Notes on setting up the 200 mm long CARS KB mirrors

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The mirrors' optical surface is the distance between the rollers i.e. 170 mm. The mirrors are coated with Rhodium. The closest working distance from the end of the horizontal mirror is 90 mm.

For an experiment at the Kr edge 14326 eV, focusing horizontally and vertically the incident angle must be set at 4.09 mrad (See Fig.1).

This angle ensures the maximum throughput for the product of the square of the reflectivity times the angle of incidence (R x R x theta). Slits must be set up in front of the mirror to illuminate only the good part of the dynamically figured surface. This maximum slit opening should be 170 mm * 4.09 mrad = 0.695 mm.

Note that the beam will go off from the main beam direction propagation by twice this angle or 8.18 mrad. Measurements of the lever arms to know how much the chamber will move will be needed. The angle of incidence must be set up using the chamber movements so one must make sure the table motion is calibrated and the lever arms are accurately measured.
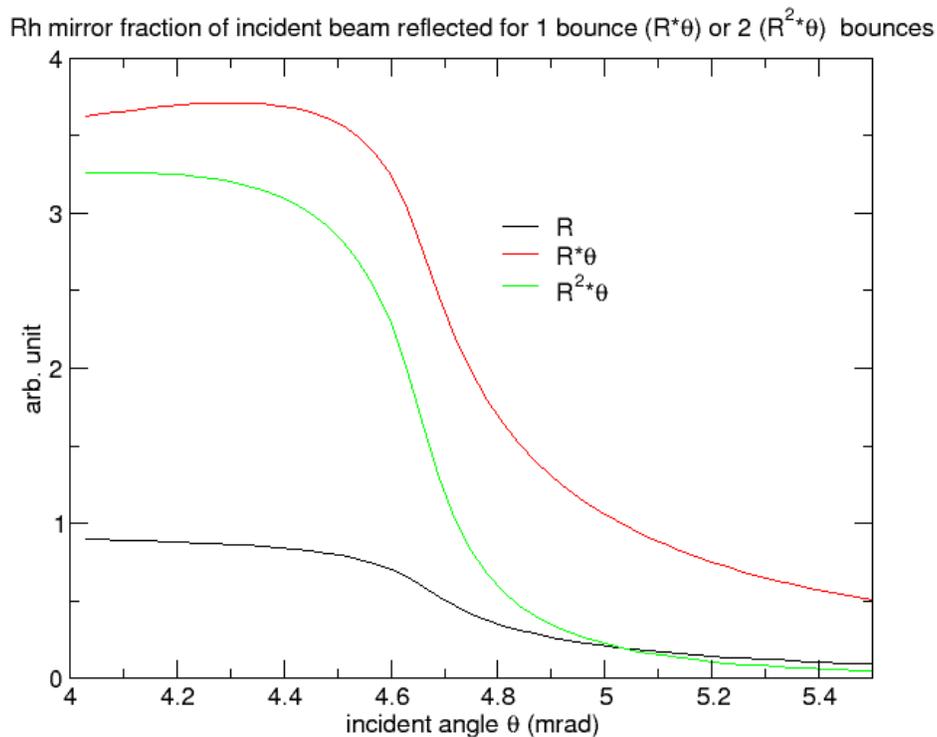

Figure 1.

Notes on setting up the 100 mm long CARS KB mirrors

With the 100 mm long mirrors, the optical surface is 72 mm long. They are coated with Rh too. I have also one Au coated vertical mirror. The slit aperture can be set up to 4.09mrad*72mm=0.295mm. This will be the input beam size on the first mirror. Assuming we focus 6" from the last mirror, the vertical image distance is 30.75cm, the horizontal image distance is 20 cm. So the beam will climb up by twice the grazing angle times the vertical image distance thus 2.5 mm. Horizontally, the beam would move by 20cm*8.18 mrad = 1.64 mm. The horizontal depth of focus assuming 5 um focus is 3.1 mm so it is pretty large compared to the laser DOF of 0.1 mm (10um focus, 1cm beam on optics, 100 m focal length).