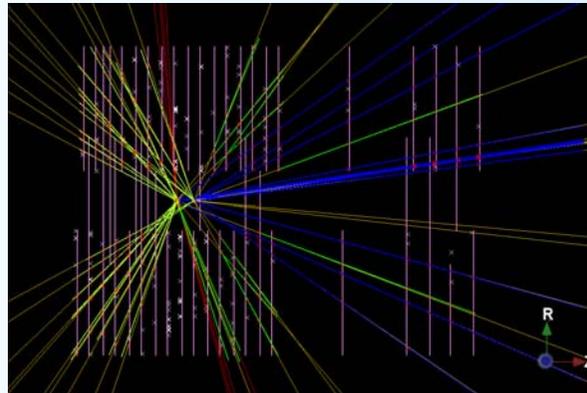


Clone Tracks Killing in DC'06

E. Rodrigues, NIKHEF



Goal

- Find tracks that are clones of other tracks

Definition of clones

- Two tracks are clones of each other if they share in the VELO and in the SEED stations at least 70% of hits

Present usage in our tracking

- Clone finder and killer run at the end of the tracking
- Uses by default Long, Ttrack, Upstream and Downstream tracks
- Outputs UNIQUE (= not clone) tracks to “best” container

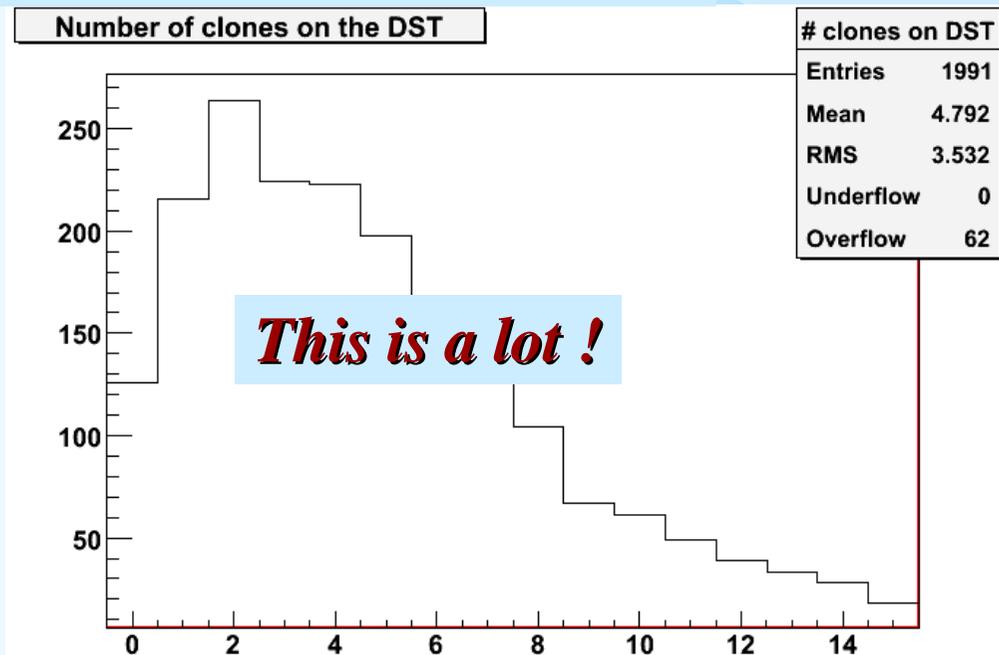
Bug found in the TrackCloneFinder tool !

- It affects all DC06 DSTs produced so far with Brunel, versions up to v31r0

Checking for clones on a buggy DST ... with the fixed tool ...

