

**IBIS Open Forum Minutes**

Meeting Date: **June 21, 2019**

Meeting Location: **SPI-E IBIS Summit, Chambéry, France**

**VOTING MEMBERS AND 2019 PARTICIPANTS**

ANSYS Curtis Clark, Marko Marin, Miyo Kawata

 Toru Watanabe, Akira Ohta

Applied Simulation Technology (Fred Balistreri)

Broadcom (Yunong Gan)

Cadence Design Systems [Brad Brim], Ambrish Varma, Ken Willis

 Yingxin Sun, Zhen Mu

Cisco Systems (Stephen Scearce)

Dassault Systemes (CST) Stefan Paret, Longfei Bai\*

Ericsson Anders Ekholm, Anders Vennergrund, Felix Mbairi

 Hui Zhou, Inmyung Song, Mattias Lundqvist

 Wenyan Xie, Zilwan Mahmod

GLOBALFOUNDRIES Steve Parker

Google Zhiping Yang, Songping Wu

Huawei Technologies Antonio Ciccomancini

 Futurewei Technologies Albert Baek

IBM Michael Cohen, Greg Edlund

Infineon Technologies AG Anke Sauerbrey, Pietro Brenner\*, Francesco Settino\*

Instituto de Telecomunicações (Abdelgader Abdalla)

Intel Corporation Hsinho Wu, Michael Mirmak, Nhan Phan

 Kinger Cai, Eddie Frie, Wendem Beyene

 Yuanhong Zhao

Keysight Technologies Radek Biernacki, Hee-Soo Lee, Stephen Slater

 Jian Yang, Ming Yan, Pegah Alavi

Maxim Integrated Joe Engert, Yan Liang, Charles Ganal

Mentor, A Siemens Business Arpad Muranyi, Raj Raghuram, Weston Beal

 Vladimir Dmitriev-Zdorov, Mikael Stahlberg

 Todd Westerhoff, Ed Bartlett, Nitin Bhagwath

Micron Technology Randy Wolff, Justin Butterfield

NXP (John Burnett)

SiSoft (MathWorks) Mike LaBonte, Graham Kus, Walter Katz

SPISim Wei-hsing Huang

Synopsys Ted Mido, Adrien Auge, John Ellis, Sam Sim

 Scott Wedge

Teraspeed Labs Bob Ross

Xilinx Ravindra Gali

ZTE Corporation (Shunlin Zhu)

Zuken Michael Schäder\*

 Zuken USA Lance Wang

**OTHER PARTICIPANTS IN 2019**

Apollo Giken Co. Satoshi Endo

AVL Wolfgang Röhrner\*

Carleton University Ram Achar\*

Continental Stefanie Schatt\*

Hitachi Norio Chujo

IO Methodology [Lance Wang]

John Baprawski, Inc. John Baprawski

Hamburg University of Technology Til Hillebrecht\*

KEI Systems Shinichi Maeda

Marvell Johann Nittmann

OmniVision Sirius Tsang

Politecnico di Torino Stefano Grivet-Talocia\*, Paolo Manfredi\*

 Alessandro Zanco\*

Qualcomm Kevin Roselle

Raytheon Joseph Aday

Renesas Genichi Tanaka

Ricoh Co. Kazuki Murata

SAE ITC (Jose Godoy)

Seagate Alex Tain

Signal Metrics Ron Olisar

Silvaco Japan Co. Yoshiharu Furui

Socionext Megumi Ono, Motoaki Matsumura, Yuji Nakagawa

STMicroelectronics Olivier Bayet\*, Aurora Sanna\*

Toshiba Imi Hitoshi

 Toshiba Electronic Devices & Atsushi Tomishima

 Storage Corp.

Université de Bretagne Occidentale Mihai Telescu\*

University of Cassino Antonio Maffucci\*

University of Toronto Fadime Bekmambetova\*

University of Zagreb Adrijan Baric\*

In the list above, attendees at the meeting 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 bridge numbers for future IBIS teleconferences are as follows:

Date Meeting Number Meeting Password

June 28, 2019 624 227 121 IBISfriday11

For teleconference dial-in information, use the password at the following website:

 http://tinyurl.com/IBISfriday

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.

