Damping influenced level attraction in CMP systems

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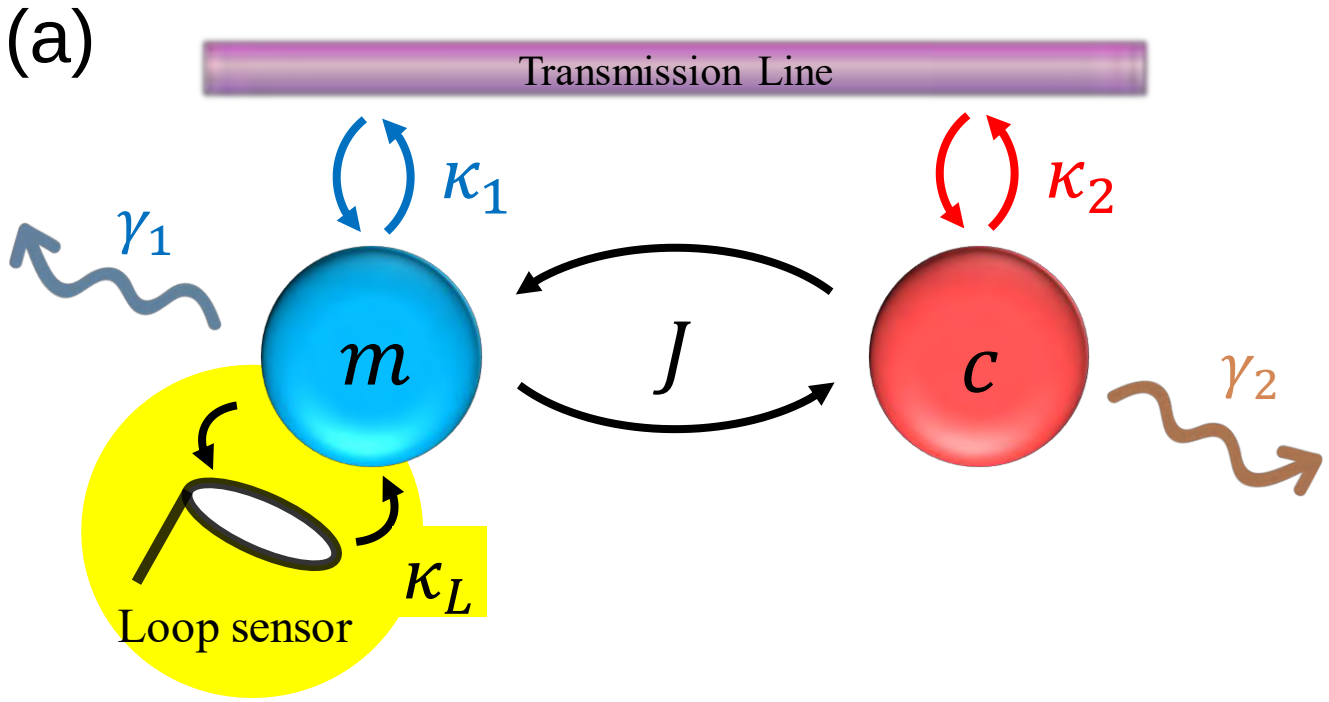
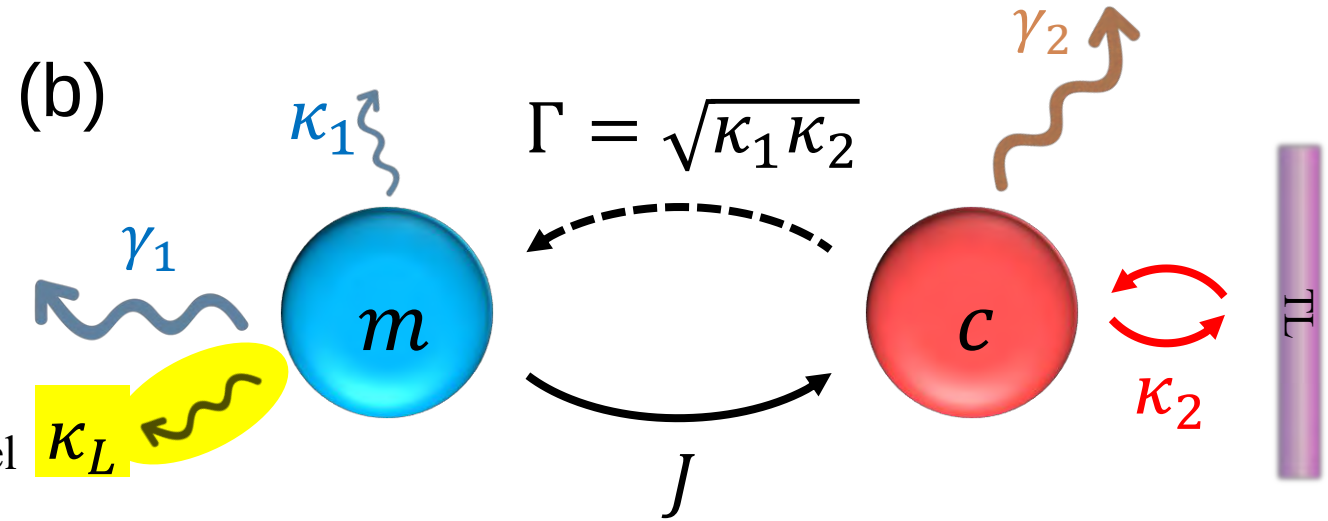
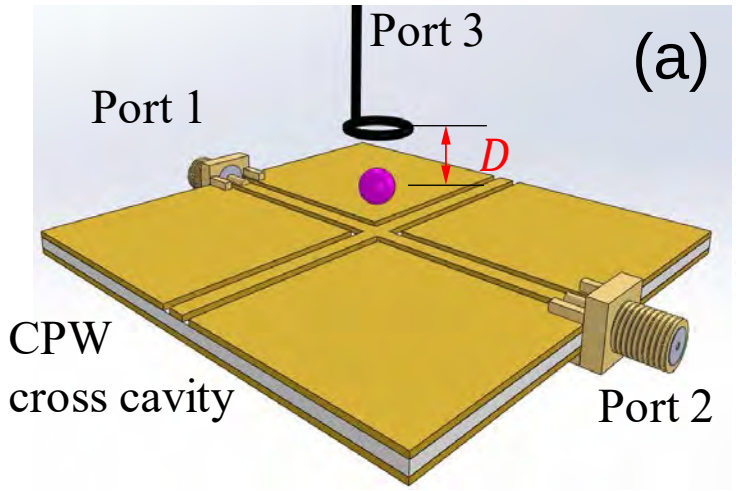
Objective

