CETECOM ICT Services GmbH

Radio Satellite Communication
Untertürkheimer Straße 6-10 . D-66117 Saarbrücken
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Recognized by the
Federal Communications Commission
Anechoic chamber registration no.: 90462 (FCC)
Anechoic chamber registration no.: 3463 (IC)
TCB ID: DE 0001

Federal Communications Commission

Accredited by the
German Accreditation Council
DAR–Registration Number
TTI–P–G 081/94-D0

Deutscher Akkreditierungs Rat
DAR

Independent ETSI
compliance test house

ETSI

Accredited Bluetooth™ Test Facility (BQTF)

Test report no.: 2-3497-01-04/04
FCC Part 15.225
WT-2000 ISO Tagit
FCC ID: PW3201

CETECOM – ICT Services GmbH
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1 General information

1.1 Notes

The test results of this test report relate exclusively to the test item specified in 1.5.
The CETECOM ICT Services GmbH does not assume responsibility for any conclusions and generalisations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of the CETECOM ICT Services GmbH.

Test laboratory manager:

2004-05-04	RSC - 8431	Gillmann D.	
Date	Section	Name	Signature

Technical responsibility for area of testing:

2004-05-04	RSC - 8412	Hausknecht D.	
Date	Section	Name	Signature

1.2 Testing laboratory

CETECOM ICT Services GmbH
Untertürkheimer Straße 6 - 10
66117 Saarbrücken
Germany
Telephone : + 49 681 598 - 0
Telefax : + 49 681 598 - 9075
E-mail : info@ict.cetecom.de
Internet : www.cetecom-ict.de

Accredited testing laboratory
Accredited by : Regulierungsbehörde für Telekommunikation und Post (RegTP)
Listed by : Federal Communications Commission (FCC)

Authority	Identification/Registration No.
RegTP	TTI-P-G 081/94-D0
FCC	90462

1.3 Details of applicant

Name : Sphinx Electronics GmbH & Co KG
Street : Tullastr. 3
City : 79341 Kenzingen
Country : Germany
Telephone: +49 7644 922857
Telex : +49 7644 922891
E-mail : clemens.meier@sphinx-electronics.de

Contact person:
Name : Mr. Clemens Meier
Telephone: +49 7644 922857
Telex : +49 7644 922891

1.4 Application details

Date of test : 2004-04-22

1.5 Test item

Type of equipment	:	Transponder wall terminal
Type designation	:	WT-2000 ISO Tagit
Manufacturer	:	See applicant
Street	:	
City	:	
Country	:	

Additional Information	:	
Frequency	:	13.110 – 14.010 MHz
Frequency (EUT)	:	13.562 MHz
Number of channels (EUT)	:	1
Modulation	:	Tx : 100H0NON; Passive transponder: 4K00F1D
Antenna	:	Integral antenna
H-field strenght (30m)	:	31.0 dBµV/m
Power supply normal (AC/DC)	:	110V /12V by external AC/DC Adapter
Power supply extreme (AC)	:	85% to 115% (at nominal AC Voltage)
Type of equipment	:	Class 1, Category III
FCC ID	:	PW3201

1.6 Test Set-up :

1. **AC/DC Adapter: HÄFELE Model EPA-301DN-12 INPUT 100V-240VAC 50Hz-60Hz**
2. **AC/DC Adapter: Altronic Model AL 400ULX INPUT 100V-240VAC 50Hz-60Hz**
3. **Wall Reader Control Unit dialock**
4. **WT-2000 ISO Tagit**

1.7 Test specifications: FCC Part 15.225

2 Technical test

2.1 Summary of test results

The radiated measurements are performed in vertical and horizontal plane in the frequency range from 9 kHz to 20 GHz in semi-anechoic chambers. The EUT is positioned on a non-conductive support with a height of 0.80 m above a conductive ground plane that covers the whole chamber. The receiving antennas are conform with specifications ANSI C63.2-1987 clause 15 and ANSI C63.4-1992 clause 4.1.5. These antennas can be moved over the height range between 1.0 m and 4.0 m in order to search for maximum field strength emitted from EUT. The measurement distances between EUT and receiving antennas are indicated in the test set-ups for the various frequency ranges. For each measurement, the EUT is rotated in all three axes until the maximum field strength is received.
The wanted and unwanted emissions are received by spectrum analysers where the detector modes and resolution bandwidths over various frequency ranges are set according to requirement ANSI C63-4-1992 clause 4.2.
Antennas are conform with ANSI C63.2-1996 item 15.
150 kHz - 30 MHz: Quasi Peak measurement, 9kHz Bandwidth, passive loop antenna.

30 MHz - 200 MHz: Quasi Peak measurement, 120KHz Bandwidth, biconical antenna
200MHz - 1GHz: Quasi Peak measurement, 120KHz Bandwidth, log periodic antenna
>1GHz: Average, RBW 1MHz, VBW 10 Hz, wave guide horn

All measurement settings are according to FCC 15.35, 15.209.

No deviations from the technical specification(s) were ascertained in the course of the tests performed.

FINAL VERDICT : PASS

LIST OF MEASUREMENTS.

The list of measured parameters is given below.

Section 15.225 Operation within the band 13.110 – 14.010 MHz
Section 15.225a - max. field strength of the transmitter -

Test conditions		Transmitter field strength (dBµV/m at 30m)
		Tx 13.562 MHz
T_{nom} 23 °C	V_{nom} 110.0 V	**31.0**
Maximum deviation from rated output under extreme test conditions (dB)		**± 0.1**
Measurement uncertainty		**± 3 dB**

Limit: Section 15.225 a Operation within the band 13.553 – 13.567 MHz

Between 13.553 MHz and 13.567 MHz the field strength shall not exceed
15,848 µV/m at 30meters
15,848µV/m = 84dBµV/m (at 30meters)

Limits kept : **Yes** [X] **No** [ ]

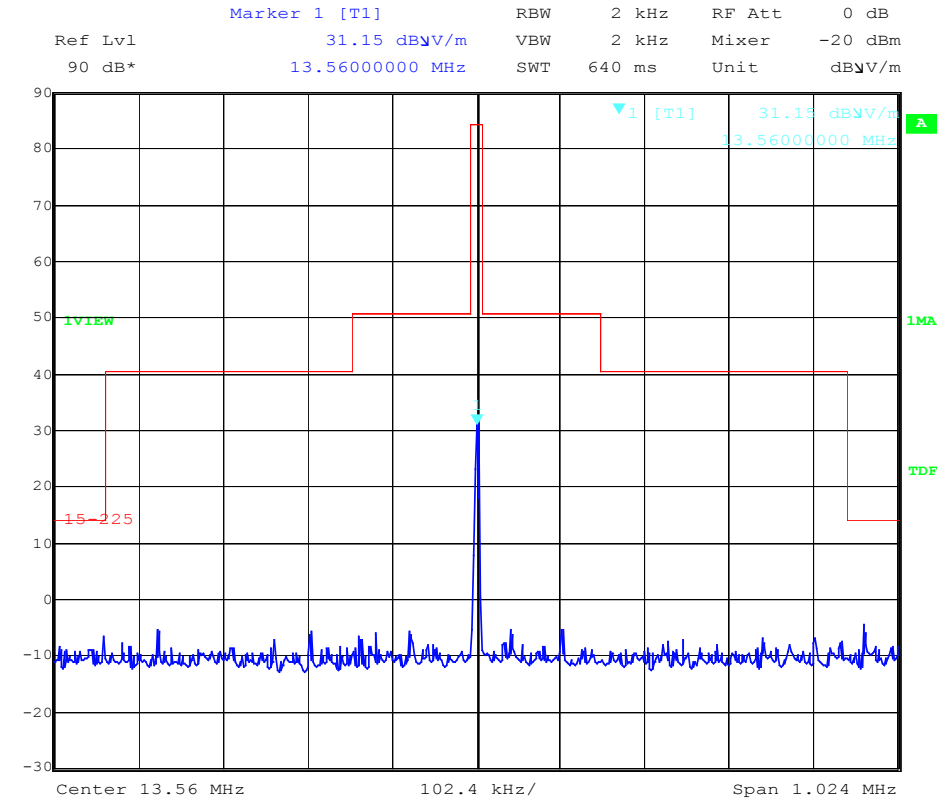
Section 15.225 e Frequency tolerance

Test conditions		Tx frequency 13.562 MHz	
		Measured frequency (MHz)	
T_{nom} 23 °C	V_{nom} 110 V	f	13.561 350
T_{min} -20 °C	V_{min} 97.8 V	f	13.561 480
	V_{max} 132.3 V	f	13.561 480
T_{max} +50 °C	V_{min} 97.8 V	f	13.561 270
	V_{max} 132.3 V	f	13.561 270
Measurement uncertainty		$\pm$ 1x 10^{-7}	

Limit: +/ - 0.01 % (= 1.356 kHz)

Limits kept : **Yes** [X] **No** [ ]

Section § 15.209(b) /.225 Spurious emission < 30MHz (Tx radiated)



LIMITS: **SECTION 15.225 / 15.209**

Frequency range (MHz)	Measurement distance [m]	Field strength e [dBµV/m] @ 3 m	Field strength E [µV/m]
0.009 – 0.490	**300**	**88.5 ... 53.8**	**2400/F(kHz)**
0.490 – 1.705	**30**	**53.8 ... 43.0**	**24000/F(kHz)**
1.705 – 30.0	**30**	**49.5**	**30**
30.0 – 88.0	3	40.0	100
88.0 – 216.0	3	43.5	150
216.0 – 960.0	3	46.0	200
> 960.0	3	54.0	500
Harmonics	3	67.9 = 7.9 dBmV/m	2,500

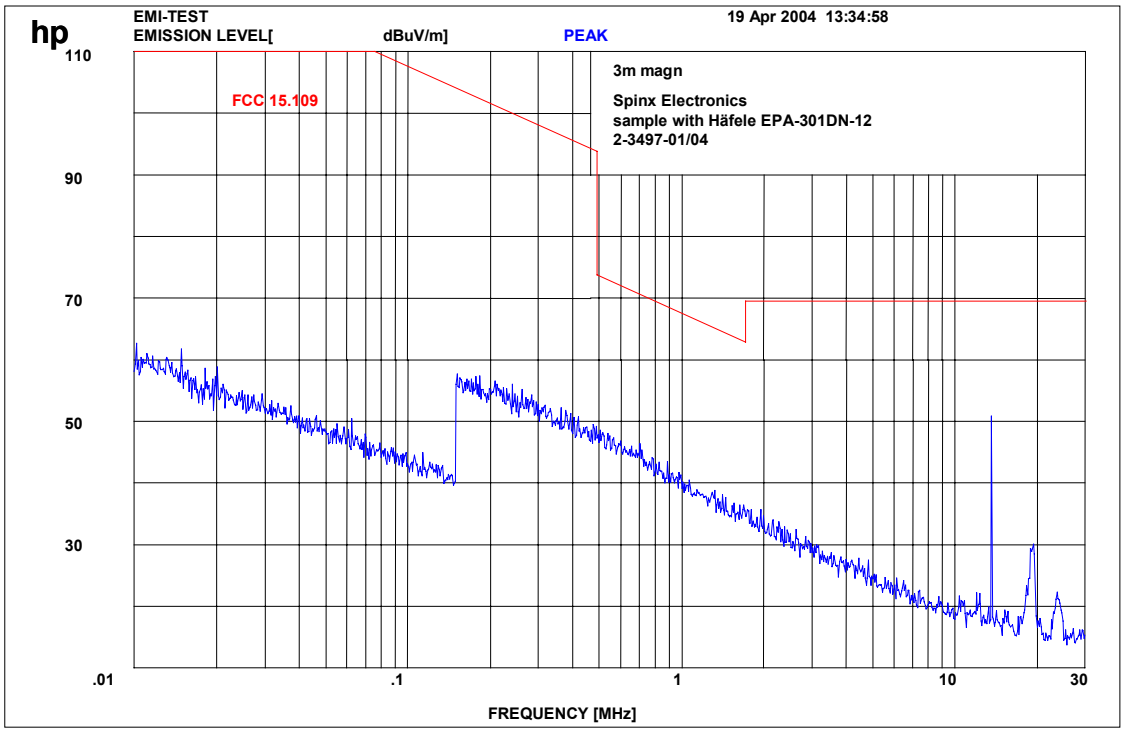
REFERENCE OF TEST EQUIPMENT USED : see test set-up on pages 6,7 and 8

