

TOF report

N. Jacazio, F. Noferini
for the TOF group

CODE SPRINT (TOF/EMCAL)

At the beginning of July we (Sandro, Markus, Francesco and myself) had a code sprint (TOF/EMCAL) in order to start with the porting of detector geometry in the O2.

The goal was:

- to define/implement the detector stub class
 - to implement/construct the detector geometry within the FairDetector interface
 - to define hit object
 - (hopefully) to be able to run a simulation including our detectors → hit creation!
- Therefore we worked on simulation! (reconstruction will follow)

During the code sprint (3 full days) TOF completed all the steps including hit creation.

Structure of the TOF code

According to the conventions in O2:

- A TOF directory was created under Detectors main directory
- A TOF namespace (`o2::tof`) was defined and in this namespace classes were created:
 - `base/Geo`
 - `simulation/detector`
 - `simulation/HitType` (inherits from base structure `BasicXYZHit`)
 - `prototyping` → dir with some macros to check/draw the geometry

Geo → Define all the constants and methods connected to the TOF geometry (static class)

Detector → implements the TOF detector simulation (geometry, materials and media, ...)

Requirement: TOF detector is hosted in a common frame with TRD which implements the 18 sectors segmentation → to run a simulation with TOF **the FRAME structure (material, medium, geometry) was strictly required** (thanks to Sandro to having provided it!)

We implemented the same geometry as in AliRoot (AliTOFv6T0) because no changes are foreseen at Run-3.

More details can be found here:

<https://paper.dropbox.com/doc/EMCALTOF-code-sprint-4.7.-YJBdYed96EuX2G3mTARv7>

TOF detector simulation

We implemented all the methods needed to construct a single supermodule (in the configuration with/without holes for PHOS)

The method to add (mis/)alignment was provided but not used yet.

A method to fill all the sectors of the frame (B077) with a TOF supermodule is added in the chain.

Creation of a TOF supermodule

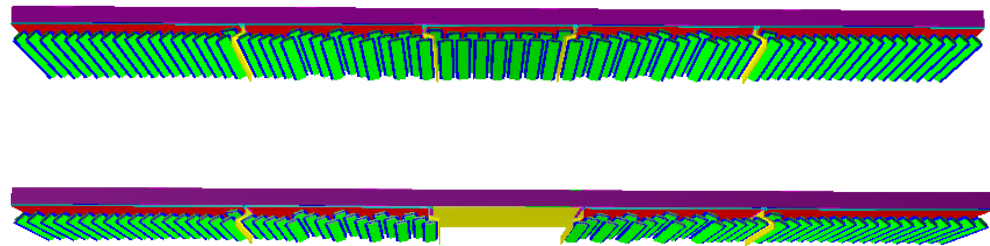
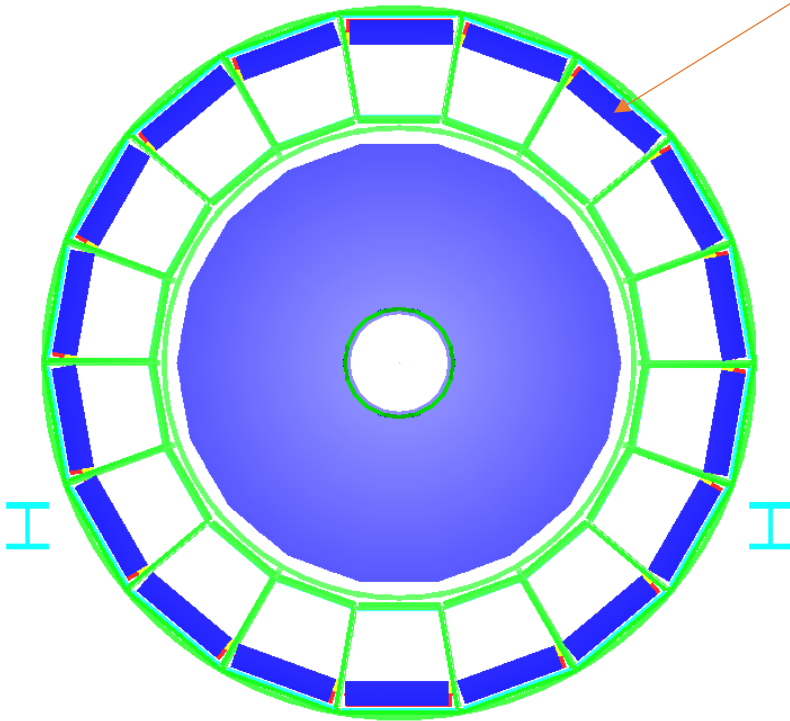
1. Creation of a single MRPC (definition of the active volumes, at the pad level)
2. Creation of the 5 TOF modules to be put along Z coord (91 strips)
3. Creation of a supermodule formed by 5 modules (4 modules for the sector in front of PHOS)

