Beam Spot and Reprocessing

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- The problem
- May2010 reprocessing summary
- Possible solutions

Introduction

- **Obvious from past reprocessing campaigns that current beam spot reprocessing model is not sustainable**
  - Discussion with Data Preparation Coordination and others ongoing
- **Main problem: a circular dependency**
  - Reprocessed data (alignment!) is needed as input for beam spot determination
  - Beam spot is needed as input for reprocessing
- **In addition:**
  - Need primary vertices reconstructed without beam constraint - so far tried to redo only primary vertexing w/o beam constraint, but this is still not fully supported by autoconfiguration
  - Would like to run on express stream – so far only available at Tier0

Current Beam Spot Reprocessing Model

- **Current work flow:**
  1. Get (hopefully) final alignment tag plus updated conditions and release information as early as possible
  2. Produce primary vertex collection w/new alignment constants and w/o beam constraint (ESD, "DPD")
  3. Run beam spot fits on data from step 2
  4. Validate fits (rerun on data from step 2)
  5. Produce and check final beam spot tag
  6. (Ideally, would have time to run full reprocessing validation jobs w/new beam spot tag)

Equivalent to a private reprocessing campaign!

- **Very large effort required for step 2 - leaves typically no time to improve beam spot fit or address any problems**
  - As a result, danger that – instead of being better – reprocessed beam spot data is worse than original determination!

Example: May2010 Reprocessing

- **Switched to new alignment constants. With new COG scheme (using transverse beam spot as constraint) change of beam spot indeed small:**
  - ~5 μm in x, 0.1 mm in z, 0.4 mm in σ(z), O(50 μrad) changes in tilts
  - Changes in other parameters even smaller
- **Decided to carry out beam spot reprocessing anyway**
- **Almost all of the effort went into producing the necessary input data samples**
  - Heroic effort from James (in spite of being stranded for some time by Iceland volcano), using both Tier1 and private grid jobs,
- **Final analysis showed slightly larger fraction of cases where beam spot fit had not converged (mainly due to run 153565)**
  - In view of the small changes to the beam spot, it was felt that it was not worthwhile to delay reprocessing start by even 1 day to fix this
  - Stayed with old beam spot for May reprocessing

Possible Solutions (I)

- **Ideally, no need for beam spot redetermination when new alignment constants are introduced**
  - May still be possible to improve beam constraint in alignment procedure to minimize impact on beam spot, but unlikely that changes to beam spot can be completely avoided
  - After improving beam spot fits may want to provide better beam spot (this is really what beam spot reprocessing should be about!)
- **Main issue in current scheme that needs to be addressed is that beam spot group has had to carry out a "private reprocessing" just to obtain the necessary input data**
  - In principle, could re-reconstruct express stream at Tier0 with new conditions for reprocessing, then redetermine beam spot exactly as done initially
  - Would be ideal from beam spot point of view
  - But doesn't seem to be feasible (lack of resources; would require staging back of raw data for express stream)

Possible Solutions (II)

- **If Tier0 cannot be used for reprocessing, work at Tier1**
  - So far express stream not exported, so had to work with larger MinBias stream
  - Possible improved scenario for using Tier1:
    1. Reconstruction of express stream using reprocessing conditions without beam constraint. Carried out by production/reprocessing team.
    2. Beam spot group runs beam spot fits and validation jobs at Tier1 on this new express stream data (requires ESD or AOD).
    3. Download results (beam spot validation ntuples) to CAF for final validation and generation of beam spot tag.
    4. Provide updated beam spot tag for reprocessing.
  - Note: requires ability to run jobs over predefined sets of luminosity blocks (e.g. 1-5, 6-10, etc)

- **Other alternatives:**
  - Derive and apply approximate transformation to existing beam spot data to take into account changes w/o a full redetermination
  - **...**

Conclusions

- **The present model for beam spot reprocessing is not sustainable and needs to be improved**
- **From point of view of beam spot determination, favored solutions are:**
  - Run at Tier0 exactly as done for the initial processing
  - If this is not possible, run at Tier1 in a similar manner (requires job bunching per N LBs at Tier1)
  - In both cases, need express stream re-reconstructed with reprocessing conditions and without beam constraint as input
- **Discussions on best solution are in progress**