



Nemko

TEST REPORT

Date: Espoo 27 / 08 2001

Page: 1 (34)

Number: 1010876

Date of handing in: 02.07.2001

Measured by:

Risto Hietanen

Product Manager

Approved by:

Aarni Roth

Application Manager



T017 (EN 45001)

SORT OF EQUIPMENT: **Radio Modem**

MARKETING NAME:

SATELLINE-3ASd EPIC

TYPE:

SATELLINE-3ASd/250/10W/DIV

MANUFACTURER:

Satel Oy

SERIAL NUMBER:

0125238, 0125239, 0125240, 0125241

CUSTOMER:

Satel Oy

ADDRESS:

Meriniitynkatu 17, FIN-24100 Salo

TELEPHONE:

+358 2 777 7800 / Tapio Malmivaara

TESTSPESIFICATION:

ETSI EN 300 113-1 v1.3.1 (2001-01)

REMARKS:

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

Three original identical test reports have been prepared.
All have been delivered to the client. This test report is No. 1 (of 3).

The test results are valid for the tested unit only. Without a written permission of Nemko Product Services Oy it is allowed to copy this report as a whole, but not partially.

Type:	SATELLINE-3ASd/250/10W/DIV			Category:	AR3
Alignment range:	75 MHz				
Switching range:	1 channel				
Measurement Frequencies Tx/Rx:	Equipment 1 and 4 Serial no. 0125241, 0125238 1) 400.000 MHz 4) 475.000 MHz	Equipment 2 Serial no. 0125240 2) 425.000 MHz	Equipment 3 Serial no. 0125239 3) 450.000 MHz		
Voltages:	Normal 24.0 VDC	Minimum 11.8 VDC	Maximum 30.0 VDC		
Temperatures:	21.9 to 23.9 °C	- 20 °C	+ 55 °C		
Humidity:	31.2 to 57.4 %				
Carrier power:	10 W /1 W	Antenna:	Two TNC-connectors (*)		
Class of emission:	F1D	If frequencies:	77 550 khz, 455 kHz		
Number of channels:	1	Production model:	Yes		
Channel separation:	25 kHz	Mode of DATA	Multilevel State FM, 19200 pbs		

The following measurements according to ETS EN 300 113-1 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: *) Two receivers (diversity receiver)

We have measured earlier (Test Report No. TL1010749) the radio modem Satelline-3ASd/125/10W/DIV, of which channel separation was 12.5 kHz (modulation bit rate: 9600 bps).
This Test Report includes the measurement results of another version: Satelline-3ASd/25/10W/DIV, of which channel separation is 25.0 kHz (modulation bit rate is 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.

The results of the transmitter
(Rated output power: 1W)

Ambient temperature: 23.5 °C Relative humidity: 51.3 % Date: 08.08.2001 (1 and 4)
 Ambient temperature: 23.9 °C Relative humidity: 57.4 % Date: 09.08.2001 (2 and 3)

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.

ADJACENT CHANNEL	BELOW CARRIER POWER (dBc)			
	Channel			
	1	2	3	4
+ 25.0 kHz	- 72.4	- 70.7	- 70.8	- 70.5
- 25.0 kHz	- 70.3	- 71.7	- 70.1	- 70.7
Measurement uncertainty (U95)	± 1.6 dB			

LIMIT CLAUSE 5.1.4	20.0 kHz & 25.0 kHz channel spacing: 70dB below carrier power 12.5 kHz channel spacing: 60dB below carrier power
--------------------	---

TEST EQUIPMENT USED: 9, 77, 120, 377, 390, 136, 314, 389, 392, 404

Ambient temperature: 23.5 °C Relative humidity: 51.3 % Date: 08.08.2001

TRANSIENT BEHAVIOUR OF THE TRANSMITTER CLAUSE 8.10

(ADJACENT CHANNEL POWER TRANSIENT)

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

Channel separation: 25.0 kHz

ADJACENT CHANNEL	BELOW CARRIER POWER (dBc)					
	Channel					
	1		4			
	TX on	TX off	TX on	TX off	TX on	TX off
+ 25.0 kHz	- 62.5	- 62.0	- 63.0	- 63.0		
- 25.0 kHz	- 62.0	- 63.0	- 63.0	- 63.0		
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: 10, 42, 43, 146, 120, 390, 389, 136, 134, 335, 332, 314, 77, 404

The results of the transmitter
(Rated output power: 10 W)

Ambient temperature: 23.5 °C Relative humidity: 51.3 % Date: 08.08.2001 (1 and 4)
 Ambient temperature: 23.9 °C Relative humidity: 57.4 % Date: 09.08.2001 (2 and 3)

TRANSMITTER ADJACENT CHANNEL POWER CLAUSE 8.5

Modulation bit rate: 19200 bps (direct 4-FSK)
 Channel separation 25.0 kHz
 Rated output power: 10 W.

ADJACENT CHANNEL	BELOW CARRIER POWER (dBc)			
	Channel			
	1	2	3	4
+ 25.0 kHz	- 77.4	- 73.7	- 75.9	- 75.4
- 25.0 kHz	- 72.6	- 75.5	- 71.9	- 73.0
Measurement uncertainty (U95)	± 1.6 dB			

LIMIT CLAUSE 5.1.4	20.0 kHz & 25.0 kHz channel spacing: 70dB below carrier power 12.5 kHz channel spacing: 60dB below carrier power
--------------------	---

TEST EQUIPMENT USED: 9, 77, 120, 377, 390, 136, 314, 389, 392, 404

Ambient temperature: 23.5 °C Relative humidity: 51.3 % Date: 08.08.2001

TRANSIENT BEHAVIOUR OF THE TRANSMITTER CLAUSE 8.10

(ADJACENT CHANNEL POWER TRANSIENT)

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

Channel separation: 25.0 kHz

ADJACENT CHANNEL	BELOW CARRIER POWER (dBc)					
	Channel					
	1		4			
	TX on	TX off	TX on	TX off	TX on	TX off
+ 25.0 kHz	- 66.0	- 65.5	- 67.0	- 66.0		
- 25.0 kHz	- 67.0	- 66.0	- 67.0	- 66.0		
Measurement uncertainty (U95)	+ 1.4 dB, -1.6 dB					

LIMIT <u>CLAUSE 5.1.9.2</u>	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)
-----------------------------	--

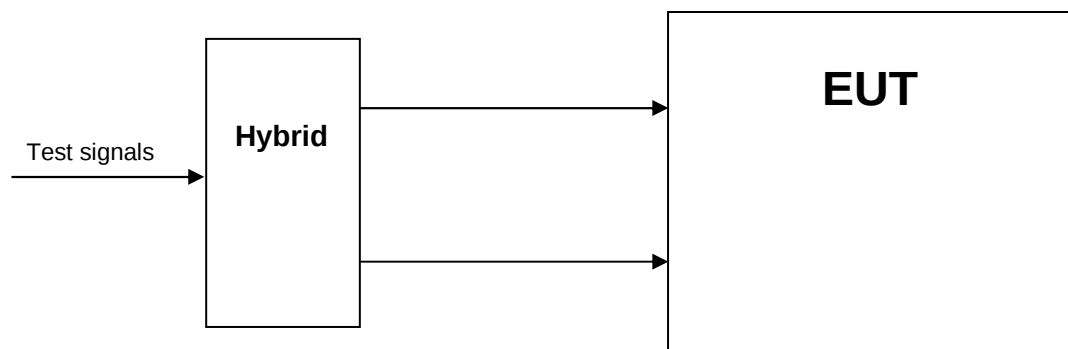
TEST EQUIPMENT USED: 10, 42, 43, 146, 120, 390, 389, 136, 134, 335, 332, 314, 77, 404

The results of the receivers

Note

EUT includes two receivers (diversity receiver).
The customer had ordered only a simultaneous measurement of receivers (diversity mode).

