Abstract Submitted
for the DAMOP13 Meeting of
The American Physical Society

Enhancement of X-ray dose absorption for medical applications
SARA LIM, S. NAHAR, A. PRADHAN, R. BARTH, The Ohio State University —
A promising technique for cancer treatment is radiation therapy with high-Z (HZ) nanomoities acting as radio-sensitizers attached to tumor cells and irradiated with X-rays. But the efficacy of radiosenstization is highly energy dependent. We study the physical effects in using platinum (Pt) as the radio-sensitizing agent, coupled with commonly employed broadband x-ray sources with mean energies around 100 keV, as opposed to MeV energies produced by clinical linear accelerators (LINAC) used in radiation therapy. Numerical calculations, in vitro, and in vivo studies of F98 rat glioma (brain cancer) demonstrate that irradiation from a medium energy X-ray (MEX) 160 kV source is far more effective than from a high energy x-ray (HEX) 6 MV LINAC. We define a parameter to quantify photoionization by an x-ray source, which thereby provides a measure of subsequent Auger decays. The platinum (Z = 78) results are also relevant to ongoing studies on x-ray interaction with gold (Z = 79) nanoparticles, widely studied as an HZ contrast agent. The present study should be of additional interest for a combined radiation plus chemotherapy treatment since Pt compounds such cis-Pt and carbo-Pt are commonly used in chemotherapy.

Sultana Nahar
The Ohio State University

Date submitted: 18 Jan 2013 Electronic form version 1.4