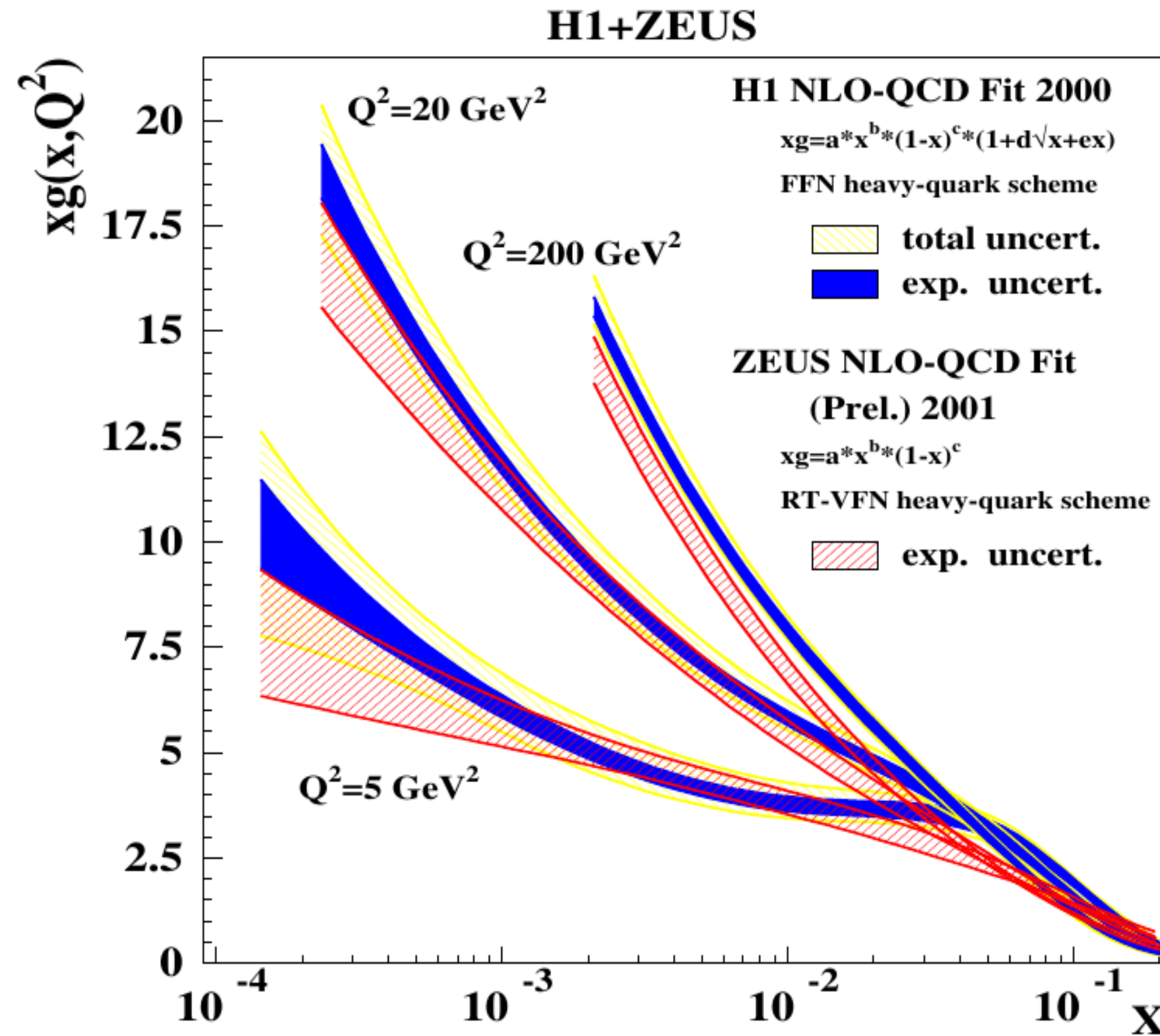


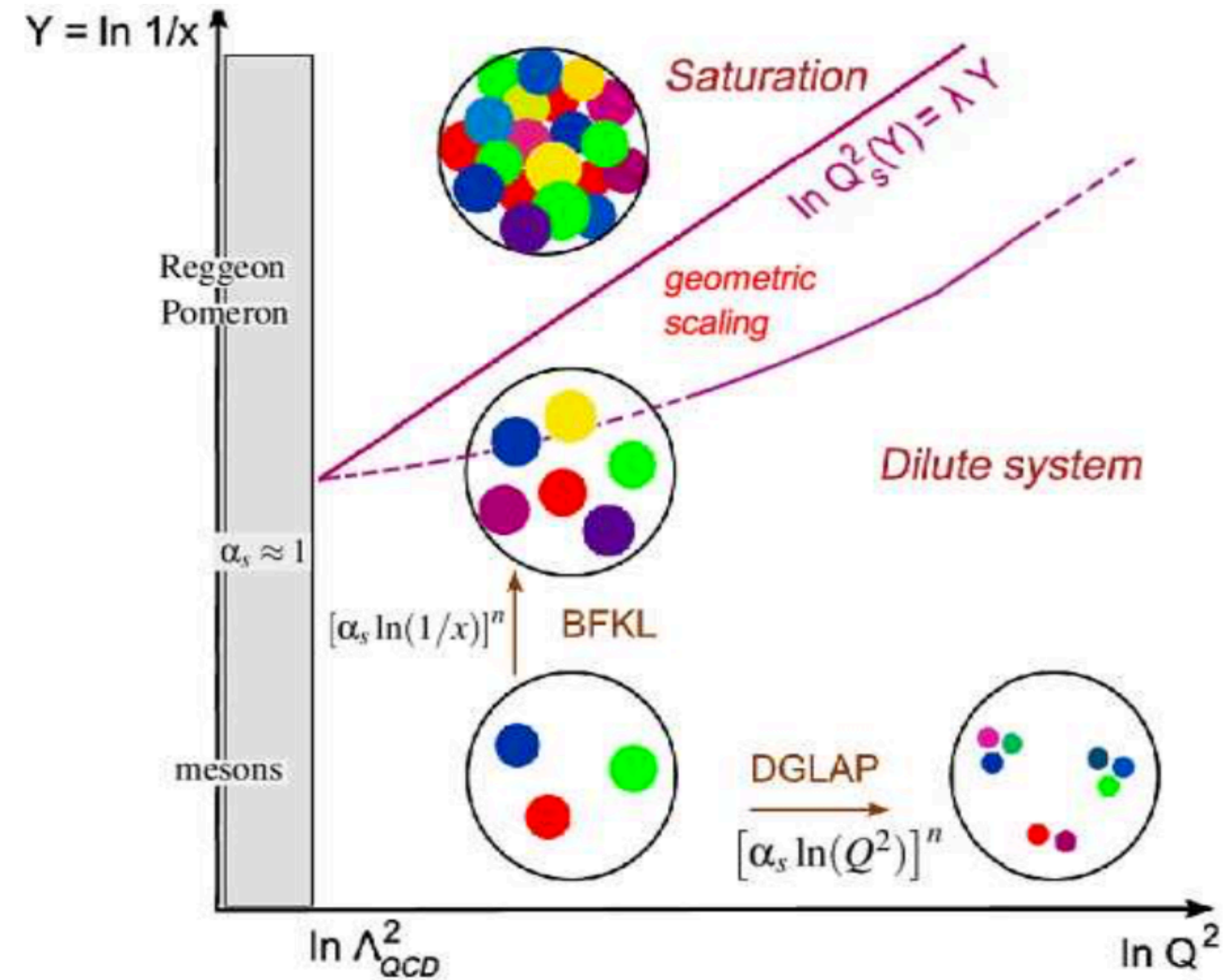
- Activities and achievements in this year (01.11.2020-15.11.2021)
- Impact on other activities

HADRON PHYSICS DEPARTMENT

Motivation



M.Dittmar et al., Proceedings HERA-LHC Workshop
 arXiv:[hep-ph]0511119



D. d'Enterria, Eur.Phys.J. A31(2007)816

Following A.H. Mueller
 approximations NPA715(2003)20

System	Au-Au	Pb-Pb	pp	
$\sqrt{s}(\text{TeV})$	0.2	2.76	5.02	7
$\frac{dN_g^{in}}{dyd^2b} (fm^{-1})$	$\simeq 4.7$	$\simeq 11.8$	$\simeq 15.9$	$\simeq 18.7$
f_{in}^g	$\simeq 0.9$	$\simeq 2.3$	$\simeq 3.1$	$\simeq 3.6$

Highlights of accomplishments in the last year

Physics

- Charged particles p_T spectra as a function of charged particle multiplicity and sphericity in pp collisions at $\sqrt{s} = 7$ TeV
 - Implementation of unfolding based on a multi-dimensional detector response matrix
 - 2 presentation in ALICE spectra PAG
 - Internal Note
 - systematic errors estimate - in progress
- Studies of two-particle correlations as a function of multiplicity and sphericity in pp collisions at $\sqrt{s} = 7$ TeV
 - PhD Thesis
 - Internal Note ready
 - systematic errors estimate - in progress
- Considerations on charged particles and π^0 suppression at RHIC and LHC energies
 - published in Phys.Rev.C103(2021)034903
- Strange and multi-strange geometrical scaling
 - 1 poster at EPS-HEP 2021
 - 1 oral presentation - PANIC 2021
- Studies on the core-corona interplay at LHC and RHIC energies
 - Preliminary manuscript
- Contribution to 7 conference presentations
- Co-authors to 23 ALICE published papers
- 2 institutional reviews
- PhD service task started within the Data Preparation Group
- 18 EPN/PDP and QC remote ALICE shifts at the Romanian ROS

Highlights of accomplishments in the last year

Computing

- NIHAM maintained the leading position among Tier2 ALICE GRID centers
 - done jobs: $5.4 \cdot 10^6$, i.e. 6.1 % of total Tier2 ALICE contribution
 - CPU: 8.7 Mhours, i.e. 3.3 % of total Tier2 ALICE contribution
- a data storage unit of 2.3 PB - to be implemented during Run3
- new UPS stations of ~120 KVA - installed
- NAF is efficiently managed
- new cooling unit - in progress

Teaching and Outreach

- 1 PhD thesis
- 1 diploma thesis
- 1 master student
- visit of the Prime Minister adviser
- visit of Research and Education Commission of the Romanian Senate
- visit of the Charge d’Affaires ad-interim of American Embassy in Romania
- visit of the vice Prime Minister
- German bachelor students visit
- visit of EUROGAMs consortium members and the Director of ERIC-ELI
- a movie related to the ALICE-TPC upgrade finalized
- a movie for “Researchers Night” event - finalized
- more details can be seen in:
 - <https://niham.nipne.ro>
 - <https://www.facebook.com/Hadron-Physics-Department-211078852968333/>
- contribution to the new web page of IFIN-HH
 - <https://www.nipne.ro/mission.php>

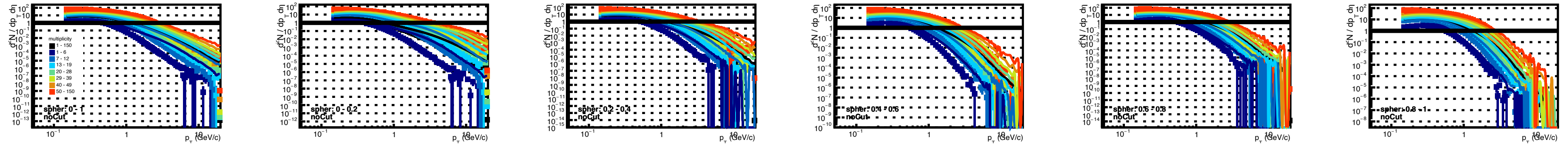
Charged particle p_T distributions

Multi-differential analysis in pp collisions at 7 TeV

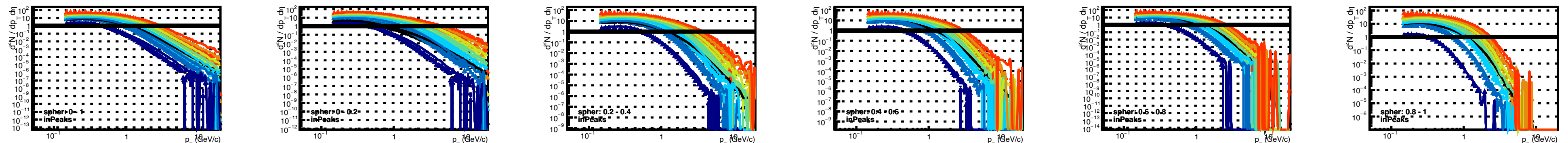
Sphericity



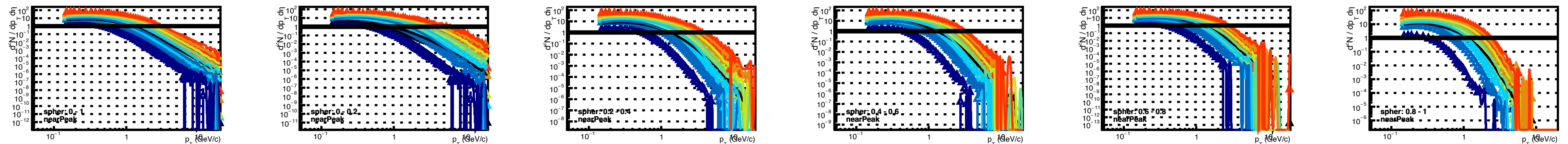
no Cut



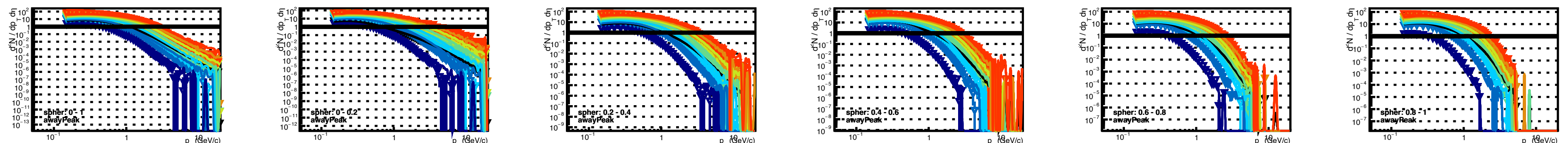
In Peaks



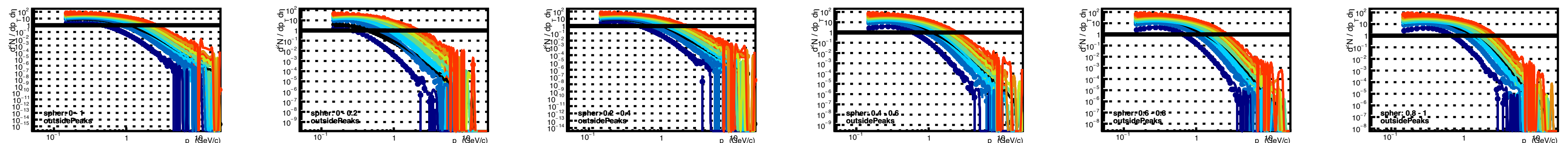
Near Peak



Away Peak

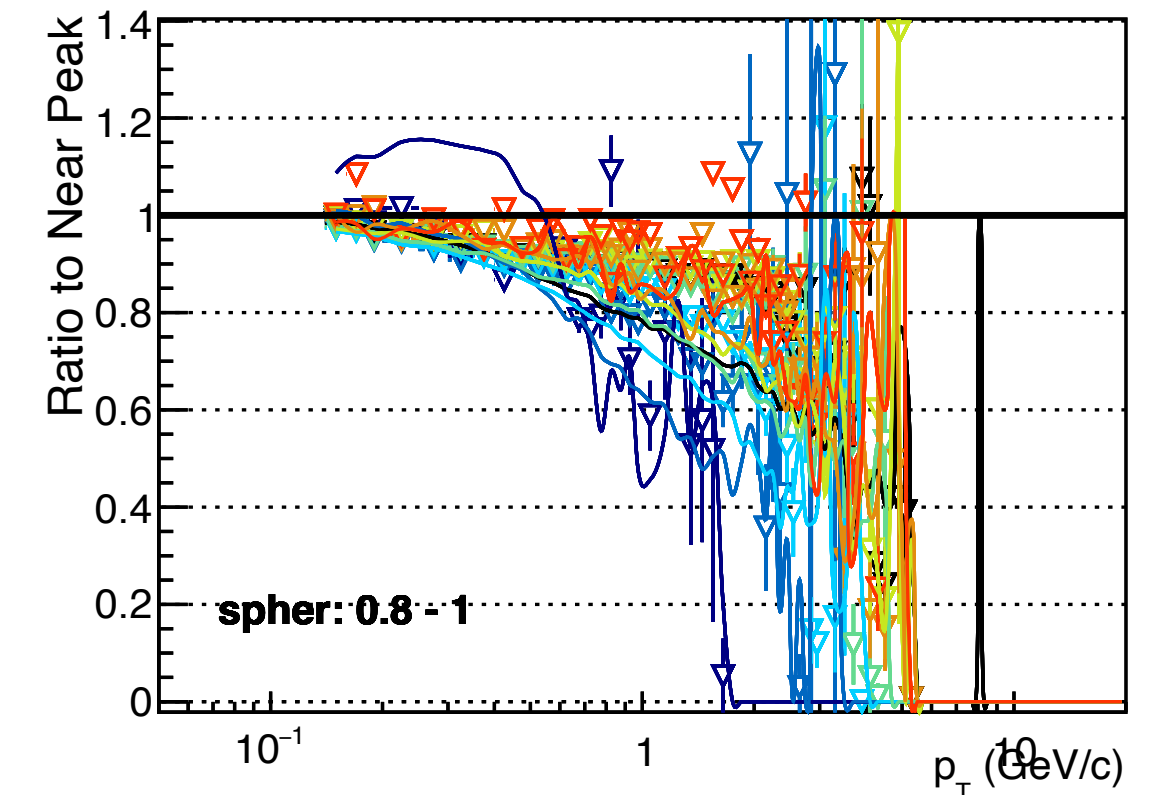
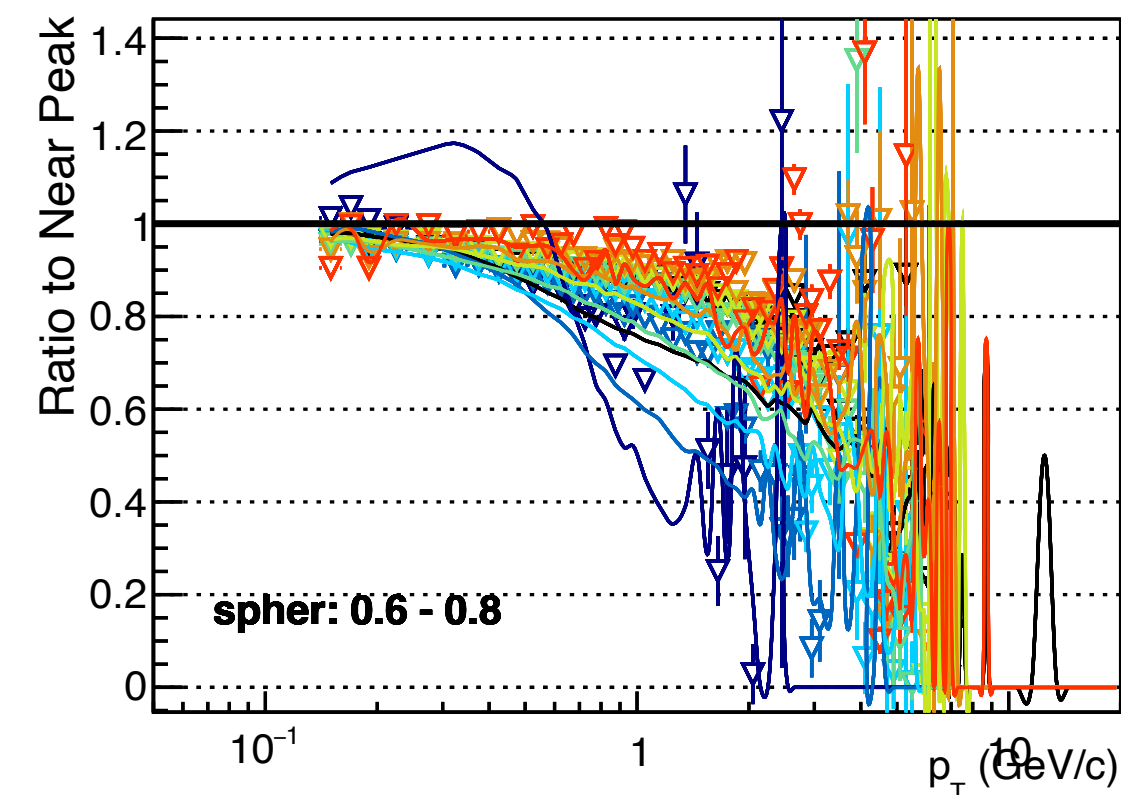
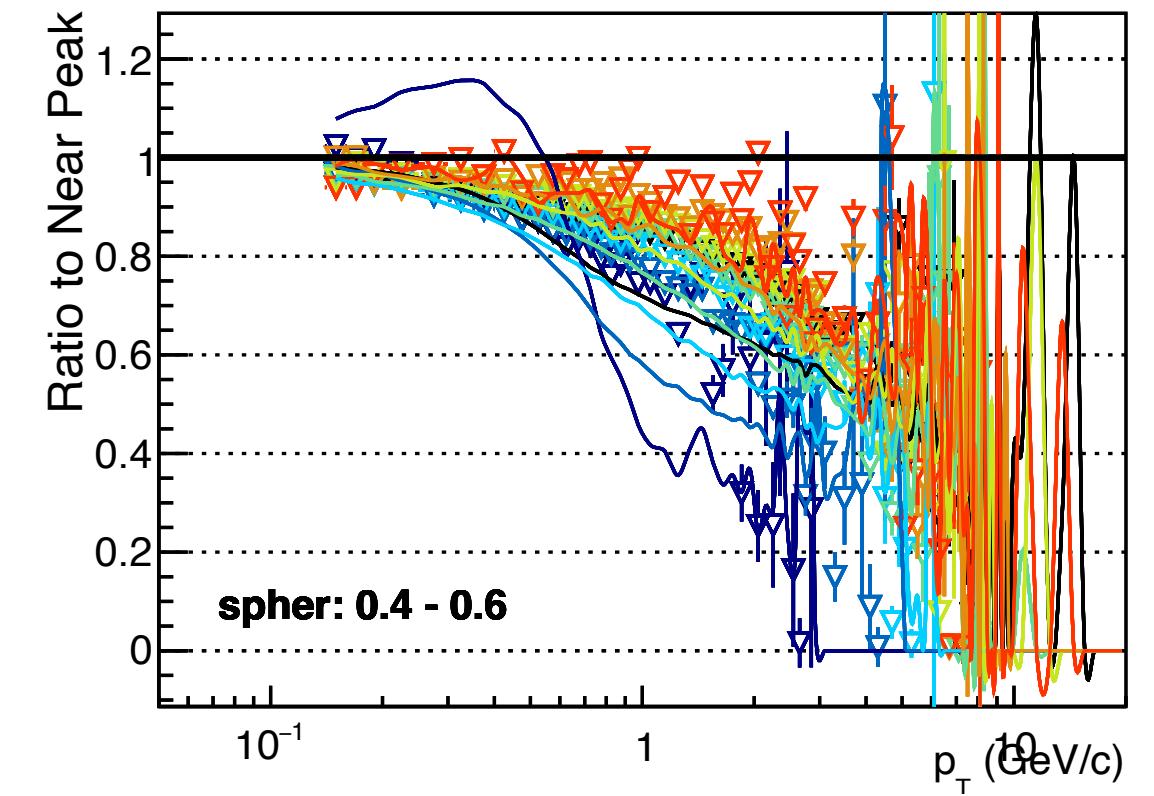
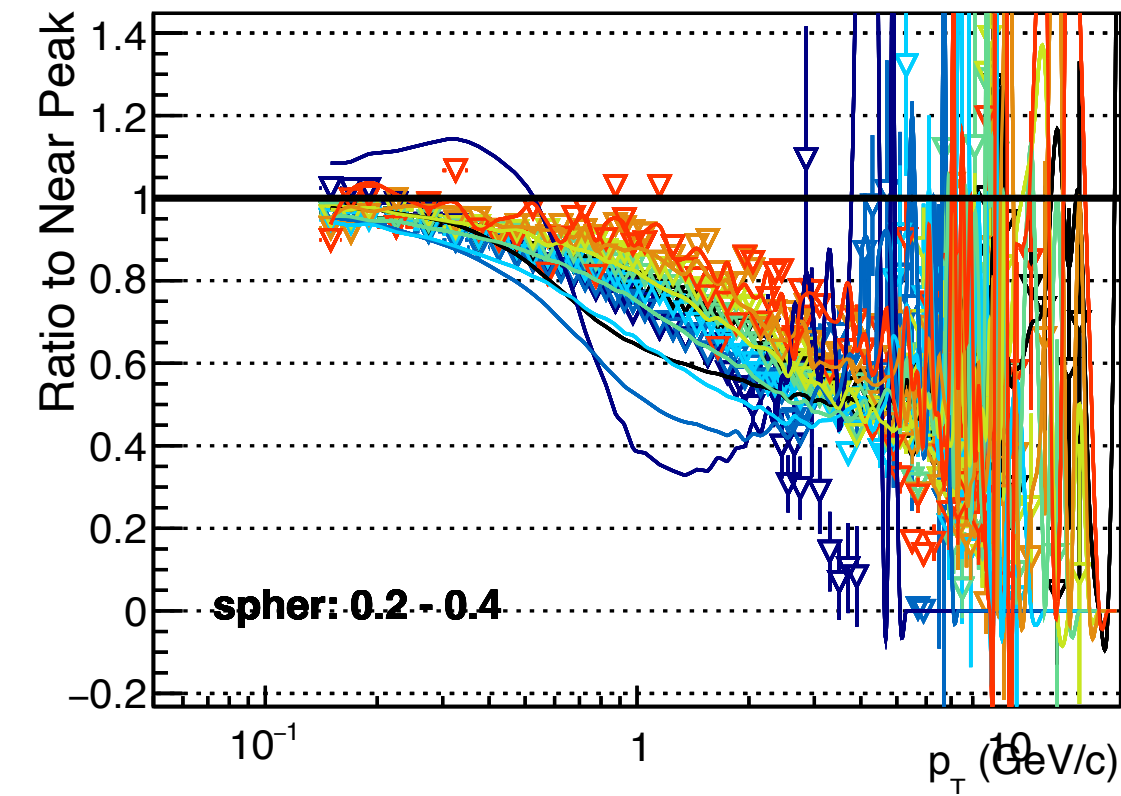
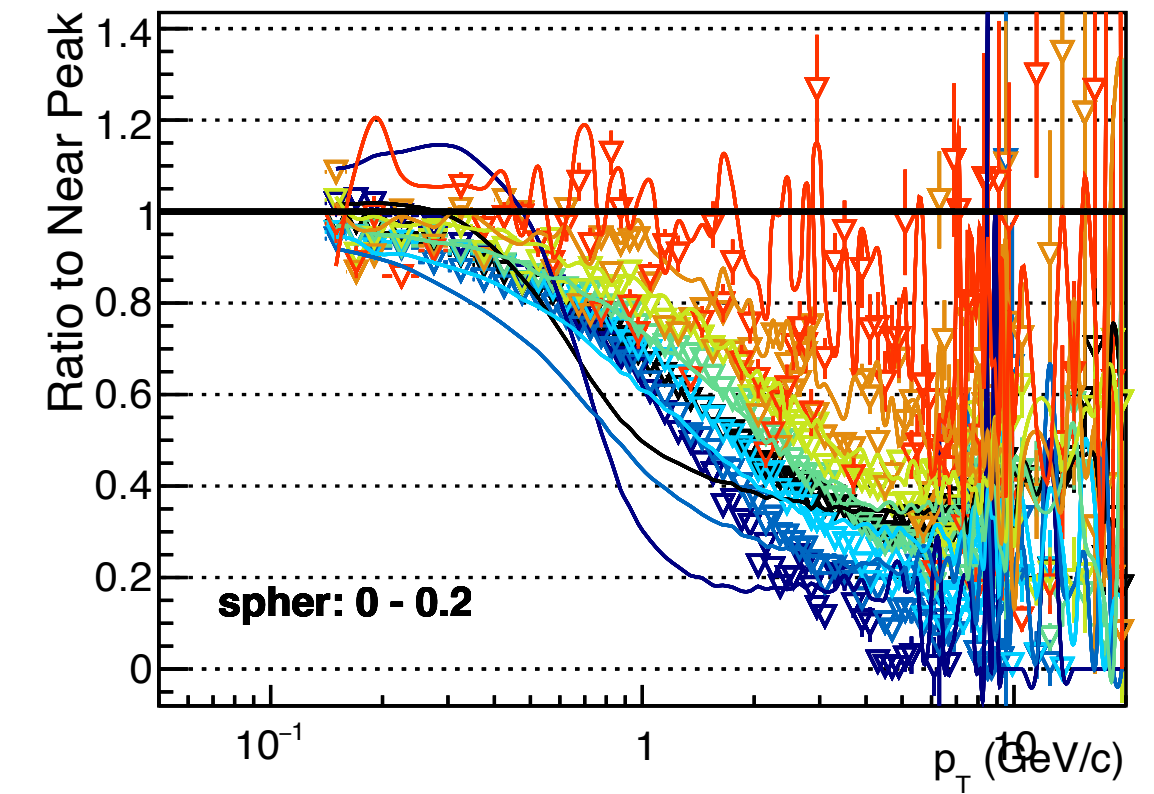
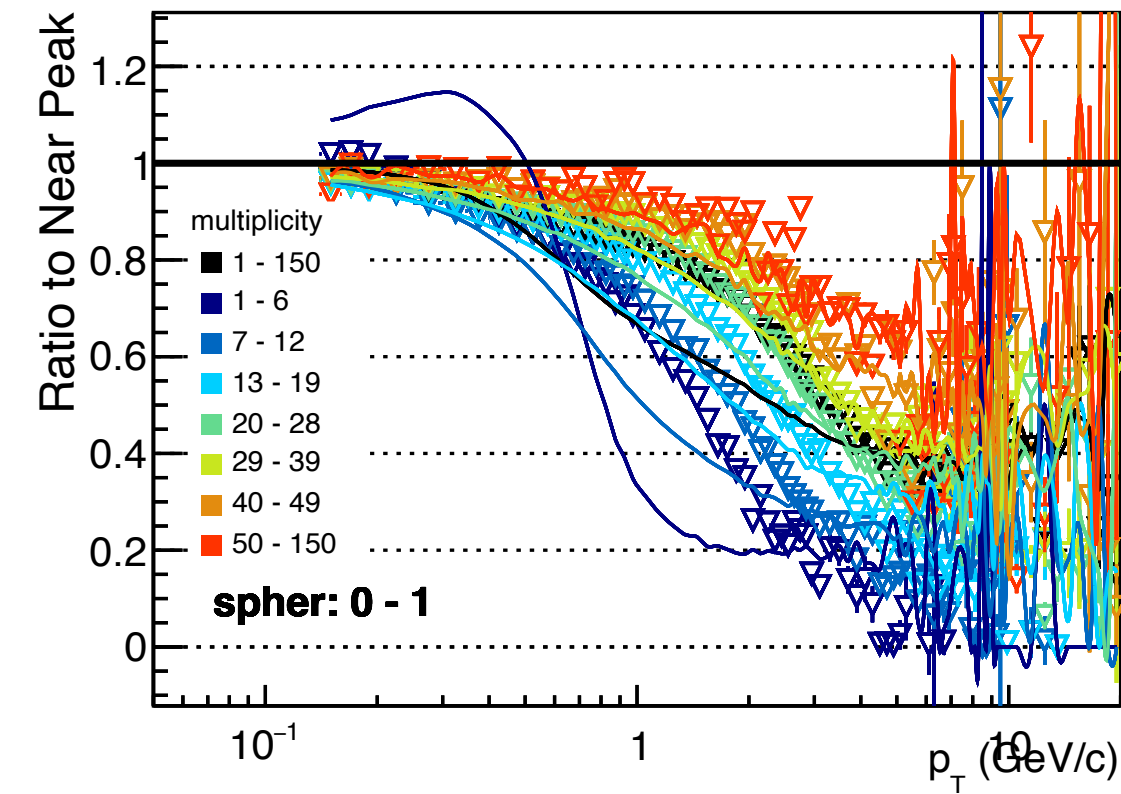


