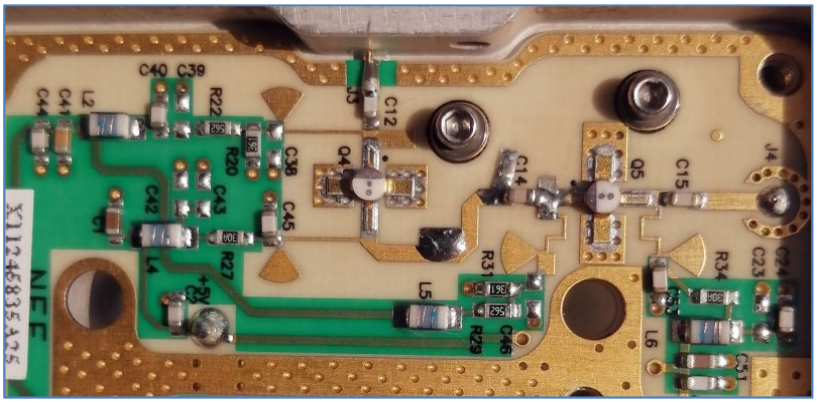
ALCATEL 9500 MICROWAVE RADIO LINK
MTI LB 11GHz XVRT conversion to 10.368GHz
E500 XVRT P/N: 131-142264-1005, PLL P/N: 131-142286-007
YO4HFU, rev.4, April 2023

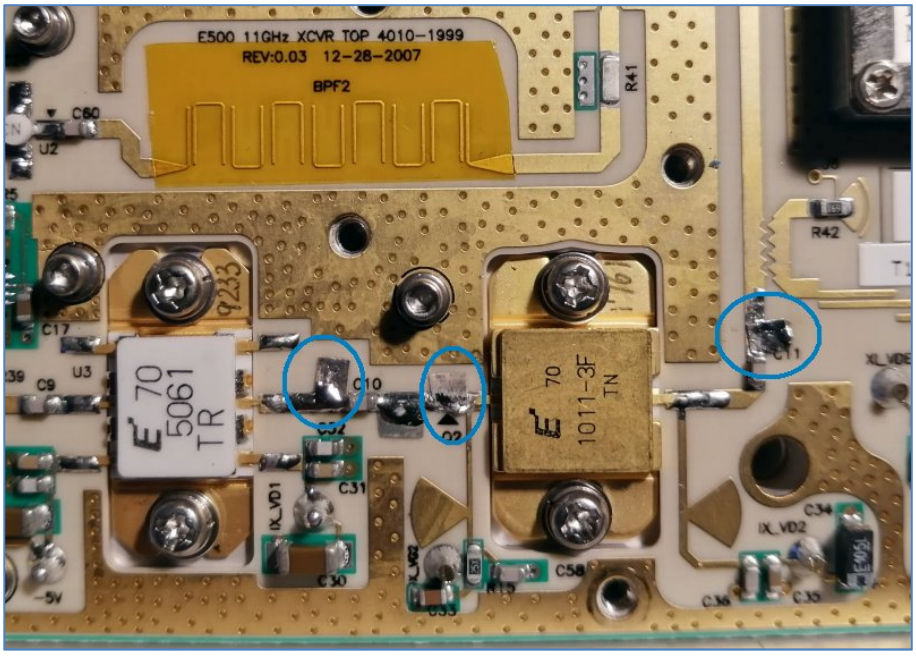
MTI PCB TOP SIDE modification:

- 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 is the most accurate, input circuit will be tuned for minimum NF. Actual NF was not determined due to uncalibrated Noise Source.
UPDATE: RX frontend tuning is NOT required for the RF units which are using ceramic FETs FHX76. It seems optimal adjusted by factory. View of RX frontend, FHX76 version:



- TX Hairpin BPF 2 retuned using 1-2 layers of KAPTON tape 0.05mm.

