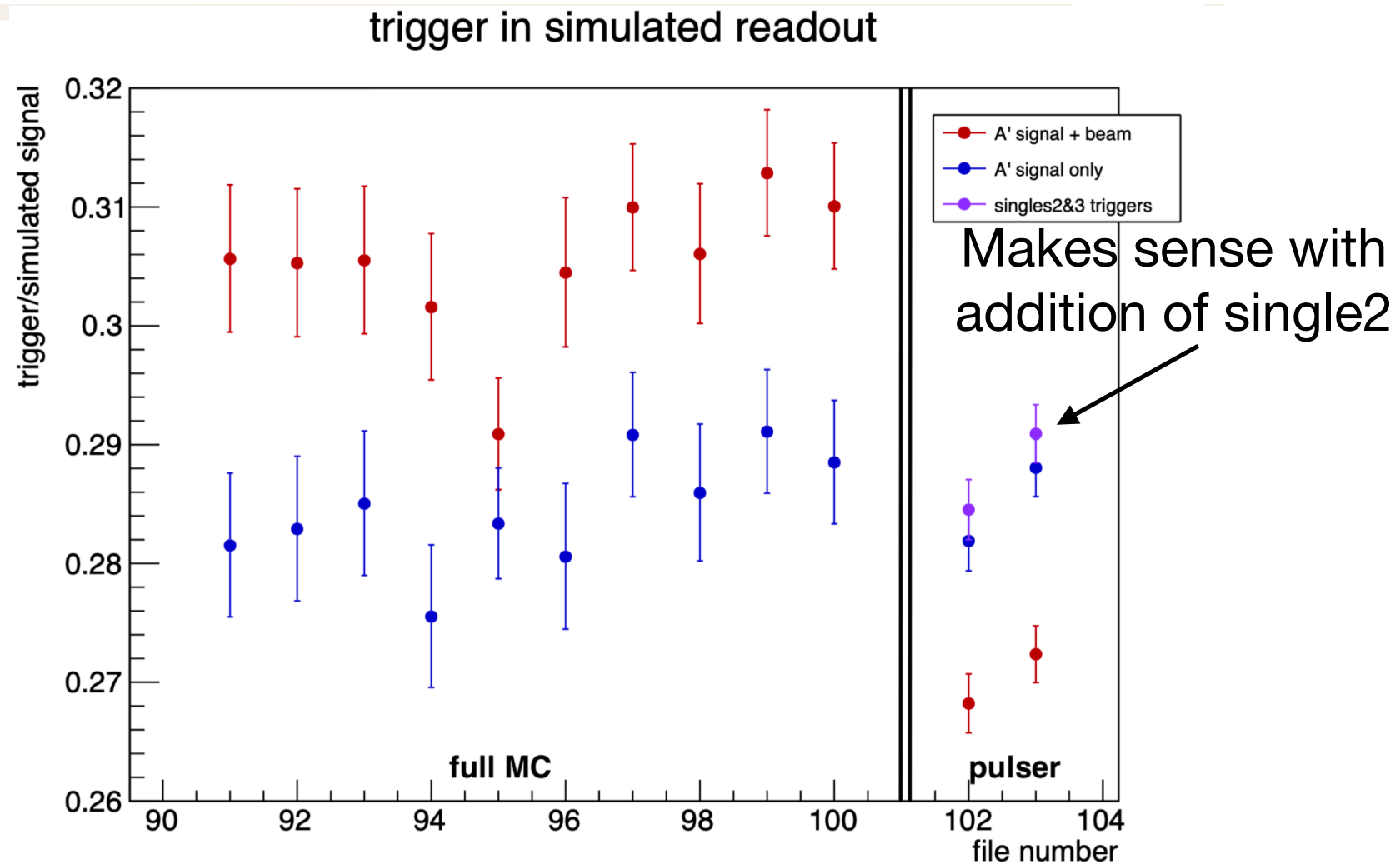# HPS MC Updates

**T. Cao**
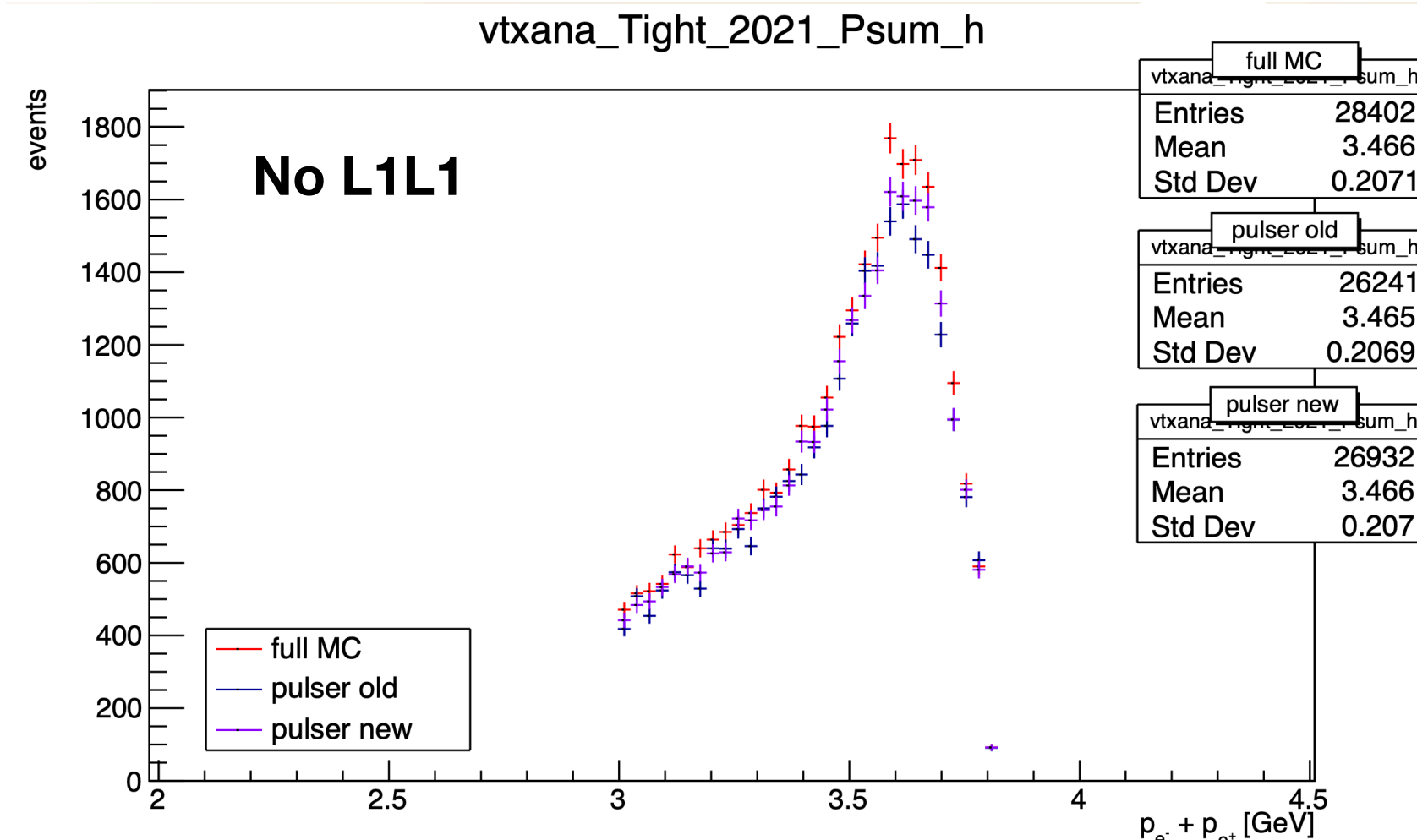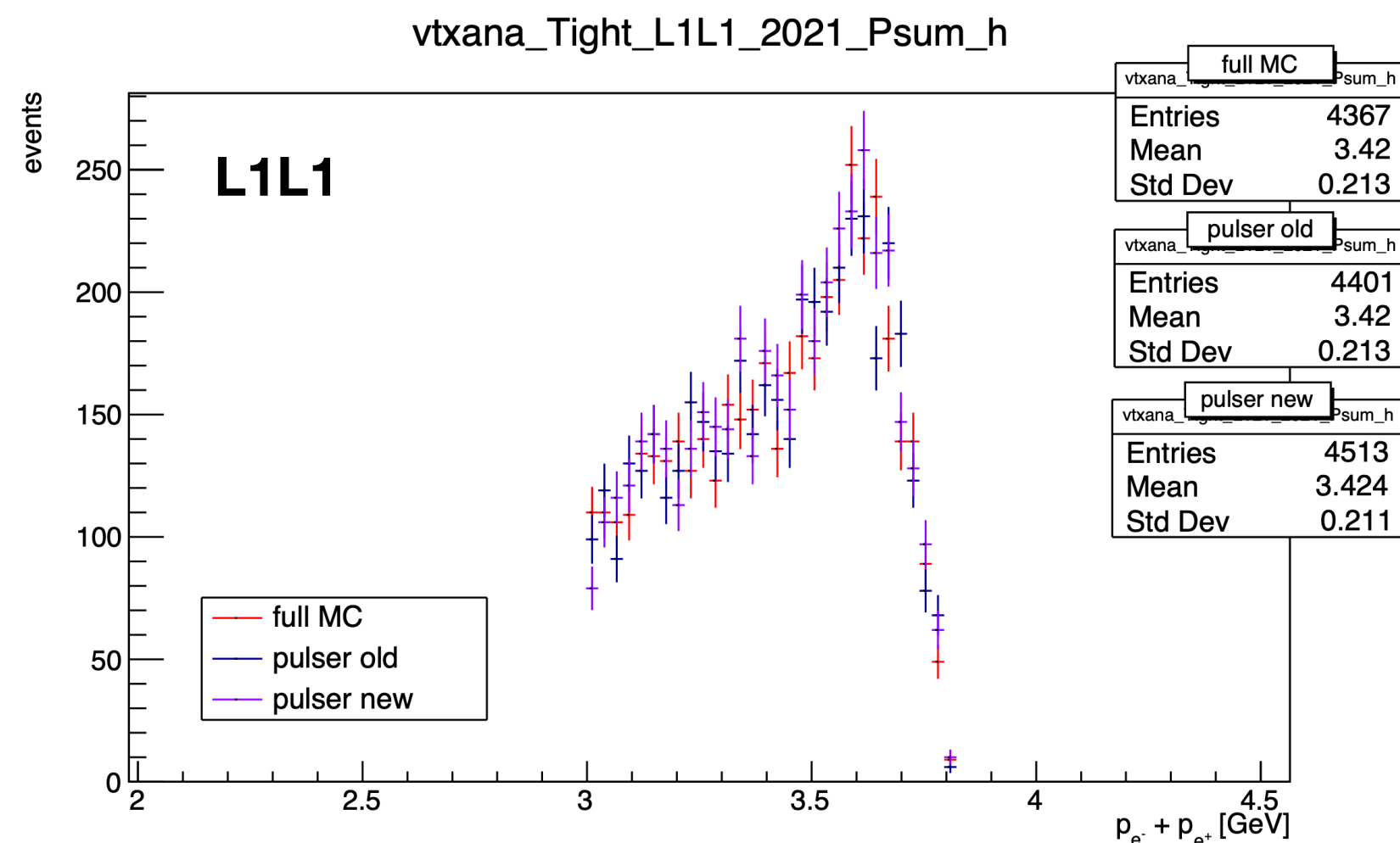**HPS Weekly Meeting**

**April 17, 2024**

# Updates for Validation of Pulser Data Merging by Sarah

Comparing to validation of last time, trigger2 is added into readout for MC production with pulser data merging for fair comparison to sample with MC beam merging, which includes trigger2 and trigger3.

### trigger in simulated readout

trigger/simulated signal

- A' signal + beam
- A' signal only
- singles2&3 triggers

Makes sense with addition of single2

**full MC**          **pulser**

file number

Why the ratio for MC beam merging is larger than pulser data merging?

- Difference between MC beam and pulser data

- Different ways for spacing and merging:

  ‣ MC beam: signal events are spaced firstly, and then merged with continuous MC beam. For a signal event, it is merged with a MC beam event at the hit level, and its neighbored events are MC beam events. When digitization, Hits are piled up along time axis.

