

Poročilo o preskusu / Test Report

Št. / No.:

T251-0965R3/10

Datum / Date:

2011-05-06

Project / Product

CONTACTLESS READER

Type: RD852

Naročnik / Applicant

NXP Semiconductors Austria GmbH Mikron-Weg 1, A-8101 Gratkorn, Austria

Proizvajalec / Manufacturer

ČETRTA POT, d.o.o.

Planina 3, 4000 Kranj, SLOVENIA

Blagovna znamka / Trade Mark

Standardi - predpisi / Standards - regulations

FCC Part 15, Subpart C

Listov / Pages

Vrsta preskusa / Test procedure

EMC

St. merjencev / No. of items tested

1

Mapa predmeta št. / Subject file No.

C20101799

Kraj preskusa / Place of test

SIQ, EMC lab., Trpinčeva ul.39, 1000 Ljubljana, SLOVENIA

Opomba / Remark

The former report T251-0965R2/10 is superseded with T251-0965R3/10 and is no longer valid. (SEE PAGE 3)

Zaključek / Conclusion

Preskušani proizvod ustreza zahtevam navedenih standardov. / Tested product complies with the requirements of stated standards.

Rezultati preskusov se nanašajo samo na preskušan vzorec. / The test results relate only to the item tested.

Datum prispetja vzorca / Date of receipt of test item: 2010-11-12

Datum izvedbe preskusov / Date of performance of tests: 2010-11-19 - 2011-05-05

Odgovoren za preskušanje / Responsible for the test Andrej Škof

Vodja področja / Department Manager

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1 GENERAL

1.1 Equipment under test description

CONTACTLESS READER

Type: RD852

Remark: Report T251-0965R2/10 is replaced by T251-0965R3/10 due to additional testing.

Power supply: USB, 5V DC

Transmitting frequency: 13,56 MHz

Protective class: III



Plate of the device



Ferrite WE 742 711 31 - 2 turns

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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	



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2 LIMITS

2.1 Subpart C: Intentional Radiators

2.1.1 Conducted emission limits:

Frequency Range	Limits (dBuV)	
(MHz)	Quasi-peak	Average
0.15 to 0.5	66 – 56*	59 – 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 uV within the frequency band 535-1705 kHz, as measured using a 50 μ 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:

Frequency Range	Limits (c	Test distance	
(MHz)	VERTICAL	HORIZONTAL	(m)
0,009 to 0,490	20*log(2400/F(kHz))	20*log(2400/F(kHz))	300
0,490 to 1,705	20*log(2400/F(kHz))	20*log(2400/F(kHz))	30
1,705 to 30,0	30	30	30
30 to 88	40**	40**	3
88 to 216	44**	44**	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

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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, AMN	ENV216	106765	2010-08	2012-08	24 months	Х
Rohde-Schwarz, RFI receiver	ESU8	105187	2009-09	2011-09	24 months	
Hewlett Packard, RF Spectrum Analyzer	8593E	101277	2009-04	2011-04	24 months	
Rohde & Schwarz, Artificial main network	ESH 2-Z5	06/048H	2009-04	2011-04	24 months	Х
ETS, Anechoic chamber	3m	103949	2010-09	2012-09	24 months	Х
EMCO, Antenna	model 3142	104351	2010-09	2012-09	24 months	Х
Schwarzbeck Mess-Elektronik, Horn antenna	BBHA9120E	105063	2010-09	2012-09	24 months	
Heinrich Deisel, Turn table	DS 420.00	103337	NA	NA	NA	Х
ETS, Antenna tower	1	1	NA	NA	NA	Х
Controller for turn table and antenna tower	1	1	NA	NA	NA	Х

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3.2 Other instrument information and auxiliary equipment

Description	Model No.	Bandwidth	Detector functions	Antenna factors	Cable loss	Range
Rohde-Schwarz, RFI receiver	ESU8	200Hz, 9kHz, 120kHz, 1MHz	Peak, Q-peak, Average	1	1	20 Hz – 8 GHz
Hewlett Packard, RF Spectrum Analyzer	8593E	200Hz, 9kHz, 120kHz, 1MHz	Peak, Q-peak, Average	1	1	9 kHz – 26.5 GHz
Rohde & Schwarz, Artificial main network	ESH 2-Z5	I	1	1	1	9 kHz – 30 MHz
ETS, Anechoic chamber	3m	1	1	/	1	30 MHz – 18 GHz
EMCO, Antenna	model 3142	1	1	See tables below	1	26 MHz – 2 GHz
Schwarzbeck Mess-Elektronik, Horn antenna	BBHA9120E	1	1	See tables below	1	450 MHz – 6 GHz
SIQ, Conducted emission cable	SIQ	1	1	1	See tables below	/
SIQ, Radiated emission cable	SIQ	/	/	1	See tables below	/
PC, HP Compaq	D330 uT	104245	1	1	1	Х

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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

