

Recycling the Ericsson Minilink for 24GHz amateur band use.

Another 24GHz Transverter
Nordic VUSHF meeting 26.52012
OH6NVQ Tomas Talkvist

What can be made out of this pile?



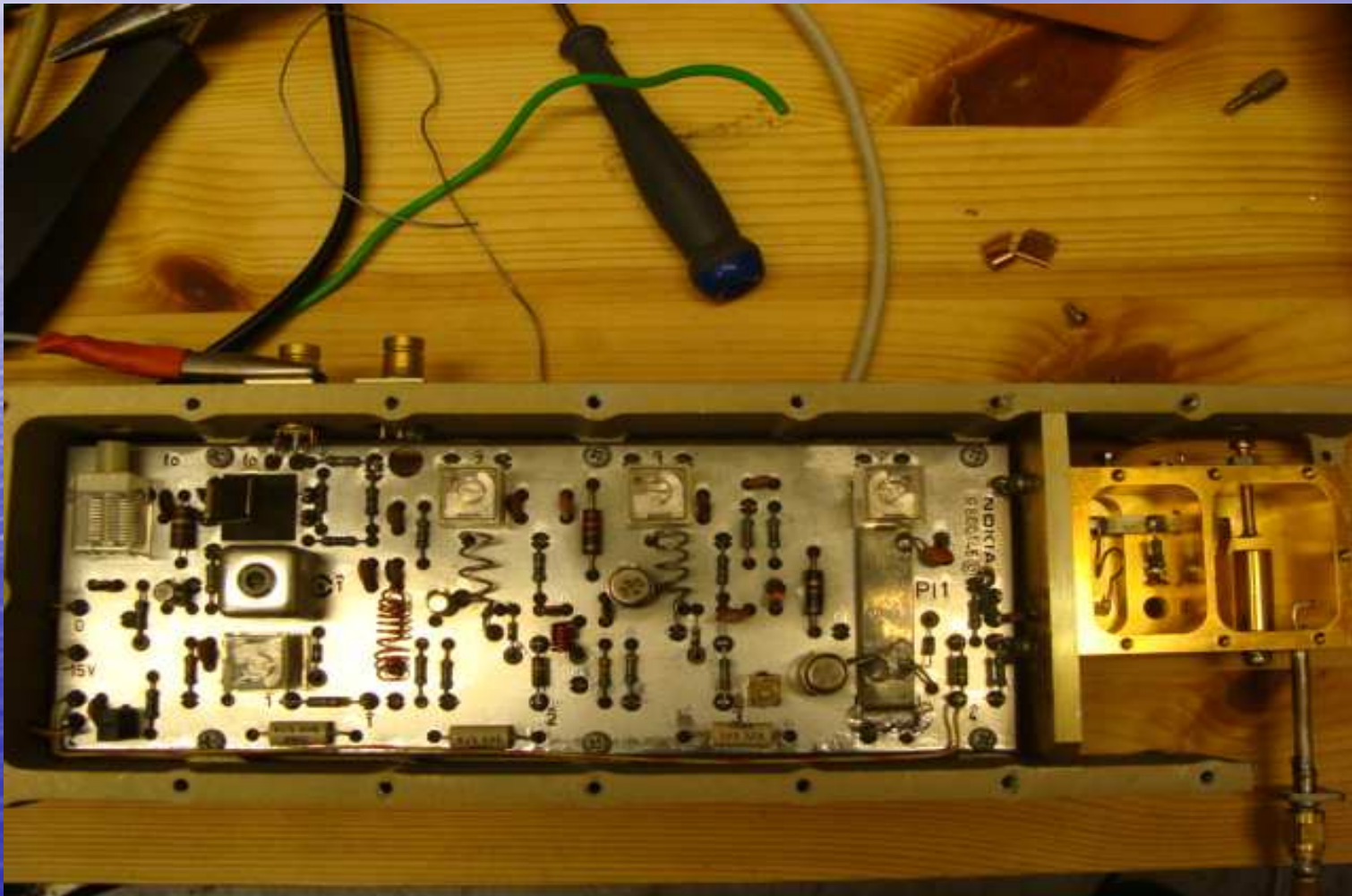
A short history

- These n*E1 microwave links are now exchanged for Ethernet versions due to the demand from fast mobile communications. This leaves an load of usable equipment for us microwave experimenters. Go and collect them before they are recycled as scrap aluminium. In this presentation we concentrate on The Ericsson Minilink 23E, commonly used in Finland among Telcos. The Minilink is one of the last built with discrete smd components and easy to work with.

