NA-MIC
National Alliance for Medical Image Computing
http://www.na-mic.org

Cardiac Agatston Scoring

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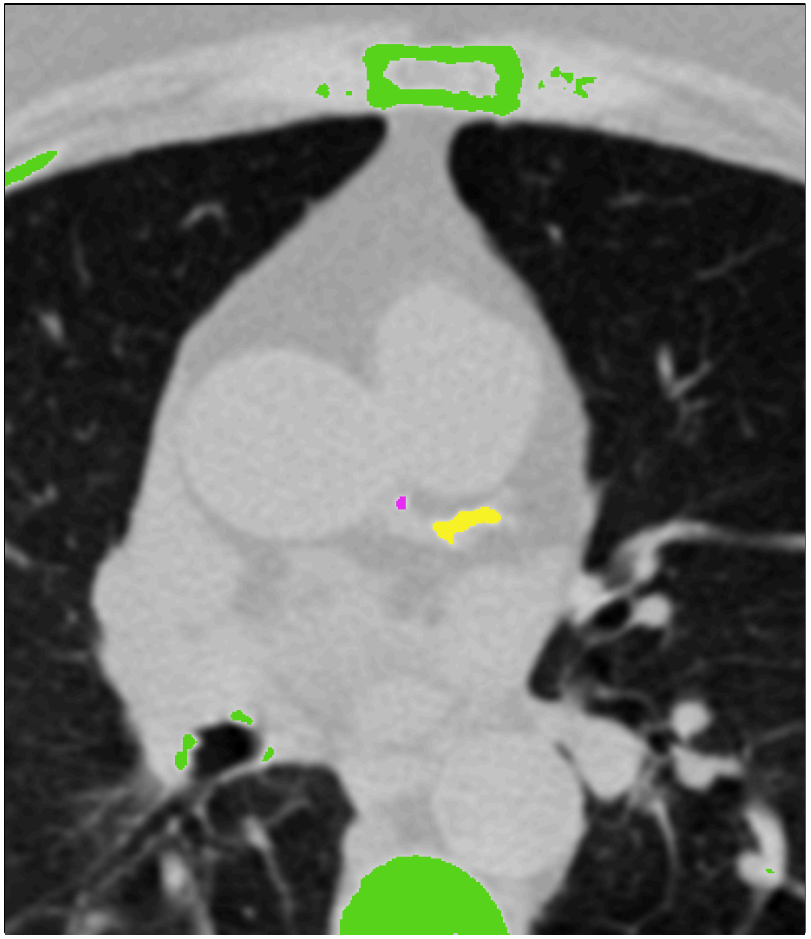
NA-MIC Tutorial Contest: Summer 2014

Learning Objective

This tutorial demonstrates a semi-automated method to segment and identify calcium plaques in coronary arteries. Then calculate the Agatston score.

Following this tutorial, the user will be able to load scans into Slicer4.3.1, segment calcium plaques, then calculate a calcium score and label statistics.



Pre-requisite

- Pre-requisite tutorial:
  - "Data loading and 3D visualization"
  - Author: Sonia Pujol, Ph.D.
  - http://www.slicer.org/slicerWiki/index.php/Documentation/4.3/Training

Material

This tutorial requires the installation of the Slicer4.3.1 release built after 06-05-2014 and the tutorial dataset. They are available at the following locations:

Slicer download page

http://download.slicer.org/

Tutorial dataset: [name of dataset]

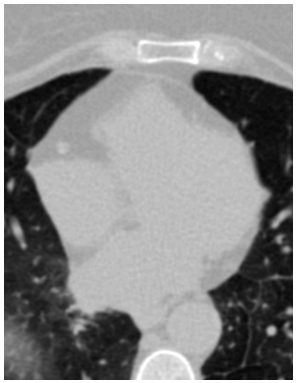
http://wiki.na-mic.org/Wiki/index.php/File:CardiacAgatstonMeasures_TutorialContestSummer2014.zip

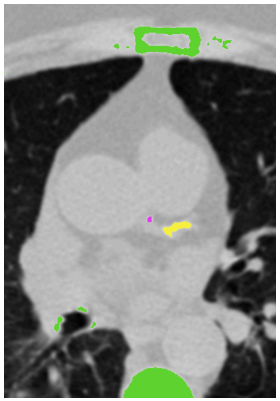
Note: A SimpleITK bug fix occurred on 06-04-2014 that is necessary for this module to function.

Platforms

Tutorial Name	Platform	Slicer Version	Test Date	Author	Test Results
Cardiac Agatston Measures	Mac OS	4.3.1-2014-06-05	2014-06-19	Jessica Forbes	All tests pass
Cardiac Agatston Measures	Windows 7 64 bit	4.3.1-2014-06-05	2014-06-23	Jessica Forbes	All tests pass
Cardiac Agatston Measures	Linux 64 bit	4.3.1-2014-06-05	2014-06-20	Jessica Forbes	All tests pass

Overview





	Index	Label Name	Agatston Score
	2	Left Main (LM)	4.5229
	3	Left Arterial Descending (LAD)	88.3706
	5	Right Coronary Artery (RCA)	24.2671
	6	Total	117.161

