JASMINE Project –Instrument design and Centroiding experiment–

T. Yano(1), N. Gouda(1), Y. Kobayashi(1), Y. Yamada(2), and JASMINE WG

(1)National Astronomical Observatory of Japan, Tokyo, Japan, (2)Kyoto University, Kyoto, Japan

JASMINE is the acronym of the Japan Astrometry Satellite Mission for INfrared (z-band :0.9 micron) Exploration, and is planned to be launched around 2015. The main objective of JASMINE is to study the fundamental structure and evolution of the Milky Way Galaxy. Another important objective is to investigate stellar physics. In order to accomplish these objectives, JASMINE will measure trigonometric parallaxes, positions and proper motions of about ten million stars during the observational program, with the precision of 10 microarcsec at z =14mag.

We present the instrument design of JASMINE(optics, detectors, etc.), and techniques for estimating the centroiding of satar images to accomplish the objectives. In order to obtain measurements of astrometric parameters with high accuracy, the optics with a long focal length and a wide focal plane is requested. The Korsch system (3-mirror system) is one of the convincing models. However, the center of the field is totally vignetted because of the fold mirror. Therefore we consider the improved Korsch system in which the center of the field is not vignetted. We obtain the diffraction limited optical design with small distortion. We place dozens of CCD arrays with high quantum efficiency at z-band on the focal plane. This new type of detectors is now being developed mainly at National Astronomical Observatory of Japan.

In order to accomplish the objective, we must estimate positions of star images on the CCD array with sub-pixel accuracy. Therefore we need a technique to obtain precise positions of star images on solid state detectors in analyzing the data. We show the algorithm to estimate the real positions of stars with high accuracy and some experimental results, which show that the accuracy of estimated distances of stars is a variance of under 1/100 pixels.