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**OFFICIAL OPENING**

The IBIS Open Forum Summit was held in Chambéry, France at Le Manège following the 2019 SPI conference. About 17 people representing 13 organizations were recorded in attendance. The IBIS Open Forum would like to thank the summit sponsors Mentor, a Siemens Business, and Zuken.

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

 <http://www.ibis.org/summits/jun19/>

Michael Schäder opened the summit. He noted that attendees’ organizations included a mix of universities, semiconductor manufacturers, EDA companies, and IBIS users. He noted that IBIS based component modeling had been discussed at SPI-E in several meetings. In the second tutorial, by Stefanie Schatt of Continental, IBIS was an important part of the sign-off process for an LPDDR4 interface. In the Industry Forum on Thursday, package modeling, both with and without IBIS, had been discussed for some time.

**IBIS CHAIR’S REPORT**

Randy Wolff, Micron Technology, USA

[Presented by Michael Schäder, Zuken, Germany]

Michael Schäder gave a brief overview of the IBIS Open Forum organization and its activities. There were twenty-six member organizations, IBIS 7.0 had been ratified in March, and new officers for 2019-2020 had recently been elected. The report described new BIRDs and topics under consideration, and asked attendees to think about other applications and directions for IBIS. Michael encouraged attendees to consider having their organizations becoming member organizations, consider drafting a BIRD to advance the IBIS standard, visit ibis.org regularly, and subscribe to ibis@freelists.org.

**ADDRESSING NON-IDEAL TX-FFE BEHAVIOR OF HIGH-SPEED DRIVERS THROUGH HIERARCHICAL WAVEFORM APPROXIMATIONS**

Claudio Siviero, Riccardo Trinchero, Stefano Grivet-Talocia, Igor S. Stievano, Politecnico di Torino, Italy

Mihai Telescu, Université de Bretagne Occidentale; Brest, France

[Presented by Stefano Grivet-Talocia, Politecnico di Torino, Italy]

Stefano Grivet-Talocia introduced a reduced order model formulation that better describes non-linearities and other non-ideal effects introduced by the hardware implementation of a transmitter’s FFE. The formulation uses progressively higher order basis functions derived from the system’s response to bit patterns with increasing numbers of transitions. Better reproduction of slow transient effects in the pre-emphasis was demonstrated. Stefano noted that the proposed model fits naturally into the IBIS-AMI framework.

Since the technique offers technical advantages and fits into the AMI framework, attendees asked if this might be put into a BIRD.

**AN ADAPTIVE ALGORITHM FOR FULLY AUTOMATED EXTRACTION OF PASSIVE PARAMETERIZED MACROMODELS**

Alessandro Zanco, Elisa Fevola, Stefano Grivet-Talocia, Tomasso Bradde, Marco De Stefano, Politecnico di Torino, Italy

[Presented by Alessandro Zanco, Politecnico di Torino, Italy]

Alessandro Zanco presented a method for the creation of stable, compact, passive, parameterized macro models. An adaptive sampling scheme is used to reduce the number of field solver extractions required to create the parameterized model. For a coupled line bandpass filter example, an order-of-magnitude performance improvement was demonstrated over a traditional approach with non-adaptive sampling over the parameter space.

Adrijan Baric asked whether the technique works when the number of parameters grows large. Alessandro said that thus far the number of parameters needs to remain small.

**INTRODUCING IBIS VERSION 7.0**

Michael Mirmak, Intel Corporation, USA

[Presented by Michael Schäder, Zuken, Germany]

Michael Schäder presented the overview of IBIS 7.0 changes. The new version contains five interconnect and packaging related BIRDs, 6 IBIS-AMI BIRDs, and 6 traditional IBIS BIRDs. Long awaited package modeling improvements are introduced in IBIS 7.0, including the use of Touchstone and IBIS-ISS models. AMI improvements include backchannel support and expanded receiver noise support. Traditional IBIS improvements include improved parameter passing to multi-lingual models.

