

2021 IEEE International Solid-State Circuits Conference (ISSCC 2021)

**San Francisco, California, USA
13 – 22 February 2021**



**IEEE Catalog Number: CFP21ISS-POD
ISBN: 978-1-7281-9550-6**

**Copyright © 2021 by the Institute of Electrical and Electronics Engineers, Inc.
All Rights Reserved**

Copyright and Reprint Permissions: Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

****** This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.***

IEEE Catalog Number:	CFP21ISS-POD
ISBN (Print-On-Demand):	978-1-7281-9550-6
ISBN (Online):	978-1-7281-9549-0
ISSN:	0193-6530

Additional Copies of This Publication Are Available From:

Curran Associates, Inc
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: (845) 758-0400
Fax: (845) 758-2633
E-mail: curran@proceedings.com
Web: www.proceedings.com

CURRAN ASSOCIATES INC.
proceedings
.com

TABLE OF CONTENTS

REFLECTIONS.....	4
REMEMBRANCES OF DAVE PRICER.....	5
FOREWORD.....	6
AWARDS.....	22

PAPER SESSIONS

1 Plenary Session.....	7
2 Highlighted Chip Releases: 5G and Radar Systems.....	36
3 Highlighted Chip Releases: Modern Digital SoCs.....	44
4 Processors.....	52
5 Analog Interfaces.....	70
6 High-Performance Receivers and Transmitters for Sub-6GHz Radios.....	88
7 Imagers and Range Sensors.....	104
8 Ultra-High-Speed Wireline.....	124
9 ML Processors From Cloud to Edge.....	142
10 Continuous-Time ADCs and DACs.....	162
11 Advanced Wireline Links and Techniques.....	178
12 Innovations in Low-Power and Secure IoT.....	198
13 Cryo-CMOS for Quantum Computing.....	206
14 mm-Wave Transceivers for Communication and Radar.....	216
15 Compute-in-Memory Processors for Deep Neural Networks.....	234
16 Computation in Memory.....	244
17 DC-DC Converters.....	254
18 Biomedical Devices, Circuits, and Systems.....	274
19 Optical Systems for Emerging Applications.....	284
20 High-Performance VCOs.....	292
21 UWB Systems and Wake-Up Receivers.....	300
22 Terahertz for Communication and Sensing.....	312
23 THz Circuits and Front-Ends.....	322
24 Advanced Embedded Memories.....	332
25 DRAM.....	342
26 RF Power-Amplifier and Front-End Techniques.....	352
27 Discrete-Time ADCs.....	368
28 Biomedical Systems.....	384
29 Digital Circuits for Computing, Clocking and Power Management.....	402
30 Non-Volatile Memory.....	420
31 Analog Techniques.....	430
32 Frequency Synthesizers.....	440
33 High-Voltage, GaN and Wireless Power.....	458
34 Emerging Imaging Solutions.....	478
35 Adaptive Digital Techniques for Variation Tolerant Systems.....	488
36 Hardware Security.....	496

TUTORIALS

TUTORIALS 1-12.....	509
---------------------	-----

FORUMS

F1 Striking the Balance Between Energy Efficiency & Flexibility: General-Purpose vs Special-Purpose ML Processors.....	513
F2 Pushing the Frontiers in Accuracy for Data Converters and Analog Circuits.....	517
F3 Silicon Technologies in the Fight Against Pandemics – from Point of Care to Computational Epidemiology.....	520
F4 Electronics for a Quantum World.....	525
F5 Enabling New System Architectures with 2.5D, 3D, and Chiplets.....	529
F6 Optical and Electrical Transceivers for 400GbE and Beyond.....	533

SPECIAL EVENTS

SE1 What Technologies Will Shape the Future of Computing?.....	537
SE2 Going Remote: Challenges and Opportunities to Remote Learning, Work, and Collaboration.....	539
SE3 Favorite Circuit Design and Testing Mistakes of Starting Engineers.....	541
SE4 ICs in PandemicCs.....	543
SE5 Making a Career Choice.....	546
SE6 Student Research Preview (SRP).....	548

SHORT COURSE

SC PLLs, Clocking, and Clock Distribution.....	552
--	-----

INDEX TO AUTHORS.....	554
-----------------------	-----

EXECUTIVE COMMITTEE.....	562
--------------------------	-----

INTERNATIONAL TECHNICAL PROGRAM COMMITTEE.....	563-567
--	---------

ITPC EUROPEAN SUBCOMMITTEE.....	568
---------------------------------	-----

ITPC FAR EAST SUBCOMMITTEE.....	569
---------------------------------	-----

2022 CALL FOR PAPERS.....	570
---------------------------	-----

CONFERENCE TIMETABLE.....	571
---------------------------	-----