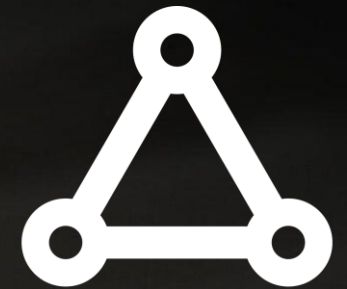
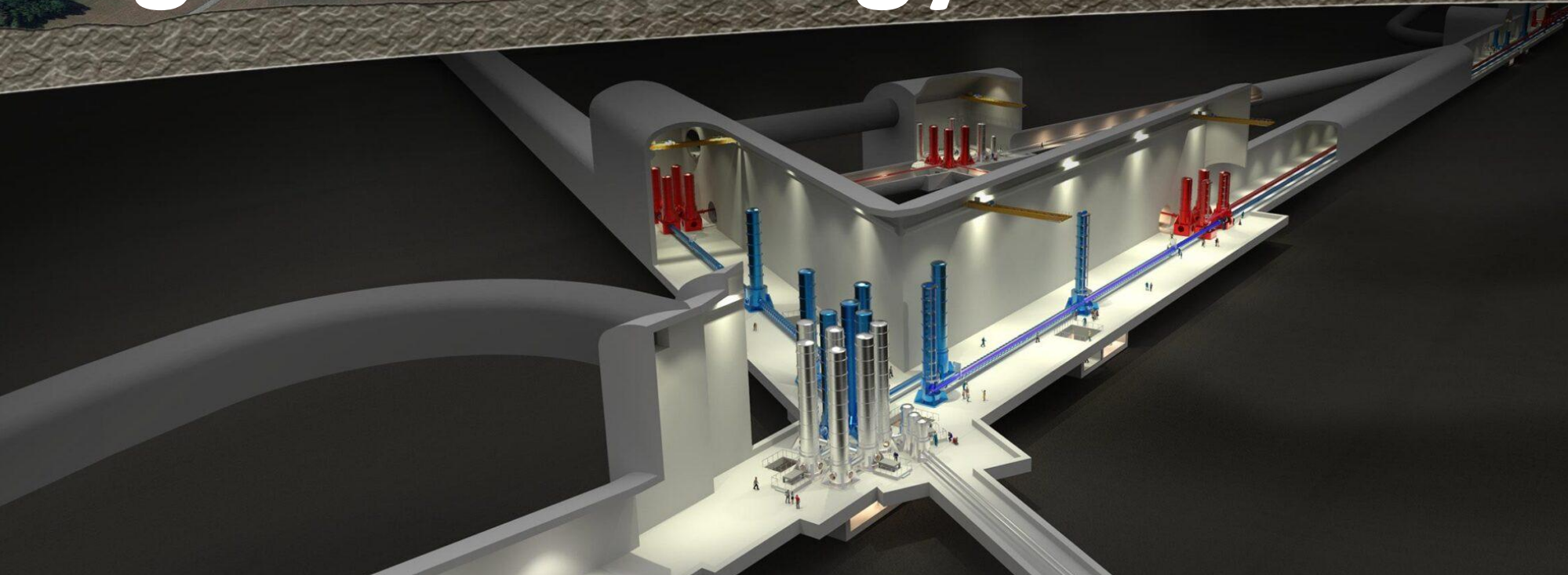


