

E band 80.832 GHz beacon with high performance frequency source.

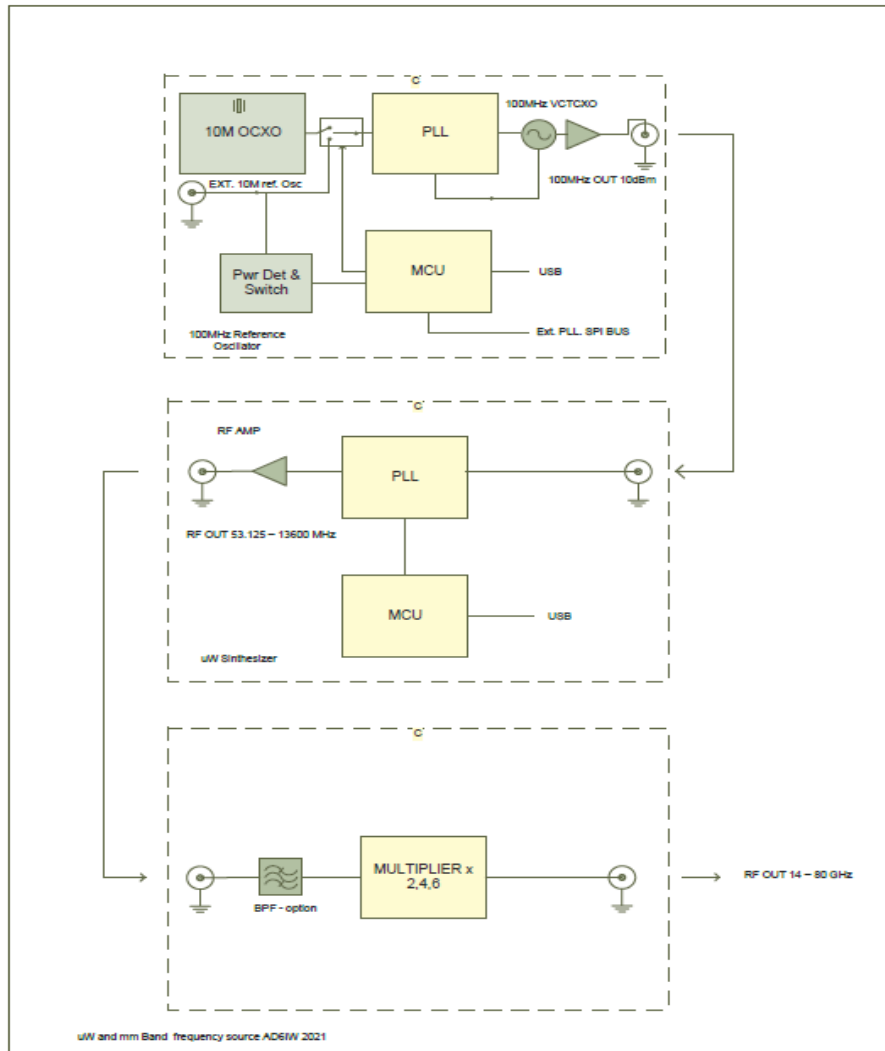
Compact USB programmable frequency source between 50MHz and 80GHz.

