

# Einstein telescope and cryogenics

20-4-2023

Tom Meerman

Cryoworld

# Our DNA

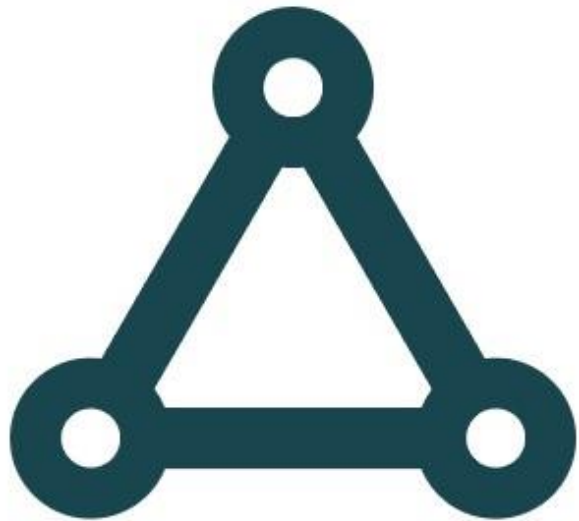
- Cryogenic special products
- Concept to detail design
- Process engineering
- Manufacturing
- Testing
- Installation
- Start-up assistance
- Maintenance
- Liquid Hydrogen and Helium experts





# Some of our Science projects





**ET**Technologies



**EUROPESE UNIE**

Europees Fonds voor Regionale Ontwikkeling  
*Mede gefinancierd in het kader van de respons  
van de Unie op de COVID-19-pandemie.*



Ministerie van Economische Zaken  
en Klimaat

provincie limburg

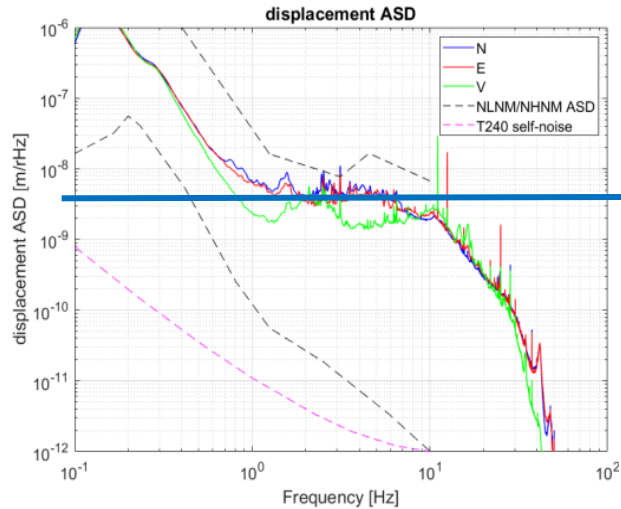


# WP1.2: Cooling System

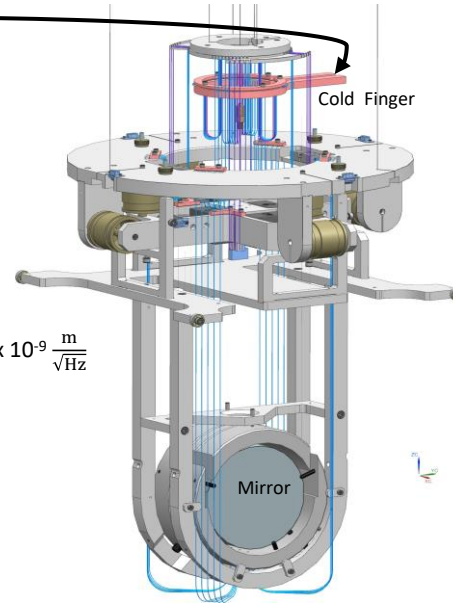
SRON presentation, 20 April 2023

ETT-WP1.2 deals with remaining vibrations  
in the lines of the cooling system

ETPF: Seismic Noise  $< \sim 4 \times 10^{-9} \frac{\text{m}}{\sqrt{\text{Hz}}}$   
at 2 – 20Hz: ca 30 nm<sub>pp</sub>



