

**Topological plasmonics:
Ultrafast vector movies of plasmonic skyrmions on the nanoscale**

Harald Giessen¹, Tim Davis^{1,2,3}, Frank Meyer zu Heringdorf², Bettina Frank¹, David Janoschka², and Pascal Dreher²

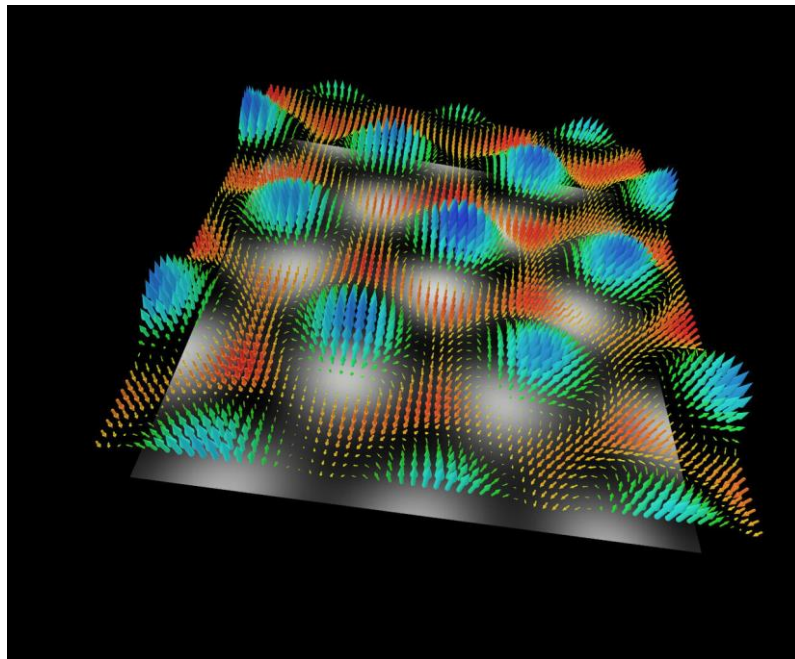
¹4th Physics Institute, Research Center SCoPE, and Center for Integrated Quantum Science and Technology IQST, University of Stuttgart, Germany

²CENIDE, University of Duisburg-Essen, Germany

³University of Melbourne, Australia

*E-mail: giessen@physik.uni-stuttgart.de

Here we introduce a new technique, time-resolved vector microscopy, that enables us to compose entire movies on a sub-femtosecond time scale and a 10 nm scale of the electric field vectors of surface plasmon polaritons. Depending on the shape and geometrical phase, in combination with the helicity of the excitation beam, topological plasmonic quasiparticles are created: skyrmions, merons, as well as quasicrystalline excitations. We observe their complete field vector dynamics at subfemtosecond time resolution.



References

T. Davis, D. Janoschka, P. Dreher, B. Frank, F. Meyer zu Heringdorf and H. Giessen
Ultrafast vector imaging of plasmonic skyrmion dynamics with deep subwavelength resolution
Science **368**, eaba6415 (2020).

G. Spektor, D. Kilbane, A. Mahro, B. Frank, S. Ristok, L. Gal, P. Kahl, D. Podbiel, S. Mathias, H. Giessen, F. Meyer zu Heringdorf, M. Orenstein and M. Aeschlimann
Revealing the subfemtosecond dynamics of orbital angular momentum in nanoplasmonic vortices
Science **355**, 1187 (2017).