SHEAR AND BULK VISCOSITIES OF THE HADRON GAS WITHIN RELAXATION TIME APPROXIMATION AND ITS TEST

O. Moroz

Bogolyubov Institute for Theoretical Physics,
Nat. Acad. of Sci. of Ukraine
(*14b, Metrolohichna Str., Kyiv 03680, Ukraine;*
e-mail: moroz@bitp.kiev.ua)

S u m m a r y

We concentrate on the calculation of the shear and bulk viscosities of a hadron gas. They define its dissipative dynamics and influence its experimentally measurable elliptic flow. Due to the difficulty of this calculation, the relaxation time approximation (RTA) was used in previous works. As those results have approached the realistic ones, there is a need to find out how accurate RTA is. For this sake, we calculate the viscosities in RTA, by using the cross sections extracted from the ultrarelativistic quantum molecular dynamics (UrQMD) model and compare them with the same ones calculated without RTA. This allows us to find the estimates of errors due to the application of RTA in the calculations of viscosities, which are valid also for other similar models. For instance, in the temperature region 100 MeV $\lesssim$ T $\lesssim$ 160 MeV at zero chemical potentials, the shear viscosity becomes smaller up to 1.57 times or up to 1.45 times if the averaged relaxation time is used. This has important consequences for the interpretation of the previously made calculations of viscosities and some other related calculations. Within RTA, we also find estimation of the enhancement of the bulk viscosity of the hadron gas because of the nonconservation of particle numbers.