

SEMINARI

principi natura modello

metodo

matematica

andezze

fisica

generale

valore

spazio

base

classica

teorie

sistemi

antistica materia

dati

fenomeni

sperimentale

esempio

fondamentali

relativa

FILOSOFIA

studio

grandezza

misura

incertezze

teoria



UNIVERSITÀ DEGLI STUDI
DI TRENTO

Dipartimento di Fisica

Prof. Luca Dal Negro

Boston University

Tuesday 16th June 2026 - 2:00 p.m.

Meeting Room NL – PovoZero

Nonlinear Photonics with Epsilon-Near-Zero (ENZ) Nanostructures

Abstract:

Highly nonlinear materials and photonic nanostructures are essential components for resonant optoelectronic devices with enhanced bandwidth and sensitivity down to the single photon regime, such as nonlinear optical sensors, quantum non-demolition photodetectors, ultrafast optical switches and modulators. In this context, the ability to design and engineer novel photonic resonant interactions in metal-dielectric nanostructures with multiple bound states in the continuum (BICs) provides exciting opportunities for both classical and quantum device applications. In this talk, I will discuss our recent work on the development of nonlinear indium tin oxide (ITO) materials and strongly coupled photonic nanostructures with engineered Tamm states and BIC resonances for enhancing nonlinear frequency generation on a chip. In particular, I will focus on refractive index modulation, harmonic generation, and cross phase modulation in multi-resonant Tamm states and cavity-coupled polariton systems with BICs and topologically designed multi-frequency nanocavities in ITO/silicon nitride photonic structures. This work leverages scalable materials and device fabrication with rigorous electromagnetic modeling and quantum electrodynamics theory to demonstrate highly nonlinear Si-compatible materials and nanostructures that enhance single photon nonlinear interactions and non-demolition detection on a Si platform.

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