

# **Double Inverted Delta HF Skeleton Slot Antenna**

**[W6NBC.COM/ARTICLES](http://W6NBC.COM/ARTICLES)**

*Undiscovered Country*  
*in Ham Radio*





**Alan Blumlein 1938**  
**EMI England**  
**TV Broadcasting**

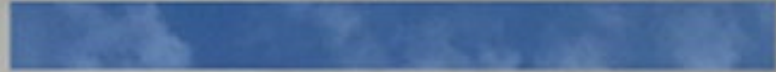


**In 1938**

**All hams were on  
HF**

**Little ham interest  
in VHF Antennas**

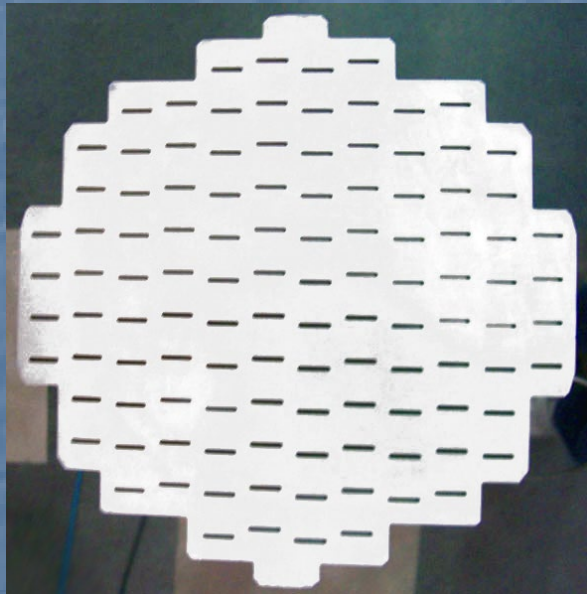
# Classical 40m Slot



**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.**

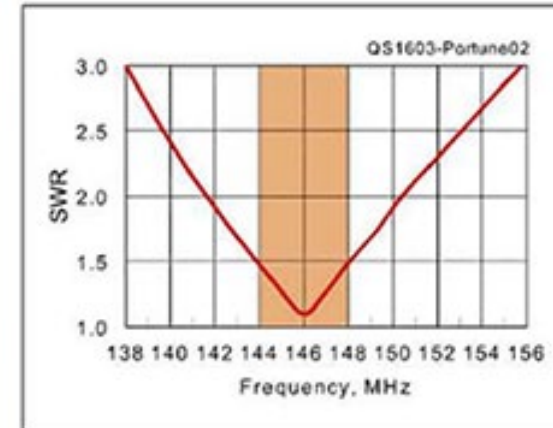
**John Portune, W6NBC**

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 reflector of the TV dish.

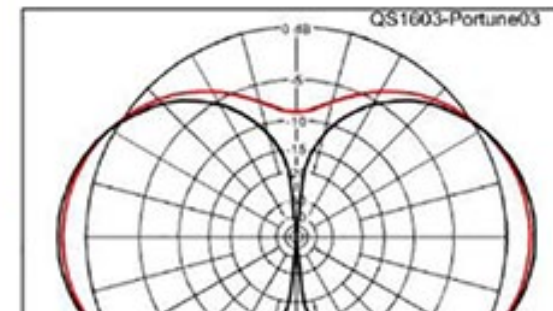
A slot antenna is a narrow rectangular opening in a large conductive surface, such as a TV satellite dish. Slot antennas are familiar to the communications world. They're common in TV broadcasting, the skin of aircraft, and in radar, microwave, and cell phone applications. This TV dish (see Figure 1)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

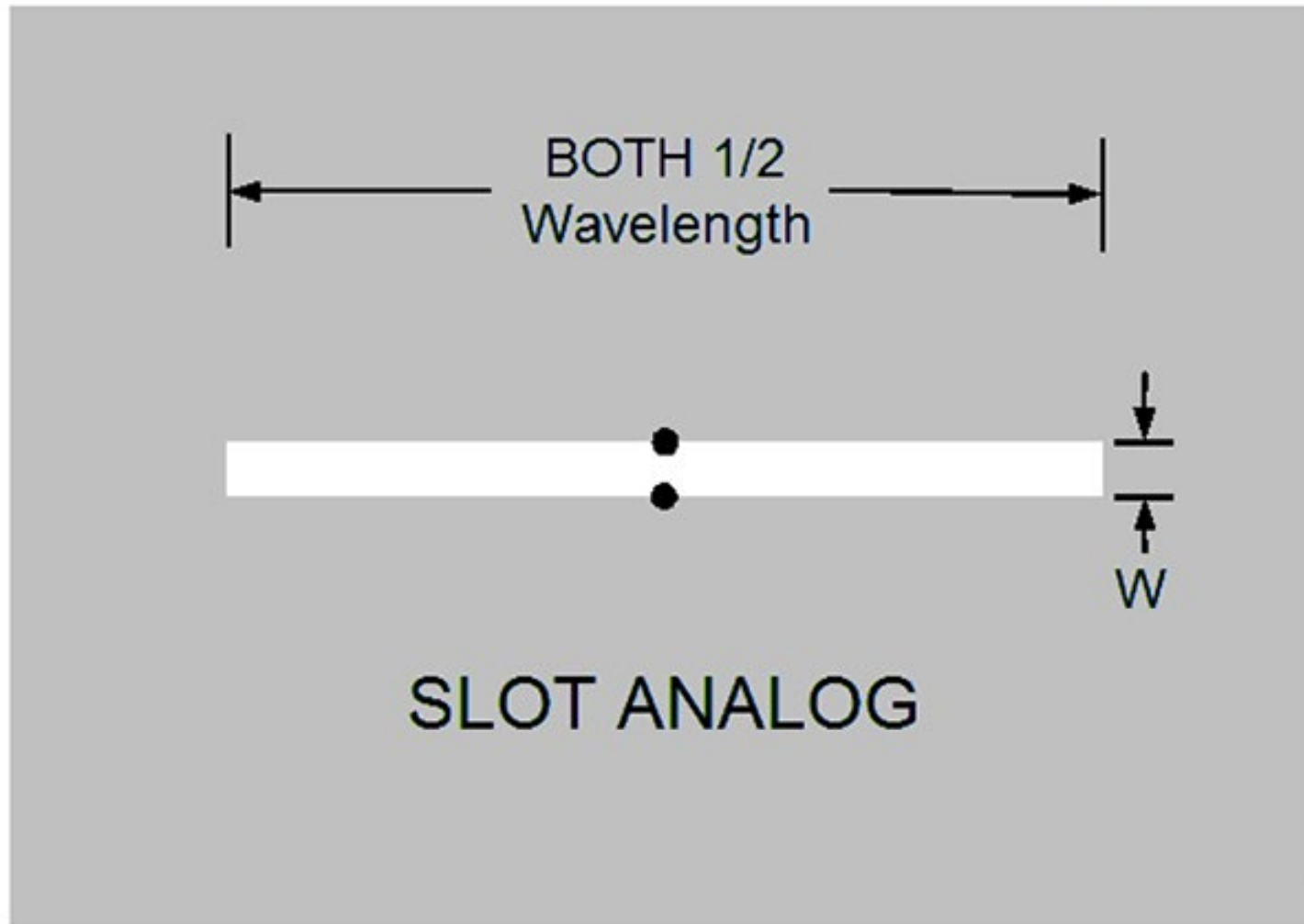
1. How a hole (a slot) can be an antenna?
2. How wide to make the Slot and Plane
3. What shape to make the Slot and Plane
4. The Skeleton Slot
5. All part of an antenna do not radiate

