

Report Files

- \$HOME/./hallc_replay/TEMPLATES/HMS/PRODUCTION
 - hstackana_production.template

```
Run # : {gen_run_number}
```

```
*****
```

```
* General Run Information
```

```
*****
```

```
1 MhZ Pulses : {H.1Mhz.scaler}
```

```
Run Length   : {H.1Mhz.scalerTime:%.3f} sec
```

```
*****
```

```
* Beamline
```

```
*****
```

```
With no cuts on BCM{gBCM_Current_threshold_index+1}.
```

```
BCM1 Current: {H.BCM1.scalerCharge/H.1Mhz.scalerTime:%.3f} uA
```

```
BCM2 Current: {H.BCM2.scalerCharge/H.1Mhz.scalerTime:%.3f} uA
```

```
BCM4a Current: {H.BCM4A.scalerCharge/H.1Mhz.scalerTime:%.3f} uA
```

```
BCM4b Current: {H.BCM4B.scalerCharge/H.1Mhz.scalerTime:%.3f} uA
```

```
BCM17 Current: {H.BCM17.scalerCharge/H.1Mhz.scalerTime:%.3f} uA
```

```
Unser Current: {H.Unser.scalerCharge/H.1Mhz.scalerTime:%.3f} uA
```

```
BCM1 Charge: {H.BCM1.scalerCharge:%.3f} uC
```

```
BCM2 Charge: {H.BCM2.scalerCharge:%.3f} uC
```

```
BCM4a Charge: {H.BCM4A.scalerCharge:%.3f} uC
```

```
BCM4b Charge: {H.BCM4B.scalerCharge:%.3f} uC
```

```
BCM17 Charge: {H.BCM17.scalerCharge:%.3f} uC
```

```
Unser Charge: {H.Unser.scalerCharge:%.3f} uC
```

Report Files

- \$HOME/../../hallc_replay/SCRIPTS/HMS/PRODUCTION/
 - replay_production_all_hms.C

```
// 2 - connect to event number
analyzer->SetEvent(event);
// Set EPICS event type
analyzer->SetEpicsEvtType(180);
// Define crate map
analyzer->SetCrateMapFileName("MAPS/db_cratemap.dat");
// Define output ROOT file
analyzer->SetOutFile(ROOTFileName.Data());
// Define output DEF-file
analyzer->SetOdefFile("DEF-files/HMS/PRODUCTION/hstackana_production_all.def");
// Define cuts file
analyzer->SetCutFile("DEF-files/HMS/PRODUCTION/CUTS/hstackana_production_cuts.def"); // optional
// File to record cuts accounting information for cuts
analyzer->SetSummaryFile(Form("REPORT_OUTPUT/HMS/PRODUCTION/summary_all_production_%d_%d.report", RunNumber, MaxEvent)); // optional
// Start the actual analysis.
analyzer->Process(run);
// Create report file from template.
analyzer->PrintReport("TEMPLATES/HMS/PRODUCTION/hstackana_production.template",
    Form("REPORT_OUTPUT/HMS/PRODUCTION/replay_hms_all_production_%d_%d.report", RunNumber, MaxEvent));
```

Report Files

- \$HOME/../hallc_replay/DEF-files/HMS/PRODUCTION/CUTS

```
trottar@ifarm1401.jlab.org> cd C
CAL/ CER/ CUTS/
trottar@ifarm1401.jlab.org> cd CUTS/
trottar@ifarm1401.jlab.org> ls
hstackana_coarsetracking_cuts.def  hstackana_production_cuts.def  hstackana_rawdecode_cuts.def
hstackana_decode_cuts.def          hstackana_production_cuts_kpp.def  hstackana_reconstruct_cuts.def
trottar@ifarm1401.jlab.org> pwd
/u/home/trottar/Analysis/hallc_replay/DEF-files/HMS/PRODUCTION/CUTS
trottar@ifarm1401.jlab.org> █
```

