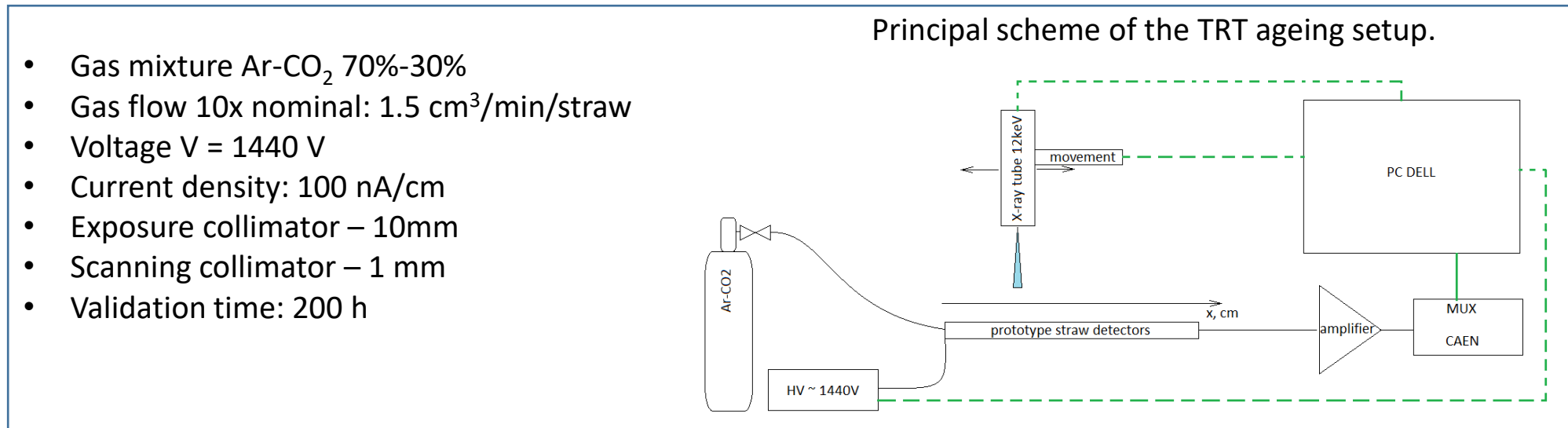


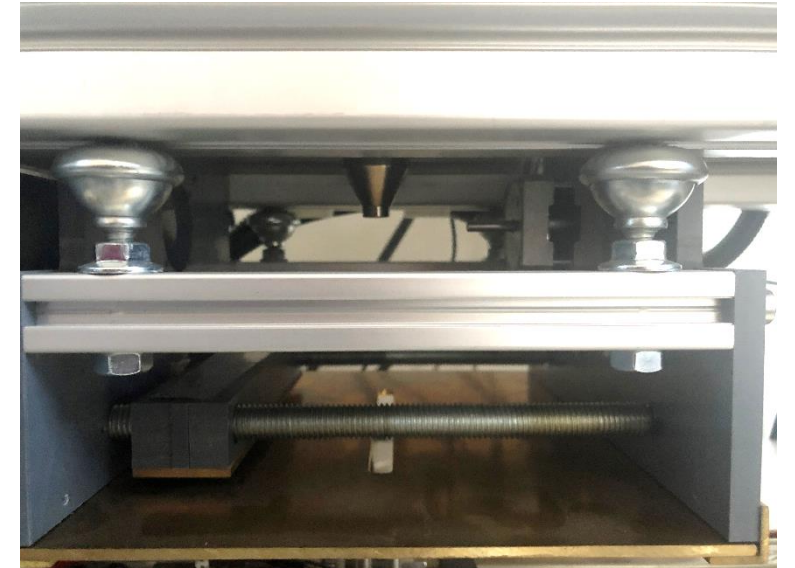
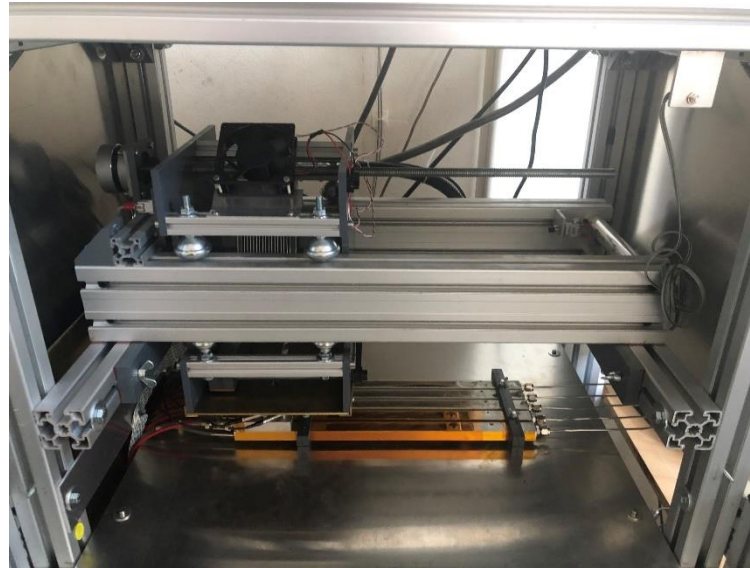
The ATLAS TRT ageing laboratory

