Improvements in Interface, Intercoms and environments

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(KEK/CRC)

Outline

- Interface
  - ✓ implementation of soft-abort by Ctrl-C
- Intercoms
  - ✓ improvement of batch macro
- Environments
  - ✓ improvements in Python interface
  - ✓ emerging web application

Geant4 (User) Interface and Applications

Analysis Tools

AIDA Interface
- JAS3

ROOT
Python binding
- PAIDA
- ROOT-Python

GUI Tools

MOMO; Java-based tools
- for editing Geometry/Physics List
- interactive session (*GAG*)

OpenScientist; interactive environment

Pythonized Applications

-Dynamic configuration of user applications
- GUIs / web app.-s

Python as software component bus

User Applications (C++)

Batch

- macro script

Terminal Front End

- simple readline
- tcsh-like shell

GUI Front End

- Motif/Athena/Win32 widgets
- Java (*GAG*)

Interactive Session

Python Front End

>>> import Geant4

UI session
UI macro
UI command

Intercoms

Python Interface NEW

C++ classes are directly bridged.

Geant4

Soft-abort by Ctrl-C

- Implemented in the 9.0 release.
- During G4 running, Ctrl-C works as soft-abort.
  - ✓ call G4RunManager::AbortRun(true)
- In other cases, just quit the current session.
- Signal hander is implemented in G4UIterminal
  - ✓ `G4UIterminal::G4UIterminal(G4VUIshell* aShell, G4bool qsig=true)`
  - ✓ If you want to use your own signal handler, the second argument is set to be false.
- Care for ray-tracer will be included in the future release.

Improvement of batch macro

- G4UIbatch is completely revised in the 9.0.p01 release.
- Bug fixed for the treatment of the last line

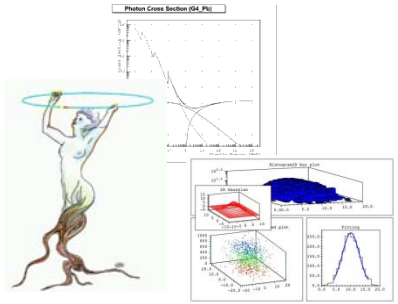
```
……
/run/beamOn 10000  EOF
```

  - ✓ Now, the last line is properly executed.
- New features
  - ✓ White spaces at the head of a line are allowed.
  - ✓ String after '#' is treated as comment
  - ✓ '#' at the head of a line echoes the line as before
  - ✓ Add support for continued line by '\' or '_'

A sample macro file

```
# echo this line if verbose level is 2

/control/echo “hallo”   # the comment is not echoed

# white spaces at the head is allowed
      /control/echo “something”

/contol/echo “hoge hoge hoge”  \  # continued line
                    “fuga fuga fuga”

#  \,_ in a token is properly treated.
/contol/echo “hoge_hoge_hoge”  _  # also continued line
                    “fuga fuga fuga”
```

