

HARVARD-SMITHSONIAN  
CENTER FOR ASTROPHYSICS

# Research to Support WFIRST (Microlensing) Exoplanet Science

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# Image the Entire WFIRST Microlensing Field with HST



×10

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HST/ACS



HST/WFC3

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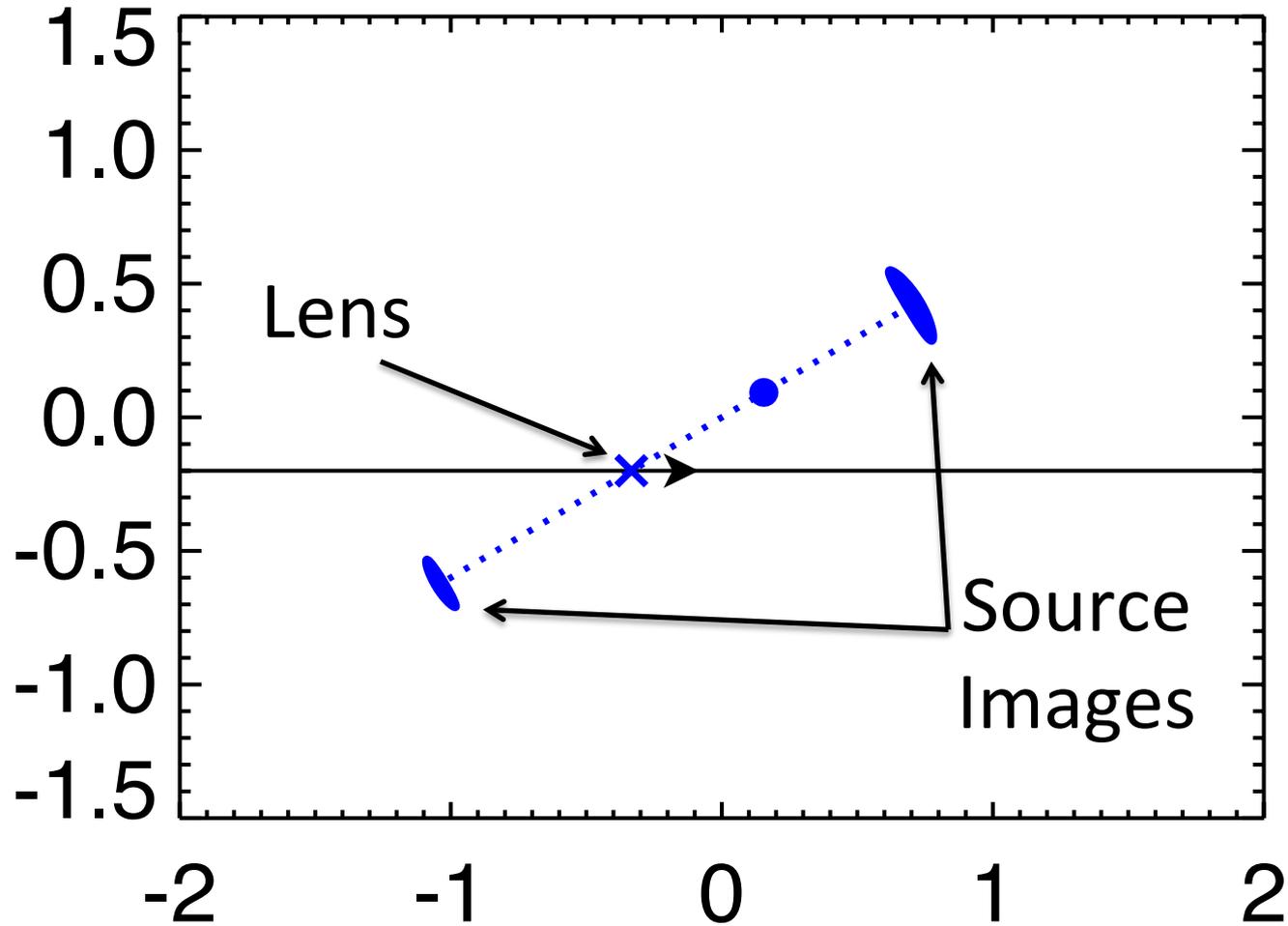


