



## SGS Germany GmbH

### RF Exposure Report No.: L29Z0006

FCC ID: 2ANJZE225-RFID-MONO

Order No.: L29Z

Pages: 18

Client: BOWA-electronic GmbH & Co. KG

Equipment Under Test: RFID Reader Monopolar  
TAG-PCB Type BOWA E225\_RFID\_Mono\_V02

Manufacturer: BOWA-electronic GmbH & Co. KG

Task: Compliance with the requirements mentioned below:

Test Specification(s): 

- FCC Title 47, Part 15.212(viii), 1.1307(b), and 1.1310

Result: The EUT complies with the requirements of the above rules

The results relate only to the items tested as described in this test report.

approved by:

Date

Signature

Bauer  
Lab Manager EMC

Jun 21, 2018

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This document was signed electronically.

## CONTENTS

<b>1 Summary .....</b>	<b>3</b>
<b>2 References .....</b>	<b>4</b>
2.1 Specifications .....	4
2.2 Bibliographical Data .....	4
2.3 Glossary of Terms .....	4
<b>3 General Information .....</b>	<b>5</b>
3.1 Identification of Client .....	5
3.2 Test Laboratory .....	5
3.3 Time Schedule .....	5
3.4 Participants .....	5
<b>4 Equipment Under Test.....</b>	<b>6</b>
4.1 Photographs of EUT and accessories .....	7
4.2 Operational conditions.....	9
4.2.1 Software.....	9
4.2.2 Radio parameters .....	9
4.2.3 Operation modes .....	9
4.2.4 Test configurations.....	10
4.3 Hardware Configuration.....	11
4.3.1 Components of the EUT.....	11
4.3.2 Interface description.....	11
4.3.2.1 Power supply port .....	11
4.3.2.2 Earthing and Grounding connections .....	11
4.3.2.3 Communication and signal ports .....	11
<b>5 Test Equipment.....</b>	<b>12</b>
5.1 Test Facility .....	12
5.2 Measurement Uncertainty .....	13
<b>6 Assessment Specifications and Results.....</b>	<b>14</b>
6.1 Test procedure .....	14
6.2 Test equipment.....	14
6.3 Environmental conditions .....	14
6.4 Evaluation of emitted EMF.....	15
<b>7 Disclaimer .....</b>	<b>18</b>

## 1 Summary

The assessment has been performed to prove the safety of radiation harmfulness to the human body for the equipment under test (EUT). The limit for Maximum Permissible Exposure (MPE) for the Occupational/Controlled exposure to electromagnetic fields as set out in FCC 1.1310 is followed.

The following results are valid only for the EUT specified in Chapter 4

Phenomena	Reference	Test Specification	Verdict
Human exposure to electromagnetic Fields EMF	FCC 47 CFR §2.1091	KDB 447498 D01 General RF Exposure Guidance v06	<b>passed</b>

## 2 References

### 2.1 Specifications

- [1] CFR 47 §2.1091 Radiofrequency radiation exposure evaluation: mobile devices
- [2] CFR 47 §15.212 Modular transmitters
- [3] CFR 47 §1.1307 and §1.1310
- [4] KDB 447498 D01 General RF Exposure Guidance v06  
RF Exposure procedures and equipment authorization policies for mobile and portable devices
- [5] KDB 865664 D02 RF Exposure Reporting v01r02  
RF Exposure compliance reporting and documentation considerations

### 2.2 Bibliographical Data

- [6] Installation manual PR709\_1.pdf

### 2.3 Glossary of Terms

AVG	Average
EMC	Electro Magnetic compatibility
EMF	Electro Magnetic Fields
EUT	Equipment Under Test
FCC	Federal Communication Commission
ITE	Information Technology Equipment
KDB	(OET) Knowledge Data Base
MPE	Maximum Permissible Exposure
N/A	Not Applicable
SAR	Specific Absorption Rate

