

# 2.5T HRS Asymmetry Comparison

David Ruth

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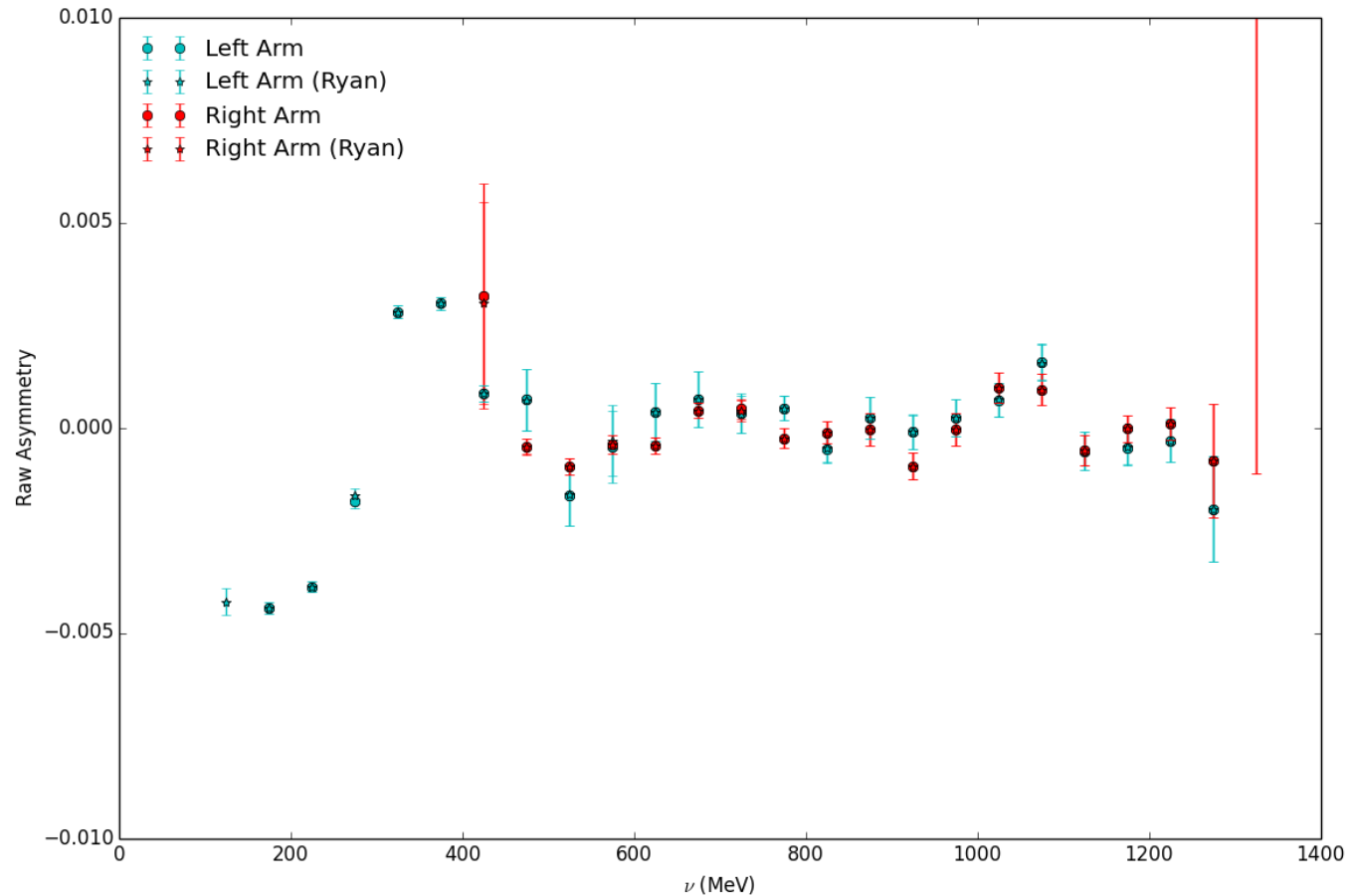
# Background

- Ryan has previously obtained good agreement for 2.2 GeV energy setting for 5T runs, both for transverse and longitudinal orientation
- Good agreement considered to be a  $\chi^2$  close to that produced by random fluctuations around one HRS data set
- Attempting to repeat this study for 2.5T Data

# Relevant Cuts

- $-0.06 < \theta < 0.06$
  - $-0.04 < \phi < 0.04$
  - $-0.04 < dp < 0.04$
- 
- Same cuts for both HRS, and for all energy settings

