LN2 Cooling Development

D15.8 Cold Irradiations at Birmingham Cyclotron Facility

The University Of Sheffield.

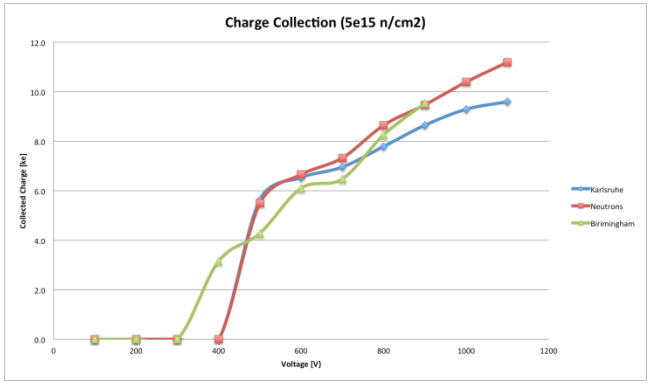
UNIVERSITY OF BIRMINGHAM

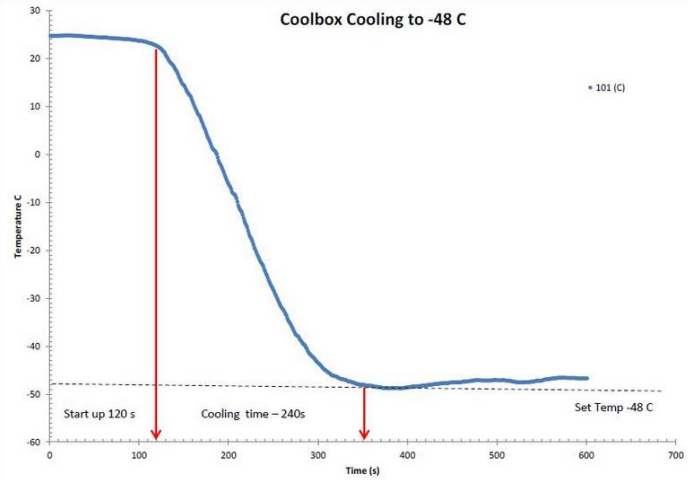
UNIVERSITY OF LIVERPOOL

AIDA 2020

A crude but now refined prototype cold box has been made with a larger volume and target window size. It could be the case this window is far too big for the relevant users. running.

A Norhof LN2 system using evaporative cooling has been purchased and installed in the High Energy beam area at the Cyclotron. The LN2 is dripped at a controlled rate on to a heat sink located at the base of the cool box evaporating to produce very cold N2 gas. LN2 flow is adjusted automatically by the system, which operates by monitoring the temperature and pumping in LN2 to achieve the pre-set required temperature of the cool box. The new cooling system can achieve a stable 120 temperature of -50 C in 30 minutes. The xy scanning robot then moves the sample mounted in the cold box through the proton beam to complete a cold irradiation.





Plans are now to refine the cold box design to allow for a silicon sensor irradiation when fully powered and instrumented with DAQ. Production can not happen until 2017 due to mechanical workshop restructuring in Sheffield.

We are in the final design stages of a more robust cold box with better dimensions to suit large area sensor irradiation will be constructed, tested before a final cold box design is reached & produced. We estimate this is likely to use the remainder of 2016 tying in with the 2017 workshop access data.

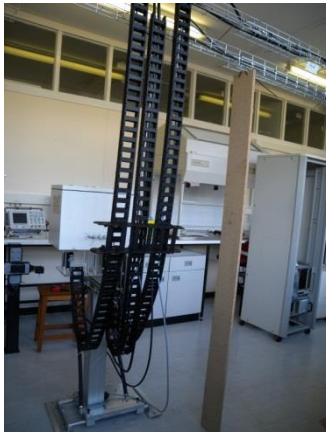
Pre-cooling using a re-circualting glycol chiller system from ambient temperatures to <0°C then to <-8°C has clearly proven more forgiving on the box materials eliminating thermal shock experienced

The University Of Sheffield.

