CONTENTS

Abstract 2

1

ELEMENTARY PARTICLE PHYSICS. EXPERIMENT

New upper limit for the branching ratio of the $\Omega^- \to \Xi^-\gamma$ radiative decay (E761 experiment, FNAL) 4
L3 experiment at LEP (CERN) 8
Measurement of the B_d^0 meson oscillation frequency using dilepton events with the L3 detector 13
New limit on probability of the muonium-to-antimuonium conversion in PNPI-JINR experiment 16
Measurement of the spin rotation parameters A and R in $\pi^{\pm}p$ elastic scattering in the momentum range 1.4–2.1 GeV/c 20
Measurement of differential cross sections for binary π^-p reactions with both neutral particles in final state in the region of $P_{11}(1440)$ and $S_{13}(1535)$ resonances 25
Hermes experiment at HERA collider 28
Polarimetry of the vector polarized deuteron beam at the JINR synchrophasotron 31
New measurements of the antineutrino-spin asymmetry in beta-decay of the neutron and restriction for mass of W_R 35
Precise determination of neutron beam polarization by two analyzer method 38
Measurement of polarization observables in $\vec{d} + p \to \vec{p} + p + n$ reactions at $T_d = 2.0$ GeV 41
Parity nonconserving neutron spin rotation in the vicinity of ^{139}La P-wave resonance .. 44
LHC-B experiment at LHC, CERN 47
The FTC detector in the L3 experiment at LEP, CERN 51
Forward spectrometer for SPES-4π experiment 54
New possibility of a search for a neutron EDM by polarization method in neutron diffraction 57
Compton scattering on protons below pion production threshold: project of experimental determination of electric and magnetic polarizabilities of the proton 59
Study of effects of leading and higher twists in one-spin asymmetries in pp$\uparrow$ interactions at 70 GeV/c and $\pi p\uparrow$ interactions at 40 GeV/c (Proposal of the RAMPEX experiment, IHEP) 62
The $\pi\Lambda$ final state interaction effects in the $p\vec{p} \to K^+\Lambda p$ reaction at COSY 65

2

NUCLEAR AND ATOMIC PHYSICS. EXPERIMENT

Small angle proton elastic scattering on ^{4}He, ^{6}He and ^{8}He at the energy of 0.7 GeV in inverse kinematics (S-105 experiment, GSI) 70
The problem of nuclear charge radius determination for ^{11}Li by laser spectroscopy 72
Development of the laser ion source technique for unstable nuclide atomic spectroscopy 75
Mass surface of the "magic cross" at ^{132}Sn 76
The beta-decay strength functions of ^{100}Ag and ^{104}In 80
The Marburg University – PNPI off-line mass separator 83
(p,2p) and (p,np) reactions on ^{90}Zn and ^{208}Pb nuclei at 1 GeV. Evolution of parameters of deep nuclear shells 85
Study of mesic atoms at the proton beam of the Moscow Meson Factory (MMF) with a two-crystal diffraction spectrometer (project "MADIS") 89
Nuclear fission beyond two-body kinematics 92
Combined analysis of neutron energy dependences of P-odd, P-even left-right and P-even forward-backward asymmetry effects of ^{233}U fission fragment emission 96
Neutron energy dependence of P-even effect of forward-backward asymmetry of ^{239}Pu fission fragment emission in the range 0.02-175 eV 98
Study of dμd and pμd fusion in D_2 and HD mixtures 101
Precision measurement of nuclear μ-capture by ^{3}He 103
Measurement of the breakup channels in nuclear muon capture by ^{3}He and ^{4}He 105
Measurement of the heavy neutrino admixture upper limit from muon capture by ^{3}He 108
Study of features for particle production in nucleus-nucleus interactions 111
Method of the light fragment identification in central collisions of 160 A GeV lead projectile with nuclei of photoemulsion 113
Fast neutron and gamma-ray channeling in crystals 116

3

THEORETICAL PHYSICS

Analytic solution of the double-logarithmic integral equations with QCD running coupling 122
The role of screening corrections in small x-behaviour of structure functions 124
Heavy quark production in parton model and in QCD 125
The model test of universality in secondary hadron production in high energy pp, ep and e^+e^- interactions 125
A-dependence of heavy flavour production in QCD 126
New corrections to the energy levels of two-body systems 126

Investigation of the double photoionization 128
Resummation of $(\beta_0\alpha_s)^n$ corrections in QCD: techniques and applications
to the τ hadronic width and the heavy quark pole mass 128
Estimates of the weak annihilation contributions to the decays
$B \to \rho + \gamma$ and $B \to \omega + \gamma$ 129
Power corrections and renormalons in Drell-Yan production 129
Resummation of running coupling effects in semileptonic B decays
and extraction of $| V_{cb} |$ 130
Instanton-induced production of QCD jets 130
Theoretical update of the semileptonic branching ratio of B mesons 131
Ioffe-time distributions instead of parton momentum distributions
in description of deep inelastic scattering 131
Naive nonabelianization and resummation of fermion bubble chains 132
Effective chiral lagrangian from dual resonance models 132
Hadronic matrix elements of gluon operators in the instanton vacuum 133
Nucleon tensor charges in SU(2) chiral quark-soliton model 133
Magnetic moments and electromagnetic form factors of the SU(3) octet
baryons in semibosonized SU(3) Nambu-Jona-Lasinio model 134
Sphaleron transitions in the minimal standard model and the upper bound
for the Higgs mass 134
Color coherent phenomena 135
Z_2 as the topological origin of $(B + L)$ violation in the hot electroweak theory 139
Formfactor $\pi^0 \to \gamma^* + \gamma^*$ at different photon virtualities 139
Topological reduction of 4D SYM to 2D sigma models 140
A critical behaviour of anomalous currents, electro-magnetic universality and CFT ... 140
On the Z_2 structure of the configuration space in non-abelian Yang-Mills theories 141
$2d$ gravity stress tensor and multi-loop amplitudes in the string theory 141
New approach in the microscopic Fermi systems theory 143
A systematic contribution to the binding energy of nuclei 145
QCD corrections to decays of intermediate mass Higgs boson 148
Kinetics of excited muonic hydrogen 151
Coherent pion effects at large rapidities in nucleus-nucleus collisions 156
Parity nonconservation in atoms and molecules 160
Nuclear polarization effects in the spectra of multicharged heavy ions 161

