

Status of the inclusive charmonia production simulation

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Simulation

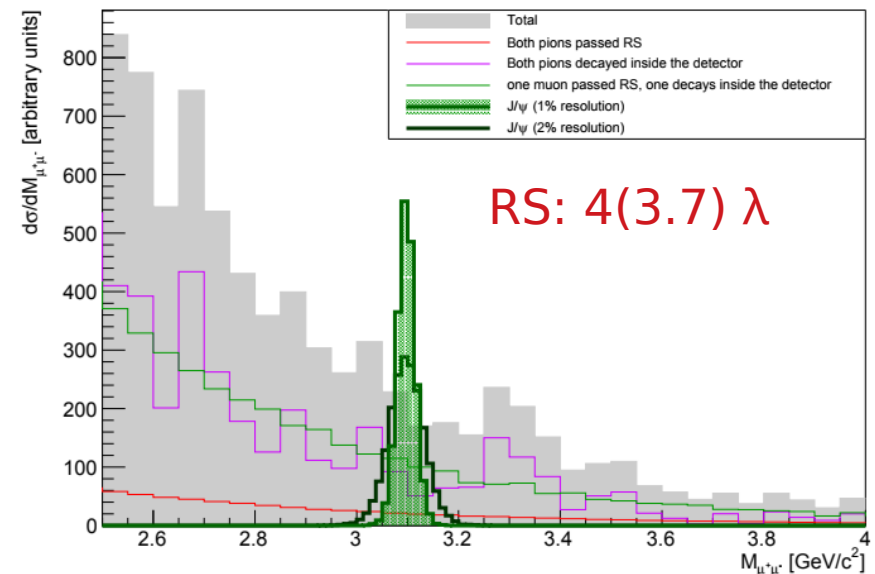
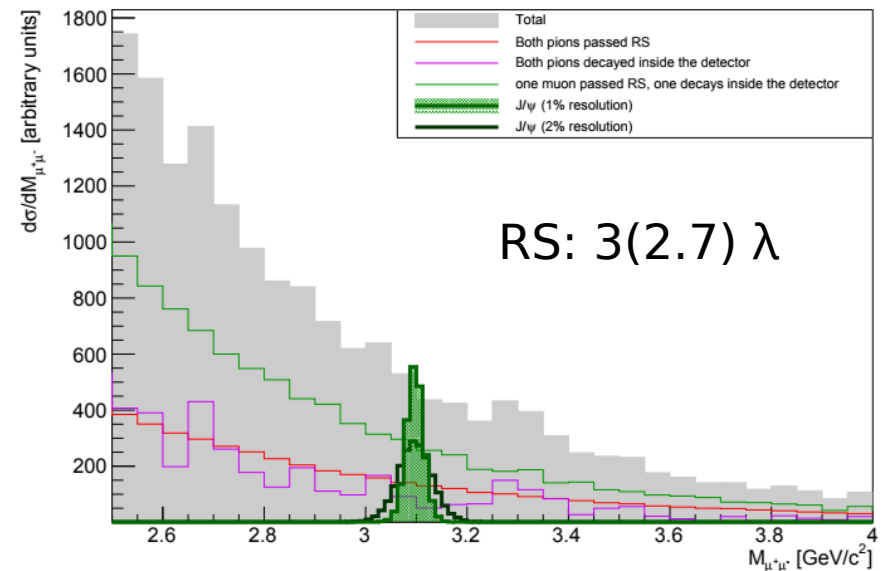
- Background level and RS requirements
 - background simulation (material map + hits in RS)
 - signal simulation (same + dimuon mass resolution)
 - ECAL energy resolution for P-wave charmonia states)
- Precision for polarized observables (p_T , x_F , polarization)
- Precision for unpolarized observables. No theoretical predictions at our energies

Background simulation (generator-level study)

