

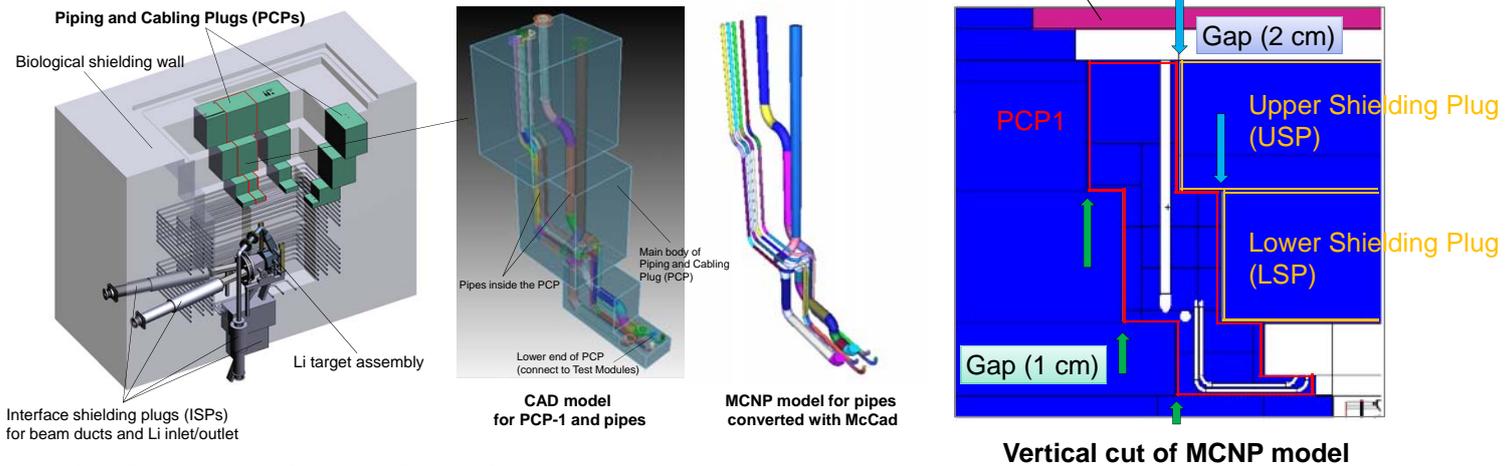
Shielding design optimization for the IFMIF test facility based on high-fidelity Monte Carlo neutronic calculation

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Background

The IFMIF Test Cell (TC) design has been further developed and optimized in the EVEDA phase, and finally the **reference TC design** has been proposed. The present study is devoted to further investigations on **the neutron streaming effect** caused by pipe penetrations and gaps around removable shielding plugs.

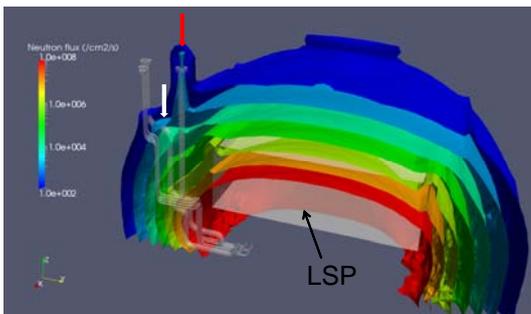
Reference TC design and calculation geometry



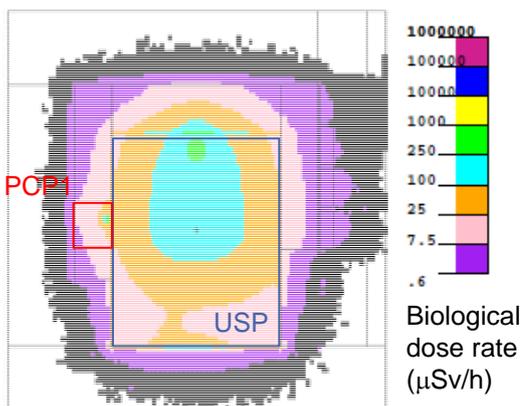
Calculation code, nuclear data

- 3-dimensional Monte Carlo code **McDeLicious-11** developed for IFMIF (enhancement to MCNP5)
- FENDL-3, Starter Library, Release 4 (extended up to 150 MeV)

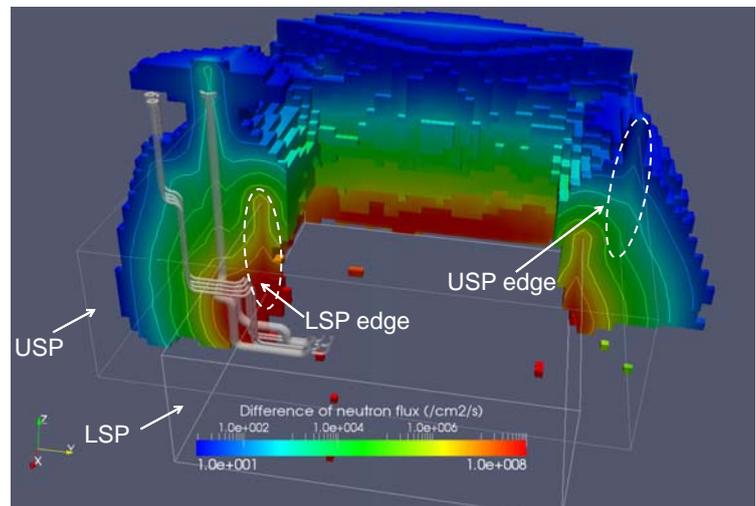
Results



Neutron flux distribution above TC



Biological dose rate distributions on USP (500 cm above the beam level)



Amount of the neutron flux increased by the streaming effect

Summary

- All the removable plugs are separately described in the new calculation model and a detailed description of pipes was successfully incorporated by means of direct conversion from CAD data with the McCad program.
- The neutron streaming effect with the pipe penetration appears only locally and can be mitigated when it is designed appropriately, e.g. with several bends. On the other hand, the gaps around the upper/lower shielding plugs above the TC have large impact.
- Occupational workers can access to the access cell above TC during operation when appropriate counter measures are taken.