Status of the beam-beam simulation code guinea-pig++

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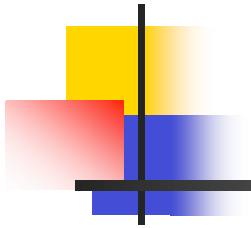
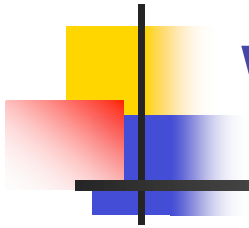
LAL, ORSAY



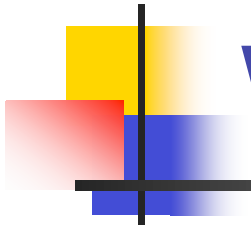
overview

- Recall of what is guinea-pig++ ?
- New features
- Next developments



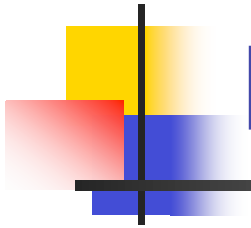
What is guinea-pig++ ?

- An object oriented version (C++) of the beam-beam simulation code guinea-pig written by Daniel Schulte (1996)
- More safety and modularity
- Easy evolution to add new features and functionnalities
- Use Standard Template Library : strings, containers (vectors, lists…)



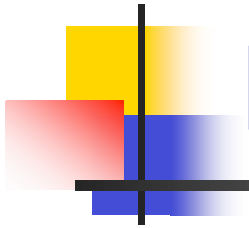
What is guinea-pig++ ?

- C-structures become C++ classes
- Original algorithms are kept
- Ready for specific developments for future ILC simulations : new classes, new algorithms
- Project designed by G. Le Meur at LAL-Orsay
  - https://trac.lal.in2p3.fr/GuineaPig



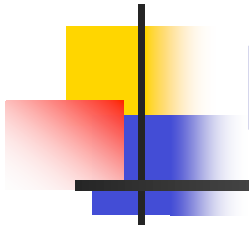
New features

- beam-beam effects on bhabhas
- all keywords of guinea-pig are now available:
  - hadrons (do_hadrons)
  - minijets (do_jets)
  - pairs (do_pairs) …
- abstract I/O interface :
  - separate algorithms and I/O
  - plugging different format (ascii)
  - plugging graphical interface



New features

- fast Fourier transform : FFTW library
  - version 2.5.1 or 3.1.2
- random number generation :
  - choose a specified rndm seed
  - algorithms for 32-bits and 64-bits computers
  - random generator checked before computing
- use on the computing Grid to increase performance for high statistic simulations :
  - http://flc.web.lal.in2p3.fr/mdi/BBSIM/bbsim.html

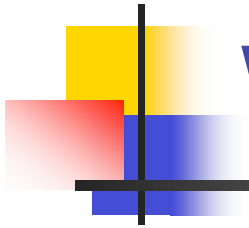


Next developments

- Automatic choice of the grid dimensions and number of cells
- Depolarization effects
- Complete the I/O abstract interface for implement other formats than ASCII (HDF5?)
- Work on feasibility of parallelization

Why parallel computing ?

- How does guinea-pig work?
  - bunches are cut into slices which are moved longitudinaly and interact when they are in the same transverse plan



Why parallel computing ?

