DR. ALEXEY YAMILOV

Bio:

Alexey Yamilov is a professor of physics at Missouri S&T. His research activities are in theoretical and computational condensed matter physics and optics; it uses various analytical and numerical methods to study the transport of electromagnetic, electronic, and other types of waves in heterogeneous media where line-of-sight propagation is hampered by scattering. The purpose of this research is to uncover and exploit the physical phenomena caused by wave interference, with the goals of (i) understanding new behavior arising not only from the fundamental laws of physics but also from the complexity of the system itself, (ii) developing methods for coherent control of wave propagation, and (iii) design of artificial structures/systems with a set of desired properties.

Abstract:

Anderson localization marks the cessation of diffusive wave propagation in disordered systems. Despite extensive research over the past 40 years, Anderson localization of light in three dimensions (3D) remains elusive, leading to questions about its very existence. Recent speedups by orders of magnitude in finite-difference time-domain calculations have enabled us to perform brute-force ab initio numerical simulations of light transport in fully disordered 3D systems of unprecedented size and refractive index contrast. We have shown that 3D localization of electromagnetic waves is indeed possible in random packings of metal spheres, compared to its absence in dielectric systems [Yamilov et al., Nat. Phys. 19, 1308 (2023)]. In my talk, I will describe the long and tricky path to discovery, littered with false starts and denials. Our results breathe new life into a field that was on the brink of despair just a few years ago.

ANDERSON LOCALIZATION OF LIGHT IN THREE DIMENSIONS OR HOW TO SOLVE A PROBLEM IN UNDER FORTY YEARS

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11:00 AM

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Venue:
AET 0.204