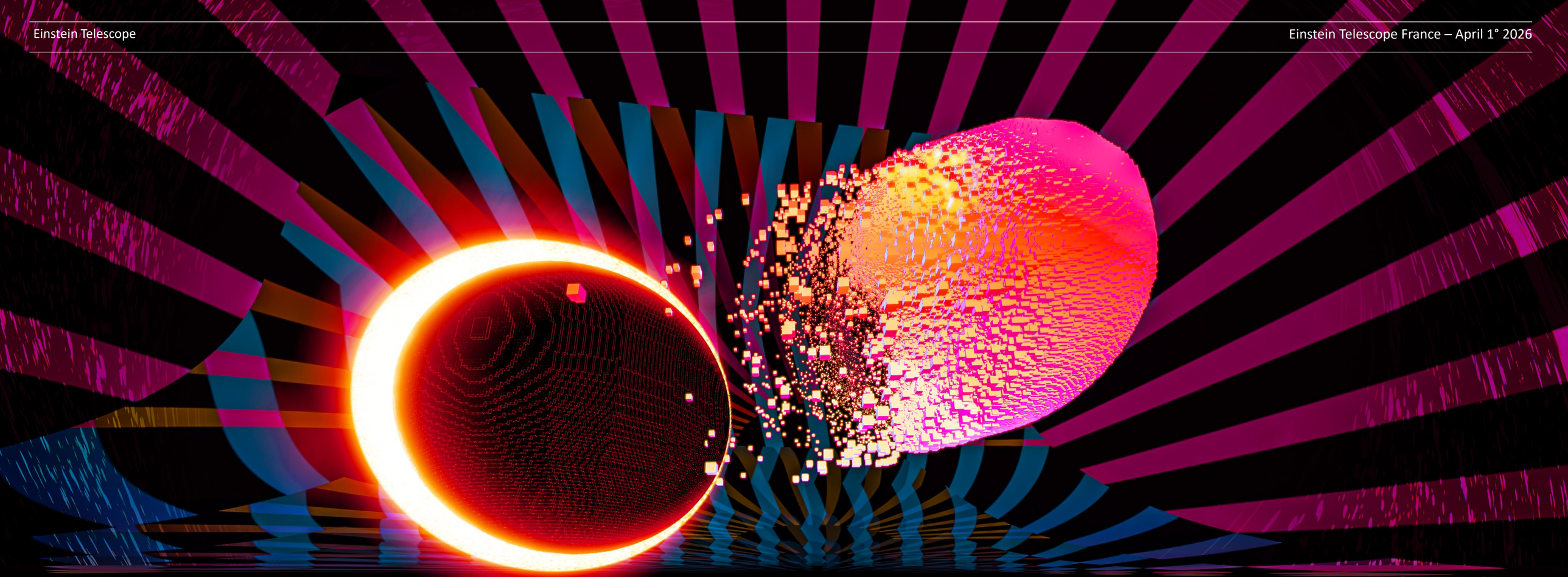


Einstein Telescope France – April 1° 2026 – dr. Rob van der Meer, Nikhef, NL

EINSTEIN TELESCOPE

Engage. Innovate. Explore.

ET-PP WP7
objectives and deliverables [1]

- Study and prepare for after the ET-PP project:
  - KTT = Knowledge & Technology Transfer including the promotion of innovative technologies connected to the ET project;
  - IP = Intellectual Property and the proper management of this before and during operation of ET;
  - establishing the liaisons with industry to maximize the industrial returns;

ET-PP WP7 objectives and deliverables [2]

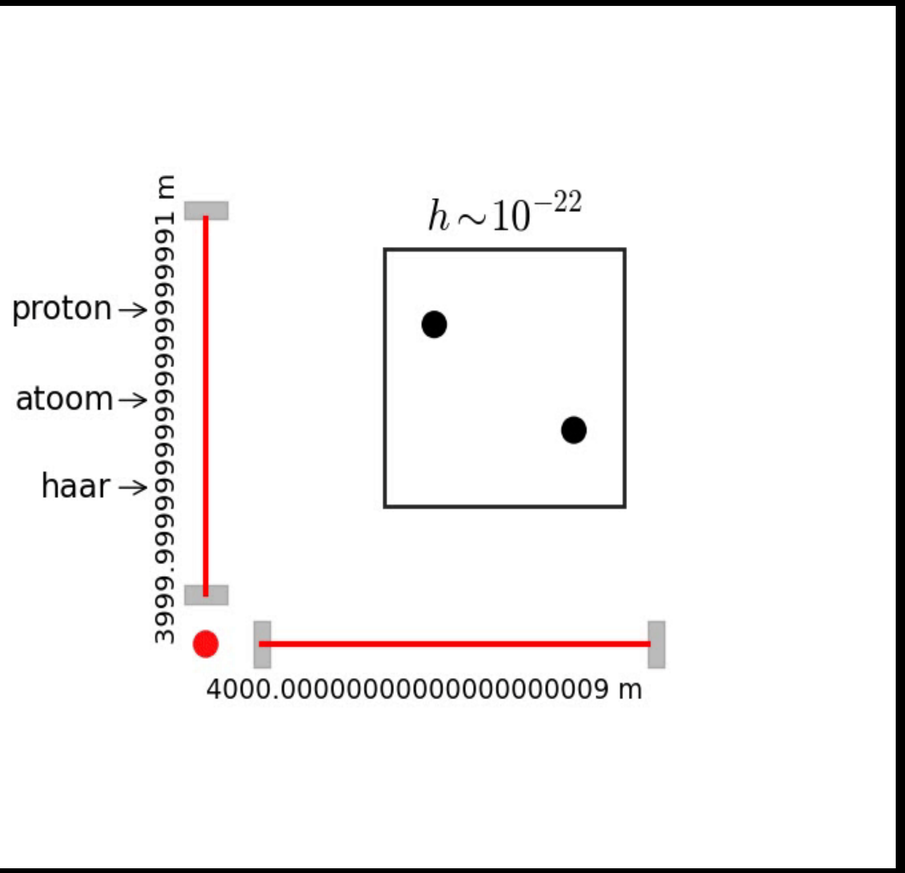
- D7.1 Innovation Plan [public]
  - The core of the plan is structured around a series of baseline actions to promote innovation from Procurement, Collaborative R&D, IP Protection and Entrepreneurship perspectives.
- D7.2 Report on industry engagement plan execution; [June 2026]
- D7.3 Model for pursuing in ET a balanced industrial return; [restricted]
  - Based on other RI/BSO – for BGR to decide on legal frame;
- D7.4 Report on TT and Intellectual property management in ET; [May 2026]

