

TASCA Go4 Analysis

OpenOffice document `tascaGo4intro.odt` (H.Essel, 26. June 2009) SVN rev. 307

Setups

Set up account

The `tasca` account should be customized for more convenience. One should define a variable for the repository path:

```
export SVN=https://subversion:443/goofy/go4/applications/tasca
```

To create a new working copy of the repository, create a directory and

```
mkdir myws
svn checkout $SVN myws
cd myws
svn info
```

Then one can use `svn` commands like

```
svn list $SVN
```

to get a listing of the subversion repository. Some useful alias:

```
svndiff='svn diff --diff-cmd /usr/bin/diff -x "-EwbB" '
svndiff1='svn diff --diff-cmd /usr/bin/diff -x "-qEwbB" '
```

On a workspace directory these give a list of files different from repository (second line file list only).

Above has been added to `.bashrc` file (HE). Other useful alias can be defined here.

Set up working directory

Once the directory is made an `svn` working directory (by checking out a repository to it) there are few commands to deal with the repository:

```
svn info
    show the repository the workspace belongs to
```

```
svn list $SVN
    list of repository
```

```
svn update
    update workspace from repository
```

```
svn commit -m "enter here comment" [file]
    copies all changed files to repository. If a file is specified, only this file is copied (if modified).
```

After login

Setup everything for Go4 (**now already done in `.bashrc`**)

```
. go4login 402-00
. leallogin
```

(Note the space behind the dot.)



Go4 analysis steps

The Go4 analysis

To build the **Tasca** analysis, simply:

make

The executable made is

MainUserAnalysis

It can be called from shell or is started from GUI. In principle it does the same in both cases.

Batch mode

The analysis is steered by a ROOT macro file **setup.C**. You can edit this file before running the analysis. There are the following lines:

```
TString unpackProcess("yes");
TString unpackStore("no");
TString unpackOverWrite("yes");

TString caliProcess("yes");
TString caliStore("no");
TString caliOverWrite("yes");

TString checkProcess("yes");
TString checkStore("no");
TString checkOverWrite("yes");

TString analysisProcess("yes");
TString analysisStore("no");
TString analysisOverWrite("yes");

TString autosave("yes");
Int_t autosaveinterval=0; // after n seconds, 0 = at termination of event loop
```

Examples:

MainUserAnalysis -f file.lmd

MainUserAnalysis -f @file.lml

processes file or list of files. respectively.

MainUserAnalysis -t r4-4 10000

connects to MBS transport node R4-4 and processes 10000 events.

Usually in batch mode one either writes an auto-save file (containing all histograms, parameters, etc.), and/or any event file. The auto-save file name and the event file names are prefixed by the input file or node name

b_r4-4_AS.root, **b_r4-4_Unpacked.root**, **b_r4-4_Calibrated.root**, **b_r4-4_Checked.root**, **b_r4-4_Analysis.root**

The **b_** is added in batch mode only. Any of these can be opened by ROOT or in the GUI. To process these in batch:

MainUserAnalysis -f r4-4

The pre and postfixes are added automatically.

To process files from a data directory, the variable

export TASCSTORE=/data.local3/x/x/x

must be set. Then all files are read and stored from/to it. Currently no files can be stored on a directory different from the source directory.

Interactive mode

In interactive mode the analysis is started by the GUI. In this case, the file name prefix is the analysis name specified in the **Start Client** panel. This name is saved by **Save Settings**. In addition the prefix **b_** is changed to **i_**. Further setup is

specified in the configuration panel coming up after starting the analysis. Default settings are the ones from `setup.C`. This setup can be modified interactively and can be stored (NOTE: after **Submit!**) in

`Go4AnalysisPrefs.root`

from where it is retrieved next time the analysis is started. If this file is present, the settings from `setup.C` are overwritten.

The analysis steps

The analysis is divided into four steps as shown in the figure.

Unpacker step

Input: LMD file or MBS (transport, stream server, event server)

Output: ROOT tree with values of all detector channels and detector hit lists. Details in `TascaUnpackEvent.h`

Autosave: Controls, Parameters, Pedestals and Codec

Histograms in directory Unpack: Adc_nn GammaE_n GammaT_n Pedestals Contents AdcAllRaw
AdcAllCal TraceRaw_nn TraceE_nn Hist_nn Pileup_nn

Processing: `TascaUnpackProc` constructor creates the parameters, histograms and pictures. Method *TascaUnpack* uses parameter class `TascaCodec` to decode Adc values, gamma values, and fills the data fields of `TascaUnpackEvent`. `TascaCodec` also contains the mapping tables for the multiplexed channels.

Calibrator step

Input: `TascaUnpackEvent` (from Unpack step or from file)

Output: ROOT tree with calibrated values of all detector channels and gammas. Hit indices of all detectors and their values. Details in `TascaCaliEvent.h`

Autosave: Controls, Parameters, Calibration, CaliFitter

Histograms in directory Cali: All detector channels, gamma channels, Sum of detector channels.

Processing: Filling histograms and `TascaCaliEvent` data fields.

Checker step

Input: `TascaCaliEvent` (from Unpack step or from file)

Output: ROOT tree with calibrated hits. Hit indices of all detectors and their values.

Condition filters: EvrH, AlphaL, Alpha1L, Alpha2L, Fission1H, Fission2H, BackH

Limits set in `setparam.C`

Details in `TascaCheckEvent.h`

Histograms in directory Check: 2d histograms of stop detector (Energy-Xstripe) for each Ystripe.

Autosave: Controls, Parameter

Processing: Filling histograms and `TascaCheckEvent` data fields.

Analysis step

Input: `TascaCheckEvent` (from Checker step or from file)

Output: ROOT tree with data from `TascaAniEvent.h` (currently none) or `TascaEvent.h`

Autosave: Creates parameters Controls, Parameters

Processing: Looking for chains, Create plain ROOT tree from `TascaEvent`

Control files

There are some ROOT macro files to setup several parameter values.

setcontrol.C : Lines to change:

```
fControl->writeChainTree =kTRUE; // used by Analyzer
//fControl->ChainCounter =0; // used by Analyzer. Without Autosave: will be 0
fControl->UnpackHisto =kFALSE; // used by Unpacker
fControl->CaliHisto =kFALSE; // used by Calibrator
fControl->CheckHisto =kFALSE; // used by Checker
fControl->AnlHisto =kFALSE; // used by Analysis
fControl->checkTof =kFALSE; // used by unpacker
fControl->checkChopper =kFALSE; // used by unpacker
fControl->checkMacro =kFALSE; // used by unpacker
fControl->checkMicro =kFALSE; // used by unpacker
fControl->TofMustbe =kTRUE; // used by unpacker
fControl->ChopperMustbe=kTRUE; // used by unpacker
fControl->MacroMustbe =kFALSE; // used by unpacker
fControl->MicroMustbe =kFALSE; // used by unpacker
```

setparam.C : Lines to change:

```
// Used by Checker
// Energy windows MeV
Float_t EvrHmin = 4.000, EvrHmax = 15.000;
Float_t Alpha0Lmin = 9.800, Alpha0Lmax = 10.200;
Float_t Alpha1Lmin = 9.700, Alpha1Lmax = 10.100;
Float_t Alpha2Lmin = 8.970, Alpha2Lmax = 9.3700;
Float_t Fission1Hmin=60.000, Fission1Hmax=220.0000;
Float_t Fission2Hmin=60.000, Fission2Hmax=220.0000;
Float_t BackHmin =10.000, BackHmax = 80.000;
// Time windows sec
Float_t fAlphaTmin =0., fAlphaTmax =900.;
Float_t fAlpha1Tmin =0., fAlpha1Tmax = 20.;
Float_t fAlpha2Tmin =0., fAlpha2Tmax =180.;
Float_t fFission1Tmin=0., fFission1Tmax=900.;
Float_t fFission2Tmin=0., fFission2Tmax= 70.;
...
fp->shift=5; // Unpacker gamma decoder for energies
fp->Adc80TofMin=300; // signals Tof (instead of TOF register)
fp->AdcThreshold=100; // Unpacker uses this is minimum raw value
fp->EventStackSize=100000; // used in Analysis
fp->AlphaMaxL=16000.; // Calibrator take low value up to this limit. Above
fp->AlphaMaxH=30000.; // take high value up to this limit as low
fp->AlphaMinL=1000.; // Unpacker raw minimum value for alpha
fp->AlphaMinH=1000.; // Unpacker raw minimum value for alpha
```

setcali.C steers the calibration:

```
fCalibration->EnableCalibration(kTRUE); // use calibration or not
fCalibration->SetPrefix("cali2"); // prefix for coefficient files
```

Processing LMD files

To process several LMD files at once and store the results in one root file, one must create a text file with extension .lml and specify this file preceded by an @ instead of the LMD filename. The `runbatch.sh` script does that on the fly (see below). File names are `t018fRRRRFFFF.lmd`, where RRR is the run number, FFFF the file number.

Example `t018f0790.lml`

```
/data.local11/tasca/t018f0790381.lmd
/data.local11/tasca/t018f0790382.lmd
/data.local11/tasca/t018f0790383.lmd
/data.local11/tasca/t018f0790384.lmd
/data.local11/tasca/t018f0790385.lmd
/data.local11/tasca/t018f0790386.lmd
/data.local11/tasca/t018f0790387.lmd
/data.local11/tasca/t018f0790388.lmd
/data.local11/tasca/t018f0790389.lmd
```

I recommend to process in batch mode Unpacker and Calibration steps from one file set into one root file. Then run Checker from this root file. Append output of all inputs (output files from one file set of 4 GB are few 10 MB). Resulting ROOT file can be fast scanned by Analysis step.

It might be necessary to find events by event number in LMD files. For this purpose in each event the run and file number is stored (Run is high two bytes, file number low two bytes). In the ROOT files these events can be found easily via macros like filter...C or print...C macros. If one wants to create an LMD subset,

Create the LML files by changing into LMD file directory, then:

```
lmlrmake t018f 3 146
```

This creates files t018fRRR.lml with RRR=003 to 146 containing lists of files t018fRRR*.lmd including full path.

Create the LMD directory files by command:

```
lmdirmake <directory of LMD files>
```

```
lmdirmake -f file
```

The second command processes only one file. Search for events by command:

```
lmdirshow <directory> [event number]
```

```
lmdirshow -f file [event number]
```

Again the second command checks only one file.

LMD files have been moved to directories

```
/d/ship01/tasca/t018/badfiles
```

```
/d/ship01/tasca/t018/backup
```

```
/d/ship01/tasca/t018/calibration
```

```
/d/ship01/tasca/t018/targettest
```

Because working directly from /d was incredible slow, we first copy the data to local disk, then process, and remove the LMD files (from local disk). The place for the processed ROOT files and LMDIR files is on lxg0708:

```
/data.local3/offlinedata
```

```
/u/tasca/GO4_offline_t018/data
```

second being a soft link to the first for convenience.

GO4 analysis is in directories of

```
/u/tasca/GO4_offline_t018
```

The code for the actual batch run is in checked01, data on data/stepdata/lmdir,calibrated0x,checked0x. There is also a shell script to execute:

```
runbatch.sh first last
```

First and last are numbers xxx mentioned above.

```
collectchecked.C(dirfile,rootfile,events)
```

```
root -b -l "collectchecked.C(\"p01.list\", \"b_p01_Checked.root\", 0)"
```

copies all checked ROOT files from a container text file into one. Additional filters could be applied.

```
filtercheckedY.C
```

copies all checked ROOT files with fast filter. Similar to collectchecked.C but uses partial read. One event can be printed by

```
printcheckevent.C
```

```
root -b -l "printcheckevent.C(\"b_p01_Checked.root\", event)"
```

Analysis chain

1. Produce ROOT files with calibrated and checked events. All LMD files of a run go into one ROOT file.
Adjust `runbatch.sh` script to the correct directories. In `setup.C` activate the Unpacker, Calibrator, and Checker. Activate output for Calibrator and Checker.
`time runbatch.sh 196 206 >> runbatch196-206.log`
2. Collect ROOT files with checked events into phase ROOT files like phase p04:
`time root -b -l "collectchecked.C(\"t018p04-196-206.list\", \"../data/stepdata/checked03/b_p04_Checked.root\", 0)"`
3. Run GO4 Analysis to search for chains. In `setcontrol.C` parameter `writeChainTree` steers the production of ROOT tree file with the chains named `xxx_Chains.root`, where `xxx` is the first name part of the input tree file. In `setup.C` Deactivate all steps and activate Analysis.
`./MainUserAnalysis -f p04 >> chainsSFoffp04.log`
4. To get a complete printout of the data of a chain, use
`printevent.C(rootfile, chain number)`
`root -b -l "printevent.C(\"b_p04_Chains.root\", 23)"`

Analysis results

Unpacker sets `isTof` when `adc[80]` is above `Adc80TofMin` (set to 300 in `setparam.C`).

Unpacker sets `isVeto` when any `VetoL` is above 0.

Unpacker calculates multiplicities for StopXY above `AdcThreshold` (set to 100 in `setparam.C`).

Calibrator copies XH(YH) to XL(YL) when XL(YL) is above `AlphaMaxL` (set to 16000 KeV in `setparams.C`).

