

**IBIS Open Forum Minutes**

Meeting Date: **November 19, 2021**

Meeting Location: **Virtual Asian IBIS Summit (China)**

**VOTING MEMBERS AND 2021 PARTICIPANTS**

|  |  |
| --- | --- |
| ANSYS | Curtis Clark, Wei-Hsing Huang, Miyo Kawata |
| Applied Simulation Technology | (Fred Balistreri) |
| Broadcom | (Yunong Gan) |
| Cadence Design Systems | Zhen Mu, Ryo Sato, Takuya Moriya, Tadaaki Yoshimura, Morihiro Nakazato, Masahiro Nakahara, Yitong Wen\* |
| Celestica | (Sophia Feng)  |
| Cisco Systems | (Stephen Scearce), Guobing Han\* |
| Dassault Systemes (CST) | Stefan Paret, David Duque, Longfei Bai |
| Ericsson | (Guohua Wang) |
| Google | Zhiping Yang, Songping Wu |
| Huawei Technologies | Hang (Paul) Yan\*, Kai Zhao\*, Liqing Guang\*, Peng Xiao\*, Wei Gao\*, Hai Wen\*, Xiaojun Zhou\*, Xusheng Liu\*, Xing Wang\*, Zhang Hui\* |
| Infineon Technologies AG  | (Christian Sporrer) |
| Instituto de Telecomunicações | (Abdelgader Abdalla) |
| Intel Corporation | Hsinho Wu, Michael Mirmak |
| Keysight Technologies | Radek Biernacki, Fangyi Rao\*, Pegah Alavi, Todd Bermensolo, Majid Ahadi Dolatsara\*, Xiuguo Jiang\*, Jiarui Wu\* |
| Keysight Technologies Japan K.K. | Toshinori Kageura, Yoshio Akashi, Satoshi Nakamizo |
| Luminous Computing | David Banas |
| Marvell | Steven Parker |
| MathWorks (SiSoft) | Mike LaBonte\*, Walter Katz |
| Maxim Integrated | Tushar Pandey, Pawan Sai, Yan Liang |
| Micron Technology | Randy Wolff\*, Justin Butterfield, Aniello Viscardi, Akshay Shivaji Chaudhari, Dragos Dimitriu, Chunqiang Weng\*, Hongyan Li\*, Tree Li\*, Zhang Cheng\* |
| Micron Memory Japan, G.K. | Masayuki Honda, Mikio Sugawara |
| MST EMC Lab | Chulsoon Hwang, Anfeng Huang, Yifan Ding, Ling Zhang\* |
| NXP | Jon Burnett  |
| SerDesDesign.com | (John Baprawski) |
| Siemens EDA (Mentor) | Arpad Muranyi, Weston Beal |
| Siemens AG | Franz Pfleger, Sebastien Kollinger |
| Siemens Electronic Design Automation Japan K.K. | Kunimoto Mashino |
| STMicroelectronics | (Gerard Mas) |
| Synopsys | Ted Mido, Andy Tai, Claire Cao\*, Jinghua Huang\*, Kevin Li\*, Xuefeng Chen\*, Yuyang Wang\*, Zhishuan Ye\* |
| Teraspeed Labs | Bob Ross\* |
| Xilinx | (Romi Mayder) |
| ZTE Corporation | Bowen Shen, Changgang Yin, Dongdong Ye, Liqiang Meng, Xiaoxuan Liu\*, Hongbin Shi\*, Jian Huang\*, Jinlong Li\* |
| Zuken | Michael Schäder, Chithrupa Ramesh |
| Zuken USA | Lance Wang\* |
| Zuken Japan | Kensuke Yoshijima, Shiratori Takayuki |

