

# Galileo|LungGuide: Principles of Design

"Declare the past, diagnose the present, foretell the future; practice these acts. As to diseases, make a habit of two things - to help, or at least to do no harm."

Hippocrates (ca. 460 - 377 B.C.) - *Epidemics*, Book I, Section XI.

## 1. **Fast.**

- All LG analyses are completed in 240 seconds or less.
- Both practical and useful in a clinical environment

## 2. **Automatic.** All LG image analyses require only "one-mouse-click".

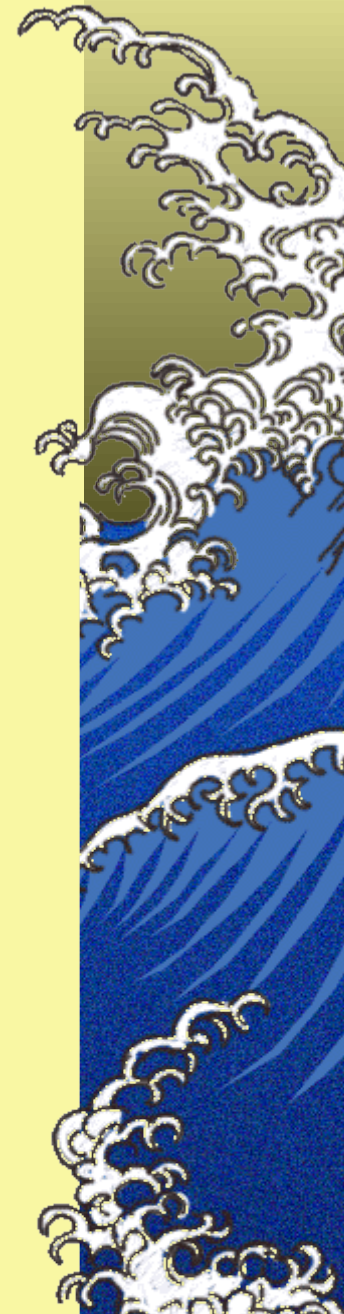
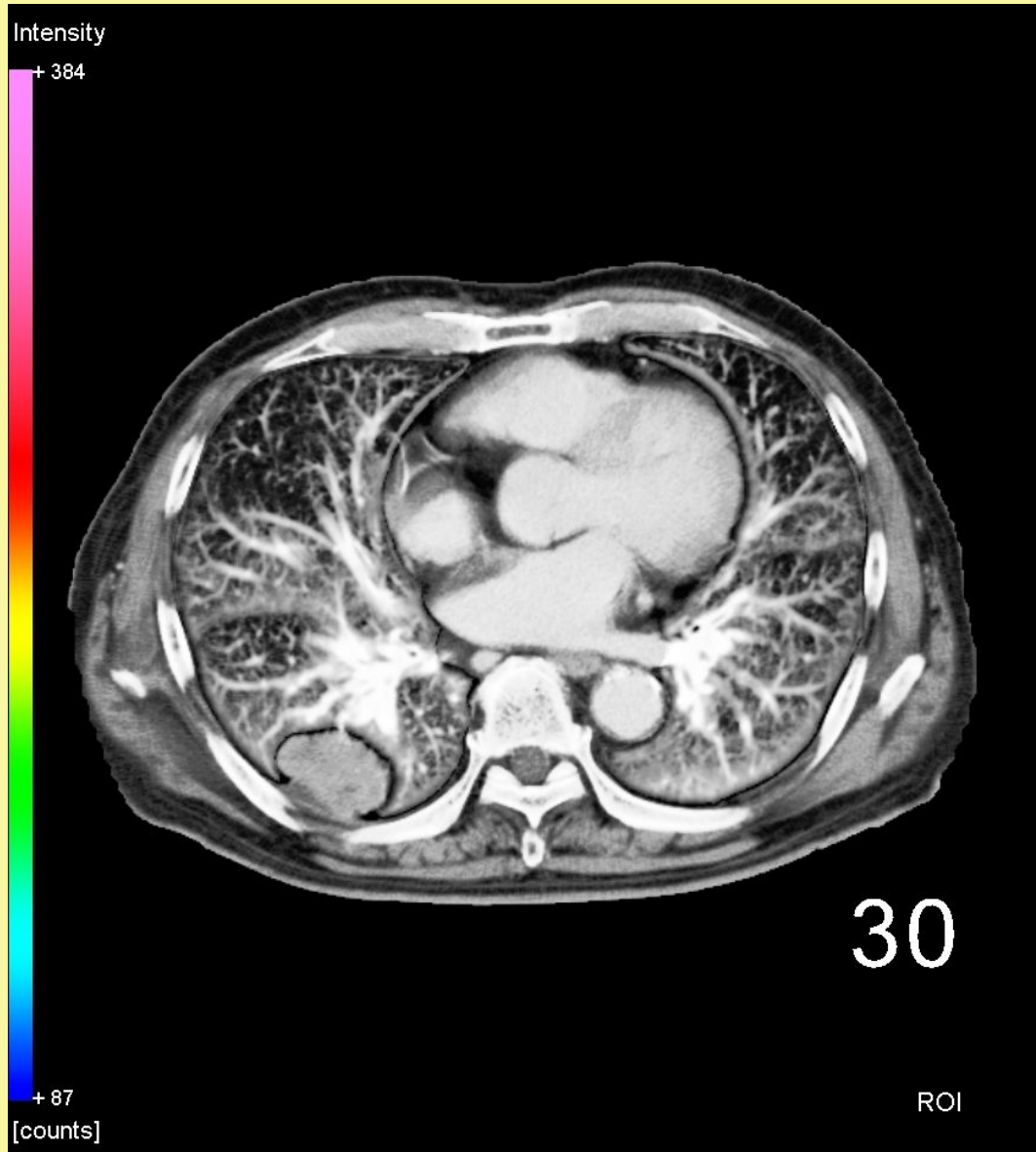
## 3. **Robust.** LG has successfully processed to-date all clinical images presented regardless of the severity of any disease-induced defects. Including

- Tumour
- Emphysema, and
- Pneumonia.

