Chapter 6

Summary

In this chapter we will summarise our observation and achievements reported in the earlier chapters of the thesis. We started out with an objective to investigate the process of production and evolution of QGP, with a particular emphasis on the underlying 'nonperturbative' non-abelian dynamics. Studying non-abelian dynamics non perturbatively is by itself a tremendous task.

We started our investigation, 'the production of QGP' in the color flux tube model. It was observed that the chromo electric field inside the flux tube was taken to be constant and essentially abelian in all the previous investigations. Moreover most of the studies were done with an electric field existing in one particular direction in color space. We have argued in chapter two that due to non-abelian dynamics the chromo electric field is time dependent, and hence one has to take this fact into account in calculating the pair production rate. We have computed the pair production rate by taking the external field to be varying sinusoidally in time and have shown how this increases, relative to the constant field case, the pair production rate from vacuum, for A-A collisions. In chapter three, we have taken an unconsidered scenario of how the production rate gets modified in the presence of a heat bath and have shown a rise in the production rate in the presence of a bath.

Chapter four contains suggestions of a new mechanism for color equilibration of plasma. In chapter five we have considered the evolution of the plasma in phase space through kinetic and hydrodynamic equations. The thing that is worth mentioning here is that the non-perturbative studies reveal the existence of chaotic modes of oscillation, that can bring about thermalisation of the plasma.

As regards the future work it would be interesting and worthwhile to include some of the effects not considered by us. To name a couple of them, in our computation of pair production at zero and finite temperature we have (almost) ignored the effect of dynamical gluons. In some of the recent studies the effect of dynamical gluons has been taken into account but these are essentially abelian in nature and at zero temperature. In our view one ought to do the pair-production problem at zero and finite temperature, taking the non-abelian nature of the dynamical gluons into account.

So far as the evolution of the plasma is concerned we think one should incorporate the production and evolution of the plasma simultaneously using quantum kinetic theory.