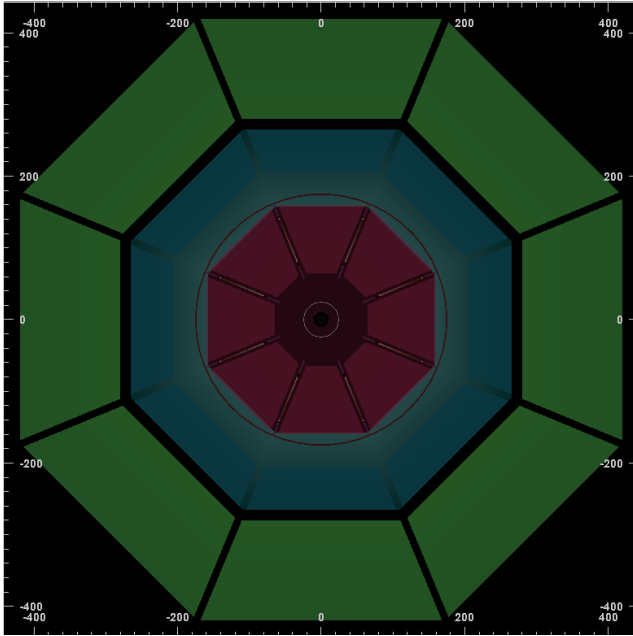
Note from October 2019

Toy MC:

- RS and ECAL (simplified geomtry),
- Pythia6 minimum bias 100×10^6 , generated events
- no magnetic field
- pion tracks in RS are weighted according to “survival probability” calculated from amount material crossed by pion.
- two muon momentum resolution scenarios.



Status of the RS simulation



RS in SPDR00T status:

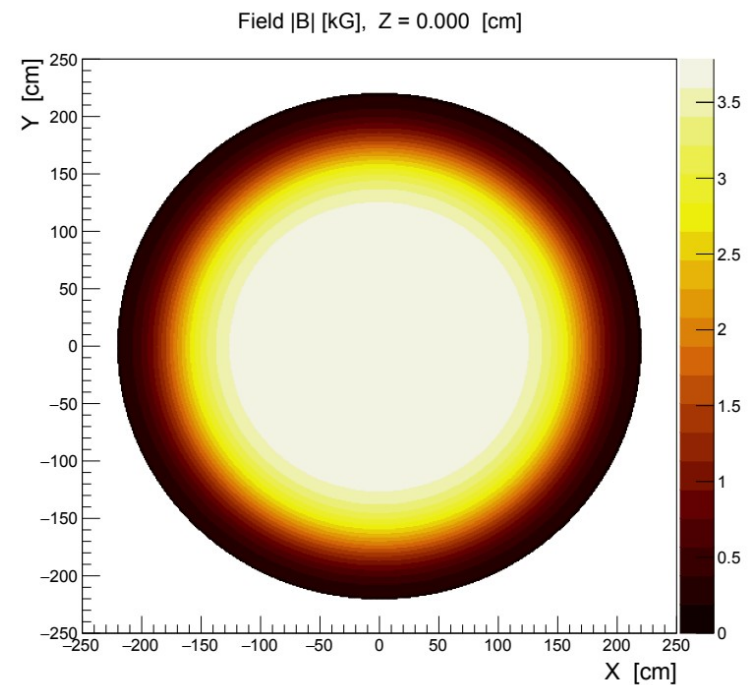
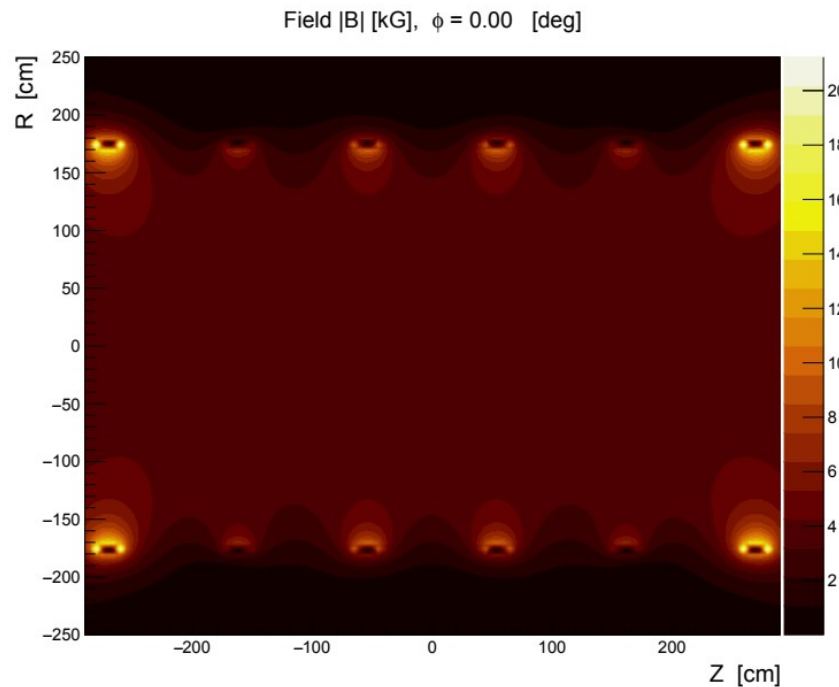
- preliminary geometry,
- no material (air).

