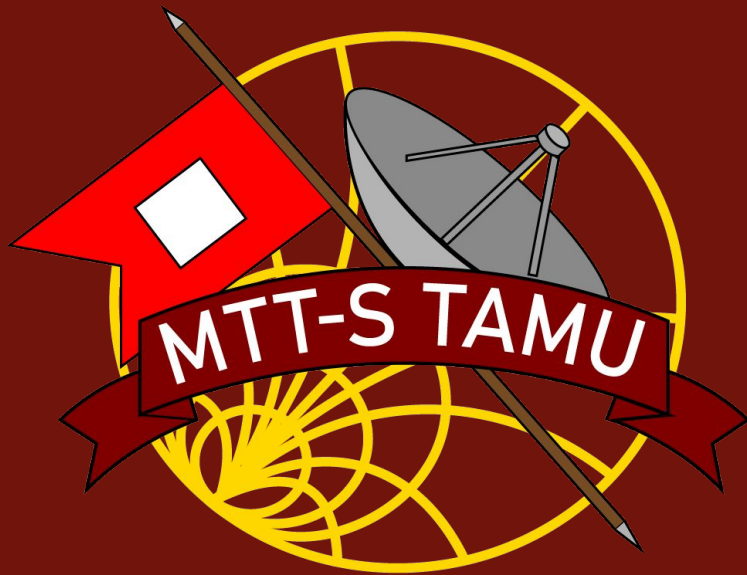




**IEEE MTT-S TAMU**

**Spiraling into Control?:  
Portable Helical Antenna Presentation**



# Agenda



1. Background
  - a. What is a Helical Antenna
  - b. Applications
  - c. Inspiration for Design
2. Design Specification
  - a. Materials and CAD Models
3. MTT-S TAMU Portable Helical Antennas (PHA)
  - a. 70cm PHA
  - b. 23cm PHA
  - c. 13cm PHA
  - d. Future Work



## What is a Helical Antenna?

- It is an antenna created by forming a conductive wire into a spiral or helix geometry in order to provide circular polarization, broadband capabilities, and two modes of operation.
  - What determines the operating frequency? **Diameter of helix**
  - What are the two modes of Operation? **Normal Mode and Axial Mode (Endfire)**

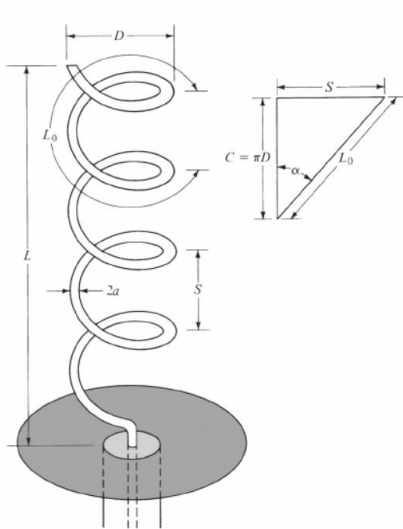
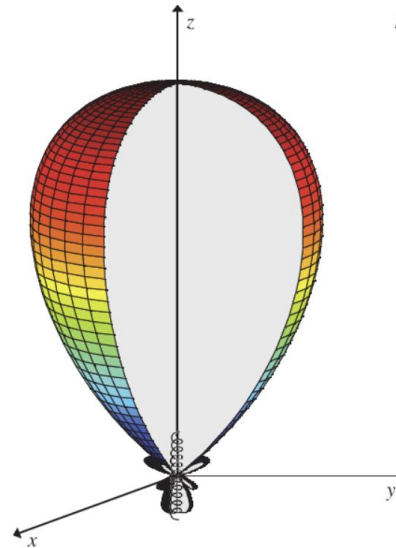
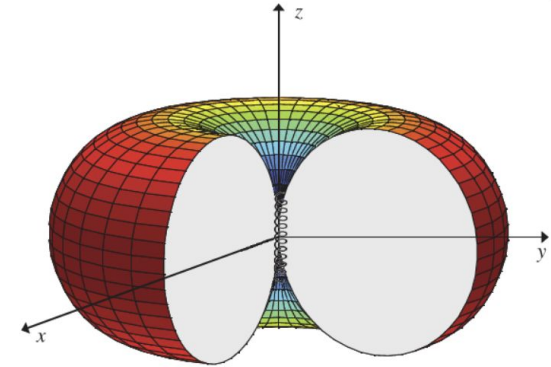
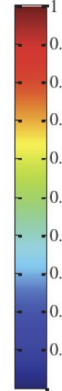


Figure 10.13 Helical antenna with ground plane.



