

EH Antenna

NATIONAL ASSOCIATION OF
BROADCASTERS
LAS VEGAS
APRIL 2004
BY

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EH ANTENNA SYSTEMS

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What Is An EH Antenna?

It is a revolutionary concept that allows small antennas to outperform large antennas.



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EH Antenna – An Example



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What Are The Defining Parameters Of An EH Antenna?

» Small Size



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What Are The Defining Parameters Of An EH Antenna?

- » Small Size
- » + Low Height



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What Are The Defining Parameters Of An EH Antenna?

- » Small Size
- » + Low Height
- » + No Radials Required

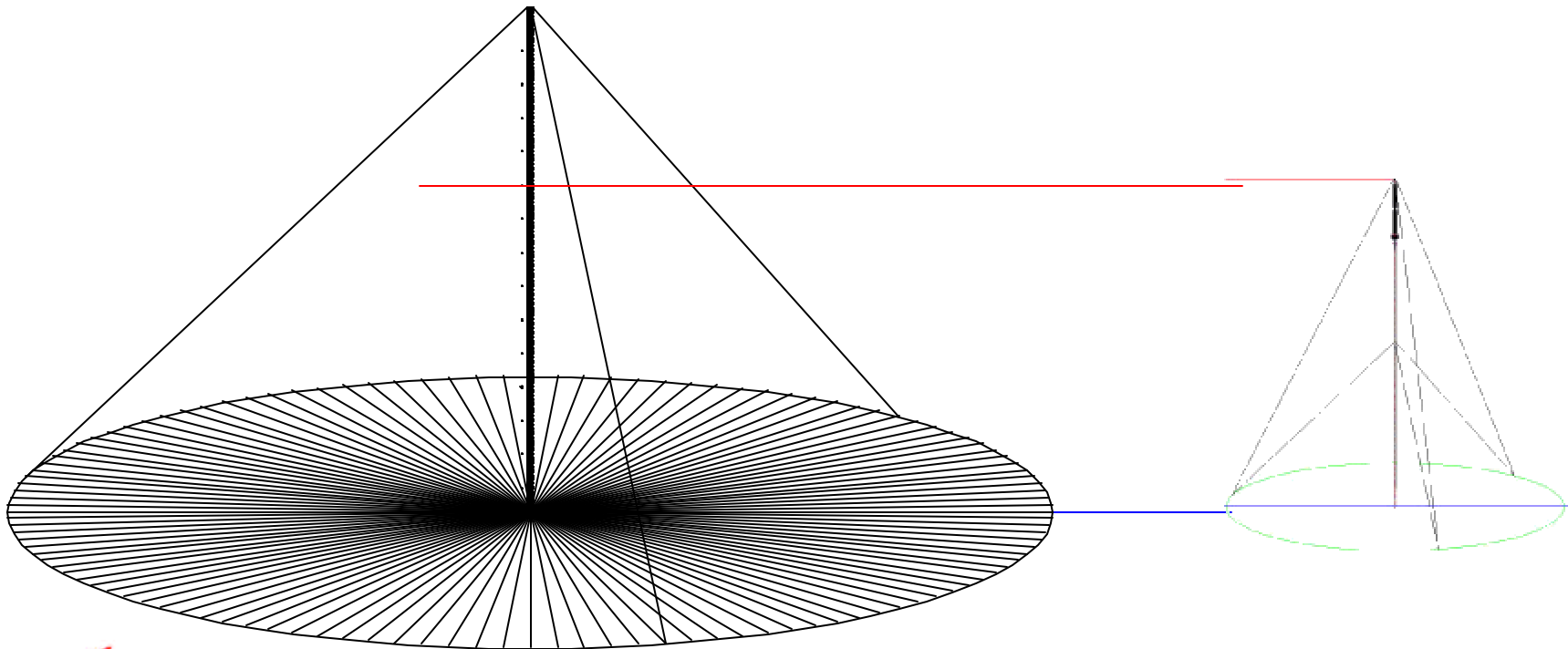


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Whole Band – 10 KW

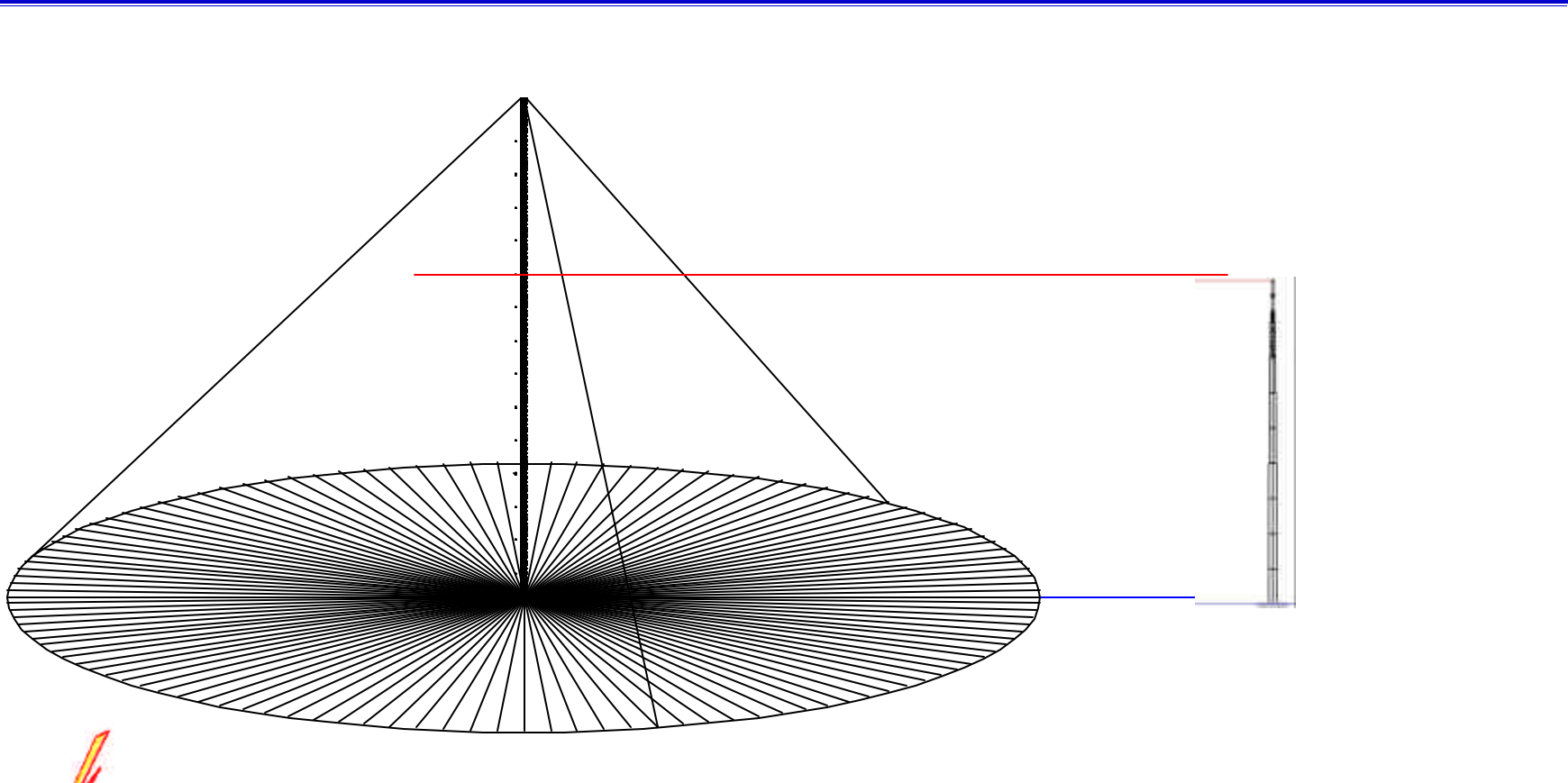


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High Band – 1 KW



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What Are The Defining Parameters Of An EH Antenna?

- » Small Size
- » + Low Height
- » + No Radials Required
- » + Broad Bandwidth



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What Are The Defining Parameters Of An EH Antenna?

- » Small Size
- » + Low Height
- » + No Radials Required
- » + Broad Bandwidth
- » + High Efficiency



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What Are The Defining Parameters Of An EH Antenna?