- Material can be easily redefined and Geant4 hits can be retrieved. The actual performance of RS remains not quite clear.
- **10^4** events are simulated more than **2 hours**.
- For 10^8 events approximately 2×10^4 hours are needed.
- Feasible, assuming similar performance on lxpub (4-5 days for 200 jobs)

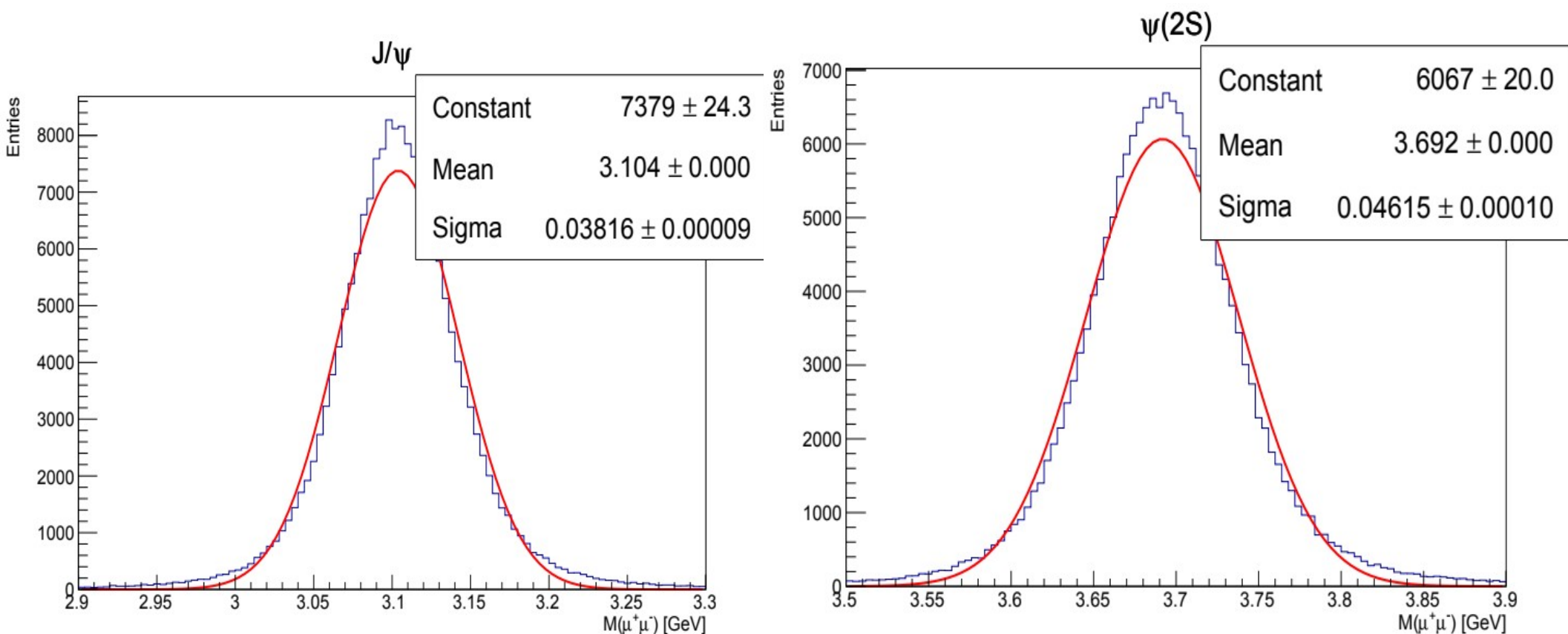
But typically 2/3 to 3/4 of tracks in a typical event have energy below 50 MeV. **Optimize?**

