

W.A. Brown Mar 19, 1993

## OFFPOINT NEEDED TO PLACE SUN'S IMAGE COMPLETELY ON THE CONICAL BAFFLE

The cone or Focal Plane Baffle is discussed in Design Note 26 ( SXT 8E045) and a drawing of the cone is SXT-2C003 by BKJ dated 88-01-20.

The opening in the cone is 150 mm upstream of the focal plane, and therefore  $1540-150 = 1390$  mm behind the mirror center

The diameter of the hole in the cone is 1.619 inches or 41.1 mm (from the drawing)

A number of raytrace exercises were done to illustrate the behavior of a bundle of rays from the full solar disc in passing through a 30 degree segment of the entrance annulus of SXT. The coordinate system was chosen as shown in the sketch with the +Z direction being the telescope axis toward the sun. The first set of three raytrace plots show the ray bundle from a 16 arcminute radius solar disc as it intercepts three planes in the telescope. We imagine the SXT pointing at the limb of the sun. Thus the source of rays is centered at +13 arcminutes in the x direction and + 13 arcminutes in the y direction. ( Correspondence with North and south directions or east or west directions is omitted to remove one level of complexity from this description. In a paragraph below an actual example is given in solar coordinates.)

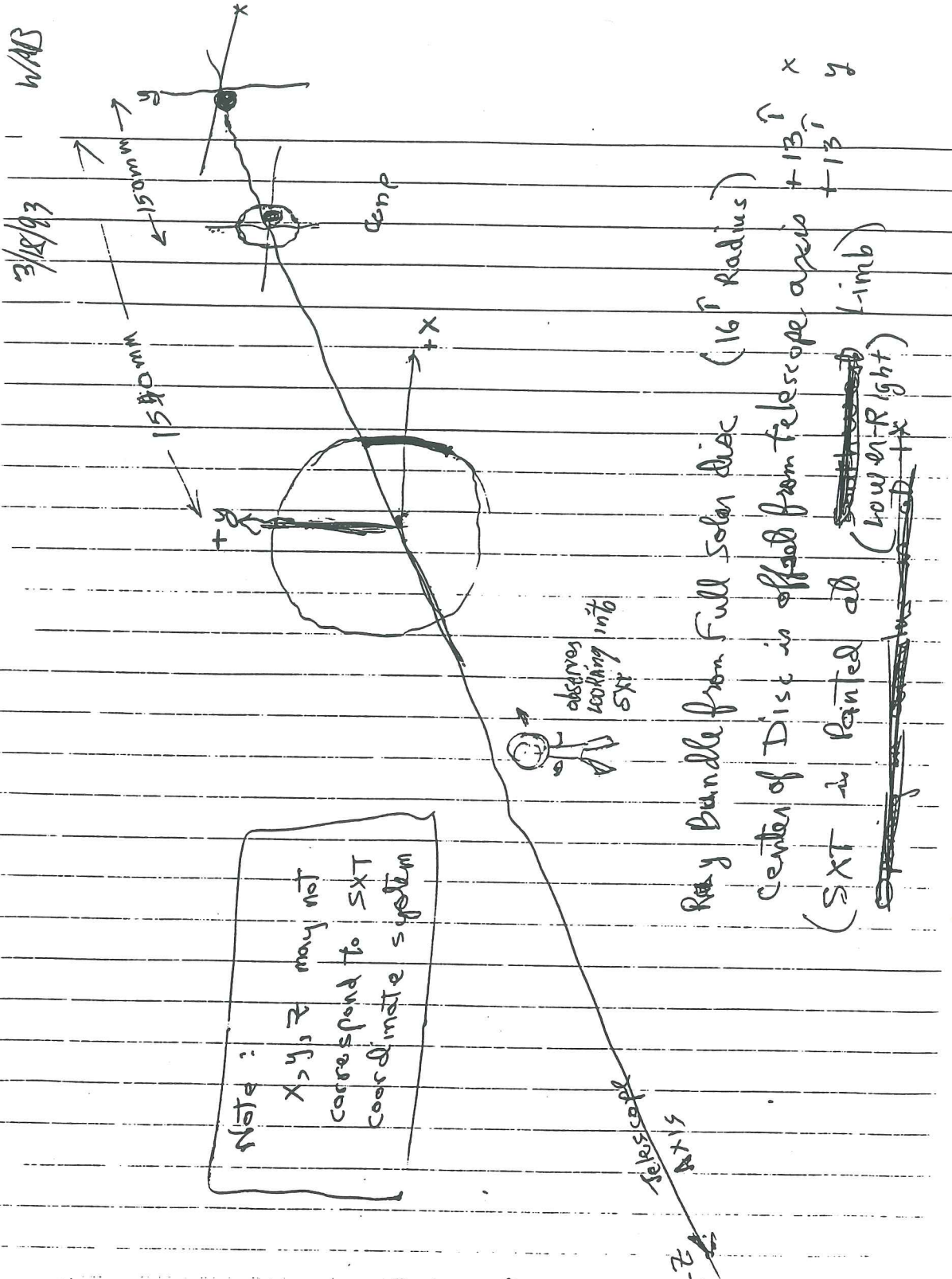
At a plane just behind the mirrors we see a 30 degree arc of rays corresponding to the opening in the annulus. At the front of the cone the ray bundle is still in the + x plane where the annular opening is assumed to exist, but is moving into the -y plane since the sun is in the + y direction. At the CCD focal plane the image of the solar disc is centered in the -x, -y quadrant.

