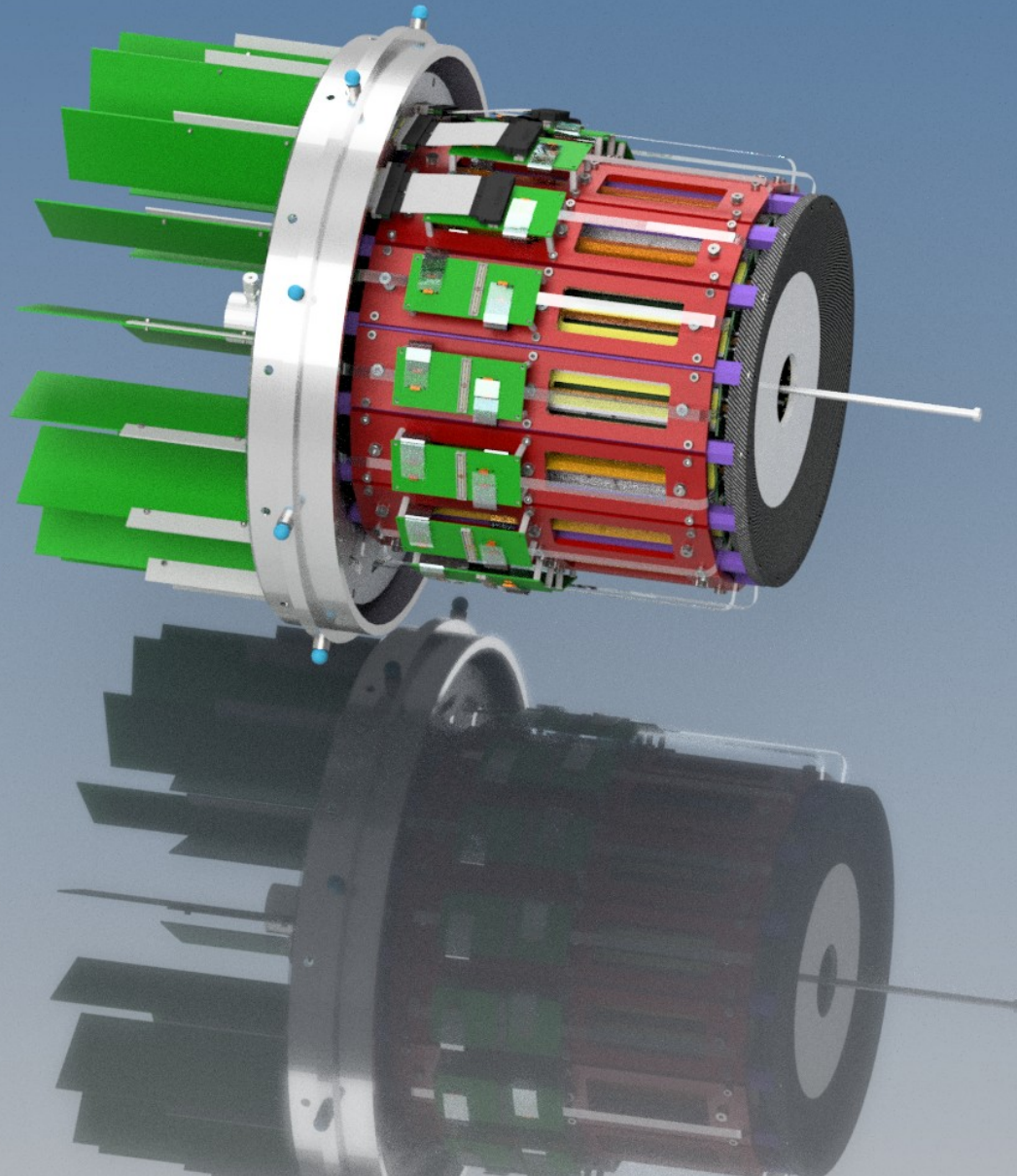


ALERT development status

All inclusive: mechanics, electronics, software for ATOF and AHDC



Gabriel Charles
for ALERT collaboration

IJCLab

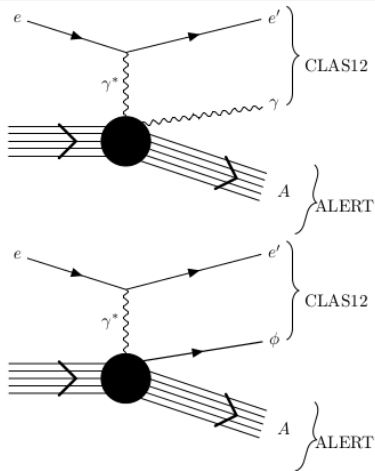
CNRS-IN2P3
Paris-Saclay University

A comprehensive program to study nuclear effects

Coherent Processes on ^4He

- $^4\text{He}(e, e' \ ^4\text{He} \ \gamma)$
- $^4\text{He}(e, e' \ ^4\text{He} \ \phi)$

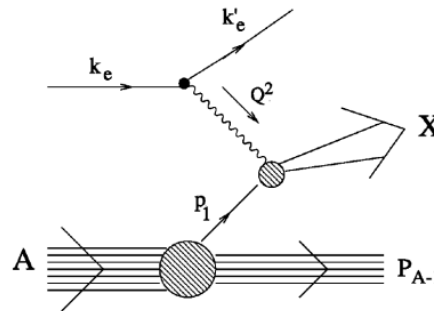
Explores the partonic structure of ^4He



DIS on ^4He and ^2H : Tagged EMC Effect

- $^4\text{He}(e, e' + ^3\text{H})\text{X}$ (proton DIS)
- $^4\text{He}(e, e' + ^3\text{He})\text{X}$ (neutron DIS)
- $^2\text{H}(e, e' + p)\text{X}$ (neutron DIS)

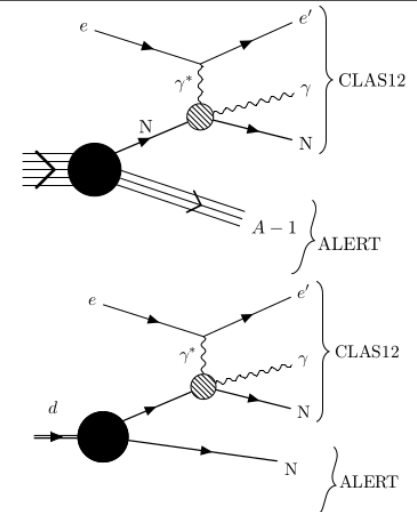
Test FSI and rescaling models



Incoherent processes on ^4He and ^2H

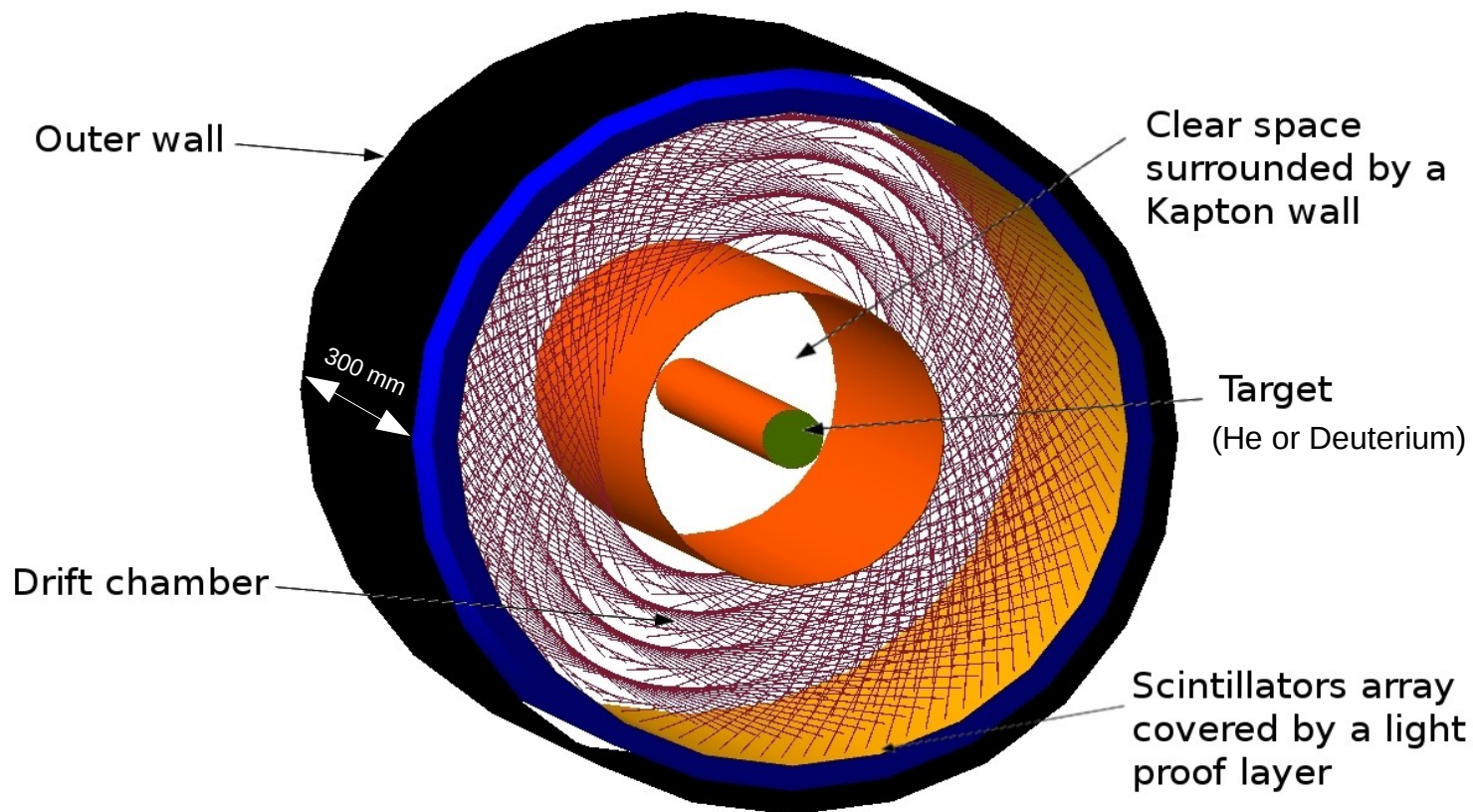
- $^4\text{He}(e, e' \gamma p + ^3\text{H})$
- $^4\text{He}(e, e' \gamma + ^3\text{He})n$
- $^2\text{H}(e, e' \gamma + p)n$

