CHAPTER 7

CONCLUSION AND FUTURE OUTLOOK

7.1 Conclusion

In this thesis, the methodology of using neutral energy deposits in the calorimeter of the ZEUS detector to reconstruct the long-lived neutral hadrons in the final states, i.e. K_L^0 .and neutron, has been explored with successful results. This could be seen from invariant mass of both K_L^0 and neutron constructed using the method in this thesis, including the constructed invariant mass of $\phi(1020)$ from $\phi(1020) \to K_L^0 K_S^0$ decay channel and mass Λ from $\Lambda \to n\pi^0$ decay channel, that showed good agreement with the standard invariant mass [35].

The algorithm for halomuon identification in the ZEUS detector has been carried out showing good results. This algorithm could be implemented for endcap energy calibration of a detector and to remove halomuons from background reading of a physics event in high energy physics experiment.

The development of FPGA-based read-out control (ROC) for calorimeter ZEUS detector including the hardware has been carried, as part of the project. The integration of four controlling modules ROC on a single FPGA chip has been shown to be feasible, while the PCB for ROC hardware implementation needs further improvement to increase its performance.

7.2 Future Outlook

The use the energy deposits in the hadronic calorimeter for particle identification could further be explored for finding other long-live neutral and charged particles with decay length comparable to the dimension of the calorimeter. The selection criteria could further be improved by making more variables to be associated with the neutral energy deposits by neutral particles in the calorimeter and could be backtracked to Central Tracking Detector (CTD) vertex to provide more information on the neutral particle trajectory and its origin.

The implementation of the FPGA-based read-out control (ROC) for a calorimeter on a single FPGA chip for new data-taking system is very convenient for its compactness, and easier to improve software design.