

Hydraulic Design of the Windowless XT-ADS Spallation Target

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- Introduction
- Water experiment first design
- Design variation, final design
- Water experiment numerical and experimental results
- XT-ADS design called v0.10LBE
- Numerical results for HLM Target, design v0.10LBE
- Summary

Introduction

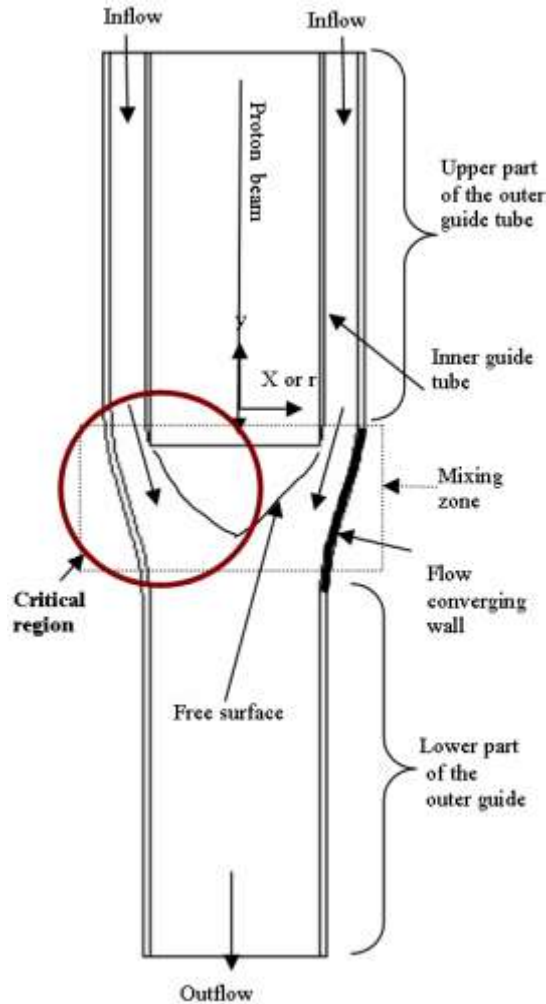
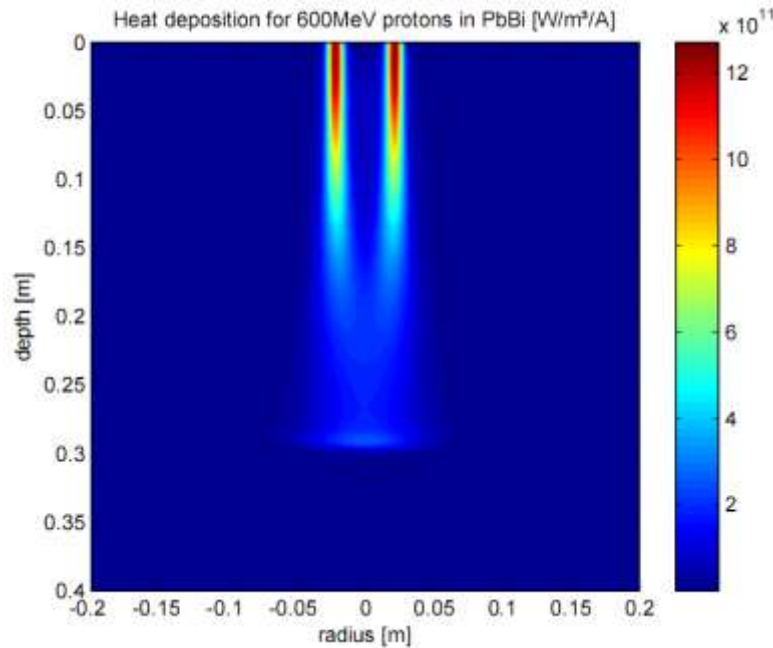
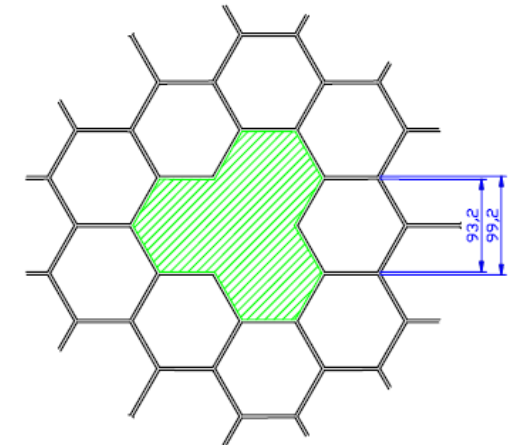


