

Numerical methods in general relativity

Károly Zoltán Csukás

Wigner RCP

csukas.karoly@wigner.hun-ren.hu

2025. 11. 26.



Wigner gravitational physics group

Gravitational Physics Research Group

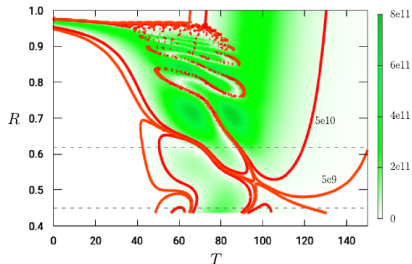
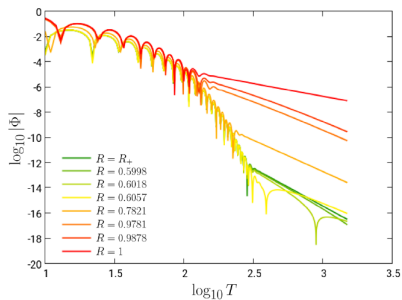
	Gergely Árpád László project leader physicist, D.Sc., scientific advisor, professor	+36 1 392 2729 Ext. 2729	gergely.laszlo@wigner.hun-ren.hu
	Barta Dániel physicist, Ph.D., research fellow	+36 1 392 2729 Ext. 2729	barta.daniel@wigner.hun-ren.hu
	Csukás Károly Zoltán physicist, Ph.D., research fellow	+36 1 392 2222 Ext. 1939	csukas.karoly@wigner.hun-ren.hu
	Kacskovics Balázs physicist, Ph.D student, junior research fellow	+36 1 392 2729 Ext. 2729	kacskovics.balazs@wigner.hun-ren.hu
	Kovács Róbert technical engineer, Ph.D., research fellow	+36 1 392 2222 Ext. 1156	kovacs.robert@wigner.hun-ren.hu
	Rácz István physicist, D.Sc., research professor, honorary professor	+36 1 392 2222 Ext. 3694	racz.istvan@wigner.hun-ren.hu

Research topics

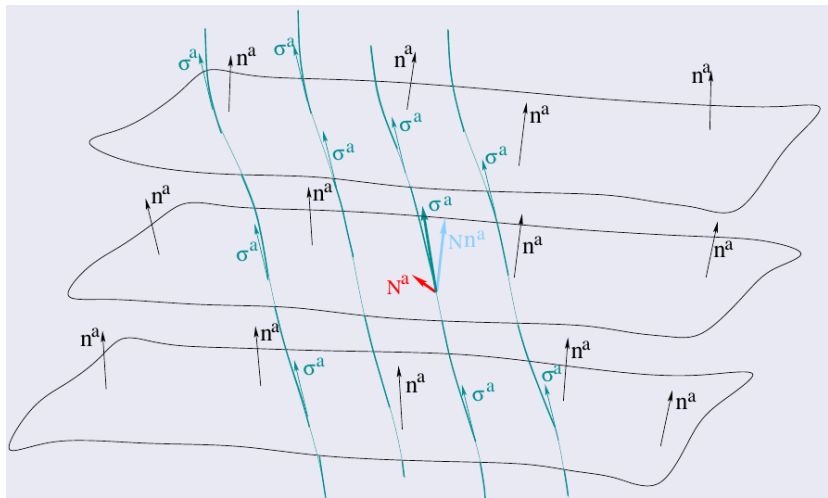
- black hole perturbation theory
- gravitational constraint equations and initial data
- waveform modeling

Black hole perturbation theory

$$[(\nabla^a + s\Gamma^a)(\nabla_a + s\Gamma_a) - 4s^2\Psi_2]\psi^{(s)} = \mathcal{S}$$



Constraint equations

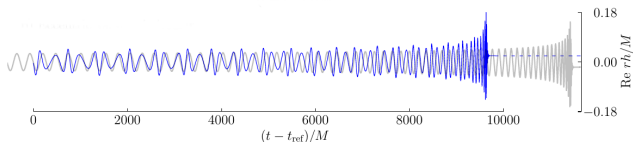
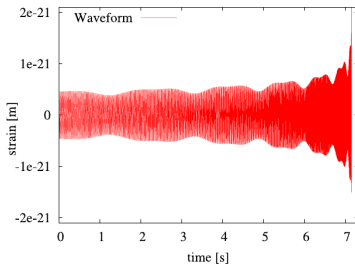


Waveform modeling



SIMULATING EXTREME SPACETIMES

Black holes, neutron stars, and beyond...



Károly Zoltán Csukás

csukas.karoly@wigner.hun-ren.hu