hstackana_production_cuts.def

```
Block: RawDecode
#include "DEF-files/HMS/PRODUCTION/CUTS/hstackana_rawdecode_cuts.def"
RawDecode_master 1

Block: Decode
#include "DEF-files/HMS/PRODUCTION/CUTS/hstackana_decode_cuts.def"
Decode_master ALL_HMS_NO_EDTM

Block: CoarseTracking
#include "DEF-files/HMS/PRODUCTION/CUTS/hstackana_coarsetracking_cuts.def"
CoarseTracking_master ALL_HMS_NO_EDTM

Block: CoarseReconstruct
CoarseReconstruct_master ALL_HMS_NO_EDTM

Block: Tracking
Tracking_master ALL_HMS_NO_EDTM

Block: Reconstruct
#include "DEF-files/HMS/PRODUCTION/CUTS/hstackana_reconstruct_cuts.def"
Reconstruct_master ALL_HMS_NO_EDTM

Block: Physics
Physics_master ALL_HMS_NO_EDTM
```

hstackana_coarsetracking_cuts.def

Block: CoarseTracking

```
#add cuts to stricter times and apply them to drift distances (HMS 6 GeV Drift Chambers)
hcut_time_cut1      H.dc.1x1.time > 0 && H.dc.1x1.time < 250
hcut_time_cut2      H.dc.1v2.time > 0 && H.dc.1v2.time < 250
hcut_time_cut3      H.dc.1u1.time > 0 && H.dc.1u1.time < 250
hcut_time_cut4      H.dc.1v1.time > 0 && H.dc.1v1.time < 250
hcut_time_cut5      H.dc.1u2.time > 0 && H.dc.1u2.time < 250
hcut_time_cut6      H.dc.1x2.time > 0 && H.dc.1x2.time < 250
hcut_time_cut7      H.dc.2x1.time > 0 && H.dc.2x1.time < 250
hcut_time_cut8      H.dc.2v2.time > 0 && H.dc.1v2.time < 250
hcut_time_cut9      H.dc.2u1.time > 0 && H.dc.2u1.time < 250
hcut_time_cut10     H.dc.2v1.time > 0 && H.dc.2v1.time < 250
hcut_time_cut11     H.dc.2u2.time > 0 && H.dc.2u2.time < 250
hcut_time_cut12     H.dc.2x2.time > 0 && H.dc.2x2.time < 250
```

hstackana_decode_cuts.def

Block: Decode

```
hcut_TRIG1      T.hms.hTRIG1_tdcTimeRaw > 2000
hcut_TRIG2      T.hms.hTRIG2_tdcTimeRaw > 2000
hcut_TRIG3      T.hms.hTRIG3_tdcTimeRaw > 2000
HMS_Pretrig     hcut_TRIG1 || hcut_TRIG2 || hcut_TRIG3

hms_trigs       HMS_event
hcut_edtm_accepted T.hms.hEDTM_tdcTimeRaw != 0.0
hcut_physics_accepted T.hms.hEDTM_tdcTimeRaw == 0.0
ALL_HMS_NO_EDTM  ALL_HMS_events && hcut_physics_accepted
```

hstackana_reconstruct_cuts.def

Block: Reconstruct

```
hcut_cer_pmt1_elec      H.cer.npe[0]>.5
hcut_cer_pmt2_elec      H.cer.npe[0]>.5
hcut_cer_elec           H.cer.npeSum>.5
hcut_cer_pi             H.cer.npeSum<.5

HMSScinGood             H.hod.goodscinhit == 1
HMSGoodBetanotrk        H.hod.betanotrack > 0.8 && H.hod.betanotrack < 1.3

HMSScinShould           HMSScinGood && HMSGoodBetanotrk && !hmsDCany_large
HMSScinShoulde          HMSScinShould && H.cal.etotnorm > 0.6&& H.cal.etotnorm < 2.0&& H.cer.npeSum > 0.5
HMSScinShouldh          HMSScinGood && H.cal.etotnorm <0.6&& H.cal.etotnorm>0.0&& H.cer.npeSum < 0.5

HMSScinDid              HMSScinShould && H.dc.ntrack > 0
HMSScinDide             HMSScinShoulde && H.dc.ntrack > 0
HMSScinDidh             HMSScinShouldh && H.dc.ntrack > 0
```


