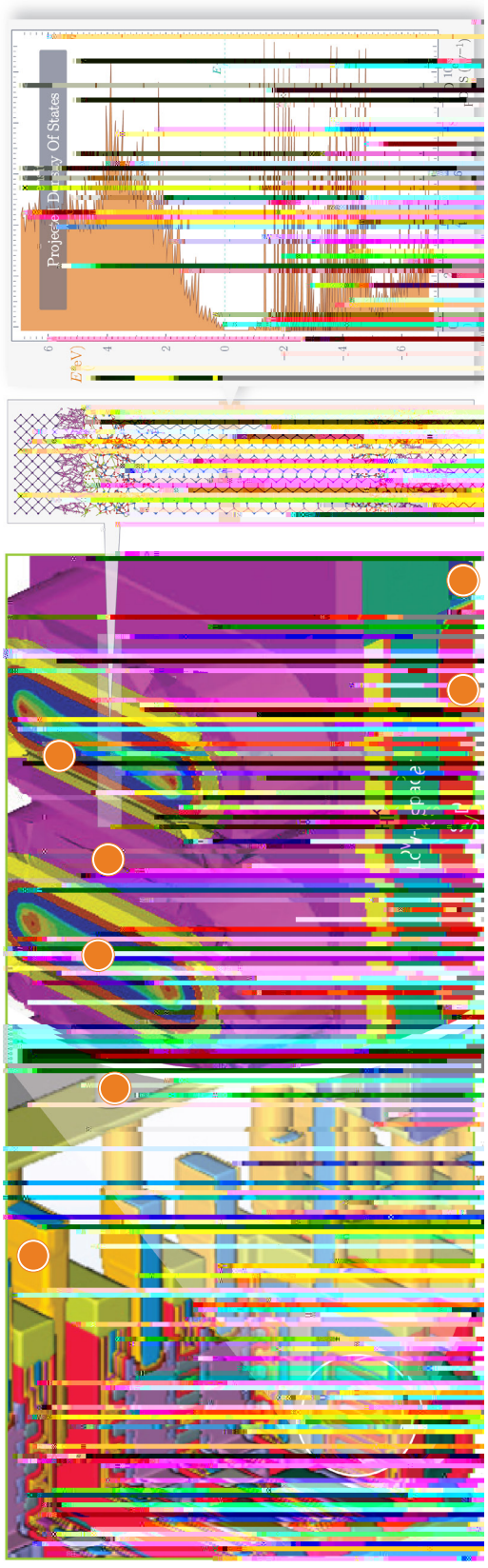
QuantumATK Software Solution for Advanced Semiconductor Development

sdbg hmc t rsqhdr- @ jdx admdĭs ne `sn l hrshb l ncdkhmf hr sgd cds`hkdc hmrhfgs hmsn sgd `sn l hb,rb`kd oqnbdrrdr vghbg bn l okd l dms dwodqh l dms`k c`s` `mc l `jd sgd Q%C oqnbdrr l nqd deĭbhdms sgqnt fg ghfgdq pt `khsx dmc qdrtksr `mc bnrs,deedbshud `mc e`rsdq downselection of material options (materials screening).

is a complete atomistic simulation toolkit developed and supported by world leading atomic-scale modeling experts. QuantumATK reduces time and cost in advanced semiconductor technology development by enabling earlier co-optimization of materials processes and transistors. The integration of QuantumATK with Sentaurus TCAD provides a seamless flow from material sn cduhbd '`r rgnvm hm sgd ohbstqd adknv(- @sn l hb,rb`kd l ncdkhmf snnkr hm Pt`mst l @SJ q`mfd eqn l bk`rrhb`k enqbd ĭdkcr enq handling large and to some extent more realistic materials systems to ab initio tools that provide highly accurate results for smaller systems.

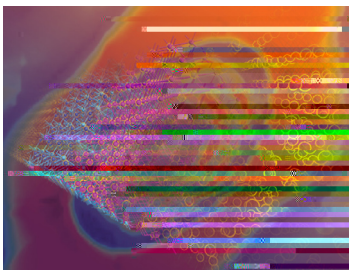


- Channel Materials in Nanoscale Geometries
- Workfunction Engineering
- Surface Scattering
- Alternative Interconnect Metals
- Contact Resistance
- Dopant Diffusion/Activation in S/D

QuantumATK addresses key applications in the semiconductor industry and is a core component of the Synopsys Design-Technology Co-Optimization flow. QuantumATK offers modeling solutions for critical materials issues in advanced semiconductor technology development:

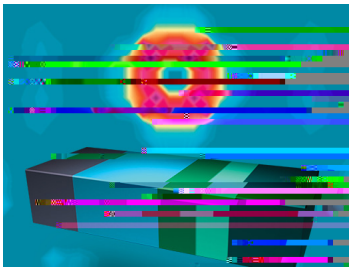
- Exploration of alternative interconnect metals
- Modeling and optimization of metal-semiconductor contacts
- Bandstructure and carrier transport modeling in new channel materials within quantized transistor structures
- Exploration and optimization of high-k dielectric and ferroelectric stacks
- L dbg`mhb`k l ncdkhmf ne bnkk`ord ne ĭmr `mc ohkk`qr
- And many other critical issues

Highlighted Publications with QuantumATK

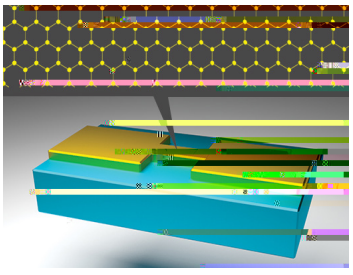


Study by IBM & GlobalFoundries | Lanzillo et al., Appl. Phys. Lett. 112, 163107 (2018)

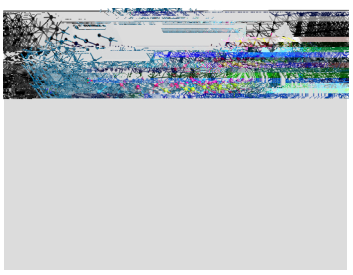
Study by GlobalFoundries & IBM Research | Dixit et al., IEEE Trans. Elec. Dev. 64, 3775 (2017)



Study by Imec, PLASMANT and Synopsys QuantumATK Team | Sankaran et al., Phys. Rev. B 94, 094424 (2016)



Study by Fujitsu Ltd. and Fujitsu Laboratories Ltd. | Harada et al., Appl. Phys. Expr. 10, 074001 (2017)



Study by IBM Research at Albany Nanotech and IBM T.J. Watson Research Center | Lanzillo et al., Comp. Mat. Sci. 158, 398 (2019)

- Support the screening and characterization of metal alternatives to Cu and barrier materials
- Calculate the mean free path and resistivity in metals and alloys and evaluate the impact of surface and grain boundary scattering
- Optimize the composition and thickness of diffusion barriers
- Calculate the resistance of the interface between interconnect and barrier metals

- Calculate bandstructures and extract band parameters to be inserted in TCAD advanced