Maia Mapper: High definition XRF imaging in the lab

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Maia Mapper is a laboratory XRF mapping system for efficient elemental imaging of drill core sections serving minerals research and industrial applications. It targets intermediate spatial scales, with imaging of up to ~80 M pixels over a 500 × 150 mm^2 sample area, as part of the analytical workflow of the Advanced Resource Characterisation Facility [1], which spans spatial scales from ore deposit to atomic scales. It brings together (i) the Maia detector and imaging system [2], with its capabilities for high efficiency detection (1.2 sr solid-angle), event-mode operation, millisecond pixel transit times in fly-scan mode and real-time spectral deconvolution and imaging [3], (ii) the high brightness MetalJet D2 liquid metal micro-focus X-ray source from Excillum [4] with high-In I2 alloy anode and 200 W power at 70 kV into an effective 20 µm source size, and (iii) an efficient XOS polycapillary lens [5] with a flux gain >8000 at 19-24 keV into a ~30 µm focus, all integrated with stage raster scanning for automated imaging and analysis of drill-core sections.

Users select scan regions on a computer screen from a tiled optical image of the entire sample area. The list of scans is then executed in sequence with display of deconvoluted element component images accumulated in real-time in the Maia FPGA using a Dynamic Analysis (DA) method transform matrix constructed using the GeoPIXE software [3]. Further off-line refinement and re-processing (at rates of ~10^5 pixels per second) and exploration of the large image data-sets are done using GeoPIXE.

[1] http://www.sief.org.au/FundingActivities/ARCF.html
[2] Siddons *et al*., X-Ray Optics and Microanalysis, Journal of Physics: Conference Series 499 (2014) 012001.
[3] Ryan *et al*., X-Ray Optics and Microanalysis, Journal of Physics: Conference Series 499 (2014) 012002.
[4] http://www.excillum.com/
[5] https://www.xos.com/focusing-optics