

kbar and at room temperature, and which has a monoclinically distorted structure of the SnS type [5].

We observed transitions of Sb-III into the superconducting state in the pressure region 90 - 100 kbar. The transition temperature in this pressure interval was practically independent of the pressure ($T_c = 3.52^\circ\text{K}$ at $p = 93$ kbar and $T_c = 3.53^\circ\text{K}$ at $p = 100$ kbar). This result agrees well with the data of [6], where the superconductivity of antimony was specially investigated in the pressure interval 85 - 150 kbar, both when it comes to the value of T_c ($T_c = 3.55^\circ\text{K}$ at $p = 85$ kbar), and when it comes to dT_c/dp .

In conclusion, the authors consider it their pleasant duty to thank Academician L. F. Vereshchagin for support and interest, and N. V. Baryshev for help with the experiment.

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PRODUCTION OF Ξ^- HYPERONS IN π^-p INTERACTIONS AT 5.1 GeV/c

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Joint Institute for Nuclear Research

Submitted 24 November 1969

ZhETF Pis. Red. 11, No. 1, 28 - 31 (5 January 1970)

We report here the observation of the decays of the cascade hyperon $\Xi^- \rightarrow \Lambda + \pi^-$ and a determination of its production cross section in π^-p interactions at 5.1 GeV/c in a meter propane bubble chamber [1].

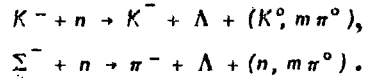
We selected for the analysis events satisfying the π^-p interaction criteria, where the negative secondary track emerging from the star had the kink characteristic of the $\Xi^- \rightarrow \Lambda + \pi^-$ decay; the V^0 -particle decay was associated with this kink. Double scanning of 230 000 photographs (with efficiency 93%) yielded 28 such events.

The selected events were measured and then processed with a BESM-4 computer using the geometrical reconstruction programs [2] and kinematic identification [3]. An event was identified as a Ξ^- -hyperon decay if its kinematics agreed with the $\Xi^- \rightarrow \Lambda + \pi^-$ decay, the ionization of each of the tracks did not contradict the Ξ^- -decay hypothesis, and the effective ($\Lambda + \pi^-$) mass did not differ from the mass $M_{\Xi^-} = 1321 \text{ MeV}/c^2$ by more than $50 \text{ MeV}/c^2$ (corresponding approximately to five standard deviations in the effective mass). These criteria were satisfied for 6 of the 28 events.

The main source of the background was the imitation of the $\Xi^- \rightarrow \Lambda + \pi^-$ decay by inelastic interactions of secondary negative particles with the quasi-free neutron of carbon:

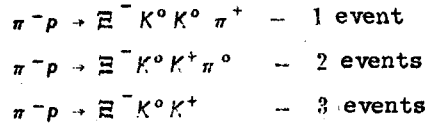
$$\pi^- + n \rightarrow \pi^- + \Lambda + (K^0, m\pi^0),$$

$$K^- + n \rightarrow \pi^- + \Lambda + (m\pi^0),$$



The analysis has shown that none of the six selected events can be related to these background reactions.

The kinematic parameters of the Ξ^- hyperon, obtained from the analysis of the $\Xi^- \rightarrow \Lambda + \pi^-$ decay, were used to identify the reaction channel in which the Ξ^- hyperon was produced. For all six events, the reaction channel was identified uniquely:



The total Ξ^- -hyperon production cross section was obtained from the cross section for one event in the given experiment (0.27 $\mu\text{b}/\text{event}$) [4] with allowance for the corrections for the weights of the Ξ^- hyperons and the scanning efficiency, and equals

$$\sigma = (2.9_{-1.0}^{+1.8}) \mu\text{b}.$$

The cross section obtained by us is compared in the table with the cross sections obtained for Ξ^- -hyperon production in $\pi^- p$ interactions at other energies.

π^- momentum, GeV/c	Number of events	Cross section, μb	Reference
3.0	1	1 ± 1	[5]
4.0	5	$1.5_{-0.6}^{+0.7}$	[6]
5.1	6	$2.0_{-1.0}^{+1.8}$	Our data
5.5	2	$2.3_{-1.6}^{+3.1}$	[7]
6.8	1	$3.6_{-2.1}^{+2.5}$	[8]
8.0	10	$10.6_{-3.2}^{+4.4}$	[8]
10.0	12	15.5 ± 4.5	[9]

As seen from the table, the cross section for the production of Ξ^- hyperons in $\pi^- p$ interactions increases smoothly with the energy, within the limits of experimental errors.

The author is grateful for the laboratory group for help in scanning and processing the photographs.

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STUDY OF THE MASS SPECTRUM OF THE ΛK SYSTEM IN $\pi^- p$ INTERACTIONS AT 4 AND 5.1 GeV/c

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Joint Institute for Nuclear Research

Submitted 24 November 1969

ZhETF Pis. Red. 11, No. 1, 31 - 35 (5 January 1970)

We report here the results of the study of the effective-mass spectrum of the ΛK system, obtained in an investigation of $\pi^- p$ interactions in the 24-liter [1] (High-energy Laboratory) and the meter [2] (Nuclear Problems Laboratory) propane bubble chambers irradiated by 4 and 5.1 GeV/c pion beams, respectively, from the JINR proton synchrotron.

The structure of the effective-mass spectrum of the ΛK system is of interest from the point of view of observing new resonances with zero strangeness and the decays of various isobars in the $N^* \rightarrow \Lambda + K$ channel for the purpose of determining the relative probabilities of such decays.

The first serious indication of the existence of a resonance structure in the K effective-mass spectrum was obtained in [3], where a resonance of mass $M_{\Lambda K^+} = (1700 \pm 25) \text{ MeV}/c^2$ and width $\Gamma = (170 \pm 50) \text{ MeV}/c^2$ was observed in the reaction $\pi^- p \rightarrow \Lambda K^+ \pi^-$ at 6 GeV/c. This resonance can be attributed to the isobar decay $N^*(1688) \rightarrow \Lambda + K^+$. A peak in the effective-mass spectrum of ΛK^0 and ΛK^+ , with $M = (1755 \pm 21) \text{ MeV}/c^2$ and $\Gamma = (221 \pm 58) \text{ MeV}/c^2$, produced in a $\pi^+ p$ interaction at 8 GeV/c, was reported in [4]. The existence of this peak is attributed to the decay of the isobars $N_{1/2}^*(1710)$ and $N_{1/2}^*(1750)$. The mass spectra obtained in [5] for the ΛK system in pp interactions at 8 GeV/c agree with the presence of a resonance with $M = 1777 \text{ MeV}/c^2$ and width $\Gamma = 345 \text{ MeV}/c^2$. Finally, in [6] they observed an appreciable excess of events over the background in the ΛK mass spectrum at $M = 1680 \text{ MeV}/c^2$ in the photoproduction reaction $\gamma p \rightarrow \Lambda K^0 \pi^+$ ($\pi^0 \dots$), and the existence of this peak cannot be attributed to the decay of an isobar N^* with mass close to $1680 \text{ MeV}/c^2$, since no isobar $N^*(1680) \rightarrow p \pi^-$ was observed in the reaction $\gamma p \rightarrow p \pi^- \pi^+$.

The data that follow were obtained by processing approximately 230 000 photographs from the 24-liter chamber and 230 000 photographs from the meter chamber. The photograph processing procedure was described in earlier papers (cf., e.g., [7, 8]).

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