

Emerging Magnetic Imaging Applications with Nitrogen-Vacancy Centers in Diamond

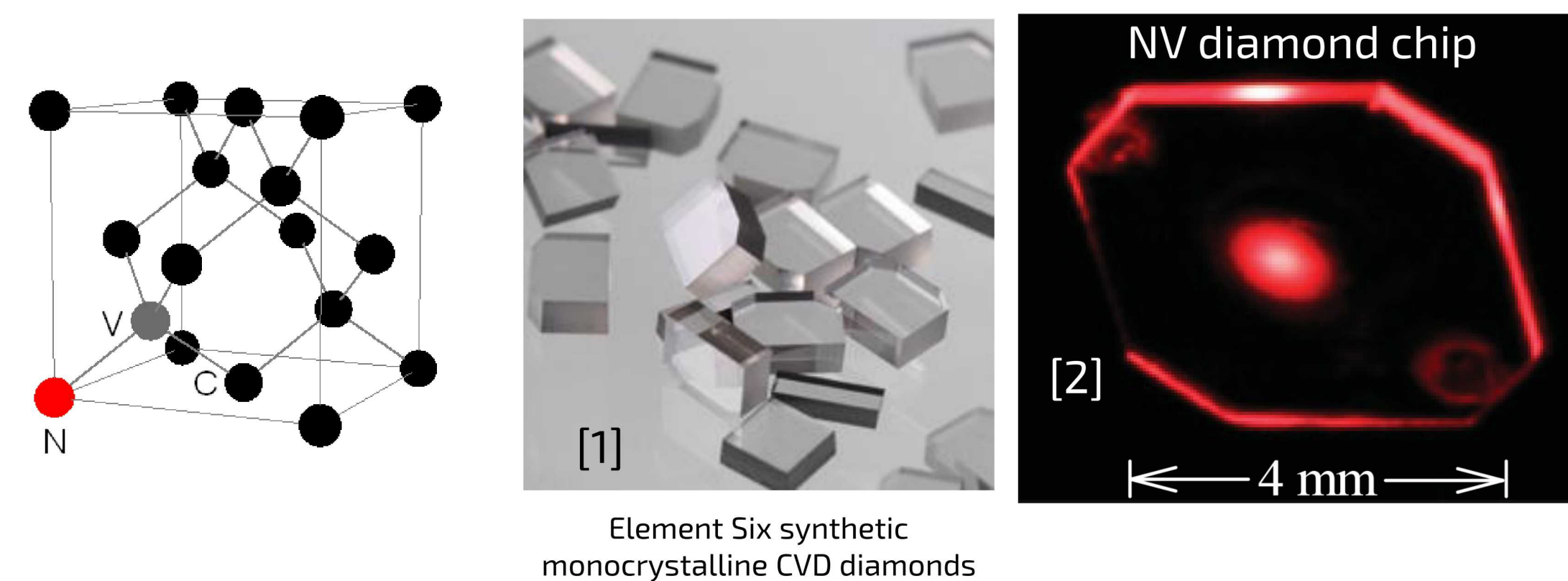
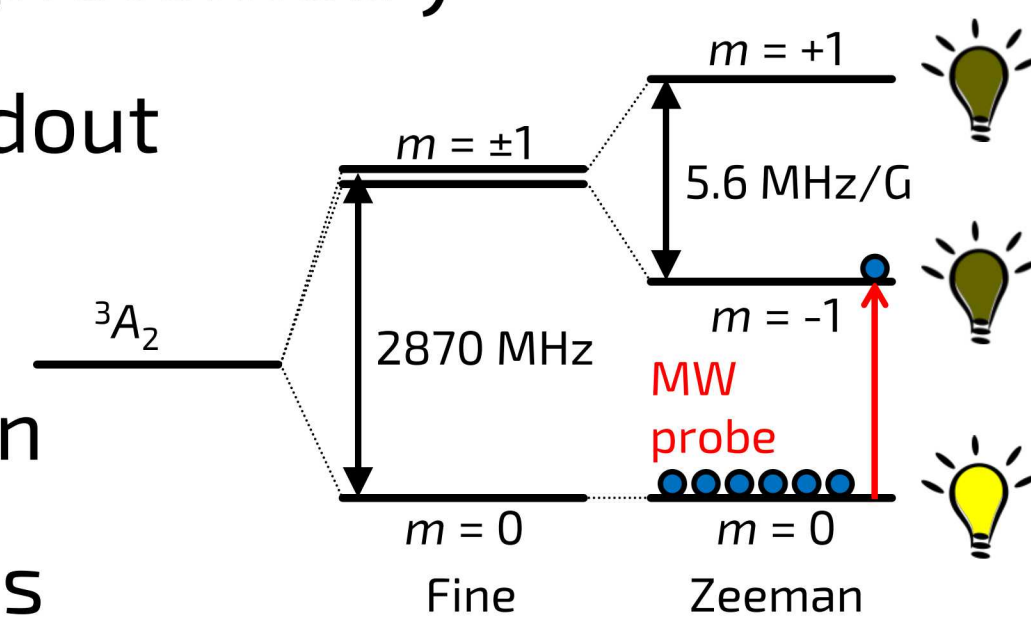
Pauli Kehayias