Identify medium modified nucleons



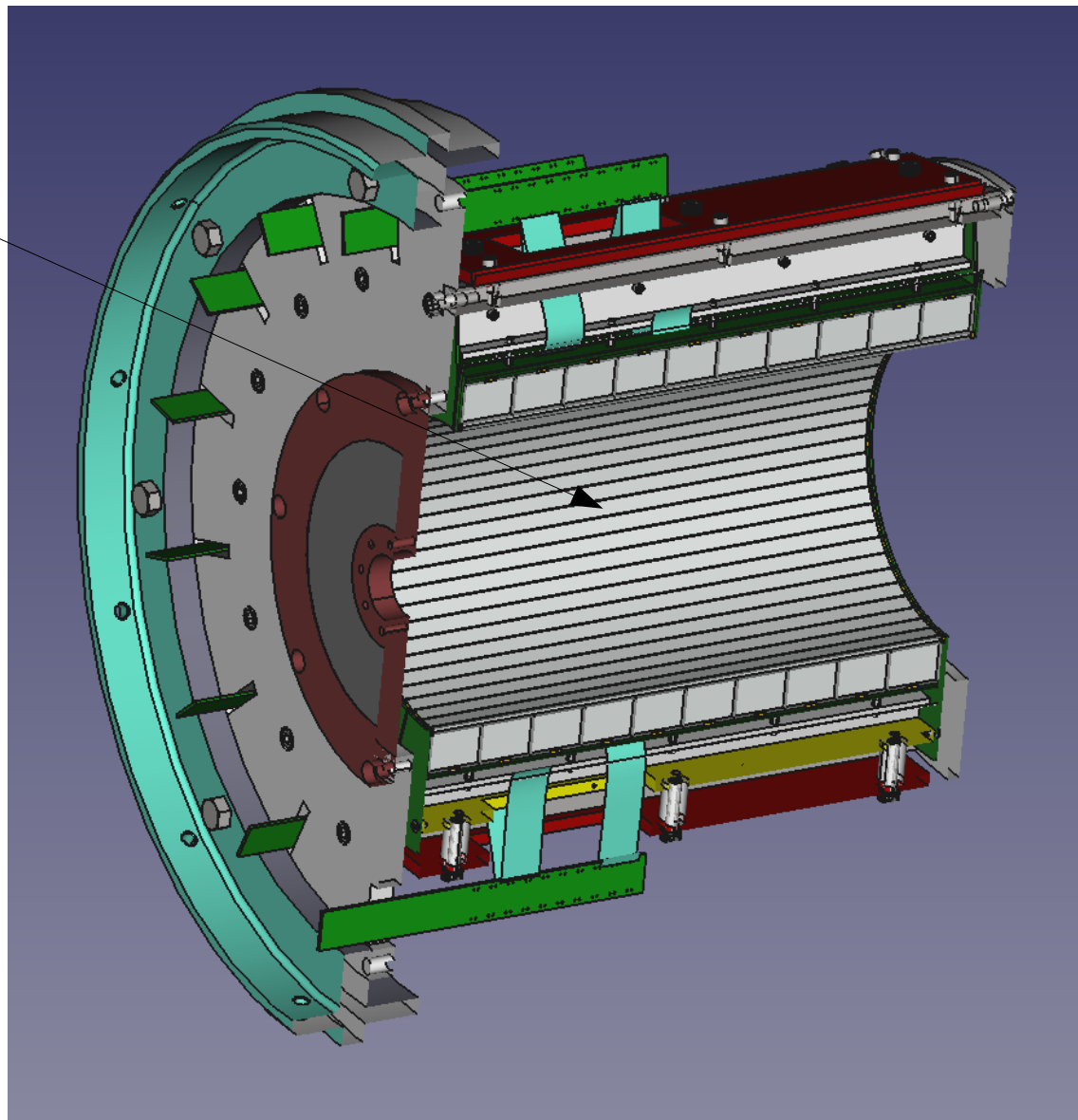
From W. R. Armstrong

ALERT: A Low Energy Recoil Tracker



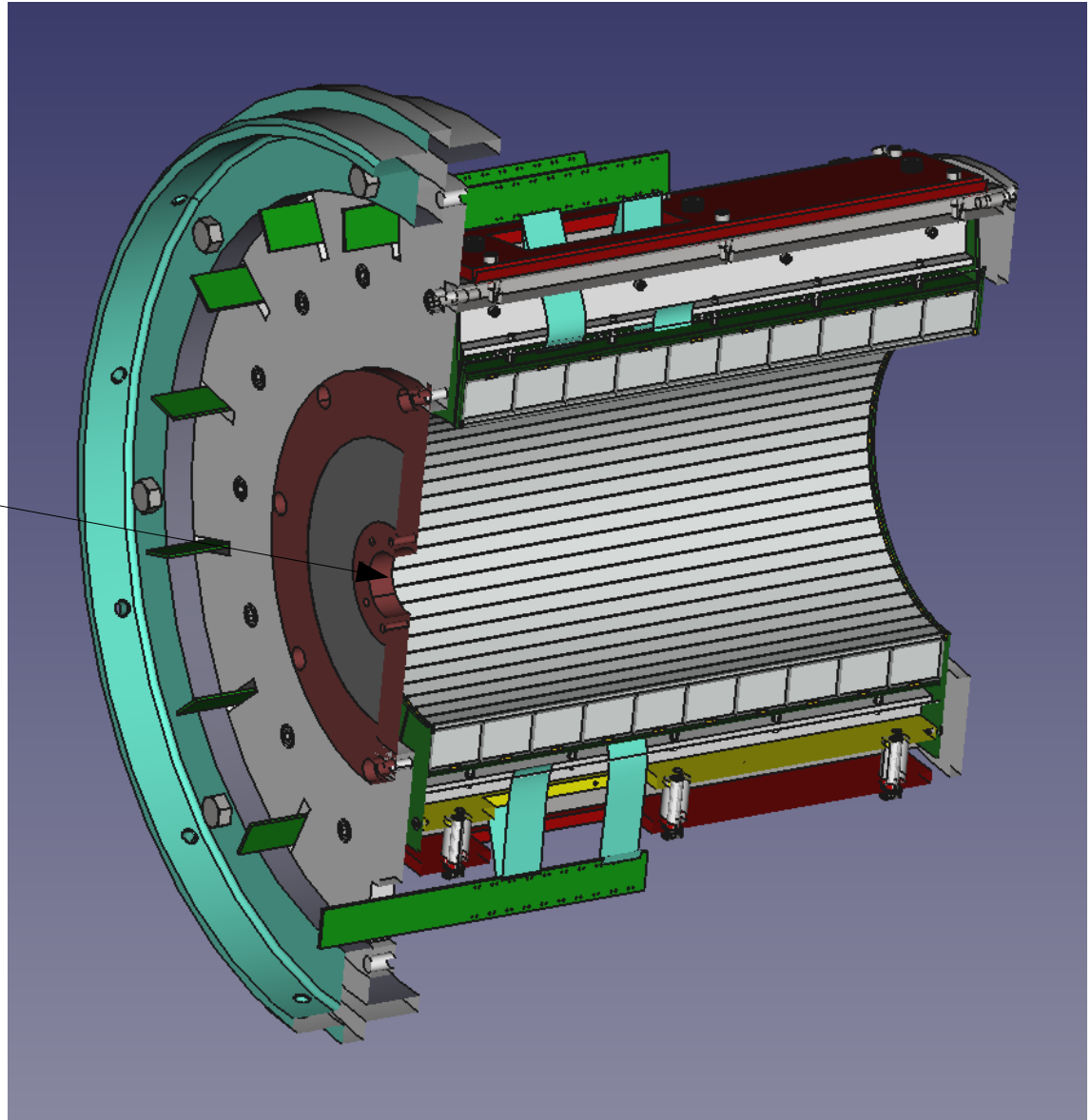
Will replace the inner tracker of CLAS12 to detect recoil nucleus between 75 MeV/c and (roughly) 200 MeV/c

