

What are baluns and how are they used in amateur radio

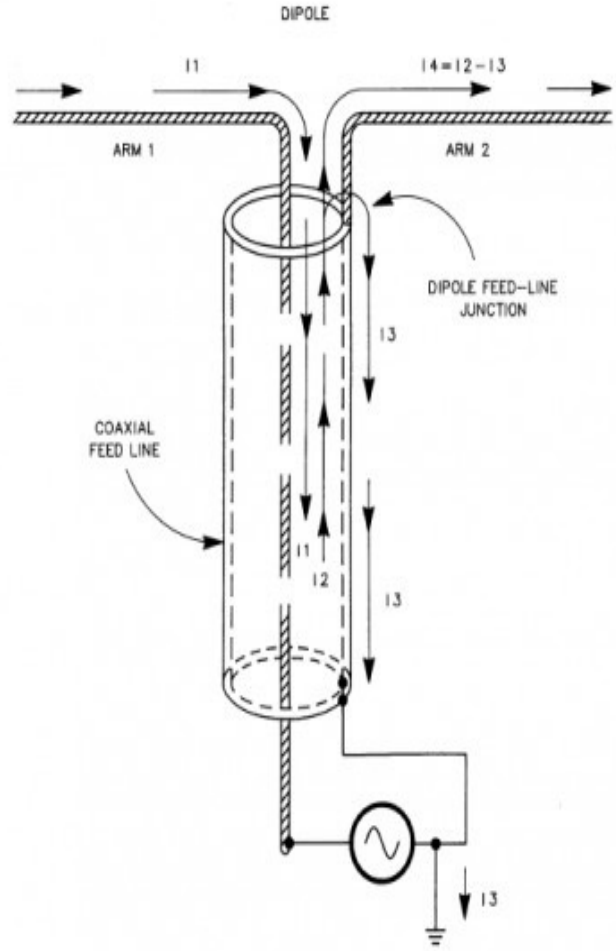
Charlestown Amateur Radio Club

What is a Balun?

- Acronym for **BAL**anced-to-**Un**balanced
- Usually means connecting a balanced load such as a dipole antenna to an unbalanced input such as 50 Ohm coaxial cable
- Shield side of the cable is usually grounded

Why do I need to use a Balun?

- Usually used to feed dipole antennas with 50-ohm coax and to transpose from ladder line feeding a multi-band antenna to the unbalanced input of an antenna tuner
- Primary reason for using a balun at the feed point of a dipole antenna is to prevent RF currents from flowing on the outside of the shield of the coax feeding the antenna (also referred to as common mode currents)
- RF current on the outside of the coax shield causes the shield to radiate causing distortion in the radiation pattern of the antenna and may cause TVI and telephone interference if the coax is passed close to a TV cable or telephone line
- Can also cause “hot mike” problem where the mike shocks one’s lips when touched
- And can cause interference to PC’s and other devices attached to the transmitter



Types of Baluns – Current

- Allow each output terminal's voltage, with respect to "ground" or chassis, to float to any value required to provide equal currents to each feedline conductor
- Work with balanced or unbalanced loads equally well
- Add common-mode isolation between systems connected at each end

Types of Baluns - Voltage

- Always try to force the output terminals to equal voltages
- If the impedance presented at each terminal is not exactly equal, feedline or load currents will not be equal and opposite. This means the feedline will radiate
- Do not provide common-mode isolation
- Almost certainly guarantees some feedline radiation (or reception), because there are very few "perfectly balanced" loads or perfect voltage baluns

Types of Baluns - Recommended

- Current baluns, rather than voltage baluns, should be used whenever possible
- Current baluns provide better balance and often have lower loss
- Current baluns, especially 1:1 ratio baluns, tolerate load impedance and balance variations much better than voltage baluns
- Current baluns can also be used as isolators or un-uns

How are Baluns constructed?

- An ideal balun consists of two wires (primary and secondary) and a core: the current in the primary wire generates a magnetic field in the core, which in turn induces an electric field in the secondary wire

T200Ab2 .wmf
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Balun ratios

- Normally stated from balanced to unbalanced (just as the words appear in the acronym)
- 4:1 balun has four times the balanced impedance as unbalanced impedance.
- 300 ohm twin lead (TV antenna cable) to 75 ohm coaxial cable is an example where 4:1 balun would be used

