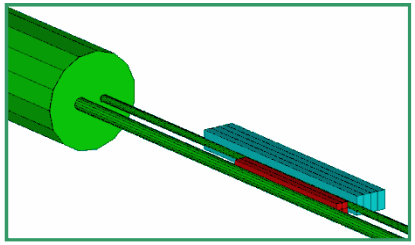
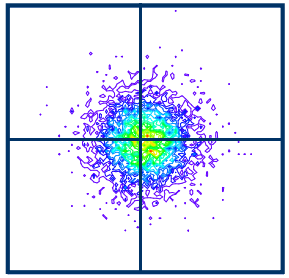
ZDC Status Report

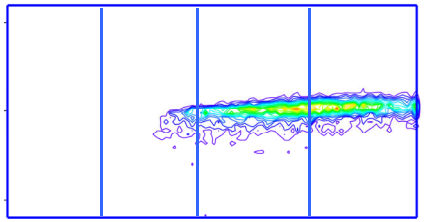
C. Oppedisano
E. Scomparin

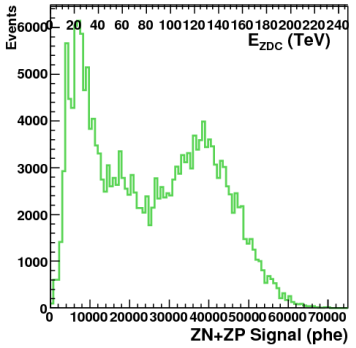


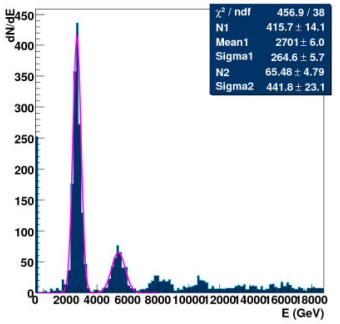
Outline

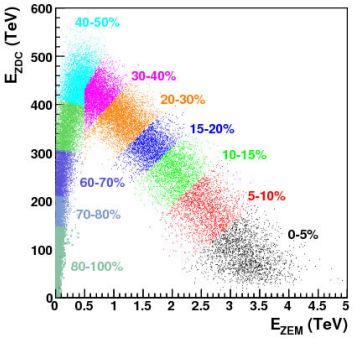
- online calibration
- offline calibration
- reconstruction algorithm
- OCDB objects
- trigger simulation
- planning for 1st data
- planning











ONLINE CALIBRATION

DA test session @ P2 in May with S. Chapeland

➡ PEDESTAL, MAPPING and LASER DA tested (for EMD we need A-A data!)
➡ DAQ "mechanics" configured for the corresponding runs
➡ MAPPING: DA working, it grabs in each run the SOD event to store the map of the ADC cabled channels it has been configured to run in global partition.
➡ PEDESTAL: DA working, calculates parameters for pedestal subtraction. There is still some electronics configuration to be adjusted.
➡ LASER: DA working (the laser was not cabled…)
➡ Minuit2 fit gives errors: bug submitted to ROOT Savannah ➧ Minuit2 is not included in the static ROOT libraries for the moment TMinuit is used

DAs updated to store histograms in Reference Data for Offline Calibration
➧ Shuttle preprocessor updated accordingly (code committed rev. 32947)

ZDC ECS update: DAQ control interface with ECS has then been updated (F. Carena and P. Cortese) to cope with the current trigger configuration ➧ still to be tested

➡ new DA test session to be scheduled

DATA NEEDED FROM GRP

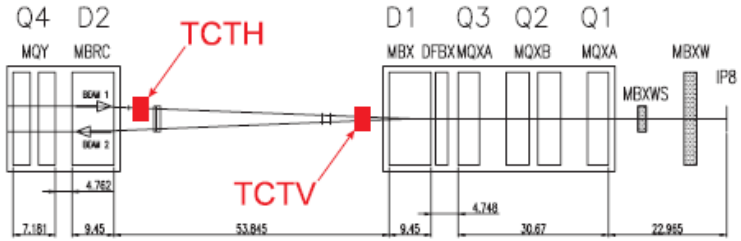
Luminosity and collimator aperture values measured by machine luminometers (BRAN) can be very useful. (G. De Cataldo contacted.)