https://etpp.ifae.es/deliverables-milestones/

ET-PP WP7
Innovation and industry engagement

- Engaging European companies to prepare for ET challenges
  - Understanding the field
  - Organising webinars (for ILO’s and one on vacuum) and
  - workshops
    - Sustainability – Rome – Feb. 2026
    - Vacuum & Cryogenics – CERN – April 21 2026 (limit reached)
    - Computing – Nikhef Amsterdam – April 14-15 2026 (closes 7 April)

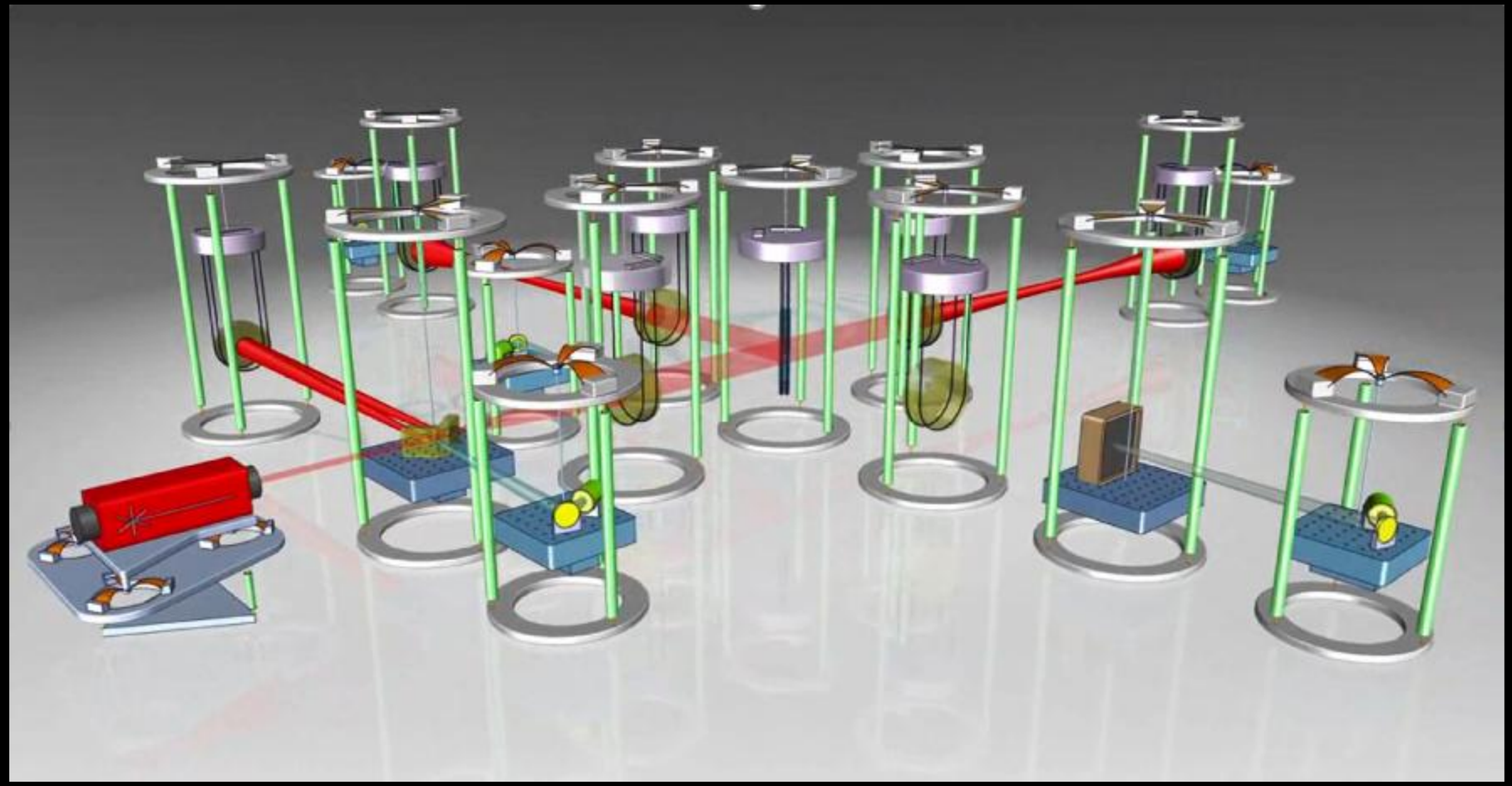
Detection Principle: laser interferometry