Beginning of transverter building

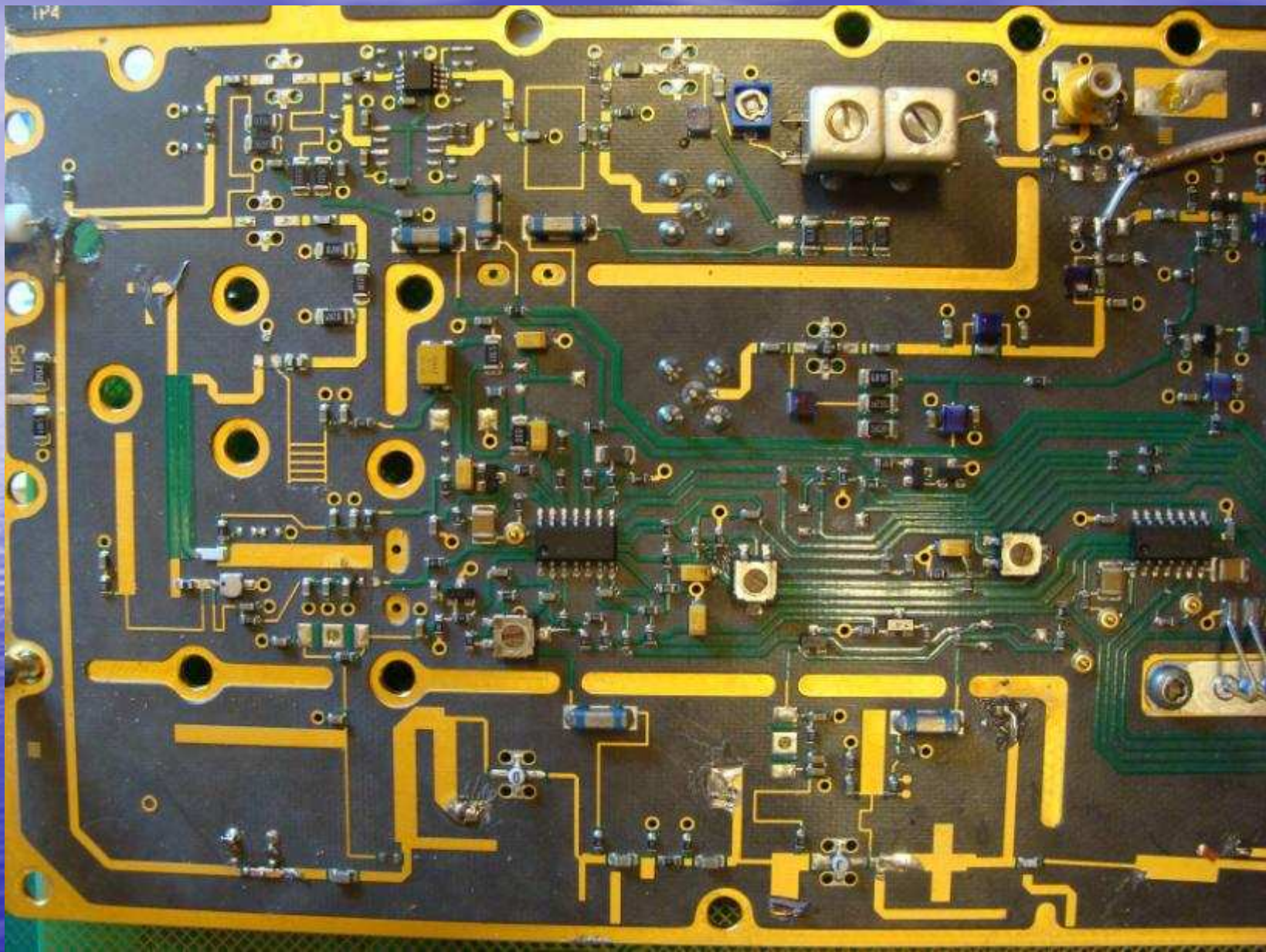
- Based on the experiences gained from modifying the 15E model to an 10GHz Transverter, i did choose the same route.
- There has been done a bit of tests, reprogramming the original PLL, using an external Reference. But not so promising results regarding phase noise. This is an area where someone could play more and come up with a nice solution. I did for convinience use an ovened Xtal source with multiplers to get the desired 2988MHz for an 144MHz If. Again sourced from a surplus L band link.

