Magnetic strong coupling in a spin-photon system and transition to classical regime

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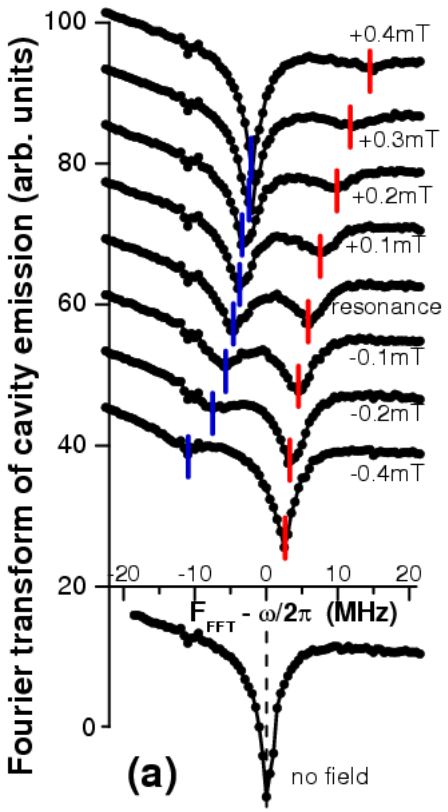
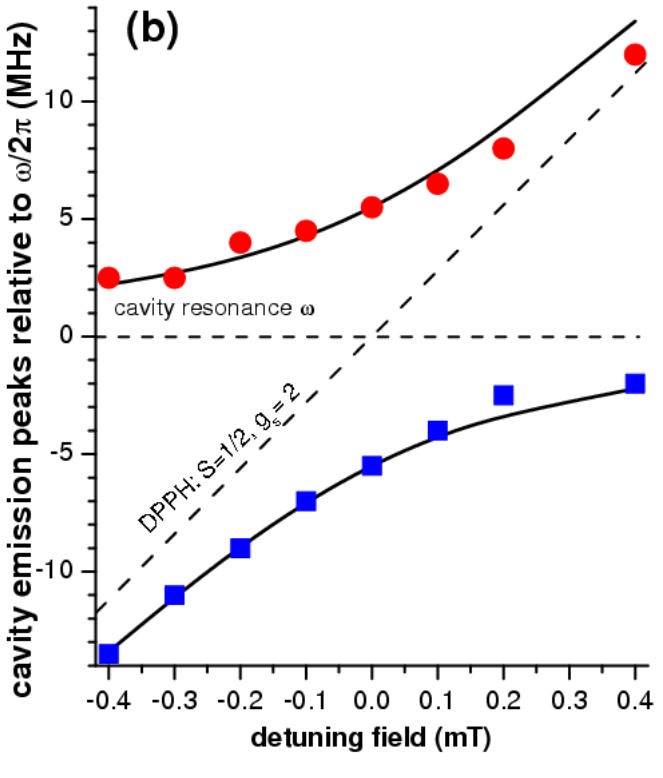
Interactions of quantum systems with electromagnetic excitations are at the core of quantum information processing. Of particular interest are the resonant modes in electromagnetic cavities, which have the potential of inducing a strong coupling regime such that the interaction outlast both photon's decay and qubit decoherence times. We present *cooperative, magnetic strong coupling* obtained between a cavity mode and a large ensemble of quasi-non-interacting spins ½ (here, DPPH).

The figure shows FFT peaks in the emission of a cavity, measured in pulsed mode with a homemade heterodyne detector (an UCGP project). The cooperative spin-photon coupling, called Tavis-Cumming, is demonstrated by a splitting the classical signatures of the cavity and spins (shown by dashed lines). The study is accompanied by a detailed theoretical treatment, also dealing with the passage towards a classical magneto-resonance case.





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