

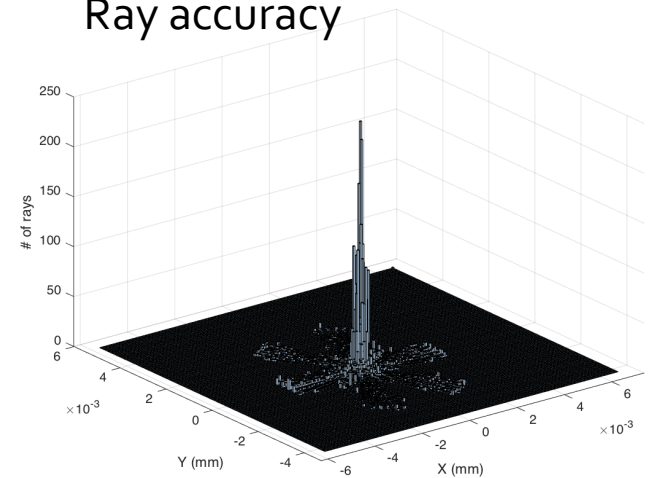
Improved Ray Trace Program for Deformed X-ray Optical Systems

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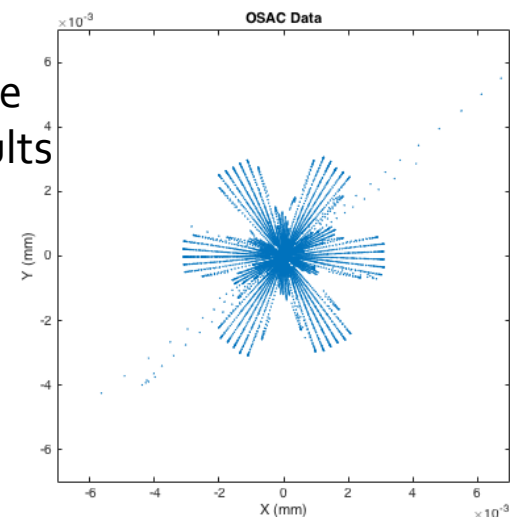
Accomplishments

- Increased processing speed by a factor of 5
- Adapted the program to use input from new FEA software
- Program now accepts new optical designs and predicts optical performance for both the perfect surface and an approximation of the deformed surface
- Program also has the ability to reflect rays off of the actual deformed surface

Ray accuracy



Ray trace results

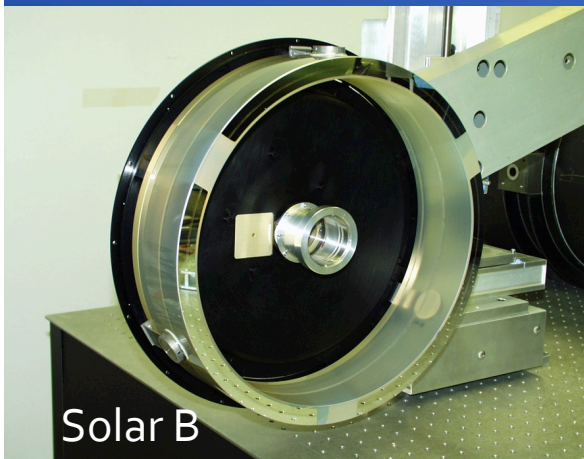
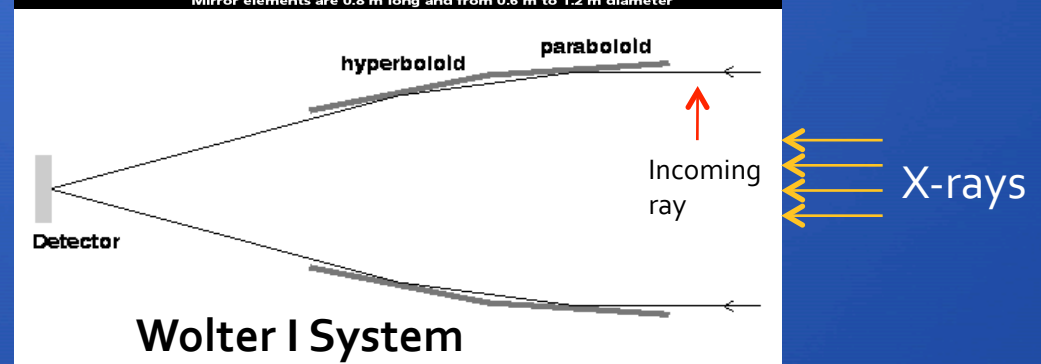
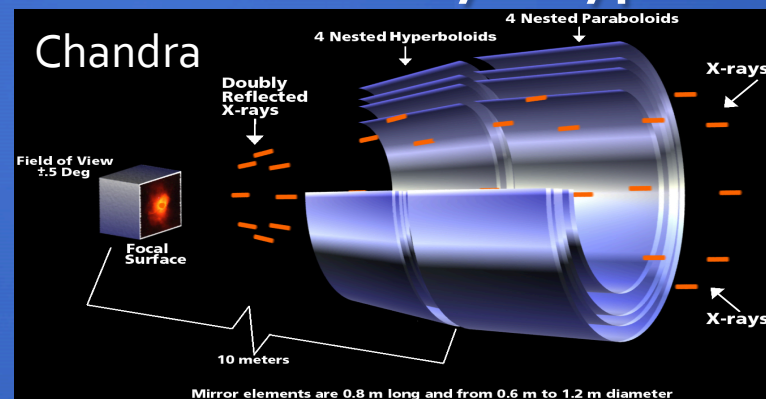