Calibrator skips events with true `isVeto`.

Checker filters out Evr, SF and Alpha.

Evr: `isTof` & `isMacro` & energy XH in [4 , 15] MeV.

Alpha: NOT `isTof` & energy XL or energy (XL+BL) in [8.97, 10.2] MeV.

SF: NOT `isTof` & energy XH in [60 , 220] MeV.

Analyzer looks for SF & NOT `isMacro` & `YHindex` ≥ 0 . Then it steps back 250 [s] looking for Alphas and Evrs which have the same X and Y ± 1 stripe.

Runs 32-222 show 139 chain candidates. All raw data files containing chain fragments (113 files, 52GB) were composed into ROOT files with calibrated events (8 files, 8 GB) and checked events (1 file, 0,6GB).

This takes 140m

Time covered: 274450 s (~3d).

Unpacker writes 228.934.411 events.

Calibrator writes 180.700.217 events (79%) 8 GB

Checker writes 12.826.941 events (6%) 0.6 GB

Analyzer reads 12.826.941 events, SF 3.930.899 (processed 725), Alphas 412.806, EVRs 8.483.310.

Analyzer writes 139 chains with 872 events. (Some Alphas and Evrs are counted double when chains overlap). 59KB

This takes 7m

12.826.941 events in 274450 sec is 46/sec is 12000/250sec

412806 Alphas in 274450 sec is 2/sec in 376/250sec

/data.local1/tasca/b_t018selection_Chains.root

```
Event Chain 2 Run 42 File 196 Evt 74546917 Tof:1 Off:0 EVR:1 Al:0 SF:0
[ms] 475187373 [mysec] Sys 373588 Gam 0 Adc 2640062660, d [msec] Sys 0.000 Gam 0.000 Adc 17.946
StopXL(H) i 22 ( 22), [MeV] 5.556 ( 5.504) StopYL(H) i 11 ( 11), [MeV] 2.064 ( 1.473)
BackL(H) i -1 ( -1), [MeV] 0.603 ( -2.878) VetoL(H) i -1 ( -1), [MeV] 0.000 ( 0.000)
Gamma [MeV] Sum 7.600589 Max 7.233443 XMulti 1 ( 1)
Event Chain 2 Run 42 File 196 Evt 74612240 Tof:1 Off:0 EVR:1 Al:0 SF:0
[ms] 475267016 [mysec] Sys 16379 Gam 0 Adc 2719706683, d [msec] Sys 79.643 Gam 0.000 Adc 55.580
StopXL(H) i 22 ( 22), [MeV] 9.956 ( 10.072) StopYL(H) i 11 ( 11), [MeV] 9.961 ( 10.129)
BackL(H) i -1 ( -1), [MeV] 0.603 ( -2.878) VetoL(H) i -1 ( -1), [MeV] 0.000 ( 0.000)
Gamma [MeV] Sum 0.709099 Max 0.709699 XMulti 1 ( 1)
Event Chain 2 Run 42 File 196 Evt 74632116 Tof:1 Off:0 EVR:1 Al:0 SF:0
[ms] 475291217 [mysec] Sys 217849 Gam 0 Adc 2743908524, d [msec] Sys 24.201 Gam 0.000 Adc 38.748
StopXL(H) i 59 ( 22), [MeV] 4.577 ( 4.577) StopYL(H) i 10 ( 10), [MeV] 4.610 ( 4.358)
BackL(H) i -1 ( -1), [MeV] 0.603 ( -2.878) VetoL(H) i -1 ( -1), [MeV] 0.000 ( 0.000)
Gamma [MeV] Sum 12.459943 Max 7.103706 XMulti 2 ( 2)
Event Chain 2 Run 42 File 197 Evt 74694172 Tof:1 Off:0 EVR:1 Al:0 SF:0
[ms] 475367111 [mysec] Sys 111299 Gam 0 Adc 2819803149, d [msec] Sys 75.894 Gam 0.000 Adc 21.505
StopXL(H) i 22 ( 22), [MeV] 11.274 ( 11.462) StopYL(H) i 12 ( 12), [MeV] 11.267 ( 11.118)
BackL(H) i -1 ( -1), [MeV] 0.603 ( -2.878) VetoL(H) i -1 ( -1), [MeV] 0.000 ( 0.000)
Gamma [MeV] Sum -0.000500 Max 0.000300 XMulti 1 ( 1)
Event Chain 2 Run 42 File 197 Evt 74695731 Tof:1 Off:0 EVR:1 Al:0 SF:0
[ms] 475368970 [mysec] Sys 970763 Gam 0 Adc 2821662642, d [msec] Sys 1.859 Gam 0.000 Adc 0.553
StopXL(H) i 22 ( 22), [MeV] 9.119 ( 9.145) StopYL(H) i 12 ( 12), [MeV] 9.093 ( 8.972)
BackL(H) i -1 ( -1), [MeV] 0.603 ( -2.878) VetoL(H) i -1 ( -1), [MeV] 0.000 ( 0.000)
Gamma [MeV] Sum -0.000500 Max 0.000300 XMulti 1 ( 1)
Event Chain 2 Run 42 File 197 Evt 74701476 Tof:1 Off:0 EVR:1 Al:0 SF:0
[ms] 475376071 [mysec] Sys 71825 Gam 0 Adc 2828763814, d [msec] Sys 7.101 Gam 0.000 Adc 1.130
StopXL(H) i 22 ( 22), [MeV] 6.406 ( 6.364) StopYL(H) i 11 ( 11), [MeV] 6.370 ( 6.282)
BackL(H) i -1 ( -1), [MeV] 0.603 ( -2.878) VetoL(H) i -1 ( -1), [MeV] 0.000 ( 0.000)
Gamma [MeV] Sum 8.031973 Max 7.192440 XMulti 1 ( 1)
Event Chain 2 Run 42 File 197 Evt 74704396 Tof:0 Off:1 EVR:0 Al:1 SF:0
[ms] 475379660 [mysec] Sys 660687 Gam 0 Adc 2832352732, d [msec] Sys 3.589 Gam 0.000 Adc 8.862
StopXL(H) i 22 ( 22), [MeV] 9.896 ( 10.006) StopYL(H) i 11 ( 11), [MeV] 9.900 ( 9.992)
BackL(H) i -1 ( -1), [MeV] 0.603 ( -2.878) VetoL(H) i -1 ( -1), [MeV] 0.000 ( 0.000)
Gamma [MeV] Sum -0.000500 Max 0.000300 XMulti 1 ( 1)
Event Chain 2 Run 42 File 197 Evt 74722476 Tof:0 Off:1 EVR:0 Al:1 SF:0
[ms] 475401807 [mysec] Sys 807987 Gam 0 Adc 2854500375, d [msec] Sys 22.147 Gam 0.000 Adc 21.269
StopXL(H) i 22 ( 22), [MeV] 9.259 ( 9.344) StopYL(H) i 11 ( 11), [MeV] 9.263 ( 9.374)
BackL(H) i -1 ( -1), [MeV] 0.603 ( -2.878) VetoL(H) i -1 ( -1), [MeV] 0.000 ( 0.000)
Gamma [MeV] Sum -0.000500 Max 0.000300 XMulti 1 ( 1)
Event Chain 2 Run 42 File 197 Evt 74727108 Tof:0 Off:1 EVR:0 Al:1 SF:0
[ms] 475407496 [mysec] Sys 496125 Gam 0 Adc 2860188602, d [msec] Sys 5.689 Gam 0.000 Adc 35.001
StopXL(H) i 22 ( 22), [MeV] 8.785 ( 8.880) StopYL(H) i 11 ( 11), [MeV] 8.776 ( 8.824)
BackL(H) i -1 ( -1), [MeV] 0.603 ( -2.878) VetoL(H) i -1 ( -1), [MeV] 0.000 ( 0.000)
Gamma [MeV] Sum -0.000500 Max 0.000300 XMulti 1 ( 1)
Event Chain 2 Run 42 File 197 Evt 74727109 Tof:0 Off:1 EVR:0 Al:0 SF:1
[ms] 475407500 [mysec] Sys 500177 Gam 0 Adc 2860192654, d [msec] Sys 0.004 Gam 0.000 Adc 4.052
StopXL(H) i 22 ( 22), [MeV] 136.062 (178.575) StopYL(H) i 11 ( 11), [MeV] 135.172 (135.172)
BackL(H) i 51 ( 51), [MeV] 18.345 ( 42.513) VetoL(H) i -1 ( -1), [MeV] 0.000 ( 0.000)
Gamma [MeV] Sum -0.000500 Max 0.000300 XMulti 3 ( 3)
-----
Event Chain 16 Run 59 File 278 Evt 83423174 Tof:1 Off:0 EVR:1 Al:0 SF:0
[ms] 690737305 [mysec] Sys 305031 Gam 0 Adc 455613435, d [msec] Sys 0.000 Gam 0.000 Adc 23.749
StopXL(H) i 59 ( 59), [MeV] 13.517 ( 13.792) StopYL(H) i 26 ( 26), [MeV] 13.513 ( 13.771)
BackL(H) i -1 ( -1), [MeV] 0.603 ( -2.878) VetoL(H) i -1 ( -1), [MeV] 0.000 ( 0.000)
Gamma [MeV] Sum 11.353019 Max 6.999854 XMulti 1 ( 1)
Event Chain 16 Run 59 File 278 Evt 83459103 Tof:1 Off:0 EVR:1 Al:0 SF:0
[ms] 690780714 [mysec] Sys 714829 Gam 0 Adc 499023902, d [msec] Sys 43.409 Gam 0.000 Adc 0.483
StopXL(H) i 59 ( 59), [MeV] 6.779 ( 6.714) StopYL(H) i 24 ( 24), [MeV] 6.767 ( 6.563)
BackL(H) i -1 ( -1), [MeV] 0.603 ( -2.878) VetoL(H) i -1 ( -1), [MeV] 0.000 ( 0.000)
Gamma [MeV] Sum 1.026585 Max 0.731617 XMulti 3 ( 3)
Event Chain 16 Run 59 File 278 Evt 83469984 Tof:1 Off:0 EVR:1 Al:0 SF:0
[ms] 690793806 [mysec] Sys 806402 Gam 0 Adc 512115677, d [msec] Sys 13.092 Gam 0.000 Adc 19.263
StopXL(H) i 59 ( 59), [MeV] 5.478 ( 5.341) StopYL(H) i 24 ( 24), [MeV] 5.474 ( 5.305)
BackL(H) i -1 ( -1), [MeV] 0.603 ( -2.878) VetoL(H) i -1 ( -1), [MeV] 0.000 ( 0.000)
Gamma [MeV] Sum 0.947235 Max 0.667122 XMulti 1 ( 1)
Event Chain 16 Run 59 File 278 Evt 83537291 Tof:1 Off:0 EVR:1 Al:0 SF:0
[ms] 690874675 [mysec] Sys 675958 Gam 0 Adc 592986481, d [msec] Sys 80.869 Gam 0.000 Adc 22.073
StopXL(H) i 59 ( 59), [MeV] 5.593 ( 5.413) StopYL(H) i 24 ( 24), [MeV] 5.582 ( 5.371)
BackL(H) i -1 ( -1), [MeV] 0.603 ( -2.878) VetoL(H) i -1 ( -1), [MeV] 0.000 ( 0.000)
Gamma [MeV] Sum 0.727135 Max 0.727835 XMulti 1 ( 1)
Event Chain 16 Run 59 File 278 Evt 83539772 Tof:0 Off:0 EVR:0 Al:1 SF:0
[ms] 690877700 [mysec] Sys 700722 Gam 0 Adc 596011292, d [msec] Sys 3.025 Gam 0.000 Adc 2.372
StopXL(H) i 59 ( -1), [MeV] 9.997 ( -5.985) StopYL(H) i 25 ( -1), [MeV] 0.597 ( -4.436)
BackL(H) i 7 ( 7), [MeV] 9.314 ( 9.222) VetoL(H) i -1 ( -1), [MeV] 0.000 ( 0.000)
Gamma [MeV] Sum -0.000500 Max 0.000300 XMulti 1 ( 1)
Event Chain 16 Run 59 File 278 Evt 83545501 Tof:0 Off:1 EVR:0 Al:1 SF:0
[ms] 690884655 [mysec] Sys 655893 Gam 0 Adc 602966568, d [msec] Sys 6.955 Gam 0.000 Adc 13.553
StopXL(H) i 59 ( -1), [MeV] 9.261 ( -5.985) StopYL(H) i 25 ( -1), [MeV] 0.615 ( -4.436)
BackL(H) i 42 ( 42), [MeV] 8.566 ( 8.555) VetoL(H) i -1 ( -1), [MeV] 0.000 ( 0.000)
Gamma [MeV] Sum -0.000500 Max 0.000300 XMulti 1 ( 1)
Event Chain 16 Run 59 File 278 Evt 83547306 Tof:0 Off:1 EVR:0 Al:0 SF:1
[ms] 690886833 [mysec] Sys 833853 Gam 0 Adc 605144563, d [msec] Sys 2.178 Gam 0.000 Adc 89.755
StopXL(H) i 59 ( 59), [MeV] 165.836 (195.177) StopYL(H) i 25 ( 25), [MeV] 151.843 (151.843)
```