**OTHER PARTICIPANTS IN 2021**

|  |  |
| --- | --- |
| A&D Print Engineering Co., Ltd. | Ryu Murota, Minoru Hasegawa |
| Achronix Semiconductor | Hansel Dsilva |
| AET, Inc. | Keisuke Tqahara |
| Alibaba, Inc. | Cassie Yan\* |
| AMD Japan | Tadashi Arai |
| Analog Devices | Patrick Deroy |
| Apollo Giken Co., Ltd. | Satoshi Endo |
| ATE Service Corporation | Yutaka Honda |
| Aurora System Inc. | Hitoshi Ishikawa |
| AVL Software and Functions | Wolfgang Röhrner |
| Blue Ocean Smart System | Junyong Deng\* |
| Canon Components Inc. | Takeshi Nagata |
| Canon Inc. | Syouji Matsumoto, Satoru Ishikawa |
| Ciena | Taha Kheyar, Kaisheng Hu\* |
| CMK Corporation | Motoshi Nakamura, Masaki Abe |
| Continental Automotive | Julnar Musmar, Stefanie Schatt |
| Cybernet Systems Co., Ltd. | Shiho Nagae, Takayuki Tsuzura |
| D-Clue Technologies Co., Ltd. | Kenzo Tan |
| De Montfort University (IEEE EMC)  | Alistair Duffy |
| Denso Corporation | Koji Ichikawa |
| Elite Material Co. | Nick Huang |
| Empyrean | Chenghan Jia\*, Jiajie Zhao\*, Yuting Yin\*, Tao Zhang\* |
| Eswin | Sitao Chen\* |
| Extreme Networks | Robert Haller |
| Faurecia Clarion Electronics Co., Ltd. | Yasui Takatsugu |
| Fujifilm Manufacturing Co., Ltd. | Rumi Maeda |
| Fujitsu Interconnect Technologies Limited | Manabu Fukuzawa |
| Fujitsu Limited | Takashi Kobayashi, Hideki Takauchi, Yoshio Nabeyama, Makoto Yoshino |
| Fujitsu Optical Components Limited | Masaki Kunii |
| Fujitsu Interconnect Technologies Limited, Japan | Masaki Kirinaka |
| Fulhan | Zhengyi Zhu\* |
| Furukawa Electric Co., Ltd. | Takumi Ohuchi |
| H3C | Xinyi Hu\*, Muwang Ye\*, Zixiao Yang\* |
| Hamamatsu Photonics K.K. | Akihiro Inoguchi |
| Hamburg University of Technology | Cheng Yang |
| Harbin Institute of Technology | Gang Zhang\* |
| Hitachi, Ltd. | Goro Hamamoto, Keisuke Yamamoto |
| HOEI Co., Ltd. | Tatsuya Chiba |
| Hoya Corporation | Masayuki Hagiwara |
| IB-Electronics | Makoto Matsumuro |
| Innotech Corporation | Shinobu Seki, Tasuku Kanomata |
| Integran Co., Ltd. | Norio Miyamoto |
| Interchip Corporation | Satoshi Fujita, Hiroaki Takahashi |
| IT-Beratung-Maurer | Manfred Maurer |
| Japan Aviation Electronics Industry Limited | Kentaro Toda |
| Japan Radio Co., Ltd. | Hiroto Katakura, Takashi Sato, Youichi Suzuki |
| JEDAT Inc. | Nobuto Ono |
| JEITA | Akihiko Kawasaki, Kyoji Yamazaki, Hisashi Saito |
| Jujube LLC | Taiji Hosaka |
| JVC Kenwood Corporation | Yasutoshi Ojima, Hidetoshi Suzuki, Takuo Fujimura |
| Kandou Bus | Sherman Chen |
| KEI Systems | Shinichi Maeda |
| Keita Smart Mirai Creations Co., Ltd. | Keita Miyasato |
| Keyence Corporation | Tomoh Uchida |
| Kioxia Corporation | Masato Kanie, Jyuichiro Noda,Takaya Yamamoto, Mohamedo Mansuru, Minori Yoshitomi, Takayuki Mizogami |
| Kioxia Systems Co., Ltd. | Jyun Shibasaki, Tomomichi Takahashi, Yukio Tanoue |
| Konica Minolta, Inc. | Takeshi Nomura |
