

# LIP – Expression of Interest

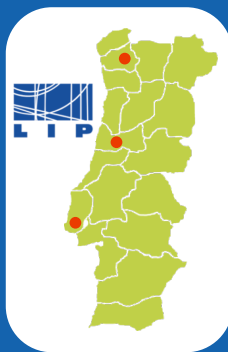




## Portuguese ATLAS Team

National group:

LIP (Lisbon, Coimbra, Minho), FCUL, FCTUC, U. Minho, CFNUL  
CEFITEC/UNL, INESC, CFMC, Adl engineers training program

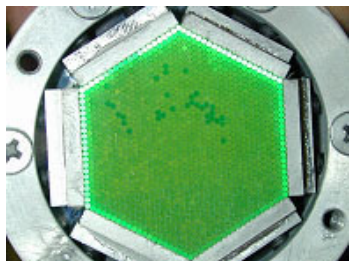




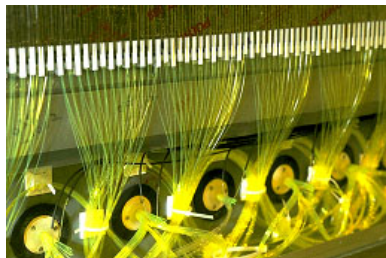
# Long-term Portuguese contributions to ATLAS construction

## TileCal hadronic calorimeter

600 k WLS fibres  
aluminized



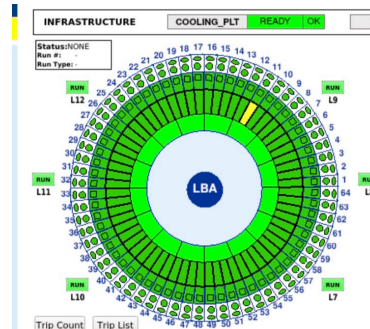
Design of the cells  
and fibres routing



Fibres insertion with robot  
in 15 k plastic profiles

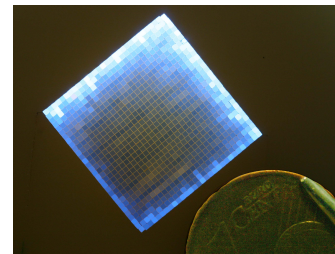


## Detector Control System

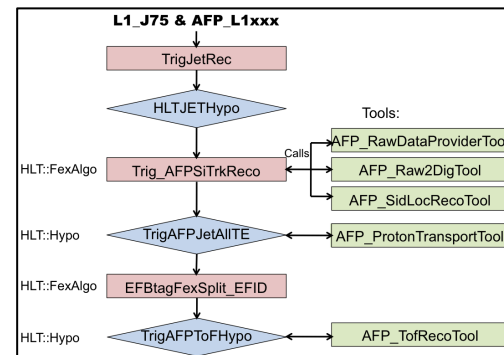


In addition: scintillators, laser calibration, PMT quality control, instrumentation of the modules, calibration, certification and commissioning