Outside



Charged particle p_T distributions

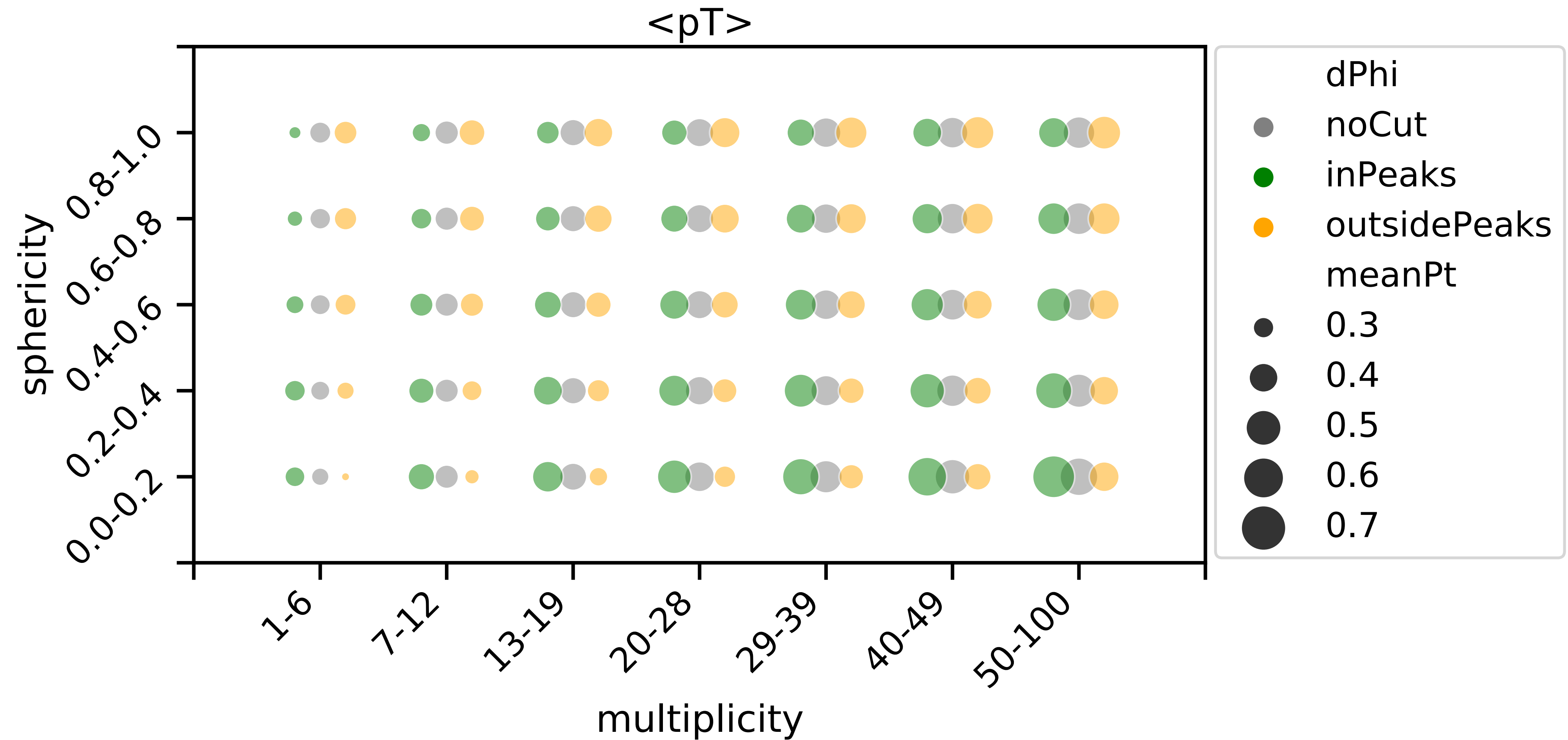
Ratio away peak to near peak



Full line = PYTHIA 6.4 Perugia0

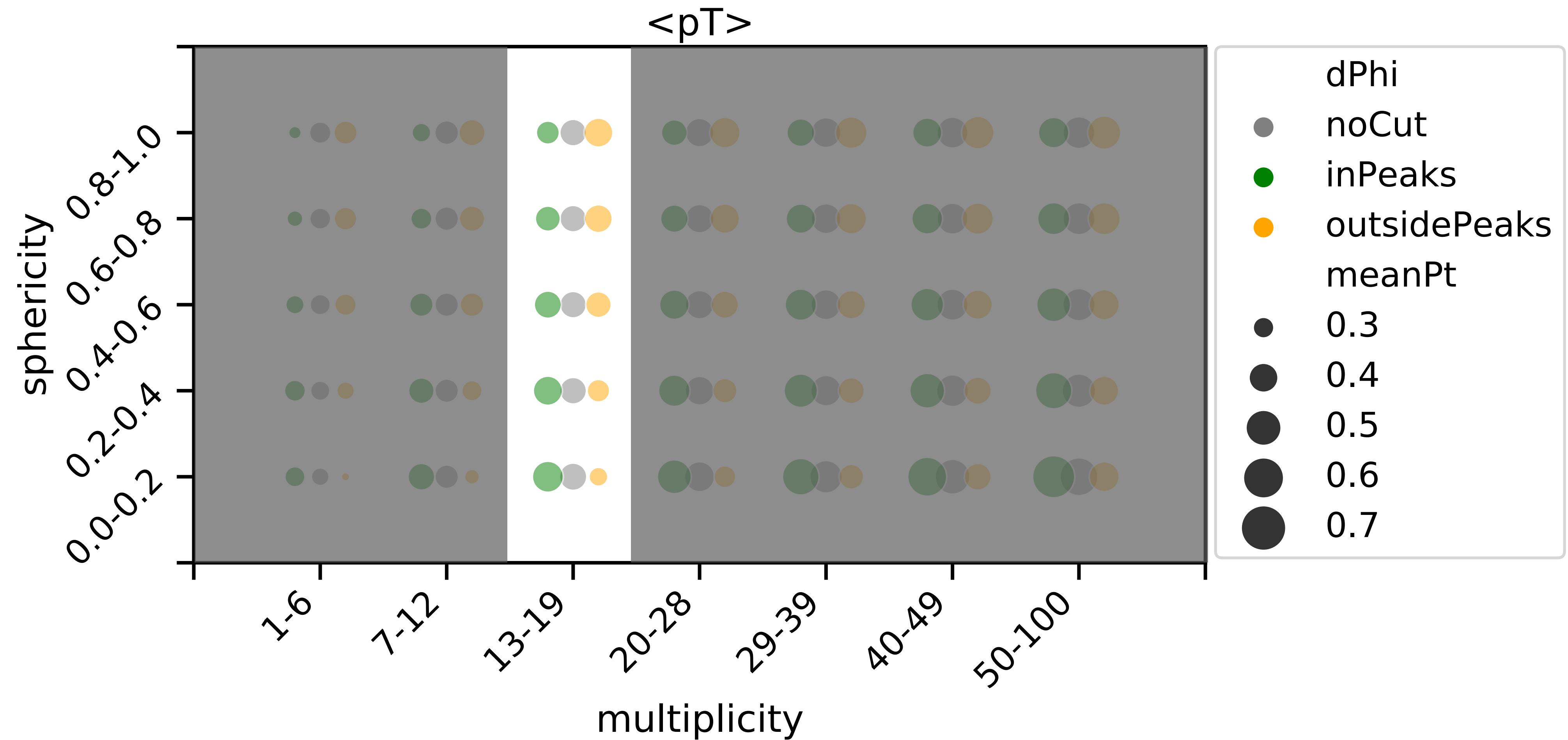
Charged particle p_T distributions

Mean of the spectra in the $0.14 < p_T < 20$ GeV range



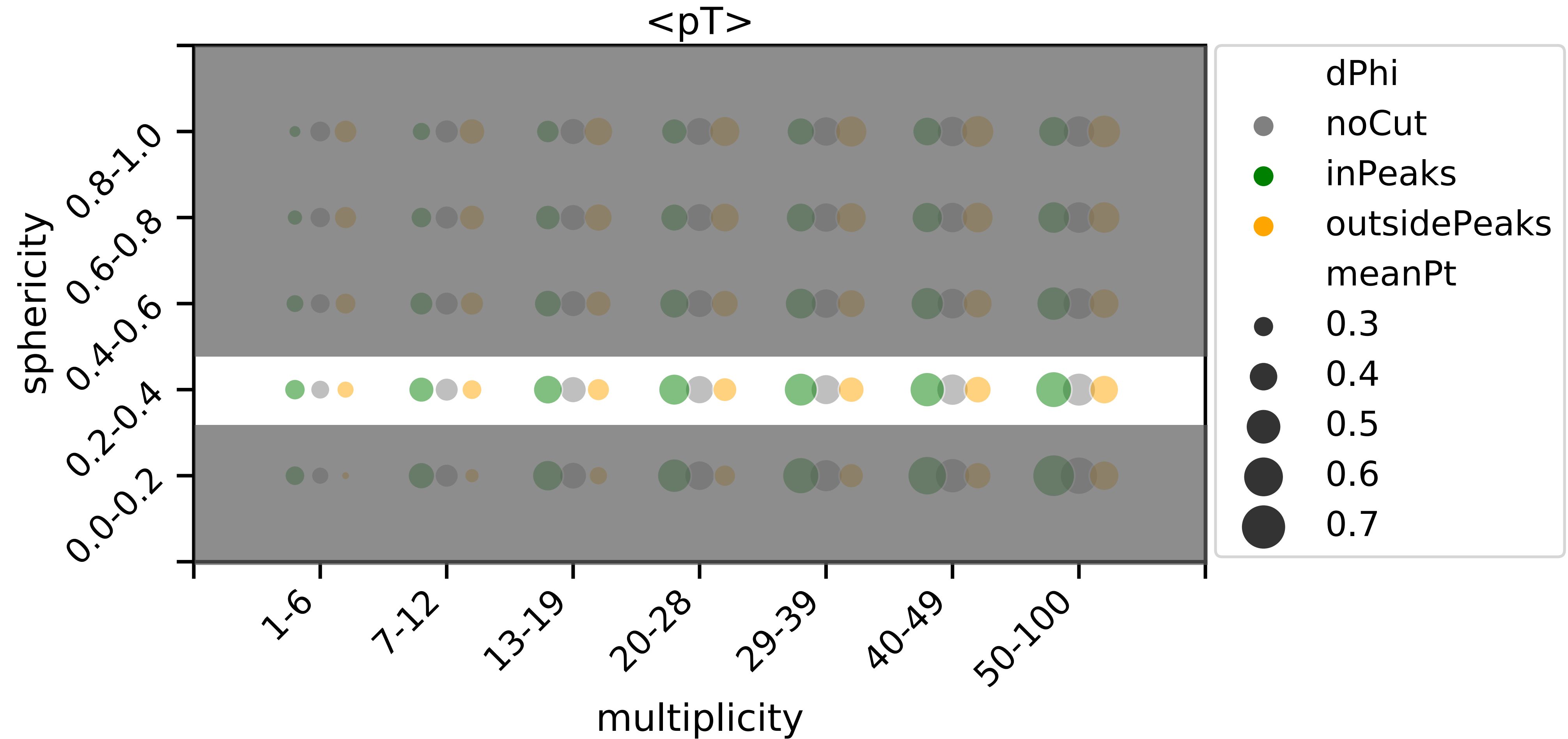
Charged particle p_T distributions

Mean of the spectra in the $0.14 < p_T < 20$ GeV range



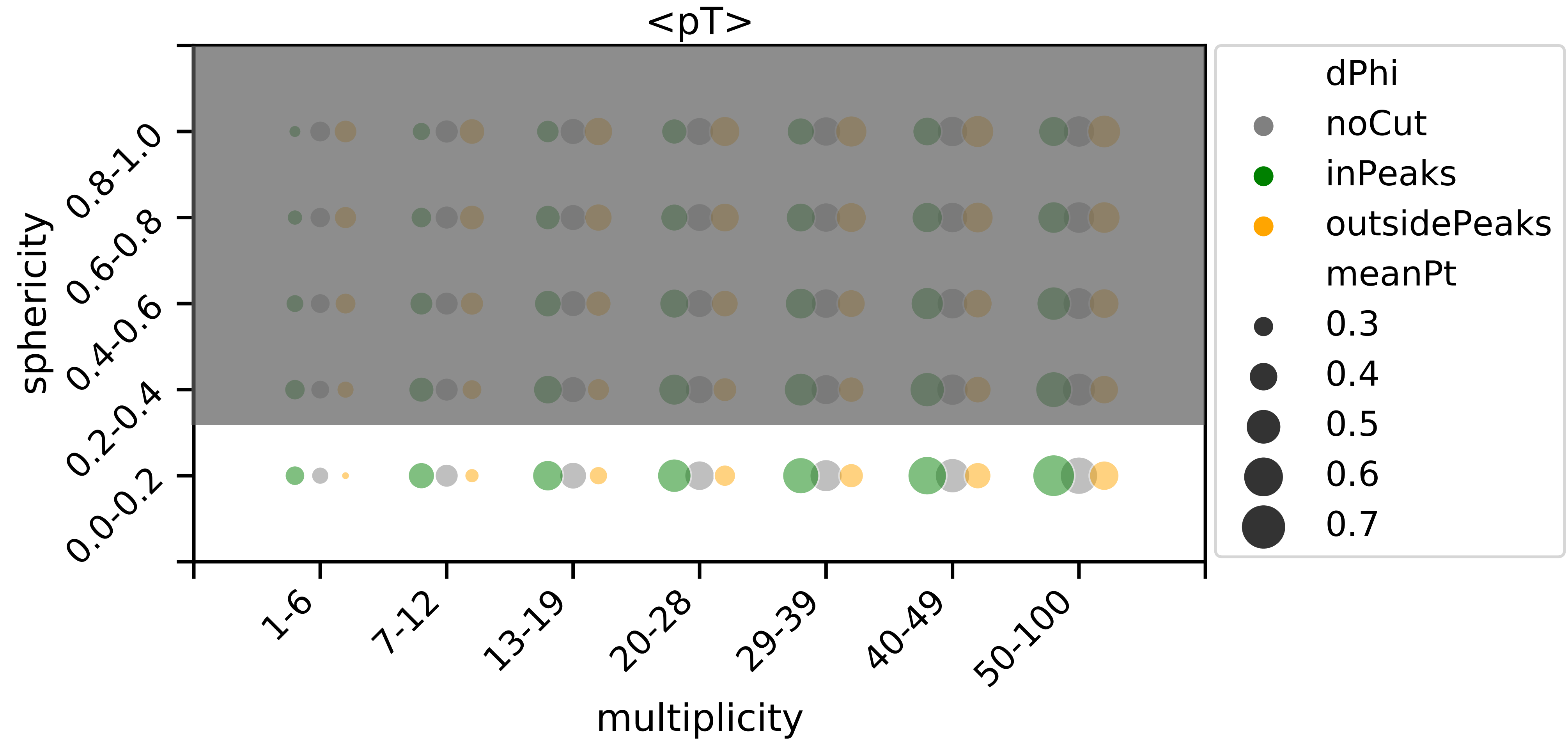
Charged particle p_T distributions

Mean of the spectra in the $0.14 < p_T < 20$ GeV range



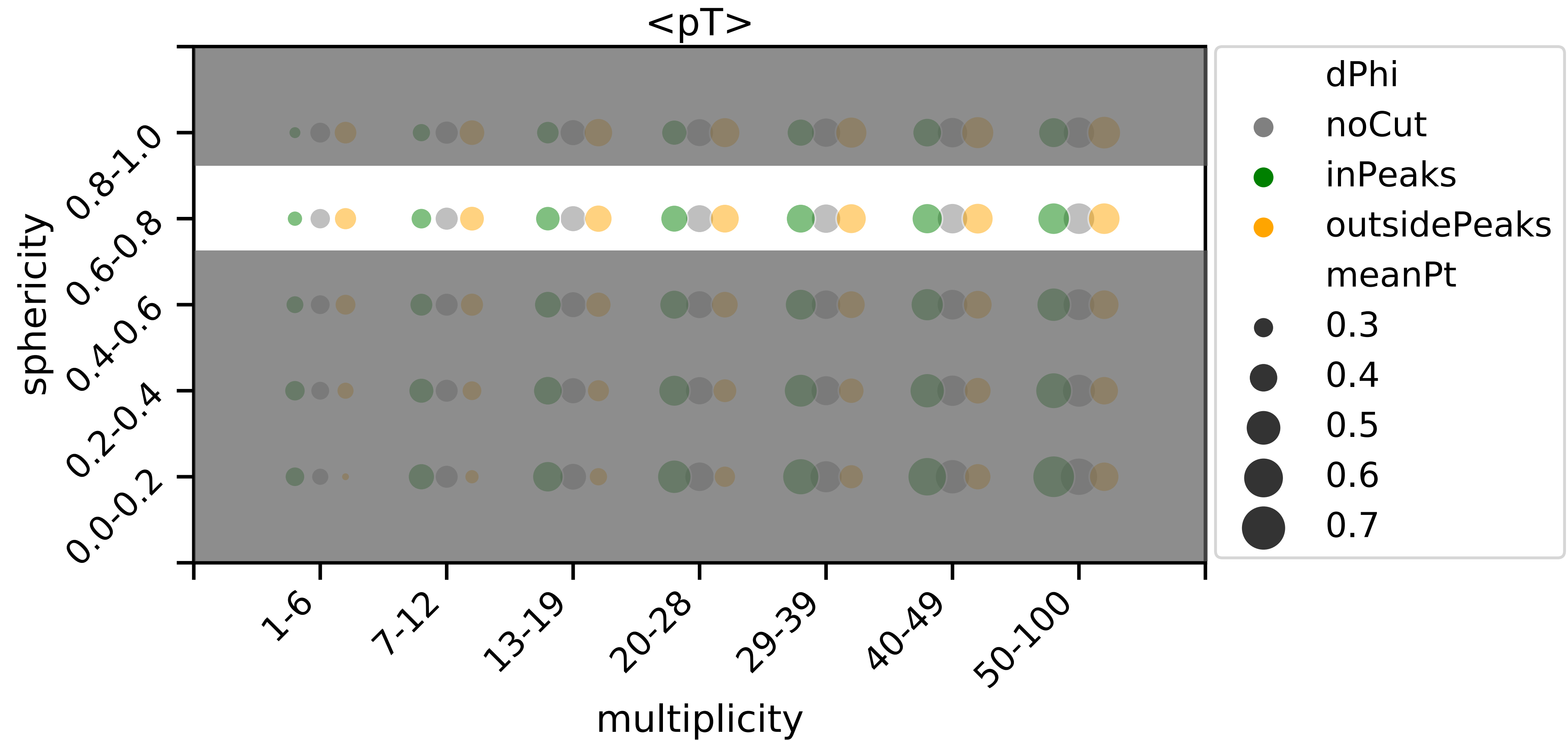
Charged particle p_T distributions

Mean of the spectra in the $0.14 < p_T < 20$ GeV range



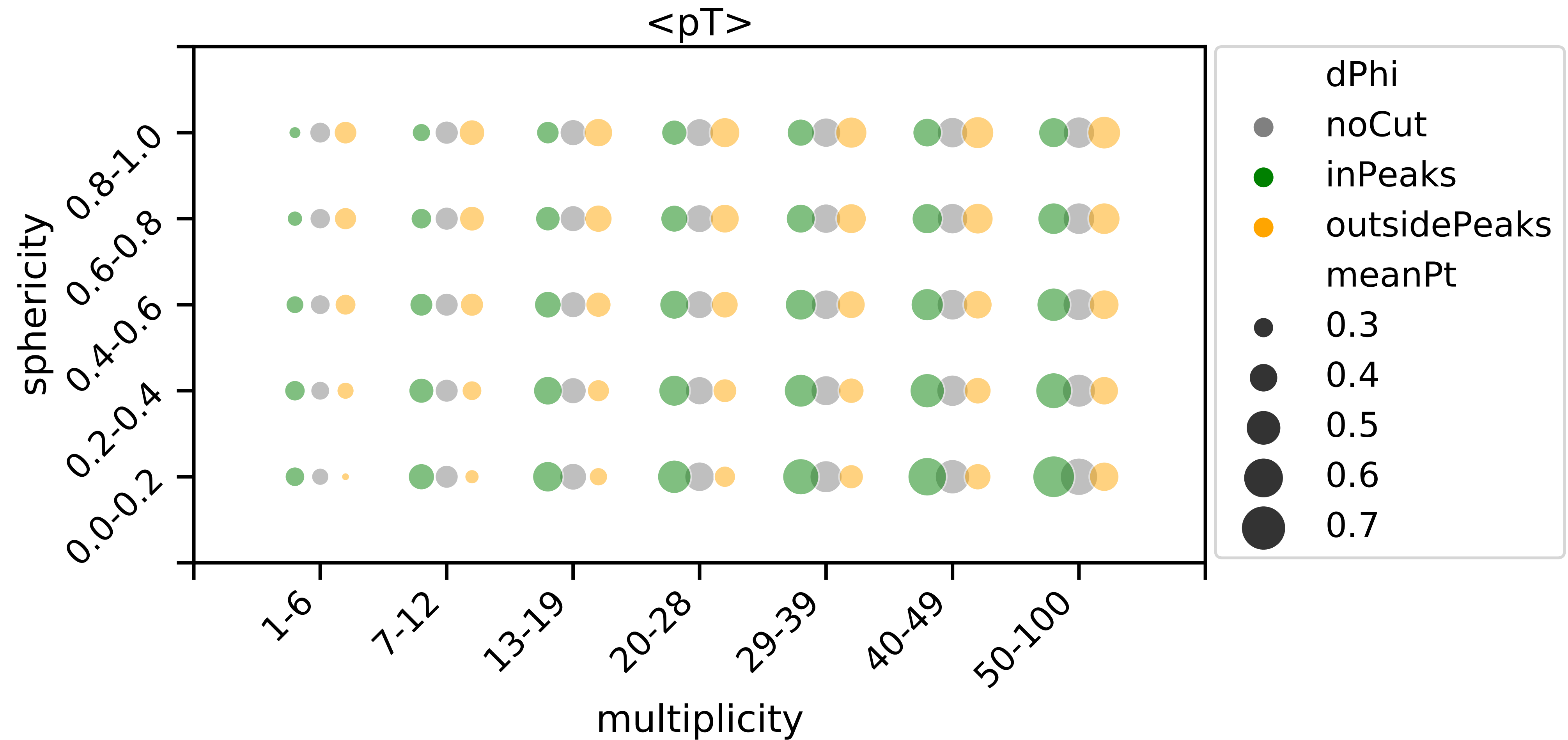
Charged particle p_T distributions

