ALICE MUON Software for run 3

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Outline

ALICE

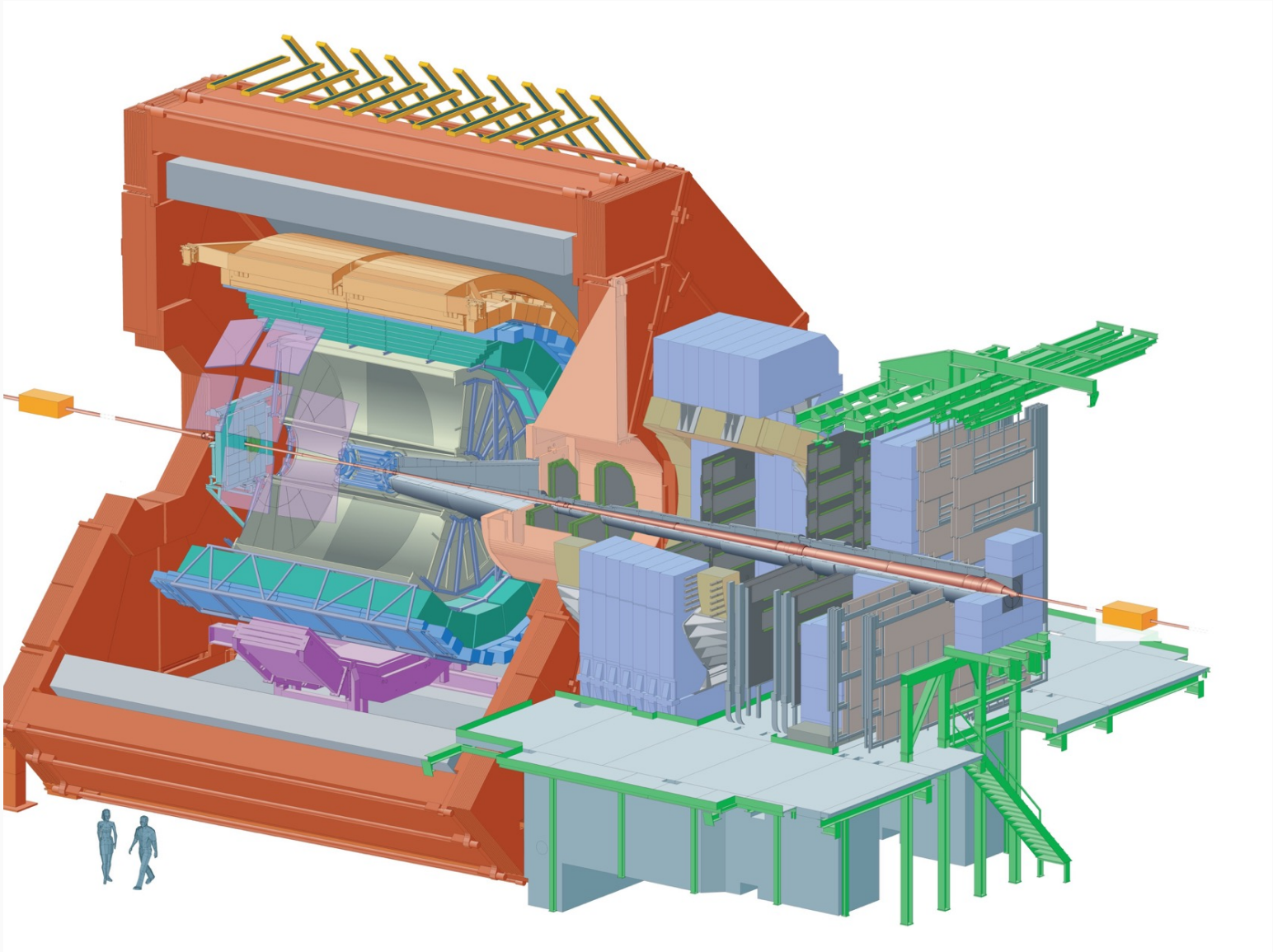
O2 and Run3

ALICE Muons

Current MUON Software

Cluster Finder

ALICE



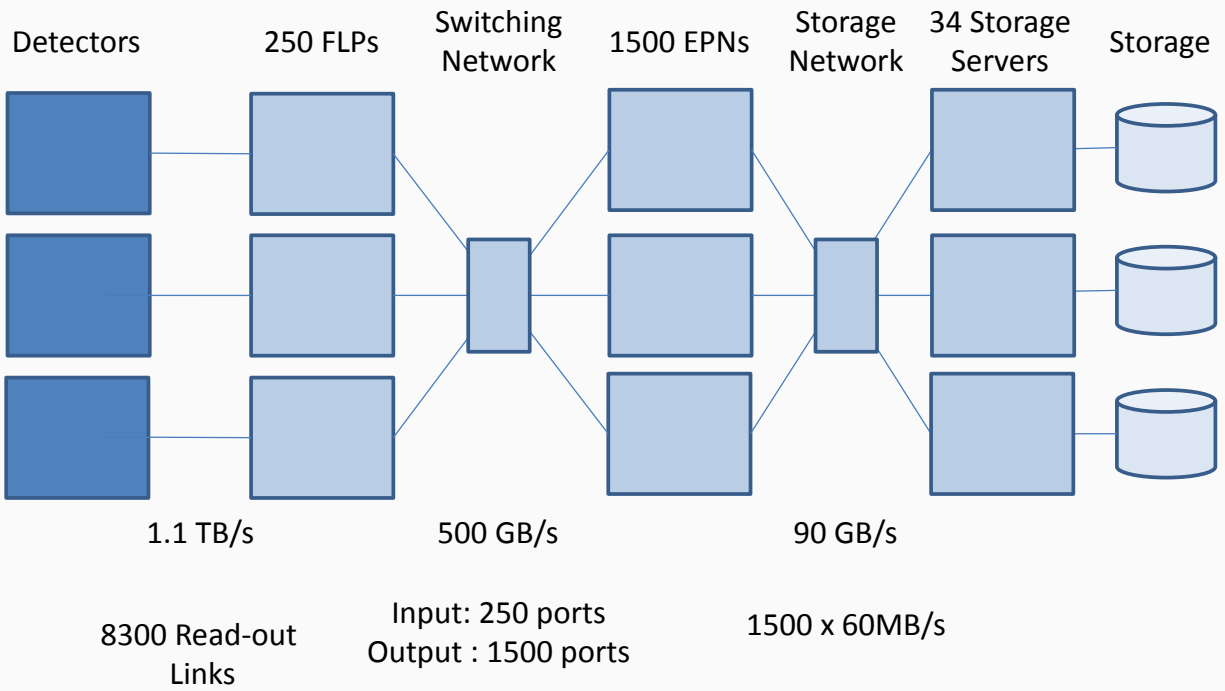
Outline

O2 Online/Offline

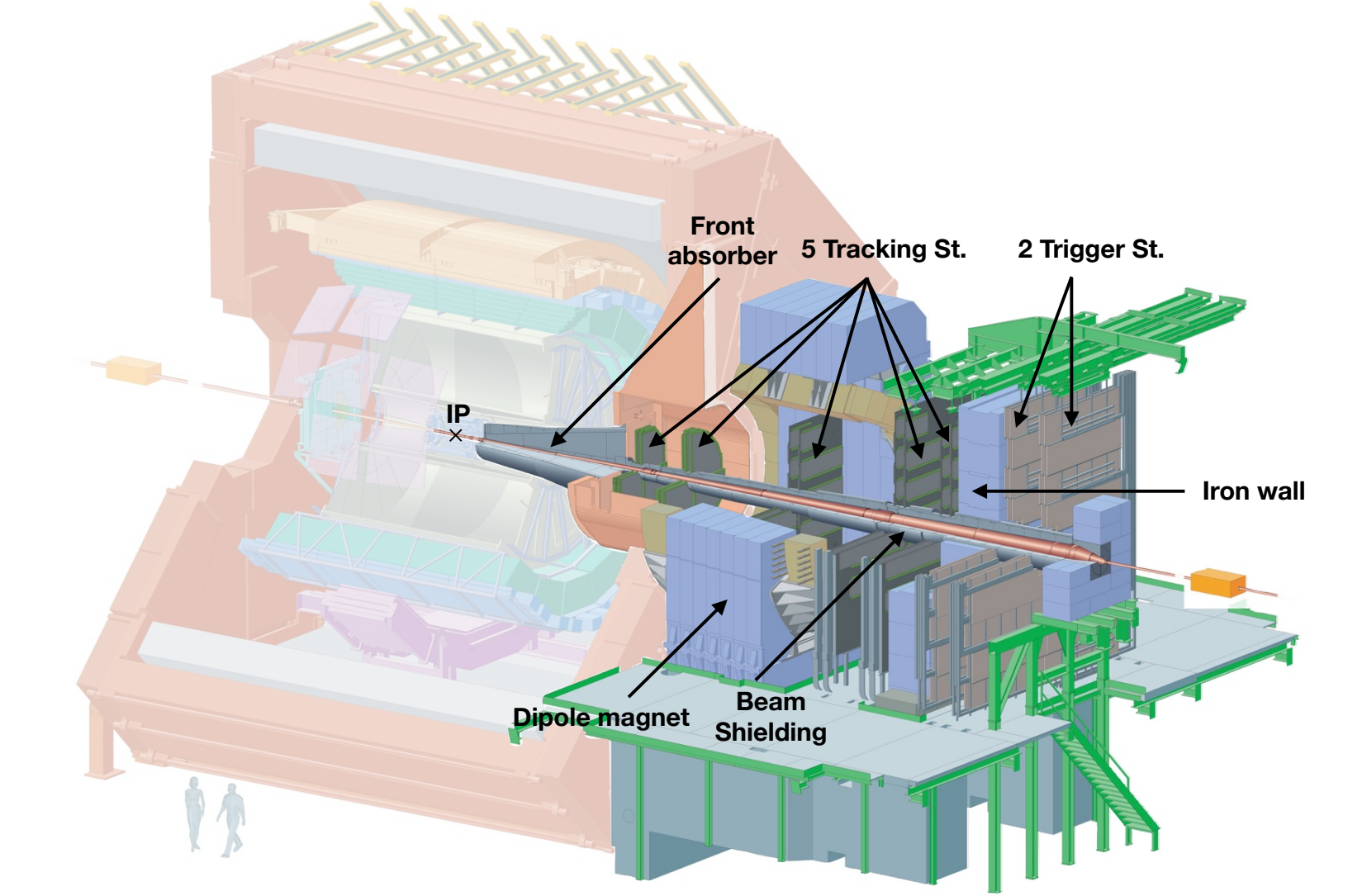
We will not go into depth, this is a whole another talk. Important numbers to take away :

- 50kHz event rate.
- 1.1 TB/s agregate data rate, spikes upto 15.
- continuous read out for most detectors, tpc and muon sharing electronics.
- Completely new framework.
- merge HLT, data acquisition and offline into 1 code base and platform.
- calibration and reconstruction online.
- Collaboration with FAIR for new framework.