# Generated Asymmetries to match Ryan's existing analysis



**2.254 GeV Longitudinal 5 T, 50 MeV Bins**

$\chi^2$  (right arm theory) = 1.393

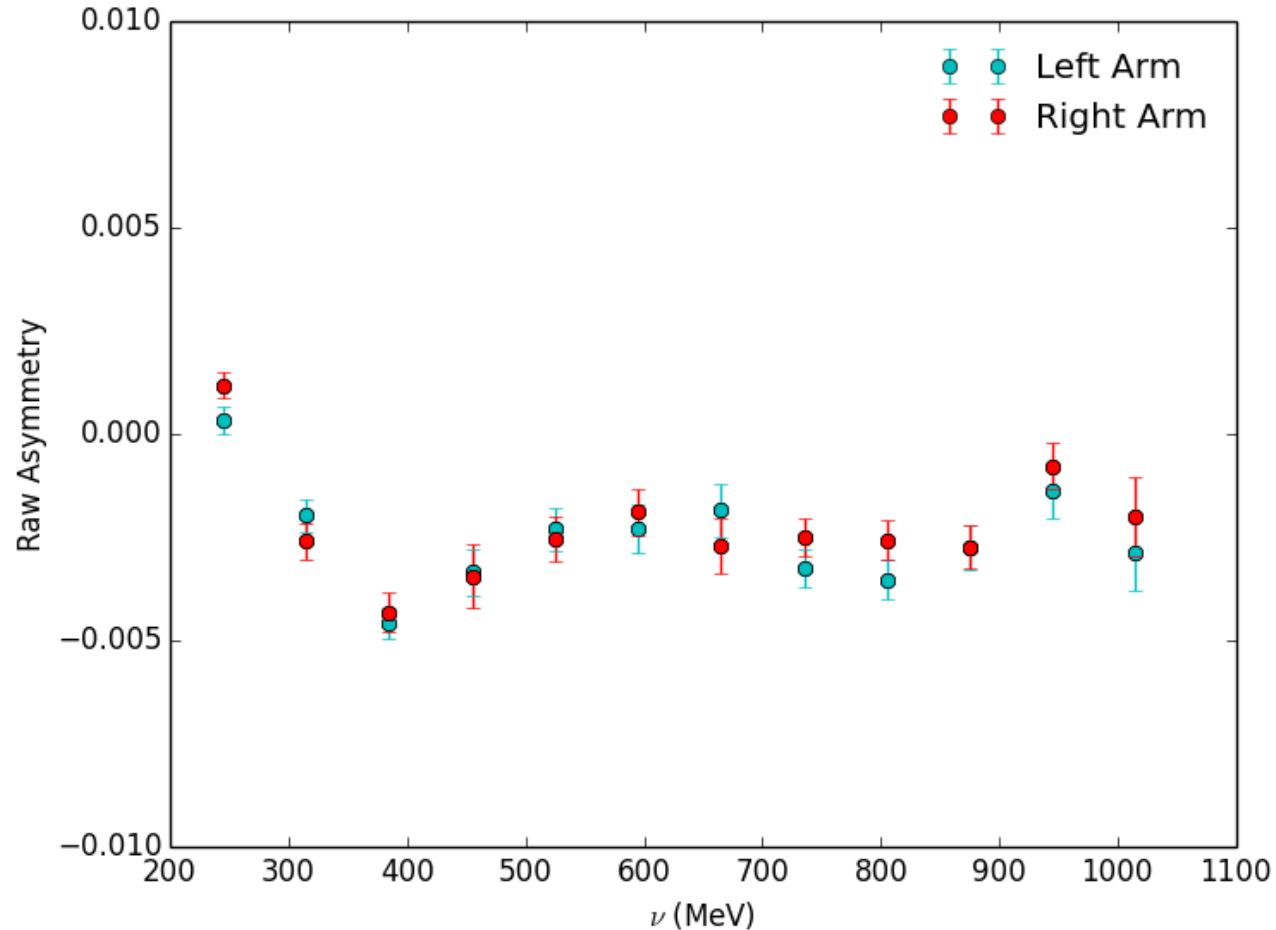
$\chi^2$  (right arm random perturbations) = 1.325

