SEMINAR NOTICE

Department of Physics and Engineering Physics
University of Saskatchewan

SPEAKER: Bassey Bassey, PhD Candidate,
Department of Physics & Engineering Physics

TOPIC: *Multiple Energy Synchrotron biomedical imaging system*

DATE: Tuesday, April 5, 2016

TIME: 3:30-4:30pm.

PLACE: Rm. 103, Physics Building

ABSTRACT:

Imaging has revolutionized the practice of health care since the discovery of x-rays by Roentgen. It is pervasively used for screening, diagnosis, and monitoring of the treatment of disease. The continuous spectrum available from synchrotron light facilities provides a nearly ideal source for multiple energy x-ray imaging. For biological subjects, a multiple energy imaging system that can extract multiple endogenous or induced contrast materials as well as water and bone images would be preferred. A novel multiple energy x-ray imaging system, which prepares a focused polychromatic x-ray beam, has been developed at the Biomedical Imaging and Therapy bend magnet beamline at the Canadian Light Source. The imaging system is made up of a cylindrically bent Laue single silicon crystal monochromator, scanning and positioning stages for the subject, flat panel (area) detector and a data acquisition and control system. Depending on the crystal's bent radius, reflection used, and the horizontal beam width of the filtered synchrotron radiation (20 to 50 keV) incident on the bent crystal, the size and spectral range of the focused beam prepared vary. For example, with a bent radius of 95 cm and a 50 mm wide beam, a 0.5 mm wide focused beam of spectral energy range 27 keV to 43 keV was obtained for a (1,1,1) reflection. This spectral energy range covers the K-edges of iodine (33.17 keV), xenon (34.56 keV), cesium (35.99 keV), and barium (37.44 keV); some of these elements are used as biomedical and clinical contrast agents. Using the developed imaging system, a test subject composed of iodine, xenon, cesium, and barium along with water and bone were imaged and their concentrations successfully extracted. The dose rate to test subjects imaged is about 0.775 mSv/s with a typical object dose of 5.16 μSv. Signal-to-noise ratios (concentration-to-noise ratios) for iodine and barium are 114 with 100 mM (14.99 mg/ml) and 300 with 50 mM (10.41 mg/ml) concentrations, respectively. Potential biomedical applications of the imaging system will include projection imaging that requires any of the extracted K-edges as a contrast agent and multi-contrast K-edge imaging.

Coffee and Cookies will be served in the Physics lounge at 3:00 pm. for those attending the seminar.