

$H_2S$   
 $CH_3SH$   
 $C_2H_6S$   
 $C_6H_6S$

Z: 71.9nm  
X: 2.0µm

matter  
energy  
mechanics  
quantum  
physics  
colloquium  
2015

FM (SM)  
1985  
2000  
2011





The idea behind Physics Colloquim held every semester by the department of **physics, CIIT Lahore** is born out of an attempt to promote Physics as a central solution to the realms of various real world problems related to science, engineering, industry as well as those linked with the inherent curiosity towards the understanding of the origin and existence of universe. To maintain its commitment, the Department of Physics organized **6th colloquim** on **March 25, 2015** where colleagues from various universities across Pakistan were invited.

### MESSAGE FROM THE HEAD

The activity started with a welcome note from **Prof. Dr. Saleem Farooq Shaukat**. He explained the objectives of the meeting and stressed that the activity aims not only to create awareness among students about the current research trends but also opens up avenues for joint research partnerships in interdisciplinary areas. A brief introduction of the faculty and the research avenues covered by the department was then presented.



### CHIEF GUEST REMARKS

**Prof. Dr. Talat Afza**, Head of Academics and Research, CIIT, Lahore, was invited as the chief guest of the event. During her address, Prof. Afza encouraged the departmental move to support the ideas.

She further stressed upon this exchange of scientific ideas to be tested on practical grounds thus to make the spell of such debates more effective and long term. Such remarks dictate her sincere concern for next generation of researchers in Physics.



COMSATS Institute of  
Information Technology  
Lahore Campus



### Nano-Magnetism

The first talk of the session was delivered by **Dr. Sadia Manzoor (HOD Physics, CIIT, Islamabad)** who discussed the recent advances in magnetic data storage materials and devices. Dr. Sadia Manzoor explained how nanoscale, surfaces and interfaces play a significant role in determination of the magnetic properties of the material. She further explained how the process of discretization can be used as a means to control the coercivity as well as the exchange bias. In later part of her lecture, she discussed how magnetoelectric multiferroics can be used as a means to achieve faster, energy efficient and non-destructive memory devices. The required properties are achieved using combinatorial approach to use a design of composites of magnetostrictive and piezoelectric materials as a technique to achieve strong magnetoelectric coupling. Such a strategy would be a strong leap towards achieving the milestone storage capacity of  $\text{Tb}/\text{inch}^2$ .



### Space Plasmas

The complicated phenomena mediated within the terrestrial magnetosheath arise as a result of interaction of solar wind and the Earth's magnetic field. Deliberating upon the issue, **Dr. Waqas Masood (CIIT, Islamabad)** discussed the abundance as well as the nature of the complex electron plasma waves in terrestrial magnetosheath. The discussion was primarily focused to convey basic components of the universal atmosphere including solar wind, sun's spots, bow shock, coronal mass ejections, magnetopause, magnetosheath and the observation of various whistler wave modes as a product of complex plasma reaction phases. He also explained how the wave dynamics can be explored using Maxwellian as well as generalised distribution functions.