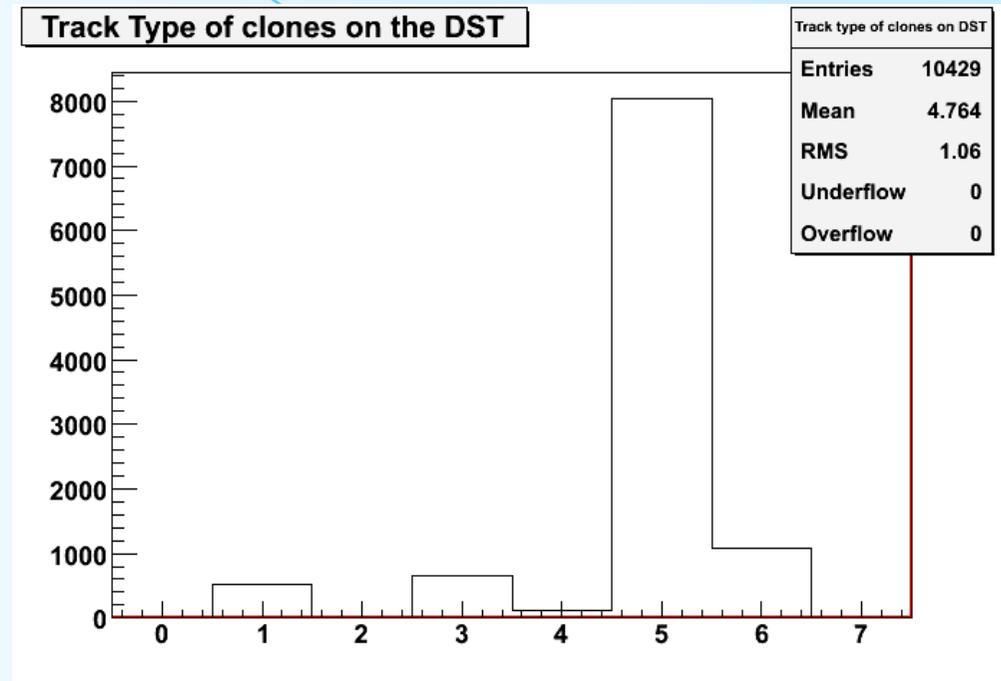
Read back a buggy DST

- check the “best” container
- Check for clones with the fixed TrackCloneFinder tool
- Plot the number of clones found per event ...



The bug potentially affects the clone finding every time one of the tracks does not have OT hits
 -> IT and OT hits ignored in the comparisons ...

Looking at the type of these clone tracks ...

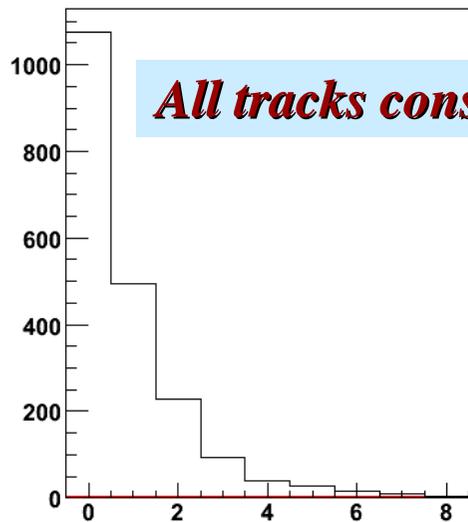


➤ **Clones of all track types !**

➤ **NOTE: Velo tracks should not be included, as they are not considered by the clone killer in Brunel**

But can the TrackCloneFinder bug explain it all ...?