$\chi^2$  (left arm theory) = 6.514

$\chi^2$  (left arm random perturbations) = 1.334

$\chi^2$  (Ryan) =  $\sim 1.38$

# Generated Asymmetries to match Ryan's existing analysis



**2.254 GeV Transverse 5 T, 70 MeV Bins**

$\chi^2$  (right arm theory) = 1.699

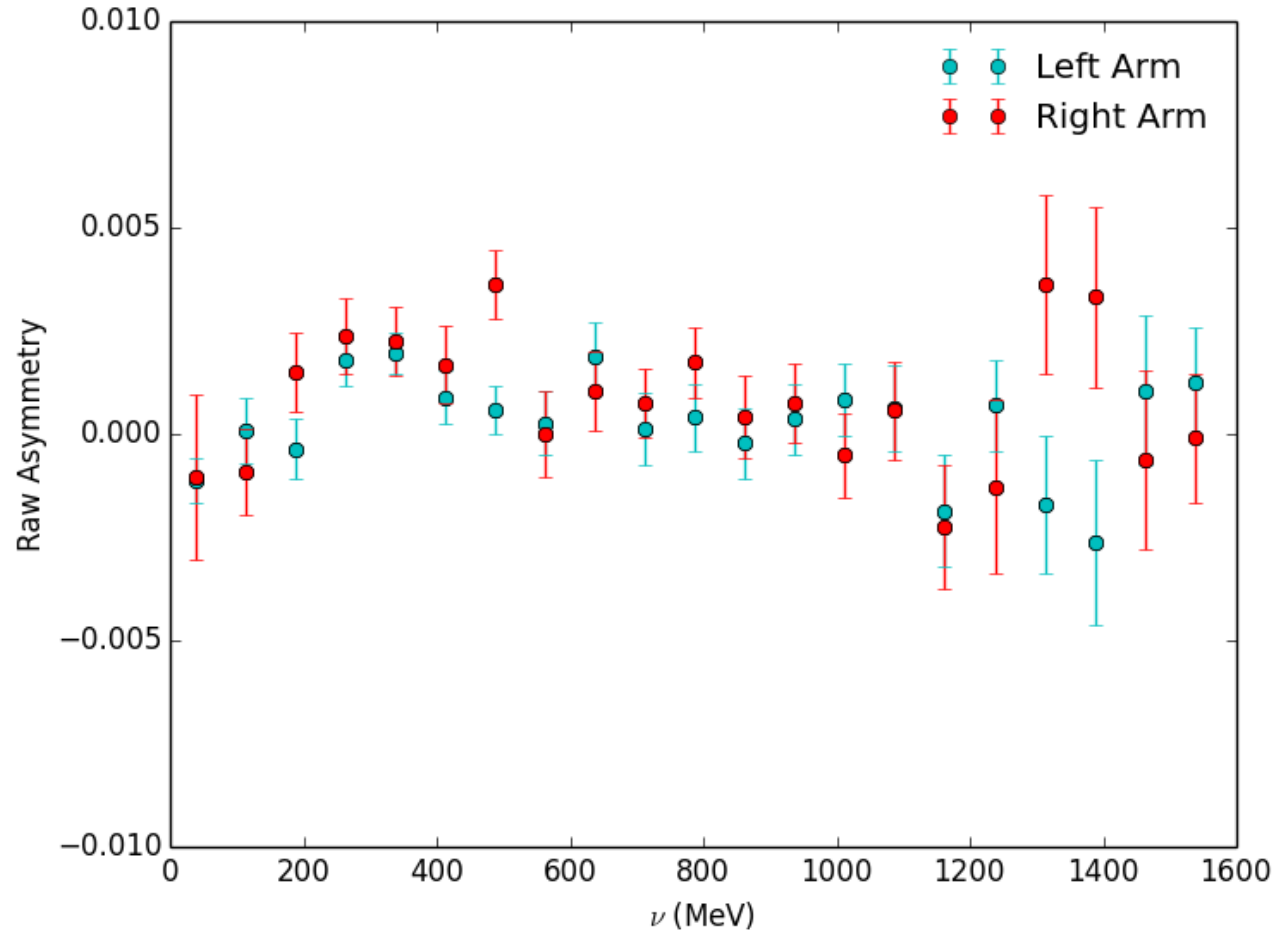
$\chi^2$  (right arm random perturbations) = 1.345