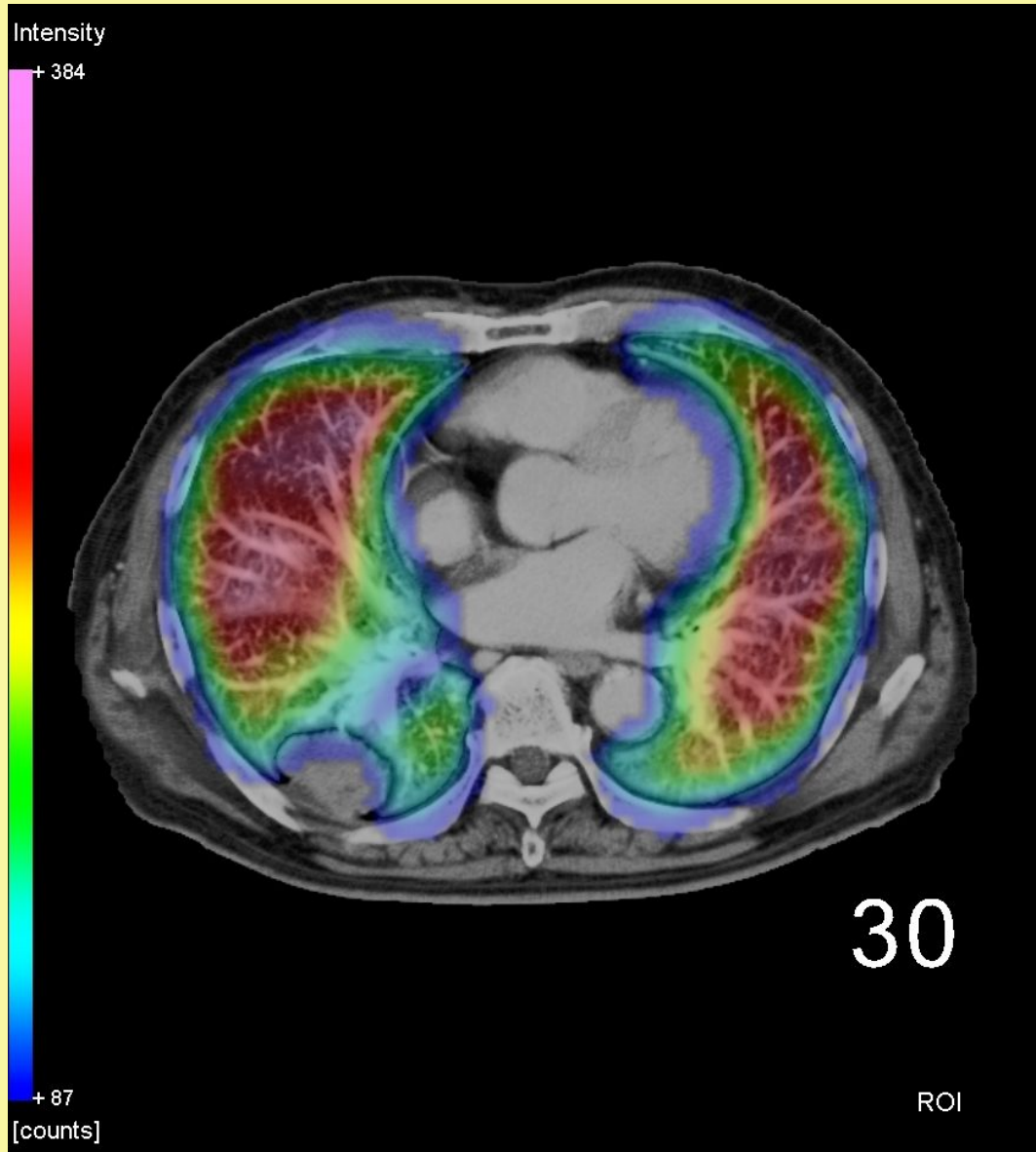
## 4. **Friendly.** LungGuide is simple, easy, and intuitive to use. LG runs on a PC with the Windows 2000 / XP operating system.



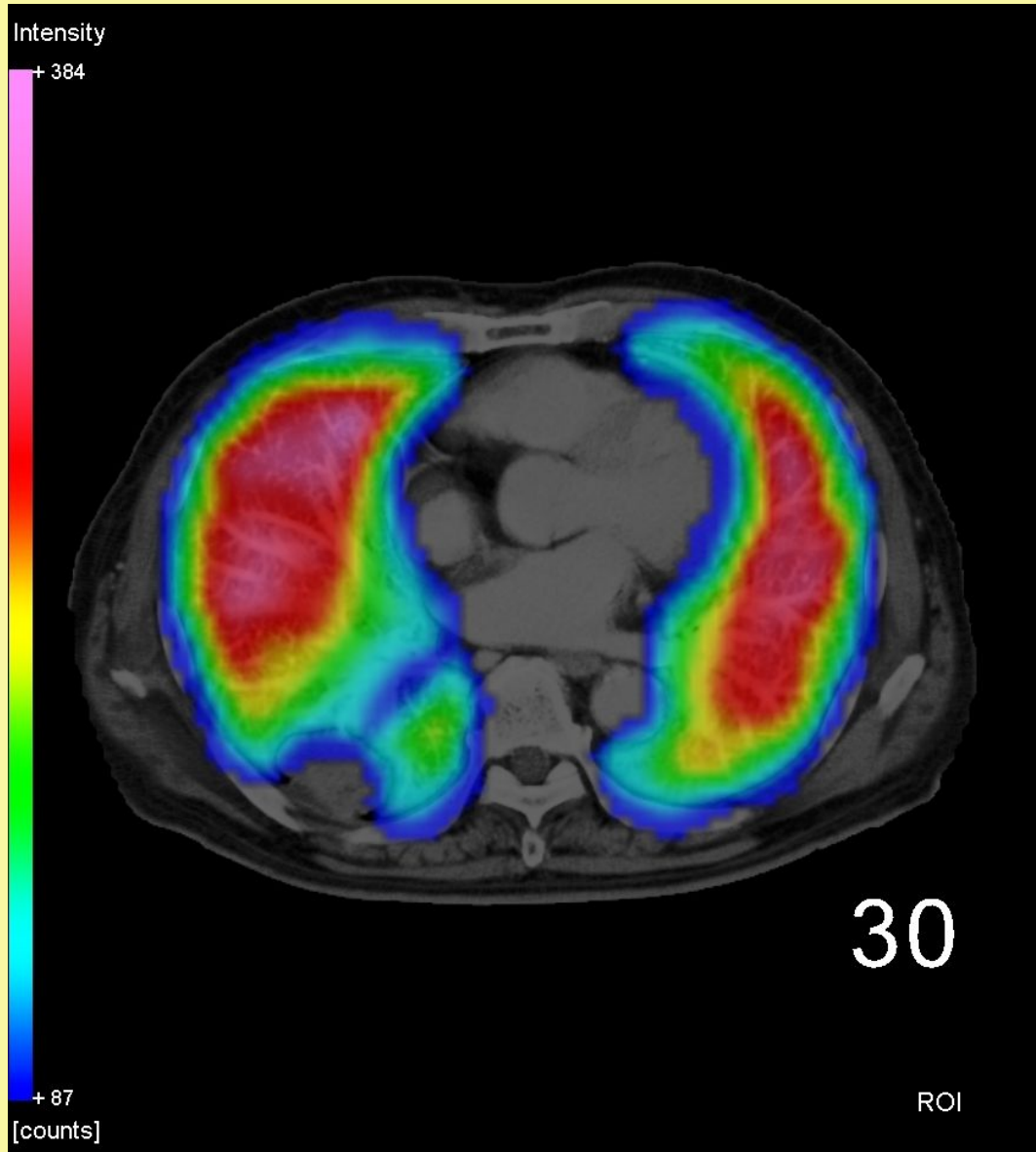
# LungGuide™ Image Fusion: CT + SPECT - Kr



