AbstractID: 7431 Title: Performance of a PET-CT scanner for hot lesion at high activity concentration

Objective: To evaluate PET-CT scanner for hot lesion at high activity concentration with and without radioactive background. **Method:** Four hollow spheres (2.96, 2.00, 1.45 and 0.91 cm) were installed to a PET-SPECT phantom with three inserts: hot lesions, uniformity linearity, cold lesions and cold spheres. 666 MBq of F-18 was in cylindrical tank with all inserts and the spheres. Two large spheres contained 26 MBq leading to a lesion to background ratio of 13.2, and two small ones were empty as cold lesions. Three bed sets of 15 cm axial field of view (slice thickness is 3.75 mm) each were scanned for a total of 9 minutes, and CT (120 kV/80 mA) scan as well. Images were at 30 min interval for two hours and then 60 min for last three, and reconstructed with OS-EM. RoIs and VoIs were defined manually. Same RoI for the largest sphere was used to obtain count as background to both RoI and VoI respectively. **Result:** Artifacts appeared on PET-AC and PET-CT images of the hot spheres and the inserts for first four data sets (0, 30, 60 and 90 min respectively) when the total activity was from 666 to 370 MBq. When it dropped from 370 to 147 MBq, images started to appear normal. However, VoI counts of the hot spheres decreased linearly with decay of the activity over the seven scans. This suggested that the PET-AC images can still yield accurate VoI counts under the high random and scattering counts from high activity in the cylinder-background and the CT scan will identify the regions even the images appear distorted. **Conclusion:** PET-AC images degraded due to increased random events and scatters at high activity. Regional counts can be measured with AC and RoI from CT data (independent of activity from F-18) in fused images.