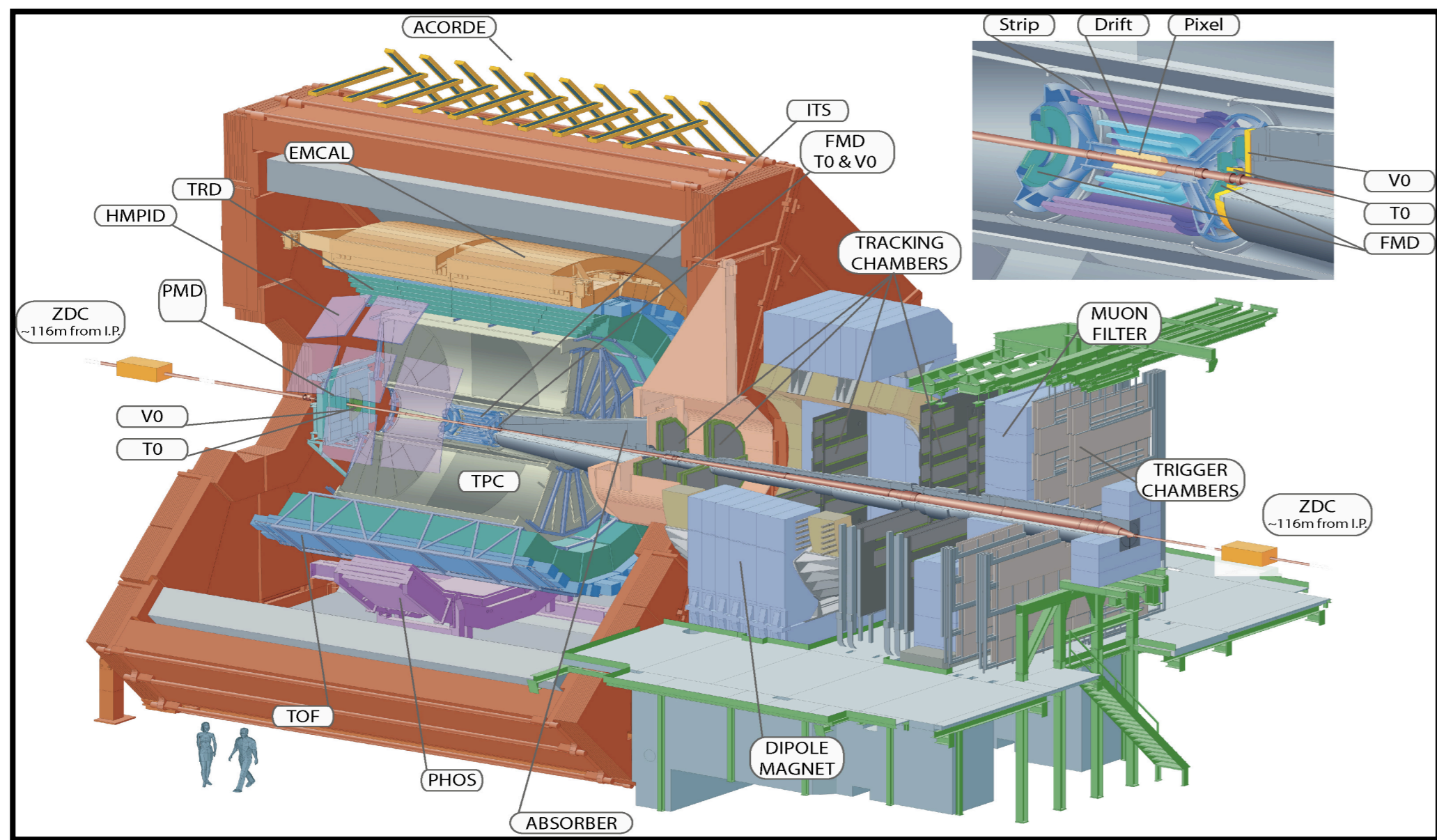# Multiplicity dependent two-particle correlation and event selection bias in pp collisions at √s=7TeV based on Monte-Carlo

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ALICE

Motivation

The two-particle correlation function has been measured in pp collisions at √s = 7 TeV based on MC. The presence of $\Delta\eta$ correlations in pp collisions are investigated and the potential biases using data and forward detectors are discussed. The dependence of near side and away side correlation function is studied for multiplicity classes obtained from different rapidity regions.

