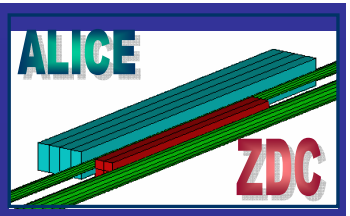
ZDC raw data and detector commissioning



- Schedule of the detector commissioning
- DDL/Equipment ID mapping
- Geometrical mapping
- Raw data reconstruction
- Dependencies on gAlice in raw data reconstruction
- Status of raw data simulation
- Raw data visualization

E. Scomparin for the ZDC group,
ALICE Software week, October 2-6 2006

Detector commissioning

- Installation at IP2 foreseen in February 2007
- Following steps
  - General hardware check with laser pulses
  - Pedestal studies with standalone generator trigger
  - Detector characterization with cosmic-ray triggers (to be prepared) → rough calibration
- When beam will be available
  - Accurate calibration with EM-dissociation trigger (either standalone or within normal data taking)

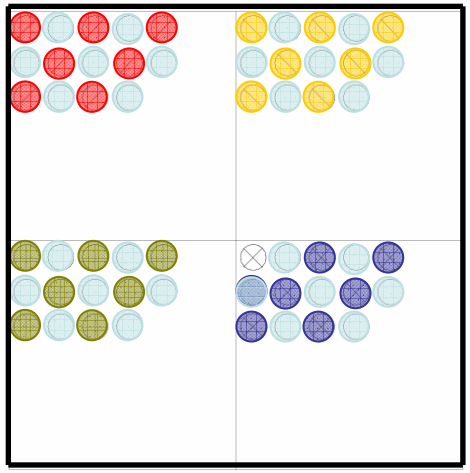
- During commissioning
- Responsible persons for DAQ → P. Cortese (Torino), M. Floris (Cagliari)
- Responsible person for data analysis → C. Oppedisano (Torino)

Mapping of channels inside DDL (1)

- Only one DDL for ZDC
- EquipID = (Detector ID) << 8 + DDL index = 3841

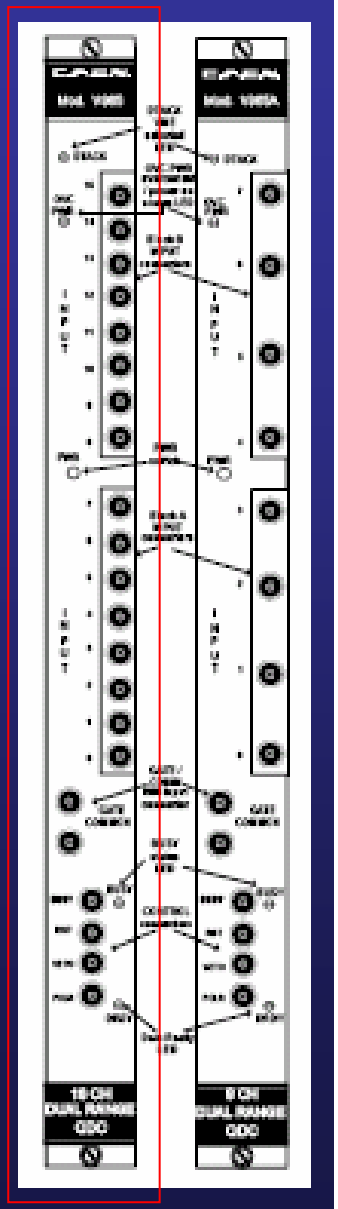
- ZDC uses CAEN V965 QDC
  - 16 channel module
  - 2 ADC in parallel per channel
    - 0 ÷ 100 fC and 0 ÷ 800 fC
      good resolution for small pulses (EMD)
      no saturation for large pulses (Pb-Pb hadr.)

