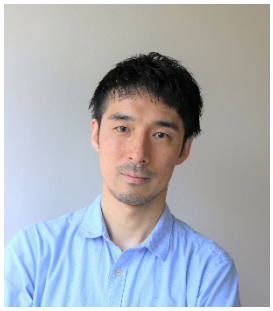
# Seminar: Shunsuke Fukami

**Research Institute of Electrical Communication, Tohoku University, Japan**

**Tuesday, May, 26th 2026 at 3 PM**
**IJL R+4 (N° 4-A014)**

## Noncollinear Spintronics and Probabilistic Spintronics



Shunsuke Fukami is a Professor of the Research Institute of Electrical Communication (RIEC), and the director of the Center for Science and Innovation in Spintronics (CSIS) of Tohoku University, Japan. His areas of expertise include spintronics physics/materials/devices and their application to integrated circuits and novel-computing hardware.He received his doctor degree in 2012 from Nagoya University. He joined NEC Corporation in 2005 and moved to Tohoku University in 2011. Since 2020, he has served as a Full Professor at Tohoku University.

In this seminar, I will discuss two topics studied in Spintronics Laboratory at the Research Institute of Electrical Communication in Tohoku University. The first topic is spintronics with noncollinear antiferromagnet. Noncollinear antiferromagnets, represented by Mn3Sn, show intriguing properties similar to ferromagnets such as the anomalous Hall effect, despite vanishingly small net magnetization. We achieved an epitaxial growth of both M-plane and C-plane Mn3Sn thin film, in which a chiral-spin structure in the Kagome plane is oriented perpendicular or parallel to the film plane [1]. Using these stacks, we have shown various interesting phenomena never seen in conventional ferromagnets, including persistent chiral-spin rotation [2,3], quantum-metric induced nonlinear Hall effect [4], and mutual switching [5].
The second topic is spintronics with probabilistic devices, to be more specific, stochastic magnetic tunnel junctions (s-MTJs). Conventional computers made of CMOS circuits are based on deterministic, synchronous, and directional operations. While playing significant role in today's information society, they have several types of problems that cannot be efficiently addressed. Probabilistic computers with probabilistic bits are expected to be promising to address such complex tasks. We have shown proof-of-concepts of probabilistic computing with s-MTJs, including combinatorial optimization [6], machine learning [7], and quantum simulation [8], and have also developed understanding and technologies to enhance the device properties [9-11].
The first and second topics have been carried out in collaboration with Y. Takeuchi, Y. Sato, Y. Yamane, J. Han, J.-Y. Yoon et al., and S. Kanai, K. Hayakawa, K. Kobayashi, W.A. Borders, K. Camsari, D. Datta et al., respectively and both topics have been supervised by H. Ohno. These works have been partly supported by JSPS Kakenhi, MEXT X-NICS, and JST-ASPIRE.

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