Data set

ALICE data set
- generated MC (Pythia)
- Total number of events: 127M

Event Selection
- minimum bias
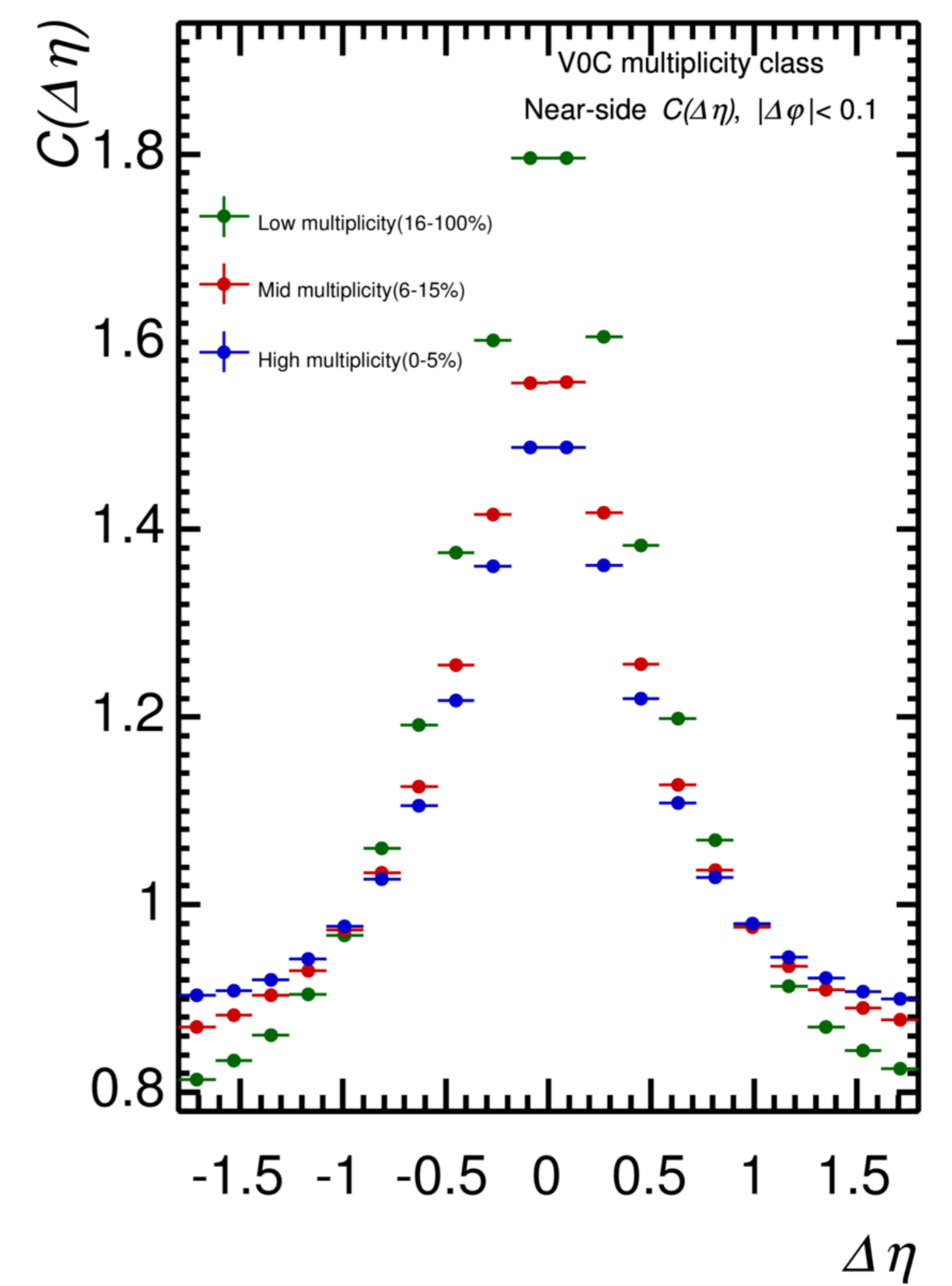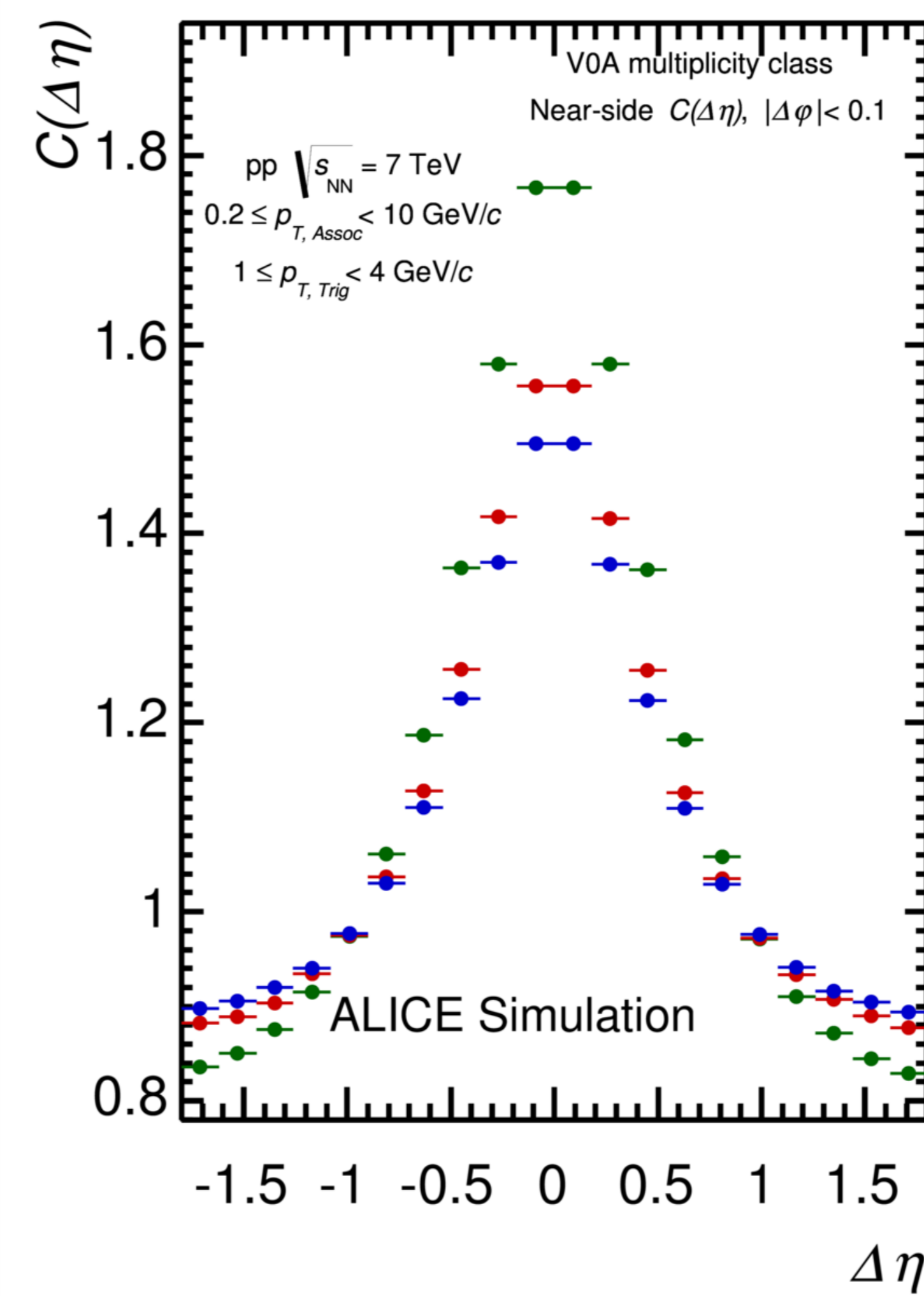