Purpose: The quantitative accuracy of CT numbers in myocardial perfusion computed tomography (MPCT) is degraded by artifacts arising from the use of partial scan reconstruction (PSR), which is used in cardiac CT to improve temporal resolution. PSR artifacts appear because of inconsistencies in the angular range of projection data used for PSR. The purpose of this study was to demonstrate the ability of targeted spatial frequency filtration (TSFF) to reduce PSR artifacts in animal studies.

Methods: TSFF superposes the high frequency information from a PSR, which contains optimal temporal resolution, with the low frequency information from a full (360-deg) scan, which contains optimal CT number accuracy. We scanned 4 pigs with an MPCT protocol that had x-rays continuously on, using 120kVp and 90mAs/rotation. Animals were scanned under two conditions: locked and unlocked. In the locked condition, the animal's heart was paced in synchrony with gantry rotation, guaranteeing consistent angular ranges in the projection data for the desired position in the RR interval. This avoids PSR artifacts. In the unlocked condition, cardiac pacing was not used, leading to variations in the angular projection range associated with any specific point in the RR interval. Filtered backprojection was used to reconstruct partial and full scans at 70% of the RR interval. Time attenuation curves (TACs) were calculated in the myocardium and back muscle.

Results: TACs in the back muscle, which should have been flat, had a mean standard deviation of 13.9HU, 2.29HU and 1.12HU over all 4 animals, for the unlocked, locked and unlocked+TSFF conditions, respectively. For the myocardium, the root mean squared error was 5.9HU and 2.45HU for the unlocked and unlocked+TSFF corrected images with respect to the gold standard (locked condition).

Conclusions: The TSFF algorithm effectively suppressed PSR artifacts in vivo, improving the accuracy of CT numbers in MPCT.