illustration of the XTADS target

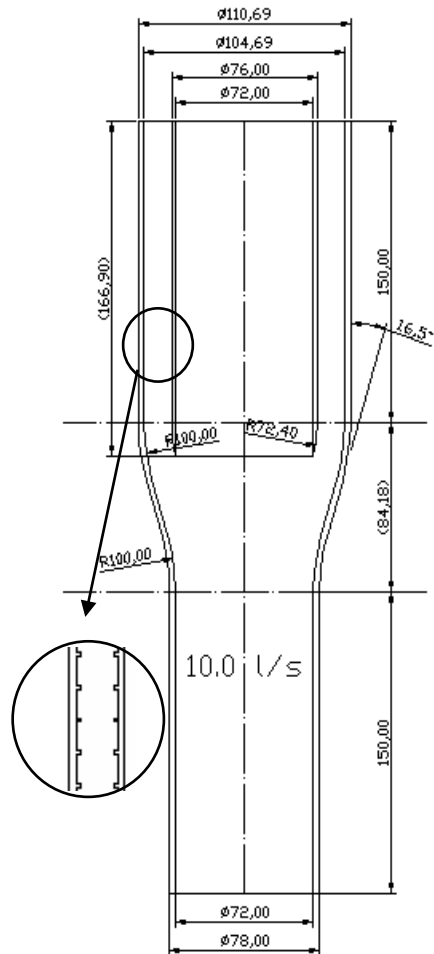


Typical beam characteristics



three assemblies in the centre of the core provide the space for the spallation module (dimensions in mm)[

