## HPS Winter 2016 Run Week 3 Update

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# SVT Run Overview

- Successfully timed in late Friday night/Saturday morning (Sho guessed the latency correctly the first time)
- Successfully moved the SVT to 0.5 mm Saturday morning
- Successfully performed APV pulse shape timing studies, HV bias scan for layer 1 hybrids, 8 ns delay scans, trigger scans, and current scans
- Successfully checked tracking with tracking recon monitoring app
  - Track/cluster matching is not great in monitoring app. SVT phase is not correct.
- Decided to perform production runs at the setting Isha = 70 and VFS = 0 since it showed all around improvement to nominal
- Minor DAQ issues, manual is being updated to try to avoid future problems

#### FSD Halo Counter Rates while Lowering SVT

- Note that bottom 1.5 mm was not at 200 nA yet
- Many FSD Halo Counter trips at bottom 0.7 mm. Raised rate limit to 185 kHz.



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## Occupancy and Current While Lowering SVT



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# Occupancy 0.5 mm Nominal



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#### Occupancy 0.5 mm Front Layer Nominal



## Max Sample Number 0.5 mm Nominal



#### Max Sample Number

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# SVT Trigger Timing 0.5 mm Nominal

#### SVT-trigger timing top-bottom



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#### Links to Logbook Plots (SVT at 0.5 mm)

- Isha = 34, VFS = 60 (nominal)
- ▶ Isha = 70, VFS = 0
- ▶ Isha = 100, VFS = 0
- ▶ Isha = 255, VFS = 0
- Several runs dissapeared to tape before I could grab them including the current scans and Isha = 120

#### Pulse Shape Timing Results

- Isha = 70, VFS = 0 shows overall improvement in SVT performance
  - Pileup reduction and timing resolution improvement
- Results below are the average over all channels and all hybrids (except slot side) of the RMS of track dt histograms in tracking recon monitororing app (about 10000 events)
- There are still things I need to understand about these results

|      |      |     | Real Beam       |             |  |  |
|------|------|-----|-----------------|-------------|--|--|
| Run  | Isha | VFS | T0 Res Avg (ns) | Improvement |  |  |
| 7373 | 34   | 60  | 3.25            | 0.0%        |  |  |
| 7455 | 70   | 0   | 3.07            | 6.0%        |  |  |
| 7404 | 100  | 0   | 3.66            | -11.1%      |  |  |
| 7408 | 120  | 0   |                 |             |  |  |
| 7456 | 255  | 0   | 3.79            | -14.3%      |  |  |

