



IBIS Summit at DesignCon 2024 Minutes

Meeting Date: **February 2, 2024**

Meeting Location: **Hybrid Meeting hosted by The MathWorks at Mission Towers, 3975 Freedom Circle, Santa Clara CA**

VOTING MEMBERS AND 2024 PARTICIPANTS

| | |
|---|---|
| Altair | (JuneSang Lee) |
| AMD (Xilinx) | (Bassam Mansour) |
| Ansys | Curtis Clark |
| Ansys Japan | Satoshi Endo* |
| Applied Simulation Technology | (Fred Balistreri) |
| Aurora System | (Dian Yang), Raj Raghuram* |
| Broadcom | (Yunong Gan) |
| Cadence Design Systems | Kyle Lake*, Ambrish Varma*, Jared James*, John Phillips*, Kristoffer Skytte* |
| Celestica | (Sophia Feng) |
| Cisco Systems | (Stephen Scearce), Hong-Man Wu* |
| Dassault Systemes | (Stefan Paret) |
| GE Healthcare Technologies | (Balaji Sankarshanan) |
| Google | (Hanfeng Wang) |
| Huawei Technologies | (Hang (Paul) Yan) |
| Infineon Technologies AG | (Christian Sporrer) |
| Instituto de Telecomunicações | (Abdelgader Abdalla) |
| Intel Corporation | Michael Mirmak*, Hsinho Wu*, Kingler Cai*, Chi-te Chen* |
| Keysight Technologies | Pegah Alavi*, Ming Yan*, David Banas*, Fangyi Rao*, HeeSoo Lee*, Heidi Barnes* |
| Marvell | Steven Parker* |
| MathWorks | Graham Kus*, Walter Katz* |
| Micron Technology | Justin Butterfield* |
| MST EMC Lab | Chulsoon Hwang, Zhiping Yang* |
| Siemens EDA | Weston Beal*, Arpad Muranyi*, Randy Wolff*, Matt Leslie*, Scott Wedge*, Todd Westerhoff*, Zhichao Deng* |
| STMicroelectronics | Anil-Kumar Dwivedi* , Bhupendra Singh*, Harsh Saini*, Hemant Kumar Gangwar*, Manda Padma Sindhuja*, Manish Bansal*, Nitin Kumar*, Olivier Bayet*, Pawan Verma*, Pranav Singh*, Rahul Kumar*, Raushan Kumar*, Shivam Soni*, Gaurav Goel* |
| Synopsys | Ted Mido*, (Andy Tai) |
| Teraspeed Labs | Bob Ross* |
| University of Illinois Urbana-Champaign | Jose Schutt-Aine* |
| Waymo | (Feng Wang), [Ji Zhang] |
| ZTE Corporation | (Zhongmin Wei), (Shunlin Zhu) |
| Zuken | (Ralf Brüning) |
| Zuken USA | Lance Wang* |

OTHER PARTICIPANTS IN 2024

| | |
|---------------------------|--------------------------------|
| Alphawave Semi | Adrien Auge*, Todd Bermensolo* |
| Applied Logix | Dan Chirpich* |
| Ciena | Hugues Tournier* |
| KEI Systems | Shinichi Maeda* |
| KT Smart Future-Creations | Keita Miyasato* |
| Meta | Ashkan Hashemi* |
| Northrop Grumman Corp. | Will McCaffrey* |
| SAE-ITC | Tammy Patton* |
| SI-Clarity | Doug Burns* |
| Signal Edge Solutions | Benjamin Dannan* |
| Si-Guys | Donald Telian* |
| Socionext America | Futoshi Terasawa* |
| Toyobo Co. | Saki Kawano* |

In the list above, attendees present at the meeting are indicated by “*.” Those submitting an email ballot for their member organization for a scheduled vote are indicated by “^.” Principal members or other active members who have not attended are in parentheses “().” Participants who no longer are in the organization are in square brackets “[].”

