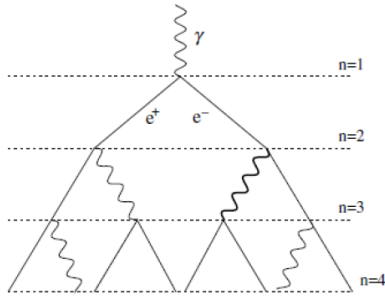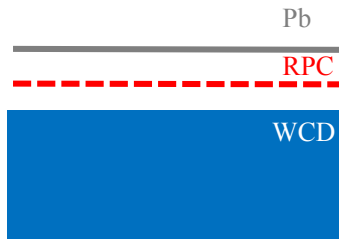# *LATTES software distribution*

Ruben Conceição, Bernardo Tomé

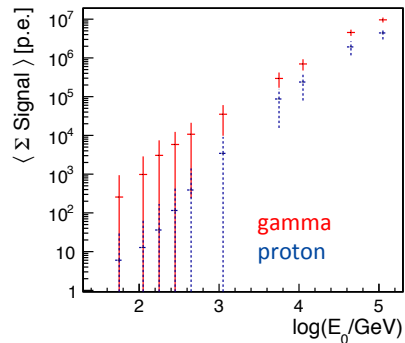# Towards LATTES sensitivity...

Shower simulation
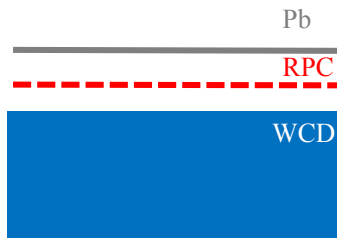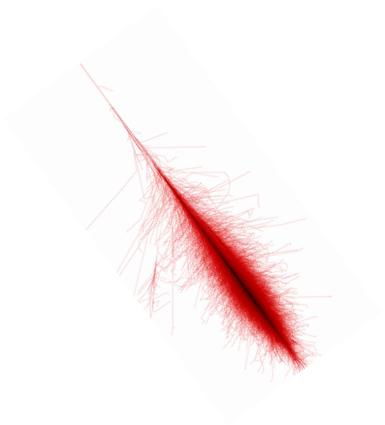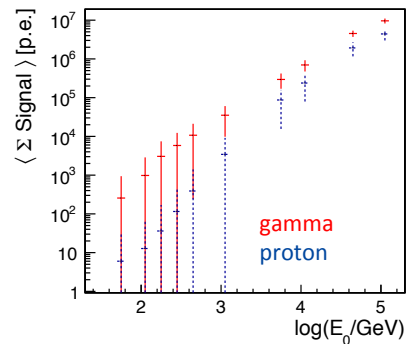
Detector simulation

