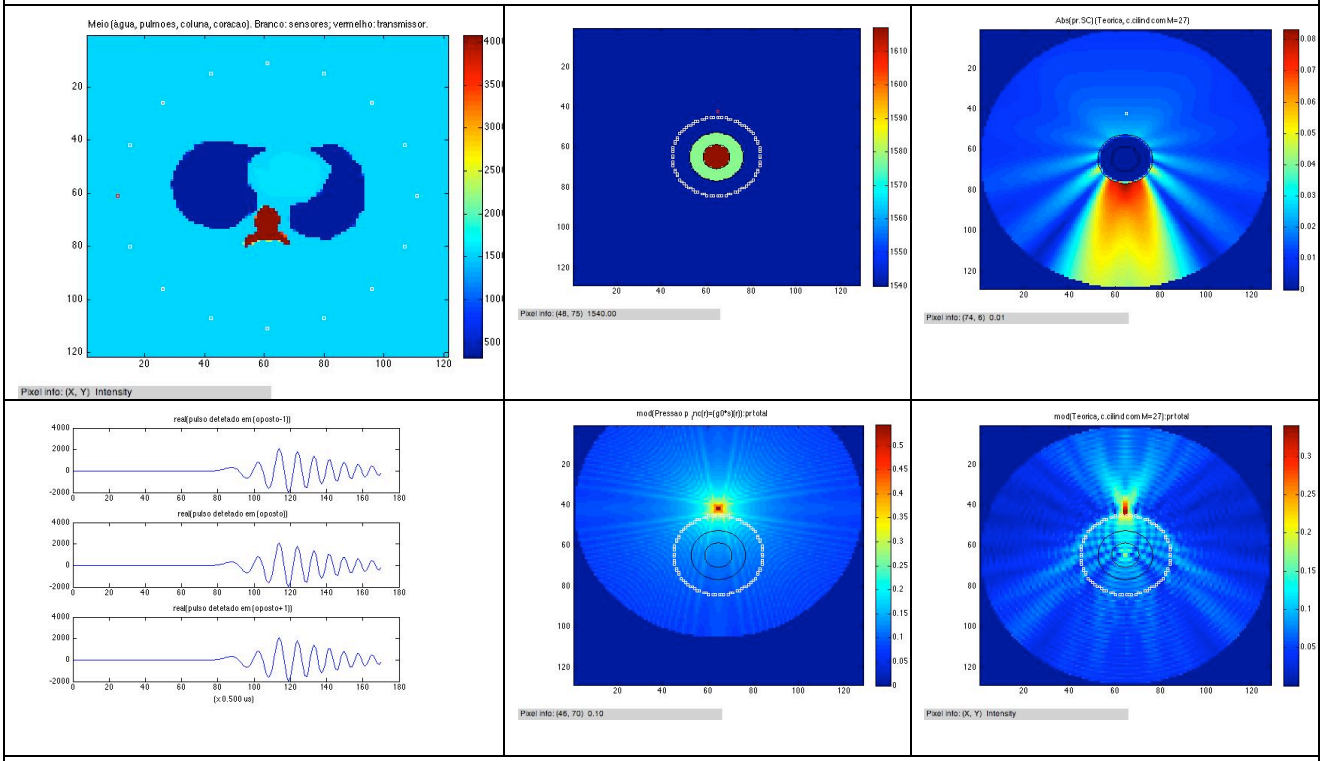
# Diffraction tomography based on Ultrasound

The objective of this project is the research and development of quantitative tomography based on scattered ultrasound. Conventional B-mode ultrasound, used in most clinics, is basically qualitative, in the sense that it measures relative local difference of acoustic impedances. On the other hand, diffracted tomography is able to estimate material properties such as velocity of propagation and density that may characterize the local tissue.

Diffraction tomography involves solving a non-linear inverse problem, given thousands of temporal signals and thousands of unknowns. Signals (pressures) are measured in multiple sensors around the object and the pressures can be described by a set of differential equations. There are several important issues related to this problem, such as resolution, convergence, reconstruction time, reflection artifacts, suitable hardware, and validity of small perturbations.

