The eccentricities can be quantified in terms of the particle azimuthal distribution.

Flow Harmonic Distributions

We can write the Fourier expansion of the particle distribution in terms of the azimuthal angle $\phi$:

$$\frac{dN}{d\Omega d\Phi d\rho} = 1 + \sum_{n=2}^{\infty} v_n \cos(n(\Phi - \rho))$$

The coefficients $v_n$ are called flow harmonic coefficients and it gives the magnitude of a certain type of anisotropy in the particle azimuthal distribution. It provides us a orientation for these anisotropy components.

Eccentricities

The initial spatial anisotropies can be quantified in terms of the eccentricities $e_{\perp \parallel}$:

$$e_{\perp \parallel} = \frac{\int d\rho d\Phi \rho^2 \sin^2 \Phi}{\int d\rho d\Phi (\rho^2 + \sin^2 \Phi)}$$

where $P$ is energy or entropy density and $\Phi$ is participant angle. We give special attention to $e_{\perp \parallel}$ which, for simplicity, we call $e_2$ with $\rho_{\perp \parallel} = \rho_2$.

It is known that in a given centrality window for each event approximately $v_2 \propto e_2$ in non central collisions [6] [7], so it is reasonable that the scaled harmonic flow distributions follow the scaled eccentricities distributions, that is: $P(v_2/v_2) = P(e_2/e_2)$ that is true also for $v_3$ and $e_3$. For $v_4$ and $e_4$ an interesting feature can be mentioned: For non central collisions $v_4 \propto e_4$ does not hold as $v_4$ has a dependence not only with $e_4$ but also with $e_2$ [7].

NeXSPheRIO V-USPHYDRO

NeXus Smoothed Particle hydrodynamic evolution of Relativistic heavy-ion collisions

NeXSPheRIO is the code used in the simulations presented in this poster. It uses NeXus initial conditions, solves the 3+1 dimensional (it can be used 2+1 dimensions too) perfect fluid equations.

V-USPHYDRO solves 2+1 dimensional viscous (Temperature dependent bulk and shear viscosities) fluid hydrodynamics assuming longitudinal boost invariance, in this case using IP-GLASMA [3], EKRT [4], AMPT and TRENTO [5].

Since NeXSPheRIO solves perfect fluid equations we present our results as scaled harmonic flow distributions $P(v_n/v_n(0))$. These scaled distributions should be independent of viscosity.

Results

We present our results and compare them with experimental data for LHC energies, and present a prediction for RHIC top energy.