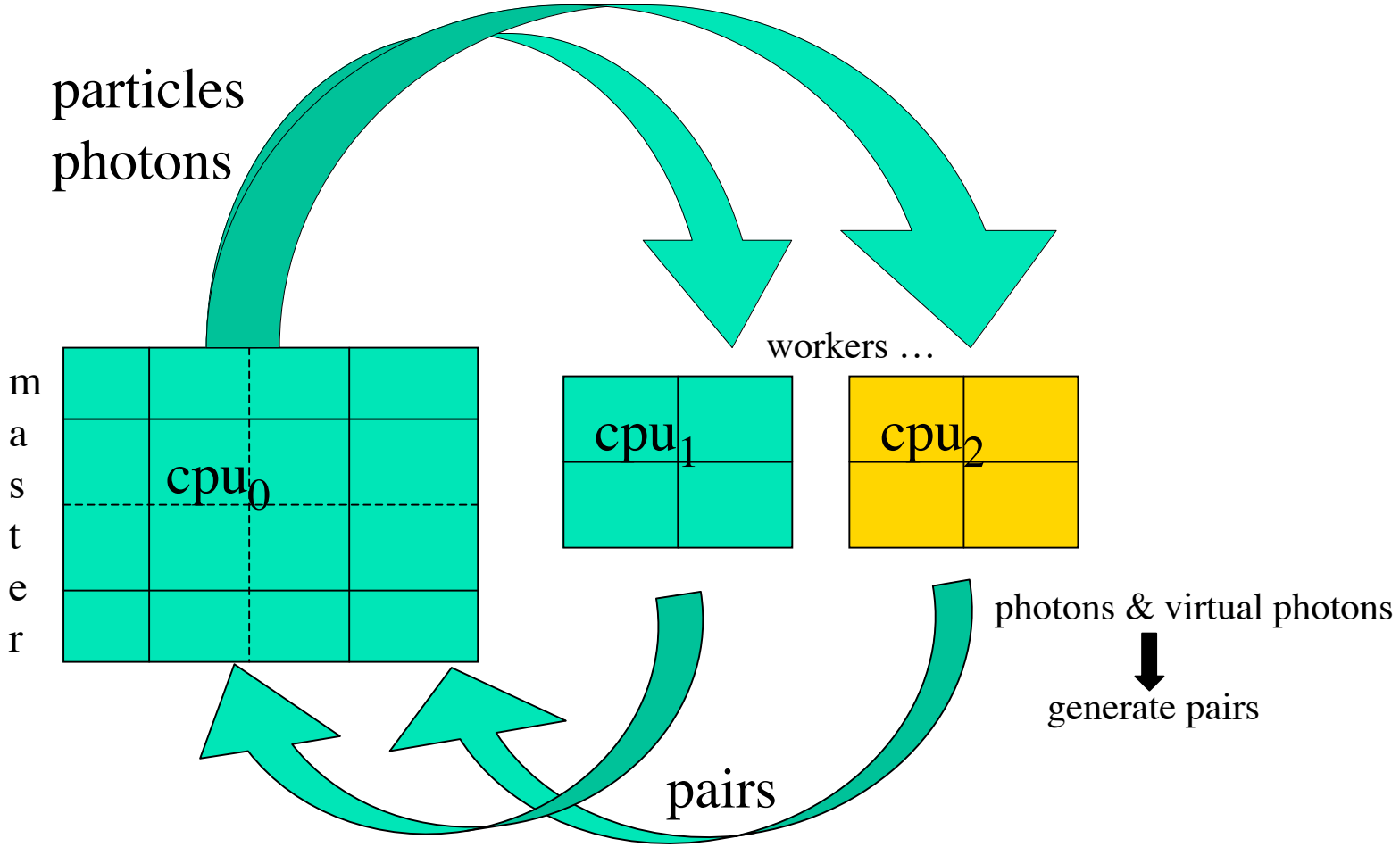
- for each slice-slice interaction
  - particles are distributed on the grid
  - integration of the field equation
  - particles are moved and photons are generated
  - e-e+ interaction: luminosity, …
  - if asked
    - photons are distributed and moved on the grid
    - if asked, pairs are generated and moved

Why parallel computing ?

- computation time

n_x=n_y=n_z= 32

	nm= 10,000	nm= 100,000
distribute particles	11.7%	2.3%
fftw	15%	0.5%
distribute photons	6.7%	15%
generate pairs	40%	80%
tracking pairs	22%	0.5%


particles
photons
workers …
master
cpu0
cpu1
cpu2
photons & virtual photons
generate pairs
pairs