

L 1553-66 FSS-2/EWT(1)/FS(v)-3/FCC/EWA(d)/EWA(h) TT/GS/GW

ACCESSION NR: AT5023610

UR/0000/65/000/000/0394/0405

AUTHOR: Vernov, S. N.; Chudakov, A. Ye.; Vakulov, P. V.; Gorchakov, Ye. V.;
 Kuznetsov, S. N.; Logachev, Yu. I.; Nikolayev, A. G.; Sosnovets, E. N.;
 Rubinshteyn, I. A.; Stolpovskiy, V. G.; El'tekov, V. A.

TITLE: Geometric position and particle composition of the earth's radiation belts

SOURCE: Vsesoyuznaya konferentsiya po fizike kosmicheskogo prostranstva. Moscow, 1965. Issledovaniya kosmicheskogo prostranstva (Space research); trudy konferentsii. Moscow, Izd-vo Nauka, 1965, 394-405

TOPIC TAGS: cosmic radiation, earth radiation belt, cosmic ray, Elektron 1, Elektron 2

ABSTRACT: An exhaustive study is made of data recorded by the Elektron-1 and -2 satellites, which were launched on 30 January 1964. Orbital data are given in Table 1 of the Enclosure. The first orbits were positioned so that the satellites passed their apogee at about 3 o'clock a.m. local time. The outer boundary of the radiation belt was thus crossed at about midnight and again at about 7-8 a.m. on the return branch of the orbit. The subsequent orbits were shifted toward the sunset: Elektron-1, by 8 min, and Elektron-2, by about 4 min in the 24-hr period. Elek-

Card 1/4

L 1553-66

ACCESSION NR: AT5023610

tron-1 and -2 were equipped with similar instrumentation. In some cases, however, there were differences in energy thresholds. A chart summarizing all data shows the electron and proton fluxes of different energies in the equatorial plane and for comparison gives IMP-1 data. The following conclusions can be made from the chart: 1) A belt of artificially injected electrons exists at distances closest to the Earth's center. The maximum of the belt in February 1964 was at $L = 1.35$. The flux of electrons with energy above 2 Mev at the maximum was about $1 \times 10^7 \text{ cm}^{-2} \cdot \text{sec}^{-1} \cdot \text{ster}^{-1}$. 2) The average directed flux of protons with an energy of 45-70 Mev at the maximum of the inner belt ($L = 1.45$) was about $1.5 \times 10^3 \text{ cm}^{-2} \cdot \text{sec}^{-1} \cdot \text{ster}^{-1}$. A change in the integral spectrum at proton energies above 50 Mev was observed at $L = 2.2$; the spectrum of these energies is in the process of hardening, which could be explained by the theory of albedo neutrons. 3) The spatial distribution of protons with an energy of one to several Mev differs from that of the electrons. There is a definite regularity in the distribution of protons according to their energies. The average directed flux of protons with an energy above 2 Mev was about $4.5 \times 10^5 \text{ cm}^{-2} \cdot \text{sec}^{-1} \cdot \text{ster}^{-1}$ in the equatorial plane at $L = 2.8$. It appears that the majority of the protons in this energy range are created by transverse drift with respect to the magnetic field lines. 4) A belt of high-energy electrons was observed at $L = 2.75$. Its width at the equator was about 0.4 earth radii. The average directed flux of electrons above 6 Mev was about $10^2 \text{ cm}^{-2} \cdot \text{sec}^{-1} \cdot \text{ster}^{-1}$. 5) A minimum of distribution

Card 2/4

L 1553-66

ACCESSION NR: AT5023610

of electrons of above 150 kev energy was observed in the region between $L = 3$ and $L = 4$. The altitude intensity shift is subject to large fluctuations in time and may drop at times to negligible magnitudes. 6) The maximum of the outer belt is positioned, on the average, at $L = 4.8$. The maximum altitude intensity shift indicator $m = 0.5 + 0.3 / - 0.2$ within a wide range of L . There is a sharp intensity jump on the night side at $L = 7 + 0.5$. On the morning side, a slow monotonic drop of intensity was observed. The average directed flux of electrons with an energy of over 70 kev at the maximum of the outer belt is about $5 \times 10^6 \text{ cm}^{-2} \cdot \text{sec}^{-1} \cdot \text{ster}^{-1}$ and can change by more than an order of magnitude. The electron energy spectrum observed within the 70 to 600 kev range is in agreement with the data of other researchers. The electron energy spectrum in the energy range above 1 Mev appears to be softening, in comparison with measurements of earlier years. Orig. art. has: 11 figures.

[FP]

ASSOCIATION: none

SUBMITTED: 02Sep65

NO REF SOV: 007

ENCL: 01

OTHER: 004

SUB CODE: AA, SV

ATD PRESS: 4094

Card 3/4

L 1553-66

ACCESSION NR: AT5023610

ENCLOSURE: 01

Table 1. Orbital data

	Elektron-1 (low altitude)	Elektron-2 (high altitude)
Altitude, apogee	7, 140 km	68,200 km
Altitude, perigee	406 km	460 km
Orbital period	2 hr 48 min	22 hr 30 min
Inclination of orbital plane	61°	61°
Period of rotation	40 sec	120 sec

Card 4/4

3D

L 2886-66

FSS-2/EWT(1)/FS(v)-3/FCC/EWA(d)/EWA(h) TT/GS/GW

ACCESSION NR: AT5023607

UR/0000/65/000/000/0381/0387

AUTHOR: Vernov, S. N.; Mel'nikov, V. V.; Savenko, I. A.; Savin, B. I.; Pervaya, T. I.

TITLE: Recording of charged particles of energies of 0.1—10 keV with a spherical electrostatic analyzer 34

SOURCE: Vsesoyuznaya konferentsiya po fizike kosmicheskogo prostranstva. Moscow, 1965. Issledovaniya kosmicheskogo prostranstva (Space research); trudy konferentsii. Moscow, Izd-vo Nauka, 1965, 381-387

TOPIC TAGS: satellite, satellite data storage, particle counter, electron density, ion density/Elektron 2 satellite

ABSTRACT: Identical spherical electrostatic analyzers were used to record positive and negative particles with energies of up to 1 keV on Cosmos-12 and Cosmos-15 and up to 10 keV on Elektron-2. Each analyzer was comprised of a spherical capacitor some 60 mm in diameter, with input apertures leading to plates spaced 12 mm apart, on which a periodic high voltage was programmed so as to allow passage through the annular gap of only particles of a desired energy range. A Faraday cylinder at the

Card 1/3

L 2886-66

ACCESSION NR: AT5023607

gap output served as the collector. The input apertures and the Faraday cylinder were furnished with biased grids to eliminate thermal particles and secondary emission, respectively. A diagram of the two analyzers used on Elektron-2 is shown in Fig. 1 of the Enclosure; accumulated charge was converted to binary code. The Cosmos data generally showed that electron flux at the 1-kev level did not exceed $10^7/cm^2/sec/kev$ at night and was only slightly higher by day. A maximum was noted during the southernmost portions of orbit, in a region south of New Zealand, attaining up to $12 \times 10^8/cm^2/sec/kev$. Electron fluxes recorded on Elektron-2 showed strong variations at sunrise and sunset (referred to the satellite); these variations reached values on the order of $10^9/cm^2/sec/kev$. Irregular variations in flux readings correlated with known geomagnetic events observed during the flight. Data show that the satellite was at all times within the magnetosphere. Positive ion flux registered by Elektron-2 in the 0.1-10-kev range did not exceed $5 \times 10^7/cm^2/sec$. Orig. art. has: 5 figures and 1 table. [SH]

ASSOCIATION: none

SUBMITTED: 02Sep65

ENCL: 01

SUB CODE: ES, NP

NO REF SOV: 008

OTHER: 003

ATD PRESS: 4109

Card 2/3

L 2886-66

ACCESSION NR: AT5023607

ENCLOSURE: 01

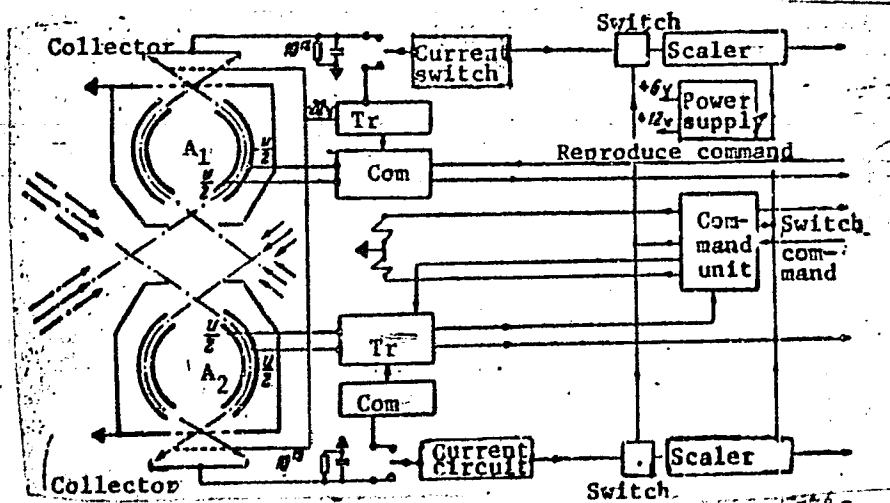


Fig. 1. Spherical particle analyzer on Elektron-2

Tr - High voltage transformers; Com - commutators;
A₁ - 0.1-1 keV range; A₂ - 1-10 keV range

Card 3/3

L 3281-66 FSS-2/EWT(1)/FS(v)-3/FCC/EWA(d)/EWA(h) TI/GS/GW
ACCESSION NR: AT5023614 UR/0000/65/000/000/0425/0433

AUTHOR: Vernov, S. N.; Chudakov, A. Ye.; Vakulov, P. V.; Kuznetsov, S. N.;
Logachev, Yu. I.; Sosnovets, E. N.; Stolpovskiy, V. G.

TITLE: Irregular flows of high energy electrons close to the boundary of the earth's radiation belts

SOURCE: Vsesoyuznaya konferentsiya po fizike kosmicheskogo prostranstva. Moscow, 1965. Issledovaniya kosmicheskogo prostranstva (Space research); Trudy konferentsii. Moscow, Izd-vo Nauka, 1965, 425-433

TOPIC TAGS: geomagnetic field, satellite data analysis, radiation belt¹²

ABSTRACT: The authors analyze data obtained from "Elektron-1" and "Elektron-2" during their first month of operation. The equipment used on the satellites is briefly described. Analysis of data pertaining to the midnight meridian indicates that the intensity of the electrons at the boundary of the outer belt decreases by two or three orders of magnitude within a narrow range of radial distances. It is established that the radiation belt on the night side of the earth terminates on quiet days at $L = 6.5-7.5$. On the day side, the boundary of the belt extends on the

Card 1/2

L 3281-66

ACCESSION NR: AT5023614

average to $L = 9-10$. (Here L is the nominal McIlwain parameter calculated in the dipole approximation and expressed in earth radii.) It is found that irregular flows of electrons outside the boundary of the earth's radiation belts appear with an increase in perturbation of the geomagnetic field both at the surface of the earth and at distances of $\sim 39,000$ km from the earth. A theoretical explanation is given for this phenomenon. The experimental data support the hypothesis of a closed system of lines of force in the earth's magnetic field up to latitudes of 75° .

Orig. art. has: 9 figures and 1 table.

[14]

ASSOCIATION: none

SUBMITTED: 02Sep65

ENCL: 00

SUB CODE: ES,SV

NO REF SOV: 002

OTHER: 010

ATD PRESS: 4105

Card 2/2

L 3096-66 FSS-2/EWT(1)/FS(v)-3/FCC/EWA(6) TT/OS/GM
ACCESSION NR: AT5023615

UR/0000/65/000/000/0433/0434

AUTHORS: Vernov, S. N.; Chudakov, A. Ye.; Vakulov, P. V.; Gorchakov, Yo. V. (+)
Logachev, Yu. I.; Nikolayev, A. G.; Rubinshteyn, I. A.; Sosnovets, E. N. 05
Ternovskaya, M. V.

