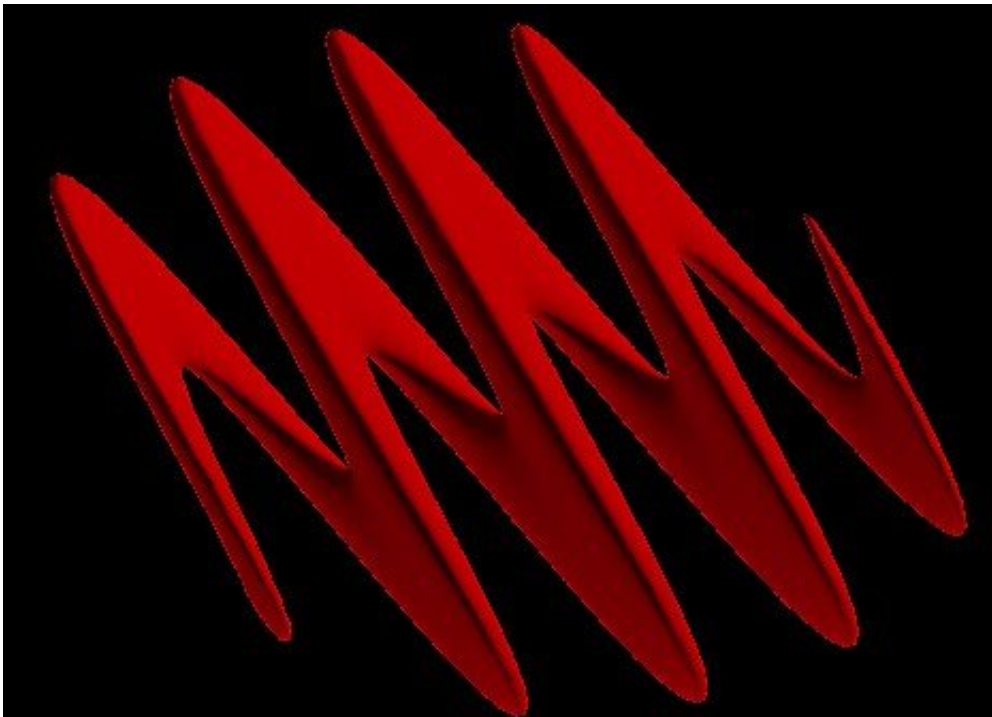


Scientists invent a new method of generating intense short UV vortices

January 23 2020



OAM pulse wave front. Credit: Skolkovo Institute of Science and Technology

An international group of scientists, including Skoltech Professor Sergey Rykovanov, has found a way to generate intense "twisted" pulses. The vortices discovered by the scientists will help investigate new materials. The results of their study were published in *Nature Communications*.

Electromagnetic waves are known to carry energy and momentum and

exert the so-called light pressure. This was demonstrated experimentally by the Russian physicist, Pyotr Lebedev, back in 1900. A little-known fact is that [electromagnetic](#) waves can also carry the [angular momentum](#), that is, twist objects. The angular [momentum](#) (twisting ability) can be transferred in two ways. First, an object can be irradiated by an elliptically or circularly polarized [electromagnetic wave](#) to produce the rotational moment, creating the Sadosky effect. Second, the substance can be twisted by electromagnetic waves with a "vortex" wave structure or, scientifically speaking, waves with an [orbital angular momentum](#) (OAM). Visible or IR-range electromagnetic pulses with such capability are already used in telecommunications to increase the data transfer capacity of fiber optic networks. Generating intense OAM pulses in the UV range is a rather challenging task which, if solved, will open new possibilities for exploring and developing new materials at characteristic spatial (tens of nanometers) and temporal (hundreds of attoseconds) scales. Such high-resolution visualizations are used to study and predict materials' properties.

Skoltech scientists in collaboration with researchers from the Shanghai Institute of Optics and Fine Mechanics (China) and the Helmholtz Institute in Jena (Germany) have proposed a simple way to generate intense short UV OAM pulses.

The scientists used the most powerful supercomputers in the world and Russia, including the Zhores supercomputer installed at Skoltech last year, to ensure realistic 3-D simulation of the UV vortex effect.

Currently, the team is preparing for the vortex search experiment.

The scientists are confident that the generation of intense attosecond UV vortices will break new ground in studying the electrons motion dynamics in various materials and condensed matter.

More information: J. W. Wang et al. Intense attosecond pulses carrying orbital angular momentum using laser plasma interactions, *Nature Communications* (2019). [DOI: 10.1038/s41467-019-13357-1](https://doi.org/10.1038/s41467-019-13357-1)

Provided by Skolkovo Institute of Science and Technology

Citation: Scientists invent a new method of generating intense short UV vortices (2020, January 23) retrieved 25 July 2024 from <https://phys.org/news/2020-01-scientists-method-intense-short-uv.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.