

Joint CQSE & NCTS Seminar

2022
Apr. 29, Friday

TIME Apr. 29, 2022, 2:30~3:30pm
TITLE Electromagnetically induced transparency in superconducting circuits controlled by a parametric drive
SPEAKER Associate Professor, Yung-Fu Chen (Department of Physics, National Central University)
PLACE Rm104, Chin-Pao Yang Lecture Hall, CCMS & New Physics Building, NTU

Abstract:

Superconducting artificial atoms can strongly interact with itinerant photons propagating in one-dimension transmission lines, forming the waveguide quantum electrodynamics architecture. The architecture is proposed to establish a quantum network to process quantum information. Electromagnetically induced transparency (EIT) is a quantum interference effect occurred in three-level Λ -type atoms. The absorption and dispersion of a probe light owing to the atoms is greatly modified by another control light due to a destructive interference effect. The atoms become transparent for the probe light, and the light can travel extremely slowly and even be trapped by the atoms. This controlled interference effect can be utilized to build a quantum memory, one of the fundamental components required for the quantum network. However, the lack of long coherent metastable states in superconducting artificial atoms poses a challenge to realize an EIT-based quantum memory. In this talk, we introduce two superconducting quantum circuits to achieve EIT. The required metastable state can be achieved by either the subradiance state of a coupled resonant qubits or a high-quality resonator. We utilize ac parametric modulation of the atom frequency to open up a transition to a suitable metastable state. The success of these Λ -type EIT schemes will advance the developments of quantum memory in superconducting circuits.

Biography Brief:

Education

Ph.D. in Physics, University of Maryland, College Park (08/2000 – 04/2006)

B.S. in Physics, National Taiwan University (10/1994 – 06/1998)

Work Experience

Associate Professor

Department of Physics, National Central University (08/2017 – present)

Assistant Professor

Department of Physics, National Central University (08/2011 – 07/2017)

Postdoctoral Research Associate

Department of Physics, University of Wisconsin-Madison (05/2009 – 06/2011)

Postdoctoral Research Associate

Department of Physics and Materials Research Laboratory, University of Illinois at Urbana-Champaign (05/2006 – 05/2009)

Research Assistant

Department of Physics and Center for Superconductivity Research, University of Maryland, College Park (05/2001 – 04/2006)

Recent research focus

superconducting quantum circuits

