

# Test report

Number: **T251-0097/15** Project file: **C20150097**  
Date: **2015-03-16**  
Pages: **61**

Product: **Contactless Reader**

Type reference: **CM1/TP**

Ratings: **5 Vdc via USB**  
**Maximum clock frequency: 13,56 MHz**  
**Protection class: III.**

Trademark: **/**

Applicant: **ČETRTA POT, d.o.o., KRANJ**  
**Planina 3, SI-4000 Kranj, Slovenia**

Manufacturer: **ČETRTA POT, d.o.o., KRANJ**  
**Planina 3, SI-4000 Kranj, Slovenia**

Place of manufacture: **ČETRTA POT, d.o.o., KRANJ**  
**Planina 3, SI-4000 Kranj, Slovenia**

## Summary of testing

Testing method: **FCC Part 15, Subpart C**

Testing location: **SIQ Ljubljana, Trpinčeva ulica 37 A, SI-1000 Ljubljana, Slovenia**

Remarks: **Date of receipt of test items: 2015-01-14**  
**Number of items tested: 1**  
**Date of performance of tests: 2015-01-14 - 2015-02-18**  
**The test results presented in this report relate only to the items tested.**  
**The product complies with the requirements of the testing methods.**

Tested by: **Andrej Škof**

Approved by: **Marjan Mak**

*The report shall not be reproduced except in full.*

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## 1 GENERAL

History sheet			
Date	Report No.	Change	Revision
2015-03-02	T251-0xxx/15	Initial Test Report issued.	--

### 1.1 Equipment under test description

<b>Product:</b>	Contactless reader
<b>Type / Model:</b>	CM1/TP
<b>Supply voltage of transmitter:</b>	5 V dc via USB
<b>Protective class:</b>	III.
<b>Operating frequency:</b>	13,56 MHz
<b>Number of channels:</b>	1
<b>Antenna type:</b>	PCB antenna, 70 mm x 70 mm
<b>Modulation:</b>	ASK, Muller coding
<b>Hardware version:</b>	3.1
<b>Software version:</b>	1.3.6
<b>FCC ID</b>	2ADMJCM1TP
<b>SIQ tested sample number:</b>	S20150251

**NOTE:** For the testing Contactless card acc. to ISO-14443 type A was used. EUT was connected to a laptop HP, Elitebook 8560p (SIQ No. 107320).

#### Section 15.203, Antenna requirements:

Antenna is integrated in the PCB of contactless reader and can not be replaced.



Picture of label

## 1.2 List of measurements performed

PART 15 section	Test name
15.207	Conducted emission
15.209	Radiated emission
15.215	Bandwidth of the emission
15.225	Frequency tolerance

## 1.3 Occupied bandwidth measurement

Fundamental frequency	Minimum resolution bandwidth
9 kHz to 30 MHz	1 kHz
30 to 1000 MHz	10 kHz
1000 MHz to 40 GHz	100 kHz

## 1.4 Quasi-peak detector

Frequency range	Bandwidth (-6dB)
10 Hz to 20 kHz	Full range (wideband)
10 kHz to 150 kHz	200 Hz
150 kHz to 30 MHz	9 kHz
30 MHz to 1 GHz	120 kHz

## 1.5 Peak, rms, and average detectors

Frequency range	Bandwidth (-6dB)
10 Hz to 20 kHz	10, 100, 1000 Hz
10 kHz to 150 kHz	1 and 10 kHz
150 kHz to 30 MHz	1 and 10 kHz
30 MHz to 1 GHz	10 and 100 kHz
1 GHz to 40 GHz	0.1, 1.0 and 10 MHz

## 2 LIMITS FOR ALL SUBPARTS

### 2.1 Subpart C: Intentional Radiators

#### 2.1.1 Conducted emission limits:

##### *CLASS B limits:*

Frequency Range (MHz)	Limits (dB $\mu$ V)	
	Quasi-peak	Average
0.15 to 0.5	66 – 56*	56 – 46*
0.5 to 5.0	56	46
5.0 to 30.0	60	50

\* Decreases with the logarithm of the frequency.

The shown limits in table shall not apply to carrier current systems operating as intentional radiators on frequencies below 30 MHz. In lieu thereof, these carrier current systems shall be subject to the following standards:

- For carrier current systems containing their fundamental emission within the frequency band 535-1705 kHz and intended to be received using a standard AM broadcast receiver: no limit on conducted emissions.
- For all other carrier current systems: 1000  $\mu$ V within the frequency band 535-1705 kHz, as measured using a 50  $\mu$ H/50 ohms LISN.
- Carrier current systems operating below 30 MHz are also subject to the radiated emission limits as appropriate.

#### 2.1.2 Radiated emission limits:

##### *Limits:*

Frequency Range (MHz)	Limits (dB $\mu$ V/m)		Test distance (m)
	VERTICAL	HORIZONTAL	
0,009 to 0,490	$20^*\log(2400/F(\text{kHz}))$	$20^*\log(2400/F(\text{kHz}))$	300
0,490 to 1,705	$20^*\log(2400/F(\text{kHz}))$	$20^*\log(2400/F(\text{kHz}))$	30
1,705 to 30,0	30	30	30
30 to 88	40**	40**	3
88 to 216	43.5**	43.5**	3
216 to 960	46**	46**	3
Above 960	54	54	3

\*\* Except as provided in paragraph below, fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz.

Perimeter protection systems may operate in the 54-72 MHz and 76-88 MHz bands under the provisions of this section. The use of such perimeter protection systems is limited to industrial, business and commercial applications.

**NOTE: For special limits refer to standard**

### 3 ALL TEST EQUIPMENT AND THEIR DESCRIPTION

#### 3.1 General information

Description	Model No.	SIQ No.	Last calibration	Calibrated until	Calibration period	Used
Rohde-Schwarz, RFI receiver	ESU8	105187	2013-10	2015-10	24 months	
Rohde-Schwarz, RFI receiver	ESU26	100428	2014-01	2016-01	24 months	X
Rohde & Schwarz, Artificial main network	ESH2-Z5	106899	2013-05	2015-05	24 months	X
ETS, Anechoic chamber	3m	103949	2014-11	2016-11	24 months	X
R&S, Antenna	HFH2-Z2	/	2013-09	2015-09	24 months	X
EMCO, Antenna	model 3142	104351	2013-09	2015-09	24 months	X
EMCO, Antenna	model 3115	103002	2013-09	2015-09	24 months	X
Heinrich Deisel, Turn table	DS 420.00	103337	NA	NA	NA	X
Kambič, Temperature Chamber	I-190 CK	107298	NA	NA	NA	X
Fluke, Digital Multimeter	179	106728	2014-06	2015-06	12 month	X
Antenna tower	/	/	NA	NA	NA	X
Controller for turn table and antenna tower	/	/	NA	NA	NA	X

## 4 GENERAL AND SPECIAL CONDITIONS DESCRIPTION

### 4.1 General condition description

#### Interconnect and power cabling (or wiring)

##### 4.1.1 Test arrangement for conducted emissions

Interconnecting cables that hang closer than 40 cm to the ground-plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.

I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.

EUT connected to one LISN. Unused LISN measuring port connectors shall be terminated in  $50 \Omega$ . LISN can be placed on top of, or immediately beneath, reference ground-plane.

All other equipment powered from additional LISN(s).

Multiple outlet strip can be used for multiple power cords of non-EUT equipment.

LISN at least 80 cm from nearest part of EUT chassis.

Cables of hand-operated devices, such as keyboards, mice, etc., shall be placed as for normal use.

Non-EUT components of EUT system being tested.

Rear of EUT, including peripherals, shall all be aligned and flush with rear of tabletop.

Rear of tabletop shall be 40 cm removed from a vertical conducting plane that is bonded to the ground-plane.

##### 4.1.2 Test arrangement for conducted emissions- floor-standing equipment

Excess I/O cables shall be bundled in the center. If bundling is not possible, the cables shall be arranged in serpentine fashion. Bundling shall not exceed 40 cm in length.

Excess power cords shall be bundled in the center or shortened to appropriate length.

I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. If bundling is not possible, the cable shall be arranged in serpentine fashion.

EUT and all cables shall be insulated, if required, from the ground-plane by up to 12 mm of insulating material.

EUT connected to one LISN. LISN can be placed on top of, or immediately beneath, the ground-plane.

All other equipment powered from a second LISN or additional LISN(s).

Multiple outlet strip can be used for multiple power cords of non-EUT equipment.

#### **4.1.3 Test arrangement for radiated emissions tabletop equipment**

Interconnecting cables that hang closer than 40 cm to the ground-plane shall be folded back and forth in the center, forming a bundle 30 to 40 cm long.

I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated if required using the correct terminating impedance. The total length shall not exceed 1 m.

If LISNs are kept in the test setup for radiated emissions, it is preferred that they be installed under the ground-plane with the receptacle flush with the ground-plane.

Cables of hand-operated devices, such as keyboards, mice, etc., shall be placed as for normal use.

Non-EUT components of EUT system being tested.

Rear of EUT, including peripherals, shall all be aligned and flush with rear of tabletop.

No vertical conducting plane used.

Power cords drape to the floor and are routed over to receptacle.

#### **4.1.4 Test arrangement for radiated emissions floor-standing equipment**

Excess I/O cables shall be bundled in center. If bundling is not possible, the cables shall be arranged in serpentine fashion. Bundling not to exceed 40 cm in length.

Excess power cords shall be bundled in the center or shortened to appropriate length.

I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. If bundling is not possible, the cable shall be arranged in a serpentine fashion.

EUT and all cables shall be insulated, if required, from the ground-plane by up to 12 mm of insulating material.

If LISNs are kept in the test setup for radiated emissions, it is preferred that they be installed under the ground-plane with the receptacle flush with the ground plane.

## Overhead cable trays and suspended ceilings

### 4.1.5 Test arrangement for floor-standing equipment

Only one vertical riser may be used where typical of system under test.

Excess power cord shall be bundled in the center or shortened to appropriate length.

EUT and cables shall be insulated from ground-plane by up to 12 mm. Where the manual has specified or there exists a code of practice for installation of the EUT, the test arrangement shall allow the use of this practice for the tests.

Power cords being measured connected to one LISN. All other system power cords powered through other LISN(s). A multiple receptacle strip may be used for other power cords.

For *conducted* tests, the LISNs may be placed on top of or immediately beneath and bonded directly to the ground-plane. For *radiated* tests, the LISN(s), if used, should be installed under, with the receptacle flush with the ground-plane.

### 4.1.6 Placement and manipulation of interconnect cabling (or wiring) of tabletop equipment

LISN(s) may have to be positioned to the side of the table to meet the criterion that the LISN receptacle shall be 80 cm away from the EUT. LISN(s) may be above ground-plane only for conducted emission measurements.

Accessories, such as ac power adapter, if typically table-mounted, shall occupy peripheral positions as is applicable.

Accessories, which are typically floor-mounted, shall occupy a floor position directly below the portion of the EUT to which they are typically connected. T

Table length may be extended beyond 1.5 m with peripherals aligned with the back edge. The table depth may be extended beyond 1 m. The 40 cm distance to the vertical conducting plane shall be maintained for conducted emission testing.

## Placement of wall-mounted equipment

### 4.1.7 Test configuration/arrangement for combination floor-standing and tabletop equipment

Interconnecting cables that hang closer than 40 cm to the ground-plane shall be folded back and forth in the center, forming a bundle 30 to 40 cm long.

I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated if required using the correct terminating impedance.

If LISNs are kept in the test setup for radiated emissions, it is preferred that they be installed under the ground-plane with the receptacle flush with the ground-plane.

Cables of hand-operated devices, such as keyboards, mice, etc., have to be placed as for normal use.

Non-EUT components of EUT system being tested.

I/O cable to floor-standing unit drapes to the ground-plane and shortened or excess bundled. Cables not reaching the metal ground-plane are draped to the height of the connector or 40 cm, whichever is lower.

Power cords and signal cables shall drape to the floor. No extension cords shall be used to the power receptacles.

The floor-standing unit can be placed under the table if its height permits.

## 4.2 Special condition description

If for some reason the above measurement conditions can't be met, the description below should be used as an appropriate measurement condition and placement.

**(Description is written additionally as the measurements differ – all is within test procedure)**

## 5 TEST SUMMARY

STANDARDS (details on first page)	Tested yes	Tested no	Sample pass	Sample not pass
ANSI C63.4-2009; FCC Part 15, Subpart C	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Test	Section within the report	Class	Conclusion
Conducted emission	3.1	/	PASS
Radiated emission	3.2	/	PASS

### 5.1 Operating voltages/frequencies used for testing

Section	Test	Operating conditions
6.1	Conducted emission	120 V; 60 Hz (AC/DC adapter)
6.2	Radiated emission	120 V; 60 Hz (AC/DC adapter)

## 6 EMISSION TESTS

### 6.1 Conducted emission measurement (intentional radiator)

#### Section 15.207 Conducted limits

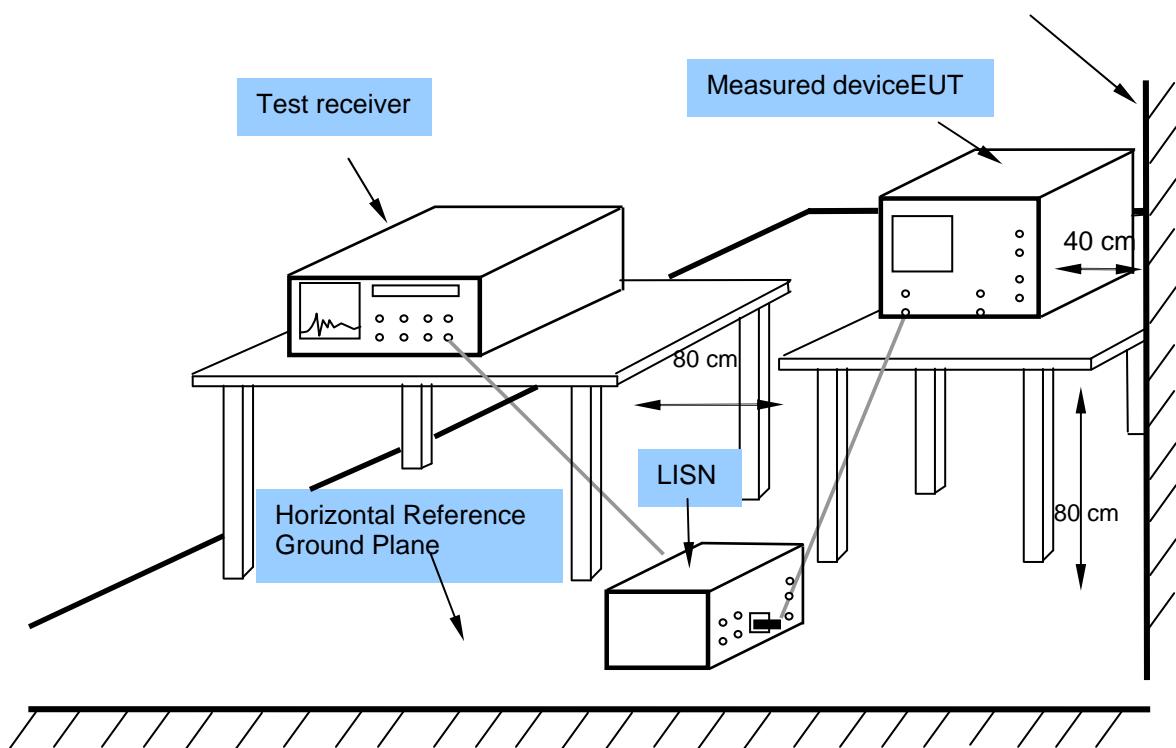
##### 6.1.1 Test instruments

Description	Model No.	SIQ No.	Last calibration	Calibrated until	Calibration period	Used
Rohde-Schwarz, RFI receiver	ESU26	100428	2014-01	2016-01	24 months	X
Rohde & Schwarz, Artificial main network	ESH2-Z5	100406	2013-05	2015-05	24 months	X

##### 6.1.2 Test procedure

- The EUT is placed on a non-conductive 0.8 meters high table, 0.4 meters from the vertical conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). LISN provide 50 Ohm / 50  $\mu$ H + 5 Ohm of coupling impedance for the measuring instrument.
- Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition.
- AC power lines of EUT are checked for maximum conducted interference.
- The frequency range from 150 kHz to 30 MHz is searched using PEAK, QUASI-PEAK and AVERAGE function of the receiver. Bandwidth is set to 9kHz.
- If applicable functions are changed (data transfer speed, clock speed,...)

