Building a Competitive Station for HF Contests and DXing

VE3VN
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FN24br

The beginning...VE4OY '72 to '79

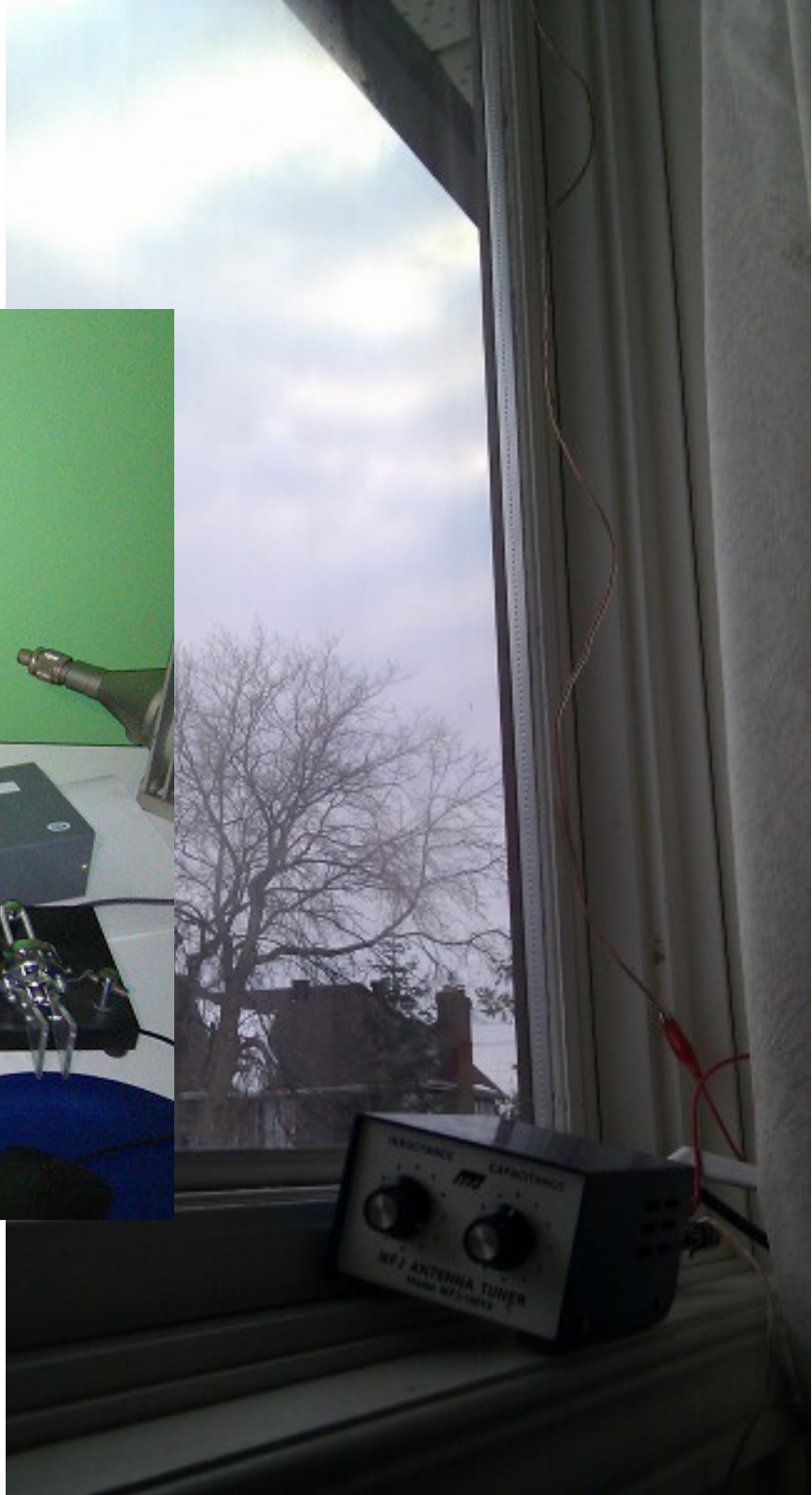
Ottawa -- 1979 to 1984

- Apartment dweller: no home station
- Active in multi-op contests and helping other build their antenna farms
  - Ottawa area: VE3PCA, VE3OCU, and many others
  - VE2, 3, 4 and 5

VE3VN – '84 to '92

1992 to 2012

2013 – VE3VN returns



Getting bigger -- '13 to '16

Thinking bigger yet

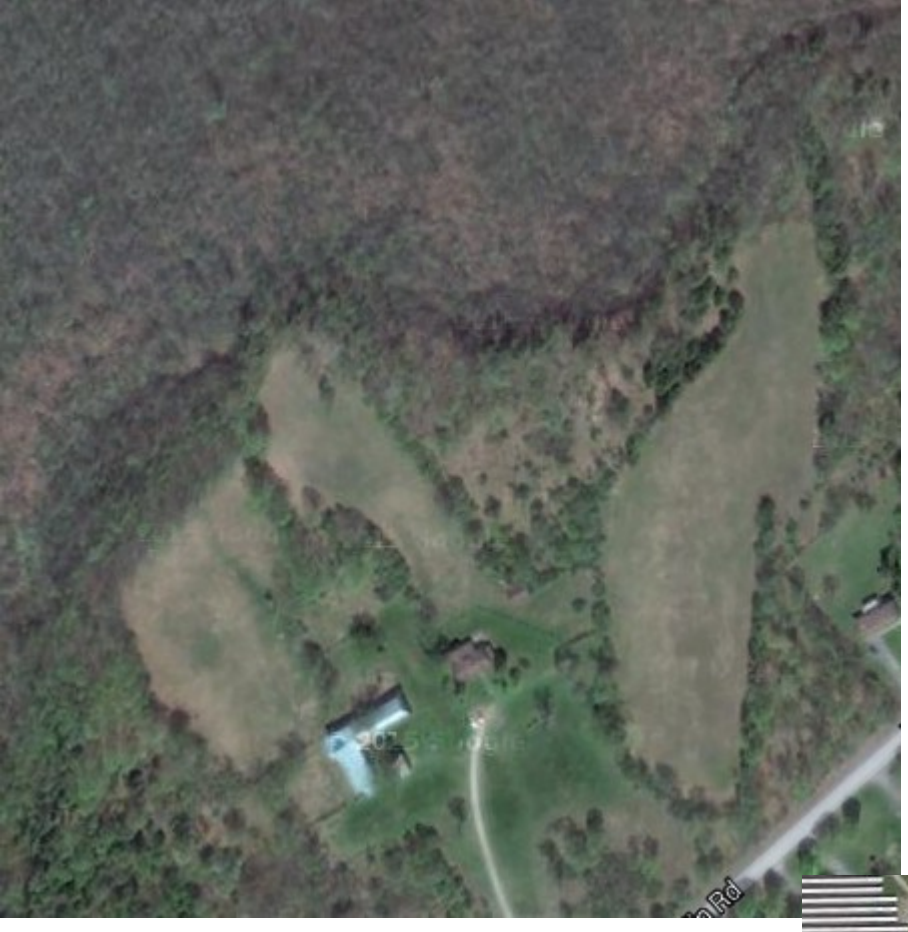
Time to Move

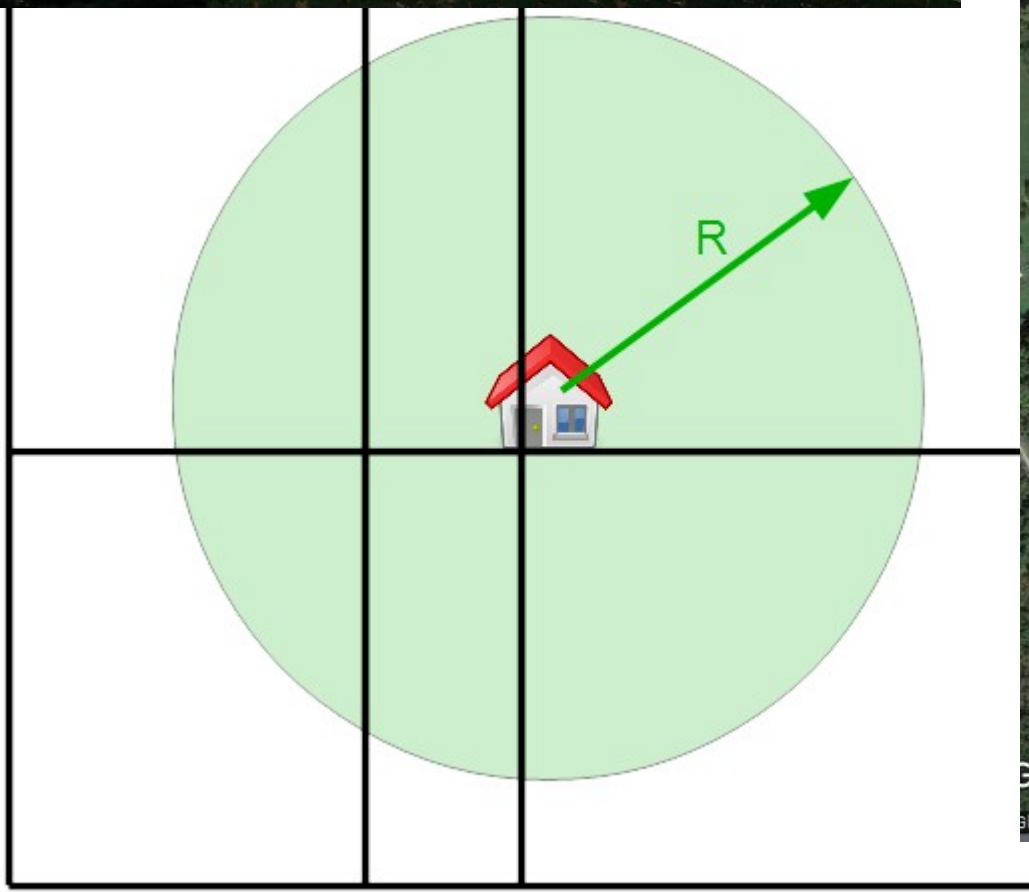
- Retirement presented an opportunity
- Freedom to do what I want
- Lots of room for towers and antennas
- Escape from noise
- Experiment with antennas
- Maybe win a contest or two
- What am I waiting for?

Finding the perfect QTH

- Options for dealing with an imperfect world
  - Choose the house and adapt to the property
  - Choose the land and fix up the house
  - Choose the land and build a house
- Realtors aren't very helpful