Arrangement for test signals applied to antenna inputs:



Ambient temperature: 21.9 °C Relative humidity: 31.2 % Date: 12.04.2001 normal and – 20 °C conditions (1 and 2)
Ambient temperature: 23.9 °C Relative humidity: 57.4 % Date: 09.08.2001 normal and – 20 °C conditions (3 and 4)
Date: 13.08.2001 (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 (dBμV)			
		Channel			
		1	2	3	4
Tnom	Vnom	- 3.2	- 1.6	- 2.6	- 1.6
Tmin	Vmin	- 3.4	- 2.0	- 2.9	- 2.3
	Vmax	- 3.2	- 2.0	- 3.2	- 2.4
Tmax	Vmin	- 1.6	- 2.2	- 2.6	- 0.6
	Vmax	- 2.1	- 2.2	- 3.0	- 1.0
Measurement uncertainty		+ 1.8 dB, - 2.1 dB			

LIMITS CLAUSE 5.2.1

Under normal test conditions	+ 3 dBμV
Under extreme test conditions	+ 9 dBμV

TEST EQUIPMENT USED: 31, 314, 175, 390, 389, 62, 157, 230, 77, 404

Ambient temperature: 21.9 °C Relative humidity: 31.2 % Date: 12.04.2001 (1)
 Ambient temperature: 23.9 °C Relative humidity: 57.4 % Date: 09.08.2001 (4)

ERROR BEHAVIOUR AT HIGH INPUT LEVELS CLAUSE 9.4

Method of measurement: Message

RF INPUT TO RECEIVER	BER		
	Channel		
	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, 175, 389, 390, 62, 77, 404

Ambient temperature: 21.9 °C Relative humidity: 31.2 % Date: 12.04.2001 (1)
 Ambient temperature: 23.9 °C Relative humidity: 57.4 % Date: 09.08.2001 (4)

CO-CHANNEL REJECTION CLAUSE 9.5

Method of measurement: Message
 Channel separation: 12.5 kHz

FREQUENCY OF UNWANTED SIGNAL	REJECTION RATIO (dB)		
	Channel		
	1	4	
f+3000 Hz	- 9.1	- 8.1	
f	- 7.6	- 7.3	
f-3000 Hz	- 8.6	- 7.7	
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, 175, 102, 135, 136, 389, 390, 62, 77, 404

Ambient temperature: 21.9 °C Relative humidity: 31.2 % Date: 12.04.2001 normal and – 20 °C conditions (1 and 2)
 Ambient temperature: 23.9 °C Relative humidity: 57.4 % Date: 09.08.2001 normal and – 20 °C conditions (3 and 4)
 Date: 13.08.2001 (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	72.3	71.9	72.4	72.9	71.0	72.6	71.1	71.5
Tmin	Vmin	73.9	71.9	72.7	71.8	70.9	71.2	73.3	73.9
	Vmax	73.0	71.7	73.1	71.9	70.9	70.0	72.1	74.1
Tmax	Vmin	70.9	70.8	71.1	72.5	71.3	73.3	71.3	71.9
	Vmax	71.6	71.3	71.7	72.2	71.6	73.9	70.9	71.6
Measurement uncertainty (U95):		+ 2.2 dB, - 2.6 dB							

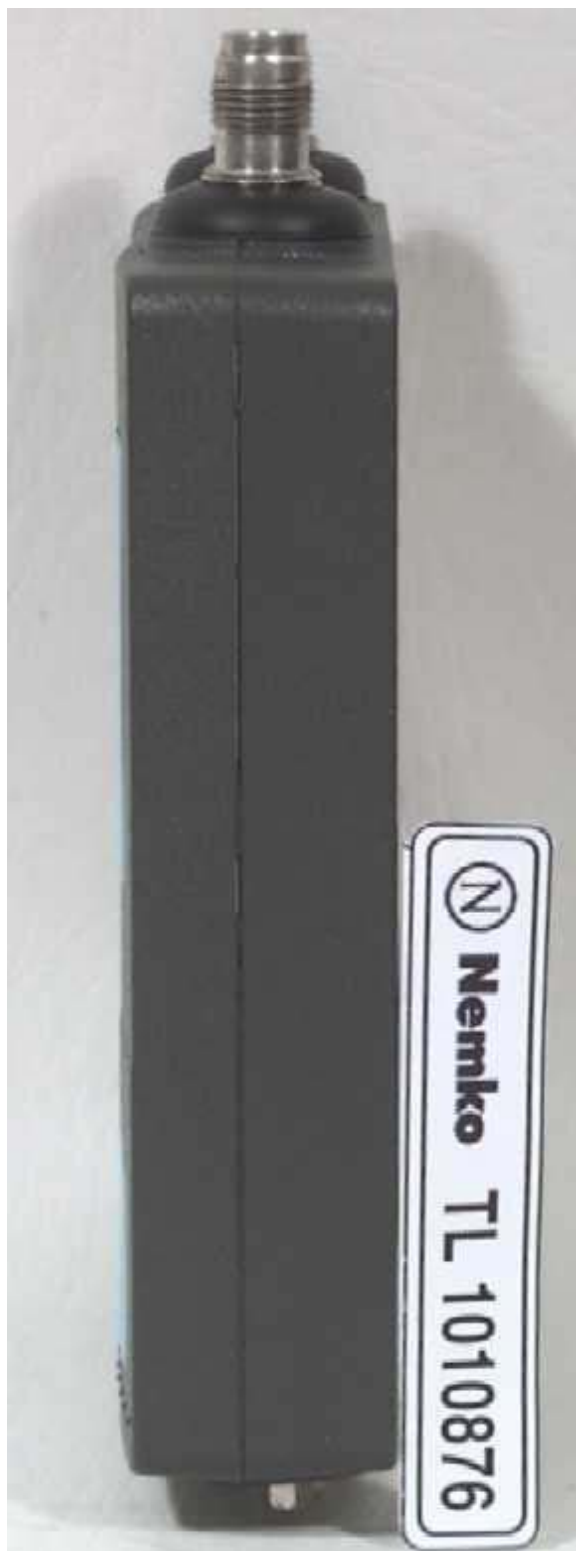
LIMITS CLAUSE 5.2.5

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, 314, 102, 131, 136, 175, 390, 389, 62, 77, 404, 157, 230

