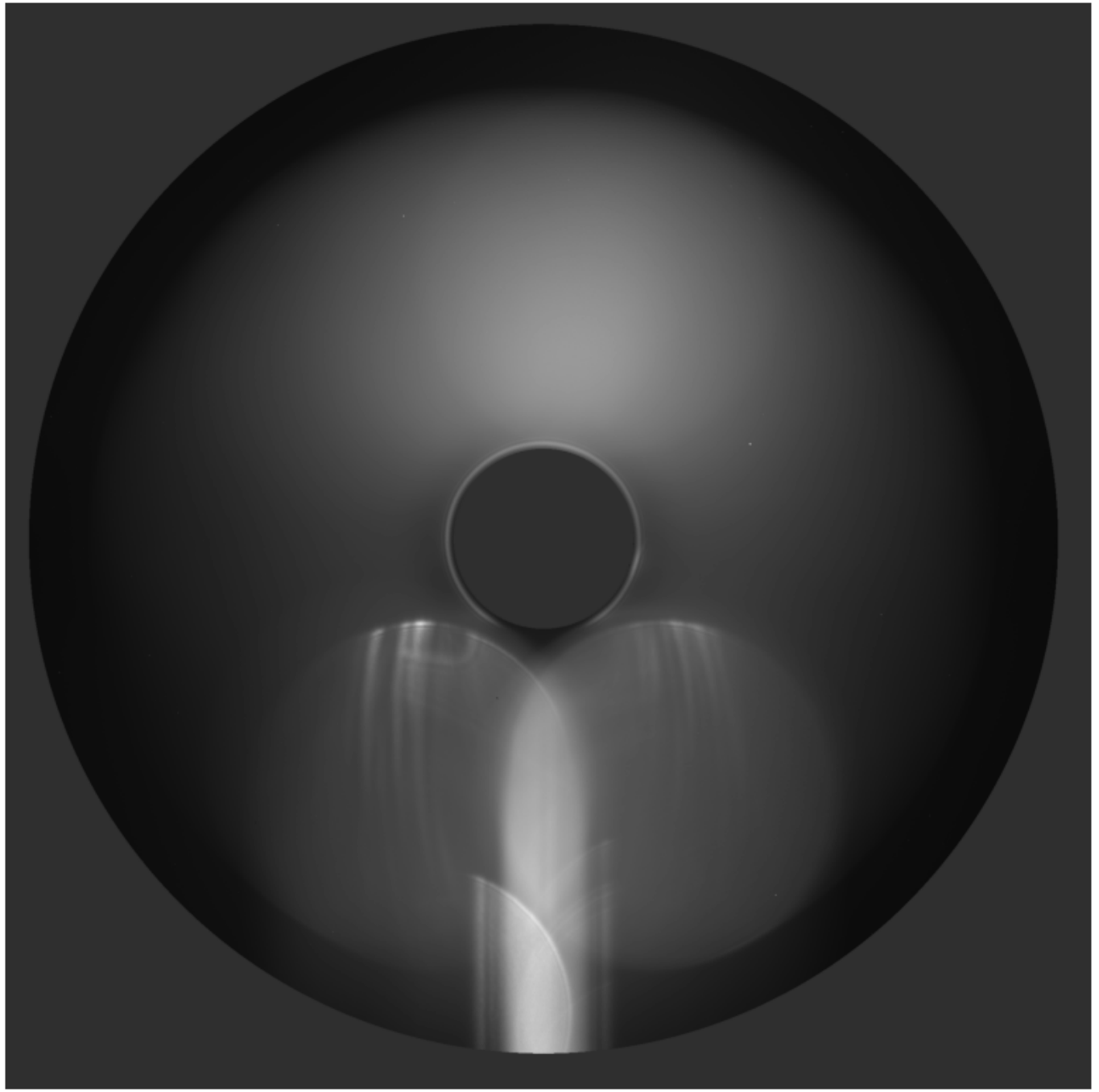
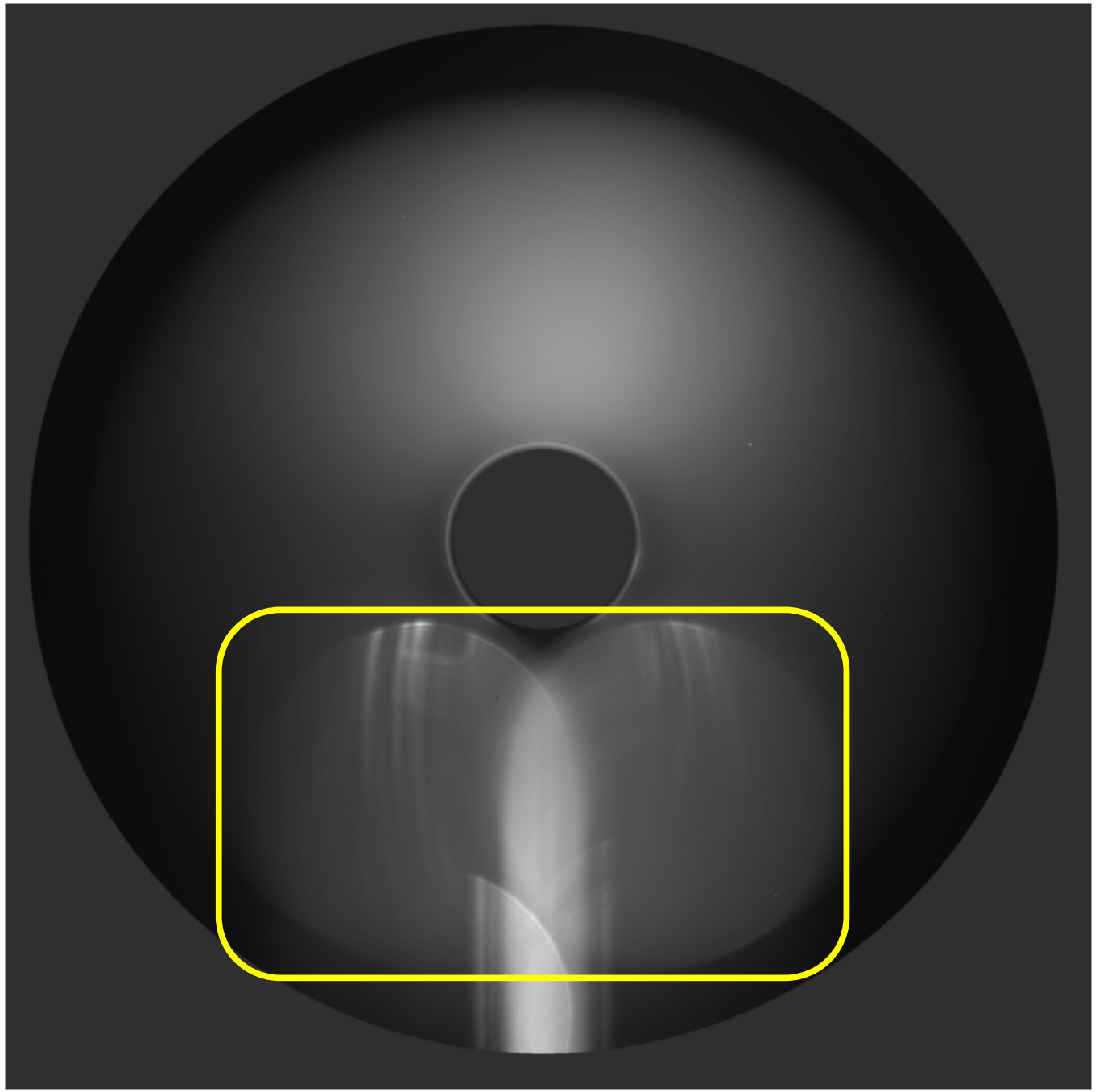
Removing Stray Light from NFI Observations

Joseph Plowman, Sam Van Kooten, Craig DeForest, Jasmine Kobayashi
joseph.plowman@swri.org

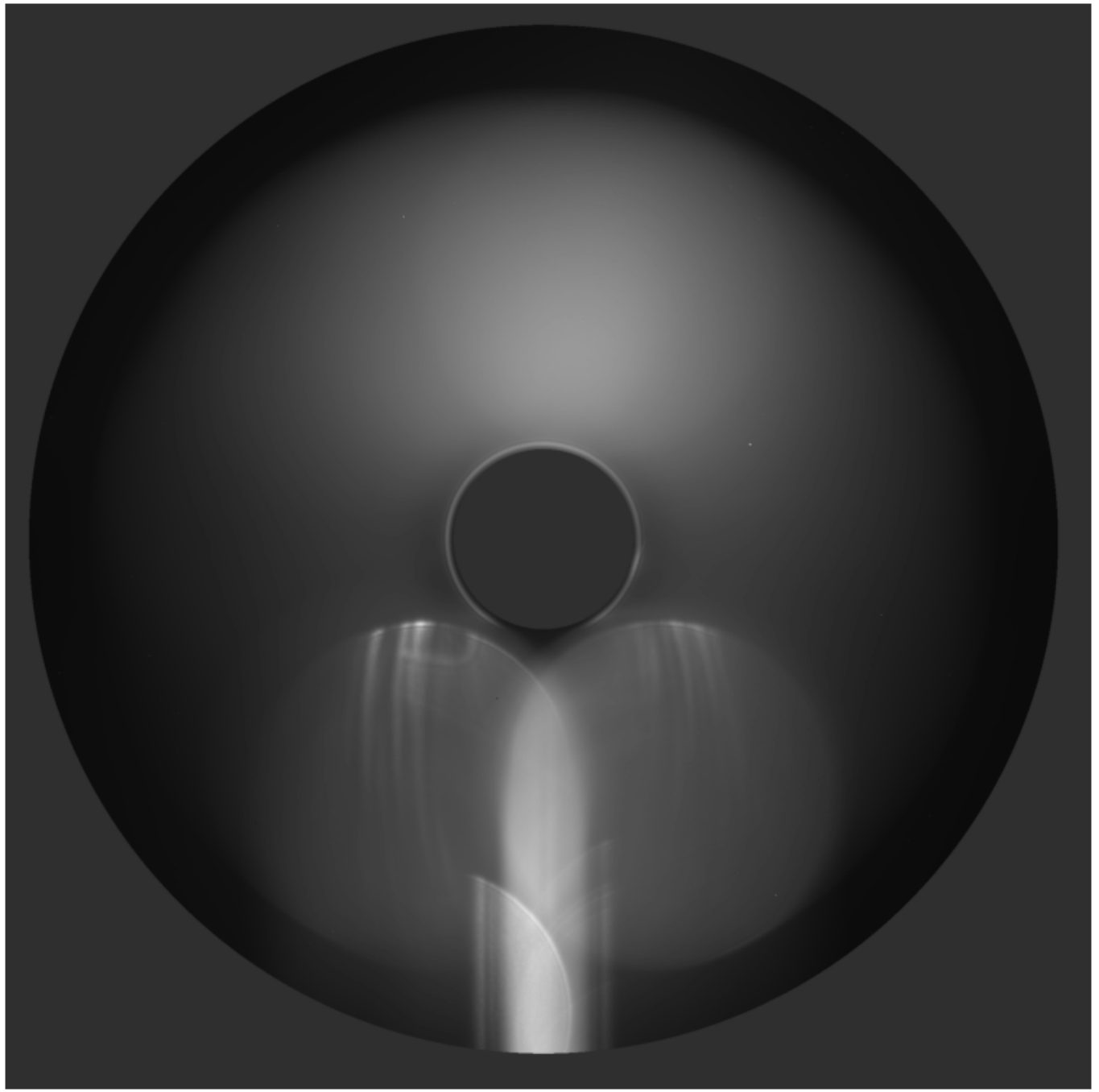
- An example NFI data frame
