PWGs' QA: discussion

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Planning/Presentation

PWGPP-41:Provide detector code for automatic trending of QA data

- https://alice.its.cern.ch/jira/browse/PWGPP-41
- Detector QA central web page and procedures:
  - https://docs.google.com/document/d/1jOIgyFx5OiWU150o45I5sA4ytxRHgTpMbXIfJLKjLmQ/edit?usp=sharing

ATO-148: QA for PWG

ALIROOT-4345: Automatic procedure to obtain production statistic on Monalisa

- https://alice.its.cern.ch/jira/browse/ALIROOT-4345

ATO-46:Provide access to external info:

- https://alice.its.cern.ch/jira/browse/ATO-46
  - https://indico.cern.ch/event/374111/contribution/11/material/slides/1.pdf
    - PWGPP meeting 16.02.2015 - naming convention for MC and DB (MI)
  - https://indico.cern.ch/event/292409/contribution/4/material/slides/0.pdf
    - External information usage using tree "relational DB" (Peter, MI)

ATO-118 TPC data volume studies

- https://alice.its.cern.ch/jira/browse/ATO-118
  - TPCOffline meeting, 10-DEC-2014,
    - https://indico.cern.ch/event/292417/contribution/1/material/slides/0.pdf

Quality assurance

http://en.wikipedia.org/wiki/Quality_assurance

Quality Assurance (QA) is a way of preventing mistakes or defects in manufactured products and avoiding problems when delivering solutions or services to customers.

Two principles included in Quality Assurance are: "Fit for purpose" (the product should be suitable for the intended purpose); and "Right first time" (mistakes should be eliminated). QA includes management of the quality of raw materials, assemblies, products and components, services related to production, and management, production and inspection processes.

Physics PWG QA “DB” proposal

QA of the PWG physics group and QA of the PWGPP- detector to be stored in the same kind of DB

- Standardization
- Enable automatic exchange of the information
- Correlation and sensitivity studies
- Simplify detector expert/tracking expert/physicist communication
  - e.g. e-mail exchange of the queries, how-to, Wikis
  - example use-cases in next slides

As an DB set of root tables (Trees) proposed as analog to relational database

- run (period, pass, production) used as primary index
- Similar query language as in “standard relational DB”
  - nice graphic support
- “Object oriented” DB
  - but not full DB support
- **Familiar to physicist - easy to use - everybody should know ROOT**
- **Additional support (function/classes) provided in AliRoot (TStatToolkit) and extended list of function planned to be implemented**

Physics PWG QA “DB” proposal. Motivation (0).

TPC QA experience

- TPC QA statement accept/reject data taking usually based on +-1 sigma deviation from the nominal resolution.
- However, 1sigma criteria can lead to some problems in physics analysis.
- Rule of thumb: All analysis where the analysis rejection factor ~ 20% of findable topologies can have problems (unless selections purely geometrical)
  - In some cases detected in time, in some cases after conference/publications

Physics PWG QA “DB” proposal. Motivation (1)

- Detector and tracking system sufficiently complex
  - e.g TPC - gain edge effect crosstalk, ion-tail
  - vdrift - T profile
  - charging up

MC simulation not perfect

- Pile-up simulation , beam-gas simulation completely missing
- Residual mis-calibration described only in effective way
  - e.g for the TPC mis-calibration effect described by random sets of mis alignment, not related to the actual distortions except of RMS
- Even more important for the high IR data taking with pile-up, TPC charging up of Field cage ...

