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Present: Generator group+ F. Gaede, T. Calancha, D. Jeans +
         W. Kilian and J. Reuter from the Whizard's.
         (Generator group = MB and J. Tian (ILD gen. group conveners), A. Miyamto,
         P. Roloff (CLICdp),T. Barklow (SiD))

(The non-generator part of the meeting is *not* included !!!!)

NB: here is a list of things where my notes were a bit to terse. Please add details as
needed (search for "[" to find them in the text!):

 -  Pt-kick of e+- emitting a WW-photon [was this an issue or a feature request?]
 -  Possibility to set Higgs BRs externally [What was the issue here??? My note was a bit terse]
 - Gluon Matching strategies. How well does the existing mlm scheme work? Get advice/opinions
     from M. Vos. [What else did we say on this topic??]
 - Questions about some of the generator status


Also, please check is I completely missed something!

Topics:

  1. Whizard validation and feature requests
  2. LCIO MCParticle info, Event header, Run header.
  3. Other generators
  4. Production schemes
  5. Metadata and run conditions/logs
  6. List of actions with names if known.
  7. Organisational

1. Whizard validation and feature requests

  List of issues - getting shorter

    - Difference in particle multiplicities in 4-quark events.
      -> Noted that the way Pythia is called is different between DBD and W2.4
         In DBD: Uses py4frm, with "trivial" probabilities for colour singlet choice,
         i.e. the probability is set to 1 for the combination for the colour-connected
         pairs from Whizard, 0 for others.
         In Whizard2.4: Uses pyexec, where the actual filling of /PYJETS/ is done with the
         LesHouces event, which contains the same event-by-event colour connections between
         the pairs.
         => Given this, why is it different?
         Action plan: W.K. to check if the observations from A.M. can be reproduced.
         If so (and no other difference of the implementations identified): Contact
         Pythia6 authors for advice (probably means SjÃ¶strand).
    - Strange behaviour of m_qq with ISR reported by M.B. is due to the cuts being applied
      to the ISR photons. No fundamental problem in ISR treatment. However, on the other hand,
      the expected cut at m_qq at 10 GeV does not seem to work.
        Action plan: Re-visit the question about the E_gamma spectrum, in particular the
        position of the radiative return peak (M.B.)
        Whizard authors: Please check the syntax of the cuts in circulated sindarin
        file: It does not seem to do the same as the default cuts in W1.95.

    - Polarised tau-decays with tauola does not take the full correlations into account.
      Not a problem for validation, since it is done in the same way in the DBD. A better
      internal treatment is in the works, but not for now (ie. for a new production
      within 6 months).
      Action plan: Re-validate wrt. DBD for ee->tauatu and ee->staustau->tautau N_1N_1.
      Was OK in 2.2.x, so probably still is. Check by M.B.

    - Some issues in current implementation of LCIO output, see below.

    - Pt-kick of e+- emitting a WW-photon [was this an issue or a feature request?]

  Feature requests:

   - Things that are already there, but needs checking and documentation:
     - Callable interface, Ie. schematically
       (call whizard_ini)

       Do ievt = 1 , nevt
         Call whizard_event(gen_event)
         Call FastSim(gen_event,rec_event)
         Call WriteoutLCIO(rec_event)
       Enddo

     - Command-line steering, ie. something like
          whizard --execute "simulate ( z_h0dq ){ ?polarized_events = true }" default.sin
       All is executed *before* the default.sin script. Might be a problem?

   - Preservation of the full input and output of a job for future reference, basically provide
     a script to clean up the run-directory of irrelevant temporary files, so that a tar-ball of the
     directory would contain all relevant settings and results.

   - Method to include a user ''event-transformation'' and a flat M.E. for
      gammagamma -> low P_perp hadrons.

   - User setting of run-number and starting offset of event counter.

   - Possibility to set Higgs BRs externally [What was the issue here??? My note was a bit terse]
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Other Whizard topics

 − Bug−tracker. Which of systems that are out there would be best ?

 − Gluon Matching strategies. How well does the existing mlm scheme work? Get advice/opinions
   from M. Vos. [What else did we say on this topic??]

 − Make sure that Whizard is quoted in any analysis using DBD−samples !


2. LCIO MCParticle info, Event header, Run header (= Frank's mail)

  General things:

  − event numbers in LCIO should be 64 bit !
  − testing the LCIO output from Whizard
      − can we define some test cases or unit tests ?
      − should first start with some manual checks by Whizard authors as
        well as LC generator working group

  (other things from my notes)


  Run header:

   − write complete sindarin steering file into the LCIO RunHeader
      − not strictly needed for mass production: Should be saved in a well−defined
        place one the SE and GitHub, anyway.
      − would be useful for individual user files


   Collection parameters.


