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GEANT4 simulations for in trap decay spectroscopy for electron capture branching ratio measurements using the TITAN facility SHAKIL SEERAJI, C. ANDREOIU, F. JANG, T. MA, Simon Fraser University, A. CHAUDHURI, A. GROSSHEIM, A.A. KWIATKOWSKI, B.E. SCHULTZ, E. MANE, G. GWINNER, J. DILLING, A. LENNARZ, D. FREKERS, U. CHOWDHURY, V.V. SIMON, T. BRUNNER, P. DELHEIJ, M.C. SIMON, TRIUMF — The TITAN-EC project has developed a unique technique to measure electron capture branching ratios (ECBRs) of short lived intermediate nuclide involved in double beta decay. The ECBR information is important for determination of nuclear matrix elements of double-β decay for both double beta decay ($2\nu\beta\beta$) and neutrino-less double beta decay ($0\nu\beta\beta$) processes. An important feature of this technique is the use of open access penning trap. Radioactive ions are stored in the trap and their decays are observed. Electrons produced from β decay are guided out of the trap by the Penning trap's strong magnetic field and the x-ray from EC are detected by seven Si(Li) detectors placed radially around trap using thin Be windows. This set-up provides a lower background for the x-ray detection compared to earlier ECBC measurements where the beam is implanted in mylar tape. Detailed GEANT4 simulations have been performed to characterize the efficiency of the detectors and understand their response. In addition the impact of different sizes and shapes of the ion cloud inside the trap has also been investigated to optimize the experimental set-up.

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