Low-energy tailing and the full width at half maximum are parameters for evaluating the quality of peak shape in energy dispersive spectroscopy. In the present work, we developed a signal processing algorithm for minimization of low-energy tailing and electric circuit noise. We applied this algorithm to the energy dispersive X-ray spectroscopy using an audio digitizer instead of spectroscopy amplifiers or a DSP (digital signal processor) [1].

Our new filter discriminates signals by their shape. The shape of ideal X-ray signals produced by the pulsed reset preamplifier is step function. Therefore, we evaluated the difference of the signal shape from step function. Firstly we applied second derivative filter to the signals from a preamplifier. Then measured pulse height and aspect ratio for all X-ray signals to generate the spectra, and compared them with the spectra generated by the conventional signal filters.

With our new algorithm, low-energy tailing and random electric noise were reduced. In the X-ray fluorescence spectrum of stainless steel, we achieved the double S/B ratio at Cr Kβ on the low-energy tail of Fe Kα.