

PAST, PRESENT AND FUTURE OF VECTOR BOSONS *)

M. Veltman

University of Michigan, Ann Arbor, MI 48109

This is a very memorable occasion. We have heard at this conference convincing evidence about the discovery of charged and neutral vector bosons with masses of ~ 80 and ~ 90 GeV. In this talk I will try to assess the implications of this discovery, and after that I will concentrate on the new frontier, the Higgs system. But first it seems appropriate to look back, over-viewing some history.

It is now almost precisely 20 years ago that the discovery of the vector boson was announced at the Sienna Conference (30 Sept. - 5 Oct. 1963). Let me read you some part of a paper presented at that conference. It concerns the observation of lepton pairs in neutrino experiments, supposedly due to the reaction of fig. 1

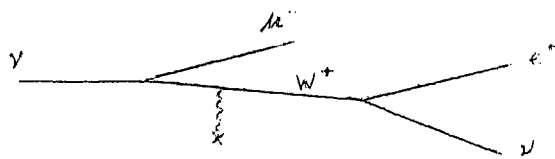


fig. 1

One observes $\mu^- \mu^+$ or $\mu^- e^+$ in either spark chamber or bubble chamber. Here is such an event (transparency). Comparing the number of events with computed cross sections gives an estimate of the W-mass. Let me now quote the paper ¹⁾

*) The organizers of this conference did leave the subject of this talk entirely open to the speaker. In particular, this talk is not meant to summarize the considerable number of interesting results presented at this conference.

--- would correspond to a mass somewhat higher than 1300 MeV ---

--- We would be very surprised if it rose as far as say 2 GeV.

There are other possible mechanisms for lepton pairs ---

--- Another proposal is that of a direct six-fermion interaction (T. Ericson and S. Glashow²⁾). This proposal springs from an idea of Efimov³⁾ that a finite field theory might result from interactions which are not low degree polynomials ---

This was two years after the fundamental paper of Glashow⁴⁾ containing most of what we now call the standard model, predicting boson masses of the order of 60-100 GeV.

We certainly have come a long way since then. The above mentioned bubble chamber event is most likely a charm event. Both theorists and experimentalist of that day failed to see for example scaling in ν -cross sections, or charm, or neutral currents or high γ anomalies, to name some.

How come that we do accept almost without question the present results from CERN? It is because of our believe in the standard model, in renormalizable field theory. That belief was not present in 1963, as you can see. Of course, the standard model has been successful elsewhere, so we have some reason for our beliefs. It is nevertheless precisely this point that I want to focus on in this talk.

Let me now put forward the following question. What can we conclude from the results of the CERN experiments UA1 and UA2? I take these results on their face value, and I assume that the observed events do indeed correspond to the vector bosons of weak interactions.

The first conclusion is that perturbation theory seems to be valid to an accuracy of about 5 %. This is a highly non-trivial observation. It eliminates a number of theories, proposed a few years ago, in which the vector bosons are suggested to be composites. The narrow width's reported exclude these theories.

Also, it appears that there is only one W^0 (or Z^0 if you prefer) and one W^+ . It is important to realize that if there had been several W^+ then we would have been forced to abandon a gauge theory structure (assuming V-A coupling of all these W's to $e-\nu$ pairs). I therefore see the present

result as very encouraging for the idea of an underlying gauge theory.

Another point is the precision of the result. Some time ago it was shown that there are exceptionally large radiative corrections to the W masses ⁵⁾ (of the order of 3 GeV), and while the results are not sufficiently accurate yet to conclude agreement here, they certainly are very encouraging. If we take this seriously then we can conclude that perturbation theory holds in this case even for the radiative corrections up to one loop.

A few years ago we ⁶⁾ introduced a new parameter in the theory, now usually called the ρ -parameter. In first approximation it is given by

$$\rho = \frac{M_w^2}{M_0^2 \cos^2 \theta_w}$$

Its value relates to the Higgs system. Even assuming renormalizable gauge theory then nature has still the option of a choice for the Higgs system. This choice can be read off from the value of ρ . The present value, $\rho \sim 1$, suggests the simplest possible Higgs system, as proposed by Weinberg as a mass generating mechanism in Glashow's model ⁷⁾.

Even more, ρ deviates from 1 at most by some 3 %. As it happens radiative corrections affect ρ , in particular radiative corrections due to intermediate states involving possible new fermion generations ⁸⁾. It seems to me that the present value of ρ tells us that there are no more fermion generations. It is still conceivable that there is a fourth generation, but it is getting hard. In any case, I assume that within a relatively short time UA1 and UA2 will tell us if there is another lepton below 80 GeV, while at the same time increasing the accuracy on ρ . If ρ keeps on being close to 1, for example within 1 %, and if no new lepton is found then it seems to me that no more fermion generation with a neutrino, a lepton and another quark pair can be accommodated within the standard model. What mystery are we facing here? Is the W-mass of 80-90 GeV also representative for the maximum mass allowed for fermions?

In the light of these observations it is imperative that a very careful analysis is made of the radiative corrections to the vector boson masses. A nice scheme, incorporating most calculations has been proposed by the Rome group ⁹⁾, and I assume that we will get some clear answers as the ex-

perimental accuracy improves.

Thus everything seems to be quite precisely in agreement with our present theoretical ideas. It now becomes important to focus attention on the next frontier, the Higgs system. Here I want to explain something very carefully, very precisely. It is what I have called the screening theorem ¹⁰⁾.

As a first remark I would like to explain that renormalizability and perturbation theory go together. Let me illustrate this on the old four fermion theory of weak interactions. In that theory there exist the coupling $(\nu e)(\nu e)$ see fig. 2



fig. 2

In the standard model a W^0 goes in between, softening the vertex for momentum transfers over 90 GeV (fig. 3)

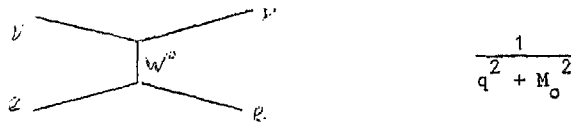


fig. 3

In higher orders one may have repeated scattering (fig. 4).

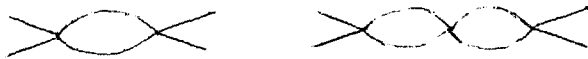


fig. 4

If there is no softening of the vertex above 100 GeV then these radiative corrections become as large, or even larger than the lowest order contribution. In other words, perturbation theory breaks down. This breakdown occurs irrespective of the initial ν and e energy. The fact that at low energies the four-fermion theory holds very well in a perturbative sense implies therefore that the $(\nu e)(\nu e)$ vertex must become soft at some, not too high, energy. A vector boson of 90 GeV is perfectly adequate. But 300 GeV would have been too high. Thus even before the discovery of the vector bosons we knew that something had to be there below 300 GeV. Pertur-

bation theory was doing too well. The non-renormalizable 4-fermion theory would induce non-perturbative effects, and thus a limit could be put on the validity of the 4-fermion theory.

Can we do the same thing with the Higgs system? Without the Higgs the standard model is non-renormalizable, therefore non-perturbative effects occur, and the non-observation of such results would put a limit on the validity of the standard model without the Higgs system. In other words, it should be possible to obtain an upper limit on the Higgs mass from the accuracy with which perturbation theory holds. The fact is now that the screening theorem says that this cannot be done. In other words, from the present day observed accuracy of perturbation theory we cannot draw any conclusion on the mass of the Higgs.

