

## Oncology Research using PMOD

Many scientists working with static oncology data have found ways to leverage PMOD's unique functionality, although their needs and workflows were not specifically addressed. Starting with the 3.9 version, PMOD has significantly improved functionality and usability for oncology research.

### Global Oncology Configuration

A new **Oncology** switch in the main configuration indicates to the program that high uptake lesion outlining, and assessment, is the main application purpose. As a result of this setting, use of **SUV** units is preset for image viewing and statistics. Outlined VOIs will be assumed to represent segmented lesions. Correspondingly, **MTV** (Metabolic Tumor Volume) and **TLG** (Total Lesion Glycolysis) will be output in the results of the calculated statistics. For convenience and proper documentation, subject name and ID appear in the image overlays per default.

### Lesion Segmentation and Image Overlay Statistics

Typically, oncologic lesions show up in PET images as bright areas of high uptake. Extensive literature exists on methods for delineating such lesions. In general, iso-contouring is applied in a box enclosing the lesion using either an absolute threshold in SUV units, or a threshold relative to  $SUV_{max}$  or  $SUV_{peak}$ . This can now easily be accomplished using hot-keys within the PMOD VOI functionality. The required specifications are located in the **VOI Configuration** tab in the lower right section of the VOI definition interface. Resulting statistics can be configured to be shown in the image overlay.

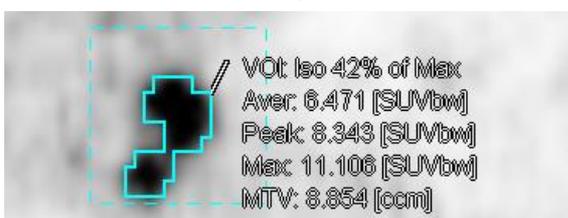
### Hot-key based Lesion Assessment

Three types of VOIs can be generated by pointing at a lesion and activating a keyboard hot-key combination:

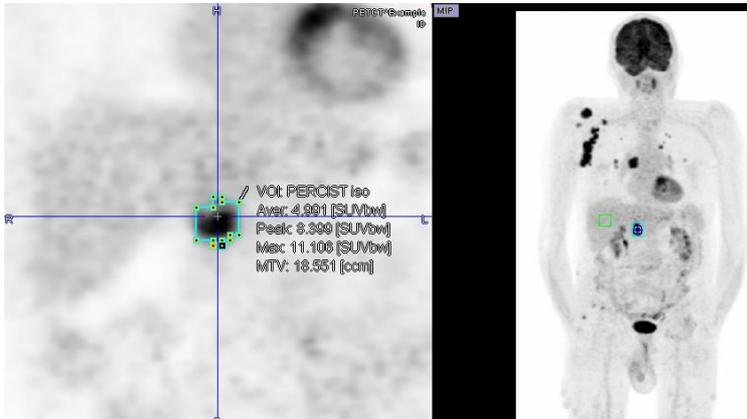
1. Spherical 1ml **Peak VOI (Ctrl+Q)** with maximal average in an enclosing sphere.



2. **Iso-contouring VOI (Ctrl+L)** within a **bounding box/sphere**. The contouring level is defined as percentage of  $SUV_{peak}$  or  $SUV_{max}$  in the enclosing space, or as **absolute SUV**. Frequently used configurations are 50% of  $SUV_{peak}$  and 42% of  $SUV_{max}$ .



3. **Iso-contouring VOI** according to **PERCIST** guidelines (**Ctrl+Shift+U**, **Ctrl+U**). Contouring is performed at a threshold level relative to uptake in a 3cm diameter reference sphere VOI placed in healthy liver.

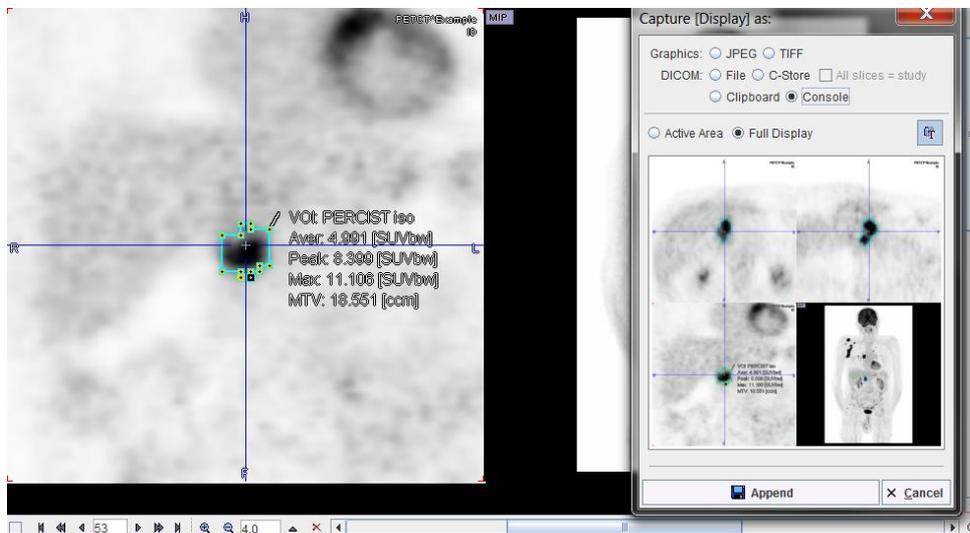


### Sorting of Segmented Lesions

Once the lesions have been segmented, they can be ordered according to different criteria such as size, MTV,  $SUV_{mean}$ ,  $SUV_{peak}$ ,  $SUV_{max}$  or longest lesion diameter. In this way, the most relevant lesions are easily brought to the top of the list for further evaluation and documentation.

### Documentation of Segmented Lesions

In order to document the segmentation and the resulting statistics, screen capturing has been improved and the **Ctrl+E** shortcut added. Various outputs are supported, including a capture buffer and direct **DICOM** sending via **C-Store** to a PACS system.



### Texture Analysis

Texture analysis quantifies the variability of the pixel intensities within a structure such as a tumor. There is a plethora of texture metrics, which might permit in vivo lesion characterization and provide predictive information about the tumor malignancy.

PMOD provides a collection of 36 indexes which have been found to be most valuable in the context of PET imaging. Six are based on the pixel histogram within a VOI, 19 based on the gray level co-occurrence matrix (GLCM), and 11 based on the run length matrix (RLM). Once the lesions are segmented, texture analysis can simply be invoked from the statistics menu.