Review PMB-104826

This is an interesting paper comparing results of the CBAC and MLACF PET reconstruction algorithms using a 57 patient clinical dataset. The MLACF algorithm uses TOF data to eliminate the need for a separate CT based attenuation scan. The authors have published previously on this algorithm including results limited to digital phantoms. Thus their results in a real world situation are obviously important.

Eliminating or reducing the need for CT based attenuation scans significantly reduces the radiation burden on a PET examination, which as the authors point out, would be particularly important for paediatric applications and repeated scans. There are also potential applications in PET/MR systems.

Unfortunately, the results, shown for example in fig 4(b), have quite large systematic errors and the authors conclude that further work is necessary. The discussion of possible further in the last paragraph of section 4 is very brief and I would have liked more detail.

On balance, after minor corrections, this paper is certainly worth publishing as a work in progress and might indeed encourage other groups to work in this important area. Appropriate sharing of (anonymized) raw clinical PET datasets between groups would be helpful for comparing real world reconstruction results. Large repositories of MR data exist (ADNI, OASIS etc.) but I am not sure if the same is yet true for PET.

The paper is clear and well written, I have only a few specific comments:

- In figure 2 the differences are mostly quite small. The exception is between 2(e) and 2(i) – is this due a large slice scaling factor between these images? If so these factors are more substantial than one might expect reading the text alone. A plot against slice number would be helpful. You should also comment on why the scaling factor between the equivalent high count images 2(f) and 2(j) is different and very close to one.
- A red arrow on figure 3 indicating the sinus region (sagittal b?) would be nice.
- Figure 6 (a) & (b) would be improved if small values (say the green regions) were made transparent to reveal an underlying structural image. All negative values then being shades of blue.
- I believe Appendix 7 is from Panin et al. 2012. On page 10 line 50 the symbol Cij,t should be Cit,j.