$\chi^2$  (left arm theory) = 1.690

$\chi^2$  (left arm random perturbations) = 1.325

$\chi^2$  (Ryan) =  $\sim 1.65$

# 2.5 T HRS Comparison



## 2.254 GeV Transverse 2.5 T, 75 MeV Bins

$\chi^2$  (right arm theory) = 3.263

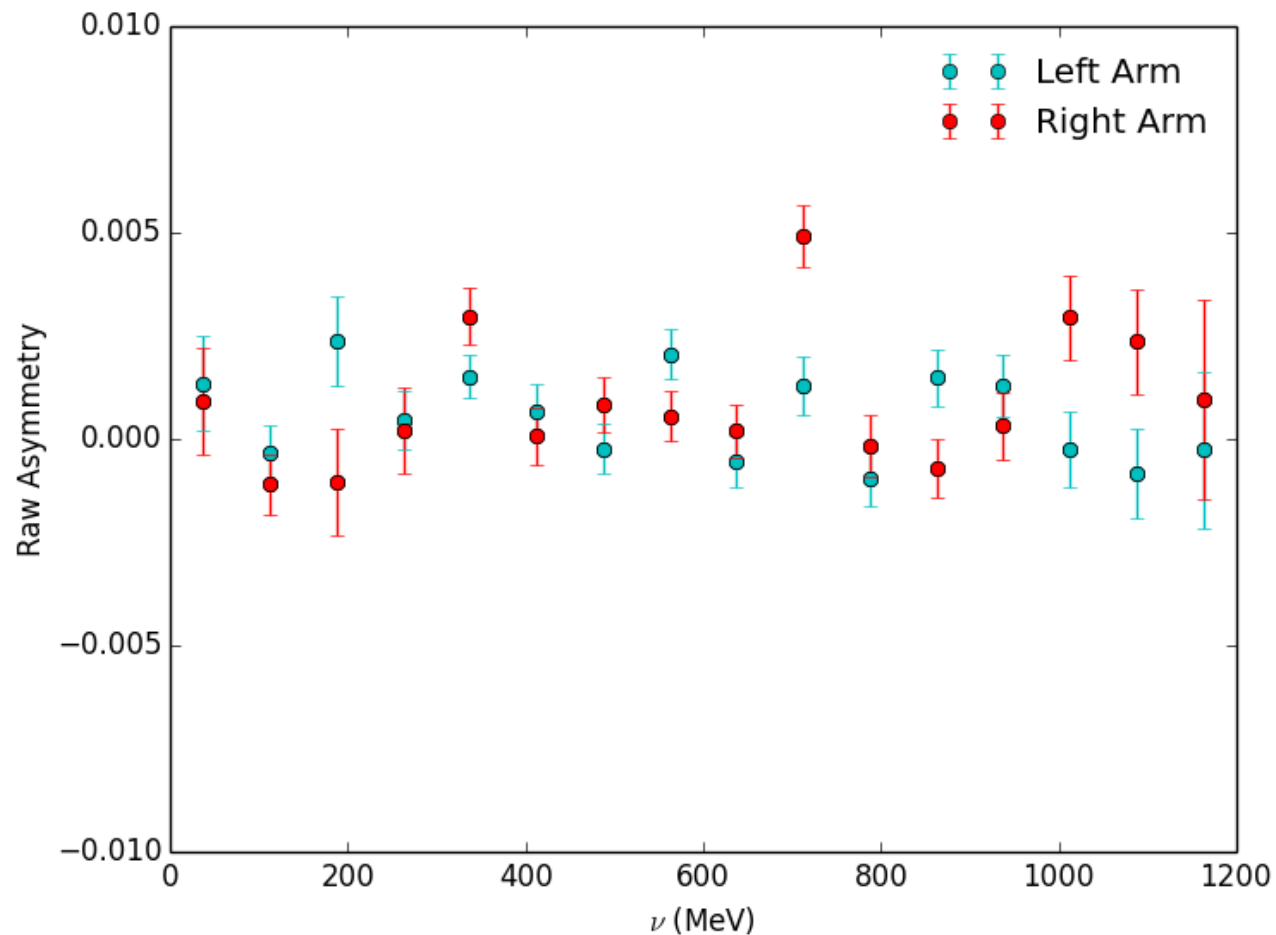
$\chi^2$  (right arm random perturbations) = 1.345

$\chi^2$  (left arm theory) = 1.970

$\chi^2$  (left arm random perturbations) = 1.342

- Points around 500 MeV, 1320 MeV, and 1380 MeV seem to show evidence of a systematic shift, currently investigating what this might be
- All other differences are well within error bars

