



dicompyler: An Open Source Radiation Therapy Research Platform with a Plugin Architecture

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Purpose

dicompyler is an open source software platform designed from the ground up to analyze, modify and visualize DICOM data for radiation therapy.

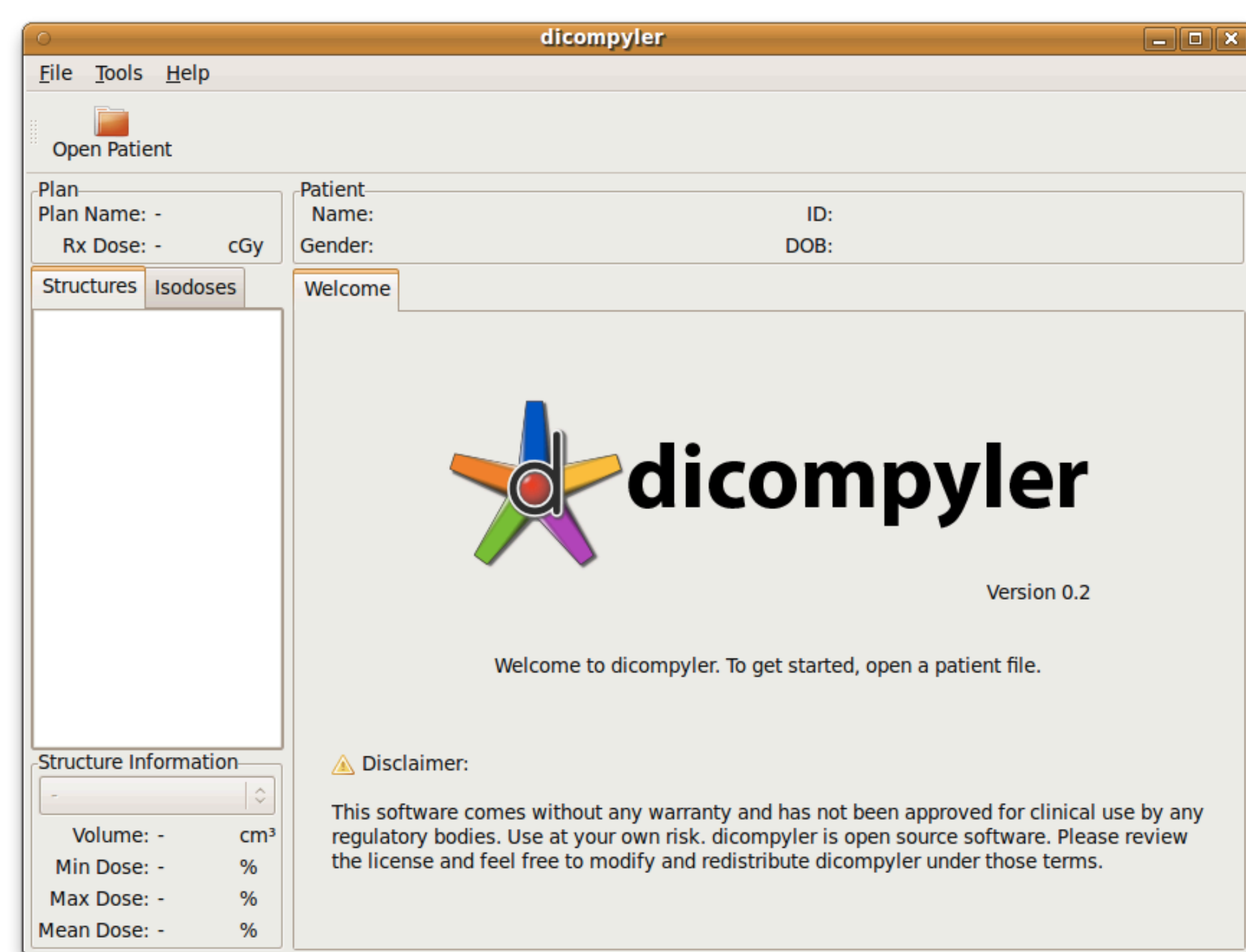


Figure 1 - dicompyler main screen running on Ubuntu Linux

dicompyler is cross-platform and actively updated, allowing users and researchers to delve into and understand the DICOM data that they work with on a daily basis.

