Jefferson Lab
Center for Injectors and Sources
JLAB-TN-XX-YYY

# Simulations of a Compton Polarimeter on the farm: Instructions

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August 2022

The purpose of this tech note is to record the methods I employed in submitting, compiling and running simulations of a Compton polarimeter on the farm. Additionally, resources I used will be included during the record.

## Contents

# 1 Login

In Ubuntu, in order to sign into the farm I first use the ssh command in the terminal.[1]

$ ssh username@login.jlab.org

After completing the password prompt, I enter the farm via the command.[2]

$ ssh username@ifarm

Originally, I could not perform these commands due to lack of permissions. To solve this I contacted my supervisor.

[1] $ ssh username@login.jlab.org

[2] $ ssh username@ifarm

# 2 Upload

As part of the positron group, I now navigate to the positron directory and create my own directory.[3,4]

$ cd /group/positron

$ mkdir farmdirectory

I then create a second directory within my directory for Geant4.[5,6,7]

$ cd /farmdirectory

$ mkdir GEANT4

$ cd /GEANT4

I then copy the directory containing my code from my home directory to the farm.[8]

$ scp -r Compton_Polarimeter/ username@login.jlab.org:/group/positron/farmdirectory/GEANT4

After completing the password prompt my Compton project is now in my directory.

[3] $ cd /group/positron

[4] $ mkdir farmdirectory

[5] $ cd farmdirectory

[6] $ mkdir GEANT4

[7] $ cd /GEANT4

[8] This is done in a separate terminal

# 3 Sourcing Geant4

I run version 11.0.1 of Geant4 and source it before compiling my project.[9]

$ source /site/12gev_phys/softenv.csh 2.6

I previously imported older forms of Geant4 using different commands.[10]

[9] $ source /site/12gev_phys/softenv.csh 2.6

[10] "Using Geant4 for Application Development at Jefferson Lab." In: *Experimental Nuclear Physics Computing* (2013)

# 4 Compiling

Inside my copied project folder I create a build directory to work in.[11,12,13]

$ cd /Compton_Polarimeter

$ mkdir build

$ cd /build

I now use cmake commands to copy cmake files into our build directory and then create my executable.[14,15]

$ cmake ..

$ make -j64

I use 64 cores but this has the possibility to change. I then test to make sure my Compton polarimeter looks correct by running the program on the virtual machine.[16]

$ ./executable example.mac

[11] $ cd Compton_Polarimeter

[12] $ mkdir build

[13] $ cd /build

[14] $ cmake ..

[15] $ make -j64

[16] $ ./executable example.mac

# 5 Farm Submission

If my program starts without errors (does not need to run to completion) on the virtual machine I then submit a job to the farm. I had to contact my supervisor to gain permission to begin doing this. I needed to be added to the accelerator computing group.

With permissions acquired I first create a batch file to contain my instructions for the farm. Documentation for the creation of a batch file can be found on the Scientific Computing webpage.[17]

An example of a batch file has the form as shown in Figure 1.

```
#!/bin/bash

#SBATCH --nodes=1
#SBATCH --ntasks=64
#SBATCH --mem-per-cpu=500
#SBATCH --job-name=test
#SBATCH --partition=priority
#SBATCH --account=accelerator
#SBATCH --mail-user=username@jlab.org
#SBATCH --time=8:00:00
#SBATCH --gres=disk:1000

/group/positron/username/GEANT4/Compton_Polarimeter/build/executable /group/positron/username/GEANT4/Compton_Polarimeter/build/example.mac
```

I copy my my batch file to my build directory (and make sure I am there) and then use the sh command to run it.[18,19,20]

$ scp -r example_batch.sh username@login.jlab.org:/group/positron/farmdirectory/GEANT4/Compton_Polarimeter/build

[17] "Sample Scripts." In: *JLab SciComp* (2019)

[18] Copying is done in a separate terminal

[19] $ pwd

[20] $sh example_batch.sh

$ pwd

$ sbatch example_batch.sh

At this point I have submitted my job to the farm. Assuming I have no errors my deliverable will appear in my build folder in some time.

# 6 Data Extraction

After my code runs it produces a root file that I want to analyze. I get this out of the farm using the same copy command I have used twice.[21]

[21] Still in other terminal, /home can be replaced by a tilde

$ scp -r username@login.jlab.org:/group/positron/farmdirectory/GEANT4/Compton_Polarimeter/build/file.root /home

I now have my output and can analyze it in root.