Fractal Structures on the Deflection of Light by Two Black Holes

Edson E. S. Filho[1*], Amanda C. Mathias[2], Ricardo L. Viana[3]

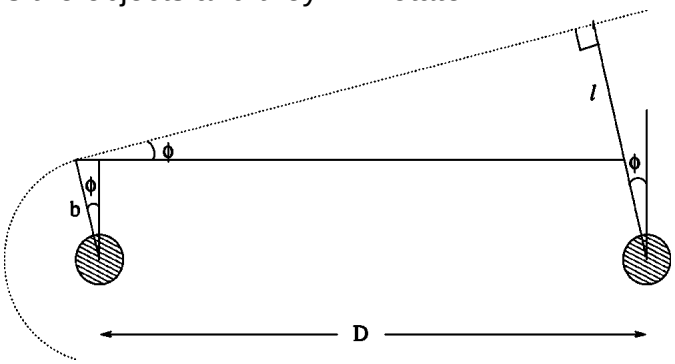
[123]Universidade Federal do Paraná, *e-mail: eesouza@fisica.ufpr.br

1st Perspectives on Oscillation Control

Introduction

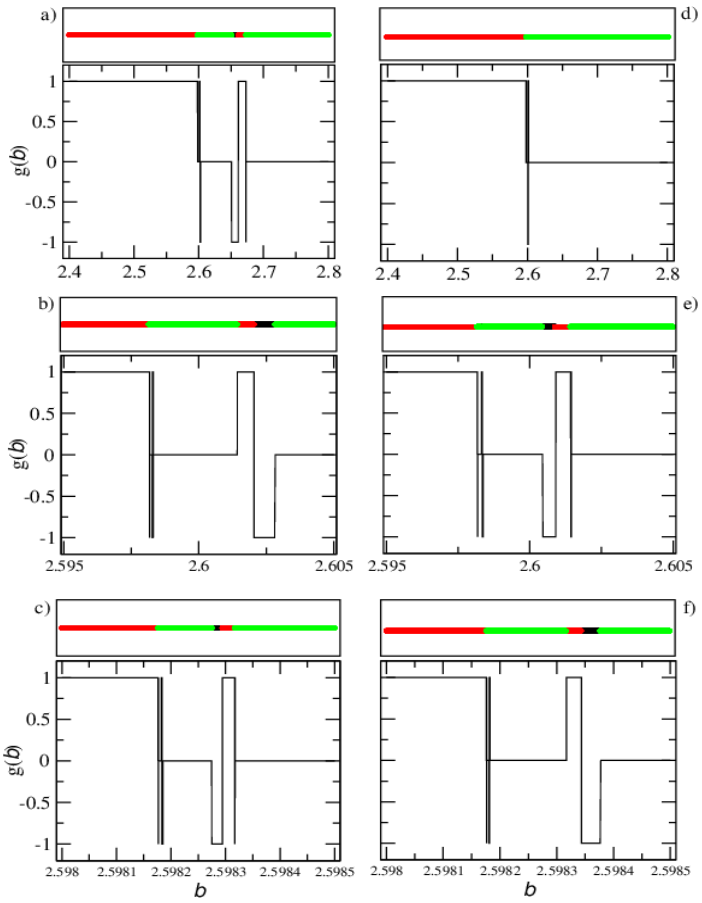
focus of our research is the study of the motion of the light in gravitational field of two non-rotational Schwarzschild/Reissner-Nordstrom black holes. In general relativity the description of a binary system of purely gravitational objects are non stationary, gravity pulls the objects and they will rotate.

As we know from recent discoveries, the real system will spiral around each other, emitting gravitational waves, what making it even more difficult to analyse.So even though this model is difficult we decided to investigate it on an idealized model of strong field black holes.



Results and Discussions

Starting with charge Q=0 we iterate the map obtaining the portrait of the escape basin for Φ_0=0 and Φ_0=π, following we do a magnification on the areas we expect to be fractal, where we defined 3 exits, 1 (red) fall into one black hole, 0 (green) escape to infinity and -1 (black) falls into the other black hole.



To overcome the fact that there is no static solution, we consider the case where the two black holes are so far apart.
we can approximate the motion of the test particles in the neighborhood of one of the mass as being the result of the field of that mass alone, and disregard the other black holes.

Conclusions/Remarks

We see in this work that the movement of light rays around the proposed system of two black holes far apart as one don't have influence over the other, as the equation of motion for each black hole can be solved analytically, we reduce the test to a two-dimensional map. Numerical integration of this map showed a fractal basin boundary,

References

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