

ALCATEL 9500 MICROWAVE RADIO LINK
MTI HB 7GHz XVRT conversion to 5.7GHz
E500 XVRT P/N: 131-142264-1103-01, PLL P/N: 131-142286-008
YO4HFU, rev.1, August 2021



MTI PCB TOP SIDE modification:

- Various stubs and snowflakes added to RX input stage for minimum noise figure. Stub position is critical around of Q3 input circuit. Noise figure meter + noise source gives best result, input circuit will be tuned for minimum NF.

- TX Hairpin BPF retuned using high Er dielectric glued on top of PCB. Enough shift frequency response was obtained using ~0.3mm ceramic isolator from old scrap TV. (Ceramic pad was used for thermal conductivity and electrical isolation between power devices and heat sink. Can be found as *aluminum oxide ceramic insulator*.) Almost same frequency response was obtained using *mica sheet*.

- Stubs added around of TX stages. The most critical is "E" shape stub located on the output of FMM5057 driver. The space is limited and double "L" stub was the only one solution.

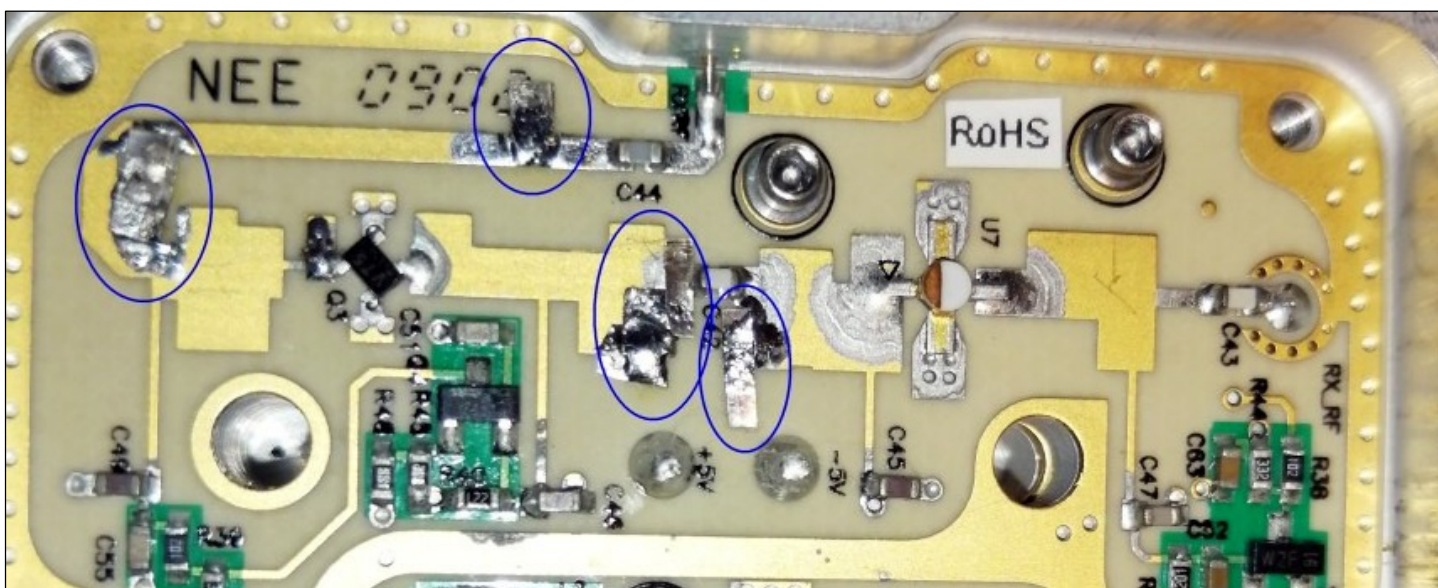
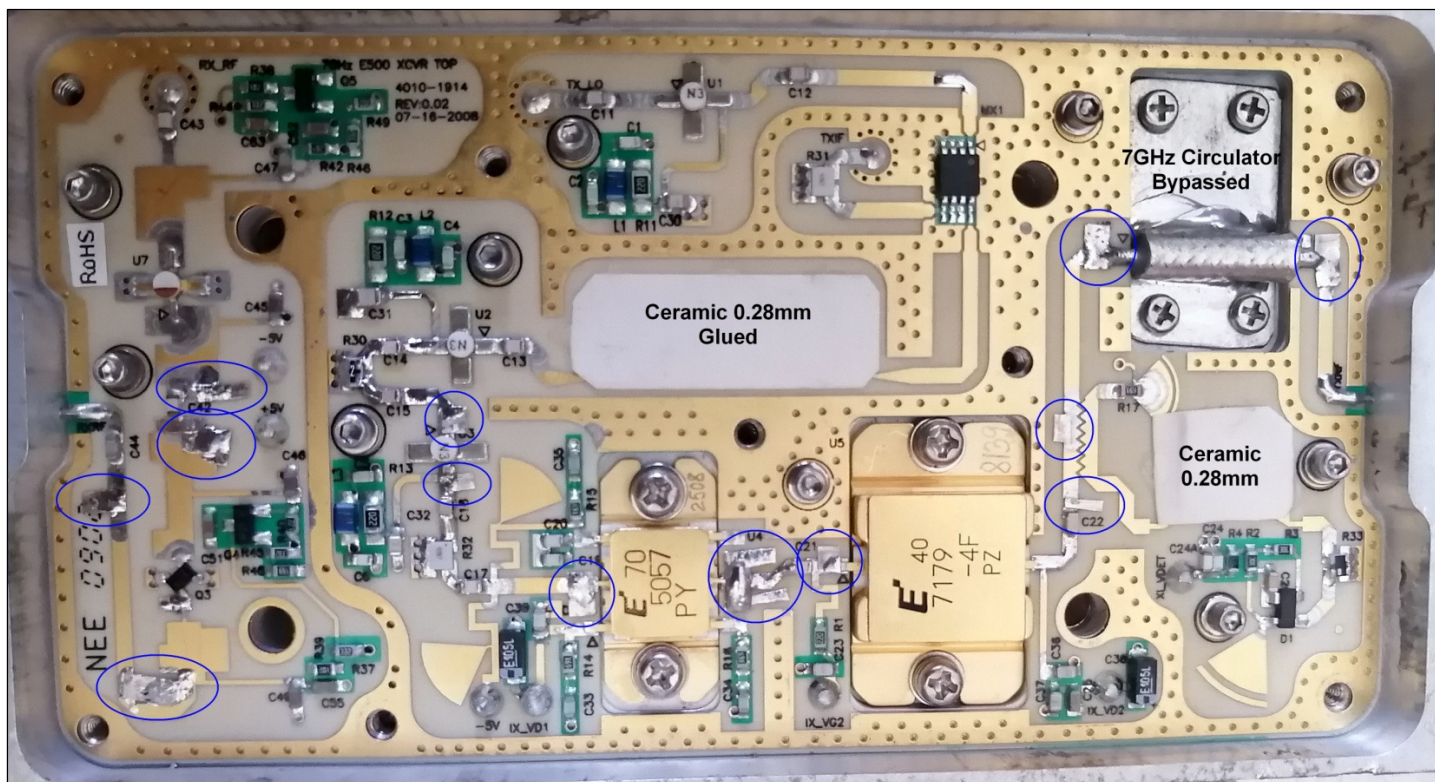
Driver supplied with 6V instead of original 10V. I observed better output power at 5.7GHz. Power stage FLM7179-4 is supplied with 10...10.5V, $I_q=1.1A$.

