Electrons interact with matter 1e6 times stronger than X-rays do, which makes it an ideal radiation source for
diffraction and imaging experiments on submicron- and nano-sized crystals. During the last three decades, 3D
electron diffraction (3D ED) has been developed into a regular and reliable technique for structure determination,
which is complementary to single-crystal X-ray diffraction (SCXD) and single particle analysis. One issue for
electron diffraction is inelastic scattering, which brings background in the diffraction patterns. This background is
most obvious for electron diffraction patterns from protein crystals, especially at low angles. Even though modern
diffraction data software (XDS, DIALS, MOSFLM) has sophisticated background removal algorithms to deal with
this, the existence of inelastic scattering will still add errors in the diffraction experiment. The inelastically scattered
electrons can be removed by energy filters. Here, we implemented energy-filtered 3D ED using a Gatan Energy
Filter (GIF) in both TEM selected area electron diffraction mode and STEM micro/nanoprobe mode. We explained
the setup in detail and this implementation can allow researcher to have better accessibility to energy-filtered 3DED
experiments because more microscopes are equipped with a GIF than an in-column omega filter. We also proposed
a crystal tracking method in STEM mode using live HAADF image stream. This method enables us to collect
energy-filtered 3DED datasets in STEM mode with a larger tilt range without foregoing any frames. This can avoid
crystal moving out of the beam during the tilting and the tilt range can always reach the maximum tilt range of the
microscope (in our case ~150°). We acquired multiple datasets from different crystals and we further processed and
refined the structures. The obtained structure after refinement also improved. Hydrogen atoms around the nitrogen
atoms were found in NH4H2PO4 crystals and the atomic displacement parameters were physically sensible for
energy-filtered datasets. We observed that the final R1 will improve 20% to 30% for energy-filtered datasets
compared with unfiltered datasets. We also discussed the possible reasons that lead to the improvement.