

TESTING AND EVALUATION

Once a system is assembled, its parameters must be quantified to determine whether the application requirements have been met. During prototyping, slight alterations to the original design are typical to accommodate component limitations.

Fundamental Parameters

Every application has first order requirements (e.g. conjugate distances, magnification). Paraxial calculations, which do not take into account the properties (dispersion, thickness, etc.) of the glass, may need adjustment to meet first order requirements.

Design Performance

Since paraxial calculations do not indicate real world performance, image quality of the assembly should be tested. Various targets exist for determining the quality of imaging systems. Non-imaging systems may require more involved interferometric instruments for testing.

Resolution and Contrast: can be measured using the USAF and EIA Grayscale targets respectively. Perspective errors can be determined by measuring magnification change across the depth of field.

Throughput: can be measured as power with a photodiode. A CCD analyzes spot size and beam profiling. Collimator measures angular resolution.

Rules of Thumb:

Test with Application in Mind: Do not test performance beyond what the application requires. Test only critical parameters to reduce costs.

Cost Associated with Testing: Testing adds significant costs. High volume production warrants extra testing resources though low-quantity production does not justify it.

Visual Tests:

Tests based on a visual observation are subjective and lack repeatability. Because the human eye can extrapolate missing information, visual tests need to be desensitized to human error (e.g. utilize a line profile function across the USAF resolution target to determine the actual Group and Element that are resolvable.)