Things To Beware




R


Home Sweet Home
Sign in
McManus Rd
McManus Rd
McManus Rd
Mills Rd
Google
Globe, USDA Farm Service Agency, Map data ©2016 Google
3D Earth view is not available
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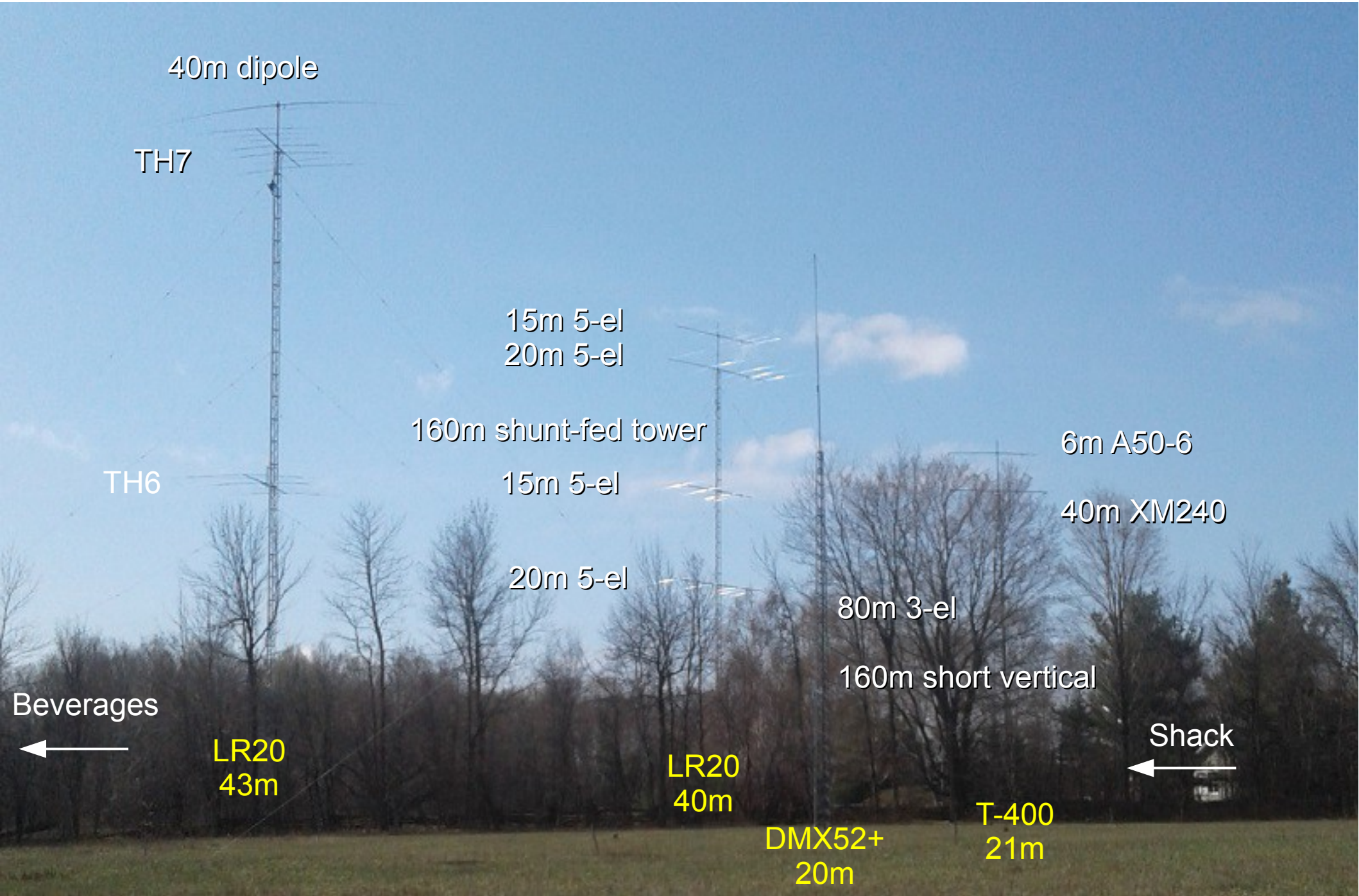
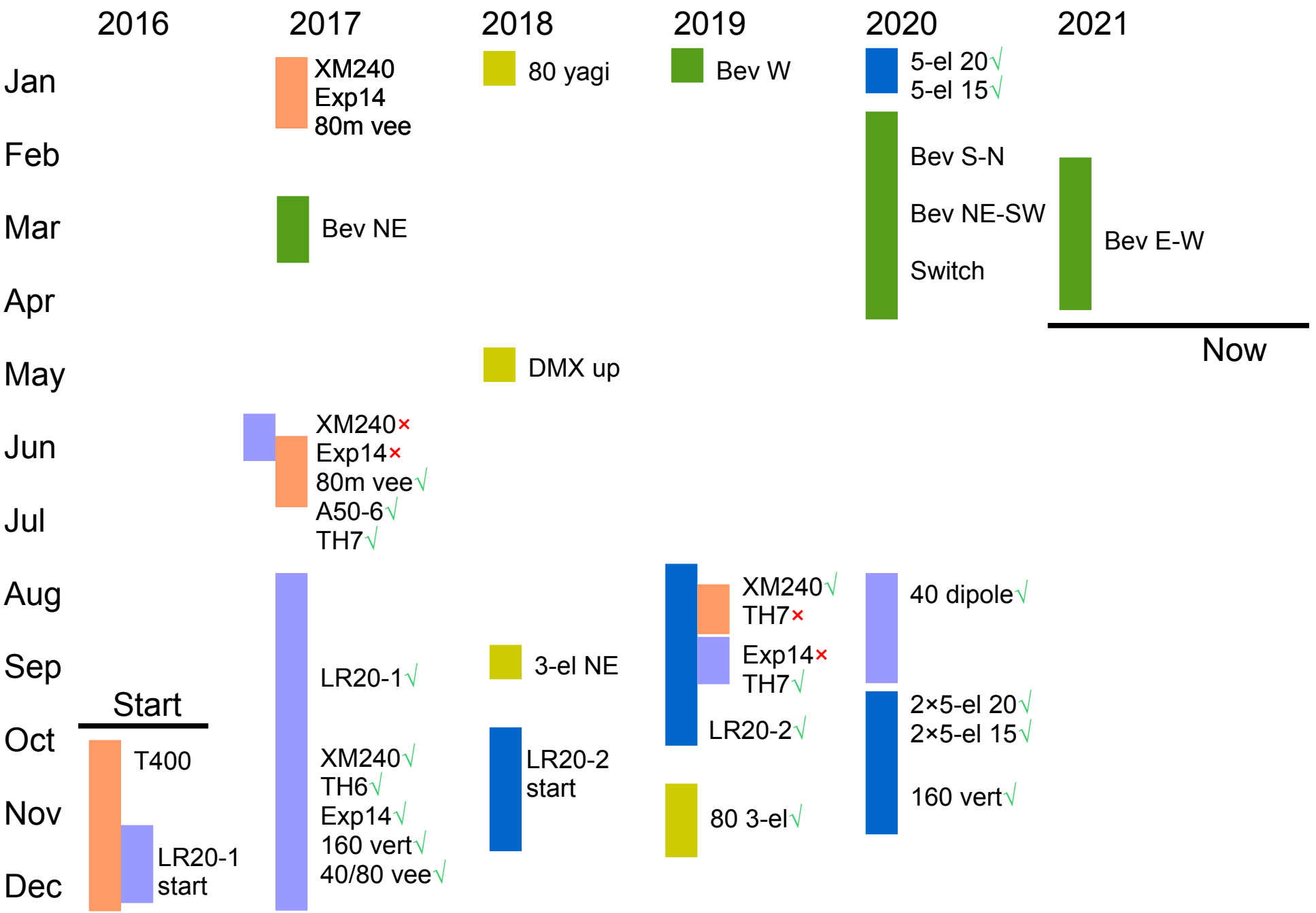
100 m

4-½ Years Into the Adventure



Retirement is a Full Time Job



Site Plan


McManus Rd
McManus Rd
McManus Rd
Google
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3D Earth view is not available
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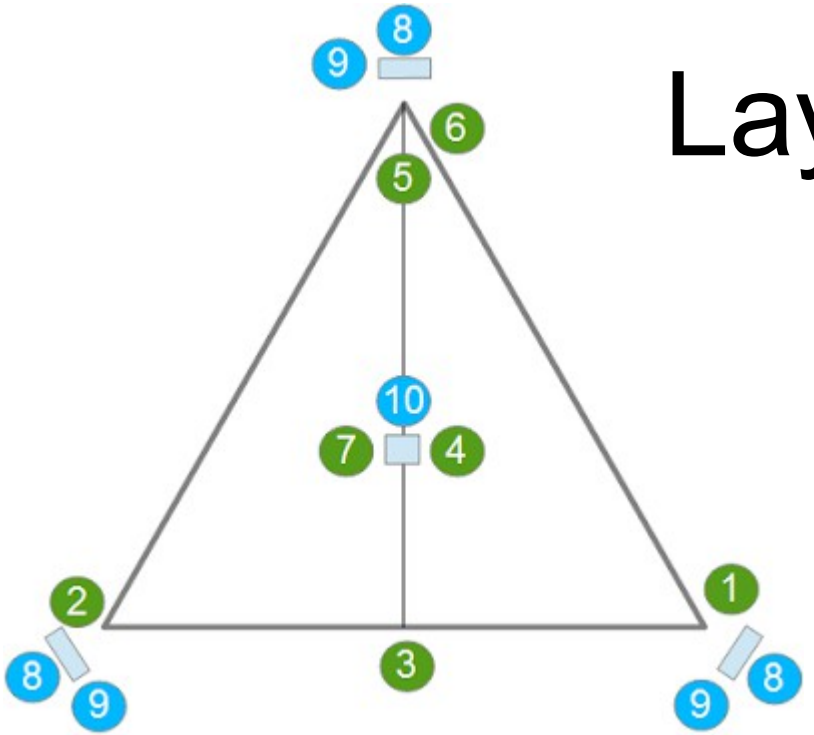
T400: Getting Started



Layout of a Guyed Tower

- 1 acre: 200'+ baselines
- Fall zones
- Face orientation
  - Climbing & antennas

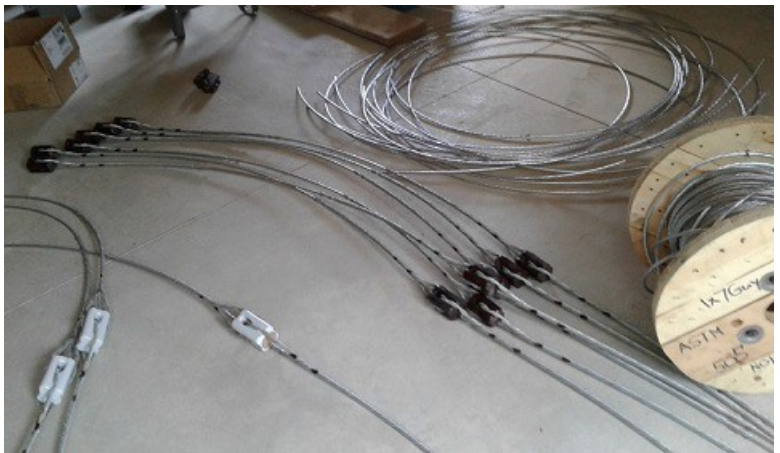
Planting a 150' Tower
Attempt #1

Disaster Strikes

Winter is Not an Excuse

150' Tower: Planted June 2017

Preparing The Tower

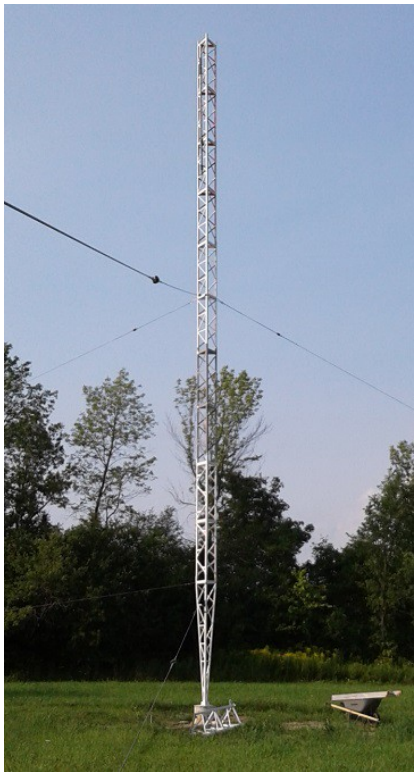


Steel Work

Heavy Lifting

- Rigging
- Power
- Equipment
- Experience

Raising a 150' Tower



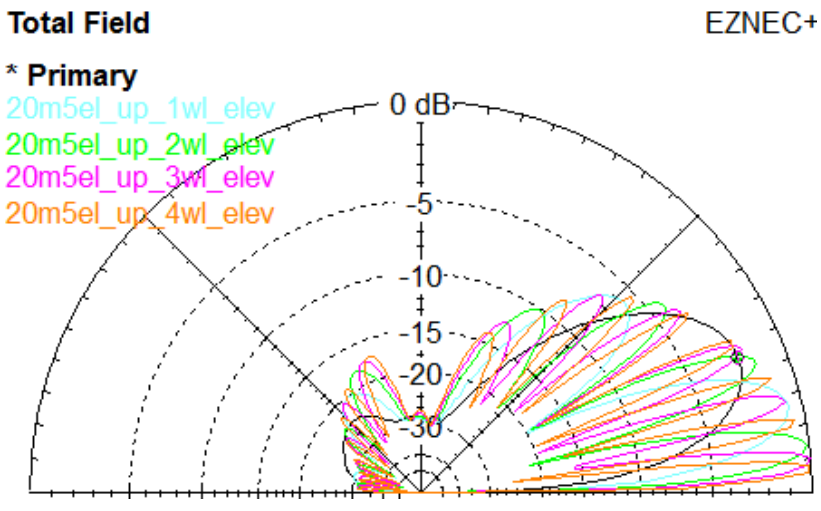
Mast and Rotator

Pricing a Big Tower

It All Adds Up

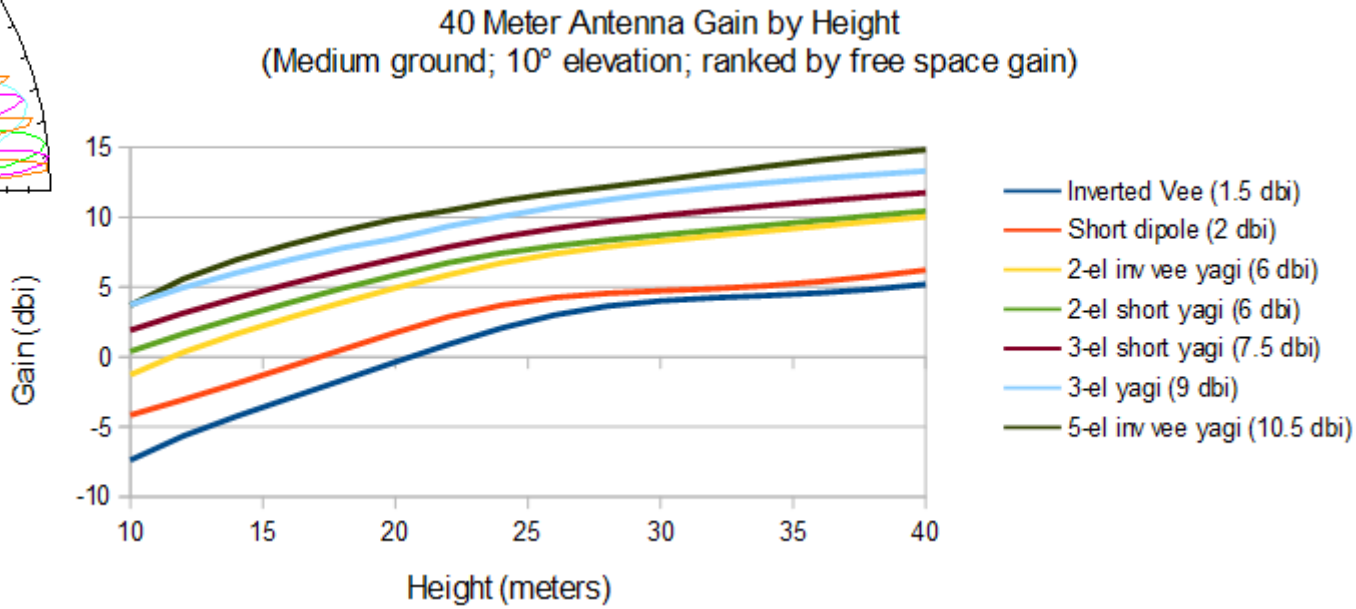
- Labour
- Equipment rental
- Material
- Fabrication

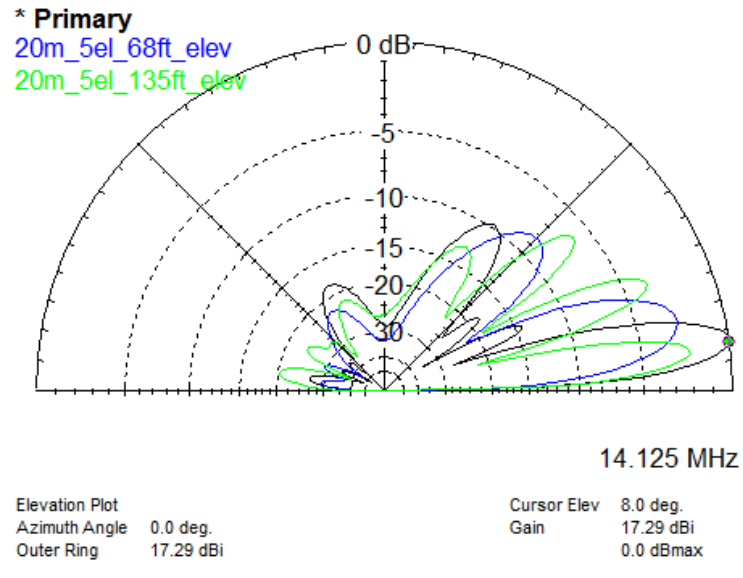
How High is 150'?

