

Notes on ET-Spain Organization

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ICREA



EXCELENCIA
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ET

EINSTEIN
TELESCOPE

**ET-Spain Meeting
8th Oct. 2021**

Spanish Meeting on ET ESFRI proposal preparation

Sponsored by ICE-CSIC-IEEC and IFAE



Back in February 2020 we led the effort to integrate support for the Einstein Telescope across Spain

→ Up to 23 institutions, including 4 “Singular Research Infrastructures” expressed interest

→ Translated into Spain politically supporting ET

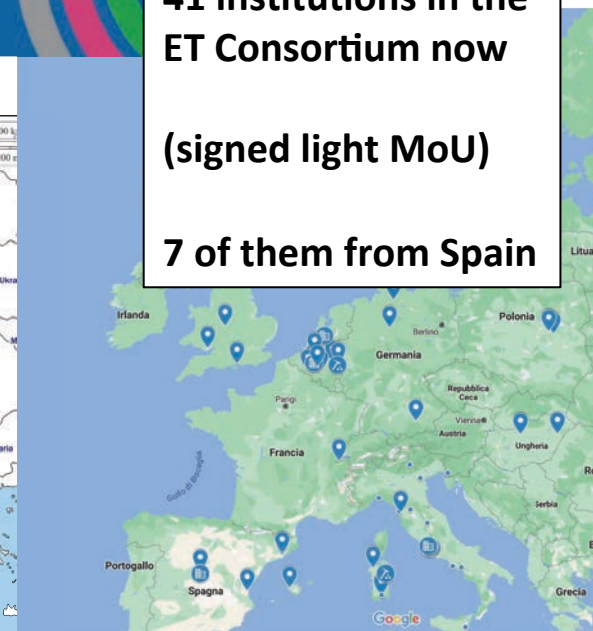


41 institutions in the ET Consortium now (signed light MoU)

7 of them from Spain

INSTRUCTIONS FOR INSTITUTIONS

Deadline for submission: end of February



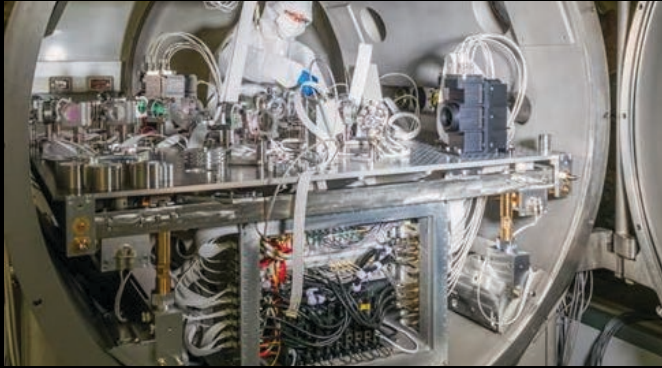
June 30th 2021:
The Einstein Telescope is included in the 2021 ESFRI roadmap !!

MINUTES of the MEETING

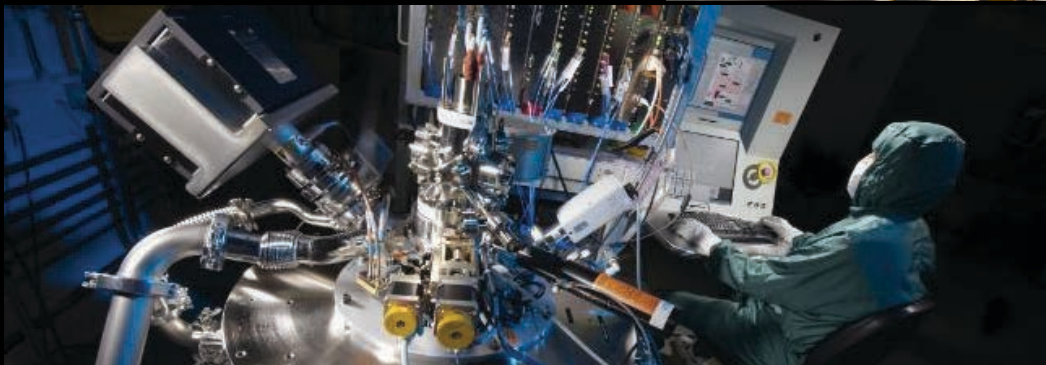
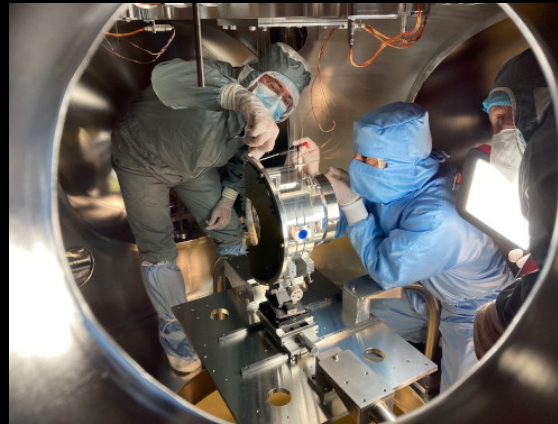
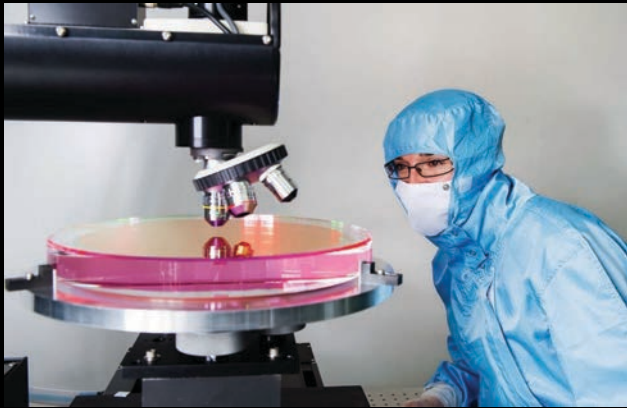
Einstein Telescope timeline

