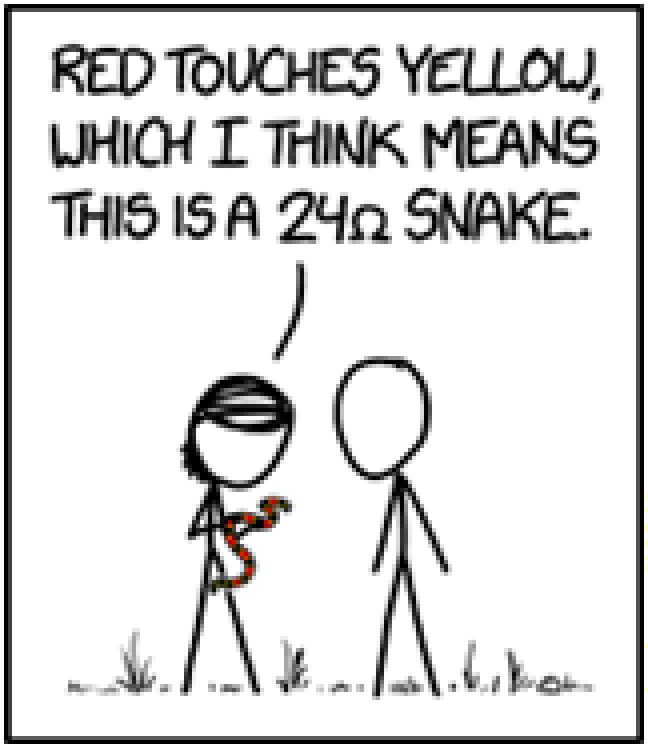
To Balun or not to Balun

You need an RF Choke / Current Balun to turn your ‘Tripole’ into a ‘Dipole’

Presented to DCARC, 2016 Oct 3

Based on: Rich Quick, W4RQ, and Kai Siwiak, KE4PT, “Does Your Antenna Need a Choke or Balun?” *QST* Mar 2017.

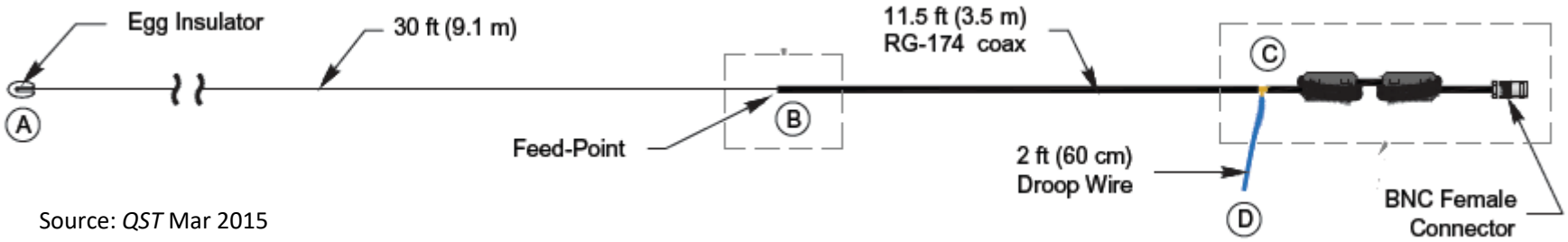


THE LAST BAND OF COLOR INDICATES THE SNAKE'S TOLERANCE FOR BEING HELD BEFORE BITING.

Some Observations

- A Current Balun is a Choke, its sole purpose is to limit Common Mode Current
- A Voltage Balun transforms impedances between balanced and unbalanced ports
- A Voltage Balun may or may not affect CMC

