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Steady-State Neutronic Analysis of Converting the UK CONSORT Reactor for ADS Experiments

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(Submitted on 1 Jul 2011)

CONSORT is the UK's last remaining civilian research reactor, and its present core is soon to be removed. This study examines the feasibility of re-using the reactor facility for accelerator-driven systems research by replacing the fuel and installing a spallation neutron target driven by an external proton accelerator. MCNP5/MCNPX were used to model alternative, high-density fuels and their coupling to the neutrons generated by 230 MeV protons from a cyclotron striking a solid tungsten spallation target side-on to the core. Low-enriched U3Si2 and U-9Mo were considered as candidates, with only U-9Mo found to be feasible in the compact core; fuel element size and arrangement were kept the same as the original core layout to minimise thermal hydraulic and other changes. Reactor thermal power up to 2.5 kW is predicted for a keff of 0.995, large enough to carry out reactor kinetic experiments.

Comments: 25 pages, 13 figures
Subjects: **Accelerator Physics (physics.acc-ph)**
Cite as: **arXiv:1107.0287 [physics.acc-ph]**
(or **arXiv:1107.0287v1 [physics.acc-ph]** for this version)

Submission history

From: Hywel Owen [view email]
[v1] Fri, 1 Jul 2011 17:51:57 GMT (700kb)

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