### 6.1.3 Test setup



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

### 6.1.4 Test results



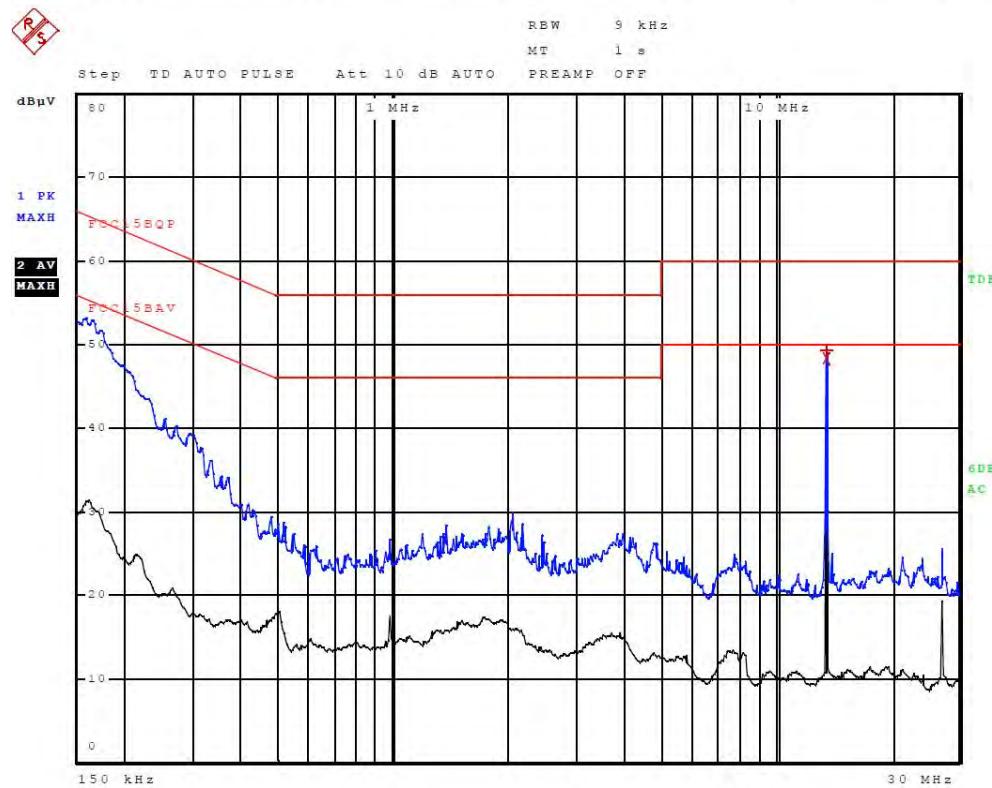
14.Jan 15 09:29

**Meas Type** CONDUCTED EMISSION  
**Equipment under Test** Contactless Reader, CM1/TP  
**Manufacturer** CETRTA POT, d.o.o.  
**OP Condition** AWAITING A TAG  
**Operator** Andrej Skof  
**Test Spec**  
 PHASE (120 V, 60 Hz)

#### Time Domain Scan (1 Range)

Scan Start: 150 kHz  
 Scan Stop: 30 MHz  
 Detector: Trace 1: MAX PEAK Trace 2: Average  
 Transducer: ESH2-Z5

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
150.000000 kHz	30.000000 MHz	2.25 kHz	9.00 kHz	30 ms	Auto	0 dB	INPUT2



**Meas Type** CONDUCTED EMISSION  
**Equipment under Test** Contactless Reader, CM1/TP  
**Manufacturer** CETRTA POT, d.o.o.  
**OP Condition** AWAITING A TAG  
**Operator** Andrej Skof  
**Test Spec**  
PHASE (120 V, 60 Hz)

**Final Measurement**

Meas Time: 1 s  
Margin: 12 dB  
Subranges: 2

Trace	Frequency	Level (dB $\mu$ V)	Detector	Delta Limit/dB
2	13.560000000 MHz	48.36	Average	-1.64
1	13.560000000 MHz	49.25	Quasi Peak	-10.75



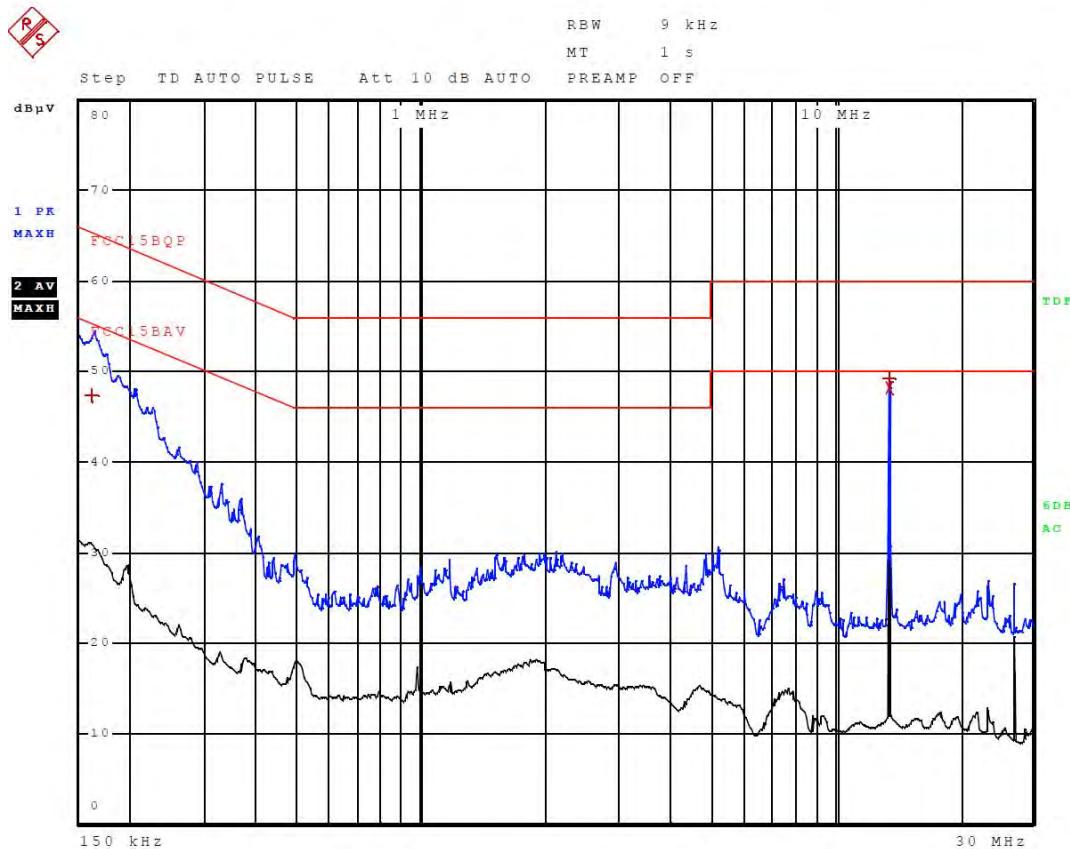
14.Jan 15 09:27

**Meas Type** CONDUCTED EMISSION  
**Equipment under Test** Contactless Reader, CM1/TP  
**Manufacturer** CETRTA POT, d.o.o.  
**OP Condition** AWAITING A TAG  
**Operator** Andrej Skof  
**Test Spec**  
 NEUTRAL (120 V, 60 Hz)

### Time Domain Scan (1 Range)

Scan Start: 150 kHz  
 Scan Stop: 30 MHz  
 Detector: Trace 1: MAX PEAK Trace 2: Average  
 Transducer: ESH2-Z5

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
150.000000 kHz	30.000000 MHz	2.25 kHz	9.00 kHz	30 ms	Auto	0 dB	INPUT2



**Meas Type** CONDUCTED EMISSION  
**Equipment under Test** Contactless Reader, CM1/TP  
**Manufacturer** CETRTA POT, d.o.o.  
**OP Condition** AWAITING A TAG  
**Operator** Andrej Skof  
**Test Spec**  
NEUTRAL (120 V, 60 Hz)

**Final Measurement**

Meas Time: 1 s  
Margin: 12 dB  
Subranges: 3

Trace	Frequency	Level (dB $\mu$ V)	Detector	Delta Limit/dB
2	13.560000000 MHz	48.20	Average	-1.80
1	13.560000000 MHz	49.14	Quasi Peak	-10.86
1	161.250000000 kHz	47.37	Quasi Peak	-18.03



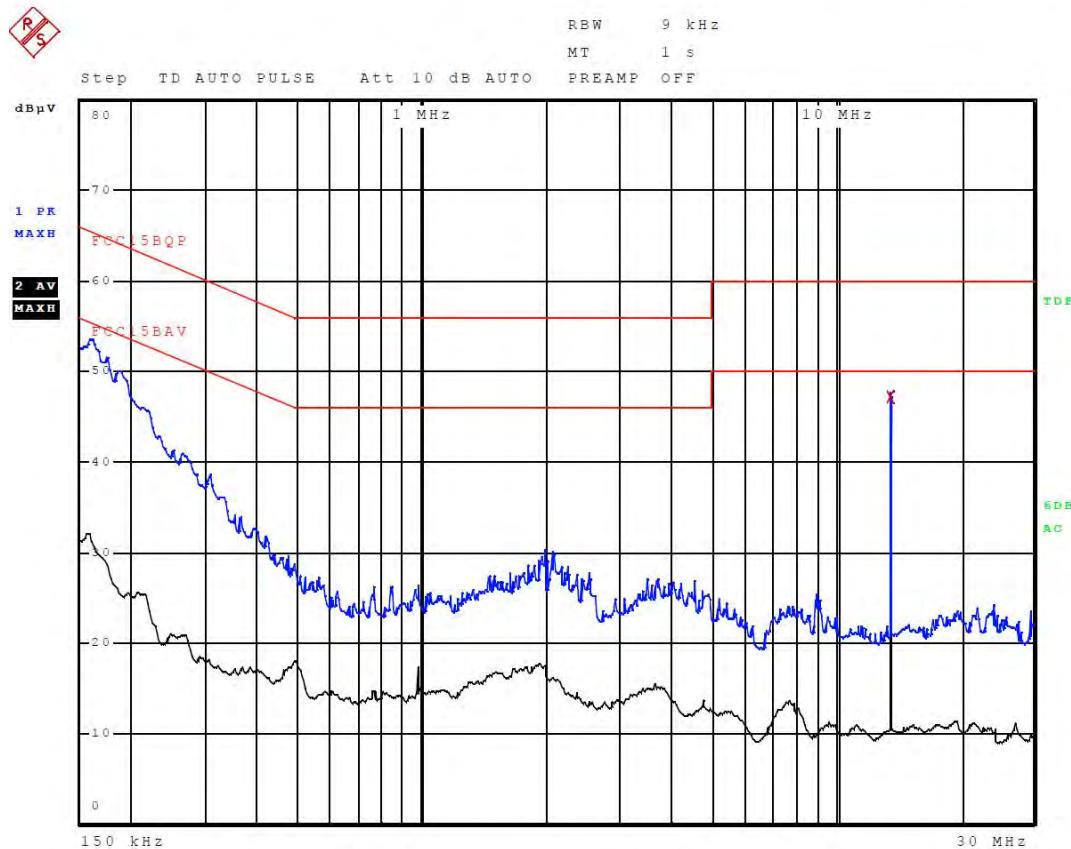
14.Jan 15 09:30

**Meas Type** CONDUCTED EMISSION  
**Equipment under Test** Contactless Reader, CM1/TP  
**Manufacturer** CETRTA POT, d.o.o.  
**OP Condition** READING A TAG  
**Operator** Andrej Skof  
**Test Spec**  
 PHASE (120 V, 60 Hz)

### Time Domain Scan (1 Range)

Scan Start: 150 kHz  
 Scan Stop: 30 MHz  
 Detector: Trace 1: MAX PEAK Trace 2: Average  
 Transducer: ESH2-Z5

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
150.000000 kHz	30.000000 MHz	2.25 kHz	9.00 kHz	30 ms	Auto	0 dB	INPUT2



**Meas Type** CONDUCTED EMISSION  
**Equipment under Test** Contactless Reader, CM1/TP  
**Manufacturer** CETRTA POT, d.o.o.  
**OP Condition** READING A TAG  
**Operator** Andrej Skof  
**Test Spec**  
PHASE (120 V, 60 Hz)

**Final Measurement**

Meas Time: 1 s  
Margin: 12 dB  
Subranges: 1

Trace	Frequency	Level (dB $\mu$ V)	Detector	Delta Limit/dB
2	13.560000000 MHz	47.21	Average	-2.79



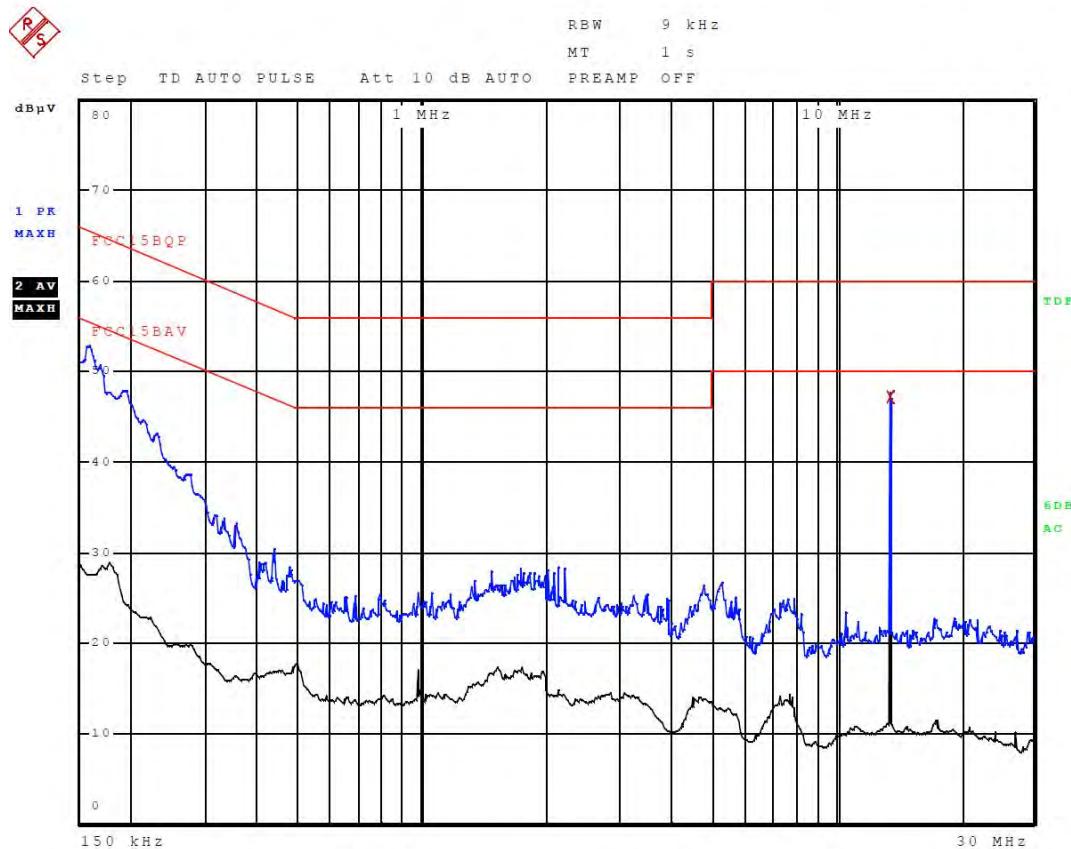
14.Jan 15 09:31

**Meas Type** CONDUCTED EMISSION  
**Equipment under Test** Contactless Reader, CM1/TP  
**Manufacturer** CETRTA POT, d.o.o.  
**OP Condition** READING A TAG  
**Operator** Andrej Skof  
**Test Spec**  
 NEUTRAL (120 V, 60 Hz)