UPCOMING MEETINGS

The connection information for future IBIS teleconferences is as follows:

Microsoft Teams meeting

Join on your computer or mobile app

[Click here to join the meeting](#)

Join with a video conferencing device

106010980@teams.bjn.vc

Video Conference ID: 114 666 897 5

[Alternate VTC dialing instructions](#)

Or call in (audio only)

[+1 267-768-8015,554664847#](tel:+12677688015554664847#) United States, Philadelphia

Phone Conference ID: 554 664 847#

[Find a local number](#) | [Reset PIN](#)

[Learn More](#) | [Meeting options](#)

All teleconference meetings are 8:00 a.m. to 9:55 a.m. US Pacific Time. Meeting agendas are typically distributed seven days before each Open Forum. Minutes are typically distributed within seven days of the corresponding meeting.

NOTE: "AR" = Action Required.

OFFICIAL OPENING

The 2024 IBIS Summit at DesignCon US was held both online and in-person at The MathWorks, Mission Towers, 3975 Freedom Circle, Santa Clara, CA. Approximately 60 individuals representing 29 organizations attended.

The notes below capture some of the content and discussions. A summit recording has been made available in 2 parts where time index is relative to the beginning of each part. The meeting presentations and other documents are available at this link:

<https://www.ibis.org/summits/feb24/>

Lance Wang introduced himself as the Chair of the IBIS Open Forum. He thanked the Sponsors of the Summit, including Cadence Design Systems, Keysight, The MathWorks, and Siemens EDA. He also expressed thanks to the partnership with DesignCon 2024 for assisting with conference passes and assisting with other aspects of the IBIS Summit.

(Start 00:04:30, To 00:09:00. *Note: beginning of recording 1 of 2*)

Lance welcomed attendees and outlined the IBIS Summit Agenda. A copy of the agenda is available at this link:

<https://www.ibis.org/summits/feb24/>

Lance welcomed new attendees and to introduce themselves.

IBIS CHAIR'S REPORT

Lance WANG (Zuken, USA)

(Chair, IBIS Open Forum)

(Start 00:09:30, To 00:26:55)

Lance presented on the following:

- Weekly teleconferences
 - Quality task group (Tuesdays, 09:00 PT)
 - Advanced Technology Modeling (ATM) task group (Tuesdays, 12:00 PT)
 - Interconnect task group (Wednesdays, 08:00 PT)
 - Editorial task group (Suspended)
- IBIS Open Forum teleconference every 3 weeks (Fridays, 08:00 PT)
- IBIS Summit meetings (USA and international)
 - DesignCon, IEEE SPI, IEEE EMC+SIPI, Shanghai, Tokyo (JEITA-organized)
- Participants: ~290 in 2023 (~280 in 2022)
- IBIS Milestones
 - Various accomplishments and industry-associated activities
- IBIS Quality Specification
- Recent and Future Developments in IBIS
- Participation in IBIS
- SAE Industry Technologies Consortia is the parent organization of the IBIS Open Forum
- IBIS is assisted by SAE-ITC representatives as follows:
 - Tammy Patton (replacing José Godoy), Phyllis Gross, and Michael McNair

- SAE-ITC provides financial, legal, and other services to the IBIS Open Forum:
 - <https://www.sae-itc.com/>

Graham Kus made an announcement to address points of order regarding the conference facilities.

ENABLING CROSS CONNECTED DIFFERENTIAL TX-RX SYSTEM USING IBIS [SERIES_SWITCH]

Raushan Kumar (STMicroelectronics, India)

Rahul Kumar (STMicroelectronics, India)

Manish Bansal (STMicroelectronics, India)

[Presented by Raushan Kumar]

(Start 00:29:00, To 00:41:00)

The presentation covered the following:

- Introduction
 - Conventional Tx-Rx Pair using IBIS Model
- Challenge
 - Cross-connected Tx-Rx Pairs
- Proposed Solution
 - Series-Switch for Termination of Receiver
- Validation
 - Cross connected Tx-Rx pair current and differential swing between pads
- Conclusion
 - Application specific configuration is gaining demand

MORE IBIS HISTORY

Bob Ross (Teraspeed Labs, USA)

[Presented by Bob Ross]

(Start 00:42:45, To 01:05:45)

The presentation covered the following:

- IBIS Open Forum practices
- IBIS documents
- Parent organizations
- IBIS co-located Summits
- European IBIS Activities
- First Asian IBIS Summit
- Some mergers, acquisitions in IBIS
- Conclusion

