**Installation of Python and Root for BYScIT**

This is the installation guide for setting up Python, ROOT and any necessary libraries needed in order to run the image analysis software (BYScIT) that finds the beam’s characteristics from an image. So first thing first, here is a list of all the software you will need:

Python 2.7.11: The Graphical User Interface (GUI) is written in python hence why we need the software to understand it.

PyQt4: This is a library allows for the creation on GUIs.

pyqtgraph: This library is used in our GUI to plot graphs and images.

Numpy: This library lets us use and manipulate arrays of data. On a side note, you will need to download Microsoft Visual C++ in order to set this up, but that’s explained later.

matplotlib: In the Image Analysis GUI it is used for plotting contours on the beam image, but in general it used to plot graph and images in python.

Root: This is a data analysis library used in C++ to analysis and fit data. It was developed at CERN and is used in most particle physics analysis.

**Installations**

**Python 2.7.11**

The first thing to do is to get Python up and running. Download Python 2.7.11 using this link: <https://www.python.org/downloads/release/python-2711/>

You want the ‘**Windows x86 MSI Installer**’ version. Run the .msi you’ve just downloaded and follow the installation process. This installation also includes ‘pip’ which is software that will help you install the other libraries.

**Path Variable Setup**

Next we need ensure Python will work correctly from the command line so follow these instructions.

Set up paths:

->Click on the windows home button

->Right-click ‘Computer’ and select ‘Properties’

->On the left hand side select ‘Advanced system settings’

->Now choose the button ‘Environment Variables…’

-> In the top box add the following variables with their values:

Variable Value

PATH C:\Python27\;C:\Python27\Scripts\;

HTTP\_PROXY wwwcache.dl.ac.uk:8080  
HTTPS\_PROXY wwwcache.dl.ac.uk:8080

->Continually click the ‘OK’ buttons to agree to these new variables.

Test it has installed and paths are set up correctly by inputting:

>>pip help

While in the command line lets download the **first library** needed:

>> pip install wheel

If it suggests **upgrading pip**, do so. You **will need the latest version** to get these following versions of numpy, scipy etc. Though I’m not sure exactly what version you will get, to upgrade I believe you enter:

>> python –m pip install –upgrade pip

**PyQt4**

For PyQt4 go to

<https://www.riverbankcomputing.com/software/pyqt/download>

You want the ‘[**PyQt4-4.11.4-gpl-Py2.7-Qt4.8.7-x32.exe**](http://sourceforge.net/projects/pyqt/files/PyQt4/PyQt-4.11.4/PyQt4-4.11.4-gpl-Py2.7-Qt4.8.7-x32.exe)’. When installing, make sure to put it the C:\Python27 folder.

**pyqtgraph**

Now download pyqtgraph from

<http://www.pyqtgraph.org/>

and select the ‘**pyqtgraph-0.9.10.win32.exe**’ option and go through installation process.

**VC suitable C++ compiler**

Also to install numpy you will need Visual C++ for Python 2.7. Go to

<https://www.microsoft.com/en-gb/download/details.aspx?id=44266>

then download and run.

**numpy**

Go to

<http://www.lfd.uci.edu/~gohlke/pythonlibs/#numpy>

and download ‘**numpy-1.11.0+mkl-cp27-cp27m-win32.whl**’. To install, open a command window in the file directory it is located and enter:

>> pip install numpy-1.11.0+mkl-cp27-cp27m-win32.whl

**scipy**

This method is almost identical to that of getting numpy. Go to

<http://www.lfd.uci.edu/~gohlke/pythonlibs/#scipy>

and download ‘**scipy-0.17.1-cp27-cp27m-win32.whl**’. In the command line enter:

>> pip install scipy-0.17.1-cp27-cp27m-win32.whl

**matplotlib**

Next is to install matplotlib, so go to

<http://iweb.dl.sourceforge.net/project/matplotlib/matplotlib/matplotlib-1.5.0/windows/>

and download ‘[**matplotlib-1.5.0.win32-py2.7.exe**](http://iweb.dl.sourceforge.net/project/matplotlib/matplotlib/matplotlib-1.5.0/windows/matplotlib-1.5.0.win32-py2.7.exe)’. Run this to get matplotlib. You will also need some extra libraries so using pip in the command line, enter:

>>pip install python-dateutil

>>pip install six

>>pip install pyparsing

>>pip install cycler

A useful final test that I do to check everything is installed correctly is to open a fresh command line and type:

>>python

>>import matplotlib

If you get no error everything has set up correctly.

**Root**

So if everything ran smoothly you should have python with all the necessary tools. One last download requirement is Root. If you haven’t already got it then go to <https://root.cern.ch/content/release-53434>

and download ‘**root\_v5.34.34.win32.vc12.debug.exe**’. Run the .exe and when setting up PATH settings in the installation choose for ‘all users’, it makes things easier in my opinion.

Now for the moment of truth, go to the file where the GUI python script sits and run the code.

>> python BYScIT.py