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Steps Towards The Moon: Rotator, Yagi, Phase Locking, Trailer

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Recap

- The overall plan is to make something like this Verizon trailer as a portable ham shack with an 23 cm EME capability
- Expect other bands/modes can be included as a bonus by sharing electrical power, radios, etc

Progress

- Rotator K3NG System
  - Added LCD display
- Yagi
  - Two 23 cm yagis designed using VK5DJ calculator
  - While not strictly part of the trailer plan these were built to gain experience working at 23 cm and get a feel for mechanical tolerances
- Phase Locking
  - Installed Leo Bodnar kit in Icom-9700
- Trailer
  - Cut wood for floor and framing

Rotator K3NG

- No progress on mechanical this period
- With minor software fix got LCD working
- Need to hook in additional sensors to run full software loop
- Very impressed with K3NG software

Two 23 cm Yagis

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- Several goals
  - 23 cm six foot boom yagi for terrestrial use
  - Help test eventual 23cm LNA
  - Practice with 23 cm antenna tolerances
- Building pairs of things allows some lessons learned on the first one to transfer to the second
- Pairs of yagis are good if you need circular polarization
- Wood boom and copper wire not the best materials
  - One piece of wood may be too warped. Aluminum boom should be better.
  - Wire a bit curved coming off roll. Aluminum tubing should be better.
- Bent driven element loop for desired impedance
  - Started with thin wire #14 gauge to more easily find length and approximate shape
- Then used #6 gauge wire that will hold shapeImmersing driven element connection in epoxy raised impedance 10 ohms
  - Expect this was due to added dielectric capacitance
  - Required rapid retune while “five minute” epoxy set
- Second antenna was pre-tuned a few ohms low and a smaller amount of epoxy was used which raised it right to 50 ohms
  - Watching handheld VNA measuring antenna while adding epoxy
- Thought a balun would be required for folded dipole feed, however coax line showed minimal SWR change, 0.03, when touched so left it out
- Conclusion – impedance matching was touchy but workable – tolerance around 1 mm

23 cm Yagi

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Phase Locking

- Planning for operations at 23cm or higher
  - Should be complete solution for frequency stability
- Leo Bodnar kit
  - Small box with GPS receiver and PLL
  - Programmable with his software for arbitrary frequencies
    - Can reuse on different projects
  - Installation went ok
- Downside is kit does not output time or location
- Need to check stability

Leo Bodnar Kit Install

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- Goal is to put in coupler
- Re-route reference connector to go to coupler board rather than main PCB
- Note SMA on coupler is finger tight
- SMA on chassis is about 1 inch-pound with light touch on the wrench
- I didn’t feel good about torquing the SMAs all the way.

Kit Install

- Static precautions – put antistatic bag on table, grounded case to earth ground and used static strap.
- The kit provides a small PCB board that looks like an LC circuit that inductively couples the 49.152 MHz PLL signal to the Icom-9700 local oscillator
- PCB mounts using existing holes in chassis
- Open up radio from bottom side
- Longer mounting screws are provided, however on my unit these didn't seem to engage enough threads. Used two longer screws from my junk box.
- Dropped screw into radio. Shook it around for 15 minutes but finally had to open up top of radio to retrieve it.
- Whole process took about two hours

Trailer

- The multiple plywood pieces are used because one goal was to use up leftover materials from other projects
  - Makes it easier to apply undercoating
- The framing is going to be made up from plywood strips to provide better accuracy than DIY center framing lumber
  - Had some plywood warping after cutting into strips
  - Plan to make box beams from plywood strips
- Made a workbench from other leftovers

Trailer Floor and Framing Cut

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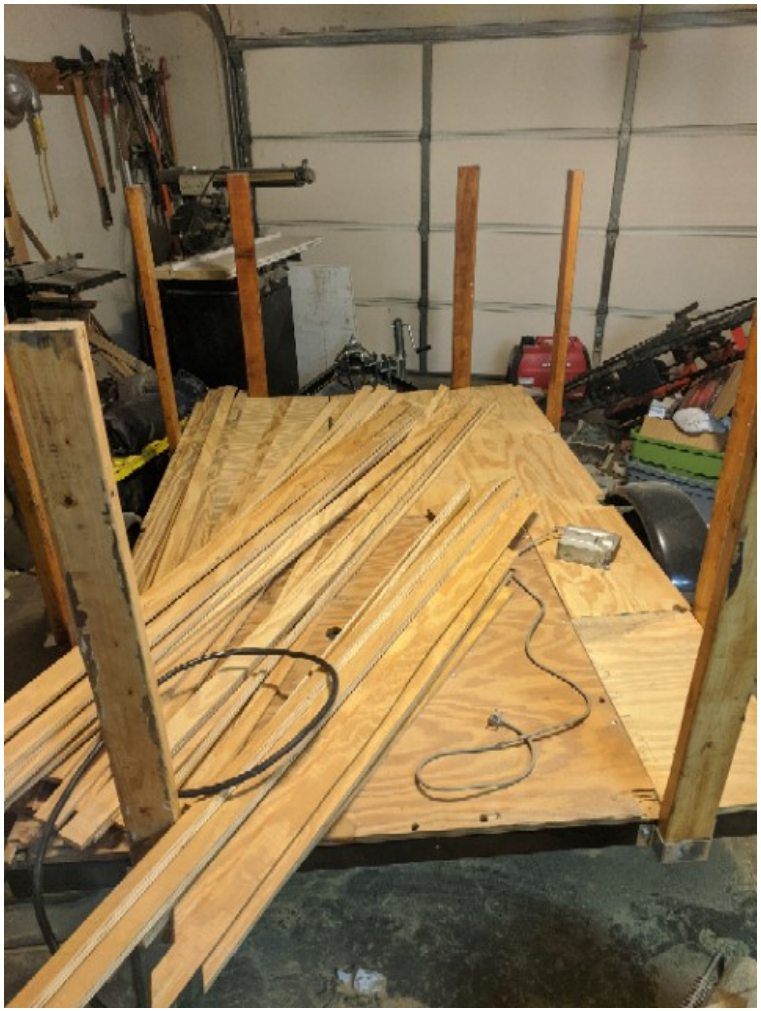

Leftover Workbench Building Yagi

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Next Steps

- Continue adding electronics to rotator
  - Get electronics/software working on the bench
  - Get main tracking loop to cycle
  - Rotator mechanical is on hold for now as trailer glue operations seem to be the critical path
- Assess phase locking stability
  - PLL can be turned on/off to perform A/B comparison
- Trailer has many epoxy glue steps
  - Need to have parts curing continuously
  - Glue parts directly on trailer to ensure fit and use large work area for parallel operations