

WHAT IS CANADA'S MOST POWERFUL LASER USED FOR?

Our monthly science question: A series that demystifies complex topics with simple, effective answers.

INRS

A LASER LIKE NO OTHER

Did you know that the most powerful laser in Canada is located in Québec? More specifically, it is at the INRS Advanced Laser Light Source (ALLS) facility. The 750-TW laser—recognized internationally for its ability to generate an extraordinarily powerful beam—delivers the energy of each pulse in an extremely short amount of time.

A HIGHLY SOUGHT-AFTER TOOL

Headed by researcher Heide Ibrahim at the Énergie Matériaux Télécommunications Research Centre, the ALLS national laser facility serves more than 250 users each year from academic, government, and industrial sectors. The technical team, made up of only nine people, accomplishes some remarkable scientific feats for such a small group.

TRAINING THE NEXT GENERATION, DRIVING INNOVATION

Training is central to ALLS's mission. Each year, the facility hosts about sixty students and postdoctoral researchers, some of whom are co-supervised by both industry and academia. Nearly thirty companies, mostly Canadian, have partnered with ALLS over the past decade to carry out research and development projects.

SO... WHAT CAN AN ULTRA-POWERFUL LASER DO?

Much more than you might imagine! The 750-TW laser opens the door to advanced fields as diverse as medicine, biology, physics, chemistry, telecommunications, advanced materials—and even the arts. Its phenomenal precision makes it possible to capture images and films at the atomic scale. ALLS lasers can generate radiation ranging from terahertz to X-rays, and even accelerate particles such as electrons, ions, and neutrons.

A LASER SERVING HUMAN HEALTH

The ALLS team is pushing the boundaries of medical physics by exploring lasers' potential to generate radiation intense enough to destroy cancerous tumours—while reducing damage to healthy tissue. These experiments conducted at INRS offer promising avenues for more effective and less risky cancer treatments.

FIGHTING CLIMATE CHANGE, ONE LASER SHOT AT A TIME

In the face of climate change, some of the ultra-high-resolution X-ray imaging techniques developed at ALLS are proving extremely useful. For example, users have explored the possibility of imaging plant roots to better understand how essential minerals are redistributed under harsh environmental conditions. Other research using the 750-TW laser has focused on imaging the degradation of lithium batteries.

It's quite a versatile laser, to say the least!