CM31 - Vacuum System Update

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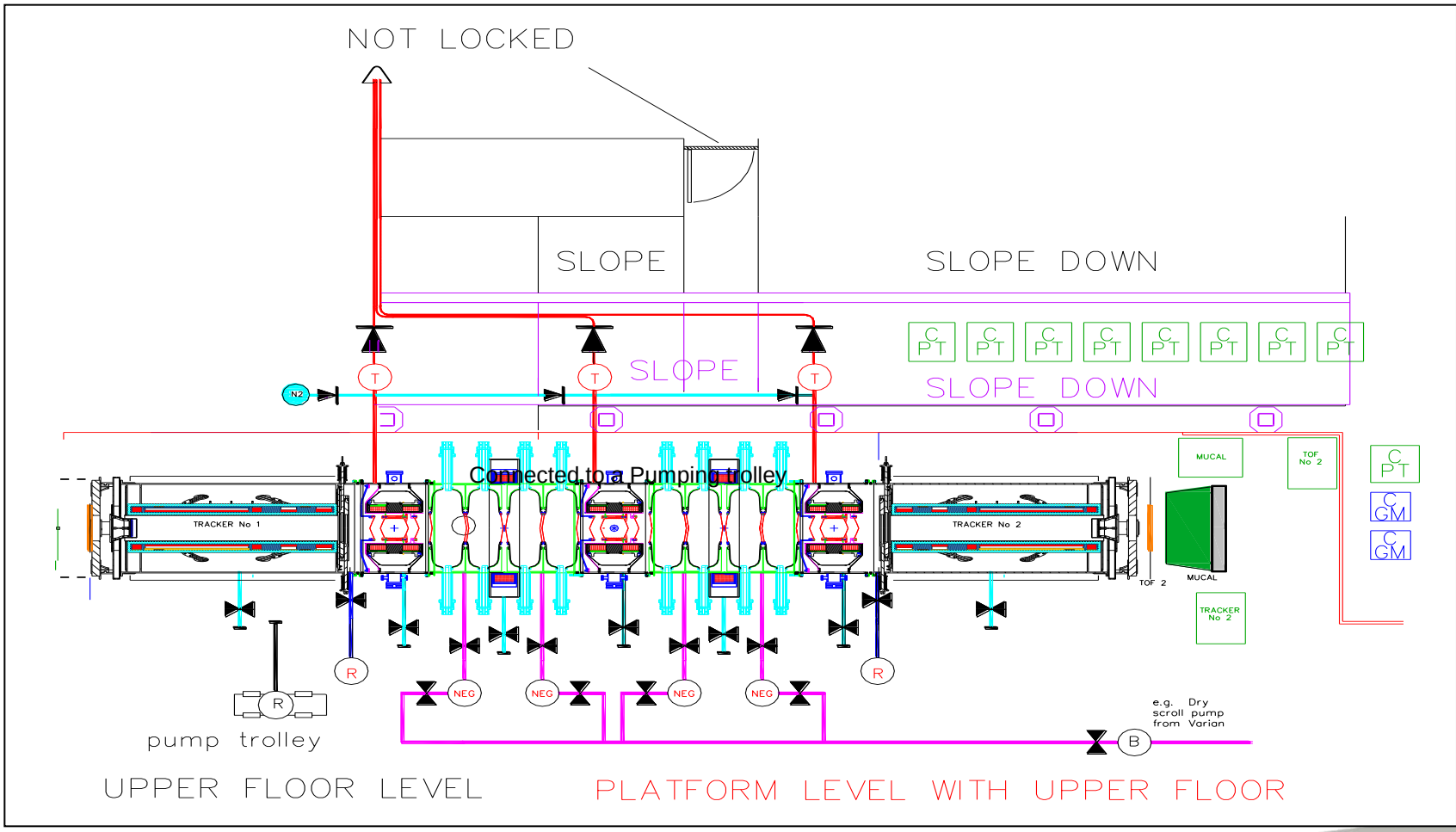
MICE Cooling Channel Vacuum System



