

**~ The Magic Band ~**  
**and**  
**Simple 6 Meter Antennas**  
**You can Build**

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# QUIZ!!!!!! What do you remember from last months presentation?

1. What does the “V” stand for in **VSWR**?
2. Are we more concerned with **VSWR** at (circle one) **a)** the antenna or **b)** the radio?
3. A length of coax will have greater losses at (circle one) **a)** longer  $\lambda$  or **b)** shorter  $\lambda$ .
4. The impedance of a  $\frac{1}{2} \lambda$  dipole in free space is \_\_\_\_\_.
5. The purpose of an antenna tuner is (circle one) **a)** make the antenna happy or **b)** make the radio happy.

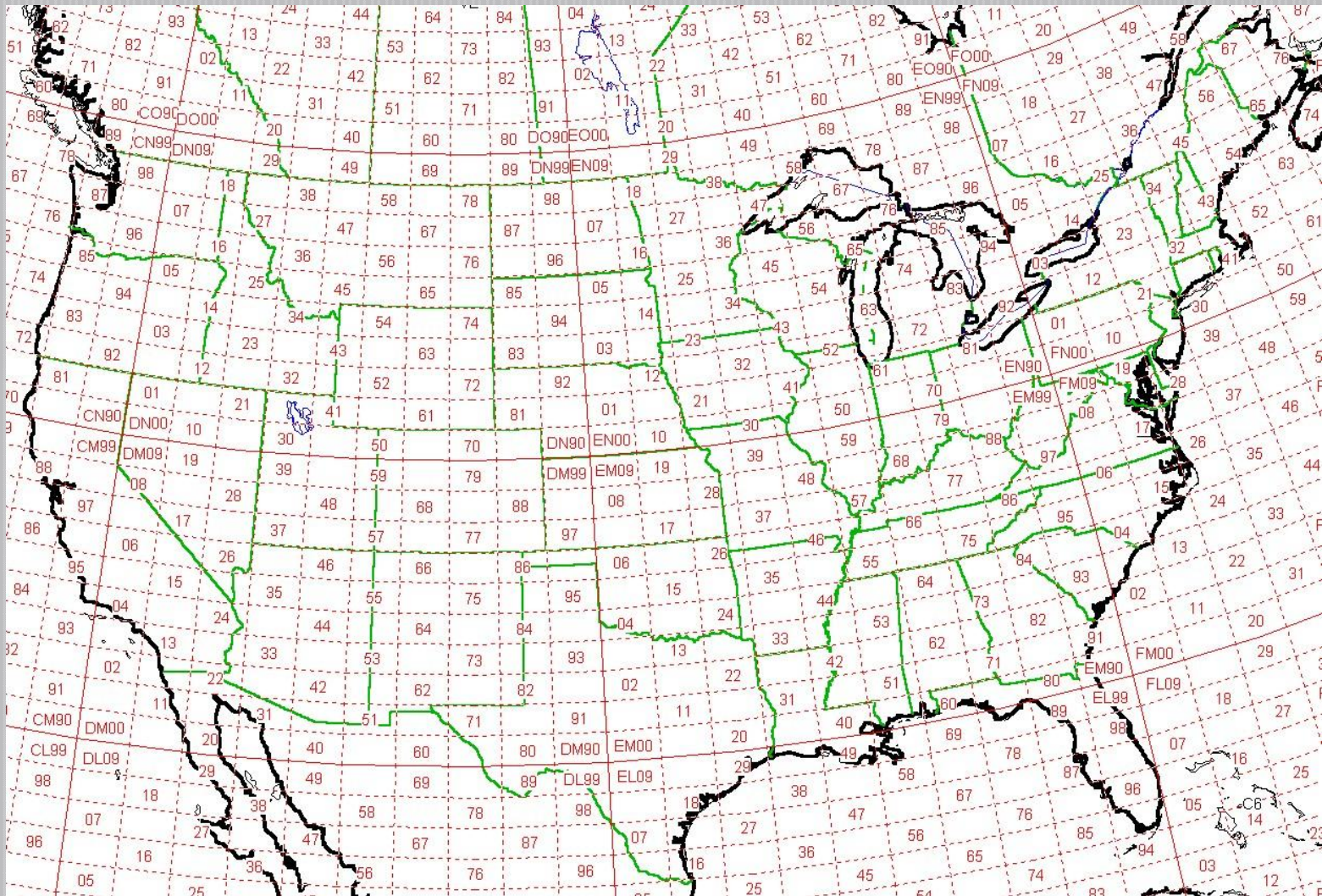
# 6 Meters – About

- VHF band
- 50.0 – 50.1 MHz CW only
- 50.1 – 54 MHz CW, RTTY, Image, Data, Phone
- Available to all classes of radio operators  
(except for the old Novice class)
- Transmitter power output is legal limit
- Sometimes called “The Magic Band”
- QSOs tend to be short due to fast QSB
- Most QSOs involve exchanging grid square designation (EL87 for my Florida QTH)

# 6 Meters – Fun Stuff to do!

- Good for local communications/Nets and rag-chewing
- BARS 6 meter net – Tuesdays @ 7 PM on 50.2 MHz (WB4AKA holds court)
- Working States
- Working DX
- Working Grid Squares for VUCC award
- Grid Square Expeditions – FUN!
- Contesting – Lots of categories for simple stations/setup