TITLE: Pulsations of the earth's magnetic field, from the measurements taken by the Elektron-3 satellite

SOURCE: Vsesoyuznaya konferentsiya po fizike kosmicheskogo prostranstva. Moscow, 1965. Issledovaniya kosmicheskogo prostranstva (Space research); trudy konferentsii. Moscow, Izd-vo Nauka, 1965, 433-434

TOPIC TAGS: satellite, satellite data analysis, pulse counter, pulse amplifier, pulse amplitude, earth magnetic field

ABSTRACT: The Elektron-3¹² satellite, launched on July 11, 1964, carried a coil with a ferrite core. Signals from this coil were transmitted to two amplifying circuits, one for the band of 1-10 cps, the other for 30-300 cps. Both circuits recorded pulses with amplitudes exceeding ~ 1 , ~ 5 , $\sim 25 \gamma$. The type and operation of the memory bank are briefly described. From a small amount of data processed it can be seen that no pulses with the amplitudes $\sim 25 \gamma$ were recorded, that at

Card 1/2

L-3096-66

ACCESSION NR: AT5023615

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the maximum sensitivity ($\approx 1 \gamma$) the count exceeded seven pulses per 2 minutes, and that at the intermediate sensitivity ($> 5 \gamma$) about 2-3 pulses were recorded by the low-frequency circuit and about 1 by the high-frequency circuit. It is noted that the number of magnetic field pulses with the amplitude $\approx 5 \gamma$ is generally greater in the frequency region of 1-10 cps than in the region of 30-300 cps and that the pulse intensity tends to increase in some geographical regions. Normally, this increase is recorded by the low-frequency circuit but not by the high-frequency one.

[04]

ASSOCIATION: none *... (illegible) ...*

SUBMITTED: 02Sep65

ENCL: 00

SUB CODE: ES, SV

NO REF SOV: 000

OTHER: 000

ATD PRESS: 4106

Card 2/2

L 2322-66 EWT(d)/FSS-2/EWT(1)/FS(v)-3/BEC(k)-2/FCC/EWA(h) TT/AST/GS/GW
ACCESSION NR: AT5023616 UR/C000/65/000/000/0434/0448

AUTHORS: Vernov, S. N.; Nesterov, V. Ye.; Pisarenko, N. F.; Savenko, I. A.;
Tverskaya, L. V.; Shavrin, P. I. 75
E+1

TITLE: Investigation of the upper Van Allen radiation belt at low altitudes during
the flights of the satellite ships and artificial earth satellites "Kosmos" from
1960 to 1963

SOURCE: Vsesoyuznaya konferentsiya po fizike kosmicheskogo prostranstva. Moscow,
1965. Issledovaniya kosmicheskogo prostranstva (Space research); trudy konferentsii.
Moscow, Izd-vo Nauka, 1965, 434-48

TOPIC TAGS: sputnik, artificial earth satellite, Van Allen belt, radiometry,
geomagnetic field

ABSTRACT: The results of radiometric measurements of the Van Allen radiation belt
from several "sputnik" and "Kosmos" satellites are discussed. The radiometers
consisted of inner and outer scintillation counters and gas discharge counters.
The internal scintillation counters recorded electron energies between 50 to 300 kev.
Among the various recorded measurements was the variation of radiation intensity
with longitude, which was quite apparent in the outer belt and which could be
explained clearly by the structure of the actual geomagnetic field. Several
Card 1/2

L 2322-66

ACCESSION NR: AT5023616

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altitude versus longitude particle drift trajectory curves were obtained to explain the various geomagnetic anomalies observed. Next, data were obtained to determine the location of maxima in the outer Van Allen belt. Over a period of four years this varied within the limits $4 \leq L \leq 6$, and this variation could be associated with geomagnetic disturbances. As a third observation, an electron energy gap was discovered between the outer and inner radiation belts on $2 \leq L \leq 3$. The special profile of the outer Van Allen belt is shown to be characterized by the location of a maximum, a maximum radiation intensity I_{max} , and a half-width corresponding to $0.5 I_{max}$. Intensity measurements and geomagnetic line-of-force cross section estimates gave the following values for the electron lifetimes in the outer belt: for electron energies > 100 kev, $T = 5 \times 10^5$ sec, for energies > 600 kev, $T = 5 \times 10^7$ sec. Orig. art. has: 13 figures and 1 formula. [04]

ASSOCIATION: none

SUBMITTED: 02Sep65

ENCL: 00

SUB CODE: AA,SV

NO REF SOV: 015

OTHER: 012

ATD PRESS: 1107

Card 2/2 *nd*

L 2321-66 EWT(d)/EWT(1)/SEC(k)-2/FCC/EWA(b) GS/GW
ACCESSION NR: AT5023618 UR/0000/65/000/000/0454/0460

AUTHORS: Vernov, S. N.; Lisutin, L. L.; Charakhch'yan, A. N.; Charakhch'yan, T. N. 48

TITLE: Outer Van Allen belt and bursts of x-rays in the stratosphere 47
Br1

SOURCE: Vsesoyuznaya konferentsiya po fizike kosmicheskogo prostranstva. Moscow, 1965. Issledovaniya kosmicheskogo prostranstva (Space research); trudy konferentsii. Moscow, Izd-vo Nauka, 1965, 454-460

TOPIC TAGS: radiation belt, x ray, stratosphere, magnetic storm, solar activity, Van Allen belt

ABSTRACT: Observations of bursts of x-rays in the stratosphere, which are apparently the result of bremsstrahlung of high-energy electrons trapped in the magnetic field of the earth, are discussed. The work and results from a number of American and Soviet groups are described. The results of observations made during 1964 above Murmansk and Mirnyy are presented, giving the integrated photon energy spectra and the dependence of count rate on pressure for the four events described. By comparison with the previous results, it was found that increased radiation in

Card 1/2

L 2321-66

ACCESSION NR: AT5023618

the stratosphere is correlated with recurrent magnetic storms, with large ionospheric disturbances, and, in the aurora zone, with the absorption of radio waves in the F2 layer of the ionosphere. Toward the minimum of solar activity the frequency of x-ray bursts remained unchanged, and the photon energy spectrum became more stable. Satellite measurements made at the same time showed no increase in galactic cosmic ray intensity.¹⁾ Since the number of high-energy electrons in the outer Van Allen belt is insufficient to explain the intensity of x-rays in the stratosphere, it is concluded that the x-rays must be caused, in part, by an additional flux of electrons produced by transient electron-accelerating processes occurring in the magnetosphere of the earth. Orig. art. has: 3 figures and 3 tables.

[04]

ASSOCIATION: none

SUBMITTED: 02Sep65

ENCL: 00

SUB CODE: AA, ES

NO REF SOV: 007

OTHER: 008

ATD PRESS: 4107

Card 2/2 *md*

L 21028-66 FSS-2/EWT(1)/FCC/EWA(d)/EWA(h) TT/CS/GH

ACCESSION NR: AT5023619

UR/0000/65/000/000/0460/0464

AUTHORS: Vernov, S. N.; Savenko, I. A.; Tel'tsov, M. V.; Shavrin, P. I.

16
B+1

TITLE: Some results of measurements in the outer Van Allen belt by the satellite Kosmos-41

SOURCE: Vsesoyuznaya konferentsiya po fizike kosmicheskogo prostranstva. Moscow, 1965. Issledovaniya kosmicheskogo prostranstva (Space research); trudy konferentsii. Moscow, Izd-vo Nauka, 1965, 460-464

TOPIC TAGS: radiation belt, Van Allen belt, proton bombardment, electron bombardment

ABSTRACT: Some results of measurements of proton and electron intensities in the outer Van Allen belt are presented. The measurements were made during September and October 1964 on the satellite "Kosmos-41," which was launched August 22, 1964. The form, shielding, geometric factor, and energy range of the nine detectors used are given. The results are presented as a series of graphs giving the measured particle intensities, magnetic field intensity, and altitude above the earth's surface as a function of the parameter L. The intensity of protons with

Card 1/2

L 21028-66

ACCESSION NR: AT5023619

energies 0.4-3 Mev reached $2 \cdot 10^5/cm^2$ sec ster for L=3.5, whereas the intensity of protons with energies 3-8 Mev during the same time was always below the detector threshold of $3/cm^2$ sec ster. The maximum electron intensities were measured at L=5. Orig. art. has: 4 figures, and 2 tables. [04]

ASSOCIATION: none (Soviet Conference on Cosmic Rays, 1965)
(Sov. Union Conference on Cosmic Rays, 1965)

SUBMITTED: 02Sep65

ENCL: 00

SUB CODE: ES, SV

NO REF SOV: 003

OTHER: 002

ATD PRESS: 4106

Card 2/2 BK

L 1552-66 FSS-2/EWT(1)/FS(v)-3/FCC/EWA(d)/EWA(h) TT/GS/GW

ACCESSION NR: AT5023628

UR/0000/65/000/000/0502/0506

AUTHOR: Vernov, S. I.; Vakulov, P. V.; Zatselin, V. I.; Logachev, Yu. I.;
Okholopkov, V. P.; Chudakov, A. Ye.

44.55 44.55 44.55 44.55 60
B+1

TITLE: Primary cosmic radiation investigations

SOURCE: Vsesoyuznaya konferentsiya po fizike kosmicheskogo prostranstva. Moscow, 1965. Issledovaniya kosmicheskogo prostranstva (Space research); trudy konferentsii. Moscow, Izd-vo Nauka, 1965, 502-506

TOPIC TAGS: cosmic ray, cosmic radiation, primary cosmic ray, primary cosmic radiation, Elektron 2, Elektron 4

12.55 12.55 12, 44, 55,

ABSTRACT: Experimental data obtained by Elektron-2 and -4 on primary cosmic radiation are presented and interpreted. The data, covering the period 30 January to 1 November 1964, were obtained primarily by means of gas-discharge counters with an average frequency of 20 pulses/sec. The apogee of the satellites was 68,000 km, keeping them outside the earth's radiation belts most of the time. The higher count frequency as the thickness of the screens was increased, made it possible to conclude that the primary radiation did not contain particles within the 50 to 110 Mev range. Two types of radiation intensity variations were distinguished:

Card 1/3

L 1552-66

ACCESSION NR: AT5023628

those connected with the 11-year period of solar activity, and fast variations, with a period of the order of two weeks. The 11-year period variations grew in intensity at the rate of about 2 percent per month during the first half of 1964. During the second half of the year the intensity reached a ceiling and in October indicated a tendency to decline. These data are in fair agreement with those of the Fort Churchill and Deep River observation posts. Certain indications of a phase shift between the periods of solar activity and the intensity of cosmic rays were discerned in the sequence of monthly averages of the intensity of cosmic radiation, the relative number of solar spots, and the solar flux of 10.7-cm radio waves. These observations, however, are not considered conclusive. The short-period variations of radiation with a 1.5-percent amplitude periodically acquire a clearly cyclic character. The same observation was made in April 1963 by the Luna-4 interplanetary station. In general, however, the cyclicity is not very regular and the nature of these variations remains obscure. There are also indications of a 27-day period in the data for 1964. An attempt was made to correlate these periods with the sun's rotation. A regular coincidence was not observed, but in some cases (rotations 1792, 1793, and 1794) there was a fair indication of parallelism. The absence of a conclusive connection with the sun's rotation suggests the possibility that the short-period variations have a common

Card 2/3

L 1552-66

ACCESSION NR: AT5023628

origin with the 11-year variations. It is also possible that the intensification of cosmic radiation during decline of solar activity is not monotonic, but displays ups and downs stemming from changes in the condition of its propagation or dimensions of the region of its effective scattering within the solar system. Orig. art. has: 4 figures.

[FP]

ASSOCIATION: none

SUBMITTED: 02Sep65

ENCL: 00

SUB CODE: AA, SV

NO REF SOV: 003

OTHER: 001

ATD PRESS: 4094

Card 3/3

50



Card 1/2

and 2 tables.

[08]

KELDYSH, M.V., akademik; SIFOROV, V.I.; VERNOV, S.N.

Explorers of the Universe. Kryl.rod. 15 no. 4:6-7 Ap '64.
(MIRA 17:5)

1. Presidnet Akademii nauk SSSR. (for Keldych). 2. Chleny-kor-
respondenty AN SSSR (for Siforov, Vernov).

L 9604-66 ENT(1)/FCC/EWA(h) GVI
ACC NR: AR5020397 UR/0315/65/000/003/0035/0035 57
SOURCE: Ref. zh. Issledovaniye kosmicheskogo prostranstva, Abs. 8.62.238 E
AUTHOR: Vernov, S.N.; Chudakov, A.Ye.; Gorchakov, Ye.V.; Logachev, Yu.I.; Nesterov, V.Ye.; Savenko, I.A.; Shavrin, P.I.
TITLE: Radiation belts of the earth
CITED SOURCE: Geofiz. byul. Mezhdruved. geofiz. kon-t pri Prezidiume AN SSSR, no. 14, 1964, 96-109
TOPIC TAGS: satellite, rocket, radiation effect, cosmic radiation
TRANSLATION: A short outline is given of the results obtained from studies conducted using Soviet artificial satellites and cosmic rockets of the radiation belts and of primary cosmic radiation beyond the limits of the magnetic sphere.
SUB CODE: 04,03 ENCL: 00
Card 1/1

L 2164-66 FSS-2/ENT(1)/FS(v)-3/FCC/EWA(d)/EWA(h)

TT/GW

ACCESSION NR: AP5020993

UR/0203/65/005/004/0645/0648
523.165

AUTHOR: Vernov, S. N.; Savenko, I. A.; Tel'tsov, M. V.; Shavrin, P. I.