To explain at least something of this curious fact let me first mention again the ρ -parameter. It is the only parameter that can be observed at low energies and is sensitive to the Higgs system in lowest order of radiative corrections. Thus the value of the Higgs mass affects the ρ -parameter through diagrams of the type of fig. 5.



fig. 5

However, there are all kinds of cancellations, and in the end the Higgs mass enters only through a logarithm. The actual calculation gives ¹¹⁾

$$\rho = 1 - \frac{3\alpha}{16\pi c^2} \log \frac{m^2}{M^2} + 9.5 \cdot 10^{-4} \frac{\alpha^2}{s^2 c^2} \frac{m^2}{M^2} + \dots$$

where we also included the recently calculated second order contribution (leading term in the Higgs mass m only). In this equation α is the fine structure constant, c and s are the cosine and sine of the weak mixing angle and M is the charged W mass. Putting in numbers gives:

$$\rho = 1 - 5.66 \cdot 10^{-4} \log \frac{m^2}{M^2} + 2.85 \cdot 10^{-7} \frac{m^2}{M^2} + \dots$$

Even for very large Higgs masses (many TeV) the actual influence on ρ is

of the order of 0.2 %. Similar things hold for the values of the vector boson masses separately.

The very first occurrence of a sizable effect (about 5 %) is in W^+W^- production by e^+e^- (fig. 6). For this we need to be well above 160 GeV, so this

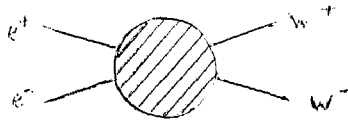


fig. 6

will be a while before it is measured. Even then 5 % accuracy seems to be difficult to achieve. And also there the Higgs mass enters only logarithmically, and it will be hard to conclude anything.

It is very instructive to discuss W^+W^- scattering as a parallel to νe scattering. In lowest order, without a Higgs, one has the following diagrams:

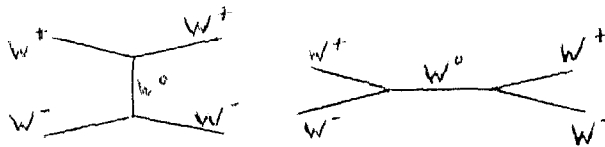


fig. 7

If there is a Higgs there are additional diagrams (fig. 8)

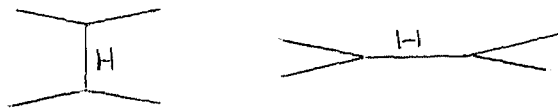


fig. 8

At high energy they partially cancel the W^0 exchange diagrams, thus softening the amplitude.

Like in the (νe) case there are higher order corrections.

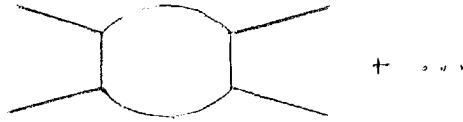


fig. 9

Indeed, these diagrams may become as large as the lowest order diagrams of fig. 7 if there is no softening due to Higgs exchange. But this is only if the W^+W^- energy is sufficiently large, i.e. of the order of 1 TeV or larger. If the Higgs has a mass larger than 1 TeV then W^+W^- scattering at 1 TeV becomes non-perturbative. But at low energies this is not so. Again the Higgs mass enters only logarithmically. Thus at 200 GeV the scattering will still be perturbative (at the one loop level) even if the Higgs mass is way beyond 1 TeV.

In higher order of perturbation theory the two-loop contributions become comparable to the one-loop contributions even at low energy if the Higgs mass is of the order of 1 TeV. But that is higher order, implying another factor of $\alpha \sim 1/137$. Thus the Higgs is screened off from present day observation. This is the screening theorem. The practical consequence is the following statement:

From the present experimental data we cannot conclude on any sensible upper limit on the Higgs mass.

One might even go further and say that we have really no basis to believe in the Higgs system at all. I am actually quite sympathetic to this view, and let me explain why.

In present day theory non-abelian gauge theories are very much like good old fashioned electromagnetism. Now all of you, during your education, or in relation with experiments have had to work with classical electromagnetism, Maxwell's equations applied to various situations with various boundary conditions. This now is precisely what theorists have been doing with non-abelian gauge theories. Instantons, monopoles, axions etc. are all upshots of such calculations. The Higgs system itself is of this type. Imagine that the Maxwell equations with certain boundary conditions (a box

of some form) would show that the configuration with lowest energy was one with non-zero electric and magnetic fields. Then, if you make such a box, at some point electric and magnetic fields would spontaneously arise in that box. This is what is supposedly happening to the Higgs system, with the universe as a box. If this is indeed the way things happened then there are consequences: The new state is so much lower in energy that gravitation, coupling to energy, would see a huge difference: a large cosmological constant arises ¹²⁾. Actually, nothing is seen. In fact, none of these things related to solving the classical equations of motion of gauge field theory seem to have anything to do with nature. For instance, Baluni ¹³⁾ has shown and calculated that instanton related effects give rise to large CP violation effects (unless by some freak accidents coefficients conspire to give a small result). Nothing is seen. An alternative to the problem is to generate quark masses through the Higgs system, but this then leads to axions. No axion has been observed. People then twist and bend the theory to make the axion disappear; the invisible axion has been introduced. Also monopoles are notoriously absent, and so on. I do not know of any success of the classical theory of non-abelian gauge theories. For this reason I am really wondering about this whole spontaneous symmetry breakdown story. I think it is nonsense.

Thus what do we have? On the one side there is this curious screening theorem that tells us that we know nothing about the Higgs system. On the other hand, theoretically, there is no encouragement whatsoever to believe in this Higgs system. What is really the function of the Higgs system in the theory? As we all know it is there to make the theory renormalizable. This means that forces are carefully chosen in such a way that at small distances they do not become strong. In this way the theory becomes insensitive to the structure of particles at the very smallest scale. This is the idea of renormalization; all our ignorance on the structure of particles is put into one number, the mass of the particle. At the same time we abandon hope of ever understanding where this mass comes from.

As noted above the situation with non-abelian gauge theories is quite subtle. The Higgs system is there to produce some additional force that cancels a part of the gauge forces such that at small distances the total force remains sufficiently weak. But, as we have seen, from a pragmatic point of view perturbation theory may be a good description at low energies

difference. At last something is appearing on the horizon, namely what we call the Higgs system. No one knows whether this is at 100, 300, 1000 or 5000 GeV. Any new machine may move into that territory. Physics is still as exciting as ever.