## Practical HF Slots



# 1st Discovery

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

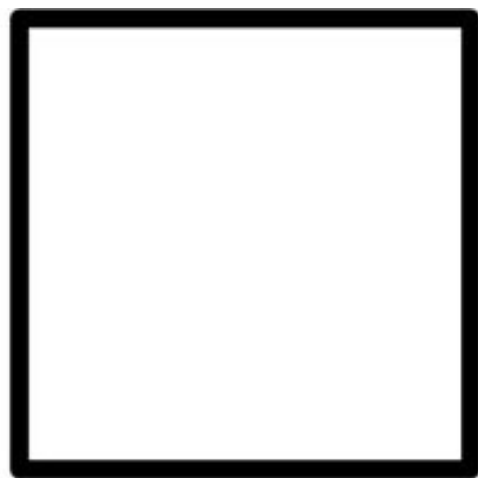


**Dipole and Slot are Complements**



# Jacques Babinet's Principle

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



ONE WAVELENGTH WIRE (QUAD) LOOP

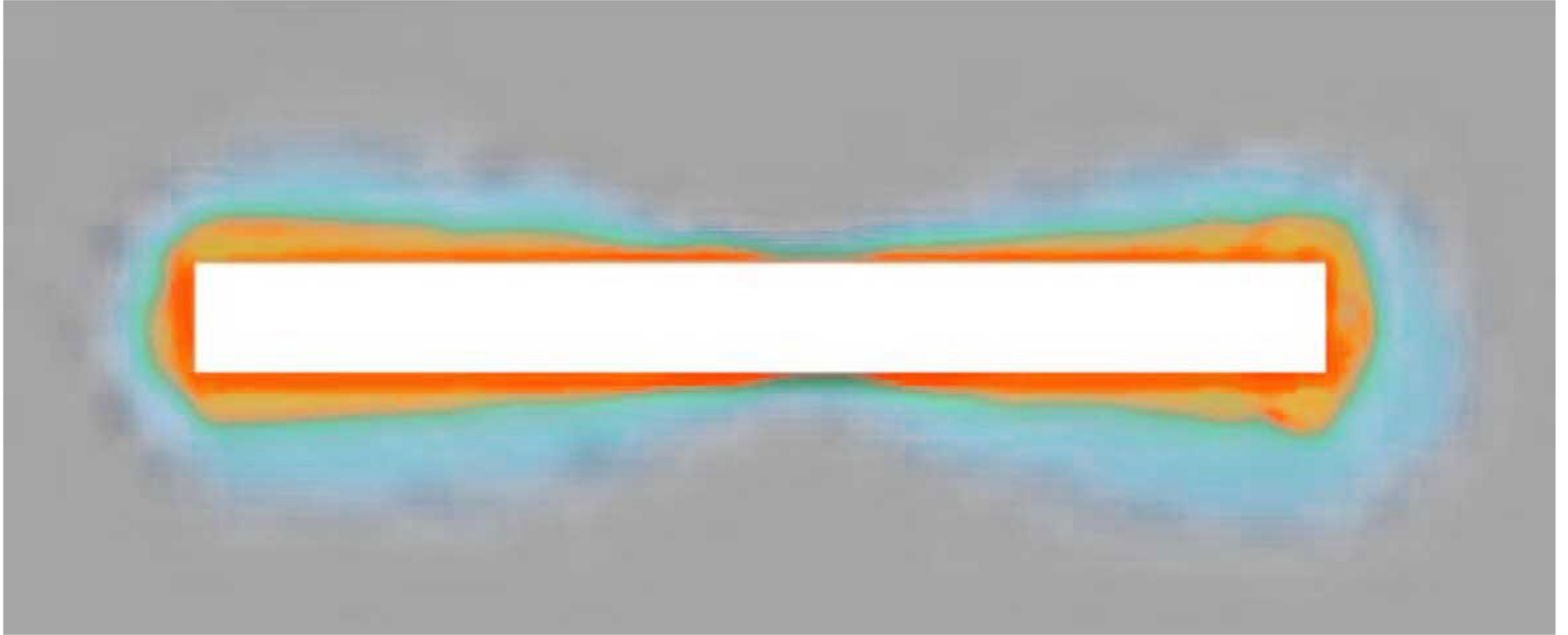


FOLDED DIPOLE



HALF WAVELENGTH SLOT ANTENNA

# Current Around a Slot Antenna



# 2<sup>nd</sup> Discovery

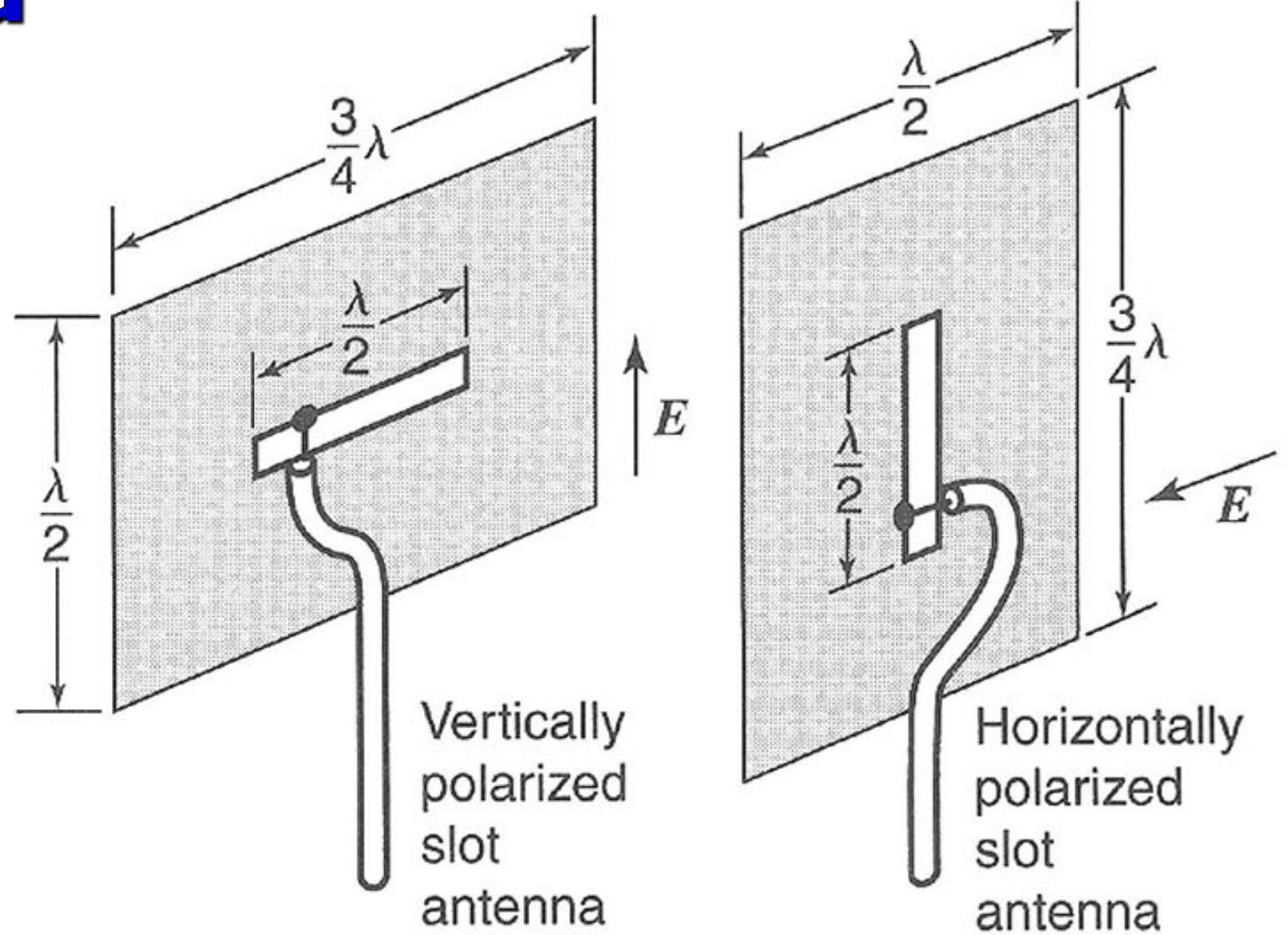
**How Wide to  
Make the Slot  
and Plane**

