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Higher-order strongly intensive observables for forward-backward multiplicity fluctuations

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Higher-order multiplicity fluctuations can reveal features of particle production that are not accessible through variances and two-particle correlations alone. Their interpretation, however, is complicated by fluctuations in the number of particle-emitting sources. We develop a systematic construction of strongly intensive observables that remove this dependence within the independent-source model.

Starting from the relations between the joint cumulants of observed multiplicities, the emission properties of a single source, and the source-number distribution, we construct independent combinations at successive orders. We discuss their normalization relative to independent particle production, extending the approach used for the second-order quantities Sigma and Delta. Particular attention is paid to the fourth-order observable Upsilon and its relation to other independent combinations at the same order. The study establishes the conditions under which source-number fluctuations cancel and explores the additional information carried by higher-order strongly intensive observables.

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Primary author(s) : ANDRONOV, Evgeny (Saint Petersburg State University)

Presenter(s) : ANDRONOV, Evgeny (Saint Petersburg State University)

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