

Top news

Nanoresonators: the plot thickens amid new insights

A team of researchers from Leti along with three of Leti's international partners* have finally shed new light on the discrepancy of up to two orders of magnitude between the theoretical detection limits of nanoresonators and the resonators' actual performance.

Until now, it was believed that the tiniest mass or force that could be detected by a nanoresonator depended on temperature fluctuations in the resonator's environment. Given that state-of-the-art resonators offer sensitivities of 10^{-21} gram, the theory was plausible.

In research published in *Nature Nanotechnology*, a Grenoble-based team of researchers demonstrated that the nanoresonator's own frequency plays a much greater role than environmental factors. In other words, the "background noise" once thought to be the main culprit of performance problems is actually not as significant as the noise from the system itself.

One resonator, two frequencies

The researchers developed and patented a technique that simultaneously exposes the nanoresonator to two frequencies close to the system's resonant frequency. They then used the return signal to determine the influence of measurement noise and that of fluctuations in the resonant frequency.

While the research did provide new insights into the discrepancies between theoretical and actual detection limits, there is still much to uncover. The researchers tested the various theories in the literature—temperature gaps, trapped charge, diffusion of gas molecules on the resonator's vibrating cantilever—to no avail. They still don't know *why* the resonant frequency fluctuates.

Leti is pursuing its investigations, hoping to solve the mystery and unlock the secrets to better nanoresonator performance.

EPFL Lausanne, Indian Institute of Sciences, California Institute of Technology

Contact: sebastien.hentz@cea.fr

Innovation

Leti and Liten join forces on additive technologies

Researchers at Leti are convinced that additive technologies are a plus for silicon! And research carried out with Liten proves that they are right. Additive technologies can be used for very thick (100 microns and more) layers and for large-surface systems at lower cost than silicon processes.

The researchers have already produced a radio-frequency inductor using screen printing. The inductor, which operates at 2 GHz with a quality factor of 30, has already garnered interest from a manufacturer for integration. The researchers have also built an energy-harvesting system demonstrator. Rather than the usual hybrid piezoelectric layer, the system boasts a piezoelectric layer printed using a process developed by Liten. The system provides enough energy to power a radio-frequency link.

Contact: christophe.billard@cea.fr

New ideas for more effective spin current sources

Researchers at the Spintec lab recently demonstrated that the spin current that propagates from one ferromagnetic layer to another can be doubled if the second layer has a fluctuating magnetic order. When the researchers heated the second layer to its magnetic phase-change temperature, the spin current was much greater.

And there are more ideas where that one came from! The researchers now plan to improve system efficiency and enhance the properties of the materials used. They are using the method to probe antiferromagnetic phase transitions, which are not magnetic. The research could drive advances in future generations of devices without ferromagnetic materials.

Contact: vincent.baltz@cea.fr

A 275 nm microlaser active at ambient temperature

A research consortium* that includes scientists from INAC recently produced a deep-UV laser with record-breaking performance. The laser emits at 275 nm at ambient temperature, as opposed to 310 nm cooled to 10 K, making it the best-performing system in the literature to date. The key to this technological advance? Extremely simple optical resonators (micro disks) made of a thin (200 nm) layer of gallium nitride/raw aluminum nitride on silicon.

The advantages of the system include low cost and the use of proven selective silicon etching processes. In its current state, the laser uses optical pumping. However, the researchers are hoping to shift to electrical injection. Market applications for the technology could include biological diagnostics and water purification.

*CNRS, University of Montpellier, Paris-Saclay University

Contact: bruno.gayral@cea.fr

Innovation

Characterizing 2D materials could soon get easier

Rapidly assessing the technological potential of 2D materials requires—for certain crucial measurements—a synchrotron beamline. Researchers on the CEA Cascade* project decided to find a workaround that would eliminate the need for difficult-to-access synchrotron resources. They combined two analysis methods available at the Nanocharacterization Platform: micro-photoluminescence and photoemission microscopy in reciprocal space. The results on measurements like hole mobility and the nature of the gap were at least as reliable as those taken using a synchrotron beamline.

This advance will mean faster process optimization for fabricating nanoelectronic components from 2D materials, which, due to their thickness of just one atom, will pave the way for even greater circuit miniaturization. EPFL in Lausanne plans to collaborate with Leti to use this new combined-analysis technique.

