UPDATE ON THE ANALYSIS OF GSI2 AND GSI1 ^{16}O (200 MEV)

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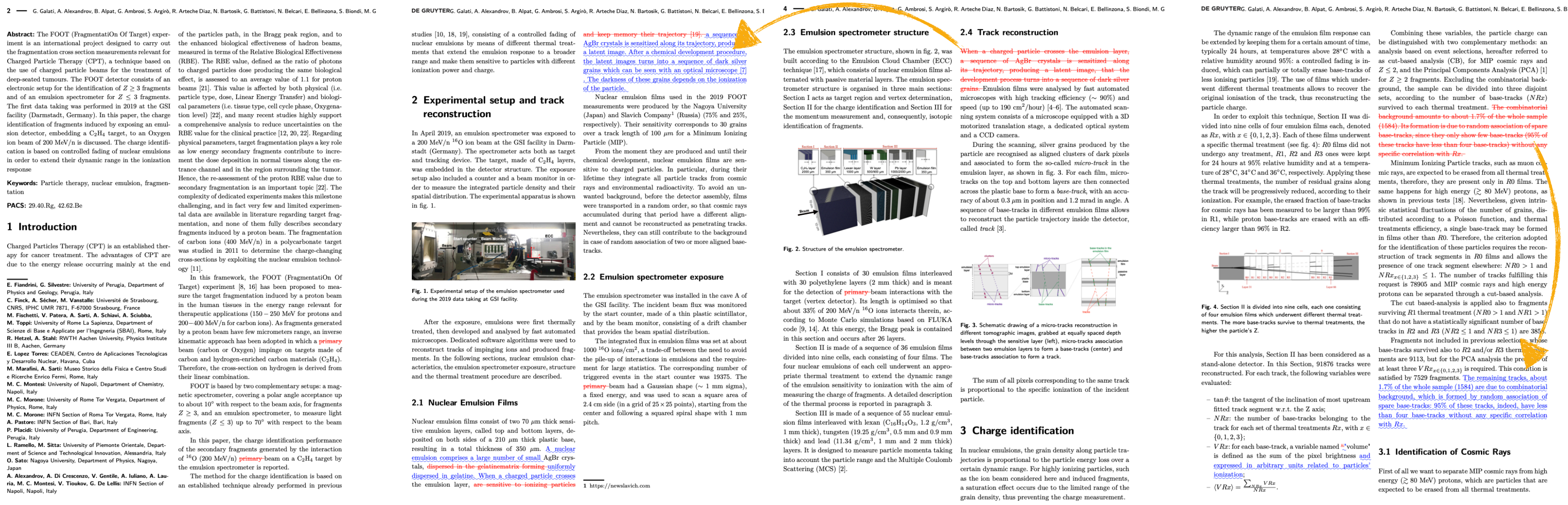
Outline

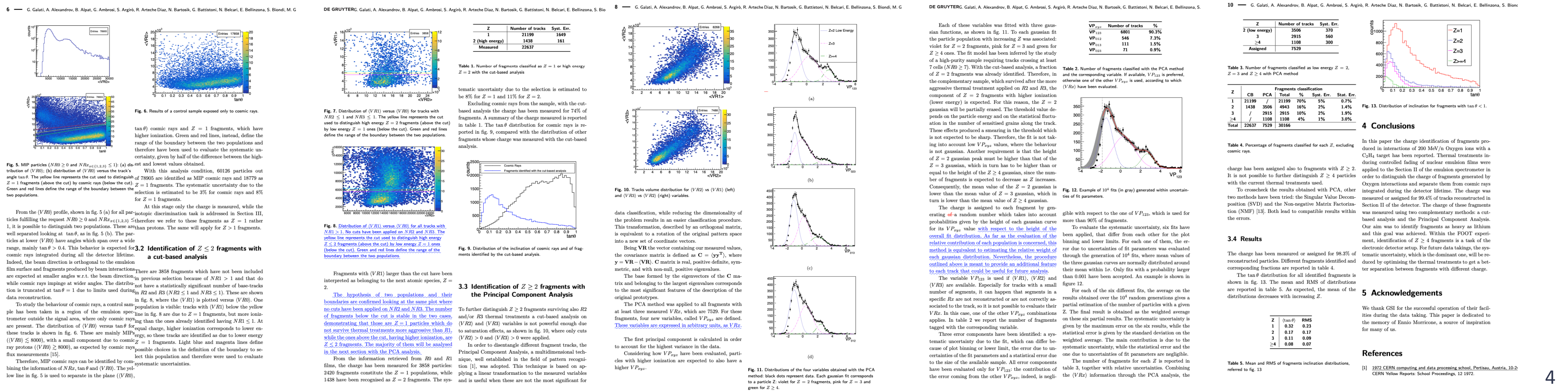
- Status of the paper submitted on OPEN PHYSICS
- Status of the analysis
  - Scanning Progresses
  - GSI1: tracking, vertexing, charge measurement

Status of the paper

Paper on OPEN PHYSICS

- Answers received from referees
- Mainly minor comments and additional explanation required
- Answers prepared, article's text+figures modified
- We'll submit the new version before the end of the week





Paper on OPEN PHYSICS

Reviewer #1: The text in figure 10 is very small and difficult to read. Please make this figure bigger so the text and data points are easier to see.

