

**DIGITAL SIGNAL PROCESSING SYSTEMS OF AN X-RAY
MICROCALORIMETER ARRAY FOR GROUND AND SPACE APPLICATIONS**

Session: SpaceWire missions and applications

Short Paper

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ABSTRACT

We are developing a high resolution EDS (Energy Dispersive Spectrometer) for a Transmission Electron Microscope (TEM). The EDS utilizes an array of TES (Transition Edge Sensor) microcalorimeter, which operates at 100 mK and achieves an extremely high energy resolution of FWHM < 10eV in 0.1 to 10keV energy range. To obtain the energy resolution, we need sophisticated digital signal processing, in which we employ Space Wire technology.

The analog signals from the calorimeter array are continuously digitize. Then X-ray events are detected by a digital logic in FPGA and the blocks of data are buffered in it. Then the data blocks are transferred to a CPU via SpaceWire. The CPU perform optimum digital filtering to determine the pulse height.

At present development, we assume a high count-rate condition, such as 200 counts/s/pixel, and data transfer rate between the FPGA and the CPU is estimated to be 25 Mbps, corresponding to a 800 counts/s (4 pixels per FPGA). SpaceWire has a capability to deal with this high speed transfer rate, and this is why we choose standardized SpaceWire devices for this system.

We will combine this DAQ system with a TES microcalorimeter array this year.

The basic logic of the system will be applied for the next Japanese X-ray astronomy mission called NeXT.