CHAPTER 6

CONCLUSION

In this thesis, we investigate the effects of oscillations on the energy losses of solar neutrinos due to the ν_e–e scattering. Using the stopping power of matter, we calculated the energy losses under the adiabatic and non-adiabatic conversions.

We set the mixing angles as the Weinberg angle borrowed from the quark sector while a near maximum angle of 40° is used to discuss the non-adiabatic case. The energy losses are calculated along the path from the core to the surface of the sun. Both adiabatic and non-adiabatic cases give similar pattern for the energy losses along the radius with the total adiabatic losses (5×10^{-7} MeV) slightly lower than the non-adiabatic conversion (7×10^{-7} MeV) as seen in Figs 5.4 and 5.6. From our result, the maximum energy loss for solar neutrinos is $\Delta E_\nu \leq 10^{-6}$ MeV.

We also extend the calculation to include the electron density in the plasmasphere of the Earth and there is no significant change. By varying the electron density in the Sun, it is found that the density would be higher by 10^7 for any significant loss of this kind to exceed the threshold energy of the Chlorine experiments.

We can conclude that the effect of energy losses of solar neutrino cannot solve the solar neutrino problem because of the value of the energy losses are very much smaller than the threshold energy in the Chlorine experiments.

Suggestions for further work are to continue this work for the other neutrinos coming from other sources such as supernova and cosmological neutrinos, and to calculate the predicted capture rates for energy losses of solar neutrinos. However it is expected that the effect on the capture rates would not be important because of the small value of energy losses calculated in this thesis.

LIST OF PUBLICATIONS

1. H. Abu Kassim and Z. Zainal Abidin, The Effect of Conversion Probability to the Energy Losses of Solar Neutrinos, Proceedings of the National Physics Conference (Kuala Lumpur, Malaysian Institute of Physics, 1999)

2. Z. Zainal Abidin and H. Abu Kassim, Neutrino Energy Losses in the Plasmasphere, Proceedings of the National Physics Conference (Kuala Lumpur, Malaysian Institute of Physics, 2000)