Reviewer #2

Major comments

1) Page 5- Lines 52-59 - left column
The procedure used to extract the percentage of combinatorial background (1.7%) should be detailed.

2) Par. 3.2 and Fig. 7
While the presence of two populations (cosmics and Z=1) is evident in Fig. 5, the same is not true for Fig. 7. It is not clear to me how the presence of Z=2 fragments can be inferred by data for the class of events reported in Fig. 7. Moreover, the choose of the position of the boundaries between the "two populations" looks to me completely arbitrary. This also affects the associated systematic uncertainties.
The authors should better ague the results of this paragraph or maybe reconsider their interpretation.

3) Page 8 - Lines 44-47 and 53-57 - left column
Authors should specify why the charge assignment is done taking into account the gaussian height and not the integral. What is the meaning of the sigma in the fits of Fig. 10?

Minor comments

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The effects of ionizing radiation on AgBr crystals could be described more clearly.

2) Page 3 - Line 39 - right column
Change "primary beam" with "beam"

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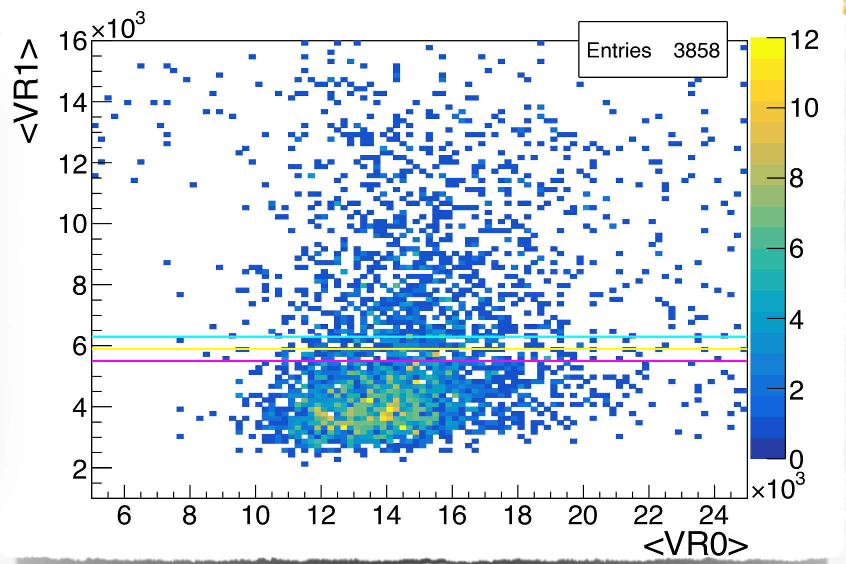
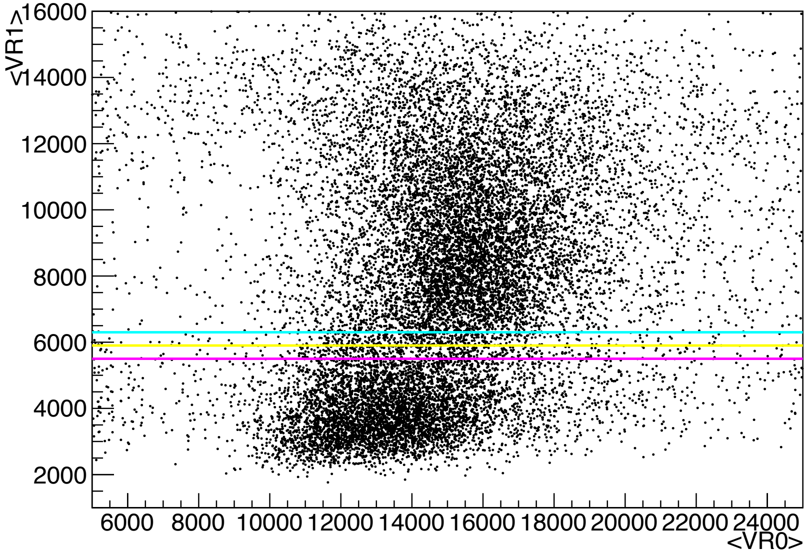
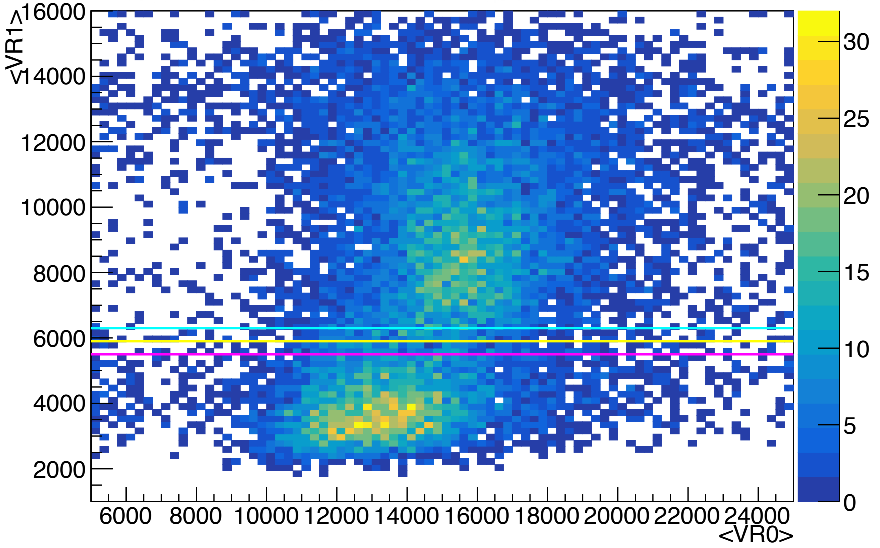