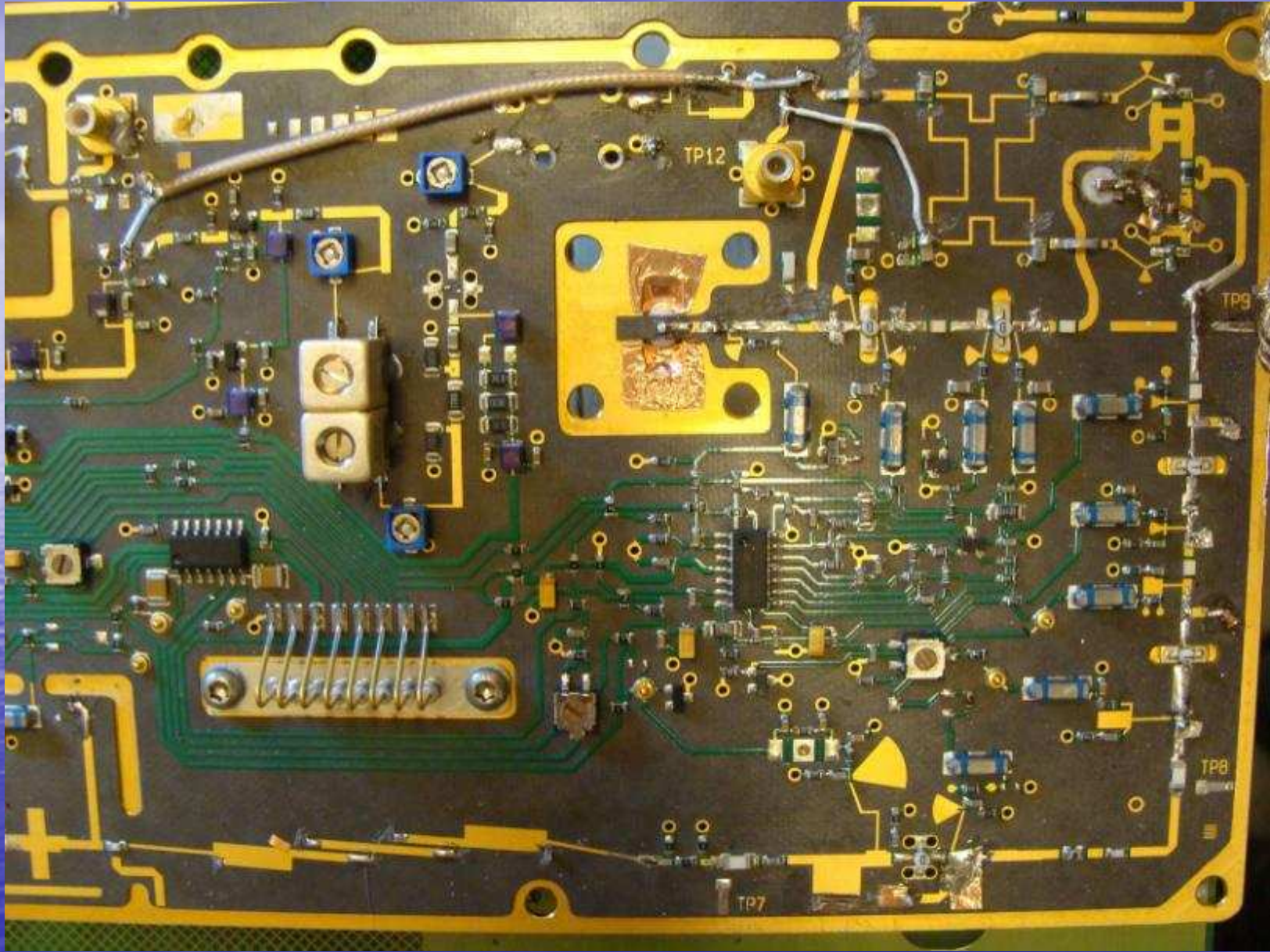
Joint venture, substituting Ericsson
PLL with a clean Nokia Xtal Lo.



Tuning up the LO multiplier chain.

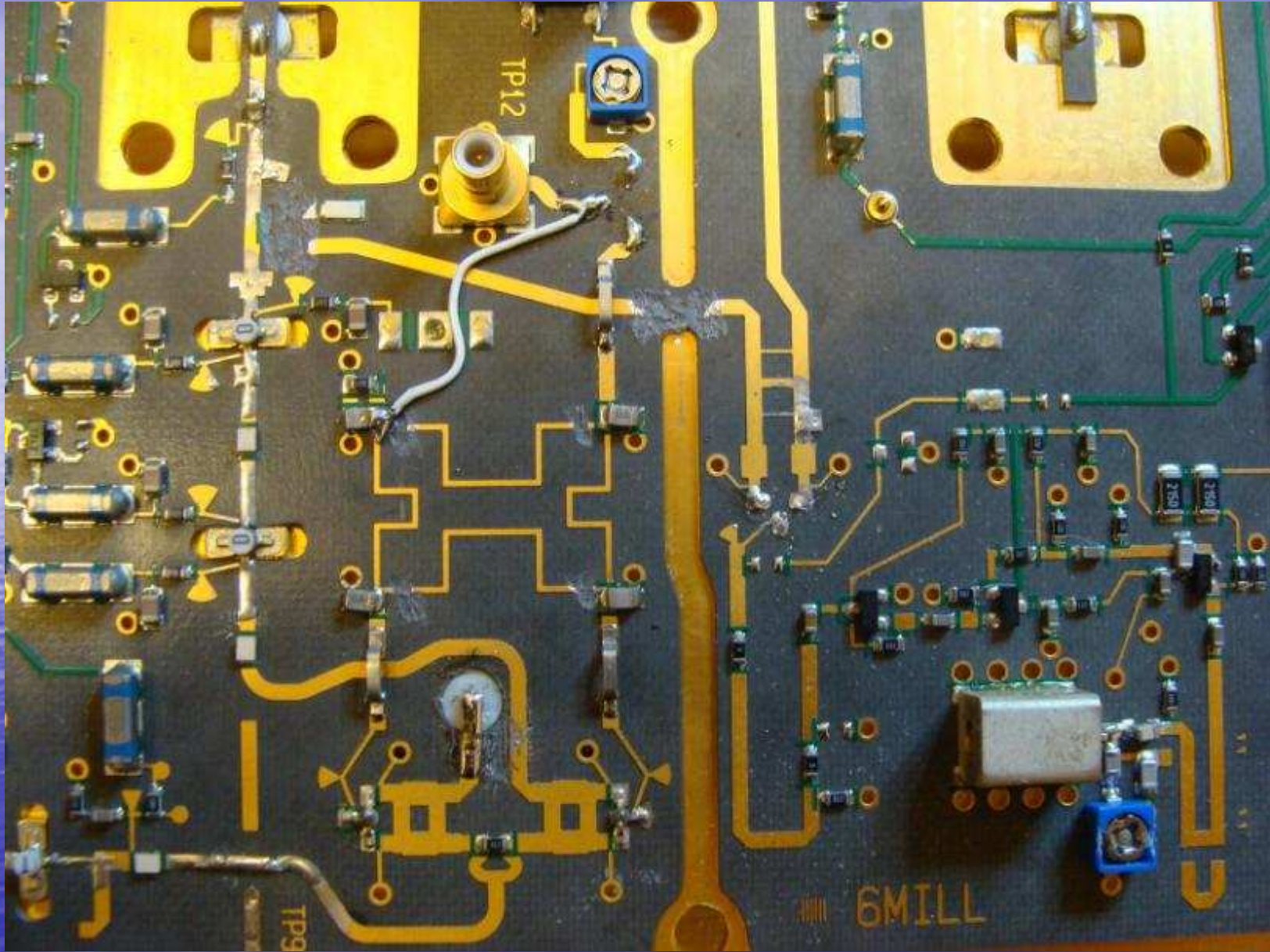
- It is very useful to simply connect an potentiometer to the vco, using an SA or frequency counter together with a sharp scalpel. Simply tune the vco to 2988 MHz or other desired frequency. Slowly working through the multiplier chains with a scalpel and some snowflaking will give the desired results. This method will work perfectly also for the tx chain in order to get it tuned to 24048 MHz as end frequency.