# 6 Meters – Grid Square Map



# 6 Meter Grid Expedition



# 6 Meters - Propagation

- F<sub>2</sub> layer skip during high levels of sunspots
- Sporadic E skip
- Meteor Scatter
- Moon Bounce - EME
- Ducting
- Check CW beacons for propagation
- Many Hams constantly monitor 50.125 MHz for activity and openings.
- Additional on-line propagation tools listed in reference section

# 6 Meters - Radios

- FT-620B – Got me started
- Other older famous 6 meter rigs:  
Swan 250, Drake TR-6, Heathkit Lunch box  
and SB110, Gonset Communicator G-50,  
Ameco TX-62
- Most HF rigs manufactured in the last 15  
years include 6 meters



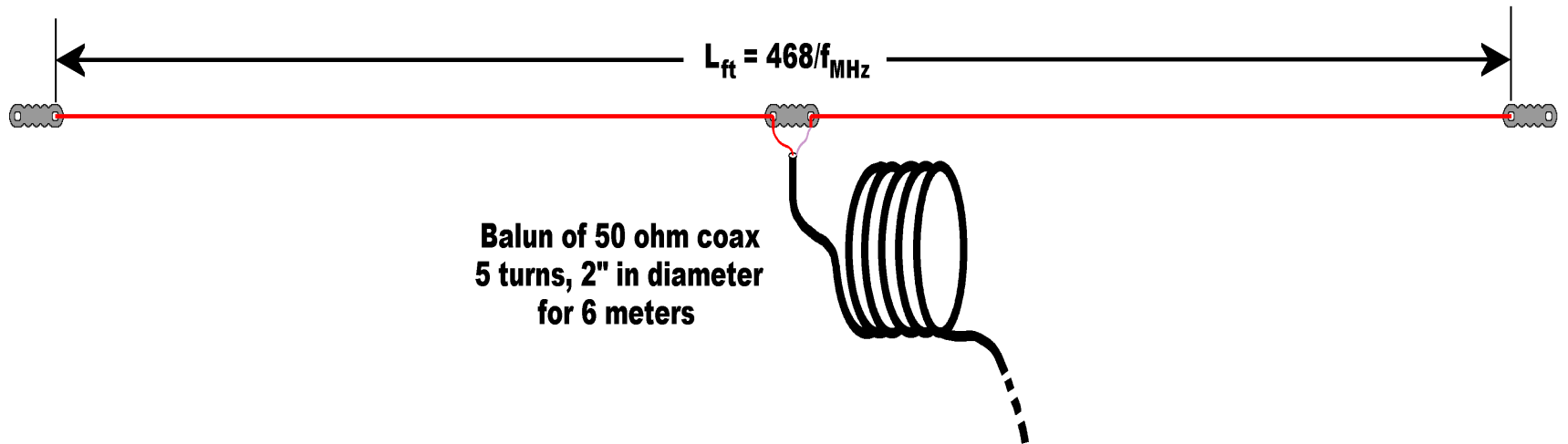
# 6 Meters – Simple Antennas

- Dipole
- Ground Plane
- Delta Loop/Square Loop/Bi-square
- End Fed Zepp
- J pole/Slim Jim
- Extended Double Zepp
- Hentenna
- Beams and Beam adaptations

# 6 Meter Antennas – Dipole antenna

- Simple to build  $1/2\lambda$  antenna
- Formula:  $L_{ft} = 468/f_{MHz}$
- Install horizontally, inverted V, sloping, or vertically
- Feed through a choke balun with  $50\Omega$  or  $75\Omega$  coax
- Have a “Buddy Pole” center? Get two CB whips, cut each to  $1/4\lambda$  for  $1/2\lambda$  6 meter dipole.

