FREQUENCY OF HIGHLY ENERGETIC PIONS PRODUCED IN NEUTRAL STARS

Numbers for the estimation of neutral star background in the neutrino experiment

Neutral stars in CF_3Br (Exp. R 7 : 4 GeV/c π⁻) have been investigated in order to estimate the neutral star background in the neutrino - experiment using the number of clearly identified neutral stars in the neutrino - experiment (for instance : stars without any negative track). A total of 35 events (with an energy above 0.5 GeV/c) have been measured. In the scanning for these neutral stars two prong events have been disregarded to avoid confusion with V_0. In these neutral stars highly energetic negative pions are very rare, but very low energy negative pions (interacting, highly scattered or stopping) occur quite often. Therefore the following numbers are valid only for pions with momentum higher than 150 MeV/c.

1) Produced : π⁻
   non-interacting in 30 cm 4
   interacting(partially low-energy)in 30 cm 9

2) fast⁺/π⁻ ratio :
   (fast⁺ = π⁺ and highly energetic p)
   fast⁺ (non-interacting inside 16 cm) 37
   π⁻ ( " " " ) 7
   fast⁺/π⁻ ratio : 5.3 ± 2.2

3) Frequency of events
   total number 35
   only positive particles 8)} 14 without any negative track
   " " " and π⁰ 6
Events with $\pi^-$ interacting 8
" " $\pi^-$ non-interacting (in 30 cm) 4

In the remaining 9 events negative pions interacting or stopping of very low energy ($P_\pi < 150$ MeV/c) are involved.

Conclusion

For every $\chi$ neutral stars $X^0$ ($E > 0.5$ GeV) found with only fast positives or $\pi^0$ in the neutrino - experiment, there should be expected $X \cdot 0.36 \pm X \cdot 0.14$ neutral stars having a negative pion ($P_\pi > 150$ MeV/c) interacting in 30 cm and $X \cdot 0.18 \pm X \cdot 0.1$ neutral stars (having a highly energetic non-interacting $\pi^-$) which will be confused with neutrino events. The number $X$ found up to now is 5.

This rough estimation may be sufficient for the time being. If after the next part of the neutrino - experiment a big number of identified neutral stars is found one could make a more accurate estimation. Therefore it would be necessary that the neutral stars (energy distribution Fig. 1) are for the comparison selected so, that the energy distribution of the selected events and the energy distribution of the identified neutral stars in the neutrino - experiment are equal.

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X) From the possible neutral stars have to be reduced the expected number of anti-neutrino events.

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Energy distribution of neutral stars (R7)