# My Experiments



**NO LIMITS**


**Electronic and  
Radio  
Engineering  
Frederick  
E. Terman**





# KJ6 THU

## Copper Pipe Slot

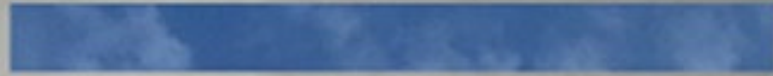


Plane:  $\frac{1}{2}$  in. Copper Pipe  
Slot:  $\frac{1}{16}$  in.

# 3rd Discovery

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

# Classical Slot



## Lose this Image



# Staggered Slot

SWR

18 in. x 18 in.

TUNE

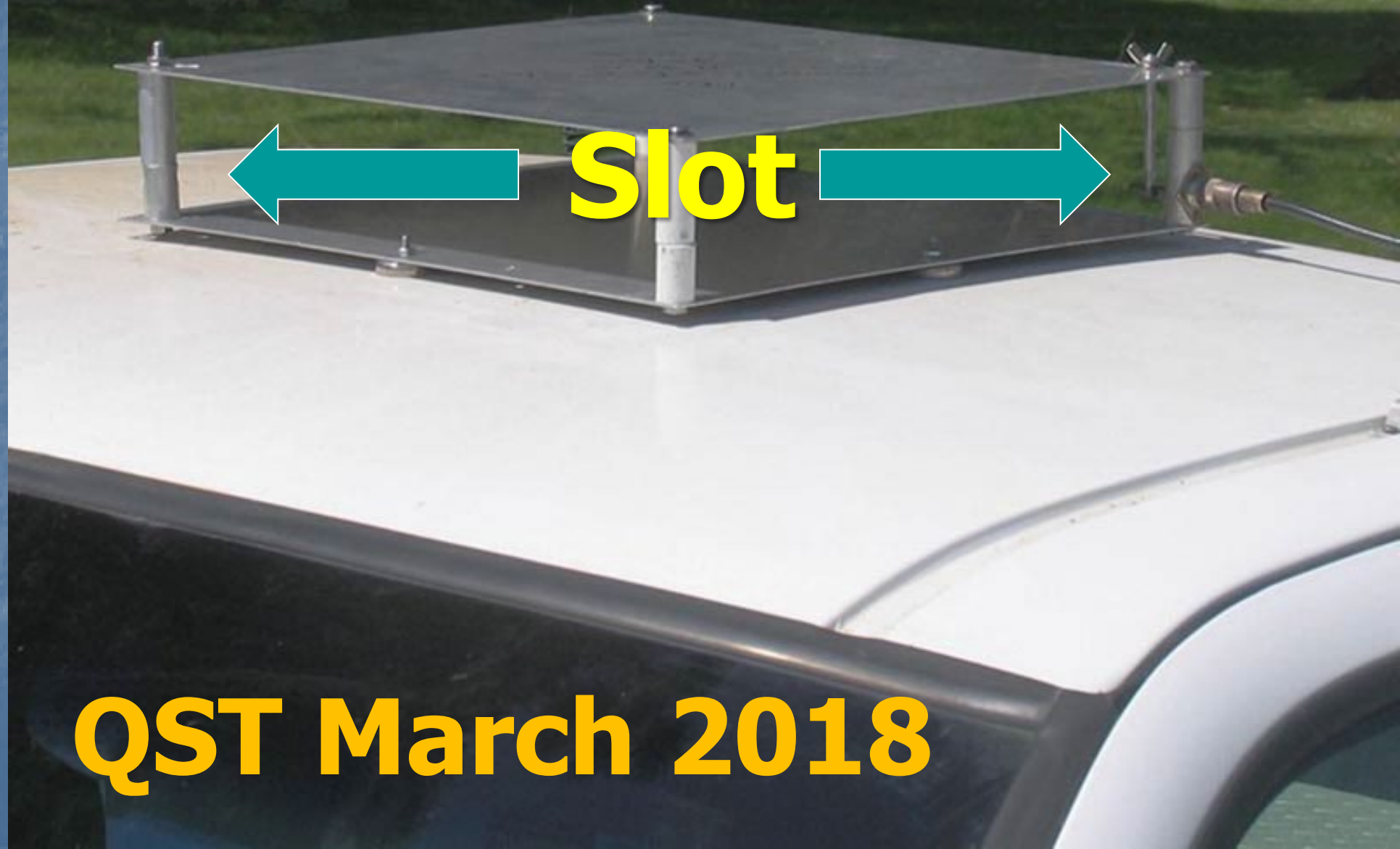
Aluminum Tape on Glass



# **A wearable antenna reminiscent of the 19<sup>th</sup> 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

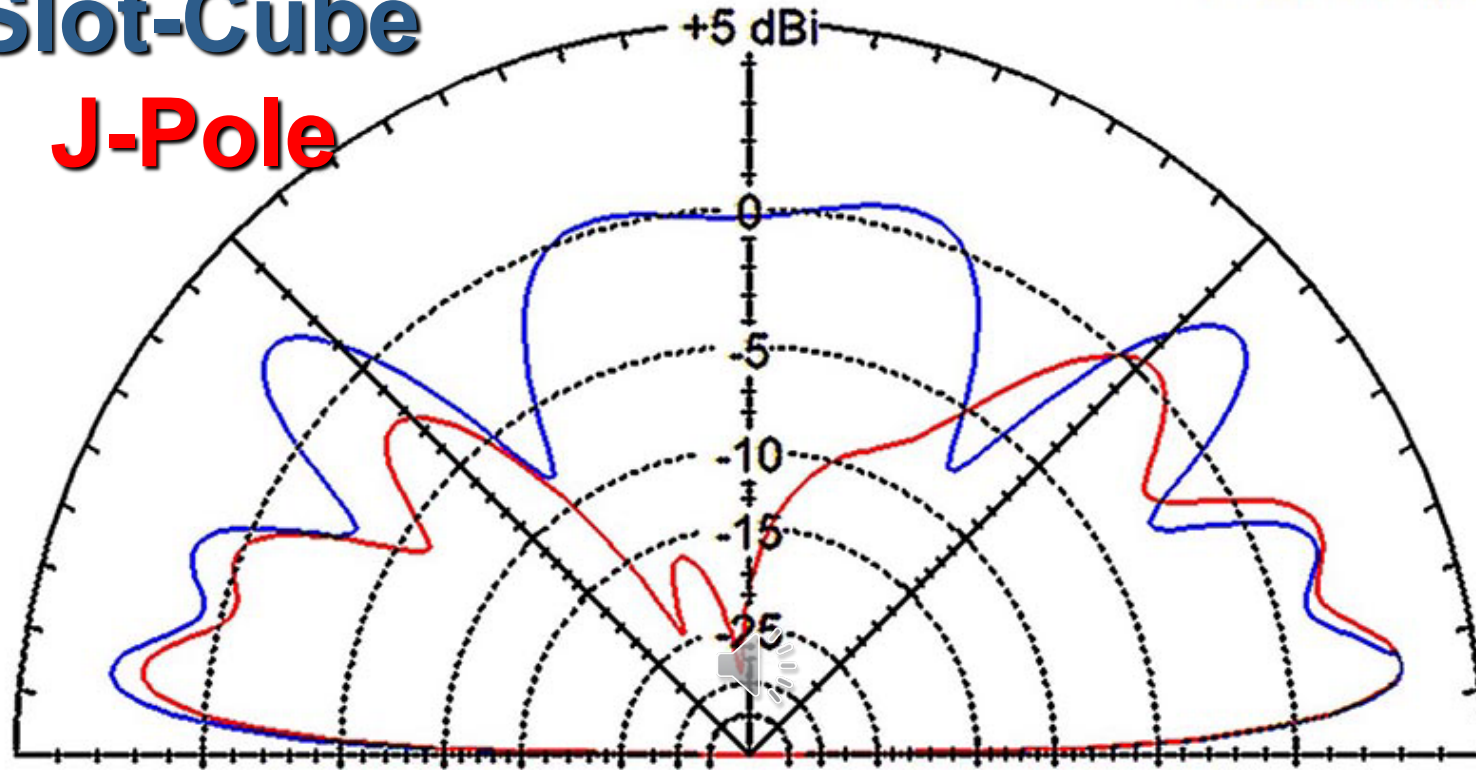


**KB9IBT**

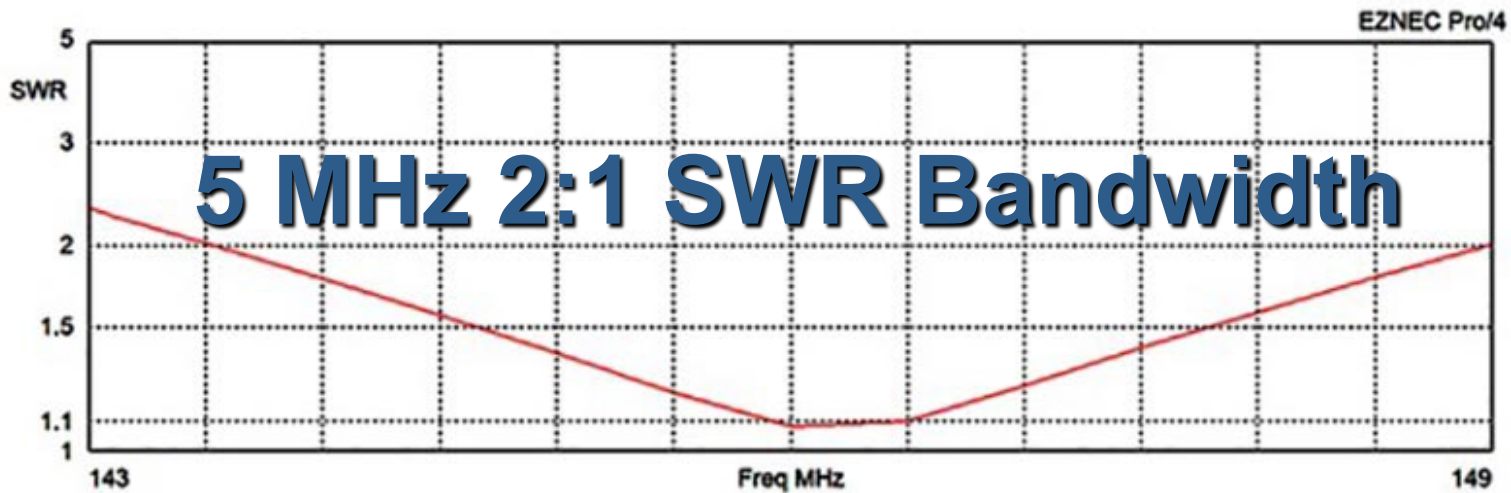
# Slot-Cube

## J-Pole

EZNEC Pro/4



