

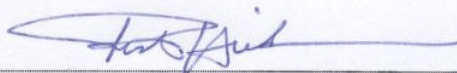
Date: Espoo 29 / 02 2000

Page: 1 (34)

Number: **TL 1000461**

Date of handing in: 15.11.1999

Measured by:



Risto Hietanen

Product Manager

Approved by:



Aarni Roth

Application Manager



T017 (EN 45001)

SORT OF EQUIPMENT: **Radio Modem**

MARKETING NAME:

SATELLINE

TYPE:

SATELLINE-3ASd/250

MANUFACTURER:

Satel Oy

SERIAL NUMBER:

99420528, 99420527, 99420526, 99420525

CUSTOMER:

Satel Oy

ADDRESS:

Meriniitynkatu 17, FIN-24100 Salo

TELEPHONE:

+358 2 777 7800 / Tapio Malmivaara

TESTSPESIFICATION:

**ETS 300 113, June 1996
prETS 300 793, December 1996**

REMARKS:

This test report includes the appendix:
"Application form for testing to ETS 300 113" from the customer.

Five original identical test reports have been prepared.
All have been delivered to the client. This test report is No. 1 (of 5).

Type:	SATELLINE-3ASd/250	
Alignment range:	90 MHz	
Switching range:	1 channel	Category: AR3

Measurement Frequencies Tx/Rx:	Equipment 1 and 4 Serial no. 99420528, 99420525 1) 380.000 MHz 4) 470.000 MHz	Equipment 2 Serial no. 99420527 2) 410.000 MHz	Equipment 3 Serial no. 99420526 3) 440.000 MHz
Voltages: Temperatures: Humidity:	Normal 13.5 VDC 21.0 to 22.1 °C 30.9 to 40.6 %	Minimum 9.0 VDC - 20 °C	Maximum 30.0 VDC + 55 °C
Carrier power:	1 W /10 mW	Antenna:	50 ohm (TNC-connector)
Class of emission:	F1D	If frequencies:	77 550 khz, 455 kHz
Number of channels:	1	Production model:	Yes
Channel separation:	25.0 kHz	Mode of DATA	Multilevel State FM, 19200 bps

The following measurements according to ETS 300 113 and prETS 300 793 standard have been performed:

Eq. 2 Ch. 2)	Eq. 1 and 4 Channels 1) 4)	Eq. 3 Ch. 3)	
☐	☐	☐	5.1.1 Frequency error
☐	☐	☐	5.1.2 Carrier power (conducted)
☒	☒	☒	5.1.4 Adjacent channel power
☐	☐	☐	5.1.5 Spurious emissions (conducted)
☐	☐	☐	5.1.5 Spurious emissions (radiated)
☐	☐	☐	5.1.6 Intermodulation attenuation
☐	☐	☐	5.1.7 Transmitter attack time
☐	☐	☐	5.1.8 Transmitter release time
☐	☐	☐	5.1.9.1 Time domain analysis of power and frequency
☒	☒	☒	5.1.9.2 Adjacent channel power transient
☐	☒	☐	5.2.1 Maximum useable sensitivity
☐	☒	☐	5.2.3 Error behaviour at high input levels
☒	☒	☒	5.2.4 Co-channel rejection
☐	☐	☐	5.2.5 Adjacent channel selectivity
☐	☐	☐	5.2.6 Spurious response rejection
☐	☐	☐	5.2.7 Intermodulation response rejection
☐	☐	☐	5.2.8 Blocking or desensitisation
☐	☐	☐	5.2.9 Spurious radiations (conducted)
☐	☐	☐	5.2.9 Spurious radiations (radiated)
☐	☐	☐	Duplex operation
☐	☐	☐	5.3.1 Receiver desensitisation and maximum useable sensitivity
☐	☐	☐	5.3.2 Receiver spurious response rejection

REMARKS: We have measured same time (Test Report No. TL990313) the radio modem Satellite-3ASd/125, of which channel separation was 12.5 kHz (modulation bit rate: 9600 bps). This Test Report includes the measurement results of another version: Satellite-3ASd/250, of which channel separation is 25.0 kHz (modulation bit rate is now 19200 bps). Due to these separations we have repeated measurements marked above. We supposed after consideration, that the modifications have an effect on these parameters only.

Ambient temperature: 22.1 °C Relative humidity: 30.9 % Date: 19.11.1999 (1 W)
Ambient temperature: 21.7 °C Relative humidity: 36.9 % Date: 09.02.2000 (10 mW)

TRANSMITTER ADJACENT CHANNEL POWER CLAUSE 8.5

Modulation bit rate: 19200 bps (direct 4-FSK)
Channel separation 25.0 kHz

Rated output power: 1 W.

MEASUREMENT	BELOW CARRIER POWER (dBc)			
Channel	1	2	3	4
+ 12.5 kHz	- 73.4	- 72.9	- 1.3	- 71.8
- 12.5 kHz	- 71.3	- 70.9	- 73.2	- 70.6
Measurement uncertainty (U95)	± 1.6 dB			
LIMIT CLAUSE 5.1.4	20.0 kHz & 25.0 kHz channel spacing: 70dBc (without the need to be below 0.2 µW) 12.5 kHz channel spacing: 60dBc (without the need to be below 0.2 µW)			

TEST EQUIPMENT USED: 314, 9, 395, 119, 362, 403

Rated output power: 10 mW.

MEASUREMENT	BELOW CARRIER POWER (dBc)			
Channel	1	2	3	4
+ 25.0 kHz	- 71.3 (0.74 nW)	- 72.9 (0.51 nW)	- 69.9 (1.02 nW)	- 69.7 (1.07 nW)
- 25.0 kHz	- 69.8 (1.05 nW)	- 69.3 (1.18 nW)	- 69.5 (1.12 nW)	- 69.8 (1.05 nW)
Measurement uncertainty (U95)	± 1.6 dB			
LIMIT CLAUSE 5.1.4	20.0 kHz & 25.0 kHz channel spacing: 70dBc (without the need to be below 0.2 µW) 12.5 kHz channel spacing: 60dBc (without the need to be below 0.2 µW)			

TEST EQUIPMENT USED: 314, 9, 327, 362, 403

Ambient temperature: 21.1 °C Relative humidity: 32.9 % Date: 07.12.1999 (1 W)
Ambient temperature: 21.7 °C Relative humidity: 36.9 % Date: 09.02.2000 (10 mW)

TRANSIENT BEHAVIOUR OF THE TRANSMITTER CLAUSE 8.10

(ADJACENT CHANNEL POWER TRANSIENT)

Power level at which the measurement has been performed: 1 W

MEASUREMENT	BELOW CARRIER POWER (dBc)					
Channel	1		4			
	TX on	TX off	TX on	TX off	TX on	TX off
+ 25.0 kHz	< - 66.0	< - 66.0	< - 66.0	< - 66.0		
- 25.0 kHz	< - 66.0	< - 66.0	< - 66.0	< - 66.0		
Measurement uncertainty (U95)	+ 1.4 dB, -1.6 dB					
LIMIT CLAUSE 5.1.9.2	Ch. spacing 12.5 kHz: - 50 dBc (without the need to be below 2 μW) Ch. spacings 20.0/25.0 kHz: - 60 dBc (without the need to be below 2 μW)					