- **4.1.1.1** 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.
- **4.1.1.2** 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.
- **4.1.1.3** EUT connected to one LISN. Unused LISN measuring port connectors shall be terminated in 50 Ω . LISN can be placed on top of, or immediately beneath, reference ground-plane.
 - 4.1.1.3.1 All other equipment powered from additional LISN(s).
 - 4.1.1.3.2 Multiple outlet strip can be used for multiple power cords of non-EUT equipment.
 - 4.1.1.3.3 LISN at least 80 cm from nearest part of EUT chassis.
- **4.1.1.4** Cables of hand-operated devices, such as keyboards, mice, etc., shall be placed as for normal use.
- **4.1.1.5** Non-EUT components of EUT system being tested.
- **4.1.1.6** Rear of EUT, including peripherals, shall all be aligned and flush with rear of tabletop.
- **4.1.1.7** 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

- **4.1.2.1** 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.
- **4.1.2.2** Excess power cords shall be bundled in the center or shortened to appropriate length.
- **4.1.2.3** 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.
- **4.1.2.4** EUT and all cables shall be insulated, if required, from the ground-plane by up to 12 mm of insulating material.
- **4.1.2.5** EUT connected to one LISN. LISN can be placed on top of, or immediately beneath, the ground-plane.
 - 4.1.2.5.1 All other equipment powered from a second LISN or additional LISN(s).
 - 4.1.2.5.2 Multiple outlet strip can be used for multiple power cords of non-EUT equipment.

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4.1.3 Test arrangement for radiated emissions tabletop equipment

- **4.1.3.1** 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.
- **4.1.3.2** 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.
- **4.1.3.3** 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.
- **4.1.3.4** Cables of hand-operated devices, such as keyboards, mice, etc., shall be placed as for normal use.
- **4.1.3.5** Non-EUT components of EUT system being tested.
- **4.1.3.6** Rear of EUT, including peripherals, shall all be aligned and flush with rear of tabletop.
- **4.1.3.7** No vertical conducting plane used.

Št. / No.

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

4.1.4 Test arrangement for radiated emissions floor-standing equipment

- **4.1.4.1** 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.
- **4.1.4.2** Excess power cords shall be bundled in the center or shortened to appropriate length.
- **4.1.4.3** 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.
- **4.1.4.4** EUT and all cables shall be insulated, if required, from the ground-plane by up to 12 mm of insulating material.
- **4.1.4.5** 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.

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Overhead cable trays and suspended ceilings

Št. / No.

4.1.5 Test arrangement for floor-standing equipment

- **4.1.5.1** Only one vertical riser may be used where typical of system under test.
- **4.1.5.2** Excess power cord shall be bundled in the center or shortened to appropriate length.
- **4.1.5.3** 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.
- **4.1.5.4** 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.
- **4.1.5.5** 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 Test arrangement for floor-standing equipment

- **4.1.6.1** Only one vertical riser may be used where typical of system under test.
- **4.1.6.2** Excess power cord shall be bundled in the center or shortened to appropriate length.
- **4.1.6.3** 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.
- **4.1.6.4** 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.
- **4.1.6.5** 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.

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

- **4.1.7.1** 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.
- **4.1.7.2** Accessories, such as ac power adapter, if typically table-mounted, shall occupy peripheral positions as is applicable.
- **4.1.7.3** 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
- **4.1.7.4** 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.

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Placement of wall-mounted equipment

- 4.1.8 Test configuration/arrangement for combination floor-standing and tabletop equipment
- 4.1.8.1 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.
- 4.1.8.2 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.
- 4.1.8.3 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.
- 4.1.8.4 Cables of hand-operated devices, such as keyboards, mice, etc., have to be placed as for normal use.
- **4.1.8.5** Non-EUT components of EUT system being tested.
- 4.1.8.6 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.
- 4.1.8.7 Power cords and signal cables shall drape to the floor. No extension cords shall be used to the power receptacles.
- **4.1.8.8** 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)

0

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5 TEST SUMMARY

ANGLOGO 4 2002: FOO Bort 45, Culturant C	Test Yes Not			Sample Pass Fail	
ANSI C63.4-2003; FCC Part 15, Subpart C	Ø		☑		

5.1 Purpose of the test

To determine whether the equipment under test fulfils the **ANSI C63.4-2003**; **FCC Part 15**, **Subpart C** requirements.

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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	ESU8	105187	2009-09	2011-09	24 months	Х
Rohde-Schwarz, AMN	ENV216	106765	2010-08	2012-08	24 months	Х
PC, HP Compaq	D330 uT	104245	1	1	1	Χ

6.1.2 Test procedure

- The EUT is placed on a non-conductive 0.1 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 μH 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,...)

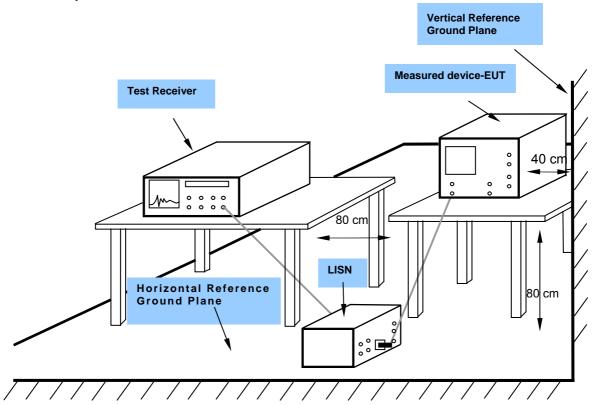
T251-0965R3/10

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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

