

Even Thoughts

- Detection/characterization of E/IMRI dynamics.
- Properties of the low-mass objects.
- Properties of the massive black holes.
- Cosmological inferences, including formation and growth of IMBH, SMBH
- Tests of GR etc.

General Thoughts on LISA Astrophysics Goals

Organization suggested by Pete Bender

- Massive black hole binaries
Structure formation in $z=5-30$ universe
- Intermediate-mass black holes
Seeds of $10^6 M_{\text{sun}}$ SMBH growth
- EMRIs
Dynamics, environment of SMBHs
Include IMRIs here, or not?

EMRI Data Analysis

Still significant work to be done in algorithms and understanding of radiation reaction.

If successful, following phase over 10^5 cycles implies that

Both masses

MBH spin

Orbital eccentricity

all determined with more than enough precision for astrophysics.

Distributions

- Suppose $\sim 10^2$ - 10^3 EMRIs detected.
- Get most extensive, precise distributions of
SMBH masses.
SMBH spins.
Stellar-mass BH masses.
- Also distribution of eccentricities within a few AU of massive black holes.
- Uniquely valuable info on SMBH growth, stellar evolution, Newtonian and relativistic orbital dynamics.

Correlations

- Some correlations between quantities will be immediately informative.
SMBH mass vs. SMBH spin.
Orbital eccentricity vs. SMBH mass.
Orbital eccentricity vs. stellar BH mass.
- Luminosity distance distribution may also give information about evolution.

Unusually Informative Events

- Some individual observations give us insight even without detailed modeling.
- $50 M_{\text{sun}}$ secondary
Larger than many expect for stellar BH.
- $1000 M_{\text{sun}}$ secondary
Proof that IMBH can sink to center.
- Zero-eccentricity EMRIs
Suggests non-standard scenario.
- Low-spin primary
Demands growth by mergers, not accretion.

Cosmology and GR Tests

- Not discussed as much by even panel.
- Cosmology
 Ω_m , Ω_Λ probably better obtained by EM.
Structure formation from MBH binary
- GR tests
Not enough expertise; need odd perspective. Question: how exactly would horizon be detected?
Merger, ringdown contain very little energy.