Theoretical and Experimental Analysis of Antenna Radiation Properties Guided by Maxwell's Equations

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Abstract*: This paper presents a comprehensive theoretical and experimental analysis of antenna radiation properties, guided by Maxwell's equations. The study focuses on fundamental antenna parameters such as radiation pattern, directivity, gain, and efficiency. A theoretical framework based on Maxwell's equations is developed to predict antenna behavior, which is then validated through experimental measurements on various antenna types. The research employs both analytical methods and numerical simulations using the Method of Moments (MoM) and Finite Difference Time Domain (FDTD) techniques. Experimental results show good agreement with theoretical predictions, demonstrating the efficacy of the Maxwell's equations-based approach in antenna design and analysis. The findings contribute to a deeper understanding of antenna radiation mechanisms and provide valuable insights for optimizing antenna performance in various applications.*

Keywords: Antenna radiation, Maxwell's equations, Radiation pattern, Directivity, Gain, Efficiency