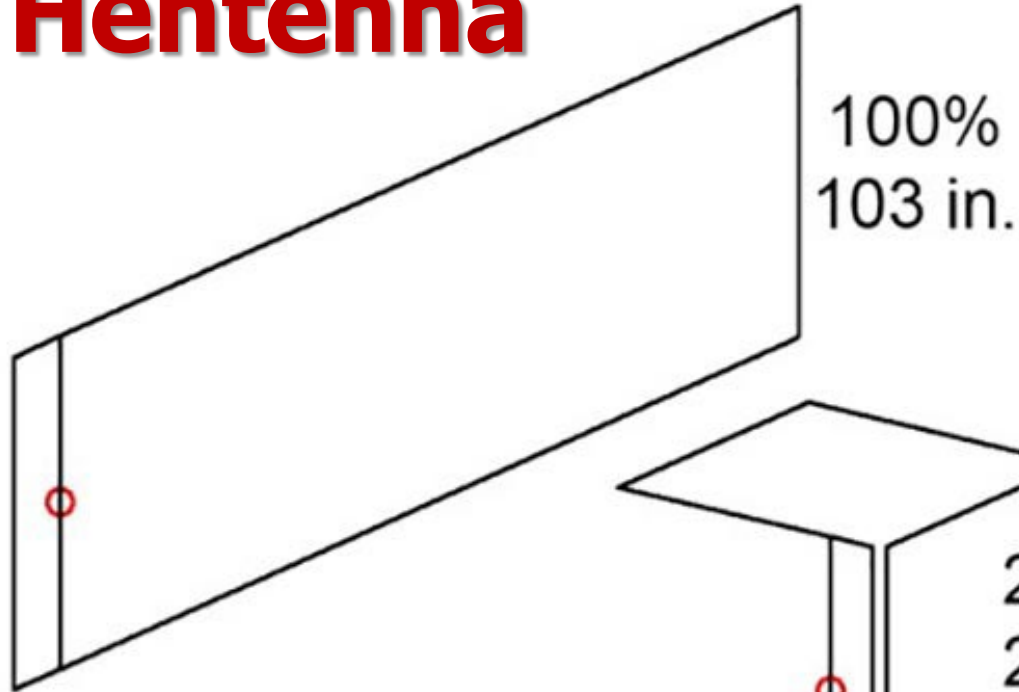
146.2 MHz



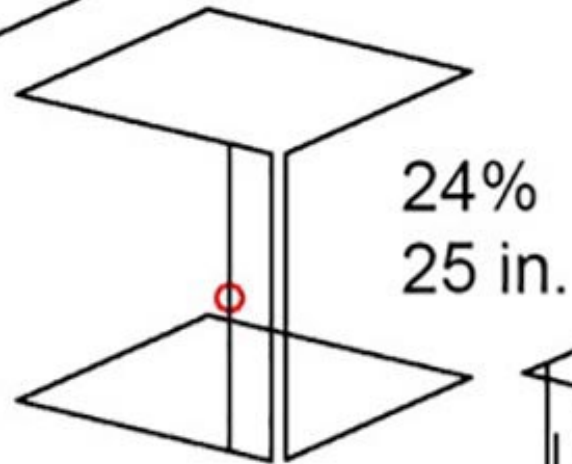
**“Can I  
make it for  
6 meters ?”**

**Hentenna**

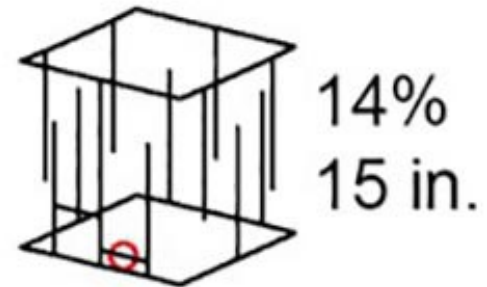
**6m**



**Folded & Staggered**



**Folded Slot-Cube**



# Double Fold

6m

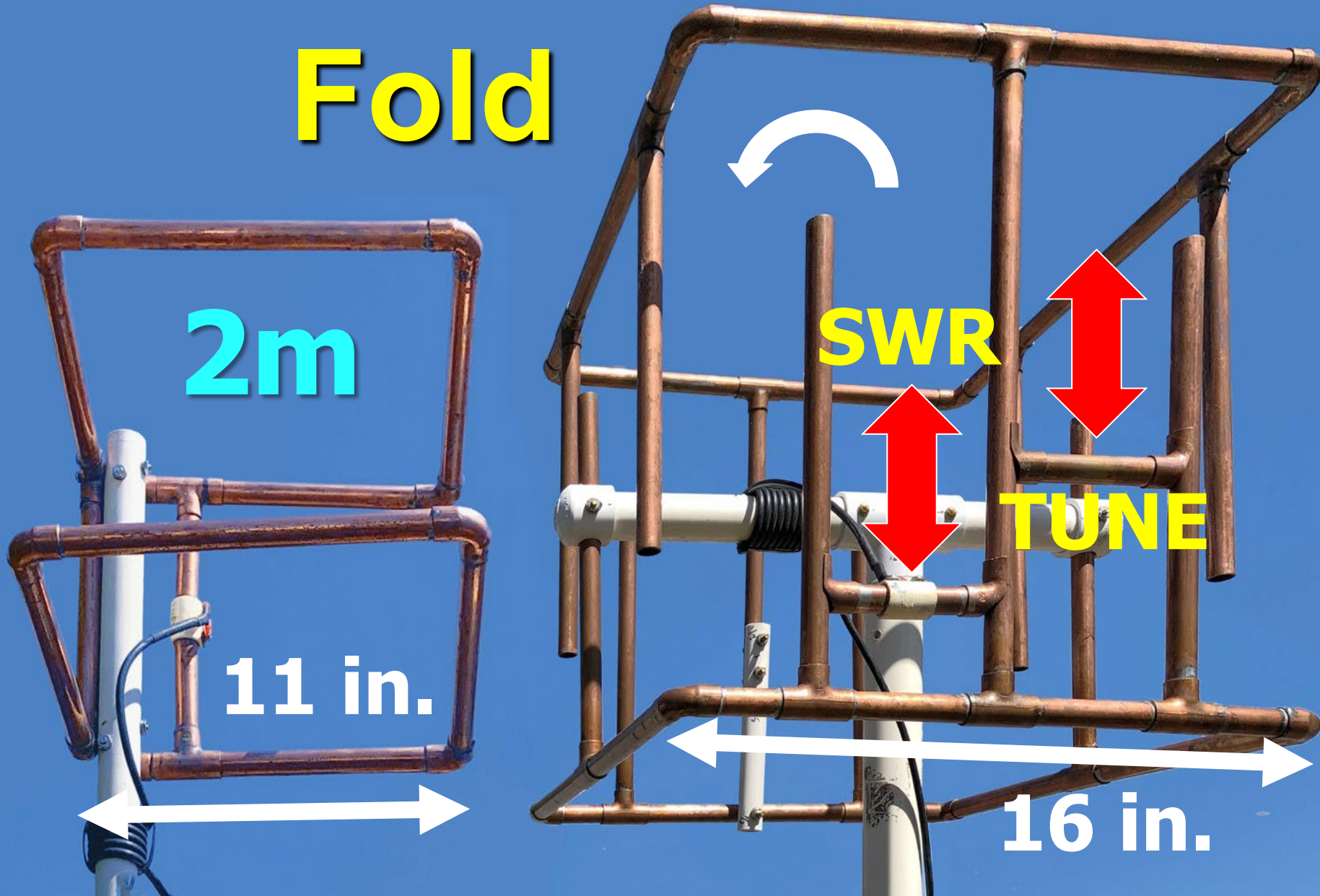
2m

SWR

TUNE

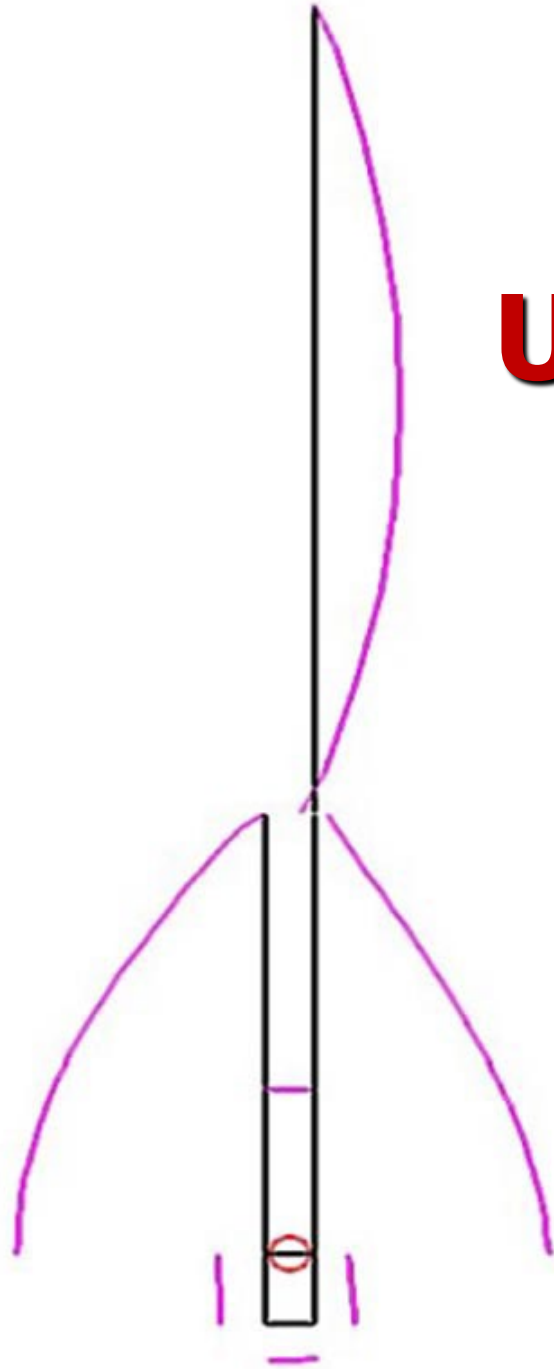
11 in.