| Kyocera Corporation | Aki Tanaka |
| MD Systems Co., Ltd. | Hidetoshi Ogawa |
| Megachips Corporation | Tomochika Kitamura |
| Mercury Systems | Vincent Tam  |
| Microchip Norway | Lars Snith |
| Mitsubishi Electric Corporation | Yusuke Suzuki, Masaki Watanabe |
|  Mitsubishi Electric Corporation | Yasuhiro Segawa |
| Mitsumine-Denshi Co., Ltd. | Ryouichi Nakahigashi |
| Modech Inc. | Tadashi Akio |
| Molex Japan LLC | Masashi Iwata |
| Murata Manufacturing Co., Ltd. | Hideki Miyazawa, Seiji Hidaka, Shigeaki Hashimoto |
| NTT Electronics Cross Technologies Corporation | Megumi Nagata |
| Panasonic Corporation | Shinichi Tanimoto, Shingo Enomoto, Atsushi Nakano |
| Politecnico di Torino | Stefano Grivet-Talocia, Paolo Manfredi, Alessandro Zanco, Felipe Treviso, Marco Destefano, Riccardo Trinchero, Tomasso Bradde |
| PWB Corporation | Toru Ohhisa |
| Renesas Electronics Corporation | Kazuyuki Sakata, Masato Suzuki, Kazuaki Tsuchiyama, Kazunori Yamada, Jyunichi Yamada, Billy Chen\*, Mengting Liao\* |
| Ricoh Company, Ltd.  | Toshihiko Makino, Hisao Kurosu, Nobuo Nakane, Miyoko Goto |
| Ricoh Electronic Devices Co., Ltd. | Takeshi Hara |
| Rohm Co., Ltd. | Nobuya Sumiyoshi, Kenichi Ozaki |
| RTC | Ken Whigham  |
| SAXA, Inc. | Takayuki Ito, Takayuki Sato |
| Schneider Electric Japan Holdings Ltd. | Hiroaki Fujita |
| Seiko Epson Corporation | Toshiyuki Nishiyama |
| Sihi Semiconductor | Ying He\* |
| Shimadzu Corporation  | Kazuo Nakajima |
| Silvaco Japan Co., Ltd | Yoshihiko Yamamoto |
| Simberian | Yuriy Shlepnev |
| Socionext Inc. | Shizue Kato, Hajime Ohmi, Motoaki Atsumura, Megumi Ohno, Ayako Kitamoto |
| Sohwa & Sophia Technologies | Tomoki Yamada |
| Sony Global Manufacturing & Operations Corporation  | Yuichi Ikeya, Atsushi Yoshimoto |
| Sony LSI Design Inc. | Kazuki Murata, Toru Fujii |
| Sony Semiconductor Manufacturing Corporation | Kengo Imazato |
| Technopro Design Company | Mai Fukuoka |
| Teikyo Heisei University | Kohtaro Hachiya |
| Tektronix & Fluke Corporation | Katsuhiko Suzuki |
| Tektronix Company | Takafumi Watanabe |
| Teradyne | Tao Wang, Tomoh Tashiro |
| Tokyo Drawing Ltd. | Masahiko Nakamura |
| Tomen Devices Corporation | Kinji Mitani |
| Toshiba Corporation | Yasuki Torigishi |
| Toshiba Development & Engineering Corporation | Nobuyuki Kasai, Nobuhiro Tsuruta |
| Toshiba Electronic Devices & Storage Corporation | Atsushi Tomishima, Toshihiro Tsujimura, Yoshinori Fukuba |
| University of Illinois, Urbana | Jose Shutt-Ainé, Xinying Wang |
| WADOW | Kazuhiko Kusunoki |
| Xpeedic | Bing Sun\*, Chengzhi Hu\*, Huashan Cui\*, Max Cang\*, Qiujie Zhang\*, Ruijie Zhao\*, Sophia Gui\*, Wei He\*, Yiwei Yang\*, Yunbing Xia\*, Zhouxiang (Zachary) Su\*, Wenliang Dai\*, Yan Liu\* |
| Yamaha Corporation | Hiroyuki Kai, Tetsuya Kakimoto |
| Yazaki Parts Co., Ltd. | Kenichi Fujisawa |
| Yokogawa Electric Corporation | Daisuke Kamezawa |

