

Master's Thesis (m/f/d)

Feasibility Analysis and Design Development of a Tritium Breeding Loop

Chair of Applied Nuclear Technologies (ANT)

Background

Tritium production is one of the open engineering challenges on the path to a working fusion power plant. Breeding blankets and their associated breeding loops must extract heat, breed tritium, and allow its efficient recovery under very demanding thermal, chemical and neutronic conditions. In our group we have already developed an initial conceptual design and layout of a tritium breeding loop test setup, along with first process parameters to develop a tritium breeding system using lithium salts. This thesis continues that work: refining the design, checking its technical feasibility, and preparing it for the next development stages.

Your Tasks

- Review and continue development of the existing design of the tritium breeding loop
- Carry out a feasibility analysis of the current design (thermal-hydraulic, mechanical, and operational aspects)
- Support sizing and selection of key loop components (e.g. pump, heat exchanger, tritium extraction unit, piping and instrumentation)
- Set up and evaluate ANSYS simulations to support design decisions, where applicable (Optional)
- Identify open design risks and propose solutions or design alternatives
- Document the design status, assumptions, and results, including updated technical drawings

Your Skills

- Enrolled in a Master's program in Mechanical Engineering, Nuclear Engineering, or other related field
- Practical experience with CAD software (e.g. SolidWorks, CATIA, NX, or similar)
- Familiarity with ANSYS (Fluent and/or Mechanical) is an advantage (Optional)
- Interest in fusion technology and the tritium fuel cycle

Start date: by arrangement (Ideally October 2026) | **Type:** Master's Thesis | **Location:** FRM II, Garching

Contact

Liliana Quintero Zambrano
Chair of Applied Nuclear Technologies, TUM / FRM II
[liliana.quintero\(at\)frm2.tu-muenchen.de](mailto:liliana.quintero(at)frm2.tu-muenchen.de)

Jacqueline Dellith
Chair of Applied Nuclear Technologies, TUM / FRM II
[jacqueline.dellith\(at\)frm2.tu-muenchen.de](mailto:jacqueline.dellith(at)frm2.tu-muenchen.de)

Forschungs-Neutronenquelle Heinz Maier-Leibnitz (FRM II)

Lichtenbergstr. 1 | 85748 Garching | www.frm2.tum.de