16 in.



**5th Discovery**

**Not all Parts  
of an Antenna  
Radiate**



**Un-opposed  
Current**

**Equal  
Opposing  
Currents**

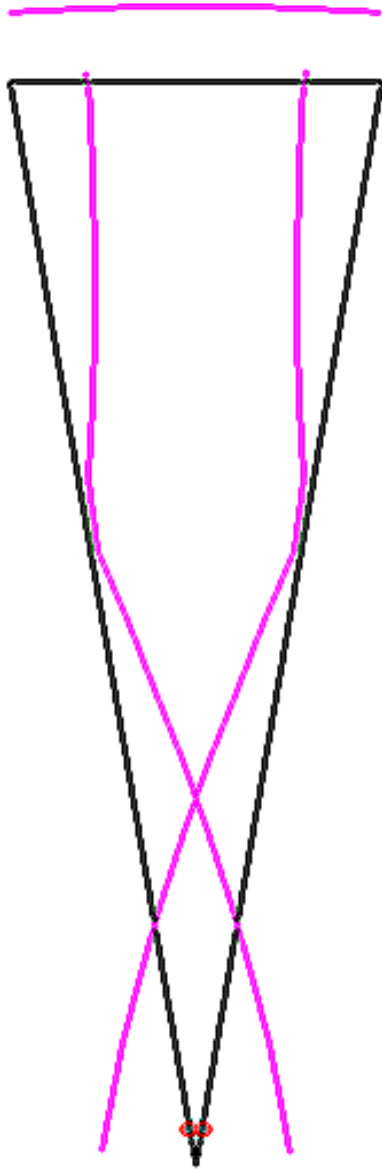


**All Discoveries  
Combined**

**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**

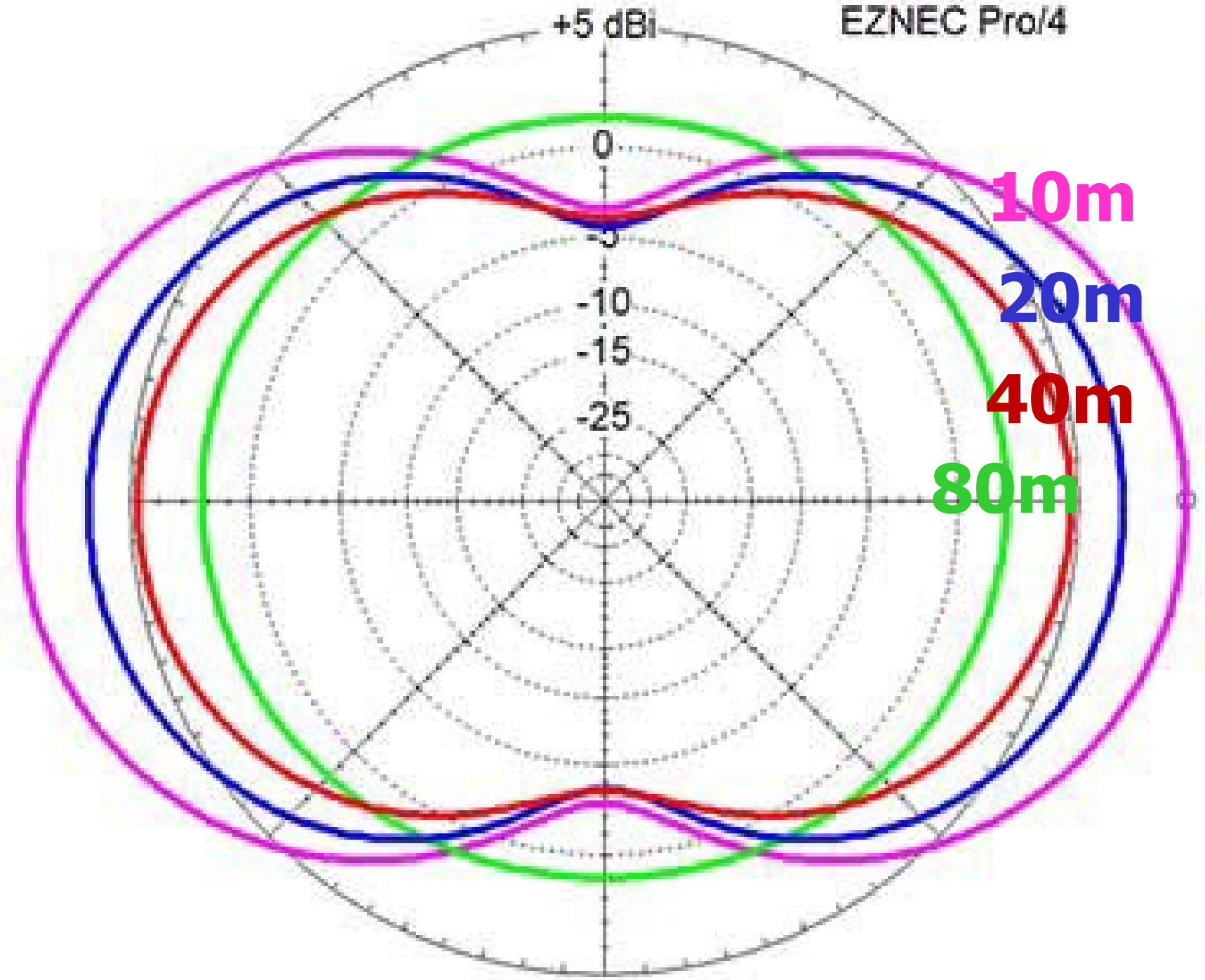


# **A Common Mistake**

**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**



**10m**

**20m**

**40m**

**80m**

# My Back Yard

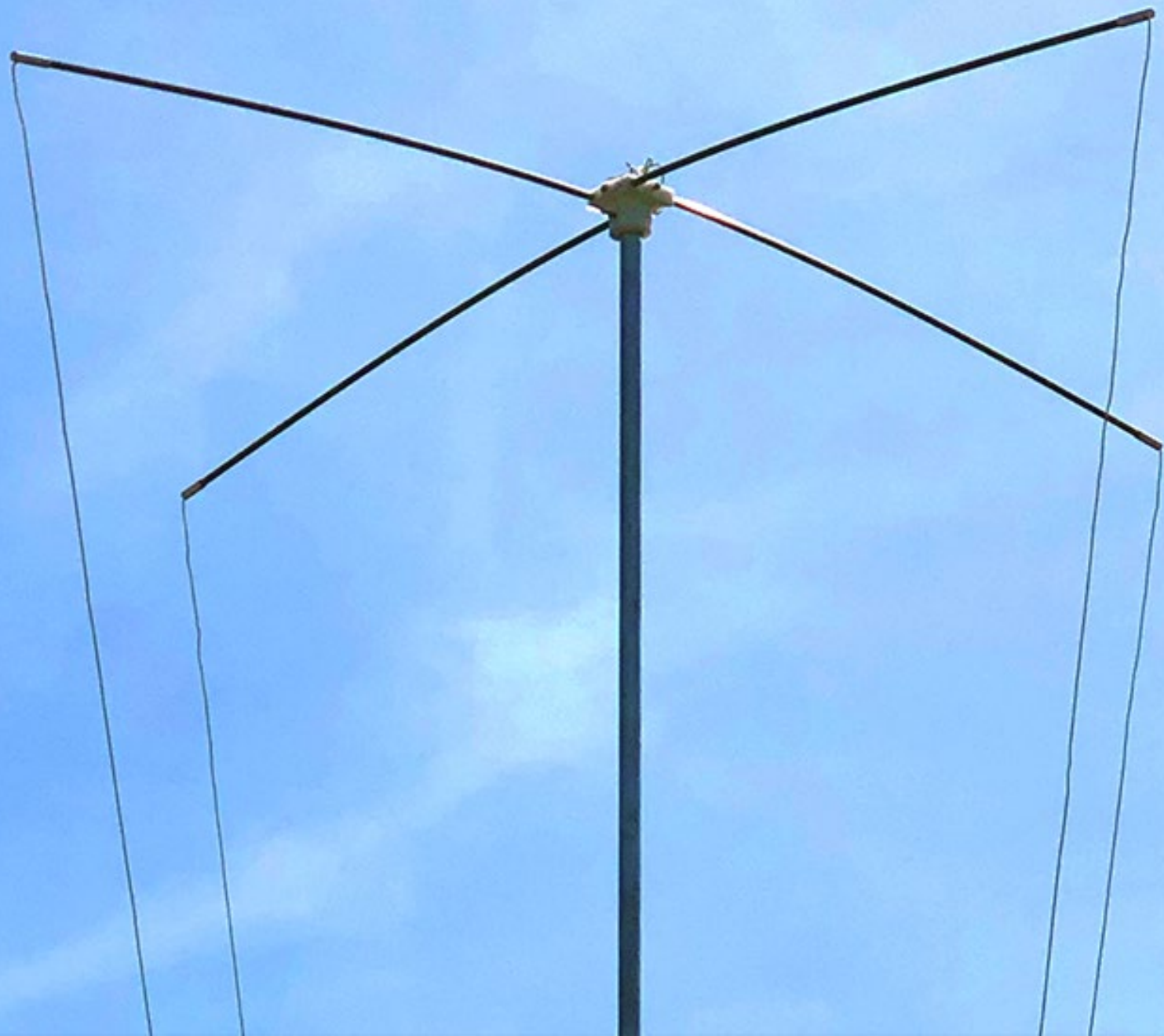
No Guys

4 ft.

Pipe in Soil  
(No Concrete)

