

## Mark Rivers

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**From:** Mark Rivers  
**Sent:** Tuesday, December 15, 2015 3:54 PM  
**To:** Dongzhou Zhang; Przemyslaw Dera  
**Cc:** Peter Eng; Vitali Prakapenka; Andrew Campbell; Bin Chen; Dan Shim; Kanani K. M. Lee; Mark Rivers  
**Subject:** Questions about PX<sup>2</sup>

Dear Dongzhou and Przemek,

At today's COMPRES Facilities Committee meeting several questions arose about the PX<sup>2</sup> project.

- What is the minimum spot size with the new K/B mirror system?
- Is this compatible with doing laser heating?
- Can you provide the layout for the laser heating system?

Thanks,  
Mark

## Mark Rivers

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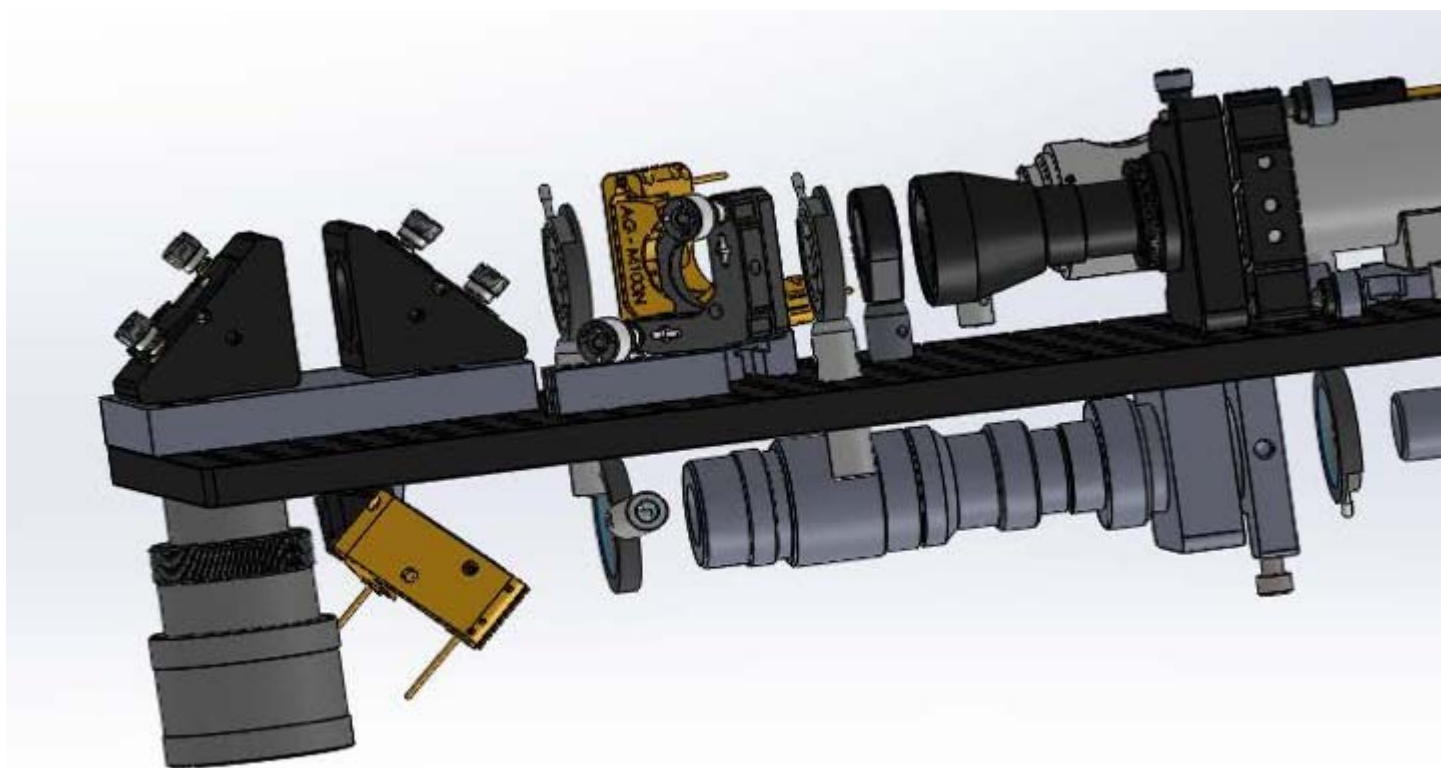
**From:** Vitali Prakapenka  
**Sent:** Tuesday, December 15, 2015 4:44 PM  
**To:** Mark Rivers; Dongzhou Zhang; Przemyslaw Dera  
**Cc:** Peter Eng; Andrew Campbell; Bin Chen; Dan Shim; Kanani K. M. Lee  
**Subject:** Re: Questions about PX^2