NV diamond overview

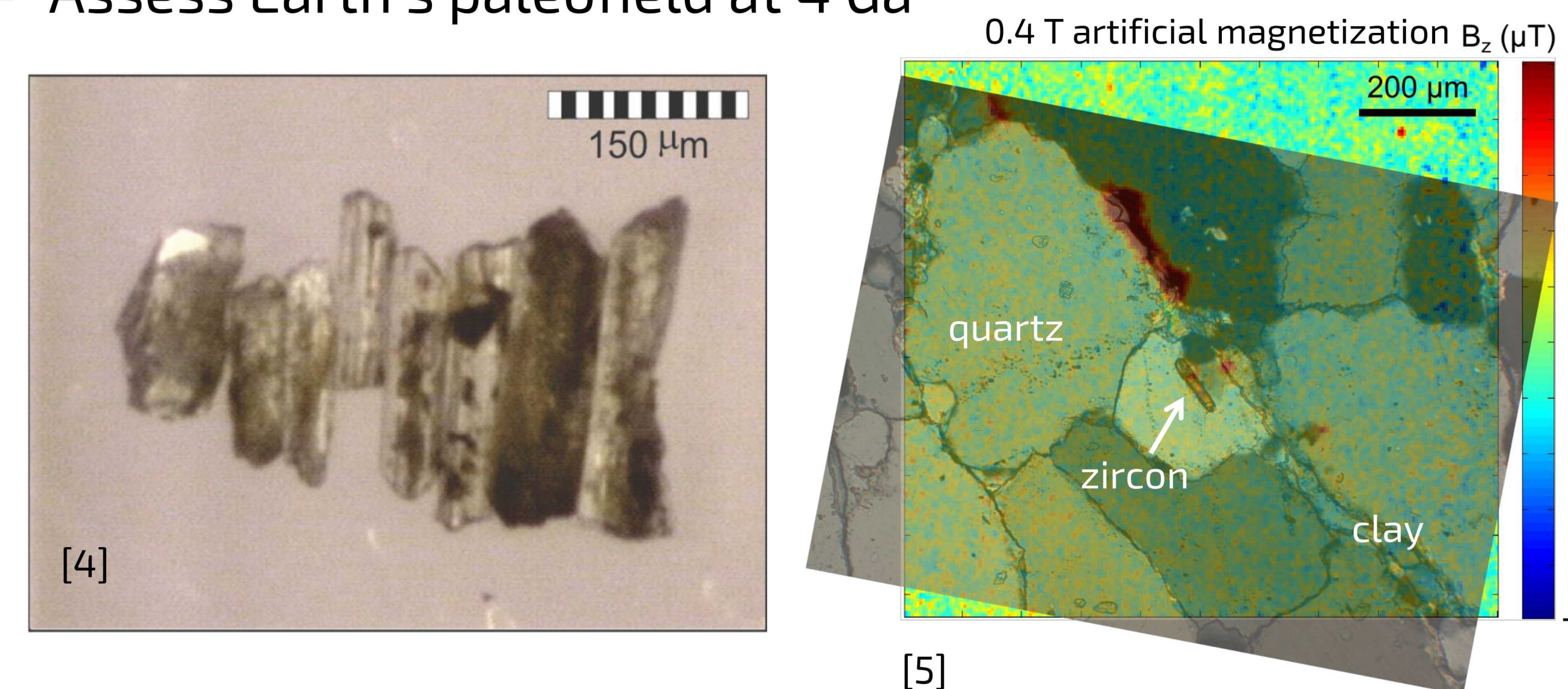
- Color center used for magnetometry

- Optical initialization & readout
- High spatial resolution
- Small NV-target separation
- Work at ambient conditions



