

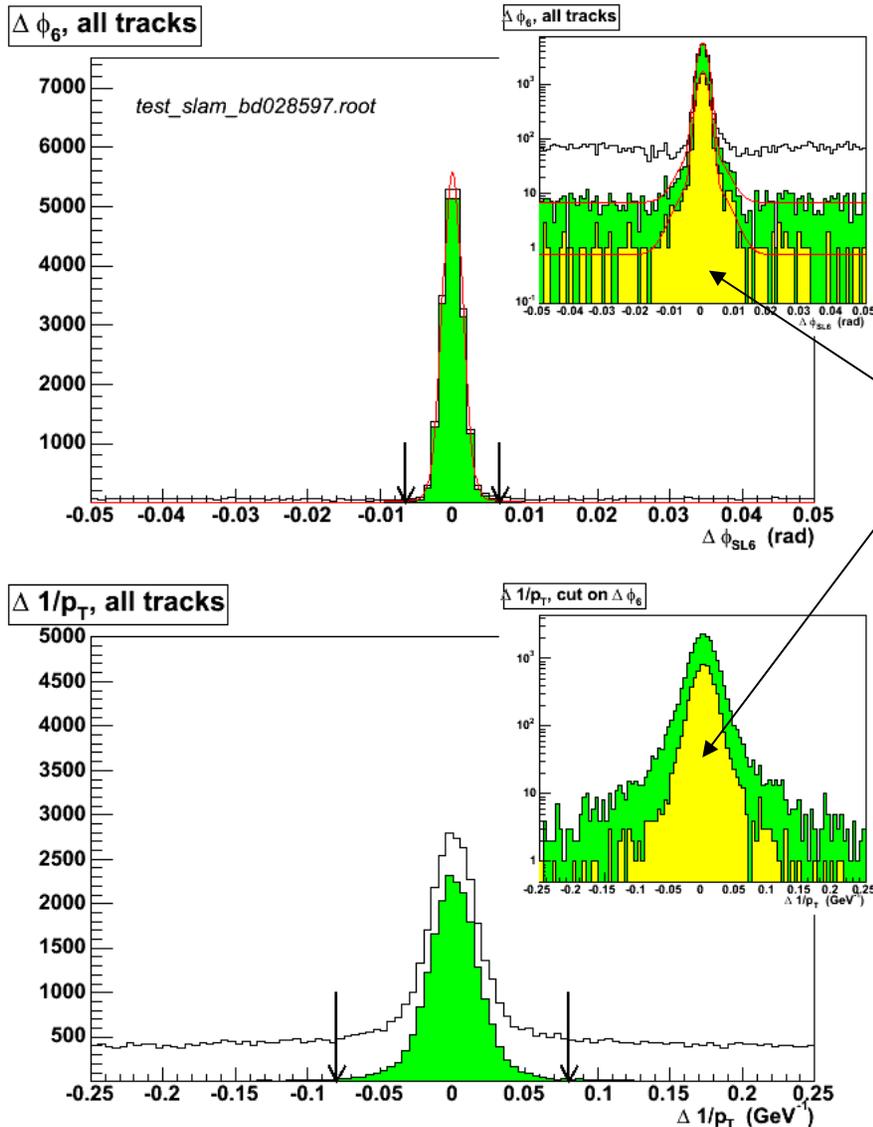
SLAM Efficiency Studies

- Matching offline-axial XFT tracks
- TDC pedestal offsets
- Efficiency for finding stereo pixels
 - as a function of φ
 - as a function of z
- SLAM efficiency
- Efficiency history plots
- Efficiencies with 2-miss finder patterns
- 1-miss and 2-miss trigger rates
- Conclusions?

Matching Offline and XFT tracks

- Basic requirements
 - Consider only non-short XFT tracks
 - Offline track must have COT parent
 - Offline track has $p_T > 1.4 \text{ GeV}/c$
- Match XFT track and offline track using
 - $\Delta \phi_{SL6}$
 - $\Delta 1/p_T$ (includes charge of track)
- High purity track sample from offline tracks matched with electrons or muons

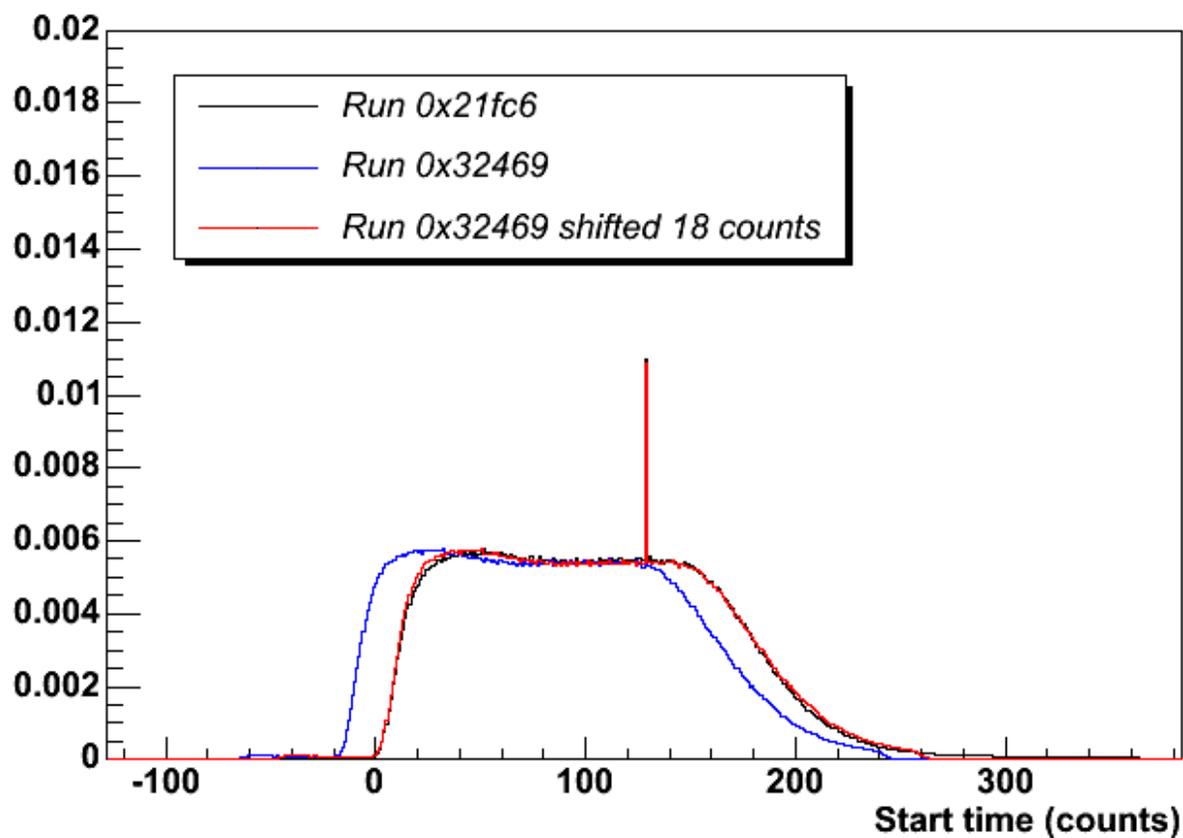
Track Matching



- Background fraction inside $\pm 5\sigma$ of $\Delta \phi_{SL6}$ is 0.8% with cut on $\Delta 1/p_T$
- For tracks associated with leptons, this fraction is 0.5%
- Do not expect any significant contribution from fake offline tracks

