

My current research focus on theoretical astrophysics for black holes, including accretion and jet formation around black holes, black hole shadow images, and comparisons between theoretical observable features and observation.

Techniques used in study

General Relativistic Magnetohydrodynamics (GRMHD)

General Relativistic Radiative Transfer (GRRT)

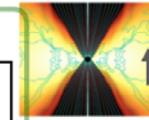
Theory :

Black Hole

Accretion flow/ Jet

black hole spin/ spacetime structure
flow velocity
spatial/energy distribution of electrons
magnetic configuration
electron heating/cooling

GRMHD



GRMHD model of black hole accretion/jet

black hole spin direction

Other Observables

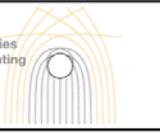
spectra
light curves
jet width etc.

Modelled Observables

Ray-Tracing

null geodesic

photon trajectories around a non-rotating black hole



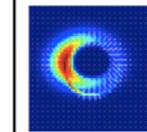
Radiation Transfer

emission/ absorption/ polarization
light-crossing time correction
energy shift

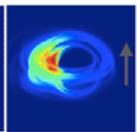
GRRT

Modelled image

Phenomenological model + Polarized GRRT



GRMHD numerical simulation + Unpolarized GRRT



black hole spin directions

Modelled Visibility

compare model with EHT observations

Observation :

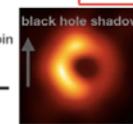
VLBI observation

array configuration
instrument (antenna gain, polarization leakage etc.)
observational duration
weather

Observed Visibility

Data Analysis

calibration



Theoretical interpretations

Image

(First result of Event Horizon Telescope Collaboration)

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Ministry of Education

National Taiwan Normal University



Publications

- H.-Y. Pu, Takahashi, M. Properties of Trans-fast Magnetosonic Jets in Black Hole Magnetospheres. The Astrophysical Journal, 892, 1, 2020.
- Event Horizon Telescope Collaboration et al. First M87 Event Horizon Telescope Results. V. Physical Origin of the Asymmetric Ring. The Astrophysical Journal Letters, 875:L5, 2019.
- H.-Y. Pu and A. E. Broderick. Probing the Innermost Accretion Flow Geometry of Sgr A* with Event Horizon Telescope. The Astrophysical Journal, 863:148, 2018.

