South County ARES

Radio and Antenna Systems

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Presentation Outline

- HTs and attached antennas
- Mobile operation
- Home base stations
- Q & A

How long is an RF cycle ?

- Speed of light 299,792,458 meters/sec
- Frequency is 146.445 MHz (Mcycles/sec)
- Length 1 cycle = m/s / c/s = meters/cycle

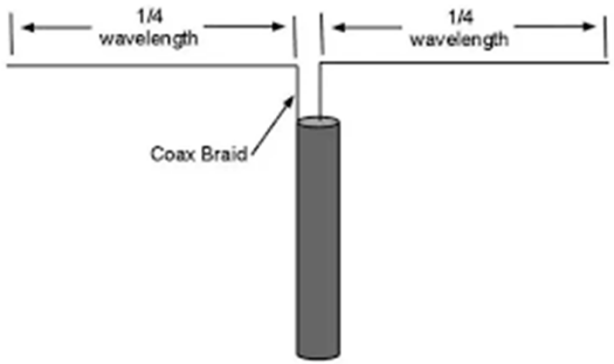
Let's simplify the math

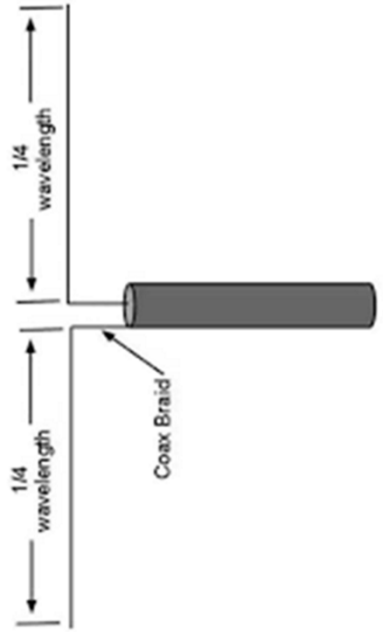
- Speed of light = 300,000,000 meters/sec
- Frequency is 150 MHz (Mcycles/sec)
- Length 1 cycle = m/s / c/s = meters/cycle
- 300,000,000 / 150,000,000 = 2 meters

- 2m = 80.5958 inches = length of 1 cycle

Half wave dipole, the standard resonant antenna

- Half wave at 2 meters is ~40 inches
- Quarter wave at 2 meters is ~20 inches





Baofeng antenna possibilities

- The Baofeng OEM antenna = 6.5 inches
- A quarter wave at 2m is ~ 20 inches
- There is a compromise between convenience and efficiency
- Quarter wave length at 70 cm = 6.5 inches
- Internal components “make” the antenna look longer electrically on 2 m yet allow operation on 70 cm

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Comet GP-15 internals

Dual band antenna options on the Baofeng HT

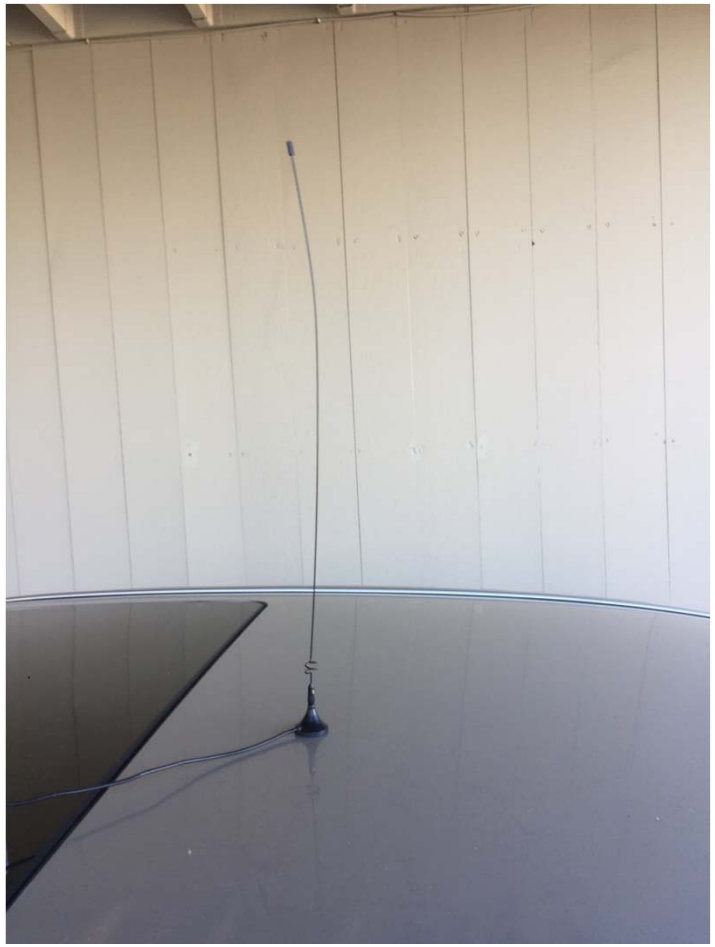
- The antenna connection on the Baofeng is a reverse SMA
- An adapter is an option for conversion
- Possible direct screw-in antennas:

Nagoya	NA-771	$17.00
Diamond	SRJ77CA	$ 25.00
Comet	SMA-24J	$ 25.00

Let's go mobile with the HT

- NC in Redwood City PD can hear a 5 Watt HT on 2 meters using a mag-mount antenna
- Antenna installation: permanent or temporary? Drill a hole, attach mount, use mag-mount
- Vehicle acts as ground plane
- Mount antenna in middle of the roof
- Second option – on the trunk
- Interface to HT – may require adapter
- Use speaker mike for convenience in vehicle

Mobile Antenna Possibilities
Hershey “Kiss”, Larsen 2/70



Taller is better?

- Is 5 watts out, 5 watts out?
- Quarter wave antennas are the baseline
- 5/8 and half-wave gain antennas will focus more energy to the horizon than upward – achieving relative gain

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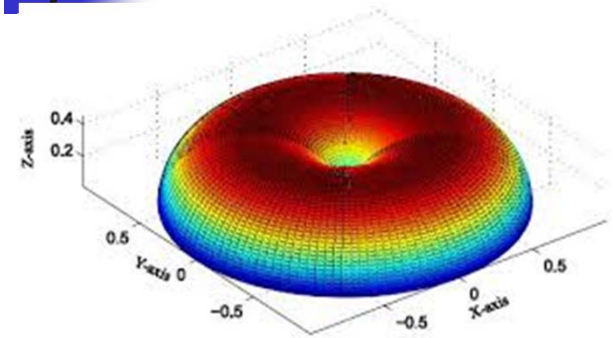
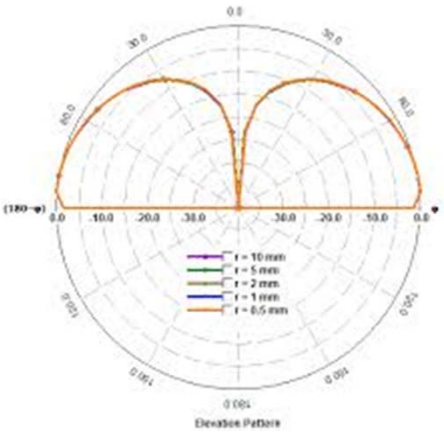
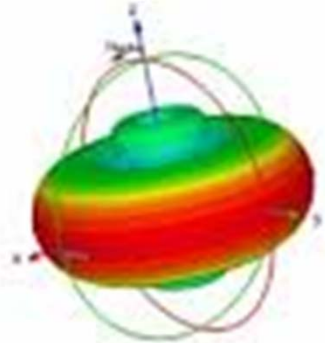
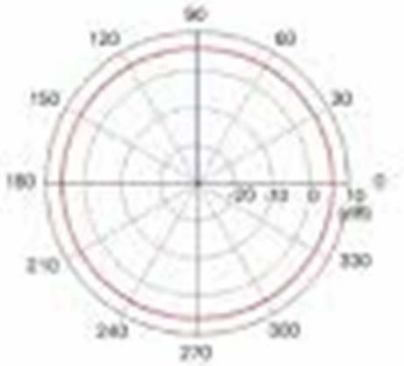
¼ vs 5/8 antenna pattern