BackL(H) i 45 (45), [MeV]	18.387 (29.341)	VetoL(H) i -1 (-1), [MeV]	0.000 (0.000)
Gamma [MeV] Sum -0.000500 Max 0.000300 XMulti 4 (4)			

Event Chain 29 Run 67 File 316 Evt 32415799	Tof:1 Off:0 EVR:1 Al:0 SF:0		
[ms] 787281271 [mysec] Sys 271469 Gam 0 Adc 2509981432, d [msec] Sys 0.000 Gam 0.000 Adc 39.920			
StopXL(H) i 91 (91), [MeV] 6.587 (6.436)	StopYL(H) i 66 (66), [MeV] 6.605 (6.364)		
BackL(H) i -1 (-1), [MeV] 0.603 (-2.878)	VetoL(H) i -1 (-1), [MeV] 0.000 (0.000)		
Gamma [MeV] Sum 0.145004 Max 0.145204 XMulti 1 (1)			
Event Chain 29 Run 67 File 316 Evt 32490150	Tof:1 Off:0 EVR:1 Al:0 SF:0		
[ms] 787372594 [mysec] Sys 594093 Gam 0 Adc 2601281933, d [msec] Sys 91.323 Gam 0.000 Adc 77.630			
StopXL(H) i 91 (91), [MeV] 6.844 (6.696)	StopYL(H) i 66 (66), [MeV] 6.845 (6.695)		
BackL(H) i -1 (-1), [MeV] 0.603 (-2.878)	VetoL(H) i -1 (-1), [MeV] 0.000 (0.000)		
Gamma [MeV] Sum 3.467192 Max 1.391349 XMulti 1 (1)			
Event Chain 29 Run 67 File 316 Evt 32577430	Tof:1 Off:0 EVR:1 Al:0 SF:0		
[ms] 787480009 [mysec] Sys 9865 Gam 0 Adc 2708653542, d [msec] Sys 107.415 Gam 0.000 Adc 18.430			
StopXL(H) i 91 (91), [MeV] 6.522 (6.371)	StopYL(H) i 66 (66), [MeV] 6.521 (6.364)		
BackL(H) i -1 (-1), [MeV] 0.603 (-2.878)	VetoL(H) i -1 (-1), [MeV] 0.000 (0.000)		
Gamma [MeV] Sum 2.376957 Max 1.765118 XMulti 1 (1)			
Event Chain 29 Run 67 File 316 Evt 32577619	Tof:0 Off:0 EVR:0 Al:1 SF:0		
[ms] 787480251 [mysec] Sys 251775 Gam 0 Adc 2708895455, d [msec] Sys 0.242 Gam 0.000 Adc 2.360			
StopXL(H) i 91 (91), [MeV] 10.034 (9.948)	StopYL(H) i 66 (66), [MeV] 9.991 (9.939)		
BackL(H) i -1 (-1), [MeV] 0.603 (-2.878)	VetoL(H) i -1 (-1), [MeV] 0.000 (0.000)		
Gamma [MeV] Sum 1.535911 Max 0.879197 XMulti 1 (1)			
Event Chain 29 Run 67 File 316 Evt 32577729	Tof:0 Off:1 EVR:0 Al:0 SF:1		
[ms] 787480382 [mysec] Sys 382207 Gam 0 Adc 2709025889, d [msec] Sys 0.131 Gam 0.000 Adc 109.607			
StopXL(H) i 91 (91), [MeV] 195.023 (203.766)	StopYL(H) i 66 (66), [MeV] 181.280 (181.280)		
BackL(H) i 9 (9), [MeV] 8.696 (8.743)	VetoL(H) i -1 (-1), [MeV] 0.000 (0.000)		
Gamma [MeV] Sum -0.000500 Max 0.000300 XMulti 3 (3)			

Event Chain 38 Run 72 File 345 Evt 88298931	Tof:1 Off:0 EVR:1 Al:0 SF:0		
[ms] 859389924 [mysec] Sys 924937 Gam 0 Adc 1603883621, d [msec] Sys 0.000 Gam 0.000 Adc 3.498			
StopXL(H) i 103 (103), [MeV] 5.561 (5.363)	StopYL(H) i 80 (80), [MeV] 3.279 (3.186)		
BackL(H) i -1 (-1), [MeV] 0.603 (-2.878)	VetoL(H) i -1 (-1), [MeV] 0.000 (0.000)		
Gamma [MeV] Sum 5.696070 Max 5.033726 XMulti 1 (1)			
Event Chain 38 Run 72 File 345 Evt 88390045	Tof:1 Off:0 EVR:1 Al:0 SF:0		
[ms] 859500986 [mysec] Sys 986420 Gam 0 Adc 1714905767, d [msec] Sys 111.062 Gam 0.000 Adc 2.859			
StopXL(H) i 103 (103), [MeV] 10.014 (9.984)	StopYL(H) i 80 (80), [MeV] 9.235 (9.344)		
BackL(H) i -1 (-1), [MeV] 0.603 (-2.878)	VetoL(H) i -1 (-1), [MeV] 0.000 (0.000)		
Gamma [MeV] Sum 1.841992 Max 1.576165 XMulti 2 (2)			
Event Chain 38 Run 72 File 345 Evt 88491887	Tof:1 Off:0 EVR:1 Al:0 SF:0		
[ms] 859624203 [mysec] Sys 203916 Gam 0 Adc 1838125155, d [msec] Sys 123.217 Gam 0.000 Adc 37.076			
StopXL(H) i 103 (103), [MeV] 11.904 (11.874)	StopYL(H) i 79 (80), [MeV] 0.731 (1.134)		
BackL(H) i -1 (-1), [MeV] 0.603 (-2.878)	VetoL(H) i -1 (-1), [MeV] 0.000 (0.000)		
Gamma [MeV] Sum 4.854714 Max 4.461099 XMulti 1 (1)			
Event Chain 38 Run 72 File 345 Evt 88500429	Tof:1 Off:0 EVR:1 Al:0 SF:0		
[ms] 859634570 [mysec] Sys 570488 Gam 0 Adc 1848491890, d [msec] Sys 10.367 Gam 0.000 Adc 0.246			
StopXL(H) i 103 (103), [MeV] 7.592 (7.533)	StopYL(H) i 79 (79), [MeV] 7.597 (7.725)		
BackL(H) i -1 (-1), [MeV] 0.603 (-2.878)	VetoL(H) i -1 (-1), [MeV] 0.000 (0.000)		
Gamma [MeV] Sum -0.000500 Max 0.000300 XMulti 1 (1)			
Event Chain 38 Run 72 File 345 Evt 88501551	Tof:0 Off:1 EVR:0 Al:1 SF:0		
[ms] 859635918 [mysec] Sys 918969 Gam 0 Adc 1849840391, d [msec] Sys 1.348 Gam 0.000 Adc 27.477			
StopXL(H) i 103 (-1), [MeV] 9.690 (-5.985)	StopYL(H) i 79 (79), [MeV] 1.421 (1.198)		
BackL(H) i 13 (13), [MeV] 8.294 (8.427)	VetoL(H) i -1 (-1), [MeV] 0.000 (0.000)		
Gamma [MeV] Sum -0.000500 Max 0.000300 XMulti 1 (1)			
Event Chain 38 Run 72 File 345 Evt 88501605	Tof:0 Off:1 EVR:0 Al:0 SF:1		
[ms] 859635977 [mysec] Sys 977564 Gam 0 Adc 1849898985, d [msec] Sys 0.059 Gam 0.000 Adc 42.361			
StopXL(H) i 103 (103), [MeV] 129.841 (175.959)	StopYL(H) i 79 (79), [MeV] 128.302 (128.302)		
BackL(H) i 16 (16), [MeV] 17.069 (46.118)	VetoL(H) i -1 (-1), [MeV] 0.000 (0.000)		
Gamma [MeV] Sum 0.426496 Max 0.318658 XMulti 3 (3)			

Event Chain 46 Run 86 File 422 Evt 237942673	Tof:1 Off:0 EVR:1 Al:0 SF:0		
[ms] 1057001958 [mysec] Sys 958744 Gam 0 Adc 1646692288, d [msec] Sys 0.000 Gam 0.000 Adc 2.498			
StopXL(H) i 102 (102), [MeV] 8.537 (8.483)	StopYL(H) i 71 (71), [MeV] 8.548 (8.483)		
BackL(H) i -1 (-1), [MeV] 0.603 (-2.878)	VetoL(H) i -1 (-1), [MeV] 0.000 (0.000)		
Gamma [MeV] Sum -0.000500 Max 0.000300 XMulti 1 (1)			
Event Chain 46 Run 86 File 422 Evt 238022029	Tof:1 Off:0 EVR:1 Al:0 SF:0		
[ms] 1057104359 [mysec] Sys 359551 Gam 0 Adc 1749094674, d [msec] Sys 102.401 Gam 0.000 Adc 0.735			
StopXL(H) i 102 (102), [MeV] 8.690 (8.615)	StopYL(H) i 72 (72), [MeV] 8.679 (8.615)		
BackL(H) i -1 (-1), [MeV] 0.603 (-2.878)	VetoL(H) i -1 (-1), [MeV] 0.000 (0.000)		
Gamma [MeV] Sum 1.002754 Max 1.002954 XMulti 1 (1)			
Event Chain 46 Run 86 File 422 Evt 238022363	Tof:0 Off:1 EVR:0 Al:1 SF:0		
[ms] 1057104805 [mysec] Sys 805637 Gam 0 Adc 1749540765, d [msec] Sys 0.446 Gam 0.000 Adc 26.686			
StopXL(H) i 102 (102), [MeV] 9.977 (9.939)	StopYL(H) i 72 (72), [MeV] 9.921 (9.873)		
BackL(H) i -1 (-1), [MeV] 0.603 (-2.878)	VetoL(H) i -1 (-1), [MeV] 0.000 (0.000)		
Gamma [MeV] Sum -0.000500 Max 0.000300 XMulti 1 (1)			
Event Chain 46 Run 86 File 422 Evt 238022435	Tof:0 Off:1 EVR:0 Al:0 SF:1		
[ms] 1057104892 [mysec] Sys 892197 Gam 0 Adc 1749627327, d [msec] Sys 0.087 Gam 0.000 Adc 17.031			
StopXL(H) i 102 (102), [MeV] 189.887 (189.887)	StopYL(H) i 72 (72), [MeV] 178.500 (178.500)		
BackL(H) i 35 (-1), [MeV] 1.159 (-2.878)	VetoL(H) i -1 (-1), [MeV] 0.000 (0.000)		
Gamma [MeV] Sum 0.701475 Max 0.701675 XMulti 5 (5)			

Event Chain 47 Run 89 File 428 Evt 2042375	Tof:1 Off:0 EVR:1 Al:0 SF:0		
[ms] 1069867040 [mysec] Sys 40572 Gam 0 Adc 1626795135, d [msec] Sys 0.000 Gam 0.000 Adc 40.852			
StopXL(H) i 110 (110), [MeV] 13.726 (14.045)	StopYL(H) i 68 (68), [MeV] 12.566 (12.654)		
BackL(H) i -1 (-1), [MeV] 0.603 (-2.878)	VetoL(H) i -1 (-1), [MeV] 0.000 (0.000)		