41
45
E

TITLE: Measurement of 0.4—8 Mev protons by "Kosmos-41"

SOURCE: Geomagnetizm i aeronomiya, v. 5, no. 4, 1965, 645-648

TOPIC TAGS: proton intensity, satellite/Kosmos 41

ABSTRACT: Two semiconductor proton detectors, each capable of covering ~ 1 sterad and sensitive to 400 keV—7 MeV and 3—8 MeV protons, respectively, were mounted on "Kosmos-41". Readings were taken for $L = 3.5-10$ (C. E. McIlwain's parameter). Results showed that maximum intensity for 0.4—3.0 MeV protons was $2 \cdot 10^5$ prot/cm² sec sterad at $L = 3.5$ and $B = 7.6 \cdot 10^{-2}$ gauss. A comparison of data collected near the plane of the geomagnetic equator with those taken at higher latitudes, at $L = 5$, revealed that the dependence of intensity on height can be expressed as $(B/B_{\text{equat}})^{-k}$, where $k \approx 1$. The drop in proton intensity varied with L in the form L^{-n} , where $n = 30$; however, this depended on geomagnetic conditions and on variations in the

Card 1/2

L 2464-66

ACCESSION NR: AP5020993

outer radiation belt. Intense proton streams were observed at large values of L. [WC]
Orig. art. has: 3 figures and 1 table.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet (Moscow State University);
Institut yadernoy fiziki (Institute of Nuclear Physics)

SUBMITTED: 28Jan65

ENCL: 00

SUB CODE: ES, NP

NOREF SOV: 002

OTHER: 004

ATD PRESS: 4106

BVK

Card 2/2

08737-67 EFT(1)/FCC GW
ACC NR: AP7001643

SOURCE CODE: UR/0203/66/006/004/0658/0660

AUTHOR: Vernov, S. N.; Savenko, I. A.; Tel'tsov, M. V.; Shavrin, P. I.

ORG: Institute of Nuclear Physics, Moscow State University (Moskovskiy gosudarstvennyy universitet, Institut yadernoy fiziki)

TITLE: Intensity of protons and electrons in the outer radiation belt in the period 1961-1964

SOURCE: Geomagnetizm i aeronomiya, v. 6, no. 4, 1966, 658-660

TOPIC TAGS: radiation belt, proton, electron, solar activity

ABSTRACT: The authors present the results of equatorial measurements made in 1964 of the intensity of protons with energies $\gg 400$ keV and electrons with energies > 2 MeV at the center of the outer radiation belt. These results are compared with similar data obtained in 1961. The conclusion is drawn that there is a tendency to a decrease of the mean absolute intensity of the hard electrons of the outer radiation belt in 1964 in comparison with 1961-1962. If the noted variations in the absolute intensities of hard electrons and low-energy protons are considered within the framework of the theory of the formation of the radiation belts it can be postulated that the mean density of protons with energies of tens of keV beyond the limit of stable trapping varies little with a change of solar activity. At the same time, the density of electrons with energies of hundreds of keV, forming during the drift of hard electrons at the center of the outer radiation belt, rises sporadically only

Card 1/2

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L 08737-67

ACC NR: AP7001643

in periods of rather strong geomagnetic disturbances, leading to the formation of diffusion waves. The intensity of the hard electrons in the outer radiation belt therefore is subject to long-period variations associated with the cycles of solar activity. The authors thank B. A. Tverskoy for discussions of the work, and N. N. Rachtkina for taking part in the processing the experimental materials. Orig. art. has: 2 tables. [JPRS: 38,230]

SUB CODE: 03,20 / SUBM DATE: 04Feb66 / ORIG REF: 007 / OTH REF: 007

Card 2/2 bc

L 42150-66

FSS-2/EWT(1)/FCC

TT/GW

SOURCE CODE: UR/0203/66/006/004/0661/0663

ACC NR: AP6028350

AUTHOR: Vernov, S. N.; Savenko, I. A.; Tel'tsov, M. V.; Shavrin, P. I.

ORG: Moscow State University Institute of Nuclear Physics (Moskovskiy gosudarstvennyy universitet. Institut yadernoy fiziki)

TITLE: Observations of a diffuse wave of relativistic electrons in the outer radiation belt

SOURCE: Geomagnetizm i aeronomiya, v. 6, no. 4, 1966, 661-663

TOPIC TAGS: relativistic electron, radiation belt, ~~diffuse wave~~, geomagnetic storm, ~~magnetosphere~~, electron flux, ~~protonosphere~~, geomagnetic latitude

ABSTRACT: The generation of relativistic electrons in the outer radiation belt can be attributed to the transfer of charged particles across the drift shells. The propagation of diffuse waves of relativistic electrons, first recorded by Explorer XIV, was also recorded by Kosmos 41 when it passed the outer radiation belt. At the high geomagnetic latitudes, the propagation of the diffuse wave may be distorted by changes in the pitch-angle distribution. However, in the present case, the diffuse wave exhibited characteristics peculiar to the dynamics of a diffusion wave of hard electrons. The intensity of relativistic electrons decreased somewhat at the beginning of geomagnetic perturbation. It increased at distant L shells (> 5) of the magnetosphere several days after geomagnetic perturbation. Further shift of the intensity maximum toward

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Card 1/2

UDC: 523.72

L 42150-66

ACC NR: AP6028350

the region of smaller L occurred in the absence of geomagnetic disturbances. This was followed by a decrease in intensity and a shift in the intensity maximum to its initial position. During the magnetic storm on 1 September 1964, recorded by Kosmos 41, the intensity of electron flux with energies greater than 2 Mev at L = 5 was $3.5 \times 10^2/\text{cm}^2\text{sec}$. A peak of hard electrons with an intensity of $10^3/\text{cm}^2\text{sec}$ was recorded on September 3-4 at L = 6-7. This peak was shifted to smaller L shells until it reached a maximum intensity of $10^4/\text{cm}^2\text{sec}$. Variations in the protonosphere were of smaller amplitude. The diffuse wave of relativistic electrons was thus first observed in the outer radiation belt at high geomagnetic latitudes. This wave was not accompanied by low-energy protons. Orig. art. has: 2 figures. [EG]

SUB CODE: 04/ SUBM DATE: 18Feb66/ ORIG REF: 006/ OTH REF: 003/ ATD PRESS: 5062

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VERNOV, S.N.; KRISTIANSEN, G.B.; ABROSIMOV, A.T.; BELYAYEVA, I.F.;
DMITRIYEV, V.A.; KULIKOV, G.V.; NECHIN, Yu.A.; SOLOV'YEVA, V.I.;
KHRENOV, B.A.

Recent data on the study of extensive air showers by means of
an elaborate setup. Izv. AN SSSR. Ser. fiz. 28 no.11:1886.
1893 N '64. (MIRA 17:12)

1. Nauchno-issledovatel'skiy institut yadernoy fiziki Moskovskogo
gosudarstvennogo universiteta.

VERNOV, S.L.; SAVENKO, I.A.; SHAYAN, P.I.; LEZHNEV, V. Ye.; PISNENKO,
H.F.; BASILOVA, R.L.

Study of cosmic rays at great altitudes. I. V. AN SSSR S. S. 111.
28 no.12:2045-2012 D 181 (MIRA 18:3)

VERNOV, S.N.; SAVENKO, I.A.; SHAVIN, P.T.; MEZHENOV, V.Ye.; PLOKATKO,
N.P.; SHARVINA, K.M.

Some data on the earth's radiation belts obtained during "Kosmos"
satellite flights at altitudes of 200 to 400 km. Izv. AN SSSR Ser.
fiz. 28 no.12:2049-2057 D 194 (MIRA 184)

VERNOV, S.N.; CHUDAKOV, A. Ye.; VAKULOV, P.V.; GORCHAKOV, Ye.V.;
IGNAT'YEV, P.P.; KUZNETSOV, S.N.; LOGACHEV, Yu.I.; LYUBIMOV, G.P.;
NIKOLAYEV, A.G.; ORHLOPKOV, V.P.; SOSNOVETS, E.N.; TERNOVSKAYA, M.V.

Radiation studies by means of the artificial satellite "Kosmos-17".
Izv. AN SSSR Ser. fiz. 28 no.12:2058-2074 D '64 (MIRA 18:2)

VERNOV, S.M.; KRISTIANSEN, G.P.; ABROSIMOV, A.T.; ATRASHKEVICH, V.B.;
BELYAYEVA, I.F.; VEDENEYEV, O.V.; DMITRIYEV, V.A.; KULIKOV, G.V.;
NECHIN, Yu.A.; SOLOV'YEVA, V.I.; SOLOV'YEV, K.I.; FOMIN, Yu.A.;
KHRENOV, B.A.

Description of a modernized complex setup for studying extensive air showers. Izv. AN SSSR Ser. fiz. 28 no.12:2087-2092
D '64 (NIRA 18:2)

L 4528-66 EWT(m)/FCC/T IJP(c)

ACC NR: AP5024632

SOURCE CODE: UR/0048/65/029/009/1676/1681

AUTHOR: Vernov, S.N.; Khristiansen, G.B.; Abrosimov, A.T.; Atrashkevich, V.B.;
Belyayeva, I.F.; Vedenoyev, O.V.; Kulikov, G.V.; Fomin, Yu. A.; Nechin, Yu. A.;
Solov'yeva, V.I.; Khrenov, B.A.

ORG: none

36
B
H

TITLE: Investigations of fluctuations in the development of extensive air showers
with a fixed total number of charged particles and a fixed total number of muons /Re-
port, All-Union Conference on Cosmic Ray Physics held at Apatity 24-31 August 1964/

SOURCE: AN SSSR. Izvestiya. Seriya fizicheskaya, v. 29, no. 9, 1965, 1676-1681

TOPIC TAGS: cosmic ray shower, muon, charged particle, extensive air shower, particle
distributic particle distribution

ABSTRACT: The authors have employed the modernized installation at Moscow State Uni-
versity, described elsewhere (S.N.Vernov et al., Izv. AN SSSR Ser. fiz., 28, 2087,
1964), to investigate the simultaneous distribution of total number N of charged par-
ticles, total number M of muons, and age parameter S in extensive air showers. Show-
ers were selected for which the zenith angle of the axis was less than 30°. M was de-
termined from the number of muons recorded by the muon detector and the perpendicular
distance of the muon detector from the shower axis with the aid of the known lateral
distribution of muons. The relative error in determining M did not exceed 35%. The

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L 4528-66

ACC NR: AP5024632

error in determining S was estimated to be 0.02 by processing "artificial" showers of known age, calculated by Monte Carlo methods. The data presented were derived from some 300 showers with total numbers of charged particles ranging from 10^5 to 4×10^6 . Histograms are given showing the distribution of showers with respect to N with fixed M, with respect to M with fixed N, with respect to S with fixed N, and with respect to S with fixed M, and scatter plots are given for N versus S with fixed M and for M versus S with fixed N. The correlation coefficient of S with M for fixed N ranged between 0.62 and 0.72; the correlation coefficient of S with N for fixed M was - 0.67. Orig. art. has: 10 formulas, 4 figures, and 1 table.

SUB CODE: NP/ SUBM DATE: 00/

ORIG REF: 005/ OTH REF: 001

DC
Card 2/2

L 4529-66 EWT(m)/FCC/T IJP(c)

ACC NR: AP5024633

SOURCE CODE: UR/0048/65/029/009/1682/1685

AUTHOR: Vernov, S.N.; Khrenov, B.A.; Khristiansen, G.B.ORG: Scientific Research Institute of Nuclear Physics, Moscow State University
Im. M.V.Lomonosov (Nauchno-issledovatel'skiy institut yadernoy fiziki Moskovskogo gosudarstvennogo universiteta)TITLE: Structure of the central region of a muon shower at 40 m.w.e. /Report, All-
Union Conference on Cosmic Ray Physics held at Apatity 24-31 August 1964/

SOURCE: AN SSSR. Izvestiya. Seriya fizicheskaya, v. 29, no. 9, 1965, 1682-1685

TOPIC TAGS: cosmic ray shower, extensive air shower, muon

ABSTRACT: The authors have employed the complex modernized installation at Moscow State University, described elsewhere (S.N.Vernov et al., Izv. AN SSSR, Ser. fiz., 23, 2087, 1964), to investigate the structure of the central regions of muon showers accompanying extensive air showers. The muon flux at 40 m.w.e. underground was found to be proportional to r^n , where r is the distance from the shower axis and $n = 1/2$ for $7 \text{ m} < r < 15 \text{ m}$ and $n = 1$ for $15 \text{ m} < r < 100 \text{ m}$; it was not possible to obtain the lateral distribution for $r < 7 \text{ m}$ because of the errors in determining r . The ratio of the numbers of counters triggered in the two halves of the muon detector and the probability for triggering neighboring counters were subjected to statistical analysis.

