

# Phase 2 Thermal Management

# Phase 2 Detector Systems

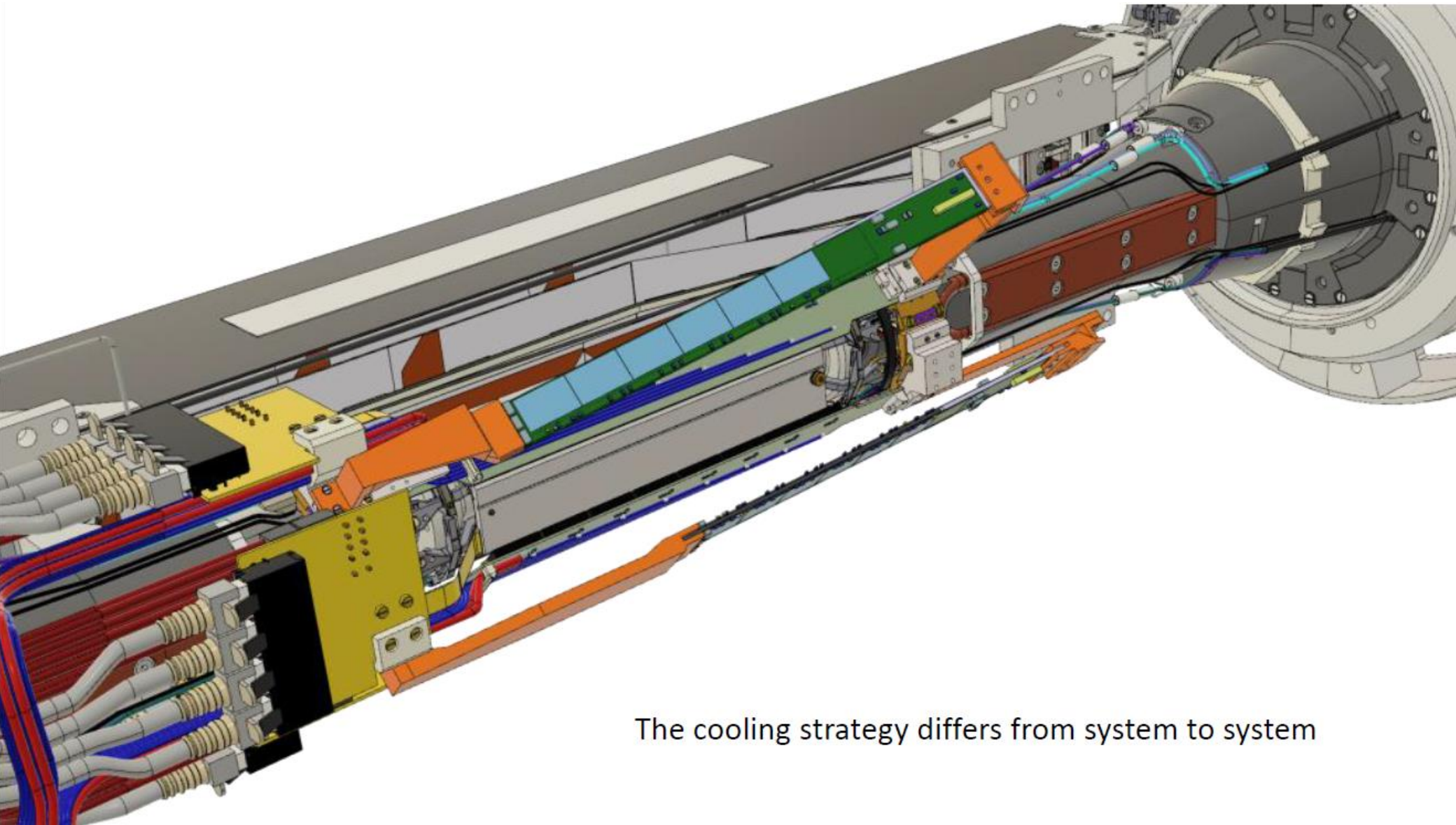
Sensor	Contact	Number	Location
Belle II PXD	C. Marinas	2 ladders	VXD
Belle II SVD	K. Nakamura	4 ladders	VXD
Diamond Sensors	L. Vitale	8 diamonds	VXD
FANGS	C. Marinas	3 arms 15 chips	VXD
CLAWS	F. Simon	2 ladders	VXD
PLUME	I. Ripp-Baudot	2 ladders	VXD
PIN diodes	H. Nakayama K. Nakamura	40+40	QCS
Micro-TPC	S. Vahsen	8 units	Dock
He-3	S. De Jong	4 units	Dock



