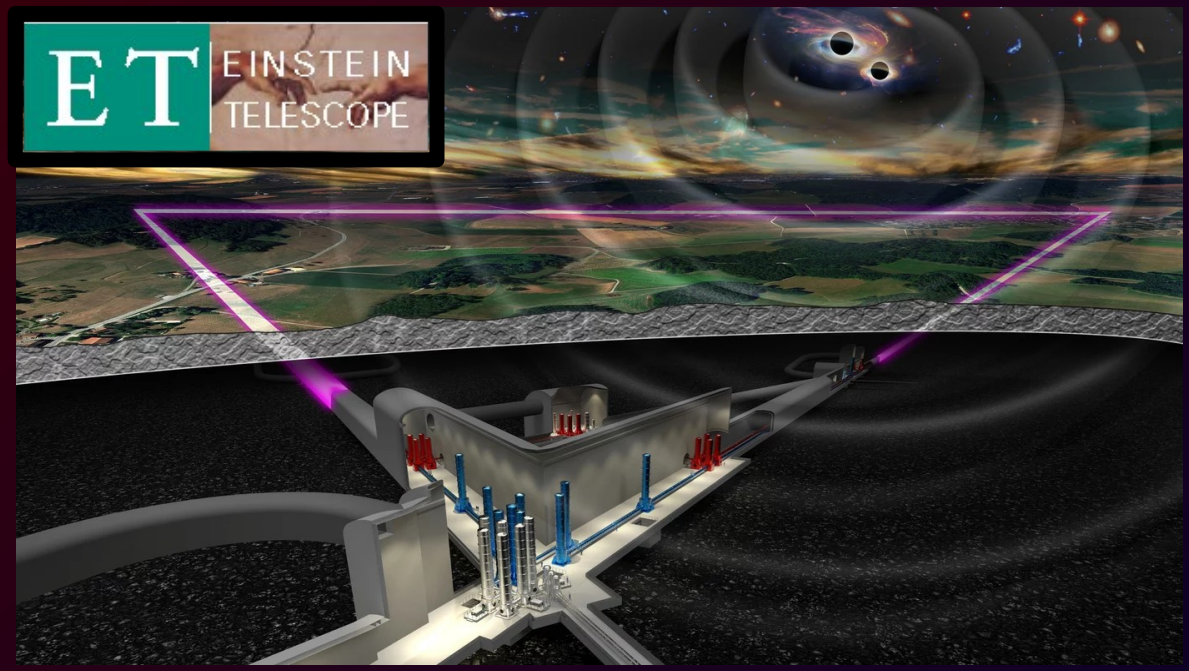
Participation of IPARCOS in the ET project



Jose Luis Blázquez-Salcedo

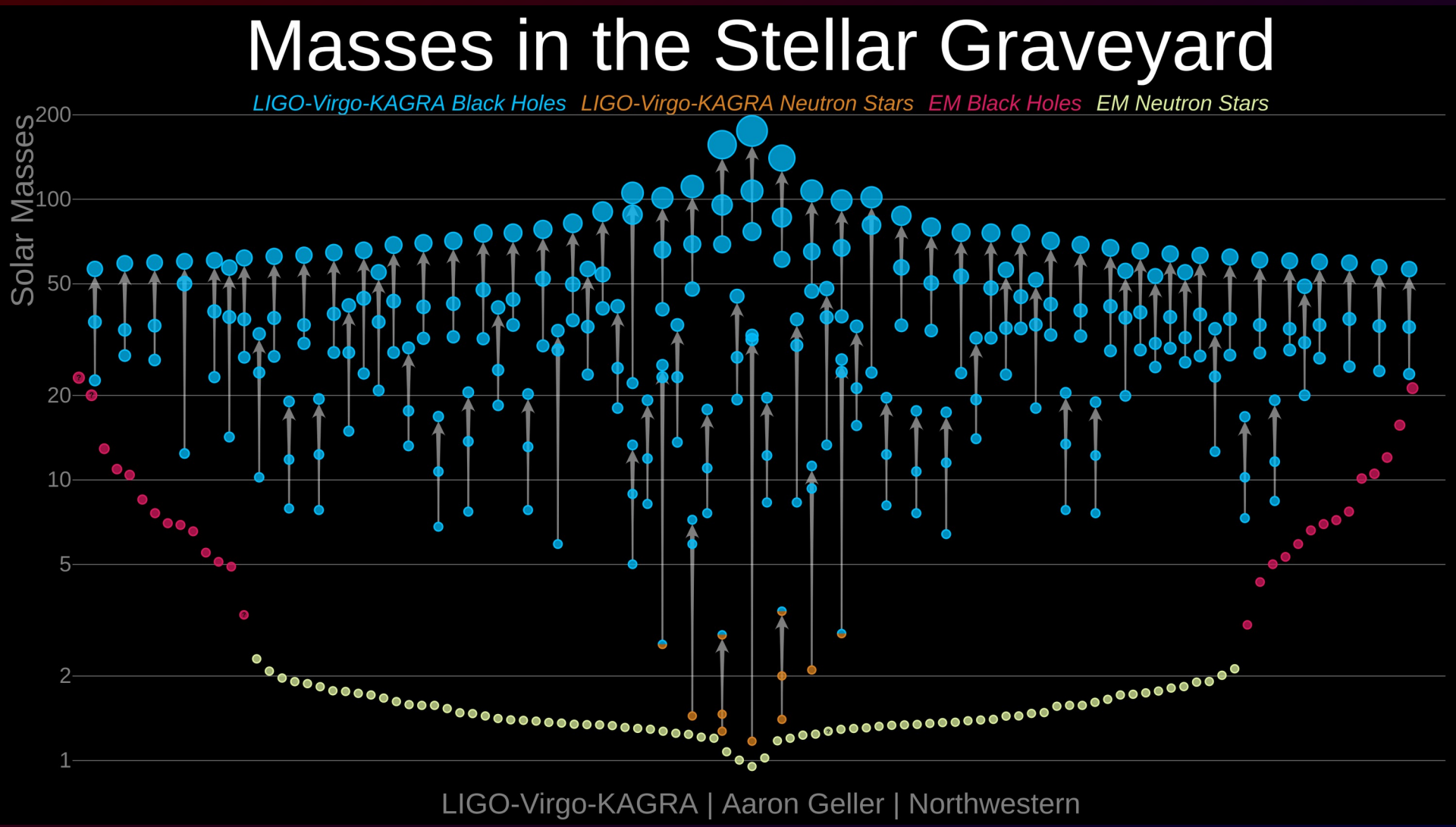
IPARCOS WORKSHOP
Madrid, 16-17 June 2022