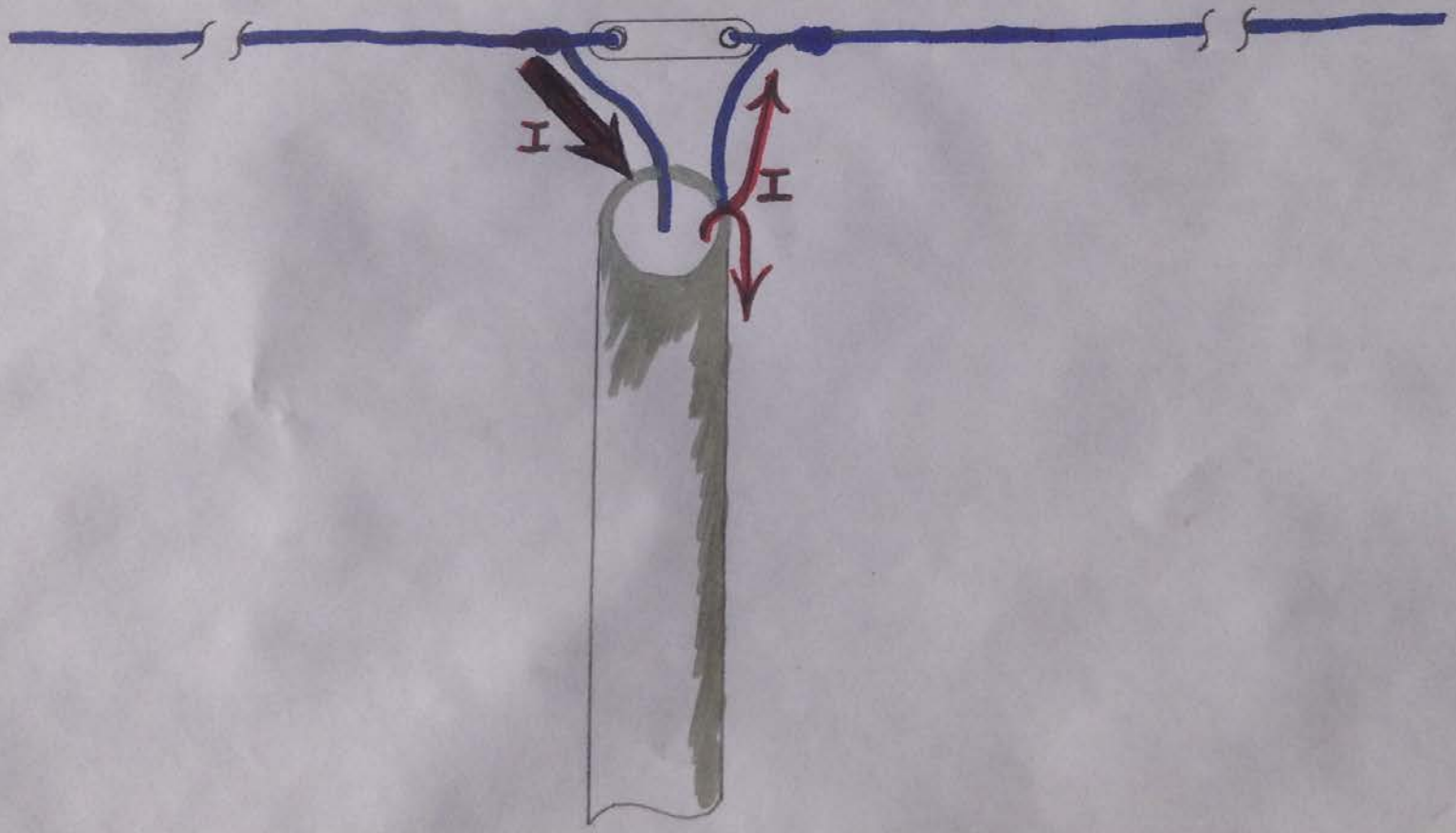
The KE4PT OCEF Dipole:
Part of the Coax Radiates Intentionally



Source: *QST* Mar 2015

radiating extension of coax center conductor, A—B	radiating coax shield, length B—C (or B-C-D)	no radiation after choke

Dipole, or Tripole?

