

EP-DT
Detector Technologies

LS2 Activities for the ALICE Gas Systems

Beatrice Mandelli
On behalf of the Gas Team

CERN

ALICE LS2 preparatory meeting
16 November 2018

Outline

ALICE Gas Systems - Maintenance and Operation

- Standard Maintenance and Operation during LS2
- PLC replacement for all gas systems

ALICE Gas Systems - Upgrades and Consolidation

- Tentative planning of LS2 activities for ALICE Gas Systems

Standard maintenance for ALICE Gas Systems

Standard maintenance covered by the M&O work-package agreement

- Maintenance need to be coordinated for the 4 LHC experiments and over 30 gas systems
 - We are trying to consider all experiment schedules
 - Need input from all detectors!
- Maintenance is schedule in parallel to gas system upgrades activities
 - Several activities for other experiments (example CMS GEM and RPC, LHCb SciFi, ATLAS NSW and RPC, ...)
- **Several activities will require the STOP of the system**
 - Activities which require stop of the system will be scheduled in parallel with other activities
 - They can be **coordinated** with the detector responsible
- **Some activities only possible during LS**
 - Examples: PLC upgrades, modification on recirculation pump, etc.

FTE CERN (weeks)	42
FSU (weeks)	35
System in stop	~ 2-3 weeks per system

Standard maintenance for ALICE Gas Systems

**Need to know how you want to keep the gas system during Xmas and LS2
 —> necessary to plan standard maintenance**

- Still preliminary since we are coordinating for all experiments with upgrades activities
 - We are trying to consider all experiment schedules
- Need info from detectors
 - Periods we cannot touch the gas system
 - When gas system needs to be operational in 2020
 - Now some info from: TRD, TRT, TOF
 - Please send an email to me and LouisPhilippe (Louis-Philippe.Sobral.De.Menezes@cern.ch)

Very similar for all LHC experiments

More details in back-up slides

Activity	2019				2020			
	T 1	T 2	T 3	T 4	T 1	T 2	T 3	T 4
Purifier module maintenance								
Mixer module maintenance								
Distribution module maintenance								
Pump module maintenance								
Exhaust module maintenance								
Electrical maintenance								
PLC replacement + Software								
Analysis module maintenance								
General maintenance								

Preliminary

PLC replacement and software re-configuration

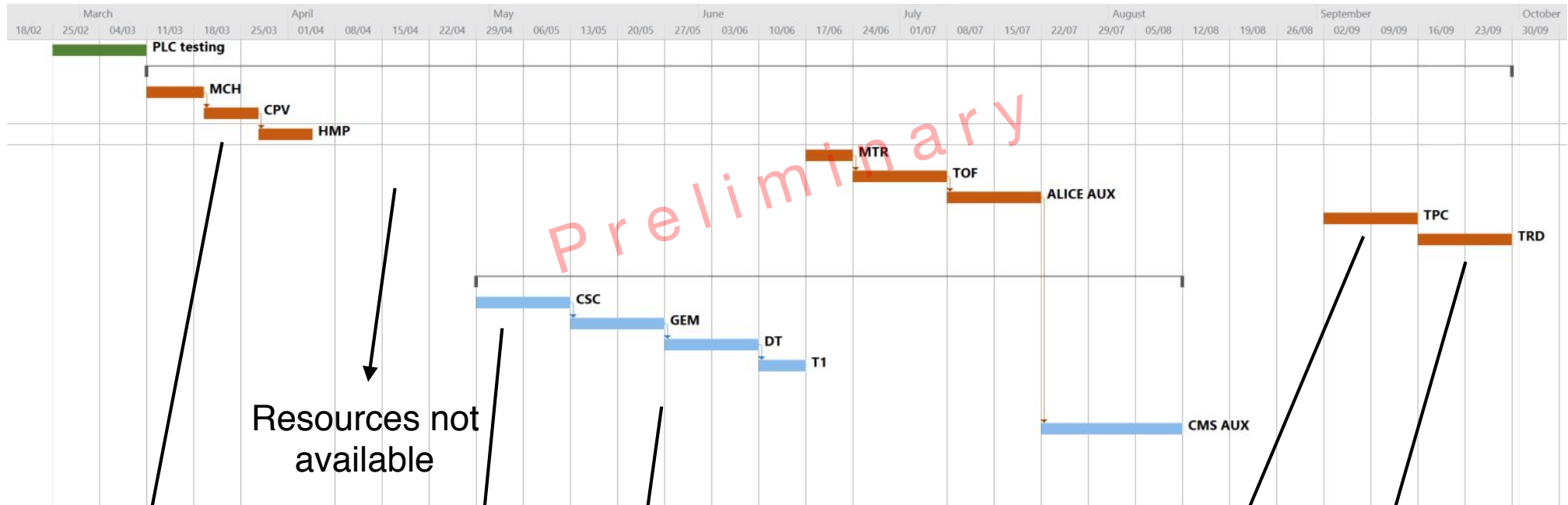
- **New generation of PLCs will be installed**
 - Compulsory for all gas systems
 - They will be paid with gas M&O budget (one PLC for each gas system)
- **The change of PLCs will be a big (and critical) intervention for all gas systems**
 - Electrical cabling to be re-done (electrical FTE and FSU allocated)
 - Mechanical modifications
 - Considerable software modification necessary: in collaboration with BE-ICS
 - 1 full FTE in gas team dedicated to software re-configuration and testing (~15 weeks for ALICE)
- **New software upgrades necessary for some gas systems**
 - They will be done during or after the change of PLC