More than 3000 wires
hyperbolic drift chamber
with $9 \times 64 = 576$ channels
Wire spacing: 2 mm
Wire material: Aluminum



More than 3000 wires
hyperbolic drift chamber
with $9 \times 64 = 576$ channels
Wire spacing: 2 mm
Wire material: Aluminum

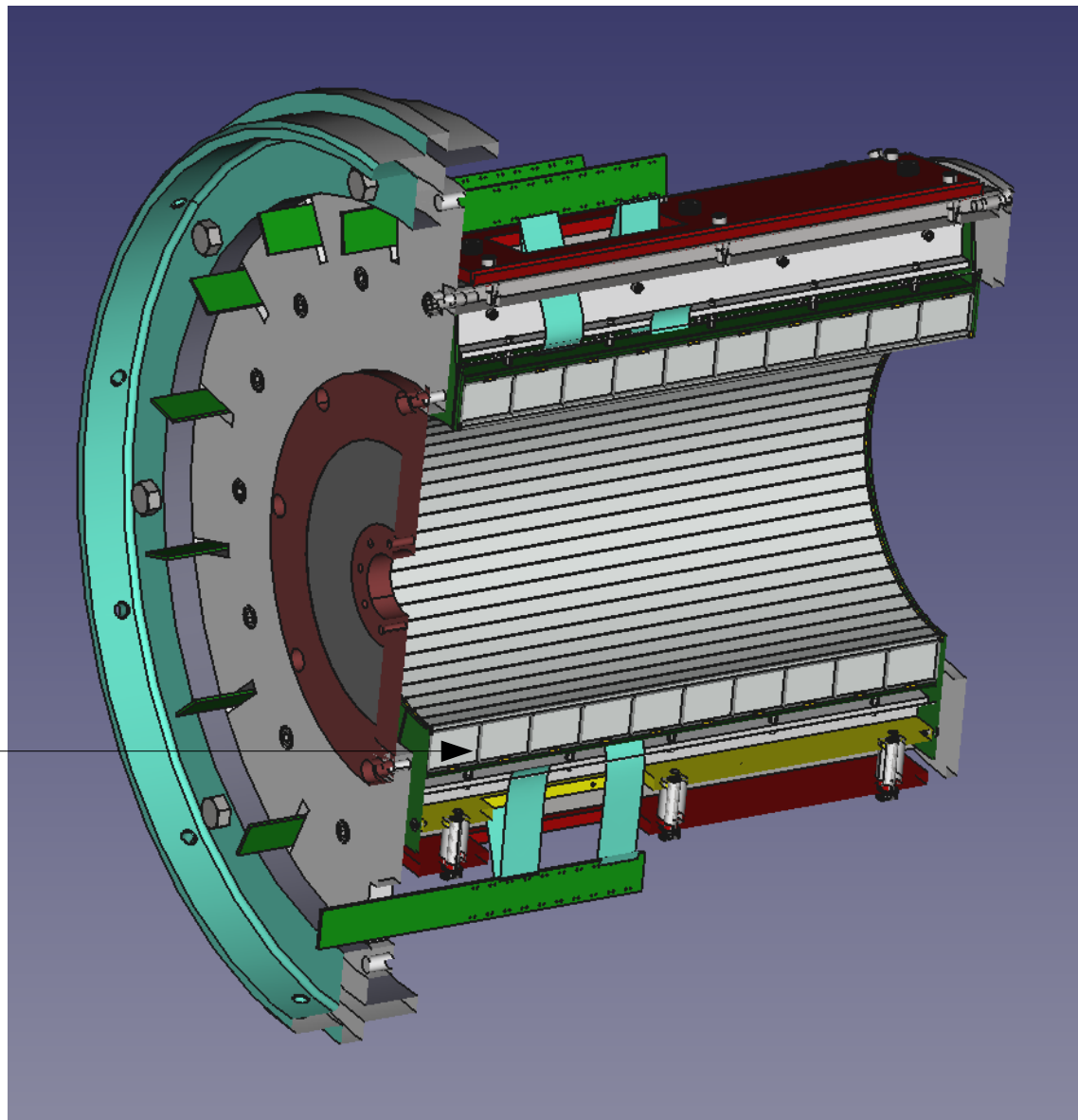
Position of the target

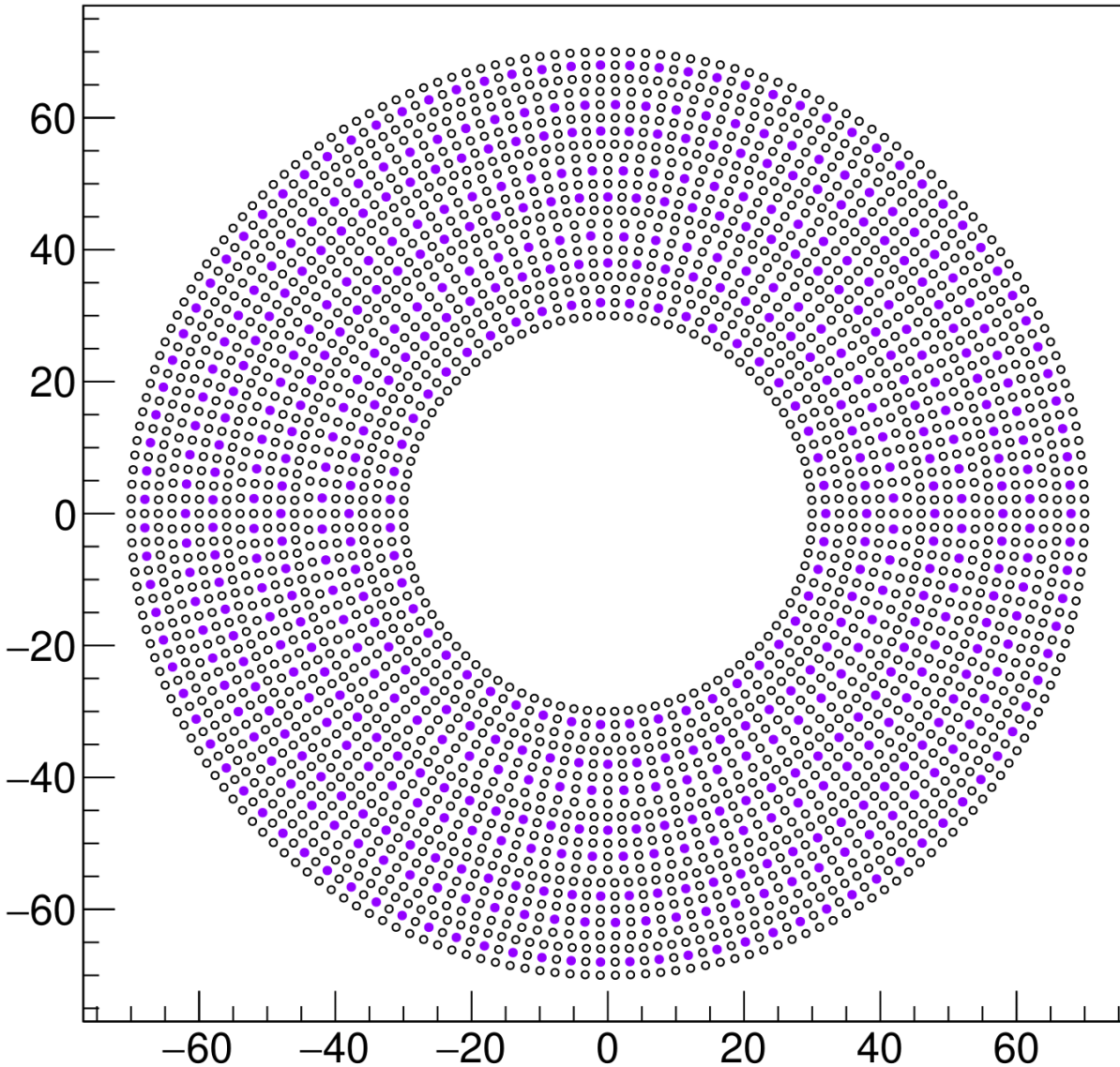


More than 3000 wires
hyperbolic drift chamber
with $9 \times 64 = 576$ channels
Wire spacing: 2 mm
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Position of the target

