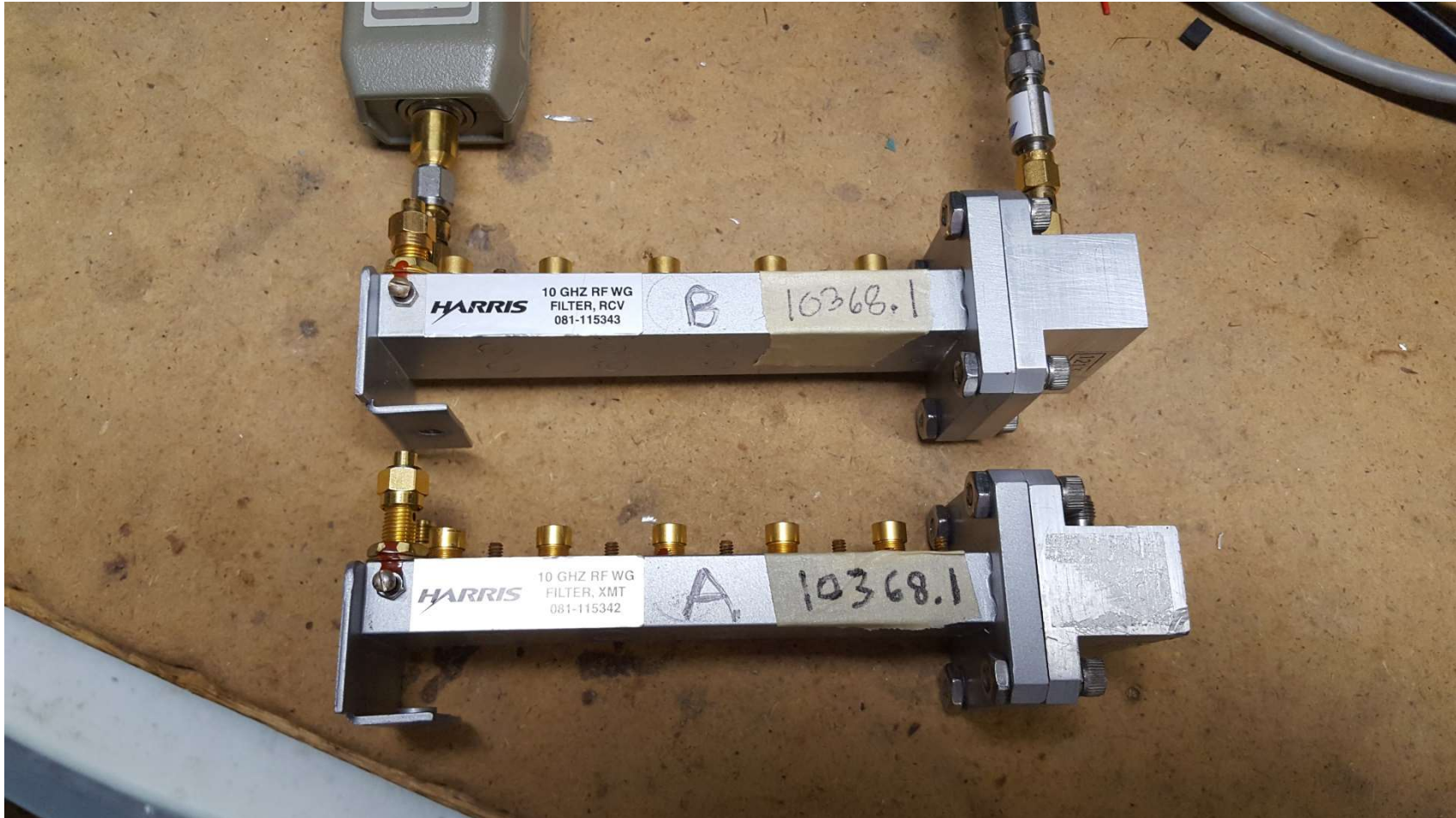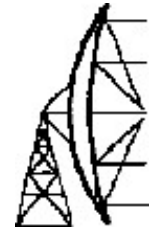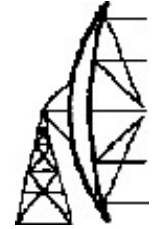# N5RIJ Harris 10 GHz Filters