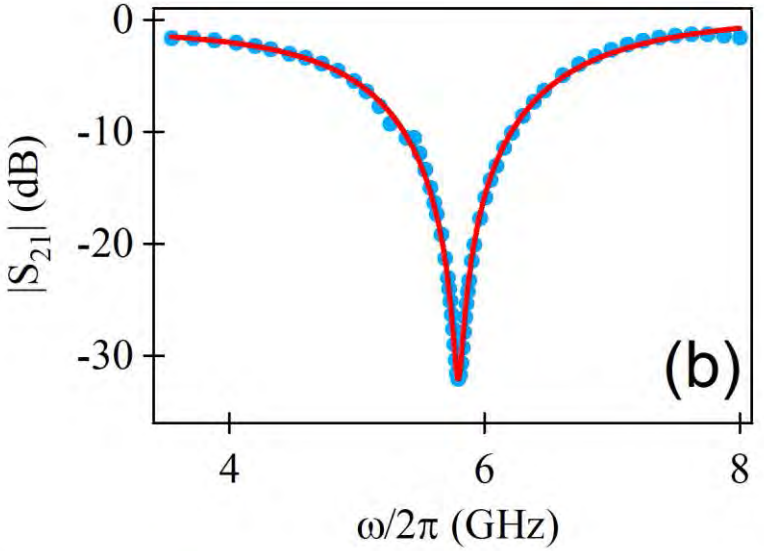


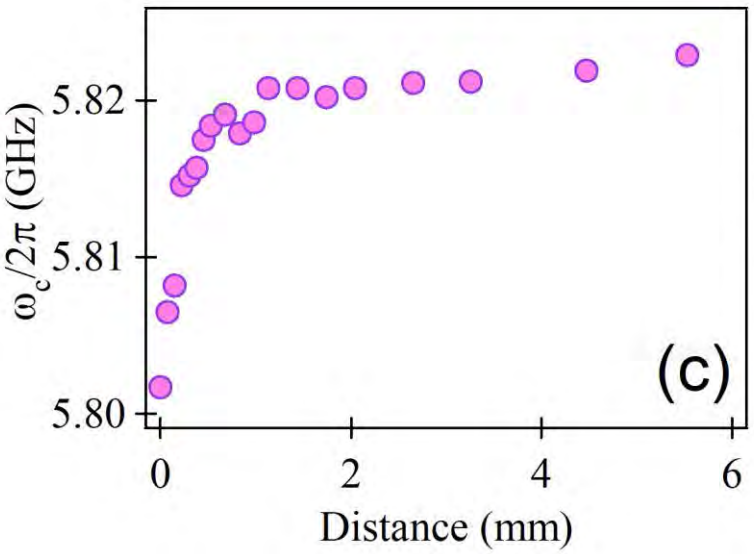


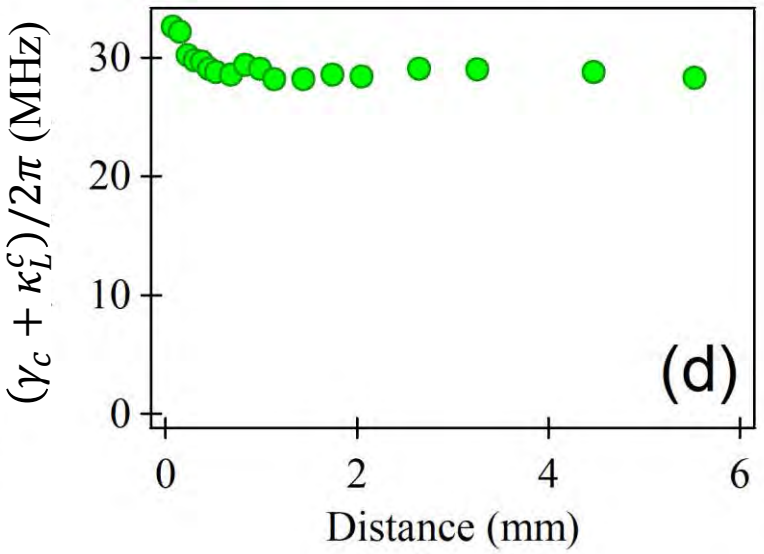
Additional damping channel

Characterize the bare cross cavity





