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P1.084 **VIDARR reactor antineutrino detector upgrade**

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With the expected increase in nuclear reactors over the next decades and the concept of small modular reactors gaining traction, nuclear non-proliferation is an increasing concern. Antineutrino detector technology provides a powerful method to directly interrogate the core content and detect anomalies, providing an answer to these concerns.

The Liverpool Reactor Monitoring group has developed the VIDARR antineutrino detector based on T2K technology. This ton-scale device utilises plastic scintillator and Hamamatsu SiPMs to observe the inverse beta decay involving reactor antineutrinos and is capable of aboveground operation thanks to an integrated cosmic ray veto system. The VIDARR detector completed its first field trial at the 1.5 GW_{th} Wylfa Nuclear Power Station, a commercial Magnox reactor, in Anglesey at a distance of ~60 m to the reactor core in a self-contained laboratory inside a 20 ft. ISO shipping container. This trial ended December 2015 with the permanent shutdown of the power plant. Subsequently, the containerised laboratory and detector were returned to the University of Liverpool campus in March 2016 for further tests and upgrades.

This poster presents current results of the off-site measurements, demonstrating long-term stability of the device, background measurements with sources and cosmic rays and the effect of external environmental factors. Furthermore, the upgrade plans are detailed, including tests of new SiPMs, increased target mass and a new readout electronics stack.

Using GEANT4 simulations, the upgraded performance is quantified and explored in terms of improved physics capability. This includes the detector's sensitivity to neutrino fluxes with respect to distance to the core and reactor thermal power as well as the ability to distinguish core isotope ratios through improved measurement of the reactor antineutrino energy spectra.