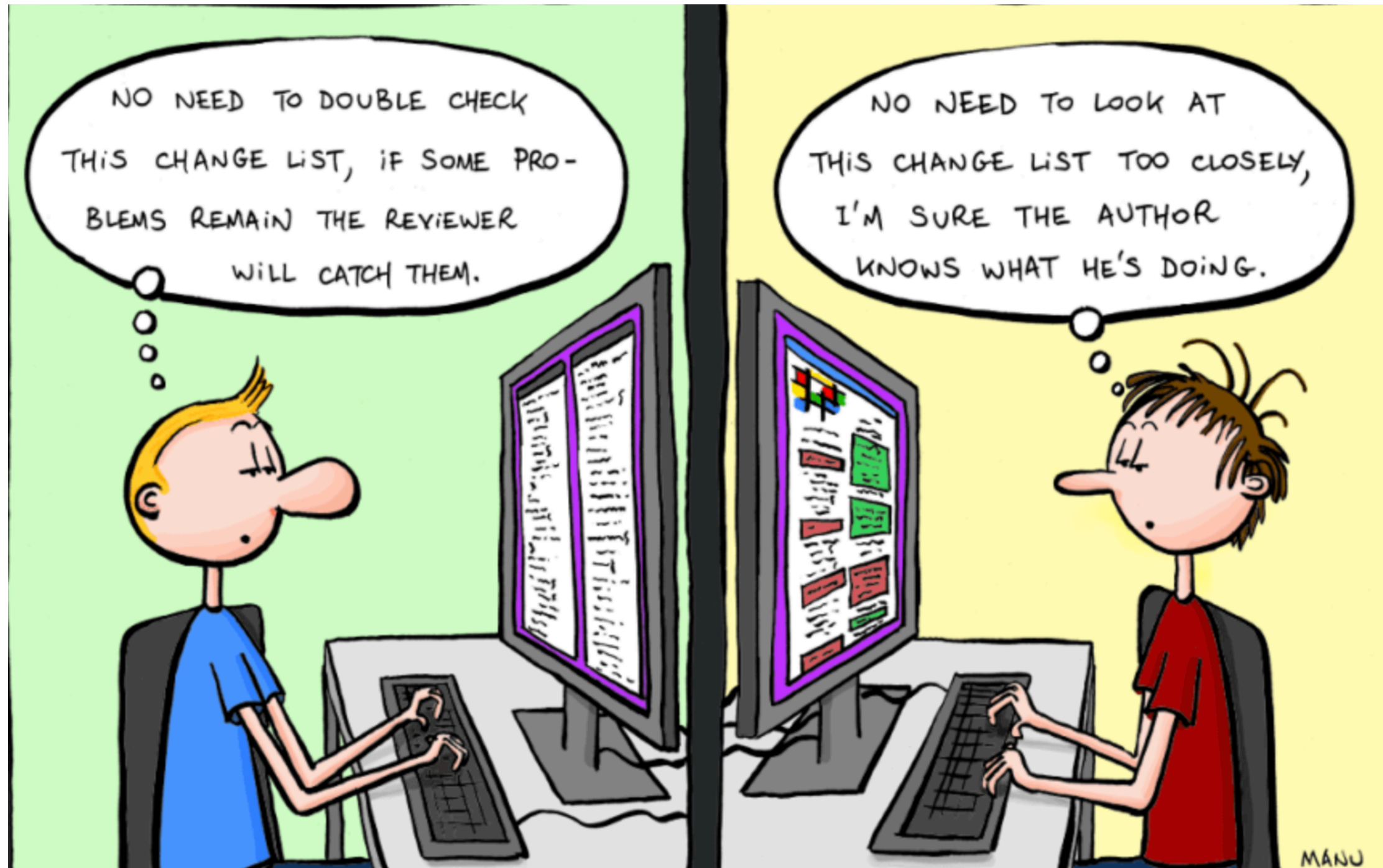# FOOT software status

MAECI-MOFFIITS meeting

Y. Dong & R. Zarrella
27/05/2025

Outline

- Code development: New Guidelines

- SHOE 25.0

- Wiki

- Software tutorial

- Doxygen

- Pipelines

- Campaign viewer

- Other developments

- Software tasks and organization

- Current software development

- To do list

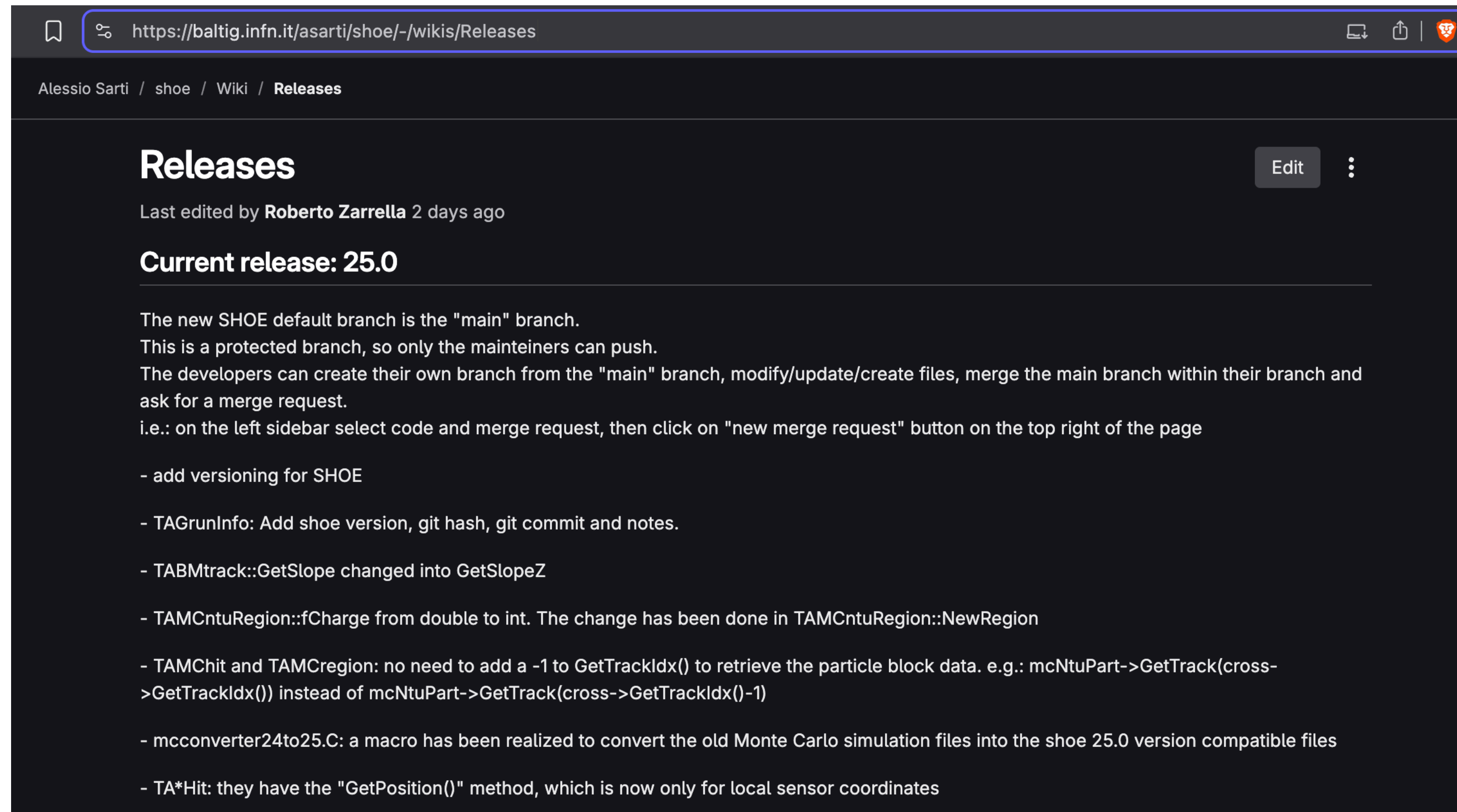# Code development: New Guidelines

Probably this will happen… but we should avoid this as much as possible

Since December 2024 we changed the push policy for the SHOE software

- The SHOE main branch is called "main" and it is protected
  (aka: only mainteiners can directly push into the branch (Battistoni, Dong, Finck, Toppi, Zarrella))

- Other developers are invited to create their own branch from the main, develop the code complying the coding conventions, **stay updated with the main branch** and, eventually, request a merge.