- Mapping towers vs channels



ZN1
ZN2
ZN3
ZN4
ZNC

...similar for ZP



Mapping of channels inside DDL (2)

Inside DDL

ADC DATA BUFFER

index	ZN, ZP Right 1st ADC module channel	ZN, ZP Left 2nd ADC module channel
0	ZN C hg	ZN C hg
1	ZP C hg	ZP C hg
2	ZN C lg	ZN C lg
3	ZP C lg	ZP C lg
4	ZN 1 hg	ZN 1 hg
5	ZP 1 hg	ZP 1 hg
6	ZN 1 lg	ZN 1 lg
7	ZP 1 lg	ZP 1 lg
8	ZN 2 hg	ZN 2 hg
9	ZP 2 hg	ZP 2 hg
10	ZN 2 lg	ZN 2 lg
11	ZP 2 lg	ZP 2 lg
12	ZN 3 hg	ZN 3 hg
13	ZP 3 hg	ZP 3 hg
14	ZN 3 lg	ZN 3 lg
15	ZP 3 lg	ZP 3 lg
16	ZN 4 hg	ZN 4 hg
17	ZP 4 hg	ZP 4 hg
18	ZN 4 lg	ZN 4 lg
19	ZP 4 lg	ZP 4 lg
20	ZEM 1 hg	
21	ZEM 2 hg	
22	ZEM 1 lg	hg = high gain
23	ZEM 2 lg	lg = low gain

Cabling of channels on the 2 QDC modules

ADC CHANNELS

ADC channel	ZN, ZP Right 1st ADC module signal	ZN, ZP Left 2nd ADC module signal
0	ZN C	ZN C
1	ZN 1	ZN 1
2	ZN 2	ZN 2
3	ZN 3	ZN 3
4	ZN 4	ZN 4
5	ZEM 1	
6		
7		
8	ZP C	ZP C
9	ZP 1	ZP 1
10	ZP 2	ZP 2
11	ZP 3	ZP 3
12	ZP 4	ZP 4
13	ZEM 2	
14		
15		

This part is ready and already implemented

Mapping of channels inside DDL (3)

- Two more QDC modules could be used for ZDC
- Contain ancillary info used for pedestal subtraction

- Still to be added in the framework
- No difficulty foreseen
  (same cabling as for the two existing modules)

Status of raw-data reconstruction

- Reconstruction can be performed starting from:

Digits

```
//_____
void AliZDCReconstructor::Reconstruct(AliRunLoader* runLoader) const
{
  // *** Local ZDC reconstruction for digits

  Float_t meanPed[47];
  for(Int_t jj=0; jj<47; jj++) meanPed[jj] = fCalibData->GetMeanPed(jj);

  AliLoader* loader = runLoader->GetLoader("ZDCLoader");
  if (!loader) return;
  loader->LoadDigits("read");
  loader->LoadRecPoints("recreate");
```

Raw data

```
//_____
void AliZDCReconstructor::Reconstruct(AliRunLoader* runLoader,
                                      AliRawReader* rawReader) const
{
  // *** Local ZDC reconstruction for raw data

  Float_t meanPed[47];
  for(Int_t jj=0; jj<47; jj++) meanPed[jj] = fCalibData->GetMeanPed(jj);

  AliLoader* loader = runLoader->GetLoader("ZDCLoader");
  if (!loader) return;
  loader->LoadRecPoints("recreate");
  // Event loop
```

- NO preprocessing needed on raw-data

Dependence on gAlice External parameters (1)

- Dependences on Galice in raw data reconstruction are not present
- Still some hardwired parameters are present in the code
- In AliZDCReconstructor::ReconstructEvent
- Factor to go from ADC channels to photoelectrons
  - Float_t convFactor = 0.08 (from ADC specifications + PM gain)
- Possible way out
  - ADC specifications are fixed (could remain hardwired)
  - PM gain could be obtained on a run per run basis from
    - PM HV read from DCS +
    - gain vs HV histo stored in “reference” DB (22 TH1F)

Dependence on gAlice External parameters (2)

- Still in AliZDCReconstructor::ReconstructEvent
- Factor to go from photoelectrons to energy

```
Float_t znlphexTeV=329., zplphexTeV=369., zn2phexTeV=329., zp2phexTeV=369.;
```

(obtained from simulation)

- Possible solution
  - Use EMD dissociation events to directly get the link
    ADC channels $\leftrightarrow$ Energy
    by using the one neutron-proton peak at 2.7 TeV
  - Store the coefficient extracted from these events in CDB