TOF Geometry

TOF sectors hosted in a volume shared with TRD → B077

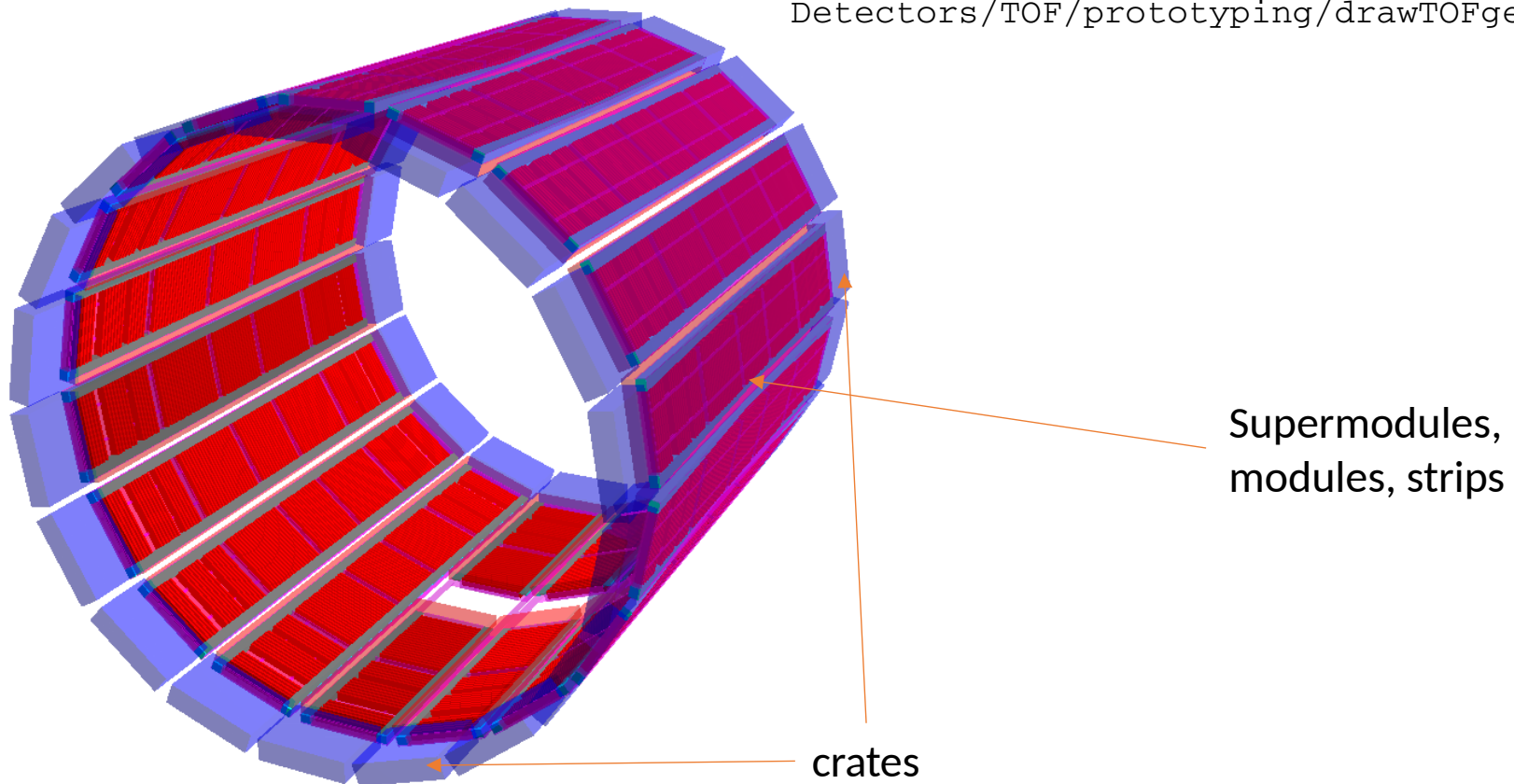
B077 divided in 18 sectors BSEGMOX

TOF supermodules replicated in all sectors
(with same special treatments in the sectors
