

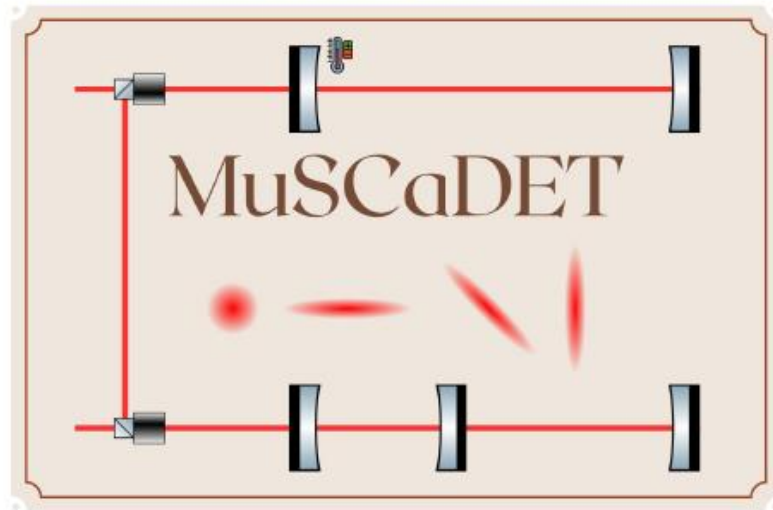


Our mechanical activity proposal through several possible developments:

From Muscadet to the vacuum tube development and integration in the detector layout

Multifold Squeezing filter Cavities Developments for Einstein Telescope

MuSCaDET



ERC request for 2025-2030

Project Leader : Angélique Lartaux

With physicists and opticians from IJCLAB

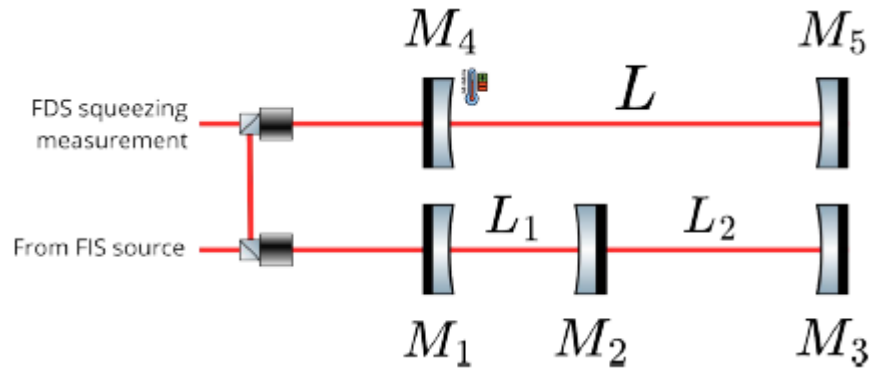
Mechanical leader : Denis Douillet

Dynamics Leader : Simon Chesne (INSA Lyon / CNRS Laboratory)

Mechanical engineer : Yann Peinaud



Principle of Muscadet proposal



Use of superposed cavity and 2 or 3 mirrors

Removing filter cavity tunnels and placing them in the main arm tunnel:
Objective: save 400-500 M€

Squeezing length to be
1 km or 5 km (baseline) ?

⇒ Physical concept to define

ET-LF FC1			ET-LF FC2			CALVA		
2-mirror cavity			2-mirror cavity			2-mirror cavity		
Length	Finesse		Length	Finesse		Comer	Finesse	
1 km	17354		1 km	43935		70 Hz	30284	
5 km	3471		5 km	8787		700 Hz	3028	
3-mirror cavity			3-mirror cavity			3-mirror cavity		
Total length	Finesse		Total length	Finesse		Comer goal	Finesse	
	Sub-cavity 1	Sub-cavity 2		Sub-cavity 1	Sub-cavity 2		Sub-cavity 1	Sub-cavity 2
1 km	156	311	1 km	156	311	70 Hz	124	248
5 km	61	122	5 km	61	122	700 Hz	40	81

Table 1: FC parameters for ET-LF (FC1 and FC2) and MuSCaDET project implemented on the CALVA 50-meter long cavity. For each cavity 2-mirrors and 3-mirrors cavities are considered. Two lengths of ET FC are also considered (1 km and 5 km) based on the baseline design while for CALVA two squeezing corner frequency are considered (70 Hz and 700 Hz) to be representative of ET FC finesse.