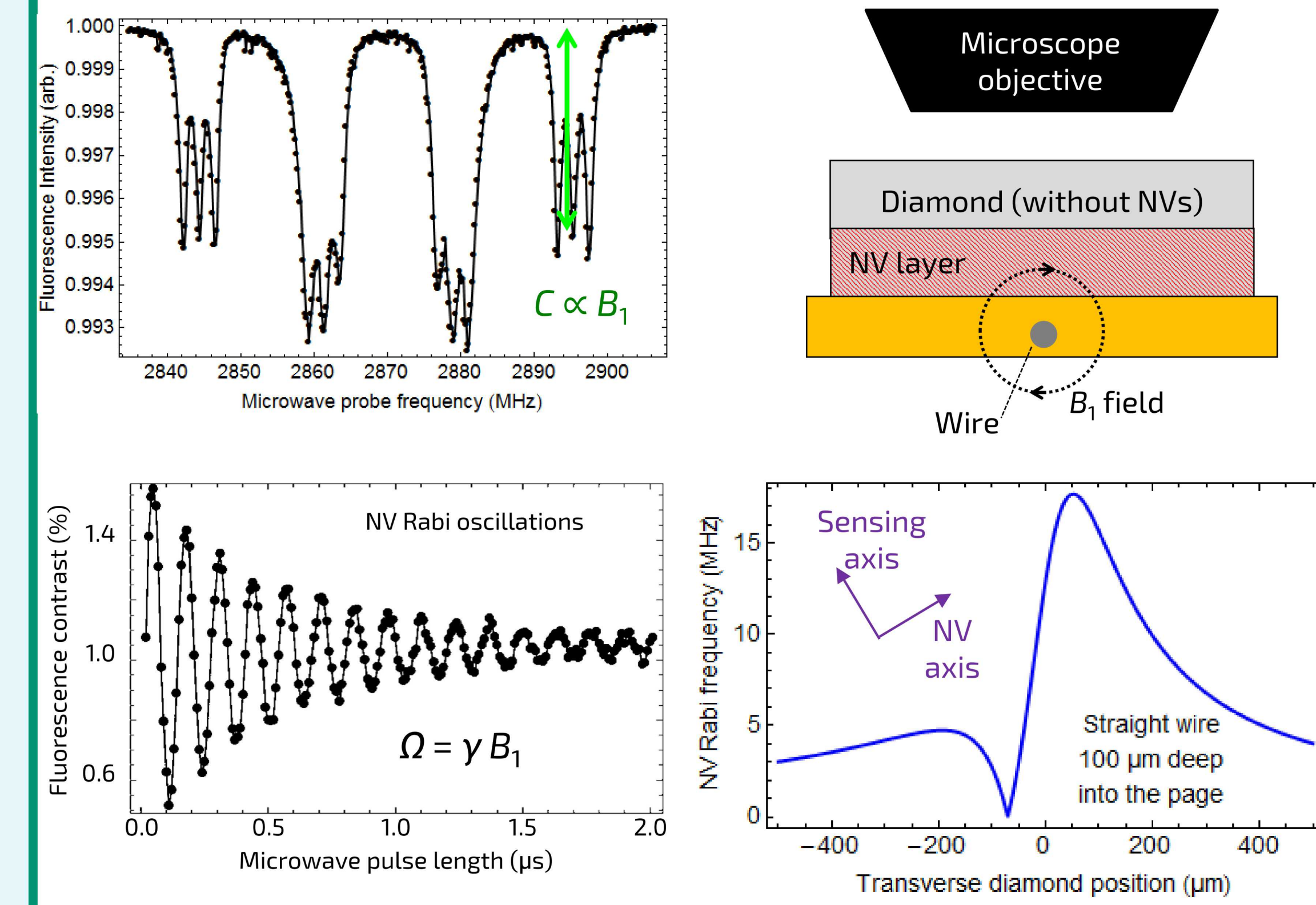
Jack Hills Zircons

- Assess Earth's paleofield at 4 Ga



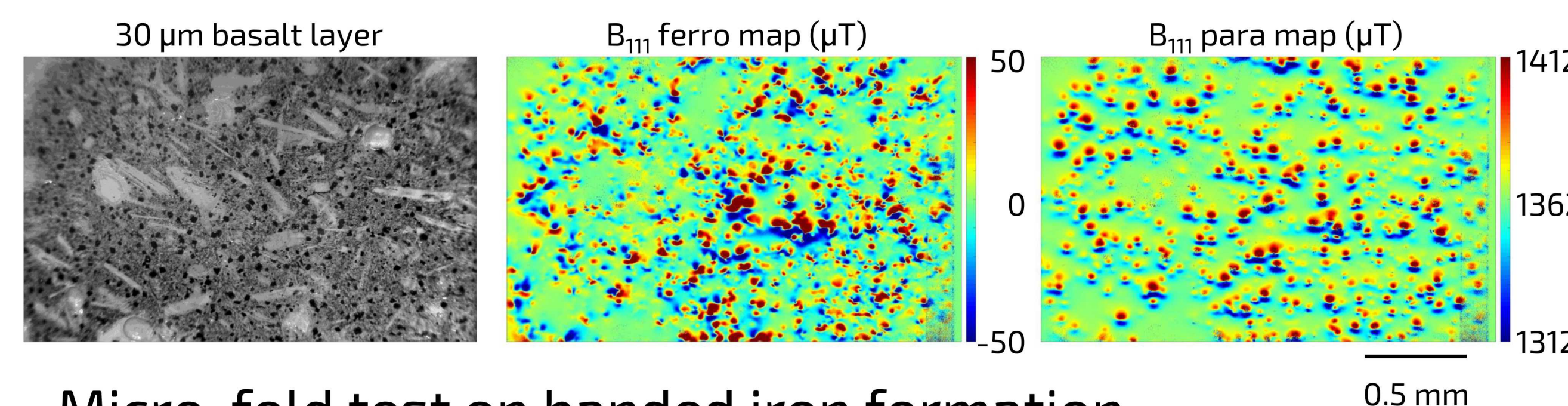
RF and microwave imaging

