

ATLAS RPC tests and leaks search activities in 2023-2024

R. Guida, K. Kapusniak, B. Mandelli, G.Rigoletti



EP-DT
Detector Technologies

■ Outline

- Overview of the tests performed in 2023-2024
- Leak search in TS

Summary of tests performed

Test performed	Goal	Date	Results	Remarks
Overpressurize output of distribution racks	Check correct working of non-return valves installed by RPC team	Jan-Feb 2023	Some issues found.	Slides . No clear overview for gas team
Lower the chamber pressure setpoint	Minimize gas consumption while keeping O2 intake under control	June 2023	Setpoint found. Not clear how much we could saved due to overlap of other factors	
Offline check of HVAC + GCS data	Check if mixer consumption is affected by ventilation mode of UX	Oct-Dec 2023	Mixer consumption increases with plug opening. Not clear if new leaks are developed	Slides
Read flow with additional flowmeter at the output of distribution rack	Understand if there is reversed flow at the channel	26 Feb 2024	No negative flow observed. Not clear	Slides . The flowmeters range was concluded to be too low
Leak search through sniffer	Check if the Freon leak detector could see any leak around RPC piping	26 Feb 2024	Several small leaks found around plastic pipes and connectors in RPC pipes	Slides . Only few pipes tested randomly
Reduce input flow in new racks by 30%	See how much gas can be spared during MD/TS without major system perturbation	26 March 2024	Flow reduced by ~100 ln/h, no significant O2 changes, no significant det. current change	Request from Giulio to repeat the test for confirmation?
Check flowcells calibration for new CO2 based gas mixture	Check what is the offset introduced in the distribution flowmeters by changing the gas mixture	April 2024	The value currently read is 10-15% lower than the real value	Slides . It seems the total leak of the flowcell roughly matches with what the mixer injects

Conclusions and plans for TS

What (we think) we understood from tests

- Most of the leaks seem to be spreaded throughout all the distribution
- We could not see any major leak (i.e. reverse flow)
- We spotted some anomalies in Rack 63
- The leak calculated by the gas system flowcells is 10-15% lower than the real value
- We can save some gas during MD/TS by leveraging new rack design

Plans for TS

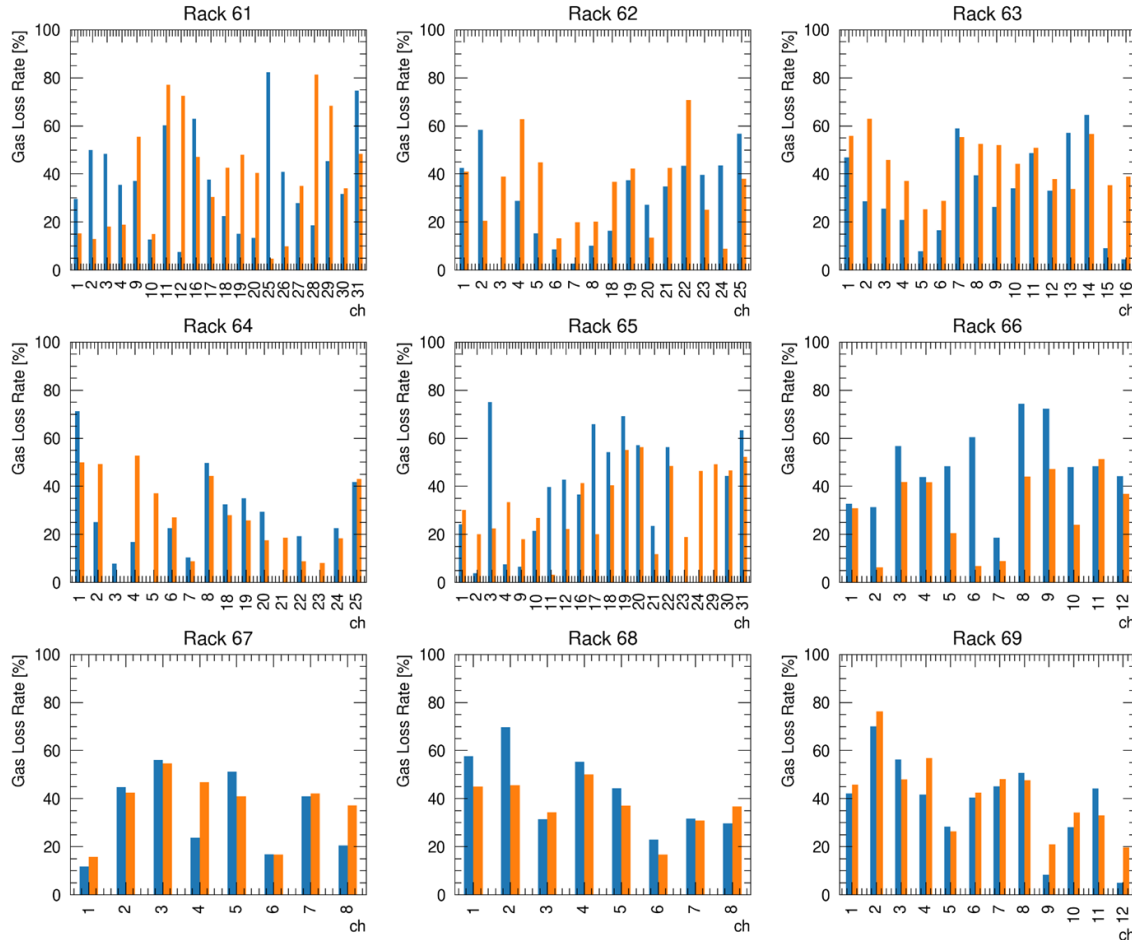
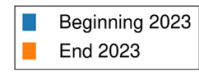
Gas System leak search:

- Search for leaks with sniffer around distribution racks in UX
 - Pros: sensitive, easy to localize leaks
 - Cons: time consuming, to check compatibility with magnetic field

Other tests:

- Switch off one rack to see if flowcells readout matches the mixer injection
 - Pros: clear result on the loss rate contribution of one rack
 - Cons: no leak monitoring during test. New leaks might develop during the restart of the rack

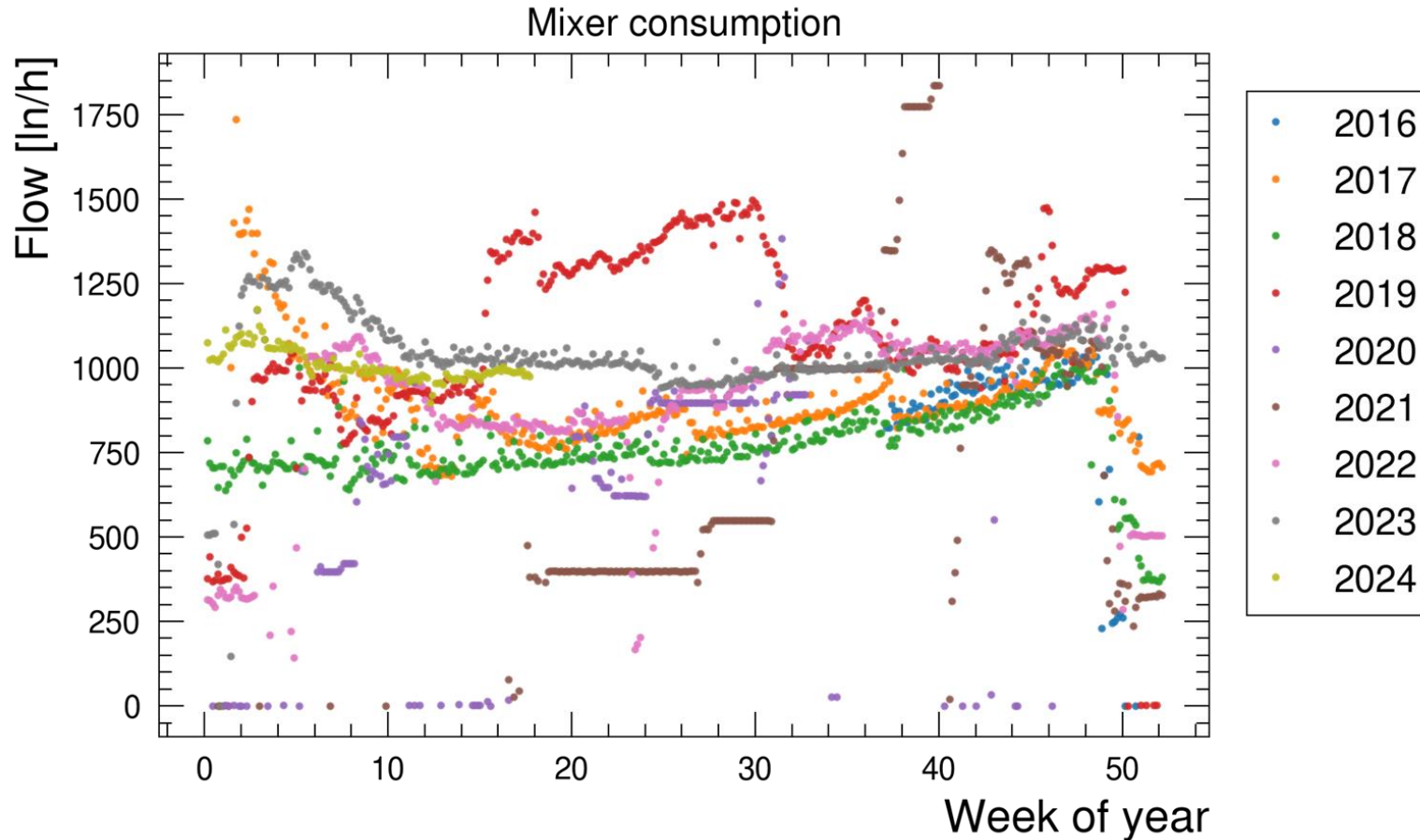
Gas loss rate beg vs end 2023



Gas Loss Rate definition

$$\frac{(\text{in. flow} - \text{out. flow})}{\text{in. flow}}$$

Mixer consumption over the years



RPC distribution-chamber layout

1 channel in distribution rack = 1 RPC manifold

Each channel in distribution rack has 1 input flowcell and 1 output flowcell

1 RPC manifold has several chamber connected to it
Chamber are installed at different heights \Rightarrow delta p.