Mean of the spectra in the $0.14 < p_T < 20$ GeV range



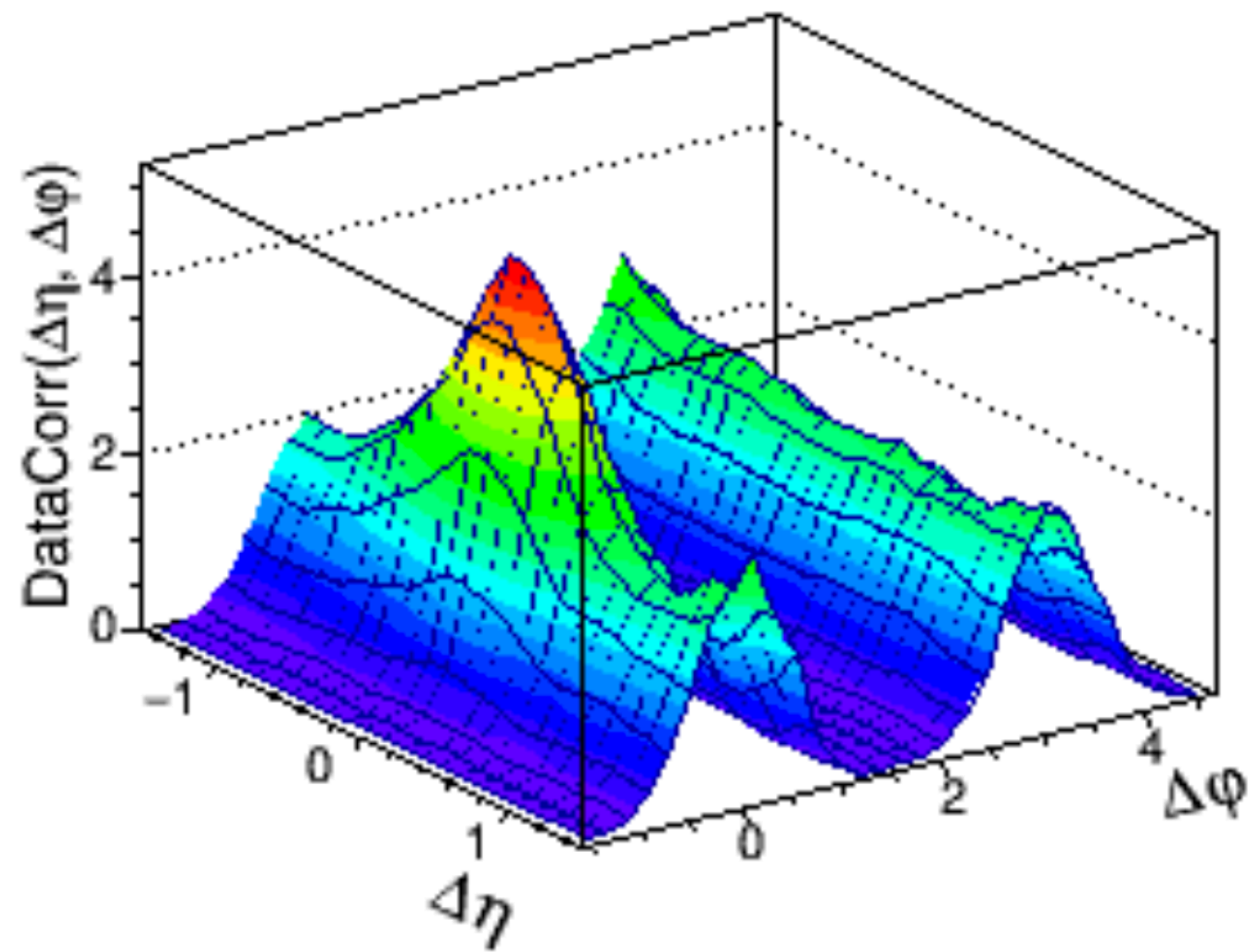
Charged particle p_T distributions

Mean of the spectra in the $0.14 < p_T < 20$ GeV range

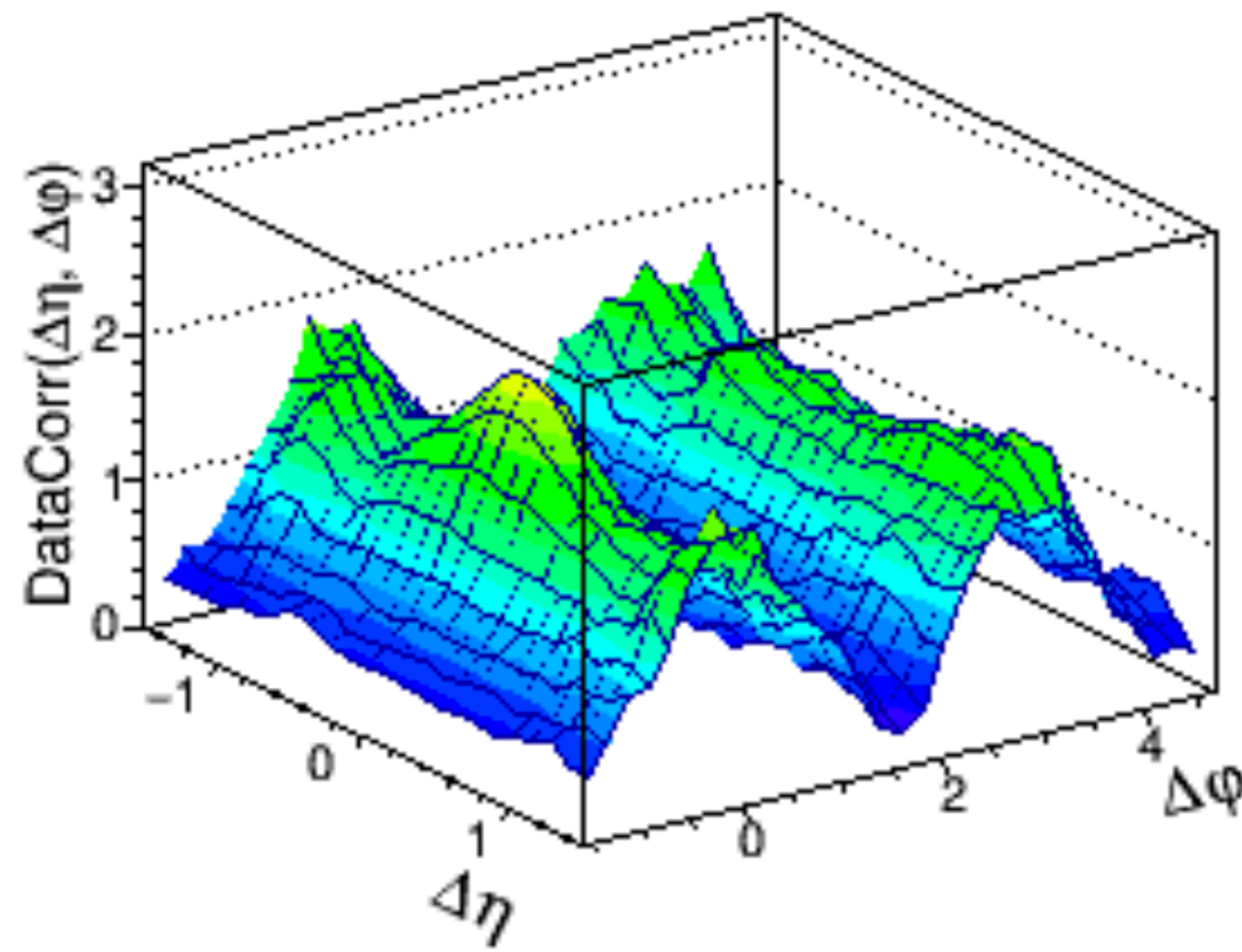


Two-particle correlations

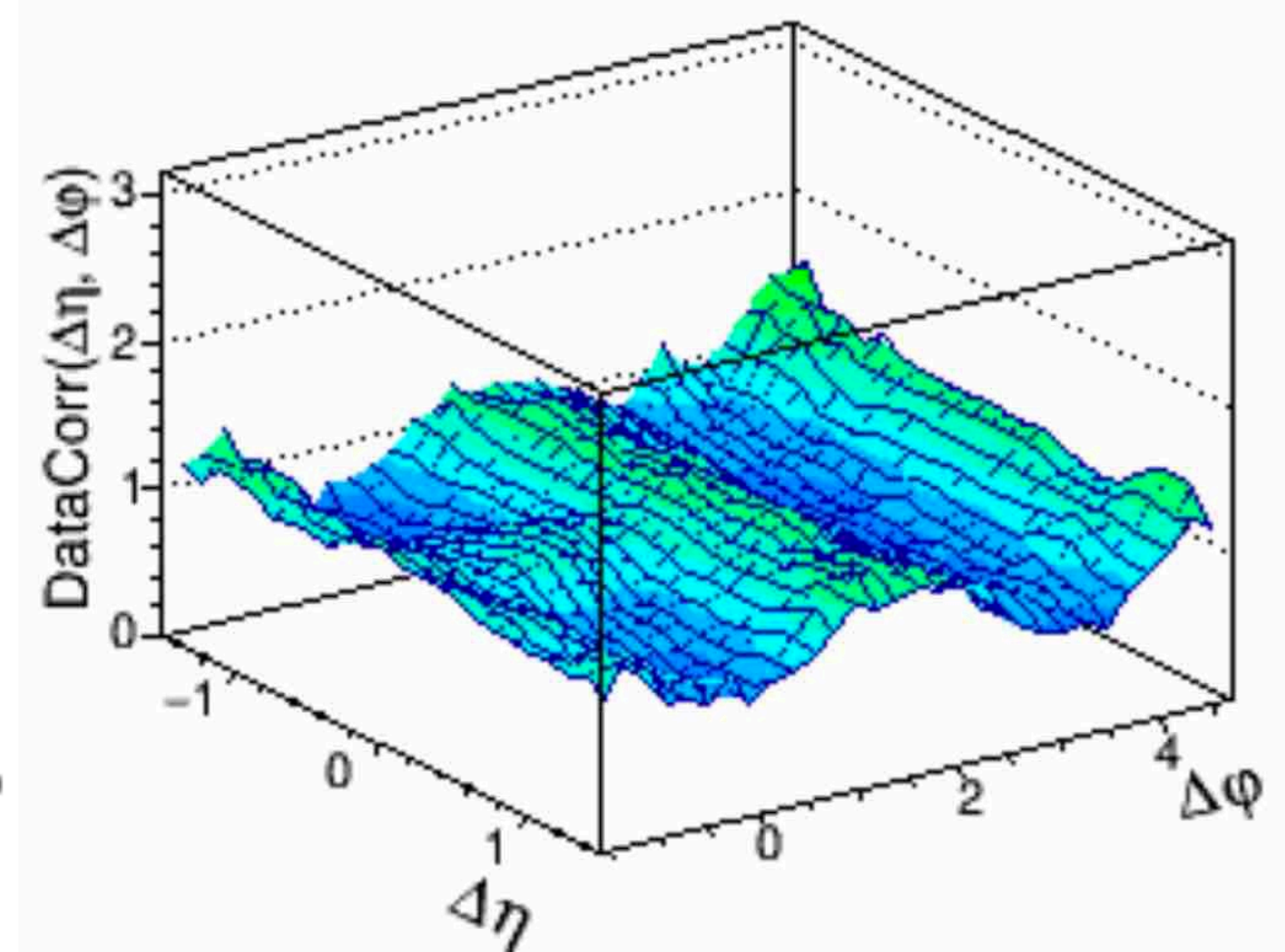
$15 \leq N_{ch} \leq 19 - S [0.0-0.3]$



$50 \leq N_{ch} \leq 59 - S [0.3-0.6]$



$30 \leq N_{ch} \leq 39 - S [0.6-1.0]$



$1 \text{ GeV}/c < p_{T}^{\text{trig}} = p_{T}^{\text{leading}} < 2 \text{ GeV}/c, 1 \text{ GeV}/c < p_{T}^{\text{ass}} < 2 \text{ GeV}/c, p_{T}^{\text{trig}} > p_{T}^{\text{ass}}$

Two-particle correlations

Fit parameters

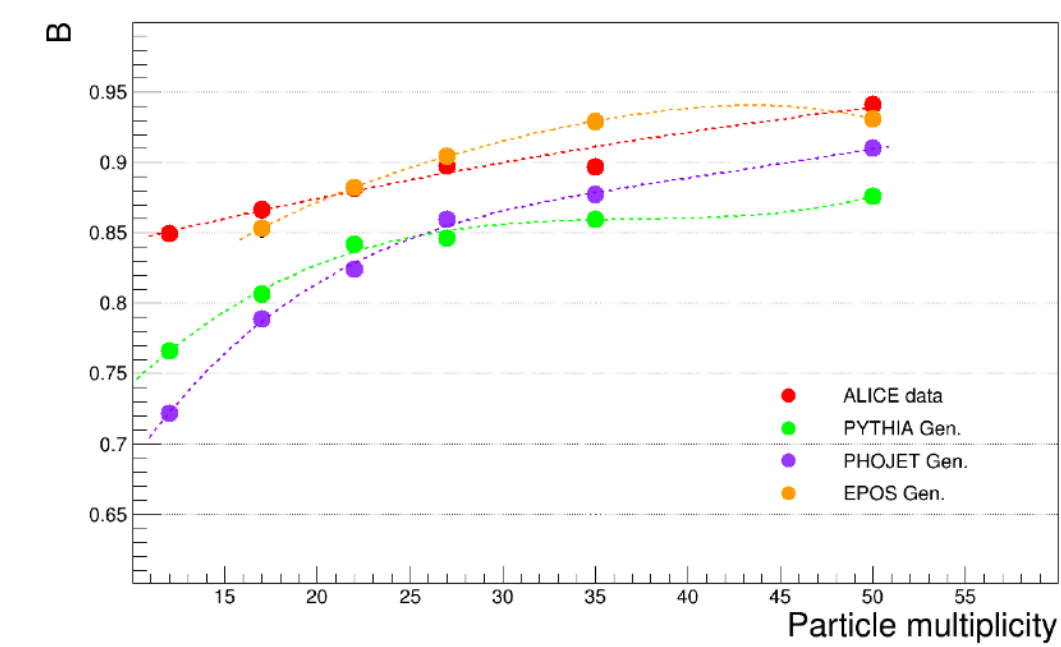
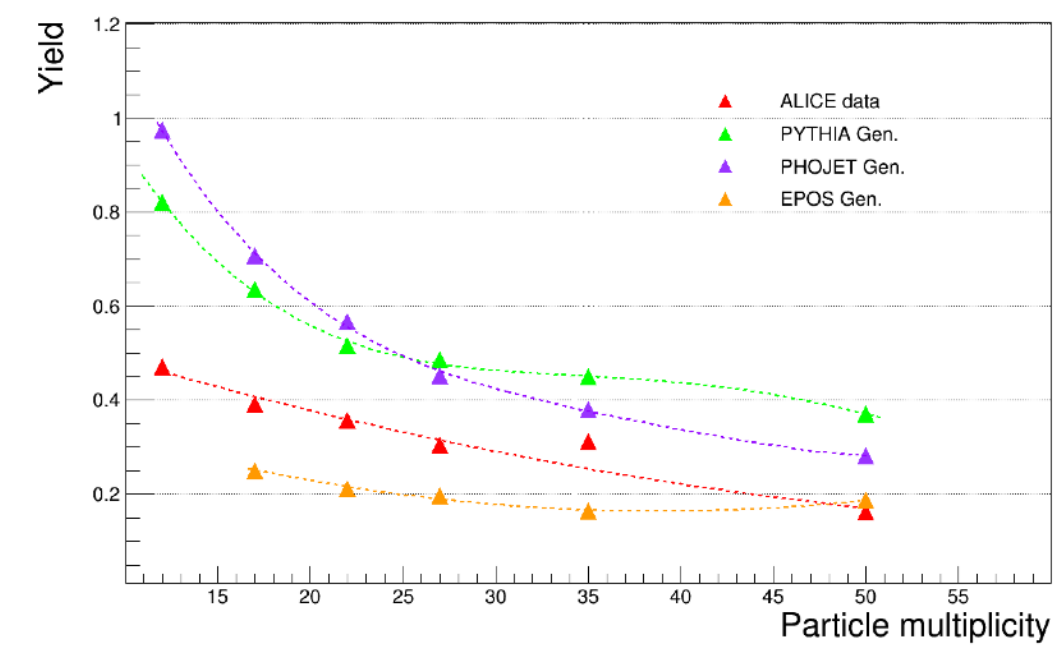
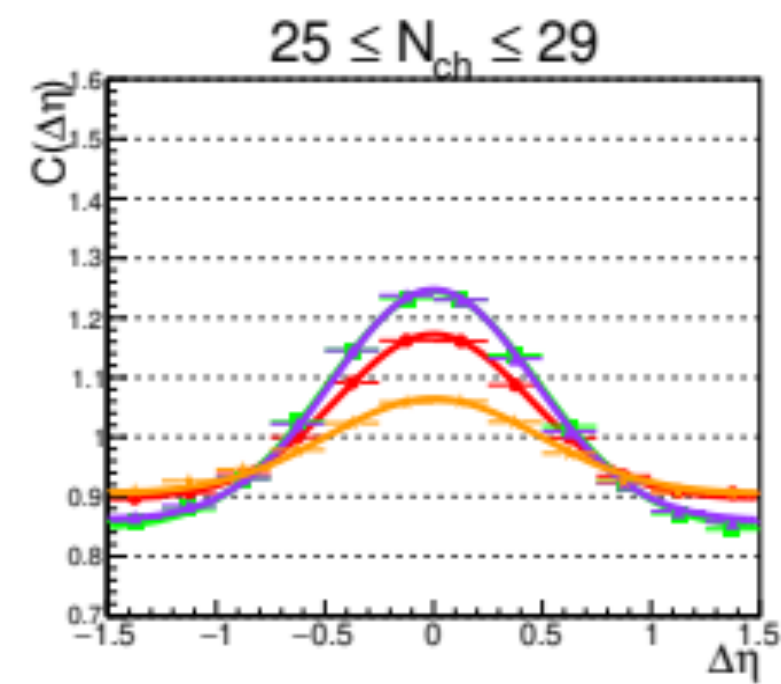
Corrected Data