Goran Popovic AD6IW

original design and implementation

50 MHz and up club Beacon project July, 2021

Block Diagram



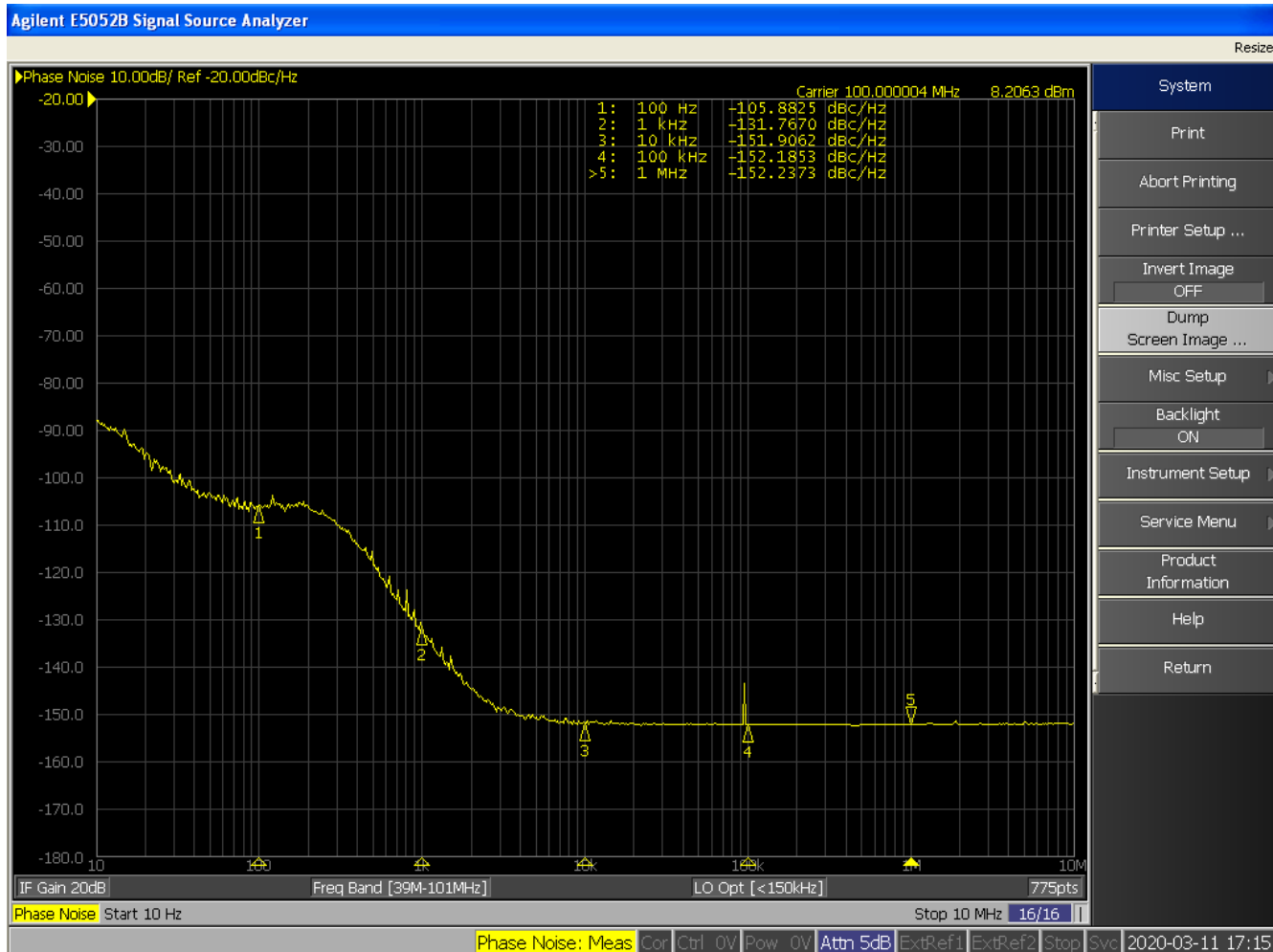
AD6IW 100MHz reference board



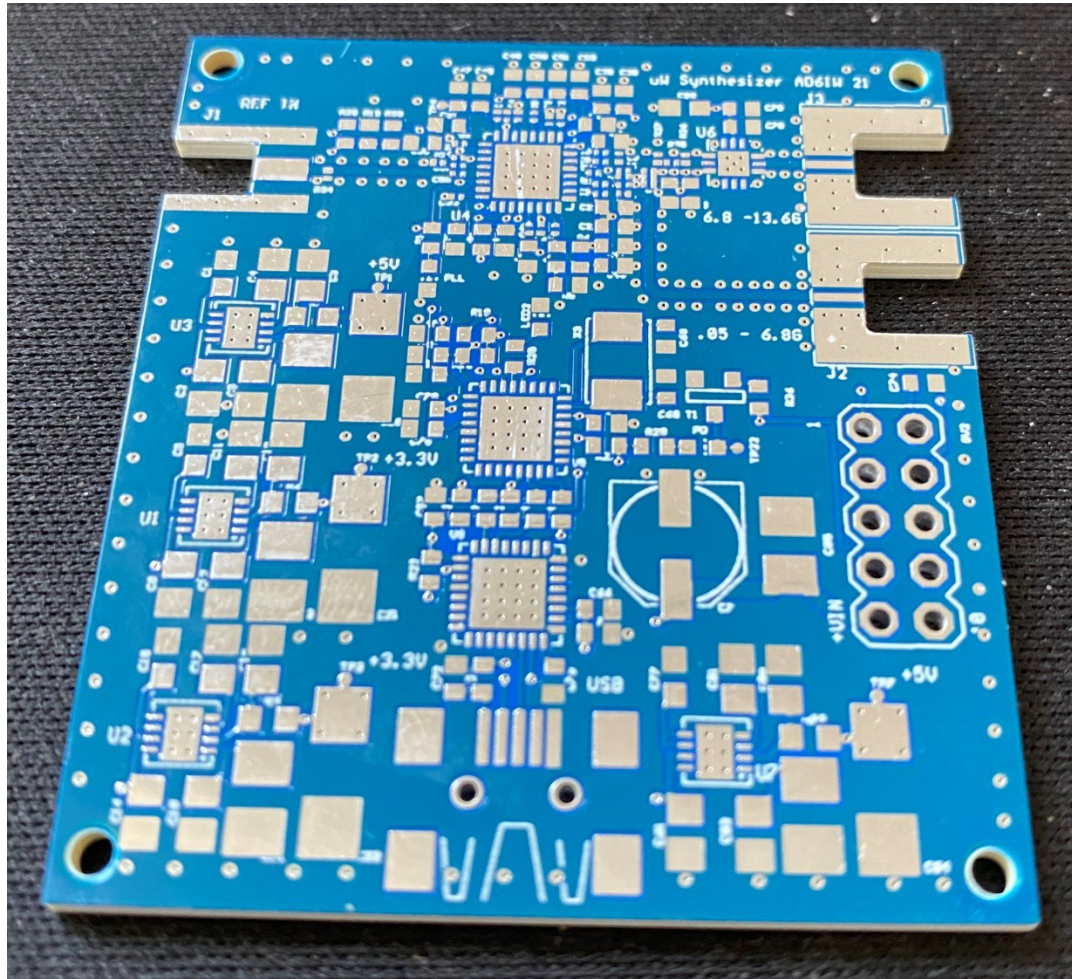
100MHz Ref. PLL Board Features

- 100 MHz locked to 10MHz OCXO
- Higher ref. frequency – better Phase Noise
- 12 bit DAC for fine frequency tuning
- Auxiliary SPI bus for external uW PLL
- Auto switching external reference, power level reading in dBm, overload protection, USB port
- Oven temperature and ready status indicator
- 10 dBm out at 100MHz, low phase noise