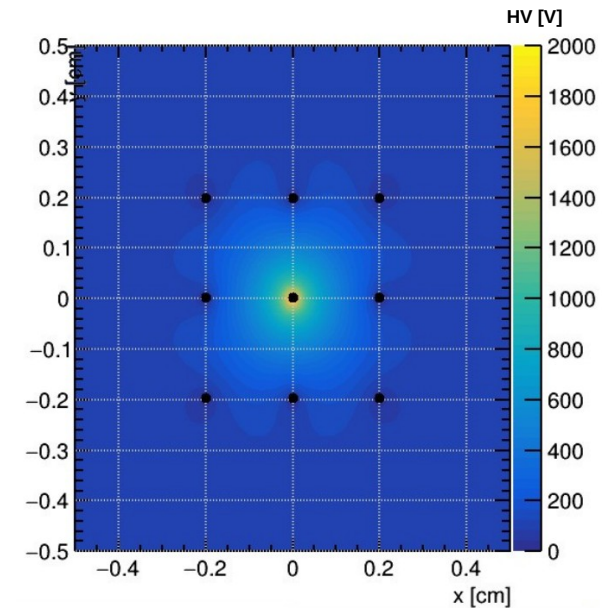
660 plastic (eg-204)
scintillators two
layers Time Of
Flight readout by
SiPMs





8 readout layers
 3 double layers, 2 single
 layers (inner and outer most)

To increase field
 homogeneity, only signal
 wires are readout







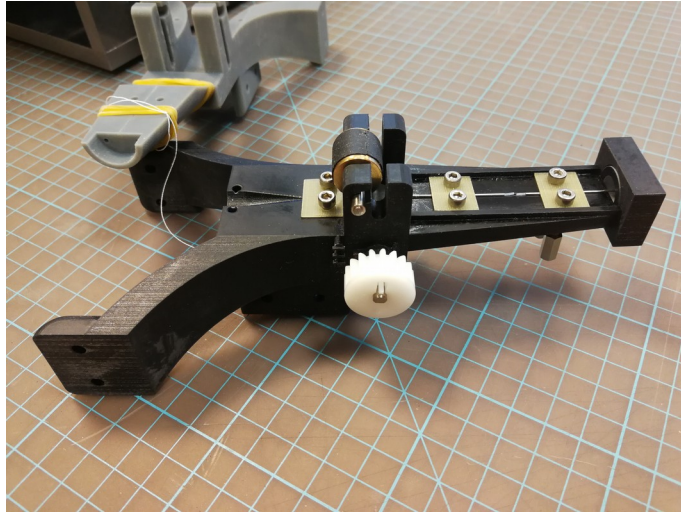
Tungsten wires to simulate the tension due to the 3026 aluminum wires (36 Kg)

Mechanical prototype to evaluate the deformation of end plates



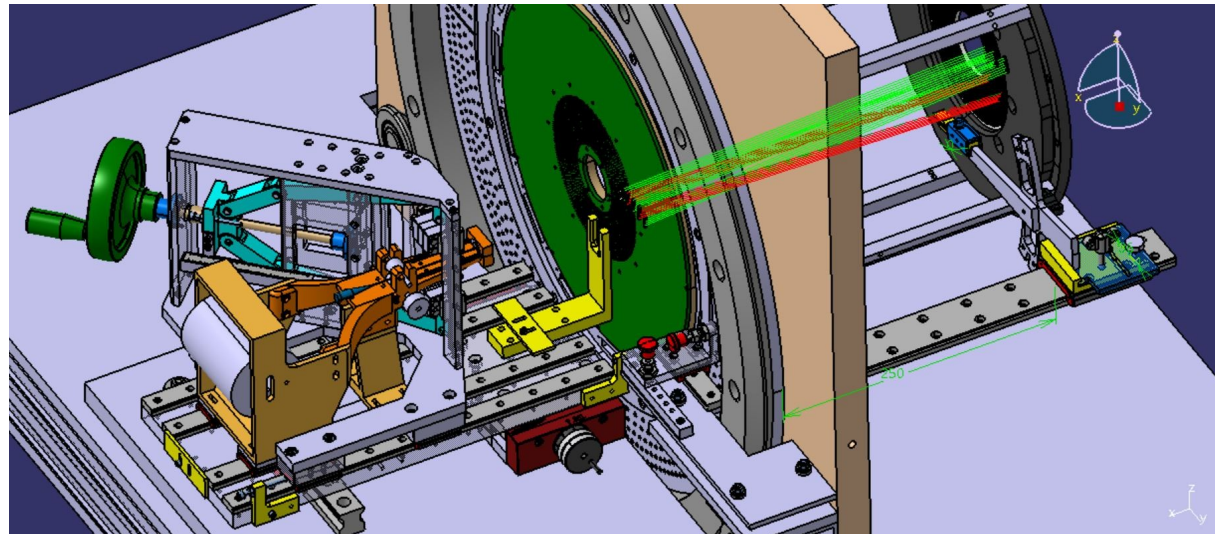
Artefact scintillator modules with similar weight to evaluate the deformation of the structure

Deformations all within acceptable values and in line with simulations

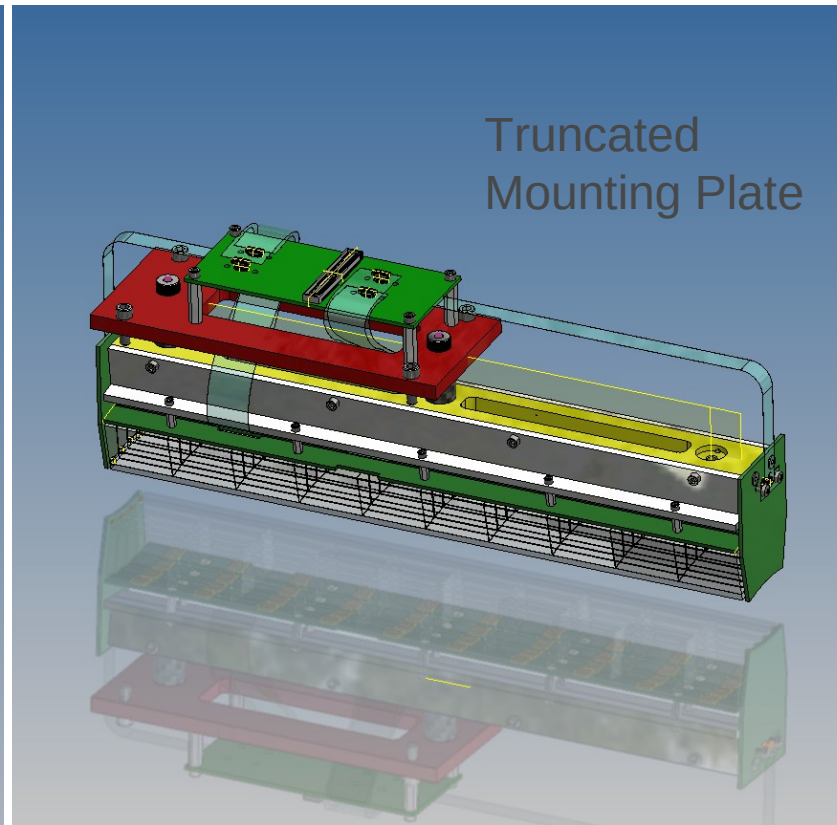
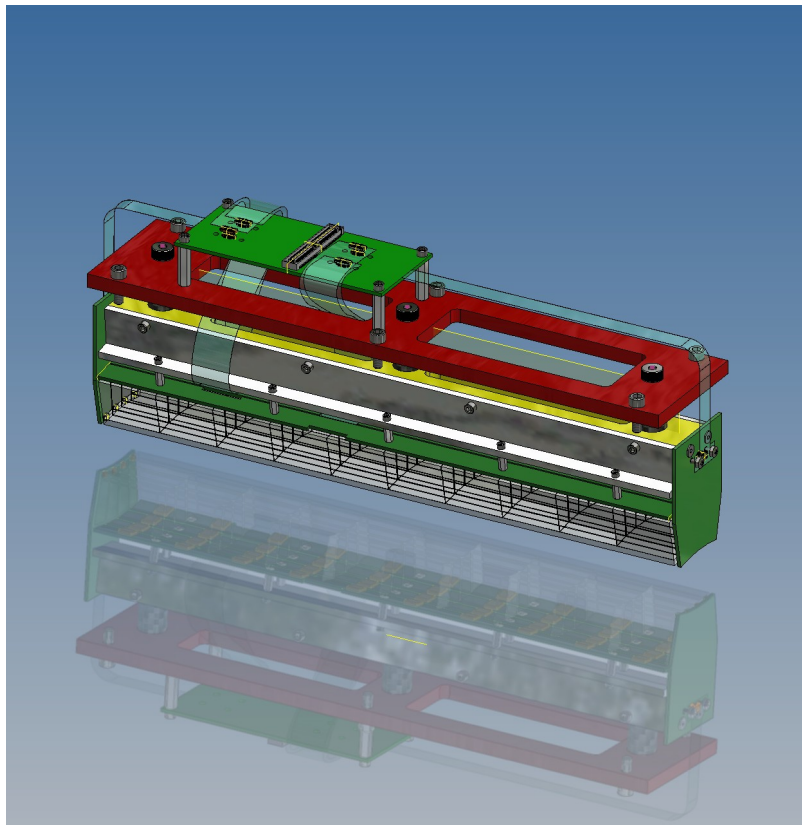