A PRACTICAL REVIEW OF IBIS DDR5 ENHANCEMENTS

Doug Burns (SI-Clarity, USA)

Pegah Alavi (Keysight Technologies, USA)

[Presented by Doug Burns and Pegah Alavi]

(Start 01:14:00, To 01:46:45)

The presentation covered the following:

- Introduction
- Memory Performance
- IBIS and IBIS-AMI Brief Overview
- DDR5 Overview
- New IBIS-AMI Features for DDR Analysis
- DC Offset
- DLL Function Programmability
- Clock- Data Pin Relationship
- Clock Forwarding
- Statistical Back Channel
- DDR5 Equalization Modeled In IBIS-AMI
- Summary

IBIS OFFICER GIFT AND BREAK

(Start 01:47:00, To 02:12:00)

- IBIS Officers' Gifts
- Transfer of the Gavel to Chair (Lance Wang) from previous Chair (Randy Wolff)
- Honorary Gavel Award to Bob Ross for Distinguished Service

USING MEASURED WAVEFORM DATA IN AMI SIMULATION FOR SYSTEM DESIGN

Hee-Soo Lee (Keysight Technologies, USA)

Fangyi Rao (Keysight Technologies, USA)

Yoonman Choi (SK Hynix, Korea)

[Presented by Yoonman Choi]

(Start 02:13:00, To 02:47:40)

The presentation covered the following:

- Problem Statement: In high-speed link systems, the pivotal elements ensuring design success are transceiver equalization and Clock Data Recovery (CDR)
- To evaluate the overall link performance, designers should be able to analyze Rx post-processing signal
- However, in the lab measurements, measuring signal inside the Rx chip is very limited
- Additionally, Tx AMI models are not always available
- In this presentation, we propose an innovative approach that leverages the Rx AMI model to simulate the Rx post-processing signal based on the measured input waveform.

BIRD229: [AMI TEST CONFIGURATION] – STANDARDIZING ALGORITHMIC MODEL TESTING

Michael Mirmak (Intel, USA)

[Presented by Michael Mirmak]

(Start 02:48:00, To 03:12:30)

The presentation covered the following:

- Why AMI Test Definitions Are Needed
- Enabling Automated Testing - BIRD229: [AMI Test Configuration]
- What Does It Include?
- Where Is it In An IBIS File?
- The Ideal Use Case
- Potential Issues
- Text data precision
- File size
- BCI support? Repeater support?
- Next Steps
- References

UPDATE ON BIRD226: PSIJ SENSITIVITY

Kinger Cai (Intel, USA)

Fern Nee Tan (Intel, Malaysia)

Chi-te Chen (Intel, USA)

Michael Mirmak (Intel, USA)

[Presented by Kinger Cai]

(Start 03:13:00, To 03:32:30)

The presentation covered the following:

- SI simulation sets up all involved power supplies ideal at $V_{nom}/V_{min}/V_{max}$, (which is equivalent to “disabling” of BIRD220, and/or [ISSO PU] & [ISSO PD], and [Composite Current]).
- Takes into consideration the total PI noises of each power supply rail, including (1)self-noise, (2)coupling noise and (3)power management relevant noise; while taking care of multiple power supplies to one IO interface simultaneously.
- Takes into consideration the jitter impact to all relevant ckt blocks from the total PI noise of each power supply rail, which will be calculated with defined/ [IEEE published algorithm](#) for PSIJ.
- All involved power rails' jitter values to a concerned IO interface, can be super-positioned upon the eye-diagram resulting from SI simulation with ideal power supplies setup, or super-positioned upon Tx_Dj or Rx_Dj in IBIS-AMI.