EUT	CONTACTLESS READER	Туре:	RD852
Mode:	Reading card		
Input voltage:	5V DC	Date:	09.03.2011
Environmental conditions:	20±10°C, 55±30% RH	Tested by: Andrej Škof	

NOTE: PASS

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C20101799/1-2

EMI Measurement Test Report
Meas Type: CONDUCTED EMISSION **CONTACTLESS READER** Equipment under Test:

RD852 Type:

Manufacturer: **NXP Semiconductors** OP Condition: **READING CARD** Operator: Andrej Skof LINE L1 Test Spec:

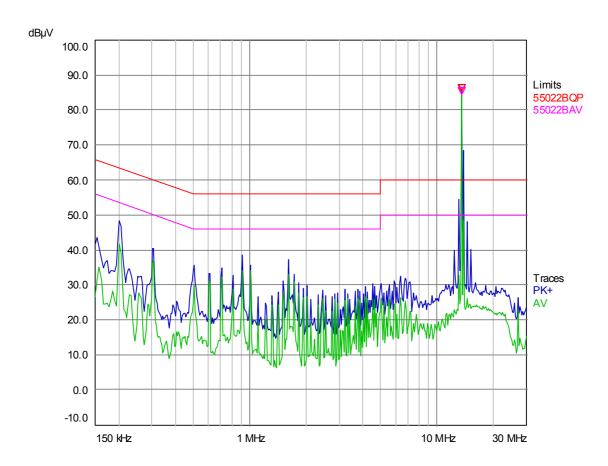
Scan Settings (1 Range)

Frequencies				Receiver Settings			
Start	Stop	Step	Res BW	M-Time	Atten	Preamp	
150 kHz	30 MHz	4 kHz	9 kHz (6dB)	10 ms	10 dB	Off	

Final Measurement

Meas Time: Detectors: QP, AV 1 s Peaks: Acc. Margin: 10 dB

Pre-measurement Graph





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Final Measurement Results

Trace	Frequency	Level	Limit	Delta Limit	Delta Ref	Comment
	(MHz)	(dBµV)	(dBµV)	(dB)	(dB)	
2 AV	13.56	84.47 *	50.00	34.47		Allowed
1 QP	13.56	85.15 *	60.00	25.15		Allowed

^{* =} limit exceeded



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C20101799/1-2

EMI Measurement Test Report

CONDUCTED EMISSION Meas Type: **CONTACTLESS READER** Equipment under Test:

RD852 Type:

Manufacturer: NXP Semiconductors OP Condition: **READING CARD** Operator: Andrej Skof Test Spec: LINE N

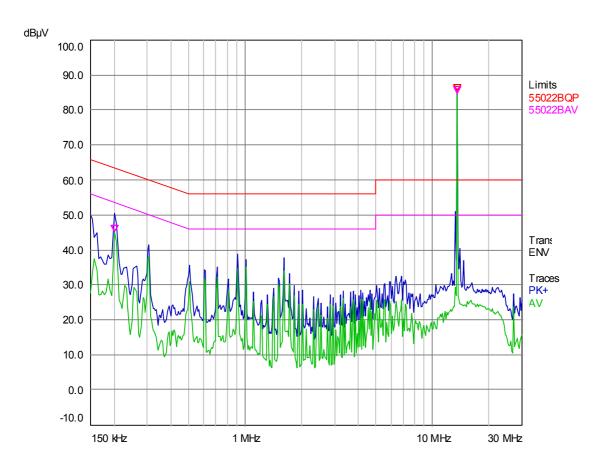
Scan Settings (1 Range)

Frequencies				Receiver Settings			
Start	Stop	Step	Res BW	M-Time	Atten	Preamp	
150 kHz	30 MHz	4 kHz	9 kHz (6dB)	10 ms	10 dB	Off	

Final Measurement

 $\mathsf{QP}\;,\;\;\mathsf{AV}$ 1 s Detectors: Meas Time: Peaks: 10 Acc. Margin: 10 dB

Pre-measurement Graph





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T251-0965R3/10	
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Final Measurement Results

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Trace	Frequency	Level	Limit	Delta Limit	Delta Ref	Comment
	(MHz)	(dBµV)	(dBµV)	(dB)	(dB)	
2 AV	0.20	45.24	53.53	-8.29		
2 AV	13.56	84.66 *	50.00	34.66		Allowed
1 QP	13.56	85.22 *	60.00	25.22		Allowed

^{* =} limit exceeded

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6.2 Bandwidth of the emission (intentional radiator)

Section 15.215 Additional provisions to the general radiated emission limitations

6.2.1 Test instruments

Description & Manufacturer	Model No.	SIQ No.	Last calibration	Calibrated until	Calibration period	Used
ETS, Anechoic chamber	3m	103949	2010-09	2012-09	24 months	Х
Rohde-Schwarz, RFI receiver	ESU	105187	2009-09	2011-09	24 months	X
R&S, Loop antenna	ESH2-Z2	1	2010-05	2012-05	24 months	Х
Heinrich Deisel, Turn table	DS 420.00	103337	NA	NA	NA	Х
Controller for turn table and antenna tower	1	1	NA	NA	NA	х
PC, HP Compaq	D330 uT	104245	1	1	/	Х

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.
- 3. Resolution bandwidth is set to a value greater than 5% of the allowed bandwidth. If no bandwidth specifications are given, the guidelines in pt. 1.4 are used

6.2.3 Test results

EUT	CONTACTLESS READER	Type:	RD852
Mode:	Reading card		
Input voltage:	ut voltage: 5V DC		29.03.2011
Environmental conditions:	20±10°C, 55±30% RH	Tested by: An	drej Škof

6.2.4 Summary of results

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



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



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29.Mar 11 13:58

Meas Type BANDWIDTH

Equipment under Test CONTACTLESS READER RD852

 Manufacturer
 CETRTA POT D.O.O.

