

**TEST REPORT** 

of the accredited test laboratory

TÜV Nr.:M/FG-15/165

**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

TUV Austria Services GmbH
Test laboratory for EMC

Supervisor of EMC-laboratory:

ing. Wilhelm Seier

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AUSTRIA

20.10.2015

Ing. Michael Emminger

checked by:

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

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**Division:**Medical Technology/
Communication
Technology/ EMC

Department: Testing Body for Communication Technology/ EMC

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UID ATU63240488 DVR 3002476 Test Report Reference: M/FG-15/165

Ambient temperature: 23°C

Relative humidity: 45%



### **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	
15 225 (a) (b) (a)	Test object data Field strength of emissions at 13,110 – 14,010 MHz	3
15.225 (a) (b) (c) A2.6	Field strength of emissions at 13, 110 - 14,010 Minz	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

Relative humidity: 45%



### **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 ist 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 dBµV/m field strength in 3m distance.
- 2.1033 (7) Maximum output power rating: 56 dBµV/m @ 3m distance.
- 2.1033 (8) DC Voltage and Current: 24 V DC powered

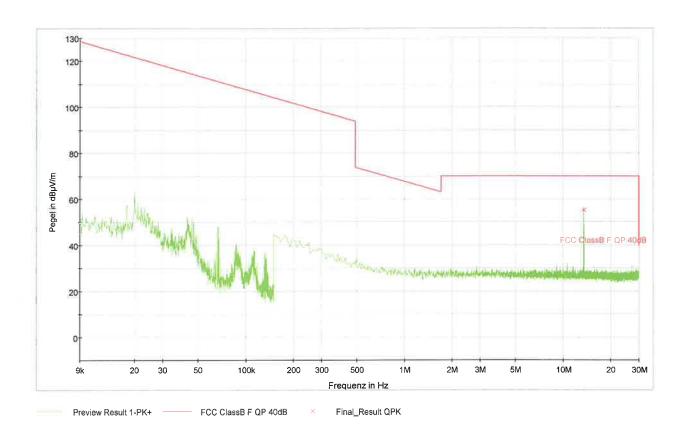
maximum current consumption: 110 mA

Relative humidity: 45%



### Field strength of emissions at 13,110 - 14,010 MHz

§ 15.225 (a) (b) (c)



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

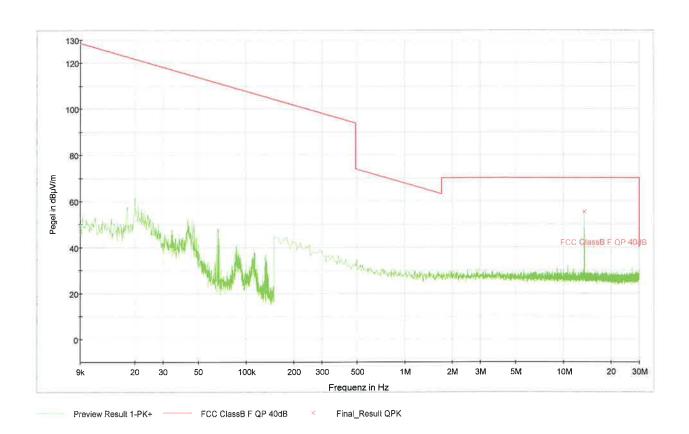
Test Equipment used: NT-100; NT-110; NT-111; NT-112; NT-122; NT-151; NT-207

Relative humidity: 45%



### Emissions outside 13,110 - 14,010 MHz

§ 15.225 (d)



#### 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

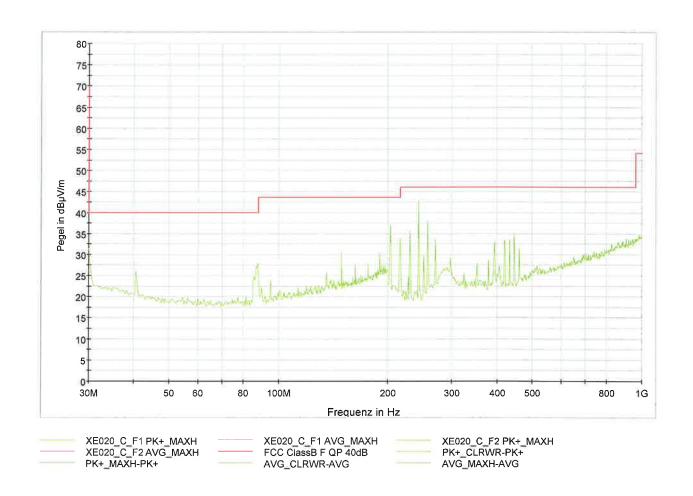
Test Equipment used: NT-100; NT-110; NT-111; NT-112; NT-122; NT-151; NT-207

