

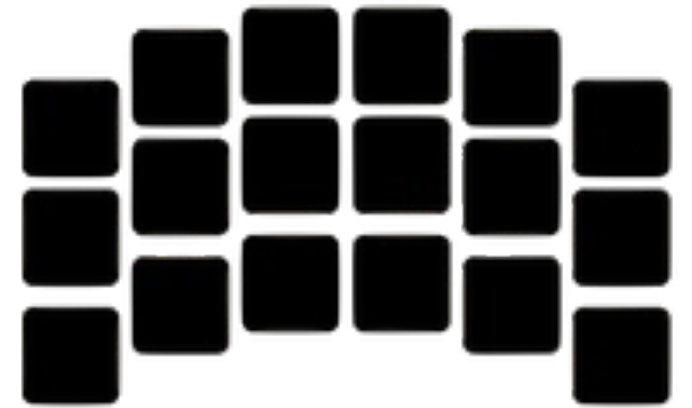


Simulating Roman Optical Aberrations

Brenna N. Wells

Mentor: Jeffrey Kruk

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R.ÖMAN



SPACE TELESCOPE

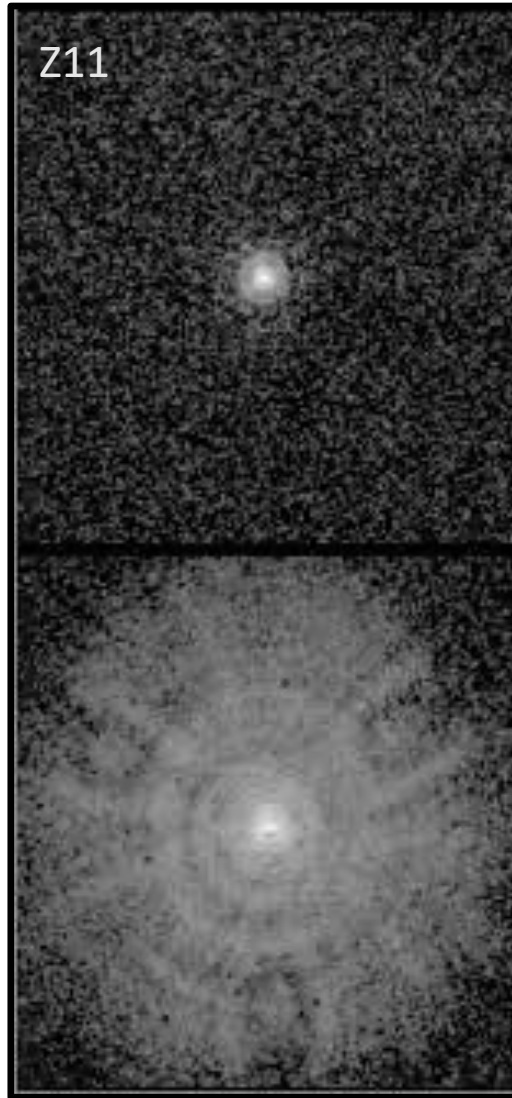