Participation of IPARCOS in the ET project

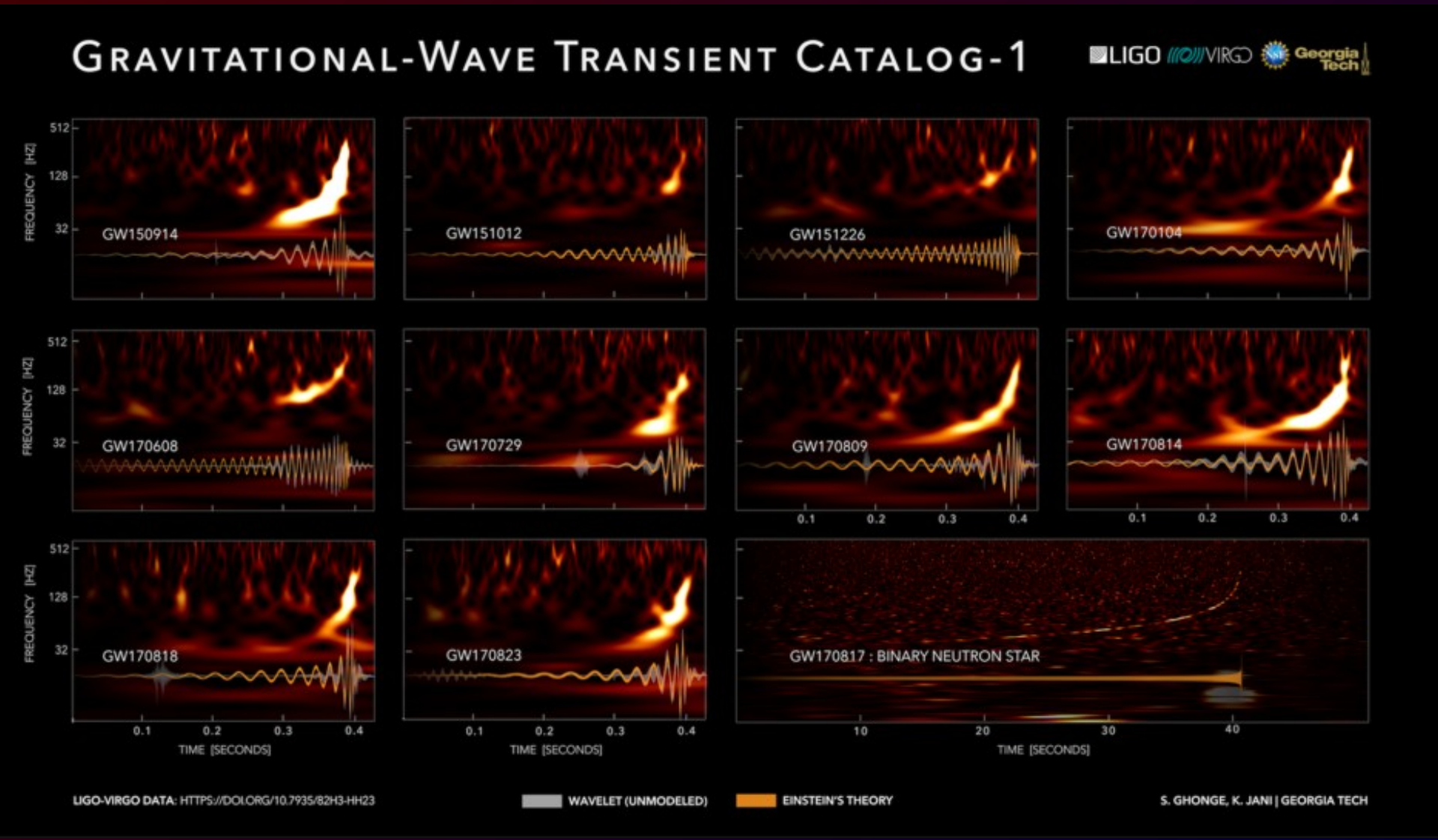
-) The Einstein Telescope

-) Roadmap and the ET collaboration

-) IPARCOS-UCM Research Unit


Masses in the Stellar Graveyard
LIGO-Virgo-KAGRA Black Holes
LIGO-Virgo-KAGRA Neutron Stars
EM Black Holes
EM Neutron Stars
Solar Masses
200
100
50
20
10
5
2
1
LIGO-Virgo-KAGRA | Aaron Geller | Northwestern

The age of gravitational wave astronomy



The Einstein Telescope

- 3rd generation gravitational wave detector

  (LIGO Voyager, Cosmic Explorer)

- Improved sensitivity

  (10x advanced LIGO/VIRGO)