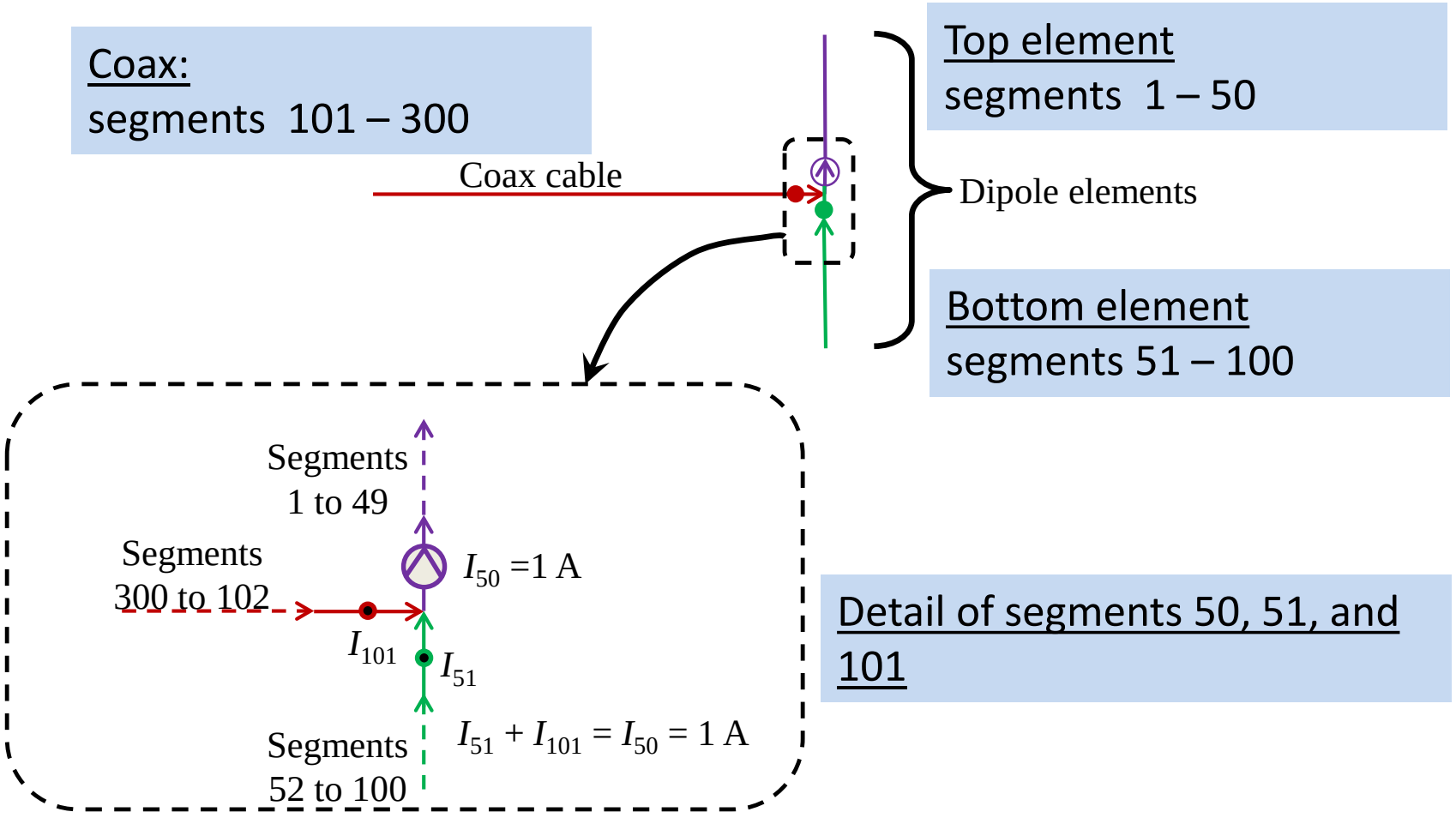


Source: *Rich Quick, W4RQ.*

Dipoles Fed by Coax: The Coax Radiates Unintentionally

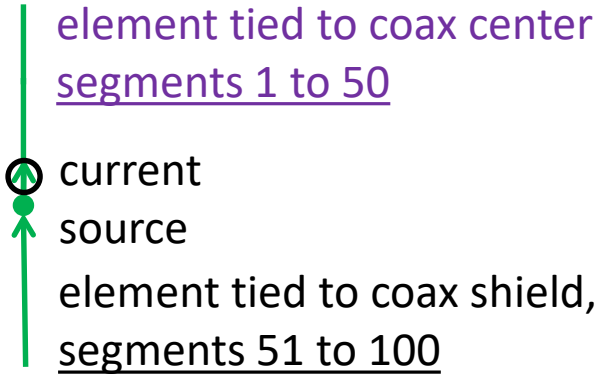
- Kai's OCEF dipole intentionally uses coax as radiator.
- Normally this is unintentional and unwanted
- Feeding with coax cable at the dipole center makes the coax shield a part of the radiator
- As much as 35% of the total power might be radiated by the coax feed line!

Modeled in 4nec2

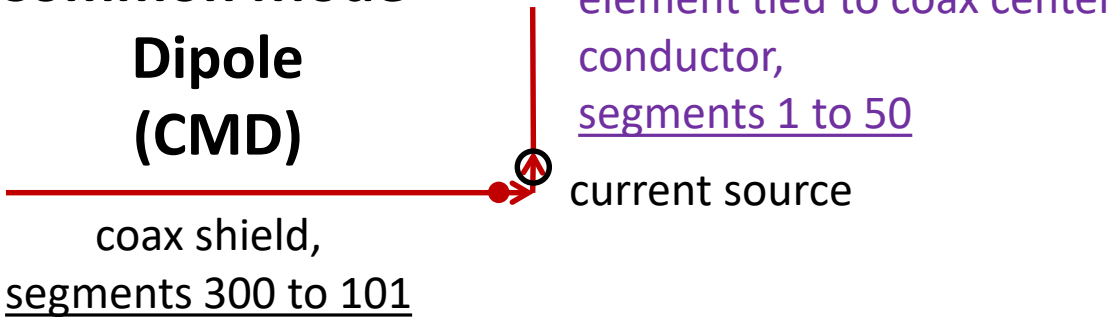


There are Really Two Dipoles that Share One of the Elements!

