Level attraction in metamaterials

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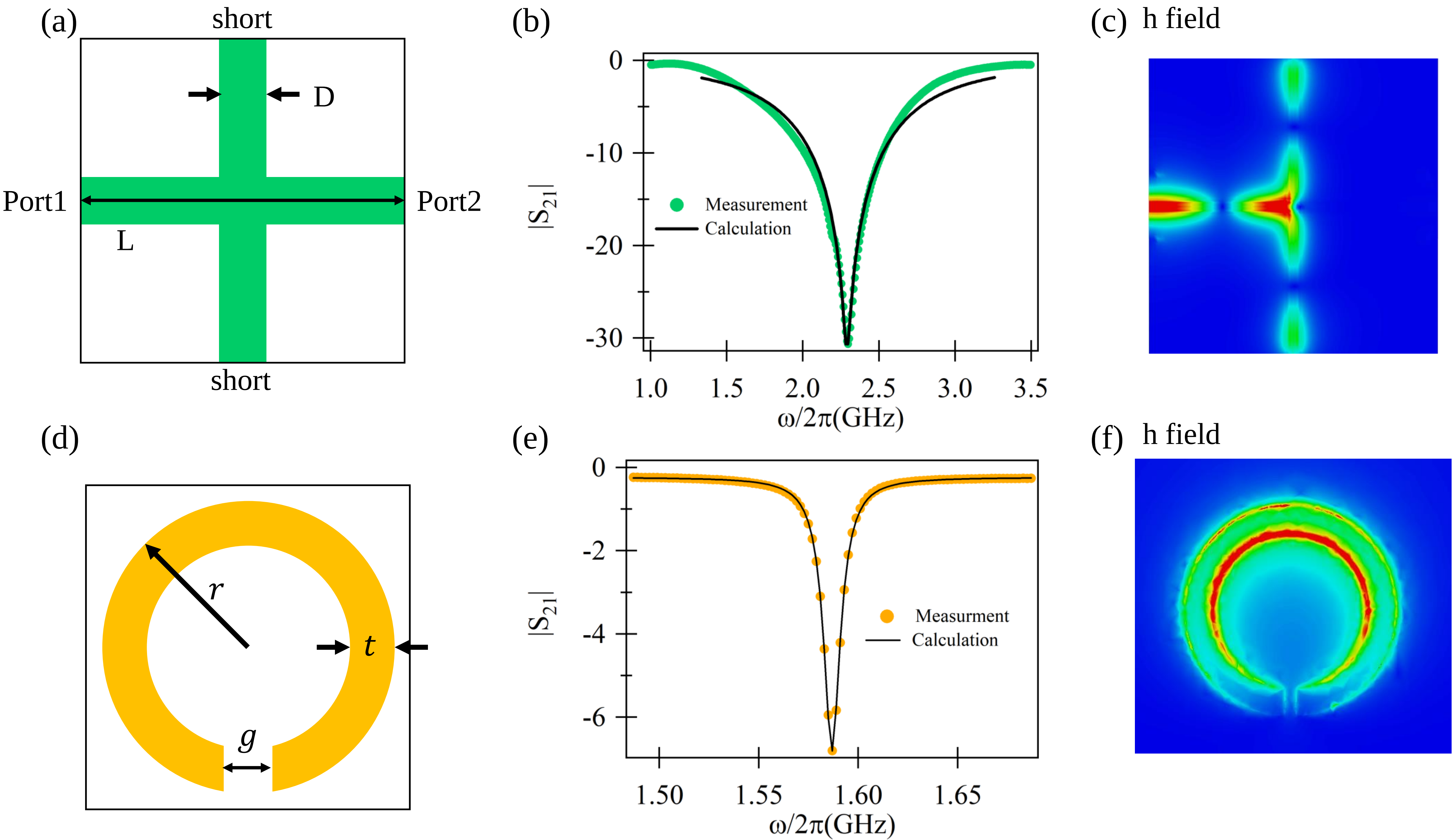
