

C_6F_{14} Liquid Circulation System: status and perspective in Run-3

HMPID PLENARY MEETING
December 14th, 2018

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TOPICS

- Liquid circulation system in Run-2
- C_6F_{14} consumption
- Maintenance activities planned for LS2
- Summary

Liquid Circulation System in Run-2

Filling and purifying station



Transparency system



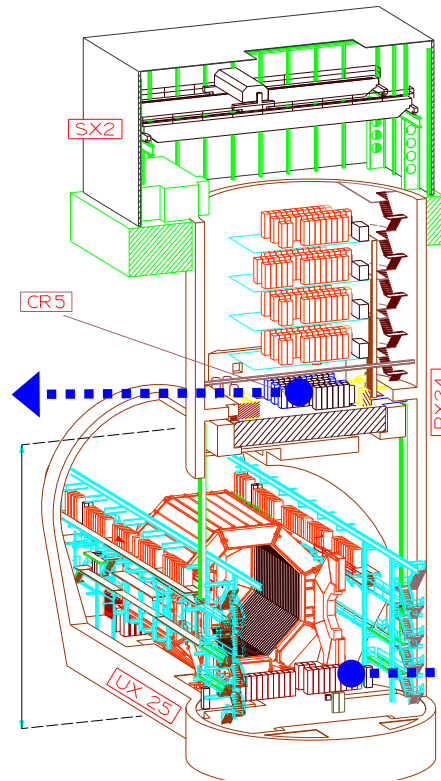
Cold trap



Ar distribution station



LCS is fully operated by a dedicated PLC based Control System



Distribution station

YP 2004	YP 2003	Year of production YP			
RICH6 Rad: YP 2003 AUGUST 2006	YP 2003	2002	2003	2004	2005
YP 2004	YP 2003	N° radiators			
		1	10	5	5

YP 2003	YP 2003	YP 2004
RICH4 Rad1: YP 2002 JUNE 2012	YP 2003	YP 2005
RICH4 Rad0: YP 2003 OCTOBER 2010	RICH3 Rad0: YP 2003 JUNE 2010	YP 2005
YP 2004	YP 2005	YP 2005
YP 2003	YP 2005	YP 2005
YP 2004	YP 2005	YP 2005

