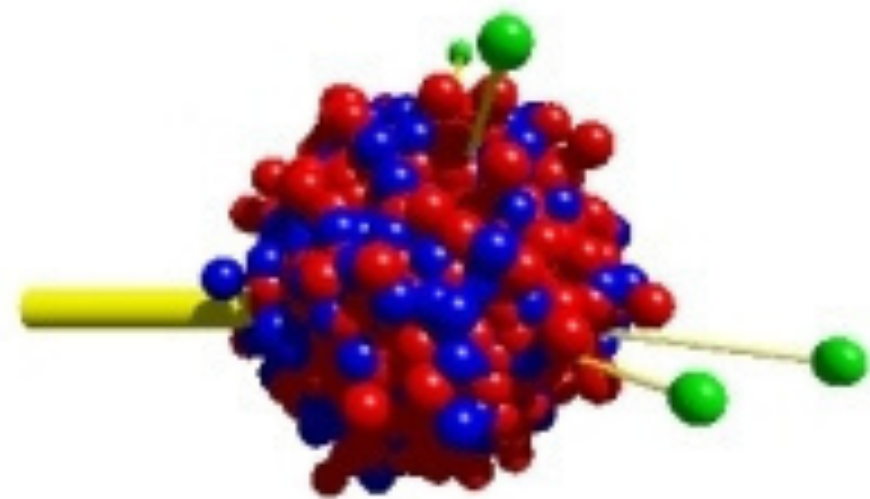


Lohengrin Meeting - 27.11.2025

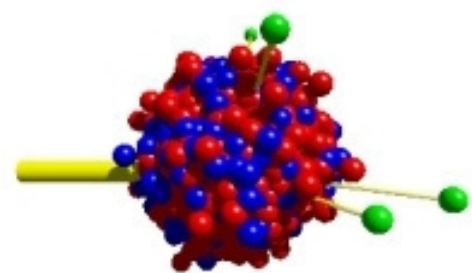


GiBUU

The Giessen Boltzmann-Uehling-Uhlenbeck Project

feat





GiBUU

The Giessen Boltzmann-Uehling-Uhlenbeck Project

What is GiBUU?

The GiBUU project

The **GiBUU project** provides a unified theory and transport framework in the MeV and GeV energy regimes for

- **elementary reactions on nuclei**, as e.g.
 - **electron** + A,
 - **photon** + A,
 - **neutrino** + A ,
 - **hadron** + A (especially **pion** + A and **proton** + A)
- and for A + A **heavy-ion collisions**,

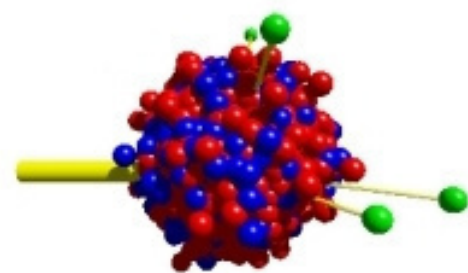
using the same physics input and code. The GiBUU code provides a full dynamical description of the reaction and delivers the complete final state of an event; it can thus be used as an **event generator**. The source code is freely available.

For all the reactions, the flow of particles is modeled within the quantum-kinetic **Boltzmann-Uehling-Uhlenbeck (BUU) framework**. The relevant degrees of freedom are **mesons** and **baryons**, which propagate in mean fields and scatter according to cross sections which are applicable to the energy range of a few 10 MeV to about 40 GeV; incoming lepton energies can go up to 1 TeV. In the higher energy regimes the concept of **pre-hadronic** interactions is implemented in order to realize *color transparency* and *formation time* effects. For a general overview of the model, its theoretical basis as well as many practical details, refer to the review paper:

Transport-theoretical Description of Nuclear Reactions

O. Buss, T. Gaitanos, K. Gallmeister, H. van Hees, M. Kaskulov, O. Lalakulich, A. B. Larionov, T. Leitner, J. Weil, U. Mosel

⇒ **Phys. Rept. 512 (2012) 1-124** / ⇒ **Inspire**



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170 pages
long
script



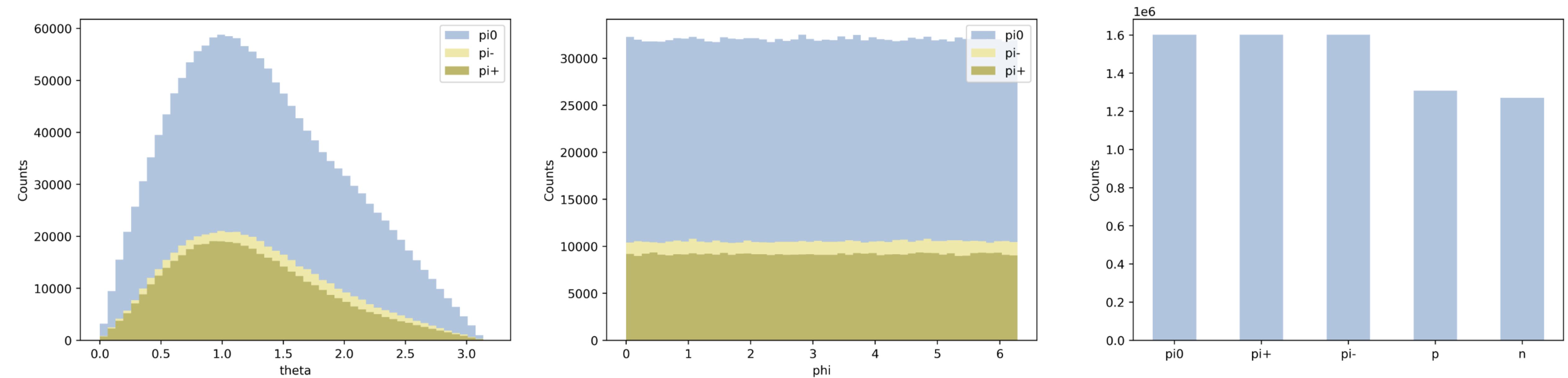
First simulation in GibUU:

```
!----- *- fortran *- ----
!* Electron and photon induced reactions: MasterJobCard
!* 0. Buss, 21.04.2008
!*****
!* This JobCard serves as a template for
!* electron (eventType=4) and photon (eventType=3) nucleus collisions with
!* sqrt(s)<2 GeV and Q^2<2 GeV^2.
!*****

! file: code/inputOutput/inputGeneral.f90
&input
  numEnsembles = 100,
  eventtype    = 4,      ! 3 = Photon induced, 4 = VirtualPhoton induced
  fullEnsemble = T,
  localEnsemble = T,
  delta_T      = 0.25,
  numTimeSteps = 0,      ! use more time steps if you want to perform a non-inclusive run
  num_energies = 1,
  num_runs_sameEnergy = 1,
  length_perturbative = 200,
  freezeRealParticles = T,
  LRF_equals_CALC_frame = T,
  path_To_Input = "~/GiBUU/buuinput",
  version = 2025
/
```

Thought this was # of events, but it is not (changes make no difference)

First simulation in GibUU:



**Simulated X? events with tungsten target (suddenly no error) and 3GeV electron.
All of these events are pions and a nucleon.**

**What are things we want to know from
GiBUU that I can try and look into?**