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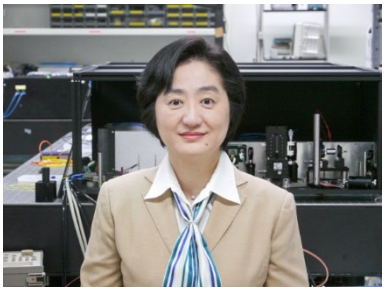
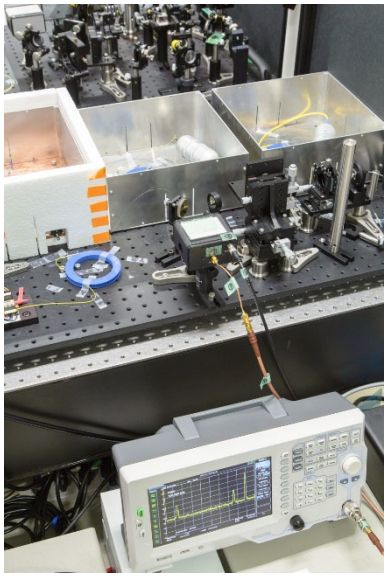
Cutting edge research: An ‘optical comb’ for medicine, environment, astronomy, and other applications

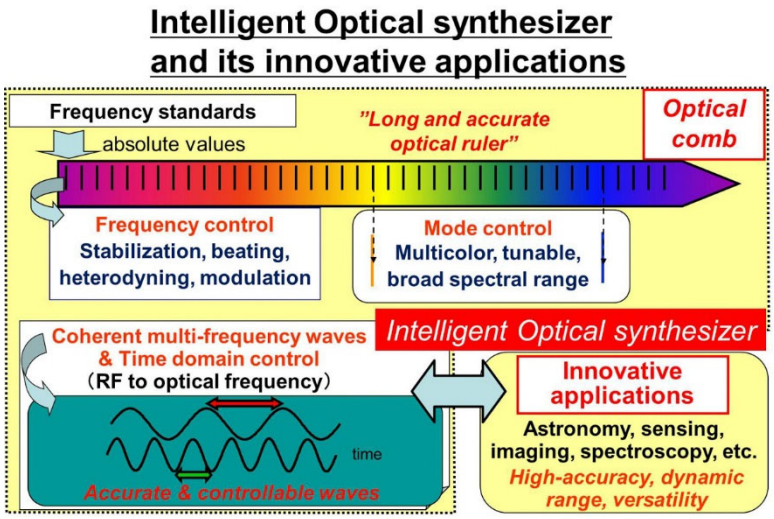
Kaoru Minoshima
Research Director of the ‘JST-ERATO MINOSHIMA Intelligent Optical Synthesizer Project’
Department of Engineering Science, Graduate School of Informatics and Engineering, UEC



“In spite of the tremendous advances in laser and optical communications, we still have not harnessed the potential of light and optical waves,” says Professor Kaoru Minoshima. “Light waves could become an ‘intelligent fundamental entity’ if we could control and exploit the time, phase and frequency information of light.”

The core of the JST-ERATO project is the concept of an ‘optical frequency comb’ that was the basis for the 2005 Nobel Prize in physics. The ‘optical frequency comb’ is the optical spectrum of a stable light source such as a laser, where the peaks are equally spaced in for example, a power density (ordinate) versus frequency (abscissa) plot. An ‘optical frequency comb’ can be produced by monitoring the continuous pulses of light from a laser and converting the light to frequency over time. The result will be highly discrete frequencies along the time axis corresponding to the ‘teeth’ of a comb. Now, one application of an ‘optical frequency comb’ is an optical ruler.





"Applications of 'optical frequency combs include metrology, such as an optical ruler, optical atomic clocks, imaging, astronomy and spectroscopy," explains Minoshima. "One of the main objectives of this project is to develop an 'intelligent optical synthesizer' by integrating state of the art electronics and optical technology." Specifically, the project will develop an intelligent light source enabling the control the properties of light including time, frequency, phase, and polarization.

"I think that the 21st century may be the 'age of light'", says Minoshima. "I hope that this project will make significant contributes to this field. I am looking for young, motivated scientists to join me for this project."

Minoshima Laboratory at UEC
http://www.femto-comb.es.uec.ac.jp/en/index_e.html

JST-ERATO MINOSHIMA Intelligent Optical Synthesizer Project
http://www.jst.go.jp/erato/minoshima/en/index_e.html