

7th Theme Meeting on Ultrafast Sciences (UFS) – 2021 was organized by CEBS, Mumbai, on-line Zoom platform during November 12 – 14, 2021.

Ultrafast science is a general term referring to a knowledge system to investigate and explore the phenomena and laws of ultrafast changes in the universe. Phenomena or processes happening in microscopic / nanoscale world often are ultrafast. Molecular processes like rotation, charge transfer relaxation, proton transfer reactions and magnetization reversal happen in picoseconds, whereas molecular and lattice vibrations can happen even faster, occurring in femtoseconds. Looking into the depths of an atomic system, electrons move orders faster to the attosecond, which is currently the fastest process that human beings can observe. These ultrafast processes, which eventually govern the properties of matter, need special pulsed probing sources, methods, and instruments to investigate. The related ultrafast technologies play important roles for research and applications in molecular and condensed matter physics, mechanics, optics, chemistry, material science, biology, energy, and information science. Thus, ultrafast science has developed rapidly in the past few decades.

The series of theme meeting on Ultrafast Sciences (UFS) is being organized since 2013 to discuss recent developments in the field of ultrafast science. Since its inception, UFS has been playing a unique role in bringing together pioneers as well as young researchers, who are using different ultrafast techniques for their research. In this forum, discussions focus mainly on the development of ultrafast light sources and their applications in fundamental and applied research and to set the course of future direction. Scientists from all over the world participated in this three-day meet. The proceedings of the UFS-2021 constituted seven Special Lectures (50 mins), five Plenary lectures (40 mins), eight invited lectures (30 or 25 mins) and presentation of contributory papers and posters (47 numbers), all are in virtual mode. Total number of participations were about 150. Five Ph. D. students were awarded best poster prizes.

Presentations made in this meeting emphasized the importance and applications of the recent developments of attosecond and femtosecond time-resolved soft x-ray spectroscopy, THz spectroscopy and Raman spectroscopy in resolving the structure and dynamics of molecular motions, electron and proton transfer reactions as well as exciton and carrier dynamics in organic and inorganic optoelectronic and semiconductor materials. In addition, the ultrafast spectroscopy too reveals the spin dynamics in ferromagnetic materials. Several presentations revealed that it is not that the ultrashort duration of the light pulse is only the attractive feature of the ultrafast pulses, the high intensity, femtosecond laser pulses ($>10^{18} \text{ W cm}^{-2}$) can create unusually hot and dense plasmas, enabling laboratory simulation of astrophysical phenomena, relativistic optics, particle acceleration on a table top, real time x-ray diffraction of the condensed phase, biological imaging and medical therapies for cancer.