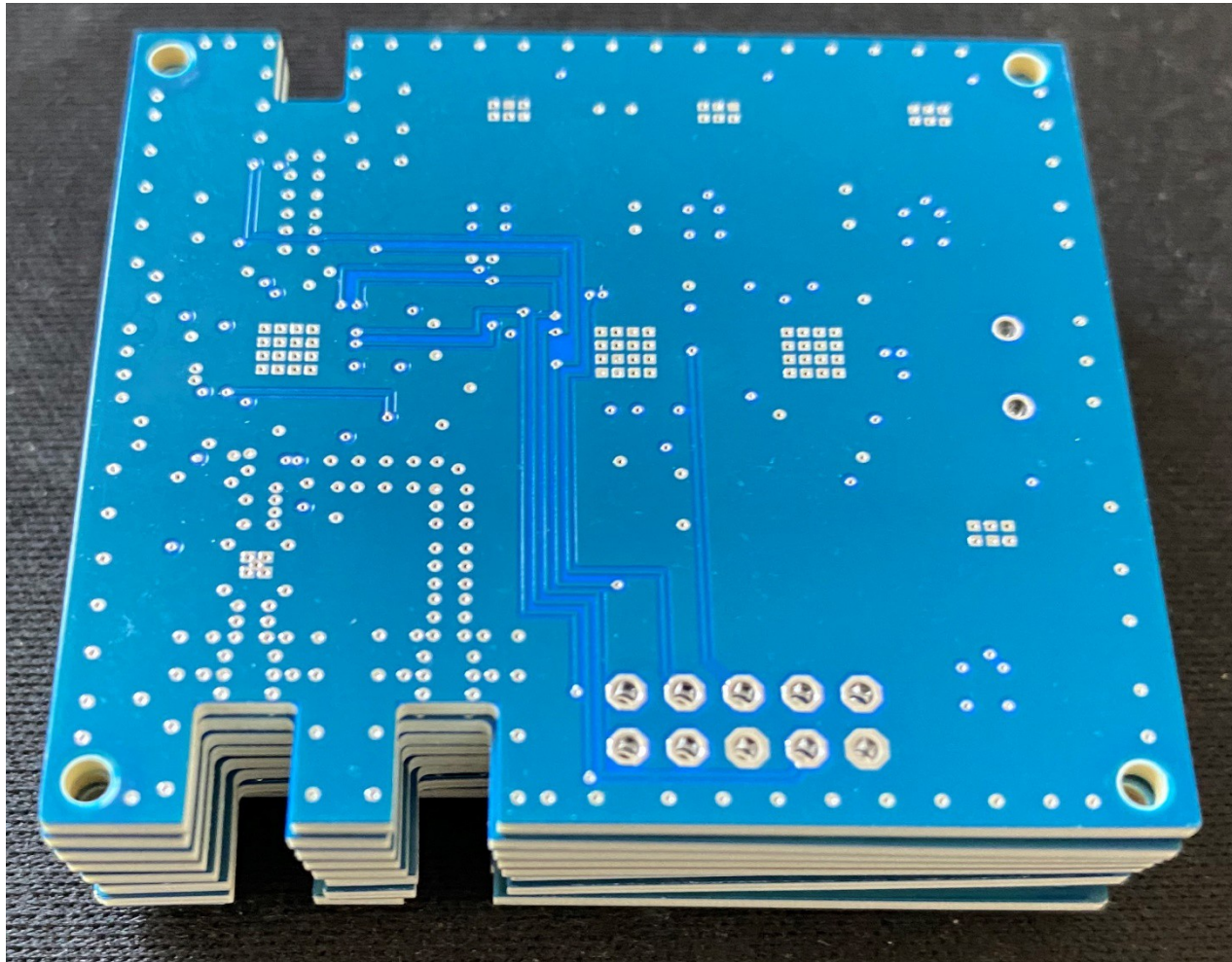
100MHz Phase Noise



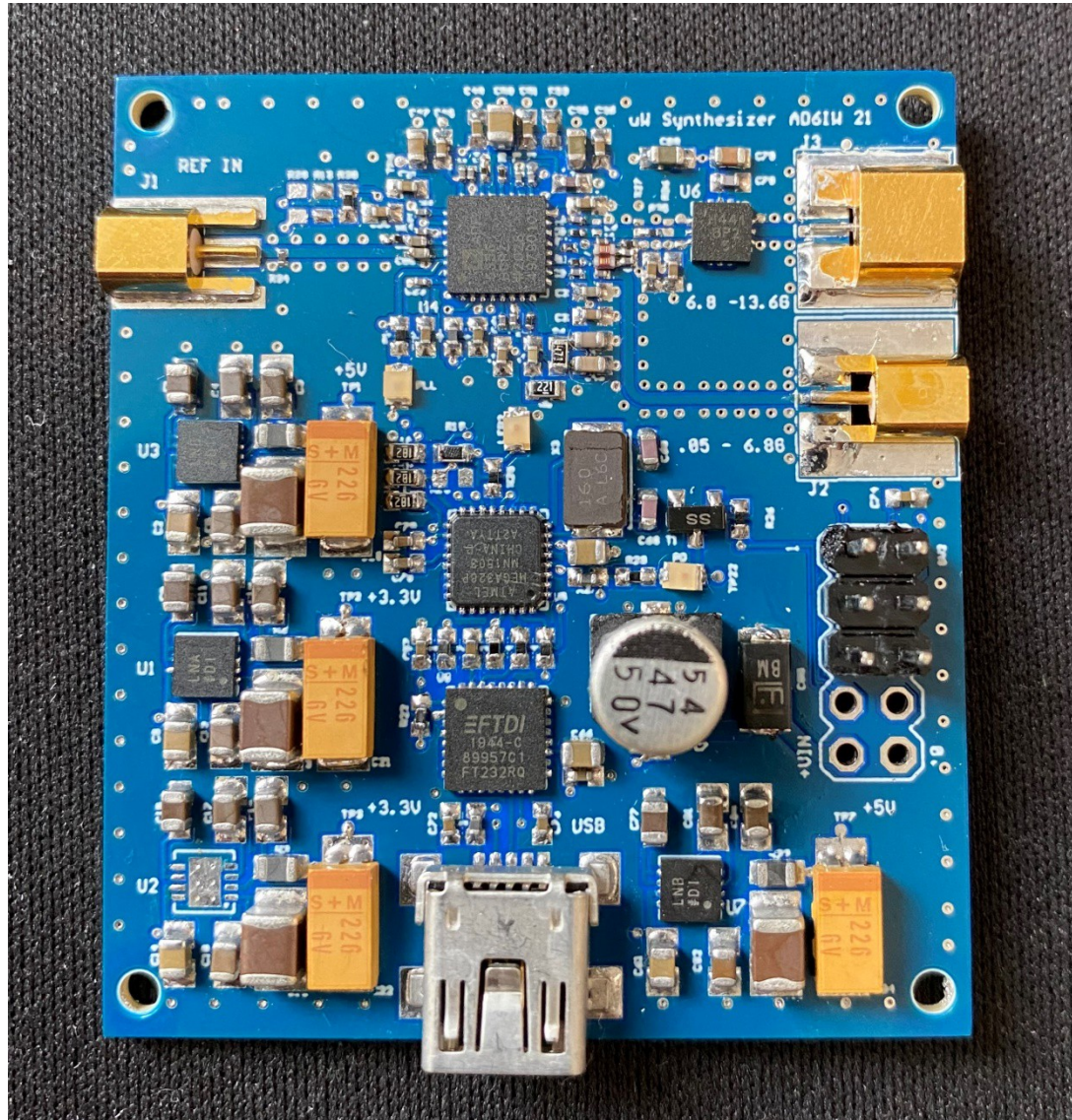
uW PLL 4 Layers PCB RO4350B



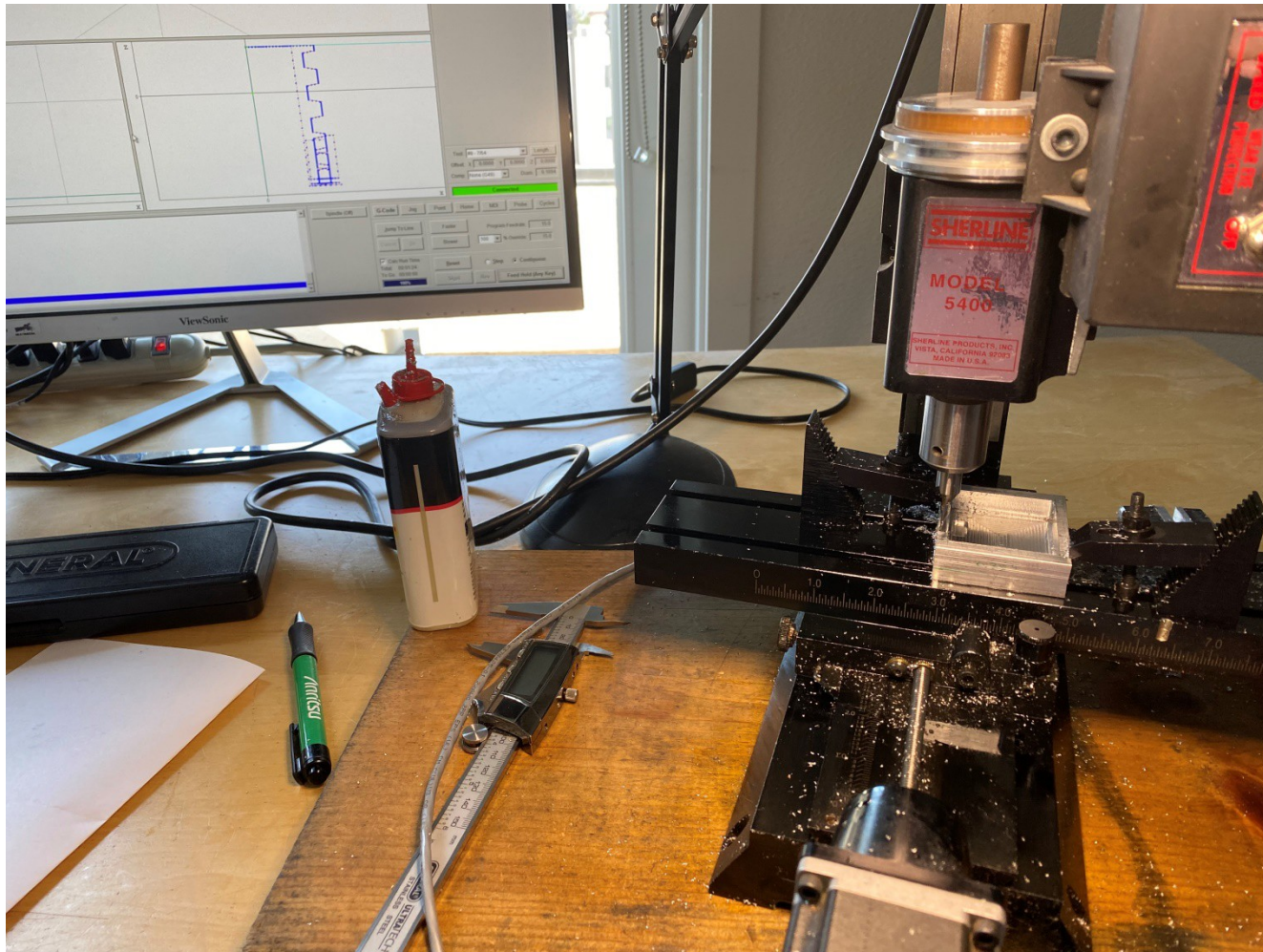
Boards are made by PCB.WAY



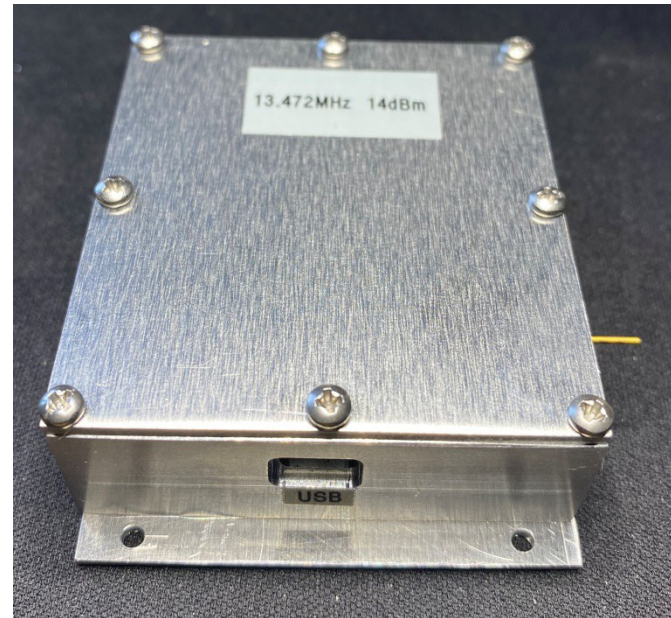
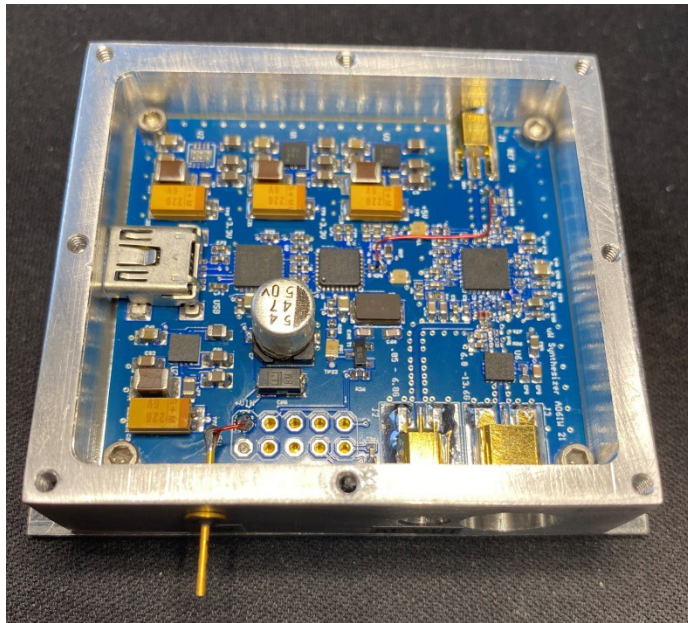
Assembled board