### NI Lab View

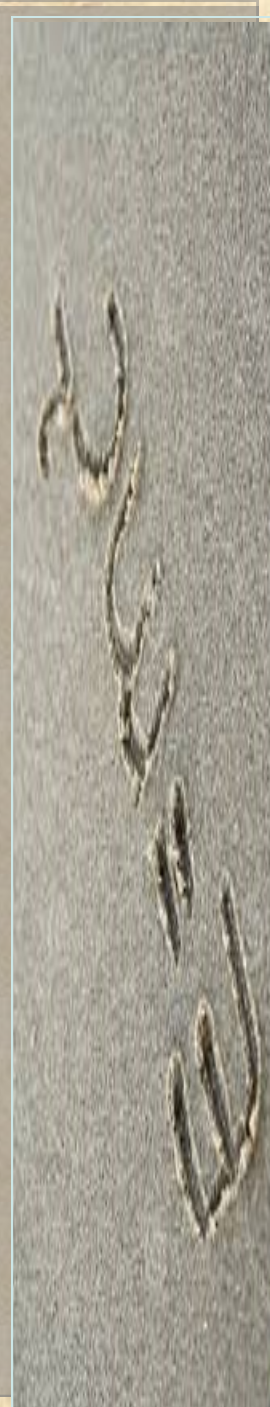
Every scientific advancement requires excellence in measurements", says **Engr. Ahmad Khalid**, technical consultant at National Instruments, Islamabad. To do the purpose, commercial off-the shelf products can be customized for an efficient control, diagnostics and measurement of various real world physical problems. Ranging from programming chip based data acquisition to data communication, National Instruments is committed to provide tools to the scientists and the technology partners to meet their needs. Ahmad Khalid further emphasized how various technological caveats can be met as a result of joint sci-tech collaborations.



### Graphene Revolution

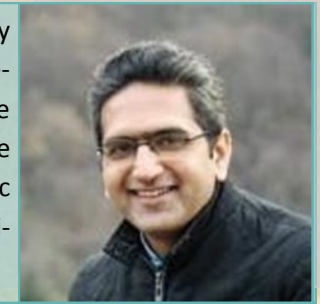
Some things in science become more interesting only as we discover more about them. **Dr Rashid Jalil (UET Lahore)** uncovered the amazing properties of graphene, new arrangement of carbon in the form of a one-atom-thick crystal layer, declared it a "miracle material". In his talk, he mainly focused on the device fabrication and graphene electronics. He also explained the electrical and optical characterization of nano-devices & nanostructures with respect to device fabrication. He unveiled the superb electronic properties of graphene for its potential application as transistor at nanoscale. Furthermore, he shared some of his experimental results along with ideas for future perspectives.





### Atomic Disorders

Fundamental investigations on the atomic structures of amorphous semiconductors, disordered alloys, glassy state and many other interesting systems now constitute the significant proportion of the activity of innumerable physical and chemical labs in the world. But beneath the luxuriance of real materials and observable phenomena, there are stratum of concepts, hypothesis, models and mathematical theories. These ideas were explained by **Dr Fakharul Inam (LUMS, Lahore)** who focused on the modeling of the disorder at the atomic scale on Ge-Se glassy alloy. He demonstrated his modeling approaches on LDA and HDA ice. He further explained interatomic interactions by using different DFT codes.



### Composite Materials

**Dr. Arslan Usman (CIIT, Lahore)** discussed about composite materials and Nano-structures. He started from the basics of nanotechnology leading to an advanced laser assisted thin film deposition technique for the synthesis of Nano sized structures. Further, it was explained how the incorporation of metallic and non-metallic particles be intercalated into graphite film matrix, what are their potential applications and how functional properties of a film matrix be enhanced. In the later part of presentation, he explained in detail about the band gap variation due to degeneration of intermediate states as a result of intercalation. The surface properties and roughness profiles were also explained. Such kind of tunable band gap materials would have wide applications in photo voltaic, optical windows and multi-band devices.



### LIPSS

The last talk of the session was delivered by **Dr. Muhammad Imran (CIIT, Lahore)** who discussed his recent work on laser induced periodic structures. He explained the interaction of carbon dioxide laser with non-metallic materials like Quartz glass, optical crown glass BK-7 and polymers PMMA. Dr. Imran demonstrated his findings by various imaging techniques. He also presented the working of complete laser system along with the function of CAD software which is used to draw fine patterns on the substrate. He discussed how the process of laser micromachining can be controlled by optimizing parameters such as laser scanning velocity, irradiated power and spot size laser beam. In the end, the fabrication processes by relevant analysis were explained.





PHOTOSHOP



*All Speakers and guests also enjoyed the sumptuous tea and lunch during the ceremony.*