

Double Inverted Delta HF Skeleton Slot Antenna

w6nbc.com/published.html

in Ham Radio

Undiscovered Country





Alan Blumlein 1938
EMI England
TV Broadcasting



In 1938
All hams were on
HF

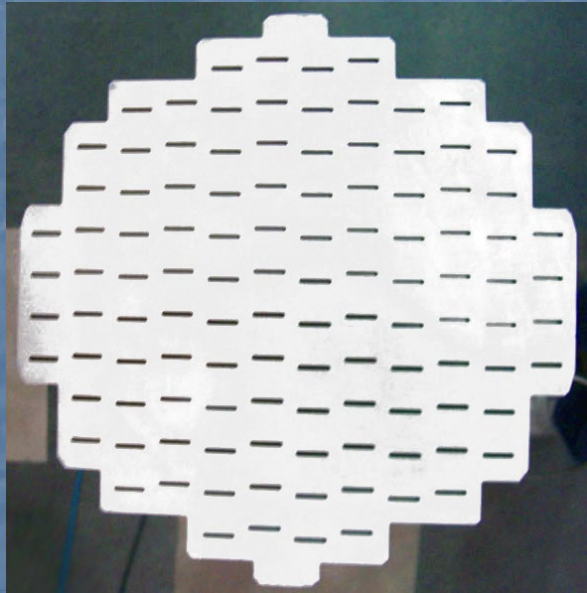
Little ham interest
in VHF Antennas

Classical 40m Slot

70 x 105 ft.



Hams today still know little about slots



**Microwave
Computers**



Aviation

An Efficient 2 Meter Antenna Disguised as a TV Satellite Dish

This vertically polarized horizontal slot antenna, cut into the reflector of a TV dish, might be the ultimate stealth antenna.

John Portune, W6NBC

I've long wondered if it would be practical to hide an efficient 2 meter base-station antenna in a TV satellite dish. My homeowners covenants, conditions, and restrictions (CC&R) committee wouldn't force me to take it down. But could all the metal in the TV dish compromise a 2 meter antenna? Finally, it struck me: don't fight the metal, take advantage of it by cutting a half-wave slot into the TV dish reflector.

A slot antenna is a narrow rectangular opening in a large conductive surface, such as a TV satellite dish. Slot antennas are familiar to the communications world. They're common in TV broadcasting, the skin of aircraft, and in radar, microwave, and cell phone applications. This TV dish (see Figure 1) slot is the complement to a dipole. It is also a great way to learn about slot antennas.



Figure 1 — Note the low visibility of the slot in my modified satellite TV dish.

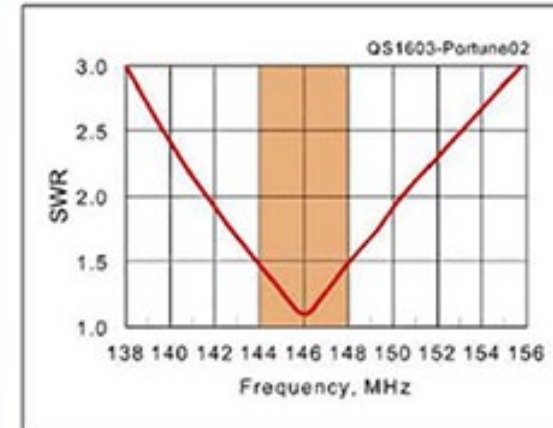
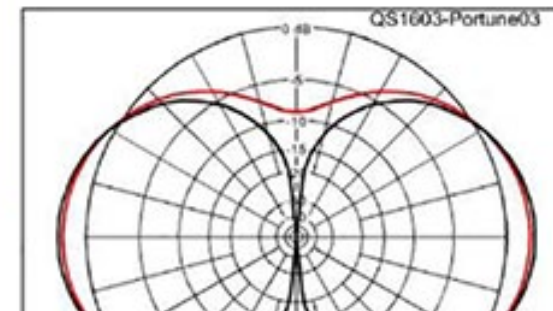


Figure 2 — Bandwidth of a single-saw-blade-cut TV dish slot antenna.



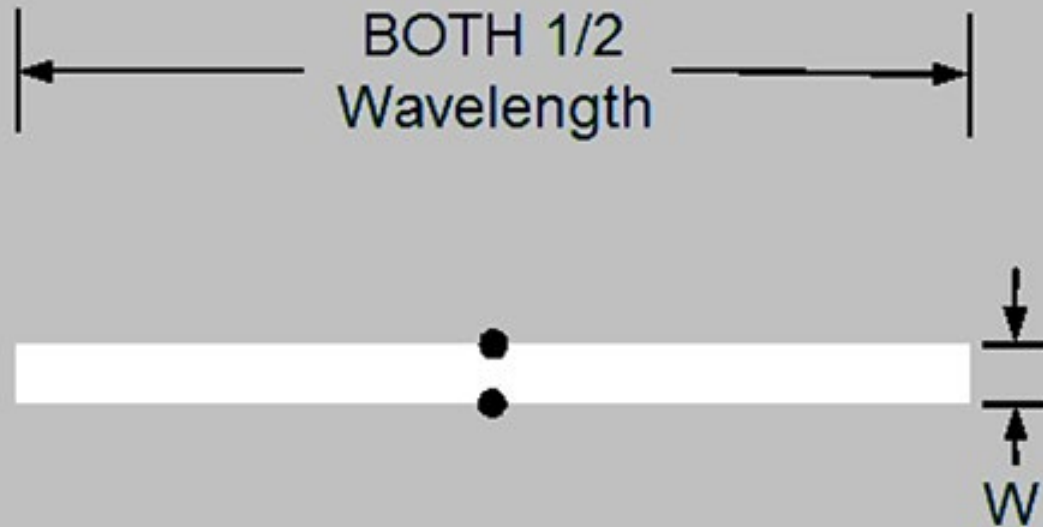
I Needed 5 Discoveries

1. How a hole (a slot) can be an antenna?
2. How wide to make the Slot and Plane
3. What shape to make the Slot and Plane
4. The Skeleton Slot
5. All part of an antenna do not radiate