in front of PHOS → holes)



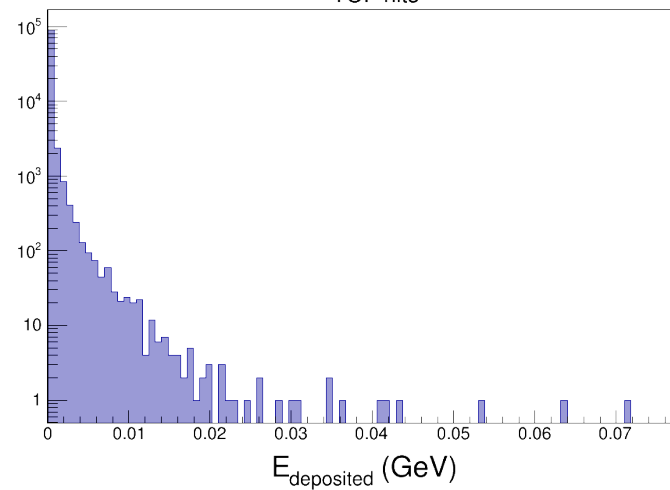
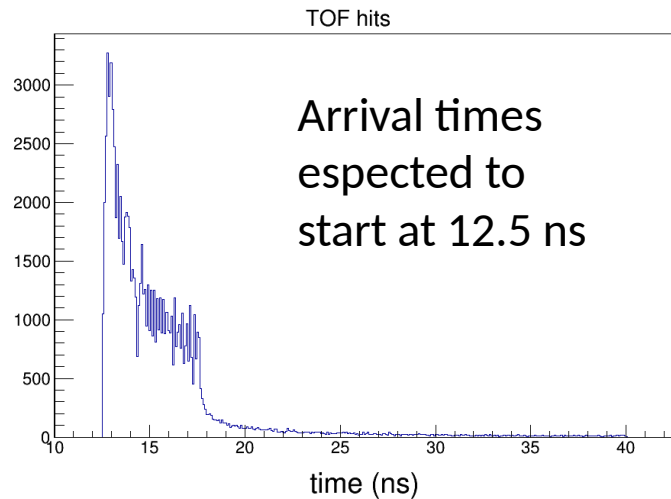
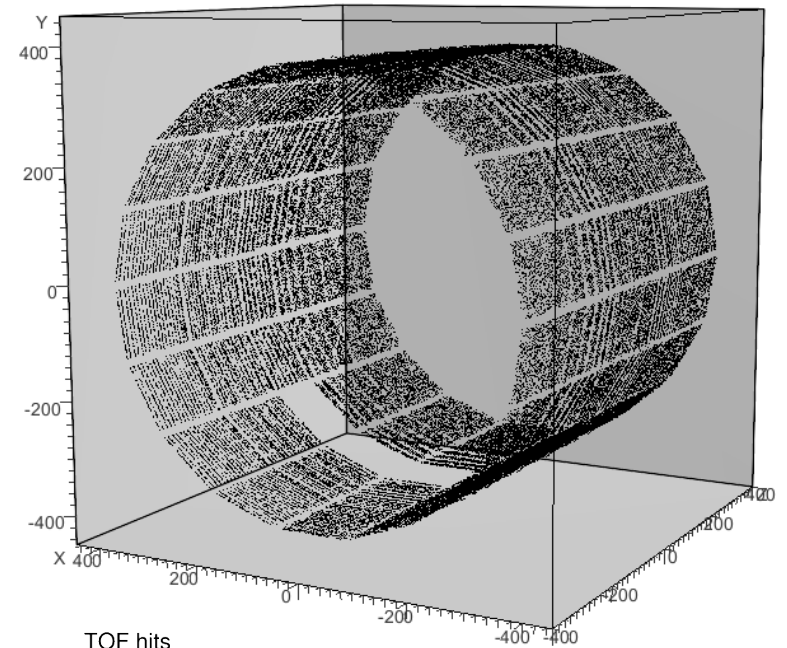
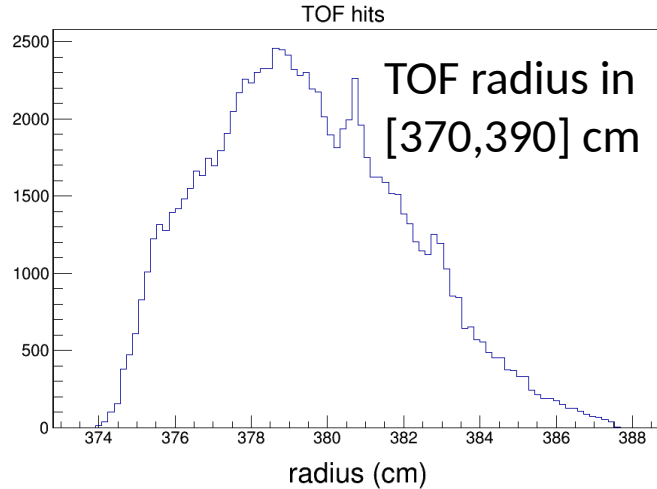
Drawing TOF