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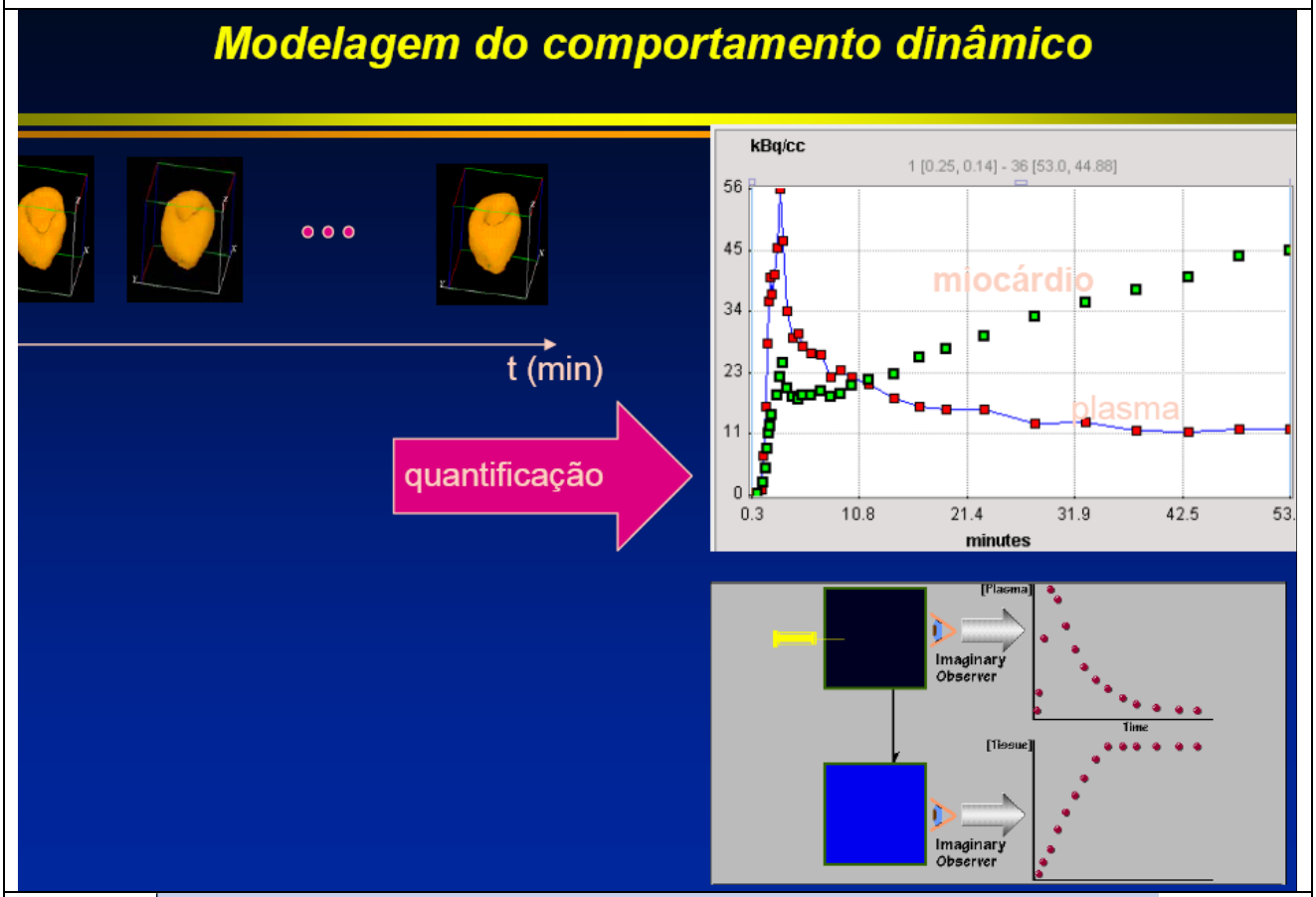
## Model identification and analysis in dynamic PET

Analysis in dynamic PET (Positron Emission Tomography) deals with estimation and quantification of parameters for compartmental and non compartmental models. The objective is the estimation of myocardial metabolic rates of Glucosis. The problem involves modeling and parameters estimation that best describe a linear system, given an input curve and an output signal. *(For details, please see related papers in our CV in the tab "members".)*




$$C_1(t) = K_1.e^{-(k_2+k_3).t} \otimes C_a(t)$$

$$C_2(t) = \frac{K_1.k_3}{k_2+k_3}(1-e^{-(k_2+k_3).t}) \otimes C_a(t)$$

$$C_1(t) + C_2(t) = C_T(t) = \frac{K_1}{k_2+k_3}[k_3 + k_2.e^{-(k_2+k_3).t}] \otimes C_a(t)$$

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