# The Einstein Telescope

Gravitationsessie  
Digital Technology and Automation



Einstein  
Telescope

# Some background



# What are Gravitational Waves

## Simulation



Example: neutron star merger with a black hole

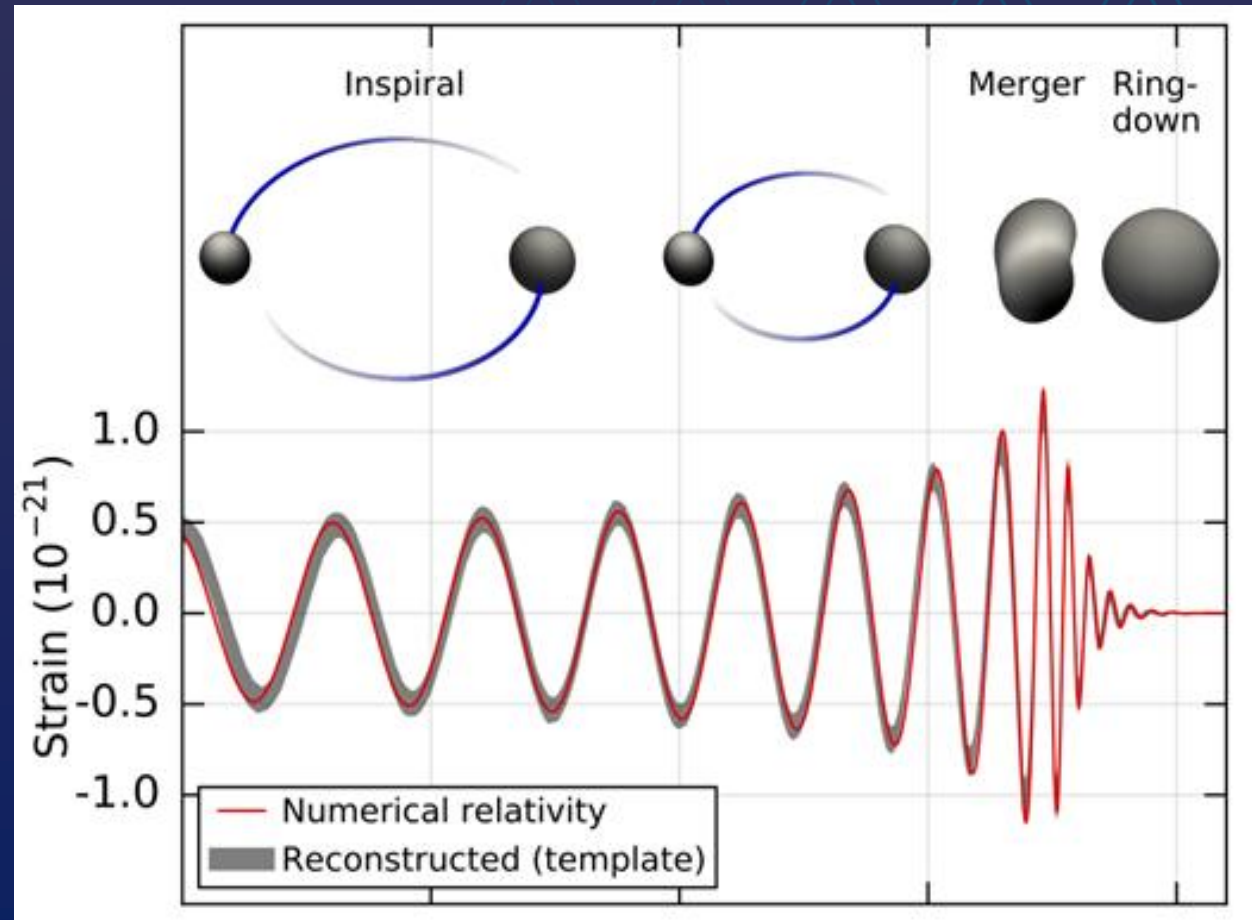
## GW150914



First detection of a gravitational wave by LIGO (US) on september, 14th, 2015

## Einstein Telescope

What GWs in the ET would sound like

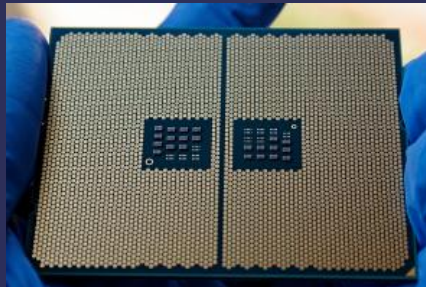




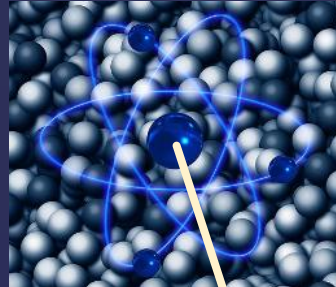
Impact of tidal waves (meter)