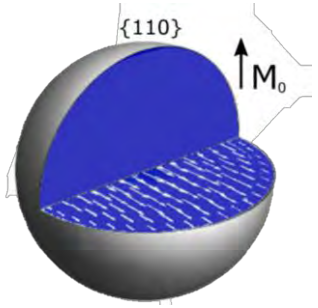




External damping
$\kappa_c/2\pi = 1.30$ GHz

κ_L^c Loop influenced cavity damping change

Characterize the YIG sphere



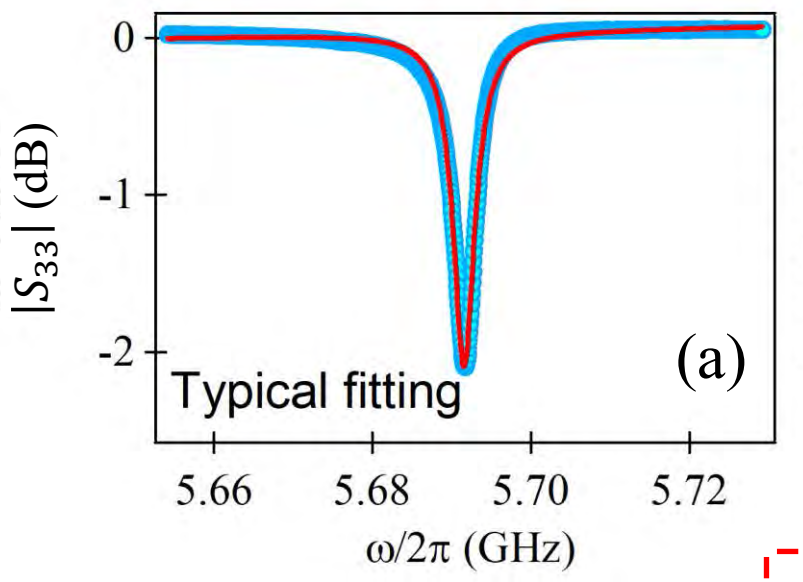
Intrinsic damping

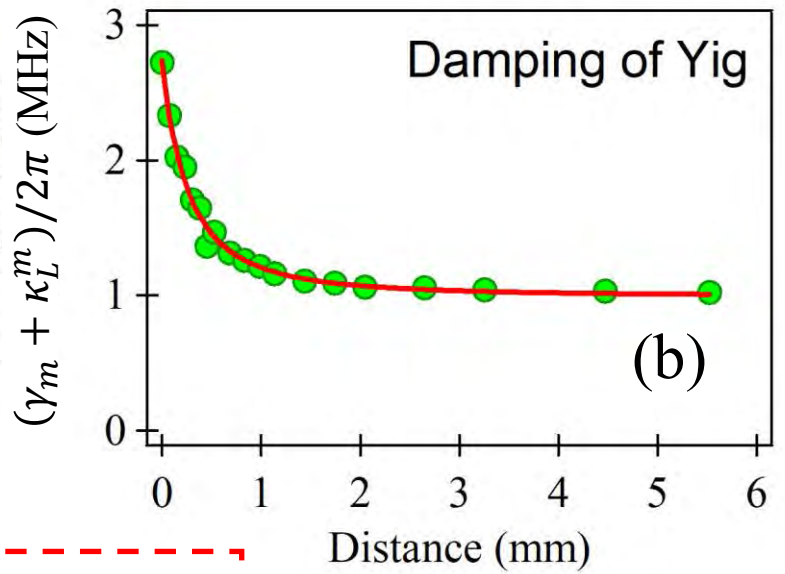
– Gilbert Damping

External damping

– cooperative damping

– radiative damping