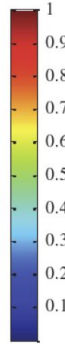
(b) End-fire (axial) mode

Amplitude Pattern  
(linear scale)



(a) Normal (broadside) mode

Amplitude Pattern  
(linear scale)



## Applications of Helical Antennas?

- Communications
  - Satellite Communications
- Radio Astronomy
  - Hydrogen Line

## Inspiration for Designing a Portable Helical Antenna:

- Lack of carriable helical antennas that can compete with Yagi-Udas in HAM Bands
- Interest in performing satellite communication without using a Yagi-Uda
- Passion to build a lighter helical antenna design that can be used in tracking mounts for satellite communications or radio astronomy



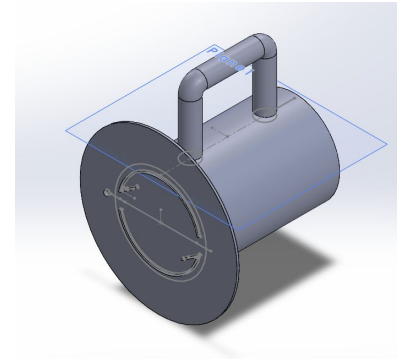
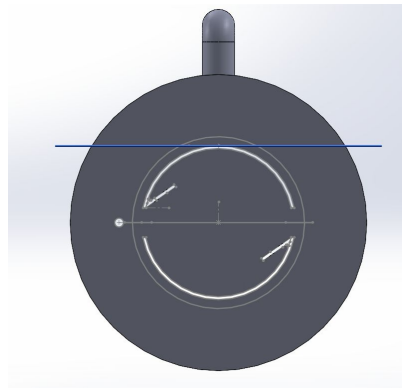
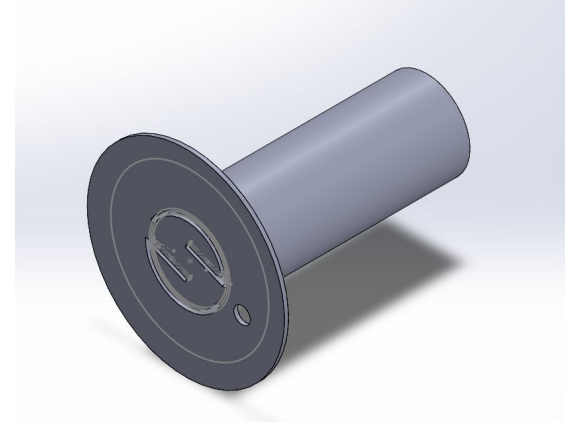
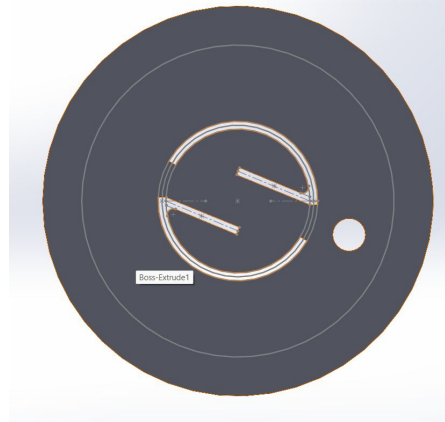
# Design Specifications



- Building Materials

01. 3D Printer / PLA 1.75mm Filament
02. Masking Tape
03. Aluminum Foil
04. Poster Paper
05. SMA Jack
06. 22 AWG Enameled Copper Wire
07. Male to Female Fly Wire
08. Soldering Equipment