## 2.5 T HRS Comparison



**1.711 GeV Transverse 2.5 T, 75 MeV Bins**

$\chi^2$  (right arm theory) = 5.714

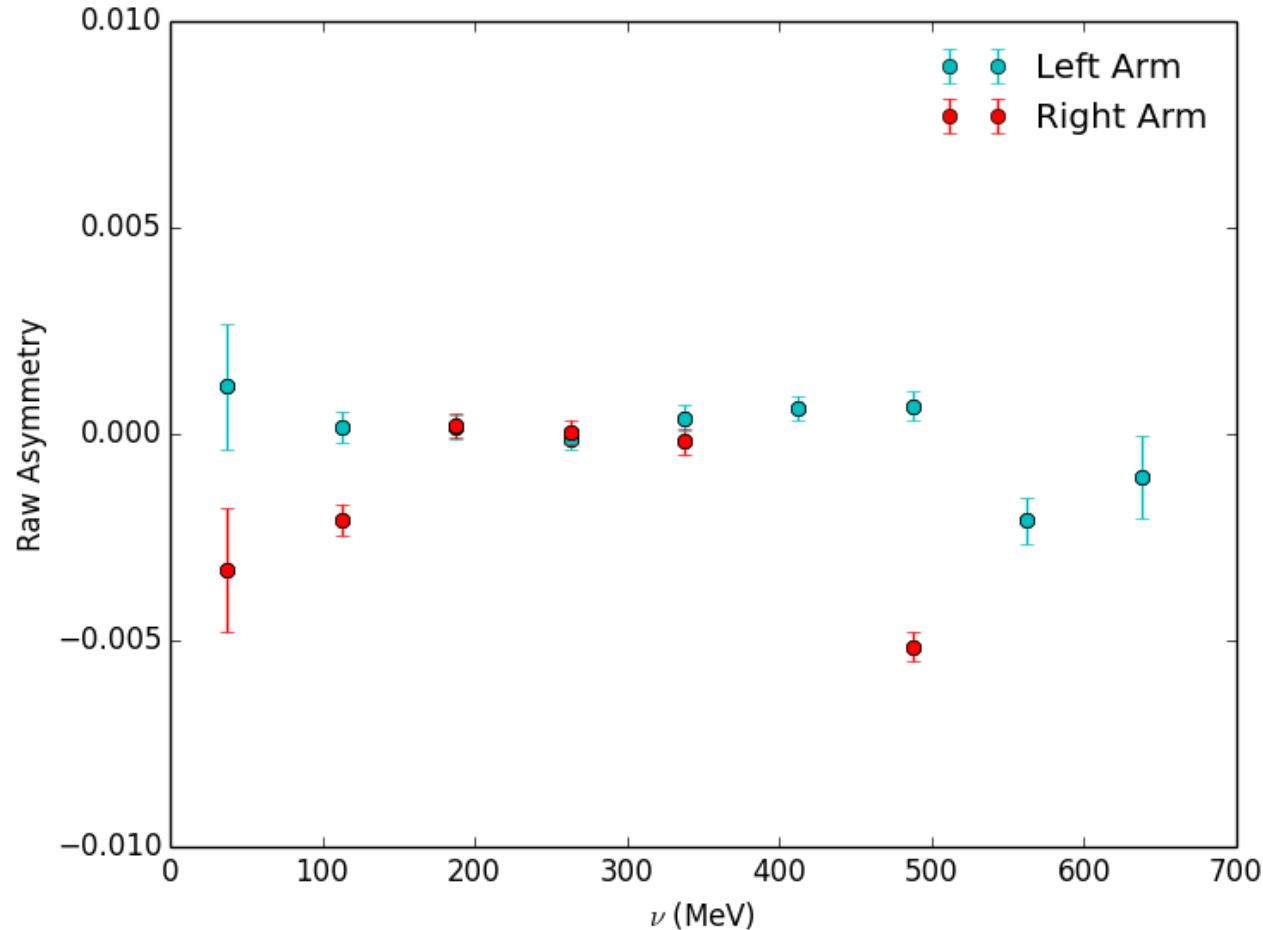
$\chi^2$  (right arm random perturbations) = 1.345

$\chi^2$  (left arm theory) = 4.711

$\chi^2$  (left arm random perturbations) = 1.327

- Have not looked into deeply yet but there appear to be large differences at this energy setting on first pass

# 2.5 T HRS Comparison



## 1.157 GeV Transverse 2.5 T, 75 MeV Bins

$$\chi^2 \text{ (right arm theory)} = 11743.247$$

$$\chi^2 \text{ (right arm random perturbations)} = 1.331$$

$$\chi^2 \text{ (left arm theory)} = 9377.582$$

$$\chi^2 \text{ (left arm random perturbations)} = 1.329$$

- Karl has suggested that the tiny error bars seen on this energy setting are likely incorrect, and the reason for the absurd  $\chi^2$  difference.
- Have not yet determined the reason for this issue



# Details

- In all cases, Ryan has suggested to use the better  $\chi^2$  from treating the left arm as theory vs the right arm as theory.
- Bin size has significant effect on  $\chi^2$  difference, evidence of systematic effect?

# Further Work

- Investigating the systematic shifts in 2.5 T 2.2 GeV energy setting
- Determining source of potential error in 1.1 GeV energy setting asymmetries
- Applying Toby's dilutions to raw asymmetries – mostly completed, but not relevant to asymmetry comparison