

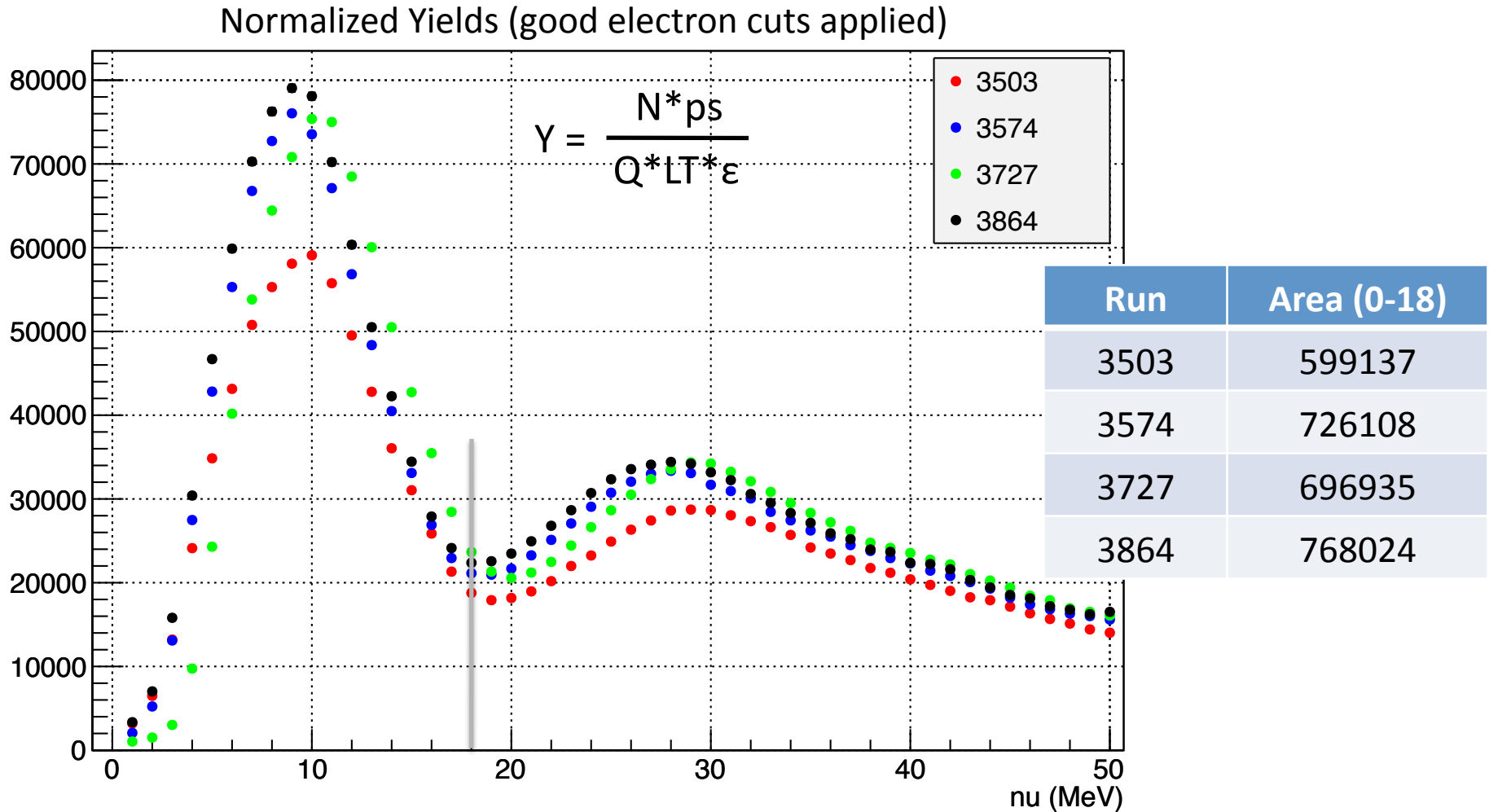
# Summary of Yields Study

M. Cummings

2/12/14

# Yields for Packing Fraction Runs

2.2 GeV, 2.5T, Transverse, Material 7

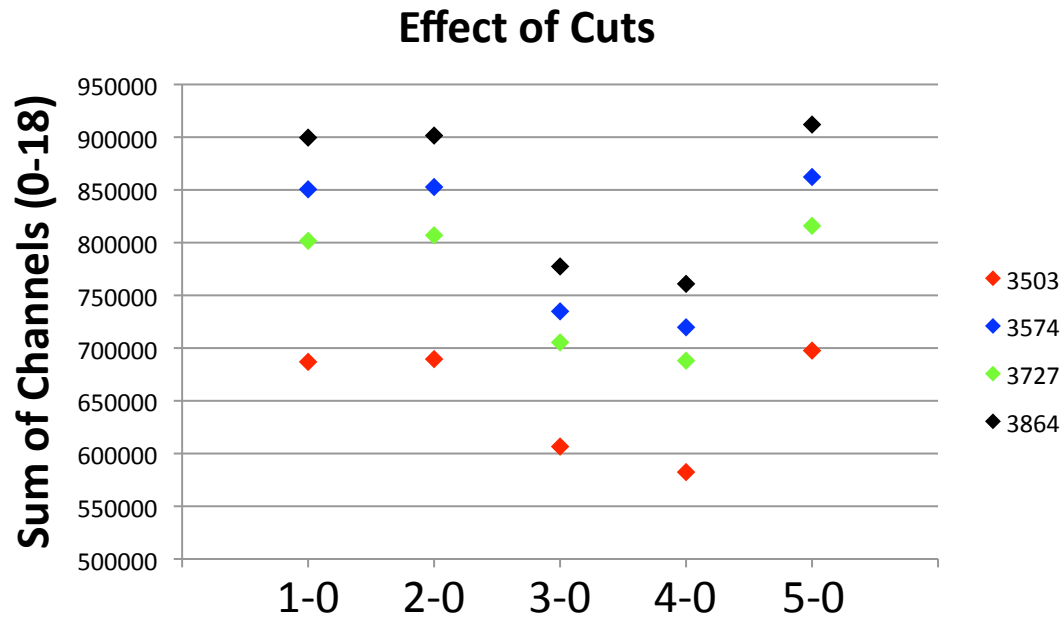


\*LT normalization is the average of the helicity gated LT

# Things that have been checked

- Effect of Cuts
- Tighter Acceptance/PID cuts
- Helicity gated yields
- 1<sup>st</sup> and 2<sup>nd</sup> half of run
- Multi-track efficiency
- Raster cuts
- Rate/current

