

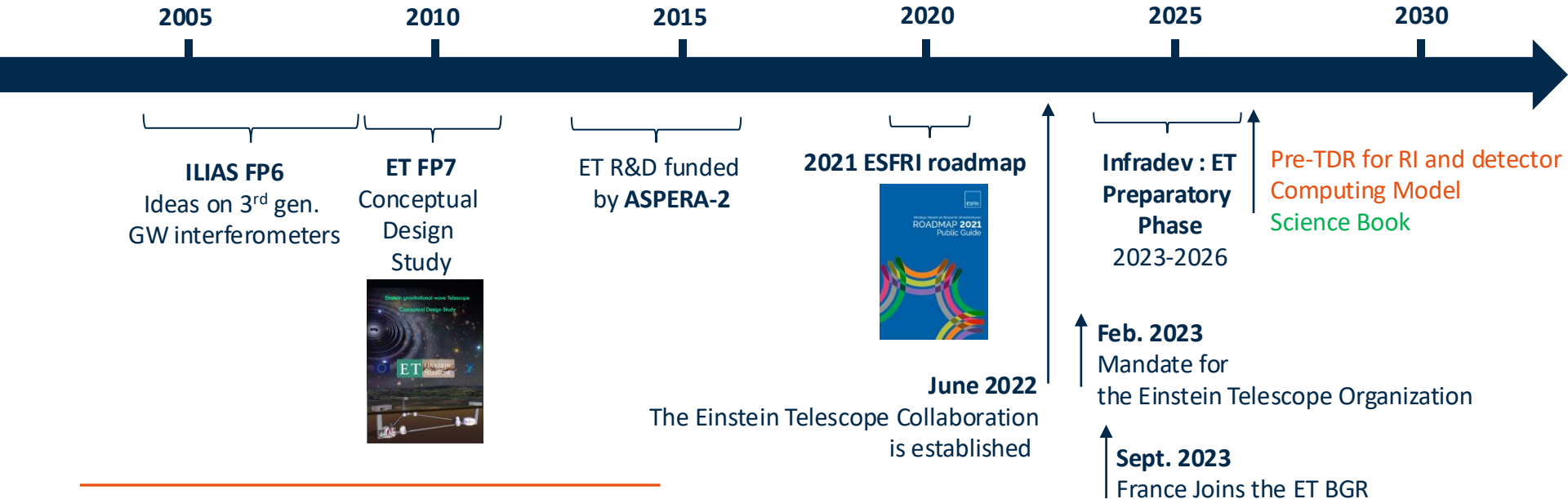
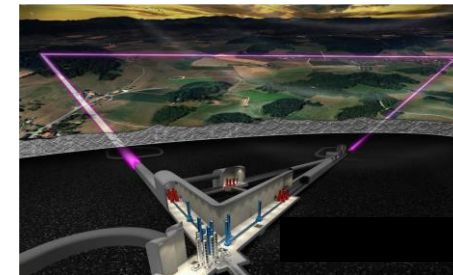
ET-France Workshop: Introduction and goals

IJCLab – March 31th, 2026

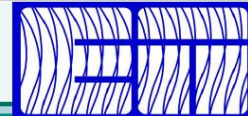
Patrice Verdier (IP2I Lyon – IN2P3) - patrice.verdier@in2p3.fr

ET pioneered the idea of 3rd generation GW observatory:

- A new infrastructure for >50 years
- Sensitivity at least 10 times better than 2nd generation
- Huge improvement in sensitivity at low frequency (a few Hz to 10 Hz)
- **Essential French contribution since the initial studies**



The Einstein Telescope Collaboration



EINSTEIN
TELESCOPE

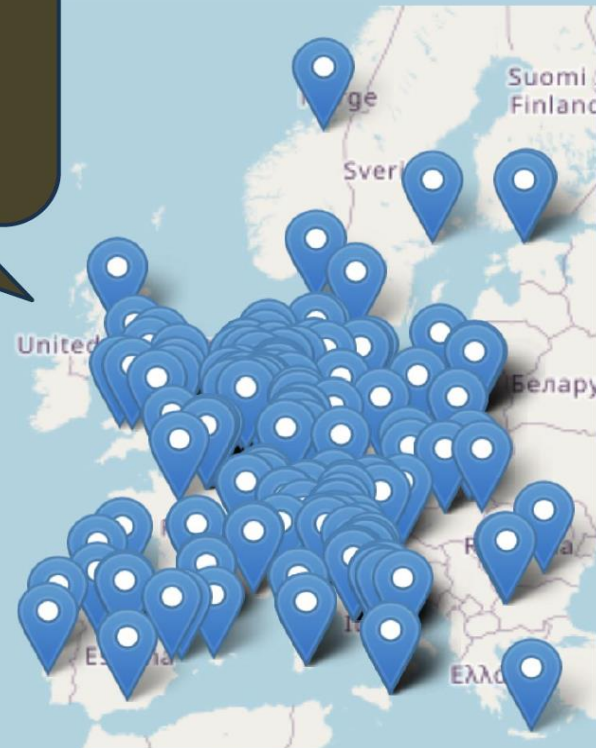
- 97 Research Units
- 2005 members (05/03/2026)
- Total: 291 Institutions
in 34 Countries

+ FZU: Institute of Physics of the
Czech Academy of Science
+ TNO: Dutch Organisation for
Applied Scientific Research
+ Tallinn: National Institute of
Chemical Physics and Biophysics
+ Queen Mary Univ, London

- ET member database



ET Member's affiliation map



Who we are? A complementary team

Candidate spokesperson:
Michele Maggiore



- Theorist
 - Co-chair of the Observation Science Board (OSB) since 2020
 - Co-coordinator of the Blue Book (The Science of the Einstein Telescope)
- Long experience in gravitational wave experiments since the mid-1990s
- I created and led the Research Unit of the Geneva group (Switzerland)
- Member of the ET Steering Committee and then Executive Board since 2019
- ...



