1) The purpose of the meeting was to review the single zone plate design, especially the alignment process, the background estimates, the chromatic broadening and the mirror heating issues. We decided that the design was mature enough to develop a performance table which lists component distances, apertures and power dissipation. This will be done by Justin and Marc before the next meeting, Tuesday, Feb 3, 2004. A simple one-line diagram of the optics is at: http://www.slac.stanford.edu/~afisher/XRay/Status2004-01-27.ppt - page 5.

2) Alan presented the mirror specifications obtained earlier this week from Osmic. The new mirror is a carbon-vanadium composite with 62% reflectivity at nominal incidence of 3.27 degrees and 2800eV, 1.02% bandwidth. The second harmonic reflection is less than 0.1% of that (http://www.slac.stanford.edu/~afisher/XRay/C-V_MultilayerMirror2.8keV/1000-9000eV.gif). This mirror is excellent from that point of view. The correlation between incident wavelength and peak reflection angle is 1% energy / 0.03 degrees (~1/2 mrad).

3) We discussed the chromatic blurring of the focus. Since the distance between the zone plate and the image is about 12 m, we expect a 12 cm (1%) change in the focus position at the edge of the 1% bandwidth. Since the zone plate is 2.4 mm diameter, the blur 1% from the focus will be 24 um diameter. Alan used his ray trace program to model this chromatic increase in apparent beam size – his estimate is 4.6 um rms quadrature increase.

4) Because angle and energy are correlated, shifts in the source (the positron beam position and angle inside bend PR06 4032) will move the focus point. We need to understand this completely. Of course, adjustments to the mirror incidence angle, using the mirror – pair mover, will also move the focal point back and forth with little transverse shift. We will not have an axial mover for the imager; the distances are too large and the vacuum system would be cumbersome. It is not clear how well a beam based stabilization feedback will work in this area. The xbpm will also be used for stabilization. Without stabilization, we expect the beam to move +/- 2mm /1.5mrad x and +/- 5mm / 0.6mrad y, so these effects can be estimated – worst case.

5) There remains a lot of unfocused diffuse light striking the imager. A scanning imager, such as would be needed for bunch to bunch measurements, would be swamped by this light. To address this, Alan proposed a small slit before the imager. The obvious problem with this is that it complicates the alignment.

The numbers in the latter table have changed a little bit. In the initial design, the power was 6.1 W, in the present design the power is close to 44W. Almost all of this power is absorbed. I am concerned that this will complicate the design of the mirror mount. Alan reports that higher power mirrors have been used at ESRF, up to 100W, but it seems prudent for us to develop a LER design that is well within easy reach of the present designs, such as those used at SSRL. As a result of this discussion, Alan will return to an examination of the use of higher energy x-rays, where straightforward graphite attenuation foils can be used to limit the power (as in the 12/2003 design). We will discuss this topic at our next meeting, Feb 6, 2004 14:30 B280C, with the SSRL experts.

Links for this project:

http://www.slac.stanford.edu/~afisher/XRay/
http://www-project.slac.stanford.edu/lc/local/PEPILER/PEPILER.htm
http://www.slac.stanford.edu/~jalbert/beamsizemon/