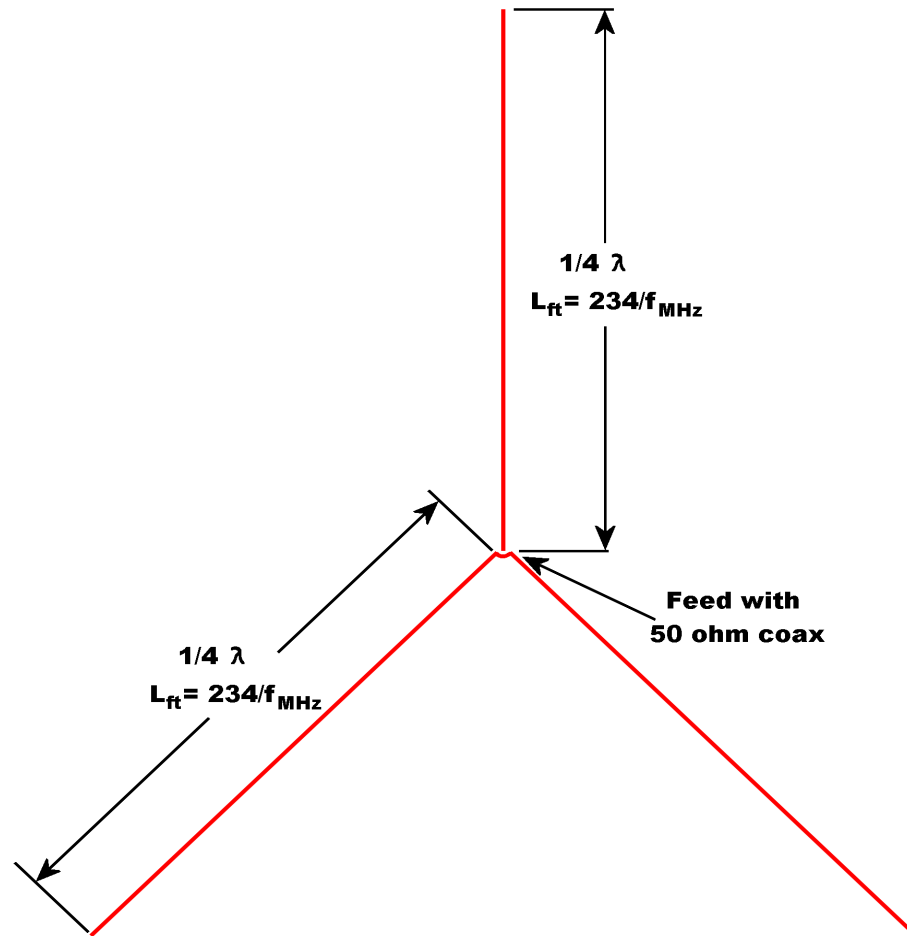
# 6 Meter Antennas – Dipole antenna



# 6 Meter Antennas – Ground Plane

- Simple to build  $1/4\lambda$  vertical
- Make from wire, copper tubing, or cut a CB whip
- Formula:  $L_{ft} = 234/f_{MHz}$
- Gain is same as dipole but omni-directional and lower angle of radiation
- Feed with  $50\Omega$  coax – excellent match when radials slope down  $45^\circ$

# 6 Meter Antennas – Ground Plane



# 6 Meter Antennas – 2 meter $5/8\lambda$

- In a pinch, a 2 meter  $5/8\lambda$  mobile antenna can be used on 6 meters (I have!)
- $1/4\lambda$  on 6 meters is 55.9"
- $5/8\lambda$  on 2 meters is 50" and impedance matching is provided by a low inductance coil
- The above combination provides a base-loaded vertical antenna that works on 6 meters.

# 6 Meter Antennas – Loops

- A **1λ** delta or square loop is easy to build and tune (I worked all over NA with my FT-620B and 10 watts output!)
- About **1.5 db** gain over a dipole
- Feed with **¼λ** matching stub of **75Ω** coax
- Formulas:

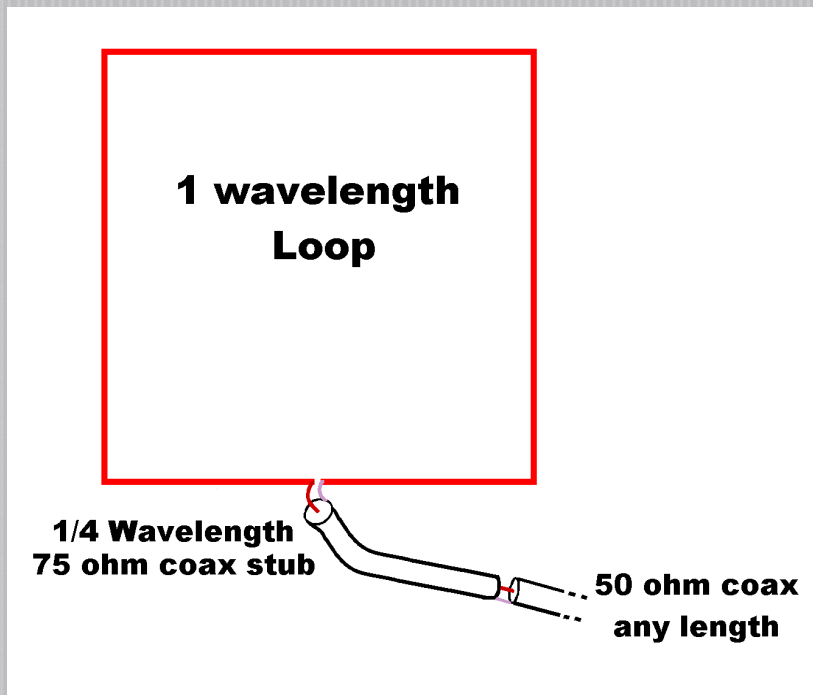
Loop:  $L_{ft} = 1005/f_{\text{MHz}}$

Stub:  $L_{ft} = V_f(246/f_{\text{MHz}})$

$V_f$  = velocity factor of coax; use .66 for polyethylene coax and use .82 for foam coax