Already defined DP (to be archived):

- dip/acc/LHC/Beam/LuminosityAverage/BRANB.4L2
- dip/acc/LHC/Beam/LuminosityAverage/BRANB.4R2
- dip/acc/LHC/Beam/LuminosityPerBunch/BRANB.4L2
- dip/acc/LHC/Beam/LuminosityPerBunch/BRANB.4R2
- dip/acc/Machine/CollimatorPosition/TCDD.4L2
- dip/acc/Machine/CollimatorPosition/TDI.4L2
- dip/acc/Machine/CollimatorPosition/TCTH.4L2.B1
- dip/acc/Machine/CollimatorPosition/TCTH.4L2.B2

DP to be defined and stored in archive:

TCTV.4L2 TCTV.4R2 TCTVB TCL



Run types for which these DP should be retrieved by Shuttle preprocessor:

PHYSICS CALIBRATION_EMD

CALIBRATION_MB CALIBRATION_CENTRAL CALIBRATION_SEMICENTRAL

Still I don't see any of them in the GRP preprocessor ?

http://alisoft.cern.ch/viewvc/trunk/STEER/AliGRPPreprocessor.cxx?root=AliRoot&view=markup

OFFLINE CALIBRATION

STANDALONE_PEDESTAL / STANDALONE_LASER runs

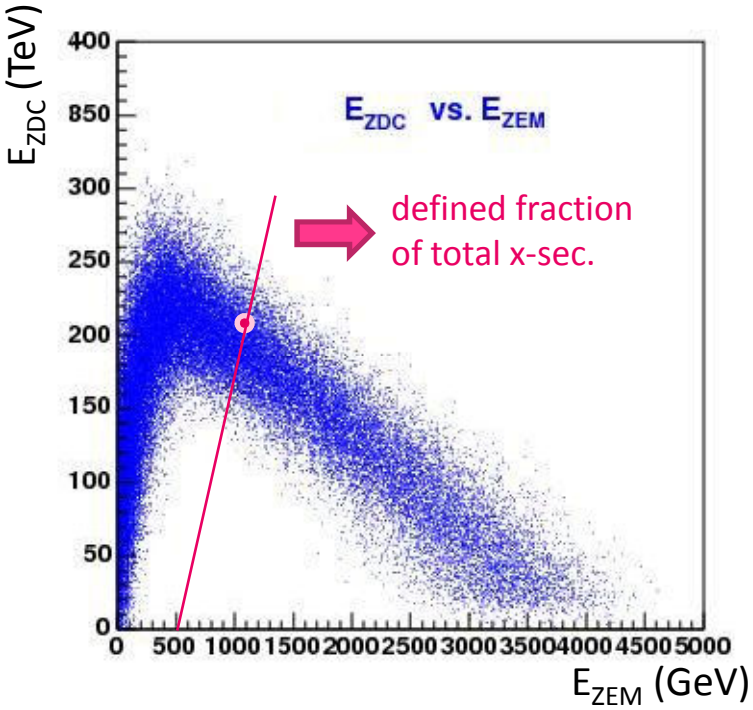
- ~10^3 events per run, acquired at each machine filling (2/3 times per day)
- NO reconstruction performed on such data
- save histograms for "human" check and eventually update the OCDB object, procedure important in particular for 1st data
  - PEDESTAL: 96 TH1F + 48 TH2F
  - LASER: 22 TH1F

