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Thermal Imaging Applied to Cryocrystallography: Cryocooling and Beam Heating. Edward Snell[1], Henry Bellamy[2], Gerd Rosenbaum[3], Mark van der Woerd[4], Michael Kazmierczak[5], [1]Hauptman-Woodward Medical Research Inst., 700 Ellicott St., Buffalo NY 14203, [2]CAMD, Louisiana State Univ., 6980 Jefferson Hwy. Baton Rouge, LA 70806, [3]Dept. of Biochemistry, Univ. of Georgia, SER-CAT at the APS, Argonne, IL 60439, [4]BAE SYstems, 308 Voyager Way, Huntsville, AL 35806, [5]Dept. of Mechanical, Industrial and Nuclear Engineering, Univ. of Cincinnati, Cincinnati, OH 45221.

Thermal imaging provides a non-invasive method to study both the cryocooling process and heating due the X-ray beam interaction with the sample. The method has been used successfully to image cryocooling in a number of experimental situations, i.e. cooling as a function of sample volume and as a function of cryostream orientation. There are experimental limitations to the method but it has proved a powerful technique to aid cryocrystallography development. Due to the rapid spatial temperature information provided about the sample it has also proved powerful in the testing of mathematical models.

Recently thermal imaging has been used to measure the temperature distribution on both model and typical crystal samples illuminated by an undulator produced X-ray beam. A brief overview of thermal imaging, and previous results will be presented. Following that a detailed description of the calibration then experimental and modeling aspects of the beam heating experiments will be described.