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*Physics lists for LCG and the LHC  
experiments – ongoing work*

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# *The plan*

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- Separate LHC related simulation engines from the hadronic physics lists onto a separate area.
- Update simulation engines for the LHC experiments and LCG.
- Provide documentation for these simulation engines along the lines of the current 'calorimetry' area, adding back-links to the physics reference manual for the individual models.

## *Constraints:*

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- Use common simulation engines between use-cases wherever reasonable.
- Provide (at least) two alternatives for each case.
- All on one page – i.e. no division for calorimetry, tracking, etc into separate pages.

# *The cases considered*

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- LCG validation project:
  - LCG detector simulation engine (latest, greatest)
  - Tracker 'interaction trigger'
  - Nucleon penetration
  - Others?
  - Merge the lessons back into the LCG engine
- Detector design and physics studies
  - Calorimeter test-beam
  - Tracker test-beam
  - Full detector simulation (fully robust)
  - Others?

# *The use-cases*

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- Radiation studies:
  - Neutron fluence calculations ?
  - Deep penetration studies ?
  - Others?

# *Changes in the lay-out and contents*

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- No medical/space/etc.. stuff
- The entry page contains the complete menu, including the links to the code.
- Add description pertaining to performance considerations.
- Expanded textual description as to what changes when moving from one engine to the other.
- A '\*' for the engines that reproduce data best.
- Added cross-link to the physics reference manual, and papers pertaining to the models used.
- A link to verification plots for the relevant hadronic models in the simulation engines
- A description of current work on optimizing physics lists?

# *Changes in the physics lists in the next iteration*

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- Improvements from the last release:
  - Will incorporate cascade codes at low energies for most cases.
  - Will include an improved transition from pre-compound to binary cascade.
  - Will ensure the environment for data needed is set.

# *Changes in the physics lists in the next iteration*

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## ■ Usability:

- Most LHC experiments need a physics list to inherit from 'their' class, so the physics lists will be templated with the class to inherit from.
- Will be backwards compatible using a 'typedef' of the template instantiation with G4VModularPhysicsList.
- Will allow for steering the cut default from outside.
- Will allow tailoring (UI command) for synchrotron radiation, gamma nuclear, etc..
- Will come with makefiles allowing for easy installation.
- Will come with a 'users guide'.



## *Future work:*

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- Enable switching physics lists at runtime, through UI commands?
- Have self-generating physics lists?
- Have physics lists per sub-detector?
  
- For your to answer.

# *Conclusions:*

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- This is work in progress...