In the list above, attendees 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](https://nam10.safelinks.protection.outlook.com/ap/t-59584e83/?url=https%3A%2F%2Fteams.microsoft.com%2Fl%2Fmeetup-join%2F19%253ameeting_MmIwNzhhNmItNzA1NC00ZTg1LWE0MDMtNGFiYzg1NDQ3MmE5%2540thread.v2%2F0%3Fcontext%3D%257b%2522Tid%2522%253a%2522fcbfc6fa-e20b-4a1d-b629-1b8e17697dbc%2522%252c%2522Oid%2522%253a%25227735c7ad-2577-4290-9e27-bce52c296030%2522%257d&data=04%7C01%7Ccurtis.clark%40ansys.com%7C31ef953a4d93460c286f08d90345d1fb%7C34c6ce6715b84eff80e952da8be89706%7C0%7C0%7C637544421277314270%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C3000&sdata=zAeh7fCRElDR1NAQiiqHUfTwbTIg%2BkEQnkgGnEn65Kk%3D&reserved=0)

**Join with a video conferencing device**

106010980@teams.bjn.vc

Video Conference ID: 114 666 897 5

[Alternate VTC dialing instructions](https://nam10.safelinks.protection.outlook.com/?url=https%3A%2F%2Fsupport.bluejeans.com%2Fknowledge%2Fvtc-dial-in-options-for-teams&data=04%7C01%7Ccurtis.clark%40ansys.com%7C31ef953a4d93460c286f08d90345d1fb%7C34c6ce6715b84eff80e952da8be89706%7C0%7C0%7C637544421277324259%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C3000&sdata=1kD4GmLd%2BbdzErQBSHS1UPBmh0y5G8PlDlZUtMSsxkQ%3D&reserved=0)

**Or call in (audio only)**

+1 267-768-8015,554664847#   United States, Philadelphia

Phone Conference ID: 554 664 847#

[Find a local number](https://nam10.safelinks.protection.outlook.com/?url=https%3A%2F%2Fdialin.teams.microsoft.com%2Fd1ae197a-e3fc-4c53-90b6-39fdeba65bc1%3Fid%3D554664847&data=04%7C01%7Ccurtis.clark%40ansys.com%7C31ef953a4d93460c286f08d90345d1fb%7C34c6ce6715b84eff80e952da8be89706%7C0%7C0%7C637544421277324259%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C3000&sdata=N5Ha2rFhHG%2FIXyLoSEfS%2B1XYjLP9c1I8%2B%2BKSMNVgqgM%3D&reserved=0) | [Reset PIN](https://nam10.safelinks.protection.outlook.com/?url=https%3A%2F%2Fmysettings.lync.com%2Fpstnconferencing&data=04%7C01%7Ccurtis.clark%40ansys.com%7C31ef953a4d93460c286f08d90345d1fb%7C34c6ce6715b84eff80e952da8be89706%7C0%7C0%7C637544421277334256%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C3000&sdata=iKkTEbcyELtfgSacAxVtz%2BCU%2Fmsr5%2Bb04%2Bwg8PpOSH4%3D&reserved=0)

[Learn More](https://nam10.safelinks.protection.outlook.com/?url=https%3A%2F%2Faka.ms%2FJoinTeamsMeeting&data=04%7C01%7Ccurtis.clark%40ansys.com%7C31ef953a4d93460c286f08d90345d1fb%7C34c6ce6715b84eff80e952da8be89706%7C0%7C0%7C637544421277334256%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C3000&sdata=2Udj6qD9gLjqoYgziYRQlGCwj7uJH4%2FQCDhrtMrFYdk%3D&reserved=0) | [Meeting options](https://nam10.safelinks.protection.outlook.com/?url=https%3A%2F%2Fteams.microsoft.com%2FmeetingOptions%2F%3ForganizerId%3D7735c7ad-2577-4290-9e27-bce52c296030%26tenantId%3Dfcbfc6fa-e20b-4a1d-b629-1b8e17697dbc%26threadId%3D19_meeting_MmIwNzhhNmItNzA1NC00ZTg1LWE0MDMtNGFiYzg1NDQ3MmE5%40thread.v2%26messageId%3D0%26language%3Den-US&data=04%7C01%7Ccurtis.clark%40ansys.com%7C31ef953a4d93460c286f08d90345d1fb%7C34c6ce6715b84eff80e952da8be89706%7C0%7C0%7C637544421277344253%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C3000&sdata=C5t3AZlfs3uti2goGqd28L%2FvDdjsizM1qfsUE05mJS4%3D&reserved=0)

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 Virtual Asian IBIS Summit (China) took place on Friday, November 19, 2021, as an online virtual meeting. About 64 people representing 22 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/nov21b/>

Start times and durations listed in these minutes refer to the meeting recording linked at:

 <https://ibis.org/summits/nov21b/summit_recording.mp4>

(Start time: 00:00, Duration: 3:30)

Randy Wolff (IBIS Open Forum) welcomed everyone to the meeting. He showed where the agenda and presentations could be found online. Lance Wang encouraged participants to ask questions in English, if possible, but he would assist with questions asked in Chinese. The meeting would be recorded.

