Measures of Tagging Performance at Hall D

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Outline

- Tagger efficiency
- Tagging efficiency or tagging ratio
- What are they good for?
- Outlook

Tagger efficiency

- Efficiency of detecting the “tagging” electrons in the tagger detectors
  - Includes the tagger geometrical acceptance, which is expected to dominate
- Given a photon on target, what is the probability that it was tagged by a tagger detector?
- eff(tagger) = N(e-,tagger) / N(photon,target), where N(e-,tagger) are true time coincidences with photons on target

Hall-D tagger efficiency

- Must trigger on detector other than tagger

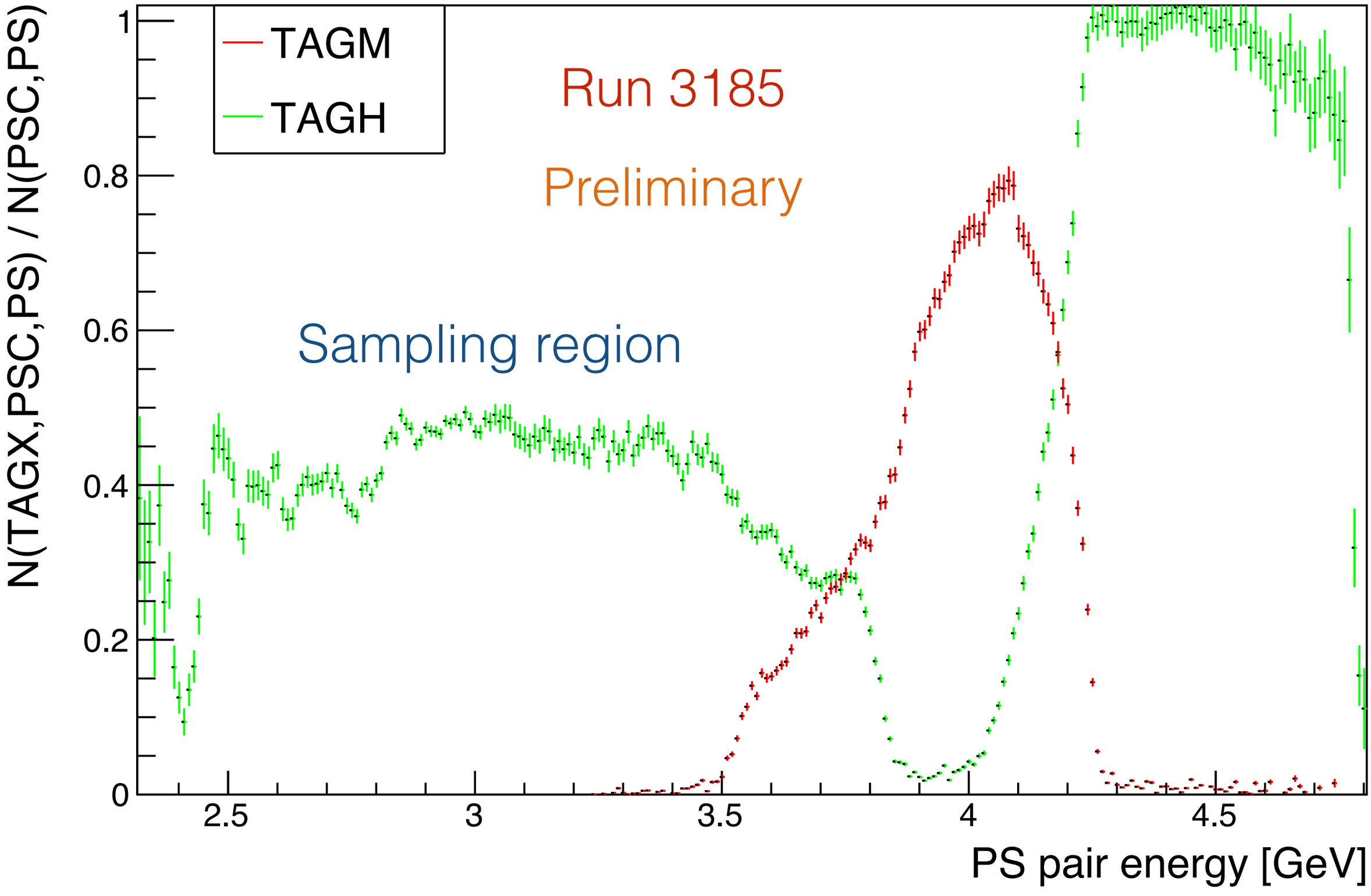
- Pair spectrometer with its left-right coincidence trigger is relatively clean, use these events

1. Count number of “good” PS left-right arm time coincidences for denominator

2. Count number of true tagger-PS coincidences for numerator (subtract accidentals to get “trues”)

3. Form ratio for each PS photon energy bin

Tagger Efficiency



Tagging efficiency

- Transmission efficiency of tagged photons through the collimator and to the target

- Given a bremsstrahlung electron in the tagger, what is the probability that the corresponding tagged photon passes through the collimator and arrives on target?

- Tagging ratio = N(photon,target) / N(e-,tagger), where N(photon,target) are true time coincidences with “good” tagger hits

Hall-D tagging ratio

- Trigger on tagger detectors (not available), option at low rates
- OR use in-beam detector trigger in combination with live-time corrected tagger scalers (not archived per counter)
- Total absorption counter, TAC = in-beam detector, very high efficiency at low rates, near 100% (not commissioned yet)

1. Count number of “good” electrons in the tagger (denominator)
2. Count number of true tagger-TAC coincidences (numerator)
3. Form ratio for each tagger counter or energy bin

Hall-D relative tagging ratio

- Trigger on tagger detectors (not available), op. at low rates
- OR use in-beam detector trigger in combination with live-time corrected tagger scalers (not archived per counter)
- PS = in-beam detector, ratio depends on PS efficiencies

1. Count number of “good” electrons in the tagger (denominator)

2. Count number of true tagger-PS coincidences (numerator)

3. Form ratio for each tagger counter or energy bin

What are they good for?

- Tagger efficiency
  - Monitor tagger performance
- Tagging ratio
  - Monitor the amount of collimation
  - Photon flux on target from e- rates in tagger
  - Absolute normalization of cross sections

Outlook

- Use improved PS energy calibration for tagger efficiency
- Can we extract relative tagging ratio from Spring data?
  - Only tagger scaler sum over counters was archived
- Will we get the required low beam current for TAC runs?
- Will tagging ratios be reliable (beam stability)?
  - Monitor time and rate stability of relative tagging ratio
- Normalize using PS rates, corrected for efficiencies?