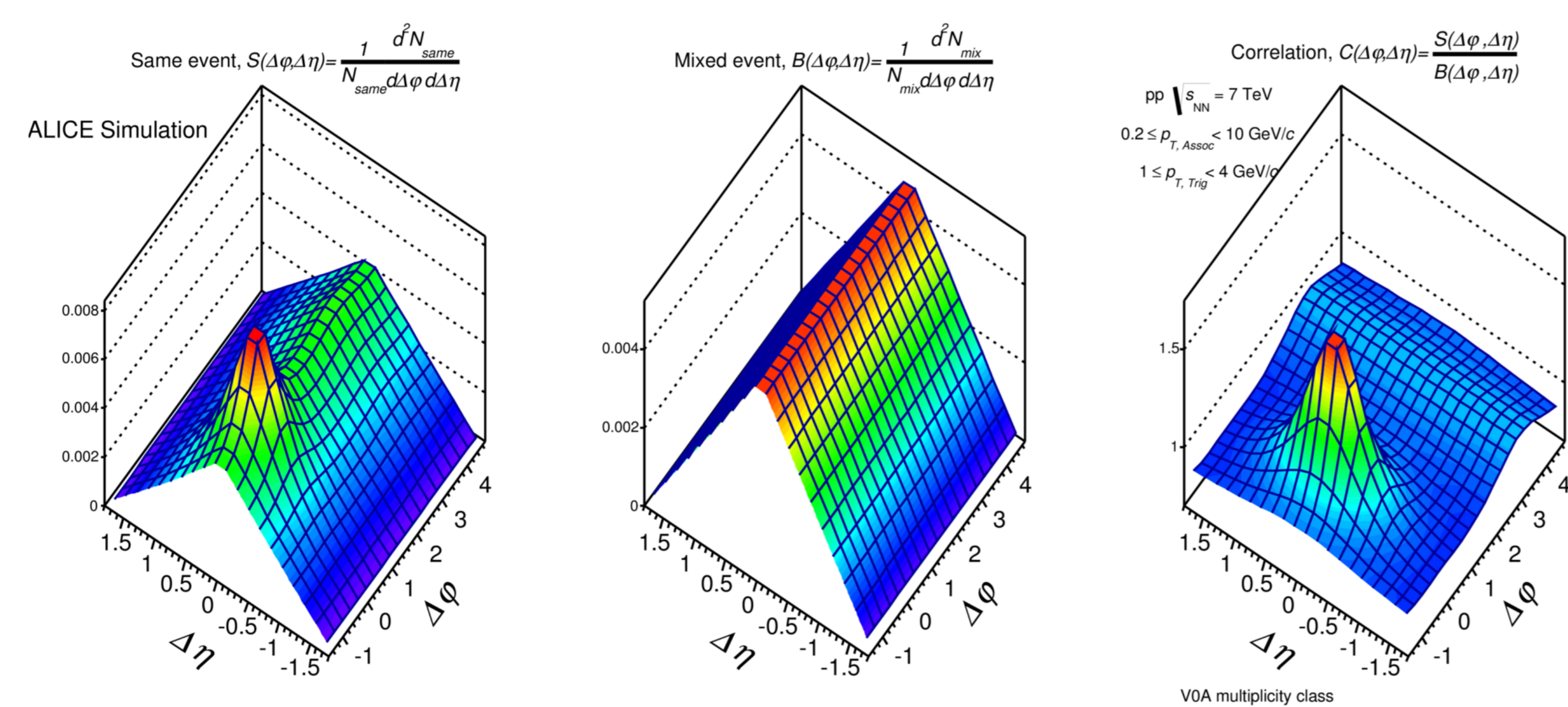- multiplicity selection with forward detectors (V0A/V0C)