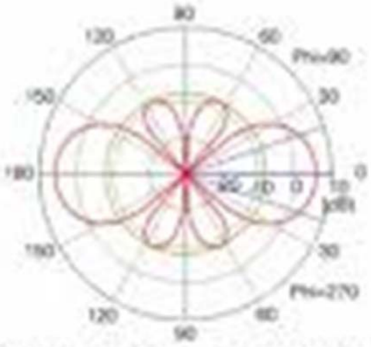




(a) 5.8 dBi Omni 3D Pattern

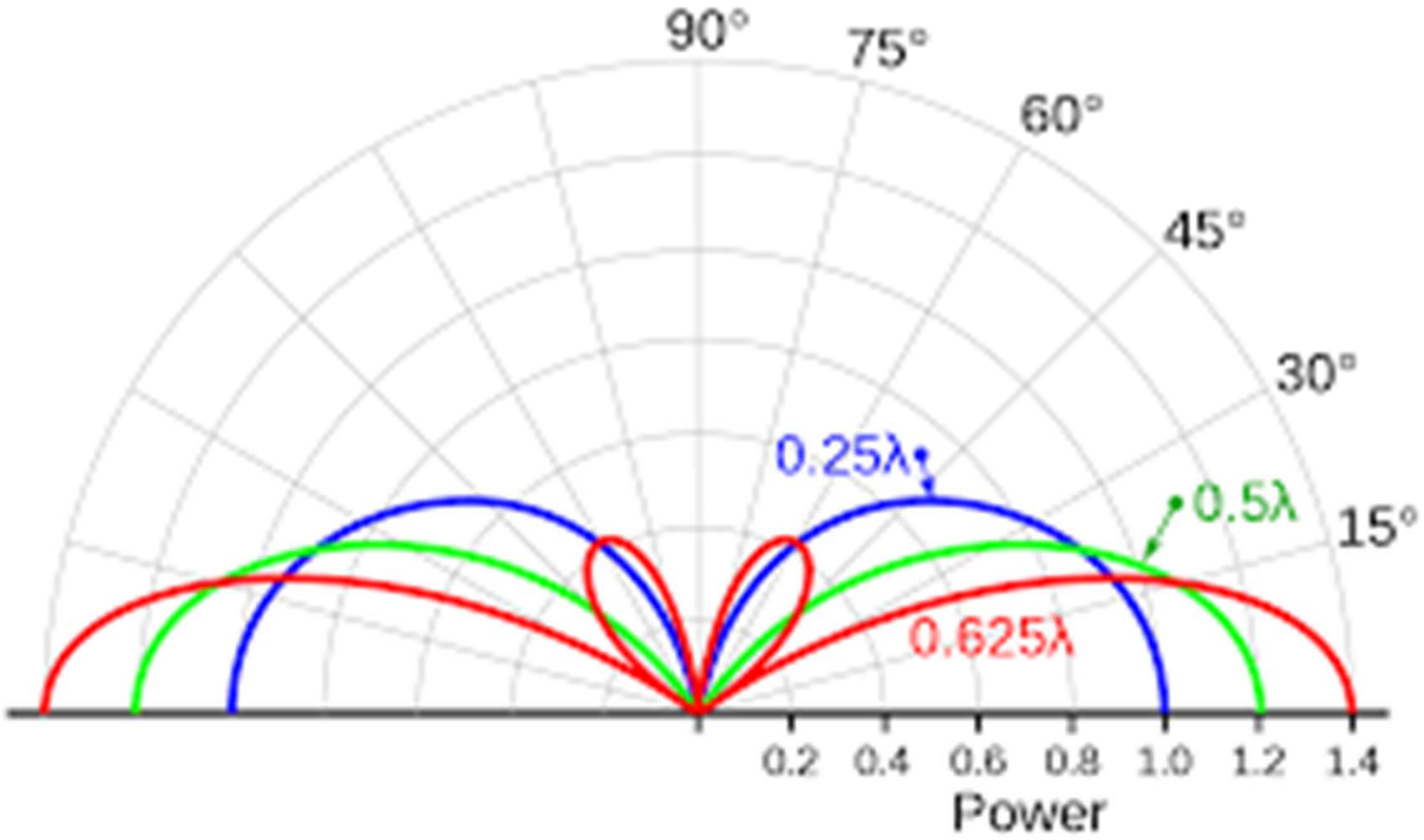


(b) 5.8 dBi Omni Azimuth Plane Pattern



(c) 5.8 dBi Omni Elevation Plane Pattern

¼ vs ½ vs 5/8 antennas



¼ vs ½ vs 5/8

- Ground plane needed for ¼ and 5/8
- ¼ single band only
- ½ easy dual band 2m and 70 cm with reasonable length ~39 inches
- 5/8 no 2 and 70 cm options
- 2m 5/8 will tune on 6m, length ~48”