Overview

- We need the ability to evaluate the optical performance of deformed optical systems
- Current programs to do so either do not work because of system upgrades or are inefficient and not very versatile
- They ray trace off of the ideal surface rather than the deformed surface

Wolter I System

- X-ray optical system
- Two mirror system, parabola followed by a hyperbola
- Examples
 - Chandra
 - Solar B



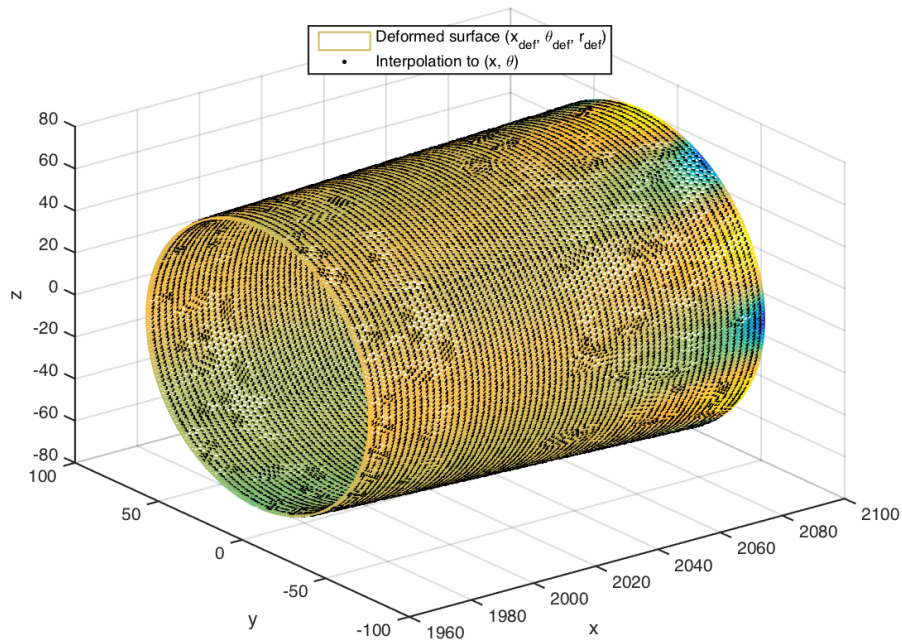
Optical Surface Analysis Code (OSAC)

- OSAC
 - Previous program for ray tracing deformed optics
 - Written in Fortran
 - Obsolete due to several system upgrades
- OSAC-like Program
 - Written in Matlab
 - Slow
 - Not very versatile
 - No longer have the ability to retrieve the FEA data