Limits kept : **Yes** [X] **No** [ ]

Plots of the measurements

Section 15.209(a) Spurious emission < 30 MHz (Tx radiated)

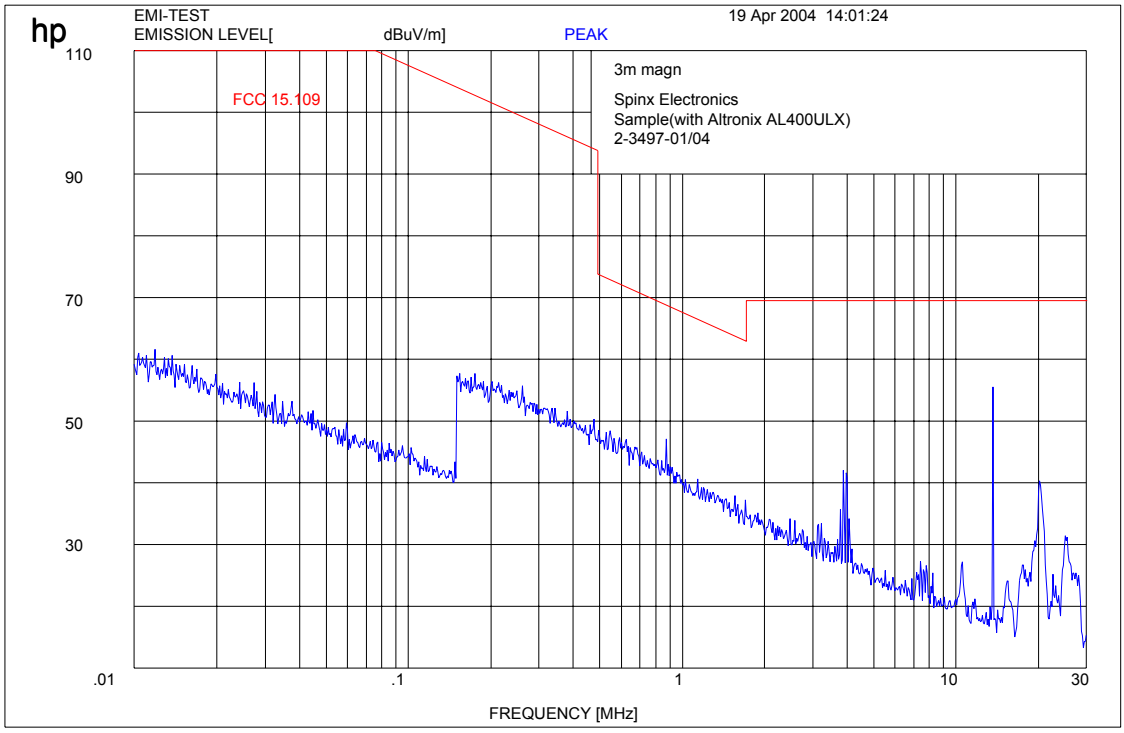
All limits are recalculated to 30m with 40 db/decade according to FCC part 15.31 (f)(2)



Limits kept : **Yes** [X] **No** [ ]

Section 15.209 (a) **Operation within the band 13.110 – 14.010 MHz**

All limits are recalculated to 30m with 40 db/decade according to FCC part 15.31 (f)(2)



Limits kept : **Yes** [X] **No** [ ]

Section § 15.209(b) /.225 Spurious emission > 30MHz (Tx radiated)

(with Häfle - Trafo 110V / 60 Hz)

SPURIOUS EMISSIONS LEVEL (µV/m)								
13.56 MHz								
f (MHz)	**Detector**	**Level (µV/m)**	**Limit (µV/m)**	**Margin (dB)**	**Results**			
	QP/V				**All spurious 10 dB below the limit**			
Measurement uncertainty			**±3 dB**					

Remark: see plot on page 15

f < 1 GHz : RBW/VBW: 100 kHz **f ≥ 1GHz : RBW/VBW: 1 MHz**

Measurement distance see table

LIMITS: **SECTION 15.245 / 15.205 / 15.209**

Frequency range (MHz)	Measurement distance [m]	Field strength e [dBµV/m] @ 3 m	Field strength E [µV/m]
0.009 – 0.490	300	88.5 ... 53.8	2400/F(kHz)
0.490 – 1.705	30	53.8 ... 43.0	24000/F(kHz)
1.705 – 30.0	30	49.5	30
30.0 – 88.0	**3**	**40.0**	**100**
88.0 – 216.0	**3**	**43.5**	**150**
216.0 – 960.0	**3**	**46.0**	**200**
> 960.0	**3**	**54.0**	**500**
Harmonics	**3**	**67.9 = 7.9 dBmV/m**	**2,500**

REFERENCE OF TEST EQUIPMENT USED : see test set-up on pages 6,7 and 8

Limits kept : **Yes** [X] **No** [ ]

Section § 15.209(b) /.225 Spurious emission > 30MHz (Tx radiated)

(with Altronic - Trafo 110V / 60 Hz)

SPURIOUS EMISSIONS LEVEL (µV/m)								
13.56 MHz								
f (MHz)	**Detector**	**Level (µV/m)**	**Limit (µV/m)**	**Margin (dB)**	**Results**			
	QP/V				**All spurious 10 dB below the limit**			
Measurement uncertainty			**±3 dB**					

Remark: see plot on page 16

f < 1 GHz : RBW/VBW: 100 kHz **f ≥ 1GHz : RBW/VBW: 1 MHz**

Measurement distance see table

LIMITS: **SECTION 15.245 / 15.205 / 15.209**

Frequency range (MHz)	Measurement distance [m]	Field strength e [dBµV/m] @ 3 m	Field strength E [µV/m]
0.009 – 0.490	300	88.5 ... 53.8	2400/F(kHz)
0.490 – 1.705	30	53.8 ... 43.0	24000/F(kHz)
1.705 – 30.0	30	49.5	30
30.0 – 88.0	**3**	**40.0**	**100**
88.0 – 216.0	**3**	**43.5**	**150**
216.0 – 960.0	**3**	**46.0**	**200**
> 960.0	**3**	**54.0**	**500**
Harmonics	**3**	**67.9 = 7.9 dBmV/m**	**2,500**

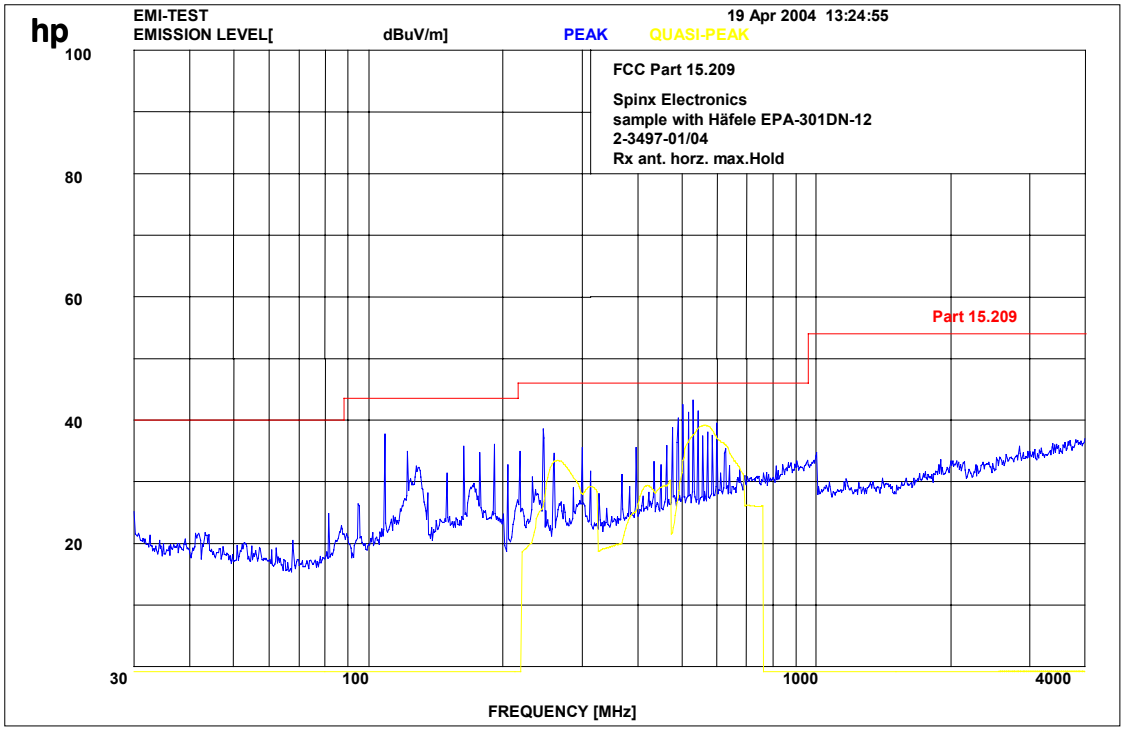
REFERENCE OF TEST EQUIPMENT USED : see test set-up on pages 6,7 and 8

Limits kept : **Yes** [X] **No** [ ]

Plots of the measurements

Section 15.209(a) Spurious emission < 30 MHz (Tx radiated)

Plot 01

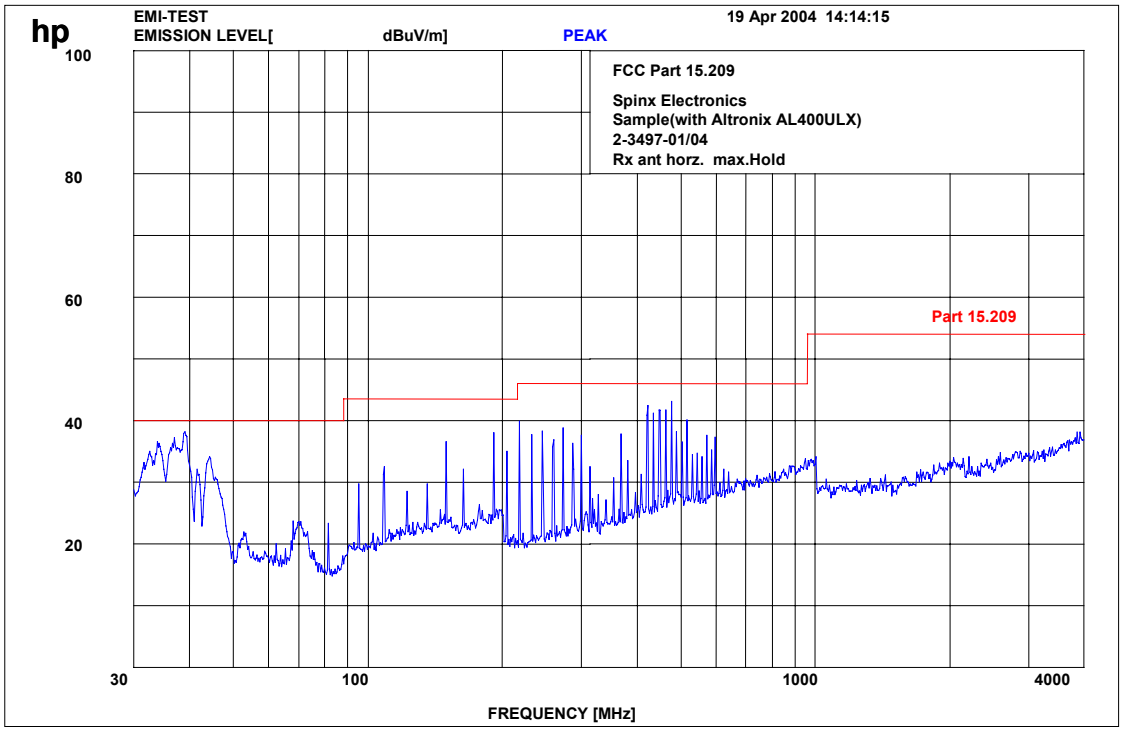


Limits kept : **Yes** [X] **No** [ ]

Plots of the measurements

Section 15.209(a) Spurious emission < 30 MHz (Tx radiated)

