

# Tutorial of Event Display based on Unity



Jiang Zhu, Zhengyun You, Yumei Zhang  
Sun Yat-sen University

JUNO Physics and Software Workshop@WHU  
May 14<sup>th</sup> , 2018

# Outline

- Data Input
- View Control
- Draw the hits
- Display Setting

# Before start

## Get the software

### Get the corresponding built software for your system.

If you are an IHEP AFS user

```
/afs/ihep.ac.cn/users/z/zhujiang/event_display
```

```
eve_juno_alpha_0.61_mac.tar      eve_juno_alpha_0.61_windows.tar  
eve_juno_alpha_0.61_ubuntu.tar  eve_macro
```

macro to extract data  
from root file

Or you can just download from the indico page of the workshop.

Then unfold the tar.

```
$tar -xvf eve_juno_alpha_0.61_<platform>.tar
```

# Data Input

Extracting data from JUNO offline software

## Generate you data with offline

After you run the simulation with JUNO offline. You will have the simulation data for user:  
**sample\_detsim\_user.root**

```
CalibAnalysis
ElecAnalysis
eplus.sh
geometry_acrylic.gdml
RecAnalysis
sample_calib.root
sample_detsim.root
sample_detsim_user.root
sample_rec.root
SimAnalysis
tut_calib2rec.py
tut_det2calib.py
tut_det2elec.py
tut_detsim_mu.py
tut_detsim.py
tut_elec2calib.py
tut_muonToyMC.py
tut_sim2rec_mu.py
tut_vis.sh
vis.mac
```

# Data Input

## Extracting data from JUNO offline software

### Get the eve\_macro folder

You can get the eve\_macro folder from the workshop website or find it in the software main directory. **eve\_macro/** and your data files like **sample\_detsim\_user.root** and **sample\_rec.root** should be in the same directory, to make the macro works.

```
CalibAnalysis      sample_detsim.root      tut_detsim_mu.py
ElecAnalysis       sample_detsim_user.root tut_detsim.py
eplus.sh          sample_rec.root         tut_elec2calib.py
eve_macro          SimAnalysis             tut_muonToyMC.py
geometry_acrylic.gdml tut_calib2rec.py        tut_sim2rec_mu.py
RecAnalysis        tut_det2calib.py        tut_vis.sh
sample_calib.root  tut_det2elec.py         vis.mac
```

# Data Input

Extracting data from JUNO offline software

## About the scripts in the `eve_macro` folder

`eve_macro.sh` will run the three \*.cc.

Just run this and every thing will be done if you are luck enough.

`eve_data` is the output directory. The extracted data can be found in it.

`README.txt` gives a pretty simple guide. (If you feel this one is too long and boring)

```
eve_data      LoadPhotonPath.cc  LoadVertexes.cc  
eve_macro.sh  LoadSortedPMTHit.cc  README.txt
```

# Data Input

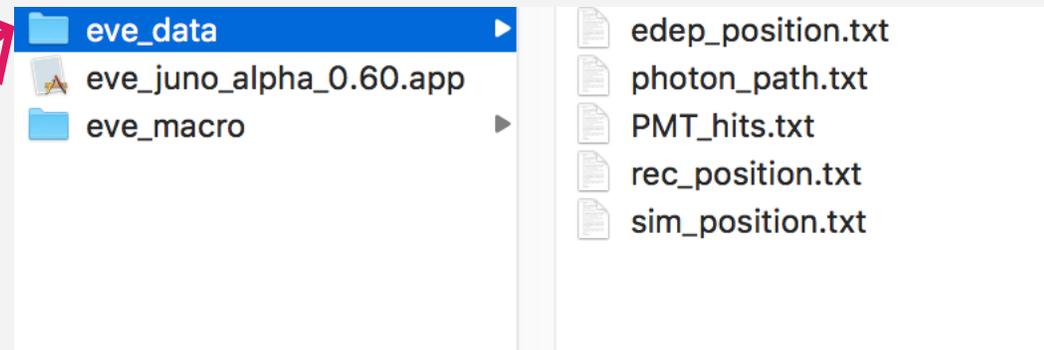
Hey, this is the most important page of the tutorial.

## What you need to do is:

```
$ sh eve_macro.sh  
$ cp -r eve_data <directory of the event display program>
```

If you find five \*.txt in eve\_data, that's perfect!  
Copy the \*.txt into the eve\_data folder in the **software main directory**.

```
eve_data      LoadPhotonPath.cc  LoadVertexes.cc  
eve_macro.sh  LoadSortedPMTHit.cc  README.txt
```



# Data Input

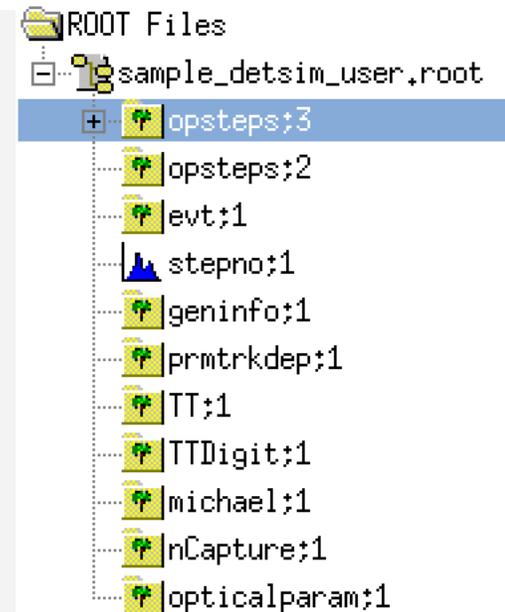
Photon path (optional)

## Output the optical photon path

To get photon\_path.txt, your **sample\_detsim\_user.root** must have the **opsteps** Ttree.

This can be generated by adding the argument **--anamgr-photon-tracking**, when running the simulation.

```
python tut_detsim.py --anamgr-photon-tracking --gdm1
```



# First Launch

When you use the software for the first time

## Choose the control style

This page only will be played in the first time.

If you want to replay this page, you can delete the `/eve_data/display.conf`

### Choose your control style:

#### 1. Unity Style

Like most FPS games style. It's convenient to get your view angle. A tutorial will be given later.

#### 2. SERENA Style

It's the same control style as the one in SERNEA, ROOT-based event display in JUNO offline, which you are familiar with.

This option can be changed later in the ESC Menu.

