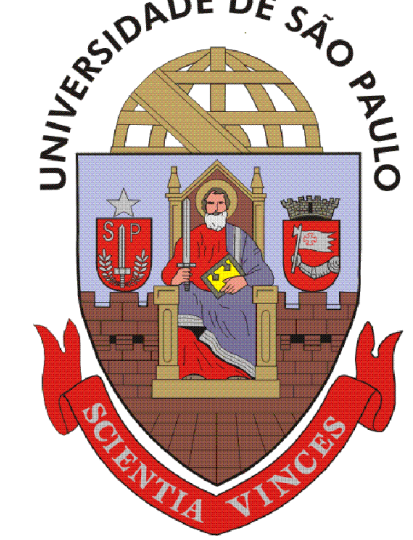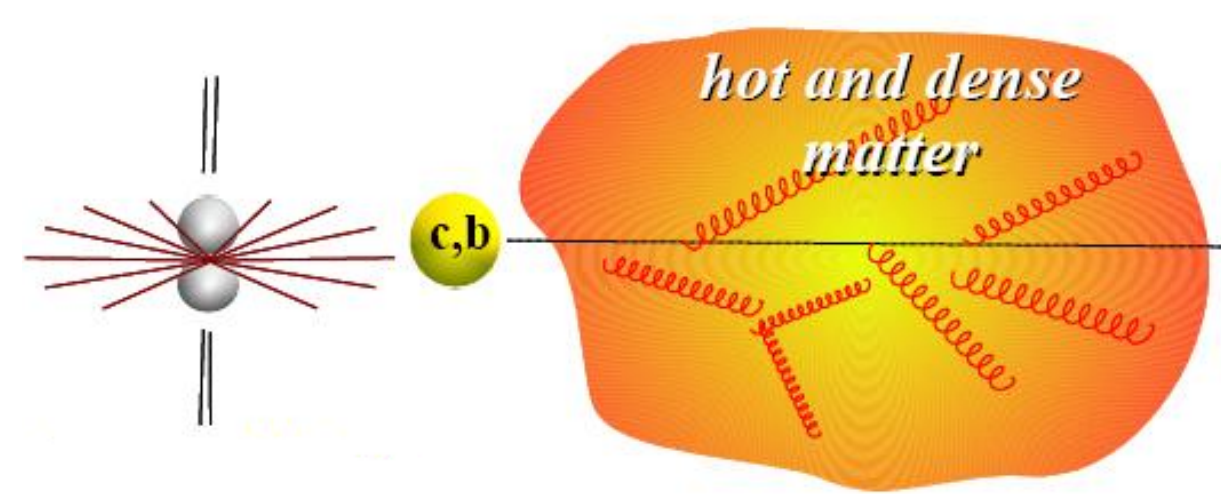# Elliptic flow of high transverse momentum electrons from heavy-flavour decays in Pb-Pb collisions at $\sqrt{s_{NN}}$=2.76 TeV measured by ALICE
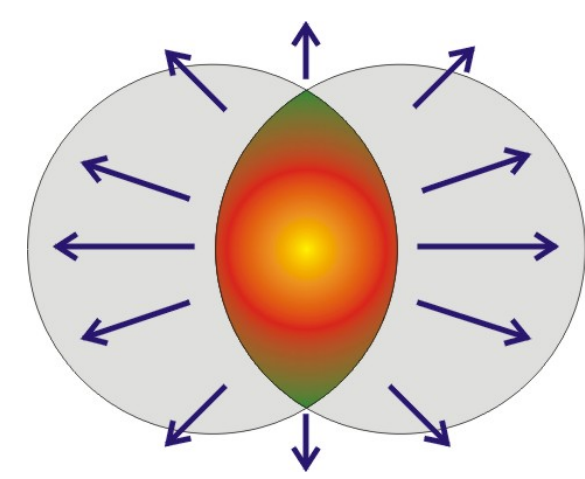
Quark Matter 2012
12-18 August

Denise Moreira de Godoy for the ALICE Collaboration
University of Sao Paulo

Motivation

- Heavy quarks, charm and bottom, are produced in early stages of heavy-ion collisions.
- Propagating through the created matter they serve as a probe of the dynamics of the strongly-interacting, hot and dense plasma of quarks and gluons (QGP).

- Non-central collisions generate space anisotropy in the particle distribution in the early stages of the collision.
- If there is collective motion or energy loss in asymmetric medium, momentum anisotropy can be observed in the particle azimuthal distribution.

