Conductor influence on a dielectric ring's resonance

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An experimental study and numerical simulation of resonant magnetic fields in a structure consisting of a subwavelength dielectric ring and a straight conducting element have been conducted.
The experimental setup included an antenna and a positioning system for the structure under study. The subwavelength dielectric ring (relative to the incident wavelength) was oriented parallel to the electric field vector. A straight conductor was positioned perpendicular to the wave vector in two configurations: between the antenna and the ring (position "before") and behind the ring (position "after"). A magnetic probe, installed in the plane of the ring, measured the transmission spectrum in the near-field zone.
Configurations with conducting elements of different lengths relative to the resonant wavelength of a single ring were investigated: quarter-wave, half-wave, and arbitrary lengths. Numerical simulation was performed in CST Studio Microwave.
The key result: placement of a straight half-wave conductor leads to strong attenuation of the main magnetic resonance of the ring. The strongest suppression is observed when the conductor is placed **after** the ring (on the probe side). The configuration with the conductor **before** the ring (between the antenna and the ring) also shows significant attenuation, but less pronounced. For conductors of other lengths, a shift in resonant frequencies is characteristic. The experimental data qualitatively agree with the results of numerical simulation. The possibility of controlling the resonant characteristics of subwavelength dielectric elements using a nearby straight conductor is demonstrated.