## Forward detectors



## Trigger/DAQ



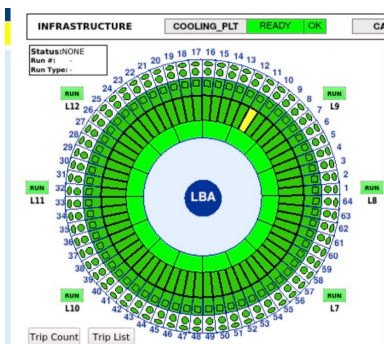




# Current Portuguese Contributions to ATLAS

**ATLAS Roman Pot DCS and HLT**

**TileCal Calibration, DCS**



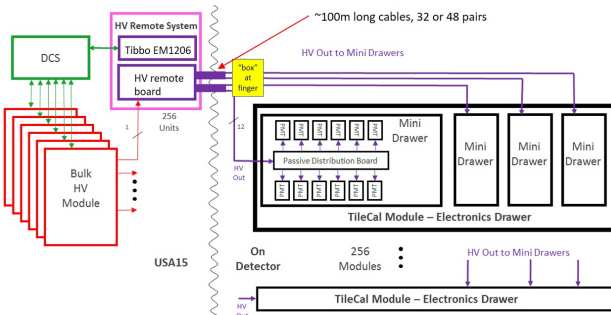
**Leading TileCal DCS**

**Distributed computing**

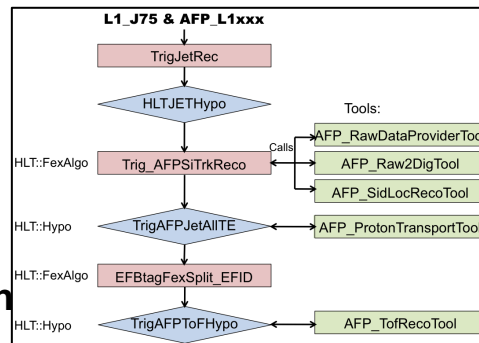


**Iberian Cloud Coordination**

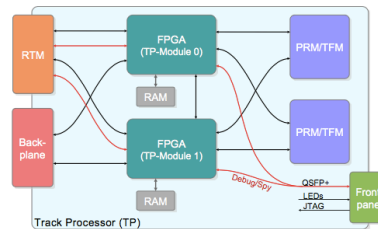
**TileCal Upgrade HV distribution system**



**Jets HLT**

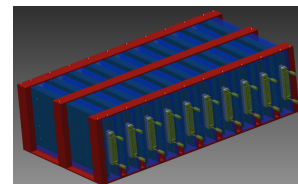


**Trigger Upgrade: HTT DCS, simulation, mezzanine production**



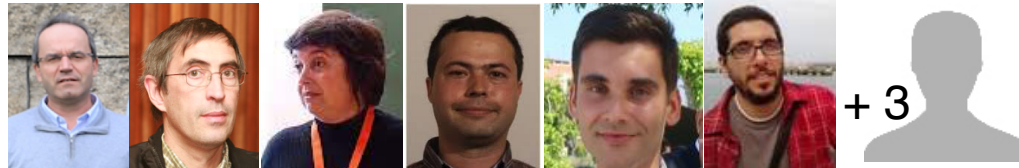
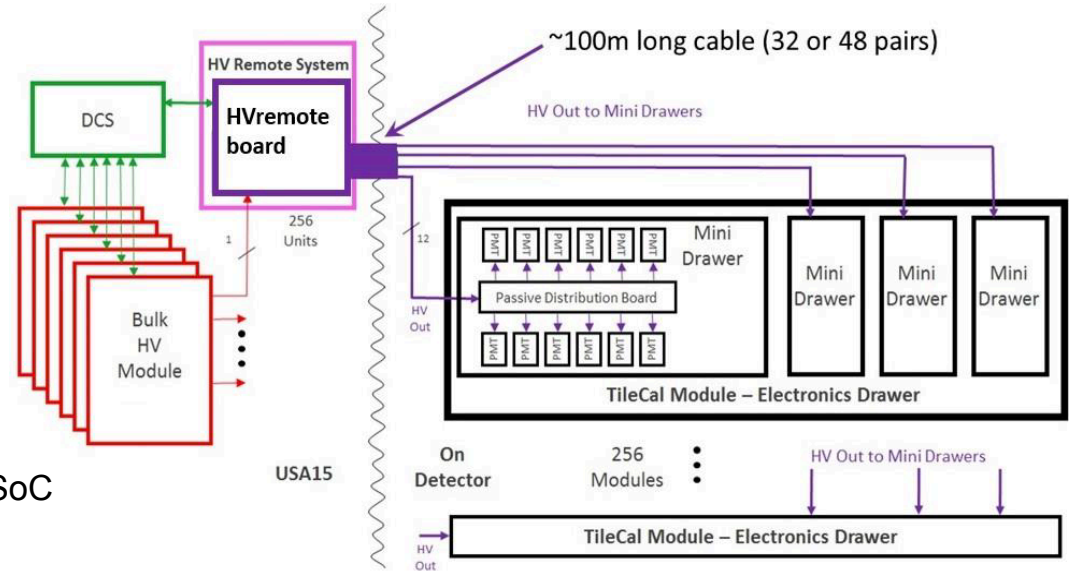
**Co-leading ARP DCS**