Tools designed to help wiring

A complex somewhat simple way to insert wires and then move them into the chamber



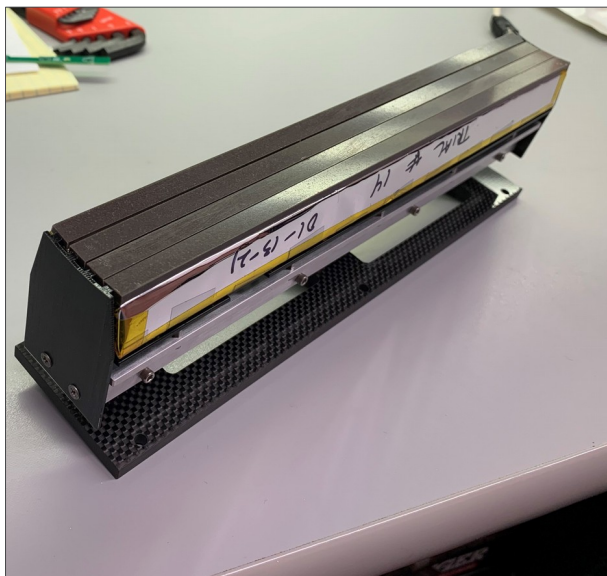
One of the 15 modules of the ATOF
Currently studying ways to reduce amount of material in the forward part





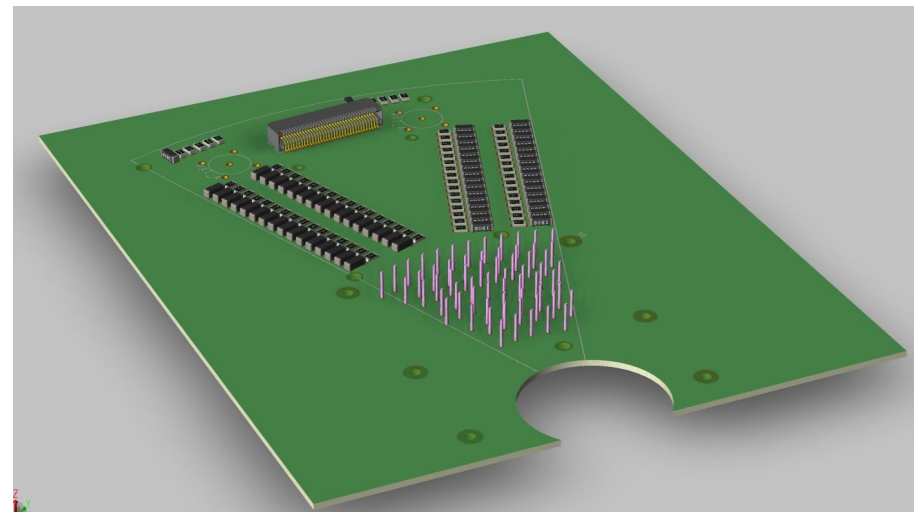
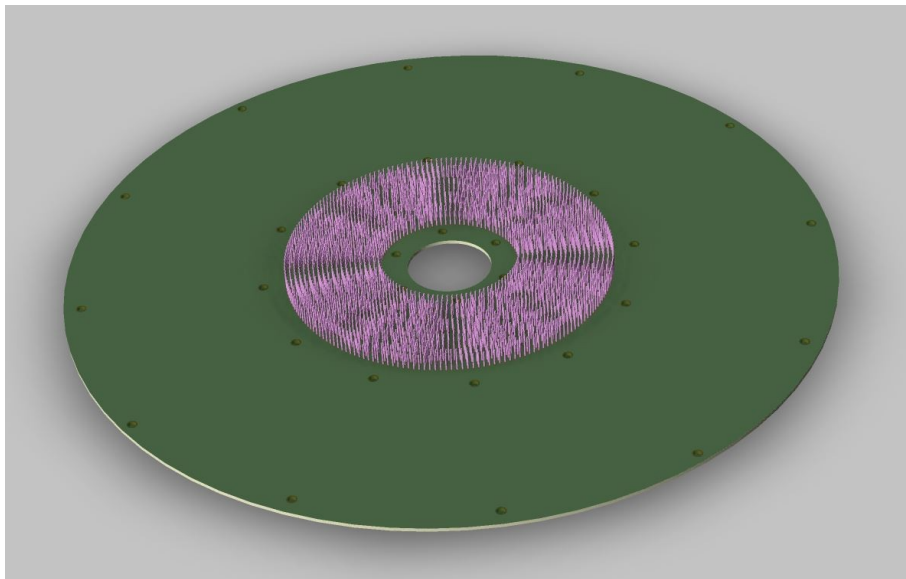
Folding, wrapping and gluing fixtures designed and built

Overall buildup of tape and wrapper less than 250 μm



**Wrapping of actual
scintillator wedges
has started**

Pin board separated from HV/signal board to increase ground-HV distance (we previously had issue with leakage current)

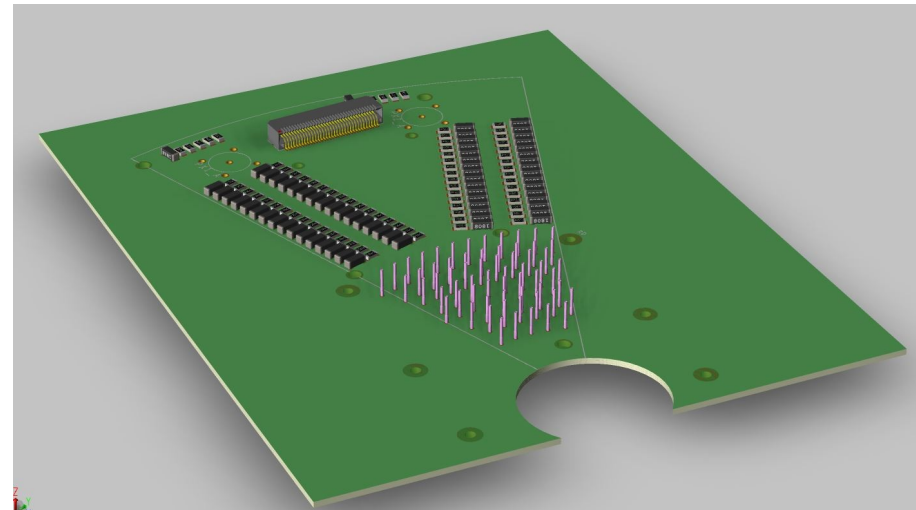
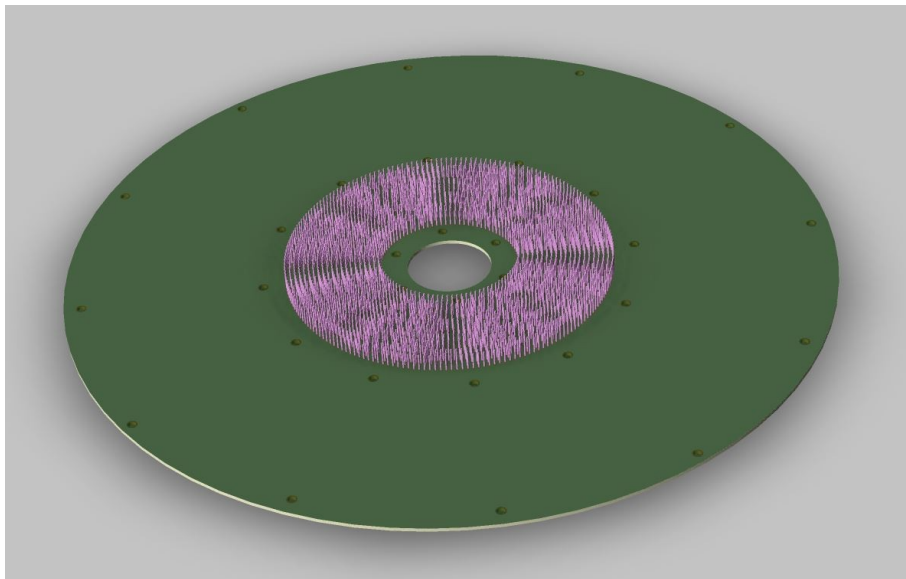


Signal board to bring HV to signal wires and readout signal

The two are connected with jumper cables



Pin board separated from HV/signal board to increase ground-HV distance (we previously had issue with leakage current)