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Gamma [MeV] Sum 0.935364 Max 0.721272 XMulti 1 ( 1)
Event Chain 47 Run 89 File 428 Evt 2053036 Tof:1 Off:0 EVR:1 Al:0 SF:0
[ms] 1069880261 [mysec] Sys 261238 Gam 0 Adc 1640016003, d [msec] Sys 13.221 Gam 0.000 Adc 1.745
StopXL(H) i 110 (110), [MeV] 9.738 ( 9.854) StopYL(H) i 66 ( 66), [MeV] 9.738 ( 9.675)
BackL(H) i -1 ( -1), [MeV] 0.603 ( -2.878) VetoL(H) i -1 ( -1), [MeV] 0.000 ( 0.000)
Gamma [MeV] Sum 3.317190 Max 2.208689 XMulti 2 ( 2)
Event Chain 47 Run 89 File 428 Evt 2122701 Tof:1 Off:0 EVR:1 Al:0 SF:0
[ms] 1069966731 [mysec] Sys 731913 Gam 0 Adc 1726488005, d [msec] Sys 86.470 Gam 0.000 Adc 22.929
StopXL(H) i 110 (110), [MeV] 7.086 ( 6.969) StopYL(H) i 67 ( 67), [MeV] 7.101 ( 7.038)
BackL(H) i -1 ( -1), [MeV] 0.603 ( -2.878) VetoL(H) i -1 ( -1), [MeV] 0.000 ( 0.000)
Gamma [MeV] Sum 1.911466 Max 1.912166 XMulti 2 ( 2)
Event Chain 47 Run 89 File 428 Evt 2240128 Tof:1 Off:0 EVR:1 Al:0 SF:0
[ms] 1070112465 [mysec] Sys 465113 Gam 0 Adc 1872223444, d [msec] Sys 145.734 Gam 0.000 Adc 0.212
StopXL(H) i 110 (110), [MeV] 7.982 ( 7.999) StopYL(H) i 67 ( 67), [MeV] 5.841 ( 5.801)
BackL(H) i -1 ( -1), [MeV] 0.603 ( -2.878) VetoL(H) i -1 ( -1), [MeV] 0.000 ( 0.000)
Gamma [MeV] Sum 1.568638 Max 1.568838 XMulti 1 ( 1)
Event Chain 47 Run 89 File 428 Evt 2241099 Tof:0 Off:1 EVR:0 Al:1 SF:0
[ms] 1070113629 [mysec] Sys 629140 Gam 0 Adc 1873387489, d [msec] Sys 1.164 Gam 0.000 Adc 25.609
StopXL(H) i 110 (110), [MeV] 9.945 ( 10.061) StopYL(H) i 68 ( 67), [MeV] 5.447 ( 4.564)
BackL(H) i -1 ( -1), [MeV] 0.603 ( -2.878) VetoL(H) i -1 ( -1), [MeV] 0.000 ( 0.000)
Gamma [MeV] Sum -0.000500 Max 0.000300 XMulti 1 ( 1)
Event Chain 47 Run 89 File 428 Evt 2241393 Tof:0 Off:1 EVR:0 Al:0 SF:1
[ms] 1070113972 [mysec] Sys 972201 Gam 0 Adc 1873730554, d [msec] Sys 0.343 Gam 0.000 Adc 9.970
StopXL(H) i 110 (110), [MeV] 157.776 (183.718) StopYL(H) i 67 ( 67), [MeV] 97.934 ( 97.934)
BackL(H) i 17 ( 17), [MeV] 17.345 ( 25.942) VetoL(H) i -1 ( -1), [MeV] 0.000 ( 0.000)
Gamma [MeV] Sum 1.057711 Max 1.057911 XMulti 2 ( 2)
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Event Chain 48 Run 89 File 428 Evt 2590881 Tof:1 Off:0 EVR:1 Al:0 SF:0
[ms] 1070548244 [mysec] Sys 244598 Gam 0 Adc 2308009625, d [msec] Sys 0.000 Gam 0.000 Adc 60.143
StopXL(H) i 119 (119), [MeV] 9.454 ( 9.410) StopYL(H) i 76 ( 76), [MeV] 9.475 ( 9.410)
BackL(H) i -1 ( -1), [MeV] 0.603 ( -2.878) VetoL(H) i -1 ( -1), [MeV] 0.000 ( 0.000)
Gamma [MeV] Sum 6.183044 Max 3.669946 XMulti 1 ( 1)
Event Chain 48 Run 89 File 428 Evt 2790005 Tof:1 Off:0 EVR:1 Al:0 SF:0
[ms] 1070795225 [mysec] Sys 225862 Gam 0 Adc 2554994682, d [msec] Sys 246.981 Gam 0.000 Adc 60.609
StopXL(H) i 119 (119), [MeV] 9.112 ( 9.079) StopYL(H) i 77 ( 77), [MeV] 9.135 ( 9.781)
BackL(H) i -1 ( -1), [MeV] 0.603 ( -2.878) VetoL(H) i -1 ( -1), [MeV] 0.000 ( 0.000)
Gamma [MeV] Sum 0.798545 Max 0.798545 XMulti 1 ( 1)
Event Chain 48 Run 89 File 428 Evt 2790208 Tof:0 Off:1 EVR:0 Al:1 SF:0
[ms] 1070795468 [mysec] Sys 468072 Gam 0 Adc 2555236896, d [msec] Sys 0.243 Gam 0.000 Adc 41.980
StopXL(H) i 119 (119), [MeV] 10.022 ( 10.006) StopYL(H) i 77 ( 77), [MeV] 10.035 ( 10.864)
BackL(H) i -1 ( -1), [MeV] 0.603 ( -2.878) VetoL(H) i -1 ( -1), [MeV] 0.000 ( 0.000)
Gamma [MeV] Sum -0.000500 Max 0.000300 XMulti 1 ( 1)
Event Chain 48 Run 89 File 428 Evt 2790226 Tof:0 Off:1 EVR:0 Al:0 SF:1
[ms] 1070795494 [mysec] Sys 494392 Gam 0 Adc 2555263216, d [msec] Sys 0.026 Gam 0.000 Adc 26.320
StopXL(H) i 119 (119), [MeV] 184.524 (184.524) StopYL(H) i 77 ( 77), [MeV] 200.141 (200.141)
BackL(H) i 12 ( -1), [MeV] 0.828 ( -2.878) VetoL(H) i -1 ( -1), [MeV] 0.000 ( 0.000)
Gamma [MeV] Sum 1.004251 Max 0.747463 XMulti 4 ( 4)
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Event Chain 77 Run 114 File 559 Evt 58617751 Tof:1 Off:0 EVR:1 Al:0 SF:0
[ms] 1384231230 [mysec] Sys 230961 Gam 0 Adc 2457176455, d [msec] Sys 0.000 Gam 0.000 Adc 22.457
StopXL(H) i 86 ( 86), [MeV] 6.565 ( 6.364) StopYL(H) i 69 ( 69), [MeV] 3.742 ( 3.602)
BackL(H) i -1 ( -1), [MeV] 0.603 ( -2.878) VetoL(H) i -1 ( -1), [MeV] 0.000 ( 0.000)
Gamma [MeV] Sum 3.497565 Max 2.237984 XMulti 1 ( 1)
Event Chain 77 Run 114 File 559 Evt 58618108 Tof:0 Off:1 EVR:0 Al:1 SF:0
[ms] 1384231575 [mysec] Sys 575942 Gam 0 Adc 2457521436, d [msec] Sys 0.345 Gam 0.000 Adc 26.632
StopXL(H) i 86 ( 86), [MeV] 10.008 ( 9.873) StopYL(H) i 69 ( 69), [MeV] 5.865 ( 5.664)
BackL(H) i -1 ( -1), [MeV] 0.603 ( -2.878) VetoL(H) i -1 ( -1), [MeV] 0.000 ( 0.000)
Gamma [MeV] Sum -0.000500 Max 0.000300 XMulti 1 ( 1)
Event Chain 77 Run 114 File 559 Evt 58674508 Tof:0 Off:1 EVR:0 Al:1 SF:0
[ms] 1384282612 [mysec] Sys 612576 Gam 0 Adc 2508558867, d [msec] Sys 51.037 Gam 0.000 Adc 12.078
StopXL(H) i 86 ( 86), [MeV] 9.279 ( 9.145) StopYL(H) i 69 ( 69), [MeV] 7.345 ( 7.312)
BackL(H) i -1 ( -1), [MeV] 0.603 ( -2.878) VetoL(H) i -1 ( -1), [MeV] 0.000 ( 0.000)
Gamma [MeV] Sum -0.000500 Max 0.000300 XMulti 1 ( 1)
Event Chain 77 Run 114 File 559 Evt 58713496 Tof:0 Off:1 EVR:0 Al:0 SF:1
[ms] 1384318088 [mysec] Sys 88960 Gam 0 Adc 2544035806, d [msec] Sys 35.476 Gam 0.000 Adc 12.784
StopXL(H) i 86 ( 86), [MeV] 201.076 (201.076) StopYL(H) i 69 ( 69), [MeV] 103.705 (103.705)
BackL(H) i 40 ( 40), [MeV] 3.338 ( 3.245) VetoL(H) i -1 ( -1), [MeV] 0.000 ( 0.000)
Gamma [MeV] Sum 0.224585 Max 0.124354 XMulti 8 ( 8)
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Event Chain 109 Run 124 File 606 Evt 134861899 Tof:0 Off:0 EVR:0 Al:1 SF:0
[ms] 1473821636 [mysec] Sys 636030 Gam 0 Adc 1852920615, d [msec] Sys 0.000 Gam 0.000 Adc 320.190
StopXL(H) i 131 (102), [MeV] 8.549 ( 8.549) StopYL(H) i 75 ( 75), [MeV] 8.730 ( 8.618)
BackL(H) i -1 ( -1), [MeV] 0.603 ( -2.878) VetoL(H) i -1 ( -1), [MeV] 0.000 ( 0.000)
Gamma [MeV] Sum -0.000500 Max 0.000300 XMulti 6 ( 6)
Event Chain 109 Run 124 File 606 Evt 134973068 Tof:1 Off:0 EVR:1 Al:0 SF:0
[ms] 1474011423 [mysec] Sys 423905 Gam 0 Adc 2042711388, d [msec] Sys 189.787 Gam 0.000 Adc 2.348
StopXL(H) i 131 (131), [MeV] 7.358 ( 7.393) StopYL(H) i 74 ( 74), [MeV] 7.325 ( 7.093)
BackL(H) i -1 ( -1), [MeV] 0.603 ( -2.878) VetoL(H) i -1 ( -1), [MeV] 0.000 ( 0.000)
Gamma [MeV] Sum -0.000500 Max 0.000300 XMulti 4 ( 4)
Event Chain 109 Run 124 File 606 Evt 134973563 Tof:0 Off:1 EVR:0 Al:1 SF:0
[ms] 1474012246 [mysec] Sys 246822 Gam 0 Adc 2043534321, d [msec] Sys 0.823 Gam 0.000 Adc 105.165
StopXL(H) i 131 (131), [MeV] 9.997 ( 1.232) StopYL(H) i 74 ( -1), [MeV] 0.846 ( -4.436)
BackL(H) i 35 ( 35), [MeV] 9.163 ( 9.176) VetoL(H) i -1 ( -1), [MeV] 0.000 ( 0.000)
Gamma [MeV] Sum 0.746787 Max 0.746787 XMulti 1 ( 1)
Event Chain 109 Run 124 File 606 Evt 134973601 Tof:0 Off:1 EVR:0 Al:0 SF:1

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[ms] 1474012309 [msec] Sys 309876 Gam 0 Adc 2043597376, d [msec] Sys **0.063** Gam 0.000 Adc 27.325
StopXL(H) i **131 (131), [MeV] 170.446 (170.446)** StopYL(H) i 74 (74), [MeV] 133.811 (133.811)
BackL(H) i -1 (-1), [MeV] 0.603 (-2.878) VetoL(H) i -1 (-1), [MeV] 0.000 (0.000)
Gamma [MeV] Sum 1.449835 Max 0.438038 XMulti 2 (2)

Event Chain 115 Run 156 File 707 Evt 136137319 Tof:1 Off:0 EVR:1 Al:0 SF:0
[ms] 1841789274 [msec] Sys 274476 Gam 0 Adc 451946690, d [msec] Sys 0.000 Gam 0.000 Adc 139.253
StopXL(H) i 89 (89), [MeV] 8.789 (8.824) StopYL(H) i 72 (72), [MeV] 8.787 (8.748)
BackL(H) i -1 (-1), [MeV] 0.603 (-2.878) VetoL(H) i -1 (-1), [MeV] 0.000 (0.000)
Gamma [MeV] Sum -0.000500 Max 0.000300 XMulti 1 (1)

Event Chain 115 Run 156 File 707 Evt 136146267 Tof:1 Off:0 EVR:1 Al:0 SF:0
[ms] 1841803782 [msec] Sys 782697 Gam 0 Adc 466455133, d [msec] Sys 14.508 Gam 0.000 Adc 82.991
StopXL(H) i **89 (89), [MeV] 8.697 (8.687)** StopYL(H) i 72 (72), [MeV] 8.715 (8.615)
BackL(H) i -1 (-1), [MeV] 0.603 (-2.878) VetoL(H) i -1 (-1), [MeV] 0.000 (0.000)
Gamma [MeV] Sum 9.975562 Max 9.550147 XMulti 1 (1)

Event Chain 115 Run 156 File 707 Evt 136146568 Tof:0 Off:1 EVR:0 Al:1 SF:0
[ms] 1841804265 [msec] Sys 265100 Gam 0 Adc 466937544, d [msec] Sys **0.483** Gam 0.000 Adc 23.535
StopXL(H) i **89 (89), [MeV] 10.011 (10.129)** StopYL(H) i 72 (72), [MeV] 9.903 (9.939)
BackL(H) i -1 (-1), [MeV] 0.603 (-2.878) VetoL(H) i -1 (-1), [MeV] 0.000 (0.000)
Gamma [MeV] Sum -0.000500 Max 0.000300 XMulti 1 (1)

Event Chain 115 Run 156 File 707 Evt 136146841 Tof:0 Off:1 EVR:0 Al:0 SF:1
[ms] 1841804665 [msec] Sys 665604 Gam 0 Adc 467337998, d [msec] Sys **0.400** Gam 0.000 Adc 65.127
StopXL(H) i **89 (89), [MeV] 161.417 (161.417)** StopYL(H) i 72 (72), [MeV] 142.086 (142.086)
BackL(H) i -1 (-1), [MeV] 0.603 (-2.878) VetoL(H) i -1 (-1), [MeV] 0.000 (0.000)
Gamma [MeV] Sum 0.706054 Max 0.706654 XMulti 4 (4)

Event Chain 119 Run 163 File 738 Evt 35256655 Tof:1 Off:0 EVR:1 Al:0 SF:0
[ms] 1932028149 [msec] Sys 149899 Gam 0 Adc 496160551, d [msec] Sys 0.000 Gam 0.000 Adc 58.174
StopXL(H) i 100 (100), [MeV] 8.507 (8.484) StopYL(H) i 53 (53), [MeV] 7.839 (7.887)
BackL(H) i -1 (-1), [MeV] 0.603 (-2.878) VetoL(H) i -1 (-1), [MeV] 0.000 (0.000)
Gamma [MeV] Sum 0.533983 Max 0.534583 XMulti 1 (1)

Event Chain 119 Run 163 File 738 Evt 35285660 Tof:1 Off:0 EVR:1 Al:0 SF:0
[ms] 1932073816 [msec] Sys 816623 Gam 0 Adc 541827970, d [msec] Sys 45.667 Gam 0.000 Adc 40.096
StopXL(H) i 100 (100), [MeV] 7.690 (7.666) StopYL(H) i 53 (53), [MeV] 7.689 (7.688)
BackL(H) i -1 (-1), [MeV] 0.603 (-2.878) VetoL(H) i -1 (-1), [MeV] 0.000 (0.000)
Gamma [MeV] Sum 4.372772 Max 3.224428 XMulti 1 (1)

EVR missing with 6.926 MeV and following 0.774 sec Alpha.