- Works for Pb-Pb
  (technical issues on EMD trigger now under discussion)
- For pp impossible to get absolute energy calibration
  - MC info needed

Dependence on gAlice External parameters (3)

- AliZDCReconstructor::ReconstructEvent also gives an estimate of N_{part} and b, from the detected energy
- Based on HIJING (simulations from Chiara's thesis)
- Implemented through 6 TF1, now in the constructor of the class

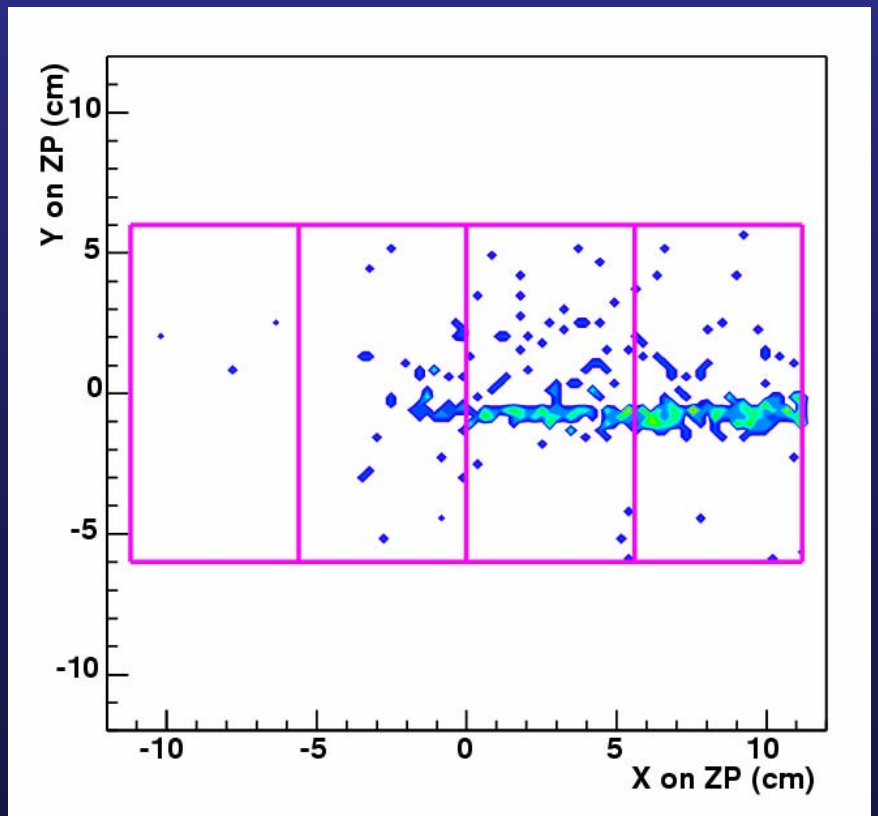
```
//____________________________________________________________________________
AliZDCReconstructor:: AliZDCReconstructor()
{
  // **** Default constructor

  //  ---      Number of generated spectator nucleons and impact parameter
  // ------------------------------------------------------------------------
-----------------------
  // [1] ### Results from a new production  -> 0<b<18 fm (Apr 2002)
  // Fit results for neutrons (Nspectator n true vs. EZN)
  fZNCen = new TF1("fZNCen",
       "(-2.287920+sqrt(2.287920*2.287920-4*(-0.007629)*(11.921710-x)))/(2*(-0.007629))",0.,164.);
  fZNPer = new TF1("fZNPer",
       "(-37.812280-sqrt(37.812280*37.812280-4*(-0.190932)*(-1709.249672-x)))/(2*(-0.190932))",0.,164
.);
  // Fit results for protons (Nspectator p true vs. EZP)
  fZPCen = new TF1("fZPCen",
        "(-1.321353+sqrt(1.321353*1.321353-4*(-0.007283)*(3.550697-x)))/(2*(-0.007283))",0.,60.);
  fZPPer = new TF1("fZPPer",
       "(-42.643308-sqrt(42.643308*42.643308-4*(-0.310786)*(-1402.945615-x)))/(2*(-0.310786))",0.,60.
);
  // Fit results for total number of spectators (Nspectators true vs. EZDC)
  fZDCCen = new TF1("fZDCCen",
       "(-1.934991+sqrt(1.934991*1.934991-4*(-0.004080)*(15.111124-x)))/(2*(-0.004080))",0.,225.);
  fZDCPer = new TF1("fZDCPer",
       "(-34.380639-sqrt(34.380639*34.380639-4*(-0.104251)*(-2612.189017-x)))/(2*(-0.104251))",0.,225
.);
  // ------------------------------------------------------------------------
```