*Led by Leti, INAC, and Iramis and funded by the Transversal Nanoscience Program

Contact: olivier.renault@cea.fr

Lithography: non-chemically-amplified resin validated

In the coming years, non-chemically-amplified resins could be used in 300 nm lithography processes to create circuit patterns with more accurate control of dimensions and lower edge roughness. The members of the industrial R&D project Imagine, which include Leti, recently validated the process on industrial-grade equipment for the first time ever.

A preliminary evaluation of the resin was completed with a single beam. The resin was then successfully tested on a 1,300-beam Mapper machine (Mapper is also a partner on the project). The process was developed specifically to facilitate transfer to a manufacturer, which is expected to take place in 2018. In other research conducted under an Inter-Carnot project currently undergoing final approvals, Leti plans to assess other non-chemically-amplified resins in conjunction with the University of Mulhouse.

Contact: laurent.pain@cea.fr

Advances toward CMOS-transistor quantum computers

According to a team of researchers from INAC and Leti, tomorrow's quantum computers could be made from simple SOI CMOS transistors!

Quantum computers do not store information as bits, represented by a one or a zero, like traditional computers. They use quantum bits, or qubits, which can represent a superposition of one and zero. And the search is on for a physical medium suitable for producing qubits. The researchers showed that the electron holes (quasiparticles with charge and motion opposite to the electron) trapped in transistor channels could potentially play this role.

The holes' intrinsic magnetic moment, or spin state, is highly sensitive to grid voltage, which opens the door to future qubits whose spin would be controlled electrically.

Contact: romain.maurand@cea.fr

Day by day

Cesar Lab an active patent filer

With sixteen patent applications filed in two and a half years, plus eight additional filings this year, the Cesar Lab (a joint Safran-CEA Tech R&D lab) is more active than ever. The lab unites researchers from all three CEA Tech institutes (Leti, List, and Liten) to investigate breakthrough low-TRL* technologies, factoring in future market applications from the start.

The lab's research focuses on current and emerging sensor and sensor-system technologies with applications in Safran's business lines (aeronautics, defense, and security). In particular, the lab is working on wireless-sensor and structural monitoring systems, MEMS inertial sensors, and biometric sensors.

*Technology Readiness Level

Contact: angelique.rasclé@cea.fr

Day by day

A film that turns gender stereotypes on their heads

A group of third-year students at Grenoble Institute of Technology-Phelma (Carole Le Goc, Christopher Filosa, and Valentin Ramez) produced one of two short films that won awards in the first ever "Stereotype Busters" contest organized by the Conférence des Grandes Écoles, a French higher-education consortium. Students were invited to submit an original poster or film challenging the conventional wisdom on gender equality in all areas.

The winners, all former members of the Phelma Student Government (Carole was Student Body President in 2014–2015), shot the film very quickly and edited it in just one night. The resulting 2'25" film is short and to the point! If you still think that women can't drive, play video games, or run a business, think again!

Watch the video here: <https://goo.gl/1aBpne>
Contact: filosa.christopher@gmail.com

Nanosystems design: Samson growing in popularity

The Inria-Nano-D team developing the Samson generic nanosystems design software package, which has been working out of MINATEC for more than a year now, has a number of new wins to report. In March the team secured a European Research Council Proof of Concept grant to assess the software's market potential, and recently released version 0.5 of the tool. In June, the team is running its first Samson School in Aix-les-Bains.

Samson is used to analyze and design nanosystems of all types, and offers interactive simulation features. The software boasts an open architecture, which enables users to create and share modules—a key advantage over costly and non-customizable commercial software. The beta version, released in March 2015, has more than 600 academic and private-sector users worldwide.

Downloads: <https://www.samson-connect.net>
Contact: stephane.redon@inria.fr

Phelma Thursday Updates

Since April, Grenoble Institute of Technology-Phelma staffers have been invited to "Thursday Updates" held around once a month. The one-hour meetings aim to keep employees abreast of the school's latest projects and provide a forum for informal discussion. The first Thursday Update focused on the restructuring of Grenoble Institute of Technology's logistics and maintenance departments. The second meeting addressed the EcoMarch project. Between 40 and 50 staffers from all horizons attended each of the meetings.

Other upcoming Phelma events include the Phelminaire on July 5. This recreational off-site staff event, to be held at local caving site Choranche, will involve cave tours, a picnic, and a hike. The goals are to break down silos, foster open communication, and have fun!