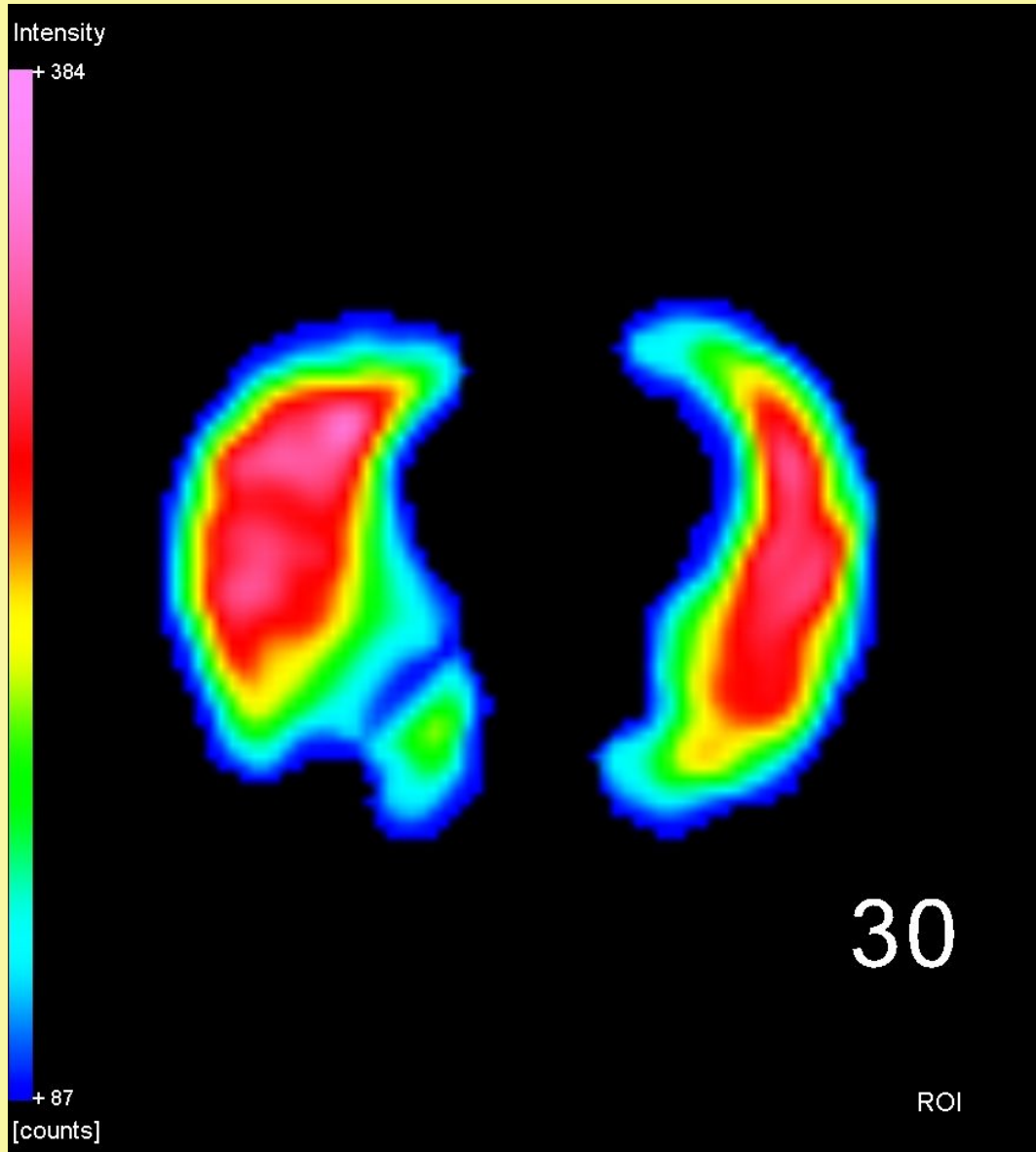
# LungGuide™ Image Fusion: CT + SPECT - Kr



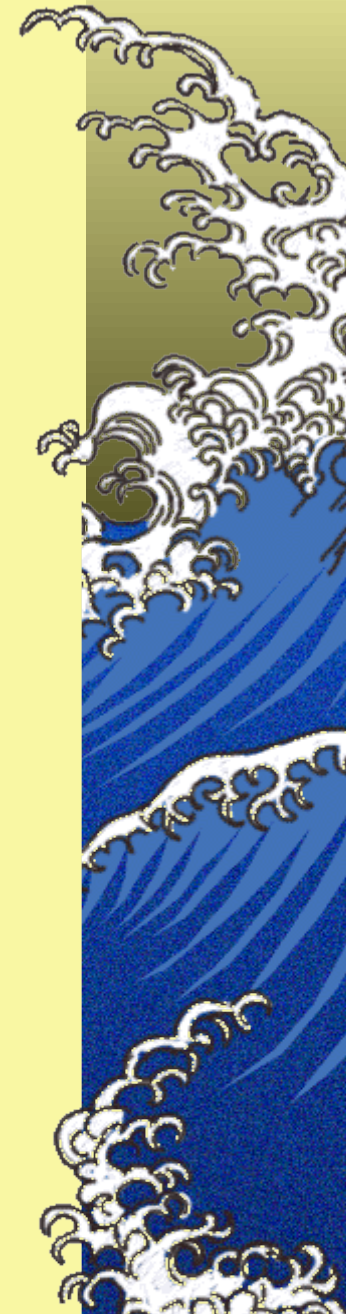
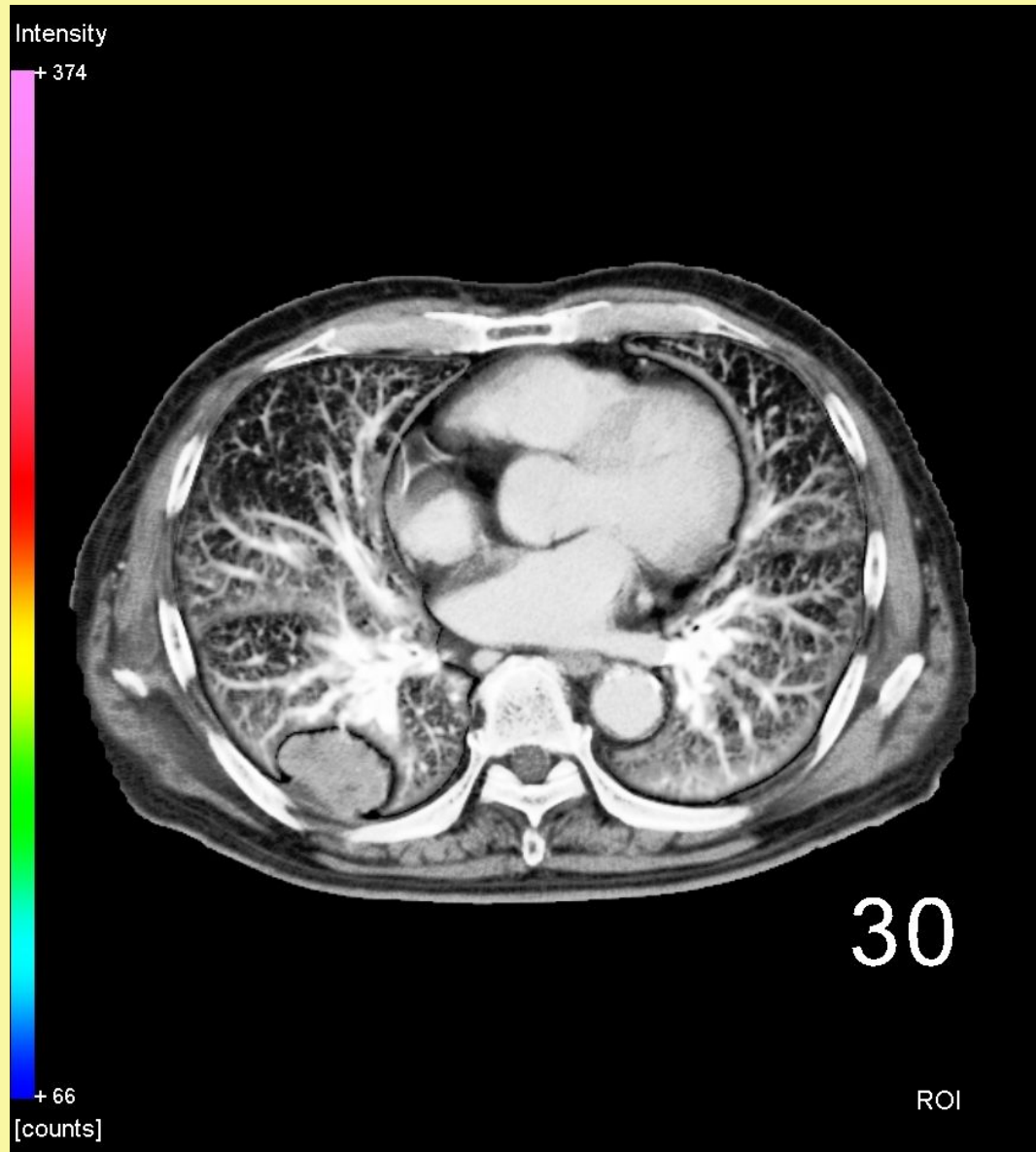
# LungGuide™ Image Fusion: CT + SPECT - Kr