Water target first design

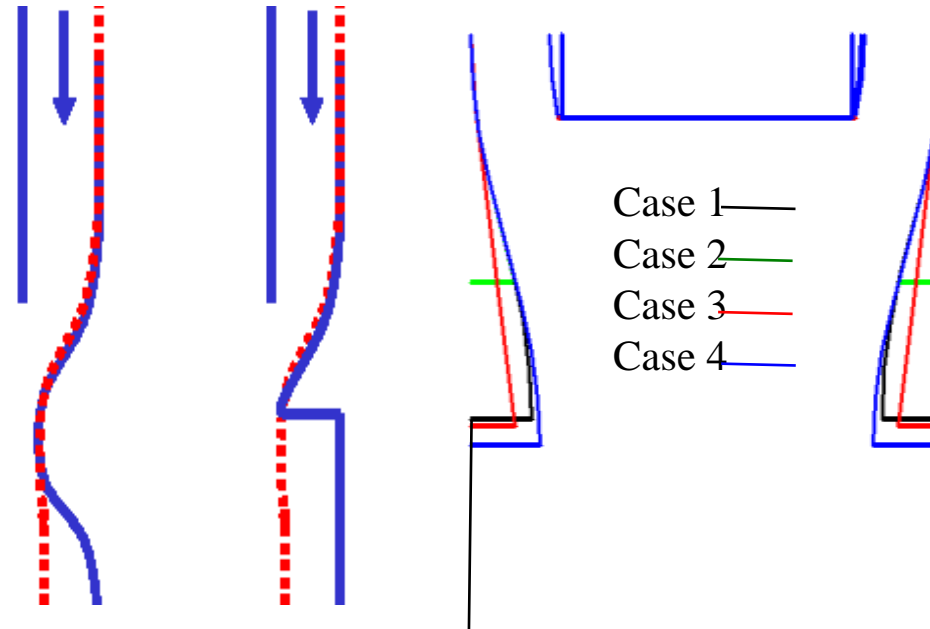


Flow visualization at 10 l/s for a swirl intensity of 10.5%

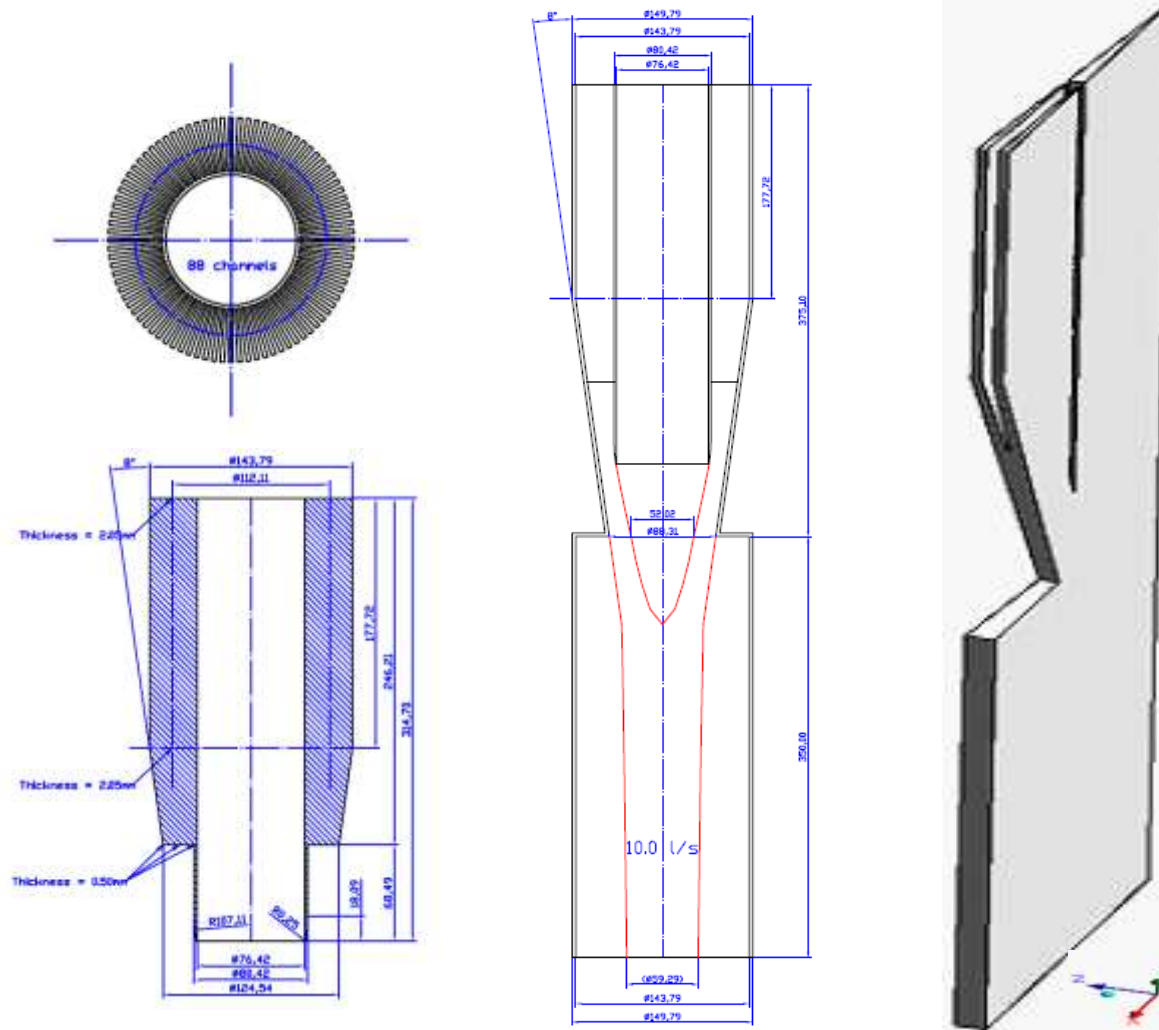