Event Chain 119 Run 163 File 738 Evt 35316464 Tof:0 Off:1 EVR:0 Al:1 SF:0
[ms] 1932123304 [msec] Sys 304518 Gam 0 Adc 591316619, d [msec] Sys 49.488 Gam 0.000 Adc 52.059
StopXL(H) i **100 (100), [MeV] 9.913 (9.982)** StopYL(H) i 53 (53), [MeV] 9.879 (9.939)
BackL(H) i -1 (-1), [MeV] 0.603 (-2.878) VetoL(H) i -1 (-1), [MeV] 0.000 (0.000)
Gamma [MeV] Sum -0.000500 Max 0.000300 XMulti 2 (2)

Event Chain 119 Run 163 File 738 Evt 35322483 Tof:0 Off:1 EVR:0 Al:1 SF:0
[ms] 1932132846 [msec] Sys 846813 Gam 0 Adc 600859061, d [msec] Sys **9.542** Gam 0.000 Adc 15.179
StopXL(H) i **100 (100), [MeV] 9.293 (9.301)** StopYL(H) i 53 (53), [MeV] 9.279 (9.344)
BackL(H) i -1 (-1), [MeV] 0.603 (-2.878) VetoL(H) i -1 (-1), [MeV] 0.000 (0.000)
Gamma [MeV] Sum -0.000500 Max 0.000300 XMulti 4 (4)

Event Chain 119 Run 163 File 738 Evt 35340259 Tof:0 Off:1 EVR:0 Al:0 SF:1
[ms] 1932161260 [msec] Sys 260055 Gam 0 Adc 629272733, d [msec] Sys **28.414** Gam 0.000 Adc 15.554
StopXL(H) i **100 (100), [MeV] 154.109 (193.221)** StopYL(H) i 53 (53), [MeV] 141.689 (141.689)
BackL(H) i 29 (29), [MeV] 21.159 (39.112) VetoL(H) i -1 (-1), [MeV] 0.000 (0.000)
Gamma [MeV] Sum 0.272122 Max 0.219680 XMulti 4 (4)

Event Chain 132 Run 179 File 836 Evt 223465063 Tof:1 Off:0 EVR:1 Al:0 SF:0
[ms] -2111787873 [msec] Sys 423212 Gam 0 Adc 2538336364, d [msec] Sys 0.000 Gam 0.000 Adc 19.203
StopXL(H) i 122 (122), [MeV] 8.300 (8.019) StopYL(H) i 88 (88), [MeV] 0.812 (1.134)
BackL(H) i -1 (-1), [MeV] 0.603 (-2.878) VetoL(H) i -1 (-1), [MeV] 0.000 (0.000)
Gamma [MeV] Sum -0.000500 Max 0.000300 XMulti 1 (1)

Event Chain 132 Run 179 File 836 Evt 223479045 Tof:1 Off:0 EVR:1 Al:0 SF:0
[ms] -2111770917 [msec] Sys 379287 Gam 0 Adc 2555292696, d [msec] Sys 16.956 Gam 0.000 Adc 15.336
StopXL(H) i 122 (122), [MeV] 5.521 (5.371) StopYL(H) i 88 (88), [MeV] 5.494 (5.437)
BackL(H) i -1 (-1), [MeV] 0.603 (-2.878) VetoL(H) i -1 (-1), [MeV] 0.000 (0.000)
Gamma [MeV] Sum -0.000500 Max 0.000300 XMulti 1 (1)

Event Chain 132 Run 179 File 836 Evt 223576595 Tof:1 Off:0 EVR:1 Al:0 SF:0
[ms] -2111652219 [msec] Sys 77780 Gam 0 Adc 2673993021, d [msec] Sys 118.698 Gam 0.000 Adc 0.900
StopXL(H) i 122 (122), [MeV] 8.391 (8.350) StopYL(H) i 87 (87), [MeV] 7.278 (7.244)
BackL(H) i -1 (-1), [MeV] 0.603 (-2.878) VetoL(H) i -1 (-1), [MeV] 0.000 (0.000)
Gamma [MeV] Sum 11.749644 Max 6.669339 XMulti 3 (3)

EVR missing with 3.26 MeV and following 0.9 sec Alpha

Alpha missing with 9.995 MeV and 92.2 sec

Event Chain 132 Run 179 File 836 Evt 223604065 Tof:0 Off:1 EVR:0 Al:1 SF:0
[ms] -2111618789 [msec] Sys 507890 Gam 0 Adc 2707423644, d [msec] Sys 33.430 Gam 0.000 Adc 25.326
StopXL(H) i **122 (122), [MeV] 9.297 (9.277)** StopYL(H) i 88 (88), [MeV] 9.299 (9.344)
BackL(H) i -1 (-1), [MeV] 0.603 (-2.878) VetoL(H) i -1 (-1), [MeV] 0.000 (0.000)
Gamma [MeV] Sum -0.000500 Max 0.000300 XMulti 2 (2)

Event Chain 132 Run 179 File 836 Evt 223629649 Tof:1 Off:0 EVR:1 Al:0 SF:0
[ms] -2111587559 [msec] Sys 737747 Gam 0 Adc 2738653985, d [msec] Sys **31.230** Gam 0.000 Adc 19.837
StopXL(H) i 122 (122), [MeV] 14.070 (14.243) StopYL(H) i 88 (88), [MeV] 14.041 (14.243)
BackL(H) i -1 (-1), [MeV] 0.603 (-2.878) VetoL(H) i -1 (-1), [MeV] 0.000 (0.000)
Gamma [MeV] Sum -0.000500 Max 0.000300 XMulti 1 (1)

Event Chain 132 Run 179 File 836 Evt 223642101 Tof:0 Off:1 EVR:0 Al:0 SF:1
[ms] -2111572506 [msec] Sys 790910 Gam 0 Adc 2753707379, d [msec] Sys **15.053** Gam 0.000 Adc 13.729
StopXL(H) i **122 (122), [MeV] 102.098 (131.439)** StopYL(H) i 88 (88), [MeV] 88.460 (88.460)
BackL(H) i 14 (14), [MeV] 18.182 (29.341) VetoL(H) i -1 (-1), [MeV] 0.000 (0.000)
Gamma [MeV] Sum 0.563841 Max 0.407735 XMulti 2 (2)

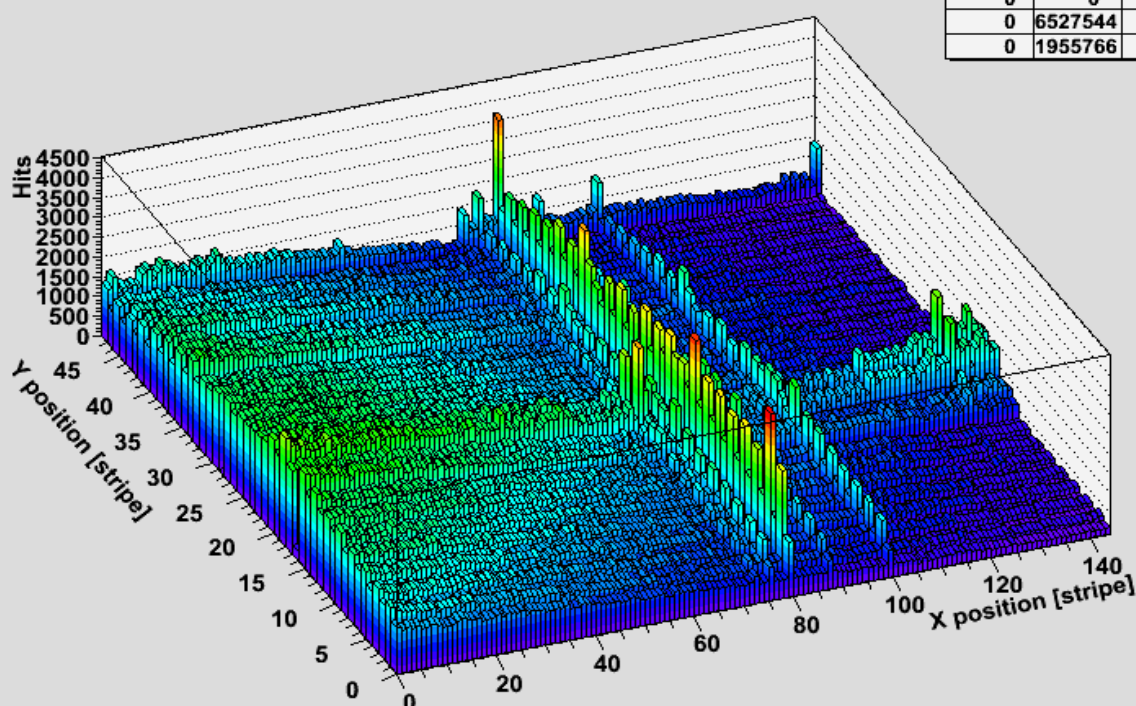
```

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Event Chain 138 Run 198 File 904 Evt 106958183 Tof:1 Off:0 EVR:1 Al:0 SF:0
[ms] -1881425015 [mysec] Sys 281998 Gam 0 Adc 972044888, d [msec] Sys 0.000 Gam 0.000 Adc 46.018
StopXL(H) i 59 ( 59), [MeV] 4.459 ( 4.258) StopYL(H) i 47 ( 47), [MeV] 4.451 ( 4.152)
BackL(H) i 10 ( -1), [MeV] 0.819 ( -2.878) VetoL(H) i -1 ( -1), [MeV] 0.000 ( 0.000)
Gamma [MeV] Sum -0.000500 Max 0.000300 XMulti 1 ( 1)
Event Chain 138 Run 198 File 904 Evt 106997000 Tof:1 Off:0 EVR:1 Al:0 SF:0
[ms] -1881358171 [mysec] Sys 125689 Gam 0 Adc 1038889619, d [msec] Sys 66.844 Gam 0.000 Adc 41.288
StopXL(H) i 59 ( 59), [MeV] 9.139 ( 9.169) StopYL(H) i 46 ( 46), [MeV] 8.968 ( 7.133)
BackL(H) i -1 ( -1), [MeV] 0.603 ( -2.878) VetoL(H) i -1 ( -1), [MeV] 0.000 ( 0.000)
Gamma [MeV] Sum 0.592514 Max 0.593014 XMulti 1 ( 1)
Event Chain 138 Run 198 File 904 Evt 107083748 Tof:1 Off:0 EVR:1 Al:0 SF:0
[ms] -1881209527 [mysec] Sys 769395 Gam 0 Adc 1187535611, d [msec] Sys 148.644 Gam 0.000 Adc 78.274
StopXL(H) i 59 ( 59), [MeV] 8.459 ( 8.447) StopYL(H) i 47 ( 47), [MeV] 8.445 ( 8.412)
BackL(H) i -1 ( -1), [MeV] 0.603 ( -2.878) VetoL(H) i -1 ( -1), [MeV] 0.000 ( 0.000)
Gamma [MeV] Sum 4.443708 Max 3.279788 XMulti 1 ( 1)
Event Chain 138 Run 198 File 904 Evt 107084412 Tof:0 Off:1 EVR:0 Al:1 SF:0
[ms] -1881208395 [mysec] Sys 901624 Gam 0 Adc 1188667857, d [msec] Sys 1.132 Gam 0.000 Adc 34.593
StopXL(H) i 59 ( 59), [MeV] 10.004 ( 10.108) StopYL(H) i 47 ( 47), [MeV] 10.012 ( 10.061)
BackL(H) i -1 ( -1), [MeV] 0.603 ( -2.878) VetoL(H) i -1 ( -1), [MeV] 0.000 ( 0.000)
Gamma [MeV] Sum -0.000500 Max 0.000300 XMulti 1 ( 1)
Event Chain 138 Run 198 File 904 Evt 107084434 Tof:0 Off:1 EVR:0 Al:0 SF:1
[ms] -1881208352 [mysec] Sys 944776 Gam 0 Adc 1188711009, d [msec] Sys 0.043 Gam 0.000 Adc 43.152
StopXL(H) i 59 ( 59), [MeV] 210.041 (210.041) StopYL(H) i 47 ( 47), [MeV] 193.159 (193.159)
BackL(H) i -1 ( -1), [MeV] 0.603 ( -2.878) VetoL(H) i -1 ( -1), [MeV] 0.000 ( 0.000)
Gamma [MeV] Sum 1.744879 Max 1.148250 XMulti 4 ( 4)
-----
Event Chain 139 Run 219 File 1000 Evt 67896741 Tof:1 Off:0 EVR:1 Al:0 SF:0
[ms] -1562182506 [mysec] Sys 790288 Gam 0 Adc 2385684616, d [msec] Sys 0.000 Gam 0.000 Adc 57.063
StopXL(H) i 89 ( 89), [MeV] 8.151 ( 7.999) StopYL(H) i 49 ( 49), [MeV] 1.899 ( 1.429)
BackL(H) i -1 ( -1), [MeV] 0.603 ( -2.878) VetoL(H) i -1 ( -1), [MeV] 0.000 ( 0.000)
Gamma [MeV] Sum 1.040753 Max 1.041353 XMulti 2 ( 2)
Event Chain 139 Run 219 File 1000 Evt 67933718 Tof:1 Off:0 EVR:1 Al:0 SF:0
[ms] -1562123567 [mysec] Sys 729816 Gam 0 Adc 2444625035, d [msec] Sys 58.939 Gam 0.000 Adc 80.479
StopXL(H) i 89 ( 89), [MeV] 10.238 ( 10.267) StopYL(H) i 48 ( 48), [MeV] 10.205 ( 10.143)
BackL(H) i 41 ( 41), [MeV] 3.393 ( 3.246) VetoL(H) i -1 ( -1), [MeV] 0.000 ( 0.000)
Gamma [MeV] Sum -0.000500 Max 0.000300 XMulti 1 ( 1)
Event Chain 139 Run 219 File 1000 Evt 67960814 Tof:1 Off:0 EVR:1 Al:0 SF:0
[ms] -1562080292 [mysec] Sys 4228 Gam 0 Adc 2487900108, d [msec] Sys 43.275 Gam 0.000 Adc 322.037
StopXL(H) i 89 ( 89), [MeV] 9.968 ( 9.992) StopYL(H) i 48 ( 48), [MeV] 8.581 ( 8.452)
BackL(H) i -1 ( -1), [MeV] 0.603 ( -2.878) VetoL(H) i -1 ( -1), [MeV] 0.000 ( 0.000)
Gamma [MeV] Sum 1.202417 Max 0.604794 XMulti 1 ( 1)
Event Chain 139 Run 219 File 1000 Evt 68020658 Tof:1 Off:0 EVR:1 Al:0 SF:0
[ms] -1561985359 [mysec] Sys 937313 Gam 0 Adc 2582834633, d [msec] Sys 94.933 Gam 0.000 Adc 41.069
StopXL(H) i 89 ( 89), [MeV] 7.623 ( 7.519) StopYL(H) i 48 ( 48), [MeV] 7.636 ( 7.476)
BackL(H) i -1 ( -1), [MeV] 0.603 ( -2.878) VetoL(H) i -1 ( -1), [MeV] 0.000 ( 0.000)
Gamma [MeV] Sum 0.723408 Max 0.558537 XMulti 1 ( 1)
Event Chain 139 Run 219 File 1000 Evt 68021261 Tof:0 Off:0 EVR:0 Al:1 SF:0
[ms] -1561984438 [mysec] Sys 858020 Gam 0 Adc 2583755354, d [msec] Sys 0.921 Gam 0.000 Adc 39.576
StopXL(H) i 89 ( 89), [MeV] 9.895 ( 9.992) StopYL(H) i 48 ( 48), [MeV] 9.880 ( 9.818)
BackL(H) i -1 ( -1), [MeV] 0.603 ( -2.878) VetoL(H) i -1 ( -1), [MeV] 0.000 ( 0.000)
Gamma [MeV] Sum -0.000500 Max 0.000300 XMulti 1 ( 1)
Event Chain 139 Run 219 File 1000 Evt 68021522 Tof:0 Off:1 EVR:0 Al:0 SF:1
[ms] -1561984049 [mysec] Sys 247890 Gam 0 Adc 2584145229, d [msec] Sys 0.389 Gam 0.000 Adc 51.728
StopXL(H) i 89 ( 89), [MeV] 196.388 (196.388) StopYL(H) i 48 ( 48), [MeV] 176.164 (176.164)
BackL(H) i -1 ( -1), [MeV] 0.603 ( -2.878) VetoL(H) i -1 ( -1), [MeV] 0.000 ( 0.000)
Gamma [MeV] Sum 0.190875 Max 0.191675 XMulti 4 ( 4)
-----