PythiaGen

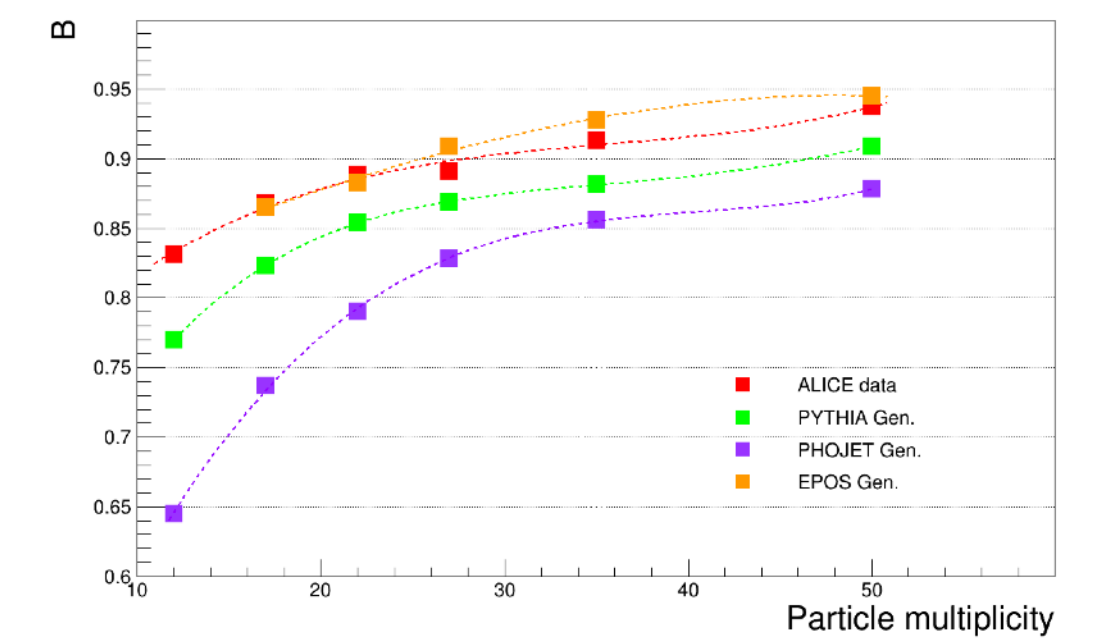
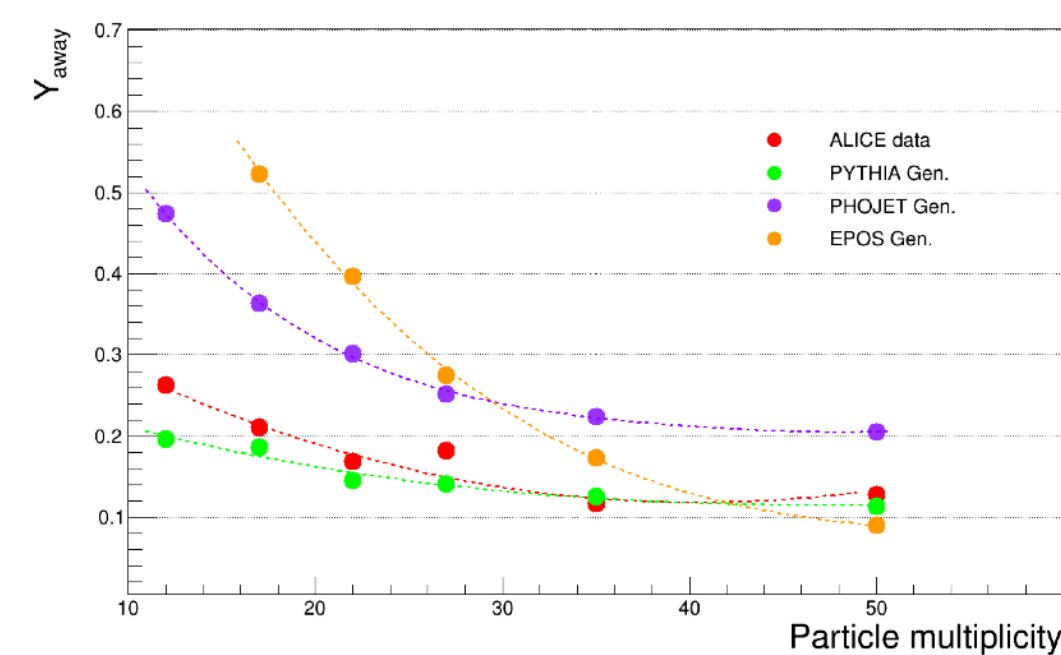
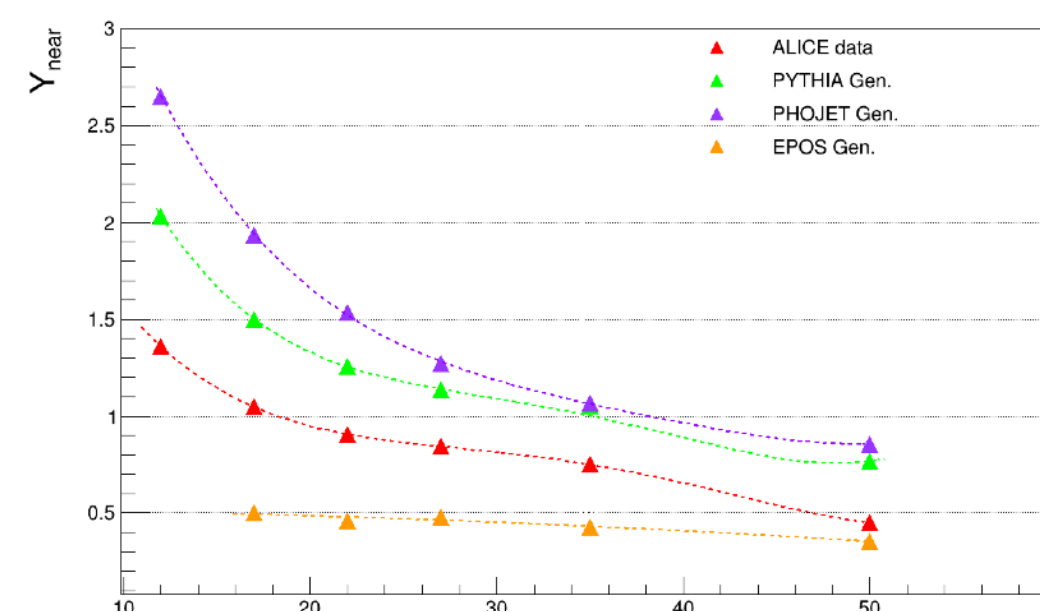
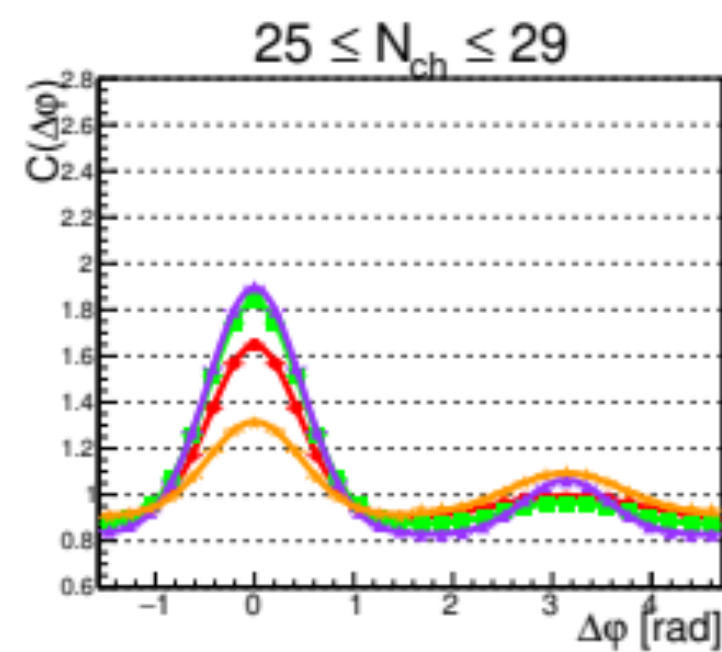
PhojetGen

EposGen

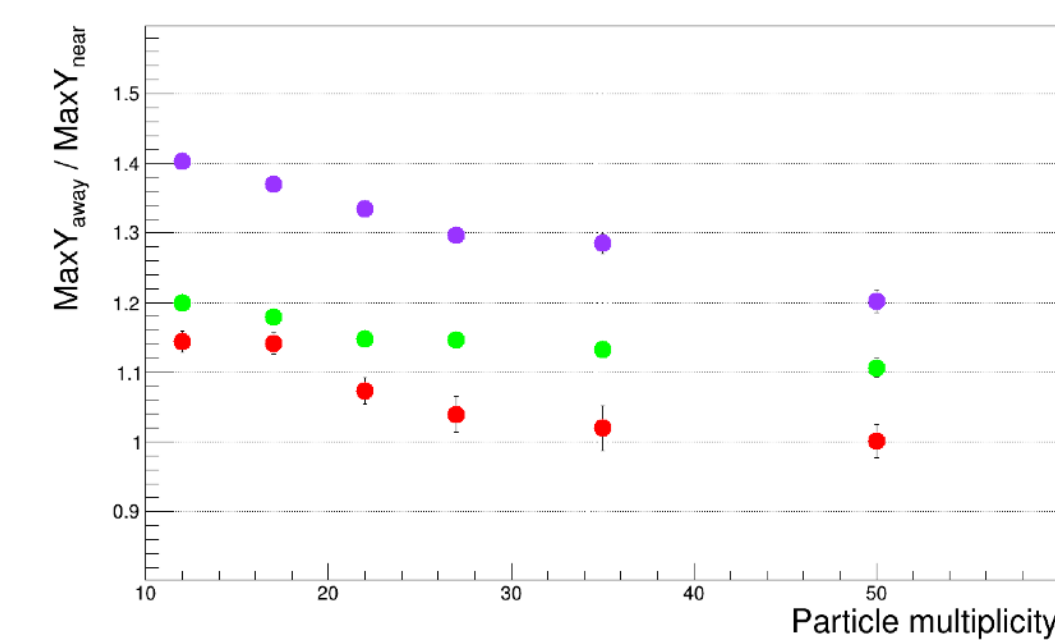
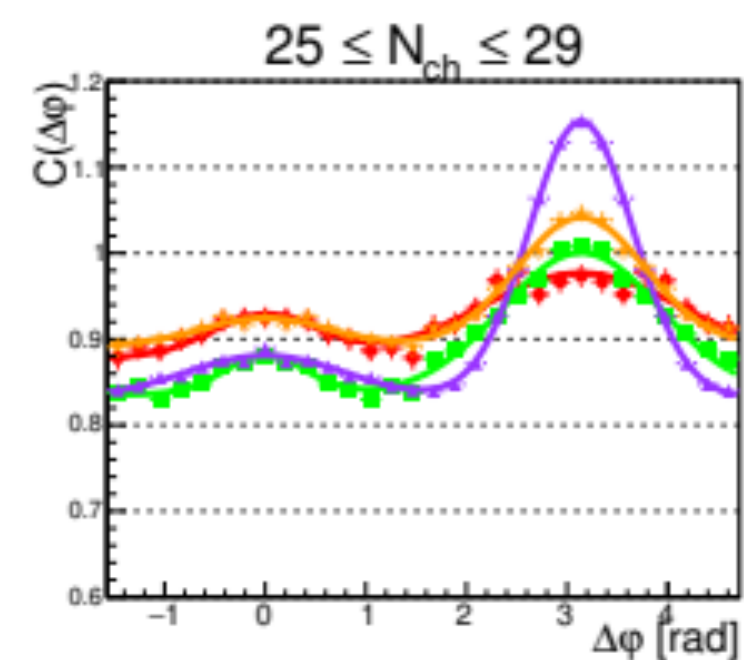
$-\pi/2 \leq \Delta\phi \leq \pi/2$



$-0.25 \leq \Delta\eta \leq 0.25$



$1.25 \leq |\Delta\eta| \leq 1.5$

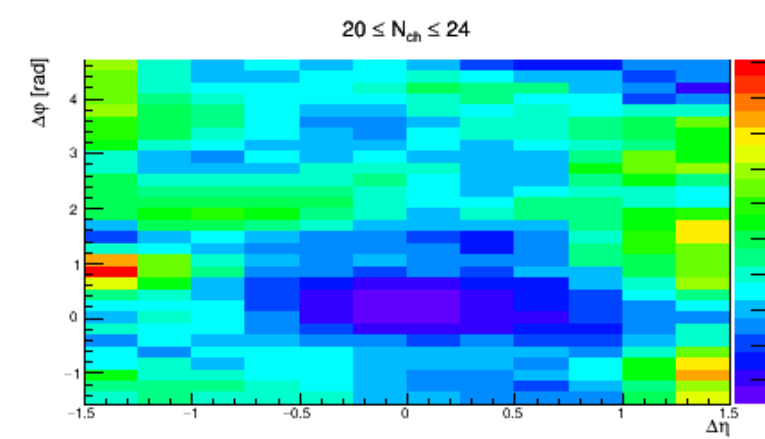
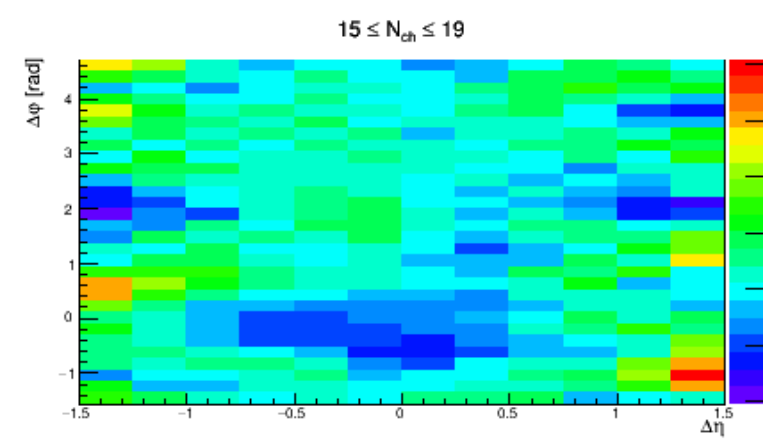
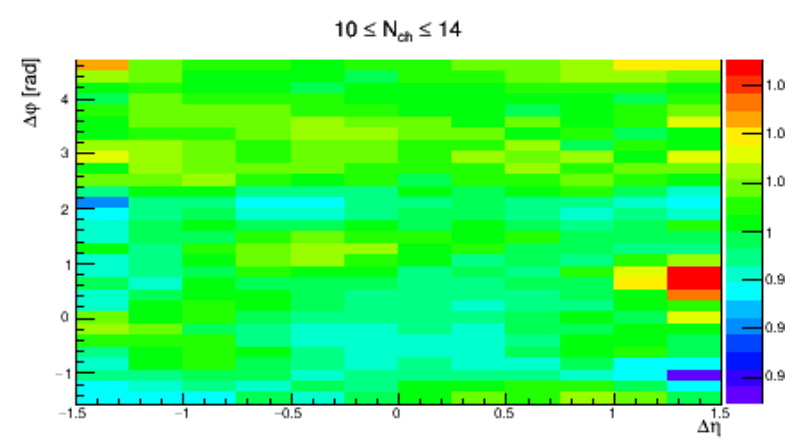
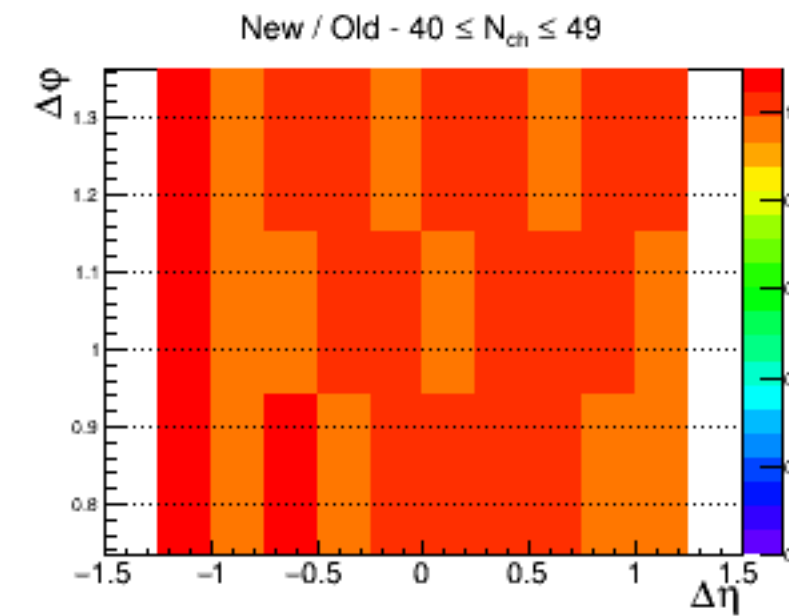
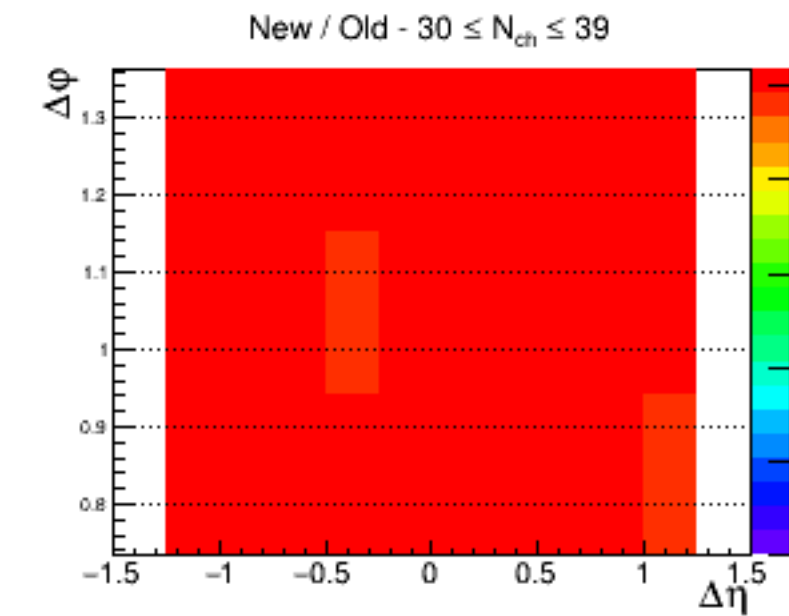
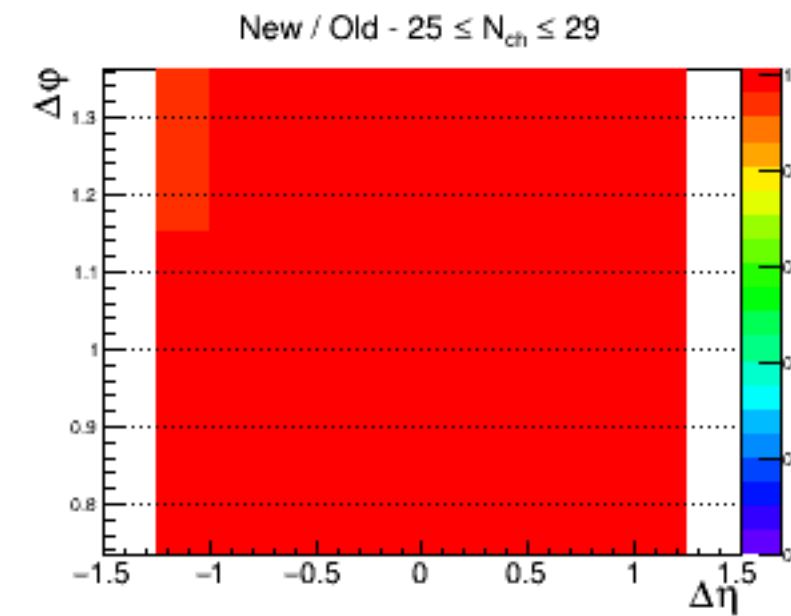
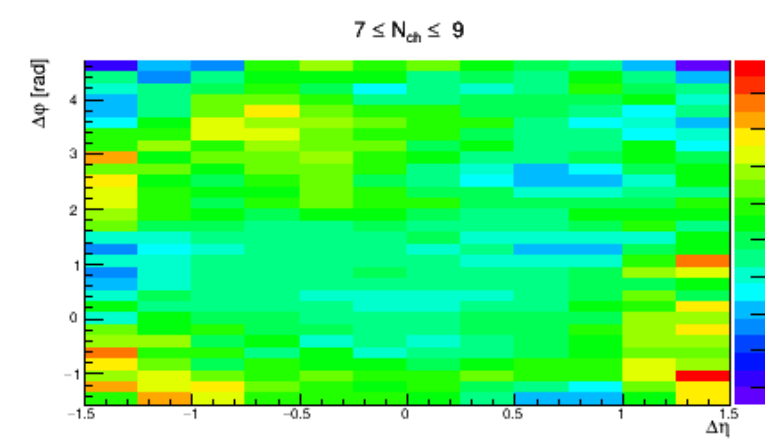
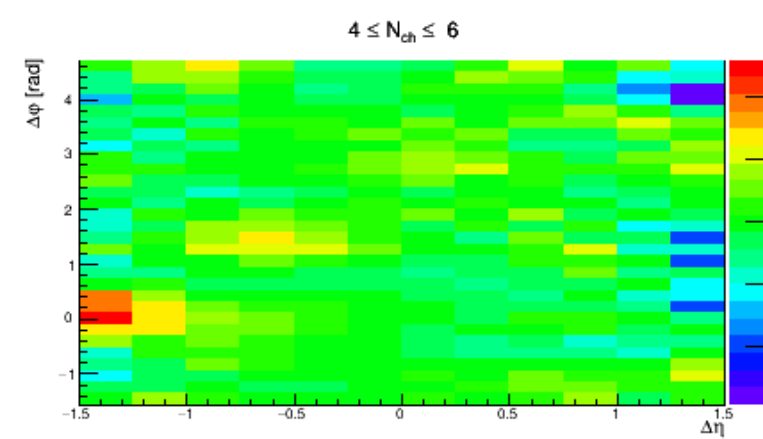
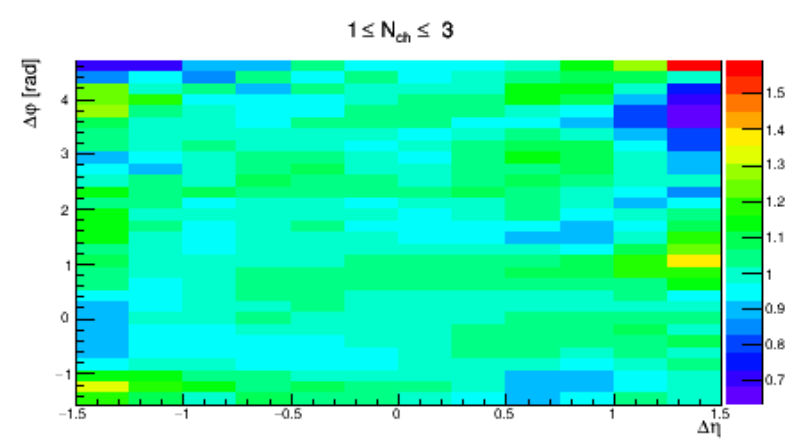