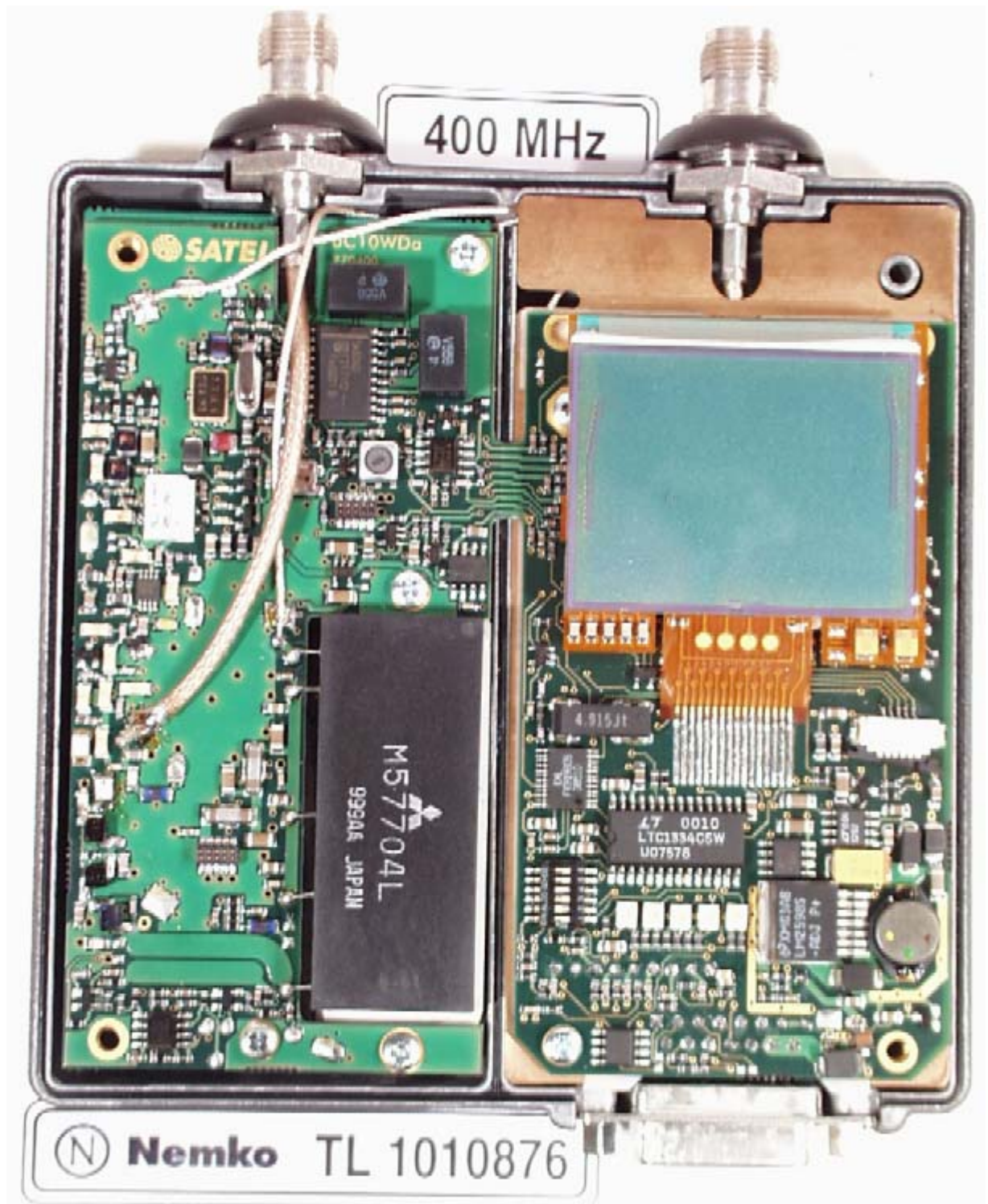


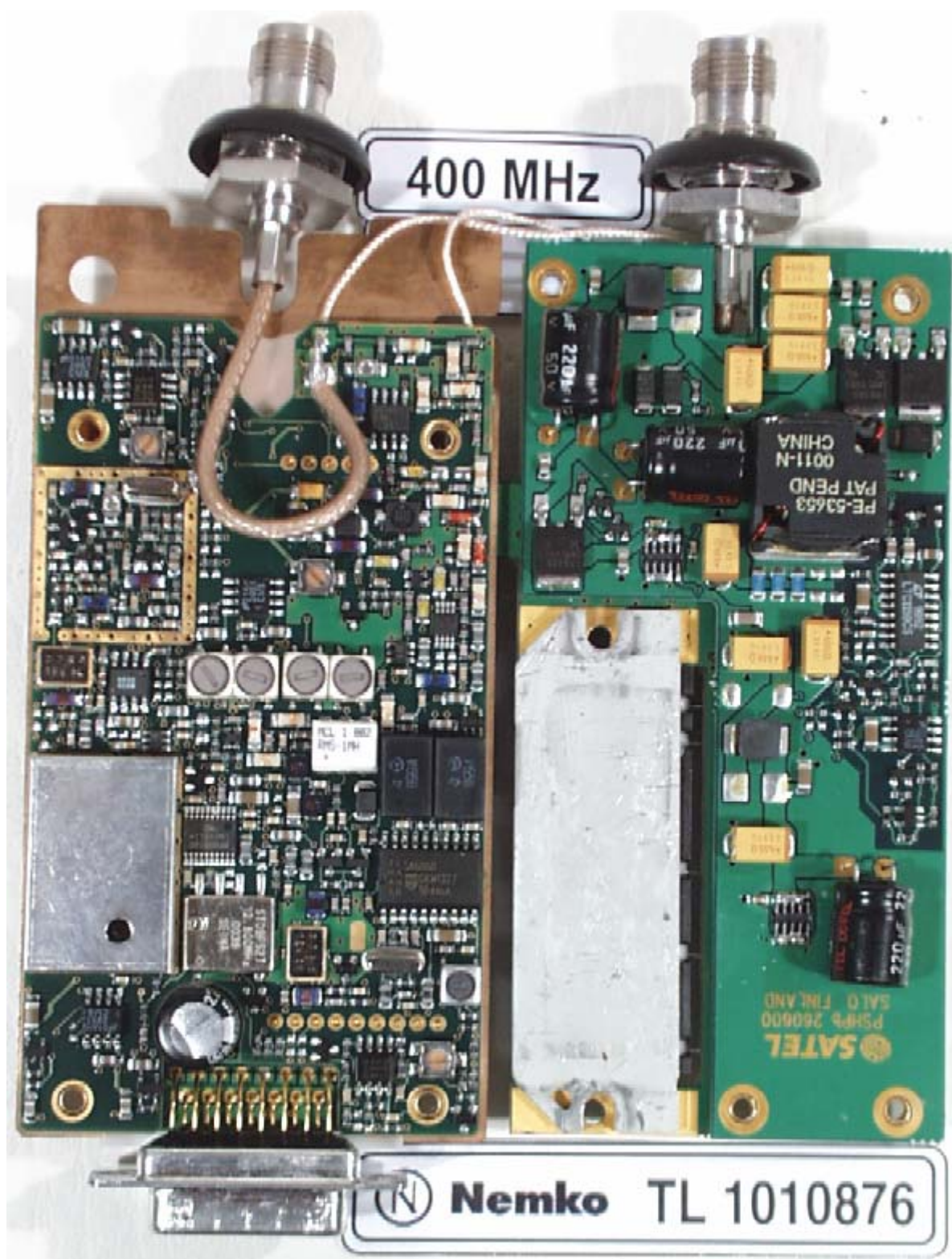


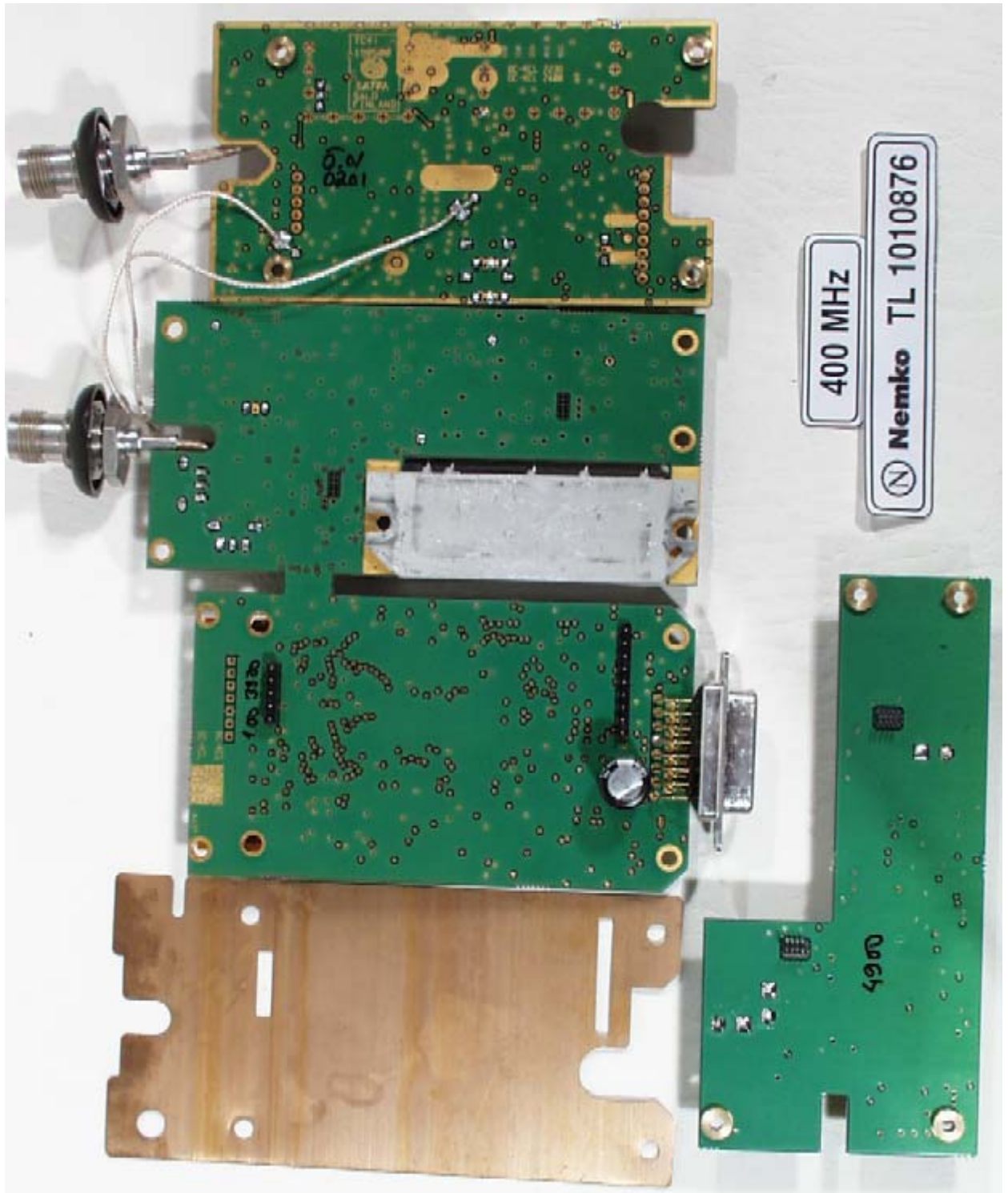




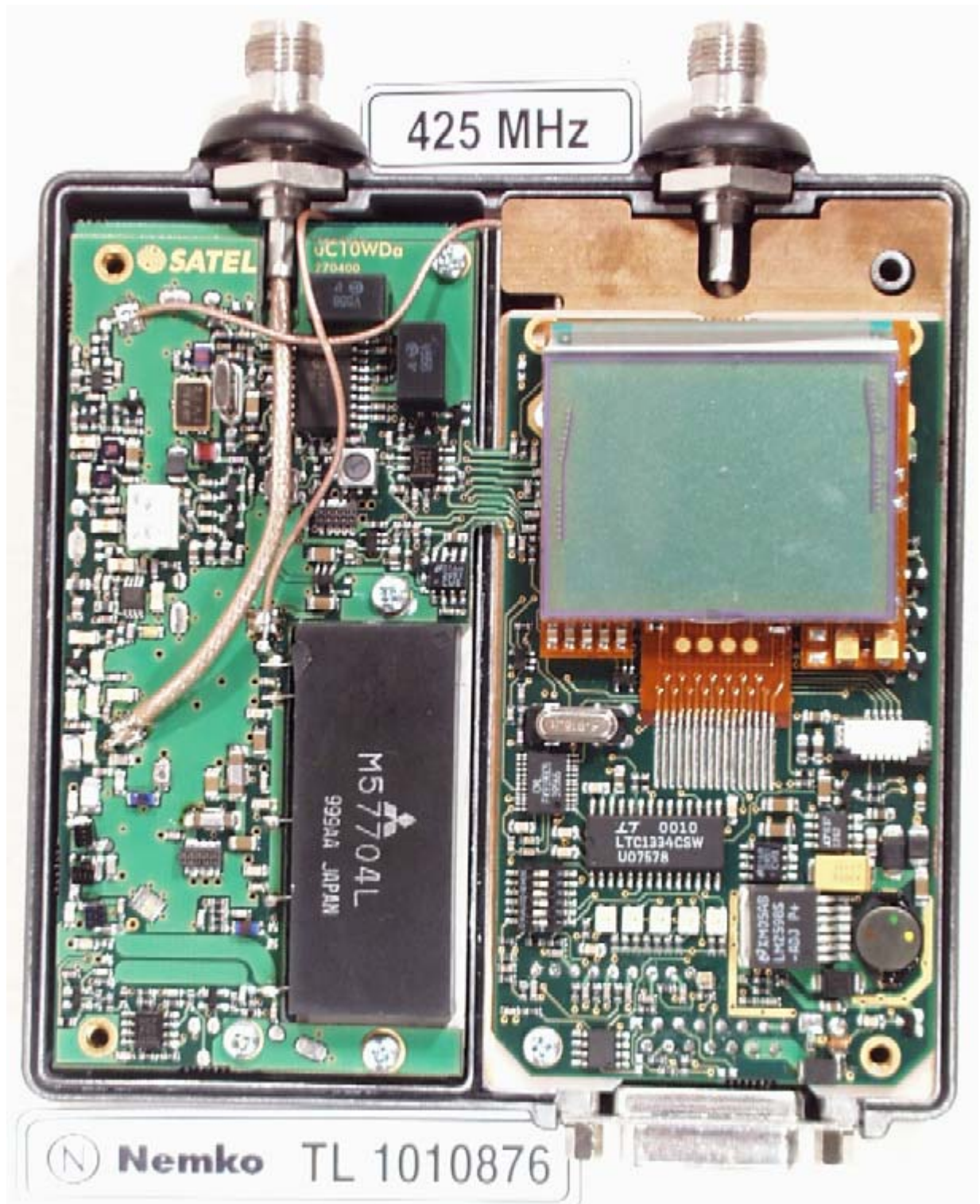




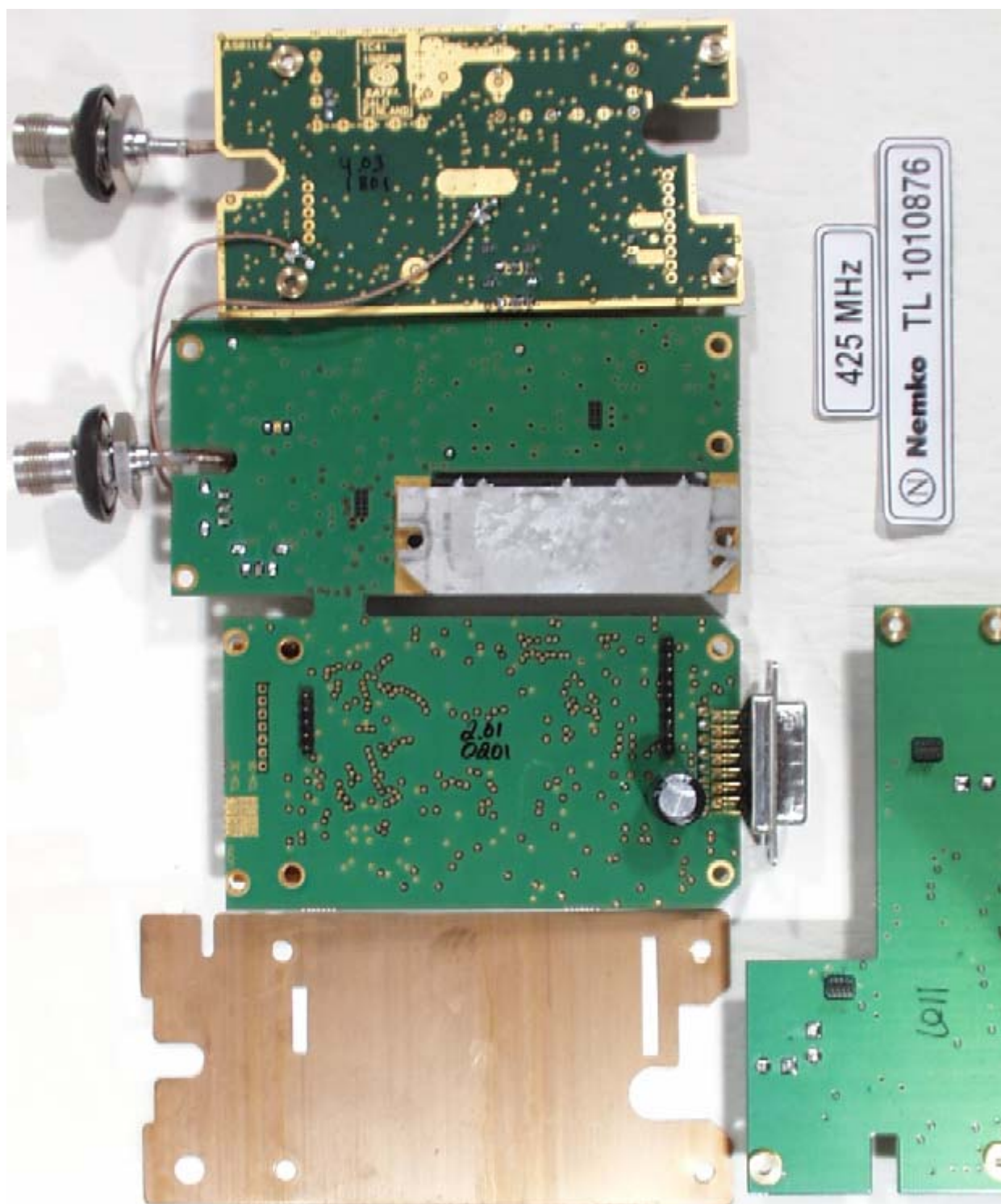




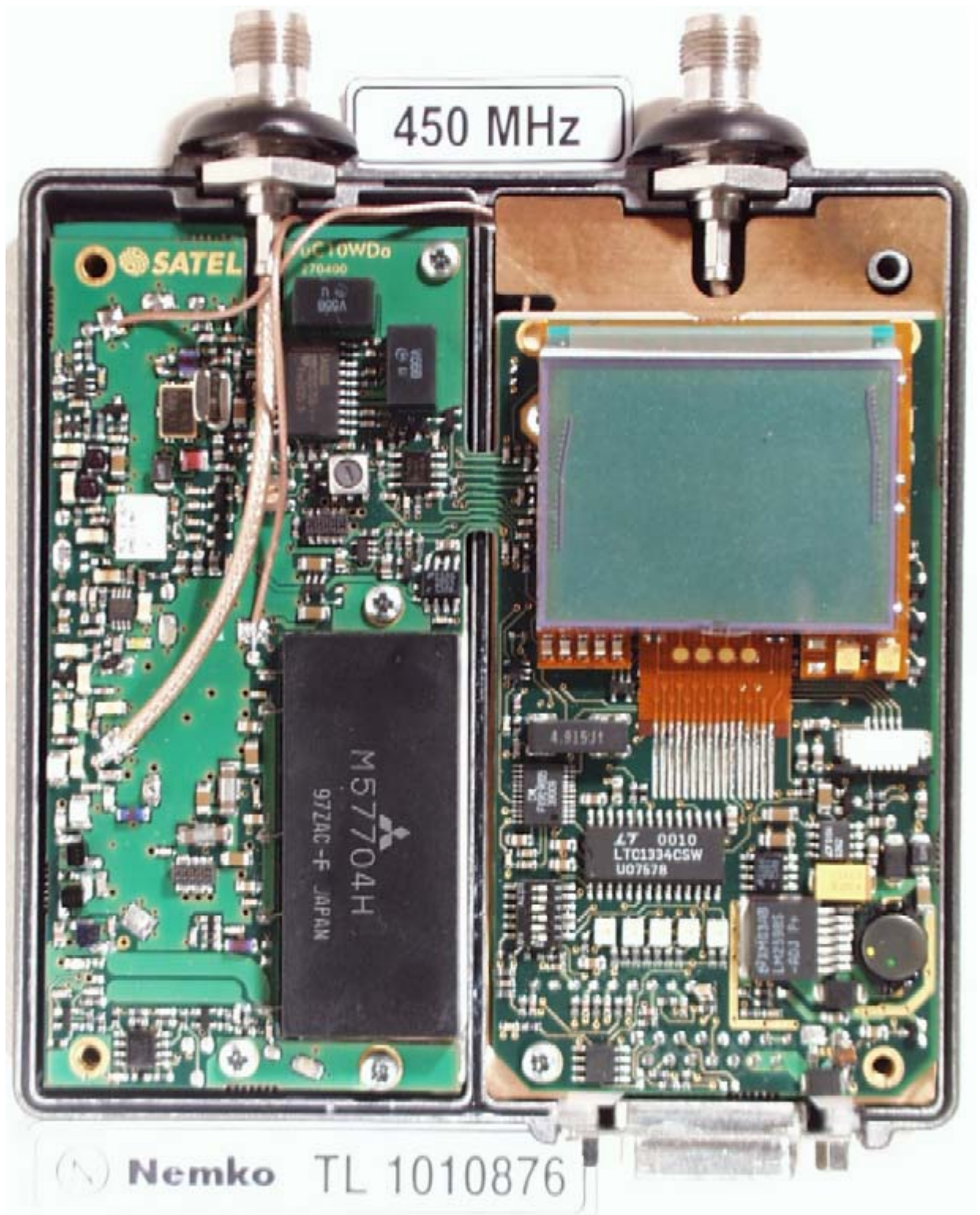


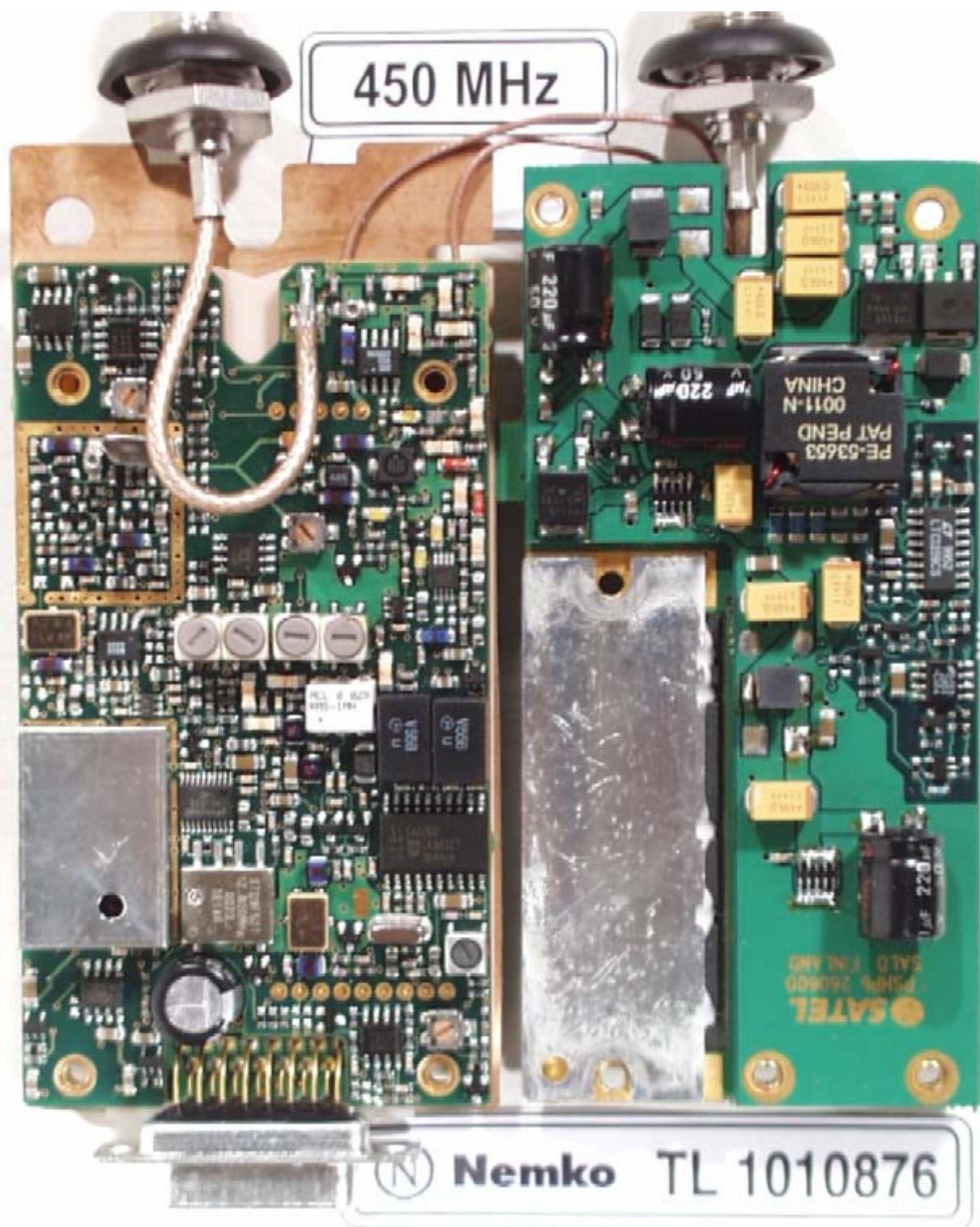