Relative humidity: 45%



### Emissions outside 13,110 - 14,010 MHz

§ 15.225 (d) 2.5



#### LIMIT

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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

Relative humidity: 45%



#### 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 ±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	Spectrumanalyzer – 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	Radiocommunicationanalyzer 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 Spectrumanalyzer	NT-233
Log. per. Antenna 800 MHz - 2500 MHz	NT-135	SRM-3006 Spectrumanalyzer	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

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## Appendix 1 (continued) Test equipment used

Immunity test system



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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	NT-325/1			

## 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		

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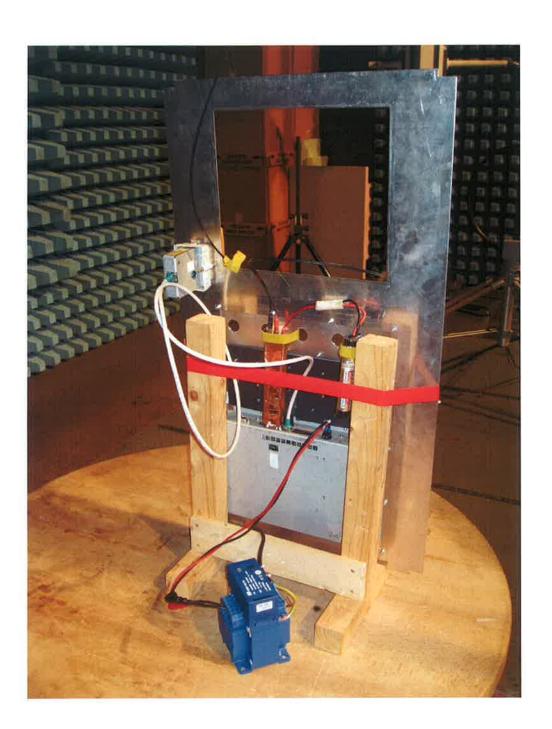
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Description: Module in test setup view #1



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Description: Module in test setup view #2



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Description: Front view (Antenna)



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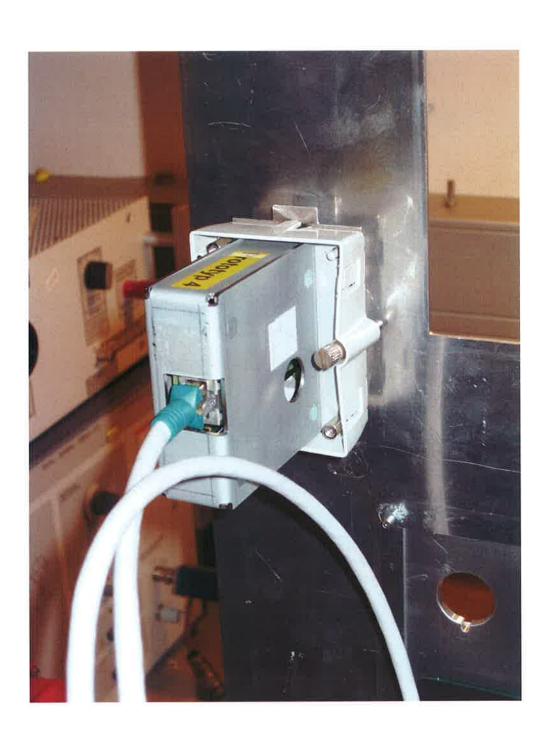
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Description: Backside view #1



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Description: Backside view #2



