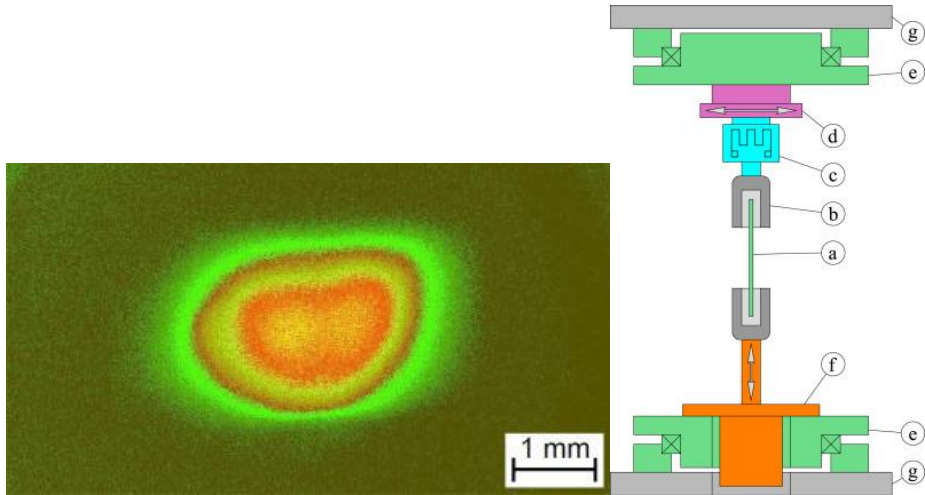


Technology Offer

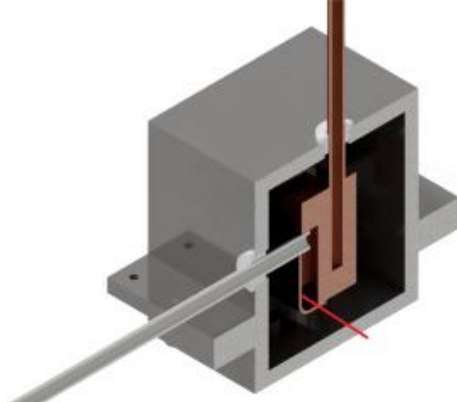
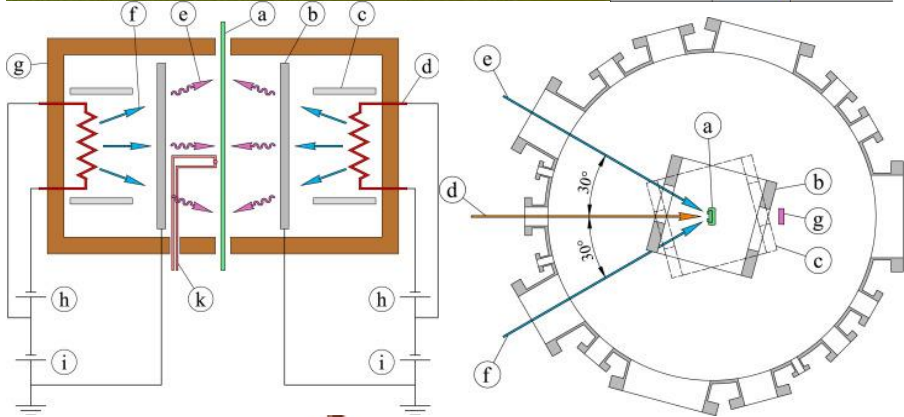
Abstract of the Offer	<p><i>The abstract of the offer should answer:</i></p> <ul style="list-style-type: none"> - <i>Where (geographically) is it from?</i> - <i>What sort of organization is offering it?</i> - <i>What is being offered?</i> - <i>What can it be used for?</i> - <i>What are the main advantages?</i> - <i>What sort of deal is sought?</i>
<p><i>Mandatory</i></p> <p><i>1-500 characters</i></p>	<p>The offered technology involves a simulator, testing machine as well as the data and knowledge acquired with this set-up regarding the behaviour of metallic components in the high temperature, high stress, high radiation environment of a fusion reactor. The analysis method targets in particular the creep behaviour under high irradiation at relatively low temperature.</p>
Description	<p><i>Provide background information or a short introductory text:</i></p> <ul style="list-style-type: none"> - <i>Describe the technology or product. Try to provide quantitative data and describe any potential application of the technology, perhaps considering more than one field</i> - <i>Provide information about the expertise or know-how behind the offer</i> - <i>Do not include sales promotion or brand names</i> - <i>Do not include advantages of your technology or product, this will come below</i>
<p><i>Mandatory</i></p> <p><i>100-4000 characters</i></p>	<p>The tendency of metals to undergo steady viscoplastic deformation when subjected to mechanical stress at elevated temperatures, known as creep, is of pivotal significance to the structural integrity of a reactor. The analysis quantitatively modelled a non-linear high-dose radiation mediated microstructure evolution effect that facilitates fast stress relaxation in the most challenging low-temperature limit. In situ experiments on a tensioned tungsten wire exposed to a high-energy ion beam demonstrate that internal stresses of up to 2 GPa relax within minutes, in agreement with predictions from a parameter-free multiscale model constrained by atomistic simulations. In the GIRAFFE set-up, a high-precision tensile testing machine is installed in a particle accelerator beamline so that thin wires and foils can be loaded mechanically while being irradiated with high-energy ions and, where required, implanted with hydrogen and helium ions under controlled temperature conditions. Relaxation of the stress under influence of irradiation also implies weakening of the material, possibly leading to failure. The test machine can analyse and indicate such failure modes, thereby helping to improve design of reactor components and other systems under similar load or in other radiation-intensive environments. The analysis set-up offers an innovative approach for the development and qualification of new materials and supports the development of lifetime prediction models under combined irradiation, thermal and mechanical loads. The GIRAFFE project and its associated multiscale modelling framework won second prize in the 2024 SOFT Innovation Prize of the European Commission.</p>
Advantages and Innovations	<p><i>Describe the <u>innovative aspects of the technology</u>. Avoid generalities such as best or unique, but try to specify <u>innovation by comparison with prevailing technologies</u>. Give the main economic advantages / benefits of the technology (if possible in a quantitative way), regarding such elements as performance, ease of use, need of specific know-how, or expertise to adopt your technology.</i></p>
<p><i>Mandatory</i></p> <p><i>50-2000 characters</i></p>	<p>The behaviour of the microstructure evolution of surfaces under high temperature, mechanical and irradiation loads was not very well studied and few datasets were available for verification and testing. The GIRAFFE test machine, analysis and published data significantly reduce this gap in knowledge and can assist during the analysis and design of similar high-load mechanical structures.</p>

