Centrality and event plane checks with elongated PSD geometry

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For the CBM Collaboration

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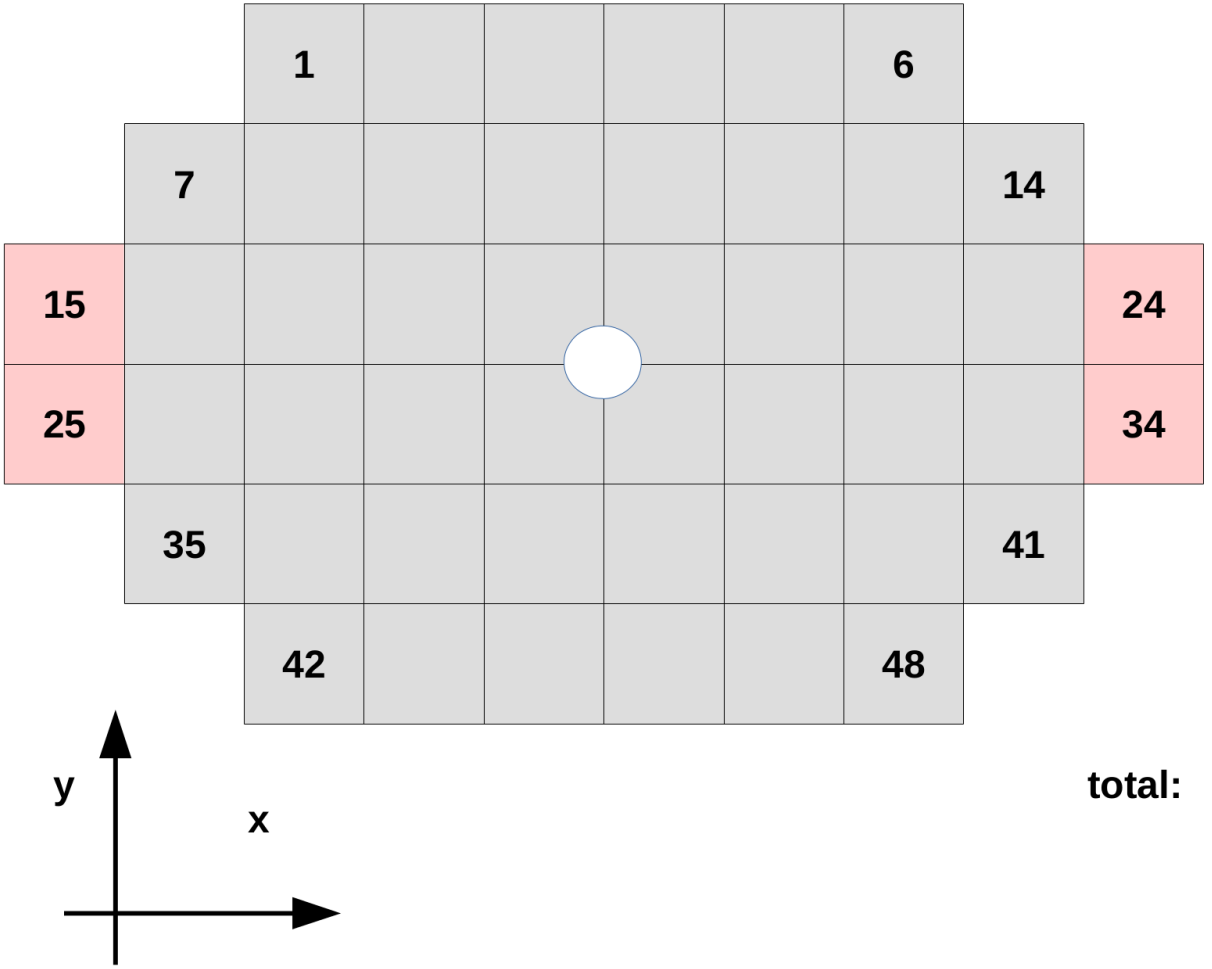
Elongated PSD geometry

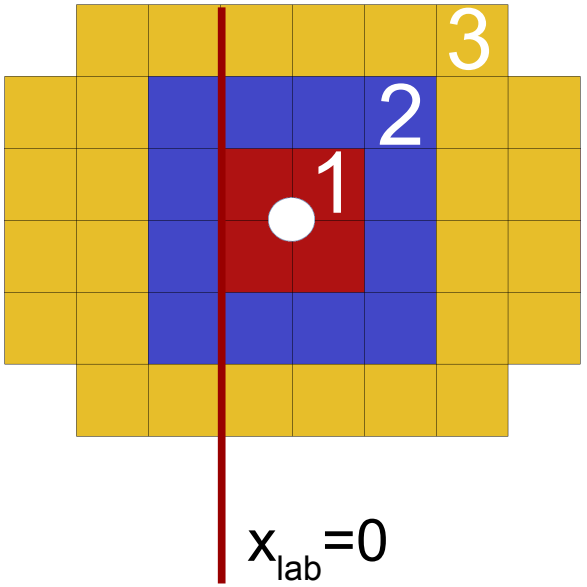
Two alternative configurations: 44 and 48 modules



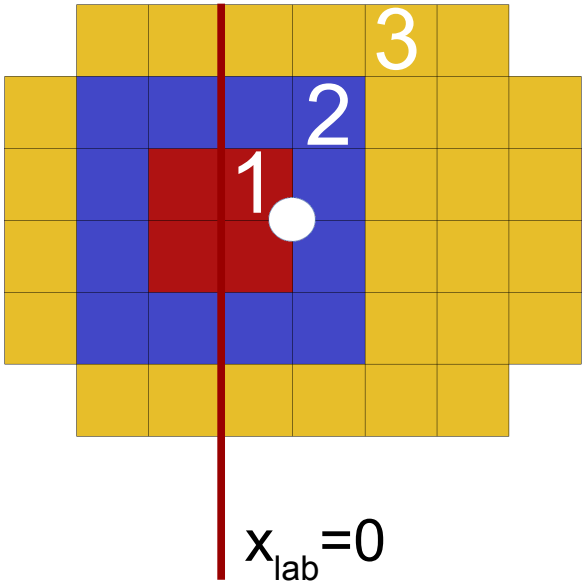
	Number of modules per raw	
	6	6
	8	8
	8	10
	8	10
	8	8
	6	6
total:	**44**	**48**

