



IBIS Open Forum Minutes

Meeting Date: **November 10, 2023**

Meeting Location: **Shanghai Parkyard Hotel, Shanghai, PR China**

VOTING MEMBERS AND 2023 PARTICIPANTS

| | |
|-------------------------------|---|
| Altair | (JuneSang Lee) |
| AMD (Xilinx) | (Bassam Mansour) |
| Ansys | Curtis Clark, Wei-hsing Huang, Minggang Hou*, Xi Hu* |
| Applied Simulation Technology | (Fred Balistreri) |
| Aurora System | Dian Yang, Raj Raghuram |
| Broadcom | (Yunong Gan) |
| Cadence Design Systems | Kyle Lake, Jared James, John Philips, Kristoffer Skytte, Dingru Xiao*, Jianping Kong*, Shengli Wang*, Shiyong Fang*, Zuli Qin* (Sophia Feng), Echo Lv*, Lurker Li* (Stephen Searce), Hong Wu, Sally Yang* |
| Celestica | Stefan Paret, Longfei Bai |
| Cisco Systems | (Balaji Sankarshanan) |
| Dassault Systemes | (Hanfeng Wang) |
| GE Healthcare Technologies | Danilo Di Febo, Marco De Stefano, Hang (Paul) Yan* |
| Google | (Christian Sporrer) |
| Huawei Technologies | (Abdelgader Abdalla), Joana Catarina Mendes |
| Infineon Technologies AG | Chi-te Chen, Kingler Cai, Michael Mirmak, Hsinho Wu, Chuanyu Li* |
| Instituto de Telecomunicações | Ming Yan, Douglas Burns, Fangyi Rao, Pegah Alavi, Hee-Soo Lee, Heidi Barnes, Chuanbao Li*, Jiarui Wu* |
| Intel Corporation | Steven Parker |
| Keysight Technologies | Graham Kus, Walter Katz, Kerry Schotz [Randy Wolff], Justin Butterfield, Akshay Shivaji Chaudhari, Dragos Dimitriu, Cheng Zhang*, Chunqiang Weng*, Hongyan Li*, Tree Li* Chulsoon Hwang, Zhiping Yang* |
| Marvell | John Baprawski |
| MathWorks | Arpad Muranyi, Weston Beal, Matthew Leslie, Mikael Stahlberg, Todd Westerhoff, Scott Wedge, Randy Wolff |
| Micron Technology | Olivier Bayet, Rahul Kumar, Raushan Kumar, Manish-FTM Bansal, Sameer Vashishtha |
| MST EMC Lab | Ted Mido, (Tushar Pandey), Wael Dghais, Jinghua Huang*, Kevin Li*, Xuefeng Chen* |
| SerDesDesign.com | Bob Ross |
| Siemens EDA | [Zhiping Yang], (Ji Zhang) |
| STMicroelectronics | |
| Synopsys | |
| Teraspeed Labs | |
| Waymo | |
| ZTE Corporation | (Shunlin Zhu), Changgang Yin*, Jian Huang*, Ming Zheng* |

Zuken

Zuken USA

[Michael Schäder], Markus Bucker, Ralf Brüning,
Hongmin Li*, Zhi Yin*
Lance Wang*

OTHER PARTICIPANTS IN 2023

Alibaba

Alphawave Semi

Ciena

Empyrean

HiSilicon

Hitachi Ltd.

Honeywell

India Institute of Technology

Lenovo

Montage Tech Co.

Nanjing University of Information Science
& Technology

Ningbo DeToolIC Technology

Nokia

OMNIVISION

Renesas

SAE-ITC

Shanghai Fullhan Microelectronics Co.

Signal Edge Solutions

SI Guys

Socionext, Inc.