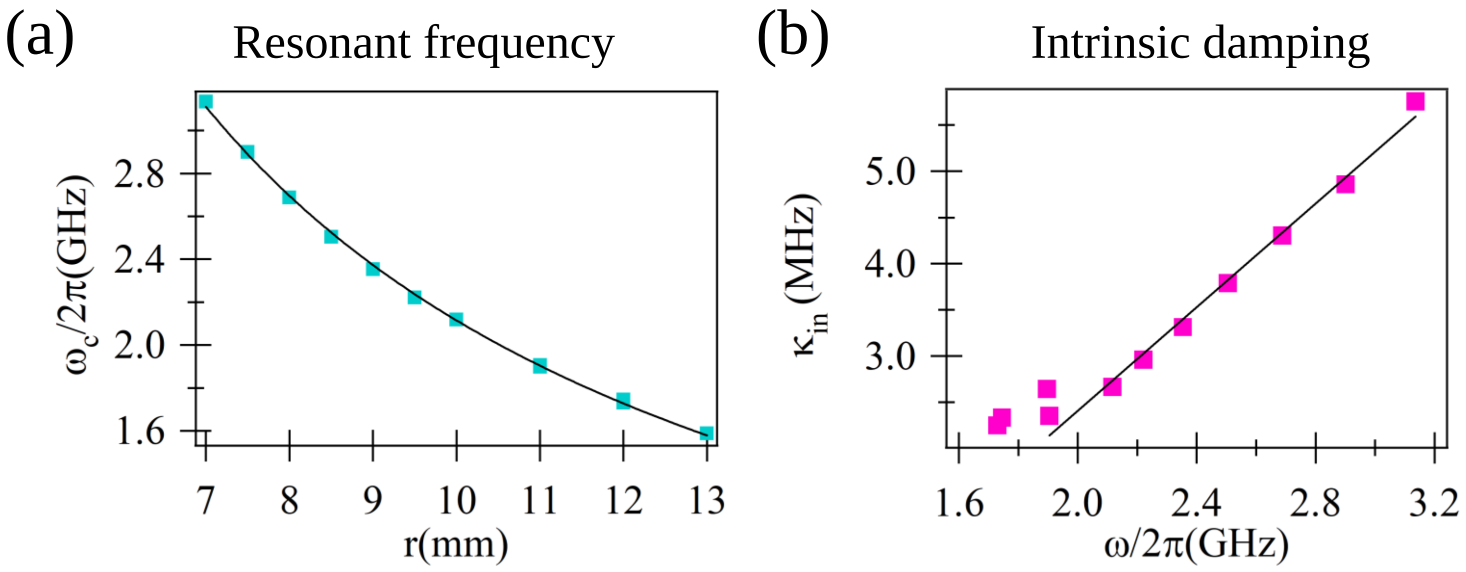
Characterize the cross cavity and Split Ring Resonator (SRR)