Attendees expressed interested in the new features. Stefanie Schatt noted that it often takes too long before models make use of new features and EDA tools support them. Aurora Sanna noted that S-parameter models for packaging tend to become large, difficult to handle, and time consuming to process.

**IBIS FILE FORMAT LINKS**

Bob Ross, Teraspeed Labs, USA

[Presented by Michael Schäder, Zuken, Germany]

Michael Schäder presented an overview of the evolution in the number and types of file formats supported by IBIS. IBIS now directly or indirectly supports over 17 formats ranging from IBIS defined formats (ebd, ibs, pkg, ami, Touchstone, etc.) to formats managed by other standards bodies (VHDL\_AMS, Berkley SPICE, etc.). Electrical Module Description (EMD) is a possible future format that is under discussion.

**OPEN DISCUSSION**

The open discussion returned to the topic of S-parameters in package modeling. The difficulties with processing S-parameter data were raised. It was asked whether rational functions in pole-residue form (e.g., HSPICE G-element) could be added to IBIS. This could address issues with model size, offer improved uniformity of results with different tools, and offer large performance improvements at simulation time. Stefano Grivet-Talocia said this might be a reasonable approach.

**CONCLUDING ITEMS**

In closing, Michael Schäder thanked the attendees, the presenters, and the sponsors. He also thanked SPI Chair Mihai Telescu for once again inviting IBIS to SPI, and for his assistance and hospitality.

**NEXT MEETING**

The next IBIS Open Forum teleconference meeting will be held on June 28, 2019. The following teleconference meeting is tentatively scheduled for July 19, 2019.

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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 the official ibis@freelists.org and/or ibis-users@freelists.org email lists (formerly ibis@eda.org and ibis-users@eda.org).
* To subscribe to one of the task group email lists: ibis-macro@freelists.org, ibis-interconn@freelists.org, or ibis-quality@freelists.org.
* 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: ibischk6, 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](http://www.ibis.org/%20bugs/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/bugsplt.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**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Organization** | **Interest Category** | **Standards Ballot Voting Status** | **April 26, 2019** | **May 17, 2019** | **June 7, 2019** | **June 21, 2019** |
| ANSYS | User | Active | - | X | X | - |
| Applied Simulation Technology | User | Inactive | - | - | - | - |
| Broadcom Ltd. | Producer | Inactive | - | - | - | - |
| Cadence Design Systems | User | Inactive | X | - | X | - |
| Cisco Systems | User | Inactive | - | - | - | - |
| Dassault Systemes | User | Inactive | - | - | - | X |
| Ericsson | Producer | Inactive | - | - | - | - |
| GLOBALFOUNDRIES | Producer | Inactive | - | - | X | - |
| Google | User | Inactive | - | - | - | - |
| Huawei Technologies | Producer | Inactive | - | - | - | - |
| Infineon Technologies AG | Producer | Active | - | - | X | X |
| Instituto de Telecomunicações | User | Inactive | - | - | - | - |
| IBM | Producer | Active | X | X | X | - |
| Intel Corp. | Producer | Active | X | X | X | - |
| Keysight Technologies | User | Active | X | X | X | - |
| Maxim Integrated | Producer | Inactive | - | - | - | - |
| Mentor, A Siemens Business | User | Active | X | X | X | - |
| Micron Technology | Producer | Active | X | X | X | - |
| NXP | Producer | Inactive | - | - | - | - |
| SiSoft  | User | Active | X | X | X | - |
| SPISim | User | Active | - | X | X | - |
| Synopsys | User | Inactive | - | - | X | - |
| Teraspeed Labs | General Interest | Active | X | X | X | - |
| Xilinx | Producer | Inactive | - | - | - | - |
| ZTE Corp. | User | Inactive | - | - | - | - |
| Zuken | User | Active | X | X | X | X |

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

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.