Institute of Theoretical Physics

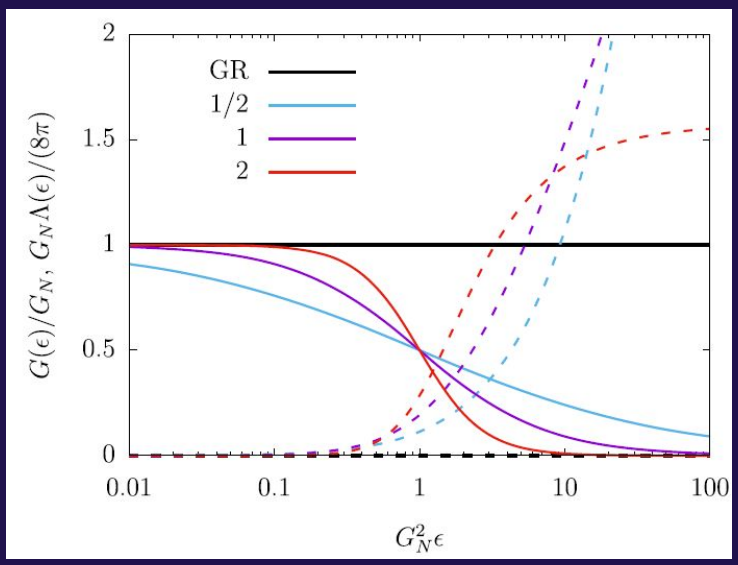
[Astrophysics] Tomohiro Harada

General Relativity and Its Applications

I would like to conduct research that explores the mysteries of modern physics based on general relativity, the theory of gravity proposed by Einstein. My interests cover a wide range of topics, including black holes, the early Universe, spacetime singularities, gravitational waves, and numerical relativity. Over the past decade, I have mainly focused on primordial black holes formed in the early Universe. More recently, I have also been tackling new problems, such as the resolution of singularities and the formation of regular black holes in asymptotically safe gravity theories incorporating quantum gravitational effects.

Recent refereed papers

1. K. Uehara, A. Escriv`a, T. Harada, D. Saito and C.-M. Yoo, “Primordial black hole formation from a type II perturbation in the absence and presence of pressure,” [arXiv:2505.00366 [gr-qc]], accepted for publication in JCAP.
2. T. Suzuki, T. Igata, K. Kohri and T. Harada, “General relativistic effects on photon spectrum emitted from dark matter halos around primordial black holes,” PRD 112 (2025) 023501 [arXiv:2504.00449 [hep-ph]].
3. T. Harada, C.-M. Chen and R. Mandal, “Singularity resolution and regular black hole formation in gravitational collapse in asymptotically safe gravity,” PRD 111 (2025) 126017 [arXiv:2502.16787 [gr-qc]].



Energy-density dependence of the effective gravitational constant (solid lines) and the effective cosmological constant (dashed lines) in asymptotically safe gravity. The qualitative behaviour changes depending on the value of the parameter (\alpha) = 1/2, 1, and 2. (Harada, Chen, Mandal, PRD111, 126017 (2025))

Recent publications

C. Byrnes, G. Franciolini, T. Harada, P. Pani, M. Sasaki (eds.) “Primordial Black Holes” (Springer-Nature)
原田知広、田中真樹（監修）「ニュートン科学の学校シリーズ　時間の学校」（ニュートンプレス）
原田 知広, 匠 英一（監修）「世界でいちばん素敵な時間の教室」（三才ブックス）
北本俊二・原田知広・亀田真吾「宇宙まるごとQ&A: はやぶさ2からブラックホールまで」（理工図書）
原田知広 著、川本梨恵 作画、ユニバーサル・パブリッシング制作「マンガでわかる熱力学」、(オーム社)