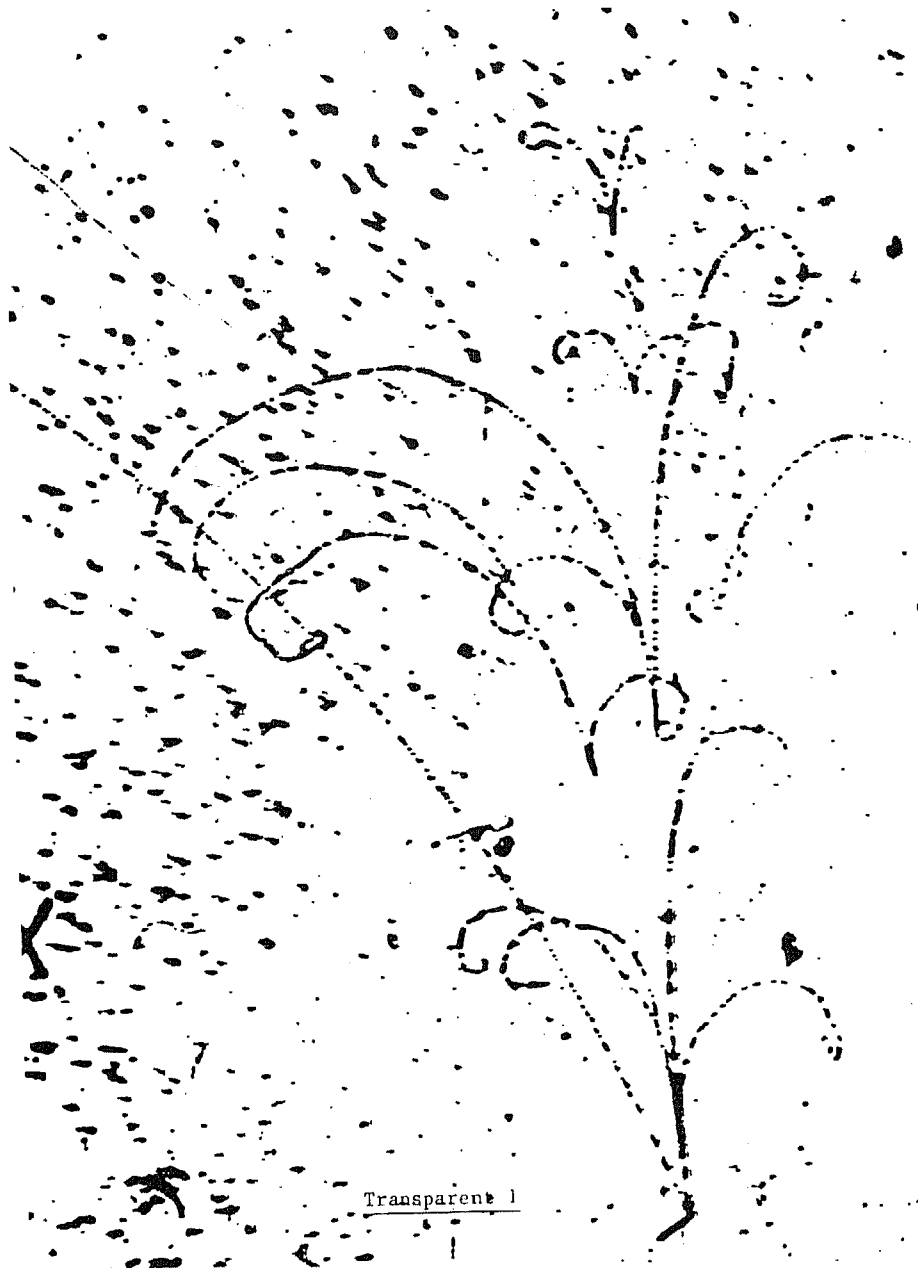
REFERENCES

1. J.S. Bell, J. Lövseth and M. Veltman, paper submitted to the 1963 International Conference, Sienna, Italy, 30 Sept. - 5 Oct. 1963.
2. T. Ericson and S.L. Glashow, CERN preprint 7039/TH.365 (1963).
3. G. Efimov, Physics Lett. 4 (1963) 314.
4. S.L. Glashow, Nucl. Phys. 22 (1961) 579.
5. F. Antonelli, M. Consoli, G. Corbò, Phys. Lett. 91B (1980) 90; M. Veltman, Phys. Lett. 91B (1980) 95.
6. D.A. Ross and M. Veltman, Nucl. Phys. B95 (1975) 135.
7. S. Weinberg, Phys. Rev. Lett. 19 (1967) 1264.
8. M. Veltman, Nucl. Phys. B123 (1977) 89.
9. M. Consoli, S.Lo Presbi, L. Maiani, Rome preprint Jan. 1983, to appear in Nucl. Phys. B.
10. M. Veltman, Acta Phys. Pol. B8 (1977) 475.
11. G. Lemoine and M. Veltman, Nucl. Phys. B164 (1980) 455; see also M.V., proceedings 1979 Conf. on electron and photon physics, Fermilab; T. Appelquist, R. Shankar, Nucl. Phys. B158 (1979) 317; T. Appelquist, C. Bernhard, Phys. Rev. D22 (200) 1980; A.C. Longhitano, Phys. Rev. D22 (1980) 1166; J. Van der Bij and M. Veltman, Michigan preprint April 1983, to appear in Nucl. Phys. B.
12. M. Veltman, Rockefeller preprint May 1974; Phys. Rev. Lett. 34 (1975) 777.
13. V. Baluni, Phys. Rev. D19 (1979) 2227.
14. M. Veltman, Acta Phys. Pol. B12 (1981) 437.
15. D. Foerster, H. Nielsen, M. Ninomiya, Phys. Lett. 94B (1980) 135.

Discussion

H Faissner (Aachen) - A comment on history: I agree with you that most of the lepton pairs observed in the early CERN neutrino experiments were due to the production and decay of free charm. Actually, this was cleared up 12 years later by the Gargamelle and Aachen - Padova groups. However, the event you showed is not charm-like! The e^+ is harder than the ψ^- , and the event looks like 2-body decay. μe^- and $\mu\mu^-$ pairs of this type have been seen by Aachen - Padova and others, and may have still another origin.

Medium-energy beam dump experiments may shed light on their mechanism.



Transparent 1

LIST OF PAPERS CONTRIBUTED TO THE BRIGHTON CONFERENCE
HELD IN THE RAL LIBRARY DATABASE

- 0001 Classical and quantum algebras of non-local charges in sigma models.
DE VEGA, H.J.; EICHENHERR, H.; MAILLET, J.M. - (LPTHE PAR 83 009)
- 0002 The neutron electric dipole moment in left-right symmetric gauge models.
GRIMUS, W.; ECKER, G.; NEUFELD, H. - (CERN TH 3618)
- 0003 Virtual effects of excited quarks as probes of a possible new hadronic mass scale.
BURGES, C.J.C.; SCHNITZER, H.J. - (Brandeis University, USA)
- 0004 On the renormalization procedure for quantum fields.
KERLER, W. - (University of Marburg, FRG)
- 0005 Higgs induced flavour changing neutral interactions in $SU(2)(L) \times SU(2)(R) \times U(1)$.
ECKER, G.; GRIMUS, W.; NEUFELD, H. - (CERN TH 3551)
- 0006 An analysis of the isolated photon conversion pairs from the Gargamelle-PS freon experiment.
ISIKSAL, E.; REIN, D.; MORFIN, J.G. - (PITHA 82 023)
- 0007 Vectorial versus axial goldstone bosons.
ECKER, G. - (UWTHPH 82 036)
- 0008 Nucleon pole terms in proton decay.
MCKELLAR, B.H.J.; THOMAS, A.W. - (University of Melbourne, Australia)
- 0009 Uniqueness of supersymmetry for the cancellation of quadratic divergences.
DESHPANDE, N.G.; JOHNSON, R.J.; MA, E. - (University of Hawaii at Manoa)
- 0010 General two-loop analysis of $SO(10)$ symmetry breaking with one intermediate scale: neutral current coupling and proton decay
MA, E.; WHISNANT, K. - (University of Hawaii at Manoa)
- 0011 Inclusive particle production in relativistic ion-ion collisions.
GAGNON, R.; SIMARD, M.-A. - (University of Moncton, Canada)
- 0012 The QCD-bag model: critical temperature and density of states.
GAGNON, R. - (University of Moncton, Canada)
- 0013 Polarization effects of supersymmetric QCD in large-p(T) direct photon production.
ANTONIADIS, I.; CONTOGOURIS, A.P. - (Centre de Physique Theoretique, Palaiseau)
- 0014 Measurement of the mass of the electron neutrino using electron capture in $(163)\text{Ho}$.
YASUMI, S.; OCHIAI, F.; ANDO, M. - (National Laboratory for High Energy Physics, Japan)
- 0015 Diagrammatic approach to weak quark decays.
TRACAS, N.D.; VLACHOS, N.D. - (National Technical University, Athens)
- 0016 Phase structure of $SU(2)$ lattice gauge theory with action including larger interaction loops in four dimensions.
NIUYA, T.; ODAKA, K. - (KEK TH 067)
- 0017 High energy pion-proton elastic scattering and the pion form factor.
SOFFER, J.; BOURRELY, C.; CHIAPPETTA, P. - (CPT 83 P 1503)
- 0018 Parity violation in high energy inclusive reactions.
SOFFER, J.; CHIAPPETTA, P.; NARDULLI, G. - (BA GT 83 03 fc)

