



## **First Test of EvtGen in ATHENA**

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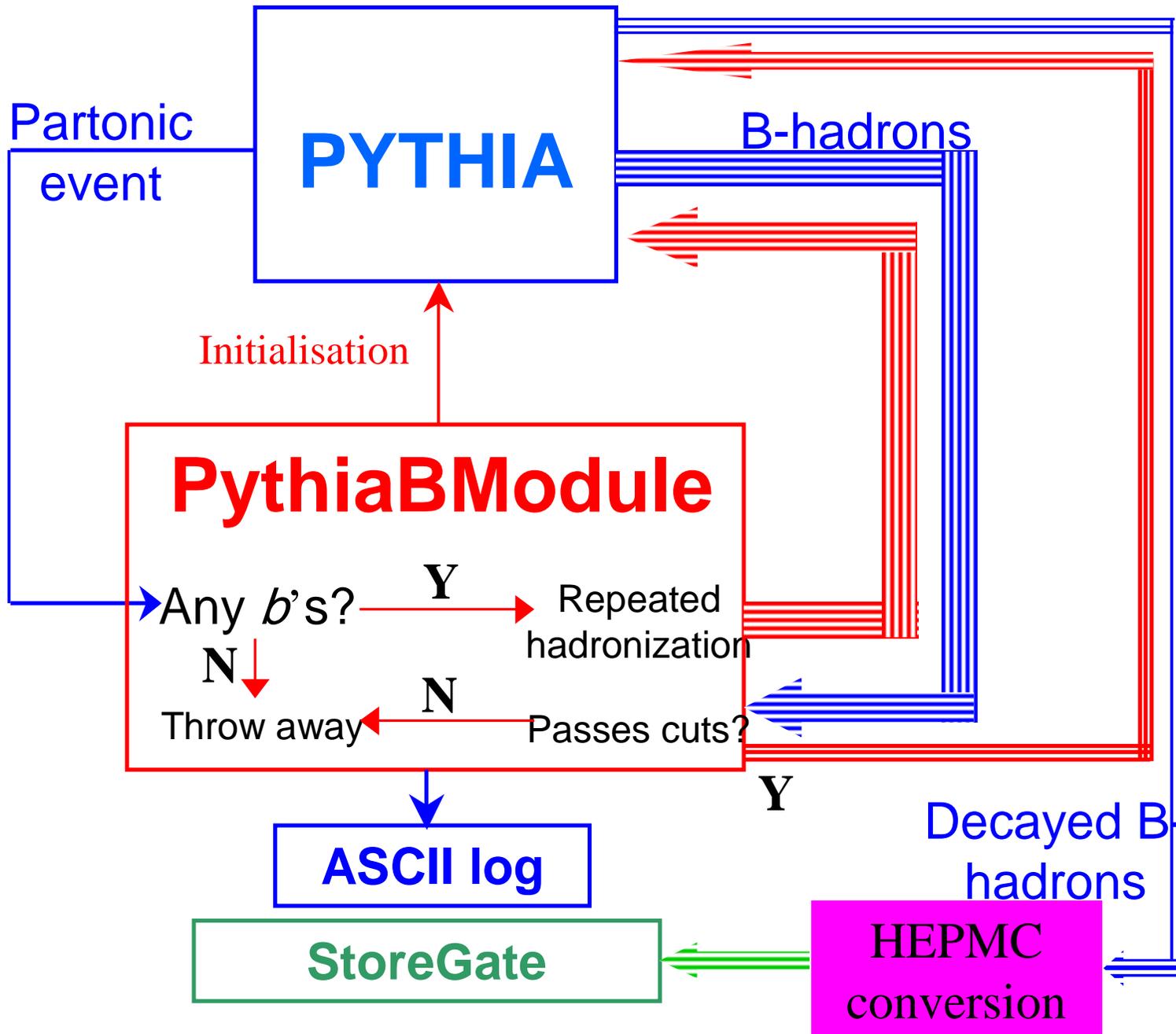
- **Current methodology for B-meson decay simulation in ATHENA**
- **Integrating EvtGen into ATHENA**
- **First results**



## Current Methodology



- **Generate partonic events using PYTHIA**
- **Passed to PythiaBModule (M. Smizanska)**
  - Checked for b-quarks
  - If found, passed back to Pythia for hadronization
    - **Each b-event is *repeatedly* hadronized to save CPU time**
- **Hadrons from PYTHIA checked for the desired mother particles**
  - If found and if they pass the appropriate cuts, passed back to PYTHIA for decay
- **Results converted to HepMC format and displayed**

