Implementation of analysis tracks in the ZEUS event display

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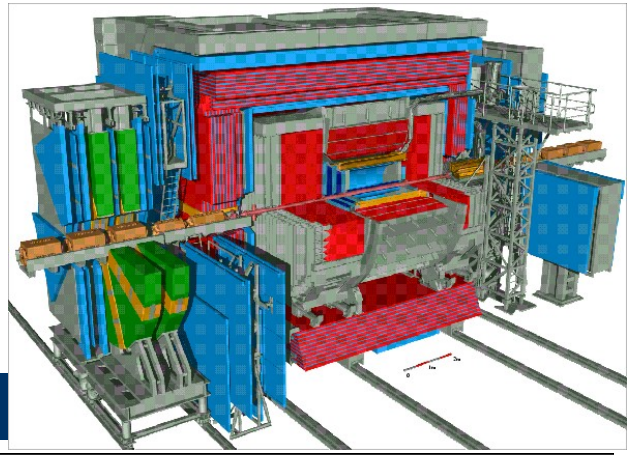
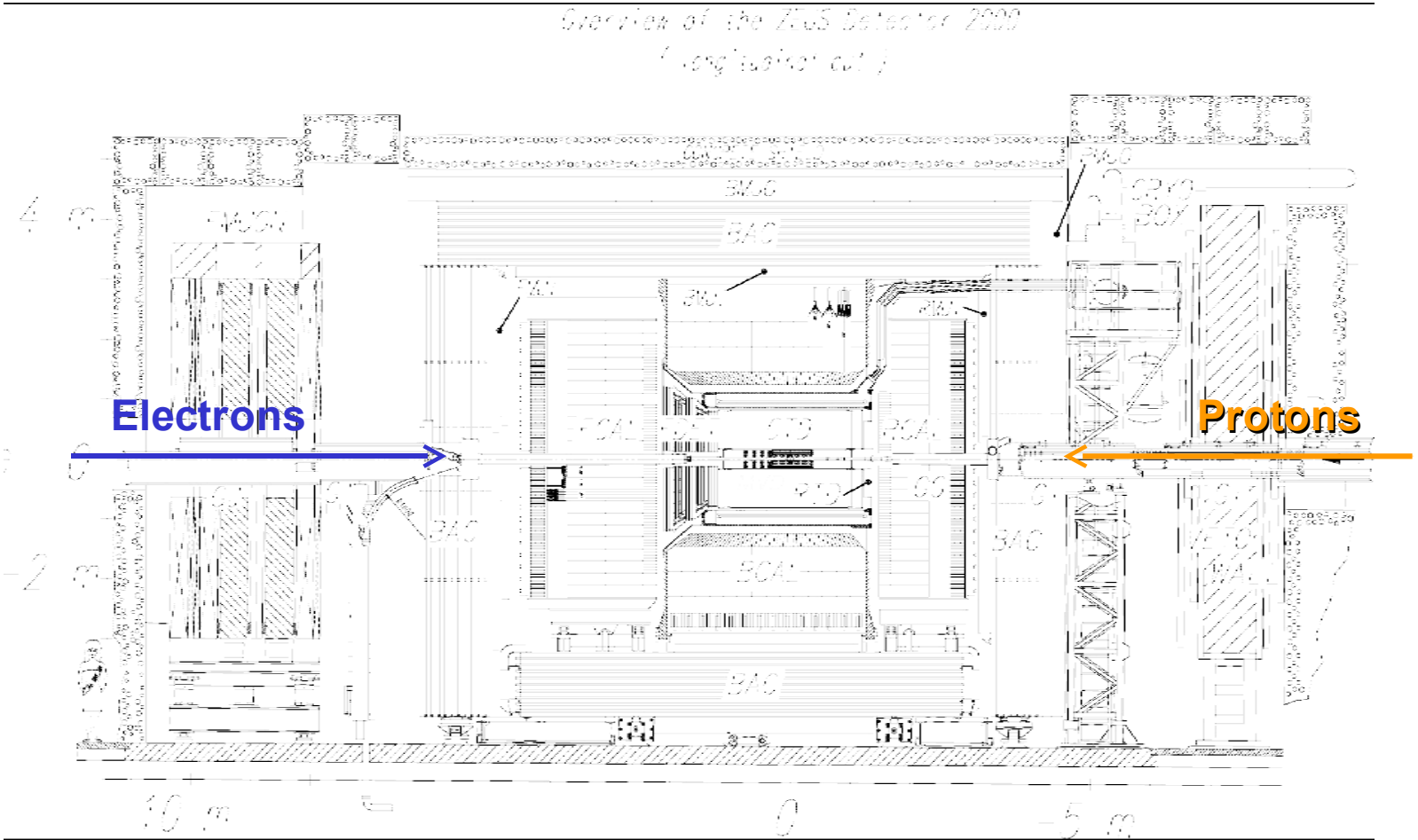
Conclusions

