Abstract

Light is a unique carrier of information and it plays an essential role in developing future quantum technologies. Quantum devices that coherently and efficiently control quantum information are building blocks of quantum communication and sensing technologies. I present my research on quantum storage and manipulation of optical information using a novel technique known as gradient echo memory. I also describe my research on optomechanical systems namely laser-cooling of nanowires and laser levitation of a millimeter-scale mirror for applications in precision sensing. Furthermore, I present my current research at MIT on nonlinear photon-photon interactions in the cavity quantum-electrodynamic regime where we have observed nondestructive photon detection and giant Kerr nonlinearity at the single-photon level. Finally I describe how, by integrating electro-optomechanical systems with atomic gases, exquisite quantum sensing and processing devices may be realized.

Biography

Mahdi has received his PhD from the Australian National University (ANU). During his PhD, Mahdi experimentally studied quantum storage and manipulation of optical information using a novel technique called gradient echo memory. At the ANU, he also carried out experimental and theoretical work on optomechanical systems to improve precision sensing using nanowires and levitated mirrors. Currently at MIT, he experiments with cold atoms inside an optical cavity and studies quantum nonlinear interactions between photons mediated by atoms.