# Effect of Cuts



## 1-0:

$\text{abs}(L.tr.r\_x) < 0.5$   
 $\text{abs}(L.tr.r\_y) < 0.05$   
 $\text{abs}(L.tr.r\_th) < 0.05$   
 $\text{abs}(L.tr.r\_ph) < 0.05$   
 $\text{abs}(L.gold.dp) < 0.035$

## 2-0:

$L.cer.asum\_c > CerCut$   
 $(L.prl1.e)/p > PR1Cut$   
 $(L.prl1.e+L.prl2.e)/p > SumCut$

## 3-0:

$L.tr.n==1$   
 $L.vdc.*.nclust==1$

## 4-0:

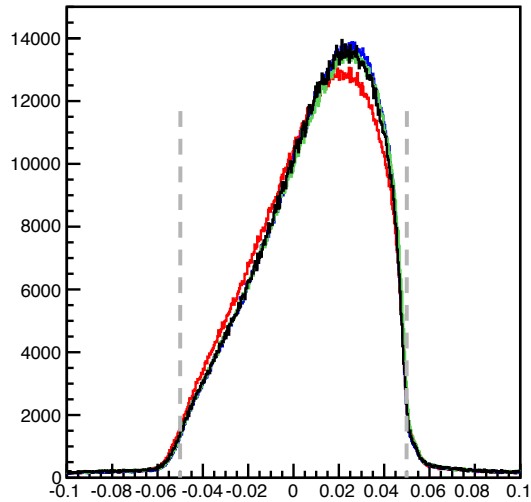
All Cuts

## 5-0:

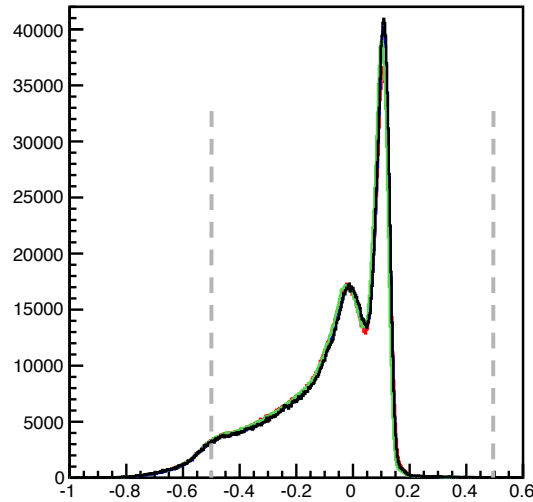
No Cuts

# Effect of Cuts (Acceptance)

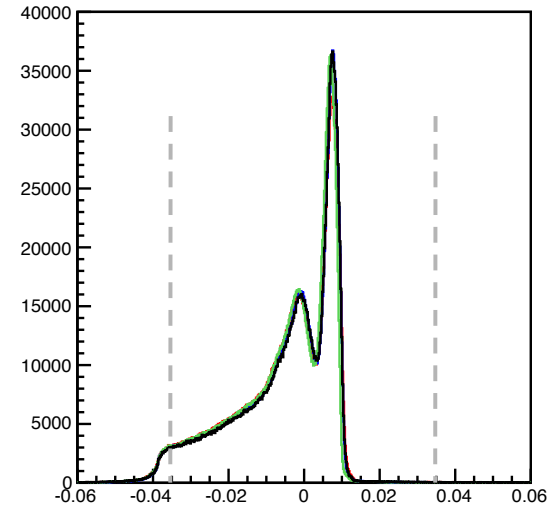
Y Cut:  $\pm 0.05$



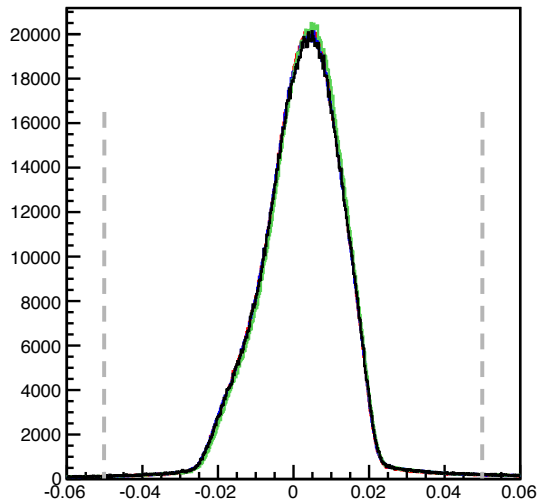
X Cut:  $\pm 0.5$



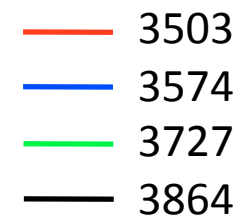
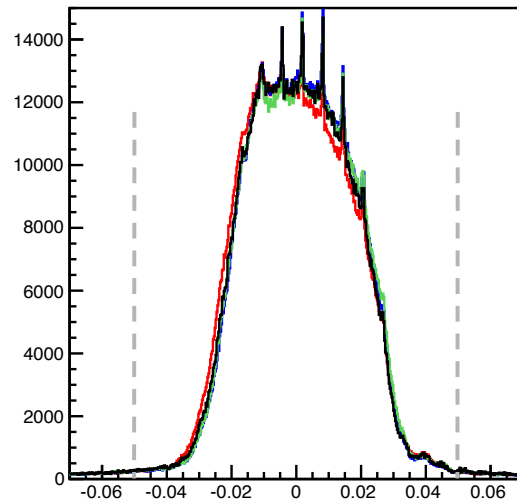
dp Cut:  $\pm 0.035$



