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## Interaction of a magnetic sphere with a microwave cavity in the strong coupling regime

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### Abstract

We study the interaction of a microwave cavity with a magnetic sphere. We show that achieving the strong coupling regime in this hybrid system is feasible. The simulation results demonstrate that the coupling rate is proportional to the square root of the volume of the magnet and also is mode dependent and decreases with increasing the mode index. Since the dielectric constant of the magnetic sphere differs from that of the medium, it can act as a spherical cavity, and coupling between its eigenmodes and the electric field of the microwave cavity also occurs. The reflection spectrum includes more than one anti-crossing for relatively larger magnetic spheres.

**Keywords:** strong coupling regime, microwave cavity-magnet interaction, Gilbert damping, level repulsion

For full article, refer to the Persian section