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Putting our hands on PHSD :)

Installation, event generation and conversion into root file

Meet PHSD

- Parton-Hadron String Dynamics is a dynamical approach for strong interacting systems [1].
- The evolution of the QGP system simulates a specific quasiparticle model [2].
- The code includes the transition between partonic and hadornic phase.
- It also includes many hadronisation models: The principal one being the Lund string model.

Installation of Intel Fortran Compiler Part1

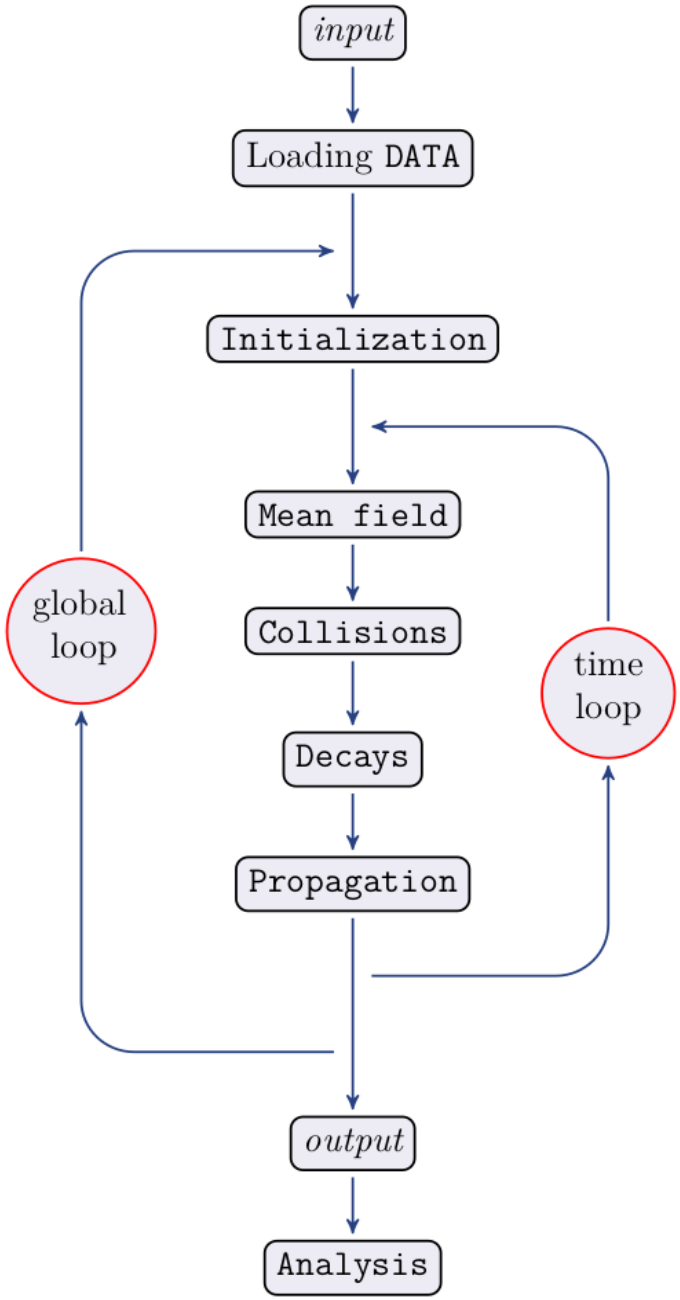
- Download from [3]: https://software.intel.com/content/www/us/en/develop/tools/oneapi/base-toolkit/download.html
- Select Linux OS, Web & Local distributions and Online installation type.
- “Maybe next time. Please take me to my download”
- Begin installation on your terminal with:
  source bash <inst_file>.sh
- Customize to install just: Threading Building Blocks, DCP++/C++ Compiler and DCP Library.
- Wait forever.

Installation of Intel Fortran Compiler Part2

- Download from [4]: https://software.intel.com/content/www/us/en/develop/tools/oneapi/hpc-toolkit/download.html
- Select Linux OS, Web & Local distributions and Online installation type.
- “Maybe next time. Please take me to my download”
- Begin installation on your terminal with:

  source bash <inst_file>.sh
- Customize to install just: Intel Fortran Compiler
- Wait forever more.

Input and structure



PHSD input file: ~/<your_path>/phsd/inputPHSD

197,	MASSTA: target mass
79,	MSTAPR: protons in target
197,	MASSPR: projectile mass
79,	MSPRPR: protons in projectile
62.623,	ELAB lab energy per nucleon
0,	BMIN: minimal impact parameter in fm
14,	BMAX: maximal impact parameter in fm
0.5,	DeltaB: impact parameter step in fm
1,	NUM: optimized number of parallel ensambles
1000,	ISUBS: number of subsequent runs
99997,	ISEED: ANY uneven INTEGER number
1,	IGLUE: =1 with partonic QGP phase; =0 (HSD mode)
50.45,	FINALT: final time of calculation in fm/c
10,	ILOW: output level (default=10)
0,	Idilept: =0 no dileptons; =1 electron pair; =2 muon pair
0,	ICQ: =0 free rho's, =1 dropping mass, =2 broadening, =3 drop.+broad.
0,	IHARD: =1 with charm and bottom; =0 - without
1,	IBweight_MC: =0 constant step; =1 by Monte-Carlo ISUBS times in $[Bmin, Bmax]$
0,	IUSER: =1 for general users; = 0 for PHSD team

Installation and event generations

- To install PHSD use the *make* command in your terminal.
- After adapting the inputPHSD file, you can run the simulation with *./phsd*
- Once the code finishes the generation, the output can be checked in the file *phsd.dat*

Important parameters

- ELAB: Energy with respect to the laboratory frame, to get the center of mass energy, we use $s_{NN}=2\times m_N\times\left(ELAB+2\,m_N\right)$
- NUM: Number of parallel events
- IGLUE: =1 with QGP formation, =0 withou QGP formation.
- FINALT: Optimal computer time obtained with

$$t_{max}=35+\frac{170}{\sqrt{s}}$$

- Ibweight_MC: =0 impact parameter by steps, =1 Monte Carlo for impact parameter

Convert to root file

- So far so good, but the output file maybe somewhat cumbersome to work with.
- For this reason the phsd directory includes a macro inside *~/<your_path>/phsd/ANALYSIS/Root/* called *ConvertToRoot.C*
- Edit the arguments of the macro, including the input file (phsd.dat), output file (root file) and the number of events.
- Run it with *root* command

Results at generator level

- Once with the root file, many macros can be used to obtain different results.
- The macro *loop.C* shows the distributions of pseudorapidity, angle of deflection and impact parameter.
- The next step is to use the MpdRoot framework.
- Try it yourself!

THANKS!
<3

References

[1] W. Cassing and E.L Bratkovskaya,*Parton-hadron dynamics: An off-shelltransport approach for relativistic energies,* Phys. Rev. C 78 (2008) 034919,arXiv:0808.0022 [hep-ph]

[2] Berrehrah H., Bratovskaya E., Steinert T., Cassing W., *A dynamical quasiparticle approach for the Quark-Gluon-Plasma bulk and transport properties*, Int. J. Mod. Physiscs 25 (2016) 1642003, arXiv:1605.02371 [hep-ph]

[3] https://software.intel.com/content/www/us/en/develop/tools/oneapi/base-toolkit/download.html

[4] https://software.intel.com/content/www/us/en/develop/tools/oneapi/hpc-toolkit/download.html

[5] https://github.com/MexNICA/phsd

[6] https://github.com/MexNICA/phsd-doc