Joint CQSE & NCTS Special Seminar

2022
Nov. 04, Friday

TIME Nov. 04, 2022, 2:30~3:30pm
TITLE Cryogenic CMOS for High-Performance Computing and Quantum Computing
SPEAKER Associate Prof. Kuo-Hsing Kao (Department of Electrical Engineering, National Cheng Kung University)
PLACE Rm104, Chin-Pao Yang Lecture Hall, CCMS & New Physics Building, NTU
ONLINE https://nationaltaiwanuniversity-zbn.my.webex.com/

Abstract:

With the development of cryogenic applications, such as high-performance computing and quantum computing, cryogenic semiconductor electronics has become one of the vital research topics in the IEEE Electron Device Society. Power consumption of MOSFETs leading to undesired heat is one the major challenges of CMOS working at low temperatures for these novel applications. In this presentation, I will briefly introduce the role of CMOS in these applications, review the fundamental device physics of MOSFETs at cryogenic temperatures and show our recent results. And these results can be found in IEEE Electron Device Letters:

[1] "Subthreshold Swing Saturation of Nanoscale MOSFETs Due to Source-to-Drain Tunneling at Cryogenic Temperatures", *IEEE Electron Device Lett.*, 41, 1296, 2020.
[2] "Linking Room- and Low-Temperature Electrical Performance of MOS Gate Stacks for Cryogenic Applications", *IEEE Electron Device Lett.*, 43, 674, 2022.
[3] "Optimal Strategy of Supply Voltage Scaling with Temperature Lowering for Cryogenic MOSFETs", *IEEE Electron Device Lett.*, submitted.

Biography Brief:

Education

2009-2013 Ph.D. in Electrical Engineering, KULeuven/imec, Belgium 2005-2008 M.Sc. in Electrophysics, NCTU, Taiwan

2001-2005 B.Sc. in Physics, NCHU, Taiwan

Employment History

1. 2019-present, visiting scholar, quantum computing, imec, Leuven, Belgium.
2. 2018-present, associate professor, Dept. of Electrical Engineering, NCKU, Taiwan.
3. 2015-2020, joint-appointment researcher, National Center for High-Performance Computing, Taiwan.
4. 2014-2018, assistant professor, Dept. of Electrical Engineering, NCKU, Taiwan.
5. 2009-2013, Ph.D. scholar, imec, Belgium.

Honor

1. 2022 中華民國十大傑出青年(科學及技術研究發展類)
2. 2021 IEEE senior member
3. 2021 Web of Science - Top 1% highly-cited paper (Kao is the corresponding and first author)

https://www.webofscience.com/wos/woscc/full-record/WOS:000299430200005

4. 2021 李國鼎研究獎
5. 2021 台灣國家實驗研究院-研發服務平台亮點成果獎
6. 2021 台灣國家實驗研究院-傑出科技貢獻獎-學術研究類
7. 2020 台灣電子材料與元件協會-傑出青年獎
8. 2019 台灣國家實驗研究院-傑出科技貢獻獎-學術研究類
9. 2019 台灣吳大猷先生紀念獎-微電子工程
10. 2018 台灣科技部-優秀年輕學者
11. 2017 台灣半導體產業協會-半導體獎:具博士學位之新進研究人員
12. 2015 台灣國家實驗研究院-傑出科技貢獻獎-學術研究類
13. 2014 Best Ph.D. Thesis Award, IEEE Tainan Section

Research Interest

1. Advanced device technology
2. Material modeling and device simulation
3. Device electrical characterization at cryogenic temperatures
4. Cryogenic devices for high-performance computing and quantum computing