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InAs/GaSb quantum wells: quantum spin Hall effect and topological superconductivity MATTHIAS SITTE, KARIN EVERSCHOR-SITTE, ALLAN MACDONALD, Univ of Texas, Austin — Topological insulators have attracted a great deal of attention as a new quantum state of matter in the last decade. The first realizations of 2D TIs were HgTe/CdTe quantum well heterostructures, but in recent years another class of semiconductor heterostructures — namely InAs/GaSb quantum wells — was shown to yield 2D TIs as well. Compared to the HgTe/CdTe-based systems they have many advantages, most prominently a continuously tunable band structure via external electric fields and stronger proximity coupling to superconductors. We perform empirical tight-binding calculations on these systems to study how topological properties are changed by varying external control parameters such as electric fields or well thicknesses. Since proximity coupling of a 2D TI and an ordinary s-wave superconductor gives rise to 1D topological superconductivity, these systems also support Majorana fermions as non-local excitations. We will present preliminary results on the proximity effects when InAs/GaSb quantum wells are coupled to a superconductor.

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