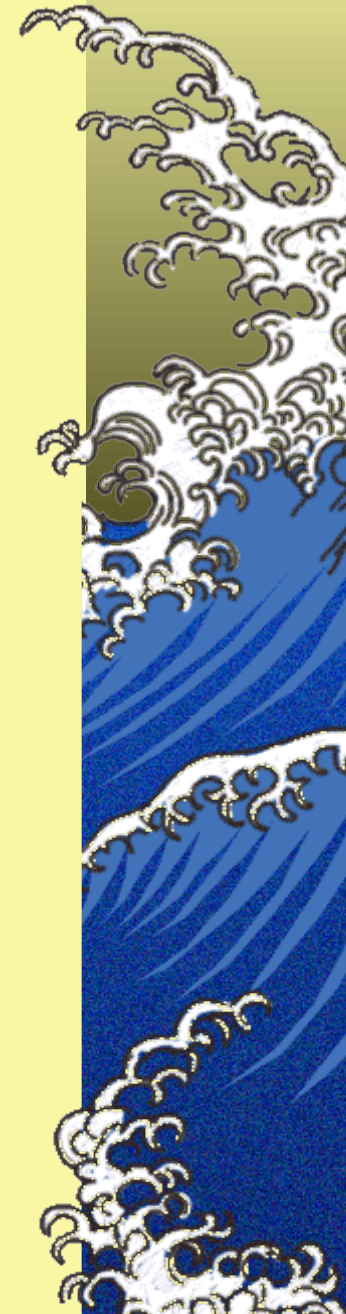
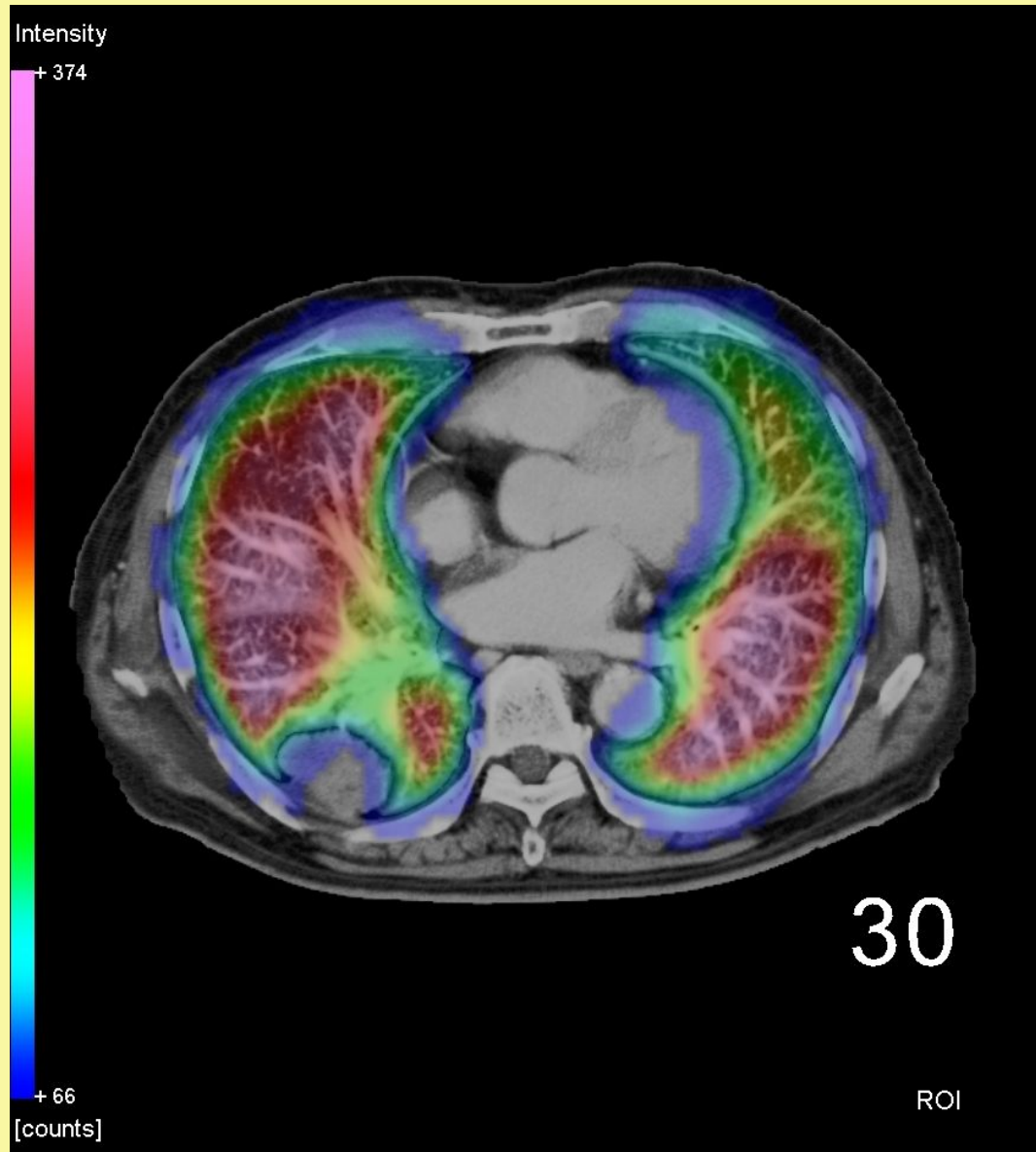
# LungGuide™ Image Fusion: CT + SPECT - Kr