HST/ACS

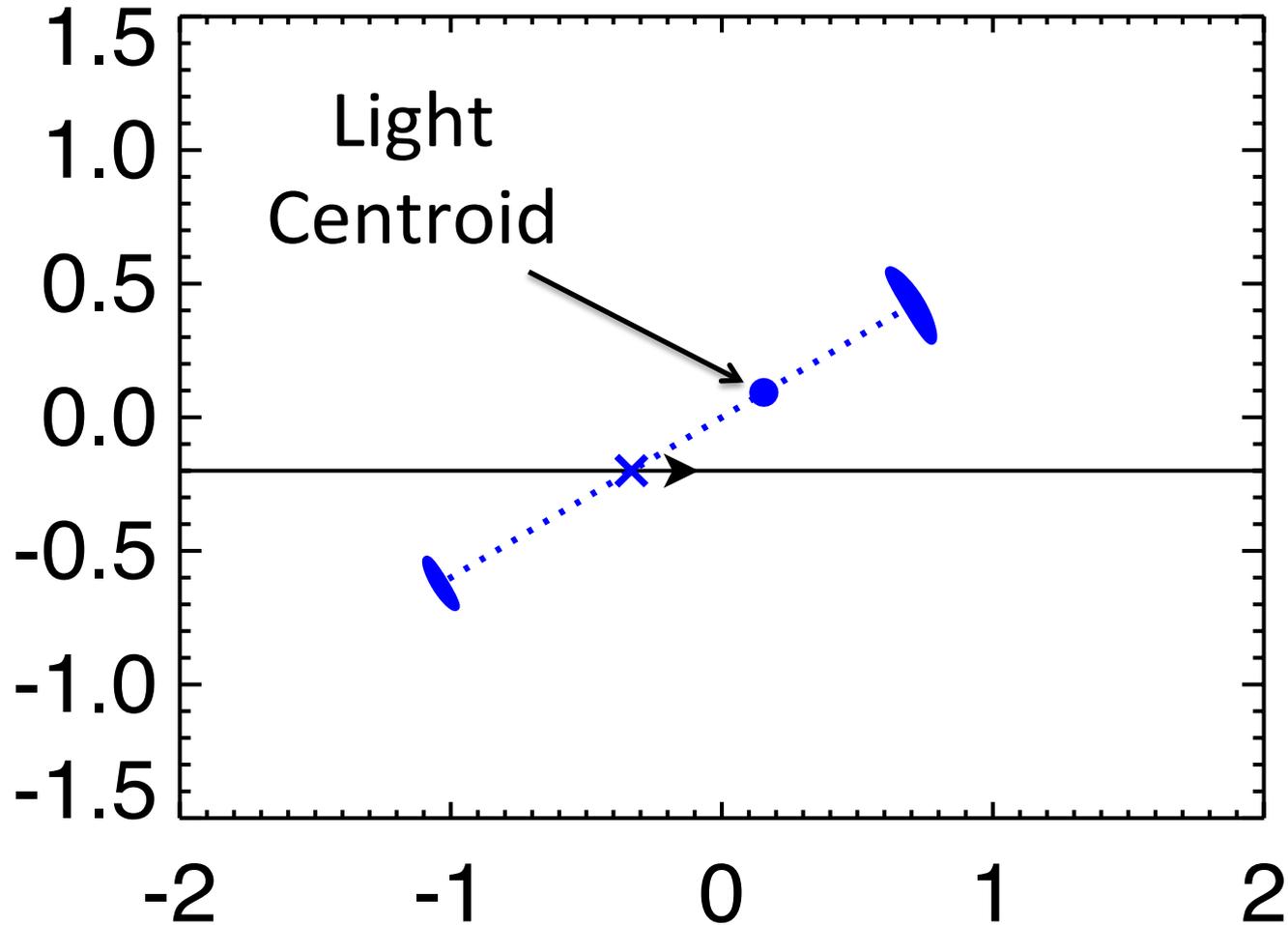


HST/WFC3

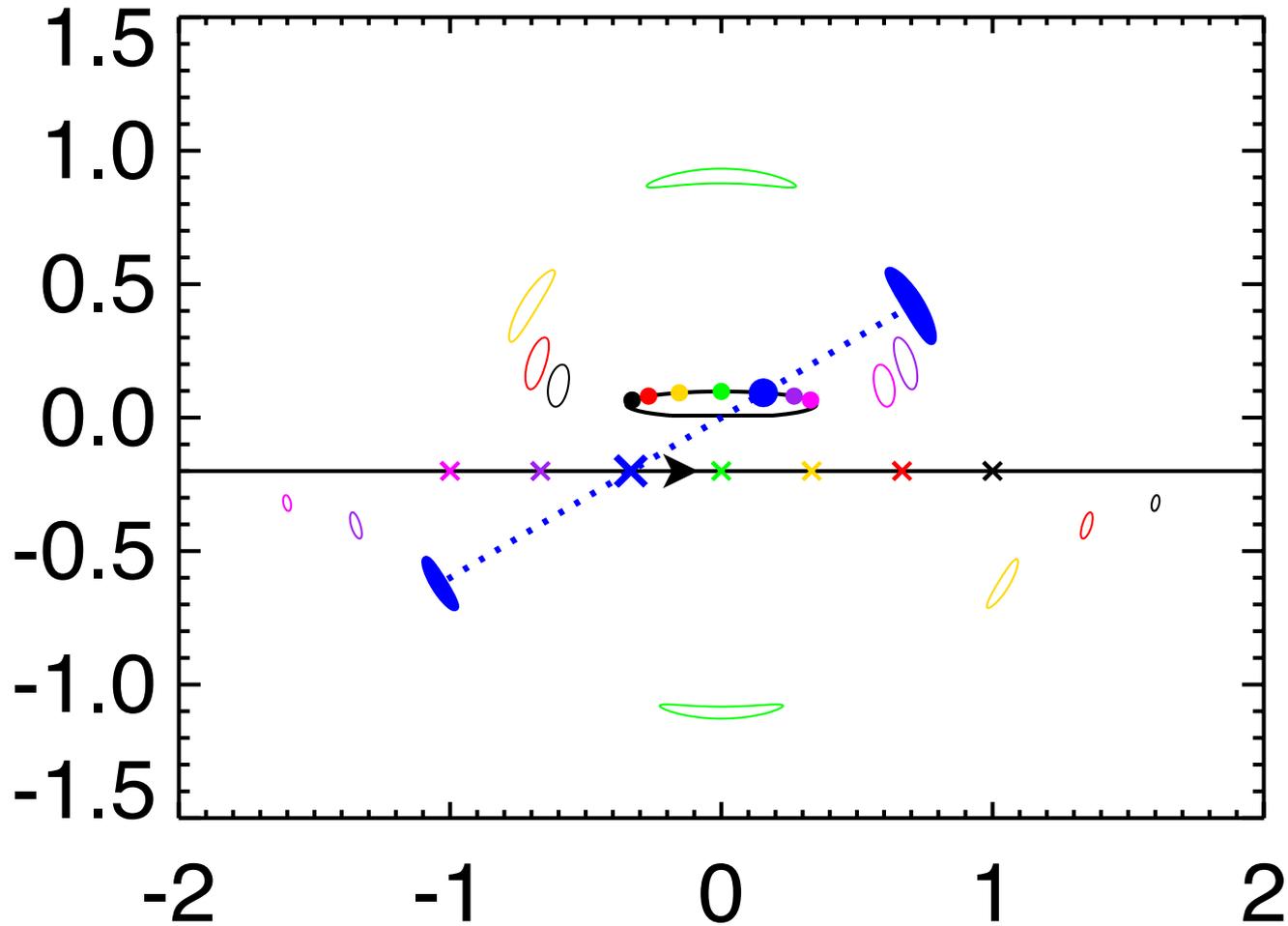
