



## Technician License Course

### Chapter 4

#### Section 4.4 Practical antenna systems



## Practical Antenna Systems

Our basic antenna : **the Dipole**

$1/2\lambda$  from end-to-end

Used as a reference



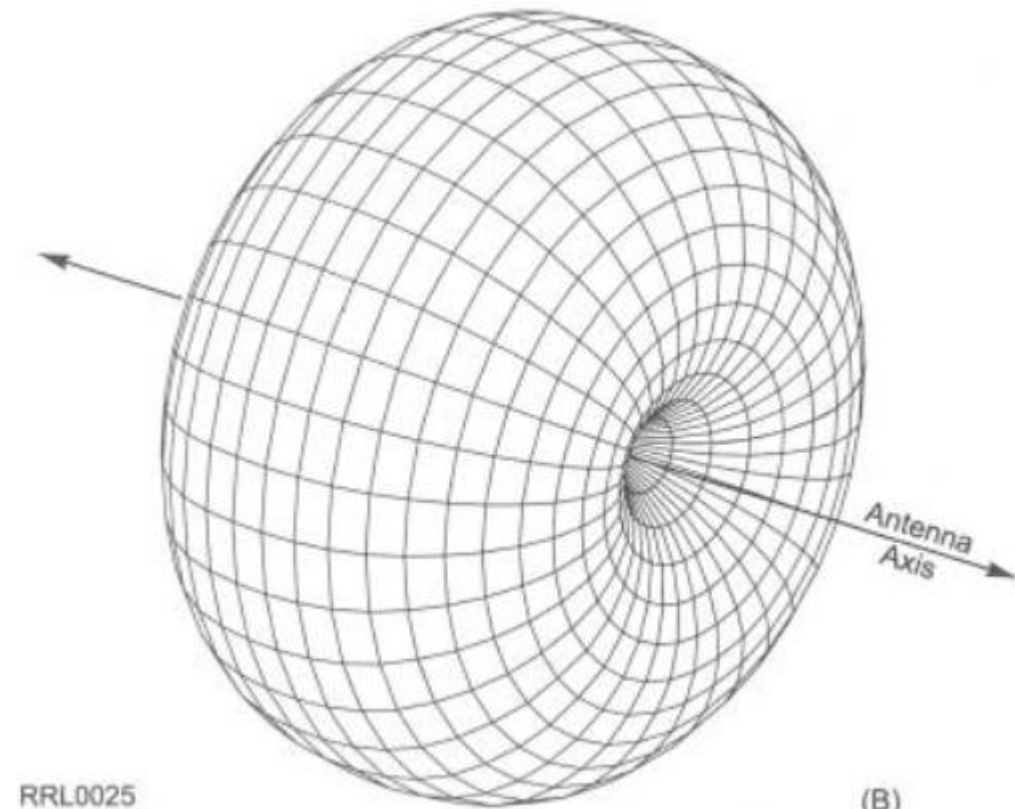


## Dipole radiating pattern

”Donut” shape

Radiates most in right angle from the axis

Nulls along the axis





## Ground plane antenna

Dipole with one side replaced by a "ground plane"

$1/4 \lambda$  long, sometimes  $5/8 \lambda$

Adding a coil allows shortening even more (with some loss)