- CAD Models



# 70cm PHA A.K.A. “Spirit of 25” / “The Cannon”



Designed Operating Frequency:  
435MHz

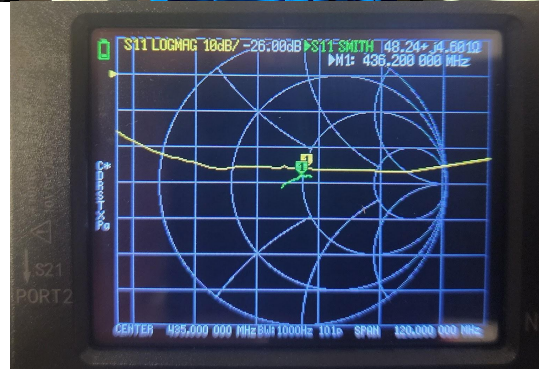
SWR < ~1.2 for 385MHz to  
485MHz

\*\*52cm coax cable was used to  
acquired low SWR\*\*

Expected Gain: 7dB at 1m in length

Accomplishments:

1. Contacted KJ5CPO using  
Yaesu FT-60(5 Watt)1 mile  
away with no line of sight



# 23cm PHA A.K.A. “The Aggie Stein”



Designed Operating Frequency:  
1.296GHz

SWR < ~1.8 for 1.246MHz to  
1.320MHz

Expected Gain: 9dB to 10dB at  
63cm in length

Accomplishments:

1. Contacted W5XTT using  
IC-905(10 Watt) 13 miles  
away with no line of sight



# 13cm PHA A.K.A. “The MTT-S TAMU Saber”



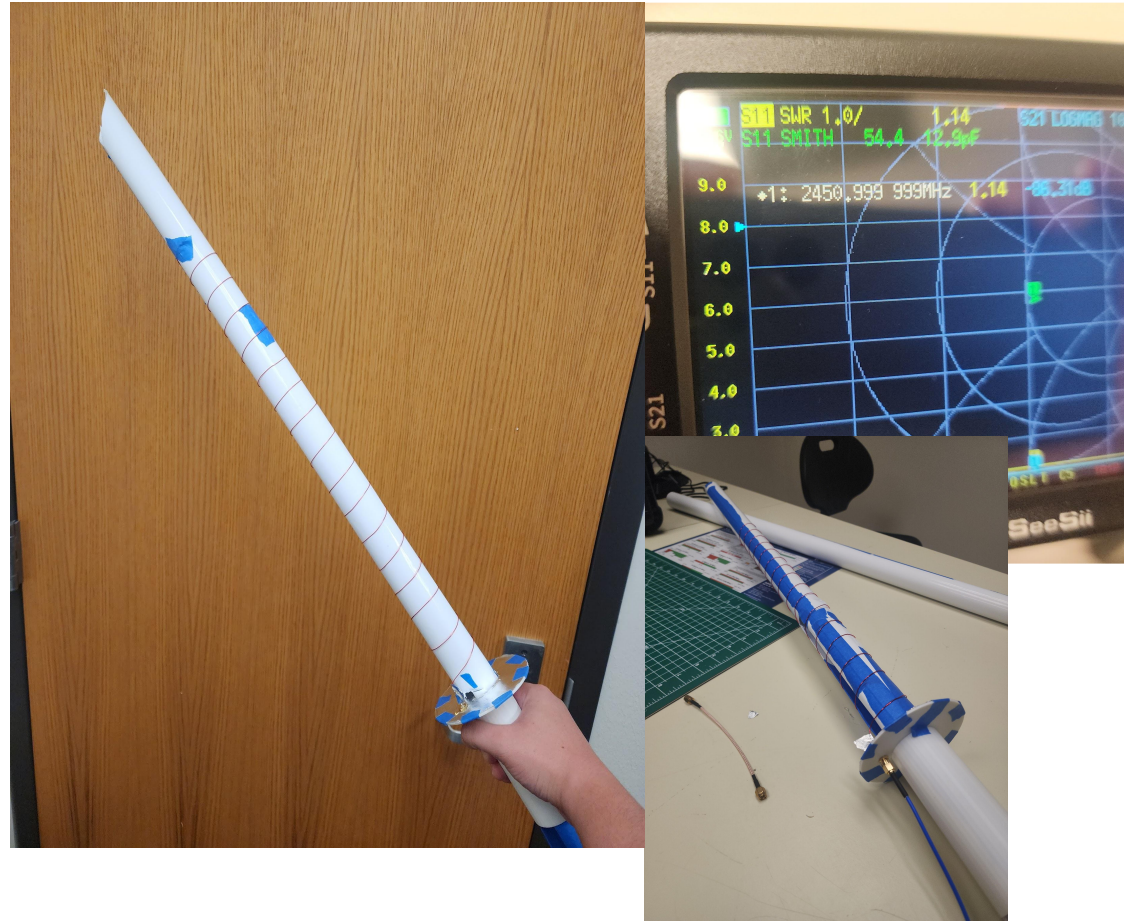
Designed Operating Frequency:  
2.45GHz

SWR < ~1.15 for 1.95GHz to  
2.95GHz

\*Aluminum Sheet was used as a  
Stub tuner to achieve SWR\*

Expected Gain: 10dB to 12dB at  
74cm in length

\*\*Developing workshop for  
MTT-S TAMU members\*\*



Build a Nested (RHP / LHP) Helical Antenna for Dual Band Satellite Communication (UHF/VHF)

Test the 23cm PHA for H-Line Radio Astronomy

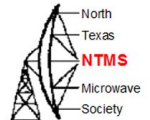
What are your Ideas?

# Thank You for Your Attention!



## Questions, Clarifications, and Comments

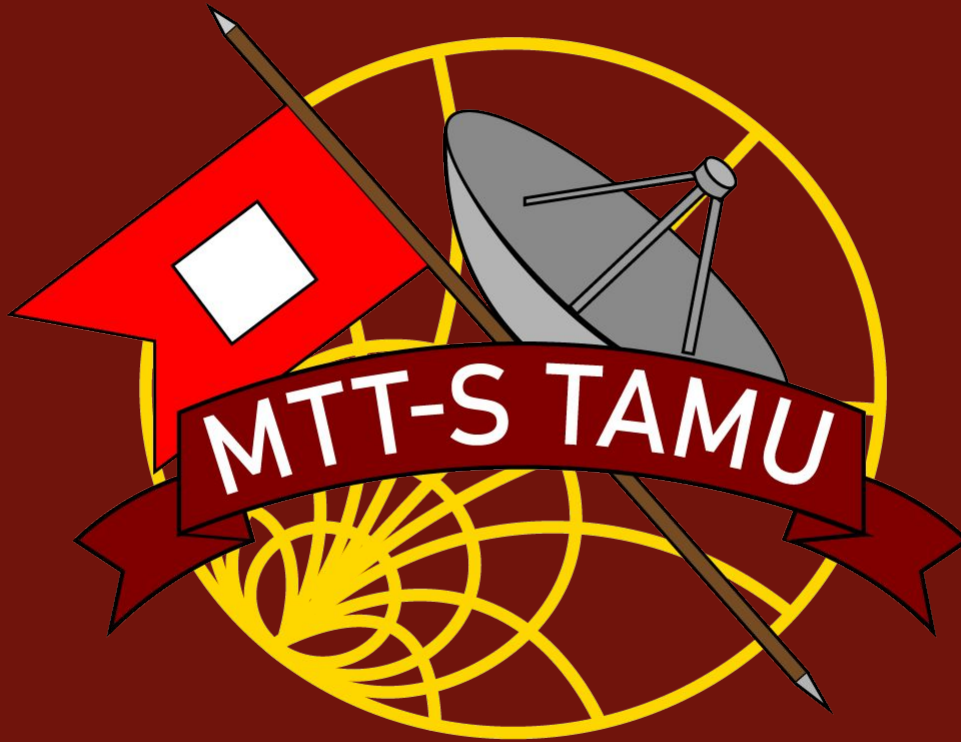
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