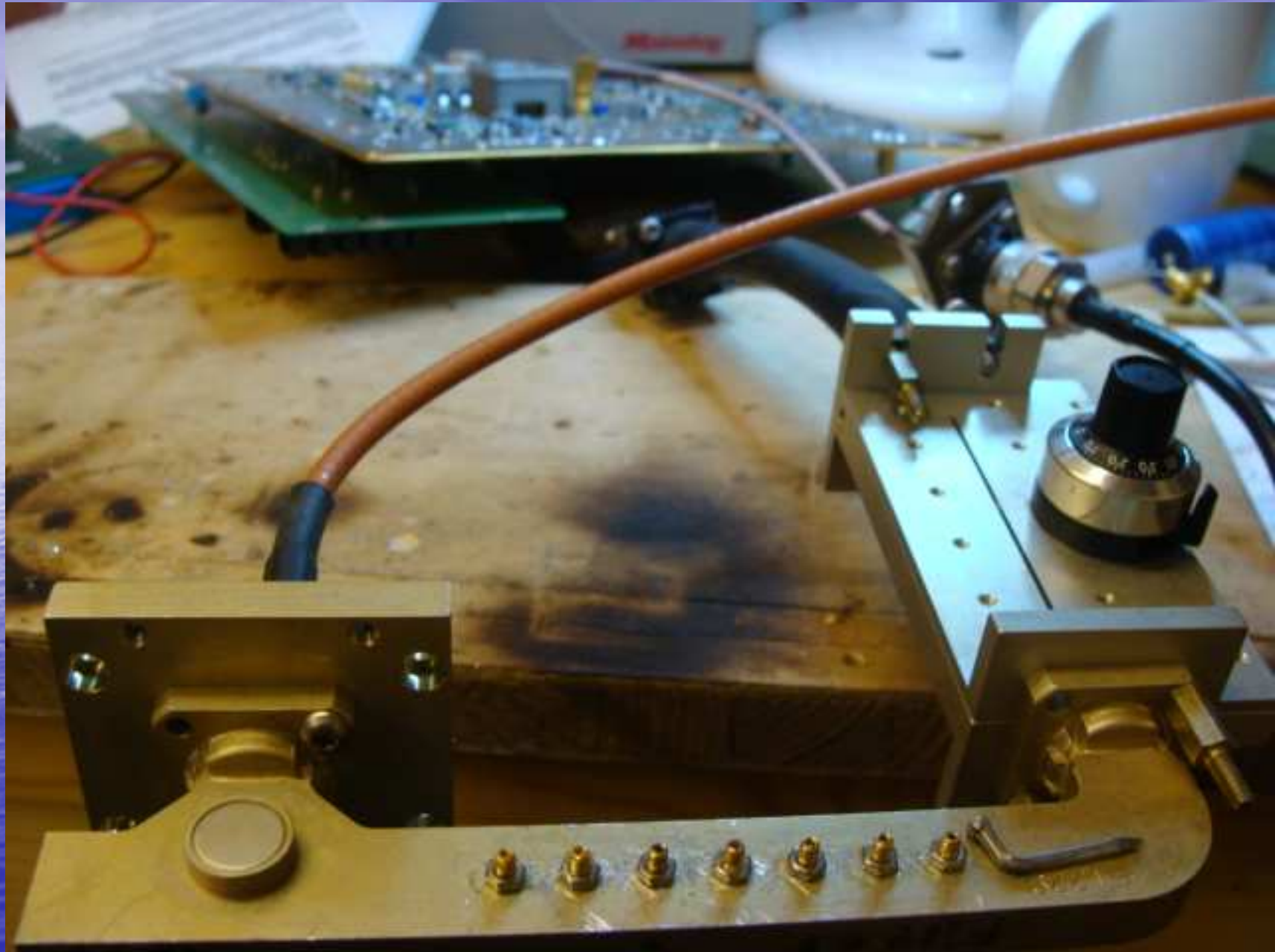
Mixer modification.