# Astrometric Microlensing



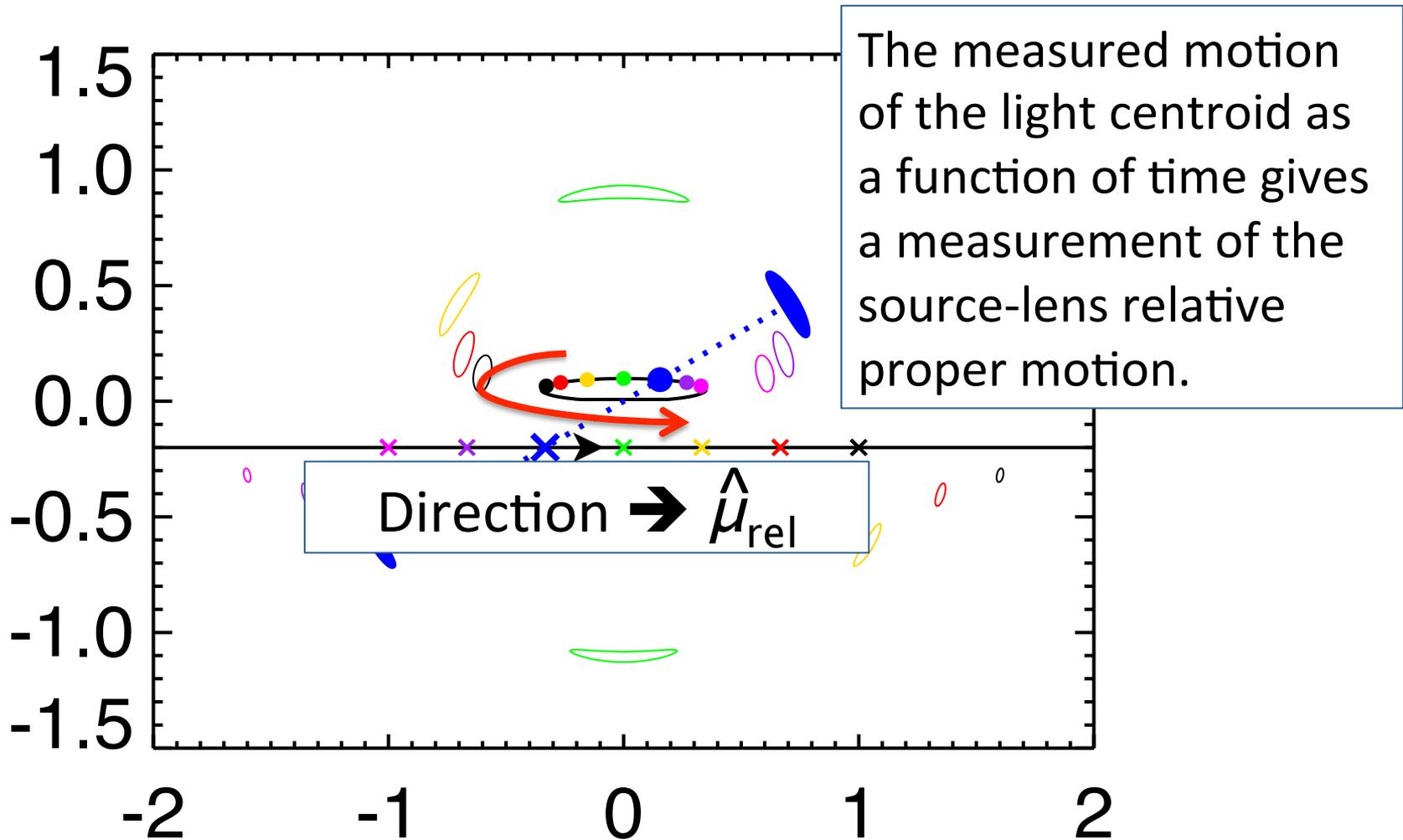