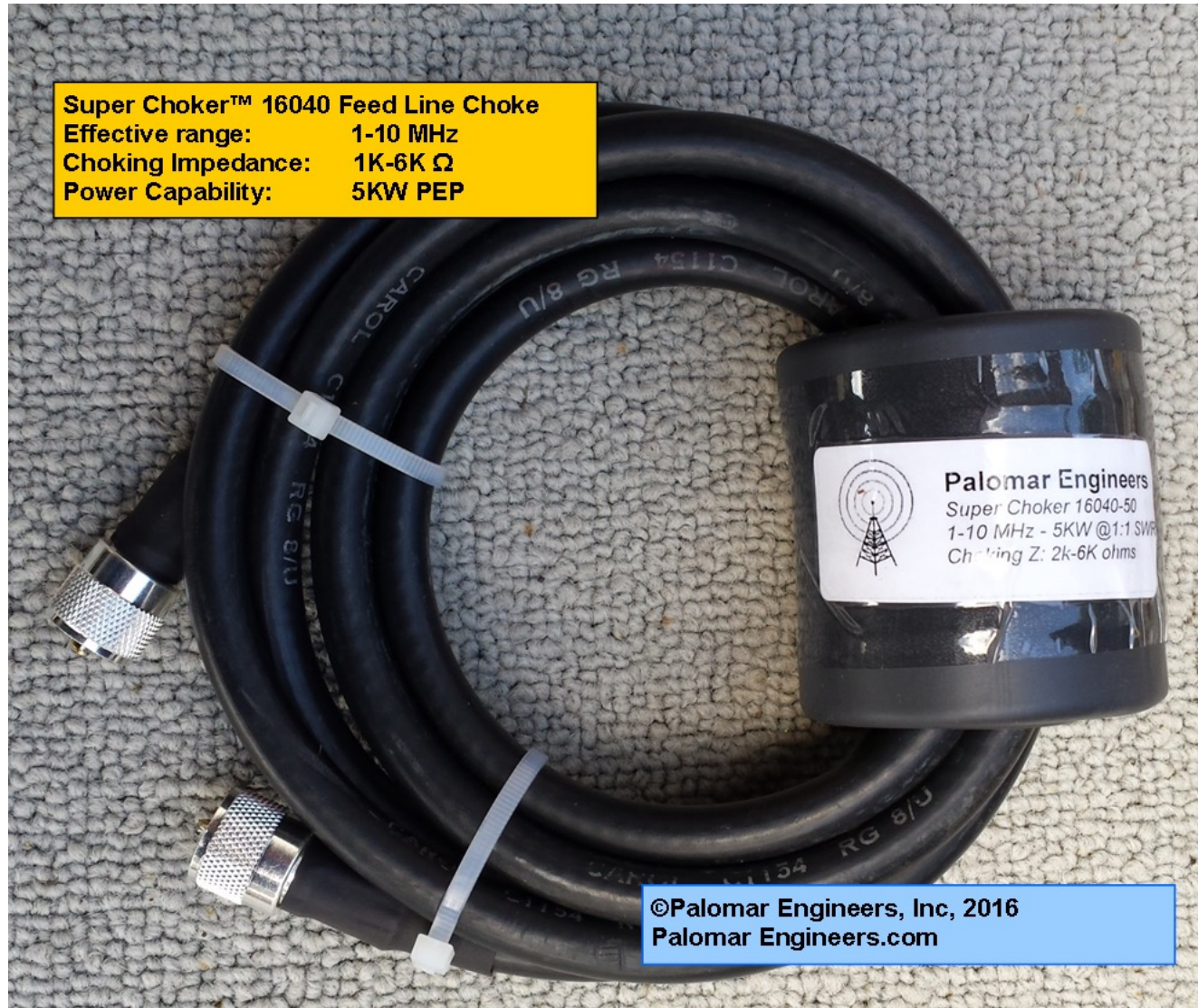
Balun applications

- Half wave dipoles – 1:1 balun
- Windom or off center fed dipoles – 4:1 balun
- End fed half wave – 9:1 balun
- Multiband end fed half wave – 49:1 balun

Other applications - Ununs

- Unbalanced to unbalanced RF transformers typically used with antennas like end fed wires where impedance transformation is required to match the coaxial feeder
- Feed line chokes and impedance transformers can be configured as unbalanced or balanced output each having identical ferrite transformers
- Feed line chokes are configured in box enclosures or in “sleeves” with clip on beads or snap on beads, multiple ring toroids, or encased

Super Choker™ 16040 Feed Line Choke
Effective range: 1-10 MHz
Choking Impedance: 1K-6K Ω
Power Capability: 5KW PEP



