

# BB/HRS Analysis for $d_2^n$

LHRS Theta, H2 Update, MWDC Calibration

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# LHRS Theta Structure (1)

- Last meeting the structure of the LHRS target theta distribution was discussed
- The theta distribution had a sharp dip in its structure
- This structure is now understood...

# LHRS Theta Structure (2)

The Structure comes from the **T5** trigger

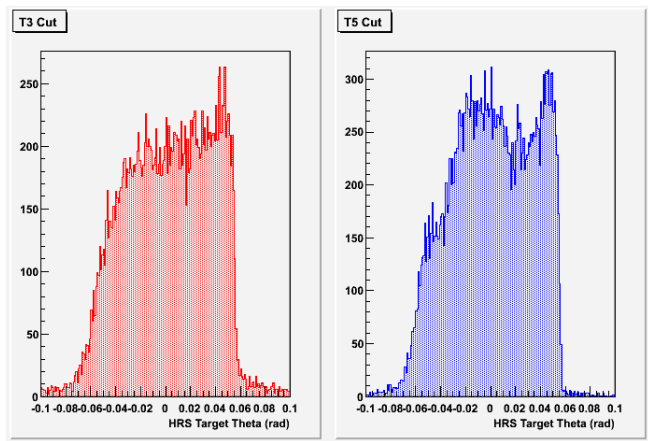


Figure: LHRS target theta for T3(left) and T5(right)

# LHRS Theta Structure (3)

T5 trigger hole inherited from T2 trigger

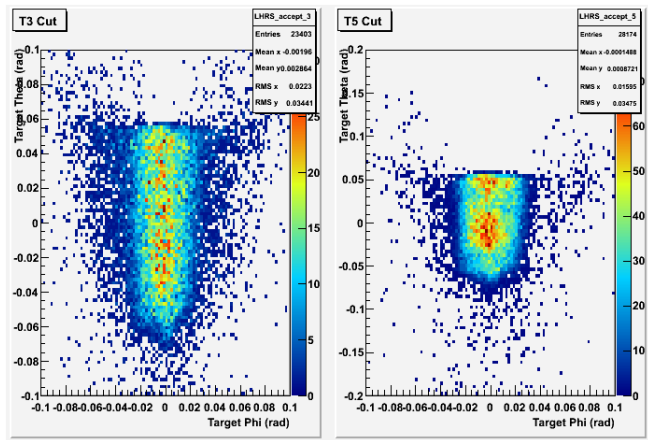


Figure: LHRS target theta vs target phi for T3(left) and T5(right)

# BigBite Tracks with Target Cuts

- Use z-vertex cut  $Abs(BB.tr.vz) < 0.2$

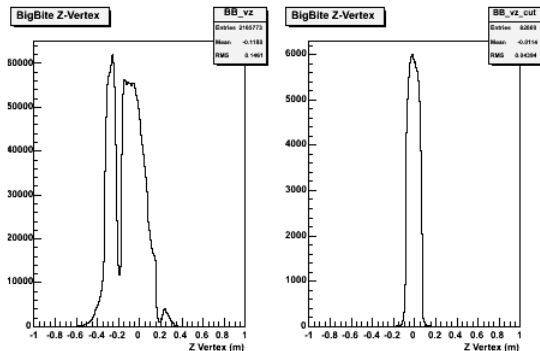


Figure: BigBite z-vertex (left) BB z-Vertex cut(right)

# BigBite Tracks with Target Cuts

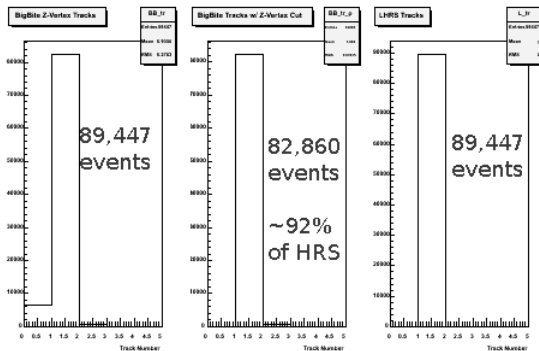


Figure: Events in BigBite w/proton cut(left), events BB z-Vertex + proton cut(center), events in LHR5 w/proton cut(right)