Non-return Valve

T — Turbo pump

NEG — NEG Pump

R — Roughing pump

B — Backing pump

N2 — Dry Nitrogen

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MICE Vacsys Pumps

Pump Ref.	Module	Vacuum position	Pump type	Port size	Pump requirement specifics	Ordering Details	Comments	Location	No. of Pumps	Group Responsible
CC-VP01	*Spectrometer Solenoid left and right*	Magnet vacuum	Turbo/Roughing Pump	100mm (was 25mm)	Turbo stack with option to use as just scroll pump.	Alcatel Model ATH300 Hybrid Molec Pump Anesta-Iwata Scroll pump ISP-500CSV	Pump mounted on a trolley Original design asked for a DN 40 port.This is a non-conformance. RAL needs to provide a KF flange at site.	Trolley	1	RAL
CC-VP02, CC-VP03		Warm Cryostat vacuum	Roughing pump	40mm (was 25mm)	Dedicated dry scroll pump.	Anesta-Iwata Scroll pump ISP-500CSV	Ditto. Also need to decide if it must be manifolded to end of MICE Hall, or located local to module.	Inside hall, local to module	2	RAL
CC-VP01	*AFC Left, Centre and Right*	Magnet vacuum	Roughing pump	40mm	A dry scroll Pump. Pump rate and manufacturer to be decided.	Edwards Scroll Vacuum Pump XDS10 1-phase 115/230 V (set to 230 V) for Europe and UK	Pump mounted on a trolley (common pumping set)	Trolley	N/A	RAL
HA-VP2a, HB-VP2a, HC-VP2a		Hydrogen Safety Pump	Turbo Pump	100mm	Turbo pump of 150 L/sec and vacuum pressure at this interspace is 10^{-5} torr Max. pipe length from Cryostat to Turbo pump be less than 9.2m so that it maintain a conductance of 43L/sec -- out-gassing rate used in deriving this number is 0.002 mbar/sec.	Leybold Oerlikon TURBOVAC SL300 DN 100 ISO-K/16KF	Turbo pump to be located on the Mezzanine, behind shielding wall, with backing pump located outside hall. Each module has its own pump and vent line. Pump manufacture to be decided. Nitrogen purge is needed and is provided for by gas bottles. Note: Minimum pipe diameter required is 150mm, even though port is only 100mm.	South Mezzanine (behind shielding wall)	3	RAL
HA-VP2b, HB-VP2b, HC-VP2b			Roughing pump	100mm	Dry scroll pump *or* ATEX approved Rotary Vane + Roots Blower	Leybold Oerlikon TRIVAC D65B, ATEX, 3~; Cat : 3i + 3o with RUVAC WAU 251 ATEX KAT.3i/3o T3		Outside Hall	3	RAL
HA-VP1		Hydrogen Delivery System Pump	Roughing pump	100mm	Dry scroll pump?	Edwards Scroll Vacuum Pump XDS10 1-phase 115/230 V (set to 230 V) for Europe and UK		Outside Hall	1	RAL
		Warm Cryostat vacuum	Roughing pump	N/A	N/A		Vacuum provided for by the adjacent Tracker Solenoid module	N/A	N/A	N/A
CC-VP01	*RFCC module, left and right*	Magnet vacuum	Roughing Pump	40mm	A dry scroll Pump . Pump rate and manufacturer to be decided.		Pump mounted on a trolley (common pumping set)	Trolley	N/A	RAL
		Cavity vacuum	NEG pump	200mm	Rate and manufacturer to be advised	Vacuum One CapaciTorr B1300 pump (4H0438) * Base flange with connector and heater * CF160 flange	One NEG pump for each cavity; 4 in total. Each NEG pump has its own roughing port which connects to a 100mm main backing line for all 4 pumps. Location of backing pump to be decided. Note: Check whether 100mm diameter backing line is sufficient when manifolded, especially as port size is 200mm. This provides the vacuum for the warm Cryostat which also shares the same vacuum with the AFC warm cryostat. Dry N2 required for back filling -- could be from gas bottles Additional nitrogen is needed for the RF tuner actuator. LBL to advise nitrogen pressure, volume and consumption rate, and RAL to decide if this could be provided for by gas bottle.	Under RFCC module	4	LBNL
CC-VP04, CC-VP05			Roughing Pump		TBD			Outside Hall?	2?	RAL?