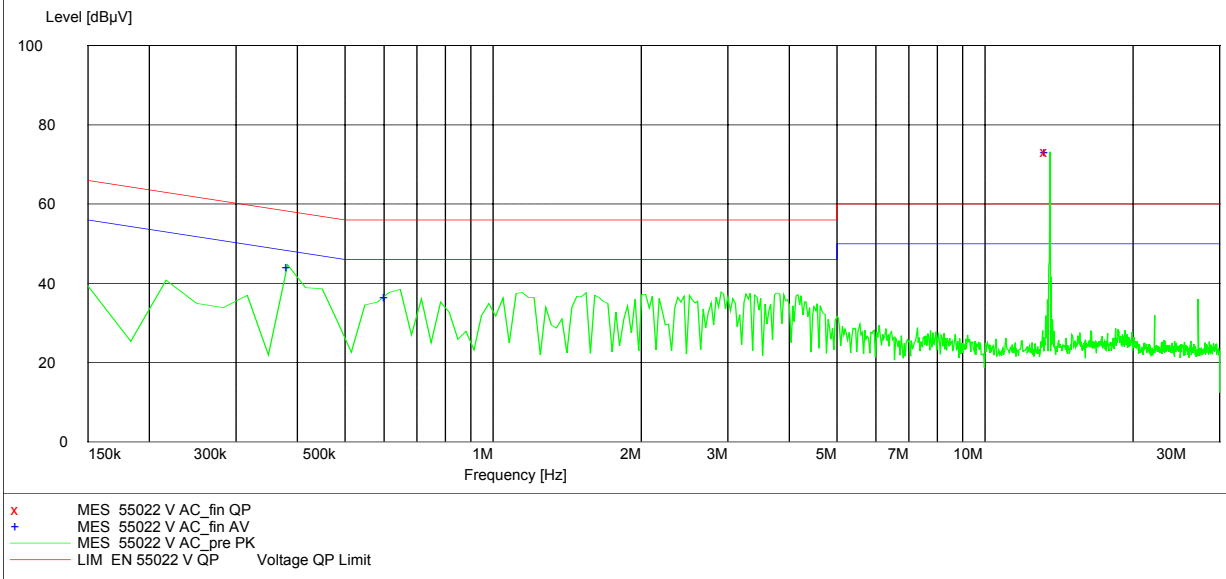
Plot 02



Limits kept : **Yes** [X] **No** [ ]

CISPR22

EUT:	Dialock WR-ISO (with Häfle Trafo /110V/60Hz)
Manufacturer:	Sphinx
Operating Condition:	Transmitting
Test Site:	Room 006 (Shielded chamber)
Operator:	Gillmann
Start of Test:	27.04.04 / 09:58:30



MEASUREMENT RESULT: "55022 V AC_fin QP"

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
13.560000	73.20	10.9	60	-13.2	N	GND

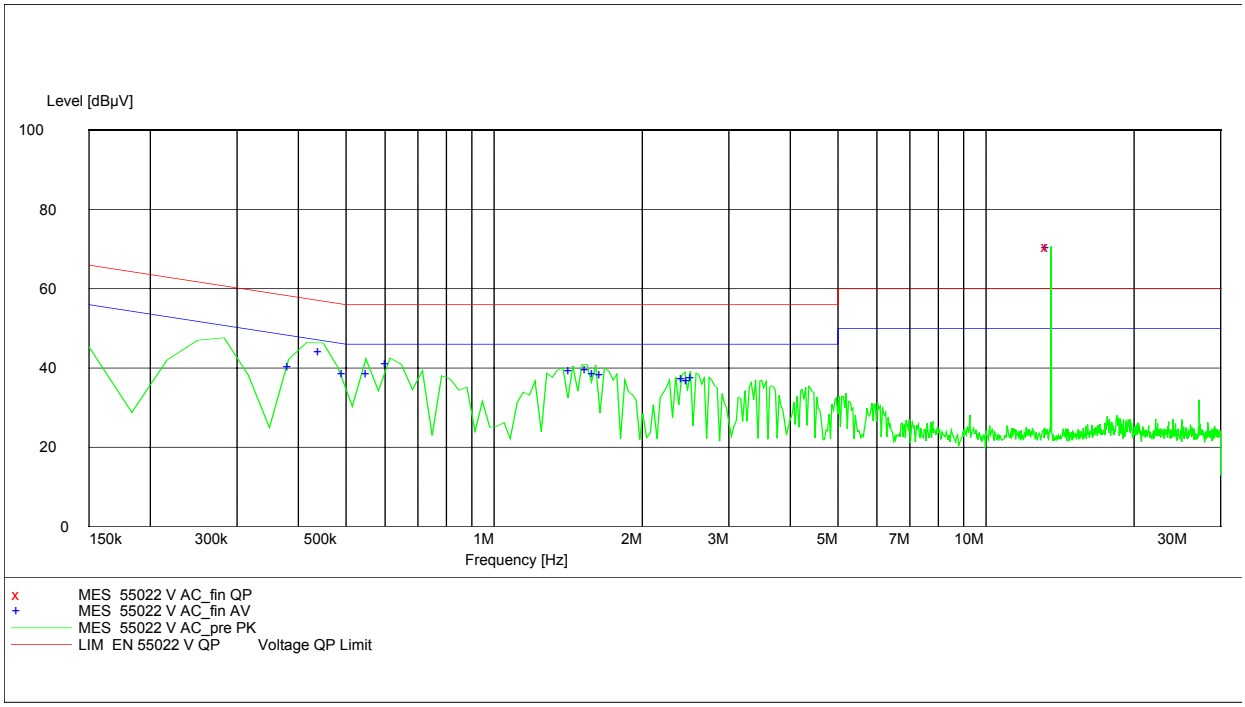
MEASUREMENT RESULT: "55022 V AC_fin AV"

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.390000	43.90	10.7	48	4.2	N	FLO
0.615000	36.40	10.5	46	9.6	N	FLO
13.560000	72.80	10.9	50	-22.8	N	GND

Limits kept : **Yes** [X] **No** [ ]

CISPR22

EUT:	Dialock WR-ISO (with Altronix Trafo /110V/60Hz)
Manufacturer:	Sphinx
Operating Condition:	Transmitting
Test Site:	Room 006 (Shielded chamber)
Operator:	Gillmann



MEASUREMENT RESULT: "55022 V AC_fin QP"

See next page

MEASUREMENT RESULT: "55022 V AC_fin QP"

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
13.560000	70.60	10.9	60	-10.6	L1	GND

MEASUREMENT RESULT: "55022 V AC_fin AV"

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.390000	40.30	10.7	48	7.8	N	FLO
0.450000	44.00	10.6	47	2.9	N	FLO
0.502500	38.60	10.6	46	7.4	N	FLO
0.562500	38.50	10.6	46	7.5	L1	GND
0.615000	41.10	10.5	46	4.9	L1	GND
1.455000	39.20	10.4	46	6.8	N	GND
1.567500	39.50	10.4	46	6.5	N	GND
1.620000	38.60	10.4	46	7.4	N	GND
1.680000	38.20	10.5	46	7.8	N	GND
2.460000	37.20	10.5	46	8.8	L1	GND
2.520000	36.70	10.5	46	9.3	N	GND
2.572500	37.50	10.5	46	8.5	N	GND
13.560000	70.30	10.9	50	-20.3	L1	GND

Limits kept : **Yes** [X] **No** [ ]

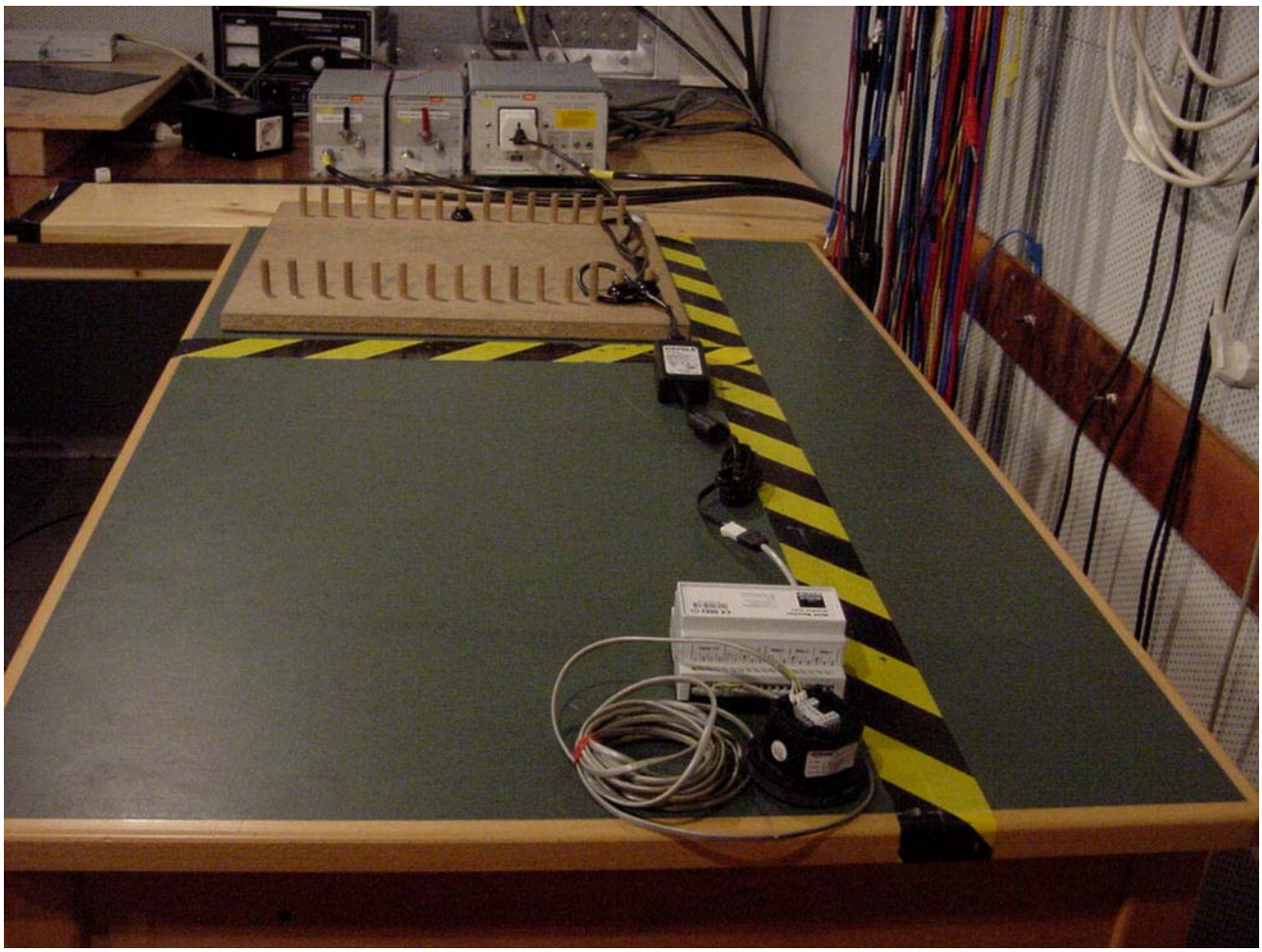
TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

To simplify the identification on each page of the test equipment used, on each page of the test report, each item of test equipment and ancillaries such as cables are identified (numbered) by the Test Laboratory, below.

