Performance analysis of in-beam PET range verification system for carbon ion beams
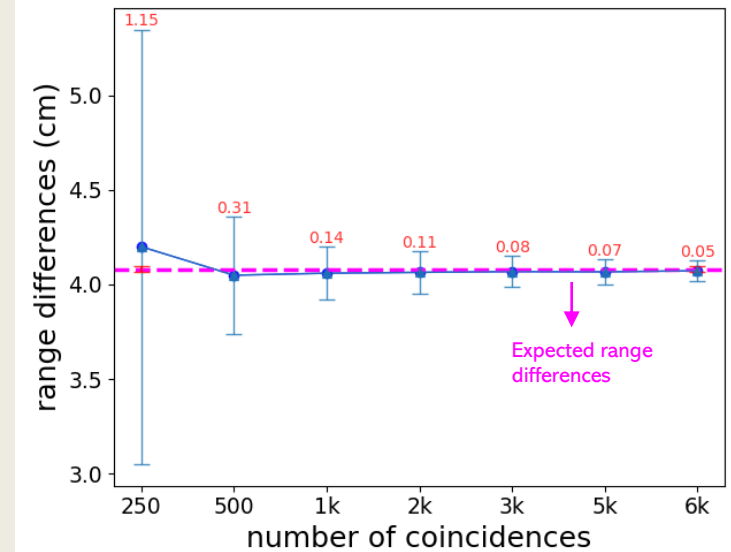
Sahar Ranjbar[1,2], Felix Mas Milian[2,3], Emanuele Maria Data[1,2], Davide Bersani[4], Piergiorgio Cerello[2], Roberto Cirio[1,2], Marco Donetti[5], Mohammad Fadavi Mazinani[2], Veronica Ferrero[2], MohammadAmin Hosseini[1,2], Simona Giordanengo[2], Diango Manuel Montalvan Olivares[1,2], Marco Pullia[5], Roberto Sacchi[1,2] Anna Vignati [1,2], Julius Friedemann Werner[6], Francesco Pennazio[2], **Elisa Fiorina**[2]
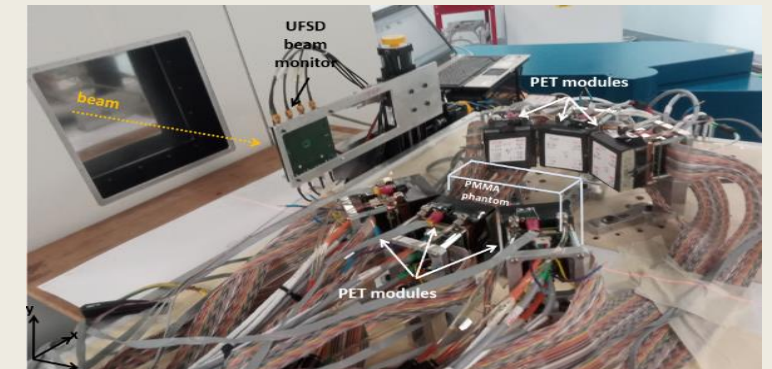
In this study, we presented the performance evaluation of an in-beam PET system for carbon ion irradiations. Two monoenergetic beams at different energies were monitored at CNAO. The performance analysis was designed to evaluate the stability of range difference estimation considering several consecutive subsets of coincidence events with different event amounts. The range difference values were calculated between the two irradiated energies for each pair of images of the two energies from the subset lists.

Our result indicates that the performance of the PET system appears to be minimally affected by the statistics included in the PET images and the average experimental range difference is compatible with the expected value. The obtained results are valuable for the ongoing design and implementation of a customized image reconstruction method focused on highlighting fast isotopes

Range difference value for different numbers of coincidences

Experimental setup at CNAO