Tracking

- Magnetic field: pseudosolenoid (map_sol_6cls5cm2.bin)
- J/ψ MC: Pythia8
- Momentum resolution $\sim 1.5\%$
- J/ψ reconstruction efficiency is $\sim 90\%$

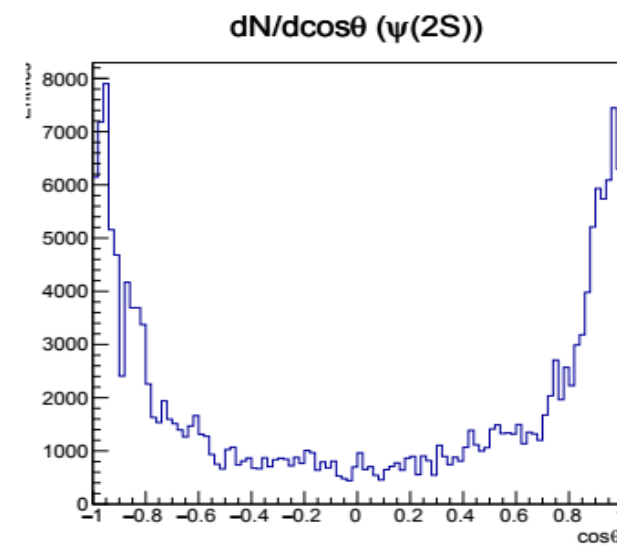
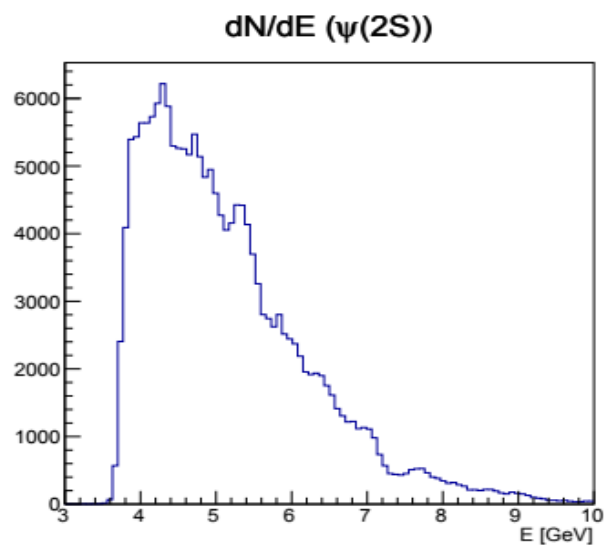
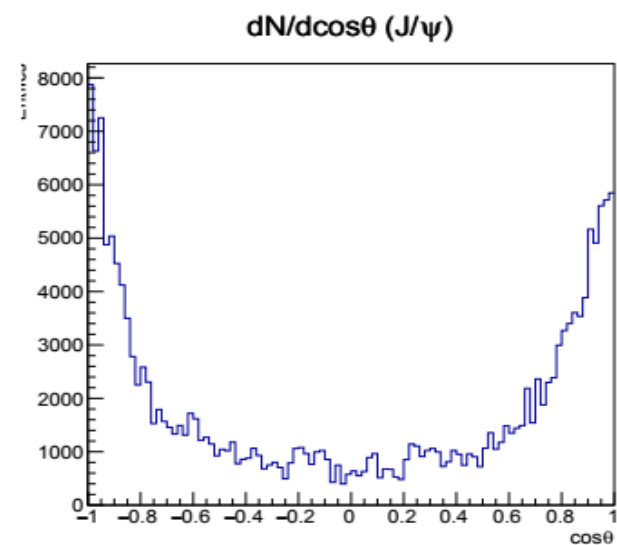
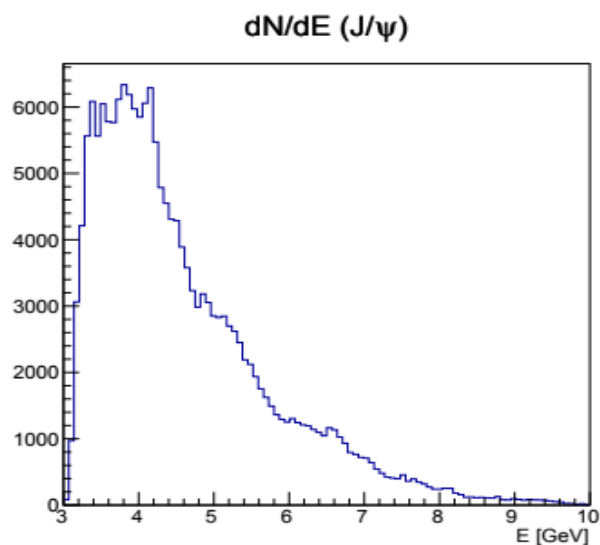