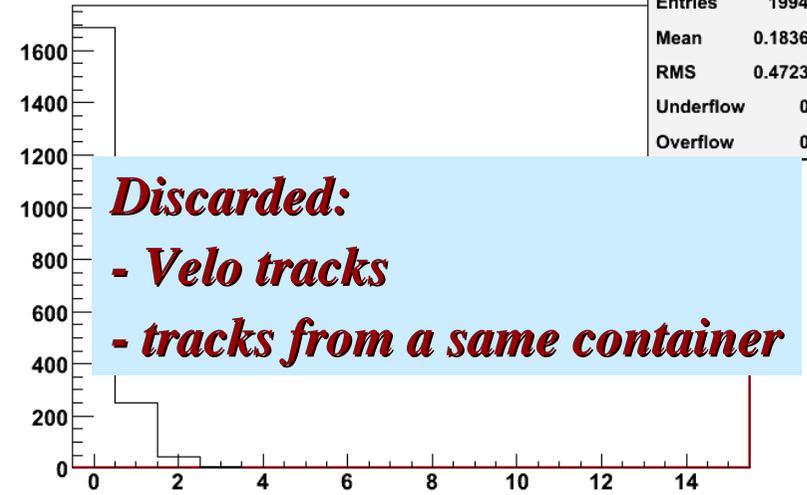
Number of clones on the DST



All tracks considered

# clones on DST	
Entries	1994
Mean	0.8852
RMS	1.362
Underflow	0
Overflow	0

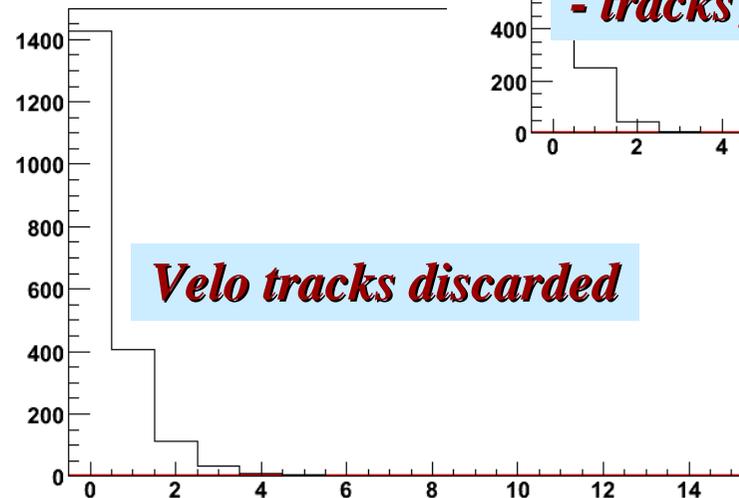
Number of clones on the DST



Discarded:
 - Velo tracks
 - tracks from a same container

# clones on DST	
Entries	1994
Mean	0.1836
RMS	0.4723
Underflow	0
Overflow	0

Number of clones on the DST



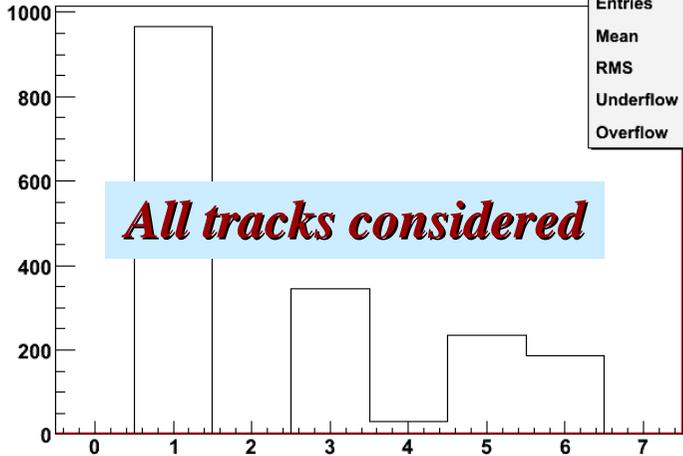
Velo tracks discarded

Read back a DST produced with the fixed tool

- Check the “best” container
- Check for clones with the fixed TrackCloneFinder tool
- `TrackCloneFinder.CompareAtLHCbIDsLevel = true`

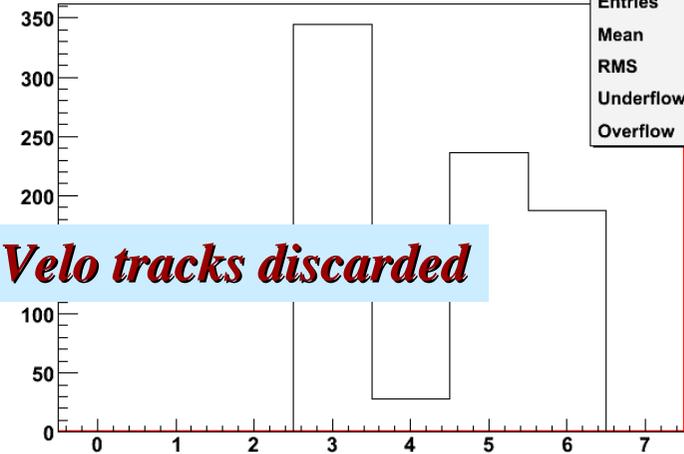
*I.e. at level of P. R. tracks.
 This is important to
 keep in mind*