Large arms: 10 km

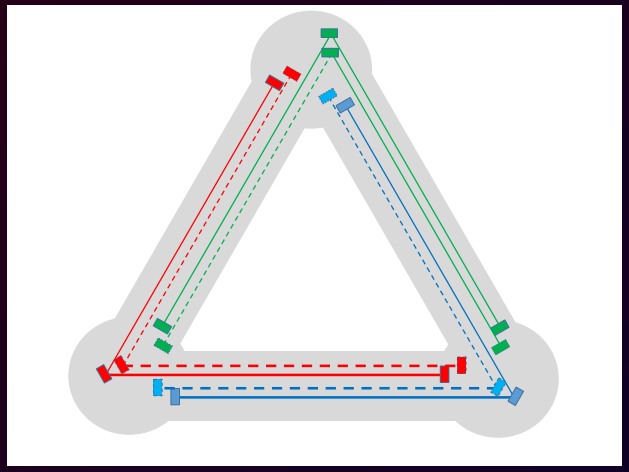
  (LIGO 4 km – Virgo 3 Km)

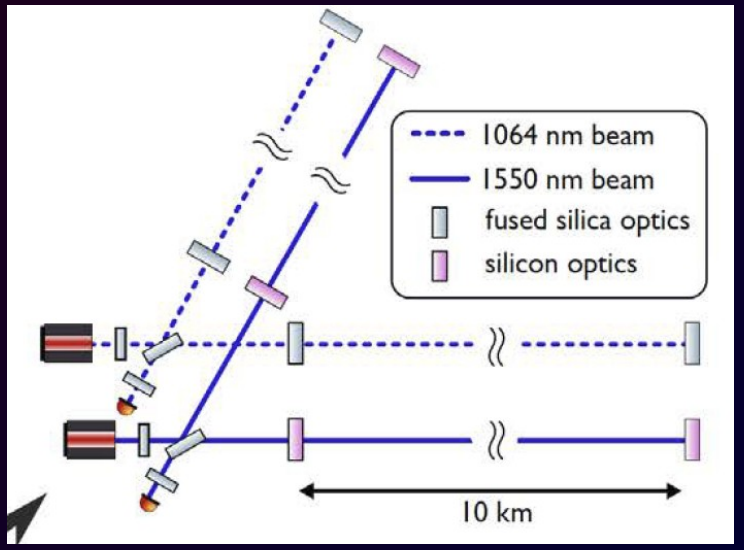
- Targets high and low frequency

  (multi-interferometer)

- Multimessenger observations (EM, neutrino, ...)

