

Prize Talk PV XI Wed 12:40 B Audimax
Focusing Light — ●GERD LEUCHS — Universität Erlangen-Nürnberg, Erlangen, Germany

Concentrating light to the smallest possible spot is at the heart of classical and quantum optics. This requires manipulating all parameters of the electromagnetic vector field and experimentally characterizing the resulting field structure. Strongly focused light fields produce non-trivial distributions, involving, e.g., transverse angular momentum of light, which in turn allows for demonstrating a nano beacon. Another example is optimizing the interaction of light with an atom in

free space. Goals are the experimental demonstrations that a single photon can excite an atom with certainty, - or that it can act as a localized dielectric medium producing a 180° phase shift of a beam of light. Some guidance can be taken from time-reversal symmetry of the underlying quantum dynamics. Experimental challenges are e.g. the fabrication of diffraction-limited deep parabolic mirrors and the shaping of a single-photon wave packet in time using a nonlinear whispering gallery mode resonator in combination with ghost imaging in the time domain. Even when studying the seemingly most trivial case, the efficient focusing of light in vacuum, i.e. in the absence of any real matter, there are still open questions and challenges.