- Two populations and their boundaries are confirmed looking at the same plot where no cuts have been applied on NR2 and NR3
- The number of fragments below the cut (Z=1) is stable in the two cases
- New plot and related explanation added also in the paper





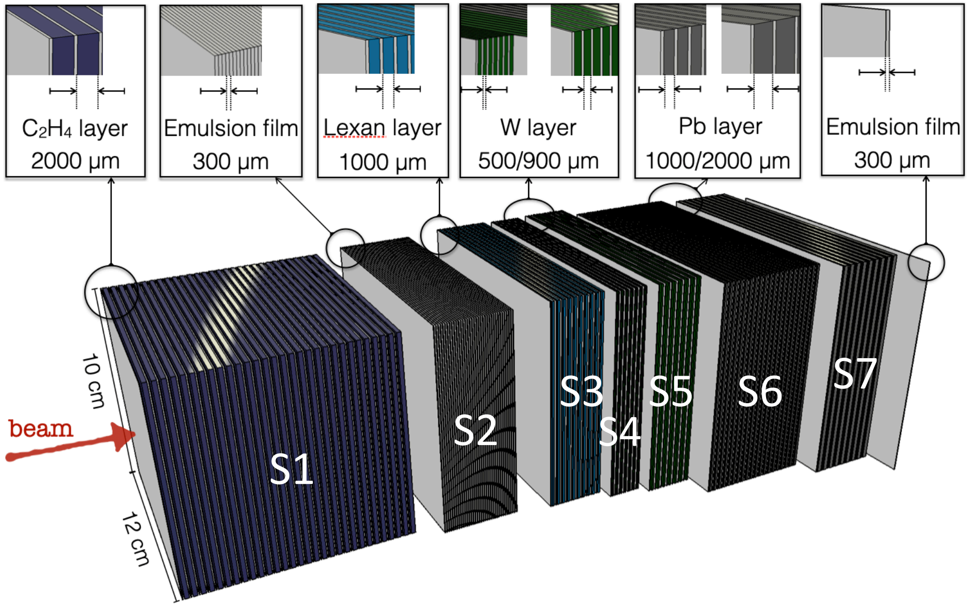
Distribution of $\langle VR1 \rangle$ versus $\langle VR0 \rangle$ for all tracks with NR1>1