University of Illinois Urbana-Champaign

University of Tunisia, Electronic Laboratory

Unaffiliated

Xiangdixian Computing Technology

Xidian University

Xpedic

Zhejiang University

Wenzhi Wang*

Adrien Auge, Todd Bermensolo

Hugues Tournier

Chenghan Jia*, Hanqing Tian*, Jiajie Zhao*, Tao

Zhang*, Yunpeng Pei*

Zhengrong Xu*, Si Ruan*, Gengxin Chen*

Yutaka Uematsu

Bavish Vazhayil

Jai Narayan Tripathi, Vinod Verma

July Rao*, Sophia Yang*

Guobing (Robin) Han*, Jianbin Wei*, Xiangting

Wang*, Xiaoliang Xu*, Hannah Bian*, Amy Zhu*

Hongchuan Jia*, Xin Cheng*

Zhifei Xu*

Ramiro Guzman

Sirius Tsang

Billy Chen*, Jie Pan*, Mengting Liao*, XiangYin

Zeng*, Zhong Fu Ji*

Tammy Patton

Zhengyi Zhu*

Ben Dannan

Donald Telian

Raymond Yakura

Jose Schutt-Aine

Malek Souilem

Will Hobbs, Mike LaBonte, Jon Powell, Stephen

Peters

Lili Dai*

Xiuqin Chu*, Yajun Lv*

Guangmeng Ji*, Jessie Zhang*

Ling Zhang*

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](tel:106010980)

Video Conference ID: 114 666 897 5

[Alternate VTC dialing instructions](#)

Or call in (audio only)

[+1 267-768-8015,554664847#](#) 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/WELCOME

The Asian IBIS Summit – China was held in-person, the first time after 2019. About 60 individuals representing 25 organizations attended.

The notes below capture some of the content and discussions. The meeting presentations and other documents are available at:

<https://ibis.org/summits/nov23a/>

Lance Wang welcomed attendees and introduced himself as the Chair of the IBIS Open Forum. Lance expressed thanks to ANSYS, Cadence, Emphyrean and ZTE for their sponsorships of the meeting. He thanked the presenters for their contributed papers and thanked everyone for attending. Lance stated this is the 19th Asian IBIS Summit held in Shanghai, and the IBIS Open Forum is looking forward another successful meeting this year.

Lance stated there will be 9 presentations starting with the Chair's Report, and that approximately 10:00 am there would be a short 20-minute break. During that time, everyone can enjoy the refreshments and visit the vendor tables outside of meeting room. Lance asked to please keep presentation timing according to schedules. After concluding summit meeting, the sponsors' promotion presentations will take place in the same meeting room. Lance encouraged attendees to stay and support the sponsors.

Lance asked if there were any questions. There were none asked.

IBIS CHAIR'S REPORT

Lance Wang (Zuken USA, USA)

Chair, IBIS Open Forum

Lance Wang reported IBIS Open Forum membership as 29 Organization Members and showed a graph indicating relatively consistent level of membership since 1995 to present.

For the Term of Office for June 2023- May 2024, officers are as follows:

- Chair – Lance Wang, Zuken USA
- Vice-Chair – Randy Wolff, Siemens EDA
- Secretary: Graham Kus, The MathWorks
- Treasurer: Bob Ross, Teraspeed Labs

- Librarian: Zhiping Yang, MST
- Postmaster: Curtis Clark, ANSYS
- Webmaster: Steve Parker, Marvell
- University Relations: Chulsoon Hwang, MST EMC Lab
- IEEE DASC, IBIS Open Forum Liaison: Michael Mirmak, Intel

Lance continued to introduce the IBIS task groups and their topics of activity as follows:

Weekly teleconferences:

- Quality Task Group (Tuesdays 9:00am PT)
- Advanced Technology Modeling (ATM) (Tuesdays 12:00pm PT)
- Interconnect task group (Wednesdays 8:00am PT)
- Editorial task group (suspended)
- IBIS Open forum is every 3 weeks (Friday 8PT)
- IBIS Summit meetings (USA and international)
 - o DesignCon USA, IEEE SPI Europe, IEEE EMC+SIPI USA, IBIS Summit Shanghai, China, and IBIS Summit Tokyo, Japan (JEITA-organized).
- Total Participants have been approximately 280 in 2022

Lance shared that the SAE-ITC is the parent organization for the IBIS Open Forum. The IBIS Open Forum is assisted by SAE employees in matters pertaining to legal, business, and working with organizations as a formal Specification.