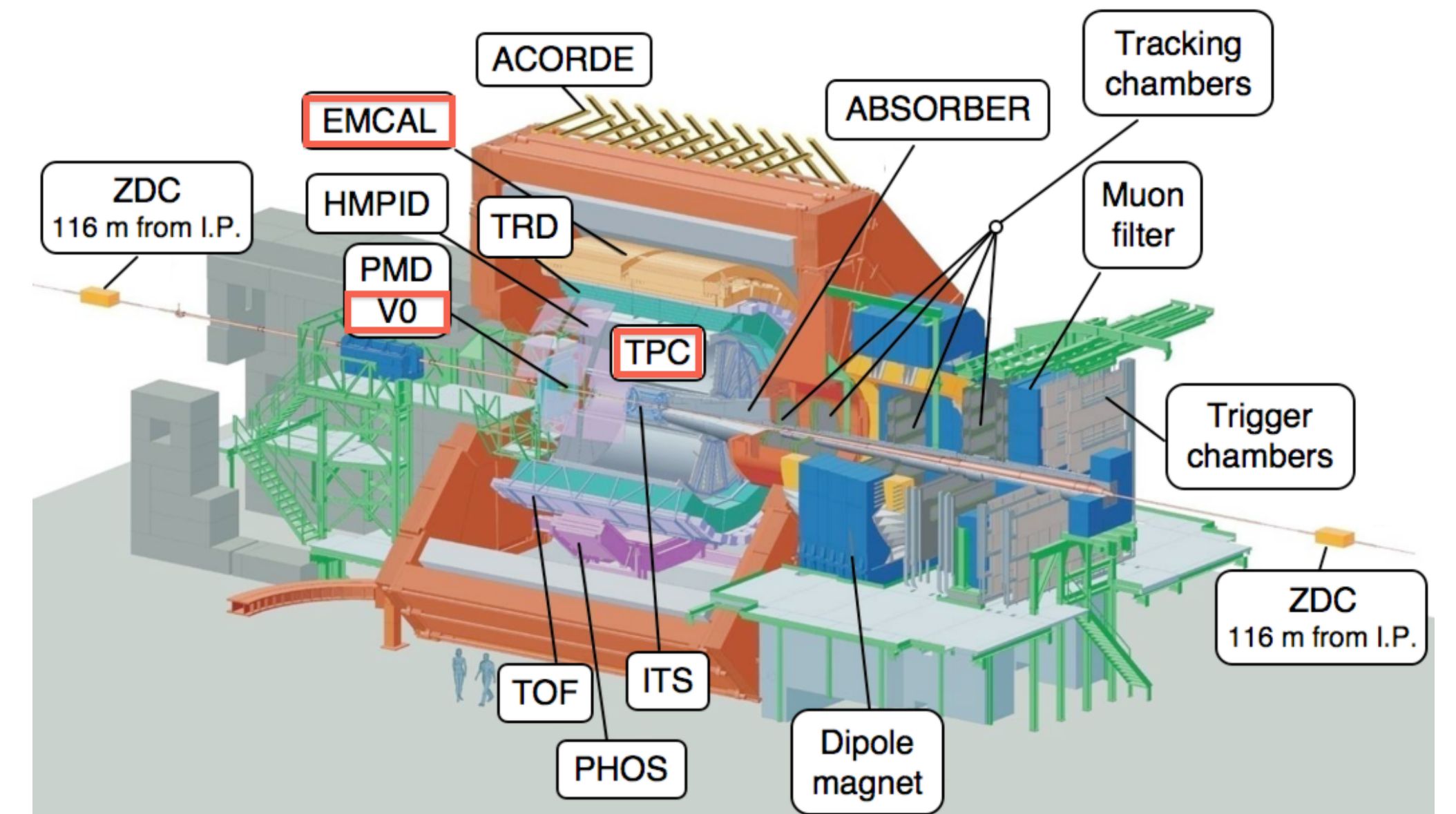## ALICE detector

Electron identification:
- ITS
- TOF   - TPC
- TRD   - EMCal

Event plane determination:
- TPC   - VZERO

Event selection:
- Semi-central trigger
7.3×10^6 events in 20-40% central collisions
- Single-shower trigger
1.3×10^6 events in 20-40% central collisions

Results

- Inclusive electron v$_2$ was obtained as a function of the transverse momentum.
- The non-heavy flavour electron background was estimated with the so called cocktail method[1, 2].
- The azimuthal anisotropy parameter of electrons from heavy-flavour decays is given by:

$$v_2^{\text{heavy-flavour decay electron}} = \frac{(1+R)v_2^{\text{inclusive electron}} - v_2^{\text{electron background}}}{R}$$

where $R = \frac{\text{inclusive electrons}}{\text{electron background}} - 1$.

