

# Observation of ultrafast Dresselhaus spin-orbit fields in NiMnSb

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Spin-orbit fields (SOFs) play a central role in ultrafast spin-charge interconversion, yet their generation mechanisms and temporal evolution remain poorly understood on femtosecond timescales. Here, we investigate the generation, lifetime, and spatial distribution of SOFs in the half-Heusler material NiMnSb using time-resolved THz-pump optical-probe measurements. We observe ultrafast magnetic linear birefringence (MLB) signals, providing direct evidence of transient SOFs. The symmetry of the MLB response is consistent with Dresselhaus-type spin-orbit coupling [1]. We find that the SOFs directly follow the THz electric-field dynamics, responding instantaneously within our time resolution of 10 fs. By analyzing the depth sensitivity of the signal, we find that these Dresselhaus SOFs are not confined to interfacial regions but extend throughout the bulk of the sample.

## References:

[1] C.Ciccarelli et al, Nature Physics 2016 Vol. 12 Issue 9 Pages 855-860