- 0019 Comparison of impact-picture predictions with data from CERN pp(bar) collider.
SOFFER, J.; BOURRELY, C.; WU, T.T. - (CPT 82 P 1441)
- 0020 High energy polarization in exclusive reactions at large angles.
SOFFER, J.; CHIAPPETTA, P. - (CPT 83 P 1479)
- 0021 Photoproduction of hermaphrodite baryons.
BARNES, T.; CLOSE, F.E. - (RL 83 020)
- 0022 Hybrid mesons: A new manifestation of glue - theory and experimental prospects.
CLOSE, F.E. - (Rutherford Appleton Laboratory, UK)
- 0023 The hadronless muon-pair events from CHARM as the Bethe-Heitler process of a weakly interacting pseudoscalar particle.
KIM, B.R.; OH, S.K.; RODENBERG, R.; STAMM, C.; CHO, B.H. - (PITHA 83 002)
- 0024 QCD analysis of non-singlet neutrino structure functions.
BARKER, I.S.; MARTIN, B.R.; SHAW, G. - (City University, London)
- 0025 Fit of the mixing angles in the six quark model and predictions on the B meson lifetime.
KLEINKNECHT, K.; RENK, B. - (UNIDO 83 276)
- 0026 An increasing QCD perturbative effect.
BARTNIK, E.A.; GLAZEK, St.; NAMYSLOWSKI, J.M. - (University of Warsaw)
- 0027 Sea and valence quarks in the light front model of nucleon.
GLAZEK, St. - (University of Warsaw)
- 0028 Charmed particles lifetimes determination in experiment WA 58. (Abstract only)
MONTELEONI-CONFORTO, B.; PHOTO-EMULSION COLLABORATION.; OMEGA-PHOTON COLLABORATION. - (DESY, Hamburg)
- 0029 Partial wave analysis of the K(o)pi(+)pi(-) system produced in K(-)p interactions at 11 GeV/c. (Abstract only)
ASTON, D.; CARNEGIE, R.; DUNWOODIE, W. - (SLAC, Stanford, USA)
- 0030 First observation of coherent K(o) lambda (o) production in neutron carbon interactions.
BIS-2 COLLABORATION. - (JINR, Dubna)
- 0031 Transformation of the renormalized coupling. (Abstract only)
TAHA, M.O. - (King Saud University, Saudi Arabia)
- 0032 Heavy quarks in the jet calculus.
JONES, L.M. - (ILL TH 83 001)
- 0033 Gauge potentials and bundles over the 4-torus.
NASH, C. - (St.Patrick's College, Maynooth, Ireland)
- 0034 Horizontal interactions and proton decay.
TAMVAKIS, K.; ZOU PANOS, G. - (University of Ioannina, Greece)
- 0035 The influence of alpha-clusters on deep inelastic lepton nucleus scattering.
FAISSNER, H.; KIM, B.R. - (Institute of Physics, Aachen)
- 0036 New results on Ge double beta decay and electron stability.
BELLOTTI, E.; CREMONESI, O.; FIORINI, E. - (National Institute of Nuclear Physics, Italy)
- 0038 Actions for quantum gauge theories - a general prescription.
FALCK, N.K.; HIRSHFELD, A.C.; KUBO, J. - (University of Dortmund)
- 0039 The intrinsic transverse momentum of Drell-Yan pairs
NAKAMURA, A.; PANCHERI, G.; SRIVASTAVA, Y N - (National Laboratory of Frascati)
- 0040 Quantum chromodynamics radiation and KNO scaling
PANCHERI, G.; SRIVASTAVA, Y N - (LNF 82 82 P)

- 0041 Soft gluon component of diphoton and dilepton transverse momentum.
PANCHERI, G.; SRIVASTAVA, Y.N. - (LNF 82 62 P)
- 0042 Small QCD corrections in inclusive $O(+)$ quarkonium decay for the bound state renormalization scheme.
KUMMER, W.; WIRTHUMER, G. - (University of Vienna)
- 0043 High transverse energy proton-nucleus interactions at 400 GeV/c.
ANL-FERMILAB-LEHIGH-MICHIGAN-PENNSYLVANIA-RICE-WISCONSIN COLLABORATION.;
MIETTINEN, H.E. - (Rice University, Houston, USA)
- 0044 Cubic interaction terms for arbitrarily extended supermultiplets.
BENGTSSON, A.K.H.; BENGTSSON, I.; BRINK, L. - (GOTEBORG 83 011)
- 0045 Cubic interaction terms for arbitrary spin.
BENGTSSON, A.K.H.; BENGTSSON, I.; BRINK, L. - (GOTEBORG 83 010)
- 0046 Extended supersymmetry and the vacuum.
BENGTSSON, I.; LINDGREN, O. - (GOTEBORG 83 002)
- 0047 The ARGUS electron/photon calorimeter. II) Properties of the light collection system of the lead/scintillator shower counters.
WEGENER, D.; DRESCHER, A.; GRAF, H.J. - (DESY 83 023)
- 0048 Nonleptonic decays of charmed baryons in the MIT-bag model.
EBERT, D.; KALLIES, W. - (CERN TH 3598)
- 0050 Neutrino oscillations with large oscillation length in spite of large (Majorana) neutrino masses?
BILENKY, S.M.; PONTECORVO, B. - (JINR 83 126 E2)
- 0051 Next-next-to-leading perturbative QCD corrections and light quark masses.
GORISHNY, S.G.; KATAEV, A.L.; LARIN, S.A. - (JINR, Dubna)
- 0052 Leading order QCD predictions near flavour thresholds in DIS.
KUMMER, W. - (University of Vienna)
- 0053 Hadron and jet production at collider energies in perturbative QCD.
ANTONIOU, N.G.; ARGYRES, E.N.; CONTOGOURIS, A.P. - (University of Paris)
- 0054 Pionic correction and the structure function of nucleons in Fe.
(Abstract only)
ERICSON, M.; THOMAS, A.W. - (CERN, Geneva)
- 0055 SVZ duality in two dimensional QCD.
DITSAS, P.; SHAW, G. - (M C TH 83 004)
- 0056 New organization of jet calculus for colorless cluster computations.
CRESP1, B.; JONES, L.M. - (UTF 81)
- 0057 Colorless clusters in jets: longitudinal momentum distributions.
JONES, L.M.; MIGNERON, R. - (ILL TH 82 47)
- 0058 Is quark-antiquark annihilation infrared safe at high energy?
FRENKEL, J.; GATHERAL, J.G.M.; TAYLOR, J.G. - (IFUSP P 405)
- 0059 Persistent interactions in quantum field theory.
BURT, P.B. - (Clemson University, South Carolina, USA)
- 0060 First measurement of efficiency and precision of CCD detectors for high energy physics.
BAILEY, R.; DAMERELL, C.J.S.; ENGLISH, R.L. - (RL 82 120)
- 0061 Coherent $\pi(0)$ production in neutrino reactions.
REIN, D.; SEHGAL, L.M. - (PI'HA 82 027)
- 0062 Strong coupling expansion for the anharmonic oscillator.
KOUZINOV, A.V.; SMONDYREV, M.A. - (JINR, Dubna)
- 0063 High energy hadron scattering and spin mechanism of total cross section growth.
GOLOSKOKOV, S.V. - (JINR, Dubna)