$4 \times 10^{-9} \frac{\text{m}}{\sqrt{\text{Hz}}}$

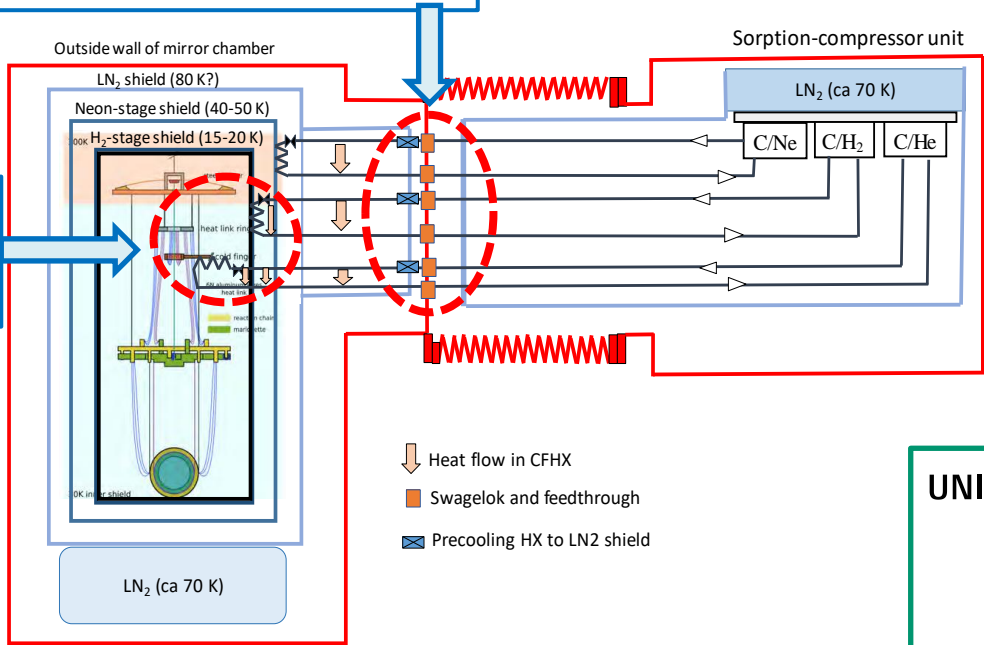


ETT-WP1.2 deals with remaining vibrations in the lines of the cooling system

Sorption-based thermal compressor operating without mechanical vibrations

cryo-vacuum feedthroughs (prevent vibrations)

Limit fluid-induced vibrations inside mirror tower



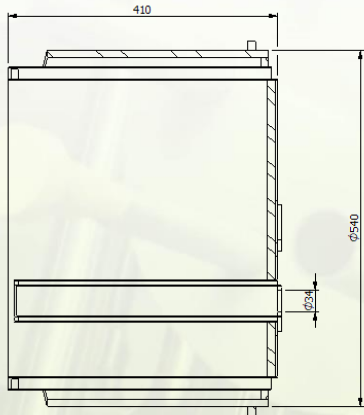
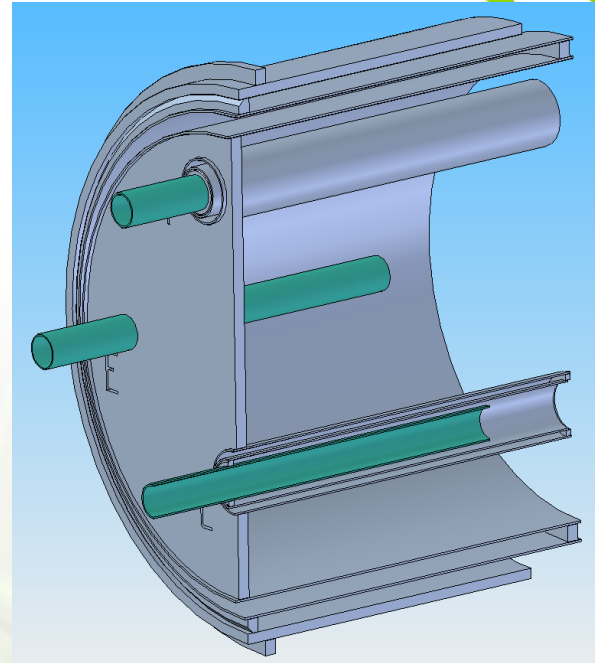
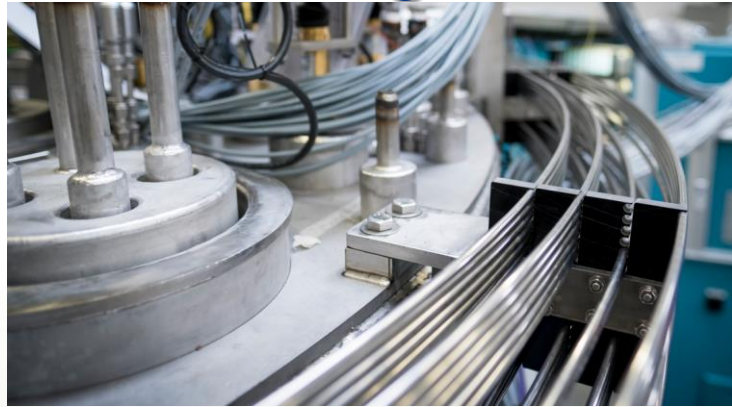
UNIVERSITY OF TWENTE.