Track Type of clones on the DST



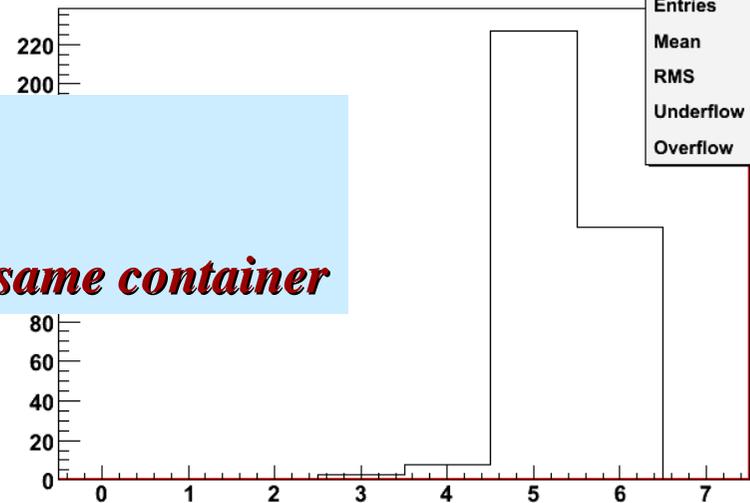
All tracks considered

Track Type of clones on the DST



Velo tracks discarded

Track Type of clones on the DST



Discarded:

- *Velo tracks*
- *tracks from a same container*

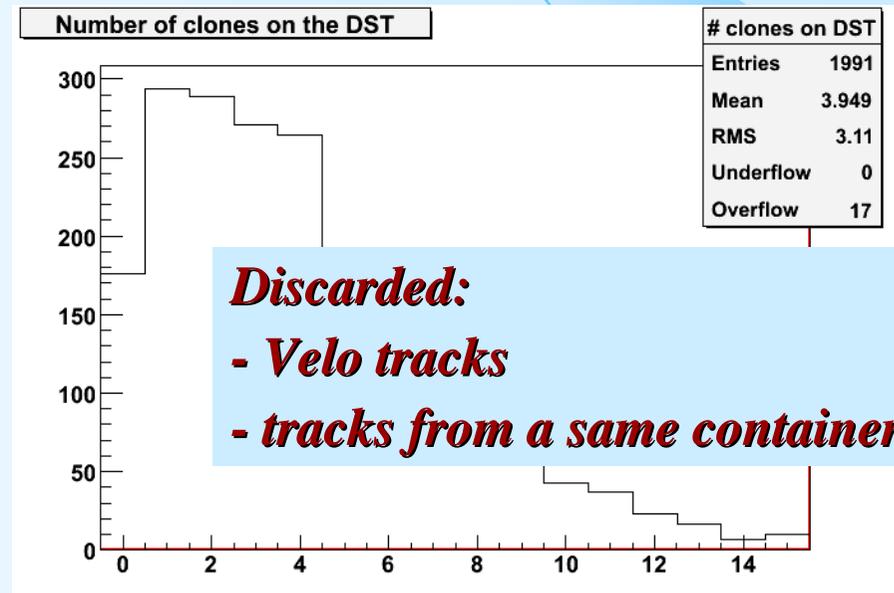
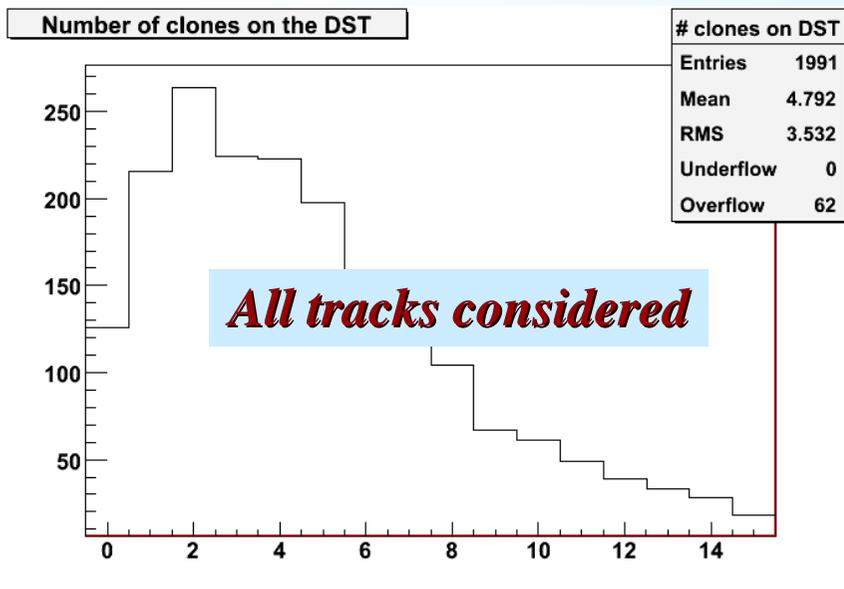
Observations & conclusions:

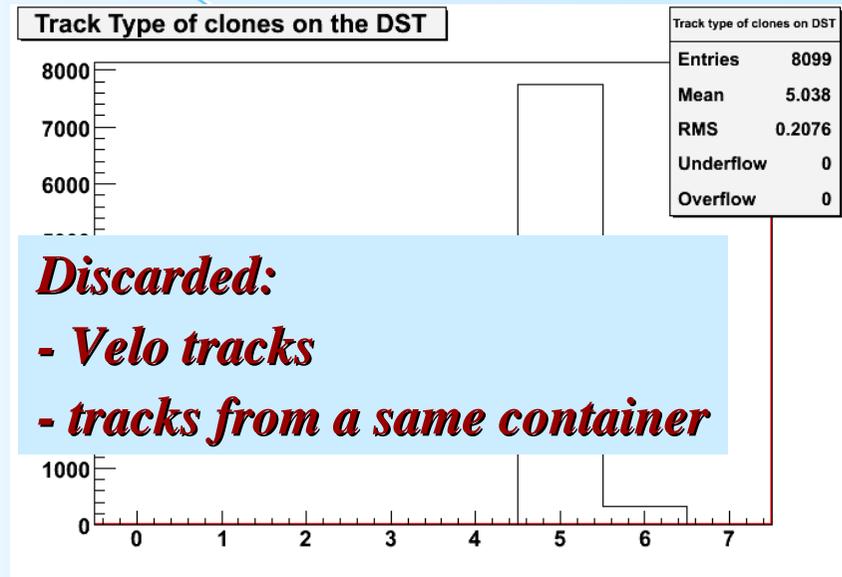
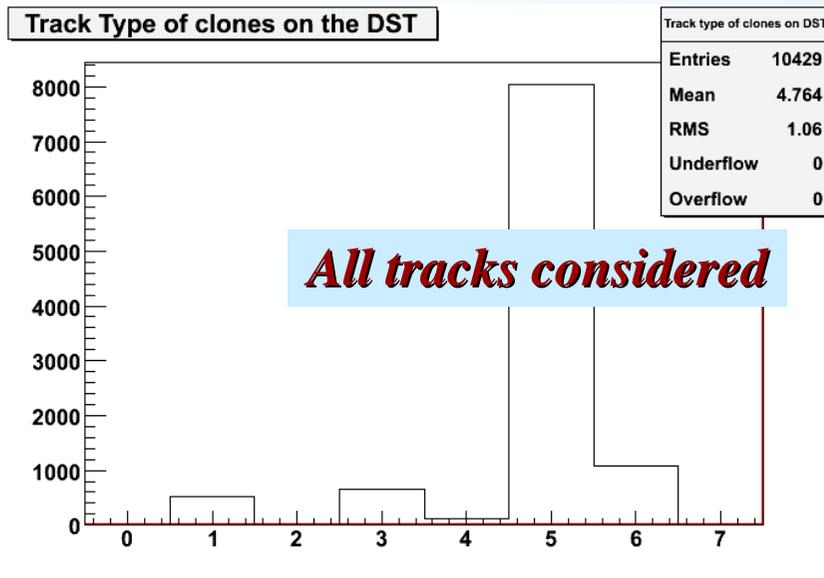
- **Almost all clones are from tracks of same type ...**
- **... and from the same container**
- **The pattern recognition algorithms are providing sets of tracks with clones amongst them !**
- **“Reason”**: by default the clone killer does not compare tracks from the same container (property *SkipSameContainerTracks = true*)

This is another « conceptual bug » !

