

Compact Models for Emerging Semiconductor Devices: from Power Electronics to Quantum Computing

Device compact models play a critical role in the semiconductor and integrated circuit ecosystem, as the core to the Process Design Kits (PDKs) required for integrated circuit (IC) design. Physics-based compact models also provide useful information to allow design-technology co-optimization (DTCO).

This presentation will briefly showcase the various compact modeling efforts from Prof. Lan Wei's team at University of Waterloo with focuses on two groups of emerging semiconductor technology: wide-bandgap semiconductor technology aiming for the next generation of power electronics with target applications such as data center power management and electric vehicles motor drive and charging; and spin-qubit quantum devices and silicon transistors at cryogenic temperatures for large-scale quantum computing. Background and model formulation will be introduced, and application examples will be demonstrated.



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Professor Lan Wei received her B.S. in Microelectronics from Peking University, China (2005), M.S and Ph. D. in Electrical Engineering from Stanford University, USA (2007 and 2010, respectively). She worked as a postdoc associate at Massachusetts Institute of Technology from 2010–2012 and as a Member of Technical Staff at Altera Corporation from 2012–2014. She is currently an Associate Professor at University of Waterloo and holds the Canada Research Chair in Nanoscale Devices and Circuits.

Professor Wei has intensive experience in semiconductor device compact modeling, device technology co-optimization (DTCO), and electronic design automation (EDA). Her recent research interests include wide-bandgap (WGB) semiconductor devices technology (e.g. gallium nitride and silicon carbide technologies) for next-generation wireless communication and power electronic applications, and cryogenic CMOS and quantum devices for large-scale quantum computing. She is the (co-)developer of several device compact models with commercial adoption, including the MIT Virtual Source GaN HEMT (MVSG) Compact Model, an Industry Standard approved and supported by the Compact Model Coalition for gallium-nitride transistor SPICE model.

She has authored/co-authored more than 100 peer reviewed publications. She is an Editor for IEEE Electron Device Letters (EDL), IEEE Transactions on Electron Devices (T-ED) and IEEE Journal of the Electron Devices Society (J-EDS). She has served on various technical program committees including IEDM, ICCAD, DATE, ISQED, VLSI-TSA, BCICTS, ISPSD, and EDTM, etc.



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All are welcome

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