- » Small Size
- » + Low Height
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- » + Broad Bandwidth
- » + High Efficiency
- » + Low EMI



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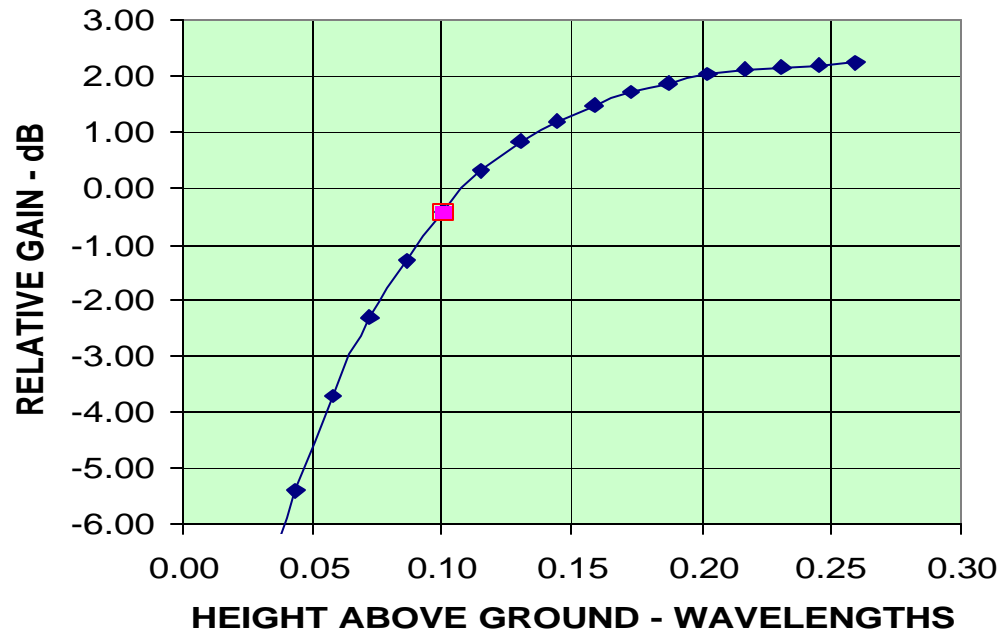
What Are The Defining Parameters Of An EH Antenna?

- » Small Size
 - » + Low Height
 - » + No Radials Required
 - » + Broad Bandwidth
 - » + High Efficiency
 - » + Low EMI
-
- » = High Economic Value For The Broadcaster



The Number 1 Question, does It Work?

RADIATION LEVEL vs. HEIGHT
Comparison of EH Antenna
to a standard 1/4 wavelength
AM Broadcast antenna

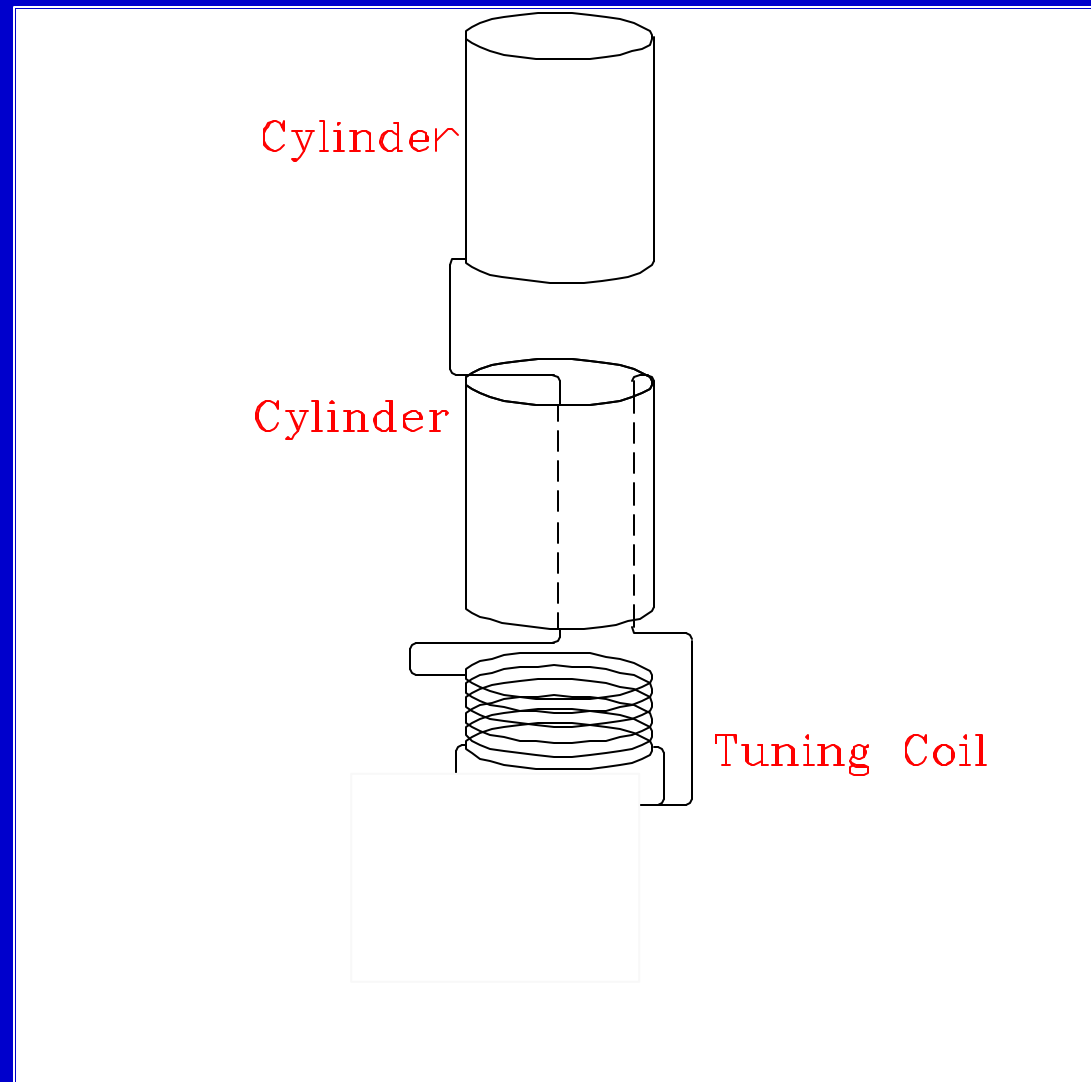


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The Evolution Of The Star EH Antenna

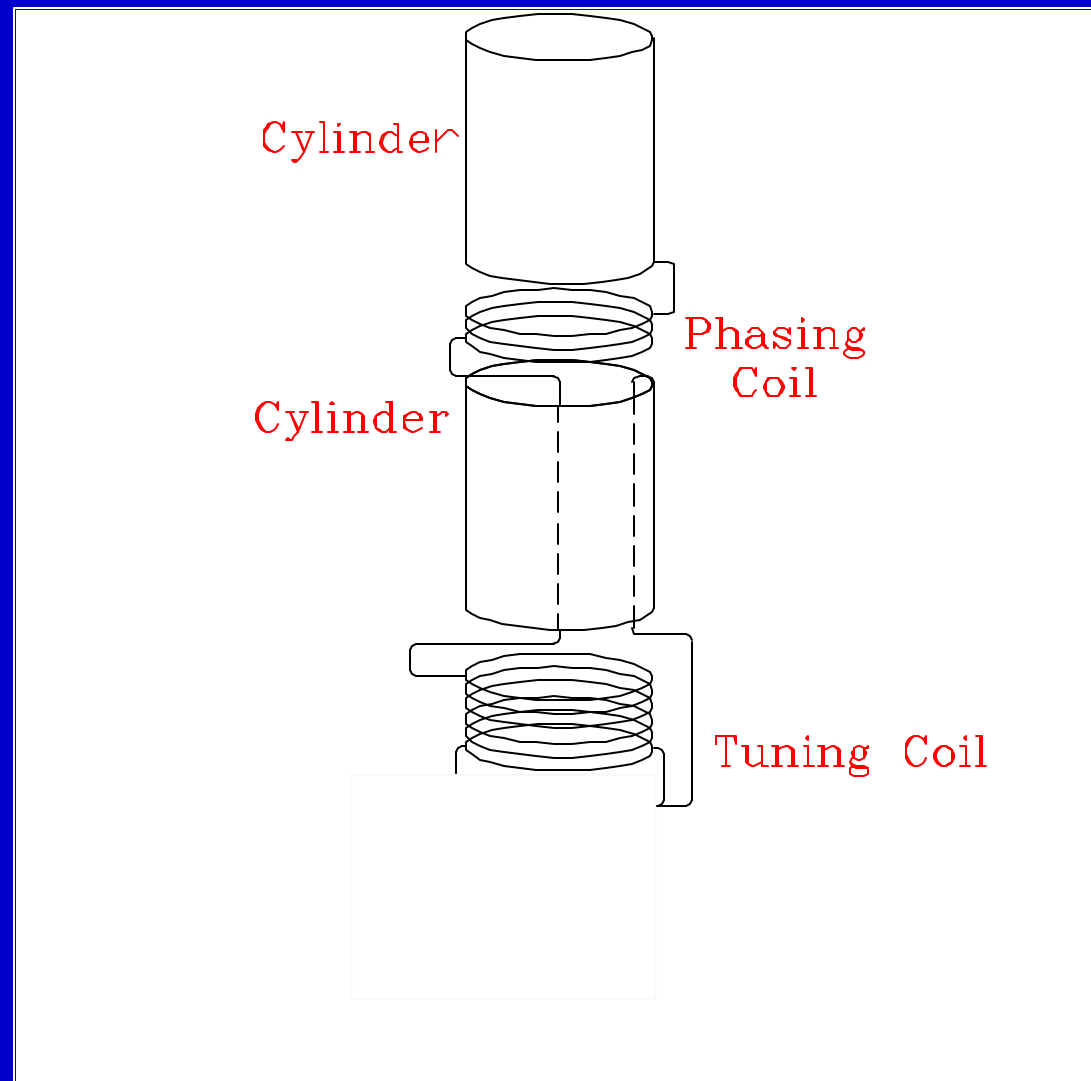


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The Evolution Of The Star EH Antenna