PSD subevent definition

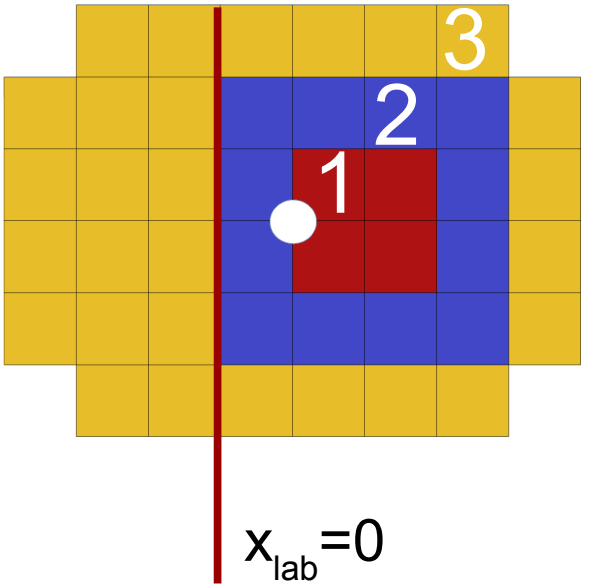
beam-centered
around beam spot



lab-centered
x_{lab}=y_{lab}=0 of the target

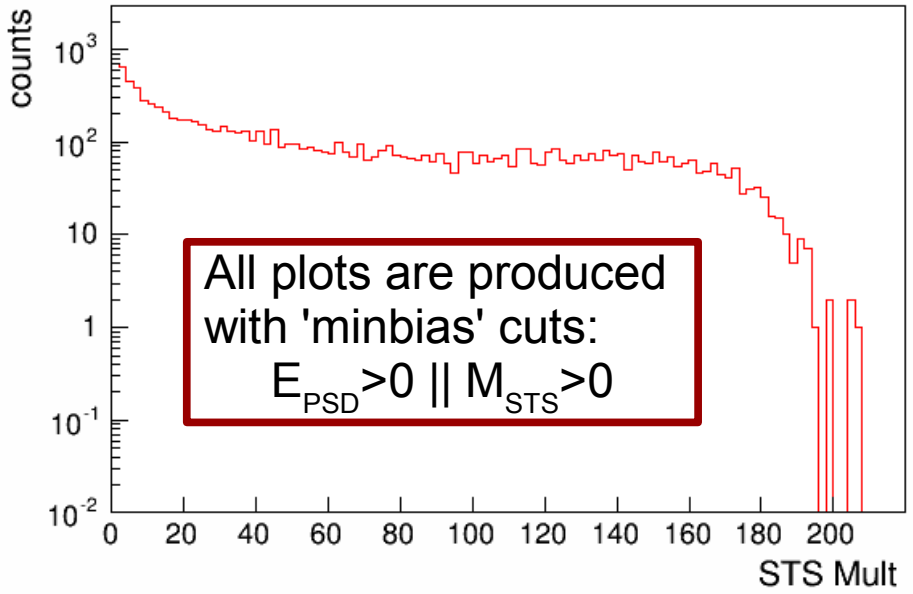


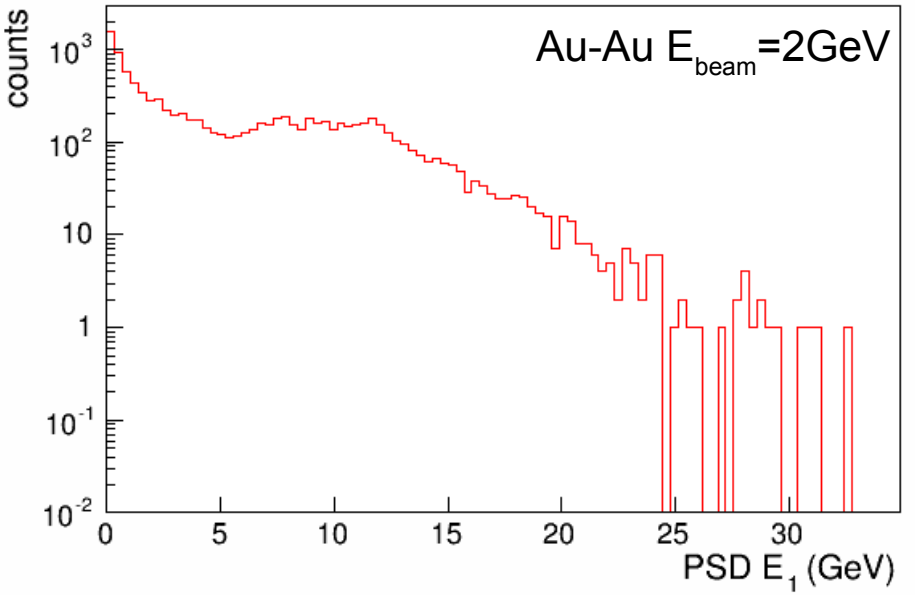
proton-centered
shifted toward proton tail