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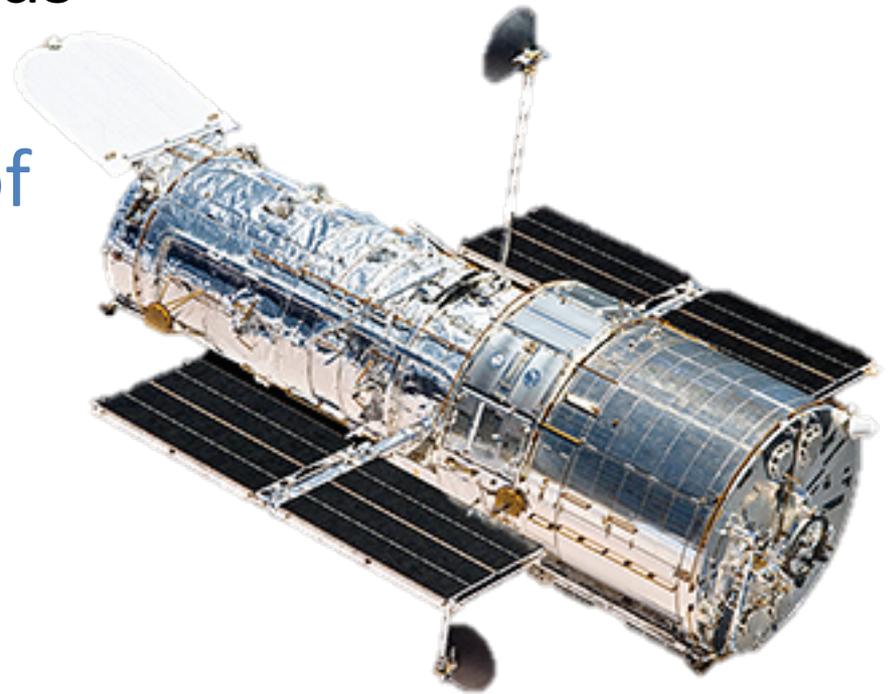