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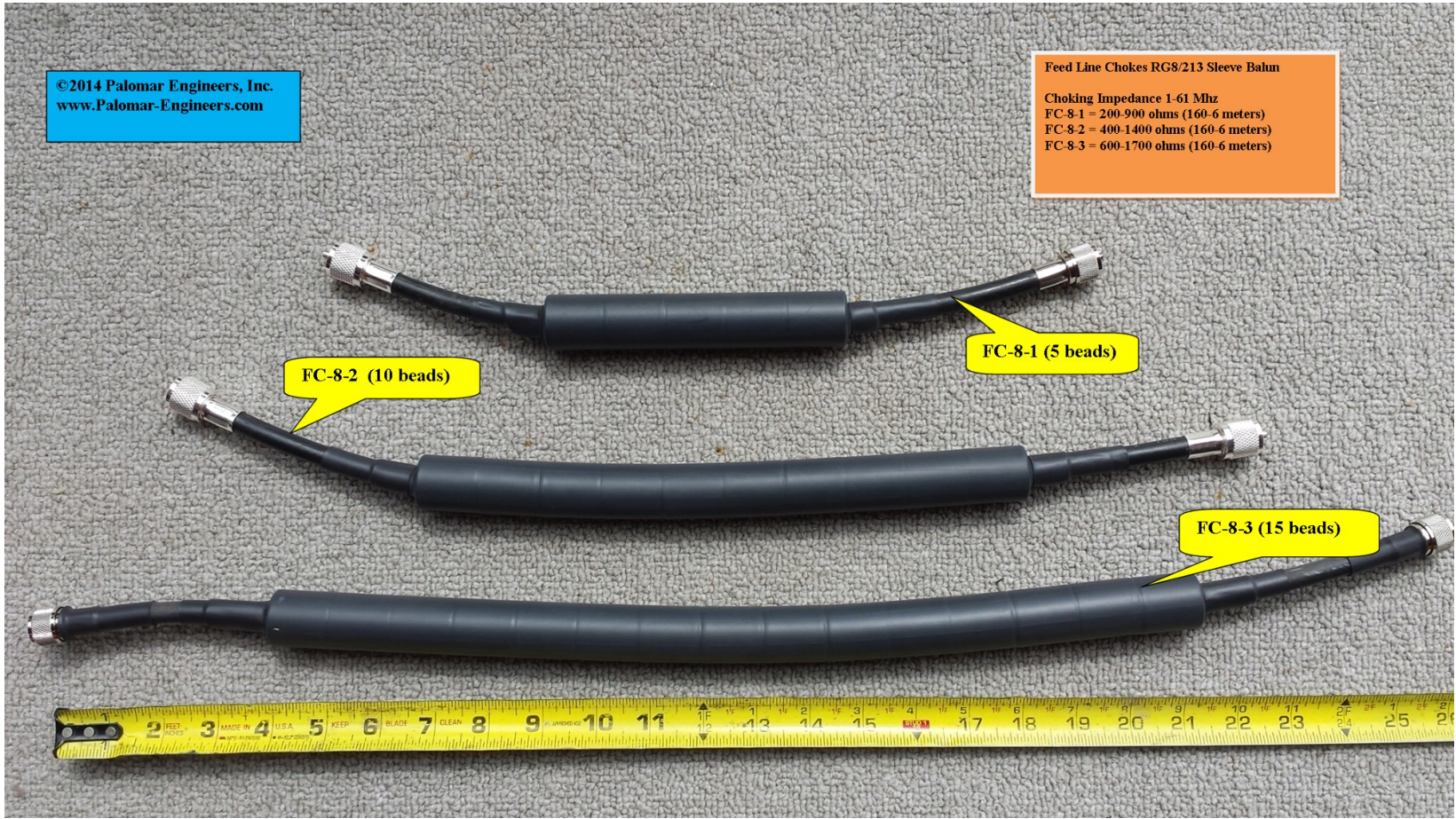
Feed Line Chokes RG8/213 Sleeve Bahm

Choking Impedance 1-61 Mhz
FC-8-1 = 200-900 ohms (160-6 meters)
FC-8-2 = 400-1400 ohms (160-6 meters)
FC-8-3 = 600-1700 ohms (160-6 meters)

FC-8-2 (10 beads)

FC-8-1 (5 beads)

FC-8-3 (15 beads)



Conclusions

- Baluns are used to connect a balanced load to an unbalanced input and prevent common mode current from traveling down the outside of the coax shield causing RFI
- Current baluns provide better common mode current mitigation than voltage baluns
- Balun ratio selection is dependent on the type of antenna and feedline
- Use of a balun will improve reception by filtering out external RFI sources

Sources

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