PLC replacement in ALICE

- ALICE will be the first experiment undergoing PLC replacement
 - To foreseen some more weeks for debugging/contingencies
- PLCs will arrive end February/beg March 2019
- During installation and commissioning gas system will be **on/off**
 - Need **gas system operational and in run for the commissioning**
 - Better to have correct gas mixture composition to validate all parameters and PID
 - There could be 1-2 days **without** reading of ALL gas system signals
- In case of questions/doubts, please contact:
 - Michal Zimny (EP-DT), Beatrice Mandelli (EP-DT)

	Actions	Infos/Contingencies
Day 1 A	1. Removal of PLC 2. Installation of new PLC and declaration 3. Final cabling	- EP-DT work (CERN + FSU) - System off - Sensors not reachable for ~ 1 day
Day 1 B (or Day 2)	1. BE-ICS: load of new software 2. Start commissioning	- EP-DT + BE-ICS - System on/off
From Day 2	1. I/O checks 2. EP-DT commissioning in collaboration with BE-ICS	- System in run but still on/off - Need to run with a gas mixture (better if the one of the detector)

PLC replacement in ALICE: preliminary plan



First system for PLC upgrade.
It could be we'll need a bit more time

Resources not available

Use this system as a test for purifier module (critical)

Following CMS planning

Waiting for TPC back in experiment

Additional upgrades needed (LOGO to PLC)

Under discussion with BE-ICS

Final schedule will be circulated through mailing list: gas-users-ALICE@cern.ch

Planning of not M&O activities

Project	Manpower (weeks)	2018		2019											
		T4		T1			T2			T3			T4		
		November	December	January	February	March	April	May	June	July	August	September	October	November	December
ALICE															
TPC removal	3			0.3	0.3	0.4	0.3	0.3	0.4	0.3	0.3	0.4			
	4			1	0.5	0.5	0.3	0.3	0.4	0.3	0.3	0.4			
CPV humidifer	7														
	8														
TRD (CO2, vessel, recup PLC)	3													1	2
	4.5			1										1.5	2
MTR GC	2														
	2														
FSU tot	15	0	0	0.3	0.3	0.4	0.3	0.3	0.4	0.3	0.3	0.4	0	1	2
FTE tot	18.5	0	0	2	0.5	0.5	0.3	0.3	0.4	0.3	0.3	0.4	0	1.5	2

