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The Lambda peak width for data samples at different years, comparison with MC results.

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1 Preface

In this work we continue the analysis of lambda peaks for real and MC data. Before we analyzed the data of year 2001 and data with target of 94μ but now this job was done for year 2002 and 2003. Now we also analyze the dependence of Lambda peak width and its position on the value of z-coordinate of exit Al membrane.

This analysis was done for five data sets: 1) year 2001, target=94μ;2)year 2001, target=98μ;3)year 2002, proton beam momentum - 20 GeV/c; 4)year 2002, proton beam momentum - 24 GeV/c and 5) year 2003. Corresponding results were obtained for MC data also.

There were selected the proton-pion pairs with total momentum from 5.0 to 8.6 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.-6.4-7.1-8.6GeV/c). The real data distributions were fitted by the function which is the sum of Gaussian and polynomial of the second degree. The last one describes the background.

The used fitting procedure was the standard one - MINUIT. In the principle it is the problem for all the fitting procedures to obtain the most correct values of errors of parameters. As in our case the real data distributions have some background whereas the MC ones don't have it(it means that MC distributions have the tails which fall up to zero) and , in principle, this fact could influence on the result for fitting of MC distributions then the MC distributions were slightly modified to make the fitting conditions equal for both types of data: the proportional constant "background" was added to each MC distribution(the ration of peak/background must be the same for MC and real data). The MC data distributions were fitted therefore by the function which is the sum of Gaussian and polynomial of the second degree.

On the Fig. 1 the widths of MC and real data Lambda peak for all five data samples are shown. The MC and real data widths are different and they depend on the sample type: they increase with sample date but for MC data the growth is about two times less. On the Fig. 2 the widths of MC and real data Lambda peak for all five data samples and for three lambda momentum intervals are shown. The widths depend on the momentum.

The ratio of these widths are shown on the pictures Fig.3 and 4. The ratio depends on sample date and momentum: it increases with both parameters increasing.

Then we studied how the lambda peak width and position depend on the value of the exit membrane position in Z-coordinate. On Fig.5 and 6 the dependence of Lambda peak position on the position of membrane are shown and we found the value of $Z_{membrane}$ at

which the peak position coincides with table value of Lambda mass: $Z_{optimal} = 143.95 \pm 0.03$cm for MC case and $Z_{optimal} = 143.93 \pm 0.04$cm for real data.

On Fig.7 and 8 the dependence of Lambda peak width on the position of membrane are shown and we found the value of $Z_{membrane}$ at which the peak width gets minimal value. $Z_{optimal} = 144.278 \pm 0.001$cm for MC case and $Z_{optimal} = 142.727 \pm 0.002$cm for real data.

