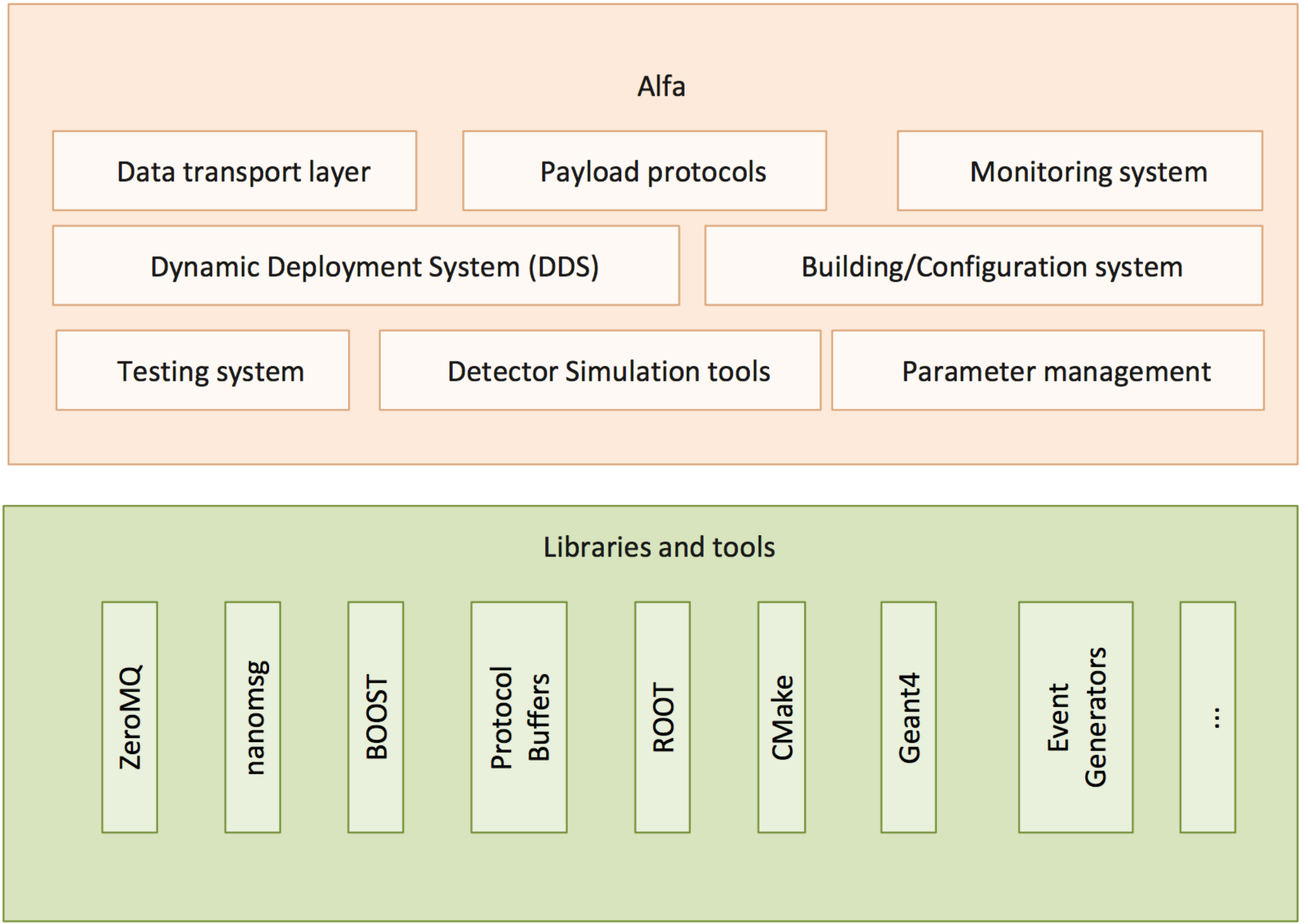
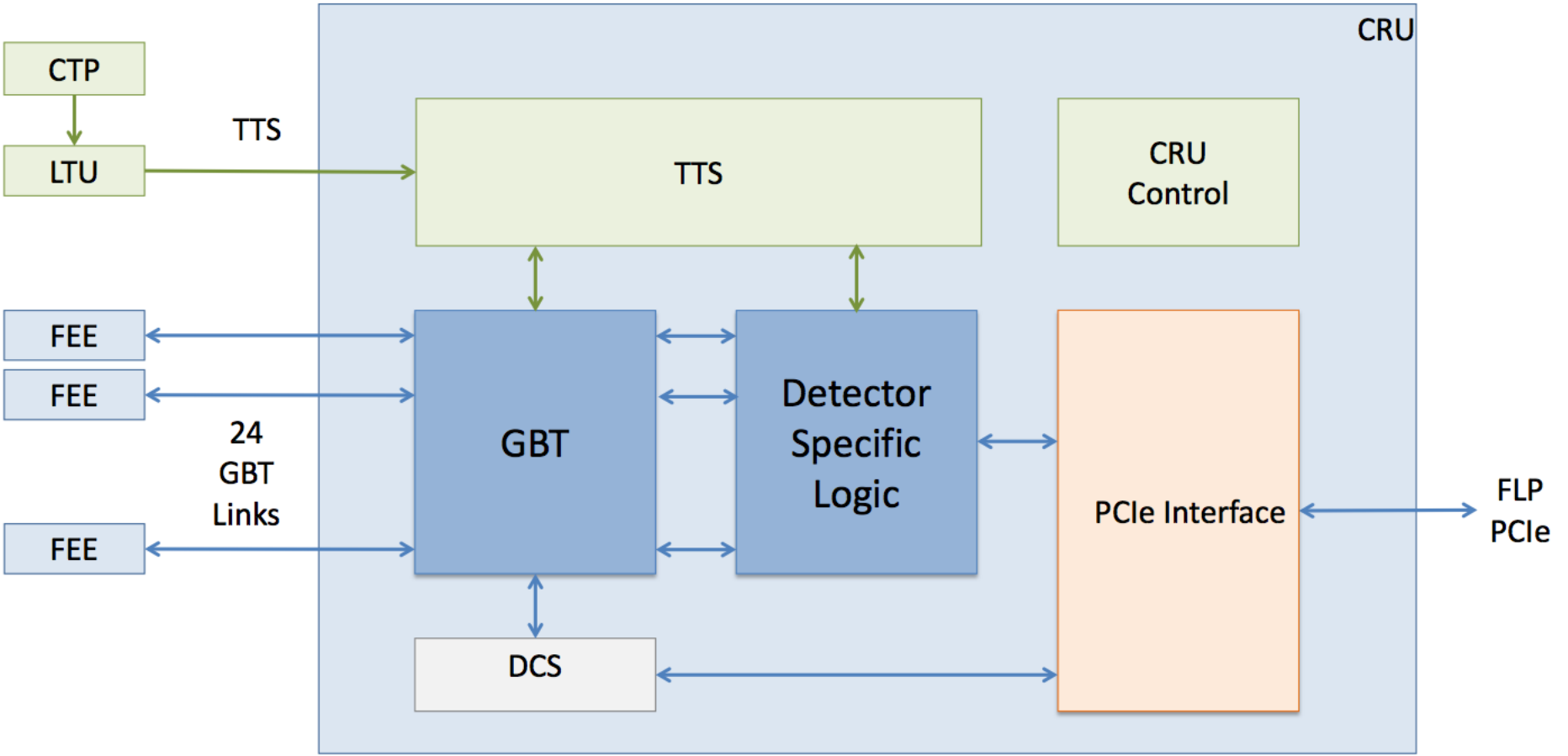
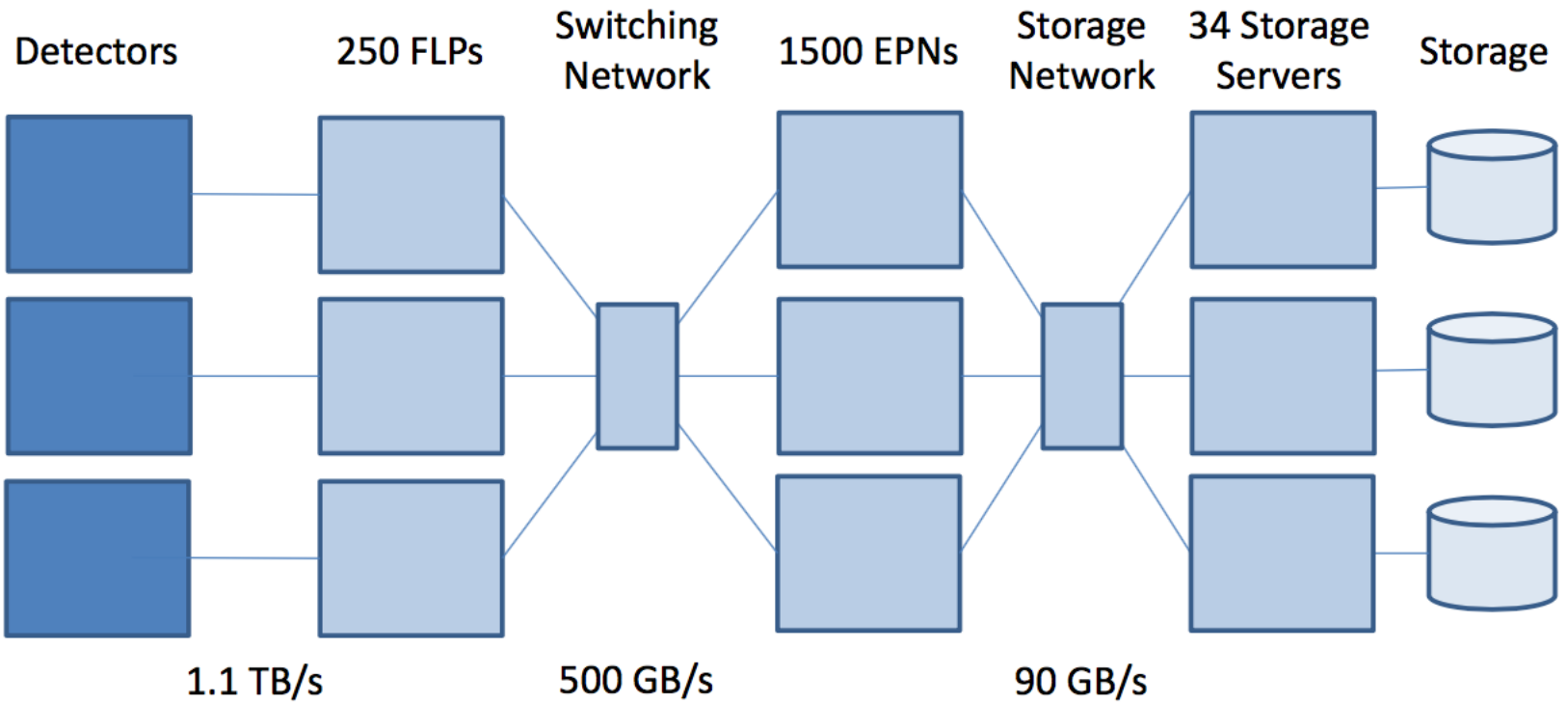
