used a highly precise and coherent optical frequency comb. They demonstrated the generation of a flat optical frequency comb generator (OFCG) based on a single commercial vertical-cavity surface-emitting laser, which, besides significantly reducing the device's cost, size and consumption, offers a wide tunability range and high phase correlation between optical modes.

"This OFCG does not need any external modulator, and it is the most energy-efficient OFCG reported to date," they wrote in their paper on the work in IEEE's *Photonics Technology Letters* (doi: 10.1109/lpt.2013.2280700).

From this source, the researchers combined radio-frequency and photonic-electronic techniques to synthesize a high-quality terahertz signal.

"The quality of the signal is so high that it has not been possible to measure some of the parameters with precision; they are higher than the measurement limits of our laboratory instruments," said Criado, who is currently working on developing the commercial system.

"Industrializing the laboratory prototype will be an important challenge; our objective is to provide a totally automated system that is easy for users with no specific training in this technology to operate."

The generator is projected for market launch by Luz WaveLabs in 2015. The company hopes to create a device that is easy for a layman to use, as the commercial systems currently available are much more oriented toward scientists. It also hopes the innovation will open the product for use by architects, doctors and technicians controlling industrial processes, among other applications.

From a scientific perspective, the application that has given the greatest impulse to the development of terahertz waves is radio astronomy.

"Since most blackbody radiation and a large quantity of molecular and intermolecular resonances are located in the area of the terahertz waves, having powerful, high-quality tools to work in this field will lead, in the future, to great advances in our understanding of the origin and function of the universe," Criado said.

'Warping' compresses big data

LOS ANGELES – A physics-based data compression method outperforms existing technologies, such as JPEG, for images and eventually could be adopted for the capture and analysis of massive amounts of data in real time for communication, scientific research and medicine.

The entirely new way to compress data was developed by a team at the University of California, Los Angeles, Henry Samueli School of Engineering and Applied Science, led by Bahram Jalali, the Northrop Grumman Opto-Electronic Chair in Electrical Engineering.

The group discovered that it is possible to achieve data compression by stretching and warping the data in a specific fashion prescribed by a newly developed mathematical function. The technology, dubbed anamorphic stretch transform (AST), operates in both analog and digital domains. In analog applications, AST makes it possible not only to capture and digitize signals that are faster than the speed of the sensor and the digitizer, but also to minimize the volume of data generated in the process.

AST also can compress digital records and does not require prior knowledge of the data for the transformation to take place; it occurs naturally and in a streaming fashion.

"Our transformation causes feature-selective stretching of the data and allocation of more pixels to sharper features where they are needed the most," postdoctoral researcher Mohammad Asghari said. "For example, if we used the technique to take a picture of a sailboat on the ocean, our anamorphic stretch transform would cause the sailboat's features to be stretched much more than the ocean, to identify the boat while using a small file size."

AST also can be used for image compression, as a stand-alone algorithm, or for combination with existing digital compression techniques to enhance speed or quality or to improve the amount that images can be compressed. Results have shown that AST can outperform the standard JPEG image compression format, with dramatic improvement in terms of image quality and compression factor.

AST has its origin in another technology pioneered by the Jalali group: time-stretch dispersive Fourier transform, which slows down and amplifies faint but very fast signals so they can be detected and digitized in real time.

High-speed instruments created with this technology enabled the discovery of optical rogue waves in 2007 and the detection of cancer cells in blood with one-in-a-million sensitivity in 2012. But these instruments produce a "fire hose" of data that overwhelms even the most advanced computers. The need to deal with such data loads motivated the UCLA team to search for a new data compression technology.

"Reshaping the data by stretching and wrapping it in the prescribed manner compresses it without losing pertinent information," Jalali said. "It emulates what happens to waves as they travel through physical media with specific properties. It also brings to mind aspects of surrealism and the optical effects of anamorphism."

The research was published in *Applied Optics* (doi: 10.1364/ao.52.006735).

Data can be compressed using 'warping,' a method that outperforms existing technologies such as JPEG for images.