TEST EQUIPMENT USED: 119, 391, 392, 146, 134, 335, 332, 41, 42, 10, 362, 403

Power level at which the measurement has been performed: 10 mW

MEASUREMENT	BELOW CARRIER POWER (dBc)					
Channel	1		4			
	TX on	TX off	TX on	TX off	TX on	TX off
+ 25.0 kHz	- 61.5	- 42.0	- 60.0	- 44.0		
	(7.08 nW)	(630 nW)	(10 nW)	(400 nW)		
- 25.0 kHz	- 44.0	- 53.0	- 53.0	- 47.0		
	(400 nW)	(50 nW)	(50 nW)	(200 nW)		
Measurement uncertainty (U95)	+ 1.4 dB, -1.6 dB					
LIMIT CLAUSE 5.1.9.2	Ch. spacing 12.5 kHz: - 50 dBc (without the need to be below 2 μW) Ch. spacings 20.0/25.0 kHz: - 60 dBc (without the need to be below 2 μW)					

TEST EQUIPMENT USED: 31, 389, 392, 389, 146, 135, 41, 43, 10, 362, 403

Ambient temperature: 22.1 °C Relative humidity: 30.9 % Date: 19.11.1999 (normal test conditions)
Date: 11.01.2000 (extreme test conditions, - 20 °C)
Date: 12.01.2000 (extreme test conditions, +55 °C)

MAXIMUM USEABLE SENSITIVITY (CONDUCTED) CLAUSE 9.1

Method of measurement: Message
Channel separation: 25.0 kHz

TEST CONDITIONS		RECEIVER SENSIVITY (dB μ V)			
Channel		1	2	3	4
Tnom	Vnom	- 3.3	- 2.9	- 3.4	- 0.9
Tmin	Vmin	- 4.6	- 4.9	+ 1.9	- 3.7
	Vmax	- 4.0	- 4.3	+ 1.1	- 3.8
Tmax	Vmin	- 2.9	- 3.3	- 3.9	- 1.2
	Vmax	- 2.9	- 3.3	- 3.0	- 1.7
Measurement uncertainty		+ 1.8 dB, - 2.1 dB			

LIMITS CLAUSE 5.2.1

Under normal test conditions	+ 3 dB μ V
Under extreme test conditions	+ 9 dB μ V

TEST EQUIPMENT USED: 31, 62, 327, 10, 157, 230, 362, 403

Ambient temperature: 21.0 °C Relative humidity: 40.6 % Date: 12.01.2000

ERROR BEHAVIOUR AT HIGH INPUT LEVELS CLAUSE 9.4

Method of measurement: Message

RF INPUT TO RECEIVER	CHANNEL		
	BER		
	1	4	
+ 6 dB μ V + 30 dB	No errors	No errors	
+ 6 dB μ V + 100 dB	No errors	No errors	
Measurement uncertainty	$\pm 0.1 \%$		

LIMIT CLAUSE 5.2.3

Errors ≤ 1

TEST EQUIPMENT USED: 31, 10, 62, 327, 362, 403

Ambient temperature: 21.0 °C Relative humidity: 40.6 % Date: 12.01.2000

CO-CHANNEL REJECTION CLAUSE 9.5

Method of measurement: Message
Channel separation: 25.0 kHz

FREQUENCY OF UNWANTED SIGNAL	CHANNEL		
	REJECTION RATIO (dB)		
	1	4	
F+3000 Hz	- 8.0	- 6.8	
f	- 7.6	- 7.3	
F-3000 Hz	- 7.9	- 7.0	
Measurement uncertainty (U95)	+ 2.2 dB, - 2.6 dB		

The lowest value of the five measurement results noted shall be recorded as the co-channel rejection.

LIMIT CLAUSE 5.2.4

CHANNEL SPACING (kHz)	LIMIT (dB)
12.5	-12 and 0
20.0	-8 and 0
25.0	-8 and 0

TEST EQUIPMENT USED: 31, 32, 102, 133, 327, 10, 62, 362, 403

Ambient temperature: 22.1 °C Relative humidity: 30.9 % Date: 19.11.1999 (normal test conditions)
Date: 11.01.2000 (extreme test conditions, - 20 °C)
Date: 12.01.2000 (extreme test conditions, +55 °C)

ADJACENT CHANNEL SELECTIVITY CLAUSE 9.6

Method of measurement: Message
Channel separation: 25.0 kHz

Conditions		UNWANTED SIGNAL + AND - RELATIVE TO WANTED RATIO (dB)							
Channel		1		2		3		4	
		+25.0kHz	-25.0kHz	+25.0kHz	-25.0kHz	+25.0kHz	-25.0kHz	+25.0kHz	-25.0kHz
Tnom	Vnom	71.6	71.9	72.3	72.7	71.8	72.2	72.8	71.8
Tmin	Vmin	73.5	72.6	72.8	73.6	72.0	72.9	72.3	72.4
	Vmax	72.6	72.8	72.6	73.4	71.1	73.0	73.6	72.8
Tmax	Vmin	72.9	72.6	72.6	73.2	72.9	71.8	73.6	73.0
	Vmax	72.5	72.6	72.3	73.2	72.7	71.6	73.0	72.2

Measurement uncertainty (U95): + 2.2 dB, - 2.6 dB

LIMITS CLAUSE 5.2.5

CHANNEL SPACING (kHz)	Under normal conditions	Under extreme conditions
12.5	60 dB	50 dB
20.0	70 dB	60 dB
25.0	70 dB	60 dB

