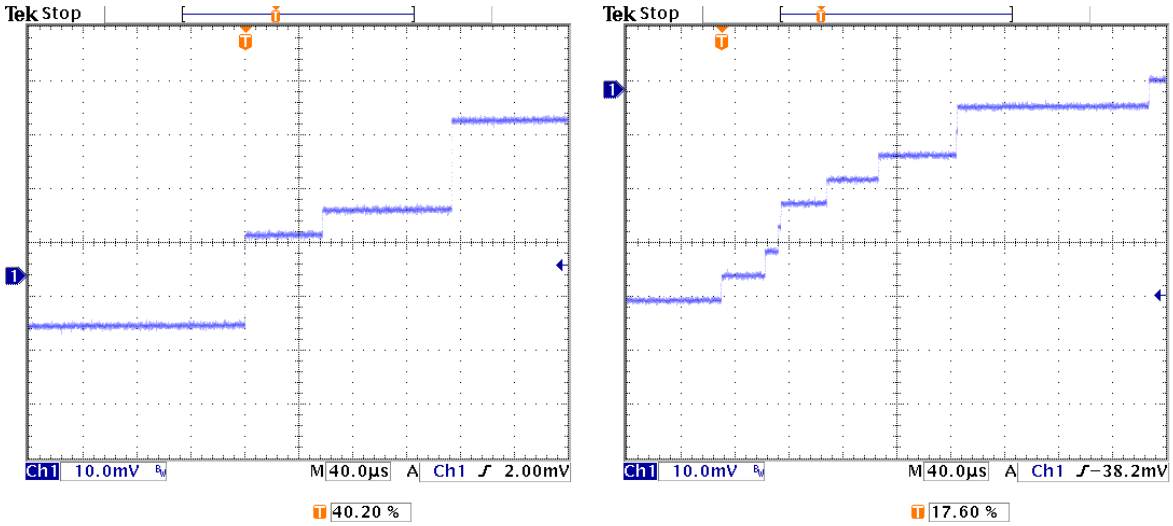
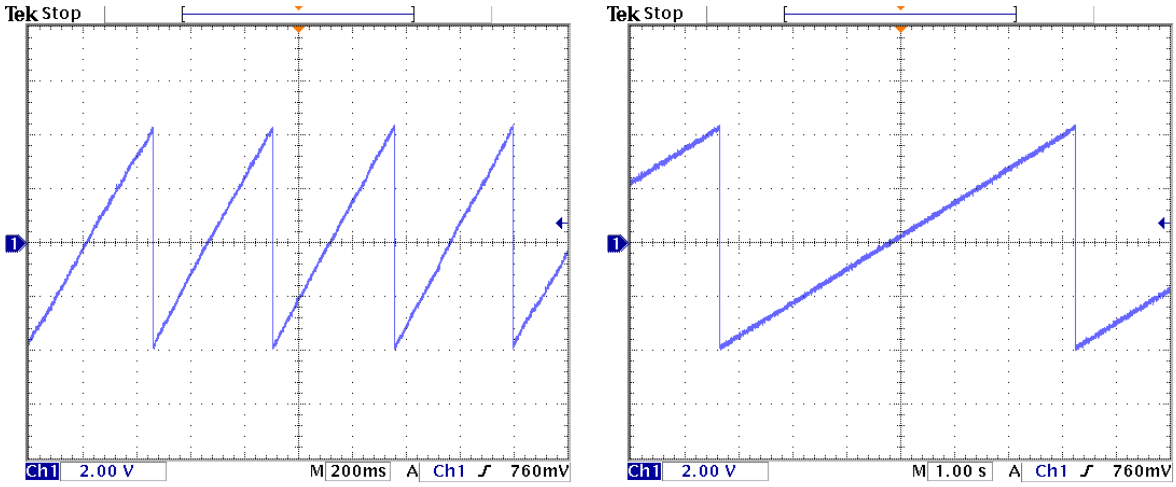
# Typical Silicon Drift Detector (SDD) Pulses