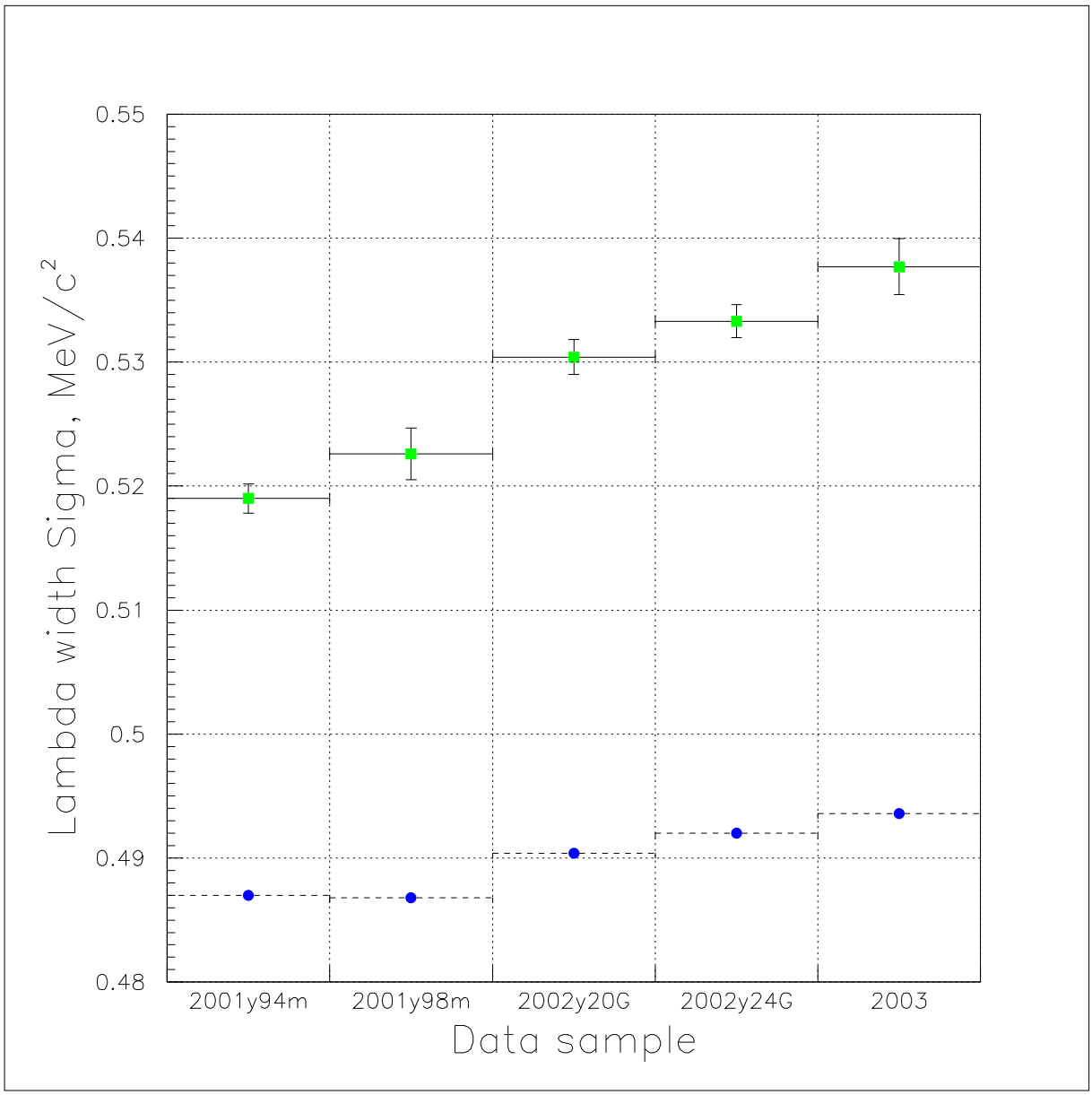

Figure 1: *MC and real data. The width of Lambda peak for five data samples. Blue marks - MC data, green ones - real data.*