cryoworld  
advanced cryogenics

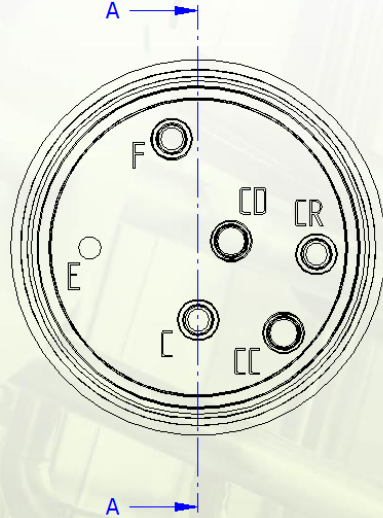
Nikhef



# The design of a “normal” vacuum barrier



Section A-A



# Some deviating design specs.

The process lines are small bore and therefore very flexible

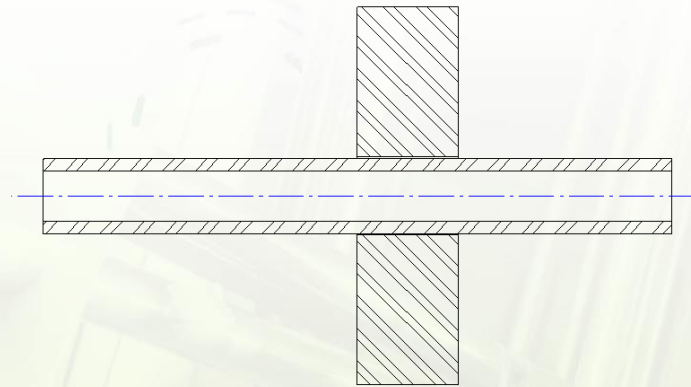
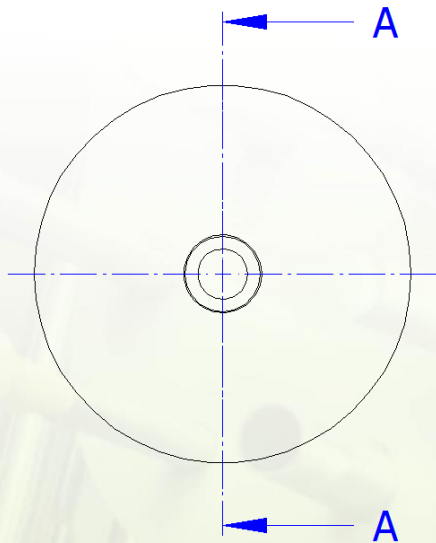
The mirror side of the vacuum is ultra high vacuum, which leads to specific design features