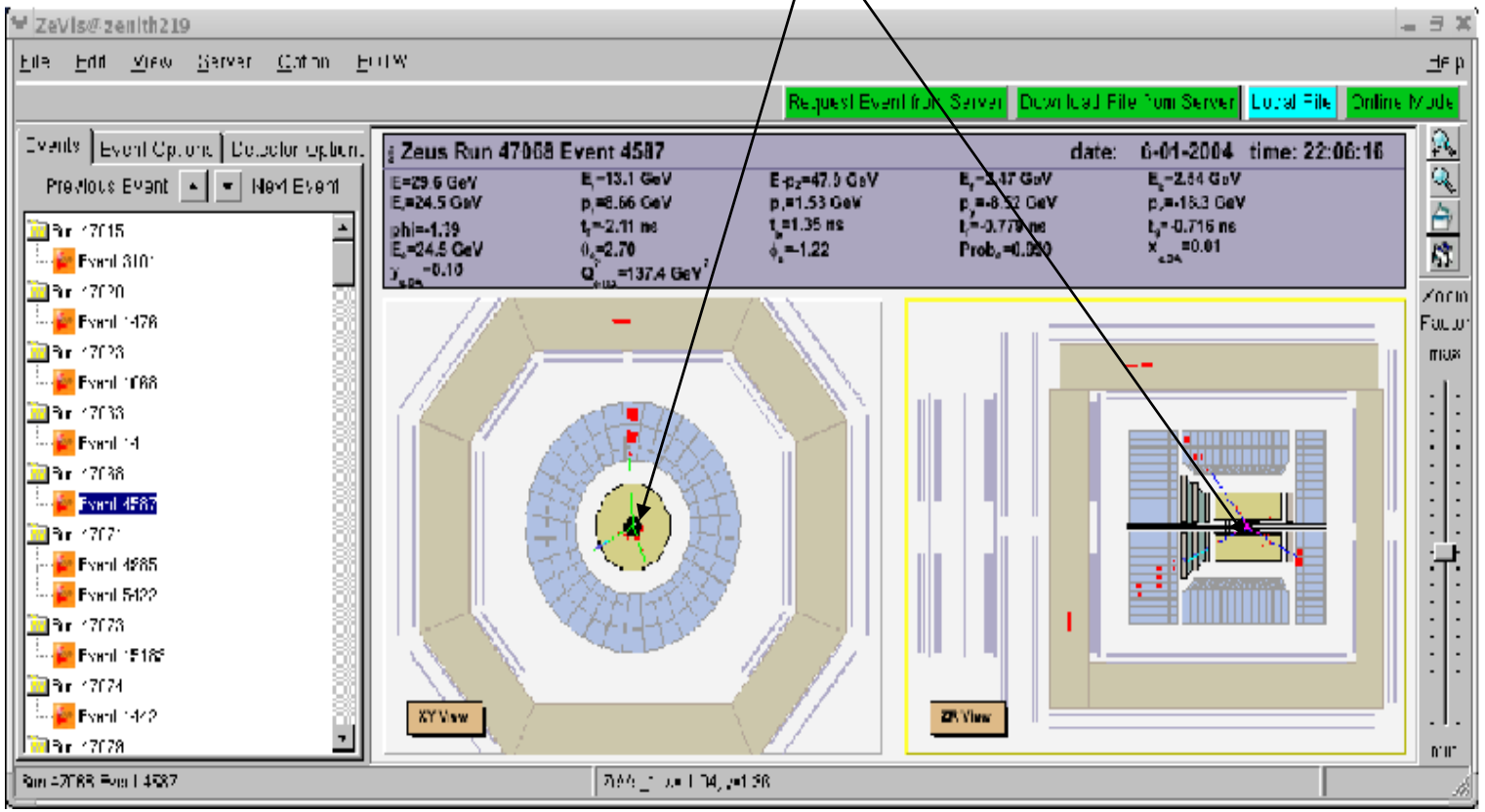
The ZEUS detector



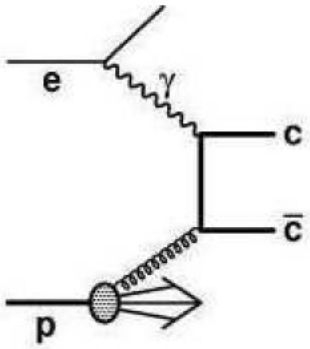


ZeVis-ZEUS Event Visualisation

MVD = Silicon Microvertex Detector



What are analysis tracks?