TEST EQUIPMENT USED: 31, 32, 102, 135, 327, 62, 157, 230, 362, 403

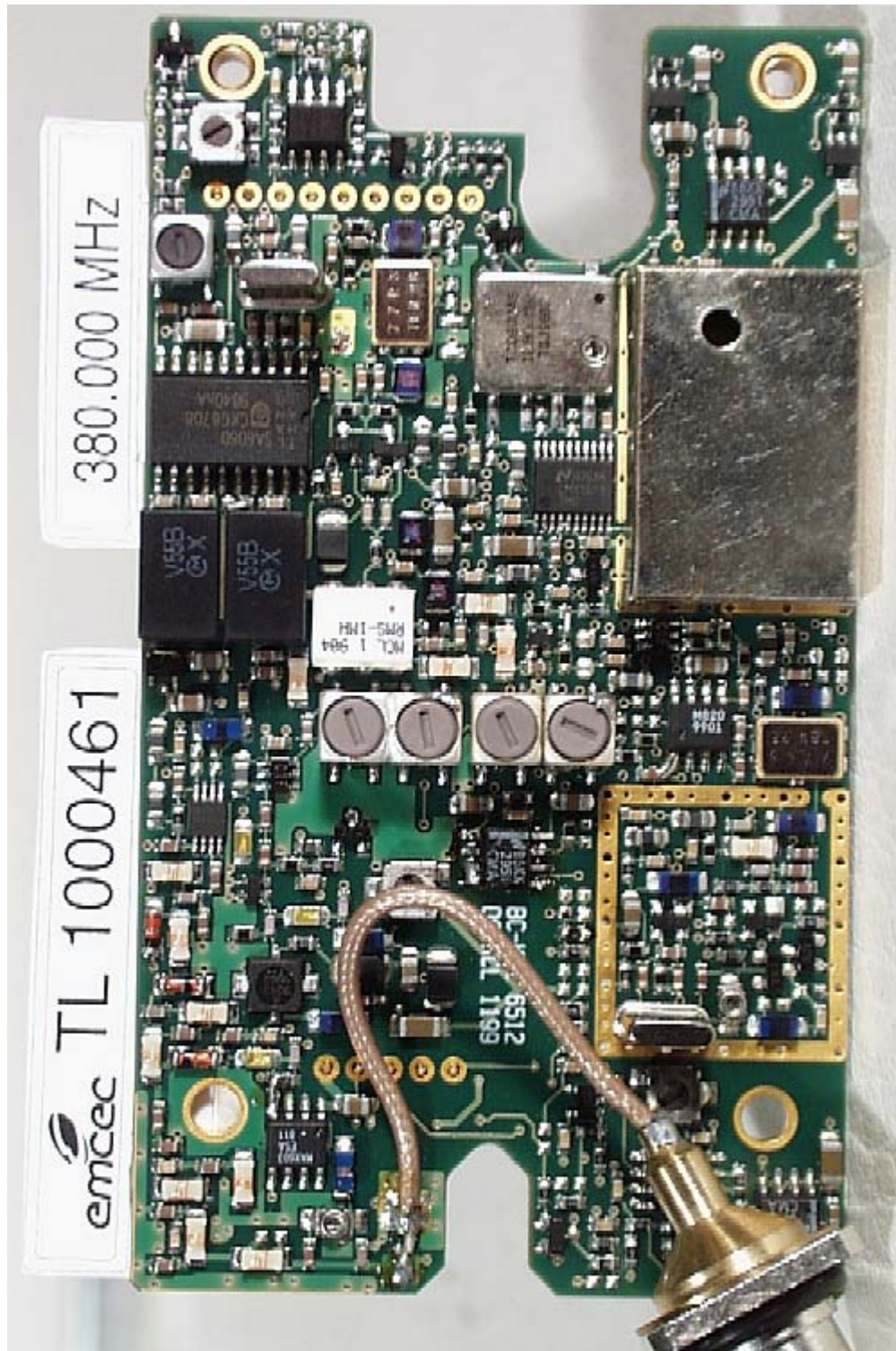