CPU LT

```
=====  
= Live/Dead Time Calculations  
=====
```

```
HMS Computer Live Time : {(hcut_TRIG1.npassed / H.hTRIG1.scaler)*100.0:%3.4f} %  
HMS Computer Dead Time : {100.0 - (hcut_TRIG1.npassed / H.hTRIG1.scaler)*100.0:%3.4f} %
```

```
Pre-Scaled Ps1 HMS Computer Live Time : {(hcut_TRIG1.npassed / (H.hTRIG1.scaler/ghconfig_ti_ps_factors[0]))*100.0:%3.4f} %  
Pre-Scaled Ps1 HMS Computer Dead Time : {100.0 - (hcut_TRIG1.npassed / (H.hTRIG1.scaler/ghconfig_ti_ps_factors[0]))*100.0:%3.4f} %
```

```
Pre-Scaled Ps2 HMS Computer Live Time : {(hcut_TRIG2.npassed / (H.hTRIG2.scaler/ghconfig_ti_ps_factors[1]))*100.0:%3.4f} %  
Pre-Scaled Ps2 HMS Computer Dead Time : {100.0 - (hcut_TRIG2.npassed / (H.hTRIG2.scaler/ghconfig_ti_ps_factors[1]))*100.0:%3.4f} %
```

```
Pre-Scaled Ps3 HMS Computer Live Time : {(hcut_TRIG3.npassed / (H.hTRIG3.scaler/ghconfig_ti_ps_factors[2]))*100.0:%3.4f} %  
Pre-Scaled Ps3 HMS Computer Dead Time : {100.0 - (hcut_TRIG3.npassed / (H.hTRIG3.scaler/ghconfig_ti_ps_factors[2]))*100.0:%3.4f} %
```

```
Total Live Time (EDTM) : {(hcut_edtm_accepted.npassed / H.EDTM.scaler)*100.0:%3.4f} %  
Total Dead Time (EDTM) : {100.0 - (hcut_edtm_accepted.npassed / H.EDTM.scaler)*100.0:%3.4f} %
```