CNC enclosure Machining



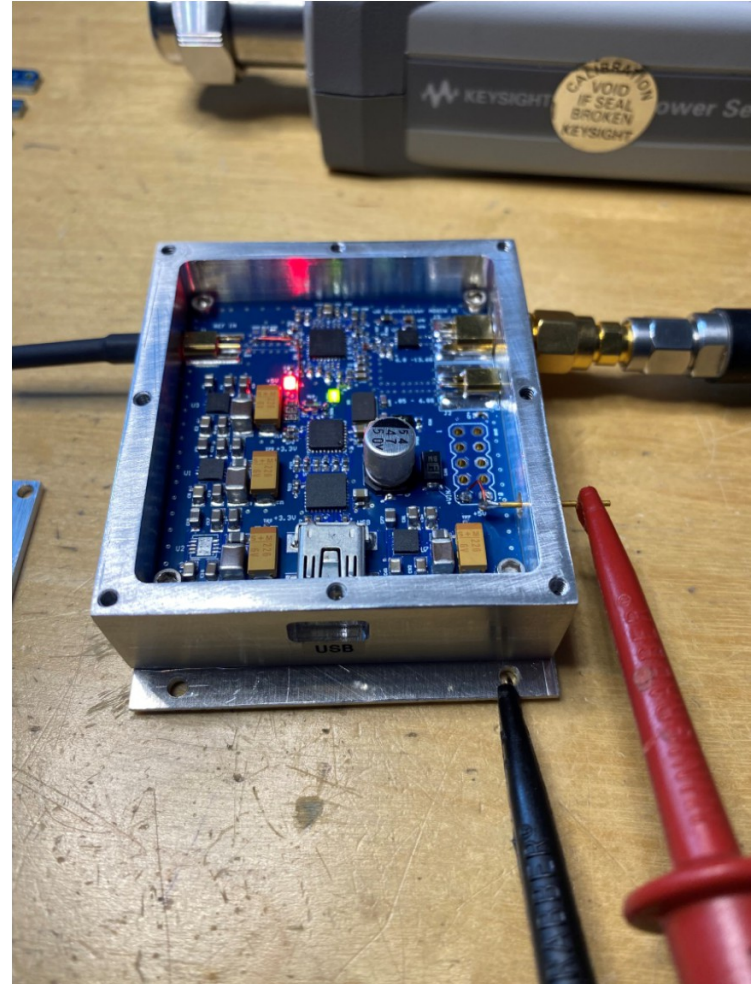
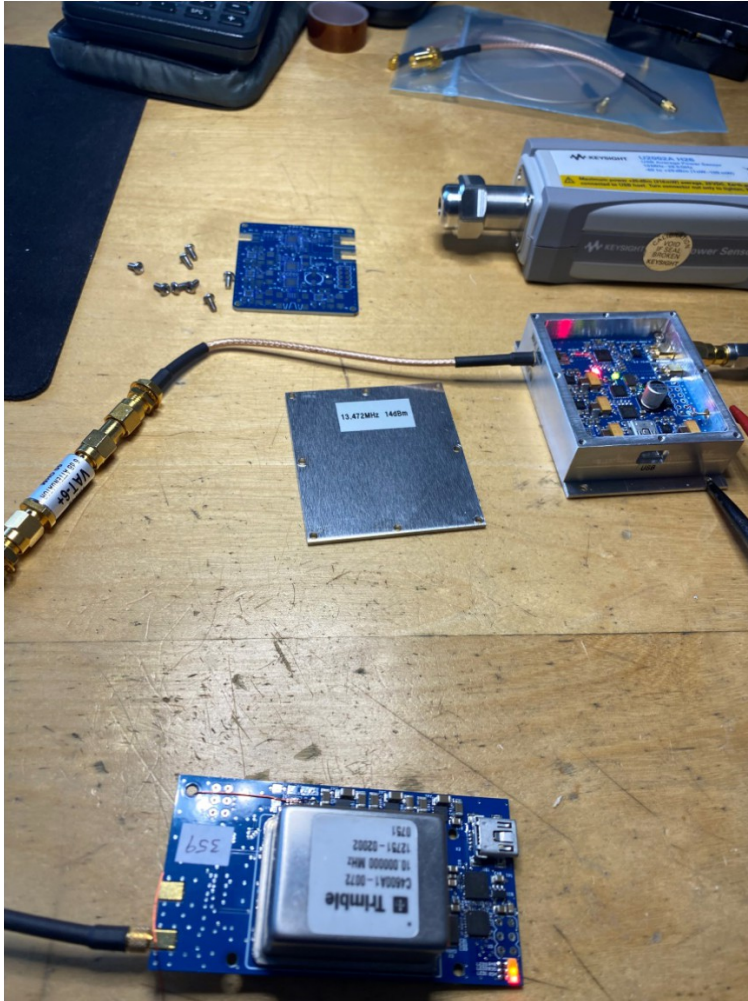
Finished μ W PLL



uW PLL ADF5356 features

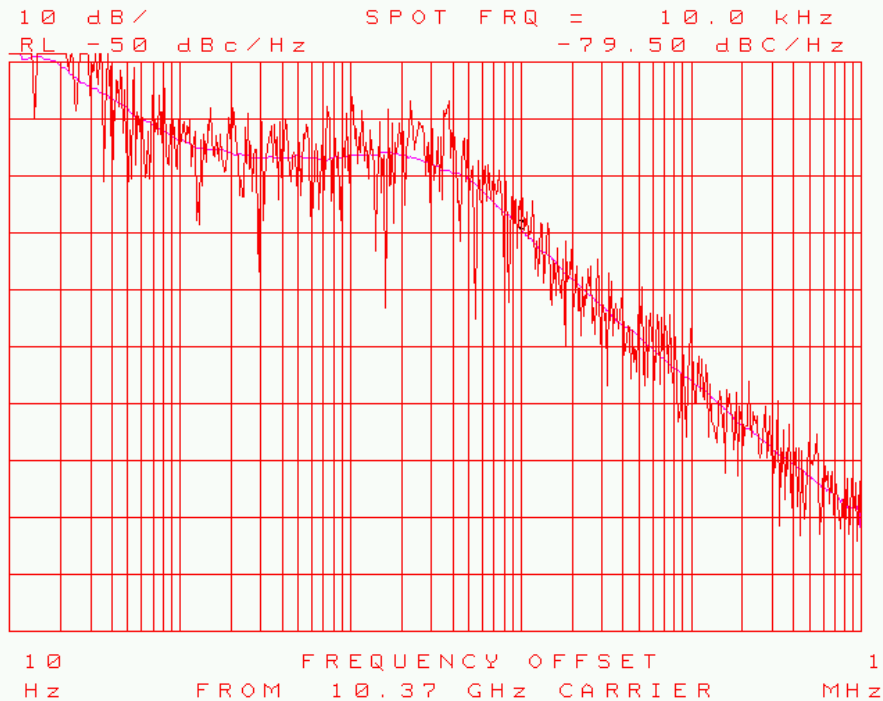
- USB port for easy frequency and beacon settings
- Integer and Fractional frequency synthesizer, high resolution 52 bits modulus, milliHertz resolution
- Frequency range 52.125MHz to 13,600MHz
- Adjustable power output in 3dB step's but useful only at rf port A
- RF output switch pin or toggle bit. 23dB