The vacuum barrier must be as rigid as possible





# Small bore process lines.



Section A-A

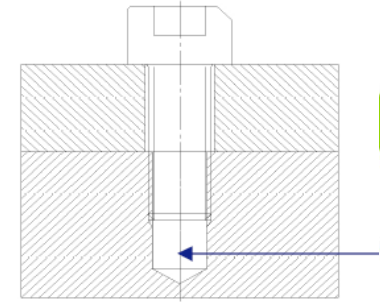


# Ultra high vacuum.

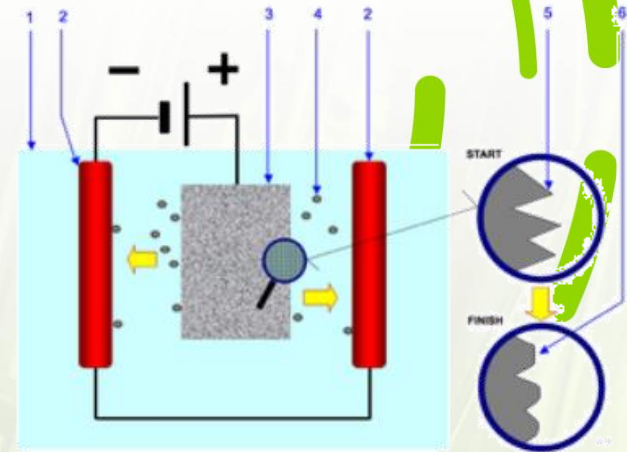
No weld coloration

Smooth and clean surfaces (Viwateq® or electropolishing)

No “virtual leaks”



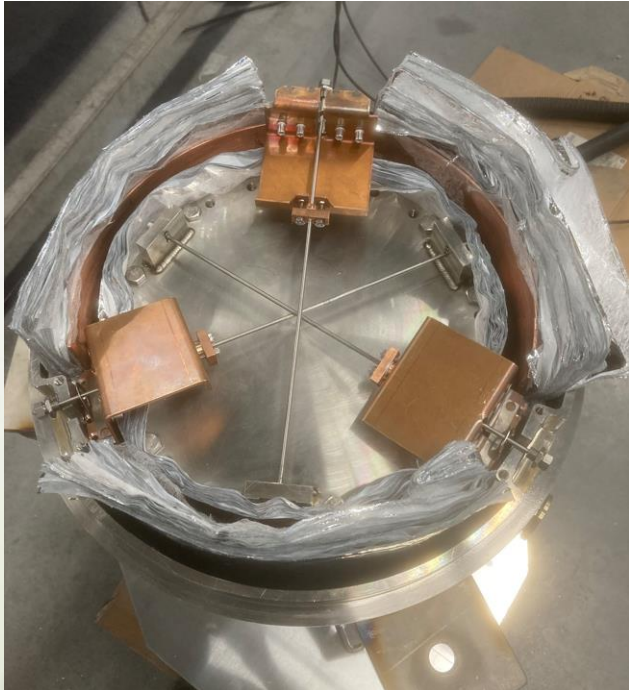
Electropolishing



Typical pressure ranges, in mbar													
10 <sup>-10</sup>	10 <sup>-9</sup>	10 <sup>-8</sup>	10 <sup>-7</sup>	10 <sup>-6</sup>	10 <sup>-5</sup>	10 <sup>-4</sup>	10 <sup>-3</sup>	10 <sup>-2</sup>	10 <sup>-1</sup>	10 <sup>0</sup>	10 <sup>1</sup>	10 <sup>2</sup>	atm
ULTRA-HIGH VACUUM			HIGH VACUUM				FINE VACUUM			ROUGH VACUUM			
													Claw P.
													Diaphragm Pumps
													Scroll Pumps
													Multistage Roots Pumps
													Rotary Vane Pumps
													Screw Pumps
													Mechanical Booster (Roots) Pumps
													Diffusion Pumps
													Turbomolecular Pumps
													Cryo Pumps
													Ion Getter Pumps

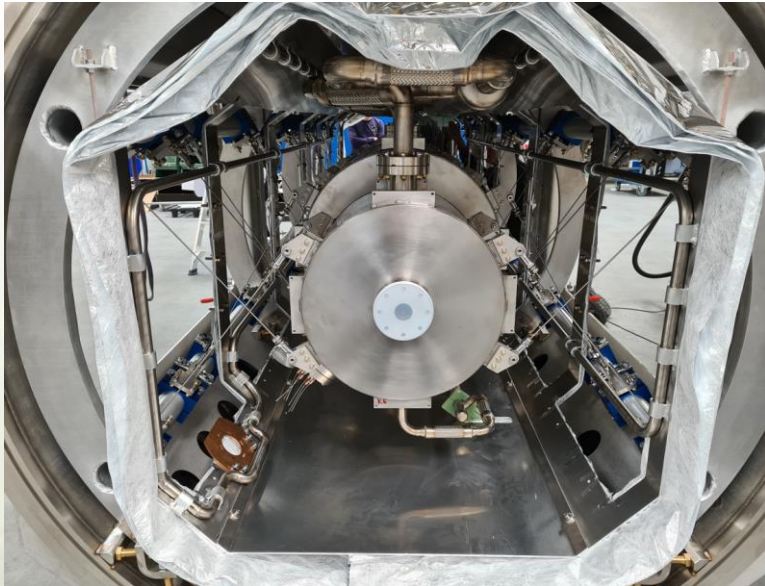
# Rigid vacuum barrier

Normal vacuum barriers are relatively flexible  
We can make use of designs of the past