Shower reconstruction

Towards LATTES sensitivity…
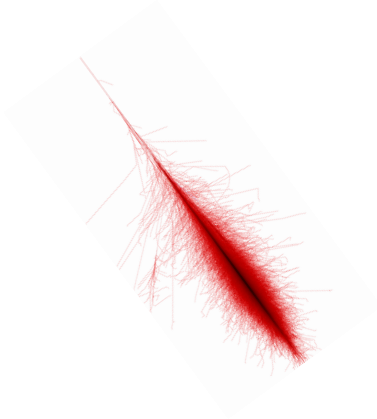

CORSIKA showers

Detector simulation

Pb

RPC

WCD

Shower reconstruction

gamma
proton

Towards LATTES sensitivity...
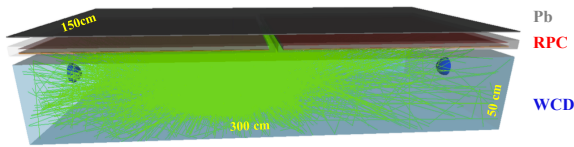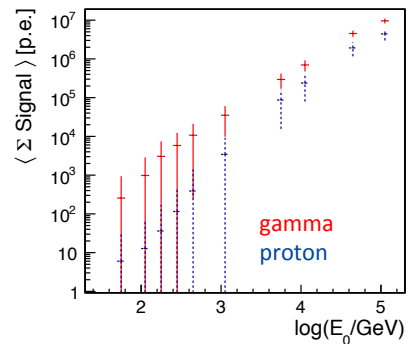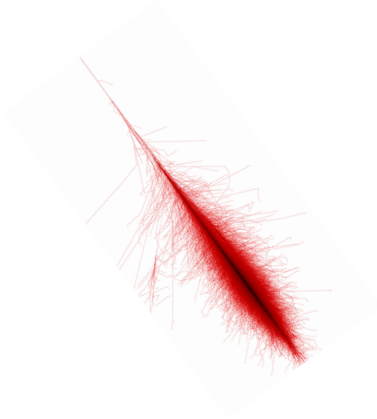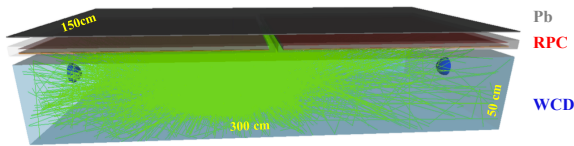
CORSIKA showers
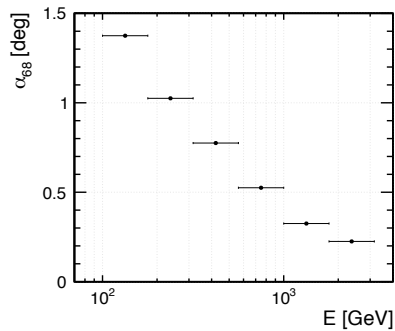
Geant4 simulation (LATTESsim)

Shower reconstruction

Towards LATTES sensitivity…

CORSIKA showers

Geant4 simulation (LATTESsim)

Reconstruction analyses (LATTESrec)

Shower reconstruction

✦ Detector simulation output
  ✦ Format is a ROOT tree
  ✦ Methods to access specific simulated shower parameters
    ✦ WCD signal
    ✦ RPC hits
    ✦ Detector configuration and parameters
    ✦ Shower simulation parameters
✦ Reconstruction tool
  ✦ Several modules to reconstruct the shower
    ✦ Geometry
    ✦ Energy
    ✦ Gamma/hadron discrimination
✦ Lightweight and easy to re-process for higher level analysis

LATTES software

✧ LATTES software has been tested and is currently running at:

   ✧ Our laptops ;-) [MACOS]

   ✧ Lisbon cluster [SL6]

   ✧ Prague cluster []

   ✧ Rio de Janeiro interactive machines (CBPF) [Ubuntu16]

✧ The codes are relatively modular and documentation can be obtained via Doxygen

   ✧ Just run: *doxygen Doxyfile*

LATTES documentation

LATTES documentation

LATTESSim v1

Main Page	Namespaces ▾	Classes ▾	Files ▾

Class List

Here are the classes, structs, unions and interfaces with brief descriptions:

- ▼ Ⓝ corsika
  - Ⓒ Longi
  - Ⓒ Particle
  - Ⓒ SubBlock
- ▼ Ⓝ utl
  - Ⓒ CORSIKAEvent
  - Ⓒ CORSIKAReader
  - Ⓒ Particle
- Ⓒ CORSIKAEventROOT
- Ⓒ EventROOT
- Ⓒ HitROOT
- Ⓒ PadROOT
- Ⓒ PMTROOT
- Ⓒ PrimaryVertex
- Ⓒ RPCROOT
- Ⓒ StationROOT

LATTESrec v1

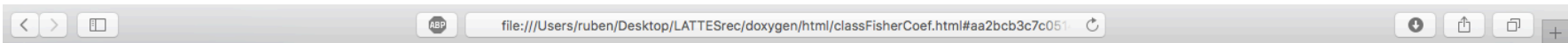| Main Page	Classes ▾	Files ▾

Class List

Here are the classes, structs, unions and interfaces with brief descriptions:

- Ⓒ AxisRec
- Ⓒ Compactness
- Ⓒ CoreRec
- Ⓒ DoubleWithError
- Ⓒ EbinInput
- Ⓒ FisherCoef
- Ⓒ FitParameters
- Ⓒ GeomRecPar
- Ⓒ LDFFitParameters
- Ⓒ Tree

LATTES documentation

LATTES SW distribution

✧ If you want to install LATTES SW register at:

    ✧ git02.ncg.ingrid.pt

    ✧ Then send us (bernardo@lip.pt, [ruben@lip.pt)](mailto:ruben@lip.pt) your username so that we can give you permissions
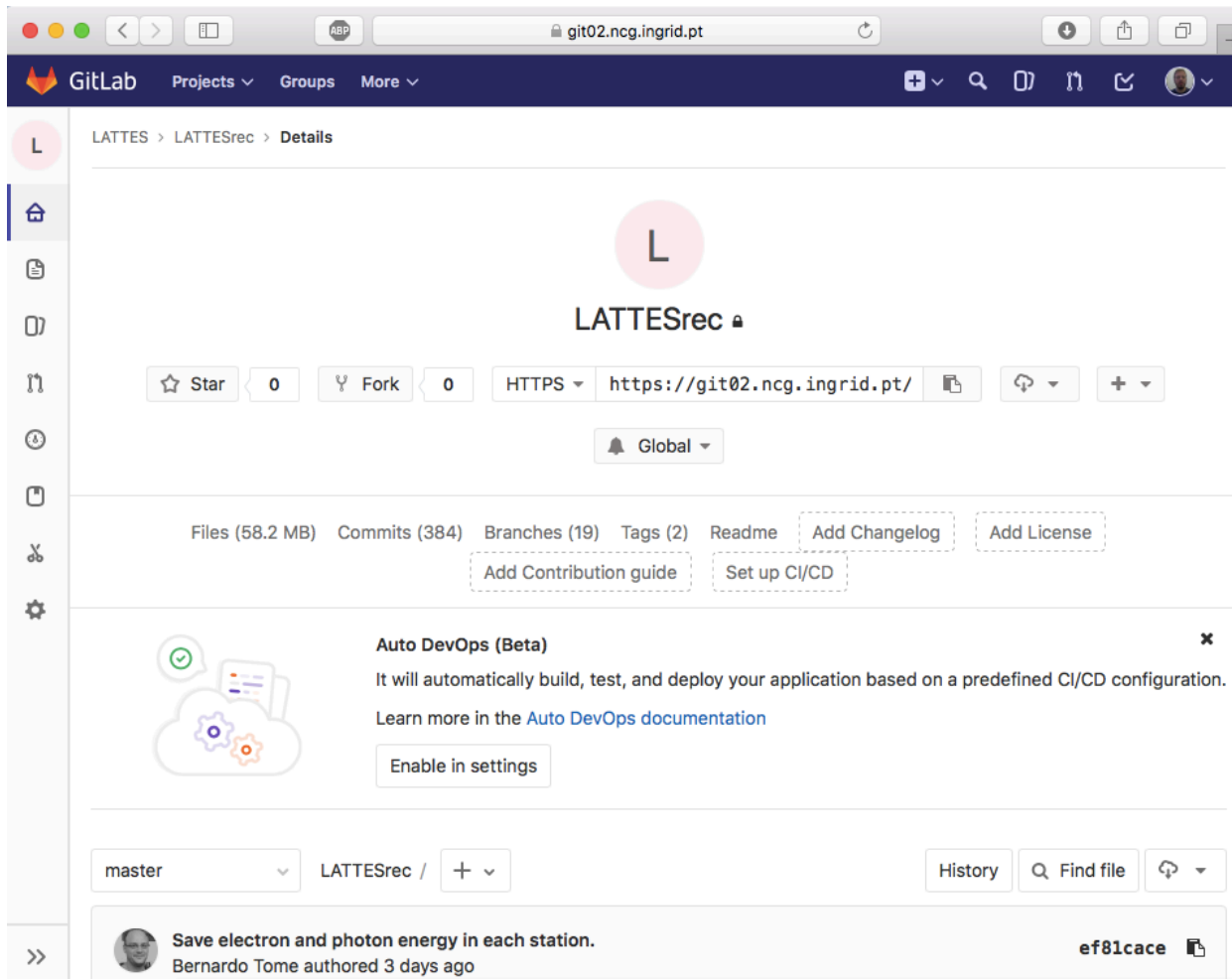
LATTES @ gitlab

Example: get LATTESrec

✧ git clone <https://....>

All info there!

Manage permissions

Summary

- Modular end-to-end simulation framework
  - From showers to high-level analysis
- Realistic and detailed description of the LATTES concept using Geant4 - LATTESsim
  - Optimization studies
  - Test different designs
- Reconstruction algorithms integrated in a single module – LATTESrec
  - Allows high-level analysis

