Importance of the tidal heating in binary coalescence

Sayak Datta

IUCAA

Papers

- arXiv:1910.07841 (Accepted in PRD), SD, Richard Brito, Sukanta Bose, Paolo Pani, Scott A. Hughes.

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- Phys. Rev. D 99, 084001 (2019), SD, Sukanta Bose.

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- ECO, Quantum BH?
- This can be done using Tidal heating.

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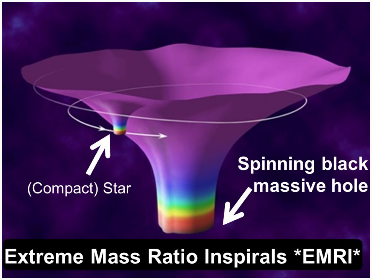
- 

Credit: *Isoyama*

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- Even for M_{BH} M_{NS}, ν_{NS} ν_{BH}, resulting in ignorable TH compared to BH.

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- ψ_4 is the perturbation quantity satisfying Teukolsky equation.
- From ψ_4 GW waveform, energy fluxes at infinity and also the flux at horizon can be calculated.

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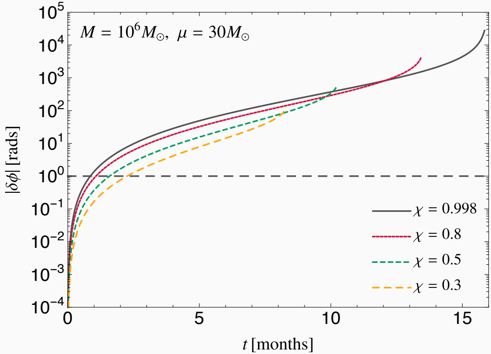

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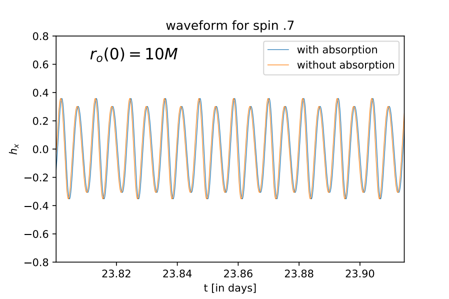

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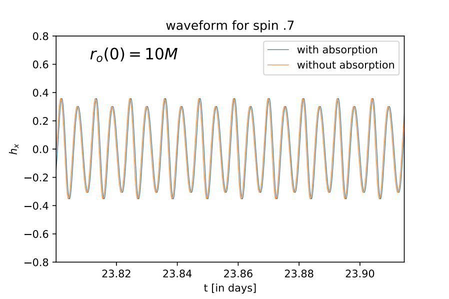
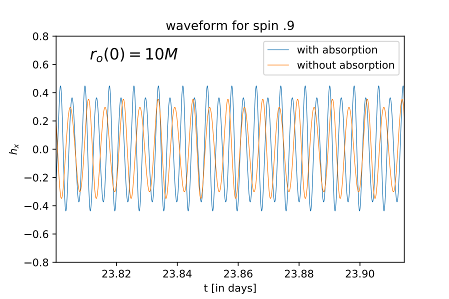
- 

- 

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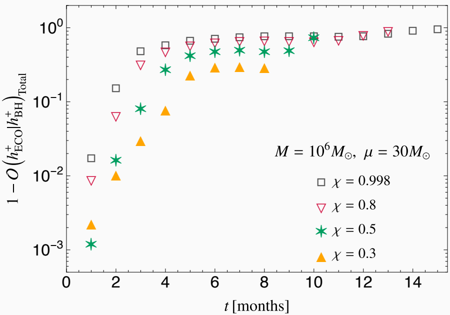

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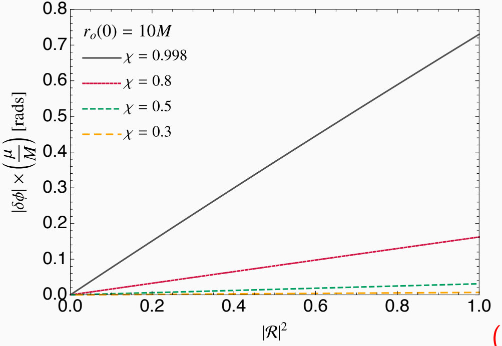

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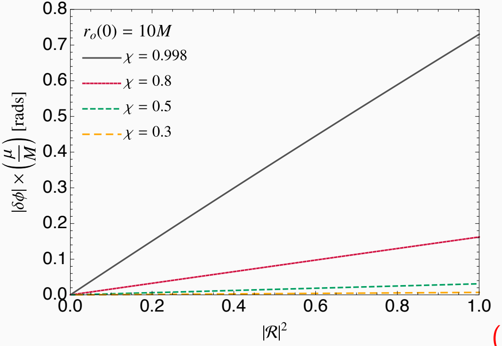

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- Measuring $|R|^2$ tests presence of horizon and multipole tests presence of hair. (SD, S. Bose, PRD99,084001 (2019), (Maselli+, PRL120,081101(2018))

Entrance of the Horizon parameter

- This is a 2.5 pn correction. So, the flux has an extra contribution $(\frac{dE}{dt}\Big|_H)$.

