

# TCSUH SPECIAL SEMINAR

---

## Donna N. Sheng

Professor of Physics, California State University, Northridge (CSUN)

**Tuesday, May 16, 2023**

12:00 p.m. – 1:00 p.m.

In Person: Houston Science Center (HSC), Room 102

Sandwiches provided, first come, first served.

### **The d-wave and topological superconductivity from doping Mott insulators on square and triangular lattices**

**ABSTRACT:** Recent large-scale numerical simulations on the square-lattice t-J or Hubbard model demonstrate unconventional d-wave superconductivity on the electron-doped side but a dominant charge density wave (CDW) order on the hole-doped side, which is inconsistent with the high- $T_c$  superconductivity of hole-doped cuprate compounds. This talk will present a new picture and global quantum phase diagram of the extended square-lattice t-J model by employing the state-of-the-art density matrix renormalization group calculations. I will demonstrate that the d-wave superconducting state emerges on both electron and hole-doped sides around the optimal  $1/8$  doping through weakening the competing charge order, which leads to a unified understanding of both hole- and electron-doped cuprate superconductors. Furthermore, I will also illustrate the changing of the symmetry of the superconducting states from d-wave to topological superconductivity through the changing of the system lattice geometry, and reveal the dominance of unconventional superconductivity in such doped Mott insulators.

**BIO:** Donna Sheng received her B.A. degree (1984) and Ph.D. in physics (1989) from Nanjing University in China. She was a Postdoctoral Fellow in condensed matter theory at the Institute of Theoretical Physics, Chinese Academy of Science, from 1989 to 1990. Dr. Sheng was a Research Scientist in condensed matter theory from 1990 until 2000 in the C. S. Ting group at the Texas Center for Superconductivity at the University of Houston. She became an Assistant Professor of Physics at California State University Northridge in 2000, an Associate Professor of Physics in 2004, and a Professor of Physics in 2007. Dr. Sheng has published more than 160 research papers, with more than 40 published in high-impact research journals, including **Phys. Rev. X**, **Phys. Rev. Lett.**, **Nature**, and **Science**. She has received more than 9700 citations with an h-index of 52. Based on her research contributions to the field, she was selected as a Fellow of the American Physical Society in 2013. Her synergistic activities include serving as a team member of the Princeton Center for Complex Materials, a senior investigator of the Princeton NSF MRSEC grant, and co-PI of the PREM project for training minority students. She is Co-PI of the NSF PREP award (CSUN/Cal Tech-IQIM Partnership).

Host: Dr. C. S. Ting

**Persons with disabilities who require special accommodations to attend this lecture should call 713-743-8212.**