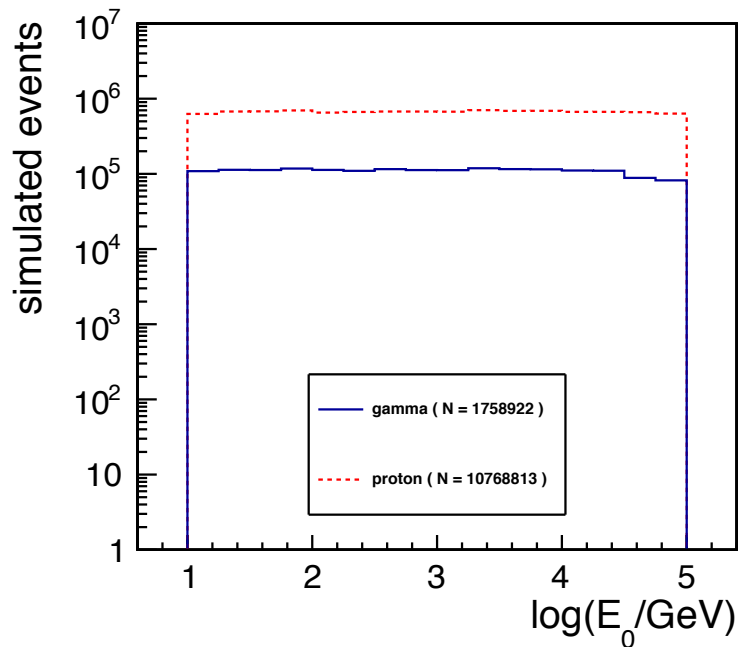- LATTESsim and LATTESrec available in gitlab repositories + doxygen documentation
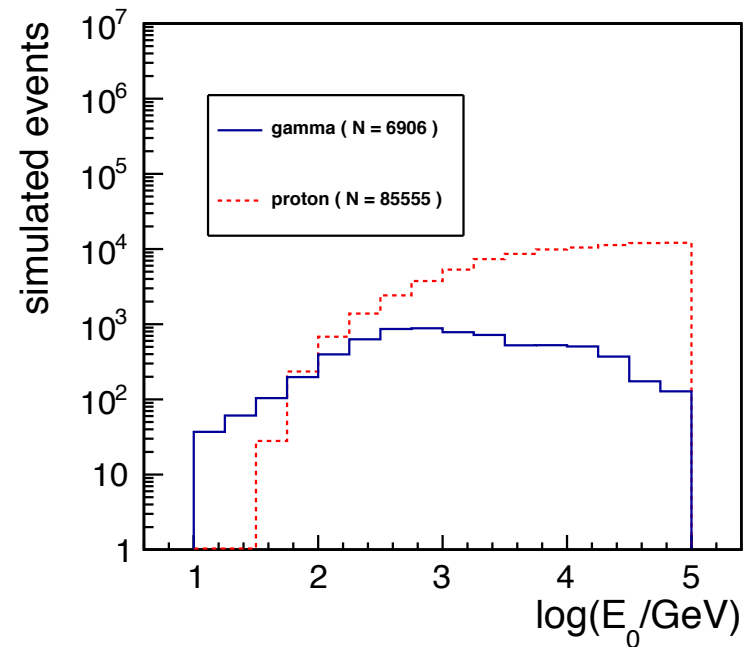
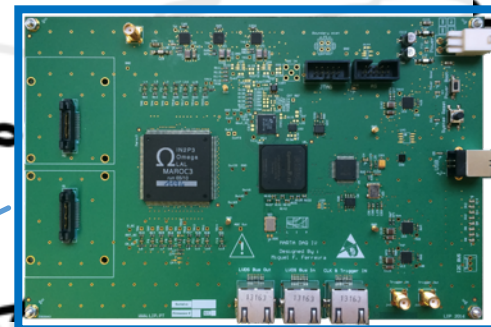# Acknowledgements

Backup slides

Reconstruction efficiency

Before quality cuts

After quality cuts

Ongoing developments and tests on RPCs, electronics and read-out systems
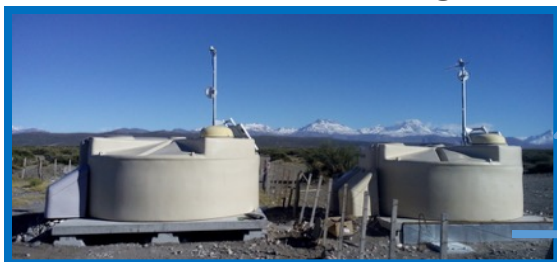

ents

DAQ Engineering prototype

RPC based muon hodoscope for precise studies of the Auger WCD

Top RPC

Gianni Navarra WCD

Bottom RPC

Construction and Assembling

RPCs in the field @ Auger

RPC hodoscope