

Modeling avalanche photo diodes under ultrafast fields

Advisor: Ron Tenne

Contact: ron.tenne@technion.ac.il

Type: Theoretical. Numerical simulations of optics and electronics.

Abstract:

Avalanche photo diodes (APDs) have revolutionized the way in which we detect low light levels. They enabled fundamental proofs of quantum mechanics, a deeper understanding of electron dynamics in materials and the invention new optical-microscopy methods. The absorption of photon is the first in a cascade of events leading to a current avalanche that is timed and registered by an external circuit. This mechanism, while enabling the observation of single photons, is temporally limited by the (random) time it takes avalanche to form. We would like to theoretically test how the buildup of such an electronic avalanche would react to an ultrafast electric field, particularly in the terahertz (THz) regime. The goal of the project is to numerically simulate the dynamics of an APD under a strong THz electric field in order to test whether such a short pulse can gate the detection of light. If successful, it will produce an entirely new concept to detect single photons with an extremely high (perhaps down to sub-picosecond) temporal resolution.