

EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH

DIRAC Note 2007-06  
April 13, 2007

# **The comparison of Lambda peak width for Monte-Carlo and real data in the DIRAC setup.**

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GENEVA  
2007

# 1 Preface

The aim of this work was to compare the width of  $\Lambda$  peak for Monte-Carlo and real data in the DIRAC setup. The previous study of this problem was done three years ago in [1]. Present versions of GEANT-DIRAC and ARIANE differ from those ones used in [1] at least in these items:

1. Correction of the setup magnetic field was done[2].
2. Correction of horizontal angular misalignment of arms was done[2].
3. Improvement of multiple scattering procedure was done [3].
4. Description of aluminum membrane was done to be close to the real one.
5. Correction of proton ionization losses in the forward detectors was done.

The real data of Ni2001 were used.

In the case of Monte-Carlo the generator of  $\Lambda$  particles emitted in the solid angle of our setup was used. The creation point of  $\Lambda$  was in the target and the  $\Lambda$  decay point was simulated by GEANT itself. The real data files and the GEANT-DIRAC output files were analyzed by ARIANE.

# 2 Results

There were selected the proton-pion pairs with total momentum from 5.2 to 8.7 GeV/c. As the momentum distribution for MC and real data pairs are a bit different then the MC events were weighted to get the same momentum distribution as for real data. Also this momentum range was divided into three subintervals(5.2-6.9-7.5-8.7GeV/c). For all of these subintervals and for whole interval the distributions of invariant mass(minus of  $1.11\text{GeV}/c^2$ ) of proton and pion are shown on Fig. 1, for MC and real data. The real data distributions were fitted by the function which is the sum of Gaussian and polynomial of the third degree. The last one describes the background. The corresponding MC distributions were slightly modified to make the fitting conditions equal for both types of data: the proportional “background” was added to each MC distribution. The MC data distributions were fitted by the function which is the sum of Gaussian and a constant.

Only for  $\Lambda$  momentum greater 7.5GeV/c the values of  $\sigma$  are enough close.

The normalized distributions for  $\Lambda$  for MC and real data are shown on Fig. 2. The shown value( $t$ ) is the difference between the invariant mass of  $p$  and  $\pi(M_{p\pi})$  and the table mass value of  $\Lambda(M_{\Lambda table})$ , divided by  $\sigma$  of  $M_{p\pi}$ :  $t = (M_{p\pi} - M_{\Lambda table})/\sigma_{M_{p\pi}}$ . For MC distributions the proportional bias was added also.

For real data the value of  $\sigma_t$  is equal to 1. For MC data the value of  $\sigma_t$  is about 0.94 and does not depend on  $\Lambda$  momentum. It means that some effects are not taken into account in GEANT-DIRAC simulation.