# Events in BigBite Shower + Čerenkov TDC

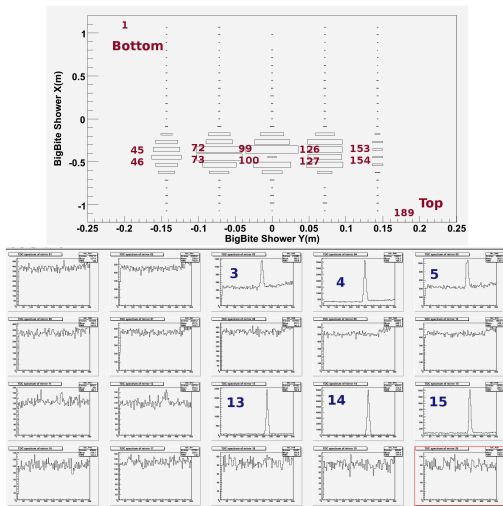


Figure: Where events fall in BigBite Shower (top) and Čerenkov TDCs (bottom)



# Events Location in BigBite

- With Čerenkov mirror groups and shower cluster events fall:

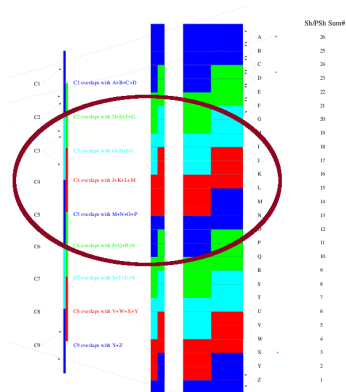


Figure: Where events fall in BigBite

# Events in BigBite Čerenkov ADC

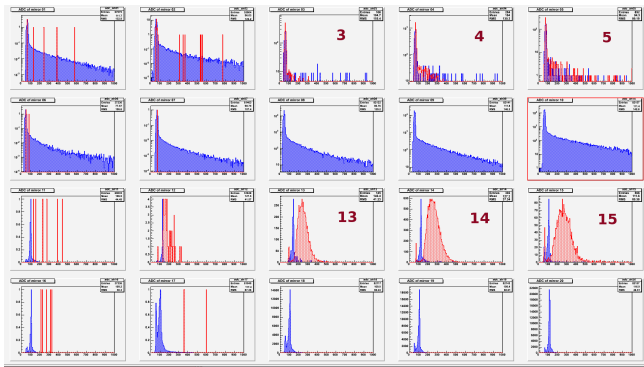


Figure: H2 elastic events in Čerenkov ADCs

Problem with **beamline** ADCs...

# BigBite ADC vs TDC

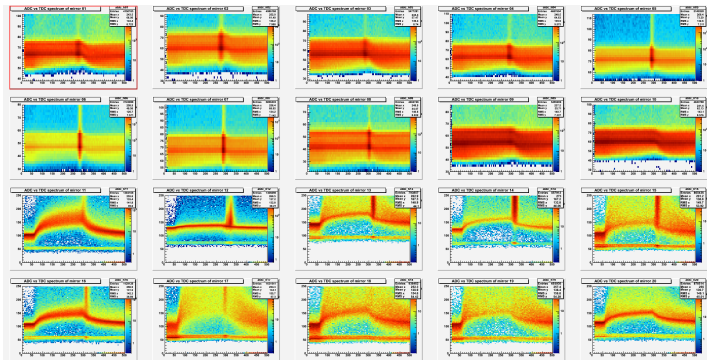
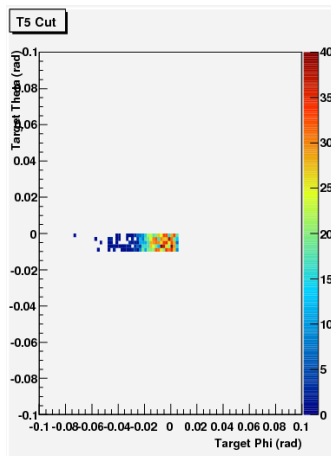


Figure: Čerenkov ADC vs. TDC

ADC threshold too low  $\sim 10$  ADC chan

# Small Acceptance H2 Cross-Section

- same procedure as last meeting with except with smaller theta and phi cut (0.1 msr):



