Rueda Hernández Jorge Armando

Position: PhD Student-University of Rome “La Sapienza”

Period covered: 2006-2009

I Scientific Work

- Neutron star physics: the electrodynamical properties of neutron stars are studied by formulating self-consistently the equations of equilibrium governing neutron star interiors along with the correct formulation of the boundary conditions of the configuration, all duly expressed in general relativity.

- Nuclear physics: we study the properties of nuclear matter under extreme conditions of compression through the solution of the relativistic Thomas-Fermi equations of equilibrium. In particular, we analyze the charge to mass ratio relation of beta-equilibrated compressed nuclear matter. We address also the application of our approach to the equations of equilibrium of neutron stars as well as to the equilibrium equations governing quark stars.

- Critical fields in massive nuclear density cores: exploiting the scaling laws of the ultra-relativistic Thomas-Fermi equation we extrapolate the treatment of compressed nuclear matter to what we have called massive nuclear density cores. These massive cores are objects at nuclear density with a number of baryons of the order of 10^{57} and are composed by electrons, protons, and neutrons in beta equilibrium and are globally neutral. One of the most exciting properties of these cores is that, on their surface, strong electric fields of the order of the critical field for vacuum polarization of Sauter-Heisenberg-Euler-Schwinger are developed.

- Vacuum polarization processes: the effect of overcritical fields on the geometric and energetic properties of Reissner-Nordstrom and Kerr-Newmann black holes is studied.

II Conferences and educational activities

Conferences and Other External Scientific Work

- 11th Italian-Korean Symposium on Relativistic Astrophysics, Seoul (Korea), November 2-4, 2009

- 1st Galileo-Xu Guangqi Meeting, Shanghai (China), October 26-30, 2009

- 12th Marcel Grossmann Meeting On General Relativity, Paris (France), July 12-18, 2009

- 6th Italian-Sino Workshop on Relativistic Astrophysics, Pescara (Italy), June 29-July 1, 2009

- 1st Sobral Meeting, Fortaleza (Brazil), May 26-29, 2009
- 3rd Stueckelberg Workshop on Relativistic Field Theories, Pescara (Italy), July 8 - 18, 2008
- April Meeting of the American Physical Society, St. Louis (Missouri - USA), April 12-15, 2008
- 4th Italian-Sino Workshop on Relativistic Astrophysics, Pescara (Italy), July 20 - 30, 2007
- 10th Italian-Korean Symposium on Relativistic Astrophysics, Pescara (Italy), June 25 - 30, 2007
- 1st Cesare Lattes Meeting on Gamma Ray Bursts, Black Holes and Supernovae, Mangaratiba (Brazil), February 25 - March 3, 2007

2009 List of Publications

The role of the gravitational, electromagnetic, weak, and strong interactions in neutron star interiors within a non--linear sigma model, Hagen Kleinert, Jorge A. Rueda, Remo Ruffini, and She-Sheng Xue. In preparation.

The effect of critical fields on the properties of electromagnetic black holes in the Euler--Heisenberg approach, Jorge A. Rueda, Remo Ruffini, and She-Sheng Xue. In preparation.

On the self--consistent general relativistic equilibrium equations of neutron stars, Jorge A. Rueda, Remo Ruffini, and She-Sheng Xue. Submitted to Phys. Rev Lett.

On the self--consistent equilibrium equations of neutron stars, Jorge A. Rueda, Remo Ruffini, and She-Sheng Xue. Submitted to Phys. Rev D.

On the relativistic treatment of compressed atoms and compressed massive nuclear density cores, Michael Rotondo, Jorge A. Rueda, Remo Ruffini, and She-Sheng Xue. Submitted to Phys. Rev D.

e^---e^+ pair creation by vacuum polarization around electromagnetic black holes, C.Cherubini, A. Geralico, J. A. Rueda H. and R. Ruffini, Phys. Rev. D 79, 124002 (2009).