- 2010 ET conceptual design completed
- **2021 Design update, forming the ET collaboration, ESFRI approval** ✓
- 2021 – 2025 stagewise technical report updates (... , preliminary, detailed, ...)
- 2021 – 2024 Detailed site characterisation, refine cost evaluation
- **2024/2025 Site Selection**
- 2026 Full Technical Design
- 2027 Infrastructure realisation start (excavation, vacuum system,)
- 2032+ detector installation / commissioning / operation (50+ years)

R&D (technologies)

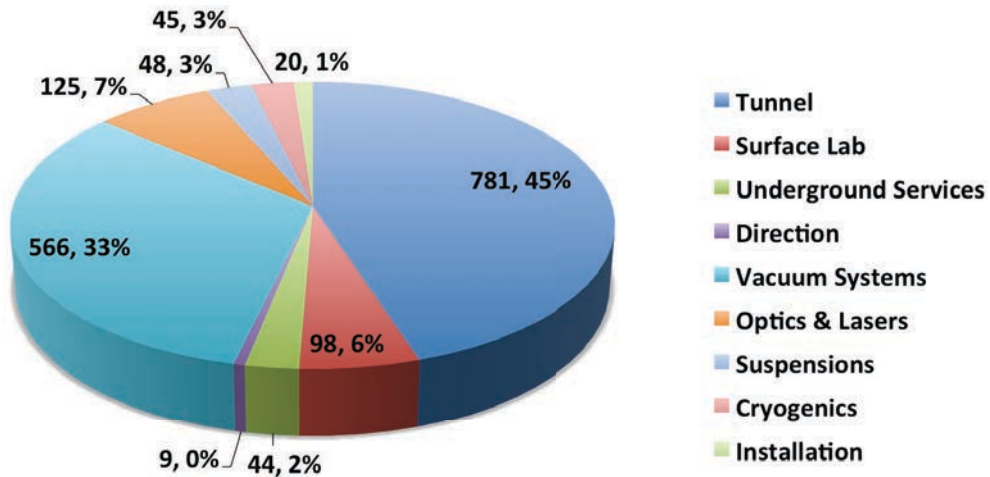


Measure and attenuation of vibrations
Optics, special materials, coatings, lasers
Active IR detection and monitoring, fast DAQ
Cryogenics
Vacuum technologies
→ Altogether to reach the $O(10^{-21})$ precision



Estimated cost

ET Estimated Costs (M€)



Preparatory phase (170M€)

1. Site qualification (funded)
2. Site preparation (50 – 60 M€)
Covered by host country
3. R&D on technology (95 M€)

Host country is expected to contribute with > 50% of the total cost

INFN and Nikhef aiming of O(100M€) each grants in recent grant applications In Italy and The Netherlands

Construction : 1900 M€ (in 10 years)
M&O : 37M€ /year

Locations ?

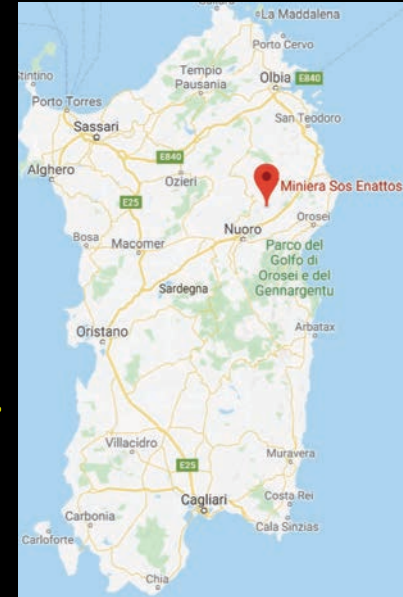
30 M€ investment
Lab in construction



30 M€ investment
ETpathfinder

Intensive studies
@ Limburg,
@ Sardinia
@ Saxony
For characterize seismic,
environmental noise, etc ...

