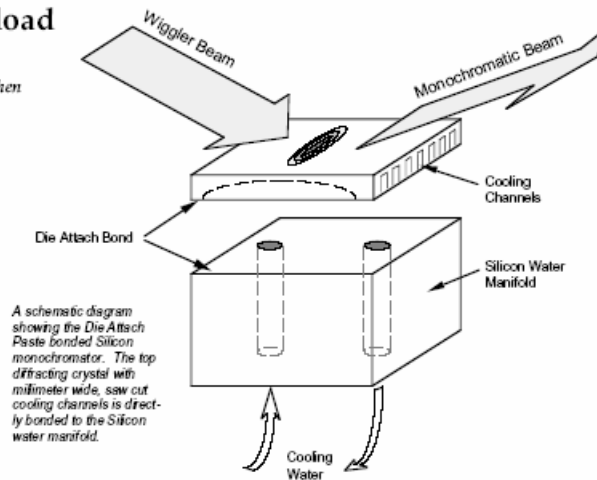


## Progress in high heat load optics

Karl W. Smolenski, Park Doing and Qun Shen

With the growing intensity of the wiggler beams, the A2 and F2 monochromators first crystals are performing below expectations due to the thermal distortion of the crystal's diffracting planes. The present cooling configuration has a thin silicon crystal clamped to a water cooled copper block with a gallium-indium eutectic liquid interface. Although improvements have been made by using thinner silicon and shorter distances to the water channels, the thermal resistance of the liquid interface ultimately limits the monochromator efficiency.

The situation can be substantially improved by flowing cooling water directly into a slotted silicon crystal. The key to this approach is how to seal the internal water channels in a strain free manner. Until recently we had been working on perfecting a simple replacement using a slotted crystal clamped onto an aluminum water manifold, with a compressed indium O-ring to seal the cooling water. With the crystal only clamped at its edges, the pressurized cooling water bowed the top surface of the crystal. Unfortunately it was also difficult to obtain a reliable, watertight seal without severely straining the crystal, bringing un-



A schematic diagram showing the Die Attach Paste bonded Silicon monochromator. The top diffracting crystal with millimeter wide, saw cut cooling channels is directly bonded to the Silicon water manifold.

acceptable rocking curve widths.

One possible solution is to bond the crystal using die attach paste directly to a silicon water manifold, eliminating the indium O-Ring. This paste, a mixture of fine Silver and glass powders, is used extensively in the microelectronics industry to attach semiconductor chips to other substrates. The die attach paste allows us to form not only a water tight, strain-free joint, but also reduces the deforma-

tion of the diffracting surface by internal water pressure. Instead of being clamped around the perimeter, the die attach paste bonded crystal is joined structurally at the tip of each fin. An indium O-ring is used within the silicon base to attach the water lines far from the diffracting surface. We are presently perfecting the bonding process and are fabricating prototypes monochromators for further testing.