

Standardizing Power Integrity Modeling in IBIS

Hybrid IBIS Summit with IEEE EMC+SIPI 2026

August 6, 2026

Dallas, Texas

Arpad Muranyi, Senior Product Architect

Outline

Background and IBIS-ATM work plan

High-level overview of BIRD234 and BIRD235

The July 7, 2026 IBIS-ATM decision and new hierarchy

Next steps

Questions, comments?

Background

- BIRD223 “*Add support for SPIM in IBIS*” was first submitted to the IBIS Open Forum on March 7, 2023, and accepted (voted) on July 14, 2023
- BIRD223.1 was submitted on September 12, 2023, and accepted (voted) on November 17, 2023
 - <https://www.ibis.org/birds/bird223.1.docx>
- BIRD223.1 was originally scheduled to be included in IBIS 8.0 (which was released on December 5, 2025) but the Editorial Committee found a few issues that needed to be addressed
 - Since IBIS 8.0 was becoming overdue, the IBIS Open Forum decided to delay BIRD223.1 (and BIRD226) for the next IBIS release (8.1?)
- The IBIS Advanced Technology Modeling Task Group (IBIS-ATM) was tasked with discussing and resolving the issues
 - Discussions on BIRD223.1 started towards the end of 2025 in the IBIS-ATM task group

Background

- The discussions initially focused on clarifications for BIRD223.1 without any technical changes
- As discussions continued, technical changes were requested / proposed
 - This resulted in heavy (and at times heated) debates
- It became clear that a new “dot version” of BIRD223.1 → BIRD223.2 may not be possible due to the amount of changes
 - As a result, two new BIRDs were submitted to the IBIS Open Forum:
 - BIRD234 “*Power Integrity Modeling*”
 - <https://www.ibis.org/birds/bird234.docx> (March 20, 2026)
 - BIRD235 “*SPIM with New Keyword Hierarchy*”
 - <https://www.ibis.org/birds/bird235.docx> (May 5, 2026)
- However, the general goal of the two BIRDs remained the same:
Standardize PI modeling to help IC and EDA vendors and board designers

The IBIS-ATM work plan

- Identify the similarities and differences between the two BIRDs
 - It turns out that the two BIRDs have a lot in common
- Identify the details and reasons behind the differences
 - This uncovered two different philosophies:
 - Aim to support the most accurate methodologies (only) in the IBIS specification and “nudge” everyone in the industry to adopt that technology, vs.
 - Include support also for entry level, possibly less accurate, simple, crude PI analysis
- Try to find a common solution with the goal to remove the differences
 - The idea here is to have a syntax in the specification that is supportive of everyone’s needs
- Update either of the two BIRDs, or write a new BIRD that would satisfy the goals and needs of everyone
 - We are about to start this part of the work
- Submit the new BIRD to the IBIS Open Forum for review and vote

High-level overview (common to both BIRDs)

- The usual IBIS header information
 - [IBIS Ver], ... [Notes], [Disclaimer], [Copyright]
- Keyword(s) to instantiate PDN model files
 - Touchstone S-parameter or SPICE subcircuit model
 - Subparameter to state what analysis type the model can support
- Keywords to define
 - Pin groups
 - Stimulus source current distributions (weights) or $I(t)$ waveforms (for time domain analysis)
 - Target definitions for probes
- Syntax to define connectivity between Touchstone ports or SPICE subcircuit terminals and
 - Device pins or pin groups
 - Stimulus sources (loads)
 - Probes

Key to color coding on the next two slides

- Green:
 - Indicates exact or almost exact **match**
- Cyan:
 - Indicates very **small and easy changes** needed to make the two proposals match
- Yellow:
 - Indicate “real changes” needed but still **not challenging or difficult**
- Others:
 - indicate similar functionality but needing **serious changes / reorganizations**