9+2 different technologies and detector systems

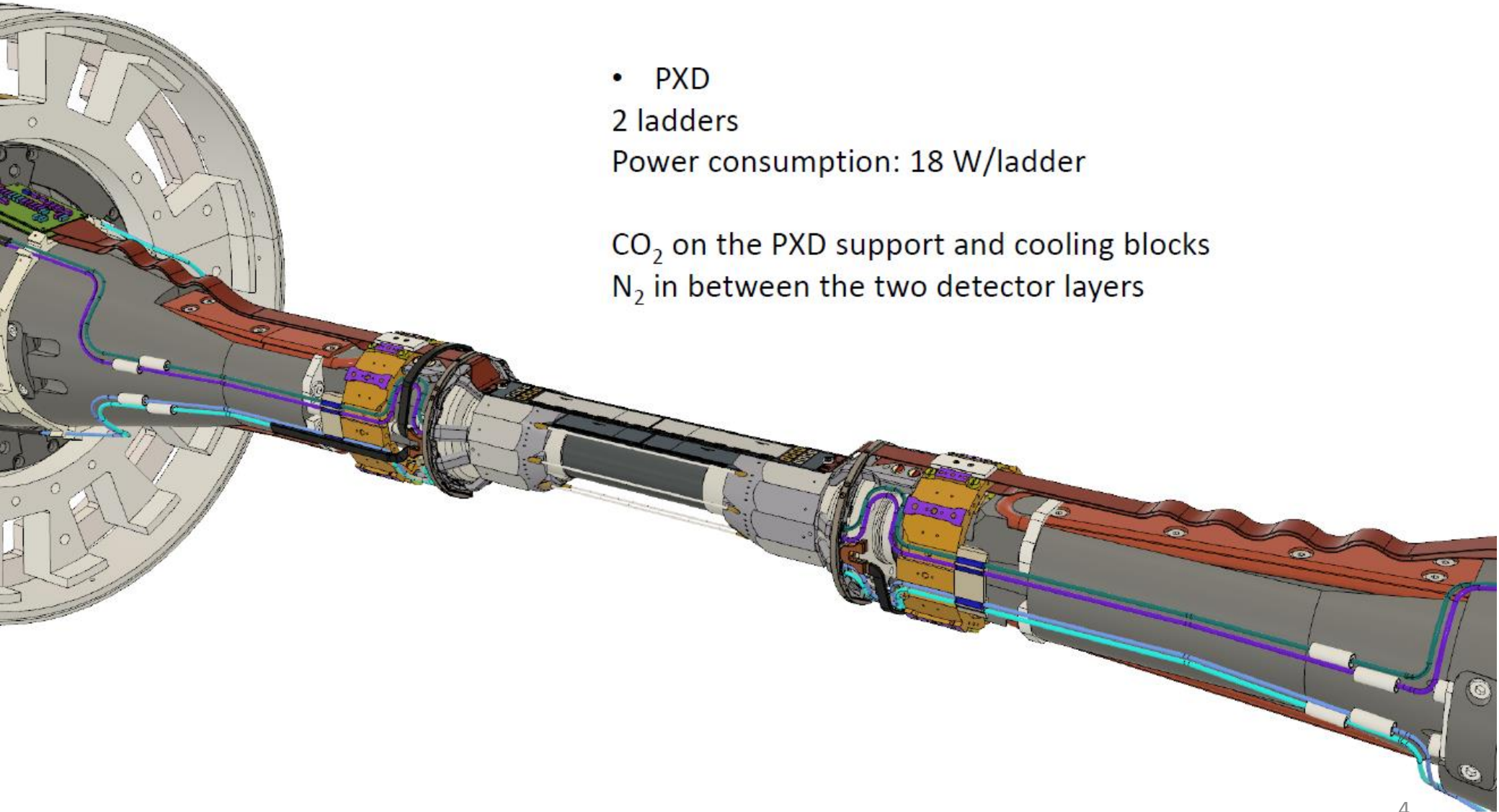
Sensor	Contact	Number	Location
FPGA**	R. Giordano	2 boards	SuperKEK pipe
LYSO-ECL**	A. Fodor	4+4 crystals	ECL endcap shield