### Time Domain Scan (1 Range)

Scan Start: 150 kHz  
 Scan Stop: 30 MHz  
 Detector: Trace 1: MAX PEAK Trace 2: Average  
 Transducer: ESH2-Z5

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
150.000000 kHz	30.000000 MHz	2.25 kHz	9.00 kHz	30 ms	Auto	0 dB	INPUT2



**Meas Type** CONDUCTED EMISSION  
**Equipment under Test** Contactless Reader, CM1/TP  
**Manufacturer** CETRTA POT, d.o.o.  
**OP Condition** READING A TAG  
**Operator** Andrej Skof  
**Test Spec**  
NEUTRAL (120 V, 60 Hz)

**Final Measurement**

Meas Time: 1 s  
Margin: 12 dB  
Subranges: 1

Trace	Frequency	Level (dB $\mu$ V)	Detector	Delta Limit/dB
2	13.560000000 MHz	47.12	Average	-2.88

## 6.2 Radiated emission measurement (intentional radiator)

### Section 15.209 Radiated emission limits; general requirements

#### 6.2.1 Test instruments

Description & Manufacturer	Model No.	SIQ No.	Last calibration	Calibrated until	Calibration period	Used
ETS, Anechoic chamber	3m	103949	2014-11	2016-11	24 months	X
Rohde-Schwarz, RFI receiver	ESU8	105187	2013-10	2015-10	24 months	
Rohde-Schwarz, RFI receiver	ESU26	100428	2013-05	2015-05	24 months	X
R&S, Antenna	HFH2-Z2	/	2013-09	2015-09	24 months	X
EMCO, Antenna	model 3142	104351	2013-09	2015-09	24 months	X
EMCO, Antenna	model 3115	103002	2013-09	2015-09	24 months	X
Heinrich Deisel, Turn table	DS 420.00	103337	NA	NA	NA	X
Antenna tower	/	/	NA	NA	NA	X
Controller for turn table and antenna tower	/	/	NA	NA	NA	X

#### 6.2.2 Test procedure

1. The EUT was placed on the top of a rotating table 0.8 meters above the ground in an Anechoic Chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 m away from the interference-receiving antenna, which was mounted on the top of variable-height antenna tower.
3. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the turn table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to PEAK and QUAS-PEAK Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. The highest points would be re-tested one by one using the quasi-peak method.

### 6.2.3 Test result

**C20150097**

17.Feb 15 09:37

**Meas Type** RADIATED EMISSION  
**Equipment under Test** Contactless reader CM1/TP  
**Manufacturer** CETRTA POT, d.o.o.  
**OP Condition** WAITING A TAG  
**Operator** Andrej Skof

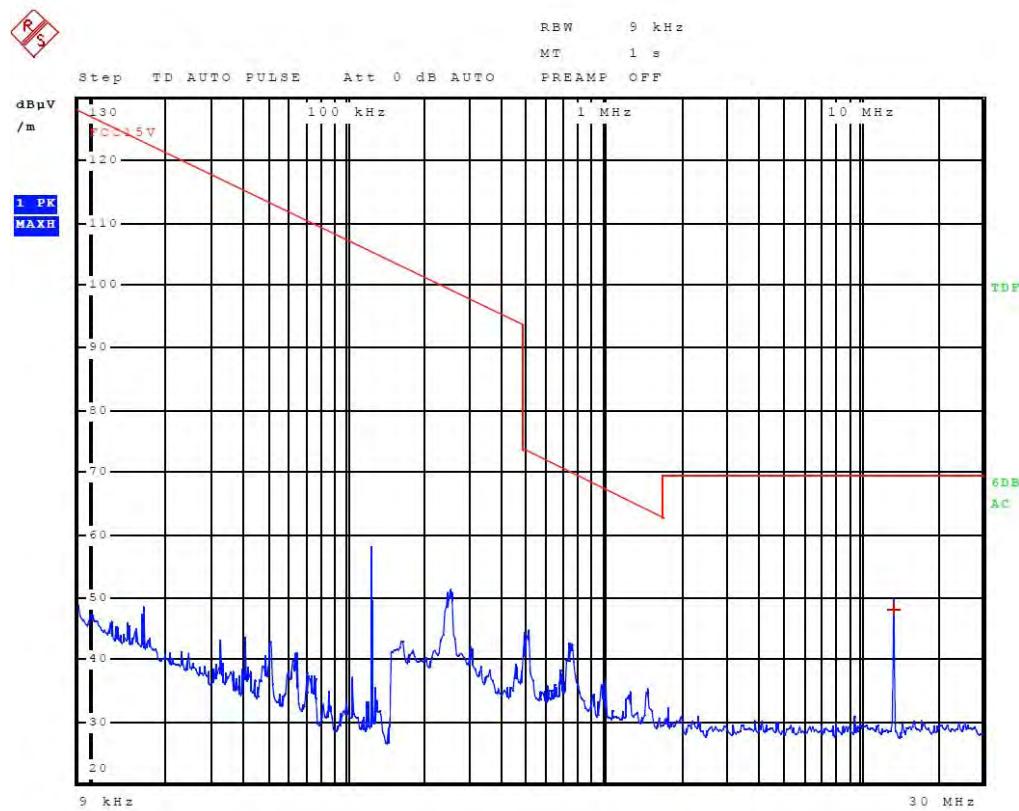
**Test Spec**

Antenna: 0 deg, Sample: 0 deg

**Time Domain Scan (2 Ranges)**

Scan Start: 9 kHz  
Scan Stop: 30 MHz  
Detector: Trace 1: MAX PEAK  
Transducer: HFH2-Z2V

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
9.000000 kHz	149.950000 kHz	50.00 Hz	200.00 Hz	500 ms	Auto	20 dB	INPUT2
150.000000 kHz	30.000000 MHz	2.25 kHz	9.00 kHz	30 ms	Auto	0 dB	INPUT2



C20150097

17.Feb 15 09:37

**Meas Type** RADIATED EMISSION  
**Equipment under Test** Contactless reader CM1/TP  
**Manufacturer** CETRTA POT, d.o.o.  
**OP Condition** WAITING A TAG  
**Operator** Andrej Skof  
**Test Spec**  
Antenna: 0 deg, Sample: 0 deg

**Final Measurement**

Meas Time: 1 s  
Margin: 25 dB  
Subranges: 1

Trace	Frequency	Level (dB $\mu$ V/m)	Detector	Delta Limit/dB
1	13.560000000 MHz	47.86	Quasi Peak	-21.64

**C20150097**

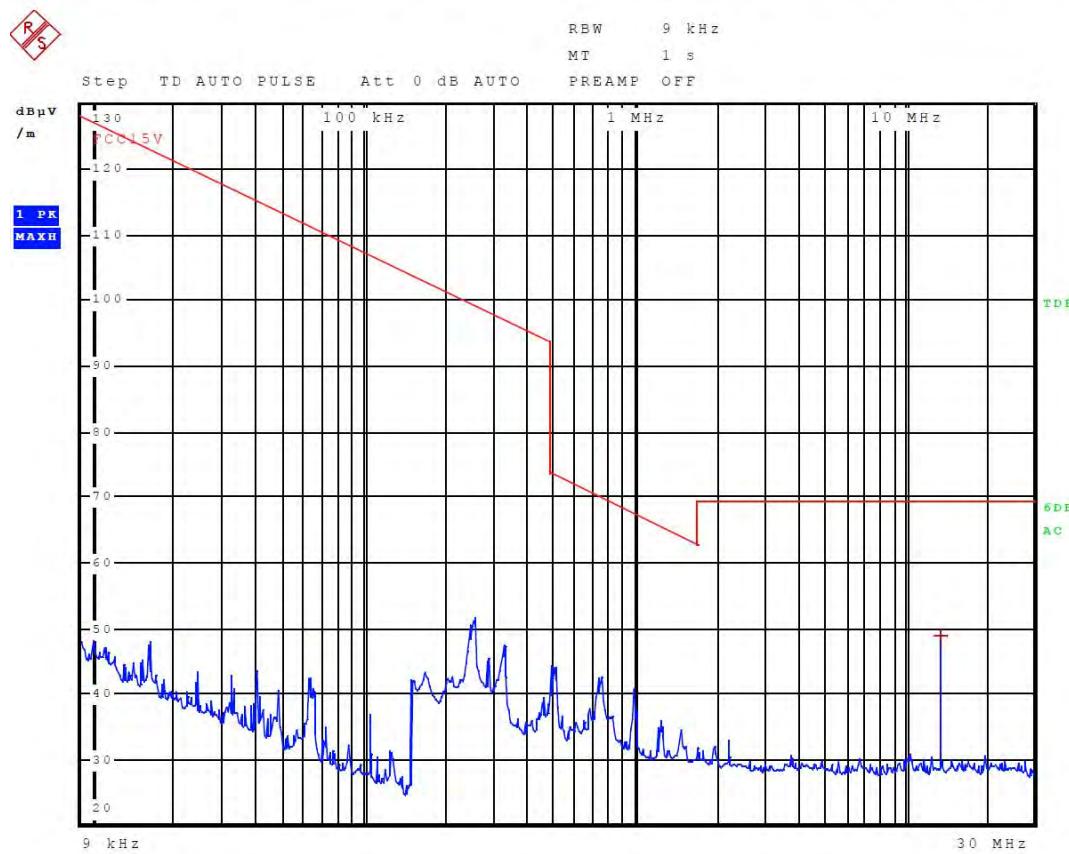
17.Feb 15 09:36

**Meas Type** RADIATED EMISSION  
**Equipment under Test** Contactless reader CM1/TP  
**Manufacturer** CETRTA POT, d.o.o.  
**OP Condition** READING A TAG  
**Operator** Andrej Skof  
**Test Spec**  
Antenna: 0 deg, Sample: 0 deg

**Time Domain Scan (2 Ranges)**

Scan Start: 9 kHz  
Scan Stop: 30 MHz  
Detector: Trace 1: MAX PEAK  
Transducer: HFH2-Z2V

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
9.000000 kHz	149.950000 kHz	50.00 Hz	200.00 Hz	500 ms	Auto	20 dB	INPUT2
150.000000 kHz	30.000000 MHz	2.25 kHz	9.00 kHz	30 ms	Auto	0 dB	INPUT2



C20150097

17.Feb 15 09:36

**Meas Type** RADIATED EMISSION  
**Equipment under Test** Contactless reader CM1/TP  
**Manufacturer** CETRTA POT, d.o.o.  
**OP Condition** READING A TAG  
**Operator** Andrej Skof  
**Test Spec**  
Antenna: 0 deg, Sample: 0 deg

**Final Measurement**

Meas Time: 1 s  
Margin: 25 dB  
Subranges: 1

Trace	Frequency	Level (dB $\mu$ V/m)	Detector	Delta Limit/dB
1	13.560000000 MHz	48.68	Quasi Peak	-20.82

**C20150097**

17.Feb 15 09:43

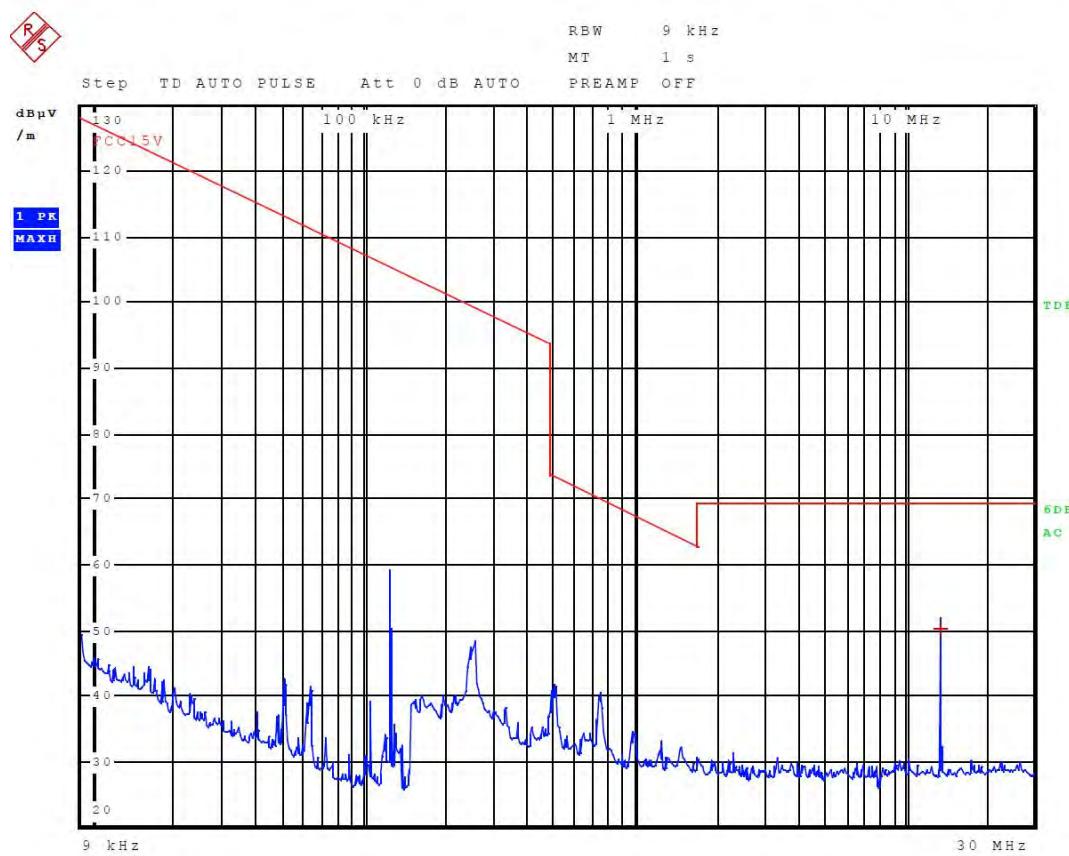
**Meas Type** RADIATED EMISSION  
**Equipment under Test** Contactless reader CM1/TP  
**Manufacturer** CETRTA POT, d.o.o.  
**OP Condition** WAITING A TAG  
**Operator** Andrej Skof  
**Test Spec**

Antenna: 5 deg, Sample: 210 deg

**Time Domain Scan (2 Ranges)**

Scan Start: 9 kHz  
Scan Stop: 30 MHz  
Detector: Trace 1: MAX PEAK  
Transducer: HFH2-Z2V

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
9.000000 kHz	149.950000 kHz	50.00 Hz	200.00 Hz	500 ms	Auto	20 dB	INPUT2
150.000000 kHz	30.000000 MHz	2.25 kHz	9.00 kHz	30 ms	Auto	0 dB	INPUT2



C20150097

17.Feb 15 09:43

**Meas Type** RADIATED EMISSION  
**Equipment under Test** Contactless reader CM1/TP  
**Manufacturer** CETRTA POT, d.o.o.  
**OP Condition** WAITING A TAG  
**Operator** Andrej Skof  
**Test Spec**  
Antenna: 5 deg, Sample: 210 deg

