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Monte Carlo study of alternative X-ray sources and K-alpha resonance fluorescence for enhancing radiation therapy MAXIMILLIAN WESTPHAL, Biophysics Graduate Program, The Ohio State University, SULTANA NAHAR, Department of Astronomy, The Ohio State University, ANIL PRADHAN, Biophysics Graduate Program, Chemical Physics Graduate Program, Department of Astronomy, The Ohio State University — Using the Monte Carlo code GEANT4 we have studied alternative X-ray sources as well as a variety of nanoparticles as a method to improve tumor irradiation and cancer theranostics (therapy and diagnostics). We used GEANT4 to simulate photons from quasi-monochromatic (QX), monochromatic (MX), and traditional broadband (BX) medical X-ray sources interacting with heavy element nanoparticles designed to enhance X-ray absorption [1]. A combined experimental, theoretical, and numerical study of Zr $K_{\alpha,\beta}$ fluorescence and scattering is presented. Simulations of resonant nano-plasma states driven by high-intensity K_α radiation is carried out [2], with nanoparticles of gold, platinum, or gadolinium in sizes from 2-20 nm, and shapes including rods, spheres, and cubes.
[1] M. S. Westphal et al., Phys. Med. Biol, 62: 6361-6378, 2017.
[2] S. N. Nahar and A. K. Pradhan, JQSRT, 155: 32-48, 2015.

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