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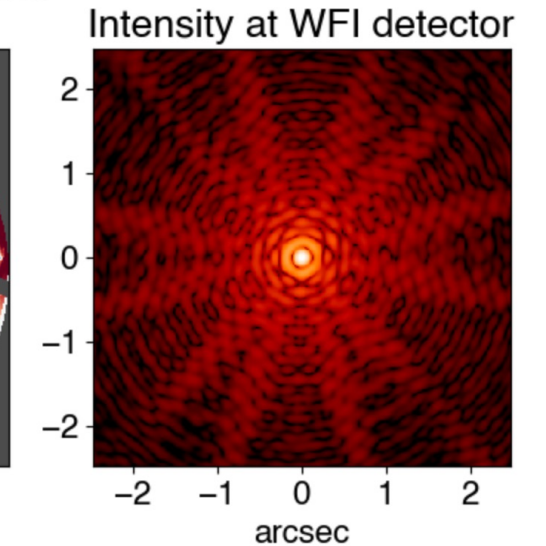
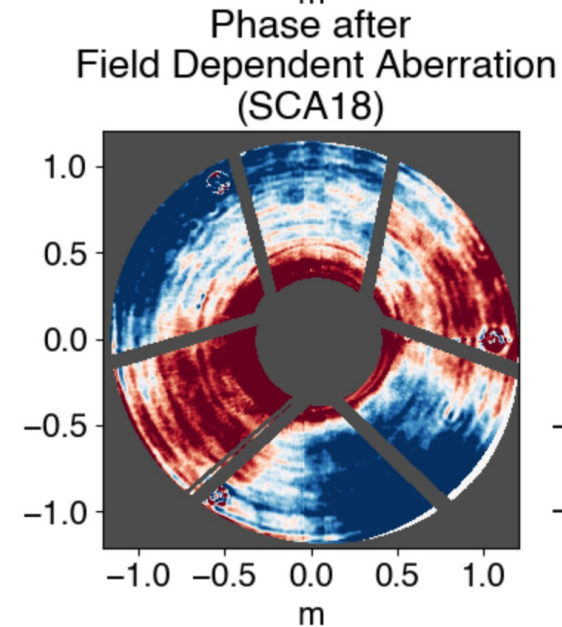
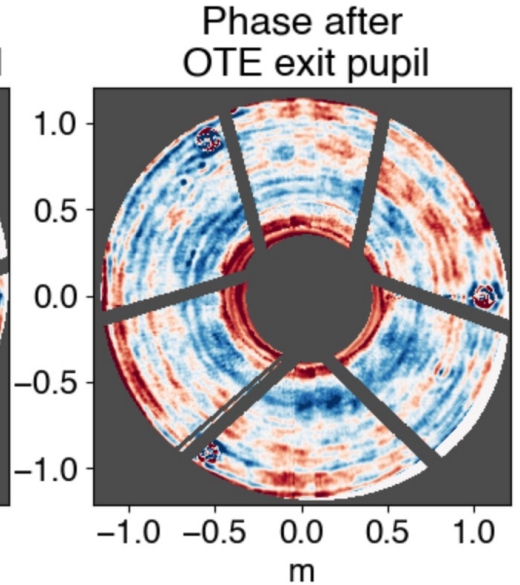
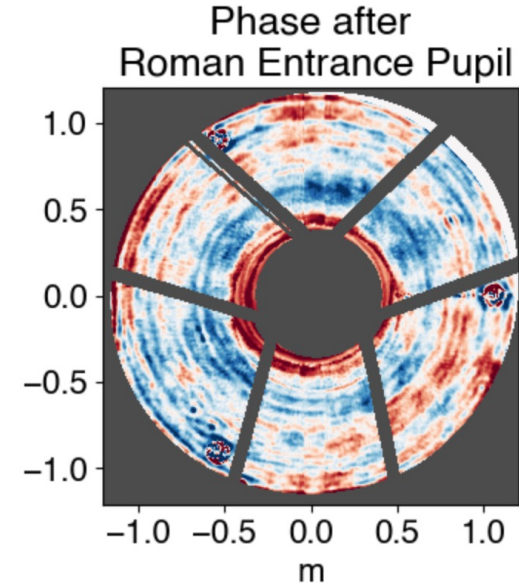
**The
Problem: A
perfect lens
isn't
possible**

The First Example: Hubble's Aberration



[Image source](#)

