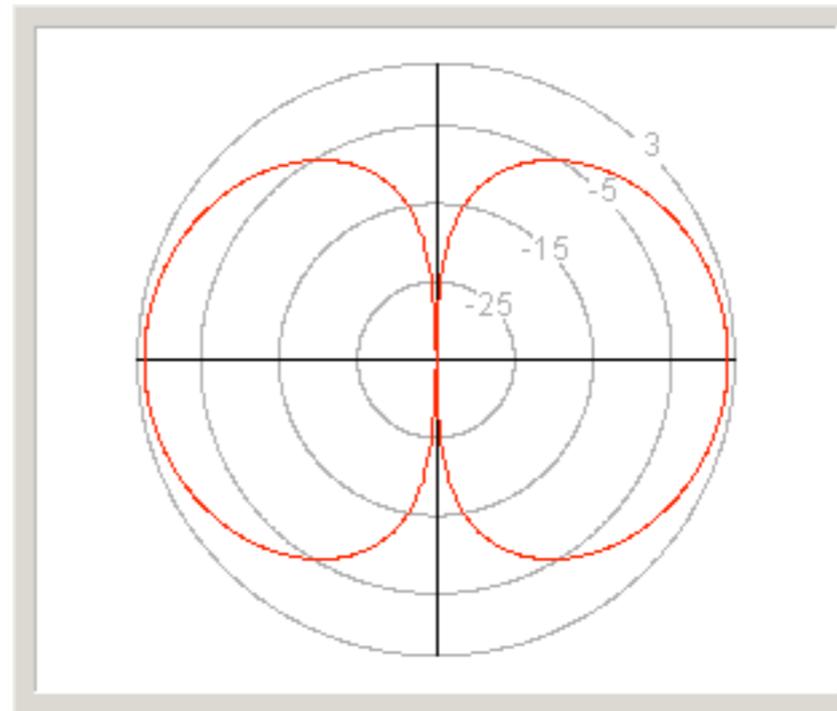
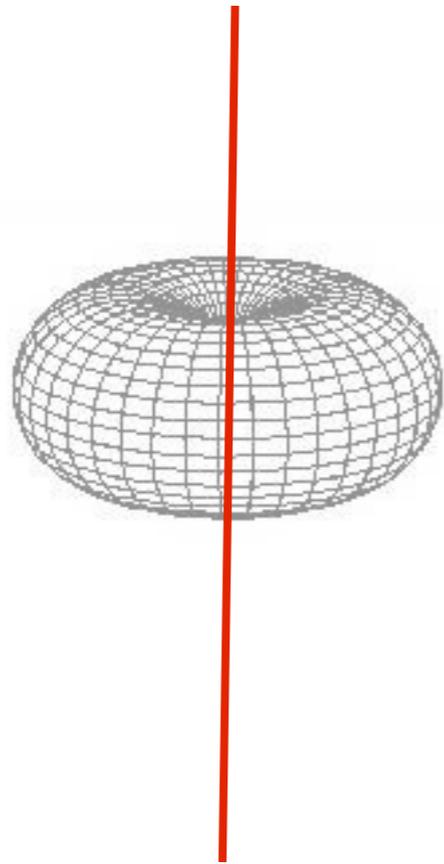