Theta Cut:  $\pm 0.05$

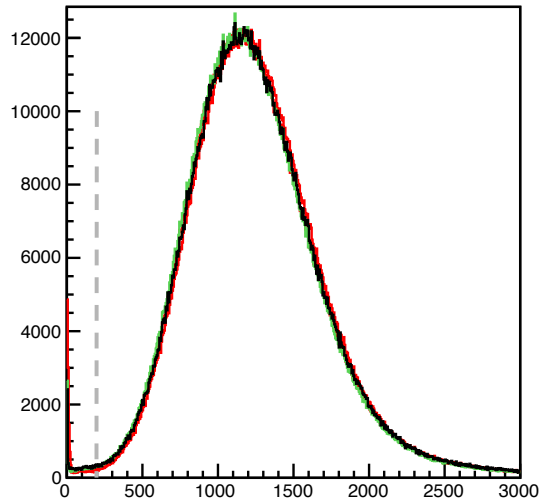


Phi Cut:  $\pm 0.05$

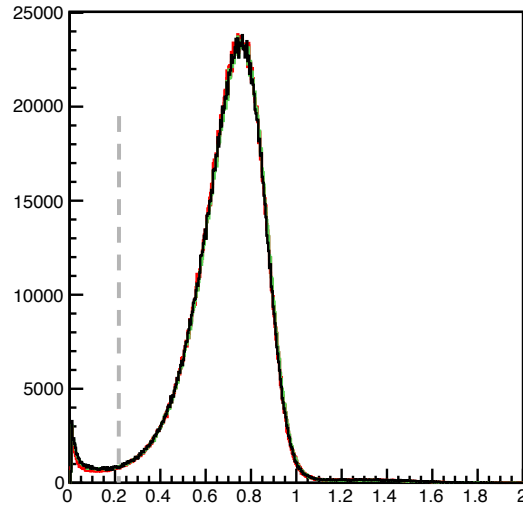


# Effect of Cuts (PID)

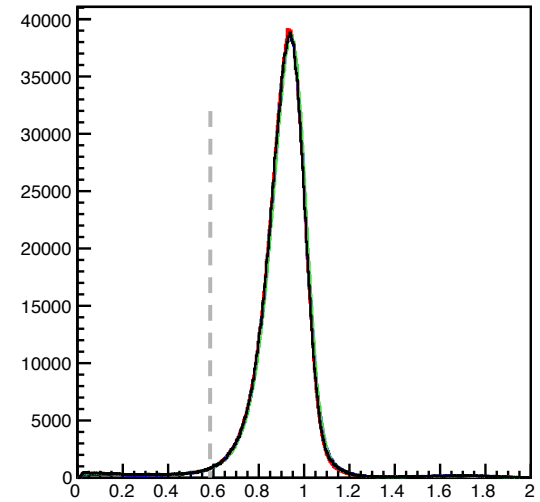
Cherenkov Sum Cut:  $C_{er} > 200$



PR1 Cut:  $PR1/p > 0.212$

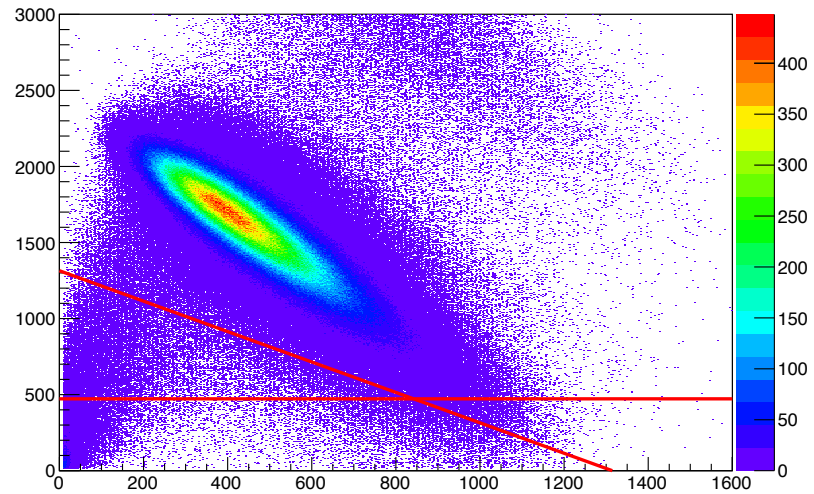


E/p Cut:  $(PR1+PR2)/p > 0.59$



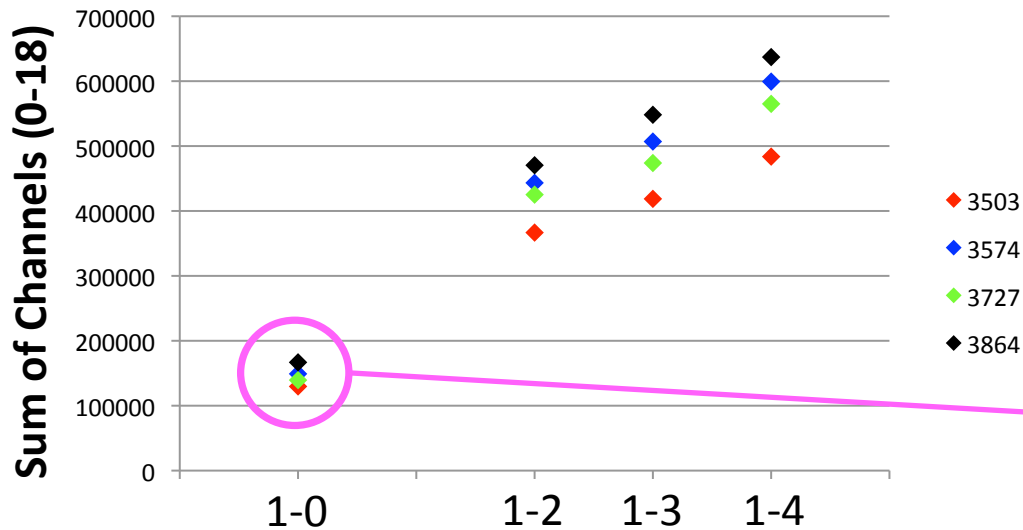
- 3503
- 3574
- 3727
- 3864

Lead Glass Cuts



# Using Tighter Acceptance Cuts

Effect of Tight Acceptance Cuts



| Run  | Sum (0-18) |
|------|------------|
| 3503 | 129671     |
| 3574 | 149058     |
| 3727 | 139426     |
| 3864 | 166796     |

**OLD:**

$\text{abs}(L.\text{tr}.r\_x) < 0.5$   
 $\text{abs}(L.\text{tr}.r\_y) < 0.05$   
 $\text{abs}(L.\text{tr}.r\_th) < 0.05$   
 $\text{abs}(L.\text{tr}.r\_ph) < 0.05$   
 $\text{abs}(L.\text{gold}.dp) < 0.035$

**NEW:**

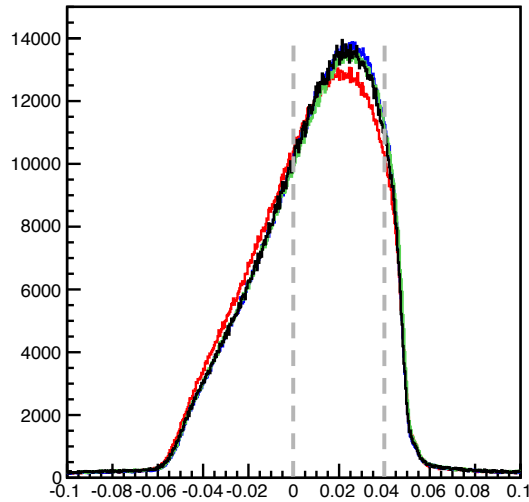
$\text{abs}(L.\text{tr}.r\_x) < 0.5$   
 $0.0 < L.\text{tr}.r\_y < 0.04$   
 $-0.002 < L.\text{tr}.r\_th < 0.01$   
 $-0.015 < L.\text{tr}.r\_ph < 0.015$   
 $\text{abs}(L.\text{gold}.dp) < 0.035$