TDC Pedestal Offsets

- Applied 18 count shift to new data to match start time distributions:



Stereo Pixel Efficiency

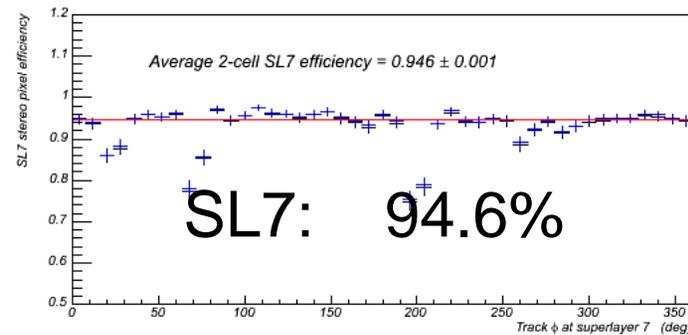
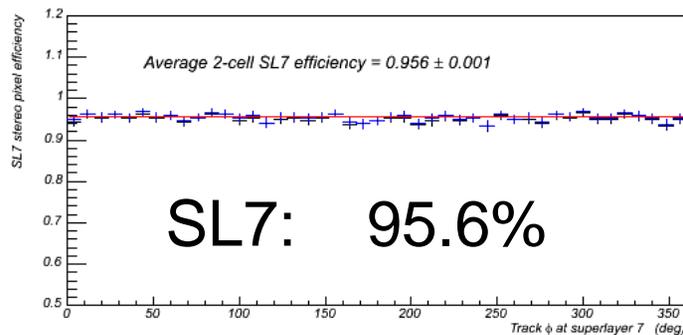
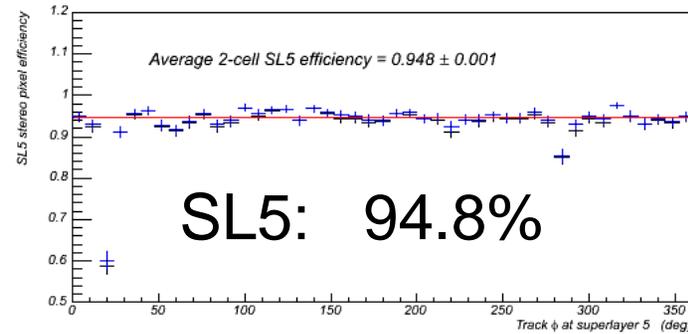
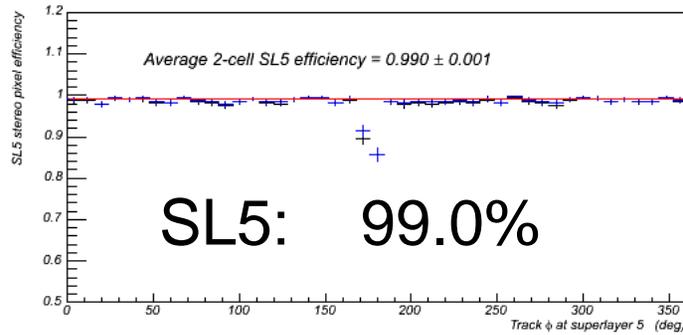
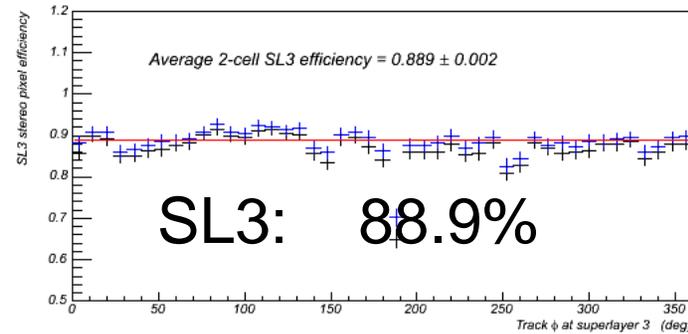
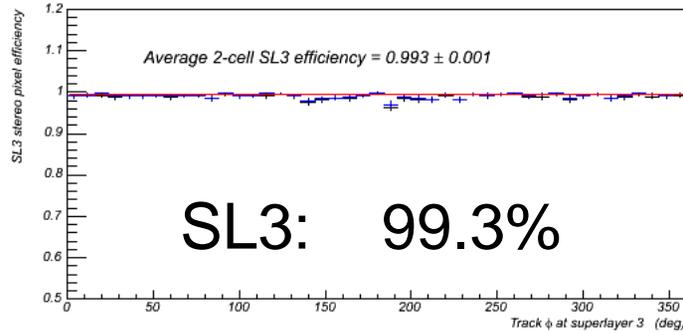
- Offline tracks matched to axial XFT tracks
- Extrapolate to super layers 3, 5 and 7
- Correct for stereo angle
- Did the stereo finder simulation set a pixel in this cell?
- Look for matches in the expected cell or within ± 1 cell (very little difference).

Stereo Pixel Efficiency

Run 0x21fc6

Run 0x32469

±1 cell
in blue



M

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Stereo Pixel Efficiency

Run	Date	ϵ_3	ϵ_5	ϵ_7
0x21fc6	Feb 15, 2002	0.993	0.990	0.956
0x24345	Jul 14, 2002	0.970	0.990	0.955
0x26dfc	Feb 22, 2003	0.880	0.955	—
0x28597	Jun 25, 2003	0.858	0.950	0.913
0x293b9	Sep 6, 2003	0.818	0.940	0.905
0x2b96b	Jan 27, 2004	0.824	0.936	0.891
0x2c356	Mar 30, 2004	0.789	0.928	0.888
0x2cfaa	Jun 19, 2004	0.879	0.968	0.957
0x2d8e6	Aug 22, 2004	0.930	0.973	0.961
0x2f81e	Feb 27, 2005	0.936	0.968	0.962
0x2ff79	Apr 14, 2005	0.930	0.960	0.951
0x30f58	Jul 5, 2005	0.934	0.969	0.957
0x31bf5	Sep 3, 2005	0.931	0.964	0.953
0x32469	Oct 21, 2005	0.889	0.948	0.946

*Also shown
as a graph
in a few
slides...*

- One SL7 quadrant off in run 0x26dfc.
- Need to check with run 201716, taken with reduced thresholds on stereo superlayers.

Stereo Pixel Efficiency

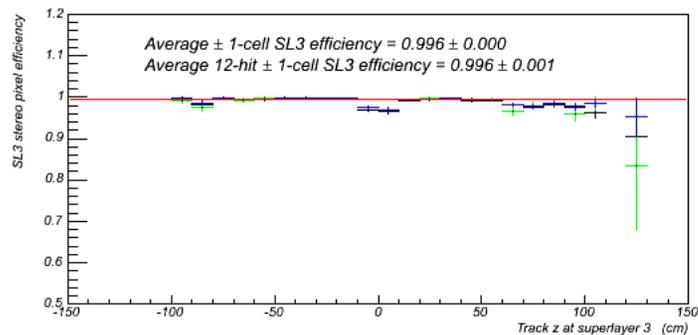
- Require offline track to have 12 hits on stereo superlayers:

Run	Date	ϵ_3	ϵ_5	ϵ_7
0x21fc6	Feb 15, 2002	0.992	0.994	0.994
0x24345	Jul 14, 2002	0.982	0.989	0.992
0x26dfc	Feb 22, 2003	0.966	0.979	(0.982)
0x28597	Jun 25, 2003	0.969	0.981	0.989
0x293b9	Sep 6, 2003	0.964	0.979	0.987
0x2b96b	Jan 27, 2004	0.959	0.980	0.985
0x2c356	Mar 30, 2004	0.963	0.977	0.984
0x2cfaa	Jun 19, 2004	0.978	0.992	0.990
0x2d8e6	Aug 22, 2004	0.984	0.991	0.992
0x2f81e	Feb 27, 2005	0.982	0.989	0.990
0x2ff79	Apr 14, 2005	0.975	0.984	0.986
0x30f58	Jul 5, 2005	0.983	0.989	0.990
0x31bf5	Sep 3, 2005	0.982	0.986	0.991
0x32469	Oct 21, 2005	0.973	0.983	0.988

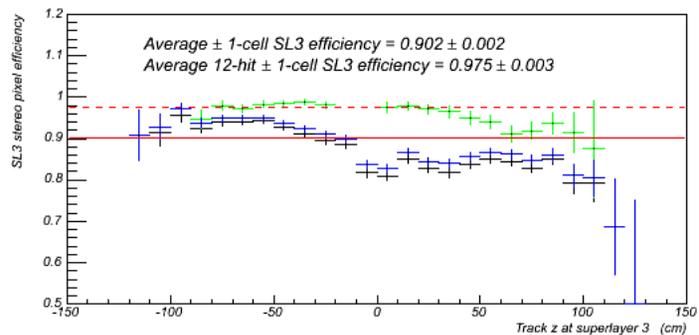
Also shown
as a graph
in a few
slides...

Stereo Pixel Efficiency vs z

Run 0x21fc6

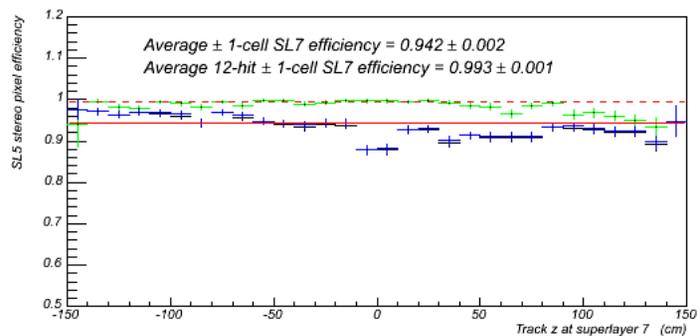
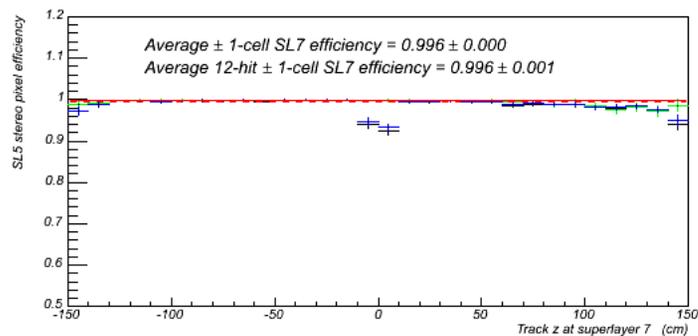
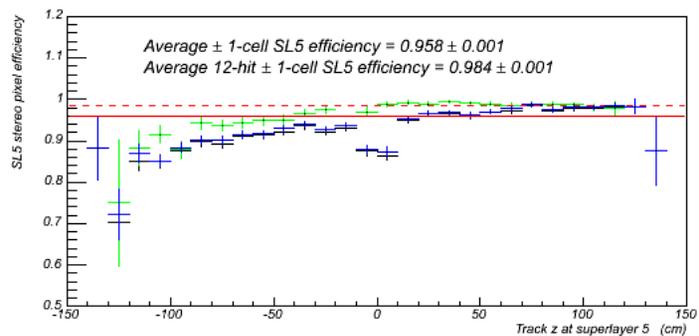
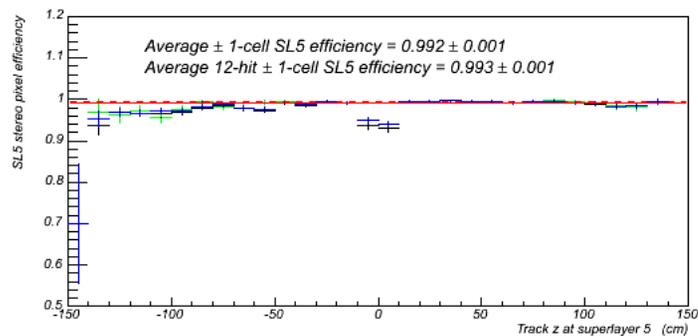


Run 0x32469



12 hit
cells in
green

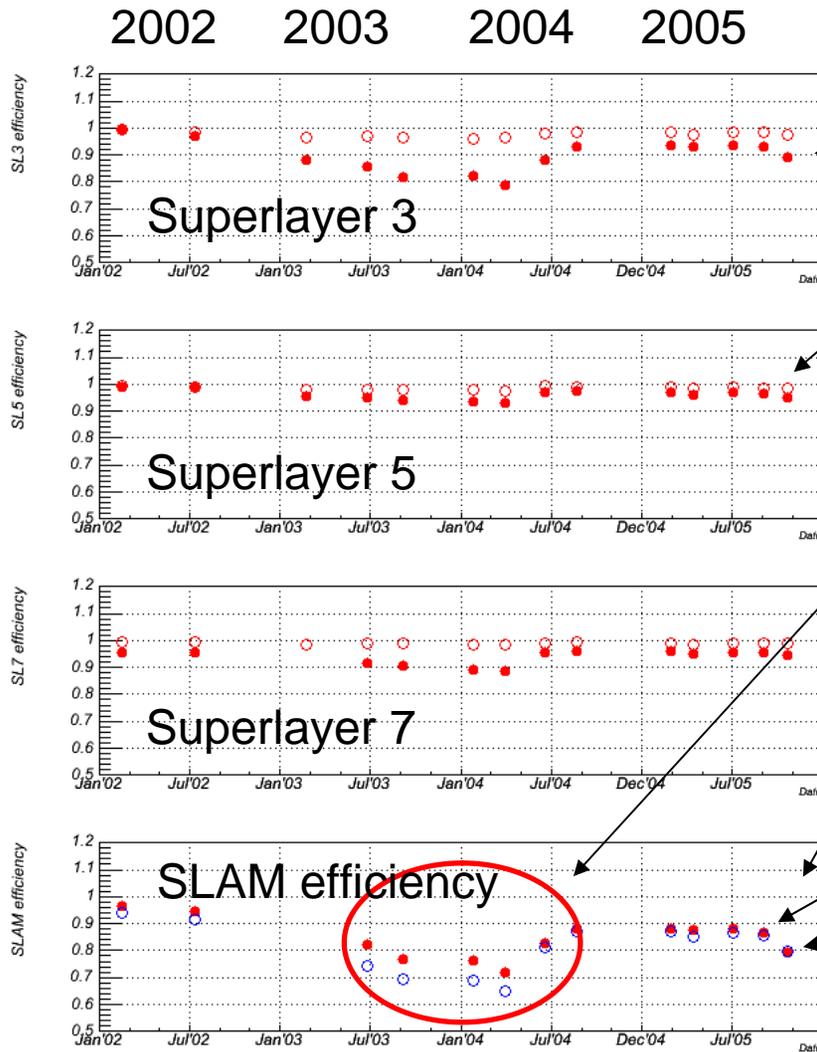
± 1 cell
in blue



1.