```


Hit counters 11:04:34 2009-07-03

XYHhitsEvr		
Entries	8483310	
0	0	0
0	6527544	0
0	1955766	0



Hit counters 11:04:34 2009-07-03

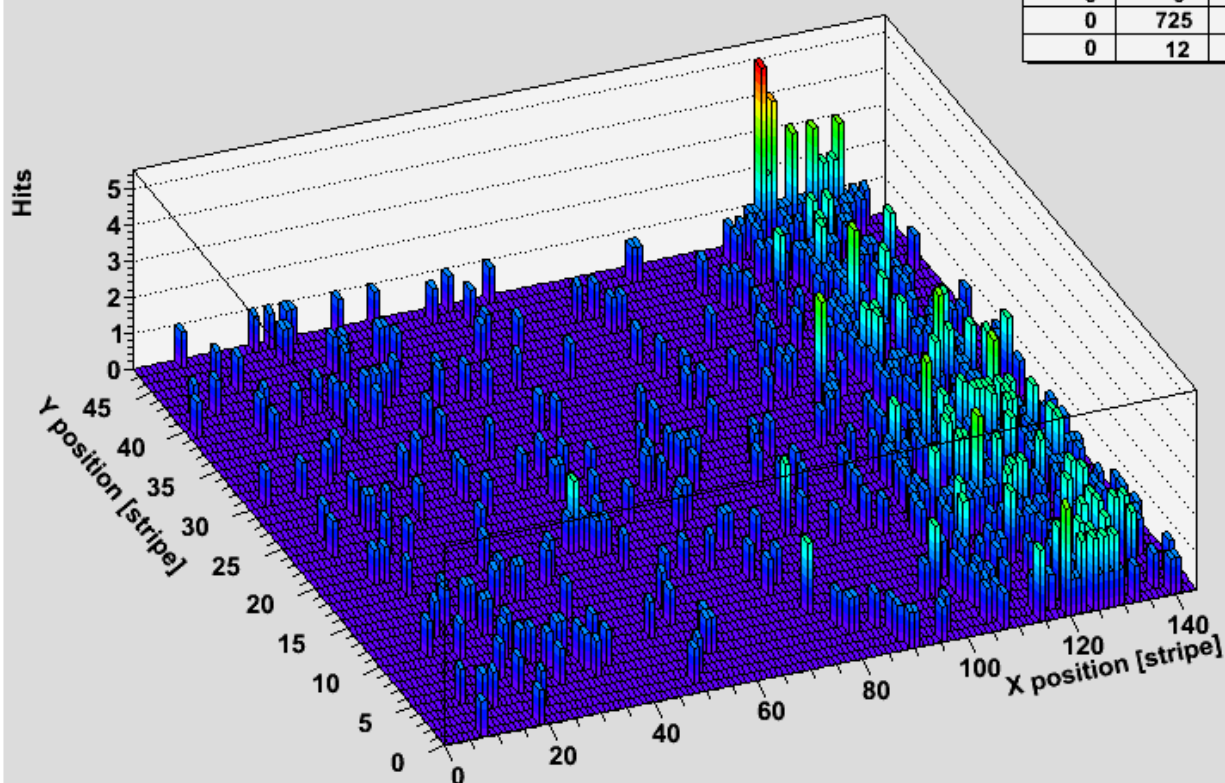
XYHhitsSF		
Entries	3930162	
0	0	0

Hit counters 11:04:34 2009-07-03

XYHhitsSF		
Entries	3930162	

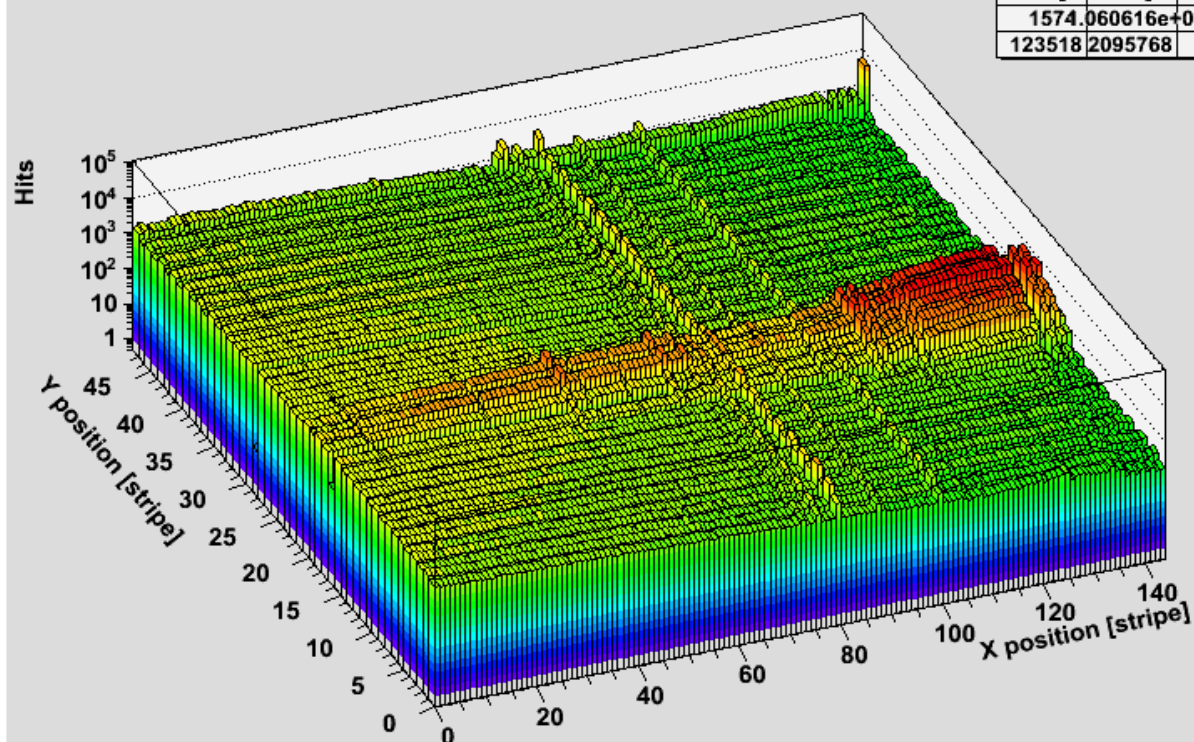
Hit counters 11:04:34 2009-07-03

XYHhitsSFOff		
Entries	737	
0	0	0
0	725	0
0	12	0



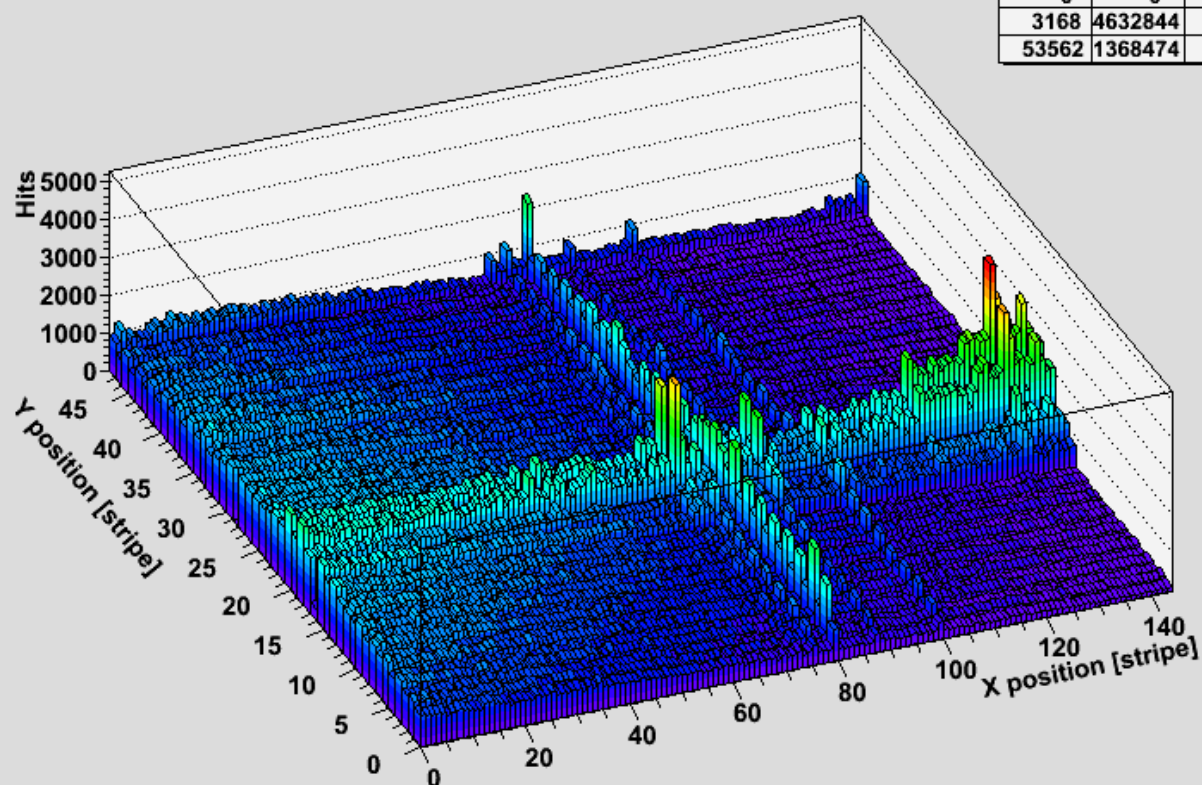
Hit counters 11:04:34 2009-07-03

XYhitsAll		
Entries	1.282702e+07	
0	0	0
1574	060616e+07	0
123518	2095768	0



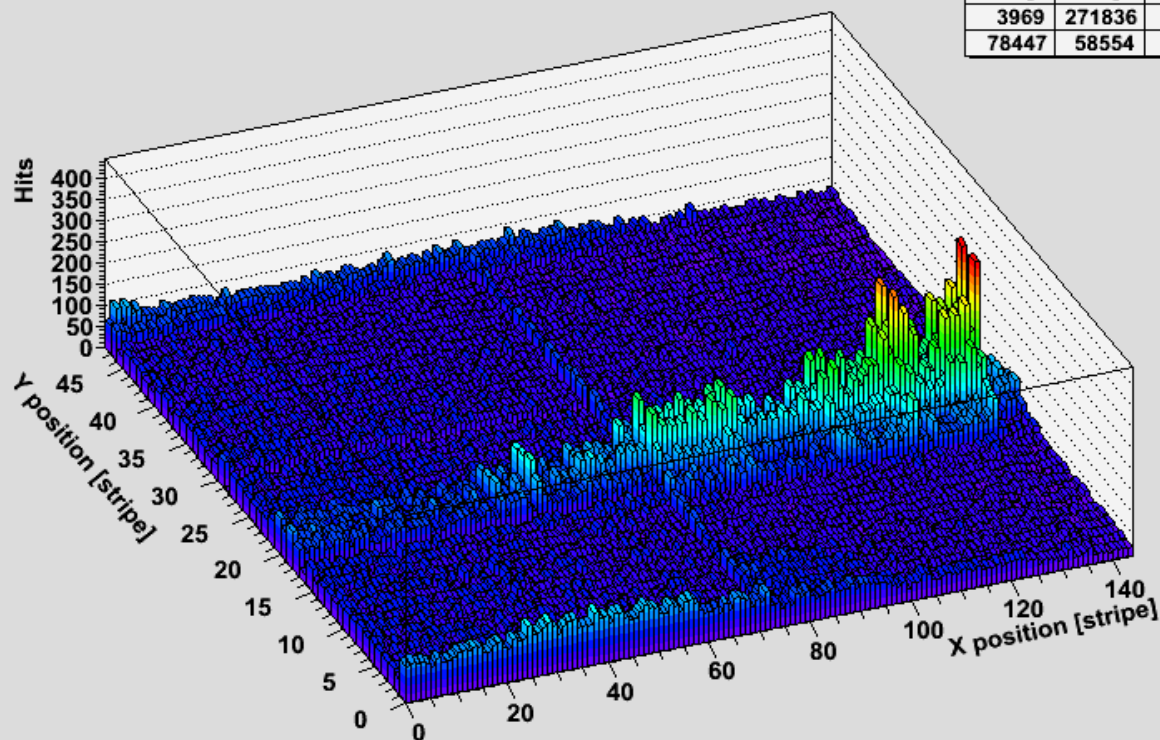
Hit counters before SF 11:04:34 2009-07-03