Improved program

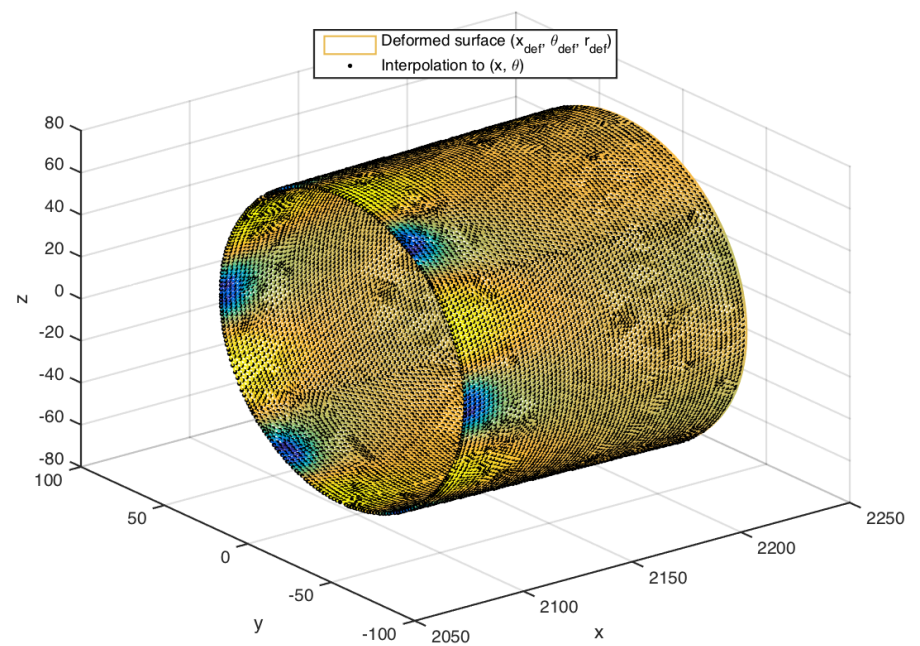
- Now accepts data from new FEA input files
- Increased processing speed by 5x
- User input allows for more versatility and variability in results
- Helped develop GUI
- Now able to deflect the rays off of the deformed surface