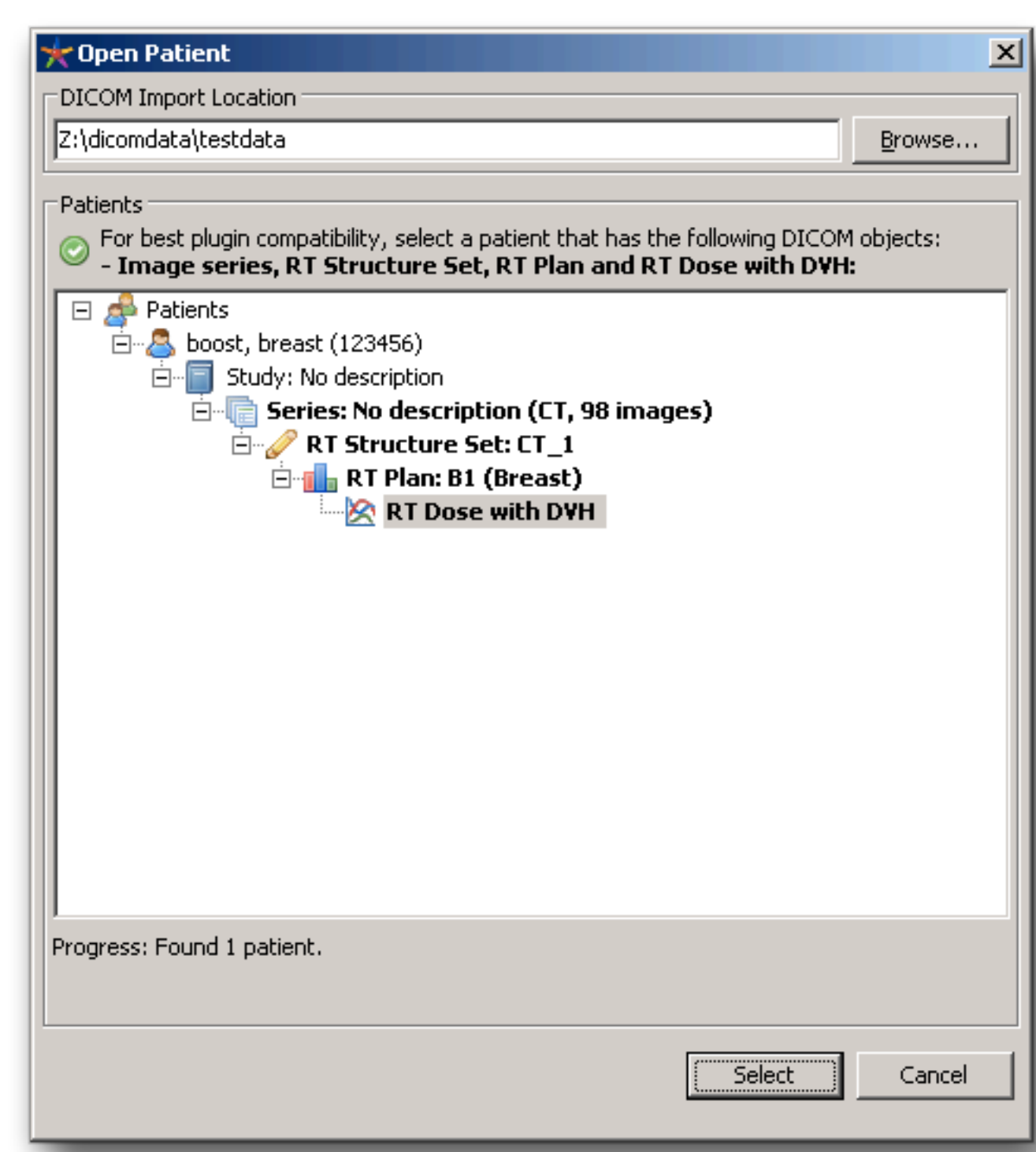


Figure 2 - dicompyler import dialog running on Windows XP

dicompyler has been designed with a modular plugin architecture with reusable components, so that users can write custom plugins that are focused on their research goals.

