Universitat de les Illes Balears AC3 Institute of Applied Computing & Community Code.

UIB

Alicia M. Sintes Olives ET-Spain Meeting (8th October 2021) CSIC Central Building in Madrid

The UIB Gravitational Physics Group is part of the LIGO Scientific Collaboration, GEO, LISA and ET.

Alicia Sintes founding member of the LSC in 1997 – Astrophysical source identification and signatures (ASIS) working group.

- 2001-2004: chair of GEO detector characterization working group"
- 2007-2010: co-chair LISA Parameter Estimation Taskforce 2016-2018: co-chair of the LIGO-Virgo CW data analysis 2019-:member of the LIGO Science Program Committee

- We focus on gravitational wave searches from binary black holes and neutron stars and the computational modeling needed to identify those sources.
- Data and detector characterization.

How do we identify the sources?



Sascha Husa leads phenomenological waveform program to develop computationally efficient models – used to identify sources for all events detected to date.



Sascha Husa and CBC@UIB pioneered the use of supercomputers for fast parameter estimation – among top users of MareNostrum4 @BSC-CNS

UIB group activities

- CBC waveform development IMRPhenom
 - Parameter estimation of special events; fast PE for LVK.
 - Lead LISA work package on efficient waveform models
 - **Numerical Relativity** for BBH largest catalog of eccentric waveforms.
- Leading all-sky CW searchers for spinning neutron starts in isolated and binary systems based on Hough transform.
- Leading long transient searches for BNS merger remnants
- **Lensing** of GWs preparing for first detection.
- **Noise modelling**: Line noise investigation and mitigation
- EPO efforts



LIGO noise studies and mitigation



Einstein Telescope

The Einstein Telescope Consortium is composed of the institutions that signed the Consortium Agreement submitted to ESFRI (European Strategy Forum on Research Infrastructures)

ET Consortium Agreement

Light agreement at this level Signed by 41 institutions Coordinated by INFN and Nikhef

Milestones

ESFRI hearing: April 14, 2021 ESFRI approval: June 30, 2021 https://www.esfri.eu/latest-esfri-news/new-ris-roadmap-2021





Einstein Telescope Design Studies

Conceptual Design Study: <u>https://tds.virgo-gw.eu/?call_file=ET-0106C-10.pdf</u> Design Report Update: <u>https://apps.et-gw.eu/tds/?content=3&r=17245</u>



Einstein Telescope Seismic Explorer in Canfranc (ETSEC)



Tomasz Bulik, Marek Cieślar (University of Warsaw) Tomasz Starecki, Mariusz Suchenek (Warsaw University of Technology) Dorota Rosińska (University of Zielona Góra) Alicia Sintes, Sascha Husa (University of the Balearic Islands) José Antonio Font (University of Valencia) Carlos F. Sopuerta, Institute of Space Sciences (CSIC-IEEC) Review of Scientific Instruments

Site-selection criteria for the Einstein Telescope

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Planned activities for ET

• Contributions to Observational, e-infrastructure and instrumental science boards.

Broad particiaption in OSB: waveforms, common tools, DA platform,

- Fast waveform models and parameter estimation, use of HPC and machine learning to address computational challenges of GW data analysis.
- Tests of GR.
- Toward routine detection of continuous waves and lensing.
- Merger remnants.
- Synergies: multi-messenger, waveforms & lensing, CW & remnants, ...
- ISB: Set up a laboratory for instrumental GW science:
 - Participation in active noise mitigation division.
- EIB: Participation in e-infrastructure board.

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