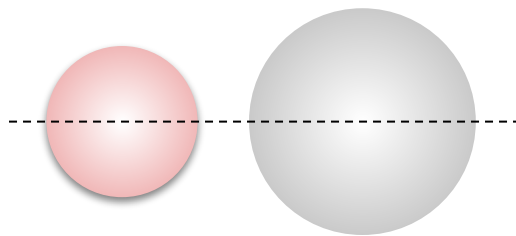




Light simulation update

03/11/2021

Julio Ureña



What's new?

PrimaryGeneration class now contains two members which are pointers to TH1D (root histogram class) objects, namely `spectrum_histogram` and `angular_histogram`. They model the energy spectrum and the angular pattern respectively.

```
class PrimaryGeneration: public G4VUserPrimaryGeneratorAction
{
public:
    PrimaryGeneration();
    virtual ~PrimaryGeneration();
    virtual void GeneratePrimaries(G4Event*);

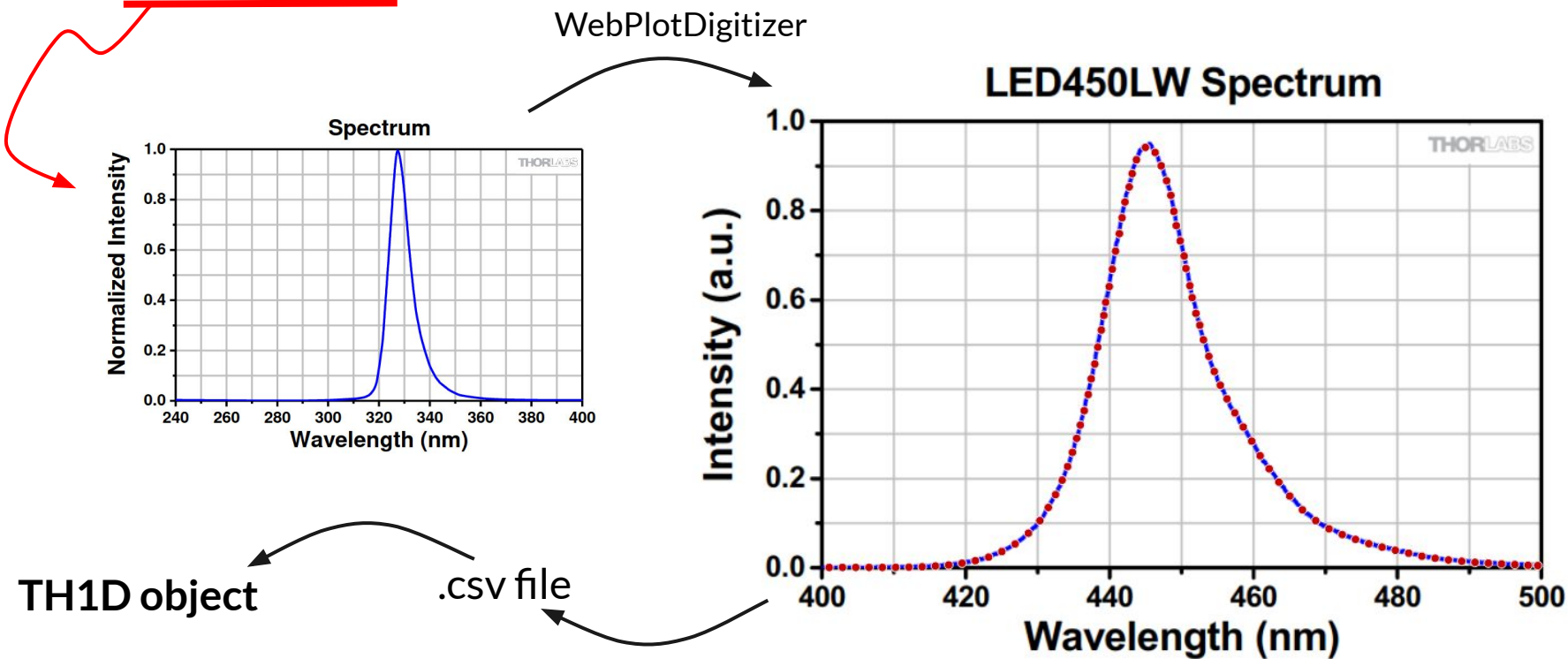
private:
    G4double kinetic_energy_;
};
```

```
class PrimaryGeneration: public G4VUserPrimaryGeneratorAction
{
public:
    PrimaryGeneration();
    virtual ~PrimaryGeneration();
    virtual void GeneratePrimaries(G4Event*);

private:
    TH1D * spectrum_histogram;
    TH1D * angular_histogram;
};
```