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Description: Label

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Description: Case opened

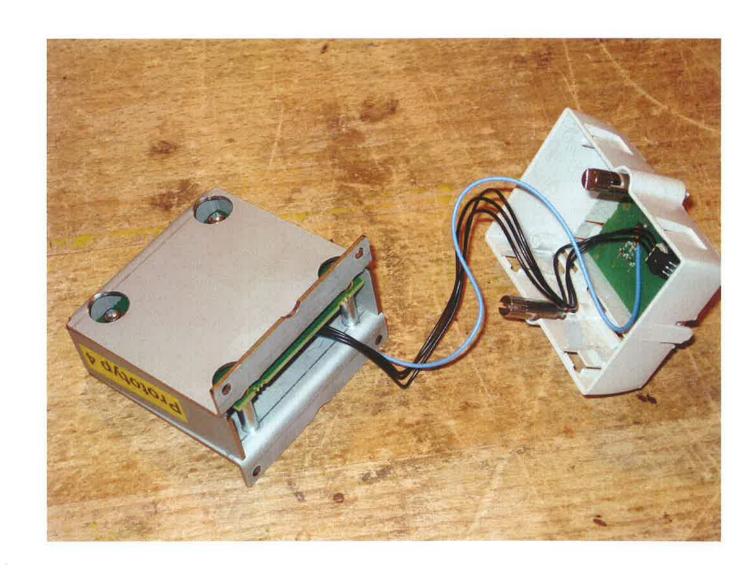
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Description: Antenna PCB view #1

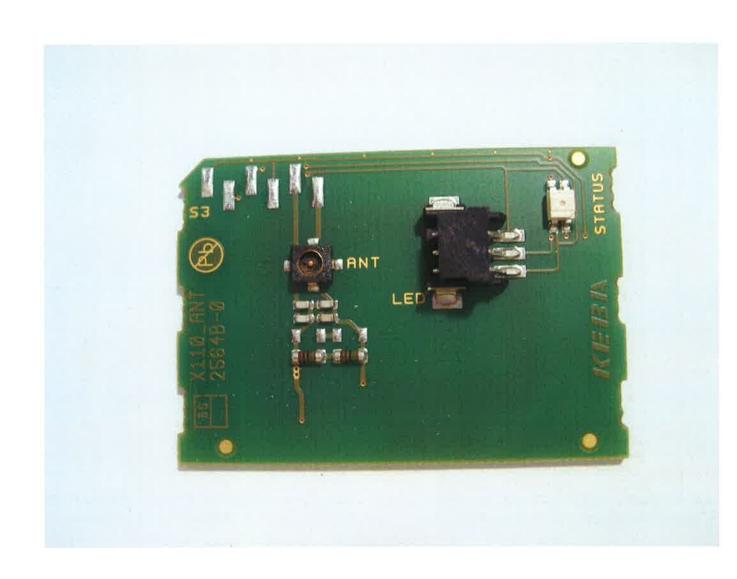
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Description: Antenna PCB view #2

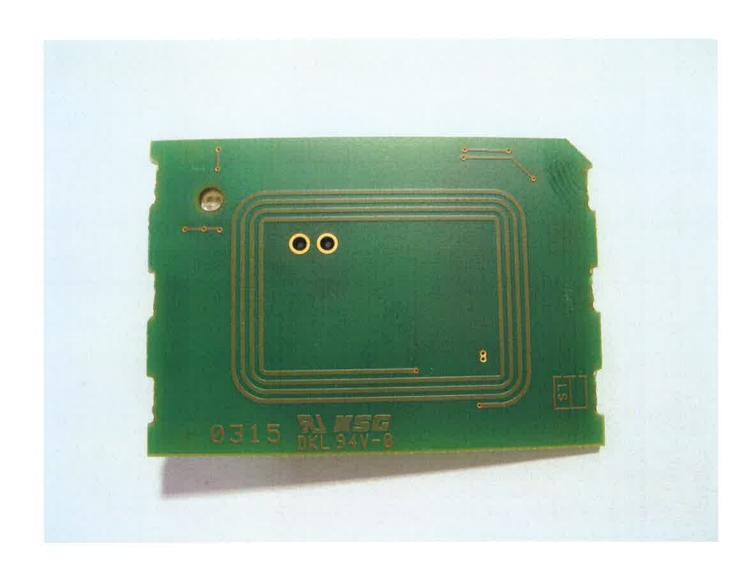
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Description: Mainboard PCB view #1