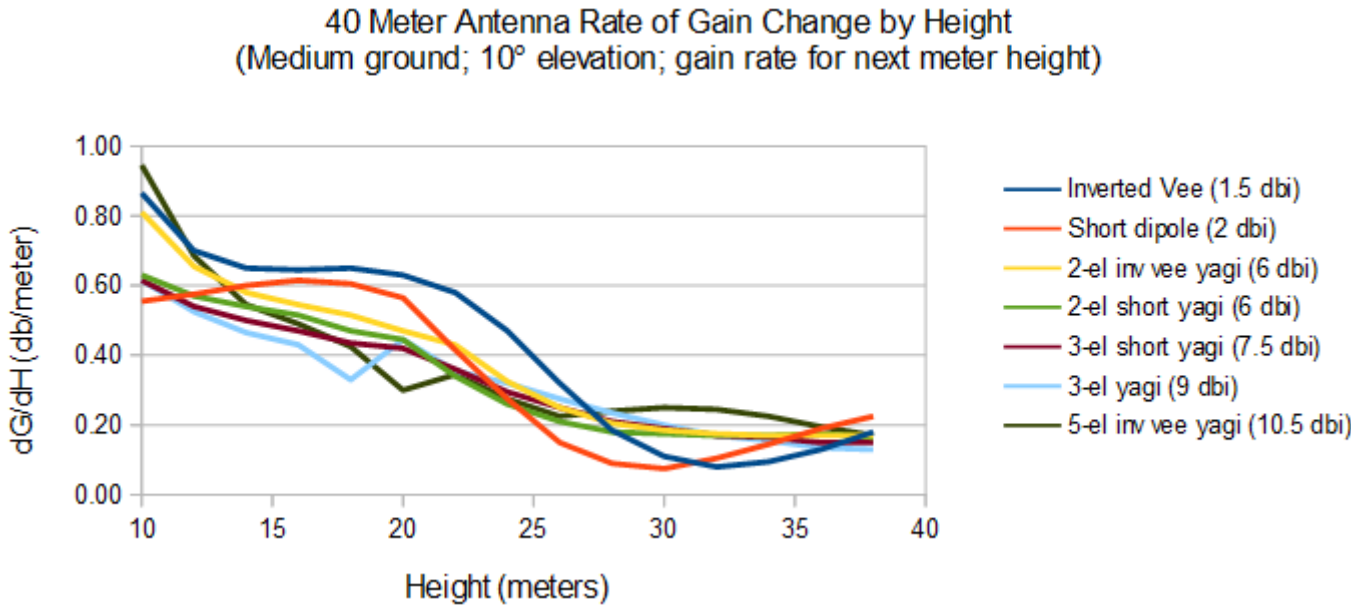


Why Go High?

- Stacking room
- Low elevation angles
- Low band wires
- Diminishing returns



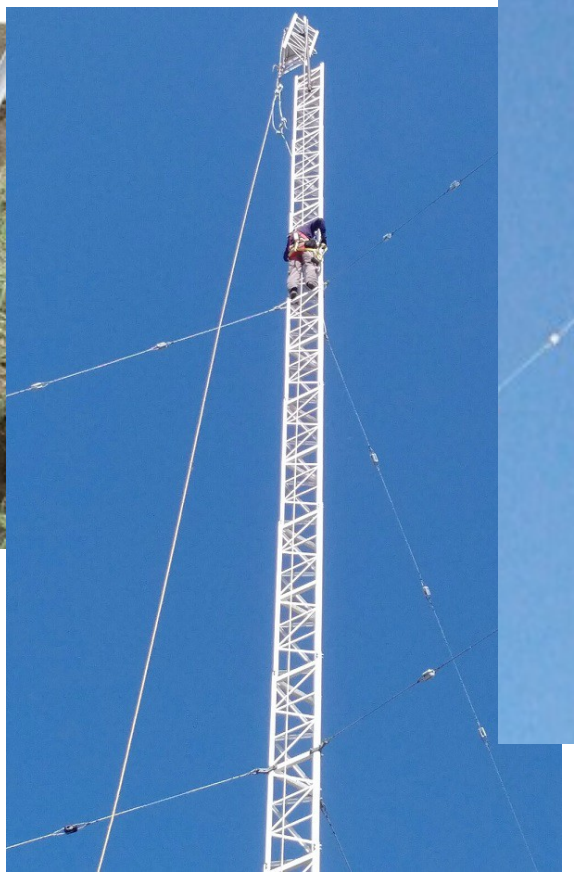




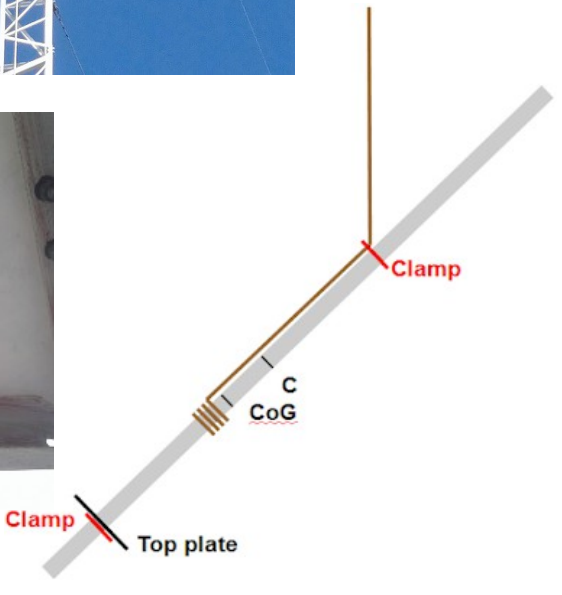
Alternatives to Big Towers

- 1 to 3 db: Mono band vs. loaded/tri-band yagi
- 1 to 4 db: Longer boom
- 2 to 4 db: Stack two yagis
- 3 to 6 db: Stack three yagis
- 0 to 3 db: Big, fat coax
- 2 to 6 db: More and longer radials (verticals)
- 10 db: Buy an amplifier!
- All of the above
- All of the above plus a big tower