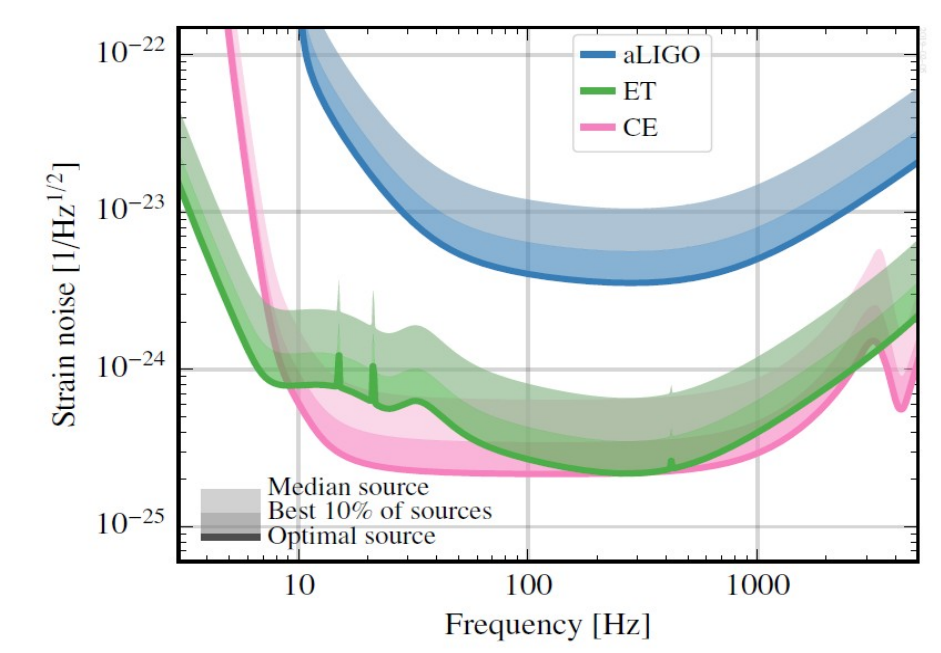
- Upgradable infrastructure

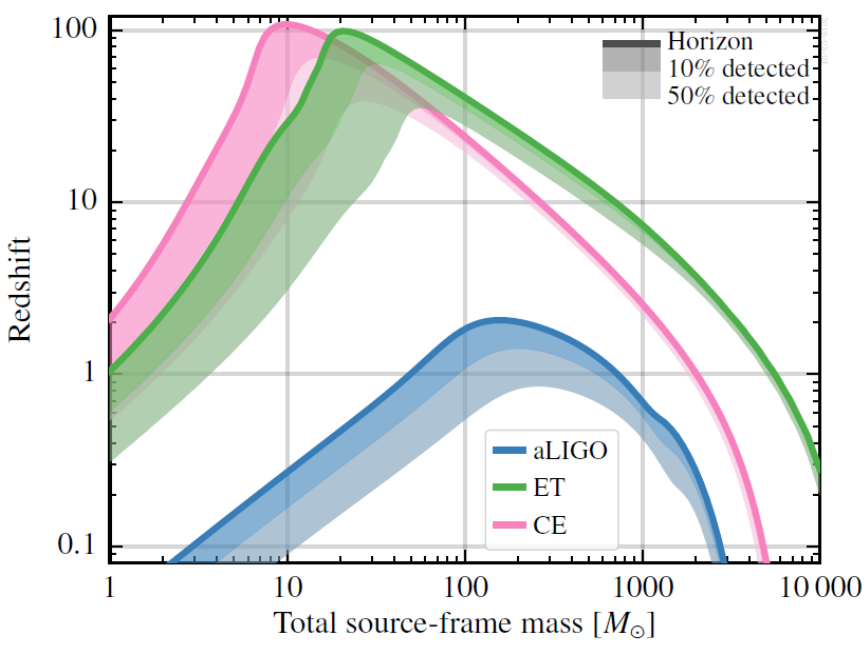


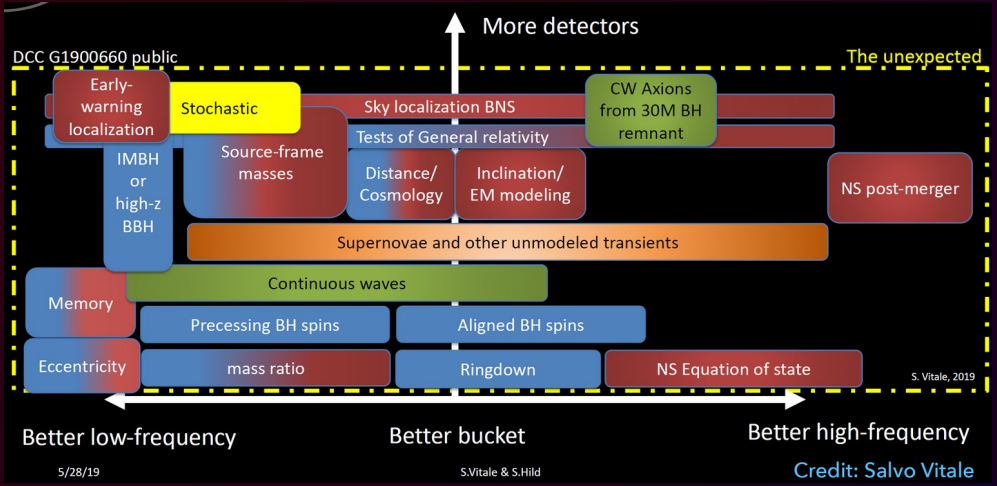


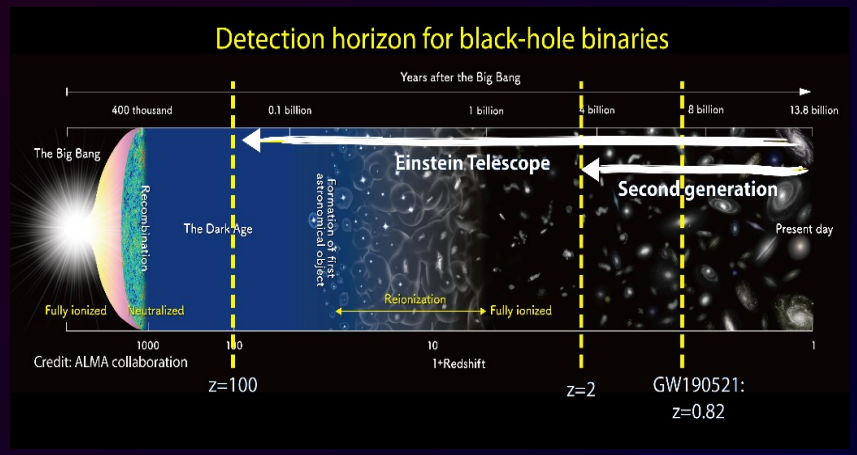
From Michele Punturo talk, XII ET Symp.

Science with the Einstein Telescope









From Michele Punturo talk, XII ET Symp.

Science with the Einstein Telescope

ASTROPHYSICS

Black hole properties
- origin (stellar vs. primordial)
- evolution, demography

Neutron star properties
- interior structure (QCD at ultra-high densities, exotic states of matter)
- demography

Multi-band and -messenger astronomy
- joint GW/EM observations (GRB, kilonova,…)
- multiband GW detection (LISA)
- neutrinos

Detection of new astrophysical sources
- core collapse supernovae
- isolated neutron stars
- stochastic background of astrophysical origin

FUNDAMENTAL PHYSICS AND COSMOLOGY

The nature of compact objects
- near-horizon physics
- tests of no-hair theorem
- Exotic compact objects

Tests of General Relativity
- post-Newtonian expansion
- strong field regime

Dark matter
- primordial Bhs, axion clouds,
- dark matter accreting on compact objects