# View Control

## Ways to control the camera

### Unity Style

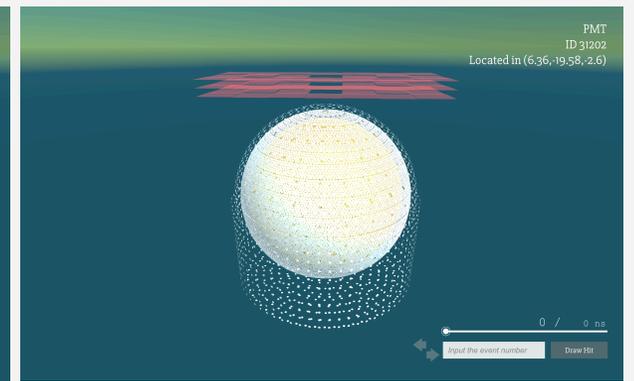
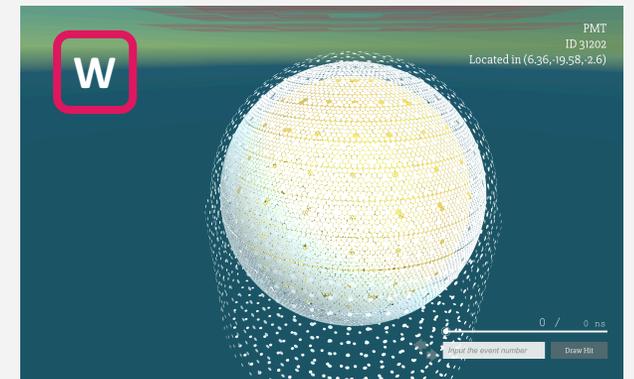
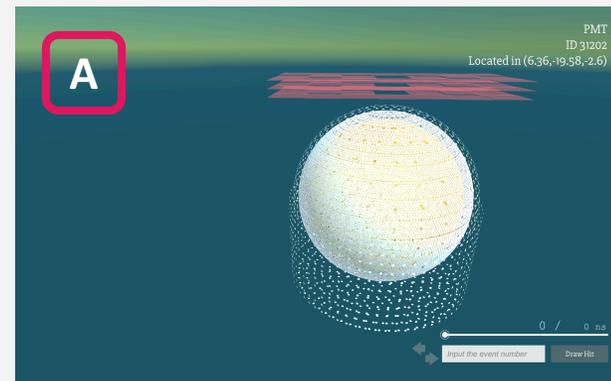
FPS games control way.



Press key A S W D for camera moving.

Hold mouse **right** key to turn the view angle.

Use **scroll wheel** to zoom in/out.



# View Control

## Ways to control the camera

### Unity Style

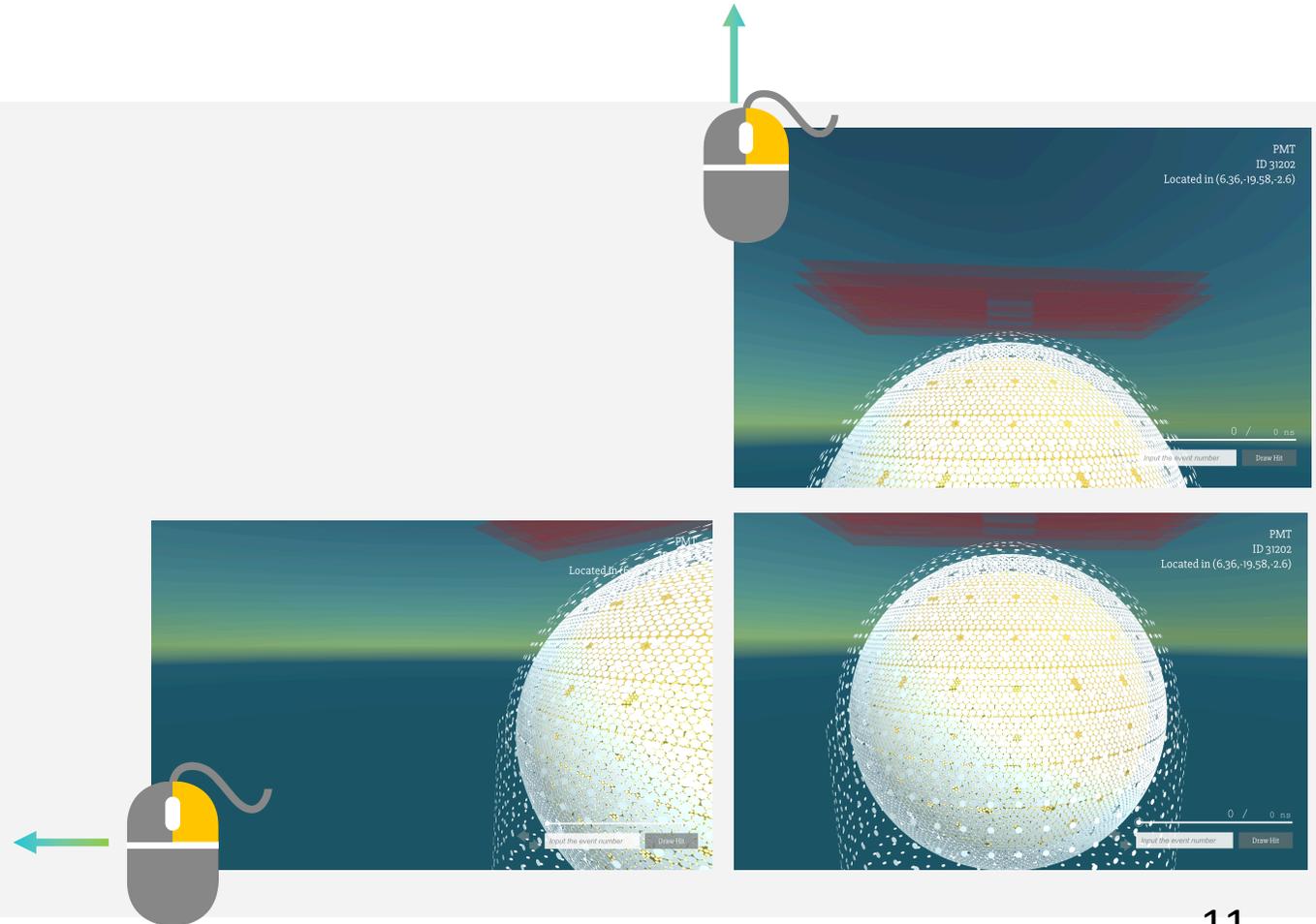
FPS games control way.

Press **key A S W D** for camera moving.



Hold mouse **right** key to turn the view angle.

Use **scroll wheel** to zoom in/out.