Swirl device

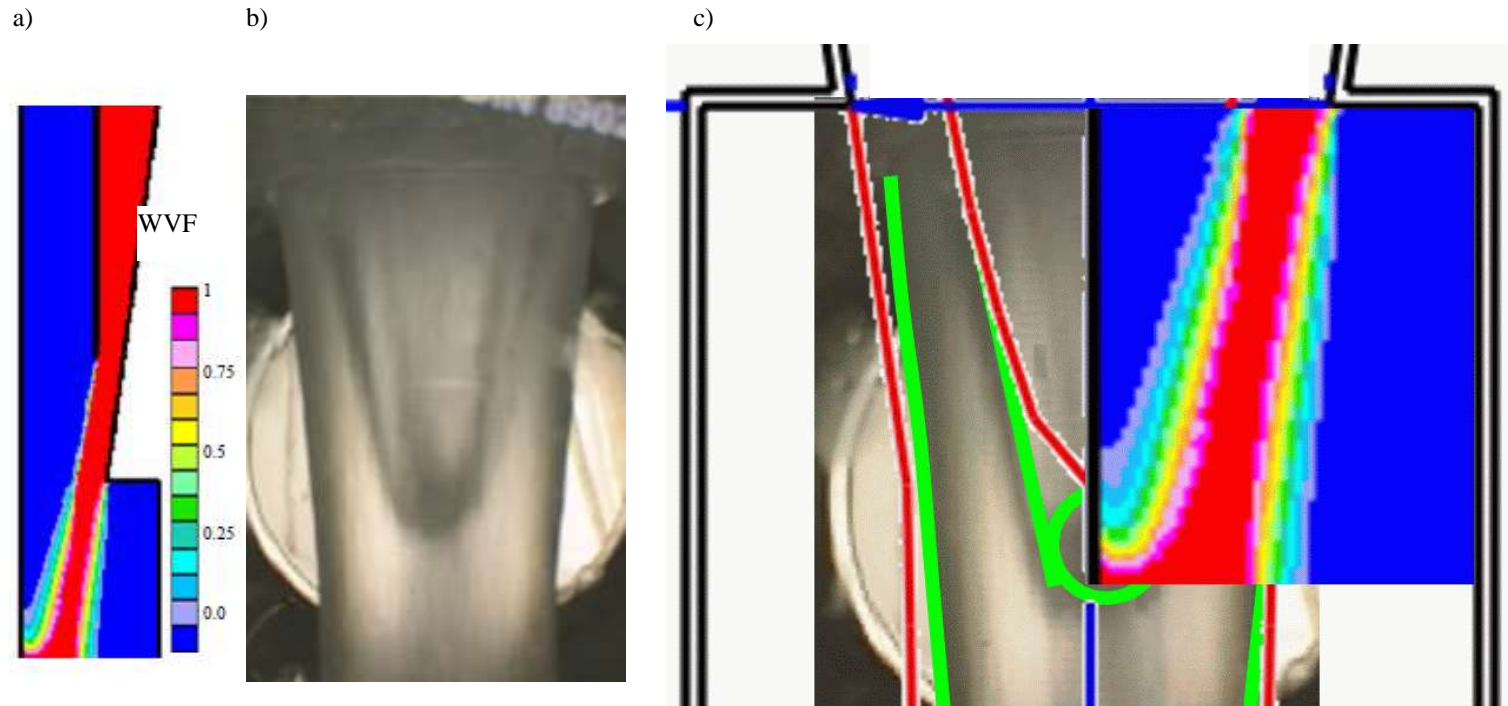
Proposed detachment zone and different contours of the outer walls of the mixing zone