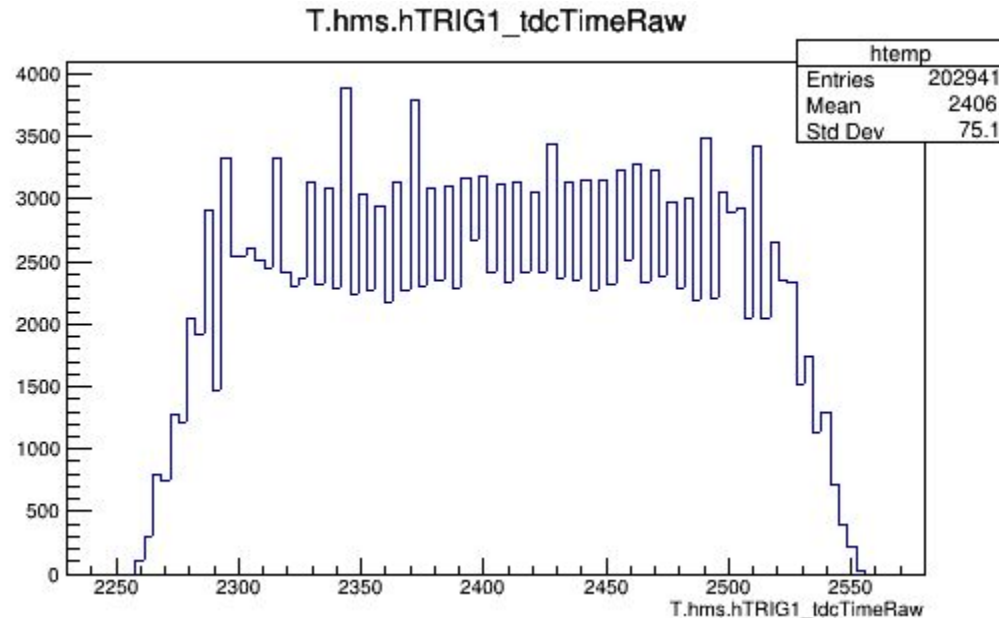

hstackana_decode_cuts.def

Block: Decode

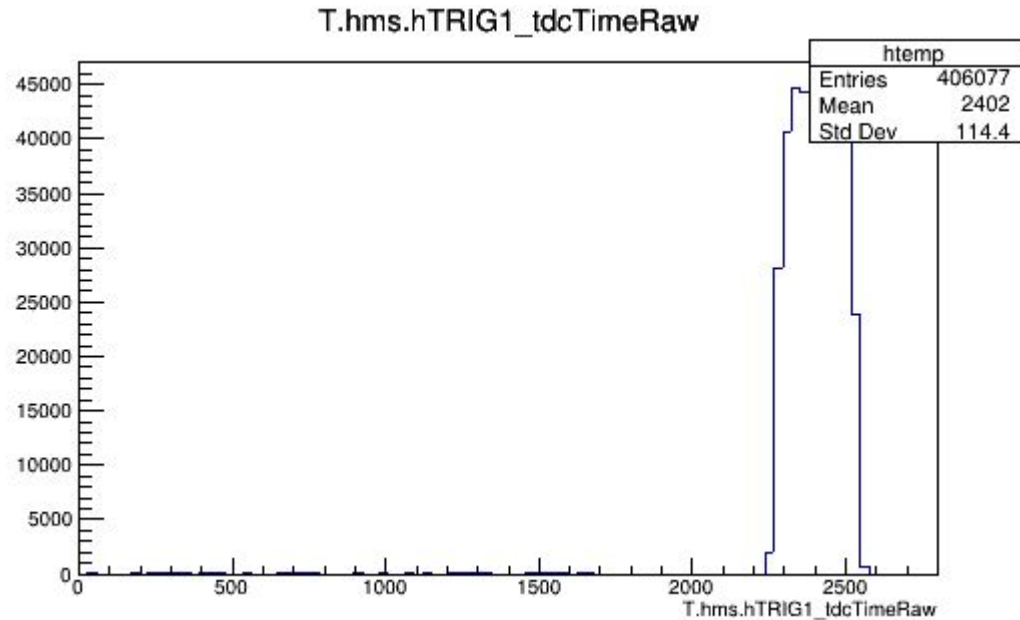
```
hcut_TRIG1      T.hms.hTRIG1_tdcTimeRaw > 2000
hcut_TRIG2      T.hms.hTRIG2_tdcTimeRaw > 2000
hcut_TRIG3      T.hms.hTRIG3_tdcTimeRaw > 2000
HMS_Pretrig     hcut_TRIG1 || hcut_TRIG2 || hcut_TRIG3

hms_trigs       HMS_event
hcut_edtm_accepted T.hms.hEDTM_tdcTimeRaw != 0.0
hcut_physics_accepted T.hms.hEDTM_tdcTimeRaw == 0.0
ALL_HMS_NO_EDTM   ALL_HMS_events && hcut_physics_accepted
```

T.hms.hTRIG1_tdcTimeRaw (1415)



T.hms.hTRIG1_tdcTimeRaw (1423)



CPU LT

- Applied cuts before signal (T.hms.hTRIG1_tdcTimeRaw>0 && T.hms.hTRIG1_tdcTimeRaw < 2000)

1415

```
==*==*==*==*==*==*
= 3/4 Triggers
==*==*==*==*==*==*
```

```
HMS 3/4 Triggers      : 12971 [ 12971 ]
Estimated HMS 3/4 Triggers : 34231
HMS 3/4 Trigger Rate   : 2,551 kHz
Accepted HMS Triggers   : 0
HMS Event Types        : 5767
```

```
HMS Computer Live Time : 0,0000 % [ 0,0000 % ]
HMS Computer Dead Time : 100,0000 % [ 100,0000 % ]
```

