Contribution ID: **1991** Contribution code: **THPB051** Type: **Poster Presentation**

Performance evaluation of additively manufactured pure copper radio frequency quadrupole by low-power RF and high-field gradient tests

Thursday 5 June 2025 15:30 (2 hours)

This paper presents studies on advanced accelerator technologies conducted under the I.FAST (Innovation Fostering in Accelerator Science and Technology) EU project, focusing on additive manufacturing (AM) advancements. AM, particularly powder bed fusion, is giving unique production capabilities for accelerator components. As a proof-of-principle, a full-size pure copper Radio Frequency Quadrupole (RFQ) was successfully manufactured earlier. Low-power RF tests and bead-pull measurements performed on this prototype confirmed the precise electromagnetic field distribution, validating design accuracy and repeatability. Furthermore, high-field gradient tests conducted in the CERN's DC pulsed measurement system showed that AM copper electrodes spaced of 94 μm can achieve gradients up to 42 MV/m. These promising results highlight the transformative potential of additive manufacturing in producing high-frequency accelerator components, advancing both precision and reliability.

Footnotes

Paper preparation format

Word

Region represented

Europe

Funding Agency

European Union's Horizon 2020 Research and Innovation programme under grant agreement No 101004730.
Latvian Council of Science under grant agreement VPP-IZM-CERN-2022/1-0001

Author: Dr RATKUS, Andris (Riga Technical University)

Co-authors: OLIVER, Concepcion (Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas); GAVELA, Daniel (Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas); MORENO, Gabriela (Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas); Mr PIKURS, Guntis (Riga Technical University); POZZI, Matteo (Rosler Italian); VEDANI, Maurizio (Politecnico di Milano); VRETENAR, Maurizio (European Organization for Nuclear Research); CALVO, Pedro (Centro de Investigaciones Energéticas,

Medioambientales y Tecnológicas); CALATRONI, Sergio (European Organization for Nuclear Research); Mr ROMANO, Tobia (Riga Technical University); Prof. TORIMS, Toms (European Organization for Nuclear Research); BJELLAND, Victoria (European Organization for Nuclear Research); WUENSCH, Walter (European Organization for Nuclear Research)

Presenter: Dr RATKUS, Andris (Riga Technical University)

Session Classification: Thursday Poster Session

Track Classification: MC7: Accelerator Technology and Sustainability: MC7.T35 Advanced Manufacturing Technologies for Accelerator Components