**Final Measurement**

Meas Time: 1 s  
Margin: 25 dB  
Subranges: 1

Trace	Frequency	Level (dB $\mu$ V/m)	Detector	Delta Limit/dB
1	13.560000000 MHz	50.14	Quasi Peak	-19.36

**C20150097**

17.Feb 15 09:45

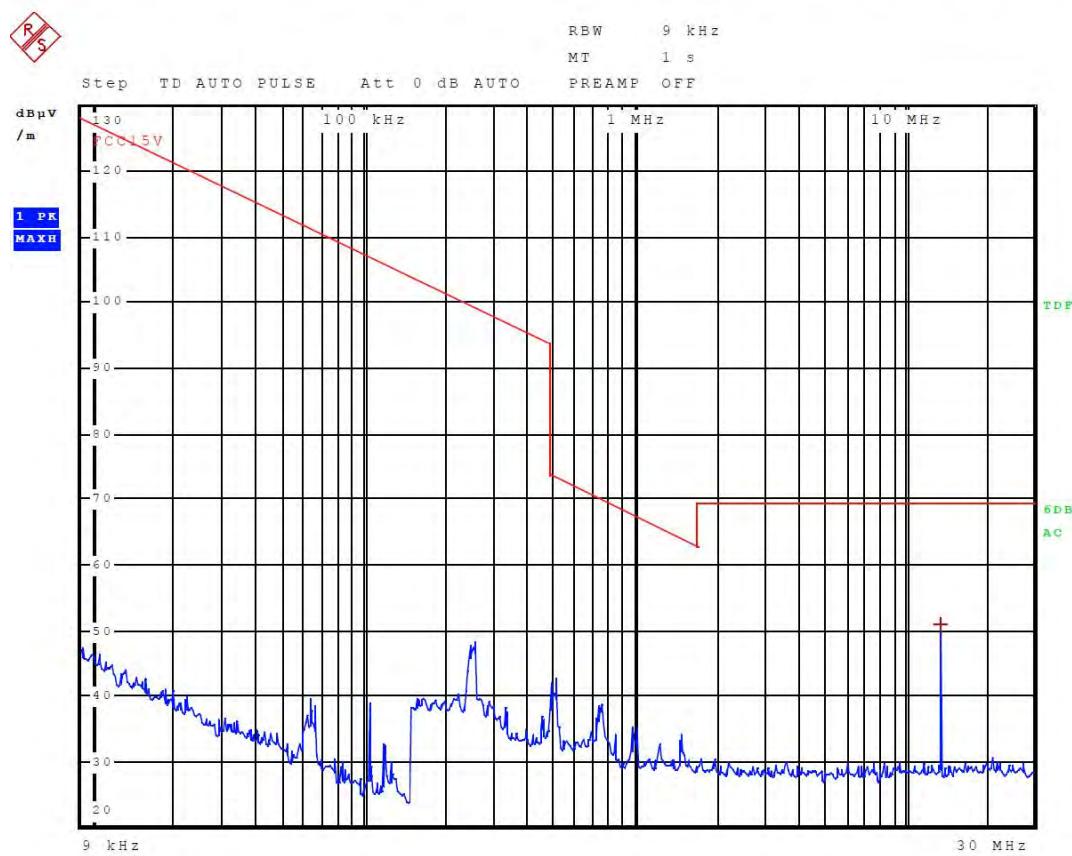
**Meas Type** RADIATED EMISSION  
**Equipment under Test** Contactless reader CM1/TP  
**Manufacturer** CETRTA POT, d.o.o.  
**OP Condition** READING A TAG  
**Operator** Andrej Skof  
**Test Spec**

Antenna: 5 deg, Sample: 210 deg

**Time Domain Scan (2 Ranges)**

Scan Start: 9 kHz  
Scan Stop: 30 MHz  
Detector: Trace 1: MAX PEAK  
Transducer: HFH2-Z2V

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
9.000000 kHz	149.950000 kHz	50.00 Hz	200.00 Hz	500 ms	Auto	20 dB	INPUT2
150.000000 kHz	30.000000 MHz	2.25 kHz	9.00 kHz	30 ms	Auto	0 dB	INPUT2



C20150097

17.Feb 15 09:45

**Meas Type** RADIATED EMISSION  
**Equipment under Test** Contactless reader CM1/TP  
**Manufacturer** CETRTA POT, d.o.o.  
**OP Condition** READING A TAG  
**Operator** Andrej Skof  
**Test Spec**  
Antenna: 5 deg, Sample: 210 deg

**Final Measurement**

Meas Time: 1 s  
Margin: 25 dB  
Subranges: 1

Trace	Frequency	Level (dB $\mu$ V/m)	Detector	Delta Limit/dB
1	13.560000000 MHz	50.83	Quasi Peak	-18.67

**C20150097**

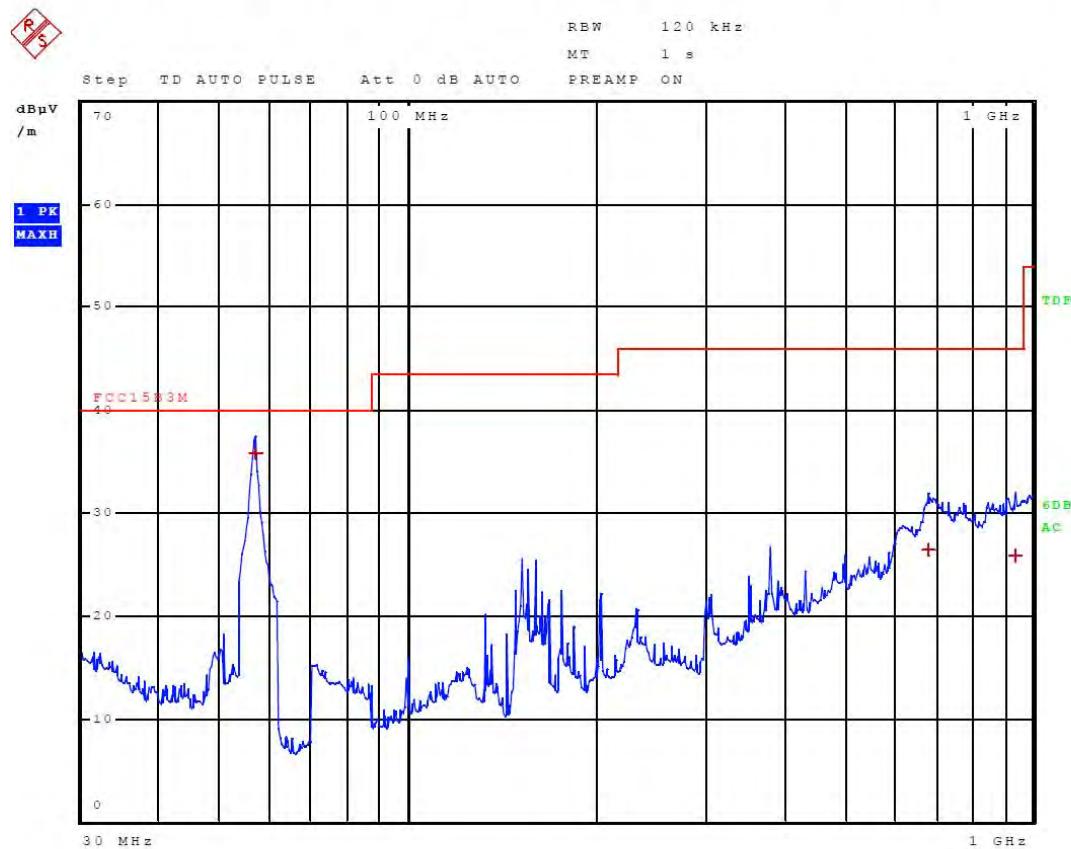
06.Feb 15 10:30

**Meas Type** RADIATED EMISSION  
**Equipment under Test** Contactless Reader CM1/TP  
**Manufacturer** CETRTA POT, d.o.o.  
**OP Condition** WAITING FOR CARD  
**Operator** Andrej Skof  
**Test Spec**  
VERTICAL 100 cm, 0 deg

**Time Domain Scan (1 Range)**

Scan Start: 30 MHz  
Scan Stop: 1 GHz  
Detector: Trace 1: MAX PEAK  
Transducer: 3142B3m

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
30.000000 MHz	1.000000 GHz	30.00 kHz	120.00 kHz	3 ms	Auto	20 dB	INPUT2





C20150097

06.Feb 15 10:30

**Meas Type** RADIATED EMISSION  
**Equipment under Test** Contactless Reader CM1/TP  
**Manufacturer** CETRTA POT, d.o.o.  
**OP Condition** WAITING FOR CARD  
**Operator** Andrej Skof  
**Test Spec**  
 VERTICAL 100 cm, 0 deg

**Final Measurement**

Meas Time: 1 s  
 Margin: 15 dB  
 Subranges: 3

Trace	Frequency	Level (dB $\mu$ V/m)	Detector	Delta Limit/dB
1	56.760000000 MHz	35.83	Quasi Peak	-4.17
1	681.360000000 MHz	26.41	Quasi Peak	-19.59
1	937.740000000 MHz	25.86	Quasi Peak	-20.14

**C20150097**

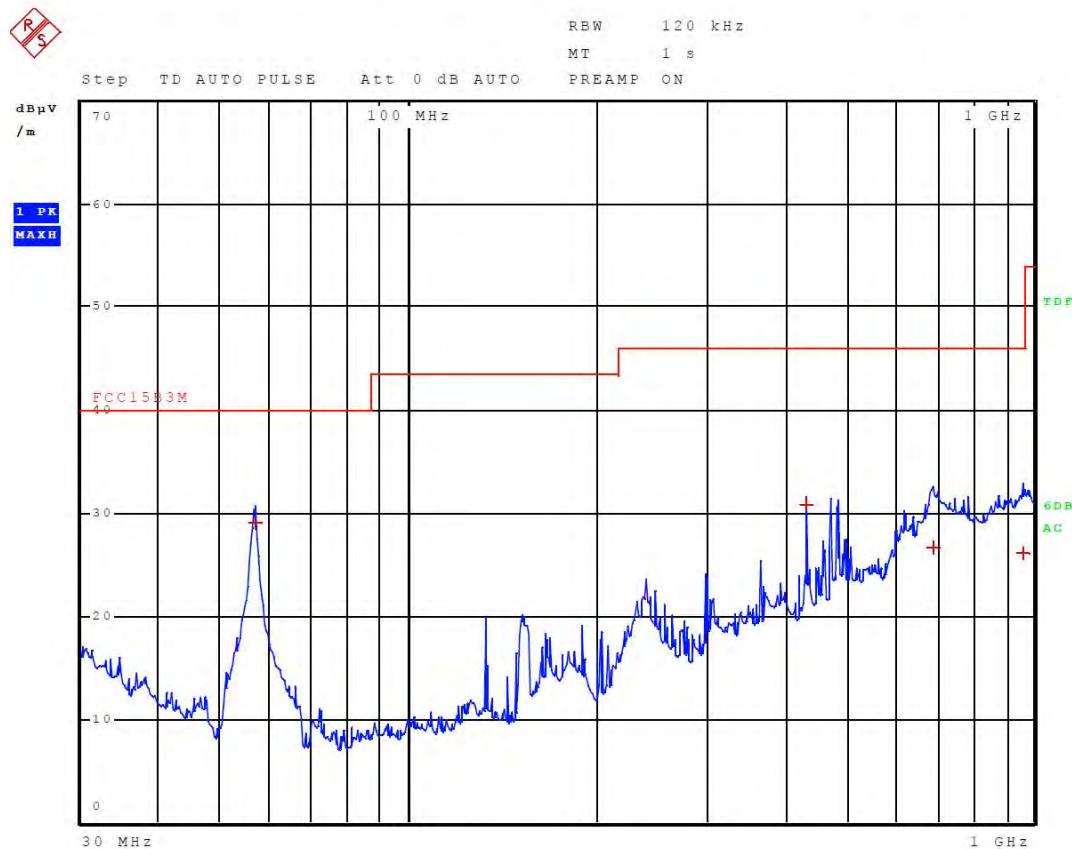
06.Feb 15 10:32

**Meas Type** RADIATED EMISSION  
**Equipment under Test** Contactless Reader CM1/TP  
**Manufacturer** CETRTA POT, d.o.o.  
**OP Condition** WAITING FOR CARD  
**Operator** Andrej Skof  
**Test Spec**  
HORIZONTAL 100 cm, 0 deg

**Time Domain Scan (1 Range)**

Scan Start: 30 MHz  
Scan Stop: 1 GHz  
Detector: Trace 1: MAX PEAK  
Transducer: 3142B3m

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
30.000000 MHz	1.000000 GHz	30.00 kHz	120.00 kHz	3 ms	Auto	20 dB	INPUT2





C20150097

06.Feb 15 10:32

**Meas Type** RADIATED EMISSION  
**Equipment under Test** Contactless Reader CM1/TP  
**Manufacturer** CETRTA POT, d.o.o.  
**OP Condition** WAITING FOR CARD  
**Operator** Andrej Skof  
**Test Spec**  
 HORIZONTAL 100 cm, 0 deg

**Final Measurement**

Meas Time: 1 s  
 Margin: 15 dB  
 Subranges: 4

Trace	Frequency	Level (dB $\mu$ V/m)	Detector	Delta Limit/dB
1	56.760000000 MHz	29.02	Quasi Peak	-10.98
1	433.920000000 MHz	30.81	Quasi Peak	-15.19
1	690.480000000 MHz	26.65	Quasi Peak	-19.35
1	958.740000000 MHz	26.04	Quasi Peak	-19.96

**C20150097**

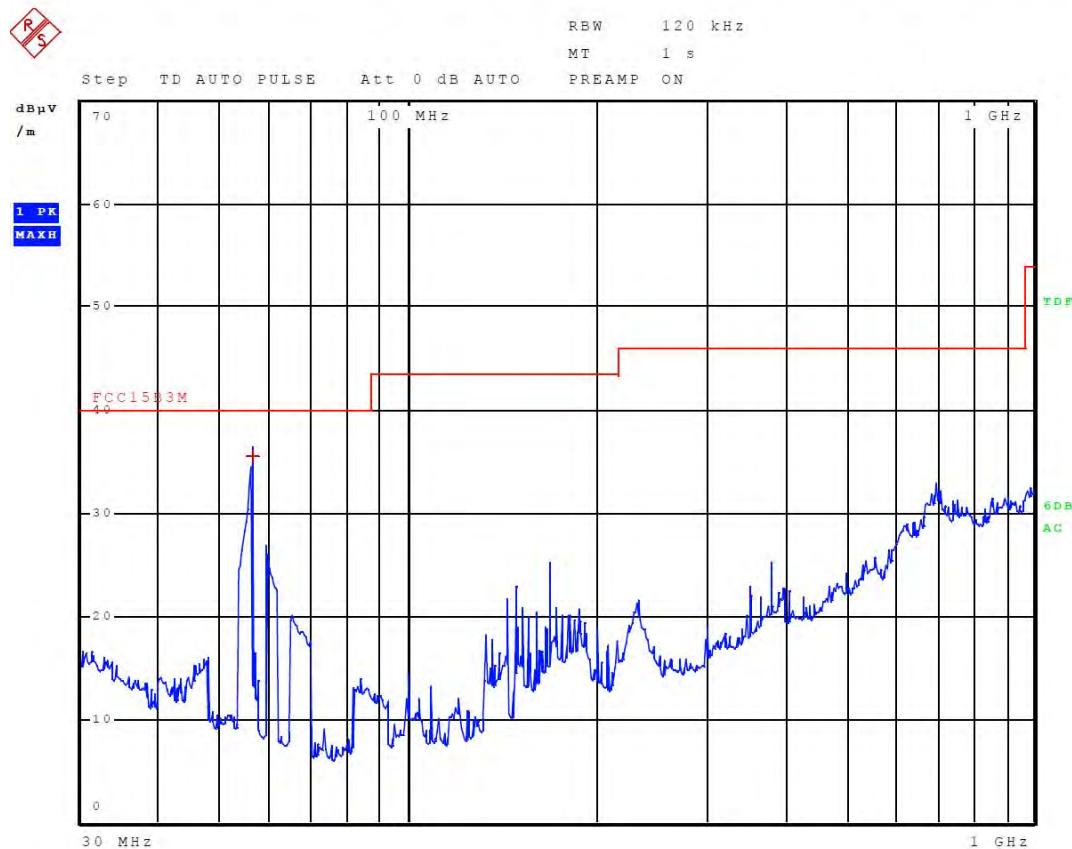
06.Feb 15 10:38

**Meas Type** RADIATED EMISSION  
**Equipment under Test** Contactless Reader CM1/TP  
**Manufacturer** CETRTA POT, d.o.o.  
**OP Condition** WAITING FOR CARD  
**Operator** Andrej Skof  
**Test Spec**  
VERTICAL 100 cm, 120 deg