Card 1/2

L 4529-66

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ACC NR: AP5024633

and after correction was made for Poisson fluctuations there remained evidence that there exist in the center of the muon shower groups of associated muons with diameters from 2 to 3 m which are capable either of contracting into narrow groups with diameters less than 30 cm or of producing secondary showers. Orig. art. has: 1 formula, 3 figures, and 1 table.

SUB CODE: NP/ SUBM DATE: 00/

ORIG REF: 005/ OTH REF: 000

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Card 2/2

L 4481-66 EWT(1)/EWT(m)/FCC/T/ENA(N) IJP(c) CW

ACC NR: AP5024635

SOURCE CODE: UR/0048/65/029/009/1690/1692

AUTHOR: Vernov, S.N.; Yegorov, T.A.; Yegimov, N.N.; Krasil'nikov, D.D.; Kuz'min, A.I.; Maksimov, S.V.; Nesterova, N.M.; Nikol'skiy, S.I.; Sleptsov, Ye. I.; Shafer, Yu. G.

ORG: none

TITLE: Plan for a large installation at Yakutsk for study of extensive air showers /Report, All-Union Conference on Cosmic Ray Physics held at Apatity 24-31 August 1964/

SOURCE: AN SSSR. Izvestiya. Seriya fizicheskaya, v. 29, no. 9, 1965, 1690-1692

TOPIC TAGS: primary cosmic ray, secondary cosmic ray, extensive air shower, spectral energy distribution, cosmic radiation composition, cosmic radiation anisotropy

ABSTRACT: After a discussion of the significance of extensive air showers for the investigation of ultrahigh energy primary cosmic rays, the authors briefly describe an installation to be completed in the next two or three years near sea level at latitude 62° N in the Yakutsk region; it is anticipated that the installation will yield information concerning the energy spectrum, composition, and anisotropy of primary cosmic rays with energies up to 10²⁰ eV. The installation, intended for investigation of extensive air showers, will comprise 65 stations spread over an area of 23 km². Each station will be equipped with scintillation counters with a total sensitive area of 1 m² or 4 m², and at the central station - 10 m². The total sensitive area of scintil-

Card 1/2

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ACC NR: AP5024635

ation counters in the whole installation will be 204 m². Each station will be equipped with photomultipliers (total cathode area 180 cm² at each station) for recording the Cerenkov flash accompanying a shower. In addition, there will be muon detectors with a total sensitive area of 22 m². Pulses will be transmitted from the more remote stations to the central laboratory by radio. It is anticipated that this installation will record 2 x 10⁵ showers per year with energies exceeding 10¹⁵ eV and 2 showers per year with energies exceeding 10²⁰ eV. Orig. art. has: 1 figure and 1 table.

SUB CODE: NP/ SUBM DATE: 00/..

ORIG REF: 002/ OTH REF: 008



Card 2/2

L 4127-66 FSS-2/EMT(1)/FS(v)-3 TT/GW

ACCESSION NR: AP5026220

UR/0048/65/029/010/1794/1799

AUTHOR: Vernov, S.N.; Mel'nikov, V.V.; Savenko, I.A.; Savin, B.I.

TITLE: Investigation of low-energy charged particles with the Cosmos 12, Cosmos 15, and Electron 2 satellites [Report, All-Union Conference on Cosmic Ray Physics held at Apatity, 24-31 August 1964]

SOURCE: AN BSSR. Izvestiya. Seriya fizicheskaya, v. 29, no. 10, 1965, 1794-1799

TOPIC TAGS: artificial earth satellite, spectrometer, charged particle, electron flux, ion flux, low energy particle

ABSTRACT: Spherical electrostatic charged particle analyzers carried by the Cosmos 12, Cosmos 15, and Electron 2 satellites are described very briefly and preliminary results obtained with them are presented. The radii of the two concentric spherical deflecting electrodes were 5.4 and 6.6 cm, and the charged particles traversing the analyzer were collected in a Faraday cup. The minimum global intensity that could be recorded was approximately $6 \times 10^6 \text{ E}^{-1} \text{ particles/cm}^2 \text{ sec}$; this intensity is two orders of magnitude below the threshold intensity for the instrument carried by Explorer 12. The luminosity at maximum transmission was

Card 1/3

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ACCESSION NR: AP5026220

0.7 cm² sterad with $\Delta E/E_0 \approx 30\%$, and the geometric factor was 0.1 E₀ cm² sterad kev. The analyzer on the Cosmos 12 was sequentially programmed to record 0.5 kev electrons or 1 kev electrons or ions, and that on the Cosmos 15 recorded 1 kev electrons or ions and was provided with a positively charged screen to reject thermal ions. The Electron 2 carried two analyzers, which were programmed to record charged particles of seven different energies ranging from 0.1 to 10 kev. The fluxes of 1 kev charged particles observed with the two Cosmos satellites were ordinarily near or below the threshold. Fluxes exceeding 10⁷ particles/cm² sec kev observed on the daylight side are ascribed to photoelectrons from the screen, although there are indications of the presence of particle fluxes. Steady fluxes up to 2 x 10⁷ particles/cm² sec kev were observed south of New Zealand in the region of the maximum southern isochasm. It is suggested that an intensity increase over the equatorial Pacific observed on 27 Dec may be associated with the solar flare of 24 Dec. The Electron 2 measurements revealed a broad region near the Earth of increased electron intensity. The extent of this region and its electron intensity fluctuates considerably. Electron intensities of 5 x 10⁸ particles/cm² sec kev at 0.2 kev and 5 x 10⁷ particles/cm² sec kev at 10 kev were observed in this region. Intensity increases were also sometimes observed near the apogee. Orig. art. has 5 figures.

Card 2/3

L 4127-66

ACCESSION NR: APS026220

ASSOCIATION: none

SUBMITTED: 00

ENCL: 00

SUB CODE: NP, ES

NO REF SOV: 004

OTHER: 005

ATD PRESS: 427

Card 3/3

L 3646-66 EWT(1)/FCC/EWA(.) Gd

ACCESSION NR: AP5026222

UR/0048/65/029/010/1805/1806

AUTHOR: Vernov, S. N.; Charakhch'yan, A. N.; Babarykin, V. K.; Bayaravich, V. V.;
Stozhkov, Yu. I.; Charakhch'yan, T. N.

35
32

TITLE: Measurements of the intensity of cosmic rays in the stratosphere above B
Antarctica

SOURCE: AN SSSR. Izvestiya. Seriya fizicheskaya, v. 29, no. 10, 1965, 1805-1806

TOPIC TAGS: cosmic ray, primary cosmic ray, outer radiation belt, artificial
radioactivity, critical energy, proton 12

ABSTRACT: Simultaneous measurements of the intensity of cosmic rays in both
hemispheres are of great importance for investigating low-energy primary
cosmic radiation, temperature effect, disturbances in the earth's outer radiation
belt, and artificial radioactivity in the stratosphere. Although the critical
energy in Murmansk is about 100 Mev and in Mirnyy about 10 Mev, measurements are
carried out in atmospheric layers above both places with a pressure of 10 g/cm²,
which can be penetrated by protons with energies above 100 Mev. Data obtained
simultaneously in Murmansk and Mirnyy are obtained at different seasons, and
they arrive from different directions in the atmosphere. Sounding takes place in
all stations at a given time. Four times a week cosmic rays are measured with a
Card 1/2

L 3646-66

ACCESSION NR.: AP5026222

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single counter and two times with a special telescope. Results of measurements are represented graphically. The difference between Murmansk and Mirnyy varies, depending upon the season of the year. The difference is small when the pressure is between 20 and 200 g/cm². The difference increases at other pressures. Orig. art. has: 2 figures.

[EG]

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva Akademii nauk SSSR (Institute of Physics, Academy of Sciences, USSR); Nauchno-issledovatel'skiy institut yadernoy fiziki Moskovskogo gosudarstvennogo universiteta im. M. V. Lomonosova (Scientific Research Institute of Nuclear Physics, Moscow State University); VIII Sovetskaya antarkticheskaya ekspeditsiya (VIII Soviet Antarctic Expedition)

SUBMITTED: 00

ENCL: 00

SUB CODE: AA,ES

NO REF SOV: 001

OTHER: 000

ATD PRESS: 416

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Card 2/2

VERNOV, S.N.; KRISTIANSEN, G.B.; ABROSIMOV, A.T.; ATRASHKEVICH, V.B.;
BELYAYEVA, I.F.; KULIKOV, G.V.; SOLOV'YEVA, V.I.; FOMIN, Yu.A.;
KHRENOV, B.A.

Ultrahigh-energy primary cosmic radiation according to data on
extensive air showers. Izv. AN SSSR.Ser.fiz. 29 no.10:1876-1880
0 '65. (MIRA 18:10)

1. Nauchno-issledovatel'skiy institut yadernoy fiziki Moskovskogo
gosudarstvennogo universiteta im. M.V.Lomonosova.

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SOURCE: AN SSB, [REDACTED]

TOPIC TAGS: cosmic ray, astrophysics, satellite data analysis

... of charged particles that were conducted

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I 1983E-66
ACC NR: AP6018859

SOURCE CODE: UR/0367/65/002/006/1075/1086

AUTHOR: Vernov, S. N.; Bolyayeva, I. F.; Vedenoyev, O. V.; Dmitriyev, V. A.;
Nechin, Yu. A.; Khristiansen, G. B.ORG: Institute of Nuclear Physics, Moscow State University (Institut yadernoy fiziki
Moskovskogo gosudarstvennogo universiteta)TITLE: Fluctuations of the energy fluxes of the nuclear-active and electron-photon
components in extensive air showers. [This paper was given at the 14th Annual Conference
on Nuclear Spectroscopy, Tbilisi, February 1964]

SOURCE: Yadernaya fizika, v. 2, no. 6, 1965, 1075-1086

TOPIC TAGS: extensive air shower, electron, photon

ABSTRACT: Experimental data are given on the fluctuations of the energy flux of the
nuclear-active and electron-photon components in extensive air showers and on the
connections of these fluctuations with each other and with fluctuations of the age
parameter s . It is shown that the bulk of these data disagrees with the model described
by Nymnik and Shestoporov (Materials on the All-Union Conference, Apatites, 1964).
The large role of the parameter s and other characteristics for the correct setting-up
of experiments concerning extensive air-showers are discussed. Orig. art. has: 10
figures and 3 tables. [Based on authors' Eng. abst.] [JPRS]

SUB CODE: 03 / SUBM DATE: 23Apr65 / ORIG REF: 014 / OTH REF: 003

Card 1/1 H S

L 04/03-07 JKI

ACC NR: AP6030010

SOURCE CODE: UR/0020/66/169/005/1044/1047

AUTHOR: Vernov, S. N. (Corresponding member AN SSSR); Vakulov, P. V.; Gorchakov, Ye. V.; Logachev, Yu. I.; Lyubimov, G. P.; Nikolayev, A. G.; Pereslegina, N. V.

ORG:

TITLE: Measurement of intensity of penetrating radiation on the Moon's surface
[Paper presented at the Seventh COSPAR Meeting held in Vienna in May 1966]

SOURCE: AN SSSR. Doklady, v. 169, no. 5, 1966, 1044-1047

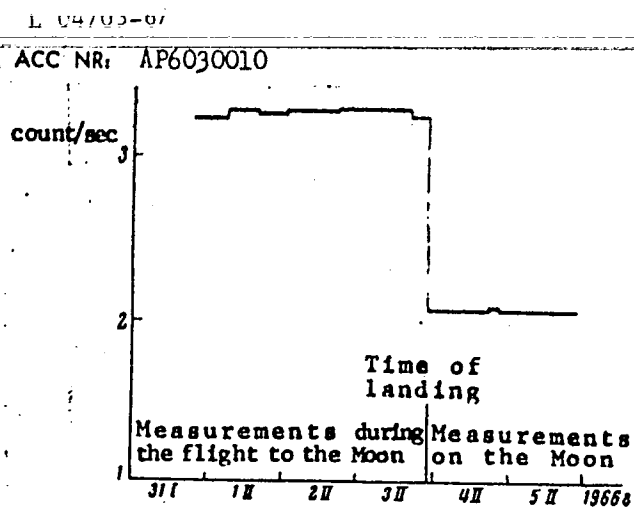
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69
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TOPIC TAGS: moon, radiation intensity, lunar probe, radiation measurement/
Luna-9 lunar probe

ABSTRACT: The lunar probe "Luna-9" launched by the Soviet Union on 30 January 1966 made a soft landing on the Moon on 3 February at 24 hr, 45 min, 30 sec (Moscow time); it was equipped with an instrument containing a 6 x 10-mm discharge counter to measure the intensity of radiation. The minimum shielding of the counter mounted inside the probe near its jacket was ~1 gm/cm².

