Einstein Telescope Observational Science Board

Division 2 : Cosmology

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Division 2 : Cosmology

- **Probe early universe physics**
- **Cosmography, Dark Matter, Dark Energy**
- **GW synergy with other cosmological probes**

Division 2 wikipage: https://wiki.et-gw.eu/OSB/Cosmology/WebHome

Division 2: Cosmology

- Monthly telecons (~ 40 attendees)
  typically, the 3rd Wednesday of the month

- Seminars on a wide range of related topics

- Encourage presentations by early-career scientists

Note: We have invited Div2 members to participate to the Blue Book

Division 2: Cosmology

- Vuk Mandic "SGWB and the Snowmass process"
- Giulio Scelfo "Cross-correlation of GWs in cosmology"
- Michele Mancarella "Dark standard sirens with 3G detectors"
- Sumit Kumar "Probing Baryon Acoustic Oscillation peak with GWs"
- Alex Jenkins "Dark Matter microphysics from GW event rates"
- Simone Mastrogiovanni "Cosmic dipole with ET and CE"
- Lorenzo Valbusa Dall'Armi "Circular polarization of astrophysical SGWB"
- Michalis Agathos "SGWB from SNe in massive scalar-tensor gravity"
- Matteo Califano "ΛCDM and dark energy forecasts for ET"
- Konstantin Leyde & Grégoire Pierra "Importance of population models for cosmology inference"
- Kamiel Janssens "Correlated magnetic noise"
- Danny Laghi "Dark siren cosmology with BBH in 3G"
- Giorgio Mentasti "Anisotropic search with ET and ground-based detectors"
- Riccardo Sturani "Cosmology plans from the Brazil "BETS" research unit"
- Juan García-Bellido "Cosmic acceleration from first principles: SMBH growth"
- Sofia Canevarolo "Lensing bias on cosmological parameters from bright standard sirens"

Division 2: Cosmology

XIII ET Symposium at Cagliari

- Charles Badger ”Probing Early Universe Supercooled Phase Transitions with GW Data”
- Debika Chowdhury “Response of the Einstein Telescope to Doppler anisotropies”
- Simone Mastrogiovanni “Detection and estimation of the cosmic dipole with next generation GW detectors”
- Nicola Borghi “Cosmology and astrophysics with dark sirens and galaxy catalogues”
- Mattteo Califano “Forecasts for ΛCDM and Dark Energy models through ET mock data”

We have received ~40 papers focused on Div2 related research

https://wiki.et-gw.eu/OSB/Cosmology/Publications

Blue Book – Division 2

- **Introduction**
- **Gravitational-wave background**
- **Probing the early universe**
- **Probing the late universe**
- **Probing the large-scale-structure of the universe**

~ 40 ET Div2 members involved
~ 60 pages + references

deadline for contributions: 15th May
AG/AR/MS: final editing 15th-30th May 2024

Contents:

- **Introduction** (AG, AR, MS)

- **GWB** (~ 10 people + AG/AR/MS)
  - **Isotropic, unpolarised GWB**
  - **Anisotropic, unpolarised GWB** (*cosmological or astrophysical origin*)
  - **Parity violation** (*cosmological origin or astrophysical due to Poisson fluctuations*)
  - **Source separability**
  - **Impact of noise on GWB** (electromagnetic or seismic phenomena)

- **Probing the early universe** (~ 20 people + AG/AR/MS)
  - **Cosmological inflation** (*vacuum fluctuations, multifield models [axion inflation]*)
  - **Alternatives to inflation**
  - **Topological defects** (*cosmic strings [bursts/GWB], domain walls*)
  - **First order phase transitions**
  - **Stiff equation of state**
  - **Primordial black holes** (*cosmological origin*)
  - **Primordial GWs in modified cosmology**
  - **Dark matter** (*axions, CDM/WDM/IDM*)

- **Probing the late universe** (~ 15 people + AG/AR/MS)
  - **Cosmography** (*bright/dark/spectral/love sirens, galaxy catalogues*)
  - **Modified GW propagation** (*observables for DE sector and ET forecast*)
  - **Cosmological tensions** (*cosmic dipole, sigma_8*)
  - **GW lensing**
  - **Astrophysical GWB as a cosmological probe** (*constrain cosmological parameters with GWB*)

- **Probing the large-scale-structure of the universe** (~ 15 people + AG/AR/MS)
  - **Cross-correlation GWxLSS** (*cross-correlation of resolved events or AGWB*)
  - **Cross-correlation GWxCMB**
  - **Primordial nongaussianity**
  - **Probing large-scale-structure with GWs alone**