Detection Limit of O$_{VI}$ Emission Lines and Optical Tolerance Study of FIMS

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Several attempts have been made to measure diffuse line emission between 900 and 1200 Å. The main contributions to the equilibrium radiative cooling curve between $10^{5.5}$ K and 10^{7} K are from the doublet of O$_{VI}$ $\lambda\lambda$ 1032 and 1038 Å in the FUV spectral region. The detection of O$_{VI}$ emission is one of the main objectives of FIMS (Far-ultraviolet Imaging Spectrograph) on KAISTSAT-4. We present the scientific importance and detection simulation of O$_{VI}$ doublet using a Monte Carlo technique and chi-square statistics. The simulation includes bright airglow lines, grating scattering, detector background, and cosmic FUV background, which could interfere with attempts to observe the O$_{VI}$ emission lines. The simulation shows that FIMS experiments can resolve the predicted O$_{VI}$ doublet during sky-survey phase and thus the global distribution and energetics of the interstellar medium. The O$_{VI}$ detection limit for various observation time scales as well as previous theoretical and observation limits will be presented.

Optical tolerancing is a process involving three essentials. The first is the specification of one or more performance criteria. The second is a means of computing the performance of the system in terms of these criteria and the sensitivity of system performance degradation to manufacturing errors. The third is a method of budgeting the errors to satisfy the performance specification within acceptable cost goals. A main performance criterion of FIMS comes from the O$_{VI}$ detection limit analysis. Tolerance study of FIMS optical system has been performed extensively including decentration and tilt of optical elements, and manufacturing figure errors of parabolic collecting mirror and ellipsoidal grating. The performance criteria and the degradation of FIMS optical system are discussed through the tolerance study.