Contact: anne.vilcot@phelma.grenoble-inp.fr

Day by day

Patents: CEA maintains activity in 2015

The French Alternative Energies and Atomic Energy Commission (CEA) earned the number-one slot in the 2015 INPI (France's industrial property institute) ranking in the French research institute category. The INPI published 658 CEA patent applications in 2015, up slightly from 2014 and 2013 (643 and 625 applications published, respectively). On average, the CEA Technological Research Division originates nearly 80% of patent applications, mainly in microelectronics and new energy technologies.

CNRS (France's national center for scientific research) came in second with 390 patent applications published, just ahead of IFP.

The CEA is also an active filer of patents with the European Patent Office. In 2015 the CEA ranked 33rd in Europe and second in France, just behind Technicolor. The CEA is the only European research organization to figure in the top 50.

Contact: isabelle.rivat@cea.fr

Nanocharacterization Platform turns ten

Nanocharacterization Platform partners Leti, Liten, and INAC will celebrate its tenth anniversary in September. Platform employees and other stakeholders having contributed to its development will celebrate the milestone at a day-long scientific and commemorative event retracing the facility's past and presenting its plans for the future.

The platform is unlike any other facility in the world, bringing together in a single location around 50 pieces of equipment covering a broad range of research needs. Certain equipment—like the Titan Ultimate transmission electron microscope offering a 0.5 angstrom resolution—is the most powerful in the world. Other, more standard equipment offers advanced features, like a scanning electron microscope that halves crystallographic imaging analysis times. The facility provides MINATEC researchers with a truly state-of-the-art resource.

Contact: jean-francois.damlencourt@cea.fr
francois.rieutord@cea.fr

GIANT Review steps into spring with a new look

The *GIANT Review*, which first appeared in 2015, is rolling out a completely new magazine-inspired design for its Spring 2016 issue, which looks back on the previous year's most important events. This most recent issue is also heftier, at 28 pages. Inside you will find the year's news from GIANT's eight partners, scientific articles on flagship research topics at GIANT, interviews with researchers, news briefs, and a special report on the digital revolution from a GIANT perspective, covering topics like Big Data and cybersecurity.

The publication was developed to promote the campus and targets foreign researchers in particular. The Spring 2016 issue also features a fun, illustrated article on "Ten Reasons to Live in Grenoble". You can download or flip through the online version on the GIANT website.

Contact: marion.levy@grenoble-inp.fr

EU project Mirphab gets €17 million for optical IR sensors

EU project Mirphab, which kicked off in early 2016, has secured €17 million to design, prototype, and manufacture small runs of infrared sensors. The project's seventeen partners include Leti, the Fraunhofer Institute, IMEC, and CSEM, and the research comes in direct response to needs expressed by manufacturers from all of the countries within the scope of the project. The IR sensors, used to detect chemical substances in liquid or gas form, leverage proven components. The goal of the project is to accelerate the innovation cycle to penetrate new markets quickly.

This year's research is focusing on sensors designed for three SMBs and a multinational corporation. A call for projects in May will fuel the next wave of development work, to take place in 2017. Over the course of the four-year project, the selection committee will choose and finance either 50% or 75% of ten European development projects.

Contact: sergio.nicoletti@cea.fr

Catherine Picart wins CNRS silver medal

Catherine Picart, a researcher at LMGP and Grenoble Institute of Technology-Phelma faculty member will receive one of sixteen 2016 CNRS (France's national center for scientific research) silver medals.

Ms. Picart has devoted her entire career to biomedical engineering, conducting research on cell/material interactions and cell biophysics for regenerative medicine. From 2010 to 2015 she won three European Research Council grants for her research on bioactive films under the Biomim, Oscodi, and BioactiveCoating projects. She coordinates LMGP's research on the interfaces between materials and biological matter.

The awards ceremony for the CNRS Alps Delegation will be held on September 30 at the Musée de Grenoble; two silver, two bronze, and two silver crystal awards will be given out.

Contact: catherine.picart@grenoble-inp.fr

Horizons

Aryballe Technologies sees fast development and raises €2.6 million

Just two years after it was founded, Aryballe Technologies has raised €2.6 million in fresh capital from five investors, including the CEA. The influx of funds will pay for industrial scale-up of the company's product—a portable, universal odor detector—and the start-up of manufacturing operations in early 2017.