Overview of BIRD234

[IBIS Ver]	Required, as defined in IBIS
[File Name]	Required, as defined in IBIS
[File Rev]	Required, as defined in IBIS
[Comment Char]	Optional, as defined in IBIS
[Date]	Optional, as defined in IBIS
[Source]	Optional, as defined in IBIS
[Notes]	Optional, as defined in IBIS
[Disclaimer]	Optional, as defined in IBIS
[Copyright]	Optional, as defined in IBIS

one	[Begin PIM] <PIM name>
	[Manufacturer] <Manufacturer name>
	[Description] <One line description text>
	[Number of PI Pins] <Integer number>
	[PIM Pin List] Signal_name Signal_type
multiple one multiple	[End PIM Pin List]
	[Rail Signal Name] <Signal_name>
	[Configurations] <List of Configurations> [End Configurations]
	[PI Model] <PI model name>
	Analysis_type <AC TD DC>
one one one	Device_PDN_model <Device PDN name>
	File_PWL <PWL file name for TD only>
	Current <Total stimulus source current for DC only>
	Voltage_target <3 values for DC or TD>
	V_ringing TD only
	V_p2p TD only
	Max_pin_current <Value for DC or TD>
	[Self-impedance Target] <Data> [End Self-impedance Target]
	[Trans-impedance Target] <Data> [End Trans-impedance Target]
	[Stimulus] <List of Stimuli Weight/PWL Port#/Terminal#> [End Stimulus]

multiple one one one	Local	[Rule] <Rule name>
		Voltage_target <3 values for DC or TD>
		V_ringing TD only
		V_p2p TD only
		Max_pin_current <Value for DC or TD>
one one one one	Global	[Self-impedance Target] <Data> [End Self-impedance Target]
		[Trans-impedance Target] <Data> [End Trans-impedance Target]
		[End Rule]
		[Port Rules] <List of Port#/Terminal# RuleName> [End Port Rules]
		[End PI Model]
multiple one one one	Local	[Groups] <List of GroupNames with PinList>
		[End Groups]
		[Device PDN Model] <Device PDN name>
		File_TS <Touchstone file name>
		or
one one one one	Global	File_IBIS-ISS <IBIS-ISS file name subckt name>
		Analysis_type <AC TD DC>
		Number_of_ports <Integer>
		Number_of_terminals <Integer>
		[Groups] <List of GroupNames with PinList>
one one one one	Local	[End Groups]
		<List of Port#/Terminal# Type Terminal+/-Terminal->
		[End Device PDN Model]
		[End Rail Signal Name]
		[End PIM]

Overview of BIRD235

[IBIS Ver]	Required, as defined in IBIS
[File Name]	Required, as defined in IBIS
[File Rev]	Required, as defined in IBIS
[Comment Char]	Optional, as defined in IBIS
[Date]	Optional, as defined in IBIS
[Source]	Optional, as defined in IBIS
[Notes]	Optional, as defined in IBIS
[Disclaimer]	Optional, as defined in IBIS
[Copyright]	Optional, as defined in IBIS

multiple	[Begin Device SPIM]	<Device SPIM name>
one	[Manufacturer]	<Manufacturer name>
one	[Description]	<One line description text>
one	[SPIM Pin List]	signal_name signal_type
	[End SPIM Pin List]	
multiple	[SPIM Rail]	<Rail Signal_name>
	Rail_voltage	<VRM voltage for TD and DC>
one	[SPIM Pin Clusters]	<Ground rail Signal_name>
		<List of ClusterNames with PinList>
	[End SPIM Pin Clusters]	
multiple	[SPIM Stimulus Group]	<Meaningful stimulus group name>
multiple		<List of Stimulus sources with weights for AC and DC>
		or
multiple		<PWL waveform table(s) for TD>
	[End SPIM Stimulus Group]	
multiple	[SPIM Target]	<Meaningful target name>
one		<Impedance vs. frequency table for AC>
		or
one		<V_DCIR for DC>
		or
one / multiple		<V_TDlimits and V_p2p for TD>
	[End SPIM Target]	

multiple	[SPIM PDN File]	<MISSING NAME>
	File_TS	<Touchstone file name>
	or	
one	File_IBIS-ISS	<IBIS-ISS file name subckt name>
	Analysis_type	<AC TD DC>
	Stimulus_group	<Name of [SPIM Stimulus Group]>
	Pin_target	<Name of [SPIM Target] for DC only>
	Ports	When File_TS is present
		<List of Port# Functionality TargetName>
	or	
	Terminals	When File_IBIS-ISS is present
		<List of Terminal# ReferenceTerminal# Functionality TargetName>
	or	
	File_TerminalList	When File_IBIS-ISS is present
	[End SPIM PDN File]	
	[End SPIM Rail]	
	[End Device SPIM]	
	[End]	Required, as defined in IBIS