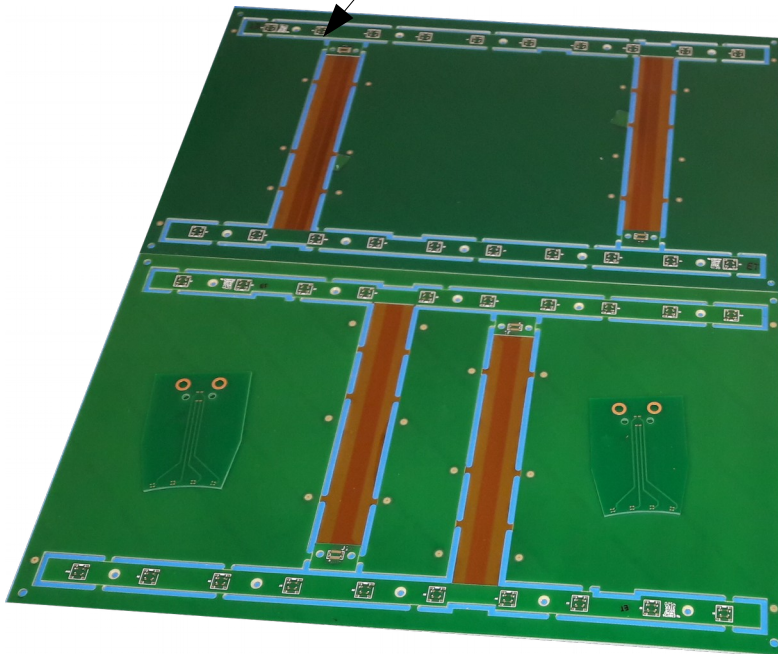
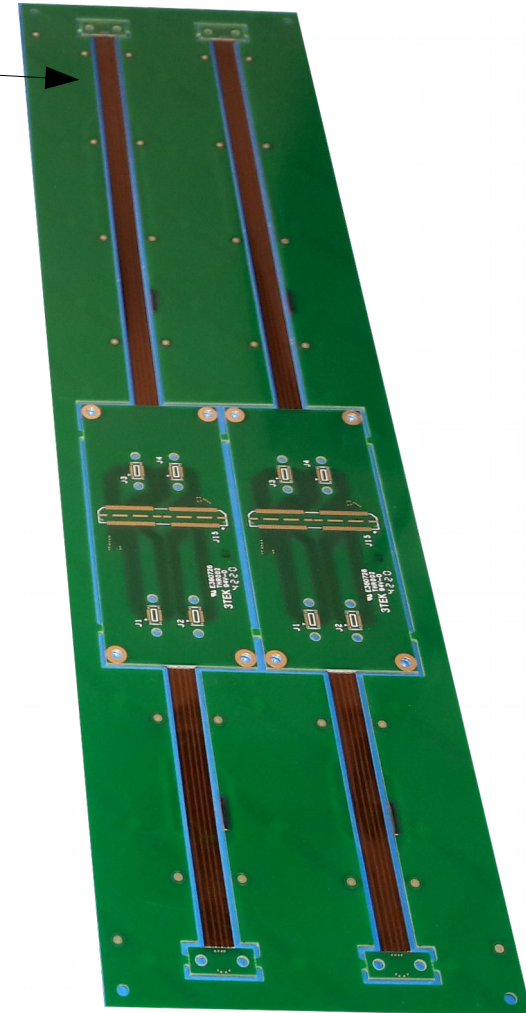
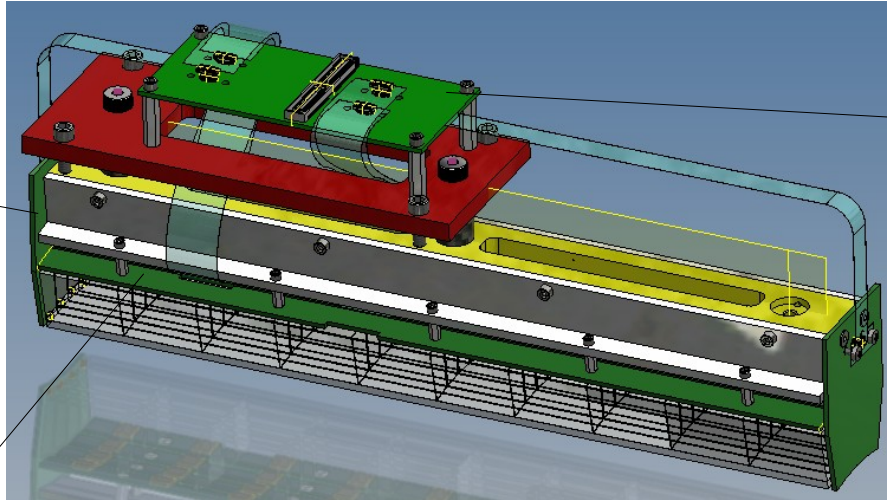
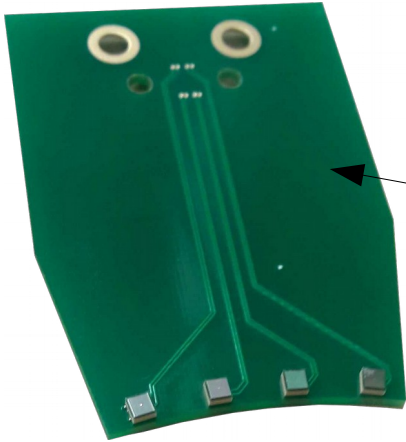
Signal board to bring HV to signal wires and readout signal

The two are connected with jumper cables



First version: perpendicular PCBs
Works well but hard to connect jumper cables
=> new version with perpendicular PCBs

PCB boards: ATOF



Use stencils to
solder SiPM's to
connectors to
various boards

Early tests are
encouraging

ALERT TOF will use JLab Petiroc2A currently under development
The Petiroc has a time resolution of 37 ps (less than 150 ps required for ALERT)

Petric2A ASIC PCB prototype is meeting
specification of ASIC datasheet for TDC/
ADC noise

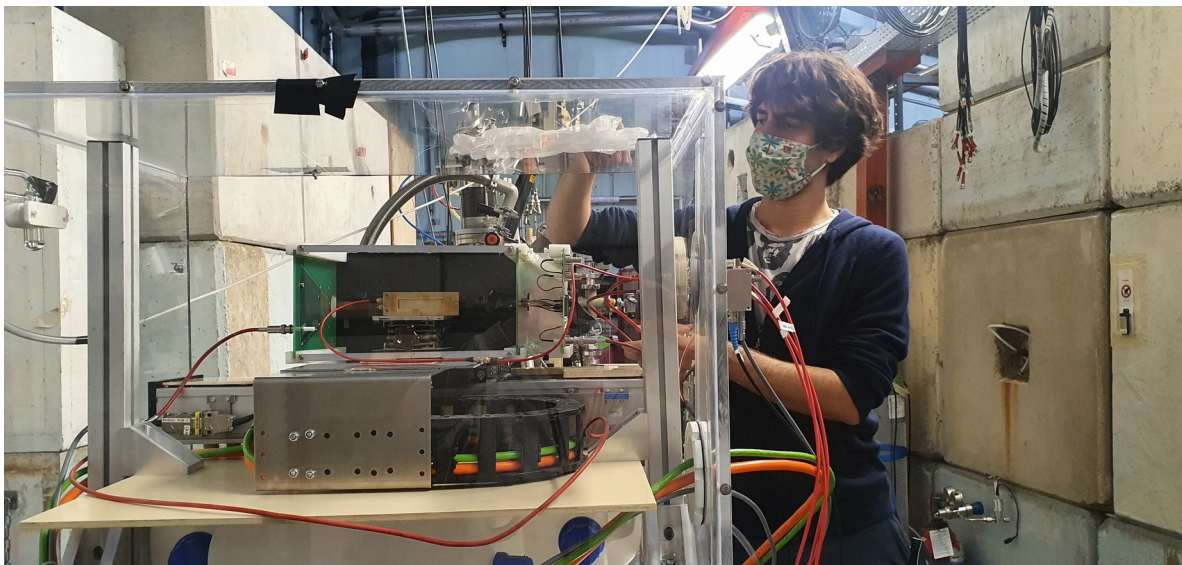
Redesign JLab Petiroc2A PCB for ALERT
has started.

It is basically a copy and paste of JLab FPGA
readout and Petiroc2A designs onto ALERT
specific shape –should be fairly quick.