**HGTD HV patch panels**



# ATLAS Upgrade – TileCal HV Upgrade

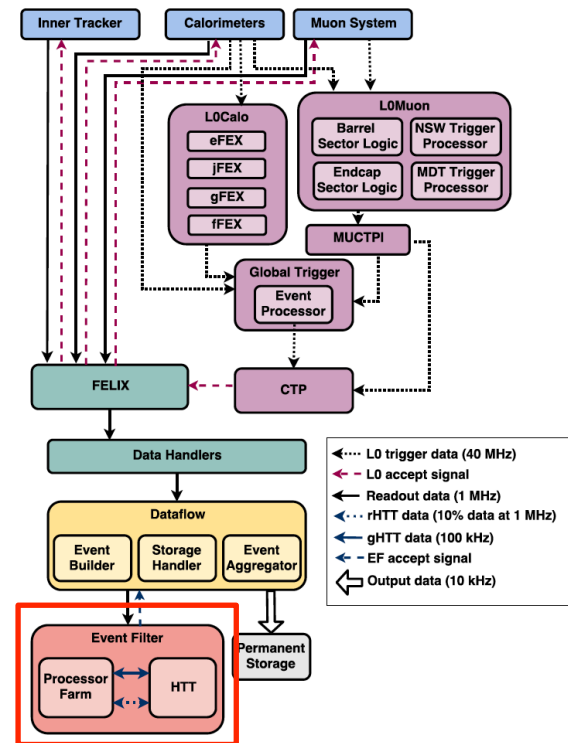
- Developing Phase II TileCal HV distribution:
  - $\sim 750 \pm 0.5\text{V}$ ;  $< 400\text{mA}$  to  $\sim 10000$  PMTs
  - Hvsupply** boards in USA15 – DC-DC converters
  - 256 **HVremote** boards in USA15 – regulation and control system
  - Crate control and DCS with Zybo Zynq SoC
  - 1024 passive **HVbus** board on detector
  - Sole responsibility of LIP: team of 3 academics, 3 engineers, 3 MSc students





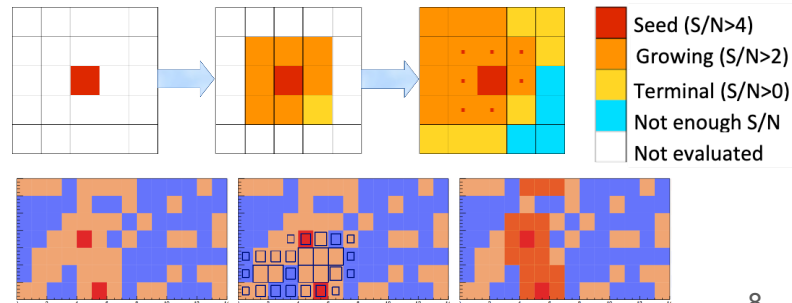
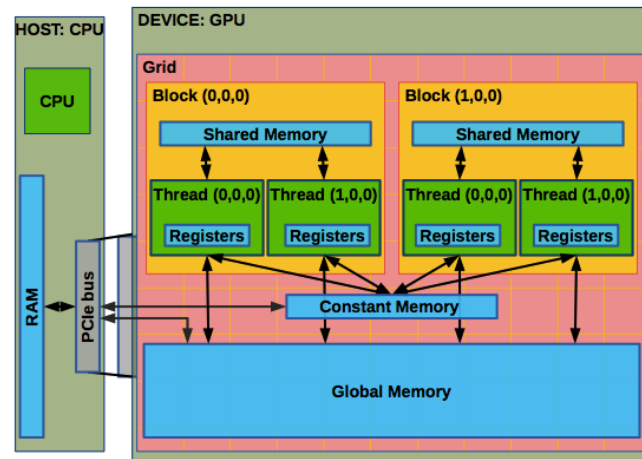
# ATLAS Upgrade – HTT electronics and software

- Hardware tracking co-processor for the trigger:
  - Up to 1 MHz RoI-based tracking for  $|\eta| < 4$
  - 727 Tracking Processor (TP) boards with track fitting and communications (RTM) mezzanines in 48 units to process separate  $\eta$ - $\phi$  regions
- Contributions atLIP:
  - Production of RTM board; development of TP network interface; DCS
  - HTT fast simulation; studies of tracking performance; alternative tracking algorithm (Hough transform) – MSc and PHD Qualif. Task
  - Team: 1 academic, 2 engineers, 1 PhD student, 1 MSc student



