ALPACA-team at 2023 Monument Collaboration meeting

Morning session:

- Intro (Betta)
- ALPACA Dead-time (Mario)
- ALPACA data stability analysis (Dhanurdhar)

Afternoon session:

- Efficiency analysis towards Partial Capture Rates (Eli)
- Total capture rate analysis (Betta)

Analysis of ALPACA data: status report

Elisabetta Bossio (TUM)

MONUMENT Collaboration Meeting, Munich 23.05.2023

What happened after the last collaboration meeting?

We have “easier to work with” data: we moved to **tier3 level**

We realized that the ALPACA DAQ has huge **dead time**

➜ Mario’s talk

We studied the **stability of the data** over the 2021 beam time

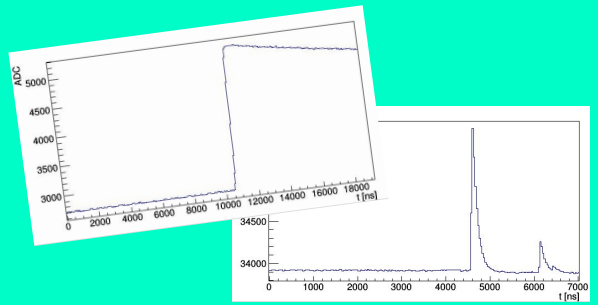
➜ Dhanurdhar’s talk

We are ready for the fun: we started to work on the analysis for the **total capture rate** and the **partial capture rate**

➜ Eli’s talk

ALPACA DATA-STRUCTURE: A QUICK REMINDER

Tier1: raw data constisting of ge-det and pmt waveforms



Tier2: output of the Digital Signal Processing (DSP), e.g. uncalibrated energy, trigger position, baseline and more

tier2.ge.root

tier2.pmt.root

Tier3: calibrated variables, quality cut flags, and integration of ge detectors and pmts

tier3.root

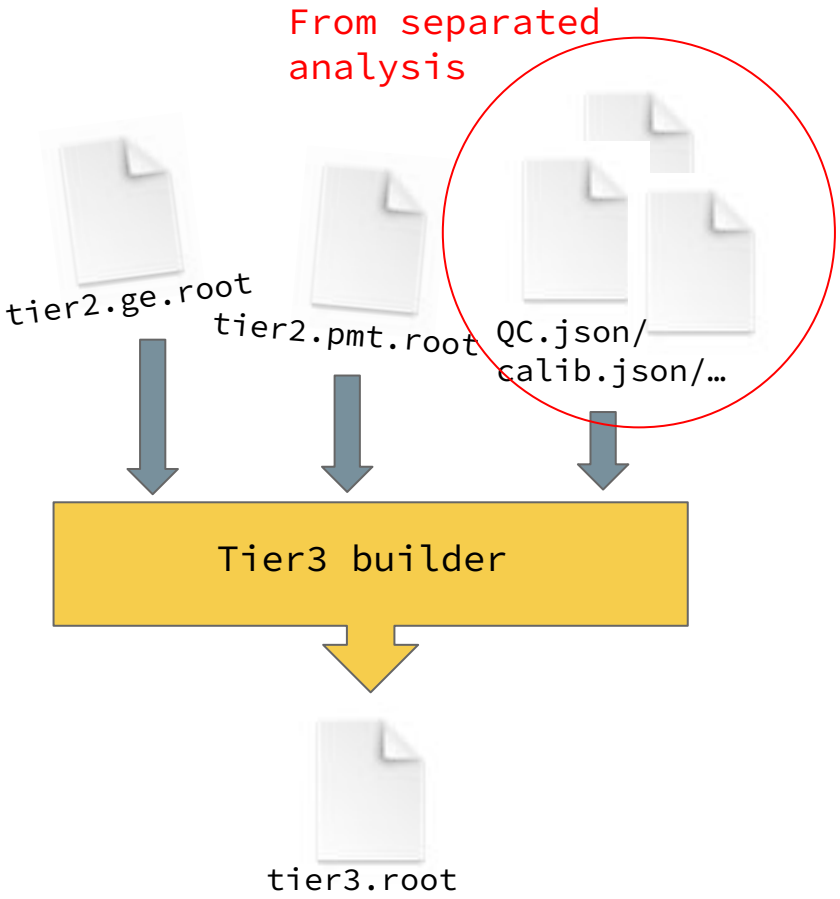
NEW!

Building tier3

Input: tier2 files from ge-det and pmts, additional info from calibrations & quality cuts (provided in the form of json files)

Tier3 builder: cpp code

Output: one tier3 file



NEW!

TIER3 CONTENT

SlidesTier3

Example of data reduction:
from 4.6 GB of tier2 files
to 195 MB of tier3 file

Technical report
in preparation!

```
Attaching file output.tier3.root as _file0...
(TFile *) 0x55a1b8d011e0
root [1] tier3->Show(1)
======> EVENT:1
 timestamp       = 1635631021
 decimalTimestamp = 59765504
 multiplicity    = 0
 isTP            = 0
 failedFlag_ge   = (vector<int>*)0x55a1b96b0da0
 failedFlag_pmt  = 0
 energy          = (vector<double>*)0x55a1b96619a0
 rawEnergy       = (vector<double>*)0x55a1b965f450
 energyBkg       = 0
 energyTP        = 0
 deltaT_ge       = (vector<double>*)0x55a1b963d9a0
 deltaT_C0       = (vector<double>*)0x55a1b965f780
 deltaT_C1       = (vector<double>*)0x55a1b96b4420
 deltaT_C2       = (vector<double>*)0x55a1b965f390
 deltaT_C3       = (vector<double>*)0x55a1b96628a0
 amplitude_C0    = (vector<double>*)0x55a1b966a4f0
 amplitude_C1    = (vector<double>*)0x55a1b9260310
 amplitude_C2    = (vector<double>*)0x55a1b963b430
 amplitude_C3    = (vector<double>*)0x55a1b926f690
 deltaT_C0_hf    = (vector<double>*)0x55a1b9267380
 deltaT_C1_hf    = (vector<double>*)0x55a1b965f5a0
 deltaT_C2_hf    = (vector<double>*)0x55a1b92674b0
 deltaT_C3_hf    = (vector<double>*)0x55a1b926ece0
 amplitude_C0_hf = (vector<double>*)0x55a1b9645090
 amplitude_C1_hf = (vector<double>*)0x55a1b926a570
 amplitude_C2_hf = (vector<double>*)0x55a1b9268980
 amplitude_C3_hf = (vector<double>*)0x55a1b9676d20
 firstTriggerChannel = 0
```

Outlook 😊

Physics results we want to obtain:

- **Total capture rate of 76Se** ➜ WIP, I'll talk later
- **Total capture rate of 136Ba** ➜ Dhanurdhar will work on it
- **Partial capture rate of 76Se and 136Ba** ➜ WIP, Eli will talk later

Outlook

- One ***elephant in the room***: we need an estimation of the dead time for each detector and physics run

  ➜ Mario will tell us more

- And we need to start looking at 2022 data