Part 1: Load module and data

Part 2: Threshold scan

Part 3: Identify calcium plaques

Part 4: Calculate scores and label statistics

Part 5: Save results

Background

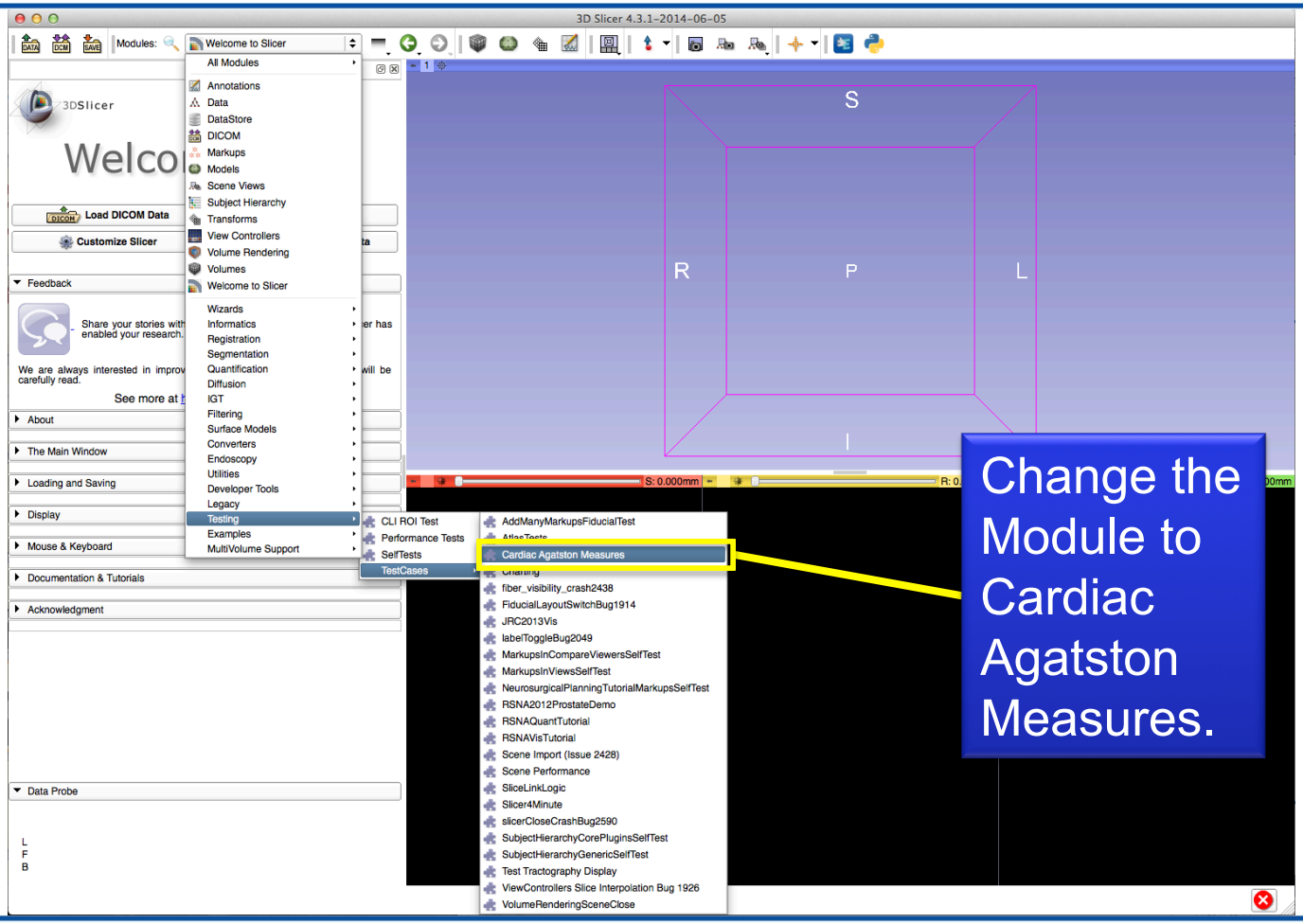
- CVD is the leading global cause of death: 17.3 million deaths/year
- USA: 1 million die of SCD or MI
- 40-60% have no cardiac symptoms before the event*
- Important to identify asymptomatic patients at risk of coronary events