XYhitsAllDT		
Entries	6058048	
0	0	0
3168	4632844	0
53562	1368474	0



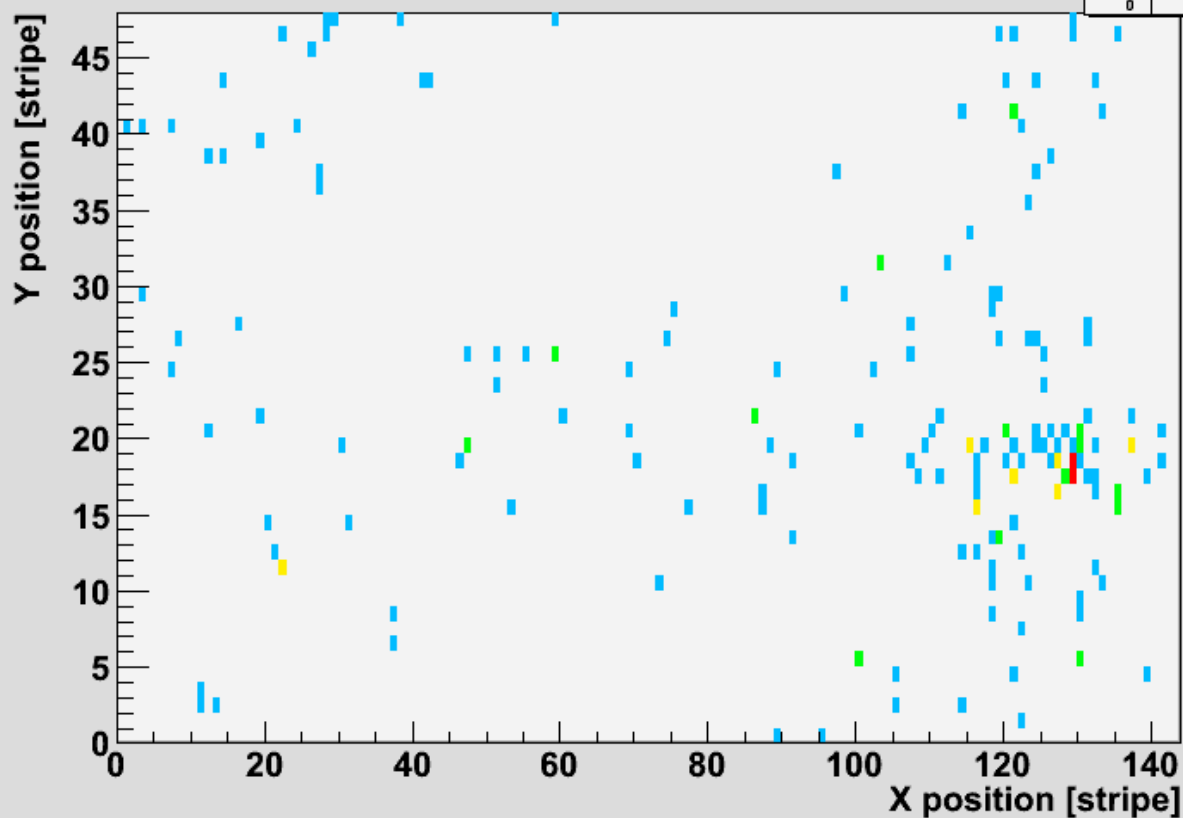
Hit counters 11:04:34 2009-07-03

XYHitsAlpha		
Entries	412806	
0	0	0
3969	271836	0
78447	58554	0



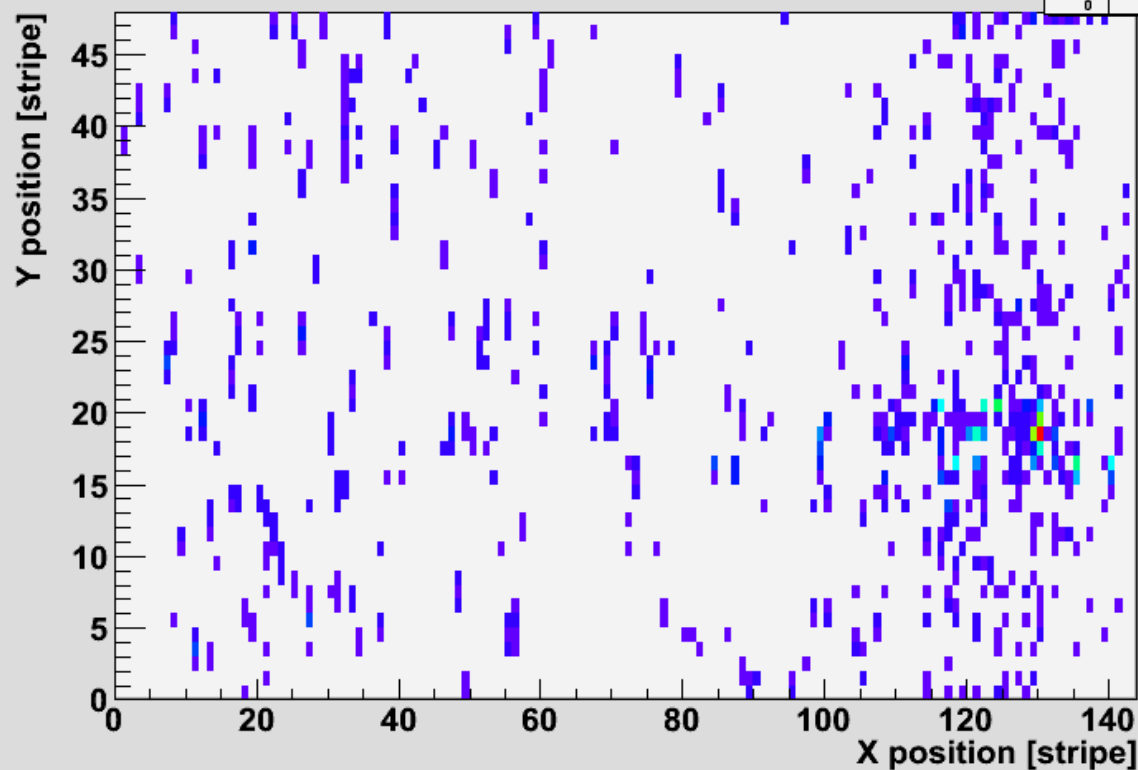
Hit counters chain 11:04:34 2009-07-03

XYHitsAlphaCH		
Entries	197	
0	0	0
0	196	0
0	1	0



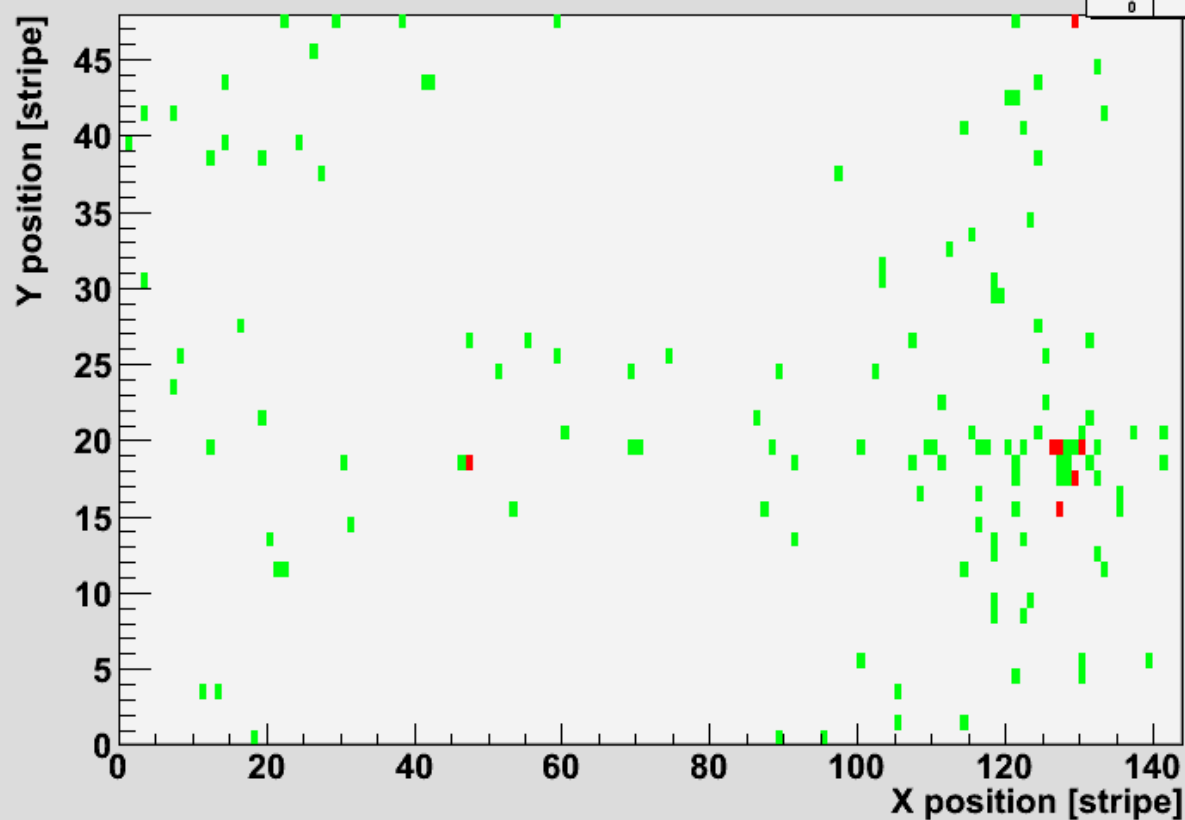
Hit counters chain 11:04:34 2009-07-03

XYHhitsEvrCH		
Entries		1385
0	0	0
0	1331	0
0	54	0



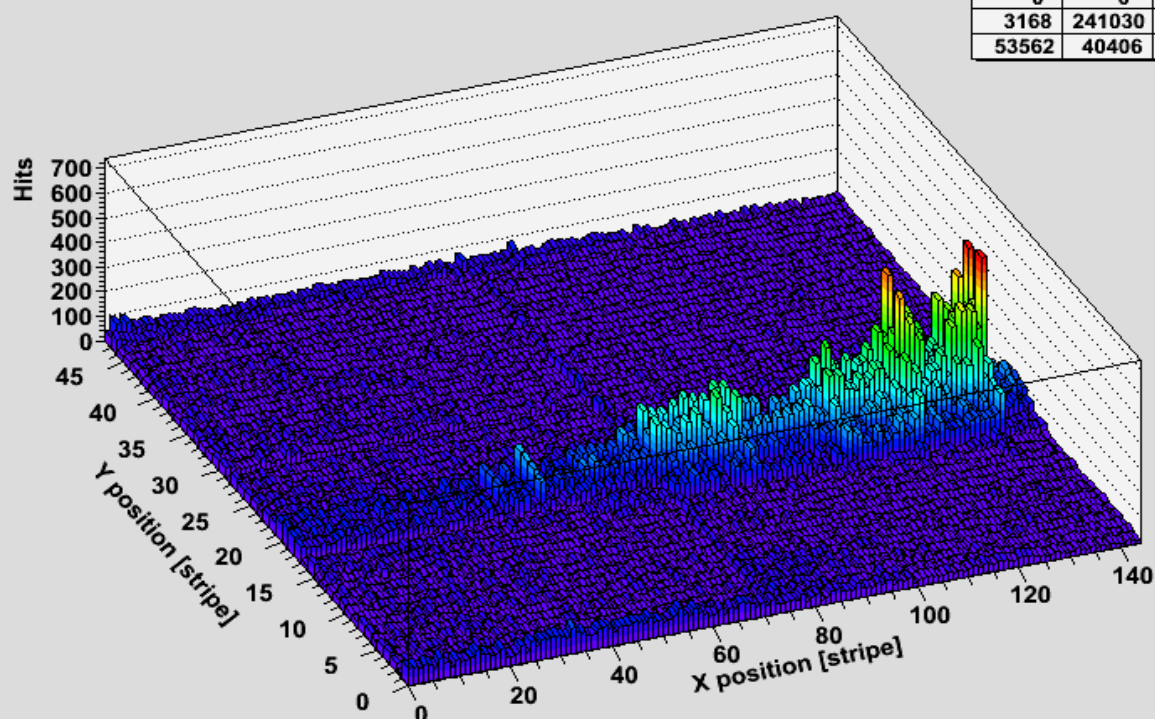
Hit counters chain 11:04:34 2009-07-03

XYHhitsSFCH		
Entries		139
0	0	0
0	139	0
0	0	0



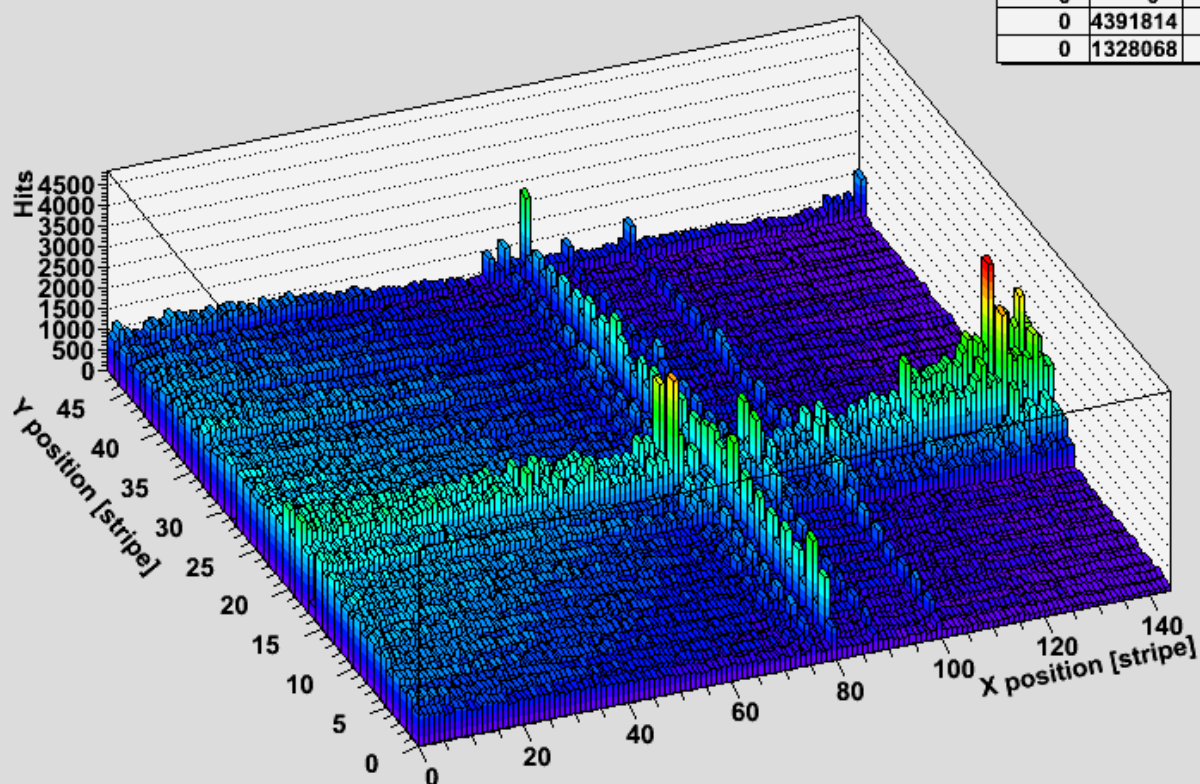
Hit counters before SF 11:04:34 2009-07-03

XYLhitsAlphaDT		
Entries	338166	
0	0	0
3168	241030	0
53562	40406	0



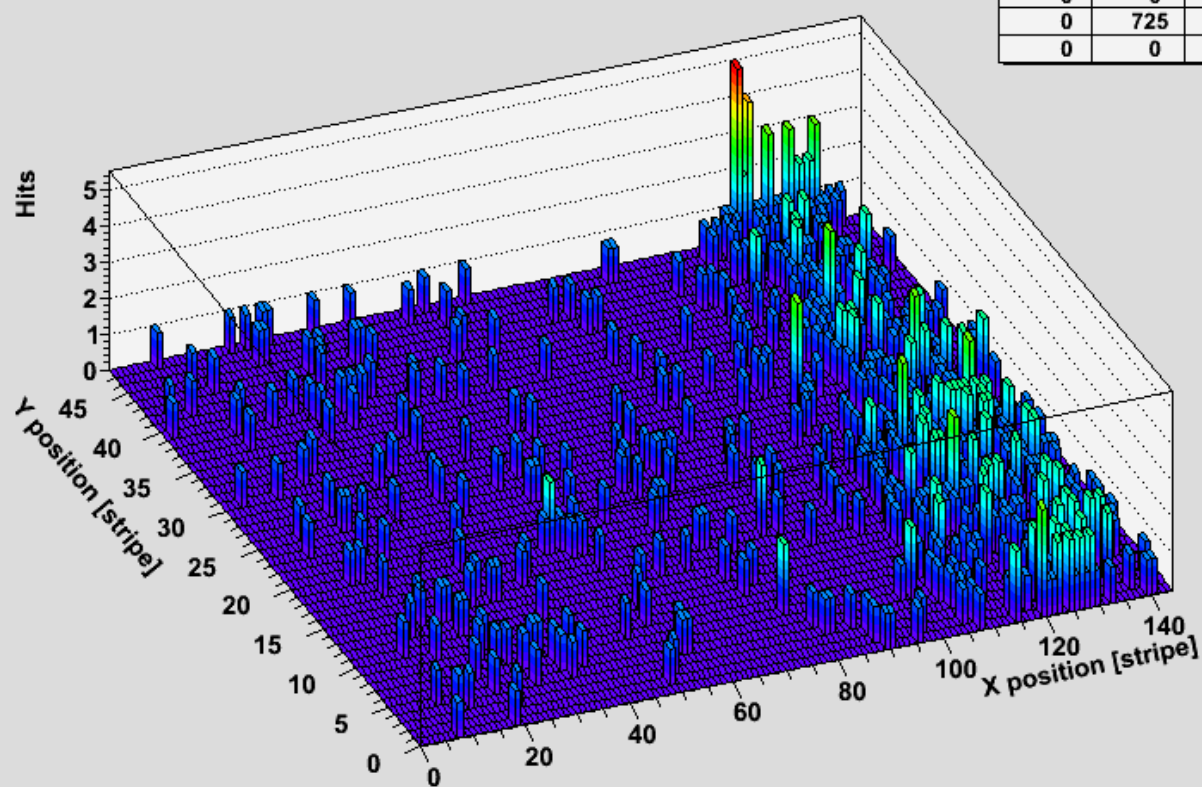
Hit counters before SF 11:04:34 2009-07-03

XYHhitsEvrDT		
Entries	5719882	
0	0	0
0	4391814	0
0	1328068	0



Hit counters before SF 11:04:34 2009-07-03

XYHitsSFD		
Entries		725
0	0	0
0	725	0
0	0	0



Calibration

An automated generation of calibration coefficient files is done by macro

`makecali.C(prefix, rootfile)`

`root -b -l "makecali(\"test\", \"test_AS\")"`

where **prefix** is a string used as prefix for all file names generated, **rootfile** is the name of the ROOT file containing the histograms (given without trailing `.root`). The macro should be adjusted. Several parameters can be set inside.

Histograms/Cali/StopXL: `prefix_StopXL[144]`

Histograms/Cali/StopYL: `prefix_StopYL[96]`

Histograms/Cali/StopXH: `prefix_StopXH[144]`

Histograms/Cali/StopYH: `prefix_StopYH[96]`

Histograms/Cali/BackH: `prefix_BackH[64]`

Histograms/Cali/BackL: `prefix_BackL[64]`

Histograms/Cali/VetoH: `prefix_VetoH[16]`

Histograms/Cali/VetoL: `prefix_VetoL[16]`

Histograms/Unpack/GammaE: `prefix_GammaE[8]`

Histograms/Unpack/GammaT: `prefix_GammaT[8]`

The format of the calibration files is:

name value

The format of the generated files is:

name index a0 a1 a2 : NOF ChiSquare

Class **TascaCalibration** is the parameter class holding the coefficients. This parameter is used in the **TascaCaliProc** processor of the second step.

To enable/disable the calibration the macro

`setcali.C`

