Abstract Submitted
for the DAMOP16 Meeting of
The American Physical Society

Monochromatic X-ray propagation in multi-Z media for imaging and diagnostics including K_α Resonance Fluorescence MAXIMILLIAN WESTPHAL, The Ohio State University, SARA LIM, Medical College of Wisconsin, SULTANA NAHAR, ANIL PRADHAN, The Ohio State University — Aimed at monochromatic X-ray imaging and therapy [1], broadband, monochromatic, and quasi-monochromatic X-ray sources and propagation through low and high-Z (HZ) media were studied with numerically and experimentally. Monte Carlo simulations were performed using the software package Geant4, and a new code Photx, to simulate X-ray image contrast, depth of penetration, and total attenuation. The data show that monochromatic and quasi-monochromatic X-rays achieve improved contrast at lower absorbed radiation doses compared to conventional broadband 120 kV or CT scans. Experimental quasi-monochromatic high-intensity laser-produced plasma sources and monochromatic synchrotron beam data are compared. Physical processes responsible for X-ray photoexcitation and absorption are numerically modelled, including a novel mechanism for accelerating K_α resonance fluorescence via twin monochromatic X-ray beam [2]. Potential applications are medical diagnostics and high-Z material detection.
1. S.N.Lim, et al, JRR 56, 77 (2015)
2. S.N.Nahar, A.K. Pradhan, JQSRT 155, 32 (2015)
Acknowledgement: Ohio Supercomputer Center, Columbus, OH

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Date submitted: 27 Jan 2016 Electronic form version 1.4