Example: charm production

Standard ZEUS reconstruction

$D^+ \to K^-\pi^+\pi^+$

candidate

Primary vertex

Secondary vertex

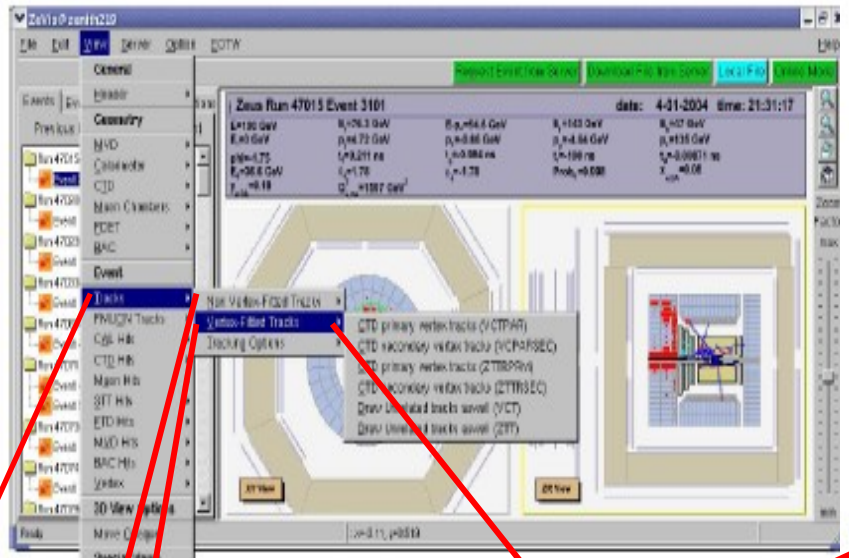
New primary vertex

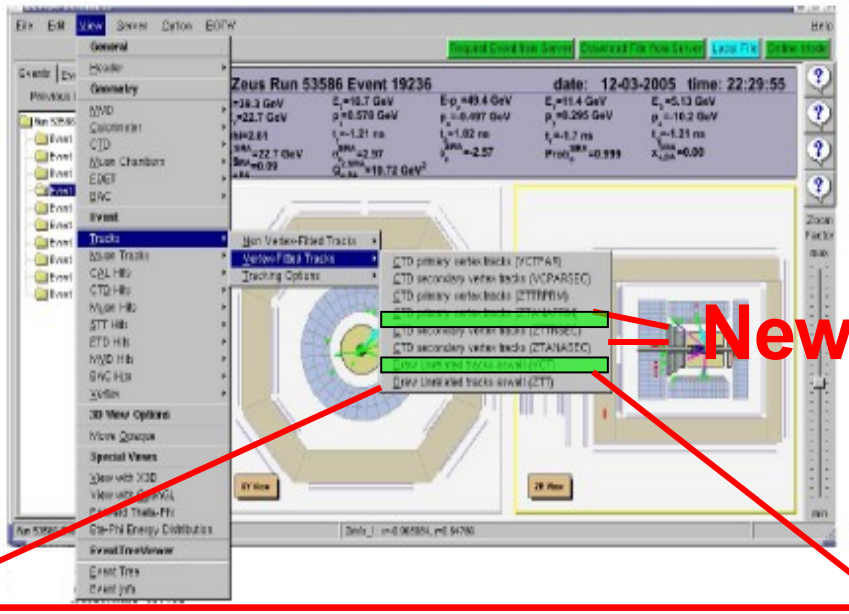
Revertexing at analysis level

The new menu options for tracks

Old display:

New display:





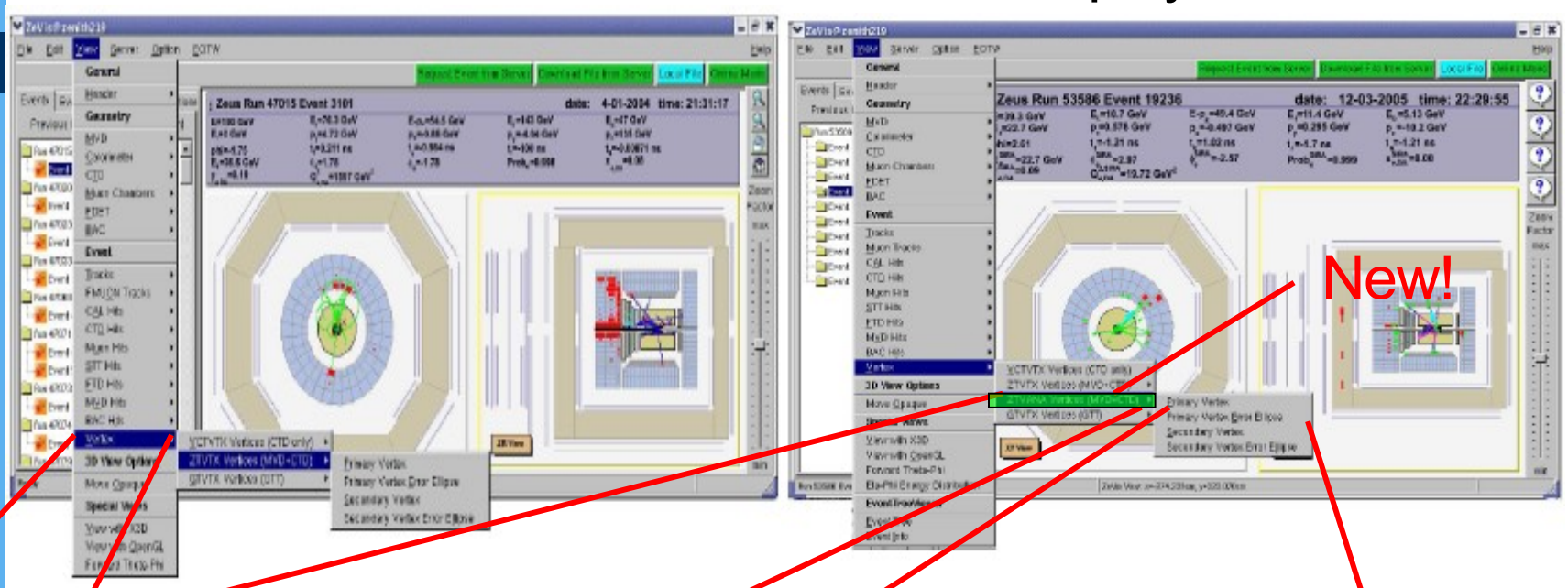
Tracks → Vertex-Fitted Tracks →

CTD primary vertex tracks (VCTPAR)
CTD secondary vertex tracks (VCPARSEC)
CTD primary vertex tracks (ZTTRPRM)
CTD primary vertex tracks (ZTANAPRM)
CTD secondary vertex tracks (ZTTRSEC)
CTD secondary vertex tracks (ZTANASEC)
Draw unrelated tracks as well (VCT)
Draw unrelated tracks as well (ZTT)