Two-particle correlations

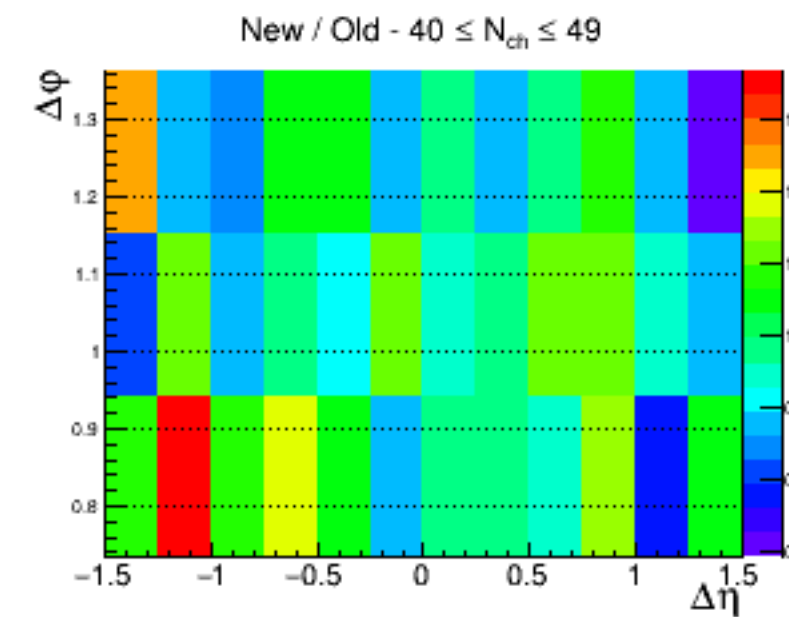
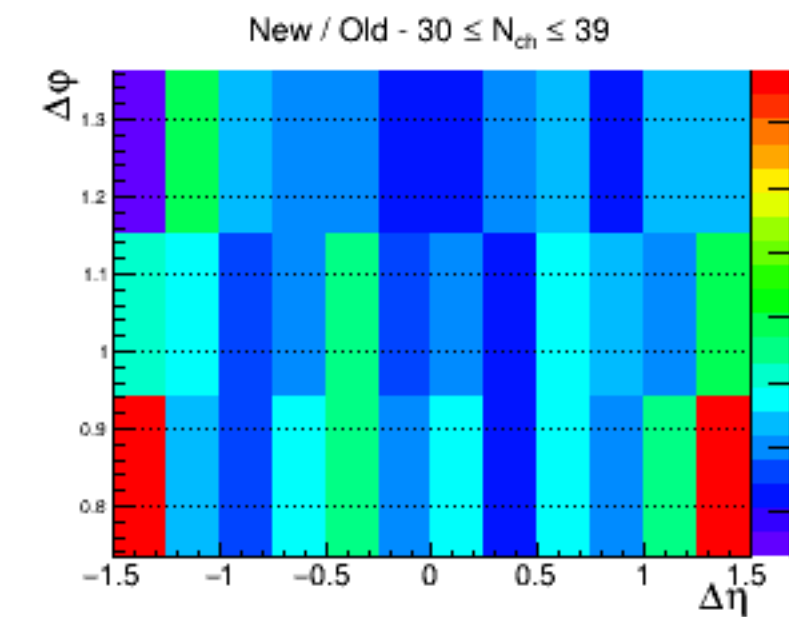
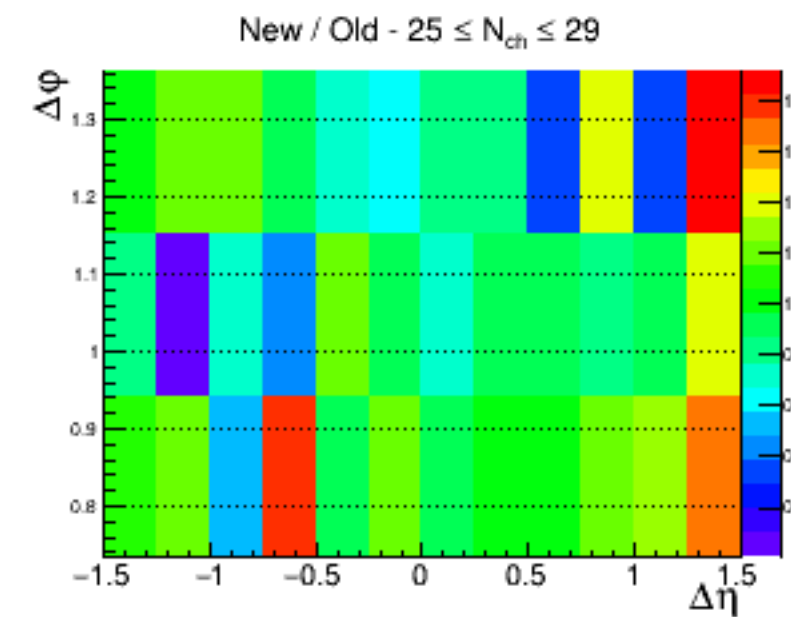
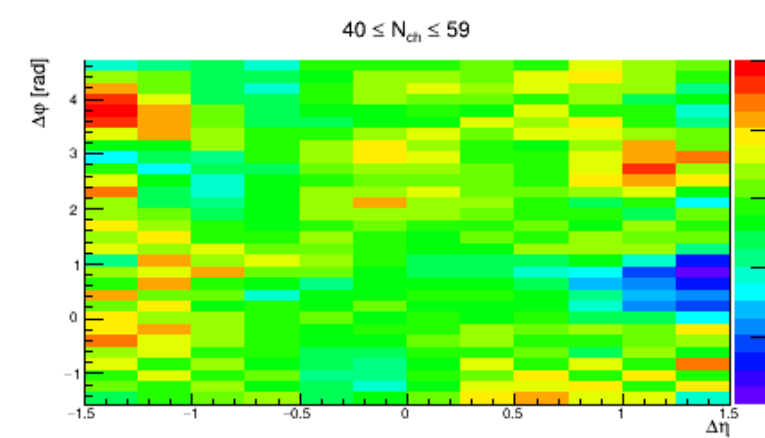
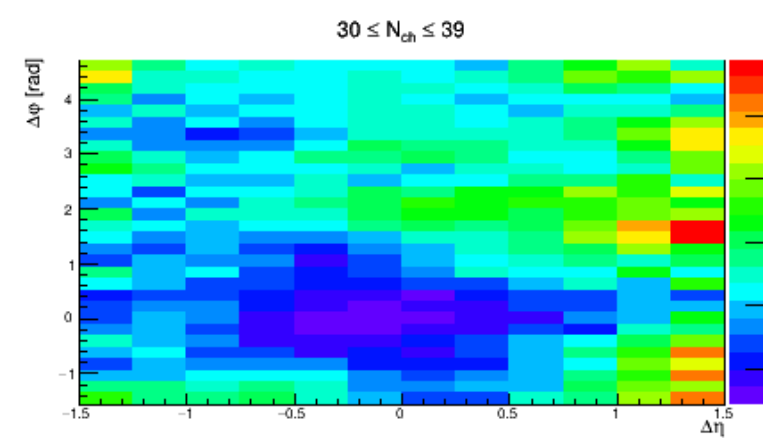
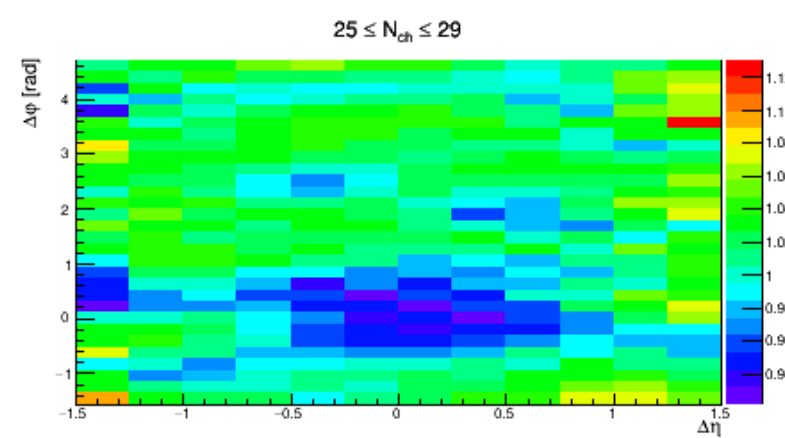
Further crosschecks and systematic errors

PythiaRec
PythiaGen
PhojetRec
PhojetGen

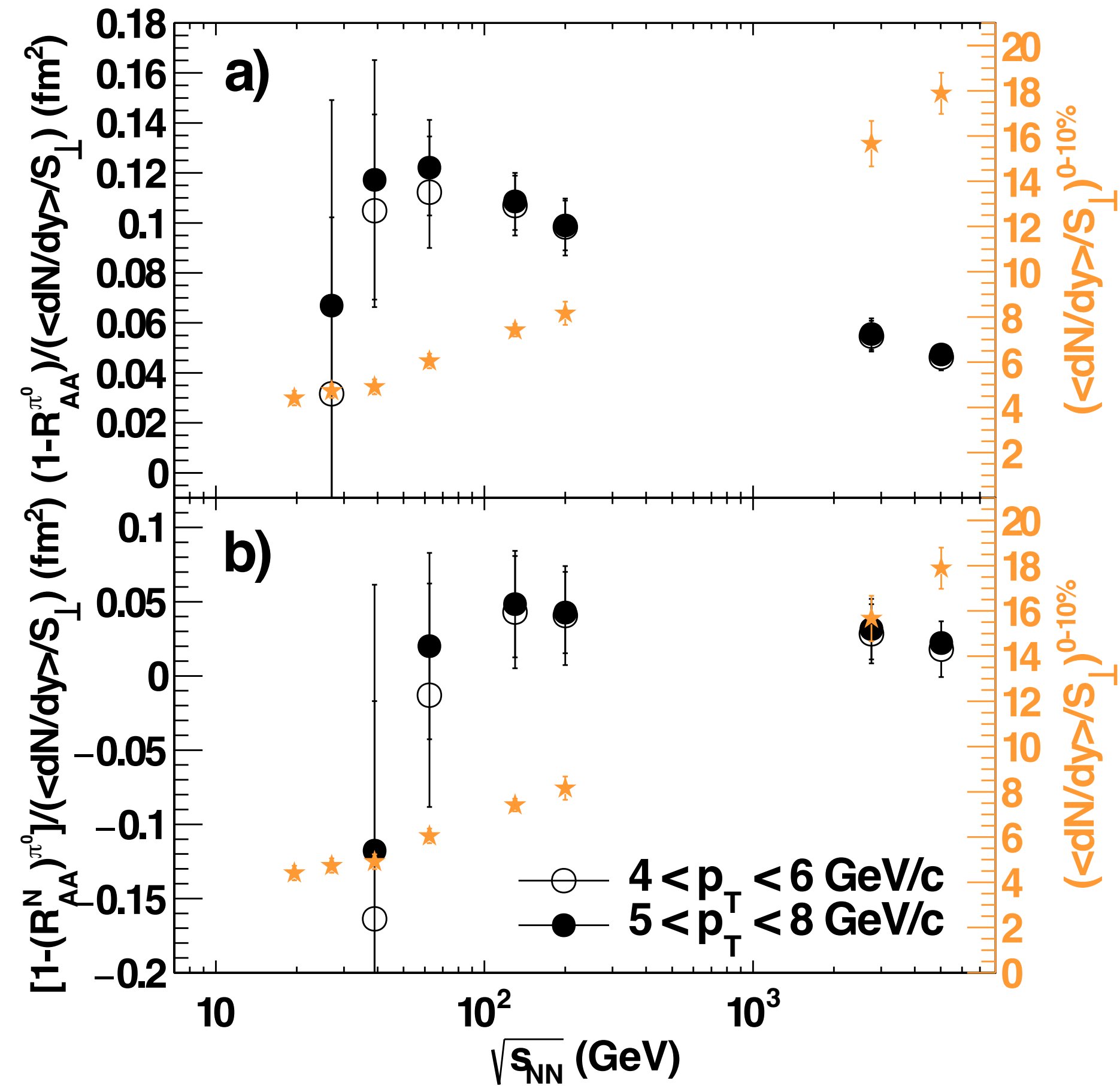
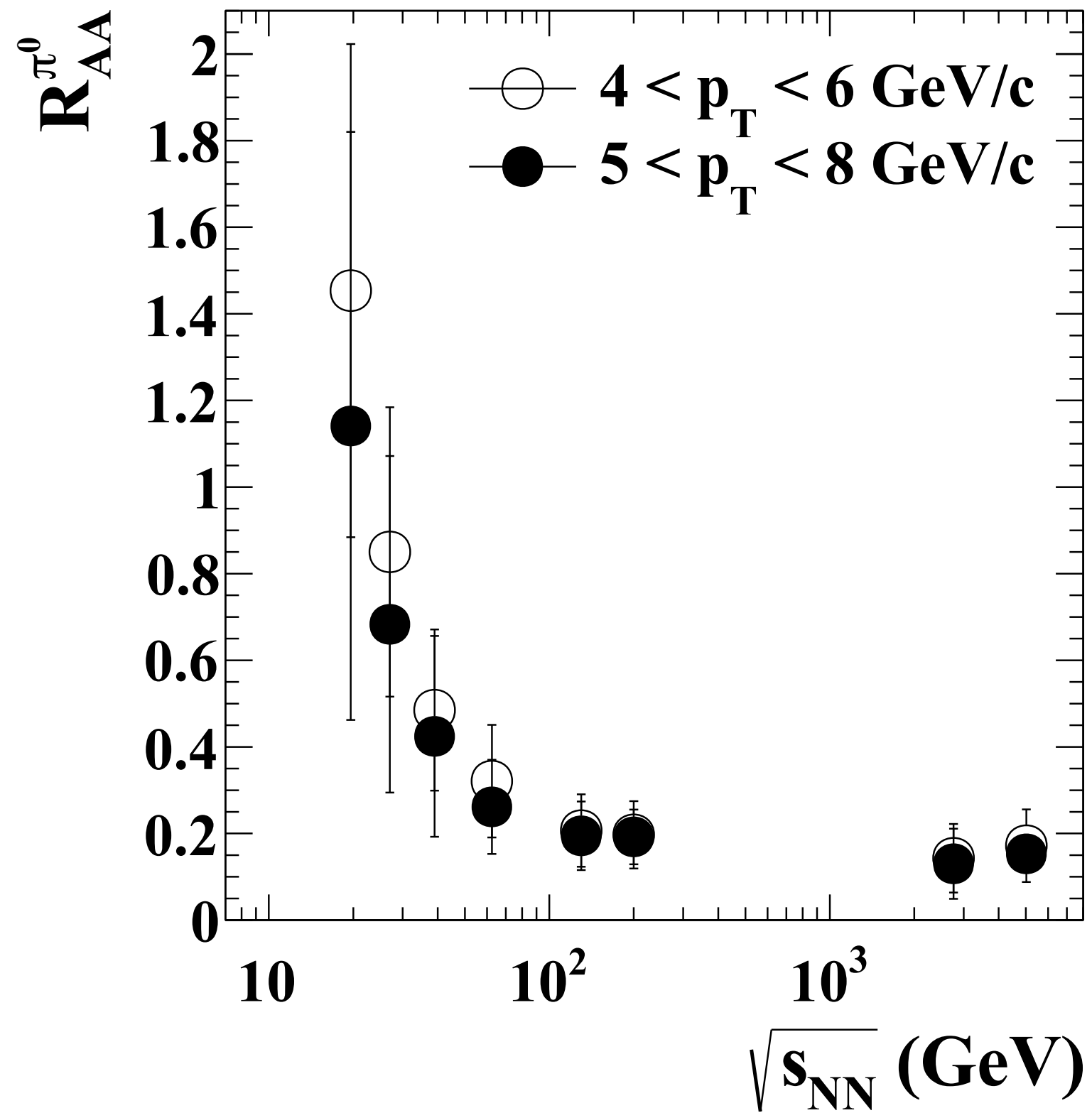
$|\eta| < 0.6$ vs $|\eta| < 0.8$



Event mixing pool size: 15 events vs no limit



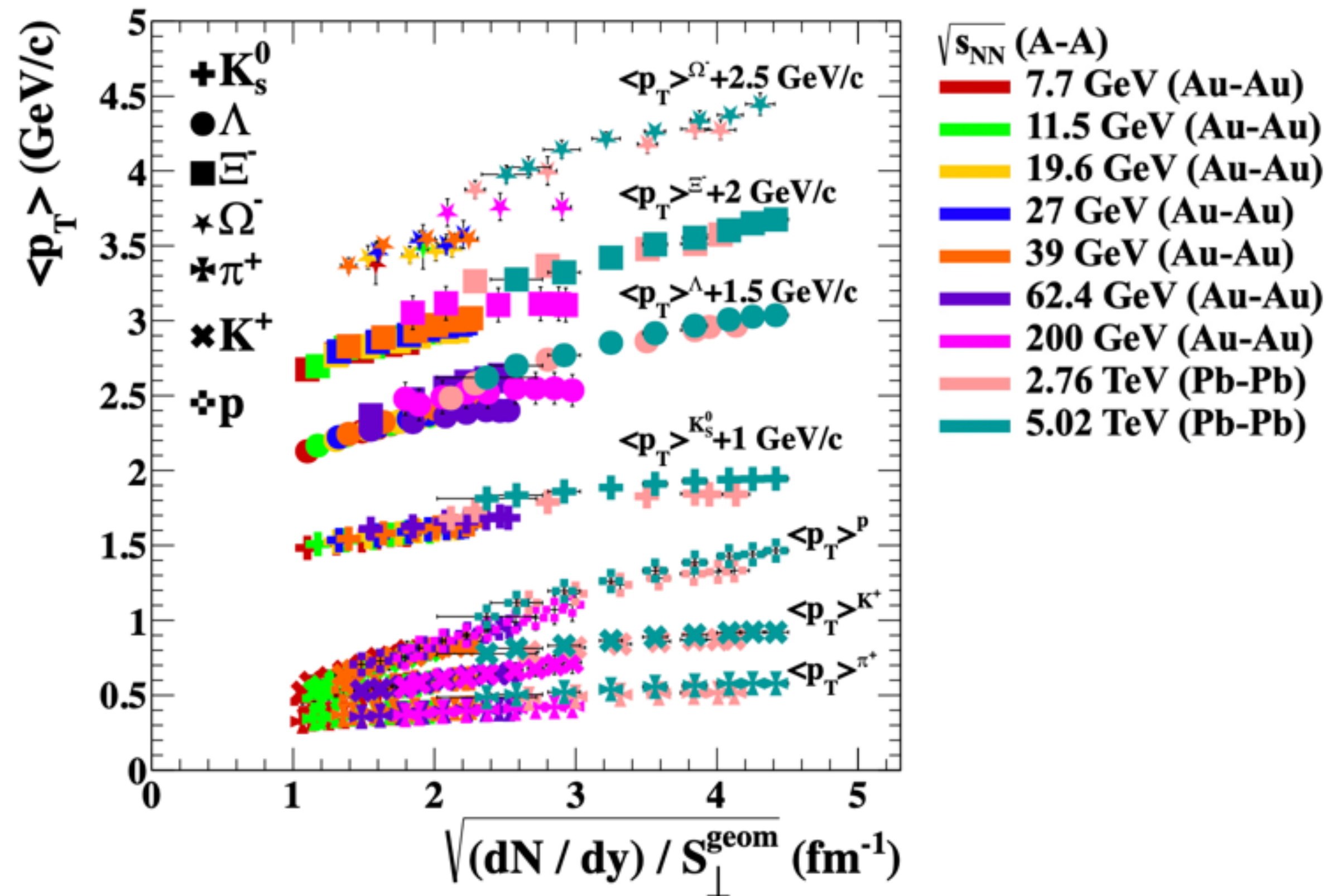
Considerations on charged particles and π^0 suppression at RHIC and LHC energies



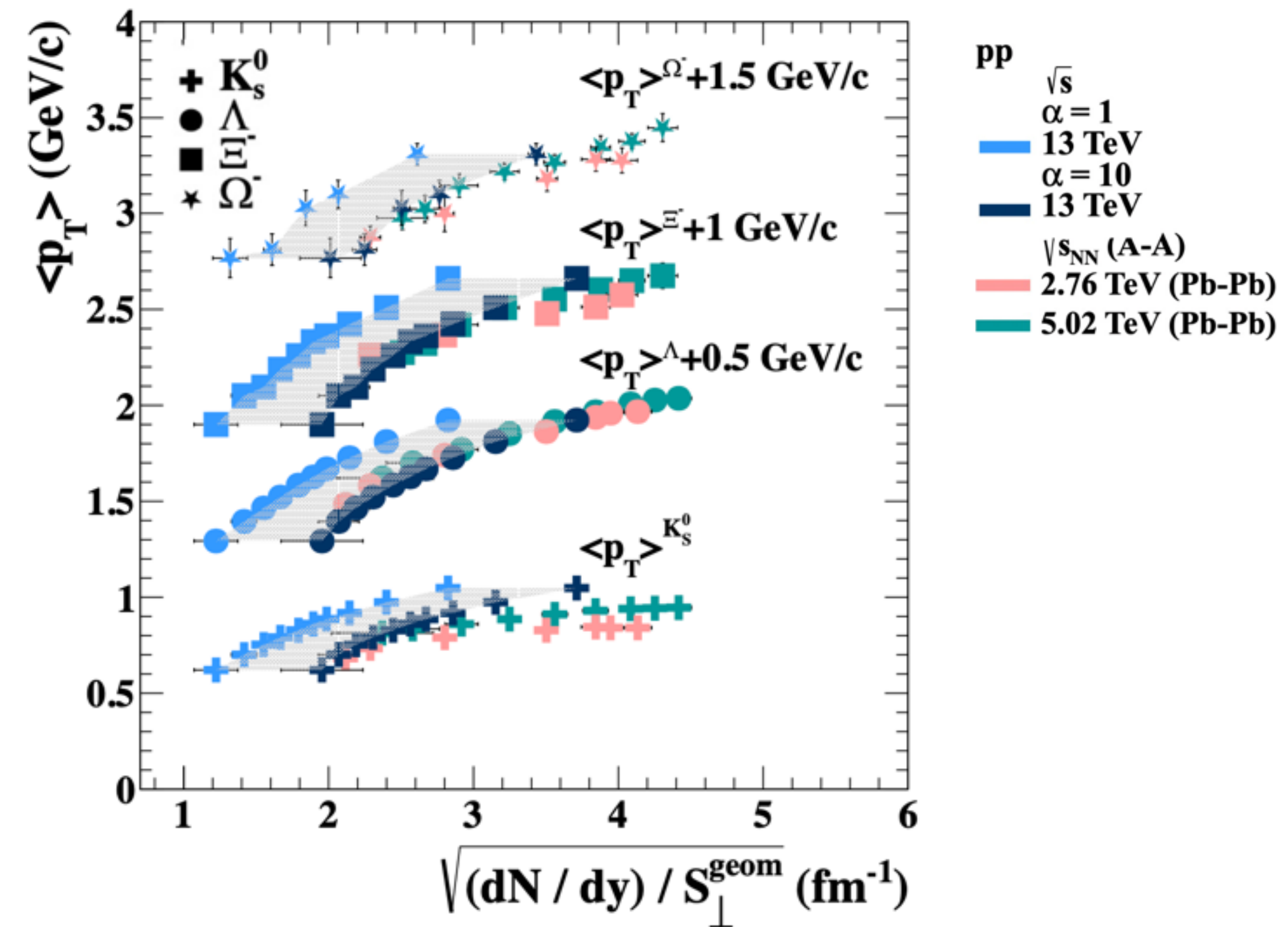
Considerations on the suppression of charged particles and π^0 in high energy heavy ion collisions
 M.Petrovici, A. Lindner, A. Pop, Phys. Rev. C 103, 034903 (2021)

Geometrical scaling

Geometrical scaling for light flavor hadrons

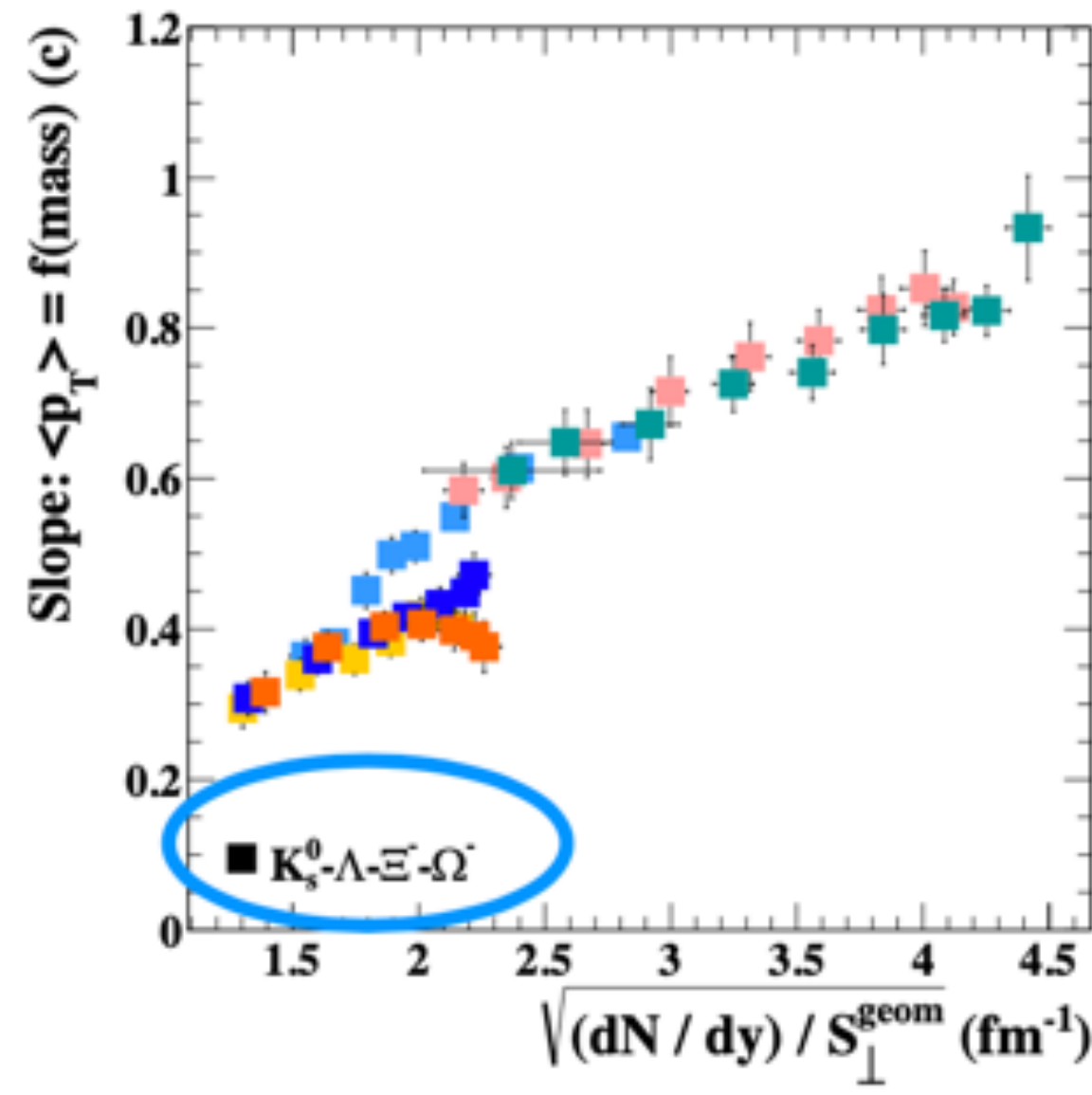
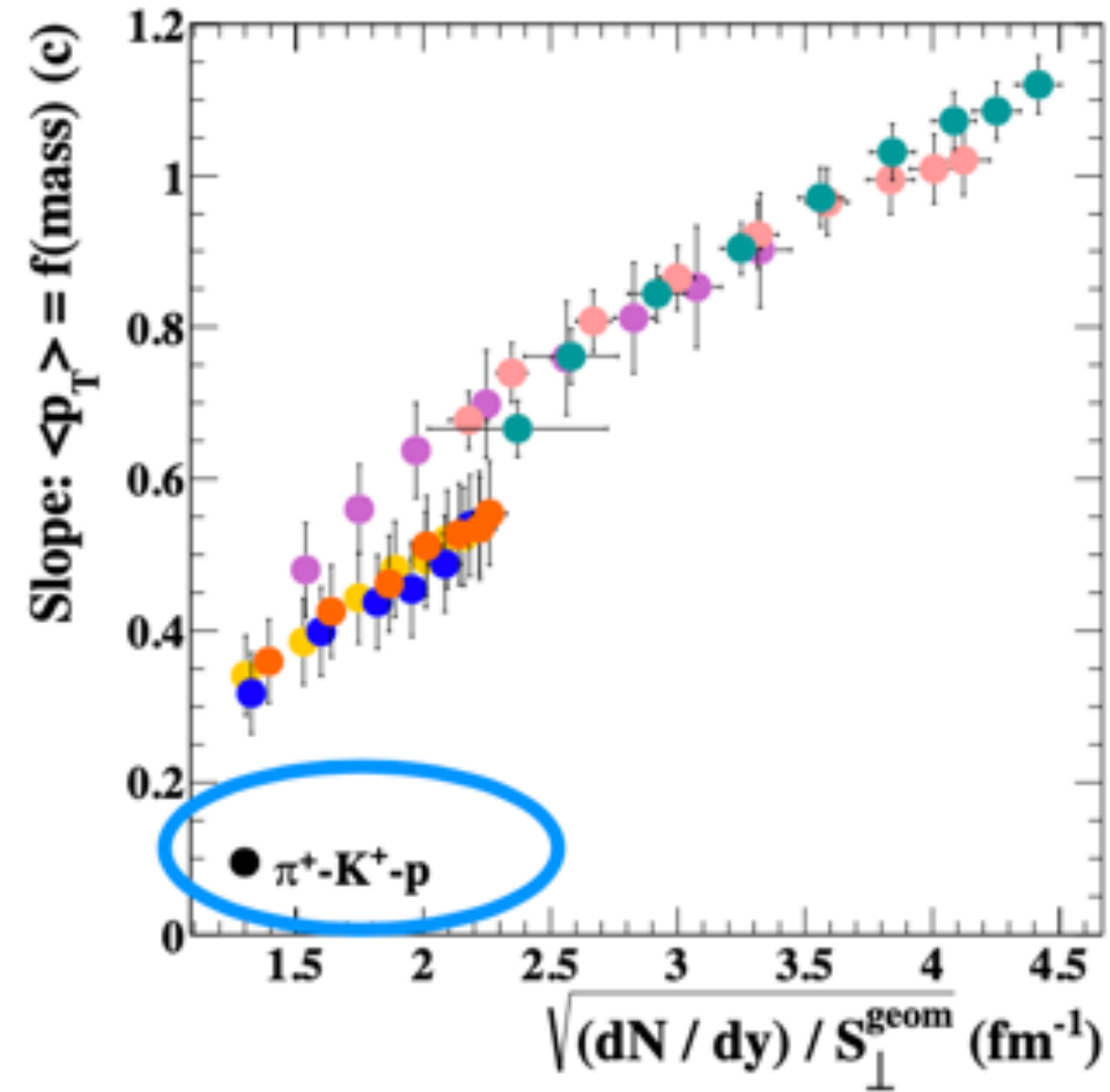