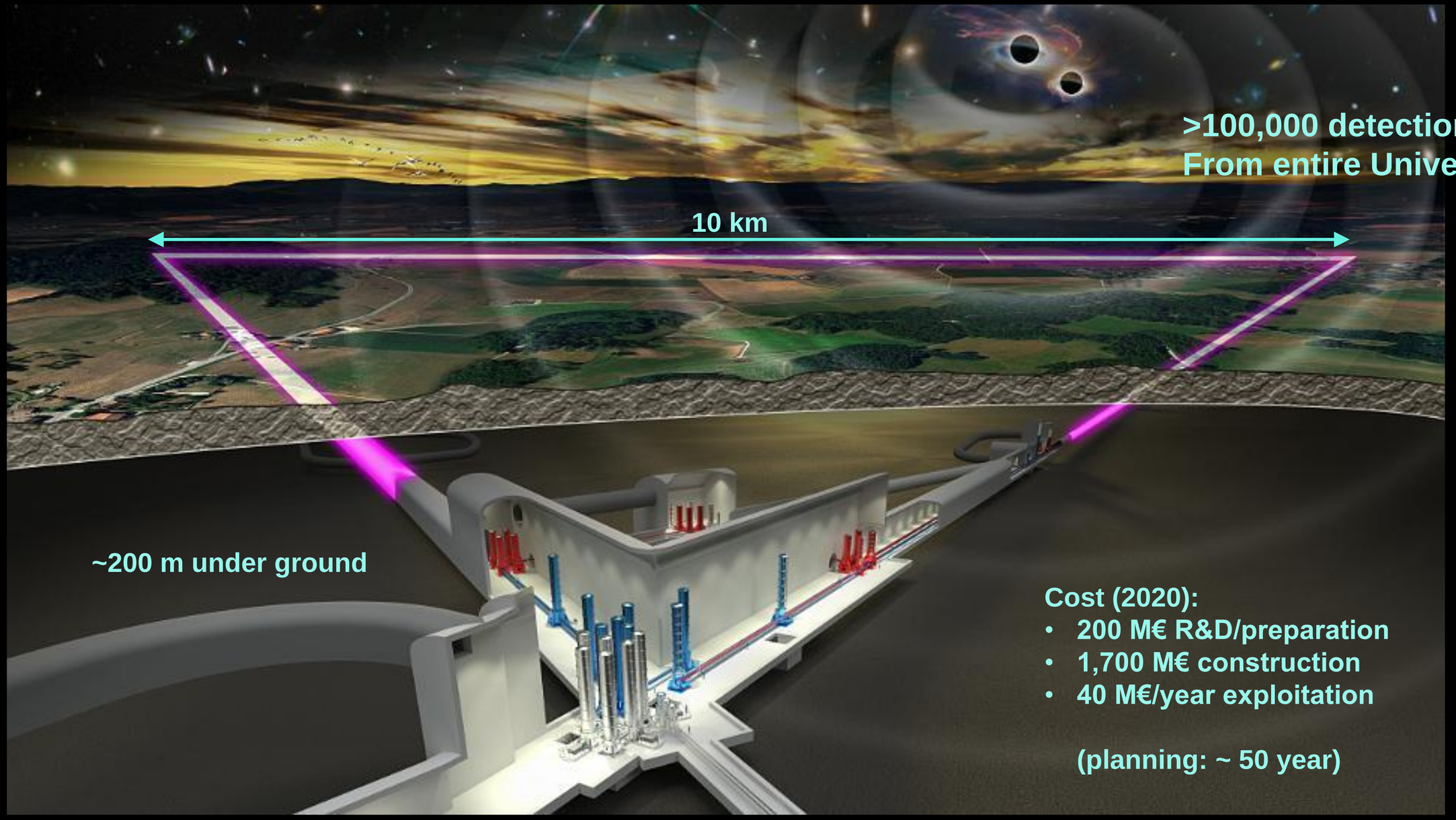
Reality =
permanent fight against noise:

- Laser (in)stability
- imperfect mirrors
- (seismic, thermal, …) vibrations
- stray light
-imperfect vacuum
-imperfect aligning
-quantum noise
-etc. etc.

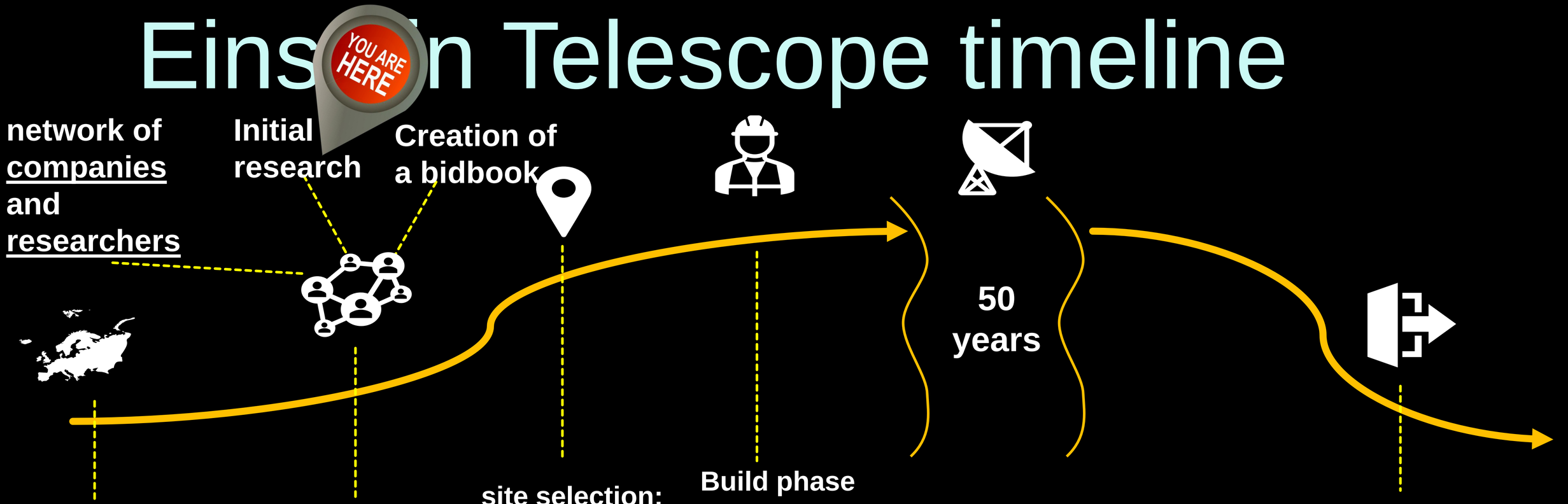
Fighting the noise in VIRGO



Dr. Rob van der Meer, Nikhef - NL


>100,000 detections/year
From entire Universe!
10 km
~200 m under ground
Cost (2020):
• 200 M€ R&D/preparation
• 1,700 M€ construction
• 40 M€/year exploitation
(planning: ~ 50 year)

Einstein Telescope timeline



Where to find the budgets?