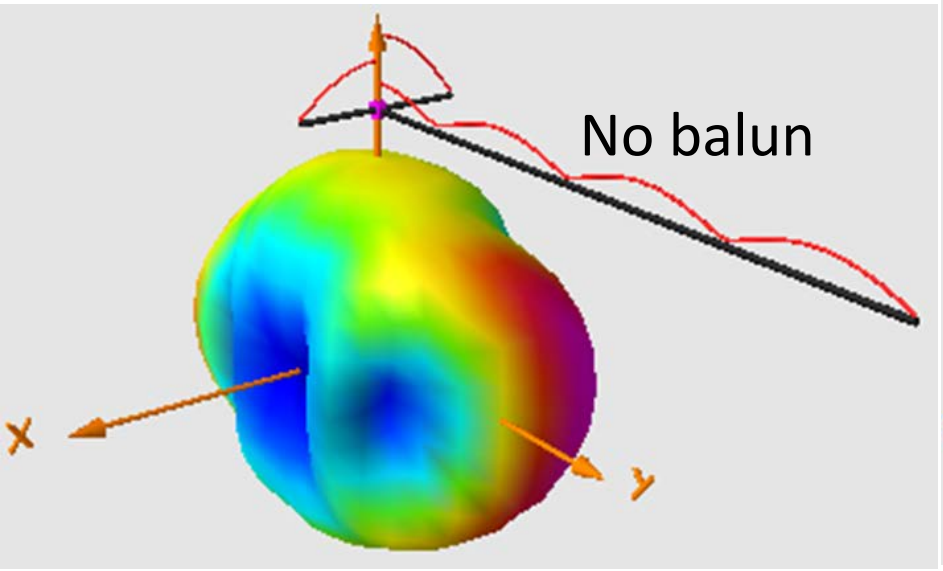
Differential Mode Dipole (DMD)

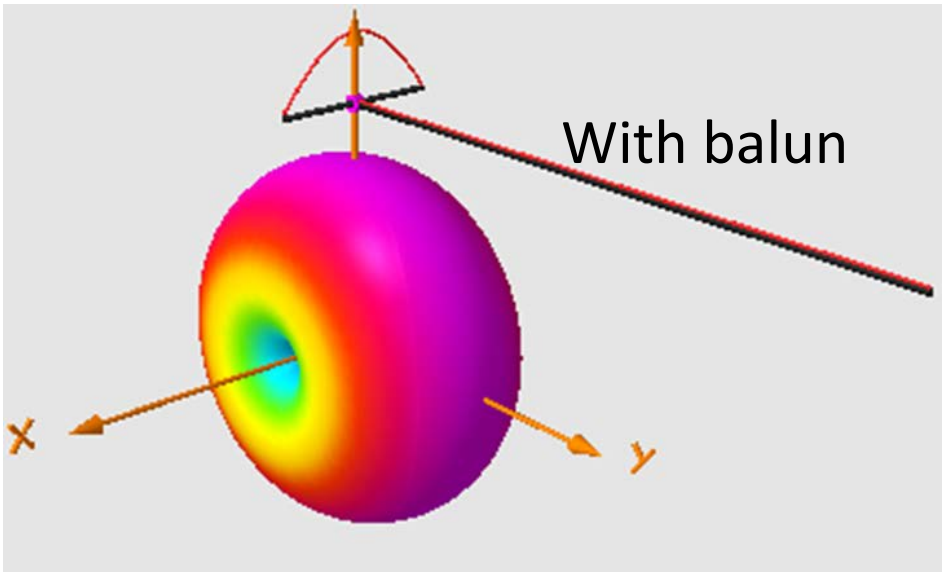


Common Mode Dipole (CMD)