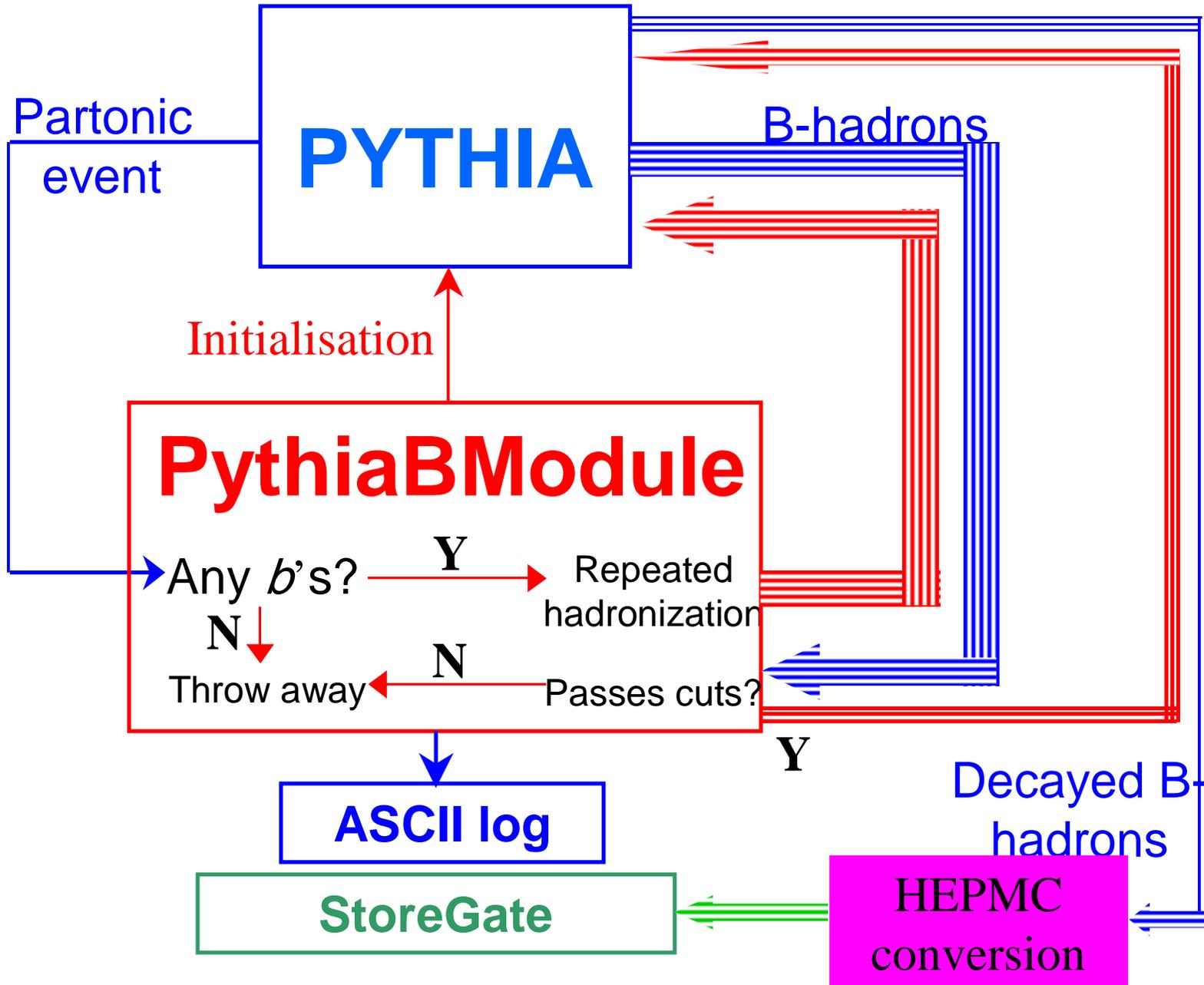




## EvtGen Interface

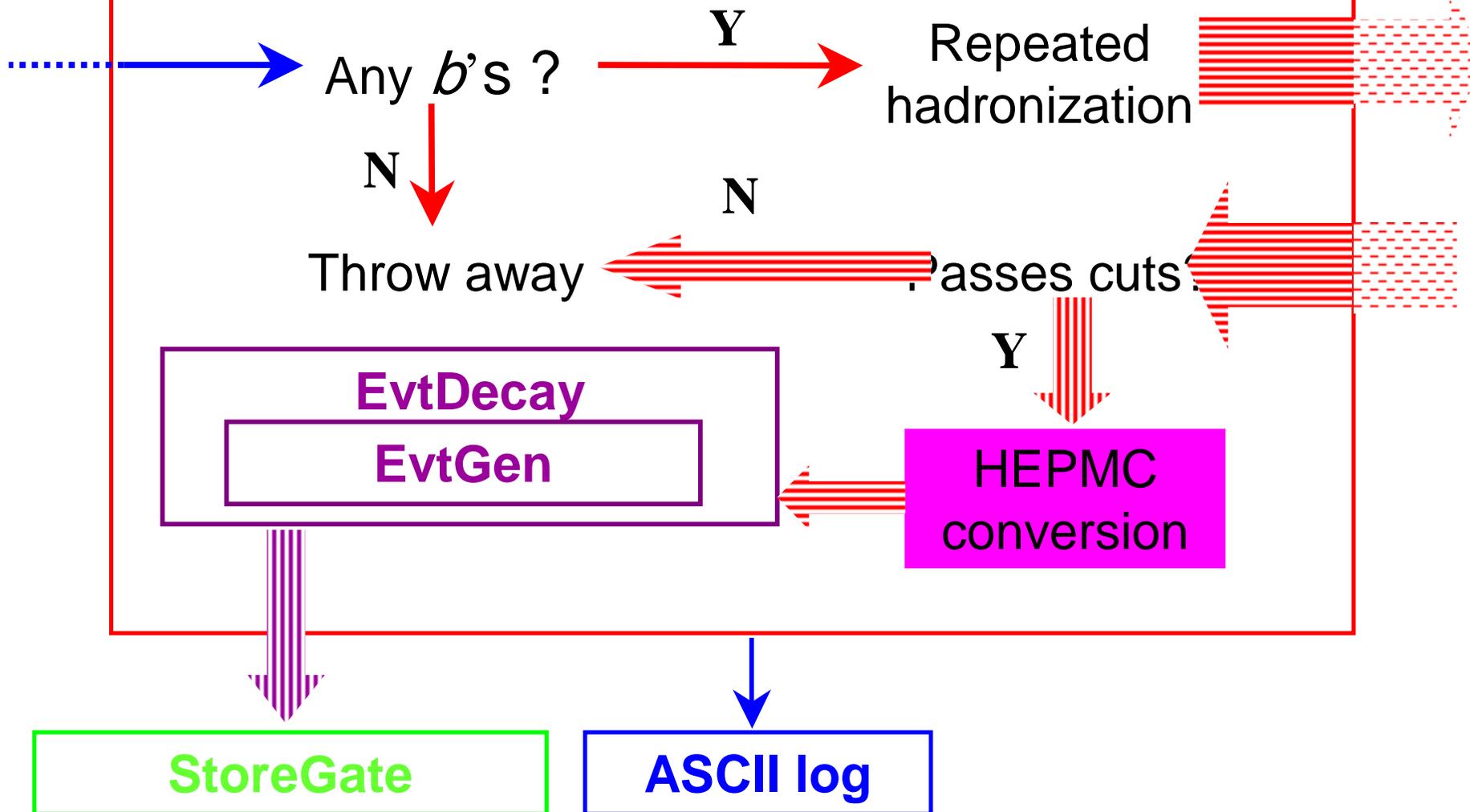


- **EvtGen has several advantages for B-decays**
  - Amplitude approach
  - Helicity amplitudes
  - ‘Nodal’ approach to decay tree - efficient
- **PYTHIA still needed for the hadronic event generation**
- **Use an interface class “EvtDecay” (adapted for ATHENA by Malte Muller) to decay B-mesons with EvtGen code**
  - Instantiated within PythiaBModule
  - DECAY.DEC and MY.DEC read in via ATHENA JobOptions