Bench Testing

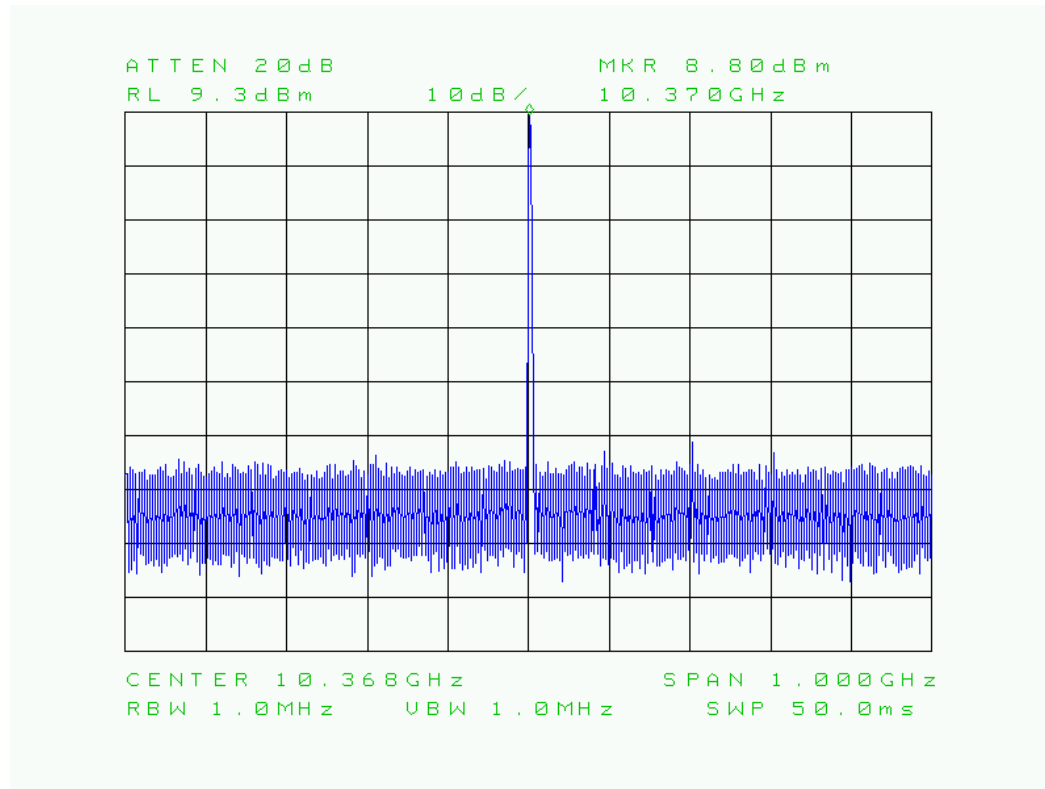


Test results Phase Noise

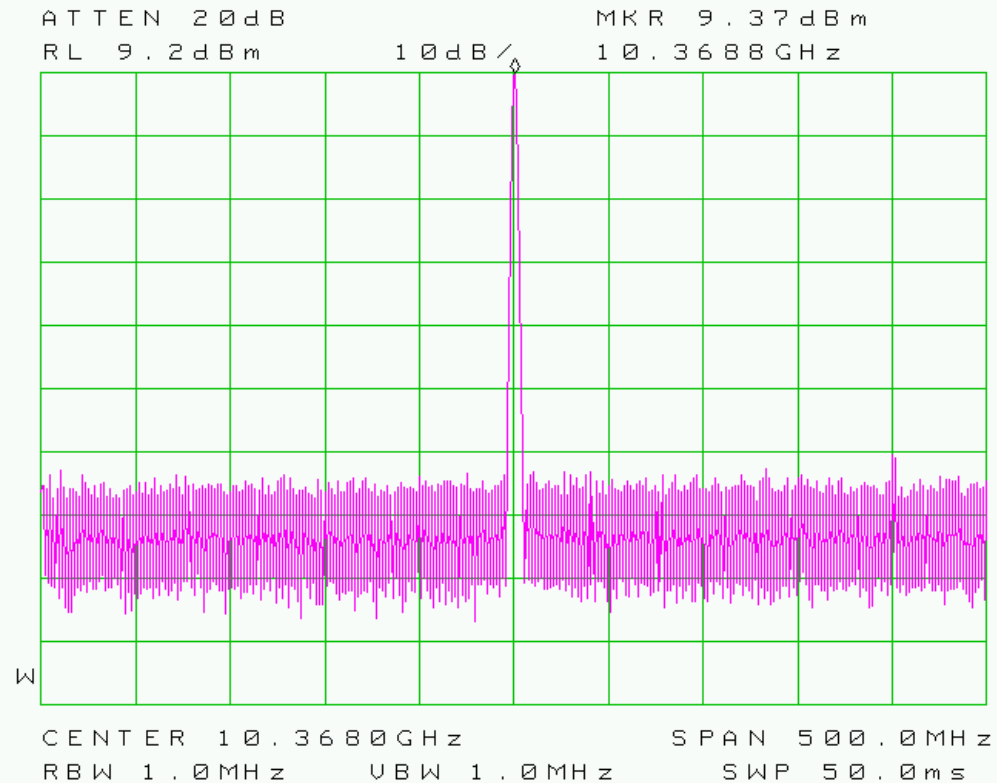
10368.1MHz



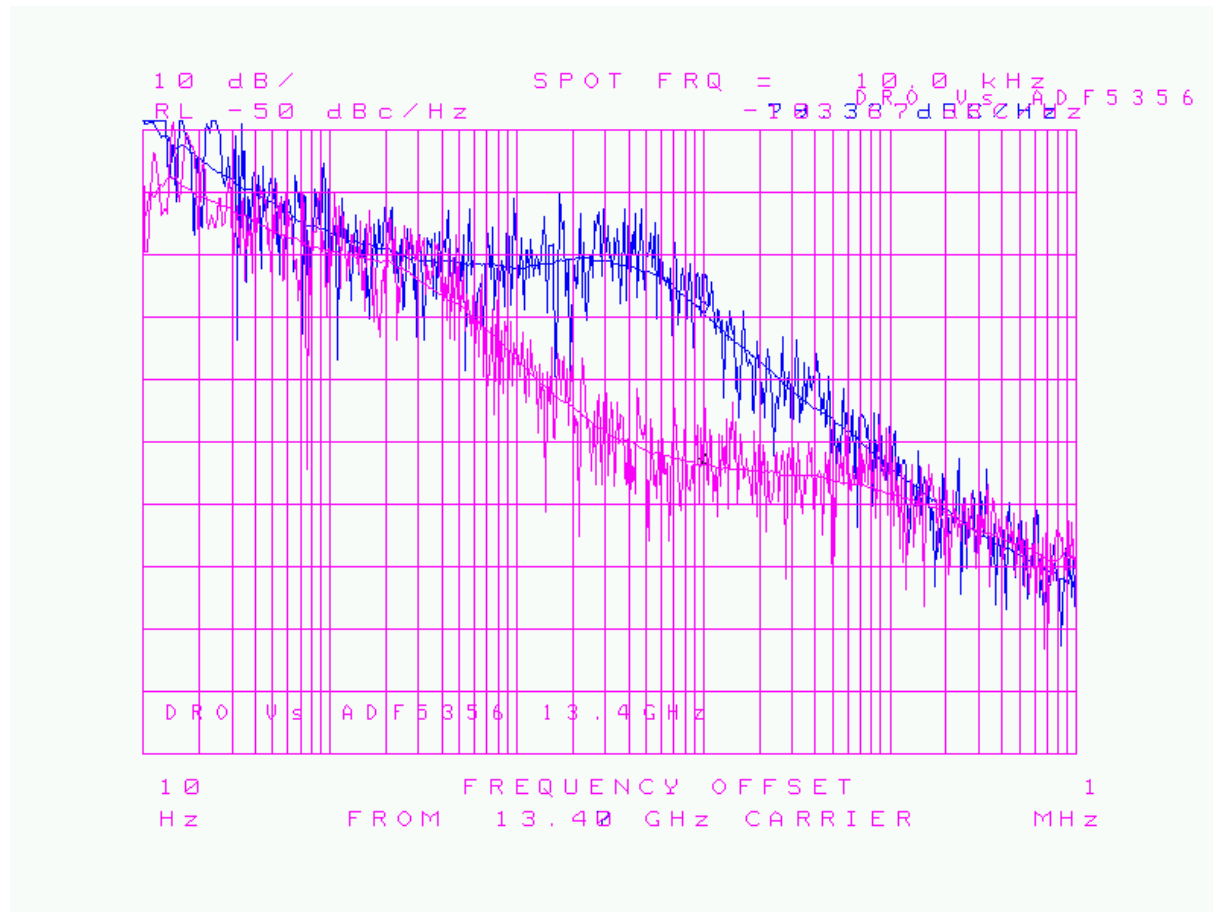
Span 1 GHz Center 10368.1MHz



Span 500M Center 10368.1M

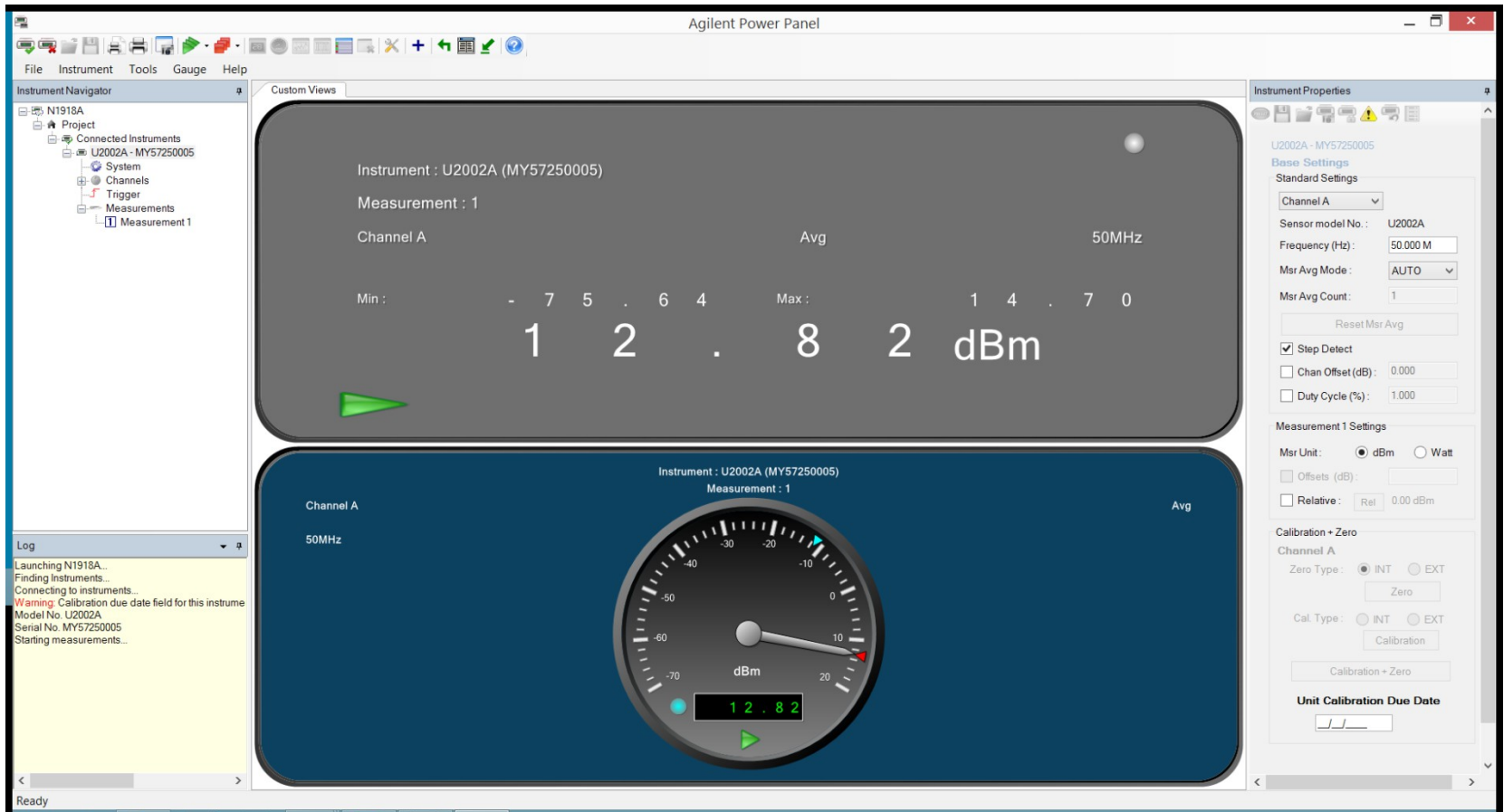