@ Limburg area (border NL-B-D)
→ Promoted by Nikhef



@ Sardinia
→ Promoted by INFN

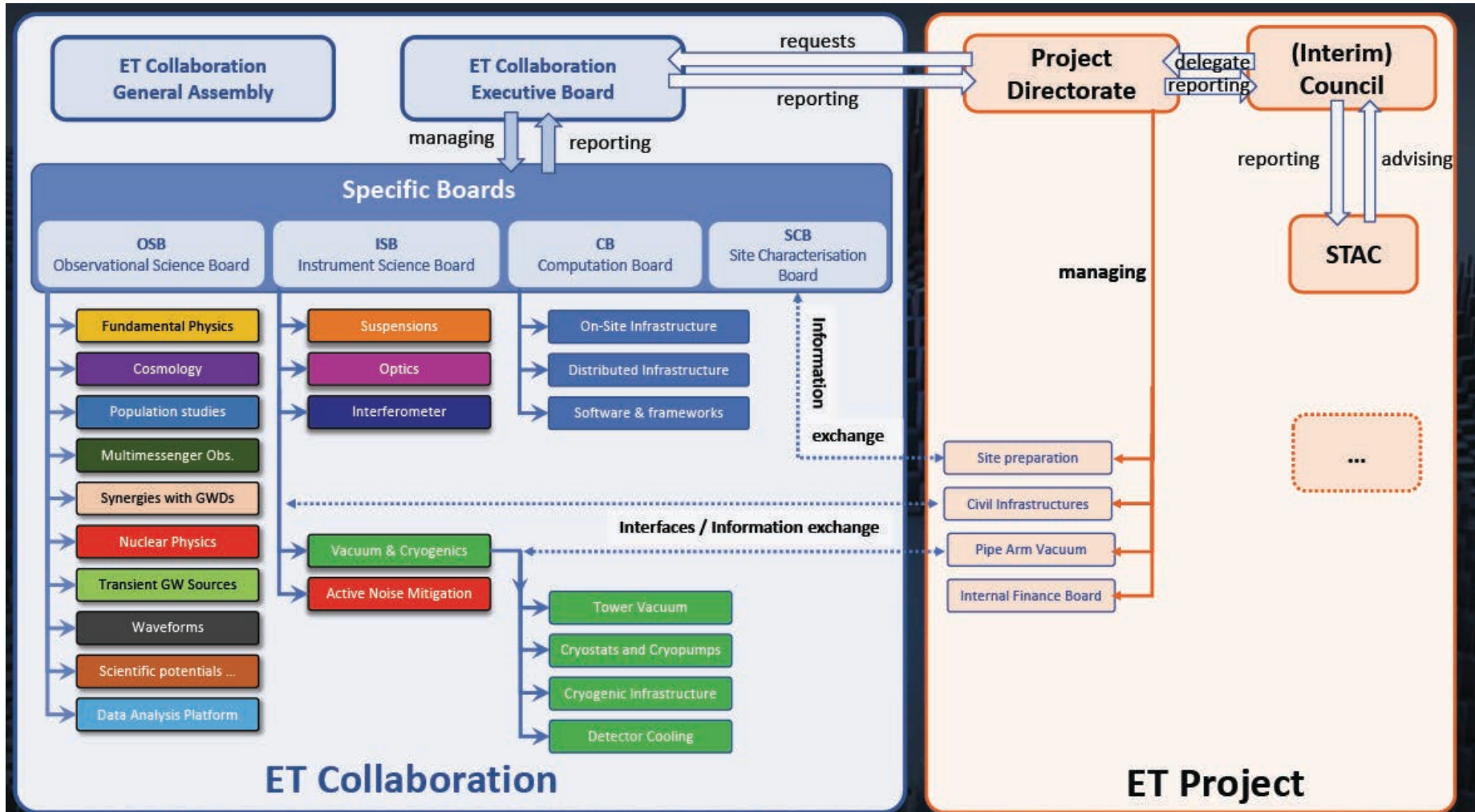


@ Germany is very present in ET and ETpathfinder
They foresee a large investment in the following years

