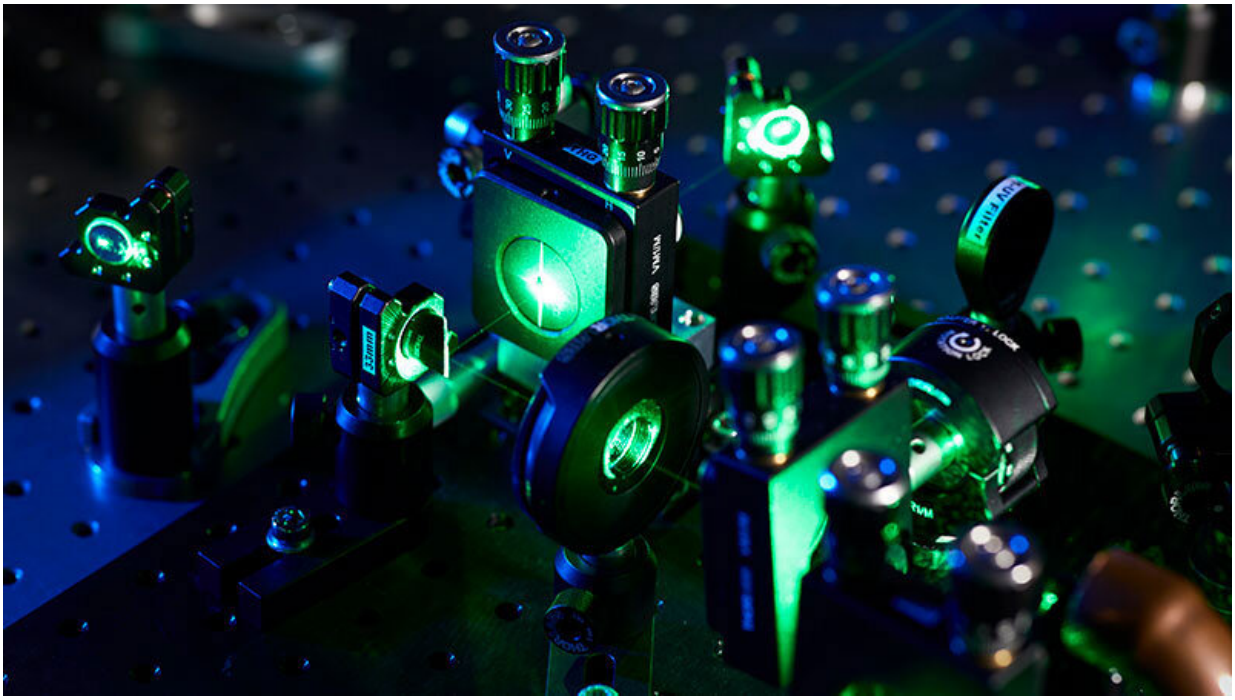
News cutting-edge laser technology that gets under your skin

September 20 2019



A Chromacity ultrafast laser in operation. Credit: Heriot-Watt University

A highly specialist laser capable of analyzing potentially deadly diseases as never before is under development at Heriot-Watt University.

The Deep Tissue project is a state-of-the-art laser that aims to carry out greater analysis of biological tissue including skin, bone and even plant life.

The three-year project builds upon research carried out by Professor Derryck Reid from the university's Institute of Photonics and Quantum Sciences (IPAQS), to create a laser capable of gathering tissue data to a depth more than double what is presently available on the market, and at around a third of the cost.

Deep Tissue is being worked on in collaboration with ultrafast laser specialist's Chromacity, the microscope manufacturer Scientifica, and the University.

Dr. Richard McCracken, a Research Fellow from IPAQS and project lead, said: "This is a hugely exciting project to be involved with and it could significantly help open up a host of new research areas by providing a specialist technology at a greatly reduced cost.

"The commercialization of an affordable laser for deep tissue imaging will benefit researchers across the life sciences, including fields such as neuroscience where imaging of the brain through intact mouse skulls has already been demonstrated. Many future applications of this technology have not yet been identified due to the prohibitive cost of suitable laser systems but our collaboration will remove this barrier to development."

At present, companies, particularly in the field of medical research, can spend up to £350,000 for the nearest comparable laser source. Aside from the significant spend, the technology is typically bulky and capable of analyzing up to half a millimeter beneath the surface of biological material.

In contrast, Deep Tissue aims to deliver a far more streamlined laser that in many cases will double the tissue depth that can be imaged.

This emerging class of laser is required for a form of imaging known as three-photon microscopy. It means individual cells can be analyzed in

high-resolution without damaging surrounding tissue and in a non-invasive manner.

The project would deliver a powerful new tool to the science community, according to Dr. McCracken, who said it could open a host of new research areas including regenerative medicine, leukemia and Alzheimer's.

He adds: "The laser can even be used to image into the roots of plants such as rice and wheat, in order to identify bacteria that inhibits growth and help with crop productivity.

"At present, companies who want to carry out this research must purchase lasers that are capable of doing a variety of analysis, which means additional costs. What we want to do is create a laser that is carefully designed to carry out a specialist set of tasks. This means we can develop and invest in the necessary components, allowing us to significantly reduce overall costs while giving the end-user greater scope to carry out their research."

Earlier this year, the project received a major financial boost when it was awarded a £360,000 research grant from the Science and Technology Facilities Council (STFC).

Shahida Imani, Chromacity CEO, said: "We are excited to join forces with the University and Scientifica to develop the laser elements of the Deep Tissue project, which has the potential to make a real difference in the fight against disease. The project is a great fit for Chromacity, as we have already integrated longer wavelength laser technology into microscopy systems to enable high-resolution imaging of biological samples at greater depths."

A prototype of the laser technology is tabled for autumn 2020.

Provided by Heriot-Watt University