Practical HF Slots

1st Discovery

**How can a Hole
be an Antenna?**



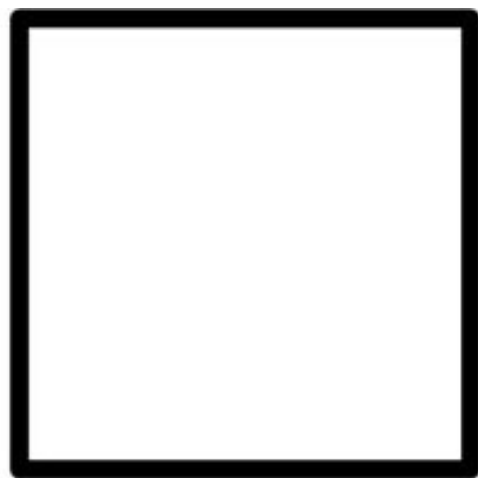
SLOT ANALOG

**Dipole and
Slot are
Complements**



Jacques Babinet's Principle

Same size
object & hole
refract E/M
wave the same



ONE WAVELENGTH WIRE (QUAD) LOOP



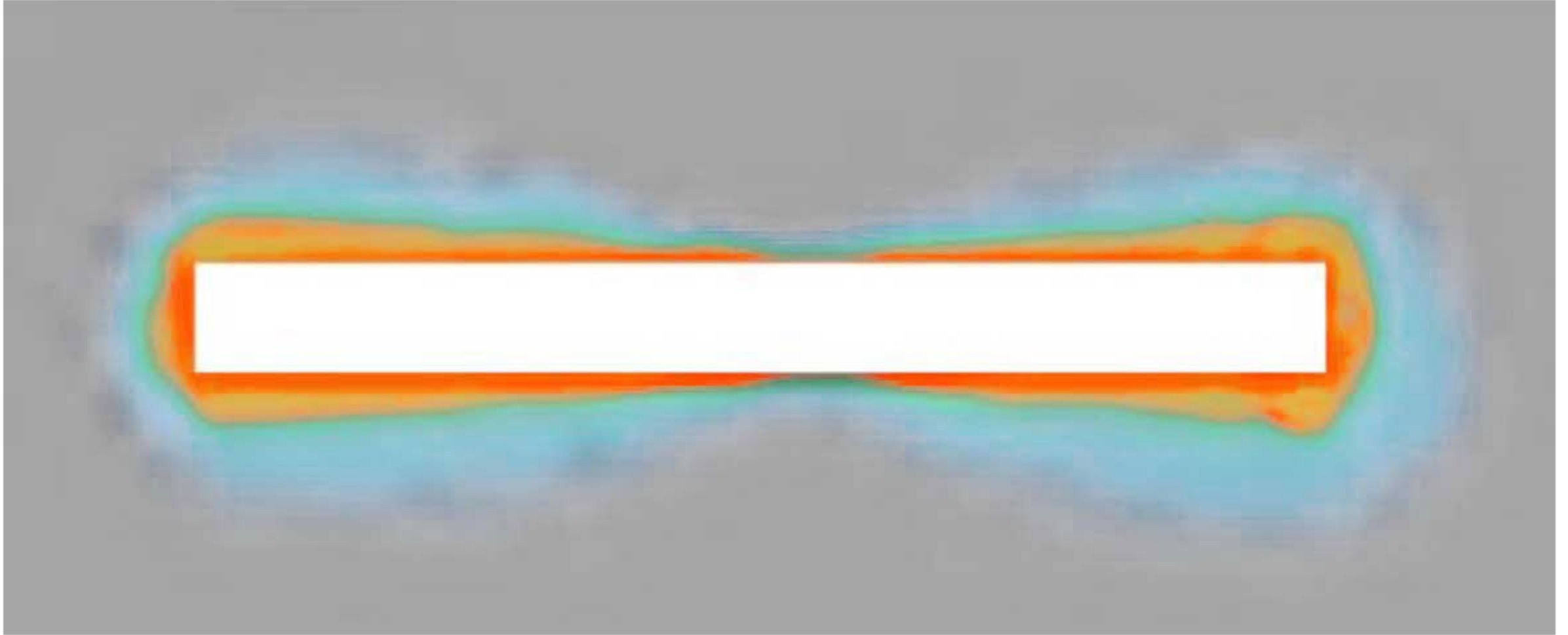
FOLDED DIPOLE



Feed Point

HALF WAVELENGTH SLOT ANTENNA

Current Around a Slot Antenna



2nd Discovery

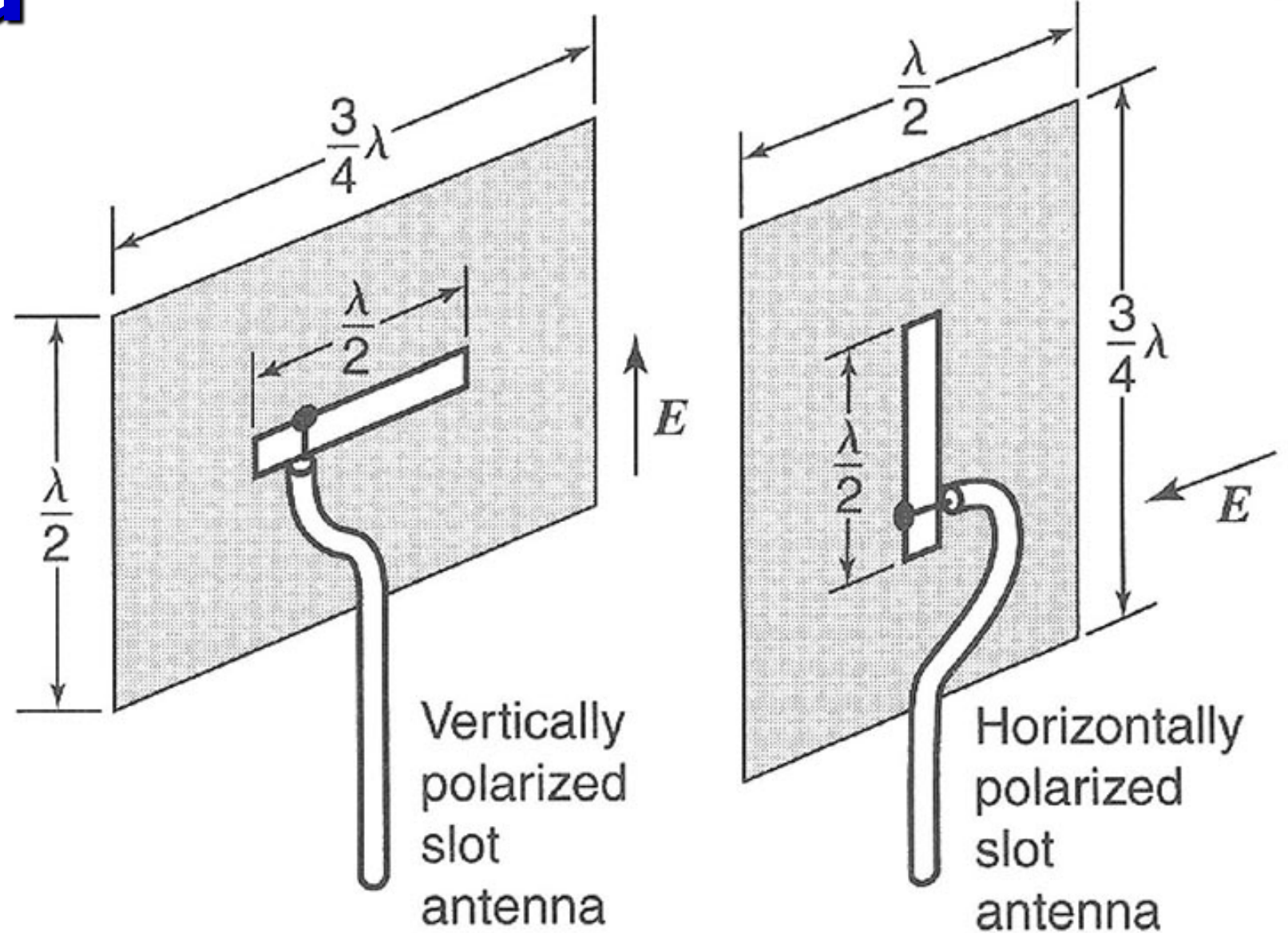
**How Wide to
Make the Slot
and Plane**

My Experiments




NO LIMITS

Electronic and Radio Engineering Frederick E. Terman



KJ6 THU

Copper Pipe Slot

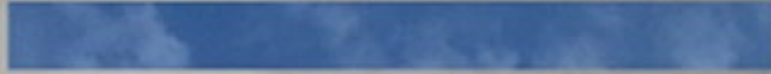
A photograph of a copper pipe with a slot cut into it, held by a white stand against a blue background. The pipe is horizontal and the slot is cut along its length. A black cable is visible on the right side of the pipe.

Plane: $\frac{1}{2}$ in. Copper Pipe
Slot: $\frac{1}{16}$ in.

3rd Discovery

**What Shape to Make
the Slot and Plane**

Classical Slot



Lose this Image



Staggered Slot

SWR

18 in. x 18 in.

