IBIS Quality Review

A status review of the IBIS Quality specification

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IBIS Quality Task Group

- **Web:**
  - **http://www.vhdl.org/pub/ibis/quality_wip**
- **Email list:**
  - **http://www.freelists.org/list/ibis-quality**
  - **Or send email**
  - **To: ibis-quality-request@freelists.org**
  - **Subject: subscribe**
- **Meetings:**
  - **Tuesdays from 11:00am to 12:00pm Eastern Time**
- **Questions? Mike LaBonte milabont@cisco.com**

Brief History

- 2002 March — Barry Katz started IBIS-Quality

- 2004 November — IQ 1.0 specification completed

- 2005 August — Parser bug 90 submitted and approved

- 2006 March — Parser bug 94 submitted and approved

- 2006 April — Book "Semiconductor Modeling" discusses IQ (Roy Leventhal, Lynne Green)

- 2006 August — IQ 1.1 specification initiated

- 2009 August — IQ 1.1 renamed IQ 2.0

- 2009 October — IQ 2.0 approval expected

Specification Version 1.0

- **IBIS Quality Levels**
  - 0   Can be checked by IBISCHK, plus a few others
  - 1   Correctness, completeness, and simulation checks
  - 2a   Simulation correlated
  - 2b   Bench measurement correlated
  - 3   Simulation and measurement correlated

Issues with IQ Version 1.0

- Passing IQ Level 0 does not sound like much of an accomplishment
  - Is a non-compliant file level -1?
- There should be a strict level for "Passes IBISCHK"
- No other IQ check should duplicate IBISCHK
- Can't have a correlated model without full IQ check
- Some checks are weak ("should" vs. "must")
- Feedback from JEITA
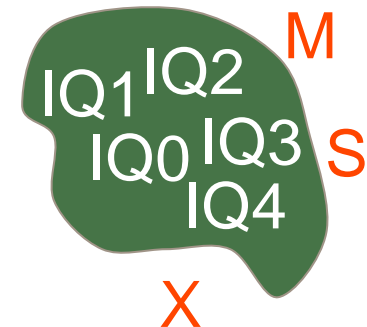
Specification Version 2.0

- **IBIS Quality Levels**
    - IQ0   Not Checked
    - IQ1   Passes IBISCHK
    - IQ2   Suitable for Waveform Simulation
    - IQ3   Suitable for Timing Analysis
    - IQ4   Suitable for Power Analysis * (defined, but no checks)

- **Special Designators**
    - S   Simulation correlated
    - M   Measurement correlated
    - X   Exceptions
    - G   Has Golden Waveforms

IQ1 IQ2 M
IQ0 IQ3 S
IQ4
X

The Only LEVEL 1 Check (IBISCHK)

2.1 {LEVEL 1} IBIS file passes IBISCHK

Checking a123_test.ibs for IBIS 4.1 Compatibility...

ERROR (line 446) - [Receiver Thresholds] should be specified immediately after all the subparameters of a model and before the other keywords of a model except [Model Spec]
ERROR - Model DQ_FULL Receiver Thresholds: Tslew_ac must be specified for single ended receivers
WARNING - Model DQ_HALF Pullup Typical data is non-monotonic
WARNING - Model DQ_HALF Pulldown Minimum data is non-monotonic
WARNING - Model DQ_HALF Pullup Minimum data is non-monotonic
WARNING - Model DQ_HALF Pullup Maximum data is non-monotonic
WARNING - Model DQ_FULL Pullup Typical data is non-monotonic

Errors : 2
Warnings: 5

File Failed

Example LEVEL 2 Checks (Waveforms)

5.3.7.   {LEVEL 2} Combined I-V tables are monotonic

5.3.8.   {LEVEL 2} [Pulldown] I-V tables pass through zero/zero

5.3.9.   {LEVEL 2} [Pullup] I-V tables pass through zero/zeroI-V

5.3.10.   {LEVEL 2} No leakage current in clamp tables

5.3.11.   {LEVEL 2} I-V behavior not double-counted

Example LEVEL 3 Checks (Timing)

3.2.2.   {LEVEL 3} [Pin] RLC parasitics are present and reasonable

3.3.1.   {LEVEL 3} [Diff Pin] Vdiff and Tdelay_* complete and reasonable

5.2.1.   {LEVEL 3} [Model] Vinl and Vinh reasonable

5.2.2.   {LEVEL 3} [Model Spec] Vinl and Vinh reasonable

Level 4 (Power) Checks for future releases

- A [Pin Mapping] Complete and Correct check was proposed

- Power analysis really needs new features:
    - BIRD95 - Power Integrity Analysis using IBIS
    - BIRD98 - Gate Modulation Effect (table format)

- IBIS 5.0 adoption still in progress
    - IBIS 5.1 may be submitted for EIA/ANSI standardization
    - IBISCHK 5.0 parser released October 2009
    - Have not yet seen IBIS 5.0 power keywords in IBIS files

- Level 4 checks are planned for future IQ 2.x

Notes on IQ Version 2.0

- **"Possible Errors" section removed**
  - Some items made into regular checks

- **"Correlation" section minimized**
  - Refers to IBIS Accuracy Handbook for details

- **IC vendor push-back on overshoot parameters**
  - Not many IBIS files have this
  - Buffer developers simply do not measure it
  - Difference between functional and destruction limits
  - BIRD103 D_overshoot parameters may work better

IQ Version 2.0 Status

- 44 draft revisions posted

- In review phase for IBIS Open Forum acceptance vote
  - Review phase in 3 consecutive Open Forum meetings.
  - Acceptance vote scheduled for October 30, 2009.

After Version 2.0

- File parser bug reports

- Update the IBIS Accuracy Handbook
  - Emphasis on feature-selective correlation

- Begin drafting IQ 2.x
  - Level 4 power analysis checks

Regular 2009 IQ Meeting Participants

- Cisco Systems

- Ericsson

- Huawei Technologies

- Micron Technology *

- Nokia Siemens Networks

- Texas Instruments *

- Teraspeed Consulting Group *

- Xilinx *

* IBIS model makers

Future IQ expectations

- IQ adoption by IC vendors

- Adoption by library flow in system companies

- IBIS modeling tools implementing the IQ checks

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