O2 Farm

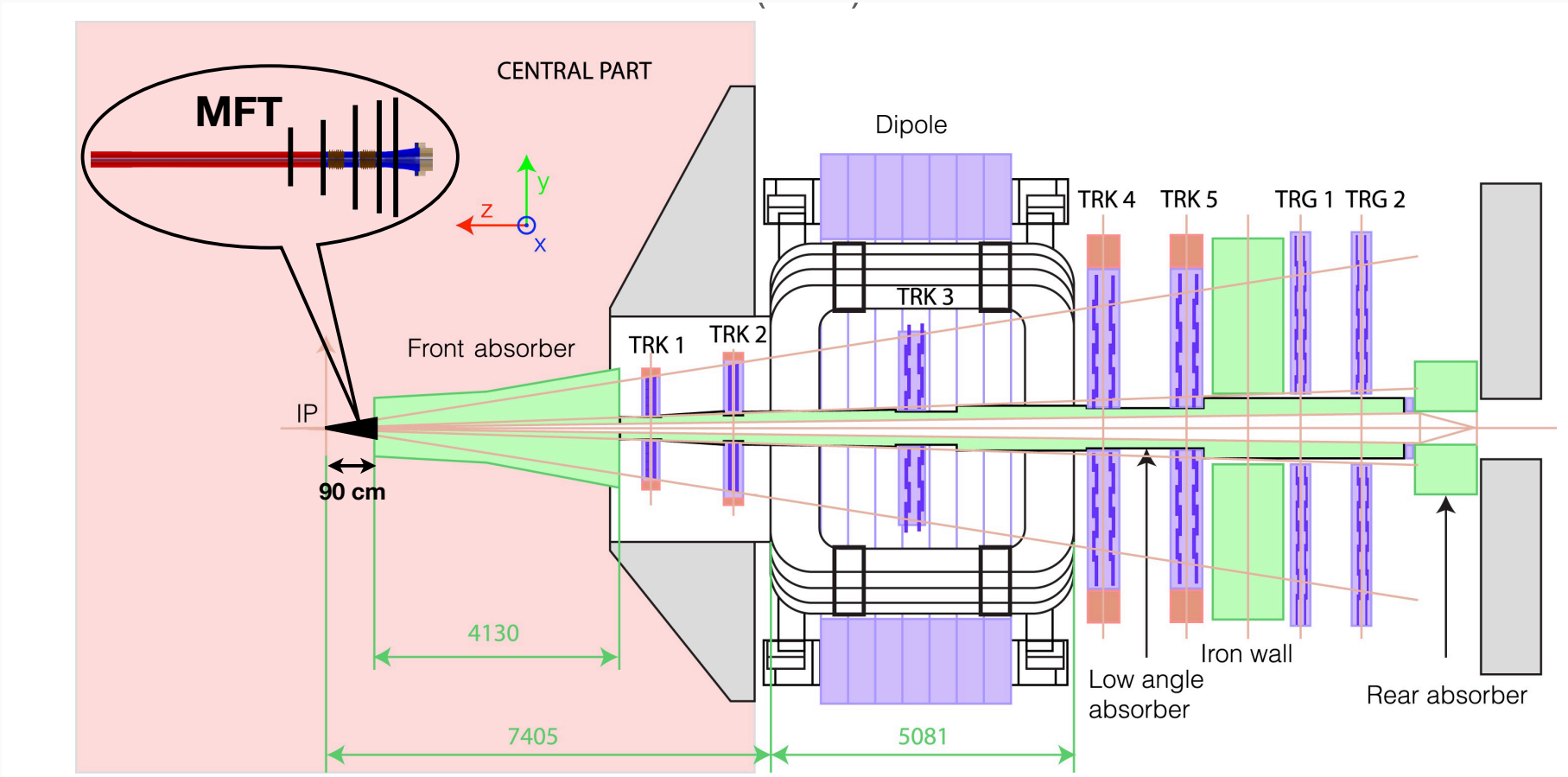

Detectors
250 FLPs
Switching Network
1500 EPNs
Storage Network
34 Storage Servers
Storage
1.1 TB/s
500 GB/s
90 GB/s
8300 Read-out Links
Input: 250 ports
Output : 1500 ports
1500 x 60MB/s