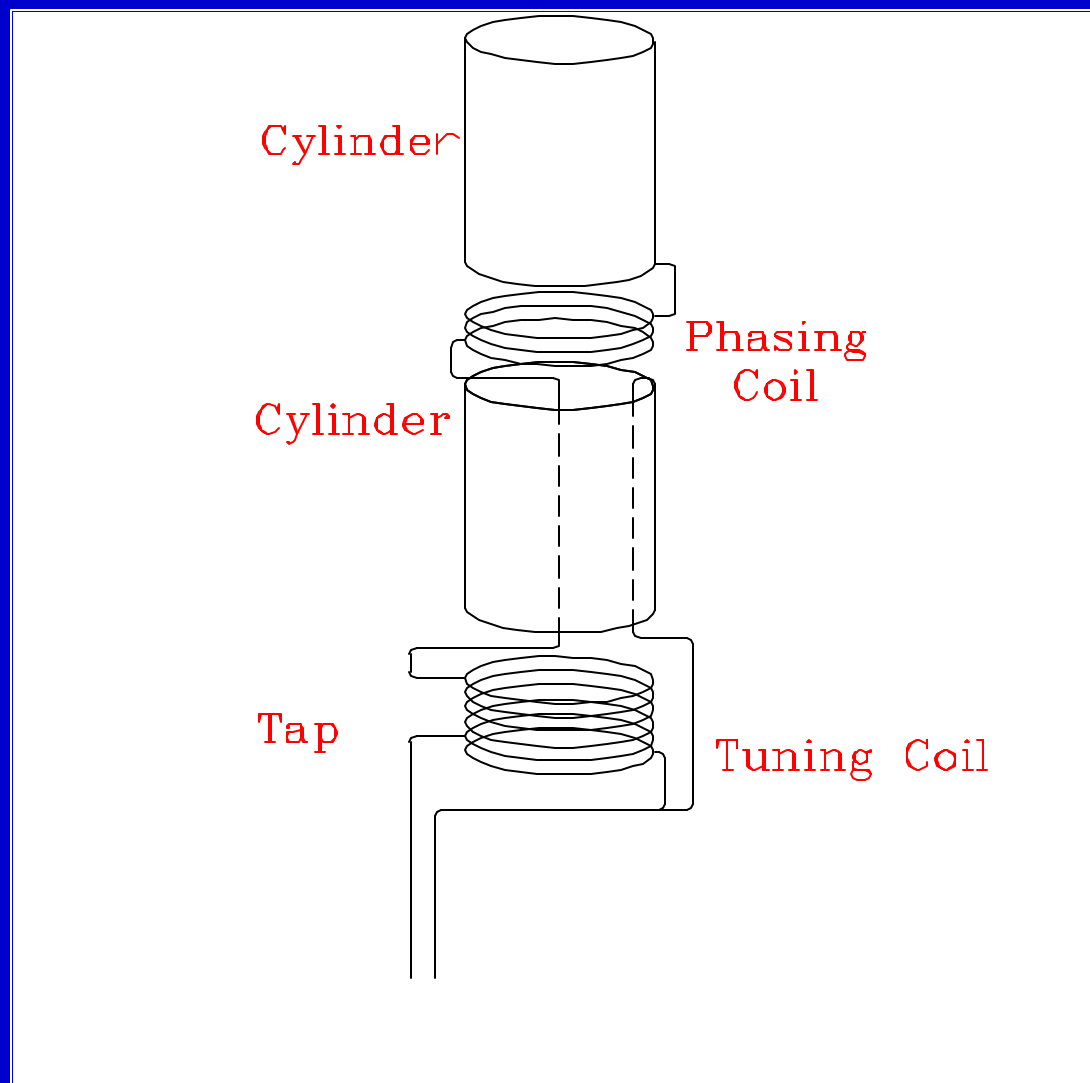


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The Evolution Of The Star EH Antenna



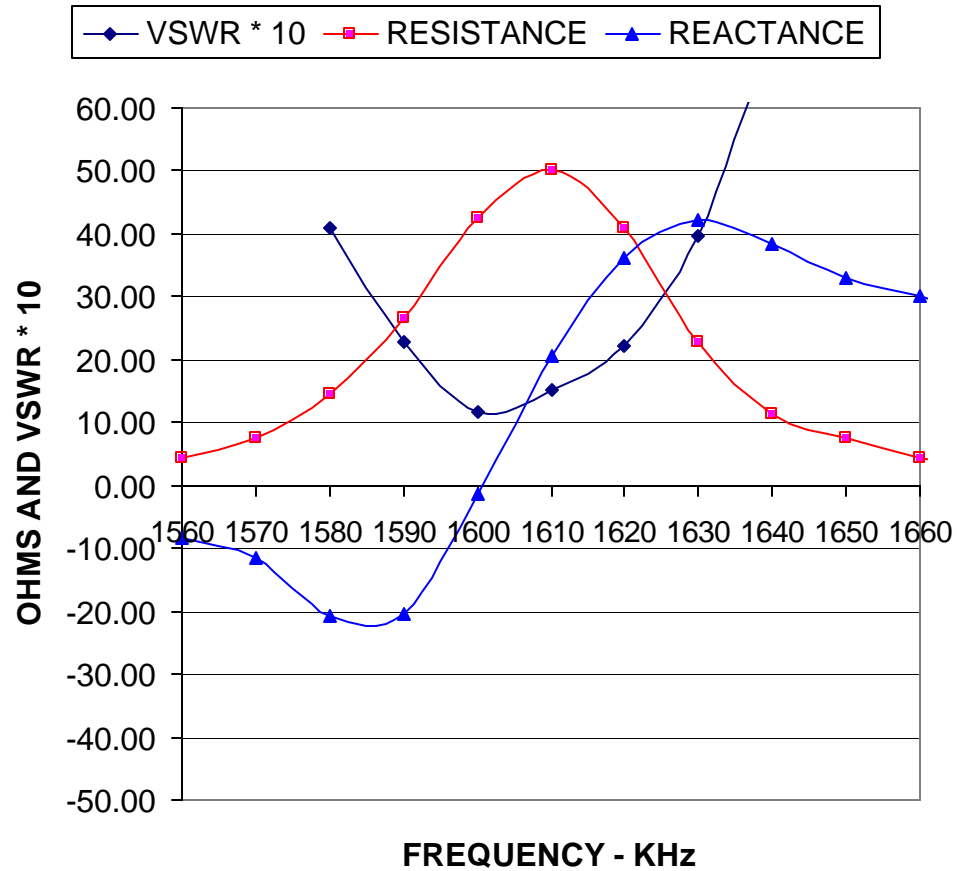
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RX

