Contribution ID: **2432** Contribution code: **SUPM010** Type: **Student Poster Presentation**

Optimisation of drift tube cooling and drift tube geometries of an additive manufacturing IH-type cavity

Sunday 1 June 2025 14:00 (2 hours)

Additive manufacturing is a now-powerful tool for the rapid prototyping and manufacturing of complex geometries. A proof-of-concept 433 MHz IH-DTL cavity was constructed for direct additive manufacturing of linear accelerator components. The CFD analysis of the initially designed cooling for the drift tube revealed a design with insufficient heat dissipation; this can lead to thermal deformations as well as problems in keeping the frequency stable during operation. In this respect, an optimization of the cooling system was done in detail with the help of advanced thermal simulation and iterative design improvements.
Furthermore, the geometries of the drift tubes were refined to improve mechanical stability and thermal efficiency without compromising electromagnetic performance. The results illustrate that additive manufacturing can achieve significant design freedom, enabling new approaches toward the thermal management challenges faced by high-frequency linear accelerator components.

Footnotes

Paper preparation format

Word

Region represented

Europe

Funding Agency

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Session Classification: Student Poster

Track Classification: MC1 :Colliders and Related Accelerators: MC1.A08 Linear Accelerators