EVOLVING SCALAR FIELDS ON A HYPERBOLOIDAL SLICING

Jonathan Heath

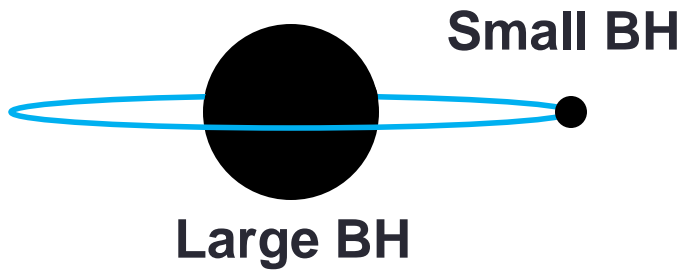Advisors: Peter Diener & Frank Löffler

Extreme Mass Ratio Binary

Small BH

Large BH

Infinity

Extreme Mass Ratio Binary

Small BH

GW

Large BH

Infinity

Extreme Mass Ratio Binary

Small BH

GW

Large BH

Back-Scattering
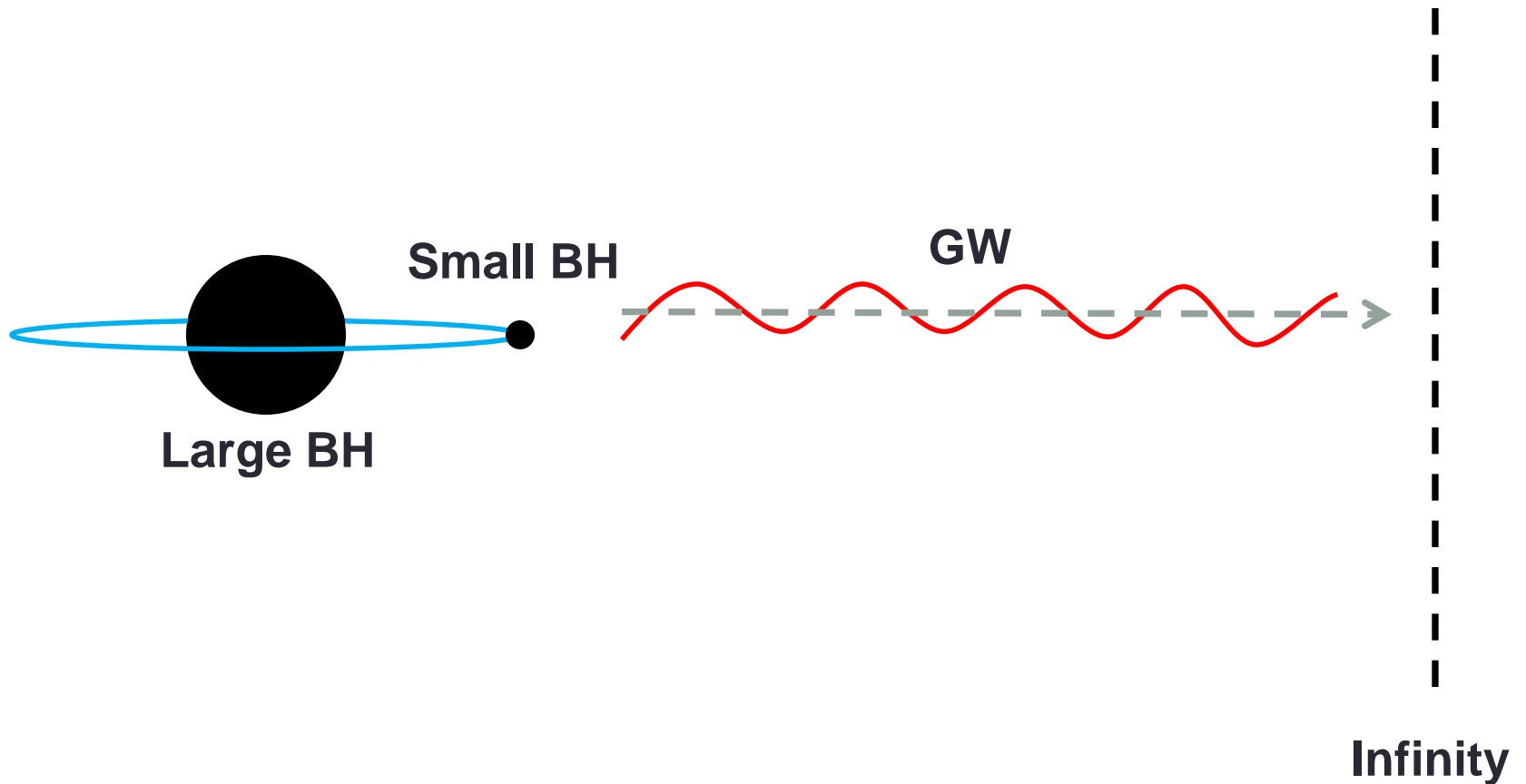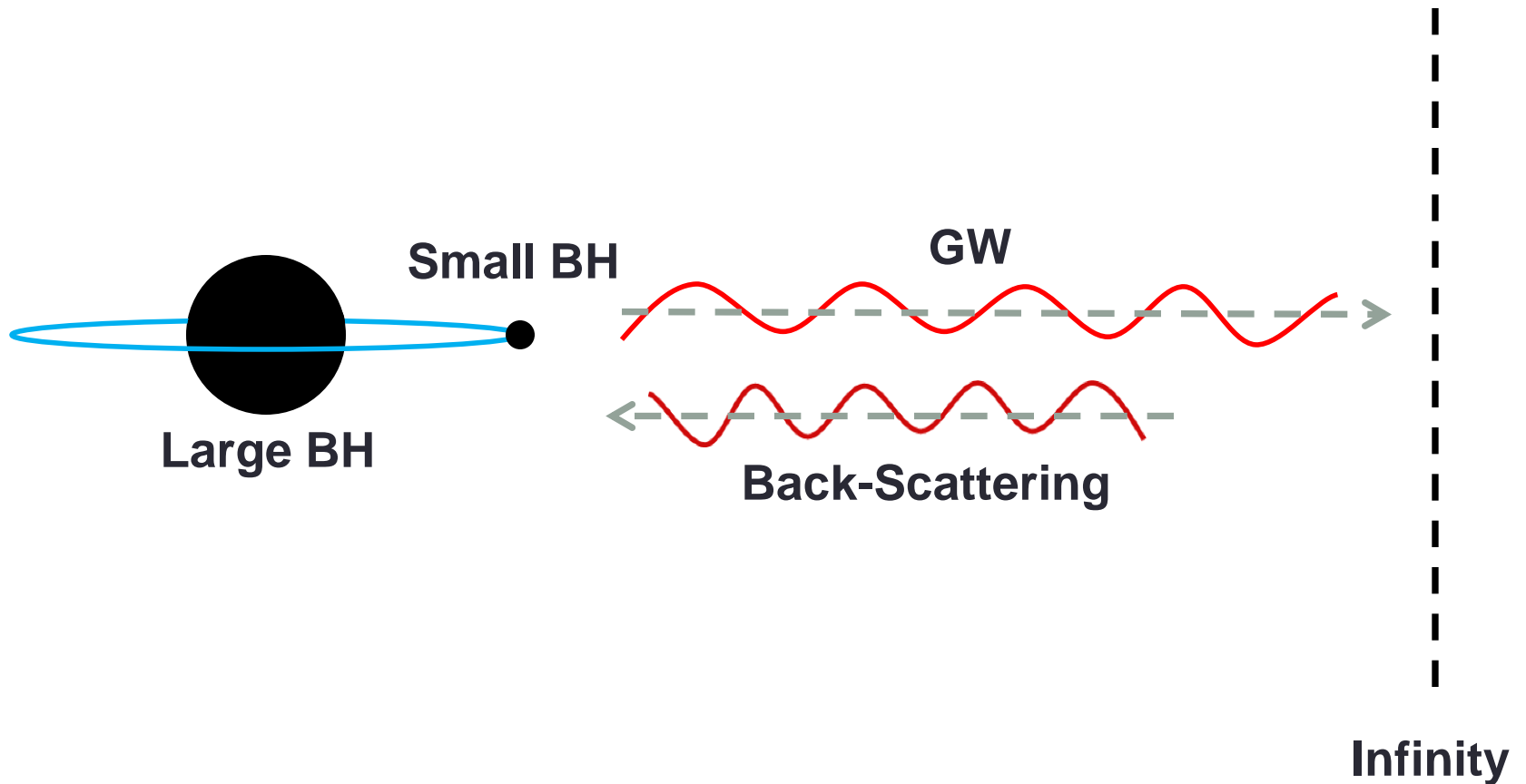
Infinity