1423

```
==*==*==*==*==*==*
= 3/4 Triggers
==*==*==*==*==*==*
```

```
HMS 3/4 Triggers      : 91698 [ 10188,666667 ]
Estimated HMS 3/4 Triggers : 92251
HMS 3/4 Trigger Rate   : 16,512 kHz
Accepted HMS Triggers   : 31
HMS Event Types        : 5802
```

```
HMS Computer Live Time : 0,0338 % [ 0,3043 % ]
HMS Computer Dead Time : 99,9662 % [ 99,6957 % ]
```

```
==*==*==*==*==*==*
```

Luminosity Scans

- Made a C program that takes the events with cuts, plots them and creates a table

```
TString filename3 = "beamTime_current";

TString foutname = "plot_YieldvsCurrent_";

TTree *tr1 = new TTree("tr1", "tr1");
Int_t ndata1 = tr1->ReadFile(filename1,"runNumber:trEvs");
tr1->Draw("runNumber:trEvs", "", "goff");

TTree *tr2 = new TTree("tr2", "tr2");
Int_t ndata2 = tr2->ReadFile(filename2,"runNumber:eLT:cpuLT:eTrackEff");
tr2->Draw("runNumber:eLT:cpuLT:eTrackEff", "", "goff");

TTree *tr3 = new TTree("tr3", "tr3");
Int_t ndata3 = tr3->ReadFile(filename3,"runNumber:current:bTime");
tr3->Draw("runNumber:current:bTime", "", "goff");

Double_t *runNumber = tr1->GetV1();
Double_t *trEvs = tr1->GetV2();
Double_t *eLT = tr2->GetV2();
Double_t *cpuLT = tr2->GetV3();
Double_t *eTrackEff = tr2->GetV4();
Double_t *current = tr3->GetV2();
Double_t *bTime = tr3->GetV3();

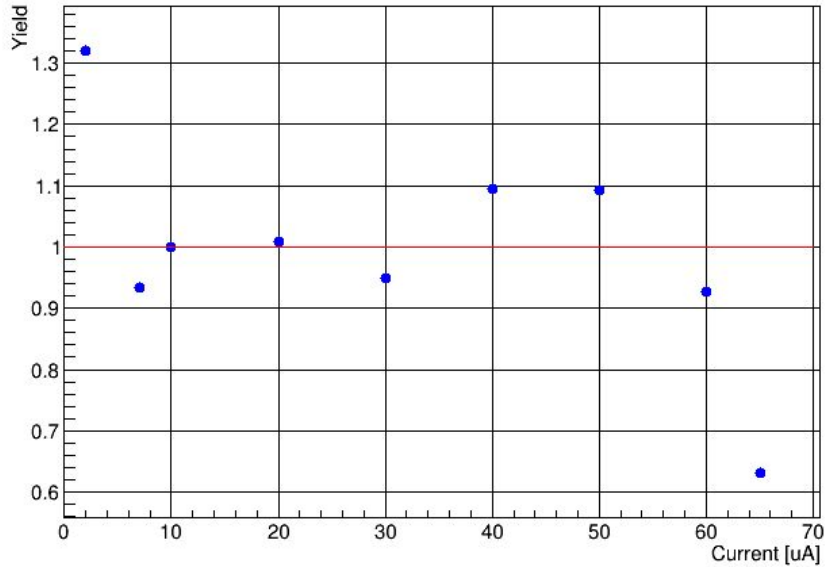
Double_t curr, beamTime, charge[9], chargeEff[9], yield[9], yieldRel[9], uncerEvs[9];

for(Int_t i=0;i<ndata1;i++){
  charge[i] = current[i]*bTime[i];
  chargeEff[i] = charge[i]*eLT[i]*cpuLT[i]*eTrackEff[i];
  yield[i] = trEvs[i]/chargeEff[i];
}
```

