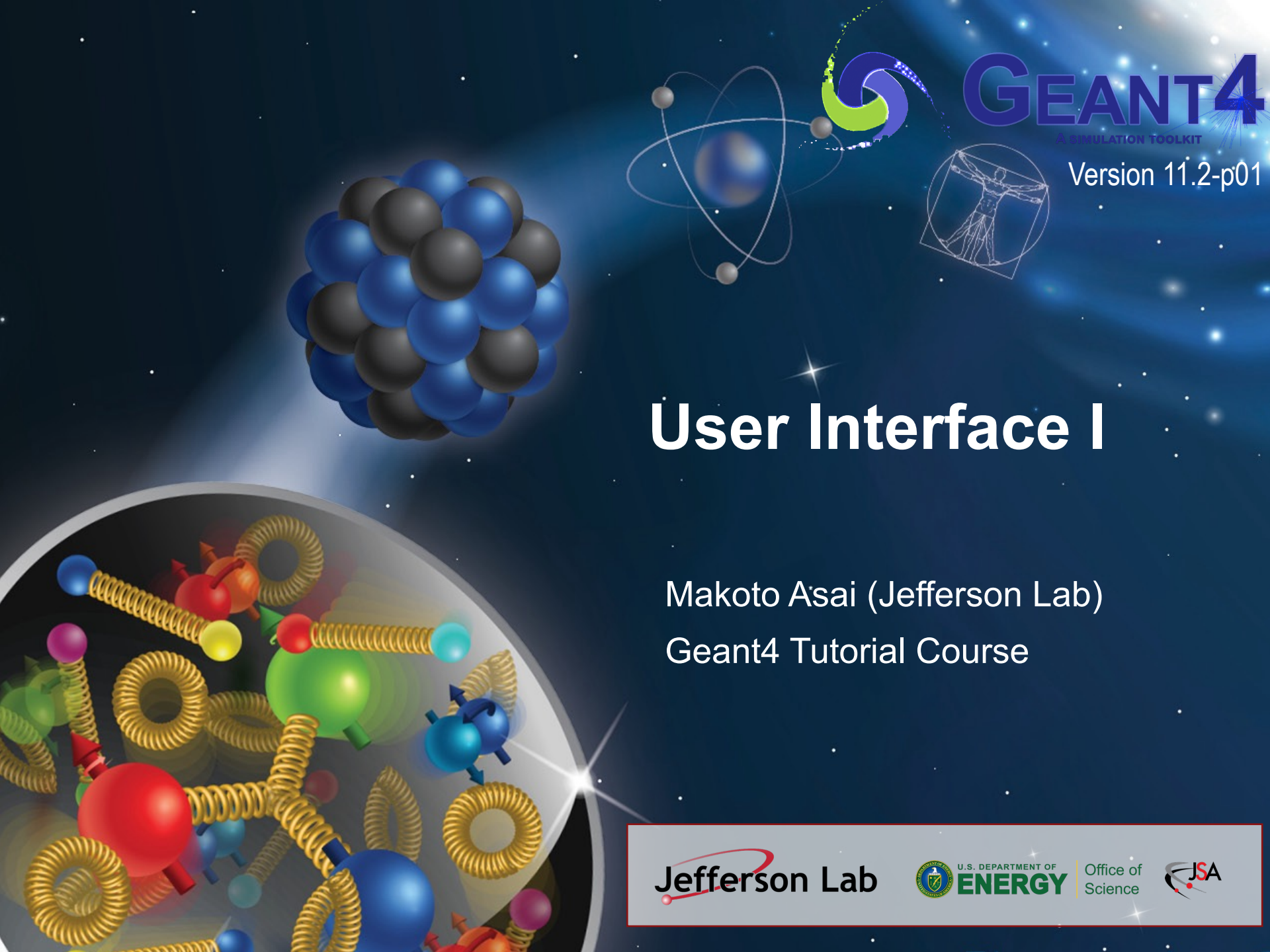

User Interface I

Makoto Asai (Jefferson Lab)