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Efficiency History Plot



- ± 1 cell efficiency
- ± 1 cell efficiency (12 hits on offline track)

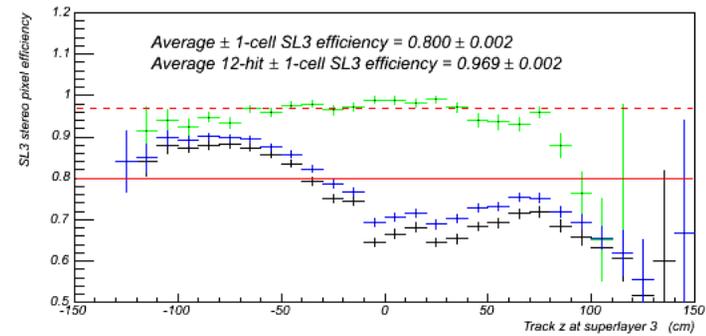
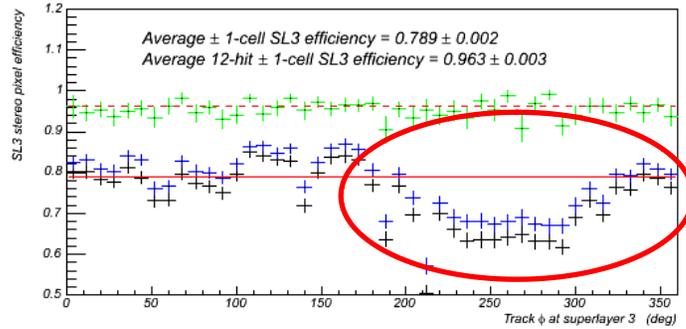
Period of COT aging (2003-2004)

Last point is from a different dataset.

- SLAM efficiency

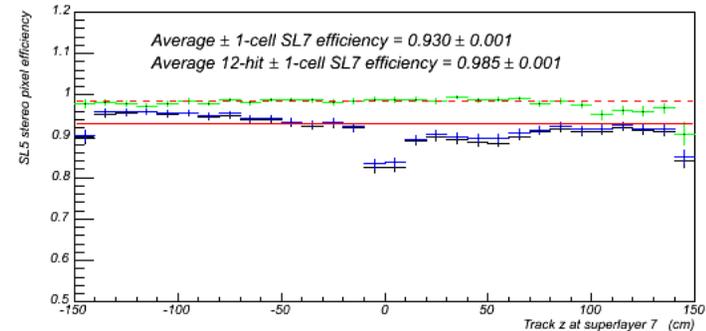
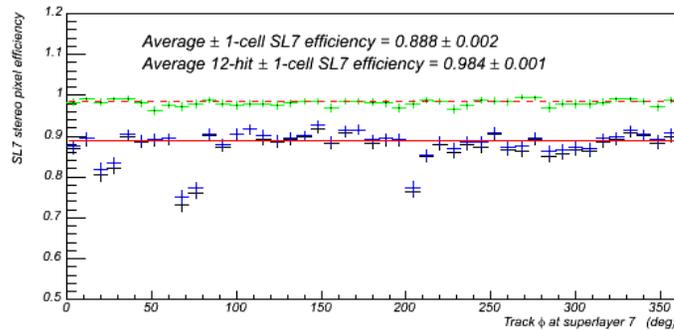
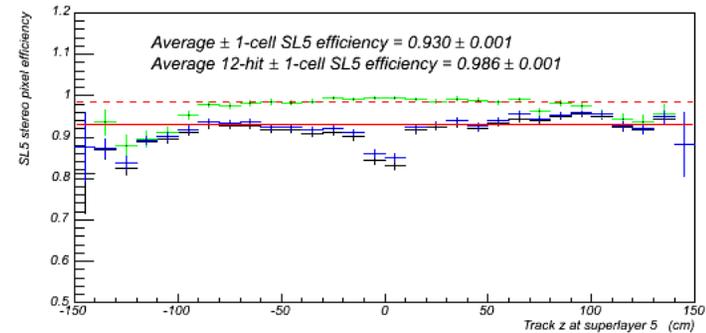
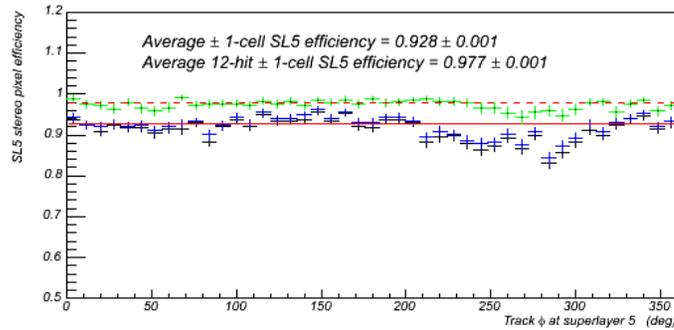
$$\circ \prod_{i=3,5,7} \epsilon_{SLi}$$