# Astrometric Microlensing



# Optical HST Imaging

An **immediate, optical** HST survey of the WFIRST fields will allow **proper motion measurements for 22% of WFIRST stars** → Direct verification of WFIRST microlens astrometry.

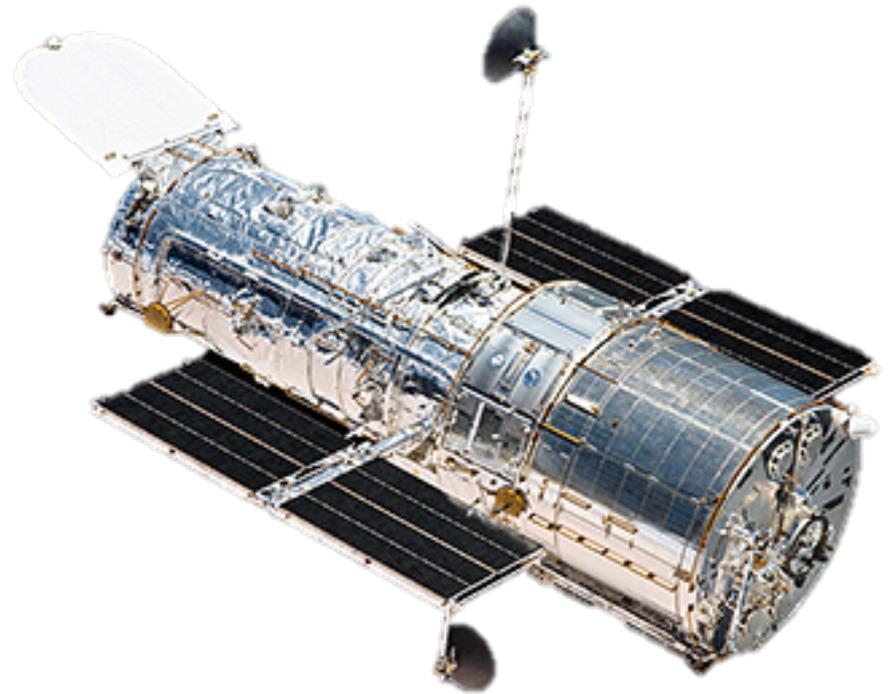


Reliable microlens astrometry measurements are vital to measuring planet masses with WFIRST.