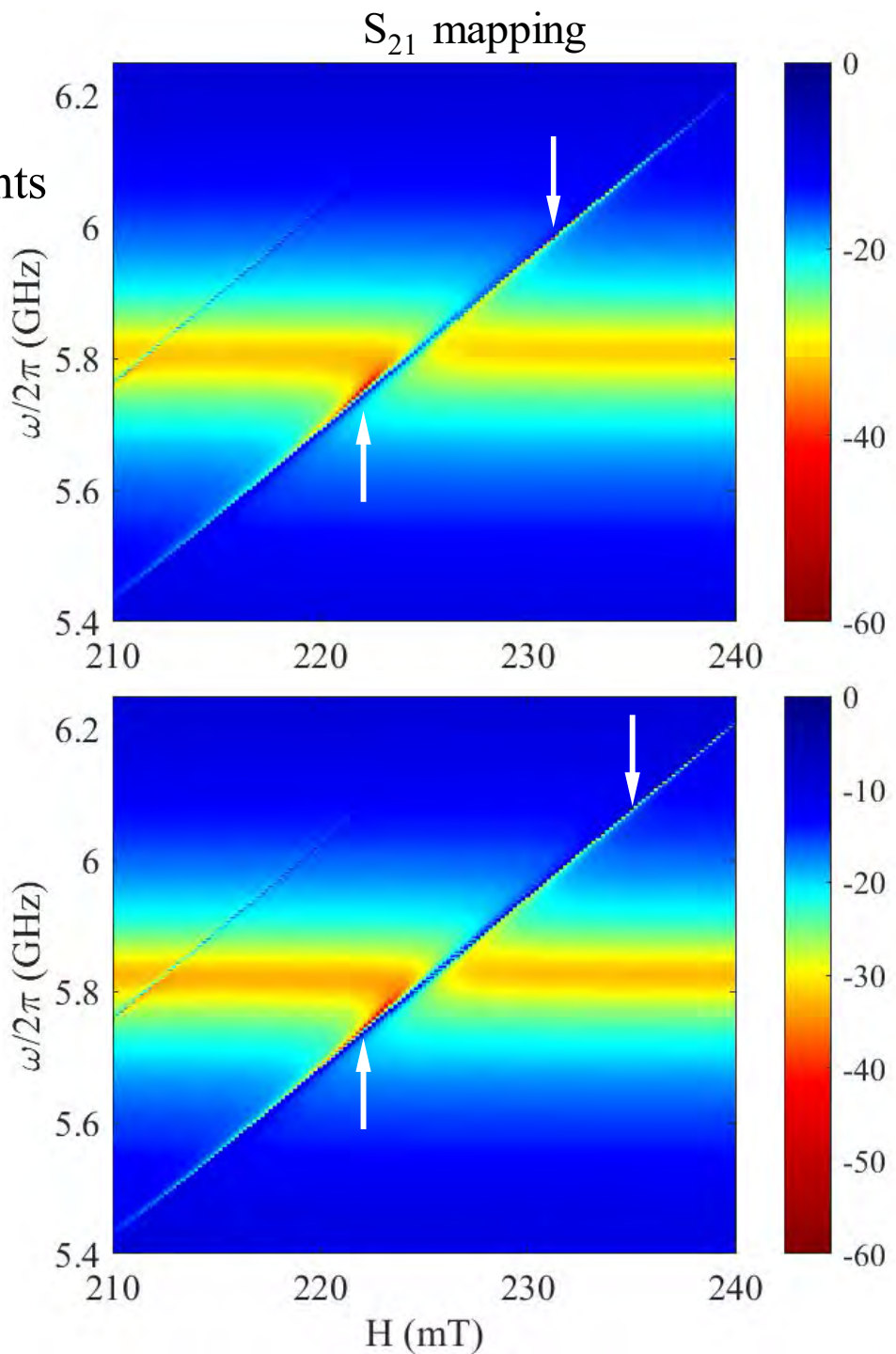


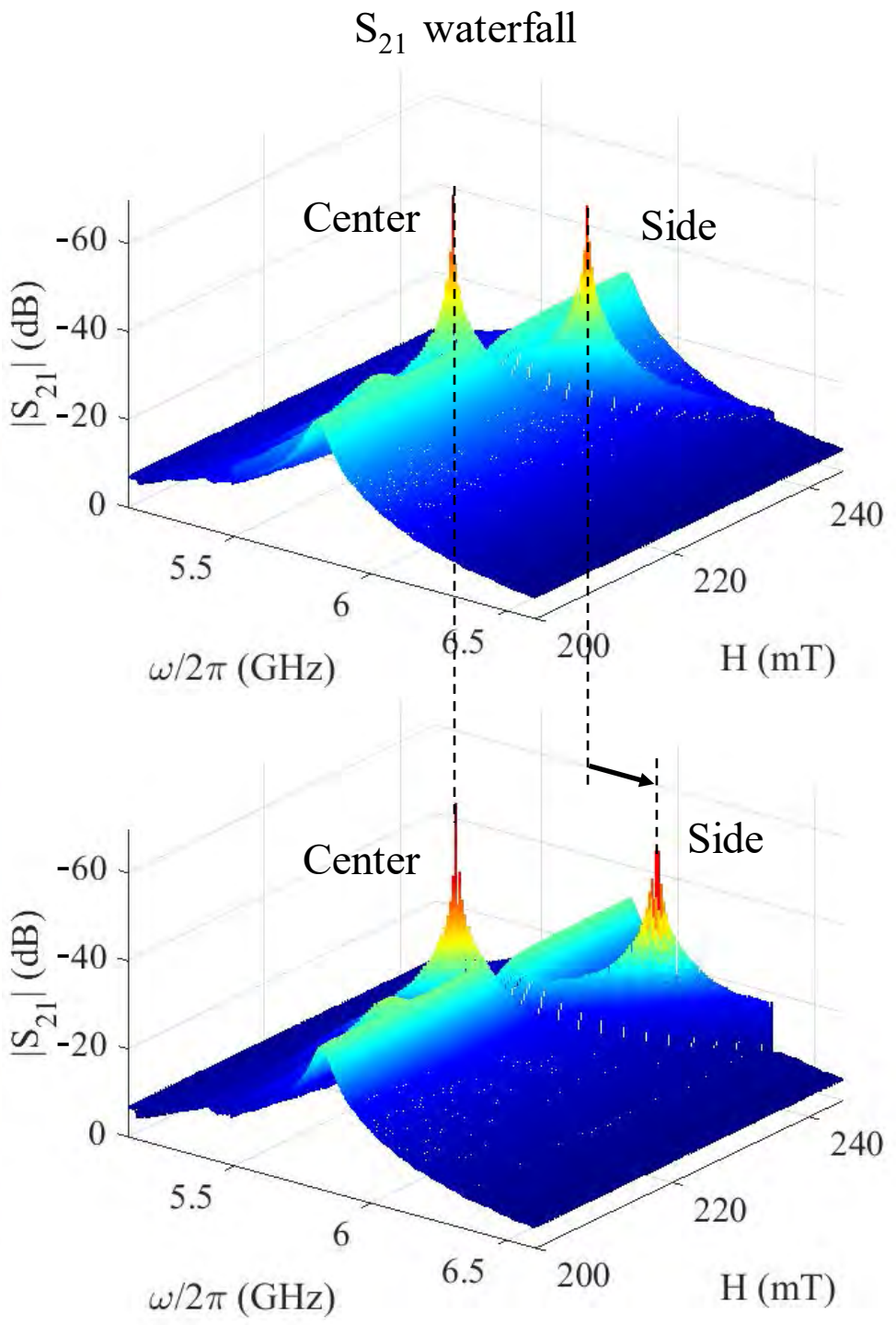


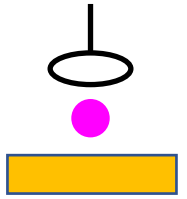
$$\Delta\omega_m = \gamma_m + \frac{A}{(d - d_0)^2}$$