Comparing Cuts

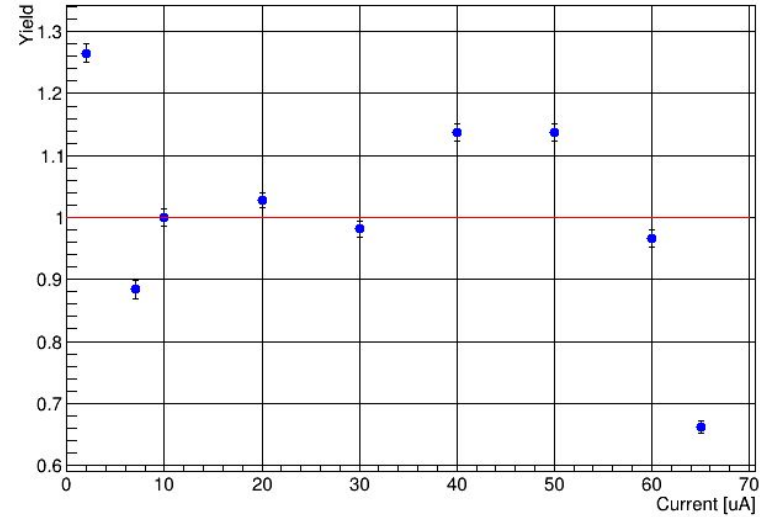
My Cuts

Carbon[1415-1423]



Ryan's Cuts

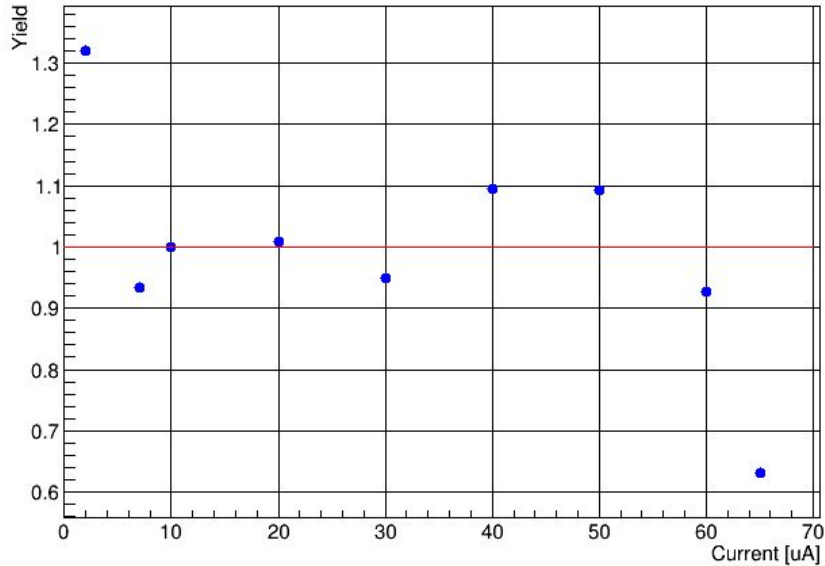
Carbon[1415-1423]



Comparing Cuts

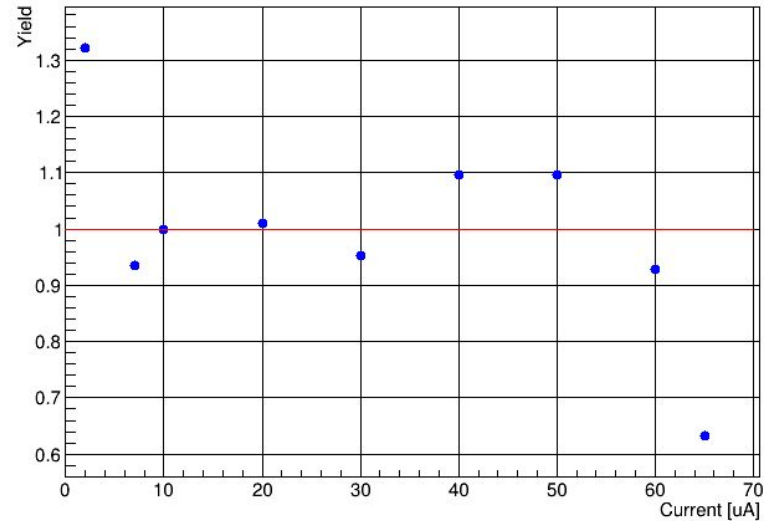
My Cuts

Carbon[1415-1423]