Project	Manpower (weeks)	2020												Deadline	
		T1			T2			T3			T4			Deadline (if present)	
		January	February	March	April	May	June	July	August	September	October	November	December		
ALICE															
TPC removal	3														following TPC plan
	4														
CPV humidifer	7						2	2	3					mid 2020	
	8	1					3	2	2						
TRD (CO2, vessel, recup PLC)	3													end 2019	
	4.5														
MTR GC	2											2		no deadline	
	2				0.5							1.5			
FSU tot	15	0	0	0	0	0	2	2	3	0	2	0	0	15	
FTE tot	18.5	1	0	0	0.5	0	3	2	2	0	1.5	0	0	18.5	

Resource for ALICE gas systems in LS2

	FSU (weeks)	FTE (weeks)
M&O	35	42
Consolidation projects agreed	5	6.5
Consolidation projects under discussion	10.5	8.5
New plants agreed	2	1
Total FTE/year	0.6	0.7

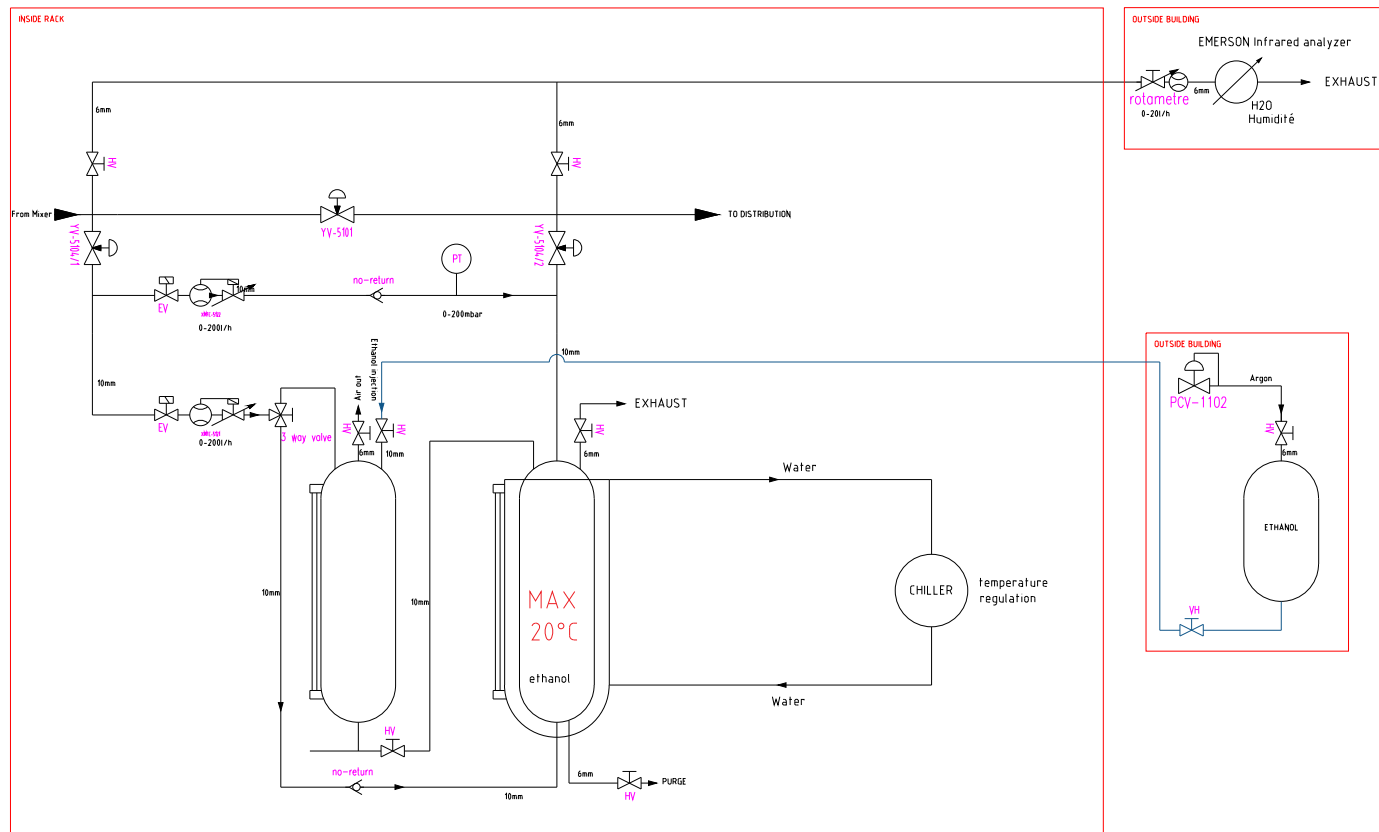
Back-up slides