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- Observation: High interest from the public, and companies
- Questions from the companies: how can we help?
  - AKA: “What can we sell?”
- The Einstein Telescope is still carried by the knowledge institutes
  - Little involvement of companies
  - Reason: companies still need to co-invest

Where to find the budgets?

Through subsidized research

- European regulations on subsidies apply
  - Typically companies invest 50% and 50% is subsidized
  - Collaborations between companies and knowledge institutes
- Results are shared and owned by partners
- E.g. Interreg, local subsidies ...
- Research (lower TRL), or engineering work

Through tenders

- Tenders apply Europe wide
  - Companies in all European countries can apply
  - E.g. construction work, tunnels and caverns, ...
- Calls are published
- Typically high TRL during construction or operational phase

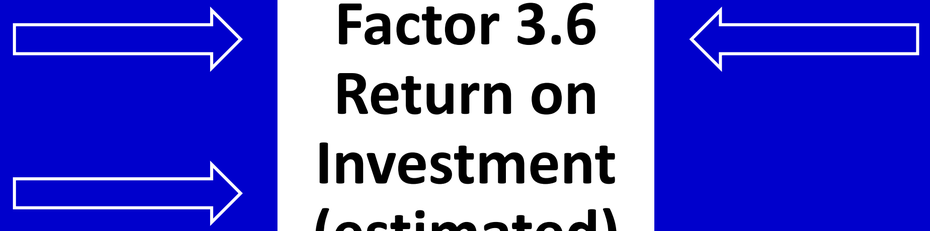
Return on investment expected

First order effects

- **Short term (build phase)**
- **Workforce income**
- **Tax on income**

Second Order Effects

- **Short and long term**
- **New markets**
- **New skills**



Ecosystem Effects

- **Long term (lifetime telescope)**
- **Spin-offs**
- **New technologies**
- **Patents**
- **Knowledge transfer**

Local initiatives

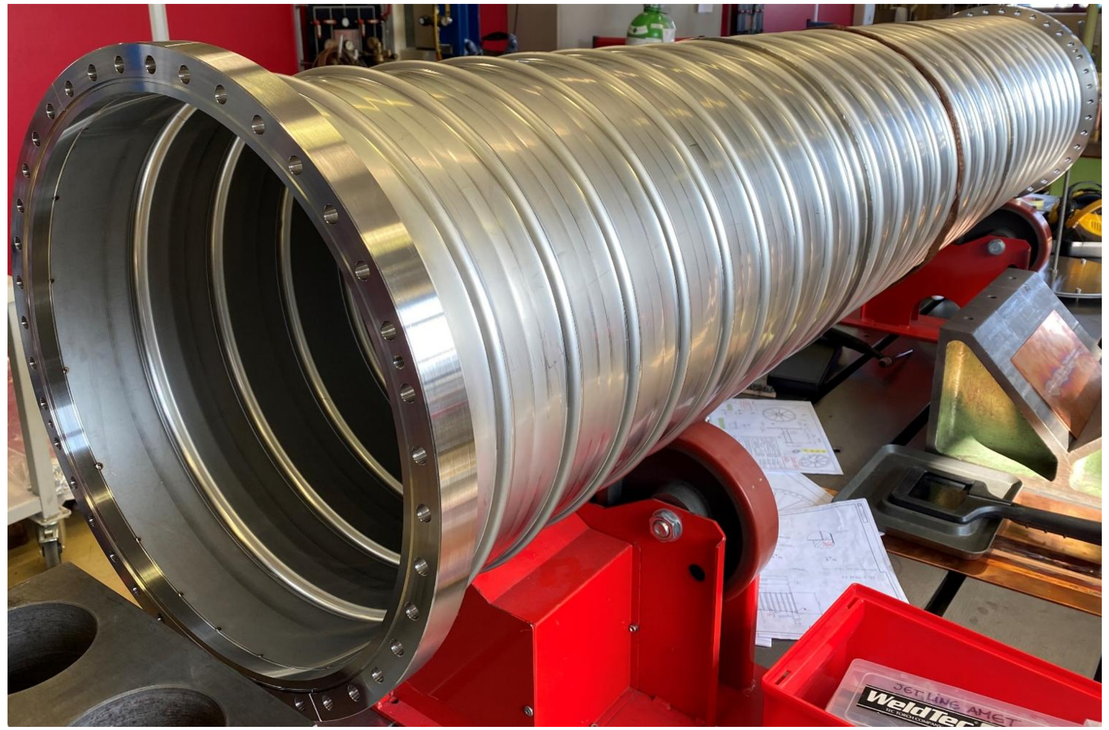
Up till now (since 2015) only ‘local’ initiatives to engage industry – with ‘local’ money:

- NL, BE, DE: national and Interreg (NL/VL + EMR + DE-NL) money;
- IT: national money;
- @CERN (ET beam pipe vacuum): IT + NL funding body money;

It might take until after the site decision for centrally organized and funded R&D.