**Labels:**

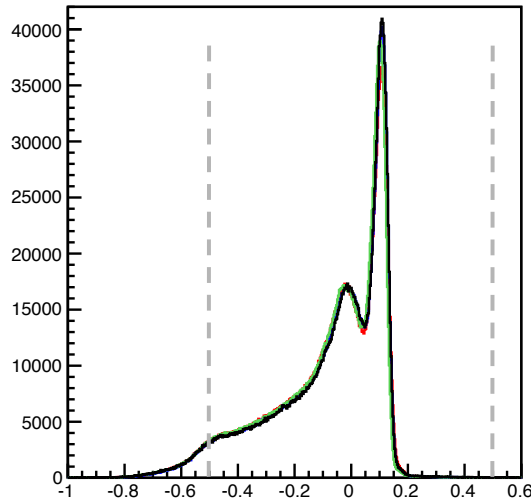
1-0: all acceptance cuts  
 1-2: only  $\theta$  cut  
 1-3: only  $\phi$  cut  
 1-4: only  $y$  cut

# Using Tighter Acceptance Cuts

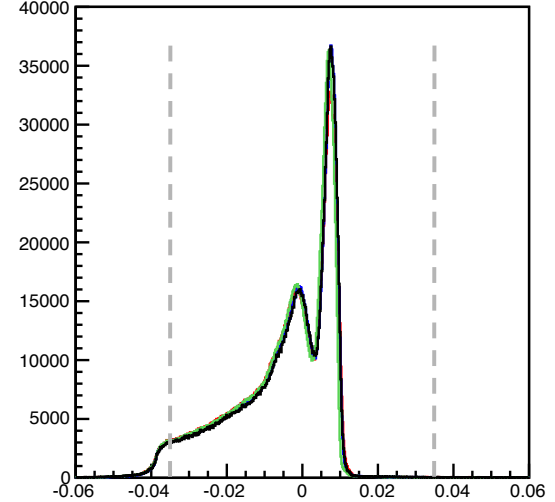
Y Cut:  $0.0 < y < 0.04$



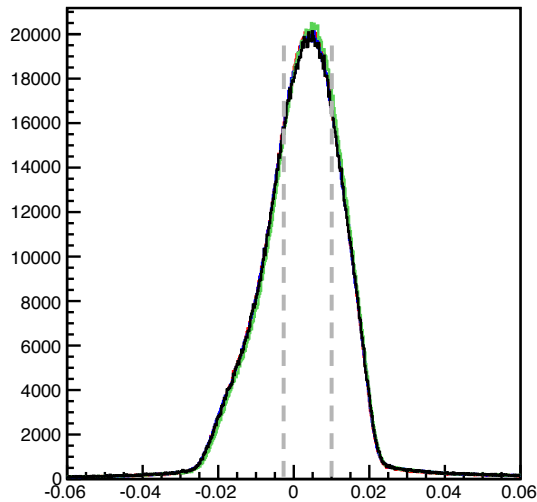
X Cut:  $\pm 0.5$



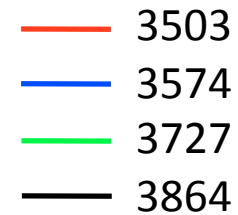
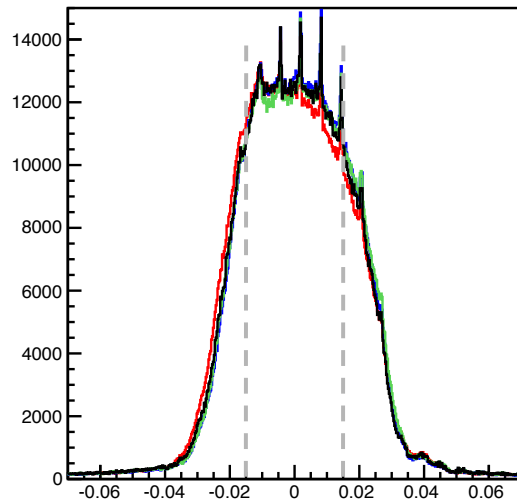
dp Cut:  $\pm 0.035$