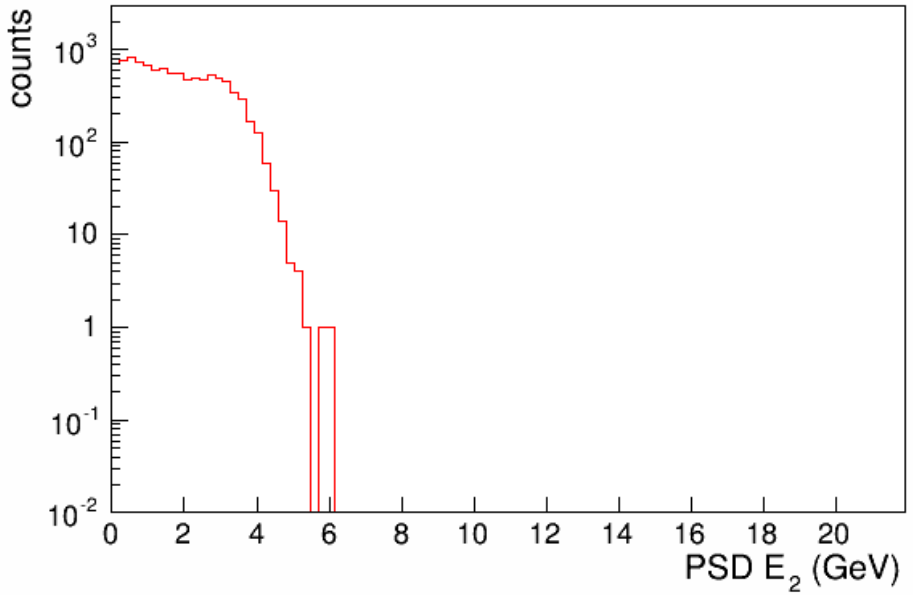


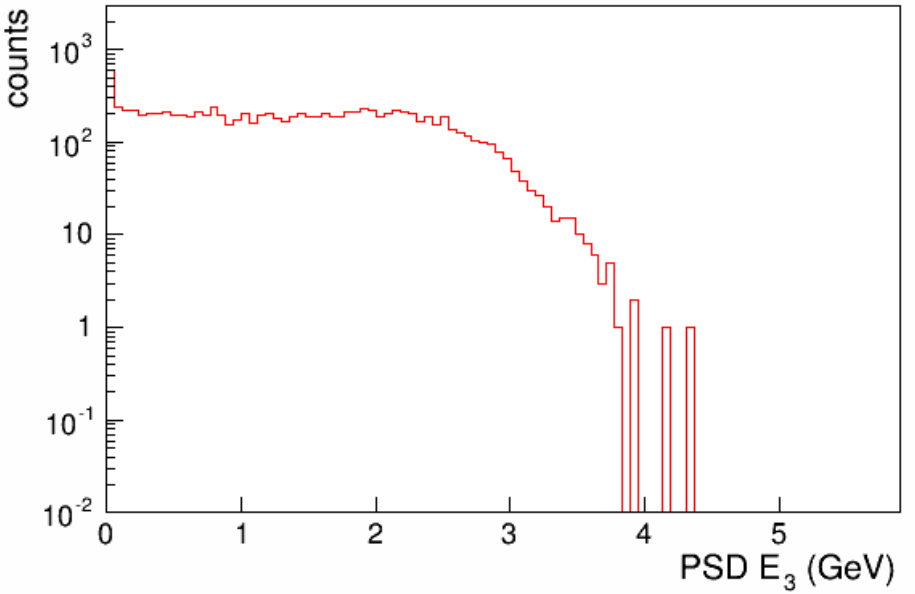
sub1
sub2
sub3

multiplicity distribution:
STS vs. “beam-centered” PSD subevents

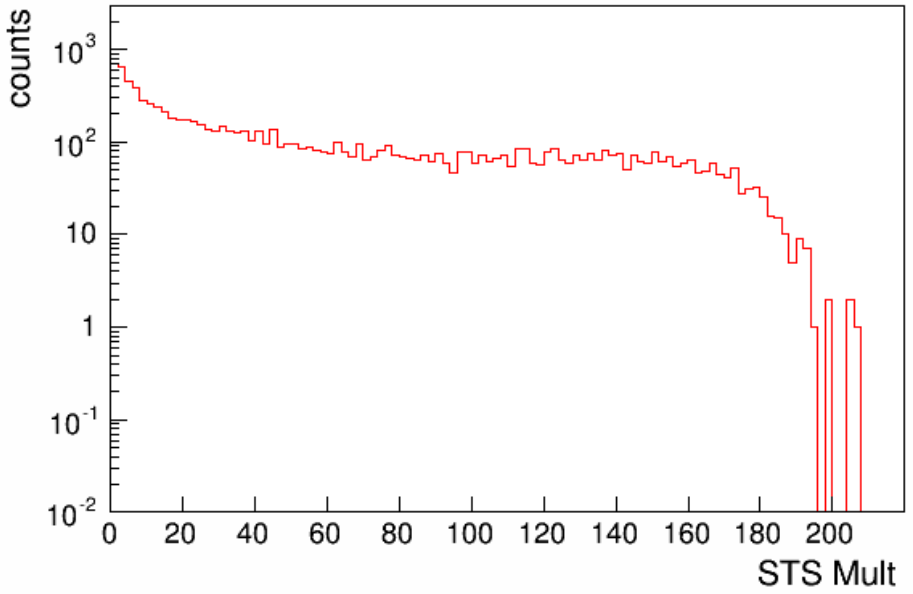


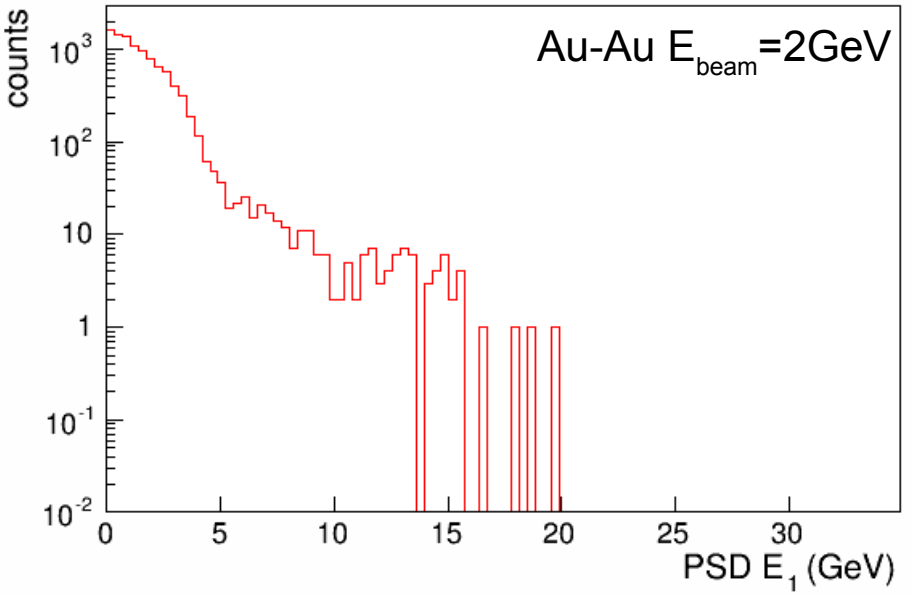


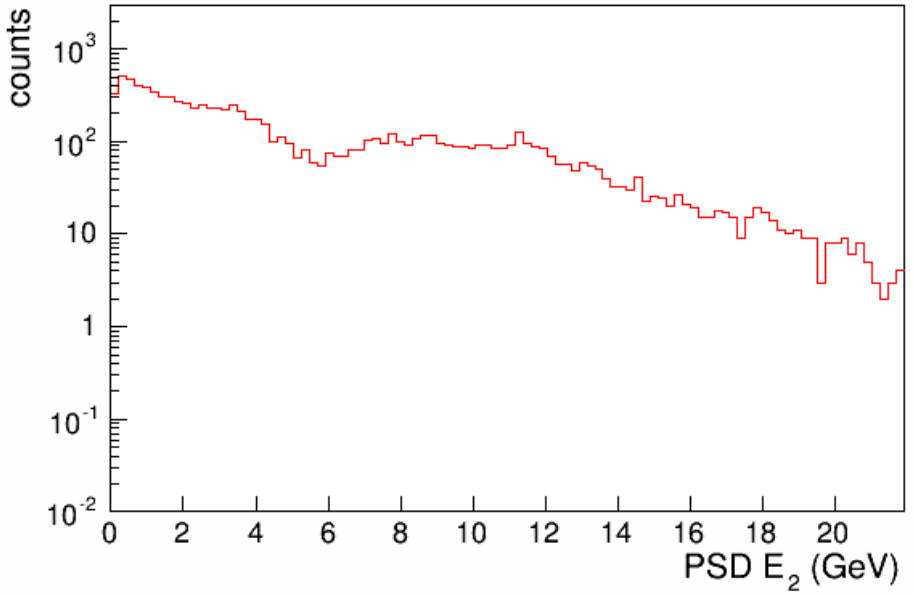


