

**Title:** A physically unclonable function using micron-scale magnetic structures and NV diamond magnetic sensing

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**Text:**

We describe a new type of physically unclonable function (PUF, a hardware “fingerprint”) based on the random magnetic moments of micron-scale ferromagnetic rods (micromagnets). We image the magnetic fields from an array of micromagnets using magnetic microscopy of nitrogen-vacancy (NV) defect centers in diamond, then use image analysis techniques to evaluate the magnetic moment of each micromagnet to use as the fingerprint. NV widefield magnetic microscopy is an appealing technique for measuring micromagnet arrays and other 2D magnetic materials, enabling parallel (rather than raster-scanned) measurements with high signal-to-noise ratio and micron-scale spatial resolution in ambient conditions. To conclude this talk, we evaluate metrics for the micromagnet PUF quality and readout rate, discuss the advantages a magnetic-based PUF can provide, and outline approaches for further optimizing and extending this scheme.

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**References:**

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