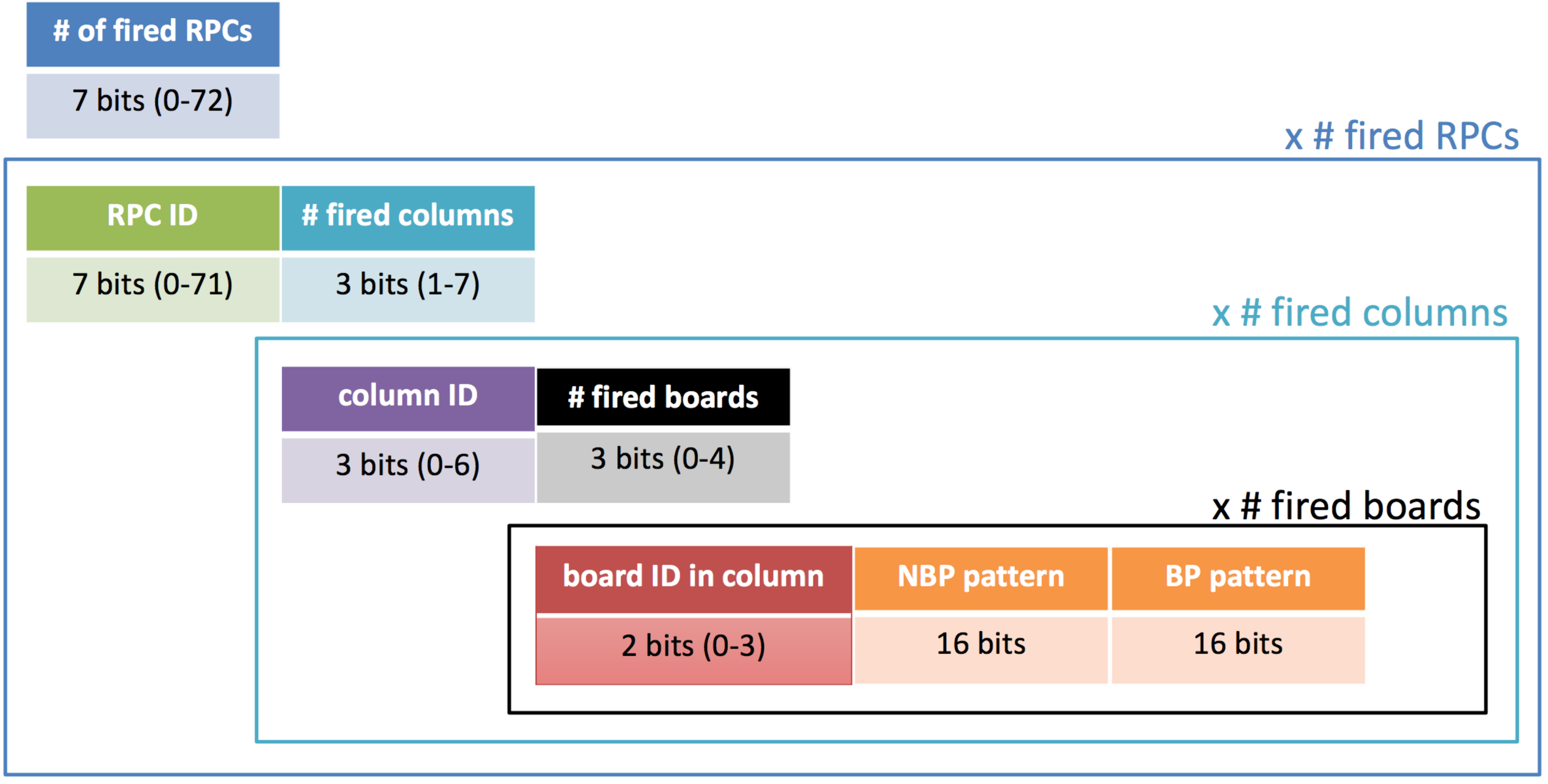
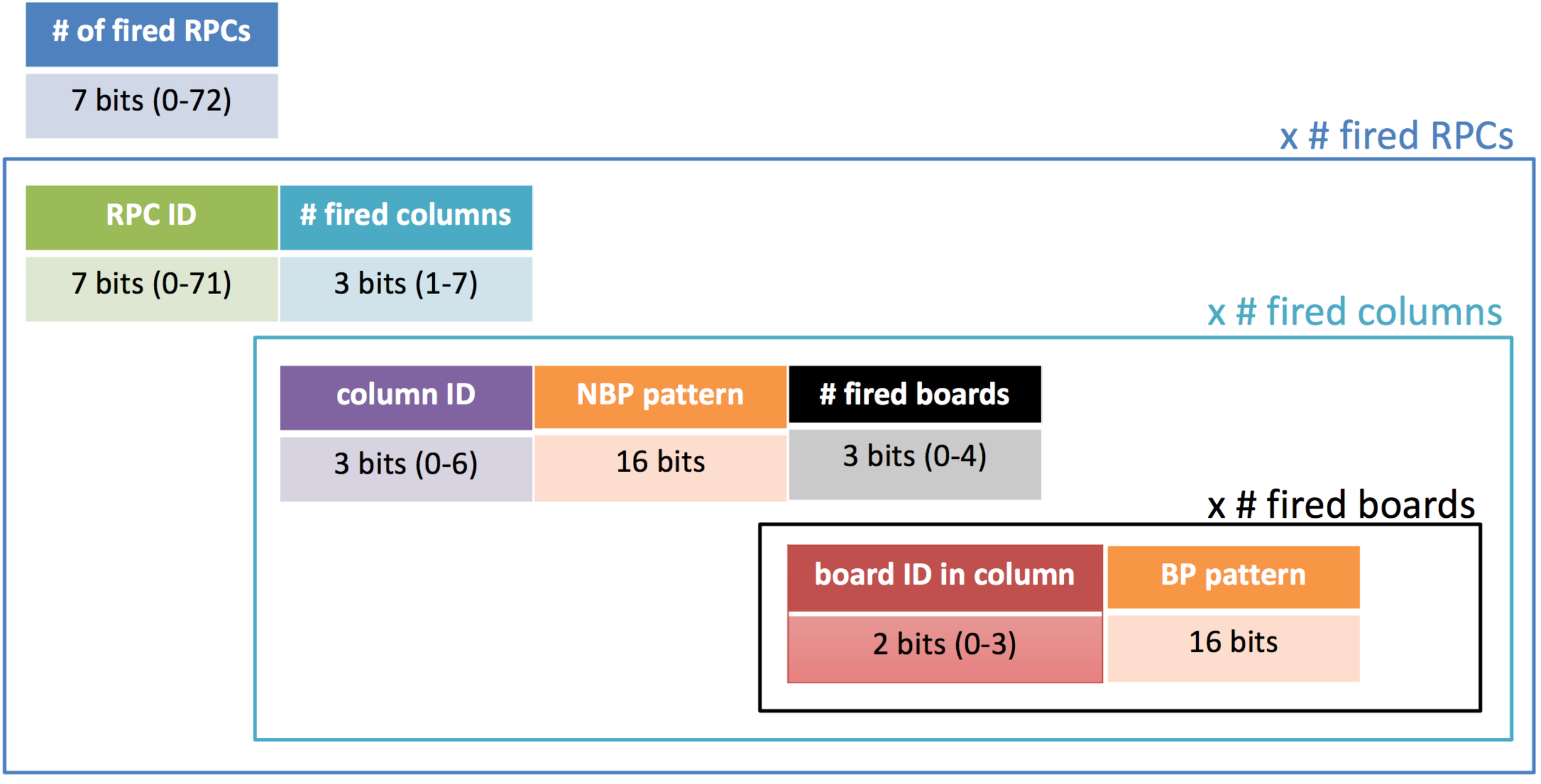