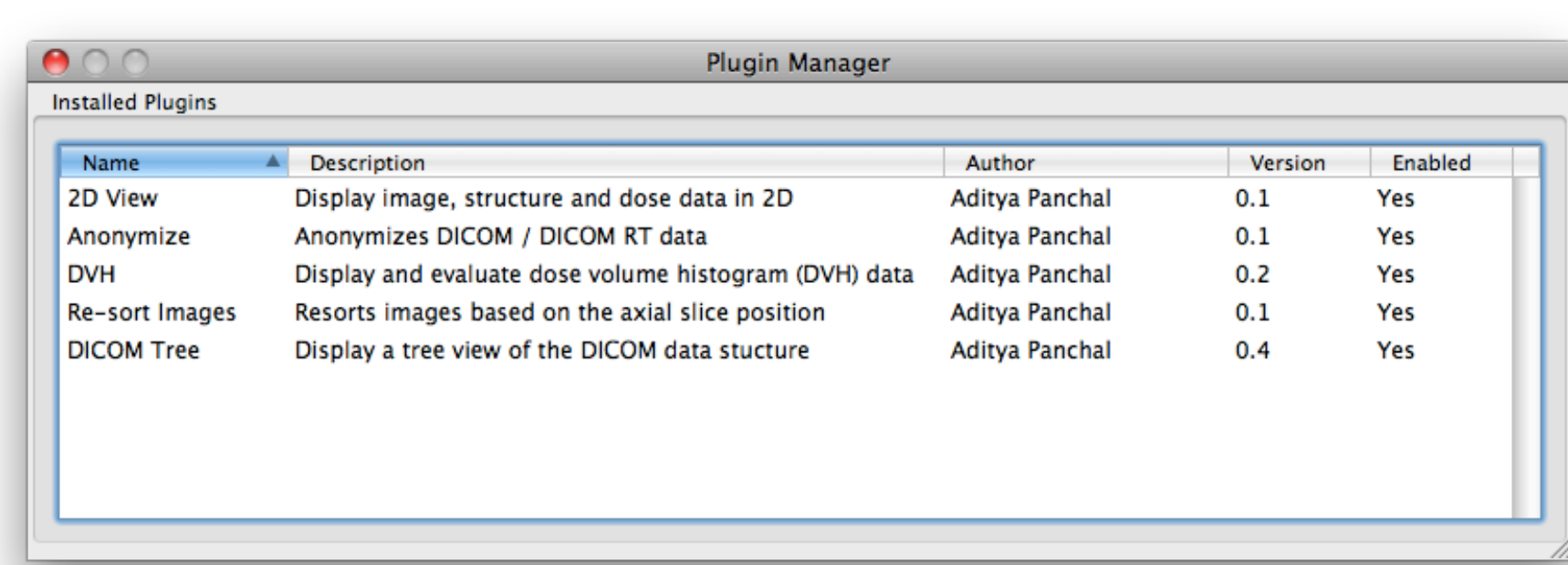


Figure 3 - dicompyler plugin manager on Mac OS X

Methods

dicompyler is written in Python and uses a number of open source Python supporting toolkits and libraries:

Toolkit	Purpose
pydicom	Read and write DICOM data using native Python objects
wxPython	Cross-platform graphical user interface library
matplotlib	High quality 2D plotting library
NumPy	Powerful mathematical array and matrix algebra library
Python Imaging Library	Fast image processing library
Elixir	Easy access to persistent data storage

Since **dicompyler** is extensible, the base package comes with a number of preinstalled, useful plugins:

- ✓ 2D image viewer with dose and structure overlay
- ✓ Dose volume histogram viewer with the ability to analyze DVH parameters
- ✓ DICOM data tree viewer
- ✓ Patient anonymizer