*Myerburg et al. *Am J Cardiol 1997*
Virmani et al. *Cardiovasc Pathol. 2001*

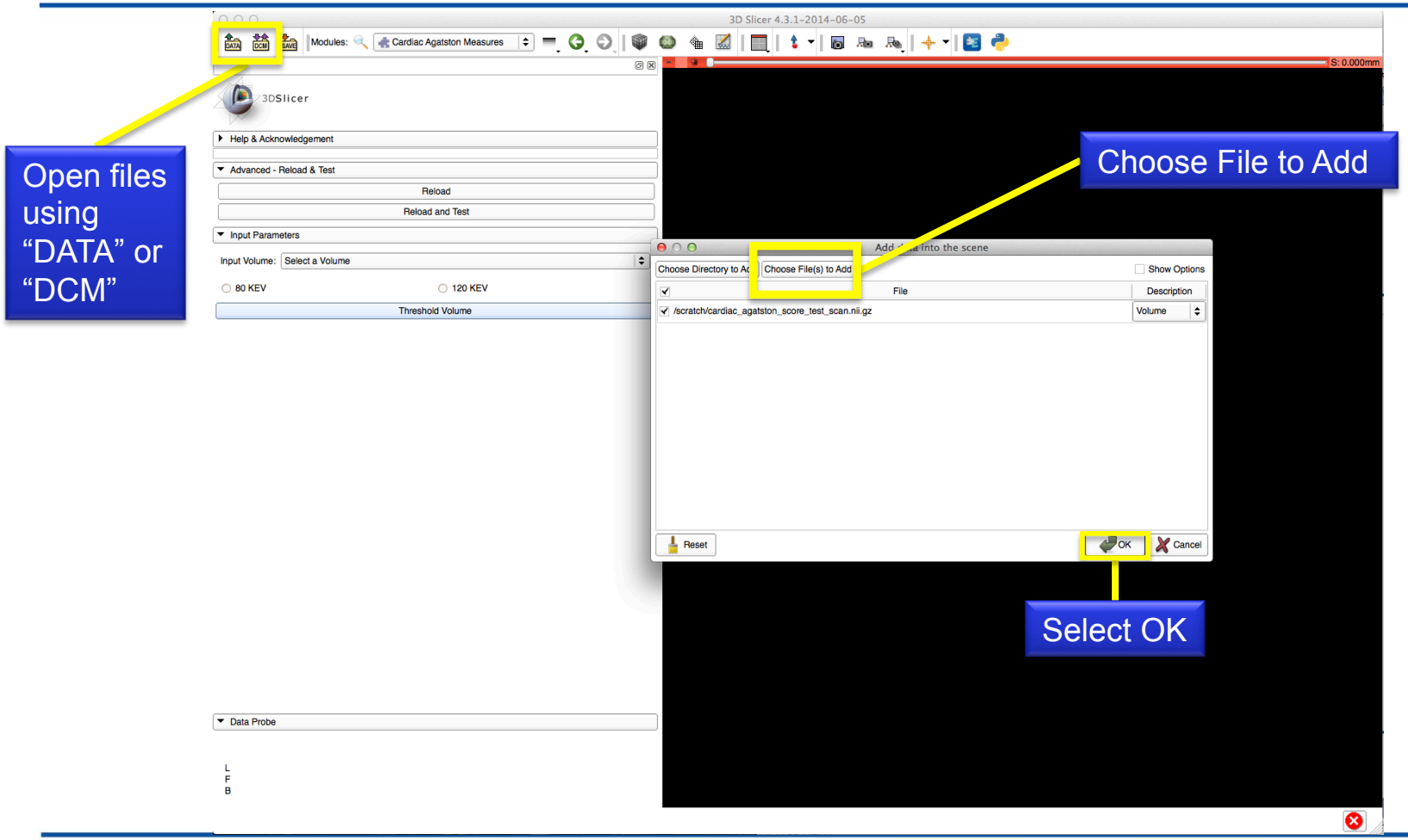
Test Procedure

- EKG-gated non-contrast cardiac CT
- No special preparation
- Scan completed within 5-10 min
- Breath-hold for 10-30 seconds during imaging
- Coronary Artery Calcium (CAC) Score – Agatston Score
    - Based on area and density of calcified plaque
    - Typical report includes:
        - Agatston score for each major coronary artery
        - Total Agatston score for the patient

