Investigating strong gravitational lensing with black hole metrics modified with an additional term.

Summary: Gravitational lensing is one of the most impressive celestial phenomena, which has interesting behaviors in its strong field limit. Near such limit, Bozza finds that the deflection angle of light is well-approximated by a logarithmic term and a constant term. In this way he explicitly derived the analytic expressions of deflection angles for a few types of black holes. In this paper, we study the explicit calculation to two new types of metrics in the strong field limit: (i) the Schwarzschild metric extended with an additional $r^{-n}$ ($n \geq 3$) term in the metric function; (ii) the Reissner-Nordstrom metric extended with an additional $r^{-6}$ term in the metric function. With such types of metrics, Bozza’s original way of choosing integration variables may lead to technical difficulties in explicitly expressing the deflection angles, and we use a slightly modified version of Bozza’s method to circumvent the problem.

MSC:
81-XX Quantum theory
83-XX Relativity and gravitational theory

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References:
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