# TOF PET/MR attenuation correction of flexible MR-hardware utilizing MLAA and template alignment

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Accurate attenuation correction (AC) of hardware components used during Magnetic Resonance Imaging (MR) remains a challenge in PET/MR, as these components are not visible in MR-derived attenuation maps. CT-based template μ-maps are widely used for stationary hardware such as the patient table, but flexible MR hardware is currently not corrected for in clinical protocols. Previously, the influence of such MR hardware (MR-HW) on PET quantification was investigated using phantom [1] and patient [2] measurements performed on the Siemens Biograph mMR. These initial studies explored the simultaneous estimation of attenuation and activity (MLAA) [3] together with registration of a CT-based template μ-map on non-time of flight data to correct for the coil attenuation, similar to [4]. It has been shown that time-of-flight (TOF) information can stabilize the joint estimation problem for patient attenuation correction, eliminating crosstalk artefacts in the presence of errors in initial attenuation or activity estimates [5].

Building on these findings, the current work evaluates AC strategies for MR hardware using a state-of-the-art TOF PET/CT system (Biograph Vision 600, Siemens Healthineers) to explore how TOF information influences the robustness and accuracy of MRAC for recent PET/MR systems. Measurements of a NEMA body phantom, with and without an MR-hardware coil placed on top, were acquired using the TOF PET/CT system. MLAA, initialized with a phantom (and patient table) μ-map only, was employed to reconstruct the attenuation distribution outside the phantom, i.e., the coil attenuation. Additionally, a CT scan of the coil in a different position was converted into a PET μ-map and registered to the MLAA output to assess registration-based correction. The impact of the different MR-hardware attenuation correction strategies on the reconstructed PET images were evaluated and compared to an acquisition without MR-hardware present (Figure 1). Both proposed methods - MLAA and template-based registration - are capable of estimating attenuation from the flexible body coil. In the current phantom setting, MLAA achieves performance comparable to that of registration-based correction.

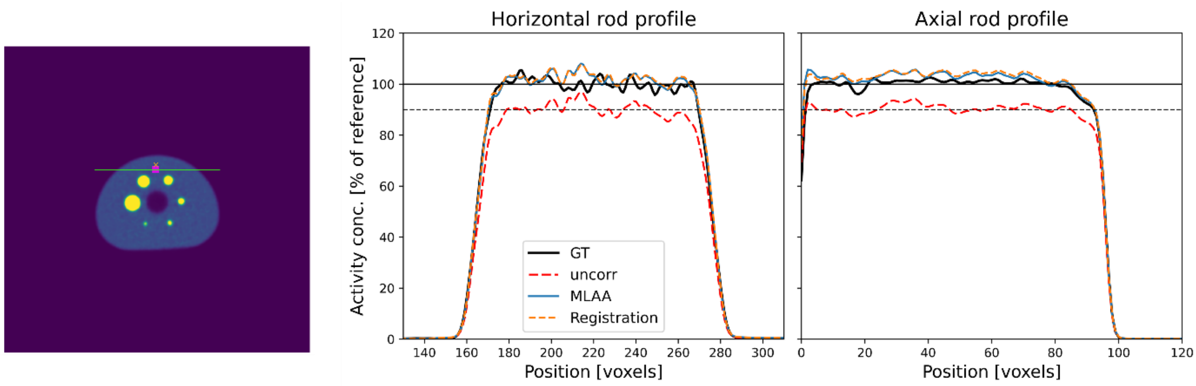


**Figure 1:** Position of line profiles on reconstructed MLEM image (left). Axial rod profiles through final MLEM images, averaged over 100 voxels for smoother representation (right).

## References:

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