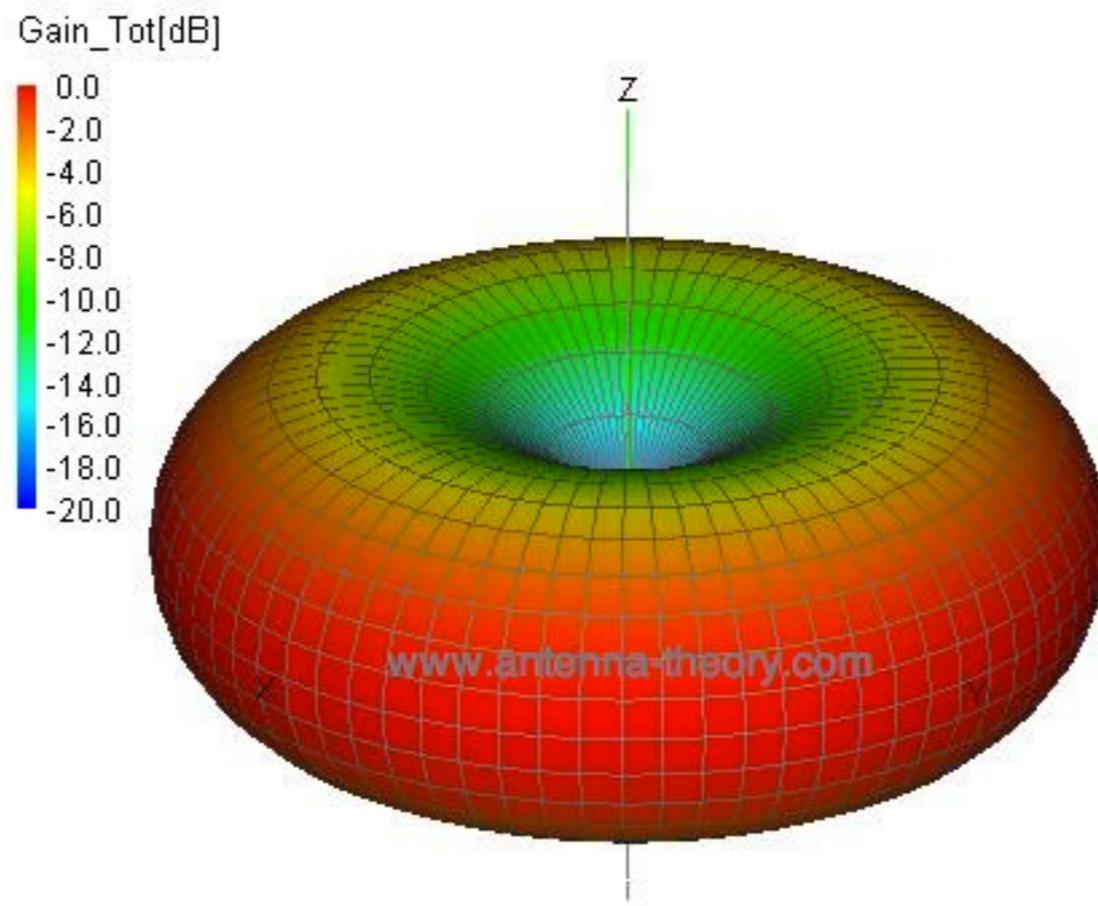
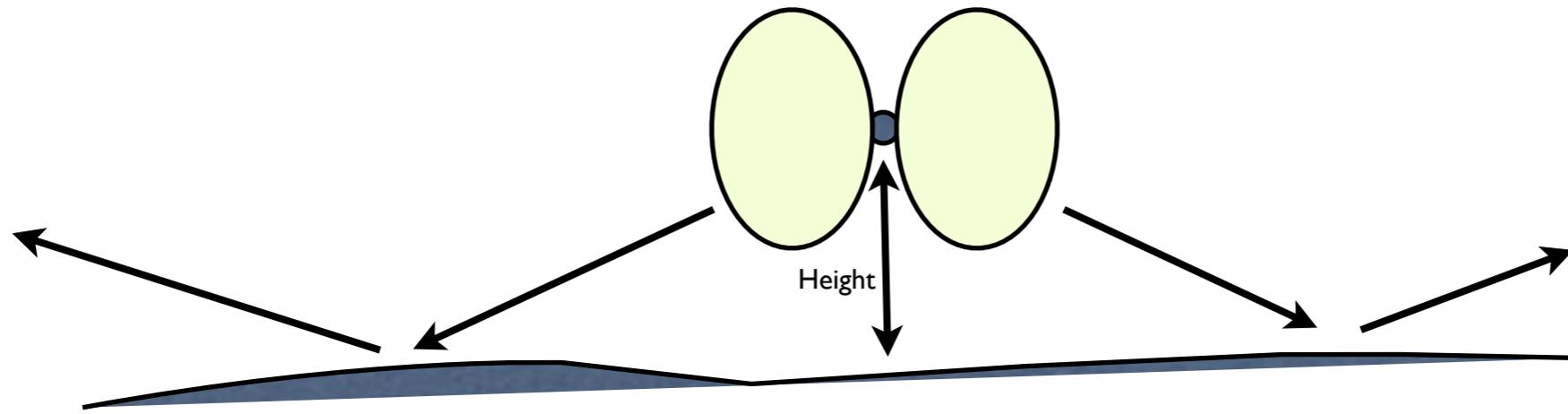