Caliper (0,1 mm)



Chip Industry (nm)



Atom (Å :  $10^{-10}$  m)



Protons and Neutrons ( $10^{-15}$  m)

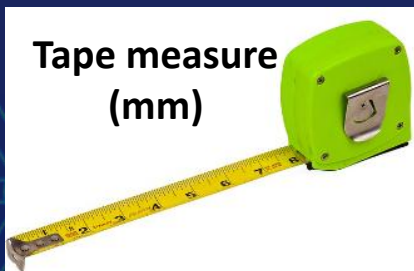


LIGO "first contact" ( $10^{-19}$  m/m)

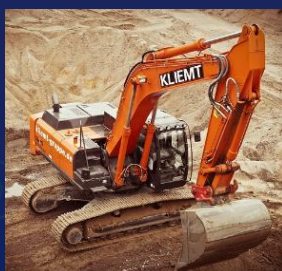
LIGO today ( $10^{-23}$  m/m)

0,000 000 000 000 000 000 000 000 004 m

External disturbances



Tape measure (mm)



This is what we want to measure:  $10^{-24}$  m/m



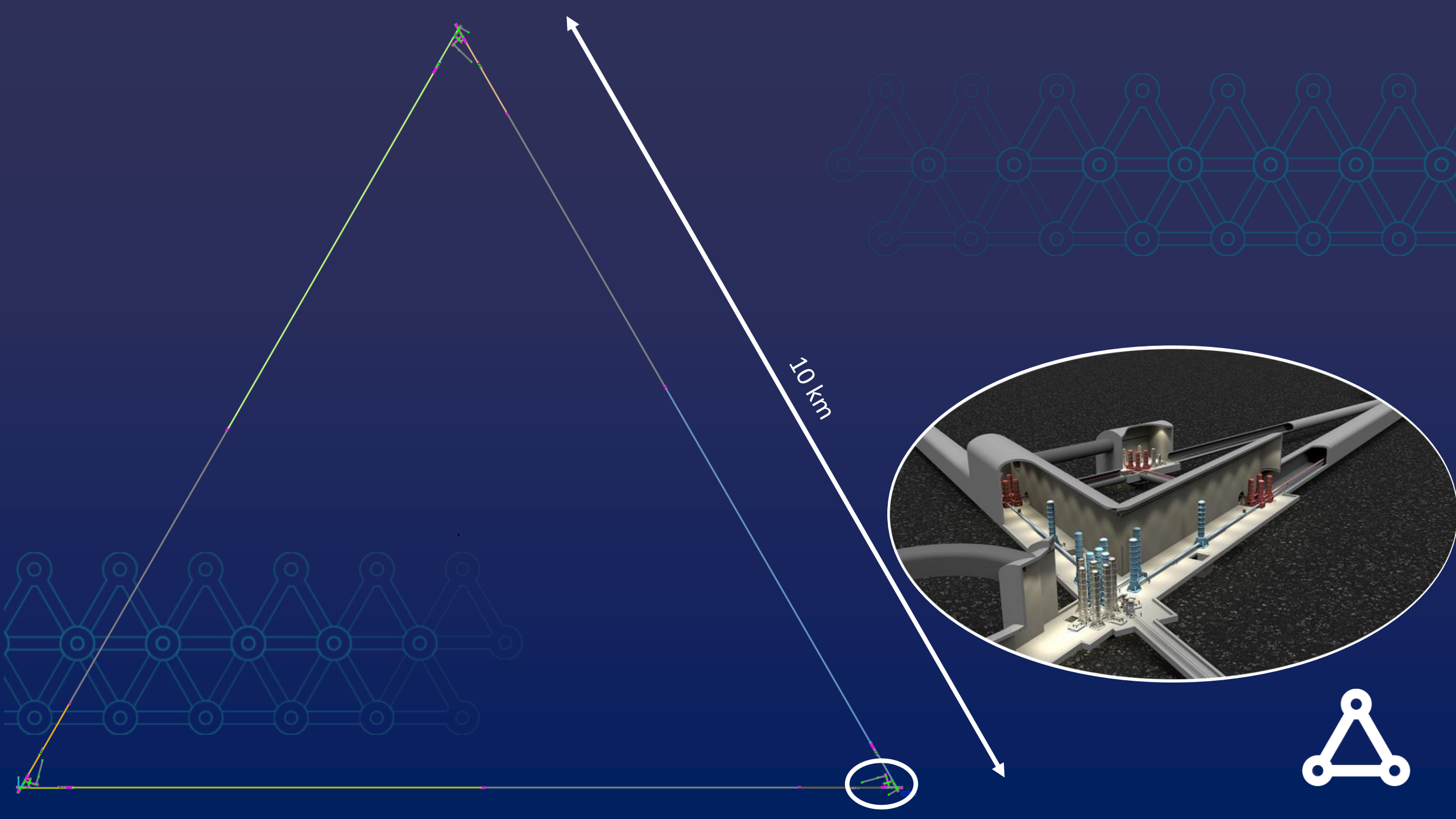
“Gravitational Waves are ripples in spacetime”

