



Karlsruher Institut für Technologie

KIT | INR | Hermann-von-Helmholtzplatz 1
76344 Eggenstein-Leopoldshafen

Aushang

Institut für Neutronenphysik und Reaktortechnik

Komm. Institutsleitung:
Prof. Dr.-Ing. John Jelonnek

Hermann-von-Helmholtz-Platz 1
76344 Eggenstein-Leopoldshafen

Telefon: 0721-608-22552
Fax: 0721-608-23718
E-Mail: Ingeborg.Schwartz@kit.edu
Web: www.inr.kit.edu

Bearbeiter/in: Ingeborg Schwartz
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Einladung zum Seminar über „Nukleare Energieerzeugung“

Zeit: Montag, 22. Juli 2024, 11:00 Uhr

Ort: Karlsruher Institut für Technologie, Hermann-von-Helmholtz-Platz 1
76344 Eggenstein-Leopoldshafen, INR, Bau 521, Kolloquiumsraum (R. 302)

Referent: Herr Dr. Sergej Gordeev, Karlsruher Institut für Technologie, INR

Titel: CFD Analysis of IFMIF-DONES Target System. Overview of technical challenges and solutions

Abstract:

International Fusion Materials Irradiation Facility-DEMO-Oriented NEutron Source (IFMIF-DONES) is a high-intensity neutron irradiation facility for qualification of fusion reactor materials, which is being designed as part of the European roadmap to fusion-generated electricity. Its main purpose is to study the behaviour of materials properties under irradiation in a neutron flux able to simulate the same effects in terms of relevant nuclear responses as those expected in the first wall of the DEMO reactor which is envisaged to follow ITER.

The plant will produce a 125 mA deuteron beam, accelerated up to 40 MeV and shaped to have a nominal footprint ranging from 100 mm × 50 mm to 200 mm × 50 mm, that will impinge on a 25 mm thick liquid-lithium curtain cross-flowing at a velocity of about 15 m s⁻¹. The stripping reactions Li (d, xn) will generate large amounts of neutrons that will interact with the materials samples located immediately behind the Lithium Target.

The Target System has to fulfil the following functions:
producing the adequate neutron flux to properly irradiate the test modules; maintaining a stable high-velocity, free surface flow of liquid lithium in front of the D⁺ beam; removing the high thermal power deposited within the lithium jet by the D⁺ beam.

There are many hydrodynamic, thermo-hydraulic and structural processes that affect the functionality of the liquid lithium target and therefore have a significant impact on the target design:

Karlsruher Institut für Technologie (KIT)
Kaiserstraße 12
76131 Karlsruhe
USt-IdNr. DE266749428

Präsidium:
Prof. Dr. Oliver Kraft (in Vertretung des Präsidenten des KIT),
Prof. Dr. Alexander Wanner, Prof. Dr. Thomas Hirth,
Prof. Dr. Kora Kristof, Michael Ganß

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Effect of turbulence on free surface stability; Mechanically or hydraulically caused malfunctions at the nozzle outlet; Cavitation phenomena due to possible flow disturbances; Unsymmetrical heat distribution; Fluid-structure interactions (thermal deformations and vibrations).

This presentation focuses on overview of the most relevant technical challenges and solutions achieved using CFD/FEM analyses (Star-CCM+) within the EURO fusion work package Early Neutron Source (WPENS) 2014-2024.

Hinweis: Alle auswärtigen Besucher des Seminars werden gebeten, ihren gültigen Personalausweis oder Reisepass mitzubringen