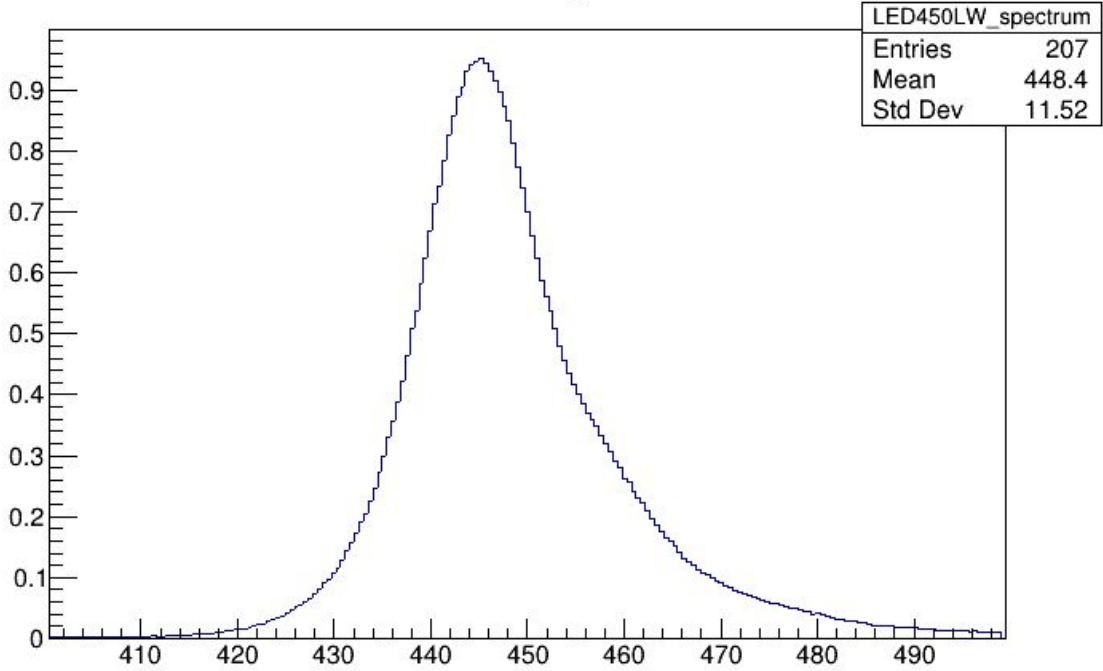
Manufacturer's info. preprocessing

These new members are crafted out of the digitisation of the information provided by the manufacturer.