uW PLL vs DRO PN at 14GHz

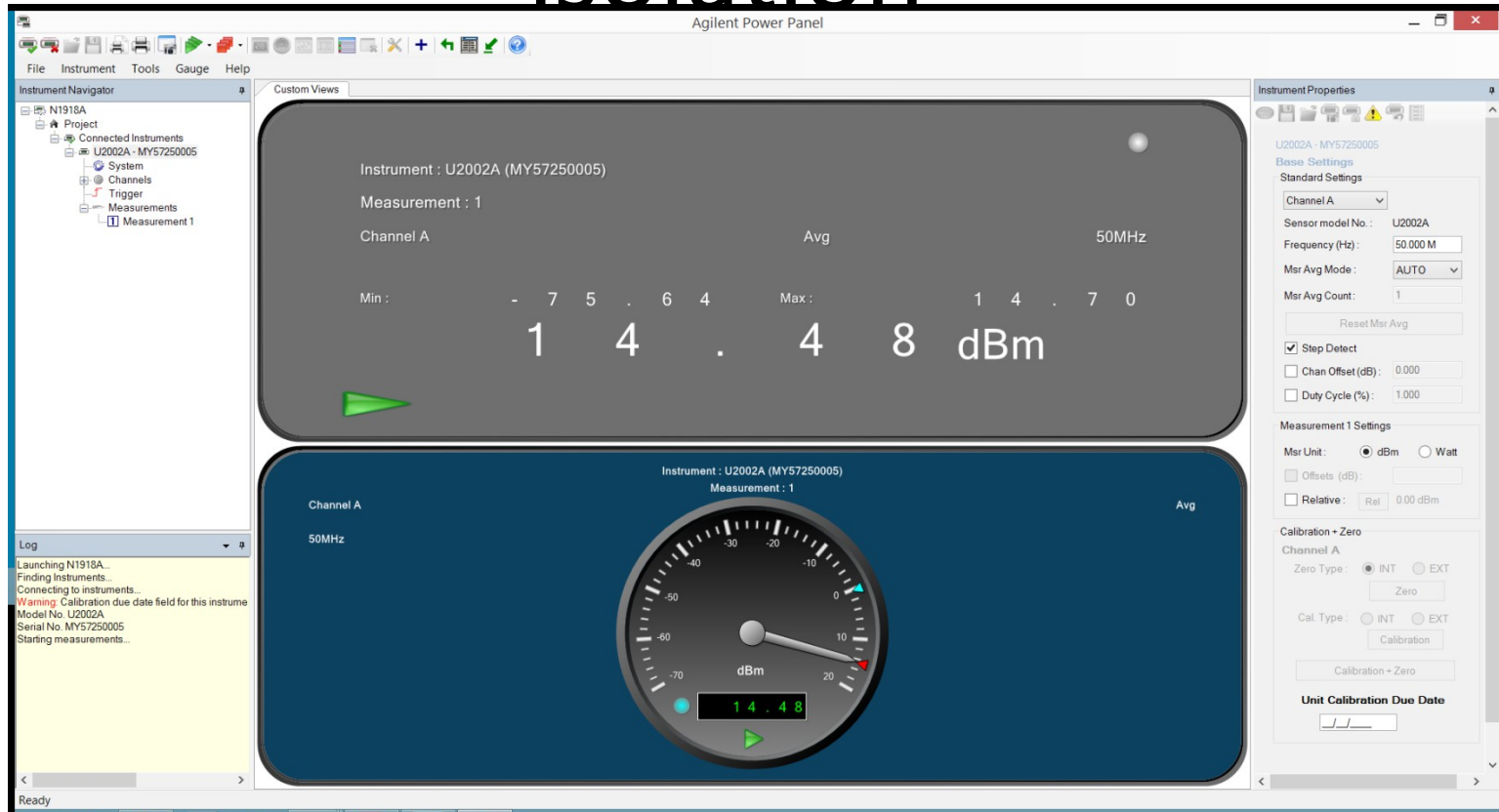


Red DRO, Blue uW PLL

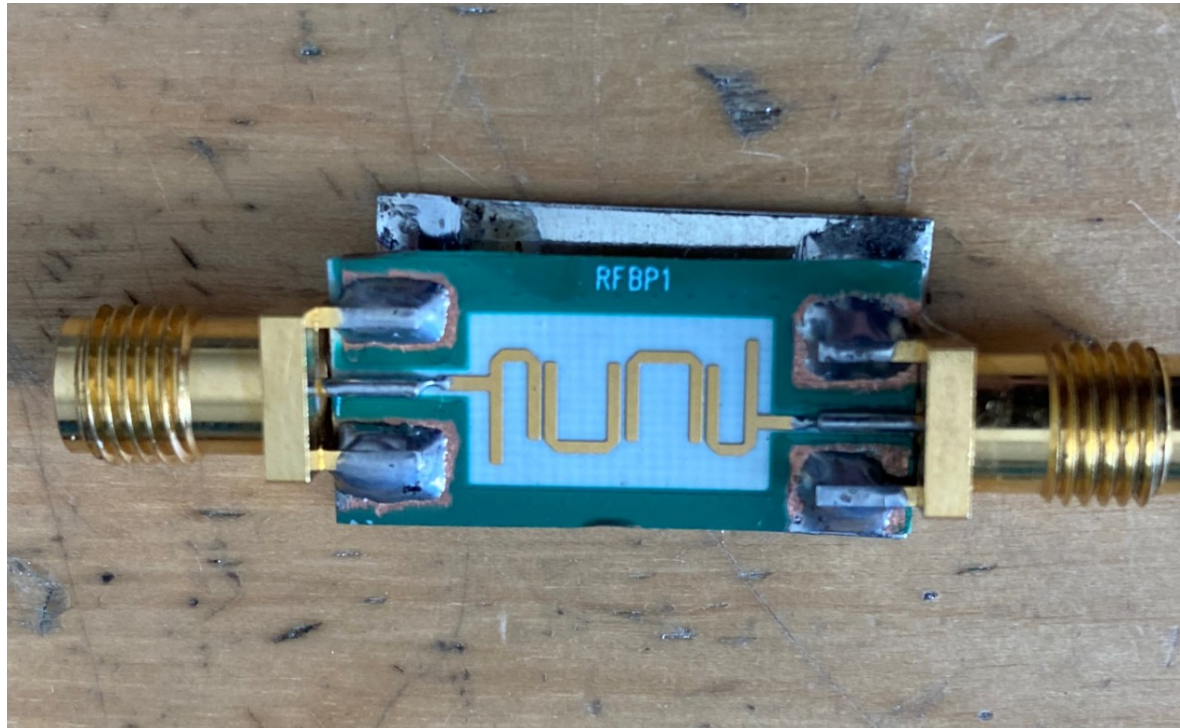
10368M RF power and sw. isolation



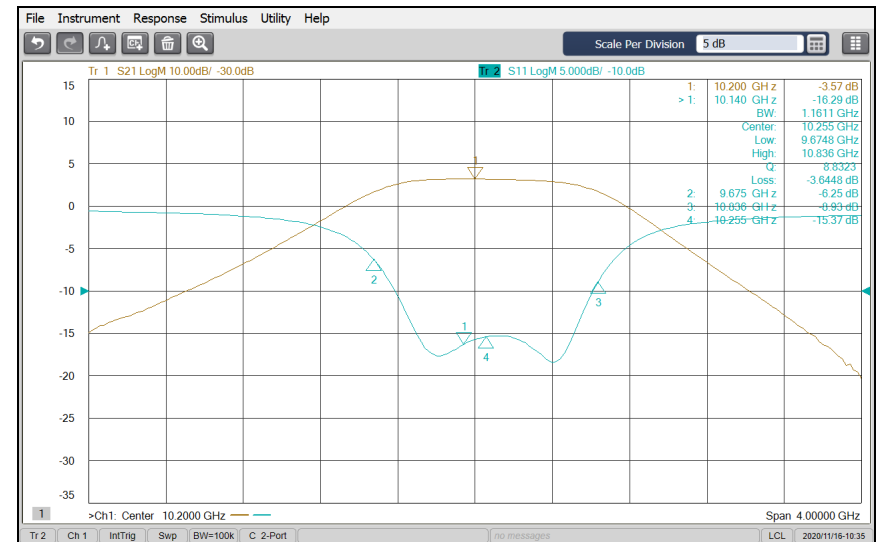
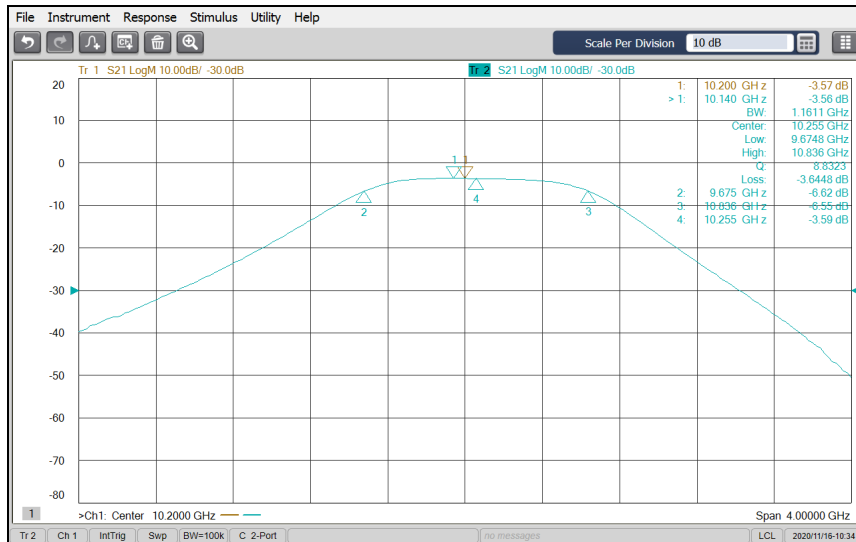
13.472Ghz RF Power and sw. isolation



