Integrated Image Projection and Detector Array for Real-time Quantitative Synchrotron XRF Elemental Imaging using the X-ray Microprobe

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The *Dynamic Analysis* (DA) method enables the generation of quantitative proton induced X-ray emission (PIXE) elemental images using a matrix transform that lends itself to real-time projection [1]. PIXE and synchrotron X-ray fluorescence (SXRF) display many similarities, such as non-destructive trace element analysis, deep penetration and similar X-ray spectra. These similarities have enabled the adaptation of the DA method to generate real-time elemental images using the X-ray Fluorescence Microprobe (XFM). DA for SXRF has been implemented in the GeoPIXE software using recent fundamental parameter compilations and a treatment of scatter peaks. Tests of the method using the 2-ID-E XFM at the APS, and samples with demanding multi-element overlaps, demonstrate the potential of the method.

The aim is to combine the DA imaging approach with an advanced 384 element silicon detector array being developed at Brookhaven National Laboratory (BNL) [2]. The detector system will combine the BNL array and a CSIRO pipelined parallel processing engine to yield a detector with 1-2 steradian solid-angle for high detection sensitivity and a maximum total count rate exceeding 10^7 counts per second, tightly coupled to sample stage control for fast scanning at ~10^3 pixels per second.

[1] C.G. Ryan, ***International Journal of Imaging Systems and Technology*** 11 (2000) 219.
[2] D.P. Siddons, *et al*., Proc. of Synchrotron Radiation Instrumentation Conference, San Francisco, 25-29 August, 2003, ***AIP Conference Proceedings*** 705 (2004) 953.

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