

# GATE Optical Imaging SHFJ Status Report

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HGATE - Brest

# Outline

Visible Light Fluorescence Validation

Optical Photons Updates in Gate v6.2

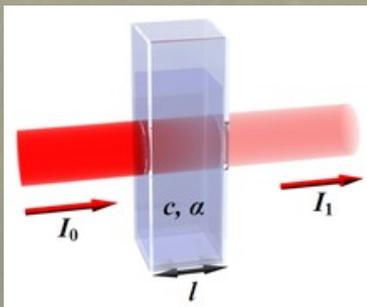
Plan

# Fluorescence Validation

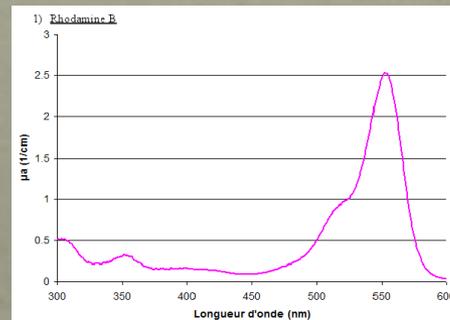
Un-successful attempts to compare existing fluorescence data (SHFJ and IMNC) with Gate MC simulation :

All experimental inputs were not available or *perfectly* known.

We **plan** to set-up our *own* fluorescence experiment (IMNC) using the Biomimic solid phantom + well known fluorophore insertion.



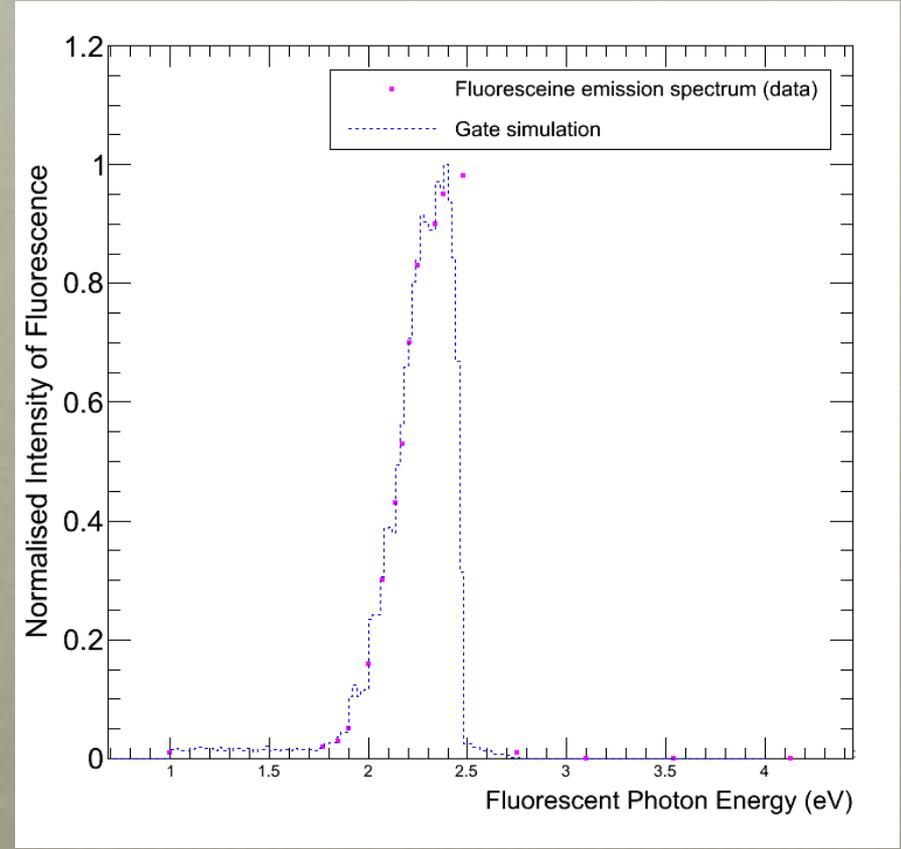
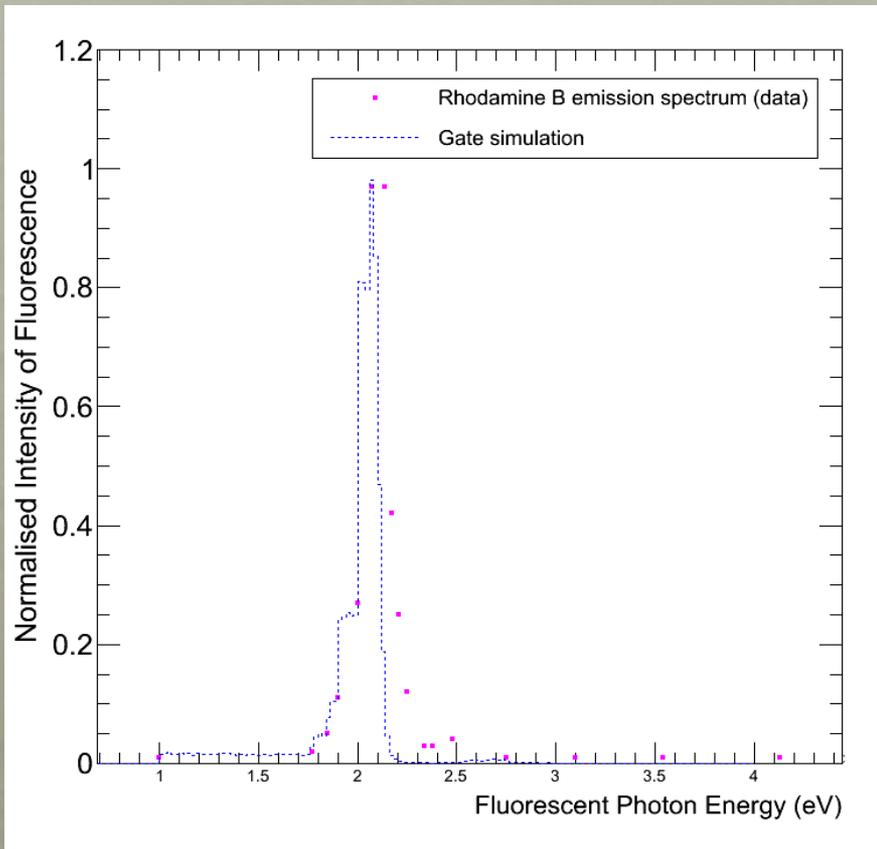
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Validation of **all** optical physics processes :  
Bulk absorption, Mie scattering, processes at boundary and fluorescence.