   − full spin density matrix ( for spin 1/2 ) :
       − 2**n x 2**n matrix for n particles
       − should be stored as collection parameters with MCParticle =
         collection, e.g.
       − SpinDensityParticleIndices   − IntVec
       − SpinDensityMatrix − FloatVec
       example code:
         LCCollectionVec* col = new LCCollectionVec( LCIO::MCPARTICLE )  ;

         IntVec particleIndices  ;
         particleIndices.push_back( 3  ) ;
         particleIndices.push_back( 7 ) ;

         FloatVec sMat ;
         sMat.resize( 16 ) ;
         sMat[0] = 1. ;
         sMat[1] = 0. ;
         // ...
         sMat[15] = −1. ;
         col−>parameters().setValues("SpinDensityParticleIndices",particleIndices );
         col−>parameters().setValues("SpinDensityMatrix", sMat  );


   Event header:

   − meta data to be put into the LCEvent header as key−value pairs :

       − Energy :                  <float>      nominal centre of mass energy [GeV]
       − BeamSpectrum:     <string>    name of file w/ beam spectrum.
           Need well−chosen name!
       − ProcessID:              <int>        user provided run ID
           (−> needs to be added to the Sindarin file )
       − processName:        <string>   user provided name for the run
       − crossSection:         <float>     averaged cross section of this Whizard run −
          unit:  [fb]. This should be the total cross−section of the ensemble of processes
          implied by the processID, NOT the cross−section of the process selected
          in this particular event!
       − crossSectionError: <float>     [fb]
       − beamPDG0:           <int>        pdg code of first incoming beam particle
       − beamPDG1:           <int>        pdg code of first incoming beam particle
       − Pol0:                      <float>     polarisation of beam 0  [−1.,1.]
       − Pol1:                      <float>     polarisation of beam 1  =[−1.,1.]

     This info is actually the same in each event in the run, but in view of the possibility
     that runs might be mixed/merged later in analysis, it is better to keep it with each event.

     It was also noted that this information is enough to disentangle the gammagamma and
     gamma e cases: The process−name starts with aa_ or ae_ ea_, and the beam−particle
     should be set to pdg=+−11 if the photon is virtual (EPA), or to pdg=22 if it is
     a beam−photon.

   − use ProcessID as run number in every event ( and in run header )
      ( evt−>setRunNumber( rn ) ; )

   − Set the event number
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   − simple counter − optionally with offset
      => need to be able to specify an offset to the event number counter in the Sindarin file  !

  MCParticle:

   − Issues in current implementation:

     − simulator status should be zero by generator.
     − spin vector definition: Should be particle helicity, ie.
       (0.,0.,+−1)


   − Extended generator codes:

       − 1 for stable particles
            − stable here means: particle is not decayed by the generator
              (S0 that summing up particle energies of all genstat=1
               particles is total energy )
       − 2 particle decayed in generator. [What did we say about the particles
         in the P.S. ?]
       − 3 documentation line : [?]
       − 4 incoming (beam) particles
       − 5 outgoing particles from hard process, ie. from whizard
          − in case of a stable particle was generated in the hard process
            this particle should be entered twice, first with genstat 5, then
            with genstat 1 (and with correct parent−daughter pointers)
          − ISR photons should be copied, first time with code ?, second
            time with code 1 [Not sure what we said for the first occurrence?
            4,5 or separate code.]


3. Other generators

   The main reason to produce a part of DBD (8f) with an other generator (Physim) was
   that it was in practice impossible to do this with Whizard1. In whizard2 "minimum
   bias" 8f *should* be possible (to be checked). If confirmed, there is no a priori
   need for any other generator.

   This said, in general it would be nice to also have other generators, but currently not much push for it.
    − BHWide for better Bhabhas. Ongoing work in CLICdp to make a modern version − to follow
      by the generator group.
    − BDK/BDKRC for $\gamma\gamma \rightarrow \ell\ell$
    − Pythia8, MadGraph, Sherpa, ... for double−checks and systematics
    − Pythia8 instead of Pythia6 for hadronisation.
       − Currently not a feature request: Generator group first need to
         see how well P8 reproduces LEP data, then decide how to proceed.

   Problem: How to get output into LCIO?
     − ‘‘Output’’ often HepMC or LesHouches (or stdhep/hepevt/pyjets, for older
       generators, but there we already have *stdhepjob*)
     − Pythia8: can write sthep, but incompatible w/ our version of stdhep.
     − Idea to test: Whizard can take these as *input*, and
       *output* LCIO.
        => Rightarrow Use Whizard simply as a *formatter*.


4. (ILC) Production schemes

   Which samples to produce ?

   − The SM as for the DBD:

     − 250, 350, 500 − at least H20 − up to 10 times as much.
        − GammaGamma, Compton, bhabha ?
     − produce all samples with fully polarised beams.
     − How to treat the Higgs?
        − As in DBD: separated out from SM sample ( use "infinite" m_h in SM sample )

     − Request from production team to reduce the number of different processes wrt. DBD samples
        − However: DBD−scheme has served the user community well: should be kept as is
        =>  Open issue. 6− (and 8−) fermion samples was not grouped very much in the DBD,
            so things are to be gained there. Can the Dirac scripts be modified so that
            jobs grouping processes can be treated more easily?

