# Pizzi Marco

Position: Ph. D. Student (IRAP Ph.D., IV Cycle)

Period covered: 1 November 2005- present

## I Scientific Work

The main results of my three IRAP PhD. years have been summarized in the thesis "A sequence of four works on exact solutions of the Einstein-Maxwell equations", which I will dicuss in a date that has to be estabished. My supervisor is prof. V. Belinski.

The thesis is divided into four chapters, which are based on a sequence of four independent works. Each of them makes use of an exact solution of the Einstein-Maxwell equations; they are concatenated in a logical way.

The first chapter is devoted to a special 2-soliton solution, constructed by a Schwarzschild metric "dressed" with a Kerr-Newman soliton. We drowned the electric force lines, and a special configuration is considered with a negligible conical singularity.

The second chapter is dedicated to the analysis of the Alekseev-Belinski solution, which is again a special case of a 2-soliton solution. We considered the different equilibrium configurations, stressing the presence of non-Newtonian cases: also two opposite-signed charges can be in equilibrium, due to the repulsive nature of the naked singularity.

The third chapter is devoted to construct a membrane-model of naked singularity which avoids the center-infinity source and allows an external region with "repulsive-gravity". We found that a radially-stable configuration with a radius smaller than $Q^2/M$ is indeed possible. This give a more sensible physical meaning also to the Alekseev-Belinski solution.

Using the same technique of the previous work, in the last chapter we consider the motion, and in particular the intersection, of charged shells. This is a generalization of an article by Barkov-Belinski-Bisnovatji-Kogan to the electric case. We found that the ejection mechanism can be magnified in presence of charges.

## II Conferences and educational activities

### Conferences and Other External Scientific Work

- Geometria Riemanniana, Marchiafava
- Onde non lineari e solitoni, A. Degasperis

- Teorie di Gauge, L. Maiani

- Lectures on General Relativity by Prof. Christodoulou (ETH, Zurich, Switzerland)

- Motion, Radiation and Timing of Compact Binaries by Prof. Damour (IHES, Bures-sur-Yvette, France)
- The Reference Frame: from Earth to CMB by Prof. Mignard (Observatoire de la Côte d'Azur, France) and Dr. Klioner (Lohrmann Observatory, Dresden, Germany)
- The Binary Pulsars: Theory and Observations by Prof. Kramer (Jodrell Bank Observatory, Manchester, United Kingdom)

- Teoria dei campi, M. Testa , University of Rome "La Sapienza"

- 1 month in Paris for the school: Gravitational Wawes, Relativistic Astrophysics and Cosmology, 1 November-4 December; organizer T. Damour, N. DeRuelle
- I Cesare Lattes Meeting on GRBs, Black Holes and Neutron Stars, Rio de Janeiro, February 25-3March 2007
- 10th Italian-Korean Symposium on Relativistic Astrophysics, June 25 - 30 2007, Pescara
- 4th Italian-Sino Workshop on Relativistic Astrophysics, July 20 - 30 2007, Pescara, Italy
- II Stueckelberg Workshop, 3-8 September, Pescara
- APS april meeting, St. Louis, Missouri (USA)
- III Stueckelberg Workshop, 8-19 July, Pescara
- Lectures delivered by prof. t'Hooft in Pescara.

Talk and Poster-sections delivered:

- "A peculiar 2-soliton solution", talk delivered at Uviversity of Rome "La Sapienza", Physics Department.

- "The fields of a naked singularity and black hole in mutual equilibrium " at the 4th Italian-Sino Workshop

- "Electric force lines of the double Reissner-Nordstrom solution" at the II Stueckelberg Workshop

- "Electric force lines and Stability in the Alekseev-Belinski solution" Talk delivered at the III Stueckelberg Workshop

- "Electric force lines in the Alekseev-Belinski solution " Poster-Section at the APS april meeting, St. Louis, Missouri (USA).

## III 2007-2008 List of Publications

1. M. Pizzi, "Gravitational field and electric force lines of a new 2-soliton solution", International Journal Of Modern Physics D, Vol.16, No. 6 (2007) 1087-1108.

2. M. Pizzi, "Electrical force lines of a 2-soliton solution of the Einstein-Maxwell Equations", proceeding of the XI MGM, in press.

3. M. Pizzi, A. Paolino, "Equilibrium configurartions in the double Reissner-Nordstrom exact solution", International Journal of Modern Physics A.,Vol. 23, No. 8 (30 March 2008).

4. A. Paolino, M. Pizzi, "The fields of a naked singularity and a black hole in mutual equilibrium", AIP Conf. Proc.966, pagg. 272-279, 2008.

5. A. Paolino, M. Pizzi, "Electric Force Lines of the double Reissner-Nordstrom exact solution", International Journal Of Modern Physics D, Vol.17, No.8, pagg.1159–1177, 2008.

6. V. Belinski, M. Pizzi, A. Paolino, "Charged membrane as a source for repulsive gravity", accepted for pub. by IJMPD.

7. V. Belinski, M. Pizzi, A. Paolino, "A membrane model of the Reissner-Nordstrom singularity with repulsive gravity", proceeding of III Stueckelberg Workshop.

8. M.Pizzi, A. Paolino, "Intersections of self-gravitating charged shells in a Reissner-Nordstrom field" submitted to IJMPD.