- Device characterization, FEM validation

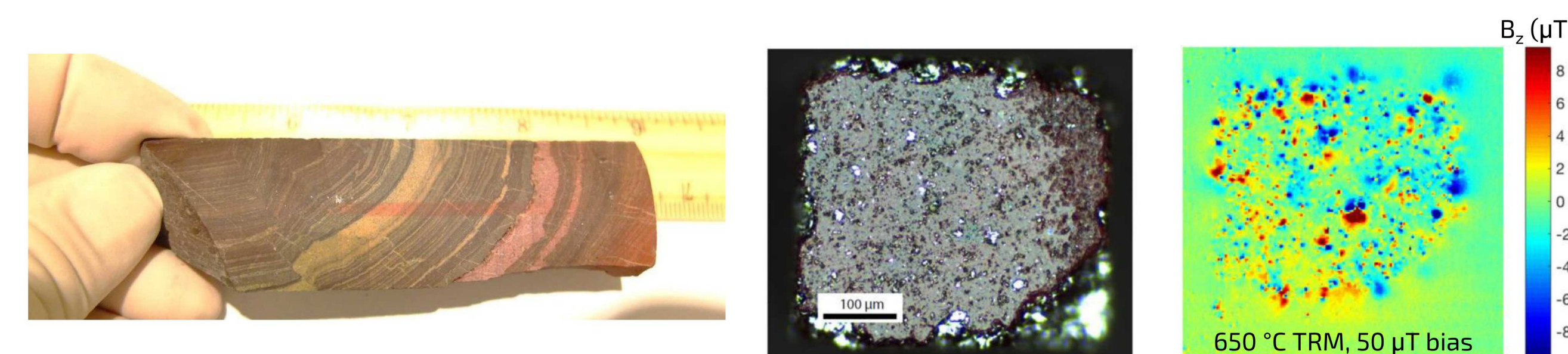


Paleomagnetism methodology improvements

- Measure and sum grain magnetizations individually [6]