4

PHYSICS OF CONDENSED MATTER

Combined study of martensitic and magnetic transitions in Cu-Mn alloys 164
Spatiotemporal chaos and self-organization of critical state in two-
-dimensional Josephson lattice 167
Dependence of electrical field vector on the angle between magnetic field
and transport current for HTSC ceramics 167

Neutron tomography experiments for the study of trapped flux distributions in high-T_c superconducting ceramics 168
Transport critical current mechanism investigation in granulated superconductors based on YBaCuO-ceramics under fast reactor neutron irradiation 169
The anisotropic properties of quasicrystal $Bi_2Sr_2CaCu_2O_8$ by fast neutron irradiation 171
Peculiarities of Cu magnetic system behavior in moderately oxygenated La_2CuO_{4+x} single crystals at phase separation 173
Mean-square displacements and characteristic frequencies of the thermal vibrations of rare-earth ions in the hexaborides REB_6(RE=La→Sm) 175
Spreading of SDTD to case of low-dislocation crystals 177
Characterization of vacancy-related defects introduced during silicon heat treatment by DLTS and gamma-ray diffraction techniques 180
Gamma-ray diffractometry researches of chaotically distributed dislocations in quartz single crystals 182
Electronic and magnetic structures of ferrites 185
Small angle scattering of neutron in iron-base FCC alloys doped with carbon or nitrogen 188
The fractal approach to the study of chitosan films swelling 189
Small-angle neutron scattering study of the polyelectrolyte hydrogels structure 189
The structure of polyacrylate-surfactant complexes 191
Spectrometer for studying broad magnetic dipole transitions in magnets and the Hall conductivity at microwave frequency in conducting materials 192
Hybrid photodiodes 194
Homoclinic points are generity 198

5

MOLECULAR AND RADIATION BIOPHYSICS

Study of lethal and mutagenic effects of ^3H-decay in various positions of DNA on a model of extracellular lambda phage 204
Properties of cloned dominant Gam18 allele 206
Properties of cloned dominant Gam43 allele 208
Natural plasmid pSD89 (Cm^r) from *Salmonella derby* K89 protects *Escherichia coli* K-12 strains against radiation 209
Karyotyping of individual cells with flow cytometry 210
Discrete preparative electrofractionation of complex protein mixture 215

6

REACTOR PHYSICS AND TECHNOLOGY

The past of WWR-M reactor (25 years from 35) 220
The reactor WWR-M at present and project 222
The PIK reactor 224
Calculation of PIK reactor permissible power by a statistical technique 226
The using of liquid regulator system in sub-critical regimes of PIK reactor 228
Advanced irradiation of the CAB-1 material in the WWR-M reactor 230
Neutron irradiation influence on CAB-1 alloy mechanical properties 233
Topaz colouring change in WWR-M reactor 236
Development of Su-MC coupling technique for PIK reactor fast neutron flux calculations 240
Solid deuterium ultra cold neutron source research 244
Computer simulation of the hydrogen distillation and cece process 249
Twofold purpose detritiation plant 255

7

ACCELERATOR PHYSICS AND TECHNOLOGY

Status report of 1 GeV PNPI synchrocyclotron 262
Experimental determination of the external beam matrix on 1 GeV synchrocyclotron 266
Progress report on the design and construction of isochronous cyclotron at Gatchina 270
Design and optimization the magnet and magnetic structure for the 80 MeV H^- isohronous cyclotron 272
Losses of H^- ions due to electro-magnetic dissociation and their effect on selection of isochronous cyclotron magnetic structure 275
The field mapping system for the isochronous cyclotron at Gatchina 278
The construction features of an acceleration system for the isochronous cyclotron at Gatchina 280
Investigation the acceleration system of isochronous cyclotron on models 283
Experimental setup for investigation internal H^--ion sources 285
Calculation of the beam dynamics in the central region of the cyclotron GIC 288
Low energy accelerators of PNPI and their using in scientific and applied researches 292
Nuclear microanalysis at PNPI electrostatic accelerator 296

8

METHODS AND APPLIED RESEARCHES

The process of an integration of Petersburg Nuclear Physics Institute into the world wide information space 300
A high speed readout system for silicon strip detectors 302
Performance of fine-mesh phonomultiplier tubes produced in Russia 304
Digital image recording system for hydrogen streamer detector 308
Xenon recovery cryostat for experiment E-781 at Fermilab 311
Automated system of temperature stabilisation for cryogenic ionization chamber 313
The absorption method and setup of high-purity ethane producing 315
Cryogenic internal hydrogen gas target 319
Knowledge based control: method and application 321
MS windows based tolls for P-CAD designers 325
Preparation of pure HD-gas for $dd\mu$-catalysis investigation 328
Perspectives of the radiophotoluminescent (RPL) method application to clinical medicine 330
The stereotactic proton therapy at the 1 GeV PNPI sinchrocyclotron 333
Development of the experimental methods to search and study of T-noninvariant effects in resonance neutron induced reactions with complex nuclei 334
Application of the two parameter SEU model to practice 336