

TEST REPORT

of the accredited test laboratory

TÜV Nr.:M/FG-15/165

:
Deutschstraße 10
A-1230 Vienna
Tel.:
+43(0)1 610 91-0
pzw@tuv.at

Division:
Medical Technology/
Communication
Technology/ EMC

Department:
Testing Body for
Communication
Technology/ EMC

TÜV®

Applicant: KEBA AG
Gewerbepark Urfahr
A-4041 Linz

Tested Product: RFID reader module

FCC-ID: U870006

IC-ID: Not decided yet

Manufacturer: See Applicant

Output power / 56 dBµV/m @ **power supply:** 24V DC
field strength: 3m distance

Frequency range: 13,56 MHz **Channel separation:** N/A

Standard: FCC: 47 CFR Part 15 (October 1, 2014 edition)
RSS-210 Issue 8, December 2010



Testing Laboratory,
Inspection Body,
Certification Body,
Calibration Laboratory

Notified Body 0408
IC 2932K-1

Chairman of the
Supervisory Board:
KR Dipl.-Ing. Johann
MARIHART

Management:
Dipl.-Ing. Dr. Hugo
EBERHARDT
Mag. Christoph
WENNINGER

Registered Office:
Krugerstrasse 16
1015 Vienna/Austria

Branch Office:
Dornbirn, Graz,
Innsbruck, Klagenfurt,
Linz, Salzburg, St. Pölten,
Wels, Wien 1, Wien 20,
Wien 23, Brixen (I) und
Filderstadt (D)

Company Register
Court / - Number:
Vienna / FN 288476 f

Banking Connections
BA CA 52949 001 066
IBAN
AT1312000529490010
BIC BKAUATWW
RBI 001-04.093.282
IBAN
AT1531000001040932
BIC RZBAATWW

UID ATU63240488
DVR 3002476

TUV Austria Services GmbH

Test laboratory for EMC

Supervisor of EMC-laboratory:

Ing. Wilhelm Seier



20.10.2015

Copy Nbr.: 01

checked by:

Ing. Michael Emminger

A publication of this test report is only permitted literally.
Copying or reproduction of partial sections needs a written permission of
TUV Austria Services GmbH.

The results of this test report only refer to the provided equipment.

LIST OF MEASUREMENTS

The complete list of measurements called for in 47 CFR 15 and RSS-210 is given below.

SUBCLAUSE	PARAMETER TO BE MEASURED	PAGE
	Intentional Radiators	
	Test object data	3
15.225 (a) (b) (c) A2.6	Field strength of emissions at 13,110 – 14,010 MHz	4
15.225 (d) 2.5	Emissions outside 13,110 – 14,010 MHz (15.209)	5-6
15.225 (e) A2.6	Frequency tolerance	7

TEST OBJECT DATA

General EUT Description

This RFID module device is intended to read data from NFC tags. It therefore uses 13,56 MHz at a very low transmitter signal level. The module is intended to be used only by the applicant.

2.1033 (c) Technical description

2.1033 (4) Type of emission: continuous transmission

2.1033 (5) Frequency range: only one operating frequency 13,56 MHz.

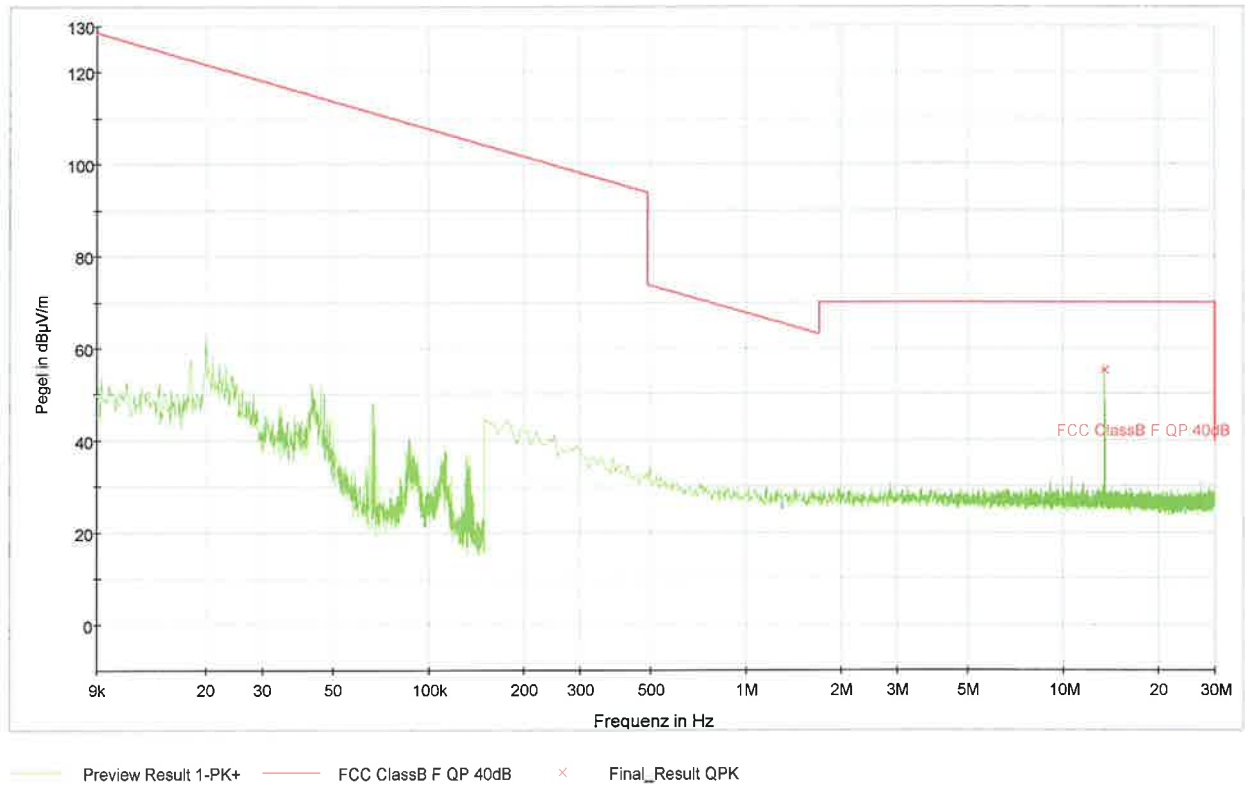
2.1033 (6) Power range and Controls: Fixed output power resulting in 56 dB μ V/m field strength in 3m distance.

2.1033 (7) Maximum output power rating: 56 dB μ V/m @ 3m distance.

2.1033 (8) DC Voltage and Current: 24 V DC powered
maximum current consumption: 110 mA

Field strength of emissions at 13,110 – 14,010 MHz

**§ 15.225 (a) (b) (c)
A2.6**



Field strength at 13,56 MHz: 56 dBµV/m = 631 µV/m at 3 m distance. Converted with 40dB per decade for the 30m Limit this would be a Level of 16dBµV/m or 6,31 µV/m.