Consequences of imperfection MC description difficult to estimate without DB software support

- Querying the information from different sources

Physics PWG QA “DB” proposal. Motivation

Consequences of imperfection MC description difficult to estimate without DB software support

- Querying the information from different sources
- Studies non systematic
- Experts can not comment
- Difficult to estimate importance of different effects
- Qualitative explanation/fit of models/sensitivities impossible

MI opinion: Any physics analysis of the high IR necessitates careful sensitivity studies as function of time (run). Otherwise, systematic uncertainties might be large and even unknown. Publication of such results can cast a shadow on the work of entire collaboration and should be discouraged

Variables:

- IR - efficiency/number of clusters/dEdx/ number of tracks
- charging up of Filed cage -DCA bias
- beam/gas - increasing cross/talk - number of clusters/dEdx

Example use case

1.) Matching efficiency example - linear with IR

- https://alice.its.cern.ch/jira/browse/ATO-141

2.) DCA bias due charging up of field cage (E field distortions) - proportional to integrated IR over fill

- Old reconstruction production (run modulation +-2 mm)
  http://aliqatpc.web.cern.ch/aliqatpc/alicewwwBackup/PWG1train/data/2012/LHC12f/pass1/dcar_0_vs_run.png

  http://aliqatpc.web.cern.ch/aliqatpc/alicewwwBackup/PWG1train/data/2012/LHC12f/pass1/Runs/186857/dca_and_phi.png
- New reconstruction production - significantly reduced but residual modulation +-1 mm (0.5 sigma)
  - http://aliqatpc.web.cern.ch/aliqatpc/data/2012/LHC12f/cpass1_pass2/dcar_0_vs_run.png

Effects (1 sigma) not simulated, however effect the physical results in case strong selection are used

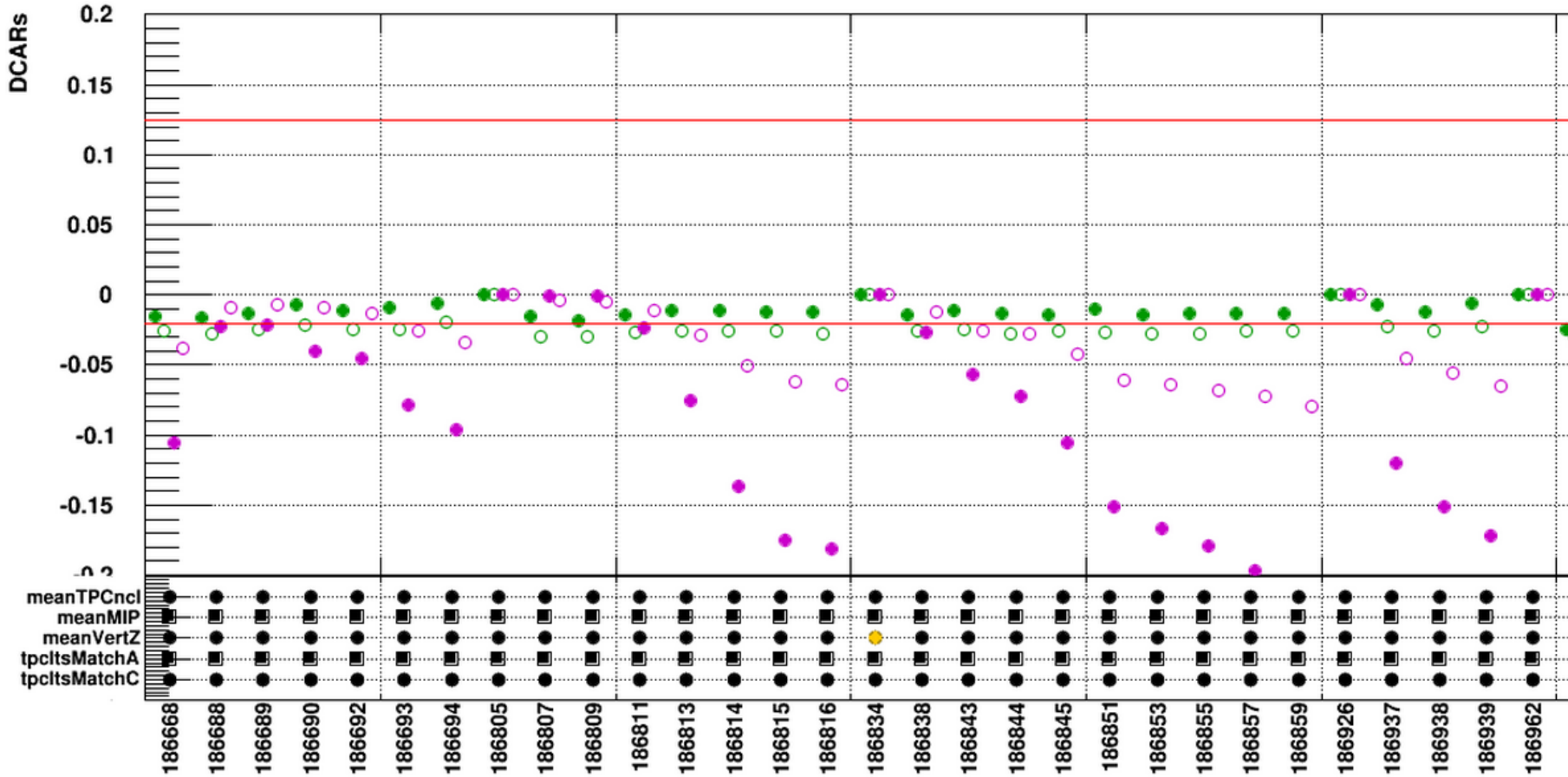
- D2H example
  - Gap/lower efficiency for the D0 at the A/C side crossing for 2012 pass1. Is it still the case?