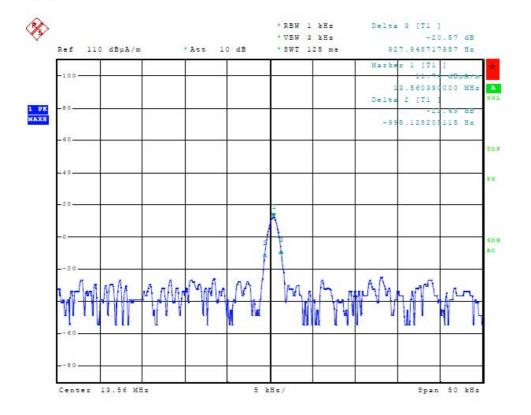
 OP Condition
 READING CARD

 Operator
 Andrej Skof

Test Spec 0DEG

Sweep Settings Screen A

Center Frequency	13.560000	MHz	Ref Level	110.000	dBµA/m
Frequency Offset	0.000000	Hz	Ref Level Offset	0.000	dB
Span	50.000000	kHz	Ref Position	100.000	8
Start Frequency	13.535000	MHz	Level Range	200.000	dB
Stop Frequency	13.585000	MHz	RF Att	10.000	dB
RBW	1.000000	kHz			
VBW	3.000000	kHz	X-Axis	LIN	
Sweep Time	125.00 ms		Y-Axis	LOG	



Bandwidth of the emission: 1,923 kHz



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6.3 Spectrum mask (intentional radiator)

Section 15.225 Operation within the band 13.110 - 14.010 MHz - pt.a - pt.d

6.3.1 Test instruments

Description & Manufacturer	Model No.	SIQ No.	Last calibration	Calibrated until	Calibration period	Used
ETS, Anechoic chamber	3m	103949	2010-09	2012-09	24 months	Х
Rohde-Schwarz, RFI receiver	ESU	105187	2009-09	2011-09	24 months	Х
R&S, Loop antenna	ESH2-Z2	1	2010-05	2012-05	24 months	X
Heinrich Deisel, Turn table	DS 420.00	103337	NA	NA	NA	X
Controller for turn table and antenna tower	1	1	NA	NA	NA	X
PC, HP Compaq	D330 uT	104245	/	1	/	Χ

6.3.2 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.
- The EUT was set 3 m away from the interference-receiving antenna.
 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.

6.3.3 Test results

EUT	CONTACTLESS READER	Type:	RD852
Mode:	Reading card		
Input voltage:	5V DC	Date:	25.03.2011 – 29.03.2011
Environmental conditions:	20±10°C, 55±30% RH	Tested by: An	drej Škof

6.3.4 Summary of results

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

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6.3.4.1 Signal measurement at 3 m in an anechoic chamber



C20101799-1

29.Mar 11 13:34

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Meas Type RADIATED EMISSION

Equipment under Test CONTACTLESS READER RD852

ManufacturerCETRTA POT D.O.O.OP ConditionREADING CARDOperatorAndrej Skof

Test Spec 0DEG

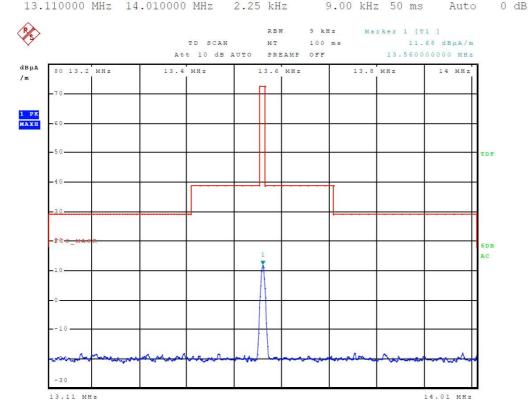
Time Domain Scan (1 Range)

Scan Start: 13.11 MHz Scan Stop: 14.01 MHz

Detector: Trace 1: MAX PEAK

Transducer: HFH2-Z2

Start	Stop	Step			RF		
Frequency	Frequency	Size	Res BW	Time	Atten	Preamp	Input
12 110000 MII-	14 010000 M	ue o oe leue	0 00 1-11-	EO ma	711+0	0 4D	TMDHT