Introduction

- TRT anode wires will accumulate more than 10 C/cm. Special measures are taken to avoid ageing effects.
- Lab started to operate more than 20 years ago as a detector material validation lab. on the basis of Fabio Sauli set up. We use 3rd generation of the setup. It operates now in a continuous mode.
- All TRT detector components in the past and now are checked for ageing.
- Special ageing validation procedure was developed and used during tests.
- Two types of ageing effects may happen in the TRT straw chambers - silicon deposition on the anode wire and organic deposition on the straw
- The sources of silicon or organic ageing are traces of oil, lubricants or components of used material which could pollute the active gas.
- the straws we use in our setup is similar to the ATLAS TRT ones.
- if during the test we see ageing the straw could potentially can be polluted. They can be recovered after X-ray exposure with Ar+CF₄ + CO₂ mixture and the straw voltage corresponding to current density 200nA/cm.
- Now set-up works in a fully automatic mode.



TRT automated ageing setup (3rd generation of the setup)



- Setup consists of 5 prototypes with three straw tube in each. It means we have 5 channels to test.
- Gas mixture: bottle -> pressure regulator -> flowmeter -> tested component -> straw prototype
- High Voltage CAEN, remote control via USB
- Movement system & Collimator controlled by microcontroller
- Mini-X X-ray tube
- Signal via amplification and MUX send to multichannel analyser CAEN
- Software and user interface to control the setup

TRT automated ageing setup (2nd version)

We have two SW to run the setup. Now we used new version of SW. The test consists of cycles of x-ray exposure (10mm width collimator) and scanning with a narrow X-ray beam along the straws (1mm width collimator).

Signal amplitude is measured during the scan. At chosen operation conditions 200h irradiation considered to be sufficient to take acceptance decision.

The screenshot displays the 'Ageing DAQ Manager' software interface. The window title is 'Ageing DAQ Manager@pcattlrageing.cern.ch'. The interface is divided into several sections:

- Runs:** A text area for 'Comment to run:' containing '3rd International Conference on Detector Stability and Aging Phenomena in Gaseous Detectors'.
- High voltage:** Settings for Voltage (1470 V), Max current (800 uA), Ramp up/down (50 V/sec), and Channel (2).
- Irradiation:** Settings for Total time (20 Hrs 0 mins), Refresh time (30 sec), and Head at (100 mm).
- Measurement:** A section for 'Straws / Run comment' with 15 numbered checkboxes (01-15) and 'Comment' fields. Below this, 'X position, mm' settings include Start (90), Stop (150), Step (3), and Offset (60). 'Time in position' is set to 30 sec and 'LLD' to 60.
- Run / Run comment:** A checkbox for 'Dry run' is checked.