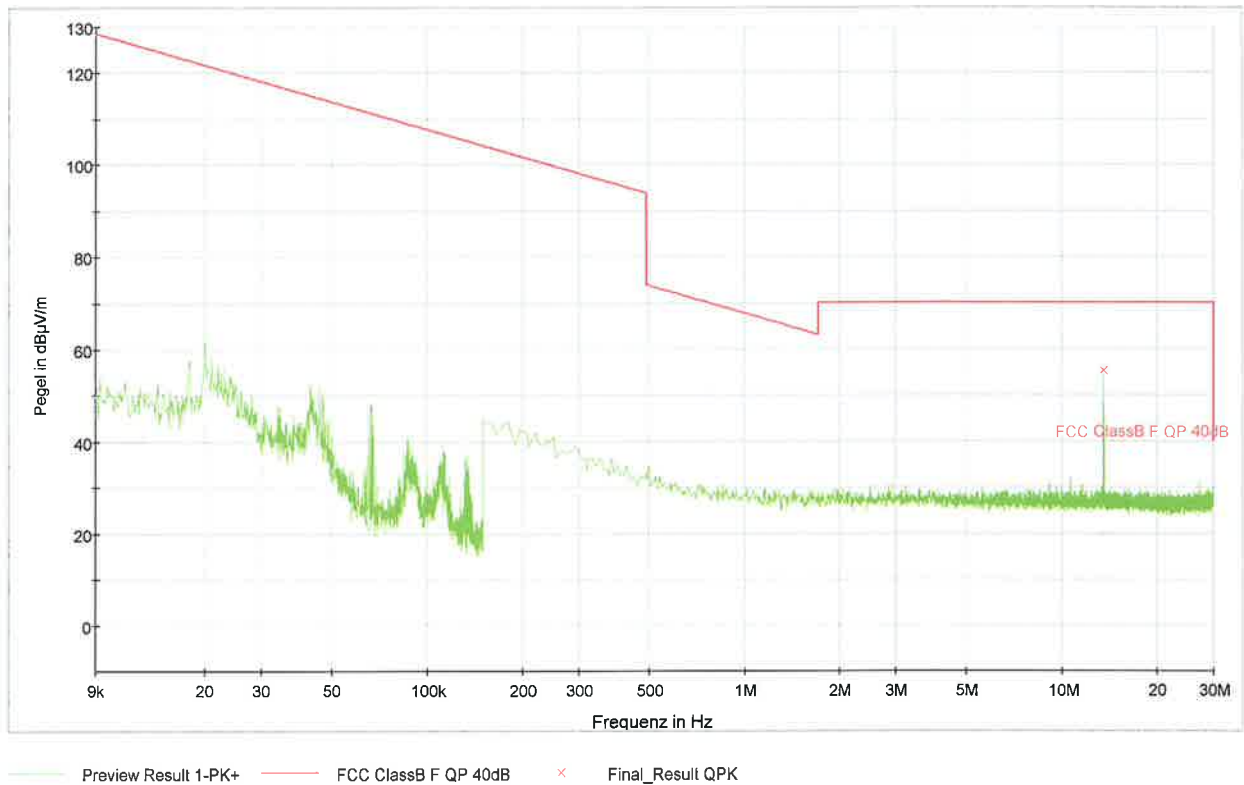
LIMIT SUBCLAUSE 15.225(a) (b) (c) (A2.6)

- (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.
- (b) Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.
- (c) Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

Test Equipment used: NT-100; NT-110; NT-111; NT-112; NT-122; NT-151; NT-207

Emissions outside 13,110 – 14,010 MHz

**§ 15.225 (d)
2.5**



LIMIT

SUBCLAUSE 15.225(d) (15.209) (2.5)

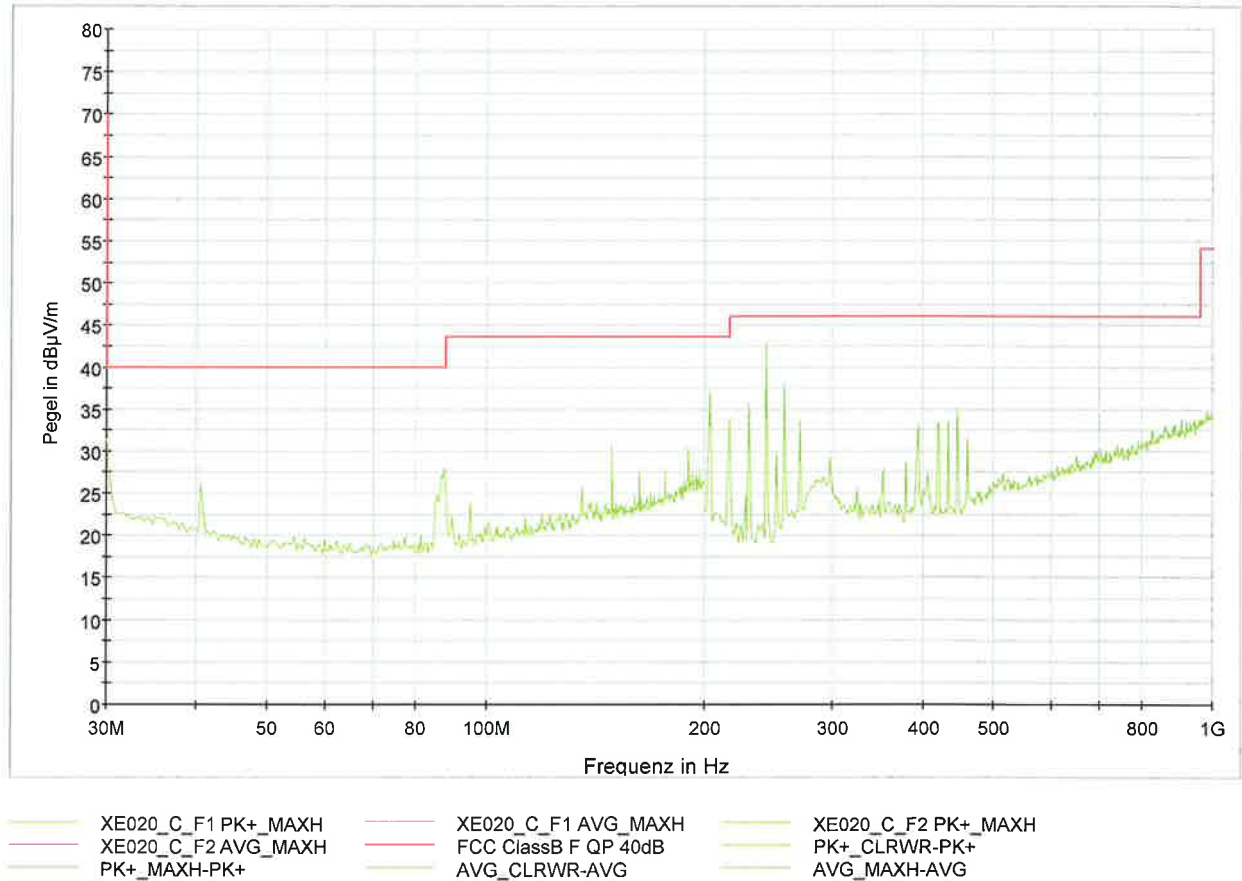
(d) The field strength of any emissions appearing outside of the 13.110–14.010 MHz band shall not exceed the general radiated emission limits in §15.209.

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009–0.490	2400/F(kHz)	300
0.490–1.705	24000/F(kHz)	30
1.705–30.0	30	30
30–88	100**	3
88–216	150**	3
216–960	200**	3
Above 960	500	3

Test Equipment used: NT-100; NT-110; NT-111; NT-112; NT-122; NT-151; NT-207

Emissions outside 13,110 – 14,010 MHz

**§ 15.225 (d)
2.5**



LIMIT

SUBCLAUSE 15.225(d) (15.209) (2.5)

(d) The field strength of any emissions appearing outside of the 13.110–14.010 MHz band shall not exceed the general radiated emission limits in §15.209.

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009–0.490	2400/F(kHz)	300
0.490–1.705	24000/F(kHz)	30
1.705–30.0	30	30
30–88	100**	3
88–216	150**	3
216–960	200**	3
Above 960	500	3

Test Equipment used: NT-100; NT-110; NT-111; NT-112; NT-129; NT-131; NT-207

Frequency tolerance

§ 15.225 (e) A2.6

Frequency error vs. Supply voltage

DC-Voltage	Frequency Error Hz	Frequency Error %
20,4 V	+195	0,00143805
24 V	+195	0,00143805
27,6 V	+185	0,00136431

Frequency error vs. Temperature

Temperature °C	Frequency Error Hz	Frequency Error %
-20	+310	0,00228614
+20	+195	0,00143805
+50	+40	0,00029499

LIMIT SUBCLAUSE 15.225(e) (A2.6)

(e) The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ 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.