J/ψ and $\psi(2S)$ mass resolution in the $\mu^+\mu^-$ mode

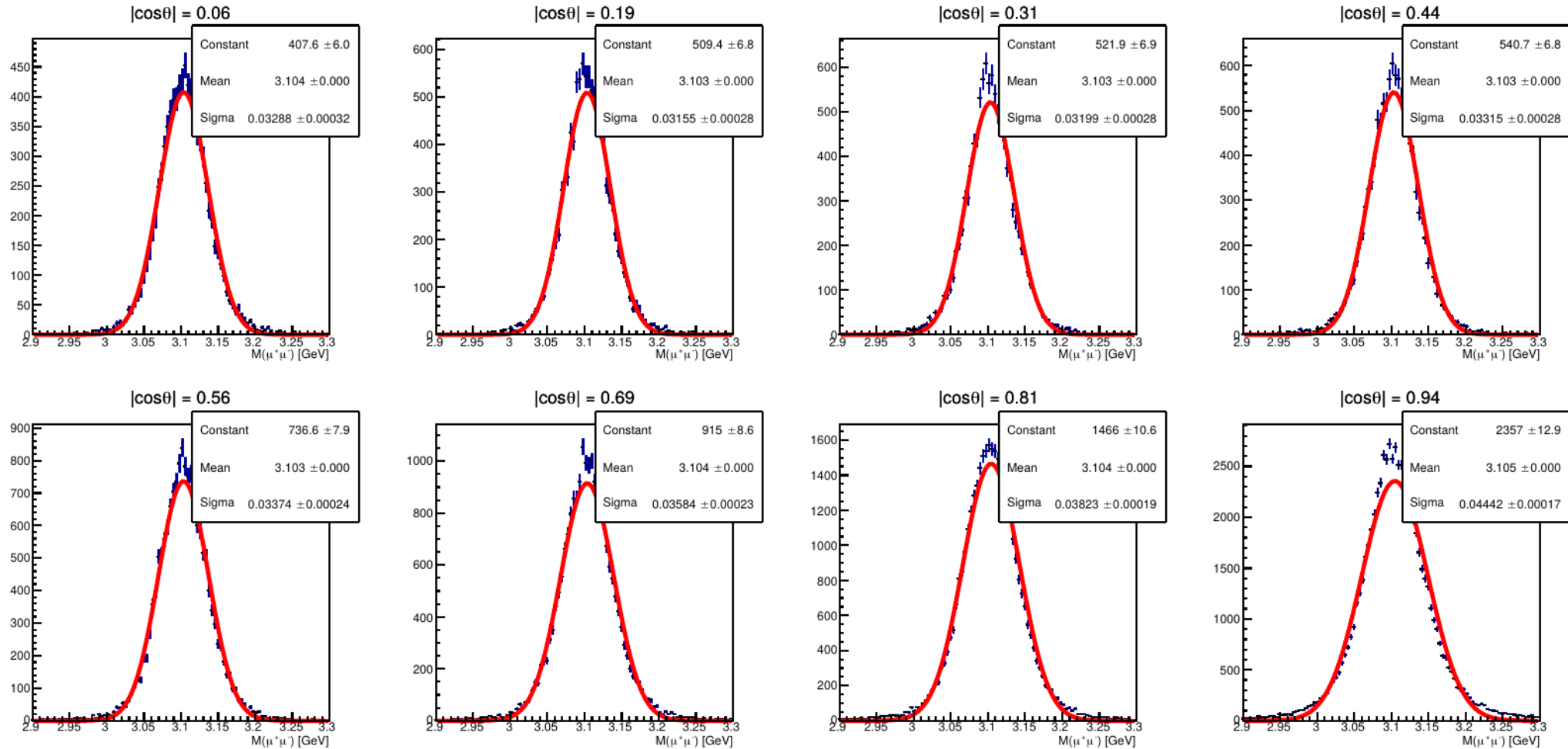


Integral dimuon mass resolution for J/ψ and $\psi(2S)$.