### 3 General Information

#### 3.1 Identification of Client

BOWA-electronic GmbH & Co. KG  
Heinrich-Herz-Straße 4-10  
72810 Gomaringen

#### 3.2 Test Laboratory

SGS Germany GmbH  
Hofmannstraße 50  
81379 München

#### 3.3 Time Schedule

Delivery of EUT: Oct 10, 2016  
Start of test: Oct 14, 2016  
End of test: Jan 27, 2017

#### 3.4 Participants

Name	Function
André Stéphane Nakpane	Editor / Assessment

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## 4 Equipment Under Test

**Test item description ..:** RFID Reader Monopolar

Trade Mark.....:

Manufacturer / Importer.: BOWA-electronic GmbH & Co. KG

Model/Type .....: TAG-PCB Type BOWA E225\_RFID\_Mono\_V02

Number of tested samples 2

.....:

Serial Number(s) .....

Ratings.....: +5 V  $\pm$  15% DC

Primary functions of EUT: RFID

Type of modulation.....: ASK 100% according to ISO 15693

Operating frequency 13.110 – 14.010 MHz  
bands .....

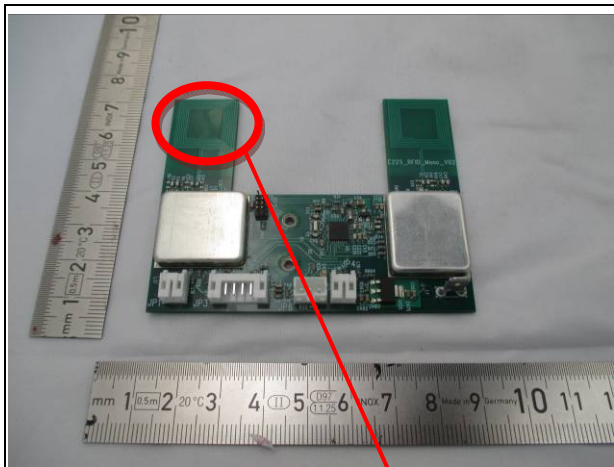
Environment in which  
EUT is intended to be Indoor 0°C to +35°C  
used .....

The RFID reader is conceived for integration in the BOWA ARC-Series and Karl Storz Autocon III Series HF Generator with coding system. Communication via a DCU-Unit is made over serial protocol UART TTL.

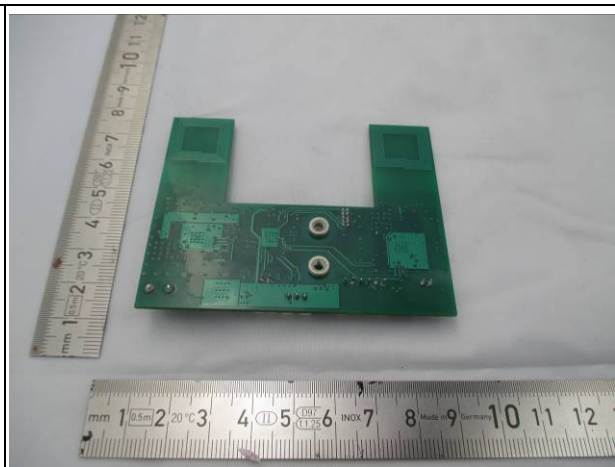
The RFID reader is provided with 2 integrated antennas, which are controlled independently from each other. The antenna cannot be activated simultaneously but sequentially

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#### 4.1 Photographs of EUT and accessories

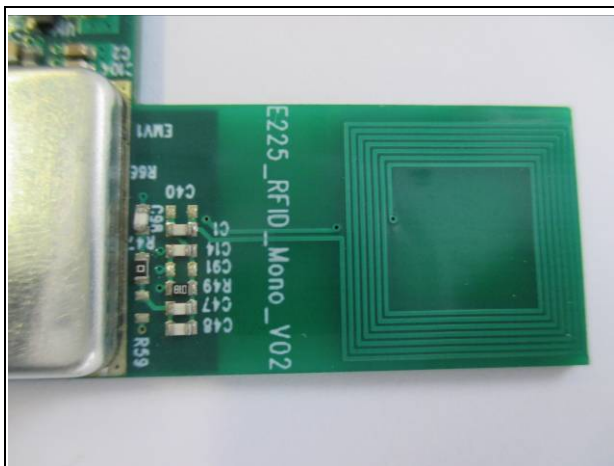


Front view of EUT (Left: Antenna Top; Right: Antenna Bottom)

