AbstractID: 10934 Title: Biological modeling of the beam delivery line components for active scan irradiation technique in heavy-ion radiotherapy.

Purpose/Objective(s): The beam delivery line of the active scanning irradiation system for heavy-ion radiotherapy requires a series of elements along the beam path before the patient like ripple filters and monitoring system. Usually these elements are optimized only for physical dose profiles. However, it is necessary to consider the biological effect and their impact on the dose distribution, especially in the Bragg peak region for a correct estimation of the peak spread.**Materials/Methods**: A full beam delivery line of the national center of oncologic hadrontherapy (CNAO) is simulated with the Monte Carlo package GEANT4 to get the actual distribution in the treated volume of particles and fragments and the corresponding energies. The treated volume is simulated as well defining different tissues in the head and neck region. The evaluation of biological effects was studied using a code based on the Local Effect Model (LEM). The computational effort was performed using the distributed INFN Grid computing resources.**Results:** We estimate the impact on the relative biological effectiveness (RBE) and the biological dose distribution of the passive elements of the beam delivery line. The shape of the physical dose at Bragg peak is different from the corresponding biological dose. Though the transfer functions characterizing each of the element should involve a rigorous evaluation of the biological effects. **Conclusions**: A full characterization of the beam delivery line considering the biological impact provides a flexible tool in the treatment planning system for modeling the possible variations in the same beam line or modeling a new beam lines.