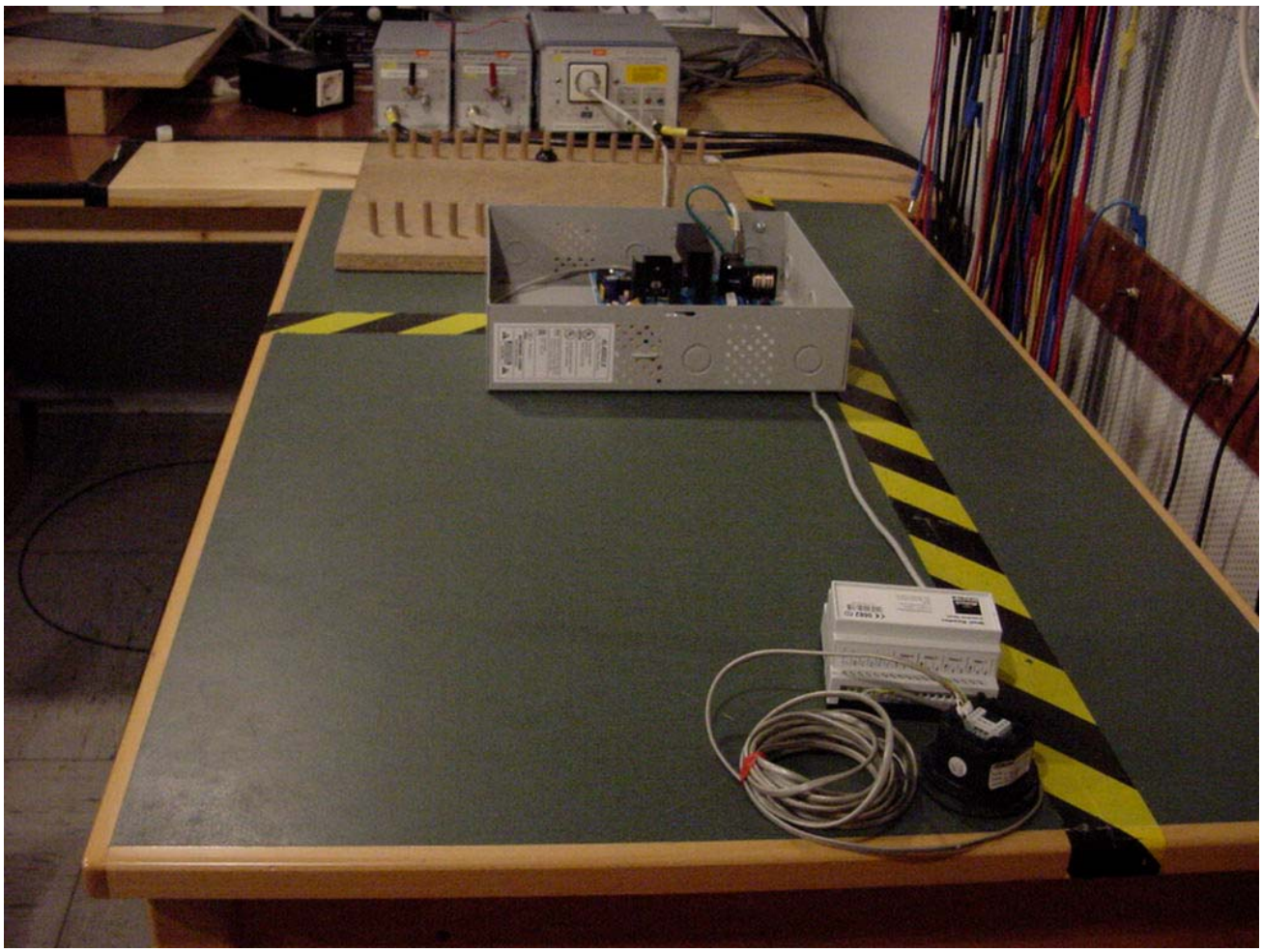
No	Instrument/Ancillary	Type	Manufacturer	Serial No.
01	Spectrum Analyzer	8566 A	Hewlett-Packard	1925A00257
02	Analyzer Display	8566 A	Hewlett-Packard	1925A00860
03	Oscilloscope	7633	Tektronix	230054
04	Radio Analyzer	CMTA 54	Rohde & Schwarz	894 043/010
05	System Power Supply	6038 A	Hewlett-Packard	2848A07027
06	Signal Generator	8111 A	Hewlett-Packard	2215G00867
07	Signal Generator	8662 A	Hewlett-Packard	2224A01012
08	Funktionsgenerator	AFGU	Rohde & Schwarz	862 480/032
09	Regeltrenntrafo	MPL	Erfi	91350
10	Netznachbildung	NNLA 8120	Schwarzbeck	8120331
11	Relais-Matrix	PSU	Rohde & Schwarz	893 285/020
12	Power-Meter	436 A	Hewlett-Packard	2101A12378
13	Power-Sensor	8484 A	Hewlett-Packard	2237A10156
14	Power-Sensor	8482 A	Hewlett-Packard	2237A00616
15	Modulationsmeter	9008	Racal-Dana	2647
16	Frequenzzähler	5340 A	Hewlett-Packard	1532A03899
17	Absorber Schirmkabine	---	MWB	87400/002
18	Spectrum Analyzer	85660 B	Hewlett-Packard	2747A05306
19	Analyzer Display	85662 A	Hewlett-Packard	2816A16541
20	Quasi Peak Adapter	85650 A	Hewlett-Packard	2811A01131
21	RF-Preselector	85685 A	Hewlett-Packard	2833A00768
22	Biconical Antenne	3104	Emco	3758
23	Log. Per. Antenne	3146	Emco	2130
24	Double Ridge Horn	3115	Emco	3088
25	EMI-Testreceiver	ESAI	Rohde & Schwarz	863 180/013
26	EMI-Analyzer-Display	ESAI-D	Rohde & Schwarz	862 771/008
27	Biconical Antenne	HK 116	Rohde & Schwarz	888 945/013
28	Log. Per. Antenne	HL 223	Rohde & Schwarz	825 584/002
29	Relais-Switch-Unit	RSU	Rohde & Schwarz	375 339/002
30	Highpass	HM985955	FSY Microwave	001
31	Amplifier	P42-GA29	Tron-Tech	B 23602
32	Absorber Schirmkabine		Frankonia	
33	Steuerrechner	PSM 7	Rohde & Schwarz	834 621/004
34	EMI Test Reciever	ESMI	Rohde & Schwarz	827 063/010
35	EMI Test Receiver	Display	Rohde & Schwarz	829 808/010

No	Instrument/Ancillary	Type	Manufacturer	Serial No.
36	Controler	HD 100	Deisel	100/322/93
37	Relais Matrix	PSN	Rohde & Schwarz	829 065/003
38	Control Unit	GB 016 A2	Rohde & Schwarz	344 122/008
39	Relais Switch Unit	RSU	Rohde & Schwarz	316 790/001
40	Power Supply	6032A	Hewlett Packard	2846A04063
41	Spektrum Monitor	EZM	Rohde & Schwarz	883 720/006
42	Meßempfänger	ESH 3	Rohde & Schwarz	890 174/002
43	Meßempfänger	ESVP	Rohde & Schwarz	891 752/005
44	Biconi Ant. 20-300MHz	HK 116	Rohde & Schwarz	833 162/011
45	Logper Ant. 0.3-1 GHz	HL 223	Rohde & Schwarz	832 914/010
46	Amplifier 0.1-4 GHz	AFS4	Miteq Inc.	206461
47	Logper Ant. 1-18 GHz	HL 024 A2	Rohde & Schwarz	342 662/002
48	Polarisationsnetzwerk	HL 024 Z1	Rohde & Schwarz	341 570/002
49	Double Ridge G Horn Antenne 1-26.5 GHz	3115	EMCO	9107-3696
50	Microw. Sys. Amplifier 0.5- 26.5 GHz	8317A	Hewlett Packard	3123A00105
51	Spectrum Analyzer	8562A	Hewlett Packard	2809AO2682
52	Steuerrechner	PSM 7	Rohde & Schwarz	883 086/026
53	DC V-Netzwerk	ESH3-Z6	Rohde & Schwarz	861 406/005
54	DC V-Netzwerk	ESH3-Z6	Rohde & Schwarz	893 689/012
55	AC 2 Phasen V-Netzwerk	ESH3-Z5	Rohde & Schwarz	861 189/014
56	AC 2 Phasen V-Netzwerk	ESH3-Z5	Rohde & Schwarz	894 981/019
57	AC-3 Phasen V-Netzwerk	ESH2-Z5	Rohde & Schwarz	882 394/007
58	Stromversorgung	6032A	Rohde & Schwarz	2933A05441
59	HF-Test Empfänger	ESVP.52	Rohde & Schwarz	881 487/021
60	Spectrum Monitor	EZM	Rohde & Schwarz	883 086/026
61	HF-Test Empfänger	ESH3	Rohde & Schwarz	881 515/002
62	Relais Matrix	PSU	Rohde & Schwarz	882 943/029
63	Relais Matrix	PSU	Rohde & Schwarz	828 628/007
64	Spectrum Analyzer	FSIQ 26	Rohde & Schwarz	119.6001.27
65	Spectrum Analyzer	HP 8565E	Hewlett Packard	3473A00773
66				