Manufacturer's info. preprocessing

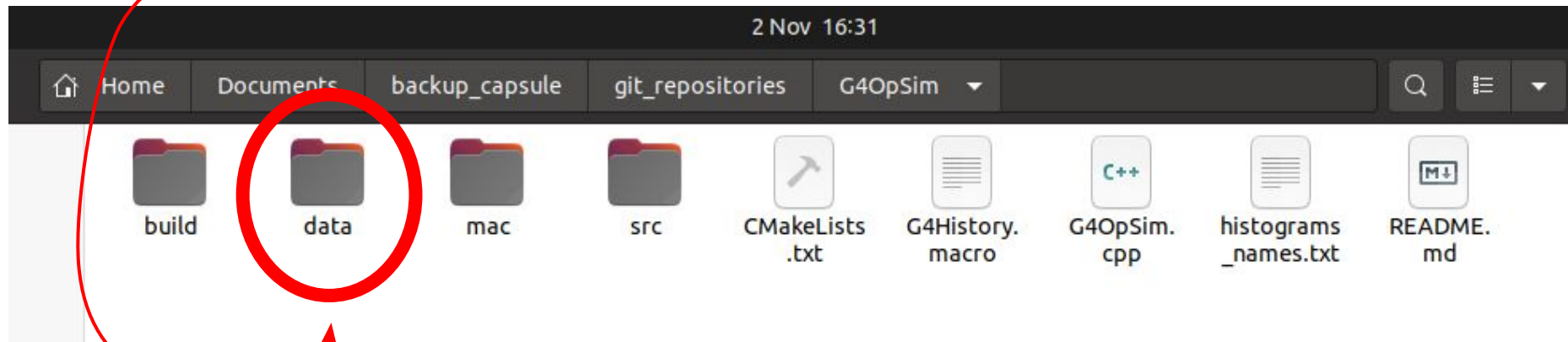
LED450LW Spectrum



TH1D object

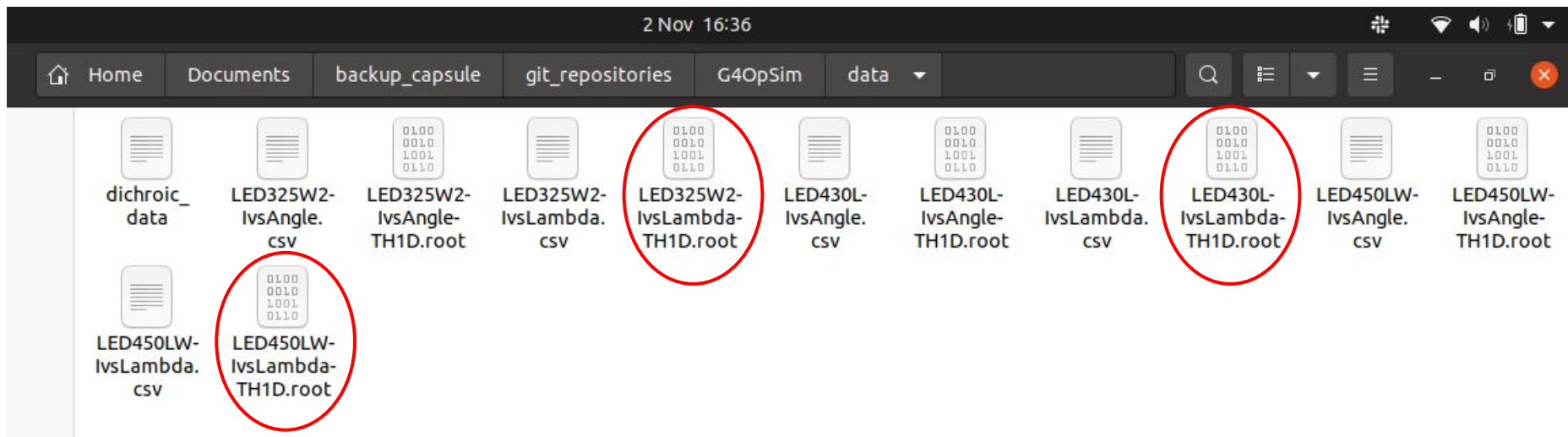
What's new within the repository?

G4OpSim/data hosts the new LED sources that are available within the simulation



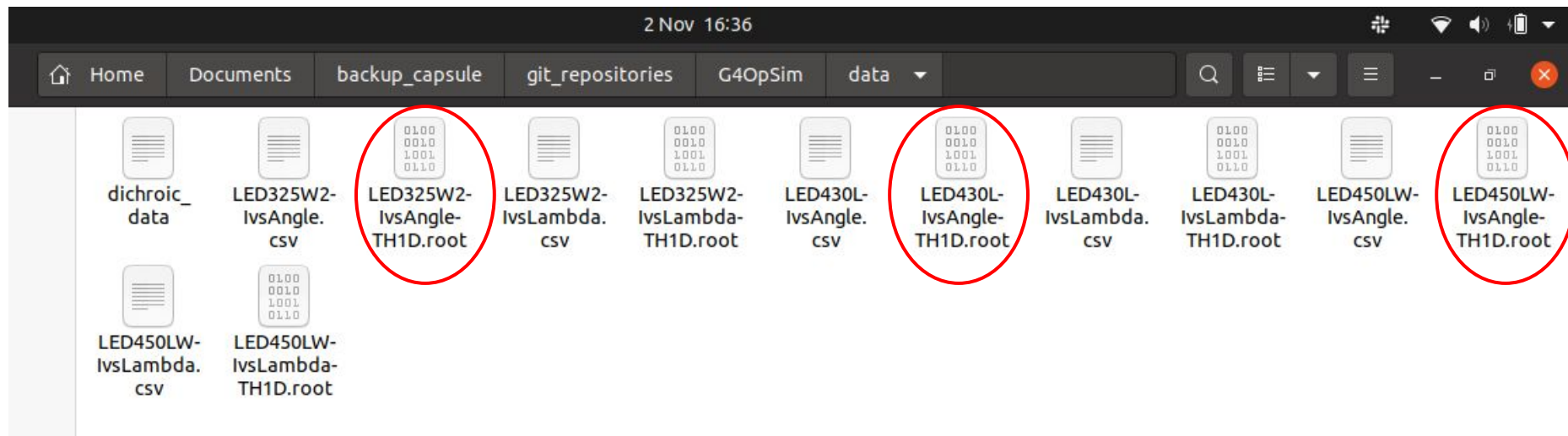
What's new within the repository?

