



## 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 Searce)
Dassault Systemes (CST)	Stefan Paret, Longfei Bai*
Ericsson	Anders Ekholm, Anders Vennergrund, Felix Mbairi Hui Zhou, Inmyung Song, Mattias Lundqvist Wenyan Xie, Zilwan Mahmood
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 Ganai
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  
Zuken USA

Michael Schäder\*  
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 & Storage Corp.	Atsushi Tomishima
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](http://ibis.org) regularly, and subscribe to [ibis@freelists.org](mailto:ibis@freelists.org).

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

Claudio Siviero, Riccardo Trincherio, 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](mailto: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](mailto:ibis@freelists.org) and/or [ibis-users@freelists.org](mailto:ibis-users@freelists.org) email lists (formerly [ibis@eda.org](mailto:ibis@eda.org) and [ibis-users@eda.org](mailto:ibis-users@eda.org)).
- To subscribe to one of the task group email lists: [ibis-macro@freelists.org](mailto:ibis-macro@freelists.org), [ibis-interconn@freelists.org](mailto:ibis-interconn@freelists.org), or [ibis-quality@freelists.org](mailto: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>

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](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

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.