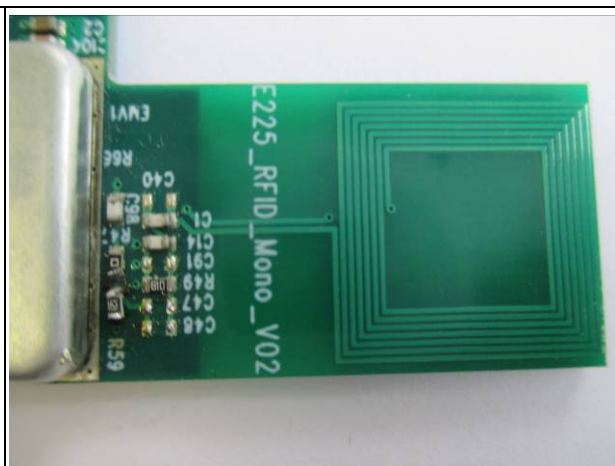


Rear view of EUT

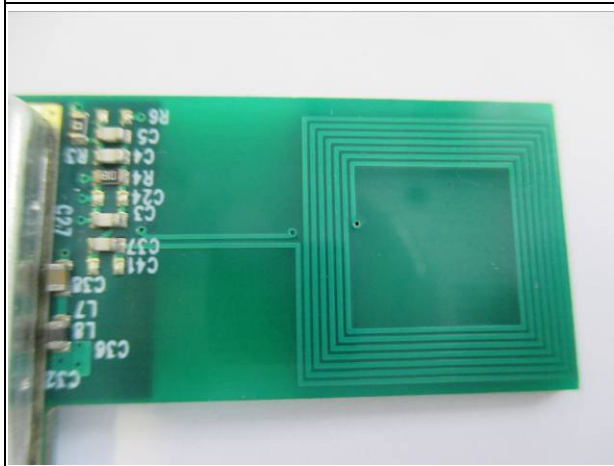
**Figure 4-1: RFID Reader Monopolar**



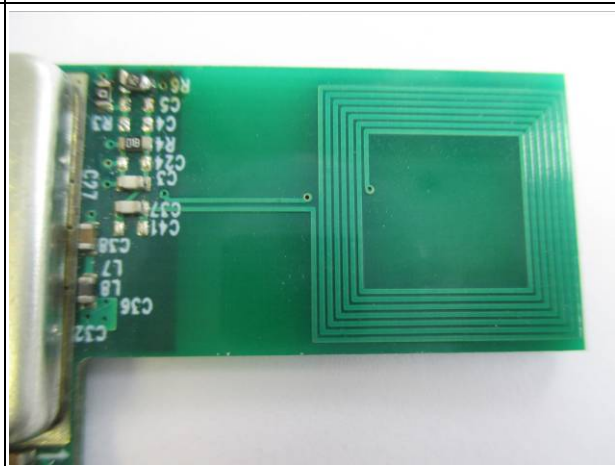
Real DUT (Antenna Bottom)



DUT with Dummy Load (Antenna Bottom)



Real DUT (Antenna Top)