4nec2 Model of Coax-Fed Dipole Shows Currents in Wires

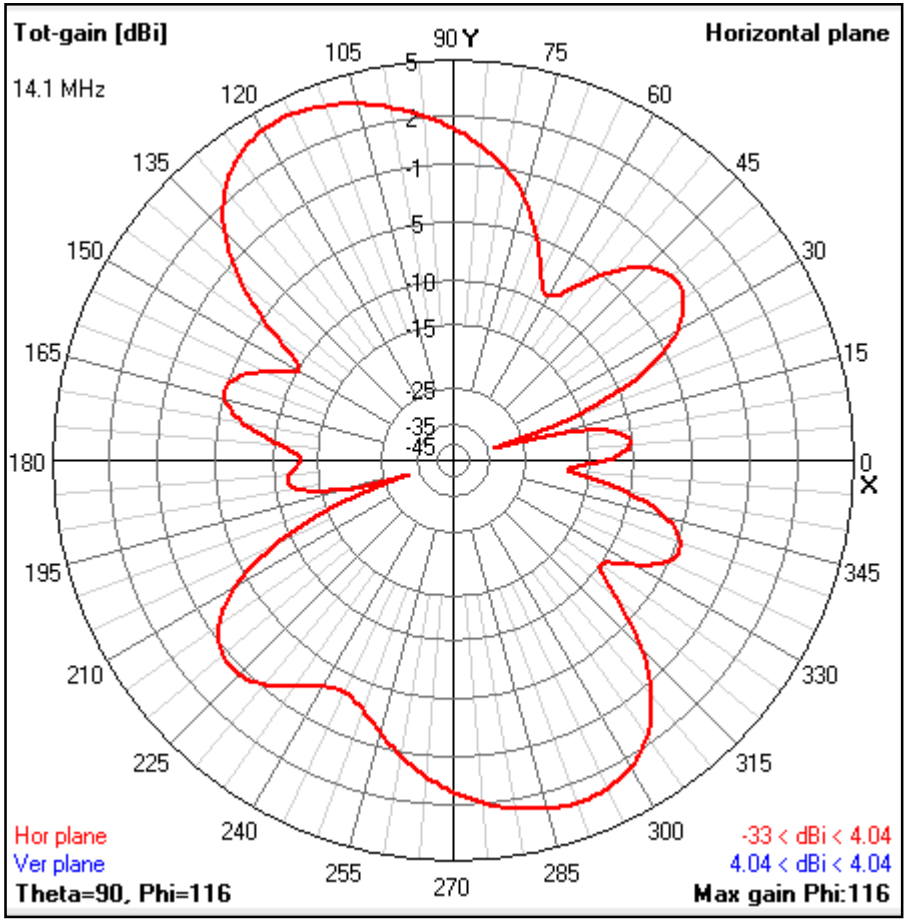




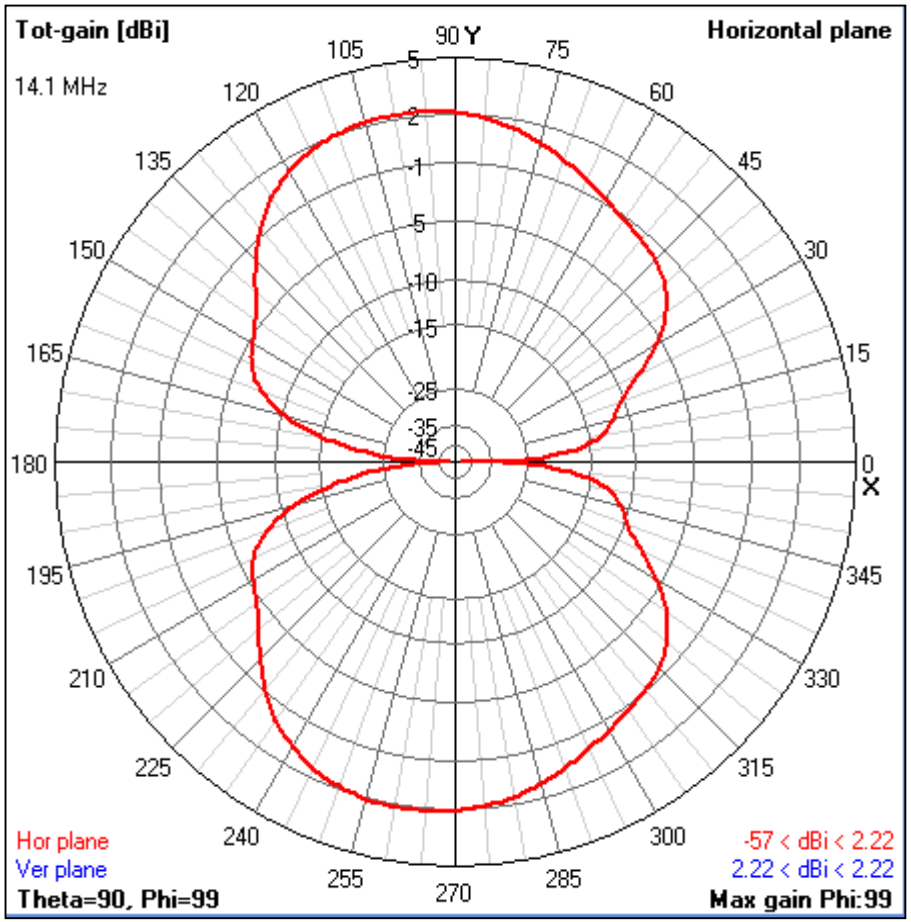
- 3—D pattern for dipole fed by a 1.75 λ coax length, without a choke.
- Worst case: 35% of the total power radiates from the coax shield / common mode dipole.