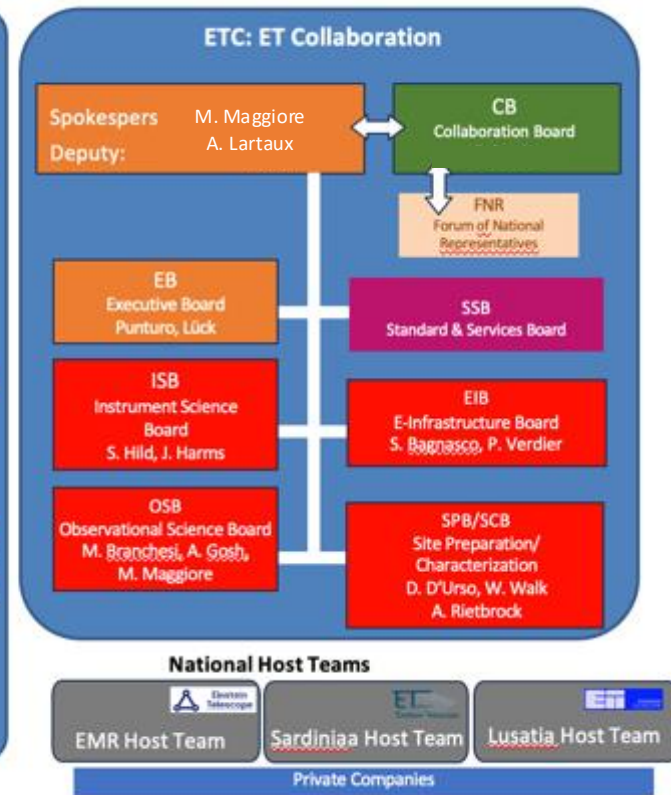
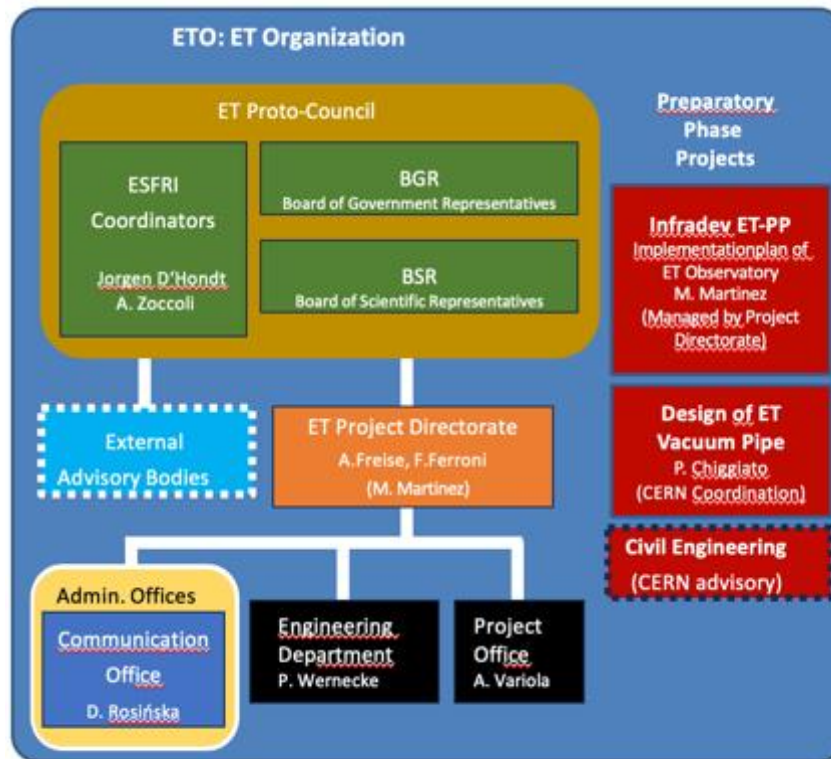
Candidate deputy spokesperson:
Angélique Lartaux

- Instrumentalist
 - Co-chair of Squeezed Light Working group since 2025
 - Contributor of the pre-TDR (preliminary Detector Technical Design Report)
- Experience in gravitational wave experiments since the mid-2010s
- Research Unit Leader of the IJCLab group (France) since 2022
- Member of the Early Career Support Committee since 2024
- ...

The EU supports the creation of the ET infrastructure (ETO) through the financing of Infradev projects:

**Einstein Telescope
Preparatory Phase
ET-PP
2023-2026**

**Implementation
Phase
ET-COMPASS
2027-2028**

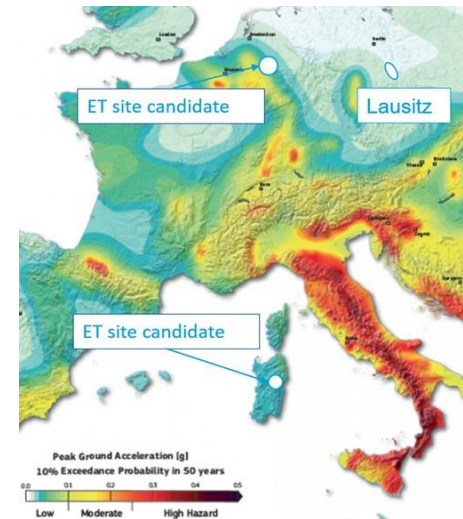


From the XIII ET symposium, an incomplete selection of the presented large facilities