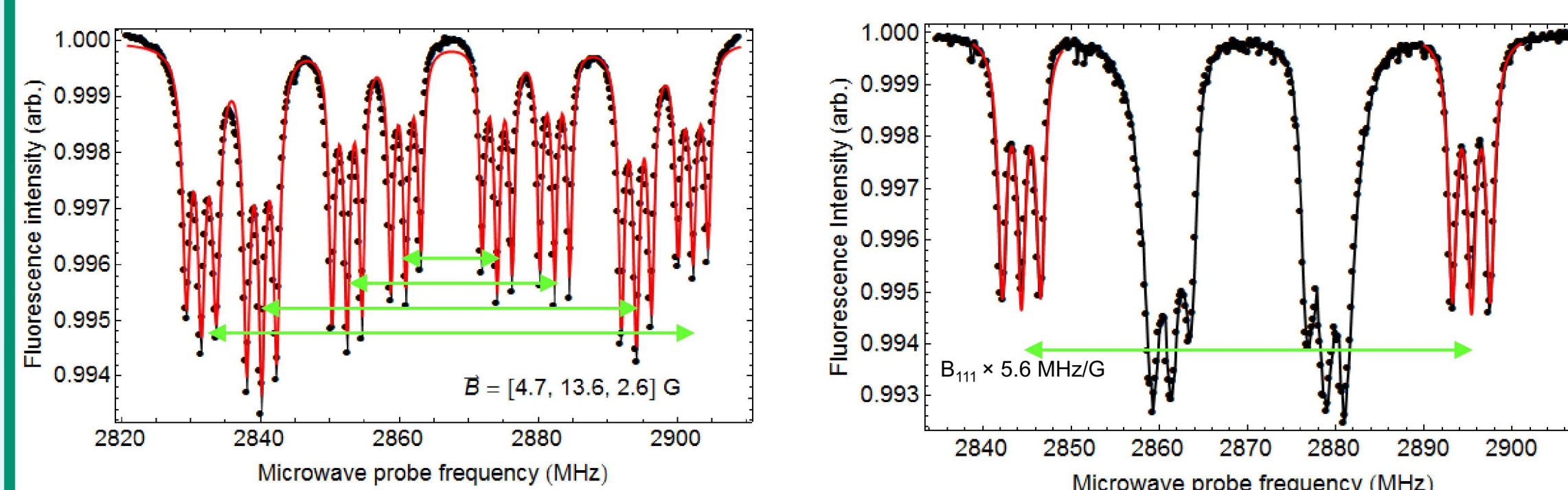
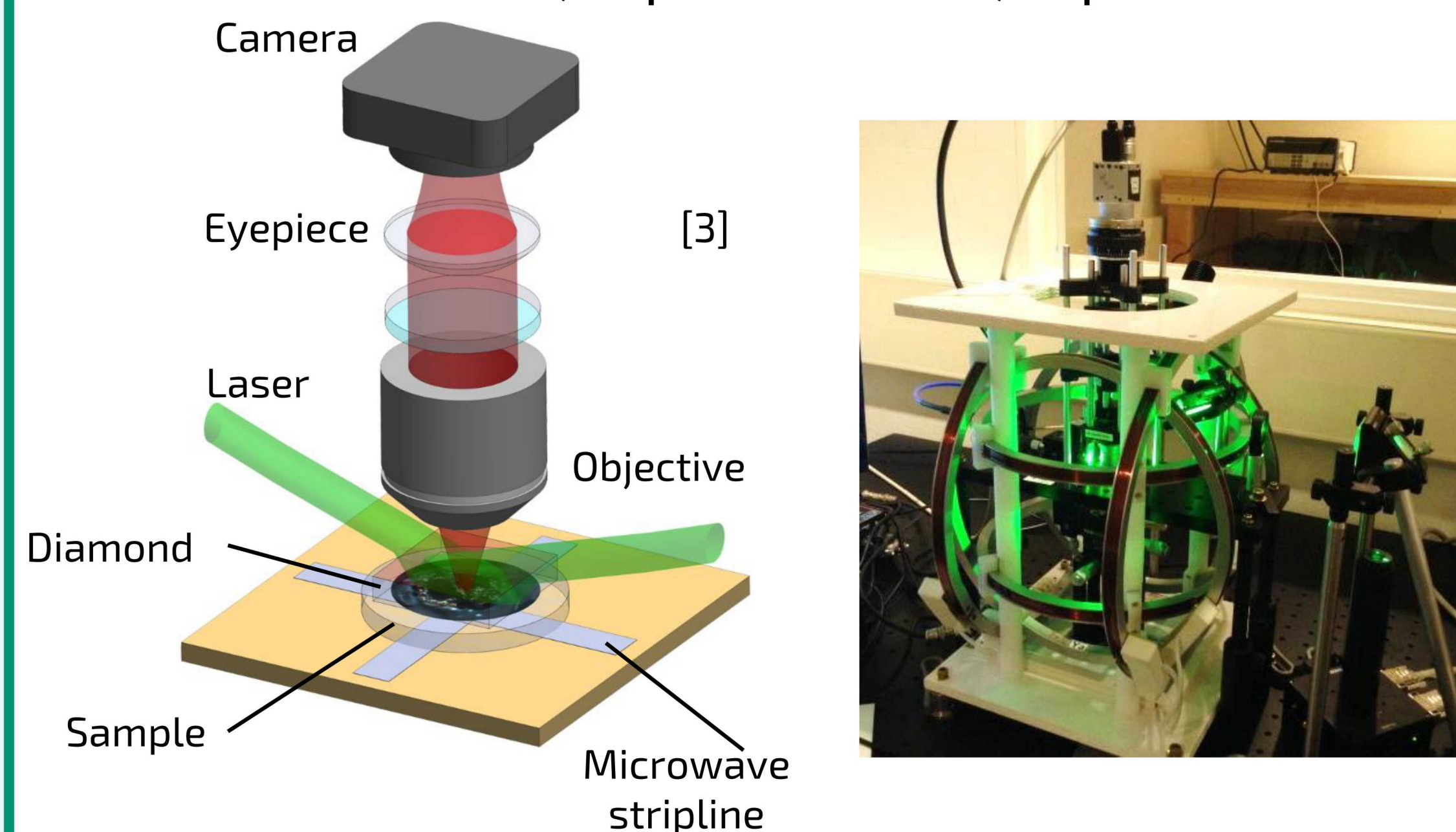
- Micro-fold test on banded iron formation