Pumping station



70 pressure sensors

44 temperature sensors

35 pneumatic valves

64 electro valves

Flow meters, hygrometer and oxymeter

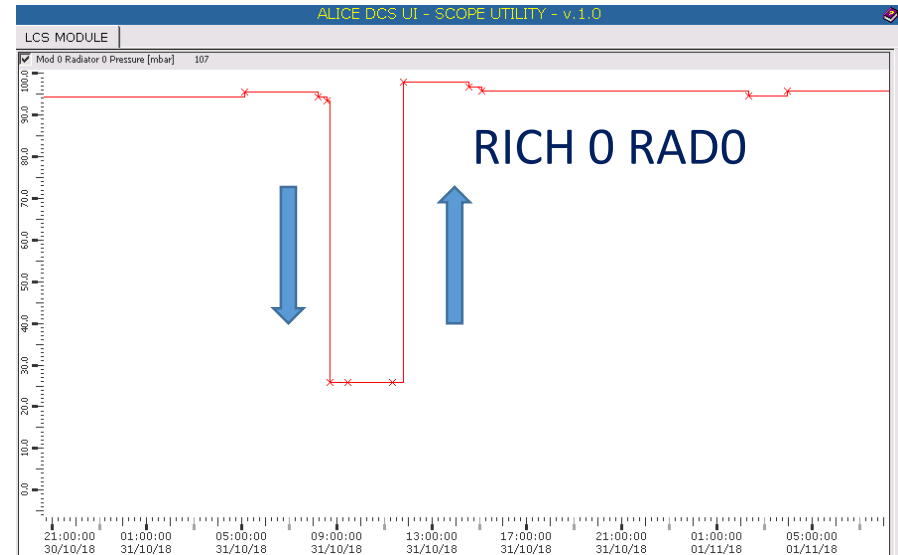
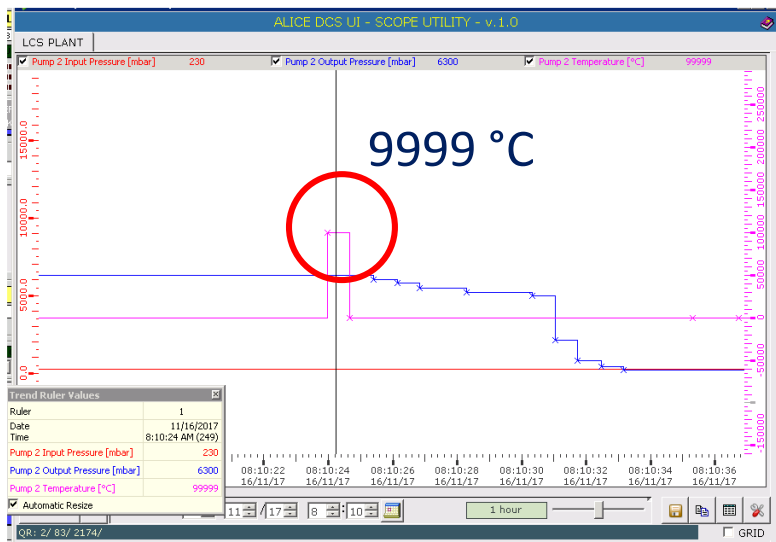
Liquid Circulation System in Run-2: 2015-2018

STAGNANT
for 12 months

RECIRCULATION
for 16 months

Thanks to an accurate system design the **circulation system** for the Cherenkov liquid radiator C6F14 has shown an excellent stability and let an easy maintenance.

Observed: abnormal behavior of some sensors (temperature, pressure) and Electro valves manifold malfunctioning



C_6F_{14} consumption until end Run-2 and expected consumption until end of Run-3

During Run-2
(4 years)

8 months/year in Stagnant mode or
radiators emptied



4 months/year in Recirculation mode



C_6F_{14} consumption
300 l/years

During Run-3
(3 years)

? months/year in Stagnant mode



? months/year in Recirculation mode

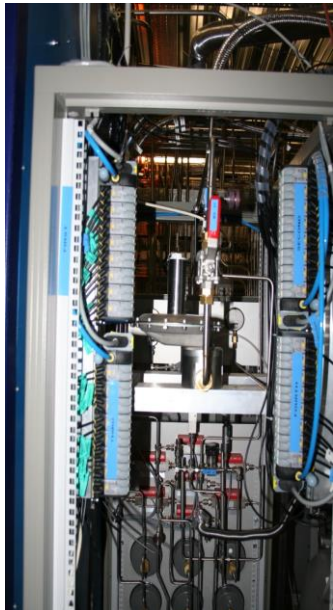
C_6F_{14} in stock: 900 l



Liquid Recirculation system must be run in
recirculation mode < 4 months/year

Maintenance activities done on the C₆F₁₄ LCS

Activity	Description
Pumping station	Change pumps' gear, filters, safety valves.....
Cold trap	Improvement of the heat exchanger
Ar distribution	Change EV manifolds
Purifying station	New filter cartridge
Detector's piping	Leak test



Handling and
transport operation

SXL2

Maintenance activities planned for LS2

Maintenance needs to ensure the right functioning of the Liquid Circulation System for the next Run-3.

