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# Turbo charging an X-ray fluorescence microscopy beamline

The X-ray fluorescence microscopy beamline (XFM) at the Australian Synchrotron saw first light in 2008 and has been serving a diverse user research community since. XFM was delivered with a unique horizontal-bounce double crystal monochromator (DCM) at the heart of its design. Several major upgrades to the X-ray fluorescence detection and scanning microprobe instrumentation have been made. Most improvements focused on maximizing X-ray fluorescence detection efficiency alongside a hyper-efficient raster scan. Recently, ptychography has been added to the imaging modes available, providing complementary nanoscale morphological context to fluorescence data. The photon delivery optics have remained unchanged, and we find that experiments are flux and/or coherent flux limited. Consequently, we formed a strategic plan to enable science in the upper energy range of the beamline, i.e., 20–30 keV where the in-vacuum undulator source flux output declines. Target science includes the investigation of cadmium in agriculture and human health, e.g., in cereal grains, and silver in material science improving detection limits by accessing the K line emissions of these heavy metals.

We describe our funded upgrade plan to “turbo charge” the beamline by incorporating a horizontal-bounce double multilayer monochromator (DMM), increasing flux delivered to the endstation across the 4 to 30 keV energy range of the beamline. The original beamline design foresaw this upgrade, allowing space in the first optics enclosure for a DMM. The tender has been awarded for the DMM build and installation scheduled for early 2024. The expected flux gains are presented along with design constraint to ensure the same horizontal offset as the DCM allowing quick, efficient changeover between narrow (DCM) and broadband (DMM) monochromation.

## Level of Expertise

Experience Researcher

## Presenter Gender

Man

## Pronouns

He/Him

## Do you intend to attend UM2022

In person - Melbourne

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