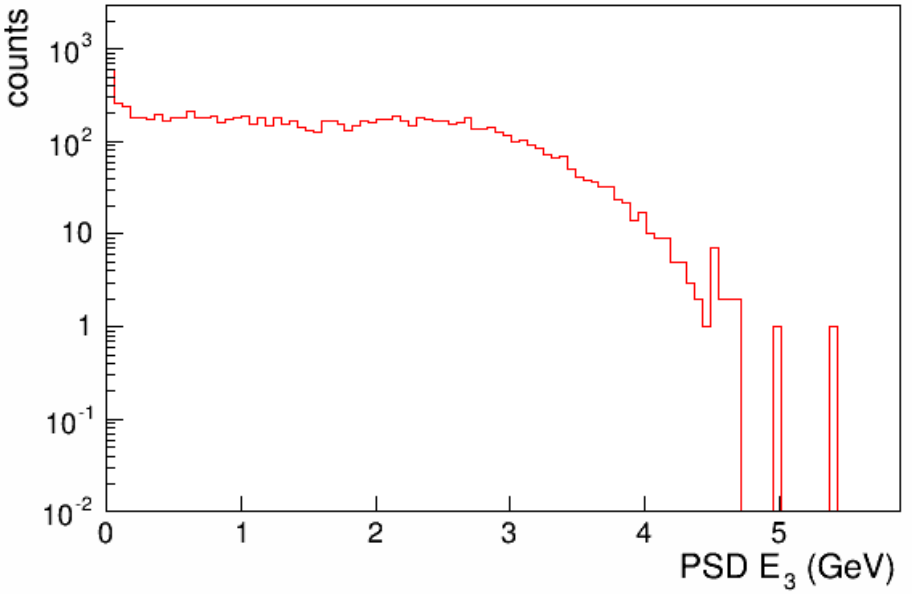


multiplicity distribution:
STS vs. “lab-centered” PSD subevents

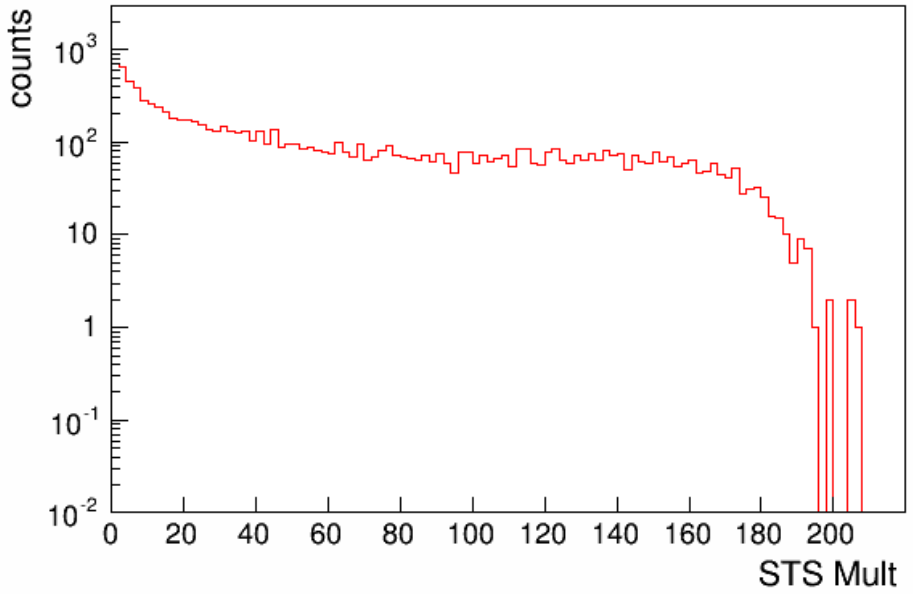


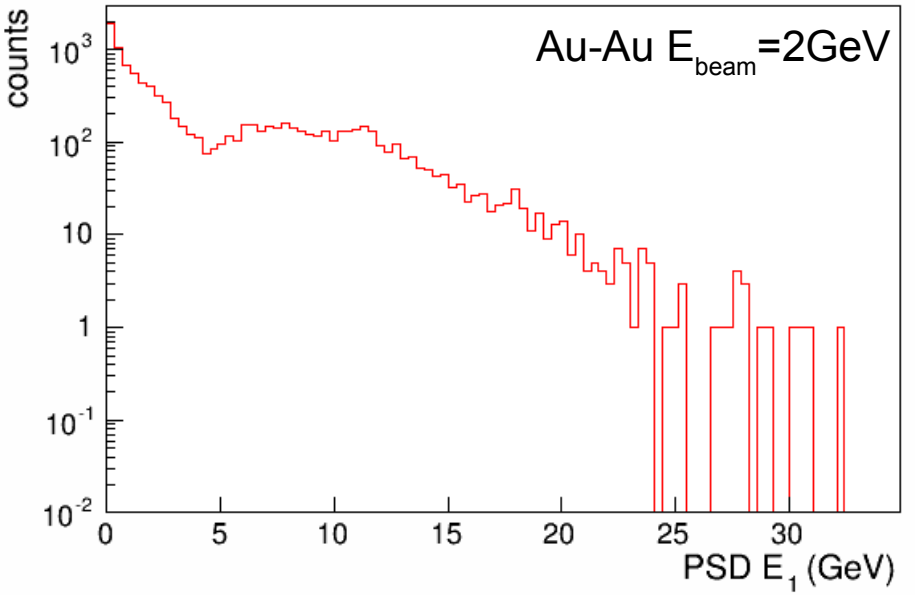


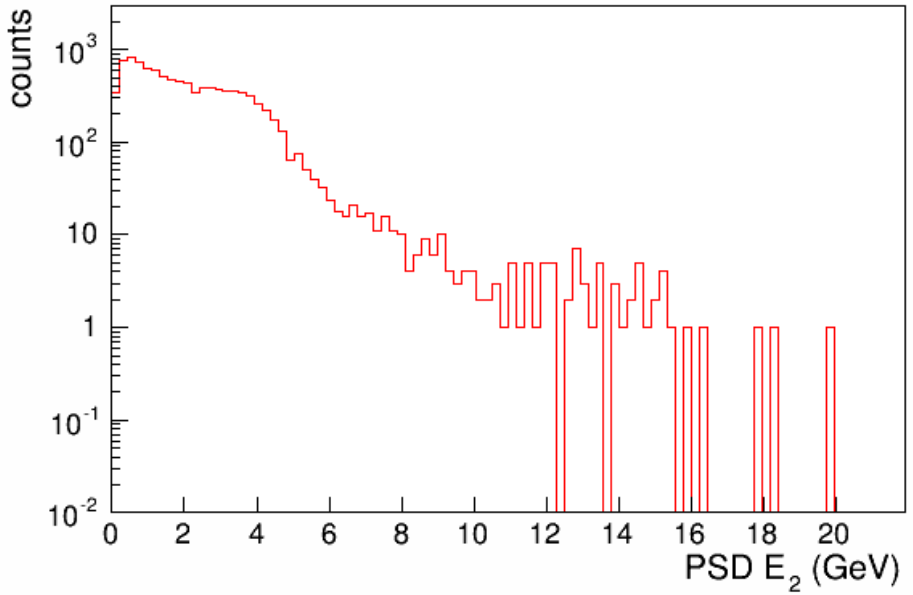


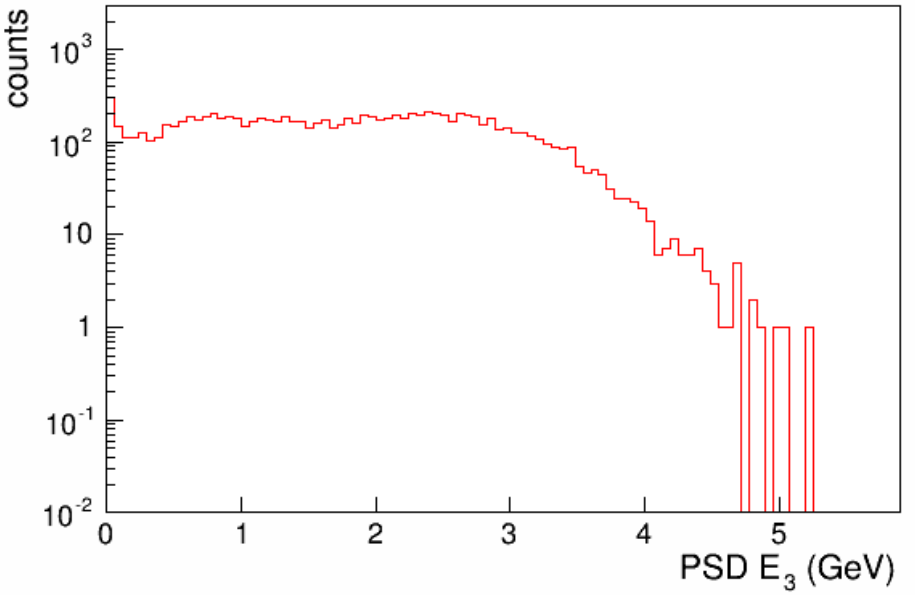