# A dipole in space





<https://www.physicsforums.com/threads/half-wave-dipole-antenna-radiation-pattern.508983/>



Think of a donut, where two opposite areas are a little squished. The main "beam" of the dipole is like the fatter part of the donut. But it's also mashed and stretched by ground reflections.

<http://www.hamuniverse.com/wb4yjtdipolepatterns.html>

Peak radiation angle from an HF antenna above ground can be found from the following chart. BUT ... pay attention to the words.

Concept: consider a **dipole** above a reasonable ground. The peak angle of radiation from the system is governed by the height above ground.

Height in wavelengths	peak radiation angle
0.25	90 deg
0.30	56.4 deg
0.35	45.6 deg
0.50	30.0 deg
0.75	19.5 deg
1.00	14.5 deg

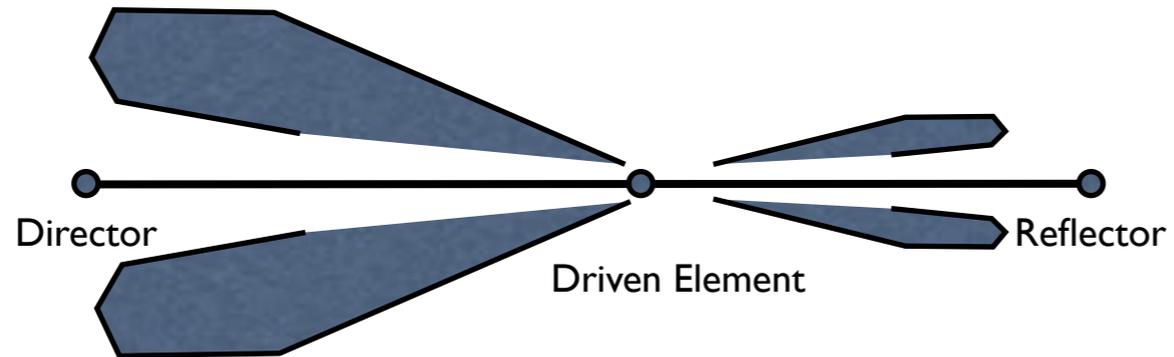
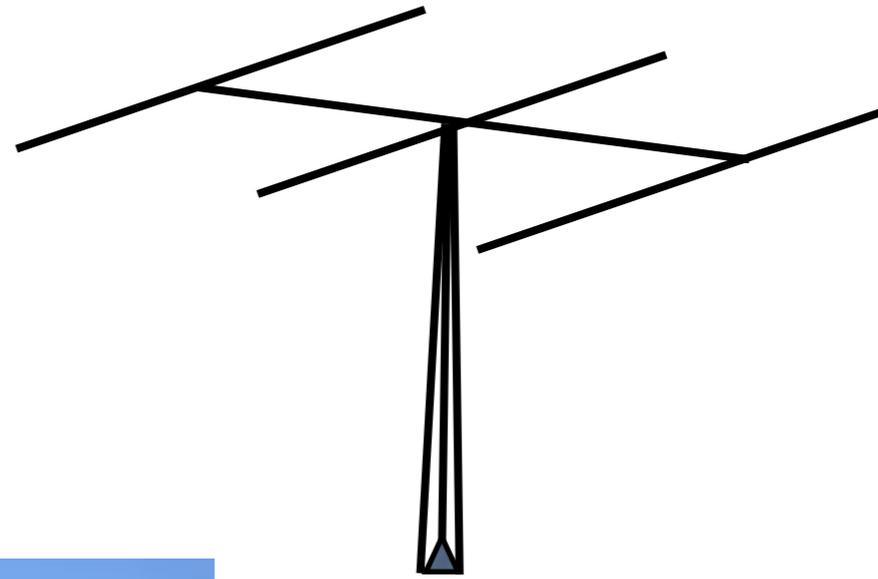
Reflector