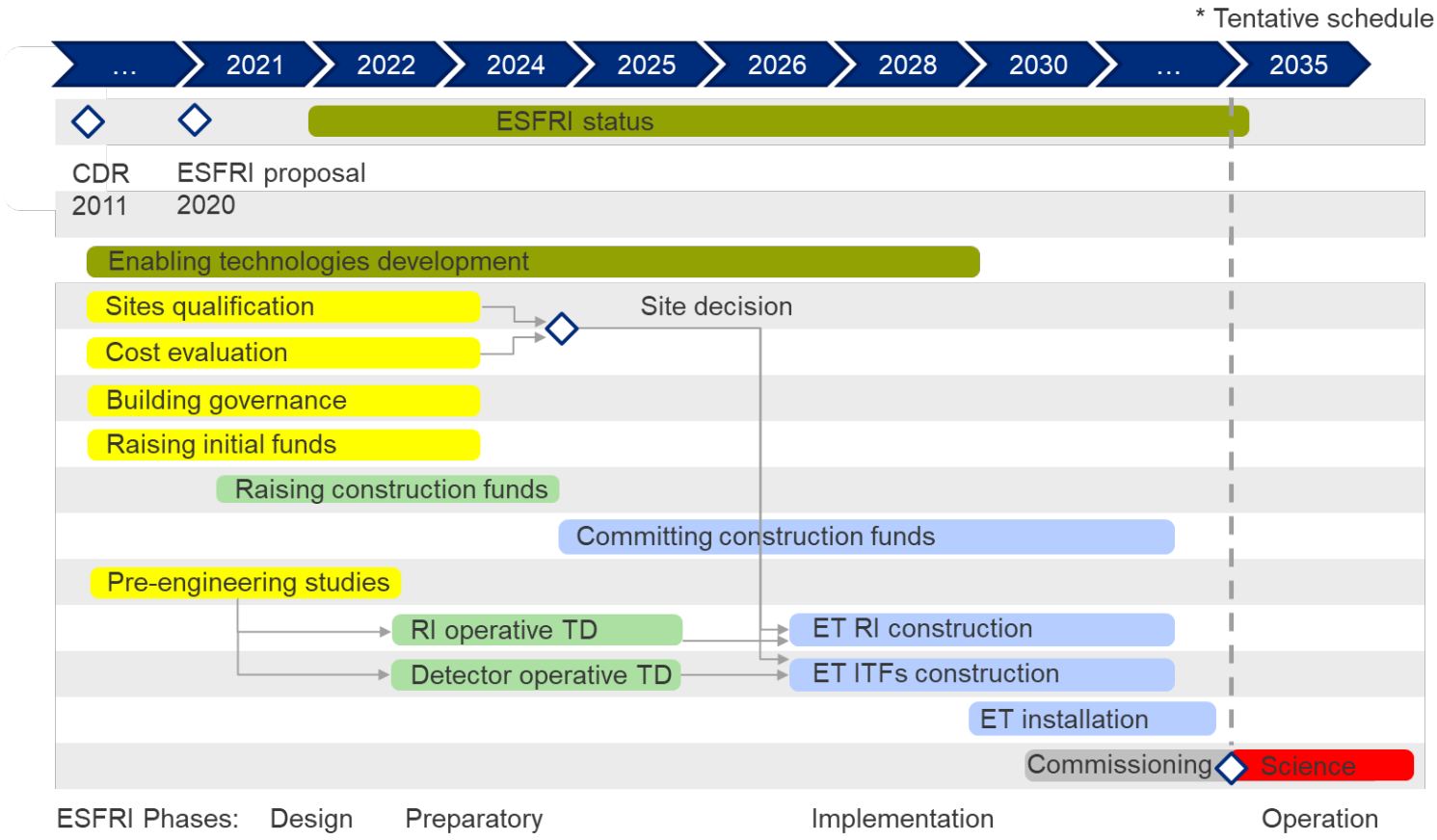
Dark energy and modifications of gravity on cosmological scales
- dark energy equation of state
- modified GW propagation

Stochastic backgrounds of cosmological origin
- inflation, phase transitions, cosmic strings

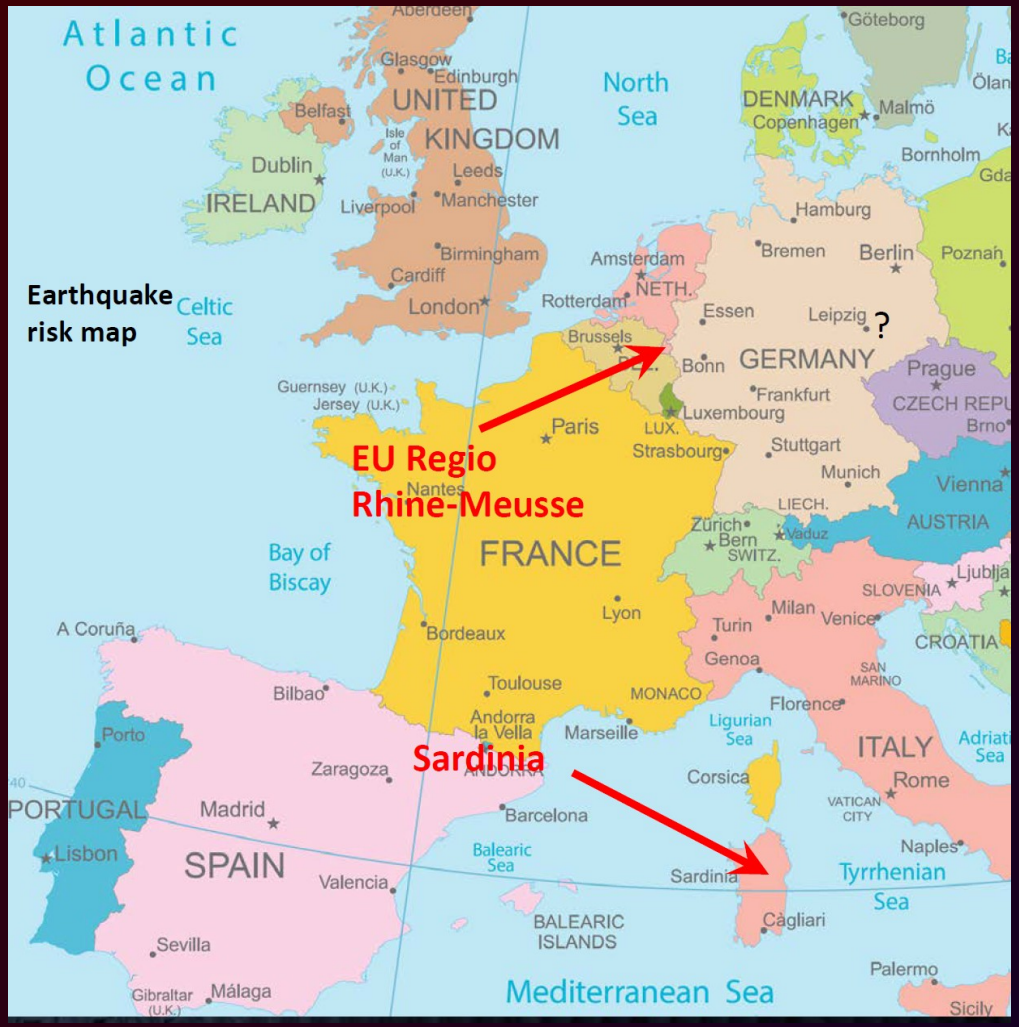
From Michele Punturo talk, XII ET Symp.

