



**GEANT4**  
A SIMULATION TOOLKIT



# Updates on B & E Examples

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# Outline

- New extended examples since the last CM
- Ongoing Common Tasks
- 2024 Work Plan

# New Extended Examples in 11.2

- [medical/radiobiology](#) - Pablo Cirrone
  - Radiobiology is an application realized for dosimetric and radiobiological applications of proton and ion beams.
  - Specific tools were built to evaluate primaries and secondary energy spectra and a set of classes, dedicated to the computation of biological quantities, such as LET (Linear Energy Transfer), RBE (Relative Biological Effectiveness), Survival Fraction, and physical (as dose and fluence), were implemented
- [medical/dna/dnadamage2](#) - J. Naoki D. Kondo, J. Ramos-Mendez, B. Faddegon
  - Scoring of plasmid DNA strand breaks using the IRT method.
  - It extends the chem6 example by adding DNA molecule information and the scoring of Strand Breaks.
- [medical/dna/UHDR](#) (ultra-high dose rate) - Hoang Tran
  - How to activate the mesoscopic model in chemistry and combine with SBS mode.
  - It allows to simulate chemical reactions long time (beyond 1 us) of post-irradiation.

# New Extended Examples in 11.3




- [exoticphysics/channeling/ch1,ch2](#) – Alexei Sytov
  - Introduced new sub-category channeling and the original channeling example was renamed in ch0
    - It demonstrates simulation of channeling in bent crystals using G4Channeling process
  - Two new examples added: ch1, ch2
    - Demonstrate simulation of the physics of channeling and channeling radiation/coherent bremsstrahlung using the G4ChannelingFastSimModel and the G4BaierKatkov models
  - More details will be given in Alexei's presentation

# Common Ongoing Tasks

- Coding Guidelines

- **Version 2.1** (available from the Geant4 web site) – last update in 2021
- Scripts for checking selected rules, `check_example.sh`, developed last year, was integrated by **Ben Morgan** in CI
  - Run in nightlies as Experimental build

Experimental 1 build [view timeline]

Site	Build Name	Configure		Build		Test			Start Time ▼
		Error	Warn	Error	Warn	Not Run	Fail ▼	Pass	
g4- alma9	 x86_64-alma9-gcc131-MTmax- TestExampleGuidelines-FPE-CXX20  	0	0	0	0	0	2 <sup>+1</sup>	633 <sup>+2</sup> <sub>-1</sub>	15 hours ago

- Two tests: one checking all basic examples and one checking all extended ones
- The test for extended examples is still failing as not all examples are fixed yet
- The **GitLab issue !183**, created last year, with the list of examples “violators” was updated
  - A number of examples have been fixed, thank to all for collaboration

# Coding Guidelines Update ?

- *“Initialize class data members using default member initializer in the class definition (.hh). Both initialization with braces or assignment are possible. This prevents from use of uninitialized values.”*
- How to apply units ?
  - Include of G4SystemOfUnits.hh should be avoided in .hh, as it defines using namespace CLHEP, polluting global space
- Currently two approaches are taken
  - Use the include from CLHEP and the units with the CLHEP scope
  - Or avoid units in headers altogether

```
                                .hh
#include <CLHEP/Units/SystemOfUnits.h>

class DetectorConstruction
: public G4VUserDetectorConstruction
{
private:
    G4double fArmAngle = 30.*CLHEP::deg;
};
```

```
class DetectorConstruction                                .hh
: public G4VUserDetectorConstruction
{
private:
    G4double fArmAngle = 0;
};
```

```
#include "G4SystemOfUnits.hh"                            .CC

DetectorConstruction::DetectorConstruction()
{
    fArmAngle = 30.*deg;
};
```

*Should we make the guideline more explicit ?*

# Coding Guidelines Update ?

- A number of examples provide **ROOT** or **python macros** for analysis, that are not tested and not documented
  - Should we extend the documentation guideline (*“All macros provided with the example should be documented in README.”*) to these ?
  - Should we add these macros in CI ?

# Work Plan 2024 - 1

- **New examples:**
  - **Biasing:**
    - Demonstration of generic biasing functionalities (DXTRAN, charged particle biasing, at rest biasing) if implementation of functionalities is achieved
  - **Parameterisation:**
    - **gflash** example for sampling calorimeter (all existing examples show usage in homogeneous media) finalization
  - **RunAndEvent:**
    - example for **sub-event parallelism**
    - examples for **probe scorer**



# Work Plan 2024 - 2

- **Existing examples improvements:**
  - **Biasing category:**
    - Merging/deprecation of the example duplication with generic biasing use case.
  - **Parameterisation:**
    - Modernization of the extended parameterisation examples
  - **Medical/dna:**
    - icsd, dnadamage, clustering: updates and improvements example
    - molecularDNA:
      - Development and validation with protons and He4 ions
      - Extension of the example
      - Independent validation of the application and optimization

# Work Plan 2024 - 3

- **Common tasks:**
  - clang-tidy checks on selected extended examples categories:
    - biasing
  - Coding guidelines:
    - Review the status and open a GitLab issue with the violations
  - Existing examples maintenance