

Prof. Dr. Satoshi Iwamoto

Research Center for Advanced
Science and Technology
The University of Tokyo

Institute of Industrial Science
The University of Tokyo

4-6-1 Komaba, Meguro-ku, Tokyo
153-8904, Japan



**Photonics Meets Topology:
Fundamentals and Future Visions of Topological Photonics**

Abstract

Topology is a mathematical concept that deals with differences in shape. The mathematical “vision” has revolutionized condensed matter physics, opening up new scientifically and technologically attractive possibilities for robust electron transport that is highly immune to defects. By introducing this foundational “vision” into optics, a novel paradigm known as topological photonics has emerged.

In this presentation, we will introduce the fundamentals, unique appeal, and potential applications of this rapidly developing interdisciplinary field to an audience spanning a broad range of scientific disciplines. First, avoiding complex equations, we will intuitively explain how and why light behaves differently in topological photonic systems. When artificial optical materials with distinct band topologies are interfaced, a topologically protected edge state of light is formed at their boundary. Remarkably, this state enables light to propagate efficiently without backscattering, even in the presence of some kinds of structural defects or sharp bends. As a concrete example, we will highlight valley photonic crystal waveguides. Finally, we will also discuss how the broad exploration and utilization of topological states of light will bring about a new “vision” for optics and photonics.

CV

Satoshi Iwamoto is a Professor at the Research Center for Advanced Science and Technology (RCAST) and the Institute of Industrial Science (IIS), The University of Tokyo, where he also received his Ph.D. in Applied Physics in 2002. Currently, he holds key leadership positions, including Deputy Director of RCAST and Deputy Director General of the Division of University Corporate Relations.

His research focuses on photonic nanostructures, quantum nanophotonics, and topological wave engineering. He has published over 240 peer-reviewed journal papers and delivered numerous invited talks globally. Currently, he leads a JST-CREST project developing oxide semiconductor-based quantum light sources and a newly awarded 2026 Grant-in-Aid for Scientific Research (S) project focusing on nonlinear topological wave engineering.

He actively contributes to the scientific community as a Director of the Japan Society of Applied Physics, an Associate Editor for Applied Physics Letters, and an advisor for JST PRESTO and CREST programs. His notable recognition includes the MEXT Young Scientists’ Prize, the Docomo Mobile Science Award, and the IEICE Electronics Society Award. He is a Fellow of Optica.