Theta Cut:  $-0.002 < \theta < 0.01$



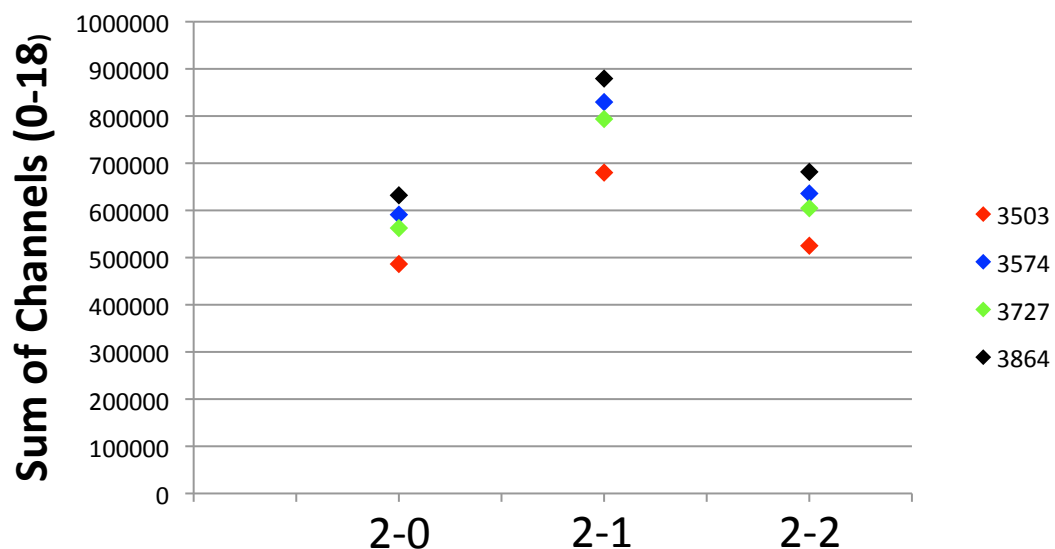
Phi Cut:  $-0.015 < \phi < 0.015$





# Using Tighter PID Cuts

Effect of Tight PID Cuts



## OLD:

$L.cer.asum\_c > 200$

$(L.prl1.e)/p > 0.212$

$(L.prl1.e+L.prl2.e)/p > 0.59$

## NEW:

$L.cer.asum\_c > 1000$

$(L.prl1.e)/p > 0.45$

$(L.prl1.e+L.prl2.e)/p > 0.75$

## Labels:

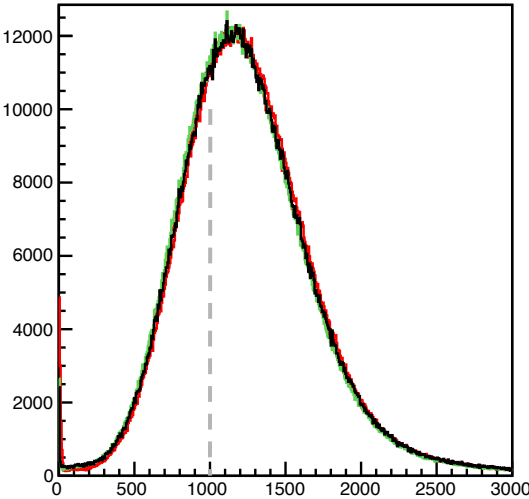
2-0: all PID cuts

2-1: only PR cuts

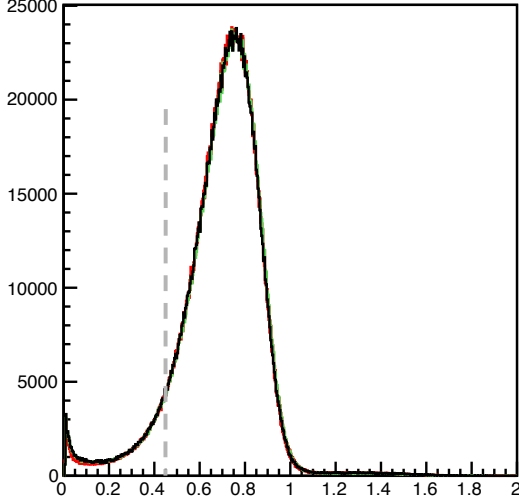
2-2: only Cherenkov cut

# Using Tighter PID Cuts

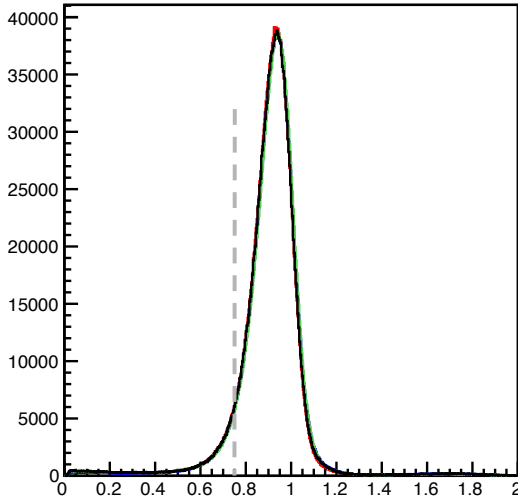
Cherenkov Sum Cut: Cer > 1000



PR1 Cut: PR1/p > 0.30

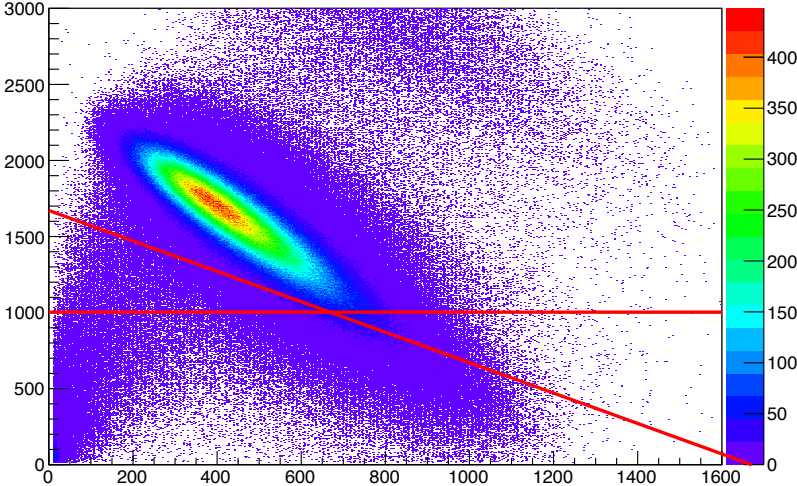


E/p Cut: (PR1+PR2)/p > 0.75

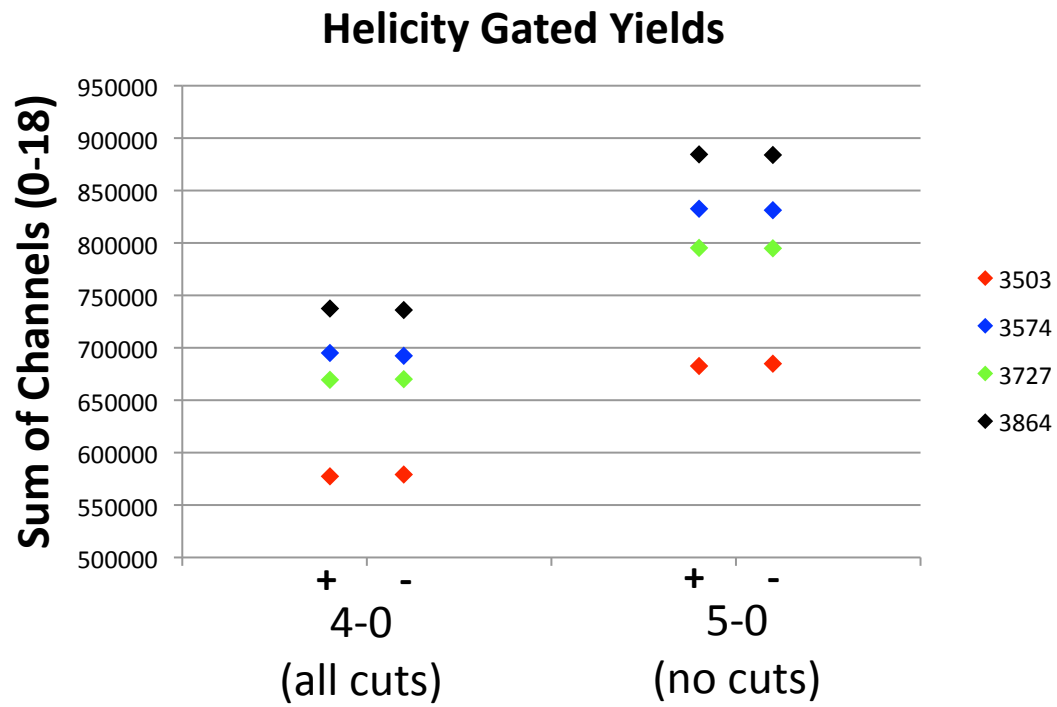


- 3503
- 3574
- 3727
- 3864

Lead Glass Cuts

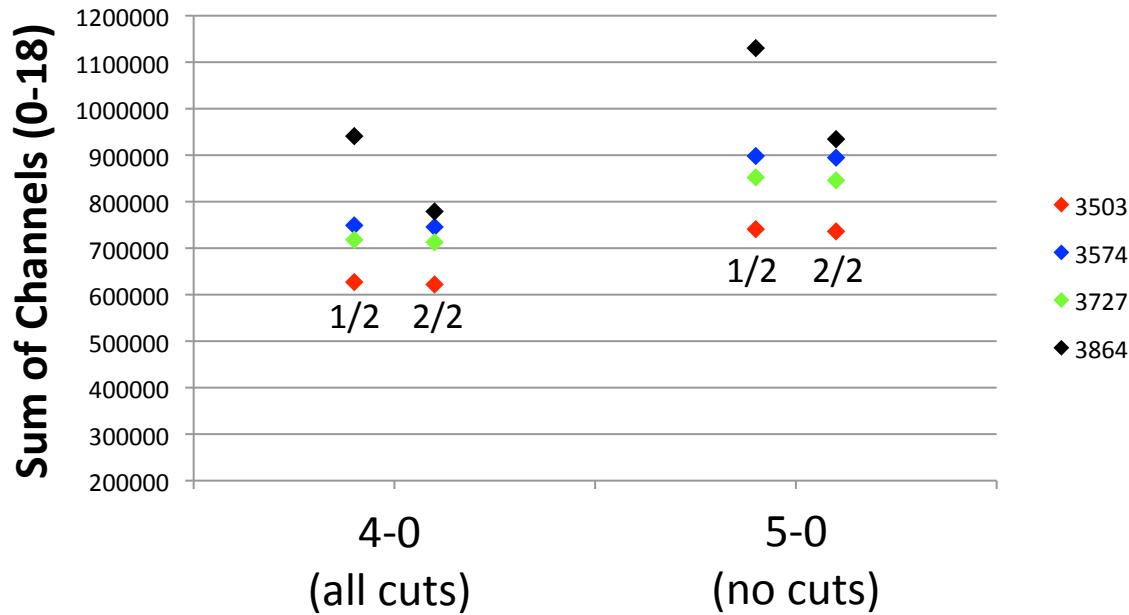