The next two pages contain a series of plots of the ray bundles from the solar disc as seen at the front of the cone. The annular opening is again 30 degrees as in the sketch. The offpoint angles vary. In the first page positive offpoint angles are displayed, while in the second page the y offpoint angle remains positive but the x offpoint angle is negative.

From the last page of plots we see from the right column of plots that a 30 arcminute offpoint is needed to place almost all rays outside the cone opening when the offpoint is -X direction. In the case of positive X offpoints, no offpoint up to +30,+40 minutes is sufficient to place the rays from the disc outside the cone.

If we imagine now that the annular opening is near the base of the SXT telescope in the direction of solar North, then pointing Yohkoh 30 minutes North from sun center will insure that most of the rays through the 30 degree aperture will fall outside the conical aperture.

Further study, including effects of diffraction, can delineate the exact offpoint angle needed to remove the sun's image from the conical aperture, although the raytrace model used here is the original version and the shorter focal length of the actual telescope will affect the results at the 10 to 20 arcsecond level.



Note:  
 $x, y, z$  may not  
 correspond to SXT  
 coordinate system

Ray Bundle from Full Solar Disc (16' Radius)

center of Disc is offset from telescope axis

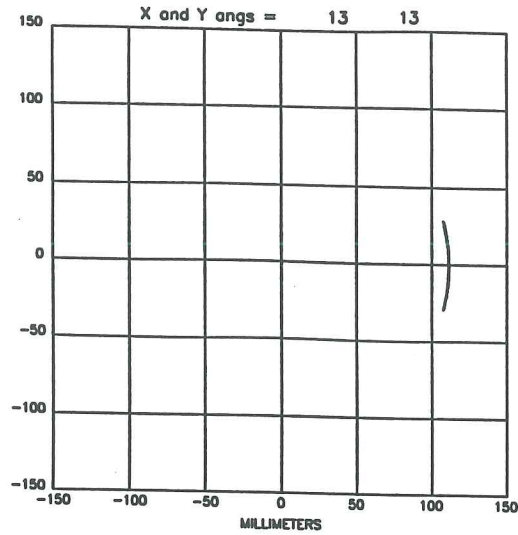
(SXT is pointed at ~~lower right~~ limb)