Final water target geometry and computational domain

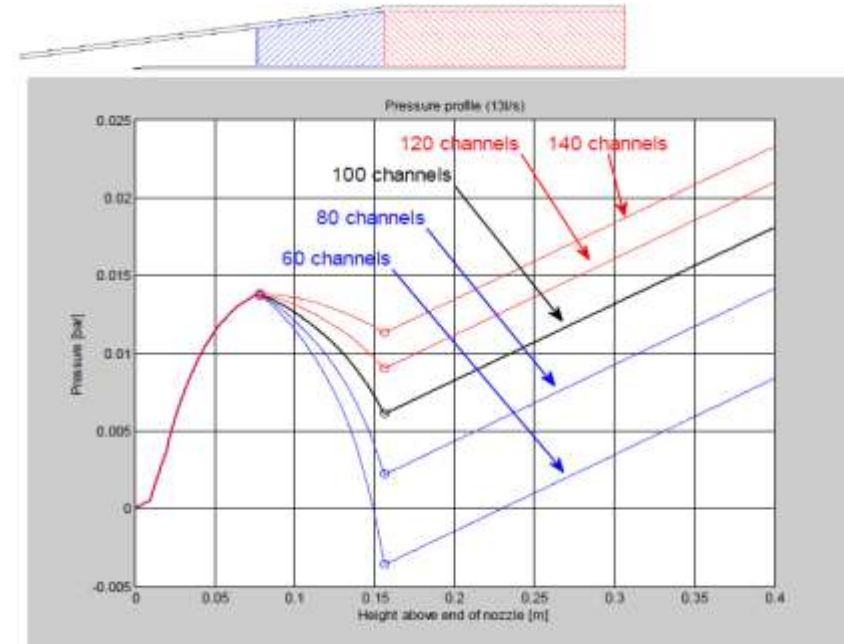
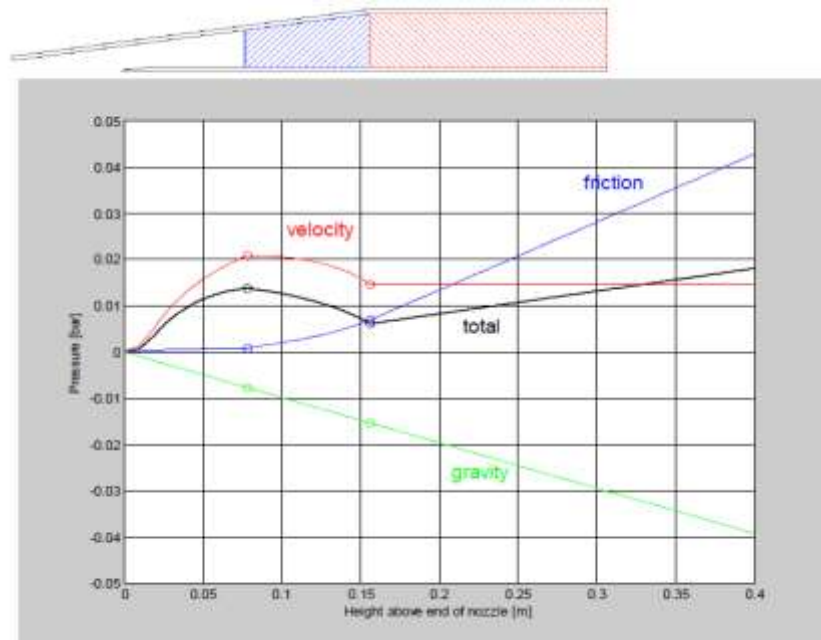