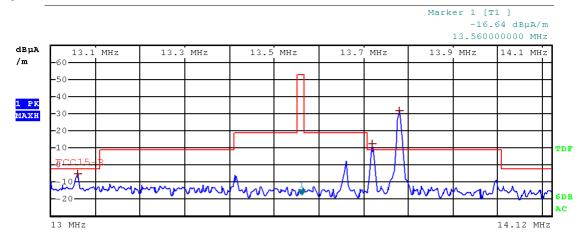




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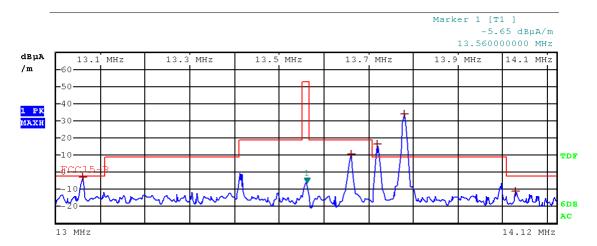
6.3.4.2 Signal measurement at 10 m on OATS

Background



Date: 25.MAR.2011 10:05:49

Operating mode



Date: 25.MAR.2011 10:04:06

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6.3.4.3 Calculations made from 10 m to 30 m distance

Section 15.225 Operation within the band 13.110 – 14.010 MHz.

(a) The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.

At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field. Pending the development of an appropriate measurement procedure for measurements performed below 30 MHz, when performing measurements at a closer distance than specified, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade).

Measured value at 10 m.

Frequency	Measured value at 10 m	Limit at 10 m
(MHz)	(dBμA/m)	(dBµA/m)
13,56	-5,65	52,5

Calculated value from 10 m to 30 m.

Frequency	Measured value at 10 m	Calculated value at 30 m	Limit at 30 m
(MHz)	(dBμA/m)	(dBμA/m)	(dBμA/m)
13,56	-5,65	-16,15	32,5

Calculated value from 10 m to 30 m and calculated values from $dB\mu A/m$ to $dB\mu V/m$.

Frequency (MHz)	Measured value at 10 m (dBμV/m)	Calculated value at 30 m (dB _μ V/m)	Limit at 30 m (dB _µ V/m)
13,56	57,15	67,65	84

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6.4 Radiated emission measurement 9 kHz – 30 MHz (intentional radiator)

Section 15.209 Radiated emission limits, general requirements

6.4.1 Test instruments

Description & Manufacturer	Model No.	SIQ No.	Last calibration	Calibrated until	Calibration period	Used
ETS, Anechoic chamber	3m	103949	2010-09	2012-09	24 months	Х
Rohde-Schwarz, RFI receiver	ESU	105187	2009-09	2011-09	24 months	X
R&S, Loop antenna	ESH2-Z2	1	2010-05	2012-05	24 months	Х
Heinrich Deisel, Turn table	DS 420.00	103337	NA	NA	NA	Х
Controller for turn table and antenna tower	1	1	NA	NA	NA	х
PC, HP Compaq	D330 uT	104245	1	1	1	Х

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, which was mounted on the top of variable-height antenna tower.
- 3. 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.
- 4. The test-receiver system was set to PEAK and QUASI-PEAK Detect Function and Specified Bandwidth with Maximum Hold Mode.
- 5. The highest points would be re-tested one by one using the quasi-peak method.

6.4.3 Test results

EUT	CONTACTLESS READER	Type:	RD852
Mode:	Reading card		
Input voltage:	5V DC	Date:	29.03.2011
Environmental conditions:	20±10°C, 55±30% RH	Tested by: An	drej Škof

6.4.4 Summary of results

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



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6.4.4.1 Measurement at 3 m in an anechoic chamber



C20101799-1

29.Mar 11 13:16

Meas Type RADIATED EMISSION

Equipment under Test CONTACTLESS READER RD852

ManufacturerCETRTA POT D.O.O.OP ConditionREADING CARDOperatorAndrej Skof

Test Spec 0DEG

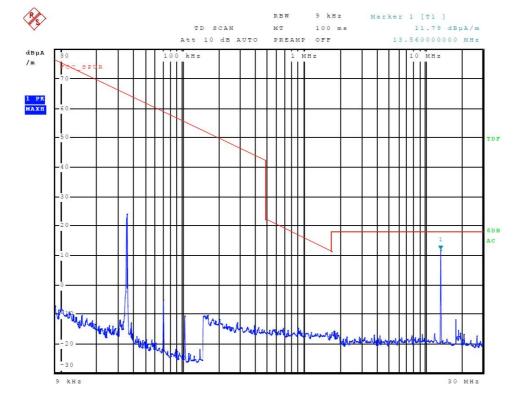
Time Domain Scan (2 Ranges)

Scan Start: 9 kHz Scan Stop: 30 MHz

Detector: Trace 1: MAX PEAK

Transducer: HFH2-Z2

Start		Stop		Step			Meas		RF		
Frequency		Frequency		Size		Res BW		Time	Atten	Preamp	Input
9.000000	kHz	149.950000	kHz	50.00	Hz	200.00	Hz	50 ms	Auto	0 dB	INPUT2
150.000000	kHz	30.000000	MHz	2.25	kHz	9.00	kHz	10 ms	Auto	0 dB	INPUT2





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6.4.4.2 Calculations made from 3 m to 30 m distance

At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field. Pending the development of an appropriate measurement procedure for measurements performed below 30 MHz, when performing measurements at a closer distance than specified, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade).

Measured value at 3 m.

Frequency	Measured value at 3 m	Limit at 3 m
(MHz)	(dBμA/m)	(dBµA/m)
13,56	11,79	18

Calculated value from 3 m to 30 m.