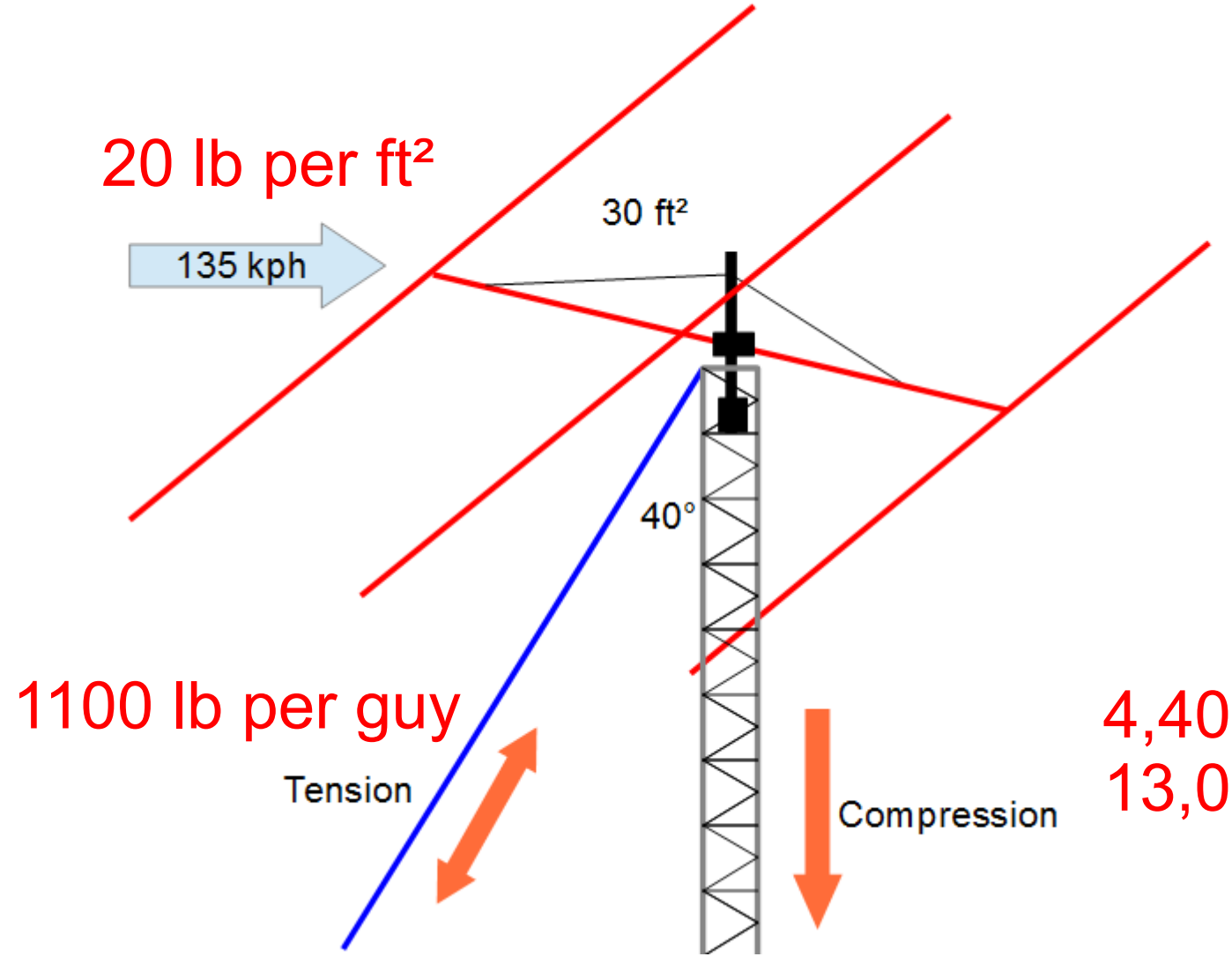
That Was Fun! Let's Do It Again

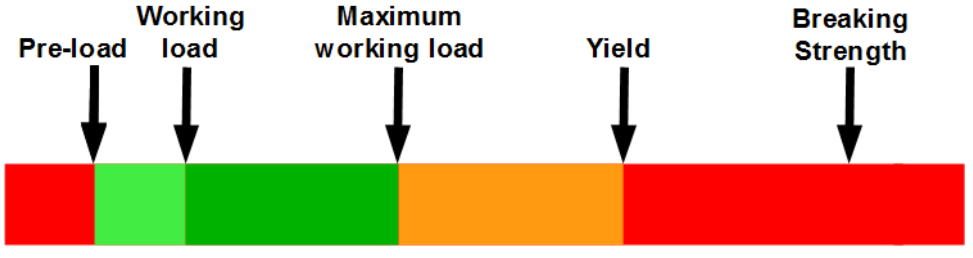


Planted Sept 2018
Completed Sept 2019

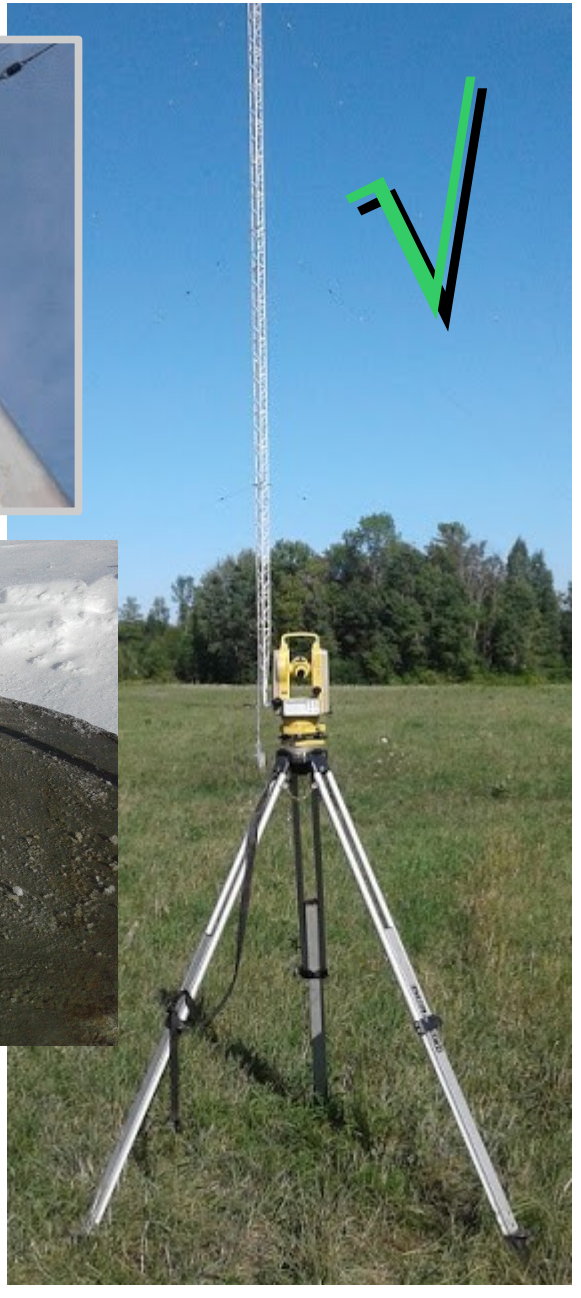


Forces On a Guyed Tower





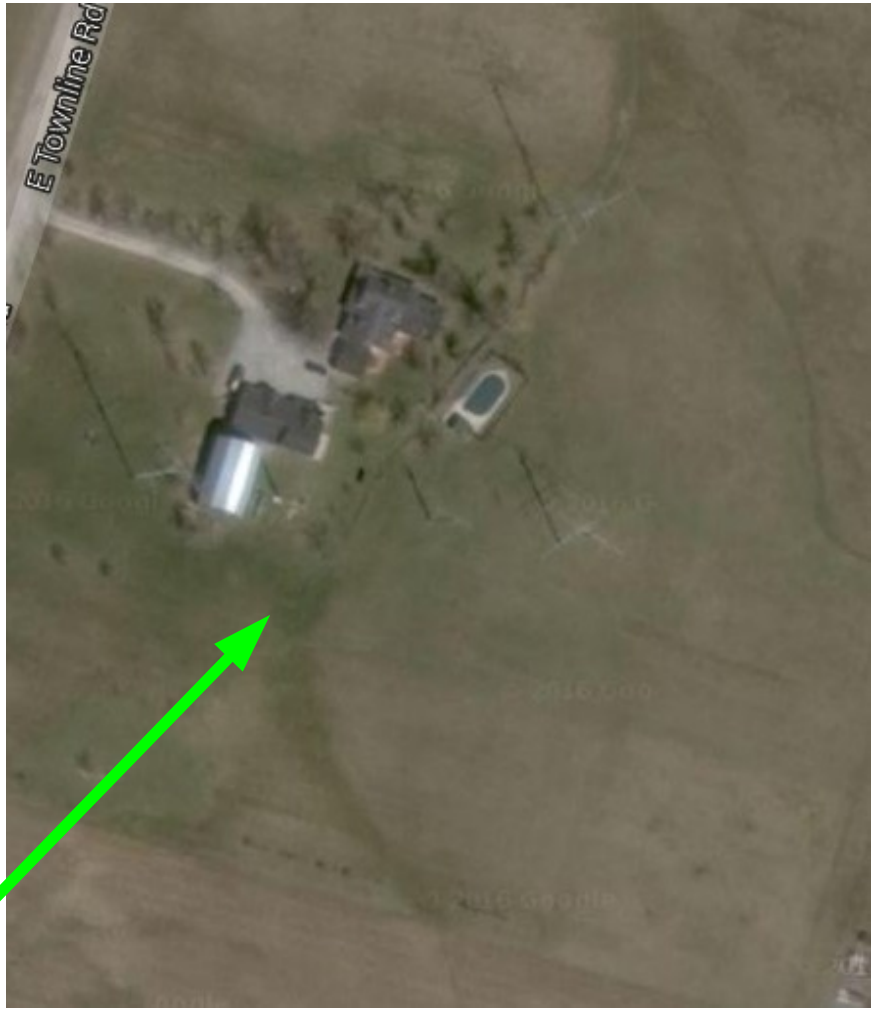
Vertical & Straight → Survival



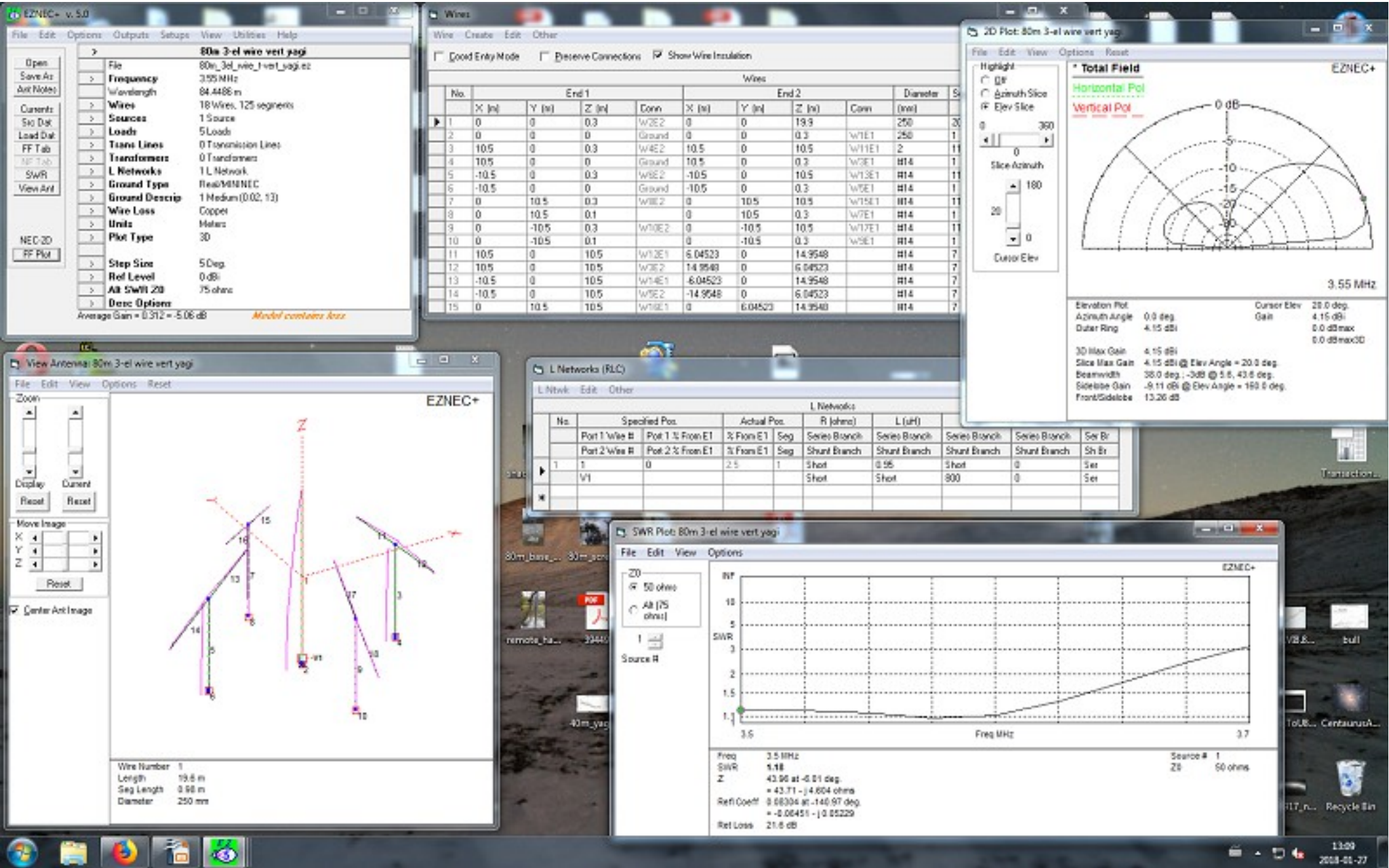
Don't let this happen to you!

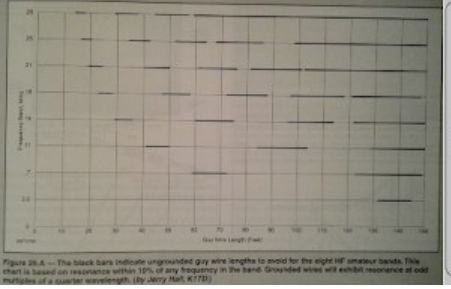
Antenna Objectives

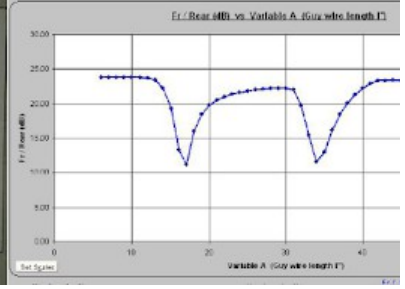
- My interests and motivation
  - Contests: single and multi-op
  - Everyday DXing
  - Design, build and learn
- Gain, diversity, low SWR, directivity
- What goes into it
  - Software design
  - Learn from the very best
  - Scrounge what you need; it gets expensive!