ET Funding Agencies are about to launch an ET R&D roadmap exercise

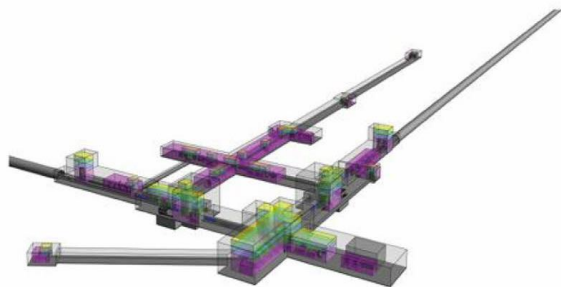
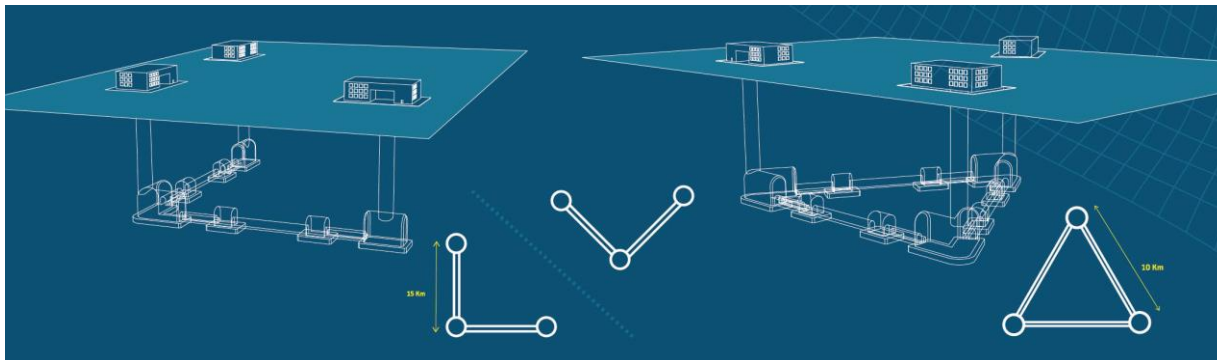
- **Three candidate sites** candidates to host ET: **EMR, Sardinia, and Lusastia**
 - Italy and the Netherlands have pledged to cover nearly half of the cost if their proposed sites are selected
 - Important budget in Italy (50M€), The Netherlands (42M€), and Germany (~90M€) to support **site characterizations** (boreholes, seismometer, environmental studies), **civil engineering studies** (tunnels and caverns), **Instrumental &D and physics studies**
 - **All 3 are underground** :
 - **Seismic noise attenuates with depth**
 - **Newtonian noise is less significant and NN cancelation system can be developed to reach sensitivity below 10 Hz**
- **Geometry:**
 - Studies of physics potential has led to two geometry possibilities which are jointly evaluated: "2L 15 km" is generally better (45° orientation) and less risky than the triangle
 - Site Selection Criteria Committee will provide recommendations to BGR in 2026



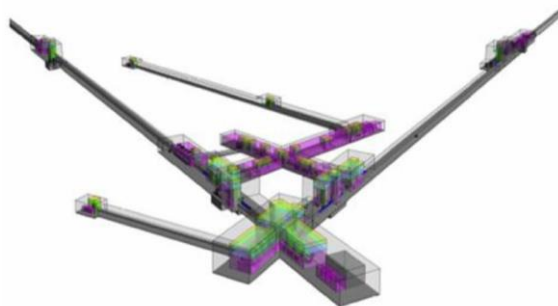
Decisions on site and geometry are expect in 2026-2027



French Position in preparation: preference for the 2L 15km geometry



• 2L, Task Force baseline



• Triangle, Task Force baseline

Significant work :

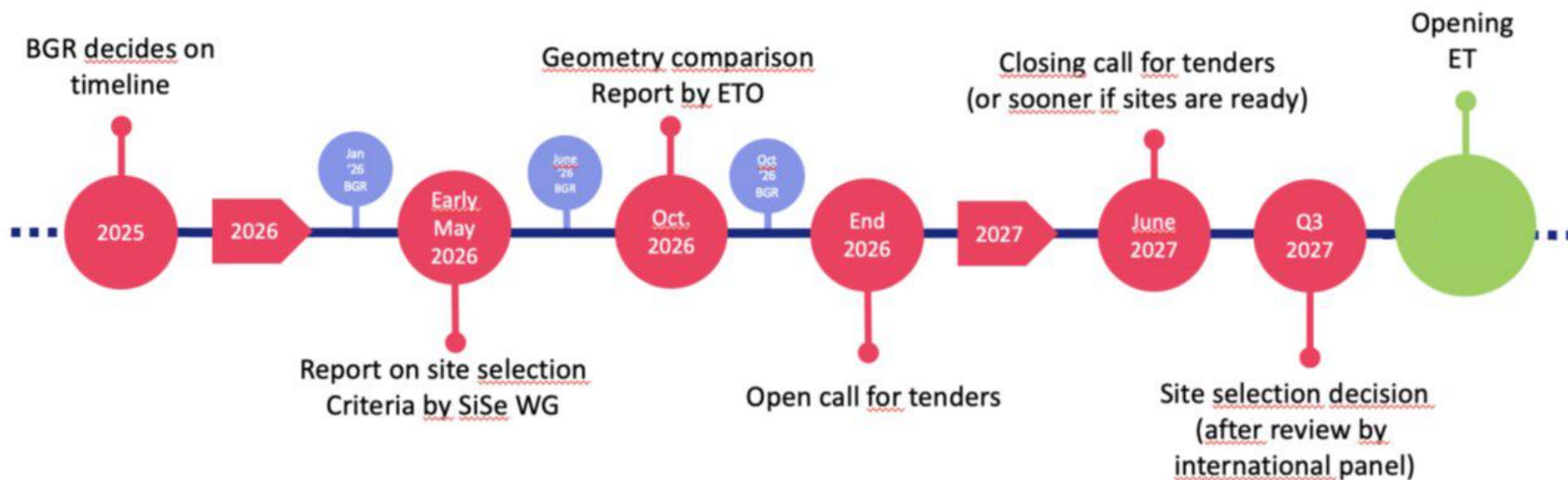
- “The ET Baseline Detector Layout”, 78 pages
- “Supporting Document for the ET Baseline Detector Layout”, 205 pages

Some key outcomes:

- Filter cavity in the main tunnel
- Reduced Input Mode Cleaner length
- Reshuffling of central interferometer
- Reduction of benches footprint and tower height

Volume reduced by ~25% from 2024 reference layout (both triangle & 2L)

Better definition of technical infrastructure (cryogenics, clean rooms, noisy rooms)



@A. Harrisson

4 subgroups have been set up, with agreed scope and terms of reference and all but 1 (SG4) have started work: it proved challenging to find Chairs for some SGs, but this has now been resolved