Geant4 Tutorial Course

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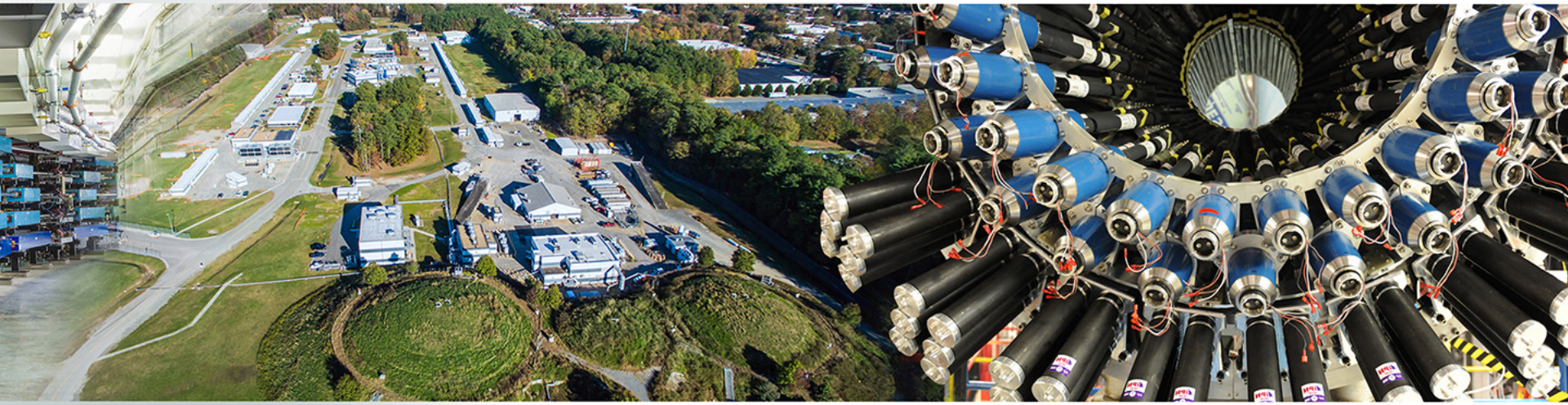

- Command syntax
- Macro file
- Some useful commands
- G4UIExective

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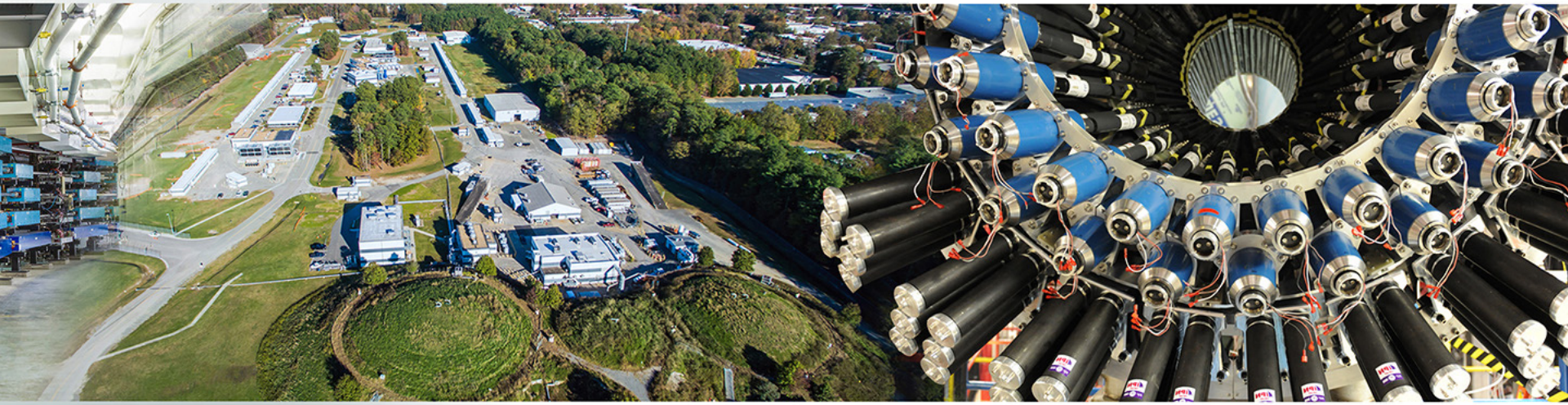

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Geant4 UI command

- A UI command consists of
  - Command directory
  - Command
  - Parameter(s)

```
/run/verbose 1
/vis/viewer/flush
```