Test site



Test site



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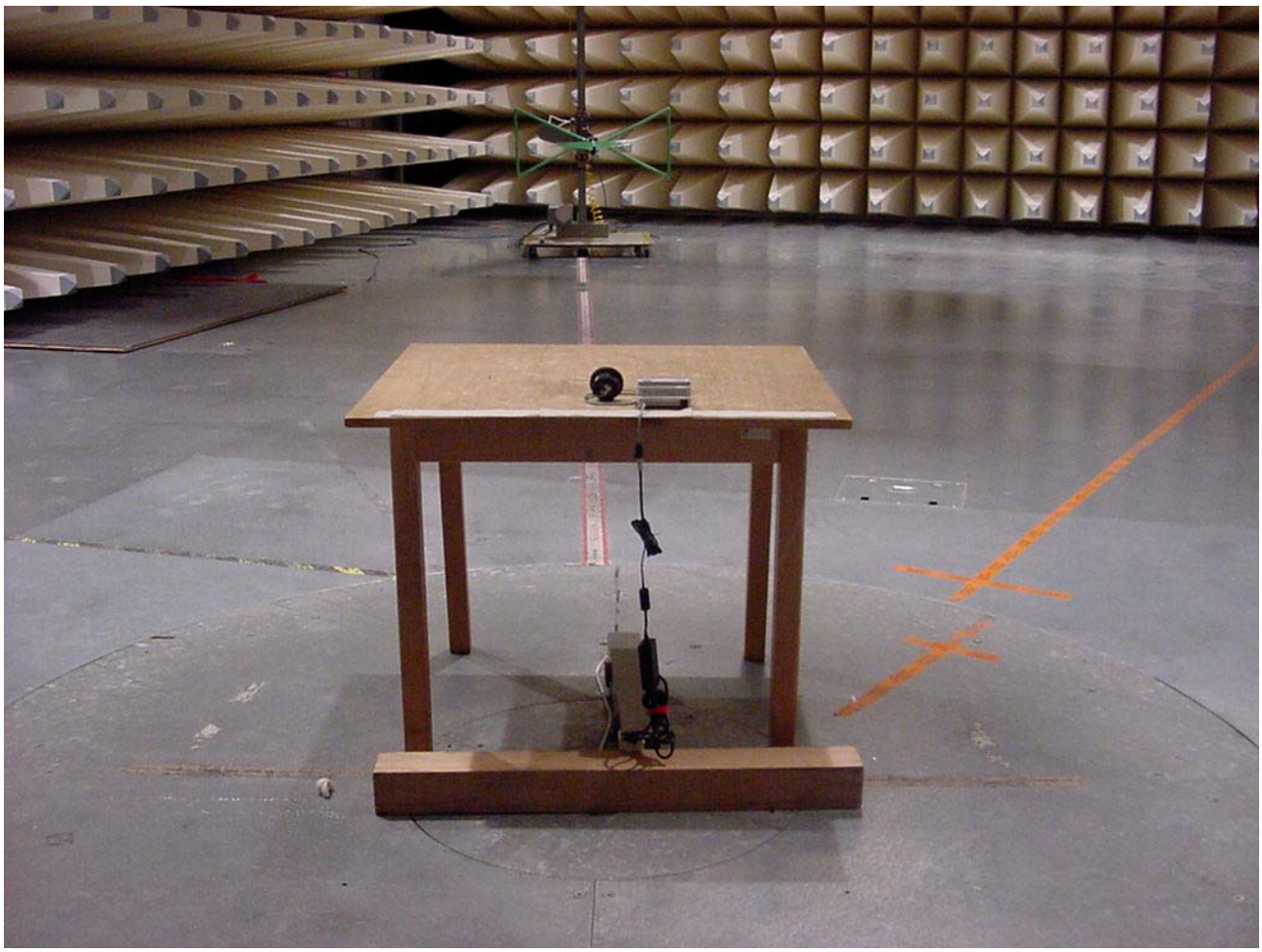
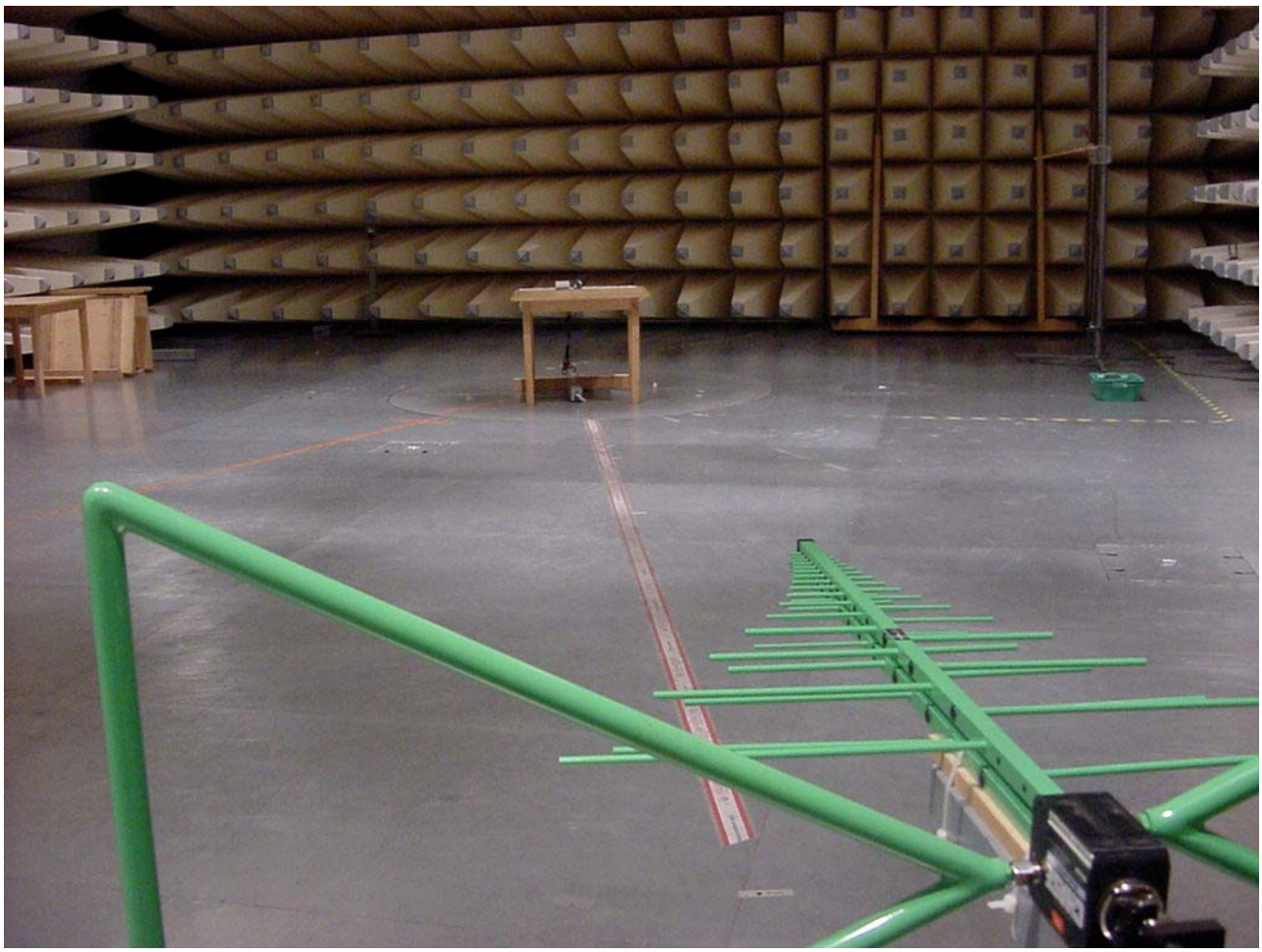
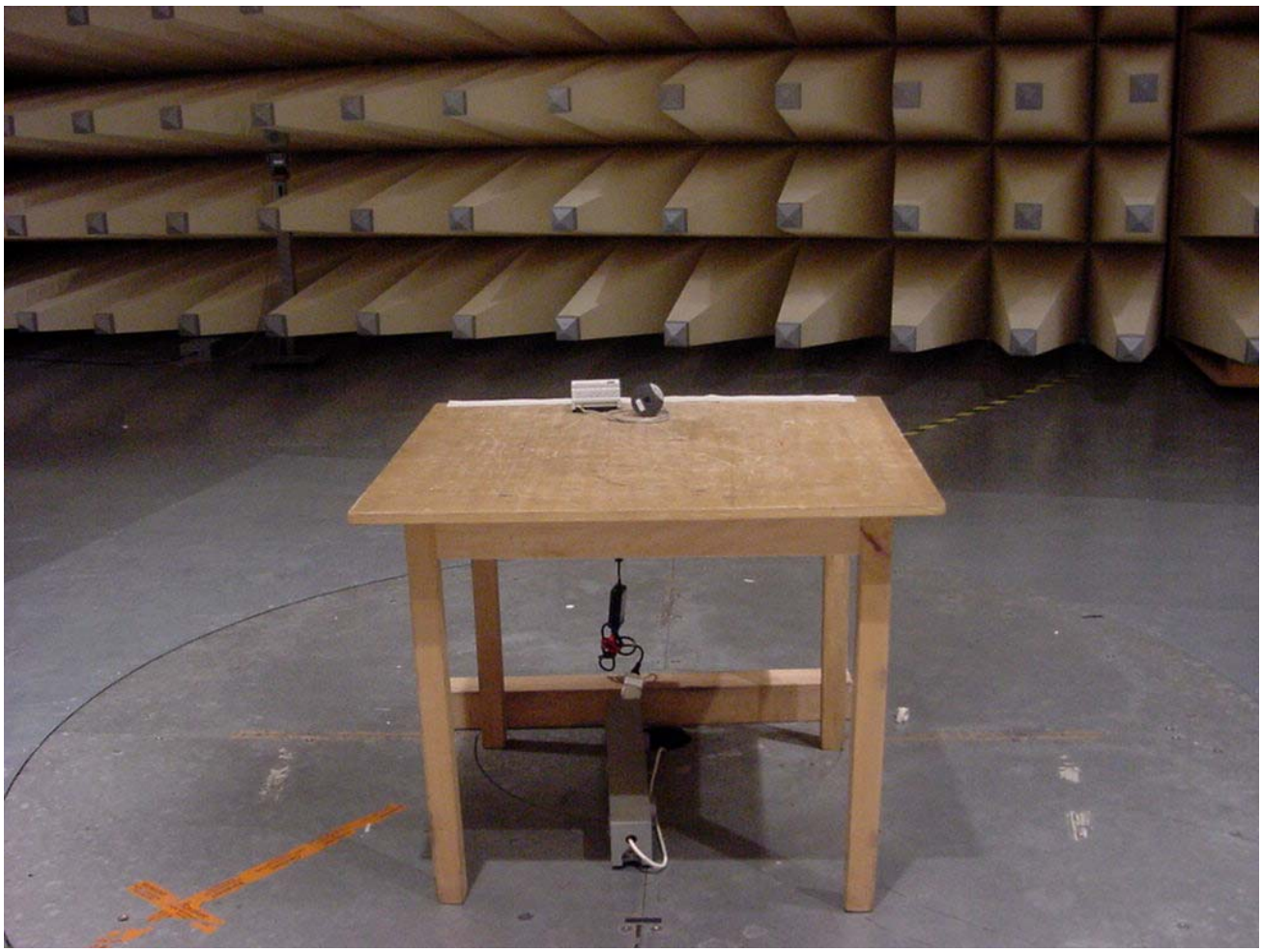