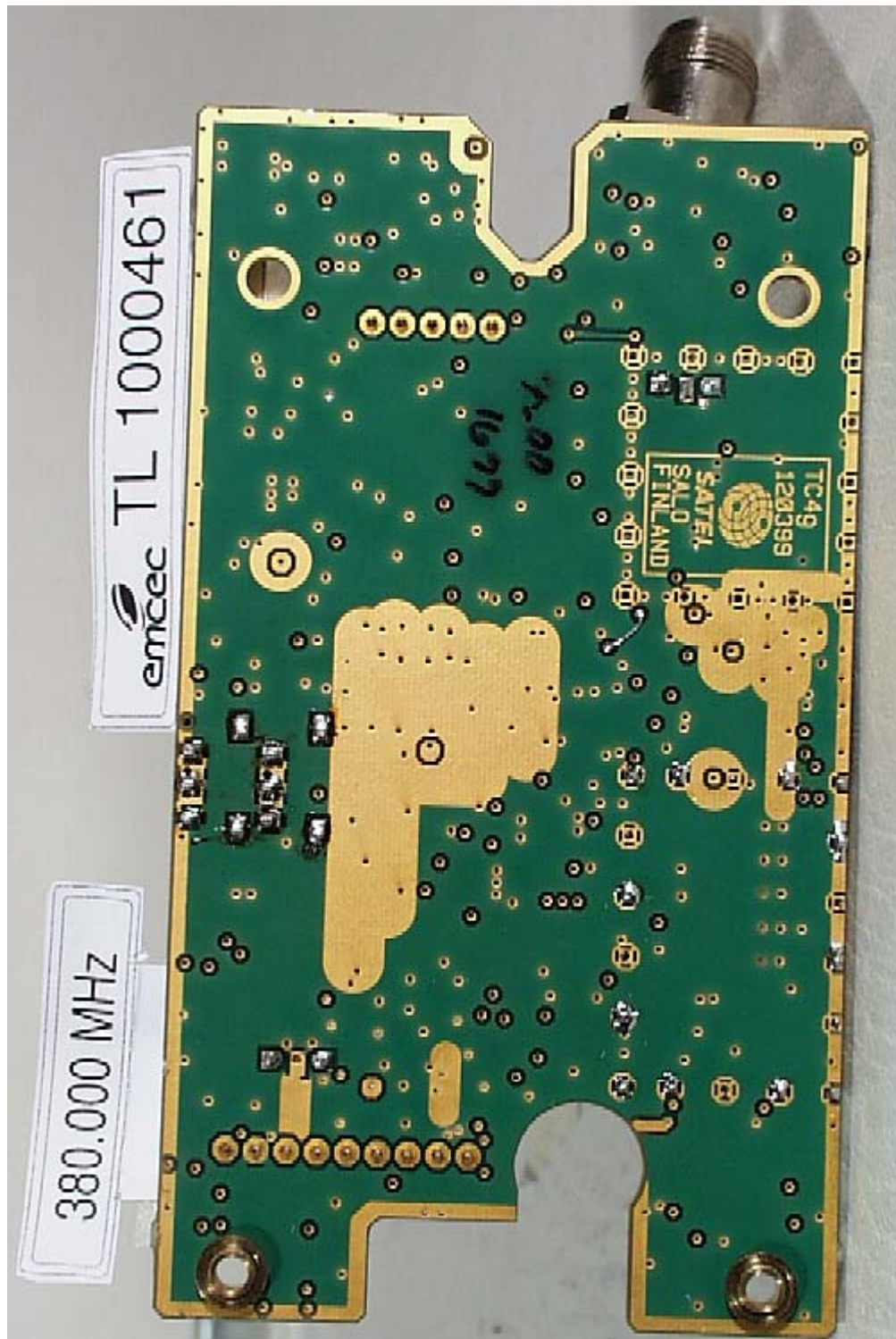




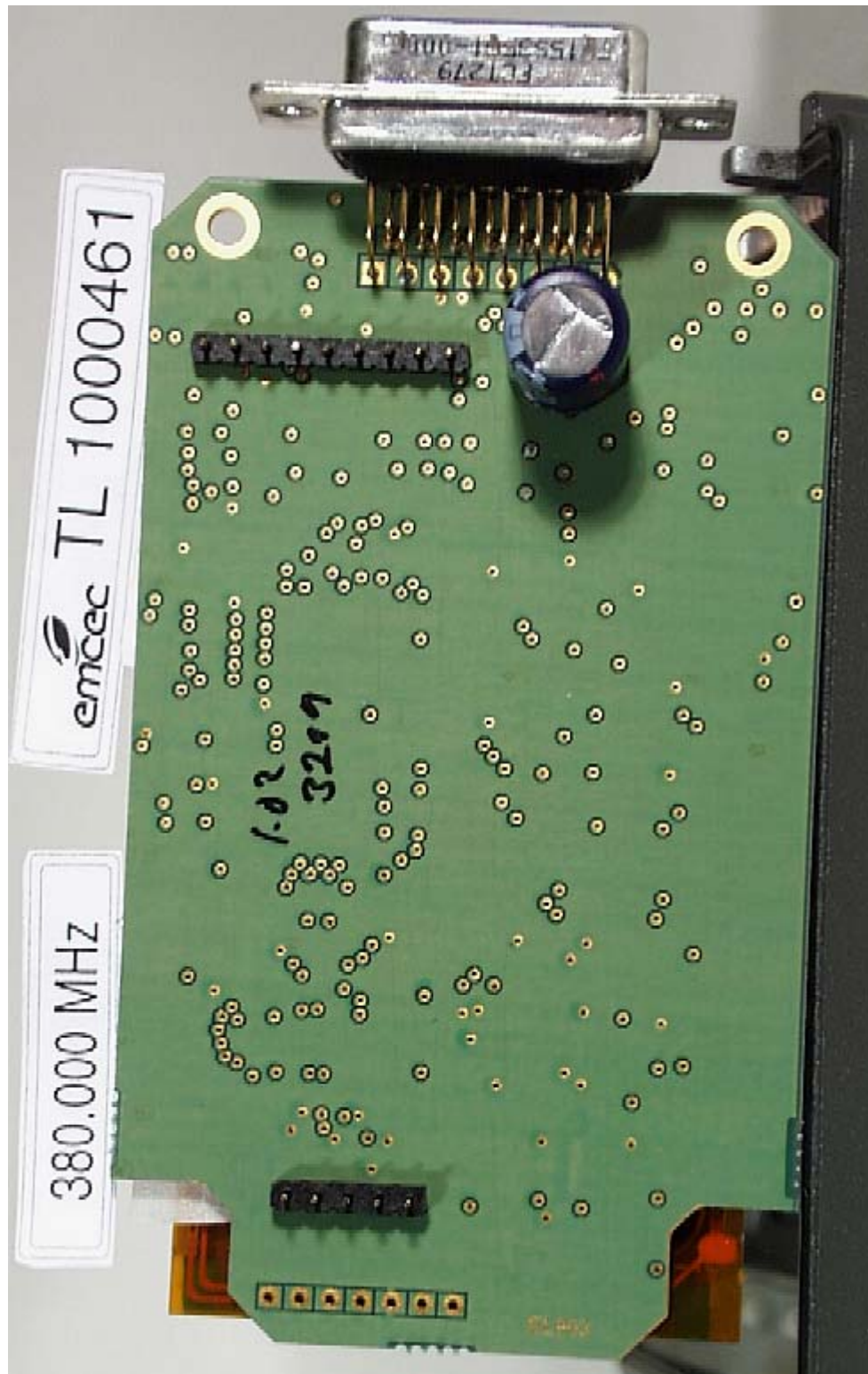






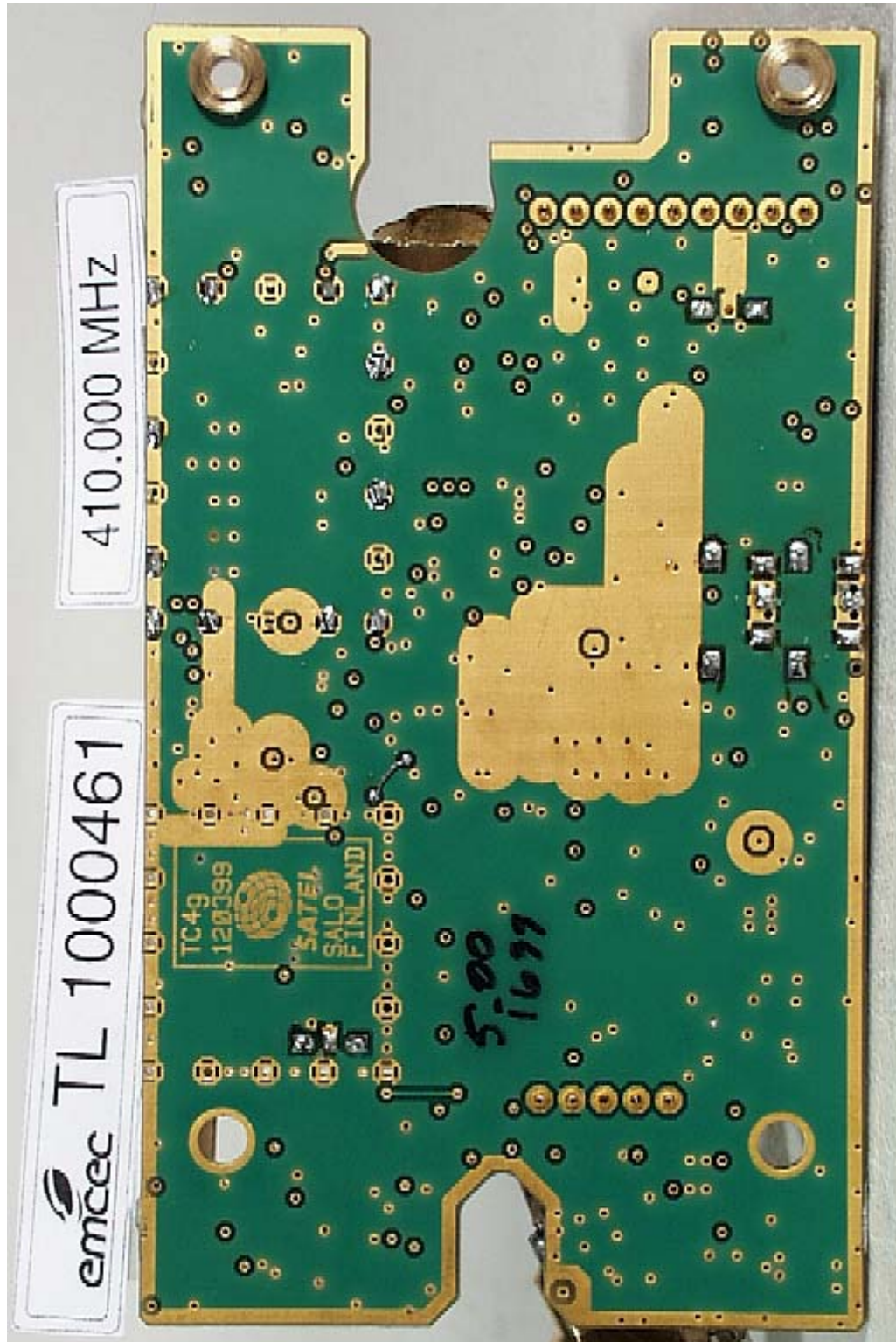




