Narrow Gap Semiconductor Structures for Electronic Device Applications

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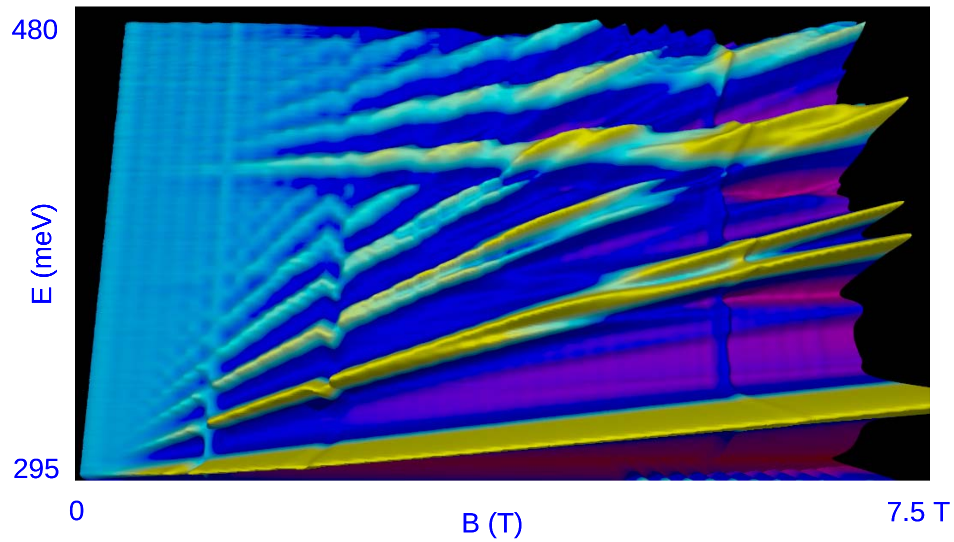
The explosion of interest in graphene, a single layer of carbon atoms, has called attention to the advantages of materials with small effective masses. In our InSb quantum wells, the electron effective mass is as small as in graphene while the room-temperature mobility (~40,000 cm^2/Vs) is more than a factor of two larger. We are studying electronic device applications that exploit high mobility. These include traditional devices (field-effect transistors, magnetic field sensors) and devices that take advantage of quantum-mechanical or spin-orbit effects. We are also exploring the properties of holes in InSb quantum wells, which are predicted to have stronger spin-orbit effects than electrons and would be required for CMOS logic applications.



The absorption of far infrared radiation by an InSb quantum well depends on the photon energy and applied magnetic field. The rich absorption spectra reflect the small effective masses and strong spin splittings for both electrons and holes.