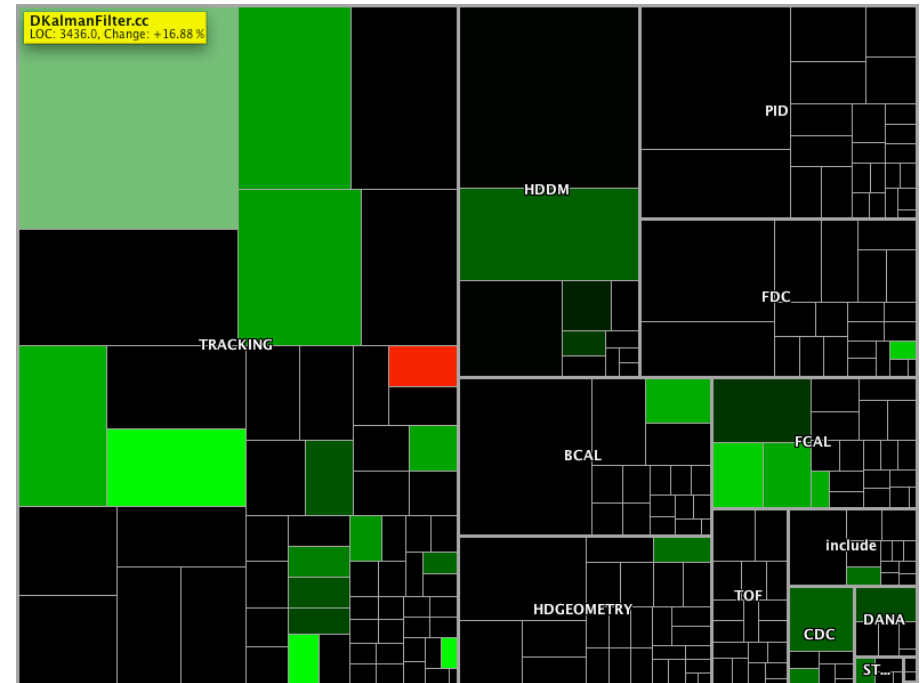
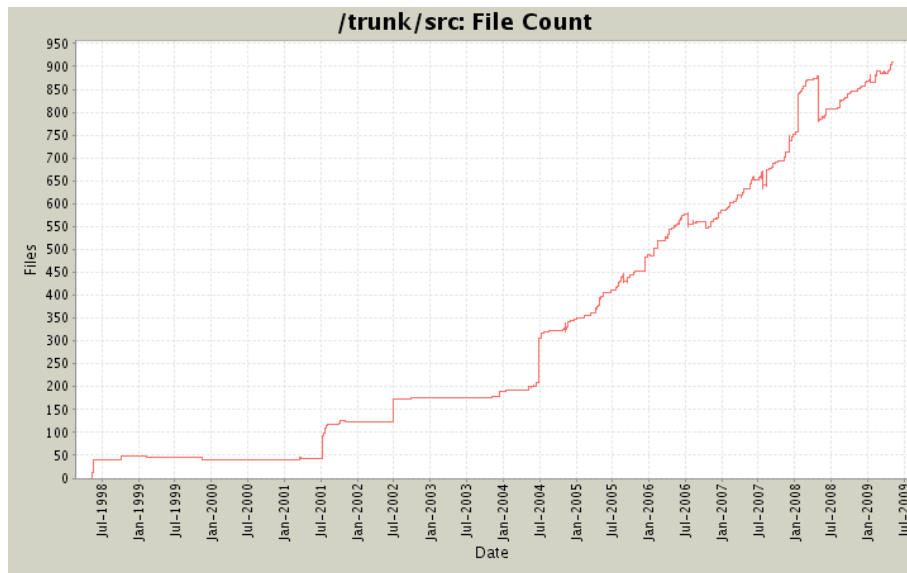
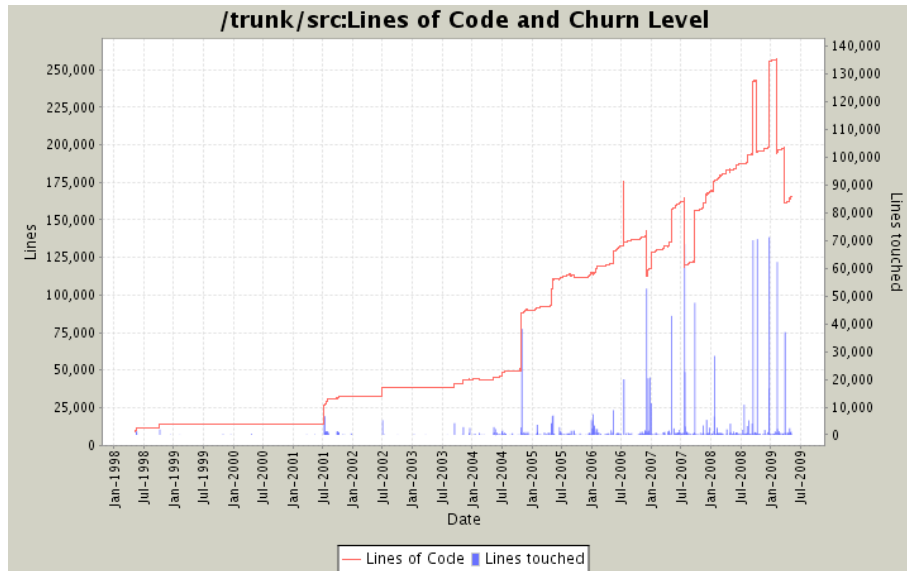