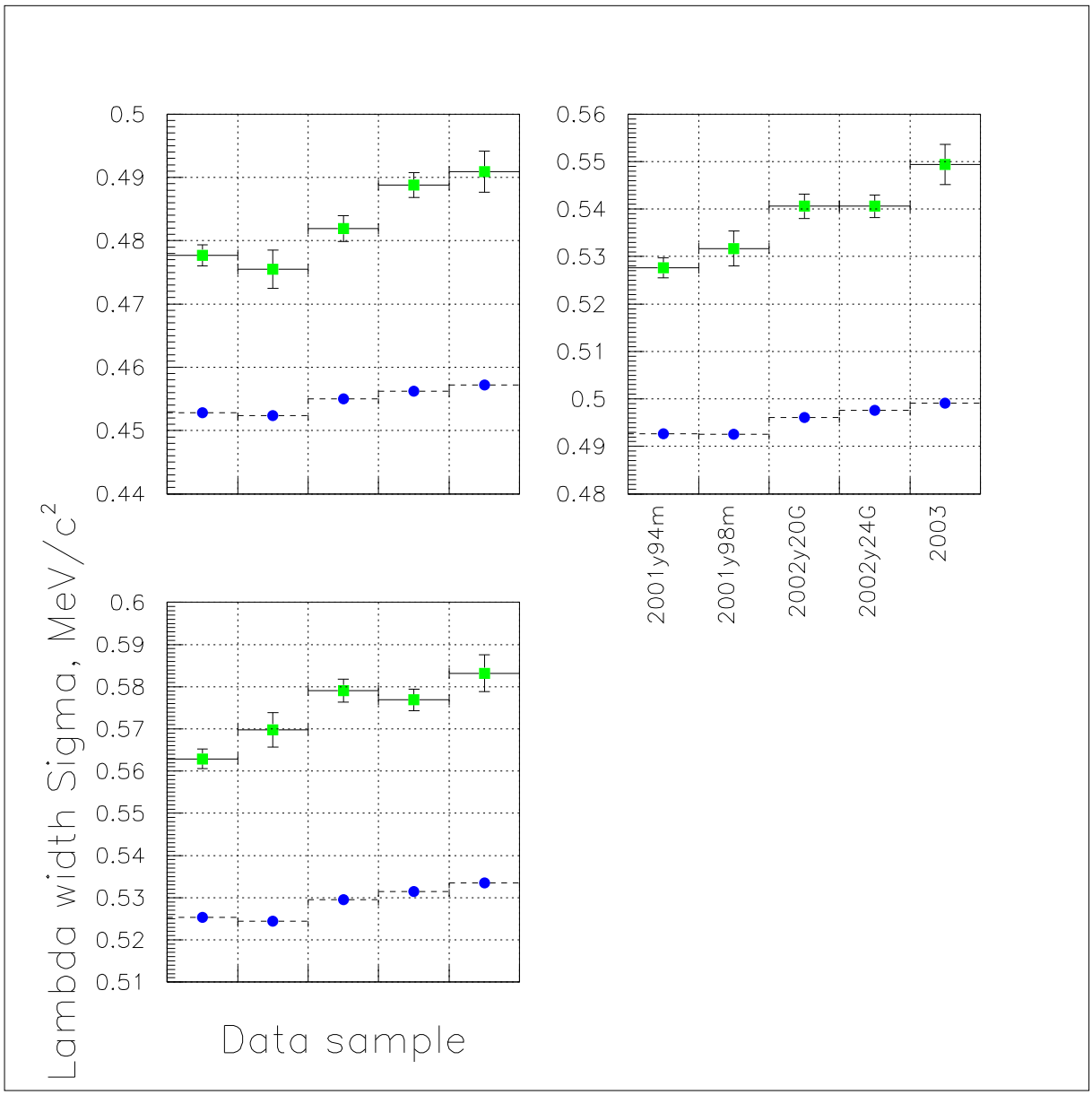

Figure 2: *MC and real data. The width of Lambda peak for five data samples. Blue marks - MC data, green ones - real data. On the top: left picture - Lambda momentum between 5 and 6.4 GeV/c, right one - from 6.4 to 7.1, on bottom - from 7.1 to 8.6.*