→ Exploring Saxony as a possibility



Governance



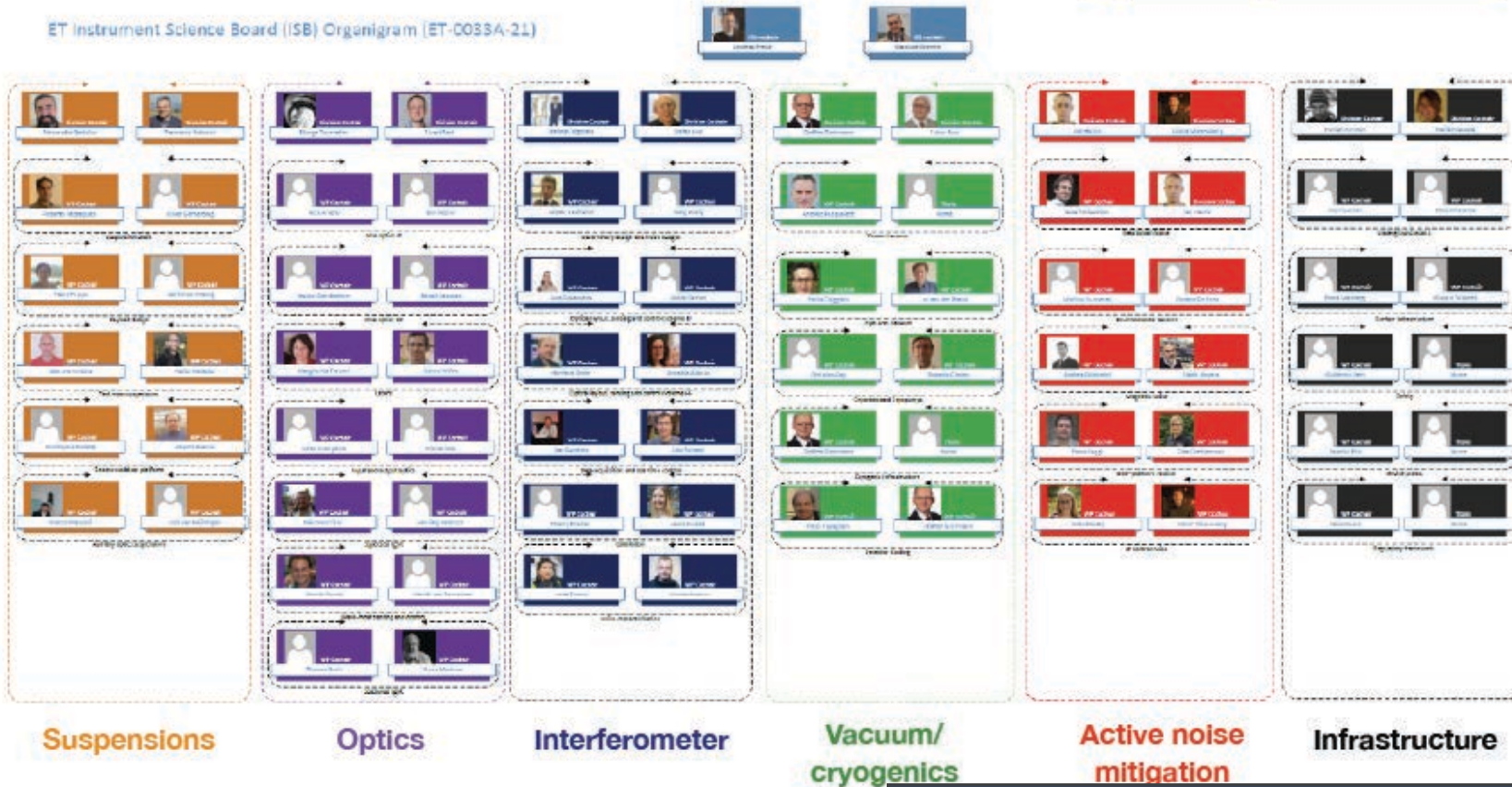
The ET collaboration has now a well defined organization

Ongoing discussion with all the countries that supported ESFRI candidature (Austria, France, Germany and UK also present) → Interim Council being formed now

Instrument science board (ISB)

<https://wiki.et-gw.eu/ISB/WebHome>

ET Instrument Science Board (ISB) Organigram (ET-0033A-2L)



A first workshop took place on 29th – 31st March

<https://indico.ego-gw.it/event/173/>

Second workshop on Sept 3rd and Sept 16th

<https://indico.in2p3.fr/event/24903/>

ET-ISB workshop (day 1)

Monday 29 Mar 2021, 09:00 → 13:00 Europe/Rome

Andreas Freise (VU Amsterdam), Gianluca Gemme (INPN)

Description: We are aiming at a hands-on workshop in which we start by discussing together, but then also have times for small groups to work on a specific task. That will happen during the days of the workshop but also on March 30th.

We will work on the following topics:

- Optimal mirror temperature for LF
- Low frequency noise strategy
- What are the facility limits?

The workshop will be held online on Zoom. Instructions for connecting are at [this link](#).

A working area where useful info will be stored is available at [this link](#).

Observational science board (OSB)

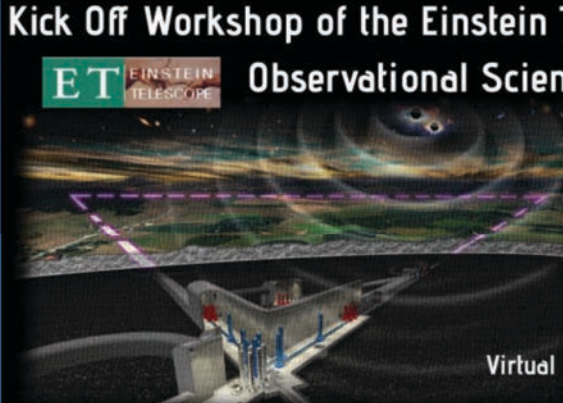
Marica Branchesi - Michele Maggiore - Ed Porter

