrierungsnummer der Urkunde: D-PL-12076-01-01

Frankfurt, 04.05.2016

Im Auftrag Dipl.-Ing. (FH) Ralf Egner  
Abteilungsleiter  
Seite 1 von 63 auf der Rückseite

Back side of certificate

Deutsche Akkreditierungsstelle GmbH

Standort Berlin  
Spittelmarkt 10  
10117 Berlin

Standort Frankfurt am Main  
Europa-Allee 52  
60327 Frankfurt am Main

Standort Braunschweig  
Bundesallee 100  
38116 Braunschweig

Die auszugsweise Veröffentlichung der Akkreditierungskunde bedarf der vorherigen schriftlichen  
Zustimmung der Deutsche Akkreditierungsstelle GmbH (DAkkS). Ausgenommen davon ist die separate  
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Es darf nicht der Anschein erweckt werden, dass sich die Akkreditierung auch auf Bereiche erstreckt,  
die über den durch die DAkkS bestätigten Akkreditierungsbereich hinausgehen.

Die Akkreditierung erfolgte gemäß des Gesetzes über die Akkreditierungsstelle (AkkStelleG) vom  
31. Juli 2009 (BGBl. I S. 2625) sowie der Verordnung (EG) Nr. 765/2008 des Europäischen Parlaments  
und des Rates vom 9. Juli 2008 über die Vorschriften für die Akkreditierung und Marktüberwachung  
im Zusammenhang mit der Vermarktung von Produkten (Abl. L 218 vom 9. Juli 2008, S. 30).  
Die DAkkS ist Unterzeichnerin der Multilateralen Abkommen zur gegenseitigen Anerkennung der  
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der International Laboratory Accreditation Cooperation (ILAC). Die Unterzeichner dieser Abkommen  
erkennen ihre Akkreditierungen gegenseitig an.

Der aktuelle Stand der Mitgliedschaft kann folgenden Webseiten entnommen werden:  
EA: [www.european-accreditation.org](http://www.european-accreditation.org)  
ILAC: [www.ilac.org](http://www.ilac.org)  
IAF: [www.iaf.nu](http://www.iaf.nu)

### Note:

The current certificate including annex can be received from CETECOM ICT Services GmbH on request.