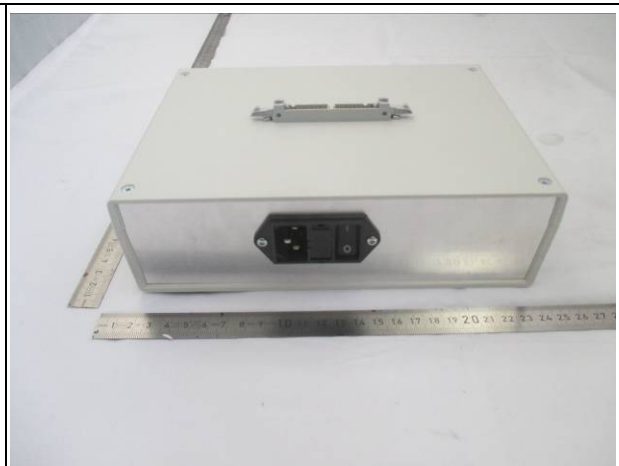


DUT with Dummy Load (Antenna Top)

**Figure 4-2: RFID Reader Monopolar - Differences between real Module and Dummy Load**



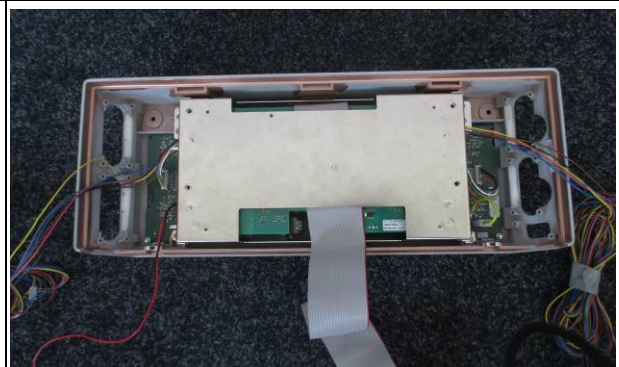
Front view of power supply



Rear view of power supply



Front view of host controller



Rear view of host controller



Front view of tag



Rear view of tag

**Figure 4-3: Auxiliary Equipment**

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## 4.2 Operational conditions

### 4.2.1 Software

Software necessary for operating, controlling and monitoring the EUT:

Name	Identification Code/Issue	Task

### 4.2.2 Radio parameters

The tested radio equipment was qualified acc. the following conditions:

<b>Permitted Frequency Range</b>	13.553 ... 13.567 MHz
<b>Frequency Separation</b>	n/a
<b>Number of Channels</b>	1
<b>Test Frequencies:</b>	
<b>Transmitter</b>	13.56 MHz
<b>Receiver</b>	13.56 MHz
<b>Transmitter: Rated Output Power (Prat)</b>	23 dBm
<b>Modulation: Type</b>	ASK, 100%, ISO 15693
<b>Operation w/o modulation</b>	Yes
<b>Antenna: Type</b>	Integral
<b>Number of Antenna Ports</b>	2
<b>Power Src.: Type</b>	DC Supply
<b>Battery type (if applicable)</b>	N/A
<b>Voltage nominal</b>	+5 V DC
<b>minimal</b>	+4.25 V DC
<b>maximum:</b>	+5.75 V DC

Table 4-1: Overview of EUT radio parameters

### 4.2.3 Operation modes

Operation mode	Active	State	Comment
1	<input checked="" type="checkbox"/>	Continuous operation without transponder:	Continuous unmodulated carrier signal with maximum output power
2	<input checked="" type="checkbox"/>	Continuous operation with a RFID transponder:	Reading of the RFID transponder
3	<input checked="" type="checkbox"/>	Standby mode:	Device connected to active host, but TX/RX mode disabled.

#### 4.2.4 Test configurations

Config.	EUT orientation		Active Antenna		Tag		Comment
	Vertical	Horizontal	Bottom	Top	Yes	No	
1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	None
2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	None
3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	None
4	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	None

### 4.3 Hardware Configuration

#### 4.3.1 Components of the EUT

Name	Identification Code/Issue/Serial Number	Interface type	Quantity
RFID reader Monopolar	E225_RFID_Monopolar_V02		1
RFID reader Monopolar	E225_RFID_Monopolar_V02		1
HF Tag	--	Induction loop	1

#### 4.3.2 Interface description

All interfaces are identified independent whether they are tested or not.