Fundamental physics	Cosmology	Population Studies	MM observations	Synergies w. other GW observ.	Nuclear physics	Transient GW Sources	Waveforms	Science Potential	DA platform
Physics near BH horizons	Dark Energy	Predictions of population of astrophysical origin	ET / high-energy	Synergies with 2G+ detector	EoS of NSs in isolated systems	Predictions for Supernovae	Waveforms relevant for ET	Science potential for various detector configurations	DA platform
Tests of GR	Dark matter	Predictions of primordial BHs	ET / optical	Synergies with CE, 3G	EoS in NSs in binary systems	Predictions for magnetars	Improvement of waveforms for BBH	Common tools	
Exotic compact objects	Estimation of cosmological parameters	Stochastic backgrounds of astrophysical origin	ET / radio	Synergies with LISA	Nucleo-synthesis in BNS mergers	Predictions for cosmic string bursts	Improvement of waveforms for NSBH		
	Modifications of gravity at cosmological scales		ET / neutrinos				Improvement of waveforms for BNS		
	Stochastic background of cosmological origin								


Science Board being organized

September 21st and 22nd
<https://indico.ego-gw.it/event/240/>

Kick Off Workshop of the Einstein Telescope
Observational Science Board



21 2021 22
 September September

Virtual meeting hosted by  EGO EUROPEAN GRAVITATIONAL OBSERVATORY

ET-Spain

The research on GWs has been included explicitly in the Spanish Strategic plan for Science, Technology and Innovation (EECTI) 2021-2027

After ESFRI approval GW community may request significant funding for Preparatory phase

→ Community needs to be organized to act coherently



In this meeting:

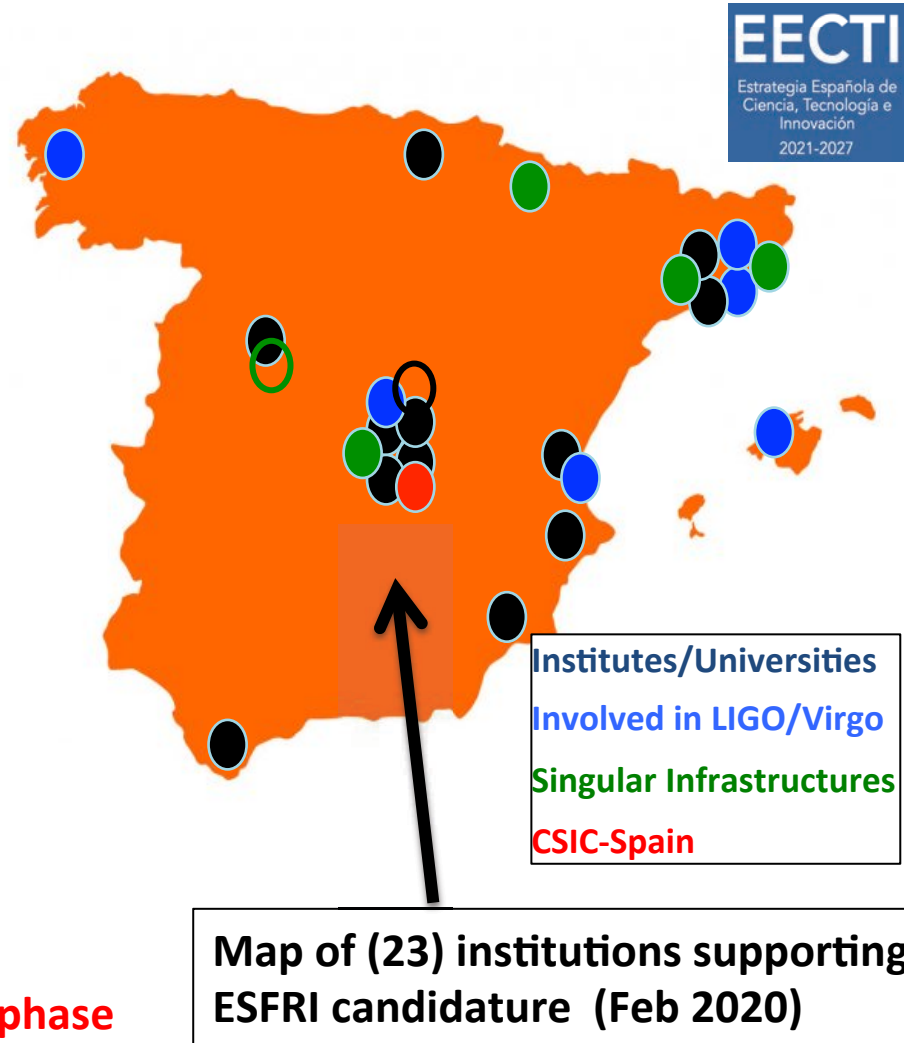
85 participants from 21 Research Institutions