  ‣ Pulser data: signal and pulser data (window of ADC) are merged event by event, and then overlaid events are spaced. For a signal event, it is merged with pulser data at the ADC level, and its neighbored events are empty. Merged ADC samples expand on time axis.

  ‣ Interval for event spacing is 250 ( * 2ns = 500 ns, i.e. 125 clock cycles) to ensure that it is large enough with consideration of ADC window and time displacement. So along time axis, ADC sample is continuous for MC beam merging, while some clock cycles are skipped for pulser data merging.

  ‣ Therefore, the way for MC beam merging has more chance to form extra triggers by background.

### vtxana_Tight_L1L1_2021_Psum_h

events

**L1L1**

| full MC | |
|---|---|
| Entries | 4367 |
| Mean | 3.42 |
| Std Dev | 0.213 |

| pulser old | |
|---|---|
| Entries | 4401 |
| Mean | 3.42 |
| Std Dev | 0.213 |

| pulser new | |
|---|---|
| Entries | 4513 |
| Mean | 3.424 |
| Std Dev | 0.211 |

- full MC
- pulser old
- pulser new

$p_{e^-} + p_{e^+}$ [GeV]

### vtxana_Tight_2021_Psum_h

events

**No L1L1**

| full MC | |
|---|---|
| Entries | 28402 |
| Mean | 3.466 |
| Std Dev | 0.2071 |

| pulser old | |
|---|---|
| Entries | 26241 |
| Mean | 3.465 |
| Std Dev | 0.2069 |

| pulser new | |
|---|---|
| Entries | 26932 |
| Mean | 3.466 |
| Std Dev | 0.207 |

- full MC
- pulser old
- pulser new

$p_{e^-} + p_{e^+}$ [GeV]

- After tight event selection, rates are very similar for L1L1, while slightly higher rate in peak for full MC for no L1L1.

- For no L1L1, sample with addition of single2 trigger for pulser data merging looks to be closer to MC beam merging

# New 2016 MC Samples

- New 2016 MC samples (pass4b) have been fully produced, including rad-beam, tritrig-beam, wab-beam, ap-beam, and simp-beam.

- Here is link for information of samples: https://confluence.slac.stanford.edu/display/hpsg/pass4b+for+2016+MC