

# DFTfringe data fitting for collimating a pair of 1 meter diameter 413 nm beams which interfere to expose diffraction gratings

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## DFTFringe: Telescope Mirror interferometry analysis Program.

Dale O Eason AKA [githubdoe](https://github.com/githubdoe) "DFTFringe: Telescope Mirror interferometry analysis Program," released this on May 2, 2016 · Version 3, 29 June 2007 GNU GENERAL PUBLIC LICENSE

DFTfringe is discussed, used & tested by member of <https://groups.io/g/Interferometry>

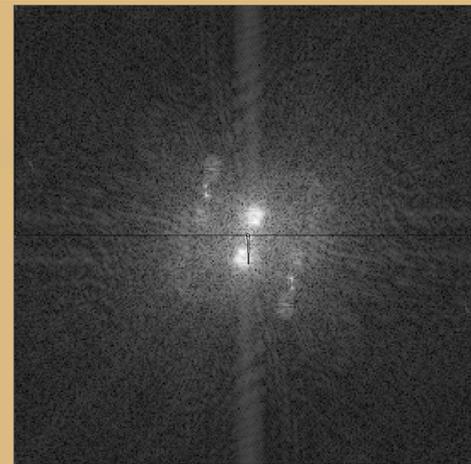
DFTfringe WIKI: <https://groups.io/g/Interferometry/wiki/Bath-Interferometer%2C-Tips-and-Best-Practices>

Source code: <https://github.com/githubdoe/DFTFringe/releases> compiled: @ <https://github.com/githubdoe/DFTFringe>

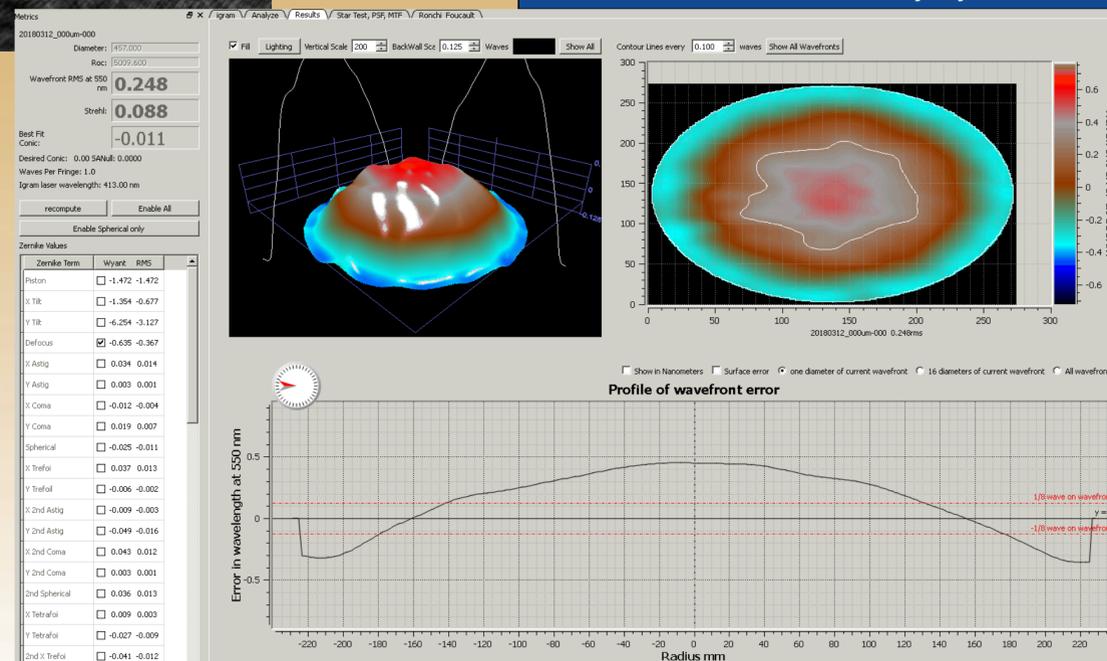
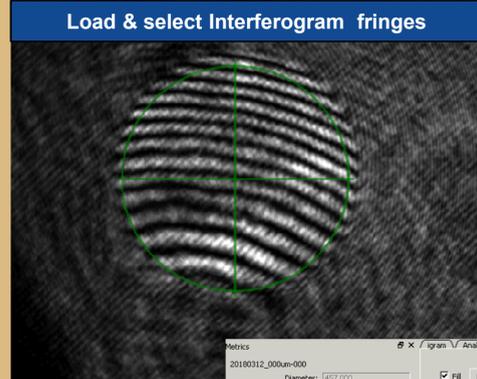
Uses: The vortex transform [VT]. Kieran G. Larkin "Natural demodulation of two-dimensional fringe patterns. II. Stationary phase analysis of the spiral phase quadrature transform" Journal of the Optical Society of America A Vol. 18, Issue 8, pp. 1871-1881 (2001) & pp 1862-1870 "Natural demodulation of two-dimensional fringe patterns. I. General background of the spiral phase quadrature transform." Karen Larkin, Derek B. J. Bone, Mark A Oldfield

This interferometer and data processing replaces human judgment when observing a collimation focal spot that shakes and thus had not been quantified. The overall design enables using the 413 nm aspheric lens design at other wavelengths, that would otherwise have spherical aberration without the addition of an optimally placed "off the shelf" Plano convex lens.