# 6 Meter Antennas – Loops

## SINGLE ELEMENT QUAD LOOP



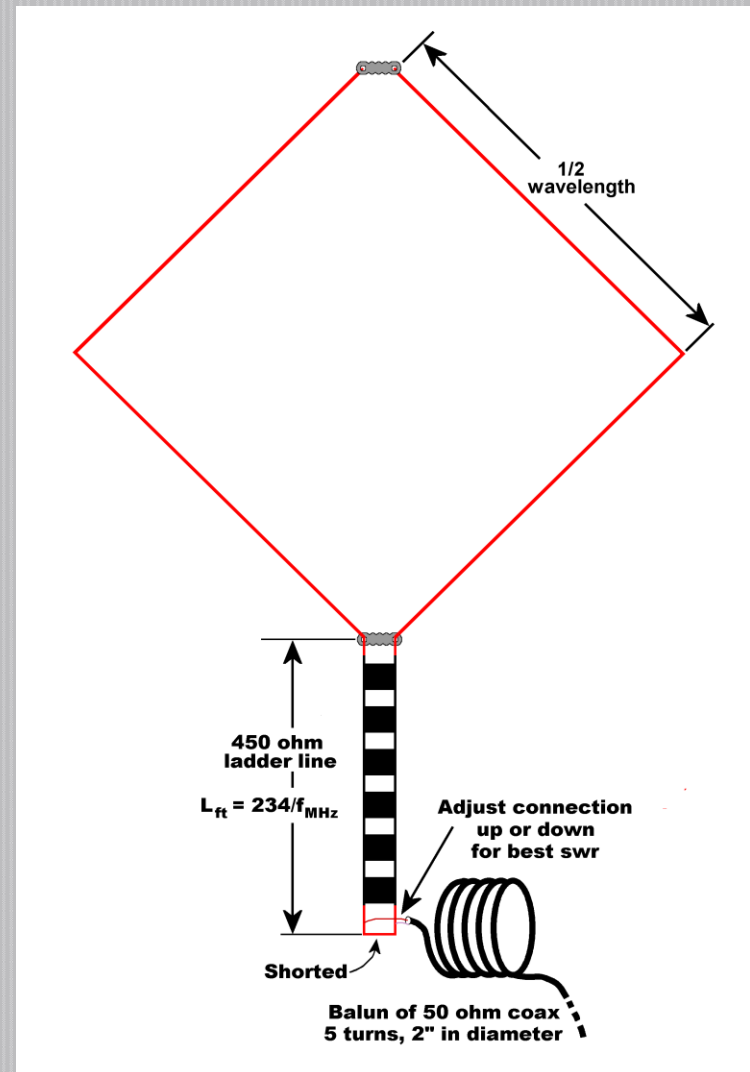
## 6 METER DELTA LOOP IN ATIC





# 6 Meter Antennas – Bi-Square

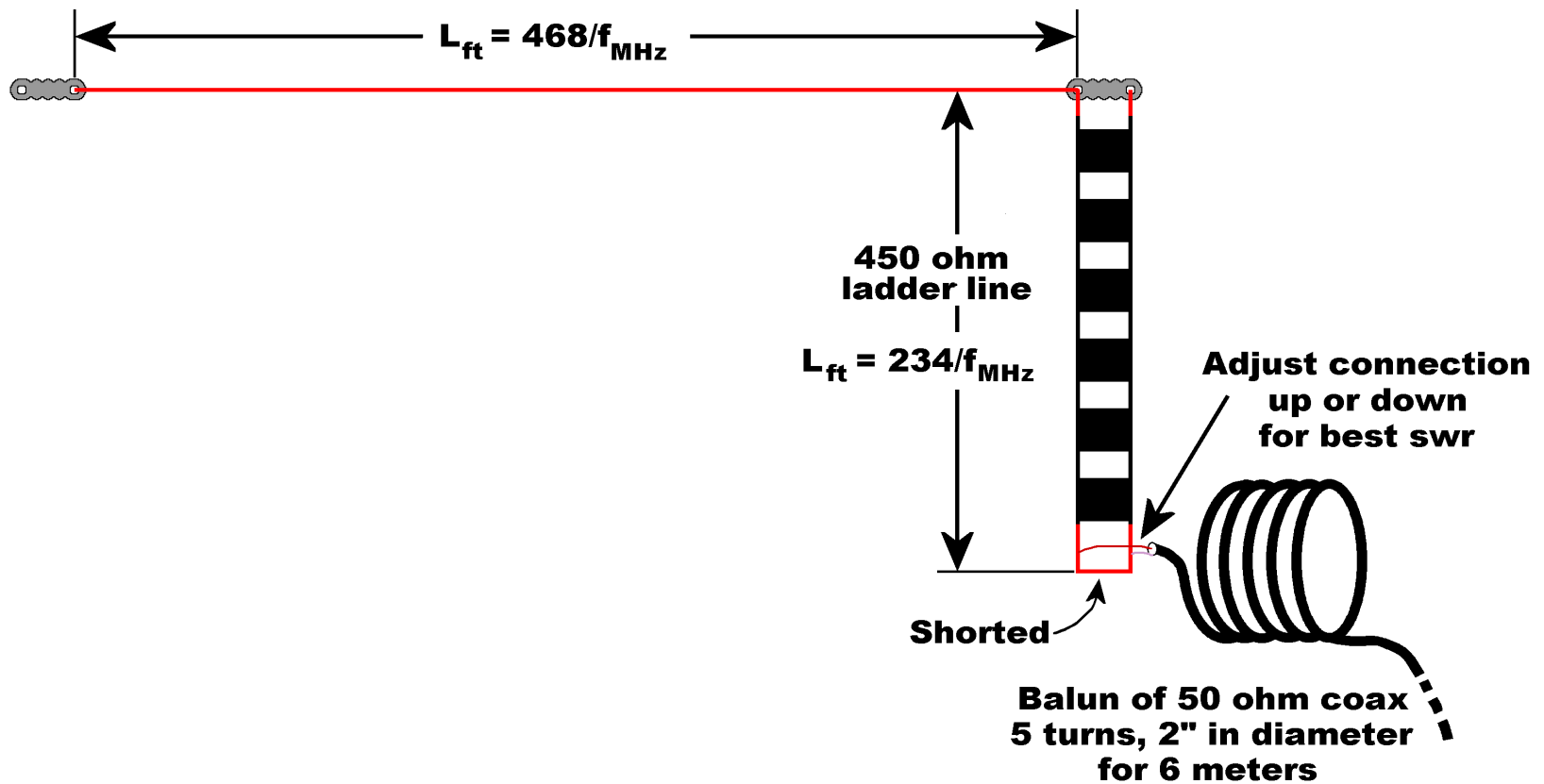
- $2\lambda$  loop open at the top
- **4.5 db** gain over dipole
- Multi-band coverage with ladder line to tuner
- Use  $\frac{1}{4}\lambda$  **450 $\Omega$**  ladder line to connect to **50 $\Omega$**  coax for single band operation.