Hall-D Software Status

May 12, 2009

David Lawrence

Repository Activity



Developer of the Month

Month	Author	Lines
May 2009	davidl	178
April 2009	davidl	3985
March 2009	davidl	919
February 2009	davidl	2856
January 2009	staylor	665
December 2008	davidl	69991
November 2008	staylor	1795
October 2008	davidl	11666
September 2008	zihlmann	59062
August 2008	davidl	5288
July 2008	zihlmann	6361
June 2008	davidl	1255
May 2008	davidl	1567

One tagged release of Hall-D source since last collaboration meeting:

release-2009-02-04

Repository Changes

- Start counter 40-stave geometry (not default)
- CDC Geometry modified to reflect final design
- Gas Cerenkov detector removed*
- Control cards in *hdgeant*
 - Pattern key size extended from 4 to 16 characters
 - SAVEHITS enable/disable “no hit” events in output
 - SHOWERS_IN_COL enable/disable showers in collimators
 - PLOG sample momentum from log distribution for particle gun
 - TLOG sample theta angle from log distribution for particle gun
- *DMagneticFieldMapSpoiled* class added to allow simulation or reconstruction with a “spoiled” field
- Updated *invariant_mass_hists* plugin which provides an example of how to use reconstructed values in an analysis

**or will be very soon*

... Repository Changes

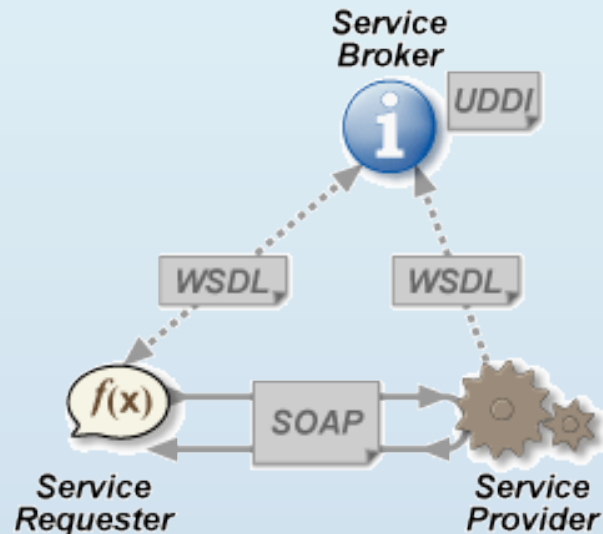
- Detector numbering scheme
 - ID number increases as lab coordinate increases
 - TOF and FCAL updated (others OK)
- Added material map for tracking
 - Simon's radlen map (deprecated)
 - Beni's DRootGeom class (Kalman and ALT1 fitters)
- hddsGeant3.F removed from repository
- DTrackHitSelector formalizes hit selection
- Calorimetry
 - BCAL segments drawn in hdview2
 - BCAL threshold based on readout device
 - BCAL dark hits added to response (post *hdgeant*)
 - FCAL radiation hard inner layer
 - TwoGammaFit updated to include both pre and post fit photons

Framework Development

- JANA releases since last meeting:
 - Jan. 25 release 0.4.9
 - Mar. 10 release 0.5.1
 - May 1 release 0.5.2
- New features:
 - Optional recording and dumping of calibration requests
 - Option to have framework maintain ownership of calibration constants
 - Discovery mechanism for calibration system
 - gSOAP and calibration DB access through Web Service
 - Optional dumping of configuration parameters at end of job

...slide shown at CHEP09 ...