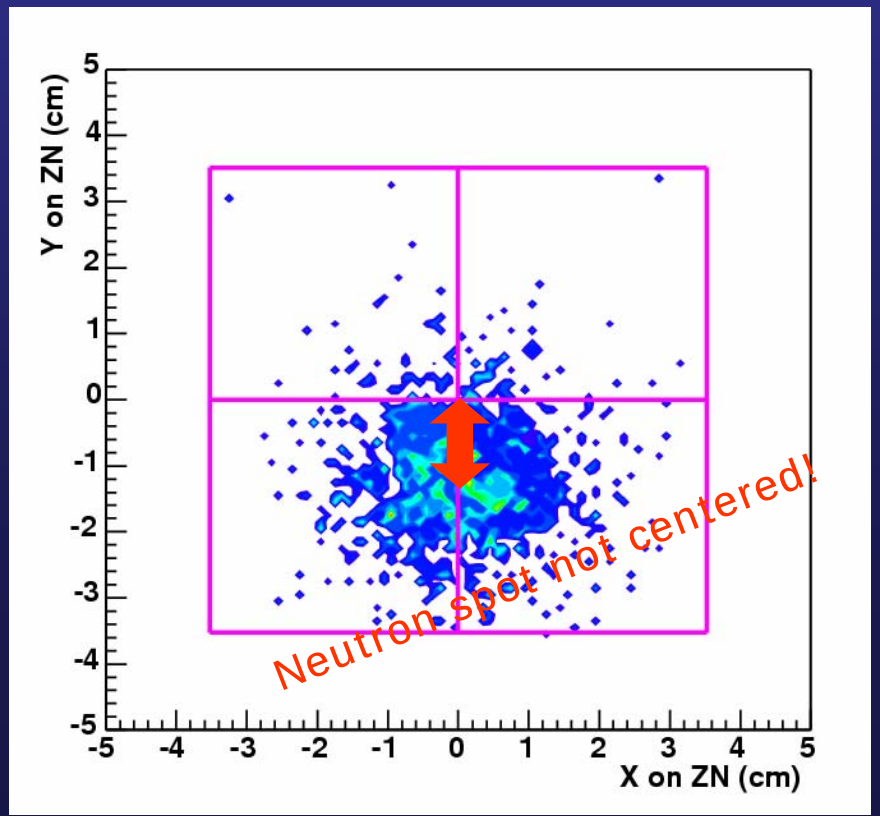
- Will be tuned directly on the data
- Where should they stay ?

Other issues

- Raw data visualization is not very useful for the ZDC
  - No particular topology for the single event → all towers hit)
- Need to integrate over several events to get relevant info

- We plan to use 2-dim histos filled with the centroid position (Y vs X) for each detector





Status of milestones

Commissionning	Provide commissionning schedule and persons in charge of DAQ and data analysis	3-Oct-06	LATE	LATE	3-Oct-06	OK
Hardware mapping	Provide DDL to equipment ID mapping	3-Oct-06	LATE	LATE	3-Oct-06	OK
	Provide Geometrical mapping	3-Oct-06	LATE	LATE	3-Oct-06	
Reconstruction	Status of raw-data reconstruction	3-Oct-06	LATE	LATE	3-Oct-06	OK
	Removal of dependencies on gAlice (AliRun)	3-Oct-06	LATE	LATE	3-Oct-06	Hardwired parameters to be removed
Simulation	Status with raw-data format	3-Oct-06	LATE	LATE	3-Oct-06	OK
	Implement Raw2(S)Digits for event embedding	3-Oct-06	LATE	LATE	3-Oct-06	To be done
Visualisation	Raw data visualisation within the aliroot event display (EVE)	3-Oct-06	LATE	LATE	3-Oct-06	?