must be edited. If enabled, it reads the files produced by `makecali`. For these the prefix string must be set.

Class **TascaCaliFitter** is a parameter class with the purpose of doing the calibration interactively. This might be necessary if the automatic calculations do not work for a histogram. This parameter is used in the **TascaCaliProc** processor of the second step. Calculating calibration parameters is done in two steps. First we need a histogram with the measured lines and a text file with the energies of these lines. These are present in arrays inside the parameter. First fitter **LineFitter** is used to find out true channel numbers for corresponding lines in calibration spectrum. This fit should be done interactively on the GUI side:

- Get parameter **CaliFitter** from analysis (Doubleclick)
- Display calibration spectrum.
- Double click on the **LineFitter** fitter in the parameter editor. Fit panel will open showing the current settings of the fitter. Press **Use pad** of the fit panel to assign this fitter to the view panel containing the calibration spectrum and **Rebuild** button.
- Use peak finder 3 to find the peaks. Enlarging the noise factor removes peaks as well as minimum noise.
- Do Fit. If the positions of the lines are fitted correctly, copy the fitter back to the calibration parameter: right mouse button click on **LineFitter**, select **Get from FitPanel**.
- Check if the name of the calibration file is correct.
- Set **DoFit** variable to 1 (will be set back to 0 after the fit).
- Now press **left arrow button**. This will perform fit of the calibration curve (polynomial of order 2) in the **UpdateFrom()** method of **TascaCaliFitter** on the analysis side.
- Pressing **right arrow button** will get the results of the calibration, present in the polynomial coefficients `fdA[0]...fdA[2]` and in the **Calibrator** fitter.
- The corresponding **TGraph** is **UserObjects/CaliGraph** and is displayed by double click. Then double click on the **Calibrator** fitter in the parameter editor to open in a fit panel, press **Use Pad**, **Rebuild** and **Draw**. This will draw the calibration polynomial over the points which indicate the energy/channel of the calibration lines.