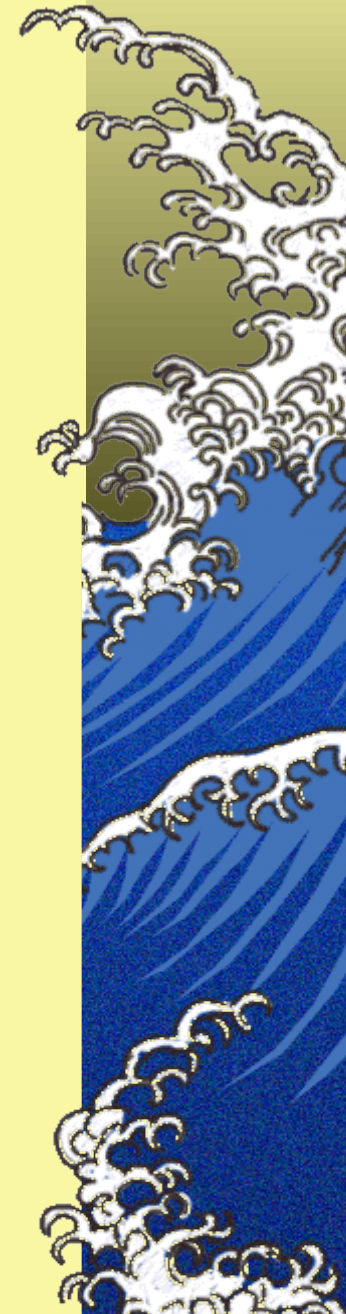
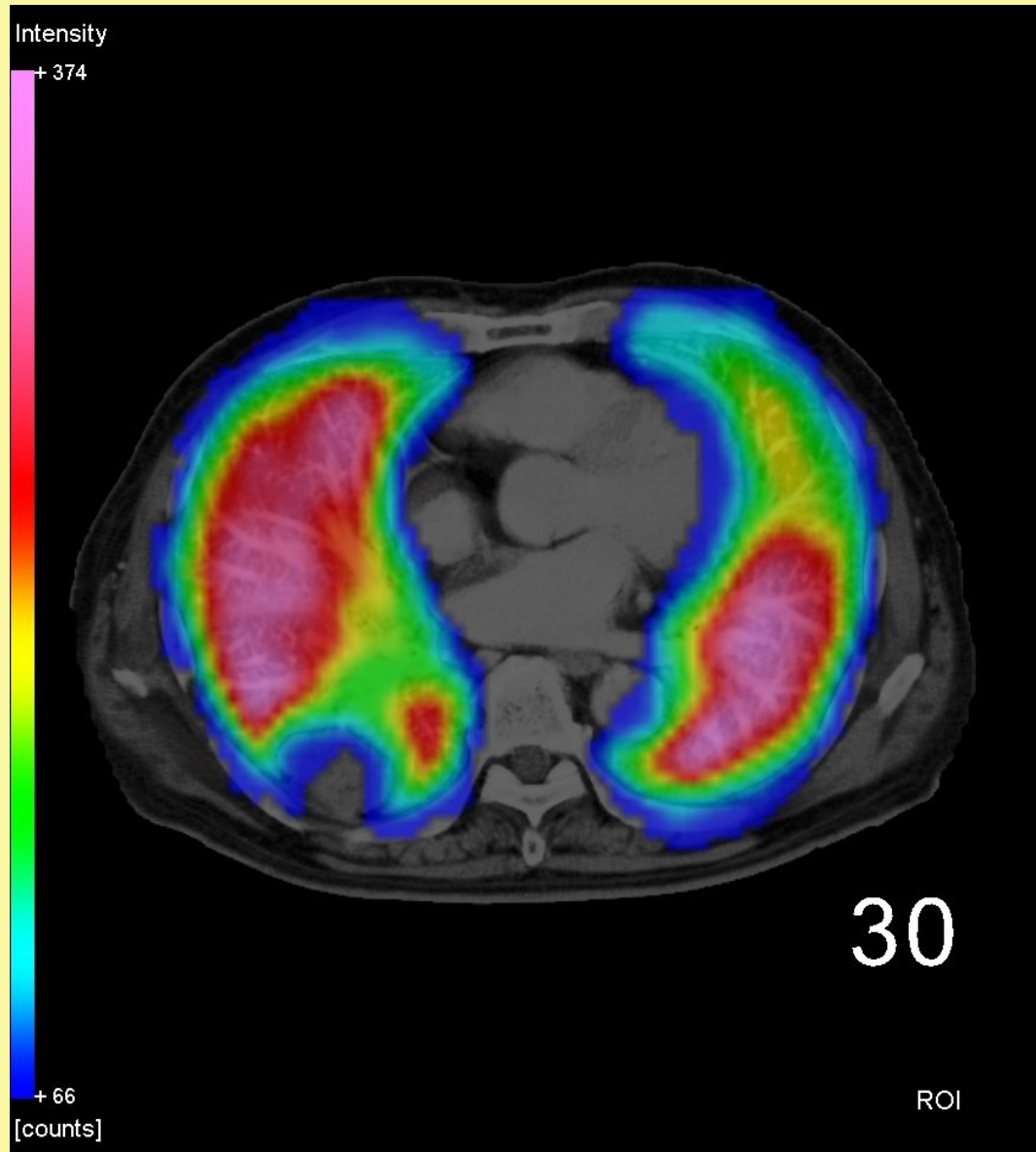
# LungGuide™ Image Fusion: CT + SPECT - MAA