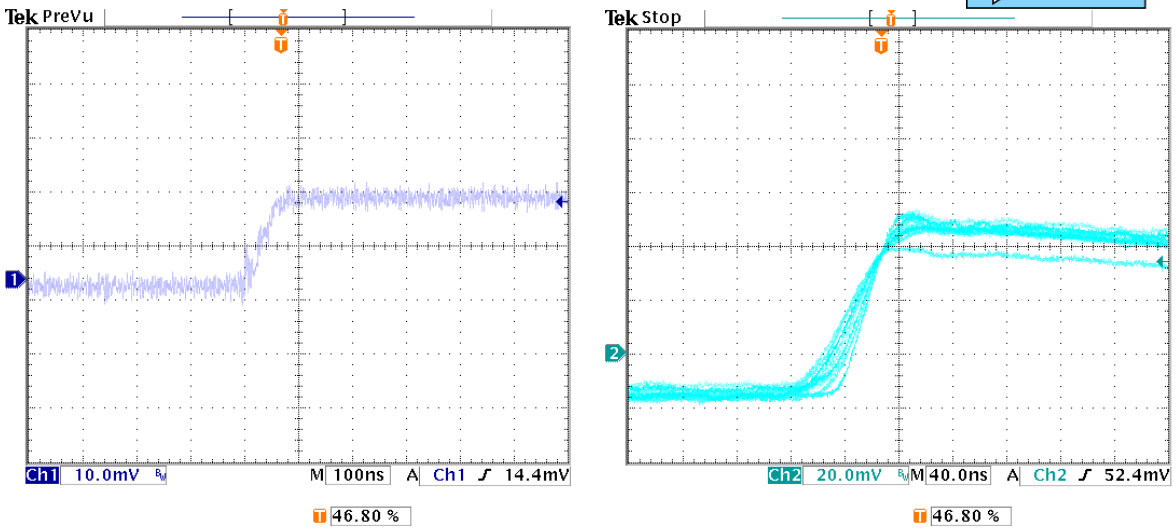



**Preamplifier outputs.** These traces illustrate typical output pulses with an SDD. Each X-ray interaction results in a positive going step of ~1 mV/keV, measured using 5.89 and 22.1 keV X-rays. The polarity is opposite that of the SiPIN. Some preamplifiers have a custom gain so the step size may differ.

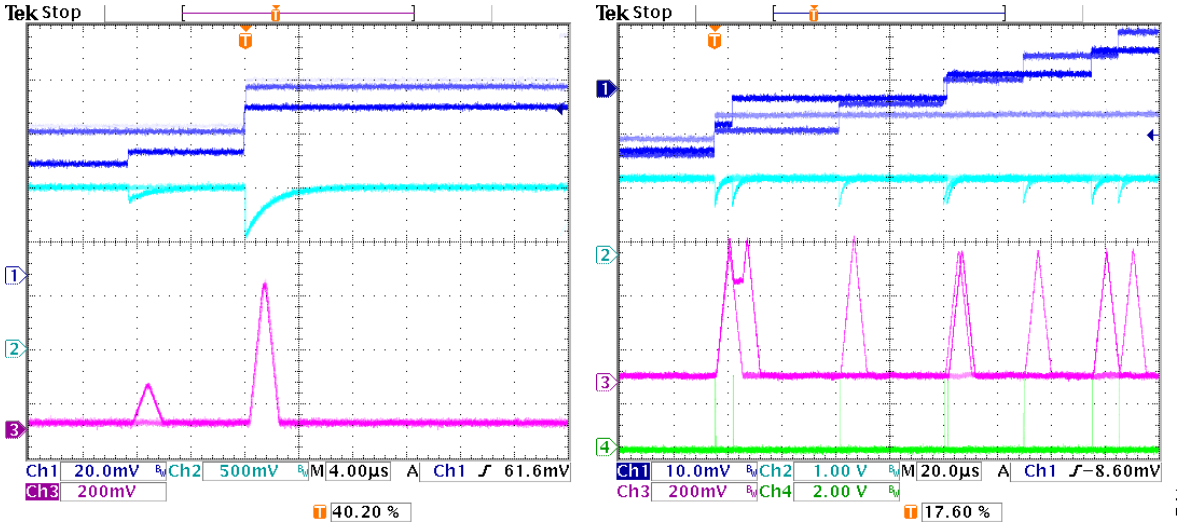



**Preamplifier output.** These traces also show the preamp output but on a different voltage and time scale to illustrate the reset. The small steps from each signal integrate towards the positive rail, where a reset signal is generated. This results in a sawtooth of several volt amplitude. The period depends on the total current through the detector (signal current plus leakage current). The trace on the right was taken at a lower signal current.

This was measured using an XR100, which has a reset range of about +/-5V. The PA210 and PA230 have reset ranges of about +/- 2.5V.