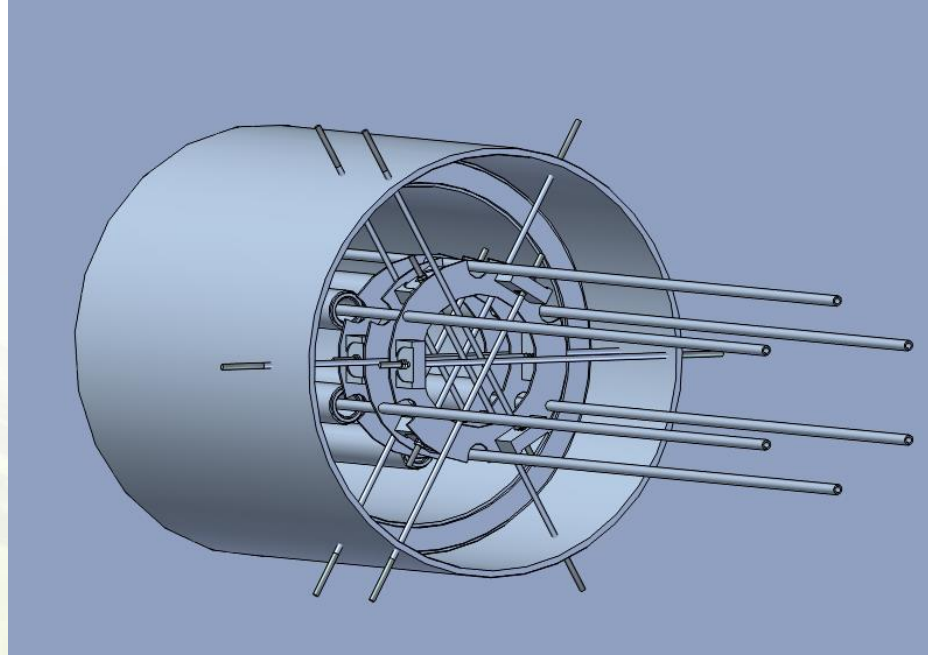
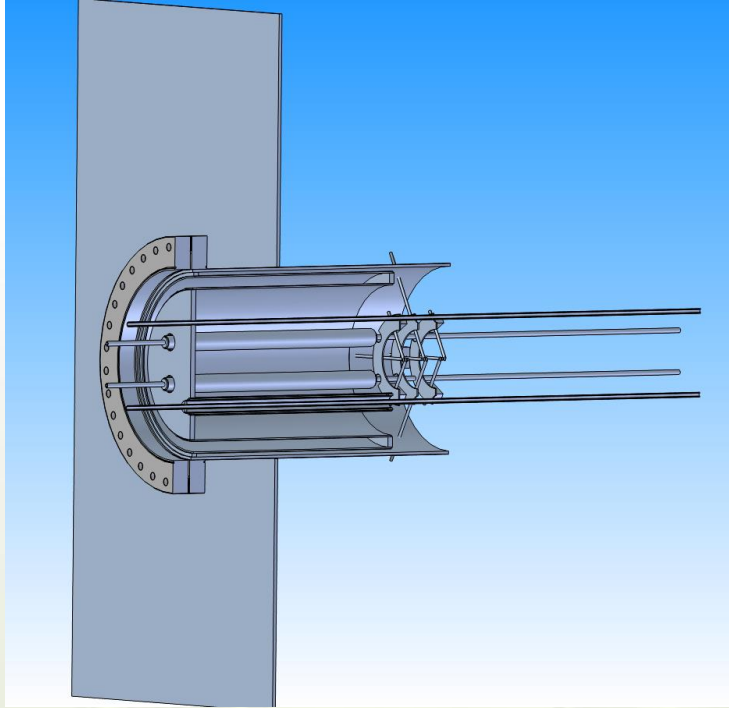
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# Status:



# Questions?