- Final result is a combined measurement from TOF-TPC and TPC-EMCal[1, 2].
- Result was compared to the results from the PHENIX experiment[3] and theoretical prediction[4 − 6].
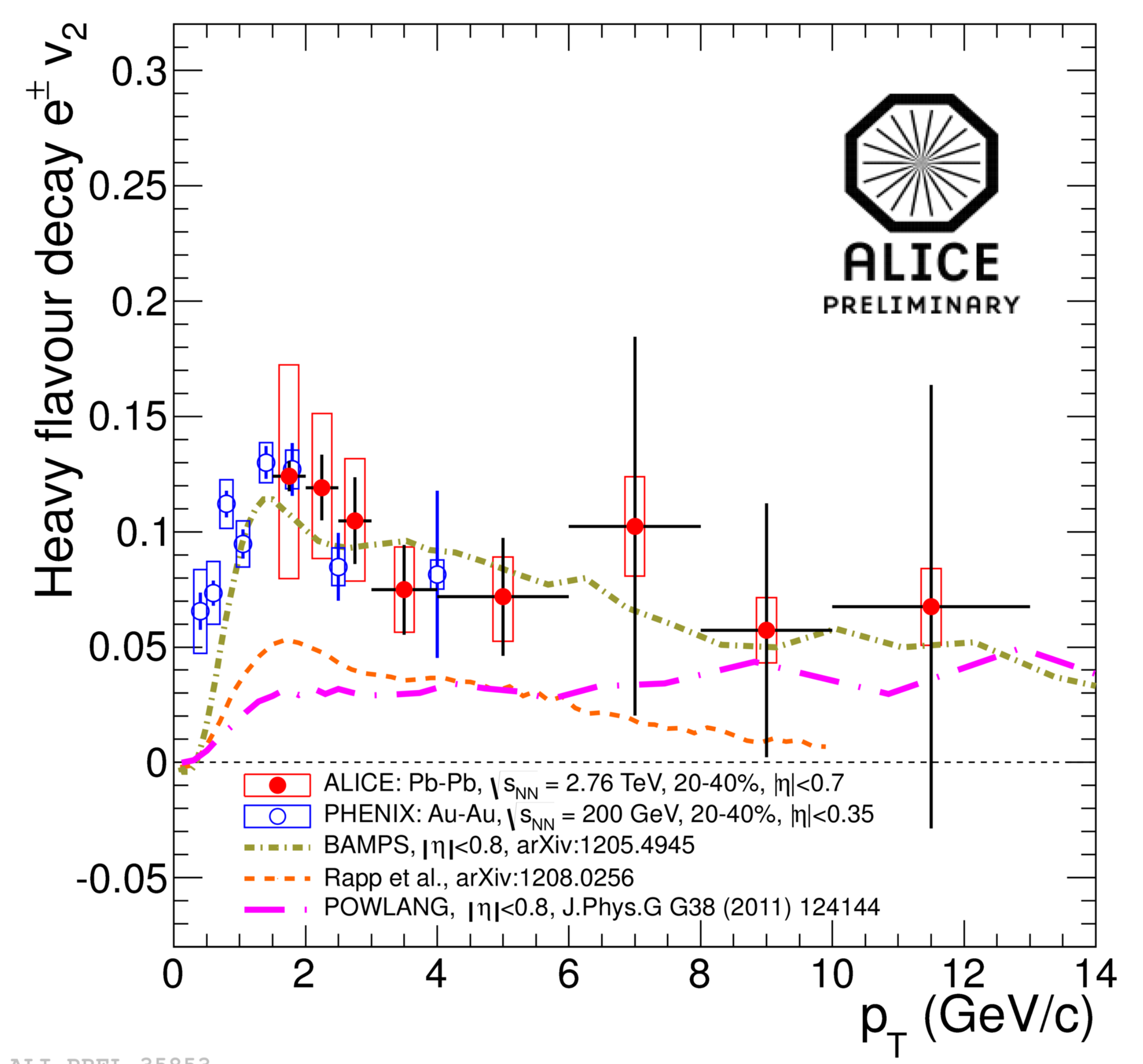