- Stubs installed on the output of the last PA stage. 7GHz circulator replaced by short coaxial bypass. I never tested the response of original circulator at 5.7GHz. Also power monitor BPF retuned using ceramic, otherwise FWD monitor DC voltage will be almost zero at 4W/5.7GHz. With retuned BPF, monitor voltage (XL_VDET) is about 0.7V for full power.

During testing is mandatory to use 6V and 10V power supply with over current protection. Keep negative voltage -5V and PA bias connected all the time. Do not supply the PA stage without negative bias already applied!

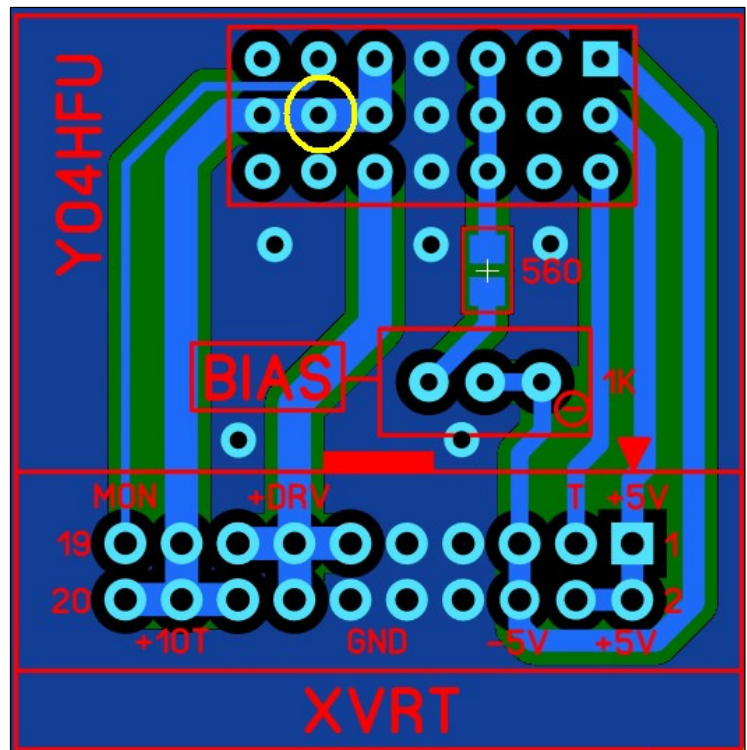
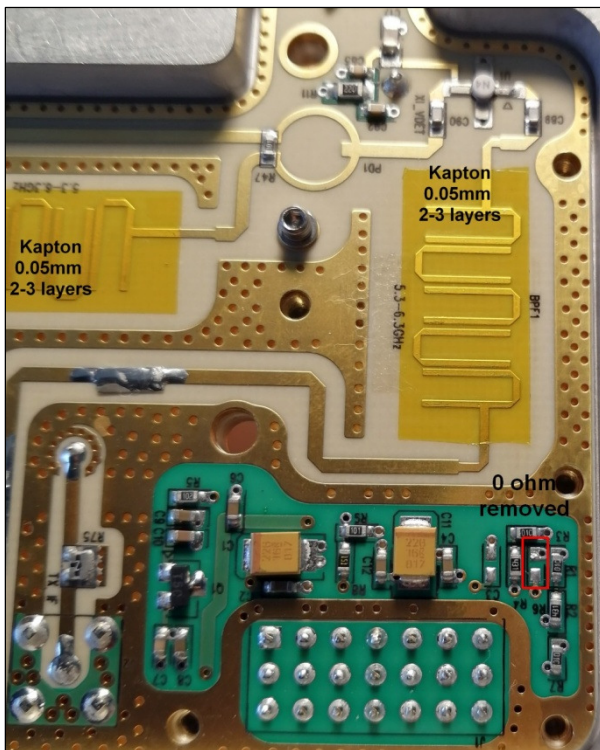
The most difficult is to retune the power stage because after every modification the top cover must be installed in order to avoid self oscillation.

I tried several techniques to retune the TX BPF, ceramic pad solution is the most simple when the available space is limited. The TX BPF must to be tuned for 5760MHz pass and sharp attenuation response under this frequency in order to avoid image frequency and LO leakage to TX output. TX/RX IF frequency is 740MHz, easy to find 740MHz GSM SAW filters for 144/432MHz conversion. Clean the PCB after every modification. It is very important to avoid additional losses and wrong tuning due to residual flux.



MTI PCB BOTTOM SIDE modification:

- LO Hairpins BPF retuned using KAPTON 0.05mm, 2-3 layers. I don't remember exactly how many layers but is according KAPTON thickness. Add KAPTON layers for best LO level (5020MHz) at the input of TX mixer.
- RX BPF retuned using small pieces of silvered sheet (shield from Suhner Multiflex 141 coaxial cable) for maximum level at FI port. RX input connected to 5.7GHz generator, level adjusted under compression point.
- LO x2 Multiplier (U14 FET) tuned for maximum 5020MHz level monitored at the LO input of TX mixer.



PLL Board modification:

- Original PLL module was tuned to 2510MHz, Vtune=5V. Self resonance frequency is decreased by removing the silver metallization (step by step) from the shortened end of coaxial resonator using Dremel tool.

For more details read "SKYWORKS Frequency_Tuning_Coaxial_Resonators_202722B_AN". The coaxial resonator is located inside of UMX-1522 VCO and is very small...I did small frequency correction by soldering.

- Remove HY1 TCXO and inject external 10MHz signal from better quality OCXO. Same OCXO will be used also for FI 2nd LO 740MHz / 144 (432) MHz board.