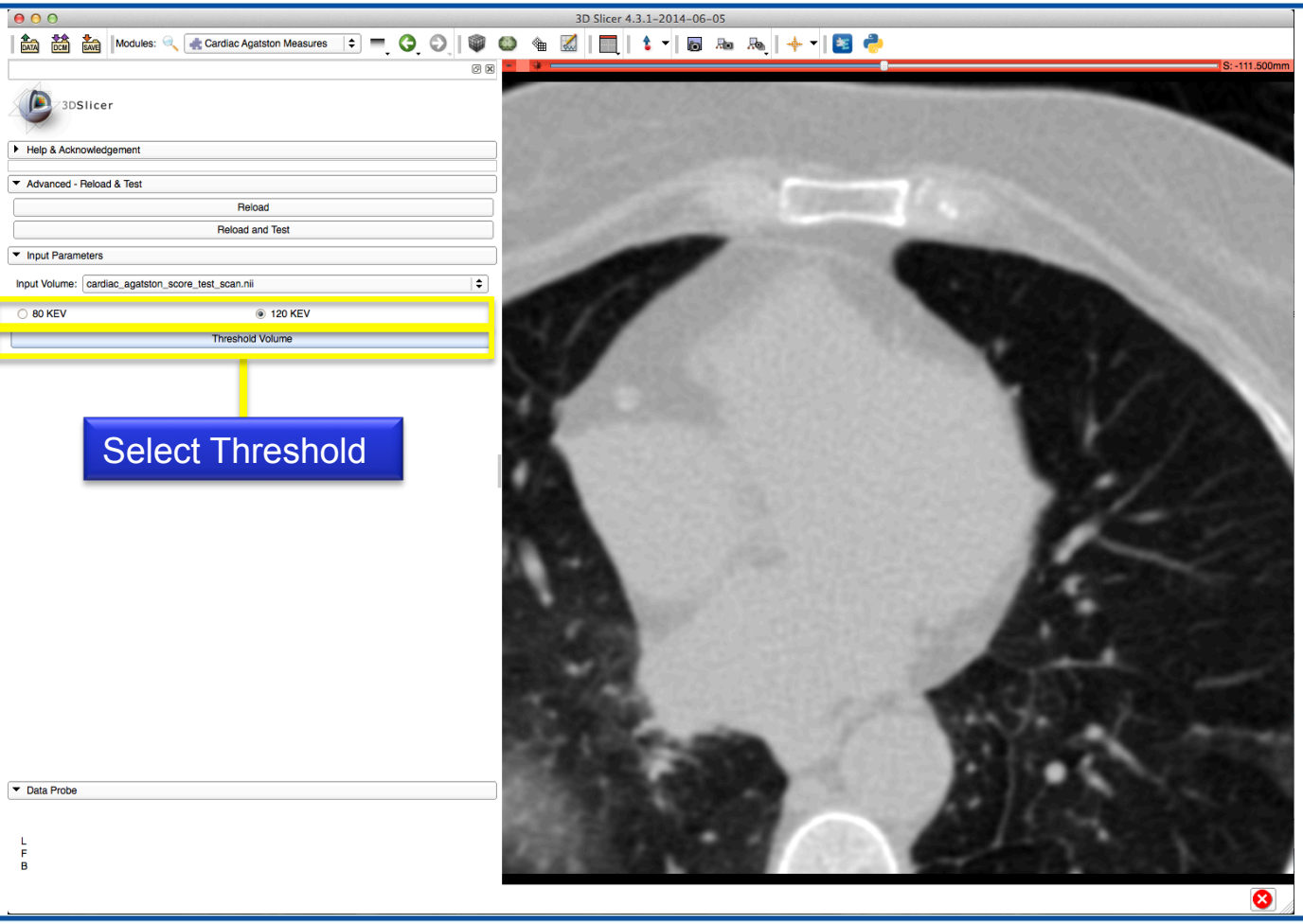
Part 1: Loading Module



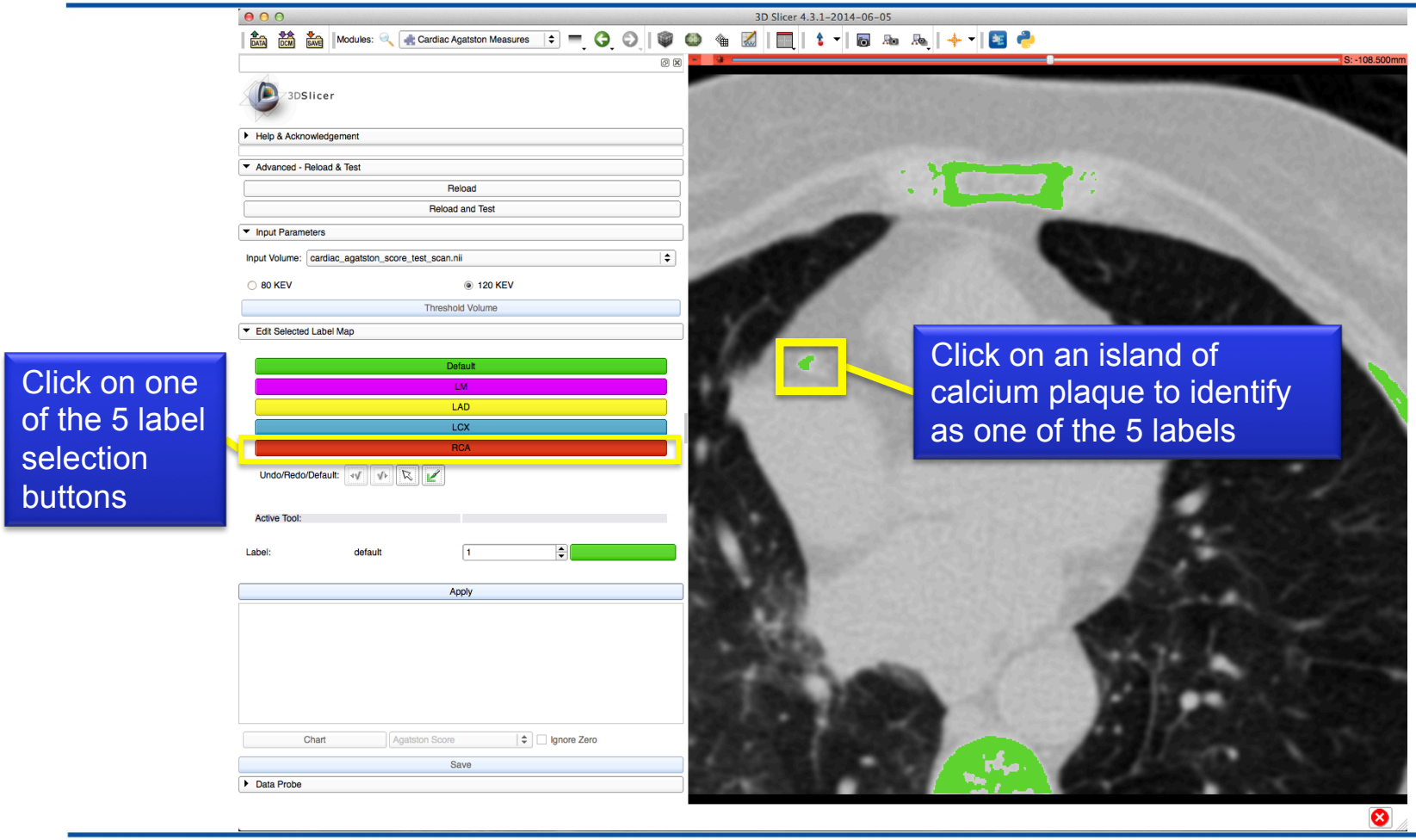
Part 1: Loading Data