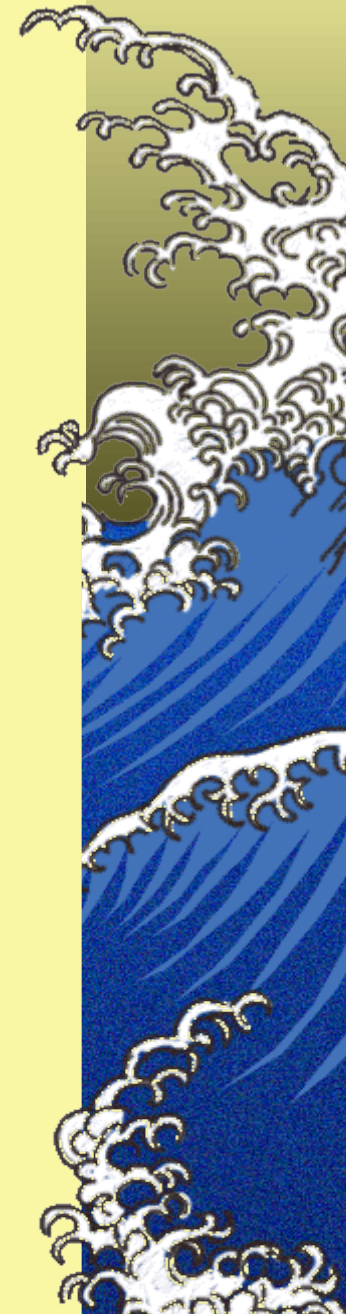
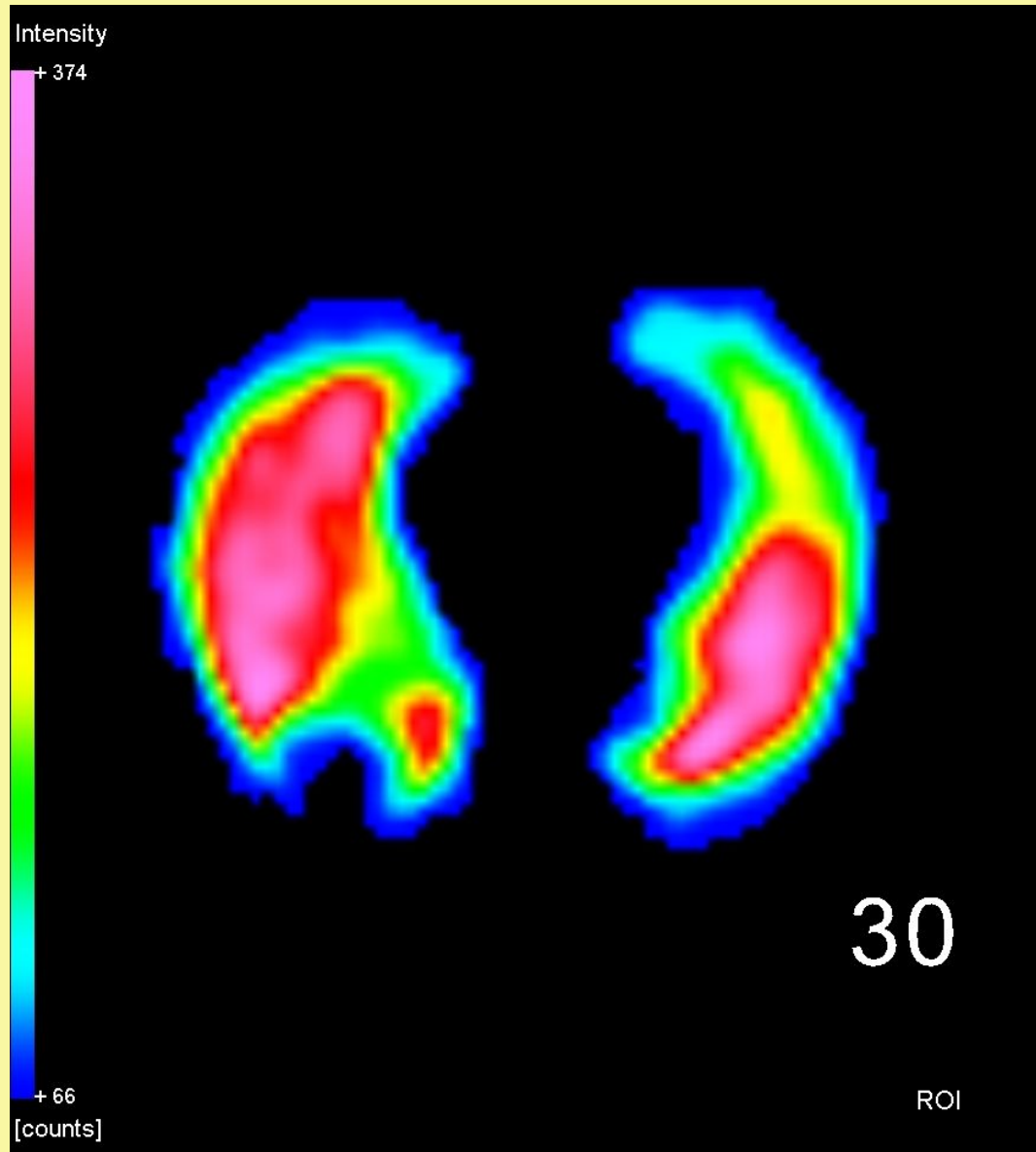
# LungGuide™ Image Fusion: CT + SPECT - MAA



