Feasibility study for the measurement of the elliptic flow of electrons from beauty hadron decays in Pb-Pb collisions at $\sqrt{s_{NN}}=2.76$ TeV with ALICE

**Heavy-flavour production**
- Heavy quarks, charm and beauty: produced in the initial stage of the collision via hard parton scattering processes.
- Experience the full evolution of the system.
- Well suited probe of the medium created in heavy-ion collisions at high energy (Quark-Gluon Plasma).
- Measure heavy-flavour hadrons and heavy-flavour decay leptons.

**Heavy-flavour hadron decay $v_2$ with ALICE**
- The azimuthal distribution of heavy-flavour decay electrons is given by:
  \[ \frac{dN_{HF}}{d(\phi - \Psi_{RP})} = \frac{dN^{ee}}{d(\phi - \Psi_{RP})} + \frac{dN^v}{d(\phi - \Psi_{RP})} \]
  where $N^{HF}$ is the number of heavy-flavour decay electrons, $N^{ee}$ is the number of electrons from charm decays, and $N^v$ is the number of electrons from beauty decays.
- If we assume that $v_2$ is the dominant term of the Fourier series, the $v_2$ of electrons from flavour decays is expressed as:
  \[ v_2^{HF} = \frac{v_{HF}^{ee} - (1 - R)v_{HF}^{v}}{R} \]
  where $R$ is the ratio of electron yields from beauty-hadron decays to the electron yields from inclusive heavy-flavour hadron decays.
- The ratio of electron yields from beauty-hadron decays to the electron yields from inclusive heavy-flavour hadron decays has been measured in pp collisions at $\sqrt{s}=2.76$ TeV by the ALICE collaboration [4].

**Elliptic azimuthal anisotropy ($v_2$)**
- If there is sufficient rescattering of heavy quarks with the medium:
  \[ \frac{dN}{d(\phi - \Psi_{RP})} = \frac{1}{2}\left\{ 1 + \sum_{n=1}^{\infty} 2n_{0n} \cos n(\phi - \Psi_{RP}) \right\} \]
  where $\phi$ is the particle azimuthal angle, $\Psi_{RP}$ is the reaction-plane angle, and $n_{0n}$ is the azimuthal anisotropy magnitude of the $n$-th harmonic [1].

**Feasibility study for the measurement of the beauty decay electron $v_2$**
- The charm decay electron $v_2$ is evaluated with a Monte Carlo simulation taking as input:
  - Measured prompt D meson average $v_2$ in Pb-Pb collisions at $\sqrt{s_{NN}}=2.76$ TeV [2], which is represented by the black horizontal lines in the figure.
  - $p_T$ distribution of D meson in pp collisions from FONLL calculations [5] scaled to Pb-Pb collisions at $\sqrt{s_{NN}}=2.76$ TeV using D meson $R_{AA}$ from BAMPS model [6].
  - The Pythia 6 event generator is used to decay D mesons into electrons.

**Conclusions**
- We presented a way to subtract the contribution of the charm decay electron $v_2$ from the heavy-flavour decay electron $v_2$.
- The significant increase of the luminosity at the LHC, as well as the ALICE detector upgrades, will increase the potential of this analysis.

**References**