The instrument was switched on immediately after "Luna-9" was put into orbit and was kept in operation until the probe stopped functioning. The data on the intensity detected with the gas counter averaged over 14 time intervals are shown in Fig. 1. The first five time intervals are those for the flight from the Earth to the

Card 1/8



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Moon. The next (sixth) interval is that for the flight near the Moon (beginning with at a distance of ~50,000 km from the Moon), the landing, and the first 5 minutes on the Moon's surface. The subsequent eight intervals are related to operations on the Moon's surface. Table 1 shows the accurate values of the time intervals and the mean-count rates recorded in these intervals. The basic errors in determining the count rate are statistical.

Fig. 1. The mean-count rate of "Luna-9" discharge counter

The data in Table 1 show that the mean-count rate recorded on the Moon's surface was about 63% of the count rate of the same counter in free space. In other words, if only primary cosmic rays had been detected, the counter on the Moon's surface would have counted not quite half as much as during the flight in free space. The detected excessive radiation

Card 2/8

L 04703-67
ACC NR: AP6030010

Table 1.

	Interval boundaries	Averaging interval	Mean-count rate	Note
31 Jan 1966	18 h 38 min 40 sec	10 h 12 min 30 sec	3.229±0.010	During the flight
1 Feb 1966	04 h 51 min 10 sec	10 h 54 min 20 sec	3.277±0.010	"
	15 h 45 min 30 sec			"
	23 h 01 min 45 sec	07 h 16 min 15 sec	3.267±0.011	"
2 Feb 1966	16 h 29 min 00 sec	17 h 27 min 15 sec	3.278±0.007	"
3 Feb 1966	15 h 34 min 15 sec	23 h 05 min 15 sec	3.286±0.006	"
	21 h 50 min 00 sec	06 h 15 min 45 sec	3.245±0.012	Near the Moon and on the Moon
4 Feb 1966	00 h 06 min 54 sec	02 h 16 min 54 sec	2.065±0.016	On the Moon
	06 h 35 min 04 sec	06 h 28 min 10 sec	2.069±0.010	"
	17 h 02 min 00 sec	10 h 26 min 56 sec	2.074±0.008	"
	19 h 52 min 30 sec	02 h 50 min 30 sec	2.077±0.014	"
5 Feb 1966	04 h 00 min 40 sec	08 h 08 min 10 sec	2.058±0.009	"
	19 h 01 min 40 sec	15 h 01 min 00 sec	2.055±0.006	"
	20 h 37 min 30 sec	01 h 35 min 50 sec	2.059±0.020	"
	22 h 42 min 20 sec	02 h 04 min 50 sec	2.059±0.017	"

The mean-count rate during the flight is 3.272±0.004
The mean-count rate on the Moon is 2.064±0.004

Card 3/8

L-09713-07

ACC NR: AP6030010

is 0.43 count/sec or ~26% of half the cosmic-ray intensity. This excessive radiation may be due to the radioactivity of the Moon's surface and to the secondary cosmic radiation produced by the primary cosmic radiation in the matter on the Moon's surface region closest to the station (cosmic-ray albedo).

Until now, no experimental data have been available on the radioactivity of the Moon's surface. The "Luna-9" measurements make it possible to evaluate the radioactivity of the Moon's surface in the landing area near the Ocean of Storms. Assuming that the total detected additional radiation is due to the radioactive gamma radiation from the Moon's surface, the radioactivity of the Moon's surface may be ~20 times greater than that of the Earth's surface (the count rate of "Luna-9" from the natural radioactivity on Earth was 0.02 count/sec). However, the radioactivity on the Moon's surface has been evidently overestimated, because the effect of multiplication of the primary cosmic radiation producing the cosmic-ray albedo particle fluxes may explain the major part or even all of the additional radiation detected. Using the data from an earlier Soviet paper, it can be shown that the albedo particle flux is 20% of the total cosmic-ray flux or 40% of half the cosmic-ray flux. Additional considerations show that at least in the region of the "Luna-9" landing, cosmic rays will be the main source

Card 4/8

L 04703-67

ACC NR: AP6030010

of radiation hazard and that the radioactivity on the surface of the Moon is close to the radioactivity on the surface of the Earth.

It was shown during the flight of the second Soviet space probe in September 1959 that at the distances greater than 1000 km from the Moon's surface, the intensity of the radiation trapped by a possible lunar magnetic field does not exceed 10% of the cosmic-ray intensity. The "Luna-9" data make it possible to evaluate the fluxes of the trapped radiation at distances less than 1000 km from the Moon's surface.

The mean-count rate just before and during the first minutes after the landing was 3.25 ± 0.012 count/sec (see Table 1). If this count rate is corrected for the geometric shielding of the counter by the Moon during the approach of the station to the Moon and during the period of radiation detection on the Moon's surface (this correction is about 1%), the resulting count rate is 3.28 count/sec. This practically coincides with previous measurements. The time required for the "Luna-9" to cover the last 1000 km to the Moon's surface was ~2% of the time measured in the given interval. At the measuring accuracy mentioned above, an increase of 50% in the count rate during this time interval would be noticeable.

Card 5/8

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ACC NR: AP6030010

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Thus the upper limit for the possible radiation flux penetrating the "Luna-9" jacket and trapped by the hypothetical magnetic field of the Moon at the altitudes below 1000 km from the Moon's surface is not more than half the primary cosmic-radiation flux. The variation which would decrease the intensity of cosmic rays might somewhat change the evaluation of the upper limit of the hypothetical trapped radiation near the Moon, but the main conclusions that the Moon has no radiation belts and consequently no marked magnetic field remain unchanged.

Fig. 2 shows the mean-count rates in free space and on the Moon's surface. The intensity in the transition interval has been corrected for the geometric shielding by the Moon.

It can be seen from Fig. 2 that the cosmic-ray intensity undergoes slow gradual changes (solid curve) similar to those recorded during the flight of "Luna-4." This makes it possible to assume that during the period of the station's approach to the Moon, no appreciable variation in cosmic-ray intensity occurred. Neither the available neutron-monitor data nor the stratospheric data of A. N. Charakhchyan and T. N. Charakhchyan (unpublished) revealed any considerable decrease in the cosmic-ray intensity.

Card 6/8

L 04703-67

ACC NR: AP6030010

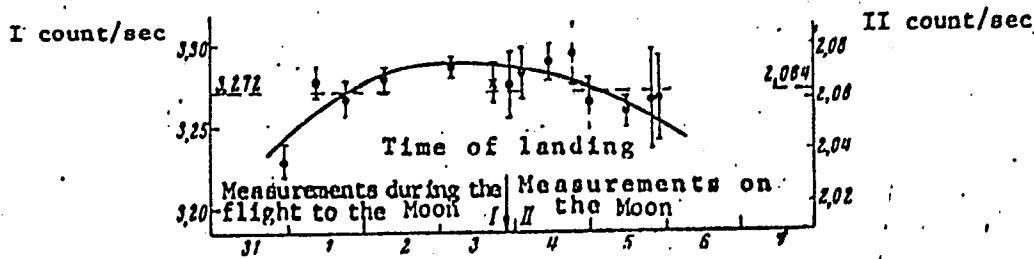


Fig. 2. The count rates of the discharge counter during the "Luna-9" flight in free space and on the Moon's surface. The mean-count rate on the Moon's surface has been reduced to the mean-count rate during the flight, and the scale has been changed in proportion to the mean-count rates during the flight and on the Moon's surface.

The absolute flux of the cosmic-ray particles detected by "Luna-9" was equal to $5.35 \pm 0.5 \text{ cm}^{-2} \text{ sec}^{-1}$. The great error in the determination of the absolute fluxes is due to the 10% uncertainty in the operational dimensions of the counter. Analogous measurements from "Luna-7" and "Luna-8" stations performed on 4-6 October and 3-6 December 1965 have shown the particle fluxes to be 5.4 and 5.9 $\text{cm}^2 \text{ sec}$, respectively. The cosmic-ray intensity in February 1966 decreased compared to December 1965. This

Card 7/8

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ACC NR: AP603001C

is likely to be associated with the beginning of a new cycle of solar activity.

Thus the cosmic-ray intensity maximum occurs during the period December 1965—January 1966, and the lag in the cosmic-ray intensity maximum behind the solar maximum detected for the protons of energies higher than 30 Mev is about 1.5 years. This conclusion is also confirmed by the data of the "Zond-3," "Venus-2," and "Venus-3" space probes.
[FSB: v. 2, no. 10]

SUB CODE: 22 / SUBM DATE: 11May66 / ORIG REF: 003 / OTH REF: 001

Card 8/8

fv

ACC NR: AP7007081

SOURCE CODE: UR/0048/66/030/010/1685/1689

AUTHOR: Vernov, S. N.; Khristiansen, G. B.; Abrosimov, A. T.; Atrashkevich, V. B.; Belyayeva, I. P.; Vedeneyev, O. V.; Kulikov, G. B.; Nechin, Yu. A.; Solov'yeva, V. I.; Fomin, Yu. A.; Khrenov, B. A.

ORG: none

TITLE: Phenomenological characteristics of broad atmospheric showers with a fixed number of μ -mesons and electrons /Paper presented at the All-Union Conference on Cosmic Radiation Physics, Moscow, 15-20 Nov 1965/

SOURCE: AN SSSR. Izvestiya. Seriya fizicheskaya, v. 30, no. 10, 1966, 1685-1689

TOPIC TAGS: mu meson, cosmic radiation

SUB CODE: 20

ABSTRACT: In an earlier work by Vernov et al (Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, 29, 1676, 1965), results obtained in a study at an installation of Moscow State University on broad atmospheric showers with zenith angles of 0-30° were reported. These results included the distribution of showers with a fixed number of electrons N_e with respect to the number of high-energy mesons N_μ and the age parameter S , distribution of showers with a fixed N_μ with respect to N_e and S , and the coefficients of the correlation between S and the fluxes of electrons and μ -mesons. In the work reported in this instance, the same relations were determined for broad atmospheric showers with zenith angles of 30-45°. The fluctuations of N_μ , S , and N_e , observed for an effective atmospheric depth of 1240 g/cm², were the same as those for vertical showers established in the earlier work. To determine the differences due to an increase in

Card 1/2

ACC NR: AP7007081

the effective atmospheric depth of 200 g/cm^2 , calculations must be carried out with greater statistical precision. When results of the theoretical calculations on characteristics of broad atmospheric showers at 1240 g/cm^2 become available, the experimental data reported will be useful for the determination of the composition of primary cosmic radiation in the superhigh-energy range. [SPR: 39,858]

Orig. art. has: 5 figures, 2 formulas and 1 table.

Card 2/2

ACC. NR: AP7007082

SOURCE CODE: UR/0048/66/030/010/1694/1696

AUTHOR: Vernov, S. N.; Khristiansen, G. B.; Nechin, Yu. A.; Stoyanova, D. A.;
Khrenov, B. A.

ORG: none

TITLE: Groups of particles at a depth of 40 meters entering into the
composition of broad atmospheric showers /Paper presented at the All-Union
Conference on Cosmic Radiation Physics, Moscow, 15-20 Nov 1965/SOURCE: AN SSSR. Izvestiya. Seriya fizicheskaya, v. 30, no. 10, 1966,
1694-1696

TOPIC TAGS: muon, physics conference

SUB CODE: 20,04

ABSTRACT: A study of the flux of particles at a depth of 40 m underground was made using the Moscow State University installation for the investigation of broad atmospheric showers. The purpose of the work described was determination of the shower-forming capacity of particles belonging to non-Poisson groups observed in the vicinity of the axis of showers. By assuming that the particles present in the groups observed were muons and using the experimental data obtained, the authors estimated that the average energy of muons in these shower-forming groups was $10^{12} < E_{\mu} < 10^{13}$ ev. The determination of the shower-forming capacity is of value in estimating the full amount of energy carried away by a muon group in a broad atmospheric shower. It was shown that the muons in a group have an energy of $\sim 10^3$ Bev $< E_{\mu} < 10^4$ Bev. This indicates that a muon group cannot carry away more than 10% of the energy of a primary particle, and therefore cannot be responsible for the escape of a signi-

Card 1/2

ACC NR: AP7007082

ficant amount of energy in the atmosphere. Presence of concentrated groups of high-energy muons ($E \geq 10^{12}$ ev) at a depth of 40m cannot be explained from the standpoint of theoretical concepts concerning the development of broad atmospheric showers that have hitherto been advanced. Orig. art. has: 4 figures.

JPRS: 9,658

Card 2/2.