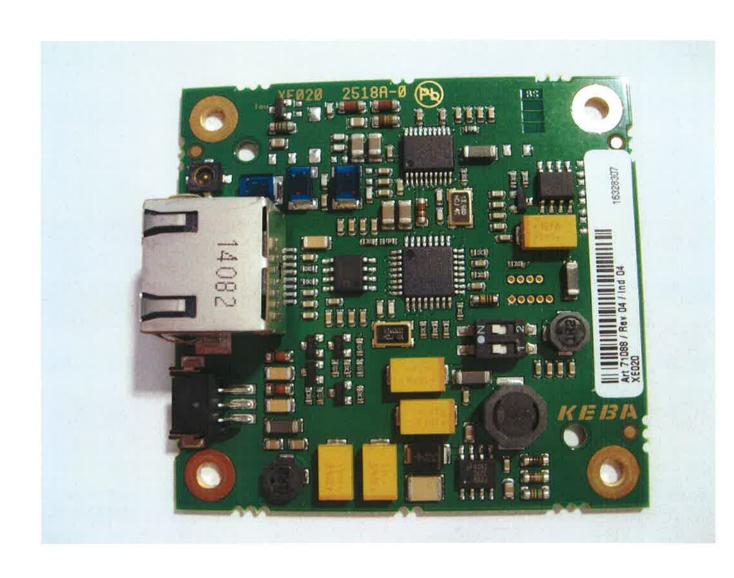
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Description: Mainboard PCB view #2

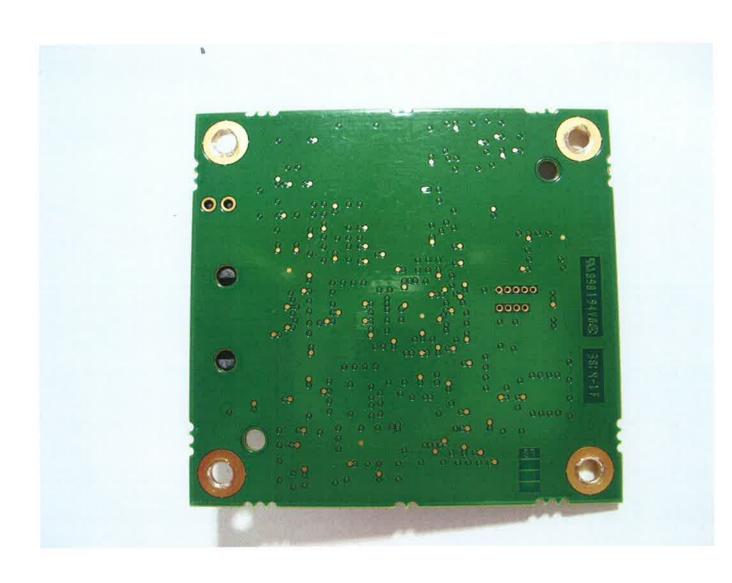
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Description: Label of Panel used as Power Supply

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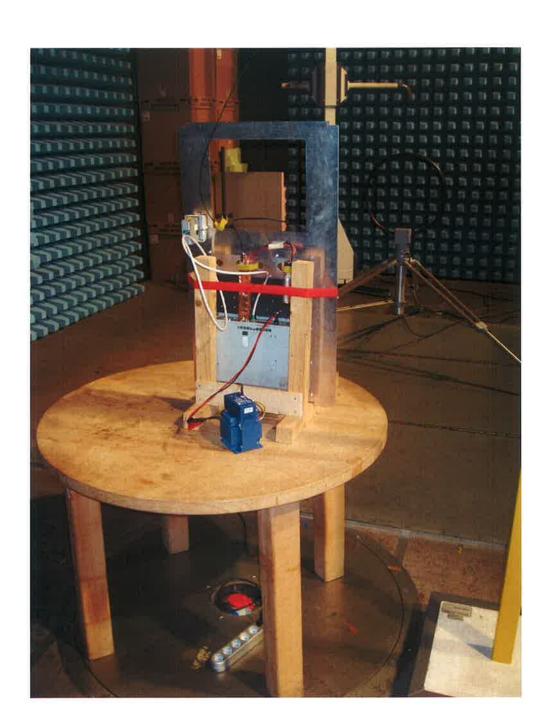
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Description: Test setup view #1



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Description: Test setup view #2

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