1 KW EH ANTENNA PARAMETERS

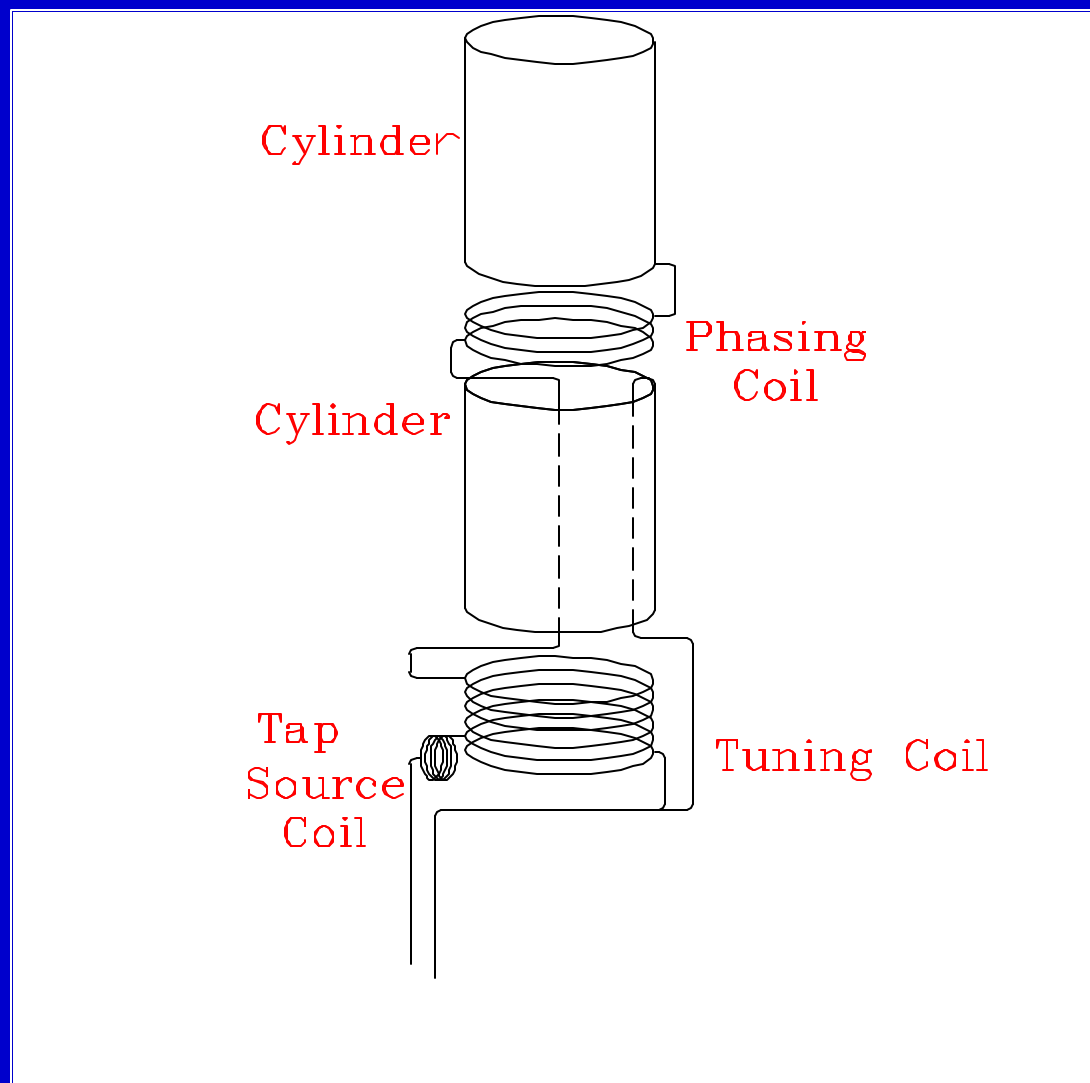


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The Evolution Of The Star EH Antenna



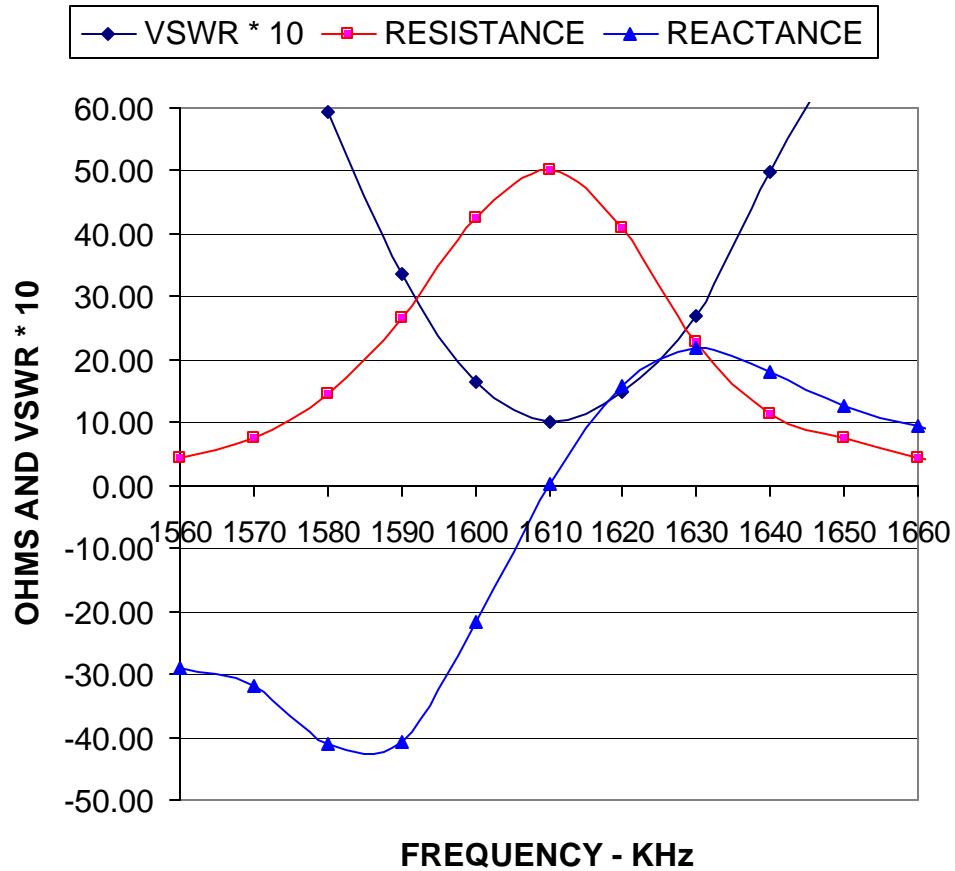
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Corrected Impedance