ALICE MUON Arm

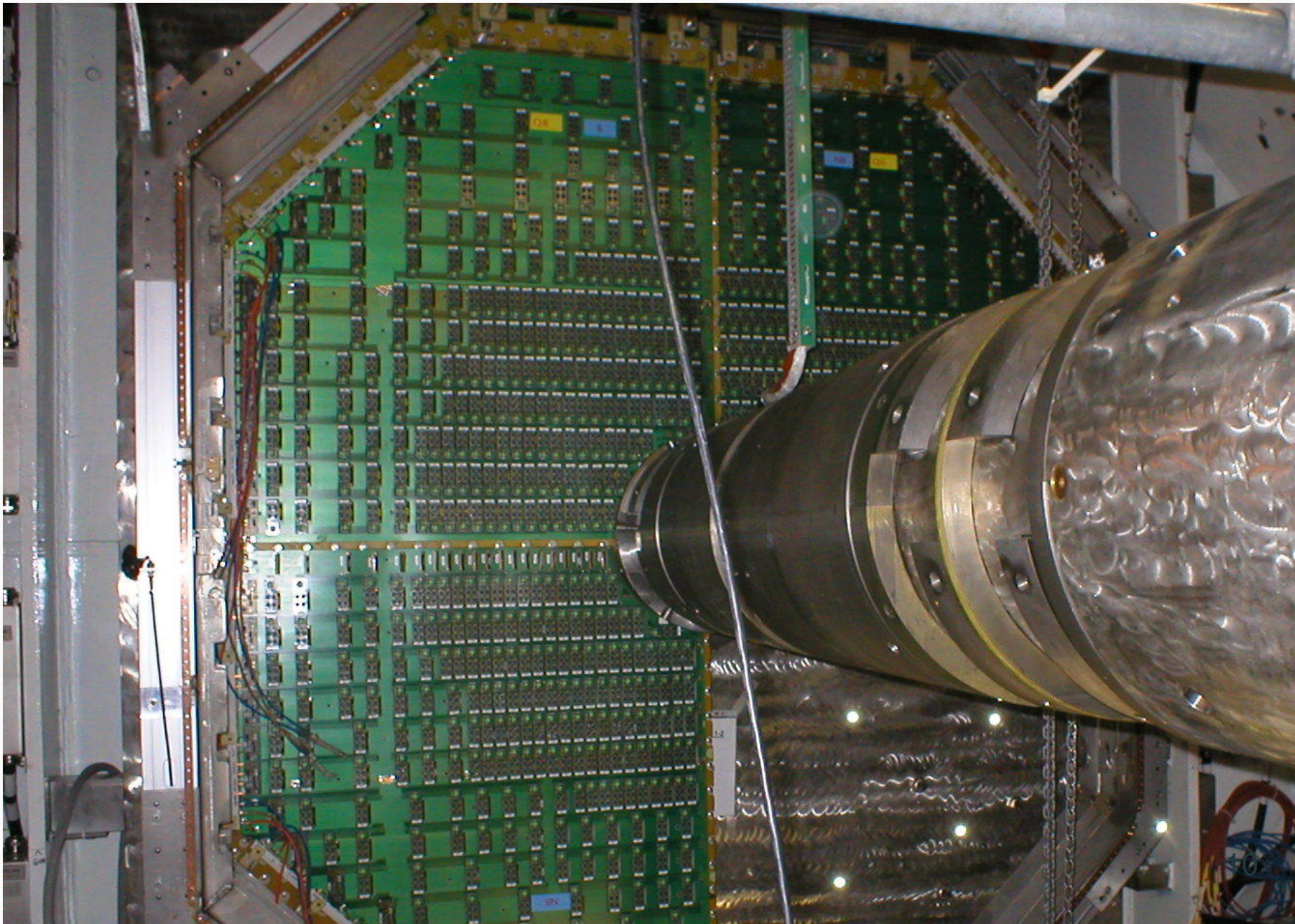


Outline

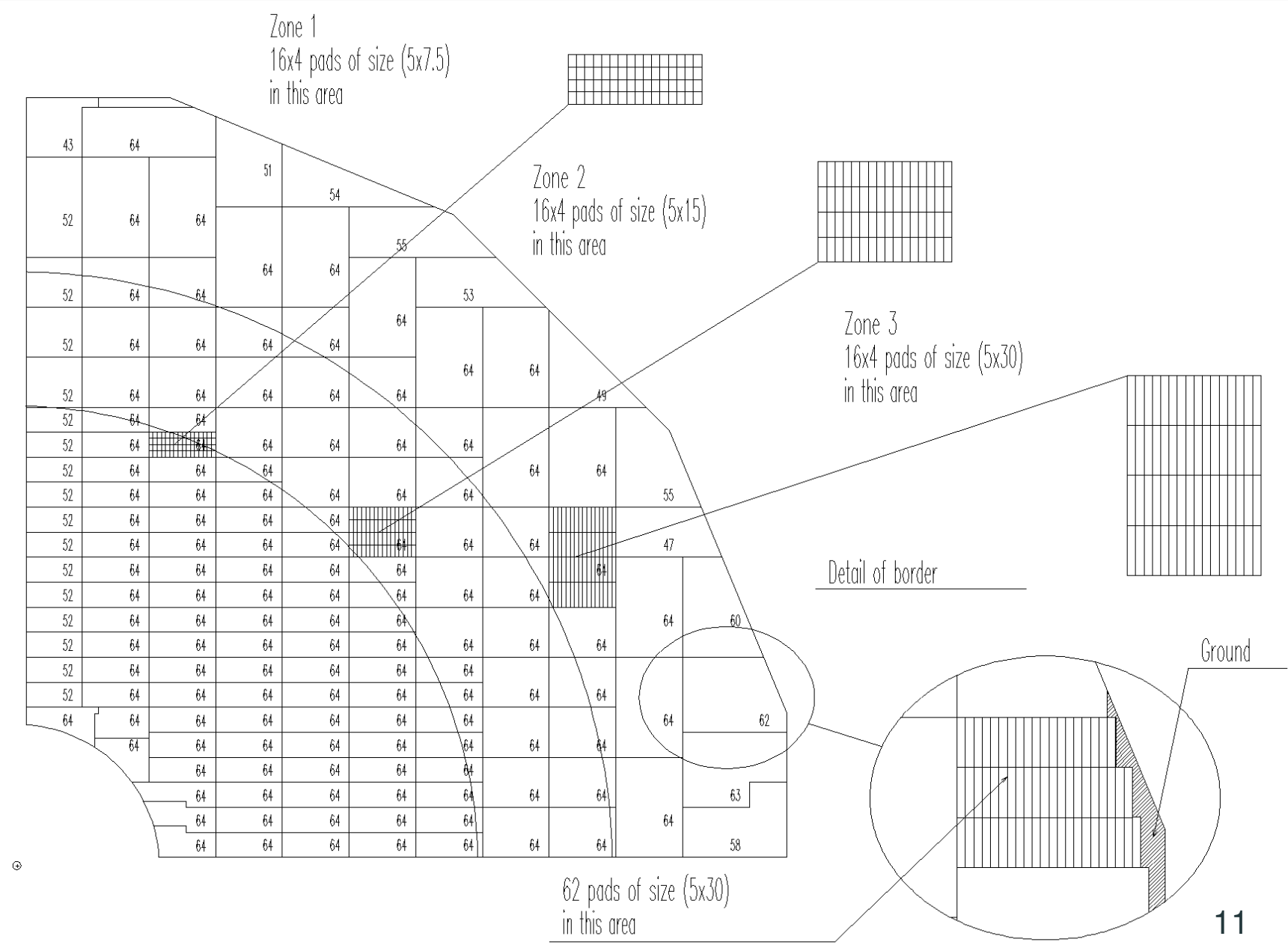
ALICE MUON diagram



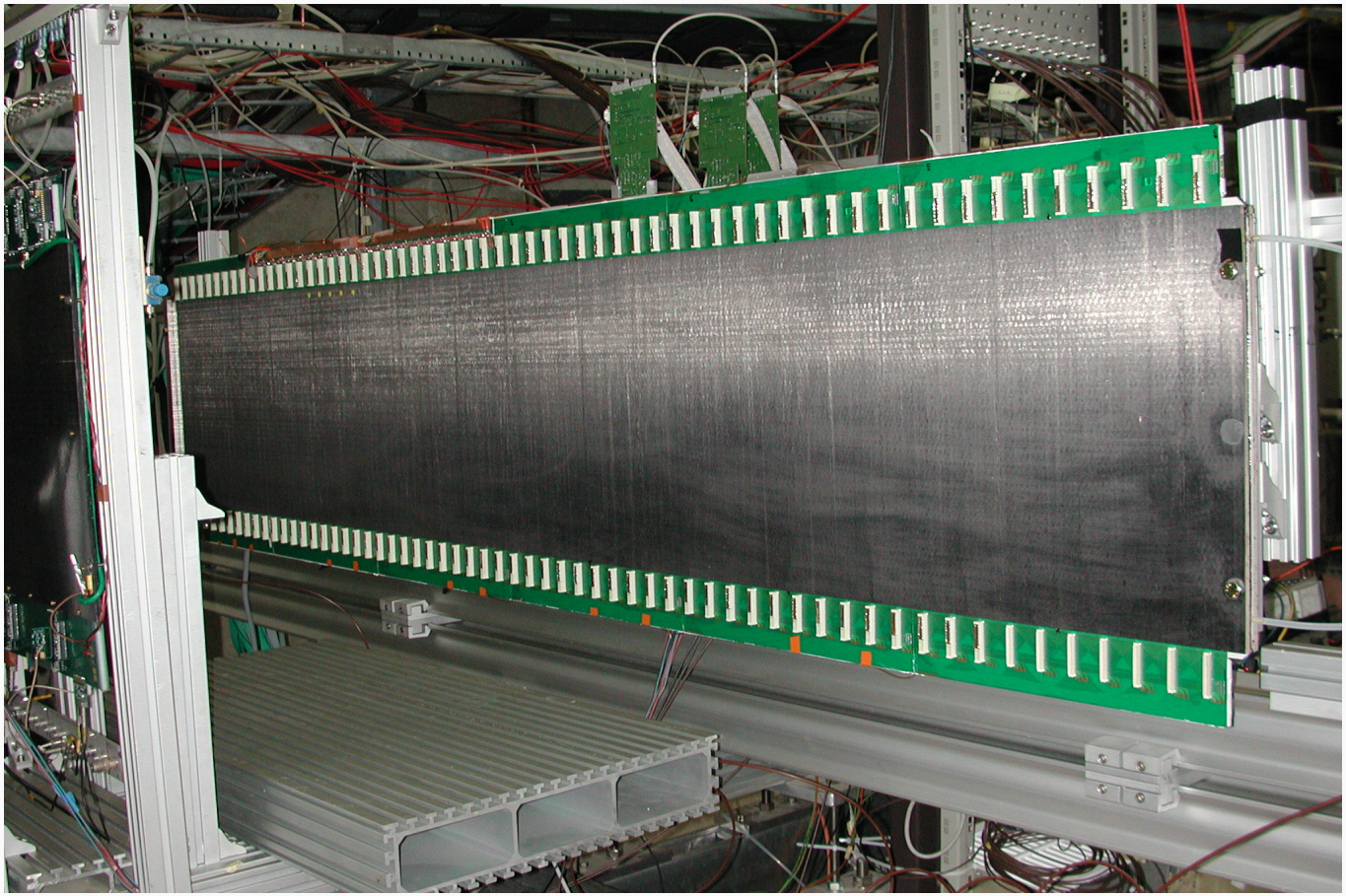
Detector Structure Station1



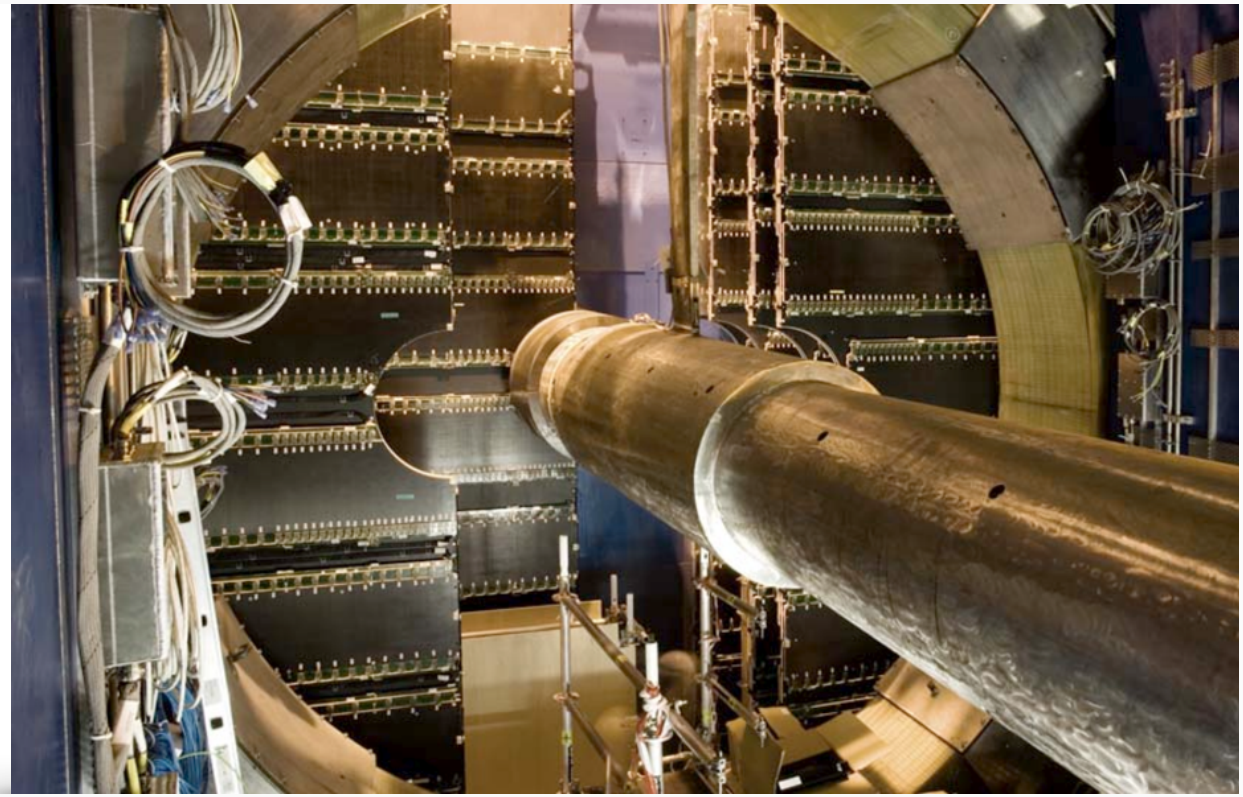
Detector Structure Station1 quadrant



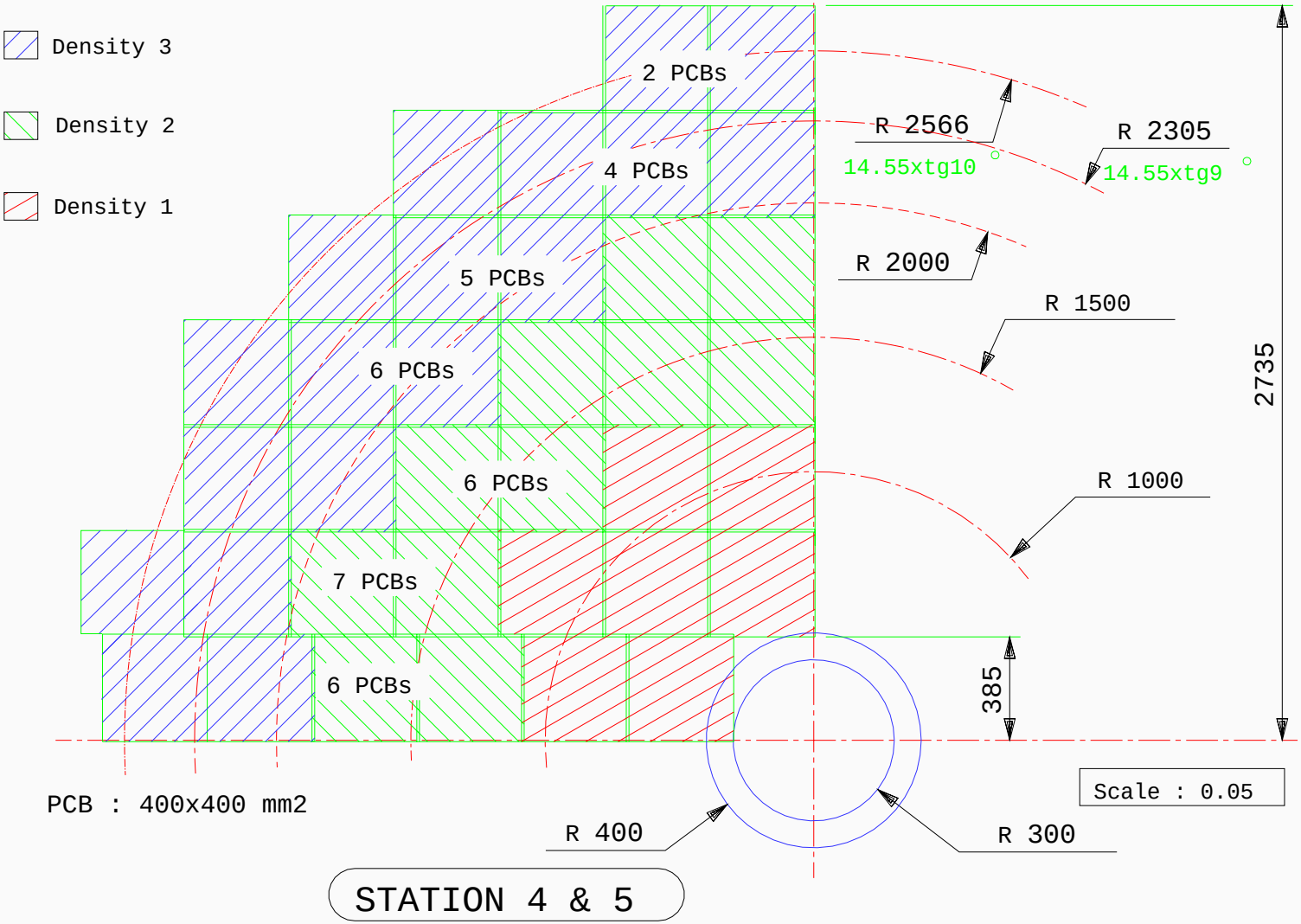
Detector Slats



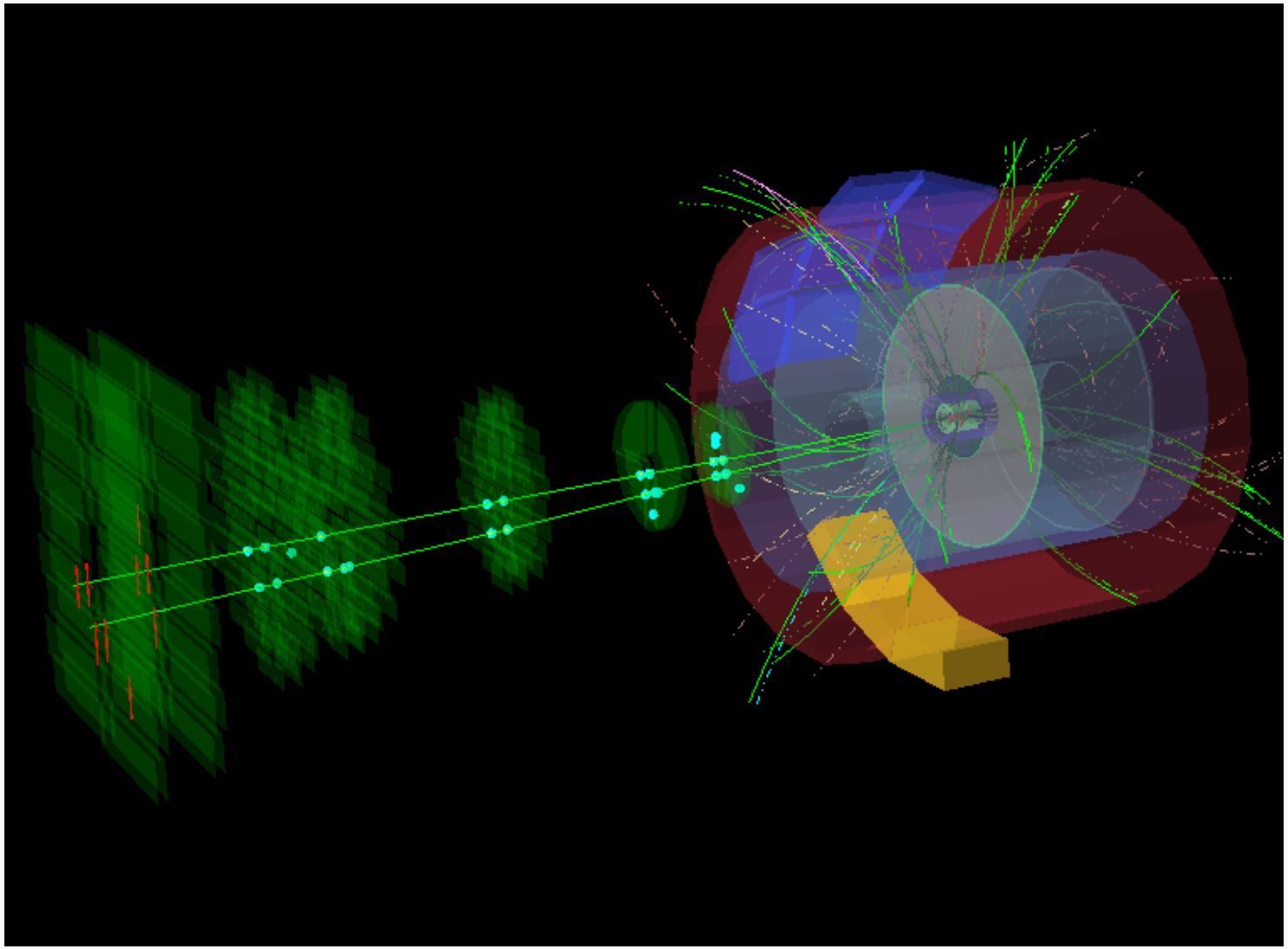
MUON Slats through the Dipole



Detector Slats schematic



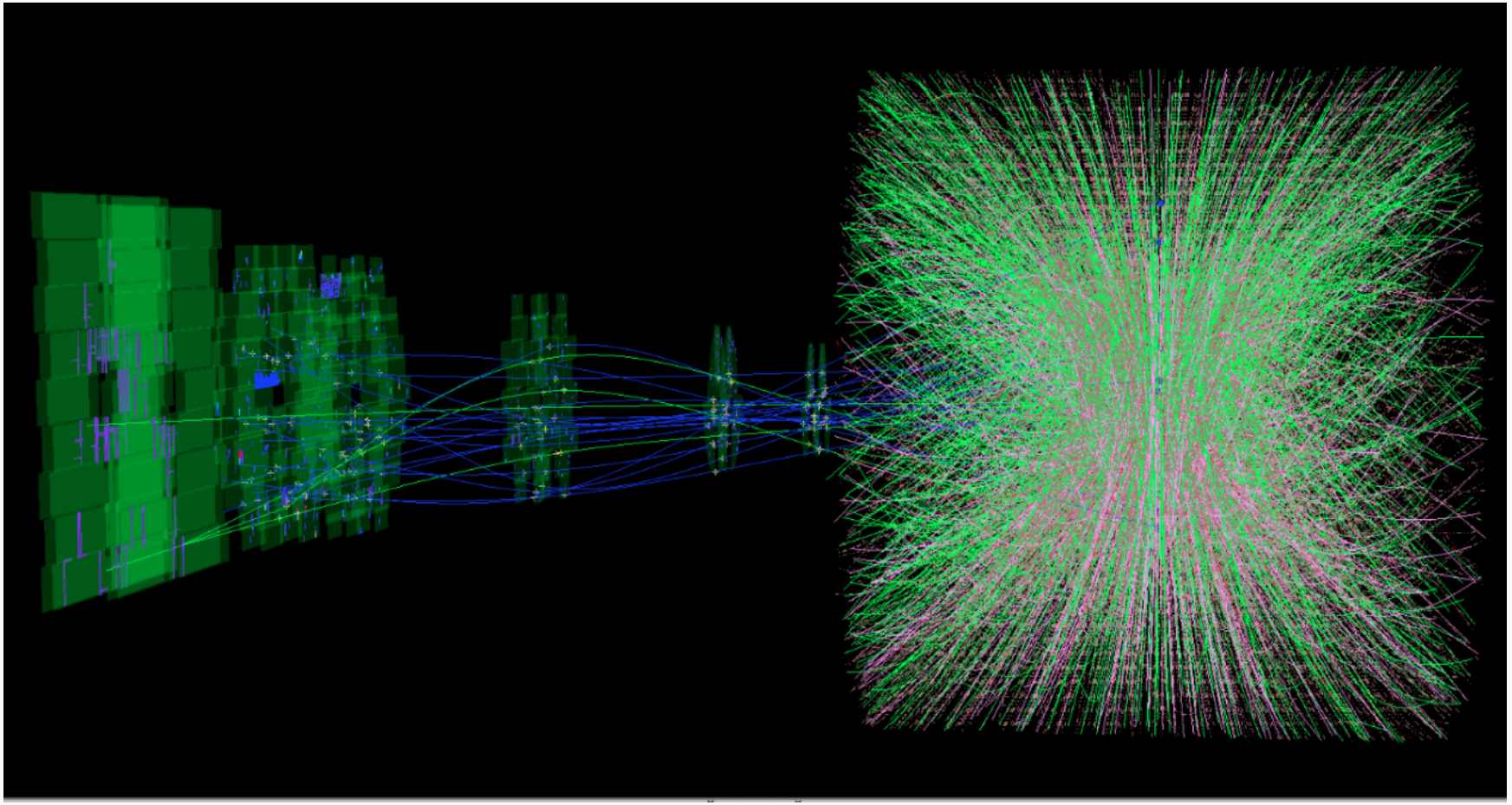
Nominal pp event



pp at $\sqrt{s}$=7TeV, 2010