##### 4.3.2.1 Power supply port

Type (AC/DC)	Voltage	Frequency	Current	Power
AC	100 V – 127 V 220 V – 240 V	60 Hz 50 Hz		
DC	5V	--	< 1A	

##### 4.3.2.2 Earthing and Grounding connections <sup>1</sup>

Type	Task	Connected to	Test E/I/NA
None			

##### 4.3.2.3 Communication <sup>2</sup> and signal <sup>3</sup> ports

Type	Bit rate/frequency/ Signal	Task	Connected to
UART	115200 BAUD	Control of Reader and monitoring of the Communication.	Control unit

<sup>1</sup> Safety ground, functional earth, specific ground connections

<sup>2</sup> Connections to communication networks, analog, Ethernet, antenna, wireless, GPS,

<sup>3</sup> Signaling, monitoring and control ports

## 5 Test Equipment

### 5.1 Test Facility

The EMC-tests are carried out in the EMC-laboratory of SGS Germany, Consumer and Retail, Hofmannstraße 50, 81379 München, Germany.

Chamber	1	2	3	4 / 5	6
Dimensions (net)	17.7 * 10.8 * 6.8 m	9.6 * 8.5 * 5.3 m	7.4 * 6.6 * 5.2 m	4.1 * 3.5 * 3.5m	6.4 * 4.3 * 4.3m
Max. Door Exit (w x h)	2.9 * 3.86 m	3.9 * 4.0 m	2.0 * 2.7 m	0.9 * 2.25 m	1.8 * 3.0 m
Shielding material	Sheet steel (Thickness: 1.5mm on floor, 1.0 mm on walls and ceiling)	Sheet steel	Sheet steel	Sheet steel	Sheet steel
Absorbers	Hybrid absorbers on walls and ceiling (TDK), length 1 m	Hybrid absorbers on walls and ceiling (E+C), length 0.5 m	Hybrid absorbers on walls and ceiling (E+C), length 0.3 m	Without absorbers	Without absorbers
Floor	Metallic ground plane floor load: 12 t/m <sup>2</sup>	Metallic ground plane floor load: 1.5 t/m <sup>2</sup>	Metallic ground plane floor load: 1 t/m <sup>2</sup>	Metallic ground plane	Metallic ground plane
Turntable	Ø 4 m / 7 t	Ø 3.2 m / 1.5 t	Ø 2.0 m / 1 t		
Listings	Industry Canada listed until June 2018 Reg. No. 9058A-1	Industry Canada listed until June 2018 Reg. No. 9058A-2  VCCI-listed until Oct. 2019, Reg. No. R-2623, G-266	Industry Canada listed until June 2018 Reg. No. 9058A-3		VCCI-listed until Oct. 2019, Reg. No. C-2866 & No. T-1942
Specials	<b>Emission:</b> <b>30 – 1000 MHz (d = 10 m)</b> - NSA acc. to: • CISPR 16-1-4 • ANSI C63.4  <b>1 – 18 GHz (d = 3 m)</b> Site VSWR 1 – 18 GHz acc. to CISPR 16-1-4	<b>Emission:</b> <b>30 – 1000 MHz (d = 3 m)</b> - NSA acc. to: • CISPR 16-1-4 • ANSI C63.4  <b>1 – 18 GHz (d = 3 m)</b> Site VSWR 1 – 18 GHz acc. to CISPR 16-1-4	<b>Emission:</b> <b>30 – 1000 MHz (d = 3 m)</b> - NSA acc. to: • CISPR 16-1-4 • ANSI C63.4  <b>1 – 18 GHz (d = 3 m)</b> Site VSWR 1 – 18 GHz acc. to CISPR 16-1-4		
	<b>Immunity:</b> Field uniformity 27 – 6000 MHz acc. IEC/EN 61000-4-3	<b>Immunity:</b> Field uniformity 80 – 6000 MHz acc. IEC/EN 61000-4-3	<b>Immunity:</b> Field uniformity 80 – 6000 MHz acc. IEC/EN 61000-4-3		