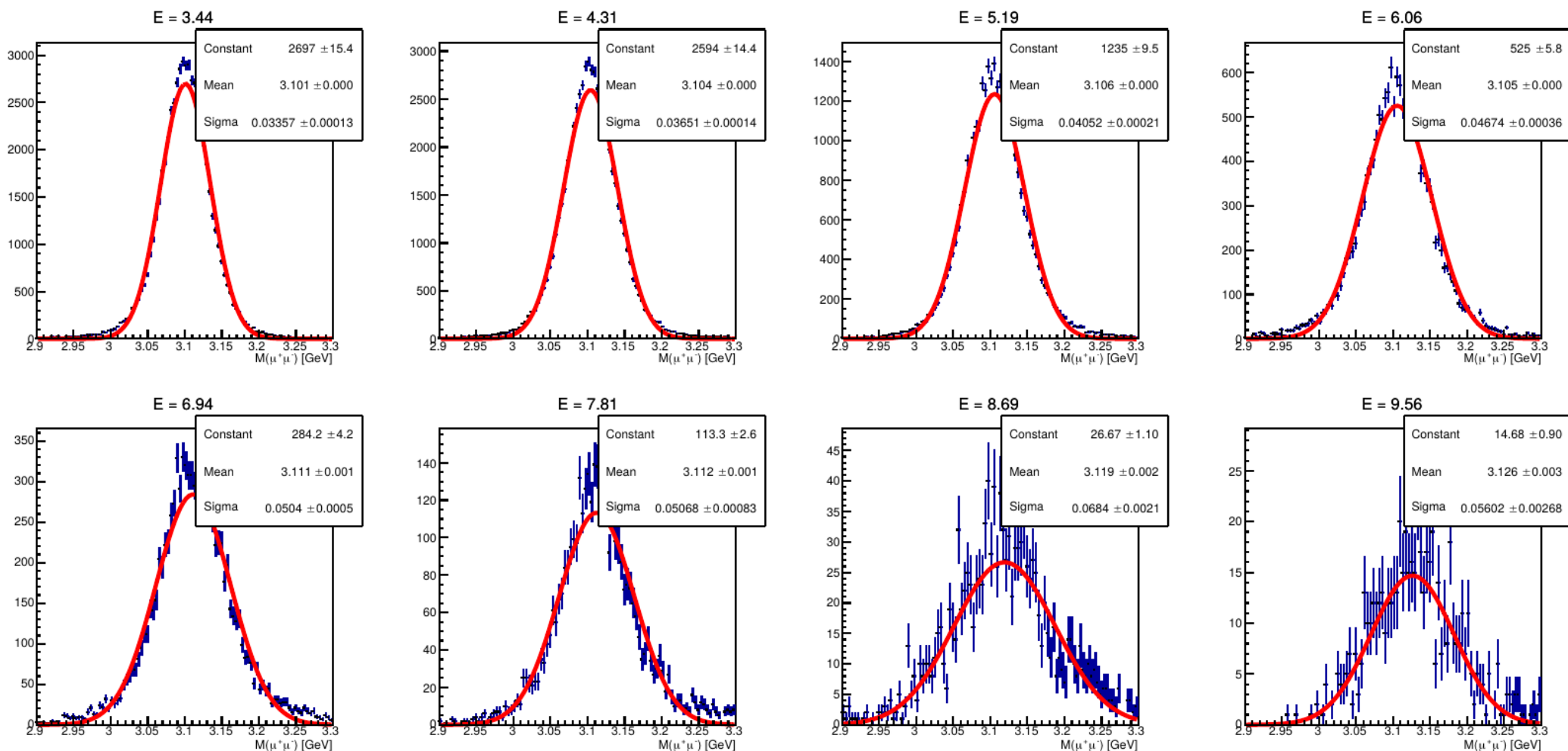
J/ψ and $\psi(2S)$ kinematic distributions



