Contribution ID: **52** Type: **Poster**

Improving detection efficiency of Ti-based superconducting transition edge sensors with optical cavity

Thursday, July 25, 2019 6:45 PM (15 minutes)

Superconducting transition edge sensors (TESs) have demonstrated high detection efficiency and photon-number resolving capability, making TESs attractive in quantum information. The detection efficiency is determined by several factors: fiber-to-detector coupling, absorption of photons in superconducting films, and internal quantum efficiency. The optical absorption of titanium film at the wavelength of 1550 nm, is approximately 30%, determined by its refractive index. Embedding the Ti-based TES in an optical structure to enhance its absorption is an effective approach for improving detection efficiency. We integrated the TES with an optical cavity, consisting of 16-layer dielectric reflection mirror and 4-layer anti-reflection layer, and studied the effect of fabricated optical cavity on the detection efficiency of Ti TES single photon detectors. The critical temperature (Tc) is decreased to 260 mK after deposition of antireflection layer from its original Tc of 350 mK. The detection efficiency (i.e., the ratio of the detected power to input power) was increased up to 30% , thanks to the enhancement of photon absorption by adding the optical cavity.

Less than 5 years of experience since completion of Ph.D

N

Student (Ph.D., M.Sc. or B.Sc.)

N

Primary authors: Mr GEN, Yue (Purple Mountain Observatory,CAS); Prof. ZHANG, Wen (Purple Mountain Obsevatory, CAS); Mr LI, Pei-Zhan (Purple Mountain Observatory,CAS); Dr ZHONG, Jia-Qiang (Purple Mountain Observatory,CAS); Dr WANG, Zheng (Purple Mountain Observatory,CAS); Prof. MIAO, Wei (Purple Mountain Observatory,CAS); Prof. REN, Yuan (Purple Mountain Observatory,CAS); Prof. YAO, Qi-Jun (Purple Mountain Observatory); Prof. SHI, Sheng-Cai (Purple Mountain Observatory,CAS)

Presenter: Prof. ZHANG, Wen (Purple Mountain Obsevatory, CAS)

Session Classification: Poster session

Track Classification: Low Temperature Detector for quantum technologies and other frontiers