



Practical Antenna systems for portable low power operations

Cost effective options for various scenarios -
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Introducing: Lorem ipsum

Spotlight on desktop

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Spotlight on wearables

Spotlight on tablet

Spotlight on landscape view on tablet

Spotlight on wearables

Project timeline



Standard disclaimer

Don't do anything that can harm you or others - watch out for power lines, when you throw items, and RF exposure

Don't operate where you are not allowed

The items discussed here are based on the experience of the presenter, and may not be the same for others - everyone is different with a different level of experience, expertise, and knowledge.

This presentation does not include every potential configuration, every potential antenna, or operating conditions, but are based on a summary of the author's experiences, and will include biases and other subjective interpretation.



What are portable operations?

- Difference between home stations and temporary
- Difference between mobile stations and portable stations
- Typical electrical power constraints
- Typical site usage constraints



What are low power operations? QRP?

Something about QRP and low power being less demanding and more optimal when portable.

Also less power requirements mean the antenna system needs to be as efficient as possible.

Portable means you have some outdoor or mobile space you can use, and not fixed at a fixed operating position.

Advantages and disadvantages

Typically very temporary (a few minutes/hours) to a few days (e.g. campsite, fishing lodge)



Considerations for portable ops

- Set up speed and time allotted to operate
- Weather and location
- Alone or with help
- Operating requirements: multiband? DX? Gain/directivity?
- Physical constraints and considerations
 - The environment you are in
 - Operating location
 - Equipment “robustness”: strain relief
 - Components and some of their limitations (wingnuts/nuts
 - Wire type/weight/”memory”
 - Limiting water ingress/damage to equipment
- Radio station: rig, antenna match, coax/feedline, chokes, grounding...
- Power requirements: batteries or grid power?



Abandon some of the orthodoxy

Antennas don't always have to be resonant: - "perfect is the enemy of good"

Simple is better than complicated: lightweight/portable vs heavy+robust, etc.

Don't worry about always getting a 1:1 SWR

Station grounding and CMC chokes

Feedline considerations

Theory vs practice: test it out first! (example backyard dollar store challenge)

You need to run high power to make a lot of contacts (false!...well not always)



Today's focus - antenna and feedline

- Focus on antenna system
- Radio, and associated components are important, may be topic for other presentation
- Principles apply for non-QRP (QRO) operations with some considerations



Objectives and challenges of QRP RF

- Limited power means you want antenna and feed system to be as efficient as possible
- Major limiting factors are:
 - deployment expediency: are you in a hurry or do you have all day?
 - Assistance in deployment: alone or have help?
 - Location: salt-water location? Urban Parc? Off grid camping? Backyard?
 - Height: of location (mountain top) and of antenna attachment points (60' tree? 10m fishing pole? 15' tree branch)?
 - Physical restrictions: can you easily and safely go to other side of tree/attachment point (e.g. cliff, water)? Can passers by be affected or hurt? (e.g. throwing weight line)

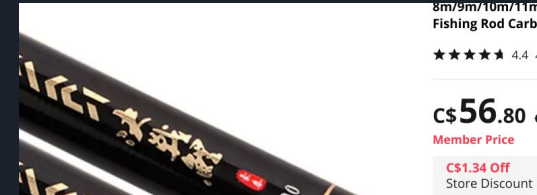
ProTip: Getting stuff into trees

- Sling shot, air-potato gun, or my favourite....
- “How do you get to Carnegie Hall?” Practice Practice Practice..
- Cordage:
 - Ideally should be easy to see for safety (yellow/orange).
 - Attachment to bottle: something that can easily break - cheap twine?
 - Bottle to main cordage: use something strong: Mastrant thin rope best, paracord ok (resistance on bark - big problem)
 - Cheap carabiners (order large pack from amazon/aliexpress) - you want them to break under load.
 - Knots you need to know:
 - Arbour knot: attaching rope to bottle
 - Bowline knot for simple loops at end of rope: useful for carabiner
 - Taut-line hitch for tensioning attachment rope, end of dipole, etc.
 - Overhand knot to make a stoppage in rope - knots are useful in many cases!