The new menu option for vertices

Old display:

New display:



Vertex →

VCTVTX Vertices (CTD only)
ZTVTX Vertices (MVD+CTD)
ZTANA Vertices (MVD+CTD)
GTVTX Vertices (GTT)

→

Primary Vertex
Primary Vertex Error Ellipse
Secondary Vertex
Secondary Vertex Error Ellipse

Technical implementation

A relative easy example:

Adding the menu options of the primary analysis tracks to the GUI

The menu options are done in ZClient

In `ZClient.h` the enumeration EZMenuOption has to be completed:

```
#ifndef ZEVIS_EZMenuViewOption
#define
ZEVIS_EZMenuViewOption
Enum EZMenuViewOption {
…
  kM_Tracks_ANA_Pri,
…
}
#endif
```

Technical implementation

Adding the menu options of the primary analysis tracks to the GUI

In `ZClient.cxx`:

Menubar has to be created:

```
void ZClient::CreateMenuBar() {
…
   fMenuViewOptionTracks->AddEntry(„&CTD primary vertex
    tracks (ZTANAPRM)“, kM_Tracks_ANA_Pri);
…
}
```

- **Entry has to be checked and unchecked alternately when clicked at:**

```
void ZClient::UpdateStatus() {
…
if (view->GetVisTracksANAPri() )
   fMenuViewOptionTracksVF->CheckEntry(kM_Tracks_ANA_Pri);
else
   fMenuViewOptionTracksVF->UnCheckEntry(kM_Tracks_ANA_Pri);
…
}
```

Technical implementation

Adding the menu options of the primary analysis tracks to the GUI

In `ZClient.cxx`:

Menubar has to be created:

```
void ZClient::HandleViewOptionMenu(Int_t id) {
…
case kM_Tracks_ANA_Pri:
  if (fMenuViewOptionTracksVF->Is EntryChecked(kM_Tracks_ANA_Pri) ) {
    fMenuViewOptionTracksVF->UnCheckEntry(kM_Tracks_ANA_Pri);
    view->SetVisTracksANAPri(0);
  } else {
    fMenuViewOptionTracksVF->CheckEntry(kM_Tracks_ANA_Pri);
    view->SetVisTracksANAPri(1);
…
  }
Break,
…
}
```

