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Improved monochromator design for high heat load beamlines at CHESS

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The use of watercooling channels in silicon x-ray monochromators for the Cornell High Energy Synchrotron Source (CHESS) high power wiggler beamlines has been studied by finite element analysis. The efficiency from channels of different dimensions, ranging from 25 mm to 2 mm width and 5 mm depth has been calculated. The new crystals are designed to replace the indirect cooled monochromators currently used at CHESS wiggler stations. At typical operation parameters of 150 mA electron current at 5.3 GeV and a gap of 40 mm, the 24-pole Wiggler at CHESS provides an x-ray beam with a total power of 2.7 kW at the monochromator. Procedures have been developed for fabrication of internally cooled crystals using a silver-glass dye attach paste. Tests of a new crystal performed with a conventional x-ray source revealed very small amounts of residual strain. Experiments with synchrotron radiation are scheduled in the near future.