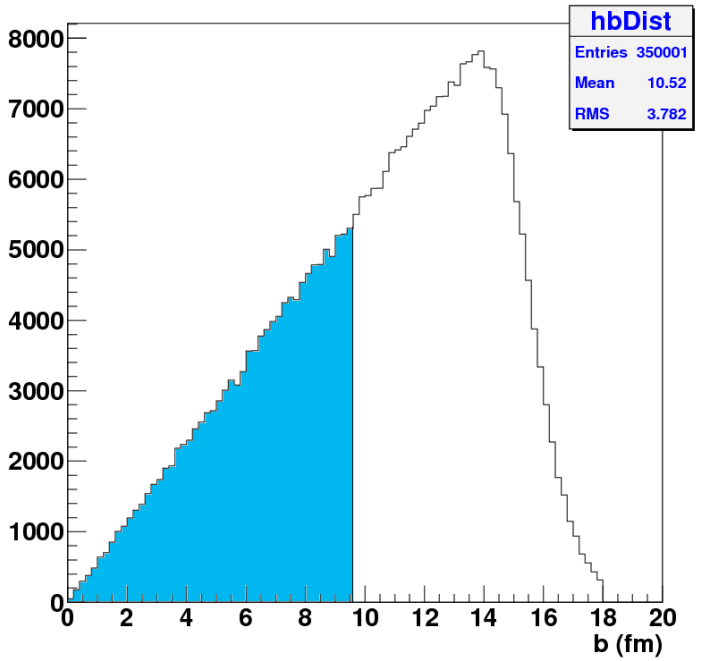
CALIBRATION_EMD runs (ONLY A-A data taking)

- special run (no idea on its frequency)
- reconstruction performed on data
- provide an AliAnalysisTask to be run on ESDs (fitting in the general framework)

RECONSTRUCTION (I)

New reconstruction algorithm implemented ➡ centrality determination is now based on experimentally measured quantities to avoid model dependences (the old algorithm made use of HIJING and a fragmentation models as inputs)





➡ b (N_{part}) value corresponding to the same fraction of event selected from the b (N_{part}) distribution obtained from a Glauber MC

➡ b (N_{part}) determination from the summed E_{ZDC} vs. E_{ZEM} correlation and separately from the side A and side C correlations ➧ estimate of the error on centrality evaluation

RECONSTRUCTION (II)

➡ BEFORE A-A DATA TAKING in order to run reconstruction, we'll have to acquire a sample of MB data to build the E_{ZDC} vs. E_{ZEM} correlation (RUN type: "CALIBRATION_MB")

➡ AliZDCReconstructor when finding data from "CALIBRATION_MB" runs, builds and writes the needed AliZDCRecoParamPbPb object in the OCDB

➡ the object should in principle be updated only if detectors vary their response (ageing effects or problems!)

➡ a new AliZDCRecoParamPbPb object is written in the OCDB only if changed w.r.t. the previous one

➡ we decided to split the ZDC RecoParam object in p-p and in A-A cases since their aim and content is extremely different!!

➡ Further ideas: implement a comparison between the stored correlation and the one obtained in a generic A-A run as a QA test?

OCDB

Calibration objects have been updated:

- energy calibration and detector inter-calibration objects split
- RecoParam object for p-p and for Pb-Pb data split

OCDB structure $ALICE_ROOT/OCDB/Calib

ChMap/	ADC channel mapping
~~EMDCalib/~~	
EnCalib/	energy calibration parameters
LaserCalib/	parameters from LASER calibration (ageing effects)
Pedestals/	parameters for pedestal subtraction
~~RecoParam/~~	
RecoParampp/	parameters for p-p reconstruction (?)
RecoParamPbPb/	parameters for Pb-Pb reconstruction
TowCalib/	parameters for the callibration of different sector in the same detector

ESD (I)

ESDs have been updated accordingly ➡ AliESDZDC class data members:

Double32_t fZDCN1Energy; // reconstructed energy in the neutron ZDC
Double32_t fZDCP1Energy; // reconstructed energy in the proton ZDC
Double32_t fZDCN2Energy; // reconstructed energy in the neutron ZDC
Double32_t fZDCP2Energy; // reconstructed energy in the proton ZDC
Double32_t fZDCEMEnergy; // signal in the electromagnetic ZDCs
Double32_t fZDCEMEnergy1; // second EM
Double32_t fZN1TowerEnergy[5];// reco E in 5 ZN1 sectors - high gain chain
Double32_t fZN2TowerEnergy[5];// reco E in 5 ZN2 sectors - high gain chain
Double32_t fZP1TowerEnergy[5];// reco E in 5 ZP1 sectors - high gain chain
Double32_t fZP2TowerEnergy[5];// reco E in 5 ZP2 sectors - high gain chain
Double32_t fZN1TowerEnergyLR[5];// reco E in 5 ZN1 sectors - low gain chain
Double32_t fZN2TowerEnergyLR[5];// reco E in 5 ZN2 sectors - low gain chain
Double32_t fZP1TowerEnergyLR[5];// reco E in 5 ZP1 sectors - low gain chain
Double32_t fZP2TowerEnergyLR[5];// reco E in 5 ZP2 sectors - low gain chain
Short_t fZDCParticipants; // number of participants estimated by the ZDC (ONLY in A-A)
Short_t fZDCPartSideA; // number of participants estimated by the ZDC (ONLY in A-A)
Short_t fZDCPartSideC; // number of participants estimated by the ZDC (ONLY in A-A)
Double32_t fImpactParameter; // impact parameter estimated by the ZDC (ONLY in A-A)
Double32_t fImpactParamSideA; // impact parameter estimated by the ZDC (ONLY in A-A)
Double32_t fImpactParamSideC; // impact parameter estimated by the ZDC (ONLY in A-A)
Double32_t fZNACentrCoord[2]; // Coordinates of the centroid over ZNC
Double32_t fZNCCentrCoord[2]; // Coordinates of the centroid over ZNA
UInt_t fESDQuality; // flags from reconstruction

ESD (II)

ZDC ESD DATA MEMBERS

N_{part} estimate on both sides + N_{part} "overall" estimation and same for the impact parameter
➡ redundant info for "safety", to evaluate asymmetries (if any) and to provide an error on centrality variables determination

The fESDQuality data member is a word giving info about the ZDC reconstruction and the status of the detectors
➡ this info can be very useful in p-p data analysis, i.e. it tells whether the ZDC is not giving signals because there's no PHYSICS signal or because of some problems (overflow or channels switched off)
➡ the feature can be used for example to tag candidate single diffractive events in p-p data

CENTROID DETERMINATION

Update on the method used to calculate the event centroid over ZN (used to determine 1st order reaction plane for flow analysis)
A method GetFOReactionPlaneFromZDC will be soon be implemented in PWG2/FLOW classes

TRIGGER SIMULATION

ZDC TRIGGERS (A-A)

- ZDC_MB ➡ Minimum bias events
- ZDC_CE ➡ Central events (0-10%)
- ZDC_SC ➡ Semicentral events (10-40%)
- ZDC_SP ➡ Special trigger for EM dissociation events

Classes for trigger simulations have been committed (rev. 32946) APPLICABLE ONLY TO A-A DATA!!!

➡AliZDCTriggerParameters is the class containing the value of the configurable parameters used to define trigger classes

- discriminator thresholds ➧ values written in the raw data
  still to be implemented by ZDC DAQ people
- corresponding ADC values ➧ ?!?

➡AliZDCProcessor selects the trigger event class basing its decision on the stored values of the configurable parameters

We plan to insert the CTP input in the raw data in order to be able to re-check the trigger selected by the ZDC for a given event.

SUMMARY - DONE

Updated/changed:

- ZDC DAs and Shuttle preprocessor in order to store histograms for PEDESTAL and LASER runs as Reference Data
- A-A reconstruction algorithm and, consequently, ESD structure
- OCDB/ZDC/Calib structure

New:

- classes for trigger simulation

SUMMARY – TO DO

TO DO

p-p data taking A-A data taking

- schedule a new DA test session ➡ as soon as the DAQ expert (P. Cortese) will finish the tests to validate the new ZDC ECS design

- produce an AliAnalysisTask offline calibration from A-A EMD data ➡ straightforward (not yet done for lack of time ☹)

- intensive tests of the new reconstruction algorithm ➡ my proposal is to join this effort to Federico's request to study the spectator sampling technique with a dedicated production (production has not yet been committed since I get a crash…under study)

- write CTP input in raw data ➡ waiting for DAQ expert!

