# 國立清華大學第 21 屆新進人員研究獎得獎人簡介

許耀銓博士於 2015 年 8 月 1 日加入台灣國立清華大學物理系，擔任助理教授。他出生於澳門。他於 2007 年獲得台灣國立交通大學電子物理系理學學士學位後。並分別於 2008 年和 2013 年在瑞典查默斯理工大學微技術與納米科學系獲得碩士和博士學位。他的博士論文主要關於利用超導電路來研究微波量子光學。然後，他再到美國加州大學聖巴巴拉分校做博士後研究，主要從事量子放大器工作。在清華大學，他的實驗組專注於利用超導電路的微波量子光學。

在他加入清華大學後，他的實驗室有兩個主要工作，第一項工作是 I.-C. Hoi *et al.* Nature Physics 11,1045（2015）。這項工作在查爾姆斯理工大學完成，部分寫作在清華完成。這項工作是利用等效的反射鏡去塑造真空擾動，藉此改變真空結構，再利用人造原子超導量子位元激發態的衰減來量測真空擾動。 第二部工作是 P. Y. Wen *et al.* Physical Review Letters 120, 063603（2018）。第一作者是許耀銓的博士生。實驗全部在清華完成，理論由 A F Kockum 博士完成，他當時是日本 RIKEN 的 F. Nori 教授的博士後研究員。這項工作是把超導人造原子放在一維的半波導上，人造原子和微波有強交互作用，當強微波和量子位元共振時，Mollow triplet 產生，如果再用一道微弱的微波，在 Mollow Triplet 間掃頻，會看到增益，這個放大的機制不是因為粒子數反轉，而是因為四光子過程，把強微波的能量轉換成弱微波的能量。

有幸能夠獲獎，許耀銓教授感謝物理系和科技部的支持。他還要感謝他實驗室的所有學生 。最後，他想感謝他的家人。

Brief Biography:

Dr. Io-Chun Hoi joined department of Physics, National Tsing Hua University (NTHU), Taiwan from 1st August, 2015 as an assistant professor. He was born in Macau. He received Bachelor of Science from Electro-Physics Department at National Chiao Tung University, Taiwan in 2007. He then received Master and Ph.D. degree at Department of Microtechnology and Nanoscience, Chalmers University of Technology, Sweden in 2008 and 2013, respectively. His doctoral dissertation focused on the microwave quantum optics using superconducting circuits. He then moved to University of California, Santa Barbara, U.S.A., working on quantum limited amplifier. At NTHU, his experimental group focus on microwave quantum optics using superconducting circuits and quantum limited amplifier.

After he joined NTHU, there are two main publications from his laboratory, the first work was I.-C. Hoi *et al.* Nature Physics 11, 1045 (2015). This work was done at Chalmers University of Technology and part of the writing finished at NTHU. This work was about shaping vacuum fluctuations using a superconducting circuit analogue of a mirror, creating regions in space where they are suppressed. Moving an artificial atom through these regions and measuring the spontaneous emission lifetime of the atom provides the spectral density of the vacuum fluctuations. The second work was P. Y. Wen *et al.* Physical Review Letters 120, 063603 (2018). The first author was Hoi's Ph.D. student. The experimental part was solely done at NTHU, where the theoretical part was done by Dr. A.F. Kockum, who was a postdoctoral researcher at Prof. F. Nori's group at RIKEN, Japan. This work was about a superconducting artificial atom strongly couple to the field in a semi-infinite waveguide. When driving the qubit strongly on resonance such that a Mollow triplet appears, there are a few percent amplitude gain for a weak probe at frequencies in between the triplet. This amplification is not due to population inversion but results from a four-photon process that converts energy from the strong drive to the weak probe.

Having this award, Professor Io-Chun Hoi would like to acknowledge support from department of Physics and Ministry of Science and Technology. He also would like to thank all students in his laboratory. Last but not least, he would like to thank his family.