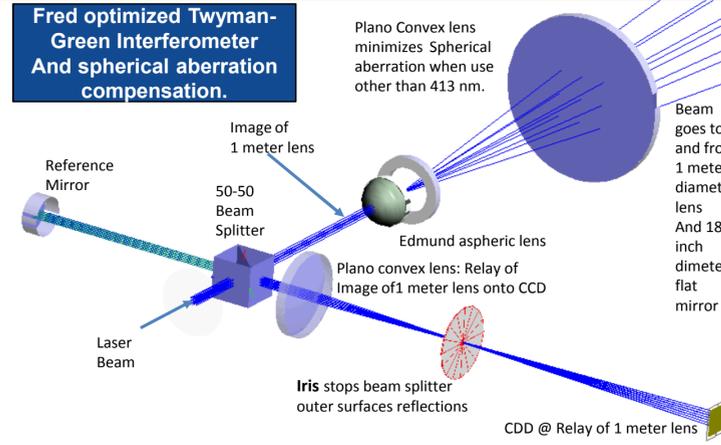
DFT & suppress the zero frequencies



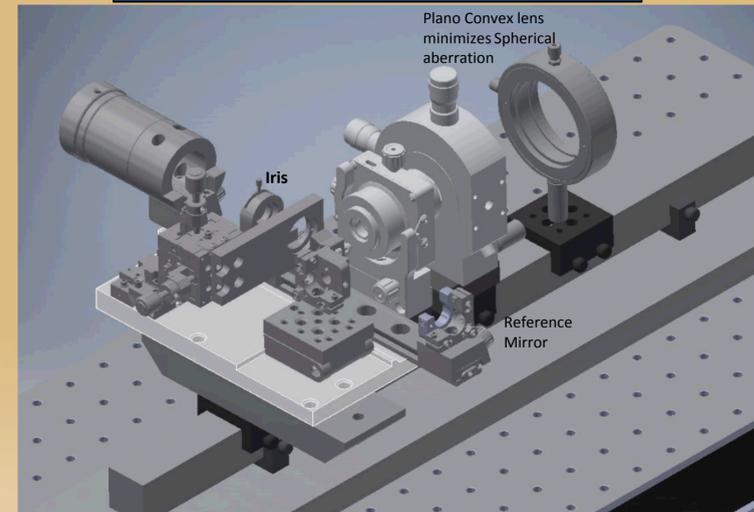
Fit to Zernike Term -Defocus only- by Nissen.



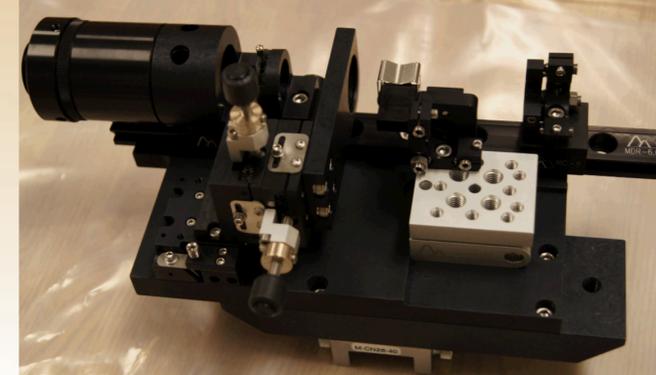
## Fred Optical & AutoCAD Design



AutoCAD by Dempsey

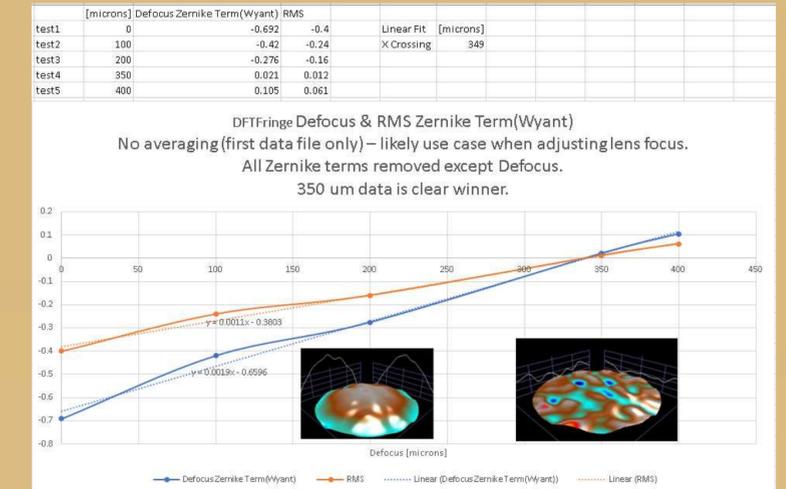


Siskiyou Corporation built the Interferometer



## Collimation Data fitting

Excel plot of DFTFringe fits as change the Edmund Aspheric Lens position



Future use of the interferometer

Monitor systematic drifts,  
Inspect optical wave front anomalies,  
Test optic up to 1 meter diameter making this the largest aperture interferometer at LLNL.

Measure spherical aberration, given a flat mirror covering at least half meter or data stitching. Then adjust the Plano Convex lens placement to minimize wave front aberrations. Otherwise there could be deviation from straight line interference patterns from two "collimated" beams.

Model simulated sensitivity to see a known lens fabrication defect often found on lens center

Model of Twyman-Green simulated interferogram processed by DFTFringe Fourier Analysis

Detecting 50 nm bumps on the first surface of 1010 mm OD Grating exposure lens