# Phase 2 Detector Systems



The cooling strategy differs from system to system

# Phase 2 Detector Systems



- PXD

2 ladders

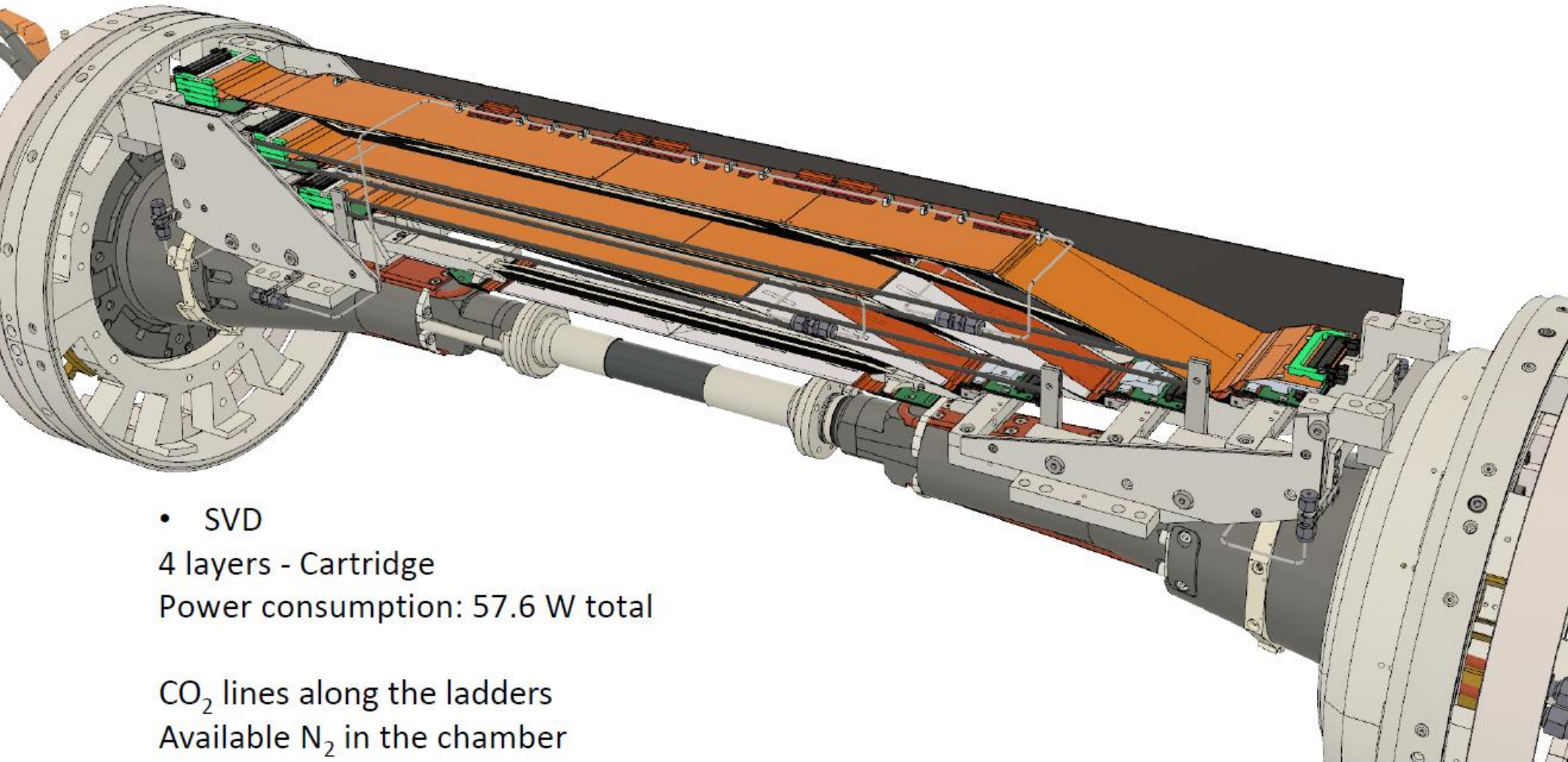
Power consumption: 18 W/ladder

CO<sub>2</sub> on the PXD support and cooling blocks

N<sub>2</sub> in between the two detector layers



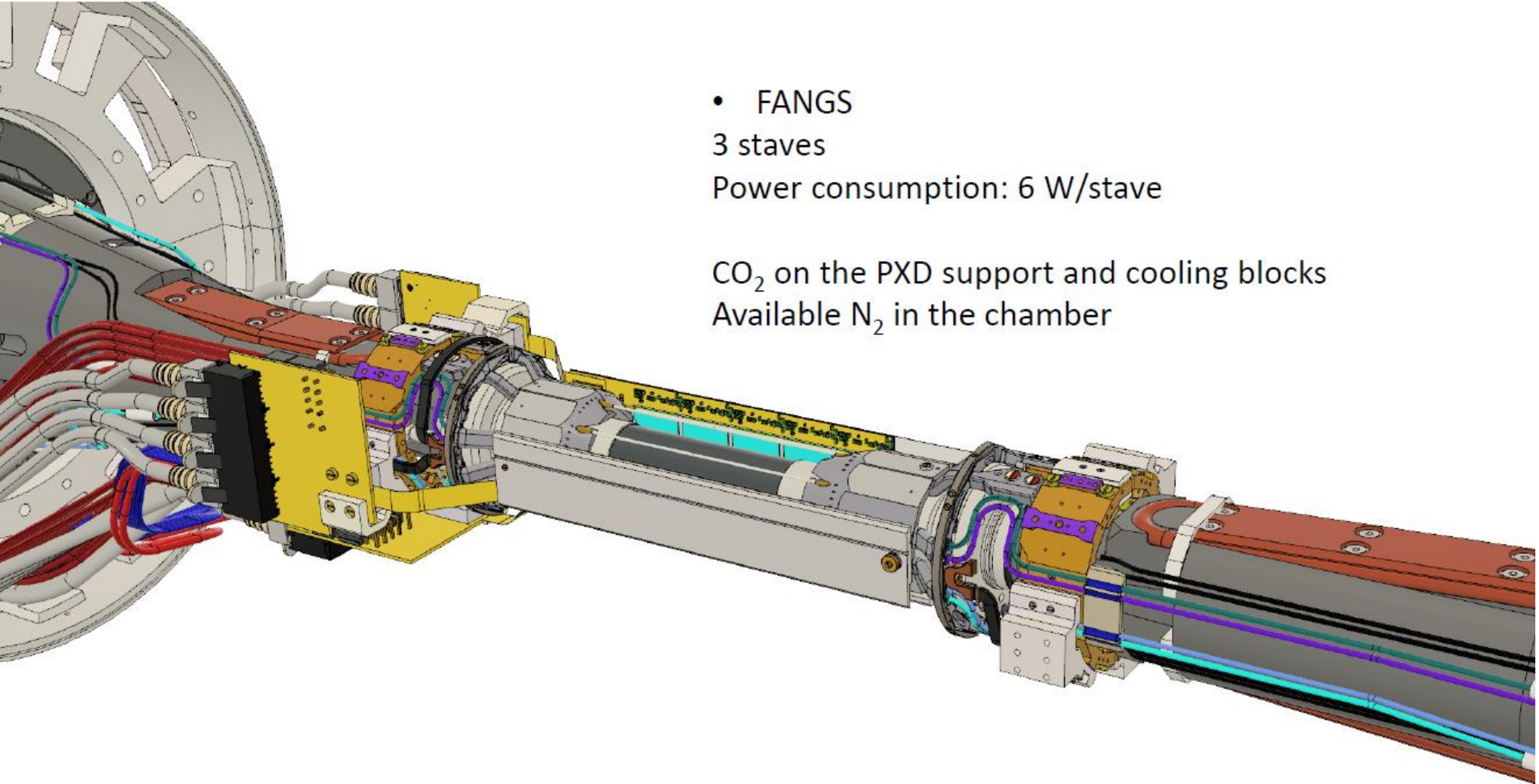
# Phase 2 Detector Systems



- SVD  
4 layers - Cartridge  