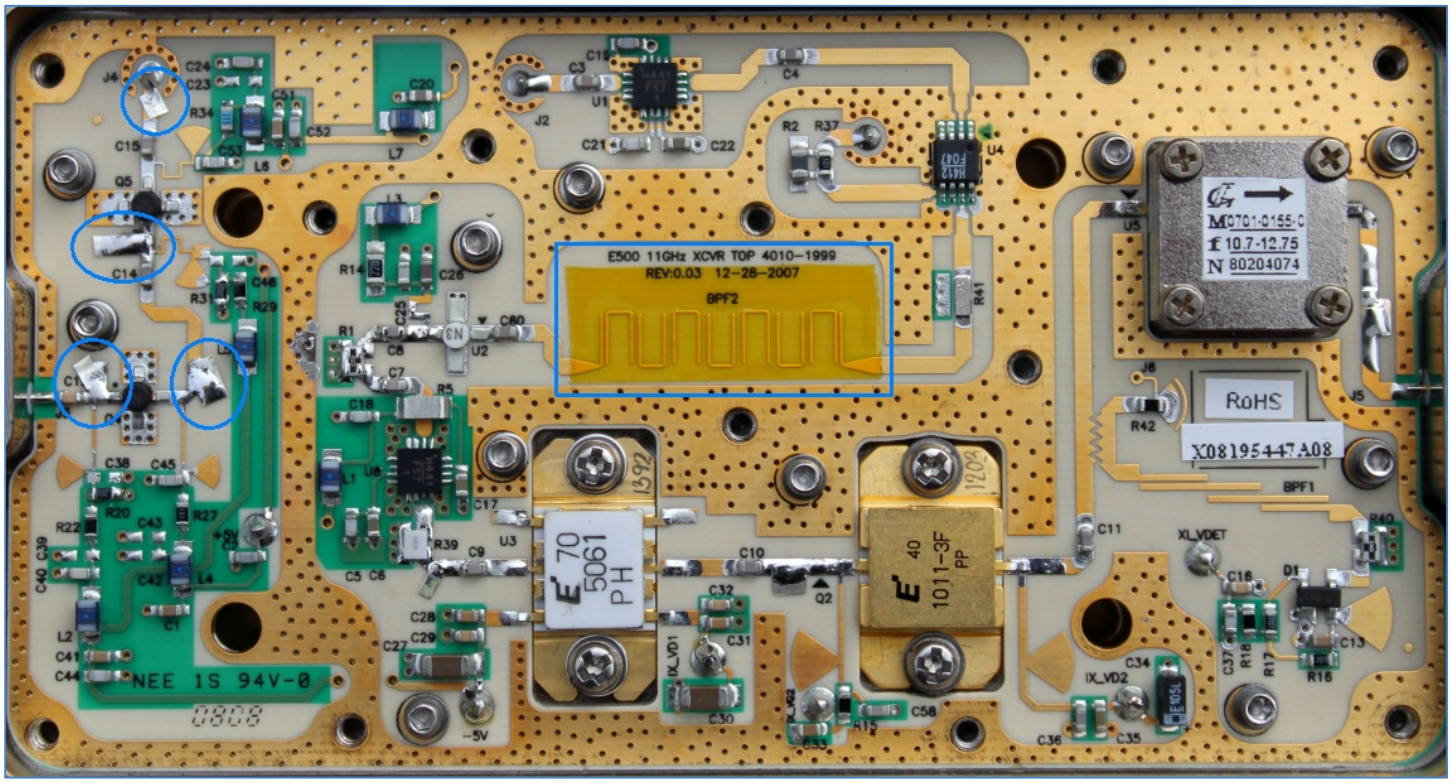
- TX power amplifier was not possible to be retuned for peak output at 10.368GHz due to instability. After every modification the top cover must be properly installed in order to avoid self oscillation, so is difficult to add stubs. I was happy with 2.5W output without any modification of PA stage. Output circulator was not removed. Q2 FLM1011-3 idle current is adjusted to 900mA.
I found only one RF unit more stable and next stubs were added for peak output power:



During testing is mandatory to use 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!
Clean the PCB after every modification. It is very important to avoid additional losses and wrong tuning due to residual flux.