CPV Humidifier

- New ethanol humidifier plan prepared for CPV → moved to H₂O
- Construction postponed due to budget reason
- Temporary set-up installed (with simple bubbler)
- As it is now, not under M&O responsibility and piquet
- Final decision by end of 2018
- Need to now for the general planning

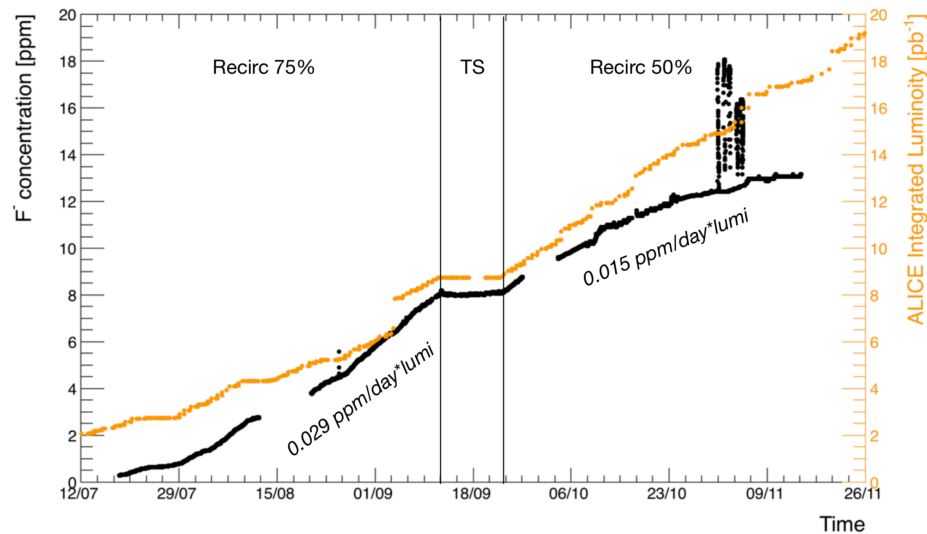
Not on M&O budget

FTE (weeks)	8
FSU (weeks)	7



MTR Gas Chromatograph and F- station

- During Run 2 gas team performed several gas measurements
- Gas chromatogram measurements to check gas quality and presence of impurities (produced by breaking of R134a)
- Fluorine measurements to measure F- presence in the system
- Temporary set-up using M&O and gas R&D budget
- Need to fix for Run 3
- Discussion on-going with ALICE MTR people (A. Ferretti, M. Gagliardi)