Power consumption: 57.6 W total

CO<sub>2</sub> lines along the ladders  
Available N<sub>2</sub> in the chamber

# Phase 2 Detector Systems



- FANGS

3 staves

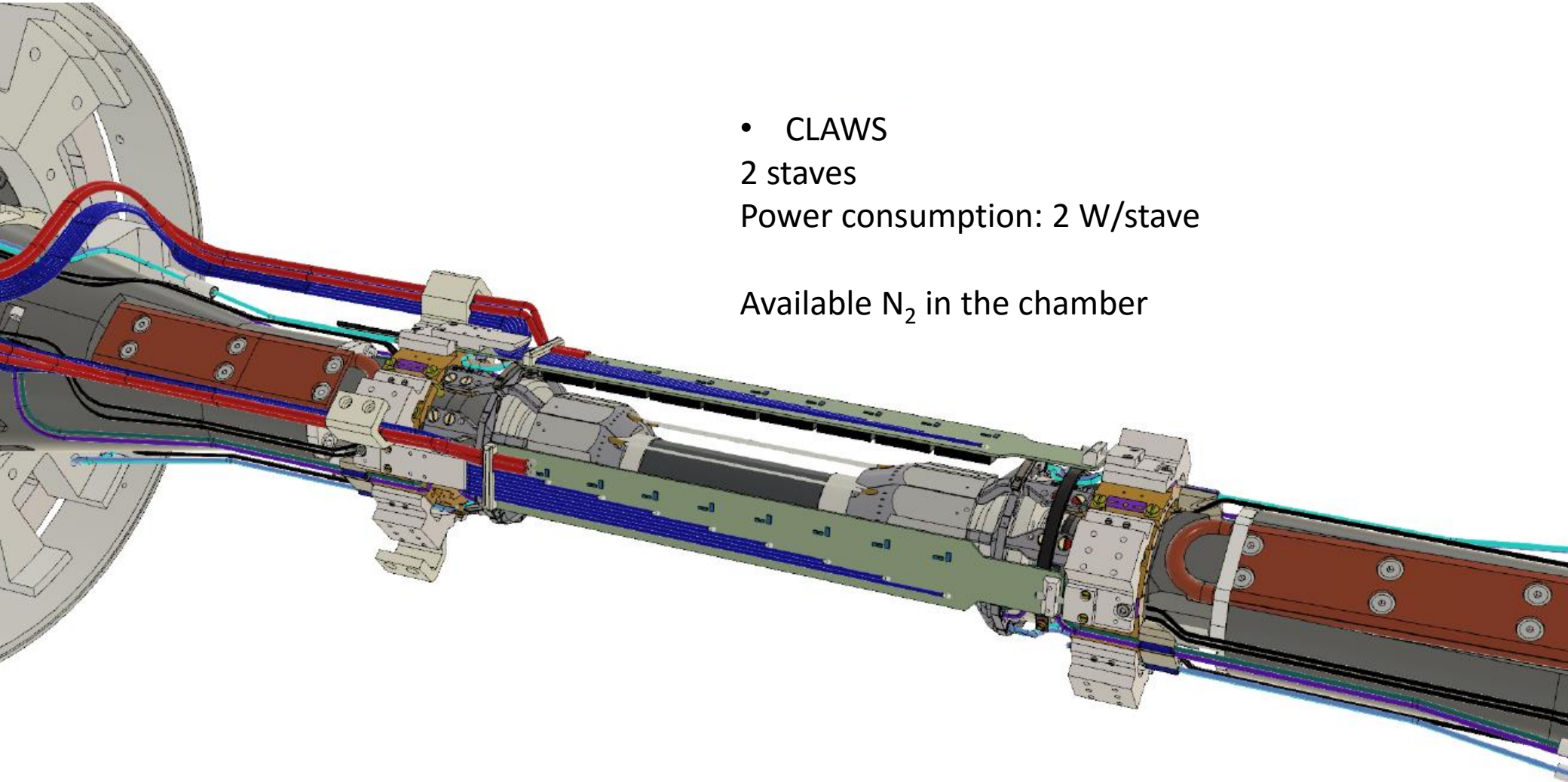
Power consumption: 6 W/stave

CO<sub>2</sub> on the PXD support and cooling blocks

Available N<sub>2</sub> in the chamber



# Phase 2 Detector Systems



- CLAWS  
2 staves  
Power consumption: 2 W/stave  
  
