

SmartSpice RadHard

Analog Circuit Simulator

SILVACO

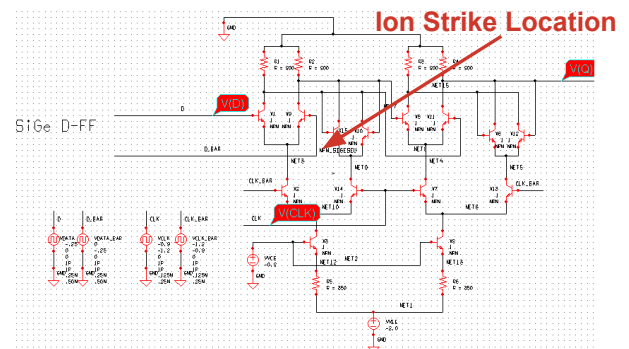
SmartSpice RadHard Analog Circuit Simulator provides simulation capability for modeling and analyzing radiation effects due to Single Event Effects (SEE), and Dose Rate (DR). Built upon the commercial SmartSpice Analog Circuit Simulator, it provides the accuracy, capacity and performance required to design and analyze the most advanced electronics and analyze the most advanced semiconductor technologies.

Key Features

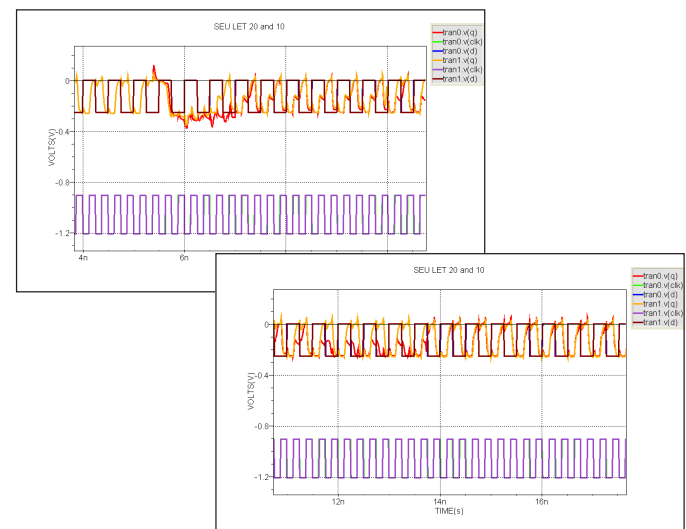
- Provides accurate Dose Rate (DR), SEE, analysis using the .RAD statement for transient and DC analysis
- Built as an extension to the industry-proven SmartSpice Analog Circuit Simulator
- Analyzes Dose Rate with modified Wirth & Rogers' models and with optional customer-defined models
- Analyzes Single Event Upsets (SEU's) and Multi-Bit Upsets (MBU's) with modified Messenger's models and with optional customer-defined models
- Advanced circuit optimization improves the radiation tolerance of the your design and enables complex analysis of design trade offs necessary to meet system specifications
- Supports standard foundry-supplied HSPICE®, PSPICE® and SmartSpice models for bulk CMOS, SOI, bipolar, an biCMOS processes
- Provides open model development environment and extensive analog behavioral capability with Verilog-A option
- Integrated within Silvaco PDK-Based analog/mixed-signal/ RF design flow
- Supports research of new and emerging phenomena through custom models and sophisticated 'what if' features in simulator control
- SmartSpice RadHard is fully integrated into the Silvaco Radiation Toolflow which links process modeling, device simulation, circuit analysis, physical layout, and chip parasitic effects to deliver a high fidelity, physics based environment to assess radiation and reliability effects

Single Event Effects

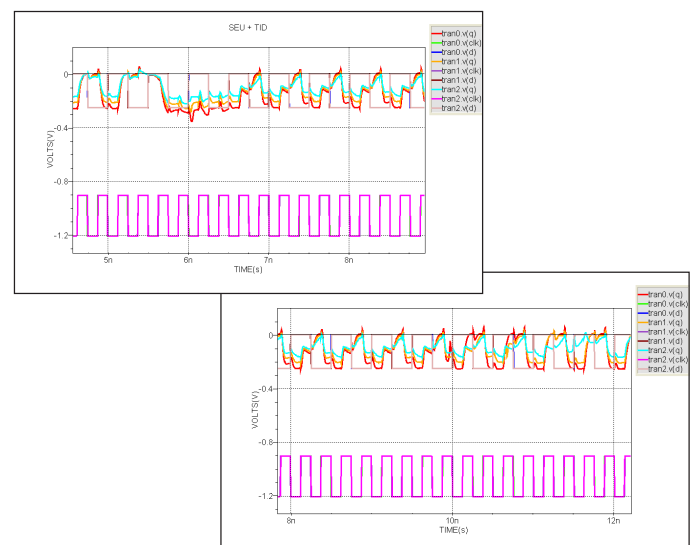
- Radiation physics incorporated through enhanced, fully complied versions of industry standard device models as opposed to subcircuits
- Customer-defined current pulse modeling
- Rapid, user friendly radiation effects analysis capability without complicating circuit netlists
- Single bit upset analysis