SG areas

Scope of SG work

1	Scientific and technical requirements of the detector
2	Civil works, environment and geology
3	Contextual factors: ecosystem, community and connectivity
4	Overall costings and finance

- Refine drafted criteria, develop definitions and propose initial weightings/minimum conditions to be met
- Define the information or evidence to be gathered for bidbooks, including the methodology to be used, assessment of risks and uncertainties where relevant, and the nature of any validation processes required

Sub Groups 1 and 2: scopes

Scientific and technical requirements of the detector

- **Noise**
Maximum admissible levels to ensure compliance with ET sensitivity requirements
 - Seismic noise:
 - Newtonian noise:
 - Magnetic noise:
 - Other relevant environmental/anthropogenic source
 - Geological and geophysical characteristics
- **E-Infrastructure**
Include infrastructure for low-latency data processing on or near the site of the detector and also for connections with equipment for later-stage data analysis.
- **Costings**

Civil works, environment and geology

- **Reliability and stability of the underground environment hosting the infrastructure**
- **Construction methods and the achievable level of functionality and performance of the infrastructure**
- **Authorization issues**
- **Costs, timelines and implementation methods for construction**
- **Expected environmental impacts due to construction**

Sub Groups 3 and 4: outline scopes

Contextual factors: ecosystem, community and connectivity

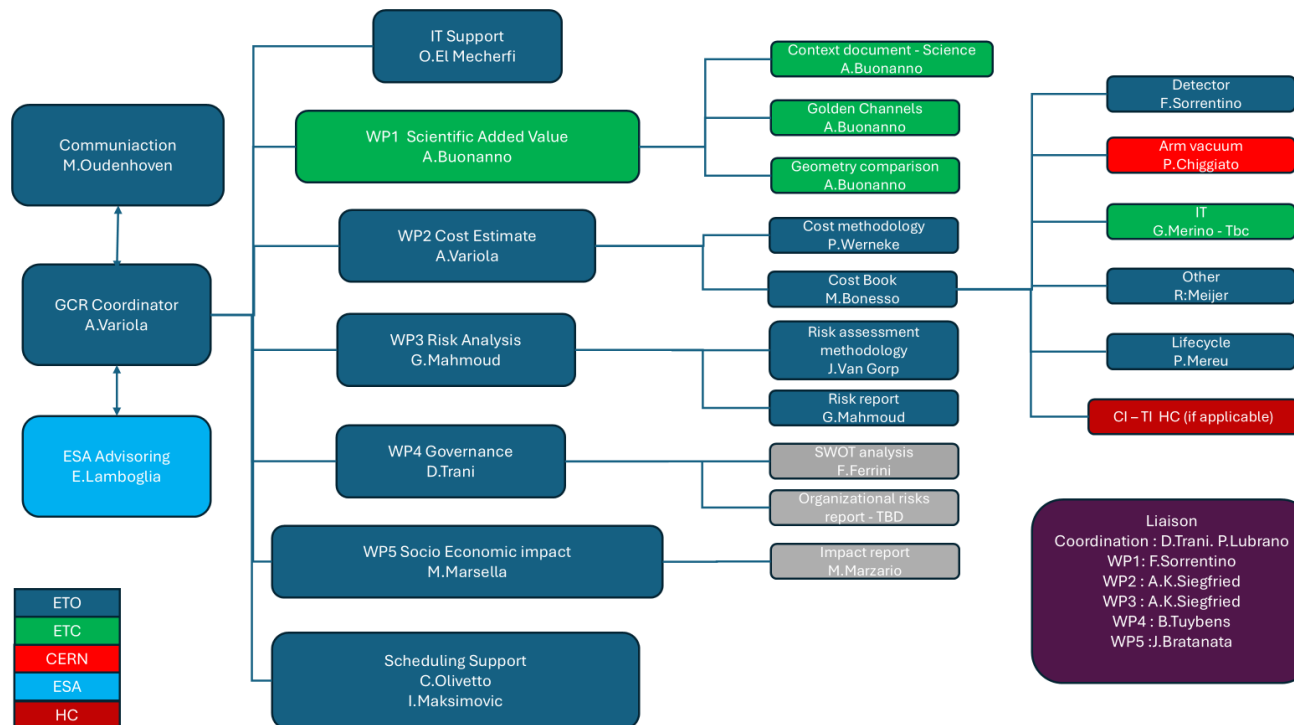
- **'Deliverability' by the local team**
- **Ecosystem and socio-economic impact**
- **Human/social issues**
- **Connectivity and accessibility for construction and operations**
- **Costs**

Overall costs and financing

- **Overall cost of the ET-project for delivery, drawing on SG1, SG2 and SG3 inputs with methodology to determine costs, risks and contingency in a manner acceptable to all potential Members**
- **Financial terms offered by the potential host(s)**

Next steps

- | | |
|--|---------------|
| 1. SGs to report back on their criteria, including definitions/methodology, acceptable ranges and validation methods where relevant, and weighting scheme, noting that the methodology for the last of these is still an open question | May-June 2026 |
| 2. The decision procedure, including timeframe and intermediate steps. | May-June 2026 |
| 3. Overall report to be put together for submission to the BGR | August 2026 |



Work towards GCR structured as a project to deliver documents providing an analysis of:

- Scientific added value
- Costs and their lifecycle
- Risks
- Governance
- Socio-economic impact.



28 MARCH 2026
ESA and ETO partner on cost estimation methodologies

<https://einsteintelecope.eu/news/esa-and-eto-partner-on-cost-estimation-methodologies>

@M. Martinez

Recent highlights

<https://indico.cern.ch/e/ETSustainability2026>

Deliverable D3.1
Financial considerations for the design and construction phase

Lead beneficiary: UCLouvain
Delivery Date: February 2026
Dissemination level: public
NAME: ET-PP-Deliverable-D3.1
Version: 0.1

This project has received funding from the European Commission Framework Programme Horizon Europe Coordination and Support action under grant agreement 101079696.