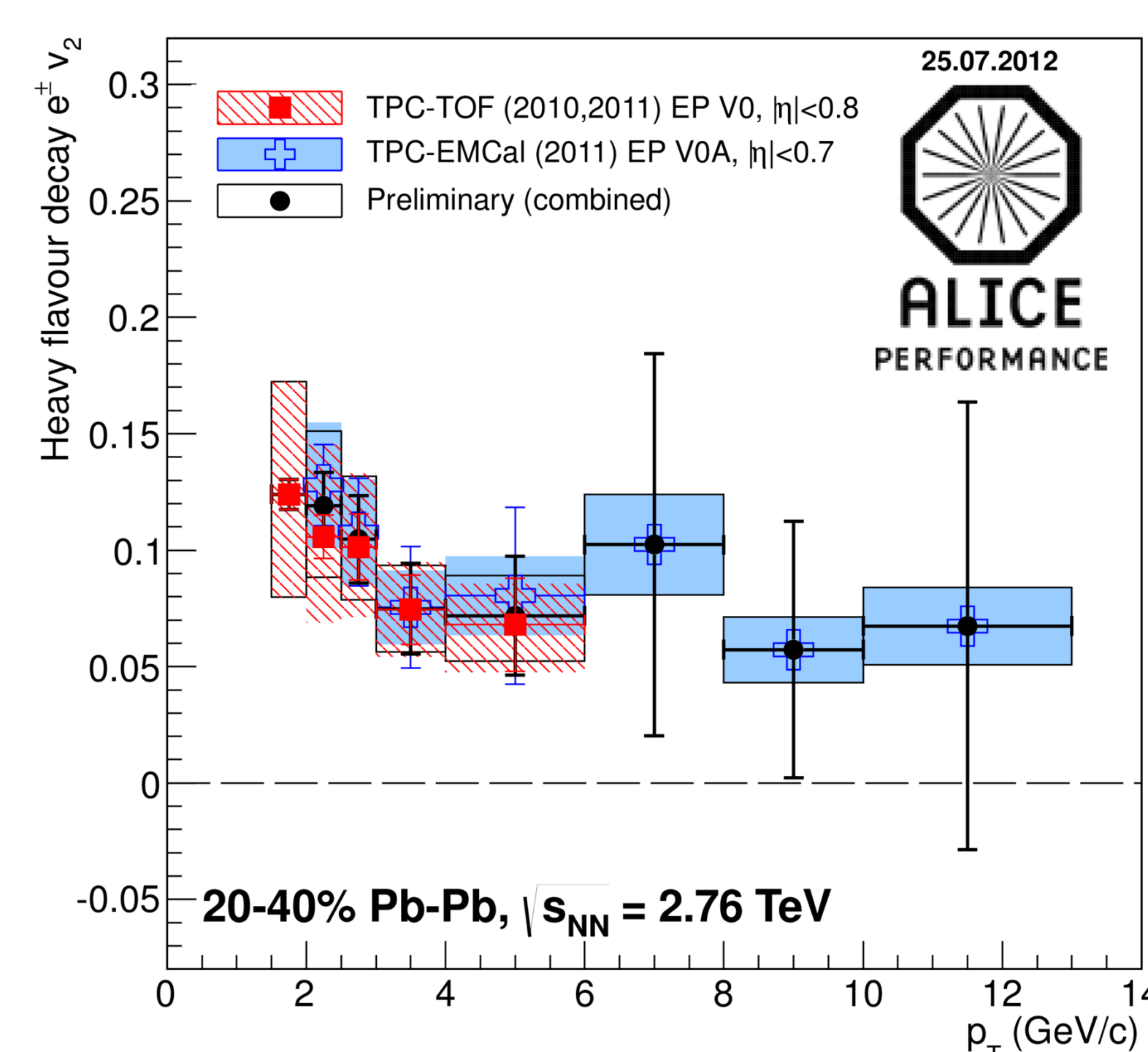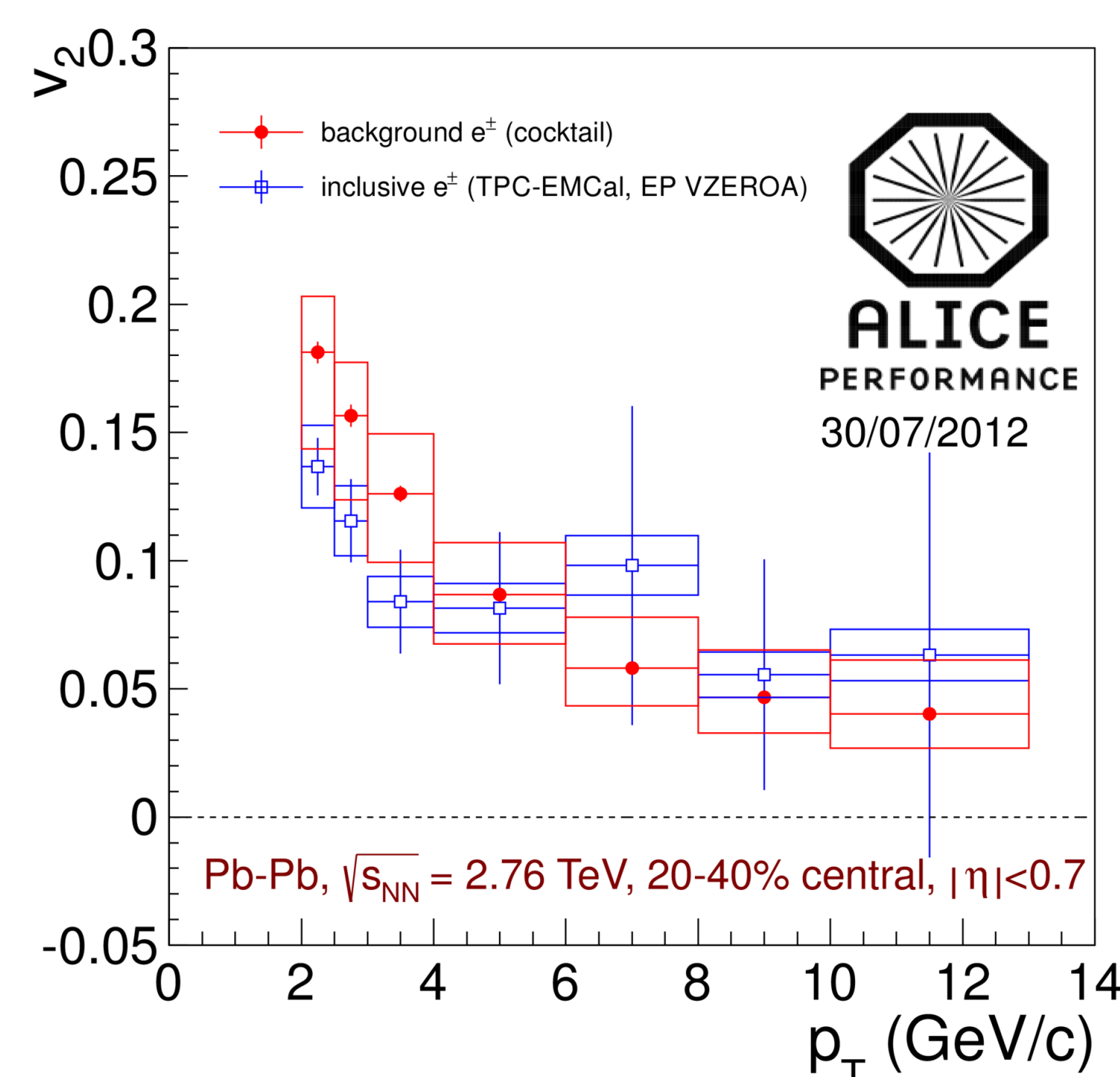
Electron identification