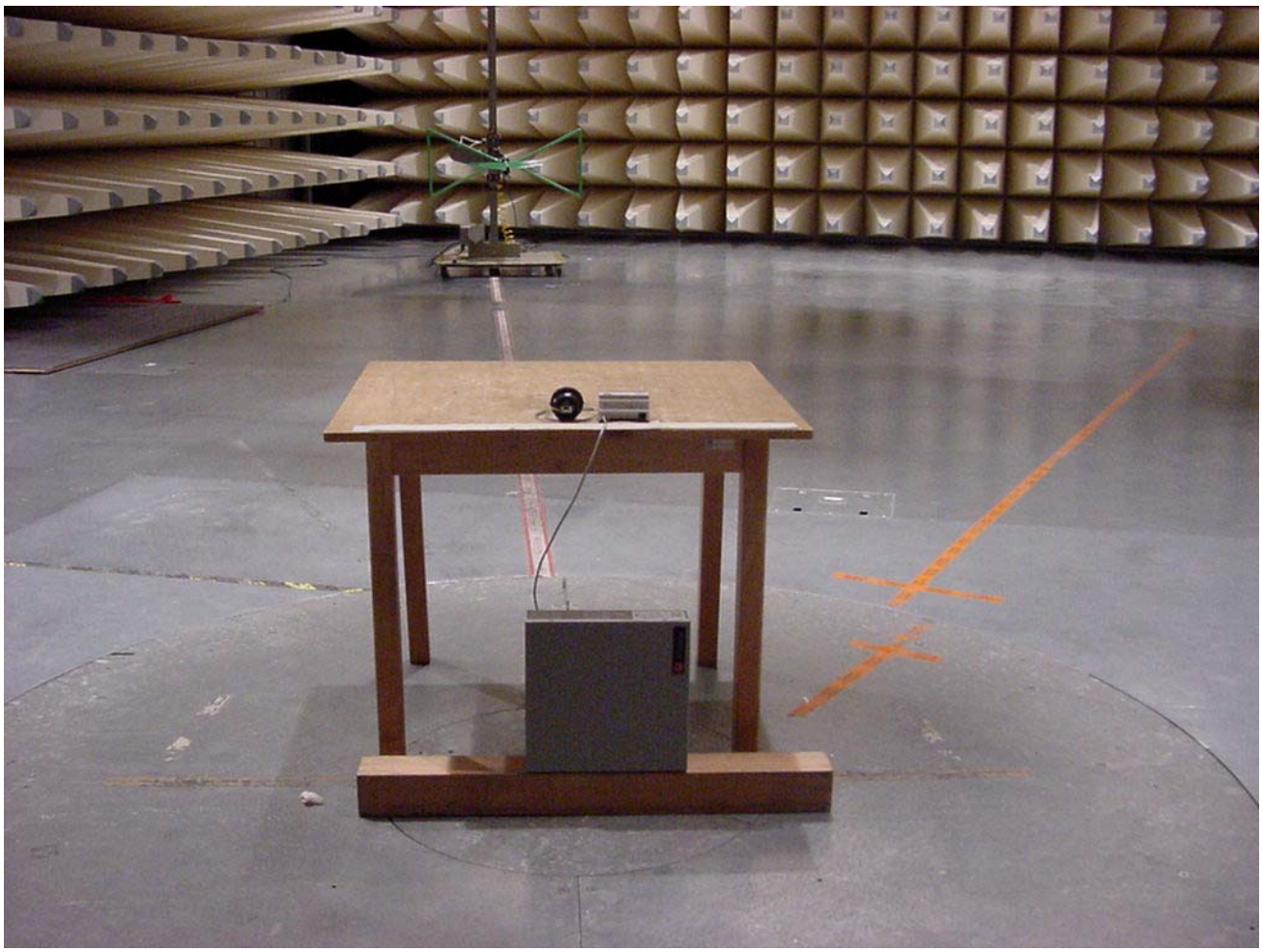
Test site



Test site

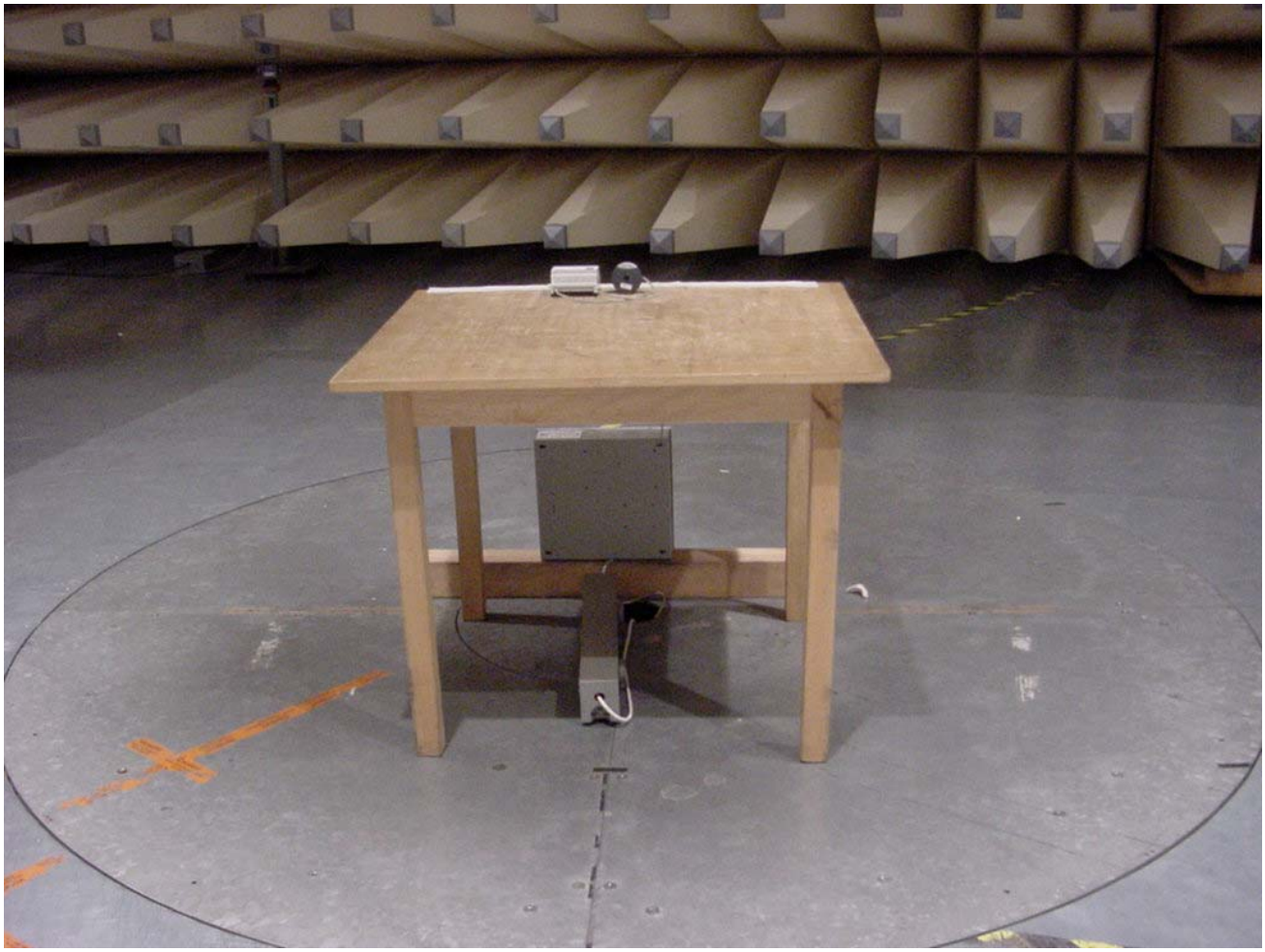


Test site



Test site

Test site



PHOTOGRAPHS OF THE EQUIPMENT

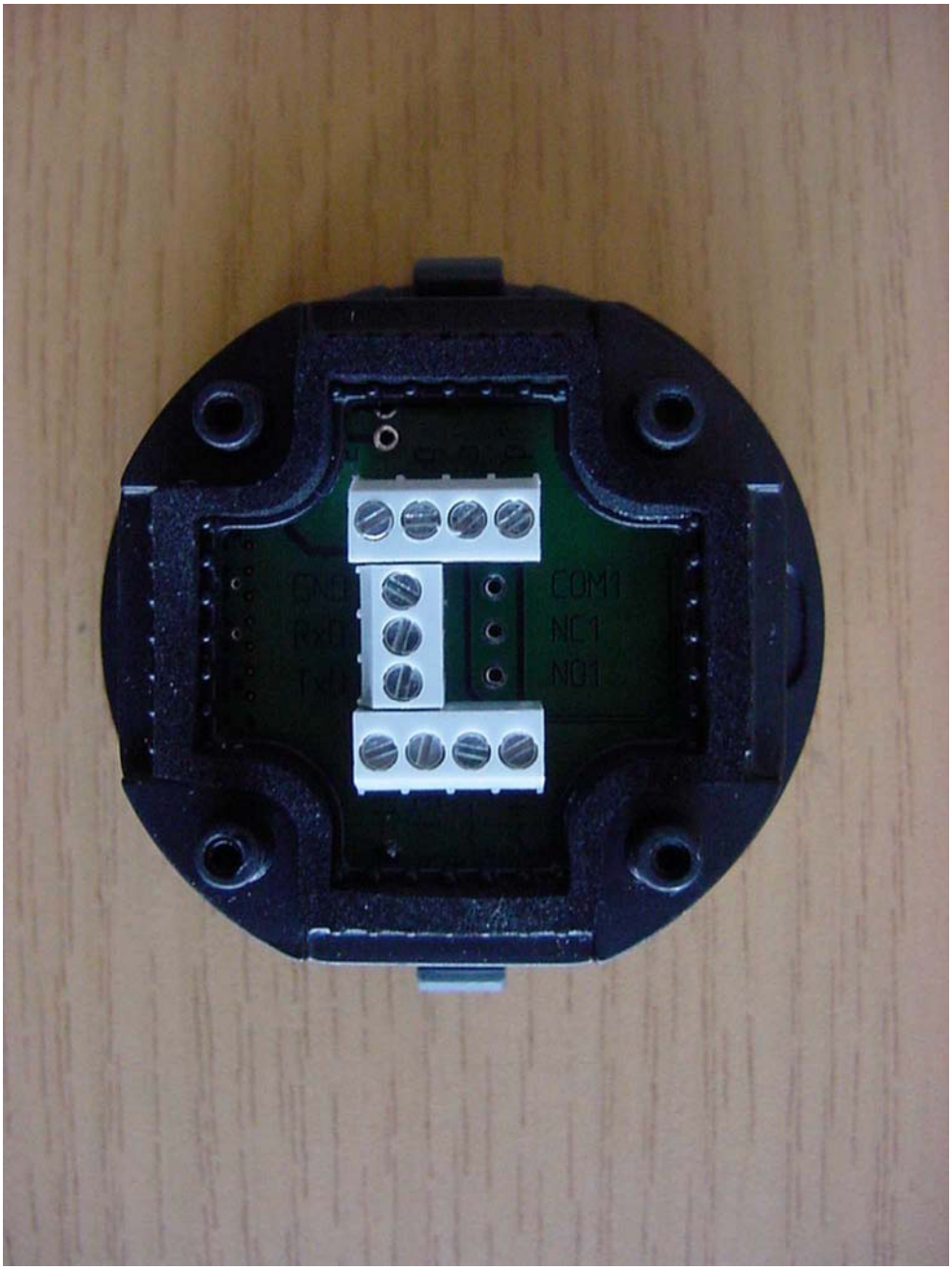
Photograph No.: 01

Photograph No.: 02

Photograph No.: 03

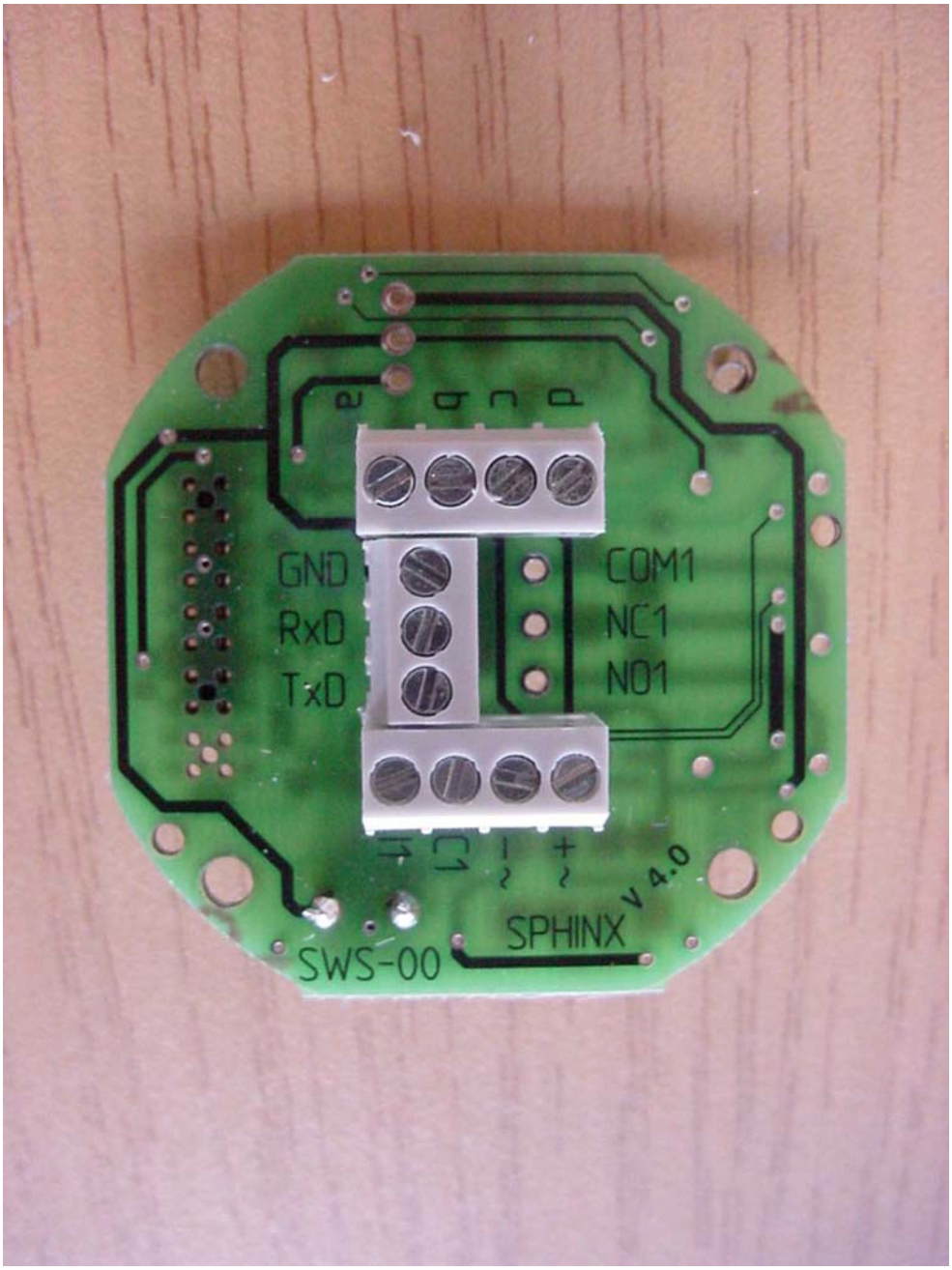