# Optical HST Imaging

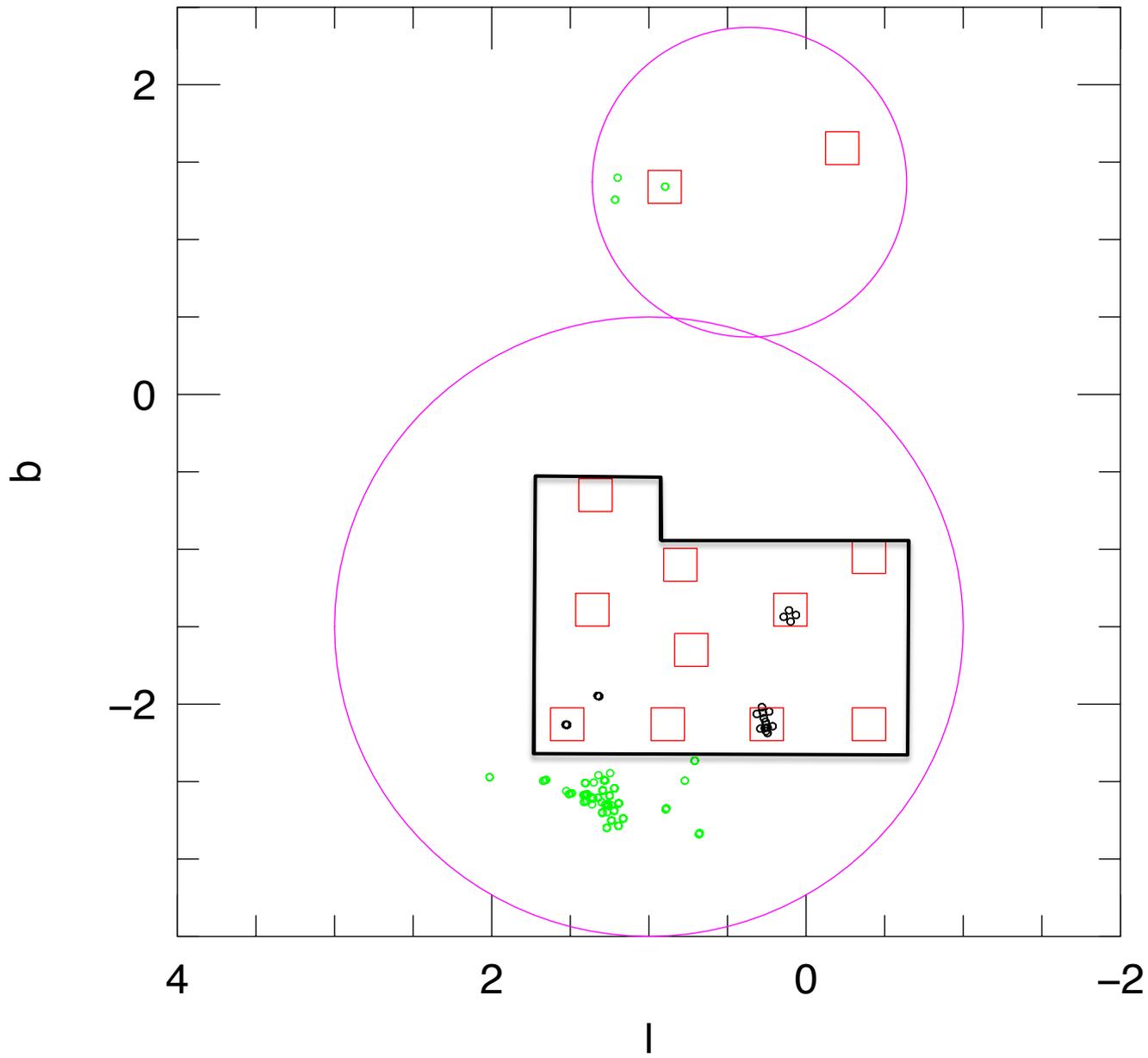
Colors of stars in WFIRST field → temperature, extinction, metallicity