Appendix 1

Test equipment used

☐ Anechoic Chamber with 3m measurement distance	NT-100	☐ Spectrum analyzer – FSP7 9 kHz – 7 GHz	NT-200
☐ Stripline according to ISO 11452-5	NT-108	☐ ESCI - Test receiver 9 kHz - 7 GHz	NT-203/1
☐ MA4000 - Antenna mast 1 - 4 m height	NT-110/1	☐ ESI26 – Test receiver 20 Hz – 26,5 GHz	NT-207
☐ DS - Turntable 0 - 400 ° Azimuth	NT-111/1	☐ Digital Radio Tester CTS55	NT-208
☐ CO3000 Controller Mast+Turntable	NT-112/1	☐ Noise-gen., ITU-R 559-2 20 Hz – 20 kHz	NT-209
☐ HUF-Z3 - Log. Per. Antenna 200 - 1000 MHz	NT-121	☐ CMTA - Radiocommunication analyzer ; 0,1 - 1000 MHz	NT-210
☐ HFH-Z2 - Loop Antenna 9 kHz - 30 MHz	NT-122	☐ 3271 - Spectrum analyzer 100 Hz - 26,5 GHz	NT-211
☐ HFH-Z6 - Rod Antenna 9 kHz - 30 MHz	NT-123	☐ Digital Radio Tester Aeroflex 3920	NT-212/1
☐ 3121C - Dipole Antenna 28 - 1000 MHz	NT-124	☐ Mixer M28HW 26,5 GHz - 40 GHz	NT-214
☐ 3115 - Horn Antenna 1 - 18 GHz (immunity)	NT-125	☐ RubiSource T&M Timing reference	NT-216
☐ 3116 - Horn Antenna 18 - 40 GHz	NT-126	☐ Radiocommunication analyzer SWR 1180 MD	NT-217
☐ SAS-200/543 - Bicon. Antenna 20 MHz - 300 MHz	NT-127	☐ Mixer M19HWD 40 GHz – 60 GHz	NT-218
☐ AT-1080 - Log. Per. Antenna 80 - 1000 MHz	NT-128	☐ Mixer M12HWD 60 GHz – 90 GHz	NT-219
☐ HK-116 - bicon. Antenna 20 MHz - 300 MHz	NT-129	☐ DSO9104 Digital scope	NT-220/1
☐ HK-116 - bicon. Antenna 20 MHz - 300 MHz	NT-130	☐ TPS 2014 Digital scope	NT-222
☐ 3146 - Log. Per. Antenna 200 – 1000 MHz	NT-131	☐ Artificial Ear according to IEC 60318	NT-224
☐ Loop Antenna H-Field	NT-132	☐ 1 kHz Sound calibrator	NT-225
☐ Horn Antenna 500 MHz - 2900 MHz	NT-133	☐ B10 - Harmonics and flicker analyzer	NT-232
☐ Horn Antenna 500 MHz - 6000 MHz	NT-133/1	☐ ARS 16/3 – Harmonics- flicker analyzer	NT-232/1
☐ Log. per. Antenna 800 MHz - 2500 MHz	NT-134	☐ SRM-3000 Spectrum analyzer	NT-233
☐ Log. per. Antenna 800 MHz - 2500 MHz	NT-135	☐ SRM-3006 Spectrum analyzer	NT-233/1a
☐ BiConiLog Antenna 26 MHz – 2000 MHz	NT-137	☐ E-field probe SRM 75 MHz – 3 GHz	NT-234
☐ Conical Dipol Antenna PCD8250	NT-138	☐ Field Meter NBM-500 incl. E- and H-Field probes	NT-240a-d
☐ HF 906 - Horn Antenna 1 - 18 GHz (emission)	NT-139	☐ Hall-Teslameter ETM-1	NT-241
☐ HZ-1 Antenna tripod	NT-150	☐ EFA-3 H-field- / E-field probe	NT-243
☐ BN 1500 Antenna tripod	NT-151	☐ Field Meter EMR-200 100 kHz – 3 GHz	NT-244
☐ Ant. tripod for EN61000-4-3 Model TP1000A	NT-156	☐ E-field probe 100 kHz – 3 GHz	NT-245
☐ Power quality analyzer Fluke 1760 (complete set)	NT-160 - NT-173	☐ H-field probe 300 kHz – 30 MHz	NT-246

Division Medical
Technology/
Communication
Technology/ EMC

Department: FG

Test report number:
M/FG-15/165

Page: 1 of 3

Date: 20.10.2015

Checked by: 

Appendix 1 (continued)

Test equipment used

☐ E-field probe 3 MHz – 18 GHz	NT-247	☐ VCS 500-M6 Surge-Generator	NT-326
☐ H-field probe 27 MHz – 1 GHz	NT-248	☐ Oscillatory Wave Simulator incl. Coupling networks	NT-328a+b+c
☐ ELT-400 1 Hz – 400 kHz	NT-249	☐ BTA-250 - RF-Amplifier 9 kHz - 220 MHz / 250 W	NT-330
☐ MDS 21 - Absorbing clamp 30 - 1000 MHz	NT-250	☐ T82-50 RF-Amplifier 2 GHz – 8 GHz	NT-331
☐ FCC-203I EM Injection clamp	NT-251	☐ 500W1000M7 - RF-Amplifier 80 - 1000 MHz / 500 W	NT-332
☐ FCC-203I-DCN Ferrite decoupling network	NT-252	☐ AS0102-65R - RF-Amplifier 1 GHz - 2 GHz	NT-333
☐ PR50 Current Probe	NT-253	☐ APA01 – RF-Amplifier 0,5 GHz – 2,5 GHz	NT-334
☐ i310s Current Probe	NT-254/1	☐ Preamplifier 1 GHz - 4 GHz	NT-335
☐ Fluke 87 V True RMS Multimeter	NT-260	☐ Preamplifier for GPS MKU 152 A	NT-336
☐ Model 2000 Digital Multimeter	NT-261	☐ Preamplifier 100 MHz – 23 GHz	NT-337
☐ Fluke 87 V Digital Multimeter	NT-262/1	☐ DC Block 10 MHz – 18 GHz Model 8048	NT-338
☐ ESH2-Z5-U1 Artificial mains network 4x25A	NT-300	☐ 2-97201 Electronic load	NT-341
☐ ESH3-Z5-U1 Artificial mains network 2x10A	NT-301	☐ TSX3510P - Power supply 0-30 V / 0 - 10 A	NT-344
☐ ESH3-Z6-U1 Artificial mains network 1x100A	NT-302	☐ TSX3510P - Power supply 0-30 V / 0 - 10 A	NT-345
☐ ESH3-Z6-U1 Artificial mains network 1x100A	NT-302a	☐ VDS 200 Mobil-impuls-generator	NT-350
☐ PHE 4500/B Power amplifier	NT-304	☐ LD 200 Mobil-impuls-generator	NT-351
☐ PAS 5000 Power amplifier	NT-304/1a	☐ MPG 200 Mobil-Impuls-Generators	NT-352
☐ EZ10 T-Artificial Network	NT-305	☐ EFT 200 Mobil-impuls-generator	NT-353
☐ SMG - Signal generator 0,1 - 1000 MHz	NT-310	☐ AN 200 S1 Artificial Network	NT-354
☐ SMA100A - Signal generator 9 kHz - 6 GHz	NT-310/1	☐ FP-EFT 32M 3 ph. Coupling filter (Burst)	NT-400/1
☐ RefRad Reference generator	NT-312	☐ PHE 4500 - Mains impedance network	NT-401
☐ SMP 02 Signal generator 10 MHz - 20 GHz	NT-313	☐ IP 6.2 Coupling filter for data lines (Surge)	NT-403
☐ 40 MHz Arbitrary Generator TGA1241	NT-315	☐ TK 9421 High Power Volt. Probe 150 kHz - 30 MHz	NT-409
☐ Artificial mains network NSLK 8127-PLC	NT-316	☐ ESH2-Z3 - Probe 9 kHz - 30 MHz	NT-410
☐ Inrush Current Source for PAS 5000	NT-317a	☐ IP 4 - Capacitive clamp (Burst)	NT-411
☐ Control and measurement device Sycore	NT-318	☐ Highpass-Filter 100 MHz – 3 GHz	NT-412
☐ PEFT - Burst generator up to 4 kV	NT-320	☐ Highpass-Filter 600 MHz – 4 GHz	NT-413
☐ ESD 30 System up to 25 kV	NT-321	☐ Highpass-Filter 1250 MHz – 4 GHz	NT-414
☐ PSURGE 4.1 Surge generator	NT-324	☐ Highpass-Filter 1800 MHz – 16 GHz	NT-415
☐ IMU4000 Immunity test system	NT-325/1		

