**报告题目：Microphysics of the heliosphere:**

**I. Kinetic scale radial structure**

**II. Invading process of galactic cosmic rays**

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**摘要：**The seminar contains two topics. First, the kinetic structure of the heliospheric boundaries is investigated using one-dimensional full Particle-In-Cell simulations. The termination shock, the heliopause, and the bow shock are simultaneously reproduced in the simulation. The spatial width of the heliopause increases as the angle between the discontinuity normal and ambient magnetic field decreases. The inner structure of the heliopause shows different profiles between magnetic field and plasma density, or pressure, which is caused by a non-MHD effect of the local plasma. The region between the two shocks is turbulent. The origin of the fluctuations outside the heliopause is in the inner heliosheath. Only compressible fast mode fluctuations generated in the inner heliosheath are transmitted through the heliopause and propagate away from it. These fast mode fluctuations are steepened when passing the heliopause. This wave steepening and probably other effects may cause the broadening of the wave spectrum in the very local interstellar medium plasma.

In the second part the effect of global structure of the heliosphere in the cosmic ray invasion process is considered. It has been unknown how galactic cosmic rays enter and reach deep inside the heliosphere. To understand the cosmic ray invasion process in the level of particle trajectory, we performed test particle simulations in the global electromagnetic structure of the heliosphere reproduced by using high resolution 3D MHD simulation. When initial particle Lorentz factor is 10 (~10 GeV), the motions of particles are strongly affected by small scale heliospheric structures reflecting the small gyro radii of the particles. When initial particle Lorentz factor is 1000 (~1 TeV), they are insensitive to the small scale structures of the heliosphere due to their large gyro radii. Some patterns of invading particle trajectories will be discussed.