Alfa
Data transport layer
Payload protocols
Monitoring system
Dynamic Deployment System (DDS)
Building/Configuration system
Testing system
Detector Simulation tools
Parameter management
Libraries and tools
ZeroMQ
nanomsg
BOOST
Protocol Buffers
ROOT
CMake
Geant4
Event Generators
...

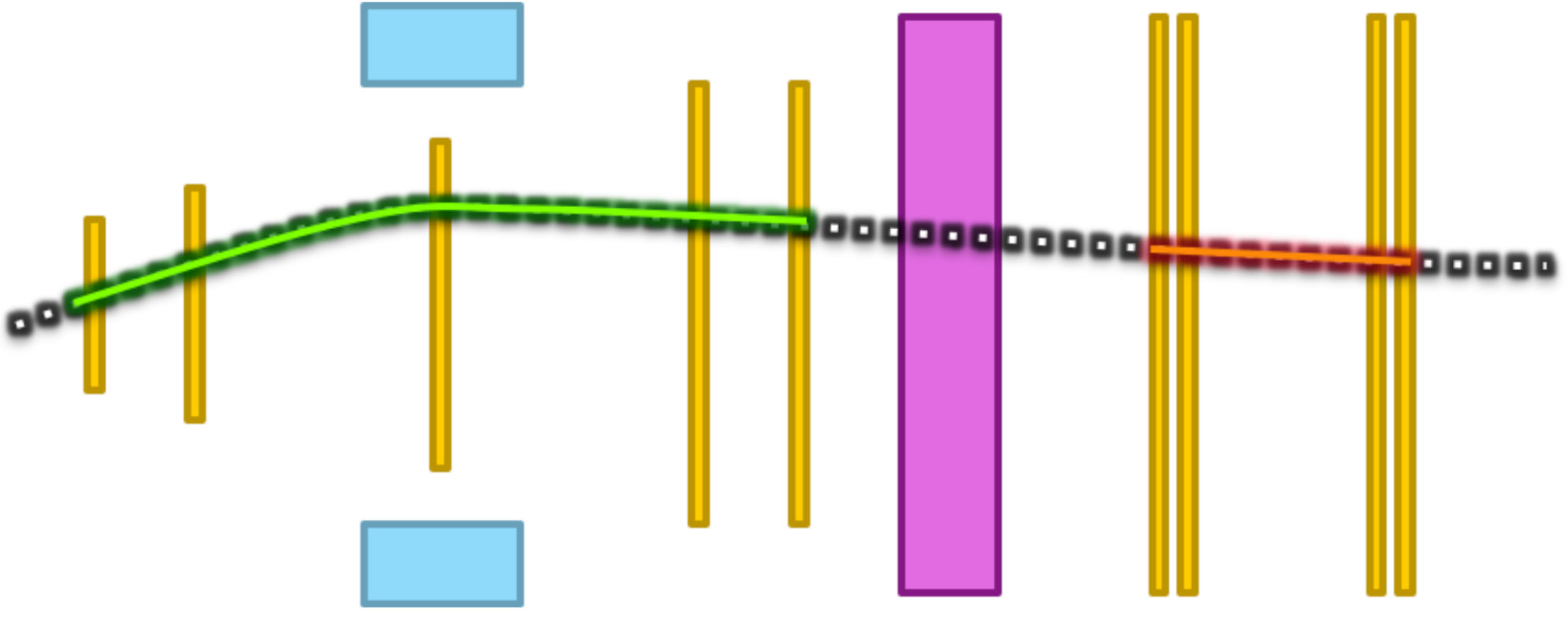

CRU
CTP
LTU
TTS
TTS
CRU
Control
FEE
FEE
FEE
24
GBT
Links
GBT
Detector
Specific
Logic
PCIe Interface
FLP
PCIe
DCS

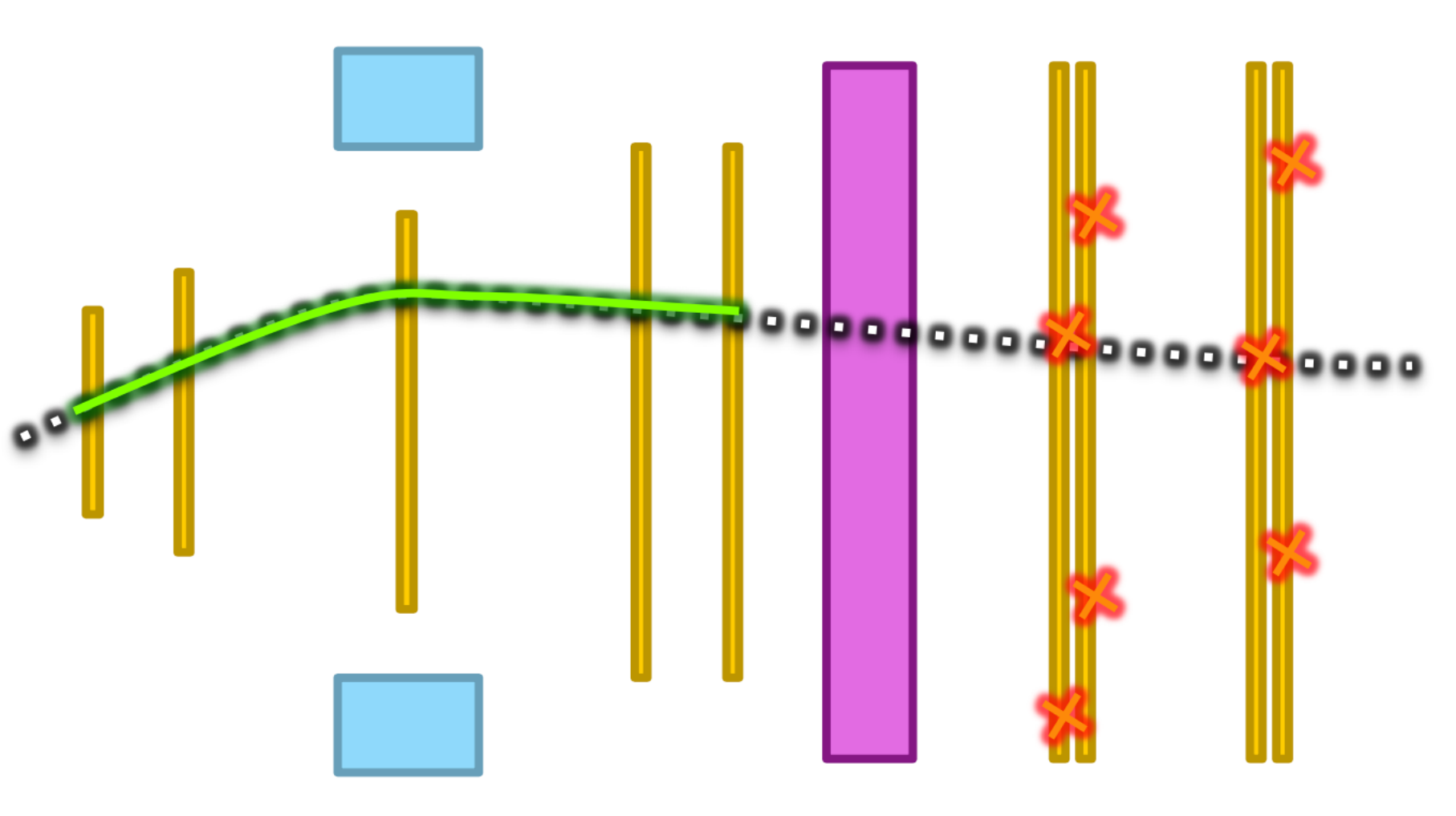

Detectors
250 FLPs
Switching Network
1500 EPNs
Storage Network
34 Storage Servers
Storage
1.1 TB/s
500 GB/s
90 GB/s
8300 Read-out Links
Input: 250 ports
Output : 1500 ports
1500 x 60MB/s

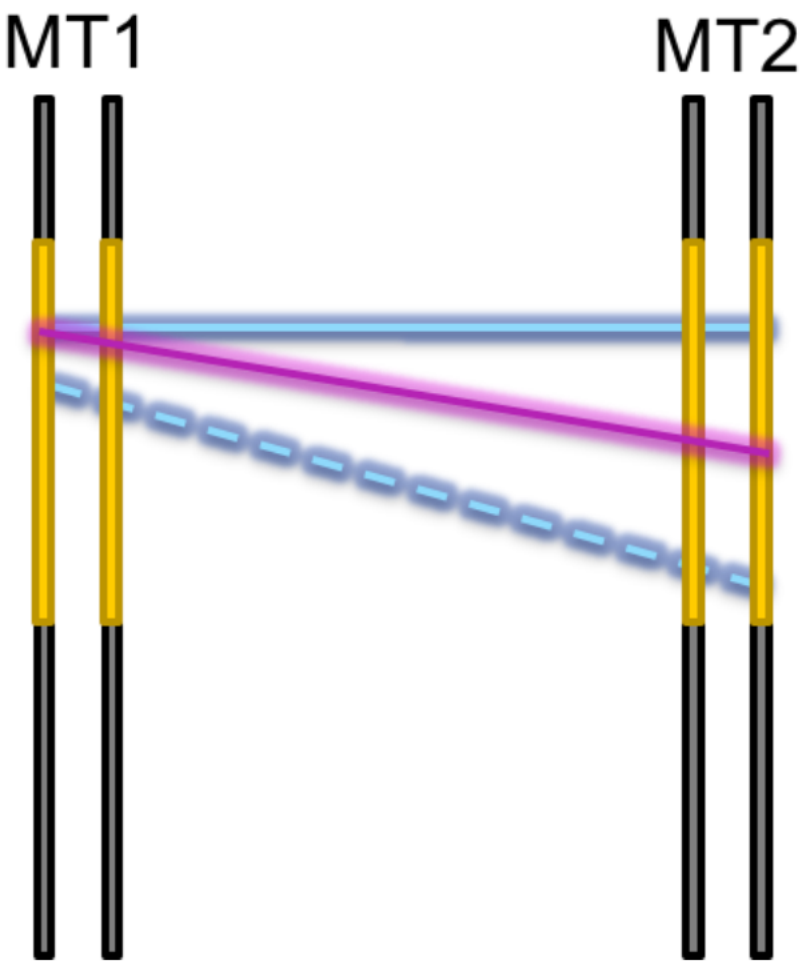


# of fired RPCs
7 bits (0-72)
x # fired RPCs
RPC ID
fired columns
7 bits (0-71)
3 bits (1-7)
x # fired columns
column ID
fired boards
3 bits (0-6)
3 bits (0-4)
x # fired boards
board ID in column
NBP pattern
BP pattern
2 bits (0-3)
16 bits
16 bits


# of fired RPCs
7 bits (0-72)
x # fired RPCs
RPC ID
fired columns
7 bits (0-71)
3 bits (1-7)
x # fired columns
column ID
NBP pattern
fired boards
3 bits (0-6)
16 bits
3 bits (0-4)
x # fired boards
board ID in column
BP pattern
2 bits (0-3)
16 bits






