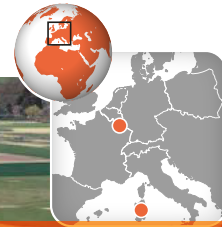
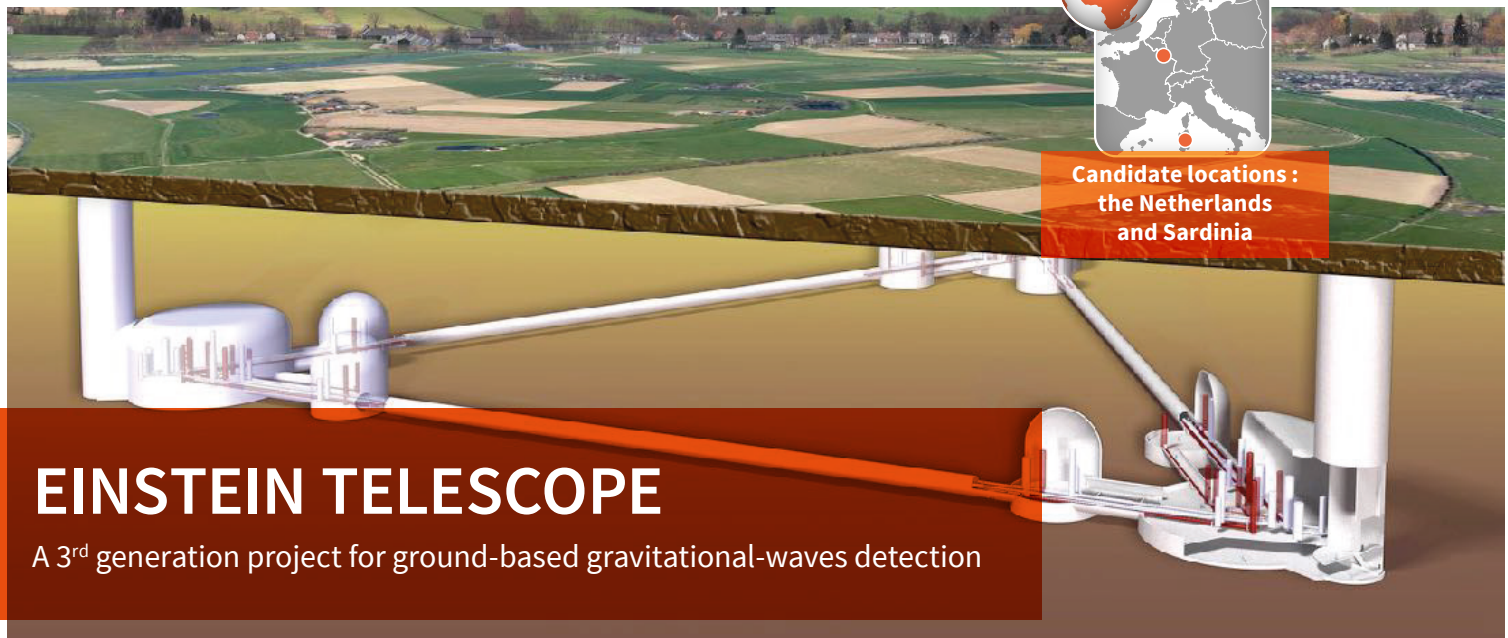


## Gravitational waves



Candidate locations :  
the Netherlands  
and Sardinia



# EINSTEIN TELESCOPE

A 3<sup>rd</sup> generation project for ground-based gravitational-waves detection

© The Virgo collaboration

- **Scientific leader:** Patrice Verrier (IP2I) \*
- **Laboratories involved:** APC (Paris), CC-IN2P3 (Lyon), GANIL (Caen), IJCLab (Orsay), IPHC (Strasbourg), IP2I (Lyon), L2IT (Toulouse), LAPP (Annecy), LMA (Lyon), LPC (Caen), SUBATECH (Nantes)
- **Nature:** research infrastructure
- **Statut :** ESFRI european project
- **Website:** <https://www.et-gw.eu> and <https://et-france.in2p3.fr>

### SCIENTIFIC OBJECTIVES

Einstein Telescope (ET) is a European research-infrastructure project (ESFRI) to host a 3<sup>rd</sup> generation gravitational waves observatory by 2035. It is based on the success of the 2<sup>nd</sup> generation interferometers Advanced Virgo and Advanced LIGO whose discoveries on black hole and neutron star fusions have revolutionised our knowledge of the Universe and the methods to study it. Einstein Telescope will improve the sensitivity by increasing the size of the interferometers, from 3 km long arms for Virgo to 10 km for ET, and by implementing a series of new technologies currently under development. Einstein Telescope will enable us to explore the Universe from the Big Bang to the dark ages through gravitational waves and answer open questions in the fields of fundamental physics and cosmology. On the ESFRI European roadmap since 2021, the ET project is in its preparatory phase which plans the start of the construction in 2026 with the goal to start data taking by 2035.

### RESOURCES DEPLOYED

- Six Michelson interferometers in a triangle configuration with 10 kilometre long arms, three for high frequencies and three for low frequencies operated at cryogenic temperatures.
- 120 kilometres of vacuum pipes in a 150 to 200 metre deep facility.
- An international collaboration network, including data exchanges and common publications.

**10 km** length of each arm

**6** Michelson interferometers

**120 km** of vacuum pipes

**23** participating countries

**202** research groups

### IN2P3 CONTRIBUTIONS

- R&D and design of the interferometer: data acquisition system and real-time control, calibration, noise characterization.
- R&D on core and input-output optics.
- R&D on optical mirror coatings and optical metrology systems.
- R&D on crystalline substrates for mirrors.
- R&D on the system for squeezed states of light.
- R&D and design of the vacuum tube system and cryogenics.
- Simulations and preparation of data analyses.
- Preparation of the computing model and development of the associated software.
- Implementation of the "Project Office" of the ET infrastructure.

### OTHER FRENCH LABORATORIES INVOLVED

Artemis (Nice), GEPI (Paris), ILM (Lyon), IAP (Paris), Institut Fresnel (Marseille), INSP (Paris), LUTH (Meudon), SYRTE (Paris), LKB (Paris)

**2005**

Founding workshop of the ET concept

**2011**

ET Conceptual Design Report

**2021**

ET on ESFRI

**2022-2026**

Preparatory phase of ET

**2026**

Start of the construction

**2035**

Start of data recording