- A parameter can be a type of string, boolean, integer or double.
  - Space is a delimiter.
  - Use double-quotes (“”) for string with space(s).
- A parameter may be “omittable”. If it is the case, a default value will be taken if you omit the parameter.
  - Default value is either predefined default value or current value according to its definition.
  - If you want to use the default value for your first parameter while you want to set your second parameter, use “!” as a place holder.

```
/dir/command ! second
```

Command submission

- Geant4 UI command can be issued by
  - (G)UI interactive command submission
  - Macro file
  - Hard-coded implementation
    - Slow but no need for the targeting class pointer
    - Should not be used inside an event loop

```
G4UImanager* UI = G4UImanager::GetUIpointer();
UI->ApplyCommand("/run/verbose 1");
```

- The availability of individual command, the ranges of parameters, the available candidates on individual command parameter may vary according to the implementation of your application and may even vary dynamically during the execution of your job.
- some commands are available only for limited Geant4 application state(s).
  - E.g. **`/run/beamOn`** is available only for *Idle* states.

Command refusal

- Command will be refused in case of
  - Wrong application state
  - Wrong type of parameter
  - Insufficient number of parameters
  - Parameter out of its range
    - For integer or double type parameter
  - Parameter out of its candidate list
    - For string type parameter
  - Command not found

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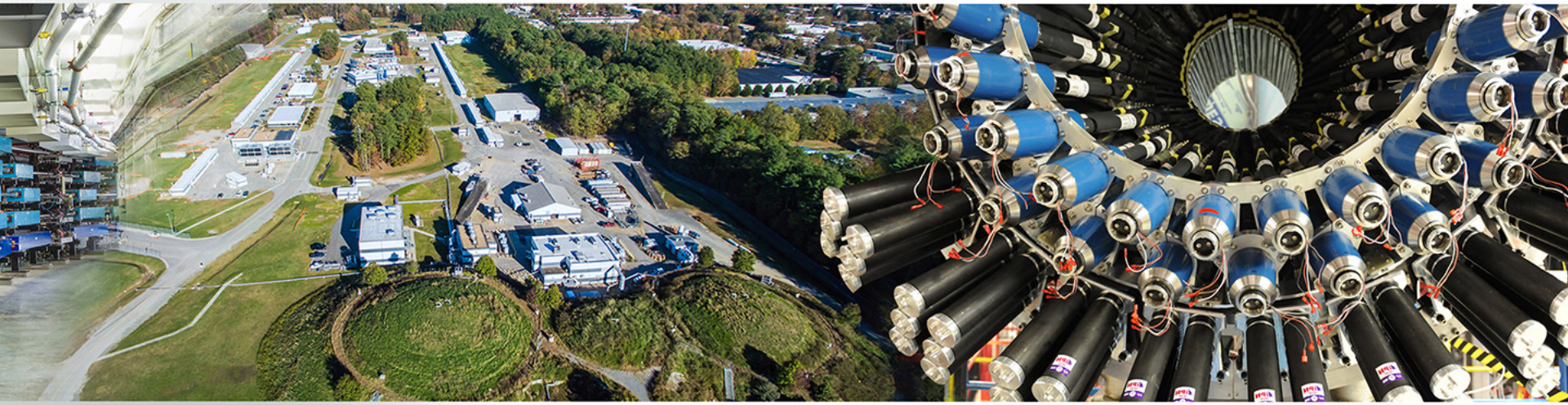

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Macro file

- Macro file is an ASCII file contains UI commands.
- All commands must be given with their full-path directories.
- Use "#" for comment line.
  - First "#" to the end of the line will be ignored.
  - Comment lines will be echoed if **`/control/verbose`** is set to 2.
- Macro file can be executed
  - interactively or in (other) macro file

    `/control/execute` ***`file_name`***
  - hard-coded

```
G4UImanager* UI = G4UImanager::GetUIpointer();
UI->ApplyCommand("/control/execute file_name");
```

Available Commands

- You can get a list of available commands including your custom ones by

  `/control/manual [directory]`

  – Plain text format to standard output

  `/control/createHTML [directory]`

  – HTML file(s) - one file per one (sub-)directory

- List of built-in commands is also available in section 7.1 of *User's Guide For Application Developers.*