MT1
MT2

Detectors electronics

Continuous and triggered streams of raw data

Readout, split into Sub-Time Frames,
and aggregation
Local pattern recognition and calibration
Local data compression
Quality control

Compressed Sub-Time Frames

Data aggregation
Synchronous global reconstruction,
calibration and data volume reduction
Quality control

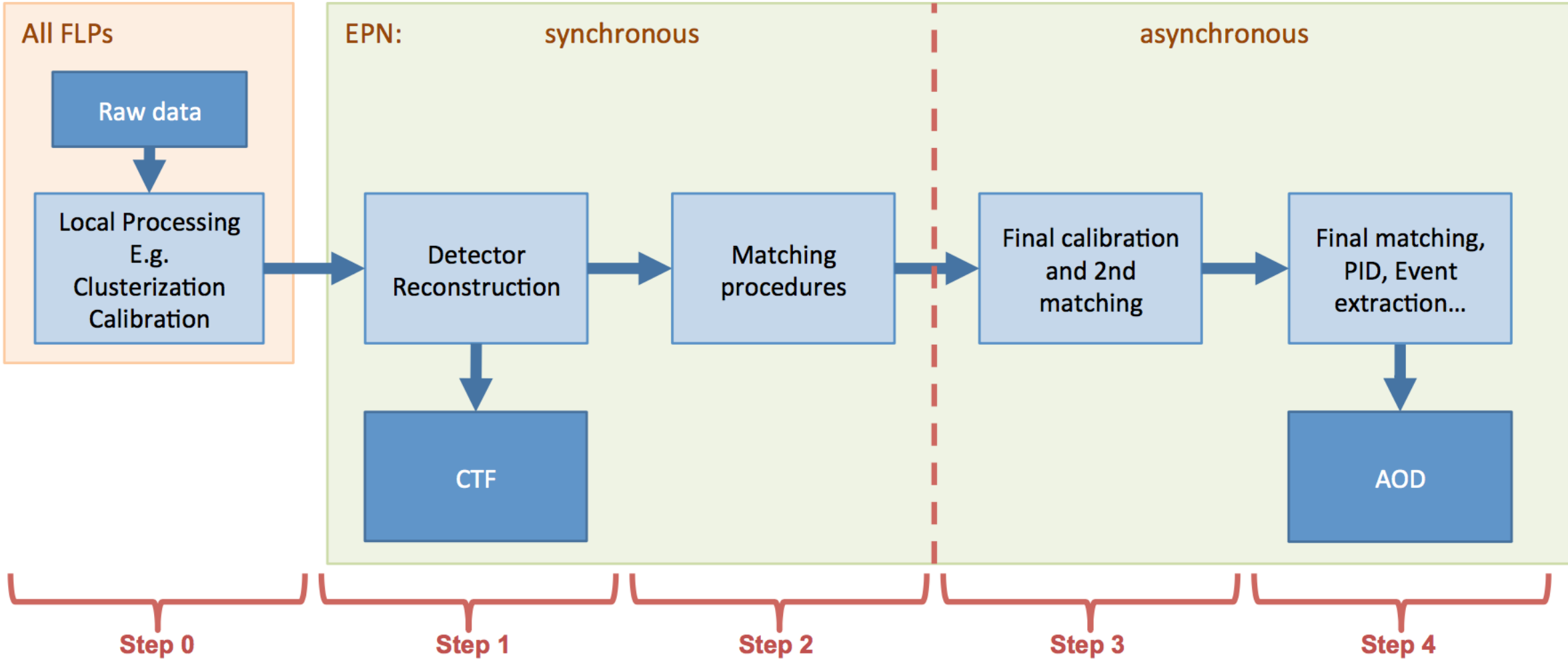
Compressed Time Frames

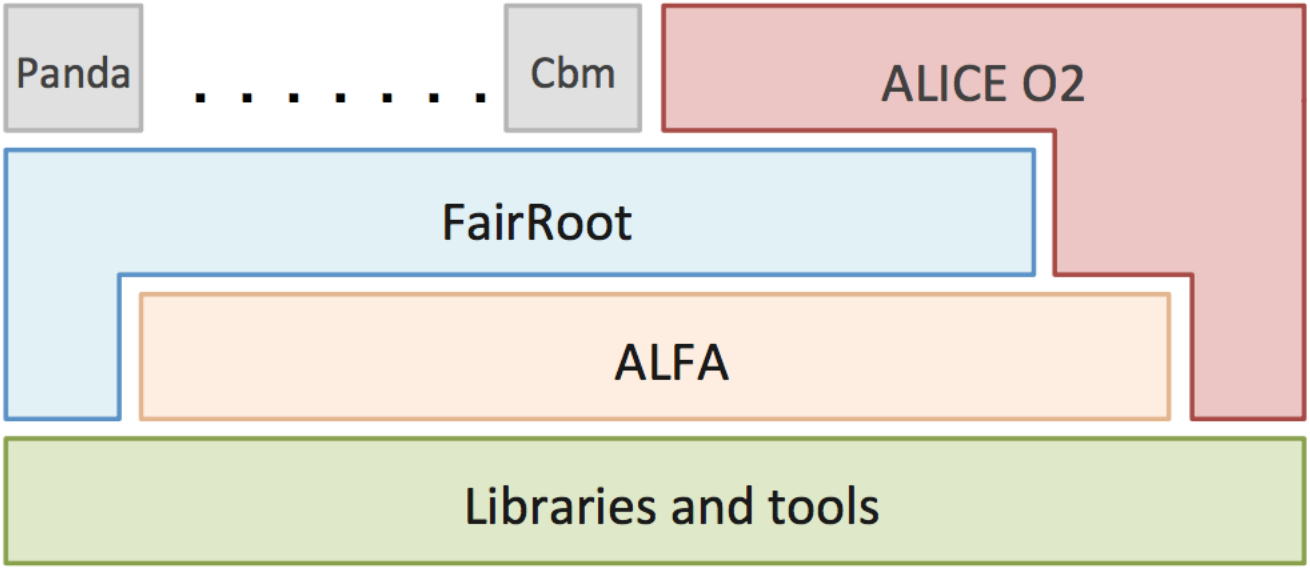
Data storage
and archival

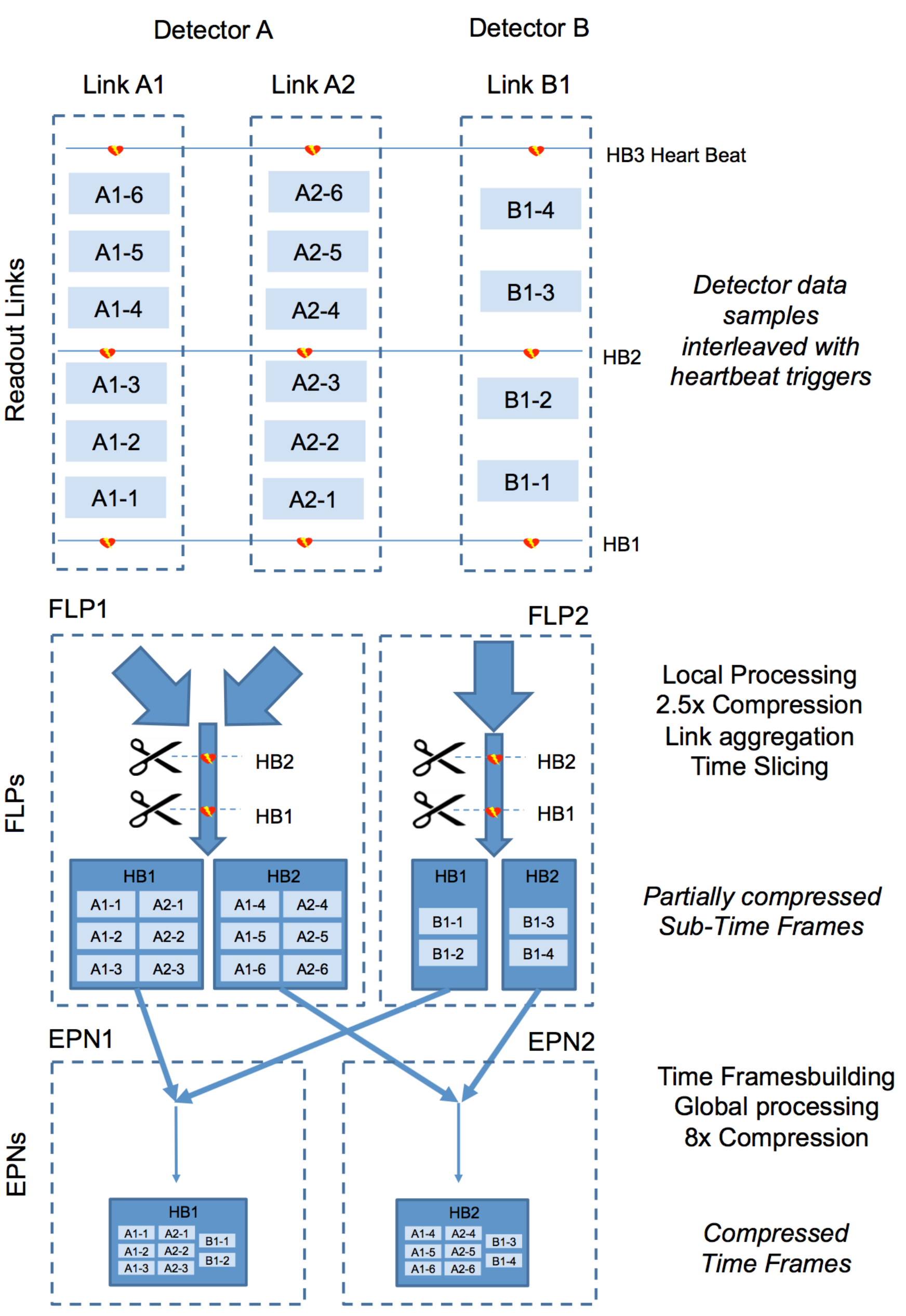
Compressed Time Frames

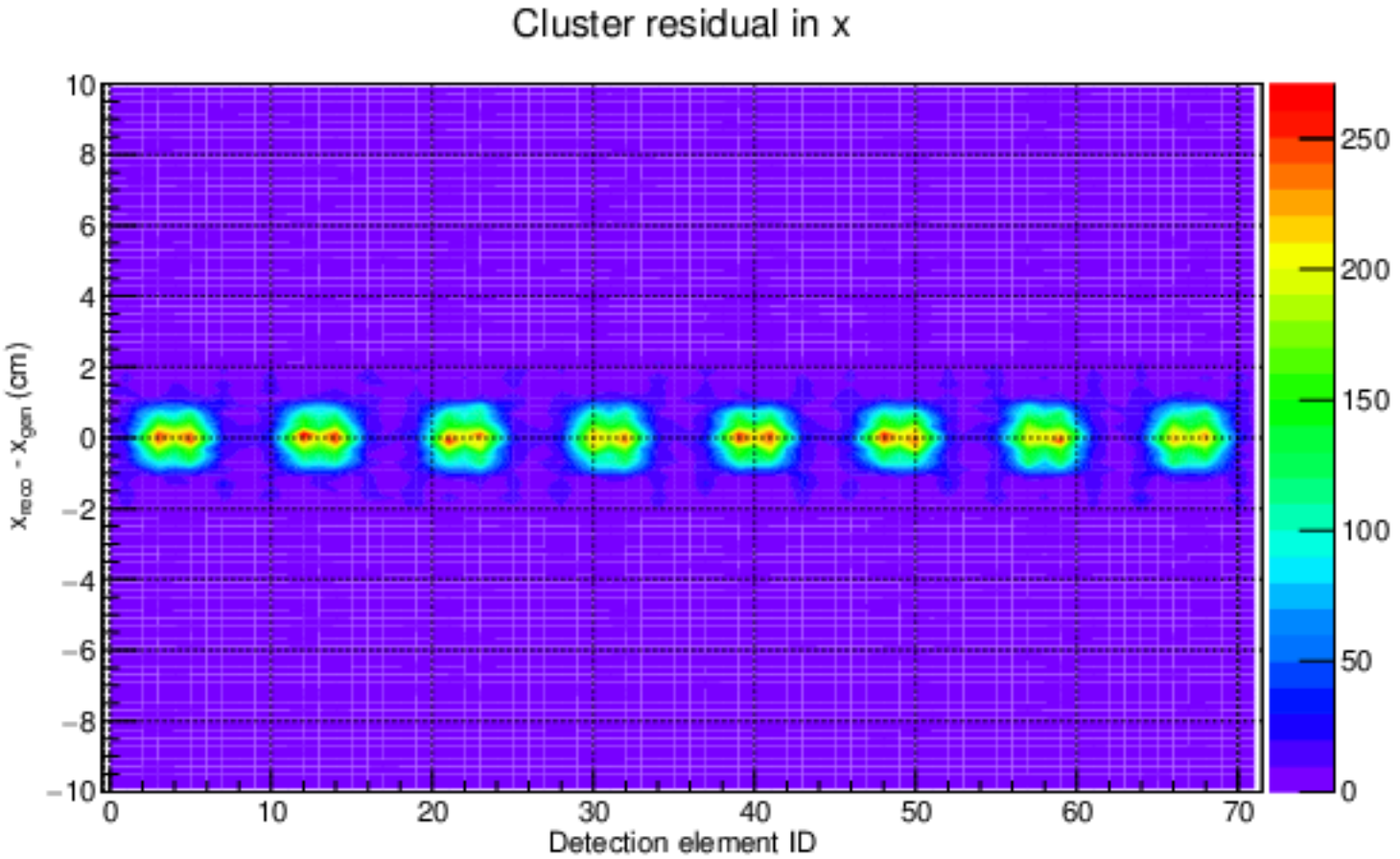
Reconstructed events

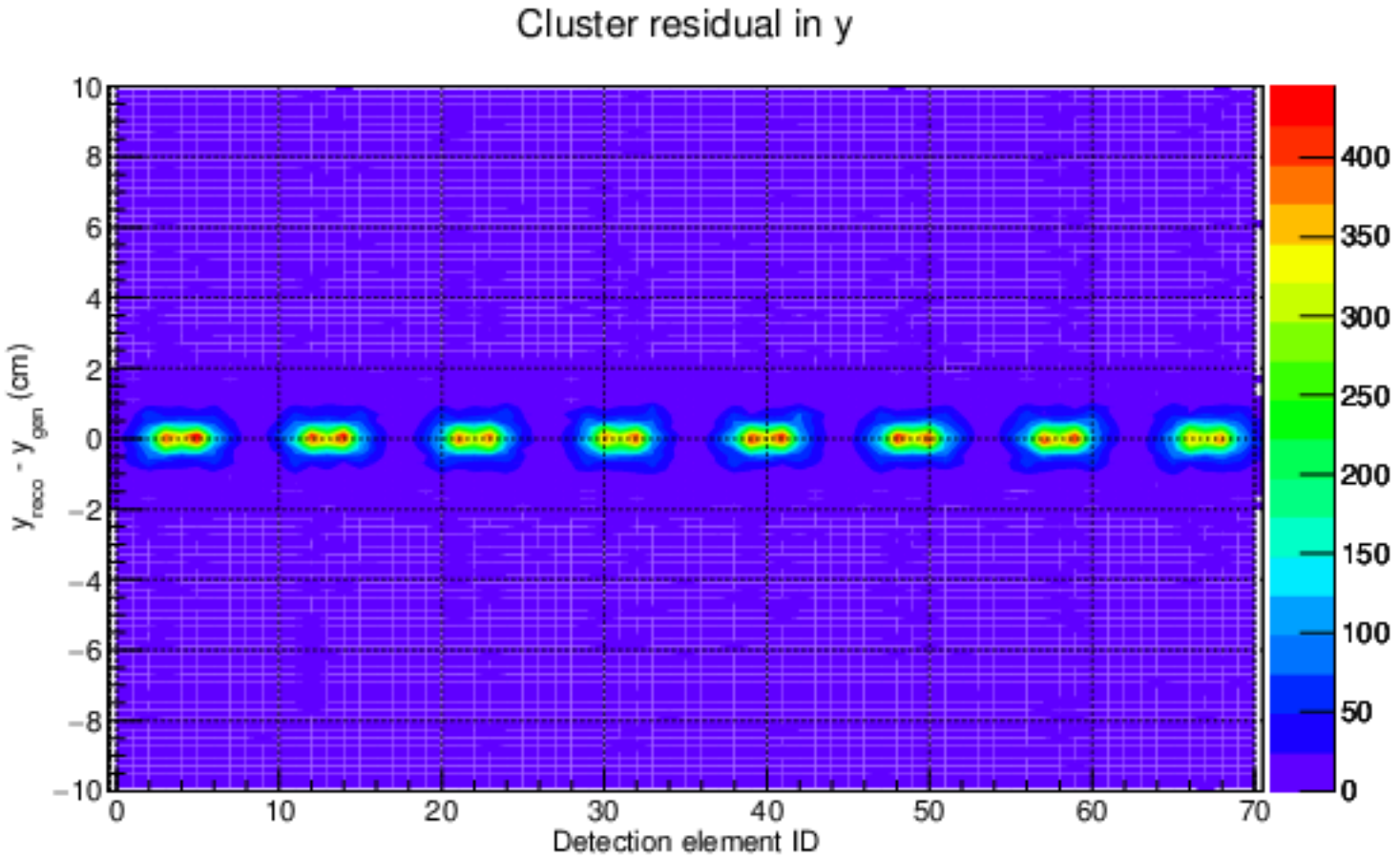
Asynchronous refined calibration,
reconstruction
Event extraction
Quality control