- 3.) Beam/gas background
  - What is the influence to physics results ?

Case 2: DCA distortion due charge up of field cage

aliqatpc.web.cern.ch/aliqatpc/alicewwwBackup/PWG1train/data/2012/LHC12f/pass1/dcar_0_vs_run.png

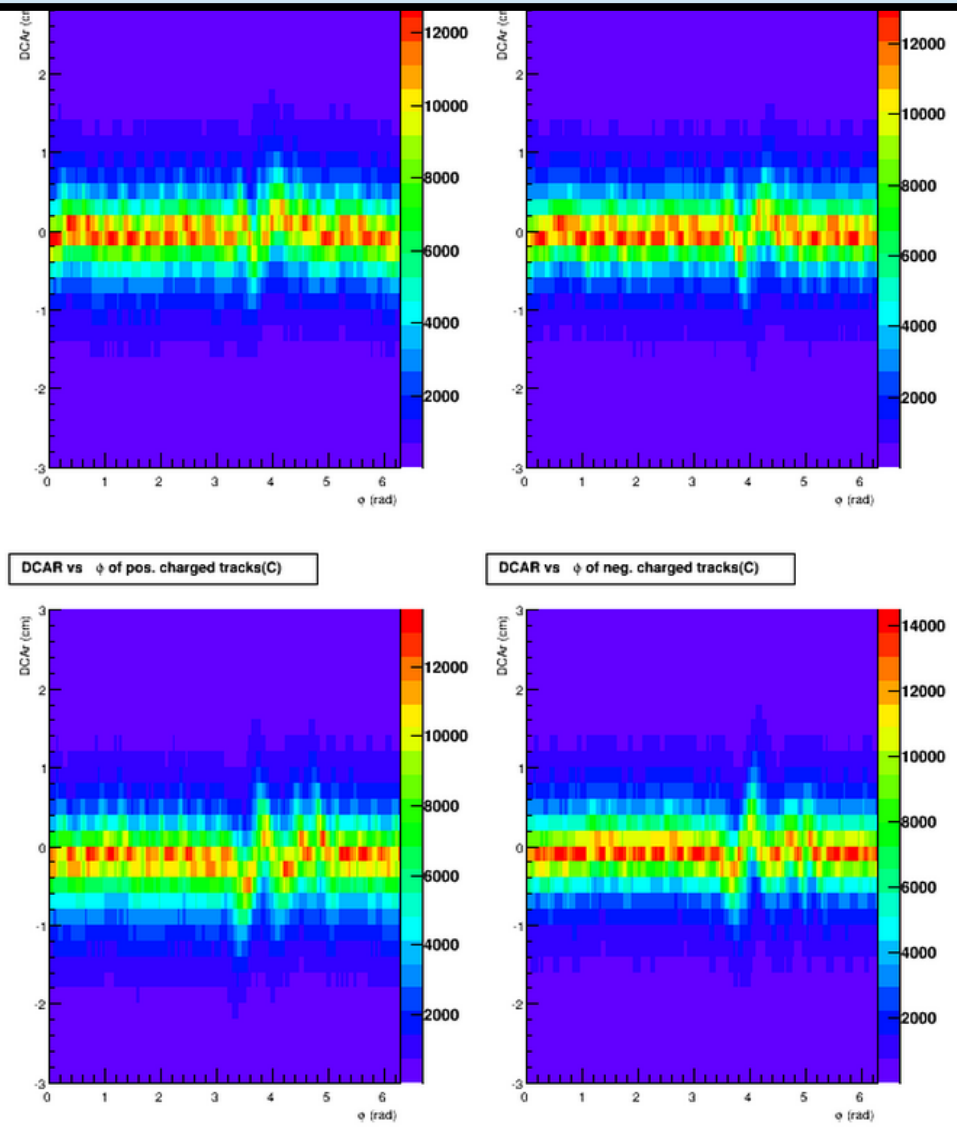
Apps CERN Physic WikiGSI TPC PWG-PP Tracking Private Planning Software CalibProductions Unsorted Bookm MyLinks Data