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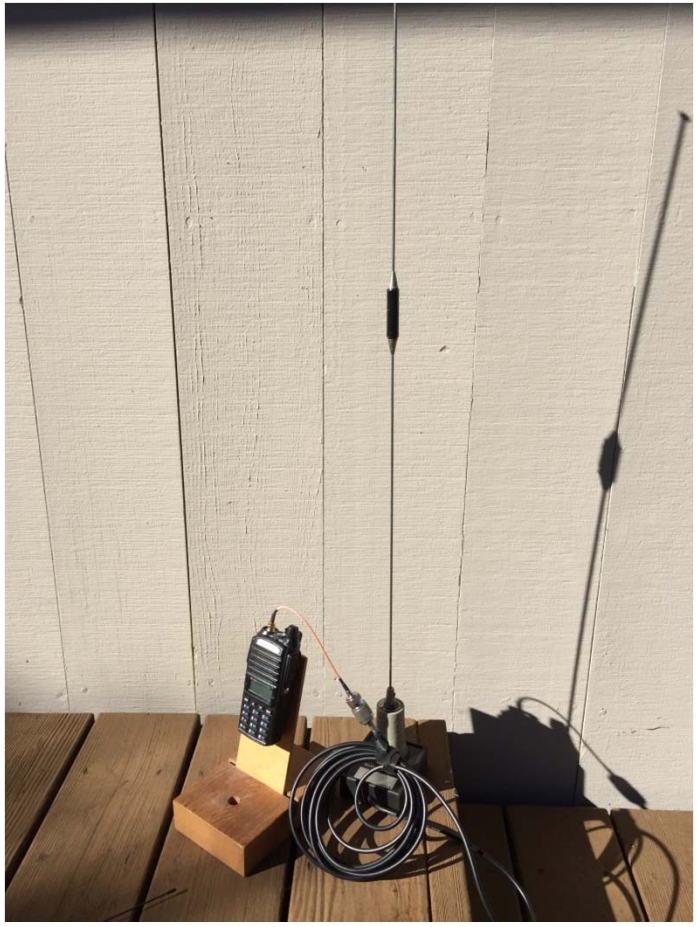
Interface HT to cable



Mobile Radio system

- Instead of HT install a mobile radio
- Dual band radio recommended: 2/70
- Use same vehicle antennas as with HT
- Make sure power handling of antenna is adequate
- 12 Volts supplied by vehicle
- More power, better range, more reliable comms, install securely

Yaesu FT-8900 remote head installation

6/2/70 antenna on mount, note thin cable into trunk

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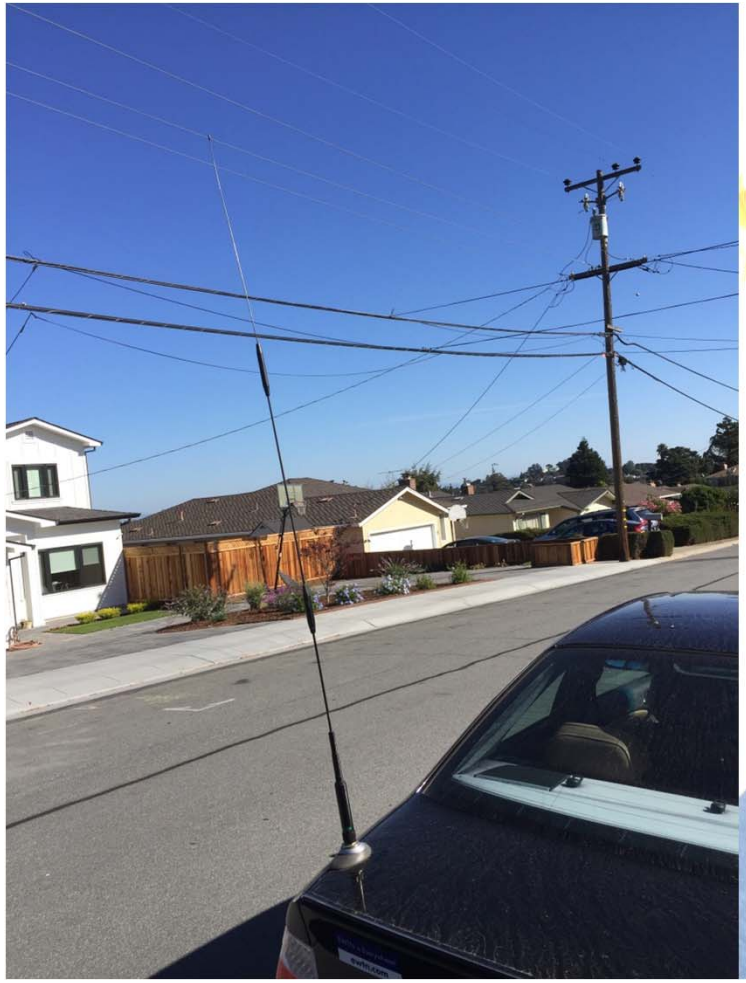