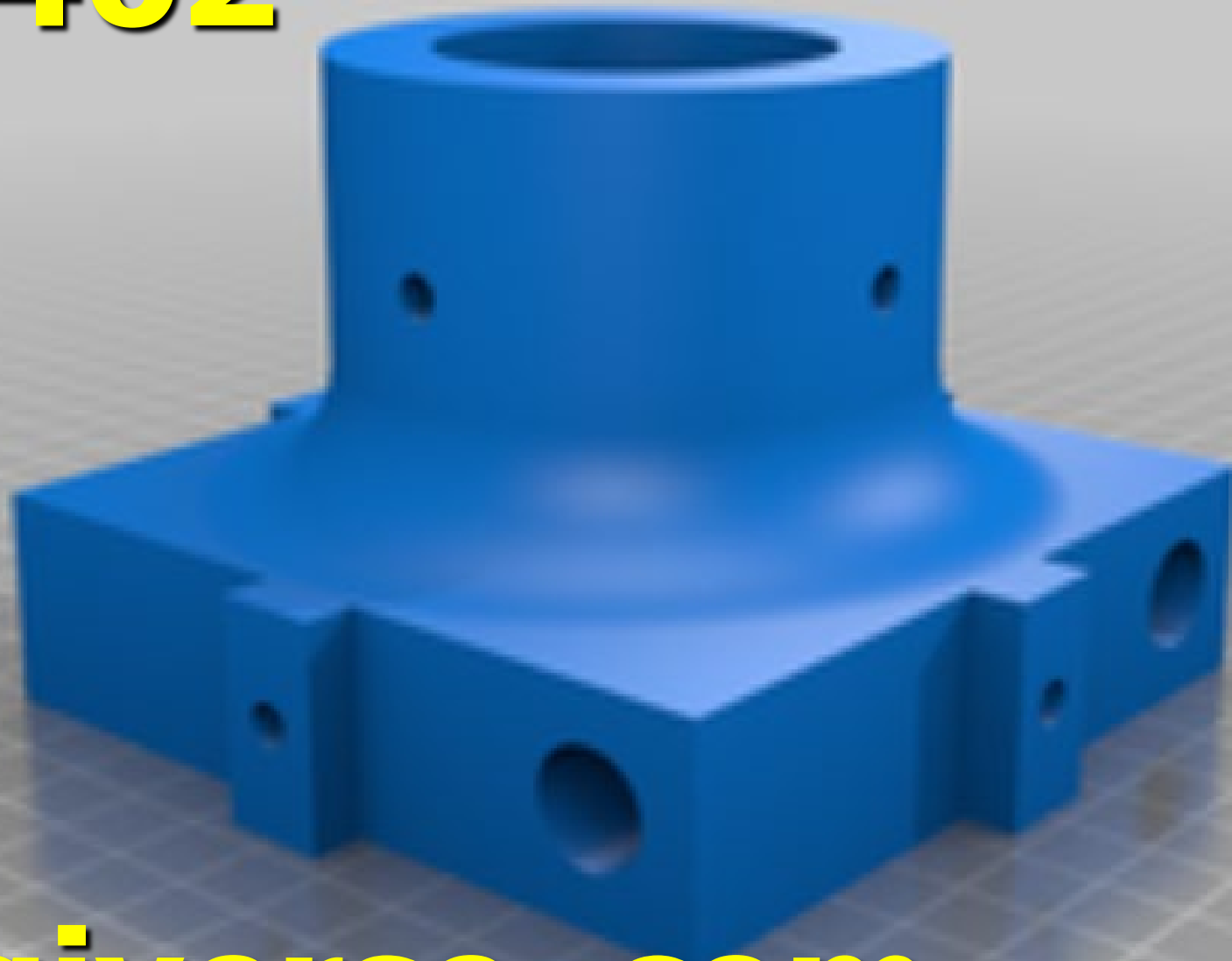
Base  
Auto-Tuner







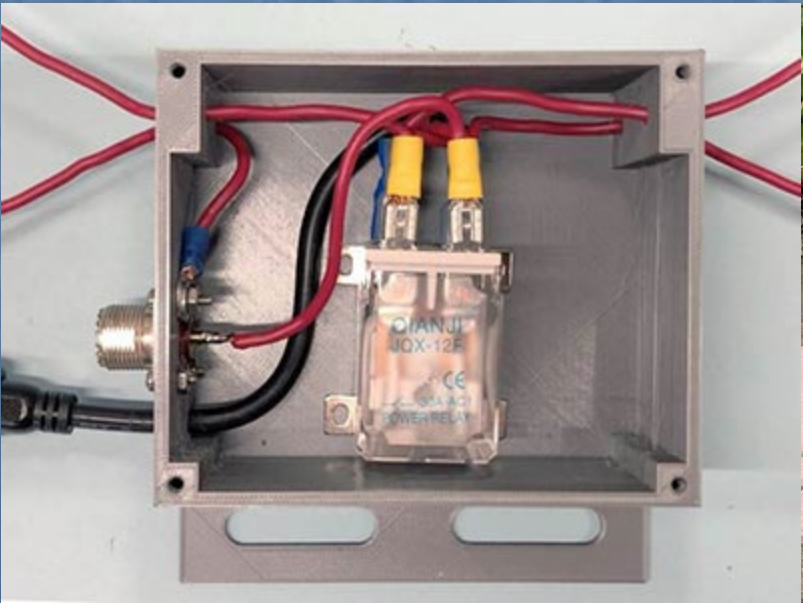
**4694462**



**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.**

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\$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

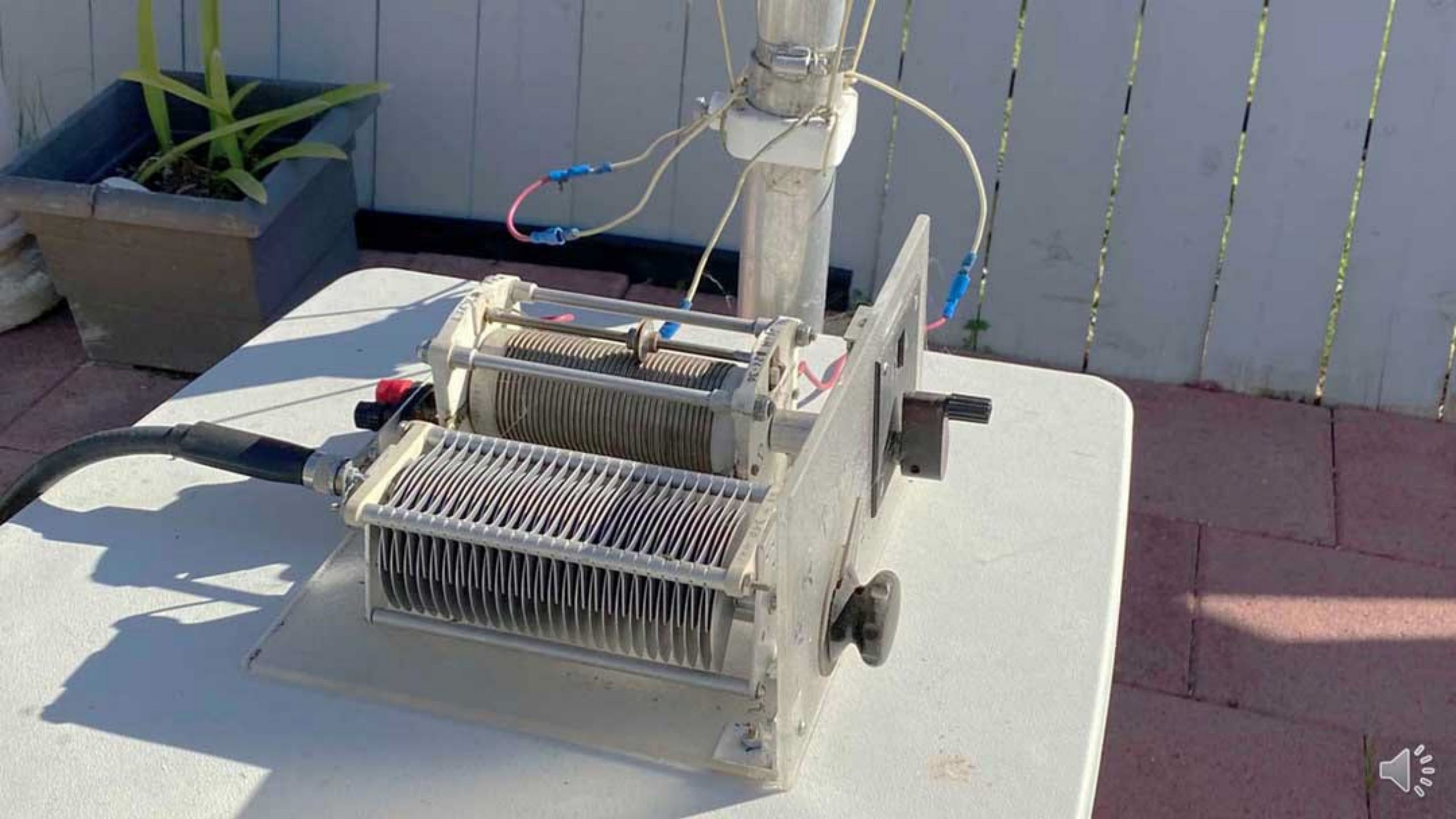
\$6.49