multiplicity distribution:
STS vs. “proton-centered” PSD subevents

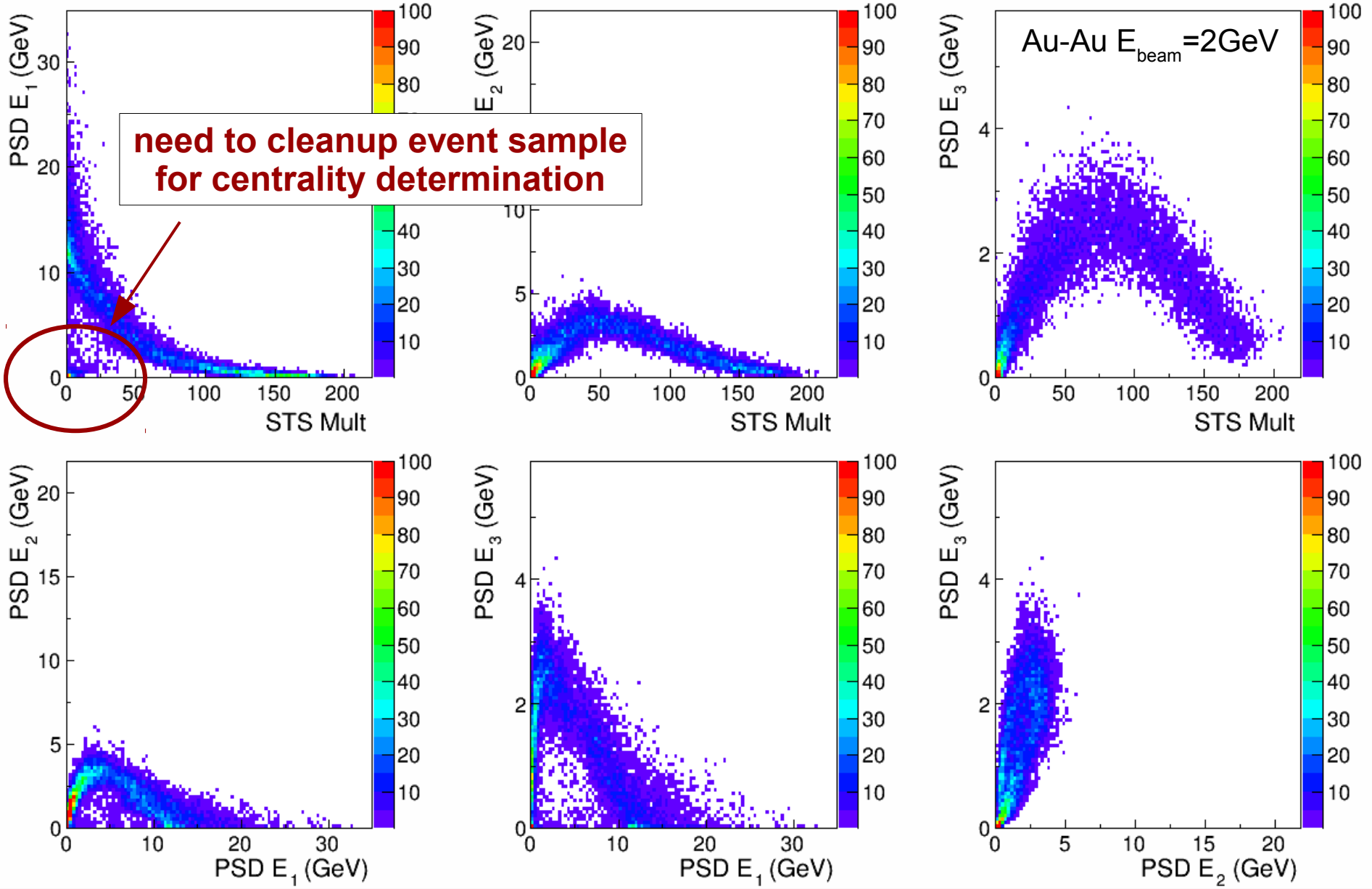






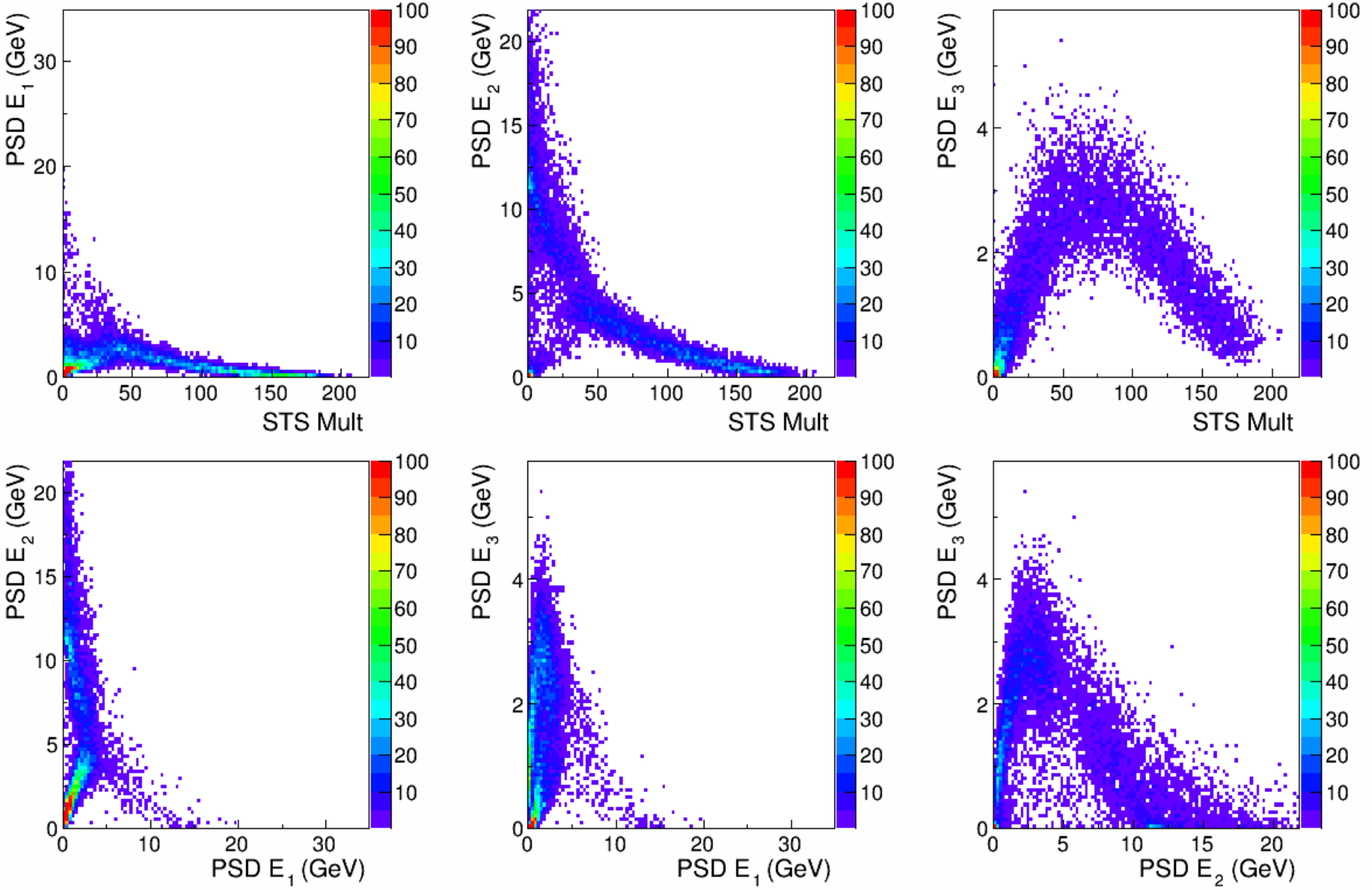


multiplicity correlation: STS vs. “beam-centered” PSD subevents



Additional PSD subevents can be used to improve the centrality resolution