Photograph no.: 04

Photograph No.: 05

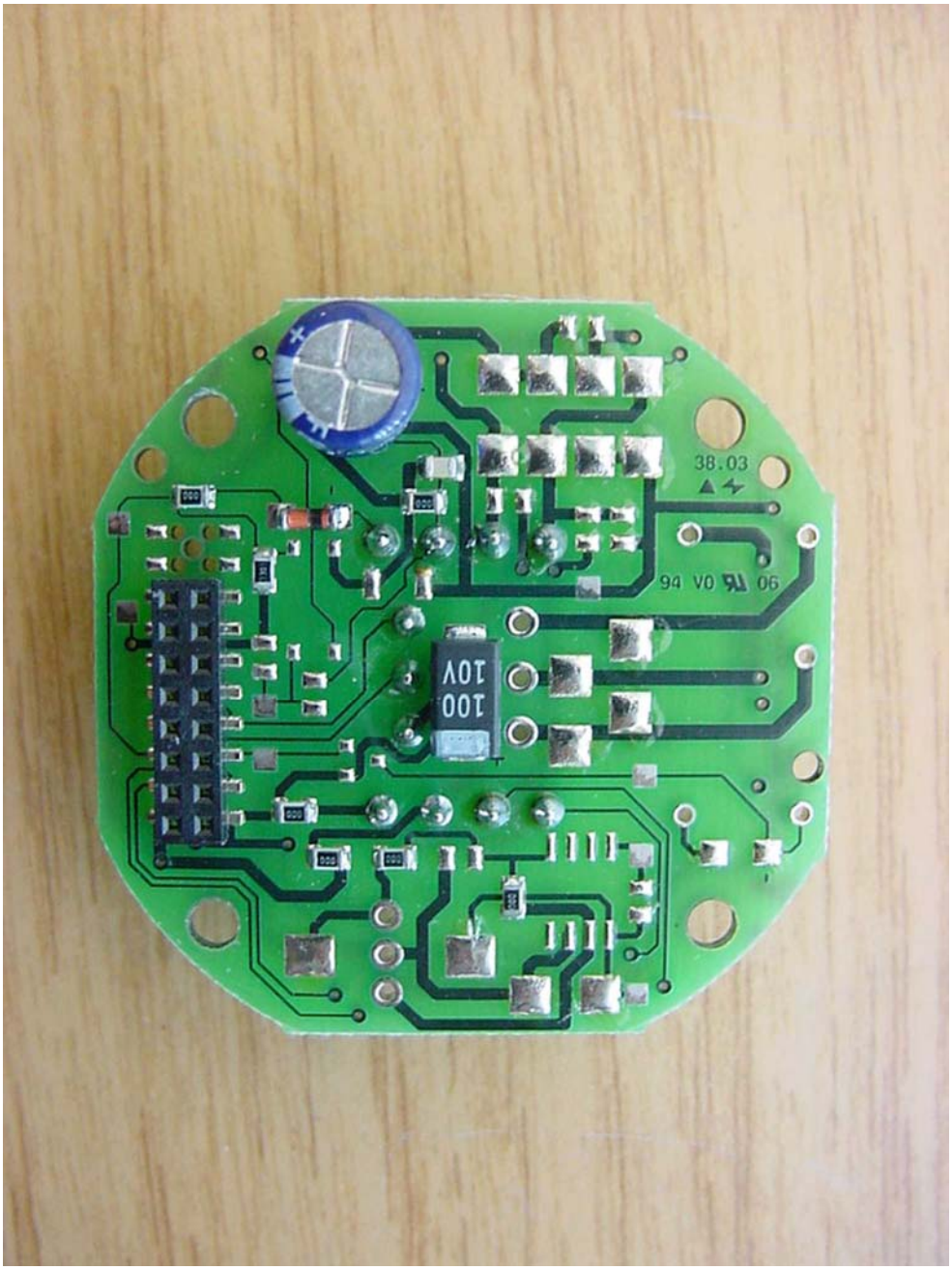


Photograph No.: 06

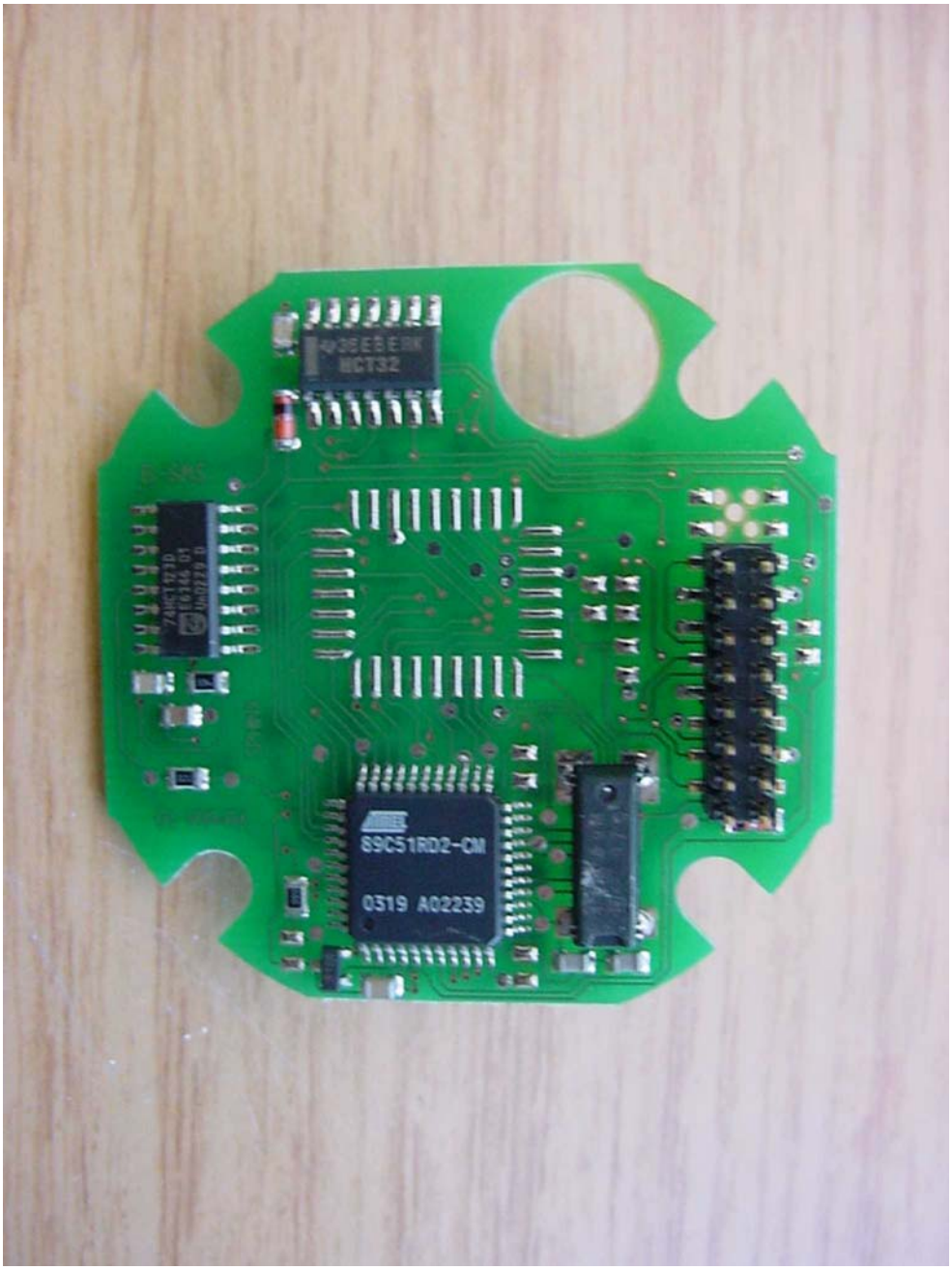
Photograph No.: 07



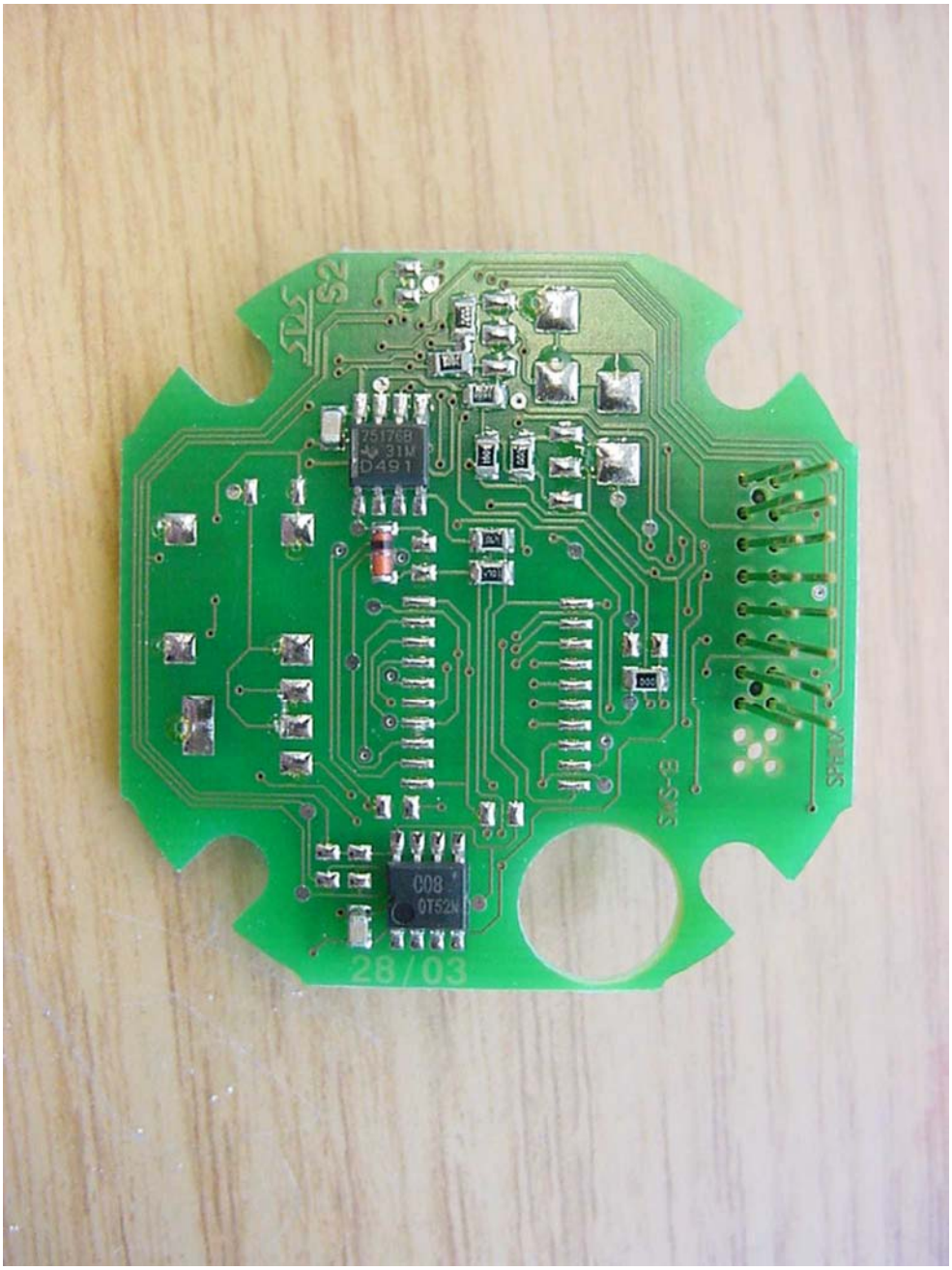
Photograph No.: 08



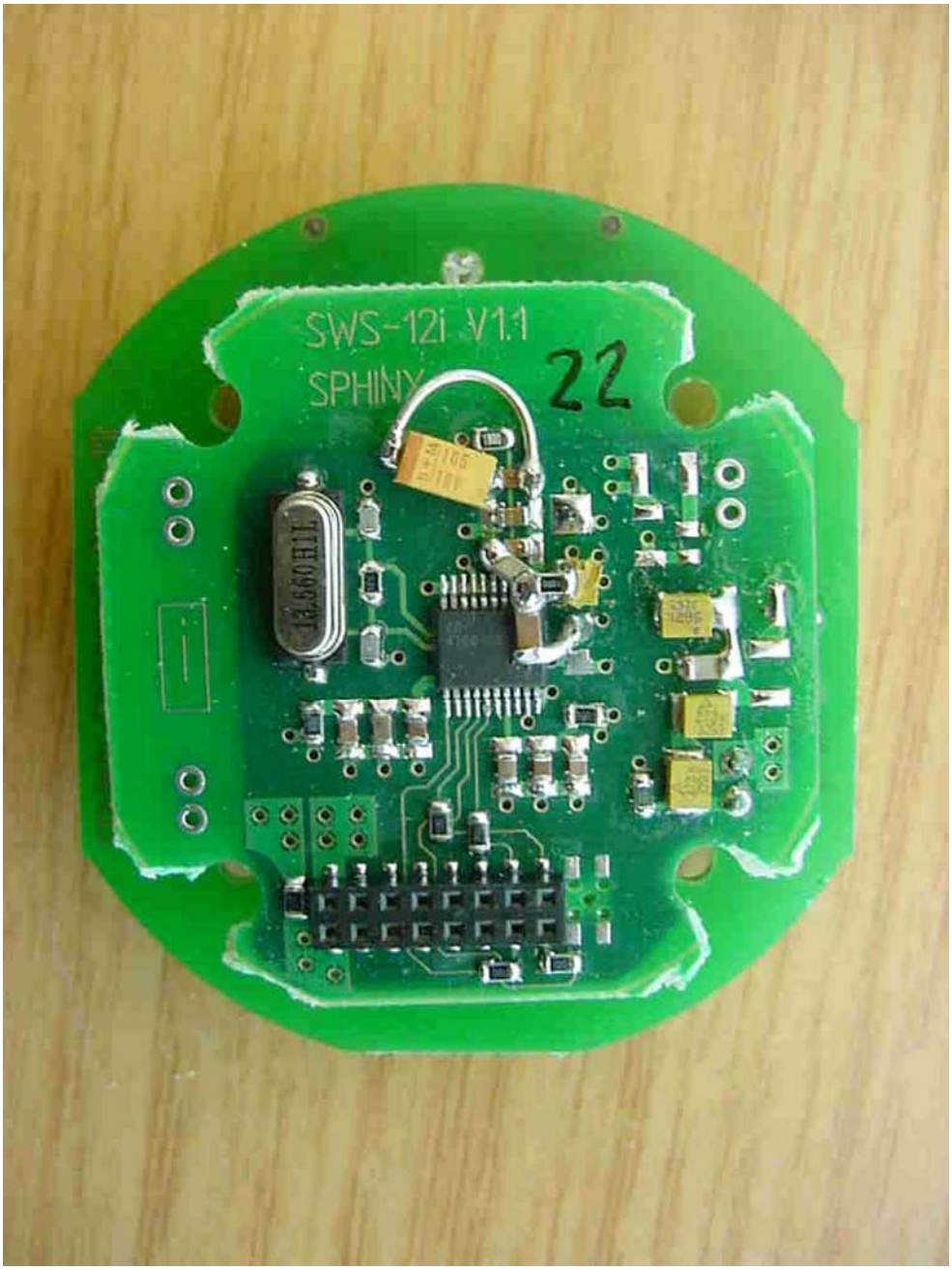
Photograph No.: 09