+13' x

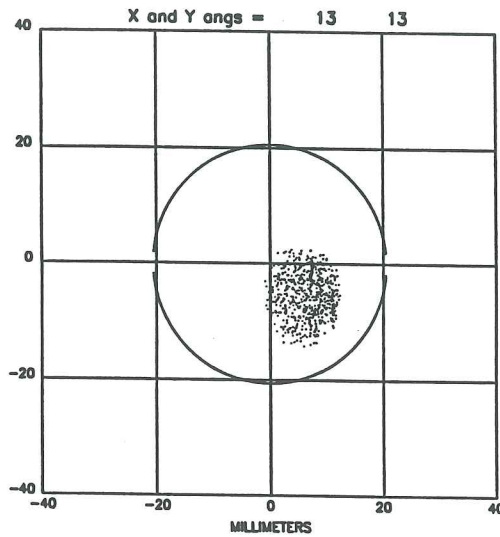
-13' y

Sun at Back of observer  
 This Plane Behind Mirrors : 30 degree annular opening

AT MIRRORS

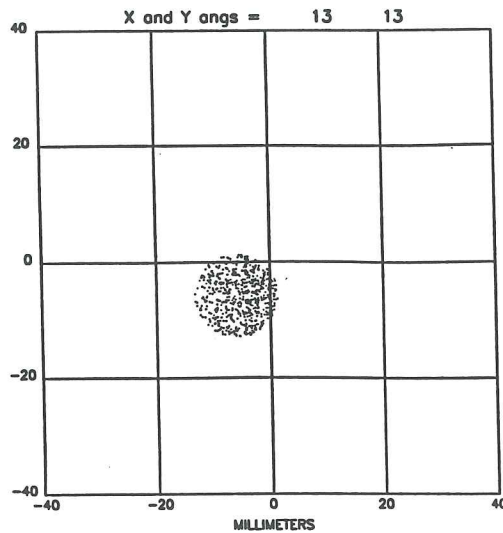


At Cone



Source - The Solar Disc  
 Focal Plane

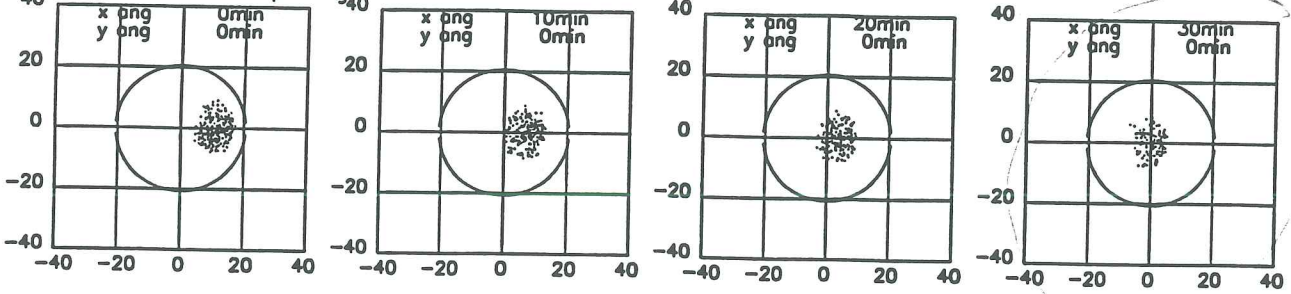
AT focal  
 plane



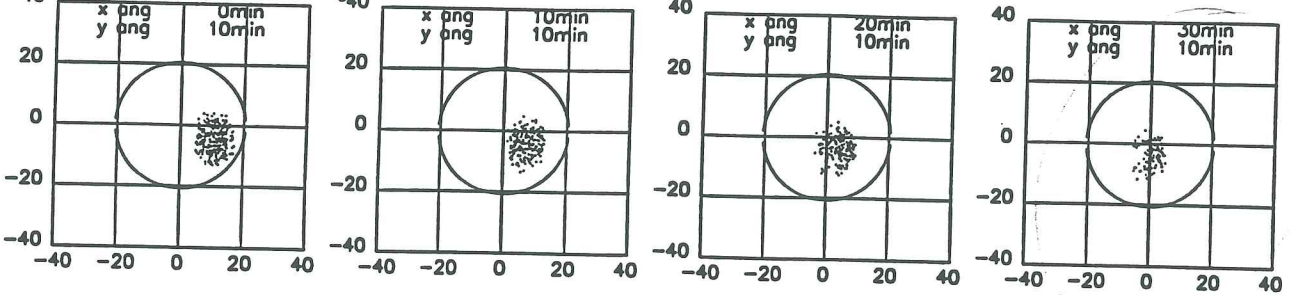
Positive X offpoint

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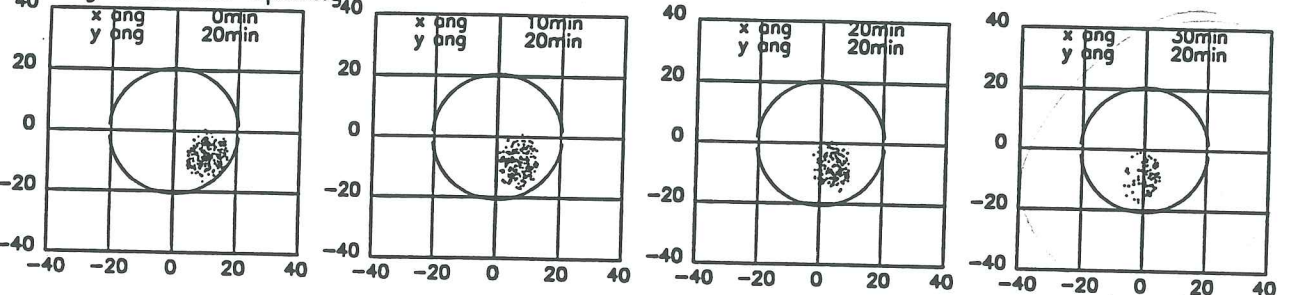
