AKARI/FIS Slow-scan Observations

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ABSTRACT

Processed data of the slow-scan observations using Far-Infrared Surveyor (FIS) are explained. We have produced calibrated images of about 800 observations of this observing mode using an interactive toolkit, *FAST* (FIS *AKARI* Slow-scan Tool). We confirm that the processed slow-scan images are in good agreement with the *AKARI* Far-infrared All-Sky Survey Maps. Coordinates of the images are determined based on the satellite attitude determination system data, and are accurate enough if spatial resolution of FIS (1–1.5 arcmin) is considered. The images are under evaluation by the *AKARI* team and will be in public soon.

1. INTRODUCTION

The Far-Infrared Surveyor (Kawada et al. 2007, FIS) is one of the two focal-plane instruments onboard *AKARI*. FIS covers the wavelength range of 50–180 μm in four photometric bands with two detector units; N60 (65 μm) and WIDE-S (90 μm) band by the SW (Short-Wavelength) array, and WIDE-L (140 μm) and N160 (160 μm) band by the LW (Long-Wavelength) array. The FIS Slow-scan observations are one of the pointed observation modes of *AKARI*. Target sources are scanned at 8, 15, or 30″ s^{-1}, realizing sensitivity one to two orders of magnitude better than that of the All-Sky Survey. Two astronomical observation templates (AOTs) are prepared; FIS01 and FIS02. FIS01 executes two sets of round trip scans around the target with a cross-scan step of 70 or 240″, while FIS02 executes one round trip scan to perform wide area mapping. Typical spatial resolution is 60″ for SW data and 90″ for LW data. Details of the FIS slow-scan observations are described elsewhere (Kawada et al. 2007; Matsuura et al. 2007; Shirahata et al. 2009). About 1100 observations were executed during *AKARI*'s cryogenic phase (Phase 1 & 2; Figure 1).

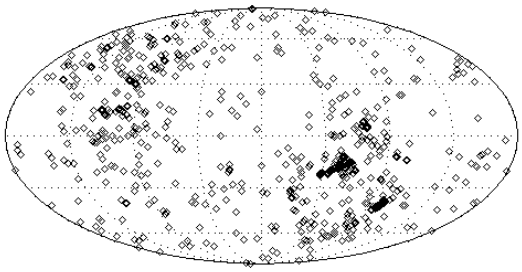

Figure 1. Observed target positions on the Galactic coordinate.

2. DATA PROCESSING AND CALIBRATION

We used an interactive reduction toolkit called *FAST* (Ikeda et al. 2012, FIS *AKARI* Slow-scan Tool) to process the slow-scan data. *FAST* enables us to interactively (1) check the data, (2) mask bad data, and (3) tune calibration parameters. To create regular grid images, we used a Gaussian function with FWHM of 30″ for SW and 50″ for LW, respectively, as a gridding convolution function (GCF), because sampling points during the scan were irregularly distributed on the sky (Figure 2). Sky brightness was calibrated using COBE/DIRBE data as the reference. FIS images were smoothed to the DIRBE resolution and compared to derive the calibration parameters (Matsuura et al. 2007; Ikeda et al. 2012). Coordinates were attached to the images using information from the satellite attitude determination system. The pointing accuracy was typically better than 10″, which was good enough compared to the spatial resolution of FIS. SW data of about 800 observations have been processed interactively by a dedicated team. Due to technical difficulty, we prioritized the SW data (N60 and WIDE-S) for processing. About 200 relatively high quality LW data (WIDE-L and N160) were processed, including observations of 37 photometric standard sources.

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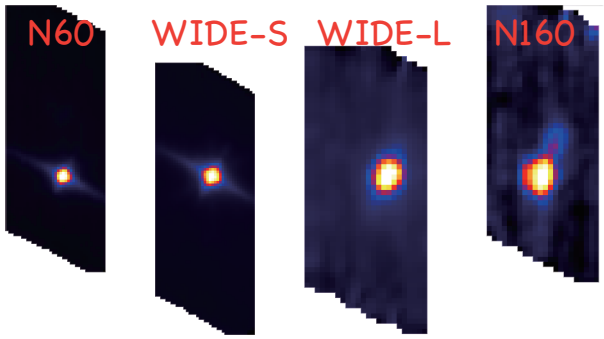

Figure 2. An example of slow-scan images of a point source at the FIS four wavelength bands.

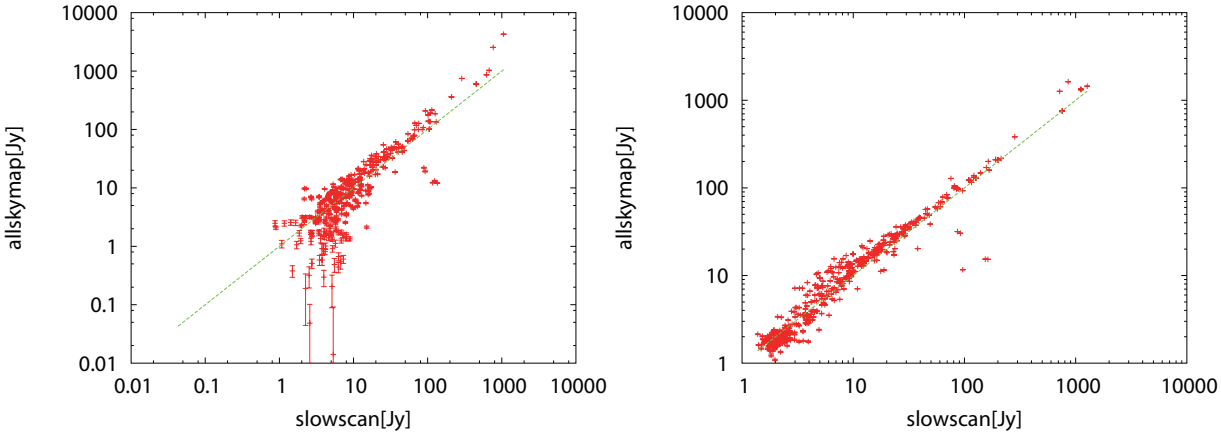

Figure 3. Comparison between slow-scan and All-Sky Survey at the N60 (left) and WIDE-S (right) bands.

3. PERFORMANCE OF PROCESSED DATA

Flux calibration of the slow-scan data are validated by comparing with the *AKARI* Far-IR All-Sky Survey Maps. We perform aperture photometry with 180″ radius towards the target positions of the slow-scan images and corresponding regions from the All-Sky Survey Maps. Flux densities measured on two dataset are almost consistent to each other throughout three order of magnitude (Figure 3). Despite of careful data reduction using interactive software tool *FAST*, there still remain some stripe patterns in the image owing to the detector characteristics. Influence of these residual patterns to the scientific output is thought to be small, because most of the processed data are observations of point sources.

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