

## Patricelli Barbara



Position: Phd Student

Period covered: 2007 - 2009

### I Scientific Work

- ✓ **Neutron Cores and Heavy Nuclei:** The relation between the total number of protons  $N_p$  and the mass number  $A$  of nuclei and neutron cores with a Thomas-Fermi approach is studied. In particular, with this model a relation between these two quantities for  $A$  ranging from the typical values of nuclei, that are well reproduced, to the ones of Neutron Stars is obtained. The effects of the penetration of electrons into the core by increasing  $A$  are also studied.
- ✓ **Critical Fields in Massive Cores:** The existence of electric fields of the order of the critical field of Sauter-Heisenberg-Euler-Schwinger for electron-positron pair production in massive cores with the Thomas-Fermi model is studied. We are extending the treatment to the General Relativistic case.
- ✓ **Neutron Star Crust:** The characteristics of the Crust of Neutron Stars is studied; in particular, by using a general relativistic treatment is calculated the mass of the thickness of this physical region for different sets of initial conditions, finding that in general the Crust is smaller in mass and in radial extension for more compact stars. It is also investigated a possible correlation between the properties of the Crust of Neutron Stars and Gamma Ray Burst within the Fireshell Model.
- ✓ **Gamma Ray Bursts:** It is studied a particular gamma ray source, GRB080319B. In particular, are analyzed the light curve and the spectrum of this source and the data are interpreted within the Fireshell Model.

### II Conferences and educational activities

#### Conferences and Other External Scientific Work

- ✓ First Cesare Lattes Meeting on Gamma Ray Bursts, Black Holes and Supernovae, Mangaratiba (Brazil), February 25 - March 3, 2007
- ✓ Tenth Italian-Korean Symposium on Relativistic Astrophysics, Pescara (Italy), June 25 - 30, 2007
- ✓ Fourth Italian-Sino Workshop on Relativistic Astrophysics, Pescara (Italy), July 20 - 30, 2007

- ✓ National School of Astrophysics, ninth cycle, second course, Isola di San Servolo - Venezia (Italy), September 16 - 22, 2007
- ✓ April Meeting of the American Physical Society, St. Louis (Missouri - USA), April 12-15, 2008
- ✓ Fifth Italian-Sino Workshop on Relativistic Astrophysics, Taipei-Hualien (Taiwan), May 28 - June 1, 2008
- ✓ Third Stueckelberg Workshop on Relativistic Field Theories, Pescara (Italy), July 8 - 18, 2008
- ✓ XIII Brazilian School of Cosmology and Gravitation, Rio de Janeiro (Brazil), July 20 - August 2, 2008.
- ✓ Probing stellar populations out to the distant universe, Cefalù (Italy), September 7 - 19, 2008

### III 2007-2008 List of Publications

Patricelli, M. Rotondo, R. Ruffini, "On the charge to mass ratio of neutron cores and heavy nuclei", 4th Italian-Sino Workshop. AIP Conference Proceedings, Vol. 966, pp. 143-146 (2008).

Patricelli, M. Rotondo, J. A. Rueda H., R. Ruffini, "The Electrodynamics of the Core and the Crust components in Neutron Stars", AIP Conference Proceedings, Vol. 1059, pp. 68-71 (2008)

R. Ruffini et al, "On Gamma Ray Bursts", to appear on the Proceedings of the Eleventh Marcel Grossmann Meeting, Berlin (Germany), July 2006.