ProTip: masts and poles - considerations

- Common types:
 - Purpose built amateur radio portable and telescoping masts - \$\$\$\$
 - Alternate (aliexpress) 10M “fishing poles” - preference for fibreglass, carbon fibre affects RF (!!!)
 - Military masts
 - Painters pole
- Center support vs vertical alignment
- Securing them : rope, bungee cord, rope, velcro (e.g. VK3YE)
- Thin sections: be careful!
- The longer the better
- If terrain allows it, attach pole as high as possible (balcony, street sign, etc)
- Remember that wire (antenna) affected by environment
- Expedient deployment: leaning fishing pole on tall tree branch as support.
- Wrap wire (twirl) around pole if little interaction, or have it free hanging if needed.
- Make sure feedpoint is not on ground! (49:1 transformer, etc)



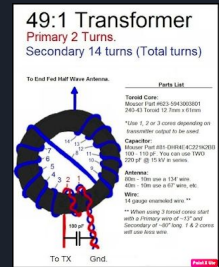
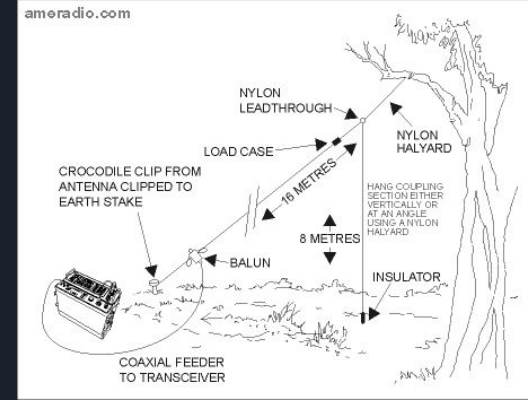


ProTip: Antenna and radial elements

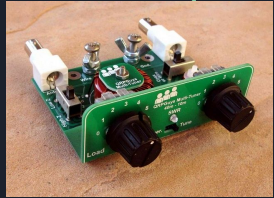
- In most cases the cheap stuff is more than ok.
 - Speaker wire (16AWG 100' @ ~\$16.00. Can be split in two)
 - Hookup wire.
 - Multi strand is better.
 - Use what you have.
 - Use many, varying length wires for radials when needed.
- Know the limitations of the wire in question
 - Single strand - kinks and breaks easily
 - PVC/coating and how slippery it is over branches
 - Stretch and strength if pulled?
 - Cheap speaker wire (*cough* amazon *cough*) OXIDIZES RAPIDLY.
- The good (\$\$\$) stuff?
 - Purpose built antenna wire like Polystealth and others that have rigid jackets and in some cases reinforcement with high break strength - can pull weight back.
 - Vendors: Davis RF, DXEngineering, SOTABeams, etc.

ProTip: Antennas - End Fed Antennas

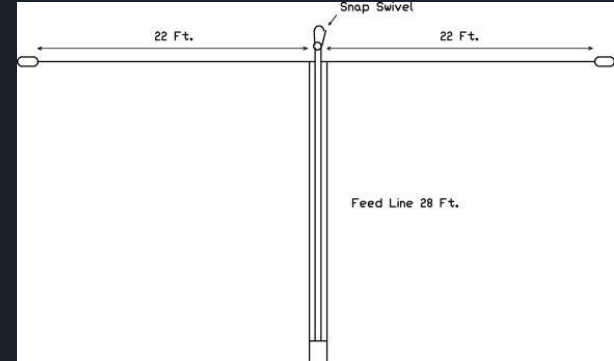
- End Fed Half Wave: 49:1/64:1 UnUn fed, no tuner, flexible configuration. Avoid traps.
- End Fed Random Wire: 9:1 UnUn, tuner, counterpoise, multiband, not as efficient as EFHW.
- “Rybakov” End fed: ~7.6M of wire, 4:1 UNUN, tuner, radials.
- Center fed vertical dipole aka “Flower pot Antenna” - built using coax only (extra wire optional), monoband.
- Whip antennas: $\frac{1}{4}$ wave ground plane antennas with elevated radials, resonant. Resonance adjustable via telescoping whip and optional coils.
- Take off angle of full wave $\frac{1}{4}$ wave, $\frac{1}{2}$ wave, and $\frac{5}{8}$ wave vertical antennas differs. (examples)