# H2 Cross-Section Comparison

$\frac{d\sigma}{d\Omega}$ large	$\frac{d\sigma}{d\Omega}$ small	$\frac{d\sigma}{d\Omega}$ world
0.0132 $\frac{\mu\text{b}}{\text{sr}}$	0.0145 $\frac{\mu\text{b}}{\text{sr}}$	0.0173 $\frac{\mu\text{b}}{\text{sr}}$

- World Data had the following:

- $E = 1.15 \text{ GeV}$
- $\theta = 47.97$
- $Q^2 = 0.62 \text{ GeV}^2$

- We had:

- $E = 1.21 \text{ GeV}$
- $\theta = 46.2$
- $Q^2 = 0.63 \text{ GeV}^2$

# BigBite MWDC $t_0$ Plane Calibration

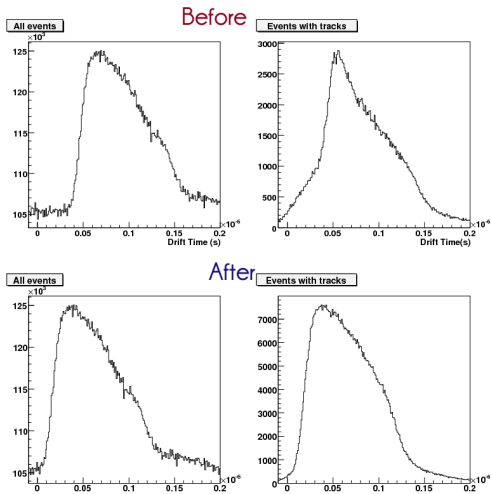


Figure:  $t_0$ 's for MWDC v3p plane before(top) and after(bottom). Left is all hits, right is requiring a track.

# BigBite MWDC Residual

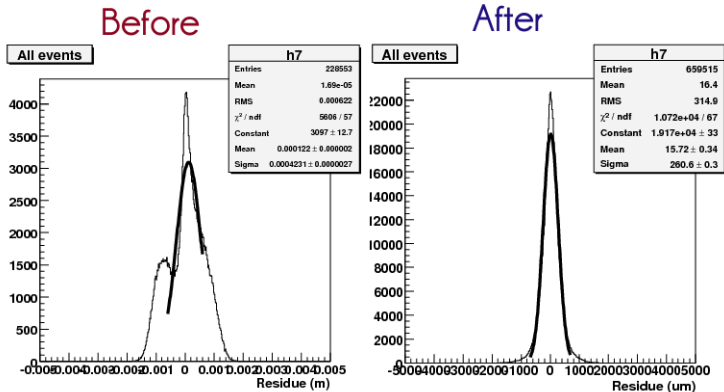


Figure: Residuals for v3p plane before(left) and after(right) t0 calibration.

# BigBite Residuals

Chamber 1 $\sigma$ ( $\mu m$ )	u1	u1p	v1	v1p	x1	x1p
Before	665.5	665.3	678.8	661.7	577.5	575.1
After	295.6	297.2	282.6	280.7	274.7	276.7
Chamber 2 $\sigma$ ( $\mu m$ )	u2	u2p	v2	v2p	x2	x2p
Before	717.3	708.2	705.4	715.8	602.9	606.9
After	295.6	289.5	285.1	285.6	276.0	268.8
Chamber 3 $\sigma$ ( $\mu m$ )	u3	u3p	v3	v3p	x3	x3p
Before	606.7	617.6	613.5	622	480.8	488.8
After	269.5	268.2	262.8	260.6	225.9	223.0



# Big Bite Tracks

- For **H2** elastics:

$$\frac{(T5 + BB_{1track} + vzflag)events}{(T5)events} = 81.11\%$$

- For **3He** elastics:

$$\frac{(T2 + BB_{1track} + vzflag)events}{(T2)events} = 62.74\%$$

- For **4-pass 3He** (before **t0** calibration):

$$\frac{(T2 + BB_{1track} + vzflag)events}{(T2)events} = 4.04\%$$

- For **4-pass 3He** (After **t0** calibration):

$$\frac{(T2 + BB_{1track} + vzflag)events}{(T2)events} = 15.23\%$$

# Summary

- T2 trigger hole is cause of odd LHRs theta structure in coin mod
- Cross-Section agrees within factor of 2
- Calibrated  $t_0$ 's drastically improve residuals and lead to a factor of  $\sim 3$  increase in tracks

# Summary

- Continue **MWDC** calibration