HiCUM Lessons Learned or What About QA in Spectre

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Outline

A Case Study

- subject : SOI technology with complementary BJTs
- high voltage ($VCBO > 40V$)
- high speed ($f_T = 5GHz@npn, 4GHz@vpnp$)
- model library with HiCUM/L2 v2.2 updatelevel=2
- self-heating included
- Spectre 7.1.1.071

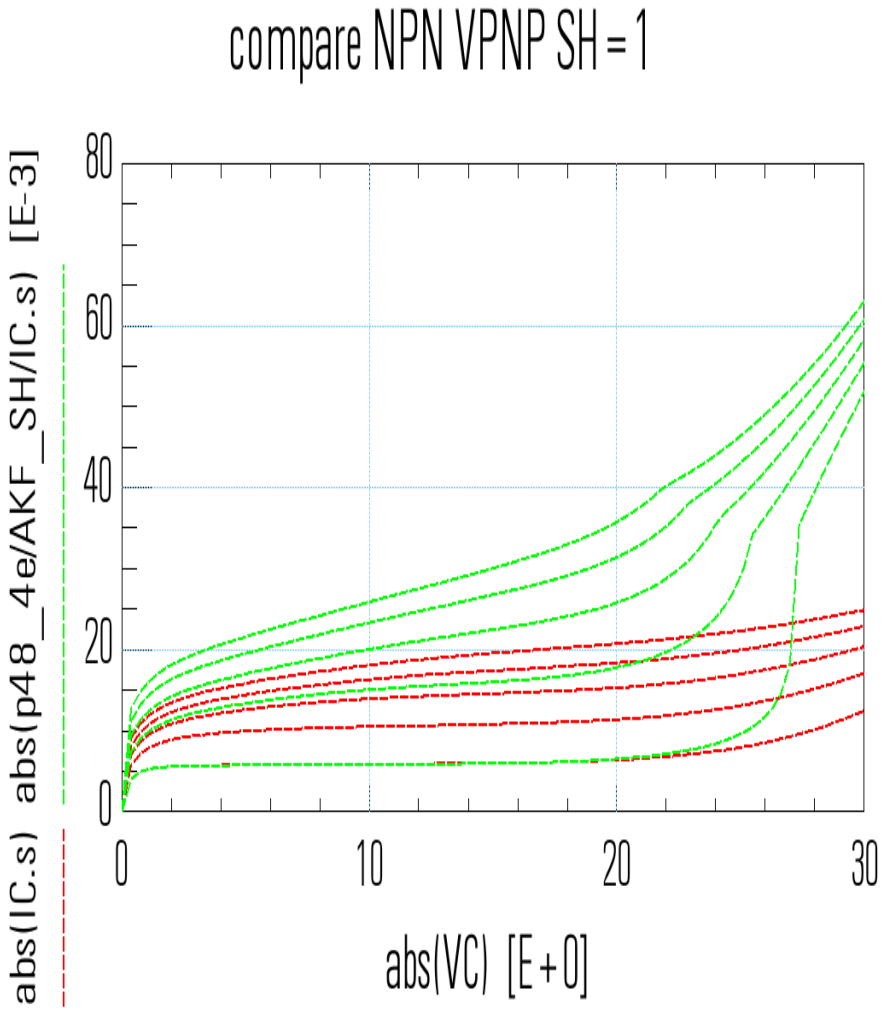
A Case Study

- convergence issues with Spectre 10.1.1.056isr5
- changed to updatelevel=3 (Cadence recommendation)
  - continuous derivatives
  - fully compatible to Verilog-A model from TUD
- draw customer's attention to HiCUM_update (WS2009)
- runtime comparison MMSIM7.2 vs HSPICE 2010.12-SP1
  - testcase 1 : 486ms vs 50ms
  - testcase 2 : 32.4s vs 0.14s
- customer requires re-extraction for v2.24 updatelevel 3

A Case Study

- extraction redone
- pnp problem
  - doesn't converge at high bias with SH enabled
  - Spectre 10.1.1.111isr8 – 4 May 2011
- artificial testcase
  - start from clean (i.e. well converging) npn model
  - switch to type=pnp
  - switch bias polarity
  - triggered thru 2003 problem (wrong base current sign)
- still no convergence
- Spectre 10.1isr11 claimed to fix the problem
- verification failed (next slide)
- finally solved with Spectre 10.1.1.189.er/101isr13
- customer satisfied

A Case Study



Conclusions

- CMC QA Spec gives methods for
  - pin swapping for symmetrical devices
  - polarity swapping (npn/pnp, nmos/pmos)
- Checks can be done even w/o testsuite from model developers
- Used for Spectre?
- Not true : polarity switch is just a flag
- Very important : use more than 1 simulator
- Do more testing!

Personal comment:
Spectre is for circuit simulation like Internet Explorer for web browsing.

References

- C.C. McAndrew and J.R. Jones, "CMC Compact Model QA Specification," CMC, release 1.3, 2007