# View Control

## Ways to control the camera

### Unity Style

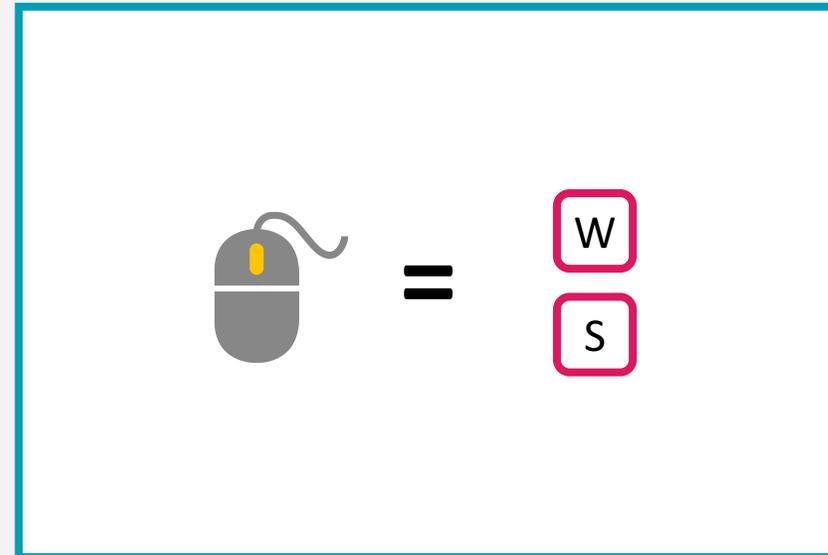
FPS games control way.

Press **key A S W D** for camera moving.

Hold mouse **right** key to turn the view angle.



Use scroll wheel to zoom in/out.



# View Control

## Ways to control the camera

### SERENA Style

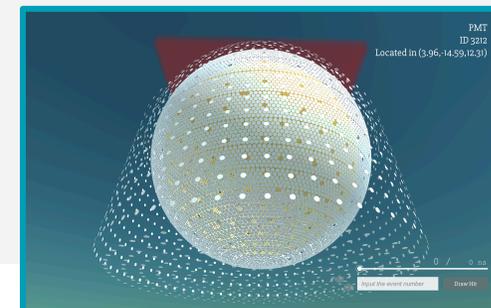
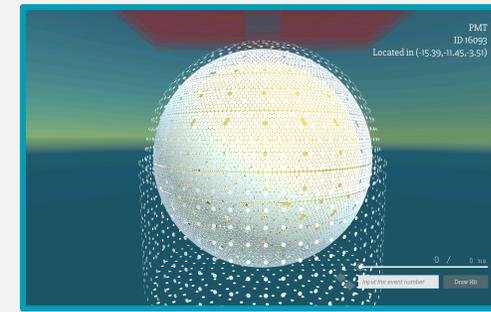
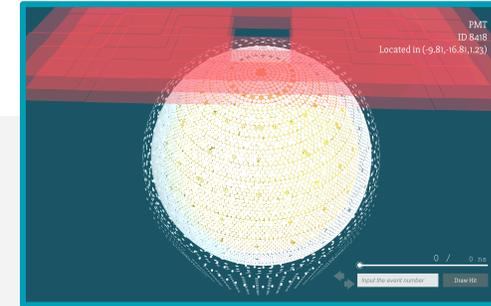
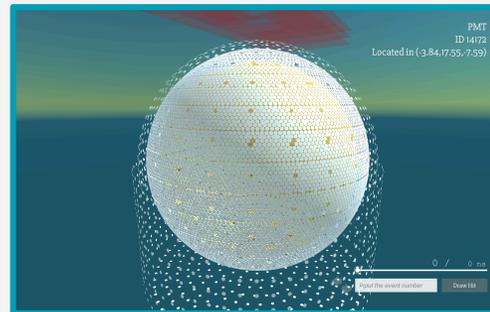
ROOT control way



Hold mouse **left** key to rotate around.

Hold mouse **right** key to shift.

Use **scroll wheel** to zoom in/out.



# View Control

## Ways to control the camera

### SERENA Style

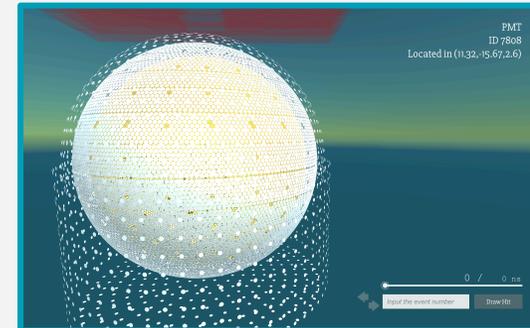
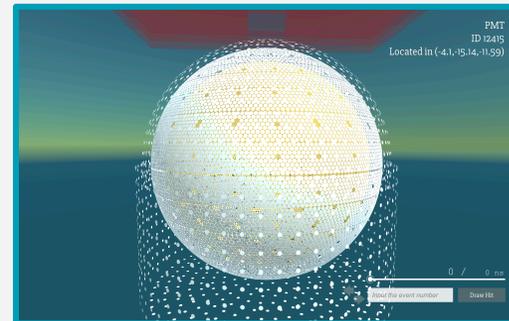
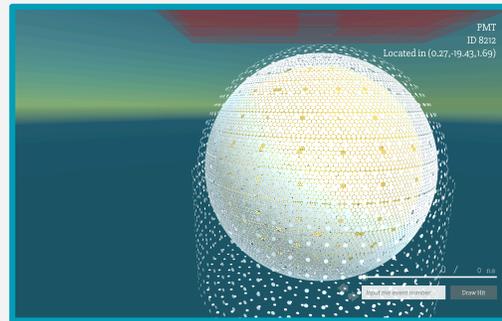
ROOT control way

Hold mouse **left** key to rotate around.



Hold mouse **right** key to shift.

Use **scroll wheel** to zoom in/out.