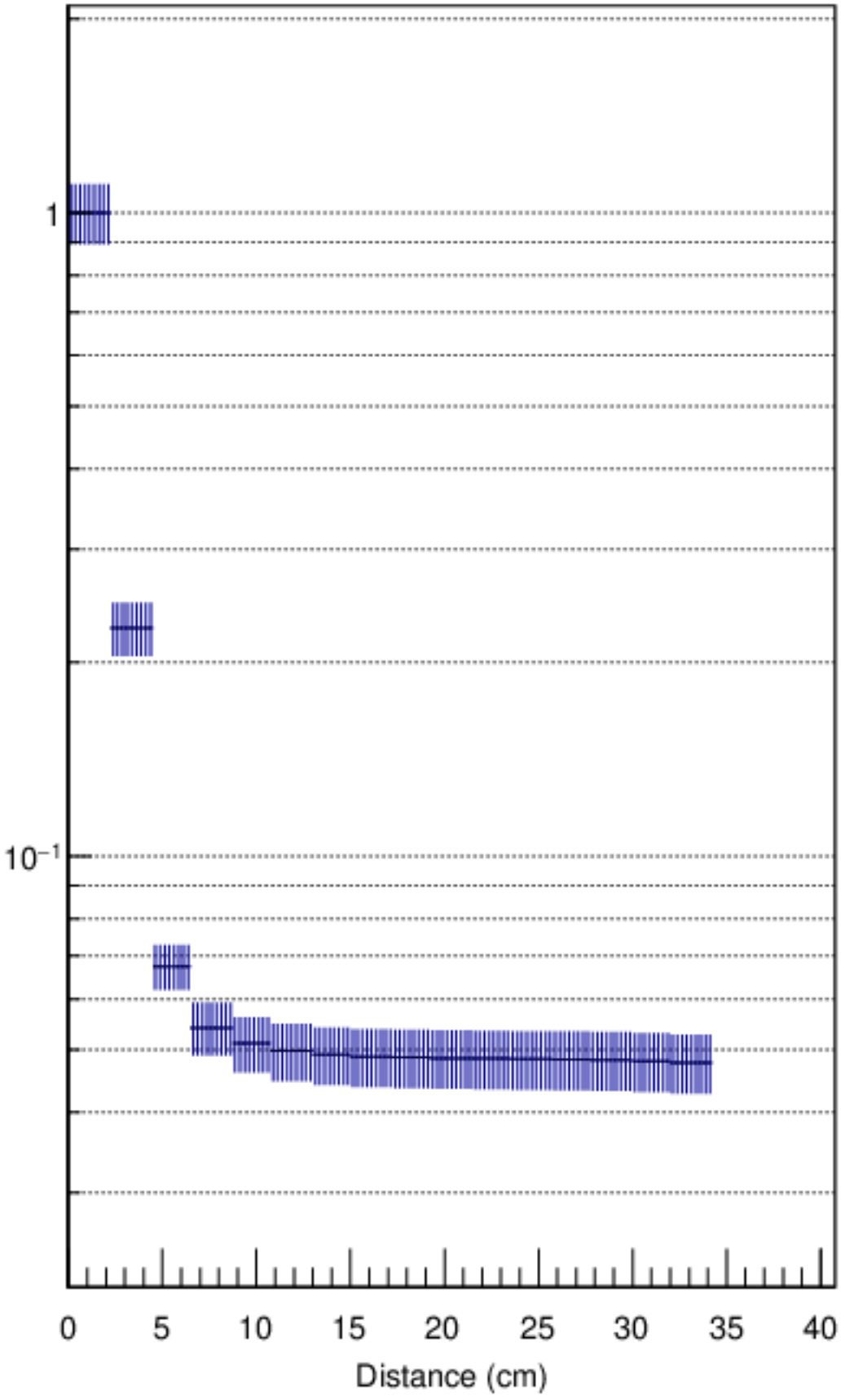

All FLPs
Raw data
Local Processing
E.g.
Clusterization
Calibration
EPN:
synchronous
asynchronous
Detector
Reconstruction
Matching
procedures
Final calibration
and 2nd
matching
Final matching,
PID, Event
extraction...
CTF
AOD
Step 0
Step 1
Step 2
Step 3
Step 4

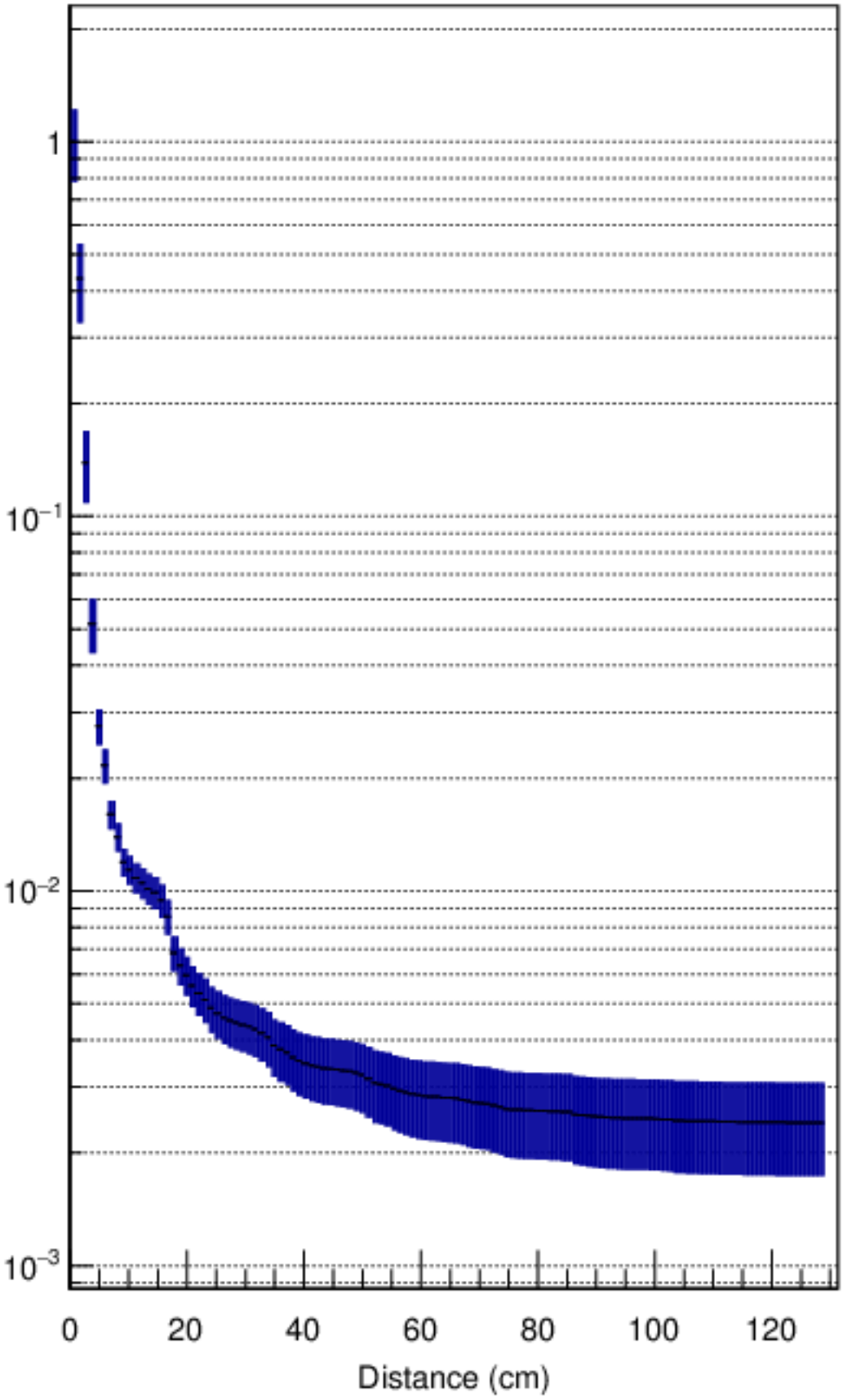

Panda
Cbm
ALICE O2
FairRoot
ALFA
Libraries and tools

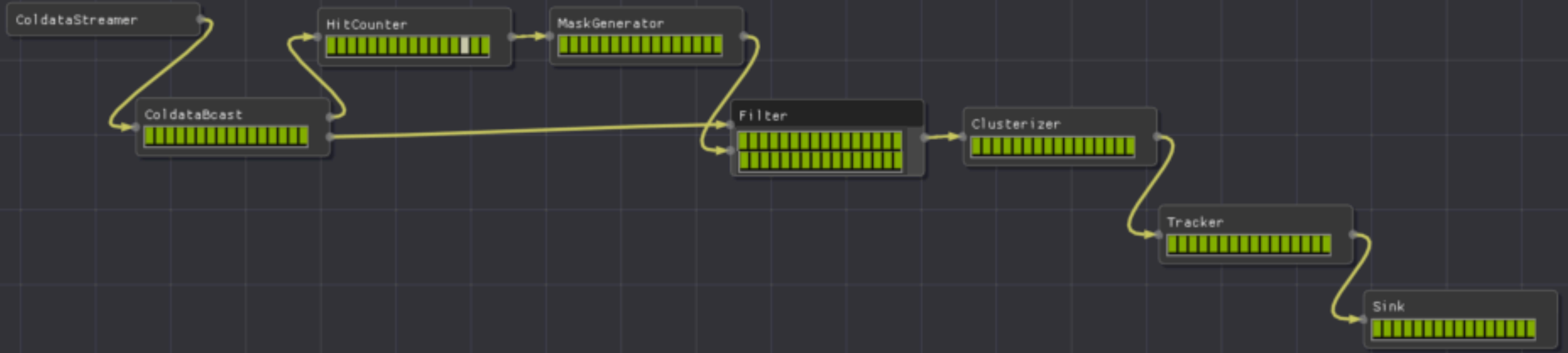

Detector A
Detector B
Link A1
Link A2
Link B1
HB3 Heart Beat
A1-6
A1-5
A1-4
A1-3
A1-2
A1-1
A2-6
A2-5
A2-4
A2-3
A2-2
A2-1
B1-4
B1-3
B1-2
B1-1
HB2
HB1
Readout Links
Detector data samples interleaved with heartbeat triggers
FLP1
FLP2
FLPs
HB2
HB1
HB1
A1-1
A2-1
A1-2
A2-2
A1-3
A2-3
HB2
A1-4
A2-4
A1-5
A2-5
A1-6
A2-6
HB1
B1-1
B1-2
HB2
B1-3
B1-4
Local Processing
2.5x Compression
Link aggregation
Time Slicing
Partially compressed Sub-Time Frames
EPN1
EPN2
EPNs
HB1
A1-1
A2-1
A1-2
A2-2
A1-3
A2-3
B1-1
B1-2
HB2
A1-4
A2-4
A1-5
A2-5
A1-6
A2-6
B1-3
B1-4
Time Framesbuilding
Global processing
8x Compression
Compressed Time Frames