- 0064 Spin mechanism of total cross section growth in meson-cloud model.
GOLOSOKOV, S.V. - (JINR, Dubna)
- 0065 Waves, shocks and symmetrization in a nonlinear theory of
electrodynamics.
BOILLAT, G.; VENTURI, G. - (University of Bologna, Italy)
- 0066 High energy elastic scattering of hadrons in meson cloud model.
(Abstract only)
GOLOSOKOV, S.V.; KULESHOV, S.P.; SELJUGIN, O.V. - (JINR, Dubna)
- 0068 Diffractive $K(\rho)\Lambda(\rho)$ production by neutrons with 40 GeV/c mean
momentum.
BIS-2 COLLABORATION.; BERLIN-DUBNA-MOSCOW-PRAGUE-SOFIA-TBILISI-VARNA
COLLABORATION. - (PHE 83 001)
- 0069 An estimate of the flux of free quarks in high energy cosmic
radiation.
McCUSKER, C.B.A. - (University of Sidney, Australia)
- 0070 Dilepton transverse momentum from soft gluon resummation.
MEUNIER, J.L.; GABELLINI, Y. - (University of Nice)
- 0071 Scaling violations from perturbative QCD in dilepton production.
MEUNIER, J.L.; CHIAPPETTA, P.; GRANDOU, T. - (University of Nice)
- 0072 Proton decay in a chiral Lagrangian model.
KAYMAKALAN, O.; LO, C.H.; WALI, K.C. - (Syracuse University, New
York, USA)
- 0073 Double phi meson production with a tagged 100 GeV/c hadron beam on a
Be target.
ACCMOR COLLABORATION.; BAILEY, R.; BELAU, E.; BOEHRINGER, T.;
DIJKSTRA, H.B. - (NIKHEF H 83 012)
- 0074 Measurement of $\omega(-)$ decay properties at the CERN Super Proton
Synchrotron.
BRISTOL-GENEVA-HEIDELBERG-ORSAY-RUTHERFORD-STRASBOURG COLLABORATION.;
STRUB, R.; BOURQUIN, M. - (CRN, Strasbourg)
- 0075 Precise determination of the coupling constants in $\Lambda(\rho) \rightarrow p +$
 $e(-) + \text{neutrino}(\bar{\nu})$. (Abstract only)
JENSEN, D.; KREISLER, M.; LOMANNO, F. - (University of Massachusetts,
Amherst, USA)
- 0076 Measurement of the ratio of $\sigma(\rho)$ to $\lambda(\rho)$ inclusive
production by 28.5 GeV/c protons on beryllium.
SULLIVAN, M.W.; JENSEN, D.A.; KREISLER, M. - (UMHEP 181)
- 0077 An innovative approach to particle spectrometers BNL E766 and FNAL
E690. (Abstract only)
HARTOUNI, E.; JENSEN, D.; KREISLER, M. - (University of
Massachusetts, Amherst, USA)
- 0078 Drell-Yan events with large acceptance in p - nucleus interactions at
400 GeV/c. (Abstract only)
NA3 COLLABORATION. - (CEN, Saclay)
- 0079 Experimental J/psi hadronic production from 150 to 280 GeV/c.
NA3 COLLABORATION.; BADIER, J.; BOUCROT, J. - (CERN, Geneva)
- 0080 Neutral charm production in 400 GeV p-emulsion interactions
ALIGARH-BOMBAY-CHANDIGARH-DELHI-JAMMU-VARANASI COLLABORATION. GURTU,
A. (TIFR BC 83 05)
- 0081 The $\omega(-)$ nonleptonic weak decays via current algebra PCAC and the
quark model.
SCADRON, M.D.; VISINESCU, M. - (University of Arizona, Tucson, USA)
- 0082 Fermion mass generation and electroweak symmetry breaking from colour
forces

- ZOUPANOS, G. - (CERN TH 3586)
- 0083 Inequivalence between gauged- $O(8)$ supergravities.
HURNI, J.P.; MOREL, B. - (UGVA DPT 1983 04 388)
- 0084 Hadronic and quark model analysis of the radiative weak decay $\Sigma(+)$ \rightarrow p γ .
SCADRON, M.D.; VISINESCU, M. - (University of Arizona, Tucson, USA)
- 0085 On a gauge approach to string dynamics in spaces of an arbitrary dimension.
ZHELTUKHIN, A.A. - (Institute of Physics and Technology, Kharkov, USSR)
- 0086 Supersymmetry induced Higgs-Yukawa coupling of the electron.
KUO, T.K.; NAKAGAWA, N. - (PURD TH 82 20)
- 0087 Finding the t quark in W boson decay debris.
BARGER, V.; MARTIN, A.D.; PHILLIPS, R.J.N. - (DTP 83 006; MAD PH 99)
- 0088 Detecting t quark pairs at p(bar)p colliders using transverse dilepton masses and jets.
BARGER, V.; MARTIN, A.D.; PHILLIPS, R.J.N. - (RL 83 025; MAD PH 100)
- 0089 Evidence for the t quark in p(bar)p collider data.
ELIAS, V.; MARTIN, A.D.; PHILLIPS, R.J.N. - (DTP 83 04; MAD PH 094)
- 0090 Perpendicular e neutrino mass from W decay.
BARGER, V.; MARTIN, A.D.; PHILLIPS, R.J.N. - (DTP 83 02)
- 0091 Testing the standard model versus left-right models on and off the Z resonance.
BARGER, V.; MA, E.; WHISNANT, K. - (MAD PH 084; IS J 1040)
- 0092 Method for W (+) boson mass determination in p(bar)p collisions.
BARGER, V.; PHILLIPS, R.J.N. - (MAD PH 078)
- 0093 VVA triangle graph ambiguities in four and N dimensions.
ELIAS, V.; McKEON, G.; MANN, R.B. - (UWO138 83)
- 0094 Meson decays in the non-relativistic quark model.
PASCHALIS, J.E.; GOUNARIS, G.J. - (University of Thessaloniki, Greece)
- 0095 Leptonic decays of tau lepton revisited, finite neutrino mass and effects of mass mixing.
SHARMA, R.R.L.; SHARMA, N.K. - (University of Rajasthan, India)
- 0096 Large N limit of composite quarks and leptons. (Abstract only)
OTSUKI, S. - (Kyushu University, Japan)
- 0097 Parity violation in pion-proton scattering.
BARROSO, A.; TADIC, D.; TRAMPETIC, J. - (MPI PAE PTH 83 018)
- 0098 Exact form of the quark-quark interaction in the nonrelativistic limit of gauge theories.
PALUMBO, F. - (LNF 83 37 P)
- 0100 Hadronic oscillator quark models for baryons and the momentum-dependent effects.
TADIC, D.; TRAMPETIC, J. - (MPI PAE PTH 83 012)
- 0101 A search for inclusive oscillations of muon neutrinos
HABER, C.; AUCHINCLOSS, P.; BLAIR, R.; SMITH, W.H. - (Columbia University, New York, USA)
- 0102 Silicon/tungsten calorimeter as luminosity monitor.
RANCOITA, P.G.; BARBIPELLINI, G.; CECCHET, G. - (CERN, Geneva)
- 0103 K(L)-K(S) mass difference in left-right symmetric models with six quarks. (Abstract only)
BASAK, P.; DATTA, A.; RAYCHAUDHURI, A. - (University of Calcutta, India)
- 0104 Quantization of nonlinear sigma model in constrained Hamiltonian

