

Joint CQSE & NCTS Seminar

2023
Mar. 10, Friday

TIME Mar. 10, 2023, 14:30~15:30pm
TITLE Every quantum error-correcting code has a structure like Pauli stabilizer codes
SPEAKER Dr. Jhih-Yuan Kao
(Department of Physics, National Taiwan University)
PLACE NCTS Physics Lecture Hall, 4F, Chee-Chun Leung
Cosmology Hall, NTU
ONLINE <https://nationaltaiwanuniversity-zbn.my.webex.com/>



Abstract:

In this talk, I will give an introduction to quantum error correction; in particular, I will introduce the fundamental theory thereof and the necessary mathematical concepts in order to have a basic understanding of error correction, while keeping it as accessible as possible to the audience.

I will then move on to present our recent work: Pauli stabilizer formalism is perhaps the most thoroughly studied means of procuring quantum error-correcting codes, whereby the code is obtained through commutative Pauli operators and “stabilized” by them. In this work we show that every quantum error-correcting codes, including Pauli stabilizer codes and subsystem codes, has a similar structure, in that the code can be stabilized by commutative “Paulian” operators which share many features with Pauli operators and which form a Paulian stabilizer group. By facilitating generalized controlled-NOT (CNOT) operations we can measure these Paulian operators to acquire the error syndrome. Examples concerning codeword stabilized codes and bosonic codes will be presented; specifically, one of the examples has been demonstrated experimentally and the observable for detecting the error turns out to be Paulian, thereby showing the potential utility of this approach. This work provides a possible approach to implement error-correcting codes and to find new codes.

Biography Brief:

National Cheng Kung University, bachelor’s degree: 2007 – 2011

National Cheng Kung University, master’s degree: 2011 – 2014

National Cheng Kung University, doctorate: 2014 – 2020

Postdoc researcher, National Taiwan University: 2020 – Present

