Kaonic Helium X-rays and Calibration Peaks (Ni and Ti) Simulation

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SDD's intrinsic resolution and white noise are

$$\text{FWHM} = 2.355w\sqrt{W_N^2 + \frac{FE}{w}} \tag{1}$$

where W_N is white noise, $F = 0.12$ is Fano factor of Si, $w = 3.81$ eV is average energy for an electron-hole pair creation in Si (77K) and E is X-ray energy. If $E = 5898.75$ eV and FWHM = 180 eV at Mn Kα X-rays, the white noise is

$$\begin{aligned} W_N^2 &= \left(\frac{\text{FWHM}}{2.355w}\right)^2 - \frac{FE}{w} \\ &= \left(\frac{180}{2.355 \times 3.81}\right)^2 - \frac{0.12 \times 5898.75}{3.81} \\ &= 216.7 \end{aligned} \tag{2}$$

So the total resolution is

$$\text{FWHM} = 2.355 \times 3.81 \times \sqrt{216.7 + 0.0315E} \tag{3}$$

this time, the Kaonic Helium X-rays and calibration peaks (Ti and Ni) are like Figure 1. All spectrums are pure gaussians. The Kaonic Helium X-rays count rate is not considered the increase of the solid angle of tilted SDDs (I will simulate soon). The escape peak intensity is assumed 1/100 of Kα or Kβ X-rays.

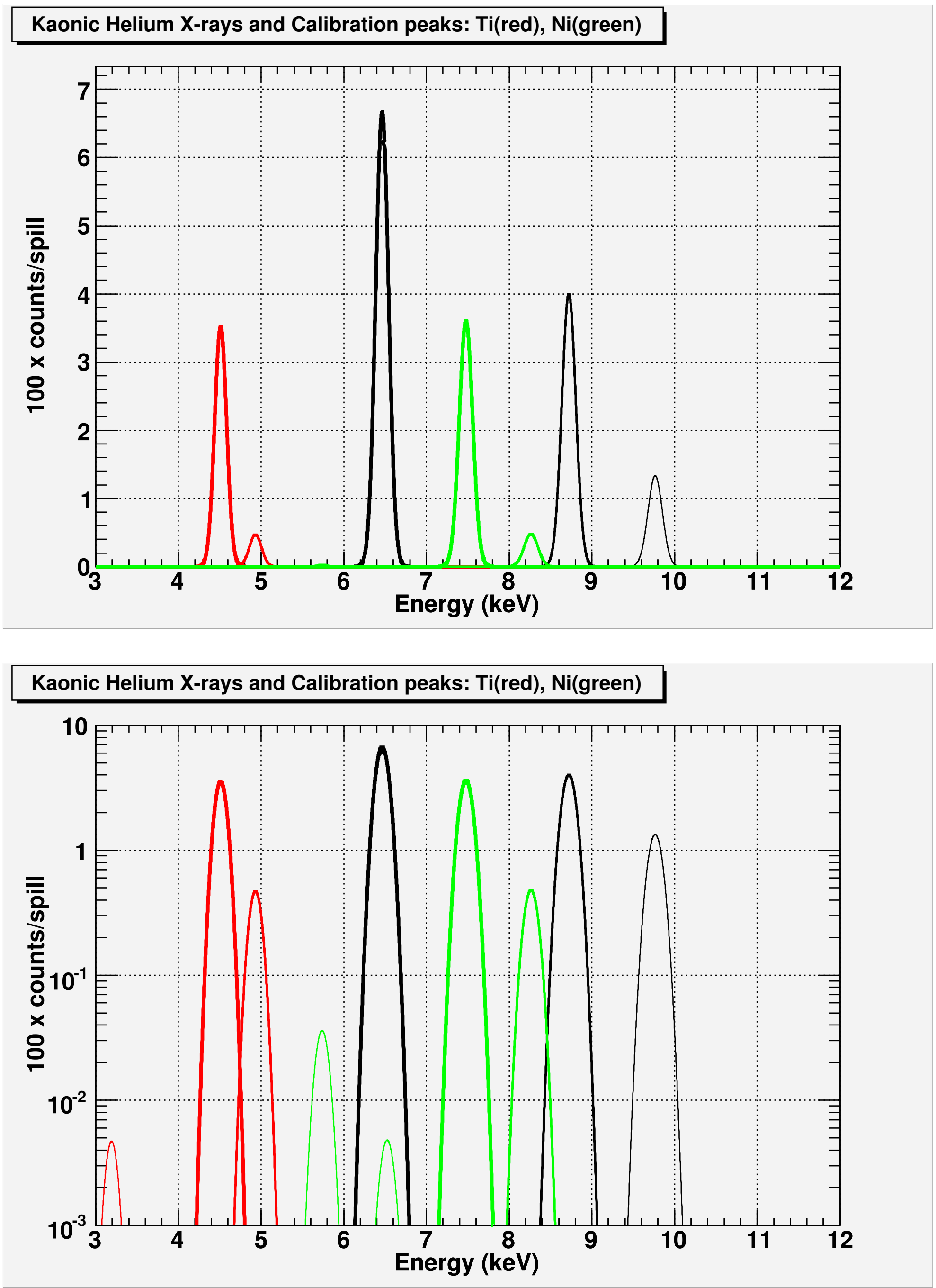

Figure 1: Kaonic Helium X-rays and the accidental calibration peaks in K_{stop} timing. KHeX Lα, Lβ and Lγ (black), Titanium X-rays Kα, Kβ and Kα-escape (red) and Nickel X-rays Kα, Kβ, Kα-escape and Kβ-escape (green).