Deliverable 9.2
Environmental Impact Assessment and Mitigation Strategy

Lead beneficiary: B2M
Delivery Date: 01 Dec 2025
Dissemination level: public
NAME: ET-PP-Deliverable-02.2
Version: 1.0.0

This project has received funding from the European Commission Framework Programme Horizon Europe Coordination and Support action under grant agreement 101079696.

Deliverable 9.3
CO2 Footprint Assessment and Mitigation Strategy

Lead beneficiary: ISO
Delivery Date: 30/06/2026
Dissemination level: public
NAME: ET-PP-Deliverable-9.3
Version: 0.0

This project has received funding from the European Commission Framework Programme Horizon Europe Coordination and Support action under grant agreement 101079696.

EINSTEIN TELESCOPE RESEARCH INFRASTRUCTURE: CHALLENGES AND LONG-TERM SUSTAINABILITY

16 - 17 FEBRUARY 2026 | SAPIENZA UNIVERSITY, ROME | GIORGIO SAN PIETRO IN VINCOLI

Key topics:
• Life cycle sustainability assessment
• Sustainable transportation and smart energy systems
• Efficient operational strategies
• Advanced technological innovation solutions
• Social impact strategies and participatory design
• Industry engagement and sustainable procurement

PROGRAM COMMITTEE:
Nicola Belluardo (CERN), Massimo Bignardi (CERN), Giovanni C. Caporaso (IFG), Giovanni Caporaso (IFG), Andrea Falanga (CERN), Paolo Ferraro (CERN), Roberto Giamberini (CERN), Luca Invernizzi (CERN), Marco Mariani (CERN), J. J. O'Connell (CERN), Thomas Schmitt (CERN), William Strohriegl (CERN)

EVENT ORGANISERS:
Claudia Cacciari, Francesco Cossu, Francesca Scuderi

INFO: <https://indico.cern.ch/e/ETSustainability2026>

ET blue book published
<https://arxiv.org/abs/2503.12263>
JCAP03 (2026) 081

arXiv:2503.12263
General Relativity and Quantum Cosmology
Published on 13 Mar 2025

The Science of the Einstein Telescope

Adrian Alvir, Paul Anderson, Mirco Andronico, Angelika Albertini, Alessandro Agostini, Michela Agulhies, Corrado Albonetti, Nik Antonenko, Tomás Andreoli, Igor Antonov, Federico Angelini, Marco Antonini, John Anderson, Fabio Anzani, Manuel Arca-Resta, M. Cabañas-Ardele, Stefano Anzani, Pierre Augier, Matteo Baruffi, Charles Bagley, Edoardo Barone, David Barua-Cabrera, Daniel Barua, Nicola Barua, Andrea Barua, Andrea Baglioni, Fraja Baranov, Mattia Baggi, Eric Baglioni, Nicola Barbone, Luca Barone, Maria Grazia Barone, Sebastiano Barone, Christopher P. L. Berry, Emanuele Baric, Giordano Barone, David Barone, Miguel Barone, Jaeha Baeg, Sofia Baroni, Maria Anna Ricciardi, José J. Blanco-Piñedo, Simone Bar, Aldo Baroni, Aino Bergman, Nicola Bergi, Sachin Berhanoo, Elia Berio, Maria Teresa Berio, Marco Brambilla, Matteo Brancati, Roberto Brini, Emilio Brusa, Florin B. Bruckmann, Tomislav Bulj, Alessandro Buonanno, Ferenc Bugli, Adam Burrows, Gabriel Cagnoli, Sofia Caporaso, Enrico Caporaso, Guido Caporaso, Carmela Carbone, Indrani Casadei, Ramon Casanova, Pablo Carda-Durán, Pasquale Chir, Sylvain Chiray, Tommaso Chiarani, Martina Chiriacchini, Francesco Ciavola, Philippe Cole, Alberto Colombo, Monica Conci, Geoffrey Conway, Carlo Conti, Riccardo Corbelli, Francesco Corbelli, Sergio Cristofari, Ramon Cuba, Giulio Cusi, Tito Dal Canton, Georgiy Diblak, Paolo D'Avanzo, Niccolò De Luca, Valdo De Renzi, Massimo Della Valle, Walter Del Pozzo, Federico De Santis, Alessio Lodato, De Santis, Tomáš Džurák, Erna Dimandjajevska, Gudrun Domenech, Daniela Donova, Marco D'Onofrio, Ursula Dupertuis, Harshad Dvornik, Nina Dvornik, Nancy Ebla-Pouso et al. (385 additional authors not shown)

Very significant progress in the last months and the preparation / production of key documents

- Financial model for design and preparatory phase
- Computing model
- Environmental Impact
- C02 footprint
- Detector preliminary TDR

Three important workshops taking place in the framework of ET-PP industrial perspective

- Sustainability (last week @ Rome)
- Vacuum and Cryogenics. (April @ CERN)
- Computing (April @ NIKHEF)

<https://indico.cern.ch/event/1605739/>

Einstein Telescope Vacuum and Cryogenics Industrial Workshop: opportunities and challenges

02-04 April 2025

The purpose of the workshop is to bring together the leading industrial actors, discussing the current state of the art, the challenges and the opportunities in the field of vacuum and cryogenics for the Einstein Telescope. The workshop will be held in a hybrid format, with a physical meeting in person and a virtual meeting online.

ET Industry Computing Workshop

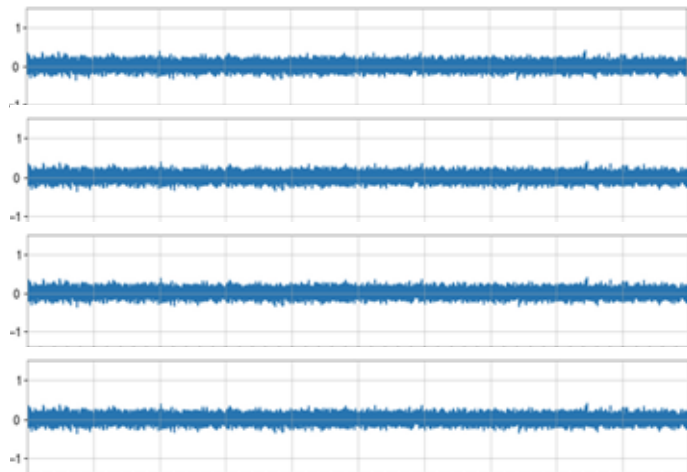
02-04 April 2025

The purpose of the workshop is to bring together the leading industrial actors, discussing the current state of the art, the challenges and the opportunities in the field of computing for the Einstein Telescope. The workshop will be held in a hybrid format, with a physical meeting in person and a virtual meeting online.