- The rx frontend comes with a nice dual balanced mixer. In my amateur application I made two mixers of that. Gentle use of the scalpel and a small grinding pen again. At this stage tx mixer output connector added. Also using tp12 connector as tx if input. Omitting the 1GHz 1st IF on rx I routed the mixer straight to the mmic 140 MHz amplifier, serveng well with 144 MHz if!



TX filtering

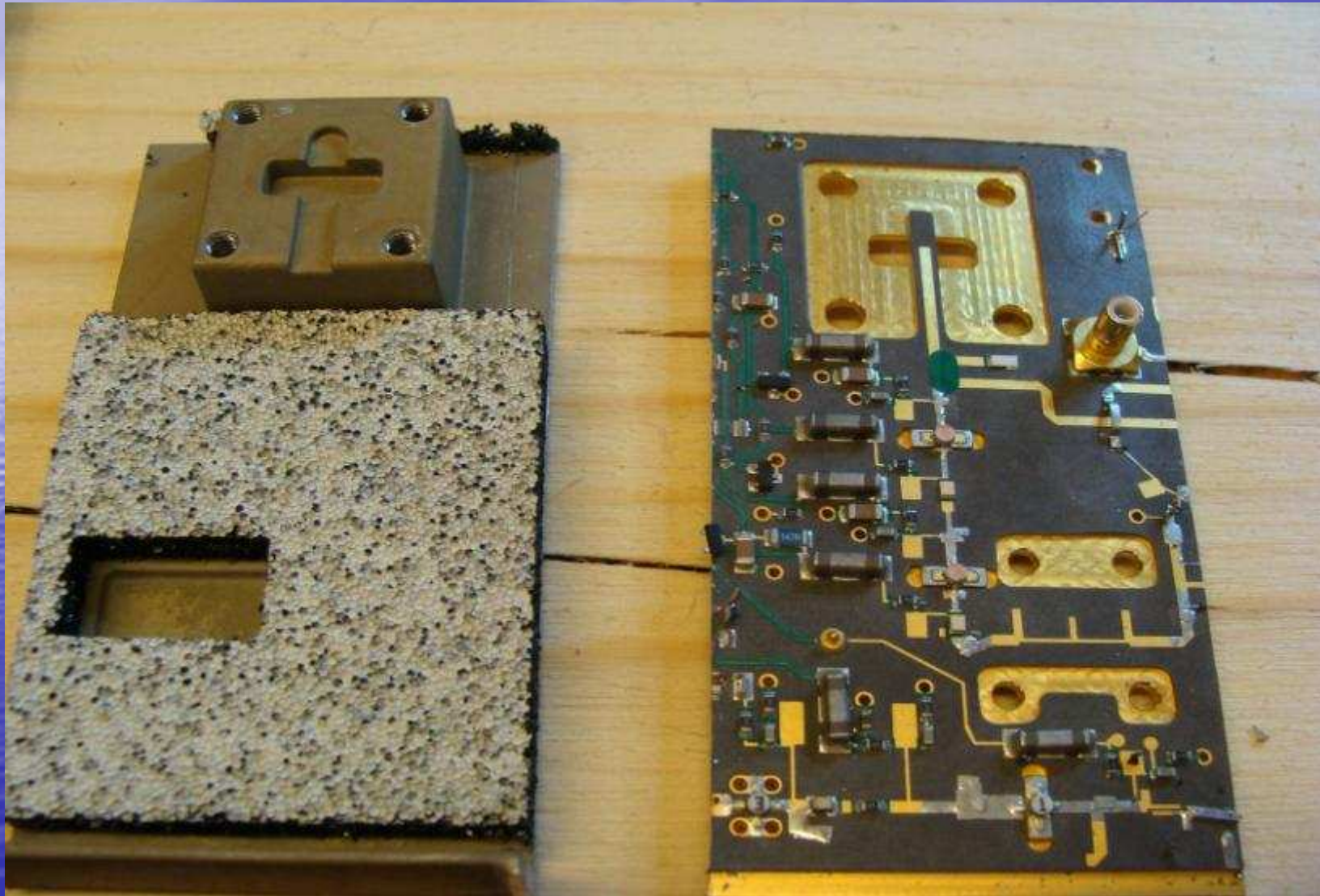
- This is the point where you have to source some alternative that suits you, building or finding some other surplus source. I was lucky having a 7 pole filter in my junkbox to tune. Already tuned up rx lo chain and the freerunning vco on 2988 MHz multiplied to 23904 MHz I used the rx mixer together with an SA to detect 24048MHz. As signal source I used an old 10dBm 12.02GHz generator and a mixer diode sourced from the linkboard as multiplier in a wg piece that functions as a highpass filter as well.