L 45257-66 EWT(1)/EEC(k)-2/FCC JKT/TT/DD/GW

ACC NR: AP6020934

SOURCE CODE: UR/0029/66/000/006/0008/0011

67
65
B

AUTHOR: Lidov, M. L., (Doctor of Physical and Mathematical Sciences);
Lebedinskiy, A. I., (Doctor of Physical and Mathematical Sciences, Professor);
Vernov, S. N., (Corresponding Member of the Academy of Sciences SSSR)

ORG: none

TITLE: The battle for the Moon continues

SOURCE: Tekhnika-molodezhi, no. 6, 1966, 8-11

TOPIC TAGS: moon, space, lunar surface, lunar radiation, lunar landing
/Geiger counter, Luna 9, Luna 10

ABSTRACT: The interviewer reviews briefly the history of lunar research, presents a table of chronology and facts and repeats questions and answers. Dr. M. L. Lidov stated that one of the problems solved by Luna 9 and Luna 10 was that of landing at the most favorable time, i. e., lunar daybreak. Another problem was the selection of the most "economical" trajectory along which to send the heaviest apparatus. He stressed the importance of human initiative in the

Card 1/2

L 45257-66

ACC NR: AP6020934

guidance and control of space vehicles and this spoke of a third major problem involving slowing down the space station. The braking process was controlled from Earth and was started 2 1/2 hr before the actual landing. The flight problems faced by Luna 9 and Luna 10 were similar enough but owing to a correction, Luna 10 moved to a flight trajectory along which it approached the Moon to within a minimum distance of 1000 km. Dr. A. I. Lebedinskiy discussed the special features of the lunar landscape as transmitted on television, explained the structure of the space station and its operation when taking pictures, also the topography of the moon. The objectives of Luna 10 were research on lunar space and lunar radiation. Academician S. N. Vernov, a specialist in cosmic rays, stated that the Geiger counter installed on Luna 9 recorded protons, electrons, and gamma-quanta with a strength sufficient to penetrate the hermetically sealed space station. Lunar radiation was found to be 10 times stronger than that of the Earth; it was found to be harmless to astronauts clad in space suits. Orig. art. has: 5 figures and 1 table. [GC]

SUB CODEL 14, 03, 18, 22/ SUBM DATE: none/

Card

2/2

VERNOV, Yu.S.; KLOKMAN, V.R.

Dependence of D on recrystallization time in the case of the arbitrary dependence on the probability time for transition of microcomponents from one phase to another. Radiokhimiia 7 no.4:488-492 '65. (MIRA 18:8)

L 24396-66 EWT(1)

ACC NR: AP6010988

SOURCE CODE: UR/0056/66/050/003/0672/0279

AUTHOR: Vernov, Yu. S.

B 25
20

ORG: Institute of Physics im. P. N. Lebedev, Academy of Sciences
SSSR (Fizicheskiy institut Akademii nauk SSSR)

TITLE: Connection between the asymptotic properties of the total cross section and the ratio of the imaginary and real parts of the amplitude of zero-angle elastic scattering

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 50, no. 3, 1966, 672-679

TOPIC TAGS: scattering cross section, scattering amplitude, asymptotic property, elastic scattering

ABSTRACT: The author analyzes in greater detail the connection, first established by N. N. Khuri and T. Kinoshita (Phys. Rev. v. 137, B720, 1965), between the asymptotic values of the symmetrical amplitude of zero-angle elastic scattering (at large laboratory-system energies). It is shown that this connection can be made more precise and upper

Card

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L 24396-66

ACC NR: AP6010988

and lower bounds can be obtained for the scattering amplitude under certain rather natural physical assumptions. It is demonstrated, in particular, that the limitation on the asymptotic value of the total cross section depends on the asymptotic value of the ratio of the imaginary to the real parts of the elastic-scattering amplitude. If this amplitude is not pure imaginary asymptotically, then the cross section increases in power-law fashion if its real part is positive, and decreases in power-law fashion if it is negative. If the asymptotic amplitude of elastic scattering is pure imaginary, then the cross section can increase or decrease only slower than a certain power of the energy. The author thanks Ye. L. Feynberg for continuous interest in the work, N. N. Meyman for useful discussion, and D. S. Chernavskiy, I. M. Dremin and I. I. Royzen for valuable discussions. Orig. art. has: 45 formulas.

SUB CODE: 20/ SUBM DATE: 09Aug65/ ORIG REF: 002/ OTH REF: 004

Card

2/2

FARBEROV, M.I.; KUT'IN, A.M.; USTAVSHCHIKOV, B.F.; VERNOVA, T.P.; FROLOV, A.F.

Conditions for the synthesis of 2-methyl-5-vinylpyridine. Zhur.
prikl.khim. 34 no.3:632-640 Mr '61. (MIRA 14:5)

1. Institut monomerov dlya sinteticheskogo kauchuka i
Yaroslavskiy tekhnologicheskii institut.
(Pyridine)

VEROUVIC, BUDIMIR

1. Chelates for selective exchange of alkaline earth metals.
Budimir Verouvic, *Czech. 93,465, Oct. 15, 1959.* The
polycondensate of 2,4-diaminophenoltetraacetic acid is
neutralized with 2N NaOH and treated with 25 cc. of 40%
HCHO. The reaction is complete after 4 hrs. at 60°. The
water is evapd., and the yield of the brown-violet resin (I)
is 0 g. I (4 g.) and 1 g. resorcinol are mixed with 40 cc. H₂O
and treated with 15 cc. of 40% HCHO. The mixt. is heated
with stirring at 70° to give a gel after 30 min. Evapp. the
H₂O gives a resin with an exchange capacity of 3.2 meq.
of dry resin. V. Kratochvilová

2
1-JAS(NB)
1-JAJ(MAY)

PLAZA I BOOK EXPLOITATION 80V/350

Sovetskaniye po khimii, tekhnologii i prirodamy protivozhnykh pirdina i khinolone. Mga. 1957

Elukh, A. [Institute for the study of the synthesis of pirdina and khinolone; materials of the conference of the Ministry of Chemical Industry, USSR, 1960. 299 p. Errata slip inserted. 1,000 copies printed.]

Sponsoring Agencies: Akademiya nauk Latvyskoy SSR, Institute Khimii Vsesoyuznoye Khimicheskoye Obshchestvo.

Ed.: S. Baidarov; Tech. Ed.: A. Elzyringa; Editorial Board: Yu. A. Baidarovskiy, Candidate of Chemistry, R. V. Gerasimov, Candidate of Chemistry (Resp. Ed.), L. P. Zaitsevskiy, Doctor of Chemistry, and M. M. Kalugin.

PURPOSE: This book is intended for organic chemists and chemical engineers.

CONTENTS: The collection contains 33 articles on methods of synthesizing or producing pirdina, khinolone, and their derivatives from natural sources. The personalities are mentioned. Figures, tables, and references accompany the articles.

II. SYNTHETIC MEANS OF PREPARING PIRIDINES AND QUINOLINES

Saifov, A. S. and O. S. Orinchenko. [Spectroscopic study of the synthesis of pirdina and khinolone]. *Trudy Khimicheskogo Universiteta imeni V. I. Lenin* (Central Chemical Institute) 1960, 1: 10.

Prokhorov, M. V. and B. P. Krasovskiy. [Synthesis of pirdina and khinolone]. *Trudy Khimicheskogo Universiteta imeni V. I. Lenin* (Central Chemical Institute) 1960, 1: 10.

Yakovlev, Ya. A. [Institute of Organic Chemistry, Academy of Sciences of the USSR]. [Synthesis of pirdina and khinolone]. *Trudy Khimicheskogo Universiteta imeni V. I. Lenin* (Central Chemical Institute) 1960, 1: 10.

Korn, M. M. [Institute of Organic Chemistry, Academy of Sciences of the USSR]. [Synthesis of pirdina and khinolone]. *Trudy Khimicheskogo Universiteta imeni V. I. Lenin* (Central Chemical Institute) 1960, 1: 10.

Arshavskiy, B. I. [Moscow State University]. [Synthesis of pirdina and khinolone]. *Trudy Khimicheskogo Universiteta imeni V. I. Lenin* (Central Chemical Institute) 1960, 1: 10.

Kozlov, M. S. and O. K. Krasovskiy. [Moscow State University]. [Synthesis of pirdina and khinolone]. *Trudy Khimicheskogo Universiteta imeni V. I. Lenin* (Central Chemical Institute) 1960, 1: 10.

Kuznetsov, A. I. [Moscow State University]. [Synthesis of pirdina and khinolone]. *Trudy Khimicheskogo Universiteta imeni V. I. Lenin* (Central Chemical Institute) 1960, 1: 10.

Yakovlev, Ya. A. [Institute of Organic Chemistry, Academy of Sciences of the USSR]. [Synthesis of pirdina and khinolone]. *Trudy Khimicheskogo Universiteta imeni V. I. Lenin* (Central Chemical Institute) 1960, 1: 10.

Korn, M. M. [Institute of Organic Chemistry, Academy of Sciences of the USSR]. [Synthesis of pirdina and khinolone]. *Trudy Khimicheskogo Universiteta imeni V. I. Lenin* (Central Chemical Institute) 1960, 1: 10.

Arshavskiy, B. I. [Moscow State University]. [Synthesis of pirdina and khinolone]. *Trudy Khimicheskogo Universiteta imeni V. I. Lenin* (Central Chemical Institute) 1960, 1: 10.

Kozlov, M. S. and O. K. Krasovskiy. [Moscow State University]. [Synthesis of pirdina and khinolone]. *Trudy Khimicheskogo Universiteta imeni V. I. Lenin* (Central Chemical Institute) 1960, 1: 10.

Kuznetsov, A. I. [Moscow State University]. [Synthesis of pirdina and khinolone]. *Trudy Khimicheskogo Universiteta imeni V. I. Lenin* (Central Chemical Institute) 1960, 1: 10.

Yakovlev, Ya. A. [Institute of Organic Chemistry, Academy of Sciences of the USSR]. [Synthesis of pirdina and khinolone]. *Trudy Khimicheskogo Universiteta imeni V. I. Lenin* (Central Chemical Institute) 1960, 1: 10.

82147

SOV/81-59-6-20403

Translation from: Referativnyy zhurnal. Khimiya, 1959, Nr 6, pp 384-385 (USSR)

5-3831

AUTHORS: Farberov, M.I., Ustavshchikov, B.F., Kut'in, A.M., Vernova, T.P.,
Yarosh, Ye.V.

TITLE: The Methods of Technical Synthesis and the Application of 2-Methyl-5-Ethylpyridine and 2-Methyl-5-Vinylpyridine

PERIODICAL: Yaroslavsk. prom-st' (Sovmarkhoz Yaroslavsk. ekon. adm. r-na),
1958, Nr 3, pp 15 - 21

ABSTRACT: In the condensation of 1 mole of paraaldehyde and 4 moles of 40-60% (better 50%) aqueous solution of NH_3 in the presence of a catalyst (organic or inorganic salt) taken in the quantity of 1-2% based on the weight of the paraaldehyde (20-30 min, 260°C, pressure 80-100 atm) 99% pure 2-methyl-5-ethylpyridine¹(I) is obtained, yield 75-80%, b. p. 176.7°C, n_D^{20} 1.4974, d_4^{20} 0.9189; as impurities α - and δ -picoline, higher pyridines and resins are formed. The reaction proceeds in the following order: $4\text{CH}_3\text{CHO} + \text{NH}_3 \rightarrow \text{N}=\text{C}(\text{CH}_3)\text{CH}=\text{CHC}(\text{C}_2\text{H}_5)=\text{CH} + 4\text{H}_2\text{O}$. I, diluted by water steam in the molar ratio 1:12-1:20 is dehydrogenated in the presence of industrial dehydrogenation catalysts²(K-10 and K-12) consisting of Zn, Cr, Fe and Al oxides activated by K_2O for 2

Card 1/3

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82147

SOV/81-59-6-20403

The Methods of Technical Synthesis and the Application of 2-Methyl-5-Ethylpyridine and 2-Methyl-5-Vinylpyridine

hours at 575-600°C and a volumetric rate of 500-600 ml per 1 l of catalyst in 1 hour, 97-99% pure 2-methyl-5-vinylpyridine (II) is obtained, yield 20-25% based on I having passed through, or 70-75% based on I decomposed, b. p. 75°C/15 mm, n_D^{20} 1.5454, d_4^{20} 0.9579. The content of II in the catalyzate is 23-27%, the yield of the catalyzate 89-91%. Pyridine, picolines, 2,5-dimethyl-, 3-ethyl- and 3-vinylpyridine are formed as impurities. II is very inclined to polymerization. S, $C_6H_2(OH)(NO_2)_3$, α -nitroso- β -naphthol and methol (sulfate salt of methylaminophenol) are used as stabilizers of II. In the process of II separation S is used as stabilizer and methol for storing (in concentrations of up to 0.001 weight %). In the case of oxidizing I by $KMnO_4$ or $Cu(NO_3)_2$, 2,5-pyridine-carboxylic acid (yield 60-70%, m. p. 236°C) is obtained which is converted to nicotinic acid by decarboxylizing with a yield of ~100% (m. p. 163°C). The dimethyl ester of 2,5-pyridine-dicarboxylic acid (m. p. 163°C) after reesterification by ethyleneglycol is condensed in the presence of $ZnCl_2$ into a high-polymeric resin. I with CH_2O forms 5-ethyl-2-vinyl- and 5-ethyl-2-(β -oxyethyl)-pyridine with a high yield. I is easily hydrogenated with a yield of ~100% by Na in butyl alcohol,

Card 2/3

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SOV/81-59-6-20403

The Methods of Technical Synthesis and the Application of 2-Methyl-5-Ethylpyridine and 2-Methyl-5-Vinylpyridine

and also catalytically (in the presence of Ni-catalysts) in 2-methyl-5-ethyl-piperidine, b. p. 160-161°C, n_D^{20} 1.4530, d_4^{20} 0.8559. It is a monomer for the industry of synthetic rubber, it can be used in the production of plastics and synthetic fibers.