Geant4 Python Interface



matplotlib

Analysis tools

GUI tools

tcl/tk

wxPython

- interactivity
- flexible application configuration

GeantPy

python™ Python Interface

•scripting environment
•Python software bus

plug-in modules

Python binding

Geant 4 C++ class library

geometry

primaries

physics process

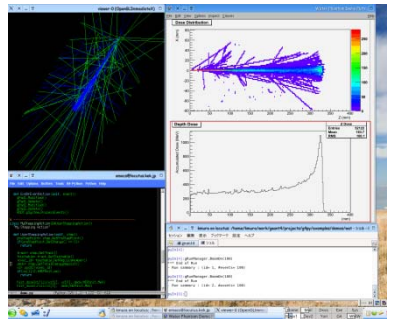
analysis

User codes

CherryPy web-ware

eGee Enabling Grids for E-sciencE Grid-ware

Service tools



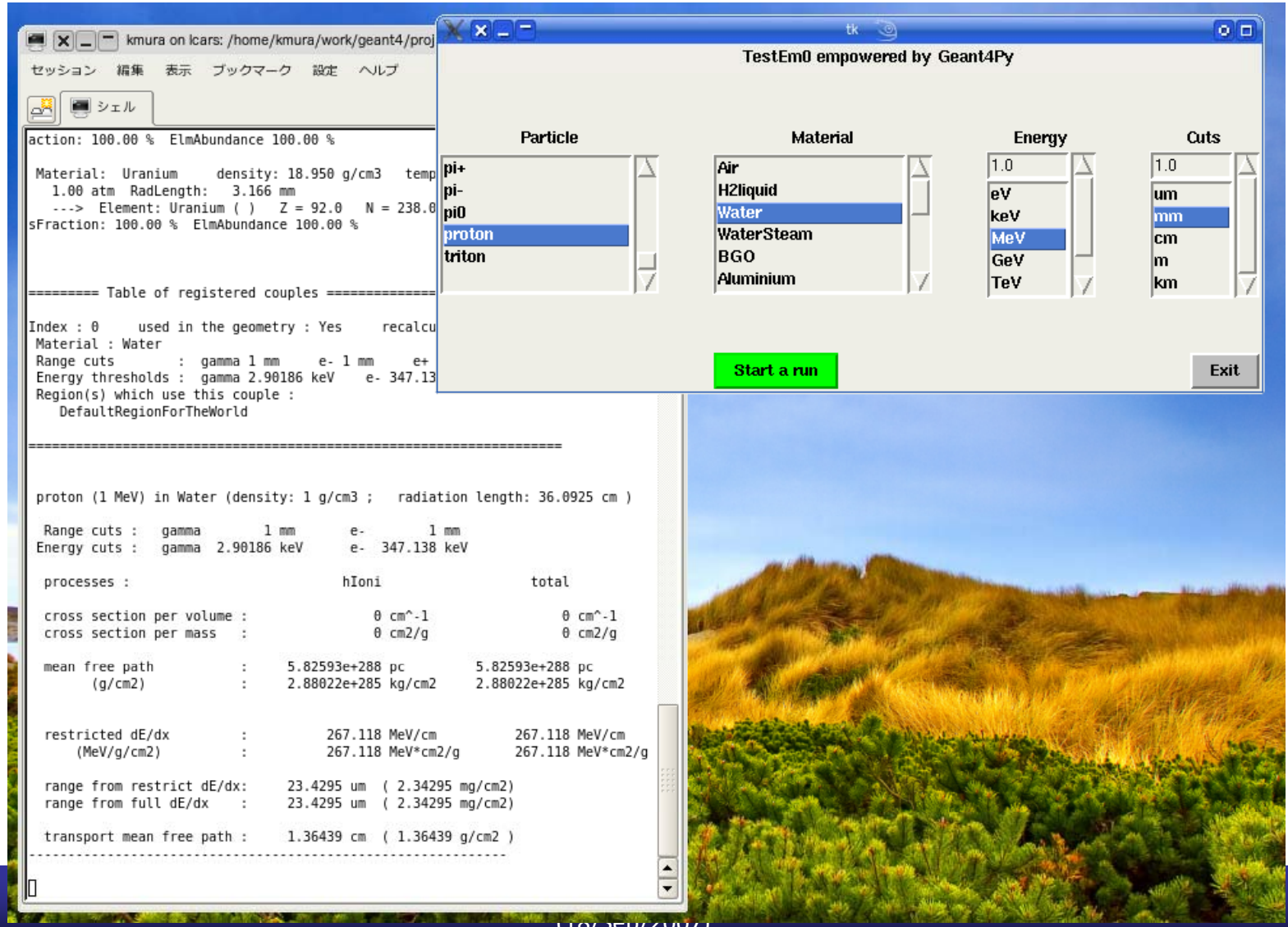
User applications

Improvements in Python interface

- Update exposed methods according to the changes in G4 classes at every release.
  - ✓ Updates of predefined physics lists are traced.
  - ✓ All (basic/specific) CSG solids and boolean solids are exposed. (examples in gtest05/06).
- G4Exception is mapped in Python exception handing.
- Soft-abort is implemented in the Python side
- A new example of TestEm0 is contributed by Jean

TestEm0 with Tcl/TK

- Jean created a new example based on TestEm0.



