

Simulations of a Compton Polarimeter on the farm: Instructions

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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.

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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/far-  
mdirectory/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/soft-
env.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

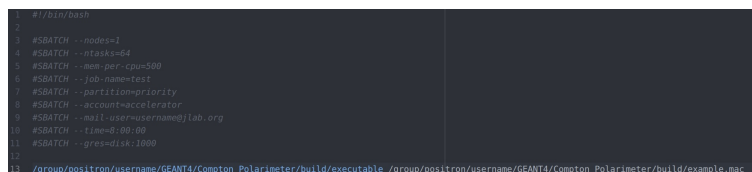
¹⁶ \$./executable example.mac

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 --mode=sl
#SBATCH --ntasks=4
#SBATCH --mem-per-cpu=500
#SBATCH --job-name=test
#SBATCH --partition=priority
#SBATCH --account=accelerator
#SBATCH --mail-user=username@jlab.org
#SBATCH --time=00:00
#SBATCH --grid=1000
1: /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/far-
mdirectory/GEANT4/Compton_Polarimeter/build
```

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/Comp-  
ton_Polarimeter/build/file.root /home
```

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