Case 2: DCA distortion due charge up

Old production:
http://aliqatpc.web.cern.ch/aliqatpc/alicewwwBackup/PWG1train/data/2012/LHC12f/pass1/Runs/186857/dca_and_phi.png

New: http://aliqatpc.web.cern.ch/aliqatpc/data/2012/LHC12f/cpass1_pass2/000186857/dca_and_phi.png



- Run modulation of the DCA bias observed (old pass 1 shown here)
- Run dependent bias mostly on C side
- Effect enhance in the region of the resistor road (phi ~ 3.5-4)

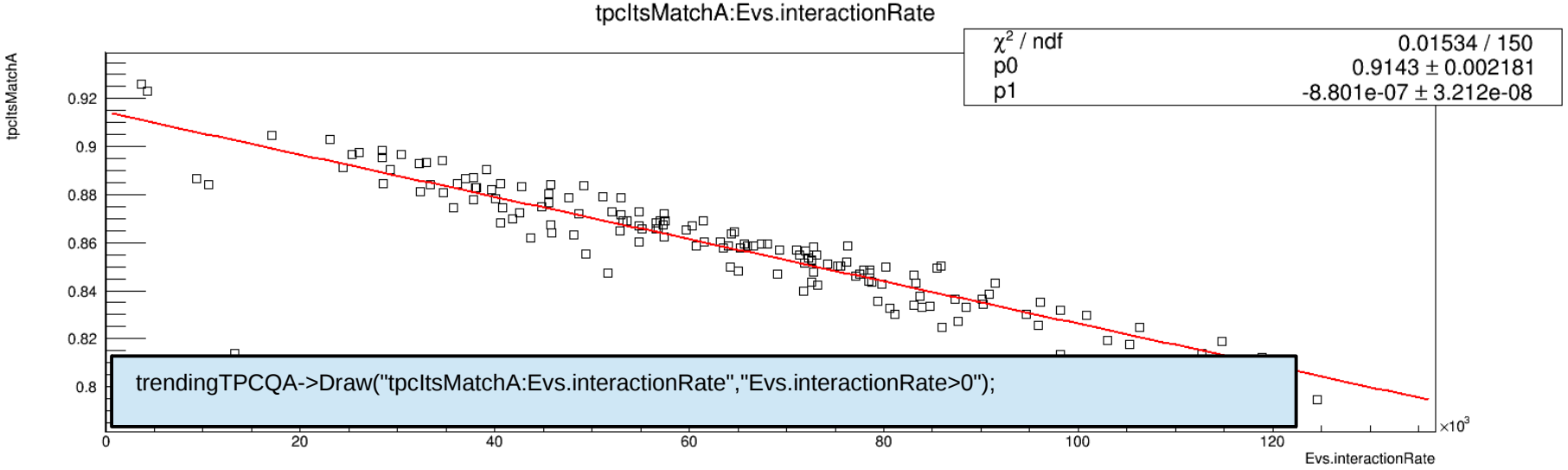
- Effect significantly reduced in ongoing pass2 (modulation <1 mm)
  - another improvement RUN2 - using time dependent E field distortion calibration

Proposed Example use case 2.