THE OPTIMIZATION OF IBIS-AMI MODEL PARAMETERS WITH MACHINE LEARNING ALGORITHMS

Jared James (Cadence Design Systems, USA)

[Presented by Jared James]

(Start 03:32:45, To 04:00:00. *Note: end of recording 1 of 2*)

The presentation was remote and covered the following:

- Introduction
- Machine Learning Optimization
- IBIS-AMI Model Generation
- Simulation Setup
- Simulation Results
- Conclusions

LUNCH BREAK

IBIS QUALITY 3.0 CHECKLIST SPREADSHEET

Weston Beal (Siemens EDA)

[Presented by Weston Beal]

(Start: 00:01:45, To 00:25:30. *Note: reference beginning of recording 2 of 2*)

The presentation covered the following:

- The purpose of the IBIS Quality Specification is to provide a methodology for validating model data against the IBIS Specification and a means of objective measures of correlating model simulation results with measurements or other model simulations
- By providing standards for validating, correlating, and replicating simulation results we seek to enhance the value of modeling and simulation

Weston reported on some history of IBIS Quality Checklist, and the motivations of defining each IQ Level. He shared on how moving forward with this involved revisiting the earlier levels of IQ check and move from level 1 to further levels.

MATRIX PARAMETERS IN TOUCHSTONE (UPDATED)

Bob Ross (Teraspeed)

[Presented by Bob Ross]

(Start 00:27:00, To 00:59:30)

The presentation covered the following:

- Goals
- Touchstone V1.0, V1.1, V2.0, V2.1 differences
- Reference Impedances (resistances)
- n-Port matrices (S, Y, Z)
- Conversions and mathematics
- 2-port matrices (H, G)
- Conversions (updated)
- Conclusion

UPDATE ON BIRD223.1: ADD SUPPORT FOR SPIM IN IBIS

Kinger Cai (Intel, USA)

Chi-te Chen (Intel, USA)

[Presented by Kinger Cai]

(Start 01:00:00, To 01:24:30)

The presentation was live and covered the following:

- Summary:
- Corrected editorial typos, updated terminology and descriptions related to [Device SPIM], including refining the "S" to "streamlined" in SPIM, and simplified the addition of [Device SPIM Group] and [End Device SPIM Group] in the "tree" structure of .ibs files, while addressing minor errors and formatting.
- Timeline:
- BIRD223 submitted on March 7, 2023, and approved on July 14, 2023
- BIRD223.1 submitted on Sep. 12, 2023, and approved on Nov. 17, 2023

ADDRESSING THE CHALLENGES OF PAM-3 USB 4.0 - DESIGN AND ANALYSIS

Zhiping Yang (MST EMC Lab and JAY Plus, USA)

Zhen Mu (Cadence Design Systems, USA)

Kyle Lake (Cadence Design Systems, USA)

[Presented by Zhiping Yang]

(Start: 01:25:00, To 01:49:30)

The presentation covered the following:

- USB4 Compliance Kit
- USB4 AMI Model parameters
- Requirements to pass USB4 Gen 4 Compliance
- USB4 Spec
- This presentation refers to tables and sections defined in the USB4 Specification V2.0
- <https://www.usb.org/document-library/usb4r-specification-v20>
- TX/RX AMI Optimization
- TX/RX AMI and Channel Co-Optimization
- Conclusions
- Zhiping presented on USB 4 V2.

OPEN DISCUSSION - IBIS OPEN FORUM

(Start 01:49:00, To 02:09:00)

Lance Wang announced the conclusion of the papers and announced the start of open discussion. There were multiple topics discussed.

CLOSING REMARKS

(Start 02:10:00, To 02:10:30)

Lance Wang thanked everyone for attending. Lance announced the meeting was officially adjourned. The meeting adjourned.

NEXT MEETING

The next IBIS Open Forum teleconference meeting will be held on February 16, 2024. The following IBIS Open Forum teleconference meeting is scheduled for March 1, 2024.

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NOTES

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This meeting was conducted in accordance with SAE ITC guidelines.

All inquiries may be sent to info@ibis.org. Examples of inquiries are:

- To obtain general information about IBIS.
- To ask specific questions for individual response.
- To subscribe to or unsubscribe from the official ibis@freelists.org and/or ibis-users@freelists.org email lists (formerly ibis@eda.org and ibis-users@eda.org):
 - <https://www.freelists.org/list/ibis>
 - <https://www.freelists.org/list/ibis-users>
- To subscribe to or unsubscribe from one of the Task Group email lists: ibis-macro@freelists.org, ibis-interconn@freelists.org, ibis-editorial@freelists.org, or ibis-quality@freelists.org:
 - <https://www.freelists.org/list/ibis-macro>
 - <https://www.freelists.org/list/ibis-interconn>

- <https://www.freelists.org/list/ibis-editorial>
- <https://www.freelists.org/list/ibis-quality>
- To inquire about joining the IBIS Open Forum as a voting Member.
- To purchase a license for the IBIS parser source code.
- To report bugs or request enhancements to the free software tools: ibischk7, tschk2, icmchk1, s2IBIS, s2IBIS2 and s2iplt.