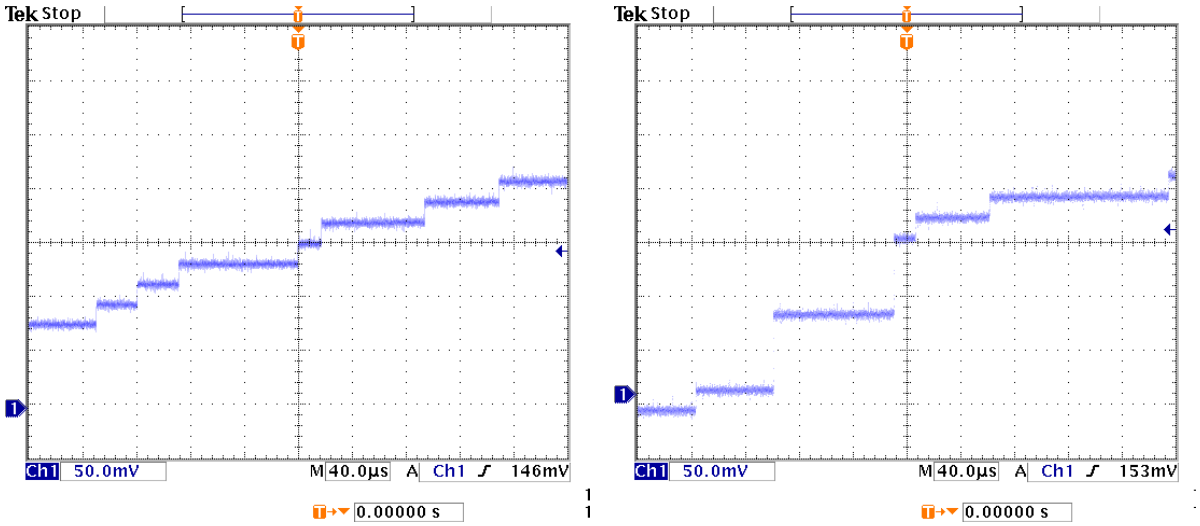

**Preamplifier risetime**. The plot on the left shows the trace from the preamplifier for a single pulse at a short time scale, while the trace on the right shows the AC coupled signal from several pulses. The risetime is typically <100 ns.



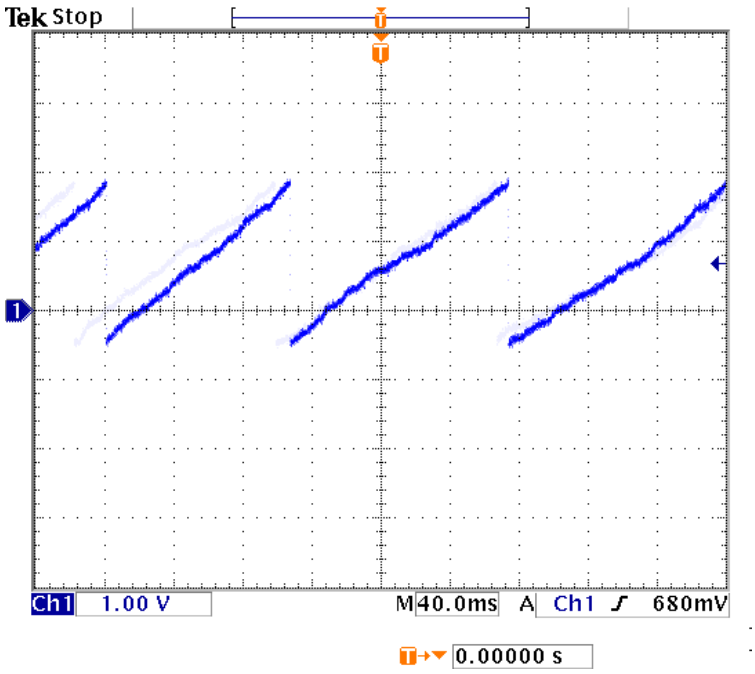

**Signals.** These traces show the preamplifier output (dark blue), the input to theADC (light blue) and the shaped output (magenta) for typical pulses. The trace on the left shows two pulses, one of 5.9 keV and the other 22.1 keV, which are well separated in time. The plot on the right shows two pulses which overlap in time (pile up) followed by two pulses which are separated.

Note that the ADC input has an offset of approximately 1.8 V, with negative going pulses exhibiting an exponential 3.2 µs tail. A 1V step into the ADC corresponds to a full scale event in the histogram.