## Time Resolution Detailed Results

| Run      | Hybrid |              |           | TO Dec (no) | Dum                          | Hybrid |              |           | TO D ()     |
|----------|--------|--------------|-----------|-------------|------------------------------|--------|--------------|-----------|-------------|
|          | Layer  | Axial/Stereo | Slot/Hole | TO Kes (hs) | кun                          | Layer  | Axial/Stereo | Slot/Hole | TO Kes (ns) |
|          | 14     | Axial        | -         | 4.08        |                              |        | Axial        | -         | 3.97        |
|          | 11     | Stereo       | -         | 4.03        |                              | 11     | Stereo       | -         | 3.58        |
|          |        | Axial        | -         | 4.4         |                              |        | Axial        | -         | 4.22        |
|          |        | Stereo       | -         | 4.34        |                              | 10     | Stereo       | -         | 4.29        |
|          | 24     | Axial        | -         | 3.14        |                              | 24     | Axial        | -         | 2.97        |
|          | Zt     | Stereo       | -         | 2.98        |                              | Zt     | Stereo       | -         | 2.95        |
|          | 26     | Axial        | -         | 3.56        |                              | 26     | Axial        | -         | 3.35        |
|          | 20     | Stereo       | -         | 3.41        |                              | 20     | Stereo       | -         | 3.38        |
|          | 2+     | Axial        | -         | 3           |                              | 2+     | Axial        | -         | 2.81        |
|          | 51     | Stereo       | -         | 3.13        | 7455<br>Isha = 70<br>VFS = 0 | 51     | Stereo       | -         | 2.8         |
| 7272     | 26     | Axial        | -         | 3.2         |                              | 3b     | Axial        | -         | 3.12        |
| /3/3     | 30     | Stereo       | -         | 3.26        |                              |        | Stereo       | -         | 3.12        |
| VEC - 60 | 4+     | Axial        | hole      | 2.82        |                              | 4t     | Axial        | hole      | 2.68        |
| VF3 = 00 | 41     | Stereo       | hole      | 3.01        |                              |        | Stereo       | hole      | 2.77        |
|          | 4b     | Axial        | hole      | 3.07        |                              | 4b     | Axial        | hole      | 2.73        |
|          |        | Stereo       | hole      | 3.08        |                              |        | Stereo       | hole      | 2.78        |
|          | 5+     | Axial        | hole      | 2.9         |                              | 5+     | Axial        | hole      | 2.85        |
|          | 51     | Stereo       | hole      | 2.96        |                              | 51     | Stereo       | hole      | 2.74        |
|          | 56     | Axial        | hole      | 3.05        |                              | Sh     | Axial        | hole      | 2.91        |
|          | 50     | Stereo       | hole      | 2.97        |                              | 50     | Stereo       | hole      | 2.99        |
|          | 6t     | Axial        | hole      | 2.8         |                              | 6t     | Axial        | hole      | 2.69        |
|          |        | Stereo       | hole      | 2.93        |                              |        | Stereo       | hole      | 2.64        |
|          | 6h     | Axial        | hole      | 3           |                              | 6h     | Axial        | hole      | 2.65        |
|          | 00     | Stereo       | hole      | 2.84        |                              | 00     | Stereo       | hole      | 2.57        |

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### Time Resolution Detailed Results Continued)

| Rup                           | Hybrid |              |           | Burn         | Hybrid                        |       |              | TO Bog (pg) |             |
|-------------------------------|--------|--------------|-----------|--------------|-------------------------------|-------|--------------|-------------|-------------|