Hubble



The aberration was 1/50 the thickness of a human hair

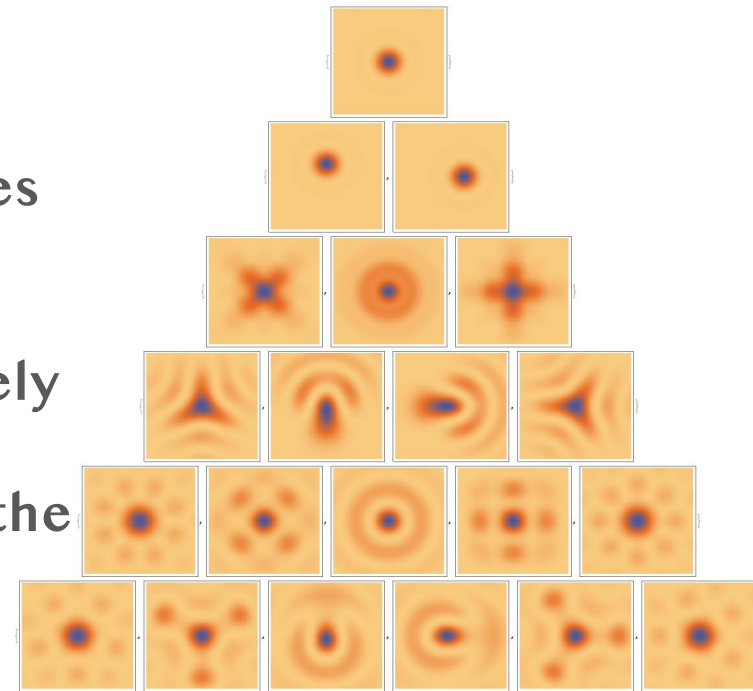
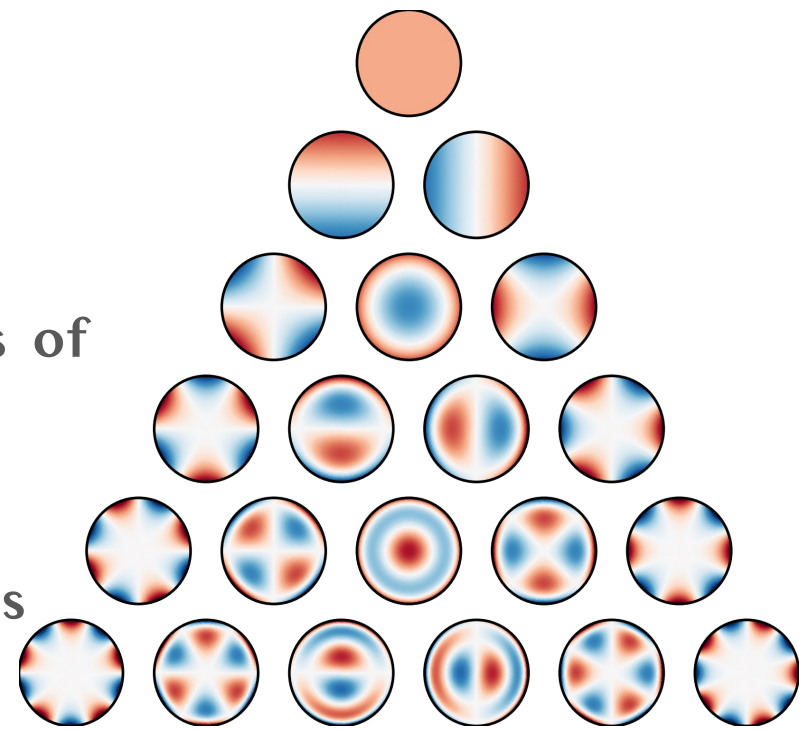
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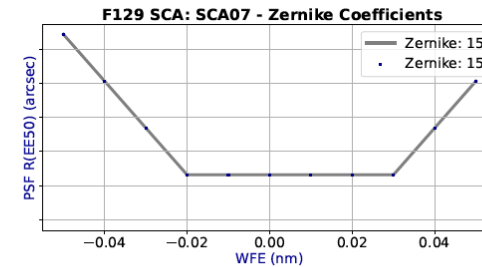
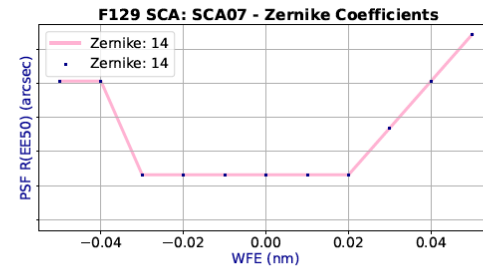
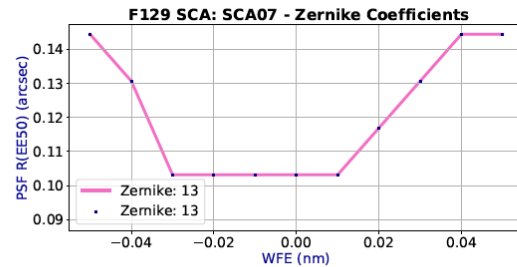