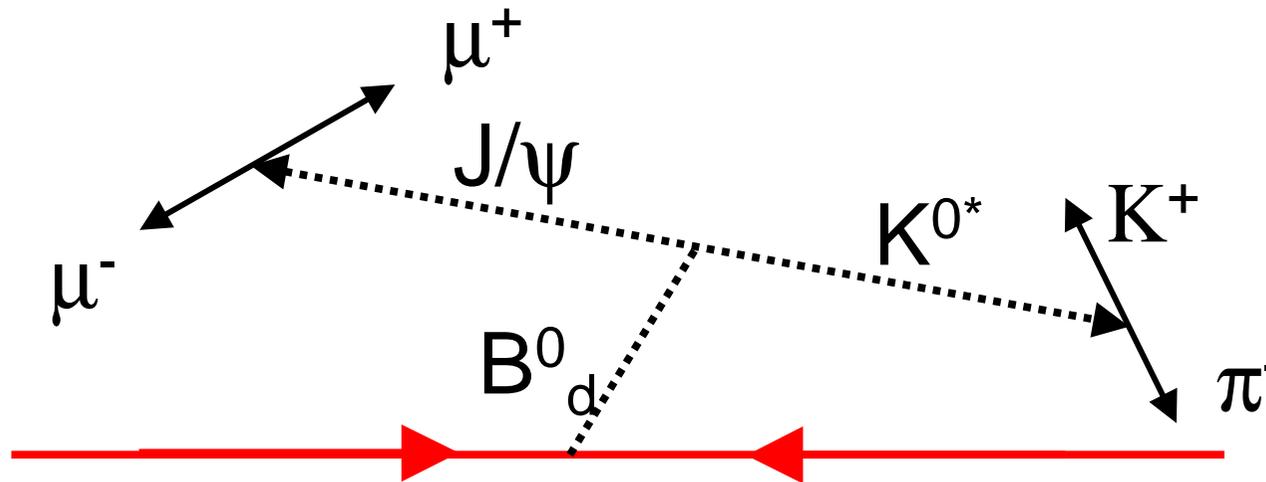


# PythiaBModule



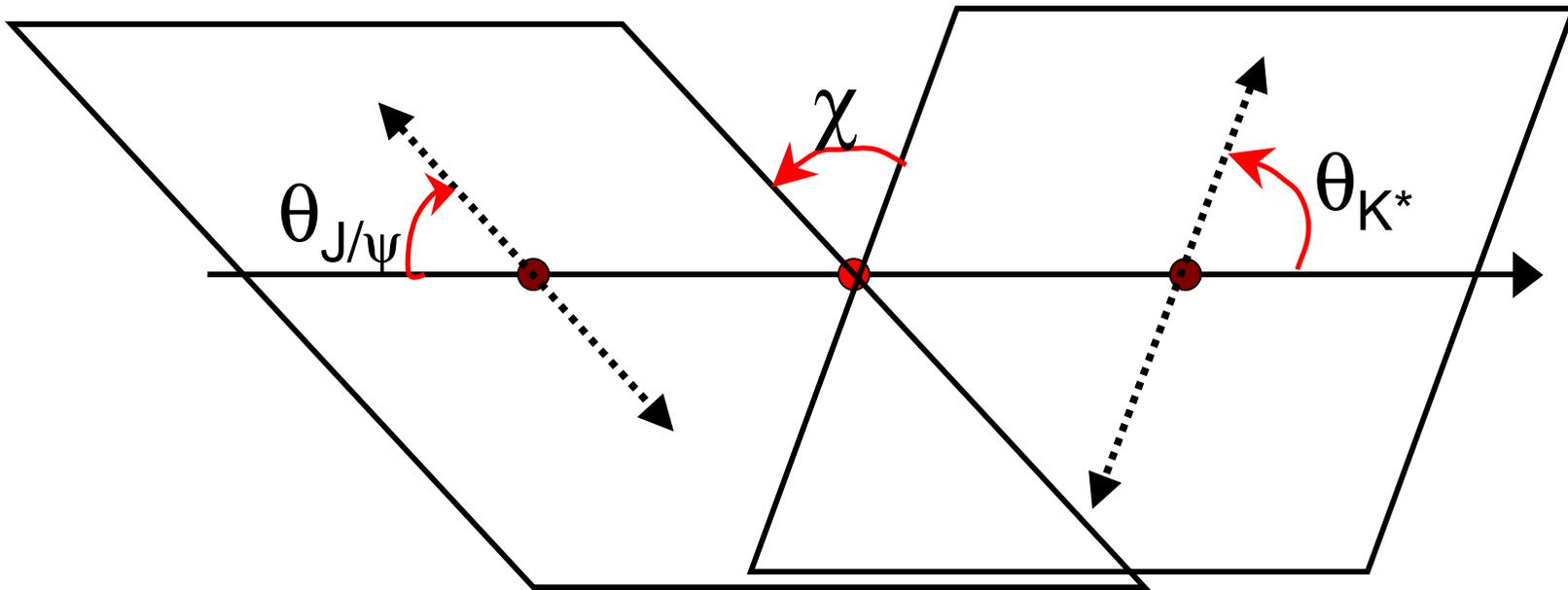


First Attempt – angular distribution  
of  $B^0_d \rightarrow J/\psi (\mu^+\mu^-)K^{0*} (K^+\pi^-)$



