2011 Nuclear Science Symposium and Medical Imaging Conference

GATE users’ meeting

Organized by the OpenGATE collaboration
Many thanks to:

The MIC Chair and Deputy Chair
Alberto Del Guerra and Juan Jo Vaquero

The IEEE NSS-MIC committee
Dora Merelli and Bo Yu

The OpenGATE collaborators and GATE users
Program

- 17:30 - 17:45  Welcome, purpose of the meeting
  Status of the OpenGATE collaboration
  Irène Buvat, IMNC CNRS, Orsay

- 17:45 - 18:15  GATE V6 : functionalities and demos
  Sébastien Jan, CEA-SHFJ, Orsay

- 18:15 - 19:15  Four examples of GATE applications
  - Using GATE for helping in detector design: Virtual PET scanner.
    From simulation in GATE to a final multiring small animal Albira PET/SPECT/CT camera
    Marcin Balcerzyk, Universidad de Sevilla, Spain

  - Using GATE for CT simulations: Photon counting x-ray CT imaging using GATE: effects of energy window widths
    Seung-Wan Lee, Yonsei University, Wounju, Gangwon, Korea
Program

- 18:15 - 19:15  Examples of GATE applications
  - Using GATE for radiotherapy applications: Validation of Dose Point Kernels generated by GATE based on homogeneous sphere phantom and variable dosel size
    Panagiotis Papadimitroulas, University of Patras, Greece
  - Using GATE for hadrontherapy applications: Validation of the hadronic models for PET monitoring of dose deposit in hadrontherapy
    Charlotte Robert, IMNC CNRS, Orsay, France

- 19:15 - 19:30  News and upcoming functionalities of GATE
                 Sébastien Jan and Irène Buvat

- 19:30 - 20:00  Discussion and concluding remarks
Purpose of the meeting

- What is GATE and the OpenGATE collaboration?
- What GATE can currently achieve, what is new in GATE
- Examples of GATE applications through scientific presentations
- Information on what to expect with GATE in the future
- Opportunity for you to make contact with other GATE users
- Opportunity for us to hear from you, your satisfaction level and your needs
What is GATE?

- **GATE**: Geant4 application for Monte Carlo simulations of Emission Tomography, Transmission Tomography and Radiation Therapy based on the general purpose Monte Carlo simulation tool Geant4.

- GATE is an open source software freely available through registration on the OpenGATE web site http://www.opengatecollaboration.org.

- First release of GATE in May 2004.
  - 17 releases since that date (about 2 releases each year).
  - Currently GATE V6.1.

- GATE functionalities have been described in 2 reference articles.
GATE: a simulation toolkit for PET and SPECT

S Jan¹, G Santin²,²⁴, D Strui²,²⁵, S Staelens³, K Assié⁴, D Autret⁵, S Avner⁶, R Barbier⁷, M Bardiès⁵, P M Bloomfield⁸, D Brasse⁶, V Breton⁹, P Bruyndonckx¹⁰, I Buvat⁴, A F Chatziioannou¹¹, Y Choi¹², Y H Chung¹², C Comtat¹, D Donnarieix⁹,¹³, L Ferrer⁵, S J Glick¹⁴, C J Groiselle¹⁴, D Guez¹⁵, P-F Honore¹⁵, S Kerhoas-Cavata¹⁵, A S Kirov¹⁶, V Kohli¹¹, M Koole³, M Krieguer¹⁰, D J van der Laan¹⁷, F Lamare¹⁸, G Larteron⁷, C Lartizien¹⁹, D Lazaro⁹, M C Maas¹⁷, L Maigne⁹, F Mayet²⁰, F Melot²⁰, C Merheb¹⁵, E Pennacchio⁷, J Perez²¹, U Pietrzyk²¹, F R Rannou¹¹,²², M Rey², D R Schaat¹⁷, C R Schmidtlein¹⁶, L Simon²,²², T Y Song¹², J-M Vieira², D Visvikis¹⁸, R Van de Walle³, E Wieërs¹⁰,²³ and C Morel²
GATE V6: a major enhancement of the GATE simulation platform enabling modelling of CT and radiotherapy

