

**Postdoctoral position, Lyon, France**  
**Towards an hybrid deterministic-stochastic module in GATE simulations**

<https://www.creatis.insa-lyon.fr/site/en/node/45398>

The [CREATIS](#) laboratory and the [Léon Bérard](#) cancer centre (CLB, Lyon, France) open a 24 months postdoc position in the field of simulations in radiation therapy. The position is funded by the ANR tGate project.

### **Context**

The tGate project involves 4 research teams in France (Lyon, Brest, Toulouse, Orsay) and aims at extending the Monte-Carlo Gate platform ([www.opengatecollaboration.org](http://www.opengatecollaboration.org)) to theranostic scenarios, mixing imaging and therapy. Within this project, we focus on developing a general module for hybrid simulations combining Monte-Carlo and analytical models. The main objective is the improvement of computational efficiency. To our knowledge no equivalent hybrid module exists in other known MC simulation platforms and represents a key element to the future of the proposed platform.

Examples of hybrid algorithms are:

- **TLE** (Track Length Estimator) method for low energy photon dose deposition. This method already exists in some codes (MCNPX) and was recently included in GATE (Mittone et al. 2013).
- **seTLE** (exponential TLE): this approach improves the previous approach by about one order of magnitude (Smekens et al. 2014).
- **pgTLE** : Exponential estimator for prompt-gamma emission (rare events), for which no solution currently exists.
- **fd** : forced-detection approaches for X-ray imaging simulations (Freud et al. 2005). These approaches have to be developed, adapted and validated within GATE.

### **Goal**

The task of the recruited person will be to:

- 1) Investigate methods to remove computation artefact observed with seTLE fast dose computation methods.
- 2) Propose a generic approach to analytically manage detectors response in Gate.
- 3) Participate to forced-detection project

### **Profile**

- The candidate must hold a master in medical physics, physics or image processing.
- Scientific interests: computer sciences (medical image processing), x-ray and particle physics, Monte Carlo simulations.
- Programming skills: high level in C++ required.
- Language: English required.
- Location: Centre Léon Bérard, Lyon, France.
- Salary (gross): about 1900 euros/month.
- Period: 2 years starting in 2015.

**Contacts.** Send CV by email to:

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## References

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