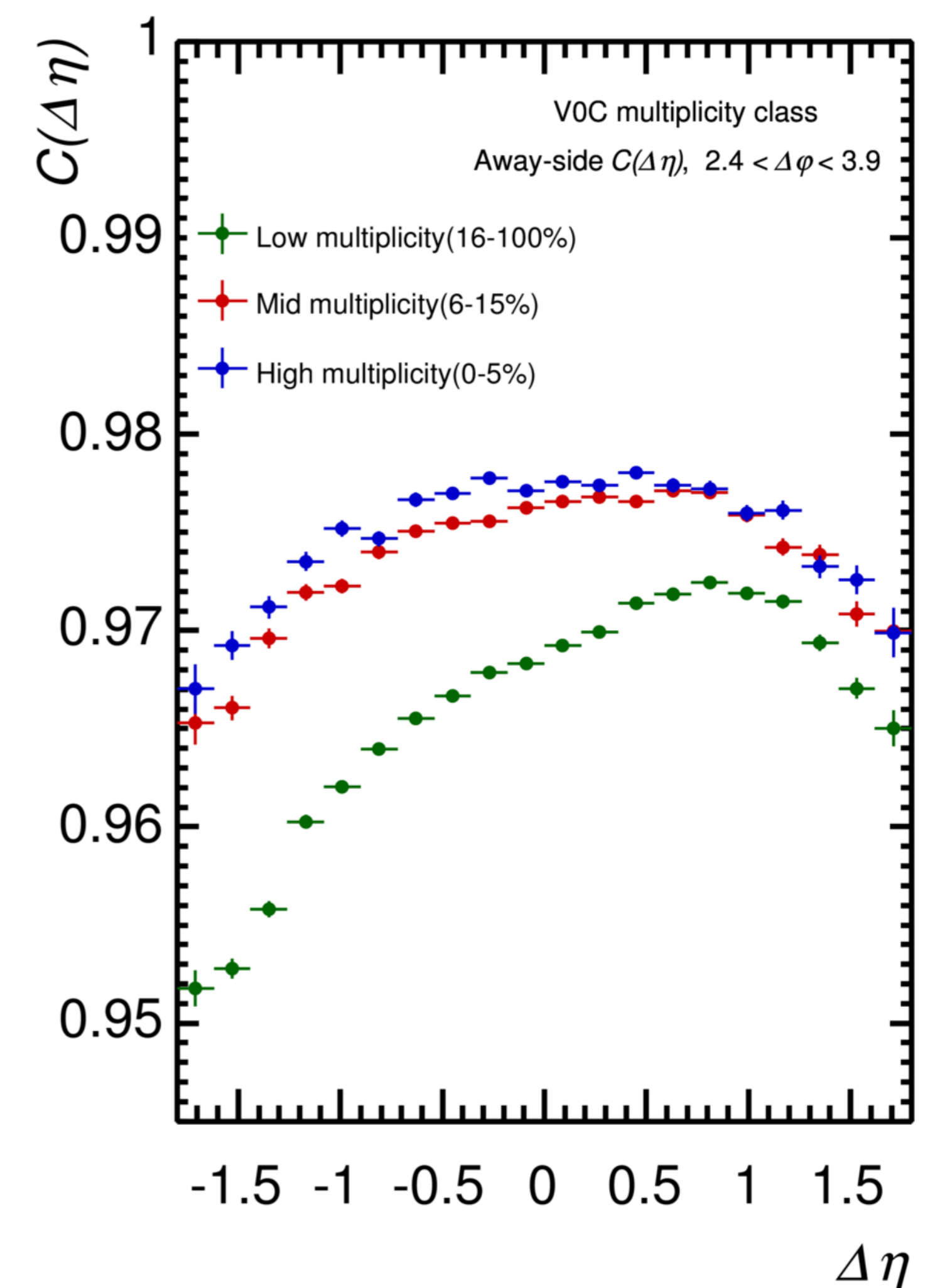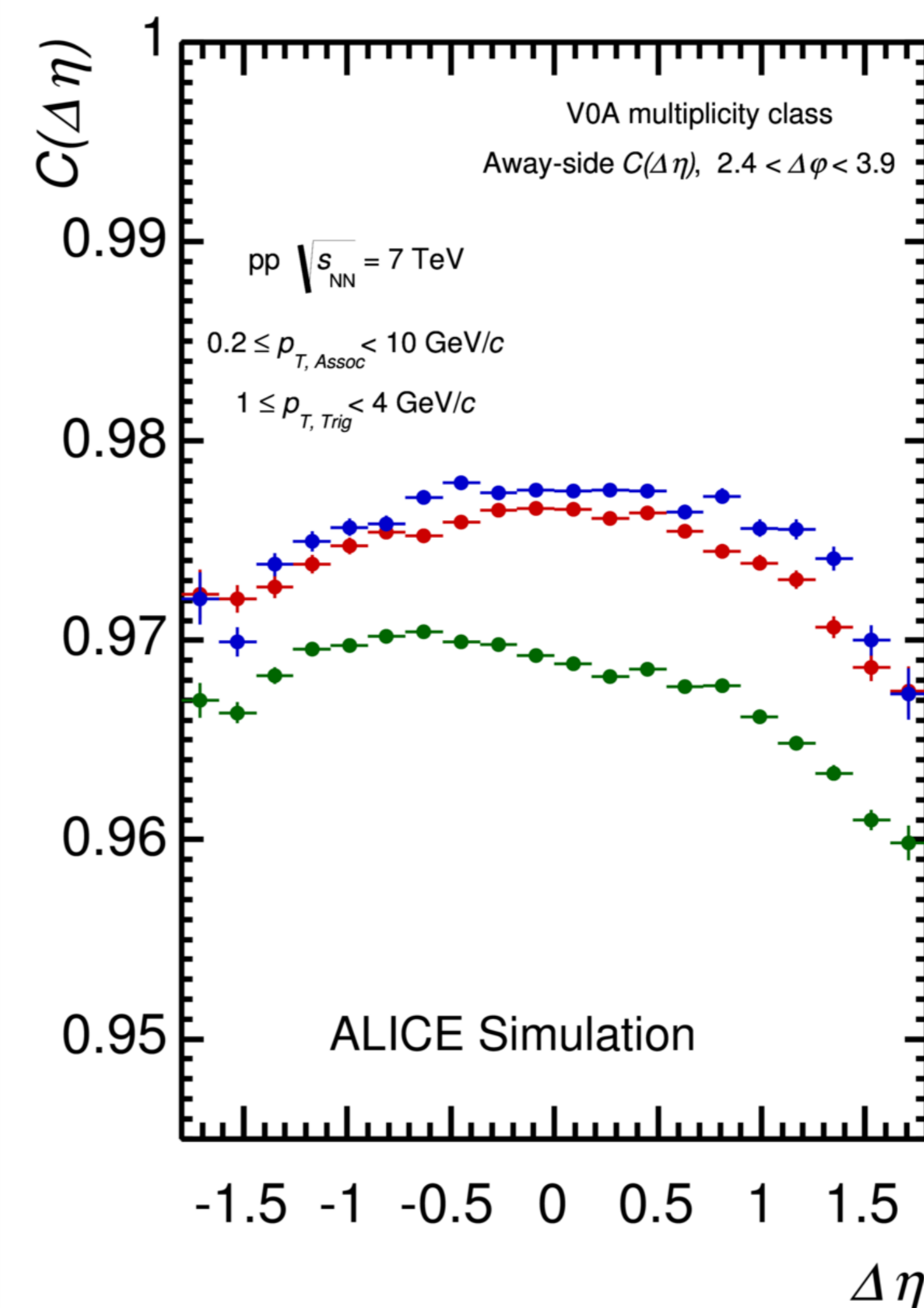|	V0A	V0C
η_{max}/η_{min}	5.1/2.8	-3.7/-1.7