Division Medical
Technology/
Communication
Technology/ EMC

Department: FG

Test report number:
M/FG-15/165

Page: 2 of 3

Date: 20.10.2015

Checked by: 

Appendix 1 (continued)

Test equipment used

☐	Highpass-Filter 3500 MHz – 18 GHz	NT-416	☐	FCC-801-S25 Coupling decoupling network	NT-462
☐	RF-Attenuator 10 dB DC – 18 GHz / 50 W	NT-417	☐	FCC-801-T4 Coupling decoupling network	NT-463
☐	RF-Attenuator 6 dB DC – 18 GHz / 50 W	NT-418	☐	FCC-801-C1 Coupling decoupling network	NT-464
☐	RF-Attenuator 3 dB DC – 18 GHz / 50 W	NT-419	☐	SW 9605 - Current probe 150 kHz – 30 MHz	NT-465/1
☐	RF-Attenuator 20 dB DC - 1000 MHz / 25 W	NT-421	☐	95242-1 – Current probe 1 MHz – 400 MHz	NT-468
☐	RF-Attenuator 30 dB DC - 1000 MHz / 1 W	NT-423	☐	94106-1L-1 – Current probe 100 kHz – 450 MHz	NT-471
☐	RF-Attenuator 30 dB	NT-424	☐	GA 1240 Power amplifier according to EN 61000-4-16	NT-480
☐	RF-Attenuator 6 dB DC - 1000 MHz / 1 W	NT-425	☐	Coupling networks according to EN 61000-4-16	NT-481 - NT-483
☐	RF-Attenuator 6 dB DC - 1000 MHz / 1 W	NT-426	☐	Van der Hoofden Test Head	NT-484
☐	RF-Attenuator 6 dB	NT-428	☐	PC P4 3 GHz Test computer	NT-500
☐	RF-Attenuator 0 dB - 81 dB	NT-429	☐	PC P4 1700 MHz Notebook	NT-505
☐	WRU 27 - Band blocking 27 MHz	NT-430	☐	Monitoring camera with Monitor	NT-511
☐	WHJ450C9 AA - High pass 450 MHz	NT-431	☐	ES-K1 Version 1.71 SP2 Test software	NT-520
☐	WHJ250C9 AA - High pass 250 MHz	NT-432	☐	EMC32 Version 9.25 Test software	NT-520/1
☐	RF-Load 150 W	NT-433	☐	SRM-TS Version 1.3 software for SRM-3000	NT-522
☐	Impedance transducer 1:4 ; 1:9 ; 1:16	NT-435	☐	SRM-TS Version 1.3.1 software for SRM-3006	NT-522/1
☐	RF-Attenuator DC – 18 GHz 6 dB	NT-436	☐	Spitzenberger und Spies Test software V3.4	NT-525
☐	RF-Attenuator DC – 18 GHz 6 dB	NT-437	☐	Noise power test apparatus according to EN 55014	NT-530
☐	RF-Attenuator DC – 18 GHz 10 dB	NT-438	☐	Vertical coupling plane (ESD)	NT-531
☐	RF-Attenuator DC – 18 GHz 20 dB	NT-439	☐	Test cable #4 for EN 61000-4-6	NT-553
☐	I+P 7780 Directional coupler 100 - 2000 MHz	NT-440	☐	Test cable #3 for conducted emission	NT-554
☐	ESH3-Z2 - Pulse limiter 9 kHz - 30 MHz	NT-441	☐	Test cable #5+#6 ESD-cable (2x470k)	NT-555 + NT-556
☐	Power Divider 6 dB/1 W/50 Ohm	NT-443	☐	Test cable #8 Sucoflex 104EA	NT-559
☐	Directional coupler 0,1 MHz – 70 MHz	NT-444	☐	Test cable #9 (for outdoor measurements)	NT-580
☐	Directional coupler 0,1 MHz – 70 MHz	NT-445	☐	Test cable #10 (for outdoor measurements)	NT-581
☐	Tube imitations according to EN 55015	NT-450	☐	Test cable #13 Sucoflex 104PE	NT-584
☐	FCC-801-M3-16A Coupling decoupling network	NT-458	☐	Test cable #21 for SRM-3000	NT-592
☐	FCC-801-M2-50A Coupling decoupling network	NT-459	☐	Shield chamber	NT-600
☐	FCC-801-M5-25 Coupling decoupling network	NT-460	☐	Climatic chamber	M-1200
☐	FCC-801-AF10 Coupling decoupling network	NT-461			

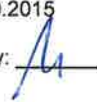
Division Medical
Technology/
Communication
Technology/ EMC

Department: FG

Test report number:
M/FG-15/165

Page: 3 of 3

Date: 20.10.2015

Checked by: 

