



ダイヤモンド量子磁気センサの高感度化に向けた カイラル導波路構造の検討と作製



プロジェクトメンバー: 電気・電子情報工学系

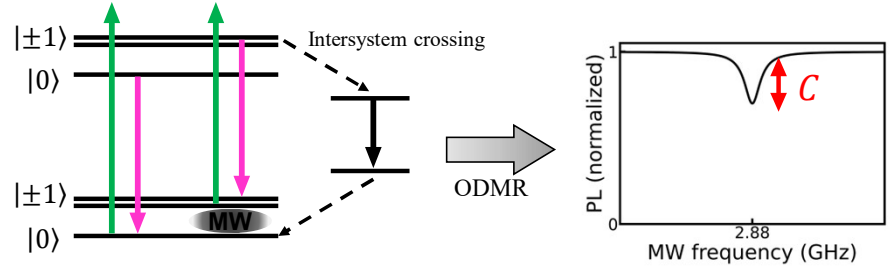
高田晃佐、勝見亮太、鳴瀬駿、河合健太、佐藤大地、飛沢健、八井崇



Introduction

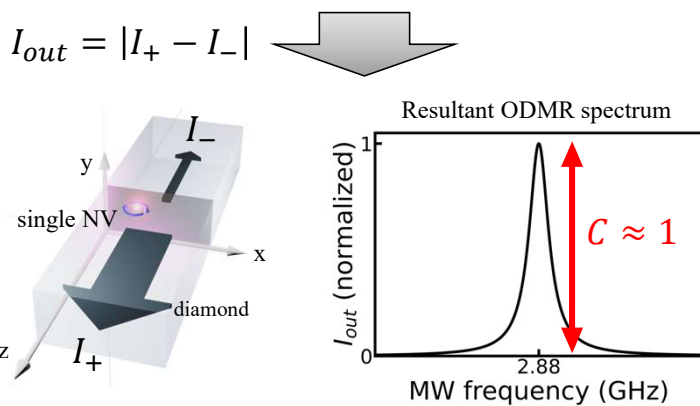
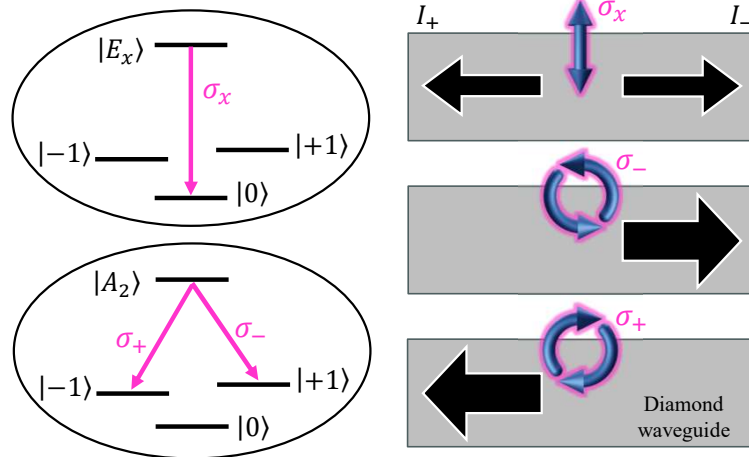
- NV center (as a quantum sensor)
- ○ High spatial resolution
- × Low light-extraction efficiency
- × Low contrast

$$\delta B = \frac{\pi \hbar}{2 g \mu_B} \frac{\sqrt{T_m}}{T_2^*} \sqrt{1 + \frac{1}{C^2 \eta N_{\text{photon}}}}$$

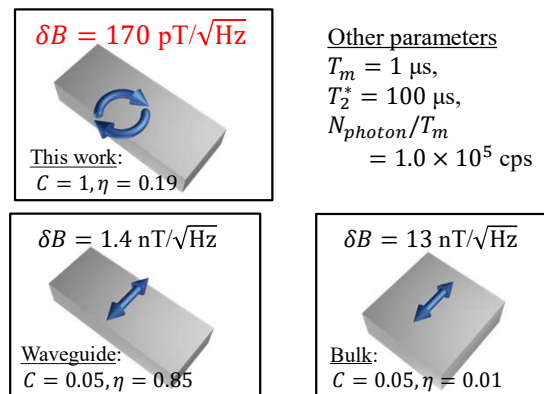
J. F. Barry, et al. *Rev. Mod. Phys.* **92**, 015004 (2020).

Research purpose

- Develop a diamond chiral waveguide
- ○ Improved light-extraction efficiency
- ○ Improved contrast

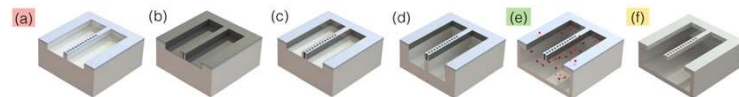
K. Takada, et al. *Opt. Express* **32**, 795-802 (2024).

Comparison

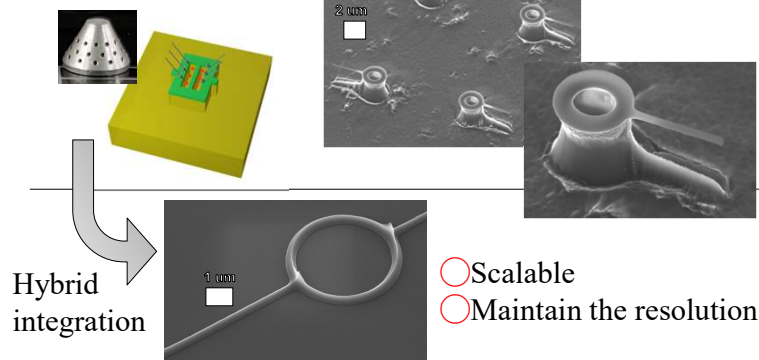


Fabrication

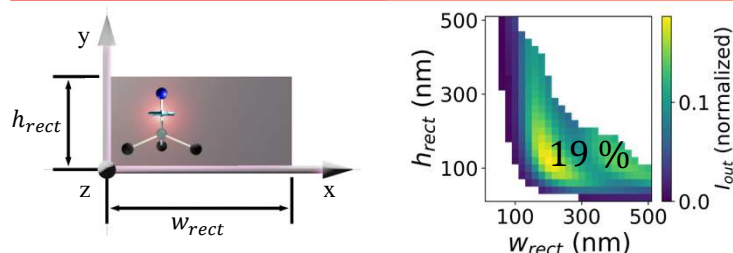
(1) Quasi-isotropic etching

S. Mouradian, et al. *Appl. Phys. Lett.* **111**, 021103 (2017).

(2) Angled etching



Simulation



Conclusion

- Proposed a chiral-waveguide-based device
- Fabricated and integrated the waveguide structure

Publications

- R. Katsumi, K. Takada, S. Naruse, K. Kawai, D. Sato, T. Hizawa, and T. Yatsui, *Appl. Phys. Lett.* **123**, 111108 (2023).
- K. Takada, R. Katsumi, and T. Yatsui, *Opt. Exp.*, **32**, 795 (2024)

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