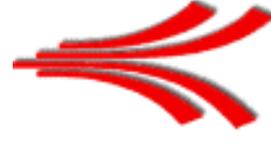
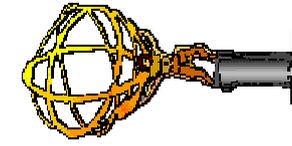


# Angles

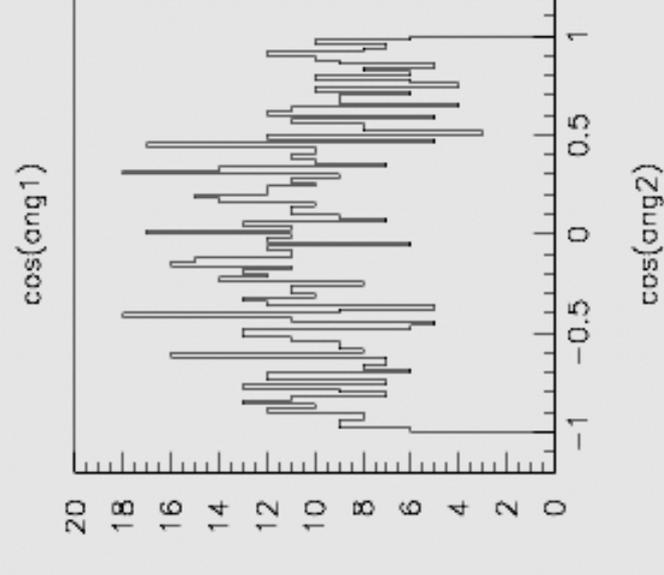
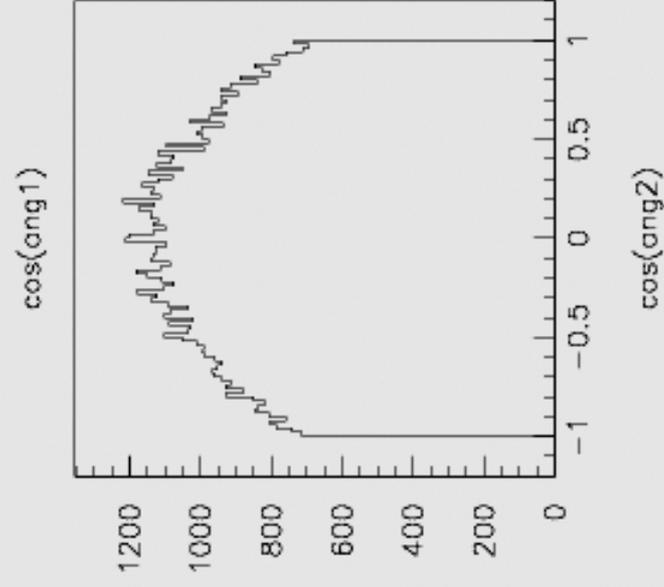
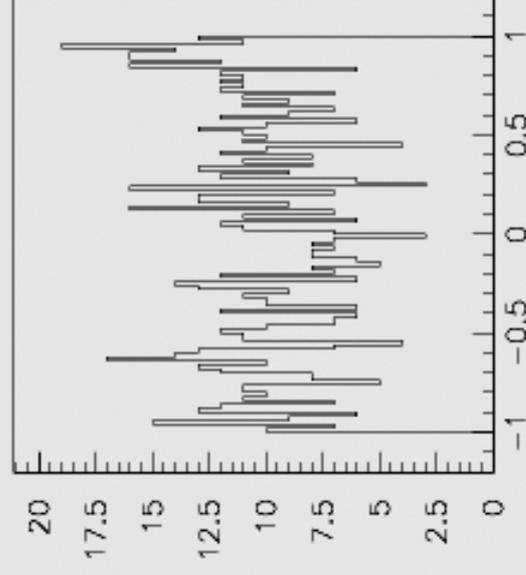
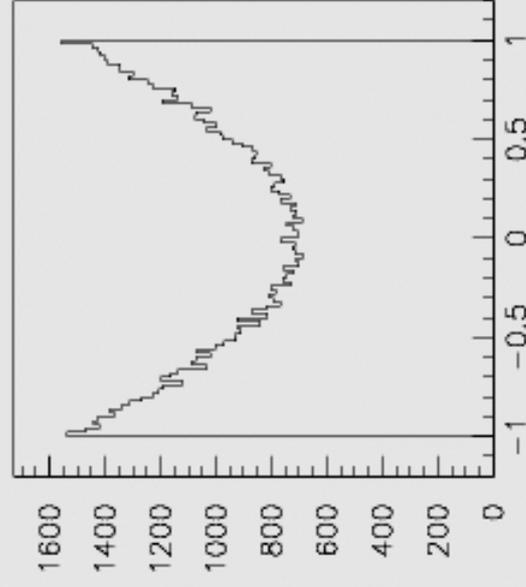