Appendix 2 Photodocumentation

Description: Module in test setup view #1

Division Medical Technology/
Communication Technology/
EMC

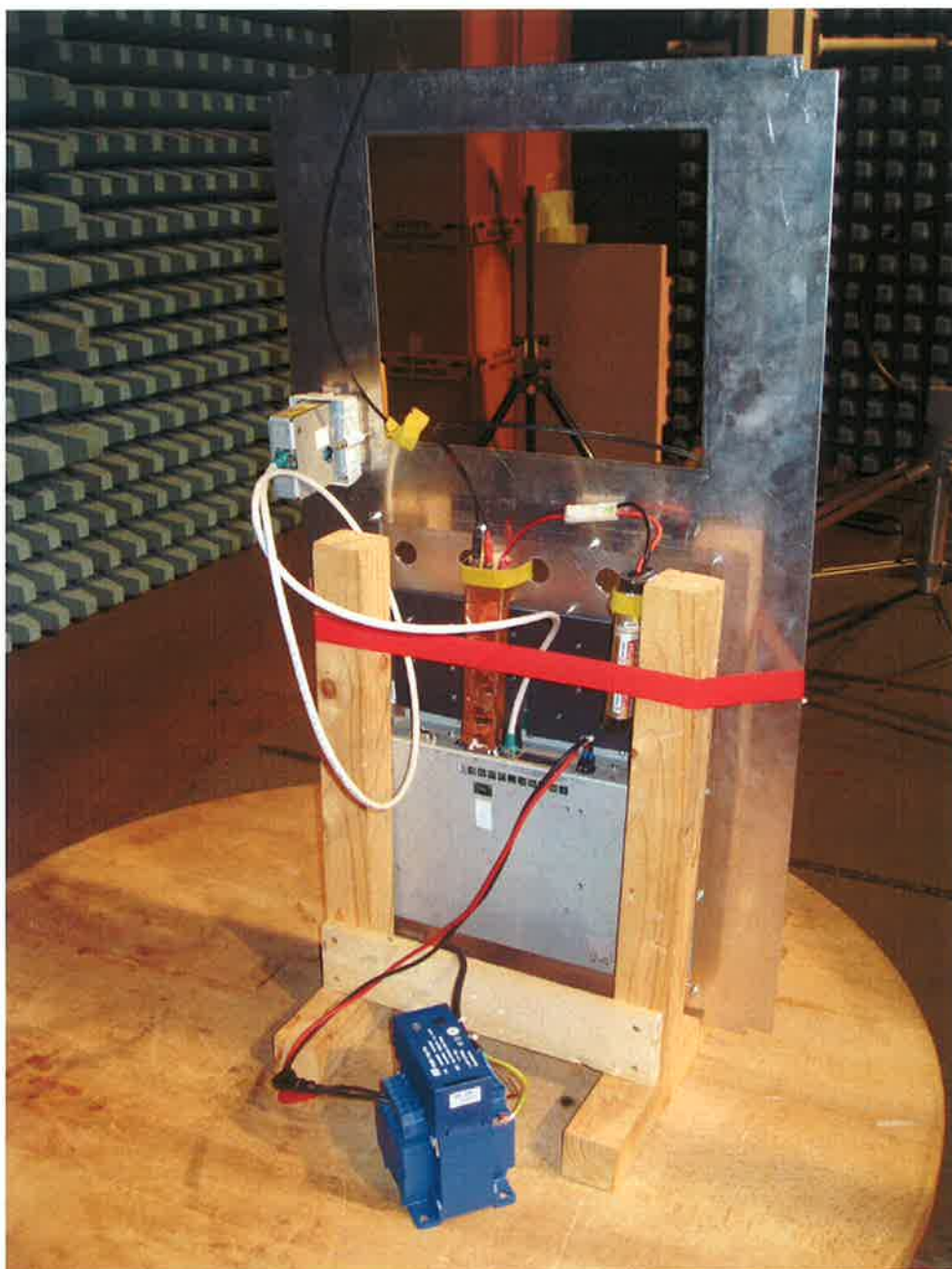
Department: FG

Test report reference:
M/FG-15/165

Page: 1 of 14

Date: 20.10.2015

checked by: 



Appendix 2 Photodocumentation

Description: Module in test setup view #2

Division Medical Technology/
Communication Technology/
EMC

Department: FG

Test report reference:
M/FG-15/165

Page: 2 of 14

Date: 20.10.2015

checked by: *M*



Appendix 2 Photodocumentation

Description: Front view (Antenna)

Division Medical Technology/
Communication Technology/
EMC

Department: FG

Test report reference:
M/FG-15/165

Page: 3 of 14

Date: 20.10.2015

checked by: M



Appendix 2 Photodocumentation

Description: Backside view #1

Division Medical Technology/
Communication Technology/
EMC

Department: FG

Test report reference:
M/FG-15/165

Page: 4 of 14

Date: 20.10.2015

checked by: 



Appendix 2 Photodocumentation

Description: Backside view #2

Division Medical Technology/
Communication Technology/
EMC

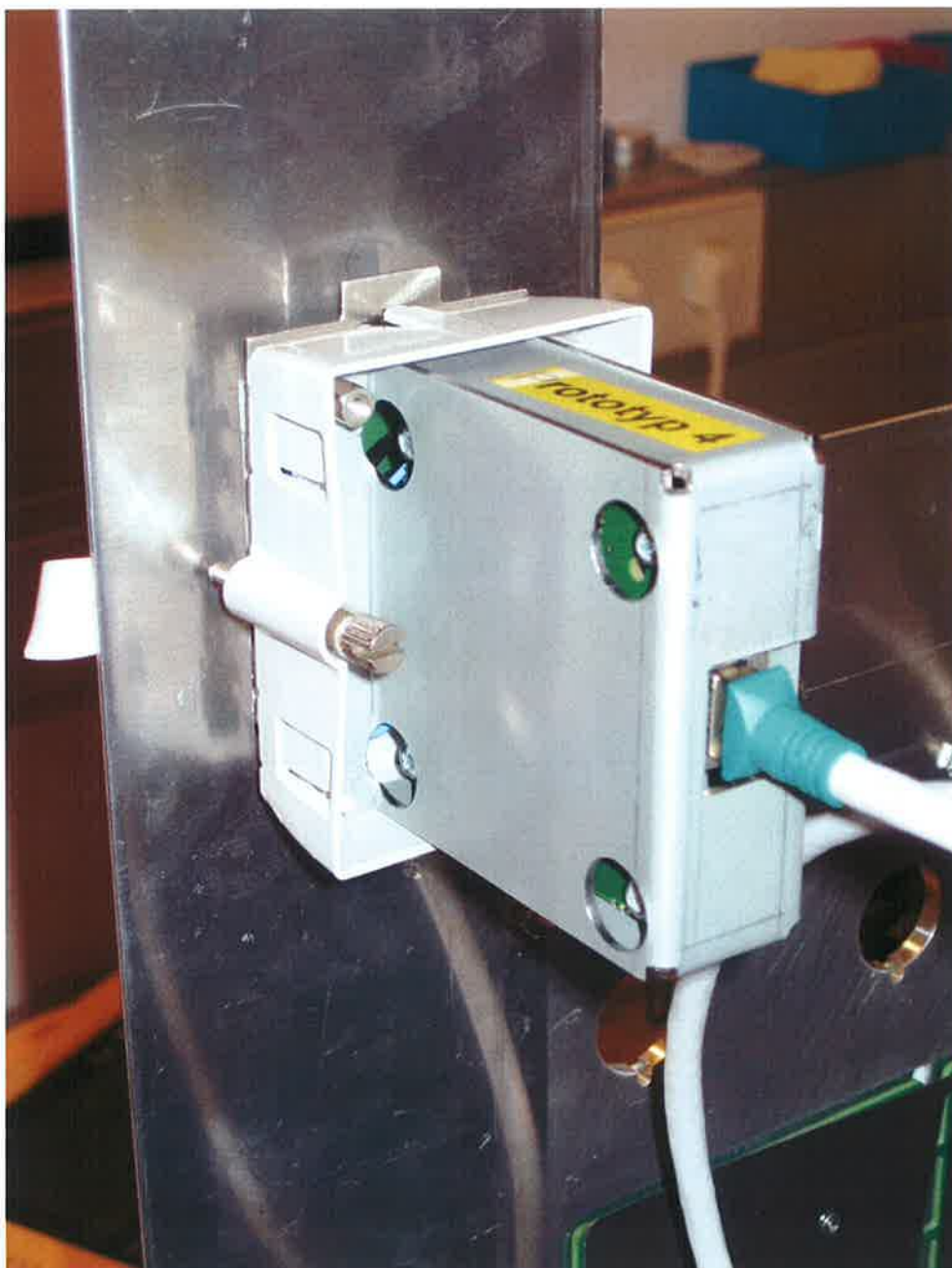
Department: FG

Test report reference:
M/FG-15/165

Page: 5 of 14

Date: 20.10.2015

checked by: 