Results of water experiment



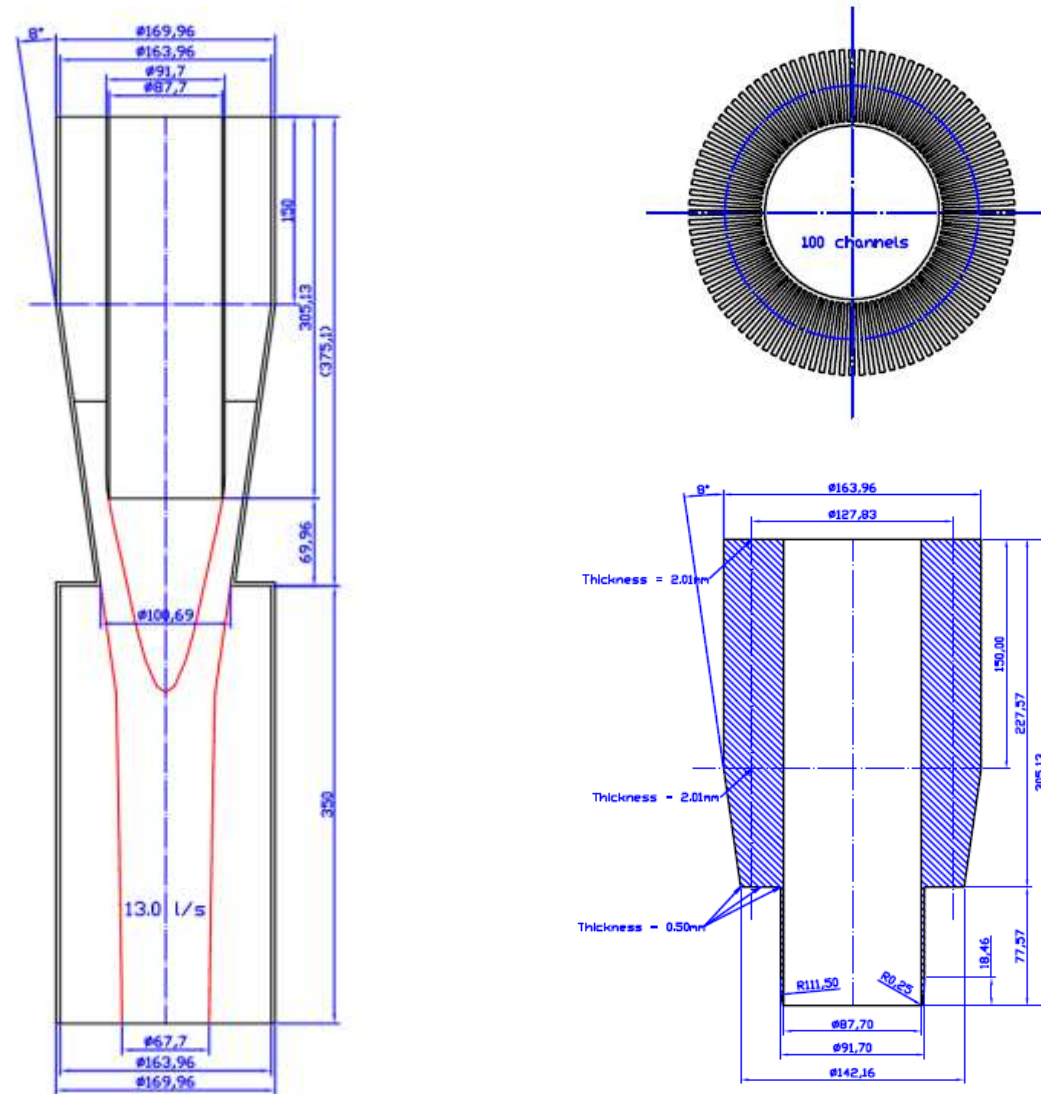
a) Predicted water volume fraction (WVF) (red is water, blue is vapour), b) observed free surface in the water loop experiments. c) comparison of numerical and experimental results, the red lines indicates the expected LBE flow profile, green lines highlights the experimentally observed free surface.