→ Growing interest on ET

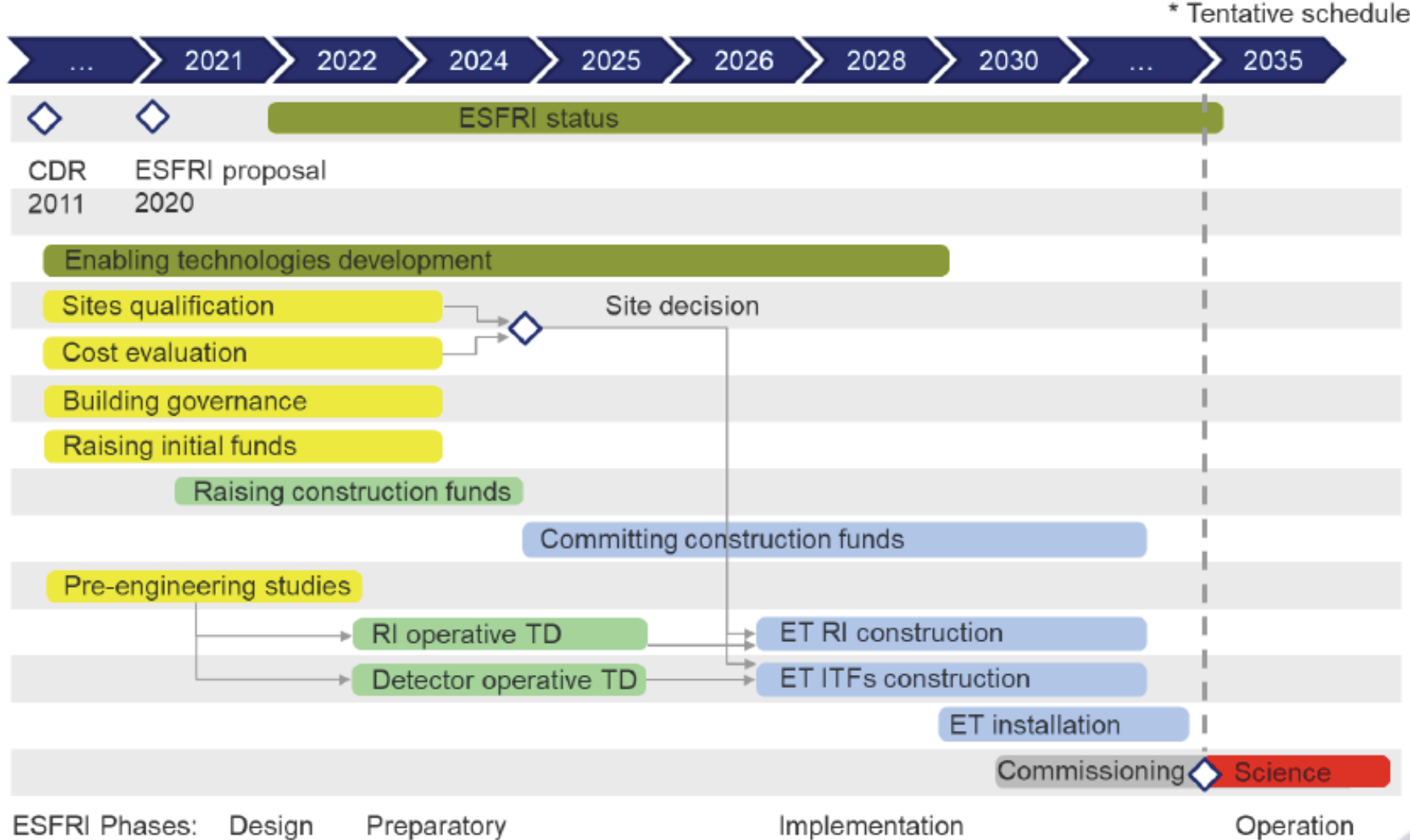
→ Time to get organized as ET-Spain

→ Time to play a significant role in preparatory phase

→ Needs energetic involvement in ET Working Groups



ESFRI: project timeline



Horizon INFRA-DEV Call now to develop the project design



Horizon ESFRI Initiatives



The screenshot shows the European Commission website with the following details:

- Logo: European Commission
- Page Title: Funding & tender opportunities
- Sub-page: Single Electronic Data Interchange Area (SEDIA)
- Navigation: SEARCH FUNDING & TENDERS, HOW TO PARTICIPATE, PROJECTS & RESULTS, WORK AS
- Topic: Preparatory phase of new ESFRI research infrastructure p
- Topic ID: HORIZON-INFRA-2021-DEV-02-01
- Grant type: Grant
- General information section:
 - Programme: **Horizon Europe Framework Programme (HORIZON)**
 - Call: [Developing and consolidating the European research infrastructures leadership \(2021\) \(HORIZON-INFRA-2021-DEV-02\)](#)
 - Type of action: **HORIZON-CSA HORIZON Coordination and Support Actions**
 - Deadline model: **single-stage**
 - Planned opening date: **30 September 2021**
- Footer: Go back to search results

Will be used to define the project office (not so much for R&D on technology)

But technical work for

1. Cost Estimates
2. Experiment Design
3. Governance /Legal Structure
4. Project planning /HHRR
5. Enlarge ET community
6. ENV impact / low-carbon.. etc
7. Enhance interest in the Society
8.