OK, but what does that mean?

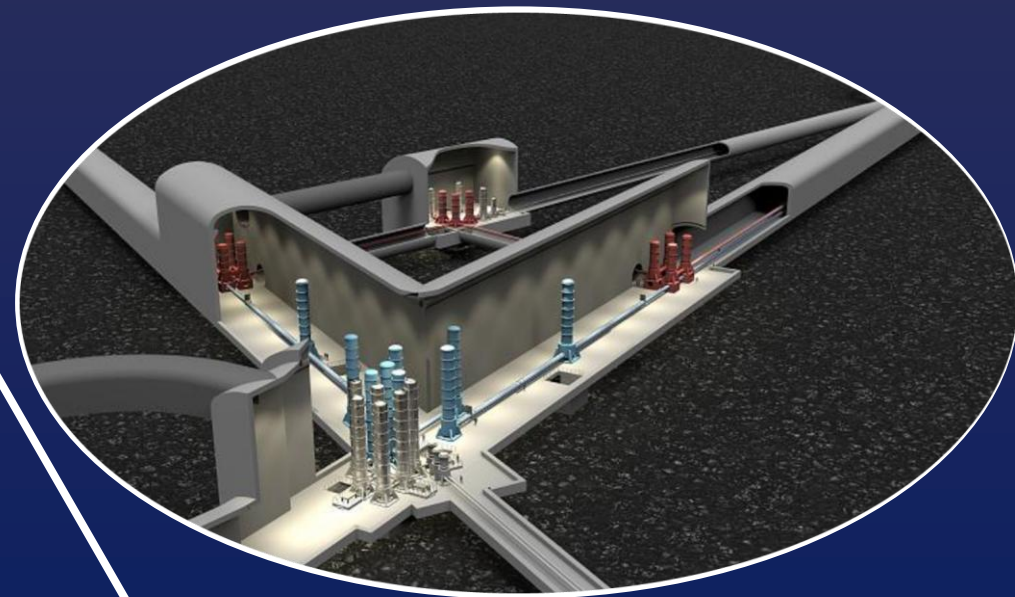


Scale of Effect Vastly Exaggerated

Image Credit: LIGO Laboratory, MIT/Caltech



10 km



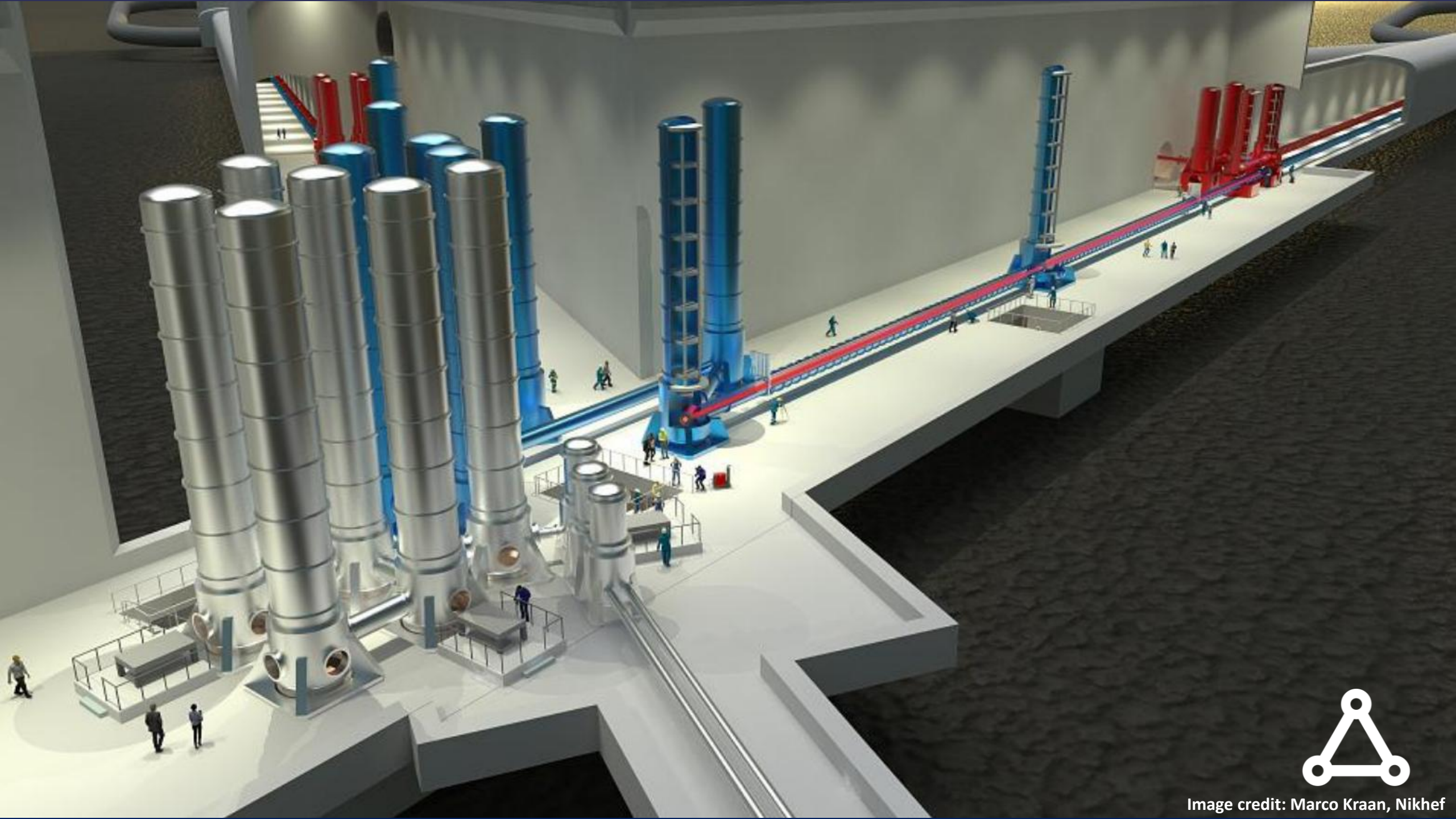