Not on M&O budget

FTE (weeks)	2-4
FSU (weeks)	2
Material (kCHF)	41

Standard maintenance for ALICE Gas Systems

ALICE Gas System Standard Maintenance during LS2 per experiment

Activity	2019				2020				FTE (weeks)					Responsible	Comment		
	T 1	T 2	T 3	T 4	T 1	T 2	T 3	T 4	CERN	Mech	Weld/Pipe	Elect	FSU total				
Purifier maintenance																	
cleaning of valves	x	x							0.6	0.6			0.6	Site responsible	2 purifiers TRD, TOF		
modification with manual valves filters bypass	x	x							2		2		2	Site responsible	4 purifiers TOF, TRD, MTR, TPC		
pressure vessel check & leak test	x	x							1	1			1	Fred	TOF, TRD, MTR, TPC Purif et CO2 Removal		
replacement of material	x	x							x	x			1.5	Andrea	TOF, TRD, TPC (CO2 Removal????)		
change of filters	x	x							2	1.5			0	Site responsible	TOF, TRD, MTR, TPC Purif et CO2 Removal		
Electrovalve change by pneumatic + Festo	x								1	1		1	2	Site responsible	TPC & Co2 removal		
Regeneration HMPID									x	0.4	0.2		0.2	Site responsible			
Mixer maintenance																	
MFC check + recalibration									x	x	2	3		3	Beatrice/Kacper		
Distribution maintenance																	
flowcell check + calibration									x	x	x	1	1	0.5	1.5	Michal	
check bubblers											x	0.2		0	Site responsible		
Vanne bloc Festo (control et remplacement vannes)				x	x				0.5	0.5			0	0.5	Site responsible		
Filtres	x	x	x	x	x	x			0.5	0.5				0.5	0.5	Site responsible	TPC
Check regulation valves									0.5					0.5	0.5	Site responsible	
Pump maintenance																	
Change of membranes +service									x	3	2	0	0.5	2.5	Kacper/Site responsible	TPC 1 et TRD 3 maintenance pompe	
Check regulation valves	x	x	x	x					0.2	0	0	0	0	0	Site responsible		
Upgrade filter + pt for DeltaP	x	x	x	x					0.5	0	1	1	2	Kacper/Site responsible	TOF, TRD, TPC, MTR		
Exhaust module																	
Buffer volumes to be qualified	x	x	x	x					2	1			1	Fred	TPC, TOF, TRD, TRD recuperation		
Upgrade filter + pt for DeltaP									x	x	1	1	1	2	Site responsible	TOF, TRD, TPC, MTR	
Electrical maintenance																	
Change of power supplies (18 V/ 24 V)	x	x	x	x					0.5	1	0	1	2	Lukasz/Patrick	TPC(2), TRD(3), TOF(3), MTR(3) HMPID(1), MCH CPV PMD(3), AUX(2)		
Canbus quality			x	x					0.5	0	0	0	0	0	Michal		
Profibus quality	x	x	x	x					0.5	0	0	0	0	0	Patrick		
Check/repair connectors	x	x	x	x					0.5	0	0	1	1	Patrick	Earth connection		
Heating cables purif + bloc regul.	x	x	x	x					1	0	0	1	1	Patrick			
PLC replacement + Profibus separation (With quality check)	x	x	x	x					1.5	0	0	3	3	Michal	9 pcs: TPC, TRD, TOF, MTR. HMPID, CPV, PMD, MCH, AUX		
Analysis																	
Check/change of analysis devices				x	x	x			1	0	0	0.5	0.5	LPh/Site responsible	HMPID H2O, TPC O2, TRD O2 maintenance		
Calibration of all analysis devices							x	x	1	0	0	0	0	LPh/Site responsible	Chemical cells to change		
Manifold analysis					x	x	x	x	0.5	0	0	0	0	LPh/Site responsible	LS2 to check, LS3 to replace		
General																	
Pressure sensors: change/calibration	x	x	x	x					1	1		1	2	Beatrice/Site responsible	PT Atmospherique (1000CHF 2PT + 2 Afficheur)		
Check/repair pneumatic valves	x	x	x	x	x	x			1	1	0	0.5	1.5	Site responsible			
Check/repair electro valves	x	x	x	x	x	x			0.5	0	0	1	1	Site responsible			
Check all bubblers							x		0.5	0	0	0	0	Site responsible			
Check/calibrate safety valves							x	x	1	1	1	0	2	Site responsible			
System Commissioning									12	0	0	0	0	Michal/Site responsible	2week per Big/med system 1 per small. Plus 2 weeks of site responsible for a		
Krohne			x	x	x	x			0.5	0.5	0	0.2	0.5	Kacper	TRD, TOF		
Total									Total	Total	Total	Total	Total				
									41.9	16.8	5	13.7	35.3				