TX IF level required 0...+3dBm. External TX/RX IF frequency is 1592MHz filtered by GPS SAW filters.

RX frontend view and TX BPF, FETs NE3210 (K) version:



MTI PCB BOTTOM SIDE modification:|

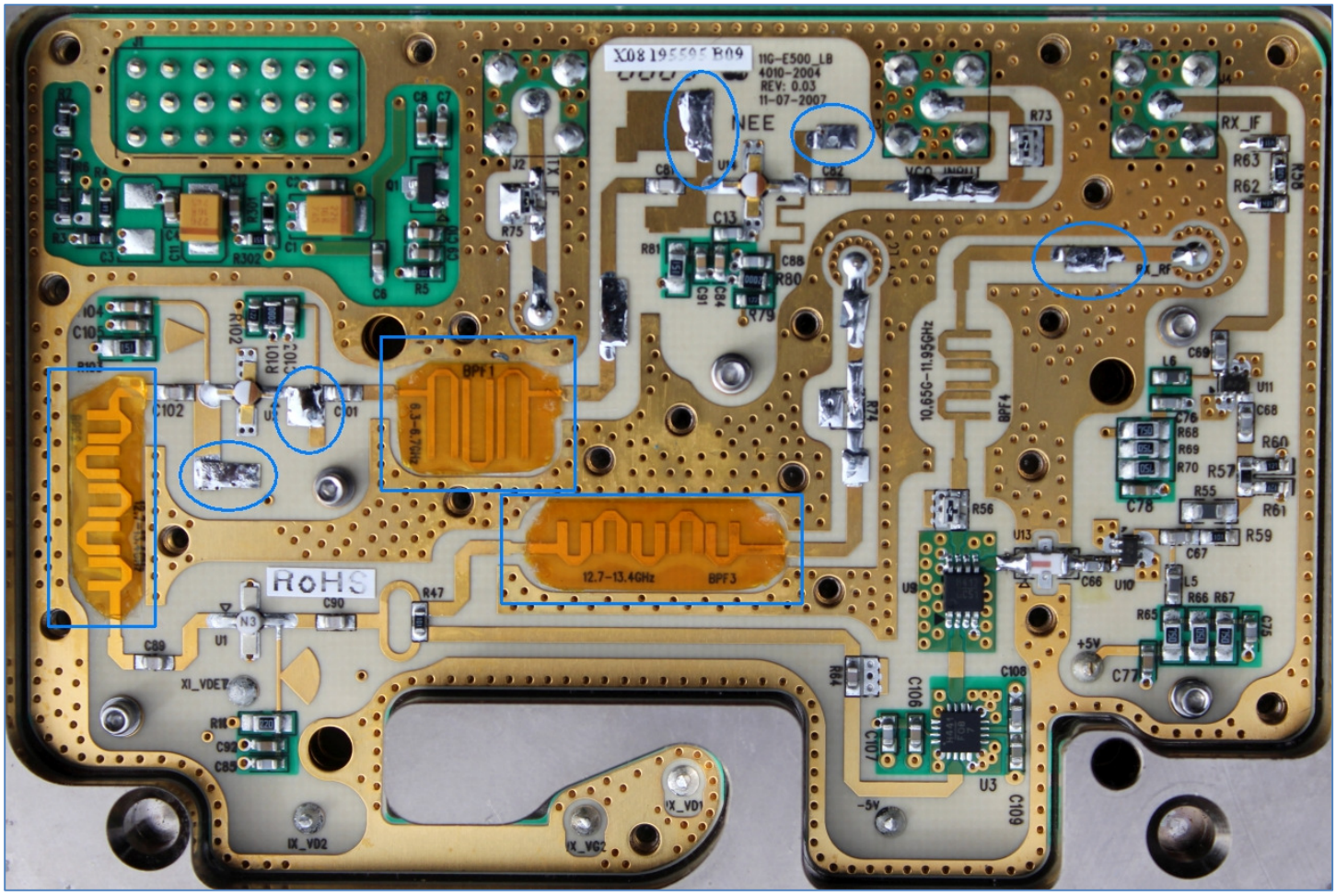
- Original LO BPFs have cutoff frequency at 6.3GHz and 12.7GHz. Multiplied LO signal 5980MHz and 11960MHz will be attenuated. LO Hairpins BPF1 & BPF2 retuned using KAPTON 0.05mm, 2 layers. Add KAPTON layers for best LO level (11960MHz) at the output of TX LO BPF3 – 3 layers KAPTON. Remove R74 attenuator (bridge) and connect bolometer sensor or spectrum analyzer by soldering a thin coaxial cable.

