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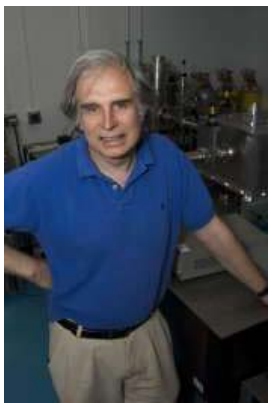
Colorado State Scientists Dramatically Improve Soft X-Ray Lasers with Discovery

Note to Editors: Photos of Jorge Rocca and his team are available with the news release at http://www.newsinfo.colostate.edu/.

FORT COLLINS - Colorado State University scientists have found a way to dramatically improve the quality of laser light at extremely short wavelengths, according to a paper that was published Sunday online by Nature Photonics.

The groundbreaking discovery covers very short wavelengths of light near 13 nanometers that are valuable particularly for the semiconductor manufacturing industry, which aims to develop the next generation of faster computer chips using that type of light by 2010 or 2011, said CSU University Distinguished Professor Jorge Rocca, senior author of the research. Rocca collaborated on the Nature Photonics paper with CSU colleagues Yong Wang, Brad Luther, Francesco Pedaci, Mark Berrill, Eduardo Granados and David Alessi.



Professor Jorge Rocca

Associated images

- EUV ERC team photo
- Professor Jorge Rocca
- Laboratory photo
- Laboratory photo

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- Profile of Professor Jorge Rocca

"The potential applications are many - ultrahigh resolution microscopy, patterning to make nanodevices, and semiconductor industry measurements," Rocca said. "There are many other possibilities that in the future will also include biology."

The technology involves the generation of short wavelength light in the extreme ultraviolet or soft X-ray range of the electromagnetic spectrum with wavelengths about 50 times shorter than visible light. A nanometer is billionths of a meter. A human hair is about 60,000 nanometers. These lasers can be used to "see" tiny features, create extremely small patterns and manipulate materials in ways that visible light can't.

The research reported in the Nature Photonics paper focused on making the light of lasers operating at 18.9 and 13.9 nanometers more "coherent" - a property that distinguishes laser light from light generated by other sources. Rocca's team generated a little seed of coherent X-ray light, converted the frequency of a visible laser beam to soft X-ray light and obtained a very coherent light at a low intensity. That seed was injected through a plasma amplifier and grew to produce a very high intensity beam of soft x-ray light with extraordinarily high coherence.

"Coherent soft x-ray light can be used to measure the properties of materials and directly write patterns with nano-scale dimension," Rocca said. "It can be used to look for extremely small defects in the masks that will be used to print the future generations of semiconductor chips."

The work is part of the research conducted at the National Science Foundation's Center for Extreme Ultraviolet Science and Technology - a partnership between Colorado State University in Fort Collins, the

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University of Colorado-Boulder and the University of California Berkeley - that combines the expertise of researchers who are among the world leaders in developing compact extreme ultraviolet coherent light sources, optics and optical systems for nanoscience, nanotechnology and other applications.

The center also has significant industry and national laboratory involvement. The largest computer chip manufacturers - Intel, Advanced Micro Devices Inc, IBM and Samsung - are industrial members of the EUV ERC, joining a set of industries that include small- and medium-sized companies.

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