Geant4 on Web

- Geant4 Python Interface
  - ✓ flexibility to configure user applications
- Geant4 Education
  - ✓ Hajime kicked off the project.
  - ✓ several workshops, to collect user requirements.
  - ✓ some prototype examples
  - ✓ how to merge and distribute?
- Geant4 on Web
  - ✓ Web 2.0 (rich client on Web) is a new possibility of Geant4 interface.

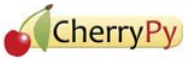
Possibilities of Geant4 on Web

- Geant4 Education, a course-ware on web
  - ✓ Not to teach Geant4 but use Geant4 to teach Physics
    - for HEP experiment, radiological physics and dosimetry,…
  - ✓ hyper document with textbook and hands-on work
- G4 examples on web with user manual
  - ✓ hyper experience with Geant4 for instant users
- Exploring inside Geant4
  - ✓ particle, material, cross section, etc.
- Geant4 simulation server
  - ✓ medical applications

Inside Geant4 on Web

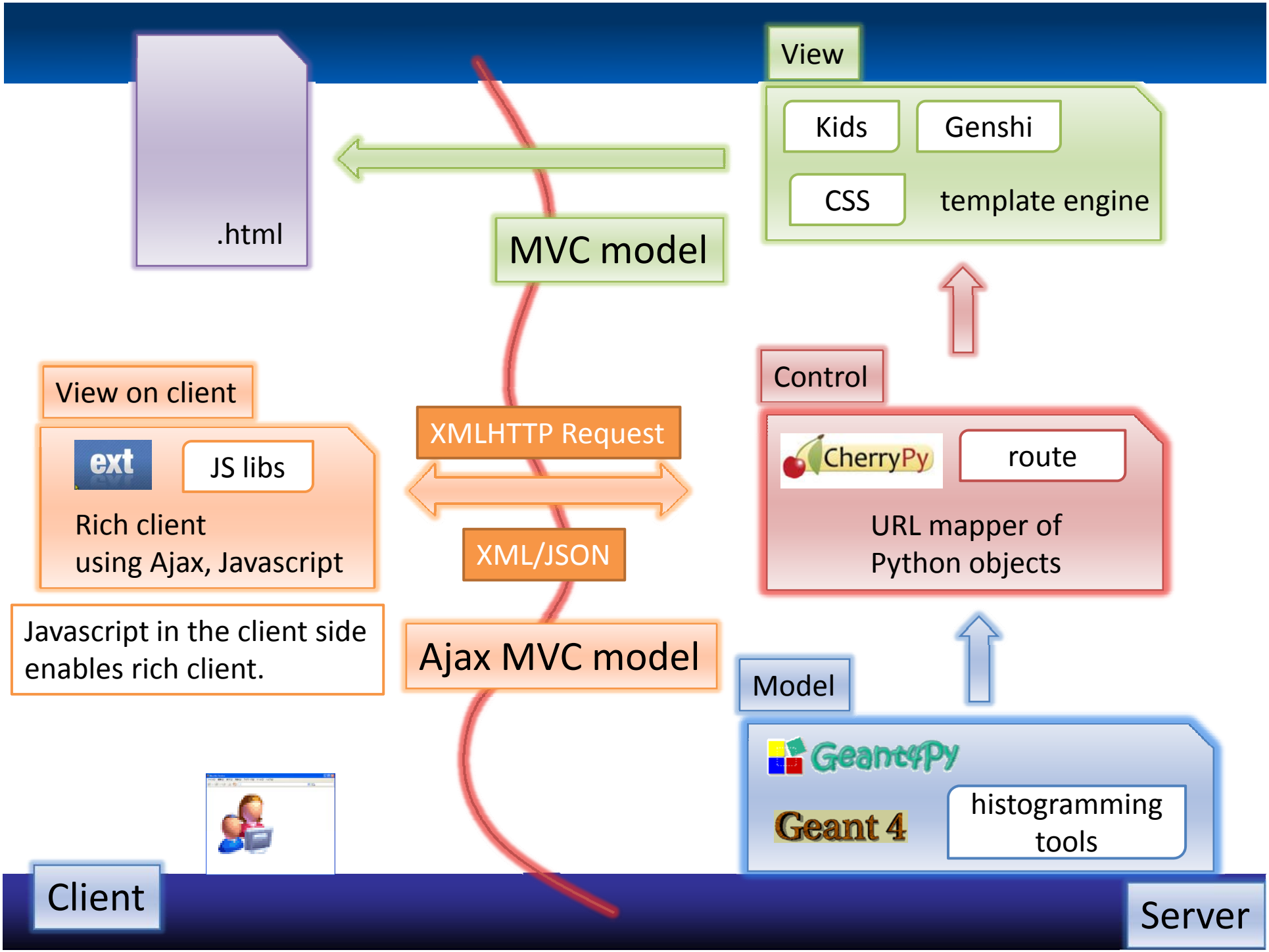
- Run Geant4 as web service
  - ✓ independent of client environment
  - ✓ Python web application framework 

