

Reconstruction of Σ^+ in p+C collisions at 30 GeV with ECAL

S.M. Kiselev

ITEP, Moscow, Russia

The feasibility of the Σ^+ reconstruction by the decay $\Sigma^+ \rightarrow p\pi^0$ was studied on a sample of 10^6 p+C ($b=0$ fm) events from UrQMD at the SIS-100 energy 30 GeV (cbmroot trunk MAY09, reconstructed in ECAL by M.Prokudin). The ECAL wall with a size of $X \times Y = 12 \times 9.6$ m² containing a beam hole of 0.8×0.8 m² is distanced from the target at 12 m downstream.

PID information is not used in the analysis. A positively charged track is named by "accepted" if it has MC points in at least four STS stations (placed at 30, 35, 40, 50, 60, 75, 95, 100 cm from the target) and by "reconstructed" if it has the reconstructed track (≥ 70 % of track hits belong to the same MC track). The impact parameter cut > 5 (in σ) is used to reject primary tracks with positive charge (~ 12 per event).

In [1] the reconstruction of π^0 was analyzed. About 50 % of "vertex" photons are lost in the detector systems placed before the ECAL (RICH, TRD and TOF). For the current analysis reconstructed photons with $p > 0.7$ GeV/c were used. Invariant mass distributions for $\gamma\gamma$ pairs with $p_{\gamma\gamma} > 0.2$ GeV/c are displayed in Fig 1. For π^0 candidates

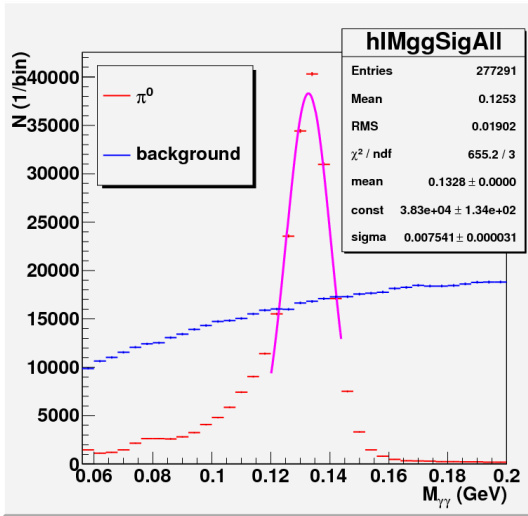


Figure 1: Invariant mass spectra of $\gamma\gamma$ pairs for p+C at 30 GeV

the pairs with $0.12 < M_{\gamma\gamma} < 0.14$ GeV were selected.

Fig. 2 shows the invariant mass distributions of $p\pi^0$ pairs. We obtain a signal-to-background ratio (S/B) of about 8 % with a significance of 1.8. In order to achieve a reasonable significance level of about 10 an event statistics of the order of 10^7 is required.

The main characteristics of the analysis are summarized in Table 1. With the current statistics (43 reconstructed signal pairs) it is not possible to study the dependence of the

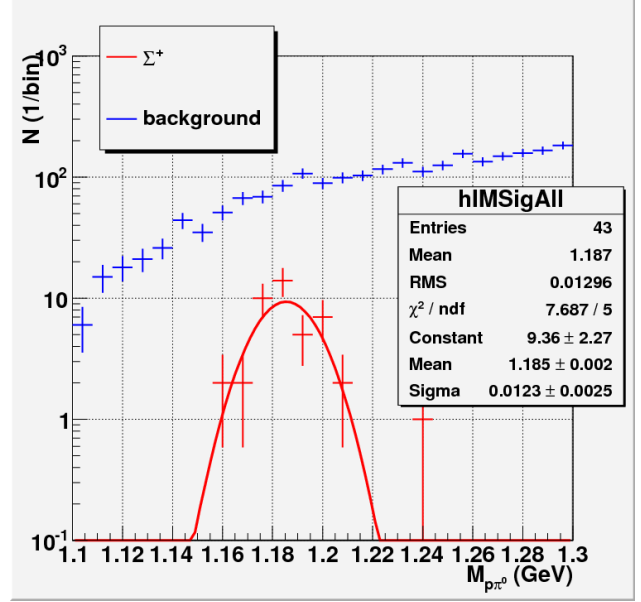


Figure 2: Invariant mass spectra of signal and background $p\pi^0$ pairs for p+C at 30 GeV

Table 1: Main characteristics of the Σ^+ analysis for p+C at 30 GeV

characteristic	value
statistics (events)	10^6
yield/event	0.03
acceptance efficiency	2.3 %
reconstruction efficiency	43 %
cut efficiency	14 %
total efficiency	0.14 %
σ (MeV)	12.3
S/B _{2σ}	8.0 %
significance	1.8

S/B on transverse momentum. The physical motivation for the presented study as well as more analysis details can be found in [2].

References

- [1] S. M. Kiselev, *CBM Progress Report 2009*, Darmstadt 2010, p. 69
- [2] S.M. Kiselev, *Reconstruction of hyperons with ECAL in p+C at SIS100*, 15th CBM collaboration meeting, April 12-16, 2010, GSI, Darmstadt, <https://www.gsi.de/documents/DOC-2010-Apr-64-1.pdf>