Step-by-Step: Modeling Basic Yagi-Uda Arrays for Beginners

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Master Yagi-Uda simulation in AN-SOF! This quick guide walks you through modeling a 3-element array (reflector, driven element, director). Analyze radiation patterns with professional results.

Introduction to Yagi-Uda Antennas

The Yagi-Uda antenna, commonly called simply "Yagi," is a directional antenna array developed in 1926 by Japanese researchers Hidetsugu Yagi and Shintaro Uda. This elegant design consists of three key elements:

1. A **driven element** (typically dipole)
2. **Reflectors** (usually 1-2 elements)
3. **Directors** (multiple elements)

Through careful spacing of these elements, Yagis achieve high directivity and gain in one direction while being relatively simple to construct. They revolutionized radio communication and remain popular today for applications ranging from TV reception to amateur radio.

Yagi-Uda Simulation Basics

Now that you've mastered **cylindrical antenna** basics, let's progress to antenna arrays. This guide walks you through simulating a classic **3-element Yagi-Uda design** (**Fig. 1**) featuring:

- **Director** (front element)
- **Reflector** (rear element)
- **Driven element** (center dipole)

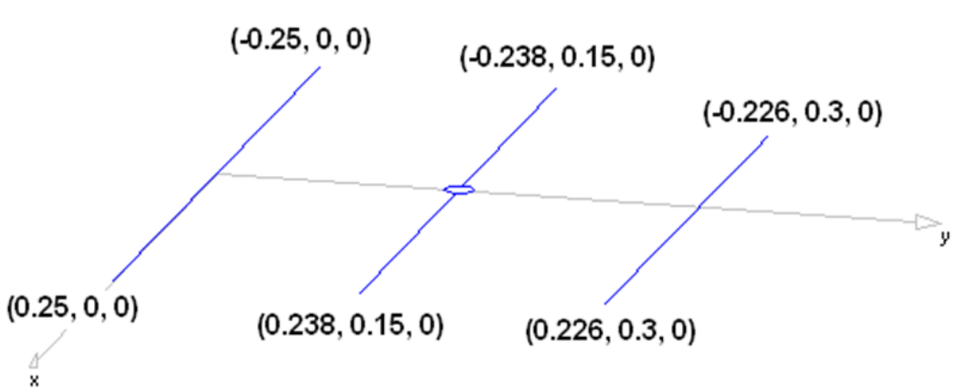


Fig. 1: Yagi-Uda array geometry definition (coordinates in meters).

Download Model

Step 1: Simulation Setup

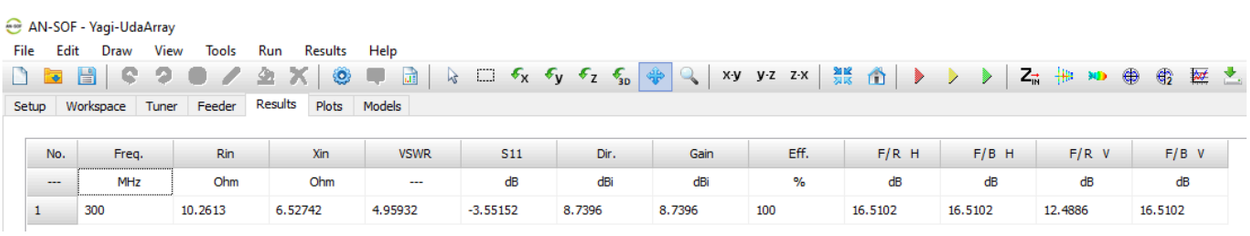
1. **Frequency Configuration**:
   - **Setup tabsheet > Frequency panel**
   - Set: **300 MHz** (UHF range ideal for Yagis)
2. **Environment Settings**:
   - **Environment panel > Ground Plane**: Select **None** (standalone array)
   - **Excitation panel**: Confirm **Discrete Sources** is active

