Frontiers of THz Science

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SLAC National Accelerarator Laboratory

Electrons, which are gathered into breathtakingly short bunches only 100 millionths of a billionth of a second long, are sent through a thin metallic foil. The electrons in the metal respond by radiating in phase with each other, emitting short, coherent bursts of terahertz light.

THz radiation occupies a special region of the electromagnetic spectrum often referred to as the "THz gap". The radiation is non-ionizing and has a strongly material dependent penetration depth. The THz spectral range contains most vibrational and rotational modes of molecules and important collective excitation modes of materials, making it important for the study of scientific problems ranging from energy flow in molecules to quantum control of matter. It is also of interest for the understanding of astrophysics data.

The science of the THz range is far from fully developed yet offers extraordinary promise. With the recent development of laser and accelerator based THz sources there is a growing awareness and interest in exploring the scientific opportunities associated with this spectral range. As an accelerator laboratory with considerable laser expertise and home of two national x-ray user facilities, SSRL and LCLS, SLAC is uniquely positioned to develop THz sources with unprecedented properties, such as high fields that rival bonding fields of valence electrons, and the utilization of the THz fields for the manipulation of matter. In particular, THz fields may be used to trigger selected atomic motion and possibly chemical reactions that can be directly observed by the ultrafast x-ray pulses of LCLS.

This workshop is focused on exploring and defining scientific opportunities associated with THz radiation in a wide range of scientific fields.

https://slacportal.slac.stanford.edu/sites/conf_public/THz_2012_09/