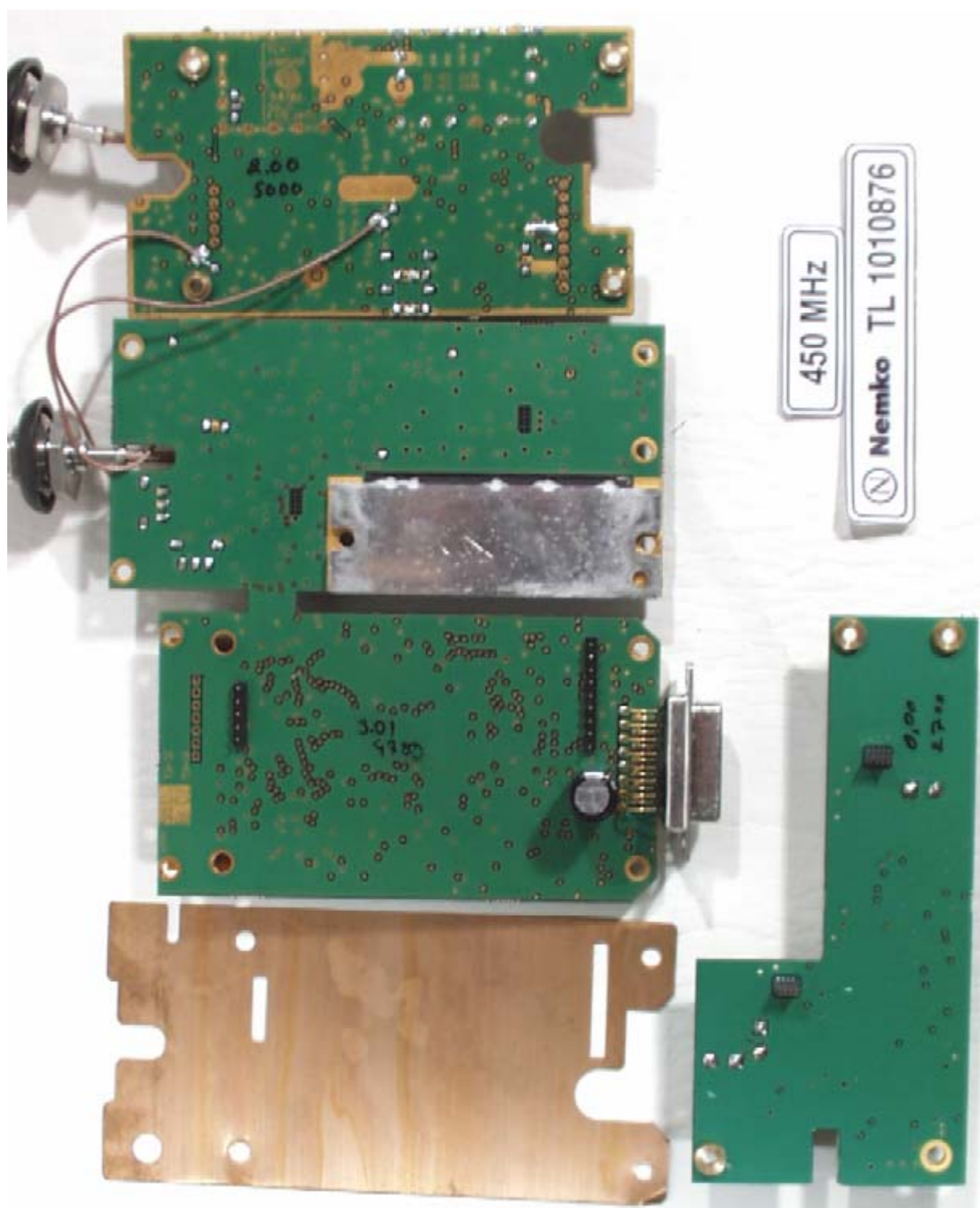




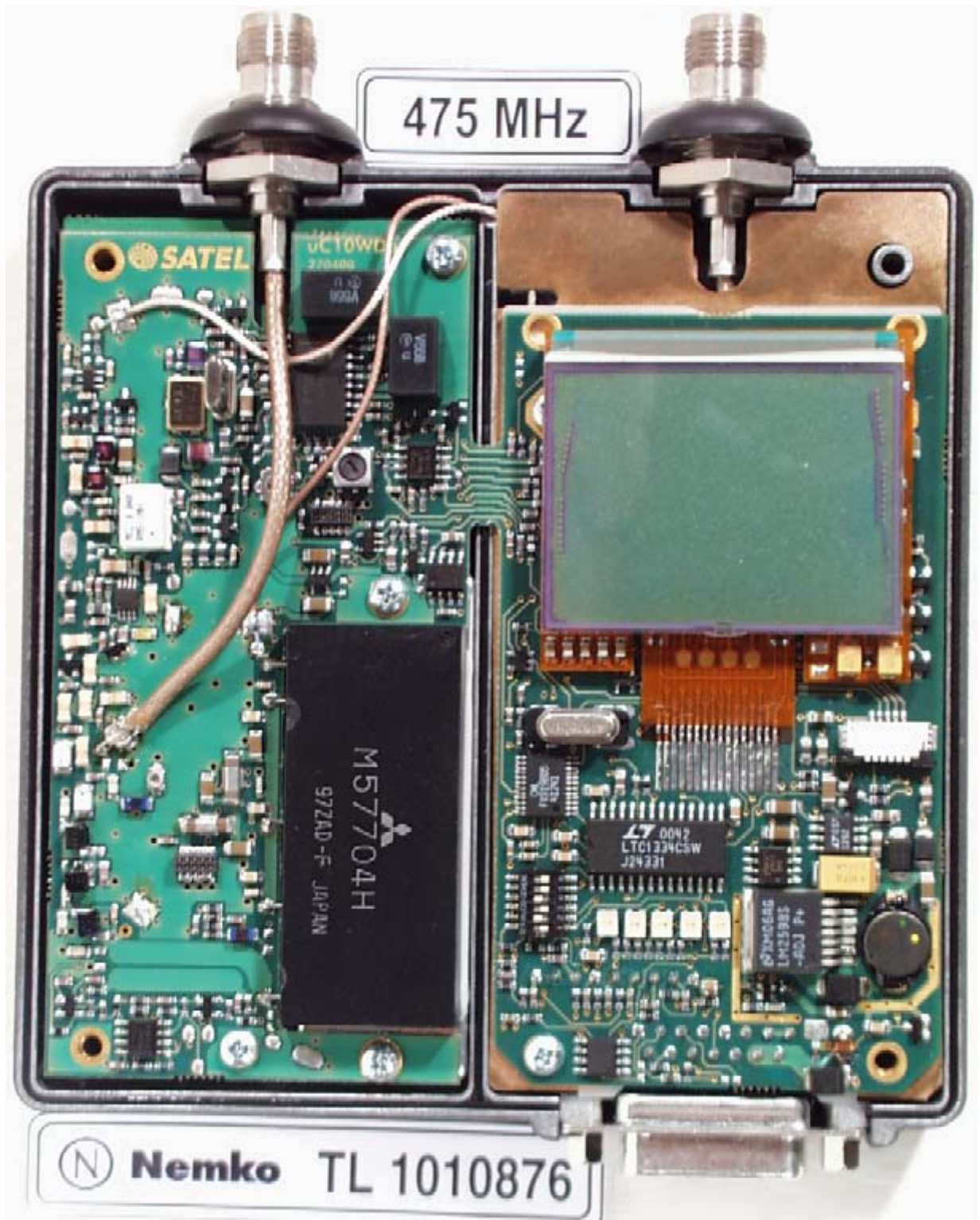


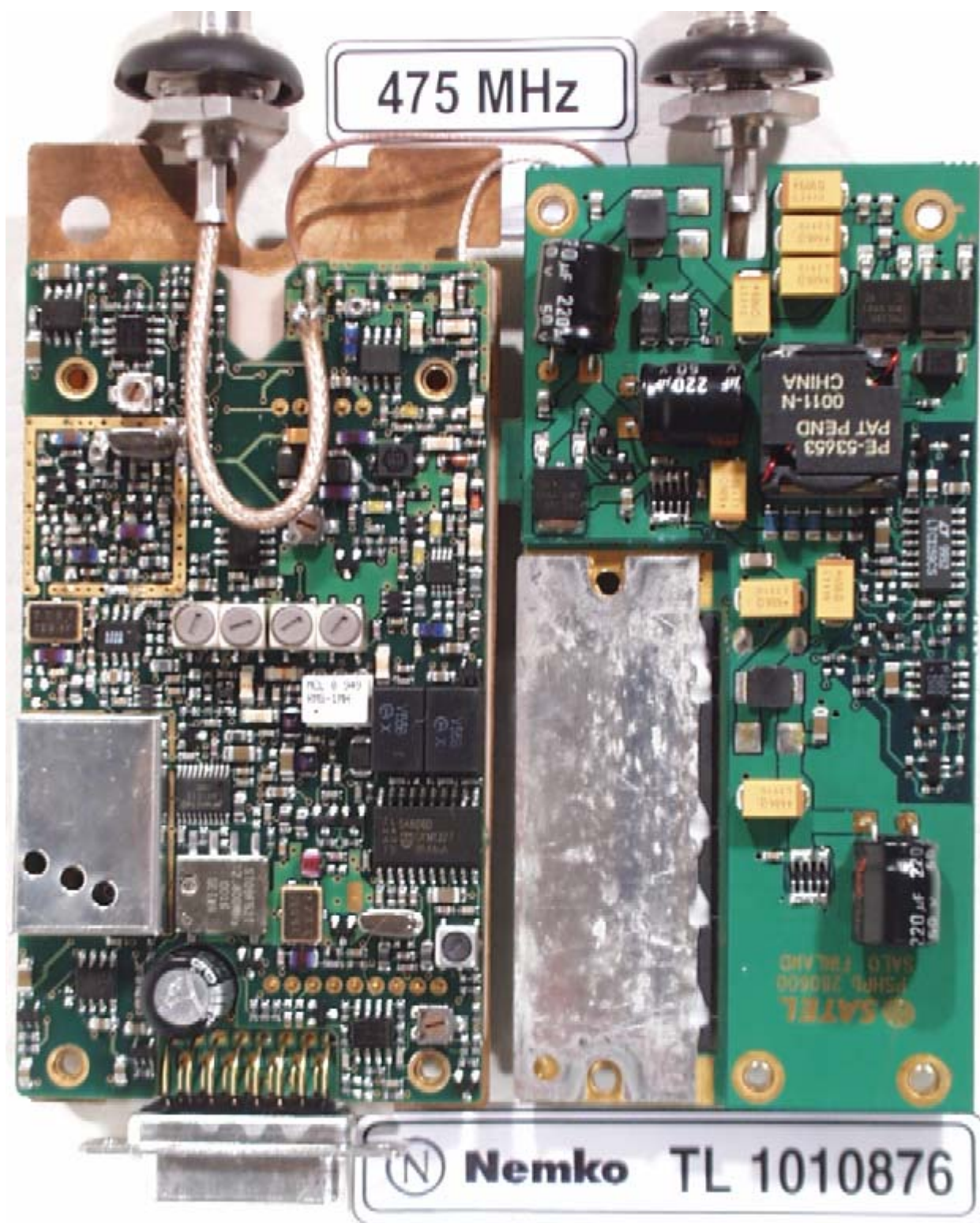


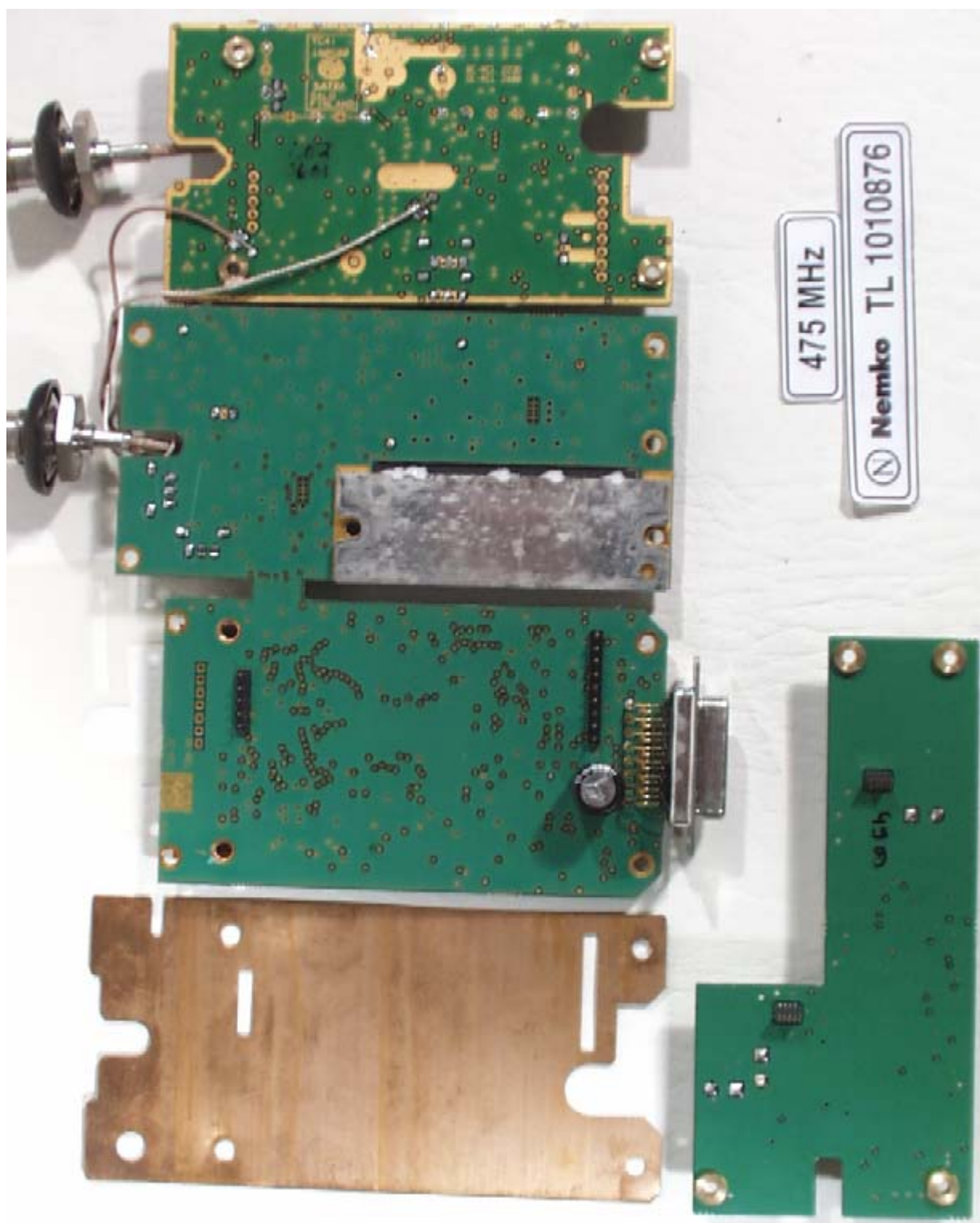












List of measuring equipment:

No.	Equipment	Type	Manufacturer	Serial Number
