Pile-Up Corrections

When two or more X rays are collected in a 3×3 "event island" during a single frame (usually 0.7 seconds for LETG/ACIS spectra), they will either be counted as a single event having an energy equal to the sum of the multiple events' energies, or will be discarded as an invalid event, depending on which pixels within the 3×3 island are activated. The first case is associated with the parameter k_p (for *p*ileup) and the second case with k_g (for *g*rade migration losses). Units for k_p and k_g are the inverse of the units for counting rates, which are cts/frame/pixel_along_dispersion_axis.

The most obvious evidence of pileup is in 2nd order below 6 Å. The large bump in the 2nd/1st ratio between roughly 3 and 5 Å arises from the pileup of 1st-order photons between 6 and 10 Å, while the smaller bump below ~ 3 Å is from pileup of 1st-order photons around 3 Å.

- k_p is determined by adjusting its value to get good agreement in corrected 2nd/1st efficiency ratios for different-rate spectra at short wavelengths (where virtually all counts come from pile-up). $k_p = 0.60$ (0.44) for FI (BI).
- k_g is determined by adjusting its value to get good agreement among spectra in all n/1st ratios around $6 - 8$ Å, where the 1st order rate is highest and suffers the largest pile-up and grade-migration losses. $k_g = 0.64$ (0.60) for FI (BI).