No cuts have been applied on NR2 and NR3

Updates on the Analysis

Scanning Progress

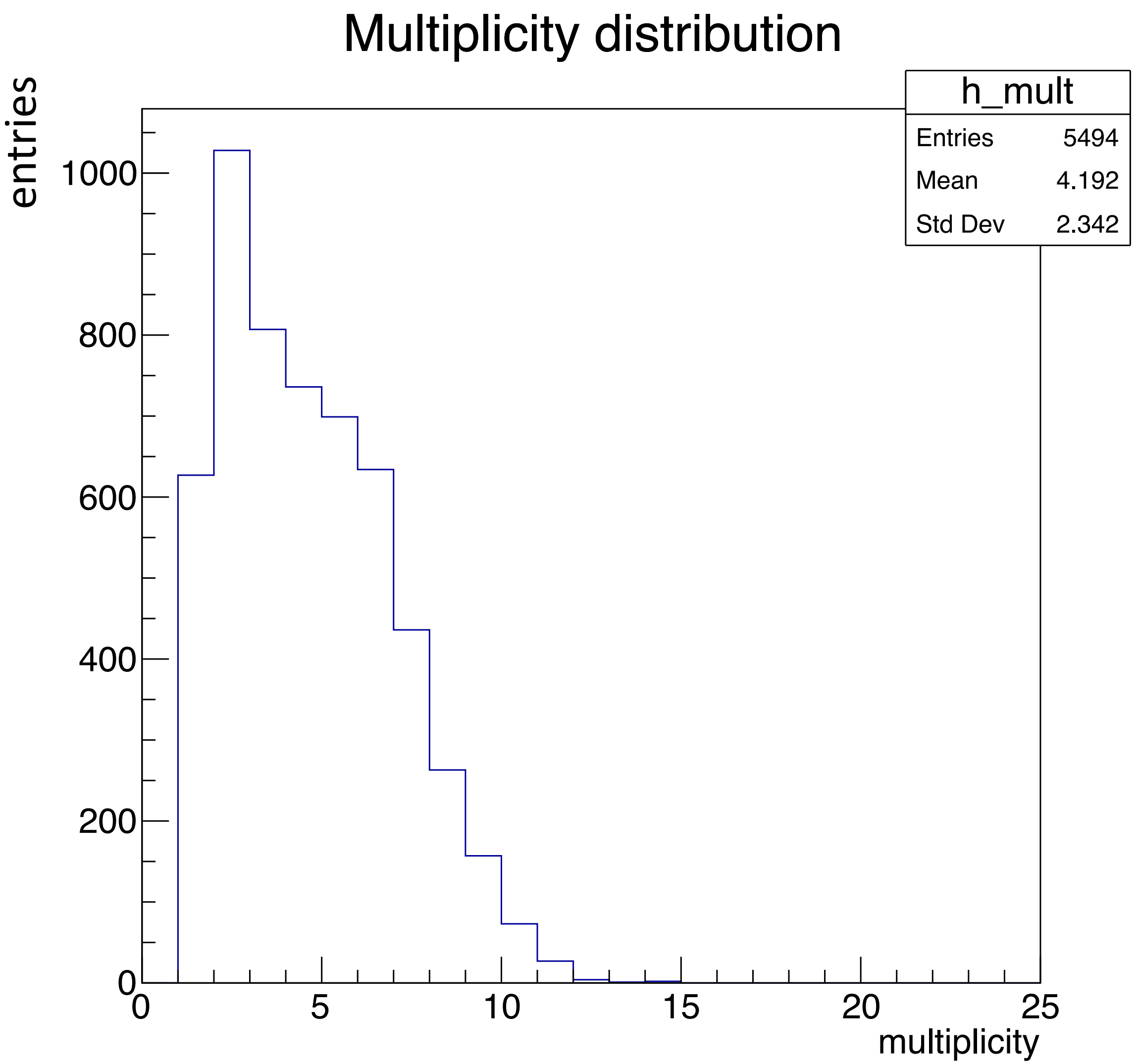
Target \ Beam	2019 Oxygen 200 MeV/n	2019 Oxygen 400 MeV/n	2020 Carbon 700MeV/n
Carbon	GSI1	GSI3	GSI5
Polyethylene	GSI2	GSI4	GSI6



- 2019 (GSI1, GSI2, GSI3, GSI4):
  - scanning: 100%
  - alignment:
    GSI1: 100%
    GSI2: 100%
    GSI3: 47%
    GSI4: 21%
  - tracking:
    GSI2: S1+S2 completed, S3 (=S3+S4+S5+S6+S7) started
    GSI1: S1+S2 quality checks ongoing
- 2020 (GSI5, GSI6):
  - scanning: 328/328 (100%)

