Purpose:
Scatter analysis plays an important role in image reconstruction system. In Philips GEMINI TF system, the image reconstruction system is idle, waiting for scatter information from all five bed positions. To reduce the time used for image reconstruction, this study was to investigate whether three bed positions might be enough for image reconstruction by exploring the distribution of scatters using Monte Carlo simulations.

Methods:
A Geant4-based Monte Carlo tool—GATE is used to generate detected event lists and spectra, and to simulate the Philips Allegro PET/GEMINI systems. To mimic clinically realistic conditions, two 70-cm-long phantoms with a uniform activity in the FOV and different activity distributions outside the FOV are required to perform scatter proportion and scatter distribution measurements.
The outside of the FOV (OFOV) is divided into two components: the proximal OFOV (POFOV), describing the two bed positions on either side of the FOV under consideration, and the distal OFOV (DOFOV), describing the two bed positions on either side of the POFOV. Including the FOV, all five bed positions are currently required for single scatter simulation (SSS).
It is possible to use what we learn from an analysis based on uniform activity to apply scaling factors when we analyze POFOV data corresponding to real patient activity. To test this hypothesis, we compare two (uniform and non-uniform) activity distributions outside the FOV in our Monte Carlo simulations.

Results:
Most (at the 80±5% level, depending on the scanner) of the scattered coincidences are from the activity in the FOV, POFOV contributes at the 20±5% level), and the activity in the DOFOV makes a negligible contribution (1%) to scatter events.

Conclusions:
Based on our preliminary results, we showed that only three bed positions are necessary for image reconstructions, thereby speeding up the image reconstruction systems, while the image quality remains unchanged.