Extended Double Zepp (EDZ): A Phased Array Solution for Directional Antenna Applications

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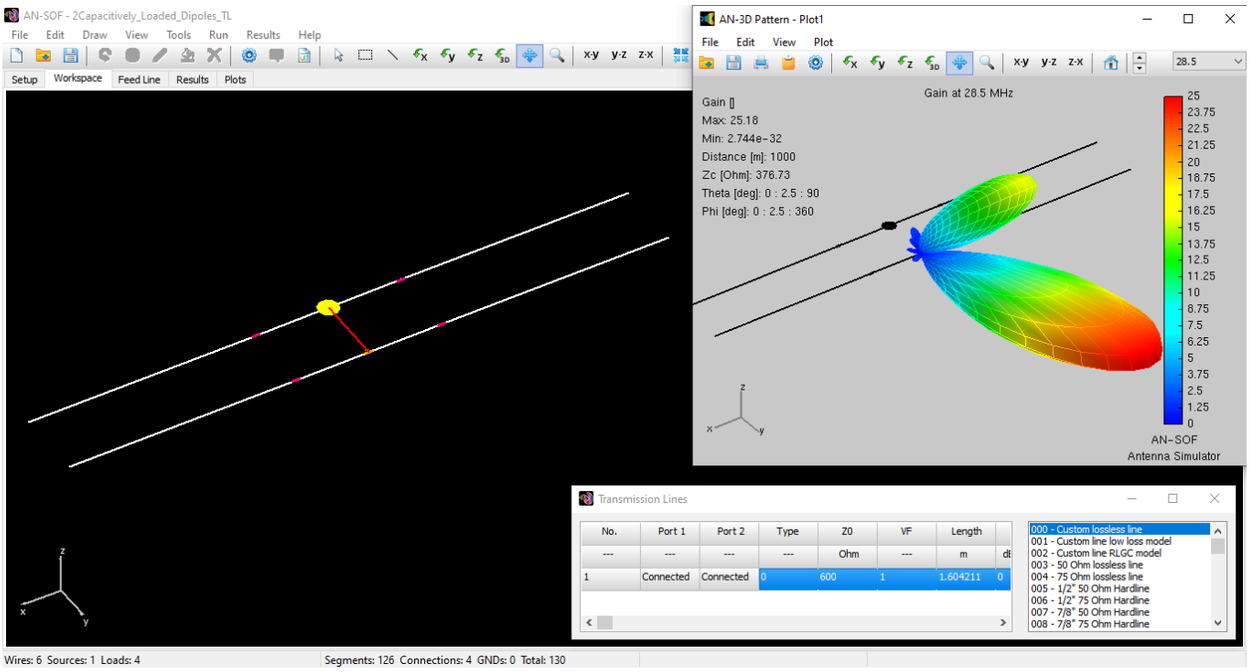
The Extended Double Zepp (EDZ) antenna offers higher gain than a half-wave dipole, but matching to 50-Ohm coax is difficult. This article explores a phased array design using two EDZs for directional radio transmission, achieving good gain and easier impedance matching.

Introduction

A popular choice for radio enthusiasts since 1938, the **Extended Double Zepp (EDZ)** antenna boasts an impressive gain advantage over traditional half-wave dipoles. This is achieved by its extended length of approximately **1¼ wavelengths** (1.25λ). Interestingly, the EDZ can also be viewed as two collinear elements, each roughly 0.62-0.64 wavelengths long, fed in phase with each other. However, this extended length comes with a drawback: the EDZ's **high capacitive reactance** at the feed point makes it challenging to match with the commonly used 50-Ohm coaxial cable, posing a hurdle for amateur radio applications.

Phased Array for Directionality

When a directional radiation pattern is needed, a phased array consisting of two identical EDZ dipoles can be a valuable solution. This concept is demonstrated in the following AN-SOF example model:



This AN-SOF model depicts an EDZ phased array antenna designed for directional radio transmission at 28.5 MHz. The 600-Ohm transmission line feeding the parasitic element is highlighted in red, and the four capacitors for impedance matching are highlighted in purple. The 3D radiation pattern visualizes the antenna's numerical gain.

Download Model

This phased array operates at a frequency of **28.5 MHz** (10-meter band). The separation between the two EDZ dipoles is approximately 1/4 wavelength. The **driven element** (the one connected to the feed line) has its feed point located in the center. The other element acts as a **parasitic element**, influencing the radiation pattern. The model incorporates a **600-Ohm two-wire transmission line** feeding the parasitic element. Additionally, each dipole is loaded with **two symmetrically placed capacitors** on either side of the feed point. This configuration transforms the two capacitively loaded phased dipoles into a directional antenna with a more favorable input impedance.

Performance and Advantages

When positioned at a **height of one wavelength** above a **ground plane**, this phased array exhibits a radiation pattern with a tilt of approximately 12 degrees above the horizon. While a secondary lobe appears, the array achieves a respectable gain of **14 dBi**. Notably, the input impedance is **59 + j106 Ohm**, a value that is significantly easier to match to a 50-Ohm coaxial cable compared to the original high capacitive reactance of a single EDZ. This phased array design also offers a **cost advantage over Yagi-Uda antennas** with similar gain due to its simpler construction requiring **less wiring**.

Conclusion

The EDZ phased array presented here demonstrates a practical approach to achieving **directionality** and improved **impedance matching** characteristics. While

it exhibits a tilted main lobe pattern, the antenna offers advantages in terms of gain and cost-effectiveness compared to traditional solutions like Yagi-Uda antennas.

See Also:

- **The Lazy-H Antenna: A 10-Meter Band Design Guide**

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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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