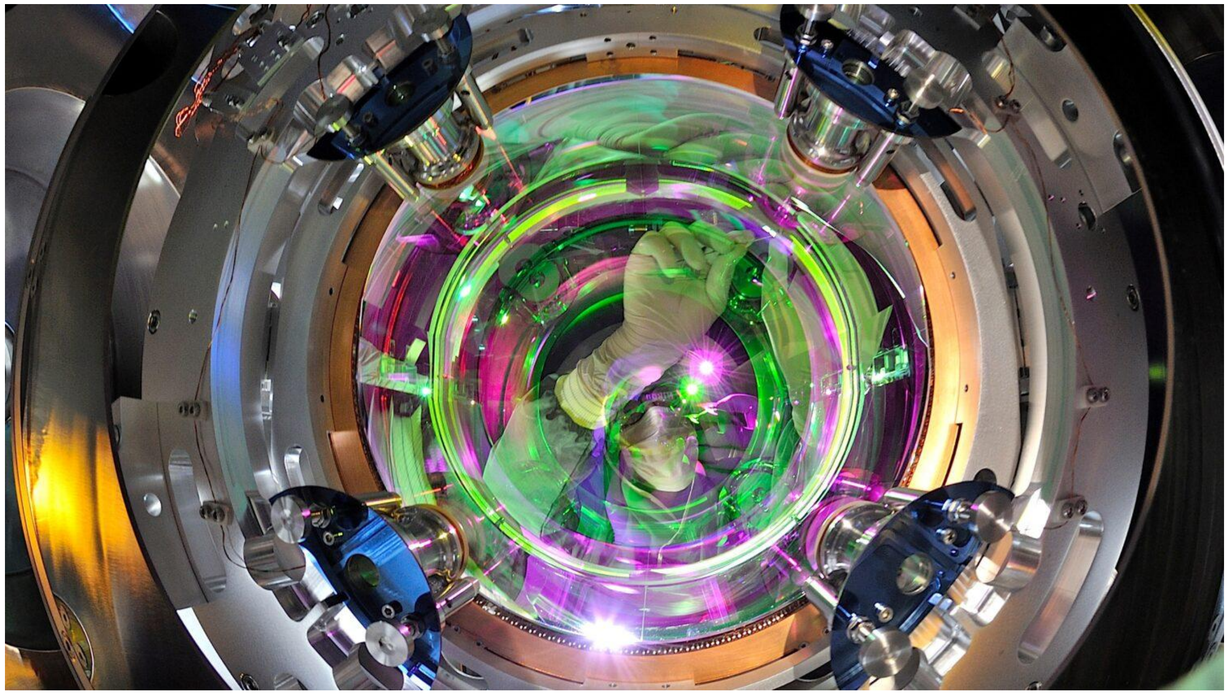
Business involvement in ET

- Research & Development
- Engineering
- Construction
- Manufacturing & Installation
- Maintenance & Services

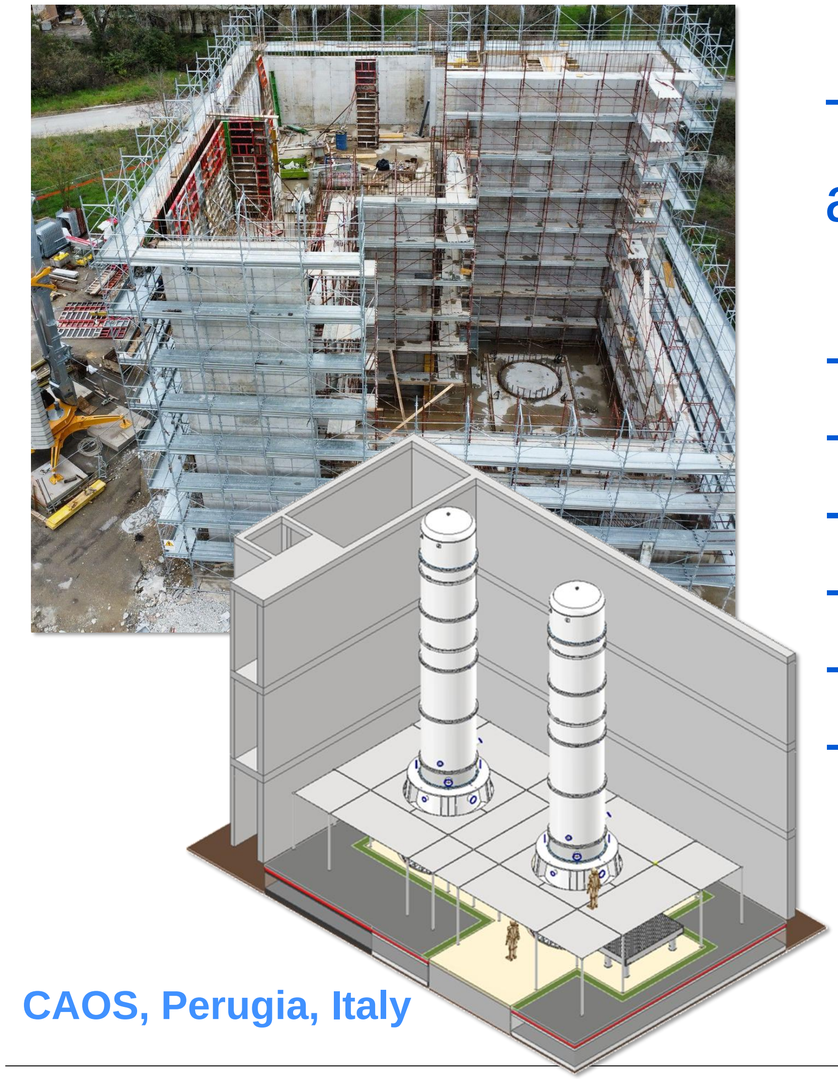


Research & Development

- Sensors and precision mechanics
- Optics & optical metrology
- Lasers
- Vibration-free cryogenics cooling
- Vacuum system



