1. Motivation and goal

- He-cooled divertor with multiple-jet cooling (HEMJ) is optional for EU-DEMO
- HEMJ must be able to accommodate at least 10 MW/m² during normal operation
- Evaluation and optimization of the heat transfer in HEMJ divertor cooling system
- CFD can optimize the cooling design and give a clear view of jet impinging

2. Parameters in simulation of HEMJ divertor

<table>
<thead>
<tr>
<th>Pressure (MPa)</th>
<th>Mass flow (g/s)</th>
<th>Inlet temperature (°C)</th>
<th>Target heat flux (MW/m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Helium Flow</td>
<td>10</td>
<td>3.35</td>
<td>500</td>
</tr>
</tbody>
</table>

2.2 Geometry and parameters of HEMJ divertor

- Heat transfer is very sensitive to Jet Array Parameterization
- Projected row (s/D, j/D), jet-to-wall distance (H), jet diameter (D) are expected to be evaluated and optimized.
- In the present article, H/D was optimized

2.3 Mesh and turbulent models

- ANSYS V19.2 Meshing and CFX
- 3.8 Million Mesh in fluid center
- SST turbulent model
- y+ close to 1
- Fluid & solid properties based on ITER material properties handbook

3. Evaluation of HEMJ Divertor cooling system

- Max local HTC can reach to 872.6 kW/m².K at the projection center and max temperature of tungsten tube is 1371K.
- Spent helium flow from the neighboring leads to cross flow between impinging jets

4. Optimization of HEMJ Divertor cooling design

Max Tube Temp (°C)

5. Conclusions

- H/D ratio strongly affects the local heat transfer
- H/D=1.3 is the best cooling ability or the minimum surface temperature

Outlooks

1) Further works of optimizing jet arrangement, e.g. hexagonal versus in-line, equal jet diameter versus unequal nozzles
2) Comparison between experiment results and CFD simulations