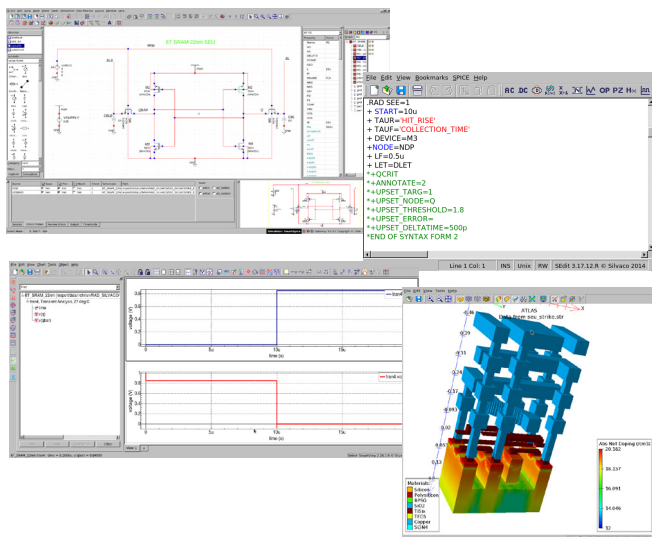
Gateway Schematic View of a SiGe D Flip Flop with Illustrated Ion Strike.



SmartSpice RadHard Simulation LET's of 20 and 10.



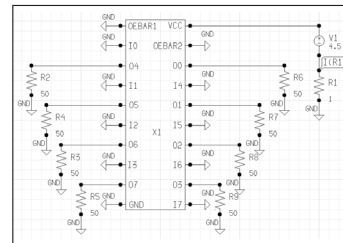
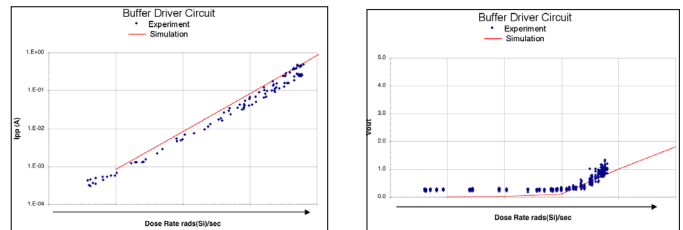
Simulated SiGe D Flip Flop with ion strike LET's of 10 and 20 after exposures to total dose.



Upset of a 6T –SRAM cell from a particle strike. The models for the 22nm NMOS and PMOS transistors were pulled from Victory 3D Device simulations. Upset occurs at a LET of 0.5 MeV-cm²/mg.

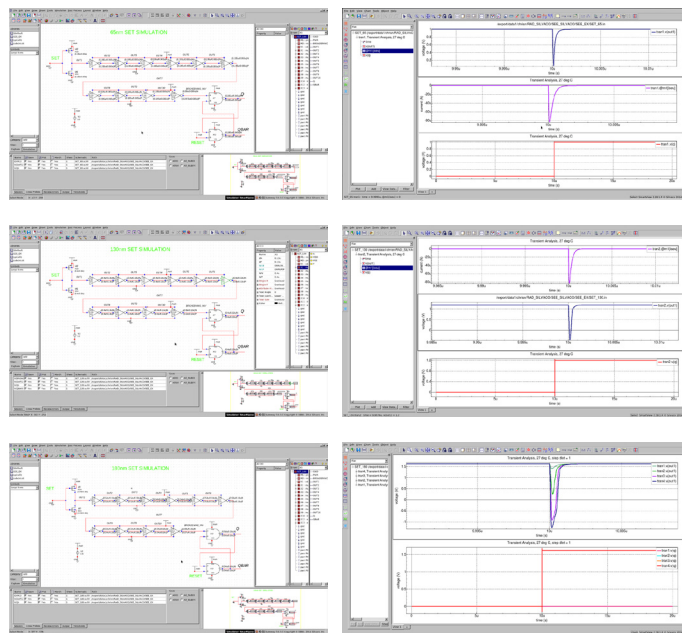
Dose Rate Effects

- Radiation physics incorporated through enhanced, fully complied versions of industry standard device models as opposed to subcircuits
- Customer-defined Photo-current Modeling
- Rapid, user friendly radiation effects analysis capability without complicating circuit netlists
- Technology dependent parameters

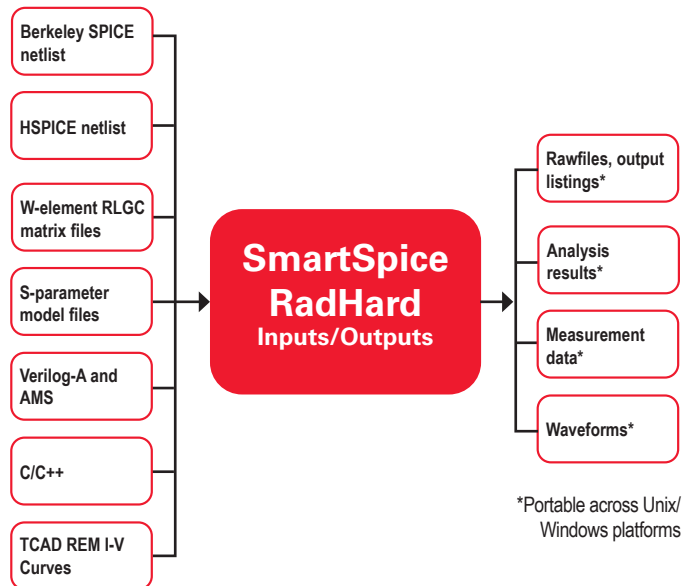


Dose rate analysis of octal buffer/driver with simulated versus experimental data.

Single Event Transient (SET) Simulation at 180nm, 130nm, and 65nm



Examination of Single Event Transient propagation induced pulse broadening.



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