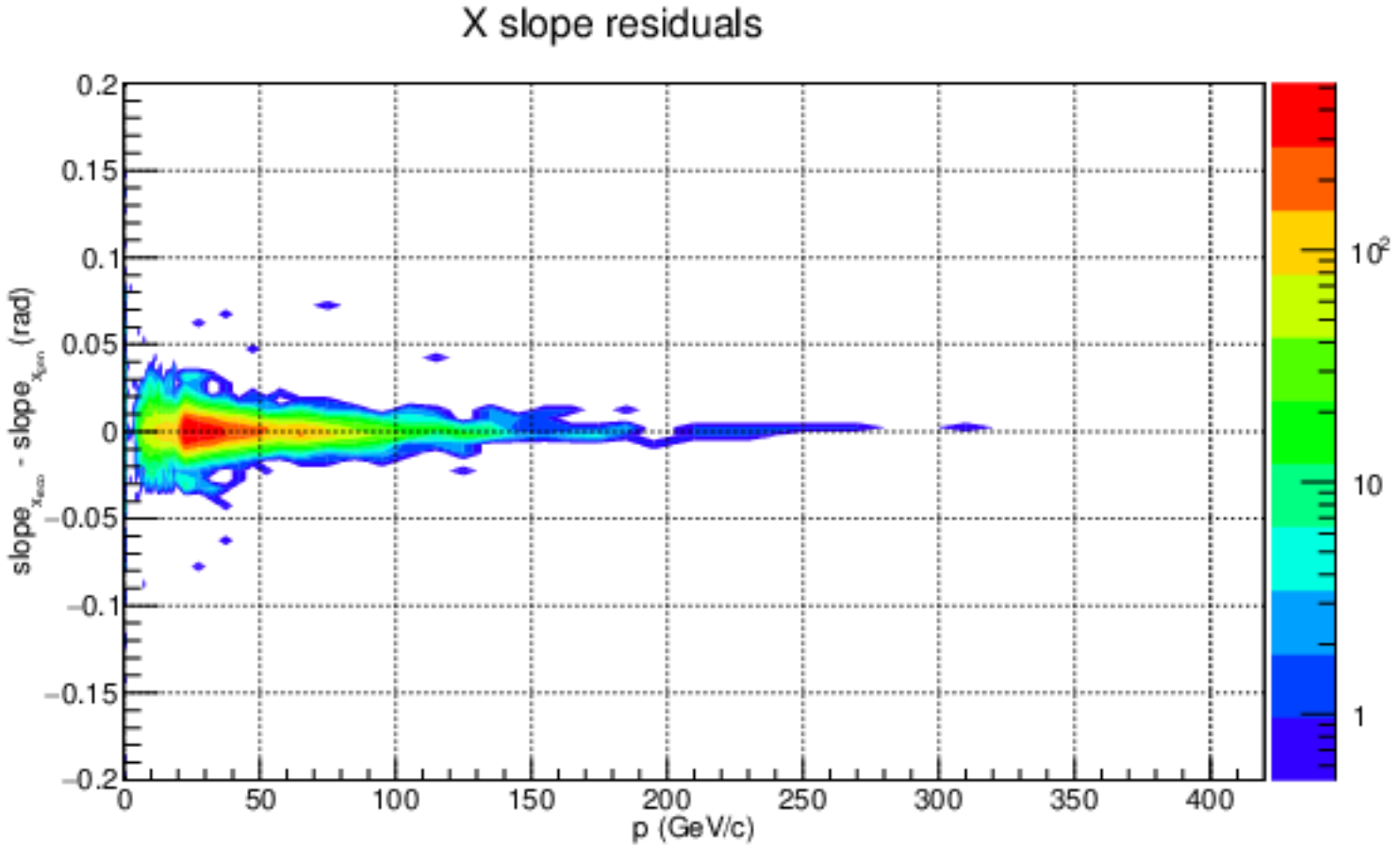

Cluster residual in x
$x_{reco} - x_{gen}$ (cm)
Detection element ID
10
8
6
4
2
0
−2
−4
−6
−8
−10
0
10
20
30
40
50
60
70
250
200
150
100
50
0

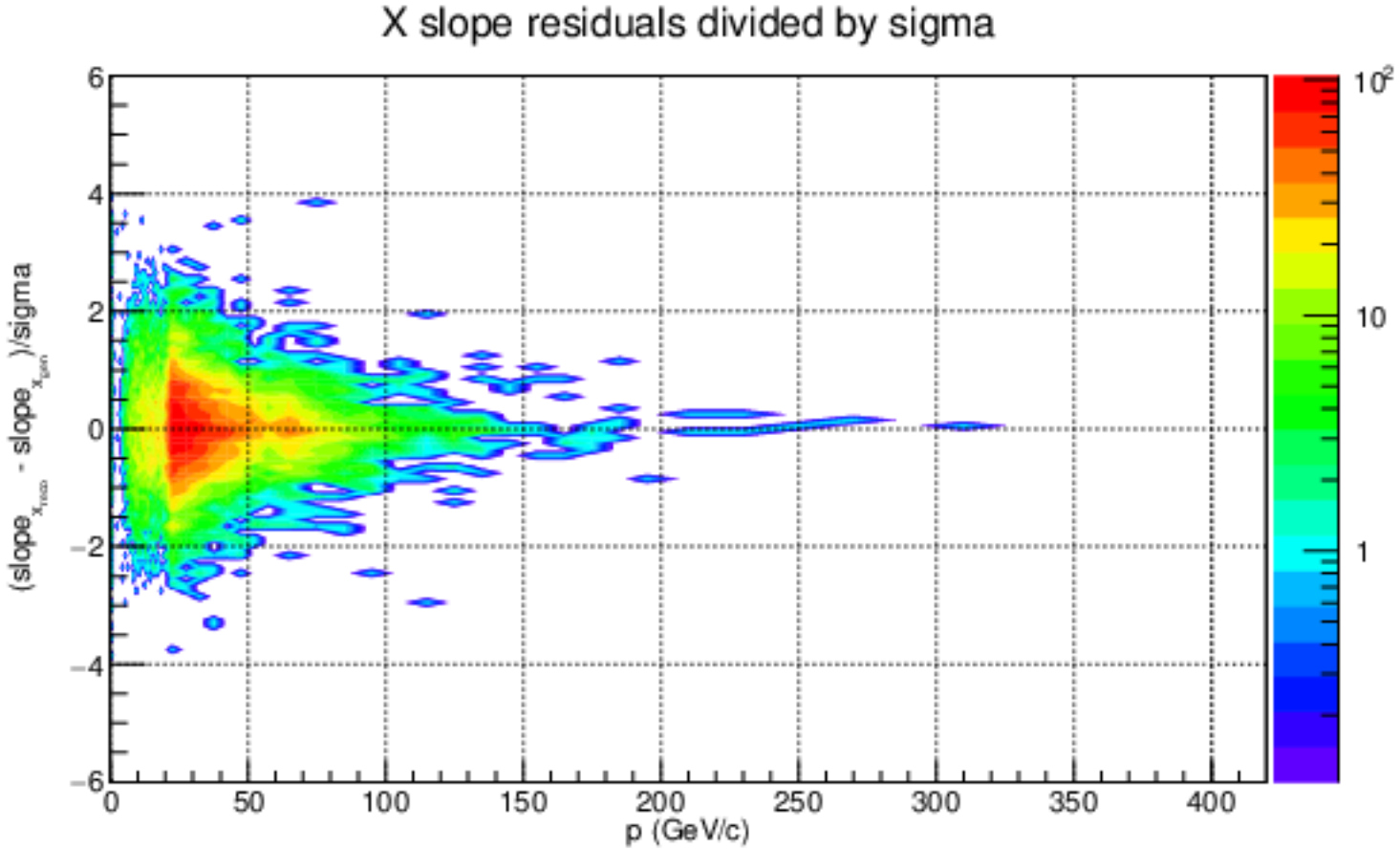

Cluster residual in y
$y_{reco} - y_{gen}$ (cm)
Detection element ID
10
8
6
4
2
0
−2
−4
−6
−8
−10
0
10
20
30
40
50
60
70
400
350
300
250
200
150
100
50
0

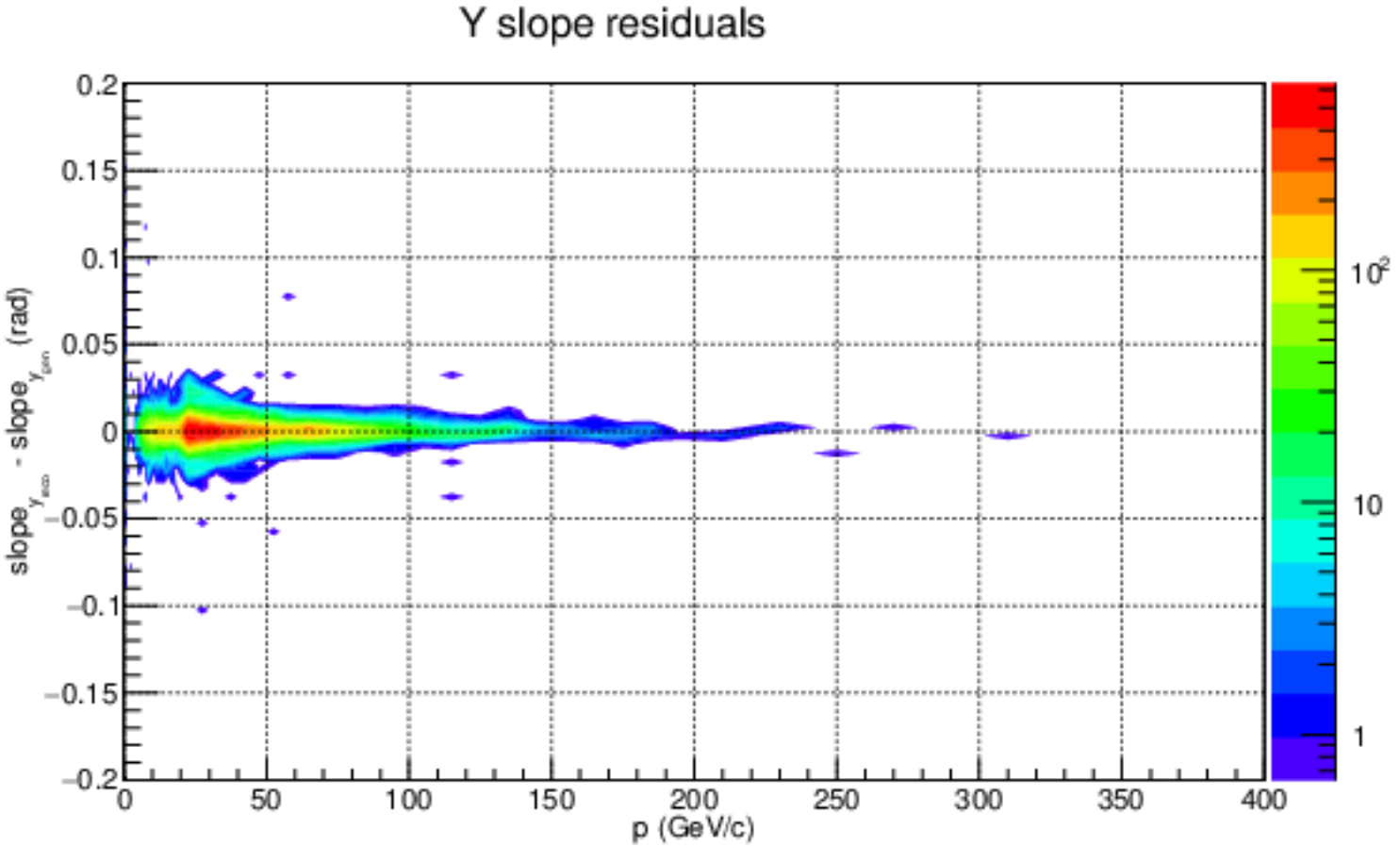

1
10^{-1}
0
5
10
15
20
25
30
35
40
Distance (cm)