- The former newgeom_v1.0 branch has been renamed to SHOE_24.0 and is now locked to prevent further modifications.

SHOE 25.0

The screenshot shows a browser with URL https://baltig.infn.it/asarti/shoe/-/wikis/Releases

Breadcrumb: Alessio Sarti / shoe / Wiki / **Releases**

Releases

Last edited by **Roberto Zarrella** 2 days ago

Current release: 25.0

The new SHOE default branch is the "main" branch.
This is a protected branch, so only the mainteiners can push.
The developers can create their own branch from the "main" branch, modify/update/create files, merge the main branch within their branch and ask for a merge request.
i.e.: on the left sidebar select code and merge request, then click on "new merge request" button on the top right of the page

- add versioning for SHOE

- TAGrunInfo: Add shoe version, git hash, git commit and notes.

- TABMtrack::GetSlope changed into GetSlopeZ

- TAMCntuRegion::fCharge from double to int. The change has been done in TAMCntuRegion::NewRegion

- TAMChit and TAMCregion: no need to add a -1 to GetTrackIdx() to retrieve the particle block data. e.g.: mcNtuPart->GetTrack(cross->GetTrackIdx()) instead of mcNtuPart->GetTrack(cross->GetTrackIdx()-1)

- mcconverter24to25.C: a macro has been realized to convert the old Monte Carlo simulation files into the shoe 25.0 version compatible files

- TA*Hit: they have the "GetPosition()" method, which is now only for local sensor coordinates

- Current release is 25.0, we'll change the version name probably before CNAO2025

- Different methods name has been changed and new features has been added, **you can track the changes here: https://baltig.infn.it/asarti/shoe/-/wikis/Releases**

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Wiki

- We updated the wiki page and we are trying to keep it updated: https://baltig.infn.it/asarti/shoe/-/wikis/home

- New pages has been added to describe the campaign details: detectors and alignment status etc.

Software tutorial

- We have done the IIIrd FOOT software tutorial in February 2025

- Many many thanks to Chris, Marco, Giuseppe and, of course, to all the participants

- https://agenda.infn.it/event/44111/

- **All slides and presentation recordings are uploaded on indico**

Doxygen

- We (actually Chris) updated the Doxygen documentation for different SHOE classes

- The Doxygen are updated automatically after each push in the main branch

- Doxygen link: https://asarti.baltig-pages.infn.it/shoe/index.html

- **For the newcomers:** you have Doxygen, Wiki, tutorial, macro examples, data accessibility (tier1), computational power (tier1+condor) and a full list of software development and analysis task. **Don't be shy with this opportunity!**

- **For software developers: Please remember the few simple instructions for writing Doxygen-compliant code.** There won't always be a Chris who does things for you

Pipelines

update calo position for cnao2024 run 7005

Passed | Yunsheng Dong created pipeline for commit abec6d5e | 6 days ago, finished 6 days
For main
latest branch | CO 4 jobs | ⏱ 9 minutes 9 seconds, queued for 2 seconds

Pipeline | Jobs 4 | Tests 0

Group jobs by | Stage | Job dependencies

build — test — deploy
✓ compile ⟳ | ✓ testFluka ⟳ | ✓ pages ⟳
                                 ✓ pages:deploy

- We started to explore the instruments provided by gitlab

- One of that are the pipelines: at each push of any shoe branch, it builds the whole code from scratch on a linux based machine

- **If the pipeline fails, an email message will be sent. You can click on the Pipeline# link and check the error** (N.B.: sometime there can be false errors due to out-of-memory issues on baltig)

- New branch created from main branch will automatically inherit the compile and testFluka pipline stages

- This is a useful tool to check the compilation of the code. However, it is good practice to check and test the code before the push