Geometrical scaling for strange and multi-strange hadrons
Pb-Pb vs. pp @ LHC



Geometrical scaling

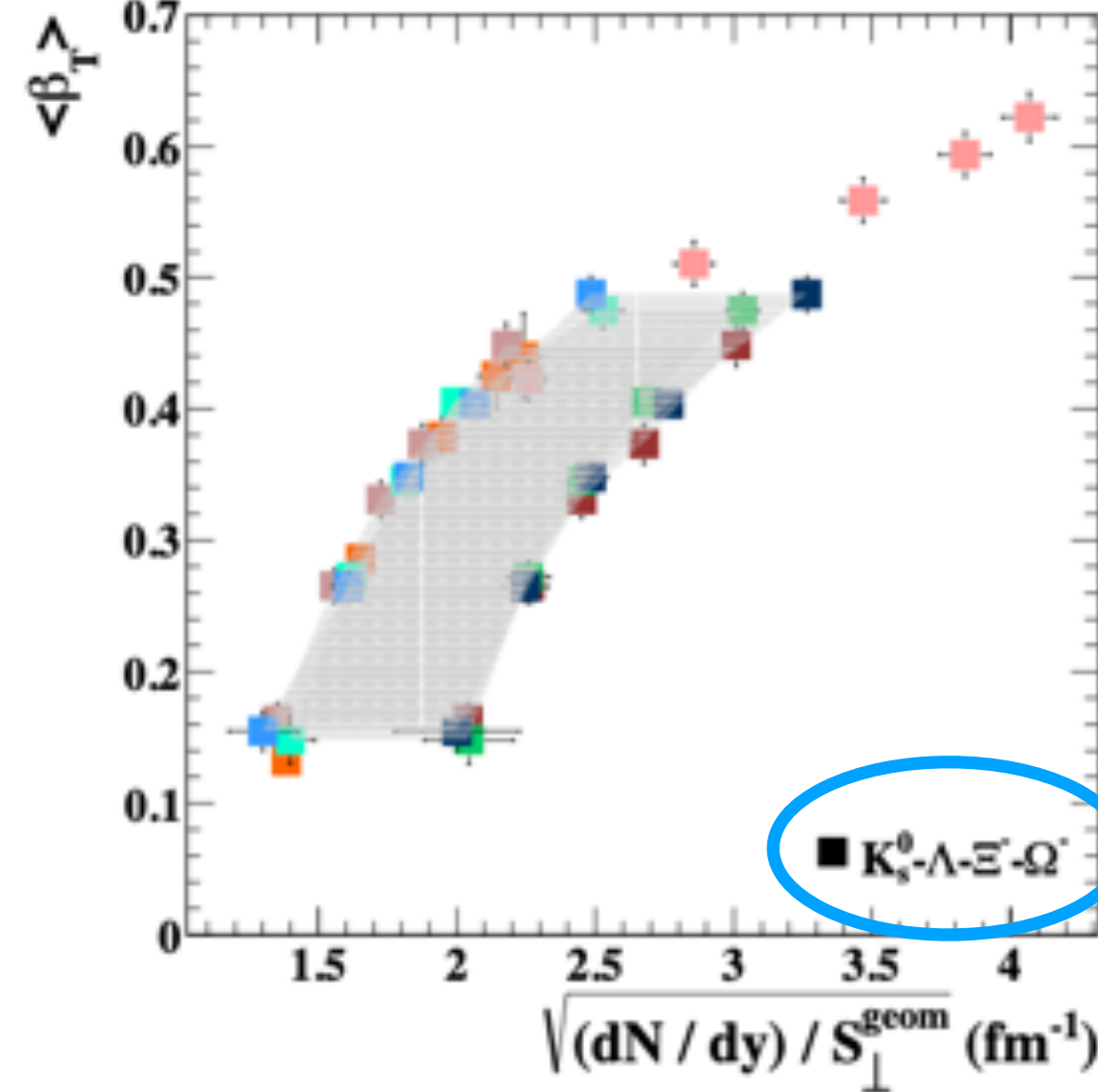
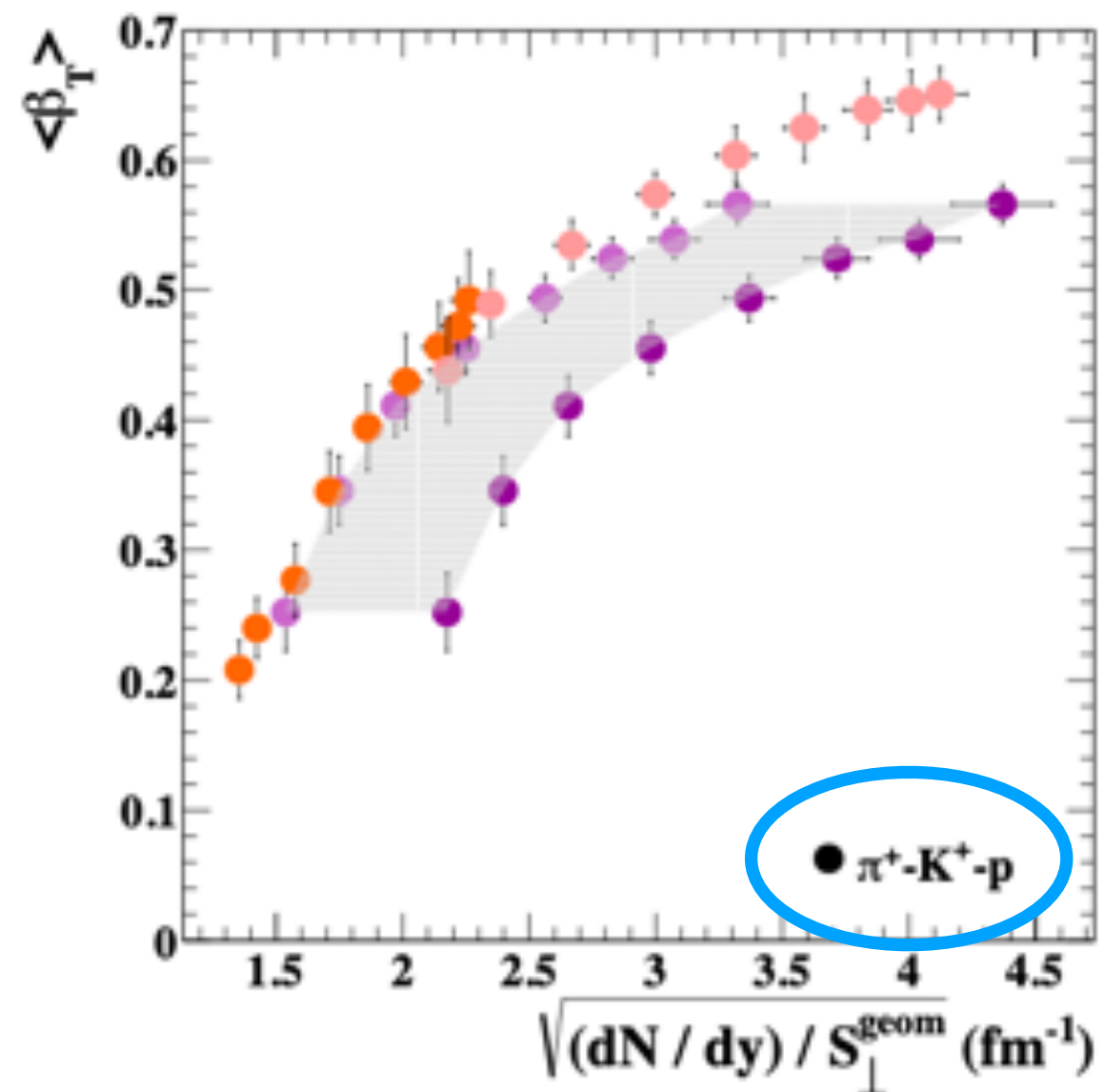
$\langle p_T \rangle$ - hadron mass slopes



$\sqrt{s_{NN}}$ (A-A)
 19.6 GeV (Au-Au)
 27 GeV (Au-Au)
 39 GeV (Au-Au)
 2.76 TeV (Pb-Pb)
 5.02 TeV (Pb-Pb)

pp: \sqrt{s} - Multiplicity selector
 $\alpha = 1$
 7 TeV: Combined
 13 TeV: SPD tracklets

BGBW - fit



$$\frac{1}{2\pi p_T} \frac{d^2 N}{dy dp_T} \propto \int_0^R r dr m_T I_0 \left(\frac{p_T \sinh \rho}{T_{kin}} \right) K_1 \left(\frac{m_T \cosh \rho}{T_{kin}} \right)$$

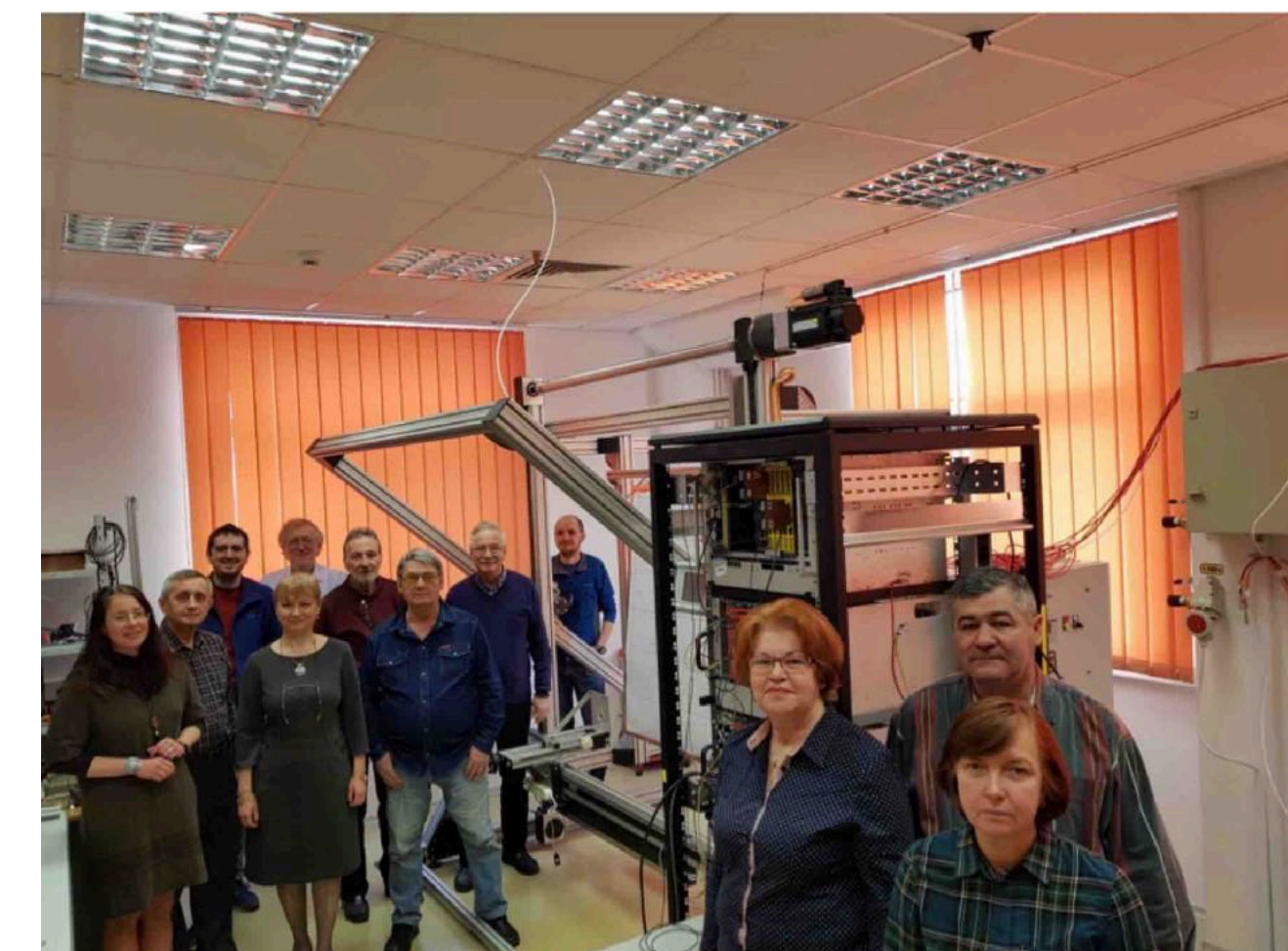
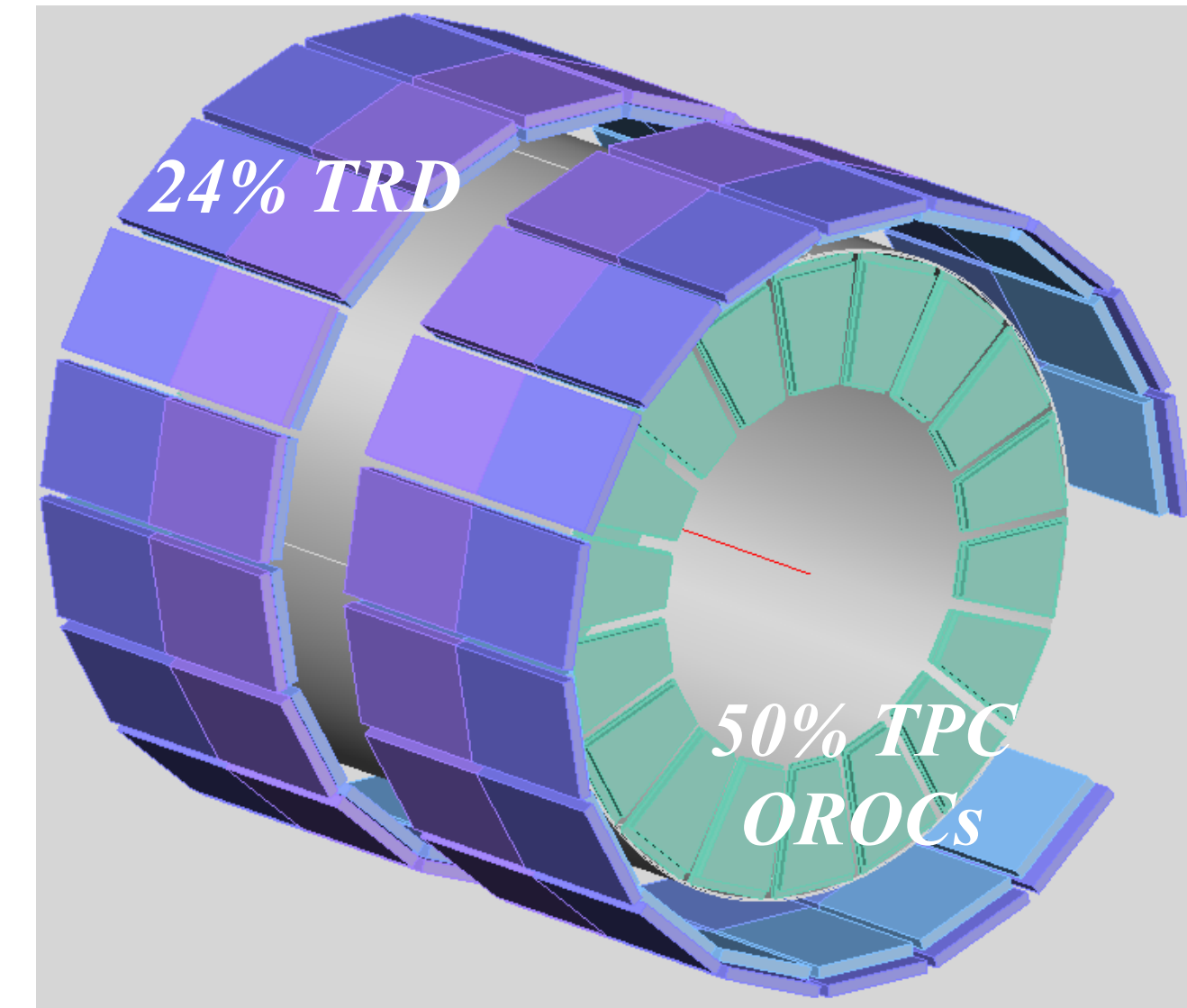
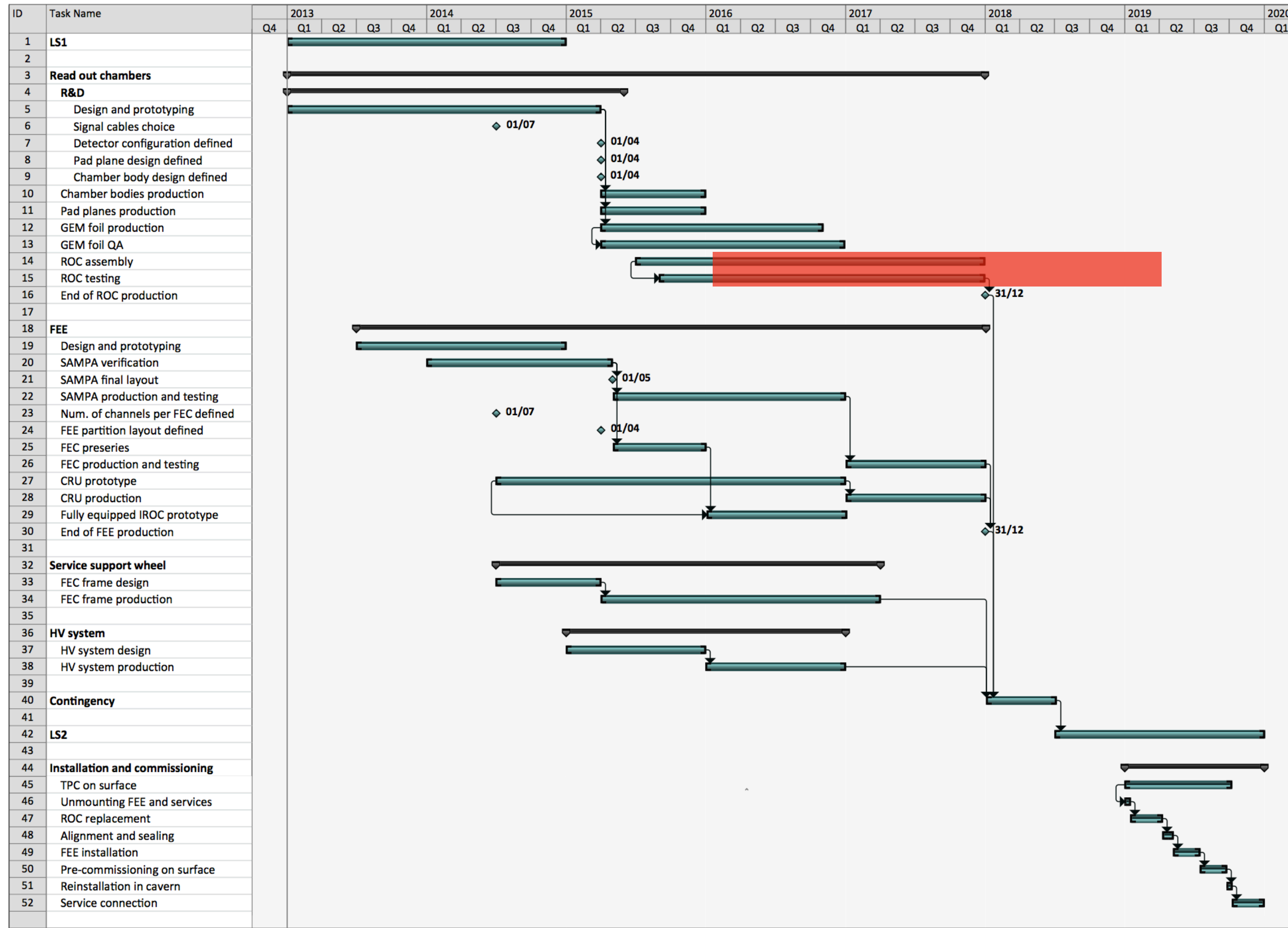
with $\rho = \tanh^{-1} \beta_T = \tanh^{-1} \left[\left(\frac{r}{R} \right)^n \beta_s \right]$

$\sqrt{s_{NN}}$ (A-A)
 39 GeV (Au-Au)
 2.76 TeV (Pb-Pb)