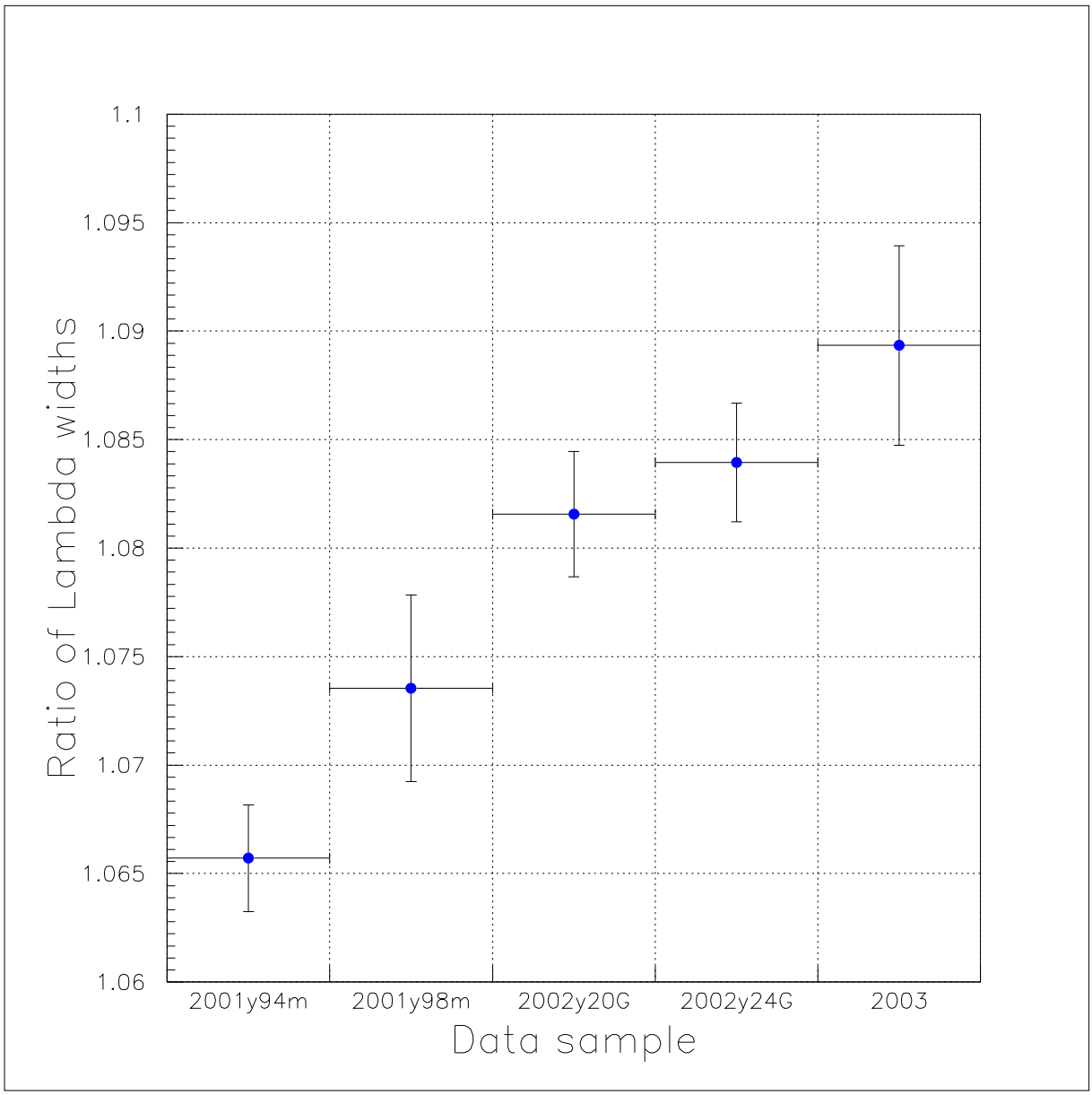

Figure 3: *The ratio of Lambda peak width of MC and real data for five data samples.*