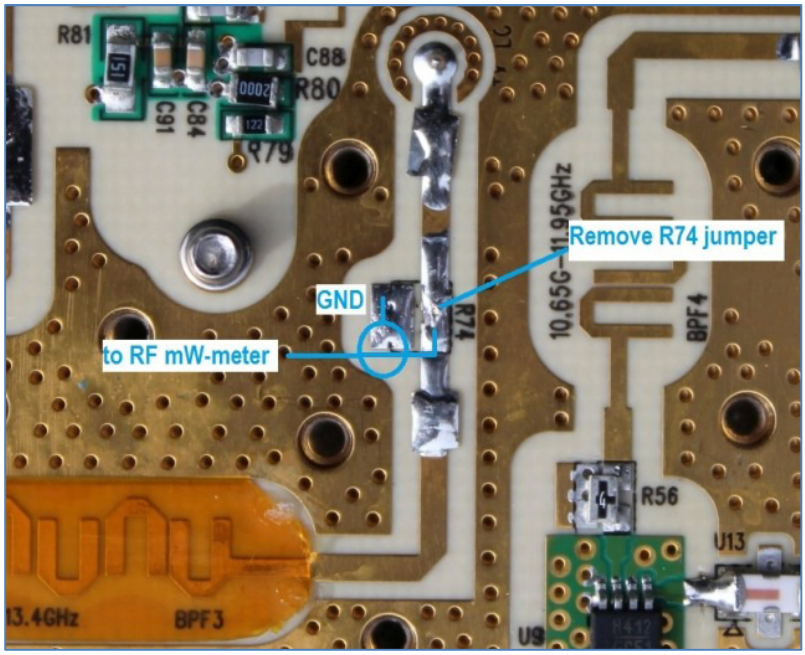
- Adjust LO BPF 1, 2, 3 using KAPTON layers until maximum RF LO level is reached (+3…5dBm on R74 test point), otherwise LO level is very low, around -8dBm and RX/TX performances are affected. The level is not critical due to HMC441 LO amplifiers in front of mixers.

- Stubs of LO x2 multipliers (U14 and U2 FET) tuned for maximum output level 11960MHz.

- No tune required for RX BPF, confirmed by NF test and Rx gain measurement. Any KAPTON layer decrease RX performance.

- The lid can be left open during tuning.


X08195505 B09
11G-E500_LB
4010-2004
REV: 0.03
11-07-2007
RoHS
BPF1
BPF3
BPF4
12.7-13.4GHz
10.65G-11.95GHz
RX_IF
TX_IF
PA_RF
+5V
-5V


Remove R74 jumper
GND
to RF mW-meter
R74
R81
C88
R80
C91
C84
R79
10.65G-11.95GHz
BPF4
R56
U13
U9
BPF3

PLL Board modification:

- Original VCO module no need retuning. Output 2990MHz is inside of PLL lock range. Install 100 ohms resistor in parallel with R1 or R5 in order to increase VCO voltage (due to 10V power supply instead of 12V).

- Remove HY1 TCXO and inject external 10MHz on TP13 or connect thin coaxial cable to output pad of HY1. Drill a hole 0.8mm in the center of TCXO output pad and then connect thin coaxial on the opposite side of PCB. Of course ground plane connected to coaxial shield.
Good quality 10MHz OCXO is required, it will be used also for FI 2nd PLL LO 1592MHz / 144 (432) MHz board.