     − Auxiliary samples needed for simulation:


       − gammagamma −> lowpt hadrons.
          − Files exist in stdhep ( for 500, need to check 250, 350 )
          − Have fixed issues in Barklow generator, rho−width, new switch between
             Barklow and Pythia: 2 Gev
          − bb, bw, wb, ww in separate files
              − need correct mixture of these to have a single file to pick overlay from.
              − SiD has code to do the correct mixing

       − Real tracks from pair background − not considered in DBD:
          − Need to create files with real tracks
          − One event with 1 BX
          − Should do this with SGV.
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          Need to also study the complete background in the detector
             − Could we even overlay back−scattered hits in the VXD (SIT) ?



   − Things *not* done centrally for the DBD:

     − Z pole

     − Maybe: produce some ‘‘standard’’ BSM benchmark samples? If so: What ?

     Special calibration samples:
       − 2f for calibration e,mu,q
       − single particle files: mu:s K^0_L:s, ...
       − uds−di−jet events
       − bb,cc for flavour tagging
       − also 4b, 6b, 4c, 6c and 4/6 uds, for flavour tag for Higgs self−coupling.


     − Question (added by MB): Is this things that the central production should do,
       or is it more efficient that the groups using these samples take charge?



   How to produce? What is the effort?

   −  Once Whizard is fully validated:
     − Largest fraction of generation is the initial integration
     − Runs on single computer − afterwards producing large sample is fast,
       but of course all the checking of log−files, re−submitting of failed jobs,
       book−keeping etc needs to be in place
       − Needs scripts, presumably not much different from the DBD ones (At least
         not for me, remember that the effort was slit between KEK/DESY/SLAC for the
         dbd, with no requirement that it should be done the same way, just that the
         final stdhep files should end up at the correct place, and that the metadata
         should be common.)


   − file−name convention: As for dbd + that the file sequence numbers should follow the
     same principle as for other items, ie. a dot followed by a letter defining the
     meaning. For the sequence number we will use .n followed by 6 digits (zero−padded).

        − *dont* zero−pad other numbers, eg. the cms energy.

   When to produce ?

   − Be ready for summer ’17, ie. in ~ 6 months


5. Metadata and run conditions/logs


   − Generator metadata files:
     − Created at job submission
     − Contain: process, cross section, polarisation, files, ....
     − The same as for the DBD *except*:
       − Remove the lists of produced files (might change with time)
       − Add ‘‘superseded’’ keyword, False by default. If a sample was found to be bugged, or
         for any other reason needs to be replaced, this keyword should change to True.
         Preferably the ProcessID of the new, replacing sample should be added to
         the comment field.
       − additional, optional, keywords, e.g. for BSM could be added by generator group
     − To be stored in Github and in Grid−SE. For DBD, they were also the SE, and on the web.

   − Full information on the conditions, as was saved during DBD:
     − Means:  Steering−files, logs, integration grids, output other than the events,...:
     − Saved as tar files − parallel to generated files on SE, e.g. mc−dbd, and also
       on Web (un−tarred).
     − The collection of outputs and steering files from Whizard2 id completely different
       to Whizard1
     − Need Whizard functionality to tidy up run−directory of temporary files, and advice
     − Also to be stored in Github and in Grid−SE



6. List of actions with names if known.

  Whizard authors:

   now:
    work:
    − LCIO output corrections and extensions, as listed in sect2 (JRR)
    − Verify tat the sindarin−file from MB *does* describe the same conditions
      as the DBD.
    − gammagamma−>lowpt hadrons: Flat ME+user defined event−transformation (WK and TB)
    − Problem with Hadrons in 4f: WK, possibly with advice form Pythia6 authors.
    − Externally set Higgs BRs (WK).
    − External set run−number and starting offset of event counter (?)
    − pt−kick of e+− in EPA events (WK? + TB)
    − script to group/tidy files in the run−directory for archiving. (WK)
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     checks/document:
     − Callable whizard
     − Command−line steering
    eventually:
     − Internal, fully correlated tau−decays.
     − gluon matching schemes

  Generator group.

    now:
     work:
     − ILC beam−spectra for 250/350/500 for ee/ge/eg/gg (?)
     − Modifications to metadata−files and run−archiving (MB for the DESY setup)
     − Prepare files with seeable tracks from beam−background (MB)
     − Event number to 64−bit in LCIO (FG)
     − Clarify (with production group and/or detector groups ) open questions on
       number of processes, what calibration samples to produce centrally, ...
     − Re−iterate with physics groups for any specific demands on how to generate
       (higgs, top, ...) (MB,JT,TB)
     checks:
     − Verify that polarised tau decays are still as OK as they can (MB)
     − Whizard as a formatter (anything−>LCIO) (?)
     − Can whizard do "minimum bias" 8f (JT?)
    eventually:
     − Pythia8 hadronisation wrt Pythia6 and LEP data (MB and DJ)

7. Organisational

  Get an actual mandate for the group.
    − MB informally suggested this to Jim Brau. Let’s see what happens.


  Next face−to−face meeting:
    March 22−23 ’17 at DESY
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