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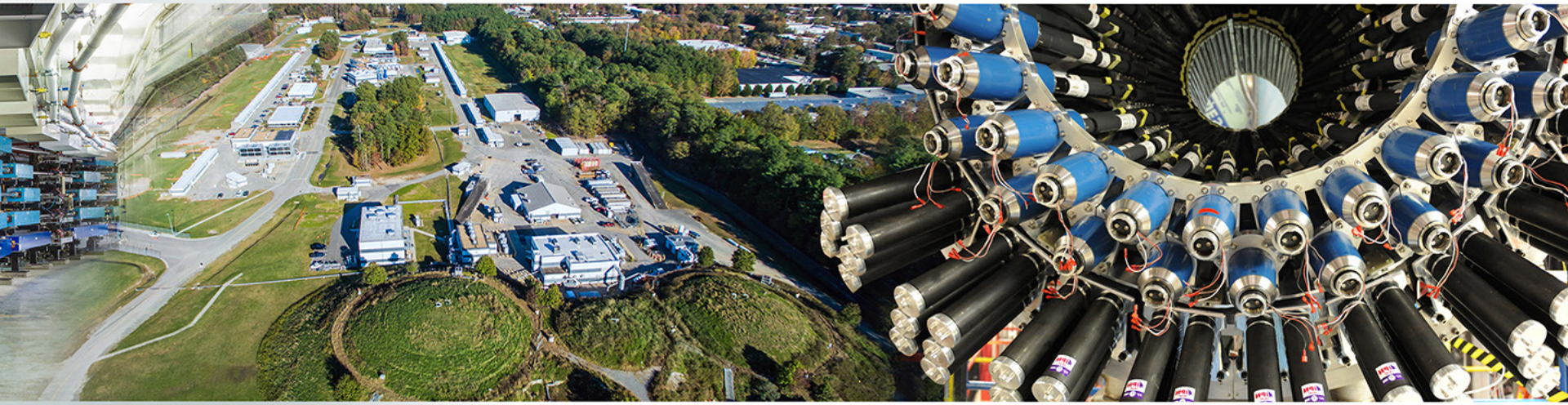

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Alias

- Alias can be defined by

  /control/alias [name] [value]

  – It is also set with **/control/loop** and **/control/foreach** commands

  – Aliased value is always treated as a string even if it contains numbers only.

- Alias is to be used with other UI command.

  – Use curly brackets, { and }.

  – For example, frequently used lengthy command can be shortened by aliasing.

```
/control/alias tv /tracking/verbose
{tv} 1
```

  – Aliases can be used recursively.

```
/control/alias file1 /diskA/dirX/fileXX.dat
/control/alias file2 /diskB/dirY/fileYY.dat
/control/alias run 1
/myCmd/getFile {file{run}}
```

Loop

- **/control/loop** and **/control/foreach** commands execute a macro file more than once. Aliased variable name can be used inside the macro file.
- **/control/loop [*macroFile*] [*counterName*]**
  [*initialValue*] [*finalValue*] [*stepSize*]
  - *counterName* is aliased to the number as a loop counter
- **/control/foreach [*macroFile*] [*counterName*] [*valueList*]**
  - *counterName* is aliased to a value in *valueList*
  - *valueList* must be enclosed by double quotes (" ")

- on UI terminal or other macro file

```
/control/loop myRun.mac Ekin 10. 20. 2.
```

- in myRun.mac

```
/control/foreach mySingleRun.mac pname "p pi- mu-"
```

- in mySingleRun.mac

```
/gun/particle {pname}
/gun/energy {Ekin} GeV
/run/beamOn 100
```

Some other useful UI commands

- `/control/shell <shell_command>`
  - Execute a Unix shell command (e.g. */control/shell ls*)
- `/control/getEnv <shell_variable_name>`
  - Get a shell variable value and define it as an alias.
- `/control/getVal <alias_name> <UI_command> <index>`
  - Get the current value of the UI command and define it as an alias.
  - <index> is the index of the parameter to take if the command has more than one parameters.
- `/control/add <alias_name> <val_1> <val_2>`
- `/control/subtract <alias_name> <val_1> <val_2>`
- `/control/multiply <alias_name> <val_1> <val_2>`
- `/control/divide <alias_name> <val_1> <val_2>`
- `/control/reminder <alias_name> <val_1> <val_2>`
  - *<val_1> and/or <val_2>* can be aliases.
  - If *<alias_name>* already exists, value is overwritten.

