

Institute of Cosmos Sciences (ICCUB): Capabilities, interests and plans for the Einstein Telescope

Jordi Portell i de Mora
Deputy technical director

Institute of Cosmos Sciences
Universitat de Barcelona

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Background and capabilities

- Institute of the University of Barcelona focused on **physical cosmology**
 - Astrophysics, high-energy physics, **gravitation**, hadronic, nuclear and atomic physics, quantum theories and technologies...
 - Created in 2006, now with ≈ 175 members
 - Yearly: ≈ 10 PhD theses, $\approx 250-300$ publications (mostly in 1st quartile, several high-impact ones), outreach activities...
- **Technology Unit**: Electronics, instrumentation, computing and software engineering
- Fundamental questions on the **Universe**:
 - What are its **origin and fate**?
 - Which are its **ultimate constituents**?
 - Why does it have its **present appearance**?
- Some key projects: LHCb, Gaia, DESI, MAGIC, CTA, Solar Orbiter, LISA, PTA...
- **Joined Virgo in July 2018**
 - Currently 15 members and ≈ 5 FTEs
 - **Science models**: BBH mergers from clusters, boson stars, neutron star physics (EoS, crust), GW lensing
 - **Data analysis**: new templates (e.g. precession, high eccentricity), pipelines, denoising for burst searches
 - **Computing and software engineering**: computing model, software migration, low-latency support, efficient data handling
 - **Instrumentation**: quadrant photodetectors for quantum noise reduction



Interests and plans for ET

- ICCUB interests on ET: natural extension of our participation in Virgo
 - **Science case** being defined.
Items from the ET **Observational Science Board** which are specially interesting for ICCUB scientists: Cosmology, Population (esp. astrophys. origin and primordial BHs), Nuclear Physics (esp. NSs), Waveforms
 - **Data analysis:**
Burst searches, denoising techniques
 - **Computing:**
Contributions to the general computing model and architecture, focusing on efficient data handling
 - **Instrumentation:**
We have capabilities on sensors, low-noise high-speed photodetectors, FPGA programming, ASICs, PCBs...
Depending on our resources, we intend to identify specific tasks where we could contribute
- No specific commitment yet
- Good perspectives of funding for some initial manpower devoted to ET
 - We expect nearly 2 FTEs (science + engineering) starting ≈Q2 2022
 - Exploratory phase to identify specific activities
 - Initial focus on data analysis and computing

Thank you

Jordi Portell (jportell@icc.ub.edu)

on behalf of the ICCUB

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Institut de Ciències del Cosmos
UNIVERSITAT DE BARCELONA