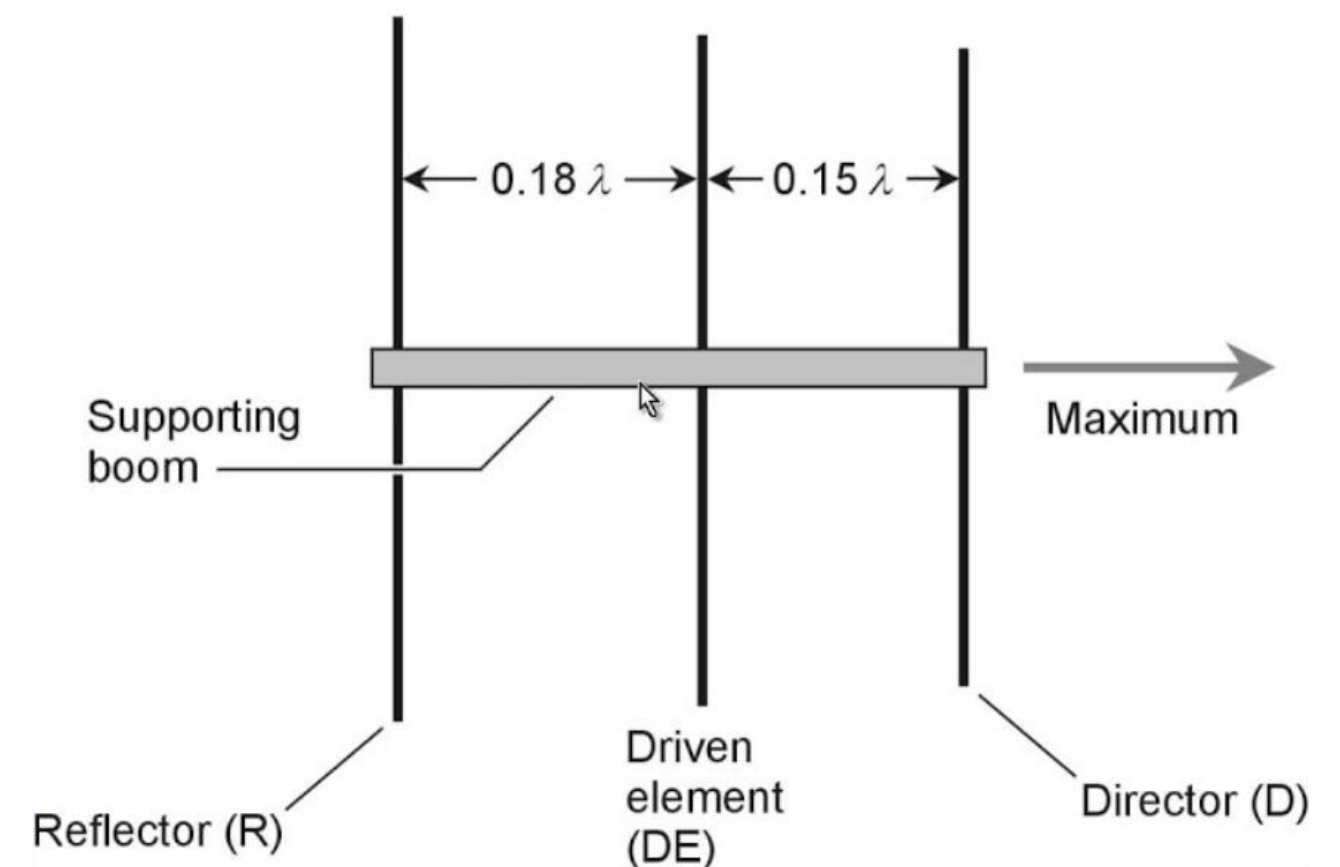
## Directional antennas

Focuses power in one main direction

### - Yagi

Active, driven element

Passive, reflector/director elements



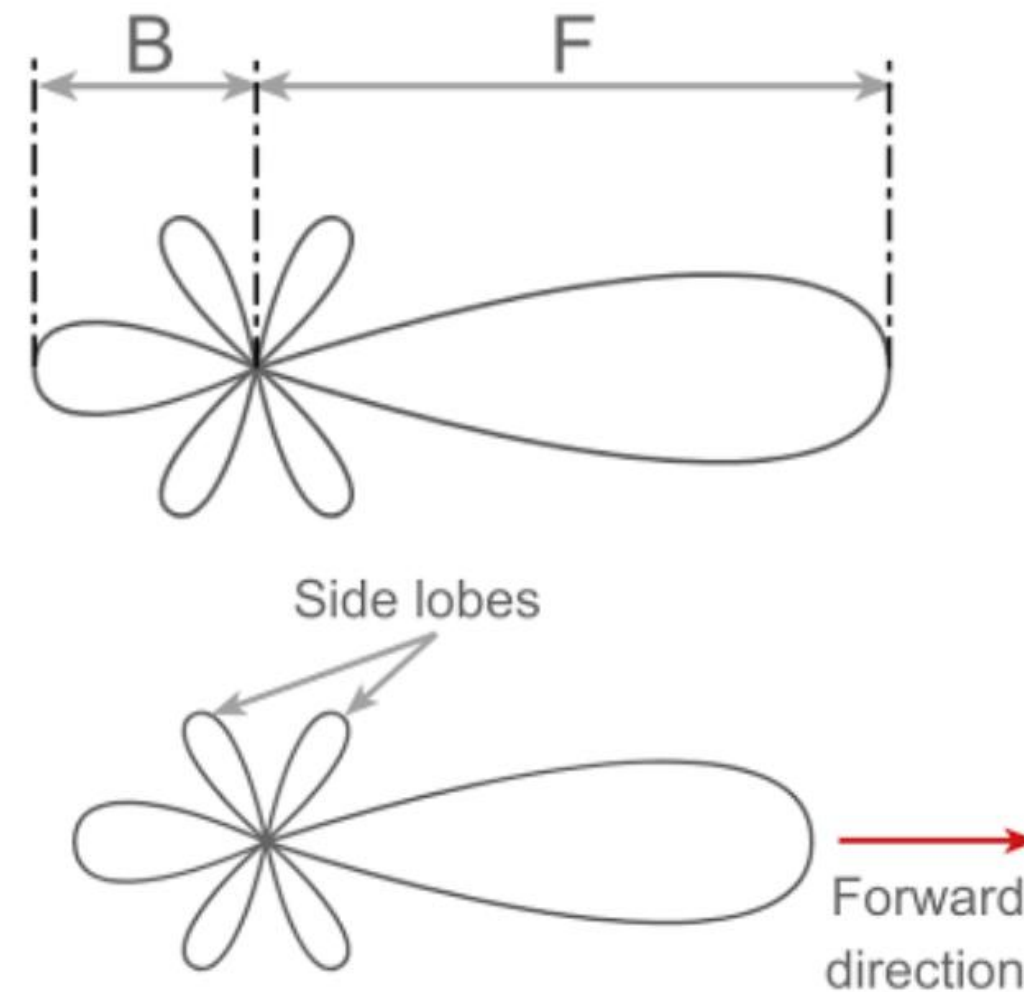


## Directional antennas

”Beam” pattern

Lobes:

- Front
- Back
- Side / Vertical







## Feed lines

Coax - easy to use

Bigger = better (lower loss)

Loss increase with  
higher frequency

TYPE	IMPEDANCE	Loss Per 100' @ 30 MHz	Loss Per 100' @ 150 MHz
RG-6	75	1.4	33
RG-8	50	1.1	2.5
RG-8X	50	2.0	4.5
RG-58	50	2.5	5.6
RG-59	75	1.8	4.1
RG-174	50	4.6	10.3
RG-213	50	1.1	2.5
LMR-400	50	0.7	1.5



## Coax handling

Can run almost anywhere

Degrades if:

- Water gets in
- Jacket is damaged
- Cable is kinked

Avoid nicks/kinks/cuts

Avoid UV light







## Connectors



PL239 / SO239



BNC



SMA



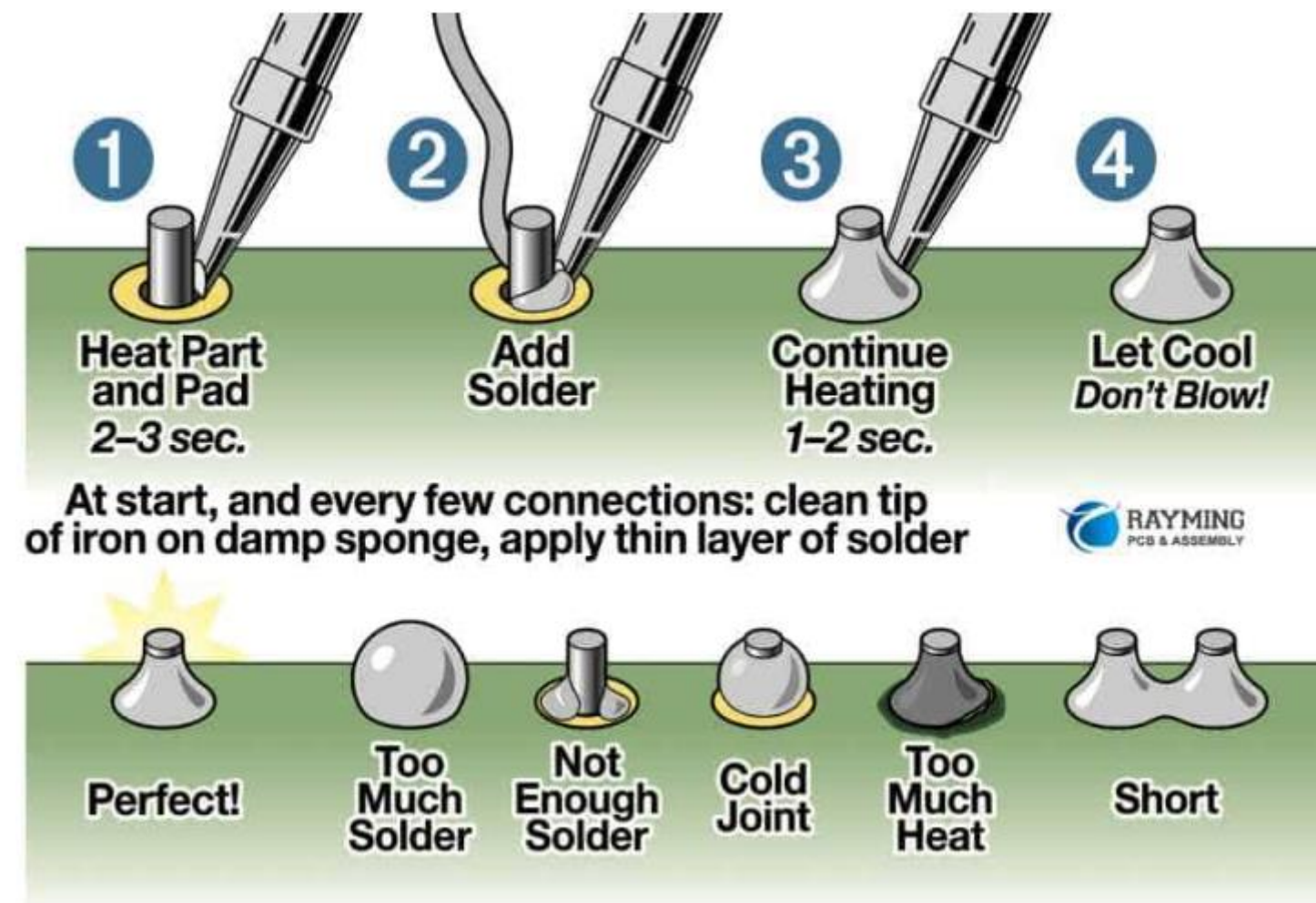
N-Type



## Soldering

### Pro-tips:

- Heat the material (not the solder)
- Let the solder melt against the material
- Use rosin-core solder
- **Avoid acid-core solder**
- Keep tip clean
- Extra rosin works wonders
- Leaded solder is easier to work with
- **“Cold joint” looks dull/lumpy**
- If it smells like chicken, you are holding it wrong