Nucl.Phys. A862-863 (2011) 223-230

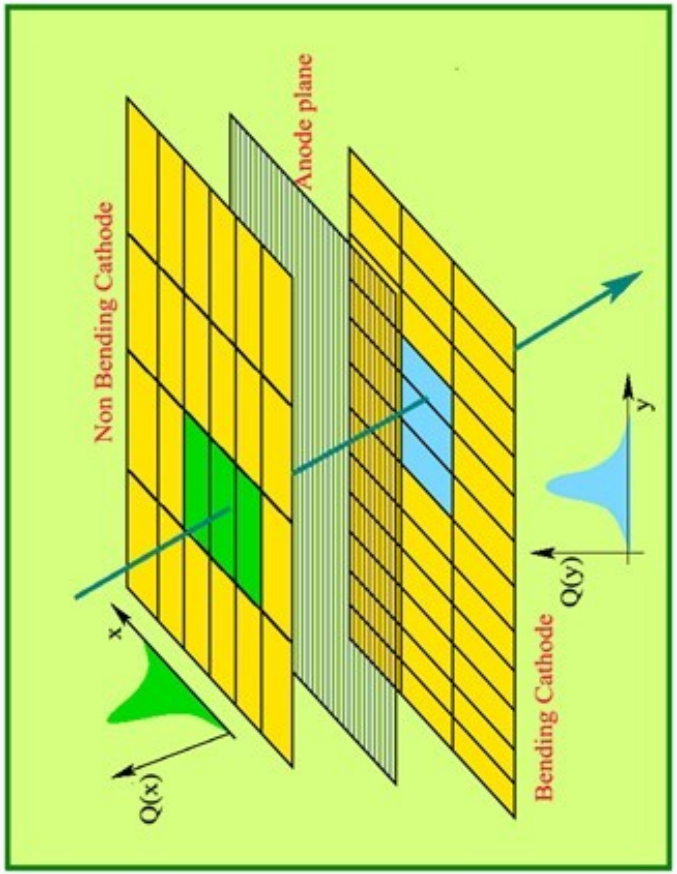
Nominal PbPb event



PbPb at $\sqrt{s}$=7 TeV, 2015

Diagram of detection

- 100m^2 total area
- 1.4 million channels
- Wire diameter = 20μm
- Wire Pitch : 2*mm* St1
  2.5*mm* St 2,3,4,5
- Pad sizes
  1. 5x 7.5*mm*
  2. 5x15*mm*
  3. 5x,30*mm*



Outline

Current MUON reconstruction Software

- Raw Data Decoding
- Raw Data Filtering
- Pre Clustering
- Clusterise, locate cluster interaction point.
- Tracking (MCH)
- Tracking (MID)
- Track Matching MCH-MID

where to start

