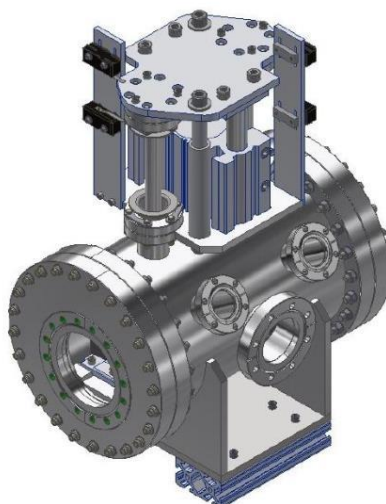




This device is a cooled multi-blade system, in horizontal and vertical disposition, placed in the fringes of the beam to detect the position of the beam. Typically, there are two BPM's. The second is placed approximately several meters (~3.6 m) downstream of the first. Together they yield precise beam position information. When swept by the beam, the blades of the front end BPM's generate photoelectrons. This, in turn, causes a microampere-level photocurrent in each blade that can be measured and reduced to correlate with the degree of deviation of the beam from its orbit. The beam missteering on the ring side is to be kept within ten percent in both position and divergence. When excessive deviations are detected, the output from the BPM's is fed back into the ring correction (steering) magnets to adjust the beam's position and the angle at the ID center. In the extreme case of beam tracking loss, the BPM can trigger a beam dump. BPM signals are fed back to the ring for proper beam steering. Extensive studies were conducted at APS looking at different design, blade material and stability of the system. The APS machine side, for example, requires, with the two BPM's spaced apart as described above, a precision of $\pm 3.3 \mu\text{m}$ in the position and $\pm 0.14 \mu\text{rad}$ in the angle of the particle beam. Given the power from the planned ID beams, early studies indicated that, with conventional blade materials, it would be very difficult to meet these specifications reliably. Therefore, new blade materials were investigated, and metallized CVD diamond blades were chosen for the ID front ends. Early tests proved beyond reasonable doubt that submicron sensitivity (on the order of $0.2 \mu\text{m}$) can be achieved with CVD diamond blades under all conventional operations. The dynamic range of the current CVD diamond blades in synchrotron tests has been shown to be at least 2 mm.

Key Specifications:

Description	Value	Units
Range of Motion	46 [1.811]	mm [inch]
Weight	108 [240]	kg [lbs.]
Horizontal Aperture	75 [2.953]	mm [inch]
Vertical Aperture	-14 / +25 [-0.551 / +0.984] (not centered on beam)	mm [inch]
Tungsten Profile (Closed)	76.2 [3] tall x 127 [5] wide	mm [inch]
Tungsten Thickness	228.6 [9] nominal 190.5 [7.5] minimum	mm [inch]