Calibration Web Service



- Calibration constants will need to be accessible from remote computers via the internet

- Direct access to a database is problematic due to cybersecurity concerns

- Web services work over HTTP and so are the appropriate mechanism for remote access

- The *JCalibrationWS* class provides calibration constants through a web service
 - Implemented as a plugin so remote access can be added to an existing executable
 - Allows read-only access to calibration constants from anywhere in the world over HTTP (<http://www.jlab.org/Hall-D/cgi-bin/calib>)
 - Uses gSOAP, a C++ SOAP implementation
 - Currently works like a proxy for *JCalibrationFile* on server side, but could trivially be made to use another type of backend

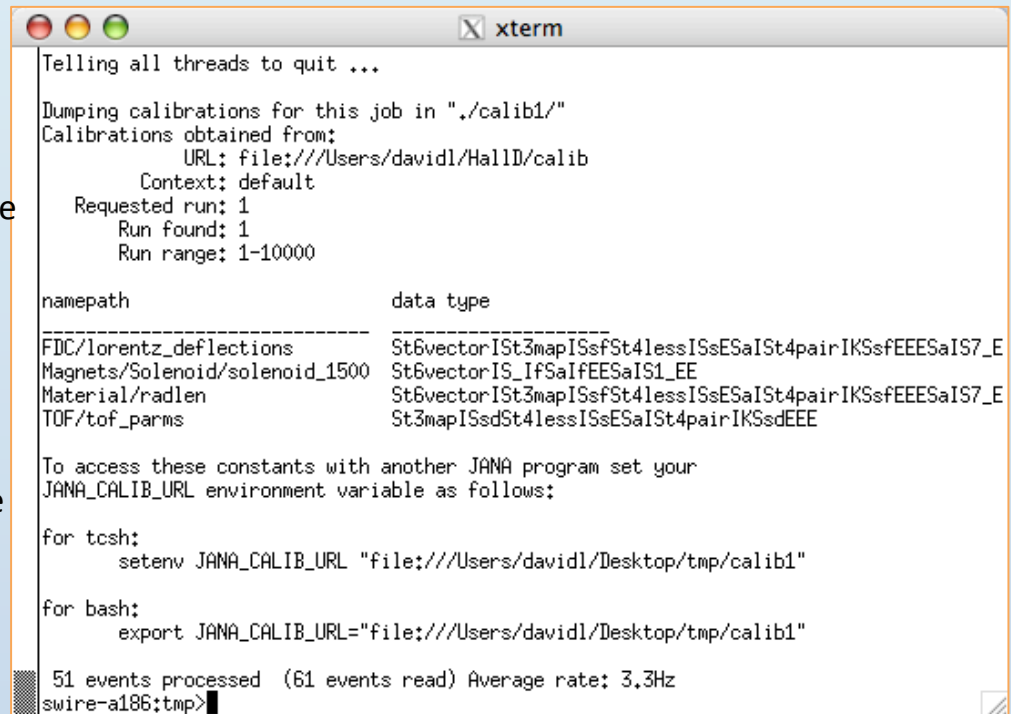
...slide shown at CHEP09 ...

Saving a (semi-)complete set of calibration constants to the local disk

All JANA programs have the command line option:

`--dumpcalibrations`

- Records which *namepaths* are requested during a job and writes the constants into ASCII files compatible with *JCalibrationFile*
- Avoids copying and running entire database or even copying a “complete” set of calibration constants (which could include obsolete ones or ones not applicable to the current run/code version)



```
Telling all threads to quit ...
Dumping calibrations for this job in "./calib1/"
Calibrations obtained from:
  URL: file:///Users/davidl/HallD/calib
  Context: default
  Requested run: 1
  Run found: 1
  Run range: 1-10000

namepath                                data type
-----
FDC/lorentz_deflections                  St6vectorISt3mapISsFSt4lessISsESaISt4pairIKSsFEESaIS7_E
Magnets/Solenoid/solenoid_1500          St6vectorIS_IFSaIFEEESaIS1_EE
Material/radlen                          St6vectorISt3mapISsFSt4lessISsESaISt4pairIKSsFEESaIS7_E
TOF/tof_parms                            St3mapISsdSt4lessISsESaISt4pairIKSsdEEE

To access these constants with another JANA program set your
JANA_CALIB_URL environment variable as follows:

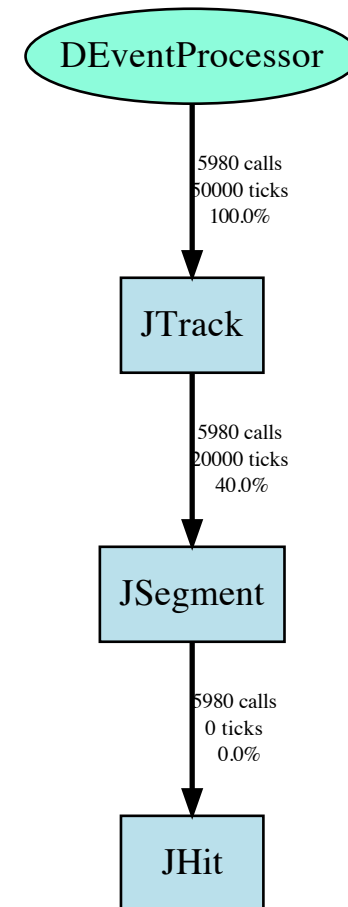
for tcsh:
  setenv JANA_CALIB_URL "file:///Users/davidl/Desktop/tmp/calib1"

for bash:
  export JANA_CALIB_URL="file:///Users/davidl/Desktop/tmp/calib1"

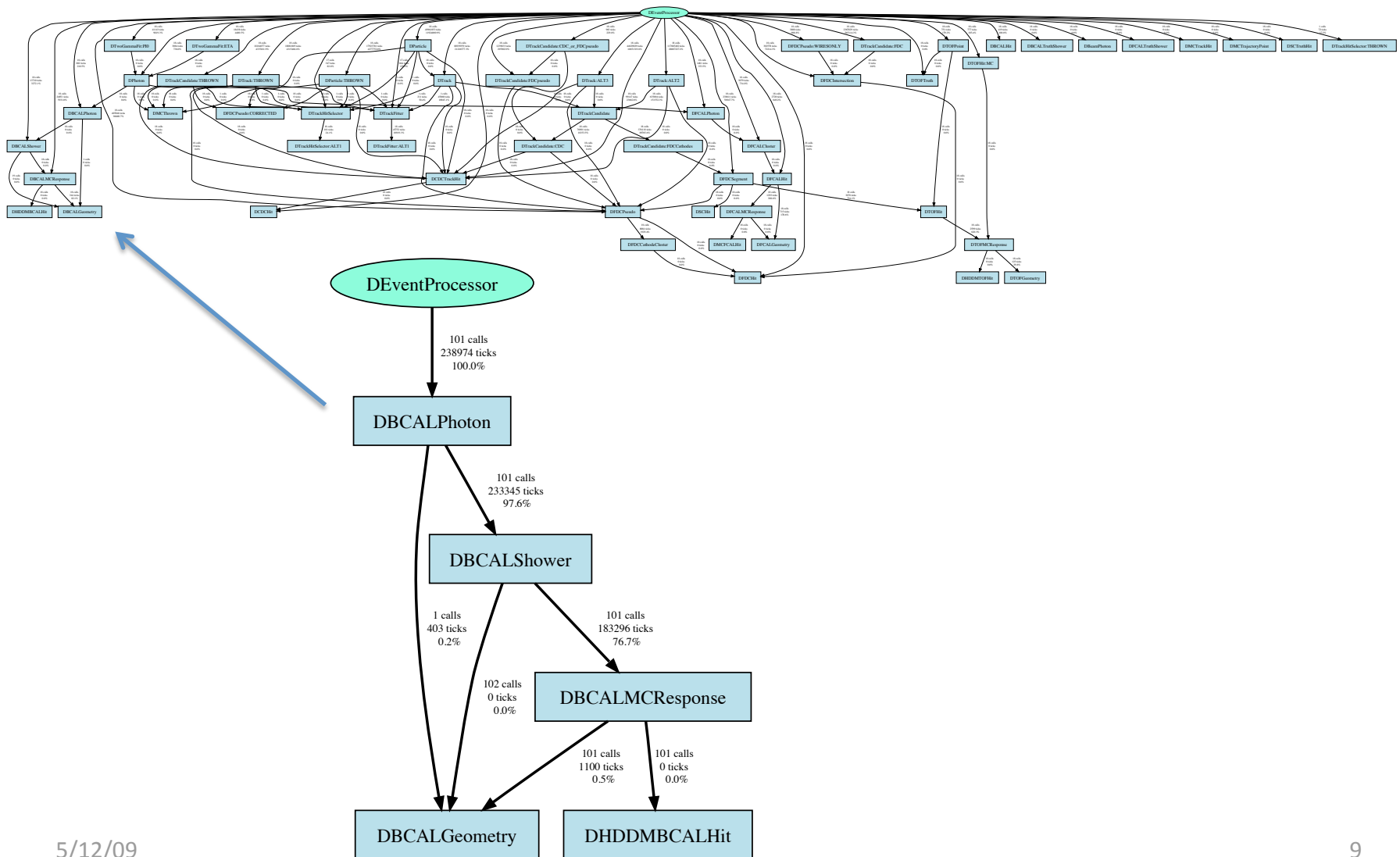
51 events processed (61 events read) Average rate: 3.3Hz
swire-a186:tmp>
```