Where “Functionality” may be:

- A Stimulus source name from [SPIM Stimulus Group]
- A dedicated probe name
- A power or ground pin or pin cluster, or a power and ground pin pair or pin cluster pair

The flexibility vs. efficiency question

- The goals stated in the high-level overview can be implemented many different ways
- A question was raised: How many different combinations do we want or actually need to support
 - A device PDN model may support one, two, or even three analysis types (AC, DC, TD)
 - Pin grouping is strongly tied with the number of ports / terminals of the PDN model
 - The number of stimulus sources and probes have to match the number of ports / terminals of the PDN model
 - Stimulus source and probe target definitions also depend on the analysis type
 - Probing should also be possible at pins, stimulus sources and dedicated probe ports
 - We also want to support different design markets: high performance, economy, etc.
- How many combinations of these variations are possible and how many of them are actually needed?
- The answer has a strong say in what the syntax will look like

On July 7, 2026, the IBIS-ATM group decided

- **Currently, neither BIRD can fully support:**
 - **A single stimulus / target / probe / pin grouping definition with multiple PDN models, and**
 - **A single PDN model with multiple stimulus / target / probe / ~~pin~~ grouping definitions?**
- No to this
- Yes to this

- **Do we want (need) all these capabilities?**
 - **They will most likely need a significant amount of work**
- **If not, how much is enough?**
 - **Can we “fix up” one or the other BIRD to our liking?**
- **Which BIRD, and how much do we want (need) to change it?**
 - **Need to make a list of changes**

That decision resulted in this high-level hierarchy

<Required and optional header keywords>		
multiple	[Begin Device SPIM]	<Device SPIM name>
one	[Manufacturer]	<Manufacturer name>
one	[Description]	<One line description text>
one	[SPIM Pin List]	signal_name signal_type
	[End SPIM Pin List]	
multiple	[SPIM Rail]	<Rail & return path Signal_name>
one	[SPIM Pin Clusters]	
(multiple)	{	<ClusterName_1 List of pins>
		<ClusterName_# List of pins>
	[End SPIM Pin Clusters]	
multiple	[SPIM PDN File]	<PDNname_#>
one	Analysis_type	<AC TD DC> one, two, or three
one	File_TS	<Touchstone file name>
	or	
	File_IBIS-ISS	<IBIS-ISS file name subckt name>
depending on file type	{	Ports
		<List of Port# and pin / pin cluster pairs for File_TS>
		or
		Terminals
		<List of Terminal# and pin / pin clusters for File_IBIS-ISS>
	[End SPIM PDN File]	

[SPIM Analysis]	AnalysisName_#
Analysis_type	AC TD DC
Rail_voltage	<VRM voltage for TD and DC>
Rail_PDN	<SPIM_PDN_File_KW_Name>

multiple
only one type
one, if needed
one

[SPIM Stimulus Group]

<List of Port/Terminal# and weights for AC and DC>

or

<List of Port/Terminal# and I(t) table(s) for TD>

[End SPIM Stimulus Group]

[SPIM Target]

<List of Port/Terminal# and Z(f) tables for AC>

or

<List of Port/Terminal# and V_DCIR for DC>

or

<List of Port/Terminal# and V_TDLimits and V_p2p for TD>

[End SPIM Target]

[End SPIM Analysis]

[End SPIM Rail]

[End Device SPIM]

[End]	Required, as defined in IBIS
--------------	------------------------------

} depending on
Analysis_type

depending on
Analysis type

Next steps

- As you might see, the keywords are mostly the same as before but their hierarchy / organization is slightly different
- There are also many unspoken assumptions and rules behind them which needs to be documented and spelled out in the new BIRD
- The **good news** is that the authors of both BIRDs (234 and 235) are in support of this hierarchy
 - This is a huge step forward and great progress towards a common, unified new BIRD
- Next steps:
 - Start writing an updated BIRD or a new BIRD (most likely based on BIRD235)
 - Document each keyword and their usage rules accurately and with great detail

| Questions, comments?



Thank you!