

# Hot topics in IC and electronic system testing - from all angles

For already a quarter of a century, the last week of May is reserved for the IEEE European Test Symposium (ETS). The 26th edition has a balanced program where, besides professors and students, all key suppliers and industrial users of test equipment and design-for-test (DfT) software are present. Under pandemic rule, ETS-2021 will take place completely online, be it with several live events.

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In its first 25 years, the IEEE European Test Symposium has set up its camps in almost every European country at least once. For example, the Netherlands has hosted it twice: in Maastricht in 2003 by Erik Jan Marinissen (at that time working at Philips Research) and in Amsterdam in 2016 by professor Said Hamdioui of Delft University of Technology. Belgium, on the other hand, was still one of the very few blank spots for ETS on the European map. When a team from Imec and KU Leuven in 2019 proposed to the ETS Steering Committee to host the 2021 edition in the historic city of Bruges, their bid was quickly accepted.

Then, in early 2020, the Covid-19 virus outbreak struck and forced ETS-2020, originally planned to take place in Estonia's capital Tallinn, to move to an online conference format. Although at that time, many were convinced that we would be freed from the pandemic and its restrictions on our daily lives well before May 2021, the Belgian organizers of ETS-2021 soon realized that there was no guarantee for a Covid-19-free world when their event would take place.

International meetings such as ETS have a special responsibility with respect



High-performance parallel parametric testing.

Credit: Imec

to Covid-19 since their participants come from many different countries from all over the globe and have the potential to spread an infection at a global level. The only way to mitigate the associated risk was to turn ETS-2021 into a fully online conference. In the summer of 2020, the Leuven-based organization team canceled their reservations in Bruges, to fully concentrate on the virtual edition of ETS-2021.

## Quiz

Online conferences offer many benefits over conventional in-person meetings. No need to travel, since one can participate from the comfort of one's own home or office; obviously, that saves time, money, and

also contributes to 'saving the planet.' Of course, participants do lack the networking and interactions with peers. For organizers, conference budget items such as meeting rooms, AV equipment and banquets aren't applicable in a virtual setting. Consequently, the registration rates for the 2021 virtual ETS edition could be reduced drastically. All recorded lectures will also remain online for a full month after the event.

Most likely, everybody has already attended several online conferences and/or other events during the ongoing pandemic. Despite the clear advantages, many of us sense a feeling of remoteness and a lack of interactivity associated with such virtual events. The ETS-2021 organizers have

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made extra efforts to address this issue and to maximally stimulate interactivity during the conference.

The keynotes will be broadcasted live (and recorded for later viewing). Although all regular paper sessions, as well as the vendor sessions, will be pre-recorded, the speakers will be present during the entire session, so that the audience can directly interact with them via chat – this is a level of interactivity even beyond what's possible at a regular (non-virtual) conference. To avoid the fatigue of sitting too many hours behind a computer screen, the program is restricted to only five hours per day (14-19h CET) and sessions are smeared out over four (instead of the usual three) days while keeping the usual amount of technical content. ETS also features a big online social event, where interactivity is of course paramount: the very first Global Test Community Quiz.

### 26th IEEE European Test Symposium

- live on 24-27 May 2021
  - one more month on-demand online
  - reduced rates until 1 May
  - discount: IEEE/CS members, speakers, students
  - 4 keynote addresses
  - 10 regular technical paper sessions
  - 3 industry sessions
  - 5 vendor sessions
  - 4 special sessions
  - 3 embedded tutorials
  - 1 panel session
  - poster sessions
  - European semi-finals of the Ed J. McCluskey Best Doctoral Thesis Award
  - virtual exhibition with 10 exhibitors
  - social event: Global Test Community Quiz 2021
- [ets2021.eu](http://ets2021.eu)

### DfT standard

In the ETS-2021 opening keynote, Oliver Dial of IBM's TJ Watson Research Center will talk about quantum computers, which hold the promise to be able to crack problems that are simply too hard for today's computers. While on the application side, the objectives and benefits are clear, the hardware implementation still has quite a number of tough hurdles to take. And,

of course, these new computers will bring their own set of unique test challenges – operation at cryogenic temperatures (just above 0 kelvin) is just one of them.

ICs are also increasingly used in safety-critical applications such as automotive and healthcare; as these new domains have very little tolerance for test escapes, test quality needs to be improved. The ETS program has at least four presentations related to automotive quality, while the keynote by Chris Van Hoof, VP R&D at Imec and general manager of the One-planet Research Center in Wageningen, the Netherlands, will address disruptive new health devices. ETS also features papers on cell-aware test generation, a new approach that has proven itself with respect to test quality improvement. It explicitly targets realistic open and short defects inside the individual basic digital library cells.

ETS-2021 offers a quite large number of contributions devoted to memory testing: next to classical charge-based memories such as SRAMs and DRAMs, new memories like resistive (RRAM) and magnetic (MRAM) memories are on the verge of a breakthrough in the market. Another new kid on the block is optical data propagation: silicon photonics.

The circuit level addressed at ETS ranges from individual digital library cells, via full ICs, to printed circuit boards containing multiple ICs. Over time, papers on board testing have made way for papers on system-level testing and test and design-for-test solutions for 3D-ICs containing multiple dies stacked on top of each other in a single package. As the test infrastructure of stacked dies needs to work in concert to get test stimuli up and test responses down in the stack, in 2020, a DfT standard was released for such 3D-ICs (IEEE 1838) and several papers address this topic now at ETS-2021.

### Revolution

ETS has expanded into domains neighboring to pure manufacturing tests, such as reliability and security. While the main question addressed in test papers is "whether the chip is okay at the start of its lifetime ( $t = 0$ )," reliability asks a similar question for  $t > 0$ . Hence, it's no surprise to encounter reliability papers at a test conference.

Having security papers at a test event is less obvious, as testability and security seem fundamental adversaries: testability

### ETS-2021 collocated events

**17-23 May 2021 (prior to ETS)**  
 Test Spring School: TSS 2021  
 "Robustness in new computing paradigms and technologies"

### 27-28 May 2021 (after ETS)

Three focused workshops:

- SURREALIST – Security, Reliability, Test, Privacy, Safety and Trust of Future Devices
- AI-TREATS Workshop on AI hardware – Test, Reliability and Security
- TAAA – International Workshop on Test Access, Automation and Adoption

requires access to the internal components of an IC to be able to control and observe their state, while security typically wants to prevent such access. But the technical skills necessary to address both issues have a large overlap and an increasing number of products simply require to be both testable and secure. Ever since ETS has added security to its topics list, it has become one of the most popular topics, and the ETS-2021 edition is no exception. The keynote of KU Leuven professor Ingrid Verbauwhede will be on secure hardware design.

The fourth keynote, delivered by professor Subhasish Mitra from Stanford University, will talk about a Cambrian revolution in system testing that grows beyond testing manufacturing defects to address robustness issues that end users really care about (like design bugs, reliability and security) in applications from (self-driving) cars to the cloud. These factors create golden opportunities for new system-driven test approaches that deal with the seemingly diverse problems at seemingly diverse scales in the emerging 21st-century designs.

*Erik Jan Marinissen (Imec, Leuven, Belgium) is the ETS-2021 industrial-relations chair. Georges Gielen (KU Leuven, Belgium) and Michele Stucchi (Imec, Leuven, Belgium) are the general co-chairs. Elena-Ioana Vătăjelu (CNRS/TIMA, Grenoble, France) is the program chair.*

**Edited by Niekke Roos**