κ_L^m

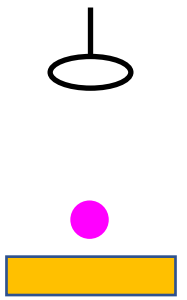
Level attraction measurements





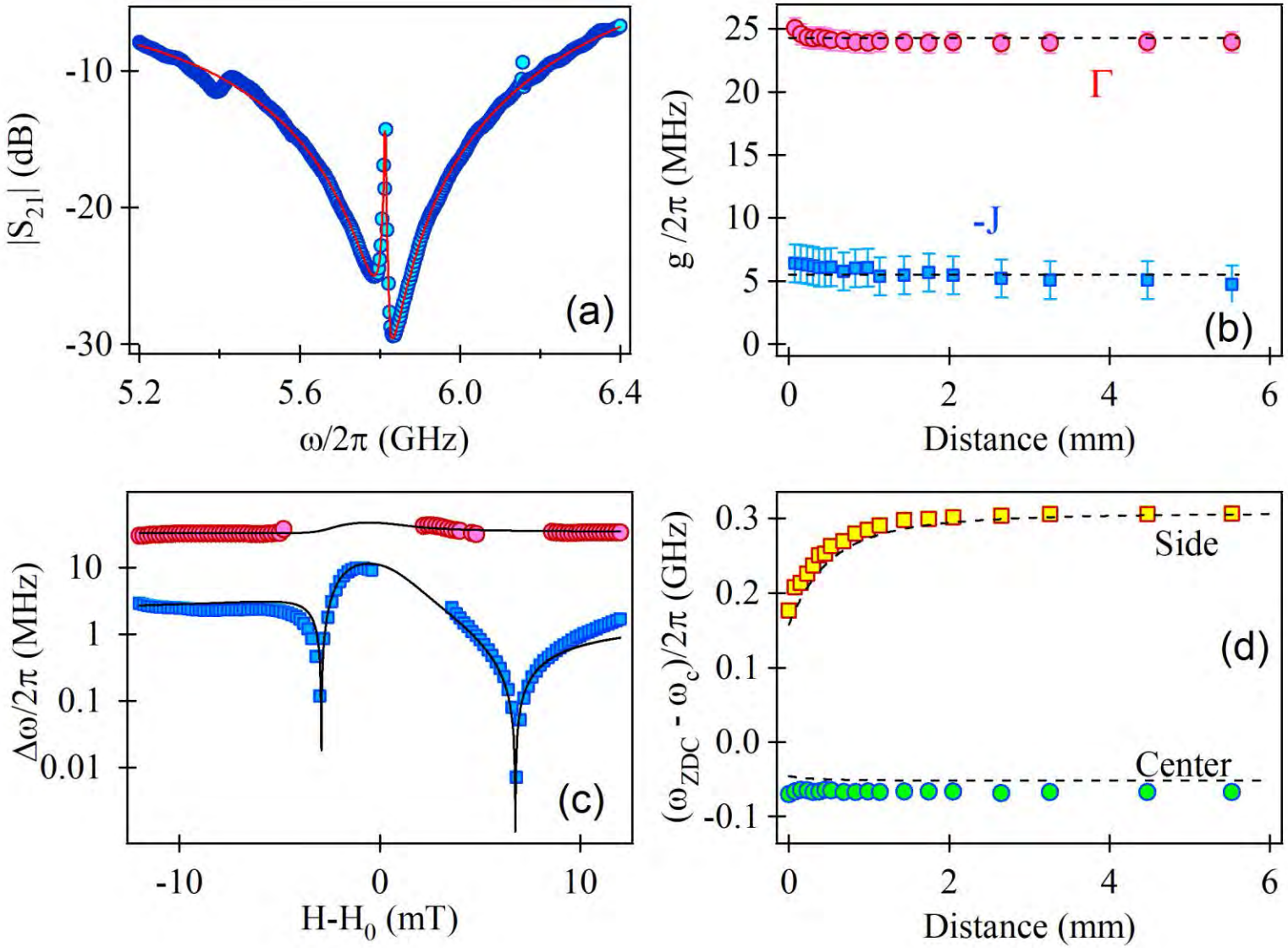


$D \approx 0.05\ mm$



$D \approx 5.6\ mm$

Level attraction data analysis



$$\Delta_{\pm} = \frac{(\gamma_2+\kappa_2-\gamma_1)J\Gamma \pm (\gamma_1+\gamma_2+\kappa_2)\sqrt{J^2\Gamma^2-\gamma_1(\gamma_2+\kappa_2)[\gamma_1(\gamma_2+\kappa_2)+J^2-\Gamma^2]}}{\gamma_1(\gamma_2+\kappa_2)}.$$

Conclusion

1. By using a loop sensor, an additional damping channel has been induced to the YIG sphere.
2. When changing the loop induced damping, the coupling strength remain the same while the ZDC has shifted a lot.
3. This study investigate the relation between the cooperative damping and dissipative coupling.