TUNE

Aluminum Tape on Glass



A wearable antenna reminiscent of the 19th Century



Orthogonal Plane



QST March 2018

4th Discovery

**The Skeleton
Slot**

HENTENNA

Skeleton Slot



2m Slot-Cube

QST
Jan.
2019

11 in.
Cube

Folded Skeleton Slot

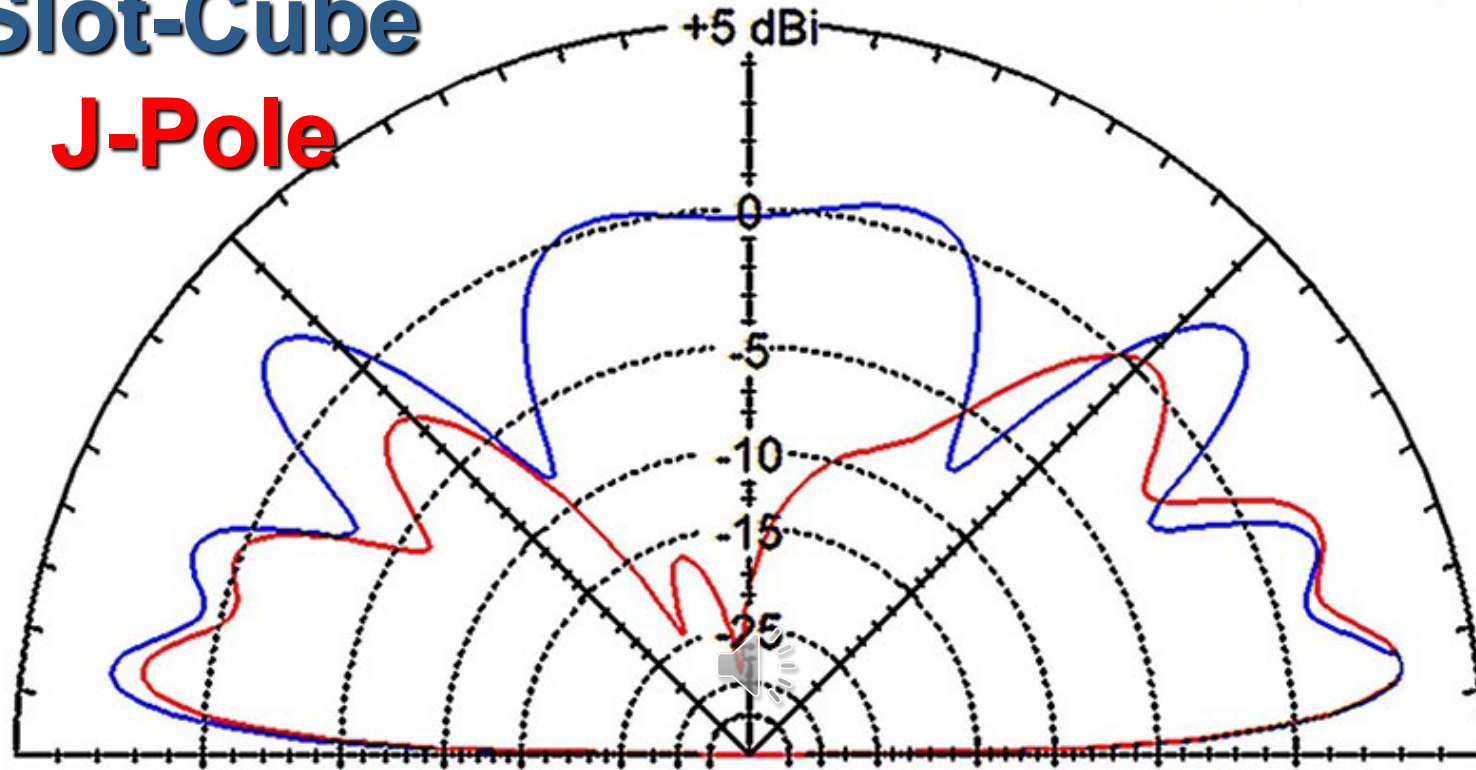




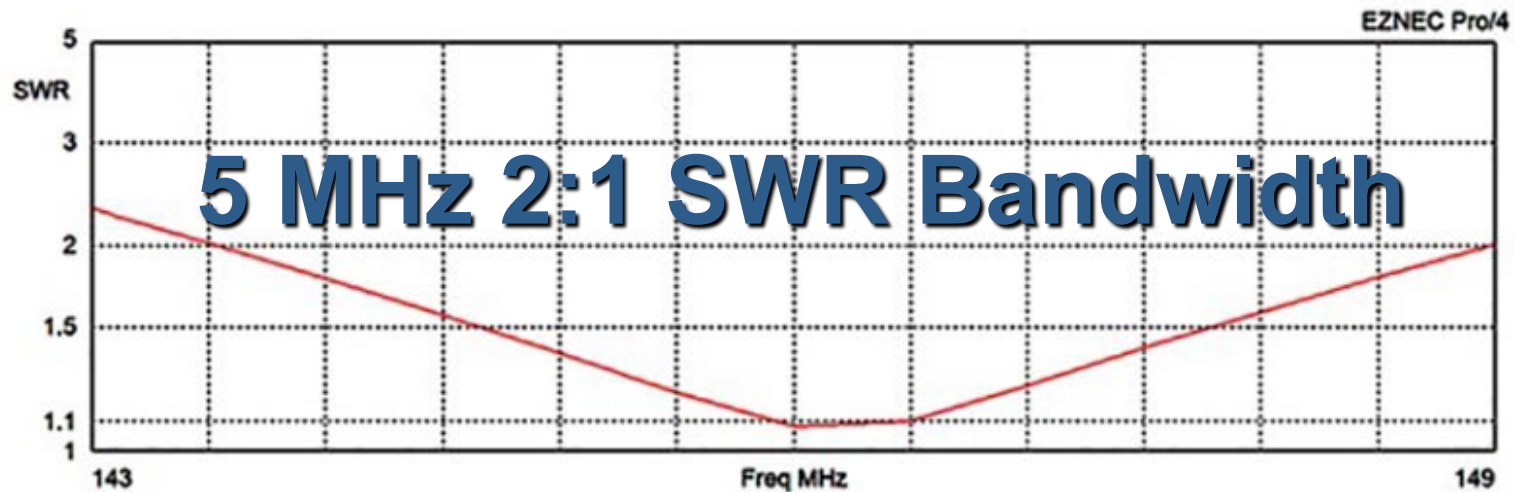
KB9IBT

Slot-Cube J-Pole