# View Control

## Ways to control the camera

### SERENA Style

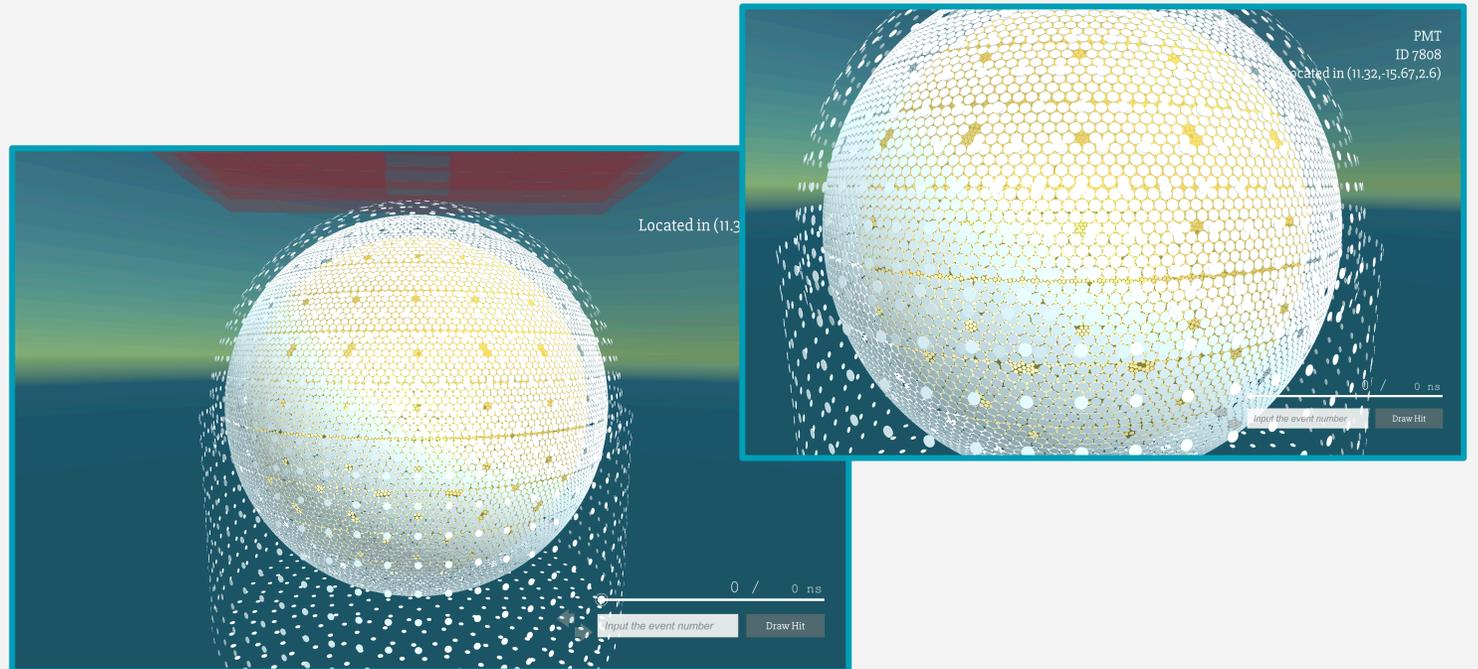
ROOT control way

Hold mouse **left** key to rotate around.

Hold mouse **right** key to shift.

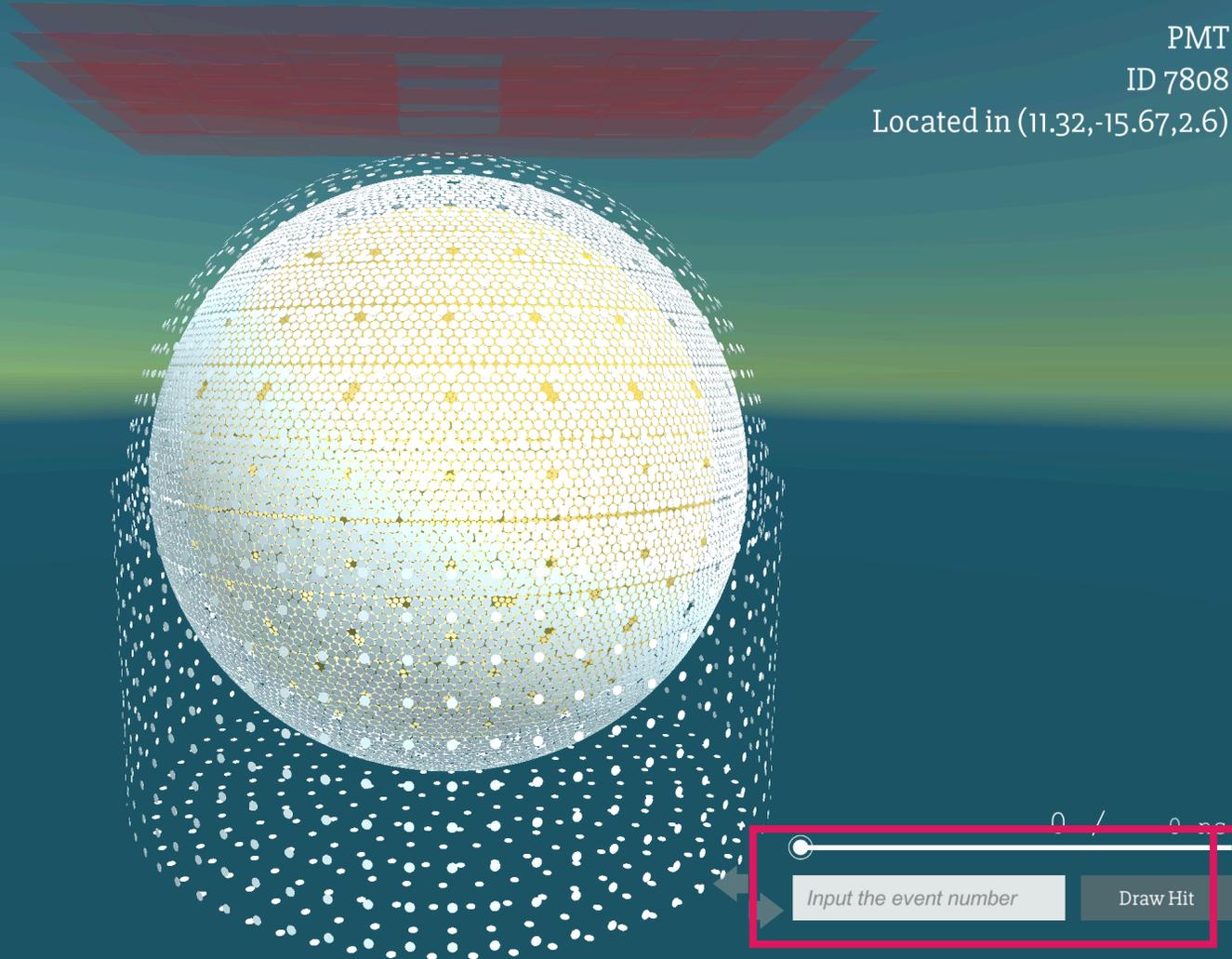


Use **scroll wheel** to zoom in/out.