Read back a buggy DST with the fixed tool

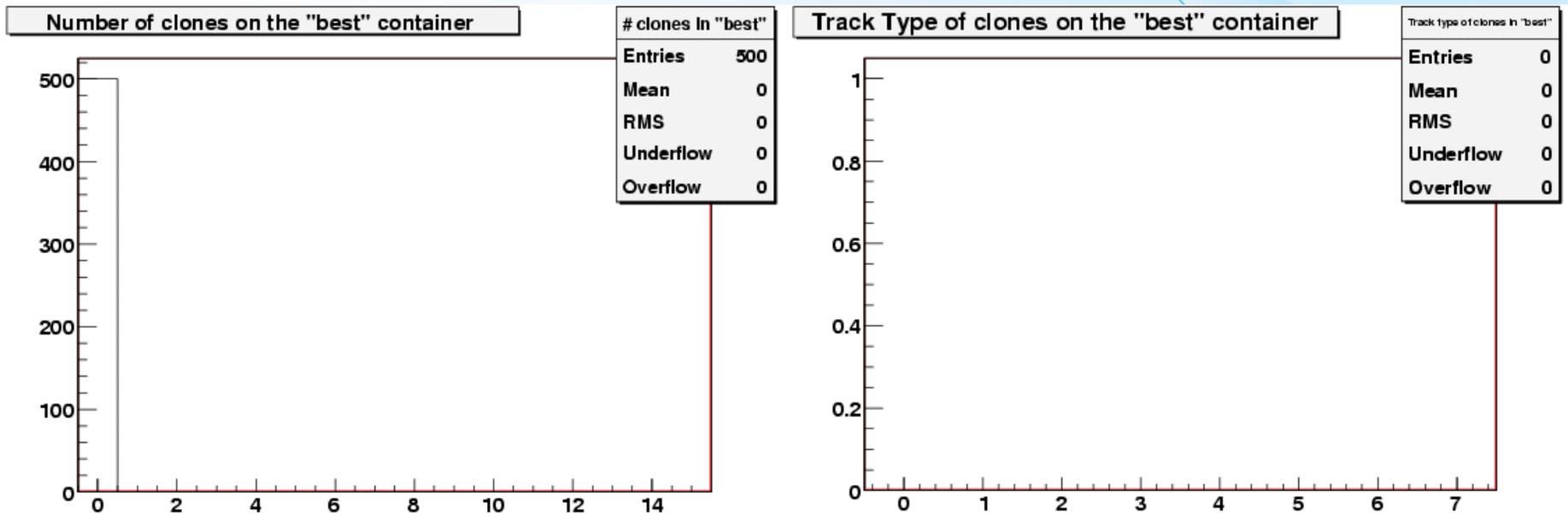
- **Check the “best” container**
- *TrackEventCloneKiller.SkipSameContainerTracks = false*
- **Check for clones with the fixed TrackCloneFinder tool**
- *TrackCloneFinder.CompareAtLHCbIDsLevel = true*





Running Brunel:

- **Fixed TrackCloneFinder tool**
- **Comparing fitted tracks at the level of the Measurements**
- **Clone killer comparing tracks from the same container**
(property *SkipSameContainerTracks = false* , not the default now!)



No clones found, obviously

TrackTools

- **Code has been fixed**
- **In CVS in the head version**

SIMPLE SOLUTION - in DaVinci

- **Add options at the very beginning of execution, to run a simple cleaner algorithm that removes clones from the *best* container**
 - **probably the easiest thing to do**
- **Need to write the trivial algorithm**

Remarks

- **Fix requires a new DaVinci build with a new Rec release, in order to run on the DSTs produced so far**
- **I would suggest to build a new Brunel as soon as possible to continue production with the bug fixed in the reconstruction**

Further remarks

- **Clone killer run in DaVinci will compare at the level of LHCbIDs, not the result of the fit (comparison of Measurements), as in Brunel**
- **This is a small difference – but it is there**

FULL SOLUTION - in DaVinci

- **Add options at the very beginning of execution, to refit all the tracks in the “best” container**
- **Run the clone killer afterwards, just as in Brunel**
- **This does mean a significantly slower DaVinci!**
- **Probably not what one really wants ...**