By Liz Seubert | February 16, 2011

# 466th Brookhaven Lecture Featuring Ramesh Gupta

## Revolutionary High Temperature Superconducting Magnets

BNL has always been a leader in the world of superconducting magnets, which are essential to great modern accelerators such as the Relativistic Heavy Ion Collider at BNL, or the Large Hadron Collider at CERN, Switzerland. These magnets are made of material, which, when cooled to 4 Kelvins (K) (-452° Farenheit), become superconducting, that is, lose essentially all resistance to electricity.

For the past decade, however, Lab researchers have been exploring the use of new materials that become superconducting at higher temperatures. These materials can operate at the relatively high temperature of 77 K (-351° F), allowing them to be cooled by cheap, plentiful liquid nitrogen, rather than helium, and can create very high magnetic fields.

Now far in the lead of this area of research, BNL scientists are exploring avenues for high temperature superconducting magnets that are energy efficient and have magnetic fields that are a million times stronger than the Earth's. If successful, these new magnets could potentially revolutionize usage in future accelerators, play a key role in energy efficiency and storage, and make possible new applications such as muon colliders and MRI screening in remote areas.

To learn more about this exciting research, join Ramesh Gupta of the Superconducting Magnet Division on Wednesday, February 16, as he gives the 466th Brookhaven Lecture on "High Temperature Superconducting Magnets: Revolutionizing Next Generation Accelerators and Other Applications." The public is welcome to attend this free lecture, which will be held in Berkner Hall at 4 p.m. Visitors to the Lab 16 and older must carry a photo ID. To join the lecturer for dinner at a restaurant off site after the talk, contact Diana Votruba or Ext. 5123.

In his talk, Gupta will describe the advantages of high temperature superconductors (HTS) and their applications, as well as some of the challenges they present and how those can be overcome. He will describe magnet designs for HTS, and experiments such as determining whether HTS magnets will operate in the presence of unprecedented heat loads and radiation environments. Gupta and his group have built more than 100 HTS coils and 10 HTS magnets using tens of kilometers of such conductors.

As Gupta will explain, the results of this research and development have been promising, and as a next step, BNL, in collaboration with its research partners (projects originally funded by DOE), is building the two highest field HTS magnets ever — the first at 20-22 Tesla (T) and the next at 24-30 T.

Gupta joined BNL in 1984 He earned his M.Sc. and Ph.D. in physics from the University of Rajasthan, Jaipur, India, with a thesis on improving the design and analysis of superconducting magnets for particle accelerators. He also has an M.S. in accelerator physics from the University of Manitoba, Canada. He has served as an instructor at several U.S. Particle Accelerator Schools and has worked at the Variable Energy Cyclotron Center in Kolkata, India, as well as at Lawrence Berkeley National Laboratory.