Campaign viewer
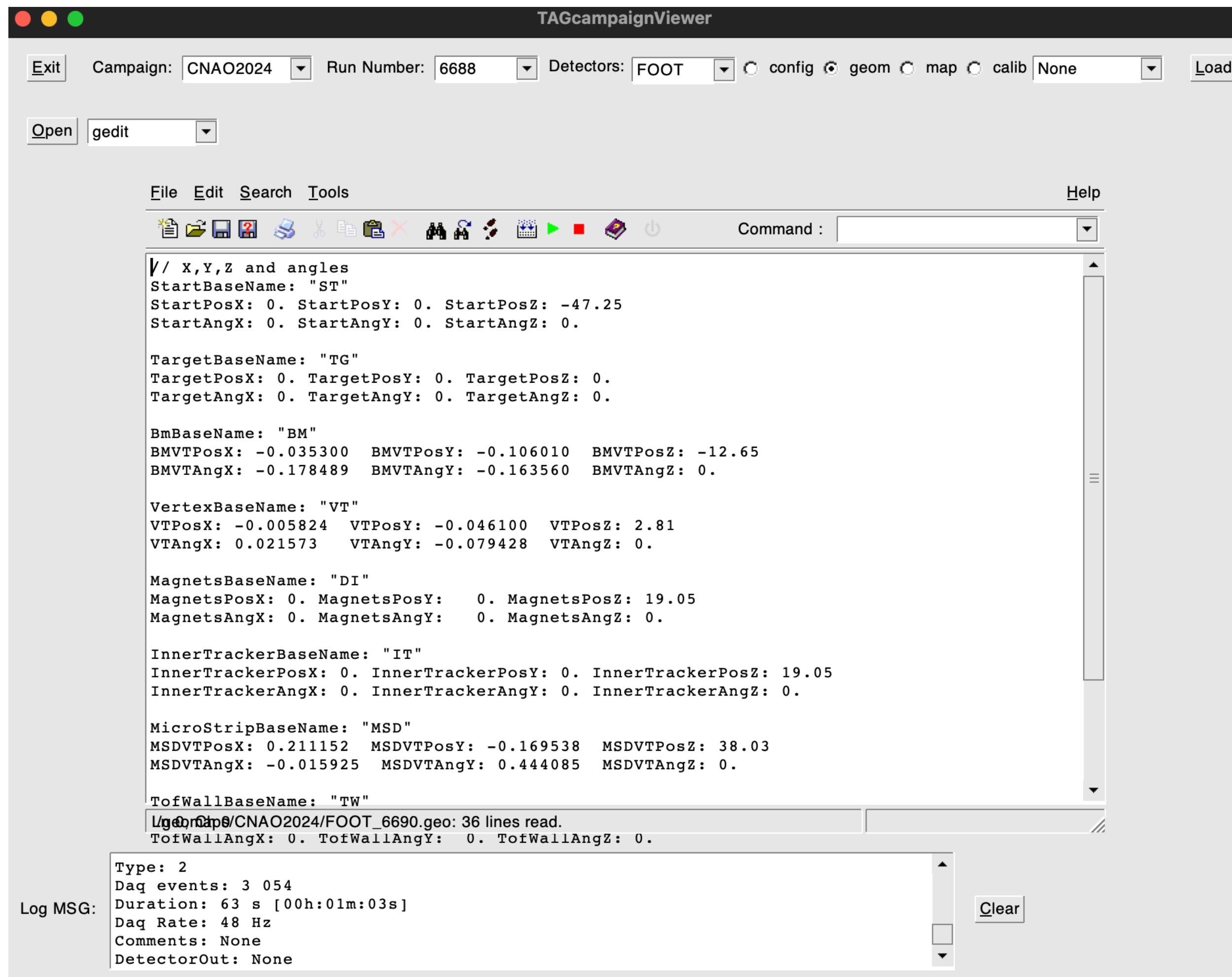
- A campaign viewer tool has been developed by Chris to check and modify all the config/geo/map/calib files of the FOOT main campaigns

- GSI, HIT2022, CNAO2022/3/4, GSI21PS_MC, HIT22PS_MC, CNAO22/3/4PS_MC)

- How to use it:
  -just open root in the Reconstruction folder and type:TAGcampaignViewer::Instance()
  -choose the desired campaign, run, detector, type of file and press the "Load" button

