Purpose: To evaluate the image fusion accuracy of a hybrid PET/CT or SPECT/CT system using a recently developed vendor-independent phantom.

Methods: The basic design of the fusion verification phantom is a 10 cm urethane cube with three 1 mm diameter channels each fitted with standard Luer connection designed to be filled with a radioactive solution. The channels also have a 0.4 mm diameter steel wire inserted in each channel. There are two versions of this cube phantom with different orientations of the wire/liquid filled channels. There is the perpendicular cube with three channels each parallel to the x, y and z axes. The second cube orientation has two opposing angled channels and one that is perpendicular to the cube base. When imaged with either a PET/CT or SPECT/CT device the wire yields a high contrast image against a high signal target of the radioisotope filled channel. Both phantoms are scanned on various vendor and model hybrid systems.

Results: Three plane reconstructed data of the perpendicular fusion phantom generates images with point source like targets of the emission and transmission data for quick visual evaluation of registration accuracy for x, y and z shifts. A series of axial reconstructed images can be used to evaluate alignment when using the opposing ramp fusion phantom. The unique utility of the opposing ramps allows for verification of a z-axis offset from the single axial image data. Alignment data are presented from a number of PET/CT and SPECT/CT systems.

Conclusions: The use of either the perpendicular or opposing ramp fusion phantom provides a convenient QC vendor independent tool for evaluation of image alignment accuracy of hybrid imaging systems. The design supports a simple 3D processing with a straightforward visual interpretation of alignment.