- Large stray light component dominated by two sources:



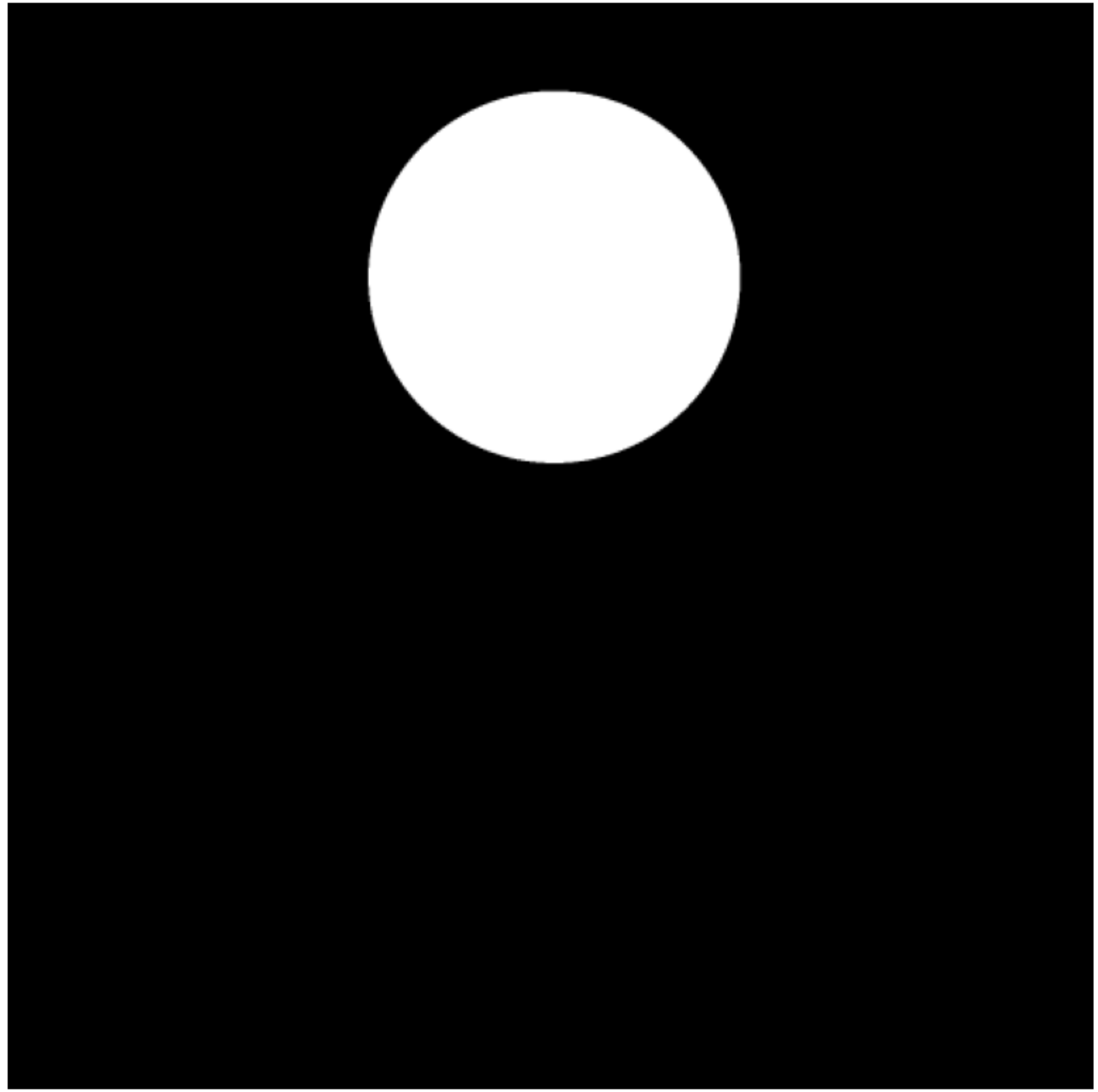
- An example NFI data frame
- Large stray light component dominated by two sources:
  - ‘spherical’ patterns at bottom of image



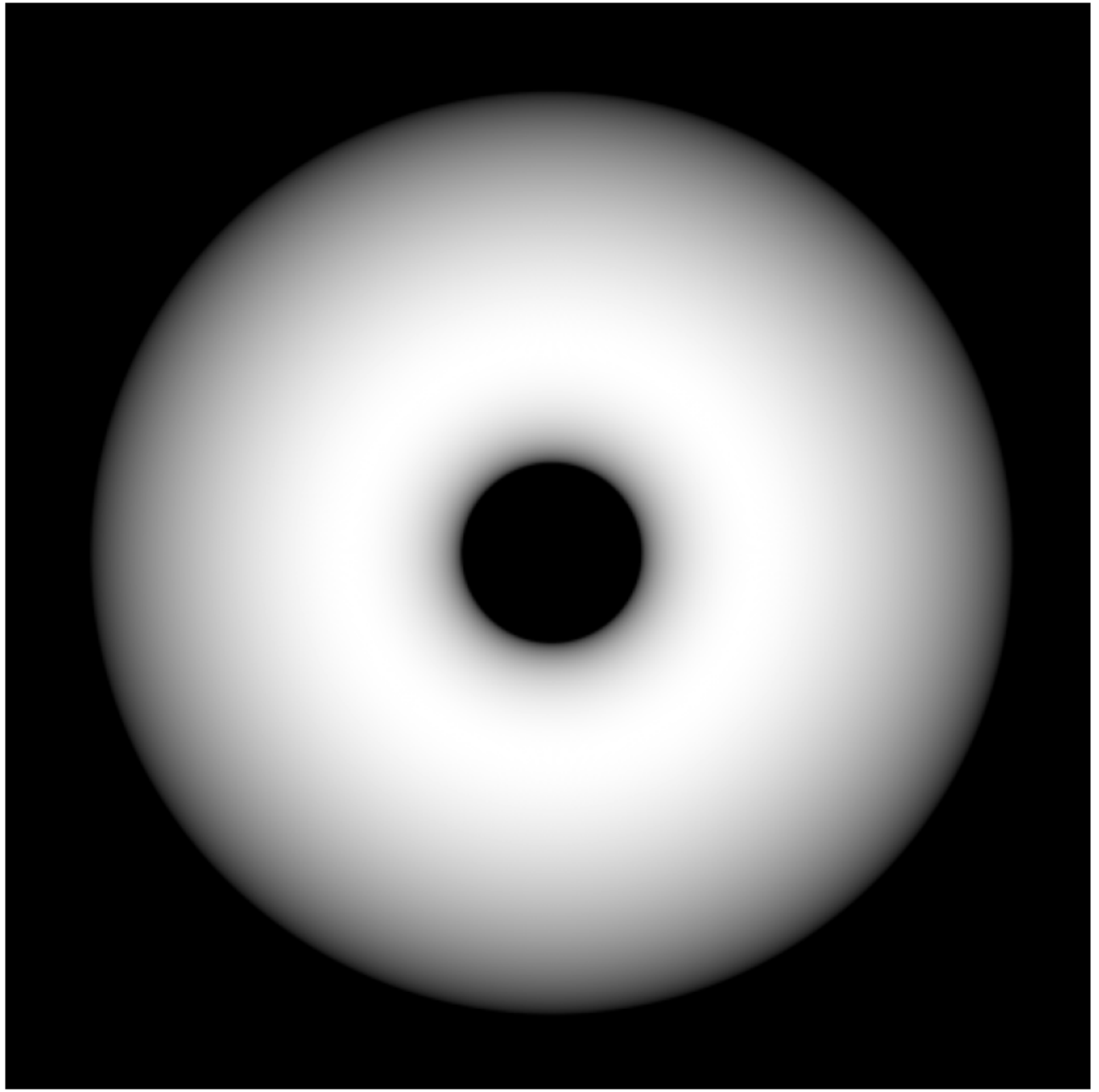