Electron identification:
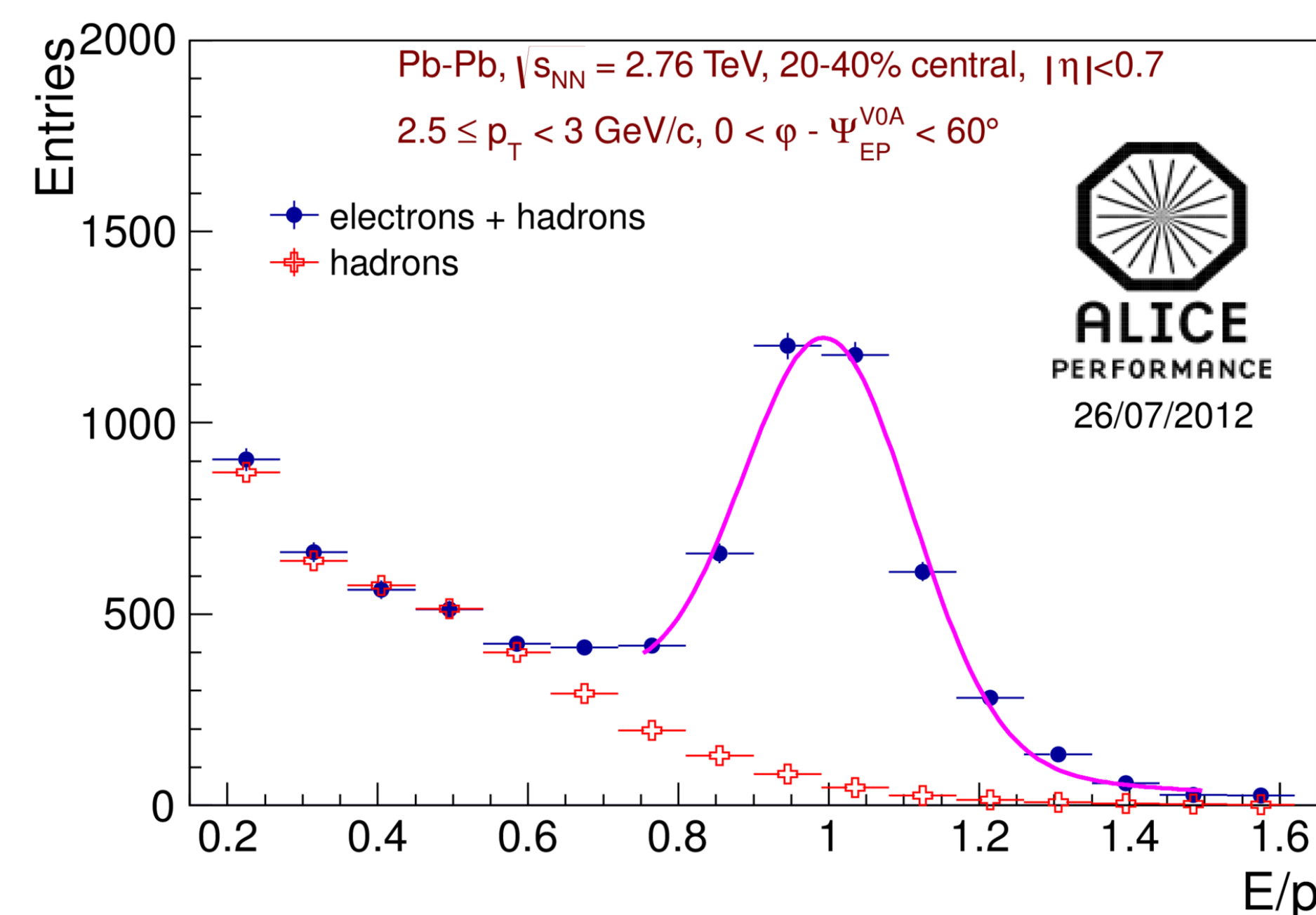**TPC:** $-1 < \frac{dE/dx - \langle dE/dx \rangle_e}{\sigma_{dE/dx}} < 3$
EMCal: $\langle E/p \rangle < E/p < \langle E/p \rangle + 3\sigma_{E/p}$
- The Exponential + Gaussian parametrization was used to obtain the $\langle E/p \rangle$ and $\sigma_{E/p}$ values.