OPEN TASKS

Pin	Log	P	Work	Task Name	Start Date	Done Date	Expected Finish Date	Last Update
	Log		!	***Calibration*** (1092)	01/01/2006	07/12/2007	30/05/2009	-
	Log		!	Deployment of some DAs at P2 (2510)	16/03/2009	-	30/05/2009	-
	Log		!	Implementation of offline calibration (2511)	16/03/2009	-	30/05/2009	-
	Log		»	***Raw Data*** (1125)	01/01/2006	03/11/2006	03/11/2006	-
	Log		!	***Quality Assurance*** (1399)	01/01/2006	19/06/2008	07/07/2008	-
	Log		!	Implementation of simulation in DataMaker (2514)	16/03/2009	-	30/05/2009	-
	Log		!	Implementation of reconstruction in DataMaker (2515)	16/03/2009	-	30/05/2009	-
	Log		!	Implementation of run type (2516)	16/03/2009	-	30/05/2009	-
	Log		!	Verification of simulation in QA checker (2517)	16/03/2009	-	30/05/2009	-
	Log		!	Verification of reconstruction in QA checker (2518)	16/03/2009	-	30/05/2009	-
	Log		!	Implementation of reference data (2519)	16/03/2009	-	30/05/2009	-
	Log		»	***Reconstruction*** (1580)	01/01/2006	05/06/2008	05/06/2008	-
	Log		!	***Simulation*** (1581)	01/01/2006	-	30/05/2009	-
	Log		✓	Verification of handling of the time information from hits during digitization (2504)	16/03/2009	27/02/2009	30/05/2009	-
	Log		!	Verification of accounting for detector response in the time information stored in digits (2505)	16/03/2009	-	30/05/2009	-
	Log		!	Verification of the event merging procedures (2506)	16/03/2009	-	30/05/2009	-
	Log		!	Verification of correct treatment of the detector signal in the sdigits for event merging (2507)	16/03/2009	-	30/05/2009	-
	Log		!	Verification of the embedding procedures (2508)	16/03/2009	-	30/05/2009	-
	Log		!	Implementation of raw data for offline scaler (2509)	16/03/2009	-	30/05/2009	-
	Log		✓	***Geometry*** (1098)	20/02/2007	12/02/2009	30/05/2009	-
	Log		✓	Updating of field map for machine magnets for different running scenarios (2503)	16/03/2009	12/02/2009	30/05/2009	-
	Log		»	***Material Budget*** (2390)	18/02/2009	-	18/02/2009	-
	Log		!	***Trigger*** (2389)	16/03/2009	-	30/05/2009	-
	Log		!	Implementation of the code for trigger parameters for the simulation of the trigger input to the CTP (2512)	16/03/2009	-	30/05/2009	-
	Log		!	Testing of trigger simulation with raw data (2513)	16/03/2009	-	30/05/2009	-

Key: =Started and on time =Overdue =Done but with delay =Done

OPEN TASKS: PLANS (I)

CALIBRATION

Deployment of some DAs at P2 ➡ END OF JULY (2nd episode)

Implementation of offline calibration ➡ AliAnalysisTask for offline calibration provided (END OF JULY)

QA

Implementation of simulation in DataMaker
Implementation of reconstruction in DataMaker
Verification of simulation in QA checker
Verification of reconstruction in QA checker
➡ Simulation and reconstruction ARE implemented in DatMaker and they are also verificated in QA checker!!!

Implementation of run type
➡ To be finished, tested and committed (END OF JULY)

Implementation of reference data
➡ Not considered as needed by the ZDC people for the moment

OPEN TASKS: PLANS (II)

SIMULATION

Verification of accounting for detector response in the time information stored in digits ➡ tested to be working as expected. It can be closed.