# LungGuide™ Image Fusion: CT + SPECT - MAA

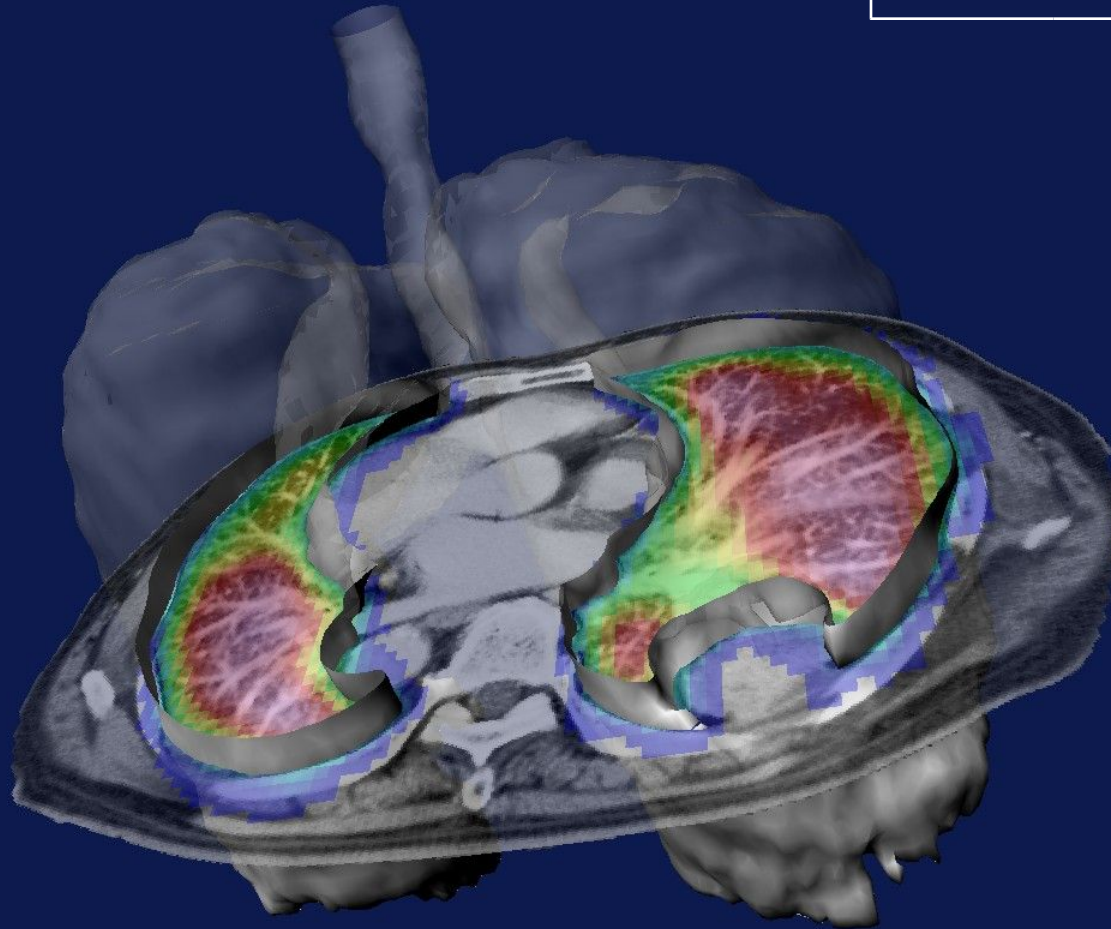


# LungGuide™ Image Fusion: CT + SPECT - MAA



# LungGuide™ 3D Image Fusion: CT + SPECT - MAA

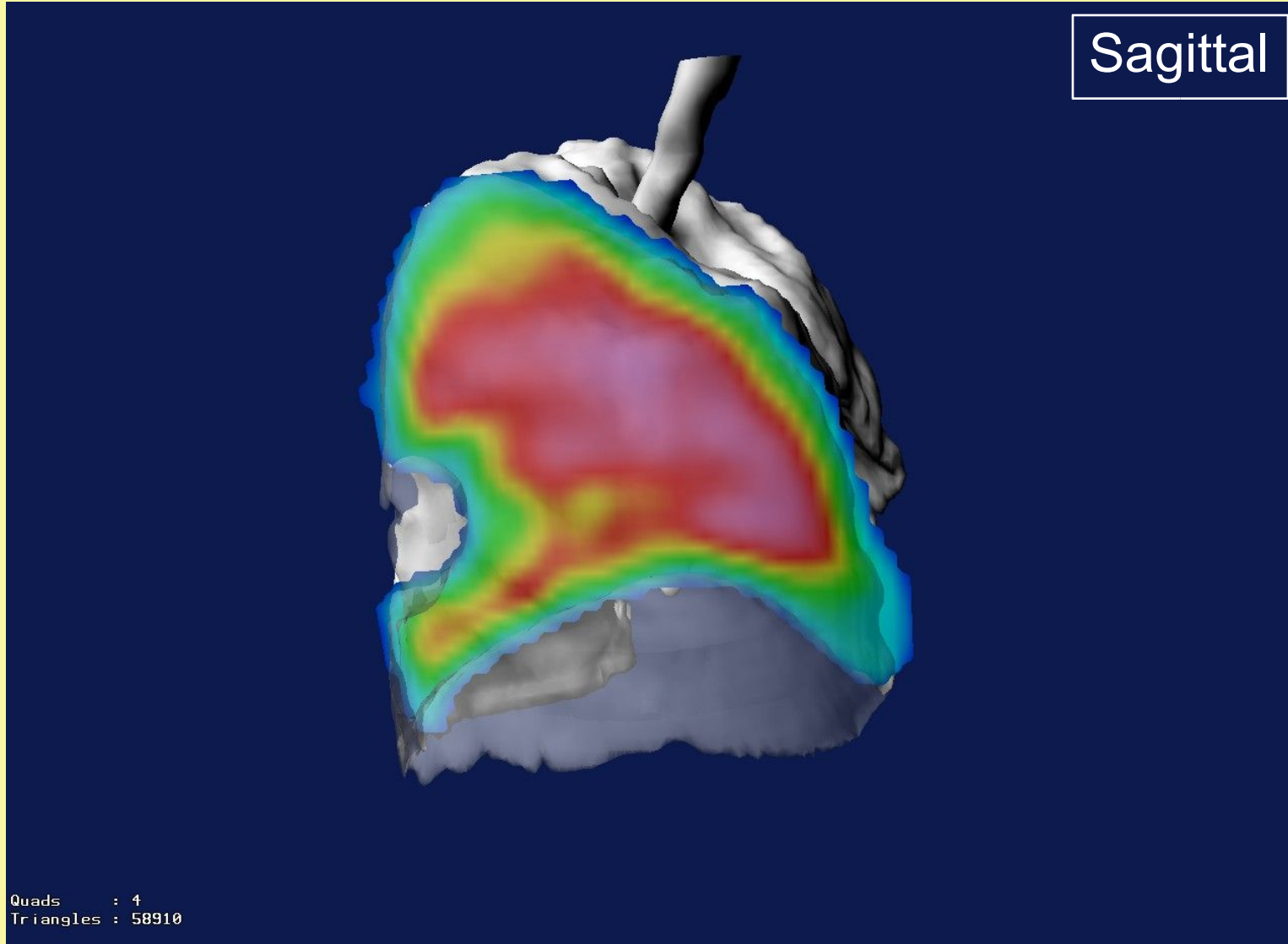
Trans-Axial



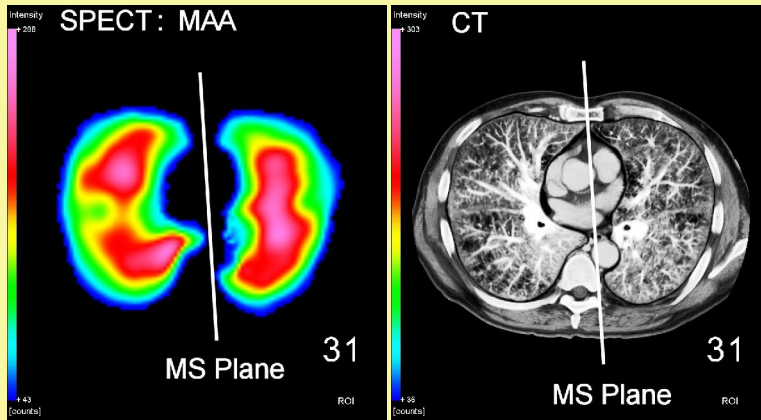
Triangles : 60822



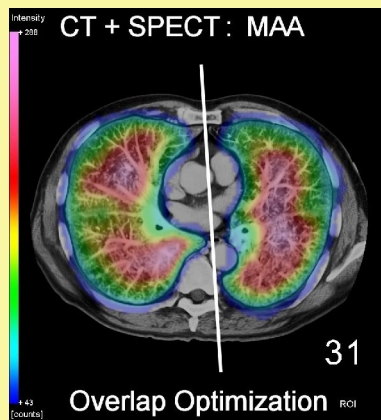
# LungGuide™ 3D Image Fusion: CT + SPECT - MAA



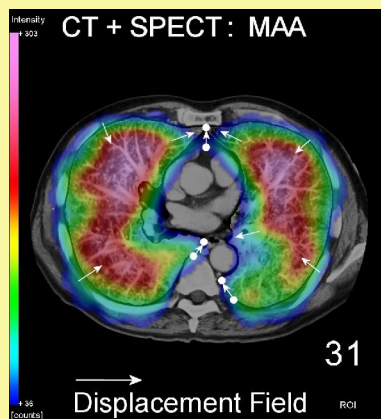
## Galileo|LungGuide™ Image Fusion: Automatic Method



**Step 1:** Find the **MS (mid-sagittal) Plane of approximate symmetry** between the right and left lungs in the original lung SPECT and CT images.