Link to SAE-ITC: <https://www.sae-itc.com/>

Lance introduced IBIS Milestones slide highlighting certain topics.

IBIS Quality Specification:

IBIS developed a quality specification that has been new update to 3.0 draft 7, which adds power-aware models. Before 2.0 only covered other IBIS features. This has been mainly done by Weston Beal by Siemens EDA and thanked him for the effort and contributions.

The new Version 3.0 Specification has been approved and is now found under

https://www.ibis.org/quality_ver3.0/

What's next for IBIS:

- Expanded system level perspective
 - o Clock-Data relationships, timing information, equalization training
- Power integrity focused modelling
 - o Chip-level
- Multi-level analog buffer modeling
- Interconnect modeling
 - o Touchstone 3.0 with Pole/Residue and port mapping support
 - o IBIS-ISS expansions
- What else should we be looking at, bring your ideas! Contributions and suggestions welcome as this is an Open Forum format committee.

Participation in IBIS:

Lance related that the success of IBIS depends on active participation and volunteering- and encouraged everyone to participate as it is an Open Forum.

Lance presented a slide on how to bring ideas and talents to IBIS as a member or participant:

- Task Groups
- IBIS email reflectors
- Open Forum teleconference for event planning and voting
- Summit presentations
- IBIS Board and task group volunteering
- Writing BIRDs – Buffer Issue Resolution Documents
 - o Official method for submitting a proposed change

Information about the IBIS .org Website:

- IBIS summits
- Regional forum information
- Task group info
- Member FAQ
- Specification documents
- *IRDs
- Email support
- Syntax Parser Downloads

Lance Wang discussed the IBISCHK parser as being available for free use, but for source code is required, that is available under license purchase for download.

Question: Is there anything for AMI quality in IBIS Quality Specification?

Answer: Not at this moment. This could be the next item for quality specification development.

Question: Can AMI model support A-phy, C-phy buffer?

Answer: A-phy, C-phy buffers requires multiple input signals. IBIS AMI currently does not have a way to support them directly.

Lance asked if there were any more questions. There were none asked.

Lance introduced the Papers Presentation portion of the summit.

AMI DLL HOOK: A NOVEL DEBUG METHOD FOR IBIS-AMI SIMULATION

Chuanyu Li (Intel Corp., PRC)

[Presented by Chuanyu Li]

Chuanyu stated the SI engineers sometimes need to debug the AMI models during the AMI model development and simulations since they don't have any access to the EDA tool source-code for debugging. He introduced the AMI hook technique which added some debug points in order to access the data called in AMI API functions. He also showed his experiments using this technique in some real cases.

Question: Suggested to add hooks in AMI models

Answer: This will depend on AMI model vendor's effort

Question: During the example, you mentioned some unexpected results are due to different settings in EDA tools. How does the user know which setting is correct for certain EDA tools?

Answer: Need to try and compare.

Questions: How to add “hooks” for existing AMI?

Answer: It needs to be added externally (adding a wrapper outside)

Lance asked if there were any more questions. There were none asked.

BREAK 20 MINS

CHALLENGES AND SOLUTIONS IN SUPPORTING USB4 INTERFACE

Jianping Kong (Cadence Design Systems, PRC)

[Presented by Jianping Kong]

Jianping started from USB4 Challenges introduction and how to set up compliance kit. He also introduced some AMI model parameter setting process with the requirements to pass USB4 Gen 4 Compliance tests. He used few cases to demonstrate how software can help this process.

Lance asked if there were any more questions. There were none asked.

STANDARD COMPLIANT IBIS AMI MODEL FOR SYSTEM SIGN OFF WITH USB4 GEN2 AS AN EXAMPLE

Zhifei Xu (Ningbo DeToolIC Technology Co., China)

Zhiping Yang (Missouri S&T EMC Lab, USA)

[Presented by Zhifei Xu]

Zhifei started with the background about why Compliant IBIS AMI model is needed for USB4 Gen2 compliant tests. Then he introduced how to build Standard Tx and RX Compliant IBIS-AMI Models. He also demonstrated the automatic verification results using standard IBIS-AMI compliant models.