The BUG Report Form for ibischk resides along with reported BUGs at:

<https://ibis.org/bugs/ibischk/>
<https://ibis.org/bugs/ibischk/bugform.txt>

The BUG Report Form for tschk2 resides along with reported BUGs at:

<https://ibis.org/bugs/tschk/>
<https://ibis.org/bugs/tschk/bugform.txt>

The BUG Report Form for icmchk resides along with reported BUGs at:

<https://ibis.org/bugs/icmchk/>
https://ibis.org/bugs/icmchk/icm_bugform.txt

To report s2IBIS, s2IBIS2 and s2iplt bugs, use the Bug Report Forms which reside at:

<https://ibis.org/bugs/s2IBIS/bugs2i.txt>
<https://ibis.org/bugs/s2IBIS2/bugs2i2.txt>
<https://ibis.org/bugs/s2iplt/bugspl.txt>

Information on IBIS technical contents, IBIS participants and actual IBIS models are available on the IBIS Home page:

<https://ibis.org/>

Check the IBIS file directory on IBIS.org for more information on previous discussions and results:

<https://ibis.org/directory.html>

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SAE STANDARDS BALLOT VOTING STATUS (attendee X; absent -)

| Organization | Interest Category | Standards Ballot Voting Status | Dec 8, 2023 | Jan 5, 2024 | Jan 26, 2024 | Feb 2, 2024 |
|-------------------------------|-------------------|--------------------------------|-------------|-------------|--------------|-------------|
| Altair | User | Inactive | - | - | - | - |
| AMD (Xilinx) | Producer | Inactive | - | - | - | - |
| Ansys | User | Active | X | X | X | X |
| Applied Simulation Technology | User | Inactive | - | - | - | - |
| Aurora System | User | Inactive | - | - | - | X |
| Broadcom Ltd. | Producer | Inactive | - | - | - | - |
| Cadence Design Systems | User | Active | - | X | X | X |
| Celestica | User | Inactive | - | - | - | - |
| Cisco Systems | User | Inactive | - | - | - | X |
| Dassault Systemes | User | Inactive | - | - | - | - |
| GE Healthcare Technologies | User | Inactive | - | - | - | - |
| Google | User | Inactive | - | - | - | - |
| Huawei Technologies | Producer | Inactive | - | - | - | - |
| Infineon Technologies AG | Producer | Inactive | - | - | - | - |
| Instituto de Telecomunicações | User | Inactive | - | - | - | - |
| Intel Corp. | Producer | Active | X | X | X | X |
| Keysight Technologies | User | Active | - | - | - | X |
| Marvell | Producer | Inactive | - | - | - | X |
| MathWorks | User | Active | X | - | X | X |
| Micron Technology | Producer | Inactive | - | - | - | X |
| MST EMC Lab | User | Active | X | X | X | X |
| Siemens EDA | User | Active | X | X | X | X |
| STMicroelectronics | Producer | Inactive | - | - | - | X |
| Synopsys | User | Active | X | X | X | X |
| Teraspeed Labs | General Interest | Active | X | X | X | X |
| Waymo | User | Inactive | - | - | - | - |
| ZTE Corp. | User | Inactive | - | - | - | - |
| Zuken | User | Active | X | - | X | X |

= Temporarily not a voting member

Criteria for SAE member in good standing:

- Must attend two consecutive meetings to establish voting membership.
- Membership dues current
- Must not miss two consecutive meetings (voting by email counts as attendance)

Interest categories associated with SAE standards ballot voting are:

- Users - members that utilize electronic equipment to provide services to an end user.
- Producers - members that supply electronic equipment.

General Interest - members are neither producers nor users. This category includes, but is not limited to, government, regulatory agencies (state and federal), researchers, other organizations, and associations, and/or consumers.