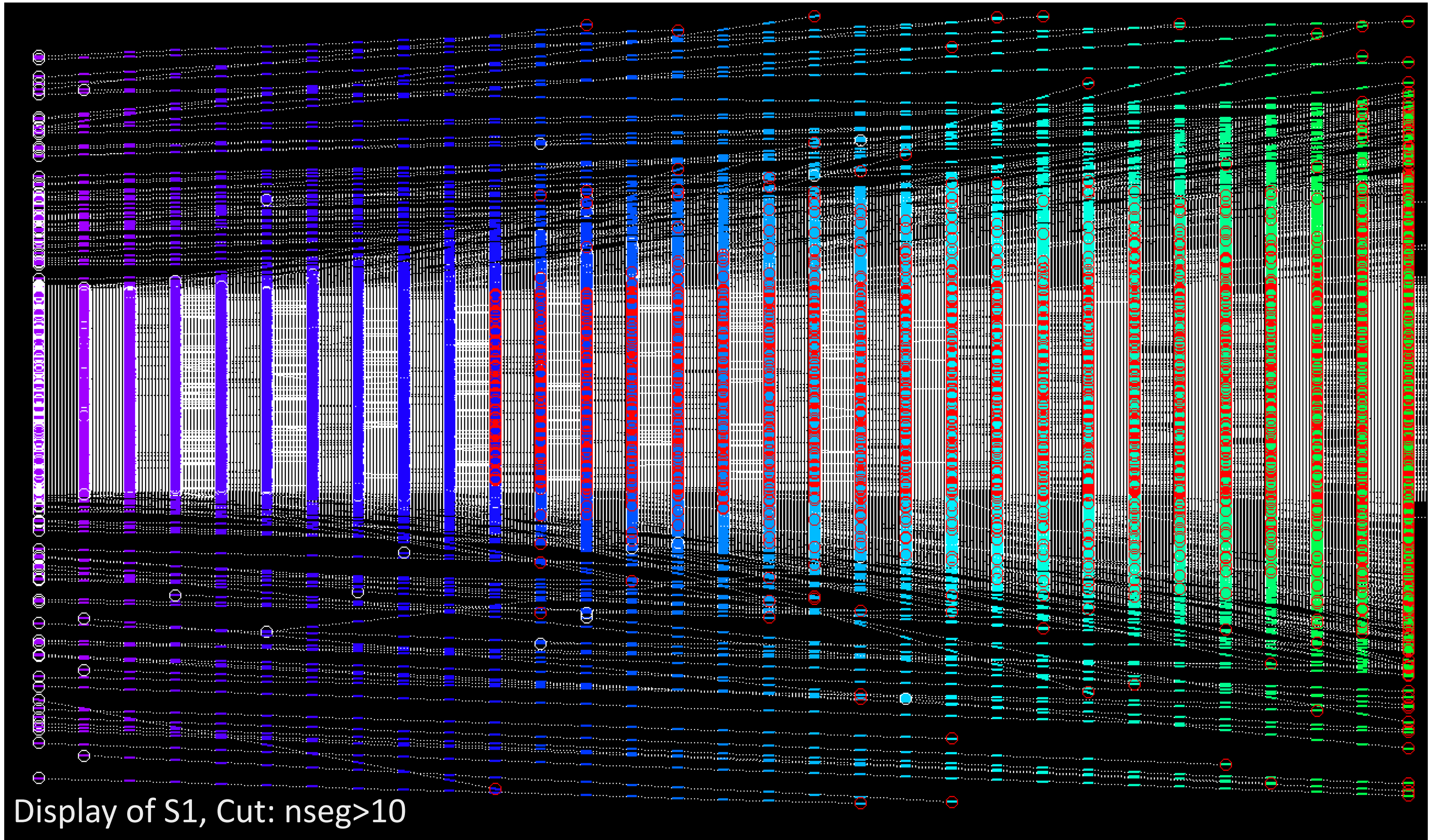
GSI1: MC Analysis

- New MC simulation with Fluka2020
- 5623 vertices expected in S1
- Mean multiplicity: 4
- 96.2% of tracks contained



Tracks reconstruction

- MC exported in data format, with smearing and inefficiencies
- Combinatorial background due to spare base tracks added to MC