**IBIS CHAIR’S REPORT**

Randy Wolff (Micron Technology, USA)

(Start time: 04:00, Duration: 18:30)

Randy Wolff, IBIS Open Forum Chair, presented on the history and current status of the IBIS Open Forum. Most of the current work was in completing the IBIS 7.1 specification. A new parser for Touchstone 2.0, tschk2.0.1, had been released. Some specification change BIRDs were not to be included in IBIS 7.1. Some BIRDs would be rejected, in favor of newer BIRDs that were accepted. Future work would include expanding the system level perspective, PAMn, and PDN modeling and analysis improvements. Randy encouraged participation by all in the IBIS development process, showing the website features that could be used for collaboration.

**Expectations for IBIS 7.1**

Randy Wolff (Micron Technology, USA)

(Start time: 23:00, Duration: 23:40)

Randy Wolff presented by video recording an overview of the new changes to be expected in IBIS 7.1. The presentation was an update to one previously given by Michael Mirmak of Intel. Randy described the process used by the Editorial Task Group to merge the changes specified by each BIRD into the IBIS 7.0 specification to produce IBIS 7.1. He said the Editorial Task Group work had completed, and a final draft had been introduced in the October 29 IBIS Open Forum meeting. Randy described changes in C\_comp modeling, on-die Power Distribution Networks (PDNs), Electrical Module Descriptions (EMD), DC offset, back-channel statistical optimization, IBIS-AMI sampling position, and IBIS-AMI clock forwarding support. He encouraged all to review the draft IBIS 7.1 documents found on the IBIS website. Randy said a second review of IBIS 7.1 draft would take place the next day in the IBIS Open Forum meeting. A vote to approve it was expected December 10. An ibischk parser updated for IBIS 7.1 was expected to be released at the same time. Randy showed where to find the draft IBIS 7.1 documents on the website.

**Modeling and Simulation of Single-ended PAM4 Signals in Memory Interfaces**

Fangyi Rao (Keysight Technologies, USA)

(Start time: 48:00, Duration: 41:40)

Fangyi Rao described the data rates and use of PAM4 signaling for GDDR6X. The reduced level separation of PAM4 required comprehensive modeling and analysis. Analysis of single-ended signals and source-synchronous clocking was required. Modeling the correct DC offset was important for single-ended signal analysis. Simulating the difference between rising and falling waveform edges, as well as non-linear transmitter behavior, were also important. Fangyi described the use of Signal-to-Noise-and-Distortion-Ratio (SNDR) for further analysis. He showed the effects of various equalization techniques, and how IBIS had been extended to model clock forwarding, which interacted with the ability of a receiver to track jitter.

Randy Wolff asked about mapping to levels since that would be dependent on the channel characteristics. Fangyi said that mapping would be non-linear and handled in the algorithmic domain. He asked Randy how non-linear it might be. Randy referenced GDDR6X technology, saying the ODT options were not designed to work over a very wide range of conditions. Fangyi agreed more study might be warranted. Xuefeng Chen commented that it seemed the top and bottom eyes looked the same in the Nonlinear Tx image, asking if that meant they had the same slew rate. Fangyi answered that we did not have enough data to define whether it was symmetric. This topic also was brought up in ATM meetings as well. More studies were needed. Fangyi wished that chip vendors could provide more data to support that. Ling Li asked whether the AMI model used in the simulation was extracted from lab measurements or generated as Spice or S-parameters. Fangyi answered that users could extract the data using different means. Ling also asked whether the EDA tools would optimize the DFE/FFE tap numbers. Fangyi answered that the algorithms were built into the AMI models, not the EDA tools.

**Using [Driver Schedule] for PAM4 Testing**

Bob Ross (Teraspeed Labs, US), Xuefeng Chen (Synopsys, PRC)

(Start time: 1:30:20, Duration: 26:00)

Xuefeng Chen presented on the use of IBIS [Driver Schedule] models for evaluating PAM4 designs. He described previous, related work by Randy Wolff and Fangyi Rao. Two Open-drain and two Open-source devices could be combined to implement an output impedance that could change dynamically among four levels. He explained how [Driver Schedule] would work to trigger a short programmed PAM4 symbol sequence. A comparison with a PAM4 IBIS-AMI model showed good correlation, although the [Driver Schedule] output was too short to fill in a full range of probabilities. One challenge was using a single, fixed C\_comp, whereas a PAM4 driver would have a more complex die capacitance characteristic. Xuefeng suggested a script might be written to automate creating [Driver Schedule] syntax for any given symbol pattern.