Verification of the event merging procedures
Verification of correct treatment of the detector signal in the sdigits for event merging
Verification of the embedding procedures
➡ we never performed merging (in the sense of secondary merging!), so I always ask to close this task... ☺

Implementation of raw data for offline scaler ➡ in progress in these days, committed by beginning of July

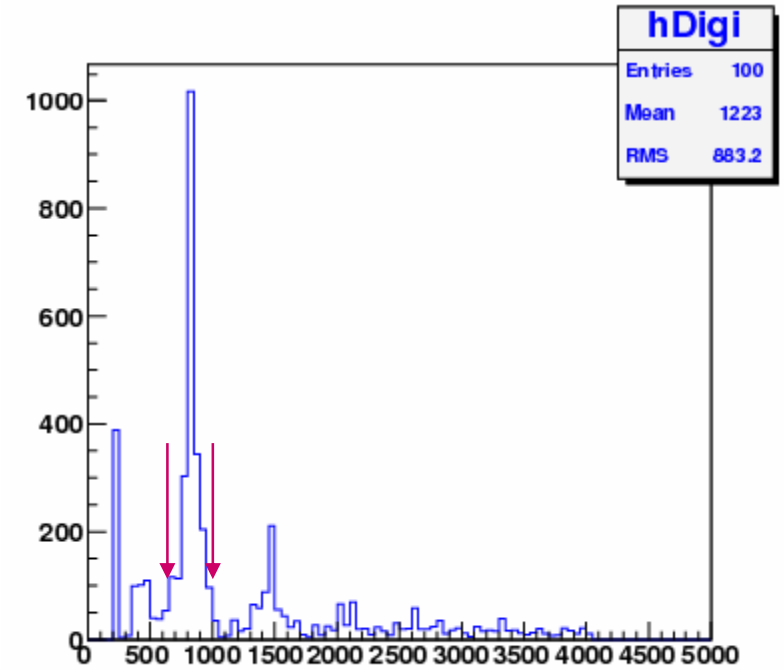
TRIGGER

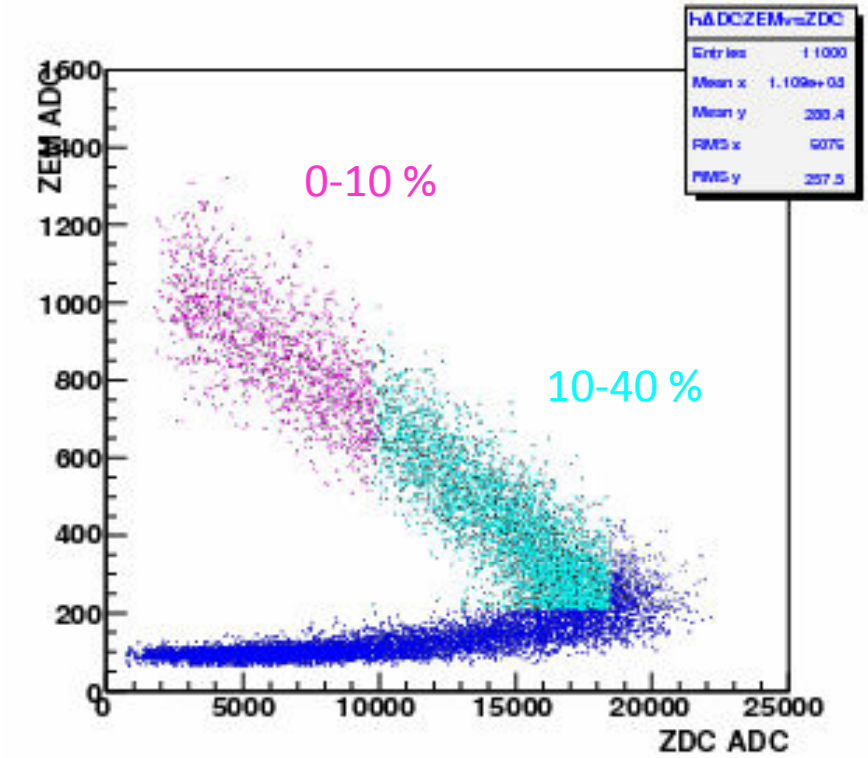
Implementation of the code for trigger parameters for the simulation of the trigger input to the CTP
Testing of trigger simulation with raw data
➡ implemented and committed

