Data from LHD has been analysed to study the influence of pellet injections to improve the efficiency of pellet fuelling. Pellet fuelling is used to mitigate density control problems in large stellarators due to outward thermodiffusion. A better understanding of the transport could improve efficiency of pellet fuelling.
An adaptive curve fitting code has been written to provide density and temperature profiles to analyse the thermodynamic forces, and thereby the transport. This code will also be used for simulations at the Max Planck Institute in Germany , but this is beyond the scope of the internship.

H_{α} light emission has been analysed of shots with pellet injections to compare the penetration depth of subsequent pellets. It was found that secondary pellets can penetrate further if fired rapidly after the first pellet ~ 10 ms. This effect dominated the effect of the pellet size (r_{pellet}=1.5 mm or 1.7 mm) and also dominated the velocity differences between pellets.

Exponential fits of line integrated densities measured by the Far infrared interferometer have been used to provide an upper and lower boundary of the ratio between the particle and energy confinement time. It was found that both increased with outward shifting magnetic axis. Moreover a spatial dependence of the relaxation time constant is shown, showing differences in edge and core particle confinement in LHD. This supports the statement that LHD is `a large reactor'.

Hollow density profiles after pellet injections with only one pellet have been found, followed by an inward particle flux. This inward particle flux could be of interest for the penetration depth of a (hypothetical) secondary pellet. Injections with multiple pellets are more likely to have a peaked density profile after ablation of the pellets, but this also depends on the plasma conditions. The availability of charge exchange recombination data limited the analysis of shots with multiple pellets injected.

Thermodynamic forces responsible for transport are influenced by the injection of pellets. Especially $\nabla n_e/n_e$ is strongly increased (since the density profile is hollow), whilst ∇T_i / T_i shows a less clear reaction. This lead to an increase of the radial electric field based on the (neoclassical) approximation. Suggestions of positive radial electric fields were found, but not within the error based on a Markov Chain Monte Carlo analysis. Positive radial electric fields could be of importance to mitigate dilution.

I would like to express my gratitude to the Max Planck Institute for having me. The hospitality has been great and I liked my freedom in my work a lot. The weather was okay and sometimes I could really enjoy sightseeing and visiting the city centre.