Accelerator Operator Involvement With Commissioning the BRIGHT Beamlines

New beamlines bring new challenges

Eight new beamlines are currently being constructed/commissioned at the Australian Synchrotron. The accelerator operators have been directly involved with these new beamlines. We have helped with the commissioning of new insertion devices, dealt with significantly increased stored beam decay rate, and recovered from new scenarios causing losses in stored beam from the new beamlines. As the new beamlines start accepting users, operators are now providing out-of-hours assistance, which is examined here.

Operator assistance to a new beamline

The first BRIGHT beamline to become operational was Micro-Computed Tomography (MCT), which has been accepting users for the past year (3 operational rounds). Figure 1 details the number of faults and average time per fault that operators have dealt with over this past year.

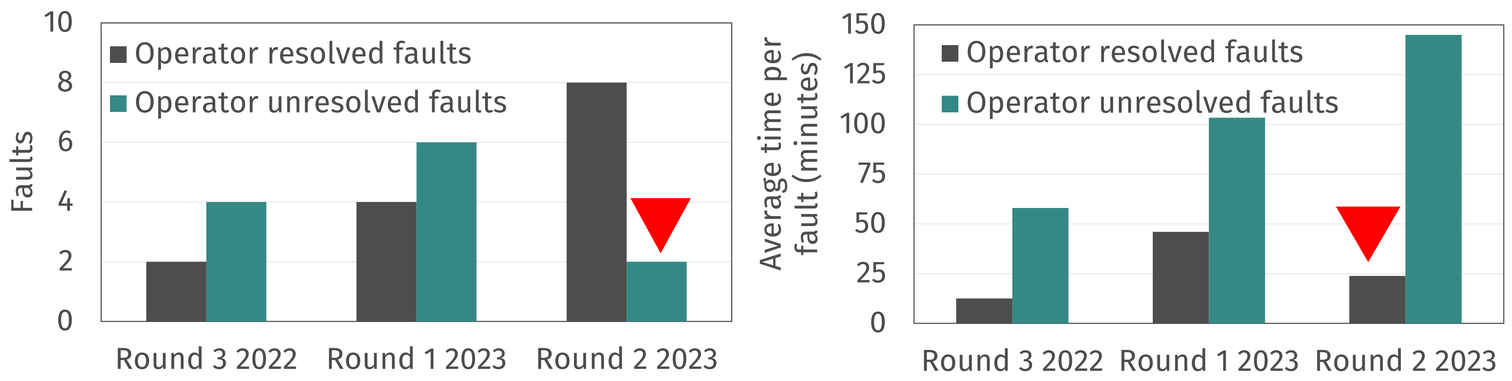

Figure 1: MCT beamline faults requiring Operator assistance. (Left) faults, (right) mean operator time per fault.

Marked with a red arrow in Figure 1 is the latest round of operation. During this round the total number of beamline faults has remained constant with the last round, however operators have been able to solve far more of these faults themselves. Additionally, the time to resolve faults has dropped. This aligns with operators being trained by beamline staff, and some operator feedback being implemented for useful software interfaces. Operator training has developed familiarity with the expected scan results and standard operational modes, while software updates have streamlined the ability to reset different services on the beamline. For users this has now noticeably reduced downtime.

Operator assistance to an existing beamline

To compare to the new MCT beamline, the fault statistics for the existing X-ray Absorption Spectroscopy (XAS) beamline have also been complied. In the past year, this beamline has had a new detector installed and an updated interface rolled out. This has been done without input from, Operators, or any training given. As seen in Figure 2, the changes to software and hardware to the XAS beamline have resulted in increased faults during operational rounds 1 and 2 this year. However, the mean time to resolve each fault has not increased for operator resolved faults. Note, the mean time per fault for round 3 2022 is disproportionately larger than other rounds due to two extraordinarily long faults, and low total faults for this round.

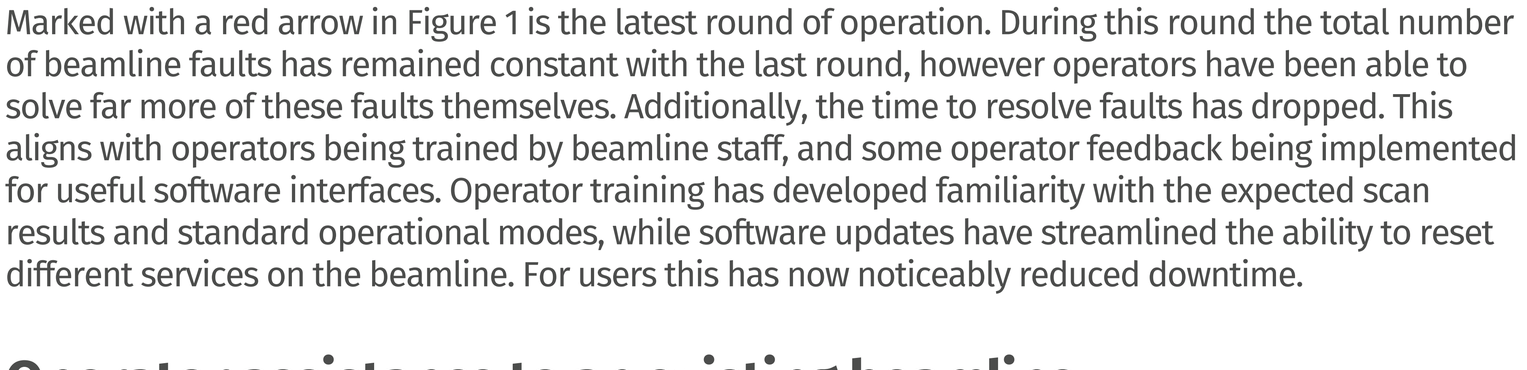

Figure 2: XAS beamline faults requiring Operator assistance. (Left) faults, (right) mean operator time per fault.

The lack of increase in mean time per fault suggests that basic familiarity with a beamline is enough for operators to resolve faults in a timely manner. The XAS beamline changes have resulted in more faults that require scientists to fix. The mean time operators spend on these faults before resorting to outside help has remained fairly constant. This mean time is also much less than for faults on MCT that require outside help. This indicates that the Operators are still not confident on fault diagnosis on the new beamline, and are willing to spend more time there trying to resolve these faults themselves before turning to outside help. While these faults requiring outside assistance still individually take up a lot of operator time, training operators and designing software interfaces to match our needs has noticeably decreased the amount of faults we cannot solve ourselves. This in turn has reduced the total time spent at the MCT beamline this operational round.

Australian Synchrotron

BRIGHT beamlines timeline

Micro Computed Tomography – MCT
First users – October 2022
Bending magnet

Medium Energy X-ray Absorption Spectroscopy – MEX-1 & MEX-2
MEX-1 first light – June 2022
MEX-1 first users – November 2022
MEX-2 first light – December 2022
MEX-2 first users – April 2023
Bending magnet

Biological Small Angle X-ray Scattering – BioSAXS
Insertion device installed in the storage ring– September 2022
First light – November 2022
First users expected – October 2023
Superconducting undulator

High Performance Macromolecular Crystallography – MX3
Insertion device installed in the storage ring – December 2022
Photon delivery system complete – April 2023
First users expected – May 2024
In-vacuum undulator

Advanced Diffraction & Scattering – ADS-1 & ADS-2
Straight section installed in storage ring – April 2023
Insertion device planned for instal in the storage ring – October 2023
Superconducting wiggler

Nanoprobe – NANO
Insertion device planned for instal in the storage ring – late 2024
Cryo-cooled undulator

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