| Null                          | Layer  | Axial/Stereo | Slot/Hole | TO Kes (IIS) | TO Res (ns) Run               | Layer | Axial/Stereo | Slot/Hole   | TO Res (ns) |
| 7404<br>Isha = 100<br>VFS = 0 | 1t     | Axial        | -         | 4.17         | 7456<br>Isha = 255<br>VFS = 0 | 1t    | Axial        | -           | 4.22        |
|                               |        | Stereo       | -         | 4.13         |                               |       | Stereo       | -           | 3.98        |
|                               | 1b     | Axial        | -         | 4.68         |                               | 1b    | Axial        | -           | 4.12        |
|                               |        | Stereo       | -         | 4.7          |                               |       | Stereo       | -           | 4.14        |
|                               | 2t     | Axial        | -         | 3.31         |                               | 2t    | Axial        | -           | 3.67        |
|                               |        | Stereo       | -         | 3.45         |                               |       | Stereo       | -           | 3.77        |
|                               | 2b     | Axial        | -         | 3.72         |                               | 2b    | Axial        | -           | 3.84        |
|                               |        | Stereo       | -         | 4.07         |                               |       | Stereo       | -           | 3.8         |
|                               | 3t     | Axial        | -         | 3.34         |                               | 3t    | Axial        | -           | 3.73        |
|                               |        | Stereo       | -         | 3.25         |                               |       | Stereo       | -           | 3.82        |
|                               | 3b     | Axial        | -         | 3.79         |                               | 3b    | Axial        | -           | 3.92        |
|                               |        | Stereo       | -         | 3.73         |                               |       | Stereo       | -           | 3.88        |
|                               | 4t     | Axial        | hole      | 3.92         |                               | 4t    | Axial        | hole        | 3.57        |
|                               |        | Stereo       | hole      | 3.22         |                               |       | Stereo       | hole        | 3.49        |
|                               | 4h     | Axial        | hole      | 3.48         |                               | 4b    | Axial        | hole        | 3.62        |
|                               | 40     | Stereo       | hole      | 3.6          |                               |       | Stereo       | hole        | 3.54        |
|                               | 5t     | Axial        | hole      | 3.48         |                               | 5t    | Axial        | hole        | 4.1         |
|                               |        | Stereo       | hole      | 3.39         |                               |       | Stereo       | hole        | 3.85        |
|                               | 5b     | Axial        | hole      | 3.4          |                               | 5b    | Axial        | hole        | 3.91        |
|                               |        | Stereo       | hole      | 3.6          |                               |       | Stereo       | hole        | 3.75        |
|                               | 6t     | Axial        | hole      | 3.06         |                               | 6t    | Axial        | hole        | 3.56        |
|                               |        | Stereo       | hole      | 3.31         |                               |       | Stereo       | hole        | 3.46        |
|                               | 6h     | Axial        | hole      | 3.42         |                               | 6b    | Axial        | hole        | 3.69        |
|                               | 00     | Stereo       | hole      | 3.51         |                               |       | Stereo       | hole        | 3.59        |
| T0 Res Avg                    |        |              | 3.66      | T0 Res Avg   |                               |       | 3.79         |             |             |