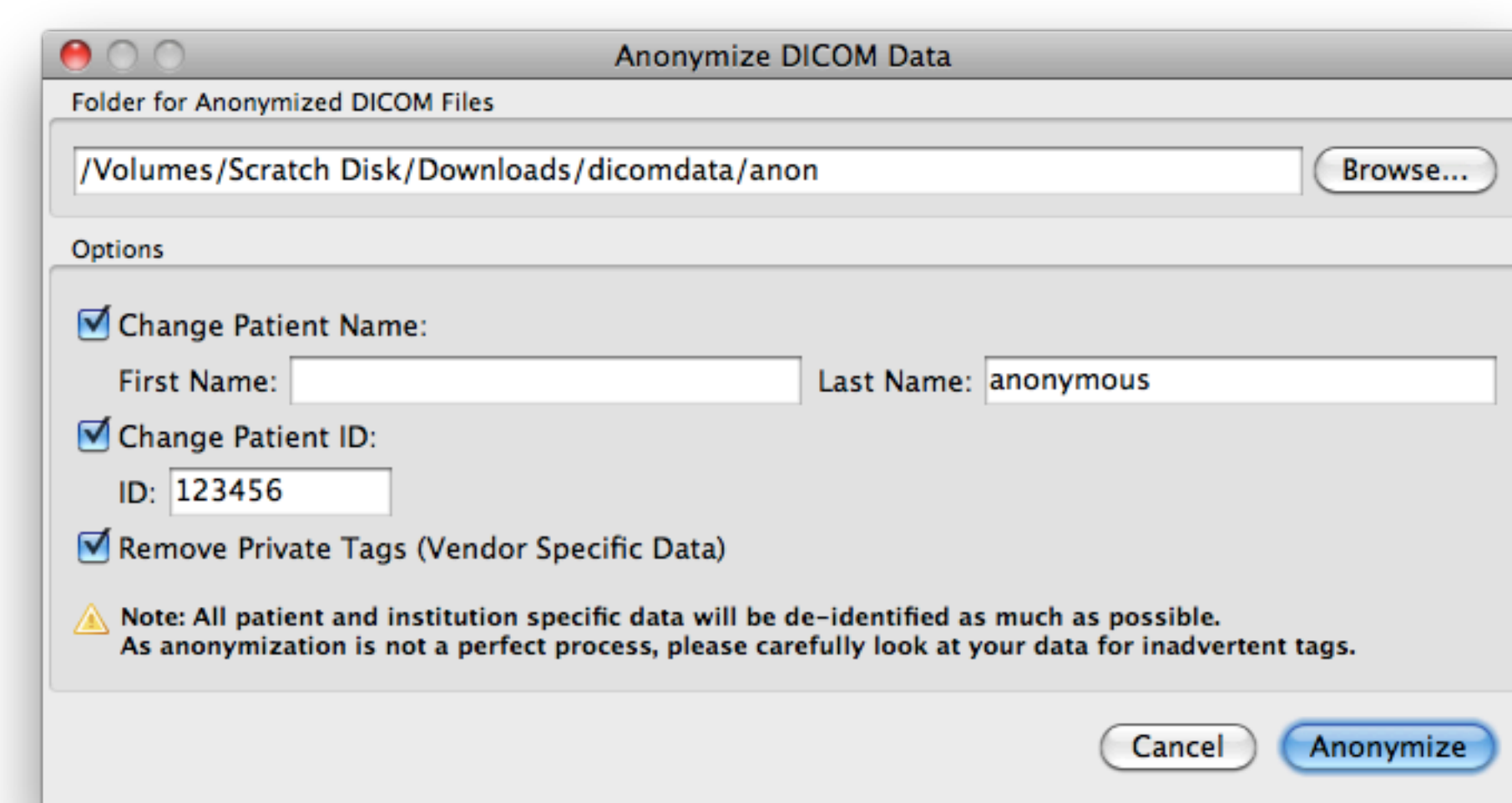
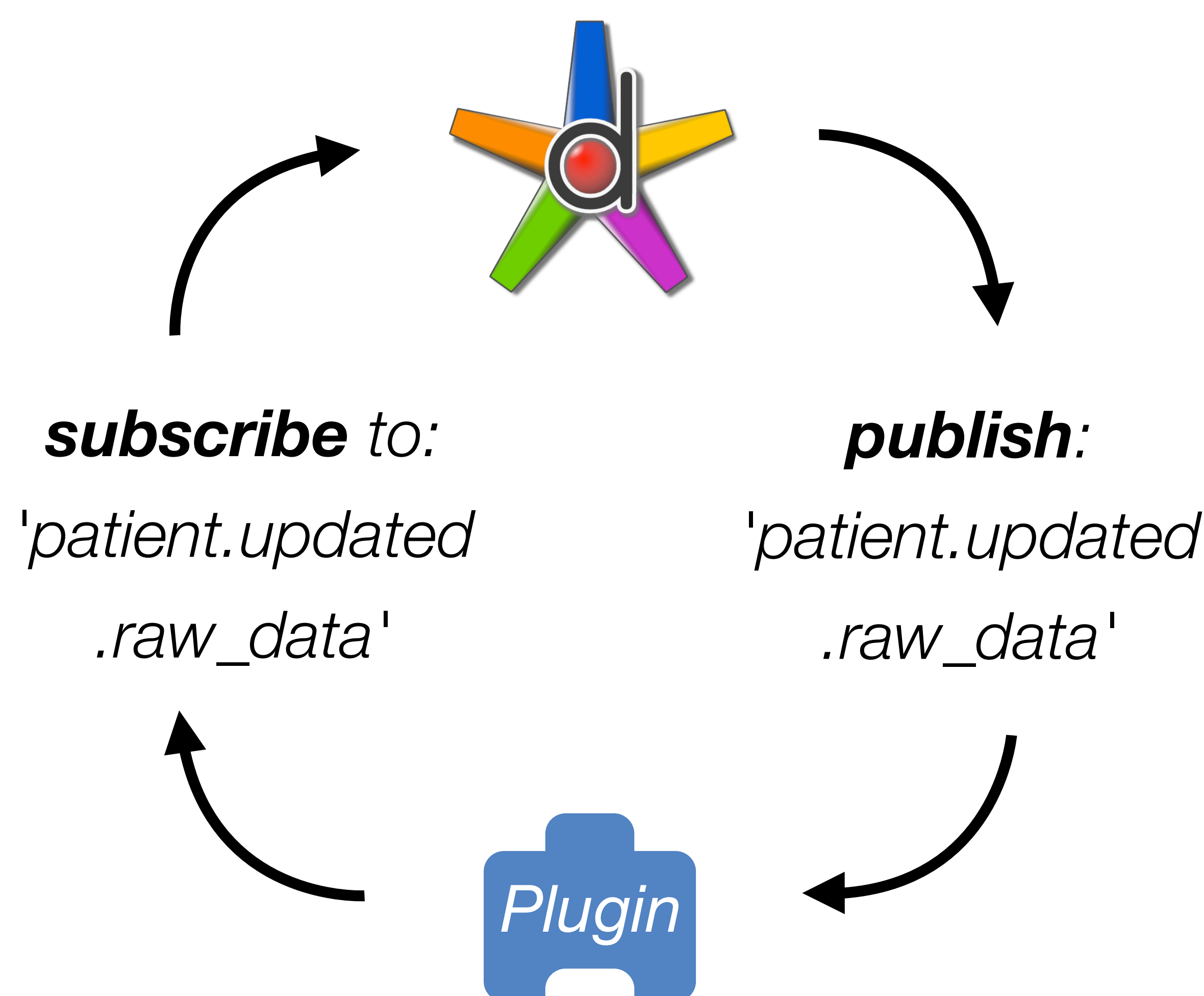


Figure 4 - Patient anonymization dialog on Mac OS X

A plugin consists of a single Python file. There is no need to read raw DICOM files; **dicompyler** will automatically send each plugin the data it requests:



Results

The 2D image viewer included with **dicompyler** accurately reproduces image, structure and dose data from the original treatment planning system:

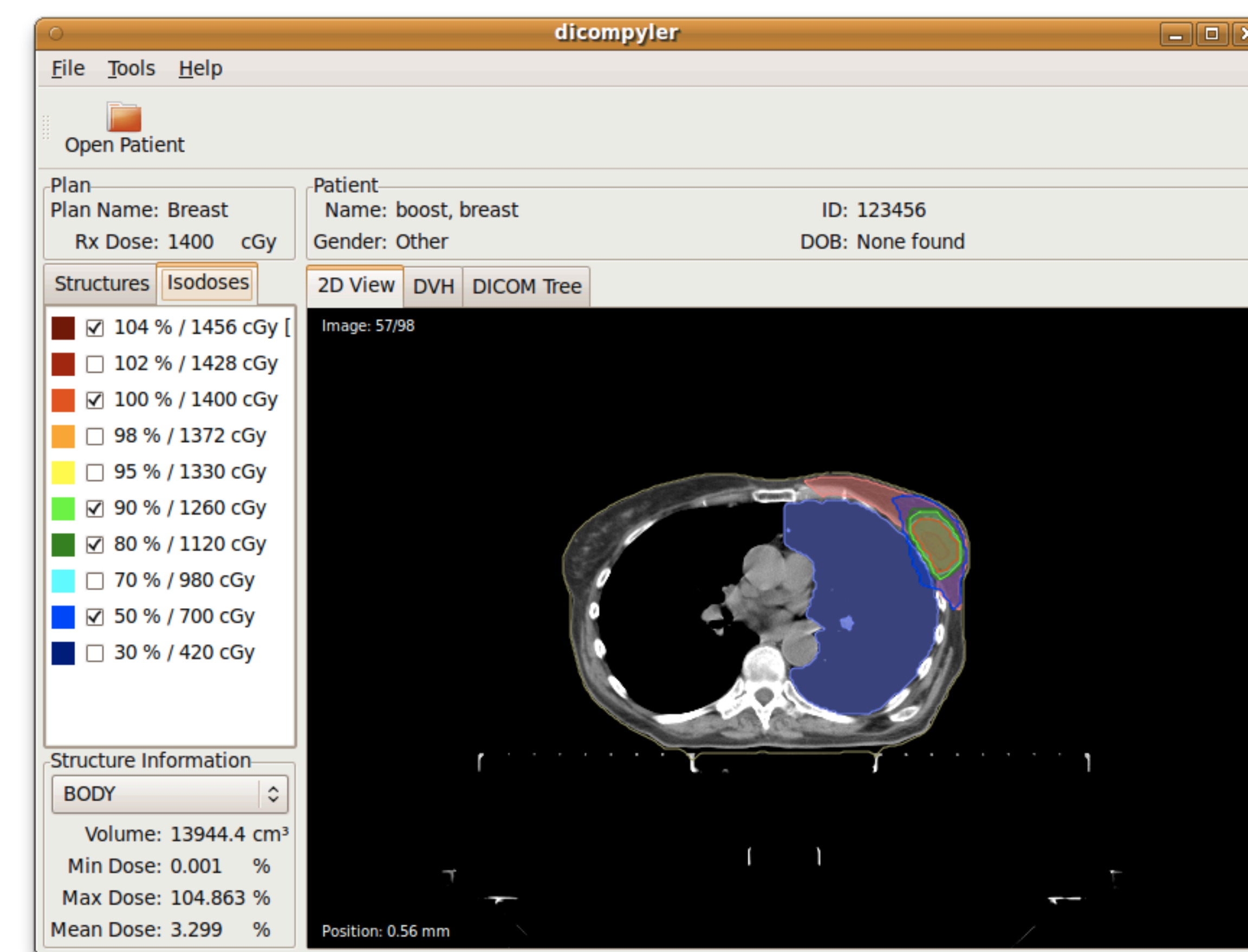


Figure 5 - 2D image viewer on Ubuntu Linux

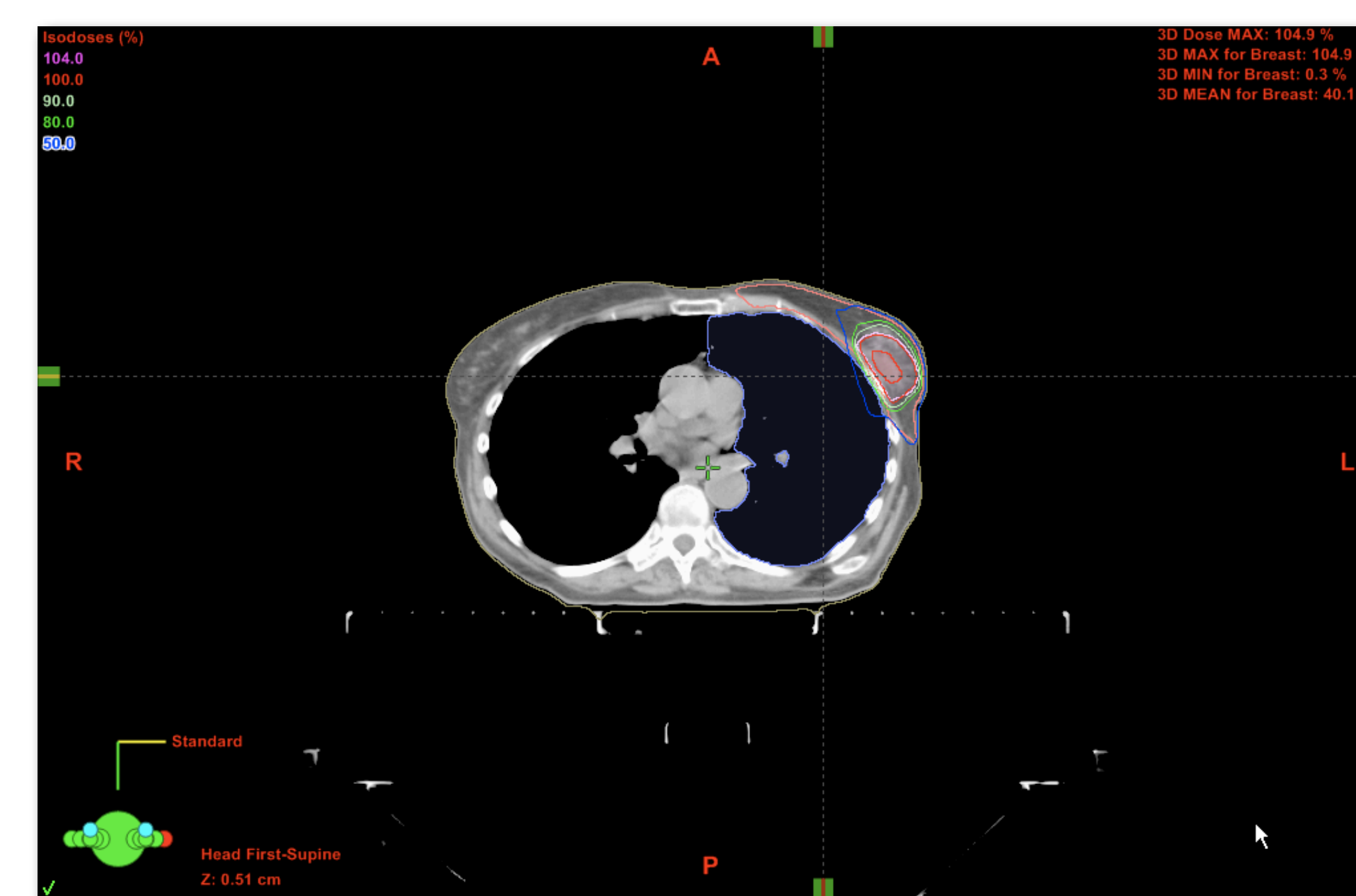


Figure 6 - Original data from treatment planning system

The DICOM data tree viewer included with **dicompyler** lets users probe into data generated from various systems in order to extract the information they need:

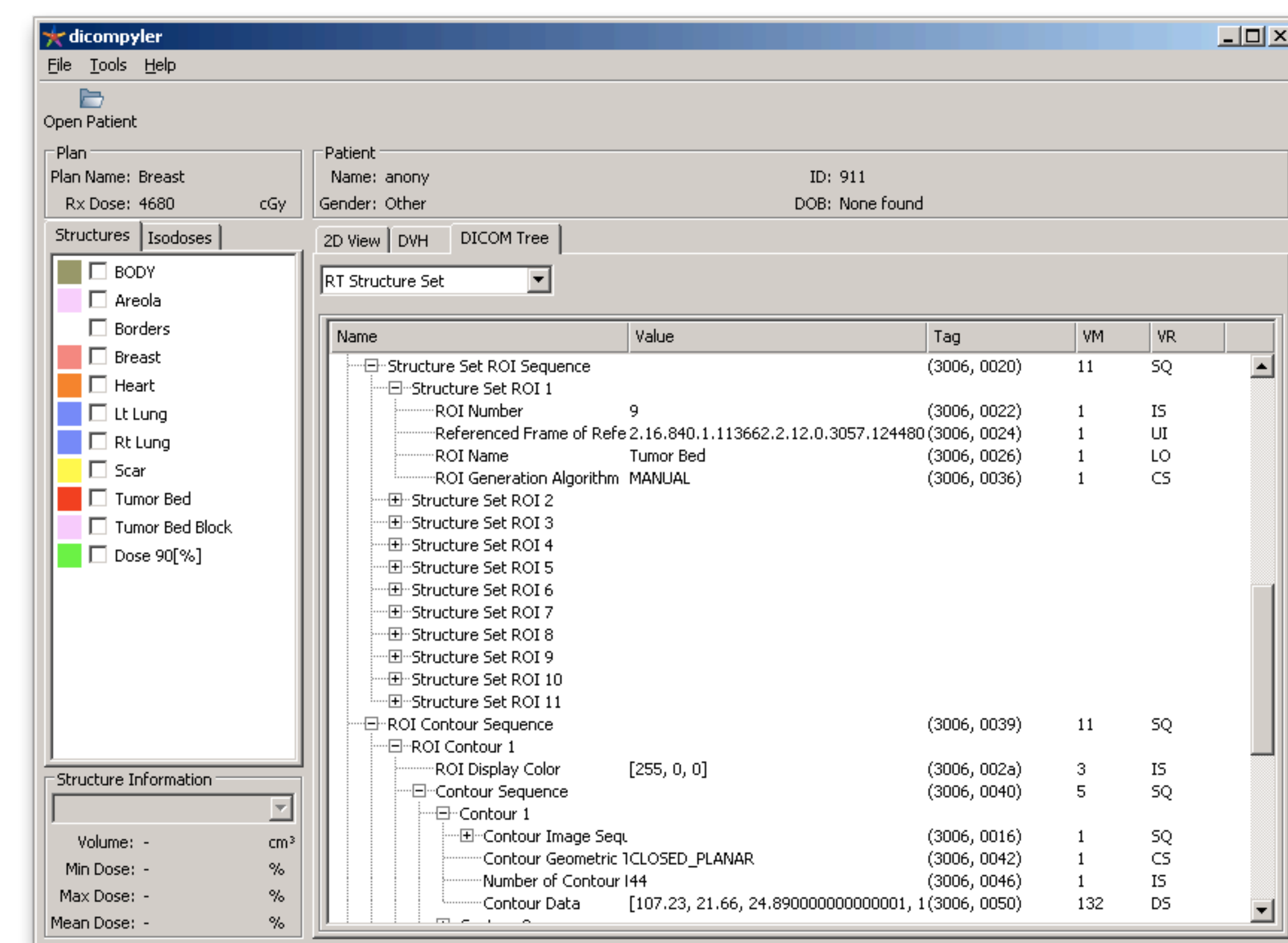


Figure 7 - DICOM data tree viewer on Windows XP

The DVH viewer included with **dicompyler** allows users to directly enter dose and volume values without resorting to inaccurate crosshairs:

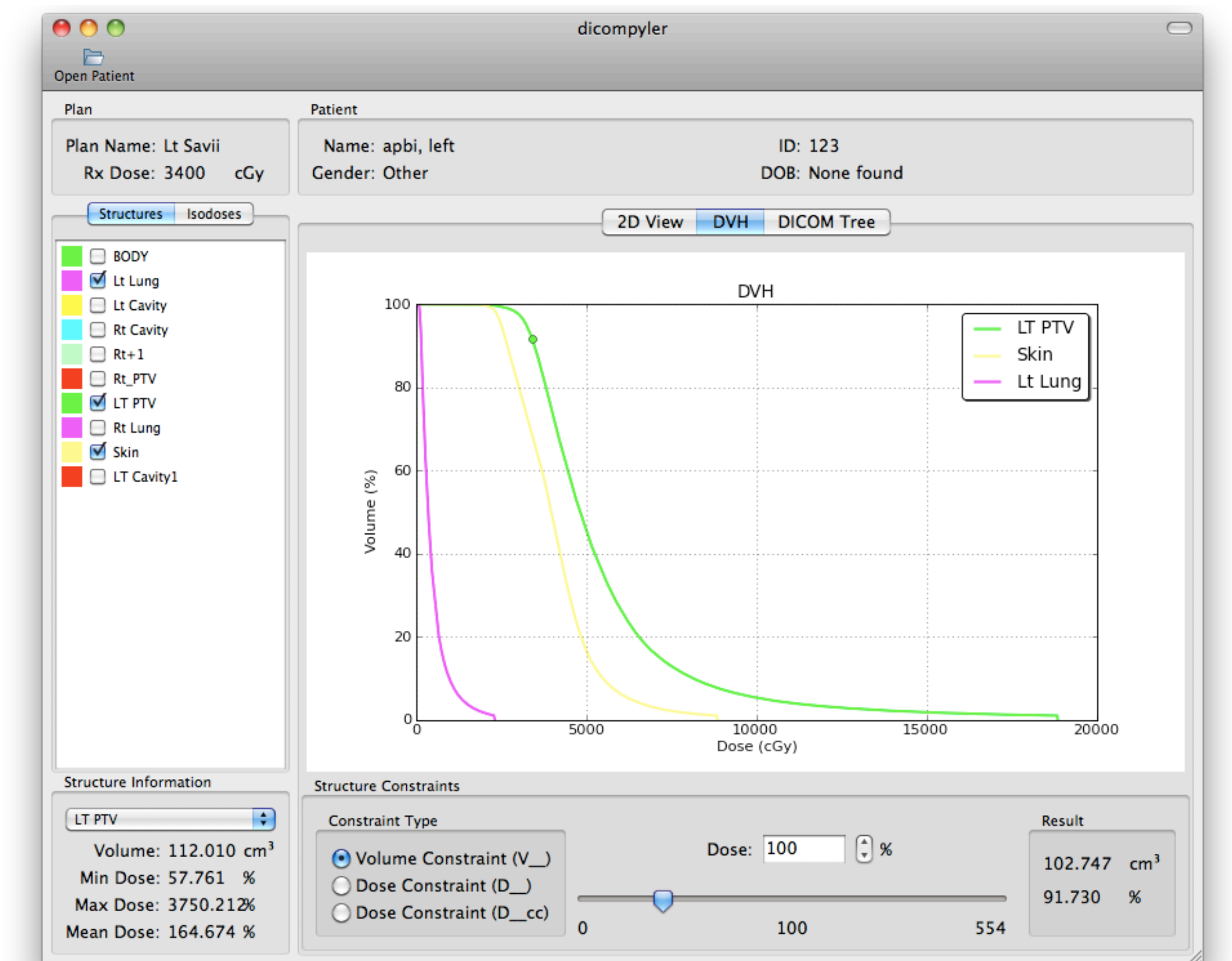


Figure 8 - DVH viewer on Mac OS X

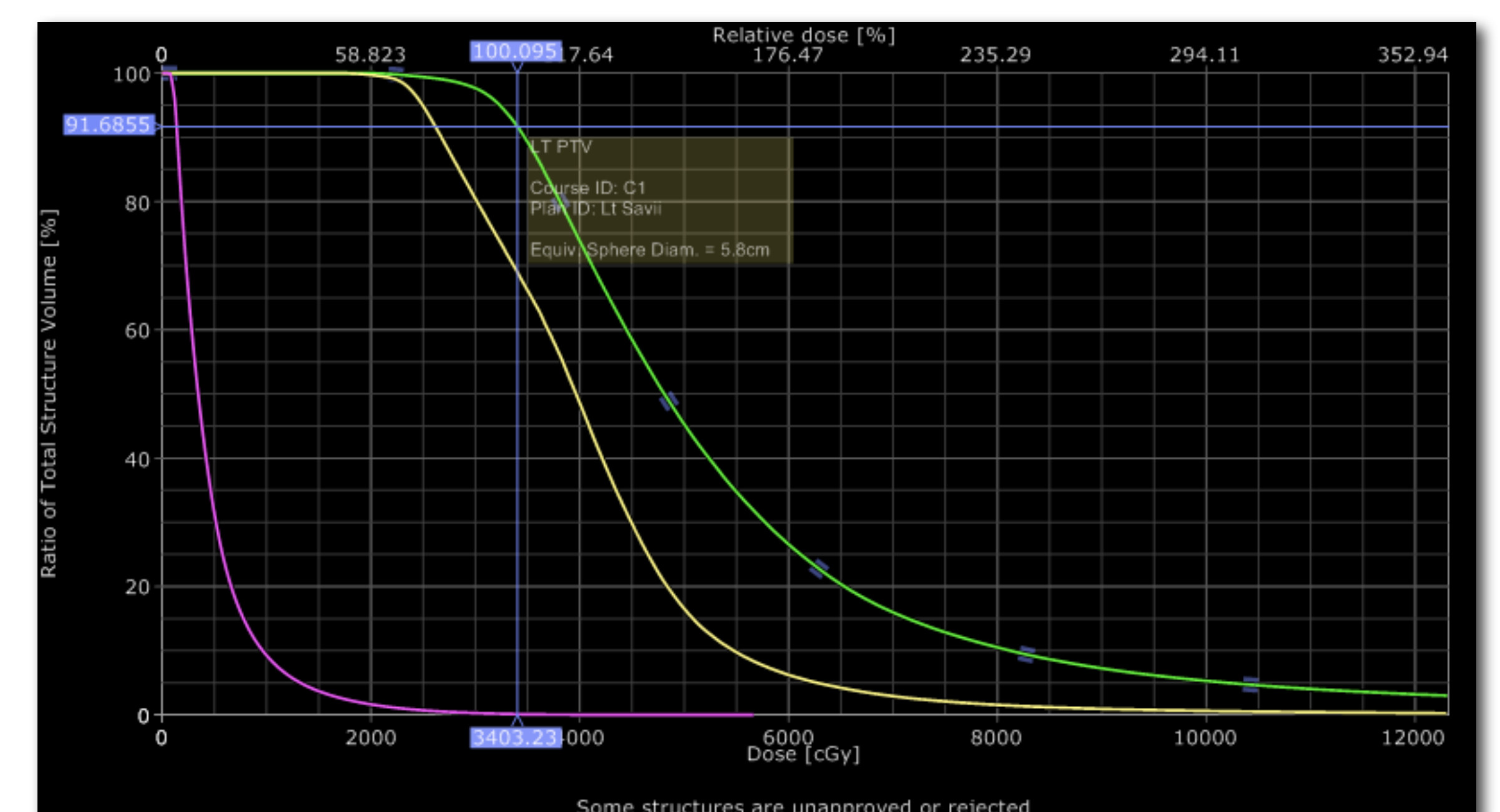


Figure 9 - Original DVH data from treatment planning system

Conclusions

dicompyler is an accessible research platform for radiation therapy based on open source technologies without commercial dependencies such as Matlab. With an extensible architecture, future plugins such as plan comparison, image registration and treatment planning can be developed.

The ultimate goal is to create a repository of open source plugins that can be used throughout radiation therapy in order to facilitate collaboration and innovation between physicists and the radiation oncology community.



Download today from: <http://code.google.com/p/dicompyler/>