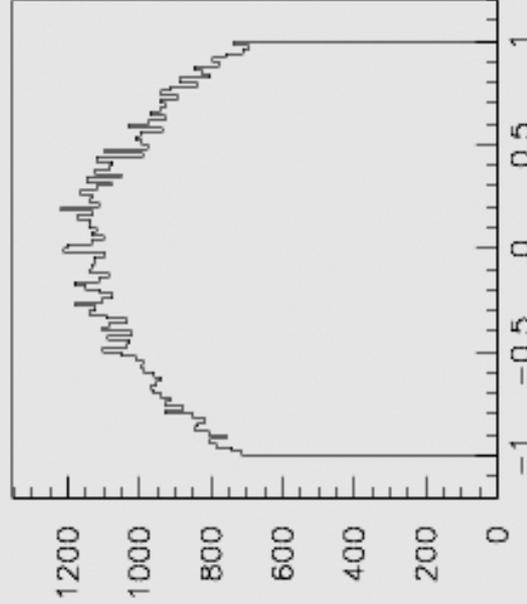
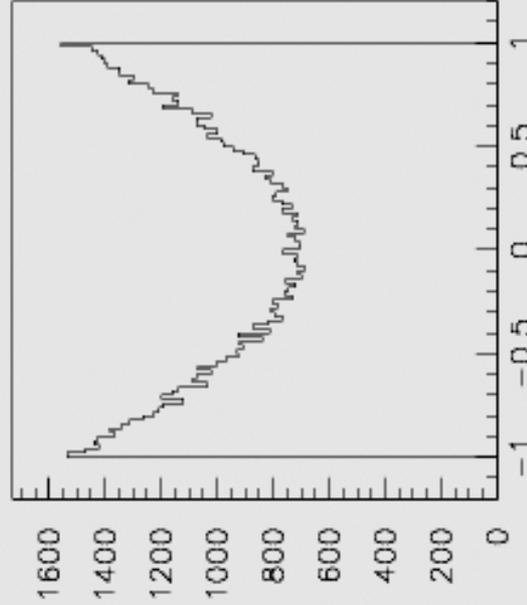
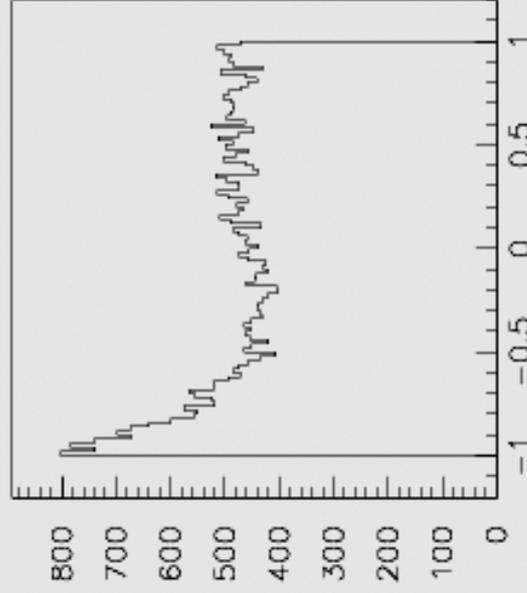
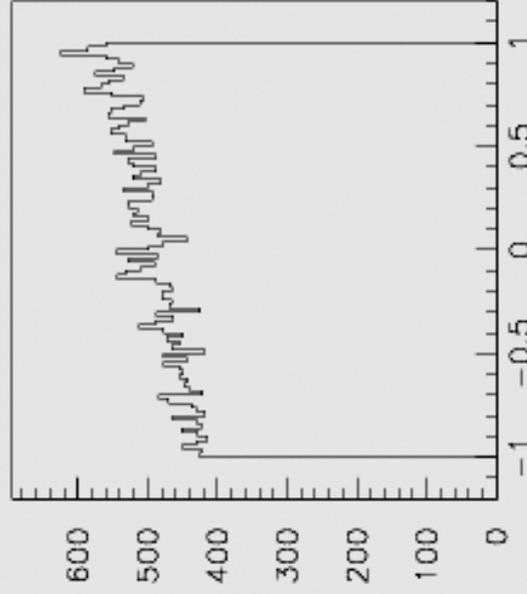
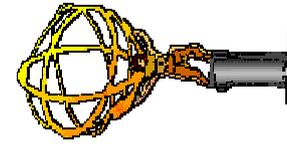