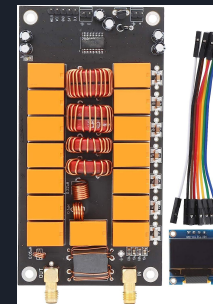
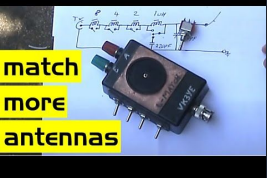
ProTip: Antennas - Dipoles and Doublets



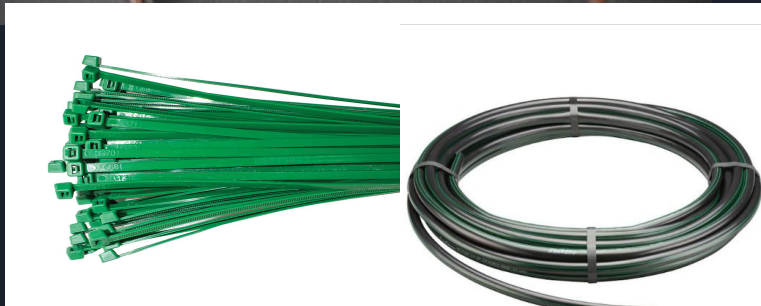
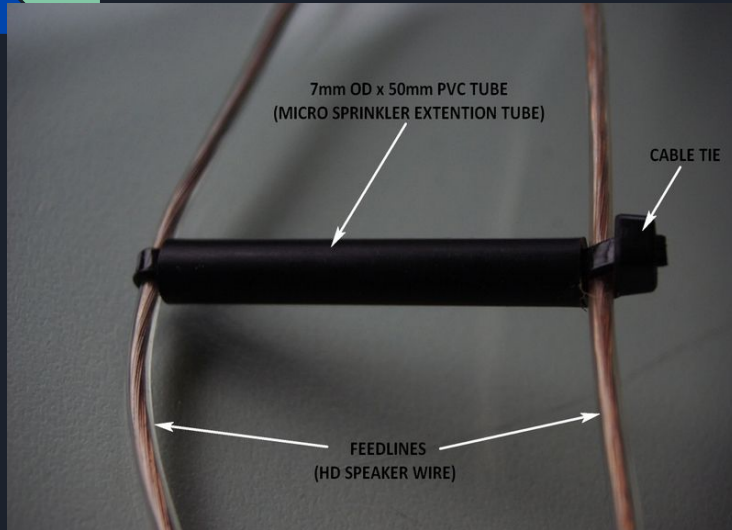
- Dipoles are great and simple to build and use because coax fed; but..... are monoband and can be complicated to deploy.
- Doublets are dipoles fed parallel feeder - multi band, don't have to be at resonant length, and tolerate higher SWRs with fewer losses.



- L.B. Cebik (W4RNL) doublet, NorCal Doublet....
- BUT, BUT, BUT!!!
 - You need a tuner (antenna transmatch): ideally a balanced line tuner.
 - Because this is QRP you can build one from parts (\$) or from a kit (\$\$). (Z or L match tuners)
 - You can find used MFJ manual tuners <\$100 at ham fests (T Match)
 - Automatic tuners? Famous \$40 kit, make sure your model supports <5W tuning limitations.
- BUT, BUT, BUT, Ladder line is hard to get!
 - Ham fests!
 - Make your own



ProTip: DIY Ladder line



RAIN BIRD

Rain Bird 1/2-in x 50-ft Irrigation Tubing

Article #52025056 Item #000303103 Model #T63-50 Format

★★★★★ (0) Write a review

1799
Each



ProTip: Antennas - other antennas

- Avoid mobile antennas
- Avoid very/moderately short antennas
- If purchasing kit of commercial antennas, read reviews; you are trading convenience for performance.
- Some designs will emphasize directional gain, or nulling slides, which may or may not be desirable.
- Some designs offer great performance but at a cost: financial, deployment time, environmental requirements, or assistance.
- For example, half-square antennas offer some additional gain and offer front-back favouring, but take up a lot of room and take a long time to set up (example)



ProTip: Feedlines

- Balanced feed line is the best and most efficient, but not always practical
 - Expensive new, find at hamfests, otherwise make your own.
 - Doesn't have to be 300/450ohm! Make it manageable size for you.
- Coax:
 - use short coax runs - don't use 50ft of coax when you need 10ft
 - Weight/thinnest? RG316 better than RG174. Remember losses based on frequency and coax lengths.
 - Quality RG8X good bang for the buck; affordable, better than RG58, but similar size/weight.