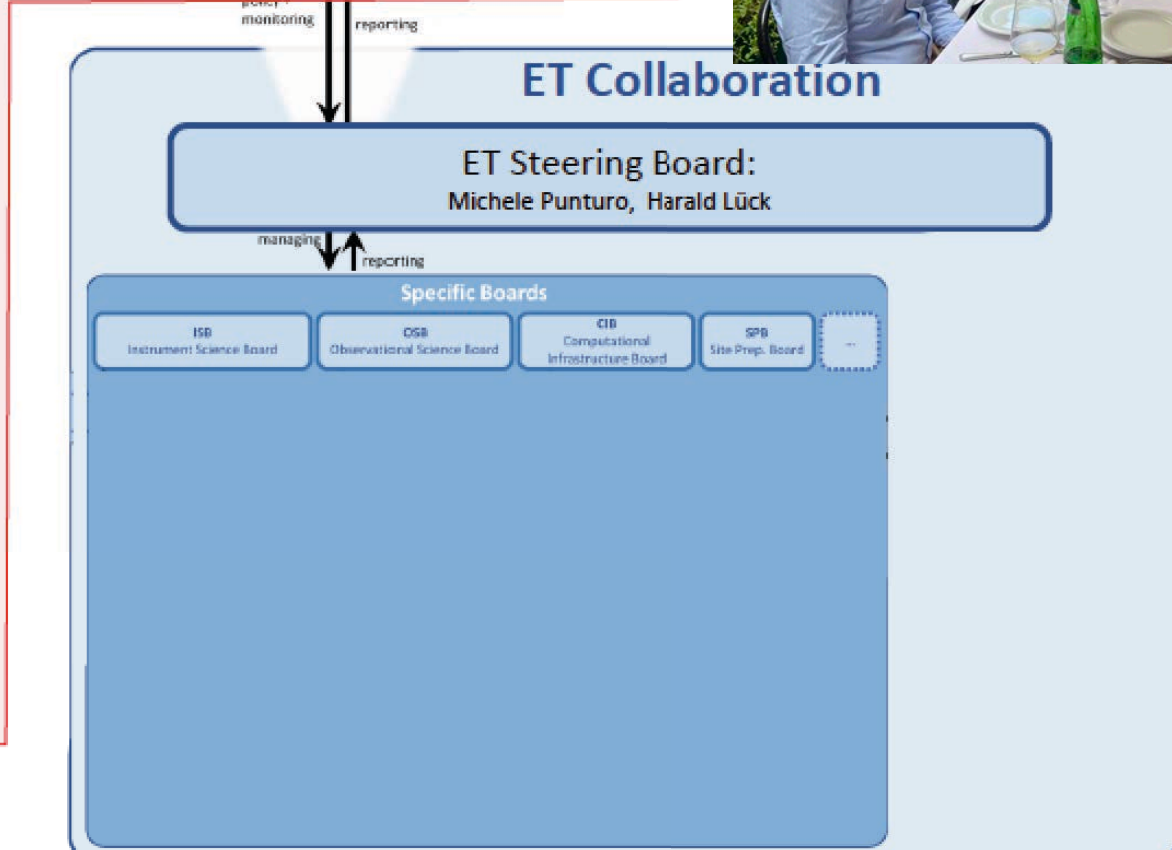
Work packages being defined now

A total of 36M€ in the program (ET aims for 3M€ to 5M€)

→ Deadline for proposal early 2022

→ A co-funding at the level of 50% is expected (in-kind personnel)

@ INFN Headquarters on 3rd October



Legal Entity:
ET Observatory

**I was asked to act at PI of the proposal at the European level
→ An opportunity for ET-Spain to play a main role in some WPs**