Evolving Scalar Fields to Infinity
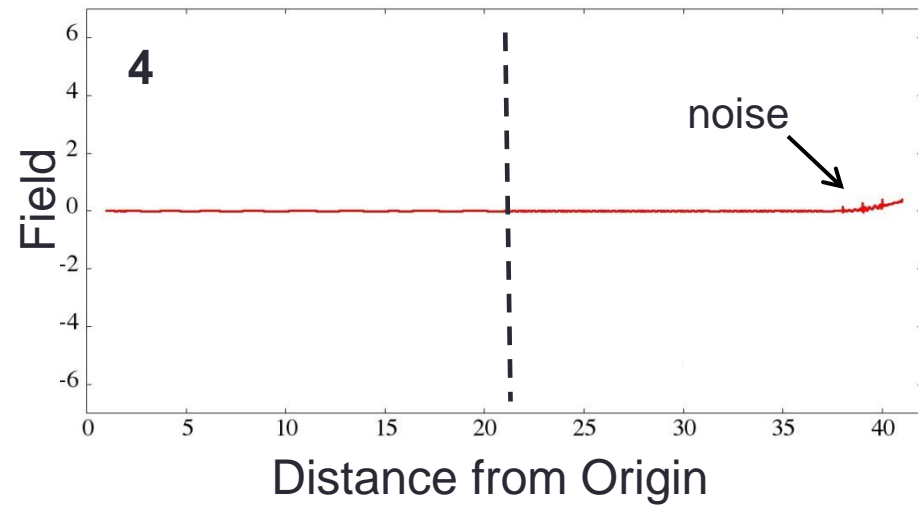
Flat Space