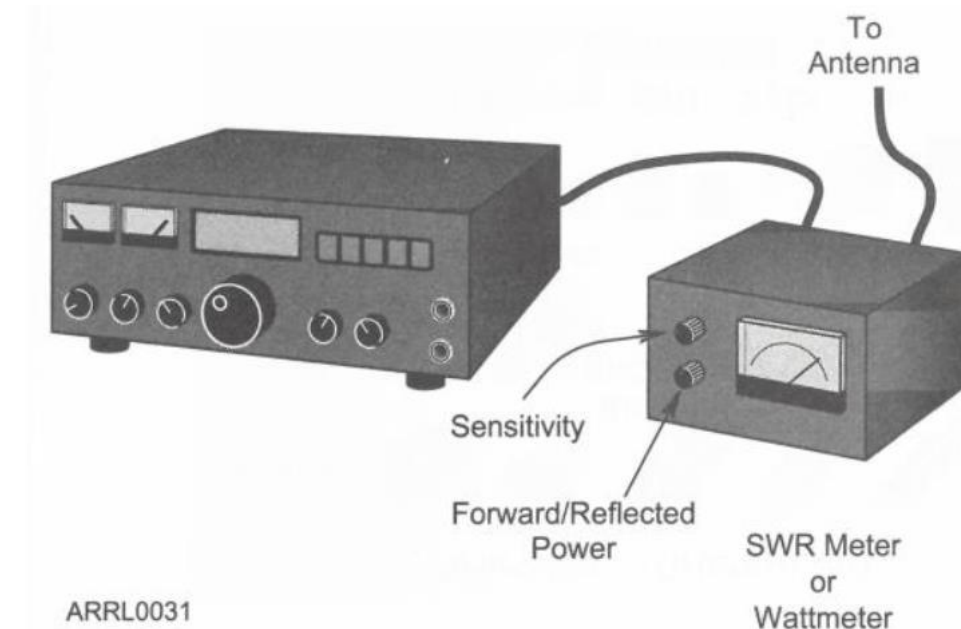
## Metering equipment

### Wattmeter

- Measures power from radio

### Directional wattmeter

- Measures power from radio and also what's being returned
- Can measure "SWR"







## Metering equipment

### Antenna analyzer

- Works without the radio
- SWR
- Impedance
- Coax length
- Find faults





## Matching equipment

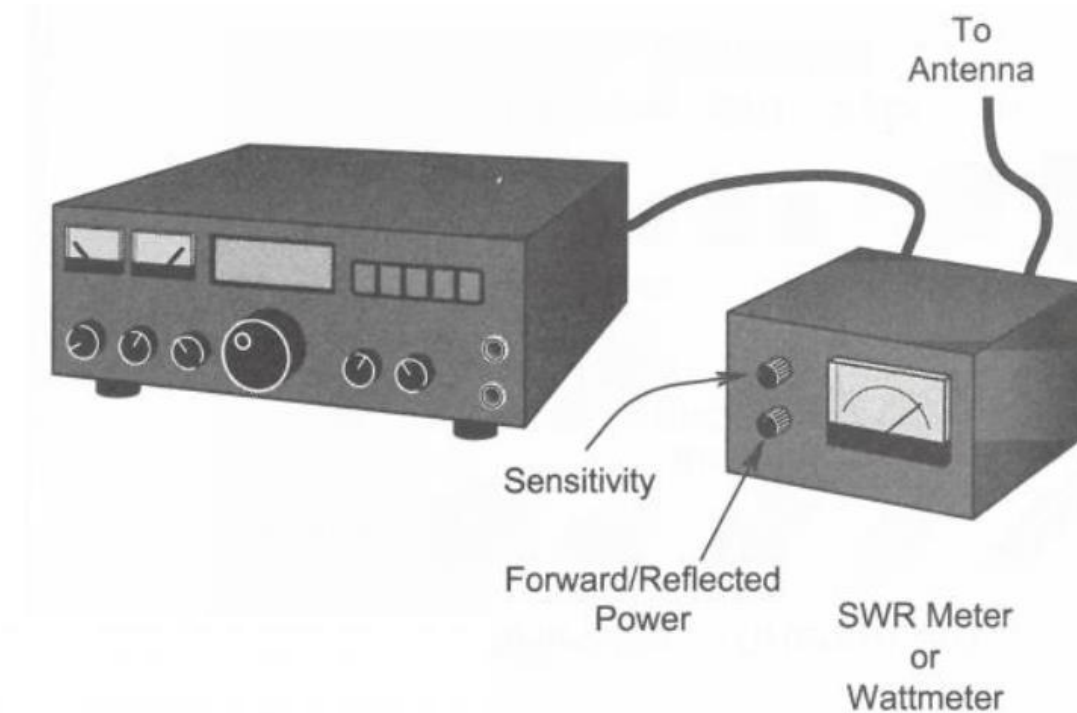
### “Antenna Tuner”

a.k.a Impedance matcher

a.k.a Transmatch

Matches antenna’s impedance  
to that of the radio (50 Ohm)

Helps the radio – not the antenna



# Ham Radio License Course

Discovering the Excitement of Ham Radio



**ARRL** The national association for  
AMATEUR RADIO®

## QUESTIONS