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40 years of ISIS targets

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The 16th December 2024, will mark 40 years since neutrons were first produced at the ISIS pulsed neutron and muon facility at STFC Rutherford Appleton Laboratory in Oxfordshire, UK. Since that date, the facility has operated several types of targets and added muon capabilities and the second target station (TS2). This talk will provide a brief history of the targets employed, touch on some of the challenges, design iterations and continuing development work, as well as looking to the future with the preliminary planning and conceptual design for the future facility, currently called ISIS-II.

ISIS'initial operation began with uranium target plates clad in zircaloy, however as the power level from the accelerator was increased, issues with plate swelling began to significantly impact operations and a decision was made to move to the all tantalum targets. At the start of the 21st century, the targets were again changed, this time for tungsten plates clad in tantalum and although the design has recently been updated with the TS1 project, this typed of target is still employed.

In early 1987, muons were first produced from an intermediate graphite target down the extracted proton beam (EPB) for the first target station (TS1). This facility has also grown and developed over the subsequent years and continues to provide a programme of complimentary science to the neutrons from TS1 and TS2.

Since 2009 a solid tungsten core clad in a tantalum sleeve has formed the heart of TS2, a lower repetition rate target station focussed on longer wavelength neutrons. The life times of the TS2 targets has not yet reached our initial design specification and has been the subject to much investigation and development work since first operation.

As ISIS heads towards its milestone later in the year, work is already underway to scope out and conceptually design a brand new neutron and muon facility for the second half of the century. Currently titled ISIS-II, this facility is planned to eventually replace the existing ISIS, while maintaining and enhancing the UK's neutron and muon provision, in a way complementary to the European Spallation Source (ESS), in order to continue to support the UK and global research communities. This facility is likely to feature next generation MW-class target stations.

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