Indian Association For The Cultivation Of Science

C. K. Majumdar Lecture Series by

Prof. G. Ravindra Kumar (TIFR)

G. Ravindra Kumar obtained his Ph.D. in 1990 from IIT Kanpur. He has been at TIFR since 1992 and is presently a Senior Professor in the Department of Nuclear and Atomic Physics. His areas of interest are experimental studies of high intensity laser pulse interaction with matter, creation and understanding of extreme states of matter and nonlinear optics. His area of study has implications for many branches of physics including plasma physics, astrophysics, condensed matter physics and optical sciences.

He was elected a Fellow of the Indian Academy of Sciences in 2004 and of the Indian National Science Academy in 2008. He received the B.M. Birla Prize for Physical Sciences in 2000, the S S Bhatnagar Prize for Physical Sciences in 2003, a DAE Outstanding Investigator award in 2005, a J C Bose Fellowship in 2010 and the Infosys Prize in Physical Sciences in 2015. He has been on the International Committee on Ultrahigh Intensity Lasers (ICUIL) since 2008 and is currently the Co-Chair. He is a life member of the American Physical Society, the Plasma Science Society of India and the Indian Laser Association. He is a member of the Optical Society of America.

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Titles of the talks

- Lecture 1 : ***Extreme Light, Extreme States***
  Monday, 29th January, 2018, 16.00 Hrs.

- Lecture 2 : ***Tabletop Plasma Gets Wind of Solar Turbulence!***
  Tuesday, 30th January, 2018, 15.00 Hrs.

Venue : C. V. Raman Hall, IACS, Kolkata

All are cordially invited to attend.

Lecture 1

Extreme Light, Extreme States

High intensity, ultrashort light pulses are revolutionizing science in exciting ways, as they can excite matter to high temperature *at* high density [1]. This feature of ultrashort pulses provides a great opportunity for doing experiments in the lab that help us study matter pushed to extreme conditions- the kind that pervades most of the 'visible' universe. Research in this area bridges diverse areas- from astrophysics to accelerator physics and from condensed matter science to biology.

This talk will introduce the subject and then dwell on two basic themes - one dealing with how light couples to such plasmas and another with the consequence of such coupling, namely the production and behaviour of 'hot' electrons (ranging up to MeV). I will present some results of experiments performed at TIFR – creation of gigantic magnetic fields [2], ultrafast plasma dynamics [3], passage of relativistic particles through dense, hot matter [4] and interesting consequences in terms of MeV ion production, ultrafast hard x-ray emission [5], laser fusion etc.

References:

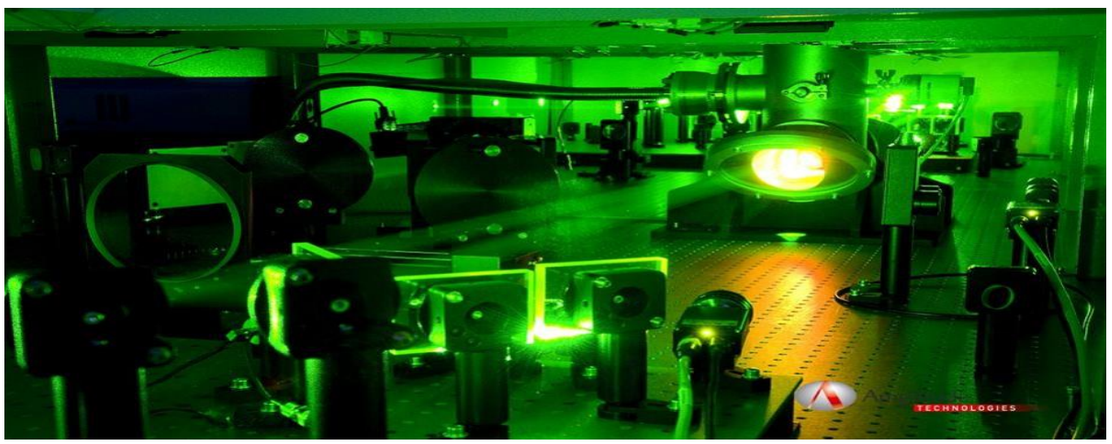
[1] G. Ravindra Kumar, "Intense, ultrashort light and dense, hot matter"
Pramana- Journal of Physics, 73, p 113-155 (2009) . *[Tutorial Review]*

[2] S. Mondal *et al.*, Proc. Natl. Acad. Sci. (USA) 109, 8011 (2012); G. Chatterjee *et al.*,
Phys. Rev. Lett. 108, 235005 (2012).