Proposed sensitivity studies interface - D0 yield at eta~0 as function of DCA bias

- ConnectDB(TPCQA, periodID)
- ConnectDB(D2H,periodID)
- db->Draw("D2H.yeald.At(0):TPC.QA.DCA_R_Cside>>his")
- db->Draw("D2H.yeald.At(resRoad):TPC.QA.DCA_R_Cside>>his")
- his->Fit();

Case 0: Efficiency as function of interaction rate (ATO-141,46)



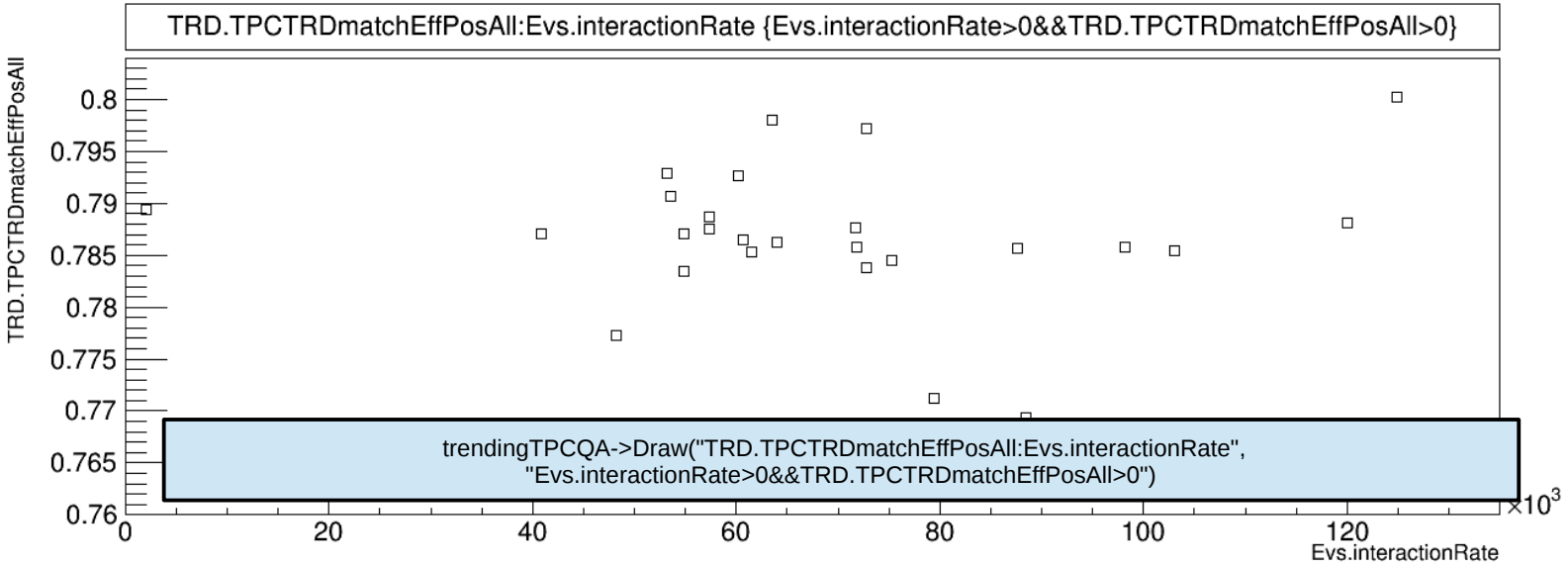
TPC -ITS matching efficiency as function of interaction rate for tracks pointing to the primary vertex

- Only DCA cut used in the basic TPC QA. We decided to do not put TPC QA dependent on other detectors
- In simulation efficiency as function of IR constant (pileup non simulated)