EZNEC Pro/4



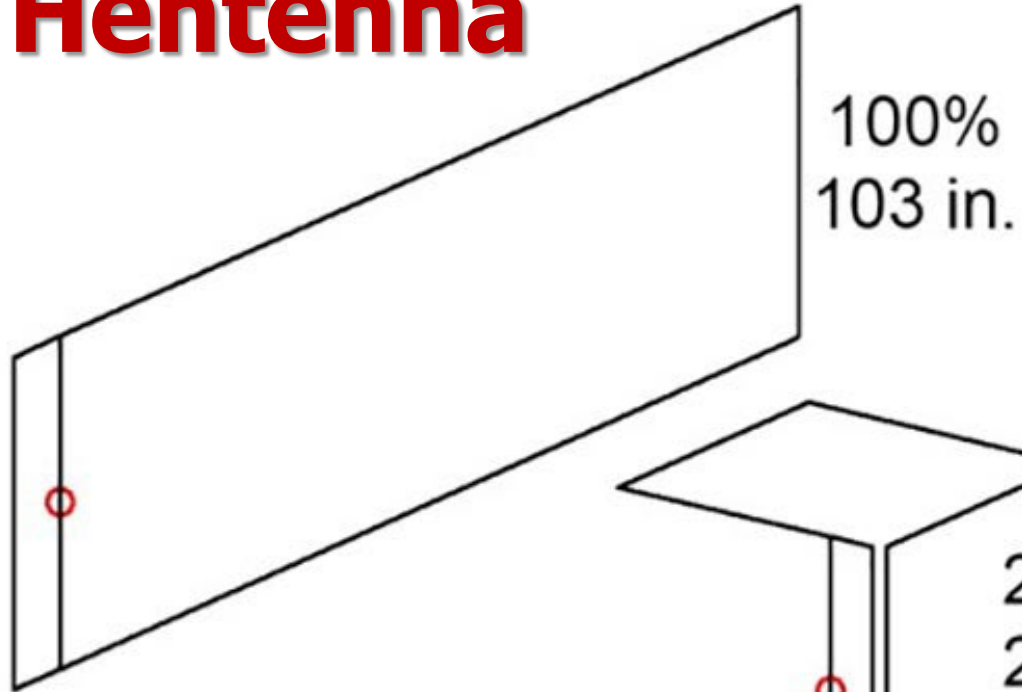
146.2 MHz



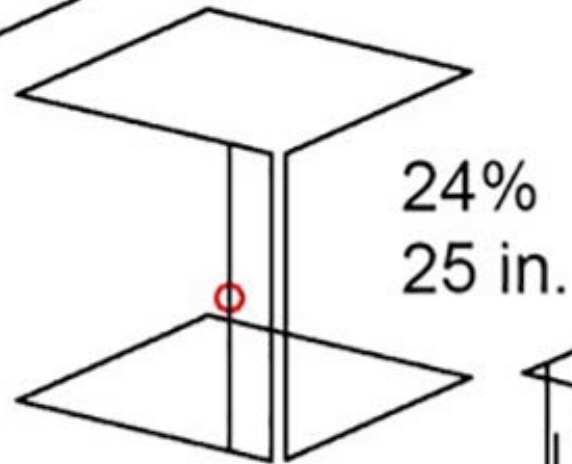
**“Can I
make it for
6 meters ?”**

Hentenna

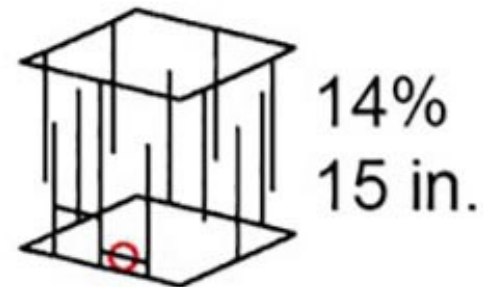
6m



**Folded
Slot-Cube**



**Folded &
Staggered**



Double Fold

6m

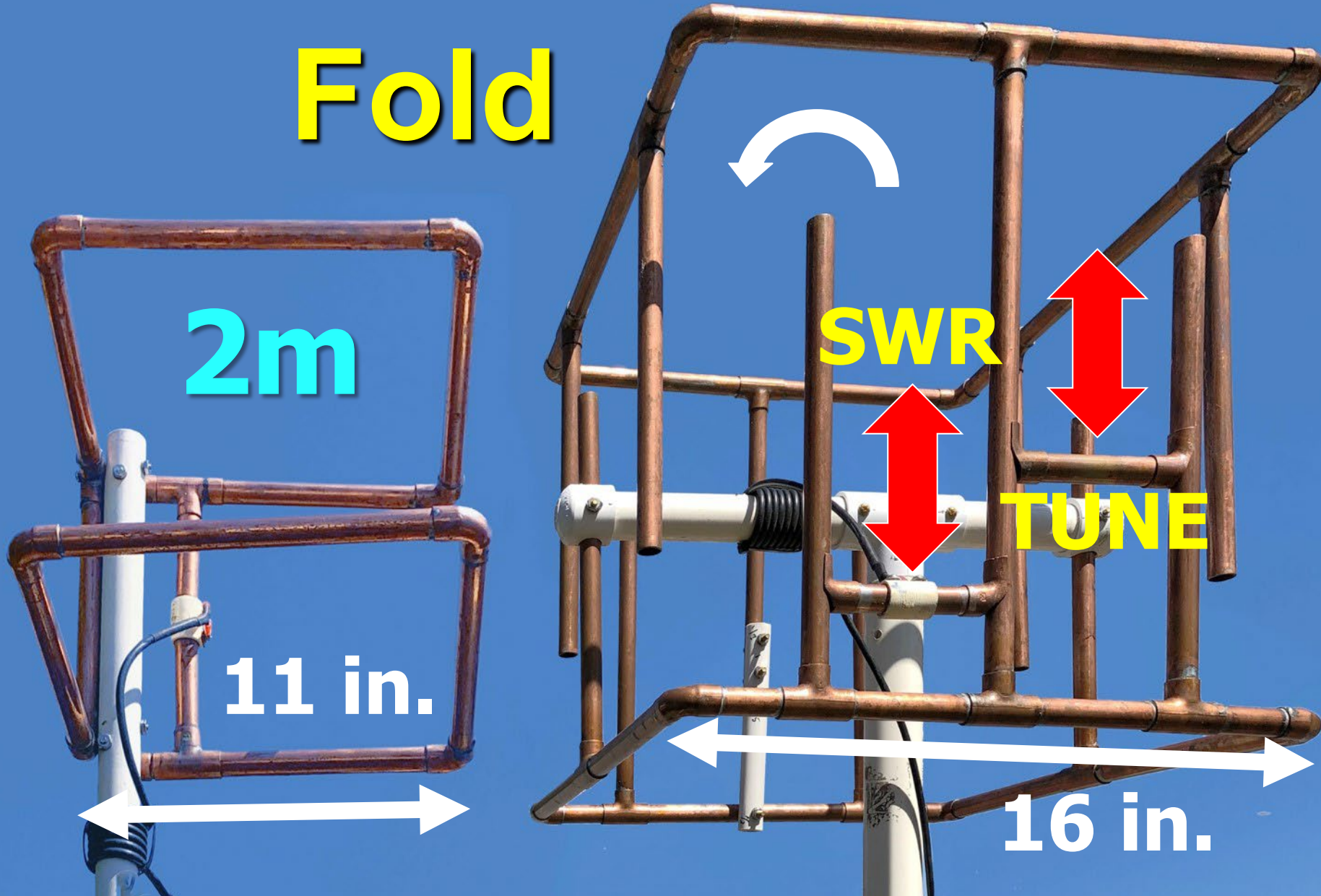
2m

SWR

TUNE

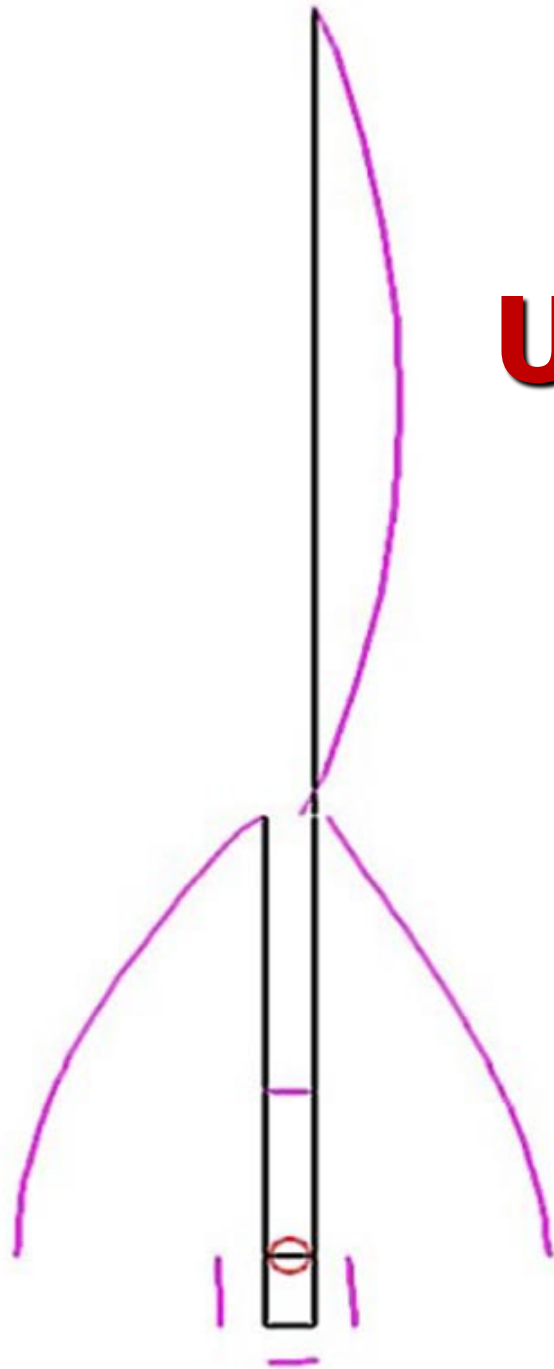
11 in.