[3] S. Mondal *et al.*, Phys. Rev. Lett. 105, 105002 (2010); A. Adak *et al*., Phys. Rev. Lett. 114, 115001 (2015).

[4] K. Ohta *et al.* Phys. Rev. Lett. 104, 055001 (2010); M. Shaikh *et al.*, Phys. Rev. Lett. (in press, Jan 2018).

[5] S. Kahaly *et al.* Phys. Rev. Lett. 101, 145001 (2008): P.P. Rajeev et al., Phys. Rev. Lett, 90, 115002(2003).



The 100 terawatt, femtosecond laser system at TIFR that produces high power light.

Lecture 2

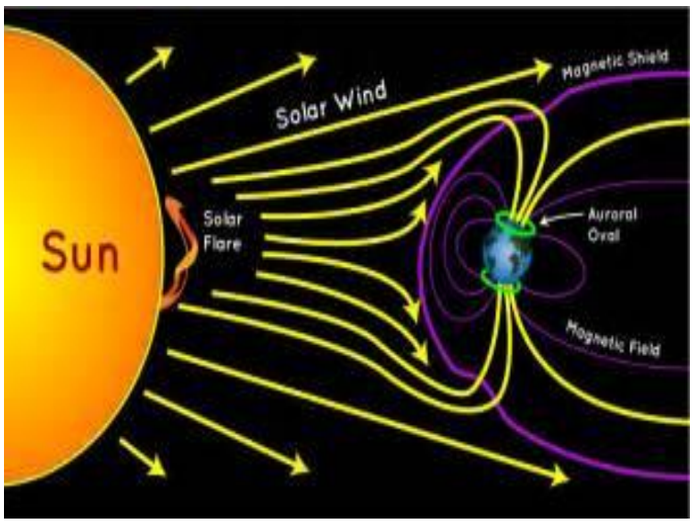
Tabletop Plasma Gets Wind of Solar Turbulence!

ABSTRACT:

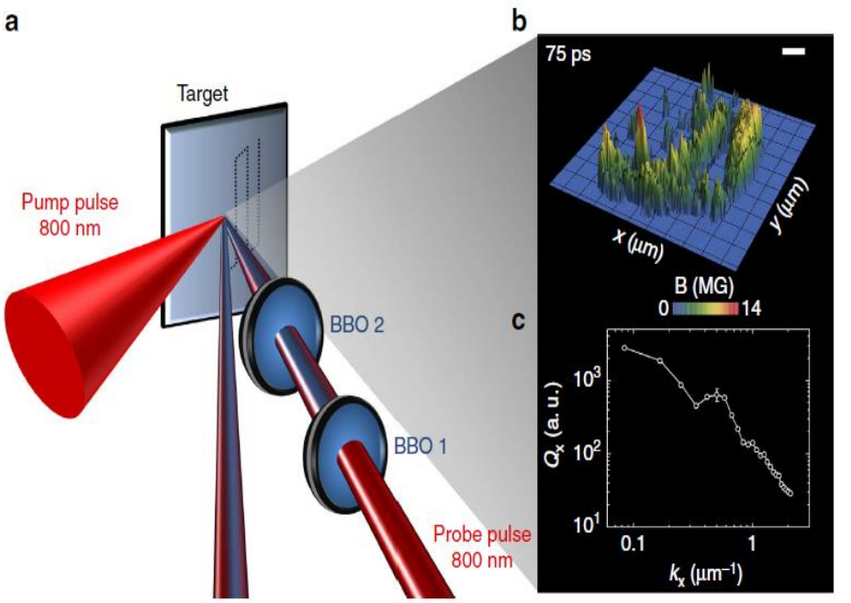
Almost all the universe is extremely hot, dense and violent. Is it possible to 'mimic' such conditions in the lab - controllably, repeatedly and reliably? If yes, can we get a peek into such violent scenarios right on a tabletop? What are the largest magnetic fields in the universe? How do these fields evolve in time?

…..Such are the questions that our group has been asking for many years, using high intensity light. We bring to you our observations of 'heavenly' turbulent magnetic field evolution, in a high intensity laser lab located at TIFR.

How do we do this? Why do we do this? This talk will address these questions



TIFR work



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