Research & Development



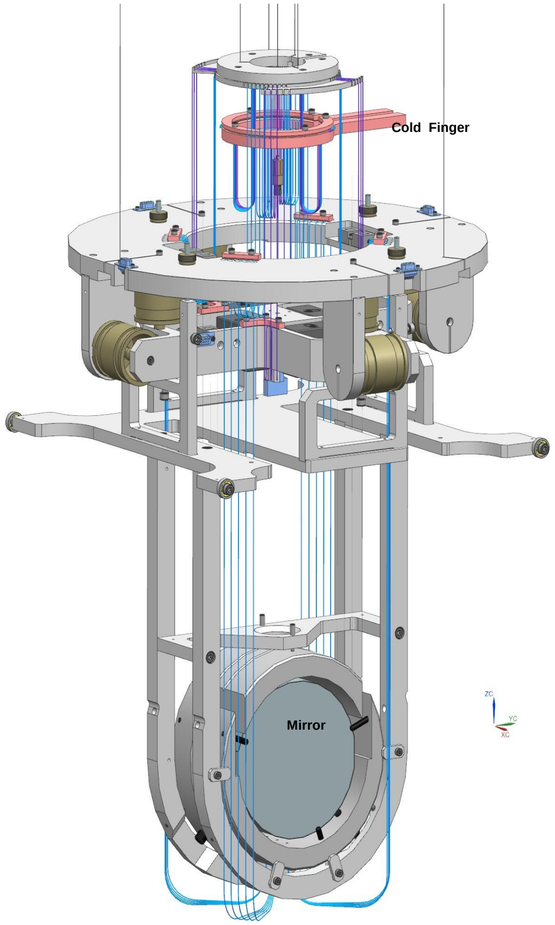
CAOS, Perugia, Italy

Test centers for prototypes, acceptance, integration

- Vibration reduction
- Mirror support, cooling
- Optical elements integration
- Vacuum system
- Cleanliness
- etc.

ETpathfinder, Maastricht, Netherlands

Vibration free cooling of mirror

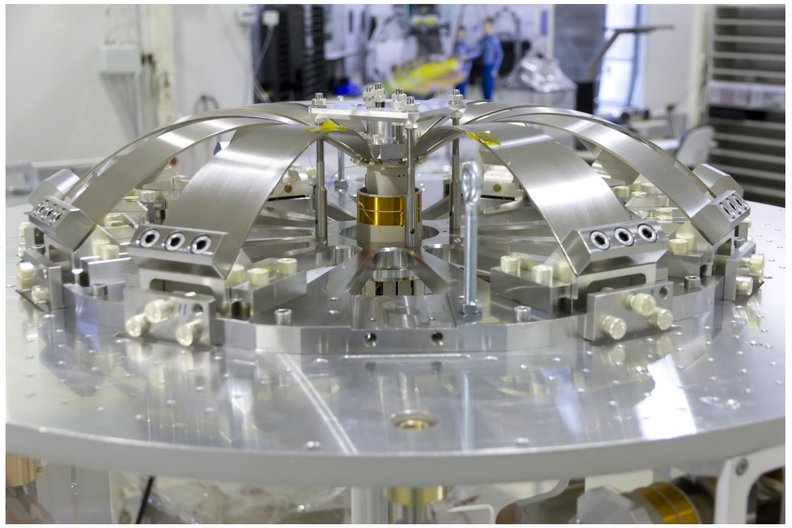


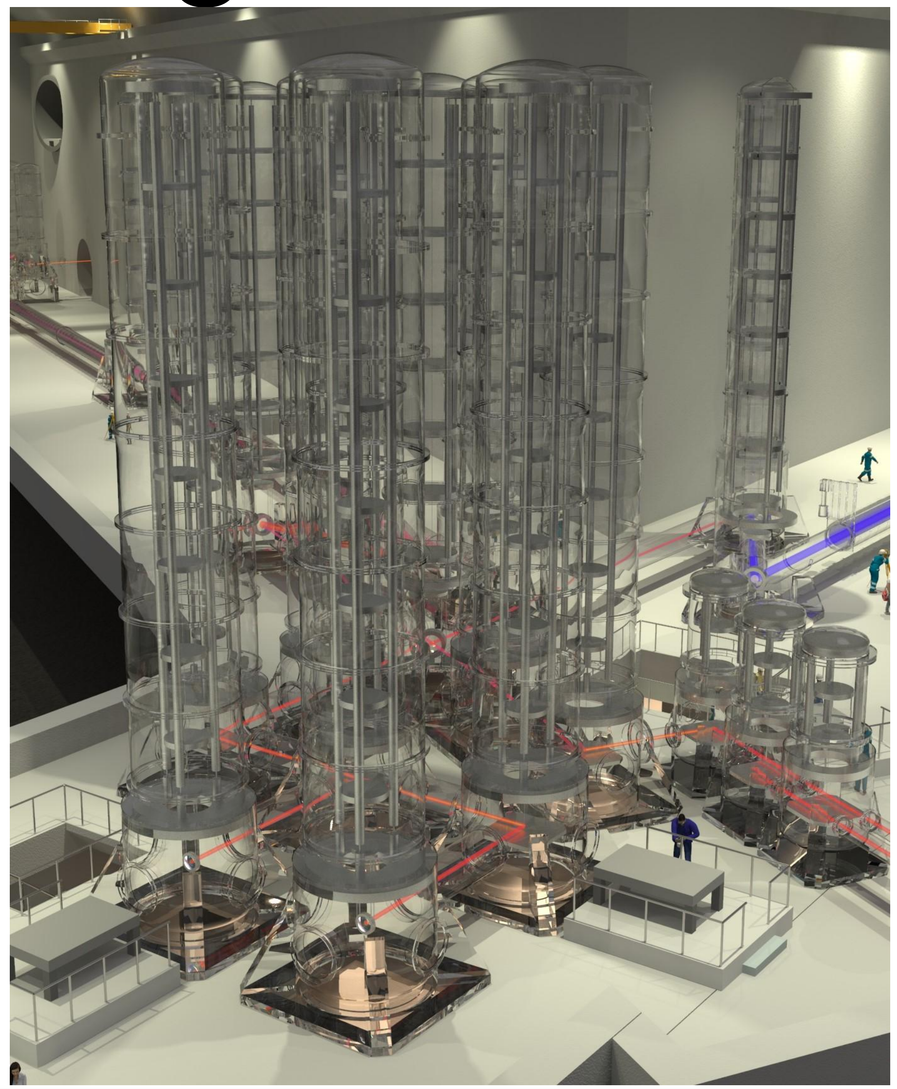
- Design and testing of mirror support and mirror cryogenic cooling
- Final mirror 50 x 50 cm
- Cooling to 10 K
- Si mirror

ET-CRISTAL, Liege, Belgium

Vibration damping

- Development of optimal combination of passive and active vibration damping;
- Can we increase the damping?
- Can we reduce the size of the (vacuum) towers?

