

## MS15-P01 | REDUCING THE BACKGROUND OF ULTRA-LOW TEMPERATURE X-RAY

### DIFFRACTION DATA

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The XIPHOS diffraction facility at Newcastle University has been designed to broaden the range of extreme sample environments available in the home laboratory.<sup>1</sup> One of these extreme conditions is the ultra-low-temperature regime, with temperatures as low as 3 K routinely accessible. In order to reach these ultra-low temperatures, the sample is cooled using a three-stage Displex closed-cycle refrigerator. Conventionally this leads to a very intense and complex background from the beryllium sample environment.

A series of recent upgrades have led to a 6-fold reduction in the average intensity and a 15-fold reduction in peak intensity of the background observed for diffraction experiments, opening up new possibilities to look at weakly diffracting samples with a much-improved signal to noise.<sup>2</sup> The upgrades include a magnetically controlled internal beamstop and separate internal collimator that together, completely remove the scattering contribution to the background from the beryllium vacuum chamber. Additionally, a new radiation shield made from flexible graphite further reduces the background and maintains excellent thermal properties to access an ultra-low base temperature, 2.05 K.

This much-reduced background allows us to elucidate the structure and phase behaviour of chemically complex samples by single-crystal X-ray diffraction at these extreme temperatures.

[1] Probert et al. 2010 J. Appl. Cryst. 43, 1415

[2] McMonagle & Probert 2019 J. Appl. Crystallogr. 52, 445