<u>NEWTONIAN AXIAL TOLERANCES ORIGIN</u>

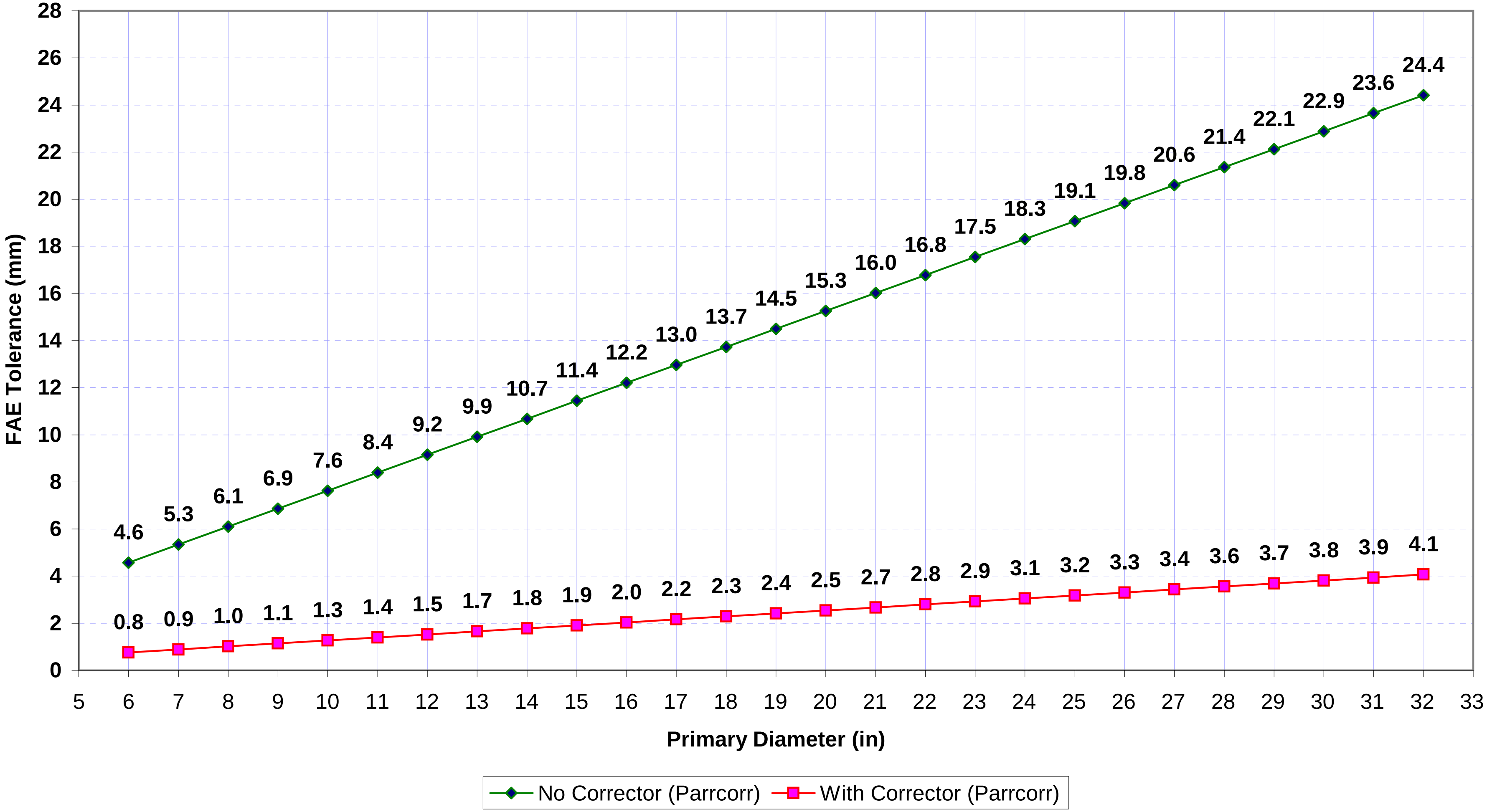
A primary mirror axial error (PAE) de-centers the coma "free" field (relative to the eyepiece field stop or image detector). The PAE is measured as the linear difference between the primary mirror axis and the center of the eyepiece field stop (or image detector) at the focal plane. The PAE tolerance is based on Edgar Everhart's analysis (Advanced Telescope Making Techniques, Volume 1, Optics) of the coma free field diameter (0.022mm times the focal ratio cubed) and Nils Olof Carlin's suggestion to use 1/4 ("moderate" magnifications) to 1/6 (higher "planetary" magnifications) of the coma free field diameter as reasonable tolerances. Rounding the tolerance to 0.005mm times the focal ratio cubed conveniently matches the constant for the coma corrected FAE tolerance described below.

A focuser axial error (FAE) tilts the eyepiece field stop (or image detector) relative to the focal plane. The result is a focusing error. The FAE is measured as the linear difference between the focuser axis (or more specifically, the eyepiece axis) and the center of the primary mirror. To keep the image defect contributed by FAE below that of the residual coma in the field of view, the FAE tolerance for a Newtonian telescope without coma correction is roughly 1/30th (3 percent) of the primary mirror diameter. Since there is (6X) less coma when a ParaCorr is used, the FAE tolerance should be reduced by a factor of six, or 0.005 times the diameter of the primary mirror when a coma corrector is used.

Considering many Newtonian enthusiasts purchase optics with higher Strehls in the pursuit of maximum performance, there's no reason these tolerances should be viewed as limits when more precision is readily attainable.

Per Vic Menard via email to J. Fly, 6/13/2011

Focuser Axial Error Tolerance (FAET)
FAET (mm) = 25.4 x 0.03 (0.005 w/Parcorr) X Primary Mirror Diameter (in)
(Vic Menard)



Primary Axial Error Tolerance (PAET)
PAET (mm) = 0.005 x (f-ratio)^3
(Vic Menard)