multiplicity correlation: STS vs. “lab-centered” PSD subevents



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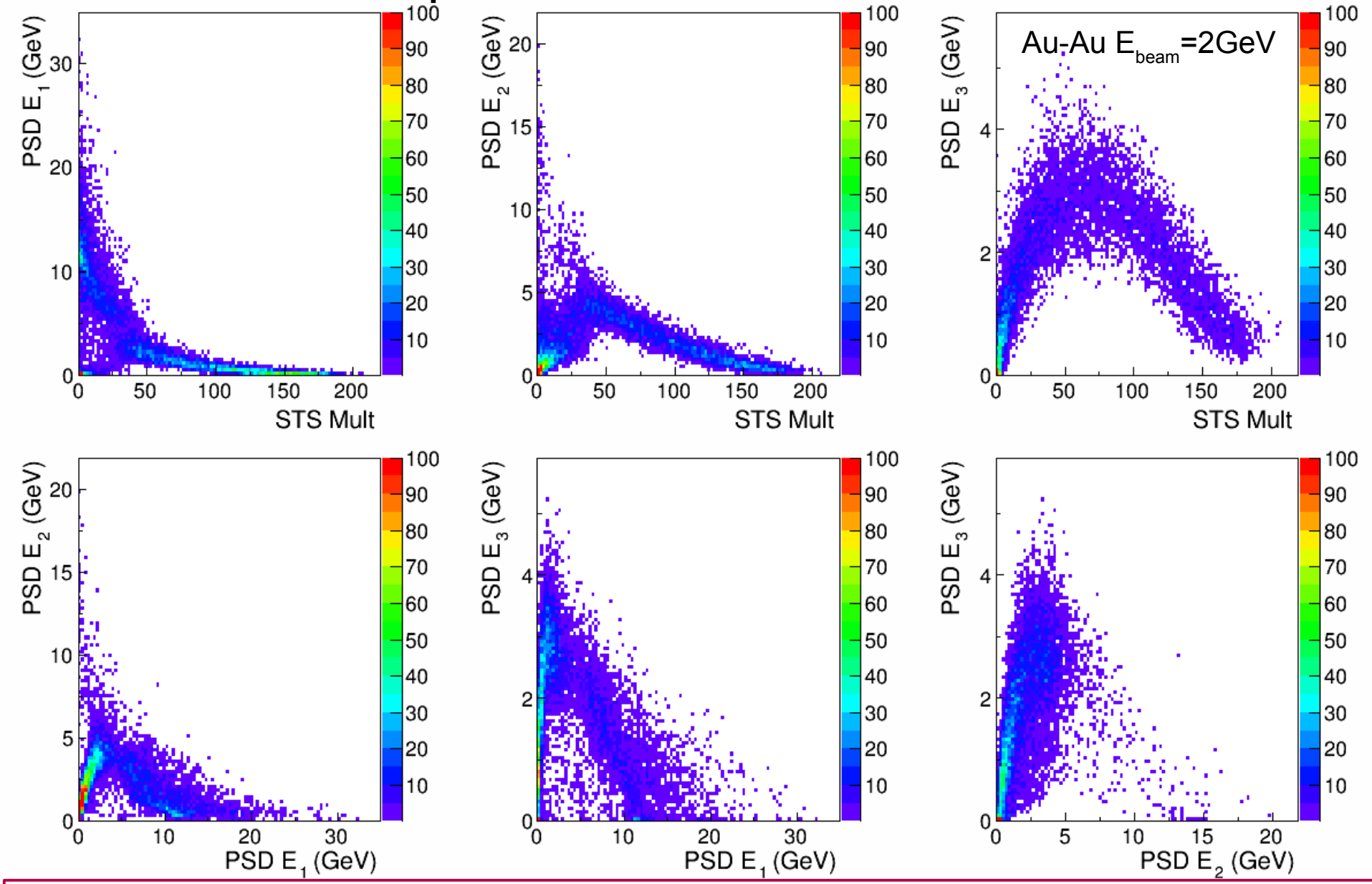
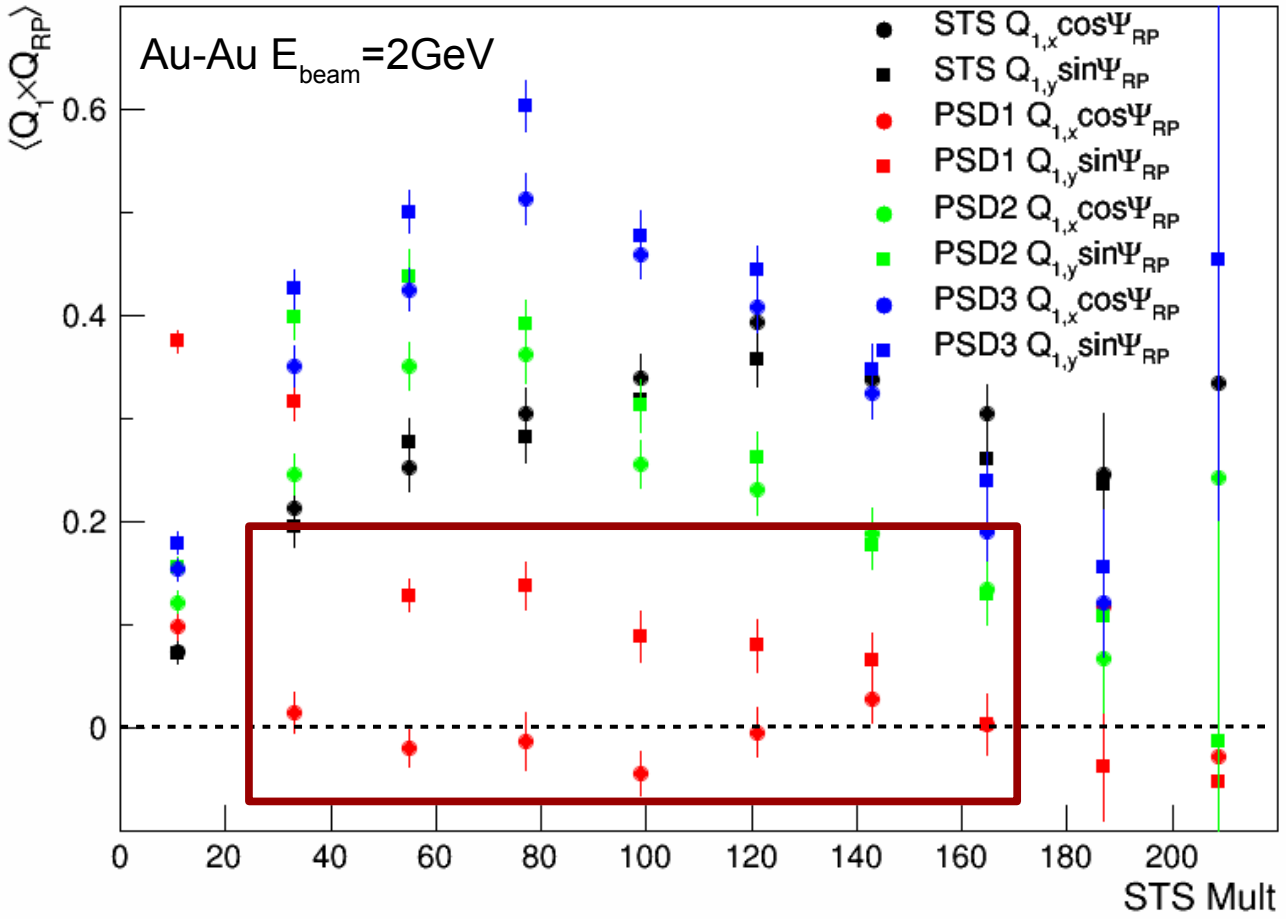
multiplicity correlation: STS vs. “proton-centered” PSD subevents



Additional PSD subevents can be used to improve the centrality resolution

Q-vector correlation wrt. to the reaction plane: STS vs. "beam-centered" PSD subevents

$\langle Q_x \times \cos \Psi_{RP} \rangle$ $\langle Q_y \times \sin \Psi_{RP} \rangle$