Collaboration with Hall-B

- Hall-B continues to work toward a service oriented architecture (SOA)
 - Cyber security issues
 - Unknown performance benefit/deficit
 - Flexibility in choosing language for individual packages
- JANA in Hall-B
 - Early discussions suggested using JANA within *Clara* (the Hall-B SOA project name)
 - Recently, test framework setup by M. Ungaro (~1.5 hrs.)



GlueX Reconstruction Dependency Graph



JANA Publications

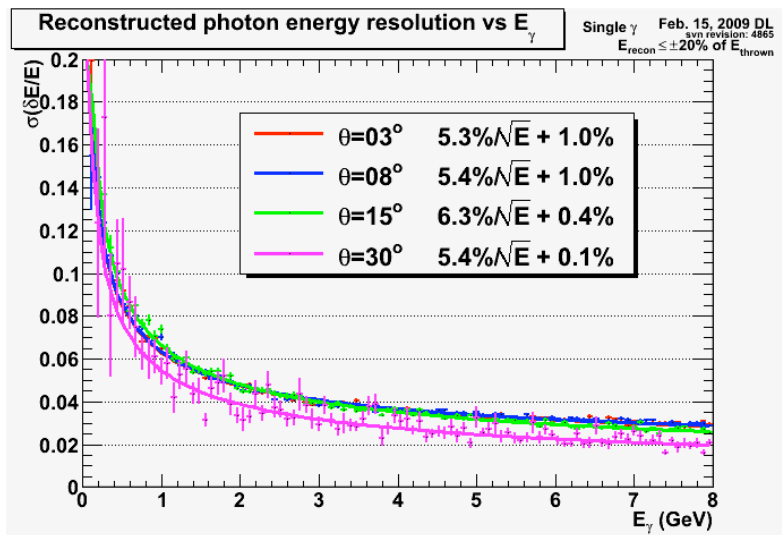
- *Multi-threaded event reconstruction with JANA*
D. Lawrence 2008 *J. Phys.: Conf. Ser.* **119** 042018 (6pp)
doi: 10.1088/1742-6596/119/4/042018
- *Multi-threaded event reconstruction with JANA*
-in process- Proceedings of ACAT08 workshop
- *The JANA calibrations and conditions database API*
-in development- Proceedings of CHEP09 conference

The *hdparsim* Project

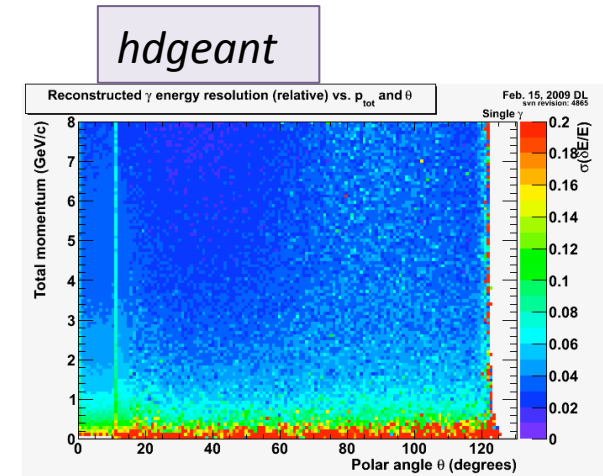
- The *hdparsim* plugin takes tables of energy/momentum resolution, angular resolutions, and efficiencies that are stored in ROOT files and uses them to smear generated values
- Source code is kept here:
<https://halldsvn.jlab.org/repos/trunk/src/programs/Simulation/plugins/hdparsim>
- Resolution tables are available on the web, and automatically downloaded when the plugin is used.

