# AbstractID: 12944 Title: Monte Carlo calculation of secondary electron production from gold nanoparticles in proton beam irradiation

**Purpose:**
We examined the production efficiency and average kinetic energy of secondary electrons produced from a single gold NP upon proton irradiation
**Method and Materials:**
The production efficiency and average kinetic energy were investigated by using the Geant4 Monte Carlo simulation toolkit. The proton energy range corresponding to the 250-MeV pristine Bragg peak is from 100 MeV to 0 MeV. We investigated proton beams with energies of 100 MeV, 50 MeV, and 20 MeV to represent the scope from 100 MeV to 0 MeV. Upon biological uptake efficiency, we chose gold NPs with diameters of 35 nm, 50 nm, 70 nm, and 100 nm.
**Results:**
We found that for a NP with a diameter of 70 nm, the secondary electron production efficiency increased as the proton energy decreased from 100 MeV to 50 MeV and then 20 MeV. The average kinetic energy of the secondary electrons increased with proton energy. We found that the larger the NP size, the higher the production efficiency and average kinetic energy of the secondary electrons. Finally, we found that among the samples we tested the smallest NP was the one with a diameter of 70 nm.
**Conclusion:**
Collectively, the secondary electron production efficiency and average kinetic energy from the NPs should also be taken into account when considering the potential use of NPs in proton radiotherapy.
**Conflict of Interest (only if applicable):**