Development of imaging techniques using monochromatic SR with high parallelity

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In order to fully utilize such a super bright synchrotron radiation from SPring-8, one needs basically to develop two technical aspects: one high heat tolerance x-ray optics and an x-ray optics for expanding the beam size.

For the first case tempature rise of a diamond crystal which has a best heat transfer character has been mesured where the diamond monochromator crystal piece was glued by soldering onto a bed diamond crystal that was brazed to a copper block for water cooling . By this design one easily finds out a big advantage over a conventional diamond mounting with liquid gallium because one can most effectively use the crystal size ranging approximately 8mm x 8mm. Further distortion which may occur due to heat power of SR and braze is negligibly small so that one can infer that this method could persist against up to 100 watts of absorbed heat power. Distortion due to heat was confirmed by computer simulation FEM and that due to braze by laboratory x-rays. Almost no temperature rise was found under the white radiation condition of 8GeV x 70mA with horizontal beam size of 1mm which is 10% of the expected beam size. As a conclusion by inserting a relatively larger volume of another diamond platelet the expecting thermal distortion, otherwise that can exceed the tolerance value, was effectively relieved.

As a second project beam size magnification was attempted by adopting asymmetric diffraction. During this process horizontal stripes were discovered as shown in figure that has approximately 25mm x 25mm in size. It has been obvious that these are not replication of any crystal component. We almost reached a conclusion that that contrast might come from a very small irregularity of both sides of a Be window. That will be replaced by a better polished one in summer of 1999.

Ref. TAKIYA Toshio, SUGIYAMA Hiroshi, ZHANG Xiaowei, SHIMADA Shoichi, YAMAZATO Kunihiro, KOMURA Akio and ANDO Masami:
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