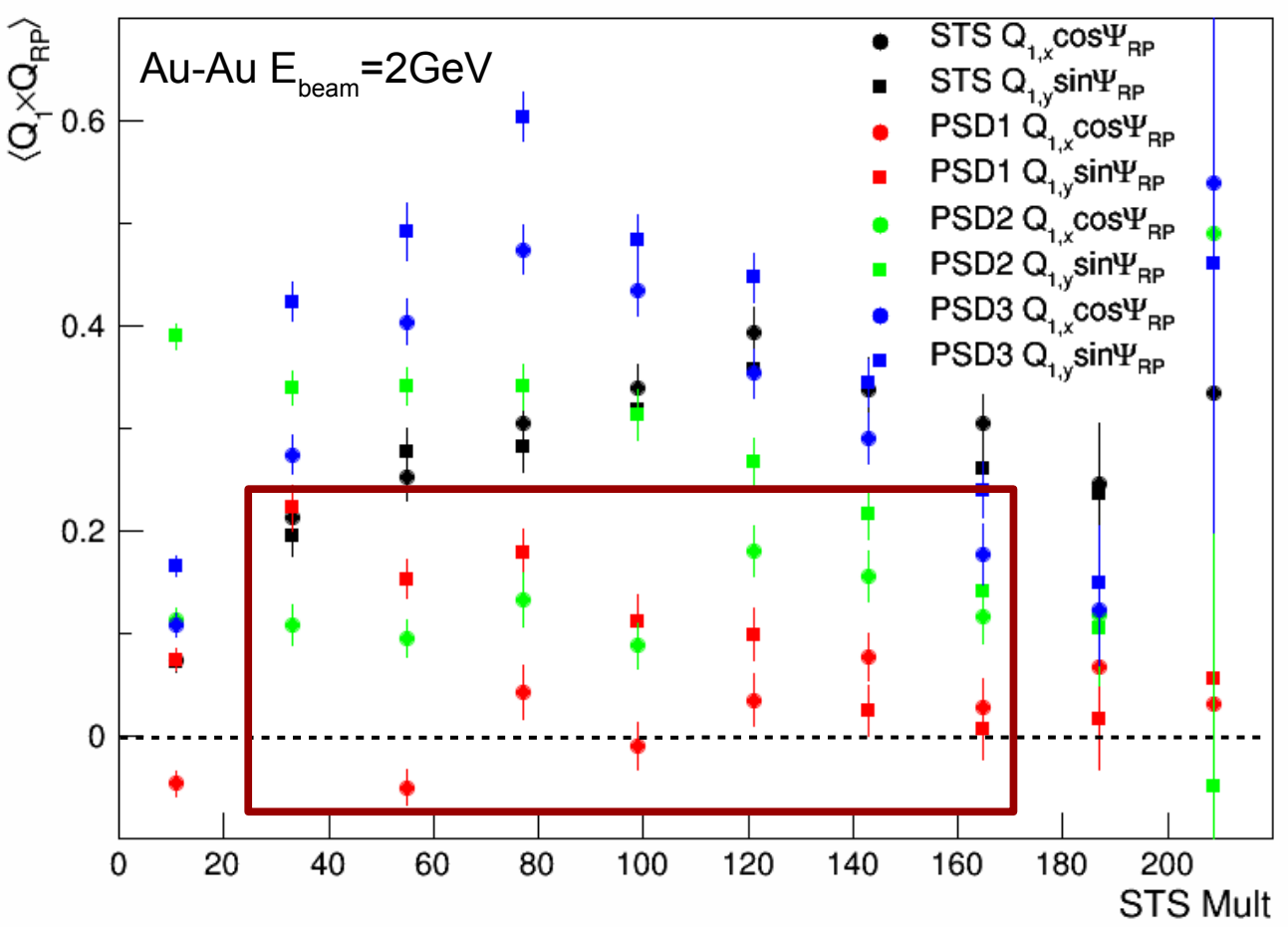
PSD1:
$Q_y >> Q_x$
$Q_x \sim 0$

PSD2:
$Q_y \sim Q_x$

With 'beam' PSD subevents correlation in x-direction is lost
PSD1 subevent is difficult to use for event plane angle construct

Q-vector correlation wrt. to the reaction plane: STS vs. “lab-centered” PSD subevents

$\langle Q_x \times \cos \Psi_{RP} \rangle$ $\langle Q_y \times \sin \Psi_{RP} \rangle$



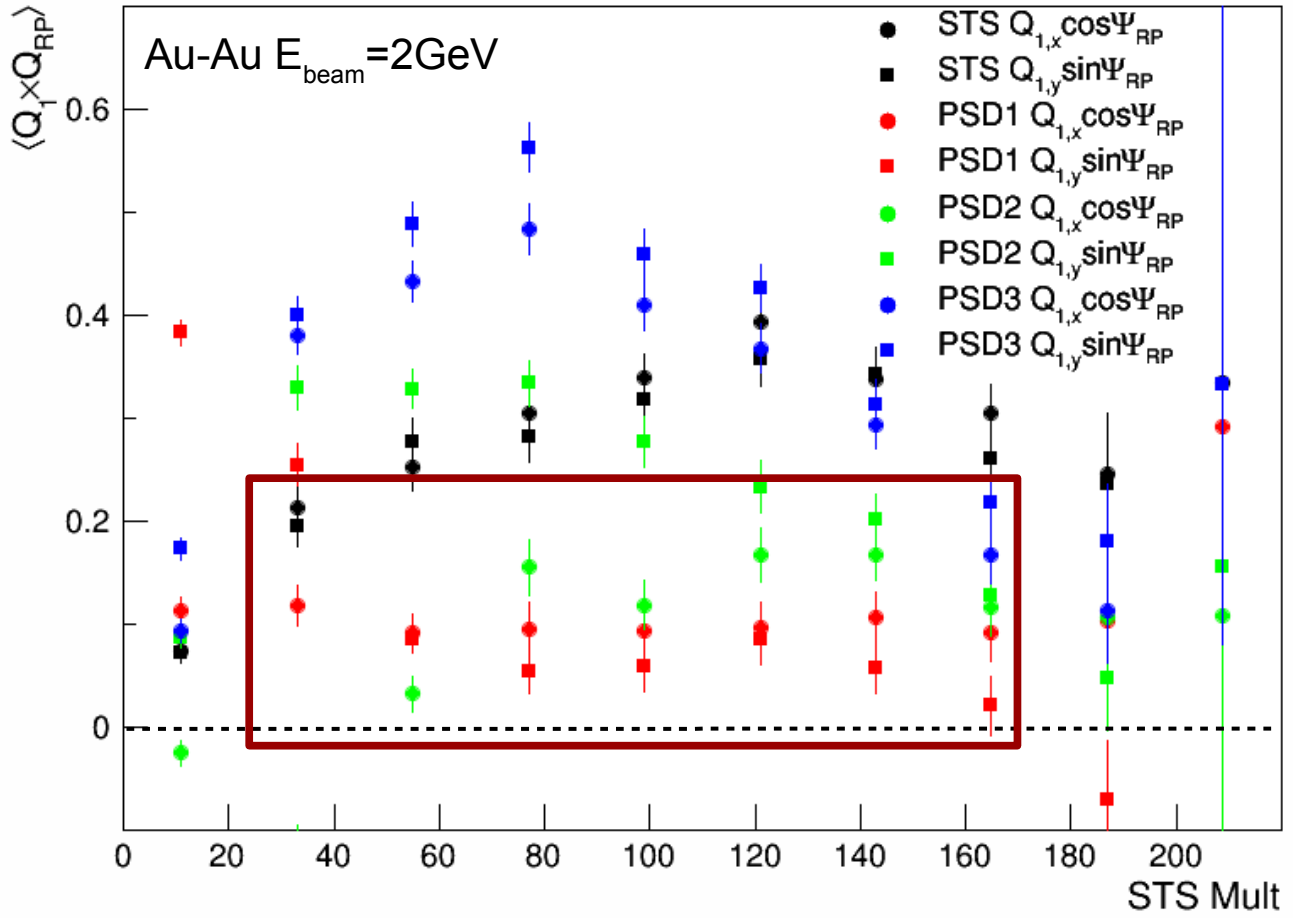
PSD1:
$Q_y >> Q_x$
$Q_x \sim 0$

PSD2:
$Q_y \sim 1/2\ Q_x$

With 'lab' PSD subevents correlation in x-direction is lost
PSD1 subevent is difficult to use for event plane angle construct

Q-vector correlation wrt. to the reaction plane: STS vs. “proton-centered” PSD subevents

$\langle Q_x \times \cos \Psi_{RP} \rangle$ $\langle Q_y \times \sin \Psi_{RP} \rangle$



PSD1:
$Q_y \sim Q_x$

PSD2:
$Q_y \sim 1/2\ Q_x$

- With 'proton'-suevents PSD1 correlation is recovered and it is raver symmetric for x and y directions: can be used for EP
- At the same time the PSD2 correlations in x-direction is reduced consider to extend the 'lab' subevents #2 with modules on the RHS.

Summary

- Elongated PSD geometry works
- PSD subevents can be used to improve centrality determination
- Additional PSD segmentation in the central region can be used for flow studies (introducing additional subevents helps)