The new investors were won over by the startup's rapid progress. Just two years in, Aryballe Technologies has already completed proof-of-concept testing, manufactured prototypes for testing by a company in the medical industry, and signed a distribution agreement for Japan. The company has also secured funding from the French Single Interministerial Fund for its R&D. INAC, a stakeholder in the program, is also working with Aryballe Technology under R&D contracts to develop applications for the medical, environmental, food, and fragrance industries.

Contact: tristan@aryballe.com

Leti joins global Stanford University SystemX Alliance

In February, Leti became an active member of the Stanford University SystemX Alliance, which brings together 80 Stanford faculty members and 21 market-leading corporations like Google, Ericsson, and Toshiba. Leti is the first technological research organization to join, and its membership will strengthen ties between business and academic research.

Leti will gain unique insights into global R&D strategies in the institute's areas of research and privileged relationships with Stanford and major corporations that could lead to joint R&D projects in the future. In April, Leti presented its research on millimeter-wave radio and antennas alongside speakers from China Mobile and Intel. In May, Leti researchers attended a SystemX Alliance conference.

Contact: barbara.desalvo@cea.fr

Interview

Michel Barsoum
(Drexel University, Pennsylvania)

I hope to spend more time in Grenoble in the coming years.

You are known worldwide for your work on materials, particularly MAX phases. What brought you to Grenoble for three months?

In materials science, to gain real understanding of a material you need large single crystals. The only person in the world growing MAX phase single crystals is Dr. Thierry Ouisse, my host. I also wanted to spend time with Thierry because I believe he has a very elegant explanation for why the MAX phases conduct electricity the way they do, a topic that has been puzzling me for the past 20 years that I think Thierry has solved!

Do you plan to come back to Grenoble?

I certainly will return to Grenoble in the future. The project I am collaborating on with Thierry will fund me to visit Grenoble for another three weeks between now and 2018. I am also applying—with Thierry—for a proposal that will allow me to spend much more time in Grenoble in the next three or four years. Hopefully it will be funded!

What were your impressions of the MINATEC campus, where researchers, students, and startups work side by side? How do you feel this supports innovation?

I get the impression that it is more difficult to start small companies in France than in the US. That said, the idea has worked quite well at MINATEC, as it has elsewhere!

Contact: thierry.ouisse@phelma.grenoble-inp.fr

Horizons

New academic chair for electronic systems on plastic

In late March, Schneider Electric and the Grenoble Institute of Technology Partners Foundation co-founded an industrial chair of excellence for plastronics. The MINT Chair will be endowed with a budget of more than €450,000. Researchers from Grenoble Institute of Technology's Pagora and Phelma schools as well as from labs LGP2 and IMEP-LaHC will be involved in research under the chair. A research scientist has been hired and additional recruitments will follow.

Schneider Electric will leverage the research conducted under the chair to develop wireless communications capabilities for its products. The research will focus on innovative electronic component printing processes on thermoplastic substrates. The chair program will also include conferences and training courses to ensure the new knowledge created is disseminated.

Contact: nadege.reverdy-bruas@pagora.grenoble-inp.fr

GIANT to host High Level Forum 2016

For the third time in five years the High Level Forum, initiated by GIANT in 2012, will be held in Grenoble. International innovation decision-makers from research, education, industry, and government will come together to foster stronger cooperation. Around 100 attendees from 25 innovation campuses in Europe, Asia, North America, and the Middle East are expected.

The event will kick off with social activities on Sunday. The forum will be held on September 26–27 on the theme of collaborative creativity. Real-world case studies will serve as the starting point for discussions of the challenges of collaborative innovation projects, both in terms of speed and added value.

This year, more than 200 students, researchers, and industrial R&D professionals from the Grenoble area will be invited to attend. Journalists will also be invited and a report published.

Contact: alain.astier@cea.fr

Grenoble INP Entreprise moves to MINATEC

Grenoble INP Entreprise, Grenoble Institute of Technology's tech-transfer company, moved to offices at MINATEC (on the sixth floor of the Phelma 2 building) in early March. The new offices will provide more space and bring the company closer to industrial R&D projects at Grenoble Institute of Technology-Phelma. It will also be easier for the company to give its customers tours of MINATEC-based labs like CTT, IMEP-LaHC, and LMGP.