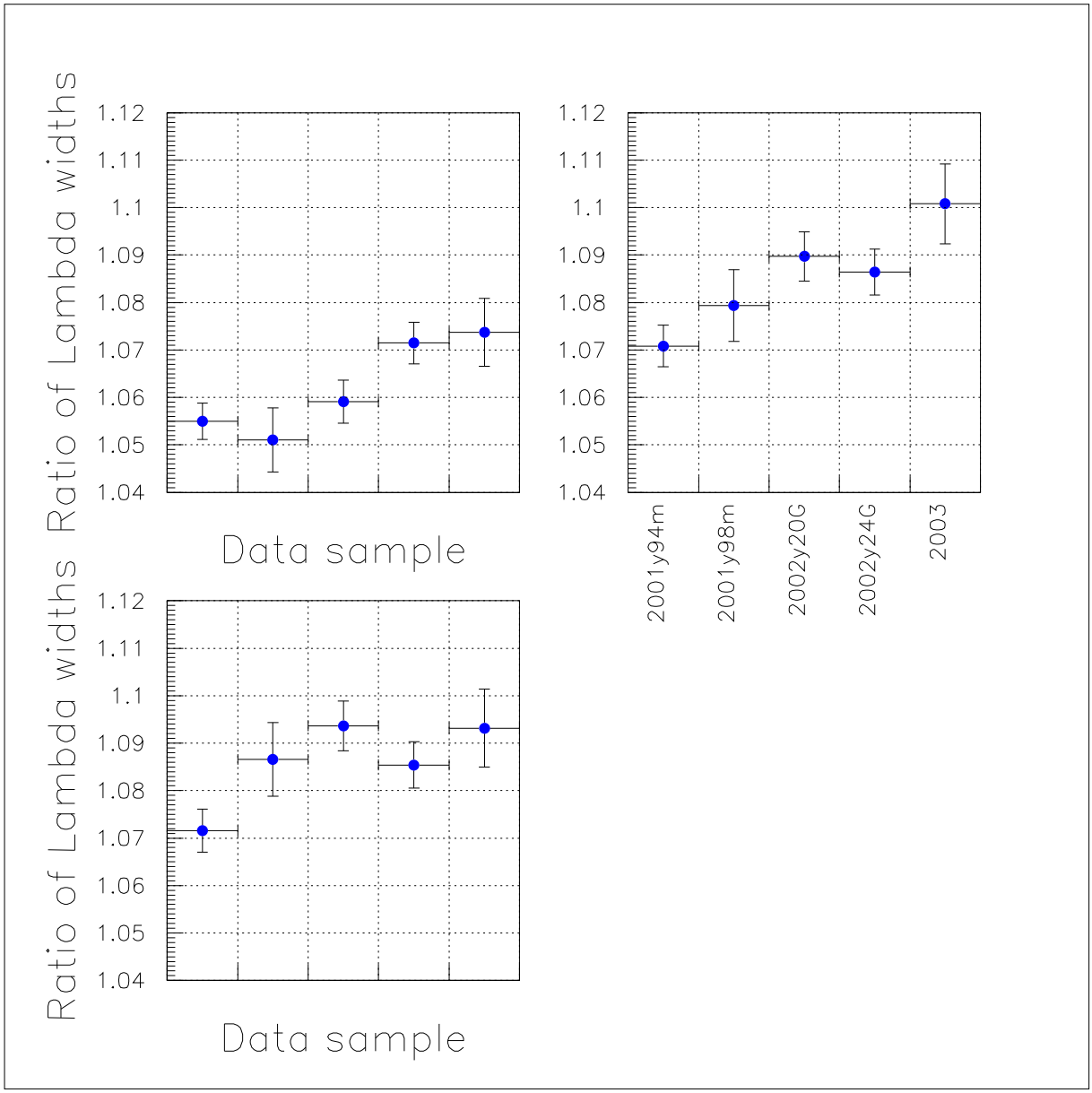

Figure 4: *The ratio of Lambda peak width of MC and real data for five data samples. The width of Lambda peak for five data samples. Blue marks - MC data, green ones - real data. On the top: left picture - Lambda momentum between 5 and 6.4 GeV/c, right one - from 6.4 to 7.1, on bottom - from 7.1 to 8.6.*

