

8th High Power Targetry Workshop (HPTW2023)



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Testing high-DPA irradiated titanium alloys for high-cycle fatigue

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The LBNF-DUNE experiment is expected to use a titanium beam window, immediately upstream of the pion-producing target and directly cooled by helium. This window will receive 2.5 DPA/yr from the proton beam and will experience significant cyclic loading due to beam heating, as well as operating at elevated temperature. To ensure beam window failure via high cycle fatigue is not a limiting factor on target life, a program of material testing has commenced to determine the effect of radiation damage on the fatigue life of various titanium grades.

The poster will detail current work at the Materials Research Facility at Culham, Oxfordshire, involving the static bending and ultrasonic fatigue testing of 3 grades of mid-scale fatigue samples at low DPA (0.1-1), obtained from the BLP irradiation experiments at Brookhaven. It will also describe ongoing work to produce and install 6 more grades of samples for high-DPA, high-current irradiation at University of Birmingham's MC40 facility, up to 3 DPA, in a nitrogen-cooled environment at temperatures similar to in-beam conditions. The application of the sample environment design and experimental techniques to other materials such as tungsten or stainless steel will be discussed through additional future use cases.

Themes for the contribution

2 Radiation damage in target material and related simulations:

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