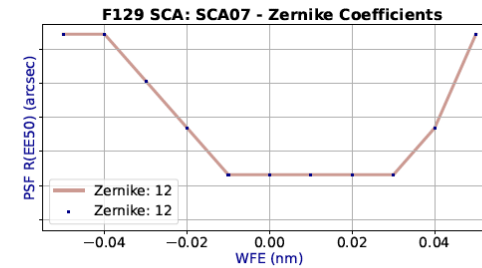
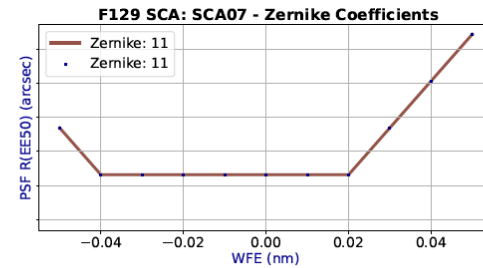
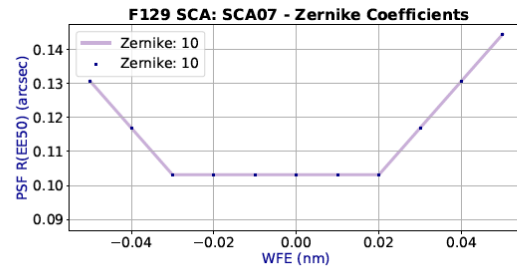
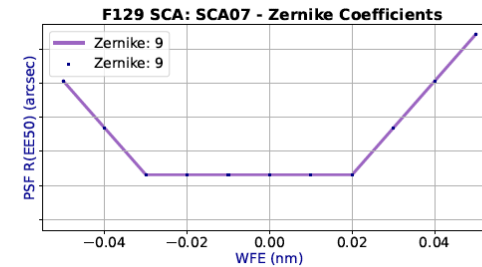
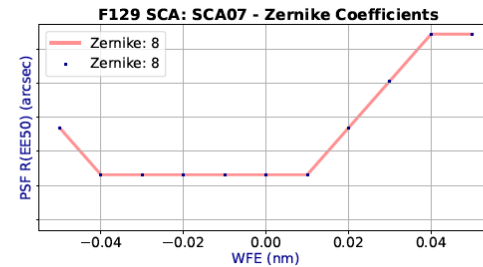
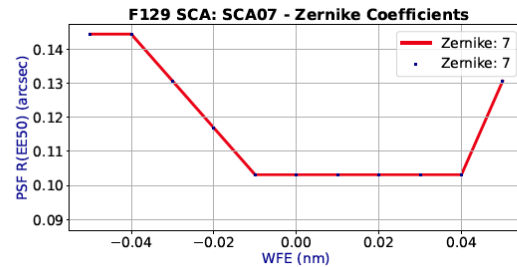
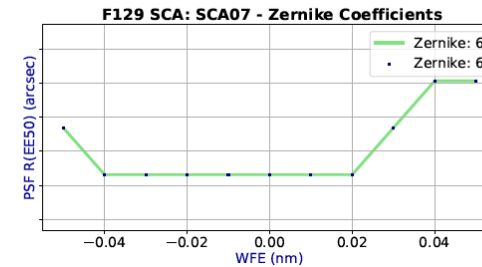