# Draw the hits

Animate the event hits with the software



Input the event number  
and click the *Draw Hit*  
button

Current displayed event: NO.8

Sum of all the PMT hits: 4223  
maximum of hit time: 766.146 ns

### Displayed Event Information

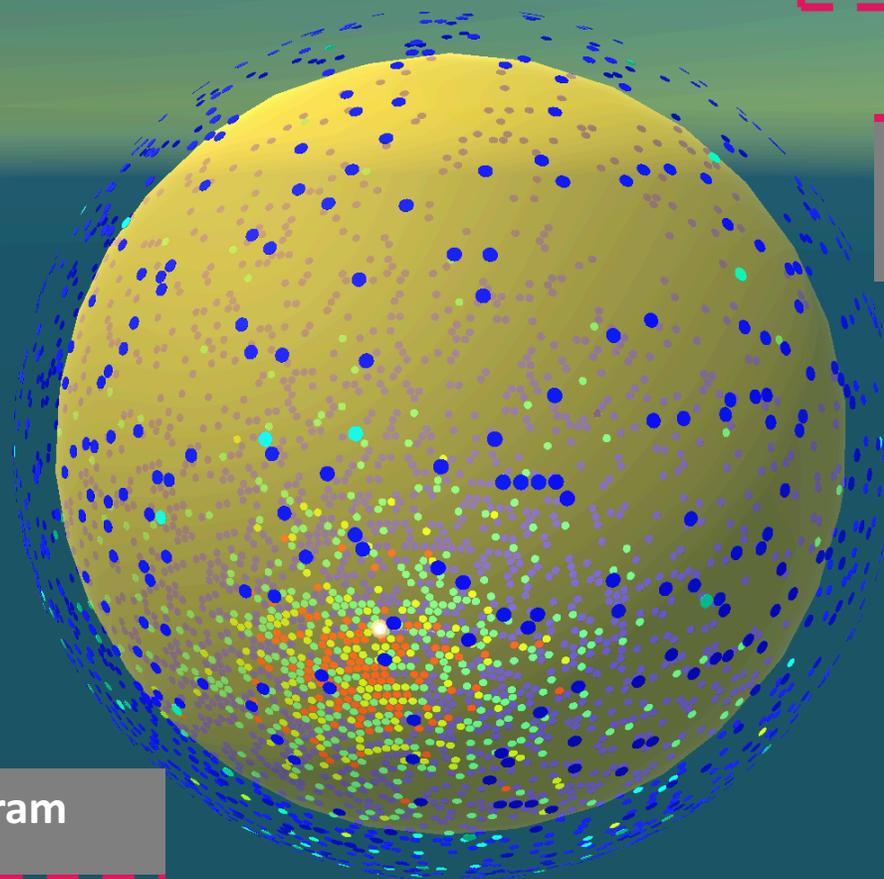
PMT

ID 16726

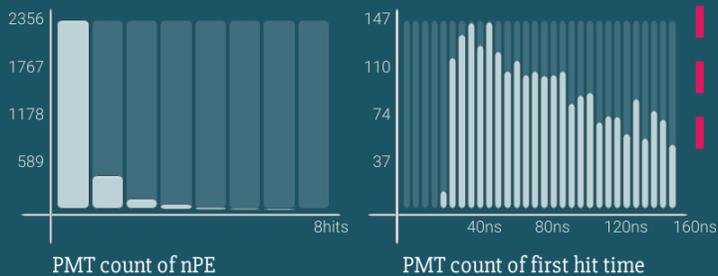
Located in (-18.56,5.58,-2.14)