# 6 Meter Antennas – End Fed Zepp

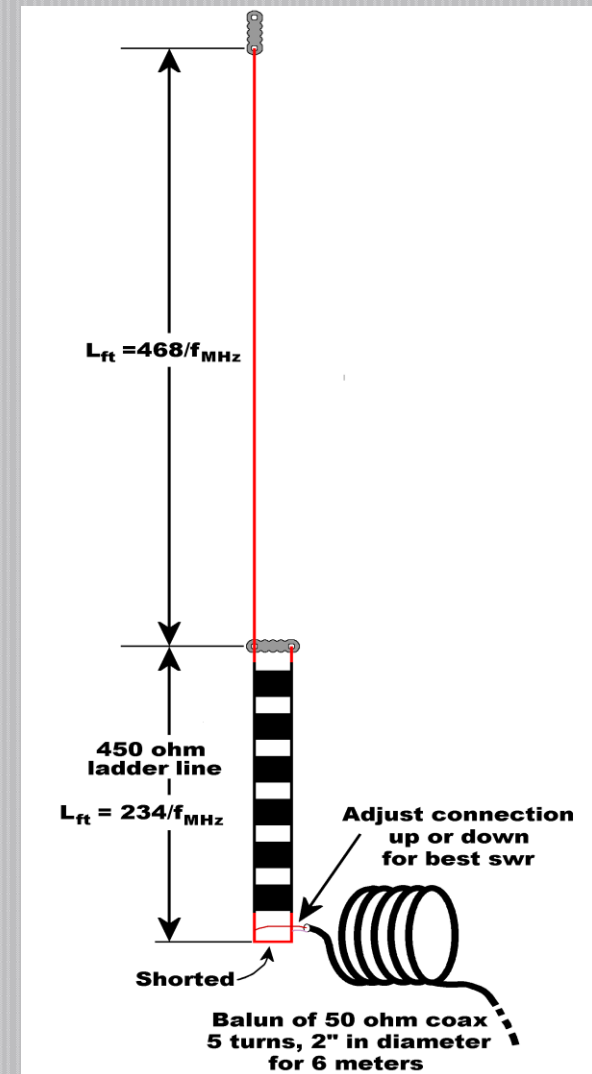
- Easy to build end-fed (voltage fed)  $\frac{1}{2}\lambda$  antenna
- Same gain as a dipole
- Advantages:
  - No center support needed for feed line
  - Hide the feed line in a tree.
  - Hide the whole antenna in a tree!
- Formulas:
  - antenna length:  $L_{ft} = 468/f_{\text{MHz}}$
  - transmission line length:  $L_{ft} = 234/f_{\text{MHz}}$

# 6 Meter Antennas – End Fed Zepp



# 6 Meter Antennas – “J” Pole

- Take that end-fed Zepp and stretch it out vertically!
- Looks like a “J” ... (well, a backwards “J” in this illustration) ...
- Make it out of wire and hide it in a tree
- Check reference section for websites that include a “J” pole calculator for **Cu** tubing like what was built as shown in the next slide