Efficiency when COT was sick



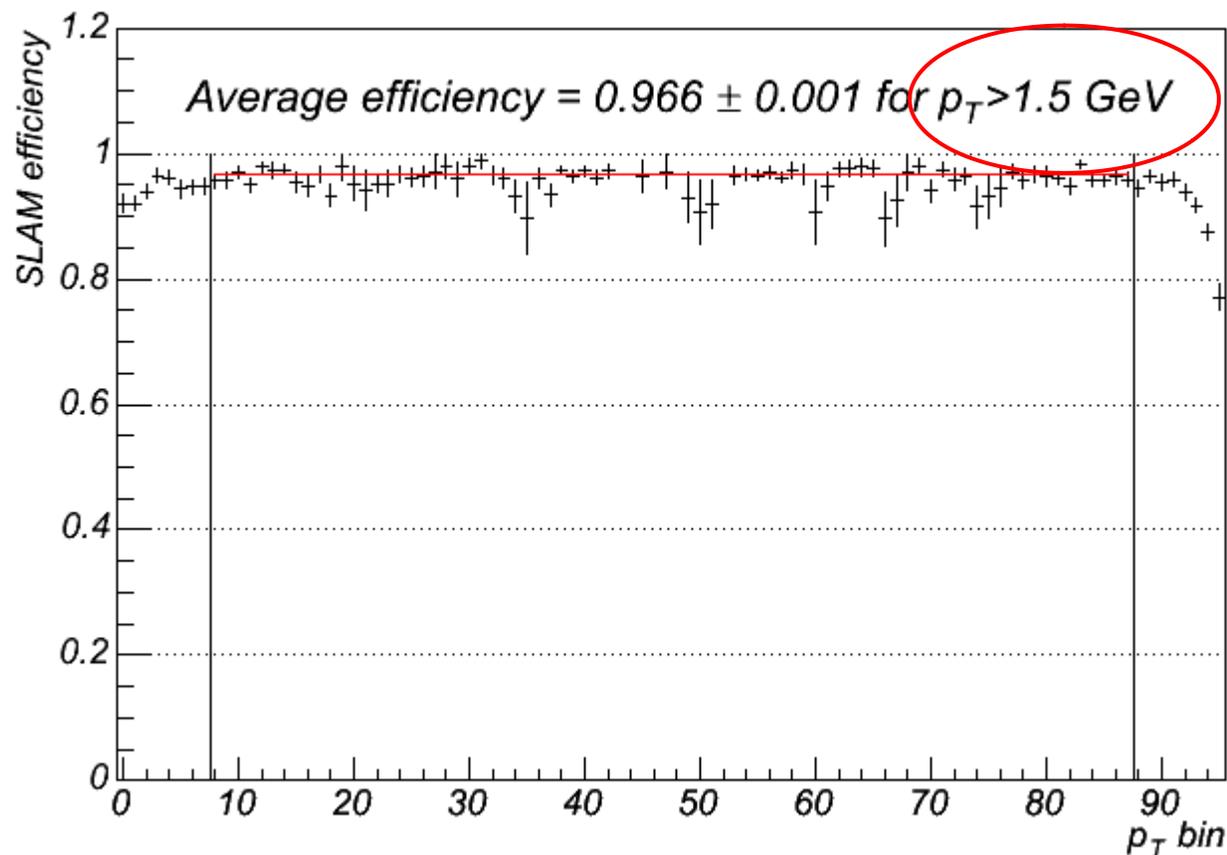
12 hit
cells in
green

± 1 cell
in blue



SLAM Association Efficiency

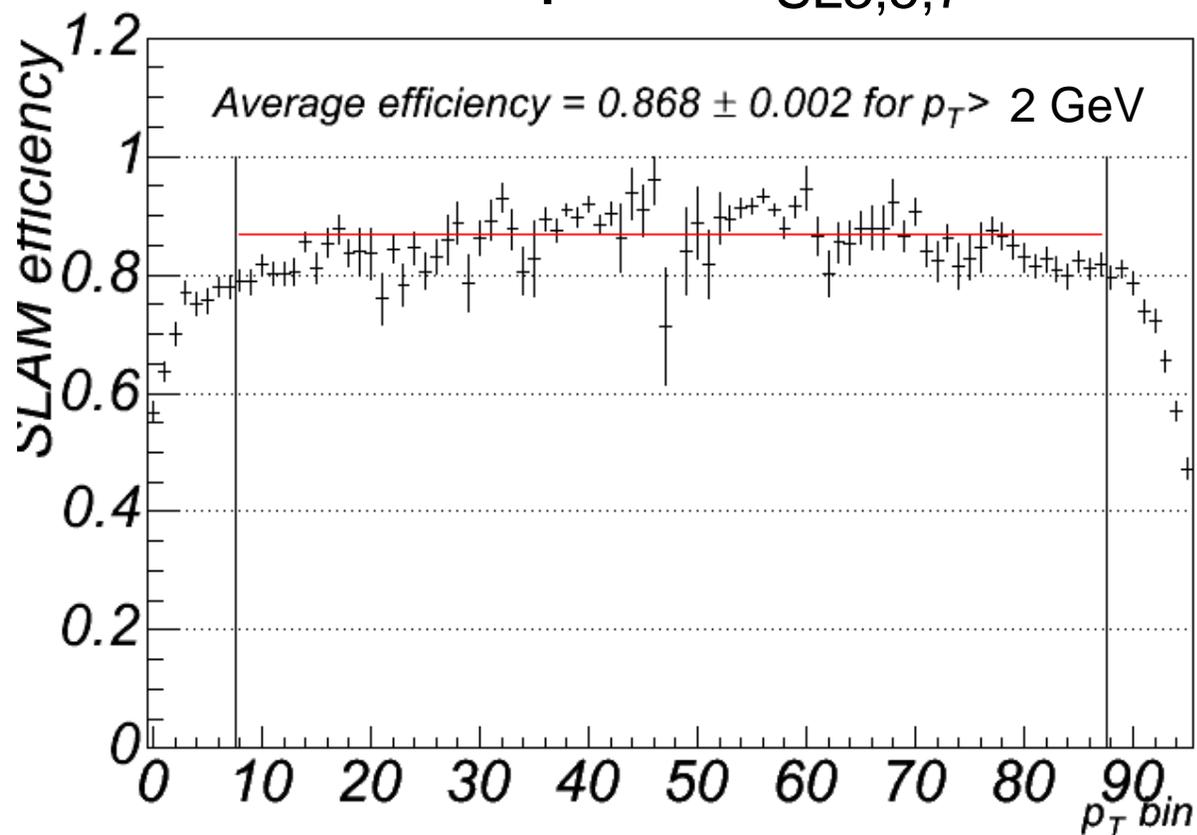
- Feb 2002 run 0x21fc6: $\varepsilon(\text{SLAM}) = 96.7\%$
- Product of pixel $\varepsilon_{\text{SL}3,5,7} = 94.0\%$



Actually 2 GeV/c

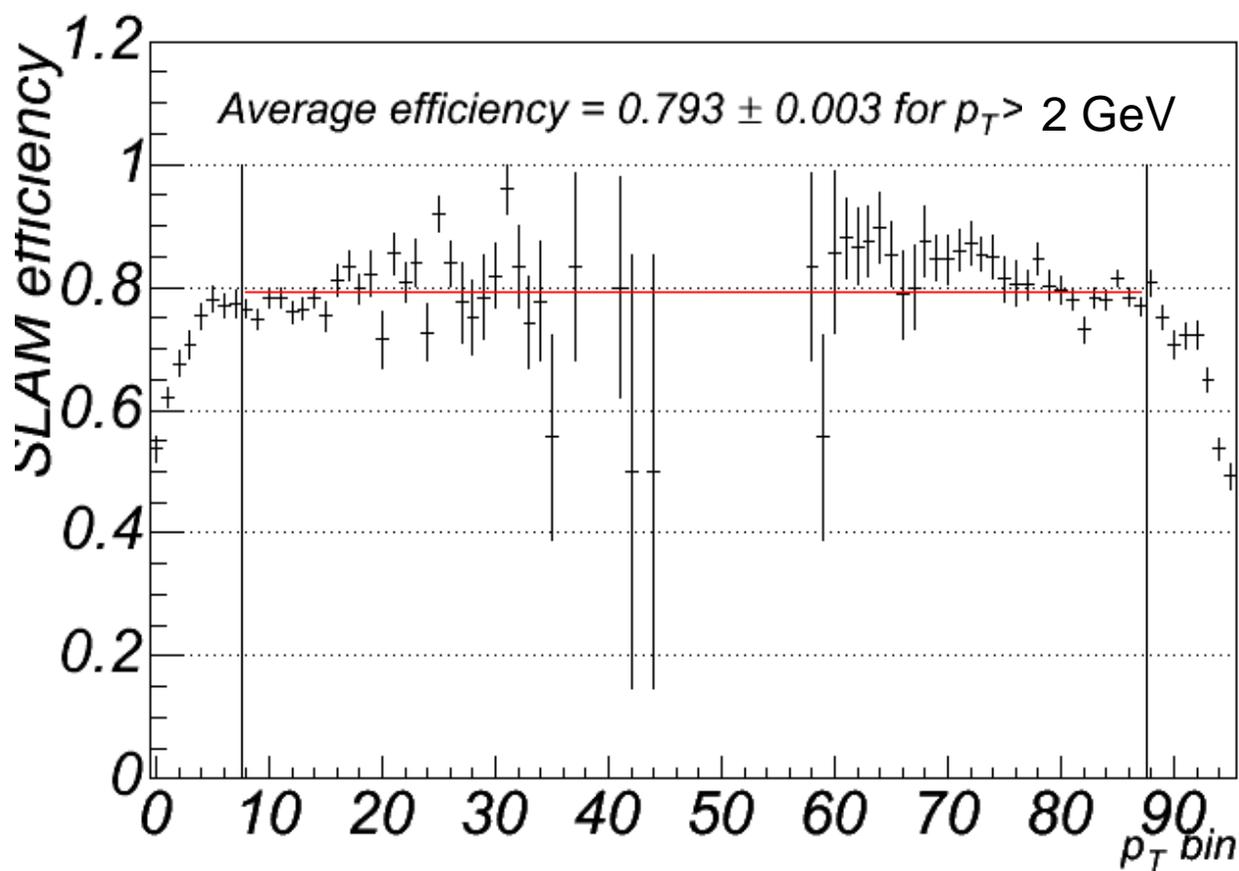
SLAM Association Efficiency

- Sep 2005 run 0x31bf5: $\epsilon(\text{SLAM}) = 86.8\%$
- Product of pixel $\epsilon_{\text{SL}3,5,7} = 85.5\%$