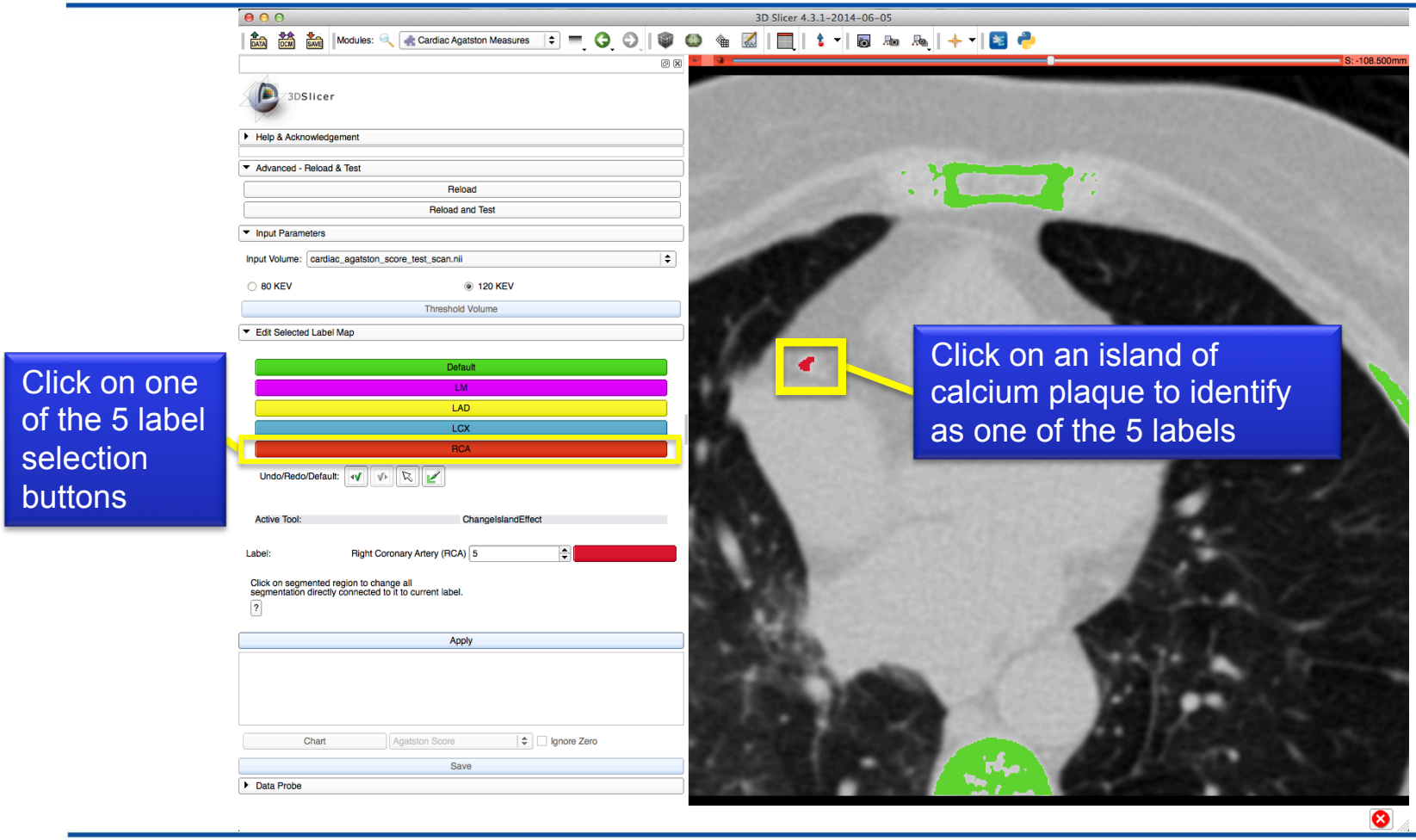
Part 2: Thresholding Scan



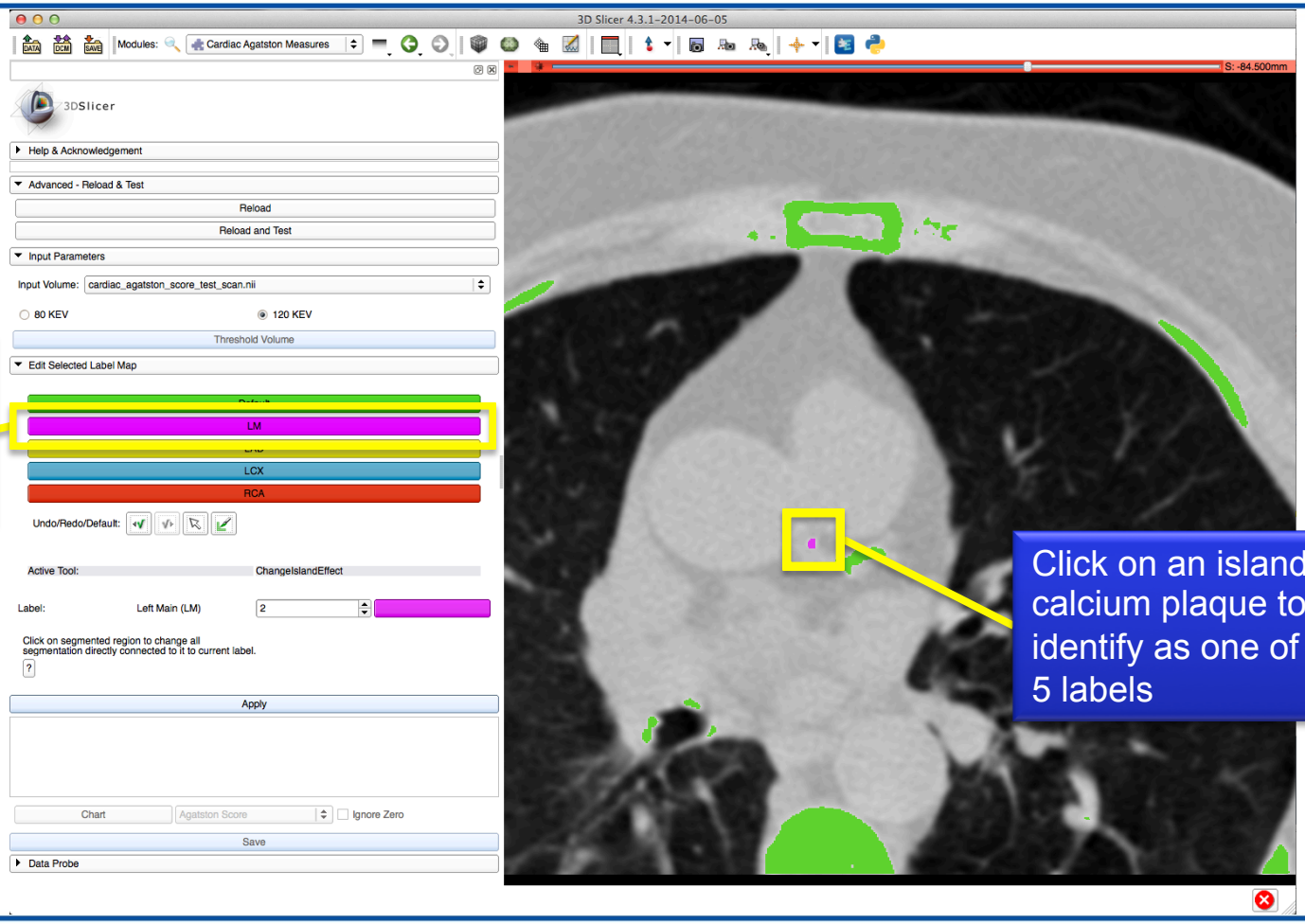
Part 3: Identifying plaques



