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A new time interpolation algorithm to increase location rates of positron emission particle tracking measurements

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Positron emission particle tracking (PEPT) is used to track the motion of tracer particles in the mineral separation process of froth flotation. Previous measurements with PEPT were performed at a target location rate of 1.0 kHz due to the 1.0 ms precision of the timestamp recorded by the Siemens ECAT "EXACT3D" HR++ positron emission tomography (PET) scanner at the PEPT Cape Town facility in South Africa. Tracking at the 1.0 kHz location rate reduces the detail in the high frequency component of the Lagrangian path. This work introduces a new time interpolation algorithm that increases the location rate of PEPT measurements with the HR++ to 5.0 - 10.0 kHz. The algorithm also decreases the uncertainty in the time of the line-of-response (LOR) and the uncertainty in the reconstructed path, when comparing the simulation input path to the tracked output path.

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