

# Modeled of Images of Sgr A\* with Relativistic Equations

Leticia Corral Bustamante

February 2, 2019

Tecnológico Nacional de México, Av. Tecnológico 137, Cuauhtémoc,  
Chihuahua, México

## Abstract

The search for the image of the shadow of the Milky Way's central black hole, Sagittarius A\* or Sgr A\*, by the Event Horizon Telescope (EHT) using the Very Long Baseline Interferometry (VLBI) technique, is a great find and it has turned out to be one of the biggest challenges radio astronomers face today. To this date, in which the database obtained by the EHT is analyzed, astronomers have predicted the possible forms of Sgr A\*, such as the circular shape predicted by Einstein's Theory of General Relativity (RG), the cardioid form and Pascal limaçon, among others. In this work, the possible form of Sgr A\* is modeled by RG equations through cardioidcylindrical coords, and, from the proposed metric, some possible forms were simulated: cardioid, circular, Pascal limaçon (the edge-on image shadow) and any conceivable mathematical forms through asymmetric contour plots, similar to those obtained by other authors, with the aim of contributing to the state of the art of modeling and simulation of astrophysical objects existing in our universe. Moreover, calculations of geometric and thermo-physical properties of Sgr A\* were made, assuming that it is a rotating black hole. The calculation of mass, temperature and evaporation time of Sgr A\*, allows us to verify, like other authors, the Hawking effect prevailing for this type of black holes.

1. Broderick, A. E., Johannsen, T., Loeb, A. and Psaltis, D. (2014). Testing the No-Hair Theorem with Event Horizon Telescope Observations of Sagittarius A\*. *ApJ*, 784:7, 1-14.
2. Chan, Ch-K., Psaltis, P., Ozel, F., Narayan, R., and Sadowski, A. (2015). The Power of Imaging: Constraining The Plasma Properties of Grmhd Simulations Using EHT Observations of Sgr A\*. *ApJ*, 799(1).
3. Psaltis, D., Naraya, R., Fish, V. L., Broderick, A. E., Loeb, A. and Doelman, S. S. (2015). Event Horizon Telescope Evidence for Alignment of the Black Hole in the Center of the Milky Way with the Inner Stellar Disk. *ApJ*, 798, 15.