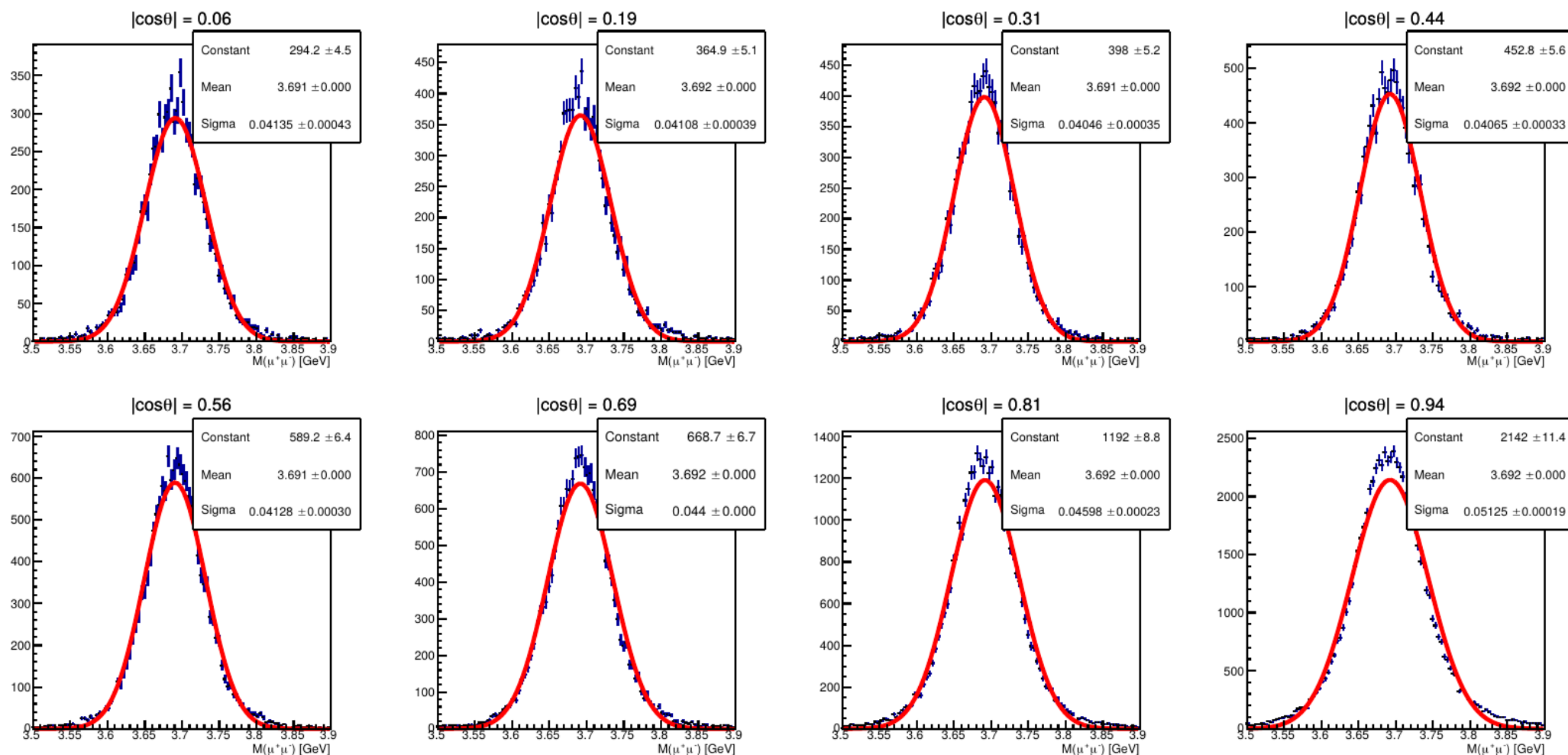
Dimuon mass resolution as function of $\cos\theta$ for J/ψ