Step 2: Building the Array

1. **Element Construction**:
   - Draw each wire individually (as in **cylindrical antenna tutorial**)
   - Use coordinates from **Fig. 1** for precise spacing
2. **Segment Configuration**:
   - Uniformly set for all elements:
     - Segments: **15** (balanced accuracy/speed)
     - Radius: **5 mm** (typical for UHF)
3. **Source Attachment**:
   - Right-click **driven element** > **Source/Load/TL**
   - **Connect voltage source** to **center segment**
     (Pro Tip: Middle placement ensures symmetrical excitation)

Step 3: Running & Analyzing

1. **Execute Simulation**:
   - Click **Run Currents and Far-Field (F10)**
   - Observe **8.7 dBi peak gain** in **Results tab** (**Fig. 2**)
2. **Radiation Pattern**:
   - Click **Far-Field 3D Plot** to visualize:
     - Forward-directive beam (**Fig. 3**)
     - Characteristic side/null patterns



No.	Freq.	Rin	Xin	VSWR	S11	Dir.	Gain	Eff.	F/R H	F/B H	F/R V	F/B V
---	MHz	Ohm	Ohm	---	dB	dBi	dBi	%	dB	dB	dB	dB
1	300	10.2613	6.52742	4.95932	-3.55152	8.7396	8.7396	100	16.5102	16.5102	12.4886	16.5102

Fig. 2: Results tab showing 8.7 dBi peak gain for the Yagi-Uda array.

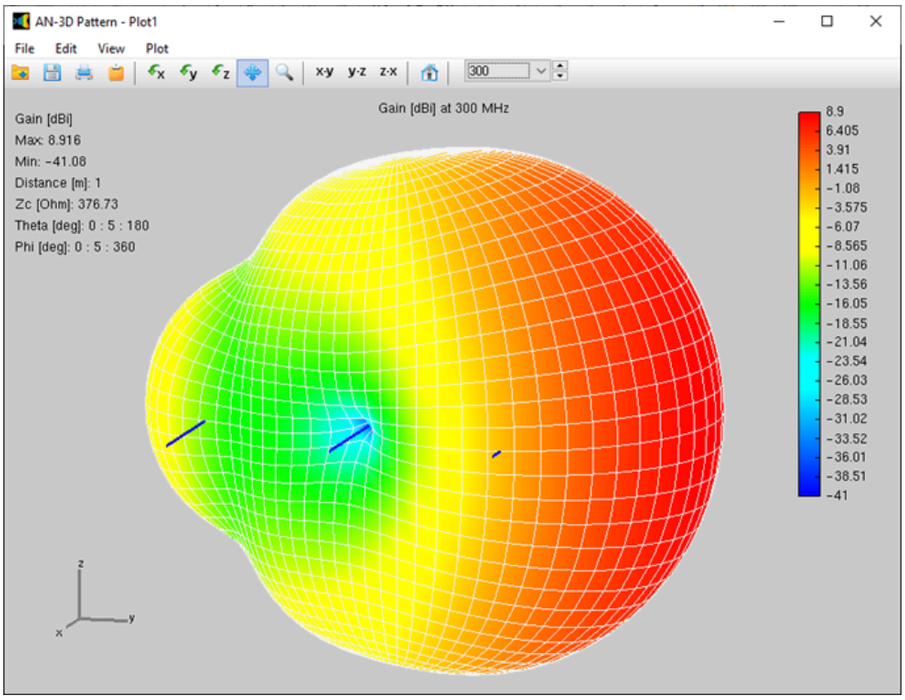


Fig. 3: Yagi-Uda array gain pattern (dBi) at 300 MHz.

Why This Matters

- Teaches fundamental array principles
- Demonstrates directional gain enhancement
- Provides baseline for more complex designs
  (Try modifying element spacing/numbers to see performance changes!)

See Also:

- **Front-to-Rear and Front-to-Back Ratios: Applying Key Antenna Directivity Metrics**

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About the Author

Tony Golden

ANTENNA SIMULATION ENGINEER & PHYSICS PH.D. With over 25 years of experience in Computational Electromagnetics, I'm a dedicated researcher specializing in antenna modeling and design. As the founder of Golden Engineering LLC, I develop intuitive yet powerful simulation tools to help RF engineers optimize designs, educators demonstrate concepts, and hobbyists bring antenna projects to life.

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