BACKUP SLIDES

ZDC TRIGGER CLASSES

Centrality triggers
cutting the correlation between ZEM and ZDC ADC spectra

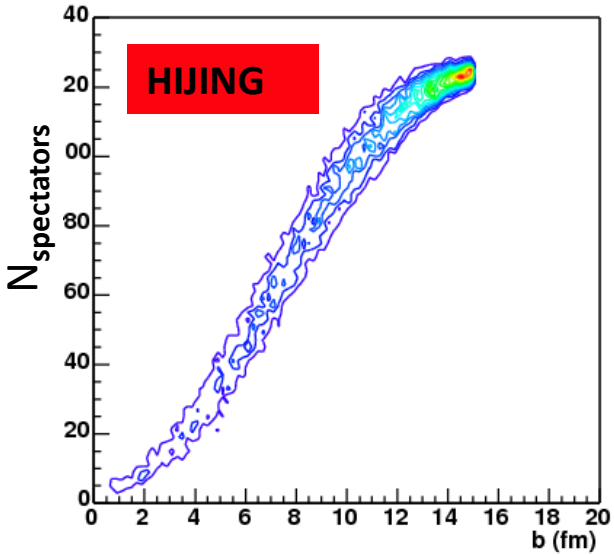


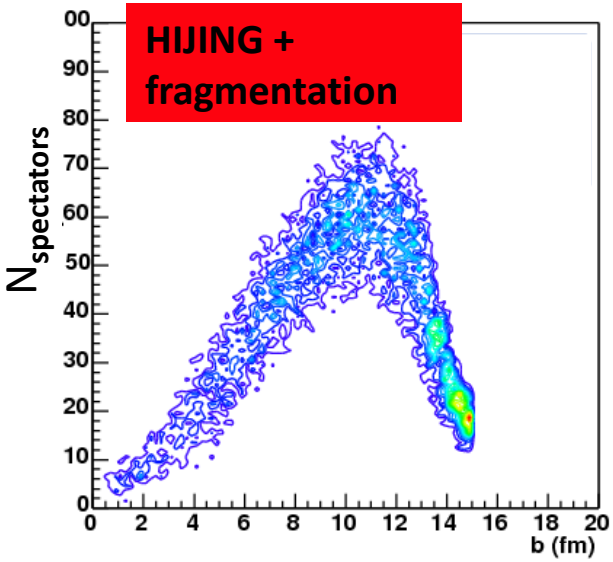


EMD trigger
set of a window corresponding to 1 neutron peak in the ZN ADC spectrum in coincidence with the window on the other ZN

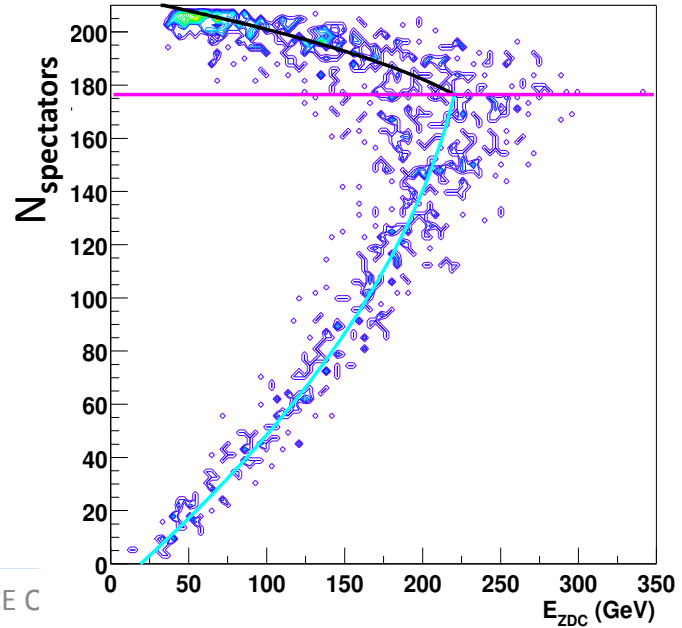
Models used for reconstruction from simulated data

