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The developments of TES array and the detector stage towards the observation from 100 eV to 15 keV for STEM

*Tasuku Hayashi[1], Ryohei Konno[1], Noriko N. Yamasaki[1], Kazuhisa Mitsuda[1], Akira Takano[2], Keisuke Maehata[2], Toru Hara[3]

ISAS/JAXA[1]
Kyushu University[2]
NIMS[3]

An energy-dispersive X-ray spectroscopy (EDS) on a scanning transmission electron microscope is a useful tool for material analysis, planetary science, and other researches. We have been developing 64-pixel TES arrays as detector for the EDS system and the detector head with 3D superconducting wirings. The energy resolution is 7 eV (FWHM, at FeK¥alpha) under a few hundred cps with 17 TES pixels^{1}. In the current system, we can detect only the low energy X-ray to 0.5 keV, to improve the sensitivity below 0.5 keV to and increase statistic are required. The sensitivity for low energy depends on background level and low detection efficiency. We increase the signal-to-noise ration by improving the energy resolution of the TES with two different type TESs. On the other hands, the s statistic was limited by the number of operating pixels, in order to improve the number of operating pixels without using the 3D superconducting wirings^{2, 3}, we adopted poly-capillary X-ray optics^{4} for increasing the solid angle from the specimen and developed a detector head with simple design. In this paper we present the details of the detector head design for 64-pixel parallel readout and of the concept design of the TES array with two types of TES in the same device for the wide energy band.

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