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Anderson localizing optical fibers

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Unlike in 3D, where Anderson localization of light is prohibitively difficult to observe, Anderson localization has been observed in quasi-2D optical systems. An optical field that is launched in the longitudinal direction tends to remain localized in the transverse plane as it freely propagates in the longitudinal direction in a transversely random dielectric medium. This behavior has dubbed transverse Anderson localization of light. I will present an overview of our recent theoretical and experimental results regarding the transverse Anderson localization of light in disordered optical fibers. Our research team has reported the first observation of Anderson localization in an optical fiber, beam multiplexing, ultra-bend performance, image transport, wave-front shaping and sharp focusing, nonlocal nonlinear behavior, and single-photon data packing. In particular, I will talk about our recent work on high-quality optical image transport in Anderson localizing optical fibers. The highly disordered fiber was initially developed to study the physics of Anderson localization in the optical domain and explore its device applications. The successful observation of Anderson localization in an optical fiber and the subsequent demonstration of beam multiplexing led the research team to explore the possibility of image transport through the disordered fiber. The transported images were observed to be of a comparable or higher quality than the commercially available multicore imaging optical fibers, with less pixelation and higher contrast. It is now understood that the higher image transport quality is achieved in spite of, the high level of disorder and randomness in this optical fiber.

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Modular research and prototyping tool for optical wireless

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This talk presents the novel modular optical wireless elements (MOWE) architecture developed at the University of Oklahoma to provide researchers and engineers with flexible, modular and versatile platform to experiment and prototype their ideas in the field of optical wireless. Current advances in short- and medium-range optical wireless communication and the increased interest in challenging applications such as multi users and mobile platforms call for new optical devices that provide wide field-of-view, exploit spatial and angular diversity and combat misalignment and weather conditions. All this is expected to arrive in the lowest size, weight and power (SWaP) possible to fit aboard small unmanned aerial vehicles (UAVs) or get integrated within personal and consumer electronics devices. The MOWE platform, available as an open-source project, provides researchers and engineers with such capabilities in an easy-to-assemble form factor. It also features programmable front-ends giving users agility and flexibility and paving the way for software-defined optics.

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