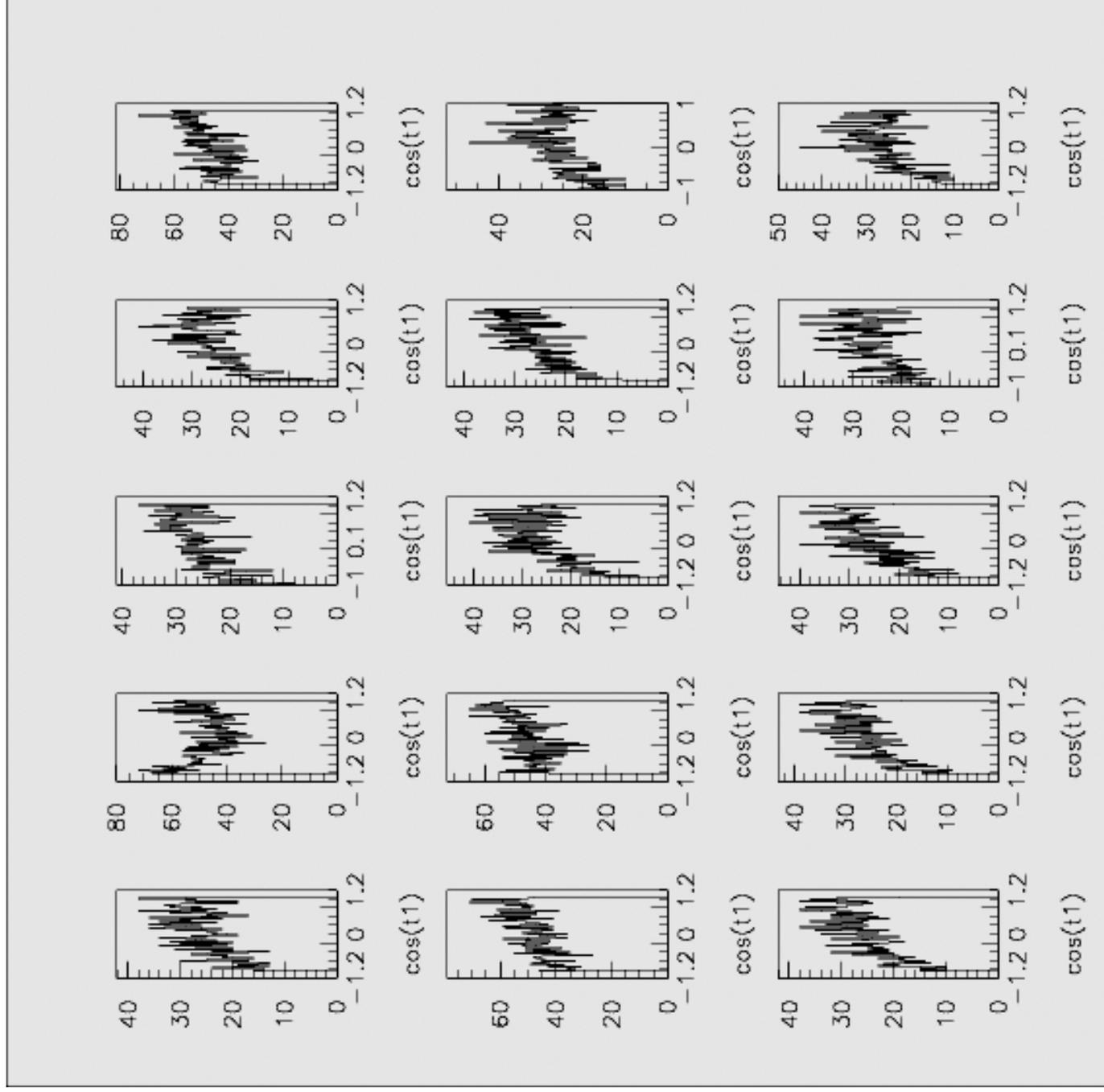
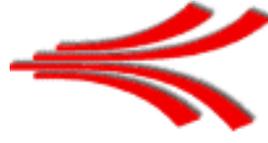
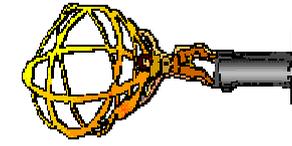
## Results