- An example NFI data frame
- Large stray light component dominated by two sources:
  - ‘spherical’ patterns at bottom of image
  - Diffuse stray light in thick ring around image
- Spherical pattern only affects part of field of view, may be amenable to minimum subtraction. Deferred for now
- Diffuse stray light affects almost entire field of view
  - Due to Earthshine from internal reflections



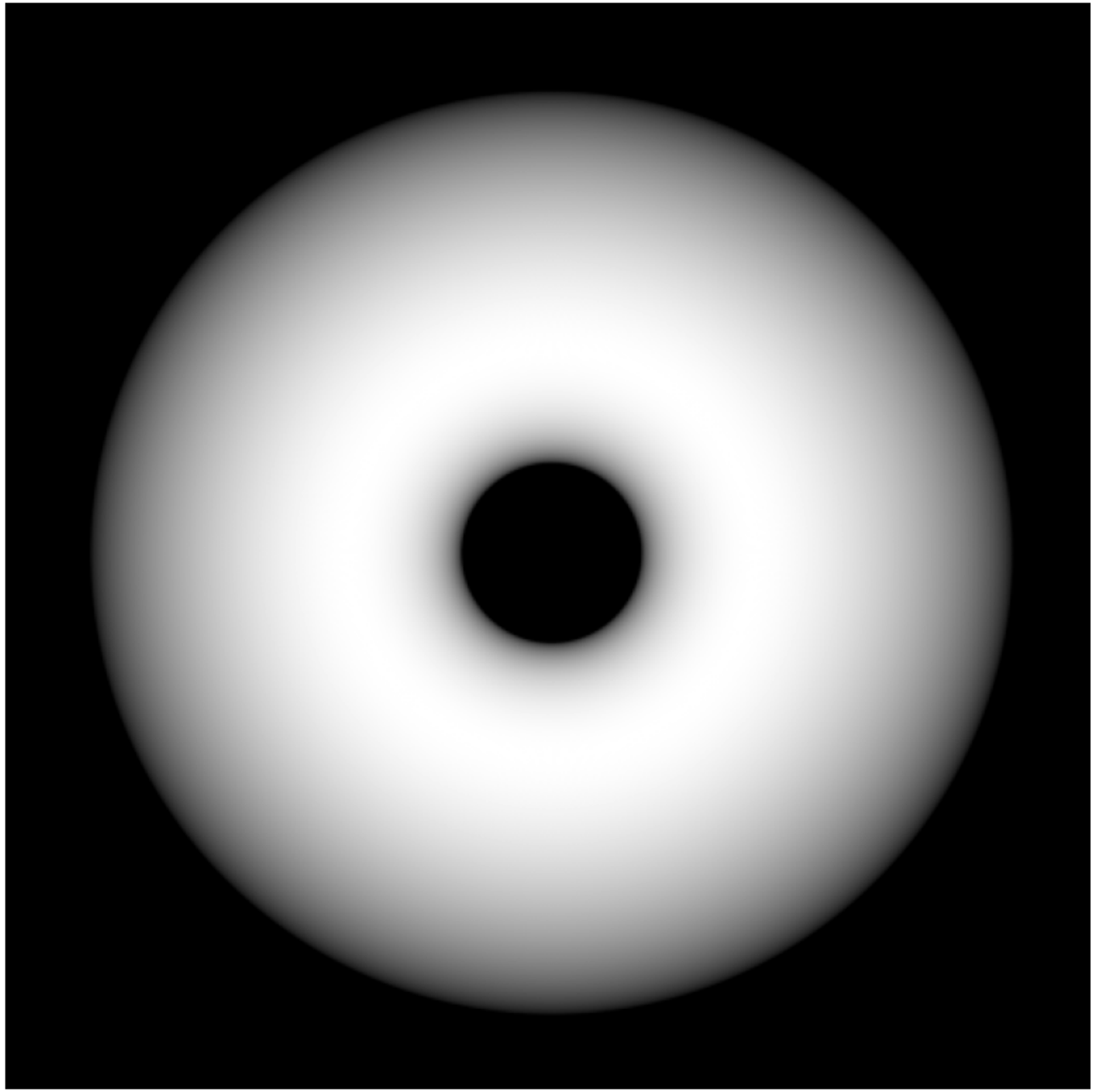
- We tackle diffuse stray light with sparse matrix inversion
- Stay light comes from kernels like those at right



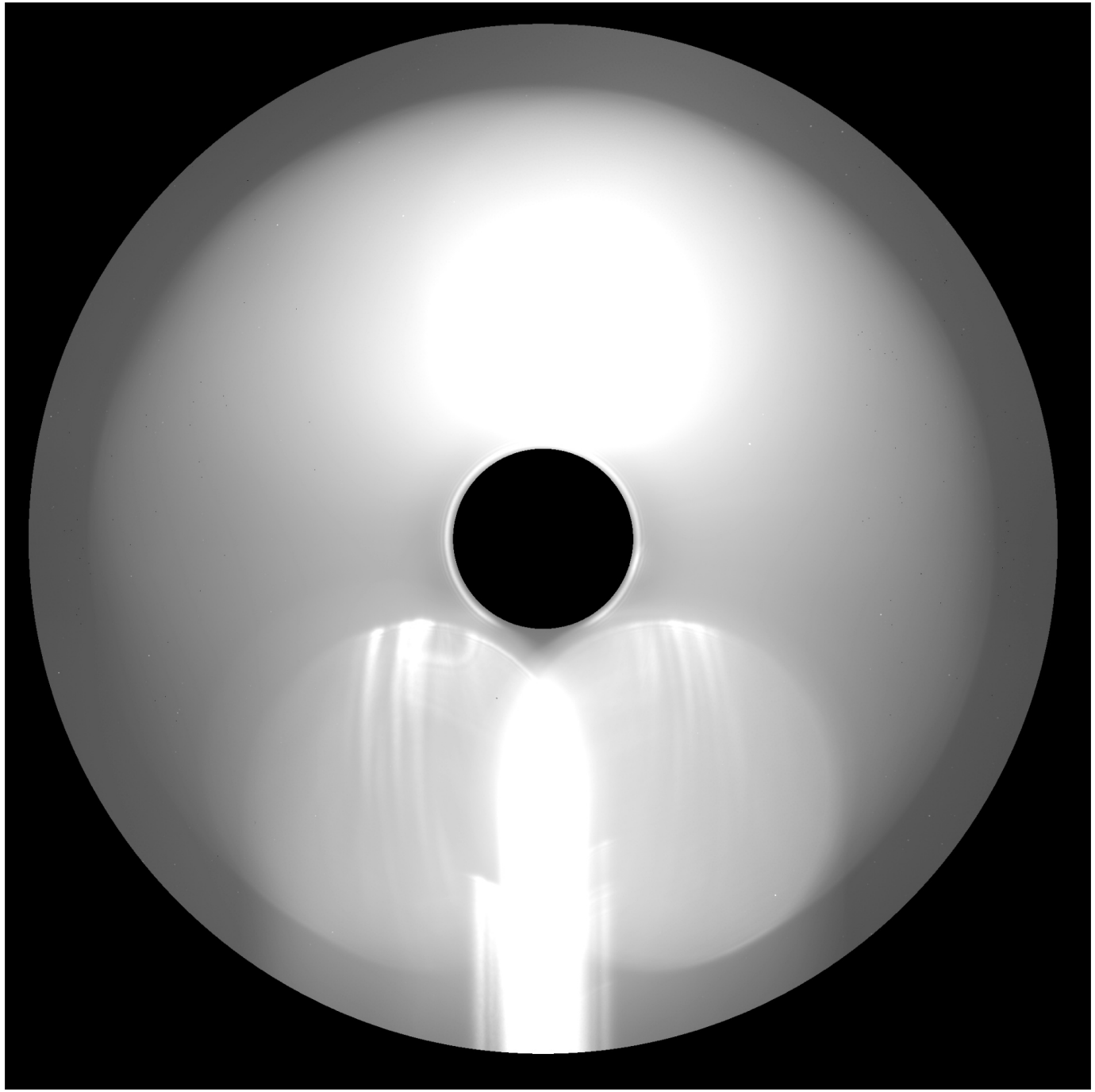