- formalism.
 MAHARANA, J. - (IP BBSR 83 09)
- 0105 A new drift chamber for the Mark II at SLAC.(Abstract only)
 HANSON, G. - (SLAC, Stanford, USA)
- 0106 Nonlocal conserved currents in supersymmetric chiral models.
 MAHARANA, J. - (Insitute of Physics, Bhubaneswar, India)
- 0107 QCD predictions for the mean total transverse momentum for pp(bar)
 collisions at high energy.
 NAVELET, H.; PESCHANSKI, R. - (CEN, Saclay)
- 0108 A path integral formulation of the theory of loops.
 MAHARANA, J.; SINGH, L.P.; MOREL, A. - (Institute of Physics,
 Bhubaneswar, India)
- 0109 Validity of the equivalent photon approximation for the production of
 massive spin-1 particles.
 JAYARAMAN, T.; RAJASEKARAN, G.; RINDANI, S.D. - (MUTP 83 001)
- 0110 Do the PETRA two photon jet experiments rule out integrally charged
 quarks?
 JAYARAMAN, T.; RAJASEKARAN, G.; RINDANI, S.D. - (MUTP 82 003)
- 0111 Quark fusion and Delta (++) production.(Abstract only)
 CHANDRAMCHAN, T. - (University of Madras, India)
- 0112 Inclusive pi(0) production in 360 GeV/c pp interactions using the
 European hybrid spectrometer.
 BOMBAY-CERN-CHANDIGARH-GENOVA-INNSBRUCK-JAPAN-UG-MADRID-MONS-RUTGERS-
 SERPUKHOV-TENNESSEE-VIENNA EHS-RCBC COLLABORATION. - (CERN, Geneva)
- 0113 Strange particle production in the 360 GeV/c pp interactions using
 the European hybrid spectrometer.
 BOMBAY-CERN-CHANDIGARH-GENOVA-INNSBRUCK-JAPAN-MADRID-MONS-RUTGERS-
 SERPUKHOV-TENNESSEE-VIENNA EHS-RCBC COLLABORATION; CASO, C. - (CERN,
 Geneva)
- 0114 Measurements of hyperon semileptonic decays at the CERN Super Proton
 Synchrotron. I. The Sigma(-) \rightarrow Lambda e(-)nu(bar) decay mode.
 WA2 COLLABORATION.; BROWN, R.M.; BOURQUIN, M. - (CERN EP 81 165)
- 0114 Measurements of hyperon semileptonic decays at the CERN Super Proton
 Synchrotron. II. The Lambda \rightarrow pe nu(bar), xi(-) \rightarrow Lambda e
 nu(bar), and xi(-) \rightarrow Sigma(0)e nu(bar) decay modes.
 WA2 COLLABORATION.; BROWN, R.M.; BOURQUIN, M. - (CERN EP 83 078)
- 0114 Measurements of hyperon semileptonic decays at the CERN Super Proton
 Synchrotron. III. The Sigma(-) \rightarrow ne(-)nu(bar) decay mode.
 WA2 COLLABORATION.; BROWN, R.M.; BOURQUIN, M. - (CERN EP 83 079)
- 0114 Measurements of hyperon semileptonic decays at the CERN Super Proton
 Synchrotron. IV. Tests of the Cabibbo model.
 WA2 COLLABORATION.; BROWN, R.M.; BOURQUIN, M. - (CERN, Geneva)
- 0115 Single diffraction dissociation at the CERN SPS collider.
 UA4 COLLABORATION.; BOZZO, M.; BRACCINI, P.L.; CARBONARA, F. - (CERN,
 Geneva)
- 0116 Elastic scattering at the CERN SPS collider.
 UA4 COLLABORATION.; BOZZO, M.; BRACCINI, P.L.; CARBONARA, F. - (CERN,
 Geneva)
- 0117 Proton-antiproton total cross section at square root s = 540 GeV.
 UA4 COLLABORATION.; BOZZO, M.; BRACCINI, P.L.; CARBONARA, F. - (CERN,
 Geneva)
- 0118 Stieltjes analysis of Hamiltonian spectra.
 DUNCAN, A ; ROSKIES, R. - (University of Pittsburgh, USA)
- 0119 Transverse correlation of charm pairs, psi psi and partons transverse

- momenta.
 GANGULI, S.N. - (CERN EP 83 054)
- 0120 Precision measurement of the Sigma (+) magnetic moment.
 BRENNER, A.E.; ANDERSON, E.W.; ANKENBRANDT, C. - (FNAL, Batavia, USA)
- 0121 Charm production in fixed target experiments.
 AZIZ, T.; GURTU, A. - (TIFR BC 83 02)
- 0122 Relativistic quark model and behaviour of the meson electromagnetic form factors at small and intermediate momentum transfer Q^2 .
 BAGDASARYAN, A.S.; ESAYBEGYAN, S.V.; TER-ISAANYAN, N.L. - (EFI 581 82).
- 0123 Hadrons from relativistic quarks and spin effects in high energy processes at high Q^2 .
 ESAYBEGYAN, S.V.; GRIGORYAN, S.G.; TER-ISAANYAN, N.L. - (EFI 593 82)
- 0124 On the calculation of $J/\psi \rightarrow \nu(c) \gamma$ width in QCD.
 KHODJAMIRIAN, A.Yu. - (Yerevan Physics Institute, USSR)
- 0125 On anomalies in the Ward identities.
 GRIGORYAN, G.V.; GRIGORYAN, R.P.; TYUTIN, I.V. - (EFI 629 83)
- 0126 Symmetries of the renormalized theories with symmetrical classical action.
 GRIGORYAN, G.V.; GRIGORYAN, R.P.; TYUTIN, I.V. - (EFI 628 83)
- 0127 Definition of string tension in gauge theories on a lattice and nonplanar contours.
 SAHAKYAN, D.B. - (EFI 567 82)
- 0128 How to deal with spin in the quark model at high energies.
 AZNAURYAN, I.G.; GRIGORYAN, A.A.; TER-ISAANYAN, I.V. - (EFI 592 82)
- 0129 On the equivalence of Hamiltonian and lagrangian approaches in quantum field theory.
 GRIGORYAN, G.V.; GRIGORYAN, R.P.; TYUTIN, I.V. - (EFI 572 82)
- 0130 Cross section asymptotic behaviour and quark structures of hadrons.
 TROSHIN, S.M.; TYURIN, N.E. - (IHEP, Serpukhov, USSR)
- 0131 Tight binding in multidimensional unified theories.
 VENTURI, G.; BERGIA, S.; ORZALESI, C.A. - (University of Bologna, Italy)
- 0132 Colour bonds between quarks.
 VENTURI, G. - (IFUB 83 001)
- 0133 On Lambda polarization asymmetry in the $pp \rightarrow \Lambda X$ process.
 TROSHIN, S.M.; TYURIN, N.E. - (IHEP 82 182)
- 0134 A study of jet like structure of low p_T $K(-)p$ and $p(\bar{b})p$ interactions at 32 GeV/c.
 MANDL, F.; CHEKULAEV, S.V.; BABINTSEV, V.V. - (IHEP, Serpukhov, USSR)
- 0135 Upper limit for the proton decay lifetime in SU(5) theory.
 MELJANAC, S.; PALLE, D.; TADIC, D. - (University of Zagreb, Yugoslavia)
- 0136 Hadronic poles in hyperon and omega (-) nonleptonic decays.
 TADIC, D.; TRAMPETIC, J. - (University of Zagreb, Yugoslavia)
- 0137 Observation of a narrow state at 2.46 GeV/c, a candidate for the charmed strange baryon Λ_c^+ .
 BRISTOL GENEVA HEIDELBERG LAUSANNE QMC RUTHERFORD COLLABORATION.; BIAGI, S.F.; BOURQUIN, M. - (CERN EP 83 009)
- 0138 Neutrino-induced pion production and proton decay.
 REIN, D. - (PITHA 83 006)
- 0139 Exact solution of the Dirac equation in the field of a topological monopole and dyon. (Abstract only)
 MARCIANO, W.J.; MUZINICH, I.J. - (Brookhaven National Laboratory,

