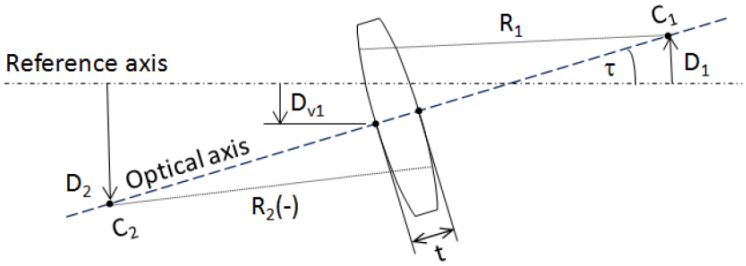
39) F. Lamontagne, et. al., “Optomechanical tolerancing and lens alignment using elastomeric lens mount to efficiently meet optical requirements”, Proc. SPIE 8836, 88360M (2013)

Figure 9 shows the geometric relationship between the centers of curvature of both lens surfaces and the decenter and tilt of the vertex. With these centers of curvature centering errors, it is possible to calculate the vertex decenter and tilt error. The vertex decenter and tilt requirements can then be verified efficiently. This implies using the apparent location of center of curvature after refraction of the first surface as described by Parks [12]. The influence of the centering error of optical surface in front of the surface under measurement can be removed by optical calculation. This can be accomplished using Trioptics Multilens® software [13]. It is then possible to have a true measurement of both lens surfaces.



40) A. Souchon, “Enabling micron level mounting accuracy with Exact PlacementTM lens assembly technology”, Melles Griot, 55 Science Parkway, Rochester, NY, USA 14620, www.mellesgriot.com

For such barrel-less construction, the subcells can be passively aligned utilizing the matched outer diameters of the cells and then locked in place, or the subcells can be individually aligned to achieve final centration accuracies to 1 µm (Figure 9).

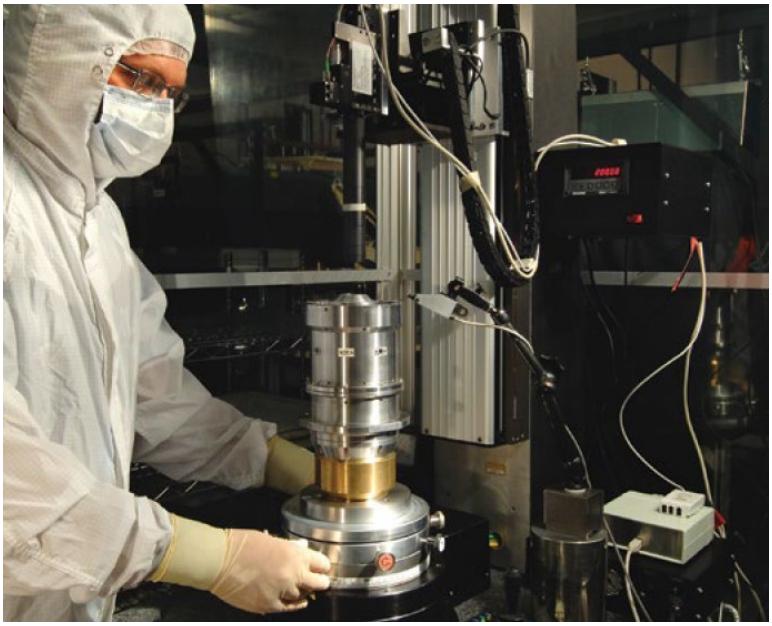


Figure 9: Active alignment of the subcells during final assembly: non-contact verification of element centration is performed within the multielement lens assembly. (PSM is in the upper center in the Figure: explanation added.)

41) J. Soon, et. al., DREAMS: Status Update and Assembly/Alignment Challenges, Proc. SPIE, 12182,121822K (2022)

Each of the individual lenses has cardinal \push-push" adjustments which allow each lens to be appropriately located within the mechanical lens barrel. The alignment of the optics will be completed using the Talyrond Alignment Station (TAS) at Mt. Stromlo Observatory. The TAS consists of a Point Source Microscope (PSM) located on a vertical linear rail, when the focus of the PSM is located at the center of curvature of the measured surface the reflected light can be used to measure the location.

The reflections from each of the surfaces can be determined using the optical model and appropriate optical design software. An example of this setup is shown in Figure 6 along with one of the lens barrels of the 7/8 lens grouping. By comparing the observed tilts and displacements of the returned surface image with the modelled returns, the performance of the system can be determined.

Figure 6. Lens alignment station at Mt. Stromlo Observatory, used to align lenses within barrels with a PSM