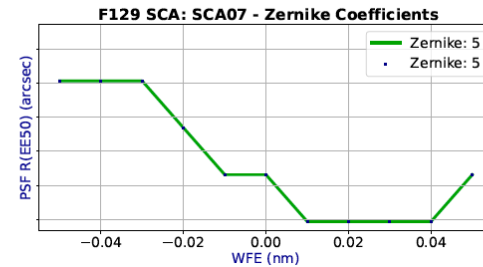
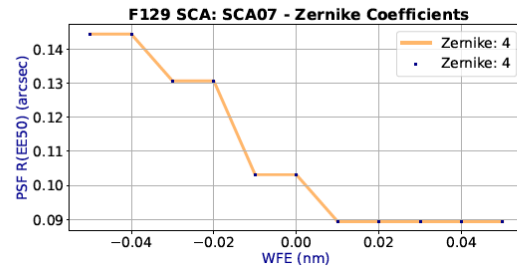
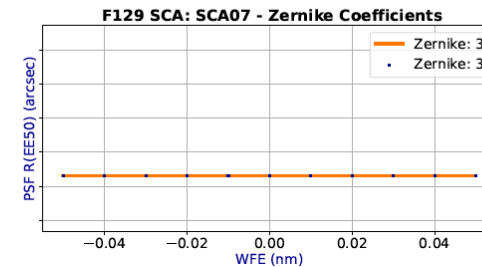
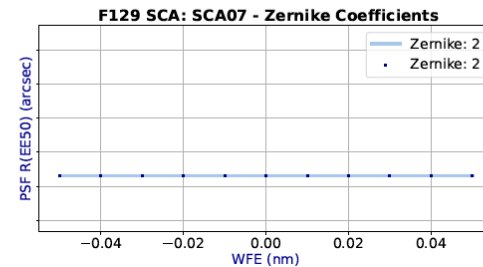
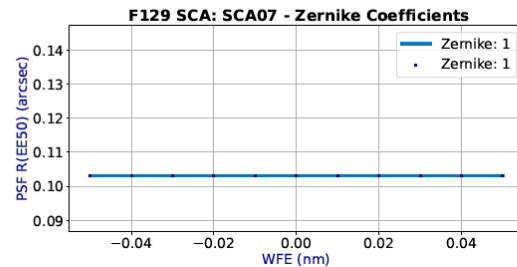
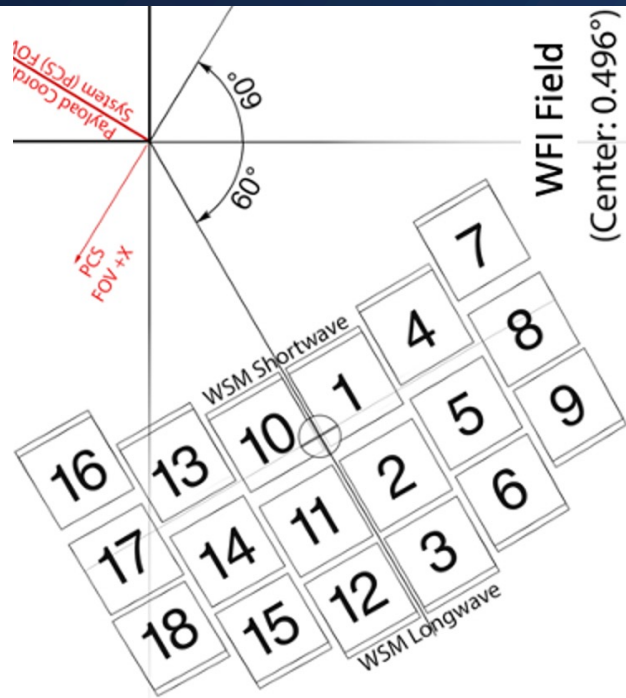
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Zernike Polynomials