*IvsLambda.root files store the root TH1D histograms regarding the LEDS angular pattern



What's new within the repository?

*IvsAngle.root files store the root TH1D histograms regarding the LEDS angular pattern



The G4OpSim/data directory also contains the .csv files which were used to generate the histograms

How to use

For the moment, the parameter initialization regarding which source to use is hardcoded into G4OpSim/src/PrimaryGeneration.cpp , lines 25 and 26. The filepath to a valid TH1D object file, which are allocated within G4OpSim/data, must be provided as shown in the figure above.

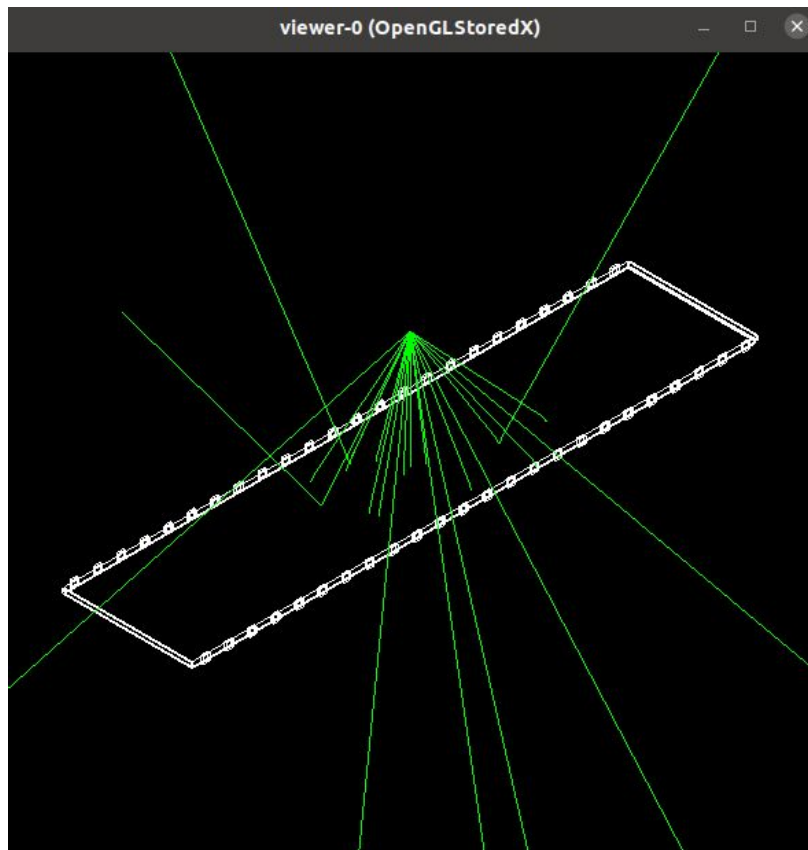
```
PrimaryGeneration::PrimaryGeneration():  
    G4VUserPrimaryGeneratorAction(),  
    //Introduce the histogram filepath with this exact format!  
    spectrum_histogram(get_TH1D("./data/LED430L-IvsLambda-TH1D.root")),  
    angular_histogram(get_TH1D("./data/LED430L-IvsAngle-TH1D.root"))  
{  
}
```

For the moment, the only valid filepaths are `"./data/X-IvsY-TH1D.root"` replacing `"X"` with `"LED450LW"`, `"LED430L"` or `"LED325W2"`; and `"Y"` with `"Lambda"` or `"Angle"`.