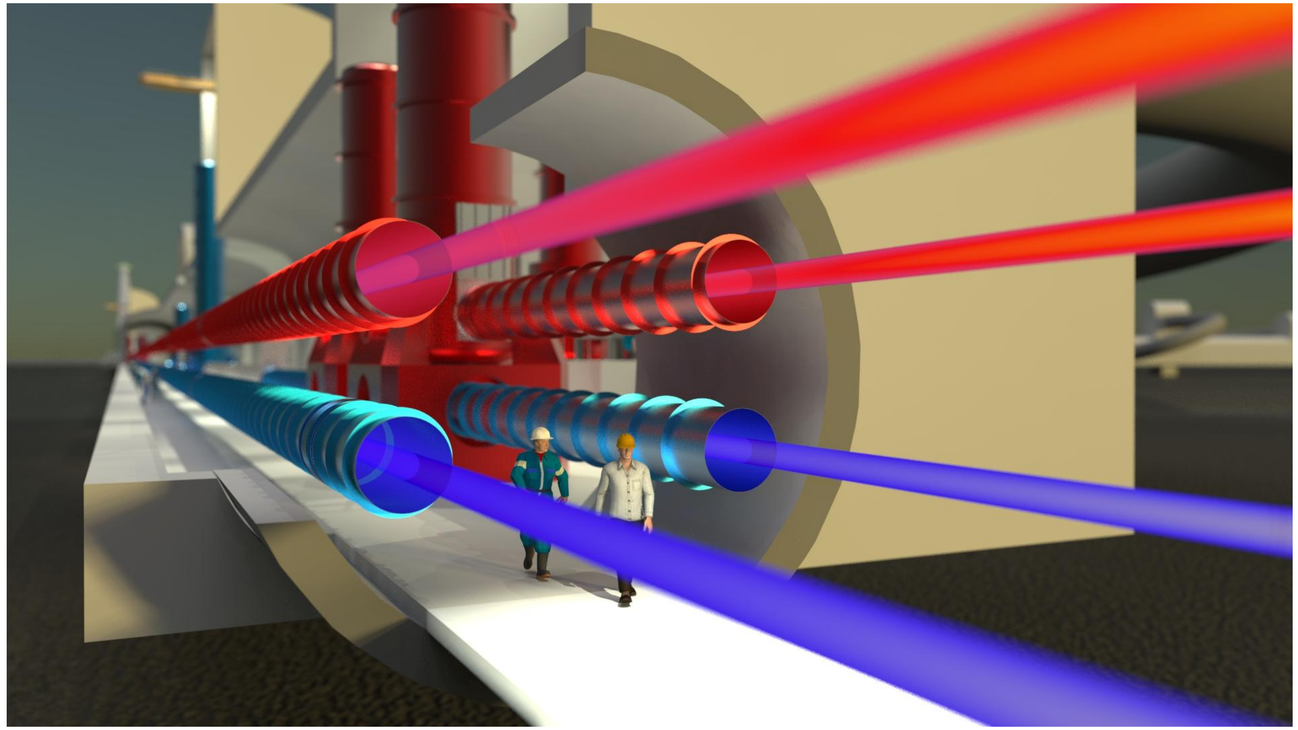




ET Vacuum system

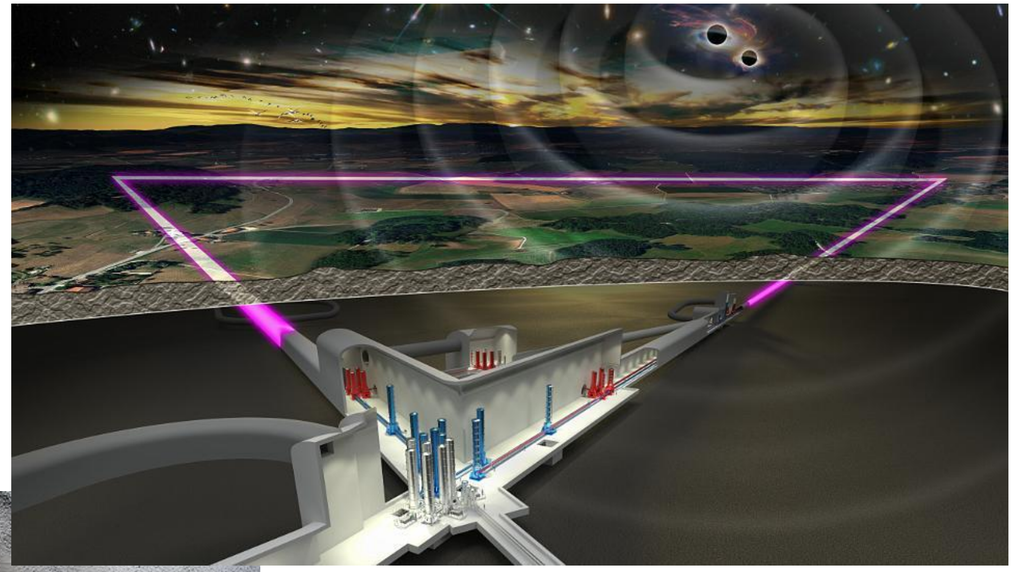
120 km, 1m diameter, 10^{-10} mbar

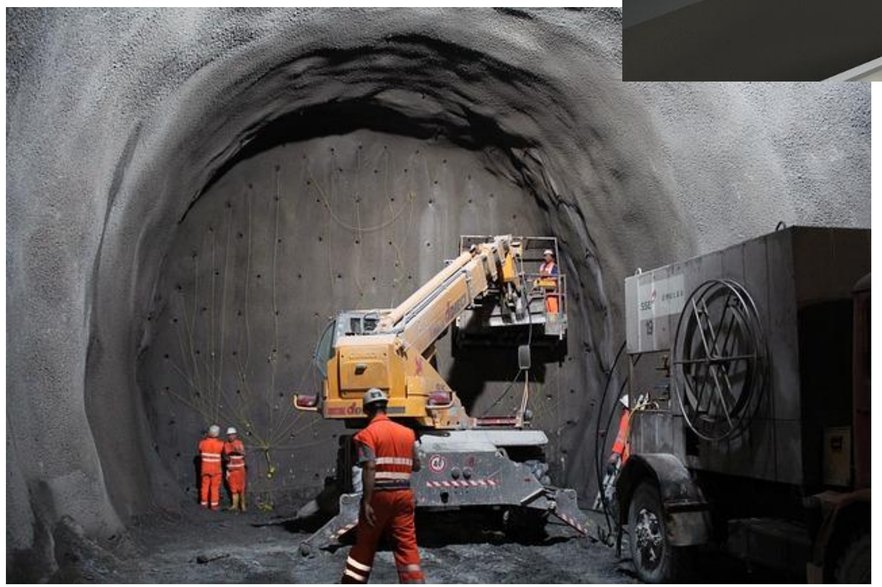
- Engineering + Manufacturing
- Welding + Installation
- Support structure
- Cleanliness in all steps
- Logistics



Civil engineering - Tunneling

- Design
  - Underground research
  - Safety
  - Time line, Budget
- Tunnel boring – 30 km
- Caverns - 20 x 100 x 20 m
- Permits
- Sustainability
  - Reuse of materials
  - Transport and logistics
  - Waste water management





- Drill & Blast ←→ TBM
- Shaft ←→ Ramp

Contact ET for industry