Photon Reconstruction

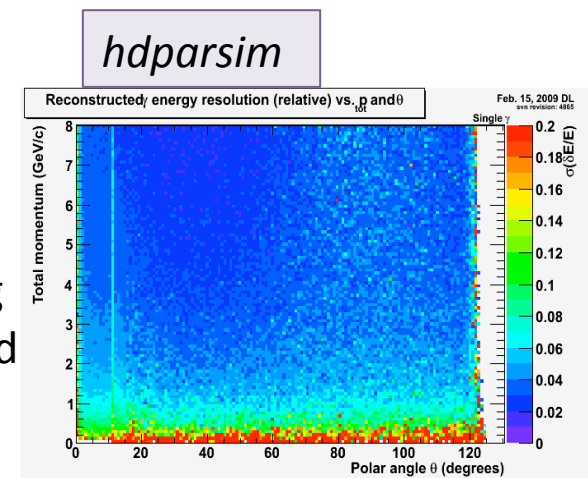
Getting resolutions from simulation with full reconstruction using *DPhoton*



3.2M photons simulated and reconstructed



100M photons parametrically simulated using *hdgeant* derived resolutions



Performance

- It took about 35 minutes to produce a file of 100M generated events with 1 photon each on my laptop
- It took about 20 minutes to process all 100M events with *hdparsim*
- Charged tracks will take the same amount of time as neutrals since they are indexed and smeared in exactly the same way.
- Charged track simulation reconstruction rates:
 - Simulation (hdgeant): ~44Hz
 - Full reconstruction: ~2-10 Hz
 - Parametric: ~80 kHz

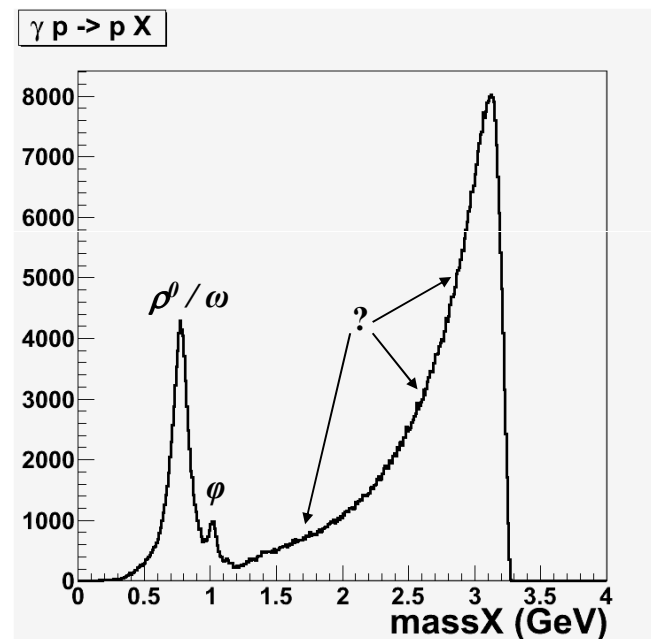
```
264 Feb 15 09:42 run_test.csh
593454704 Feb 15 09:46 genphoton.ascii
1320005967 Feb 15 10:17 output.hddm
660854 Feb 15 10:17 hd_res_photon.root ← downloaded
646808612 Feb 15 10:38 hd_root.root
```