Ya. Danyushevskiy *

Card 3/3

5(1, 3)

SOV/153-58-5-16/28

AUTHORS:

Farberov, M. I., Ustavshchikov, B. F., Kut'in, A. M.,
Vernova, T. P., Yarosh, Ye. V.

TITLE:

Technical Synthesis of 2-Methyl-5-Ethyl Pyridine and
2-Methyl-5-Vinyl-Pyridine, and Their Fields of Application
(Tekhnicheskiye sintezy 2-metil-5-etilpiridina i 2-metil-5-
vinilpiridina i oblasti ikh primeneniya)

PERIODICAL:

Izvestiya vysshikh uchebnykh zavedeniy. Khimiya i khimicheskaya
tekhnologiya, 1958, Nr 5, pp 92-99 (USSR)

ABSTRACT:

The authors took the synthesis of 2-methyl-5-ethyl pyridine
(MEP) from acetaldehyde and ammonia with a further dehydro-
genation to 2-methyl-5-vinyl pyridine (MVP) as a basis for
the working out of technical synthesis of these two substances.
The papers recently published in patents (Refs 11-13) tend to
show an intense elaboration of these reactions. There are,
however, no publications on the first, and especially on the
second stage of this process. The authors first clarified the
most important rules governing the reaction between acetaldehyde
and ammonia for the purpose of an industrial utilization.
1) Synthesis of 2-methyl-5-ethyl
pyridine. Acetaldehyde is used as paraldehyde. This

Card 1/4

DOV/153-58-5-16/28

Technical Synthesis of 2-Methyl-5-Ethyl Pyridine and 2-Methyl-5-Vinyl Pyridine,
and Their Fields of Application

offers much higher yields. Stoichiometric ratios (1.33 mol paraldehyde per 1 mol ammonia) could, however, not secure a sufficiently high MEP yield. The optimum ratio amounts to at least 4 mol ammonia per 1 mol paraldehyde. The presence of large quantities of water has a favorable effect. The opinions on the formation mechanism of MEP in literature contradict each other (Ref 14). Up to 30 different salts, among them $ZnCl_2$, $FeCl_2$, $SbCl_3$, $CoCl_2$, $NiCl_2$, CH_3COONa , NH_4Cl , CH_3COONH_4 , NH_4F , $NH_4F \cdot HF$, KF , KHF_2 and others served as catalysts. A catalyst was selected which corresponds to the technical process. Its concentration usually amounts to 1-2% of the paraldehyde. The reaction takes also place without catalyst, however, with much smaller yields.

2) Dehydrogenation of 2-methyl-5-ethyl pyridine. Synthesis of 2-methyl-5-vinyl pyridine. The best industrial dehydrogenating catalysts served for dehydrogenation: K-10 and K-12, which consist of zinc oxide, chromium oxides, iron and aluminum oxides, activated with potassium oxide. The partial pressure is

Card 2/4

SOV/153-58-5-16/28
Technical Synthesis of 2-Methyl-5-Ethyl Pyridine and 2-Methyl-5-Vinyl Pyridine,
and Their Fields of Application

best decreased by dilution with steam. Figure 2 shows typical dehydrogenation curves of MEP (catalyst K-12 at 575°). Under optimum conditions the MVP yields per passed MEP amounted to 20-25%, and per decomposed MEP to 70-75%. 3) Isolation and stabilization of MVP, i.e. the separation of MEP from MVP is a difficult process as their boiling points are close to each other (176.7 and 187°). Furthermore MVP is easily polymerized. For this reason a high vacuum is required. Sulfur, picric acid, α -nitroso- β -naphthol and sulfurous methyl amino phenol (Figs 3,4) were the best stabilizers of some dozens investigated. 4) Equipment and apparatus for the MVP synthesis. Figure 5 shows a corresponding scheme. 5) The scheme (p 98) shows some more syntheses proceeding from MEP (Refs 15,16). 6) Finally, rubber and latex types on MVP basis are discussed. Some of them show better adhesion to cord from viscose and nylon, high elasticity, frost resistance, and resistance to wear and tear. Some branches of industry announce at present a high demand for those rubber types. There are 5 figures and 18 references, 6 of which are Soviet.

Card 3/4

DOV/153-58-5-16/28

Technical Synthesis of 2-Methyl-5-Ethyl Pyridine and 2-Methyl-5-Vinyl Pyridine,
and Their Fields of Application

ASSOCIATION: Yaroslavskiy tekhnologicheskij institut i opytnyy zavod Ministerstva
va khimicheskoy promyshlennosti (Yaroslavl' Technological
Institute and Test Plant of the Ministry of Chemical Industry)

SUBMITTED: December 28, 1957

Card 4/4

S/079/60/030/04/09/080
B001/B016AUTHORS: Farberov, M. I., Kut'in, A. M., Kishinskiy, G. I.,
Vernova, T. P.TITLE: Diene Synthesis on the Basis of Olefins and Aldehydes.
II. Synthesis of Divinyl on the Basis of Propylene and
Formaldehyde ↙

PERIODICAL: Zhurnal obshchey khimii, 1960, Vol. 30, No. 4, pp. 1099-1106

TEXT: Some patents in publications indicate the possibility of obtaining divinyl from 4-methyl dioxane (Ref. 5) but without an experimental basis. ↙
The authors of the present paper thoroughly investigated the contact conversion of methyl dioxane (I) (obtained from propylene and formaldehyde) in the gaseous phase by means of various catalysts (mainly metallic phosphates) in which connection divinyl is formed in high yield. It was further shown that under certain conditions divinyl and allyl carbinol (IV), approximately in the same quantity (Ref. 6), may be obtained at the same time. On the basis of previous papers (Refs. 1-4) (Scheme 1) the synthesis of divinyl

Card 1/3

Diene Synthesis on the Basis of Olefins and Aldehydes. II. Synthesis of Divinyl on the Basis of Propylene and Formaldehyde

S/079/60/030/04/09/080
B001/B016

was carried out by allowing propylene to react with formaldehyde by means of a catalyst. As a result of the investigation of the contact conversion of the principal reaction product, methyl dioxane (Scheme), an 82% divinyl yield was obtained (calculated for the methyl dioxane having passed reaction). By a suitably conducted hydrogenation of the allyl carbinol (IV), butanol-1 was obtained quantitatively. At the same time, divinyl and allyl carbinol could be synthesized in about the same quantities. The authors investigated the contact conversion of the by-product of the above-mentioned reaction, 4-hydroxy-tetrahydropyran (III), by means of the KSD catalyst, in which connection compound (VIII) (36%), divinyl (15-20%), and the unsaturated alcohol (IV) resulted. The divinyl yield could be increased up to about 70% at a higher temperature (550°). A reaction mechanism was suggested for the formation of the products which are formed on contact conversion of methyl dioxane and 4-hydroxy-tetrahydropyran. 3 diagrams and 3 tables illustrate the investigation results. There are 3 figures, 3 tables, and 13 references, 11 of which are Soviet.

Card 2/3

Diene Synthesis on the Basis of Olefins and Aldehydes. II. Synthesis of Divinyl on the Basis of Propylene and Formaldehyde

S/079/60/030/04/09/080
B001/B016

ASSOCIATION: Nauchno-issledovatel'skiy institut monomerov dlya SK (Scientific Research Institute of Monomers of Synthetic Rubber). Yaroslavskiy tekhnologicheskii institut (Yaroslavl' Institute of Technology) ✓

SUBMITTED: April 7, 1958

Card 3/3

5.3400

78274

SOV/79-30-3-28/69

AUTHORS:

Farberov, M. I., Kut'in, A. M., Kisninskiy, G. I.,
Vernova, T. P.

TITLE:

Synthesis of Dienes From Olefins and Aldehydes. I.
Synthesis of Isoprene From Isobutylene and Formaldehyde

PERIODICAL:

Zhurnal obshchey khimii, 1960, Vol 30, Nr 3, pp
875-884 (USSR)

ABSTRACT:

Among many catalysts tested, the best results were obtained with KSD catalyst (a mixture of calcium phosphates of a definite composition). The catalyst needs regeneration after 2-4 hours of work, and this can be best done with a steam-air mixture which removes deposited "coke" from it. The activity of the catalyst decreases sharply when the reaction is carried out without steam. The dependence of the rate of dimethyldioxane conversion on contact time and temperature is shown in Figs. 2 and 3.

Card 1/6

Synthesis of Dienes From Olefins and Aldehydes. 78274
I. SOV/79-30-3-28/69

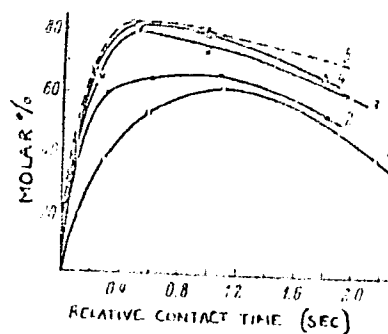


Fig. 2. Conversion of dimethyldioxane (I) into unsaturated hydrocarbons (C_5H_8 and iso- C_4H_8) at different temperatures and with steam dilution, 1:14 (molar): (1) 300°; (2) 325°; (3) 350°; (4) 375°; (5) 400°.

Card 2/6

Synthesis of Dienes From Olefins and Aldehydes. I.

78,274

SOV/79-30-3-28/69

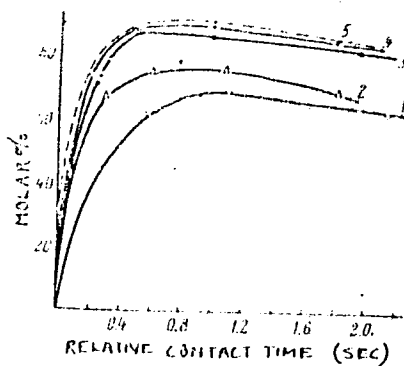


Fig. 3. Yield of isoprene based on reacted dimethyldioxane (I) at different temperatures with steam dilution, 1:14 (moles): (1) 300°; (2) 325°; (3) 350°; (4) 375°; (5) 400°.

Card 3/6

Synthesis of Dienes from Olefins and Aldehydes: 78274

I.

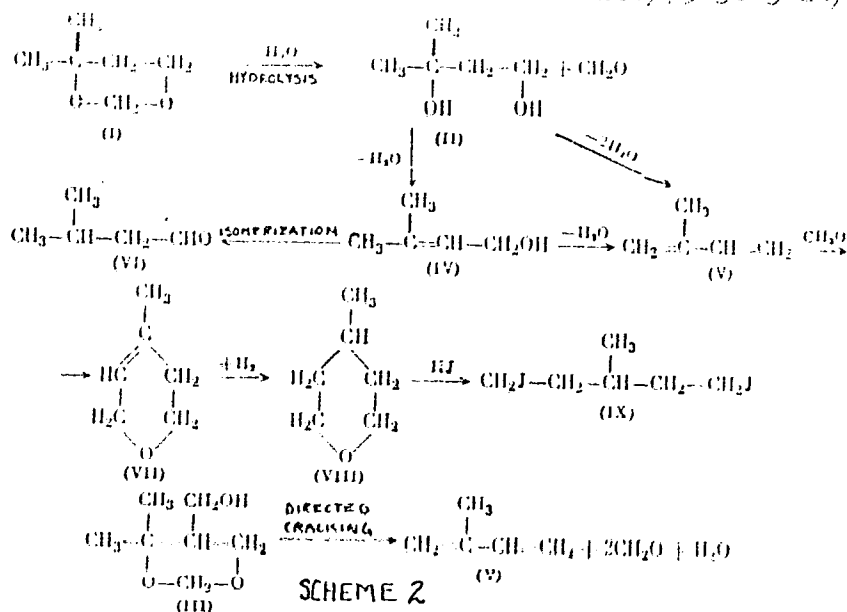
SOV/79-30-3-28/69

Dilution of dimethyldioxane with steam significantly increases the reaction rate. An appropriate selection of the reaction conditions could yield 75-78% isoprene, based on reacted dimethyldioxane, or 80-85% isoprene, based on decomposed dimethyldioxane. Among the reaction products of isobutylene with formaldehyde, in addition to the main product, dimethyldioxane (I), diol (7-10% based on unreacted formaldehyde), and cyclic alcohol (III, 7-8%) are present. They can also be converted into isoprene over the KSD catalyst. The mechanism of reaction is shown in Scheme 2.

