Design of support structure for nozzle components in heavy ion therapy gantry

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About me
Heavy ion therapy

M. Osama, et al. 2017
Radiation therapy with X-Rays

R. L. Hachadorian, et al. 2020
Mass: 600 t

O. Jäkel, et al. 2022
Heavy ion therapy gantry

• Holds all the components to direct the beam.

• Allows irradiation from different directions

Courtesy: Luca Piacentini
Gantry nozzle

Scanning magnets

Dose delivery system

Courtesy: Luca Piacentini
Design requirements of nozzle structure

1) Component displacements
2) Mass
3) Volumetric constraints
4) Component alignment
5) Assembly
6) Manufacturability
Design workflow
Mounting of components

Requirements

• Possibility of 6DOF adjustability
• Simplicity
• Minimal displacements
Assembly constraints

Scanning magnets as one piece

Maintenance
Volumetric limitations
Topology optimisation
Ongoing work

- Calculations of component displacements
- Precision of calculation
- 4th iteration
Questions
Thank you!