TX buffer amp

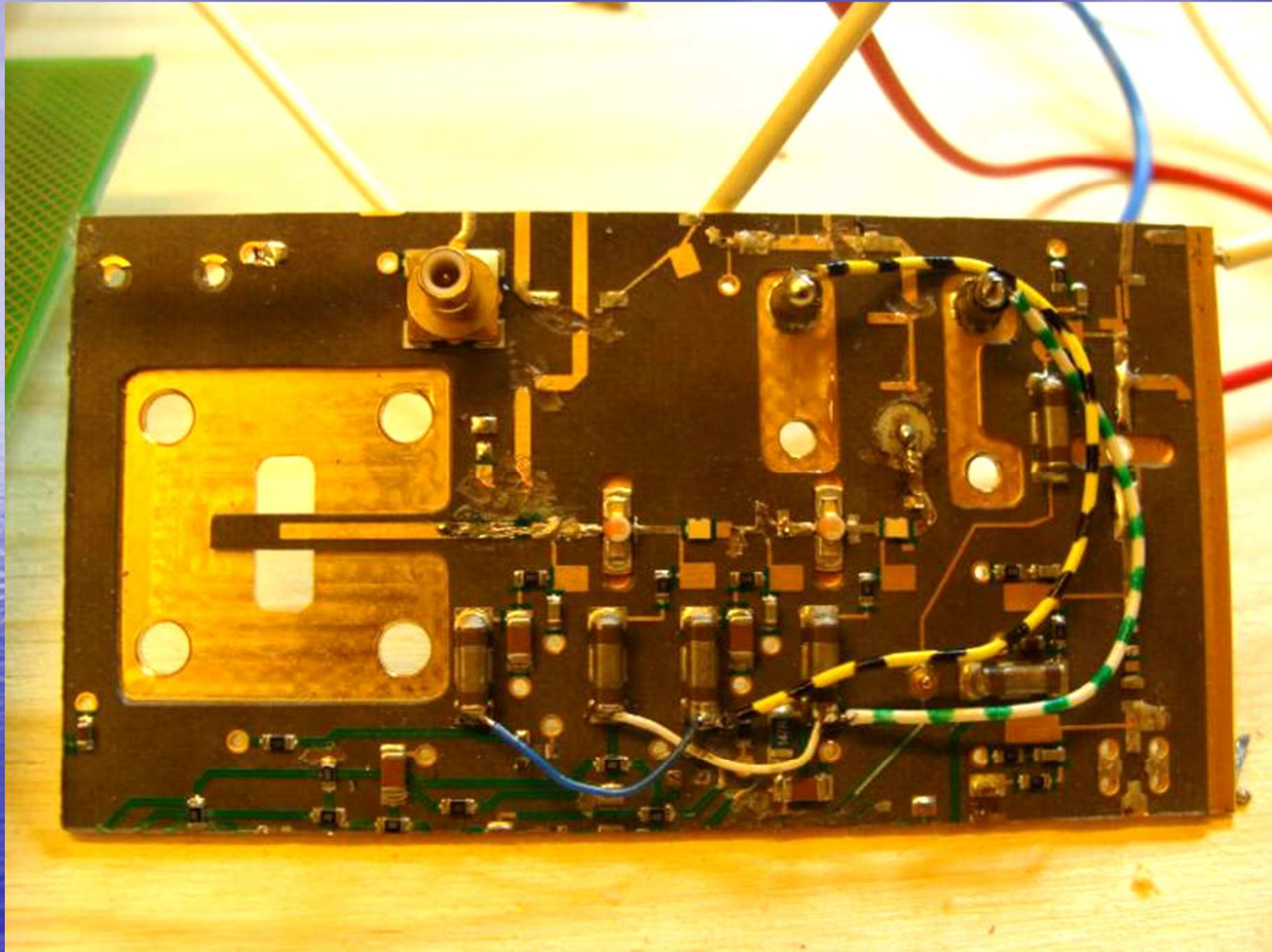
- The signal after the filter will not be enough to drive the final stage alone. Therefore I simply did a cut out of a frontend from another linkboard using a metal saw. Try to source at least a linkpair to get enough parts to a transverter!

Frontend cut out > Buffer amp



> 10dB 24GHz Buffer amp.