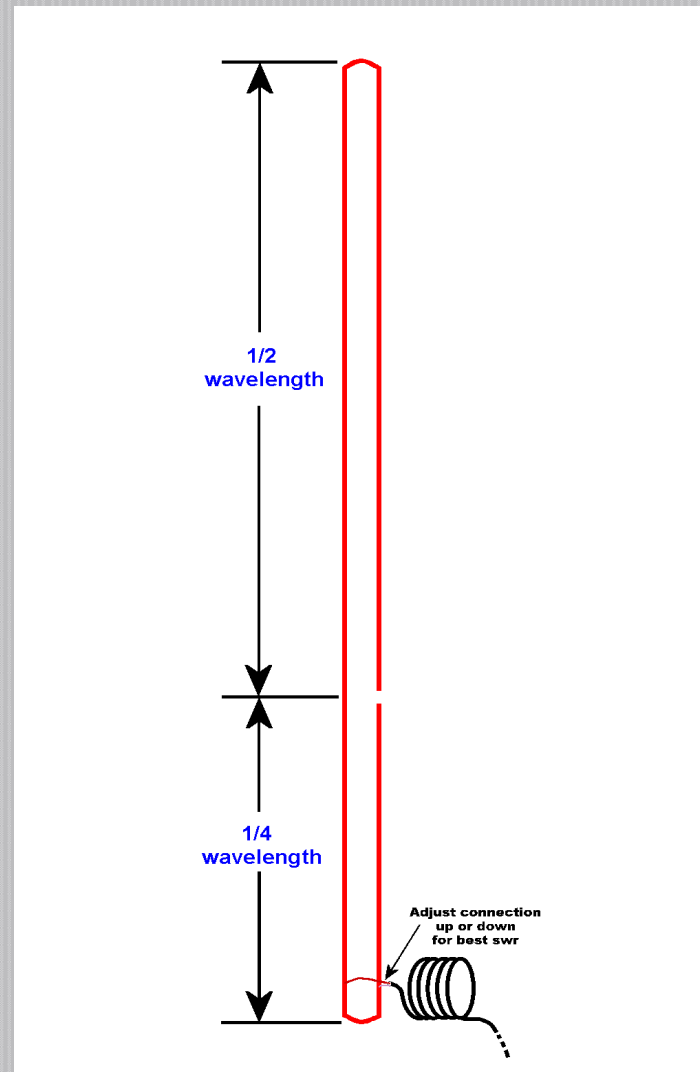


# 6 Meter Antennas – J Pole by KI5YG



# 6 Meter Antennas – “Slim Jim”

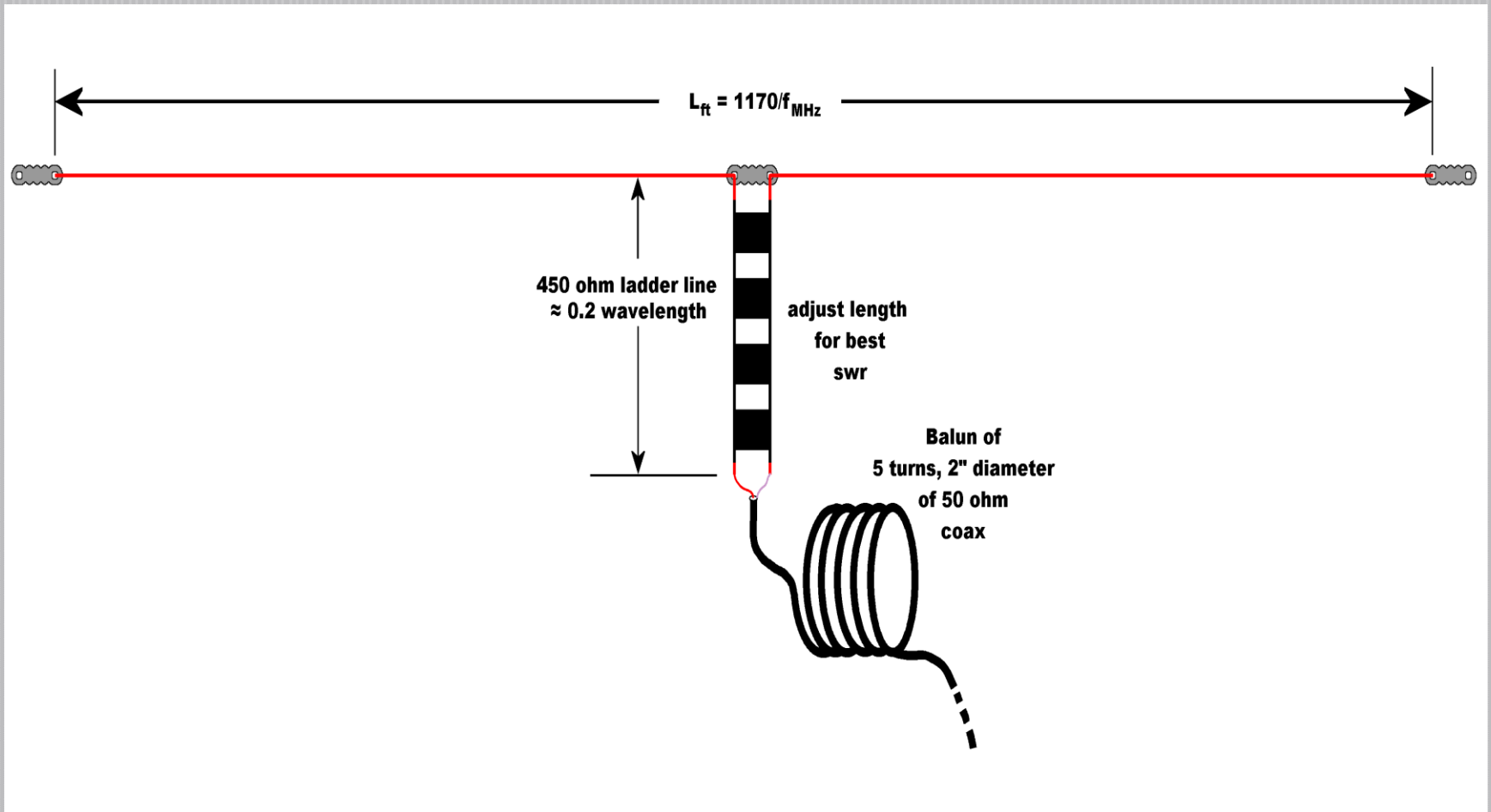
- Variation of the “J” pole
- Same length but a  $1\lambda$  radiator is folded back on itself.
- Claims of up to 3 db gain over the “J” pole
- Link to this is in References



# 6 Meter Antennas – EDZ

- Extended **D**ouble **Z**epp is Simple to build, center fed antenna with **3db** gain over a dipole
- Formula:  $L_{ft} = 1170/f_{\text{MHz}}$
- Feed with open wire line and a tuner, this antenna will function on 20-6 meters
- May need 6 meter tuner (easy to build) since some tuners, especially auto-tuners, may have a limited matching range on this band.
- Can be matched to coax for single band operation without a tuner as shown on next slide