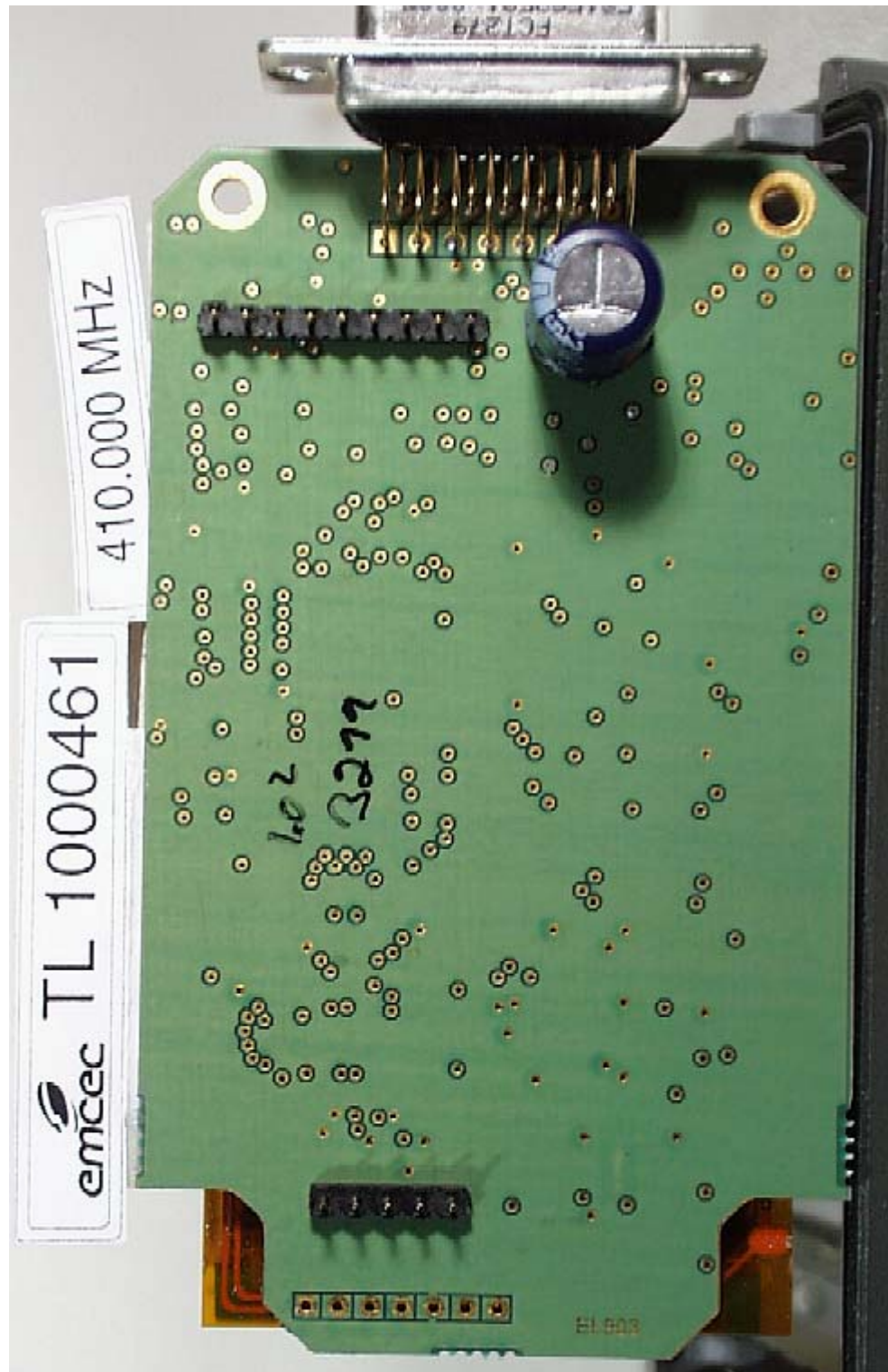




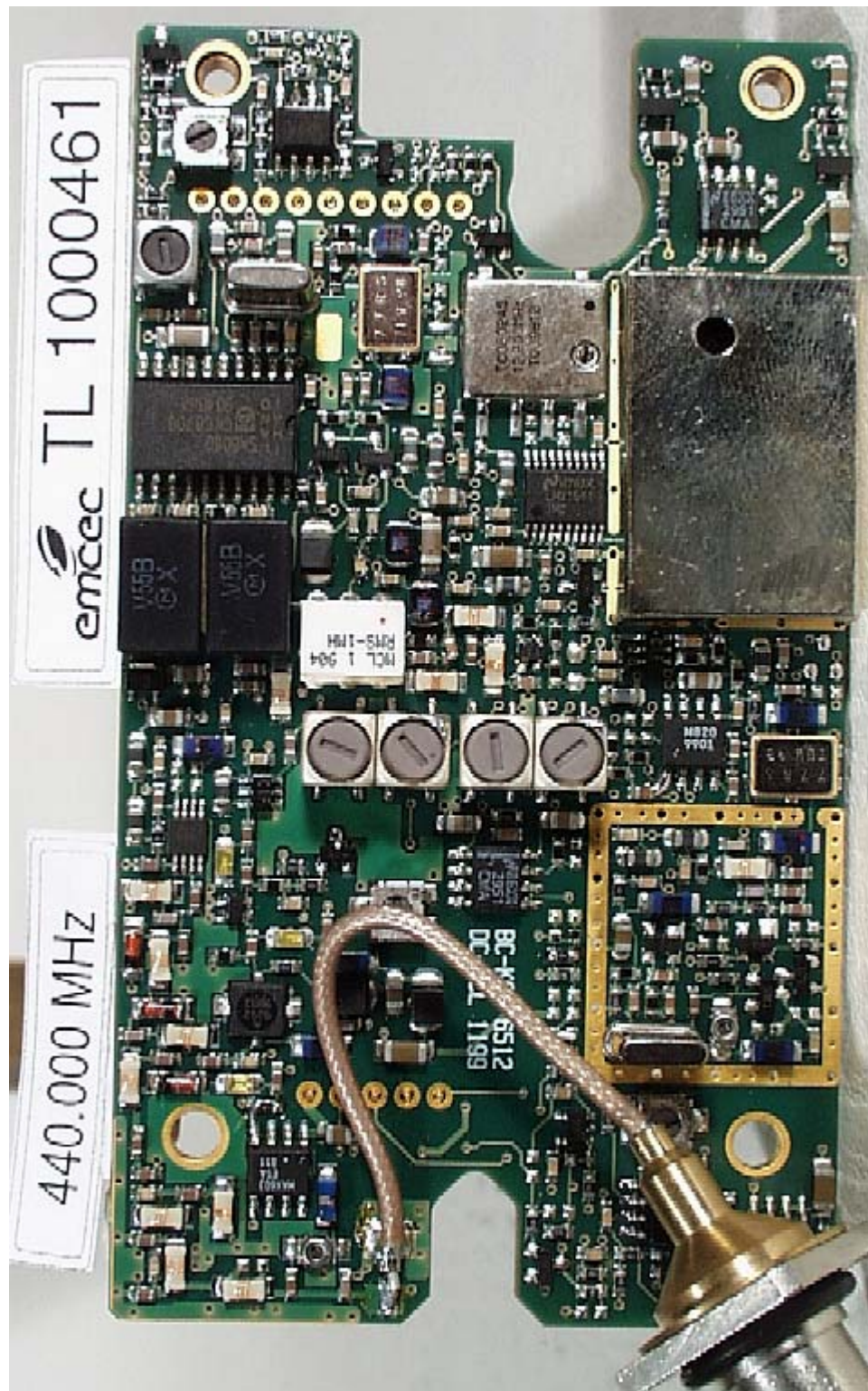


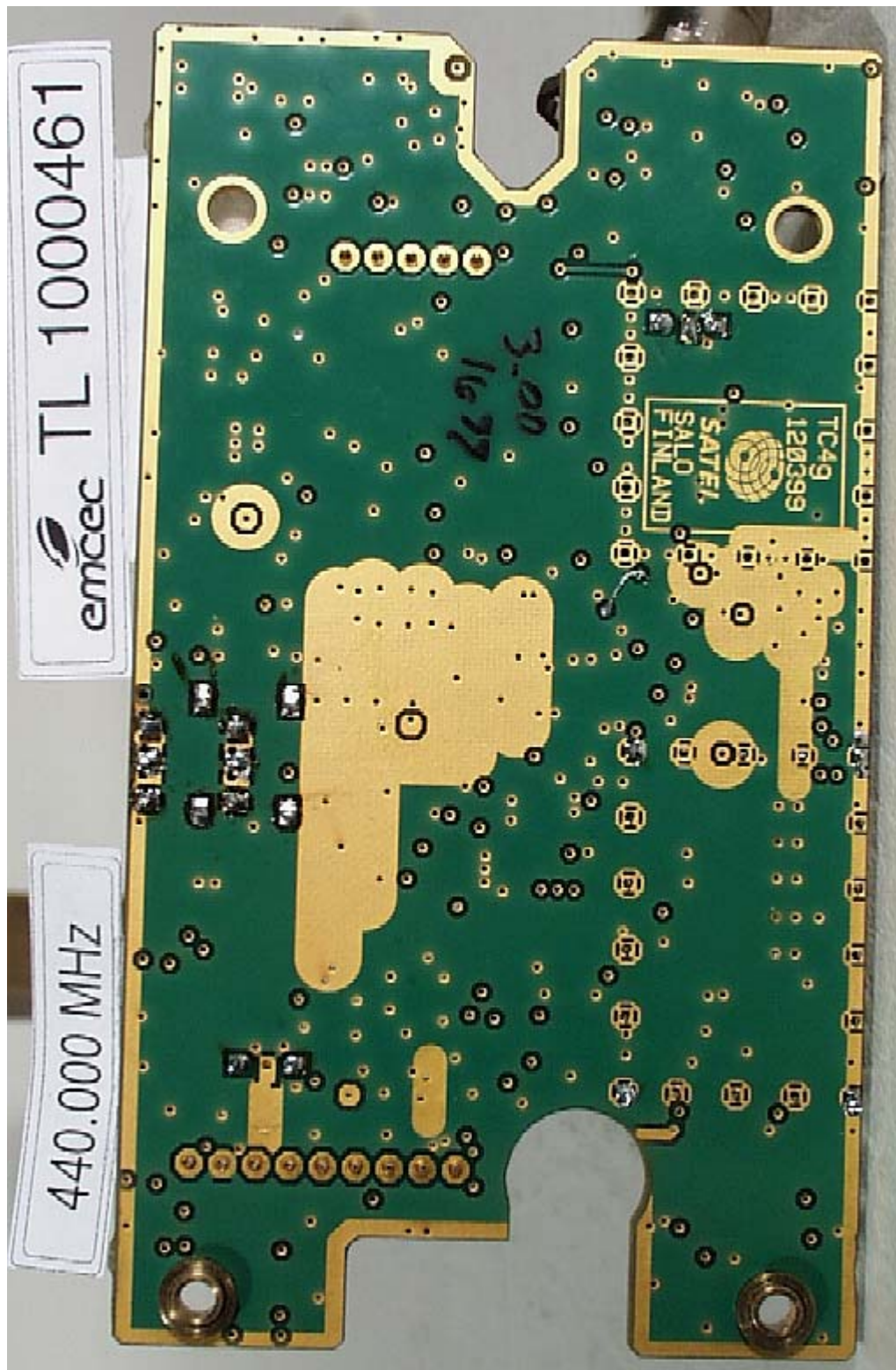