Randy Wolff asked about the difficulty in creating the model. Bob Ross said it took some time to create, and then Xuefeng made some corrections to it. Xuefeng said scheduling longer patterns was difficult. Randy noted that the output was fixed to a preset data rate. Bob felt it was a promising experiment.

**An Efficient Analysis Method for IBIS Eye-diagram Edge Analysis Based on PDA**Wei He, Jianfeng Xia, Yufeng Dan, Chengzhi Hu (Xpeedic, PRC)

(Start time: 1:49:00, Duration: 32:40)

Wei He described challenges encountered performing eye diagram analysis of high speed systems. It was necessary to model at least factors impacting signal quality. Time domain simulation would capture non-LTI effects, but it was very time consuming. Wei described the statistical analysis method, which was faster and able to represent lower bit rate errors but would not model non-LTI effects. Peak Distortion Analysis (PDA) focused on worst case bit patterns. He described SBR and DER approaches for creating worst case PDA eye masks. Crosstalk could be accounted for. Wei compared SBR, DER, MER4, and MER8 methods, showing results for a CPU to memory bus analysis. He recommended PDA, outlining the unique advantages of the SBR, DER, and MER methods.

Ling Li asked what the MER acronym stood for. Wei said it was Multiple Edge Response.

**The Impact of Crosstalk on 56G+ SerDes Signals**

Jinlong Li, Zhongmin Wei, Bi Yu (ZTE Corporation, PRC)

(Start time: 2:23:30, Duration: 10:00)

Jinlong Li presented on the importance of crosstalk analysis for PAM4 signaling, which required discriminating among smaller voltage level changes. He described the various contributors to crosstalk, and their sensitivities to factors such as line width. He showed a technique for reducing line to pad crosstalk by varying the line width. Tests showed that ICN could be reduced by 80 percent. Via to via crosstalk could be reduced by a pattern change. The impact of crosstalk on Channel Operating Margin (COM) was analyzed.

**FSV: An Introduction**

Gang Zhang (Harbin Institute of Technology, PRC)

(Start time: 2:36:15, Duration: 23:00)

Gang Zhang presented an introduction to the IEEE Feature Selective Validation (FSV) method, beginning with a history of electronic signal simulation validation efforts. Visual evaluation was used in the 1990s. Visual evaluation had its limits, especially when a set of correlation images seemed similar. Objective techniques borrowed from other disciplines were found unsuitable, and the nature of signal data, for which both amplitude and time mattered, was the problem. A visual rating scale method was developed to study the variations in how people evaluated correlations. A metric incorporating an Amplitude Difference Measure (ADM) and a Frequency Difference Measure (FDM) was developed, as well as set of thresholds for quality rating. FSV values for several cases were shown, along with the distributions of subjective visual evaluations. Gang discussed further analyses performed to evaluate the suitability of FSV for different data types. The selection of data portions for evaluation also required consideration. Gang showed a case study in which FSV was used to validate complex plane return path simulations.

**Fast PDN Impedance Prediction Using Deep Learning**

Ling Zhang (Zhejiang University Hangzhou, PRC)

(Start time: 3:00:30, Duration: 20:00)

Ling Zhang described the limitations of models used for calculation of power delivery network plane impedances. The cavity impedance model could handle only rectangular shapes. The plane pair PEEC model could handle irregular shapes, but it was slow. They explored the use of deep learning models to predict impedance quickly, with sufficient accuracy. Doing so required producing a significant amount of training data. A boundary integration solver was chosen because it was much faster than full wave, running in less than 5 seconds versus greater than 20 minutes. Training cases with random shapes, decoupling capacitors and stackups were generated and solved with boundary integration, and these were used to train a convolutional neural network. That required about 80 hours of compute time. The neural network model was then able to solve the training cases much more quickly than the Boundary Element Method (BEM), and the accuracy was tolerable. The files were available on GitHub.