S Jan¹, D Benoit², E Becheva¹, T Carlier³, T Carlier³, ⁴, F Cassol⁵, P Descourt⁶, T Frisson⁷, L Grevillot⁷, L Guigues⁷, L Maigne⁸, C Morel⁵, Y Perrot⁸, N Rehfeld², D Sarrut⁷, D R Schaart⁹, S Stute², U Pietrzyk¹⁰, D Visvikis⁶, N Zahra⁷ and I Buvat²
Who is developing GATE?

The OpenGATE collaboration currently made of 19 laboratories:

- IMNC CNRS, Orsay, Irène Buvat (spokesperson)
- Service Hospitalier Frédéric Joliot, CEA-Orsay, Sébastien Jan (technical coordinator)
- U650 INSERM, LATIM, CHU Morvan, Brest, Dimitris Visvikis
- U892 INSERM, CHU Nantes, Manuel Bardiès
- LPC Clermont-Ferrand CNRS, Lydia Maigne
- CREATIS INSERM CNRS, Lyon, David Sarrut
- Centre de Physique des Particules de Marseille CNRS, Marseille, Christian Morel
- Institut Pluridisciplinaire Hubert Curien CNRS, Strasbourg, Ziad El Bitar
- Subatech CNRS, Nantes, Jean-Pierre Cussonneau
- NIM group, BIOSIM, National Technical University of Athens, George Loudos
- Forschungszentrum-Juelich (IME), Uwe Pietrzyk
- Delft University of Technology (IRI), Dennis Schaart
- Department of Atomic Physics, Sofia University, Sofia, Krasimir Mitev
- University of California, Los Angeles, Arion Chatziioannou
- University of Pennsylvania, Stephen Avery
- Walter Reed Army Medical Center, Yu Chen
- Memorial Sloan-Kettering Cancer Center, New York, Assen Kirov
- University of Santiago of Chile, Fernando Rannou
- Sungkyunkwan University School of Medicine, Seoul, Yong Choi
How is the collaboration organized?

- OpenGATE collaborators meet twice a year, and communicate via a gate-devel private mailing list

- OpenGATE collaboration organization:
  - A steering committee made of one GATE representative for each lab belonging to the collaboration
  - A GATE dedicated engineer since 2010 (Didier Benoit)
Role of the members of the collaboration

- To upgrade GATE so as to follow the Geant4 releases
- To add new functionalities in GATE
- To test new functionalities in GATE
- To answer users’ requests on the gate-user mailing lists
- To help organize training sessions
- To write and maintain the documentation
- To publish articles demonstrating the usefulness of GATE
- To obey the publication rules
Members of the OpenGATE collaboration have committed themselves to develop code to be publicly released and/or to validate code whenever needed and/or to help in the training sessions and/or to contribute to the documentation.

To enter the collaboration:

- A significant contribution should be initially brought and validated by the steering committee.
- The group should commit itself to provide an on-going contribution to the development and validation of GATE as approved by the steering committee.

How to enter the collaboration?
Unlike members of the collaboration, GATE users do not commit themselves to give anything back to the collaboration.

GATE users can use GATE for their own purpose, respecting the LGPL licensing conditions.

GATE users should always cite Jan et al 2004 and/or Jan et al 2011 in any paper using GATE.

We welcome code or contributions by GATE users:
- If they are willing to have it included in future GATE releases under the LGPL conditions
- If they are willing to make them available through the OpenGATE website

1200 gate-user subscribers
Funding

- French Research Agency:
  Contract number ANR 06-CIS-6-004 (2007-2009)
  Contract number ANR 09-COSINUS (2010-2012)

- French National Institute for Cancer (INCA)
  Imadron project (2011-2013)

- European Commission: FP Cooperation
  ENVISION project (2010-2014)

- CNRS IN2P3: GATE engineer (2010-2012)