Frequency (MHz)	Extrapolation factor (dB/decade)	Calculated value at 30 m (dB _µ A/m)	Limit at 30 m (dBµA/m)
13,56	-40	-28,21	-22

Calculated value from 3 m to 30 m and calculated values from dBμA/m to dBμV/m.

Frequency	Frequency Calculated value at 30 m		
(MHz)	(dBμV/m)	(dBμV/m)	
13,56	23,29	29,5	

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

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6.5 Radiated emission measurement 30 MHz – 1 GHz (intentional radiator)

Section 15.209 Radiated emission limits, general requirements

6.5.1 Test instruments

Description & Manufacturer	Model No.	SIQ No.	Last calibration	Calibrated until	Calibration period	Used
ETS, Anechoic chamber	3m	103949	2010-09	2012-09	24 months	Х
Rohde-Schwarz, RFI receiver	ESU	105187	2009-09	2011-09	24 months	Х
EMCO, Antenna	model 3142	104351	2010-09	2012-09	24 months	Х
Schwarzbeck Mess-Elektronik, Horn antenna	BBHA9120E	105063	2010-09	2012-09	24 months	
Heinrich Deisel, Turn table	DS 420.00	103337	NA	NA	NA	Х
Antenna tower	/	/	NA	NA	NA	Х
Controller for turn table and antenna tower	1	1	NA	NA	NA	х
PC, HP Compaq	D330 uT	104245	1	1	1	X

6.5.2 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 QUASI-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.

6.5.3 Test results

EUT	CONTACTLESS READER	Type:	RD852
Mode:	Reading card		
Input voltage:	5V DC	Date:	23.11.2010
Environmental conditions:	20±10°C, 55±30% RH	Tested by: Andrej Škof	

6.5.4 Summary of results

Device passed the requirements stated in ANSI C63.4, FCC Part 15, Subpart C. 6.5.4.1 Signal measurement at 3 m in an anechoic chamber

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Meas Type RADIATED EMISSION

Equipment under Test CONTACTLESS READER RD852

ManufacturerCETRTA POT D.O.O.OP ConditionREADING CARDOperatorAndrej Skof

Test Spec VERTICAL

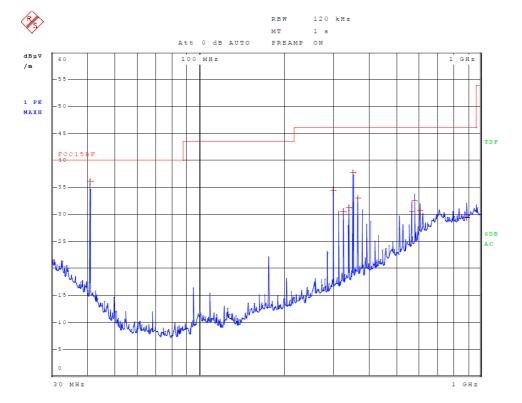
Stepped Scan (1 Range)

Scan Start: 30 MHz Scan Stop: 1 GHz

Detector: Trace 1: MAX PEAK

Transducer: 3142B

Start	Stop	Step		Meas	RF		
Frequency	Frequency	Size	Res BW	Time	Atten	Preamp	Input
30.000000 MHz	1.000000 GHz	40.00 kHz	120.00 kHz	1 ms	Auto	20 dB	TNPUT2





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Meas Type RADIATED EMISSION

Equipment under Test CONTACTLESS READER RD852

ManufacturerCETRTA POT D.O.O.OP ConditionREADING CARDOperatorAndrej Skof

Test Spec VERTICAL

Final Measurement

Meas Time: 1 s Margin: 15 dB Peaks: 10

Trace	Frequenc	v	Level (dBµV/m)	Detector	Delta Limit/dB
			(1 /		
1	40.680000000	MHz	36.07	Quasi Peak	-3.93
1	352.560000000	MHz	37.73	Quasi Peak	-8.27
1	298.320000000	MHz	34.43	Quasi Peak	-11.57
1	366.120000000	MHz	32.96	Quasi Peak	-13.04
1	583.120000000	MHz	32.43	Quasi Peak	-13.57
1	339.000000000	MHz	31.17	Quasi Peak	-14.83
1	610.200000000	MHz	30.75	Quasi Peak	-15.25
1	325.440000000	MHz	30.50	Quasi Peak	-15.50
1	569.560000000	MHz	30.47	Quasi Peak	-15.53
1	894.960000000	MHz	29.49	Quasi Peak	-16.51



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RADIATED EMISSION

Equipment under Test CONTACTLESS READER RD852

ManufacturerCETRTA POT D.O.O.OP ConditionREADING CARDOperatorAndrej Skof

Test Spec HORIZONTAL

Meas Type

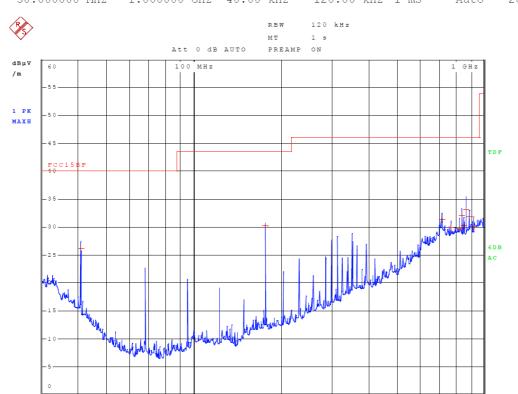
Stepped Scan (1 Range)

