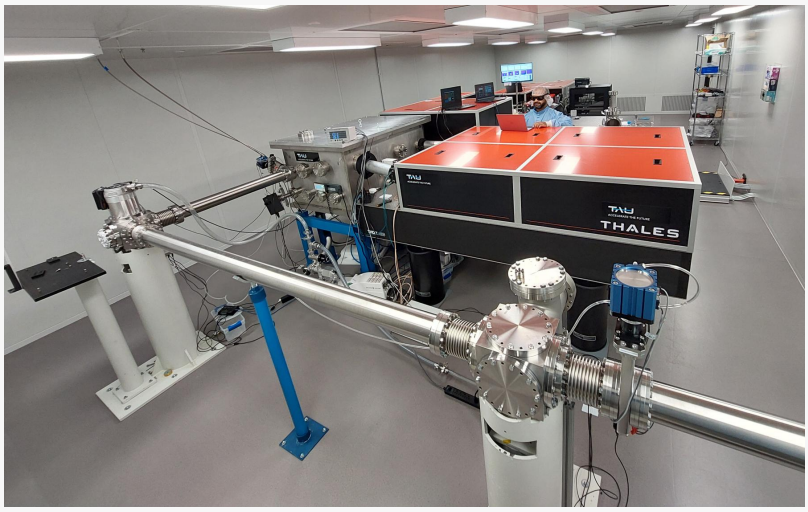
TAU Systems and Thales announce pioneering collaboration in laser-driven particle acceleration

TAU's compact accelerator offers applications throughout science, including imaging semiconductor structures and radiation testing space-bound electronics



TAU Systems' particle accelerator, driven by Thales' laser

AUSTIN, TX, UNITED STATES, July 22, 2025 /EINPresswire.com/ -- TAU Systems, the developer of next-generation ultrafast laser-plasma accelerators, today announced the collaboration with solid-state laser producer Thales. The collaboration leverages Thales' expertise in high peak power laser systems and TAU Systems' innovation in laser-driven particle acceleration.

The collaboration will see the two pioneering companies offer for the first-time complete commercial laser-driven particle and radiation sources, generating from electrons or neutrons to X-rays and Gamma rays. These crucial systems, with the first one installed in TAU Labs Carlsbad, California, are complemented by an innovative beam-time-as-a-service proposal at the first of several application centers, and will accelerate research and development into many exciting and relevant areas such as radiation testing of space-bound electronics, advanced X-Ray imaging of 3D structures, and even novel cancer therapies.

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>
> *TAU Systems CEO, Bjorn Manuel Hegelich*

TAU Systems CEO, Bjorn Manuel Hegelich said: "It is great to be working with Thales, they have been leaders of high energy Titanium:Sapphire scientific lasers for many years and their experience brought a positive impact on bringing access to laser-plasma wakefield accelerator

technologies to a broader scientific audience."

Tugdual Le Bouar, Laser Systems & Solutions Director at Thales commented; "Building on the strengths of both companies, Thales and TAU Systems are at the forefront of developing exciting new products that will combine their respective technologies and usher in new applications for the most advanced and accessible particle and light sources."

TAU Labs Application Centre, Carlsbad, California

Thales has been at the leading edge of laser system development for more than 40 years, manufacturing high-energy, flashlamp-pumped and diode-pumped nanosecond lasers for industrial applications as well as powerful ultrashort pulse Titanium:Sapphire femtosecond laser systems delivering power of up to 10 petawatts for scientific applications.

How TAU System's Compact Accelerator Works

Particle accelerators hold great potential for semiconductor applications, medical imaging and therapy, and research in materials, energy and medicine. But conventional high-energy particle accelerators require plenty of space – some upwards of kilometers – making them expensive and limiting their presence to a handful of national labs and universities.

TAU Systems have built and rigorously tested a compact laser wakefield accelerator (LWFA), which has a wide variety of applications, and the full system could be contained in a volume the size of a shipping container.

This kind of compact particle accelerator could also be used to drive another device called an X-ray free electron laser, which could be used as a light source for beyond EUV lithography for even more advanced chip production as well as being capable of recording the dynamics of processes on the atomic or molecular scale. Examples of such dynamic processes include drug interactions with cells, changes inside batteries that might cause them to go into thermal runaway, chemical reactions inside solar panels, and viral proteins changing shape when infecting cells.

The concept for LWFA was first described in 1979. An extremely powerful laser strikes a gas target (e.g. Helium), heats it into a plasma and creates plasma waves that accelerate electrons from the gas, thereby generating a high-energy electron beam. Conceptually, the laser is like a boat skimming across a lake, leaving behind a wake – a plasma wake/wave – and electrons ride

this plasma wave like surfers.

During the past couple of decades, various research groups have developed more powerful versions and Hegelich's group holds the current record with a demonstrated acceleration gradient of over 100 billion volts per meter or 1,000x more than even the strongest conventional accelerators can achieve.

"It's hard to get into the biggest wave without getting overpowered, so surfers get dragged in by Jet Skis," Hegelich said. "In our accelerator, the equivalent of Jet Skis are metal nanoparticles that release electrons at just the right point and just the right time, so they are all sitting there in the wave. We get a lot more electrons into the wave when and where we want them to be, rather than statistically distributed over the whole interaction, and that's our secret sauce."

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About TAU Systems
TAU Systems is an Austin, Texas-based deep-tech company commercializing the first compact particle accelerators and specialized X-ray free-electron lasers that combine the capabilities of large accelerators with a small footprint to provide easy and affordable beam-time access for any company. Led by premier experts in laser-driven particle accelerators, TAU is democratizing access for the progress of semiconductors, batteries, medical imaging, nuclear energy, and more.
In 2023 TAU, together with the University of Texas reached a world record with the successful demonstration of an electron beam with an energy of 10 billion electron volts (10 GeV) generated in 10 centimeters.

Learn more at www.tausystems.com

About Thales
Thales (Euronext Paris: HO) is a global leader in advanced technologies for the Defence, Aerospace, and Cyber & Digital sectors. Its portfolio of innovative products and services addresses several major challenges: sovereignty, security, sustainability and inclusion. The Group invests more than €4 billion per year in Research & Development in key areas, particularly for critical environments, such as Artificial Intelligence, cybersecurity, quantum and cloud technologies. Thales has more than 83,000 employees in 68 countries. In 2024, the Group generated sales of €20.6 billion.

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