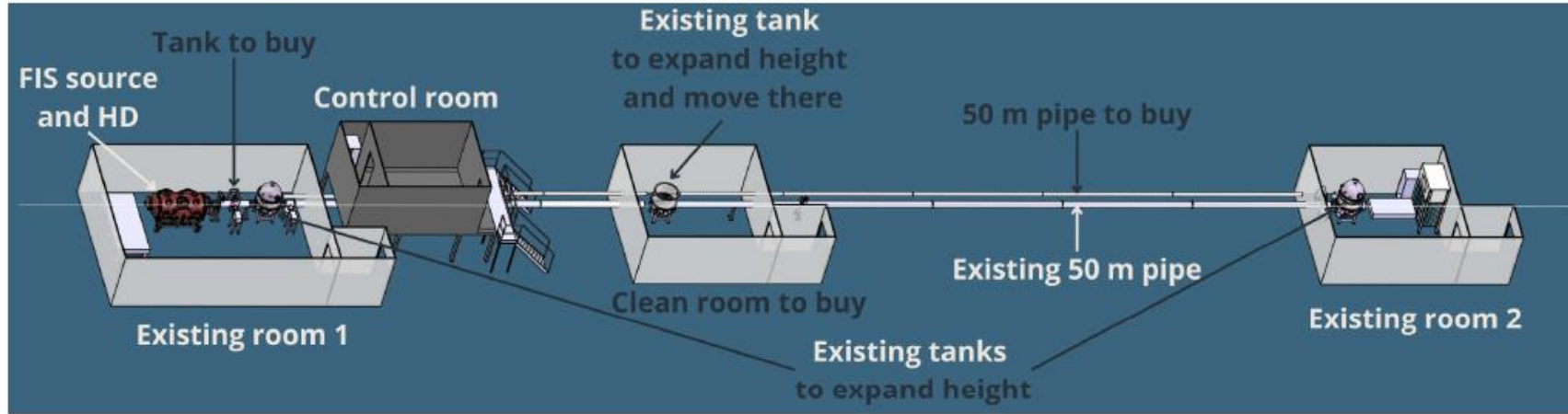


Figure 6: 3D representation of the CALVA facility, its clean rooms, vacuum tanks and beam pipes. In white are indicated already existing equipments while in black are indicated the required new equipment or modifications to the existing equipment.

Optomechanics, vacuum, construction to do on an existing experiment

Suspensions mechanics to build for the periscope (small size)

=> CALVA suspension principle to minimize R&D

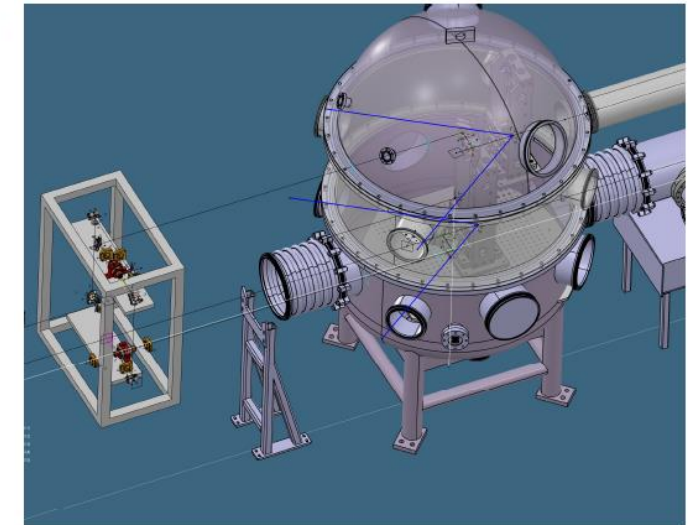


Figure 9: 3D schematic of the added vertical bench on the left and suspended mirrors on top of each other in the extended existing tank on the right.



The mech. team is aiming to work on the squeezing layout through this ERC based on the CALVA set-up (IJCLAB)

⇒ We would like also to take part in the ET squeezing tube mechanical and instrumentation development (Y.Peinaud)
For that we need specifications and ideas

Link with EGO knowledge : See Buggiani and al. presentation

⇒ and study its integration in the detector layout (Gregory laquaniello)