Grenoble INP Entreprise is a holding company that owns INPG Entreprise SA and Grenoble INP Invest. INPG Entreprise SA manages industrial R&D contracts and reported revenue of €7 million in 2015. The company also handles three to five European projects per year. Grenoble INP Invest is a venture capital firm that invests in spinoffs from Grenoble INP labs. The company currently holds stakes in around twenty companies, including Enerbee and Pulse Origin, which it co-founded.

Contact: h-m.michaud@innov-network.com

2016 MIGAS summer school to be held near Bologna

After several sessions held in the Vercors mountains near Grenoble, the MIGAS international summer school for advanced microelectronics will move this year to Italy, and the Bertinoro international conference center affiliated with Bologna University. So, why the move? Because the venue will also host an EU Horizon 2020 workshop on the Nereid project, led by IMEP-LaHC, to determine Europe's nanoelectronics roadmap. PhD candidates, researchers, and engineers from around the world attending MIGAS will benefit from the presence of Nereid-project experts on site for the workshop.

The 18th MIGAS summer school will be held on October 17–21 and will focus on smart systems, addressing issues surrounding nanosystems, sensors, energy, and connectivity.

View the program and register at: <http://www.migas.fr/>
Contact: laurent.montes@minatec.grenoble-inp.fr

Live from MINATEC

Phelma student Jordan Broisin is France's adaptive skiing champion

Third-year Grenoble Institute of Technology-Phelma student Jordan Broisin won four medals at the French National Adaptive Skiing Championships at Pra-Loup in March 2016, including a gold for the Super-G. A rising star on France's national adaptive ski team, Jordan is enrolled at Phelma under a special athletics program that allows him to combine training and classes. He is also studying for a Master's in Management at business school IAE.

Jordan lost his left leg after a motorcycle accident in 2009. An avid skier, he worked tirelessly to get back on skis after his injury. He currently skis on a prosthesis specially developed by Phelma materials engineering students and manufactured by local company Chabloz Orthopédie. Jordan hopes to complete his engineering and business degrees in 2017 and has his sights set on a medal at the 2018 Paralympic Games.

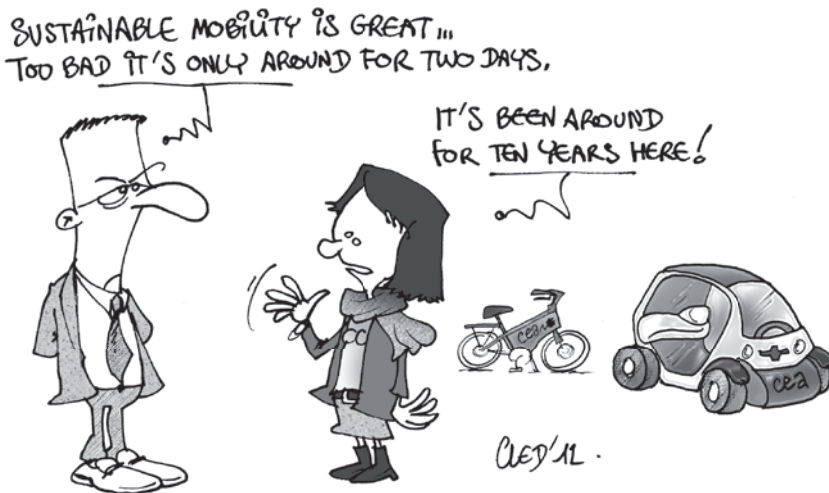
Contact: jordan.broisin@phelma.grenoble-inp.fr

CEA to organize two-day sustainable mobility event

The sixth CEA Sustainable Mobility Days, to be held on September 23–24 at MINATEC, will coincide this year with the 60th anniversary of CEA Grenoble. Friday's program will be targeting companies and government agencies, with the 2nd national conference on mobility planning (French Ecology Minister Ségolène Royal is invited) and talks on various innovative-mobility topics. The day will end with an award ceremony and 60th anniversary cocktail reception.

On Saturday, the 60th anniversary open house will offer up a full program for the general public and CEA employees' family members. And there will be something for everyone! Mobility Village will host electric vehicle test drives, a bicycle repair shop, a wheelchair circuit, a roll-over car simulator, and other activities.