Optional 10GHz AD6IW BPF

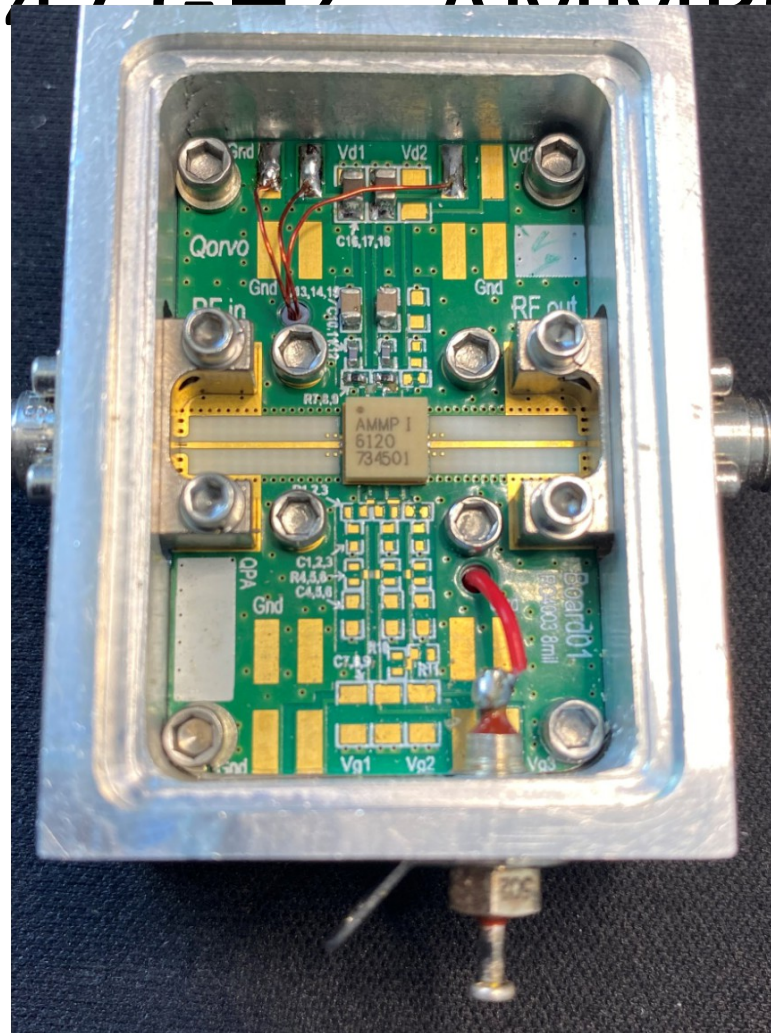


10GHz BPF Plots

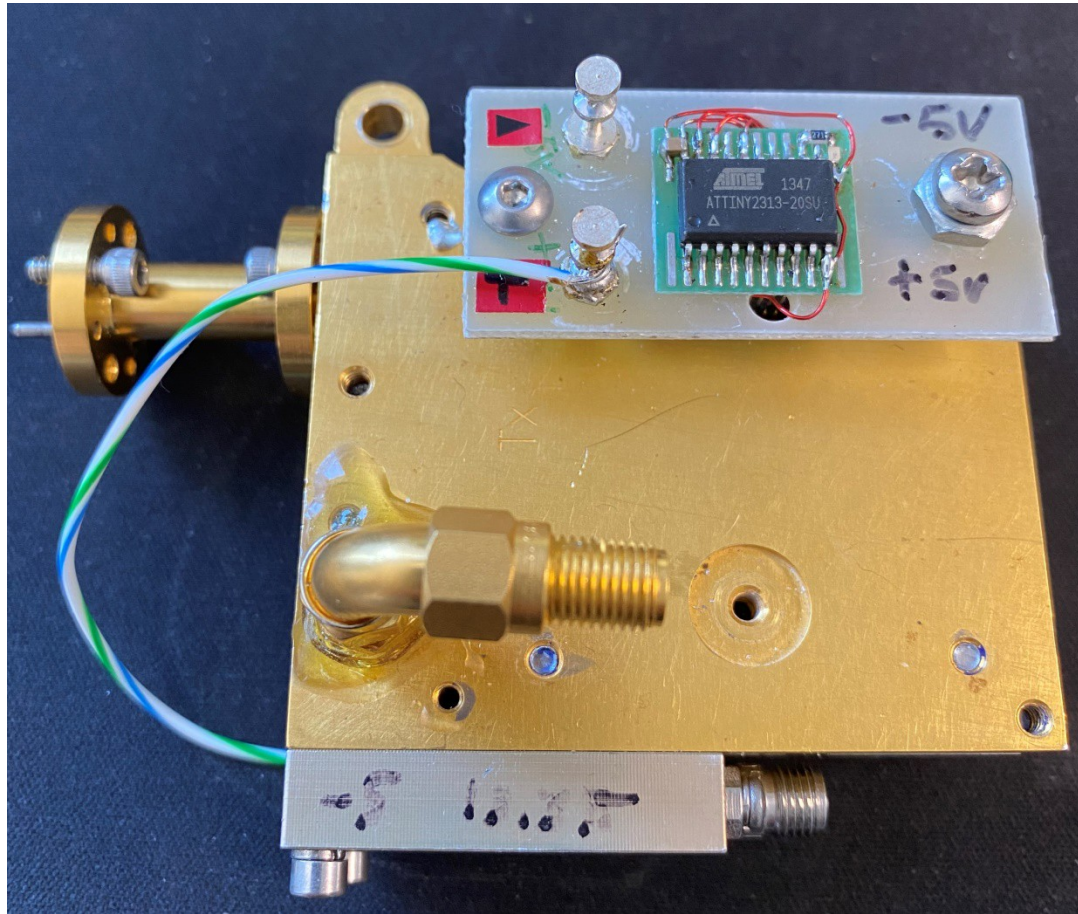


AD6IW Frequency Multiplier

24 & 47 GHz AMMP6120



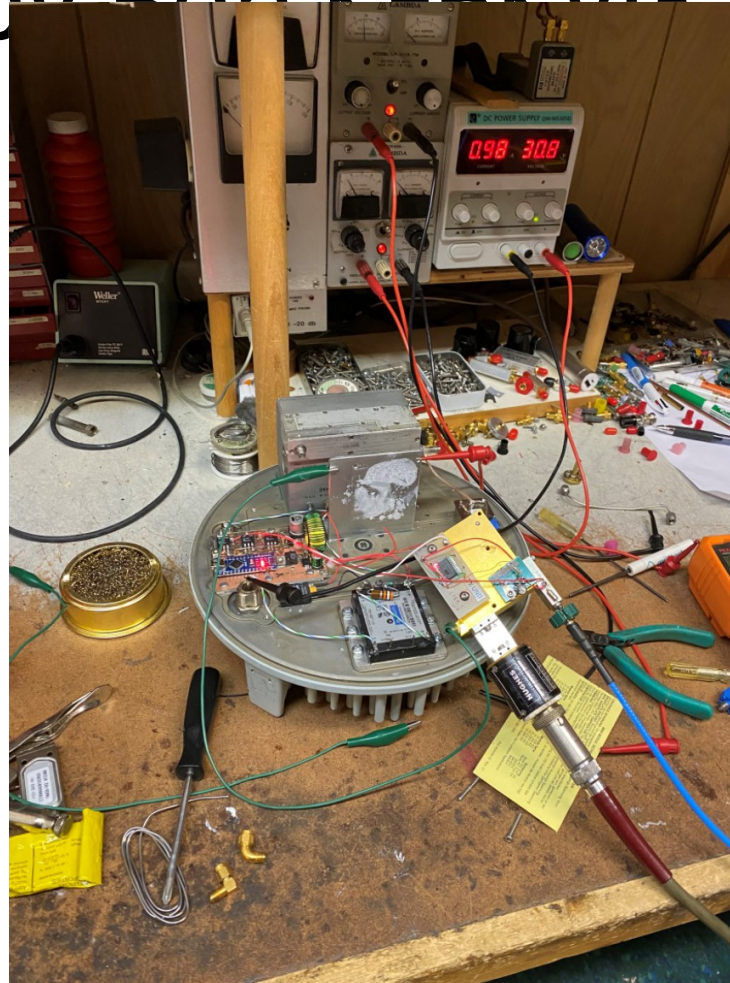
Giga Beam Up-Converter, Modified to work as multiplier



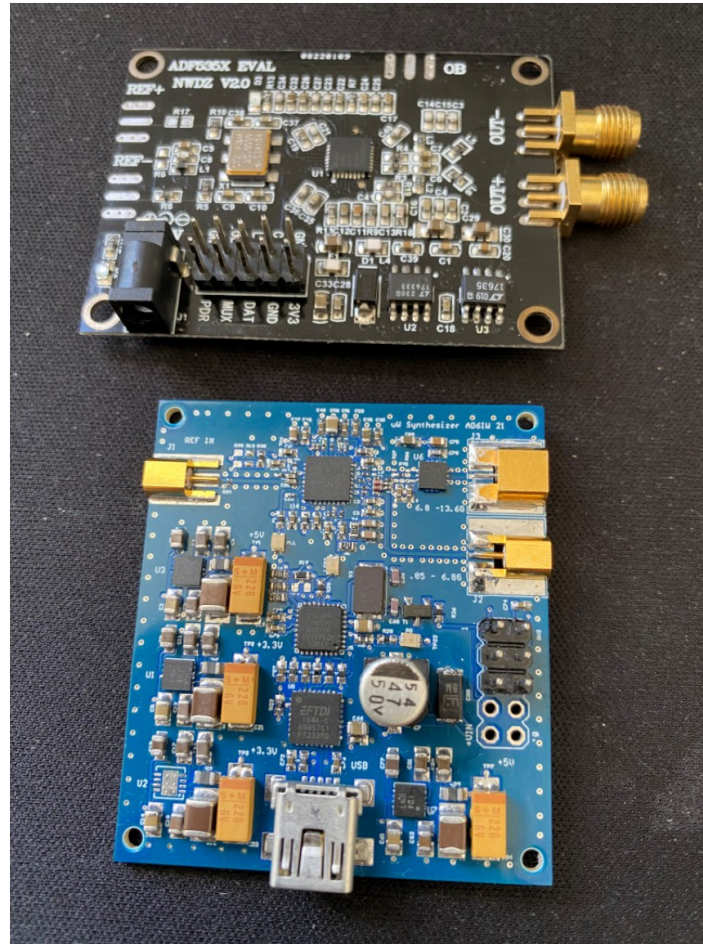
Working as 6 x Multiplier, $13,472 \times 6 = 80,832\text{MHz}$

Building and testing 80 GHz Beacon

by Bob KE6KVG



ADF5356 PLL vs. Chinese PCB



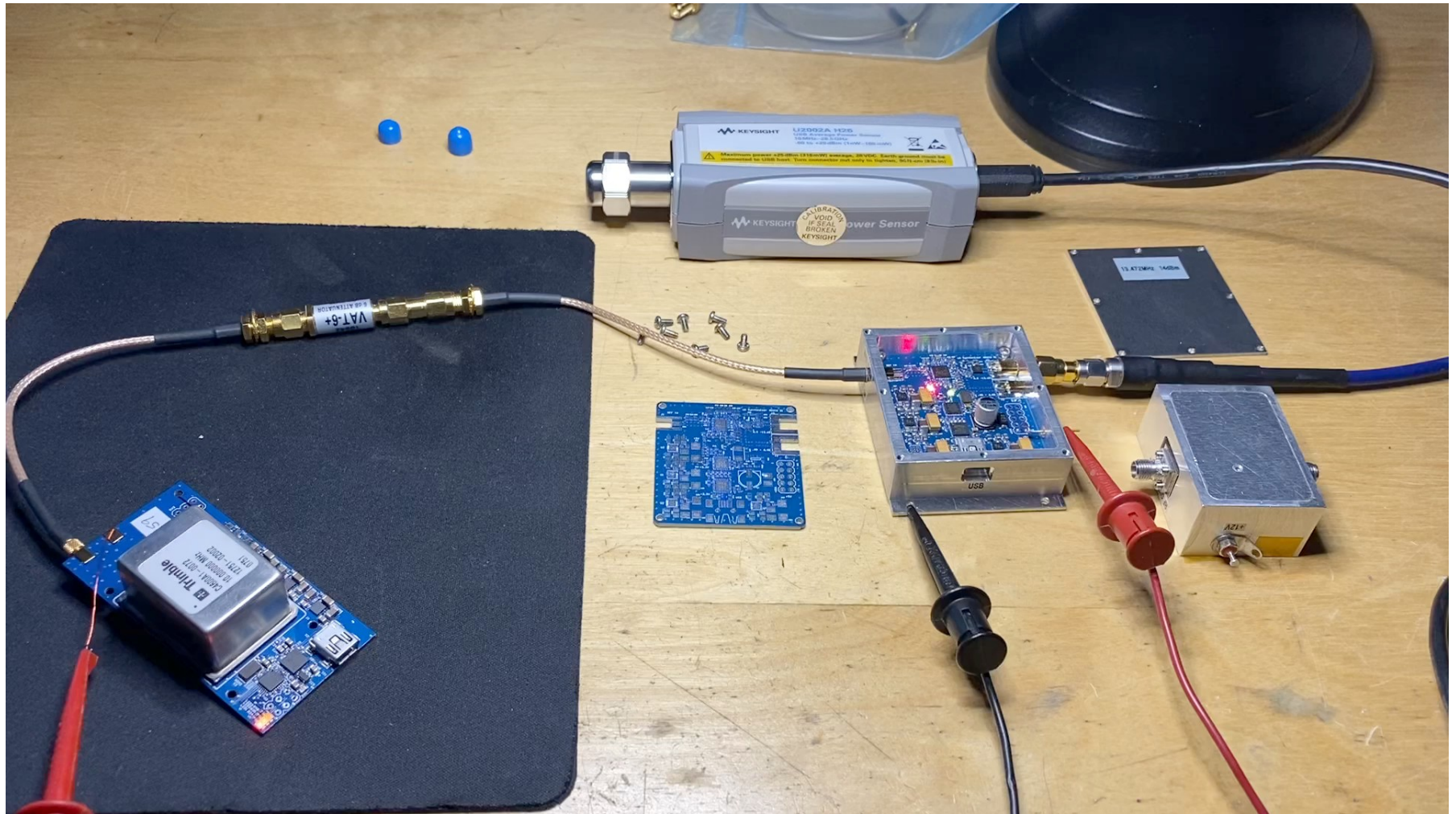
Chinese ADF5355 PLL

- I bought Chinese PLL board for testing purpose, only but it refuse to load firmware - broken 😞
- It is cheap board, but you will not get easily high performance synthesizer out of there
- Unfortunately, poor PN and spurs rich PLL synthesizer, made on 2 side FR-4 PCB Board ?!
- Take a look at Brian GM8BJF, web site for Chinese PLL board review, if you want to play

Bob KF6KVG Beacon Details

- Beacon Frequency 80.832 MHz, A1 Mod. CW
- Possible modes: FSK, PSK and FM modulation
- Call sign CW KF6KVG 20 WPM 2 Minute tone
- Location CM97BL Mt.Umunhum, Northern Cal
- Antenna wide angle Horn 7dB, Direction SV
- RF output Power 15 dBm

Beacon OTA test at 10368.1MHz



Many Thanks to:

- Bob Johnson KF6KVG – for building beacon, testing and great motivation
- Gary Lauterbach K6MG – for PCB \$upport
- 50MHz and up club members – for Beacon installation, and project managing

AD6IW July 2021