# Helicity Gated Yields



# 1<sup>st</sup> Half vs 2<sup>nd</sup> Half

First Half vs Second Half of Run

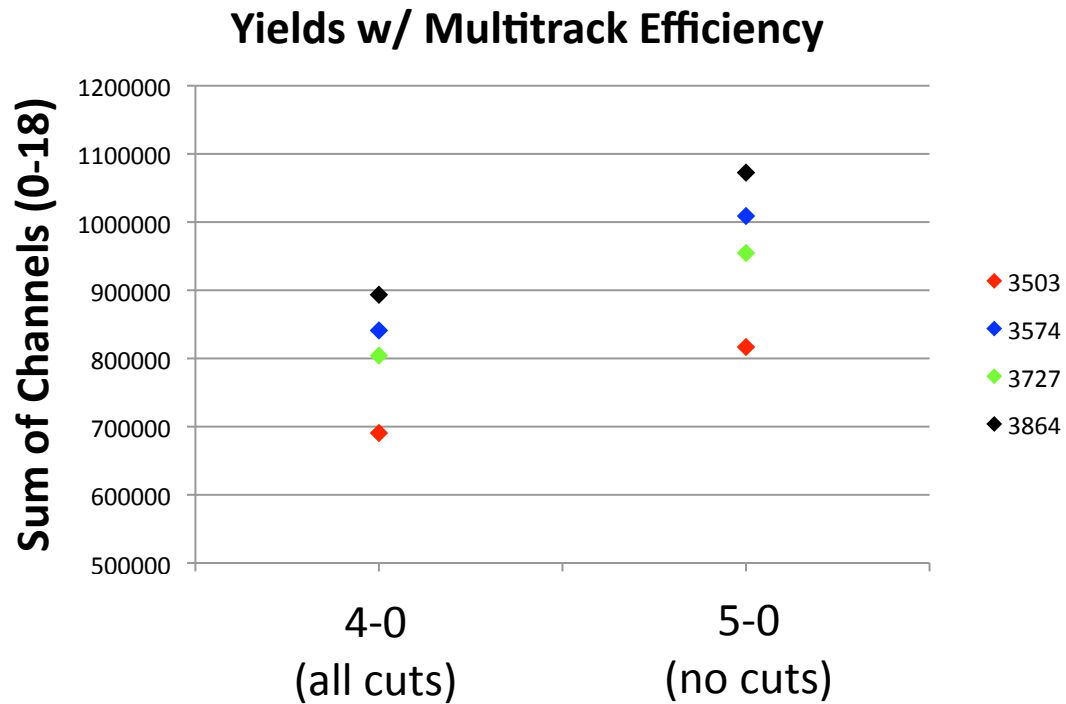


Non-helicity-gated LT!



| Run  | Q                    |                      | LT                   |                      |
|------|----------------------|----------------------|----------------------|----------------------|
|      | 1 <sup>st</sup> Half | 2 <sup>nd</sup> half | 1 <sup>st</sup> half | 2 <sup>nd</sup> half |
| 3503 | 7.177                | 7.200                | 0.9195               | 0.9249               |
| 3574 | 9.388                | 9.416                | 0.9489               | 0.9505               |
| 3727 | 8.273                | 8.314                | 0.9534               | 0.9571               |
| 3864 | 4.069                | 4.062                | 0.799                | 0.960                |