1 KW EH ANTENNA PARAMETERS

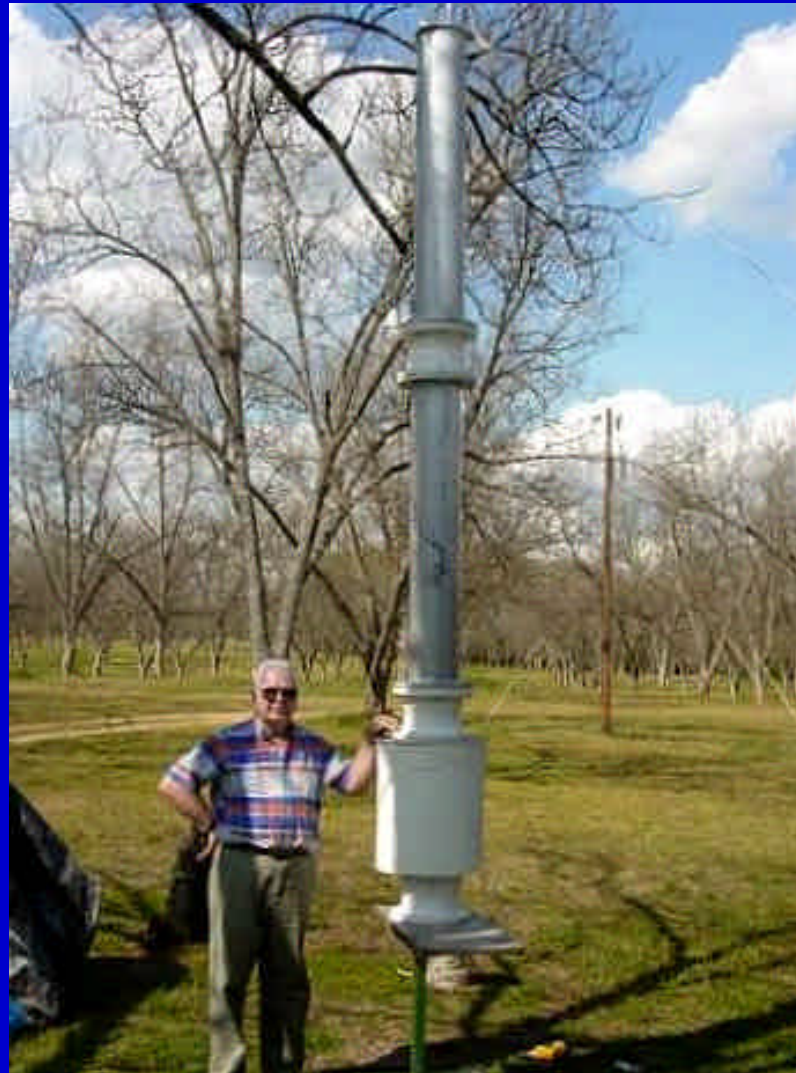


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DPH Photo

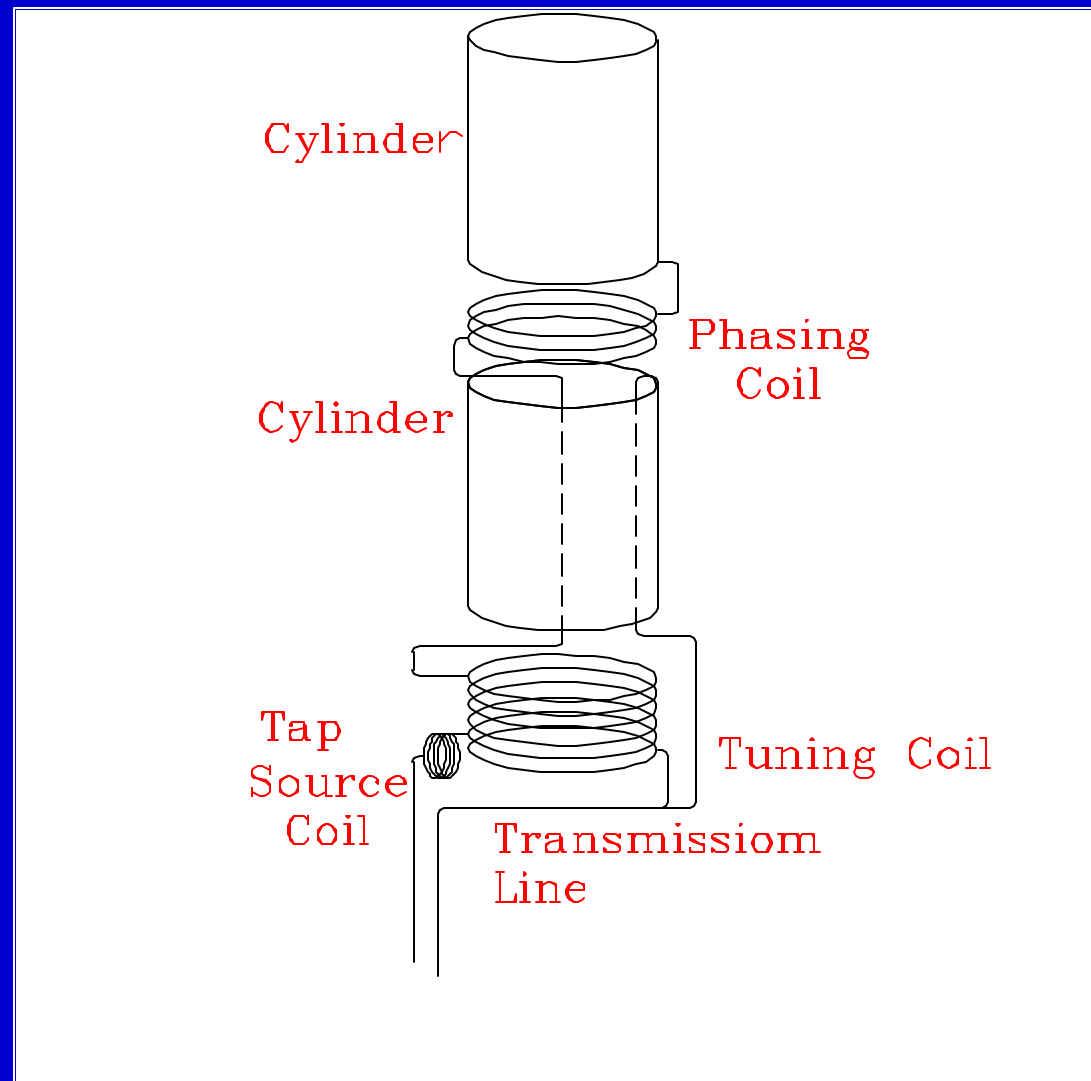


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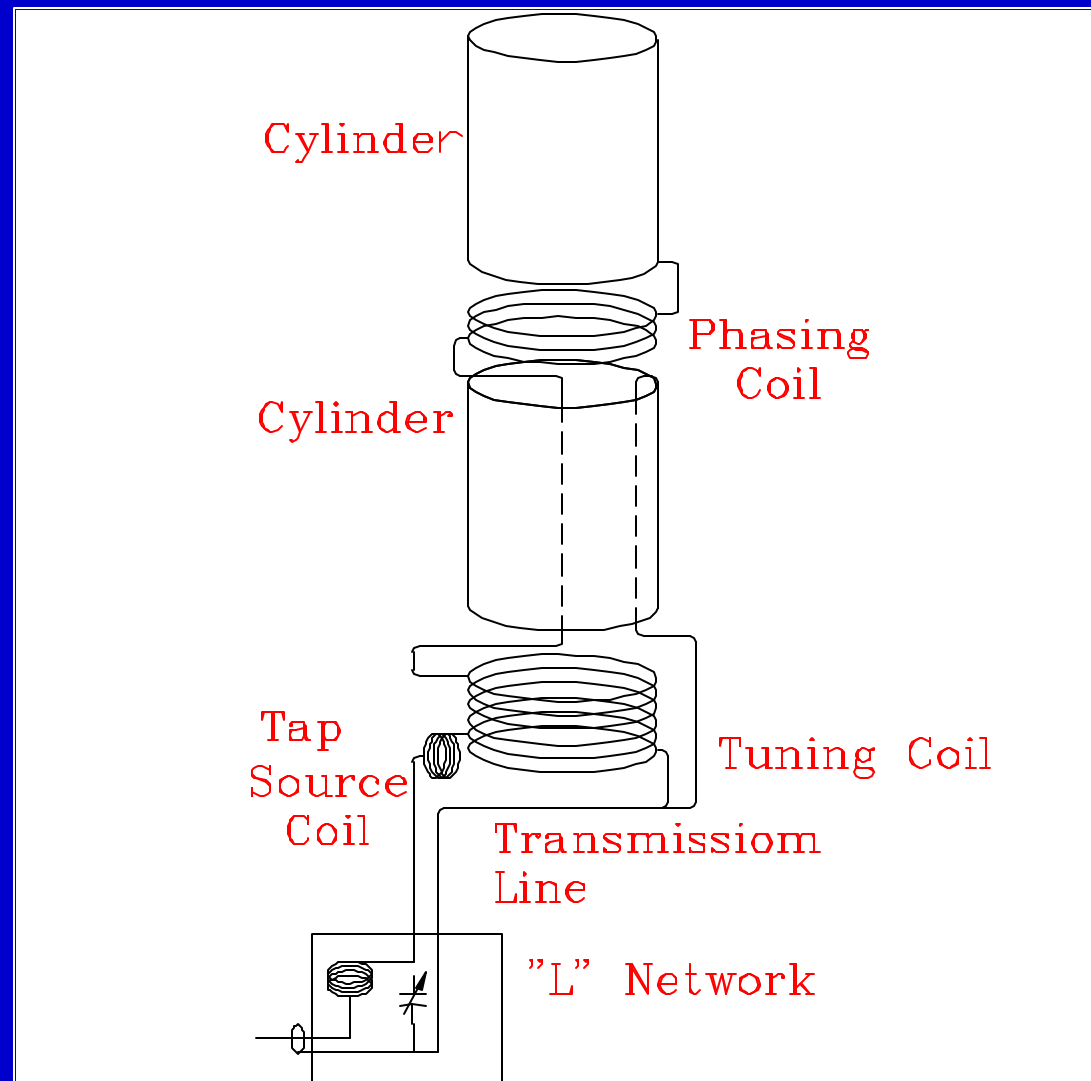


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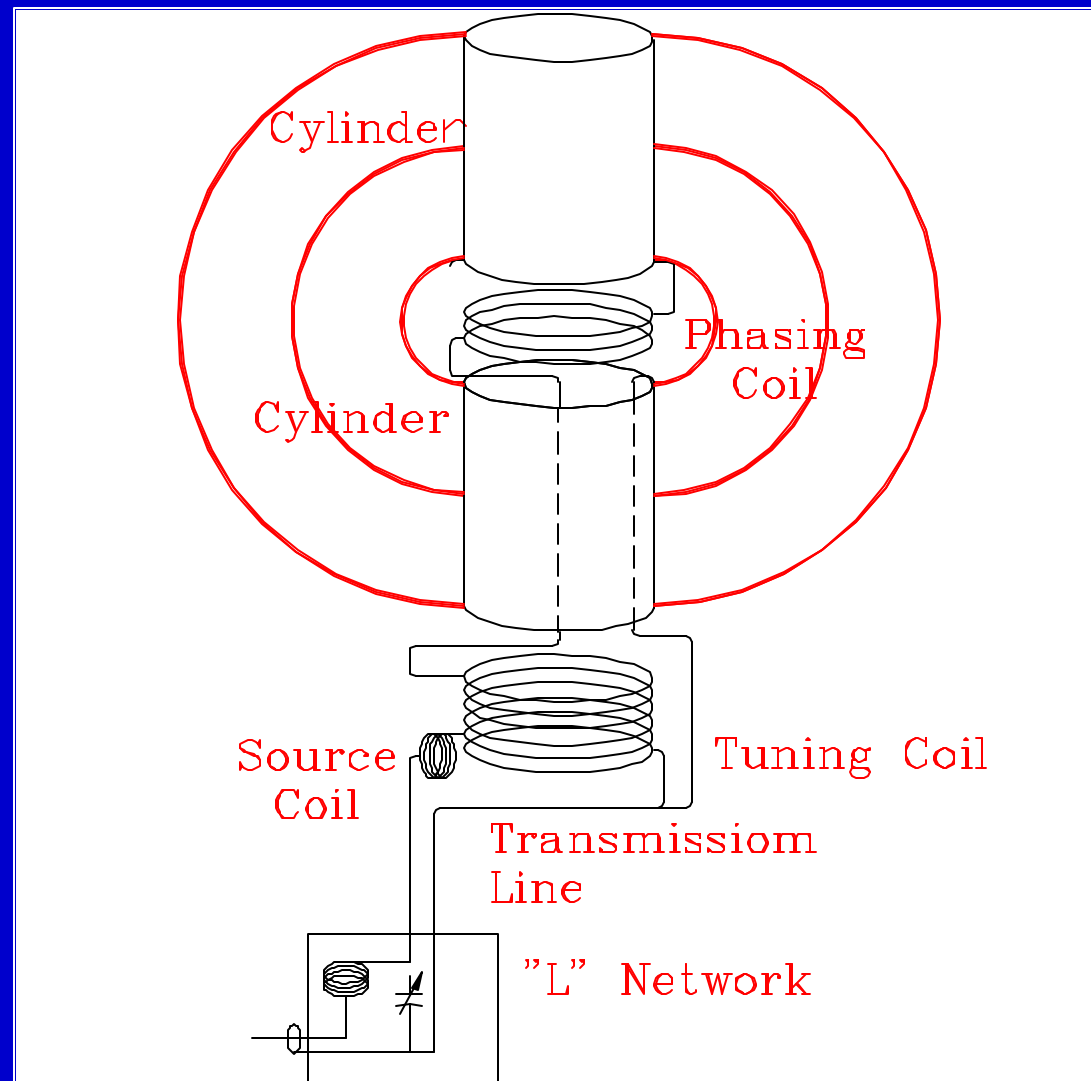