Computer Modelling

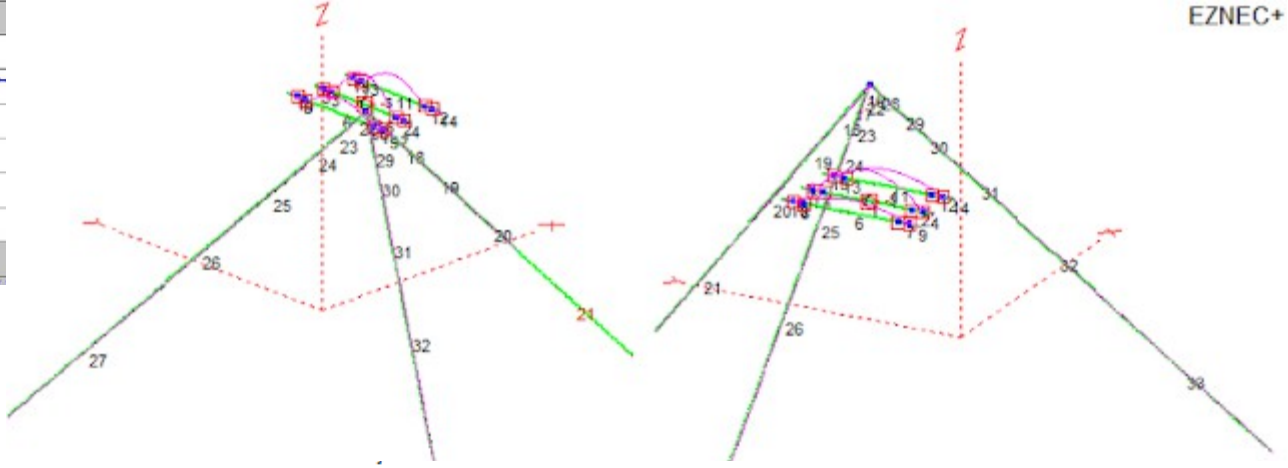


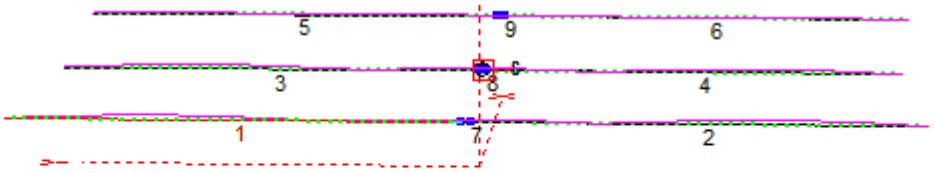


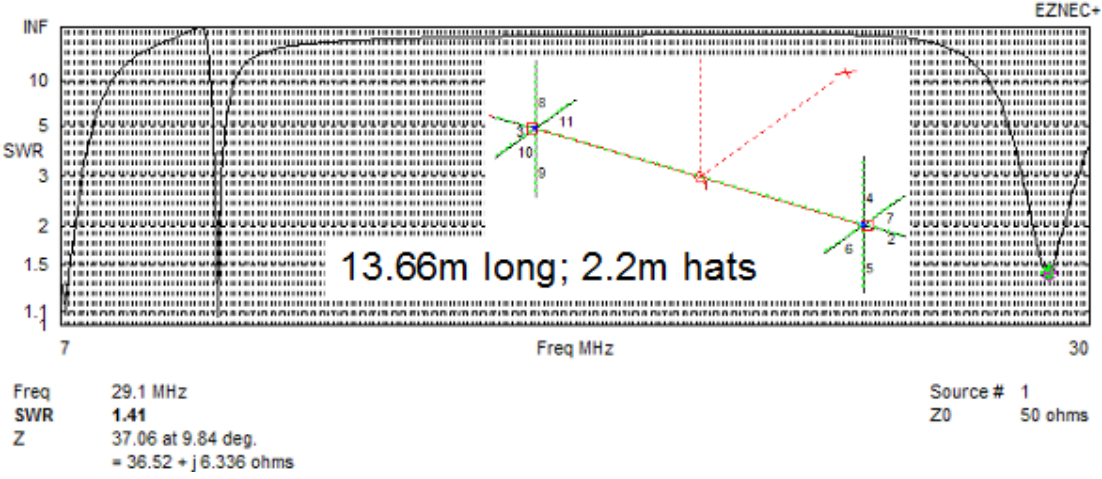


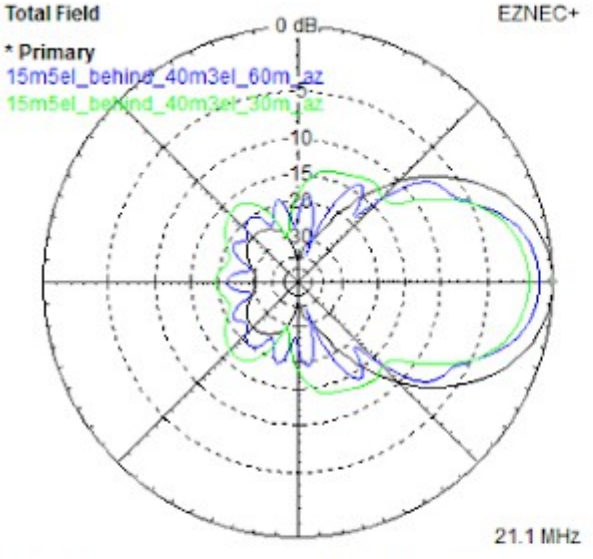
Interactions

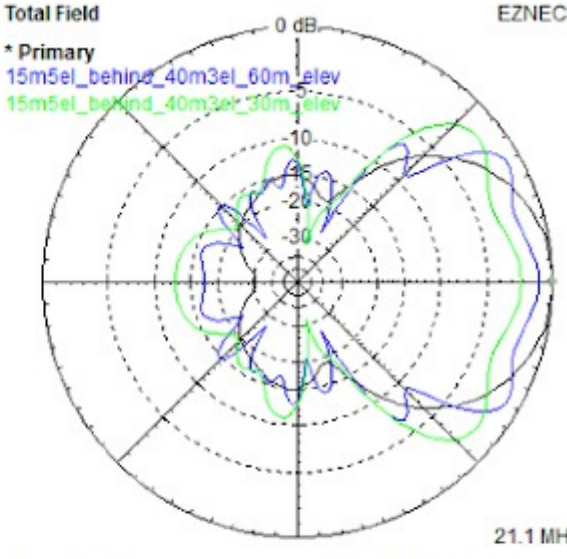
Ignorance ≠ Bliss

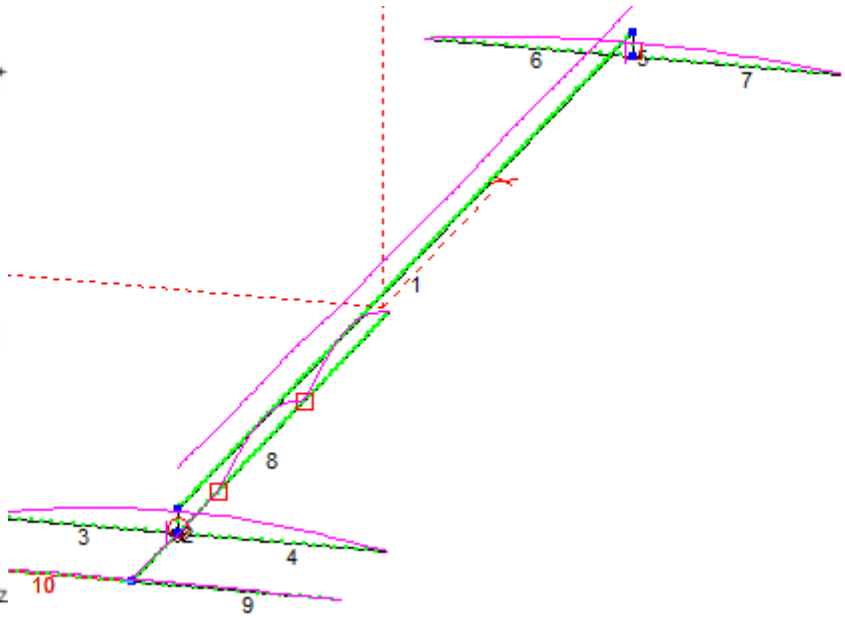








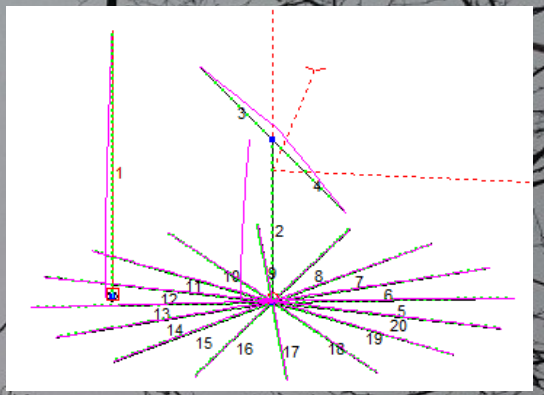




160 Meters

Catenary attachment

Egg insulator



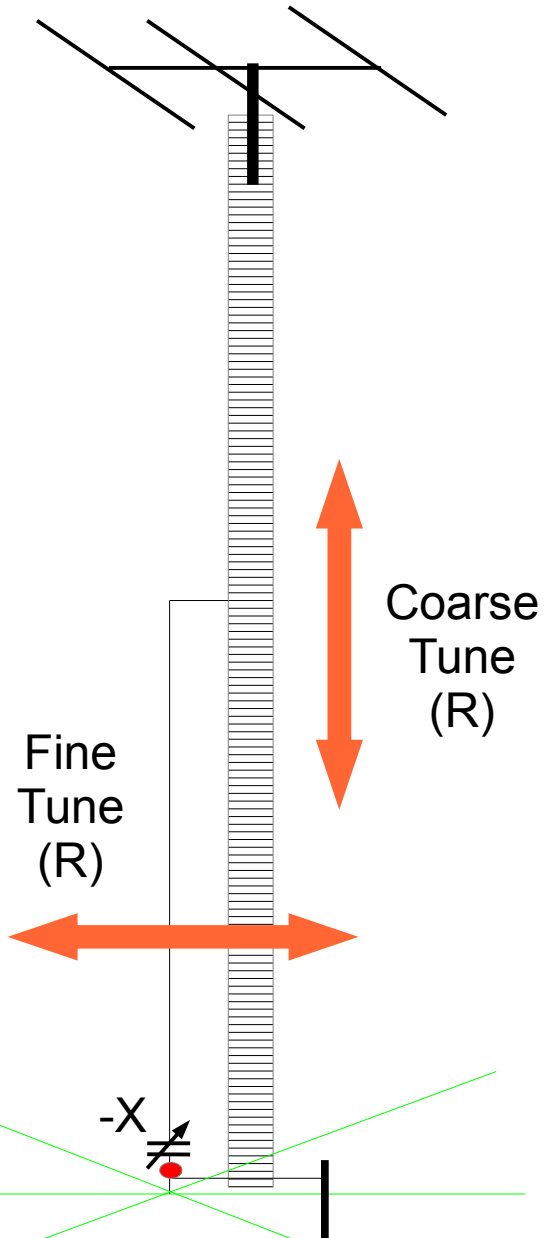
T-top

13 m

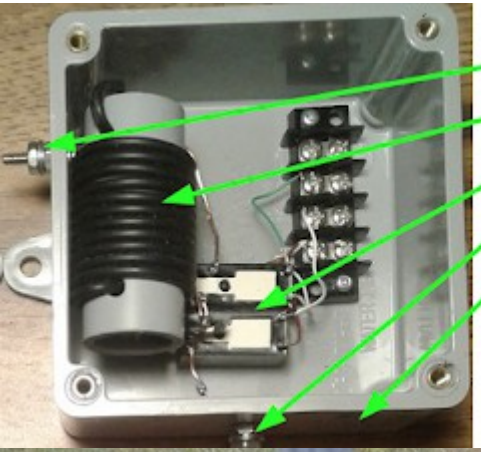
21 m

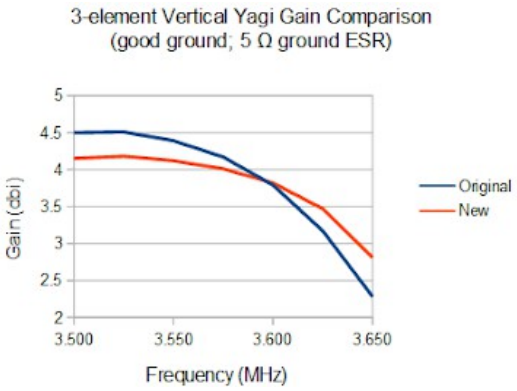
Egg insulator

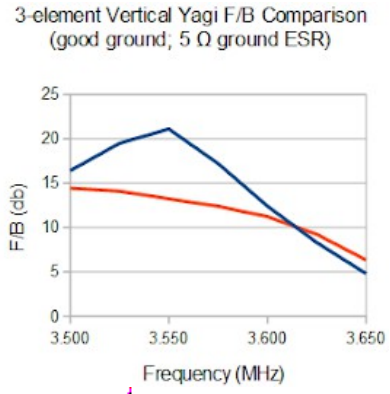
Electrical ⅜λ
1200 kHz

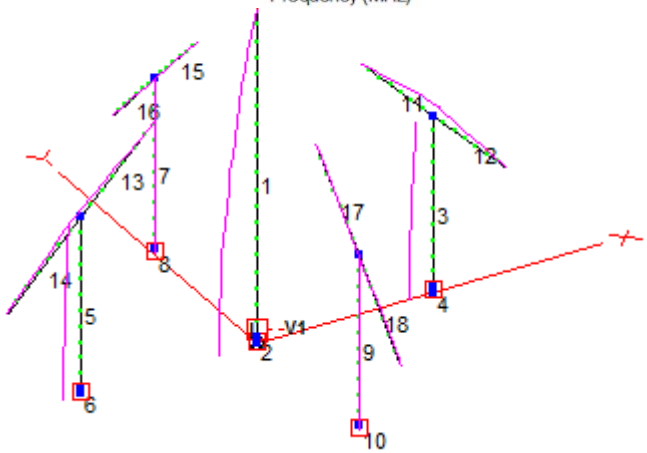


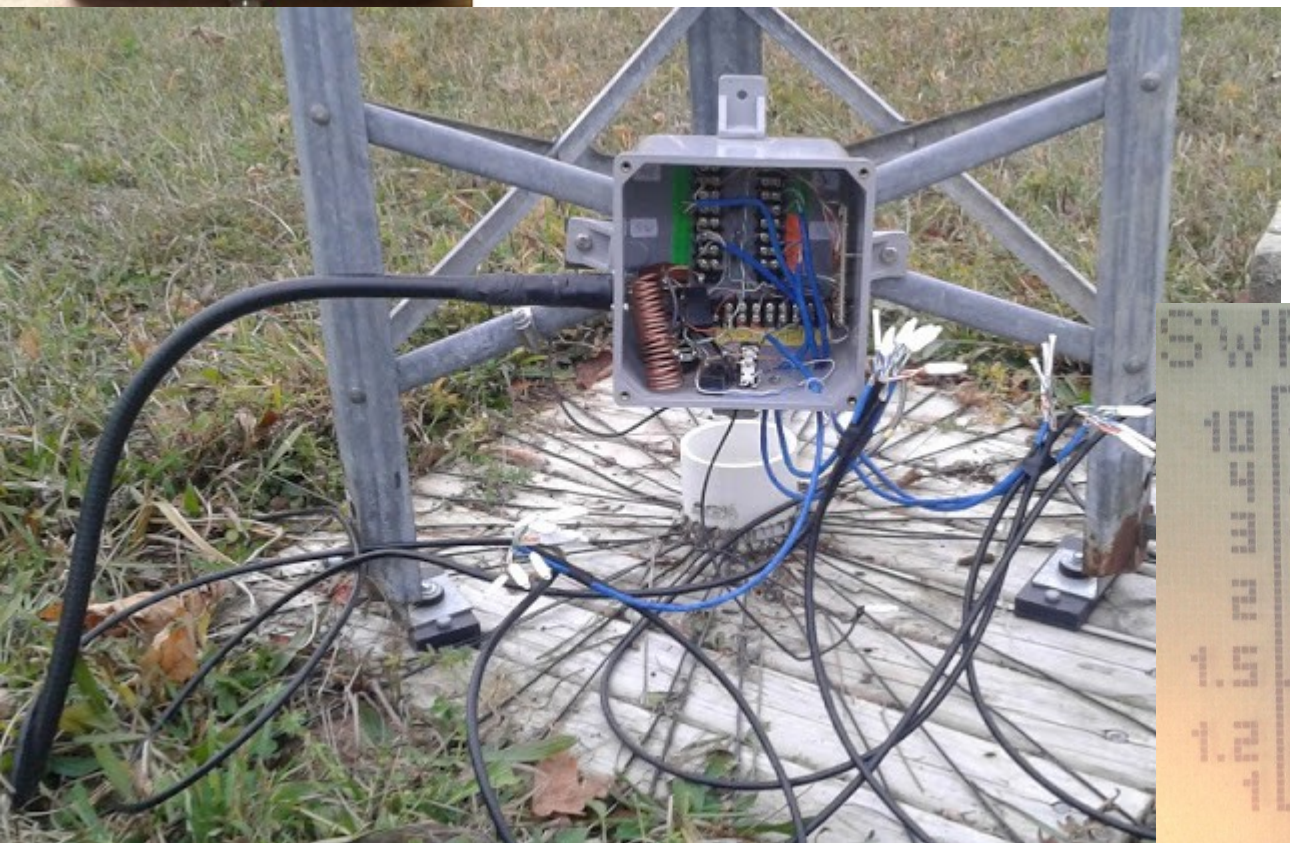
80 Meter 3-element Vertical Yagi

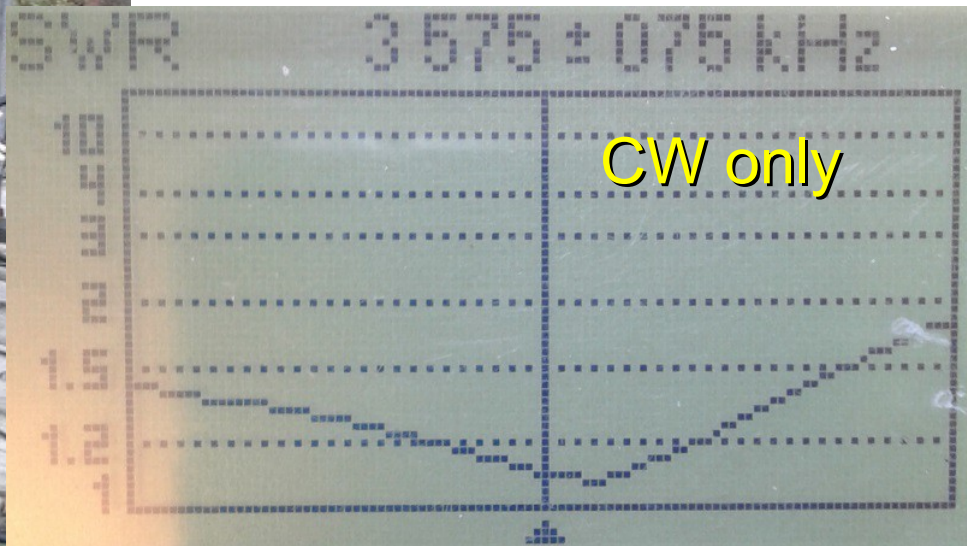










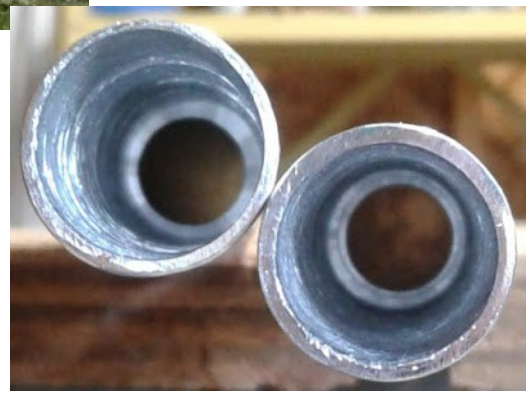


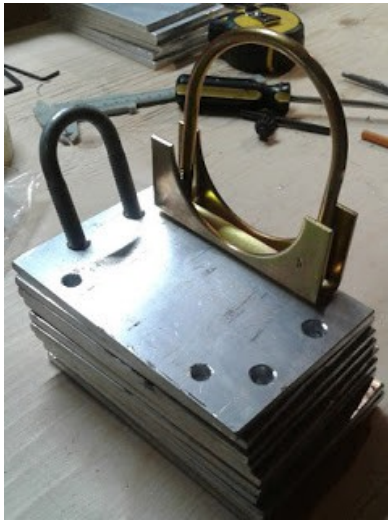
Yagis For 40 to 10 Meters

- Tri-banders are a stopgap
  - Narrow SWR bandwidth and inefficient
- 40 meter yagis are very, very big and heavy
  - Alternatives: wire yagis, loaded yagis, Moxon
  - 3-element full size yagi planned for this year
- Big 20 meter yagis are difficult but within reach
- Big yagis for 15, 10 and VHF are not so bad
- Pick a design, tweak it, make it strong and go
  - Computer optimized designs remove the mystery and the misery of yagi design