Obtained 1 photons

### Selected Object information

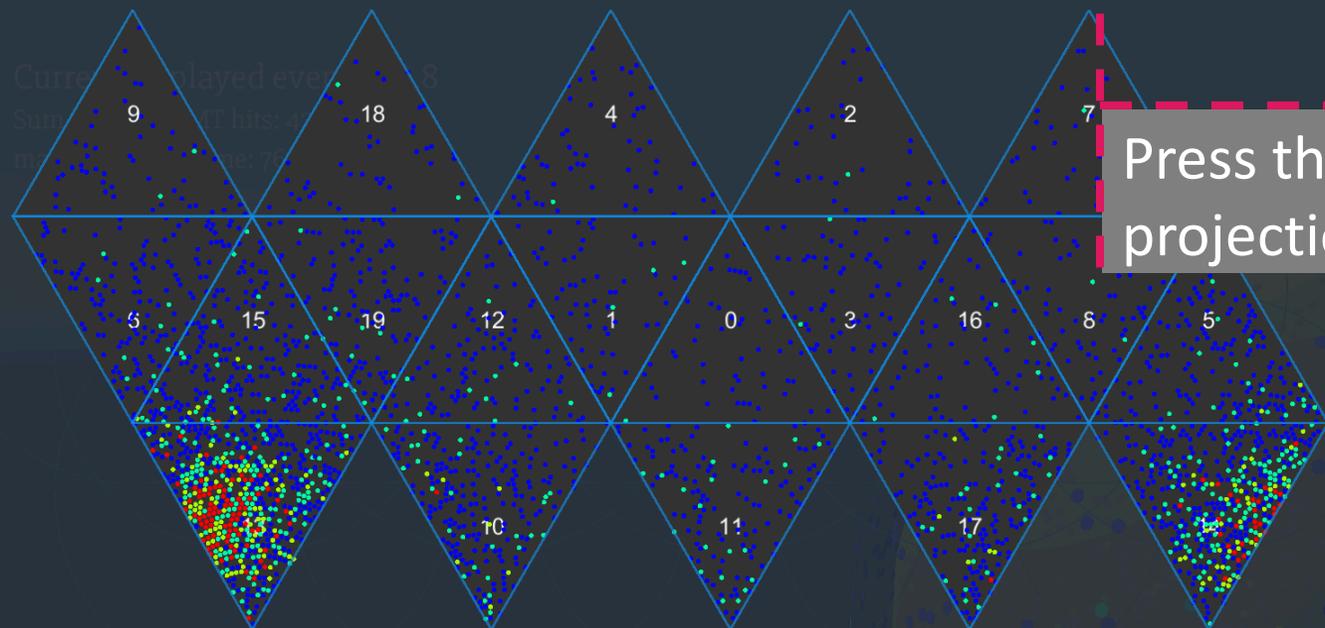


### Histogram

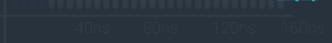
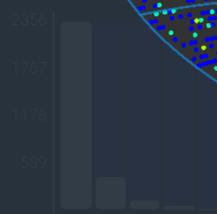
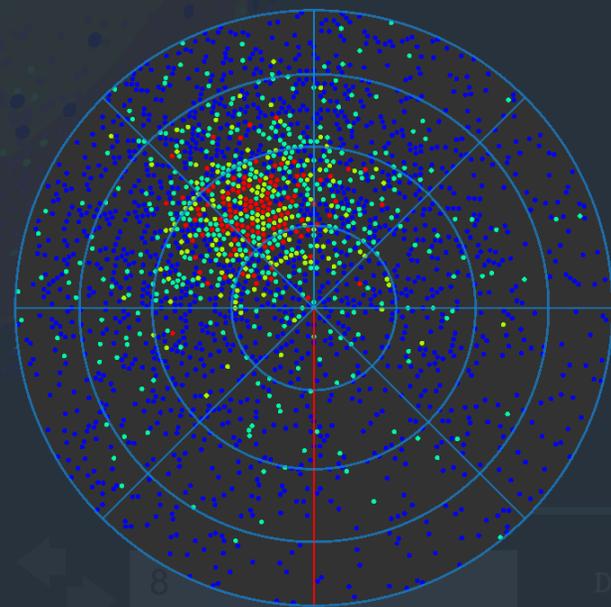
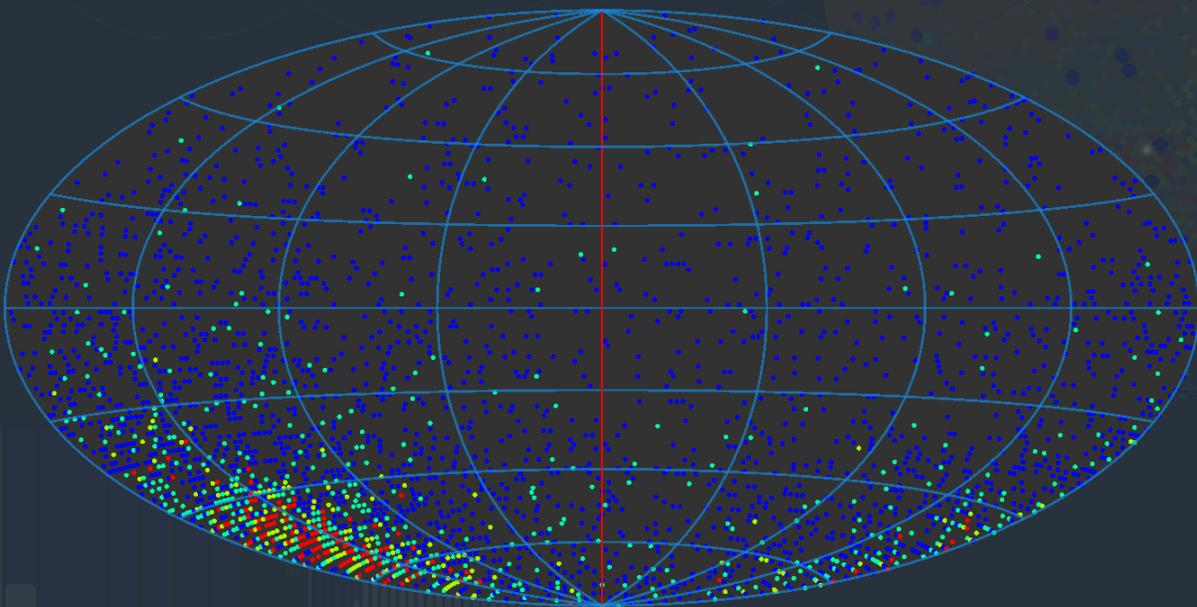
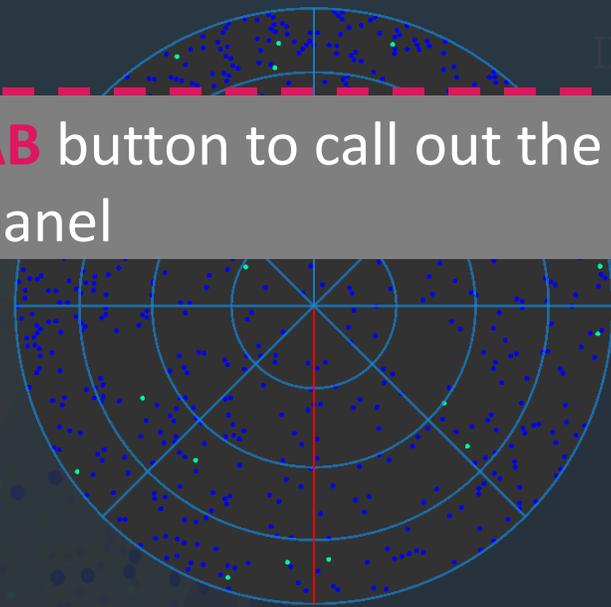


160 / 160 ns

8 Draw Hit 17



Press the **TAB** button to call out the 2d projection panel



160 ns

Draw Hit

# Display Setting

All the display setting is in the ESC menu

## Press the ESC button

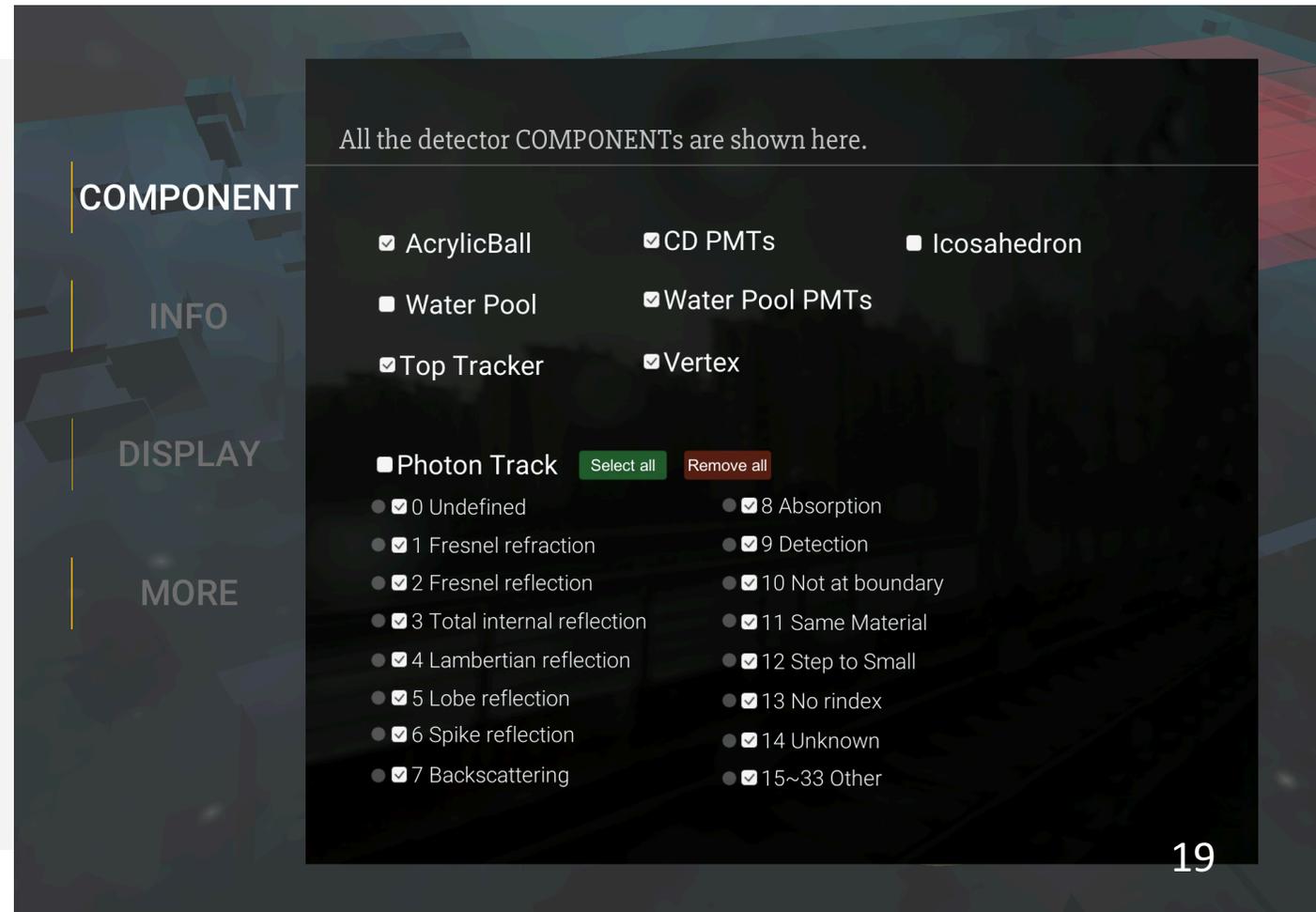
The menu contains all the software options. Including:

**COMPONENT** Switch of sub detector

**INFO** Information panel

**DISPLAY** Display effect

**MORE** Control style and so on



# Display Setting

Switch of objects in the 3d space



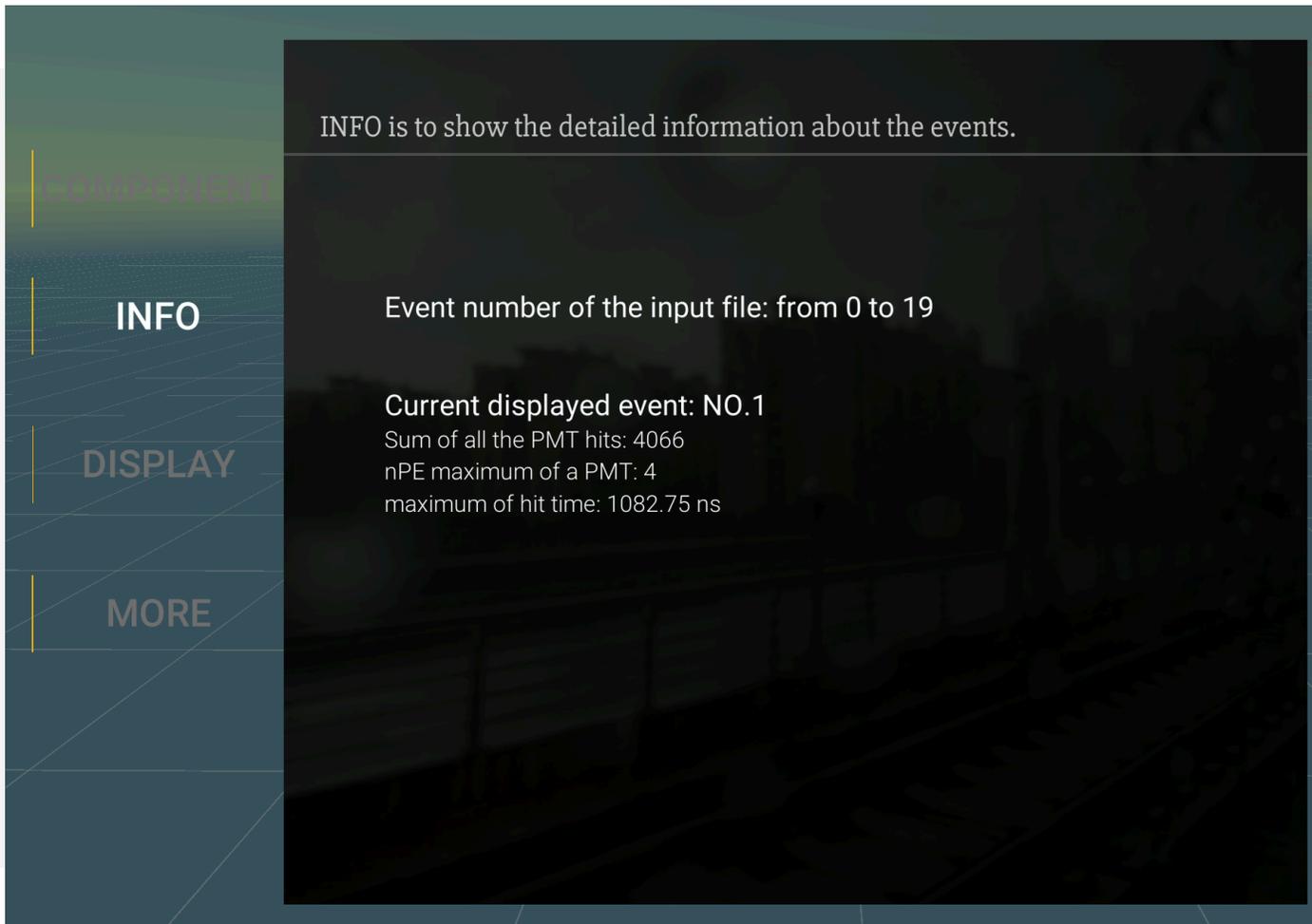
Detector components

Icosahedron corresponding to the Snyder Projection

Every type of photon process

# Display Setting

## More information



INFO is to show the detailed information about the events.