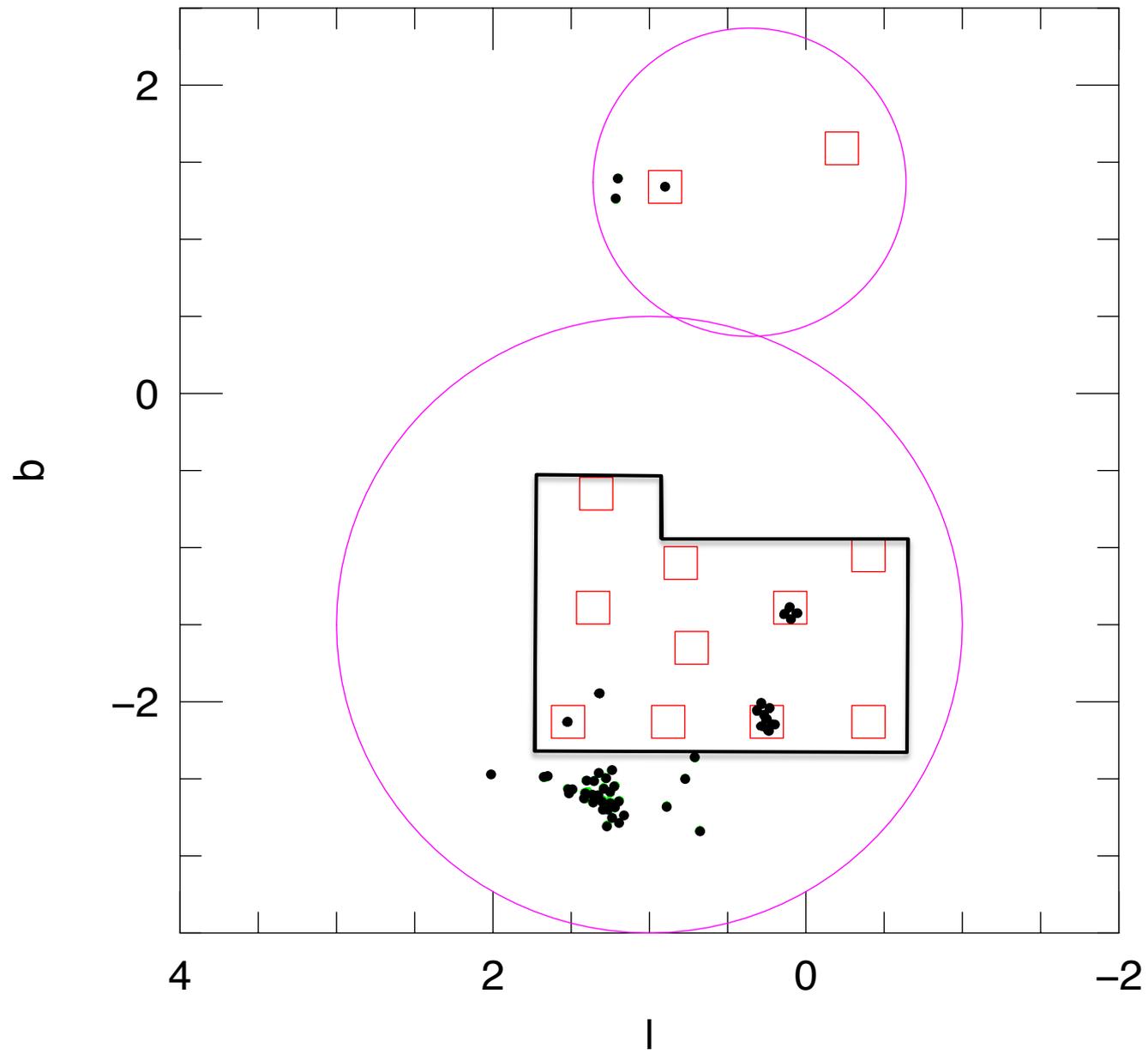
WFIRST relative astrometry + GAIA absolute astrometry + HST colors → Detailed structure of the galaxy