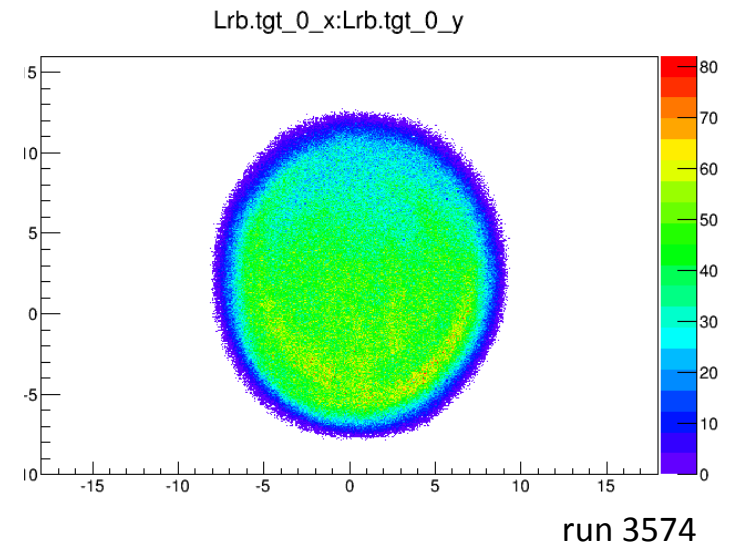
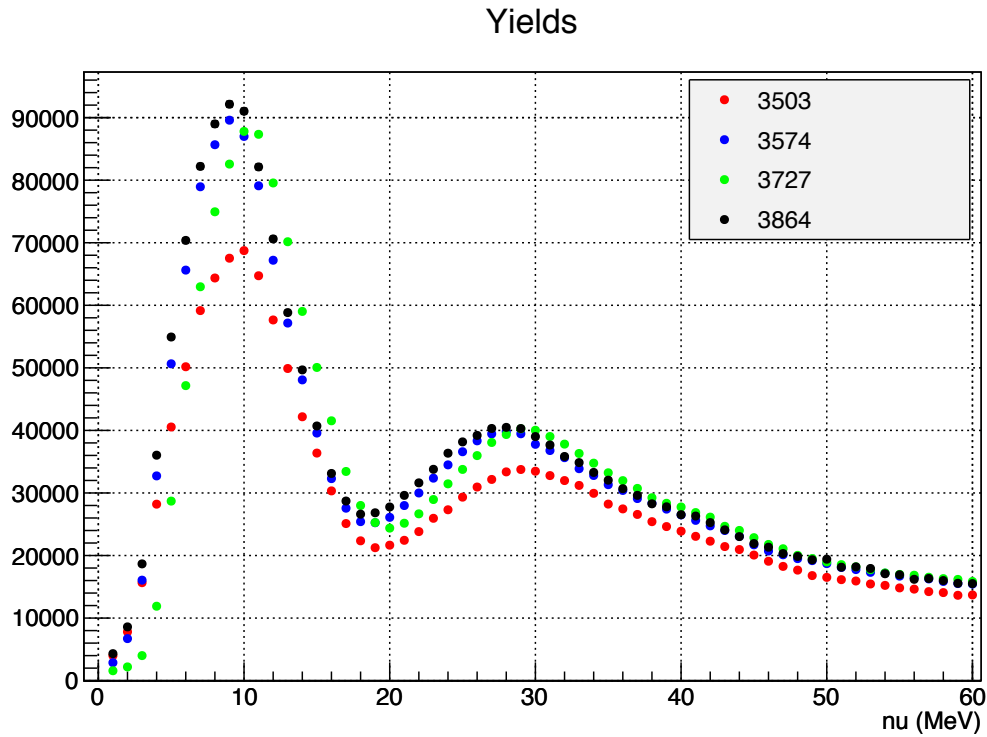
# Including Multi-track Efficiency



$$\text{eff} = \frac{\# \text{ events w/ tr}=1}{\# \text{ events w/ tr}>0}$$

| Run  | ~Multi-track eff. |
|------|-------------------|
| 3503 | 0.9004            |
| 3574 | 0.8858            |
| 3727 | 0.8948            |
| 3864 | 0.8856            |