Trigger/clock/busy wiring interface will be
determined and tested to ensure
requirements are met (mainly stable, low jitter
clock reference)



Prototypes and testing: AHDC

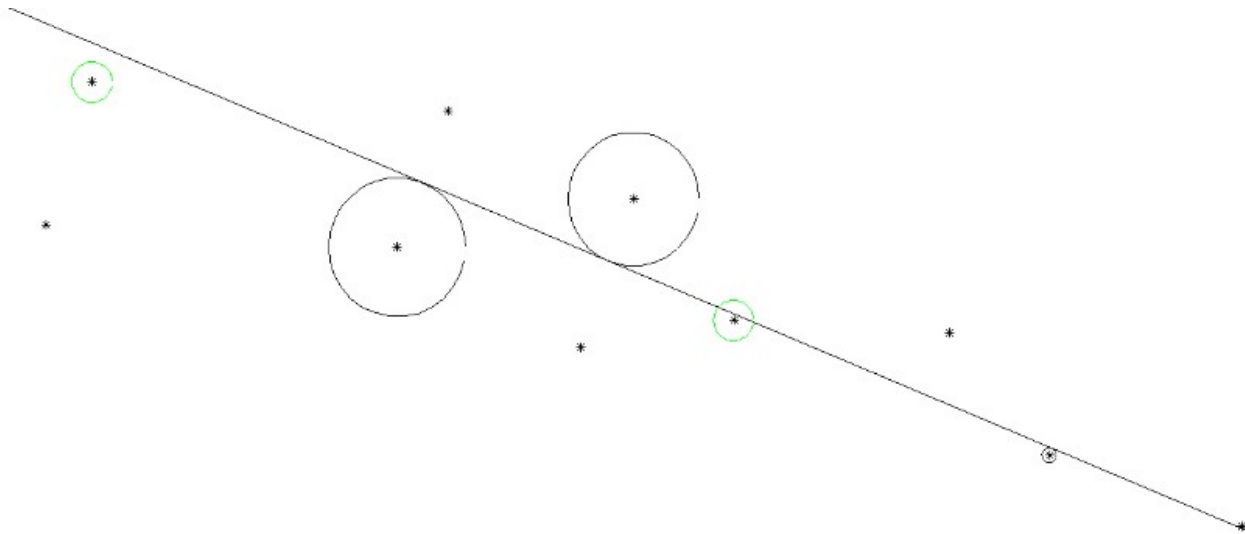


A prototype was installed at a local beam facility in Orsay (ALTO)

10 MeV protons and alphas were sent through the HDC

200 runs in different conditions
11.5 millions events recorded

Analysis is on going to determine the efficiency, time and spatial resolutions

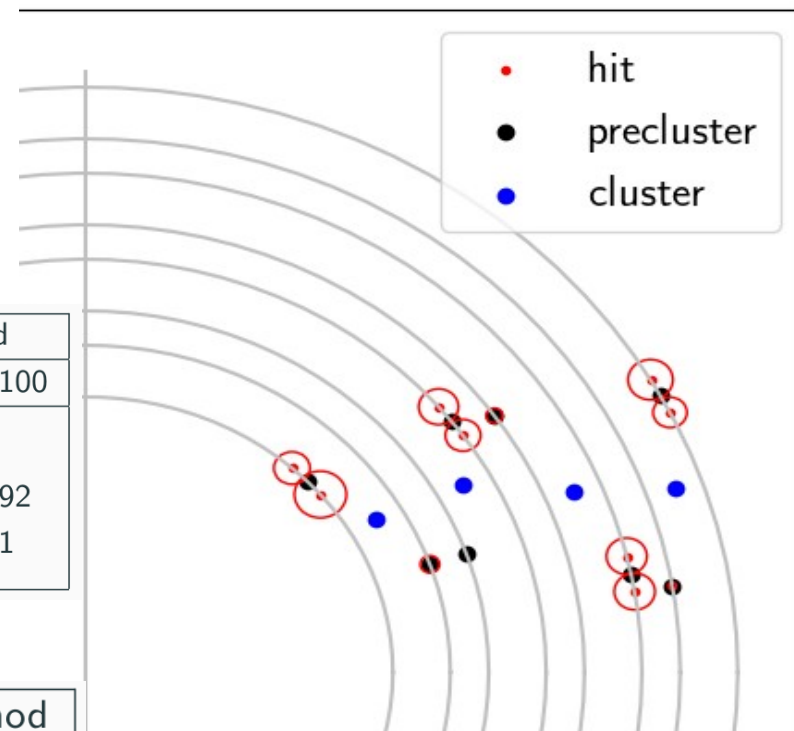


Two methods currently under study:

- distance method
- Hough transform

	Distance method	Hough transform method
1 Track per event	# event with 1 tracks : 100	# event with 1 tracks : 100
3 Track per event	# event with 2 tracks : 7	event with 2 tracks : 7
	# event with 3 tracks : 89	# event with 3 tracks : 92
	# event with 4 tracks : 3	# event with 4 tracks : 1
	# event with 5 tracks : 1	

	Distance method	Hough Transform method
execution time	5.39 s	114.20 s



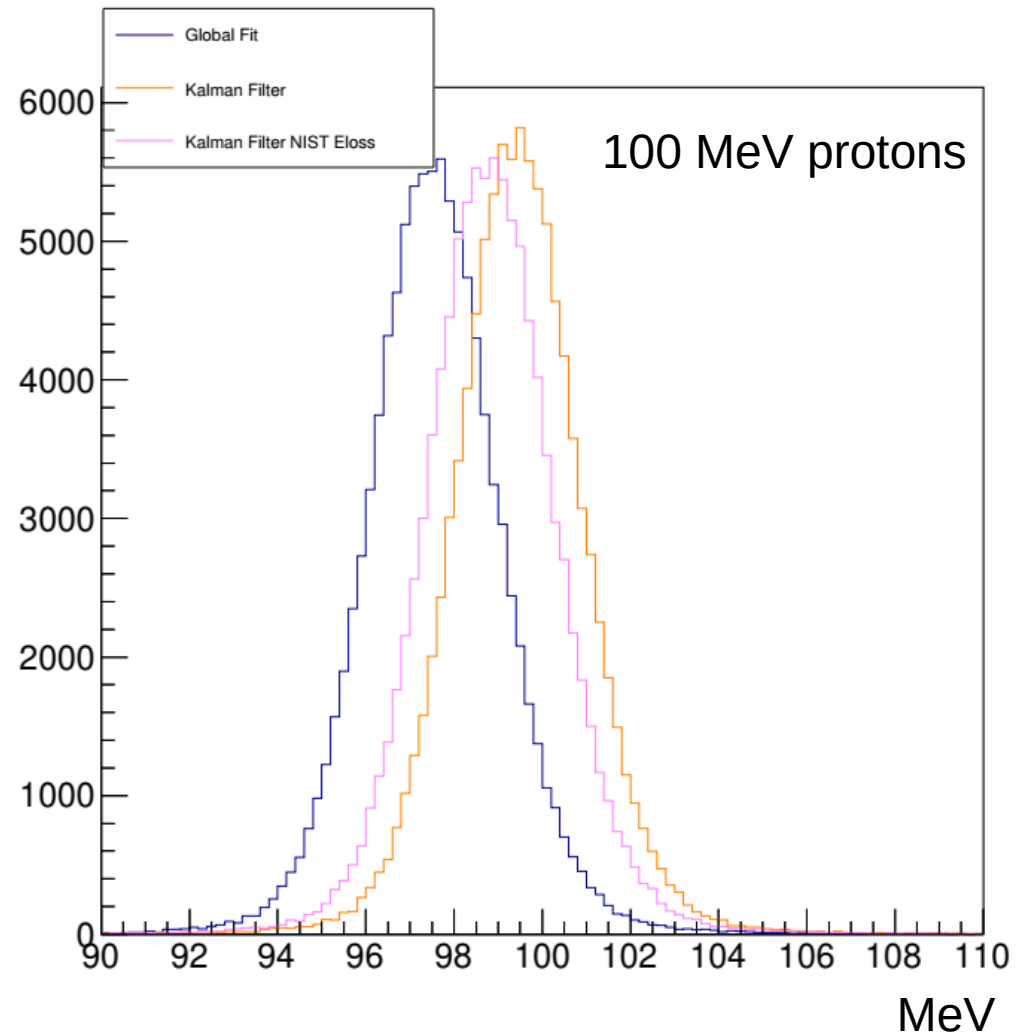
Hough transform and distance method seems to work similarly, Hough transform is slower. More tests will be carried out to investigate.

Track fitting aims to find the 5 parameters of the helix.

