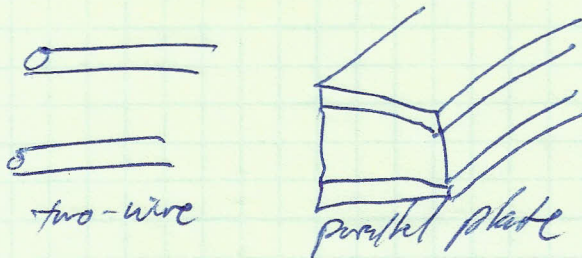


Balanced and Unbalanced Transmission Lines

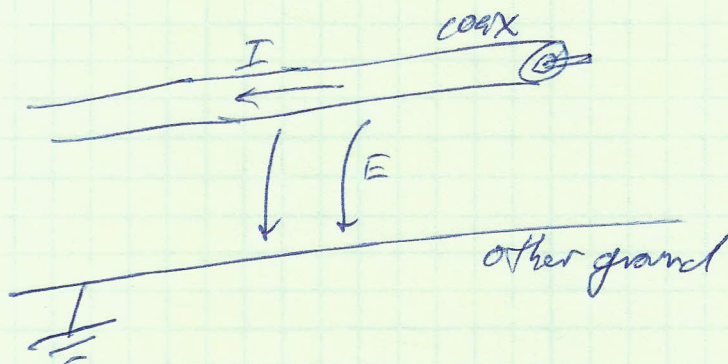
Balanced (Symmetrical)



Unbalanced (Asymmetrical)



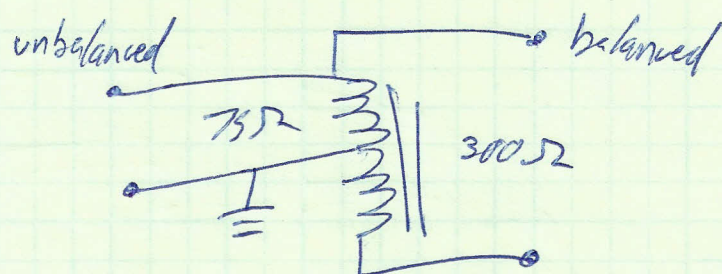
Some unbalanced lines can support other currents that are not part of the normal transmission mode



Balun (Balanced/Unbalanced)

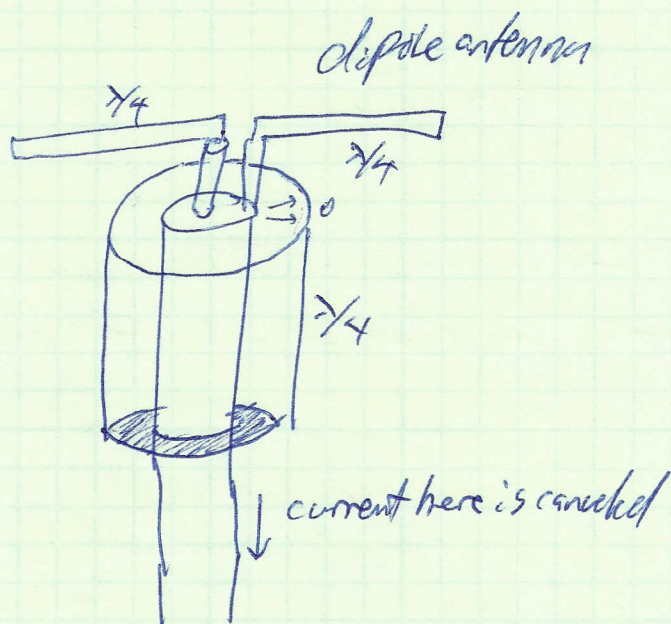
connects balanced to unbalanced line properly

example: 4:1 transformer balun



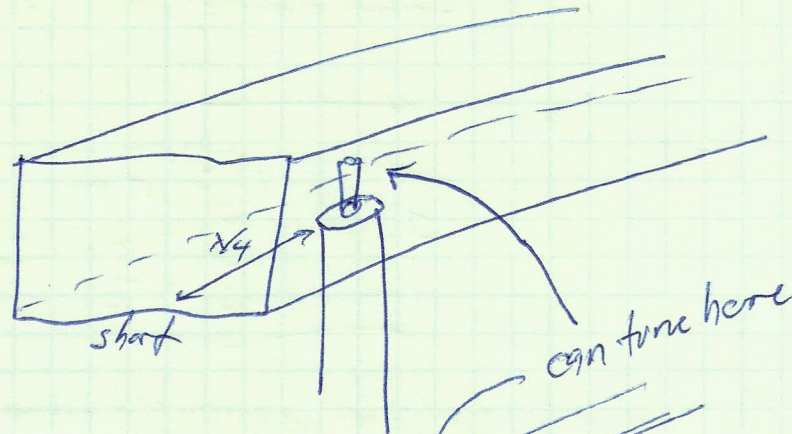
Remember - impedance on each side scales as N^2