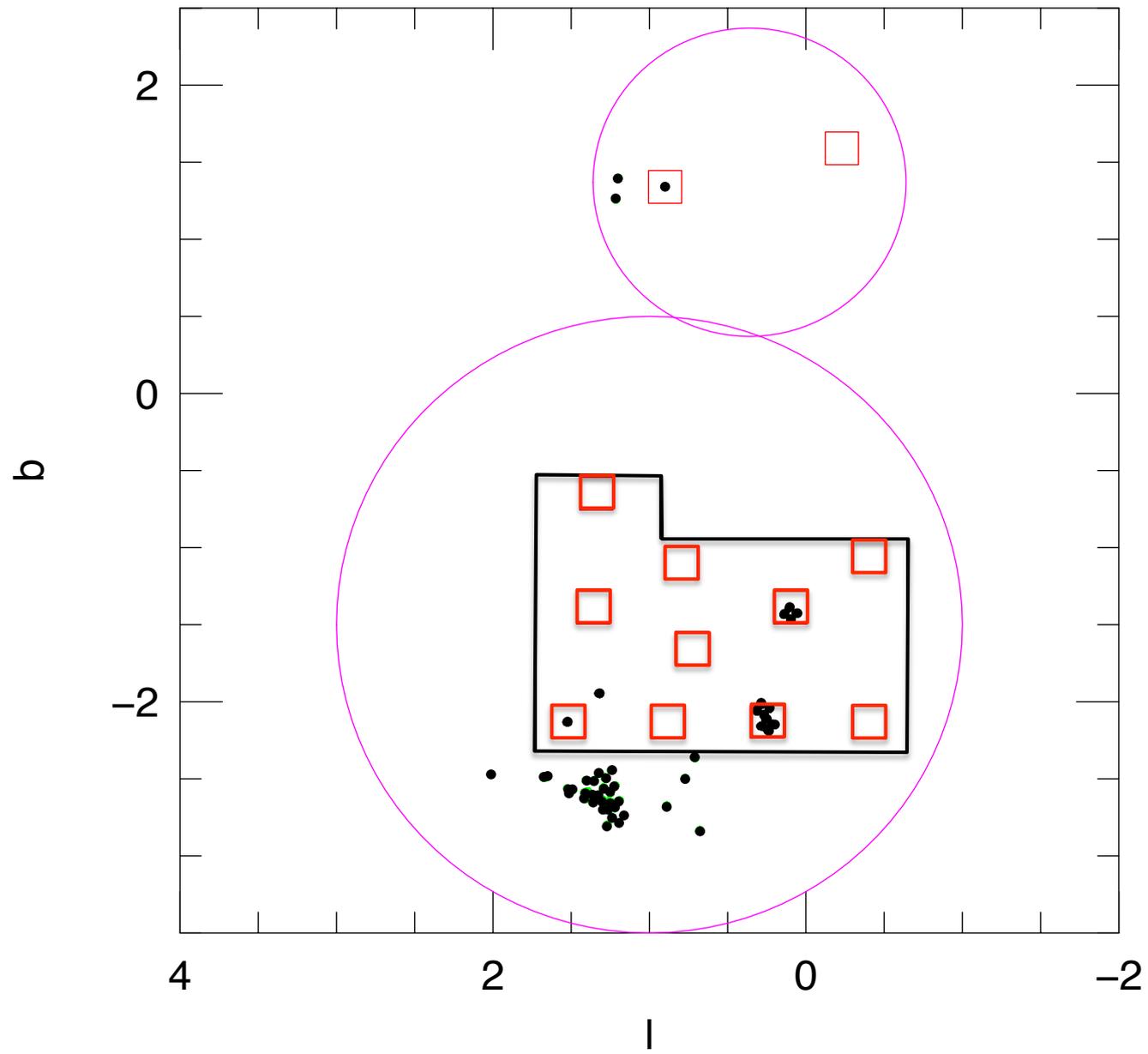


# Reasons for Optical HST Imaging

- Direct test of microlens astrometry
- Interpretation of microlensing events
- Colors of stars in the bulge → age, temperature, metallicity
- Identify KBO occultations
- Many other reasons









# Optical HST Imaging

- Phase I: Pencil beam survey
  - Characterize different environments
  - Verify the utility of optical imaging
  - (Observe past microlensing events)
- Phase II: Observations of the core WFIRST fields
  - Systematic imaging of fields guaranteed to be part of the final WFIRST field
- Phase III: Complete survey of WFIRST field

# SAG 11: Preparing for the WFIRST Microlensing Survey (arXiv:1409.2759)

- **Directly support WFIRST science and reduce its scientific risk:**
- **Develop techniques for measuring planet masses:**
- **Development of WFIRST analysis pipelines:**

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- **Directly support WFIRST science and reduce its scientific risk:**
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  - A preparatory, ground-based, **microlensing survey in the near-IR**
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- **Develop techniques for measuring planet masses:**
  - **Satellite parallax** observations using Spitzer, Kepler, and TESS
  - **HST or AO flux measurements** of lenses in ground-based microlensing events
  - Measurements of **microlens astrometry** for black holes
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## Preparing for the WFIRST Coronagraph Mission

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