2nd Symposium on Special Topics in Physics

Friday, 20 January 2012 - Saturday, 21 January 2012

University of Texas at Arlington

Book of Abstracts

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Welcome and logistics

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Welcome Message from UTA Associate VP for Research and Dean of College of Science

Corresponding Authors: pjansma@uta.edu, rajeshwar@uta.edu

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Introduction to AKPA and KSEA

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Research Activities of UTA Physics Department

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Introduction to Institute for Basic Science and Rare Isotope Science Project

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Session 2 / **6**

Frontiers of Nuclear Theories for the Physics with Rare Isotope Accelerators

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Summary:

With the current worldwide development of rare isotope accelerators such as the Korea Rare Isoptope Accelerator (KoRIA) and the Facility for Rare Isotope Beams (FRIB), it is timely to review the forefront of the nuclear physics theories that can analyze the data from these accelerators and provide the deeper understanding on the physics of nuclei and the nuclear astrophysics. In this presentation, we discuss

the frontiers of current nuclear physics theories that can address the fundamental issues in the physics of nuclei and the nuclear astrophysics such as the nature of the nuclear force, the origin of simple patterns in complex nuclei, the nature of dense nuclear matter (e.g. neutron stars), the mechanism of the nucleosynthesis (e.g. nuclear reactions that drive stars and stellar explosions), as well as the origin of the elements in the cosmos, and thereby the origin of the universe and the composition of matters in the universe. Relevance of these theories to the physics with rare isotope accelerators, in particular KoRIA, will also be discussed.

Session 3 / **7**

Recent Updates on Higgs Searches in ATLAS

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Recent Updates on Higgs Searches in CMS

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Performance of The ATLAS Transition Radiation Tracker

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Recent Updates and Current Issues in Cosmic Ray Physics

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Session 4 / **11**

Time-of-Flight PET Detector based on Silicon Photomultipliers and its Challenges

Corresponding Author: kimc@ge.com

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Nuclear Physics Experiments in Low Energy

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Summary:

US low energy subprogram studies the frontiers of nuclear structure and fundamental symmetry. In this talk, I would like to talk about nuclear experiments in low energy section with cold neutron to look for physics beyond standard model of weak interaction section and with low energy gamma rays for hadron structure.

Session 3 / **13**

X-Ray Astronomy: A Brief Introduction

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Summary:

X-ray astronomy is a relatively new field of astronomy, which looks into the hot and energetic parts of the universe. Turning into the 21st century, X-ray astronomy has been in a golden age with the emergence of Chandra X-ray Observatory. I will present a general introduction of X-ray astronomy and a brief discussion of science
cases with some examples of supernova remnants. The current status of Korean X-ray astronomy and future opportunities for Korea in this field will also be
briefly discussed.

Session 4 / **14**

Current Status and future plans of Fermilab Facility and Its role on KoRIA

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Session 5 - The Wrap-up / **15**

Spin liquid and spin glass states in frustrated magnets

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Session 5 - The Wrap-up / **16**

Hyperspectral Imaging Measurement of Nanomaterials as a High-Resolution Single-molecule Sensor

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Summary:

The detection of single molecules in nanoscale is promising new venues of research. Single-molecule detection has been studied using a variety of different methods. Among them, the hyperspectral imaging system (HSI) stands out as a method that can measure the full spectrum of each point in the sample image. Another significant advantage is that these nanosensors work in a 3D space with a high resolution, thereby enabling live cell process monitoring.

In this study, the hyperspectral imaging system (HSI) use designed and installed to detect various target molecules with multiplexing ability. Multiplexing ability of the HSI due to characteristic spectra of different materials and their structures is proposed to dynamically monitor the nanoscale processes and the change of environmental conditions, such as temperature and refractive index. Raman spectroscopy and Dark-field spectroscopy are mainly used for different purposes: Raman spectra can be used as a powerful tool especially for multiplexing detection and chemical identification with well-defined resolution, and Dark-field spectrum is good for motion tracking of dimer interaction in the range of distance from a few nanometers to 100 nm. Many different nanomaterials with spectral features in their response to the optical excitation have been employed as nanoprobes for HSI applications. This study particularly focuses on the gold nanoparticle and the control of its surface plasmon resonance by forming a regulated structure.

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Discussions: Toward strong collaboration with Korea and KoRIA

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Wrap-up and farewell

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Physics and Buddhism (This lecture is in Korean!)

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Session 5 - The Wrap-up / **21**

Gas Electron Multiplier Detectors and its Application in High Energy Physics

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Summary:

We have been developing gas electron multiplier detectors (GEM) to use them as sensitive gap detectors in digital hadron calorimeters (DHCAL). As prototype detectors, so far four 30x30 cm2 double GEM detectors have been built up and the characteristics are being surveyed. One of the chambers is installed with 16-bit analog readout electronics (KPIX) and the other three with digital readout electronics (DCAL). All the chambers have been pretested with single channel readout system in order to study individual channel response to x-ray(Fe55) or other types of radiations. The response of all the chambers were studied under the irradiation of high energy particle beams (Protons, Muons, Pions etc ⋯) at Fermi National Laboratory. In this talk, the beam test results are presented along with other test results such as analog signal test with radioactive sources or cosmic rays. Finally, our future study plans on 1x1 m2 large GEM detectors are introduced briefly.