Using *hdparsim* with pythia generated events

Slide from Mike Dugger's presentation at April 27 Physics Working group meeting

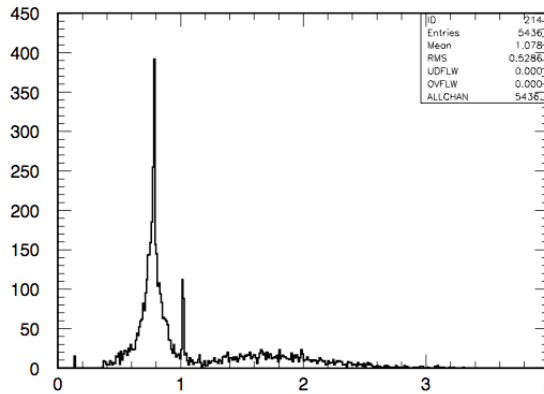
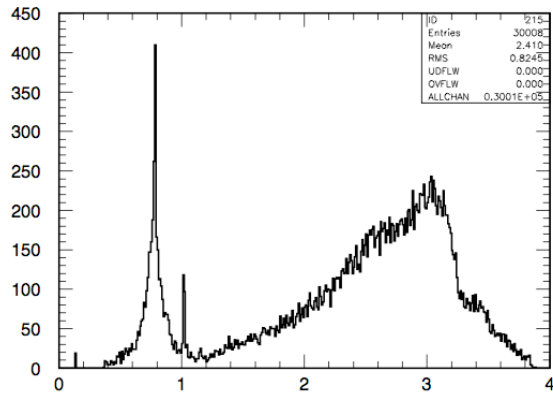
Mass X from $\gamma p \rightarrow p X$

- Vector mesons are clearly visible
- The rest of the background is comprised of a nearly random-looking selection of hadrons

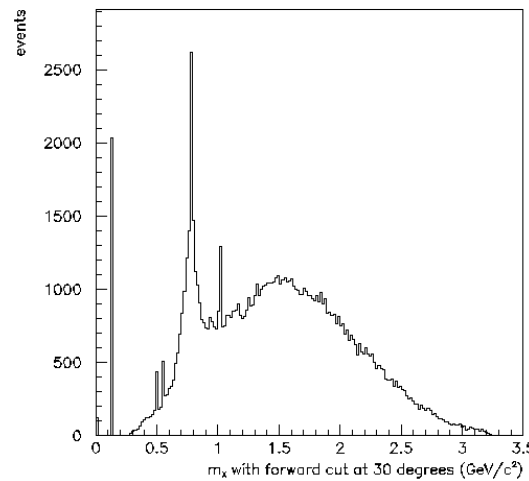
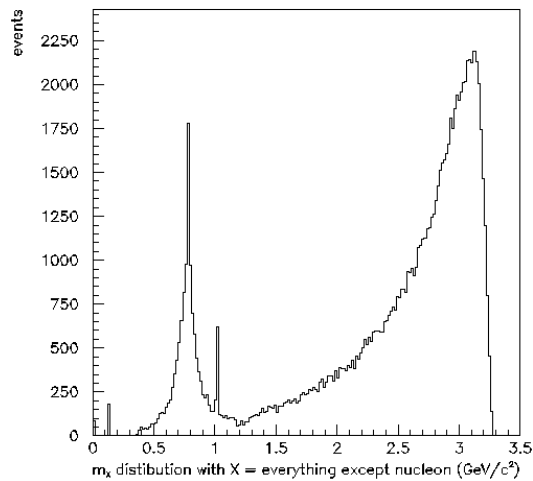


t-dependence in pythia generated events?

2009/04/28 18.28



Eugene: $E_\gamma > 6\text{ GeV}$
Cut on proton being produced at vertex



Richard: $E_\gamma = 8.5\text{--}9.0\text{ GeV}$
Cut on lab angle (30°)

Software Brainstorming on April 22nd

--- non-prioritized ---

- Tracking
 - Transition region (**between FDC and CDC**)
 - Kalman
 - Swimming algorithm (**verify consistency with GEANT**)
 - Standard definitions (**use common set of histograms, etc. to compare the 3 tracking codes**)
 - Finding
 - Fitting
 - multi-track events
 - FDC geometry update: Simon
 - Local Lorentz correction for FDC hits
 - CDC geometry update: Beni (**more or less done already**)
 - Alternate tracking philosophies
 - Tracking efficiency over-all: single tracks, multi-tracks
- Simulation
 - Parametric MC
 - Update/expand resolution tables (**need proton table and possibly Kaon table**)
- Miscellaneous
 - New release (**... of Hall-D source code**)
 - Calibration database: firewall penetration (**web service**)
 - Milestone review
 - Reconstruction->PWA interface

GlueX Software Coordinator

- Congratulations to Mark Ito who is the new GlueX software coordinator!
 - Several nominations for Mark
 - No other nominees
 - Election forgone, Mark declared winner
 - Officially took over on April 22nd 2009