- USA)
- 0140 Search for right handed currents in muon decay.
CARR, J.; GIDAL, G.; GOBBI, B. - (LBL-16183)
- 0141 Yang-Mills classical mechanics as a Kolmogorov K-system.
SAVVIDY, G.K. - (EFI 626 83)
- 0142 Homogeneous models of Yang-Mills classical fields with external sources.
ARUTUNYAN, S.G.; AVAKYAN, H.R.; BASEYAN, H.Z. - (EFI 641 83)
- 0143 Classical and quantum mechanics of non-abelian gauge fields.
SAVVIDY, G.K. - (EFI 613 83)
- 0144 Color confinement as a result of stochasticity.
EGORIAN, E.S.; MATINYAN, S.G. - (EFI 637 83)
- 0145 Configuration manifold of Yang-Mills classical mechanics.
ASATRYAN, H.M.; SAVVIDY, G.K. - (EFI 580 82)
- 0146 Superfield formulation of stochastic quantization with additional time.
EGORIAN, E.S.; KALITSIN, S. - (EFI 638 83)
- 0147 Monte Carlo simulation of SU(2) lattice gauge theory with internal quark loops.
AZCOITI, V.; NAKAMURA, A. - (LNF 82 82 R)
- 0148 Charm fragmentation function - a comparison of neutrino and e+e- data.
KLEINKNECHT, K.; RENK, B. - (UNIDO 83 277)
- 0149 Observation of neutrino and antineutrino induced coherent neutral pion production off Al(27).
FAISSNER, H.; REIN, D.; REITHLER, H. - (PITHA 83 004)
- 0151 The central rapidity region in high pT alpha alpha and alpha p interactions.
CERN-HEIDELBERG-LUND COLLABORATION.; BELL, W.; BRAUNE, K. - (CERN, Geneva)
- 0152 Two particle rapidity correlations in alpha alpha, alpha p and pp interactions at the CERN ISR.
CERN-HEIDELBERG-LUND COLLABORATION. - (CERN, Geneva)
- 0153 Multiplicity distributions in alpha alpha and alpha p collisions at the CERN ISR.
CERN-HEIDELBERG-LUND COLLABORATION. - (CERN EP 83 064)
- 0154 Consequences of initial, quark-gluon coherent/degenerate states for transverse momentum distributions in the Drell-Yan process.
NELSON, C.A. - (State University of New York, Binghamton, USA) (Abstract only)
- 0155 Infrared properties of initial state spectator interactions.
NELSON, C.A. - (SUNY BING 82 11 25)
- 0156 Study of mesons produced centrally in the reaction $pp \rightarrow pp + X(o)$ and $\pi(+)\pi \rightarrow \pi(+)\pi + X(o)$ at 85 GeV/c.
ATHENS-BARI-BIRMINGHAM-CERN COLLABORATION.; FRENCH, B.R.; PALANO, A.; ARMSTRONG, T.A.; APOSTOLAKIS, A. - (CERN, Geneva)
- 0157 Mass differences and finite size systematics in quenched QCD.
BOWLER, K.G.; PAWLEY, G.S.; WALLACE, D.J. - (University of Edinburgh, UK)
- 0158 The Monte Carlo simulation of two dimensional QED and the decoupling of heavy flavours
BURKITT, A.N.; KENWAY, A.; KENWAY, R.D. (EDINBURGH P 83257)
- 0159 Phenomenology of hermaphrodites, hybrid states of quarks and gluons.
(Abstract only)

- BARNES, T.; CLOSE, F.E. - (Rutherford Appleton Laboratory, UK)
- 0160 Finding missing penguins with D and T mesons.
PHAM, T.N.; SUTHERLAND, D.G. - (Centre for Theoretical Physics, Palaiseau)
- 0161 Measurements of the structure functions $F(2)(x, Q^2)$ from neutrino p and antineutrino p interactions.
GRASSLER, H.; LANSKE, D.; CORRIGAN, G. - (University of Oxford, UK)
- 0163 Mirror fermions, universality and the beam dump experiment.
ENQVIST, K.; MURSULA, K.; ROOS, M. - (HU TFT 83 010)
- 0164 Mirror leptons.
ENQVIST, K.; MURSULA, K.; ROOS, M. - (HU TFT 82 051)
- 0165 First results from Argus. (Abstract only)
ARGUS COLLABORATION - (DESY, Hamburg)
- 0166 A study of chiral symmetry breaking in lattice QCD. (Abstract only)
BARBOUR, I.M.; GILCHRIST, J.P.; SCHIERHOLTZ, G. - (University of Glasgow, UK)
- 0167 Non-leptonic hyperon decay s-wave amplitudes and negative-parity excited baryons.
PALLE, D.; TADIC, D. - (University of Zagreb, Yugoslavia)
- 0168 Bethe-Salpeter qqq dynamics: e.m. properties of baryons.
MITRA, A.N.; MITTAL, A. - (University of Delhi, India)
- 0169 Proton decay: is it fast enough?
MITRA, A.N.; RAMANATHAN, R. - (University of Delhi, India)
- 0170 A calorimeter study of 150 GeV and 300 GeV pion and proton interactions on a hydrogen target using a large sideways energy trigger.
BARI-KRAKOW-LIVERPOOL-MAX PLANCK-MUNICH-NIJMEGEN COLLABORATION.; SEYBOTH, P. - (Max Planck Institute, FRG)
- 0171 A study of high transverse energy interactions of 300 GeV pions and protons on a hydrogen target using a calorimeter triggered vertex detector in a magnetic field. (Abstract only)
BARI-KRAKOW-LIVERPOOL-MAX PLANCK-MUNICH-NIJMEGEN COLLABORATION (Max Planck Institute, FRG)
- 0172 Some applications of finite quantum field theories.
RAJPOOT, S.; TAYLOR, J.G.; ZAIMI, M. - (Kings College, London)
- 0173 Search for mirror neutrinos in the tritium beta decay.
ROOS, M. - (University of Helsinki, Finland)
- 0174 Measurement of the transverse polarization of the positron in muon decay - Possible deviations from the (V-A) structure in weak interactions and time reversal invariance in a purely leptonic process.
CORRIVEAU, F.; EGGER, J.; FETSCHER, W. - (University of Zurich)
- 0175 The $U(1)$ gap equation consistency condition in quantum chromodynamics. (Abstract only)
DELBOURGO, R.; SCADRON, M.D. - (University of Arizona, Tucson, USA)
- 0177 Critical properties of an one dimensional non linear lattice and hadron physics.
ANTONIOU, N.G.; KARANIKAS, A.I.; VLASSOPOULOS, S.D.P. - (University of Athens, Greece)
- 0178 Does a one-to-one relationship between the renormalization group functions and the renormalization scheme exist?
HANS, M.; CAPRASSE, H. - (PTM 83 07)
- 0179 Estimates of the photon structure function derived from factorization. (Abstract only)

- ALEXANDER, G.; MAOR, U.; MILSTENE, C. - (TAUP 1127 83)
- 0180 Inclusive $K^{*0}(896)$ and $K(\bar{*}0)(896)$ production on beryllium by $K(-)$, $\pi(-)$ at 175 GeV/c.
ACCMOR COLLABORATION.; BAILEY, R.; BARDSLEY, D.G.; BOSMAN, M. - (CERN, Geneva)
- 0181 A vertex telescope consisting of 5 μ m resolution silicon strip detectors for the observation of charm events.
ACCMOR COLLABORATION.; BAILEY, R.; BELAU, E.; BOEHRINGER, T. - (CERN, Geneva)
- 0182 Observation of D^{*+} and $D(\bar{0})/D^{*-}$ production in high energy π -Be interactions at the SPS.
ACCMOR COLLABORATION.; BOSMAN, M.; BAILEY, R. - (CERN EP 83 083)
- 0183 Production and decay properties of D and D^* mesons in $\pi(-)$ Be interactions
ACCMOR COLLABORATION.; BOSMAN, M.; BAILEY, R. - (CERN EP 83 084)
- 0184 Differential analysis of the cross section of muon pair production in $\pi(-)$ tungsten interactions.
NA 10 COLLABORATION.; DEGRE, A.; BETEV, B. - (CERN, Geneva)
- 0185 Some theories on the determination of form factors in unpolarized hyperon semileptonic decays.(Abstract only)
GARCIA, A.; KIELANOWSKI, P. - (IPN, Mexico)
- 0186 Cabibbo theory and hyperon semileptonic decays.(Abstract only)
GARCIA, A.; KIELANOWSKI, P. - (IPN, Mexico)
- 0187 Symmetry breaking and higher representation in the Cabibbo theory.
(Abstract only)
GARCIA, A.; KIELANOWSKI, P. - (IPN, Mexico)
- 0188 Electromagnetic corrections to semileptonic decays with a polarized emitted hyperon.(Abstract only)
GARCIA, A. - (IPN, Mexico)
- 0189 Connection of relativistic and nonrelativistic wave functions in the calculation of leptonic widths.
DURAND, B.; DURAND, L. - (FERMILAB PUB 83 041 THY; MAD TH 062)
- 0190 Analytic solution of the relativistic coulomb problem for a spinless Salpeter equation.
DURAND, B.; DURAND, L. - (FERMILAB PUB 83 021 THY; MAD TH 089)
- 0191 The SVZ method: Why it works, why it fails, and ways to improve it.
DURAND, L.; DURAND, B.; WHITENTON, J.B. - (MAD TH 076; FERMILAB PUB 82 088 THY)
- 0192 Bethe-Salpeter dynamics for meson-baryon couplings.(Abstract only)
MITRA, A.N.; MITTAL, A. - (University of Delhi, India)
- 0193 Photoproduction of $\pi(+)\pi(-)\pi(0)$ on hydrogen with linearly polarized photons of energy 20 - 70 GeV.
OMEGA-PHOTON COLLABORATION.; NEWTON, D. - (CERN EP 83 085)
- 0194 Photoproduction of $KK(\bar{0})\pi$ final states in the energy range from 20 to 70 GeV.
OMEGA-PHOTON COLLABORATION.; NEWTON, D. - (University of Lancaster, UK)
- 0195 Photoproduction of an isoscalar 3π resonance at 1.67 GeV
OMEGA-PHOTON COLLABORATION.; NEWTON, D.; ATKINSON, M.; AXON, T.J. (CERN EP 83 027)
- 0196 Photoproduction of ρ ρ and ρ f systems
OMEGA-PHOTON COLLABORATION.; ATKINSON, M.; AXON, T.J.; NEWTON, D. (University of Lancaster, UK)
- 0197 The reaction $\gamma p \rightarrow p \omega \pi(+)\pi(-)$ for photon energies of