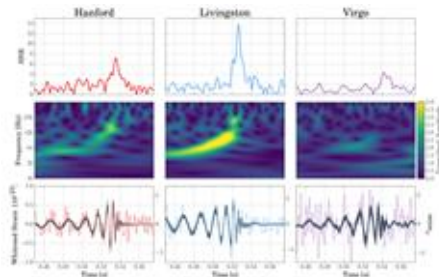
<https://indico.cern.ch/event/1604489/>

ET-PP docs available on : <https://etpp.ifaef.es/deliverables-milestones/>

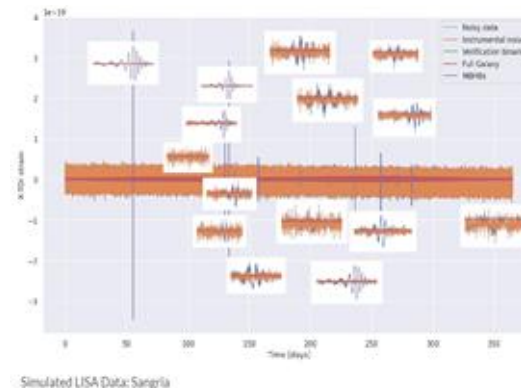
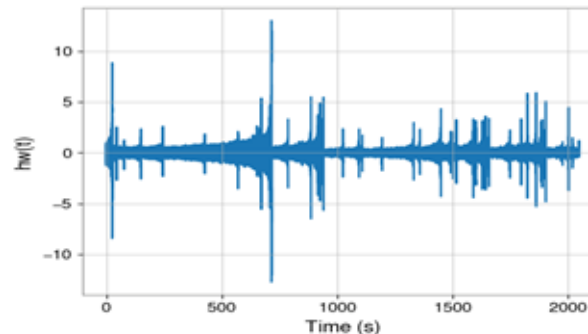
2G : LVK are dominated by backgrounds



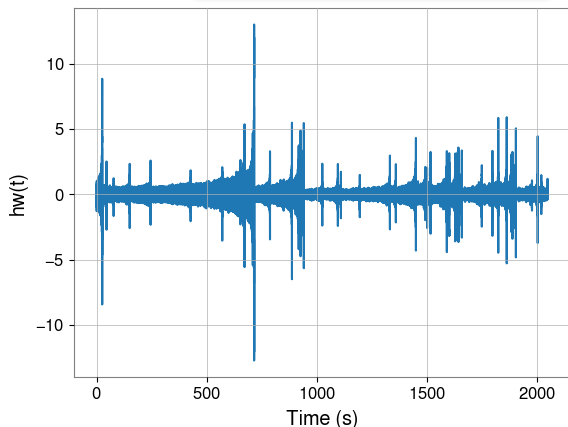
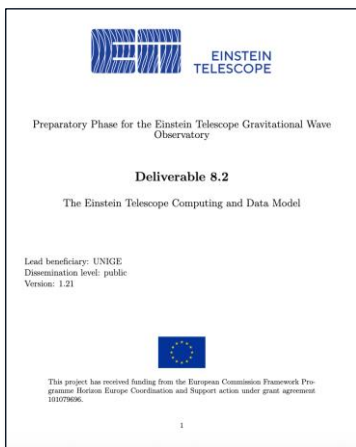
And 2-3 times per week



ET and LISA will be dominated by signals



Dataset size won't change so much
Complexity and computing power to reduce the data
and reconstruct events will increase a lot



Regimbau, Suresh arXiv:2506.12237

ET with Cosmic Explorer (3G in the US) in a network for multi-messengers astrophysics



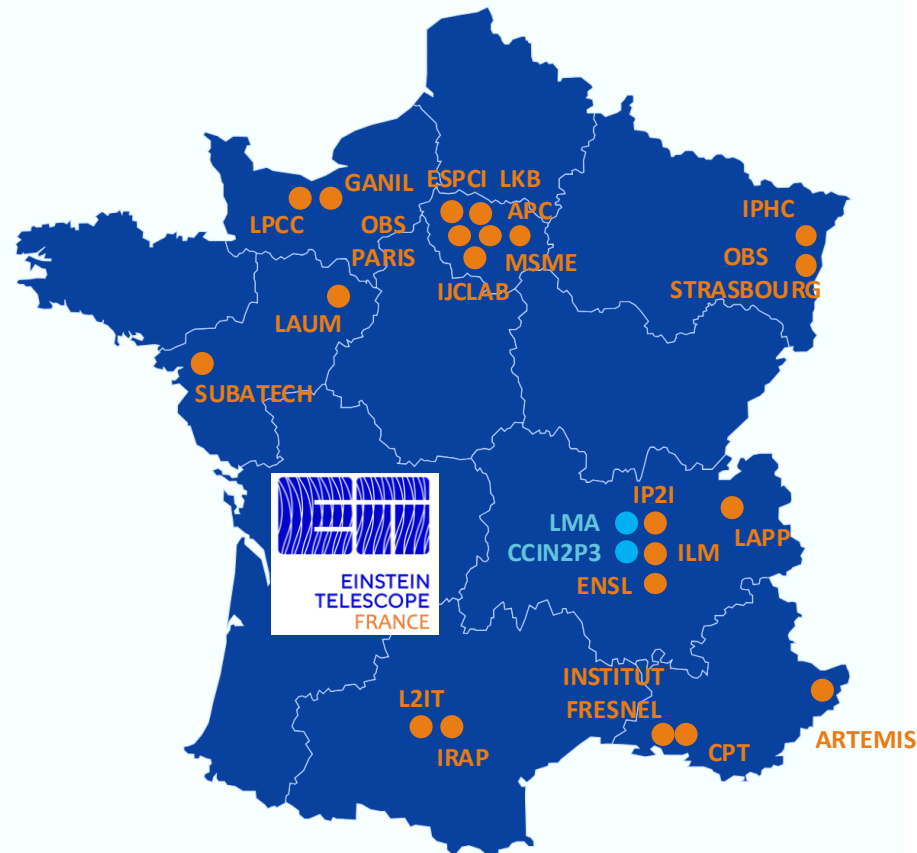
- Data format & management
- Online, low-latency, offline computing
- Simulation and MDCs
- AI/ML techniques
- Develop CC-IN2P3 usage for GW physics
- Usage of HPC resources
- Trainings
- ...