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MICE Pumping System – Ancillary Equipment

Vacuum position	Pump Ancillary Equipment	Ordering Details	Quantity	Module Ancillary Equipment	Ordering Details	Quantity
Magnet vacuum	Gauge Isolating valve	LEYCON Valves, ISO-KF Flange, DN 25 KF, Manually Operated Right-angle valve, aluminum body, DN 25 KF	2	Isolating valve	LEYCON Valves, ISO-KF Flange, DN 25 KF, Manually Operated Straight-Through Valve, aluminum body, DN 25 KF	1
	Gauge head	IONIVAC Transmitter ITR 200 S	1	Gauge head	IONIVAC Transmitter ITR 200 S	1
	Pump Isolating Valve	LEYCON Valves, ISO-KF Flange, DN 25 KF, Manually Operated Right-angle valve, aluminum body, DN 25 KF	1	Burst Disc		1
	Module Isolating Valve	LEYCON Valves, ISO-KF Flange, DN 25 KF, Manually Operated Right-angle valve, aluminum body, DN 25 KF	1	Cross	4-Way Crosses ISO-KF (Stainless Steel 1.4301), DN 25	1
	Tee	Tees ISO-KF (Stainless Steel 1.4301), DN 25	2			
	Lines					
Warm Cryostat vacuum				Isolating valve	LEYCON Valves, ISO-KF Flange, DN 25 KF, Manually Operated Straight-Through Valve, aluminum body, DN 25 KF	1
				Gauge head	IONIVAC Transmitter ITR 200 S	1
				Burst Disc		1
				Cross	4-Way Crosses ISO-KF (Stainless Steel 1.4301), DN 25	1
Magnet vacuum	See CC-VP01	See CC-VP01				
Hydrogen Safety Pump	See separate H2 system notes					
	See separate H2 system notes					
Hydrogen Delivery System Pump	See separate H2 system notes					
Warm Cryostat vacuum	N/A					
Magnet vacuum	See CC-VP01	See CC-VP01				
•Cavity vacuum	St 185 Getter cartridge					
	NEG pump controller					
	Mains input cable for NEG pump controller (2 meter)					
	Supply output cable for NEG pump controller (3 meter)					
	Mating Connector (female 6 pin)					
	Bursting disc, main isolating valve, gauge head with isolating valve					

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Issues & Progress

- **Outstanding issues:**
  - Insulating vacuums:
    - Need to decide whether roughing pumps or turbo pump stacks are required
    - Which insulating vacuums need to be continuously pumped?
    - What happens when magnets quench or warm up?
    - What size pumping ports will be required?
    - Manifolded system vs pumping trolley(s) vs Sorption pumps
      - A manifolded system is needed in order to
        - » Be able to continuously pump one or more systems whilst powered
        - » Make changes to the vacuum system whilst powered
        - » Deal with the sudden release of plated-on contaminants (eg N2, O2, H2O) when a magnet quenches
      - It had thus been decided to make use of a remotely-controlled manifolded system, instead of the originally-planned manually-controlled pumping trolley(s)
      - This decision has since been challenged by DL staff
      - A manifolded system will be more costly and difficult to implement
      - MICE management must consider the pros & cons, make a final decision, and accept the consequences
- **Recent progress:**
  - Pumps required for the H2 R&D system have already been purchased and installed
    - The vacuum systems for the AFC cryostat and H2 absorber will always be kept separate from each other, and from other Cooling Channel components, for reasons of safety