Part 3: Identifying plaques



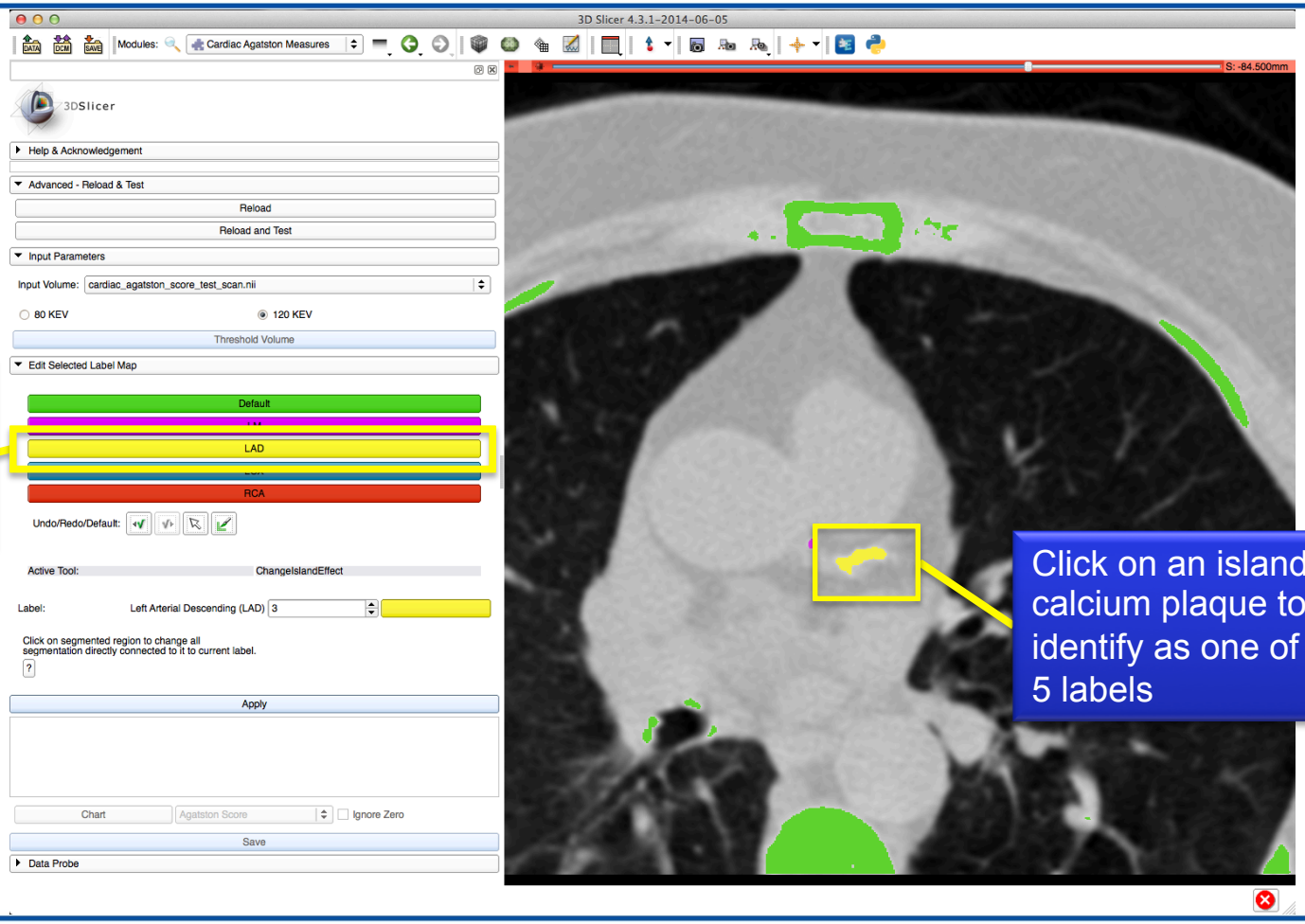
Part 3: Identifying plaques



Click on one of the 5 label