In recent CHS (Compact Helical System) experiments, X-ray oscillations related with m=2 interchange instability, or electric potential pulsation are observed. However, the time evolution measurement for electron temperature in low density plasma has not been done due to difficulty of ECE (electron cyclotron emission). The soft X-ray intensity of emission is a function of the electron temperature Te(r), the density ne(r) and the concentration of impurities along the sight line. We have applied the multi-layer mirror soft X-ray spectrometer (MLSX) to fast temperature measurement in low density CHS plasma.

In the CHS MLSX, the plasma X-ray bremsstrahlung is reflected with the Silicon and Tungsten multi layer mirror which has a flat surface with the dimension of 20mm x 40mm. Figure 1 shows a layout of the CHS MLSX. The total number of layers is about 200 and the thickness 2d is 67.4±1.4 [Å]. The 20ch. Silicon surface barrier detectors are arranged horizontally, and positions correspond to X-ray energy in Bragg condition. The reflectivity and energy resolution of the mirror has been calibrated in photon factory in KEK (Tsukuba, Japan) for the energy range of 300-1200eV. The reflectivity increases from 3%-25% with the photon energy. Although, each detector views the different toroidal observation chords, the toroidal spread length is totally about 5 cm at the magnetic axis. In addition, the bremsstrahlung is practically emitted from the plasma core region.

Figure 2 shows an X-ray spectrum from ECH and NBI low temperature plasmas (Te~200 eV), which exponentially decreases and O VII, O VIII impurity lines are observed[1].