It's a two steps process:

1) Global Fit using the same fitter as the one used by BONuS. It defines the initial parameters of the Kalman fitter

2) Extended Kalman fitter developed by Véronique Ziegler for CLAS12. Energy loss and multiple scattering are included

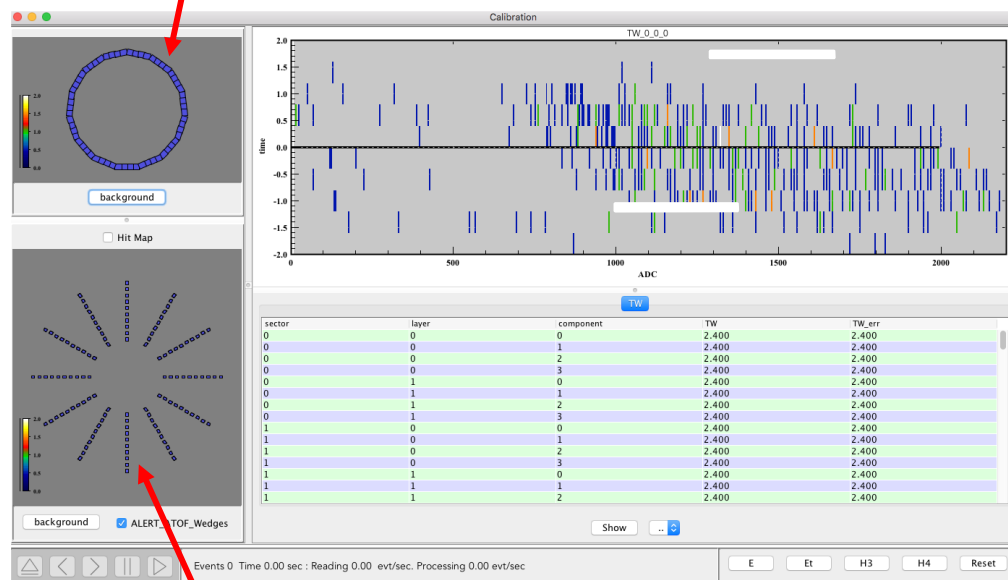


More tests of the Kalman fitter with particles of different energies will be carried out.

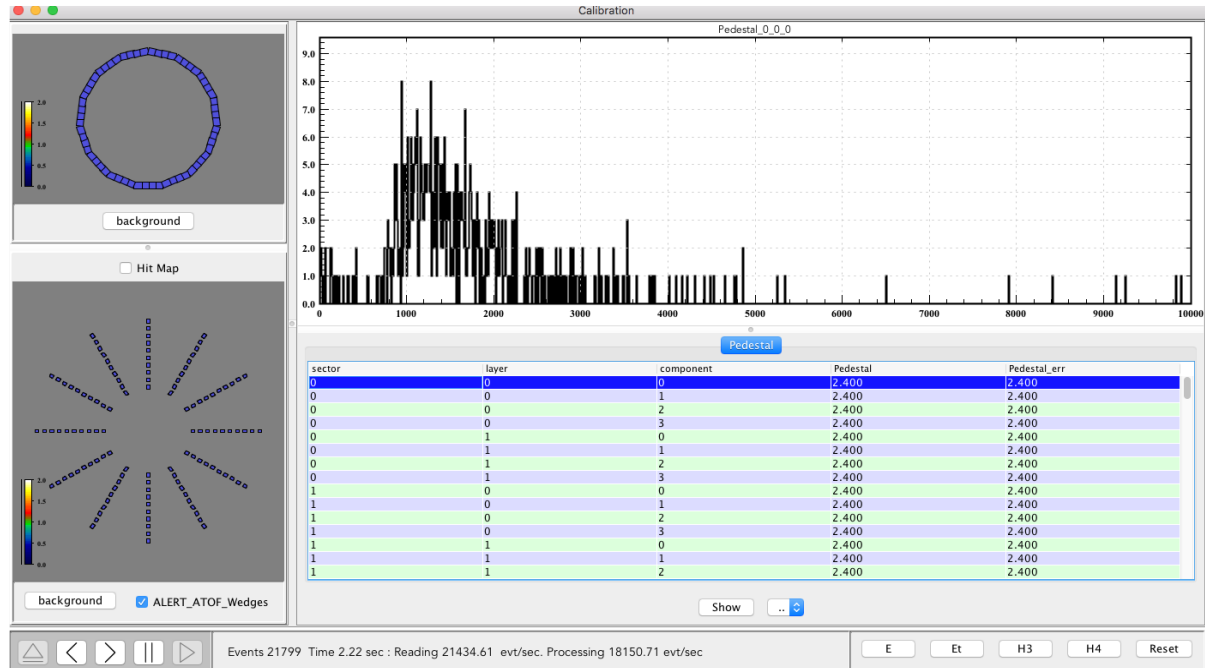
GUI displays

- Plot for selected paddle
- Table with each paddle in each:
 - Sector, superlayer, layer
 - Calibration Coefficient
- Representative geometry
 - Better way to display each component?
 - Improve layout

Scintillator bars



Pedestal calibration for ATOF



Calibration done: Pedestal subtraction, time walk, effective velocity, left right matching

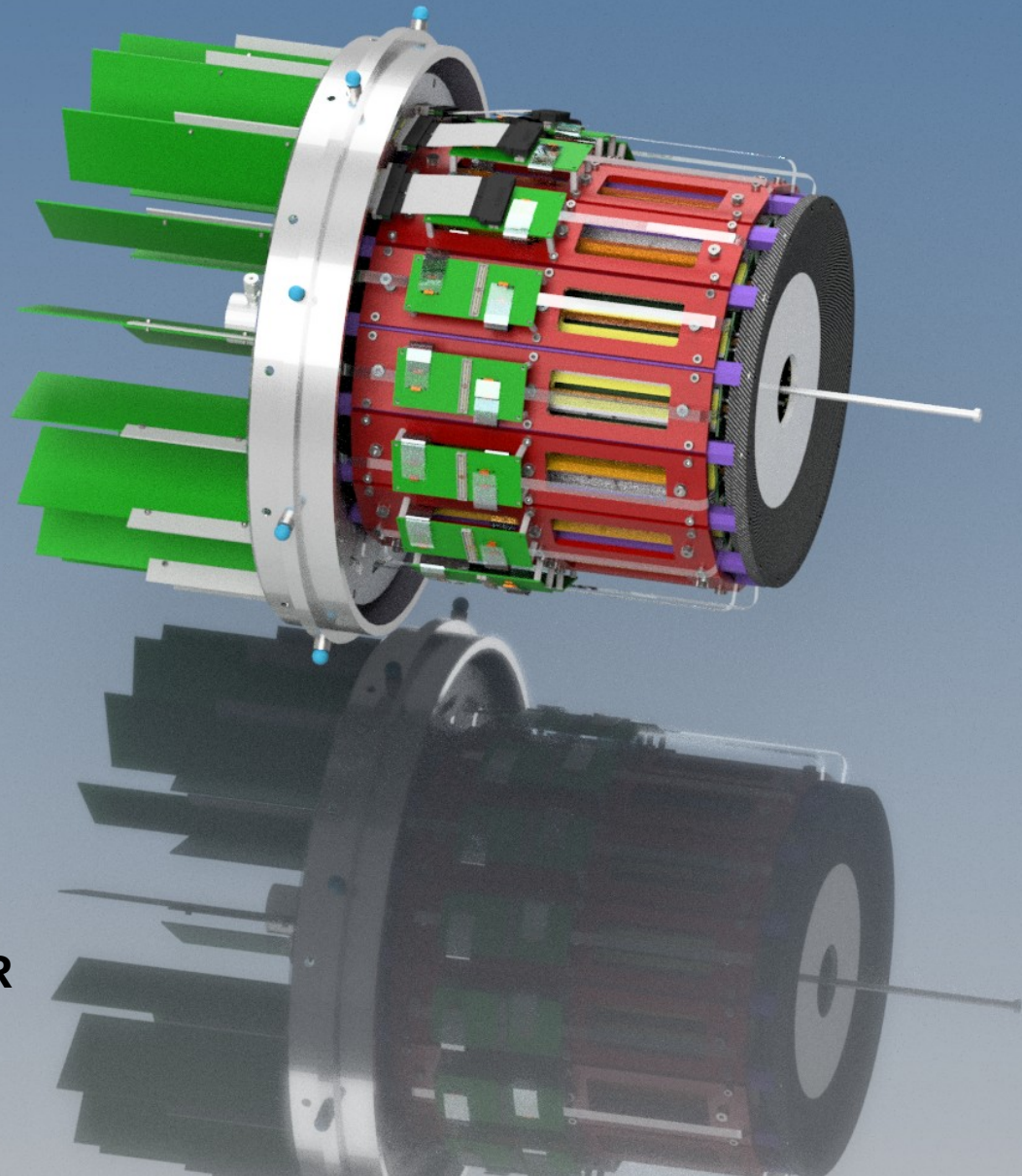
Starting for the AHDC

More than pretty close to
a final design, we are
adjusting the last points

Software very well
advanced for an
experiment at this
stage

But we keep pushing to
be as ready as possible

**Upcoming events: Hall B
meeting next week, then if
we get the green light, ERR**



Backup: wedge dimensions

Activités Navigateur Web Chromium mar. 17:41 Blue Jeans Network | Video Collaboration in the Cloud - Chromium

Blue Jeans Network | \ bluejeans.com/7572897347/webrtc

Tom O'C parle

QUI SOMMES-NOUS ? TERMES CONDITIONS D'UTILISATION DROITS D'AUTEUR DE TIERS

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