- 3—D pattern for dipole fed by a 2 λ coax length, or with a choke / balun at the feed point.
- Best case: Less than 2% of power radiates from the coax shield

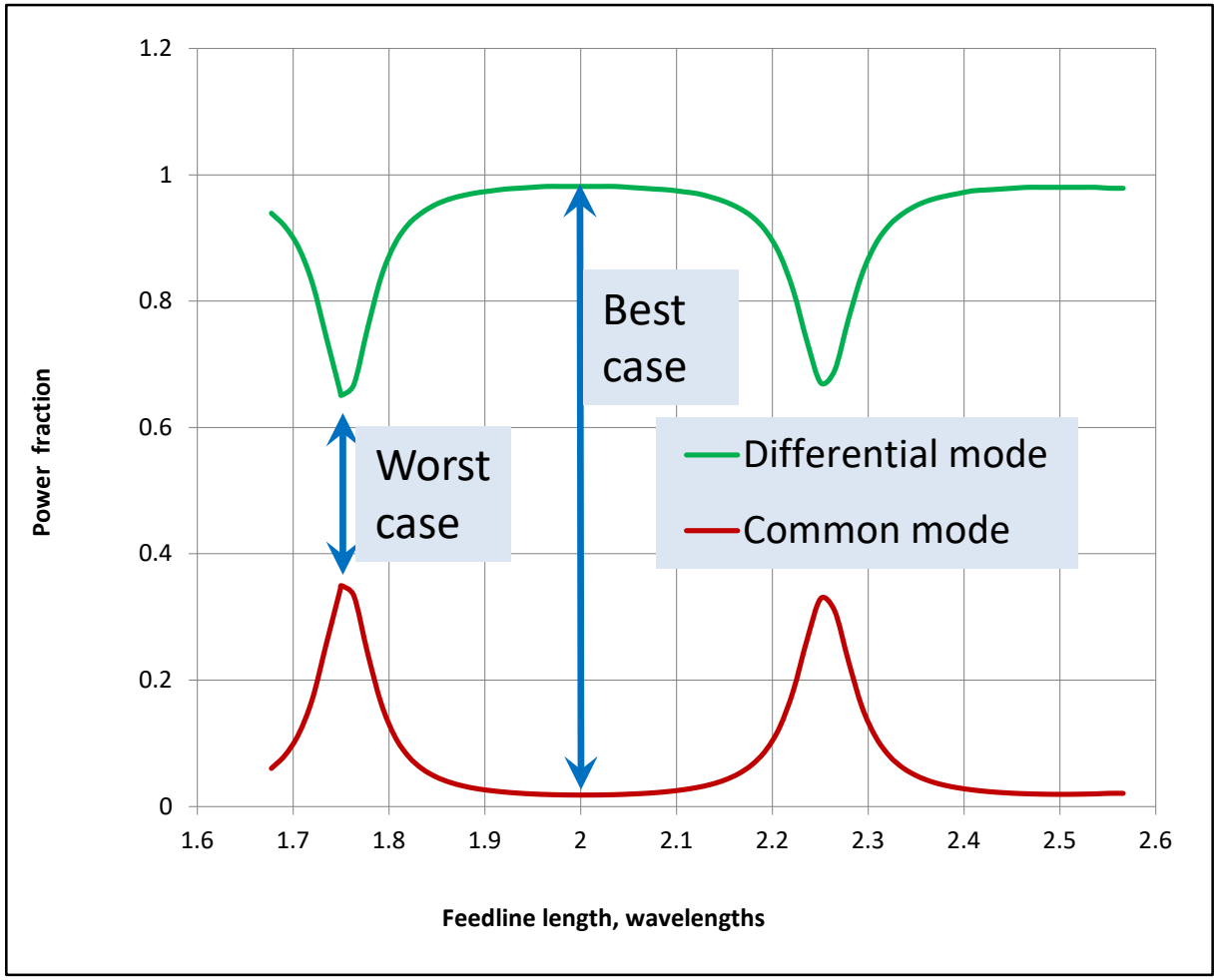
Poorly Choked ‘Tripole’ Pattern



Well Choked Dipole Pattern

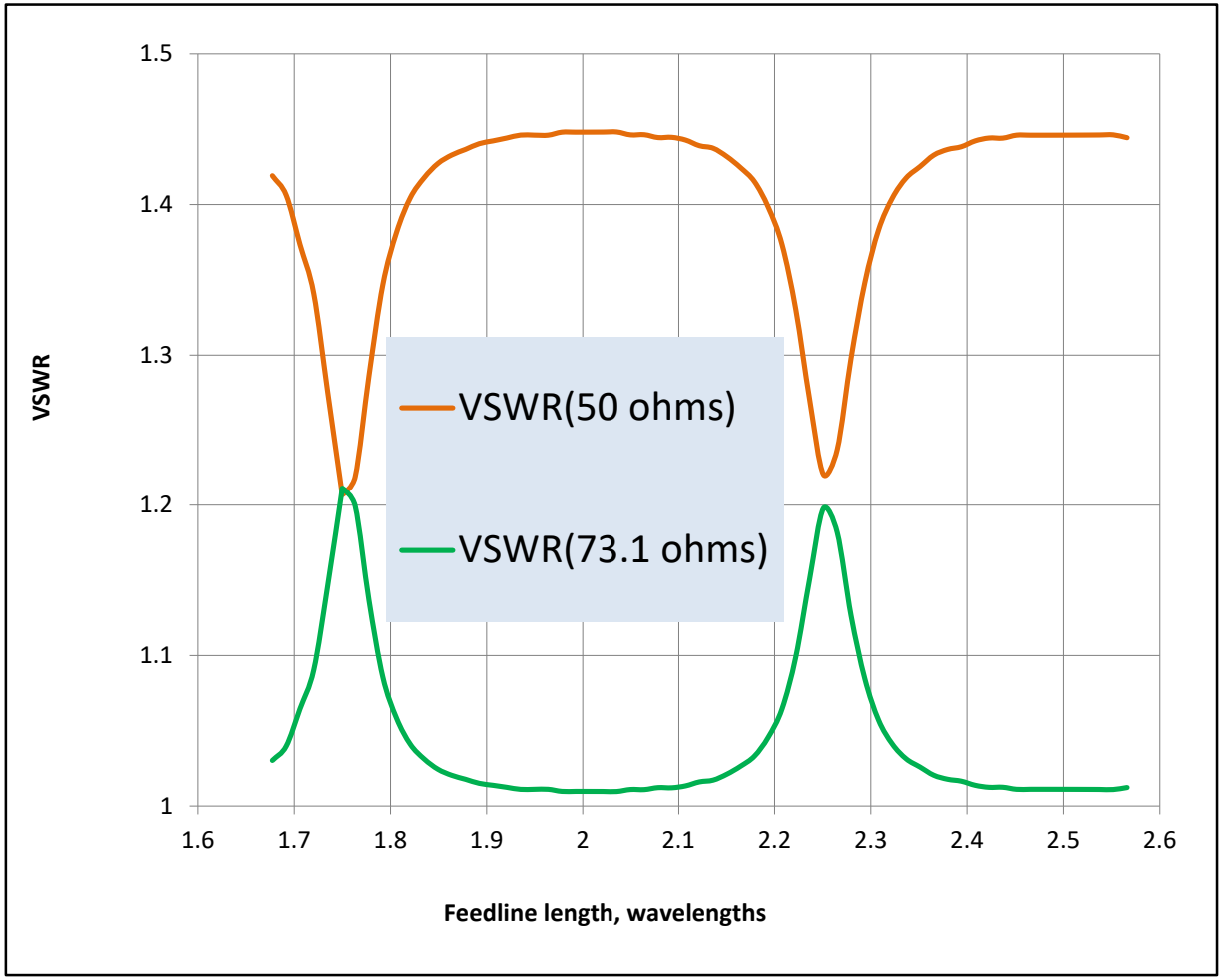


Power Splits Between the DMD and CMD Depending on the Coax Length



- **28% chance that more than 10% of the power is radiated by the coax**
- **Worst case 35% of the power is radiated by the coax**

VSWR Unreliable Indicator of CMC Problem



- **Result depends on how you match the antenna to the transmitter**
- **VSWR might peak or dip at the worst coax length**

Do you need a choke or balun?