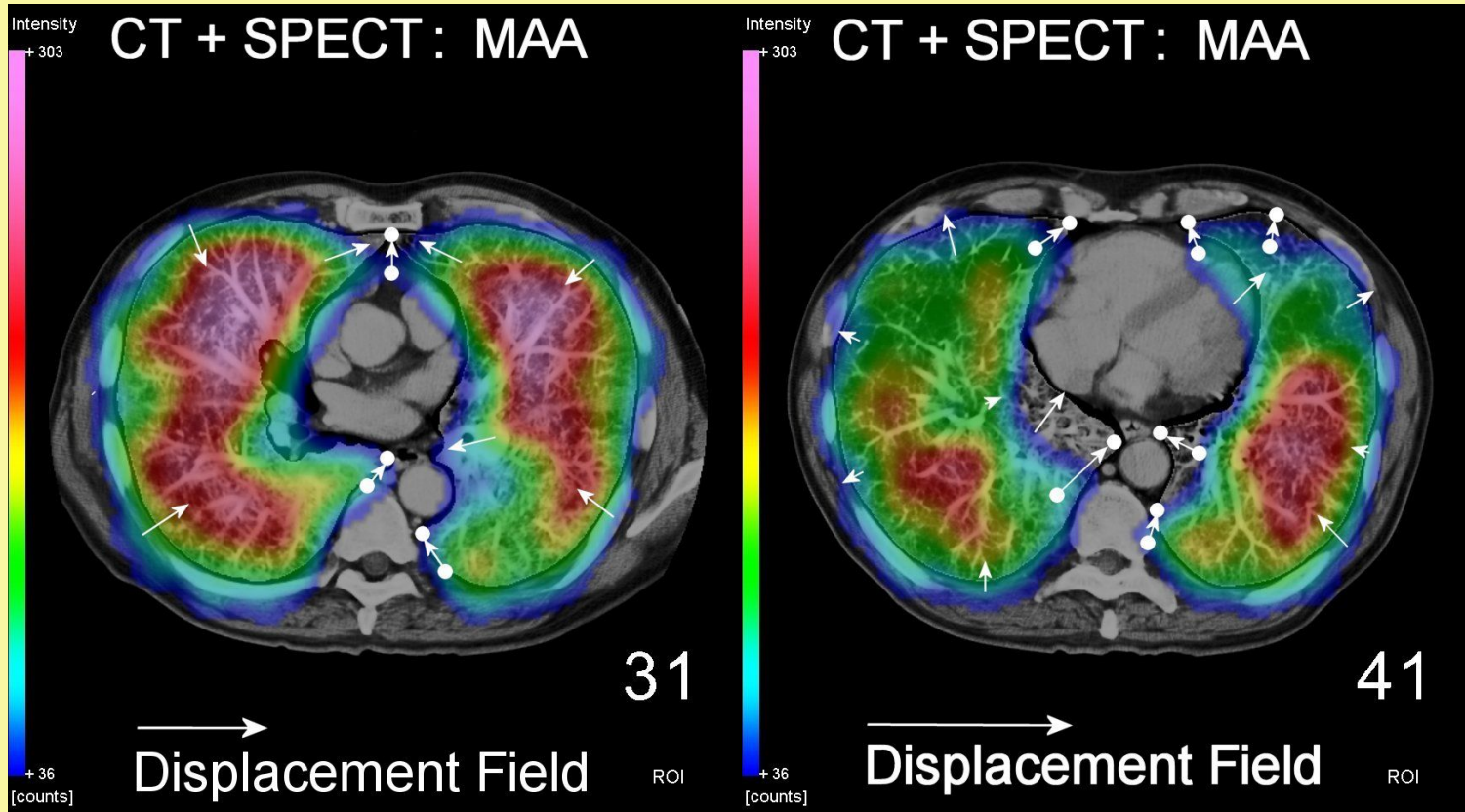
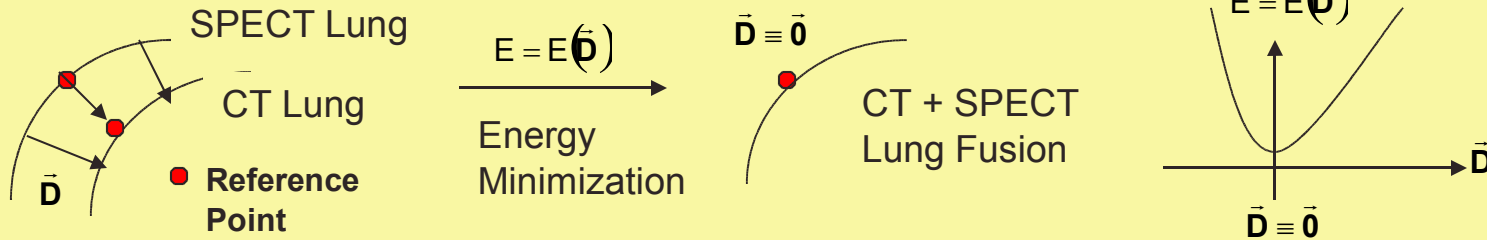
**Step 2:** Find the **optimal match** between the **original lung SPECT and CT images** using the mid-sagittal plane and **image overlap**. The **match** is quantified using a statistical **correlation function**.



**Step 3:** Estimate the **most probable SPECT outer lung surface**. Use **anatomic reference point** constrained “**energy minimization**” to calculate a **continuous SPECT to CT 3D displacement field**:

$$\bar{\mathbf{D}} = \bar{\mathbf{D}}(x, y, z)$$


# LungGuide™ Image Fusion: Automatic Method



Target: **Fast** (< 4 min) and **Automatic** (“one-click”) → **Clinically Useful**



# Galileo|LungGuide: The Future

## Next major release is LungGuide 3.1

- **Ratio Images:** SPECT  $\frac{Kr}{MAA}$  and  $\frac{MAA}{Kr}$  ratio imaging and image fusion with CT.
- **Virtual Surgical Planning:** Virtual lung surgical sectioning and prediction of remaining lung function.
- **Variable Gap CT:** Ability to handle CT images with any variable gap sequence.