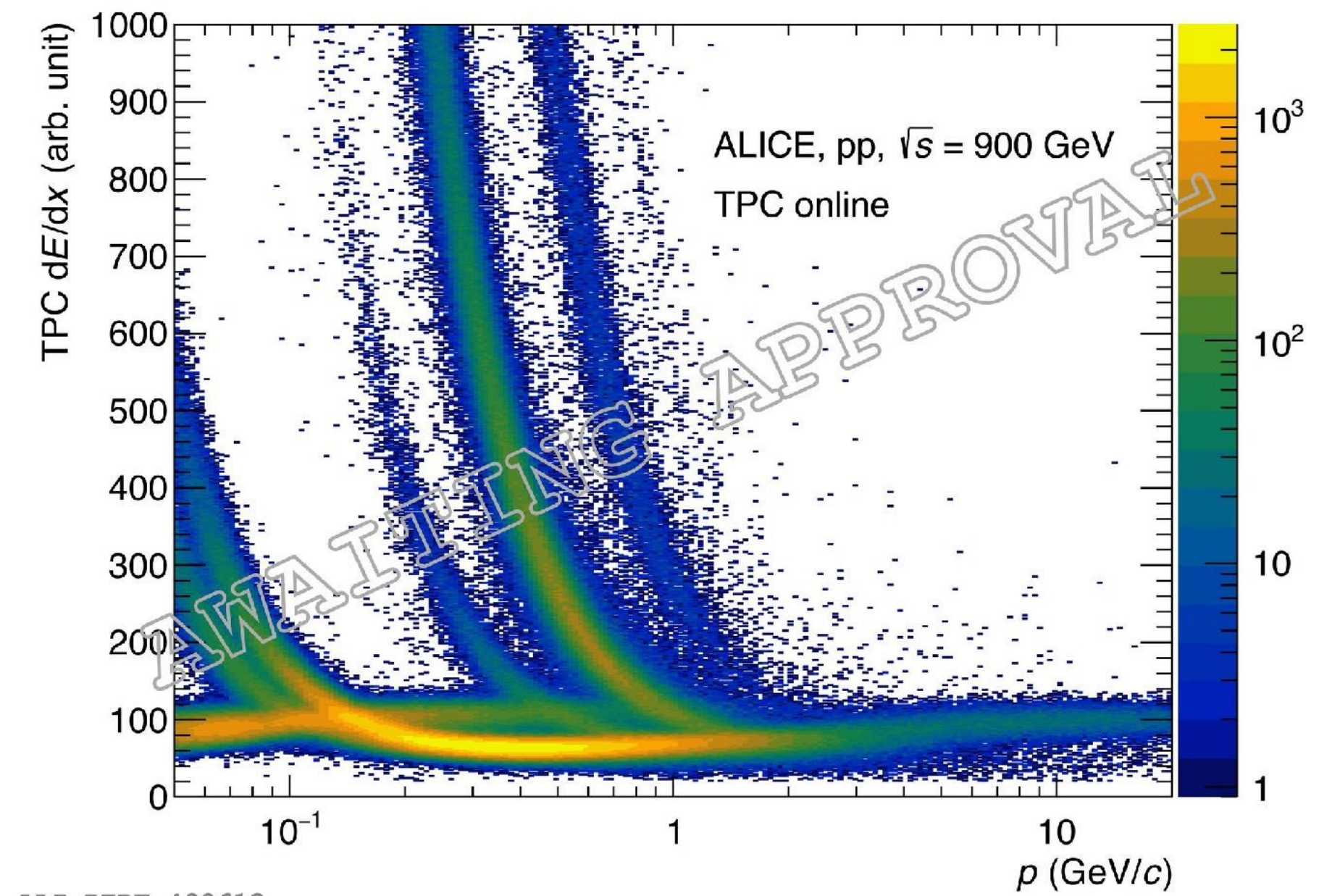
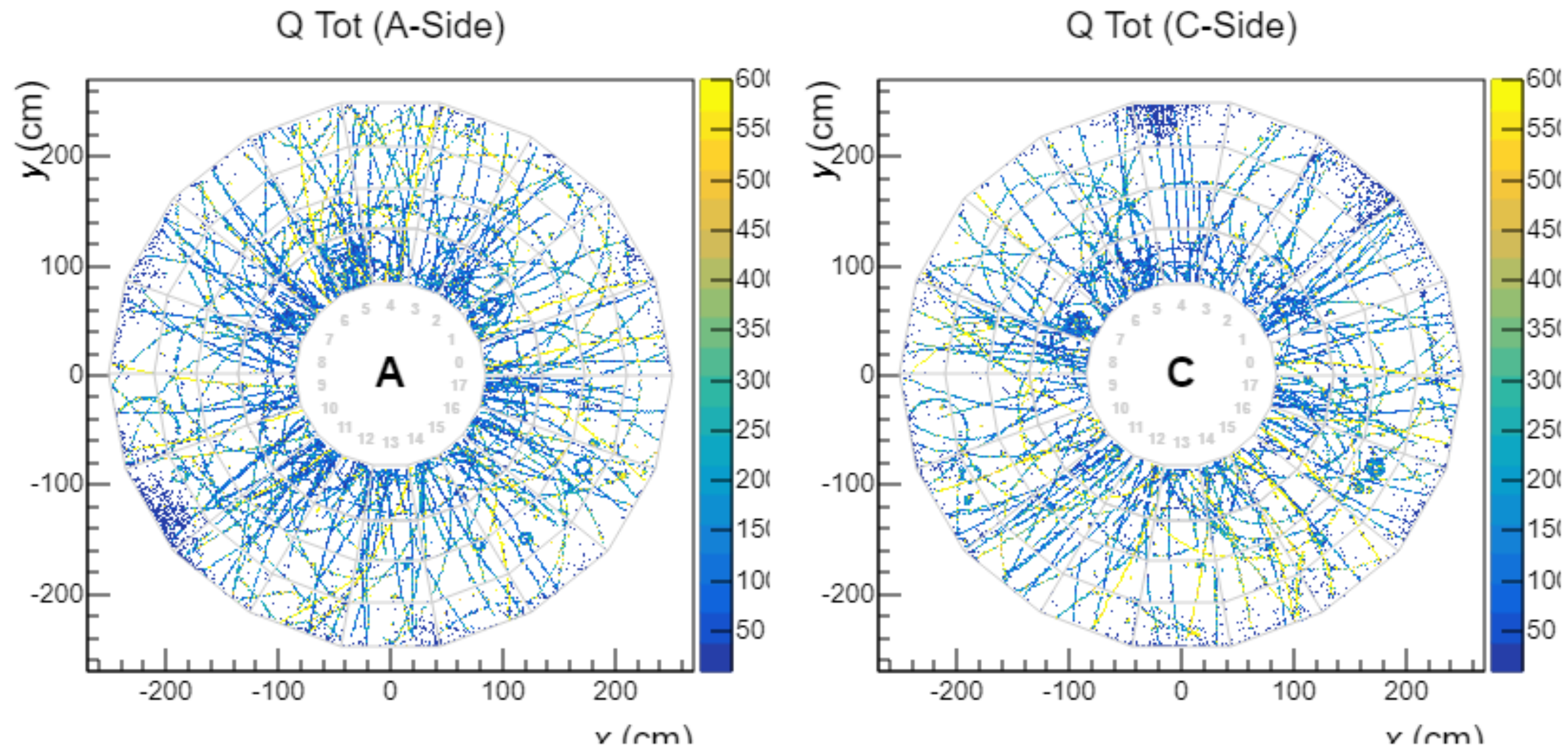
pp: \sqrt{s} - Multiplicity selector
 $\alpha = 1$
 7 TeV: V0M
 7 TeV: Combined
 13 TeV: V0M
 13 TeV: SPD tracklets
 $\alpha = 10$
 7 TeV: V0M
 7 TeV: Combined
 13 TeV: V0M
 13 TeV: SPD tracklets

Worth to be mentioned

HPD contribution to the ALICE Experiment

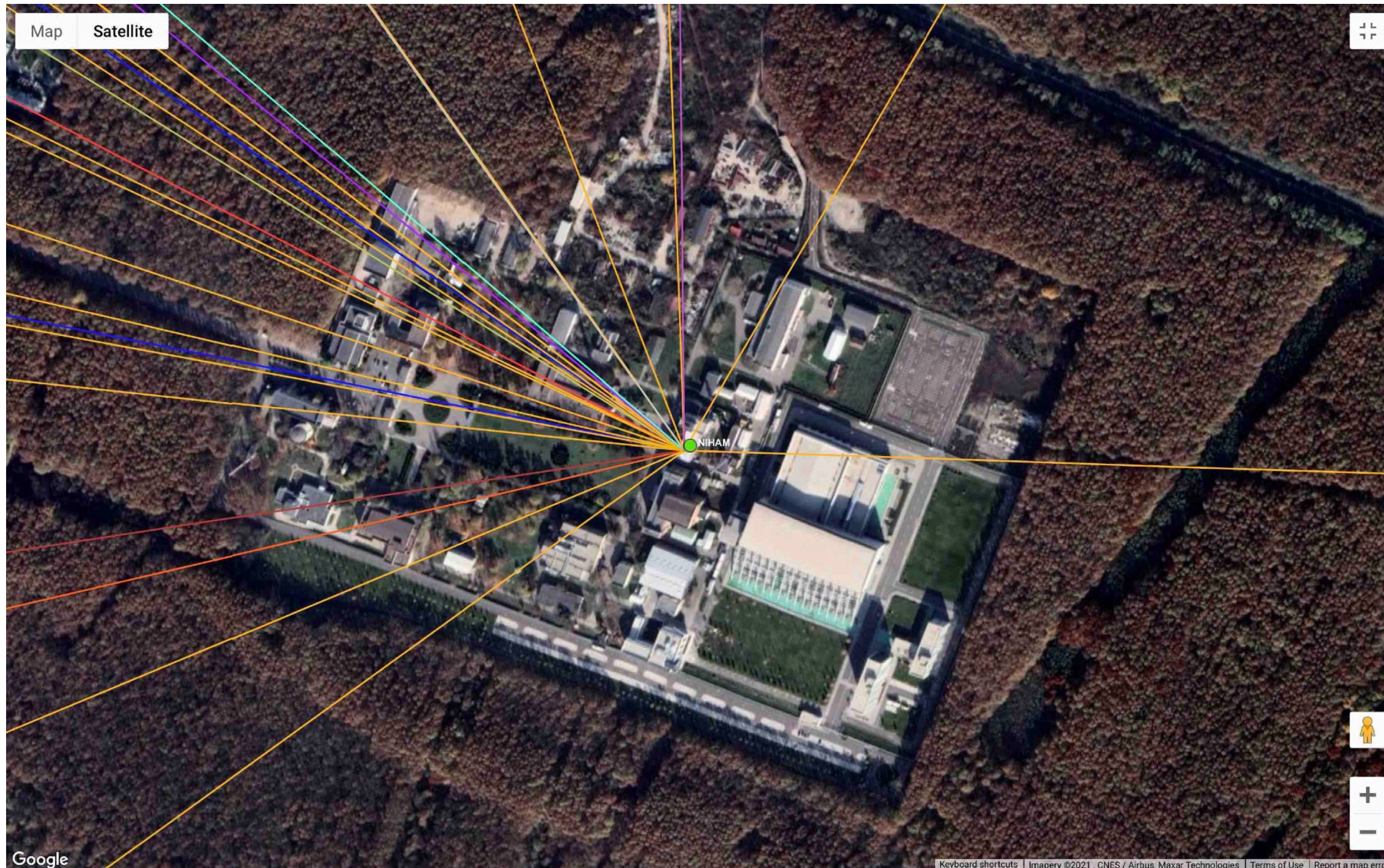


Worth to be mentioned



Computing

Contribution to ALICE GRID



Done jobs - NIHAM:

- $5.4 \cdot 10^6$
- 6.1 % of total Tier2 ALICE contribution

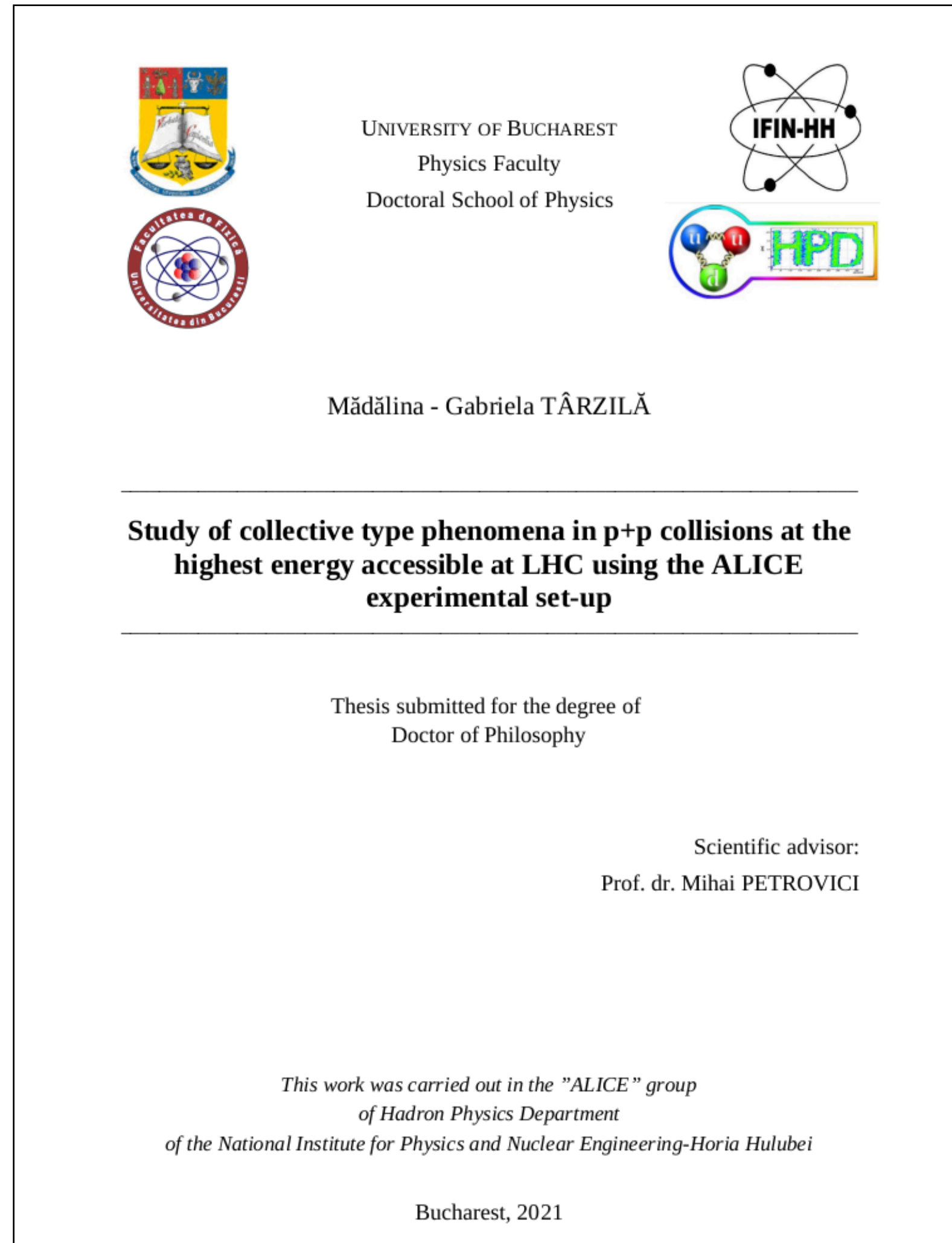
CPU:

- 8.7 Mhours
- 3.3 % of total Tier2 ALICE contribution

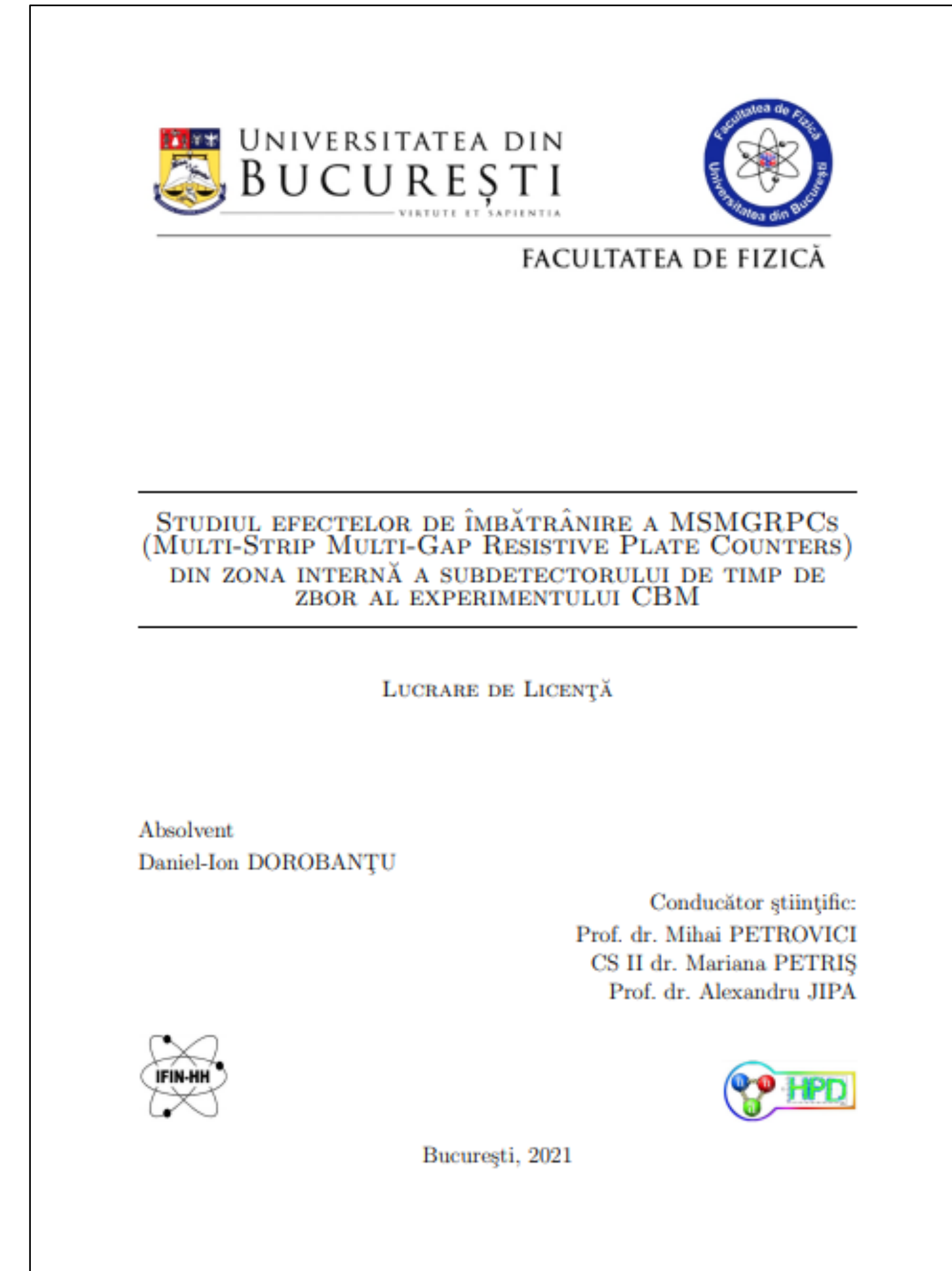
- New UPS stations - installed

- A new cooling station - in progress

Training & teaching



PhD Thesis



Diploma Thesis

Outreach



ALICE-TPC upgrade movie



<https://www.facebook.com/211078852968333/videos/582740123099895>

Outreach



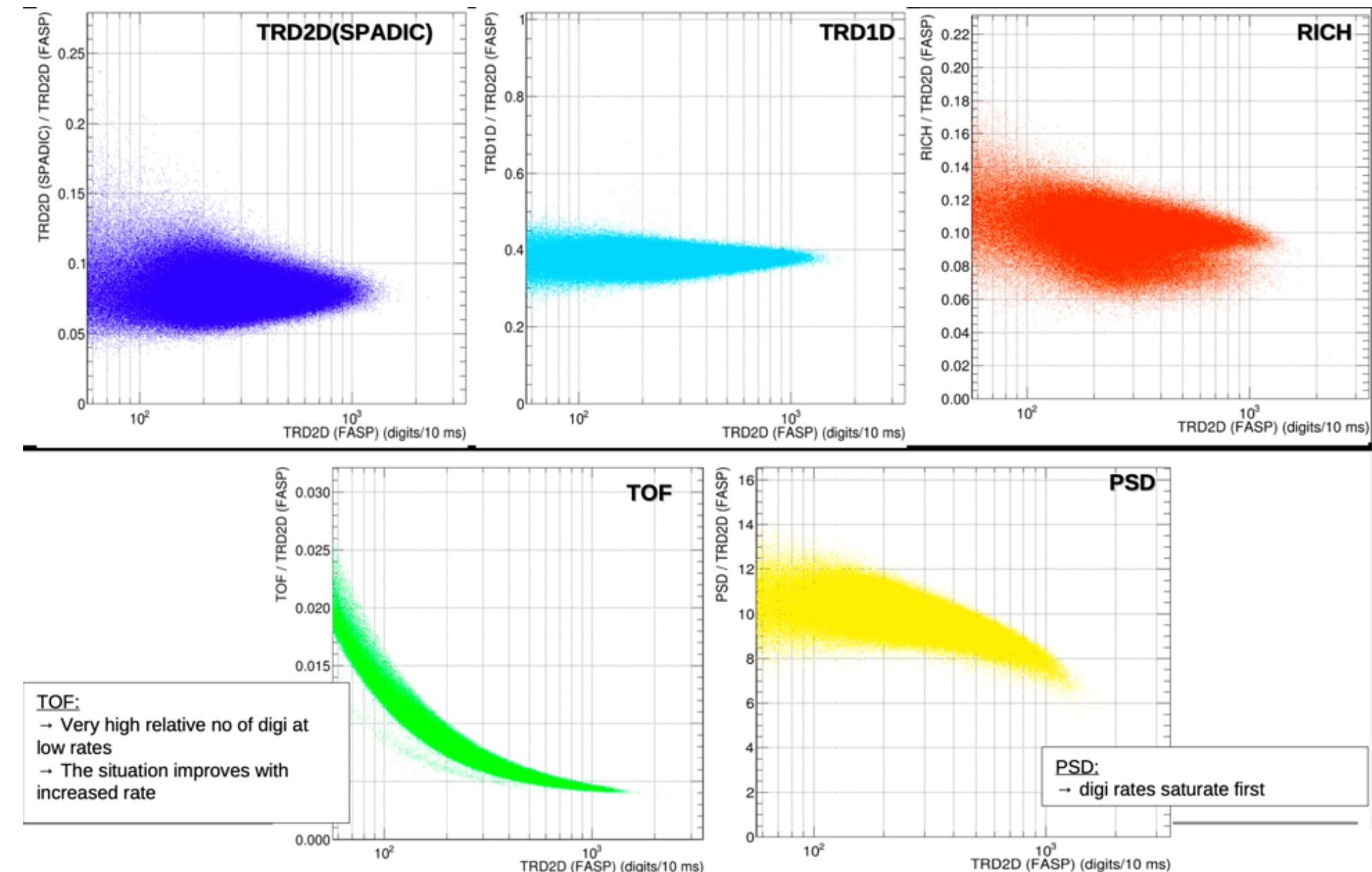
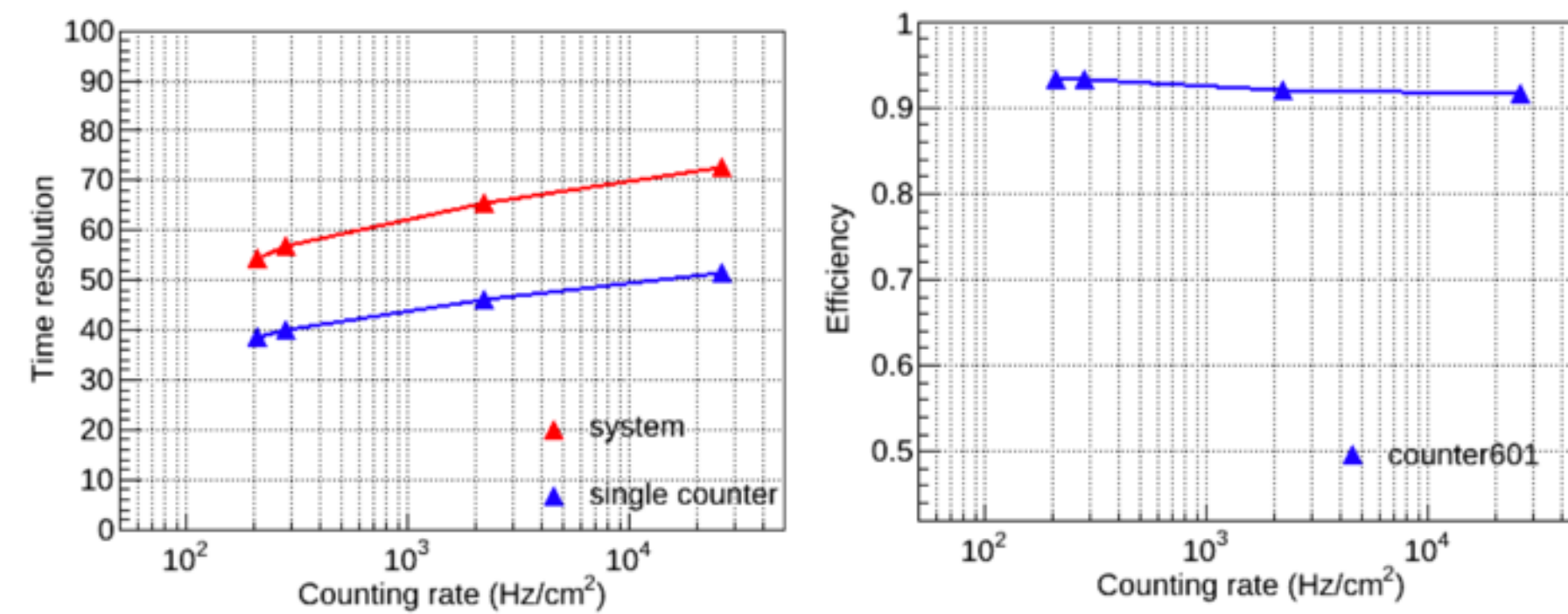
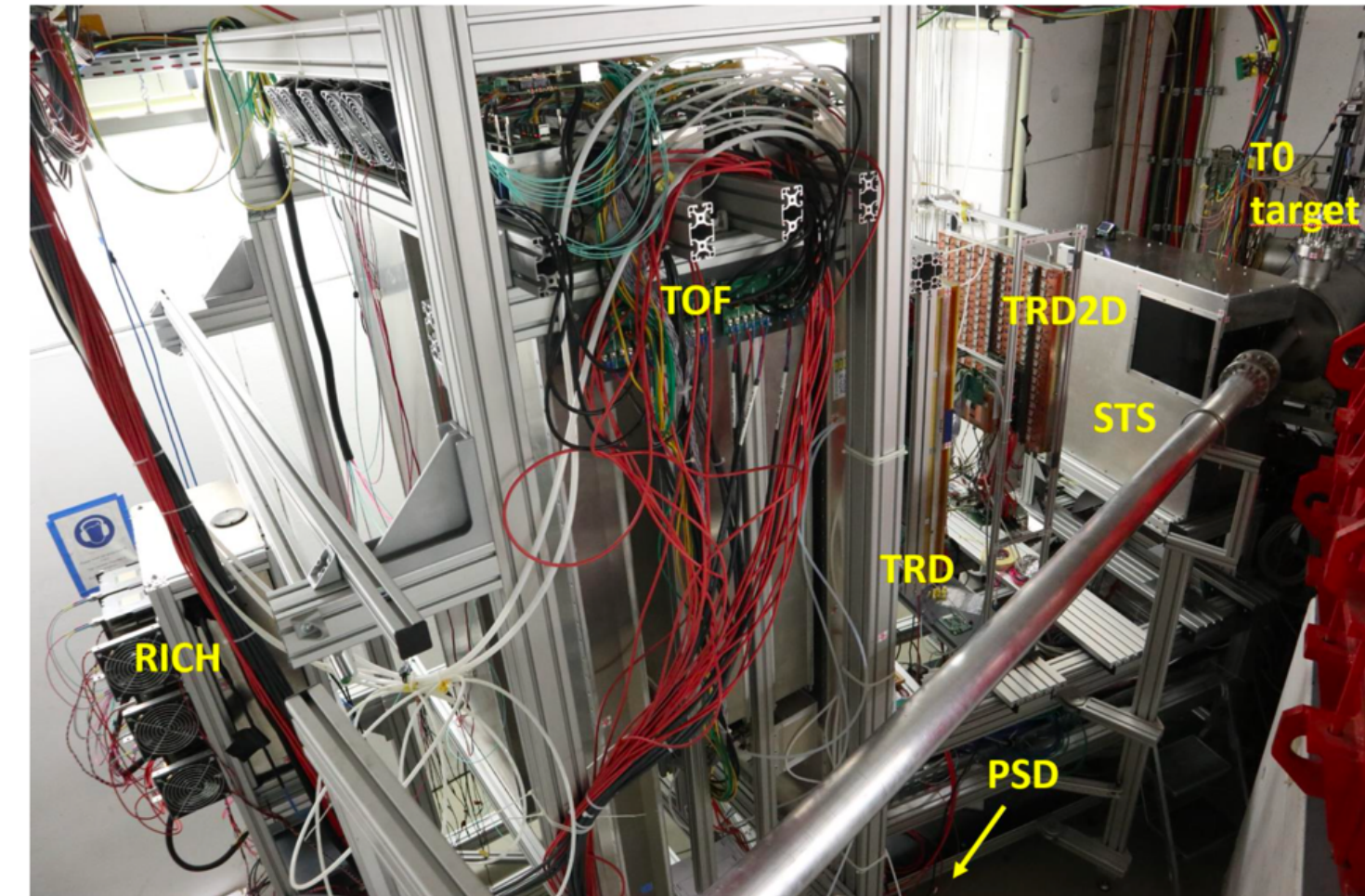
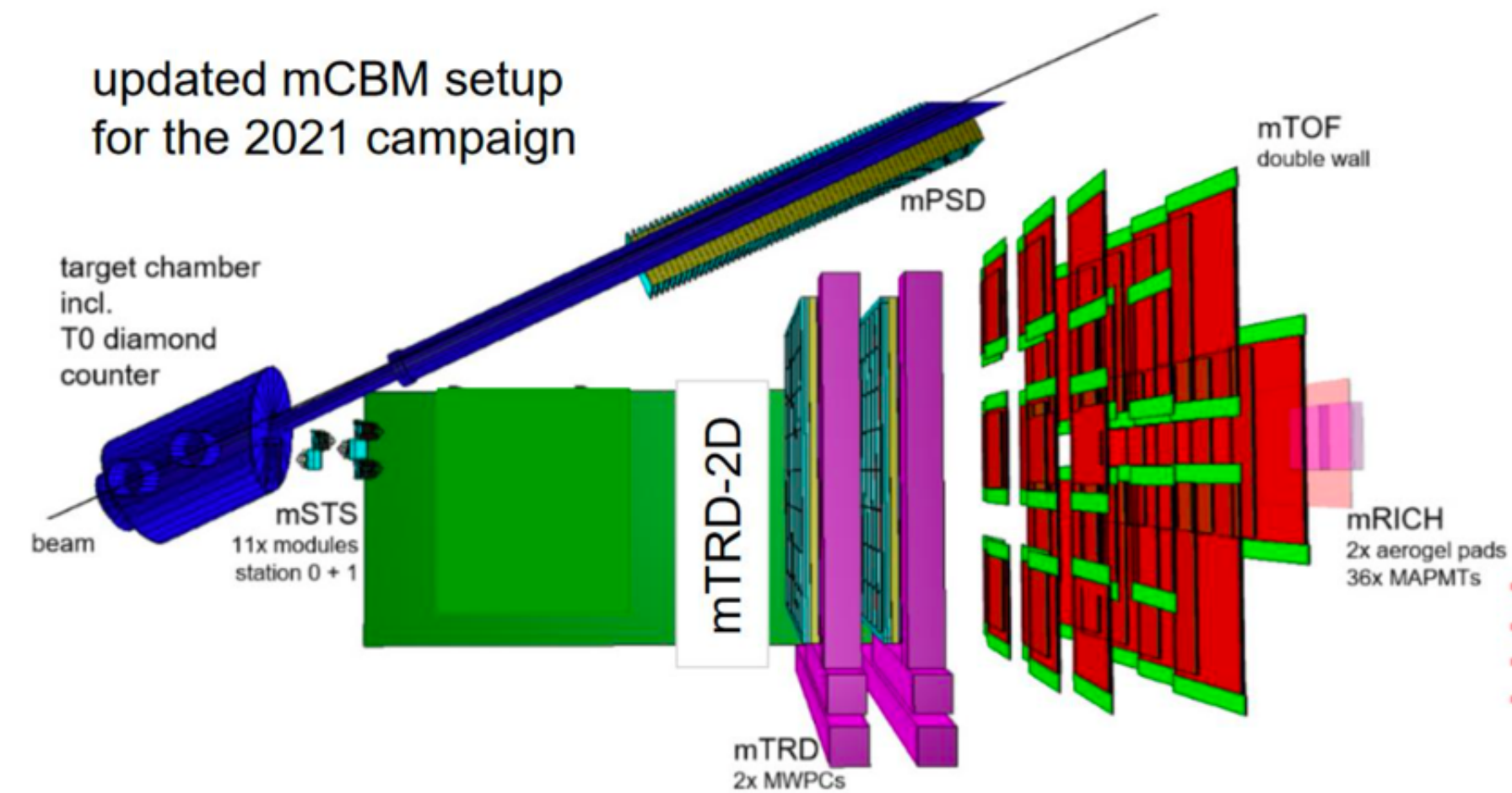
ALICE-TPC upgrade movie