Lance asked if there were any more questions. There were none asked.

FREE LUNCH & VENDOR TABLES

PERFORMANCE EVALUATION APPROACH FOR 112G SERDES

Jian Huang (ZTE Corporation, PRC)

Daishan Zhu (ZTE Corporation, PRC)

Zhiwei Yang (ZTE Corporation, PRC)

[Presented by Jian Huang]

Jian talked about high-speed Serdes channel architecture and system design requirements. He used 112G Serdes system as an example to show how to verify passive channel crosstalk (COM Sheet Configuration) using IBIS AMI model simulation against measurement results. He stated that good and consistent results between IBIS-AMI simulation and measurement results with high confidence level of BER/SNR.

Jian also discussed 112G Serdes Error Distribution Histogram Simulation and measurement test verification.

Lance asked if there were any more questions. There were none asked.

EXPLORING THE REQUIREMENTS FOR 224 GBPS CHANNEL

Ming Zheng (Zte Corporation, PRC)
Changgang Yin (Zte Corporation, PRC)
Zhongmin Wei (Zte Corporation, PRC)
[Presented By Ming Zheng]

Ming started from the discussion of the bandwidth requirements and challenges. He noted that PAM4 is still a good option for 224G serial links due to its backward compatibility and better SNR performance. The questions he brought up is: for 80GHz bandwidth, we may pay a huge price to meet this strict requirement. Is it really necessary from the perspective of system performance?

He mentioned analog channel behavioral matters for system bandwidth. He used a channel example to show the SDD21 chart for different insertion loss channels. He also showed the simulations for different roll-off frequency channels. In the end he gave the simulation results based on COM 4.0.

His conclusion is that both passive channels and analog front end of transceivers have a strong impact on system performance. The bandwidth of the transceiver and channel should be higher than the Nyquist frequency for PAM4. However, it does not need to be 1.5 times Nyquist frequency. Based on simulation results, a bandwidth higher than 70 GHz would be a good option.

Question: How to depend on the slope rate to define bandwidth?
Answer: Need more study for that.

Lance asked if there were any more questions. There were none asked.

MATRIX PARAMETERS IN TOUCHSTONE

Bob Ross (Teraspeed Labs, USA)
[Presented By Lance Wang (Zuken, USA)]

Lance noted this is Bob Ross' contribution, but Bob was not able to travel to China this time. Lance started to introduce this presentation is for the feature introduction of Touchstone Version 2.1 and some conversion mathematics for TSCHK2.1 parser development.

Lance followed the presentation and talked about the differences in Touchstone V1.0, V1.1, V2.0 and V2.1; New V1.1 option line syntax; Transformations between normalized and un-normalized matrix data are given for different per-port reference resistances and suggested TSCHK2.1 parser developer should add the per-port reference matrix transformation capability.

Question: Can TSCHK check both V1 and V2 Touchstone files?
Answer: Yes, it can.

Lance asked if there were any more questions. There were none asked.

HARDWARE AND AI/ML: APPLICATIONS OF SIPI

Zhiping Yang (Missouri S&T EMC Lab And Jay Plus, USA)

[Presented By Zhiping Yang]

Zhiping started from mentioning hardware plays a critical role in AI/ML. He also showed a chart that human brain is still more powerful compared with machines we invented. He also showed SI/PI demands and challenges in recent technology developments. He discussed how to have Gen N hardware to Gen N+1 hardware using AI/ML as a helper. He talked about few examples and case studies from AI/ML global efforts. He explained few recent studies for decap location optimization, high-speed channel modeling and eye-diagram prediction using AI/ML technologies. He mentioned the possibility of using IBIS and AI/ML for SI/PI design and simulation.

Lance asked if there were any more questions. There were none asked.