At the end of the day, it's your decision, and at QRP power levels you want every milliwatt to be radiated as best as possible.



Some deployment stories

Every deployment is a learning experience and is experimental

I learned from others and implemented some of my own ideas

My hope is that these can spur your interest in experimenting and trying new things

At a fishing camp



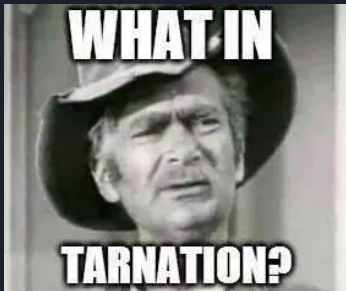
At a fishing camp



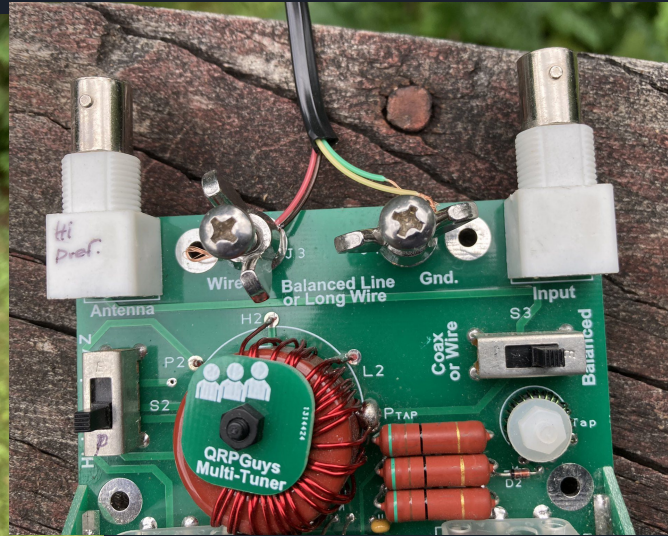
POTA with vertical whip



Cheap and expedient antenna challenge: a story



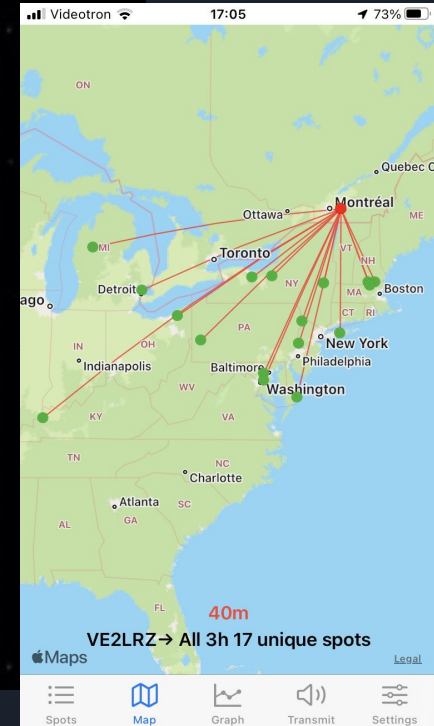
Is this cheap stuff going to work?



“How did it do?”

Components

- 500mW WSPR tx
- 30' 18AWG speaker wire (\$2)
- 15' RJ11 telephone wire (\$2)
- QRPguys Z-Tuner
- Fishing pole



In conclusion

QRP should mean more flexibility, not just less power

Focus on efficient RF radiation

Experiment

Keep it simple.





Thank you

Hope to catch you on the air

Erick VE2LRZ

When people see my **radios**
and think I'm rich



Bro, I'm just irresponsible