- Zernike polynomials are a complete set of orthogonal functions over a circular aperture, used to expand the wavefront shape into a series of components
- Used to characterize the aberrations of optical systems
 - each term represents a unique and independent aberration mode
- Real life example: Your glasses prescription!
- Zernike polynomials are widely used in telescope design, adaptive optics systems, and the analysis of telescope performance.

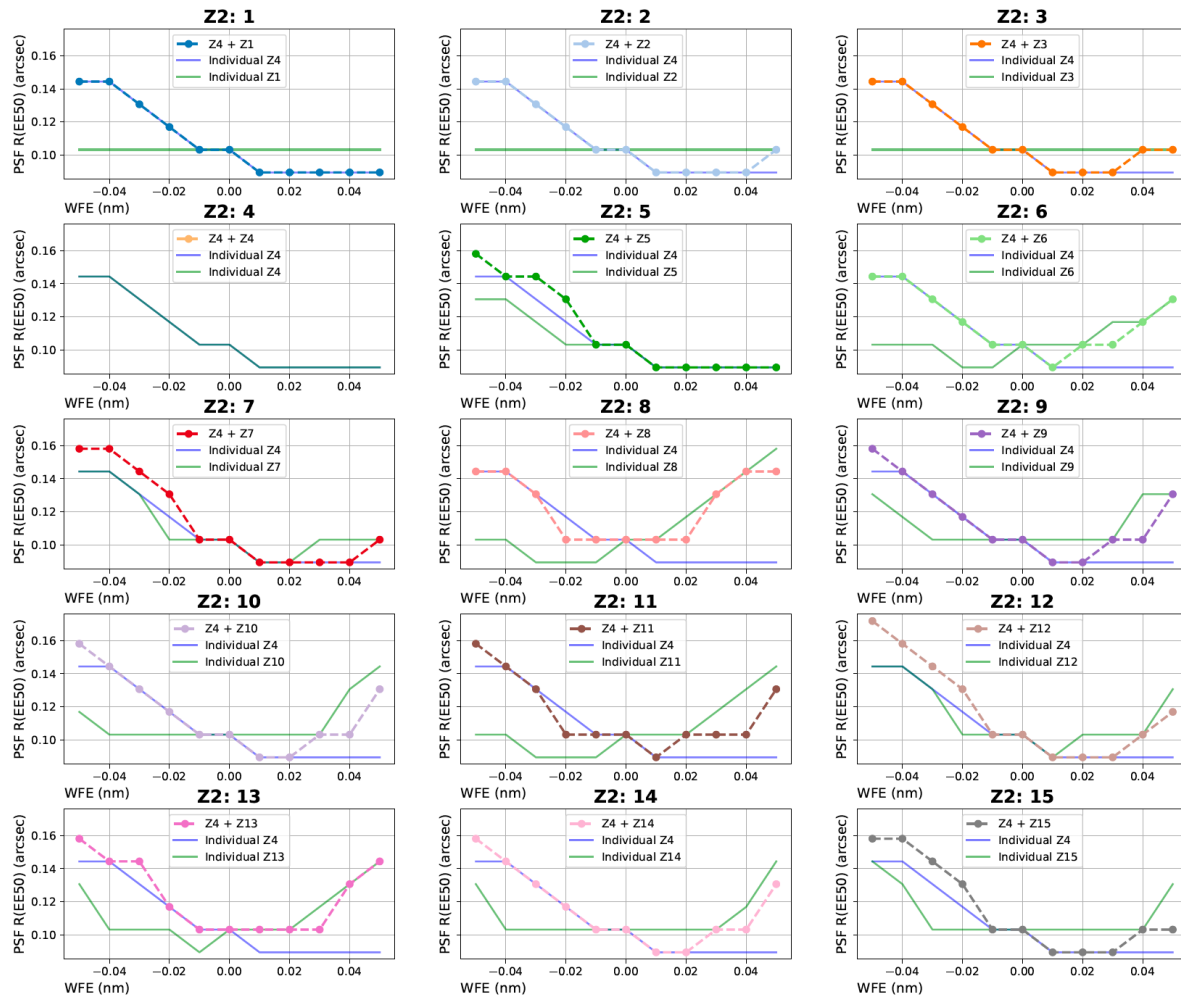


Results