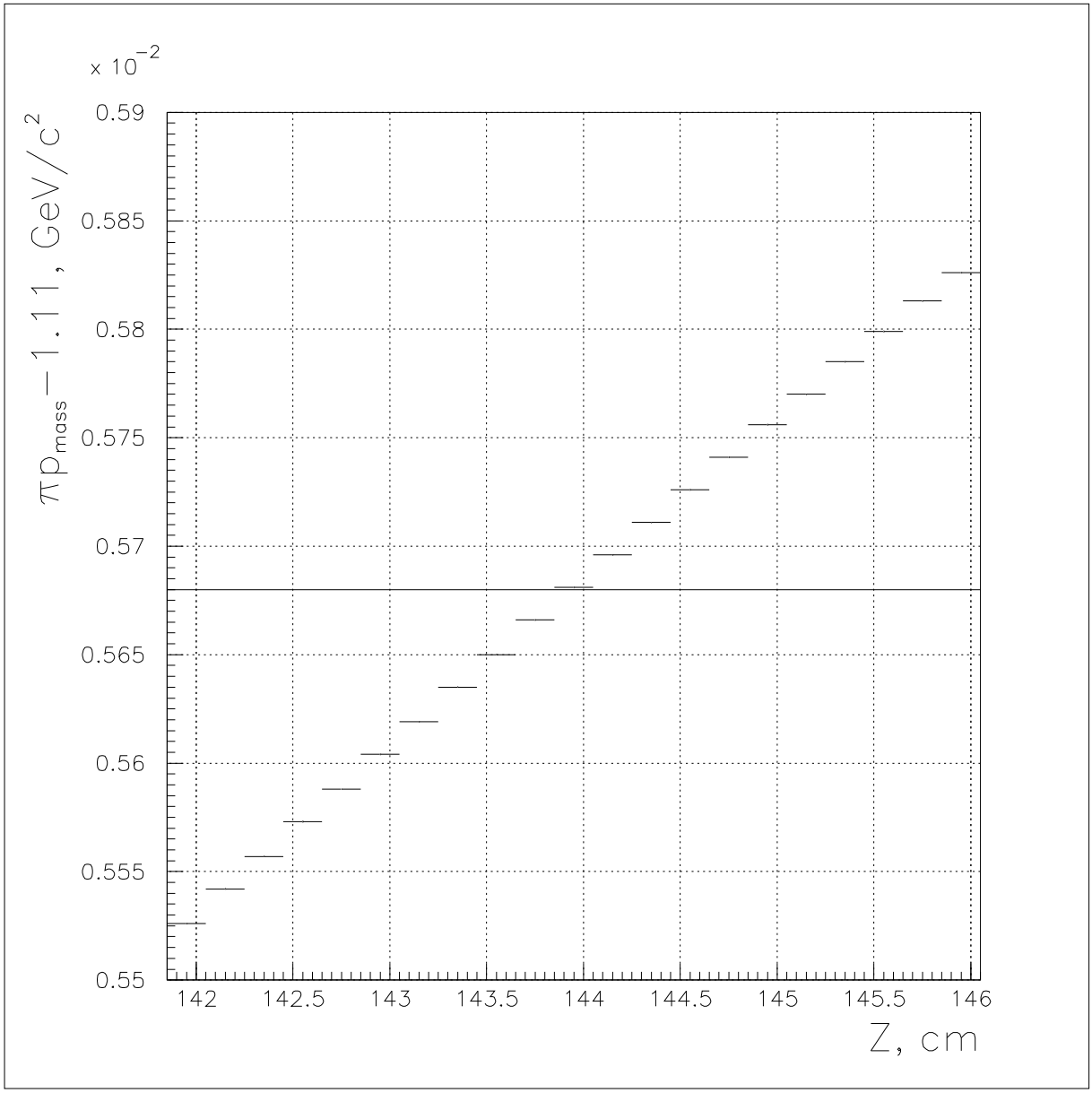

Figure 5: *The MC sample. The dependence of Lambda peak position($M_\Lambda - 1.11 GeV/c^2$) on the Z-position of membrane. Horizontal line corresponds to the table value of Lambda mass.* $Z_{optimal} = 143.95 \pm 0.03 cm$.