Technical implementation

Addition and filling of new track/vertex structures

Define new `class ZZtanaprm: public ZHelix {…}`

`class ZZtanasec: public ZHelix {…}`

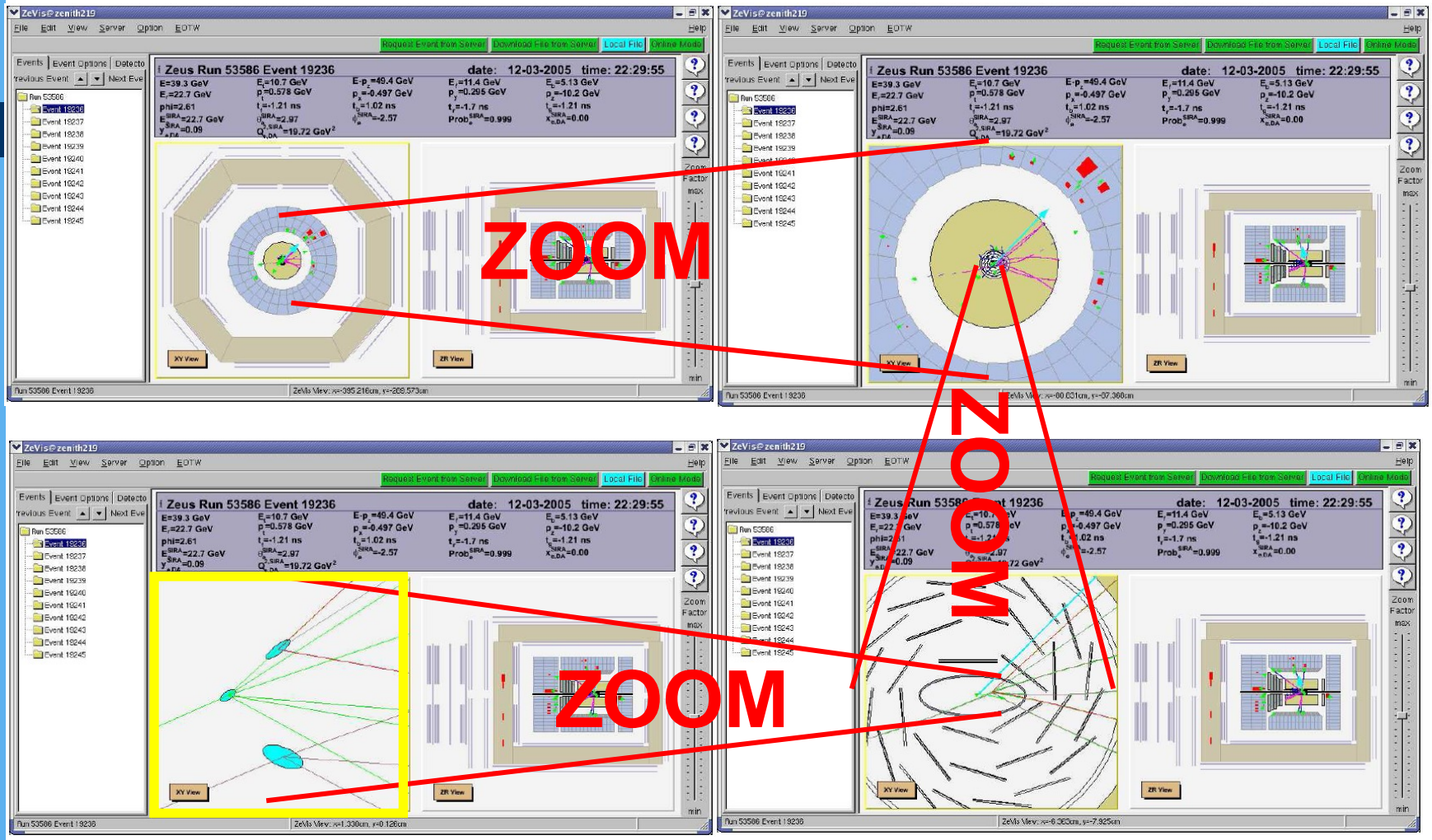
`class ZANAVertex: public ZMarker{…}`

New PopupMenu for ana vertexes

new track/vertex structures defined and filled

$\geq$ 29 files added or modified

The first revertexed events I displayed



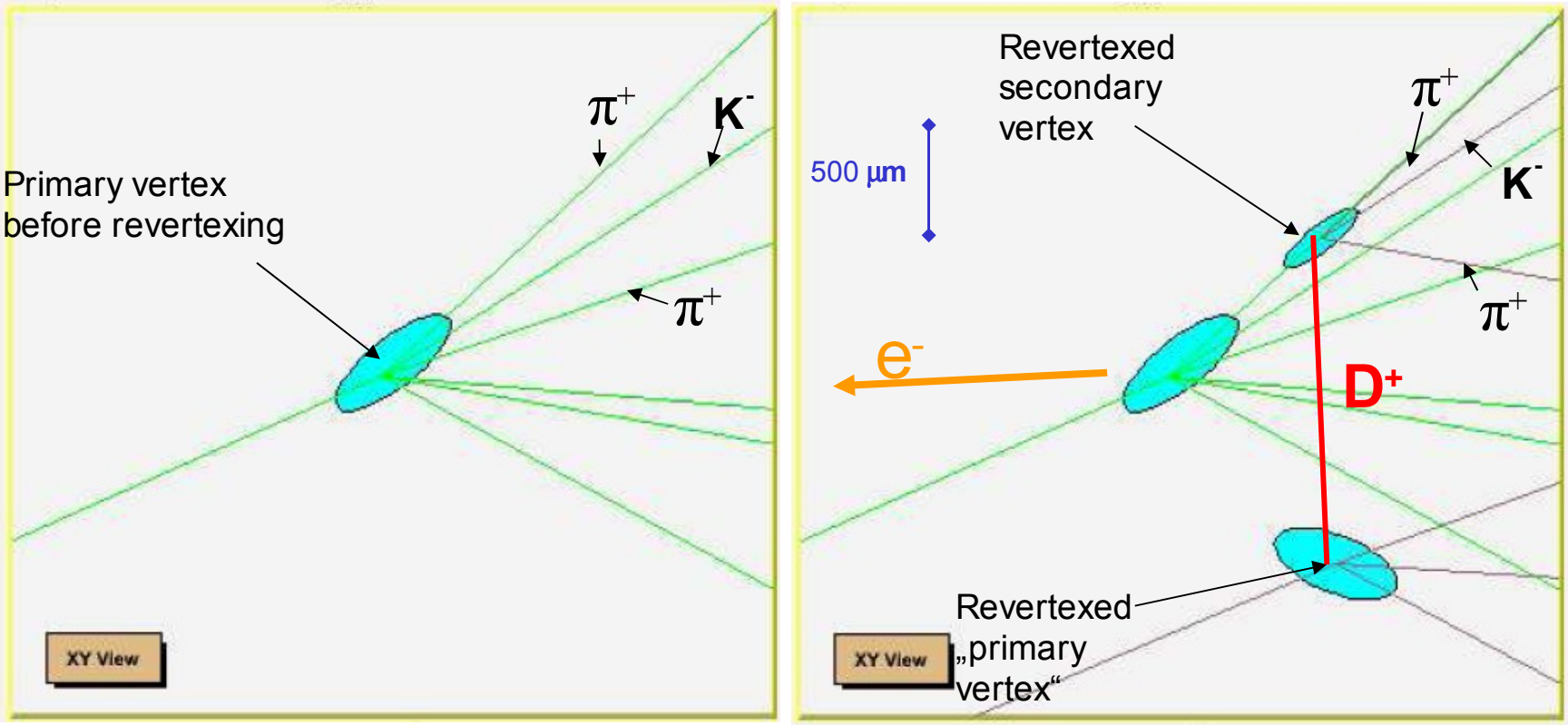
Event from D^+ preliminary result 2006 [1]

The first revertexed events I displayed

D^+-candidate

$c\tau(D+) = 305 \pm 26 \pm 14\ \mu m$

Old display: With analysis tracks:



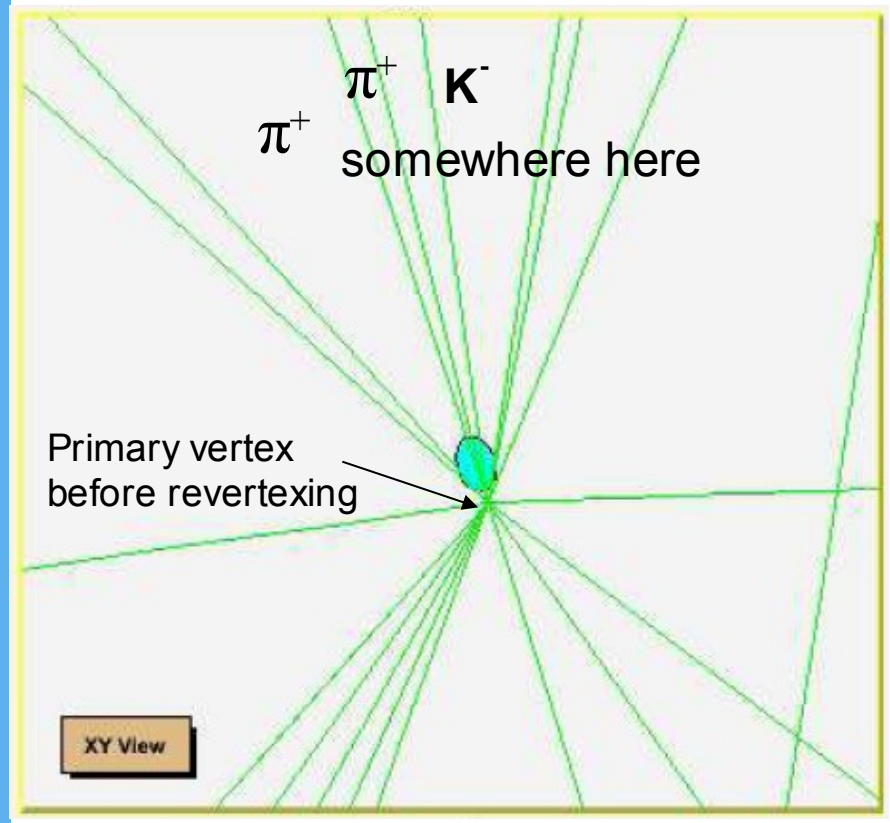
Run 53586 event 19236

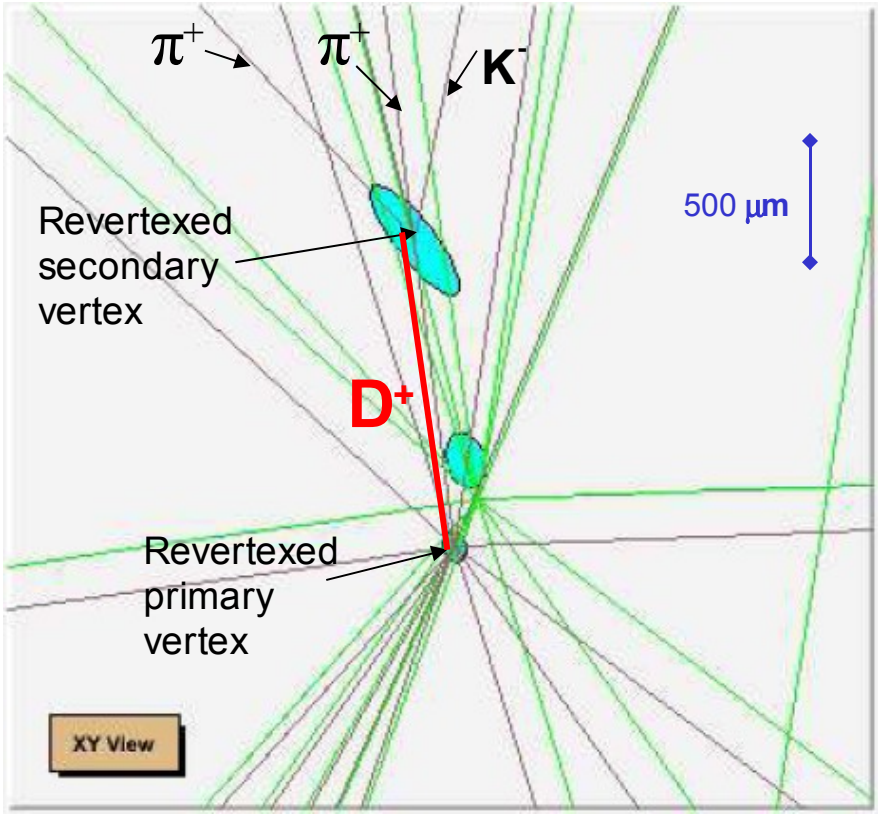
The first revertexed events I displayed

D^+-candidate

$c\tau(D+) = 305 \pm 26 \pm 14\ \mu m$

Old display: With analysis tracks:





Run 53921 event 24433

Conclusions

Task to facilitate the data analysis by adding the analysis tracks to ZeVis is fulfilled

Secondary vertices can be nicely seen

New defined classes can be used to fill in other kind of refitted data

There is still some room to improve the user-friendliness of ZeVis

The possibility to make simultaneous ticks in the user menu would be highly preferable

Problems with vertex buttons

etc.