Hadron identification:
**TPC:** $-3.5 < \frac{dE/dx - \langle dE/dx \rangle_e}{\sigma_{dE/dx}} < -3.1$
- Hadron contamination was removed from the signal in the E/p distribution.

Azimuthal anisotropy

- Inclusive electrons were counted in p_T and $\Delta\varphi = \varphi - \Psi_{EP}^{V0A}$ ranges.
- The parametrization $dN/d\Delta\varphi = k[1 + 2v_2 \cos(2\Delta\varphi)]$ was used to obtain the v$_2$ parameter in each p_T range.
- The event plane resolution was obtained by correlating event planes reconstructed with the TPC, VZEROA and VZEROC detectors[7].

$$R_{EP}^{V0A} = \sqrt{\frac{\langle \cos[2(\Psi_{EP}^{V0A} - \Psi_{EP}^{V0C})]\rangle \langle \cos[2(\Psi_{EP}^{V0A} - \Psi_{EP}^{TPC})]\rangle}{\langle \cos[2(\Psi_{EP}^{V0C} - \Psi_{EP}^{TPC})]\rangle}}$$
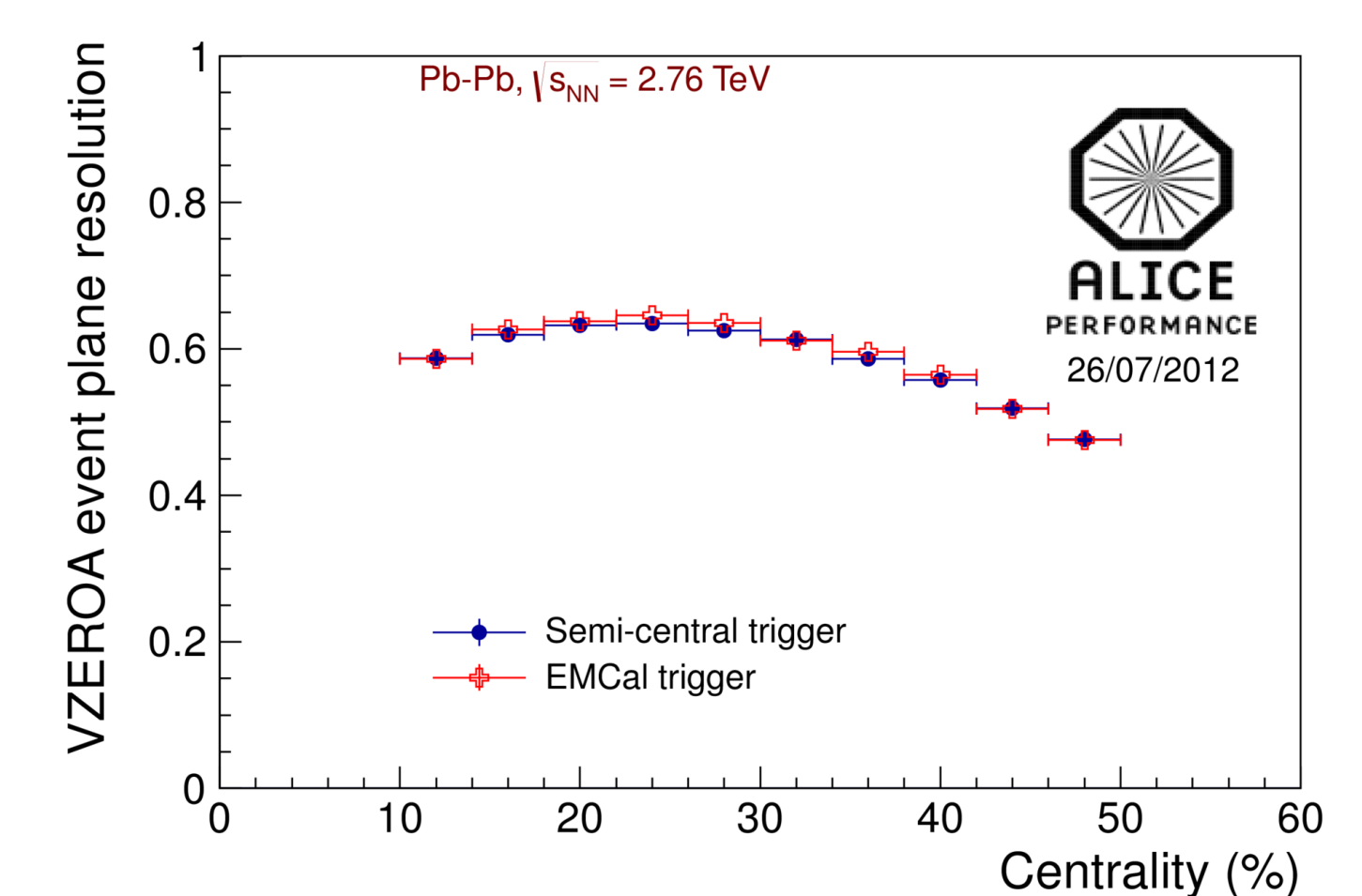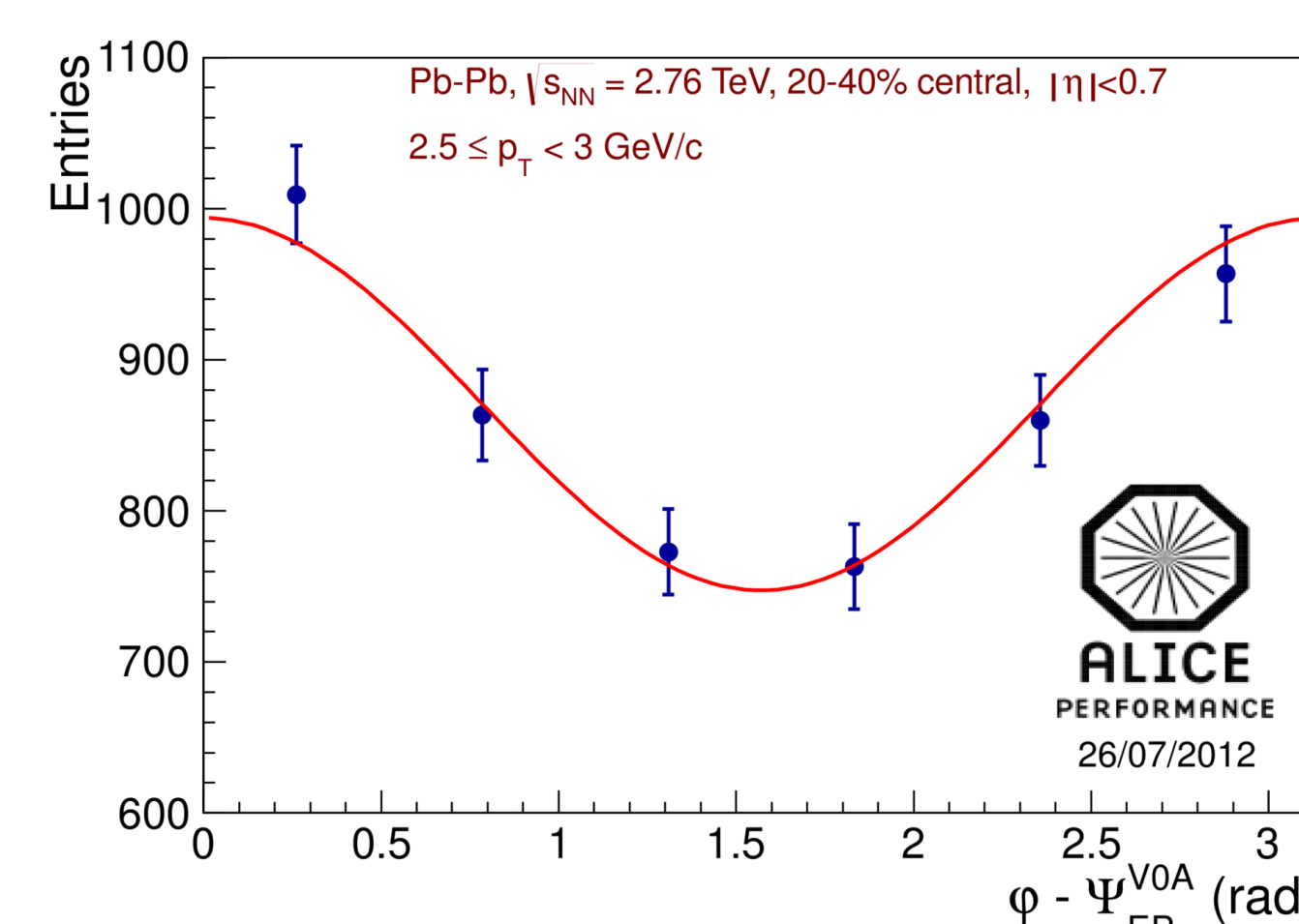
References

[1] Shingo Sakai, parallel talk 7A, 17/08 16:30, QM 2012
[2] Theodor Rascanu, poster 416, QM 2012
[3] PHENIX Collaboration, Phys. Rev. C 84, 044905 (2011)
[4] Uphoff et al., arXiv:1205.4945
[5] Rapp et al., arXiv:1208.0256
[6] A. Beraudo et al., J.Phys.G G38 (2011) 124144
[7] A. M. Poskanzer and S. A. Voloshin, Phys. Rev. C 58, 1671–1678 (1998)

Conclusions

- Non-zero v$_2$ of electrons from heavy-flavour decays was observed in 20-40% Pb-Pb collisions at $\sqrt{s_{NN}} = 2.76$ TeV.
- v2 > 0 up to $p_T \approx 5$ GeV/c indicates strong interaction of charm and bottom quarks in the created hot and dense partonic medium.