Dave N5RIJ & Al W5LUA
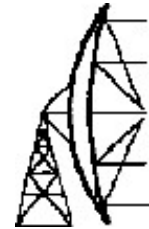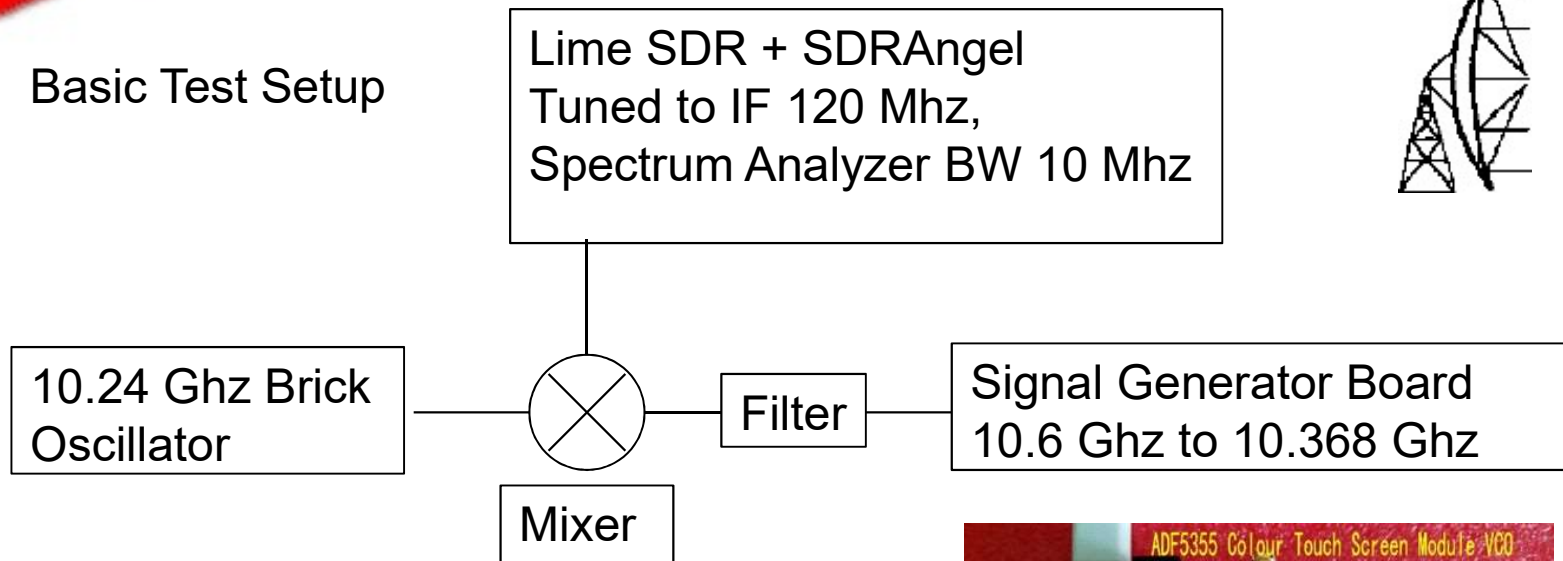## November 3, 2018

Harris 10 GHz Filters

Introduction

- ## Dave N5RIJ
- Eventual goal of surplus parts transverter - "Frankenverter"
  - Transverter Local Oscillator 10.224, IF 144 Mhz
    - Current LO is "brick" DRO Locked to Crystal
    - IF Rig – Lime SDR or Icom-706
  - Receive image rejection not critical 144 Mhz vs 20 GHz
    - Selectivity of IF rig should be ok
  - Transmit – 10.368 vs 10.080 (288 Mhz difference)
    - Don't want both these on the air!
- Need to re-tune filters for 10.368 Ghz
- Next slide shows my very basic test setup