Funding proposal for Preparatory phase

Action points

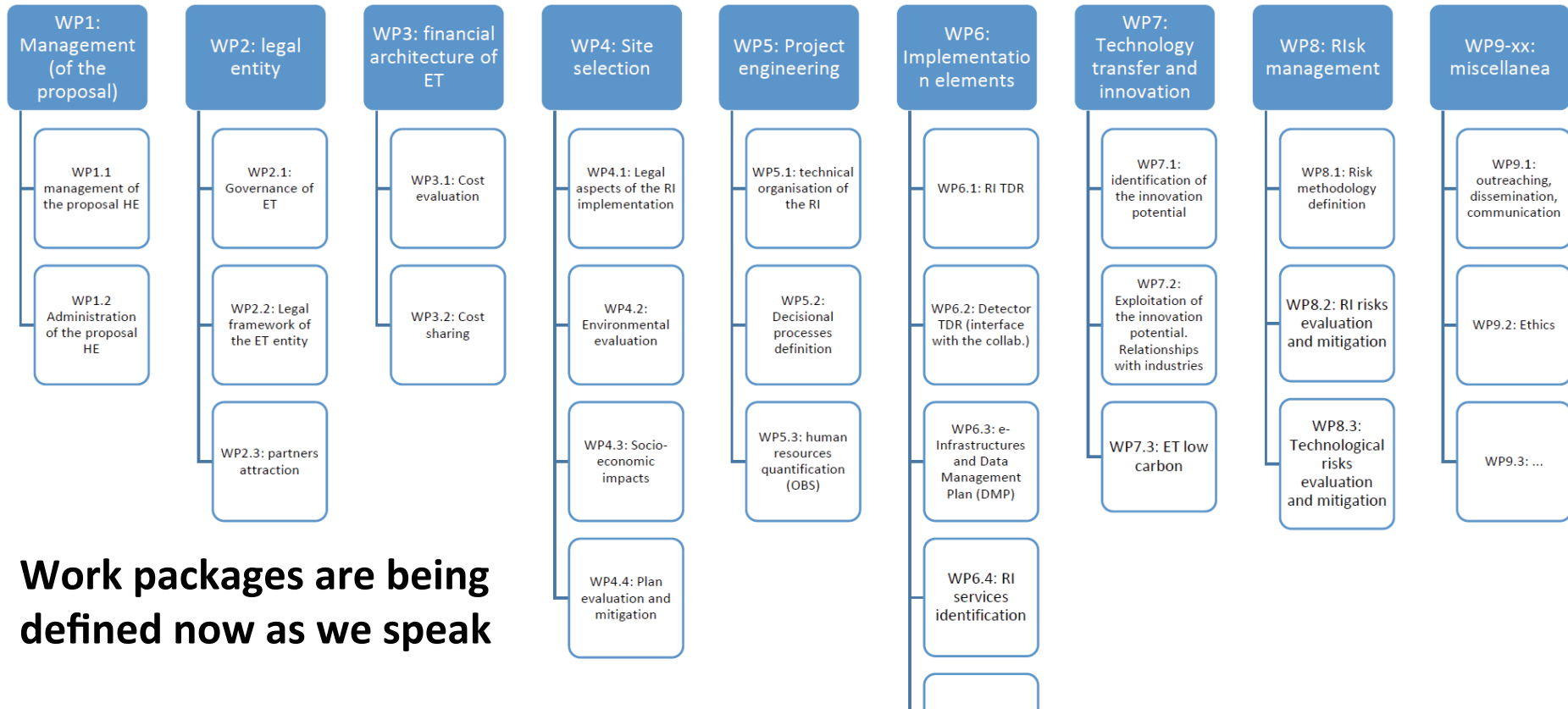
1. The development of legal and financial frameworks/plans of the research infrastructure as well as its Governance structure
2. The preparation of legal and financial agreements, including site, governance, internal rules, financing of the new research infrastructures
3. The establishment of plans for logistics and human resources management
4. The relevance of the RI for science and society, including its socio-economic impacts at local/regional level and links with the smart specialisation strategies at regional level
5. The completion of the final technical design of the infrastructure
6. The identification of strategies for the realisation of a sustainable and low emission infrastructure, with particular attention also to the preservation and the valorisation of the environment and of the natural landscape
7. The development of plans for the provision of RI services to identified scientific user communities

Funding proposal for Preparatory phase

Deliverables (as discussed in ET-SC)

1. Design of the Legal structure of ET (deliverable, statute of ET)
2. Financial architecture for ET (deliverable financial agreement)
3. OBS (organisation breakdown structure) of the RI. Human resources determination
4. Delivering of the TDR of the research infrastructure and of the preliminary TDR of the detectors
5. Detailed environmental evaluation (ET low carbon)
6. Detailed Socio-economic impact (studies and plans)
7. Plans for the provision of RI services

Work packages



Work packages are being defined now as we speak

In close contact with Ministry : Spain will need to determine the strategy to follow

- Portfolio of Industrial Capacities
- Landscape of potential returns at long term
- Technologies involved and roles of the search groups

→ **Will need full involvement of ET interested community in Spain**

Final Notes/Next Step

- **ET takes a lot of momentum and has a recognized very strong physics case**
 - I have little doubt it will happen (in one form or another)
 - Spain should be onboard from the beginning acting coherently
- **Time to participate in the preparatory phase (ESFRI-INFRA-DEV)**
 - We should have a second meeting (virtual) with those institutions willing to participate in eventually leading some ET WP work (co-funded)
- **I propose this happens in about 1-2 weeks time**
 - I will be proactively contacting people
- **Keep in mind part of the work will be done by the ET collaboration via the ISB and OSB boards and part of the work needs engineering skilled people**
 - Ongoing discussion on cost-benefit of different designs including also L – shape and triangular-shape solutions
 - Input needed (Physics studies, simulations,etc...)
 - Computing infrastructure..

Let's Discuss !!!