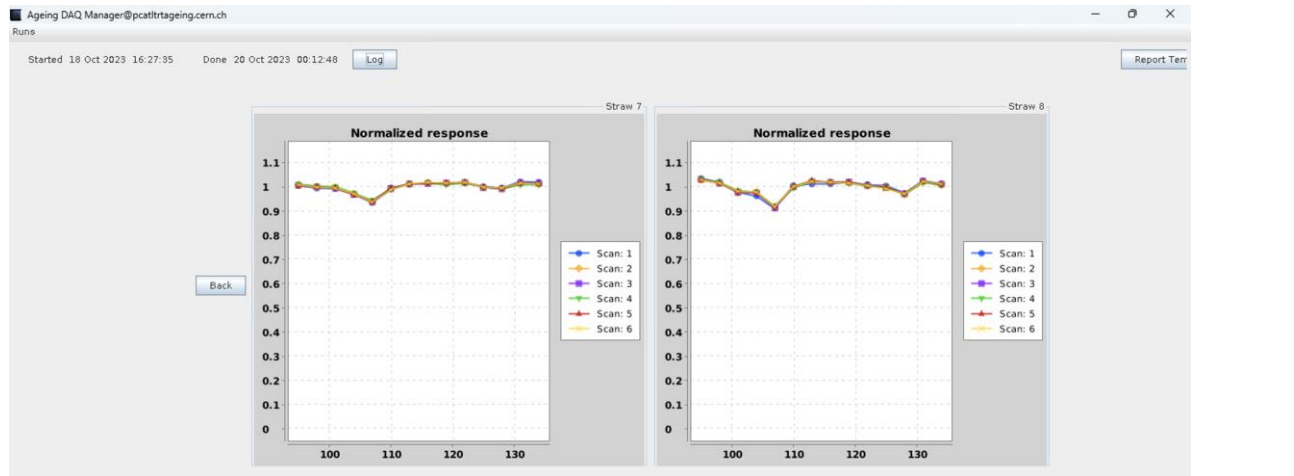
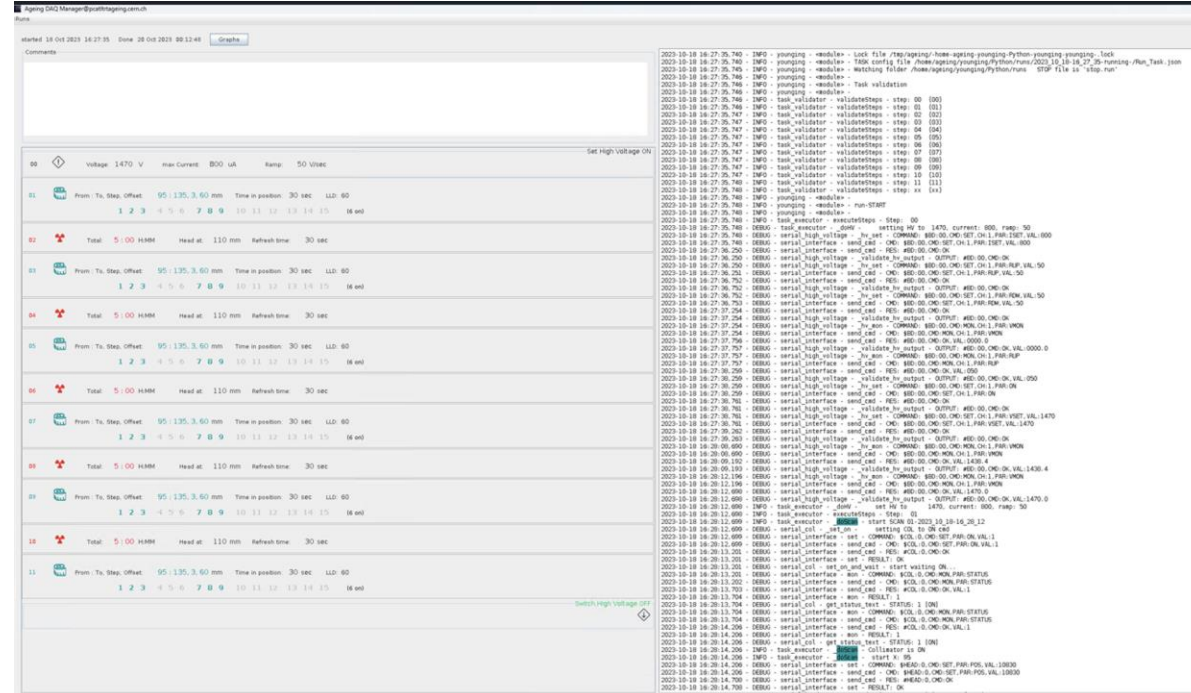
On the right side, a 'DRY RUN selected' panel shows a 'Start RUN' button and a 'Set High Voltage ON' button. Below this, a table lists parameters for a run:

00	⚠	Voltage: 1470 V	max Current: 800 uA	Ramp: 50 V/sec	Set High Voltage ON
01	☢	Total: 20 : 00 H:MM	Head at: 100 mm	Refresh time: 30 sec	⊗
02	📊	From : To, Step, Offset: 90 : 150, 3, 60 mm	Time in position: 30 sec	LLD: 60	⊗

Below the table, a row of numbers 1 through 15 is shown, with '(15 on)' to the right. A 'Switch High Voltage OFF' button is visible at the bottom right of this panel.

Text overlay: Expert's interface with general settings

TRT automated ageing setup

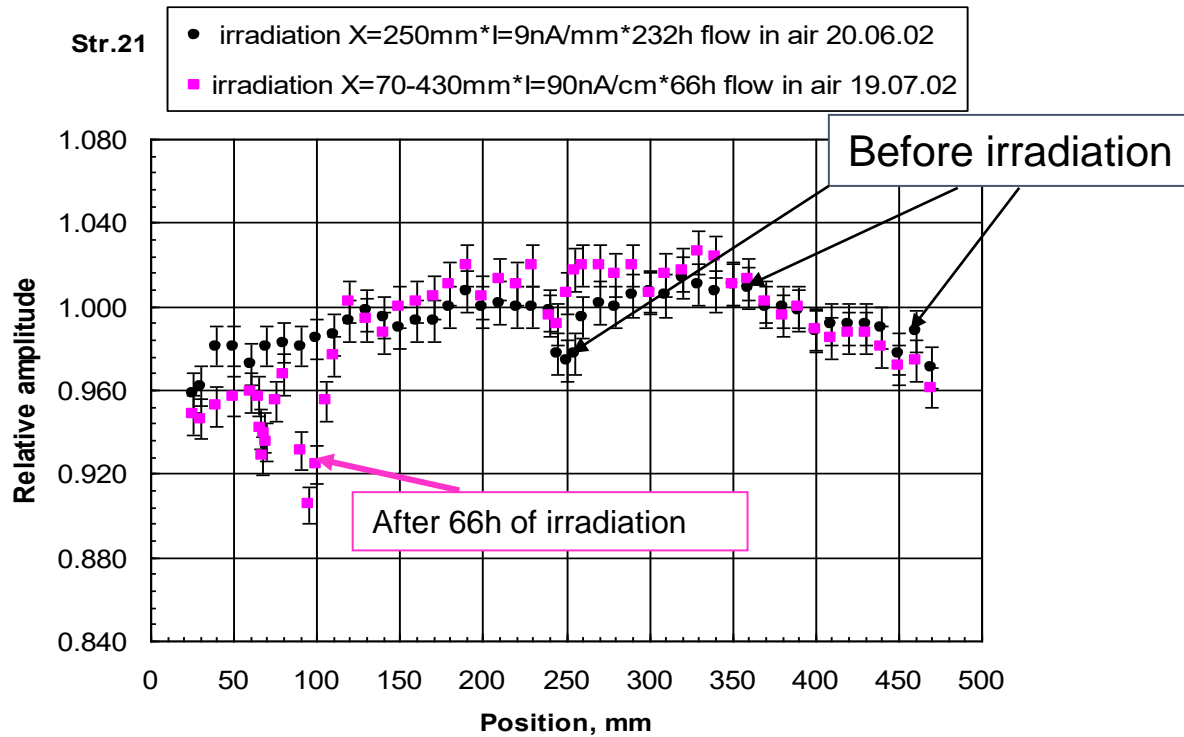


This is example of plots of amplitude scan of the straw with no Ageing seen after X-ray exposure