Basic Test Setup

Lime SDR + SDRAngel
Tuned to IF 120 Mhz,
Spectrum Analyzer BW 10 Mhz

10.24 Ghz Brick
Oscillator

Filter

Signal Generator Board
10.6 Ghz to 10.368 Ghz

⊗

Mixer

- Changed frequency by 10-20 Mhz increments
- Re-tuned filter each step for max output
- Not sure about many things with my set up
- **Key issue is I was monitoring frequency but not other parameters: loss, ripple, bandwidth**
- The bandwidth of the SDR as used was not wide enough to easily see the overall filter shape.
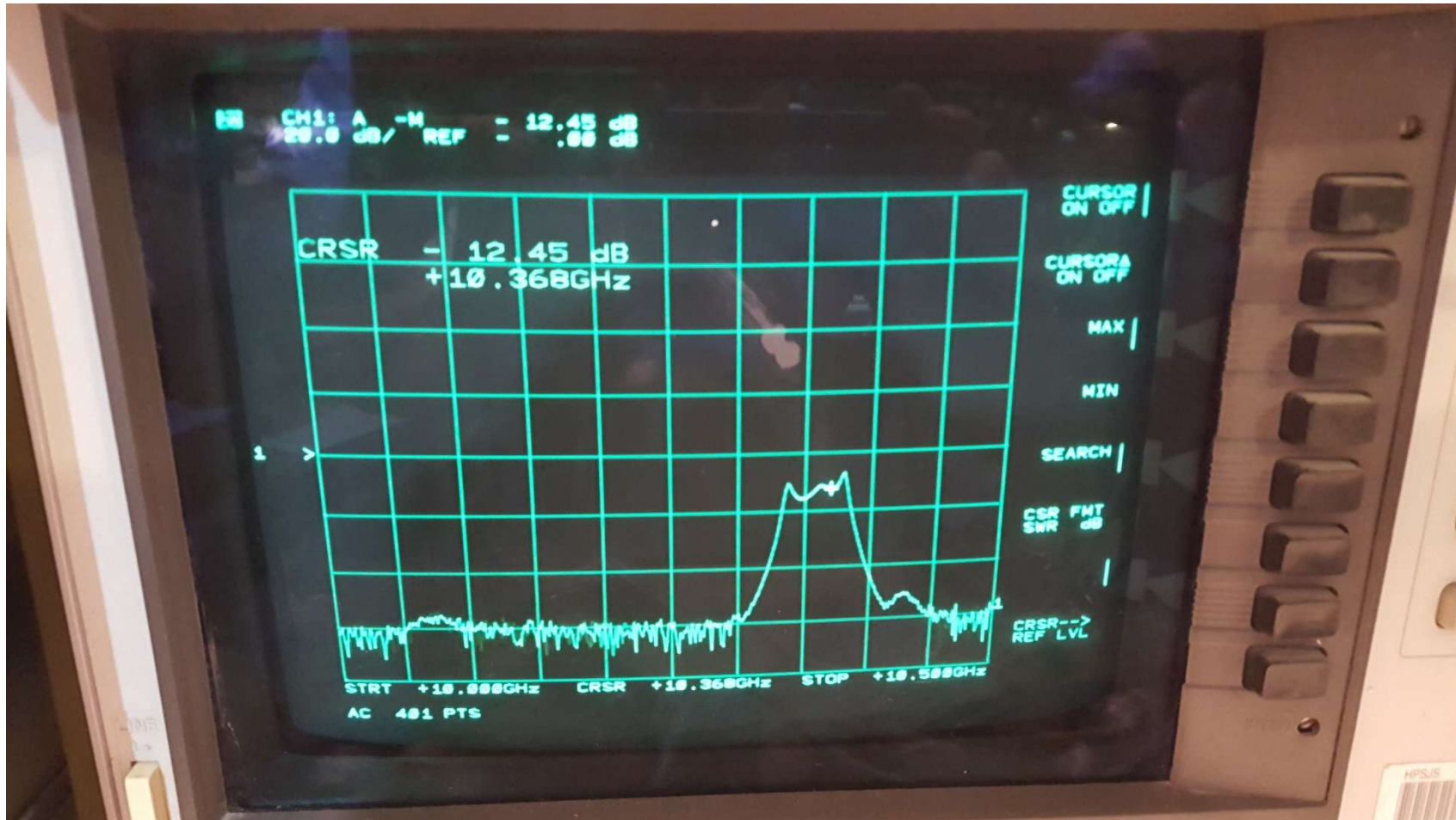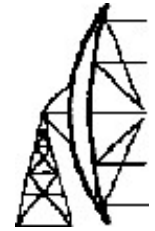- I made my best attempt and turned it over to AI…
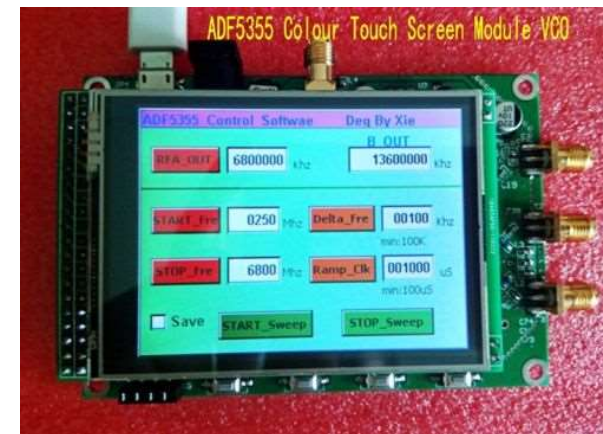
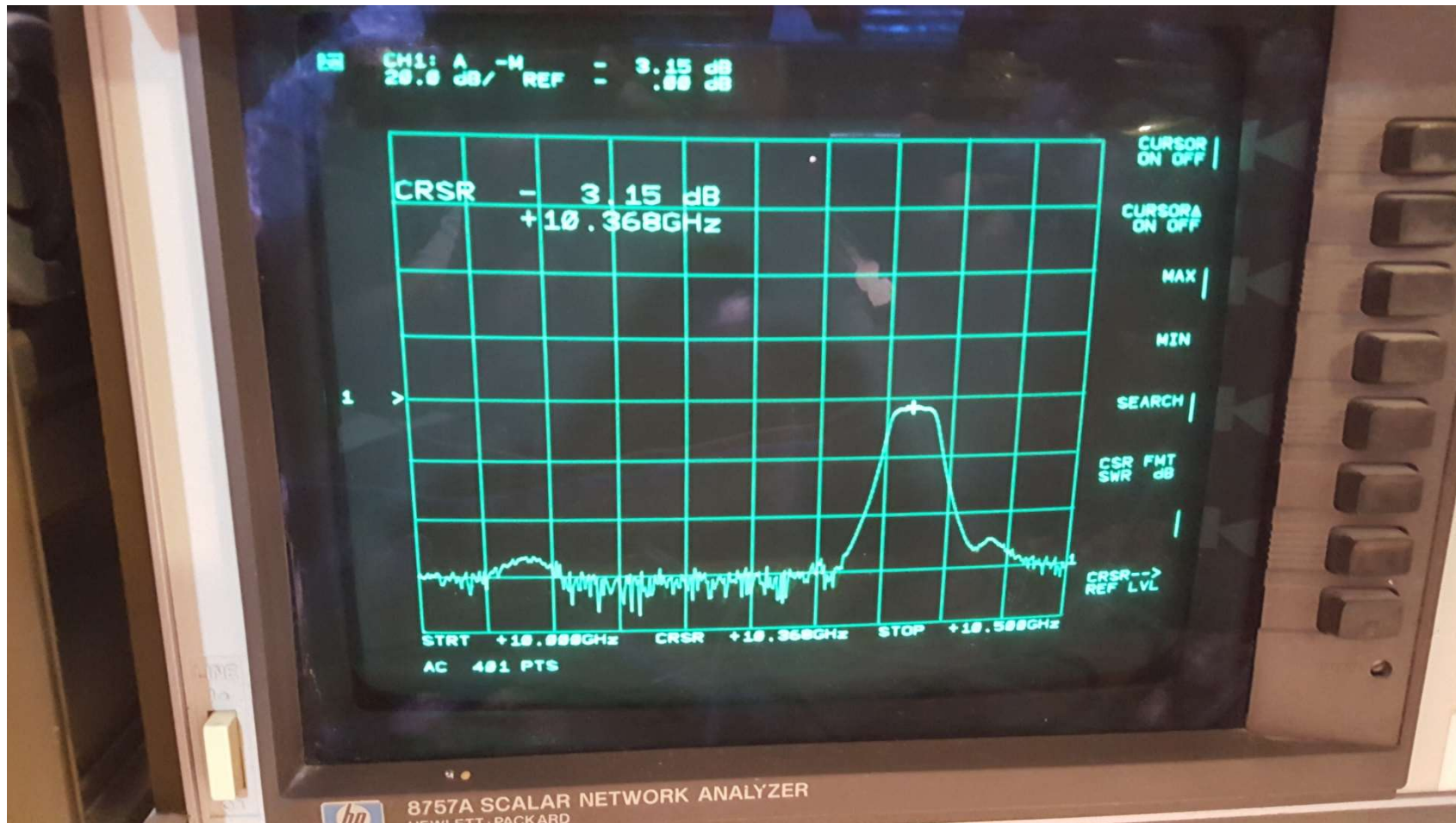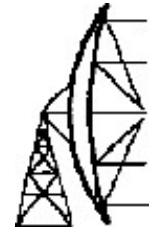# Filter A Before – note horizontal scale
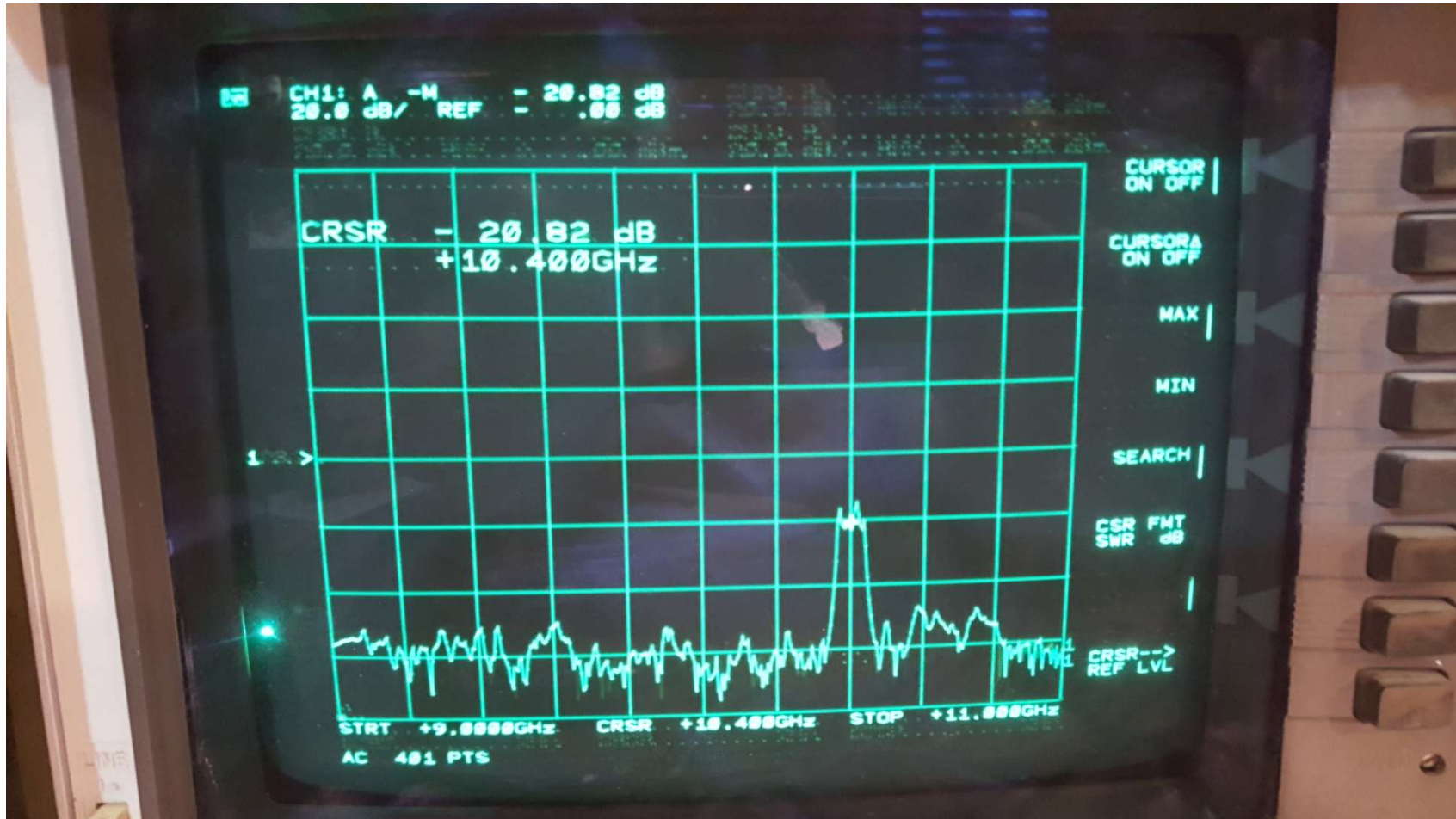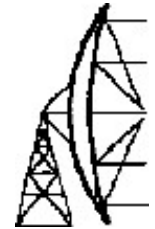
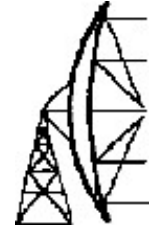# Filter A After Retuning
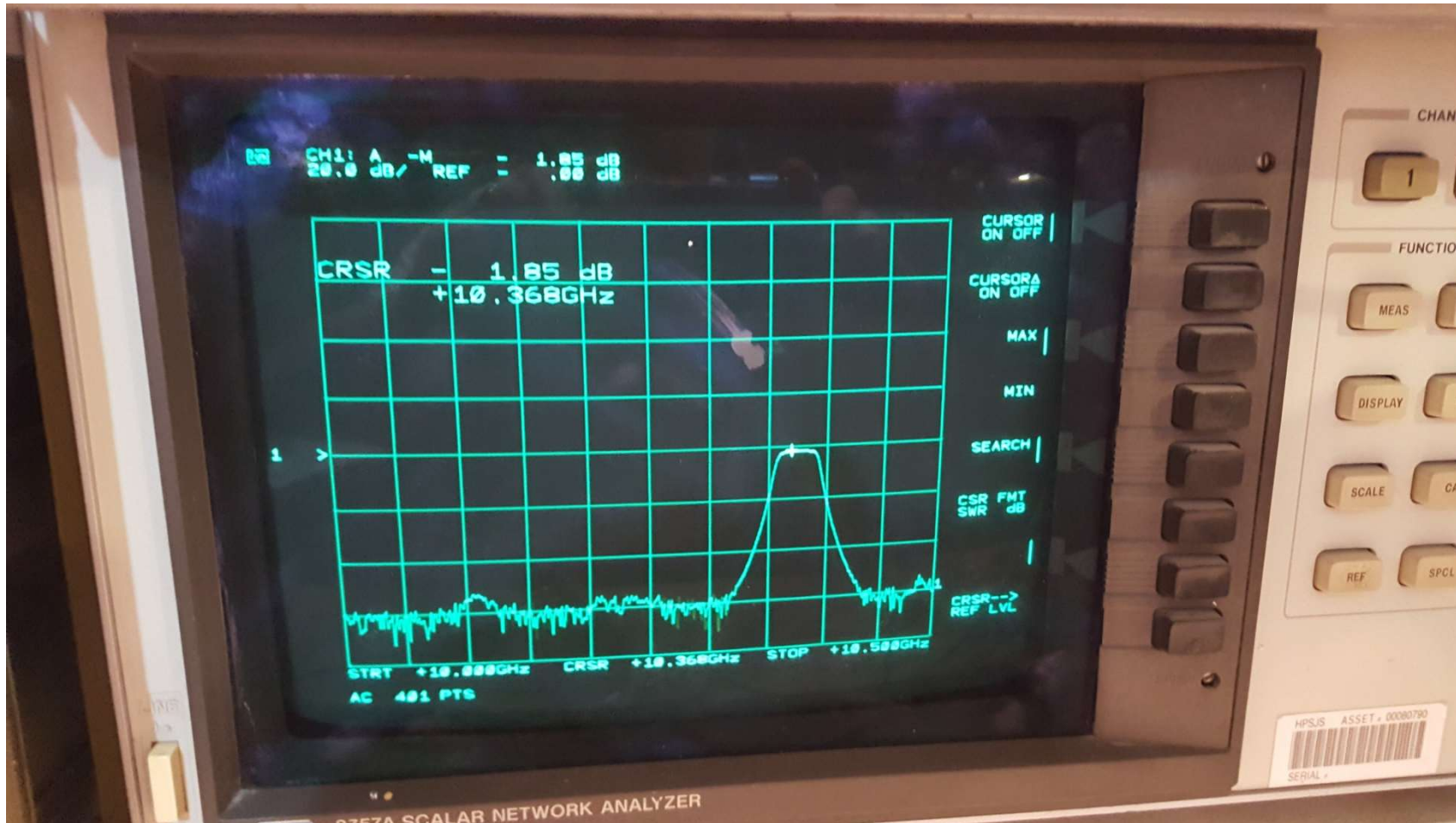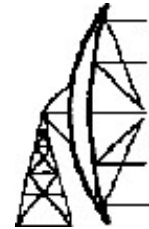
Filter B Before

Filter B After Retuning

Conclusions

- Re-tuning worked but required better test rig and technique – overall success!
  - Filter plus WR-90 to SMA transition ~ $50 ebay
  - Compare with similar new commercial filters ~$500 Pasternack
- Tuning these filters is a multi-dimensional optimization problem. 5 knobs to turn.
- **Need to observe frequency, loss, bandwidth, ripple all at the same time**
- There is a general problem with unknowns testing unknowns
  - Unit testing each component is easier than trying to debug a system
  - Plan to eventually get used test gear from good makers, HP, etc over time
- SDR has potential as a test instrument that was untapped here – full duplex
  - Quote from Lime SDR online help page
  - "This thing has more nerd knobs than I have remaining brain cells"
  - Myriad RF concentrates on hardware solution. Software is less mature.
- Lots still to learn from NTMS and ham communities
- Thanks to Al W5LUA, I'm now a big step closer to 10 Ghz