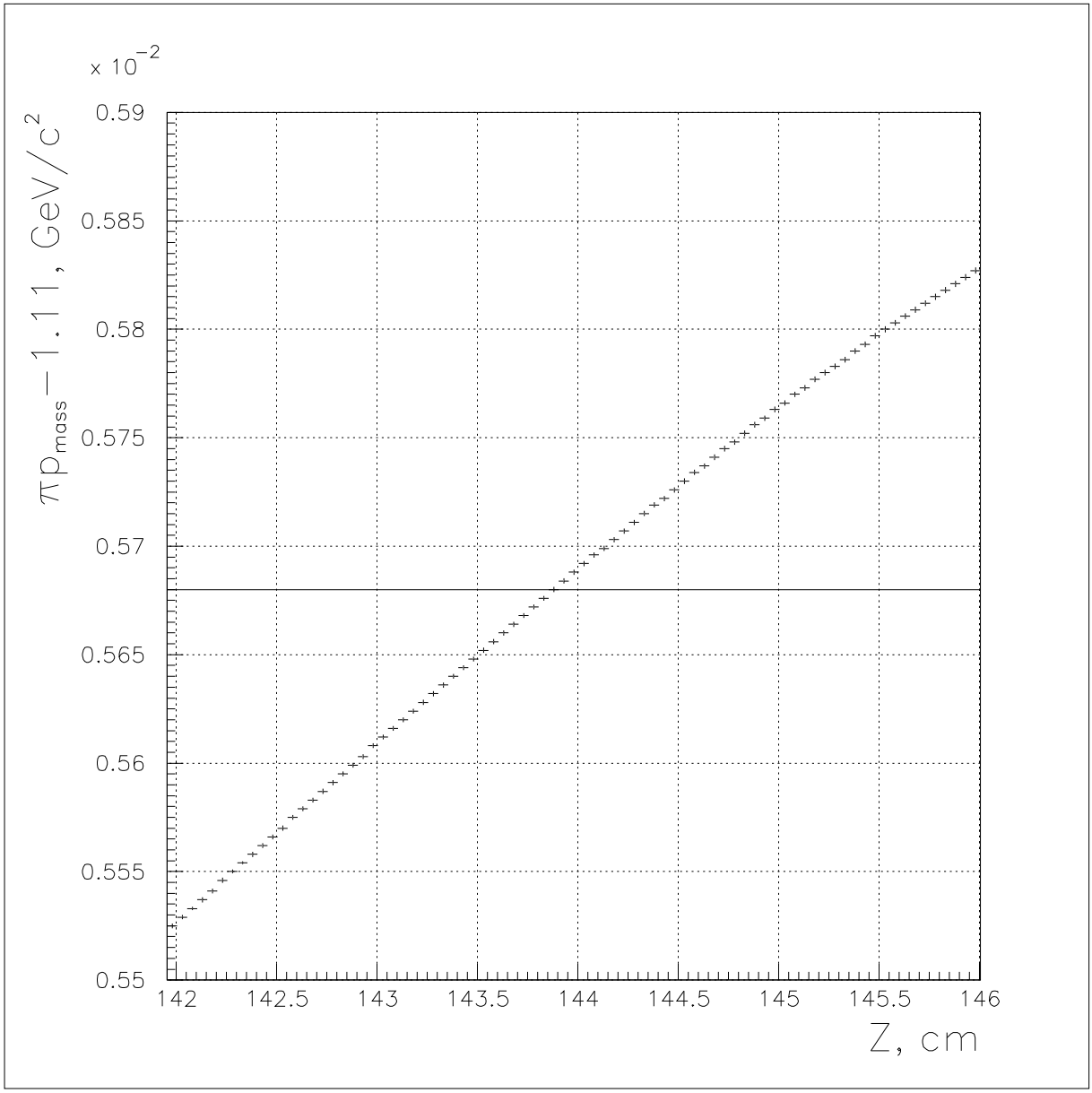

Figure 6: *The real data sample. The dependence of Lambda peak position($M_\Lambda - 1.11 GeV/c^2$) on the Z-position of membrane. Horizontal line corresponds to the table value of Lambda mass.* $Z_{optimal} = 143.93 \pm 0.04 cm$.

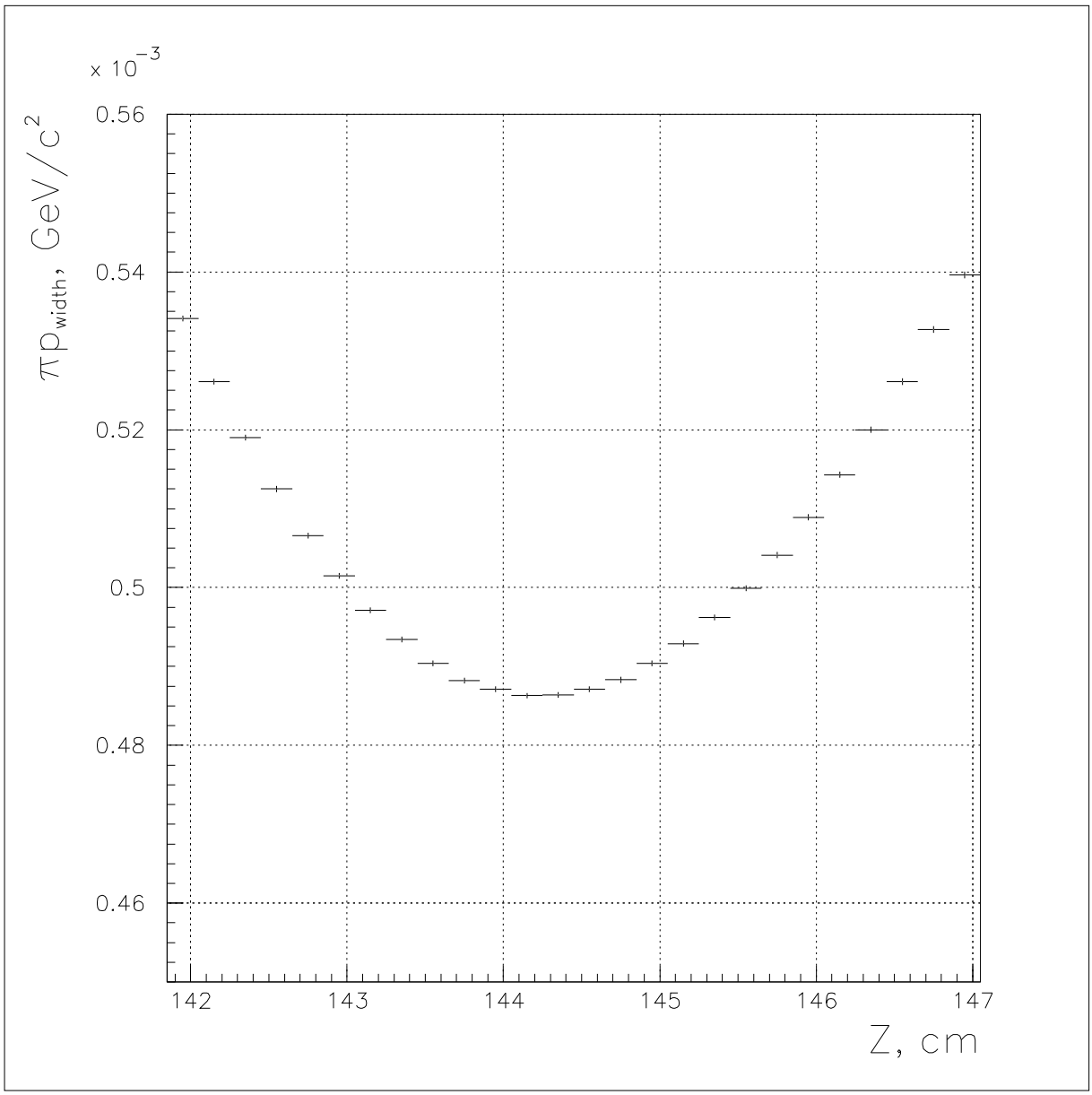

Figure 7: *The MC sample. The dependence of Lambda peak width on the Z-position of membrane.* $Z_{optimal} = 144.278 \pm 0.001 cm.$