# ATLAS Upgrade – Hardware Accelerators

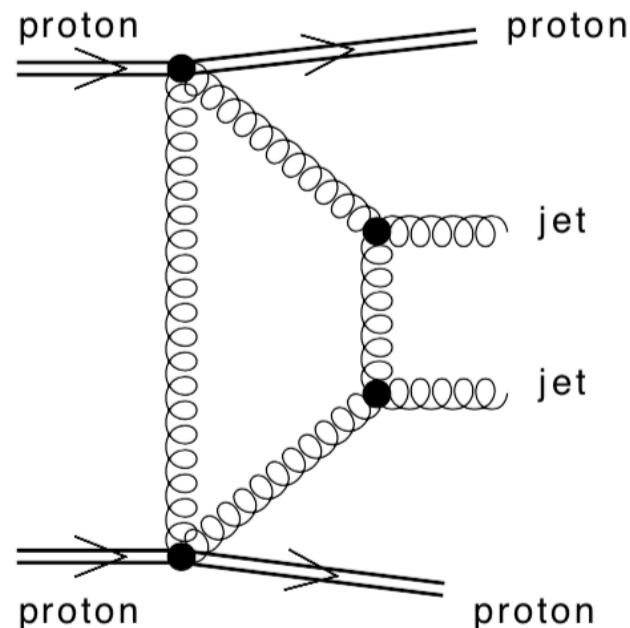
- TopoCluster reconstruction is slowest part of calo reconstruction and scales non-linearly with occupancy – affects e.g. jet trigger
- Exploit GPU parallelism to accelerate algorithm
- TopoAutomaton Clustering (TAC)
  - Cellular automaton algorithm based on cell pair-wise cluster flag propagation
  - 1st prototype demonstrated great potential – now optimizing in new, more efficient framework
  - Both for trigger and offline, as part of ATLAS HCAF (Heterogeneous Computing and Accelerators Forum)
  - Team: 3 academics, 3 MSc students - collaboration with High Performance Computing group (INESC-ID / IST)





# ATLAS ARP Phase I – AFP and ALFA

- ALFA Luminosity detector
  - Scintillating fibre preparation
  - Detector control and monitoring
- AFP Atlas Forward Proton spectrometer
  - Detector control and monitoring
  - Central Exclusive Jet Production trigger
  - Exploitation of unique physics opportunities
- Team: 2 academics, 1 engineer, 2 PhD students



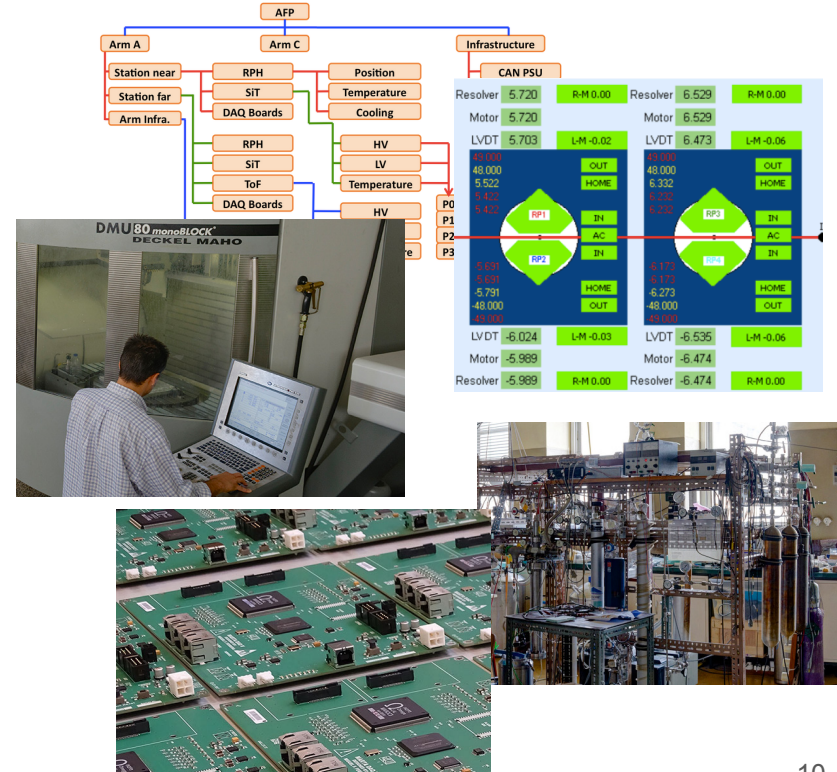
# Local expertise and support infrastructures