Driven Element



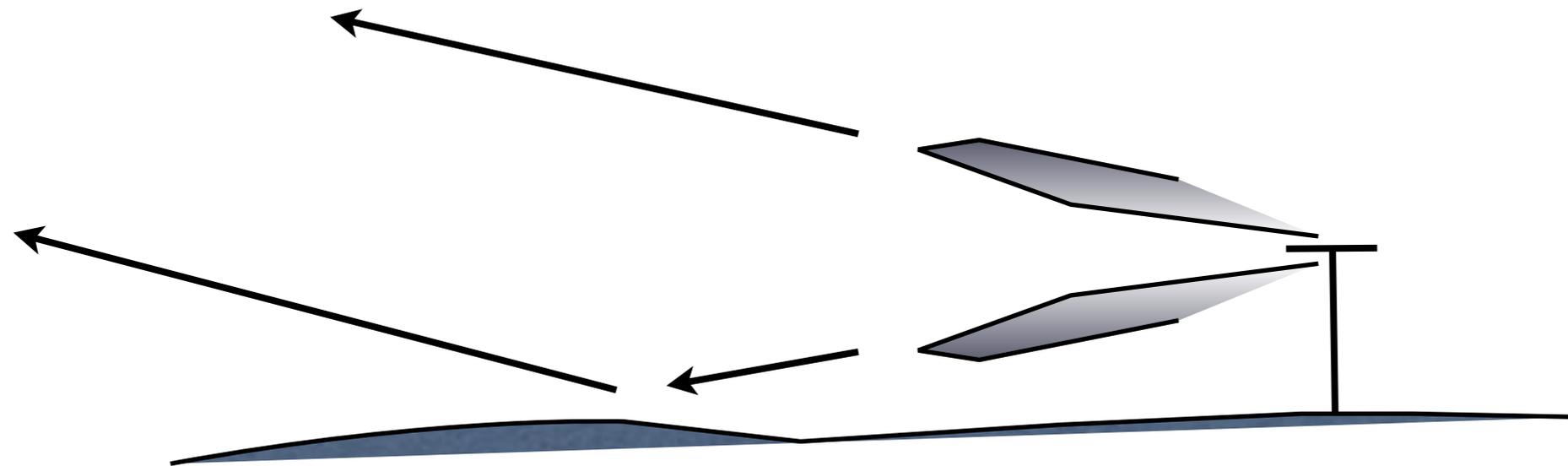
Directors

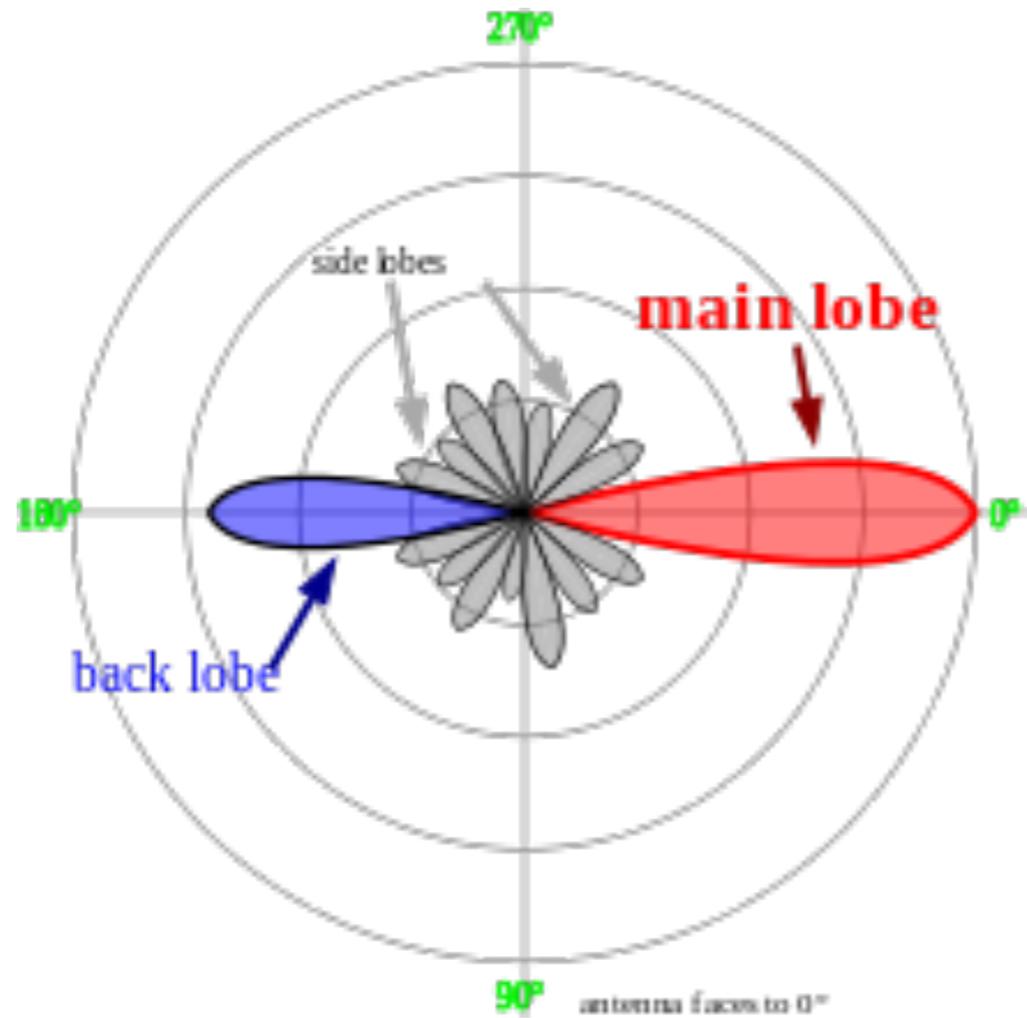


At HF we WANT a slightly elevated “launch” angle, to bounce our signal off the ionosphere (to get skip).

Antenna height reflections from ground, and spacing between elements of a multi-element beam are combined to get the best launch angle.

**Element** spacing of an HF “beam” antenna is designed to get a pattern like shown below.





<http://www.radio-electronics.com/info/antennas/dipole/dipole.php>

<http://www.rfcafe.com/references/electrical/antenna-patterns.htm>

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<http://www.radio-electronics.com/info/antennas/yagi/yagi.php>

<https://273k.net/gsm/designing-and-building-a-gsm-antenna/yagi/>