9	Modulation analyzer	8901B	Hewlett Packard	2718A01220
10	Oscilloscope	9400A	LeCroy	8878
31	RF generator	8642B	Hewlett Packard	2427A00131
32	RF generator	8642B	Hewlett Packard	2521A00226
42	Spectrum analyzer	8568B	Hewlett Packard	2039a01256
43	Spectrum analyzer	8568B	Hewlett Packard	2039A01256
62	Audio amplifier	PRL ?	Self made	
77	Power supply	B32-20R	Oltronix	500
102	Hybrid	H 9	Anzac	
120	RF High-Power Attenuator	765	Narda	
131	Termination 50Ω	908A	Hewlett Packard	
132	Termination 50Ω	908A	Hewlett Packard	
133	Termination 50Ω	370 BNM	Narda	
134	Termination 50Ω	370 BNM	Narda	
135	Termination 50Ω	370 BNM	Narda	
136	Termination 50Ω	370 BNM	Narda	
146	Dual directional coupler	778D	Hewlett Packard	1144A02333
157	Temp. test chamber	VMT 04/240	Vötsch	31884
175	Hybrid	T-1000	Anzac	
230	Thermometer	MT 120 KC	Eirelec Ltd.	0894/83
314	RF generator	HP 8642B	Hewlett Packard	2535A00464
332	IF-filter	10.7MHz/25kHz	Ultracom Oy	-
335	Mixer	ZFM-150	Mini-Circuits	-
377	Attenuator	757 C - 20 dB	Narda	
389	RF attenuator PAD	WA2-10	Weinschel	3783
390	RF attenuator PAD	WA2-10	Weinschel	3784
392	RF attenuator PAD	1A (6dB)	Weinschel	
403	Processmeter	787	Fluke	6975028
404	Processmeter	787	Fluke	7005196