**Five stainless hose clamps**

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

Availability: In Stock

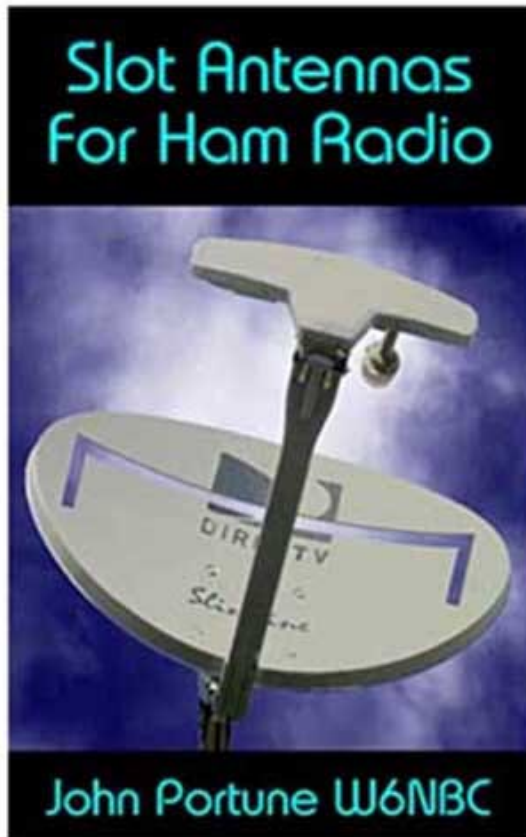
Estimated Ship Date: **Today**



# **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





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@gmail.com**

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**DØGGY**



*"That's all Folks!"*