Fin design, *Pressure profile for the v0.10 nozzle*



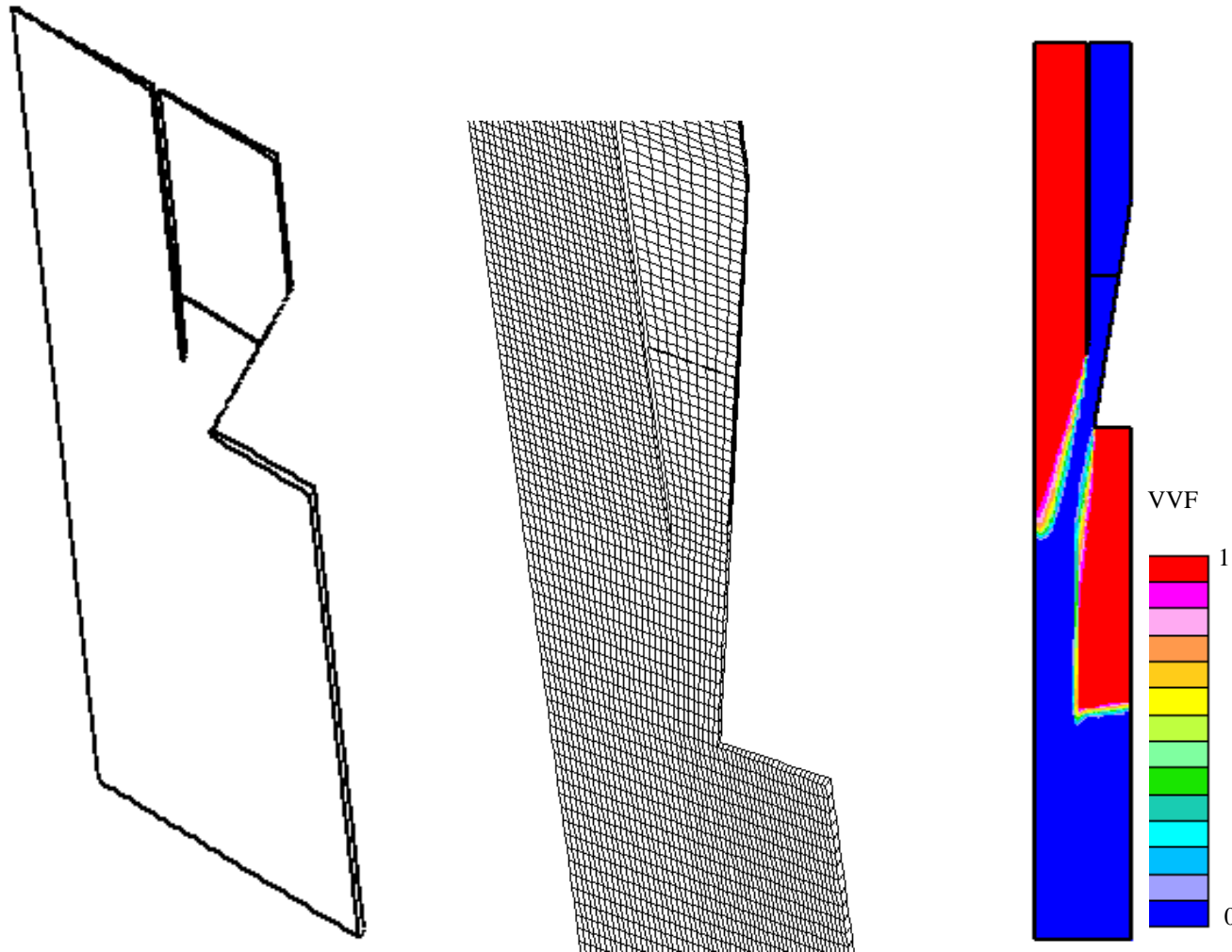
The abscissa corresponds to the height measured from the feeder outlet and is illustrated by the geometry plotted above the graph. The red hatched region indicates the drag enhancer which gradually fades in the nozzle region as indicated by the blue hatch. a) contribution of dynamic, gravitational, and friction to total pressure. b) total pressure for 60-140 fins.

XT-ADS nozzle design called v0.10LBE.



The red contour indicates the LBE flow profile computed with system code analysis

Computational domain, part of used mesh and vapour volume fraction results obtained for target HLM design v0.10LBE. with 100 radial fin.



Summary

- The design steps for the XT-ADS water experiment are reviewed.
- A final design for the water experiment is proposed and applied.
- First comparisons between numerical simulations and experimental observations show good agreement.
- A design for a heavy liquid metal target experiment is proposed.
- The numerical investigation of the proposed target indicates good performance for the desired flow rate.
- The hydraulic performance of the proposed target will be tested at KALLA.