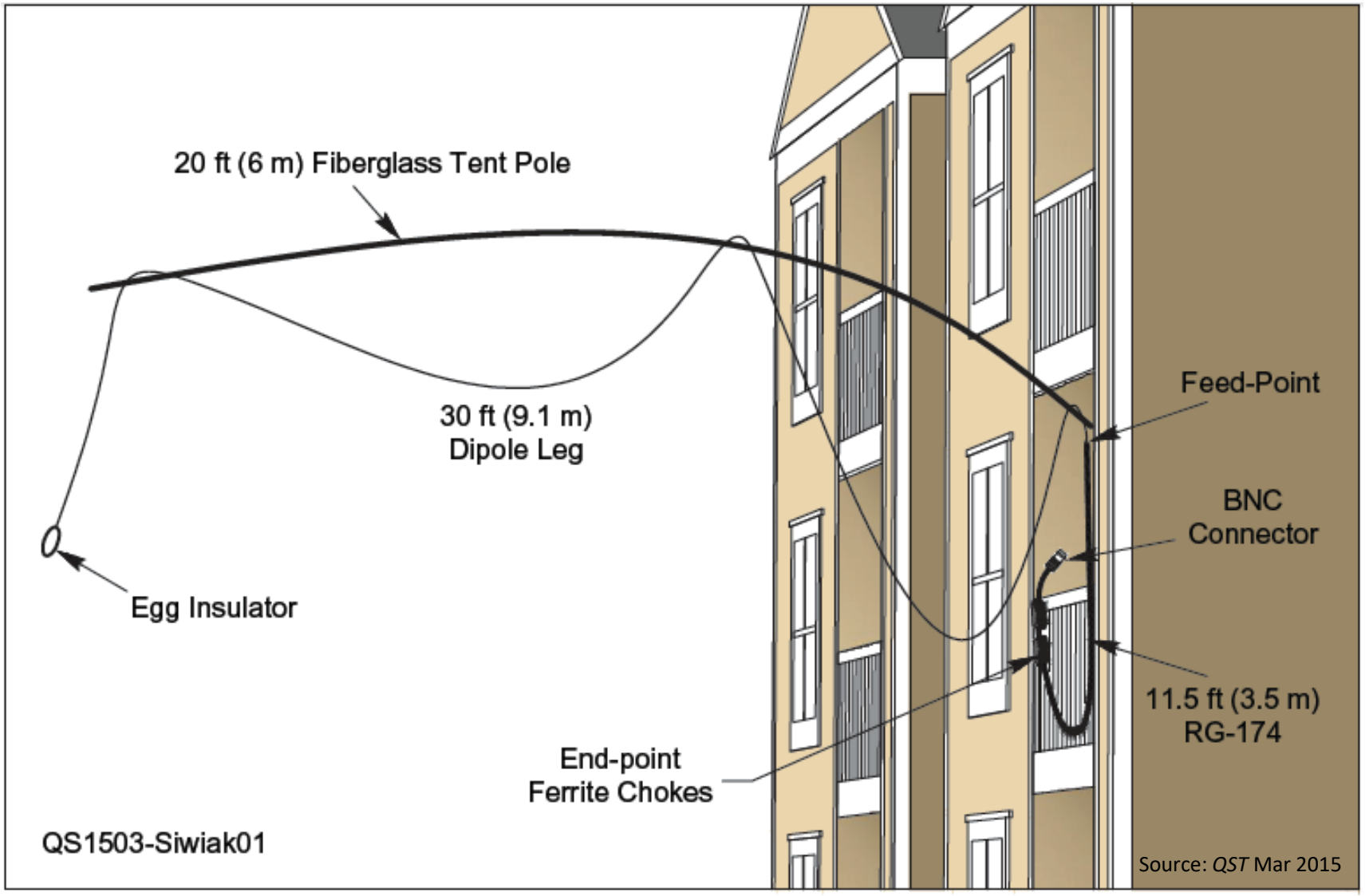
- No, If you don't care about RF in the shack
- No, If you don't care about Common Mode noise reception
- No, If you don't care about your antenna pattern

IF YOU DO CARE: Choke the feed line

USE A DIPOLE, NOT A TRIPOLE!


Dipole:
not Tripole

Extras…



The OCEF dipole relies on radiation from the coax shield up to the chokes. You can droop it from a fiberglass tent pole that is secured to a balcony using bungee cords.