selection buttons

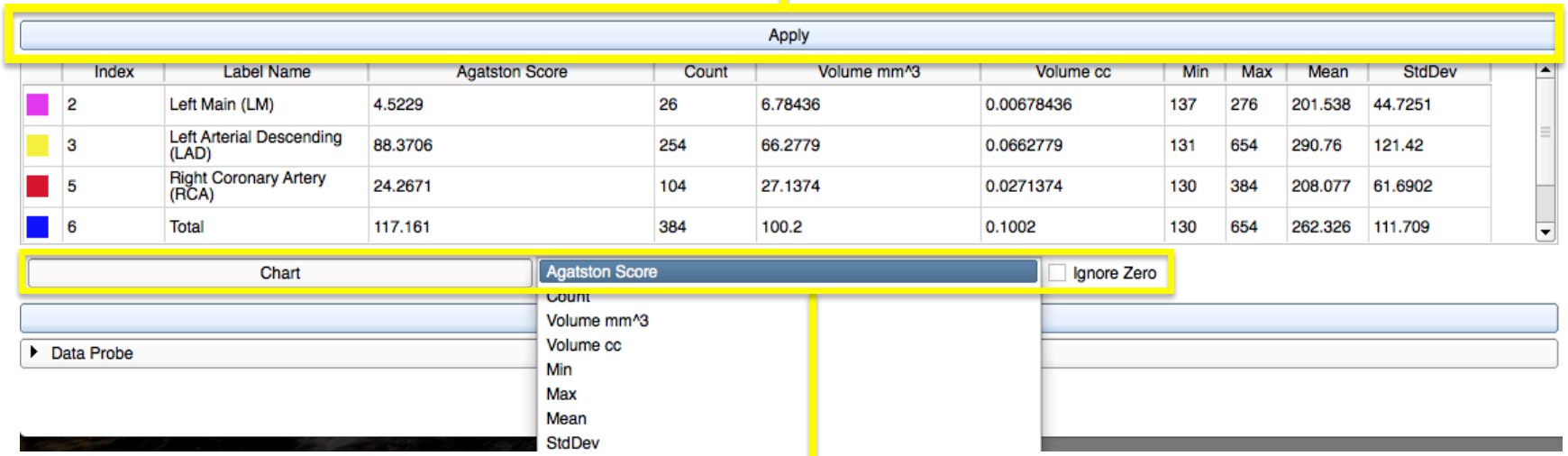
Click on an island of calcium plaque to identify as one of the 5 labels