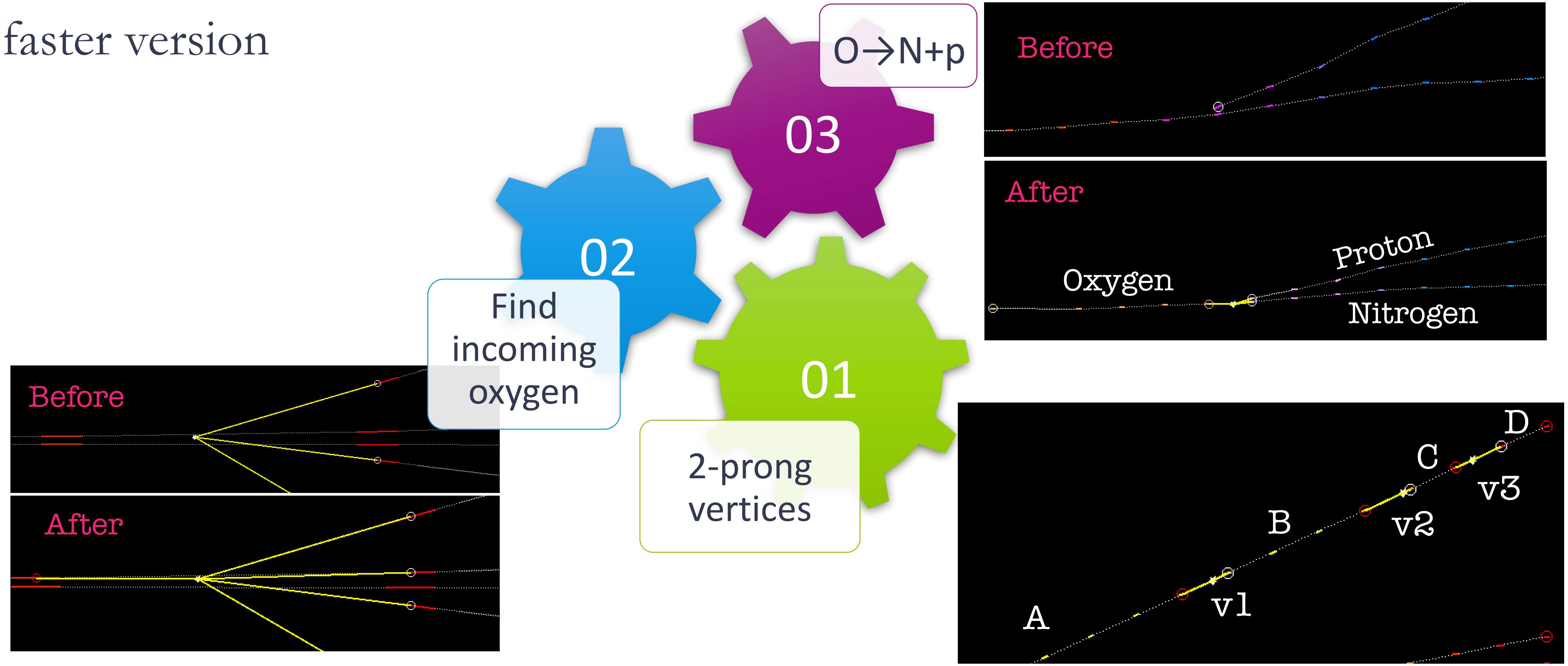
Display of S1, Cut: nseg>10

Vertices Reconstruction (MC)

- 5188 vertices reconstructed with at least 3 tracks
- Vertices quality improvements: ongoing

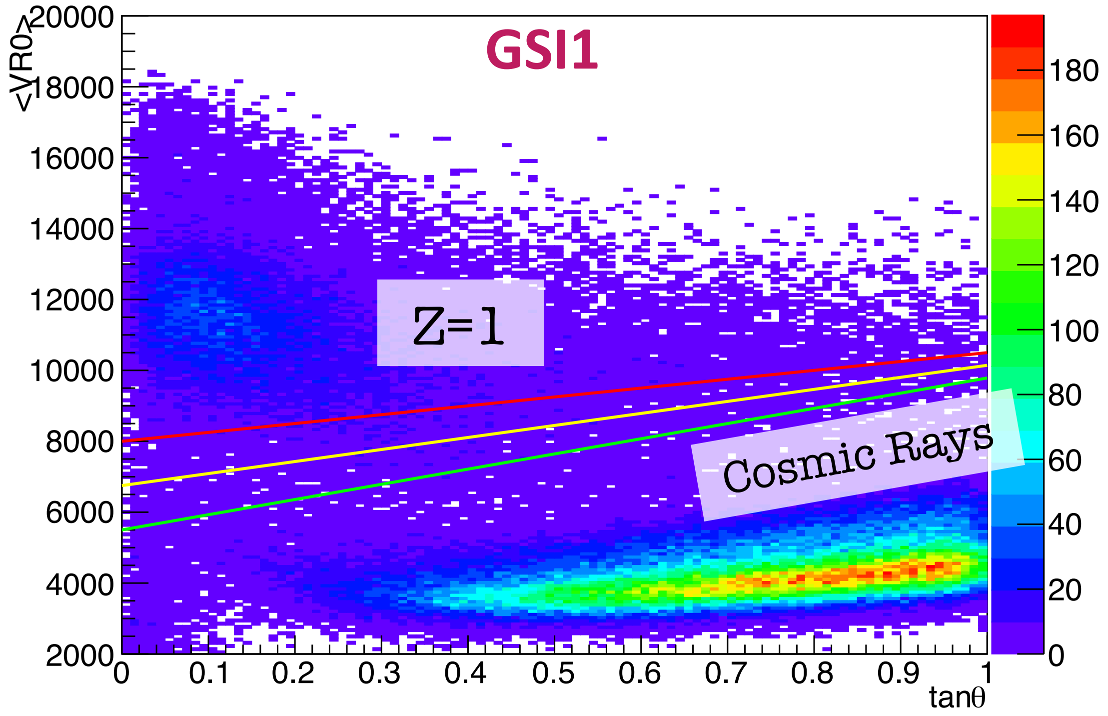
- Algorithm too slow
- Working on a faster version