**FCC** (Federal Communication Commission): Recognition by Bundesnetzagentur (BNetzA-CAB-14/21-09) and Designation as **CAB (Conformity Assessment Body)**: Designation Number DE0013; Test firm Registration #: 366296

Designation **KBA (Kraftfahrt-Bundesamt)** as Technical Service category A and D. Registration Number: KBA-P 00083-97

**CB** Testing Laboratory under the responsibility of SGS CEBC as National Certification Body and to carry out testing within the **IECEE CB Scheme**.

Designation No. for **RRA** (Radio Research Agency) in **Korea**; **EU0145**

## 5.2 Measurement Uncertainty

As far as the underlying standards include requirements concerning the uncertainty of measuring instruments or measuring methods, they are met.

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities.

The expanded measurement uncertainty of the measuring chain was calculated for all tests according to the "ISO Guide to the expression of uncertainty in measurement (GUM)". The results are documented in an "internal controlled document".

The measuring accuracy for all measuring devices is given in their technical description. The measuring instruments, including any accessories, are calibrated respectively verified to ensure the necessary accuracy. Depending on the kind of measuring equipment it is checked within regular intervals or directly before the measurement is performed. Adjustments are made and correction factors applied to measured data in accordance with the specifications of the specific instrument.

The expanded measurement instrumentation uncertainty of our Test Laboratory meets the requirements of IEC CISPR 16-4-2 "Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-2: Uncertainties, statistics and limit modeling – Measurement instrumentation uncertainty" and the relevant basic standards for all listed Tests.

## 6 Assessment Specifications and Results

The test results in the report refer exclusively to the test object described in section 4.

The EUT has been evaluated according to [4]

Compliance of electromagnetic emissions from electronic and electrical equipment with the basic restrictions usually is determined by measurements and, in some cases, calculation of the exposure level. If the electrical power radiated by the equipment is sufficiently low, the electromagnetic fields emitted will be incapable of producing exposures that exceed the basic restrictions.

The EUT is an RFID reader equipment and thus identified as intentional radiator. It is low-power equipment. The antenna loop of the RFID reader constitutes an intentional radiating electromagnetic source.

<b>Operating frequency band</b>	13.553 MHz to 13.567MHz
<b>Output Power to antenna</b>	23 dBm (200 mW)

### 6.1 Test procedure

The test is conducted according to **KDB 447498 D01 [4] section 7.**

- Test equipment: Broadband probe
  - isotropic magnetic field strength probe
- Measurement range:
  - magnetic field 300 kHz – 30 MHz
- Measurement duration: 6 min
- Distance to EUT: 20 cm

### 6.2 Test equipment

ID	Measuring Instrument	Specification	Status	Calibration due
P1837	Field Meter	Anzeigenbereich: 0.01 V/m bis 100.0 kV/m; Korrekturfrequenz: 1 kHz bis 100 GHz	cal	Nov 2017
P1842	Field Probe, H-field	300 kHz - 30MHz	cal	Nov 2017
P1917	Data logger for humidity and temperature (MZ6)	Sensortyp NTC: -20...+ 70°C, Auflösung: 0.1 °C; Genauigkeit: +/- 0.4 °C; Feuchtesensor kapazitiv: 0 ... 100 %rF; Genauigkeit: +/- 2 %rF bei 25 °C; Au	chk	Dec 2017
P0977	test chamber 6	6.4 • 4.3 • 4.35 m; without absorbers	chk	Jan 2017

cal = Calibration, car = Calibration restricted use, chk = Check, chr = Check restricted use, cpu = Check prior to use, calchk = Calibration and check, ind = for indication only, cnn = Calibration not necessary, man = Maintenance