    - TurboGears / Pylons
    - MVC (Model/View/Control) model
- MVC model 

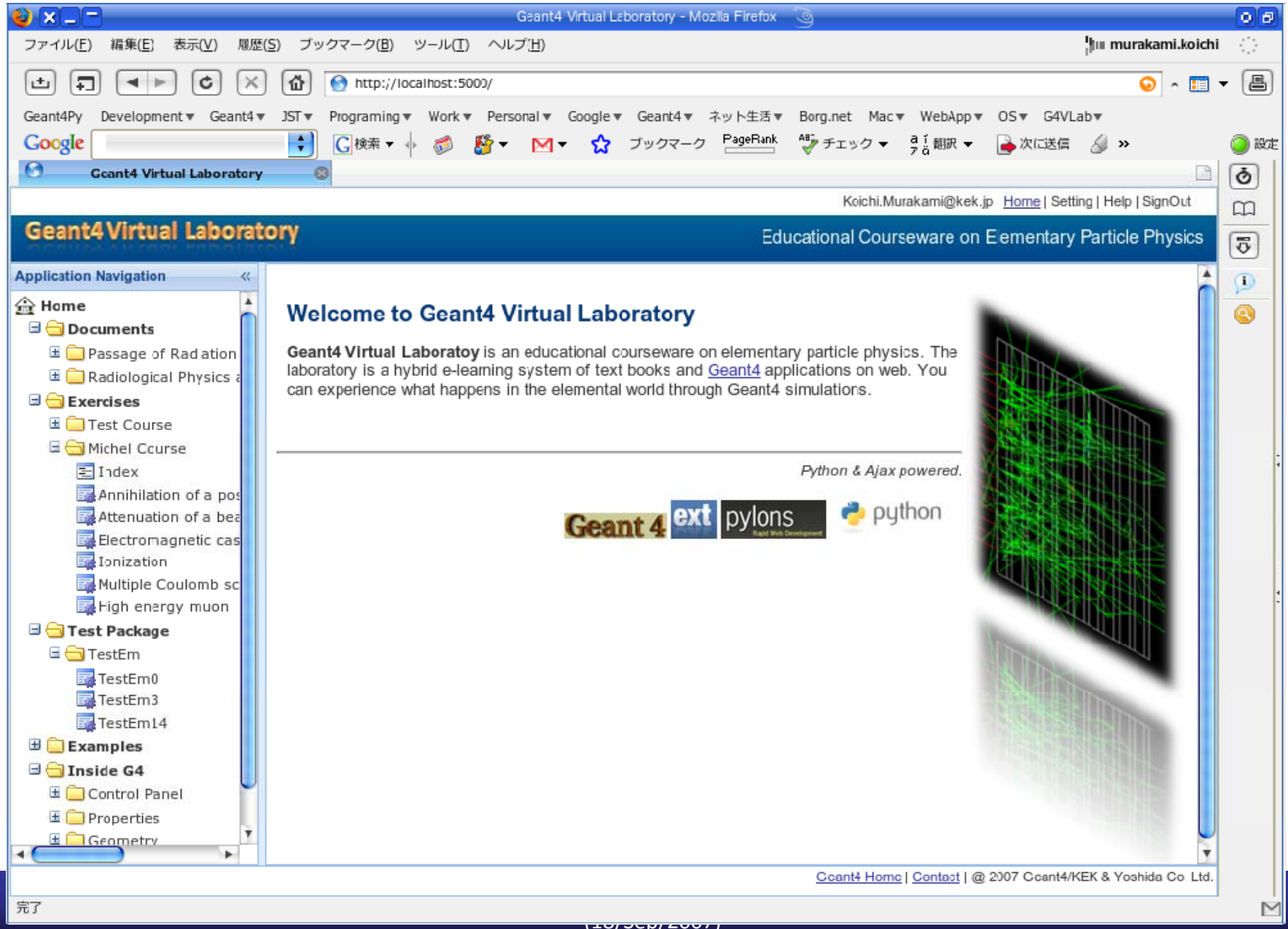
  - ✓ Model: Geant4 / Python-interface / document management
  - ✓ View: HTML template (Kids/Genshi/Mako) / XHTML+CSS
  - ✓ Control: URL mapping of Python functions
    - CherryPy, route 