# 6 Meter Antennas – Single Band EDZ

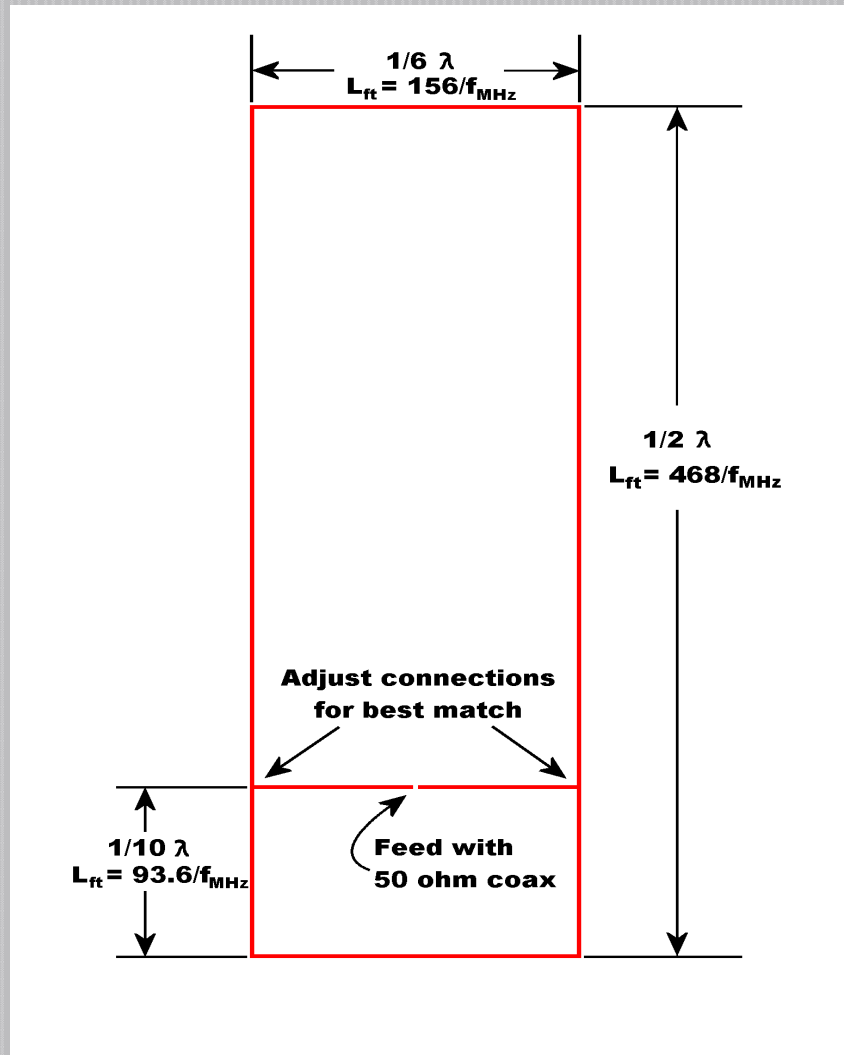




# 6 Meter Antennas - Hentenna

- Hentenna means “Strange” antenna
- Developed by the Japanese for 6 meters
- Easy to build  $1\frac{1}{3} \lambda$  Rectangle loop that provides **3-4 db** gain over a dipole
- Easily fed with 50Ω coax
- Can be oriented vertically or horizontally
- I have used this type of antenna on 20 and 10 meters effectively for many DX QSOs.