Questions to answer:

- What is the actual matching efficiency for the triggered event of interest?
  - **expert QA, PWG/PWG QA to define efficiency estimators**
- IR dependence of different efficiency/yield estimators - (linear) fits
- Is it important?
  - We can not quantitatively answer without accessing the information

Case 1: Efficiency as function of interaction rate (ATO-141)



TPC -TRD matching efficiency as function of interaction rate for tracks pointing to the primary vertex

- As obtained by TRD QA - requiring TPC-SPD matching
-

Questions to answer:

- What is the actual matching efficiency for the triggered event of interest?
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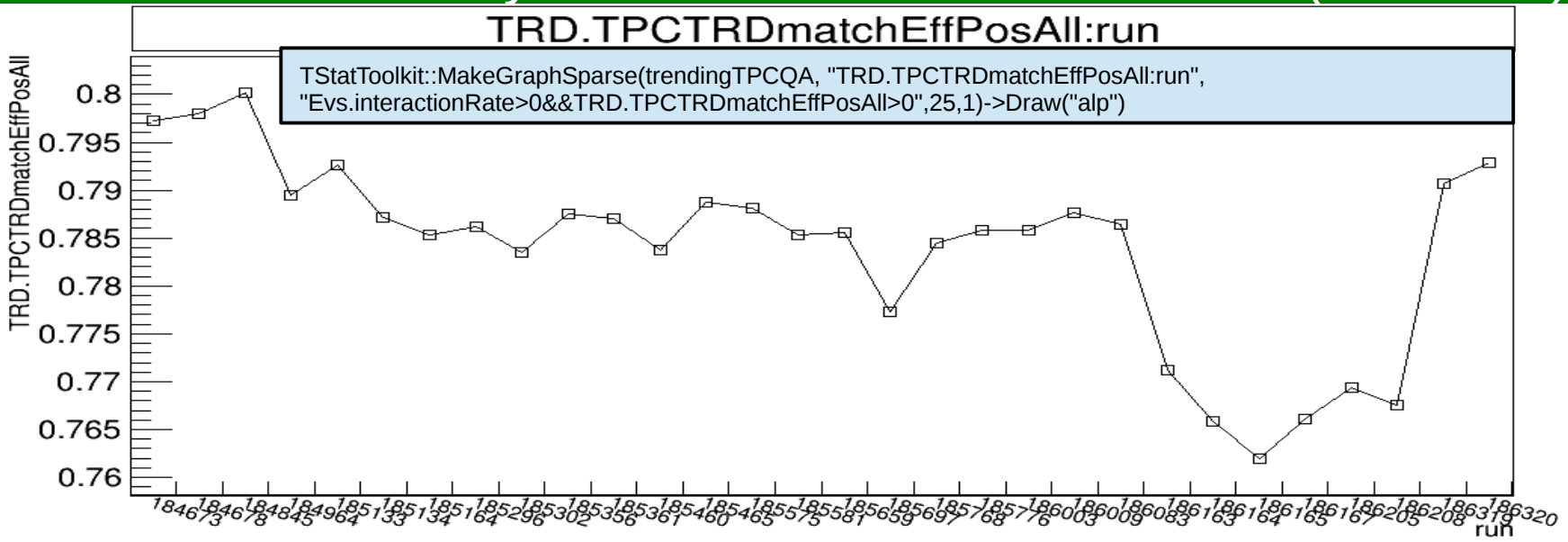
Case 1: Efficiency as function of interaction rate (ATO-141)



TPC -TRD matching efficiency as function of interaction rate for tracks pointing to the primary vertex

- As obtained by TRD QA - requiring TPC-SPD matching
- Different efficiency for different fills

Questions to answer:

- What is the actual matching efficiency for the triggered event of interest?
  - **expert QA, PWG/PWG QA to define efficiency estimators**
- IR dependence of different efficiency/yield estimators - (linear) fits
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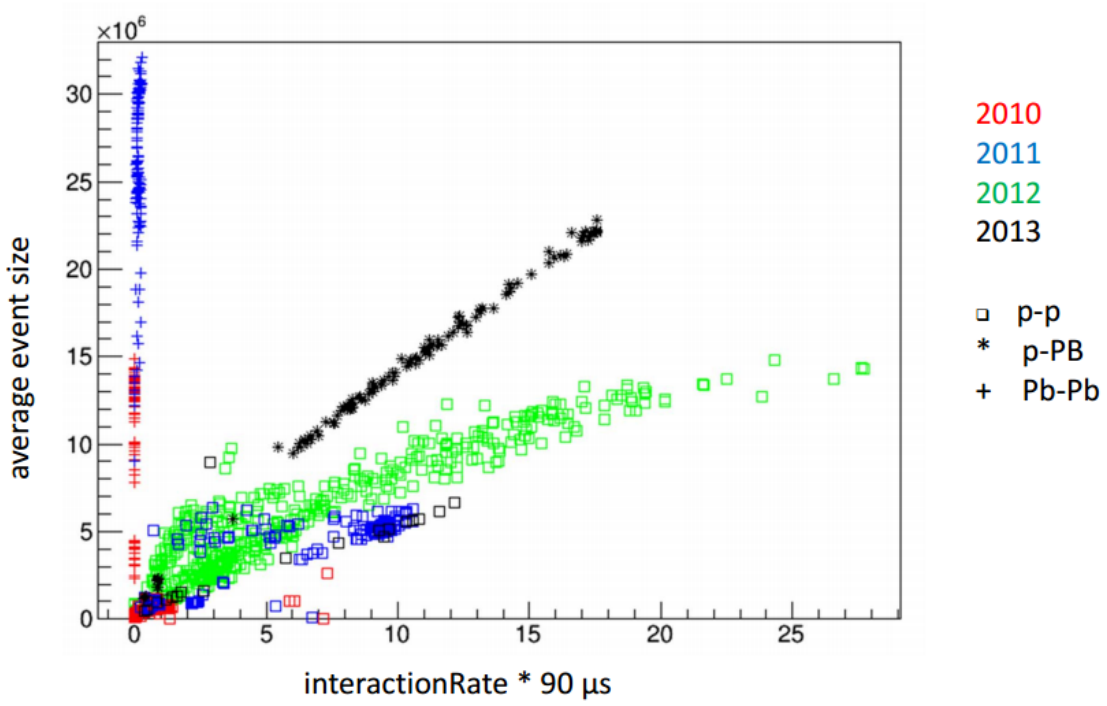
Case 3: Beam gas background

- First systematic data volume studies done after exporting full logbook, Monalisa and Ev. Selection to the central QA WebPage in form of DB (Trees)
  - See presentation of (Peter Malzacher and MI)
    - https://indico.cern.ch/event/292417/contribution/1/material/slides/0.pdf