$N_{spectators}$ vs. b





From measured value of E_{ZDC} we provide a no. of spectator (participants) according to HIJING + fragmentation models



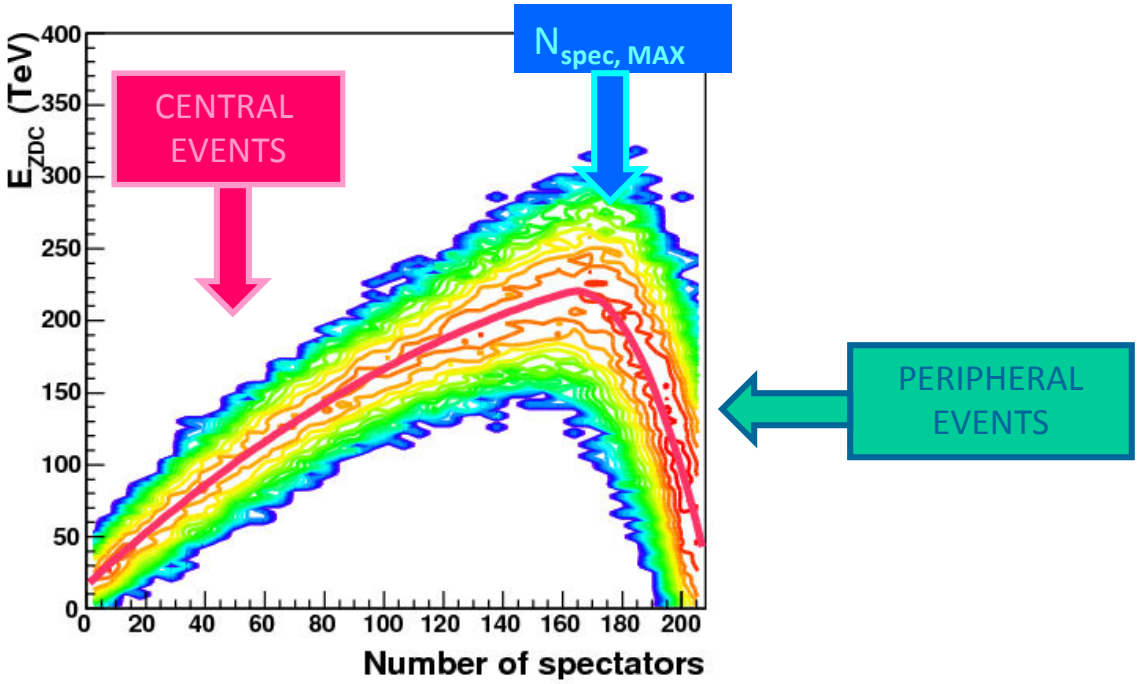
ZDC RECONSTRUCTION (I)

ZDC reconstruction relies on the parameterization of various correlations:

E_{ZDC} vs. N_{spec}, E_{ZDC} vs. b and E_{ZEM} vs. N_{spec} (see PPR vol.II, par. 6.1.2)

Due to fragments production these correlations have 2 branches corresponding to central and peripheral event samples

The two branches of N_{spec} vs. E_{ZDC} spectra are fitted separately, requiring the same values for the 2 fitting functions for $N_{spec} = N_{spec, MAX}$



ZDC RECONSTRUCTION (II)

Inverting these 2 functions one gets two possible N_{spec} values for each experimentally measured E_{ZDC} value

Using the ZEM signal, N_{spec} from one branch of events can be correctly determined since E_{ZEM} is a monotonic function of N_{spec}