Appendix 2 Photodocumentation

Description: Label

Division Medical Technology/
Communication Technology/
EMC

Department: FG

Test report reference:
M/FG-15/165

Page: 6 of 14

Date: 20.10.2015

checked by: ju



Appendix 2 Photodocumentation

Description: Case opened

Division Medical Technology/
Communication Technology/
EMC

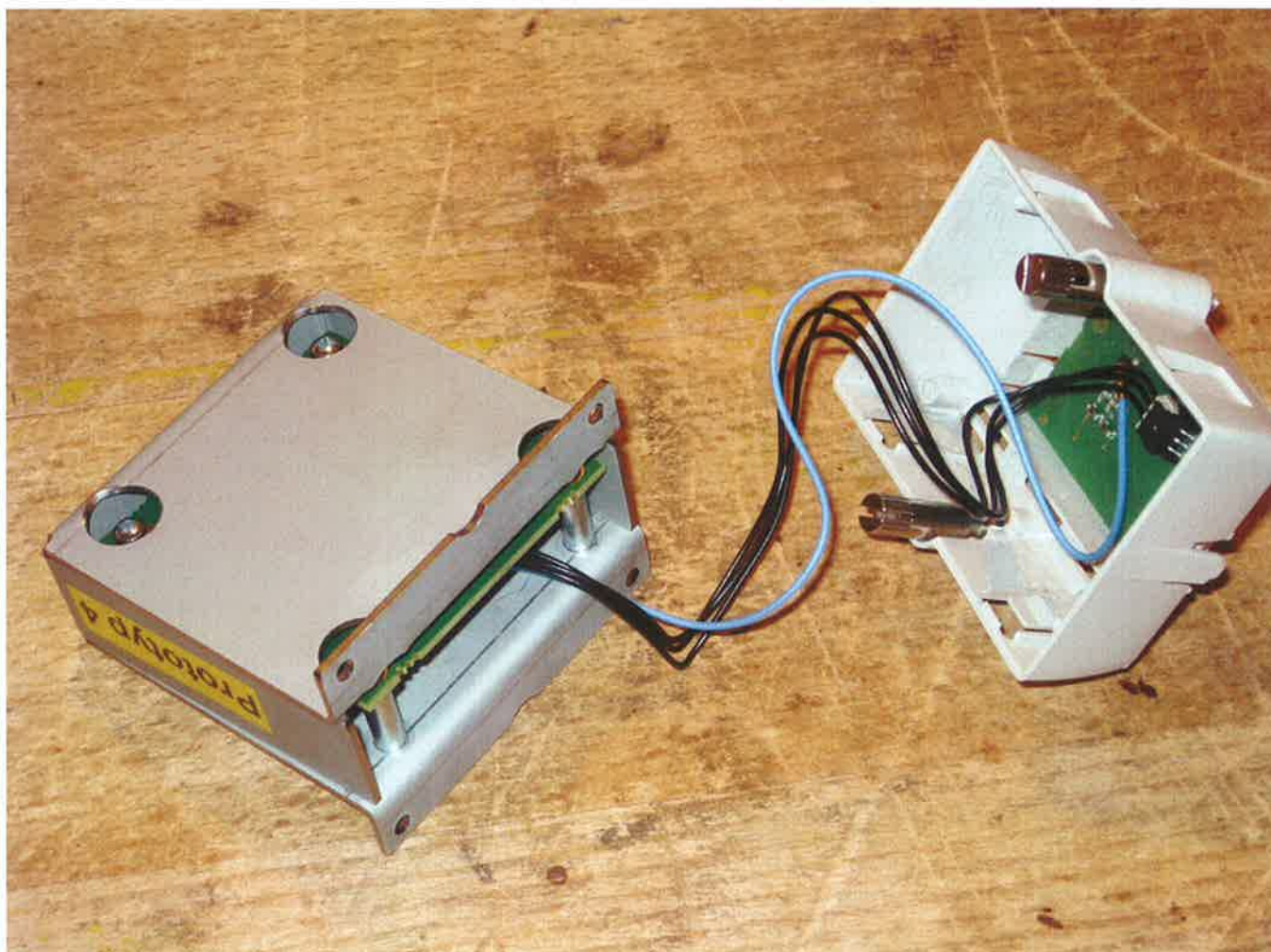
Department: FG

Test report reference:
M/FG-15/165

Page: 7 of 14

Date: 20.10.2015

checked by: mu



Appendix 2 Photodocumentation

Description: Antenna PCB view #1

Division Medical Technology/
Communication Technology/
EMC

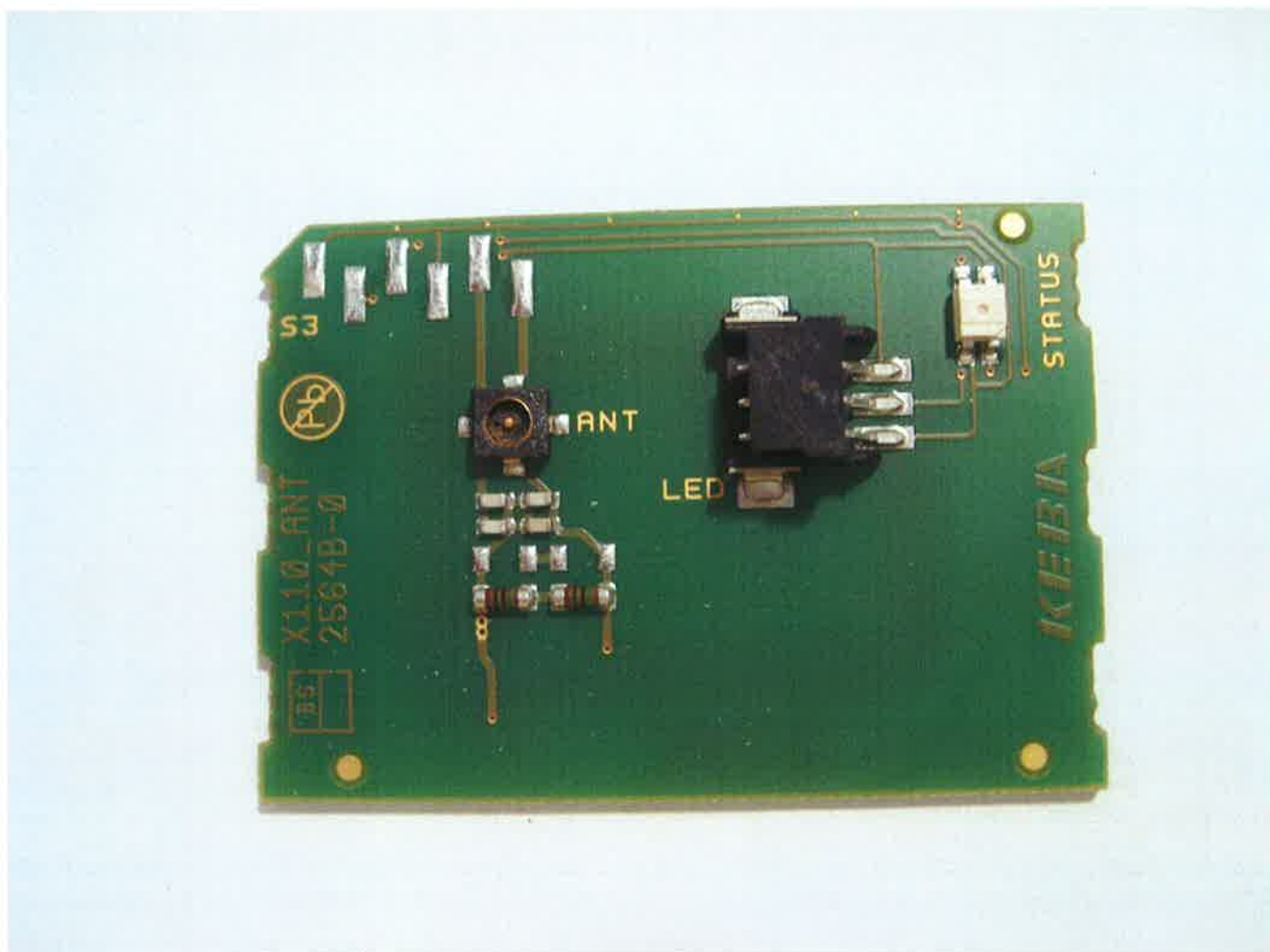
Department: FG

Test report reference:
M/FG-15/165

Page: 8 of 14

Date: 20.10.2015

checked by: μ



Appendix 2 Photodocumentation