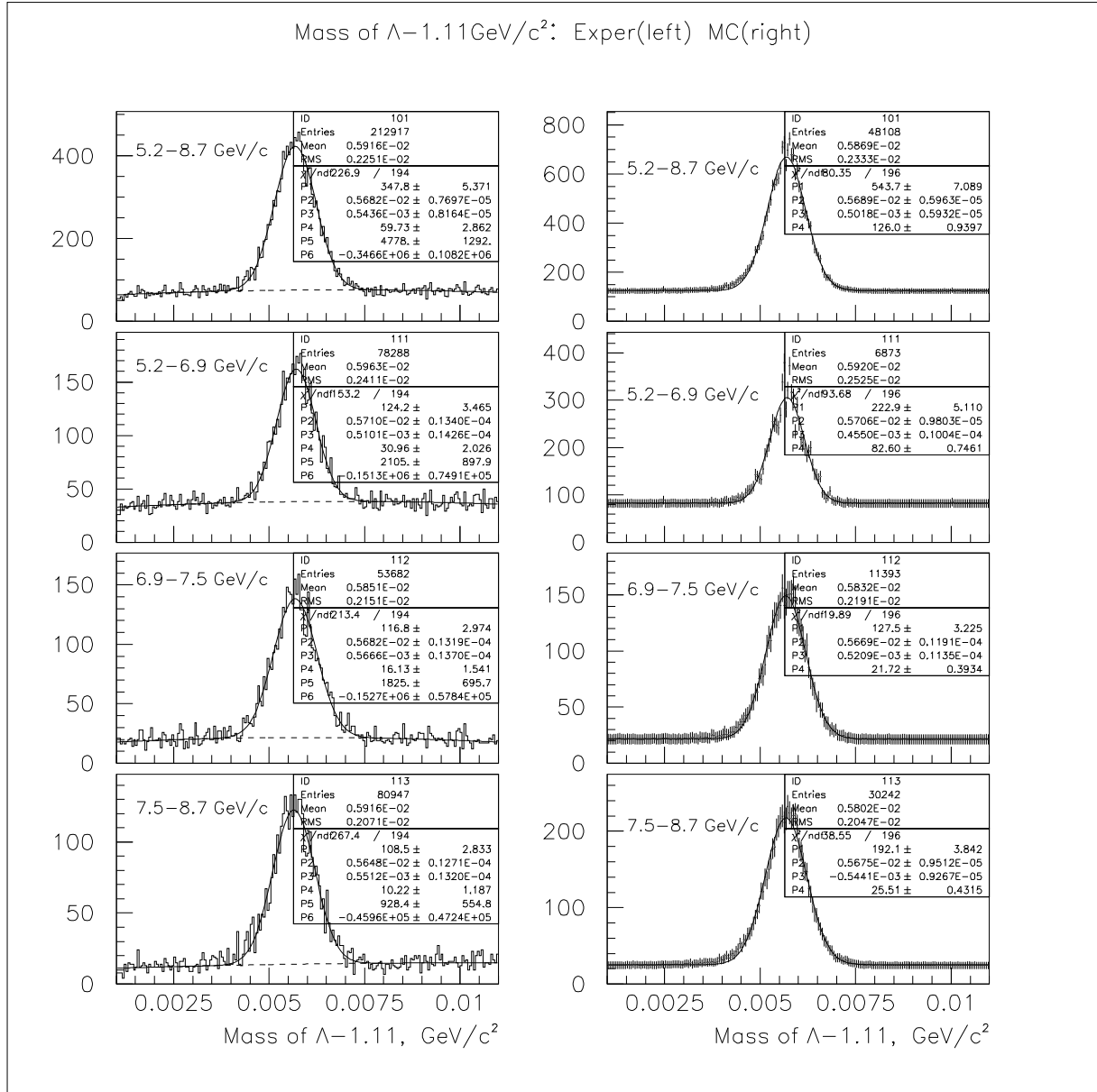


Figure 1: MC and real data. The distributions of invariant mass of proton and pion for different intervals of lambda momentum. P2 - the center of Lambda peak, P3 - its Gaussian width.

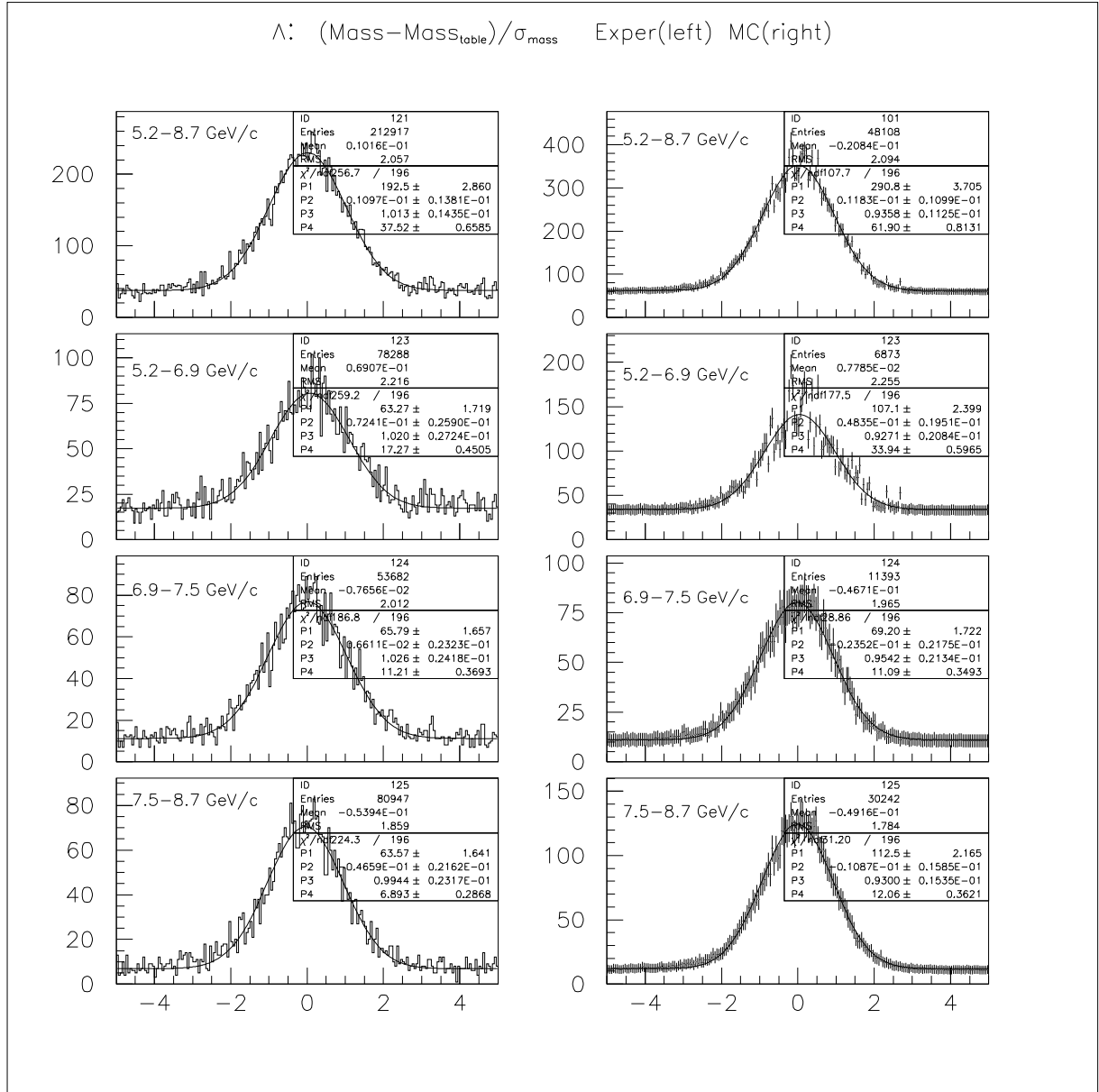


Figure 2: *MC and real data. The difference between the invariant mass of p and  $\pi$  ( $M_{p\pi}$ ) and the table mass value of  $\Lambda$  ( $M_{\Lambda_{table}}$ ), divided by  $\sigma$  of  $M_{p\pi}$ :  $(M_{p\pi} - M_{\Lambda_{table}}) / \sigma_{M_{p\pi}}$ .*

## References

- [1] P.Kokkas [Un.Ioannina], DIRAC Note 2004-04.
- [2] O.Gorchakov [JINR], DIRAC Note 2005-21.
- [3] O.Gorchakov [JINR], DIRAC Note 2007-05.