Hi Mark,

Currently we plan to have one side laser heating system that will provide flat top around 20-30 microns in diameter on sample that should result in uniform heating of isolated single crystals up to 2000K. Recent experiments with Leonid Dubrovinsky at PETRA-III and ESRF showed that such setup works very well for sXRD measurements with x-ray size up to at least 15 microns that similar to what we have at 13-BMC station with clean-up slit.

Attached is one of the SolidWorks layouts of the portable laser-heating/Raman/Fluorescence/microscope system.

Best,  
Vitali



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**From:** Mark Rivers <[rivers@cars.uchicago.edu](mailto:rivers@cars.uchicago.edu)>  
**Date:** Tuesday, December 15, 2015 at 15:54  
**To:** Dongzhou Zhang <[dzzhang@cars.uchicago.edu](mailto:dzzhang@cars.uchicago.edu)>, Przemyslaw Dera <[pdera@hawaii.edu](mailto:pdera@hawaii.edu)>  
**Cc:** Peter Eng <[eng@cars.uchicago.edu](mailto:eng@cars.uchicago.edu)>, Vitali Prakapenka <[prakapenka@cars.uchicago.edu](mailto:prakapenka@cars.uchicago.edu)>, Andrew Campbell <[campbell@geosci.uchicago.edu](mailto:campbell@geosci.uchicago.edu)>, Bin Chen <[binchen@hawaii.edu](mailto:binchen@hawaii.edu)>, Dan Shim <[sshim5@asu.edu](mailto:sshim5@asu.edu)>, "Kanani K. M. Lee" <[kanani.lee@yale.edu](mailto:kanani.lee@yale.edu)>, Mark Rivers <[rivers@cars.uchicago.edu](mailto:rivers@cars.uchicago.edu)>  
**Subject:** Questions about PX^2

Dear Dongzhou and Przemek,

## Mark Rivers

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**From:** Przemyslaw Dera <pdera@hawaii.edu>  
**Sent:** Tuesday, December 15, 2015 5:00 PM  
**To:** Vitali Prakapenka  
**Cc:** Mark Rivers; Dongzhou Zhang; Peter Eng; Andrew Campbell; Bin Chen; Dan Shim; Kanani K. M. Lee  
**Subject:** Re: Questions about PX^2

Hi Mark,

I agree with Vitali's assessment. The typical beam size we have been working with after the mirror upgrade is 15x15 microns, which should be compatible with the expected flat top beam laser profile for single crystal experiments. This could probably be reduced further if we work with cleanup slit positioned closer to the sample. The laser heating system is not designed to be competitive with insertion device laser heating setups for powder diffraction at Mbar, but should still make such (powder LH) experiments possible, while providing a unique solution for heating single crystal samples. The layout of the single-sided laser heating system was discussed in the 2014 PX^2 Annual Report Fig. 3.

Przemek

On Tue, Dec 15, 2015 at 12:43 PM, Vitali Prakapenka <[prakapenka@cars.uchicago.edu](mailto:prakapenka@cars.uchicago.edu)> wrote:

Hi Mark,

Currently we plan to have one side laser heating system that will provide flat top around 20-30 microns in diameter on sample that should result in uniform heating of isolated single crystals up to 2000K. Recent experiments with Leonid Dubrovinsky at PETRA-III and ESRF showed that such setup works very well for sXRD measurements with x-ray size up to at least 15 microns that similar to what we have at 13-BMC station with clean-up slit.