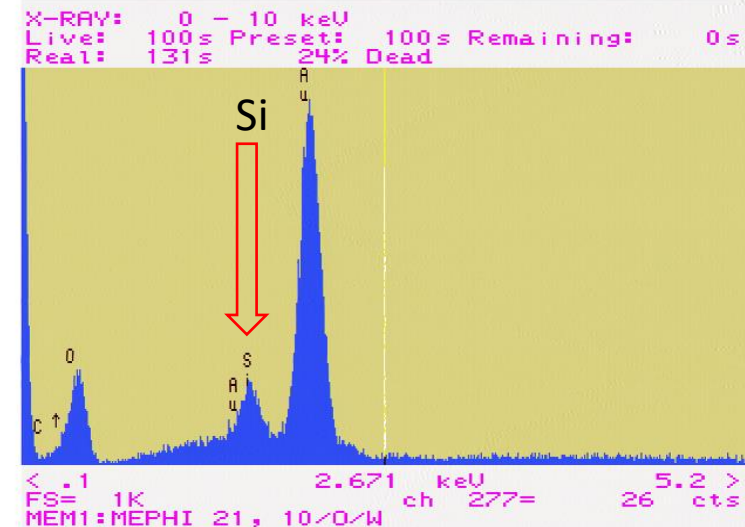
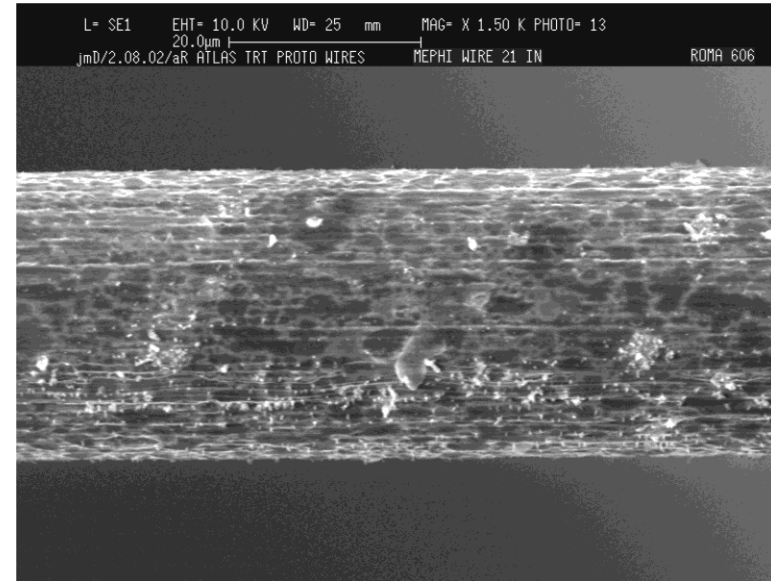
General Graphs and settings/errors logs available. It have possibility to normalize response

Back up slide

Si ageing in the Xe-CO₂-O₂ gas mixture



The most probable reason for this effect is Si pollution of the gas system components (residual of the Si-based lubricants).
Aging happens at the beginning of the irradiation area.



Statistics

- Max capacity of the setup is test of 5 gas components in 14 days
- Each year we have about 60 samples tested
- 1% of the samples were rejected because of ageing. Sometimes cleaning of the sample helps, sometimes it is enough to flush well the component before the test
- No investigation is going on the setup. Just testing of ageing effect yes/no
- This year we tested 35 samples by now
- All files stored on our PC. Copy of reports we sent to the CERN gas group. The plan is to have a database accessible on web.