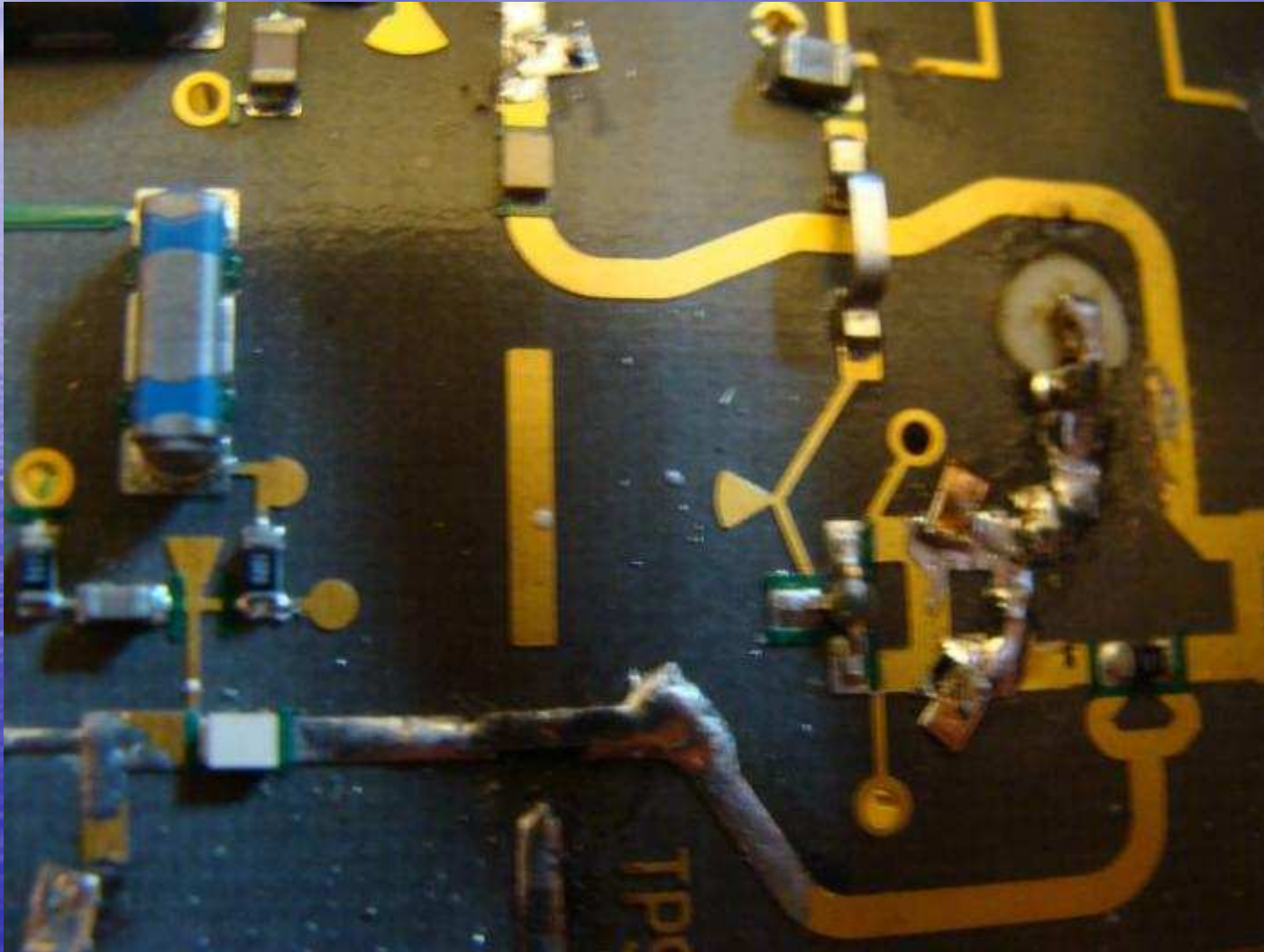
- I did add some feed through capacitors for feeding UD and $-U_g$ voltages. There is suitable voltages available in the unused tx multiplier chain. Also sma connector for output. Gentle tune up with suitable snowflakes again. As measurement equipment I used an max Ku band powermeter and as signal source filter+my harmonic diode generator.



Need for more gain in TX chain

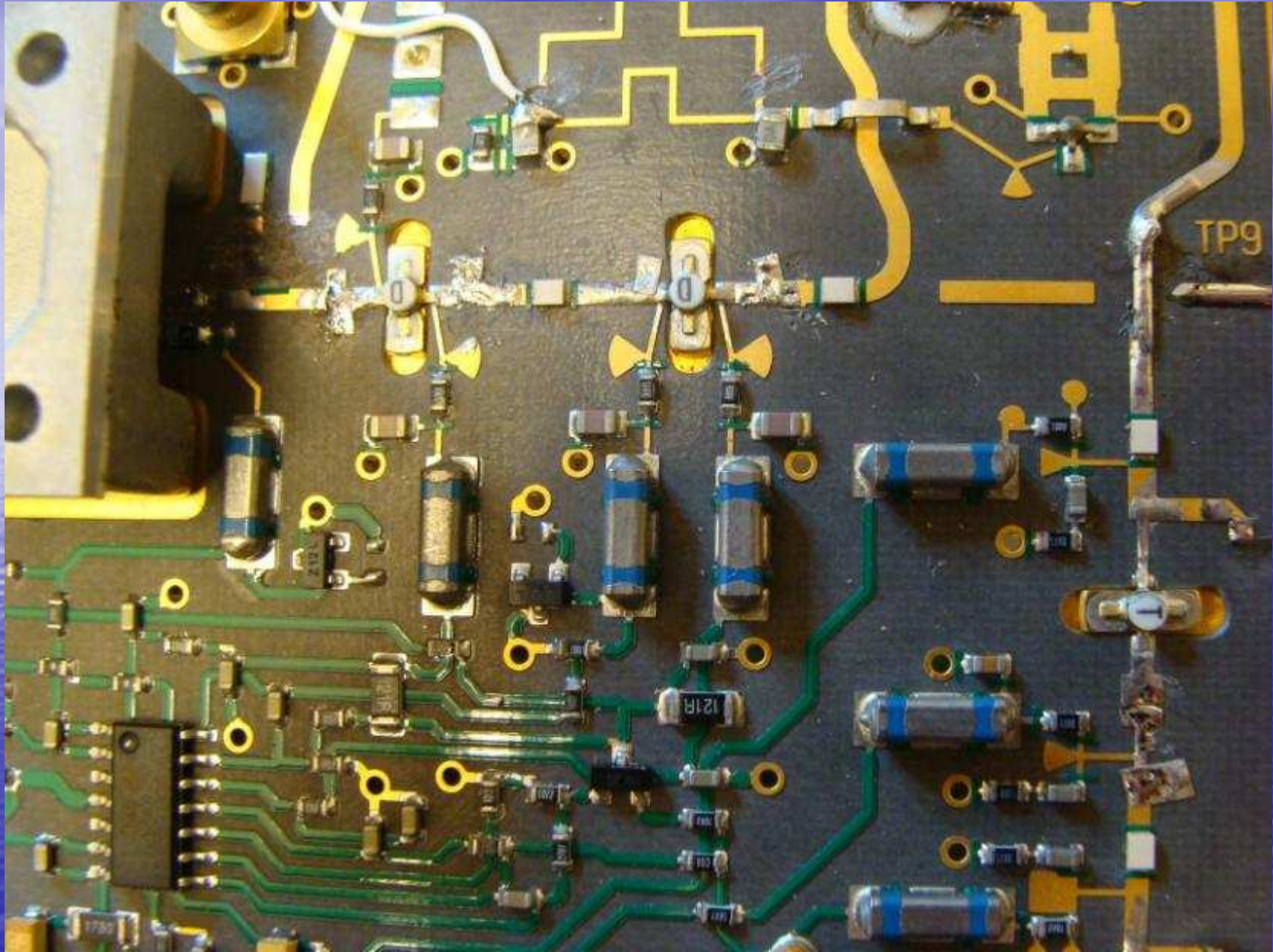
- After a closer tune up of the mixer and tx chain together I found that in my case there is need for more gain after the tx filter. Right now there is only a few mW output.. To be continued!