16 in.



5th Discovery

**Not all Parts
of an Antenna
Radiate**



**Un-opposed
Current**

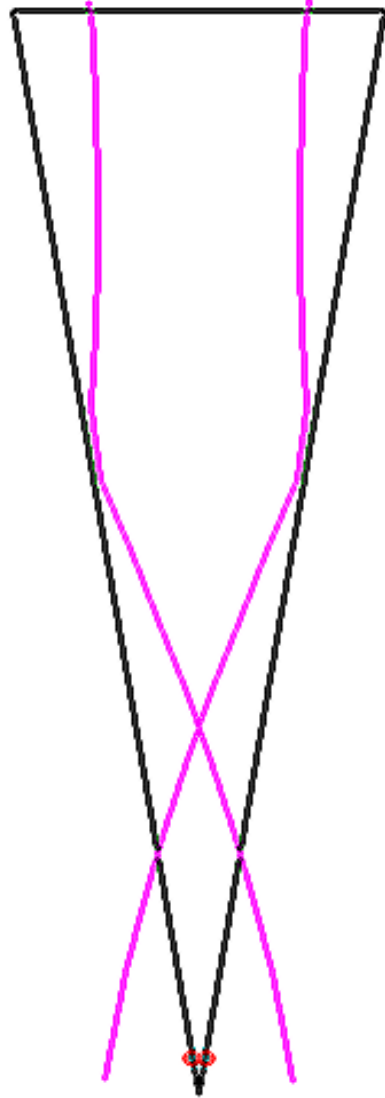
**Equal
Opposing
Currents**

**All Discoveries
Combined**

**Practical Slots for
the HF Bands**

The Double Inverted Delta HF Skeleton Slot VERTICAL

- 1. Horizontally-polarized**
- 2. Low radiation angle**
- 3. Elevated Radiation**