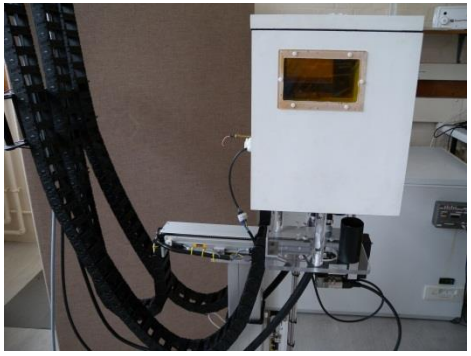
Duplicate system

For development not to damage in parallel to irradiation work at Birmingham

- Designed to be the prototype system
- Allows deployment in real-time of software updates and hardware alterations
- Can remotely connect to B'ham system to upload (network permissions needed)
- Theoretically we could operate the B'ham system from Sheffield via remote connection

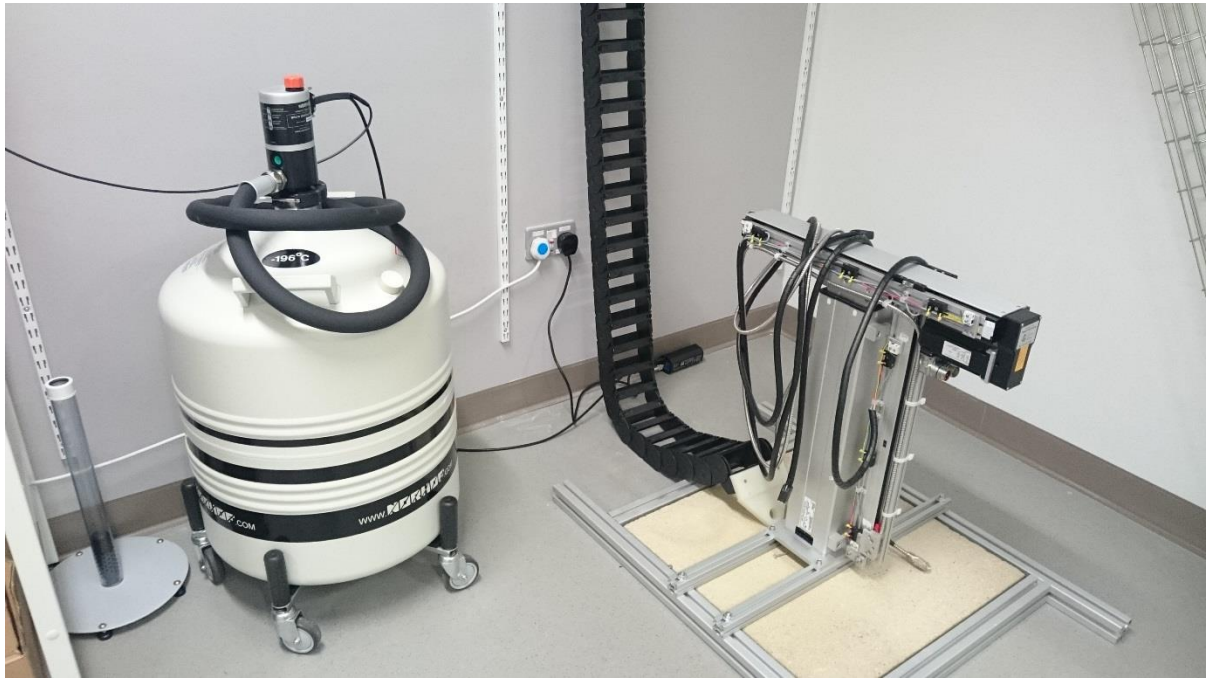


- Overall unit length with a parallel mounted motor is 598mm long to reduce working space



- Motors and cables connect to the scanning table in a straightforward and simple manner.

Installation almost completed



SHEFFIELD ROBOTICS

- To test and implement upgrades to the scanning system and software, a second scanning system and LN2 cooling unit is undergoing installation in Sheffield Robotics. This system will be used for remote troubleshooting of the system in Birmingham, testing of the software to improve user instructions as well as upgrades to the prototype cooling system and box.