Xuefeng Chen asked which area was more sensitive in the results. Ling said that the first one, the distance between power/ground plane and top/bottom layers, was very sensitive. Also, the distance between IC and decoupling capacitor was very sensitive. Lance Wang commented that on slide 11 the results shown were very good, asking how much of the data were deemed not very accurate. Ling said the images shown were for the more accurate cases. Of the total data, about 10%+ were deemed not very accurate. Model improvements were needed, and they would study further.

**DISCUSSION AND CONCLUDING ITEMS**

(Start time: 4:23:50, Duration: 2:30)

Randy Wolff said he hoped to meet in person the following year. He thanked the presenters, Bob Ross, Lance Wang and the other IBIS board members for their work organizing the summit. The meeting was concluded.

**NEXT MEETING**

The next meeting would be the IBIS Open Forum teleconference meeting, to be held on November 19, 2021.

========================================================================

**NOTES**

IBIS CHAIR: Randy Wolff (208) 363-1764

rrwolff@micron.com

Principal Engineer, Silicon SI Group, Micron Technology, Inc.

8000 S. Federal Way

P.O. Box 6, Mail Stop: 01-720

Boise, ID 83707-0006

VICE CHAIR: Lance Wang (978) 633-3388

lance.wang@ibis.org

Solutions Architect, Zuken USA

238 Littleton Road, Suite 100

Westford, MA 01886

SECRETARY: Mike LaBonte

mlabonte@mathworks.com

 Senior Engineer

 1 Lakeside Campus Drive

 Natick, MA 01760

TREASURER: Bob Ross (503) 246-8048

bob@teraspeedlabs.com

Engineer, Teraspeed Labs

10238 SW Lancaster Road

Portland, OR 97219

LIBRARIAN: Zhiping Yang (650) 214-0868

zhipingyang@google.com

Sr. Hardware Manager, Google LLC

1600 Amphitheatre Parkway

Mountain View, CA 94043

WEBMASTER: Steven Parker (845) 372-3294

sparker@marvell.com

Senior Staff Engineer, DSP, Marvell

2070 Route 52

Hopewell Junction, NY 12533-3507

POSTMASTER: Curtis Clark

curtis.clark@ansys.com

 ANSYS, Inc.

 150 Baker Ave Ext

 Concord, MA 01742

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>

Other trademarks, brands and names are the property of their respective owners.

**SAE STANDARDS BALLOT VOTING STATUS**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Organization** | **Interest Category** | **Standards Ballot Voting Status** | **October 8, 2021** | **October 29, 2021** | **November 12, 2021** | **November 19, 2021** |
| ANSYS | User | Inactive | X | X | - | - |
| Applied Simulation Technology | User | Inactive | - | - | - | - |
| Broadcom Ltd. | Producer | Inactive | - | - | - | - |
| Cadence Design Systems | User | Active | X | X | X | X |
| Celestica | User | Inactive | - | - | - | - |
| Cisco Systems | User | Inactive | - | - | - | X |
| Dassault Systemes | User | Inactive | - | - | - | - |
| Ericsson | Producer | Inactive | - | - | - | - |
| Google | User | Inactive | X | X | - | - |
| Huawei Technologies | Producer | Inactive | - | - | - | X |
| Infineon Technologies AG | Producer | Inactive | X | - | - | - |
| Instituto de Telecomunicações | User | Inactive | - | - | - | - |
| Intel Corp. | Producer | Inactive | X | X | - | - |
| Keysight Technologies | User | Active | X | - | X | X |
| Luminous Computing | General Interest | Inactive | - | - | - | - |
| Marvell | Producer | Inactive | - | X | - | - |
| MathWorks (SiSoft)  | User | Active | X | X | X | X |
| Maxim Integrated | Producer | Inactive | X | X | - | - |
| Micron Technology | Producer | Active | X | X | X | X |
| MST EMC Lab | User | Inactive | X | - | - | X |
| NXP | Producer | Inactive | - | - | - | - |
| SerDesDesign.com | User | Inactive | - | - | - | - |
| Siemens EDA (Mentor) | User | Active | X | X | X | - |
| Synopsys | User | Active | - | - | X | X |
| Teraspeed Labs | General Interest | Active | X | X | X | X |
| Xilinx | Producer | Inactive | X | X | - |  |
| ZTE Corporation | User | Inactive | - | - | - | X |
| Zuken | User | Active | - | - | 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 (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.