Home Base Station

- A mobile rig is usually used as a base station for its higher power and heat dissipation, longer talk power
- 12V power supply or battery required
- Connect the rig to an external antenna on the roof
- A mag-mount on a metal cabinet works too, check how well it works inside

Yaesu, FT-8100 dual band and 12V Power Supply

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Base dual band antennas

- Diamond X50A 2/70 5.6 ft
- Comet GP-3 2/70 5.9 ft
- Mount antenna high, with no obstructions
- Use low loss quality coax cable
- Buy cable with connectors installed

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Coax loss at 100 ft

	LMR-1200	LMR-900	LMR-600	1/2" Superflex	LMR-400	Belden 9913F7	9914	RG214 RG213	LMR-240	Belden RG8X	LMR-200	LMR-195	RG-58/U
Frequency/Size	1.200"	0.870"	0.590"	0.520"	0.405"	0.405"	0.400"	0.405"	0.240"	0.242"	0.195"	0.195"	0.195"
30 MHz	0.209	0.288	0.421	0.561	0.7	0.8	0.8	1.2	1.3	2.0	1.8	1.8	2.5
50 MHz	0.272	0.374	0.547	0.730	0.9	1.1	1.1	1.6	1.7	2.5	2.3	2.3	3.1
150 MHz	0.481	0.658	0.964	1.29	1.5	1.7	1.7	2.8	3.0	4.7	3.9	4.0	6.2
220 MHz	0.589	0.803	1.18	1.58	1.8	2.1	2.1	3.5	3.7	6.0	4.8	4.8	7.4
450 MHz	0.864	1.17	1.72	2.32	2.7	3.1	3.1	5.2	5.3	8.6	6.9	7.0	10.6
900 MHz	1.27	1.70	2.50	3.41	3.9	4.4	4.5	8.0	7.6	12.8	9.9	9.9	16.5
1,500 MHz	1.69	2.24	3.31	4.57	5.1	6.0			9.9		12.7	12.9	

External Antennas

- Waterproof connections with tape, wrap bottom up, so layered tape acts like roof shingles shedding water
- Provide service loops and drip loops
- Provide lightning protection, DC grounding

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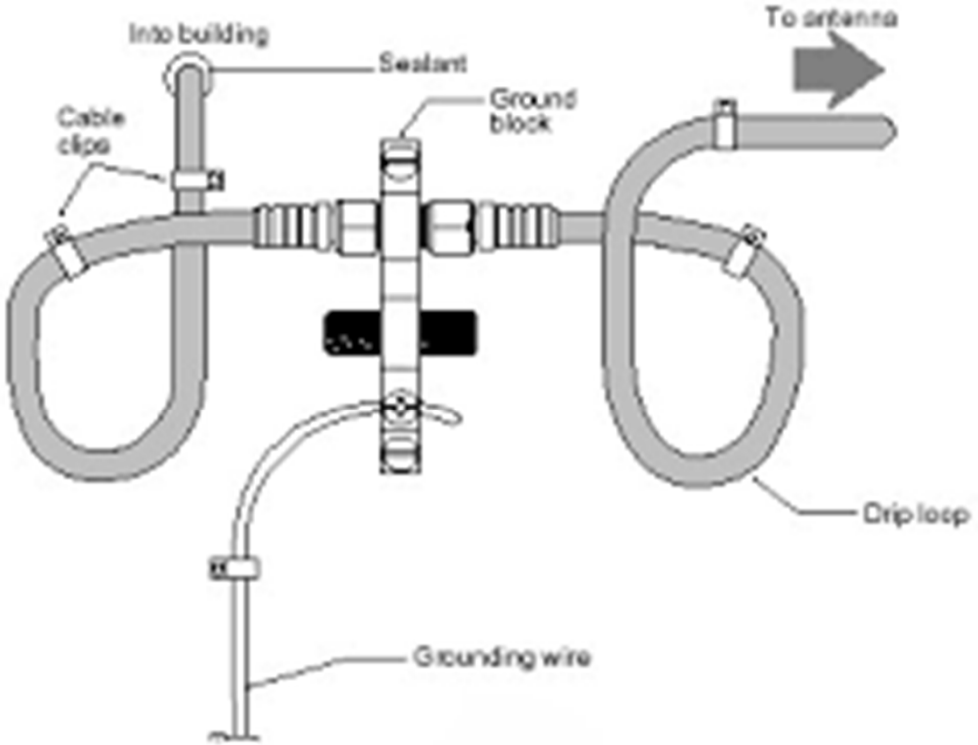
Service Loop, Drip Loop

Grounding, lightning protection



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Q & A

- Over – to you