My Cuts, no
Cherenkov cut

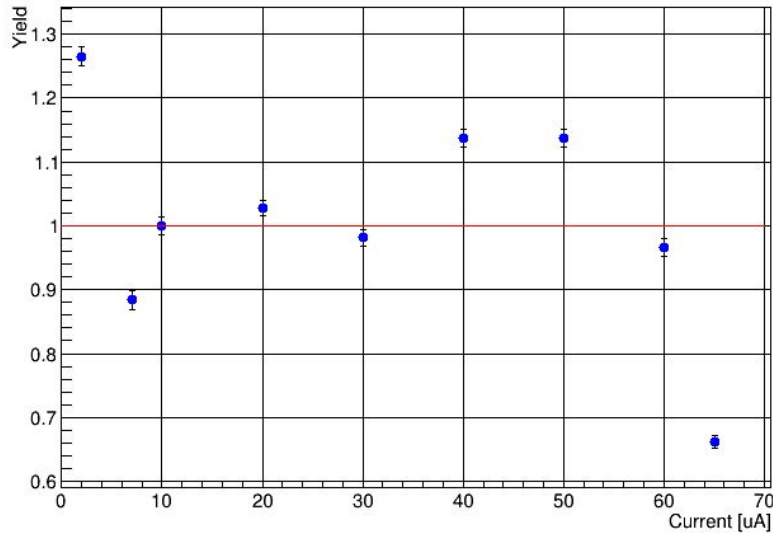
Carbon[1415-1423]



Comparing Cuts

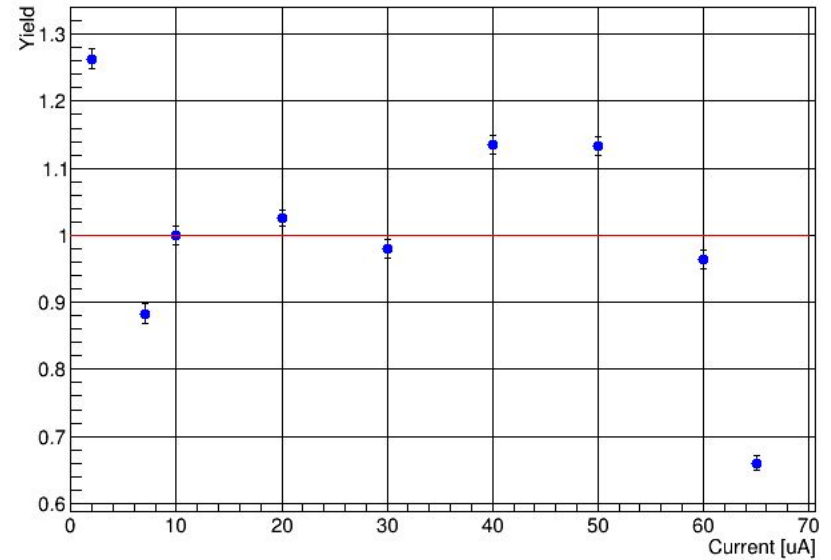
Ryan's Cuts

Carbon[1415-1423]