**Time Domain Scan (1 Range)**

Scan Start: 30 MHz  
Scan Stop: 1 GHz  
Detector: Trace 1: MAX PEAK  
Transducer: 3142B3m

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
30.000000 MHz	1.000000 GHz	30.00 kHz	120.00 kHz	3 ms	Auto	20 dB	INPUT2



C20150097

06.Feb 15 10:38

**Meas Type** RADIATED EMISSION  
**Equipment under Test** Contactless Reader CM1/TP  
**Manufacturer** CETRTA POT, d.o.o.  
**OP Condition** WAITING FOR CARD  
**Operator** Andrej Skof  
**Test Spec**  
VERTICAL 100 cm, 120 deg

**Final Measurement**

Meas Time: 1 s  
Margin: 15 dB  
Subranges: 1

Trace	Frequency	Level (dB $\mu$ V/m)	Detector	Delta Limit/dB
1	56.250000000 MHz	35.51	Quasi Peak	-4.49

C20150097

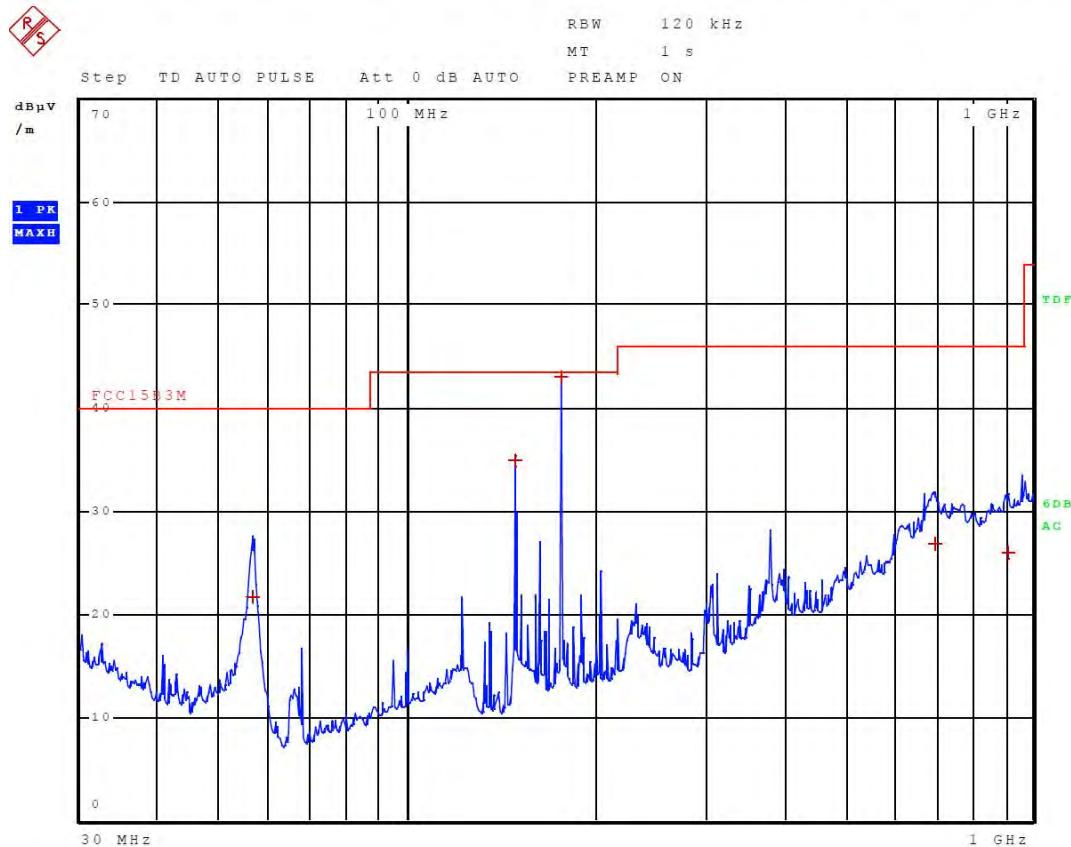
06.Feb 15 08:51

Meas Type RADIATED EMISSION  
Equipment under Test Contactless Reader CM1/TP  
Manufacturer CETRTA POT, d.o.o.  
OP Condition READING TAG  
Operator Andrej Skof  
Test Spec  
VERTICAL 100 cm, 0 deg

**Time Domain Scan (1 Range)**

Scan Start: 30 MHz  
Scan Stop: 1 GHz  
Detector: Trace 1: MAX PEAK  
Transducer: 3142B3m

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
30.000000 MHz	1.000000 GHz	30.00 kHz	120.00 kHz	3 ms	Auto	20 dB	INPUT2





C20150097

06.Feb 15 08:51

**Meas Type** RADIATED EMISSION  
**Equipment under Test** Contactless Reader CM1/TP  
**Manufacturer** CETRTA POT, d.o.o.  
**OP Condition** READING TAG  
**Operator** Andrej Skof  
**Test Spec**  
 VERTICAL 100 cm, 0 deg

**Final Measurement**

Meas Time: 1 s  
 Margin: 15 dB  
 Subranges: 5

Trace	Frequency	Level (dB $\mu$ V/m)	Detector	Delta Limit/dB
1	176.280000000 MHz	43.04	Quasi Peak	-0.46
1	149.160000000 MHz	34.88	Quasi Peak	-8.62
1	56.670000000 MHz	21.65	Quasi Peak	-18.35
1	695.970000000 MHz	26.80	Quasi Peak	-19.20
1	911.610000000 MHz	25.94	Quasi Peak	-20.06

**C20150097**

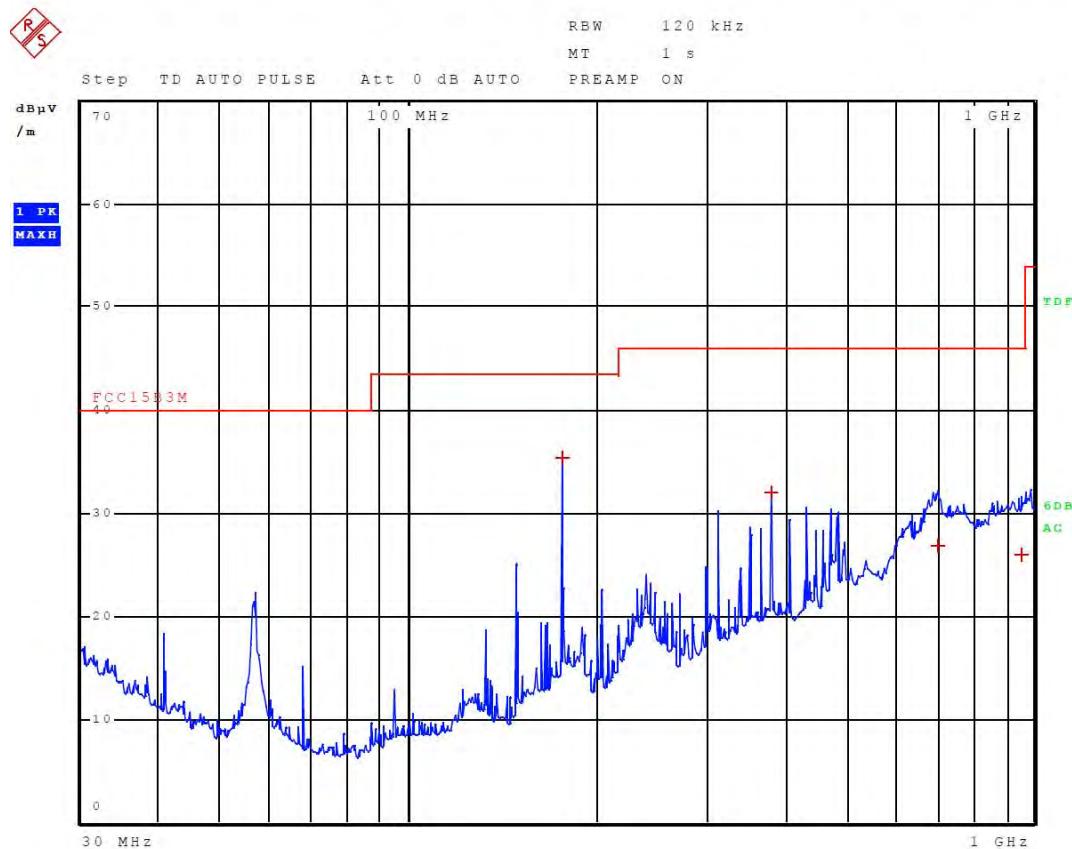
06.Feb 15 08:59

**Meas Type** RADIATED EMISSION  
**Equipment under Test** Contactless Reader CM1/TP  
**Manufacturer** CETRTA POT, d.o.o.  
**OP Condition** READING TAG  
**Operator** Andrej Skof  
**Test Spec**  
HORIZONTAL 100 cm, 0 deg

**Time Domain Scan (1 Range)**

Scan Start: 30 MHz  
Scan Stop: 1 GHz  
Detector: Trace 1: MAX PEAK  
Transducer: 3142B3m

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
30.000000 MHz	1.000000 GHz	30.00 kHz	120.00 kHz	3 ms	Auto	20 dB	INPUT2





C20150097

06.Feb 15 08:59

**Meas Type** RADIATED EMISSION  
**Equipment under Test** Contactless Reader CM1/TP  
**Manufacturer** CETRTA POT, d.o.o.  
**OP Condition** READING TAG  
**Operator** Andrej Skof  
**Test Spec**  
 HORIZONTAL 100 cm, 0 deg

**Final Measurement**

Meas Time: 1 s  
 Margin: 15 dB  
 Subranges: 4

Trace	Frequency	Level (dB $\mu$ V/m)	Detector	Delta Limit/dB
1	176.280000000 MHz	35.38	Quasi Peak	-8.12
1	379.680000000 MHz	31.97	Quasi Peak	-14.03
1	700.170000000 MHz	26.76	Quasi Peak	-19.24
1	955.020000000 MHz	26.00	Quasi Peak	-20.00

C20150097

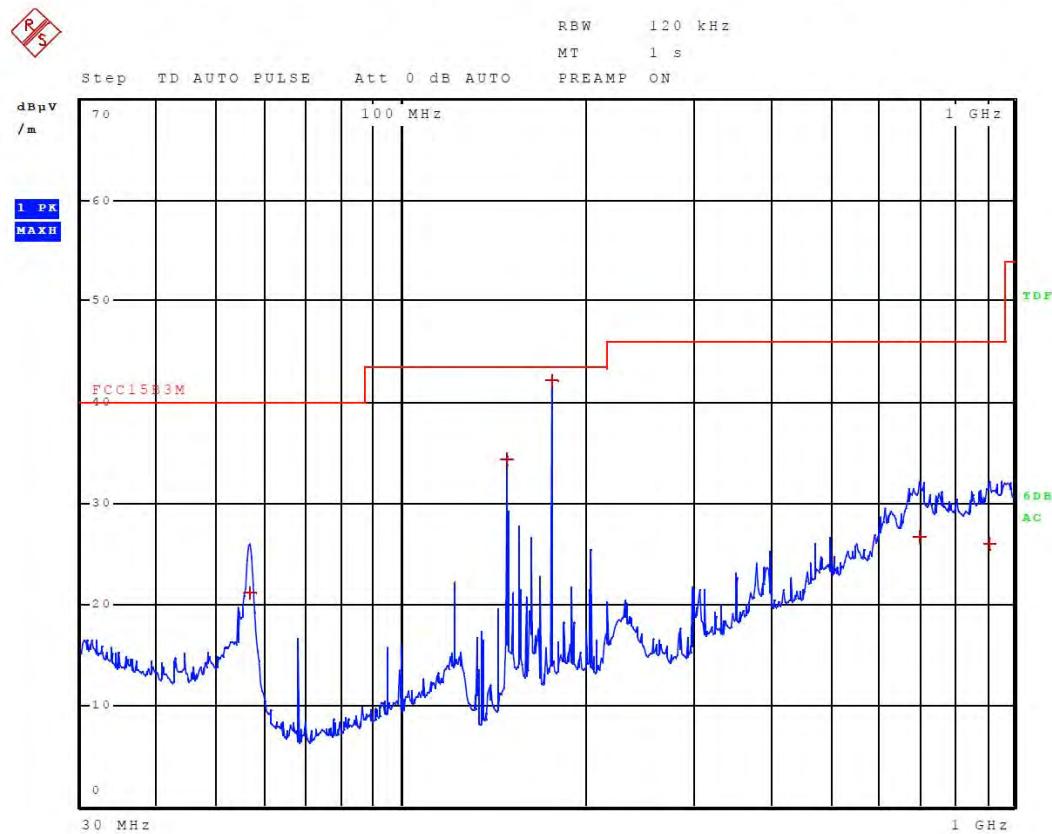
06.Feb 15 11:02

<b>Meas Type</b>	RADIATED EMISSION
<b>Equipment under Test</b>	Contactless Reader CM1/TP
<b>Manufacturer</b>	CETRTA POT, d.o.o.
<b>OP Condition</b>	READING TAG
<b>Operator</b>	Andrej Skof
<b>Test Spec</b>	VERTICAL 100 cm, 35 deg

### Time Domain Scan (1 Range)

Scan Start: 30 MHz  
Scan Stop: 1 GHz  
Detector: Trace 1: MAX PEAK  
Transducer: 3142B3m

Start Frequency	Stop Frequency	Step Size	Meas Time	RF Atten	Preamp	Input
30.000000 MHz	1.000000 GHz	30.00 kHz	120.00 kHz	3 ms	Auto	20 dB INPUT2



C20150097

06.Feb 15 11:02

**Meas Type** RADIATED EMISSION  
**Equipment under Test** Contactless Reader CM1/TP  
**Manufacturer** CETRTA POT, d.o.o.  
**OP Condition** READING TAG  
**Operator** Andrej Skof  
**Test Spec**  
 VERTICAL 100 cm, 35 deg

### Final Measurement

Meas Time: 1 s  
 Margin: 15 dB  
 Subranges: 5

Trace	Frequency	Level (dB $\mu$ V/m)	Detector	Delta Limit/dB
1	176.280000000 MHz	42.12	Quasi Peak	-1.38
1	149.160000000 MHz	34.32	Quasi Peak	-9.18
1	56.730000000 MHz	21.17	Quasi Peak	-18.83
1	702.060000000 MHz	26.71	Quasi Peak	-19.29
1	916.350000000 MHz	25.94	Quasi Peak	-20.06