Photograph No.: 10



Photograph No.: 11

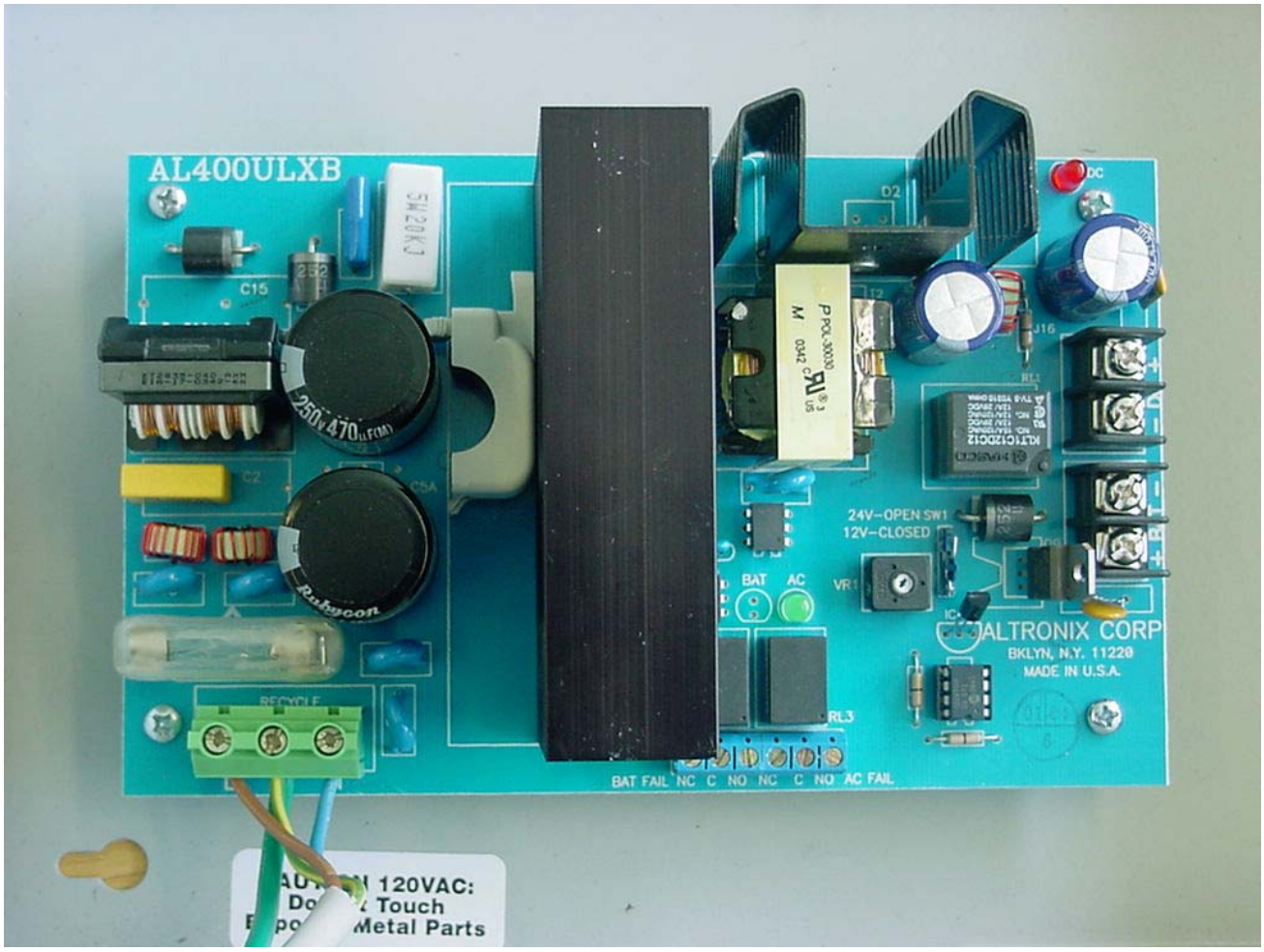


Photograph No.: 12

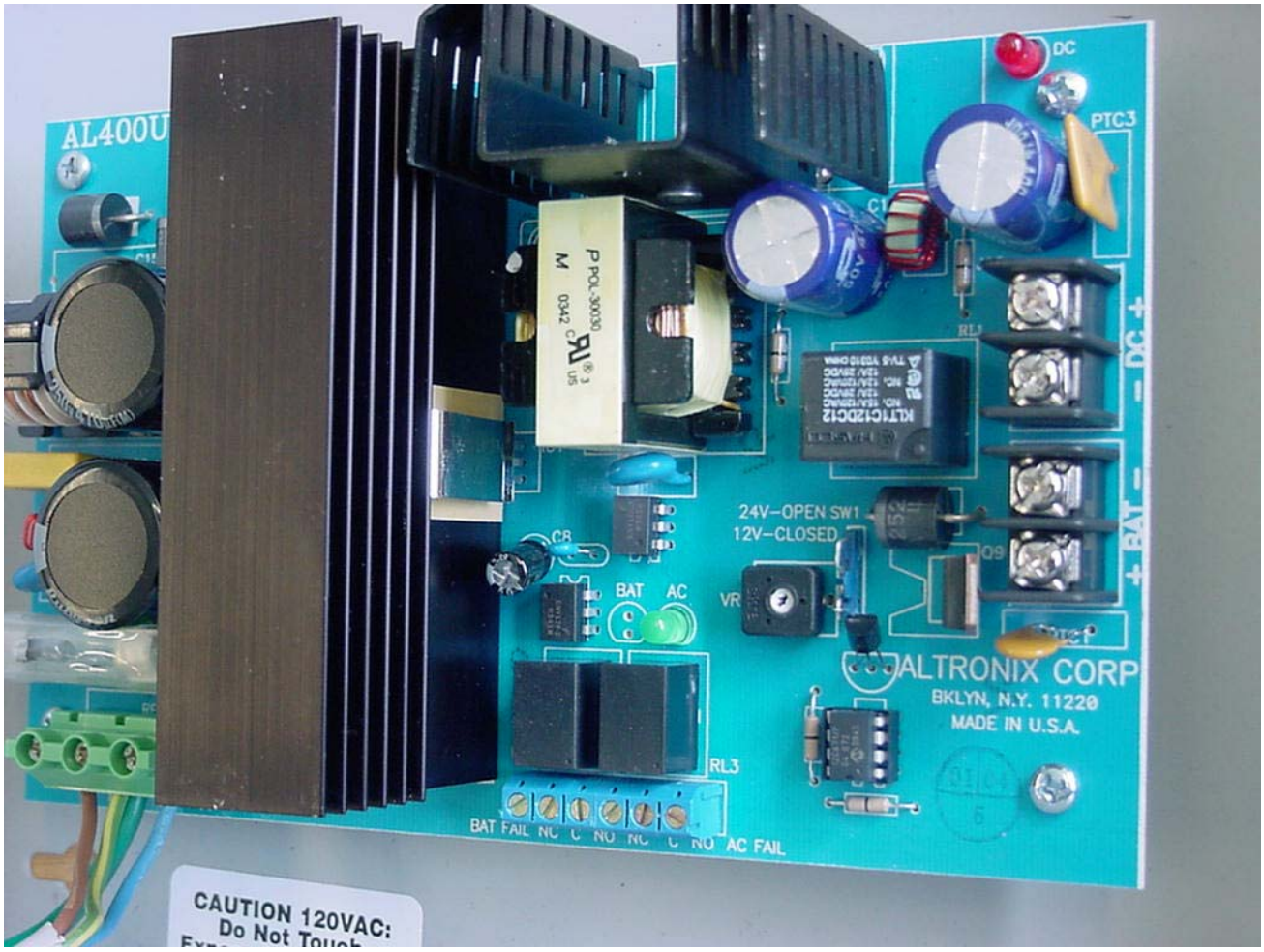
Photograph No.: 13

Photograph No.: 14

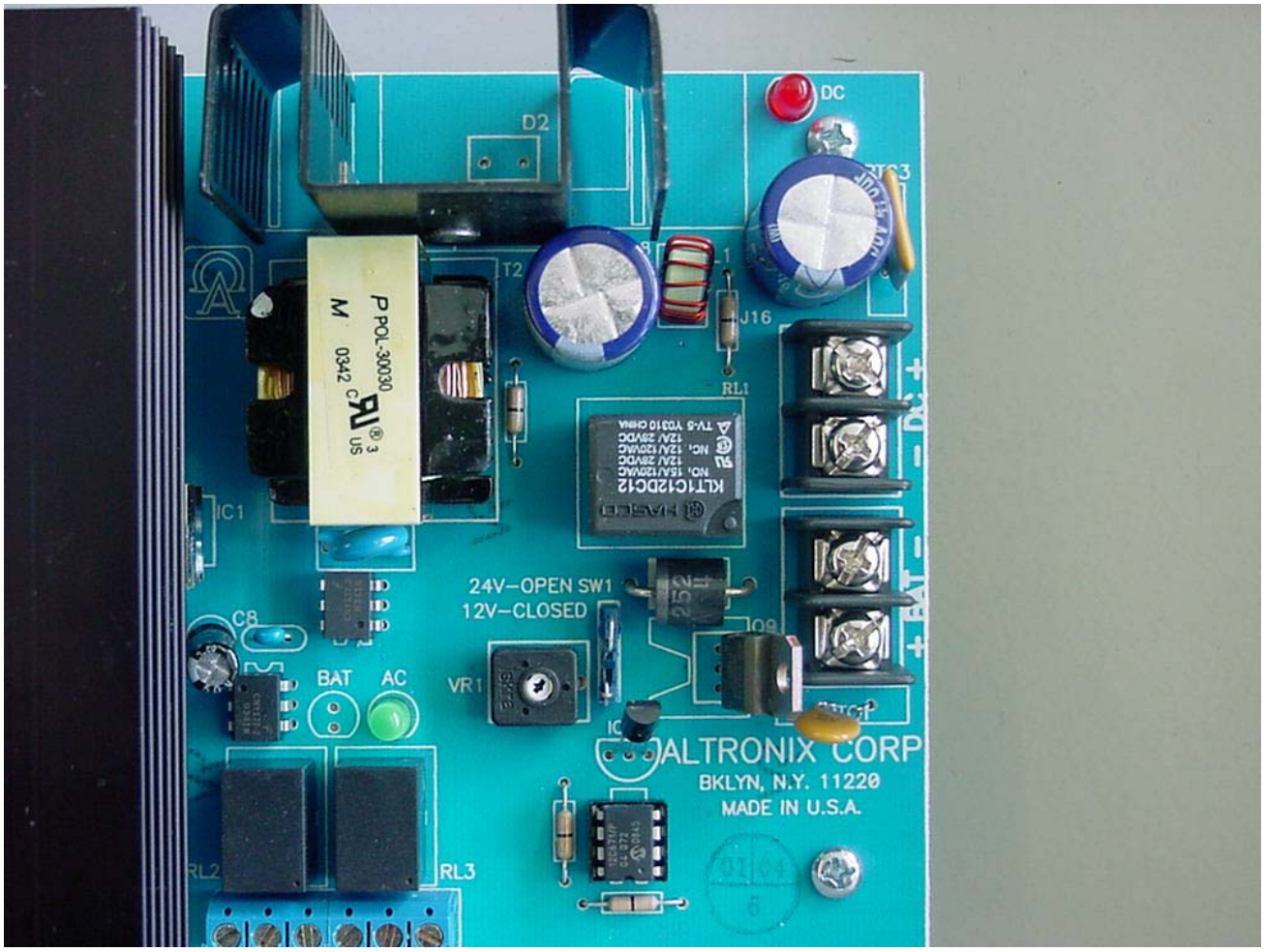
Photograph No.: 15



Photograph No.: 16



Photograph No.: 17



Photograph No.: 18