Track Selection
- $|\eta_{Lab}| < 0.9$
- $0.2 \leq p_T < 10 \text{GeV}/c$

Multiplicity class	High		Mid	Low	
V0A	0-2%	2-5%	6-15%	16%-41%	42%-100%
V0C	0-1%	2-5%	6-15%	16-40%	40-100%

Correlation function definition

Same event, $S(\Delta\varphi,\Delta\eta)=\frac{1}{N_{same}}\frac{d^2N_{same}}{d\Delta\varphi\,d\Delta\eta}$

Mixed event, $B(\Delta\varphi,\Delta\eta)=\frac{1}{N_{mix}}\frac{d^2N_{mix}}{d\Delta\varphi\,d\Delta\eta}$

Correlation, $C(\Delta\varphi,\Delta\eta)=\frac{S(\Delta\varphi,\Delta\eta)}{B(\Delta\varphi,\Delta\eta)}$

ALICE Simulation

pp $\sqrt{s_{NN}}$ = 7 TeV
$0.2 \leq p_{T,Assoc} < 10$ GeV/c
$1 \leq p_{T,Trig} < 4$ GeV/c

V0A multiplicity class

ALI-SIMUL-79697

Result

V0A multiplicity class
ALICE Simulation   Low multiplicity(16-100%) $1 \leq p_{T,Trig} < 4$ GeV/c   Mid multiplicity(6-15%) $0.2 \leq p_{T,Assoc} < 10$ GeV/c   pp $\sqrt{s_{NN}}$ = 7 TeV   High multiplicity(0-5%)

V0C multiplicity class   Low multiplicity(16-100%)   Mid multiplicity(6-15%)   High multiplicity(0-5%)

ALI-SIMUL-75651

The multiplicity dependence of two-dimensional (2-D) correlation function of charged hadrons as a function of $\Delta\eta$ and $\Delta\phi$ for $1 \leq p_{T,trig} < 4\text{GeV}/c$, $0.2 \leq p_{T,assoc} < 10\text{GeV}/c$, pp collisions at √s = 7 TeV.
- Correlation function shows various physics information including HBT, mini-jet, di-jet.
- The shapes are different for different multiplicity classes.
- Due to the combinatorial mixing, the uncorrelated part is enhanced and the near side jet yield is smaller for higher multiplicity.

V0A multiplicity class
Near-side $C(\Delta\eta)$, $|\Delta\varphi| < 0.1$
pp $\sqrt{s_{NN}}$ = 7 TeV
$0.2 \leq p_{T,Assoc} < 10$ GeV/c
$1 \leq p_{T,Trig} < 4$ GeV/c
ALICE Simulation

V0C multiplicity class
Near-side $C(\Delta\eta)$, $|\Delta\varphi| < 0.1$
Low multiplicity(16-100%)
Mid multiplicity(6-15%)
High multiplicity(0-5%)

ALI-SIMUL-68196

V0A multiplicity class
Away-side $C(\Delta\eta)$, $2.4 < \Delta\varphi < 3.9$
pp $\sqrt{s_{NN}}$ = 7 TeV
$0.2 \leq p_{T,Assoc} < 10$ GeV/c
$1 \leq p_{T,Trig} < 4$ GeV/c
ALICE Simulation

V0C multiplicity class
Away-side $C(\Delta\eta)$, $2.4 < \Delta\varphi < 3.9$
Low multiplicity(16-100%)
Mid multiplicity(6-15%)
High multiplicity(0-5%)

ALI-SIMUL-74490

1. V0A multiplicity class ($2.8 < \eta_{Lab} < 5.1$)
   - The correlation strength for $\Delta\eta < 0$ is enhanced.
2. V0C multiplicity class ($-3.7 < \eta_{Lab} < -1.7$)
   - The correlation strength for $\Delta\eta > 0$ is enhanced.
3. Multiplicity dependence
   - The correlation strength on the near-side is enhanced for low multiplicity (reduction of uncorrelated part). For high multiplicity the correlation strength is smaller or similar to intermediate multiplicities (event selection biases towards hard collision (jet-like) events).

Conclusion

1. Jet shapes show a dependence on the event selection.
2. Event multiplicity selection biases are tested with forward detect.

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