### 6.3 Environmental conditions

Temperature: 24.1 – 24.5°C

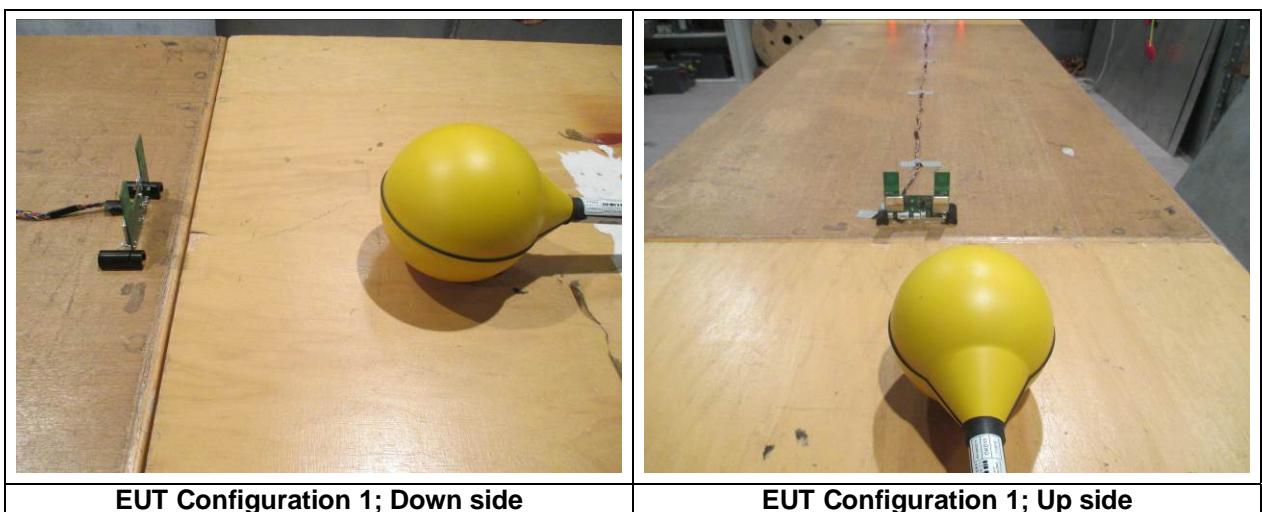
Humidity: 19.7 – 20.4 %

## 6.4 Evaluation of emitted EMF

Photo documentation of the test set-up:



**Figure 6-1: General test setup for H/B-field (radiated)**



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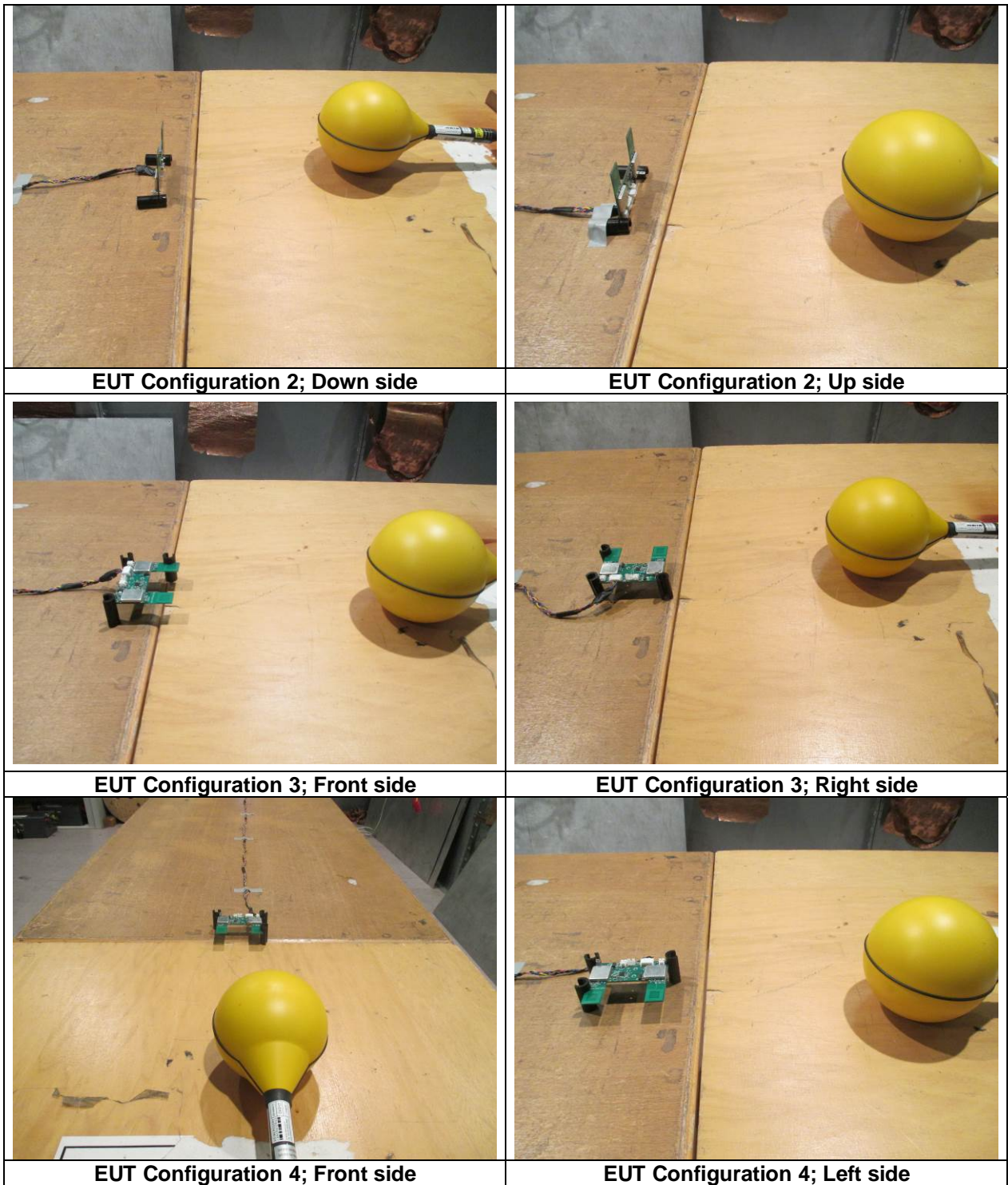


Figure 6-2: EUT orientations for H/B-field (radiated)



Configurations	Measurement Result for Magnetic Field [A/m]		Limit	Verdict
	Average	Max		
1; Down side	0.054	0.102	$4.89/f^4$ = 0.36	Pass
1; Up side	0.029	0.081		Pass
2; Down side	0.045	0.103		Pass
2; Up side	0.040	0.097		Pass
3; Front side	0.035	0.090		Pass
3; Right side	0.037	0.095		Pass
4; Front side	0.039	0.093		Pass
4; Left Side	0.040	0.094		Pass

Table 6-1: Test Results

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm <sup>2</sup> )	Averaging time (minutes)
<b>(A) Limits for Occupational/Controlled Exposure</b>				
0.3-3.0	614	1.63	*100	6
3.0-30	1842/f	4.89/f	*900/f <sup>2</sup>	6
30-300	61.4	0.163	1.0	6
300-1,500			f/300	6
1,500-100,000			5	6
<b>(B) Limits for General Population/Uncontrolled Exposure</b>				
0.3-1.34	614	1.63	*100	30
1.34-30	824/f	2.19/f	*180/f <sup>2</sup>	30
30-300	27.5	0.073	0.2	30
300-1,500			f/1500	30
1,500-100,000			1.0	30

f = frequency in MHz \* = Plane-wave equivalent power density

## Verdict:

According to KDB 447498 D01 [4] procedures the EUT complies with the requirements of CFR 47 §1.1310 Table 1.

<sup>4</sup> Worst case limit magnetic field for occupational/Controlled Exposure with f = 13.56 MHz

## 7 Disclaimer

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