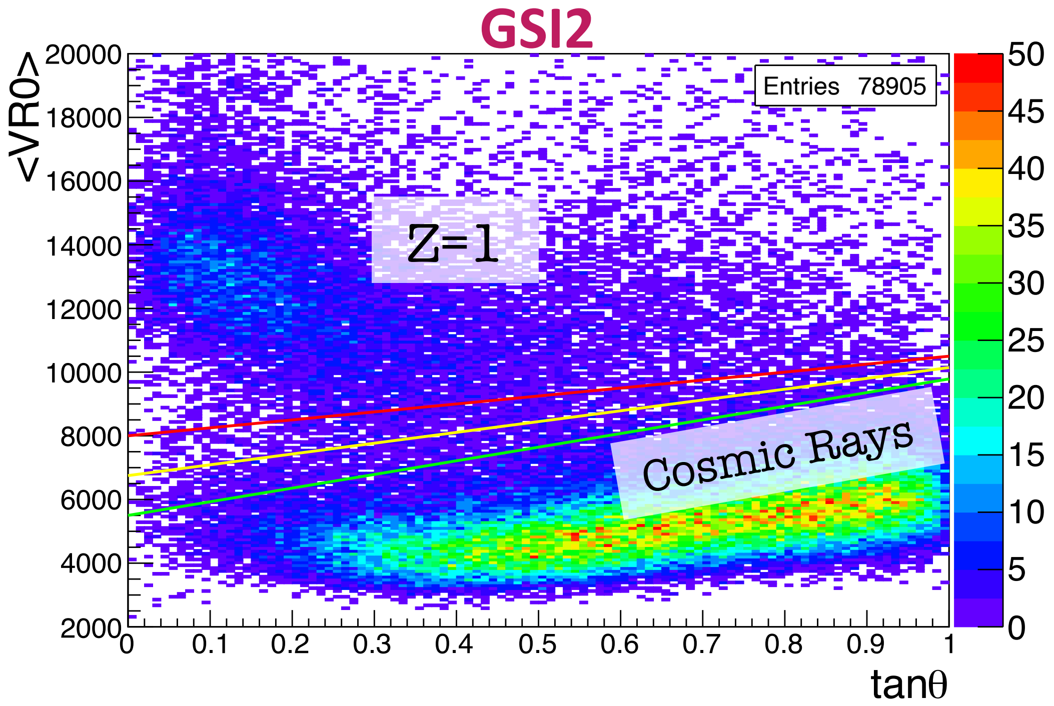
- Working on purity of O→N+p topologies



Charge reconstruction - preliminary

- Charge analysis ongoing on GSI1-S2 **data**
- The charge assignment strategy works also on this dataset, as expected
- Results still preliminary