## FastSDD Typical Signals

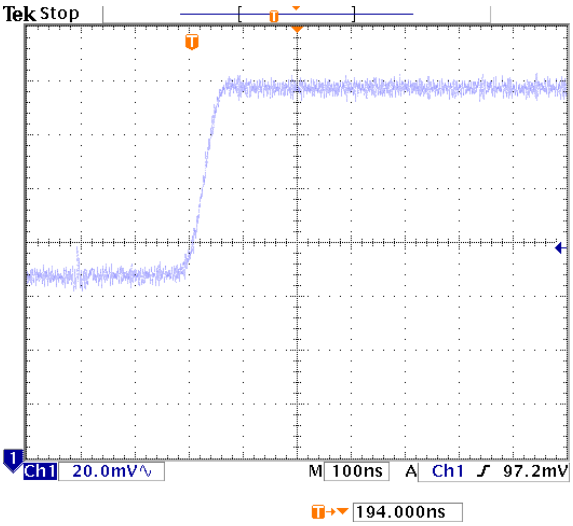


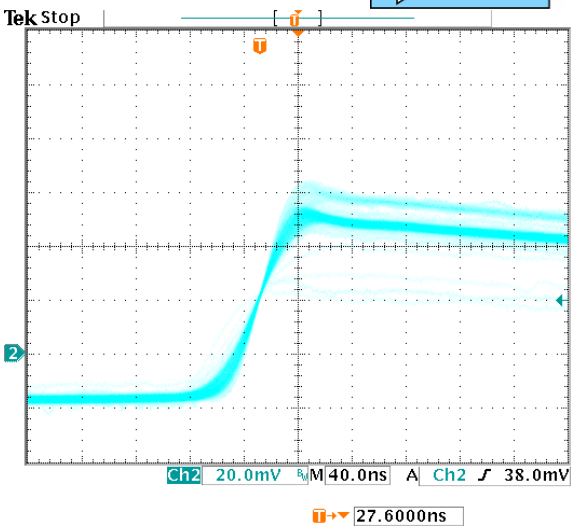

**Preamplifier outputs.** These traces illustrate typical output pulses with a FastSDD detector. Each X-ray interaction results in a positive going step of ~3.7 mV/keV. On the right, one can distinguish the 5.9 and the 22.1 keV steps.



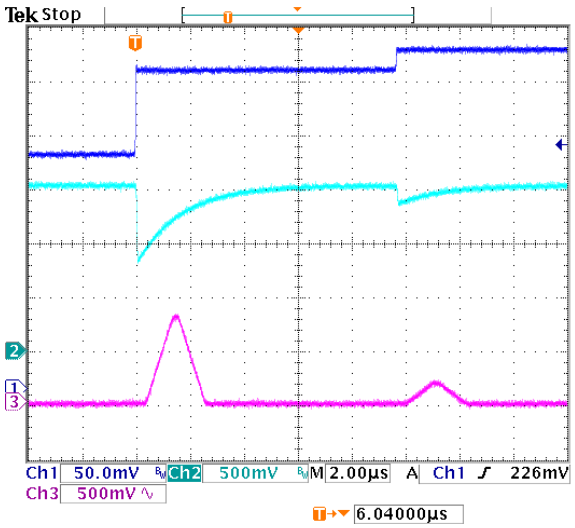

**Preamplifier output.** This trace also shows the preamp output but on a different voltage and time scale to illustrate the reset. The small steps from each signal integrate towards the positive rail, where a reset signal is generated. This results in a sawtooth of several volt amplitude. The period depends on the total current through the detector (signal current plus leakage current).

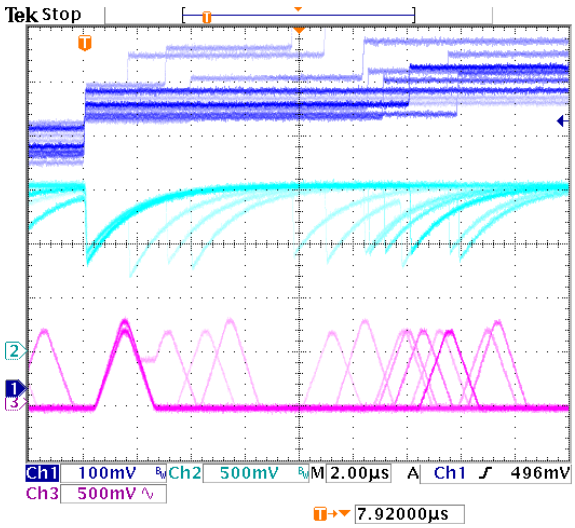
This was measured using an XR100, which has a reset range of about -0.5/+2V. The PA210 and PA230 have smaller reset ranges.




**Preamplifier risetime**. The plot on the left shows the trace from the preamplifier for a single pulse at a short time scale, while the trace on the right shows the AC coupled signal from several pulses. Note how much less high frequency noise is observed with a FastSDF. The risetime is typically <100 ns.




**Signals.** These traces show the preamplifier output (dark blue), the input to theADC (light blue) and the shaped output (magenta) for typical pulses. The trace on the left shows two pulses which are well separated in time. The plot on the right shows several pulses, illustrating the random timing and occasional pulse pileup.