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The Evolution Of The Star EH Antenna

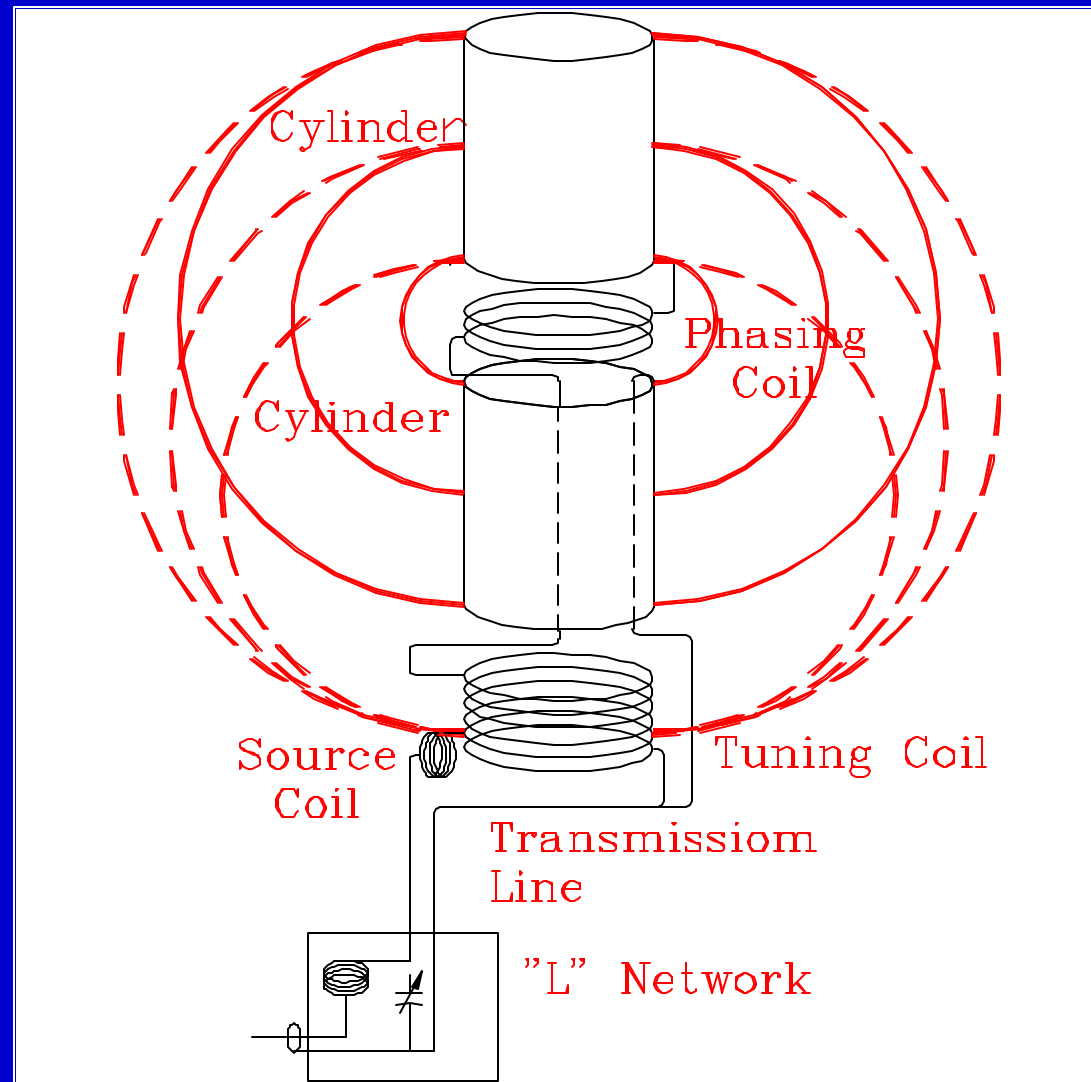


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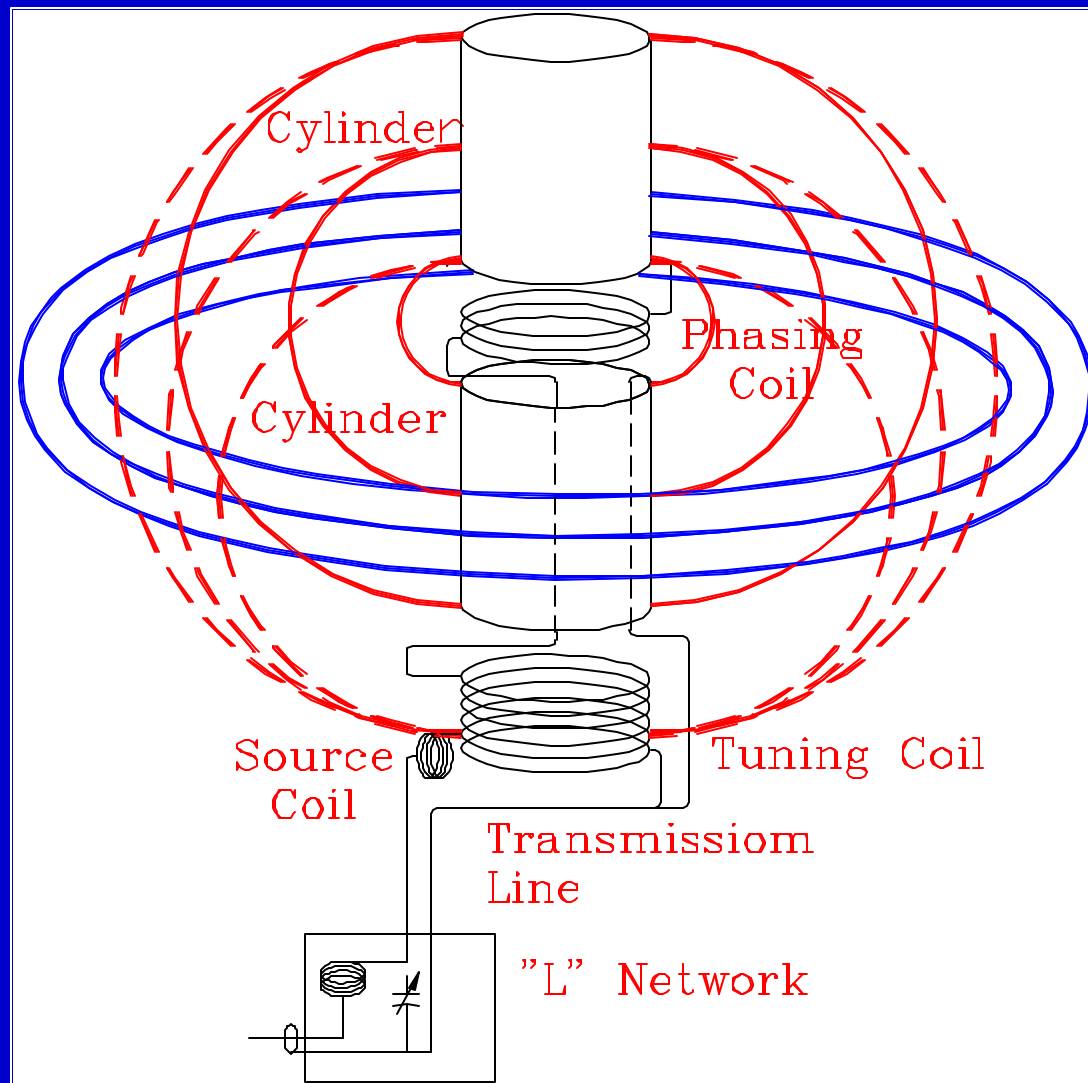


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Web Site

- http://eh-antenna.com/AM_Broadcast.htm
- <http://eh-antenna.com/amateur.htm>
- <http://eh-antenna.com>
- ted@eh-antenna.com
- **20-Meter Star Antenna >**
- **(706)473-3360**



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EH Antenna Analysis Program

Specify		
x	Frequency - Mhz - - - - -	1.600
x	Transmitter Power - Watts - - - -	1000
x	Antenna Diameter - Inches - - - -	8.0
x	Cylinder L/D Ratio - - - - -	6
x	Measured Effective 3 dB Resistance	78
x	Radiation Resistance - - - - -	77.38



EH Antenna Analysis Program

EFFECT OF LOADING ON THE EH ANTENNA

$$Q = X_L / R = F_0 / BW$$

$$\text{Therefore: } BW = R * F_0 / X_L$$

Example:

If BW increases by 10, then R increases by 10

$$h = R_R / (R_R + R_L)$$

Example:

For $R_R = 5$ and $R_L = 0.5$, then $h = 90.9\%$

For $R_R = 50$ and $R_L = 0.5$, then $h = 98.9\%$

The change in Efficiency = 0.4 dB



EH Antenna Analysis Program

Specify		
x	Frequency - Mhz - - - - -	1.600
x	Transmitter Power - Watts - - - -	1000
x	Antenna Diameter - Inches - - - -	8.0
x	Cylinder L/D Ratio - - - - -	6
x	Measured Effective 3 dB Resistance	78
x	Radiation Resistance - - - - -	77.38



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EH Antenna Analysis Program

Results:		
	Cylinder Capacity - pFd - - - - -	43
	Shunt capacity - pFd - - - - -	36
	Effective Inductive Reactance - ohm	1241
	3 dB Bandwidth - KHz - - - - -	99
	Effective Antenna Q - - - - -	16
	Tuning Inductance - uHy - - - - -	126
	Circulating current - amps - RMS -	3.6
	Cylinder voltage - volts -RMS - -	4253



EH Antenna Analysis Program

Phasing Coil details		
	Phasing coil length (6 degrees).	10 Ft.
x	Effective wire diameter - inches	0.25
	Heat loss - watts -	0.06

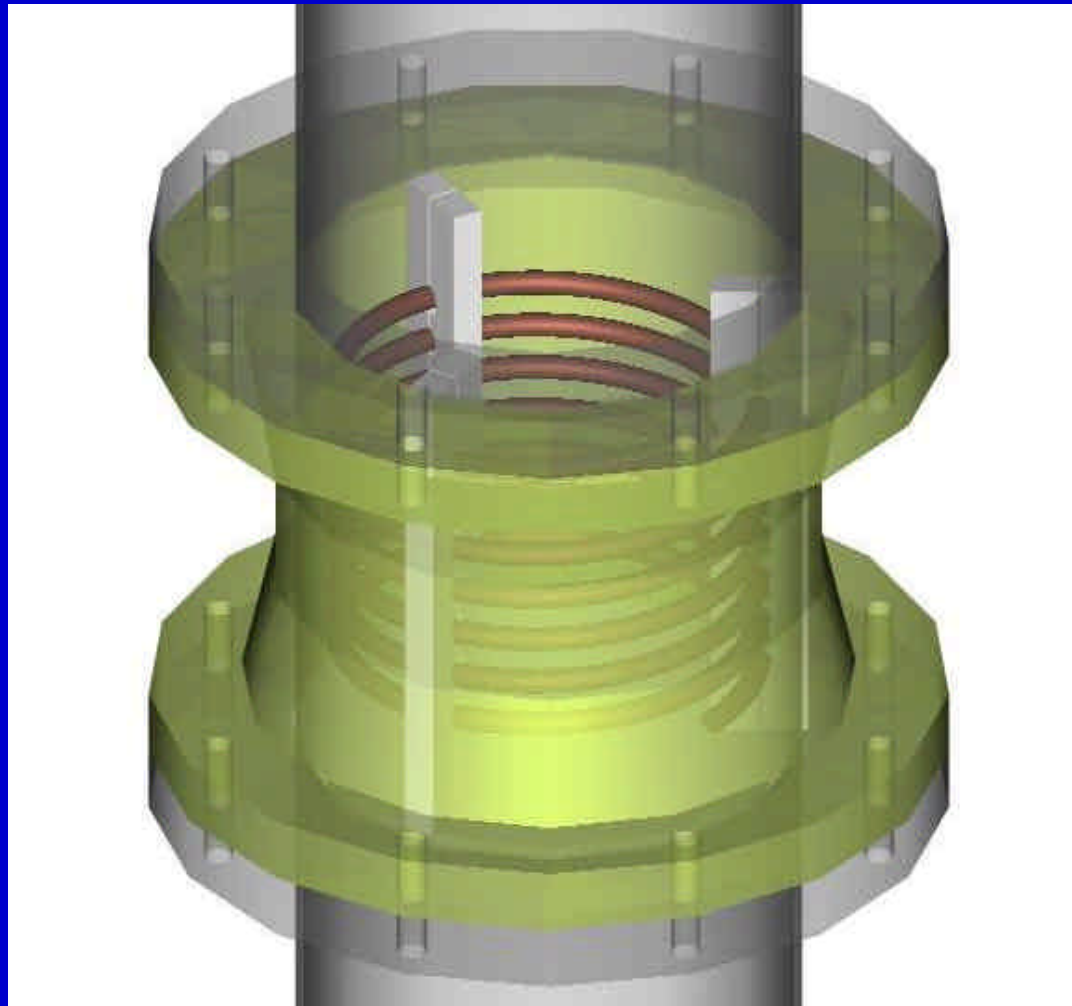


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Rendering Of Phasing Coil



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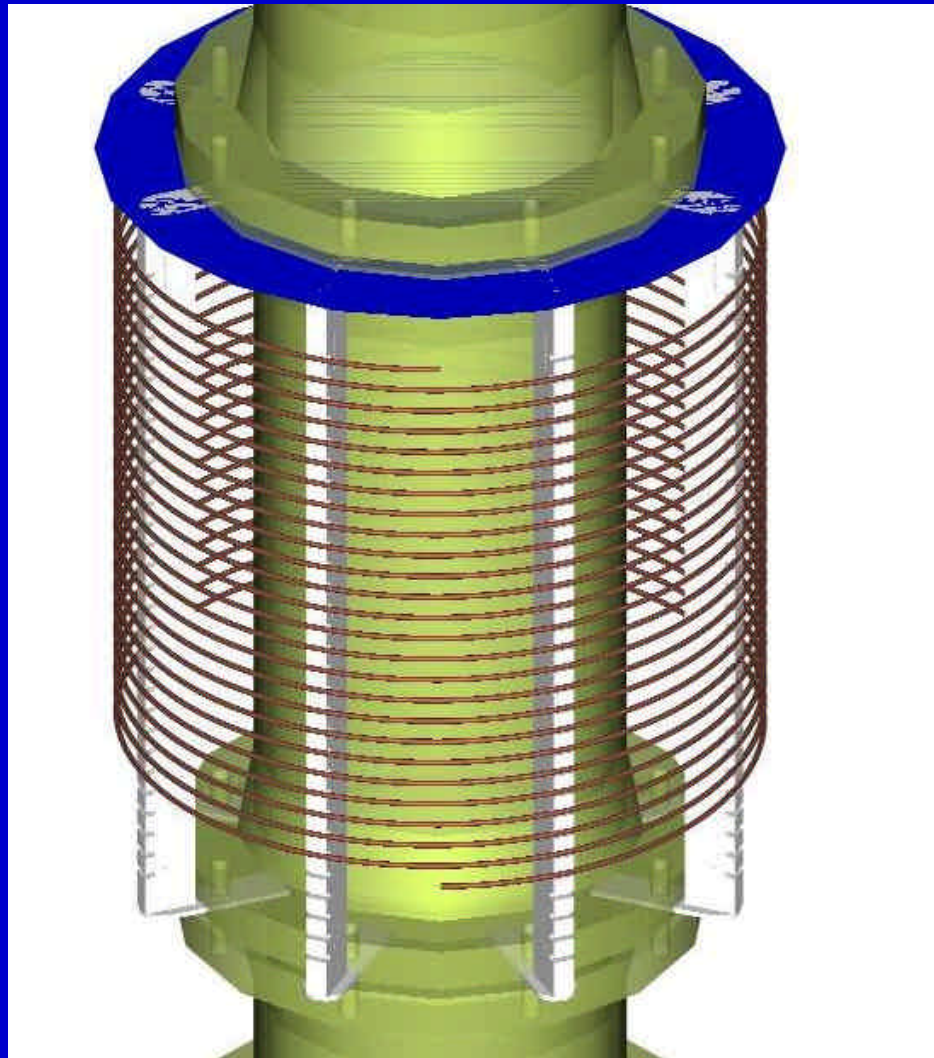
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EH Antenna Analysis Program

Tuning Coil details			
x	Diameter - inches	- - - - -	15.5
x	Pitch - inches (center to center)	- -	0.550
	Coil Length - inches	- - - - -	10.6
	Coil Turns	- - - - -	19.4
x	Effective wire diameter - inches	- -	0.25
		Wire length - feet	76.0
		Heat loss - watts	5.01