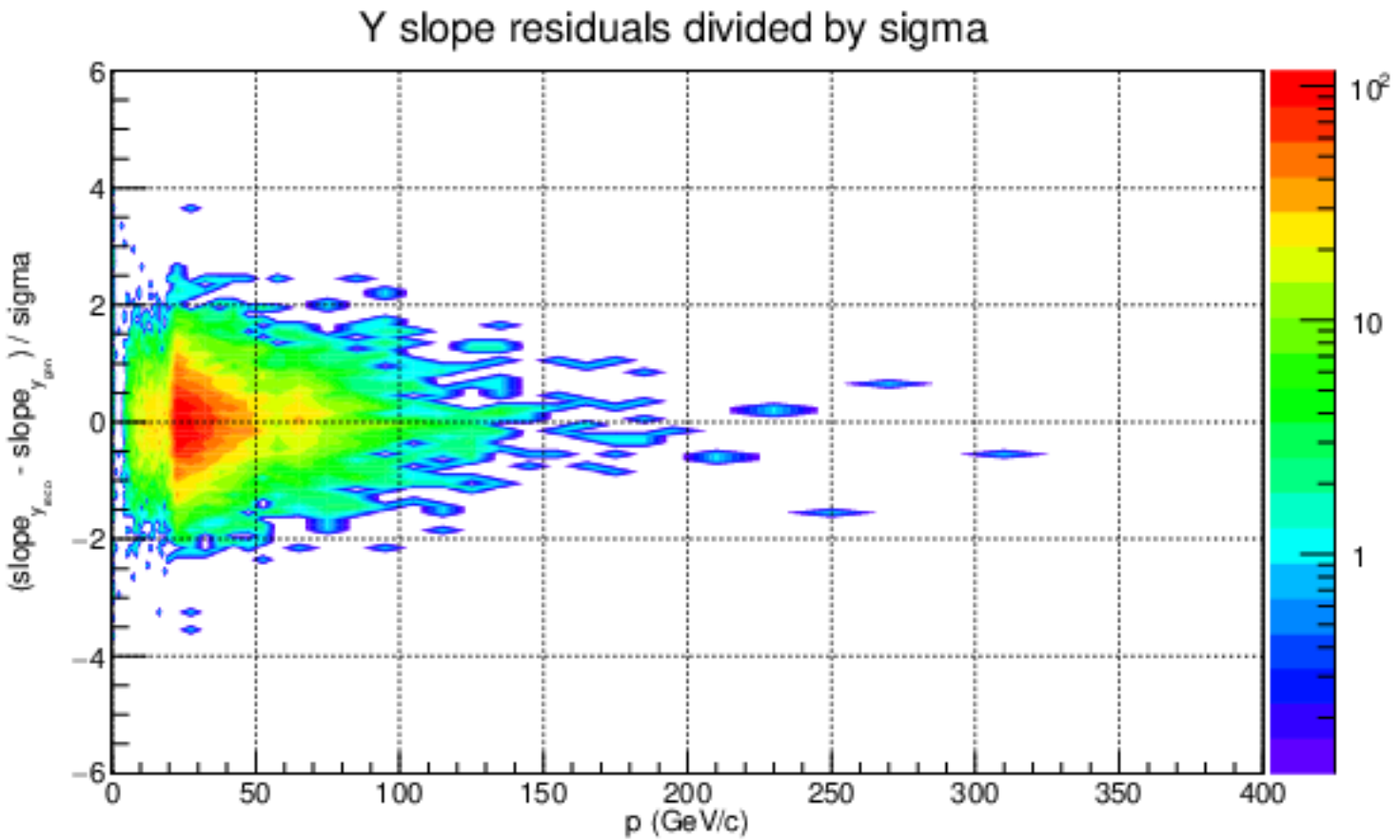

1
10^{-1}
10^{-2}
10^{-3}
0
20
40
60
80
100
120
Distance (cm)

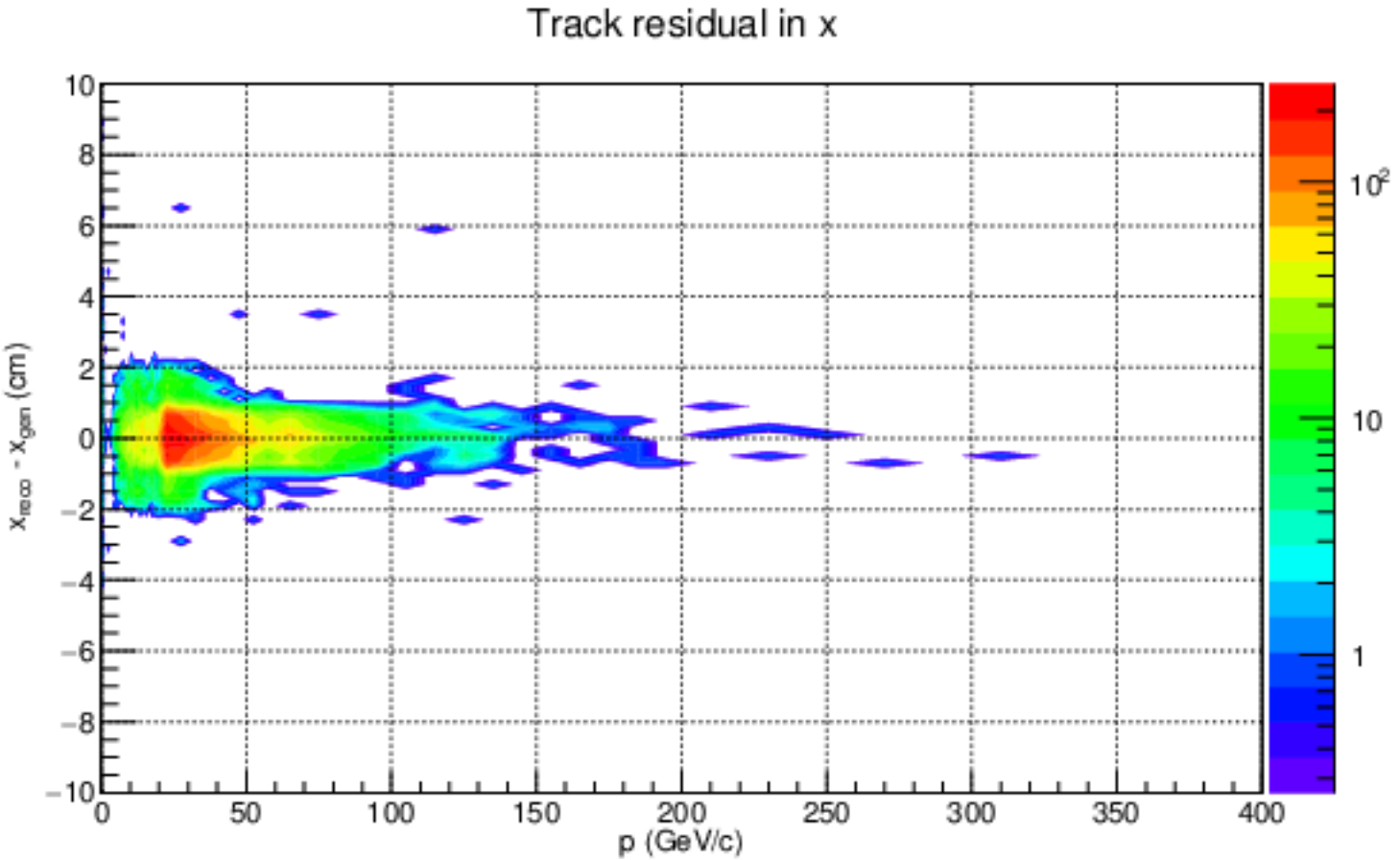

ColdataStreamer
HitCounter
MaskGenerator
ColdataBcast
Filter
Clusterizer
Tracker
Sink


X slope residuals
0.2
0.15
0.1
0.05
0
−0.05
−0.1
−0.15
−0.2
0
50
100
150
200
250
300
350
400
p (GeV/c)
slope_Ecal − slope_Kalm (rad)
10^2
10
1


X slope residuals divided by sigma
(slope$_{x_{reco}}$ - slope$_{x_{gen}}$)/sigma
p (GeV/c)
6
4
2
0
−2
−4
−6
0
50
100
150
200
250
300
350
400
10^2
10
1


Y slope residuals
0.2
0.15
0.1
0.05
0
−0.05
−0.1
−0.15
−0.2
0
50
100
150
200
250
300
350
400
p (GeV/c)
slope$_{y_{acc}}$ - slope$_{y_{prn}}$ (rad)
10^2
10
1


Y slope residuals divided by sigma
(slope$_{y_{eco}}$ - slope$_{y_{gen}}$) / sigma
p (GeV/c)
6
4
2
0
−2
−4
−6
0
50
100
150
200
250
300
350
400
10^2
10
1


Track residual in x
10
8
6
4
2
0
−2
−4
−6
−8
−10
0
50
100
150
200
250
300
350
400
p (GeV/c)
$x_{reco} - x_{gen}$ (cm)
10^2
10
1