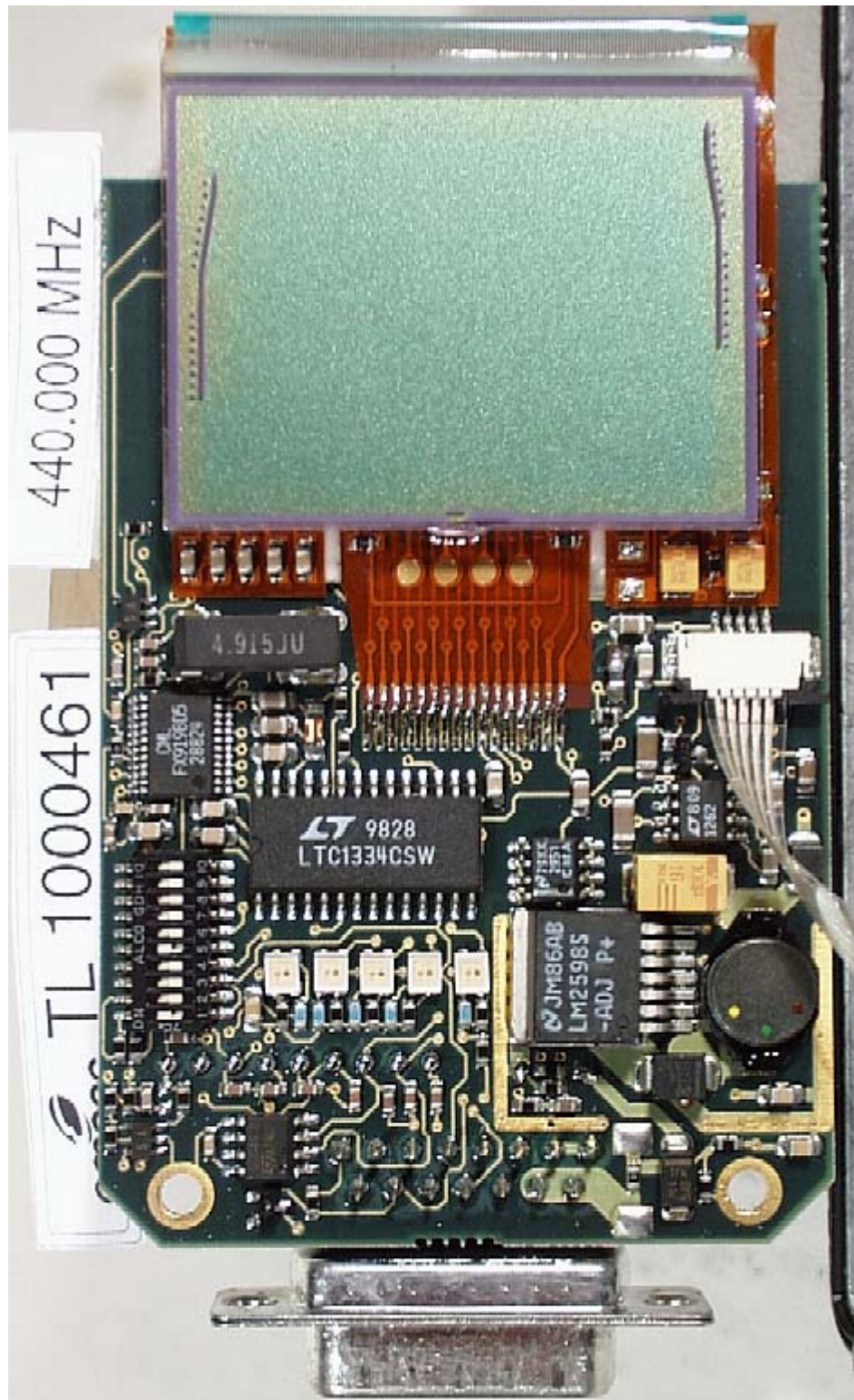


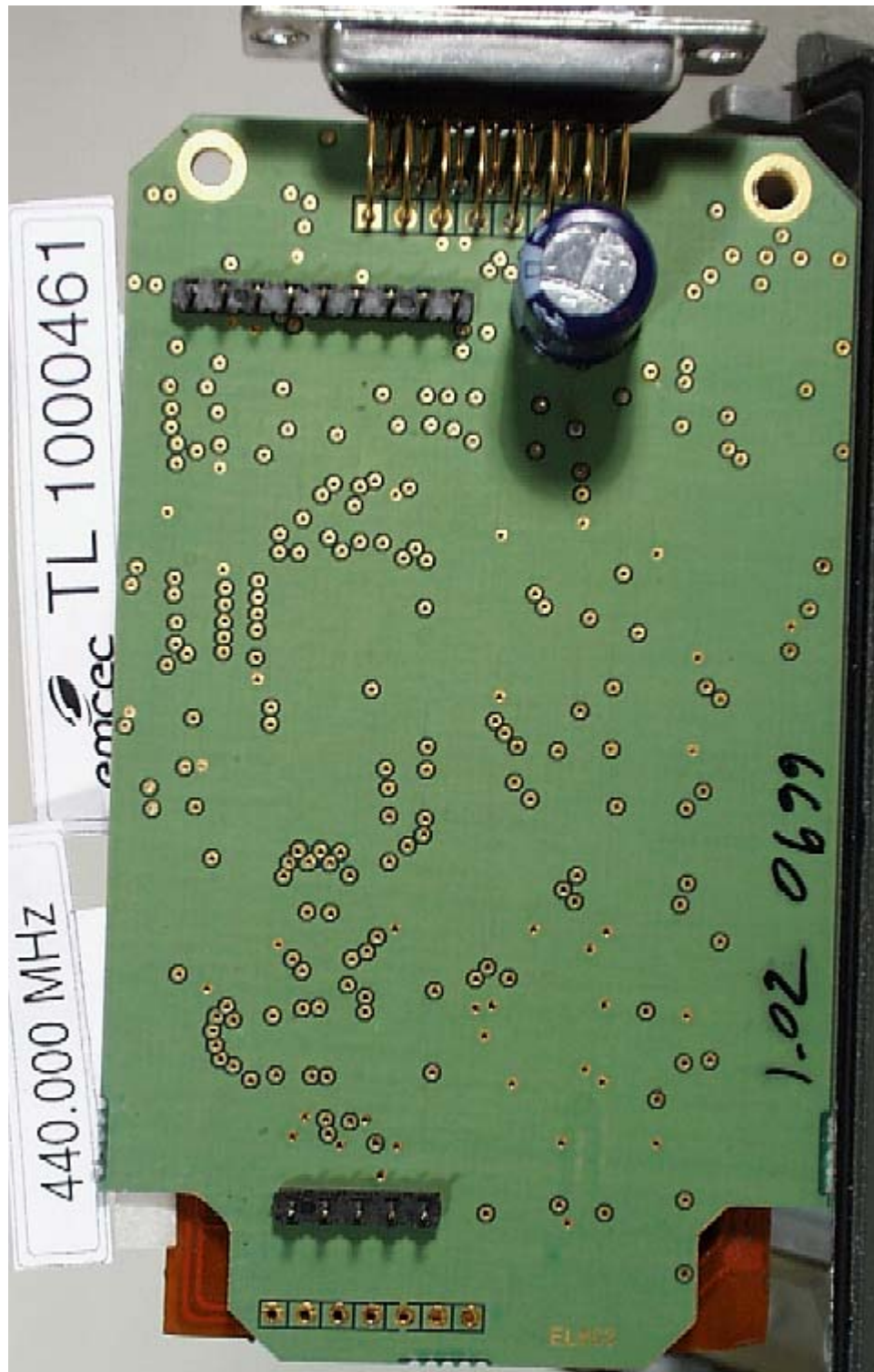