TX mixer tweaking



RX amplifier spot tuning

- Tuning up the RX front end amplifiers to 24048 by stubs, seems to give almost 10dB rejection of image reception. This is not a noise figure winning concept but it is a simple way when lack of proper filters. And it works in the 10G version.....



PA chain tuning and modification.

- Retuning the 23 GHz chain in a highband tx unit (final module fmc2223p1-02) is straightforward. Using some resnowflaking. The output detector is useful, monitoring output. Some 2V should be seen on pin8 at full output. I did also retune a 12GHz multiplier stage to amplifier, stole bias from another circuit.





Controlling TX/RX

- A nice feature is found on dc pin 6, tx side. Grounding this will disable transmission, very useful in a transverter application.



What next?

- This transverter mods were actually initiated as late as 18 May 2012, waiting for LO Xtal. Left me in a bit short timespace to do it ready and box it. The idea with this presentation is to give you ideas that it is possible! And that YOU start modifying your unit!

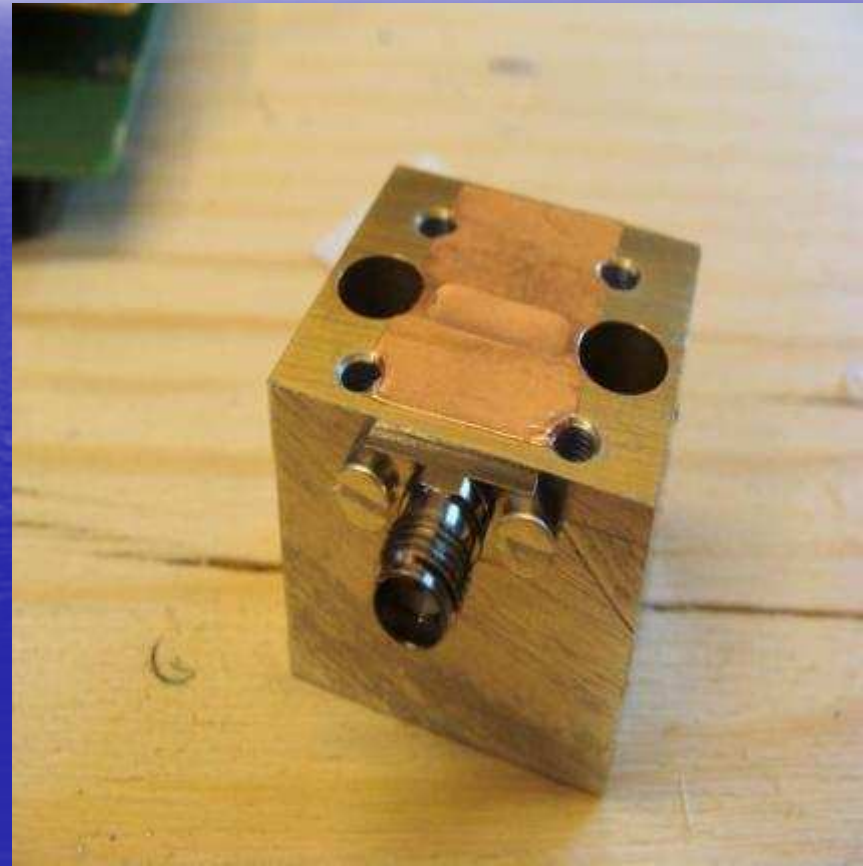
More..

- Simple to get beacons on air either 10 or 24 GHz.

Additional components

- In my case I did need some additional parts. WG-SMA adapter for example. It is very convenient to have access to a good metal cutting saw and a pillar drilling machine doing modifications to commercial equipment.

WG-SMA Adapter from cut out.



These are around now!