Card 4/6

Synthesis of Dienen From Olefins and Aldehydes.
I.

78270
SOV/12-39-3-20/69



Card 5/6

SCHEME 2

Synthesis of Dienes From Olefins and Aldehydes. 78274

I.

SOV/79-30-3-28/69

The physical constants of the basic and side products of the reaction are: isoprene (V), bp 34° , n_D^{20} 1.4219; 2-methylbuten-2-ol-4 (IV), bp $139-140^{\circ}$; isovaleric aldehyde (VI), mp $117.5-118^{\circ}$; compound (VII), bp $118.5-119^{\circ}$, n_D^{20} 1.4490; compound (VIII), bp $105-107^{\circ}$, n_D^{20} 1.4190; compound (IX), bp $120-121^{\circ}$ (4 mm), n_D^{20} 1.5870. N. K. Shemyakina participated in this work. There are 4 figures; 3 tables; and 10 references, 8 Soviet, 2 U.S. The U.S. references are: Gresham, T. L., Steadman, J. Am. Chem. Soc., 71, 878 (1949); U.S. Patent 2218640.

ASSOCIATION: Scientific Research Institute of Monomers for Synthetic Rubber, and Yaroslavl Technological Institute (Nauchno-Issledovatel'skiy institut monomerov dlya SK 1 Yaroslavskiy tekhnologicheskii institut)

SUBMITTED: March 7, 1958

Card 6/6

S/080/61/034/003/011/017
A057/A129

AUTHORS: Farberov, M. I.; Kut'in, A. M., Ustavshchikov, B. P., Vernova,
T. P., Frolov, A. P.

TITLE: Investigation of the conditions for the synthesis of 2-methyl-
-5-vinylpyridine

PERIODICAL: Zhurnal prikladnoy khimii, v. 34, no. 3, 1961, 632 - 640

TEXT: Dehydrogenation of 2-methyl-5-ethylpyridine (MEP) was investigated in order to increase the yield of 2-methyl-5-vinylpyridine (MVP). Conditions were presented ensuring a 25 % yield of MVP in relation to the amount passed of MEP and 70 - 73 % yield in relation to decomposed MEP. Steam effects partial hydrolysis of pyridine bases and is thus not a completely inert diluent in dehydrogenation of MEP. Inhibitors for polymerization were investigated for the storage of MVP and separation from dehydrogenation products. Improvement of this dehydrogenation process is important for the manufacture of polymer materials. MVP is especially significant in the production of special types of synthesized latex and synthetic rubber according to R. Frank et al. (Ref. 1: Ind. Eng. Chem., 40, 879 (1948)), J. E. Pritchard and M. H. Opheim (Ref. 2: Ind. Eng. Chem., 46, 2242,

Card 1/9

Investigation of the conditions for

s/080/61/034/003/011/017
A057/A129

1954, 47, 863, 1955), H. E. Railsback and C. C. Biard (Ref. 3: Ind. Eng. Chem., 48, 1043, 1956), and V. L. Tsaylingol'd et al. (Ref. 4: Kauchuk i rezina, 9, 1958, 3, 1959, 9, 1959), or ion exchange resins in the manufacture of synthetic fibers. The raw material - MEP - is synthesized by Chichibabin's reaction between paraaldehyde and ammonia in liquid phase according to M. I. Faberov et al. (Ref. 5: Izv. Vuzov, Khim. i khim. tekhn., 5, 92, 1958) with a 70 - 73 % yield. The present experiments were carried out (in assistance of M. Yu. Tikhvinskaya and M. A. Loginova) by a method and with a laboratory assembly described in a prior paper (Ref. 11: ZhOKh, 30, 875, 1960). Vapor pressure and liquid - vapor equilibria in the system MEP - MVP was determined on an apparatus similar to Othmer's (Ref. 12: Ind. Eng. Chem., 45, 614, 1953) especially adapted for vacuum tests. Two catalysts were used: no. 1 based on ZnO and no. 2 on Fe₂O₃, containing 86 - 88 % of the basic component, some chromium oxide and small amounts of other components, which are not specified. Since considerable carbon deposition occurs during the dehydrogenation process, the catalyst had to be regenerated after 2 - 8 hours by passing an air-steam mixture at a maximum temperature of 650° - 700°C. Results of dehydrogenation experiments with steam as diluent in varying conditions are given in Table 1, It can be seen that the yield of MVP related to decomposition of MEP decreases with the contact time. This is apparently effected by

Card 2/9

Investigation of the conditions for

S/080/61/034/003/011/017
A057/A129

side reactions and increasing carbon deposition. The latter depends on the type of catalyst and the degree of dilution by steam. Steam cannot be considered as inert diluent, since with increasing dilution by steam the yield of catalyzate and of MVP (based on decomposed MEP) decreases, in spite of the fact that the yield of MVP based on the amount of passed MEP increases (Figure 1). Also with increasing dilution by steam formation of gaseous products (CO_2 , H_2 , NH_3 etc) and the content of pyridines (α - and γ -picoline, 2,5-lutidine, 3-vinylpyridine) in the catalyzate increases. This can be explained by the reaction of pyridine bases with steam, resulting in a partial dealkylation of MEP and formation of pyridines, or total rupture of the pyridine ring with ammonia evolution. A similar reaction was observed by A. A. Baladin et al. (Ref. 8: DAN SSSR, 110, 79, 1956) on α -picoline. These side reactions of hydrolysis occur with different rates on various catalysts, thus influencing the selection of the latter. Results on dehydrogenation of MVP with other diluents are given in Table 3. The observed effect of benzene can be explained by the fact that no side reactions of hydrolysis occur. Although nitrogen does not show these side reactions, no desorption of pyridine bases from the catalyst is effected by nitrogen (contrary to benzene) resulting in thermal decomposition of these substances. Fractionation of the catalyzate at 20 torr demonstrated that the fraction boiling at 63 -

Card 3/9

Investigation of the conditions for

S/080/61/034/003/011/017
A057/A129

- 69°C. (20 torr) [Abstracter's note: Error in original paper - 200 torr instead of 20.] has an increased refraction index and contains considerable amounts of an unsaturated compound, apparently 3-vinylpyridine. Thus the following reaction and side products were obtained in dehydrogenation of MEP: (I) α -picoline, (II) 3-ethylpyridine, (III), 2,5-lutidine, (IV) 3-vinylpyridine, (V) 2-methyl-5-ethylpyridine, (VI) 2-methyl-5-vinylpyridine. The present authors consider (I), (II) and (III) as main cracking products of MEP (in presence of hydrogen), while (IV) is a cracking product of MVP. Different stabilizers for MVP were investigated (Figure 3) and it was observed that 0.1 % of sulfur is the optimum stabilizer in fractionation of MVP. For the storage of MVP an admixture of 0.001 % methol is most efficient in stabilizing MVP for several weeks, or 0.01 % methol for several months. Liquid-vapor equilibrium in the system MEP - MVP is shown in Figure 5. Corresponding experiments demonstrated that special conditions must be maintained if a 98 - 99 % concentration of MVP should be attained in fractionation. Thus in the system the maximum temperature should be 95°C (for highly concentrated MVP only 85°C), and highly effective inhibitors should be used. There are 6 figures, 4 tables and 12 references: 8 Soviet-bloc and 4 non-Soviet-bloc.

Card 4/9

Investigation of the conditions for

S/080/61/034/003/011/017
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ASSOCIATIONS: Institut monomerov dlya SK (Institute of Monomers for Synthetic Rubber) and Yaroslavskiy tekhnologicheskij institut (Yaroslavl' Technological Institute)

SUBMITTED: June 6, 1960.

Table 1: Dehydrogenation of MVP on the catalysts no. 1 and no. 2 using steam as diluent. Legend: (1) no. of the catalyst, (2) temperature(°C), (3) nominal contact time, sec., (4) volume velocity of the MEP supply (in ml/ml catalyst per h), (5) molar ratio H₂O/ MEP, (6) yield of the catalyzate (weight %), (7) yield of MVP based on the MEP passed (mole %), (8) yield of MVP based on the MEP decomposed (mole %), (9) carbon deposit on the catalyst (mole % based on the MEP passed).

Card 5/9

FARBEROV, M.I.; USTAVSHCHIKOV, B.F.; KUT'IN, A.M.; VERNOVA, T.P.;
YAROSH, Ye.V.

Synthesis and use of 2-methyl-5-ethylpyridine and 2-methyl-5-vinyl-
pyridine. Izv.vys.ucheb.zav.; khim. i khim.tekh. 1 no.5:92-99 '58.
(MIRA 12:2)

1. Yaroslavskiy tekhnologicheskii institut i Opytnyy zavod Minist-
erstva khimicheskoy promyshlennosti.
(Pyridine)

AUTHORS: Farberov, M. I., Kut'in, A. M.,
Vernova, T. P., Shemyakina, N. K.

SOV/156-58-1-36/46

TITLE: Industrial Synthesis of Allylcarbinol and Standard Butyl Alcohol on the Basis of Propylene and Formaldehyde (Tekhnicheskiy sintez allilkarbinola i normal'nogo butilovogo spirta na osnove propilena i formal'degida)

PERIODICAL: Nauchnyye doklady vysshey shkoly, Khimiya i khimicheskaya tekhnologiya, 1958, Nr 1, pp. 148 - 152 (USSR)

ABSTRACT: In their laboratory the authors have for years studied syntheses based on olefine and formaldehyde (Refs 1,2). Allyl dioxanes-1,3 are converted into dienes. Catalysts and conditions were developed by means of which 80 - 90% of the theoretically possible diene yield could be obtained (Ref 2). By passing it over a catalyst in the presence of water vapor, 4-methyl dioxane-1,3 can be easily converted into divinyl. As further investigations have shown, the allylcarbinol yield can be substantially increased by carrying out the contact process under less severe conditions (lower temperatures, shorter contact time; Fig 1). Figure 2 shows the influence of temperature upon the allylcarbinol yield, given in molar per cent

Card 1/3

Industrial Synthesis of Allylcarbinol and Standard
Butyl Alcohol on the Basis of Propylene and Formaldehyde

SOV 156-58-1-36/46

related to methyl dioxane. Table 1 shows the results of a typical balance experiment; under such conditions as were chosen here, the weight ratio of the allylcarbinol and divinyl yields, related to the decomposed methyl dioxane, may be even a little greater than unity. The author's idea about the mechanism of this reaction is as follows: The catalyst (a calcium phosphate mixture) possesses hydrolyzing and at the same time dehydration properties (Ref 9). With the same catalyst, and under the same conditions, trimethyl carbinol is dehydrated to isobutylene with a quantitative yield. The 1. reaction stage is therefore the hydrolysis of methyl dioxane (I) in the presence of water vapor to butandiol-1,3 (II), with separation of formaldehyde. Butandiol is further dehydrated, being converted to allylcarbinol (III) and divinyl (IV). Propylene is formed in small quantities due to a cracking reaction. Allylcarbinol may itself be of interest as a starting material for syntheses. From an industrial viewpoint, however, its use in hydration in standard butyl alcohol is of greater importance. There are 3 figures, 2 tables, and 13 references, 8 of which are Soviet.

Card 2/3

Industrial Synthesis of Allylcarbinol and Standard SOV/156 .58-1-36/46
Butyl Alcohol on the Basis of Propylene and Formaldehyde

ASSOCIATION: Kafedra tekhnologii osnovnogo organicheskogo sinteza i SK
Yaroslavskogo tekhnologicheskogo instituta (Chair of
Technology of Basic Organic Synthesis and SK of the Yaroslavl'
Institute of Technology)

SUBMITTED: October 3, 1957

Card 3/3

VERNOVSKIY, Aleksandr Ivanovich; KOGAN, Ye.L., red.

[Whose "plans" are they? On the nature and methods of economic planning in Western Europe] Ch'i eto plany"? O sushchnosti i metodakh ekonomicheskogo programmirovaniia v Zapadnoi Evrope. Moskva, Izd-vo "Znanie," 1964. 39 p. (Novoe v zhizni, nauke, tekhnike. III Seria: Ekonomika, no.12) (MIRA 17:7)