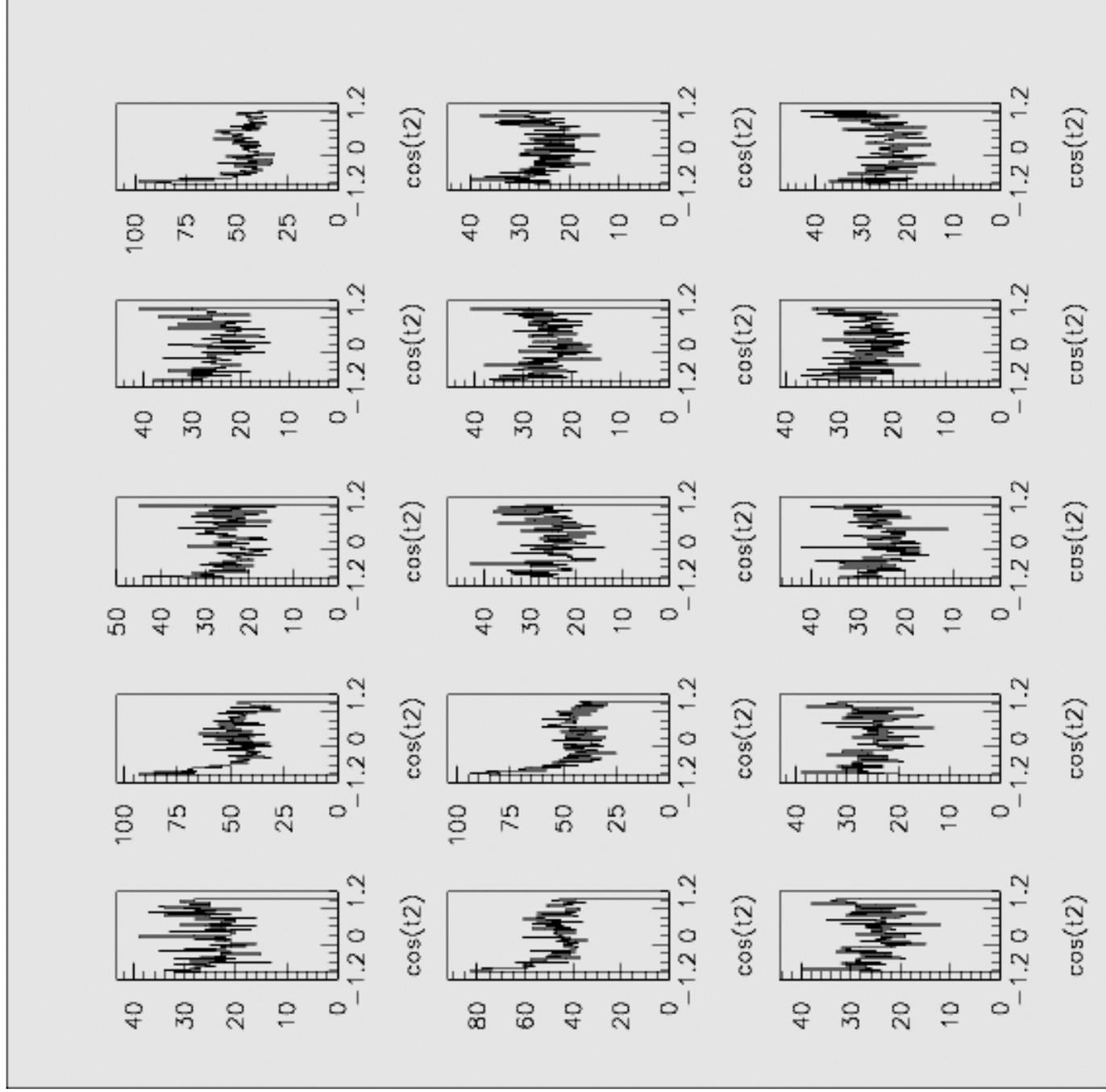
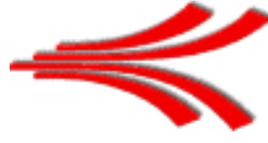
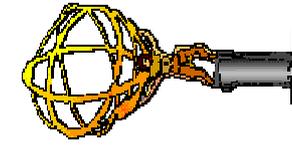


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## The plan for the next month



- **Investigate instabilities in results**
- **Fix various memory leaks**
- **Develop code so that EvtGen can be invisibly operated within ATHENA following a single request from the user**
  - **Automatic generation of MY.DEC**
- **CP violation studies?**



## Conclusions



- **EvtGen can be operated smoothly from within ATHENA**
- **The preliminary results require investigation**