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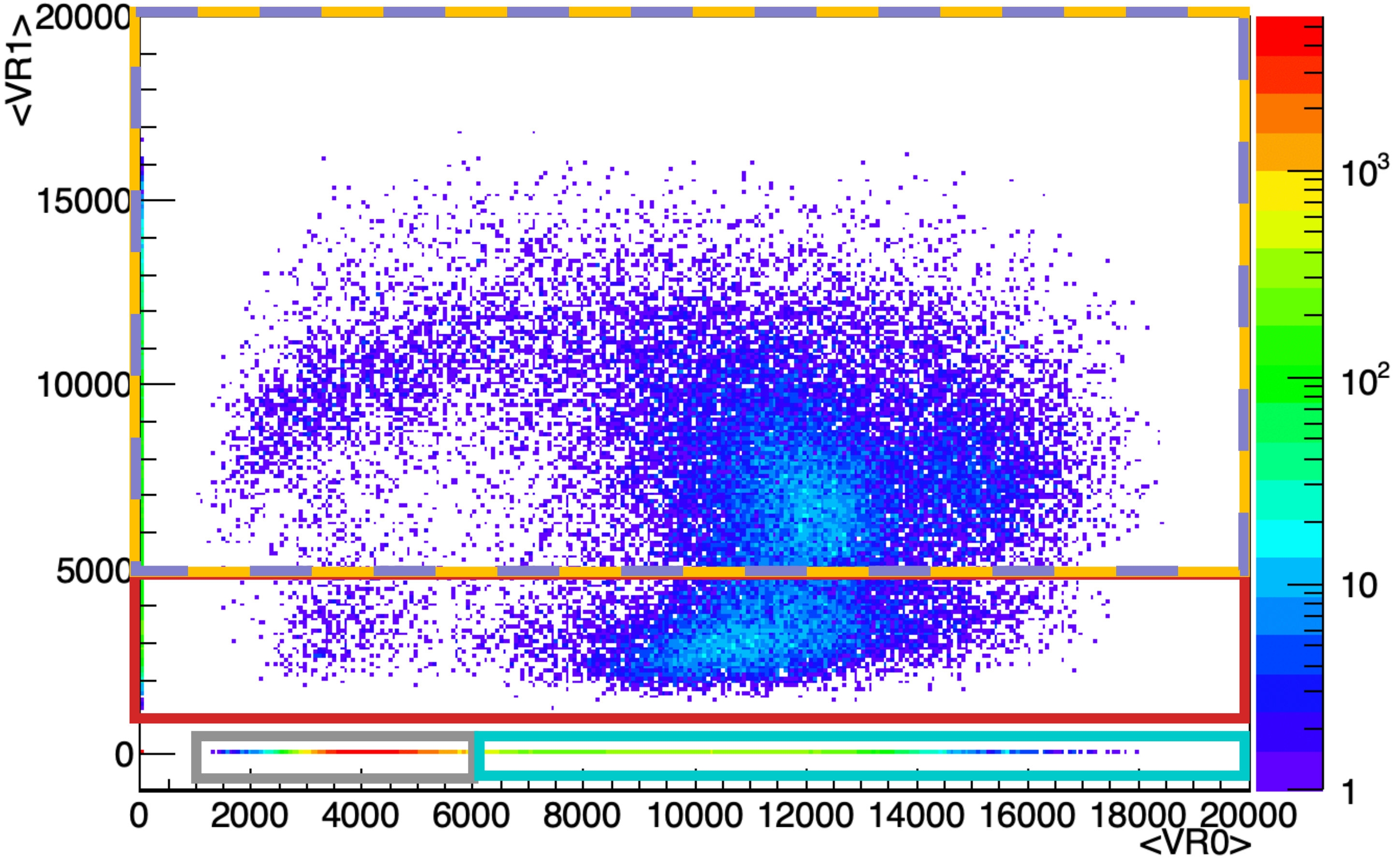
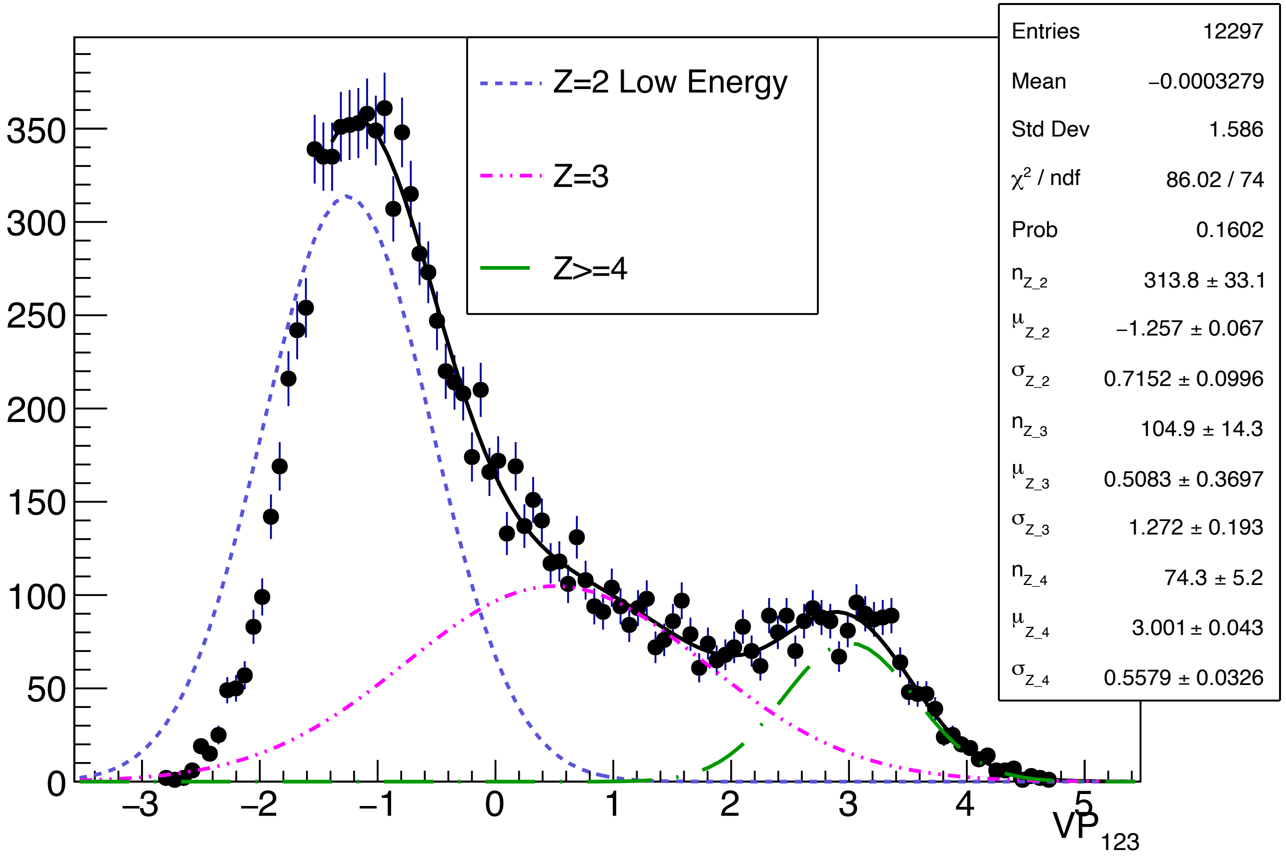


- **Cosmic Rays:** $0 < \langle VR0 \rangle < a\theta + b$ & nseg1<2 & nseg2<2 & nseg3<2
- **High energy Z=1:** $\langle VR0 \rangle \geq a\theta + b$ & nseg1<2 & nseg2<2 & nseg3<2
- **Low energy Z=1:** $\langle VR0 \rangle \geq 0$& $0 < \langle VR1 \rangle < c$ & nseg2<2 & nseg3<2
- **High energy Z=2:** $\langle VR1 \rangle \geq c$ & nseg2<2 & nseg3<2
- **Z≥2: at least 3 VRx → Principal Components Analysis**

Principal Component Analysis - Preliminary



- $VP_{123} = a \cdot \langle VR1 \rangle + b \cdot \langle VR2 \rangle + c \cdot \langle VR3 \rangle$
- 3 gaussian-model confirmed

Conclusions

- The paper with charge assignment results will be submitted again in few days: all comments by referees have been answered
- GSI1 analysis started both on “reconstructed MC” and Data: quality checks ongoing before giving first results
- Still working to improve tracking and vertices reconstruction
- Charge analysis on GSI1 ongoing

THANK YOU!