Successful Observation of a Non-Linear Optical Phenomenon in the X-Ray Region

The Laser Technology Laboratory (Chief Scientist: Dr. Katsumi Midorikawa), RIKEN Discovery Research Institute, has succeeded for the first time in the world in the observation of a non-linear optical phenomenon known as "two photon ionization" by using the world's strongest soft X-ray laser beam. The non-linear optical phenomenon can appear only when the intensity of a light is increased to a very high level. In contrast to normal conditions where an atom or a molecule can only absorb a single photon for a time, the substantially new non-linear optical phenomenon allows an atom or molecule to absorb a large number of photons.

The research group improved with its original effort two or so years ago the technology for converting a visible laser light into a soft X-ray laser beam of a high-order harmonic wave and successfully boosted the light intensity to a 100 or more times higher level than before. This time, the research group observed the non-linear optical phenomenon by irradiating the soft X-ray laser beam with a wavelength of 29.6 nm (1 nm or 1 nanometer being equal to one-billionth m) generated by this process to helium gas. The new technology has thus opened a new door of non-linear optics.

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