Some other useful UI commands

- /control/doif *<val_1> <comp> <val_2> <UI_command>*
- /control/if *<val_1> <comp> <val_2> <macro_file>*
  - Equivalent to /control/doif *<val_1> <comp> <val_2> /control/execute <macro_file>*

- /control/strdoif *<str_1> <comp> <str_2> <shell_command>*
- /control/strif *<str_1> <comp> <str_2> <macro_file>*
  - *E.g. /control/getVal particleName /gun/particle*
    /control/strif {particleName} == proton myProtonMacro.mac

- /control/doifBatch *<UI_command>*
- /control/ifBatch *<macro_file>*
- /control/doifInteractive *<UI_command>*
- /control/ifInteractive *<macro_file>*
  - *E.g. /control/ifInteractive vis.mac*

- /control/useDoublePrecision
  - Use double precision for printing out the current parameter value.

Terminal commands (not for GUI)

- Interactive terminal supports some Unix-like commands for directory.
  - **`cd`**, **`pwd`** - change and display current command directory
    - By setting the current command directory, you may omit (part of) directory string.
  - **`ls`** - list available UI commands and sub-directories
- It also supports some other commands.
  - **`history`** - show previous commands
  - **`!`***`historyID`* - re-issue previous command
  - arrow keys and tab (TC-shell only)
  - **`?`***`UIcommand`* - show current parameter values of the command
  - **`help`** `[`*`UIcommand`*`]` - help
  - **`exit`** - job termination
- Above commands are interpreted in the interactive terminal and are not passed to Geant4 kernel. You cannot use them in a macro file.

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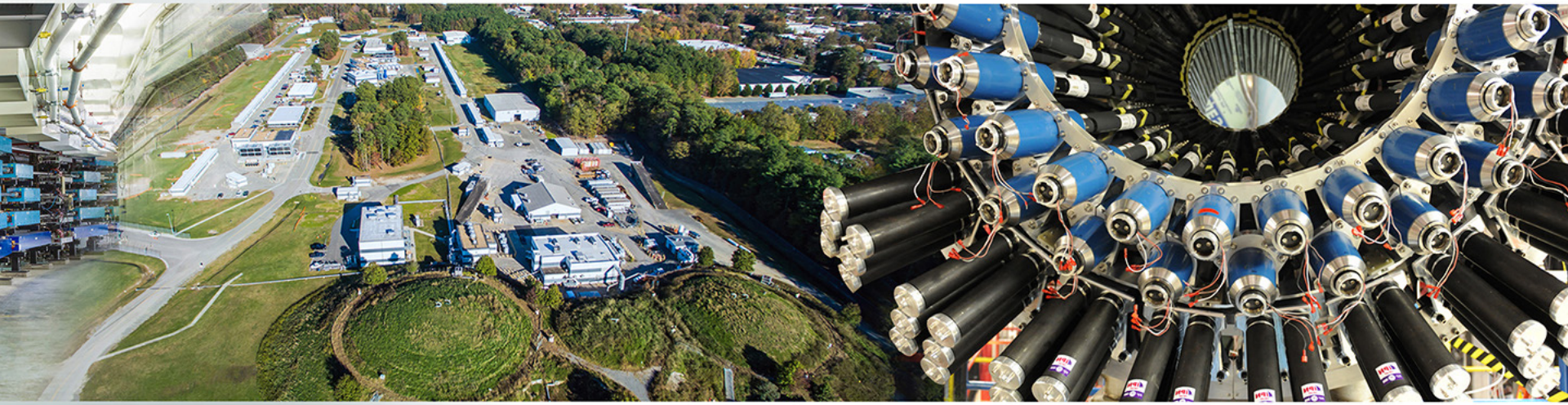

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Batch mode / interactive mode

- In your *main()*

```
int main(int argc, char** argv)
{
      …
  if (argc != 1)
   { // batch mode
     G4String command = "/control/execute ";
     G4String fileName = argv[1];
     UImanager->ApplyCommand(command+fileName);
   }
  else
   {  // interactive mode : define UI session
     G4UIExecutive* ui = new G4UIExecutive(argc, argv);
     ui->SessionStart();
     delete ui;
   }
```