Description: Antenna PCB view #2

Division Medical Technology/
Communication Technology/
EMC

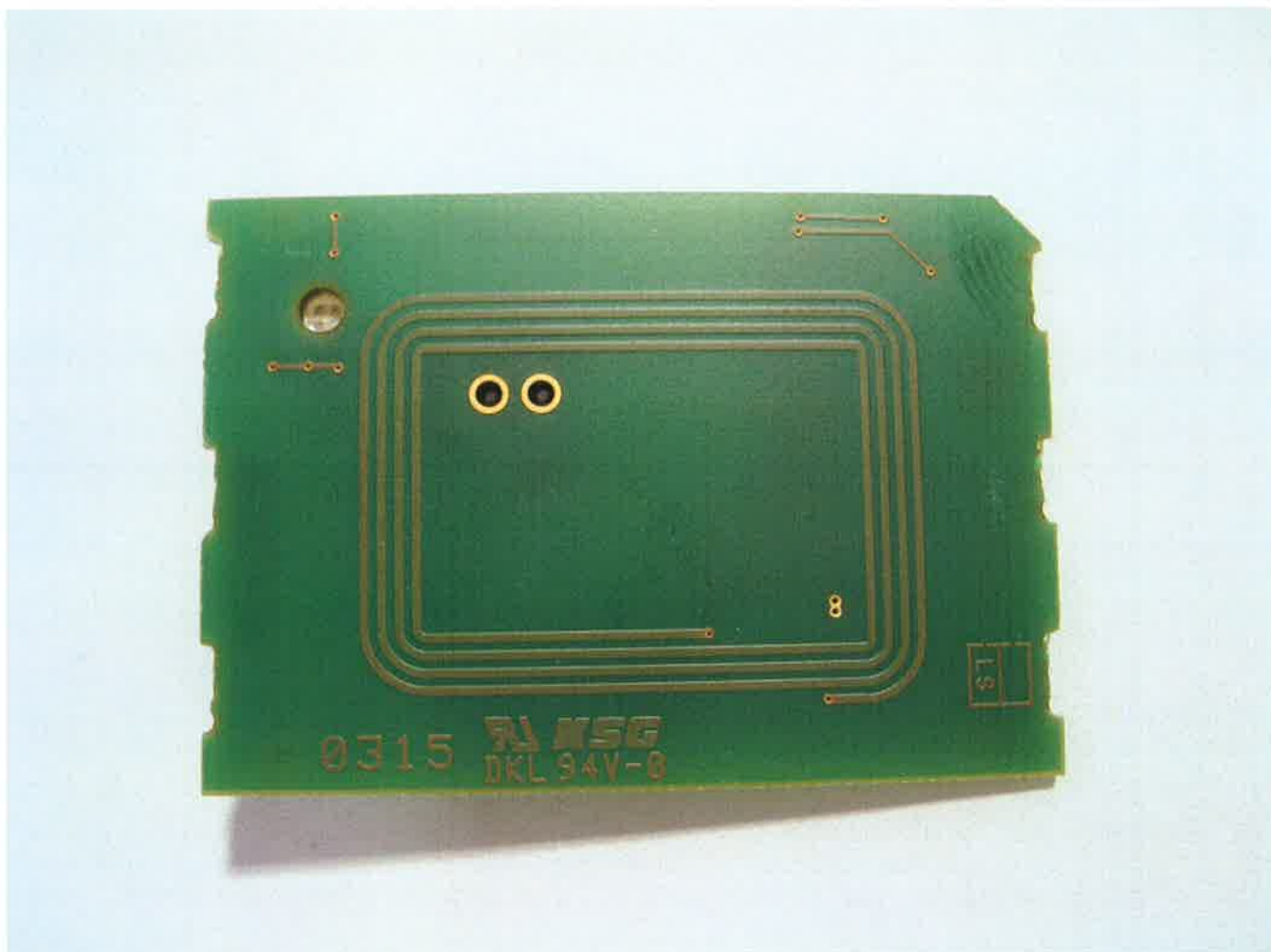
Department: FG

Test report reference:
M/FG-15/165

Page: 9 of 14

Date: 20.10.2015

checked by: μ



Appendix 2 Photodocumentation

Description: Mainboard PCB view #1

Division Medical Technology/
Communication Technology/
EMC

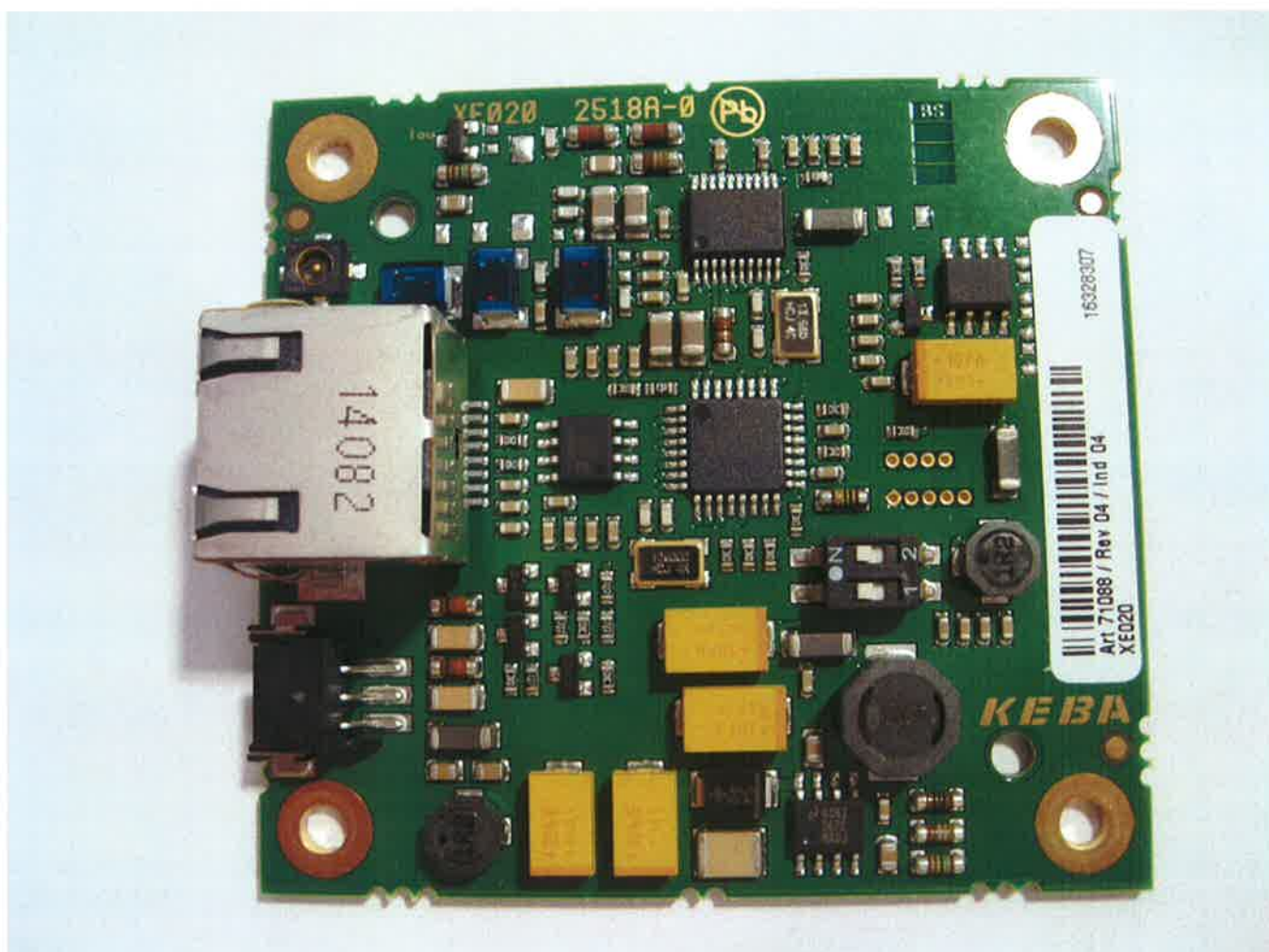
Department: FG

Test report reference:
M/FG-15/165

Page: 10 of 14

Date: 20.10.2015

checked by: A



Appendix 2 Photodocumentation

Description: Mainboard PCB view #2

Division Medical Technology/
Communication Technology/
EMC

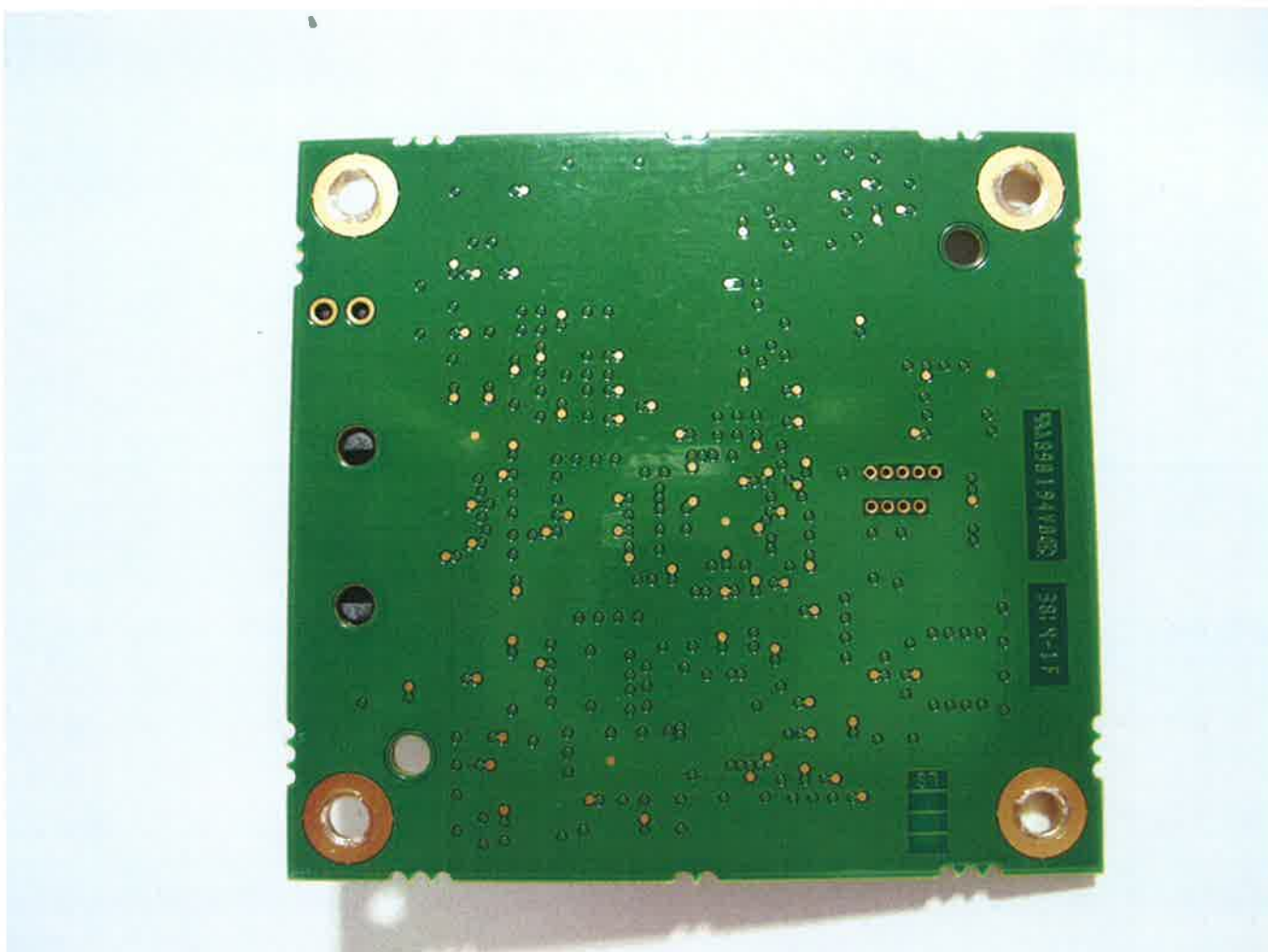
Department: FG

Test report reference:
M/FG-15/165

Page: 11 of 14

Date: 20.10.2015