- DCS expertise:

- Filipe Martins and Luis Seabra coordinating DCS of TileCal, ALFA, AFP

- Support/collaboration with local groups:

- Radiation detector lab. and precision mechanical workshop at LIP
- Electronics (LIP-eCRLab)
- Computing (INESC-ID / IST)

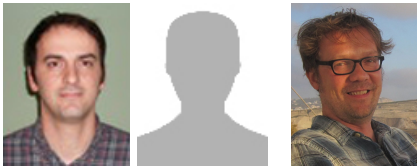




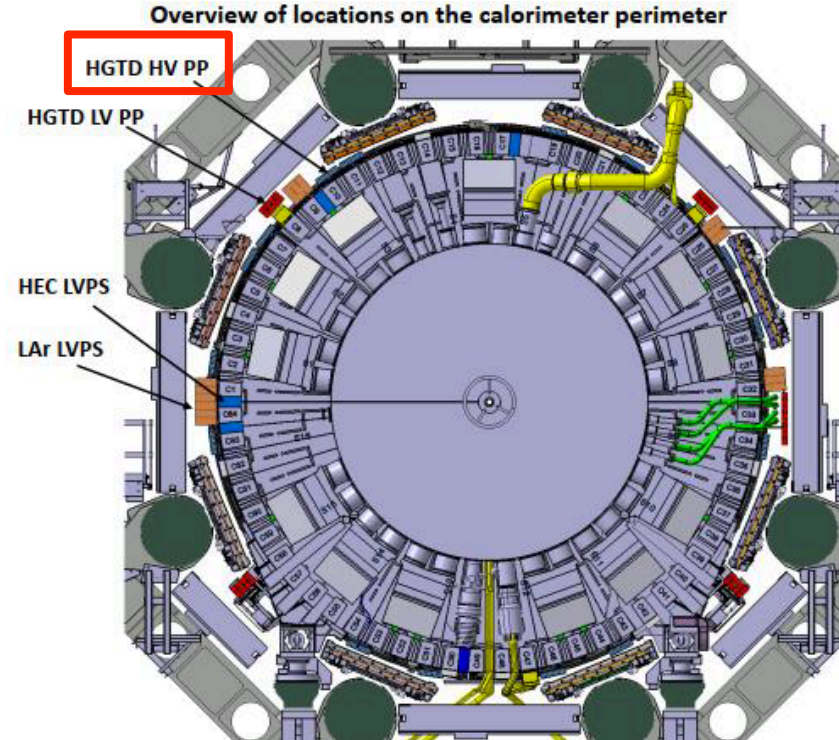
# HGTD Involvement

Producing HV patch panels with CERN group:

- 16 patch panel boxes located around the calorimeter perimeter
- Routing of High Voltage to HGTD detector and filtering AC noise out
- Presented in Electronics meetings
- Team: 1 academic, 2 engineers



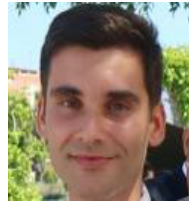
Looking for new projects to get involved  
with in HGTD



# Possible team to be involved in HGTD

Initially:

- Luís Lopes and Orlando Oliveira – mechanics and electronics
- Filipe Martins and Luis Seabra – DCS
- Rui Fernandez – electronics/firmware
- Ricardo Gonçalo – physicist
- In the future, possible involvement of other senior group members, MSc and PhD students for thesis works and qualification tasks



+ others



# Thanks!



## Acknowledgments



REPÚBLICA  
PORTUGUESA

**FCT**

Fundação  
para a Ciência  
e a Tecnologia



# Backup