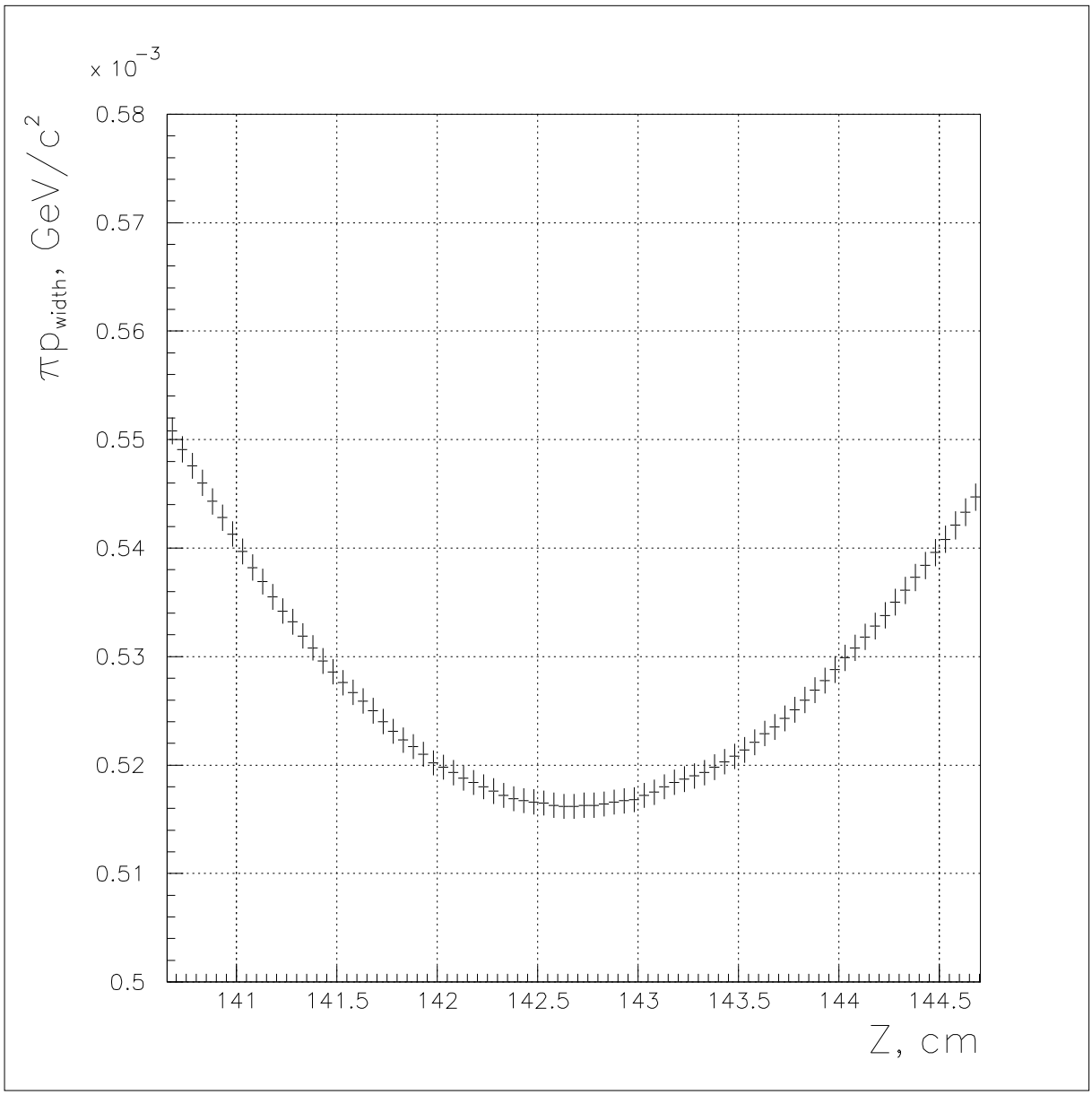

Figure 8: *The real data sample. The dependence of Lambda peak width on the Z-position of membrane.* $Z_{optimal} = 142.727 \pm 0.002 cm.$