**C20150097**

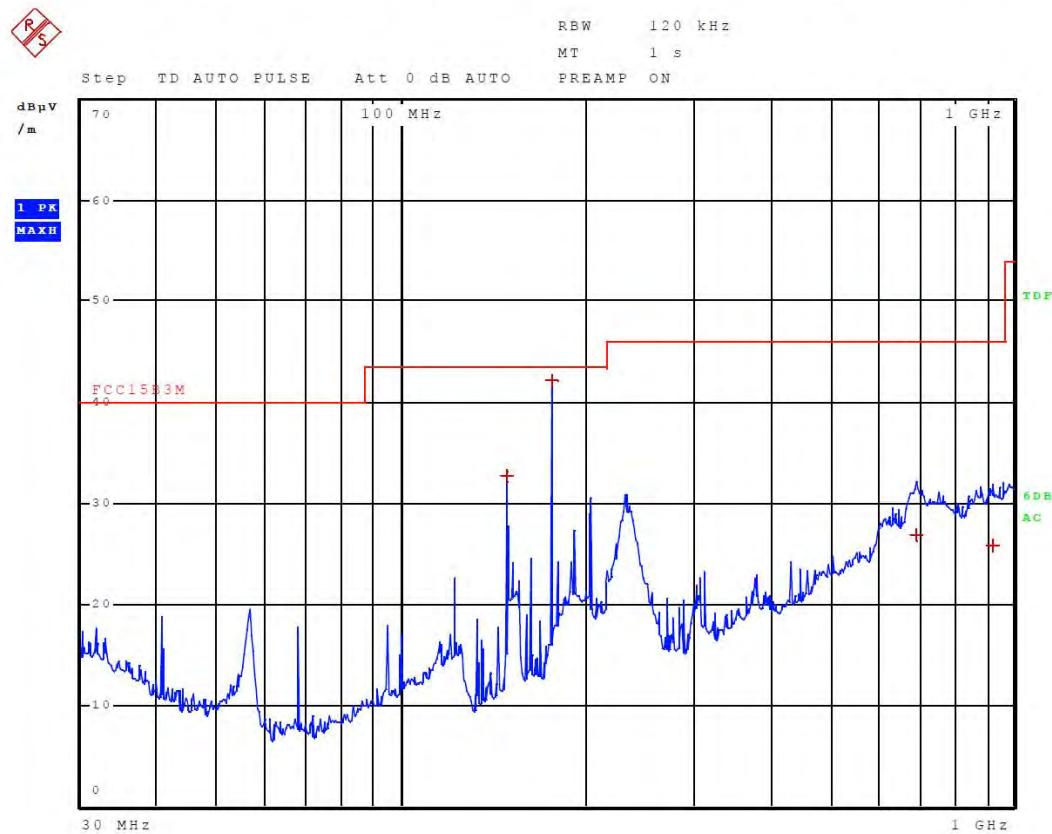
06.Feb 15 10:55

**Meas Type** RADIATED EMISSION  
**Equipment under Test** Contactless Reader CM1/TP  
**Manufacturer** CETRTA POT, d.o.o.  
**OP Condition** READING TAG  
**Operator** Andrej Skof  
**Test Spec**  
HORIZONTAL 166 cm, 50 deg

**Time Domain Scan (1 Range)**

Scan Start: 30 MHz  
Scan Stop: 1 GHz  
Detector: Trace 1: MAX PEAK  
Transducer: 3142B3m

Start Frequency	Stop Frequency	Step Size	Meas BW	Meas Time	RF Atten	Preamp	Input
30.000000 MHz	1.000000 GHz	30.00 kHz	120.00 kHz	3 ms	Auto	20 dB	INPUT2





C20150097

06.Feb 15 10:55

**Meas Type** RADIATED EMISSION  
**Equipment under Test** Contactless Reader CM1/TP  
**Manufacturer** CETRTA POT, d.o.o.  
**OP Condition** READING TAG  
**Operator** Andrej Skof  
**Test Spec**  
 HORIZONTAL 166 cm, 50 deg

**Final Measurement**

Meas Time: 1 s  
 Margin: 15 dB  
 Subranges: 4

Trace	Frequency	Level (dB $\mu$ V/m)	Detector	Delta Limit/dB
1	176.280000000 MHz	42.11	Quasi Peak	-1.39
1	149.160000000 MHz	32.73	Quasi Peak	-10.77
1	694.260000000 MHz	26.85	Quasi Peak	-19.15
1	926.370000000 MHz	25.75	Quasi Peak	-20.25

**C20150097**

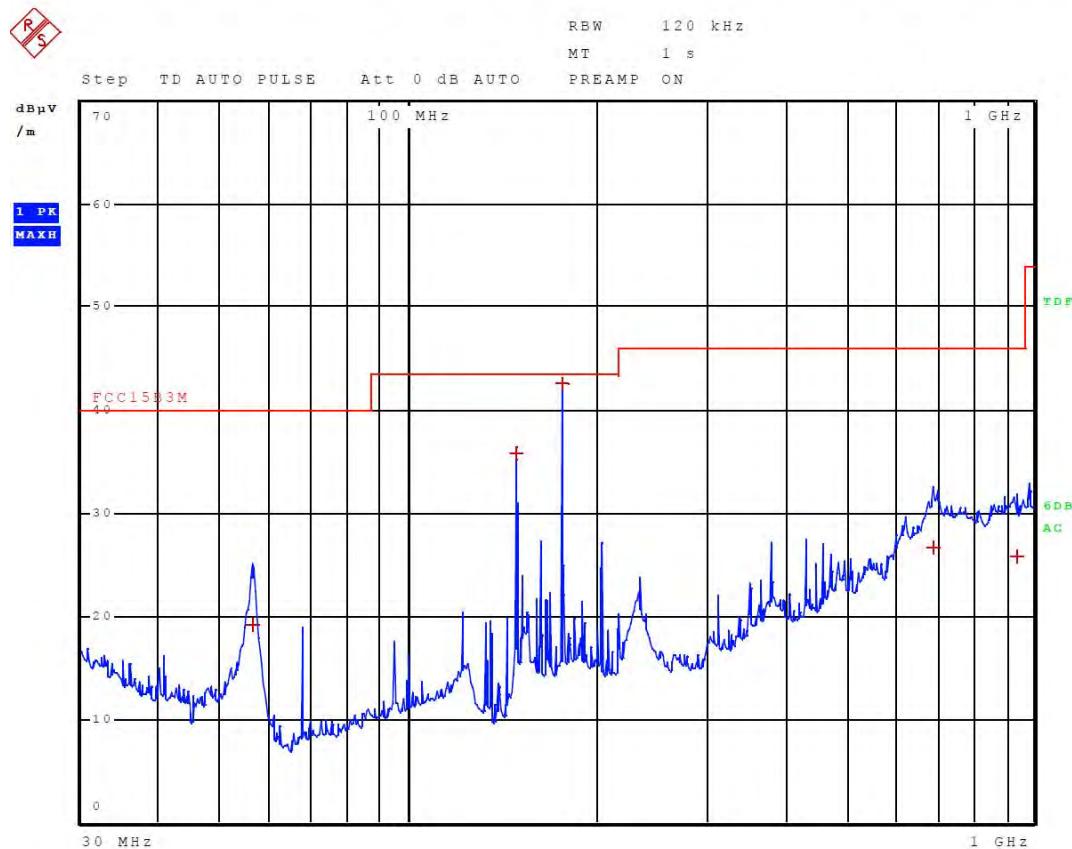
06.Feb 15 09:44

**Meas Type** RADIATED EMISSION  
**Equipment under Test** Contactless Reader CM1/TP  
**Manufacturer** CETRTA POT, d.o.o.  
**OP Condition** READING TAG  
**Operator** Andrej Skof  
**Test Spec**  
VERTICAL 100 cm, 290 deg

**Time Domain Scan (1 Range)**

Scan Start: 30 MHz  
Scan Stop: 1 GHz  
Detector: Trace 1: MAX PEAK  
Transducer: 3142B3m

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
30.000000 MHz	1.000000 GHz	30.00 kHz	120.00 kHz	3 ms	Auto	20 dB	INPUT2





C20150097

06.Feb 15 09:44

**Meas Type** RADIATED EMISSION  
**Equipment under Test** Contactless Reader CM1/TP  
**Manufacturer** CETRTA POT, d.o.o.  
**OP Condition** READING TAG  
**Operator** Andrej Skof  
**Test Spec**  
 VERTICAL 100 cm, 290 deg

**Final Measurement**

Meas Time: 1 s  
 Margin: 15 dB  
 Subranges: 5

Trace	Frequency	Level (dB $\mu$ V/m)	Detector	Delta Limit/dB
1	176.280000000 MHz	42.55	Quasi Peak	-0.95
1	149.160000000 MHz	35.87	Quasi Peak	-7.63
1	690.300000000 MHz	26.74	Quasi Peak	-19.26
1	941.160000000 MHz	25.87	Quasi Peak	-20.13
1	56.280000000 MHz	19.14	Quasi Peak	-20.86

C20150097

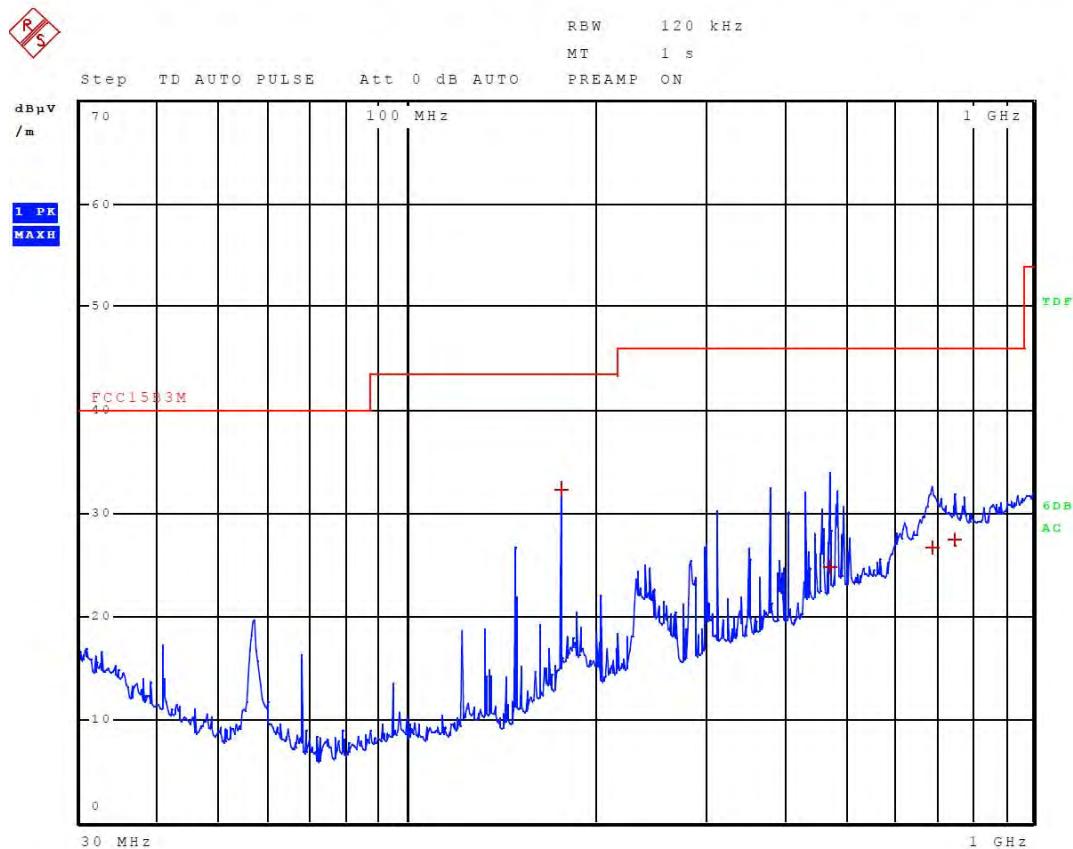
06. Feb 15 09:53

<b>Meas Type</b>	RADIATED EMISSION
<b>Equipment under Test</b>	Contactless Reader CM1/TP
<b>Manufacturer</b>	CETRTA POT, d.o.o.
<b>OP Condition</b>	READING TAG
<b>Operator</b>	Andrej Skof
<b>Test Spec</b>	HORIZONTAL 100 cm, 180 deg

### Time Domain Scan (1 Range)

Scan Start: 30 MHz  
Scan Stop: 1 GHz  
Detector: Trace 1: MAX PEAK  
Transducer: 3142B3m

Start Frequency	Stop Frequency	Step Size	Meas Res BW	RF Time	Atten	Preamp	Input
30.000000 MHz	1.000000 GHz	30.00 kHz	120.00 kHz	3 ms	Auto	20 dB	INPUT2





C20150097

06.Feb 15 09:53

**Meas Type** RADIATED EMISSION  
**Equipment under Test** Contactless Reader CM1/TP  
**Manufacturer** CETRTA POT, d.o.o.  
**OP Condition** READING TAG  
**Operator** Andrej Skof  
**Test Spec**  
 HORIZONTAL 100 cm, 180 deg

**Final Measurement**

Meas Time: 1 s  
 Margin: 15 dB  
 Subranges: 4

Trace	Frequency	Level (dB $\mu$ V/m)	Detector	Delta Limit/dB
1	176.280000000 MHz	32.33	Quasi Peak	-11.17
1	749.490000000 MHz	27.43	Quasi Peak	-18.57
1	690.690000000 MHz	26.65	Quasi Peak	-19.35
1	473.580000000 MHz	24.76	Quasi Peak	-21.24

## Worst case measurements:

C20150097

06.Feb 15 09:50

**Meas Type** RADIATED EMISSION  
**Equipment under Test** Contactless Reader CM1/TP  
**Manufacturer** CETRTA POT, d.o.o.  
**OP Condition** READING TAG  
**Operator** Andrej Skof

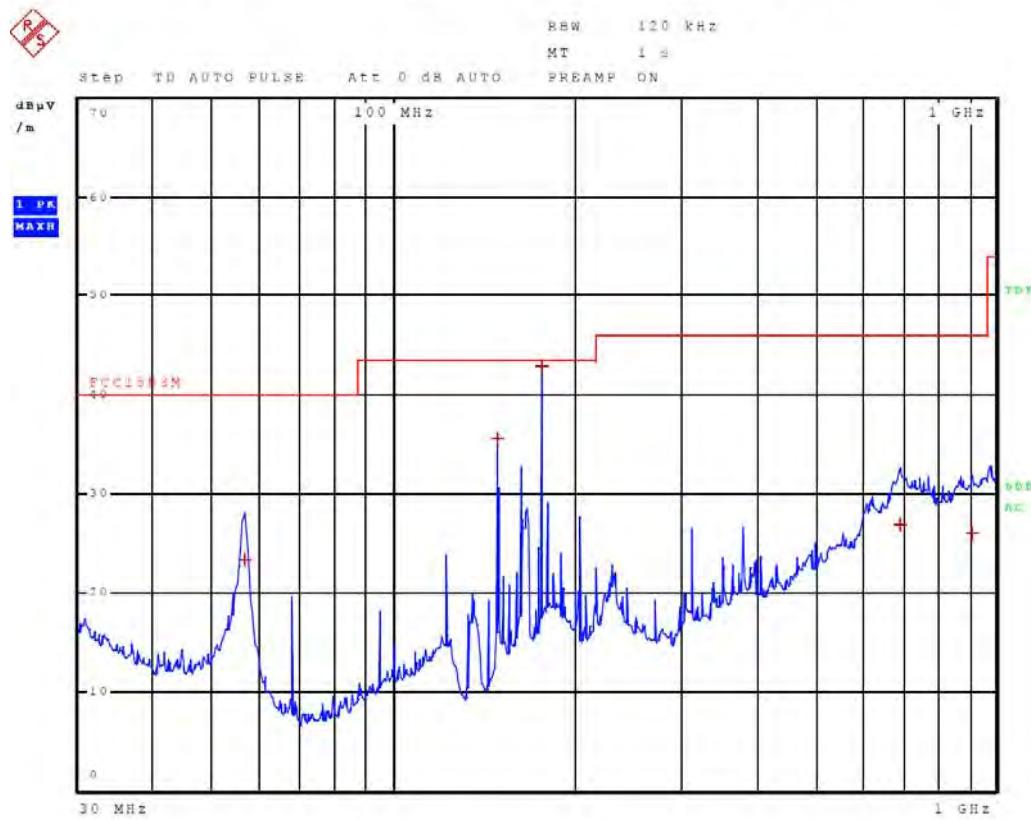
**Test Spec**

VERTICAL 100 cm, 120 deg

**Time Domain Scan (1 Range)**

Scan Start: 30 MHz  
Scan Stop: 1 GHz  
Detector: Trace 1: MAX PEAK  
Transducer: 3142B3m

