O 111: Key Note VIII

Time: Thursday 15:30–16:00 Location: R1

Plenary Talk O 111.1 Thu 15:30 R1

Light-matter interaction at the atomic scale — •Klaus Kern — MPI for Solid State Research, Stuttgart, Germany — Institute of Physics, EPFL, Lausanne, Switzerland

Light-matter interaction drives many different systems such as optoelectronic devices like light-emitting diodes and solar cells, biological structures like photosystem II, and potential future quantum devices. The absorption or emission of light is typically a local process occurring on the sub-nanometer scale. Concomitantly, the involved processes are fast and take place on attosecond to picosecond time scales. The interaction of electromagnetic radiation with matter at atomic scales can be studied by using a scanning tunneling microscope, whereby the two separate domains of spatial and temporal resolution at its atomic limits are accessed by coupling light into or extracting light from the tunnel junction. Electromagnetic radiation couples with matter through the interaction with charge carriers (electrons and holes), leading to excitations such as electronic transitions, collective oscillations, excitons, and spin flips. New approaches in which light interacts with the tunnel junction itself or with a quantum system in the junction now allow studying these excitations with highest spatial and temporal resolution. In this talk, I discuss the powerful union of photonics and scanning probe techniques and highlight the frontiers of current research.