How to use

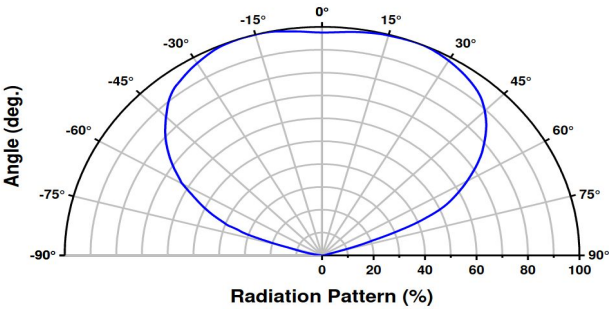
After compiling the application, running `G4OpSim/build/G4OpSim` as usual and launching some photons gives

```
Idle> //run/beamOn 20
```

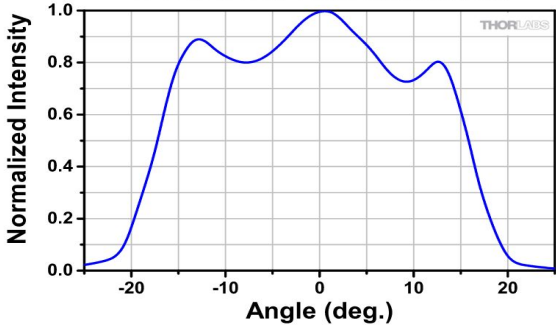


How to use

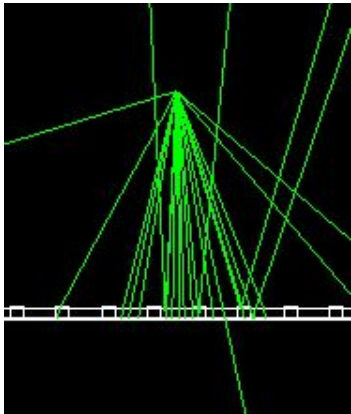
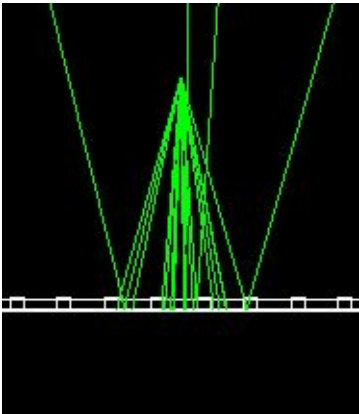
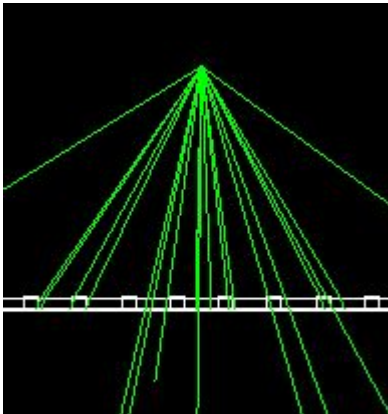
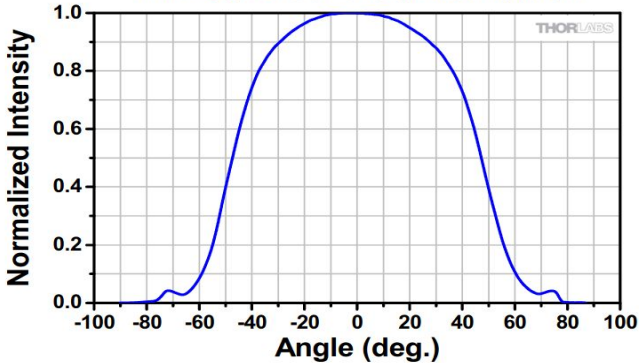
LED325W2 Radiation Pattern



LED430L Far Field Distribution



LED450LW Far Field Distribution



Next simulation steps

- Add the SiPM PDE
- Simulate the LED angular and spectral distribution
- Simulate the 5 SiPMs attached to the card
- Simulate the WLS plate with its actual dimensions, absorption and emission spectra
- Simulate the 2 SiPMs coupled to the WLS plate