Start Frequency	Stop Frequency	Step Size	Meas BW	Meas Time	RF Atten	Preamp	Input
30.000000 MHz	1.000000 GHz	30.00 kHz	120.00 kHz	3 ms	Auto	20 dB	INPUT2





C20150097

06.Feb 15 09:50

**Meas Type** RADIATED EMISSION  
**Equipment under Test** Contactless Reader CM1/TP  
**Manufacturer** CETRTA POT, d.o.o.  
**OP Condition** READING TAG  
**Operator** Andrej Skof  
**Test Spec**  
 VERTICAL 100 cm, 120 deg

**Final Measurement**

Meas Time: 1 s  
 Margin: 15 dB  
 Subranges: 5

Trace	Frequency	Level (dB $\mu$ V/m)	Detector	Delta Limit/dB
1	176.280000000 MHz	42.89	Quasi Peak	-0.61
1	149.160000000 MHz	35.57	Quasi Peak	-7.93
1	56.670000000 MHz	23.29	Quasi Peak	-16.71
1	695.430000000 MHz	26.79	Quasi Peak	-19.21
1	915.690000000 MHz	25.89	Quasi Peak	-20.11

**Final measurement at 10 m in OATS**

<b>Results with measuring distance of 10 m</b>				
<b>Mode</b>	<b>Frequency (MHz)</b>	<b>Measured value (dB<math>\mu</math>V/m)</b>	<b>Limit (dB<math>\mu</math>V/m)</b>	<b>Margin (dB)</b>
Reading a tag	13.56	33.22	104.00	- 66,78
Waiting for a tag	13.56	32.92	104.00	- 67,08

<b>Calculated value from 10 m to 30 m</b>						
<b>Mode</b>	<b>Frequency (MHz)</b>	<b>Measured value at 10 m (dB<math>\mu</math>V/m)</b>	<b>Correction factor from 10 m to 30 m (dB)</b>	<b>Calculated value at 30 m (dB<math>\mu</math>V/m)</b>	<b>Limit at 30 m (dB<math>\mu</math>V/m)</b>	<b>Margin (dB)</b>
Reading a tag	13.56	33.22	20	13,22	84,00	- 66,78
Waiting for a tag	13.56	32.92	20	12,92	84,00	- 67,08

**NOTE:** Antenna factor and cable loss are already included in measurement correction.

## 6.3 Bandwidth of the emission (intentional radiator)

### Section 15.215 Additional provisions to the general radiated emission limitations

#### 6.3.1 Test instruments

Description & Manufacturer	Model No.	SIQ No.	Last calibration	Calibrated until	Calibration period	Used
ETS, Anechoic chamber	3m	103949	2014-11	2016-11	24 months	X
Rohde-Schwarz, RFI receiver	ESU26	106897	2014-01	2016-01	24 months	X
EMCO, Antenna	3142	06/068	2013-09	2015-09	24 months	
Rohde & Schwarz, Active loop antenna	HFH2-Z2	/	2013-09	2015-09	24 months	X
Heinrich Deisel, Turn table	DS 420.00	103337	NA	NA	NA	X
ETS, Antenna tower	/	/	NA	NA	NA	X
ETS, Controller for turn table and antenna tower	/	/	NA	NA	NA	X

#### 6.3.2 Test procedure

7. The EUT was placed on the top of a rotating table 0.8 meters above the ground in an Anechoic Chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
8. The EUT was set 3 m away from the interference-receiving antenna.
9. Resolution bandwidth is set to a value greater than 5% of the allowed bandwidth. If no bandwidth specifications are given, the guidelines in Section 1.4 are used

#### 6.3.3 Test results

Device passed the requirements stated in ANSI C63.4, FCC Part 15, Subpart C.

## Bandwidth of the emission at 3 m in an anechoic chamber

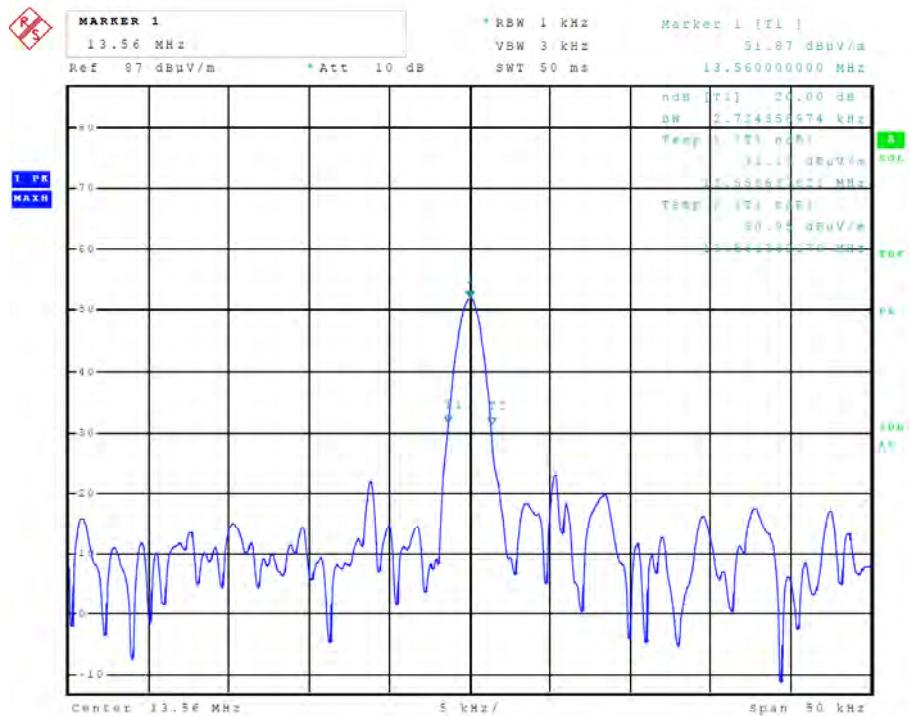


17.Feb 15 09:50

**Meas Type** OCCUPIED BANDWIDTH  
**Equipment under Test** Contactless reader CM1/TP  
**Manufacturer** CETRTA POT, d.o.o.  
**OP Condition** WAITING A TAG  
**Operator** Andrej Skof  
**Test Spec**  
Antenna: 5 deg, Sample: 210 deg

**Sweep Settings      Screen A**

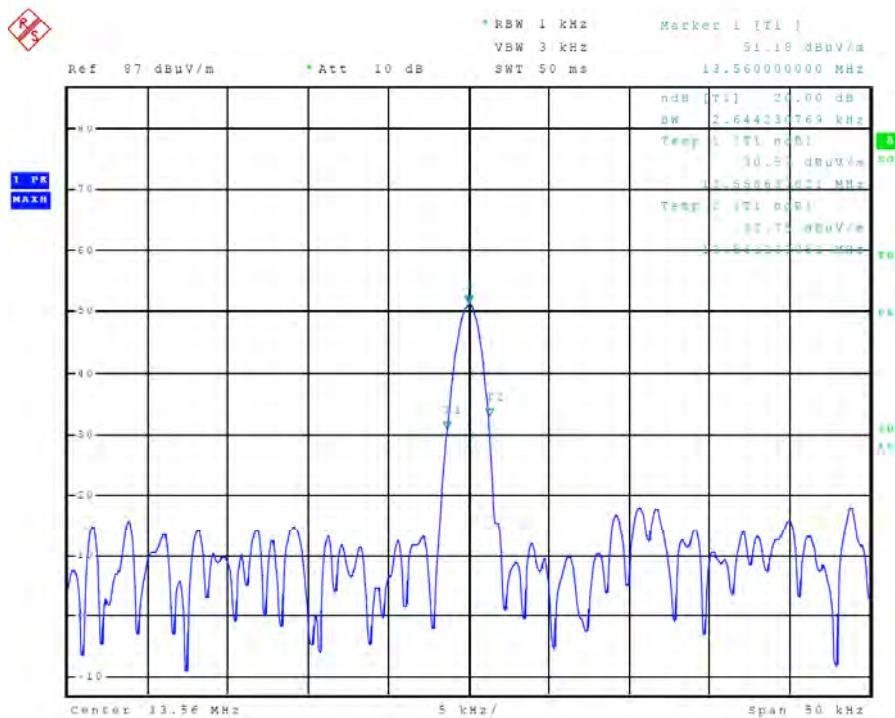
Center Frequency	13.560000 MHz	Ref Level	87.000 dB $\mu$ V/m
Frequency Offset	0.000000 Hz	Ref Level Offset	0.000 dB
Span	50.000000 kHz	Ref Position	100.000 %
Start Frequency	13.535000 MHz	Level Range	100.000 dB
Stop Frequency	13.585000 MHz	RF Att	10.000 dB
RBW	1.000000 kHz		
VBW	3.000000 kHz	X-Axis	LIN
Sweep Time	50.00 ms	Y-Axis	LOG



**Meas Type** OCCUPIED BANDWIDTH  
**Equipment under Test** Contactless reader CM1/TP  
**Manufacturer** CETRTA POT, d.o.o.  
**OP Condition** READING A TAG  
**Operator** Andrej Skof  
**Test Spec**  
Antenna: 5 deg, Sample: 210 deg

**Sweep Settings** **Screen A**

Center Frequency	13.560000 MHz	Ref Level	87.000 dB <sub>μ</sub> V/m
Frequency Offset	0.000000 Hz	Ref Level Offset	0.000 dB
Span	50.000000 kHz	Ref Position	100.000 %
Start Frequency	13.535000 MHz	Level Range	100.000 dB
Stop Frequency	13.585000 MHz	RF Att	10.000 dB
RBW	1.000000 kHz	X-Axis	LIN
VBW	3.000000 kHz	Y-Axis	LOG
Sweep Time	50.00 ms		



## 6.4 Spectrum mask (intentional radiator)

### Section 15.225 Operation within the band 13.110 – 14.010 MHz – clause a – clause d

#### 6.4.1 Test instruments

Description & Manufacturer	Model No.	SIQ No.	Last calibration	Calibrated until	Calibration period	Used
ETS, Anechoic chamber	3m	103949	2014-11	2016-11	24 months	X
Rohde-Schwarz, RFI receiver	ESU26	106897	2014-01	2016-01	24 months	X
EMCO, Antenna	3142	06/068	2013-09	2015-09	24 months	
Rohde & Schwarz, Active loop antenna	HFH2-Z2	/	2013-09	2015-09	24 months	X
Heinrich Deisel, Turn table	DS 420.00	103337	NA	NA	NA	X
ETS, Antenna tower	/	/	NA	NA	NA	X
ETS, Controller for turn table and antenna tower	/	/	NA	NA	NA	X

#### 6.4.2 Test procedure

1. The EUT was placed on the top of a rotating table 0.8 meters above the ground in an Anechoic Chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 m away from the interference-receiving antenna.
3. Frequencies with maximum emission were retested on OATS.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the turn table was turned from 0 degrees to 360 degrees to find the maximum reading.

#### 6.4.3 Test results

Device passed the requirements stated in ANSI C63.4, FCC Part 15, Subpart C.

## Signal measurement at 3 m in an anechoic chamber

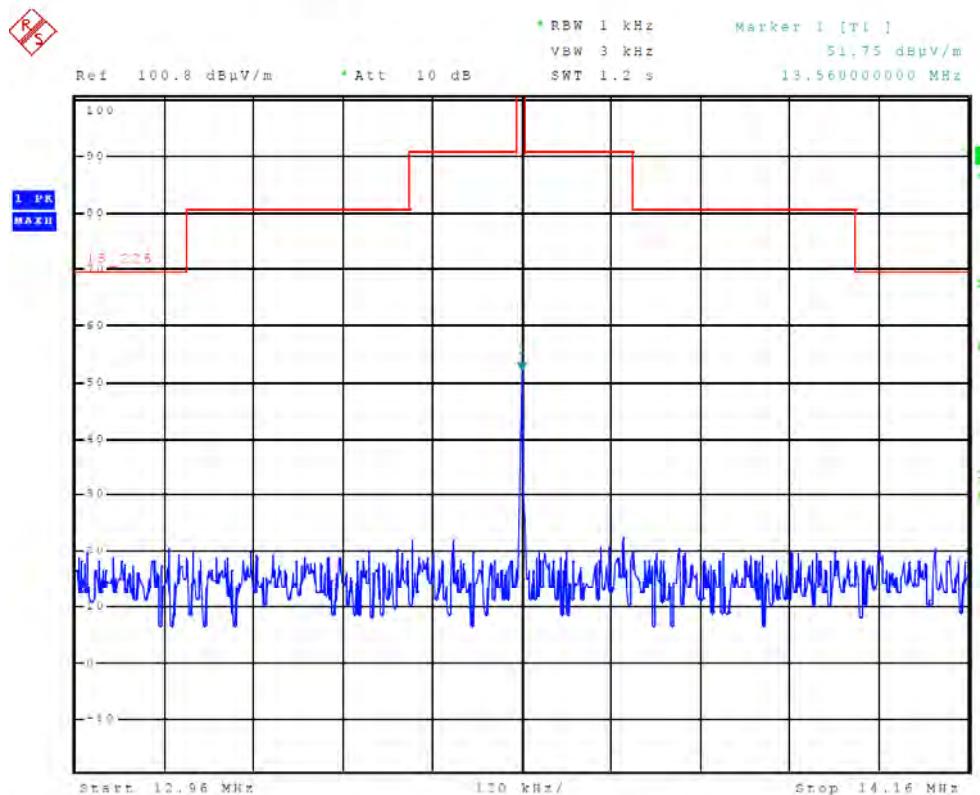


17.Feb 15 09:52

**Meas Type** SPECTRUM MASK  
**Equipment under Test** Contactless reader CM1/TP  
**Manufacturer** CETRTA POT, d.o.o.  
**OP Condition** WAITING A TAG  
**Operator** Andrej Skof  
**Test Spec**  
 Antenna: 5 deg, Sample: 210 deg

**Sweep Settings** **Screen A**

Center Frequency	13.560000 MHz	Ref Level	100.800 dB $\mu$ V/m
Frequency Offset	0.000000 Hz	Ref Level Offset	0.000 dB
Span	1.200000 MHz	Ref Position	100.000 %
Start Frequency	12.960000 MHz	Level Range	120.000 dB
Stop Frequency	14.160000 MHz	RF Att	10.000 dB
RBW	1.000000 kHz		
VBW	3.000000 kHz	X-Axis	LIN
Sweep Time	1.20 s	Y-Axis	LOG



