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Preliminary Analysis on A Maintainable Test Cell Concept for IFMIF-DONES

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^aKIT, Germany, ^bRACE, Culham Science Centre, United Kingdom , ^c ENEA C.R. Italy, ^dHAS, Wigner RCP, Hungary , ^eCIEMAT, Spain IFMIF-DONES Reference Test Cell Design Plate (TCCP) Maior Features Sealing Plug (USP) ☐ Monothilic concrete biological shielding walls Lower Piping and ☐ Closed Liner covering internal TC surfaces attached to concrete Shielding **Cabling Plugs** (PCPs) ☐ Active cooling pipes embedded in concrete / attached to liner Potential Issues **HFTM** ☐ Risks in TC leakage, loss of cooling, components degradation, etc. unavoidable Lithium Quench ☐ Difficulties/infeasibility in maintenance of biological shielding, liner, cooling pipes Tank (QT) **Target** TC Surrounding Assembly **Shielding Walls** Test Cell Piping and Top Shielding Permanent Liner Cover Plate (TCCP) **Cabling Plugs** Section (PLS) Proposal of Maintainable TC Concept 0 1 2 m TC-LS Interface Cell (TLIC) Removable Liner Section (RLS) ☐ Liner incudes: Cutting and Permanent Liner Section (PLS) welding lines Replaceable ☐ Shielding walls includes Removable Biological Shielding Section (RBSS) **Liner Section** Permanent Biological Shielding Section (PBSS) Duct Liner Replaceable **Biological** Shielding Section Preliminary FEM Analysis of RLS Welding edges

☐ RLS and RBSS

2 m

Li Inlet

Receive intense neutron irradiation

TC-Lithium Systems

Interface Cell (TLIC)

High active level (hands-on impossible)

Li outlet

- Active cooling required
- Removable for emergency maintenance

Assembly (TA)

Permanent

Shielding Section

Biological

(PBSS)

 Re-welding between RLS and PLS required during maintenance

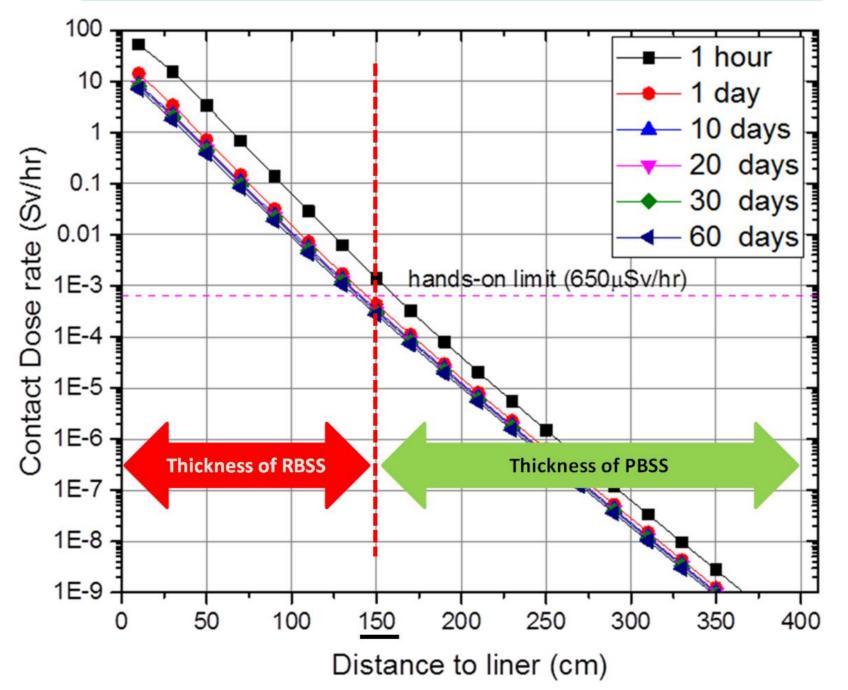
□ PLS and PBSS

- Receive less neutron irradiation
- Low level activity
- No active cooling required
- o Permanent, integrated with facility civil structures

Separation of RBSS and PBSS

View from

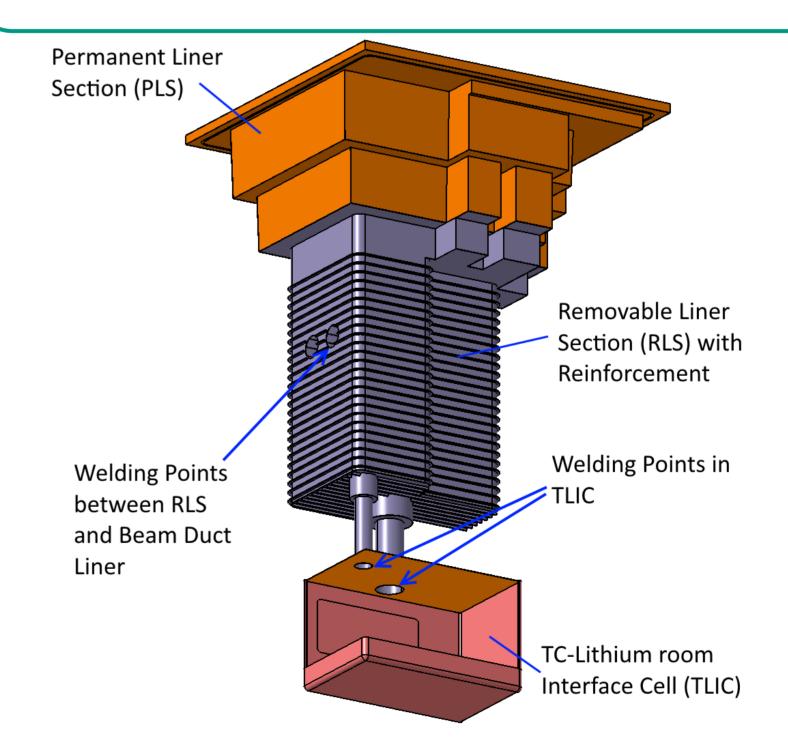
of Li pipes



Activation of Biological Shielding after 30 Years Operation

FEM Results of RLS under 1 bar pressure difference

Maintenance of RLS



RLS detachment from TLIC and Beam Duct Liner (before RLS being removed)

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