Event number of the input file: from 0 to 19

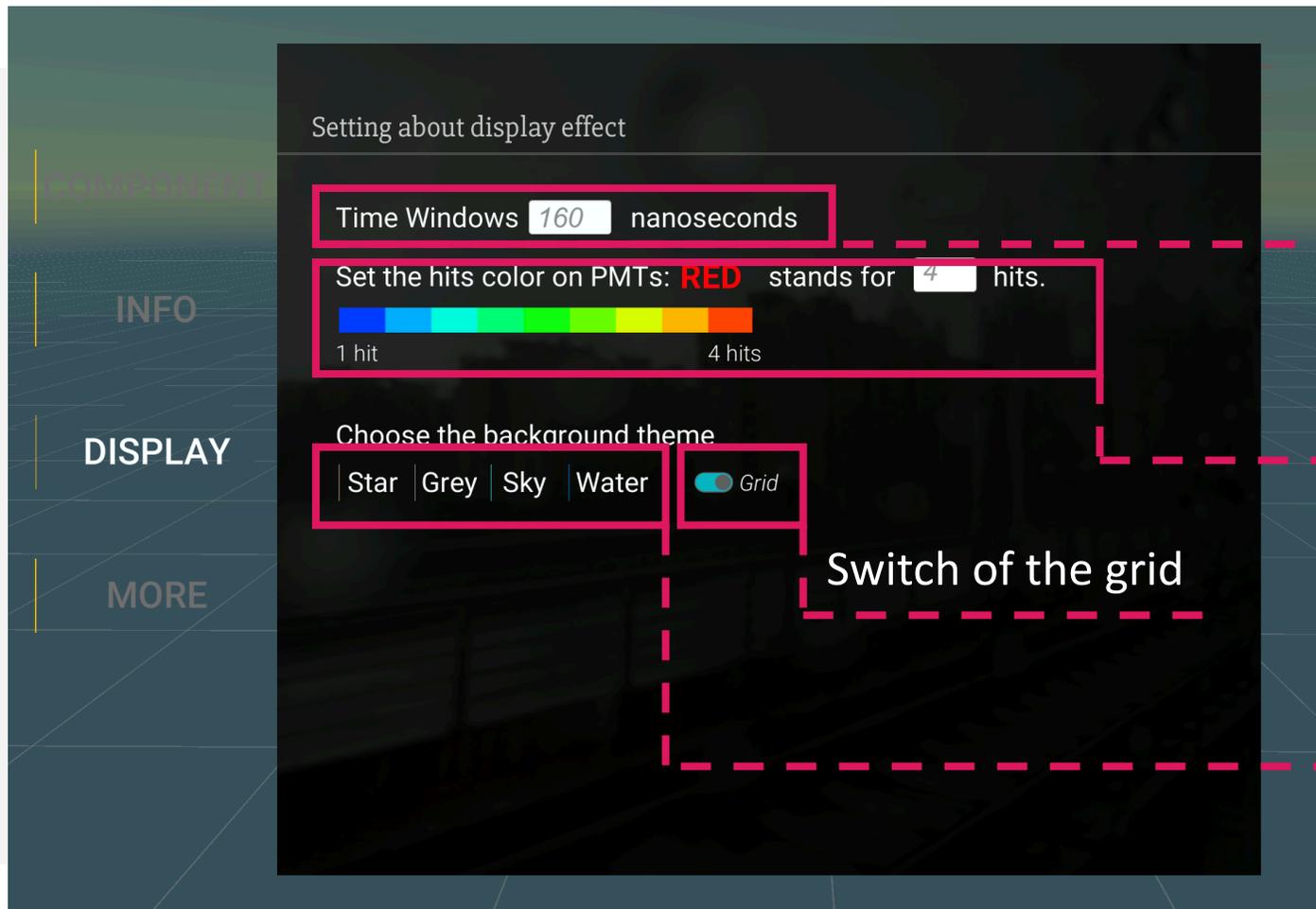
Current displayed event: NO.1  
Sum of all the PMT hits: 4066  
nPE maximum of a PMT: 4  
maximum of hit time: 1082.75 ns

The screenshot shows a dark-themed interface with a sidebar on the left containing four menu items: 'COMPONENT', 'INFO', 'DISPLAY', and 'MORE'. The 'INFO' item is highlighted with a white vertical bar. The main content area is dark and contains white text. At the top, it says 'INFO is to show the detailed information about the events.' Below that, it lists 'Event number of the input file: from 0 to 19', 'Current displayed event: NO.1', and three statistics: 'Sum of all the PMT hits: 4066', 'nPE maximum of a PMT: 4', and 'maximum of hit time: 1082.75 ns'.

More information will be found into the **INFO** tab.

# Display Setting

## Display effect



Change the slider maximum in the main interface.

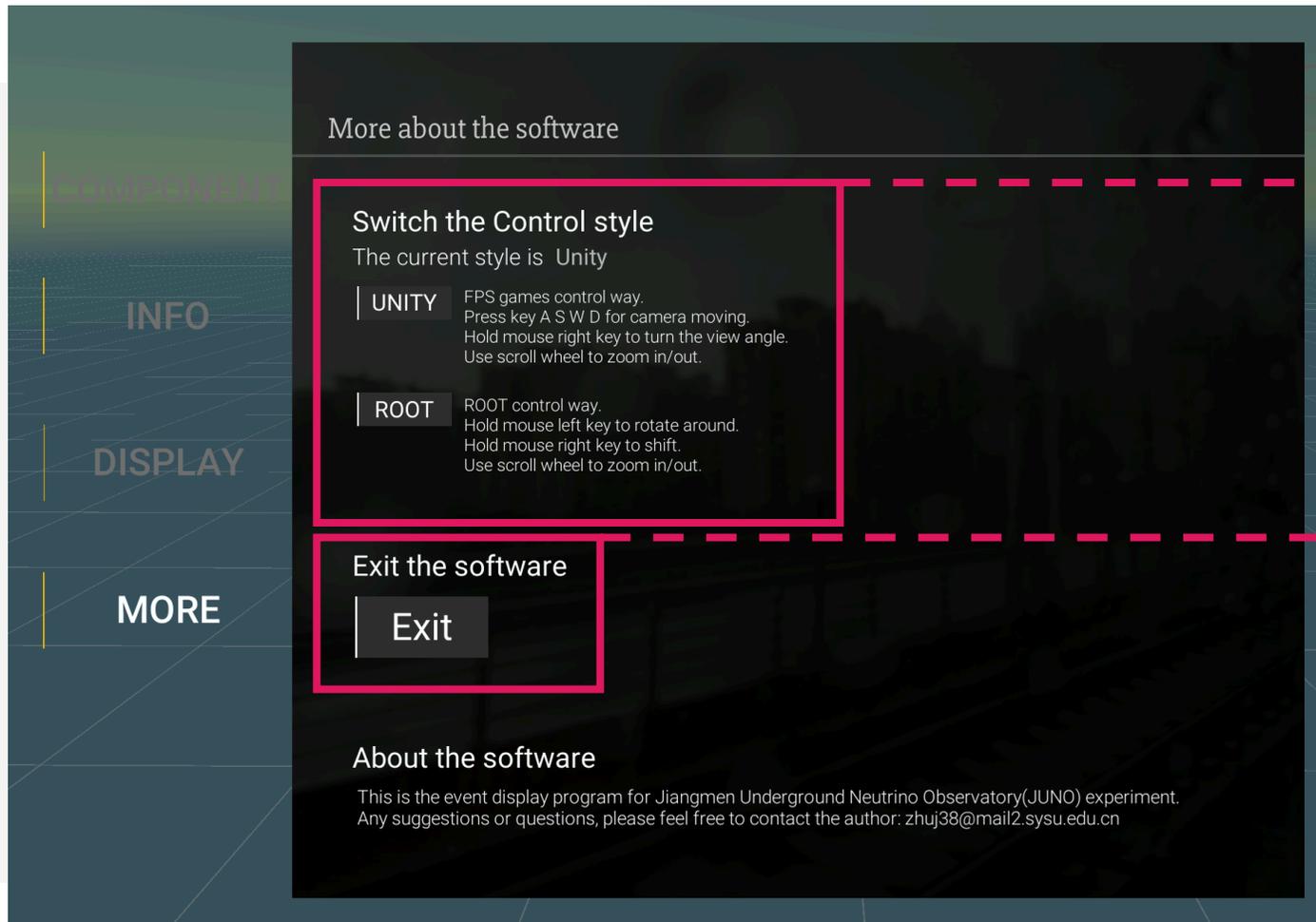
Blue always means one hit.

Hits number that Red stands for can be changed.

Several background pictures are provided.

# Display Setting

## Display effect



Switch between the two control styles

An exit button is provided. If you find difficulty to exit the software, just click it.



Thank you.