- Possibility to use different external text editors

- **Possibility to directly modify and save the file**

Other developments
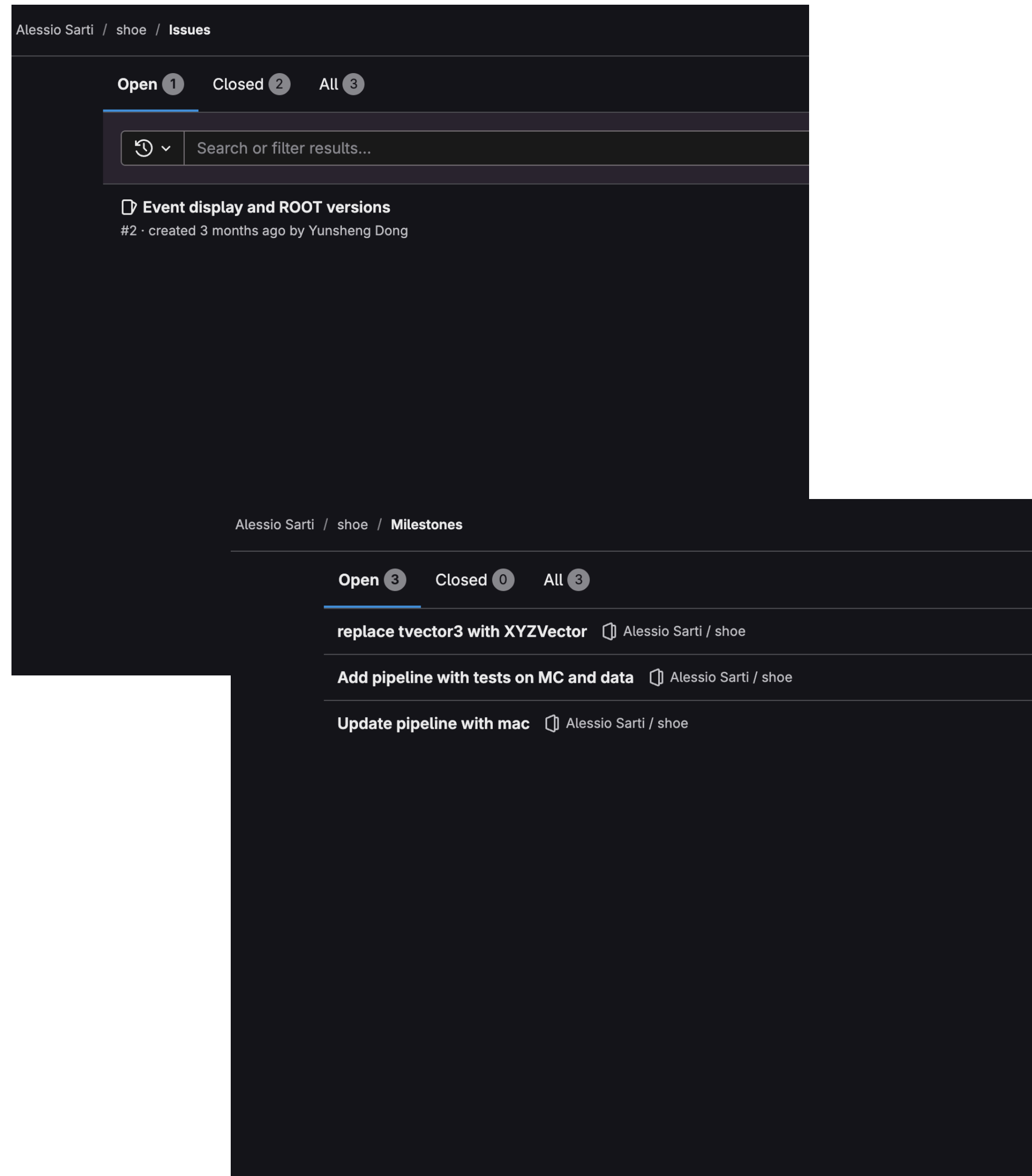
- G4 simulations —> Chris presentation

- Possibility to raise issues on gitlab (https:// baltig.infn.it/asarti/shoe/-/issues)

- Possibility to add milestones on gitlab (https:// baltig.infn.it/asarti/shoe/-/milestones)

- Other minor changes listed here: https://baltig.infn.it/ asarti/shoe/-/wikis/Releases

