VERTICAL ELECTRO-POLISHING AT CEA SACLAY: COMMISSIONING OF A NEW SET-UP AND MODELING OF THE PROCESS APPLIED TO DIFFERENT CAVITIES


Introduction: High performance required for elliptical low beta cavity makes the electro-polishing desirable for their surface treatment. For large dimension cavities, the EP treatment in vertical configuration (abbreviated as VEP) is more appropriate. VEP set-up has been designed at Saclay for the electro-polishing of such cavities. Compared to existing 9cells VEP set-ups, the electrolyte will be circulating and the process automated, including several safety procedures.

In addition, VEP has been modeled using COMSOL software with 2D axisymmetry configuration for 2 different cavities: 9Cell ILC and 5Cell SPL cavities. Different cathodes have been designed to optimize fluid and Electric Field distribution during VEP. Results will be presented.

MODELING WITH COMSOL Multiphysics

Fluide Dynamics

- 4 alternatives shapes tested
- Protruberances make it possible to increase flow in cells
- Shape C improves uniformity by 33%
- Shape D improves fluid velocity in the cell by 39%

Fluid principally flows in the beam pipe

Different cathode geometries

For better fluid distribution

Potential distribution during VEP

Conclusions: The Electro-Polishing in Vertical configuration is well adapted for large elliptical cavities. A dedicated set-up has been commissioned at Saclay. The VEP will be achieved with circulating acid through an automated process. However, some parameters must be carefully chosen in order to achieve satisfactory treatment. Modeling with COMSOL allows investigating appropriate cathodes designs. The studied cases did not take into account parameters such as gas forming at the cathode and the cavity surface. Once the first cavities electro-polished, results will be compared with models for full understanding of the process.

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