SLAM Association Efficiency

- Previous results were from lepton calib dataset
- Oct 21 test run 0x32469 has more low p_T tracks:



2-miss Finder Patterns

- Significant benefit from 2-miss patterns:

$$P(1 - \text{miss}) = p^{12} + 12p^{11}(1 - p)$$

$$P(2 - \text{miss}) = p^{12} + 12p^{11}(1 - p) + 66p^{10}(1 - p)^2$$

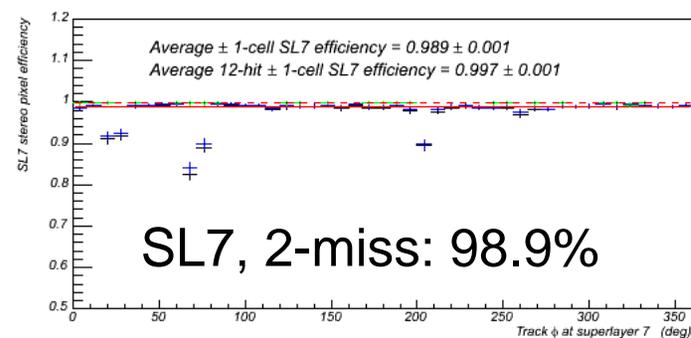
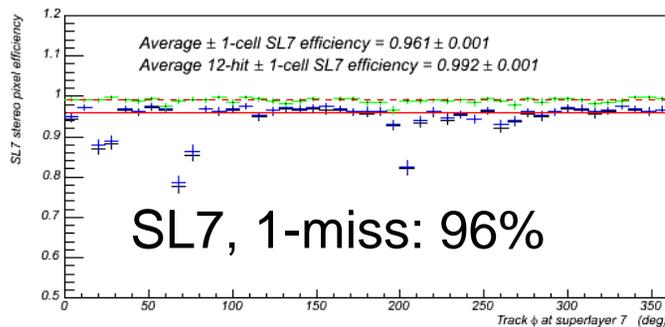
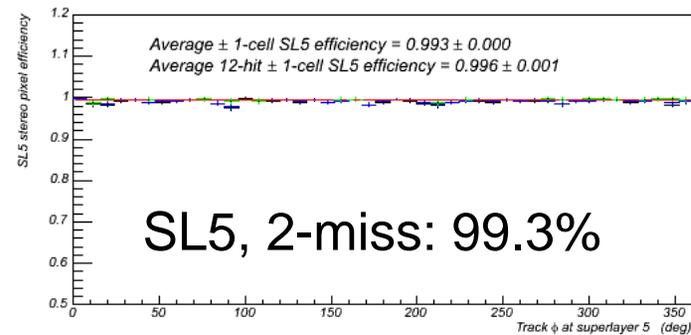
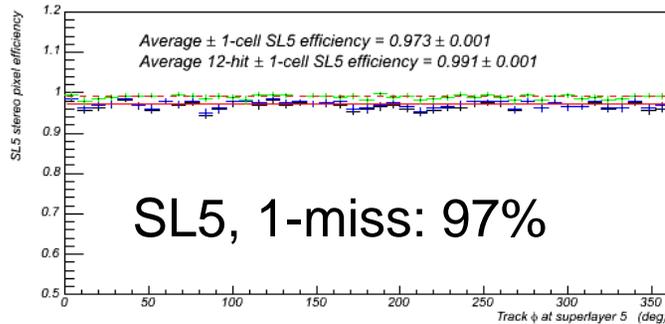
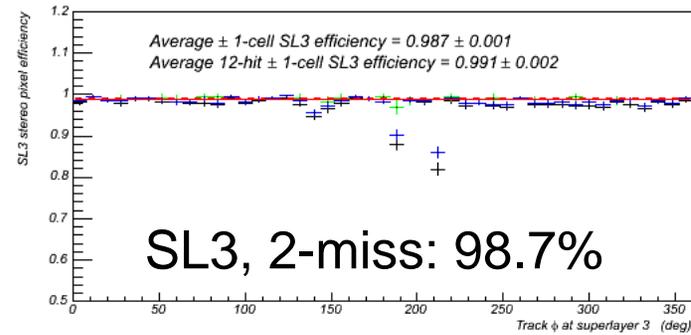
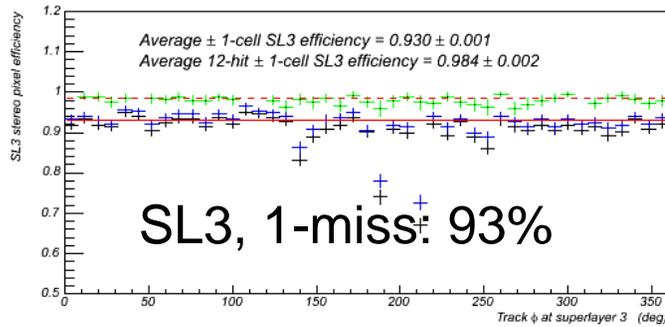
- Finder pixel efficiency with $p_{hit}=95\%$:

$$P(1 - \text{miss}) = 0.882$$

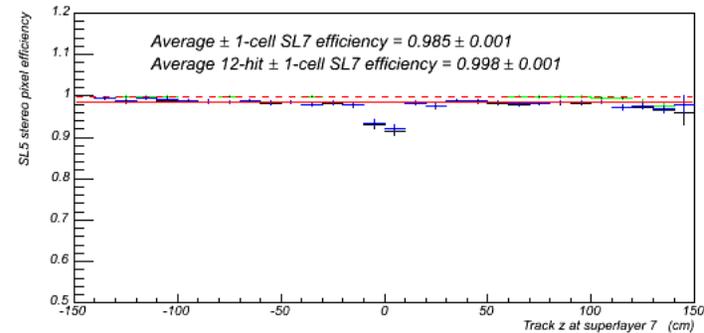
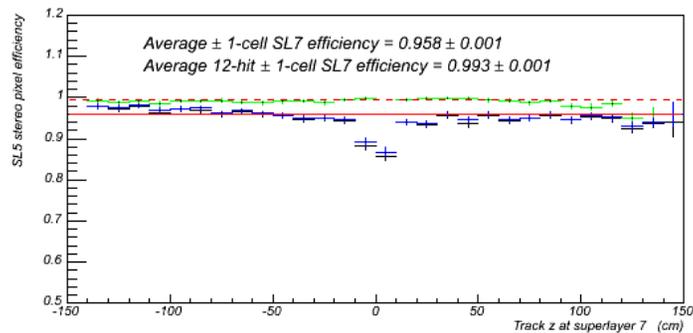
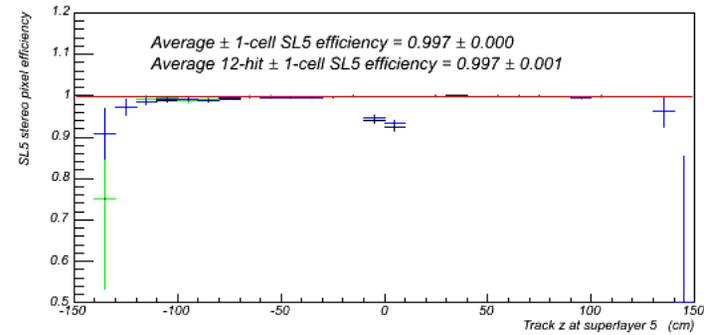
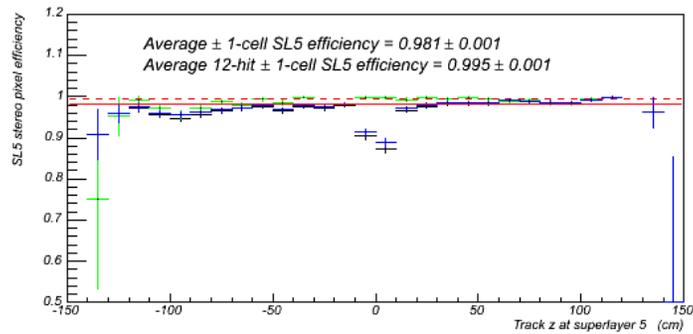
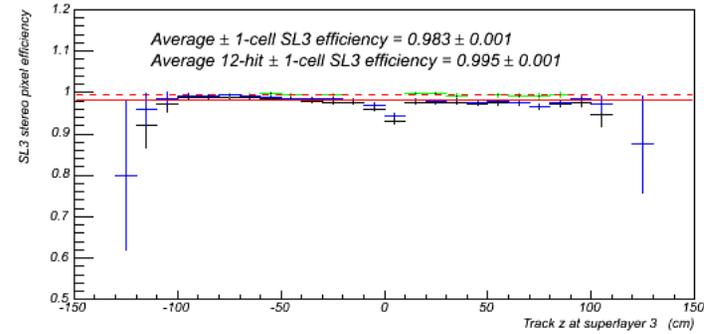
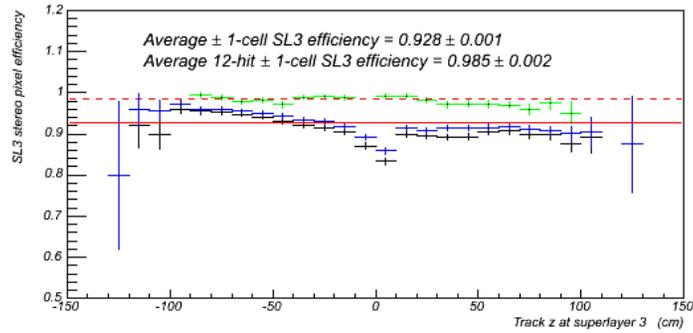
$$P(2 - \text{miss}) = 0.980$$

- Study this with run 0x2d8e6 (Aug, 2004)
 - This time analyzed with offline 6.1.3 and newer XFTSim – some small differences.

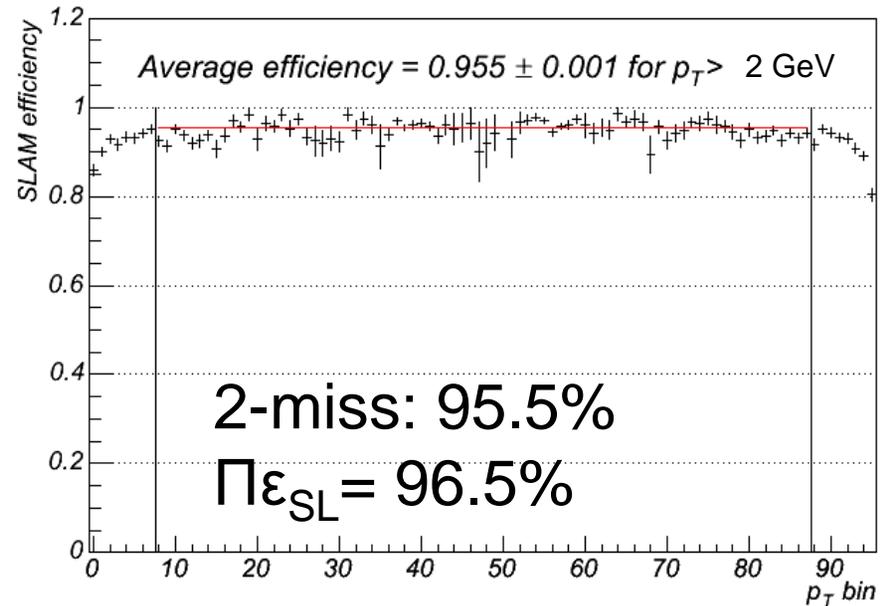
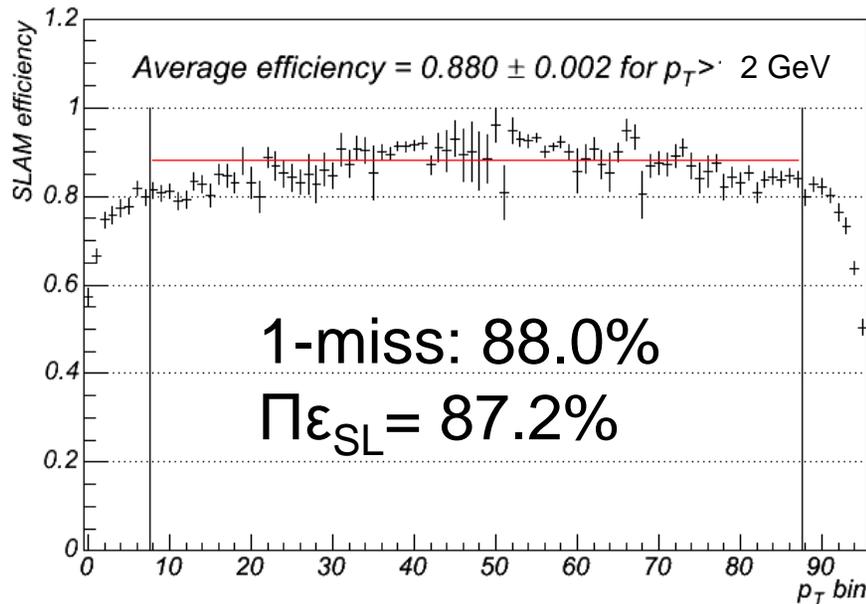
Comparison of 1-miss and 2-miss