<https://www.facebook.com/211078852968333/videos/582740123099895>

Impact on other activities

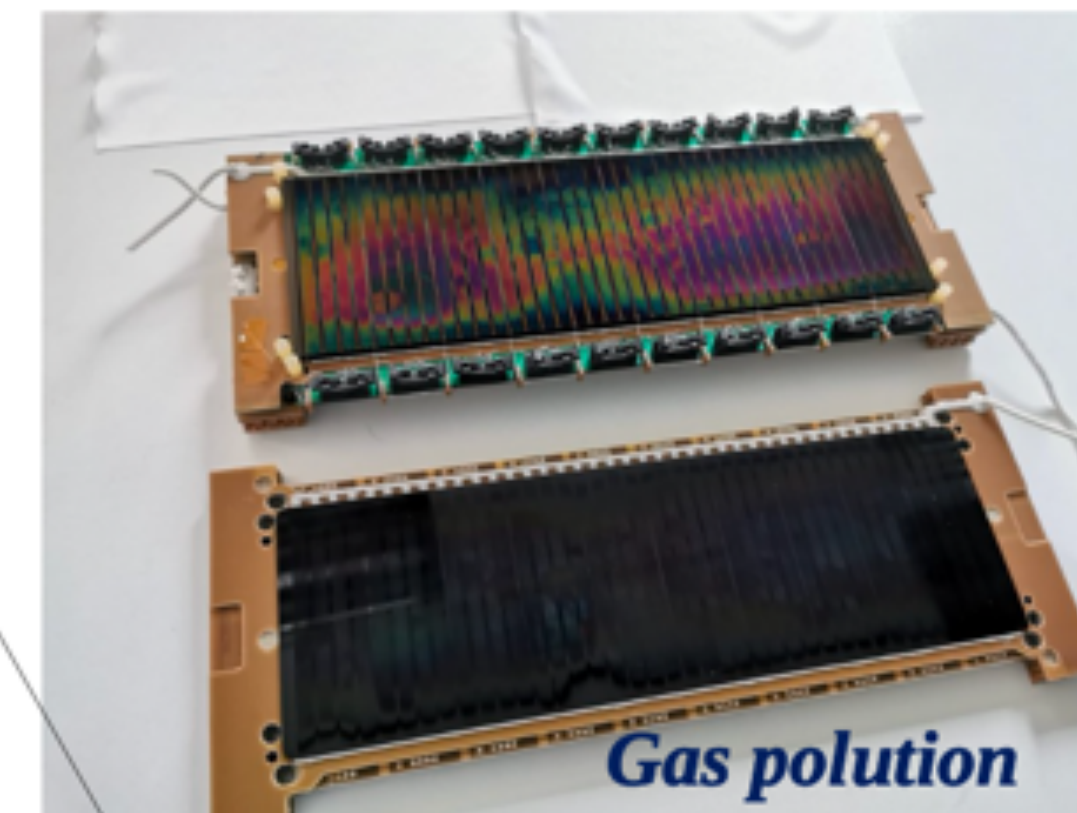
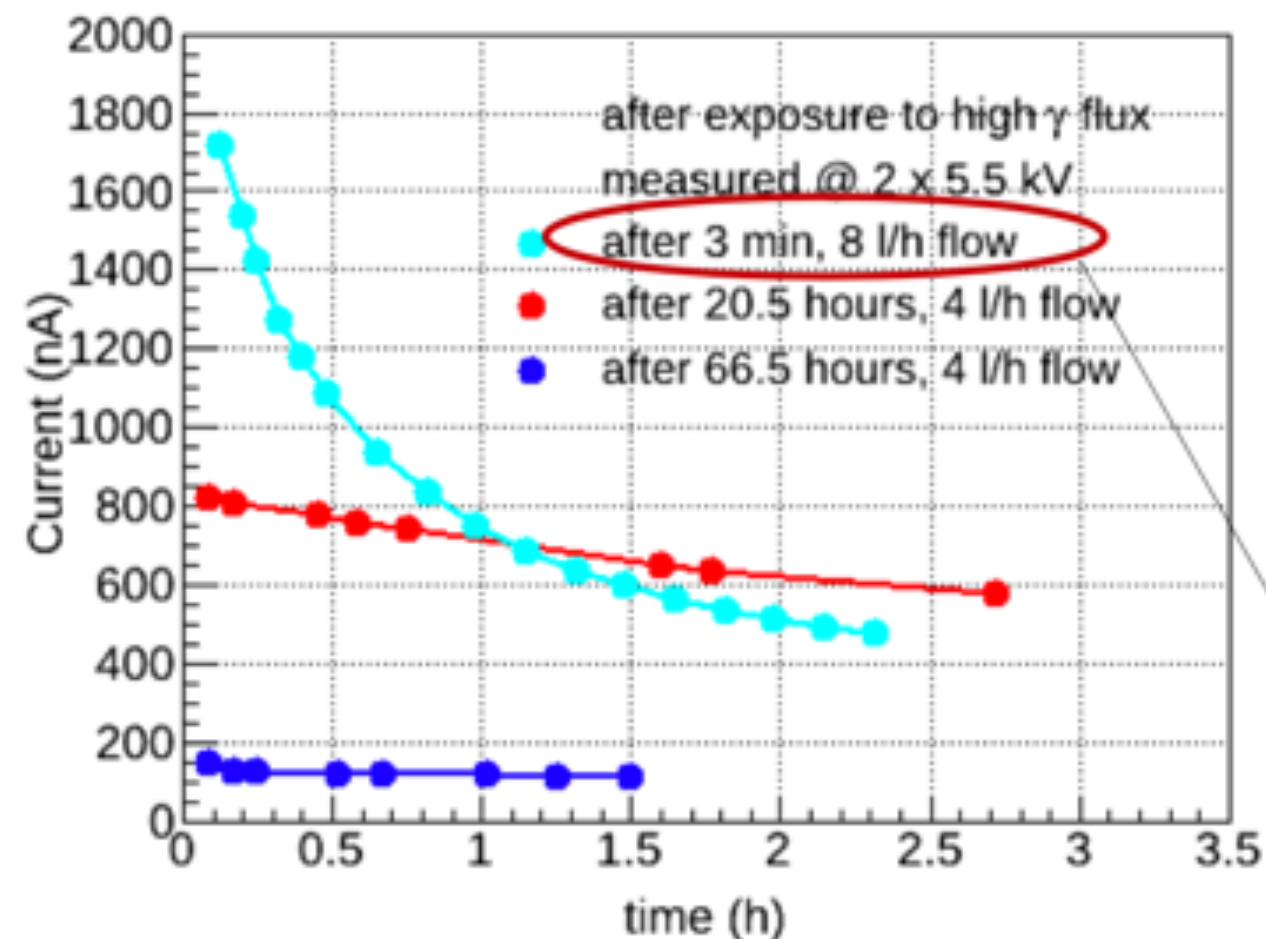
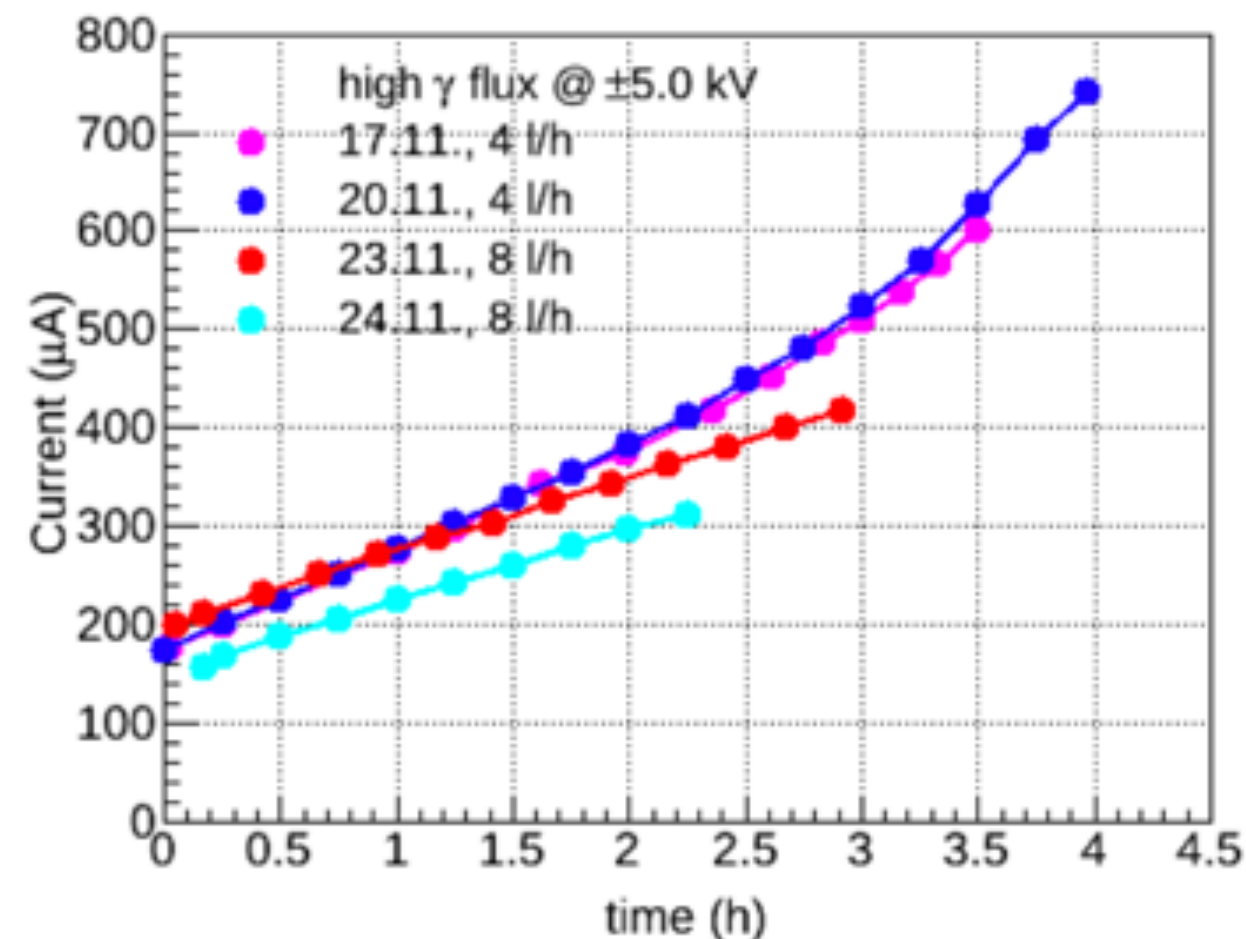
RPC & TRD-2D in mCBM FAIR Phase0 @ SIS18



Addendum of the CBM-TRD TDR was finalized and sent for EEC of FAIR

Impact on other activities

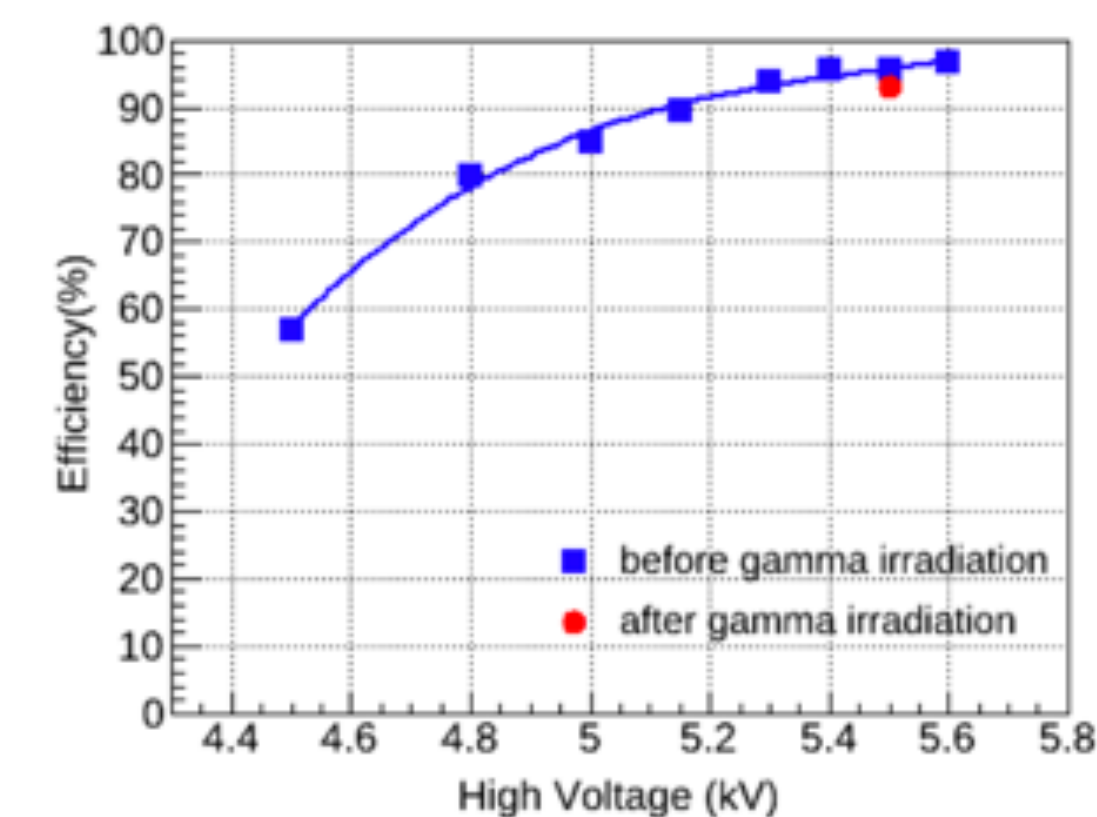
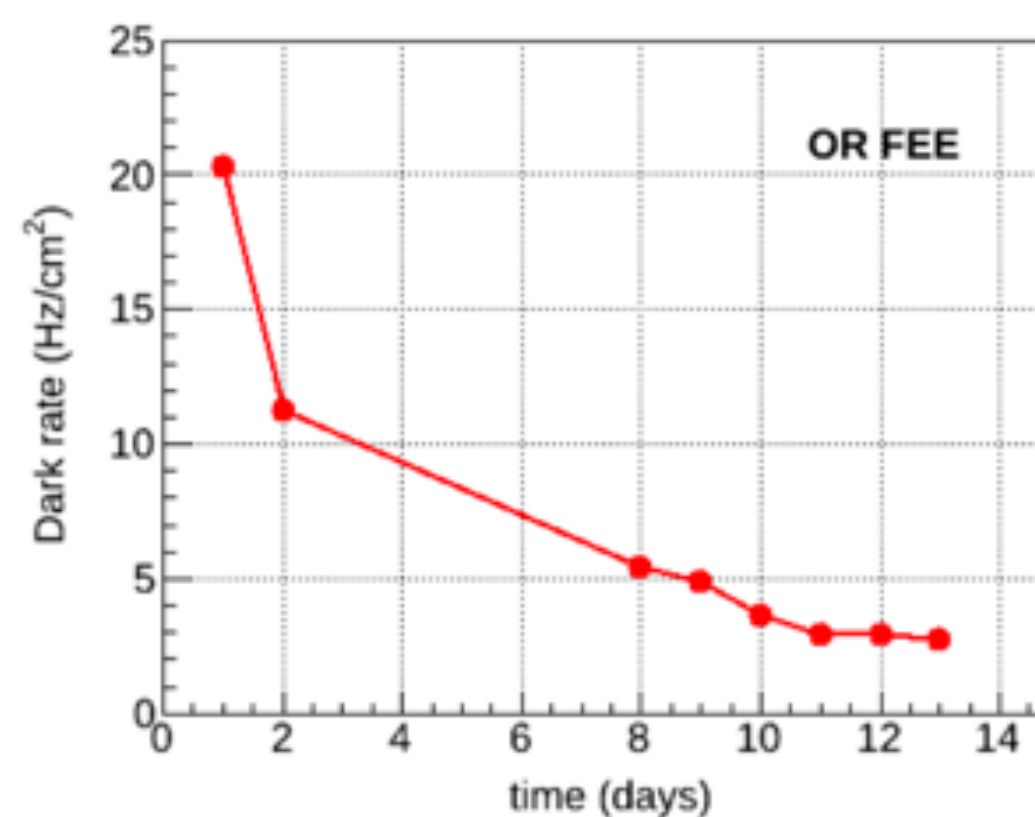
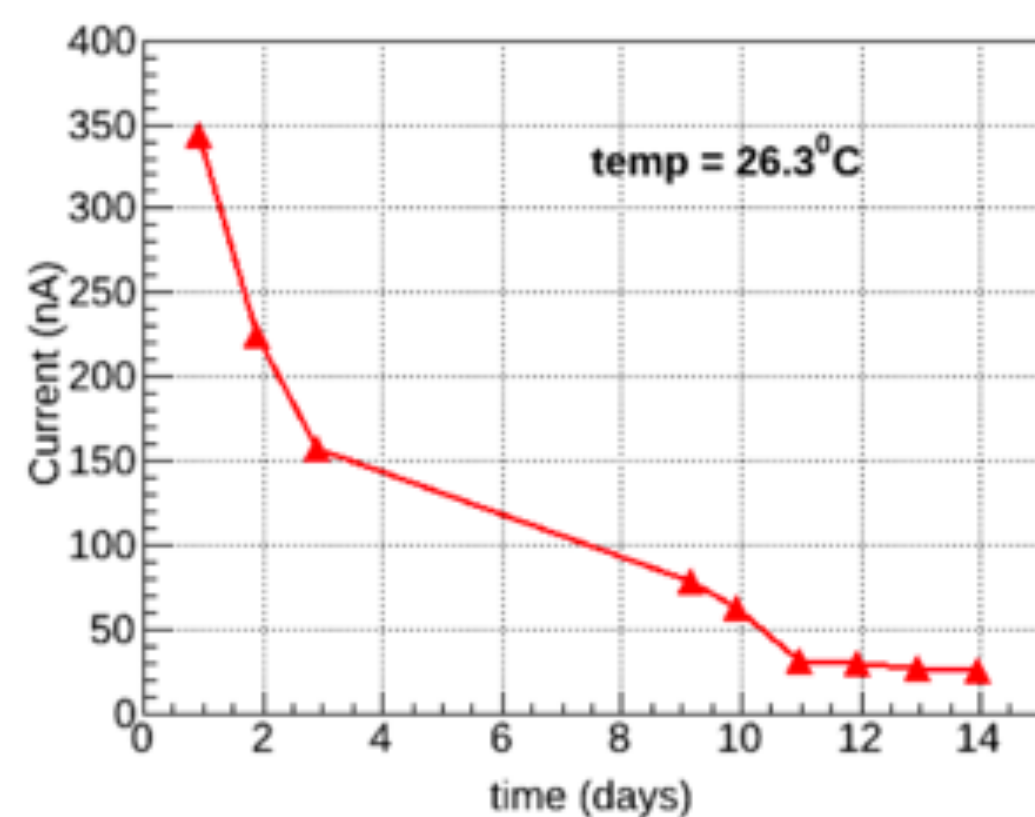
MSMGRPC - aging investigations



Gas pollution

Improved recovery with increased gas flow

Counter recovery after the end of the exposure



No change of the resistivity of the Chinese glass after exposure