Disk Space Request

Requester: Christopher Flores (chrflores@ucdavis.edu)
PWG: Light Flavor Spectra
Requested Size: 7TB / 2TB
Requested Duration: 2 Months / 8 Months
Preferred Location: /star/data01/pwg/cflores/
Purpose: Production of Fixed Target Candidate Events from Run14

Background Info:
A fixed-target apparatus containing a gold foil was installed into the beam pipe near the STAR detector at a z location of 210cm in advance of Run14. It is expected that throughout the 14GeV running during Run14 there were interactions between beam-halo nuclei and the target foil providing fixed-target nuclear interactions with a center-of-mass energy of 3.9 GeV. We would like to investigate these interactions. However, the STAR standard vertexer, used during the official production of the 14GeV Run14 data, has a z range of [-200,200] cm. This does not reach out to the location of the fixed target. Thus, to be able to investigate the fixed target interactions we must perform our own data production. This disk space request is in support of this production.

Details of Production Procedure:
STEP 1: Identify fixed-target candidate triggers using a custom vertexer and the official production data. A list of candidate triggers and their run numbers is created.
STEP 2: Full DAQ Files from HPSS are transferred to disk and processed with the daqFileChopper to create reduced DAQ files containing only fixed target candidate events. If the chopping process was successful the full DAQ files are removed.
STEP 3: The reduced DAQ files are processed with the full production chain (BFC) where the only change to the standard STAR code has been a modification of the standard STAR vertexer which allows it to search for vertices out past the location of the fixed-target. This step produces MuDst files with only fixed-target candidate events.
STEP 4: Finally, skimmed data files are created which will be used for further analysis.

Production Libraries, Options, Code and File Documentation
The data production will proceed with as near-as-possible consistency to the official production for the 14GeV Run14 data shown here: http://www.star.bnl.gov/devcgi/dbProdOptionRetrv.pl
For the fixed-target production we use:
STAR Library: SL14i
BFC Chain Options: DbV20150110 P2014a btof mtd BEmcChkStat Corr4 OSpaceZ2 OGridLeak3D -hitfilt

As noted the only change we make to the standard STAR code is to increase the range of the vertexer. Namely, we have changed the following lines in StGenericVertexMaker/Minuit/StMinuitVertexFinder.cxx:
Line 256: The upper bound of the for loop has been changed from 400 to 500.
Line 266: The seed_z variable has been changed from -200 to -250.

Together these two changes permit the vertexer to search the range (-250,250). The first change keeps the ratio of the number of searched z bins to z length = 1. E.G. each z Bin corresponds to 1cm. The second change permits the seed location for the vertexer to be in the extended search range.

Production scripts for duplicating this custom production will be documented and stored in CVS when the full production has been successful.

We expect that most users interested in this data will do so via their own scripts by accessing the MuDsts as they would for any other STAR production.

Why more disk space?:
We request a fairly large allotment of space (7TB) for a relatively short period of time (2 Months). This space will be used to temporarily store the full DAQ files in STEP 2 for processing in STEP 3. The rate of the current progress (see below) is limited by how many full DAQ files we can simultaneously store on disk for processing. Having more disk space will permit us to process more files concurrently and therefore accelerate the production process.
When the production procedure is completed we will be left with reduced DAQ files containing fixed-target candidate triggers, their respective MuDsts, and skimmed data files. We therefore ask for a smaller allotment (2 TB) for an extended period of time (8 months) which we will use to store these files.

Current Progress (as of 2/25/15) and Proof of Principle:
→ We have identified a total of ~3.3 million fixed-target candidate triggers via STEP1.
→ Production code for STEP 2 – STEP 4 has already been shown to be effective. So far we have processed ~216 runs numbers which corresponds to 4878 full daq files and 4474 reduced daq files containing only fixed-target candidate triggers. (Not every full DAQ file contains a fixed target trigger)
→ This has yielded MuDsts with ~603K fixed-target candidate triggers and 1.85M Primary Vertices (See Figures 1,2,3)

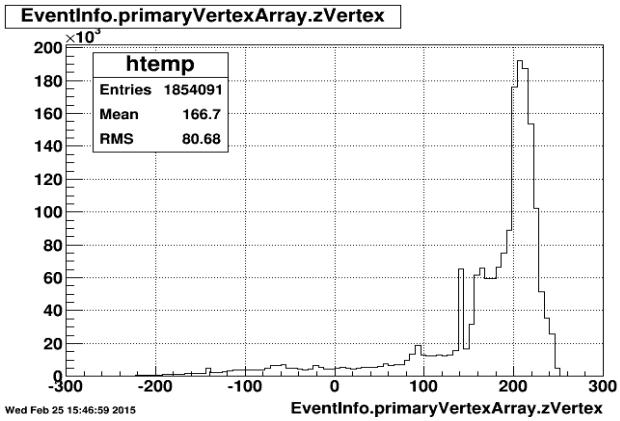

Figure 1: Z Vertex Distribution of primary vertices in fixed target candidate events obtained from the MuDst files produced via the production procedure. A clear spike is evident at the location of the fixed target, 210cm. (As of 2/25/15)

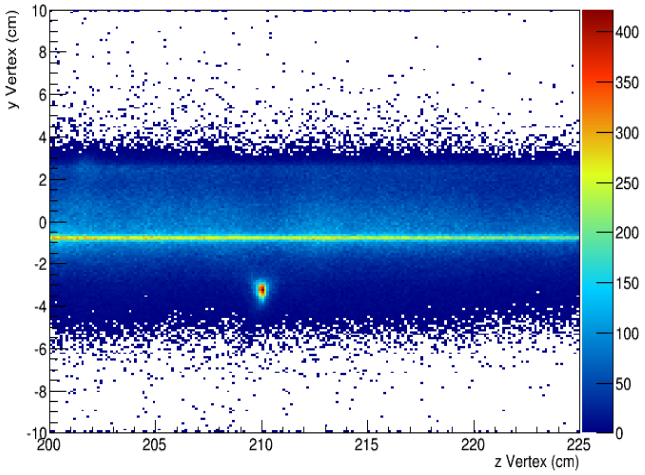

Figure 2: Y vs Z Vertex distribution of primary vertices in fixed target candidate triggers. A clear excess is shown at z=210 cm and y~-3 cm, the location of the fixed target. (As of 2/25/15)

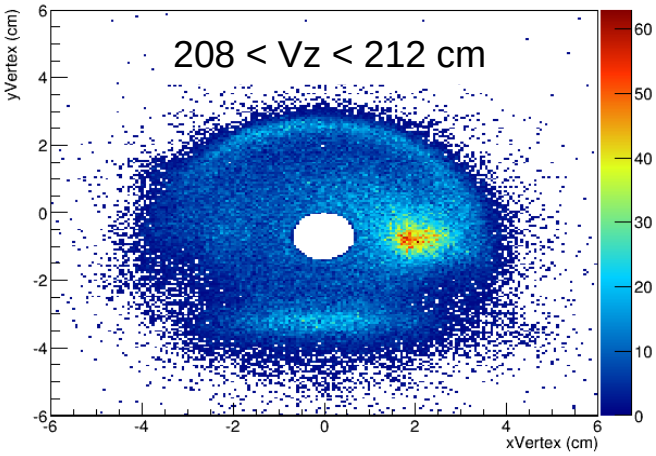

Figure 3: Y vs X distribution primary vetices of fixed target candidate triggers with a zVertex selection around the target and with the central region removed. The excess along x in the negative y region corresponds to the installed target foil. The bright spot near (2,-1) is suspected to be out-of-time pile up, but will be investigated. (As of 2/25/15)