30 degree annular opening



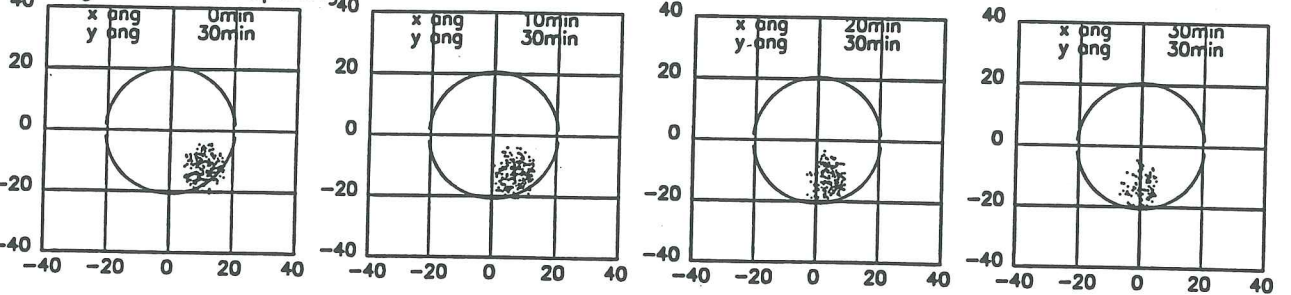
30 degree annular opening



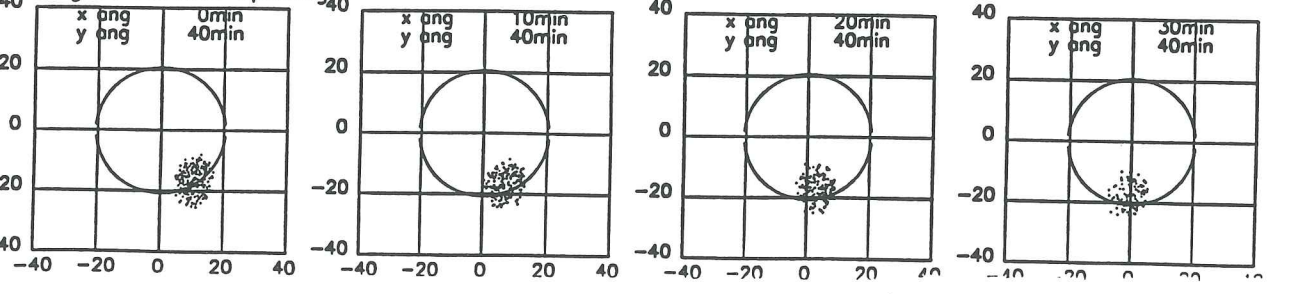
30 degree annular opening



30 degree annular opening



30 degree annular opening



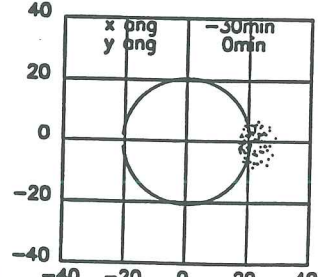
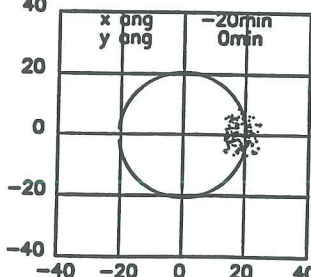
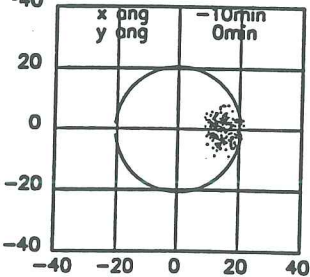
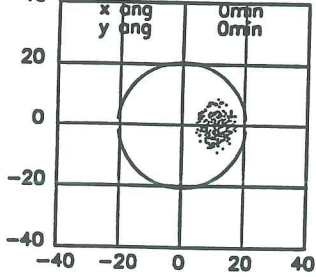
Negative X off point,