Software tasks and organization

Project/task	Contact person(s)	Branch	Work in progress
Framework	Y. Dong, R. Zarrella	main	Merge from other branches
Start Counter	G. Traini		Implementation of waveform analysis: trigger cell correction + fit-less time calculation. Check correct time propagation for global reconstruction studies.
Beam Monitor	Y. Dong		Detector calibration and analysis
Vertex	C. Finck, M. Toppi		Work on alignment strategies + tracking integration. Charge ID capabilities being explored.
Inner Tracker	C. Finck, M. Toppi		(see Vertex)
MSD	A. Sarti, I. Mattei, S. Mazzolani	AleMSDStudies	Pedestals, Common noise, and eta function studies
Tof Wall	A. Kraan, R. Zarrella, M. Morrocchi, M. Toppi, T. Minniti		Working on time and charge calibrations.
Calorimeter	P. Cerello, E. L. Torres, B. Spadavecchia, A. Valetti	bspadavec	Full porting of geometry, clustering and calibration studies
DAQ	M. Villa, R. Ridolfi		DAQ classes developed and stable. No ongoing work.
Global Reconstruction	M. Franchini, R. Zarrella	GlobalGF_dev	Different parallel strategies are being developed in two different branches
Simulation (FLUKA)	S. Muraro, G. Battistoni		
Simulation (G4)	M. Vanstalle		Geant4 simulation
Trigger	G. Traini		Triggering strategies implementation and study will be performed against the simulation.
Analysis	I. Mattei, R. Ridolfi, G. Ubaldi	Ubaldi_temp + GSI2021 + GSI2021_XS	Analysis on GSI2021 cross section measurements
Alignment	Y.Dong	Alignment macro	Alignment of the global setup

- This is an "inclusive" list of people, different people are involved in different tasks and **we still have problem of man power** (+ concorsone)

- In December Laura Buonincontri joined the CALO team in Turin and asked me instructions about SHOE… But she left few months ago. Now in Torino there is a new post-doc: Bharat

- We have a new Ph.D. student in Perugia for the MSD and she started to learn about coding in C++ and how to use ROOT

- Chris have a master student dedicated to IT

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Current software development

- Regarding software development, different detectors are in a "good shape": SC, BM, VTX, TW, Simulations

- IT: Chris and his student developed a new tracking algorithm for IT alignment that can work w/o magnetic field. A lot of work had been done to fix the decoding issues and to perform efficiency analysis. Still working on debugging, mapping, geometry etc.

- MSD: Ilaria and Sofia developed different macros to evaluate pedestals, common noise and dead strips. Currently working on the physics runs. Need to evaluate the detector performances, analyse the clustering algorithm, ghosts, MC digitiser etc.

- CALO: Benedetto worked on the analysis and calibration of the CALO using different macros. Currently working on data analysis related topics. At some point the analysis code will be included in the SHOE framework

- Global reconstruction: Added a new EnableBMmatch flag in FootGlobal.par so that Genfit or StraightTrack will reconstruct only the tracks of the vertex matched with the BM (y) or all the vtx tracks (n). Useful for high pile up campaigns e.g.: GSI2021.

- Cross section analysis: A lot of work had been done by Giacomo U. to develop the cross section analysis classes (TANA*). Now the cross sections and different other global analysis tasks can be "easily" done using configuration files to set the cuts and select the type of analysis.

To do list: towards CNAO2025

- Before CNAO2025:
  -Complete the software required for MSD and CALO and merge them into the main branch
  -Replace all the TVector3 (obsolete) with the new XYZVector
  -SHOE 25.1

- During CNAO2025:
  -Use a dedicated non protected branch
  -Use FastDecode for monitoring and analysis purposes
  -Use Footbol4 or another computer for almost-online monitoring
  -**Update the FOOT.geo files**

- After CNAO2025:
  -clean the dedicated branch and merge into main branch
  -update all the detector calib/geo/conf files
  -alignment

To do list: sooner or later

- Automatise and improve some tasks (e.g.: alignment)

- Check up all the software detector by detector and do a performance evaluation (speed, memory leaks, optimization etc.)

- Review of current "Standard" Genfit global reconstruction algorithm

- Development of further track finding algorithms for cross-check of performance ("outsidein", "back")