Characterize SRRs with different radius

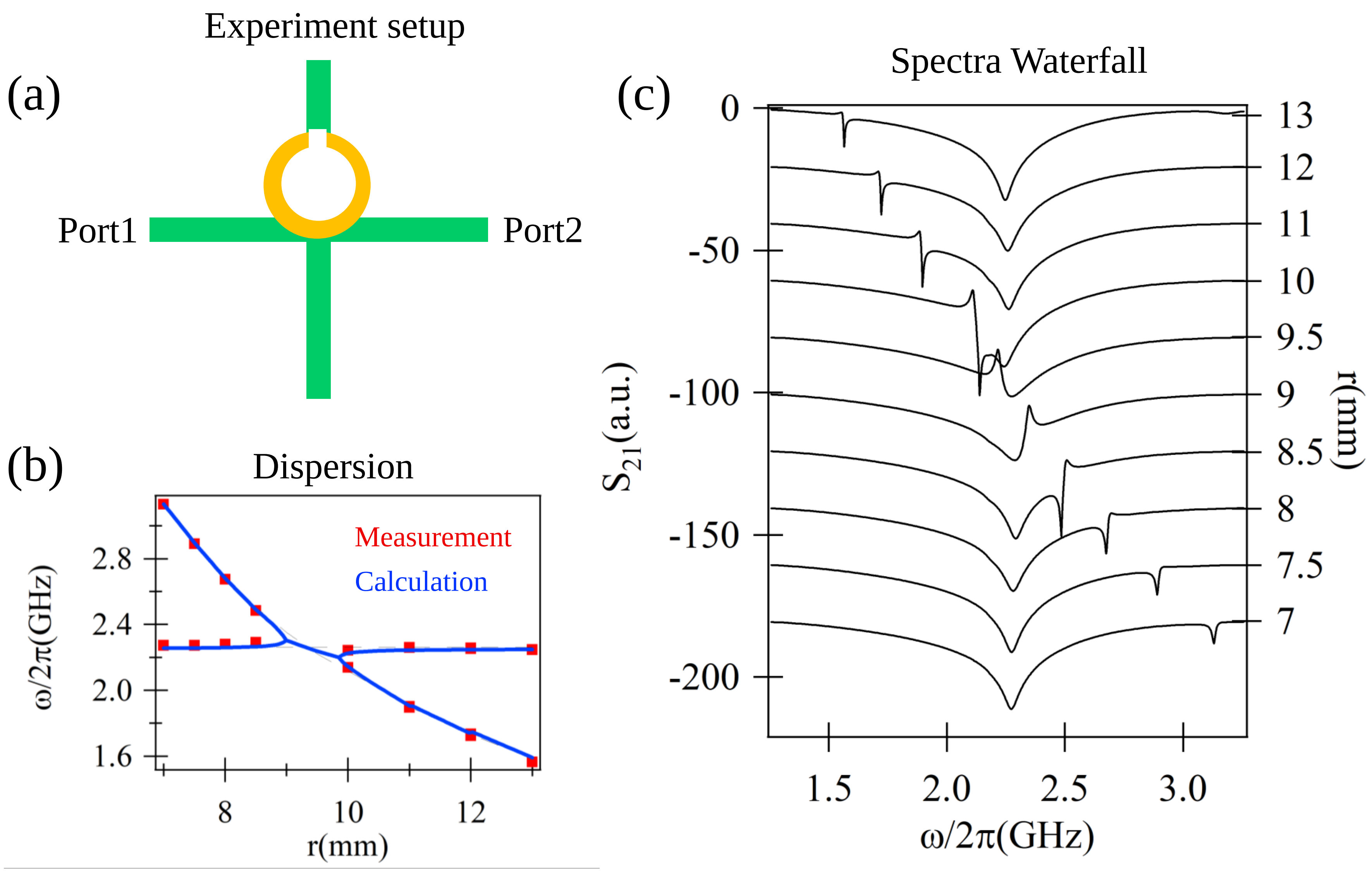


$$f_{SRR} = \frac{c'}{\lambda} = \frac{c'}{2\pi r} \propto \frac{a}{r}$$

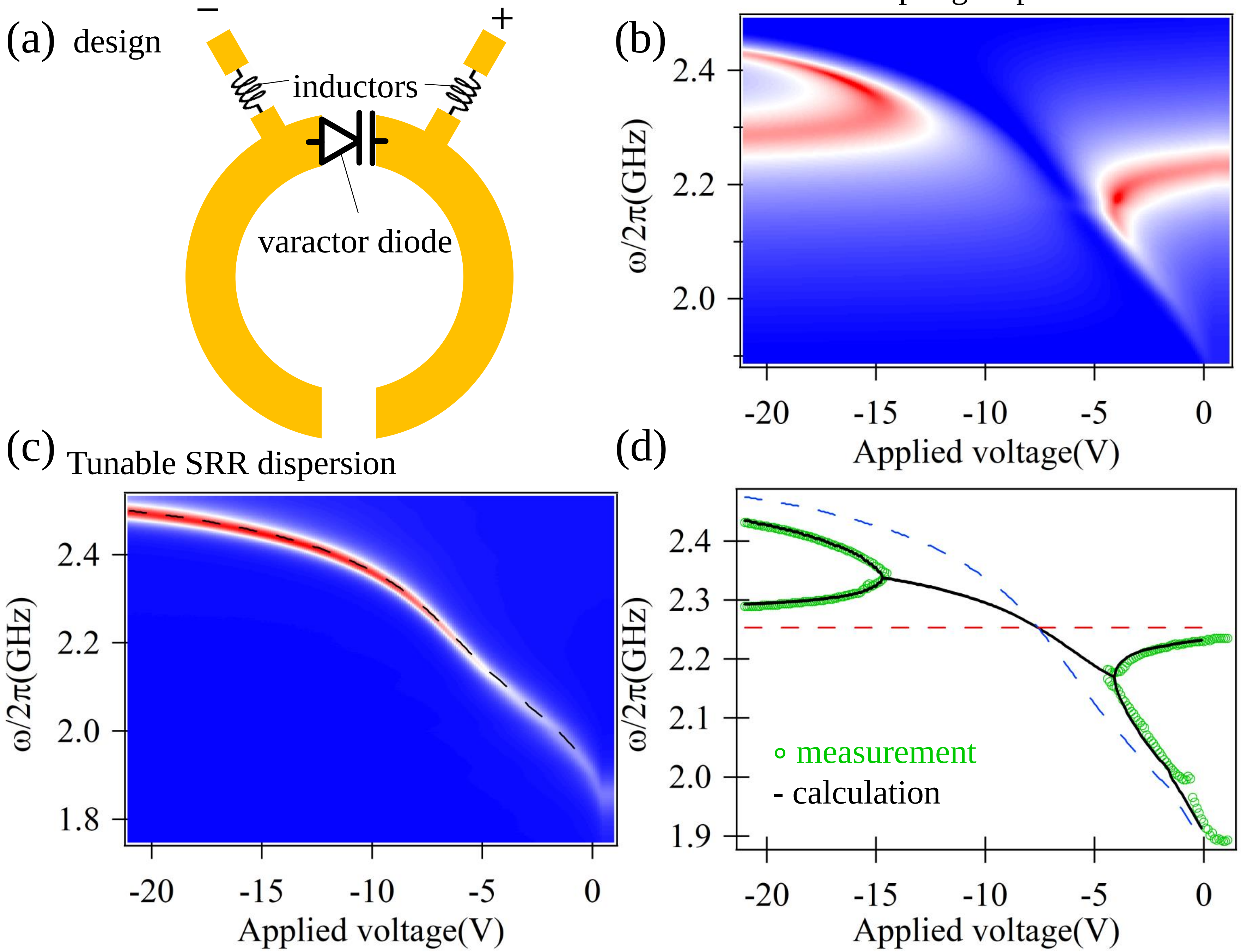
$$\Delta\omega_{in} = \frac{R}{2L} = \boxed{\frac{R}{2}\sqrt{\frac{C}{L}}} \times \frac{1}{\sqrt{LC}}$$

$$= \beta\omega_c$$

Characterize SRRs with different radius



Level attraction between Tunable SRR and cross cavity



- Conclusion

1. We have realized the level attraction in metamaterial.
2. The dispersion relation can be well descried by the model:

Fitting parameters:

$$\gamma_r \sim 4MHz;$$
$$(\gamma_c)_{in} = 20\ MHz;\ \ (\gamma_c)_{ex} = 691\ MHz;$$
$$g = 85MHz;\ \ \phi = \pi;$$

- Next step

1. Analysis the line shape of LA.
2. Try to develop coupling mechanism in this case.
3. Calculate effective μ_r and ϵ_r using S parameters.