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Evidence for quantization and topological states in spin Hall conductivity of low-dimensional systems SEBASTIAN KUEFNER, LARS MATTHES, JUERGEN FURTHMUELLER, FRIEDHELM BECHSTEDT, FSU Jena — *Ab initio* relativistic band structure calculations are performed for the frequency-dependent spin Hall conductivity of two-dimensional atomically thin crystals and one-dimensional nanoribbons. We study the influence of topology, quantization and topological edge states. As model systems, fully halogenated germanene, GeI, and its zigzag nanoribbons are investigated. GeI represents a topological insulator due to strong spin-orbit interaction and, hence, band inversion. We demonstrate the quantization of the static spin Hall conductivity. It is hardly influenced by temperature variation but significantly by Fermi level shift. The frequency dependence of the conductivity is governed by the band-structure details. Topological edge states influence the conductivity mainly for vanishing frequencies.

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