Foreword

Integrated Intelligence is the Future of Systems

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Welcome! In line with the deeply rooted tradition of the Conference, the 2021 International Solid-State Circuits Conference continues to showcase innovative contributions from industry, universities, and research institutions around the world. In view of the global pandemic, ISSCC 2021 will be presented totally virtually. However, we hope to provide as rich an experience as ever, although it will not facilitate personal networking.

This year, of the 195 papers, there are 57% from academia, 31% from industry, 11% jointly from industry with academia or research institutions, and 2% are solely from research institutions. Continuing the practice introduced a few years ago, the ISSCC paper selection followed a double-blind review process with anonymized manuscripts. It is noted that the paper selection process was done through on-line discussions, maintaining the same quality as the past in spite of time zone differences! The steady advancement of solid-state circuits has led to an omnipresence of technology in our daily lives. In particular with the current global pandemic, every part of daily life now depends on applications, not only the conventional, but also emerging ones, ranging from medical, wearable, and mobile electronics to IoT, virtual reality, autonomous driving, robotics, and quantum computing.

The ISSCC 2021 Technical Program has three parts: Innovations, Exploration, and Education. **Innovations** consists of 205 outstanding technical papers including 4 plenary and 6 invited industry ("Highlighted Chip Releases"). As well, see Special Events (details below). **Exploration** consists of six expert-oriented forums, and **Education** consists of twelve introductory tutorials, and a short course on PLLs, Clocking, and Clock Distribution. The Conference will also feature a variety of special events: three panels on "What Technologies Will Shape the Future of Computing?", "Going Remote: Challenges and Opportunities to Remote Learning, Work, and Collaboration", and "Favorite Circuit Design and Testing Mistakes of Starting Engineers", and another on "ICs in PandemICs". In addition, we continue with the "Student Research Preview" and "Making a Career Choice". As well, two Demonstration Sessions, for both recorded and "live" sessions of devices described in nearly 50 selected papers.

The complete virtual format of ISSCC consists of on-demand video presentations, with digest and slides, and live sessions with a short re-cap and Q&A. On-demand release for the regular technical presentations (except plenary), tutorial lectures, and short course lectures will be released on Friday, February 5, 2021. Forum presentations will be released on Friday February 12, 2021. Plenary presentations will be live streamed, two on Monday, February 15, two on Tuesday, February 16, and subsequently available on-demand. Live regular sessions, including "Highlighted Chip Releases" sessions consist of 1-to-2 minutes recap with 2-to-5 minutes live Q&A, as well Q&A will be continued in dedicated texting channels. Twelve tutorials are scheduled for Saturday, February 13, with 6 series lectures in 2-parallel format, with 5 minutes summary and 10 minutes live Q&A. Short course lectures are scheduled for Sunday, February 14, with 10 minutes summary and 15 minutes live Q&A. Four special sessions are scheduled on Friday, February 19, and two are scheduled on Saturday, February 20. Demonstration sessions are scheduled for Friday February 19. Six forums are scheduled three parallel on Sunday, February 21 and three parallel on Monday, February 22, with 5 minutes summary and 10 minutes Q&A. Both on-demand content and recorded live Q&A content will be available until March 31, 2021.

The high standards that we associate with ISSCC are a result of the dedicated volunteer work of the International Technical-Program Committee. This year, the ITPC consists of 166 members from industry and academe, organized into twelve subcommittees. Each member has spent a significant amount of time soliciting excellent submissions, reviewing the submitted papers, organizing special sessions and educational events, preparing the Advance Program, Press-Kit, and Digest material, and performing session-chair/moderator duties. I am deeply thankful to all ITPC members, and in particular to the Subcommittee Chairs for their leadership in overseeing these tasks: Kofi Makinwa (Analog), Michael Flynn (Data Converters), Tom Burd (Digital Architectures & Systems), Keith Bowman (Digital Circuits), Chris Van Hoof (Imagers/MEMS/Medical/Displays), Marian Verhelst (Machine Learning and AI), Jonathan Chang (Memory), Yogesh Ramadass (Power Management), Jan Craninckx (RF), Makoto Nagata (Technology Directions), Stefano Pellerano (Wireless), and Frank O'Mahony (Wireline). Also, I sincerely thank the leadership of the Regional Committees: Tim Piessens and Bruce Rae from Europe, and Long Yan and Yun-Shiang Shu from the Far East. Additionally, I have enormously benefited from the help of the ISSCC 2021 Program Vice-Chair, Edith Beigné, and the ISSCC 2020 Program Chair, Un-Ku Moon.

ISSCC would not be possible without the help of many other individuals that deliver excellent support work behind the scenes. It is my pleasure to acknowledge Melissa Widerkehr and Widerkehr and Associates for their precious support with Conference operations and arrangements. I am grateful to Brad Phillips and MIRA Digital Publishing for their assistance with the electronic manuscript submission, pre-voting, and assembly of the Advance Program, as well as the Digest, to Stephen Bonney and S³ iPublishing for page layout, and to Sol Rosenberg and Underline Science. As well, I am deeply thankful to the Technical Editors: Jason Anderson, Leo Belostotski, Dustin Dunwell, Vincent Gaudet, Glenn Gulak, James Haslett, Shahriar Mirabbasi, and David Halupka both as an Editor and multi-media-coordinator. Very special thanks go to Laura Fujino and Kenneth Smith for their truly invaluable help with all kind of aspects of the Conference, including awards, paper submission process, preparation of the Advance Program, Press Kit, Digest, Tutorial and Short Course USBs, as well as diverse editing and presentation preparation. Many thanks to Shahriar Mirabbasi for his leading role in the Press Kit preparation, and Denis Daly for organizing the Student-Research Preview, to Ali Sheikholeslami for his coordination of the Tutorials and Short Course, to Dan Friedman for organizing the Short Course, to David Robertson for leading the Forums, to Eugenio Cantatore for organizing the Demonstration Sessions, to Alice Wang and Dennis Sylvester for organizing the invited Industry Sessions, to Trudy Stetzler for managing the Conference website, and to John Weinmann for his financial oversight for the Conference.

Furthermore, I gratefully acknowledge the exceptional help provided by the volunteer graduate students from the University of Toronto, who, thanks to their technical expertise, ensure the orderly conduct of the live sessions, and countless other behind-the-scene activities.

A very special acknowledgement goes to Anantha Chandrakasan, the ISSCC Senior Technical Advisor, for his invaluable support in inviting excellent Plenary speakers, for inspiring me during the many years serving on the Technical Program Committee, and for advising in countless other aspects of the Conference. Finally, my deep appreciation and gratitude go to Kevin Zhang, the ISSCC Conference Chair and Jan van der Spiegel, the ISSCC Past Conference Chair, for his kind and inspired leadership. I am confident they will maintain, and strengthen even more, the tradition of excellence provided to Conference attendees.

Lastly but not least, great appreciation to all the contributors to ISSCC, including authors and speakers.

I look forward to seeing and speaking with many of you during the Virtual Conference. My ultimate wish is that each of you have an enjoyable and rewarding experience

Wishing everyone health and safety.

Makoto Ikeda
ISSCC 2021 Technical Program Chair