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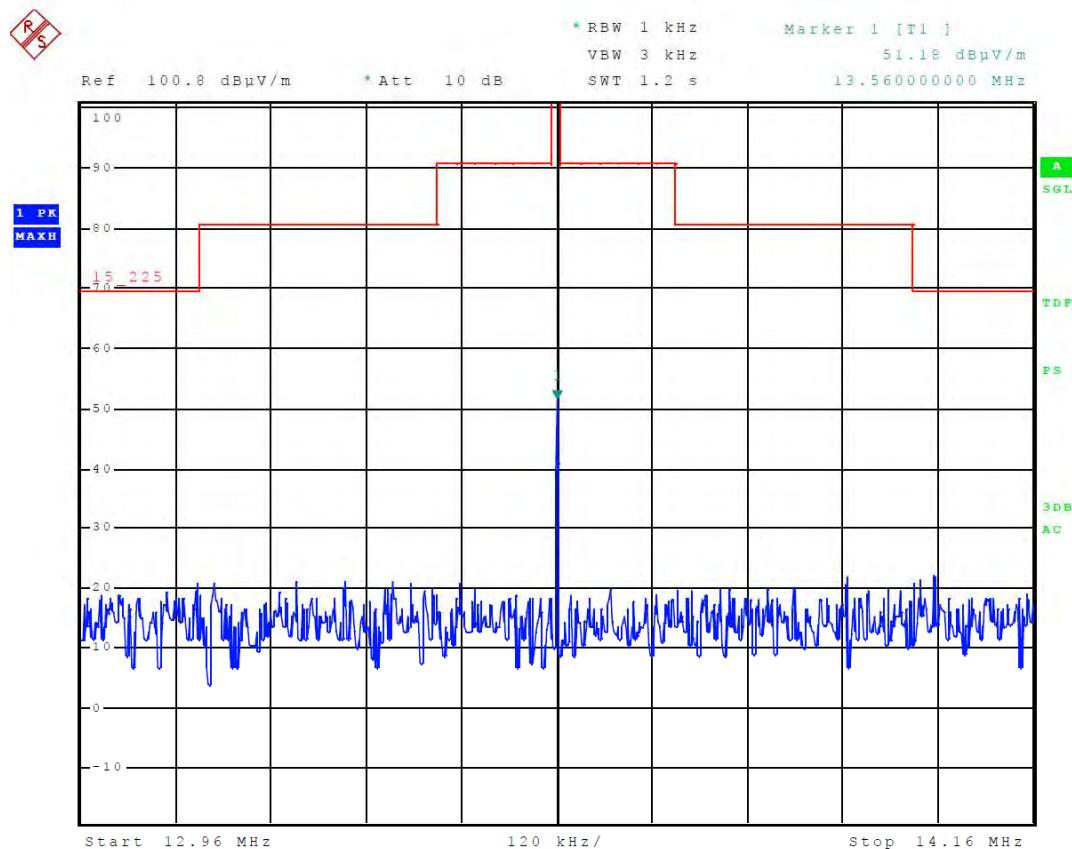
**Meas Type** SPECTRUM MASK  
**Equipment under Test** Contactless reader CM1/TP  
**Manufacturer** CETRTA POT, d.o.o.  
**OP Condition** READING A TAG  
**Operator** Andrej Skof

**Test Spec**

Antenna: 5 deg, Sample: 210 deg

**Sweep Settings** **Screen A**

Center Frequency	13.560000 MHz	Ref Level	100.800 dB $\mu$ V/m
Frequency Offset	0.000000 Hz	Ref Level Offset	0.000 dB
Span	1.200000 MHz	Ref Position	100.000 %
Start Frequency	12.960000 MHz	Level Range	120.000 dB
Stop Frequency	14.160000 MHz	RF Att	10.000 dB
RBW	1.000000 kHz		
VBW	3.000000 kHz	X-Axis	LIN
Sweep Time	1.20 s	Y-Axis	LOG





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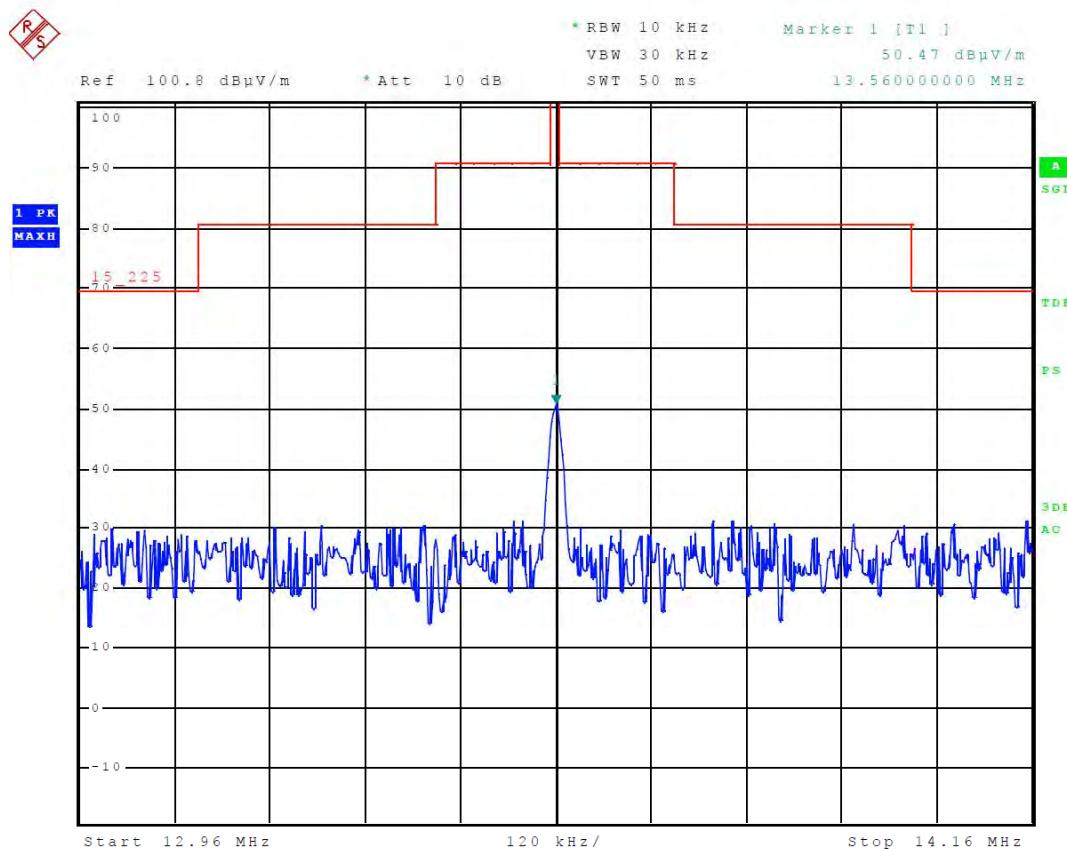
**Meas Type** SPECTRUM MASK  
**Equipment under Test** Contactless reader CM1/TP  
**Manufacturer** CETRTA POT, d.o.o.  
**OP Condition** WAITING A TAG  
**Operator** Andrej Skof

**Test Spec**

Antenna: 5 deg, Sample: 210 deg

**Sweep Settings** **Screen A**

Center Frequency	13.560000 MHz	Ref Level	100.800 dB $\mu$ V/m
Frequency Offset	0.000000 Hz	Ref Level Offset	0.000 dB
Span	1.200000 MHz	Ref Position	100.000 %
Start Frequency	12.960000 MHz	Level Range	120.000 dB
Stop Frequency	14.160000 MHz	RF Att	10.000 dB
RBW	10.000000 kHz		
VBW	30.000000 kHz	X-Axis	LIN
Sweep Time	50.00 ms	Y-Axis	LOG



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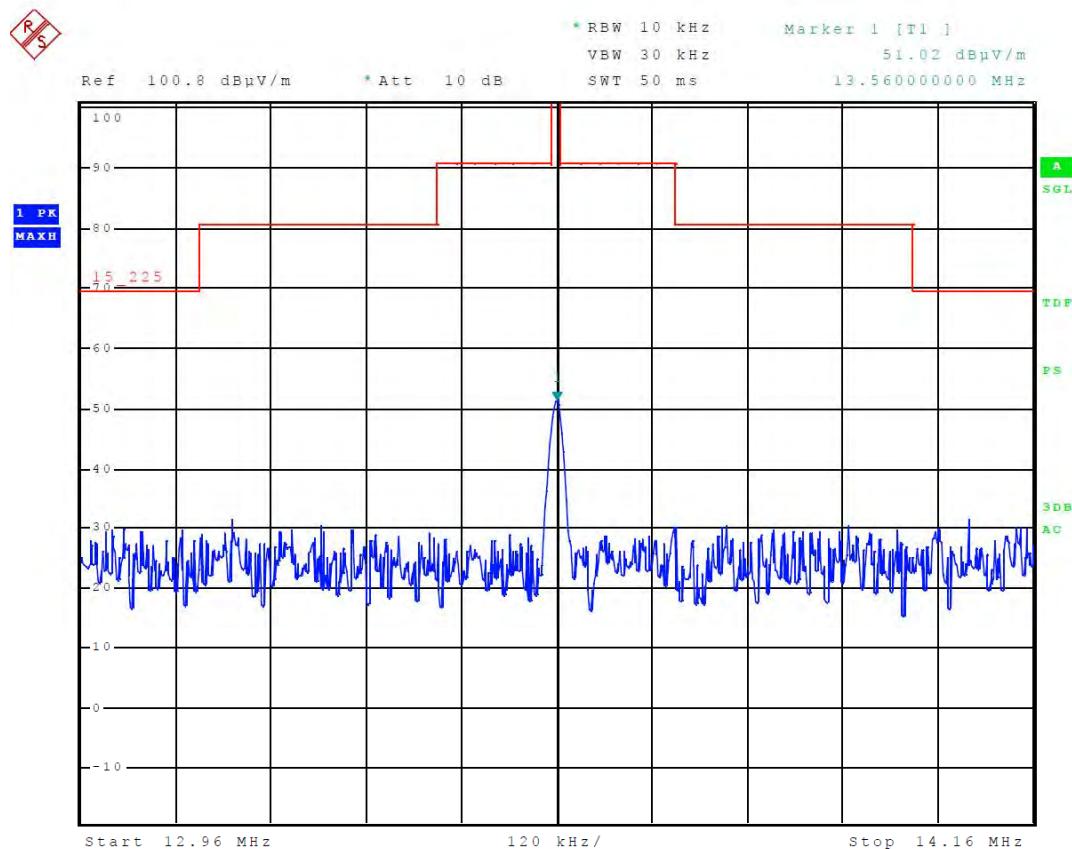
**Meas Type** SPECTRUM MASK  
**Equipment under Test** Contactless reader CM1/TP  
**Manufacturer** CETRTA POT, d.o.o.  
**OP Condition** READING A TAG  
**Operator** Andrej Skof

**Test Spec**

Antenna: 5 deg, Sample: 210 deg

**Sweep Settings** **Screen A**

Center Frequency	13.560000 MHz	Ref Level	100.800 dB $\mu$ V/m
Frequency Offset	0.000000 Hz	Ref Level Offset	0.000 dB
Span	1.200000 MHz	Ref Position	100.000 %
Start Frequency	12.960000 MHz	Level Range	120.000 dB
Stop Frequency	14.160000 MHz	RF Att	10.000 dB
RBW	10.000000 kHz		
VBW	30.000000 kHz	X-Axis	LIN
Sweep Time	50.00 ms	Y-Axis	LOG



## 6.5 Frequency tolerance of the carrier signal

### Section 15.225 Operation within the band 13.110 – 14.010 MHz – clause e

#### 6.5.1 Test instruments:

Description & Manufacturer	Model No.	SIQ No.	Last calibration	Calibrated until	Calibration period	Used
Rohde-Schwarz, RFI receiver	ESU26	106897	2014-01	2016-01	24 months	X
Rohde & Schwarz, Active loop antenna	HFH2-Z2	/	2013-09	2015-09	24 months	X
Fluke, Digital Multimeter	179	106728	2014-06	2015-06	12 months	X
Kambič, Temperature chamber	I-190 CK	107298	Na	Na	/	X

#### 6.5.2 Test requirements:

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. For battery operated equipment, the equipment tests shall be performed using a new battery.

### 6.5.3 Test results

Device passed the requirements stated in ANSI C63.4, FCC Part 15, Subpart C.

Temperature (°C)	Supply voltage (V)	Minutes after switch on	Measured Frequency (MHz)	Allowed tolerance	Measured tolerance (kHz)	RESULT
50	5.00	0	13.560627404	Fref±1.356 kHz	-0.016	PASS
50	5.00	2	13.560618590	Fref±1.356 kHz	-0.025	PASS
50	5.00	5	13.560618590	Fref±1.356 kHz	-0.025	PASS
50	5.00	10	13.560620192	Fref±1.356 kHz	-0.023	PASS
40	5.00	0	13.560641026	Fref±1.356 kHz	-0.002	PASS
40	5.00	2	13.560628205	Fref±1.356 kHz	-0.015	PASS
40	5.00	5	13.560621795	Fref±1.356 kHz	-0.022	PASS
40	5.00	10	13.560619391	Fref±1.356 kHz	-0.024	PASS
30	5.00	0	13.560660256	Fref±1.356 kHz	0.017	PASS
30	5.00	2	13.560642628	Fref±1.356 kHz	-0.001	PASS
30	5.00	5	13.560636218	Fref±1.356 kHz	-0.007	PASS
30	5.00	10	13.560630609	Fref±1.356 kHz	-0.013	PASS
20	4.25	0	13.560670673	Fref±1.356 kHz	0.027	PASS
20	4.25	2	13.560657051	Fref±1.356 kHz	0.014	PASS
20	4.25	5	13.560651442	Fref±1.356 kHz	0.008	PASS
20	4.25	10	13.560648237	Fref±1.356 kHz	0.005	PASS
20	5.00	0	13.560675481	Fref±1.356 kHz	0.032	PASS
20	5.00	2	13.560657051	Fref±1.356 kHz	0.014	PASS
20	5.00	5	13.560648237	Fref±1.356 kHz	0.005	PASS
20	5.00	10	13.560643429	-	-	Reference
20	5.75	0	13.560671474	Fref±1.356 kHz	0.028	PASS
20	5.75	2	13.560647436	Fref±1.356 kHz	0.004	PASS
20	5.75	5	13.560640224	Fref±1.356 kHz	-0.003	PASS
20	5.75	10	13.560633814	Fref±1.356 kHz	-0.010	PASS
10	5.00	0	13.560697120	Fref±1.356 kHz	0.054	PASS
10	5.00	2	13.560681895	Fref±1.356 kHz	0.038	PASS
10	5.00	5	13.560673081	Fref±1.356 kHz	0.030	PASS
10	5.00	10	13.560666710	Fref±1.356 kHz	0.023	PASS
0	5.00	0	13.560699524	Fref±1.356 kHz	0.056	PASS
0	5.00	2	13.560693113	Fref±1.356 kHz	0.050	PASS
0	5.00	5	13.560687504	Fref±1.356 kHz	0.044	PASS
0	5.00	10	13.560683498	Fref±1.356 kHz	0.040	PASS
-10	5.00	0	13.560690709	Fref±1.356 kHz	0.047	PASS
-10	5.00	2	13.560701126	Fref±1.356 kHz	0.058	PASS
-10	5.00	5	13.560701927	Fref±1.356 kHz	0.058	PASS
-10	5.00	10	13.560701126	Fref±1.356 kHz	0.058	PASS
-20	5.00	0	13.560660261	Fref±1.356 kHz	0.017	PASS
-20	5.00	2	13.560689107	Fref±1.356 kHz	0.046	PASS
-20	5.00	5	13.560698722	Fref±1.356 kHz	0.055	PASS
-20	5.00	10	13.560701150	Fref±1.356 kHz	0.058	PASS