Scan Start: 30 MHz Scan Stop: 1 GHz

Detector: Trace 1: MAX PEAK

Transducer: 3142B

Start	Stop	Step		Meas	RF		
Frequency	Frequency	Size	Res BW	Time	Atten	Preamp	Input
30 000000 MH	7 1 000000	GHz 40 00 kHz	120 00 kHz	. 1 mg	Auto	20 dB	TMDHT2

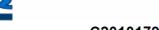


30 MHz



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Meas Type RADIATED EMISSION

Equipment under Test CONTACTLESS READER RD852

ManufacturerCETRTA POT D.O.O.OP ConditionREADING CARDOperatorAndrej Skof

Test Spec HORIZONTAL

Final Measurement

Meas Time: 1 s Margin: 15 dB Peaks: 10

Trace	Frequenc	у	Level (dBμV/m)	Detector	Delta Limit/dB
1	867.840000000	MHz	33.06	Quasi Peak	-12.94
1	176.280000000	MHz	30.15	Quasi Peak	-13.35
1	40.680000000	MHz	26.18	Quasi Peak	-13.82
1	840.760000000	MHz	32.08	Quasi Peak	-13.92
1	895.000000000	MHz	31.88	Quasi Peak	-14.12
1	718.720000000	MHz	31.33	Quasi Peak	-14.67
1	854.320000000	MHz	30.36	Quasi Peak	-15.64
1	922.120000000	MHz	30.05	Quasi Peak	-15.95
1	772.960000000	MHz	29.88	Quasi Peak	-16.12
1	827.160000000	MHz	29.63	Quasi Peak	-16.37



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6.6 Frequency tolerance of the carrier signal

Section 15.225 Operation within the band 13.110 - 14.010 MHz - pt.e

6.6.1 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.

6.6.2 Test results

EUT	CONTACTLESS READER	Type:	RD852
Mode:	Reading card		
Input voltage:	5V DC	Date:	03.05.2011 – 05.05.2011
Environmental conditions:	20±10°C, 55±30% RH	Tested by: An	drej Škof