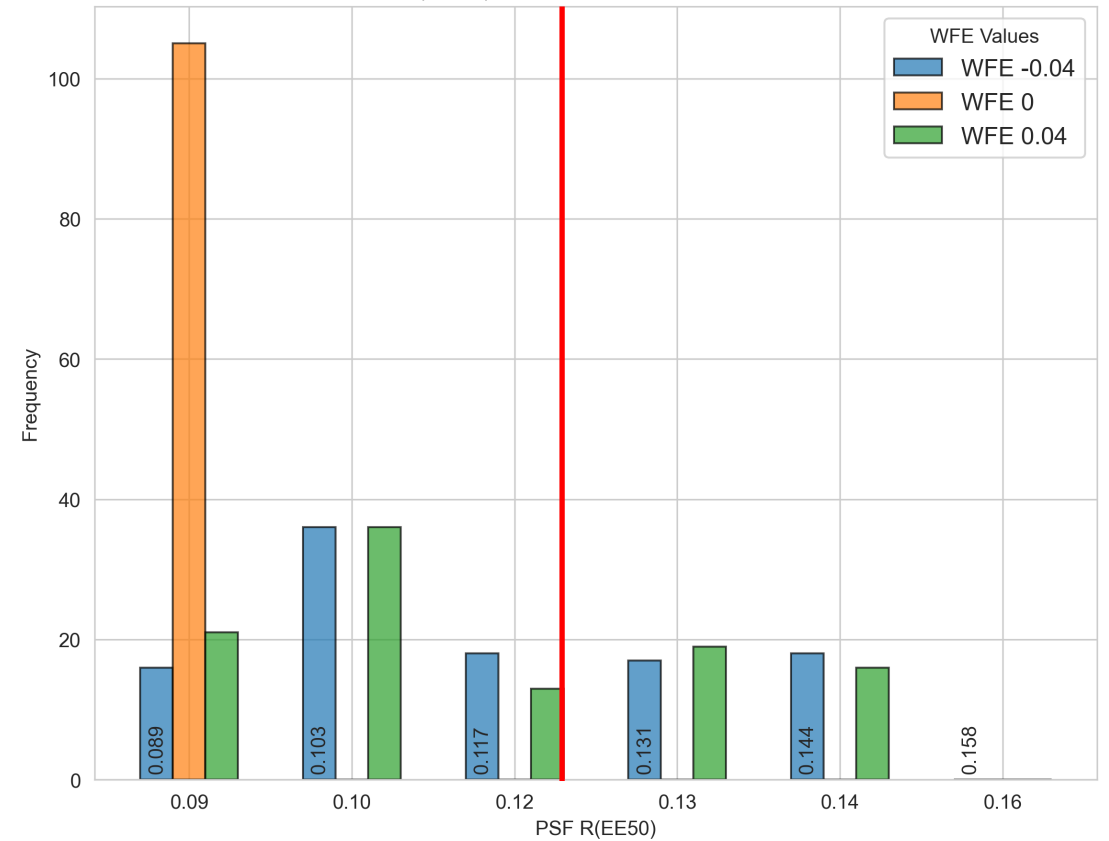


Results

SCA01 - Zernike 4 combined with 1-15



PSF R(EE50) for SCA02 - Comparison of WFE



Values on the bars represent the original PSF numbers for each group. They are displayed to not overlap

Conclusion

In most cases, adding additional WFE to the roman optics does not significantly impact our desired PSF and we are still within our allocated budget for both WFE and PSF R(EE50)!

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WebbPSF Tool
Poppy tool