Production and analysis of beauty in ZEUS

- HERA and ZEUS offer opportunity to investigate heavy flavour quarks
- Cross section for production very small, so all decay modes are important
- Tagging for hadronic decay modes introduced and used for analysis by Ana G. Yagues

Secondary analysis of beauty

Goals:

- Check results of primary analysis (decay length and invariant mass)
- Check transfer of analysis from „private“ environment to standard ZEUS analysis framework

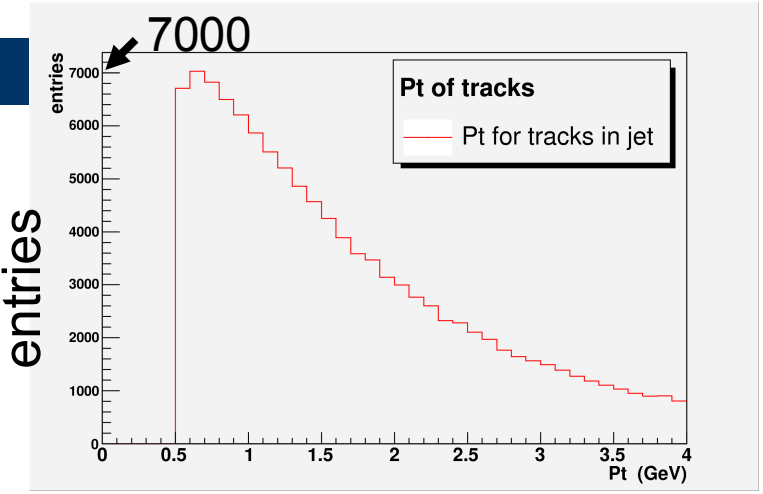
Secondary analysis of beauty

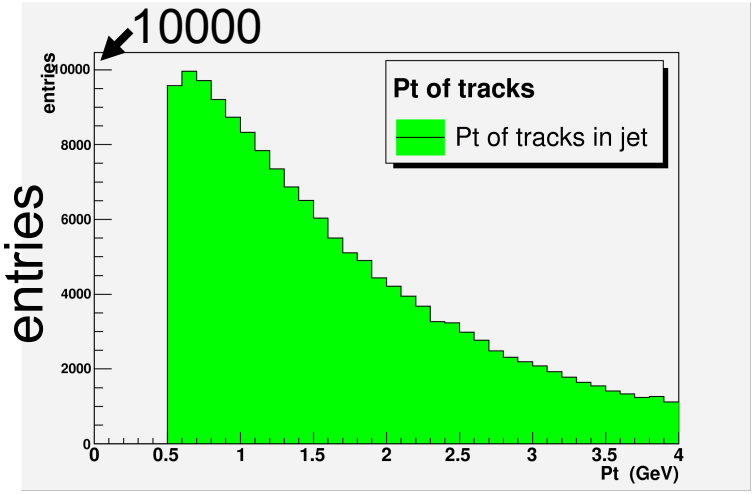
Comparison of control plots

Results:

Some problems with transfer to standard environment

Nevertheless, rough agreement with physics from primary analysis



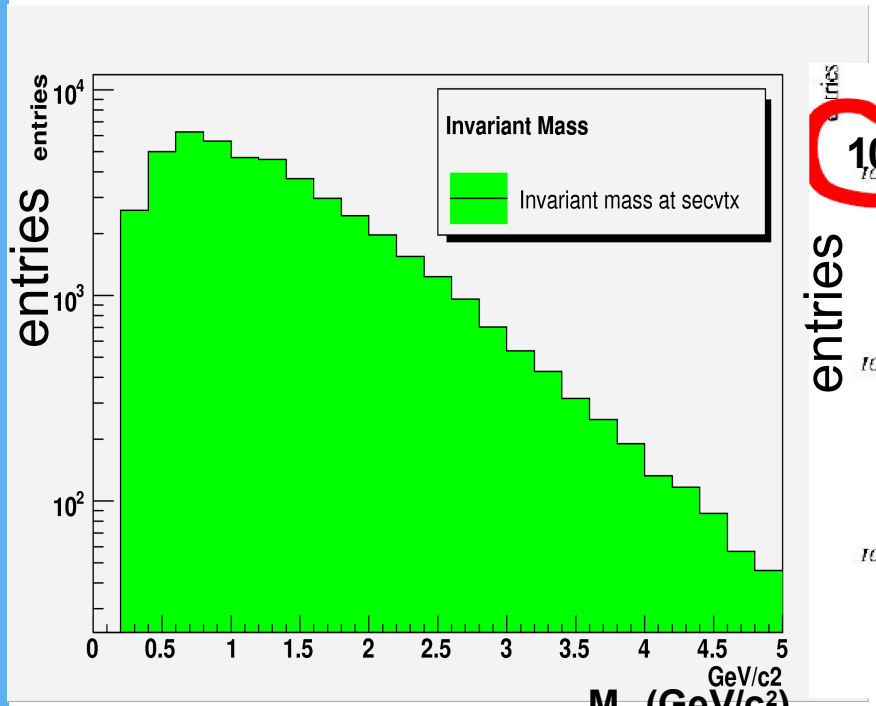


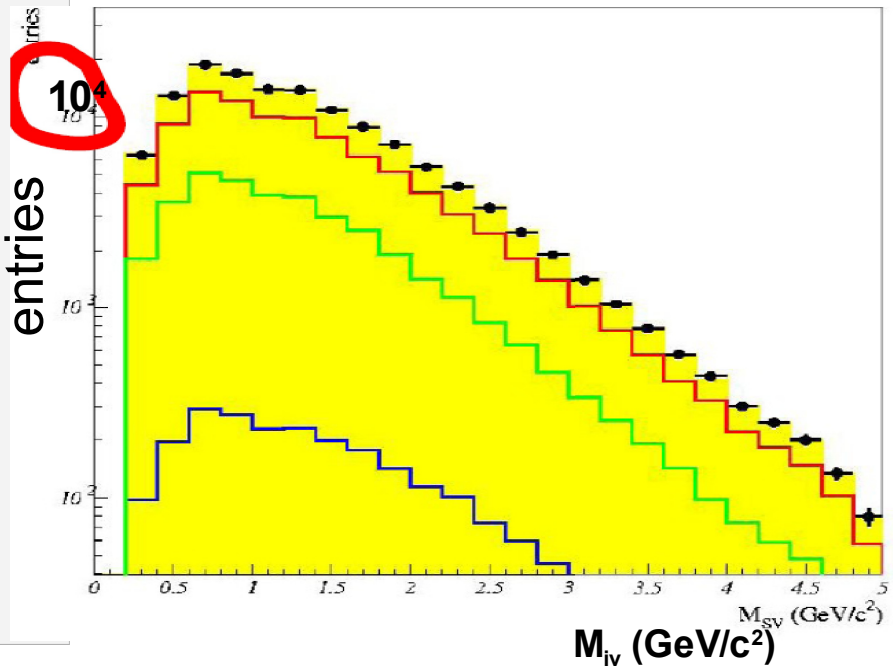
Secondary analysis of beauty

Results

Rough agreement in characteristic properties of heavy flavor mesons:

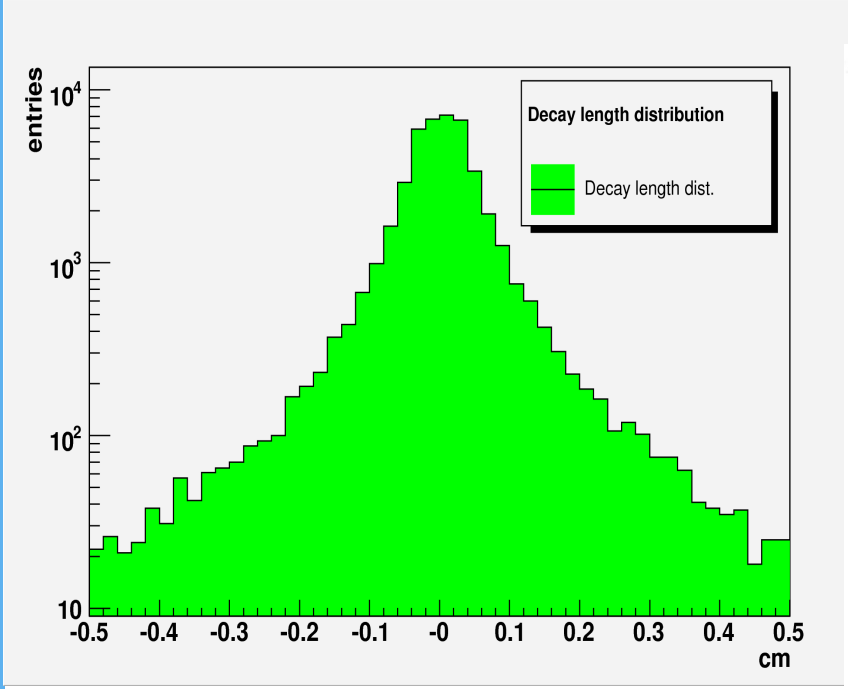
invariant mass …

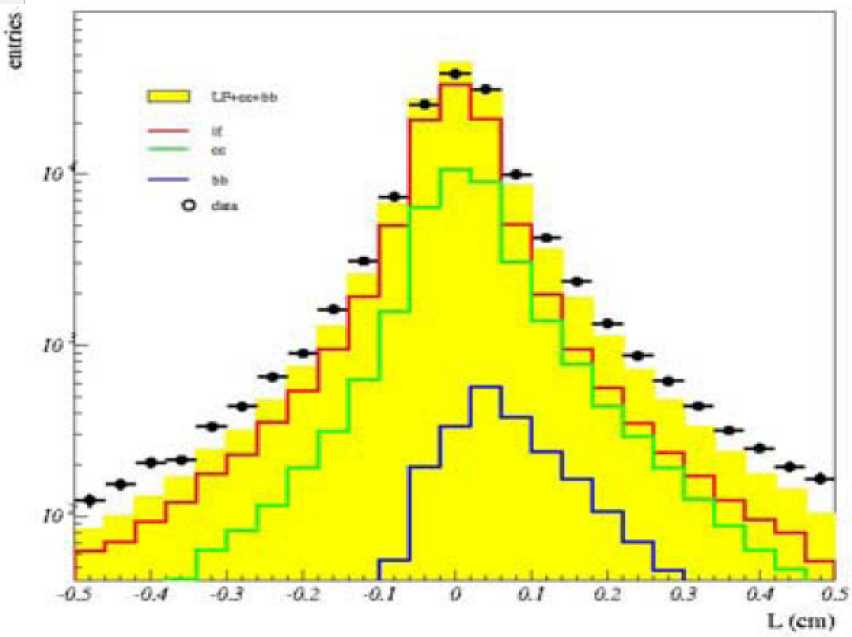




Secondary analysis of beauty

… and decay length





Conclusions

ntuple production does not work properly

the physics seems to agree

Hope that data get better with:

better flags (ntuple)

better implementation of cuts (ntuple)

better statistics/event selection

The End

Thank you for your attention!

Thanks to Achim Geiser, Ingrid Gregor, Philipp Roloff, Julia Grebenyuk, Meiert Willem Grootes