example: sleeve or "bazooka" balun

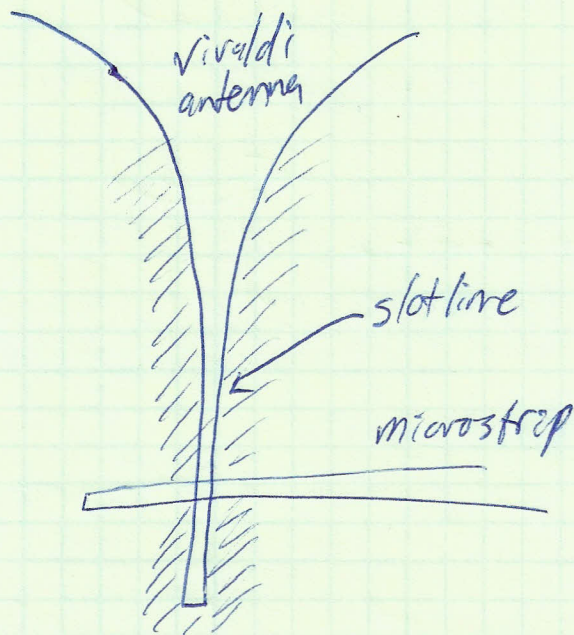
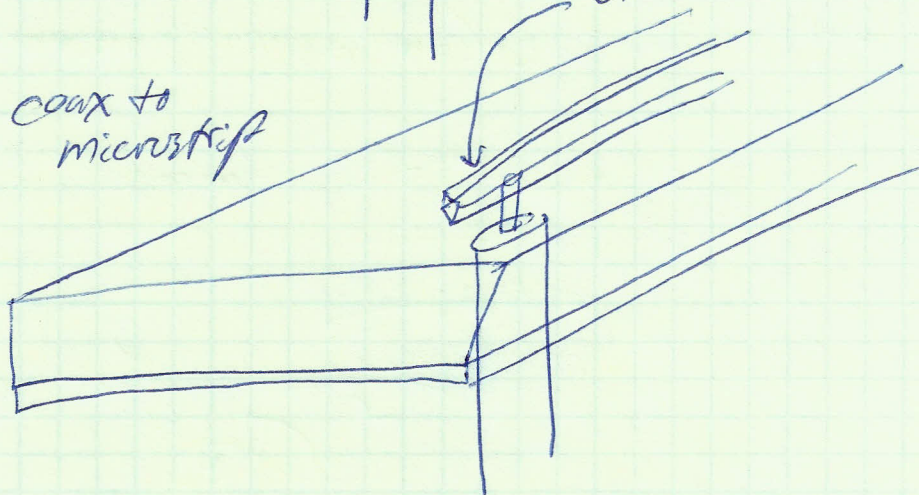


Coupling between different transmission lines

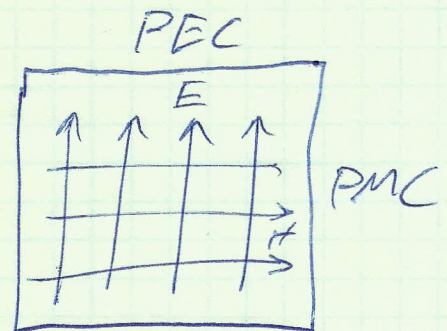
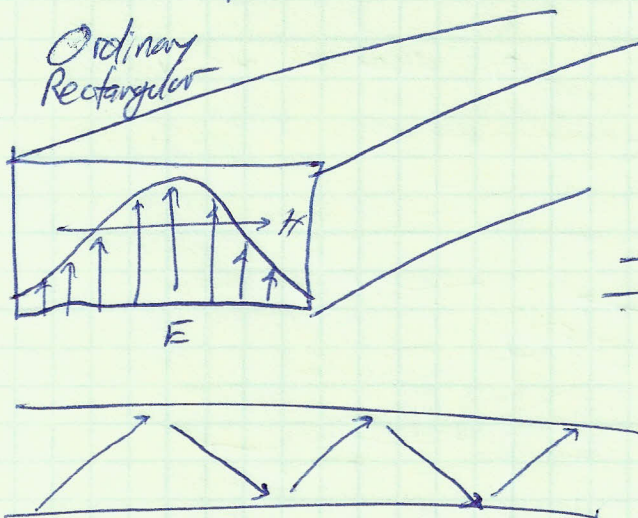
Coax to waveguide



Coax to microstrip



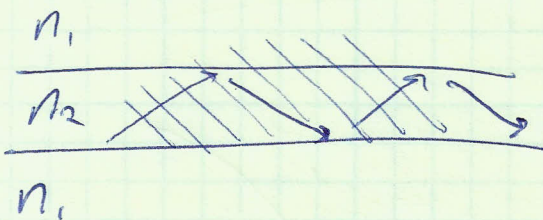
Other types of waveguides



"TEM rectangular"

- Doesn't exist, but can be approximated using AMC surfaces
- Often used in simulations to model section of free space

Dielectric Slab waveguide



Surface waveguide