> *There is no doubt that the grail of efficiency leads to abuse. Programmers waste enormous amounts of time thinking about, or worrying about, the speed of noncritical parts of their programs, and these attempts at efficiency actually have a strong negative impact when debugging and maintenance are considered. We should forget about small efficiencies, say about 97% of the time: premature optimization is the root of all evil. Yet we should not pass up our opportunities in that critical 3%. A good programmer will not be lulled into complacency by such reasoning, he will be wise to look carefully at the critical code; but only after that code has been identified.*

Donald Knuth, ACM Computing Surveys, Vol 6, No. 4, Dec. 1974 (see p.268)

Time Spent

Function	Time in %		
	pp 16	PbPb 11	PbPb 15
Raw Data Decoding	4		
Raw Data Filtering	2		
Pre Clustring	10		
Clustering	63		
Tracking MCH	7		
Tracking MID	6		
Track matching	8		

Graphically

include graphic of table.

Outline

What is a cluster finder

picture of a couple of clusters.

MLEM Algorithm

explain mlem

MLEM

Logical Parts

- Add Virtual pads if necessary
- Find Center of Gravity given maximal pixel
- MLEM

Effect of not adding Virtual Pads

graph of radius of like clusters.

Effect of limiting the convergence to 5

graph of radius of like clusters.

Speed up

- look for dead code
- change data or reorder to hit caches better.
- get a faster cpu. sadly not going to happen
- gpu x3
- fpga - try to avoid.

Performed on a i7 with nvidia gtx 980, will have to be repeated on other hardware.

Something else

Look at the physics, and figure out a way to optimise based on the physics . . .