Available N<sub>2</sub> in the chamber

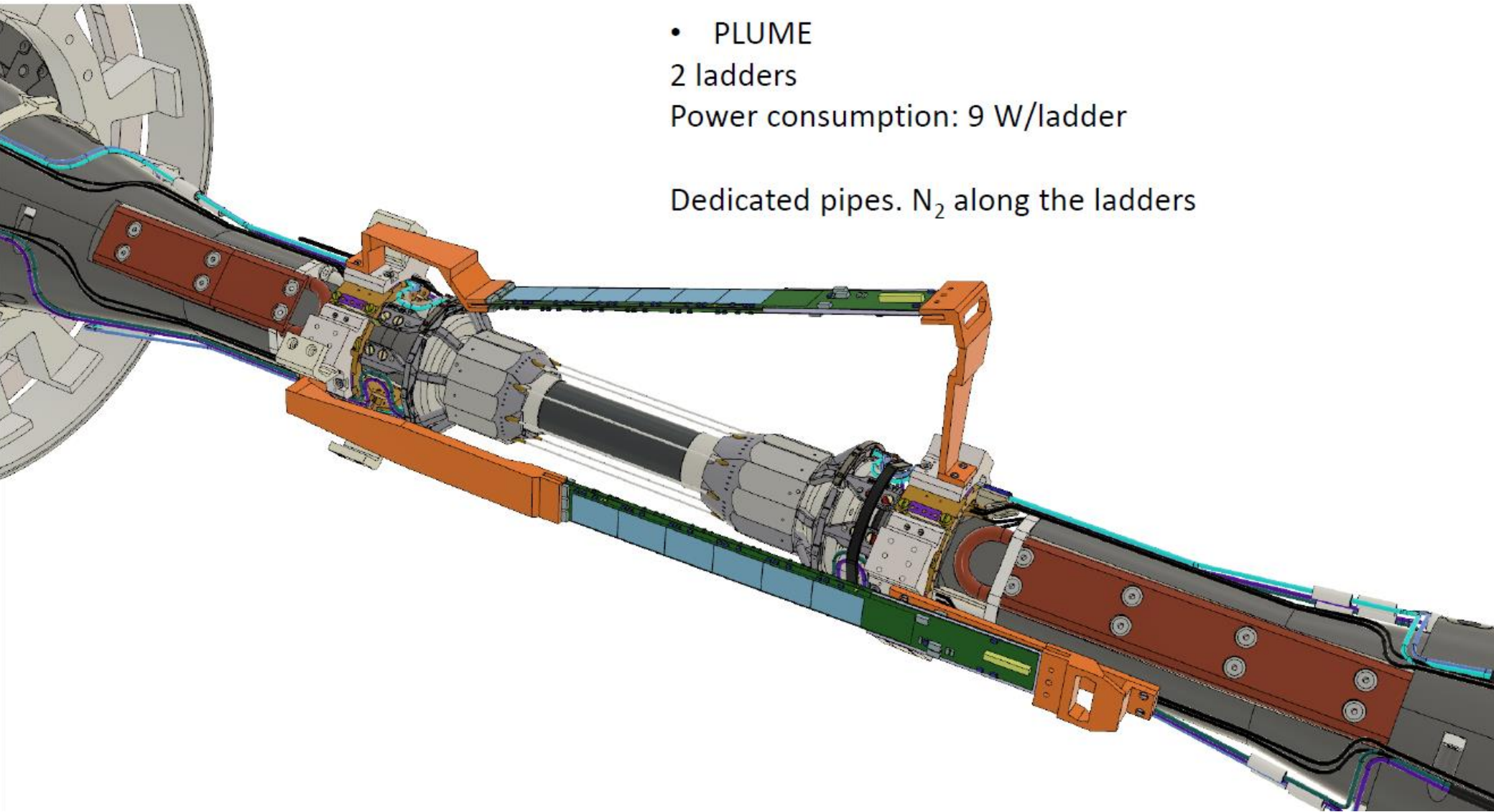
# Phase 2 Detector Systems

- PLUME

2 ladders

Power consumption: 9 W/ladder

Dedicated pipes. N<sub>2</sub> along the ladders





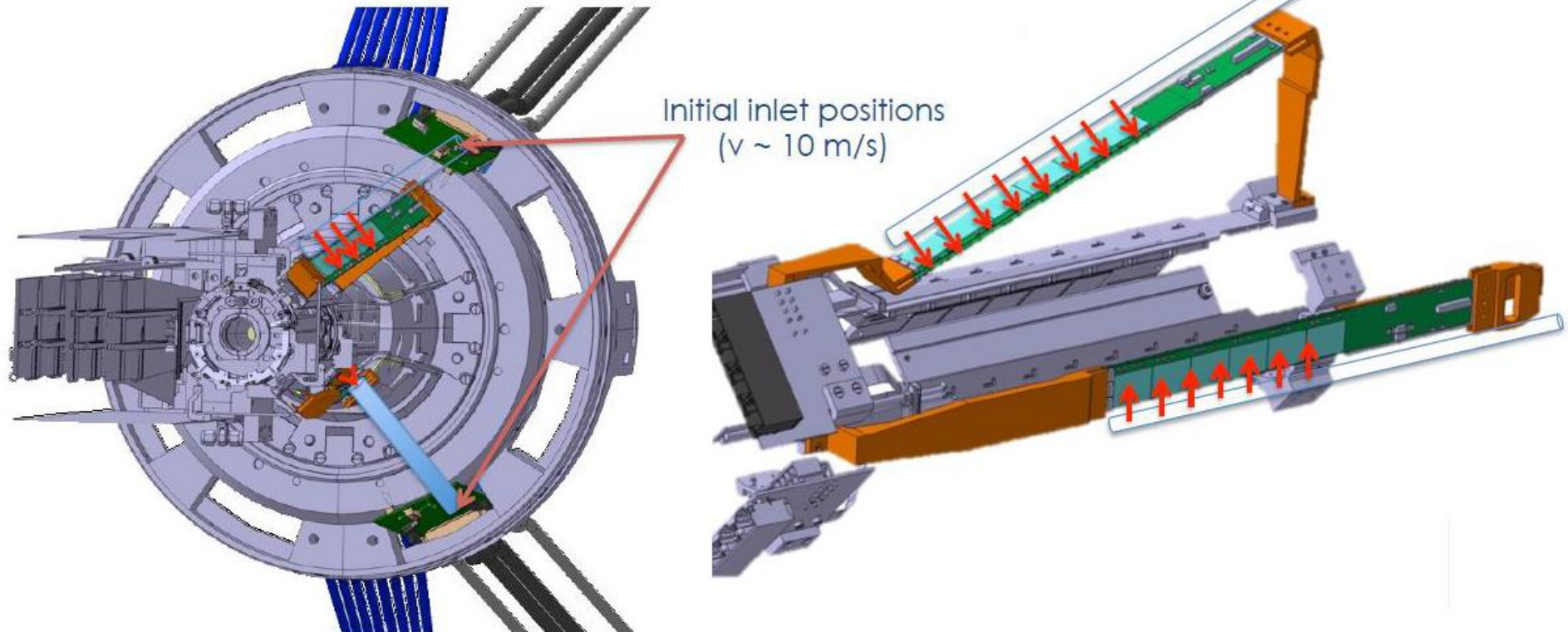
# Proposed PLUME system



## ■ Require one N<sub>2</sub> tube on each PLUME ladder

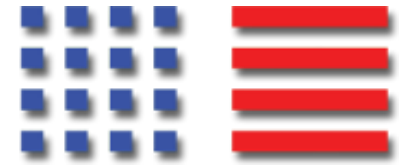
- N<sub>2</sub> flow for each of this tube  $Q_{PLUME} \sim 2$  to 4 L/min
- Tubes run along PLUME and pinholes blow N<sub>2</sub> onto Si surface
- Nb of holes & size adjusted to ensure velocity(N<sub>2</sub>)  $v \sim 1.5$  m/s
- Total N<sub>2</sub> flow in the volume not thermally isolated from PLUME :  $Q_{tot} \sim 40$  L/min

→ 2 pipes required (in phase-3)  
/ current phase-2



# Open Questions

- Which is the temperature profile along CLAWS?
- Sufficiently low and flat temperature distribution?
- Dark rate vs temperature
- PLUME proposal acceptable?
- How many nitrogen lines are available (planned) in forward?
- Only way for testing: integration campaign with the hot PXD sensors in place
- Could the change in the fluid dynamics inside the VXD chamber compromise the PXD stability for Phase 2?



# Thanks