Purpose:The use of PET-CT to delineate target volumes in radiotherapy planning is extending nowadays. Volume determination from functional imaging is not a forward step, nevertheless many methods have been proposed for automatic tumour determination. The aim of this study is to determine the threshold of SUV maximum which best fits the CT volume taking into account the signal-background ratio (SBR). This method has been previously established, but depends on camera properties and reconstruction algorithm which justifies the new calibration when a camera is acquired.

Methods:Our institution is equipped with a high-performance, time of flight (TOF) Gemini TF PET-CT from Philips. A NEMA torso phantom filled with six spheres ranging from 0,5 ml to 26,5 ml was used to generate the relation between the threshold SUV maximum and the SBR. Signal-to-background ratios from 1.5 to 11 were used. Images were reconstructed using the TOF information with a 3D OSEM algorithm.

Results:The relation between the threshold SUV and the SBR for the different lesions fits an inverse first order function ($y = 0.37 + 0.47 * (1/SBR)$) with a $r= 0.95$ for the larger lesions. To validate these results the phantom was filled to get a SBR of 3 and 6, and lesions were delimited applying the threshold determined in the above expression (52% for a SBR of 3 and 44% for a SBR of 6), an overestimation for the larger lesions was found. For the smaller lesions, the change in the threshold is very dependent on the lesion size for a given SBR, making necessary to know the size of the lesion in advance.

Conclusions:The relation between the SBR ratio and the threshold of the SUV maximum has been calibrated For larger lesions a useful threshold has been found for each SBR which agrees with previous studies.