Contribution ID: **2637** Contribution code: **THPM022** Type: **Poster Presentation**

Predictive capabilities in CFD simulations of additively manufactured extraction grid cooling channels for the DTT NBI system

Thursday, 11 May 2023 16:30 (2 hours)

Recently, Metal Additive Manufacturing technology enables the possibility to realize cooling systems in accelerator components during the manufacturing process phase, obtaining extremely high density, high thermal, and mechanical properties in metals. In the Neutral Beam Injection for the Divertor Tokamak Test facility, the beam acceleration components are submitted to extremely high-power loads. A tailored cooling channel shape for the acceleration grids is proposed and tested. However, the roughness issue in MAM manufacturing is a problem that can strongly affect the pressure drop in long and small-section channels. CFD is a valid tool that, if properly calibrated, predicts the pressure drop and efficiency of the cooling system. In this work, different single-channel samples have been manufactured via MAM and they have been tested to characterize the pressure drop behaviour. The single-channel samples have been internally smoothed via a chemical process to reduce the pressure drop and tested again. CFD models, using Ansys Fluent software, have been calibrated to properly predict the pressure drop of the single-channel samples. The CFD models have been implemented to optimize the channel design of the Extraction Grid cooling system. The optimized shape of the EG channels has been adopted to produce different scaled AM prototypes and tested with a thermal power map, which is similar to the nominal one.

Funding Agency

Footnotes

I have read and accept the Privacy Policy Statement

Yes

Primary author: FAVERO, Giacomo (INFN- Sez. di Padova)

Co-authors: BONESSO, Massimiliano (INFN- Sez. di Padova); CANDELA, Silvia (INFN- Sez. di Padova); CANDELA, Valentina (INFN- Sez. di Padova); PEPATO, Adriano (Univ. degli Studi di Padova); DIMA, Razvan (INFN-Sez. di Padova); REBESAN, Pietro (INFN- Sez. di Padova); AGOSTINETTI, Piero (Consorzio RFX)

Presenter: FAVERO, Giacomo (INFN- Sez. di Padova)

Session Classification: Thursday Poster Session

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