Modeled Deformed Surface

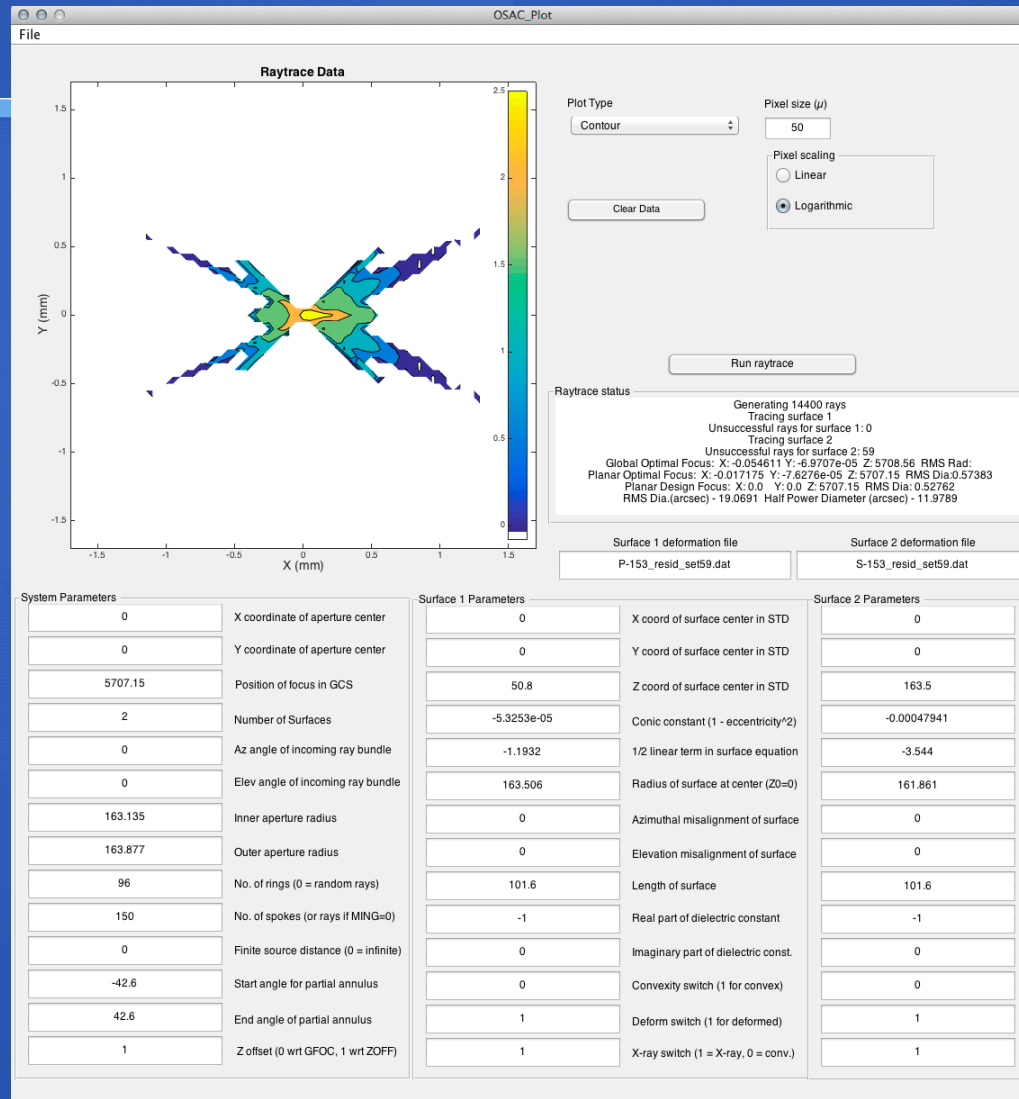


Hyperbolic Mirror

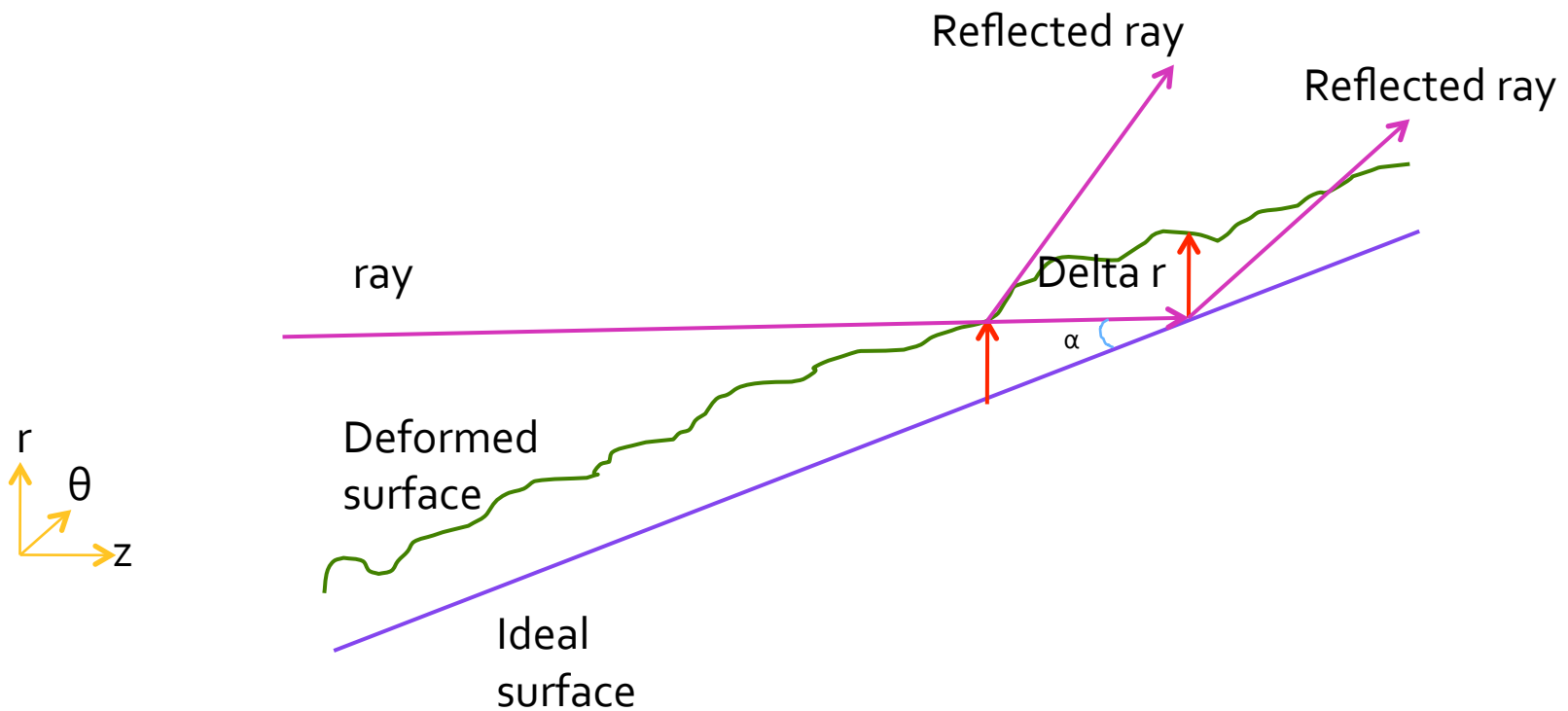
Parabolic Mirror



GUI

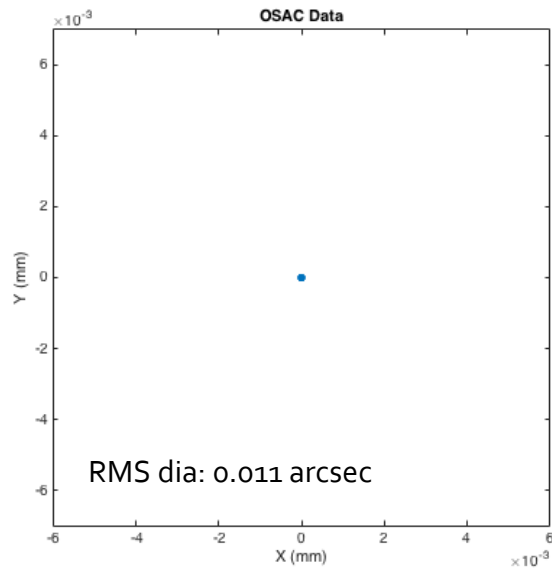


Finding the Deformed Surface

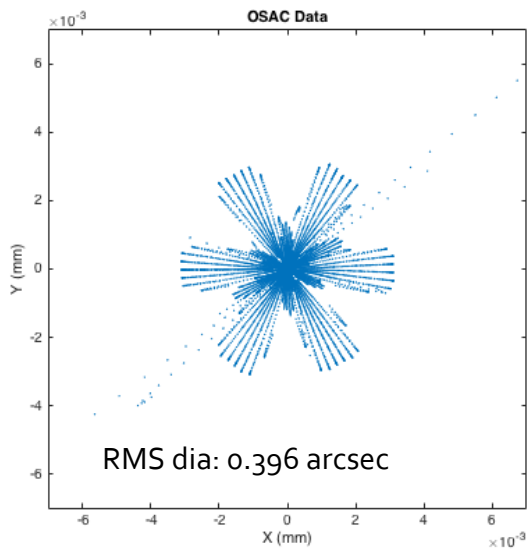


Results

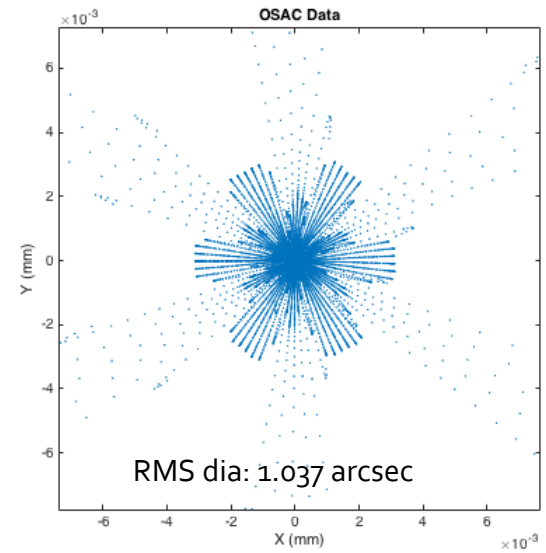
Ideal Surface



Deformed Surface



Approximated
Deformed Surface



Future Work

- Now that it's working for two surfaces, make sure the rays are finding the deformed second surface
- Work with slopes generated from FEA program rather than calculated slopes

Acknowledgements

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