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Temperature (°C)	Supply voltage	Minutes after switch on	Frequency (MHz)	Allowed tolerance (kHz)	Measured tolerance (Hz)
50	5 VDC	0	13,560323	±1,356	-52
	5 VDC	2	13,560352	±1,356	-23
	5 VDC	5	13,560301	±1,356	-74
	5 VDC	10	13,560330	±1,356	-45
40	5 VDC	0	13,560368	±1,356	-7
	5 VDC	2	13,560352	±1,356	-3
	5 VDC	5	13,560339	±1,356	-36
	5 VDC	10	13,560330	±1,356	-45
30	5 VDC	0	13,560391	±1,356	16
	5 VDC	2	13,560381	±1,356	6
	5 VDC	5	13,560368	±1,356	-7
	5 VDC	10	13,560355	±1,356	-20
20	4,25 VDC	0	13,560389	±1,356	14
	4,25 VDC	2	13,560389	±1,356	14
	4,25 VDC	5	13,560387	±1,356	12
	4,25 VDC	10	13,560384	±1,356	9
20	5 VDC	0	13,560391	±1,356	16
	5 VDC	2	13,560384	±1,356	9
	5 VDC	5	13,560378	±1,356	3
		ŭ	.0,0000.0		
	5 VDC	10	13,560375	-	Reference
20				- ±1,356	
20	5 VDC	10	13,560375	-	Reference
20	5 VDC 5,75 VDC	10 0	13,560375 13,560381	- ±1,356	Reference 6
20	5 VDC 5,75 VDC 5,75 VDC	10 0 2	13,560375 13,560381 13,560371	±1,356 ±1,356	Reference 6 -4
20 10 °C	5 VDC 5,75 VDC 5,75 VDC 5,75 VDC	10 0 2 5	13,560375 13,560381 13,560371 13,560368	±1,356 ±1,356 ±1,356	6 -4 -7
	5 VDC 5,75 VDC 5,75 VDC 5,75 VDC 5,75 VDC	10 0 2 5 10	13,560375 13,560381 13,560371 13,560368 13,560362	- ±1,356 ±1,356 ±1,356 ±1,356	6 -4 -7 -13
	5 VDC 5,75 VDC 5,75 VDC 5,75 VDC 5,75 VDC 5,75 VDC 5 VDC	10 0 2 5 10	13,560375 13,560381 13,560371 13,560368 13,560362 13,560490	- ±1,356 ±1,356 ±1,356 ±1,356	Reference 6 -4 -7 -13 115
	5 VDC 5,75 VDC 5,75 VDC 5,75 VDC 5,75 VDC 5 VDC 5 VDC	10 0 2 5 10 0	13,560375 13,560381 13,560371 13,560368 13,560362 13,560490 13,560480	- ±1,356 ±1,356 ±1,356 ±1,356 ±1,356	Reference 6 -4 -7 -13 115 105
	5 VDC 5,75 VDC 5,75 VDC 5,75 VDC 5,75 VDC 5 VDC 5 VDC 5 VDC 5 VDC	10 0 2 5 10 0 2 5	13,560375 13,560381 13,560361 13,560368 13,560362 13,560490 13,560480 13,560467	- ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356	Reference 6 -4 -7 -13 115 105 92
10 °C	5 VDC 5,75 VDC 5,75 VDC 5,75 VDC 5,75 VDC 5 VDC 5 VDC 5 VDC 5 VDC	10 0 2 5 10 0 2 5	13,560375 13,560381 13,560361 13,560368 13,560362 13,560490 13,560480 13,560467	- ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356	Reference 6 -4 -7 -13 115 105 92 92
10 °C	5 VDC 5,75 VDC 5,75 VDC 5,75 VDC 5,75 VDC 5 VDC 5 VDC 5 VDC 5 VDC 5 VDC 5 VDC	10 0 2 5 10 0 2 5 10	13,560375 13,560381 13,560368 13,560362 13,560490 13,560480 13,560467 13,560467 13,560519	- ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356	Reference 6 -4 -7 -13 115 105 92 92 144
10 °C	5 VDC 5,75 VDC 5,75 VDC 5,75 VDC 5,75 VDC 5 VDC 5 VDC 5 VDC 5 VDC 5 VDC 5 VDC 5 VDC 5 VDC	10 0 2 5 10 0 2 5 10 0 2	13,560375 13,560381 13,560361 13,560368 13,560362 13,560490 13,560467 13,560467 13,560519 13,560516	- ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356	Reference 6 -4 -7 -13 115 105 92 92 144 141
10 °C	5 VDC 5,75 VDC 5,75 VDC 5,75 VDC 5,75 VDC 5,75 VDC 5 VDC	10 0 2 5 10 0 2 5 10 0 2 5	13,560375 13,560381 13,560368 13,560362 13,560490 13,560480 13,560467 13,560467 13,560519 13,560519	- ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356	Reference 6 -4 -7 -13 115 105 92 92 144 141 134
10 °C	5 VDC 5,75 VDC 5,75 VDC 5,75 VDC 5,75 VDC 5 VDC	10 0 2 5 10 0 2 5 10 0 2 5	13,560375 13,560381 13,560368 13,560362 13,560490 13,560467 13,560467 13,560519 13,560516 13,560509 13,560490	- ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356	Reference 6 -4 -7 -13 115 105 92 92 144 141 134 115
10 °C	5 VDC 5,75 VDC 5,75 VDC 5,75 VDC 5,75 VDC 5,75 VDC 5 VDC	10 0 2 5 10 0 2 5 10 0 2 5 10 0	13,560375 13,560381 13,560361 13,560362 13,560490 13,560467 13,560467 13,560519 13,560516 13,560490 13,560490	- ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356	Reference 6 -4 -7 -13 115 105 92 92 144 141 134 115 115
10 °C	5 VDC 5,75 VDC 5,75 VDC 5,75 VDC 5,75 VDC 5,75 VDC 5 VDC	10 0 2 5 10 0 2 5 10 0 2 5 10 0 2 5	13,560375 13,560381 13,560361 13,560362 13,560490 13,560467 13,560519 13,560516 13,560490 13,560490 13,560490 13,560490 13,560490 13,560506	- ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356	Reference 6 -4 -7 -13 115 105 92 92 144 141 134 115 115 115 131
10 °C	5 VDC 5,75 VDC 5,75 VDC 5,75 VDC 5,75 VDC 5,75 VDC 5 VDC	10 0 2 5 10 0 2 5 10 0 2 5 10 0 2 5	13,560375 13,560381 13,560361 13,560362 13,560490 13,560467 13,560519 13,560516 13,560490 13,560490 13,560490 13,560490 13,560506 13,560516	- ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356	Reference 6 -4 -7 -13 115 105 92 92 144 141 134 115 115 115 131
10 °C 0	5 VDC 5,75 VDC 5,75 VDC 5,75 VDC 5,75 VDC 5,75 VDC 5 VDC	10 0 2 5 10 0 2 5 10 0 2 5 10 0 2 5 10	13,560375 13,560381 13,560381 13,560368 13,560362 13,560490 13,560467 13,560516 13,560516 13,560490 13,560490 13,560490 13,560516 13,560516 13,560516	- ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356	Reference 6 -4 -7 -13 115 105 92 92 144 141 134 115 115 131 141 141
10 °C 0	5 VDC 5,75 VDC 5,75 VDC 5,75 VDC 5,75 VDC 5,75 VDC 5 VDC	10 0 2 5 10 0 2 5 10 0 2 5 10 0 2 5 10 0 2 5	13,560375 13,560381 13,560381 13,560368 13,560362 13,560490 13,560467 13,560516 13,560509 13,560490 13,560490 13,560506 13,560516 13,560516 13,560516 13,560516	- ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356 ±1,356	Reference 6 -4 -7 -13 115 105 92 92 144 141 134 115 115 131 141 141 70



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7 Photos of the actual measurement place and EUT placement



Figure 1: Conducted emission test



Figure 2: Radiated emission test – 9 kHz to 30 MHz

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Figure 3: Radiated emission test – 30MHz to 1GHz



Figure 4: Radiated emission test – OATS measurements