1. Record Nr. UNINA9910760280203321

Autore	Xu Zhujing
Titolo	Optomechanics with Quantum Vacuum Fluctuations / / by Zhujing Xu
Pubbl/distr/stampa	Cham : , : Springer Nature Switzerland : , : Imprint : Springer, , 2024
ISBN	9783031430527 3031430522
Edizione	[1st ed. 2024.]
Descrizione fisica	1 online resource (120 pages)
Collana	Springer Theses, Recognizing Outstanding Ph.D. Research, , 2190-5061
Disciplina	535.15
Soggetti	Quantum optics Optics Quantum computing Quantum theory Quantum Optics Applied Optics Quantum Information Fundamental concepts and interpretations of QM
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di contenuto	Chapter 1: Introduction -- Chapter 2: Measurement and Calculation of Casimir Force -- Chapter 3: Experimental Realization of a Casimir Diode: Non-Reciprocal Energy Transfer By Casimir Force -- Chapter 4: Experimental Realization of a Casimir Transistor: Switching and Amplifying Energy Transfer In A Three-Body Casimir System -- Chapter 5: Proposal On Detecting Rotational Quantum Vacuum Friction -- Chapter 6: Proposal On Detecting Casimir Torque -- Chapter 7: Conclusion And Outlook.
Sommario/riassunto	This thesis presents the first realization of non-reciprocal energy transfer between two cantilevers by quantum vacuum fluctuations. According to quantum mechanics, vacuum is not empty but full of fluctuations due to zero-point energy. Such quantum vacuum fluctuations can lead to an attractive force between two neutral plates in vacuum – the so-called Casimir effect – which has attracted great

attention as macroscopic evidence of quantum electromagnetic fluctuations, and can dominate the interaction between neutral surfaces at small separations. The first experimental demonstration of diode-like energy transport in vacuum reported in this thesis is a breakthrough in Casimir-based devices. It represents an efficient and robust way of regulating phonon transport along one preferable direction in vacuum. In addition, the three-body Casimir effects investigated in this thesis were used to realize a transistor-like three-terminal device with quantum vacuum fluctuations. These twobreakthroughs pave the way for exploring and developing advanced Casimir-based devices with potential applications in quantum information science. This thesis also includes a study of the non-contact Casimir friction, which will enrich the understanding of quantum vacuum fluctuations.