### Isha = 34, VFS = 60 Tracking Time Resolution



## Isha = 70, VFS = 0 Tracking Time Resolution



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#### Isha = 100, VFS = 0 Tracking Time Resolution

#### Track Hit dt



### Isha = 255, VFS = 0 Tracking Time Resolution



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#### Isha = 34, VFS = 60 Pileup

#### First sample distributions (pedestal shifts, MAX\_SAMPLE>=4)



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# Isha = 70, VFS = 0 Pileup



Run Week 3 Update

# $\mathsf{Isha} = 100, \, \mathsf{VFS} = 0 \, \mathsf{Pileup}$



Run Week 3 Update

# Isha = 255, VFS = 0 Pileup

#### First sample distributions (pedestal shifts, MAX SAMPLE>=4) module\_111\_haffenedale\_anat\_nermet http://amale.if/AX.301911.com 43 Instanto, 111, halfmarkala, starting series, brist semiala (PAX, 35(2)) (1999) - 42 module\_121\_half-module\_amal\_server first screening (RAS\_RAP Street all) module\_COL\_ballmodule\_commonser first scenade [BAX, SAR FIRM ed] mailabe\_CAL\_hallowsdate\_anal\_server feed scrude \$255, 3529 Found? kaYnodale, cheroe, consi scende (NAE, SAMPLE) and 5.000 4,303 10,000 \* 010 -10.050 4,000 4919 -5 101 2.001 2.010 3,000 \$30 1.101 L.\$30 2.00 SC0 1.000 2.500 2.10 100 1.000 1.100 1.0 dostal INAX\_SANFLES=4[ JADC counts] edestal (MAX\_SAMPLE>=4) [ADC\_counts] edestal (MAX\_SAMPLES=4) [ADC ounts] edestal [MAX\_SAMPLES=4] [ADC counts] edestal (MAX\_SAMPLES=4) [ADC counts] dostal (MAX\_SAMPLE>=4) (ADC counts) module\_12k\_ballenshale\_anal\_server1 kedi somde 1853,35889 Firm 42 module\_11 k\_ball-module\_star m\_sressed http://www.left.MAR\_NAR\_PLAN\_#40 mobile\_14k\_balferariale\_sterres\_server first somele 1963\_35200 to wait amp 5.000 8.050 6.010 10.001 6.203 4.010 4,000 4.000 5.000 5.101 2,010 2.202 2 000 2.000 3.5 distal MAX SAMPLEX-41 (ADC control elocation (MAX SAMPLEX-4) (ADC control elocation (MAX SAMPLEX module\_tat\_baltendate\_anal\_stat\_se rel\_fiest\_sample\_(NAS\_SAME\_Pa\_mat 144\_builtenninde\_sterren\_shit\_so level somple 1958X 347191 Page 43 rendale\_UN\_ballwoolabe\_actal\_stat\_se arit\_ficst sample (2003\_30200 Pa = 4 DAL half-molifier storen status helt sample 1832, SAR (1999-44) inst sample ORAX, MANPIPERED 690 400 610 401 5,000 -100 4,000 201 210 2 000 1010 1510 2.14 501 1.000 1.510 2.10 500 1.101 3.503 3.01 edestal IMAX SAMPLE> #4 JADC county] instal (MAX SAMPLE>w4) [ADC countal edestal (MAX SAMPLEN #4) IADC countal destal IMAX SAMPLE> #4 IAOC county! cleated (MAX SAMPLE>=+4) [ADC counted edeptal (MAX SAMPLENeed) IADC counts madale, LHt, halfmadale, attal, hole, sena pr2 - first sample (NAR, SAMPLE) - 41 motule LSt, harmodale, anial, hole, sens medule\_LOt\_halfmodule\_starso\_hole\_se naur0 - first sample (NAX\_SANING> - 11 nodule\_LSt\_halfmodule\_salal\_hale\_sens or0 - first semple IMAX\_SAMPLE> - 40 module LOT halfmodule starso hole as possible distribution of the starson of the 1.000 4,000 4010 1,000 4.010 4,000 3.010 2,000 2.010 2 010 2.000 3.363 1.000 500 1.000 1.500 2.00 501 Sai 101 1.050 1.101 2.6 530 1.001 1.530 2.00 503 1,030 1,509 2,10 105 1.050 1.105 2.0 510 1.000 1.530 2.0 dectal [MAX\_SAMPI Fix=4] [ADC counts] destal (MSX SAMPLEs=4) [ADC counts] destal (MAX SAMPLEs-4) [ADC counts] ectal [MAX\_SAMPI Fix=4] [ADC counts] destal (MSX SAMPLEs=4) [ADC counts] dectal (MAX SAMPI Field) (ADC counts) ocule\_LCo\_haHmadale\_starso\_slot\_se module\_Lifb\_hafmodule\_steres\_sist\_ser sort - first service (MAR\_SAM FLSt---4) module\_L/IS\_helfmodule\_acial\_alsc\_sen or0 - first servols (MAX\_SAM FLE> - 4) produle\_LSb\_haPmodule\_axial\_slot\_sens pril - first sample (MAR\_SAN PLS)- -41 module\_LSb\_haltmotule\_asial\_slot\_av arg - first semale\_CANC\_SANPLE> - 0 600 2,000 510 430 1.600 410 -1,000 200 210 503 1 000 1 510 2 10 500 1 000 1 500 2 0 See 500 1 201 1 502 2 510 1 000 1 500 810 1 101 1 501 2 0 510 1,000 1.510 festal IMAX SOMELEX-41 IAOC counts) edestal (Max SAMPLEx= 0 (ADC counts) edestal (Max SAMPLEx=4) JADC counts edestal IMAX SAMPLEX=4LIAOC counts), edestal (MAX SAMPLEX=4) (ADC counts) destal (Max SAMPLE) = dt JADC counts andade, 13h, hatfreeniale, and their system. and first summing (MAR, SAME) Parall. and the ballenduity and hale so with first sensity (NEX 35200 Face) 6.010 6.000 4,000 0.010 4,010 2,000 2.303 2,000 2.000 2,010 1 100 500 1.000 2.500 \$20 1.101 L.\$20 2

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## Things to Do

- Sample 0 Layer 1 pedestal shifts
- Understand 8 ns. latency scans
- More careful analysis of pulse shape parameters

- Analyze current scans
- Continue looking at the strange L6 channels