1-miss and 2-miss z-dependence



Improved p_T dependence



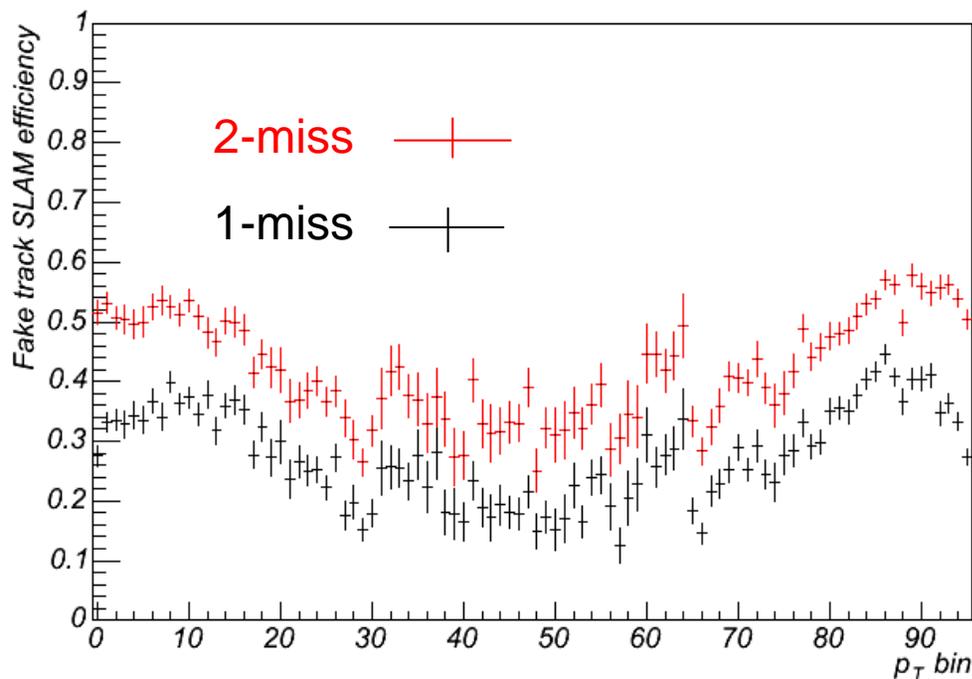
- Flatter p_T dependence down to 1.5 GeV/c
- Total efficiency follows from efficiency in individual stereo superlayers

Trigger Rates

- Of course we have higher efficiency with 2-miss compared with 1-miss patterns
- How strongly does this influence the trigger rates?
- Equivalent question: How much does the fraction of fake XFT tracks increase?
- Study using two samples:
 - L1_TWO_TRK1.5 triggers (ir032469)
 - Jet100 secondary dataset (gjt40h)

L1_TWO_TRK1.5 data

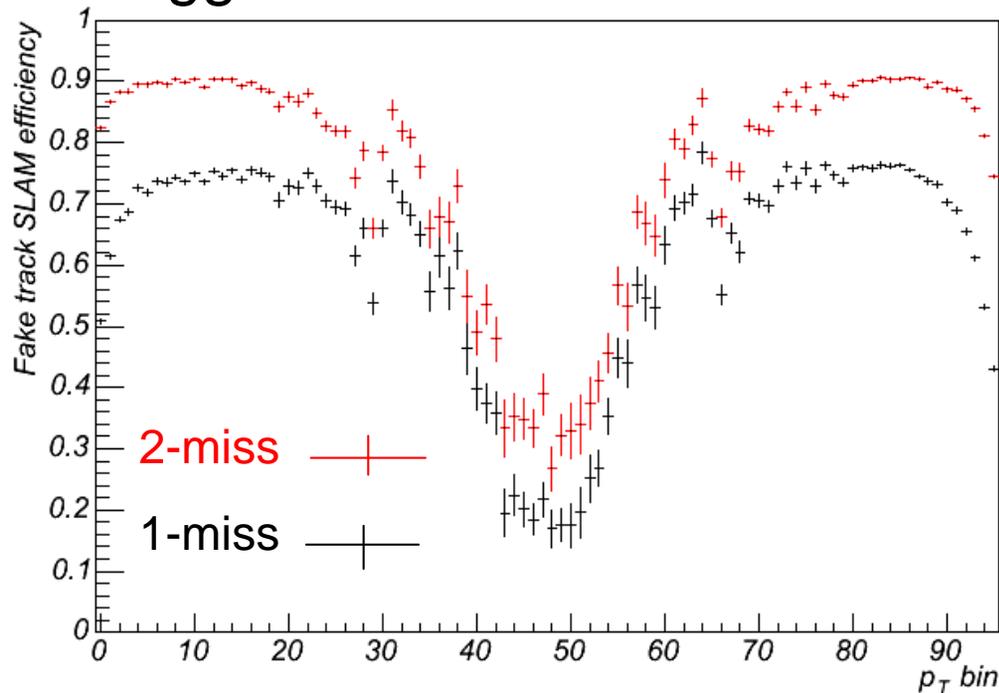
- The two-track coincidence increases fraction of XFT tracks that are real
- Consider only axial XFT tracks that were not matched to offline COT tracks



- Single low p_T tracks:
30% rejection \rightarrow 50% rejection
- Single high p_T tracks:
20% rejection \rightarrow 30% rejection

L1_TWO_TRK1.5 data

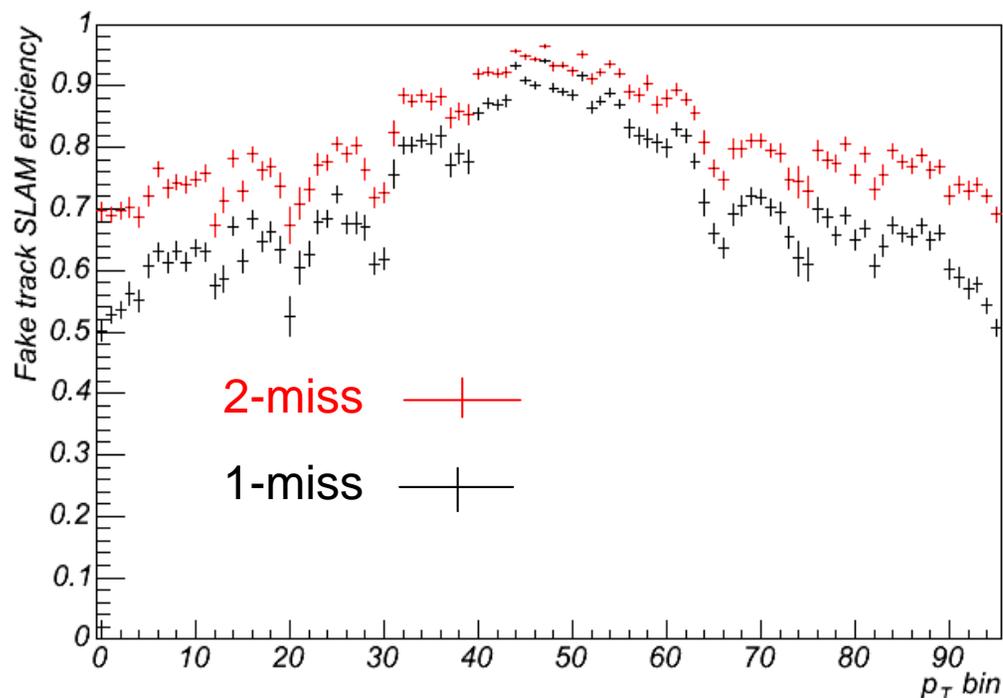
- The two-track coincidence increases fraction of XFT tracks that are real
- Consider fraction of all tracks to assess impact on actual trigger rate:



- Two XFT tracks:
70% rejection \rightarrow 87% rejection

JET100 data

- Analyze gjt40h dataset, run > 201211
- SLAM efficiency for XFT tracks not matched to a COT track:



Conclusions?

- SLAM efficiency mainly influenced by stereo superlayer hit efficiencies
- Still present after COT aging recovery
- Efficiencies have remained quite stable since COT recovery
- Need to increase total efficiency:
 - Lower COT thresholds on stereo superlayers?
 - Allow 2-misses on SL3,5,7 or maybe just on SL3?
 - Some combination of the above?
- Inefficiency for 3 SLAM tracks with $\epsilon_{\text{SLAM}}=80\%$ is equivalent to a factor of 2 prescale.

Conclusions?

- Do we really understand how 2-miss patterns affect all trigger rates?
- What additional test runs/triggers do we need in order to make more accurate projections?
- Can we justify reducing COT thresholds?
- How much additional efficiency could we expect?

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