Pictures

Add maximum 5 pictures, max 4MB each, max 50 characters for the file name including blank space. Also include a brief caption for each picture..



Mandatory
.jpg, .jpeg, .png or .gif



Target technology receiver

Stage of Development for non-fusion applications		
<i>Mandatory</i> <i>Select 1 option only</i>	<input type="checkbox"/> Already on the Market	<input type="checkbox"/> Project in negotiations - urgent
	<input type="checkbox"/> Available for Demonstration	<input type="checkbox"/> Proposal under development
	<input checked="" type="checkbox"/> Concept Stage	<input type="checkbox"/> Prototype available for demonstration
	<input checked="" type="checkbox"/> Field Tested/Evaluation	<input type="checkbox"/> Under development / lab tested
	<input checked="" type="checkbox"/> Project already started	

Current and Potential Domain(s) of Application	<i>Clearly define the potential domain(s) of application of the technology.</i>
<i>Optional</i>	Specialized materials laboratories, R&D centres, investigative institutions such as forensic labs or certification authorities; and on radiation-hard metallic materials for space, aerospace and other environments where components are exposed to combined irradiation, mechanical load and elevated temperature.

Type of partnership	<i>Specify the type of partnership that you are interested in.</i>	
<i>Mandatory</i> <i>Select 1 or more</i>	<input checked="" type="checkbox"/> Acquisition agreement	<input type="checkbox"/> License agreement
	<input type="checkbox"/> Commercial agreement	<input type="checkbox"/> Outsourcing agreement
	<input checked="" type="checkbox"/> Commercial agreement with technical assistance (joint further development, testing of new applications, adaptation to specific needs)	<input type="checkbox"/> Manufacturing agreement - (transfer of knowledge, new way to use, change in partner's currently used technology, absolutely novel process)
	<input type="checkbox"/> Distribution services agreement	<input type="checkbox"/> Reciprocal production
	<input type="checkbox"/> Financial agreement	<input type="checkbox"/> Services agreement : precise
	<input type="checkbox"/> Franchise	<input type="checkbox"/> Subcontracting
	<input checked="" type="checkbox"/> Joint venture	
Type and role of partner sought <i>Optional</i> <i>1 to 4000 characters</i>	From the side of IPP the interest is primarily scientific, not commercial. Other users can help to improve the system, or may be willing to share their own testing results which can directly contribute to ongoing work at IPP.	

EUROfusion Heritage

Description of EUROfusion Heritage	<i>What motivated the development of this technology for fusion? What was the technology innovation that stemmed from its use in EUROfusion? Describe the investments in the Fusion technology and know-how, particularly within EUROfusion ?.</i>
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Mandatory for spin-outs
100 to 4000 characters

The GIRAFFE system was developed at the Max Planck Institute for Plasma Physics (IPP) in Garching, major parts of it within the EUROfusion Consortium to test metallic fibres and foils under fusion-relevant thermo-mechanical and irradiation loads.

Key contributions come from Dr. Alexander Feichtmayer (IPP/EUROfusion), whose team combined the experiment with advanced multiscale modelling of low-temperature irradiation creep. The work has been carried out and funded in the framework of EUROfusion and the Euratom Research and Training Programme, and was recognised with the 2024 SOFT Innovation Prize of the European Commission. Key scientific results and the technical description of the facility are documented in:

- Feichtmayer, A., Boleininger, M., Riesch, J. et al. *Fast low-temperature irradiation creep driven by athermal defect dynamics*. Commun Mater 5, 218 (2024).
<https://doi.org/10.1038/s43246-024-00655-5>
- and Feichtmayer, A., Riesch, J., Curzadd, B., Höschel, T., Schwarz-Selinger, T., Appel, M., Colson, R., Estermann, S., Lürbke, R., Neu, R. *The General-Purpose Irradiated Fiber and Foil Experiment for material characterization under fusion-relevant loads*. Fusion Engineering and Design 217 (2025) 115114.
<https://doi.org/10.1016/j.fusengdes.2025.115114>.