checked by: mu



Appendix 2

Photodocumentation

Description: Label of Panel used as Power Supply

Division Medical Technology/
Communication Technology/
EMC

Department: FG

Test report reference:
M/FG-15/165

Page: 12 of 14

Date: 20.10.2015

checked by: M



Appendix 2 Photodocumentation

Description: Test setup view #1

Division Medical Technology/
Communication Technology/
EMC

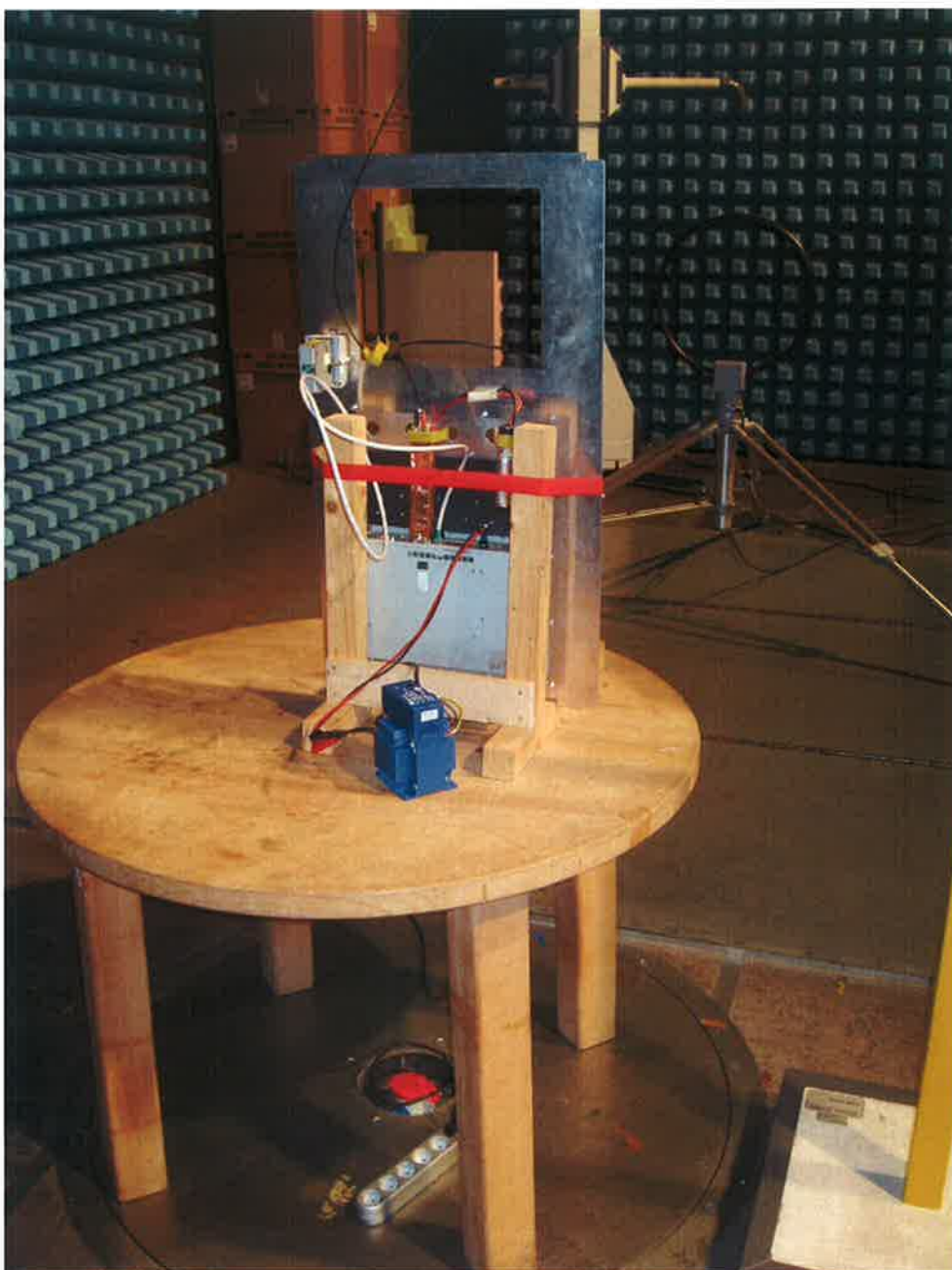
Department: FG

Test report reference:
M/FG-15/165

Page: 13 of 14

Date: 20.10.2015

checked by: mu



Appendix 2 Photodocumentation

Description: Test setup view #2

Division Medical Technology/
Communication Technology/
EMC

Department: FG

Test report reference:
M/FG-15/165

Page: 14 of 14

Date: 20.10.2015

checked by: lu