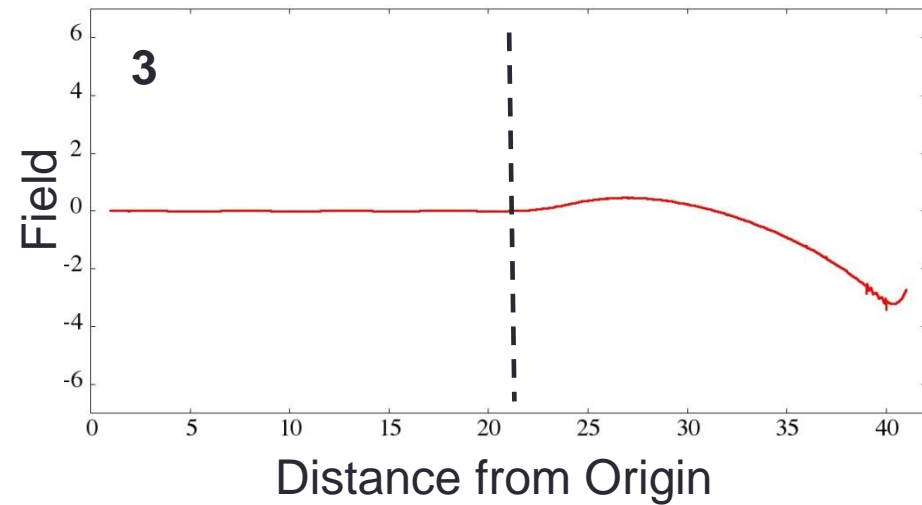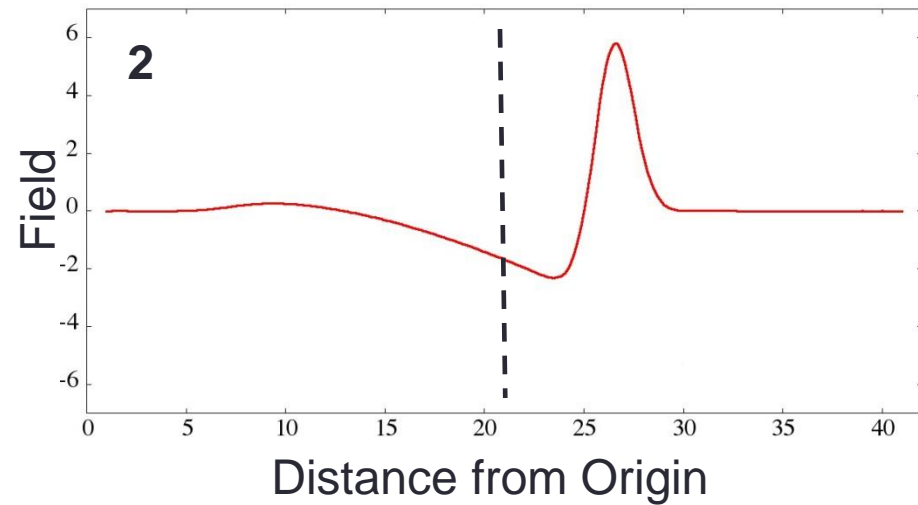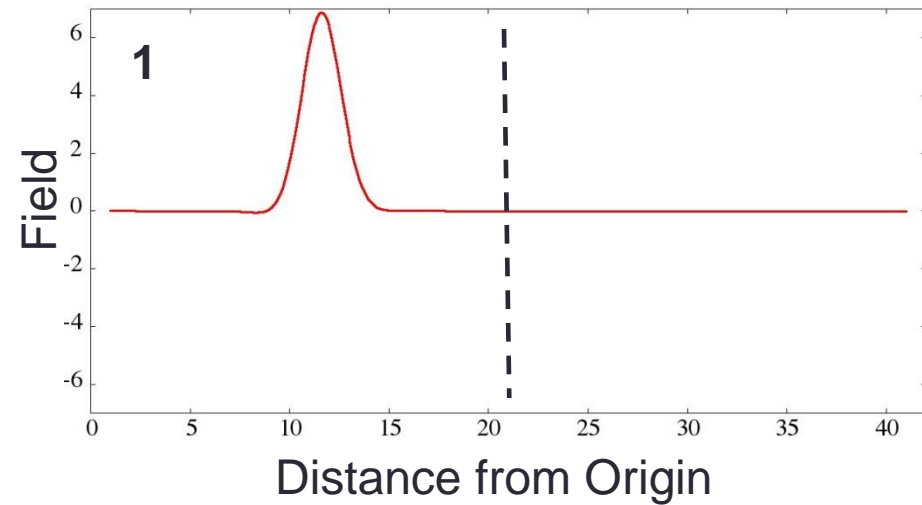**Hyperboloidal Slicing**

Spatial
Region

Space-time
Compactification

Interface

Infinity

1D Scalar Field Evolution

Future Work

- Further test and evaluate outer boundary conditions to remove observed instabilities.

- Implement transition from Schwarzschild metric to hyperboloidal slicing.

- Apply coordinate transformation method in extreme mass ratio BH simulations in order to **reduce computation time**.

References & Acknowledgements

- Bernuzzi Sebastiano, et al. *Binary black hole coalescence in the large-mass-ratio limit: the hyperboloidal layer method and waveforms at null infinity*. Phys. Rev. D. 12 Oct. 2011.