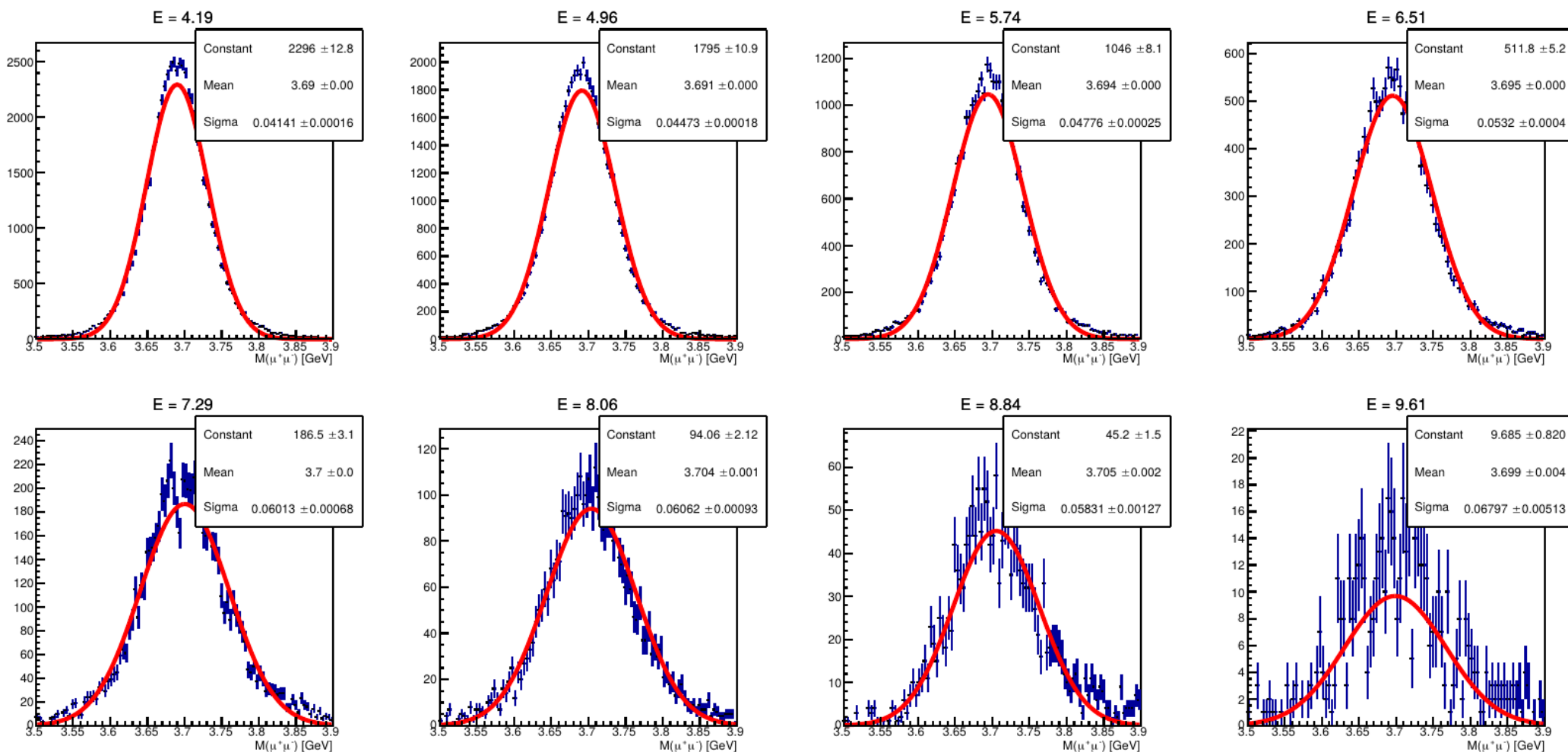
Dimuon mass resolution as function of E(GeV) for J/ψ



Dimuon mass resolution as function of $\cos\theta$ for $\psi(2S)$



Dimuon mass resolution as function of E(GeV) for $\psi(2S)$



Summary

- Simulation of the background level for inclusive J/ψ :
 - Track momentum resolution is reasonable,
 - background simulation requires Geant4 optimization (**help would be much appreciated**),
 - **results can be expected soon.**
- Apart from J/ψ and $\psi(2S)$, P-wave charmonia states are important. What is the photon energy resolution and how much it is worsened by the magnet coils?
- To be followed by estimation of precision of other observables. We do not have prediction for polarized observables at our energies.
- *Do we need intermediate pseudoreconstruction format?*

The work can be much accelerated by proper communications and documentations (Twiki, private git repositories, very short weekly technical meetings).