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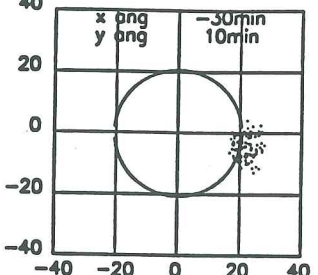
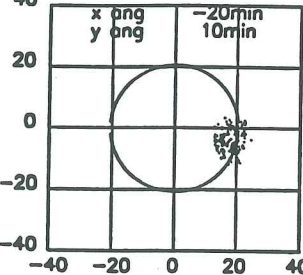
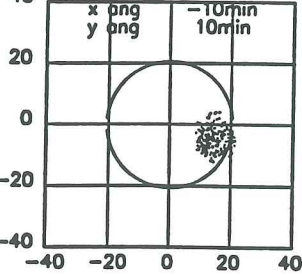
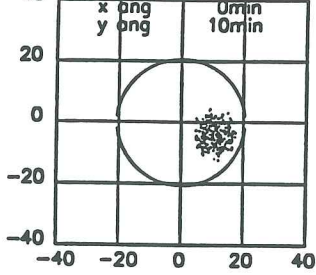
Rays AT Front of Core 150 mm from focal Plane

Observer looking Toward focal Plane (ccd) with sun at Back

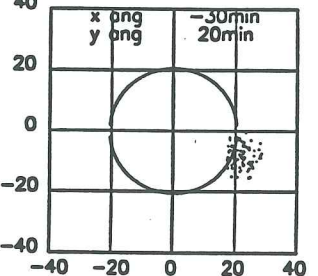
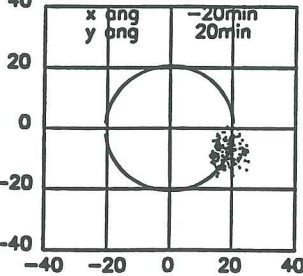
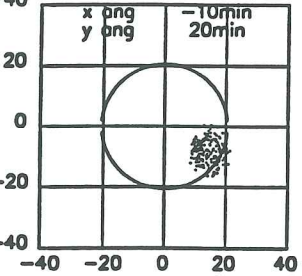
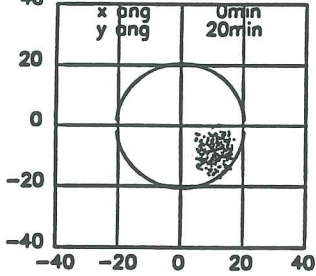
30 degree annular opening



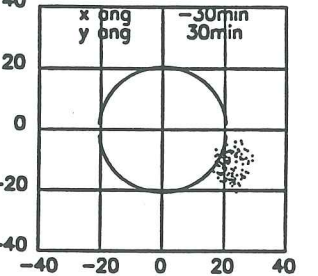
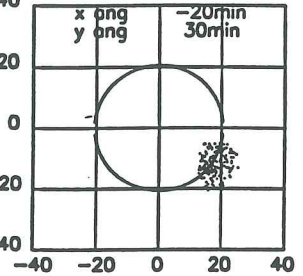
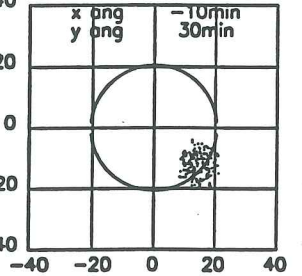
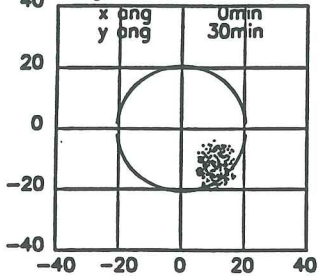
30 degree annular opening



30 degree annular opening



30 degree annular opening



30 degree annular opening