https://einsteintelescope.eu/

https://einsteintelescope.eu/get-involved/for-industry/

or the ILO in your country

r.van.der.meer@nikhef.nl

Big Science Business Forum 2026

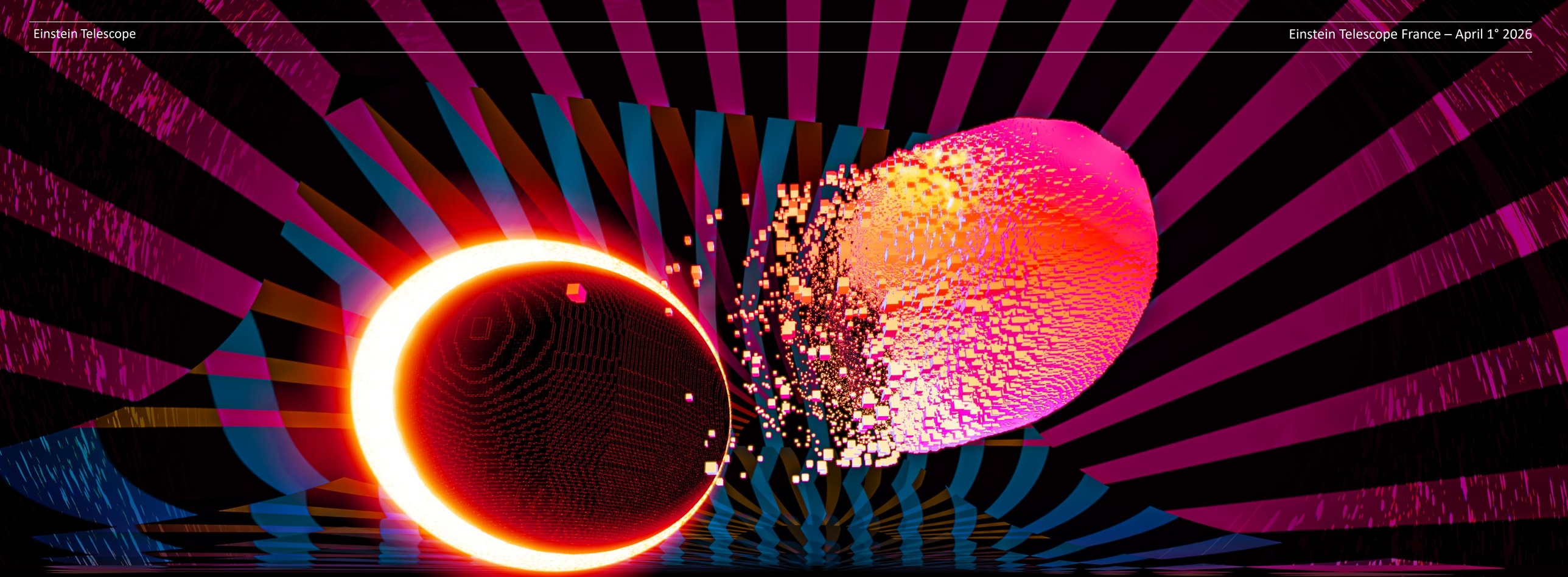
27 - 30 October 2026

MECC, Maastricht
The Netherlands

www.BSBF2026.org

Programme

Tuesday 27 October	• Satellite events & opening ceremony
Wednesday 28 October	• Plenary & parallel sessions and B2B meetings • Conference dinner
Thursday 29 October	• Plenary & parallel sessions and B2B meetings • Closing ceremony
Friday 30 October	• Visits to laboratories



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Thank you!