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Vitali

[cid:66586BE7-2C7F-4BDE-8F3A-BC4AB4DB4371]

From: Mark Rivers <[rivers@cars.uchicago.edu](mailto:rivers@cars.uchicago.edu)<mailto:[rivers@cars.uchicago.edu](mailto:rivers@cars.uchicago.edu)>>  
Date: Tuesday, December 15, 2015 at 15:54  
To: Dongzhou Zhang <[dzzhang@cars.uchicago.edu](mailto:dzzhang@cars.uchicago.edu)<mailto:[dzzhang@cars.uchicago.edu](mailto:dzzhang@cars.uchicago.edu)>>, Przemyslaw Dera <[pdera@hawaii.edu](mailto:pdera@hawaii.edu)<mailto:[pdera@hawaii.edu](mailto:pdera@hawaii.edu)>>  
Cc: Peter Eng <[eng@cars.uchicago.edu](mailto:eng@cars.uchicago.edu)<mailto:[eng@cars.uchicago.edu](mailto:eng@cars.uchicago.edu)>>, Vitali Prakapenka <[prakapenka@cars.uchicago.edu](mailto:prakapenka@cars.uchicago.edu)<mailto:[prakapenka@cars.uchicago.edu](mailto:prakapenka@cars.uchicago.edu)>>, Andrew Campbell <[campbell@geosci.uchicago.edu](mailto:campbell@geosci.uchicago.edu)<mailto:[campbell@geosci.uchicago.edu](mailto:campbell@geosci.uchicago.edu)>>, Bin Chen <[binchen@hawaii.edu](mailto:binchen@hawaii.edu)<mailto:[binchen@hawaii.edu](mailto:binchen@hawaii.edu)>>, Dan Shim <[sshim5@asu.edu](mailto:sshim5@asu.edu)<mailto:[sshim5@asu.edu](mailto:sshim5@asu.edu)>>, "Kanani K. M. Lee" <[kanani.lee@yale.edu](mailto:kanani.lee@yale.edu)<mailto:[kanani.lee@yale.edu](mailto:kanani.lee@yale.edu)>>, Mark Rivers <[rivers@cars.uchicago.edu](mailto:rivers@cars.uchicago.edu)<mailto:[rivers@cars.uchicago.edu](mailto:rivers@cars.uchicago.edu)>>  
Subject: Questions about PX^2

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## Mark Rivers

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**To:** Vitali Prakapenka  
**Cc:** Mark Rivers; Dongzhou Zhang; Przemyslaw Dera; Peter Eng; Andrew Campbell; Bin Chen; Dan Shim; Kanani K. M. Lee  
**Subject:** Re: Questions about PX<sup>2</sup>  
**Attachments:** LaserHeating\_PX2.pdf

Hi All,

Greetings. Here are the answers to the questions:

- What is the minimum spot size with the new K/B mirror system?

The X-ray spot size in PX<sup>2</sup> is to some extent adjustable. Currently we have successfully run the experiments at a spot size of ~12 micron (horizontal) X ~15 micron (vertical), determined from scanning a metallic cross hair. The X-ray spot size can be further decreased by closing up the entrance slits, at a cost of flux.

The single crystal diffraction is slightly different from powder diffraction, as we don't want the X-ray's spot size as small as in ID-D. For single crystal diffraction. Ideally we would like the X-ray to fully cover the sample, so that we can get consistent peak intensities for structure refinement.

- Is this compatible with doing laser heating?

Yes. As Vitali has mentioned, the system is compatible with laser heating. In the proposed laser-heating setup, we are planning to do a sample rotation in the mu-axis.

- Can you provide the layout for the laser heating system?

Please find the slides attached to this email, which contains the basic optical designs of the proposed laser heating system. The optical layout might change slightly. Vitali, Przemek and I are working on it now.

Best,

Dongzhou

On Tue, Dec 15, 2015 at 4:43 PM, Vitali Prakapenka <[prakapenka@cars.uchicago.edu](mailto:prakapenka@cars.uchicago.edu)> wrote:

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