Building Big Yagis

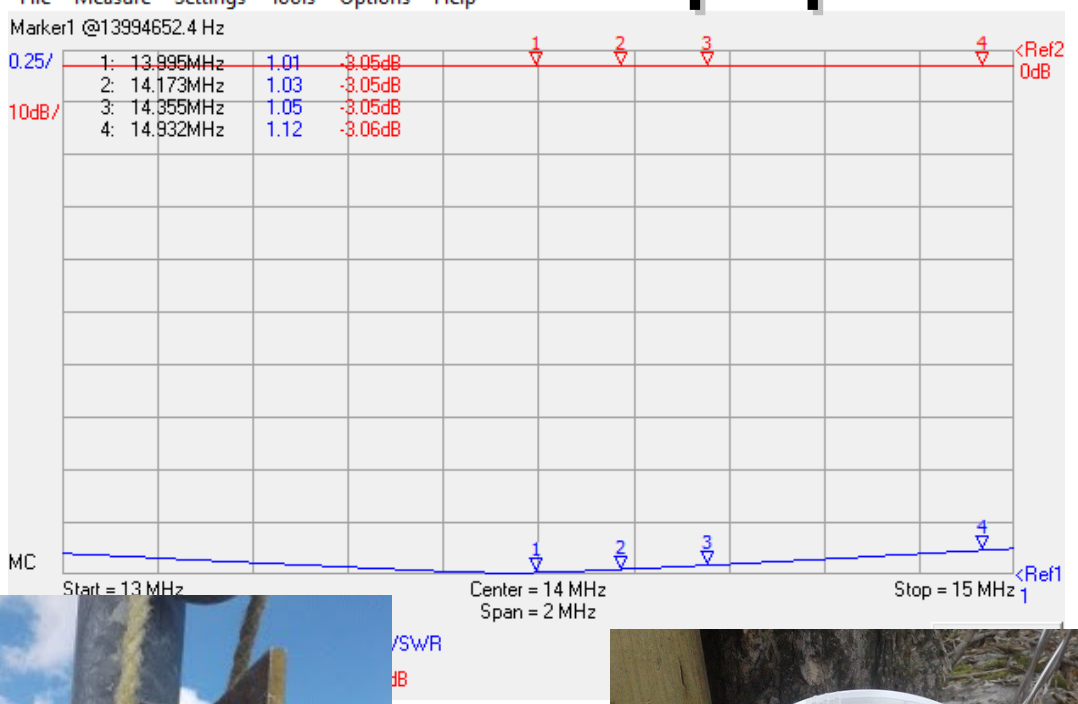
- Booms
- Taper
- Strength
- Clamps
- Matching
- Cost

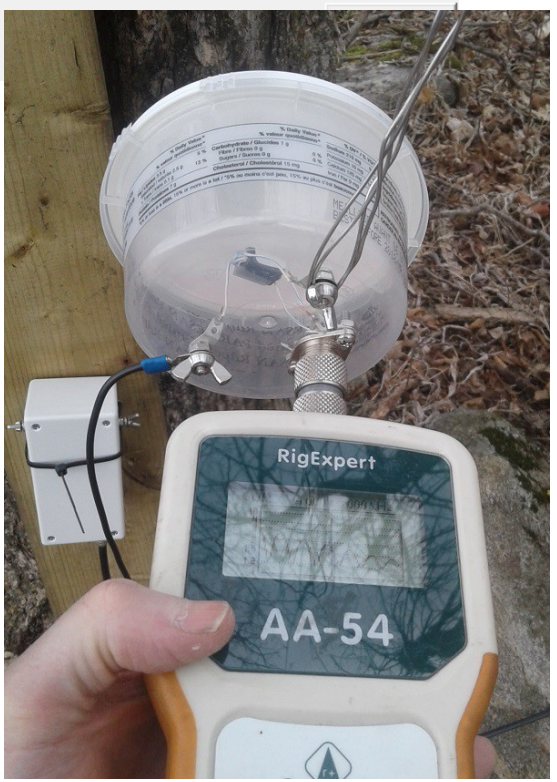




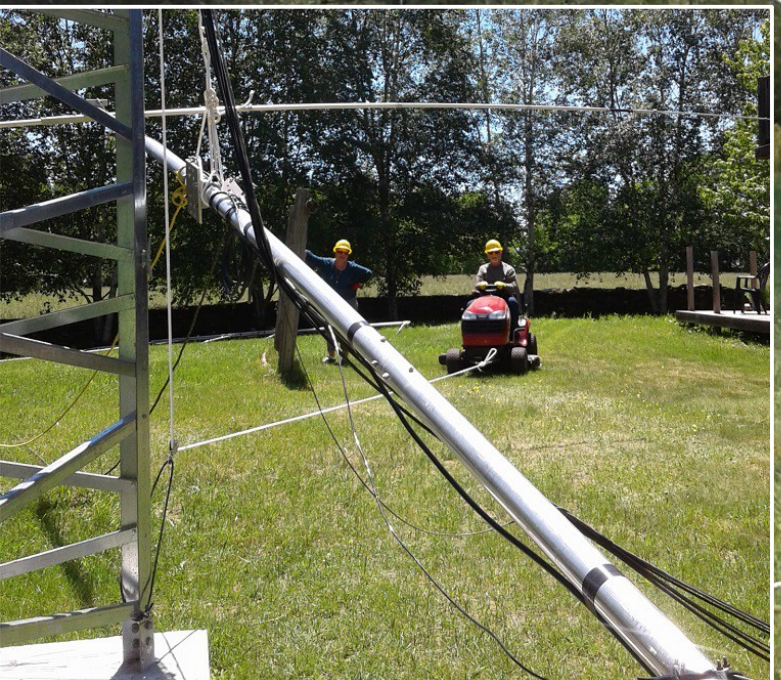
Test and Tune *Before* You Lift

Antenna Test Equipment



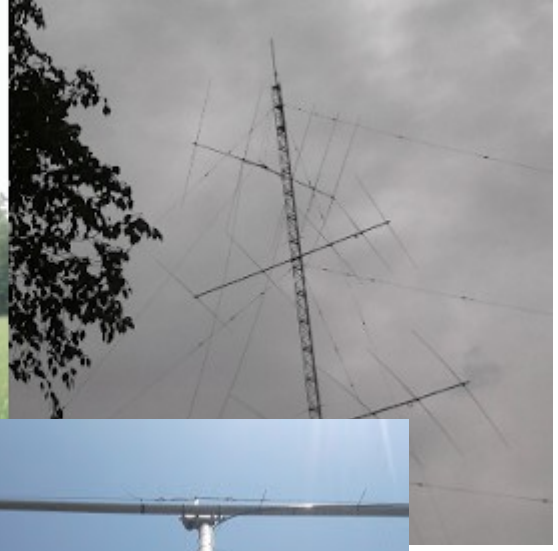


Raising Yagis

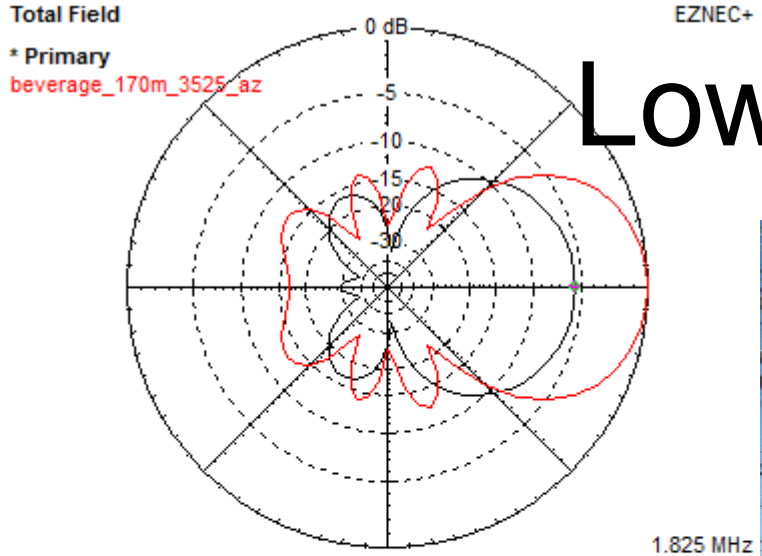


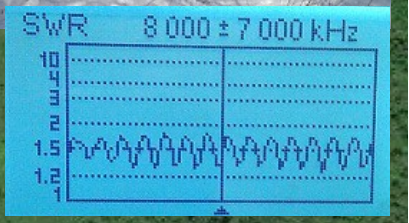
Lifting Yagis: The Tram Line

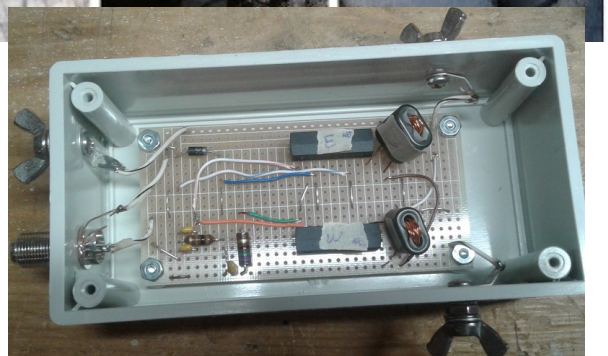
Trams for Big Antennas



Low Band Receive Antennas



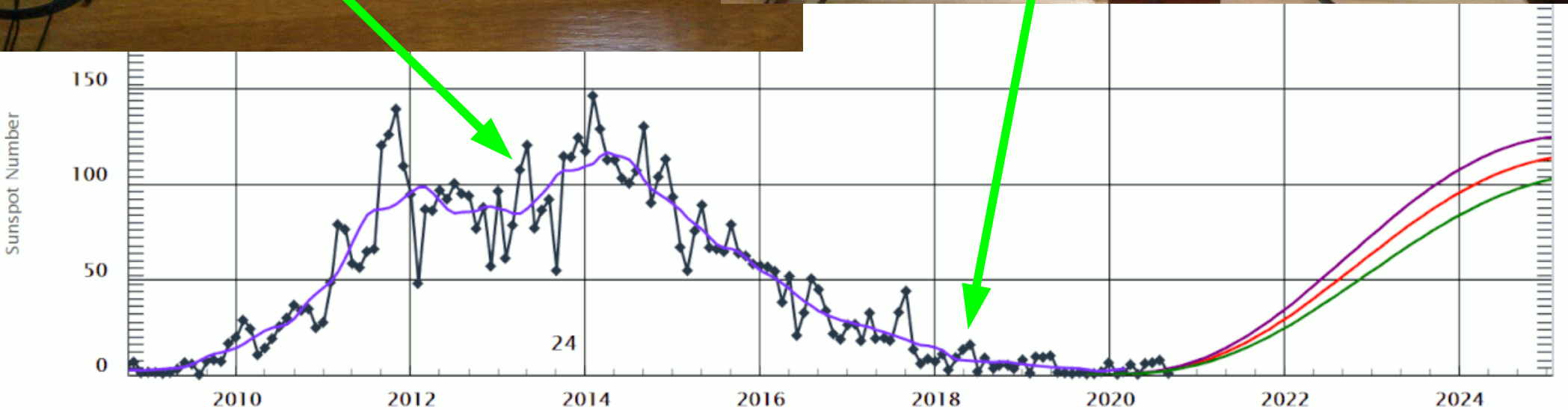




Noise in the wilderness

- Isolation is no panacea
- Search and destroy noise in the home
  - switches; lights; appliances; data cables
- Search and destroy noise further away
  - power lines; electric fences; solar panels

They Have to Hear You to Work 'em



Performance, so far

- 160: Killer antennas easy with a tall support
  - Run EU; crack pile-ups; work DX with 5 watts
- 80: Gain within 1.5 db of a 4-square
  - Verticals poor for short distances: need inverted vee
- 40: High antennas extraordinary on long path
  - but, little difference to Europe for low vs. high
- 20 and 15: Stacks are band openers
  - “You're the strongest signal on the band!”
- Beverages: Awesome on 160 & 80; good on 40

Maintenance – Build It To Last

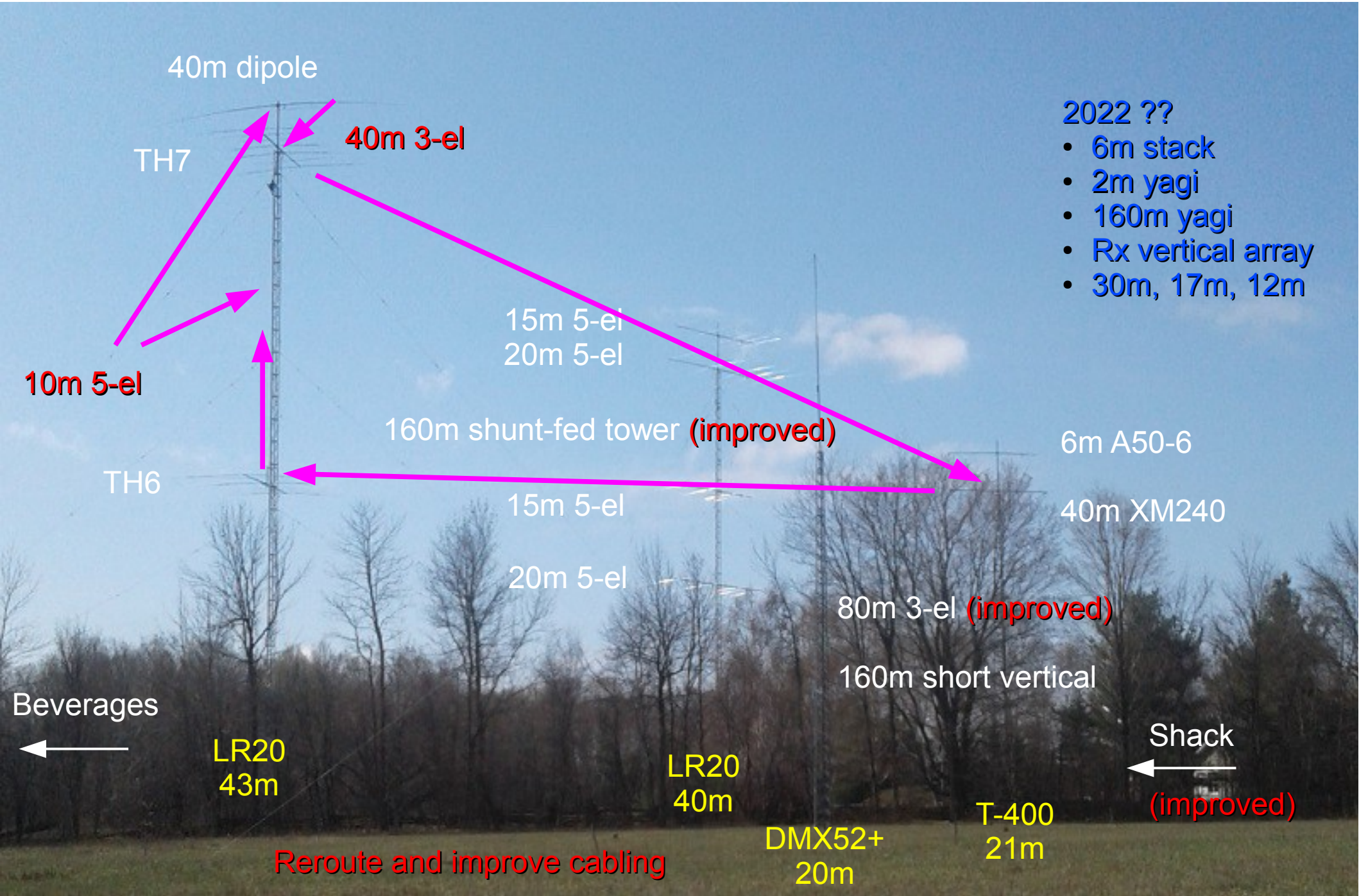
- Every climb involves risk
- Build it right and you can avoid many climbs
- Who will you call if you don't climb?
- Stay safe, save money and enjoy what you've built