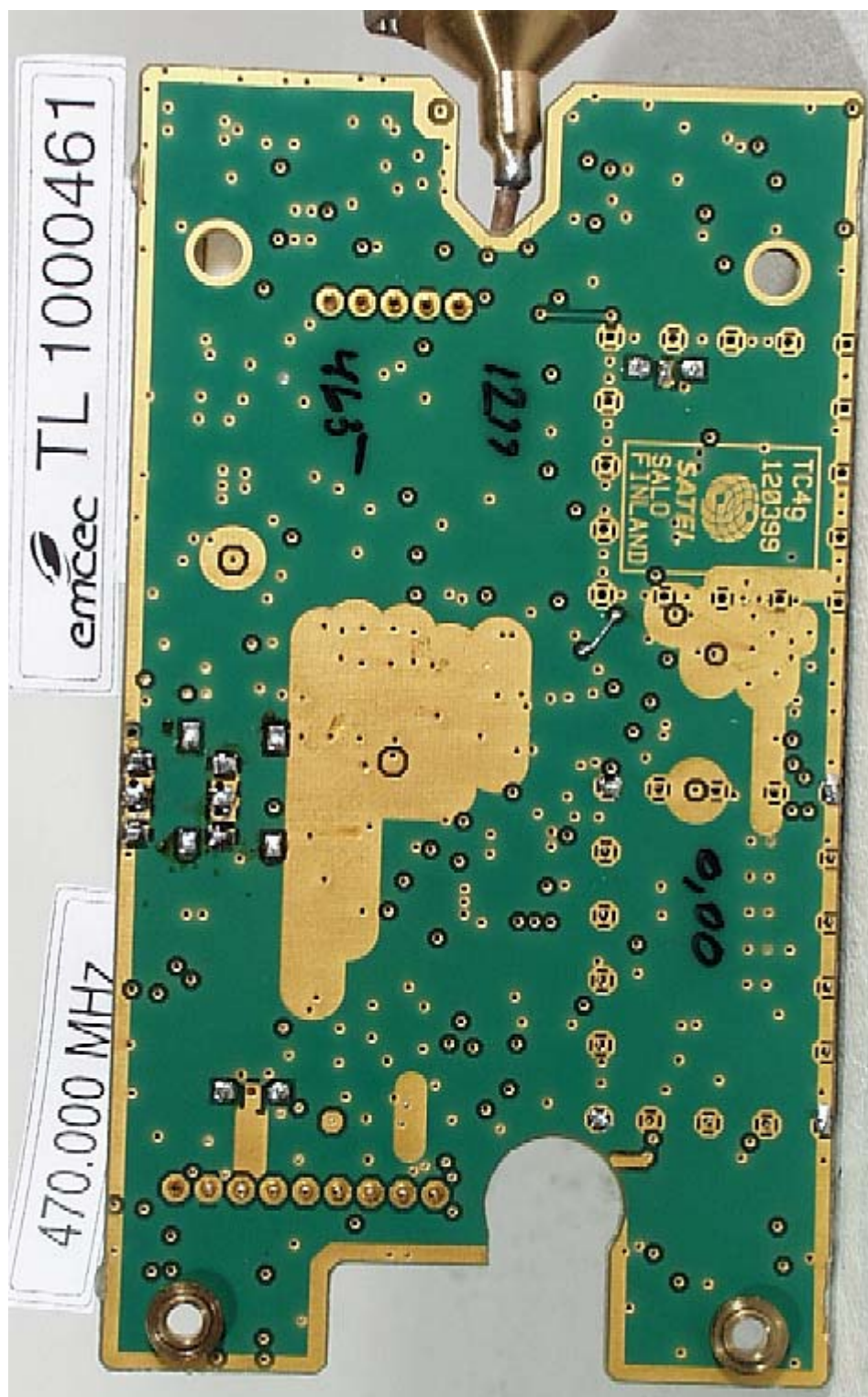




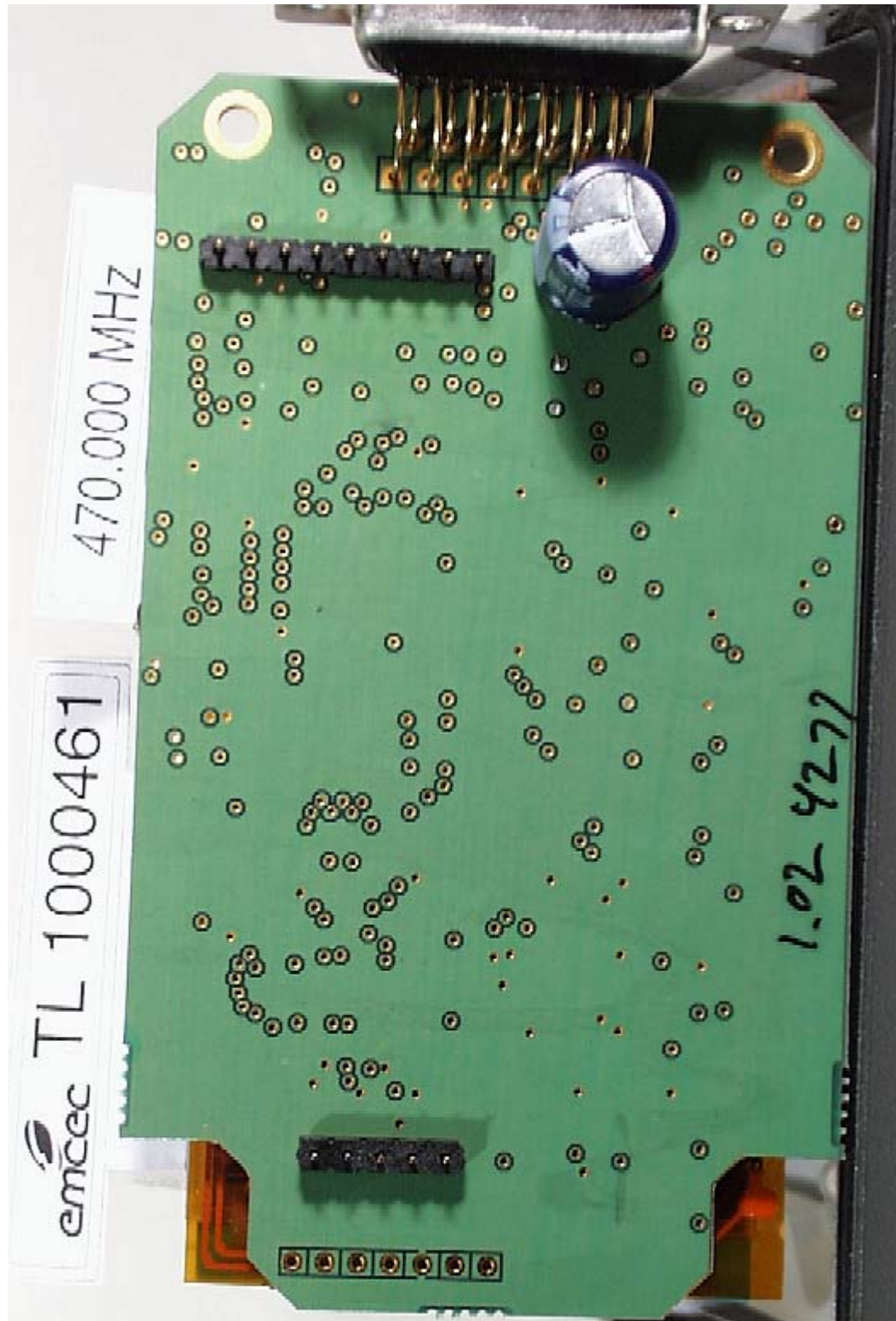












List of measuring equipment:

No.	Equipment	Type	Manufacturer	Serial Number
9	Modulation analyzer	8901B	Hewlett Packard	2718A01220
10	Oscilloscope	9400A	LeCroy	8878
30	RF generator	8642A	Hewlett Packard	2644A00601
31	RF generator	8642B	Hewlett Packard	2427A00131
32	RF generator	8642B	Hewlett Packard	2521A00226
33	RF generator	8642B	Hewlett Packard	2521A00232
35	RF generator	8656B	Hewlett Packard	2506A00751
41	Spectrum analyzer	8566B	Hewlett Packard	2005A01452
42	Spectrum analyzer	8568B	Hewlett Packard	2039a01256
43	Spectrum analyzer	8568B	Hewlett Packard	2039A01256
45	Spectrum analyzer	FSBS	Rohde & Schwarz	862563/010
48	Counter	351DCCN150	EiP Incorporated	00369
53	Counter	1999	Racal-Dana	1321
59	Power meter	435A	Hewlett Packard	1430000505
61	Audio amplifier	PRL 737	Self made	
62	Audio amplifier	PRL ?	Self made	
70	RF amplifier	510L	EIN	
71	RF amplifier	25W1000M7	Amplifier Research	11128
79	Power supply	B60-15R	Oltronix	512
89	Antenna	3147	EMCO	9202-1078
90	Antenna	3109	EMCO	9109-2582
92	Antenna	VHA 9103 BBA 9106	Schwarzbeck	
99	Hybrid	H 9	Anzac	
100	Hybrid	H 9	Anzac	
101	Hybrid	H 9	Anzac	
102	Hybrid	H 9	Anzac	
109	Audio load	1840-A	General Radio	4749
118	RF High-Power Attenuator	RBU	Rohde & Schwarz	300213/57
119	RF High-Power Attenuator	765	Narda	
120	RF High-Power Attenuator	765	Narda	
125	Circulator	235 - 5B - 440	El.magn.sci.Inc.	120
126	Circulator	235 - 5B - 440	El.magn.sci.Inc.	121
127	Circulator	235 - 2A - 160	El.magn.sci.Inc.	199
128	Circulator	235 - 2A - 160	El.magn.sci.Inc.	200
129	Circulator	236 - 0B - 84	El.magn.sci.Inc.	05
130	Circulator	236 - 0B - 84	El.magn.sci.Inc.	06
131	Termination 50□	908A	Hewlett Packard	
132	Termination 50□	908A	Hewlett Packard	
133	Termination 50□	370 BNM	Narda	
134	Termination 50□	370 BNM	Narda	
135	Termination 50□	370 BNM	Narda	
136	Termination 50□	370 BNM	Narda	
137	Termination 50□	370 BNM	Narda	
140	Notch Filter	TTR - 95 - 3EE	Telonic	00232 - 1
141	Notch Filter	TTR - 95 - 3EE	Telonic	3046 - 1
142	Notch Filter	TTR - 190 - 3EE	Telonic	00407 - 8
143	Notch Filter	TTR - 190 - 3EE	Telonic	3047 - 1
144	Notch Filter	TTR - 315 - 3EE	Telonic	10217- 2
145	Notch Filter	TTR - 375 - 3EE	Telonic	3062 - 1
146	Dual directional coupler	778D	Hewlett Packard	1144A02333
149	Doubler	D-5-4	Anzac	
156	Temp. test chamber	VMT 04/140	Vösch	17031
157	Temp. test chamber	VMT 04/240	Vösch	31884
158	Temp. test chamber	VKT 08/130	Vösch	17984
159	Temp. test chamber	VMT 04/140	Vösch	16227
165	Spectrum monitor	EZM	Rohde & Schwartz	862065/011
176	Anechoic chamber	888 cm x 585 cm x 416 cm	length of absorber 66 cm	
185	Antenna	PRL LogPer	Self made	1A93

188	Antenna	CBL6111	Chase	1028
195	Calibrator	Fluke 515A	Fluke	18522
199	RF-Amplifier	ZHL-1042J	Mini-Circuits	
201	RF-Generator	2042	Marconi	119571/062
205	RF- Amplifier	ZHL-1042J	Mini-Circuits	012288-11
211	Bandpass Filter	TTF 1500-5-5EE	Telonic Berkeley Inc	93037-3
212	Bandpass Filter	TTF 3000-5-5EE	Telonic Berkeley Inc	93039-1
218	Power sensor	HP 8485A	Hewlett Packard	2942A08711
230	Thermometer	MT 120 KC	Eirelec Ltd.	0894/83
272	Power supply	B603D/F	Oltronix	409
279	Lowpass filter	874-F185	General Radio Co.	-
281	Attenuator 20dB/600Ω	-	Self made	-
284	Power sensor	HP 11722A	Hewlett Packard	3111A04849
307	Temp. test chamber	VMT 04/140	Heraeus VÖTCH GmbH	27045
308	Internet advisor	J2300A	Hewlett Packard	3530A00685
314	RF generator	HP 8642B	Hewlett Packard	2535A00464
317	RF generator	2052	Marconi	119754/058
318	Power supply	B 603D/F	Oltronix	416
326	Power attenuator	765-6	Narda	-
327	Power attenuator	765-20	Narda	-
328	Power attenuator	765-20	Narda	-
329	Power attenuator	BN 745392	Spinner	12/93
330	Power attenuator	BN 745394	Spinner	36009
332	IF-filter	10.7MHz/25kHz	Ultracom Oy	-
333	IF-filter	10.7MHz/20kHz	Ultracom Oy	-
334	IF-filter	10.7MHz/12.5kHz	Ultracom Oy	-
335	Mixer	ZFM-150	Mini-Circuits	-
337	Modulation analyzer	HP 8901B	Hewlett Packard	3538A05622
341	Multimeter	Fluke 87	Fluke	593100386
350	Unechoic shielded room, 10 m test site, hybrid absorber			
362	Power supply	B32-20R	Oltronix	653
377	Attenuator	757 C - 20 dB	Narda	
385	RF attenuator PAD	WA2-3	Weinschel	3779
389	RF attenuator PAD	WA2-10	Weinschel	3783
390	RF attenuator PAD	WA2-10	Weinschel	3784
391	RF attenuator PAD	1A (3dB)	Weinschel	
392	RF attenuator PAD	1A (6dB)	Weinschel	
393	RF attenuator PAD	1A (10dB)	Weinschel	
394	RF attenuator PAD	1A (20dB)	Weinschel	
395	RF attenuator PAD	757 C - 10 dB	Narda	
403	Processmeter	787	Fluke	6975028
404	Processmeter	787	Fluke	7005196