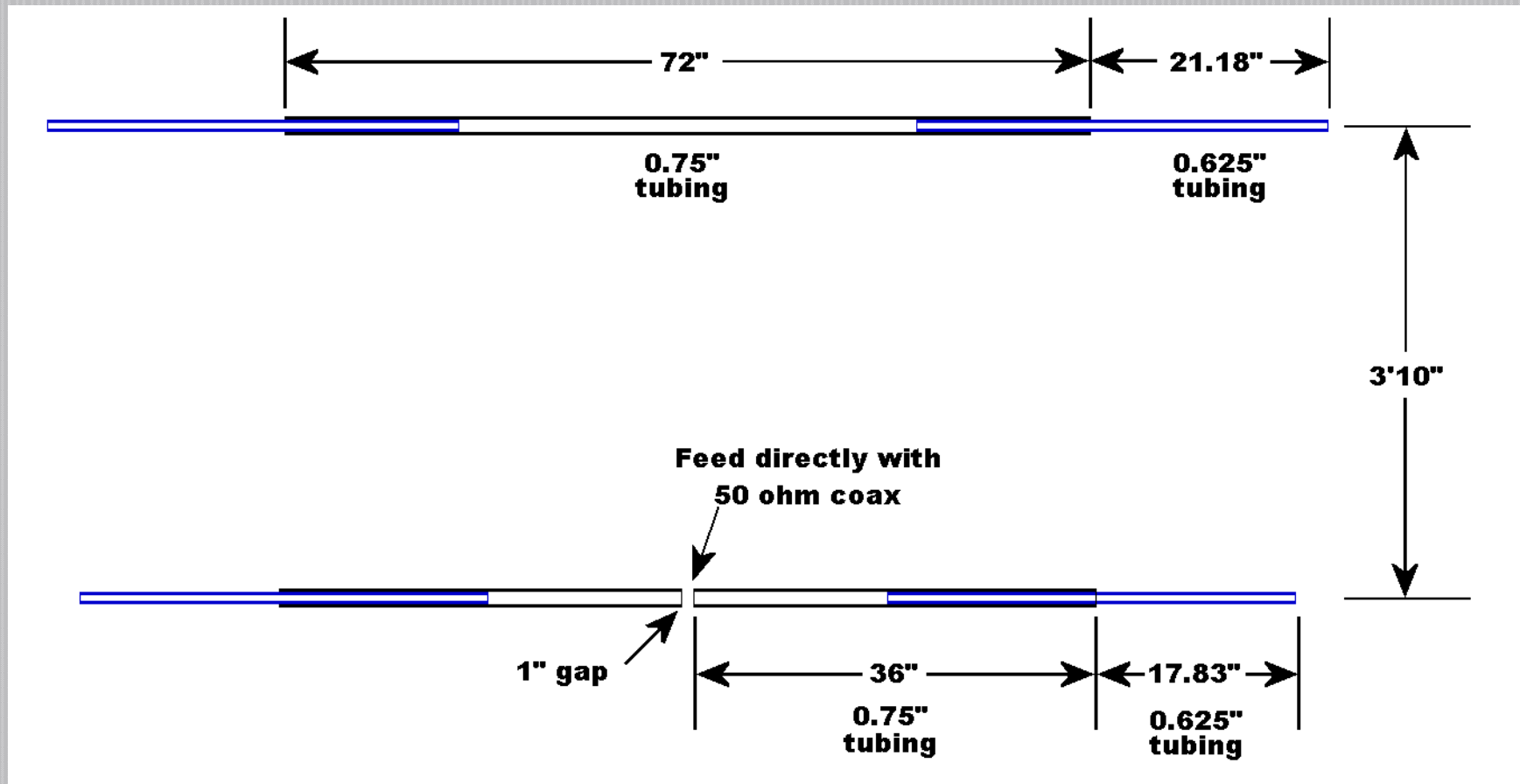
# 6 Meter Antennas - Hentenna



# 6 Meter Antennas – 2 Element beam

- **Quack Beam** – So named because my good friend, **AD5Q** modeled and provided the dimensions for me to build this beam.
- My criteria:
  - Feed directly with **50Ω** coax
  - Elements are insulated from the boom
  - No gamma, “T” matches, hairpin matches, or baluns (well ... a choke balun at feed point).
- Link to my article in reference section

# 6 Meter Antennas – 2 Element beam



# 6 Meter Antennas – 2 element Quad



- I used this quad in DL99.
- Add a reflector  $.12\lambda$  (30") behind the driven loop for an increased gain of **5 to 6 db** (equivalent to a 3 element beam)
- Formulas:  
Driven:  $L_{ft} = 1005/f_{\text{MHz}}$   
**75Ω** Stub:  $L_{ft} = V_f(246/f_{\text{MHz}})$   
Reflector:  $L_{ft} = 1030/f_{\text{MHz}}$

# 6 Meter Antennas - MOXON

- A 2 element beam with the element ends folded in 90° to provide a more compact antenna.
- Photo by KG4JJH
- Check reference section for details



# 6 Meter Antennas – HF Beam Adaptations



# 6 Meter Antennas – HF Beam Adaptations

- You can either home brew or purchase a kit from DX Engineering (\$139) to add up to 3 elements to your HF beam (bolts on the boom, no mods to the HF beam!)
- No additional feed lines are needed
- Original article is in **QST** September 2011 pages 40-42
- Links to article and DX Engineering in reference section; preceding photo is from article



# 6 Meters – Antenna Tips, etc.

- Small –  $1/2\lambda$  dipole at 51 MHz is 9'2" long
- Measure carefully!
- 2" change can shift resonant frequency 1 MHz!
- Easy to hide in strict HOAs
- Not much material thus a low cost antenna
- Minimal tools required to build these antennas
- SWR meter is only test equipment required
- Wide bandwidth due to wavelength-to-conductor ratio

# 6 Meters – Lets do it!

- Pick an antenna.
- *BLOW* the dust off your soldering iron.
- Build it and experiment with it.
- Join the fun of “The Magic Band!”
- At least lets keep WB4AKA busy!

**73 de WA5POK/4**

*Making life easier for VHF operators!*

# 6 Meters – References

- **50 MHz Beacon Map**  
<http://www.k9mu.com/map/>
- **G3USF's Worldwide List Of 50MHz Beacons**  
<http://www.keele.ac.uk/depts/por/50.htm>
- **6 Meters and the Power of the Reverse Beacon Network**  
<http://reversebeacon.blogspot.com/2013/06/6-meters-and-power-of-reverse-beacon.html>
- **Real Time QSO/SWL 50 MHz Map**  
<http://www.dxmaps.com/spots/map.php>
- **Grid Square map**  
<http://www.qsl.net/w0jt/Contests/GridMap-US-MoreDetail.jpg>

# 6 Meters – References

- **Six Meter International Radio Klub – Lots of 6 meter reasources**  
<http://www.dxmaps.com/spots/map.php>
- **Radiowave Propagation Center**  
<http://prop.hfradio.org/>

# 6 Meters – References

- **J pole Antenna Calculator**  
<http://www.hamuniverse.com/jpole.html>
- **Slim Jim Antenna Calculator**  
[http://www.m0ukd.com/Calculators/Slim\\_Jim/](http://www.m0ukd.com/Calculators/Slim_Jim/)
- **Hentenna by Dk7ZB**  
<http://dk7zb.darc.de/Quadlong/Hentenna.htm>
- **The Hentenna Re-visited**  
<http://www.hamuniverse.com/hentenna.html>

# 6 Meters – References

- **6 Meter Quack Beam**  
<http://physicsfiles.com/6%20meter%20Quack%20beam.pdf>
- **Moxon Antenna Project**  
<http://www.moxonantennaproject.com/index.html>
- **6 meter wire Moxon**  
<http://www.nc4fb.org/wordpress/6-meter-moxon-wire-beam-antenna/>
- **A 6 meter Moxon**  
<http://www.kg4jjh.com/6mmoxon.html>

# 6 Meters – References

- **DX Engineering 6 meter 3 element beam add-on kit**

<http://www.dxengineering.com/search/product-line/dx-engineering-w1zr-6-meter-add-on-kits/beam-antenna-add-on-kit-band/6-meters>

- **QST Article**

<http://static.dxengineering.com/pdf/Hallas.pdf>