Hard Hat Zone

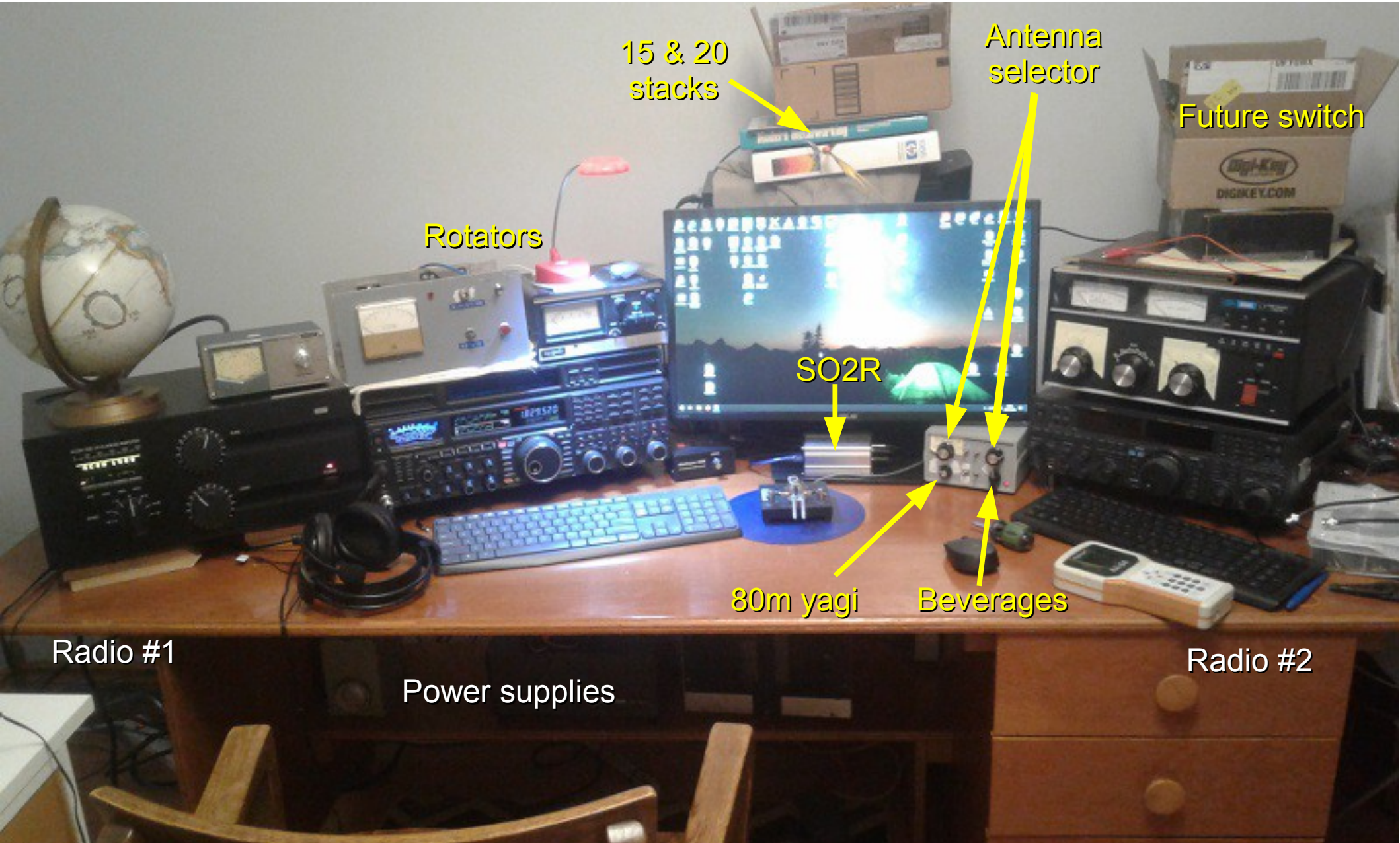
It's a hobby, and
it's fun, but...

Plan for 2021

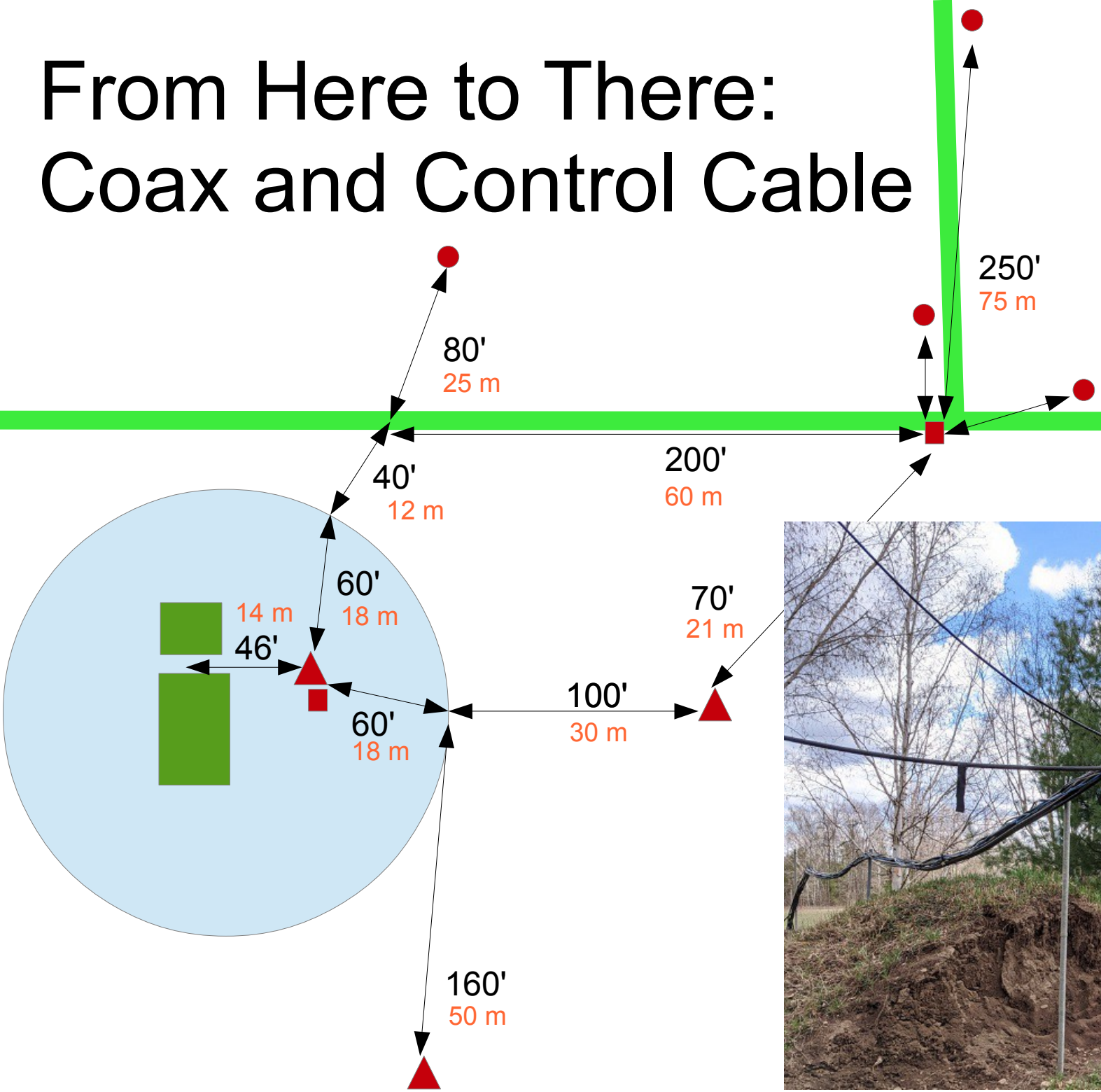
I am an optimist!



Inside the Shack

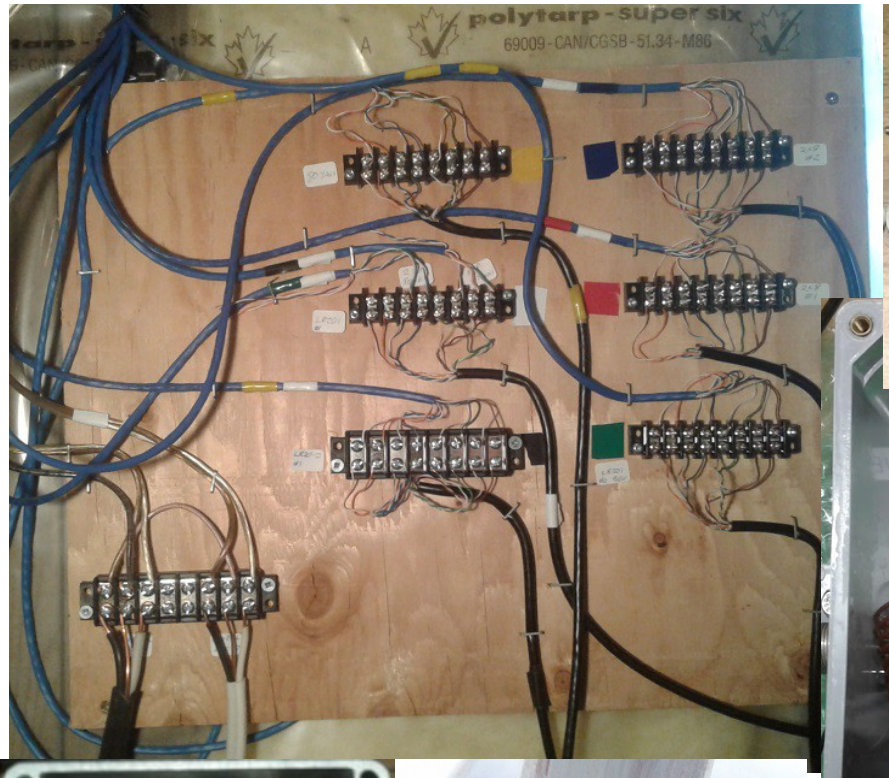


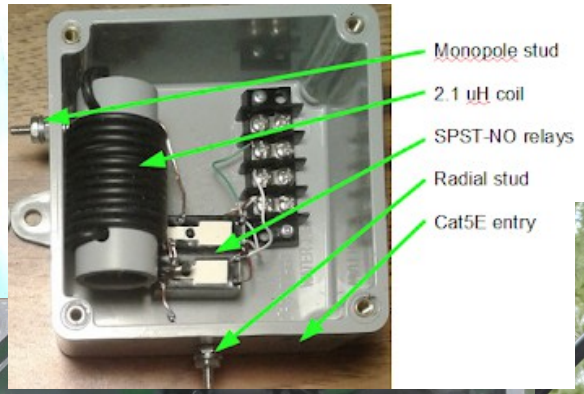
From Here to There: Coax and Control Cable

