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Upgrade to the Birmingham Irradiation Facility

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In
approximately 2024,the Large Hadron Collider (LHC) will be upgraded to the High Luminosity LHC (HL--LHC). The upgrade is foreseen to increase the LHC design integrated luminosity by a factor ten. This planned increase in luminosity results in significantly
higher levels of radiation inside the planned ATLAS Upgrade detector. This means existing detector technologies together with new components and materials need to be re examined to evaluate their performance and durability within this enhanced radiation field. Of particular interest is the effect of radiation on the upgraded ATLAS tracker. To study these effects an ATLAS irradiation scanning facility using the Medical Physics Cyclotron at the University of Birmingham was built in 2013. The intense cyclotron beam allows irradiated samples to receive in minutes, fluences corresponding to years of operation at the HL--LHC. Since commissioning in early 2013 this facility has been used to irradiate silicon sensors, optical components and carbon fibre sandwiches for the ATLAS upgrade programme. Irradiations of silicon sensors and passive materials can be carried out in a temperature controlled cold box which moves continuously through the homogenous beamspot. This movement is provided by a pre--configured XY--axis cartesian robot system (scanning system). In 2014 the cooling and the cold box was upgraded from a recirculating glycol chiller system to a liquid nitrogen evaporative system. This paper reviews the design, development, commissioning and performance results of the new cooling system.

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