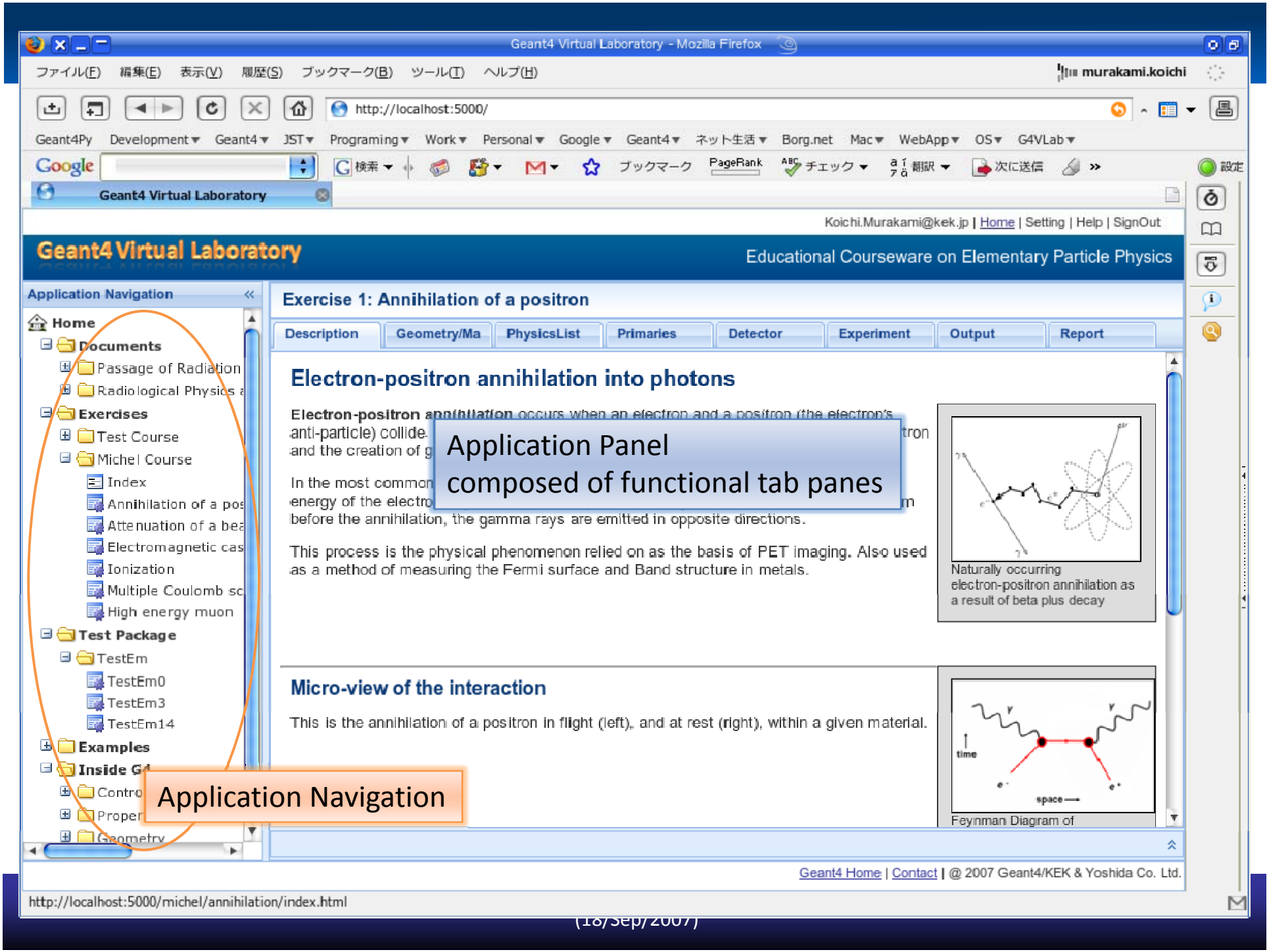
- Rich client
  - ✓ web application like google applications
  - ✓ Ajax (Javascript) powered
    - powered by Ext library 