Rendering Of Tuning Coil



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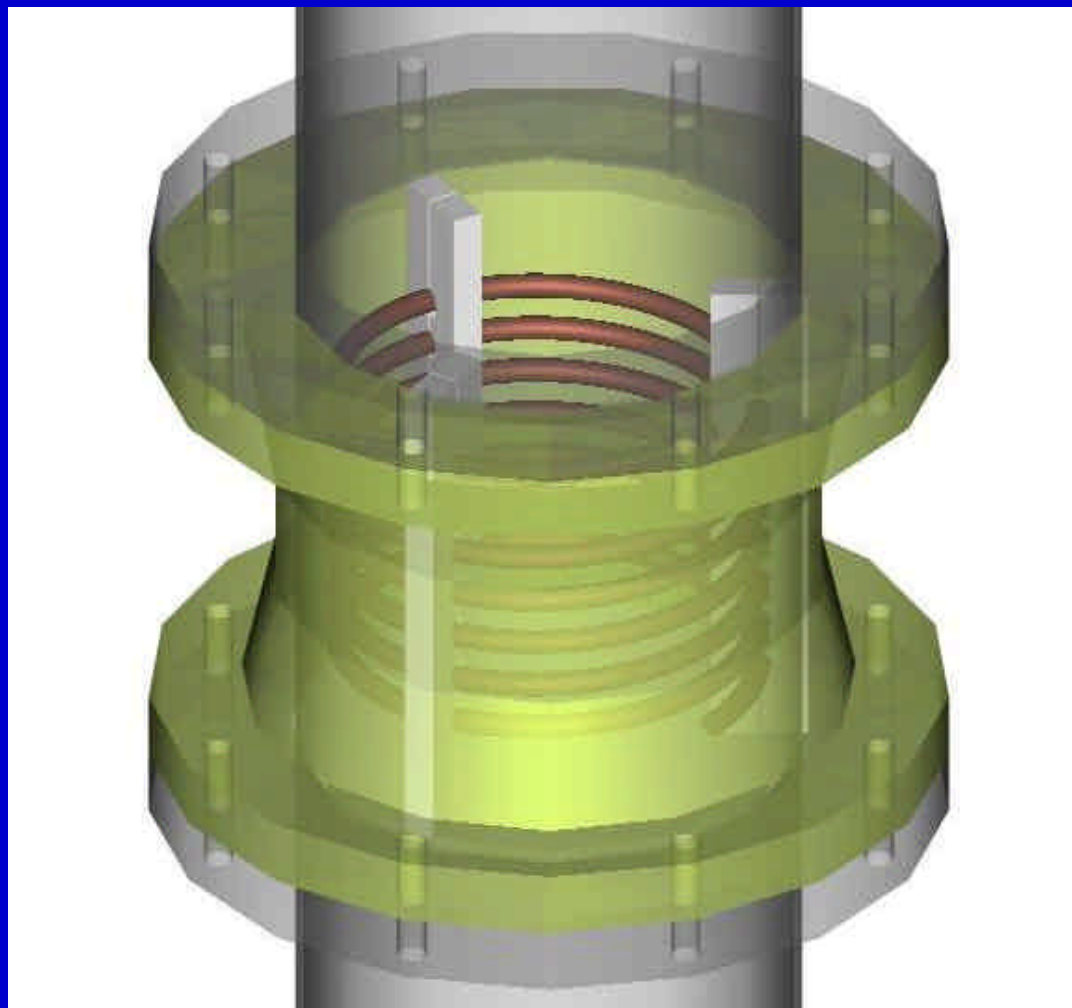
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Source Coil Details			
x	Reactance - ohms - - - - -		19.40
		Wire length - feet -	14.86
		Heat loss - watts -	0.08



Rendering Of Source Coil



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Transmission line			
x	Type		
		Parallel coax- Z	25
		Loss -dB - - - - -	0.012
		Heat Loss - watts -	2.8



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L Network - transform to 50 ohms			
	Shunt Capacity across 50 ohms -pF		1990
	Capacitor voltage - volts -RMS	- -	224
	Capacitor current - amps - RMS	-	4.5
	Series Inductance - uHy	- - - - -	4.98
x	Coil Diameter - inches	- - - - -	6
x	Pitch - inches	- - - - -	0.55
	Length - inches	- - - - -	3.8
	Coil Turns	- - - - -	6.6
x	Wire diameter - inches	- - - - -	0.25
		Wire length - feet -	26
		Heat loss - watts -	5.35



“L” Network

- Mounted at the base of the tower.
- Enclosed in NEMA Housing.
- Enclosure size to be determined by:
 - Transmission line impedance.
 - Transmitter power.



EH Antenna Analysis Program

Summary of losses		
	Total Heat loss - watts	- - - - 13.18
	Antenna System Efficiency - Percent	98.68
	Antenna System Efficiency - dB - -	-0.06



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EH Antenna Economics

COST ITEM	1/4 WAVE TOWER	LARGE	SMALL
\			
TOWER	1/4 l	0.15 l	0.15 l
RADIALS	120	0	0
LAND	Acres	guys	square feet
ANTENNA	TOWER	\$37,000	\$17,700
LOCATION	OUT OF TOWN	IN TOWN	IN TOWN

TO BALANCE THE EQUATION THE LAND MUST COST LESS THAN AN EH ANTENNA AND A SET OF RADIALS.



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EH Antenna Economics

EXAMPLE - THE TOTAL COST OF A SMALL EH ANTENNA

EH ANTENNA	\$17,700		
TOWER	\$4,000	(Free standing)	
	= \$21,700 + Installation		
COMPARE			
TOWER	\$10,200 + installation (Guyed)		
RADIALS	\$5,000		
Match Box	\$2,000		
LAND	Break even would be about \$4500		
FOR THE LARGE EH ANTENNA			
LAND COST WOULD BE ABOUT \$27,000 FOR BREAK EVEN.			

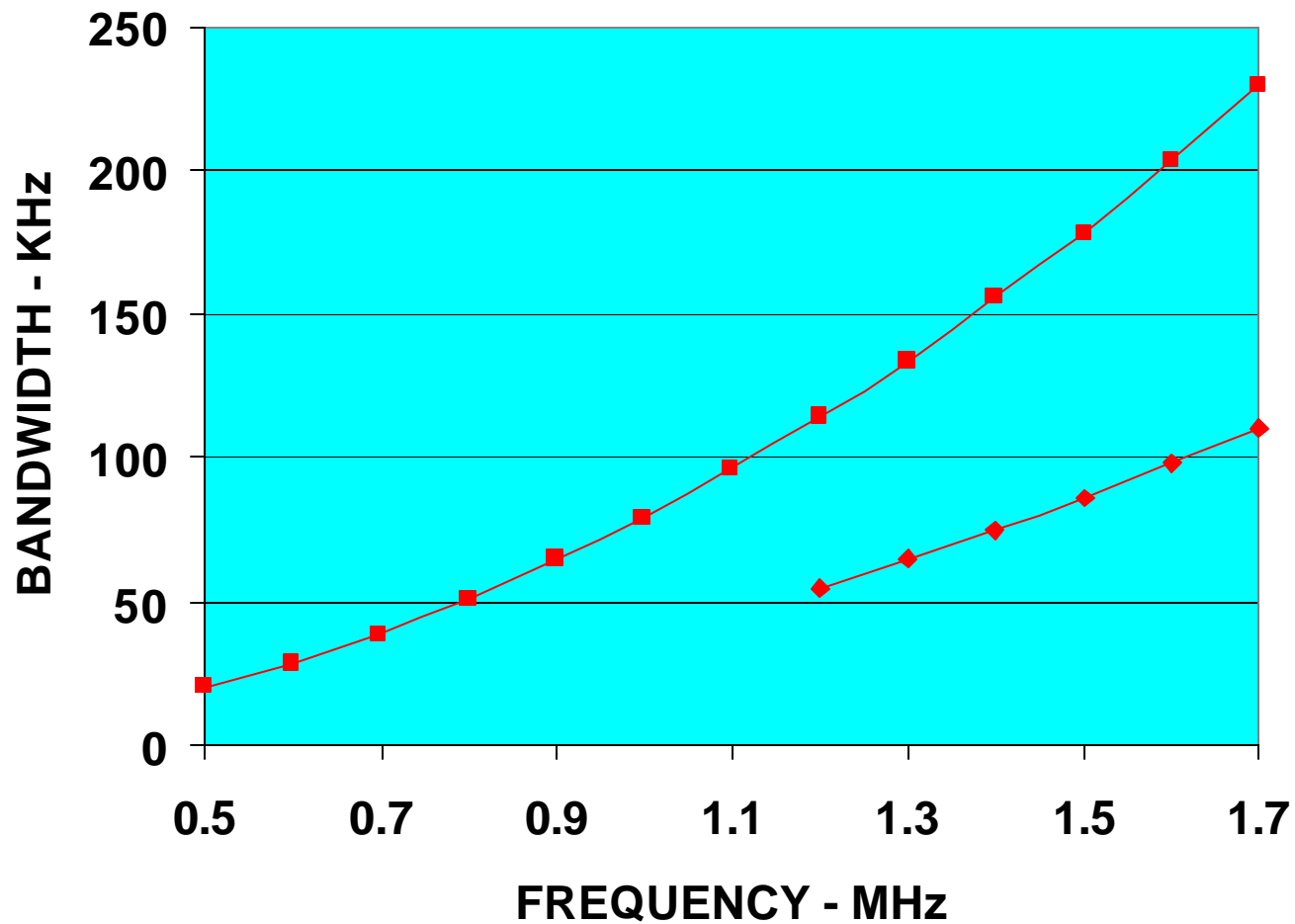


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Bandwidth Vs. Frequency



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