TIPS AND TRICKS

Dead-Time Optimization for High Productivity Data Analysis

For a microanalysis system, the dead time is the time when the X-ray processing system is busy processing X-ray events or rejecting X-ray events when pileup occurs. Historically, one of the first rules or guidelines that an EDS user learned was how to keep the percentage dead time within a recommended range, typically 20 to 30 percent. This dead time range is also noted in several relevent ISO and ASTM standard procedures. This tip will examine dead time with the goal of obtaining high quality throughput from the current generation of Silicon Drift Detectors (SDD).

Previously, if a user wanted to collect a spectrum and the dead time was too high, system parameters were normally adjusted in one of two ways: reduce count rate by decreasing beam current or select a shorter amp time. On the other hand, if the user had a dead time that was lower than the normal optimal range of dead times, the system was adjusted by increasing the count rate by increasing beam current, selecting a longer amp time, or choosing to let dead time remain lower than what had been considered optimal. Typically, users did not consider the last choice as an option because they would effectively be sacrificing throughput for resolution. The longest amp time typically yielded the best resolution.

By contrast, with EDAX's new SDD technology, the intermediate to long amp times do not exhibit a significant decrease in resolution with increased throughput, giving rise to the concept of Resolution Stability. For example, at an input count rate of 30 kcps, the longest amp time would allow a throughput of 18 kcps, while moving to an amp time eight times shorter would provide a throughput of 28 kcps, with a change in resolution of less than 4 eV (see Figure 1 below.) Although the dead time at that shorter amp time is outside of the traditional range (8.4 percent vs. 20-30 percent), this is obviously a much more efficient and productive mode of collection with very little sacrifice in resolution.

In summary, with today's Silicon Drift Detectors some guidelines for dead time still apply but others do not. The rule that dead time should typically fall within the range of 20 to 30 percent should be modified. It still makes sense to maintain a maximum of 30 percent dead time in most conditions, but users should primarily focus on resolution as the benchmark for collecting high quality data as throughput increases. In many instances, operating at relatively low dead times can provide a throughput improvement that is significant with minimal degradation of resolution.

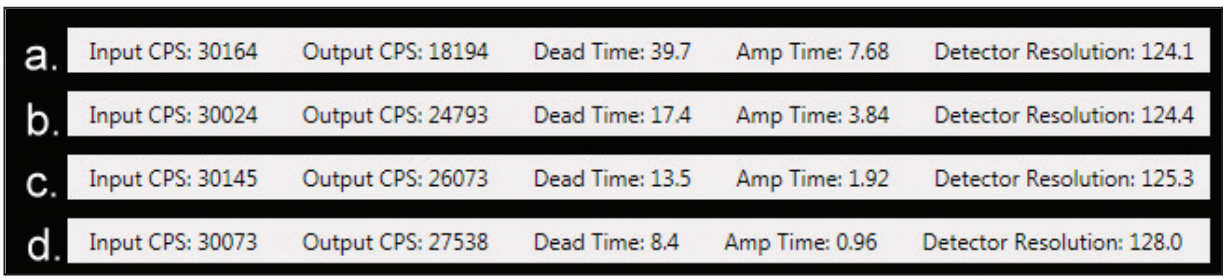

Figure 1. Four status bars are shown from the TEAM™ software illustrating the throughput at the 7.68 (a), 3.84 (b), 1.92 (c), and the 0.96 (d) amp times.