4 CNRS Institutes: IN2P3, INP, INSIS, INSU

ET-France web site: <https://et-france.in2p3.fr>

154 French collaborators officially joined
the ET Collaboration
(~2/3 are also members of Virgo)

Organized in **8 Research Units** :
FTE threshold to get 1 voting voice at
the ET Collaboration Board



New RIs for Roadmap
2021 announced

The ET project entered the
ESFRI roadmap in 2021

ET is a strong priority in the French
strategic plan for Nuclear, Particle, and
astroparticle physics (2021)

« Participate in the 3G GW interferometer
development guided by the leveraging of
French Virgo expertise and facilities. »



- Almost 40% of survey answers mentioning gravitational-waves
- Einstein Telescope is the most cited experiment, followed by LISA and Virgo
- *Based on the survey, ET stands out as the most indicated next-generation infrastructure to be included in the roadmap.*
- *It is of interest not only to the GW community but also to a broader range of astroparticle scientists*

European FAs are working together towards an integrated European R&D roadmap for ET



Einstein Telescope is applying to enter this roadmap

- April 2025: eligibility application – **OK**
- July 2025: application to enter as IR
- October 2025: audition by the GT PNHE

Next steps:

End of October 2025 : WG evaluation

February 2026: decision at MESR

April 2026 : validation of the final list by CD TGIR

Final publication: September 2026

Being on the French roadmap for Research Infrastructures is a mandatory step, but non sufficient to get an ET budget:

- If IR* label => ET is a budget line in French national budget
- If IR label => ET's budget will come from CNRS budget

ET-France is asked, both by CNRS and MESRE/DGRI, to provide by summer 2026 :

- Detailed information about ET-France contributions to the preparation of ET:
 - “what, who, where, how” ...
 - How do ET-France exploit existing expertise/know-how, R&D and computing platforms/labs ?
 - How ET-France is connected to the French landscape: Virgo, LISA, GDR OG, AISSAI, ...
- An organization chart (next slide) :
 - with identified responsibilities and people in charge
 - including governance and steering mechanisms
 - Including all mandatory transverse actions for a large RI like ET:
 - Project management, Sustainability & environmental impact, Industrial partnership, communication

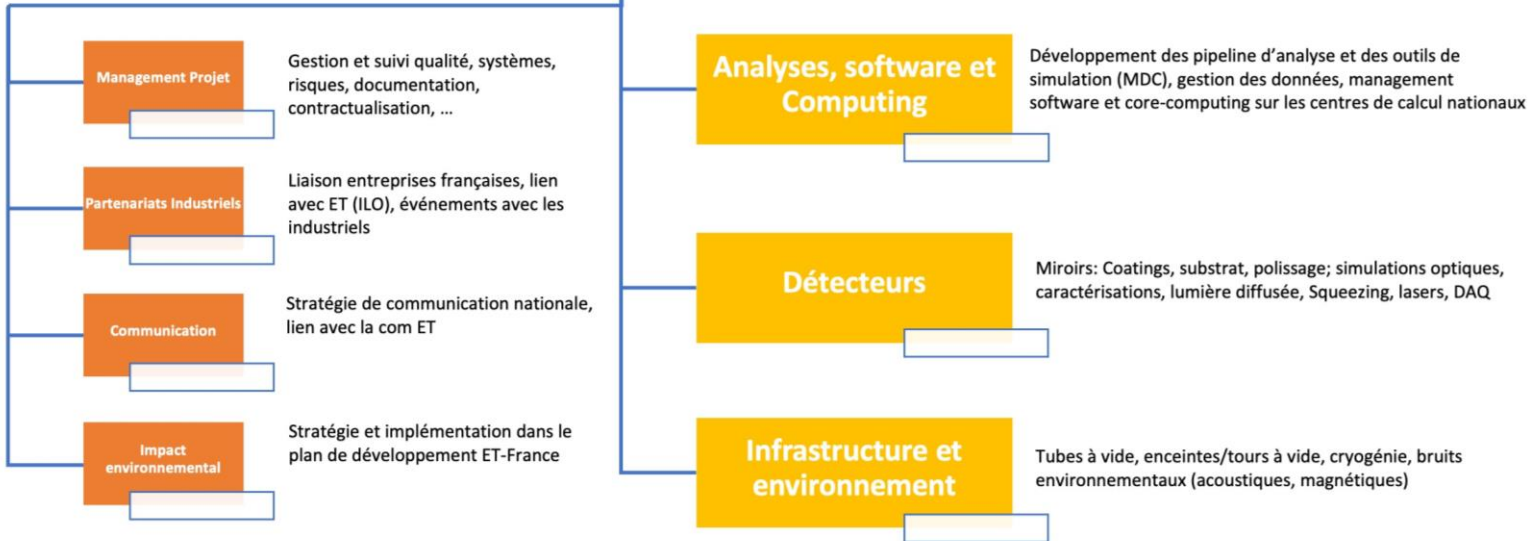
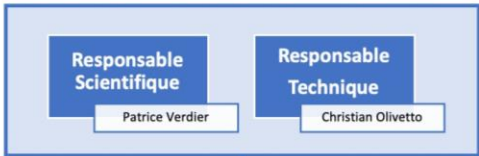
=> Elaboration of a document for the summer 2026 => workshop to prepare that document !!!