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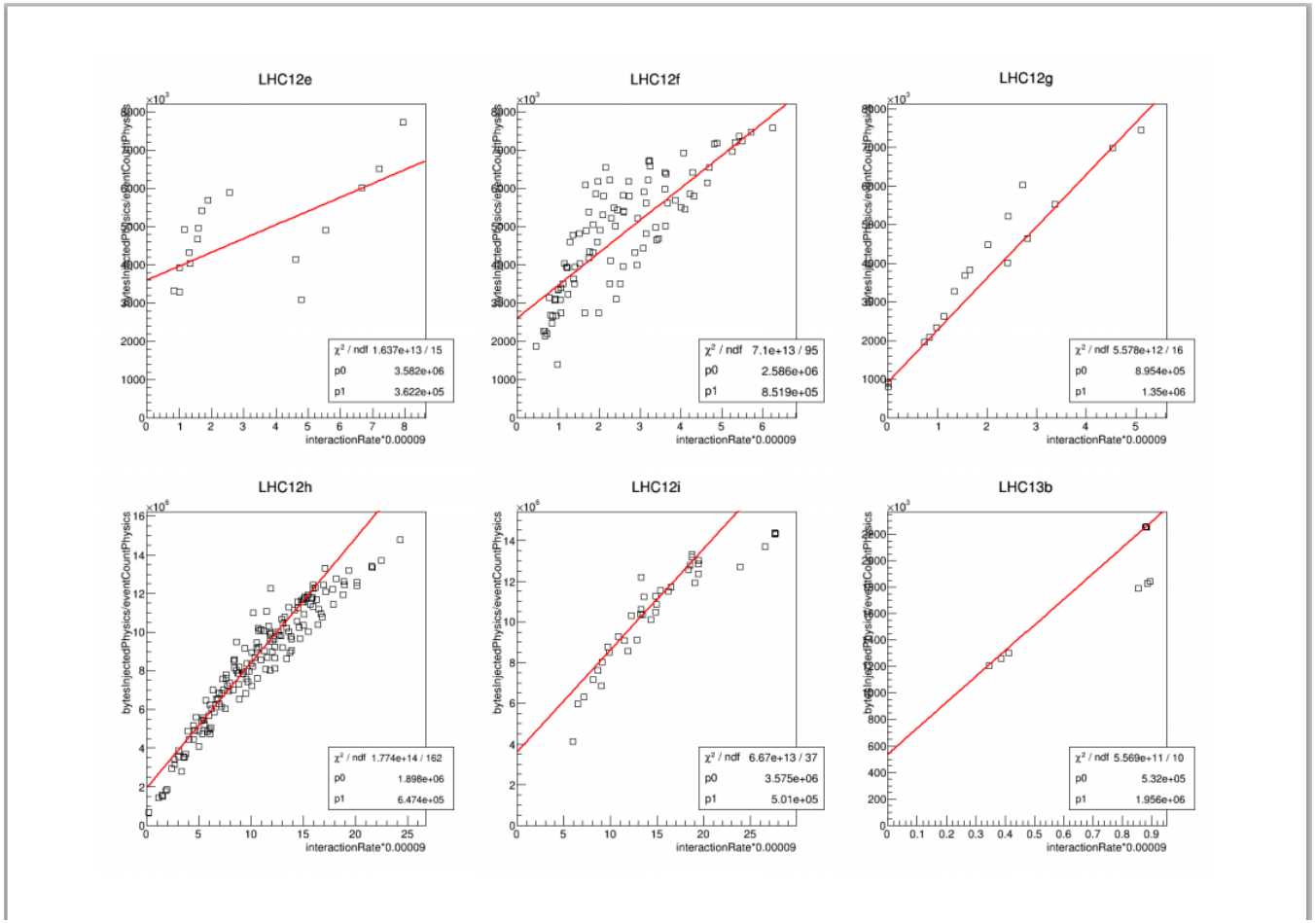
Case 3: Beam gas background (0)

- Signal - number of tracks to background - occupancy varies significantly
  - Number of found tracks and IR - can not be used as an occupancy estimator



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Physics PWG QA proposal

afs web directories following the naming convention as for the PWGPP detector QA

- structure can be created by QA group
- QA to be done per run
  - In case sufficient statistic - run properties can be correlated
  - In case not sufficient statistic - run to be divided to bins of “deviation bins”
    - IR, DCA bias, occupancy (beam/gas)
- Service accounts (to be created centrally by QA group)

QA content responsibility of the PWGXXX group

- PWG QA is not centrally produced => Automatic filing of the DB not possible

Information to share

- Responsibility of groups
- E.g: Yield, efficiency, resolution, bias maps - space (phi,eta, q/pt) and time (run, period)

Current status

First version of presentation - presented in January, second on 12.02.2015

PWG GA used as an example

Progress slower as expected

- 3 iterations needed
- Not ready to show today

Physics PWG QA proposal

New Physic QA

- Some effort by PWGs/PAGs necessary, highly overcompensated by available output and benefit from it

Why?

- Black box approach does not work and was never working
- Example(s) from the past, when physics results had to be modified, because recommendation of detector and tracking experts were not fully propagated. Communication between expert and physics analyzers to be improved.
  - In good cases modifications within systematic errors. In some case not.
- Lets skip this stage