- Multi-users access and scalability
  - ✓ Deployment of web servers


View
Kids
Genshi
CSS
template engine
.html
MVC model
Control
CherryPy
route
URL mapper of
Python objects
View on client
ext
JS libs
Rich client
using Ajax, Javascript
XMLHTTP Request
XML/JSON
Javascript in the client side
enables rich client.
Ajax MVC model
Model
GeantyPy
Geant 4
histogramming
tools
Client
Server

Geant4 Virtual Laboratory




Geant4 Virtual Laboratory - Mozilla Firefox
http://localhost:5000/
Geant4 Virtual Laboratory
Koichi.Murakami@kek.jp | Home | Setting | Help | SignOut
Geant4 Virtual Laboratory
Educational Courseware on Elementary Particle Physics
Application Navigation
Home
Documents
Passage of Radiation
Radiological Physics
Exercises
Test Course
Michel Course
Index
Annihilation of a pos
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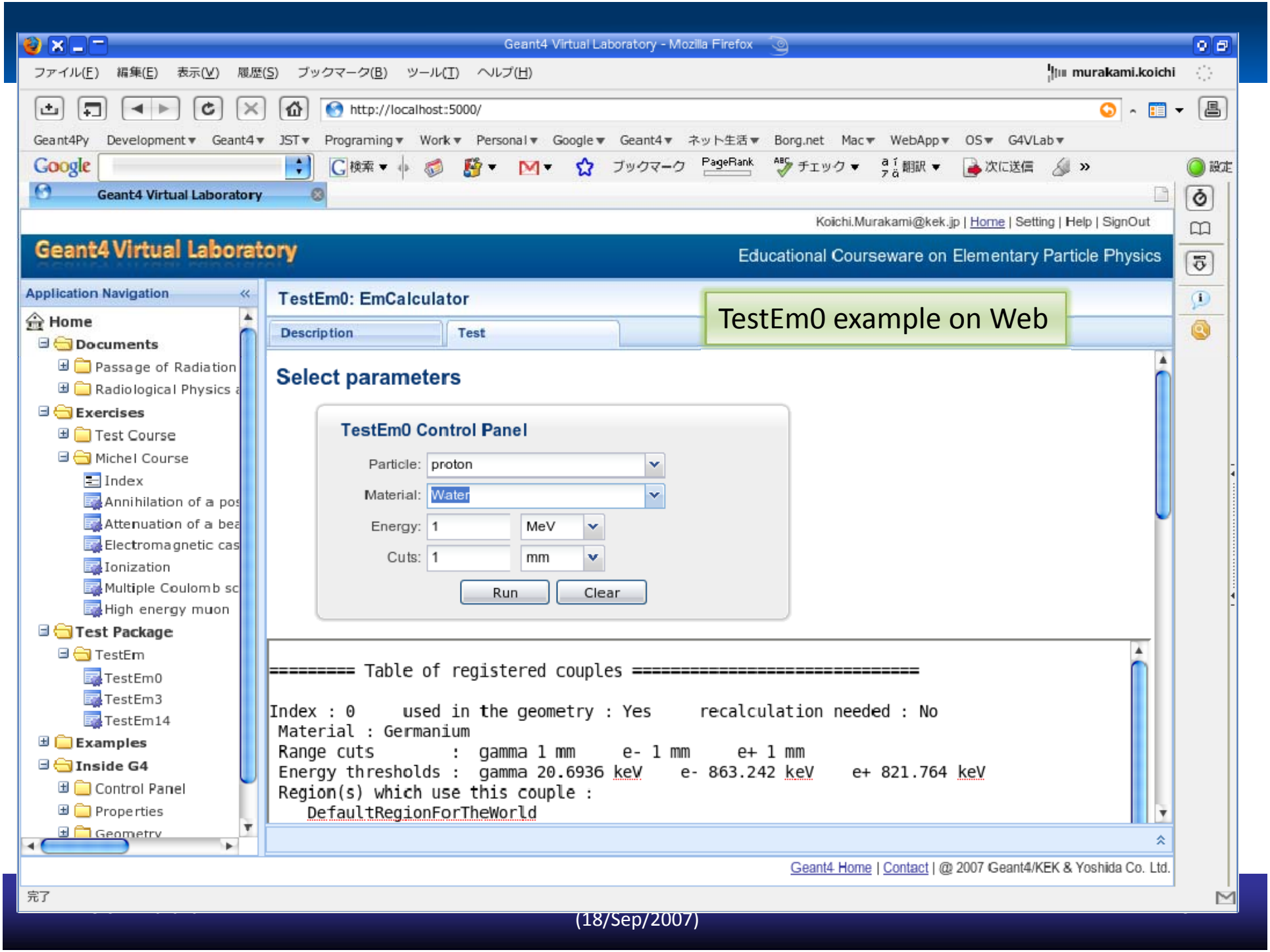
Electromagnetic cas
Ionization
Multiple Coulomb sc
High energy muon
Test Package
TestEm
TestEm0
TestEm3
TestEm14
Examples
Inside G4
Contro
Proper
Geometry
Application Navigation
Exercise 1: Annihilation of a positron
Description
Geometry/Ma
PhysicsList
Primaries
Detector
Experiment
Output
Report
Electron-positron annihilation into photons
Application Panel
composed of functional tab panes
Naturally occurring
electron-positron annihilation as
a result of beta plus decay
Micro-view of the interaction
This is the annihilation of a positron in flight (left), and at rest (right), within a given material.
time
space
Feynman Diagram of
Geant4 Home | Contact | @ 2007 Geant4/KEK & Yoshida Co. Ltd.
http://localhost:5000/michel/annihilation/index.html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High energy muon
Test Package
TestEm
TestEm0
TestEm3
TestEm14
Examples
Inside G4
Control Panel
Properties
Geometry
TestEm0: EmCalculator
Description
Test
TestEm0 example on Web
Select parameters
TestEm0 Control Panel
Particle: proton
Material: Water
Energy: 1 MeV
Cuts: 1 mm
Run
Clear
========= Table of registered couples ==========
Index : 0 used in the geometry : Yes recalculation needed : No
Material : Germanium
Range cuts : gamma 1 mm e- 1 mm e+ 1 mm
Energy thresholds : gamma 20.6936 keV e- 863.242 keV e+ 821.764 keV
Region(s) which use this couple :
DefaultRegionForTheWorld
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