NV magnetic microscopy

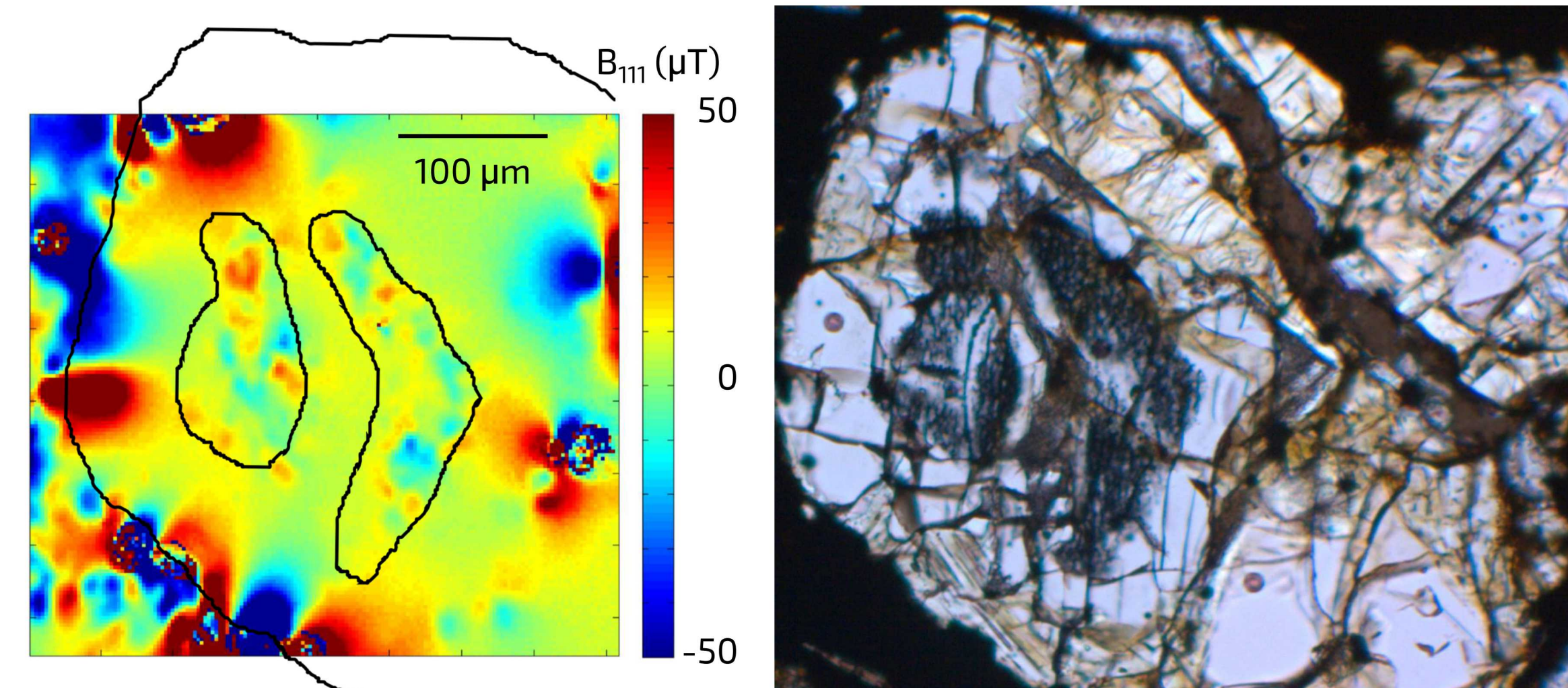
- Image NV fluorescence with microscope

- Resonance spectrum in each pixel indicates local B
- Correlate optical, SEM, and magnetic images
- 2.1 × 1.3 mm FOV, ~1 μm resolution, ~1 μT/Hz^{1/2}



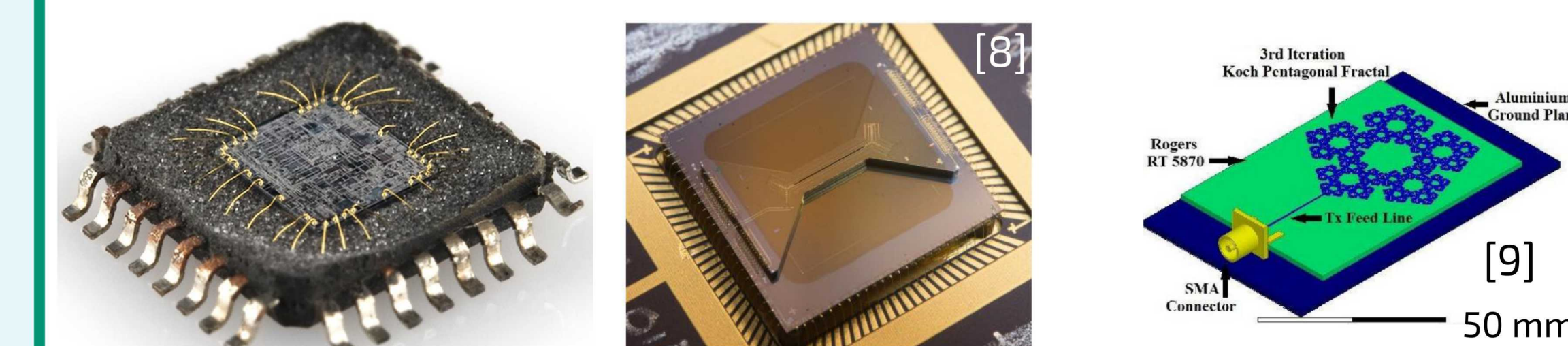
Protoplanetary B field

- How did the Solar System form, and how important was the nebular B field?



Upcoming work

- DC and AC imaging applications



- NV AC field imaging capabilities:

- Continuous and pulsed fields
- Polarization, vector, and phase reconstruction
- 0.01-100 GHz frequency range
- Field sensitivity improvements ongoing

References

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