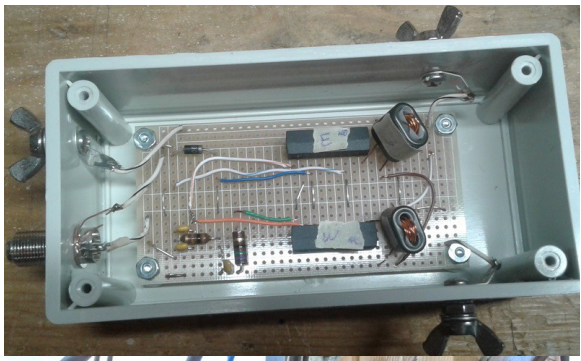


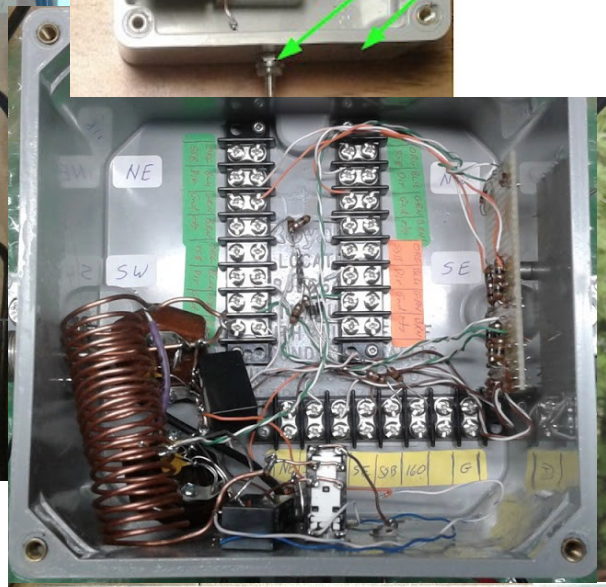
Trench Warfare: Cable Burial

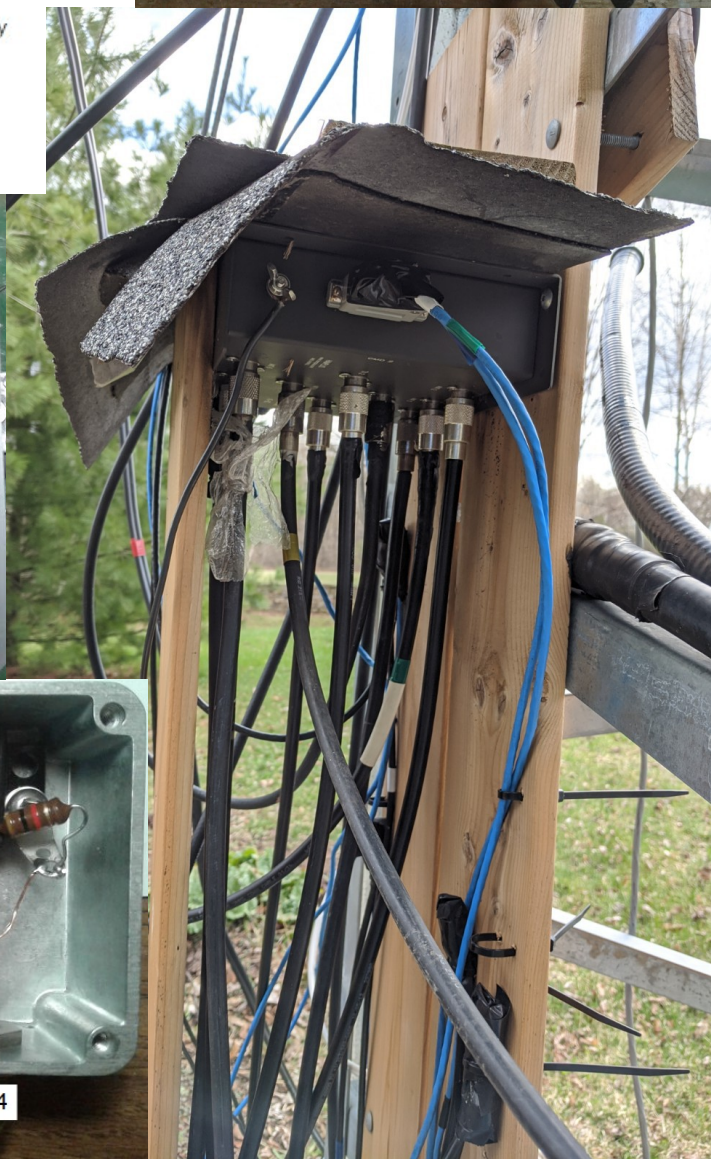
Remote Switching

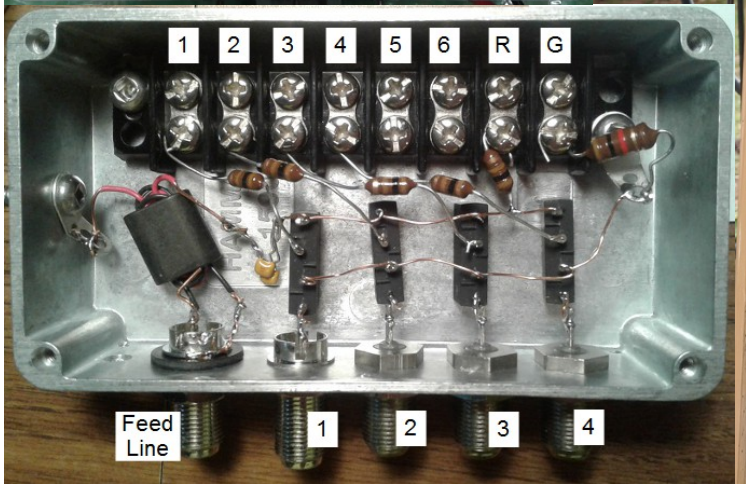




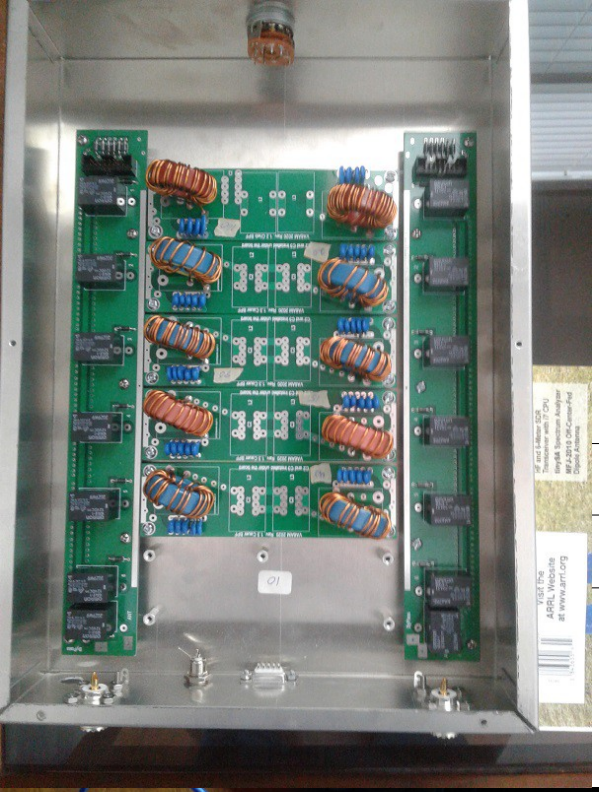


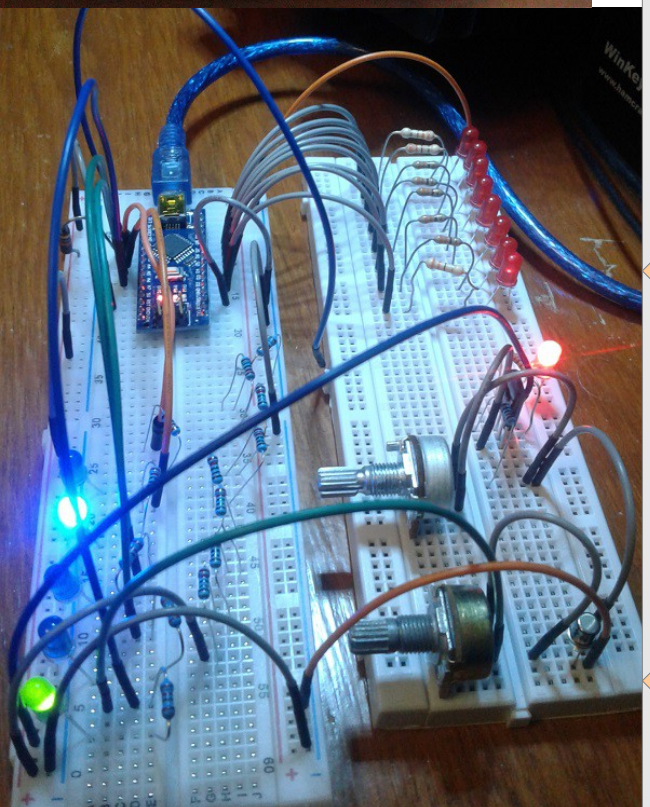


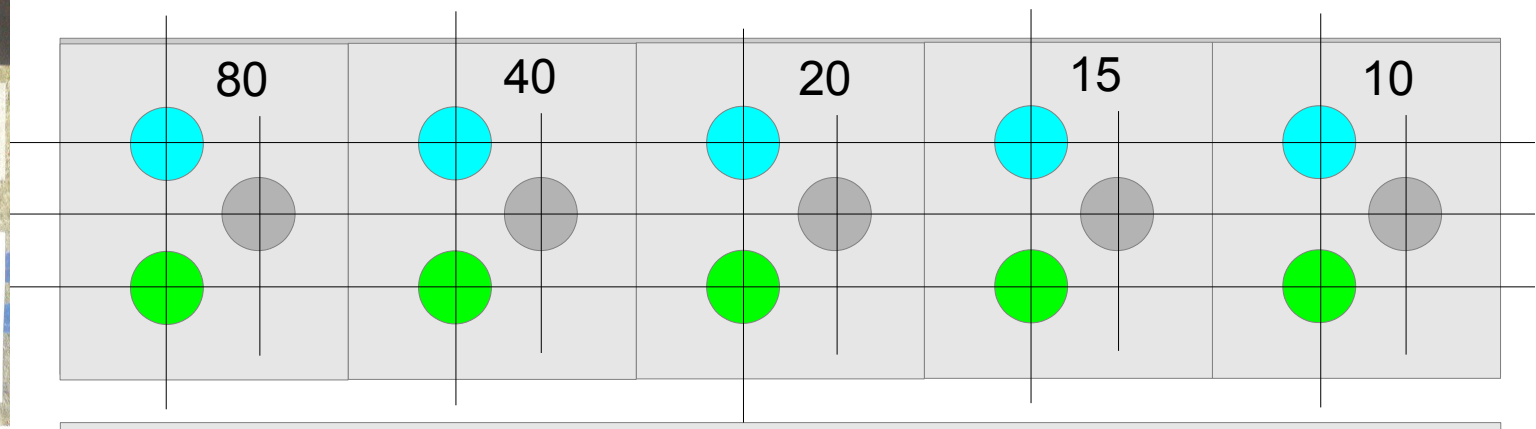


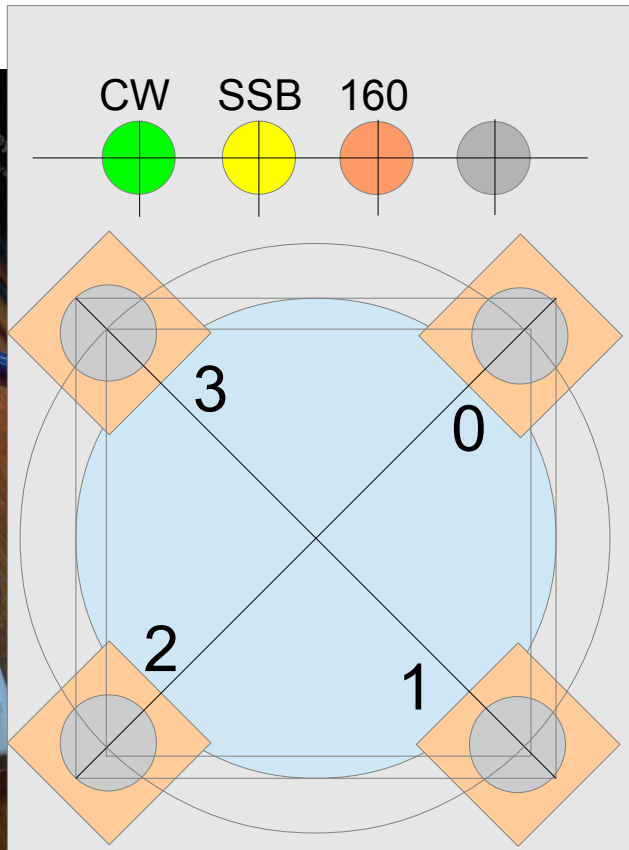


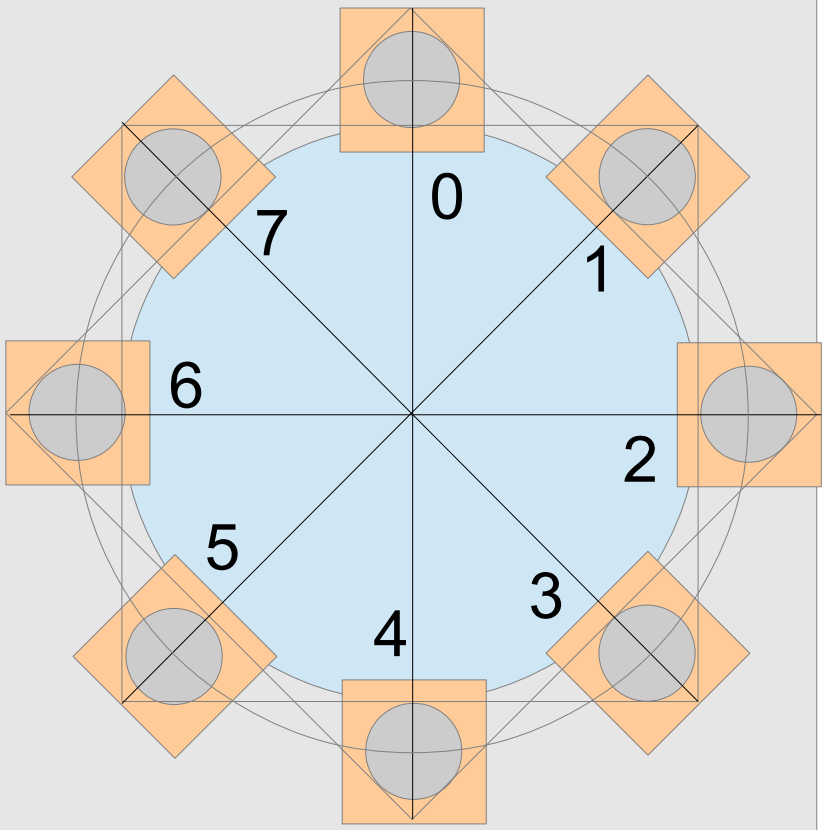
Station Automation











The VE3VN Advantage

- Time (retired)
- Tower rigger
- Antenna design
- Home brewer
- Scrounger
- Motivation!

Commitment and Investment

- What does all of this cost?
  - House and land
  - Towers
  - Antennas
  - Cable
  - Switching and control
  - Equipment on the operating desk
- Construction and maintenance isn't free!
  - Who are you going to call on or hire?
  - Do you have the knowledge, skill and tools?

No Ham is an Island

Building a Competitive Station for HF Contests and DXing

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FN24br