Image credit: Marco Kraan, Nikhef



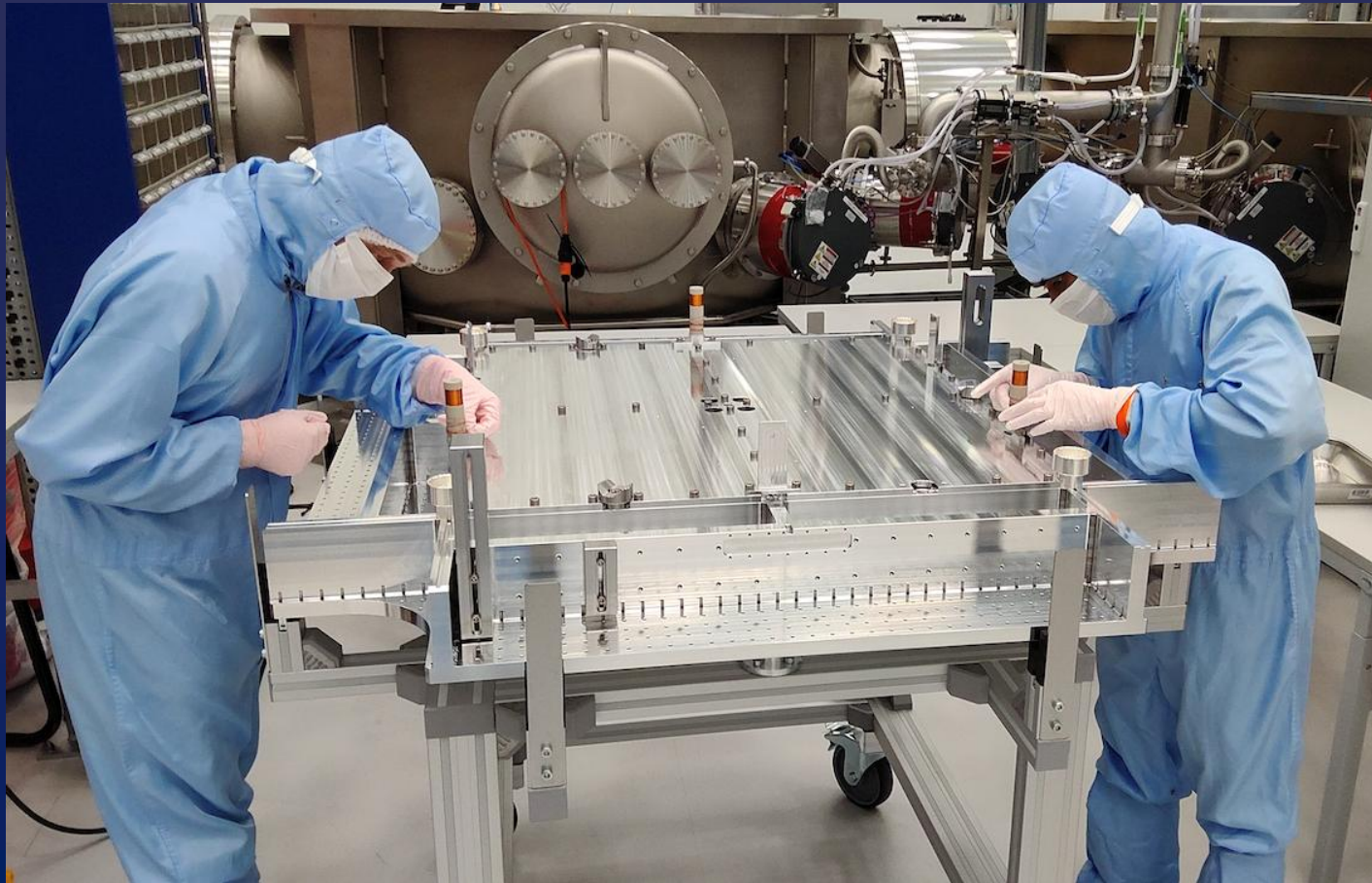


# Challenges

Example: building a vacuum tower for ETpathfinder







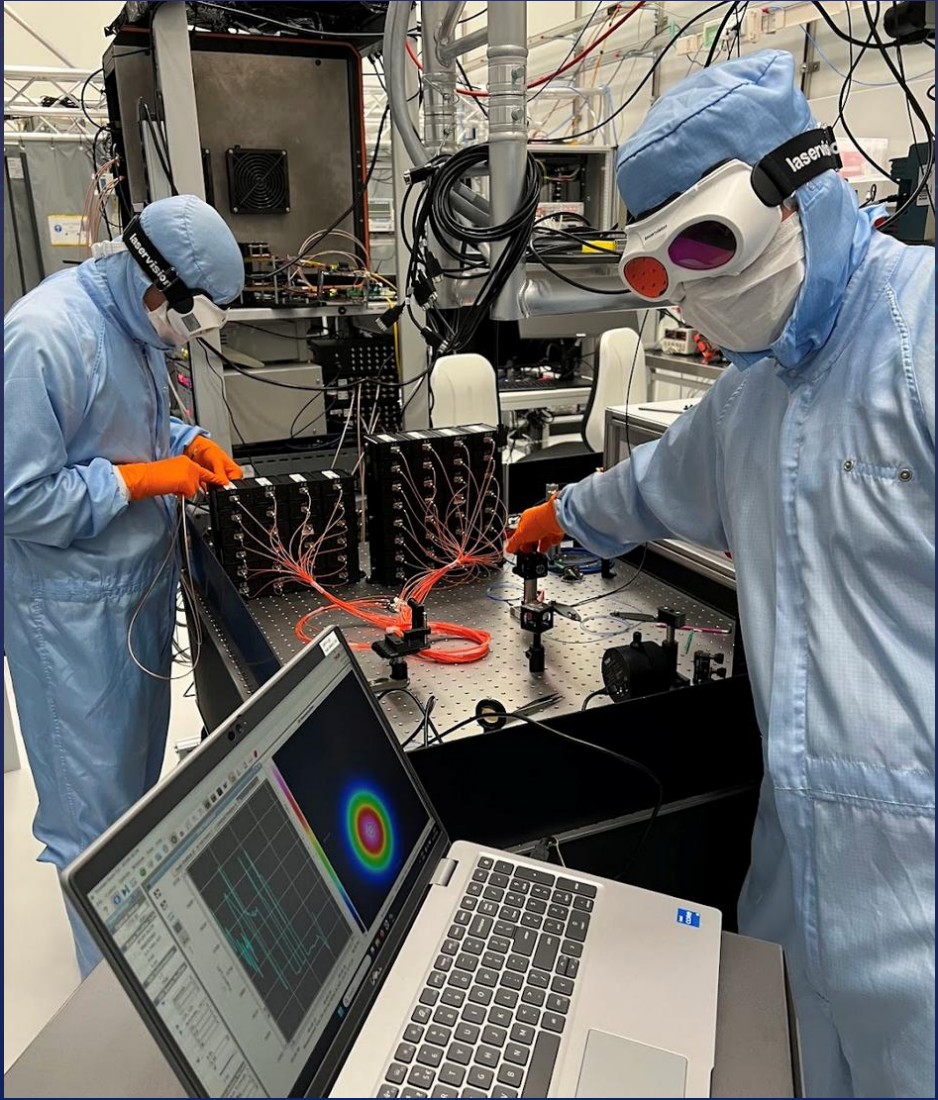