ET Roadmap

ET roadmap from ESFRI (European Strategy Forum on Research Infrastructures) proposal



Einstein Telescope candidate sites



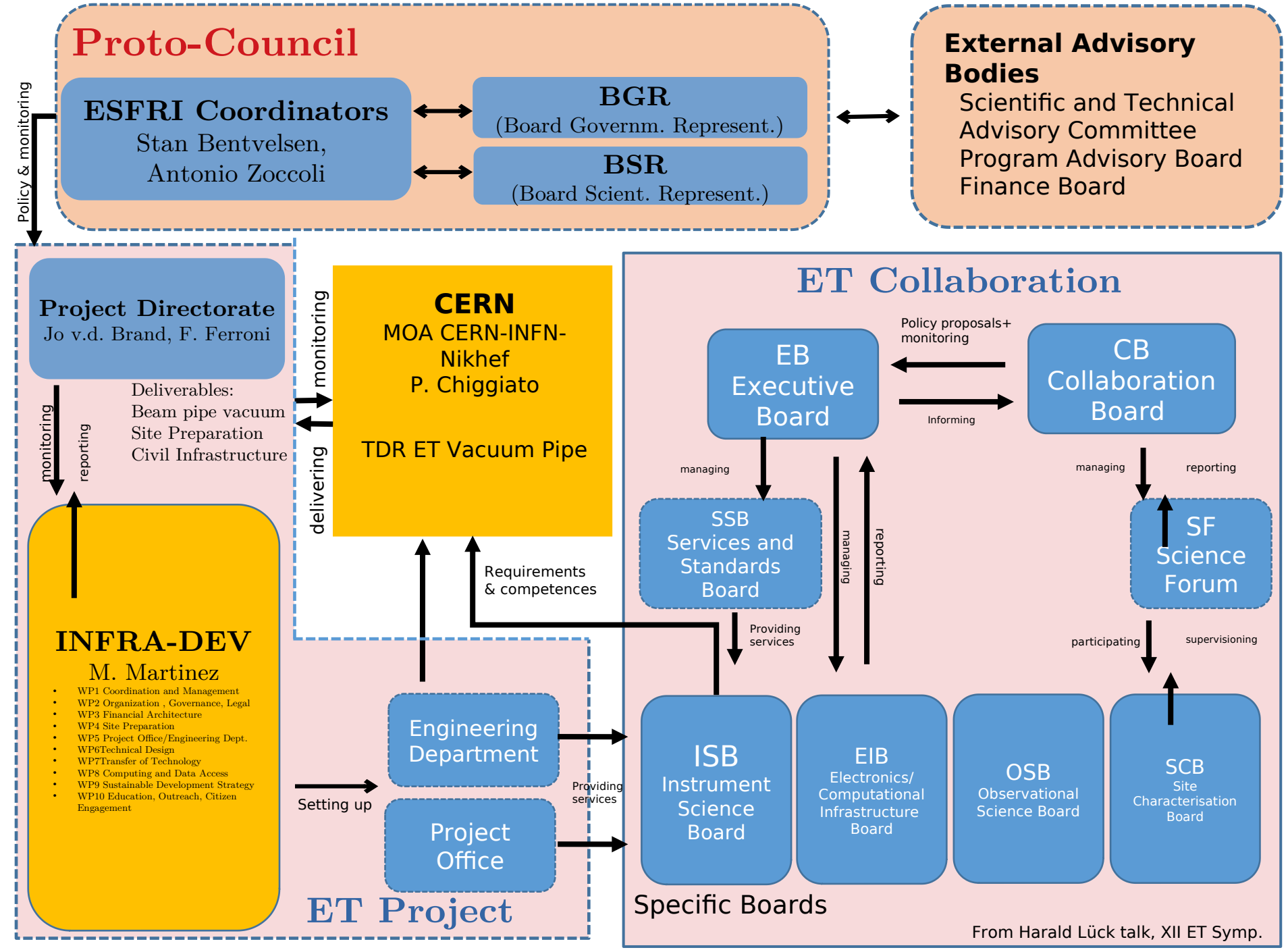
Two ET sites under characterisation:

- Sardinia site

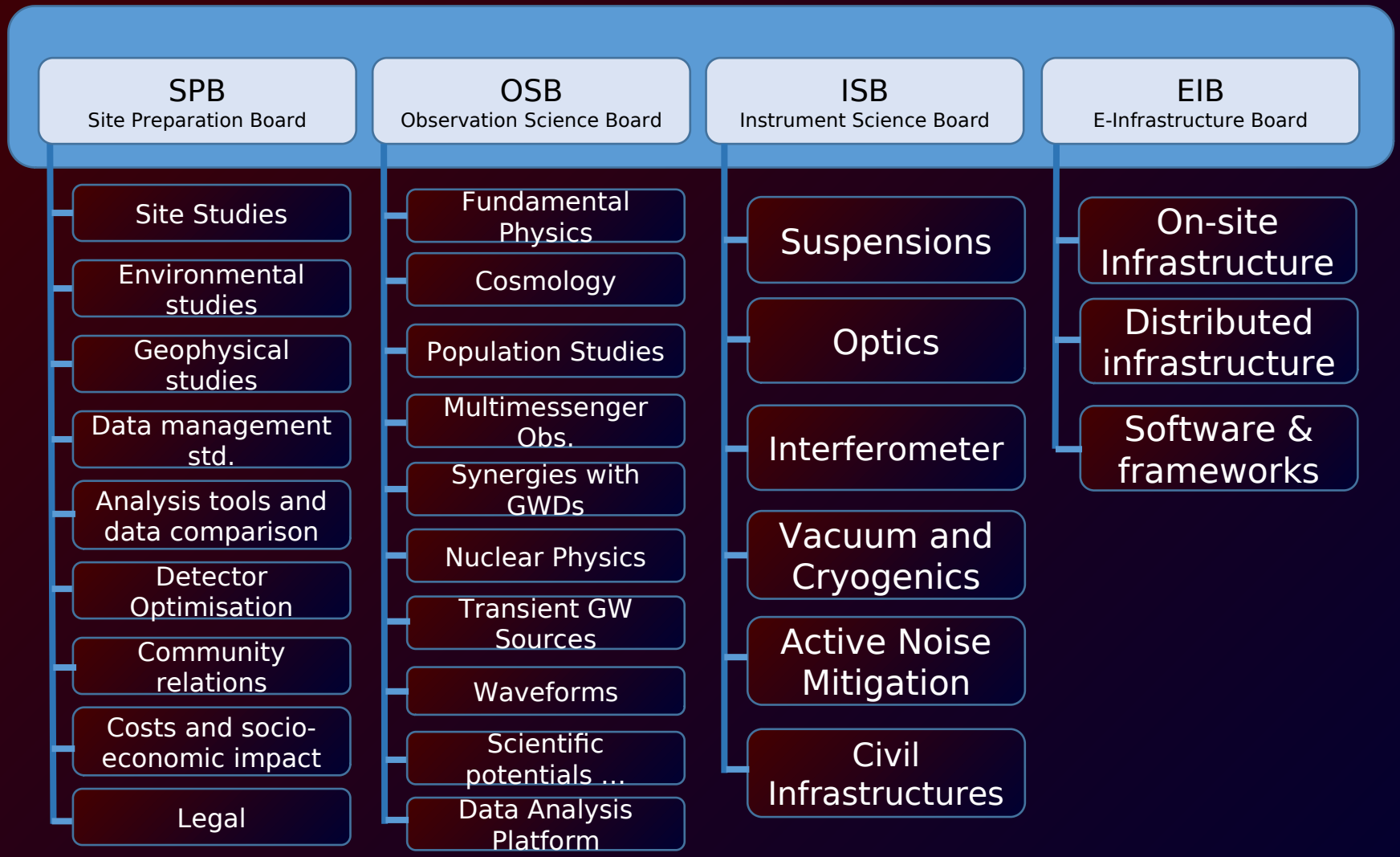
- Rhine-Meusse site,

+third option in Saxony (under discussion)

From Michele Punturo talk, XII ET Symp.


Proto-Council
ESFRI Coordinators
Stan Bentvelsen,
Antonio Zoccoli
BGR
(Board Governm. Represent.)
BSR
(Board Scient. Represent.)
External Advisory Bodies
Scientific and Technical Advisory Committee
Program Advisory Board
Finance Board
Policy & monitoring
Project Directorate
Jo v.d. Brand, F. Ferroni
Deliverables:
Beam pipe vacuum
Site Preparation
Civil Infrastructure
monitoring
reporting
CERN
MOA CERN-INFN-Nikhef
P. Chiggiato
TDR ET Vacuum Pipe
monitoring
delivering
Requirements & competences
ET Collaboration
EB Executive Board
CB Collaboration Board
Policy proposals+ monitoring
Informing
managing
managing
reporting
SSB Services and Standards Board
SF Science Forum
managing
reporting
Providing services
participating
supervisioning
INFRA-DEV
M. Martinez
WP1 Coordination and Management
WP2 Organization , Governance, Legal
WP3 Financial Architecture
WP4 Site Preparation
WP5 Project Office/Engineering Dept.
WP6Technical Design
WP7Transfer of Technology
WP8 Computing and Data Access
WP9 Sustainable Development Strategy
WP10 Education, Outreach, Citizen Engagement
Engineering Department
Project Office
Setting up
Providing services
ISB Instrument Science Board
EIB Electronics/ Computational Infrastructure Board
OSB Observational Science Board
SCB Site Characterisation Board
Specific Boards
ET Project
From Harald Lück talk, XII ET Symp.

The specific boards



From Michele Puntoro talk, XII ET Symp.

Observational Science Board

OSB: Observational Science Board

Objective: define the science case for the Einstein Telescope.

- Studies of different detector configurations
- Construction of the data analysis platform
- Exploration of the computational needs for optimum science extraction
- Interaction between ET and other GW/non-GW observatories.