# Pure fluorophore Data/MC comparison



Need to investigate the difference on the right part of the spectrum.

# Gate v6.2 Updates

Successful installation and compilation of Gate v6.2

## **Modifications in the following classes :**

GateFastAnalysis (re-structuration)

GateRootDefs (re-structuration)

GateToRoot (code update)

## **+ New classes and Messengers:**

GateOpticalWLSBP (Fluorescence a.k.a **WaveLength Shifting**)

GateElTub (Elliptical Tub was needed for some validation tests)

## **+ Gate v6.2 Wiki pages were updated :**

Generating\_and\_tracking\_optical\_photons

Defining\_a\_geometry

**SVN Revision 183**  
**(June 29<sup>th</sup> 2012)**

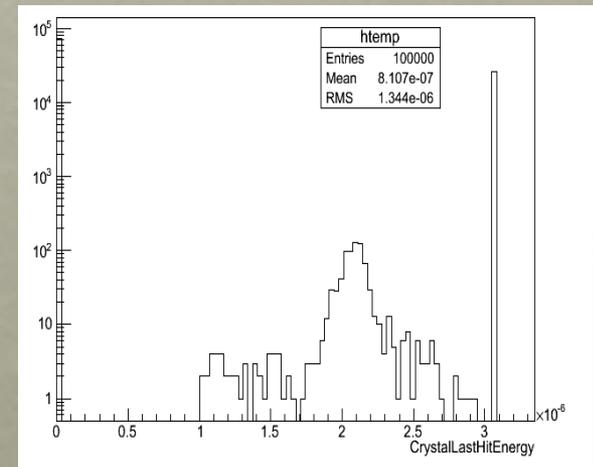
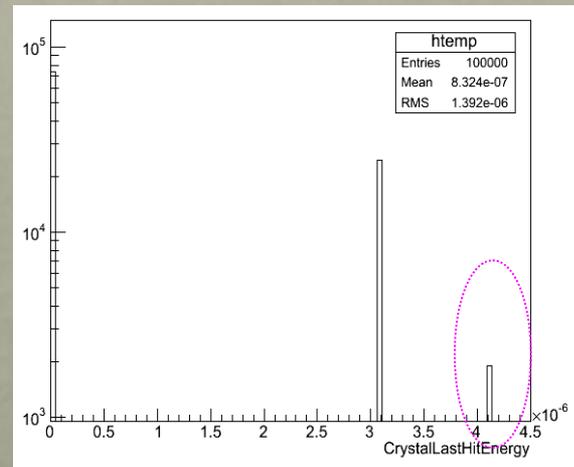
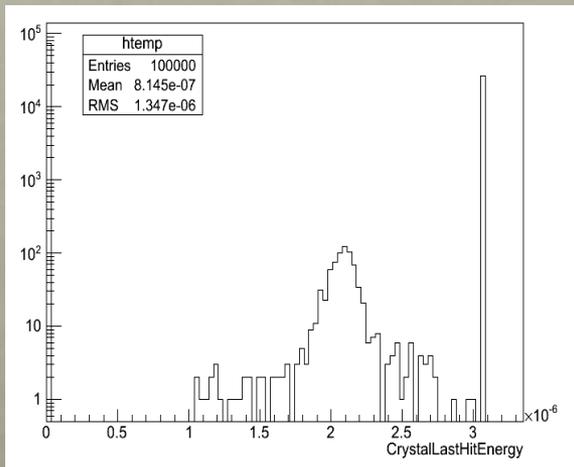
# Gate v6.1 to Gate v6.2

## Issue with MaterialPropertyVector

Gate v6.1  
(Geant4.9.4)  
+ new code

Gate v6.2  
(Geant4.9.5.p01)  
+ new code

Gate v6.2  
(Geant4.9.5.p01)  
+ new code  
+ Ordering Fixed



With geant4.9.5, all material properties input values have to be given in increasing (NOT decreasing) order of energy.

In 9.4 the code was using G4MaterialPropertyVector that automatically sorts the entries by photon energy (increasing order of energy). With >9.5, the method was replaced by G4PhysicsOrderedFreeVector where the original input order is preserved. That class didn't actually 'order' anything. **New patch p02 will be available soon. When v6.2 becomes public, we NEED to tell users about ordering their properties values by increasing order of energy.**

# Plan

*Unfortunately quite some time was lost in trying to reproduce available fluorescent data.*

**Back to GPU code** for optical imaging :

Geant4.9.5.p01, CLHEP 2.1.1.0 and Gate v6.2 were successfully installed on the CURIE Machine at the CCRT (where GPUs are available)

Next step : Implementation in the standalone code (that already simulates Mie scattering) of Fresnel formulaes for optical physics at boundaries.

Ultimate step : coding session to incorporate the optical imaging GPU module in Gate v6.2

# BACKUP

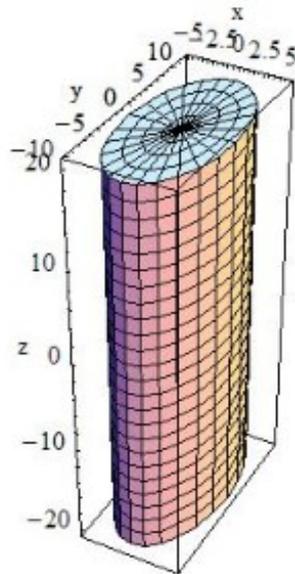
# Gate Elliptical Tube

eltube (G4EllipticalTube)

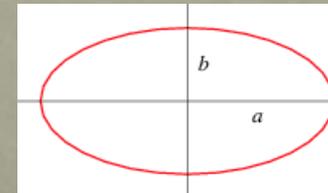
<eltube

```
name = "eltExample"  
dx = "10"  
dy = "15"  
dz = "20"  
lunit = "mm" />
```

name	Elliptical tube name
dx	x semi axis
dy	y semi axis
dz	z semi axis
lunit	unit of dx, dy and dz



[gate/source/geometry/src/GateEITub.cc](#)  
[gate/source/geometry/src/GateEITubMessenger.cc](#)  
[gate/source/geometry/include/GateEITub.hh](#)  
[gate/source/geometry/include/GateEITubMessenger.hh](#)



## ELLIPTICAL TUBE

setLong: Set the length of the semimajor axis

setShort: Set the length of the semiminor axis

setHeight: Set the height of the tube