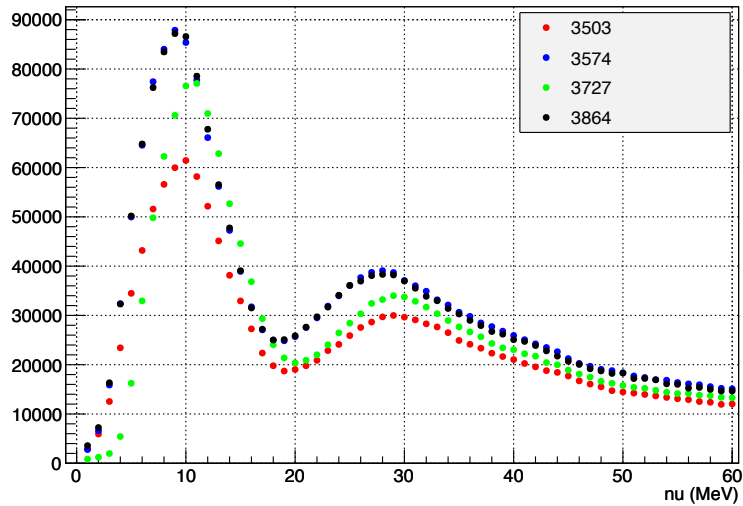
# Raster Test



**Test:** try different sized cuts on raster to check if beam was scraping something

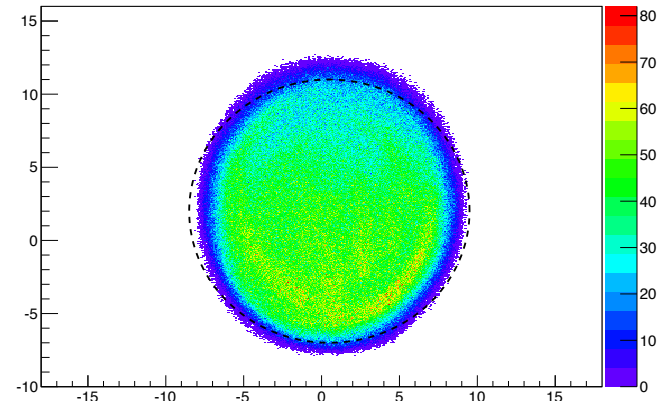
# Raster Test

Yields

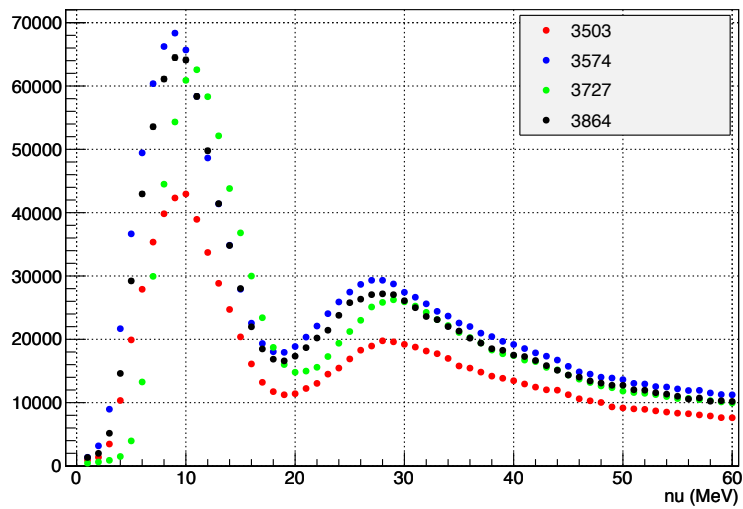


$r < 9$

Lrb.tgt\_0\_x:Lrb.tgt\_0\_y

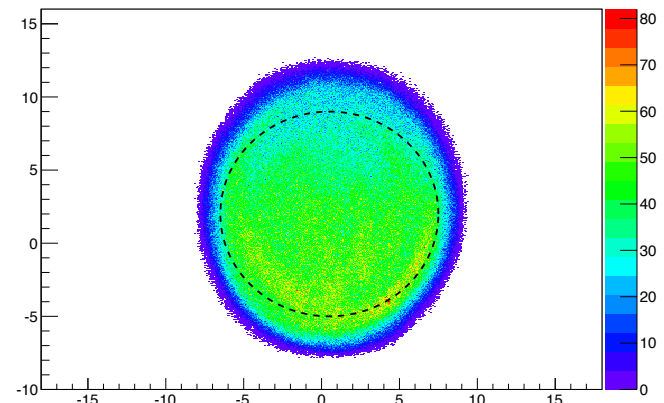


Yields



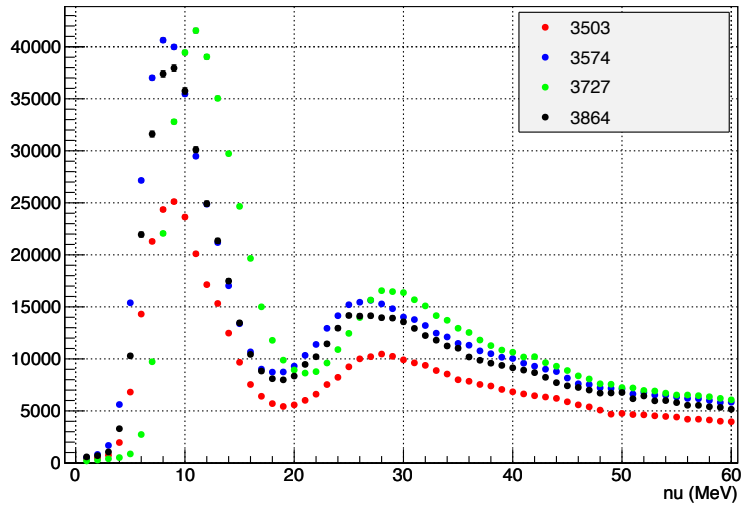
$r < 7$

Lrb.tgt\_0\_x:Lrb.tgt\_0\_y



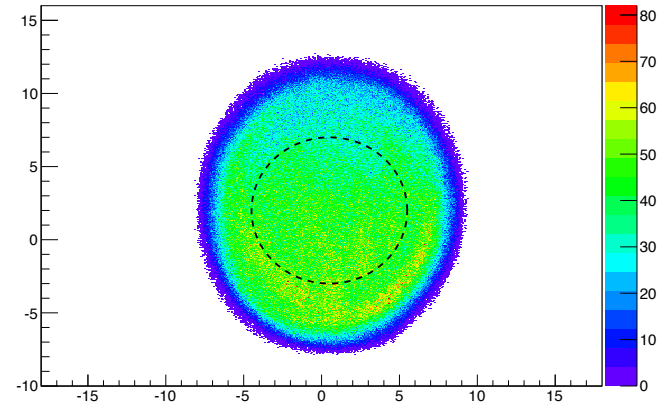
# Raster Test

Yields

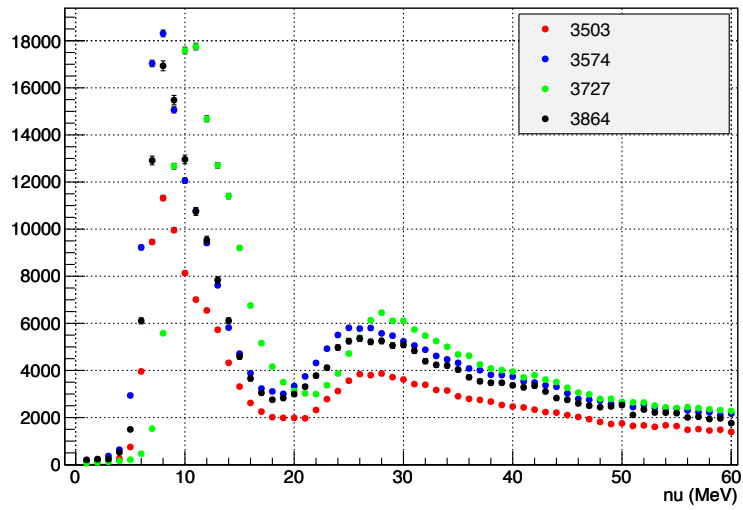


$r < 5$

Lrb.tgt\_0\_x:Lrb.tgt\_0\_y

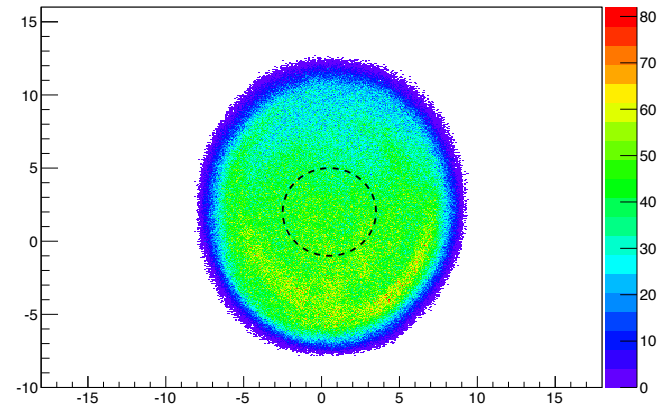


Yields



$r < 3$

Lrb.tgt\_0\_x:Lrb.tgt\_0\_y





# Rate/Current Check for 2.2 GeV

