

Precision Simulations with AN-SOF for Magnetic Loop Antennas

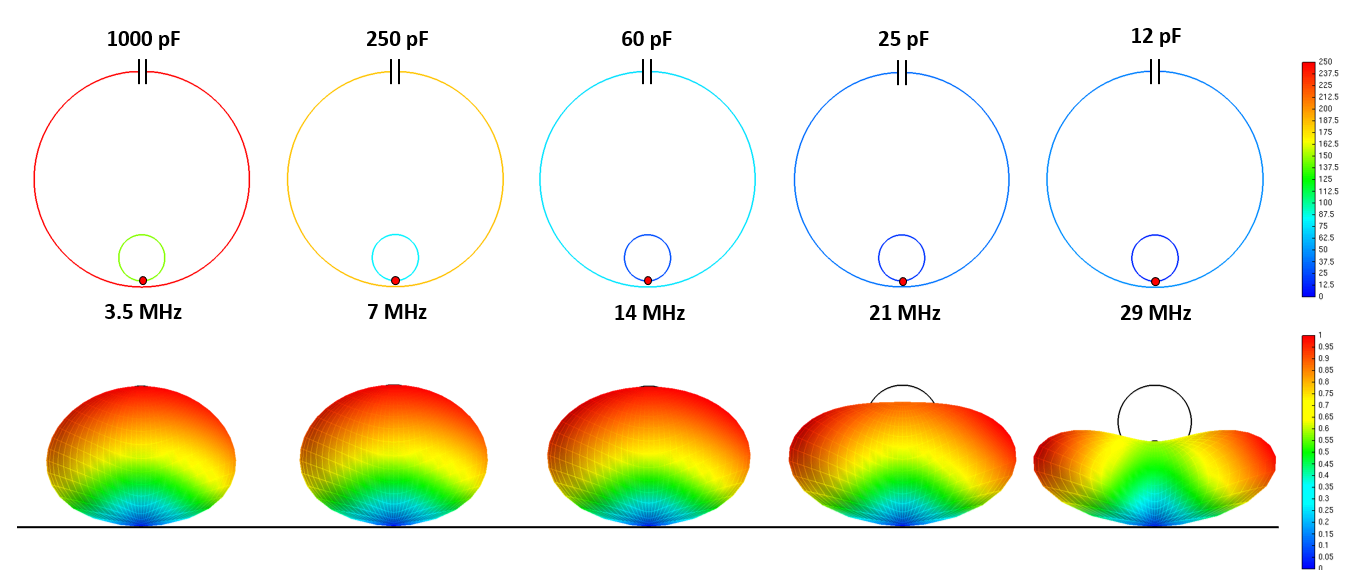
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Explore dual-loop magnetic antenna design and simulation with AN-SOF. Model performance at five frequencies, showcasing radiation patterns, current distributions, and tuning values. Automated bulk simulations streamline the process.

Magnetic loop antennas are widely used in amateur radio. A common design involves a **dual-loop configuration** where a larger loop, equipped with a **tuning capacitor**, is magnetically coupled to a smaller, internal loop. The coaxial cable feeding the antenna connects to the smaller loop. This antenna is simple to construct using readily available coaxial cable. Importantly, the interaction between the loops is inductive, not physical.

The accompanying figure shows a simulation of a magnetic loop antenna. The larger loop, made from **RG-8 cable**, has a diameter of **70 cm**, while the smaller loop, made from **RG-6 cable**, has a diameter of **15 cm**. The loops are separated by **2 cm** at the base. The required tuning capacitor values for resonance at **3.5, 7, 14, 21, and 29 MHz** are indicated.



A series of images showcasing radiation patterns, current distributions, and tuning capacitor values for the magnetic loop antenna across 3.5, 7, 14, 21, and 29 MHz. Simulated using AN-SOF Antenna Simulator.

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Placed one meter above a ground plane, the antenna’s radiation pattern deviates from the typical toroidal shape expected of a small loop in free space. The color scale on the loops represents current distribution at each resonant frequency.

The **AN-SOF Antenna Simulator** enables accurate simulations of this antenna design using the **Conformal Method of Moments** with **curved segments** to precisely model loop shapes. AN-SOF’s **exact Kernel** accurately handles the close proximity of the loops at the antenna’s base.

The simulator streamlines the calculation process by automating resonance calculations for the five specified frequencies. To access this feature, go to the AN-SOF main menu and select “**Run Bulk Simulation**” under the “Run” category. This allows you to easily run calculations on the five provided .nec files, which can be downloaded by pressing the “Download Model” button above. Importantly, this feature is available in the **trial version of AN-SOF**.

See Also:

- **[Modeling a Circular Loop Antenna in AN-SOF: A Step-by-Step Guide](#)**
- **[Exploring the Spiral Loop Antenna: A Compact Solution for 80m DXing](#)**

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About the Author
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RF ENGINEER & PHYSICS PH.D. With 25+ years in Computational Electromagnetics, I’m a passionate researcher focused on antenna modeling and design. As Founder of Golden Engineering LLC, I develop accessible, high-performance simulation tools that help RF engineers optimize their designs, educators teach complex concepts, and hobbyists bring antenna projects to life.

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