**Bottom
Currents
Produce no
Radiation**

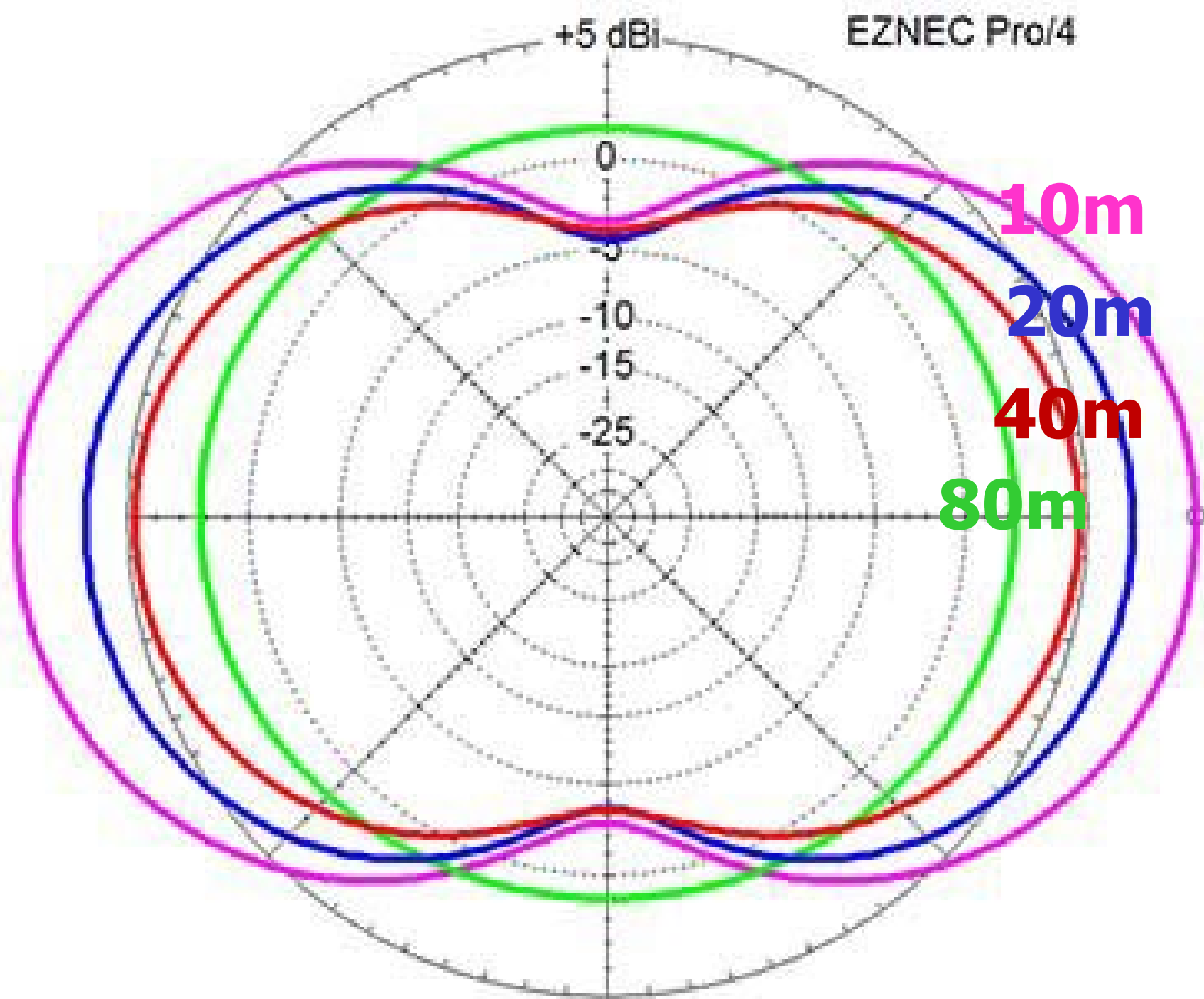


A Common Mistake

**Deltas
Should
Be
Inverted**

The Double Inverted Delta HF Skeleton Slot VERTICAL

- 1. Horizontally-polarized**
- 2. Low radiation angle**
- 3. Elevated Radiation**
- 4. Azimuth Gain**



My Back Yard

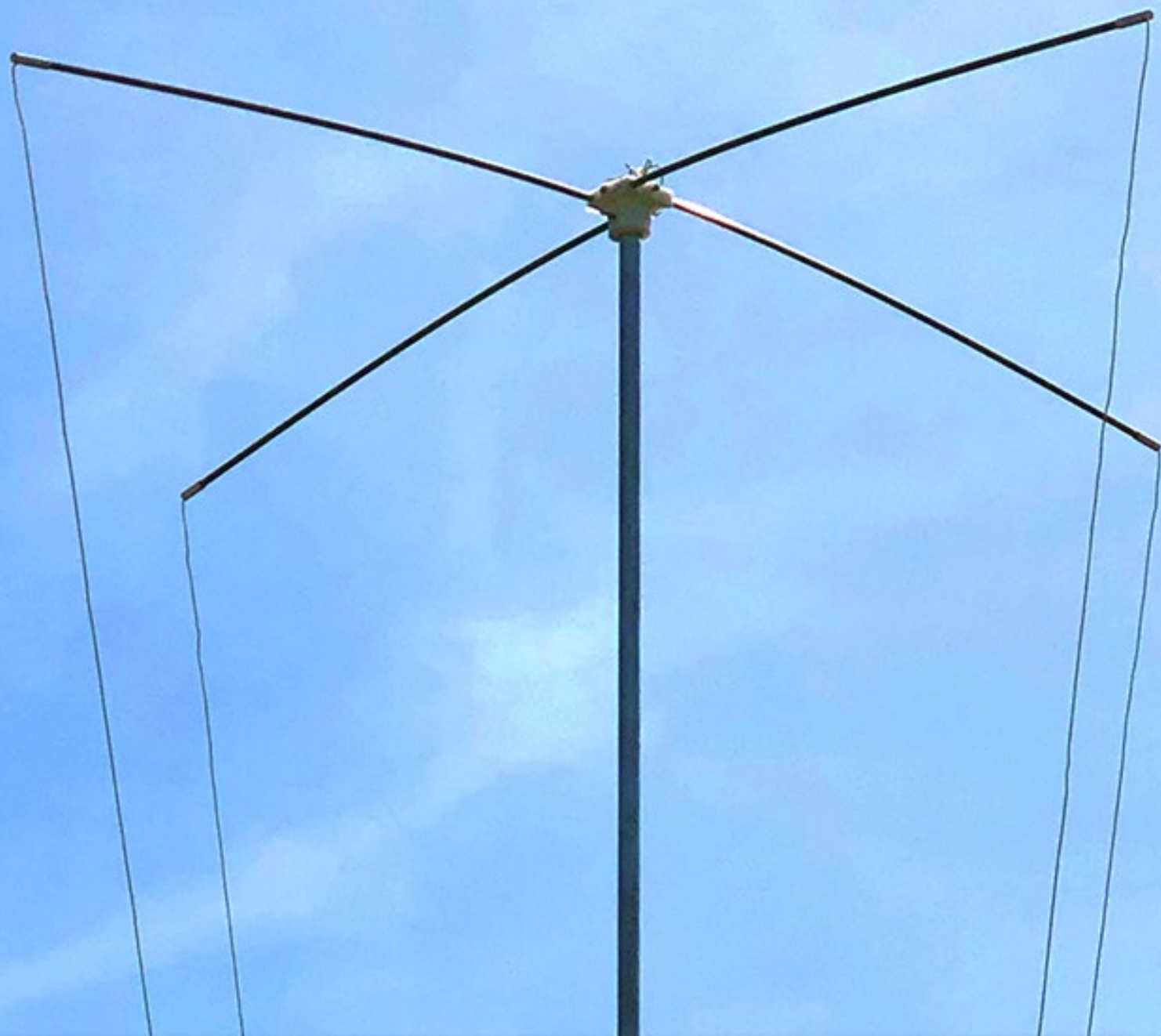
No Guys

4 ft.

