Universitat de les
Illes Balears

UIB Relativity Group's proposal for joining the LSC

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UIB
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The University

http://www.uib.es

Founded in 1978 (with democracy in Spain).

Main Campus: Cra.Valldemossa of 99 ha, 7km from the sea.

Composed of 17 Departments. Offers more than 40 degrees.

Faculty of 895 + staff of 396.

Hosts several research centers + laboratories.

Over 14.000 students. ~ 400 graduate students.

It is a modern university with many facilities.

PHYSICS DEPARTMENT

Part of the "Facultat de Ciencies".

Faculty of 35. *"Asociados"* ~17.
Visitors ~20/year.
Post-docs + graduate students ~ 46.

Research Groups (#faculty):

- General Relativity & Gravitation (6)
- Solar Physics (3)
- Atomic Molecular & Nuclear (4)
- Non-linear Science (3)
- Photonics (3)
- Applied Physics (5)
- Electronic Technology (5)
- Meteorology (3)
- Physical Oceanography (3)

IMEDEA: center of inter-disciplinary research.

Grup de Relativitat i Gravitació de la UIB

The UIB Relativity Group

- **Faculty:**

  Carles Bona García, Jaume Carot Giner, Lluís Mas Franch *(Head of the Physics Department),* **Joan Massó Bennasar** *(part-time),* **Alicia M. Sintes Olives, Joan Stela Fiol.**

- **Post Docs:**

  Tomas Ledvinka, Miroslav Zacek.

- **Graduate Students:**

  Carlos Palenzuela, Magdalena Collinge, Manuel Luna.

Main Reseach Topics:

- **Numerical Relativity: Black Hole Simulation**
- **Relativistic Cosmology: Inhomogeneous Solutions**
- **Gravitational Radiation**

Resources

- **Hardware directly available to the group:**
  - **Group's mini-cluster: 8 dual processor Pentium II at 400 MHz, 512 MB each.**
  - **"SCI" IBM beowulf cluster: 16 nodes, 32 processors Pentium III at 800 MHz, 5 GB.**
  - **Several PCs.**
  - **Central University facilities (including VMS cluster).**
  - **New Linux boxes to be acquired soon.**
- **Software:**
  - **Matlab, Mathematica, Maple, IDL, NAG…**
  - **LAL and related software…**

Latest Research Grants

• "Radiación Gravitatoria en Sistemas Relativistas Axialmente Simétricos: un estudio analítico-numérico" DGICYT (Dirección General de Investigación Científica y Técnica) BFM2001-0988. Principal investigator: Jaume Carot.

• "Theoretical Foundations of Sources for Gravitational Wave Astronomy of the Next Century: Synergy between Supercomputer Simulations and Approximation Techniques" European Commission on Research Directorates ref. HPRN-CT-2000-00137. Principal Investigator: Ed Seidel (at UIB: Carles Bona)

• "Métodos Analítico-Numéricos en Relatividad Computacional" DGICYT PB97-0134. Principal Investigator: Carles Bona.

• "Symmetries in General Relativity and their application to physical problems" NATO Cooperative Research Grant-MA05 RF042. Principal Investigator: G.S. Hall (at UIB: Jaume Carot).

GEO 600 & LSC past related work

Sintes joined the AEI in Jan'97 and has been involved in GEO & LSC activities:

Participated in the LSC working groups:

- Astrophysical Source Identification and Signatures (ASIS).
- Detector Characterization.
- Continuous Waves Upper Limit Group

Contributed software to the LAL library. --Packages :

- clremoval/ removal of coherent line interference, e.g. power harmonics
- houghpulsar/ routines for the Hough incoherent pulsar search
- vectorops/

Coordinated the activities of the GEO Detector Characterization Group since Sep'00
(served as a meeting organizer, webmaster and took shifts during E7 at the GEO site)
http://www.aei-potsdam.mpg.de/~sintes/GEO_DC /

Analysed data [from GEO: Sep. 29, 2001; Oct. 15-18, 2001; Nov.-Dec. 2001; E7] and was involved in the study of "Narrow Resonances in the E2 Data"

Numerical Relativity effort at UIB

- CACTUS Development:

  Refinement of evolution methods and formulation of equations.

  Development of appropriate gauge conditions for stable numerical evolutions.

- Vacuum Black Hole Evolutions:

  Continuing studies of 3D, grazing black hole mergers and extraction of waveforms and other physics; comparison with perturbation theory.

LIGO related Current and Future Work

- **Detector characterization:**
  - Sintes will continue leading the GEO-DC effort and serve as liaison between GEO and LIGO/LSC on DC matters.
  - She is interested in the problem of finding an efficient and robust method for monitoring line noise and building a line database for GEO (+ AEI & Cardiff).
- **Hough hierarchal pulsar search algorithm:**
  - Participate in the development, tuning & test of the full hierarchical algorithm, working closely with M.A. Papa and her group at AEI.
  - Deliver extra LAL modules as needs arise.
  - Use of E7 & S1 data as playground data.
- **Get involved in grid computing with LIGO data using the pulsar code.**
- **Participate in the activities of the Periodic Sources Upper Limit Group.**
- **Participate in the upcoming science runs: sign up for shifts at the GEO site.**
- **Theoretical studies on detection and parameter estimation of gravitational waves from compact binary systems.**
- **Axially symmetric source analysis.**
- **Numerical relativity**