Part 3: Identifying plaques



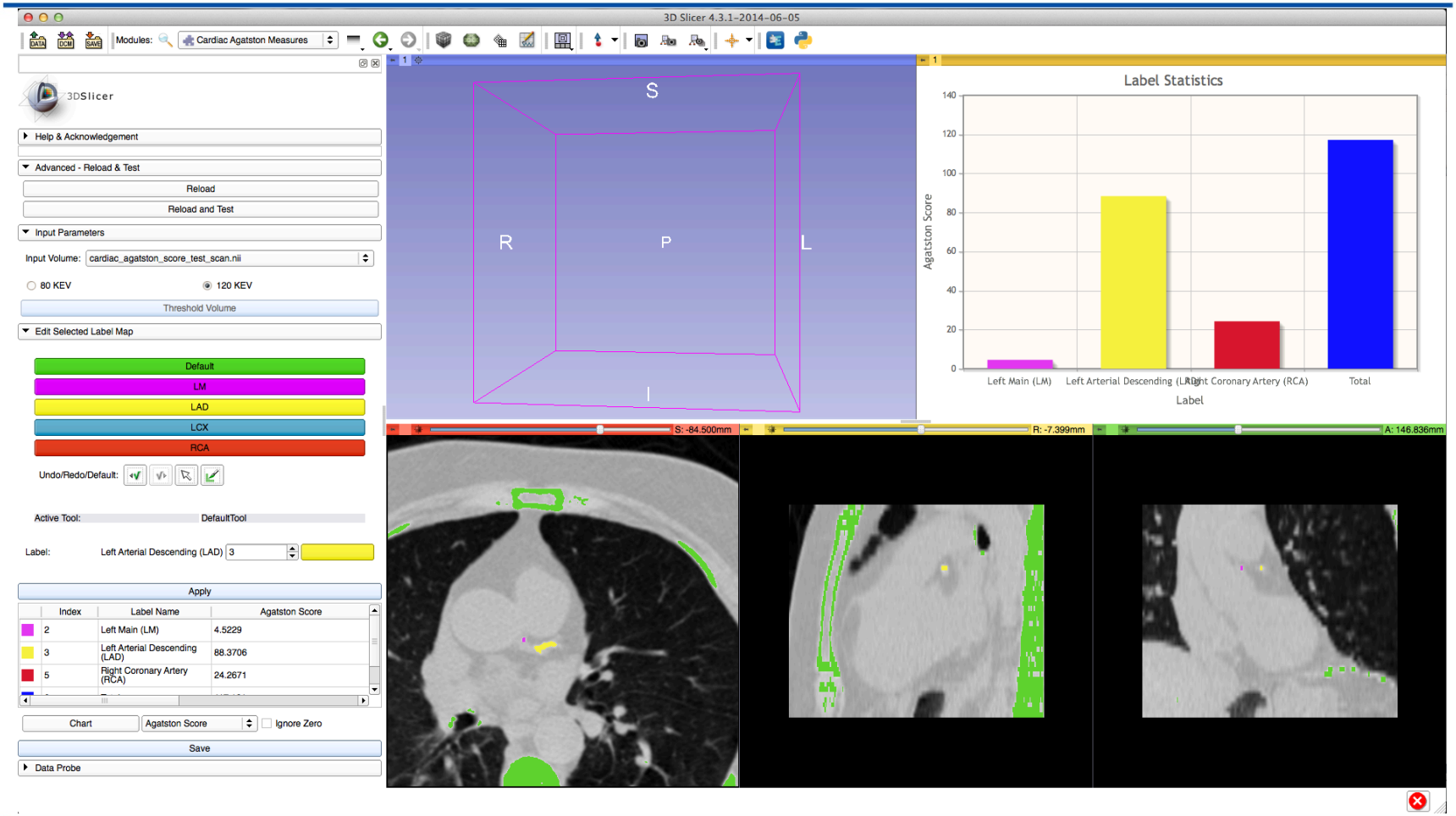
Part 4: Calculating Scores

Select Apply to calculate the Agatston score for individual labels and total

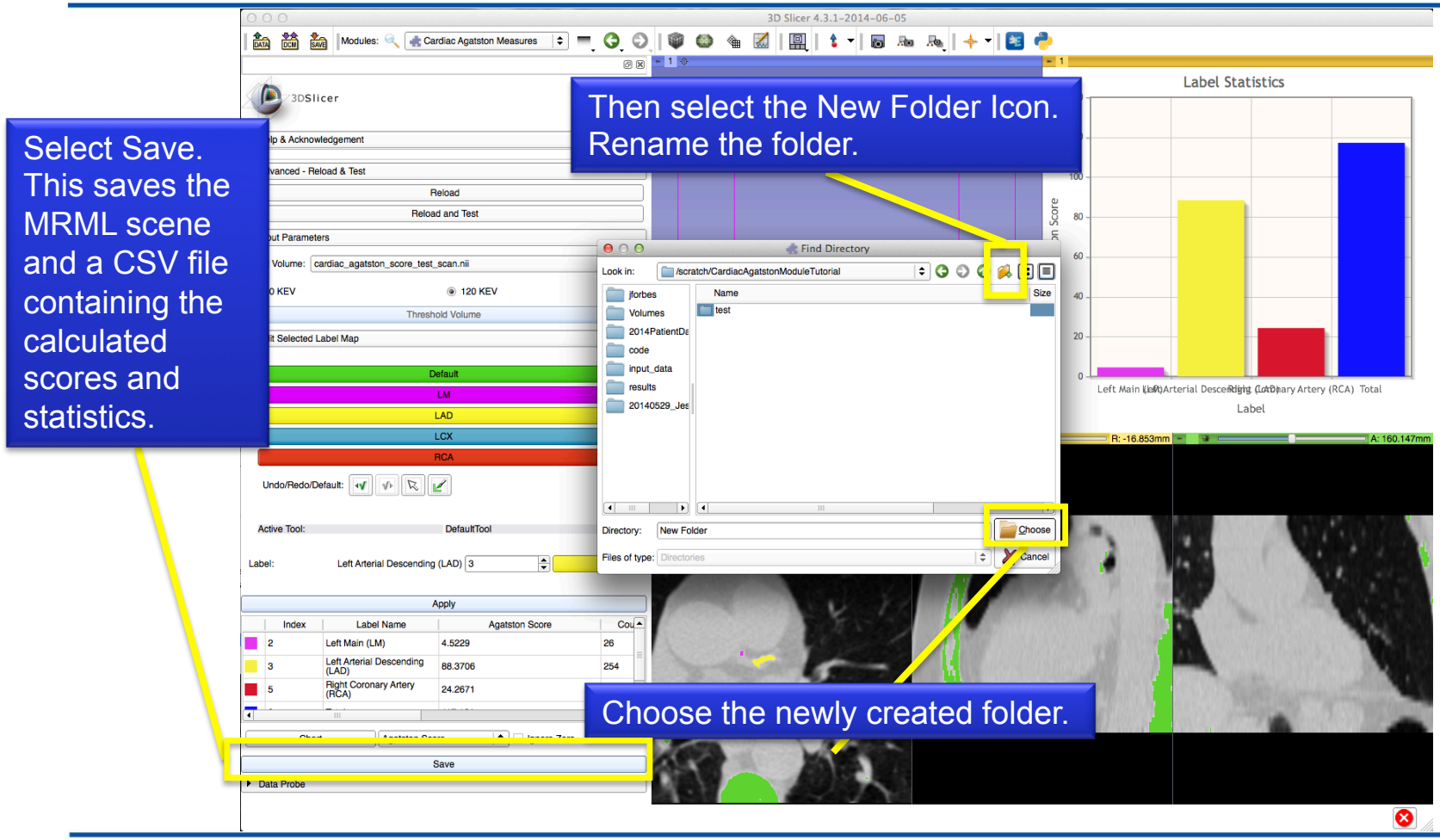


Select Chart and Column to compare the values for each label

Part 4: Calculating Scores



Part 5: Saving Results



Conclusion

- All tests passed with:
  - Linux 64-bit
  - MacOS
  - Windows 7 64-bit

Acknowledgments

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SINAPSE Lab