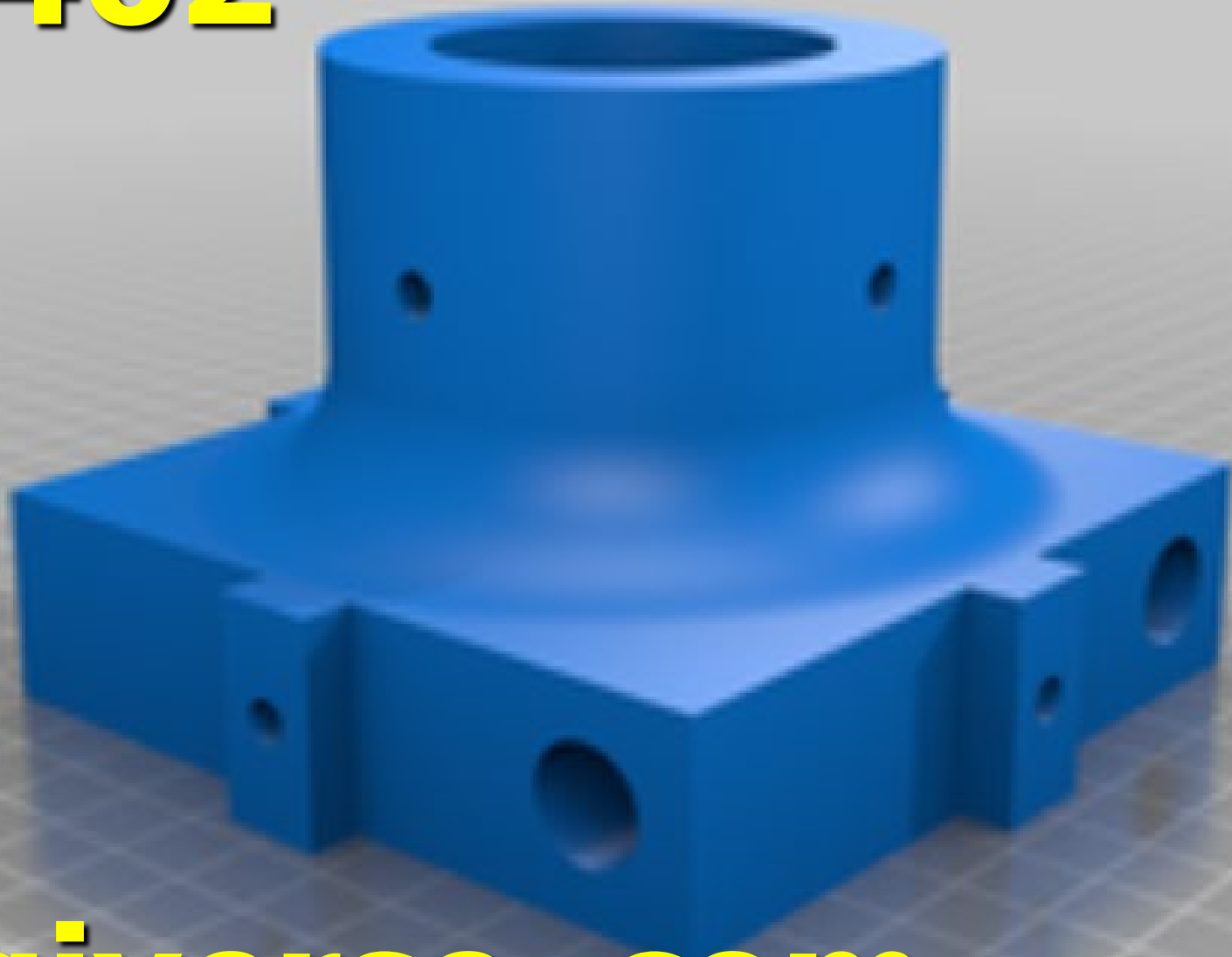
Pipe in Soil
(No Concrete)

Base
Auto-Tuner





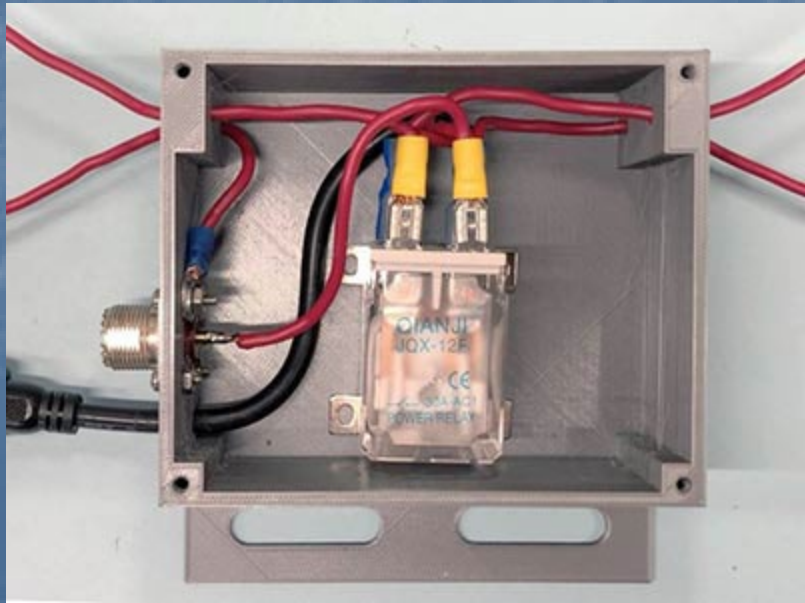
4694462



Thingiverse. com



Collapses to 6 ft.
Easy one-man lift
Easily telescopes





DX Engineering Aluminum Tubing

★★★★★ 21 Customer Reviews

DX Engineering High-Strength Aluminum Tubes are ideal for your antenna projects. They are available in two types.



6063-T832 seamless drawn aluminum tubing is available in 1, 3, 6 and 12 ft. lengths. 6063-T832 tubing provides good resistance to general corrosion, including stress corrosion cracking, and an excellent surface appearance.