- Stay light comes from kernels like those at right
- Combined they produce diffuse ring around image
- Variation of intensity in each kernel component produces variation in light pattern in ring
- Need to find intensity of each kernel component



- We find these components with sparse matrix inversion
- The set of all kernels is a sparse matrix
- Set of point sources on sky is also a sparse matrix
- Together these produce observed image
- Slightly underconstrained, to solve this we enforce:
  - Mild regularization on point sources
  - All sources non-negative



- Results:
  - Original (for comparison)



- Results:
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  - Corrected
- Spherical pattern at bottom of image masked out

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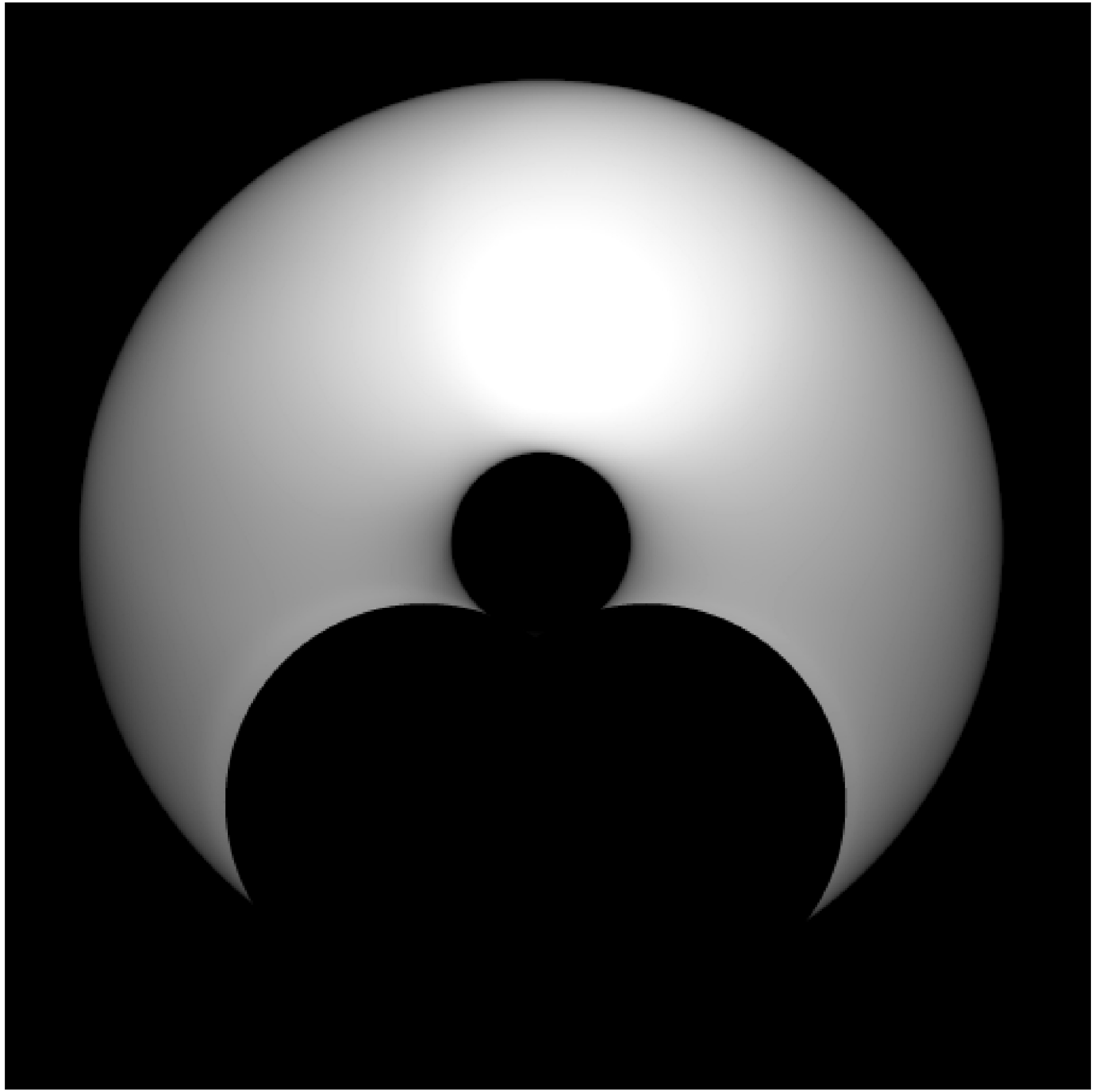

- Results:
  - Original (for comparison)
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  - Stray light component
- Spherical pattern at bottom of image masked out
- Still work in progress
  - Refine stray light kernels
  - Extra info from WFI?
  - Multiframe reconstruction?
  - ...