Macro added to draw TOF in
`Detectors/TOF/prototyping/drawTOFgeometry.C`



TOF hits (100000 particles sim)

TOF hits infos: track_ID, (x,y,z), time, Edep, detID



Mapping validation

- In our base directory we provide some macros to check that channels are mapped in the correct way:
- `base/test/checkTOFindex.cxx`
 - (`checkIndexAR.C` for a comparison with AliRoot)
 - Check conversion from TOF channels to TOF 5-indexes array
 - Included into Unit test
- `prototyping/checkRotation.C`
 - Check conversion from position and TOF 5-indexes (and vice versa)
 - We still need to convert this macro into Unit test

TOF digitizer

We started to fill the TOF digitizer (*only in our local repository*).

We are trying to simplify what is current in AliRoot.

To test the effect of digitization on the hit time we added a macro which allows us to validate parameterization in ideal/fast (no tracking effect) simulations.

The main features/parameters are in but we are still tuning them accordingly to the data obtained with the last calibration (we recently improve the time slewing corrections). The flags/parameters we have are for:

- Pad efficiency dependence on position
- Time resolution
- Multiple hits
- Time walk
- Time delay for cross talk effect (in multiple hit cases)

Testdigitizer.C

It works both on a TOF hit tree as input or generating a uniform “hit” distribution on one strip.

The variables we are monitoring (we will store) are:

- Time
- Time Over Threshold (currently set at 12 by default)
- Channel ID
- Charge?