Chairs: Marica Brachesi, Michele Maggiore, Ed Porter

10 research divisions

- Fundamental Physics
- Cosmology
- Population Studies
- Multimessenger observations
- Synergies with other GW observatories
- Nuclear Physics
- Transient GW sources
- Waveforms
- Common Tools
- Data analysis platform

ET Collaboration: Research Units

Members of the OSB were asked to group in Research Units (RUs)

- RUs are the basic building blocks of the collaboration

(alternatively, individual researchers can join the science forum)

- Group of people from the same institution

- Members must declare some FRTE (Full research time equivalent) dedication (≥0.1 FRTE)

RU total ≥2 FRTE
(1st year ≥1.5 FRTE)

- The leader of each RU participates in the Collaboration Board

IPARCOS-UCM Research Unit

IPARCOS-UCM Research Unit

Composition:
18 members (3.2 FRTE)

José Antonio Briz Monago,
José Luis Blázquez Salcedo,
José Luis Contreras González,
Alfredo Delgado Miravet,
Luis Mario Fraile Prieto,
Luis Javier Garay Elizondo,
Luis Manuel González Romero,
Mercé Guerrero,
Felipe J. Llanes-Estrada,
Evangelina Lope Oter,
Antonio López Maroto,
Mercedes Martín,
Prado Martín Moruno,
Francisco Navarro Lérida,
Diego Rubiera-Garcia,
José Alberto Ruiz Cembranos,
Alexandre Salas,
Héctor Villarrubia-Rojo.

We cover a wide range of ET related science:

Gravitational waves from compact objects,

alternative theories of gravity and cosmology,

neutron star physics,

nuclear matter properties,

astroparticle physics,

...

7-8 June: XII Einstein Telescope Symposium, Budapest:

Formal establishment of the ET Collaboration

- 79 applications for Research Units were received.
More than 1240 members from 13 countries

- Collaboration Board (1st meeting 8 of June): composed by leaders from the RUs

Collaboration Board priorities:

Evaluation and admission of the RUs,
voting mechanisms,
completion of the bylaws,
election of the CB chair,
election of the spokesperson and deputy spokesperson,
monitoring of the Executive Board, ...

- Executive Board

Define interface & integration level with
Project Office, Engineering department, Vacuum pipe team
Evolve the ET Conceptual Design Report in to ET Technical Design Report
Coordinate the definition and the development of the ET technologies
Complete the ET science book
Develop the tools
Support the site selection procedure through the National Host Teams

Last remarks...

- Collaboration Board will meet regularly (~monthly)

- To appear: list of Research Units

Could be interesting to establish contact with RUs with affine interests...

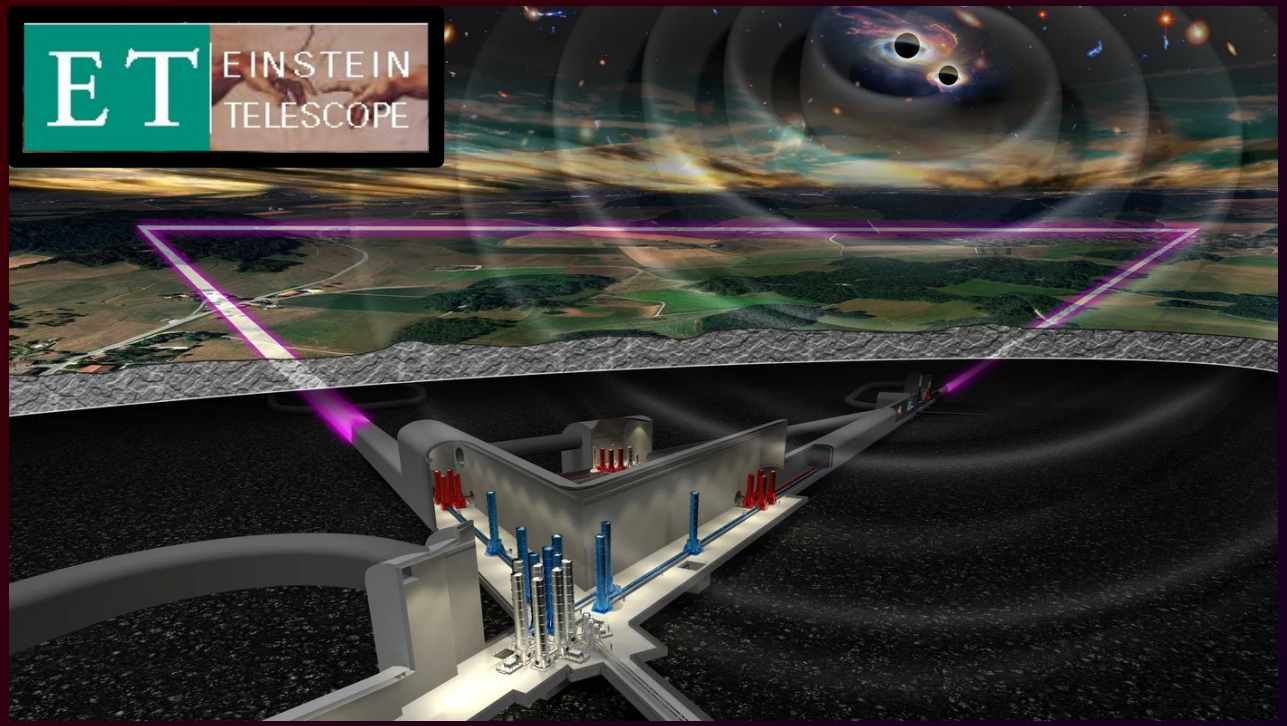
- To be formed: Forum of National Representatives (FNR).

For coordination on a national basis.
Formed by ET collaboration members elected by the RU leaders.

- ET project at a critical stage: site preparation, technological challenges, infrastructure...

Likely, involvement of IPARCOS-UCM RU with ET project
more intense at a later stage...

If you are interested in joining the RU, please contact me!



Thank you for your attention!

More information: http://www.et-gw.eu/index.php

ET Collaboration bylaws: https://apps.et-gw.eu/tds/?content=3&r=17888

ET OSB: http://www.et-gw.eu/index.php/observational-science-board

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