MESRE/DGRI

Steering committee:
(Entretien Annuel Projet)
CNRS Institutes (+ other organisms)

Advisory Scientific
Committee (?)



1.5 days of presentations

Welcome	
Bâtiment 200 - Salle 101, IJCLab	13:30 - 14:00
Impact of the rotation of the Earth on the detection of signals of long durations for ET	
Bâtiment 200 - Salle 101, IJCLab	14:00 - 14:20
Modelling and detection of gravitational-wave and neutrino signals from core-collapse supernovae	
Bâtiment 200 - Salle 101, IJCLab	14:20 - 14:40
Discussion Session 1: Searches, Parameter Estimation, and Global Fit	
Tito DAL CANTON	
Bâtiment 200 - Salle 101, IJCLab	14:40 - 15:30
Discussion Session 2: Population Inference and Cosmology	
Michele Mancarella	
Bâtiment 200 - Salle 101, IJCLab	15:30 - 15:50
Pause café	
Bâtiment 200 - Salle Bleue, IJCLab	16:30 - 17:00
Environmental impact and sustainability: summary of ET's approach	
Disha Sawant	
Bâtiment 200 - Salle 101, IJCLab	17:00 - 17:20
Impact Environmental : discussion	
Bâtiment 200 - Salle 101, IJCLab	17:20 - 17:45
Communication in ET	
Jerome DEGALLAIX	
Bâtiment 200 - Salle 101, IJCLab	17:45 - 18:05
Communication ET-ET-France: Discussion	
Bâtiment 200 - Salle 101, IJCLab	18:05 - 18:30

09:00	Support Einstein Telescope and Prototype of Tube	Alexandre Lacroix
	Bâtiment 200 - Salle 101, IJCLab	09:00 - 09:25
	Modélisation du bruit newtonien d'origine acoustique dans les cavernes terminales d'ET	Lionel Maurin
	Bâtiment 200 - Salle 101, IJCLab	09:25 - 09:50
10:00	Intégration 3DExperience, simulations des tours	Grégory Iaquaniello
	Bâtiment 200 - Salle 101, IJCLab	09:50 - 10:15
	CryoMat : plateforme de caractérisation des matériaux à basse température	Patxi DUTHIL
	Bâtiment 200 - Salle 101, IJCLab	10:15 - 10:40
	Pause café	
11:00	Bâtiment 200 - Salle Bleue, IJCLab	10:40 - 11:10
	Mirror substrates for ET-LF and HF	Severin Nadjj
	Bâtiment 200 - Salle 101, IJCLab	11:10 - 11:30
	Coating pour ET	Benoit Sassolas
	Bâtiment 200 - Salle 101, IJCLab	11:30 - 11:50
12:00	Calibration pour ET	Benoit Mours
	Bâtiment 200 - Salle 101, IJCLab	11:50 - 12:10
	Acquisition de données et control temps réel: exploiter l'héritage de Virgo	Sebastien Vret
	Bâtiment 200 - Salle 101, IJCLab	12:10 - 12:30
14:00	Bancs suspendus, plateformes de R&D et développements associés	Loic Rolland
	Bâtiment 200 - Salle 101, IJCLab	14:00 - 14:20
	High power lasers and PI mitigation	Margherita Turconi
	Bâtiment 200 - Salle 101, IJCLab	14:20 - 14:40
	Bancs pour la caractérisation de la lumière diffusée	M. Frederic Cleva
	Bâtiment 200 - Salle 101, IJCLab	14:40 - 15:00
15:00	Metrologie pour les miroirs: mesure de bruit thermique, points absorbants	Antoine SYX
	Bâtiment 200 - Salle 101, IJCLab	15:00 - 15:20
	États comprimés du vide	Isander-Louis AHREND
	Bâtiment 200 - Salle 101, IJCLab	15:20 - 15:40
	Simulations optiques et caractérisation optique	Clément JACQUET
	Bâtiment 200 - Salle 101, IJCLab	15:40 - 16:00
16:00	Pause café	
	Bâtiment 200 - Salle Bleue, IJCLab	16:00 - 16:30
	Management de projet: ETO Project Office	christian olivetto
	Bâtiment 200 - Salle 101, IJCLab	16:30 - 16:50
17:00	Management de projet: discussion	
	Bâtiment 200 - Salle 101, IJCLab	16:50 - 17:15
	Industrial Partnership: ET-PP WP7 and ET 2026 action plan	Rob Van der Meer
	Bâtiment 200 - Salle 101, IJCLab	17:15 - 17:35
	Partenariats industriels: discussion	
	Bâtiment 200 - Salle 101, IJCLab	17:35 - 18:00
18:00		

Half a day of working session and preliminary restitution

09:00	Session parallele: WG1 Analyse, Software et Computing	Session parallele: Détecteurs	Session parallele: Infrastructure et environnement
10:00			
11:00	Bâtiment 200 - Salle 139, IJCLab 09:00 - 11:30	Bâtiment 200 - Salle 101, IJCLab 09:00 - 11:30	Bâtiment 200 - Salle 129, IJCLab 09:00 - 11:30
	Pause café		
	Bâtiment 200 - Salle Bleue, IJCLab 11:30 - 11:45		
	Restitutions : Analyses, Software et Computing		
	Bâtiment 200 - Salle 101, IJCLab 11:45 - 12:00		
12:00	Restitution: Détecteurs		
	Bâtiment 200 - Salle 101, IJCLab 12:00 - 12:15		
	Restitution: Infrastructures et environnement		
	Bâtiment 200 - Salle 101, IJCLab 12:15 - 12:30		
	Restitution: 4 axes transverses		
	Bâtiment 200 - Salle 101, IJCLab 12:30 - 12:50		
	Final last words		
	Bâtiment 200 - Salle 101, IJCLab 12:50 - 13:00		
13:00			

We go back to our labs with a working plan and on organization to elaborate our ET-France document