ADVANCED SERDES & DDR AMI MODELING AND SIMULATION

Jiarui Wu (Keysight Technologies, PRC)
Chuanbao Li (Keysight Technologies, PRC)
Xiuguo Jiang (Keysight Technologies, PRC)
[Presented By Jiarui Wu]

Jiarui started for discussion of development trends and challenges in high-speed digital designs. He used PCIe technology evolution as an example to show the signal speed from 2.5GT/s to 128GT/s in 20 years, and mentioned it is no sign of slowing. He also mentioned that multi-level signaling (PAM-n) is the trend for high-speed serdes channel designs. But it has the challenges as well. He discussed the RLM and SNDR are the challenges when modeling the PAM-n buffers. He also mentioned other modeling challenges. Then, he explained some insight of modeling and simulations.

Lance asked if there were any more questions. There were none asked.

CLOSING REMARKS

Lance Wang thanked everyone for attending, especially thanks to the IBIS Summit sponsors, ANSYS, Cadence Design Systems and Emphyrean Technology. Lance asked the attendees stay for our sponsor promotion period to support their contributions for this summit. The IBIS Summit meeting was concluded.

NEXT MEETING

The next IBIS Open Forum teleconference meeting will be held on November 17, 2023. The following IBIS Open Forum teleconference meeting is tentatively scheduled for December 8, 2023.

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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:

<http://www.ibis.org/bugs/ibischk/>
<http://www.ibis.org/bugs/ibischk/bugform.txt>

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

<http://www.ibis.org/bugs/tschk/>
<http://www.ibis.org/bugs/tschk/bugform.txt>

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

<http://www.ibis.org/bugs/icmchk/>
http://www.ibis.org/bugs/icmchk/icm_bugform.txt

To report s2ibis, s2ibis2 and s2iplt bugs, use the Bug Report Forms which reside at:

<http://www.ibis.org/bugs/s2ibis/bugs2i.txt>
<http://www.ibis.org/bugs/s2ibis2/bugs2i2.txt>
<http://www.ibis.org/bugs/s2iplt/bugspl.txt>

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

<http://www.ibis.org/>

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

<http://www.ibis.org/directory.html>

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

| Organization | Interest Category | Standards Ballot Voting Status | Sept 15, 2023 | Oct 6, 2023 | Oct 27, 2023 | Nov 10, 2023 |
|-------------------------------|-------------------|--------------------------------|---------------|-------------|--------------|--------------|
| Altair | User | Inactive | - | - | - | - |
| AMD (Xilinx) | Producer | Inactive | - | - | - | - |
| Ansys | User | Active | X | X | X | X |
| Applied Simulation Technology | User | Inactive | - | - | - | - |
| Aurora System | User | Inactive | - | - | - | - |
| Broadcom Ltd. | Producer | Inactive | - | - | - | - |
| Cadence Design Systems | User | Active | X | X | - | X |
| Celestica | User | Inactive | - | - | - | X |
| Cisco Systems | User | Inactive | - | - | - | X |
| Dassault Systemes | User | Inactive | - | - | - | - |
| GE Healthcare Technologies | User | Inactive | - | - | - | - |
| Google | User | Inactive | - | - | - | - |
| Huawei Technologies | Producer | Inactive | - | - | - | X |
| Infineon Technologies AG | Producer | Inactive | - | - | - | - |
| Instituto de Telecomunicações | User | Inactive | - | - | - | - |
| Intel Corp. | Producer | Active | X | X | X | X |
| Keysight Technologies | User | Inactive | - | - | - | X |
| Marvell | Producer | Inactive | X | - | - | - |
| MathWorks | User | Active | X | X | X | - |
| Micron Technology | Producer | Inactive | X | - | - | X |
| MST EMC Lab | User | Active | X | X | - | X |
| SerDesDesign.com | User | Inactive | - | - | - | - |
| Siemens EDA | User | Active | X | X | X | - |
| STMicroelectronics | Producer | Inactive | - | - | - | - |
| Synopsys | User | Active | X | X | X | X |
| Teraspeed Labs | General Interest | Active | X | X | X | - |
| Waymo | User | Inactive | - | - | - | - |
| ZTE Corp. | User | Inactive | - | - | - | X |
| 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.