Most sizes (except 12 ft.) are available slit on one end for use with DX Engineering stainless steel element clamps. If un-slit ends are required for your applications, merely insert the slit end into the next larger size in the stack and use your own attachment method.

6ft. nesting sections 1 3/8 - 2 in.

6063-T832 seamless drawn aluminum tubing is available in 1/8 in. increments from 3/8 in. to 2-1/8 in. O.D.

\$12.25 avg. 6 ft. lengths

Four 1/2 in. 4ft. fiberglass spreaders

DX Engineering DXE-FT0500-8 - DX Engineering Fiberglass Tubing



Fiberglass Tubing, 8 ft., 0.500 in. OD, 0.120 in. Wall, No Slit, Each

\$6.49

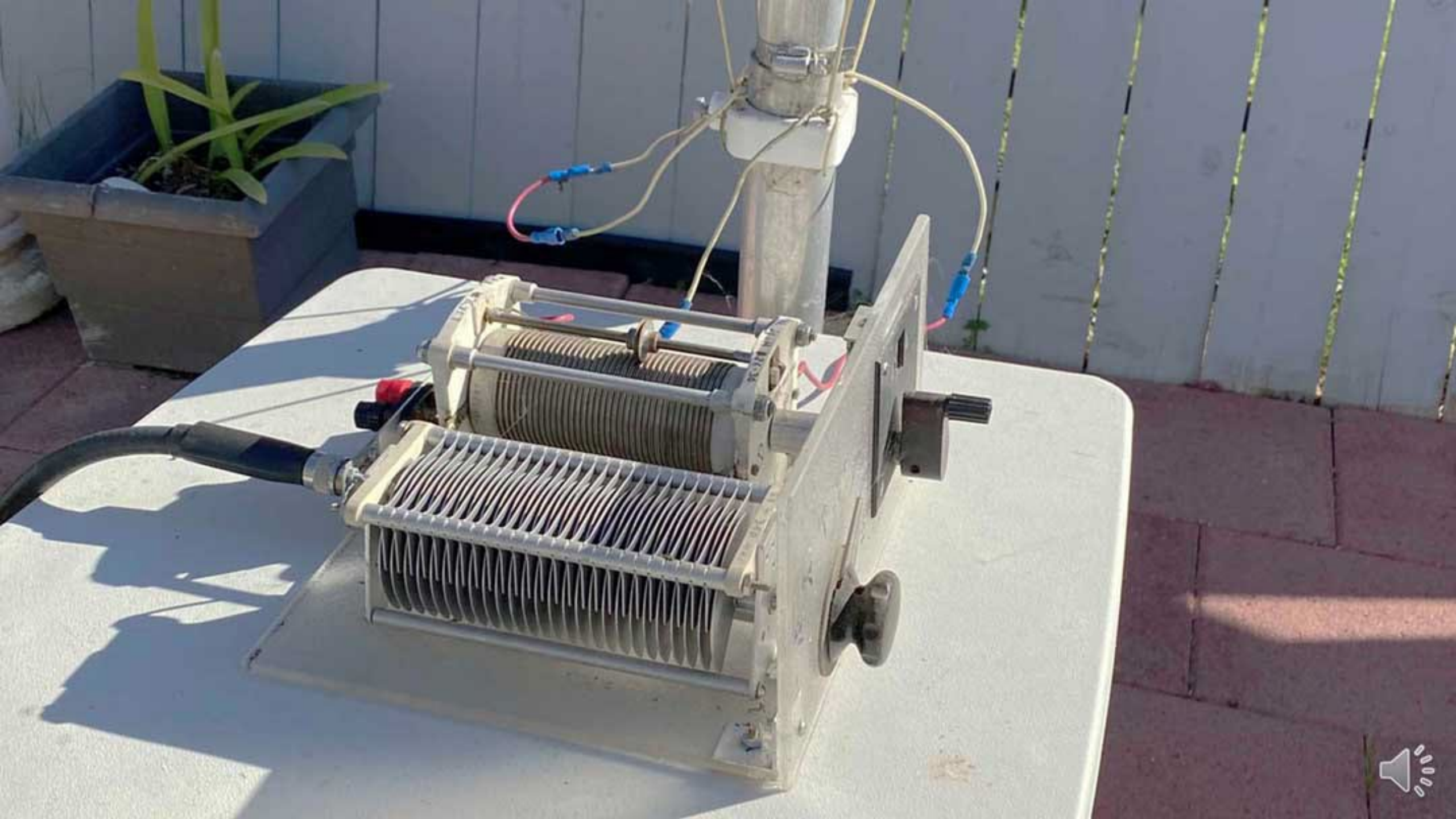
Five stainless hose clamps

Not Shown

Part Number: DXE-FT0500-8 [More Detail...](#)

Availability: In Stock

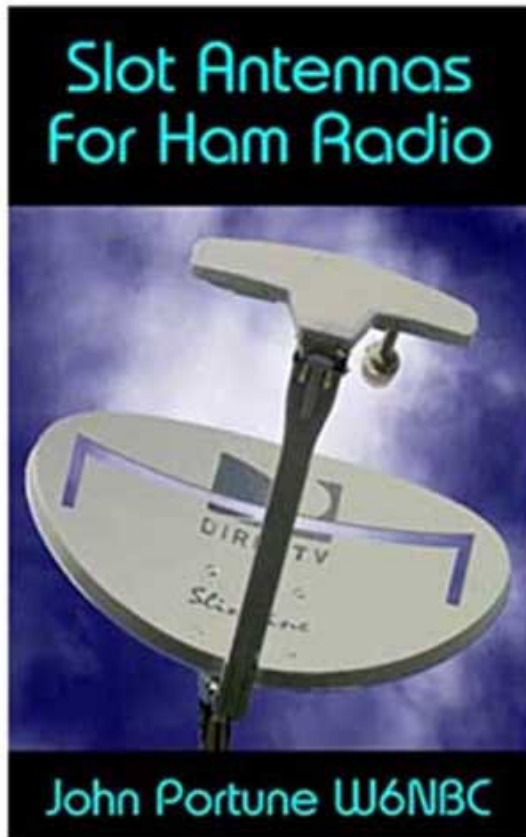
Estimated Ship Date: Today



The Double Inverted Delta HF Skeleton Slot VERTICAL

- 1. Horizontally-polarized**
- 2. Low radiation angle**
- 3. Elevated Radiation**
- 4. Steerable Azimuth Gain**

Let's pause for these important messages



Slot Antennas for Ham Radio: The Forgotten Antenna Kindle Edition

by [John Portune W6NBC](#) (Author) | Format: Kindle Edition

★★★★★ ▾ 16 ratings

Slot antennas have been overlooked by ham radio operators since they were introduced in 1938. An aura of mystery surrounds them. Here's how they work and practical homebrew slot antenna projects from HF to UHF.

\$4.95 to buy





**W6nbcmail
@gmail.com**

w6nbc.com/slides.html

DØGGY



"That's all Folks!"