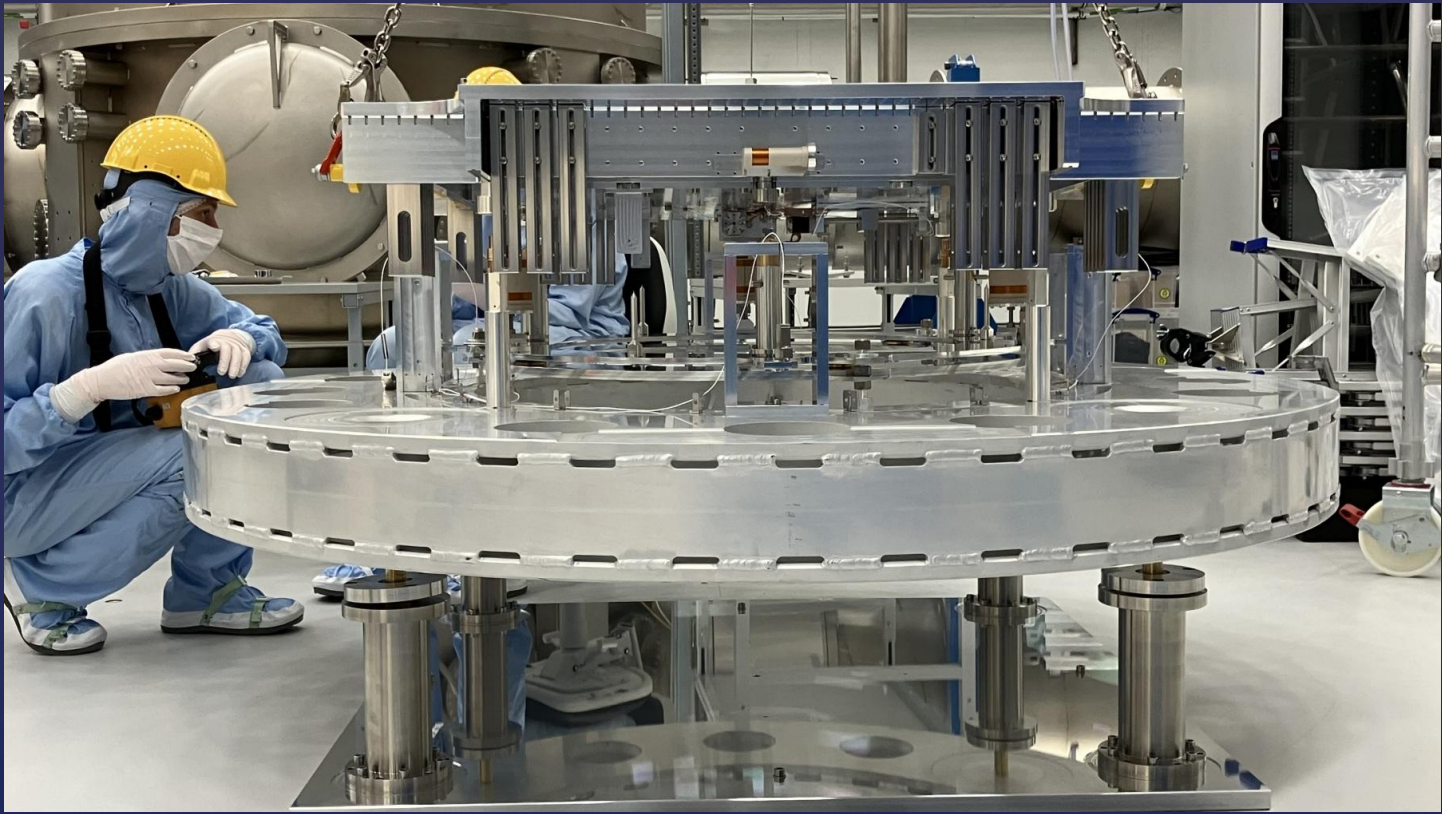


Image credit: ETPathfinder



3 months  
later



Image credit: ETpathfinder

# Break-Out sessions



# Break-out sessions

## Break-out sessie 1: Robotic Assembly & Mechatronics

Jorg Hendrickx

Dominiek Reynaerts

- Automating pre-assemblies
- Robotic tower constructions
- Use Case: Bench-top suspension
- Use Case: GAS filters

## Break-out sessie 2: Sensoren en Monitoring

Sam Jordens

Jürgen Van Gorp

- Surface and subsurface sensors
- Use Case: health monitoring and Inspection
- Use Case: remote maintenance sensors