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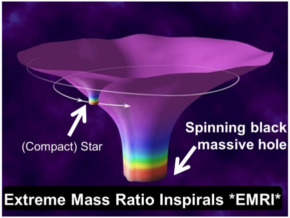
- We name it Horizon parameter.

Modelling

- We construct waveform of EMRI in circular equatorial orbit.



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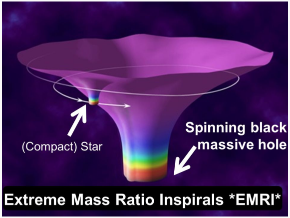

- We model multipole moments of central object as $M_\ell + iS_\ell = \alpha_\ell M(ia)^\ell$ and treat α_ℓ as independent parameter.

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- Then adding the LISA noise curve we try to estimate the values for SNR 20.

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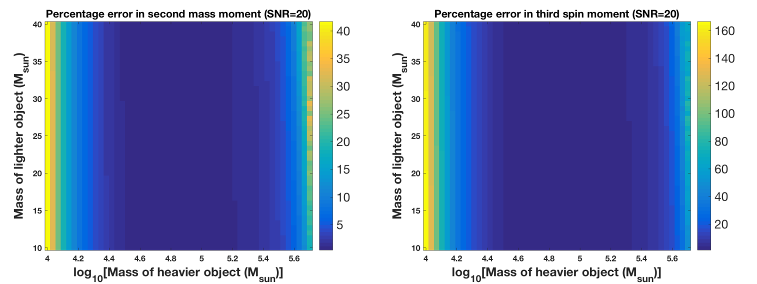
- 

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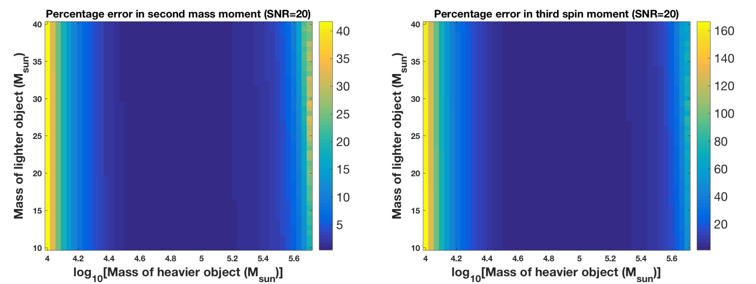
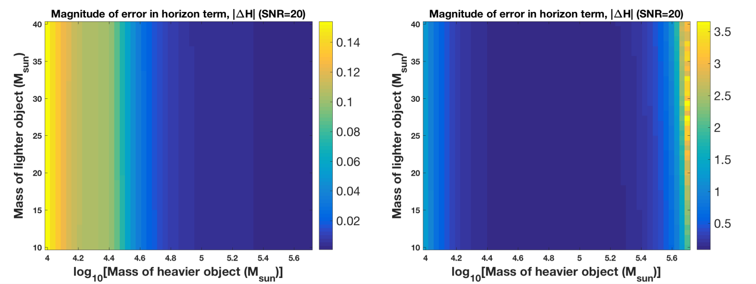
- 

- 

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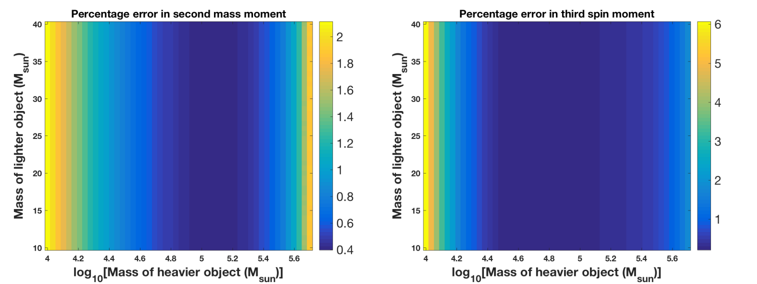
- 

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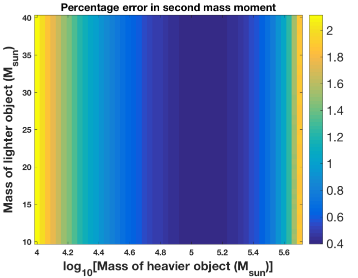
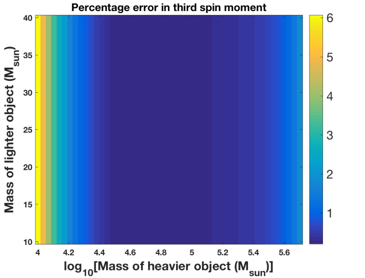
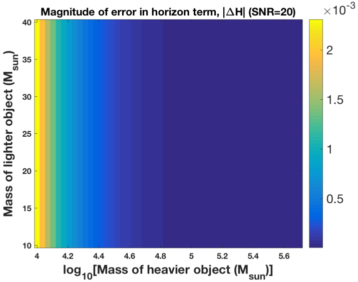
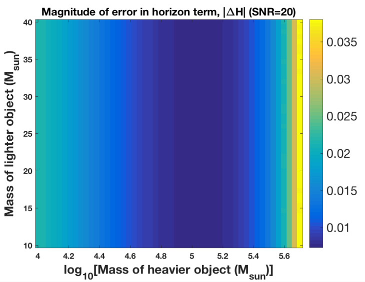
- 



- 



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- Therefore, testing presence of hair and distinguishing between different sources will be possible.

THANK YOU!