Learn more at: <http://journee-mobilite-durable.fr/jmd/>
Contact: bruno.renard@cea.fr



Midis MINATEC brown-bag lunch talks tally up more than 80,000 attendees

MINATEC's weekly brown-bag lunch talks are more popular than ever! Since 2008, the talks have brought in more than 80,000 attendees, with an average of 270 people each week over the past three years. The 300th Midi MINATEC will be held in September. The talks are free of charge and sandwiches are on the house. Attendees are simply required to register.

The best-loved topics include new energy technologies and microelectronics, as evidenced by the record attendance at a talk on "Silicon, a familiar yet little-known material." More open topics, like "The relationship between progress and innovation," and guest lectures by foreign scientists like Amy Wagoner Johnson or Michel W. Barsoum or high-school students have also been a big draw in recent months.

Contact: julie.spinelli@cea.fr

SOI Industry Consortium to set up shop at MINATEC

The SOI Industry Consortium, which counts among its members around twenty large companies and universities from around the globe, will be moving into offices on the MINATEC campus before summer. The members of the consortium, which include Soitec, STMicroelectronics, GlobalFoundries, Leti, and UC Berkeley, will soon have a neutral meeting point and independent address.

The consortium was set up to coordinate the global SOI ecosystem with the broader objective of promoting the development of the material, developed largely from research conducted in Grenoble. The consortium regularly publishes market research and organizes technical events, such as the upcoming meetings in Shanghai in September and in Grenoble in October (during Semicon Europa). The consortium's two executive directors represent Soitec and STMicroelectronics.

Contact: carlos.mazure@soitec.com

MOOC on habitable exoplanets

More than 3,000 students are enrolled in a new MOOC on habitable exoplanets that launched on June 1 on the FUN* platform. The course was created by Grenoble-Alpes University and the Grenoble Universe Science Observatory under the direction of astronomer Jean-Charles Augereau. Content was contributed by nine scientists, including Phelma graduate and INAC PhD candidate Maxime Morinière.

The online course is free of charge and open to the general public. It will run until August 3. It includes around twenty videos lasting between seven and ten minutes and covers topics like the detection and formation of planets and the methods used to identify their life forms. Students can complete a quiz after each video and a final homework assignment to earn a certificate of course completion.

*France Université Numérique

To register (deadline: July 24): <https://goo.gl/F6OAPt>
Contact: maxime.moriniere@cea.fr

MINATEC strengthens ties with Shanghai's Sitri institute

Shanghai's Sitri research institute and MINATEC have signed a memorandum of understanding establishing a framework for ongoing talks that should result in a partnership agreement. Sitri, which specializes in More than Moore solutions, would like to intensify its activities in the field of IoT, focusing on topics like MEMS and sensors, RF technologies for 5G, RF on SOI, ultra-low-power communications, and FDSOI technologies.

If the potential partners finalize an agreement, it would be signed with Leti and would generate direct benefits for Grenoble's high-tech ecosystem. It would also strengthen Sitri's relationship with Soitec, which began in 2014 with an RF-SOI agreement, and would support Sitri's current talks with STMicroelectronics. Finally, an agreement would accelerate the adoption by Chinese manufacturers of FDSOI technologies, which originated mainly in Grenoble.

Contact: jean-charles.guibert@cea.fr

Agenda

June 13–17, Aquakub Hotel, Aix-les-Bains

First Samson School

on nanosystems simulation and modelling software

<https://project.inria.fr/samsonschool2016>

June 15

Inauguration of the Software Design Center

Contact: helene.loriot@cea.fr

June 16, Voiron

Inosport: Innovation in sports, leisure, healthcare, and wellness

<http://www.inosport.fr/>

September 23–24, MINATEC

CEA Mobility Days

<http://journee-mobilite-durable.fr>

September 23–24, MINATEC

CEA Grenoble's 60th anniversary

vanessa.gaultier@cea.fr

September 25–27, MINATEC High Level Forum

Contact: alain.astier@cea.fr

October 6–8, MINATEC Expérimenta

<http://experimenta.fr>

October 6–8, MINATEC The Parvis des sciences science fair

francine.papillon@cea.fr

david.riassetto@grenoble-inp.fr

October 23 Presqu'île scientifique 8th Ekiden Marathon

<http://www.grenoble-ekiden.fr/ekiden>

October 25–27 Grenoble Alpexpo Semicon Europa 2016 and IoT Planet

<http://www.semicon.europa.org/>

November 7–10 Maison MINATEC Nanosafe 2016

www.nanosafe.org

Contacts

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