Filling and purifying station



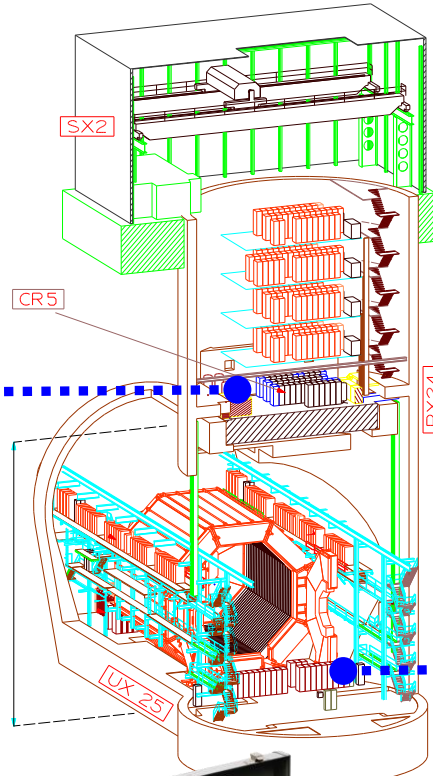
Transparency system



Cold trap



Ar distribution station



Distribution station

YP 2004	YP 2003	Year of production YP			
RICH6 Rad1: YP 2003 AUGUST 2006	YP 2003	2002	2003	2004	2005
YP 2004	YP 2003	N° radiators			
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	YP 2004	YP 2005			
	YP 2003	YP 2005			
	YP 2004	YP 2005			

Pumping station



Maintenance activities planned for LS2

Pumping station

Station	intervention	Work time (day)	Estimation period intervention	Cost (k€)	Note
Pumping	Disconnect the input/output lines	10	to be defined		
	Move the rack on the surface				
	Change pumps' gear			0.7	
	Change safety valves			0.4	
	Change unidirectional valves			0.4	
	Change filters			0.3	
	Leak test				
	Move the rack underground				
	Reconnect the input/output line and leak test				

Maintenance activities planned for LS2

Ar distribution station

Station	intervention	Work time (day)	Estimation period intervention	Cost (k€)	Note
Ar distribution	Pressure reducers	4	to be defined	3	
	Change 2 manifolds (32 electro valves)				<u>High priority</u>
	Reconnect the input/output lines and leak test				
	Test with PLC				

In order to optimize the working day the intervention will be done in the same period of the pumping station maintenance.

Maintenance activities planned for LS2

Filling and purifying station + Transparency system

Station	intervention	Work time (day)	Estimation period intervention	Cost (k€)	Note
Filling and purifying + Transparency	UV lamp	10	to be defined	5	
	Pressure transducers				
	Replace flow meter			1.5	
	Change sintered filter			0.3	
	Molecular sieve (big cartridge)			3	
	Leak test				
	Change cell and calibration Oxymeter			0.6	
	Calibration Hygrometer			0.6	

Maintenance activities planned for LS2

Cold trap

Station	intervention	Work time (day)	Estimation period intervention	Cost (k€)	Note
Cold trap	Disconnect the input/output lines	2-3	to be defined	4.0	Include the shipping
	Move the rack on the surface				
	Preparation for the shipping to Tecnodelta (Italy)				
	Move the rack in CR5	5	to be defined		Tecnodelta needs 1 month for the maintenance
	Reconnect the input/output lines and leak test				

In order to optimize the working day the intervention (disconnection) will be done in the same period of the filling and purifying station maintenance

Maintenance activities planned for LS2: summary

System	Work time (day)	Estimation period intervention	Manpower (Bari)	Note
Pumping Ar distribution	10	to be defined	Cosimo, Mimmo	
Filling and purifying + Transparency	10		Cosimo, Mimmo	
Cold trap	5		Cosimo, Mimmo	
Detector's piping Leak test	5			

Summary

- Thanks to an accurate system design the circulation system for the Cherenkov liquid radiator C_6F_{14} has shown an excellent stability and let an easy maintenance
- In Run-3 the liquid Recirculation system must be run in recirculation mode < 4 months/year
- HMPID maintenance activities should be finalized and discussed with ALICE integration
- In order to avoid C_6F_{14} consumption the whole liquid must be sealed in the filling tank