Ryan's Cuts,
My Ecal leaf

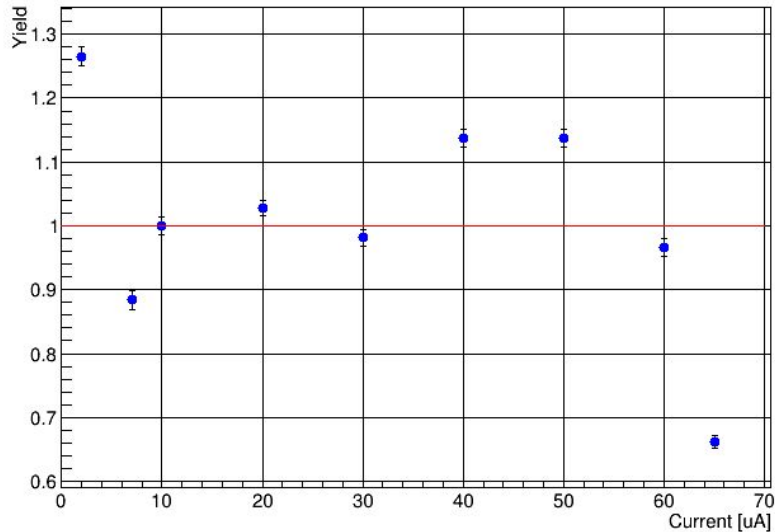
Carbon[1415-1423]



Comparing Cuts

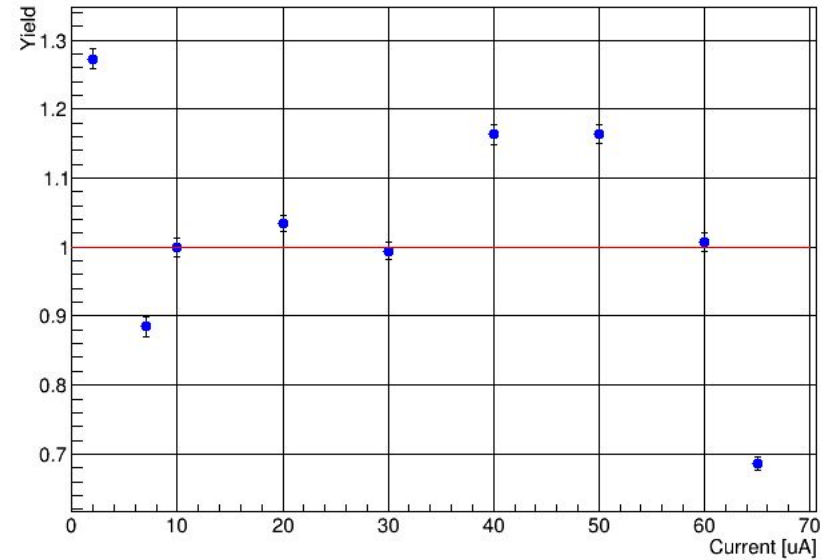
Ryan's Cuts

Carbon[1415-1423]



Ryan's Cuts,
no beta cut

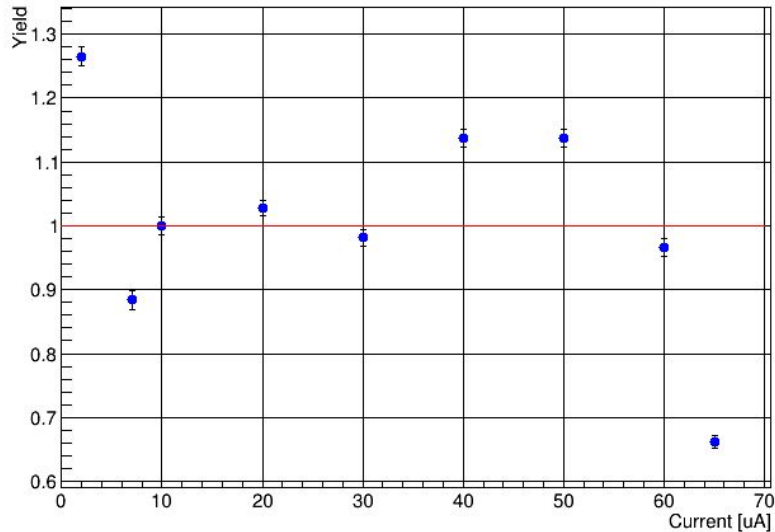
Carbon[1415-1423]



Comparing Cuts

Ryan's Cuts

Carbon[1415-1423]



Ryan's Cuts,
no chi cut

Carbon[1415-1423]