- 25-50 GeV.
 OMEGA-PHOTON COLLABORATION.; ATKINSON, M.; AXON, T.J. - (CERN EP 83 028)
- 0198 Grand unification for subfermions.
 CHAICHIAN, M.; KOKMAKOV, Yu.N.; NELIPA, N.F. - (HU TFT 82 015)
- 0199 Quark mass renormalization and family unification.
 CHAICHIAN, M.; ENQVIST, K. - (CPT 82 P 1444)
- 0200 Semi-classical quantization of the complex Sine-Gordon field theory.
 DE VEGA, H.J.; MAILLET, J.M. - (PAR LP THE 82 15)
- 0201 Baryons from diquarks in e^+e^- annihilation.
 EKELIN, S.; FREDRIKSSON, S.; JANDEL, M.; LARSSON, T. - (TRITA TFY 82 020)
- 0202 A comment on diquark fragmentation.
 FREDRIKSSON, S.; LARSSON, T. - (TRITA TFY 82 021)
- 0203 pp and $p(\bar{p})p$ elastic scattering.
 DONNACHIE, A.; LANDSHOFF, P.V. - (M C TH 83 13; DAMTP 83 09)
- 0204 Exact one-gluon corrections for inclusive weak processes.
 HOKIM, Q.; PHAM, X-Y. - (PAR LP THE 83 05)
- 0205 Mass effects in QCD corrections of weak decays.
 HOKIM, Q.; PHAM, X-Y. - (Laval University, Quebec, Canada)
- 0206 A simple perturbative renormalization scheme for supersymmetric gauge theories.
 FODA, O.E. - (PURD TH 83 07)
- 0207 The fine-tuning problem in renormalized perturbation theory: spontaneously broken gauge models.
 FODA, O.E. - (PURD TH 82 21)
- 0208 Bose-Einstein correlations in $\alpha\alpha$, pp and $pp(\bar{p})$ interactions.
 AXIAL FIELD SPECTROMETER COLLABORATION.; AKESSON, T.; ALBROW, M.G. (CERN EP 83 074)
- 0209 Particle ratios at high transverse momentum in pp collisions at $\sqrt{s}=63$ GeV and correlations between high $p(T)$ identified charged particles and associated identified charged particles.
 AXIAL FIELD SPECTROMETER COLLABORATION.; AKESSON, T.; ALBROW, M.G. (CERN, Geneva)
- 0210 High- $p(T)$ direct photon production at $11(\sigma)$ in pp collisions at square root $s = 63$ GeV.
 AXIAL FIELD SPECTROMETER COLLABORATION.; AKESSON, T.; ALBROW, M.G. (CERN EP 83 018)
- 0211 The dominance of jets at large transverse energy in a full-azimuth hadron calorimeter at ISR energies.
 AXIAL FIELD SPECTROMETER COLLABORATION.; AKESSON, T.; ALBROW, M.G. (CERN EP 83 071)
- 0212 Production of antihyperons in the central region at the ISR.
 AXIAL FIELD SPECTROMETER COLLABORATION.; AKESSON, T.; ALBROW, M.G. (CERN, Geneva)
- 0213 A measurement of $pp(\bar{p})$ and pp elastic scattering at ISR energies.
 AMES-BOLOGNA-CERN-DORTMUND-HEIDELBERG-WARSAW COLLABORATION.; PUTZER, A.; BREAKSTONE, A. - (CERN, Geneva)
- 0214 A glueball search experiment using the split field magnet detector at the CERN ISR.
 AMES-BOLOGNA-CERN-DORTMUND-HEIDELBERG-WARSAW COLLABORATION.; PUTZER, A.; BREAKSTONE, A. - (CERN, Geneva)
- 0215 Charged multiplicity distributions in proton-proton interactions at

- ISR energies.
 AMES-BOLOGNA-CERN-DORTMUND-HEIDELBERG-WARSAW COLLABORATION.; PUTZER, A.; BREAKSTONE, A. - (CERN, Geneva)
- 0216 Multiplicity dependence of transverse momentum spectra at ISR energies.
 AMES-BOLOGNA-CERN-DORTMUND-HEIDELBERG-WARSAW COLLABORATION.; SOSNOWSKI, R.; BREAKSTONE, A. - (CERN, Geneva)
- 0217 Comparison of inclusive distributions in pp and p(bar)p interactions at square root s = 53 GeV.
 AMES-BOLOGNA-CERN-DORTMUND-HEIDELBERG-WARSAW COLLABORATION.; PUTZER, A.; BREAKSTONE, A.; CAMPANINI, R. - (CERN, Geneva)
- 0218 Inclusive Delta(++) in pp interactions at ISR energies.
 AMES-BOLOGNA-CERN-DORTMUND-HEIDELBERG-WARSAW COLLABORATION.; FISCHER, H.G.; BREAKSTONE, A. - (CERN, Geneva)
- 0219 Study of the A-dependence of inclusive p and p(bar), Lambda and Lambda(bar) production in pi(+)-nucleus interactions at 30 GeV/c.
 CERN-LISBON-NEUCHATEL-PARIS VI-WARSAW-COLLABORATION.; BEUSCH, W.; ABREU, M.C. - (CERN, Geneva)
- 0220 Production of charged pions at high transverse momentum in pp collisions at square root s = 44 and 63 GeV.
 AMES-BOLOGNA-CERN-DORTMUND-HEIDELBERG-WARSAW COLLABORATION.; WEGENER, D.; BREAKSTONE, A. - (CERN, Geneva)
- 0221 Relative production of charged kaons and pions at high transverse momentum in p-p collisions at the ISR.
 AMES-BOLOGNA-CERN-DORTMUND-HEIDELBERG-WARSAW COLLABORATION.; WEGENER, D.; BREAKSTONE, A. - (CERN, Geneva)
- 0222 Measurement of charged multiplicities in high transverse momentum pp collisions at the ISR.
 AMES BOLOGNA CERN DORTMUND HEIDELBERG WARSAW COLLABORATION.; SOSNOWSKI, R.; BREAKSTONE, A. - (CERN, Geneva)
- 0223 High P(T) baryons emitted at theta = 10(o), 20(o) and 45(o) in pp collisions at square root s = 63 GeV.
 AMES-BOLOGNA-CERN-DORTMUND-HEIDELBERG-WARSAW COLLABORATION.; SOSNOWSKI, R.; BREAKSTONE, A. - (CERN, Geneva)
- 0224 Associated pi(o) production in events with a particle of high transverse momentum at square root s = 63 GeV.
 AMES-BOLOGNA-CERN-DORTMUND-HEIDELBERG-WARSAW COLLABORATION.; WEGENER, D.; BREAKSTONE, A. - (CERN, Geneva)
- 0225 High p(T) hadrons as leading particles in jets produced at the ISR.
 1. Momentum distribution of secondaries in the trigger jet.
 AMES-BOLOGNA-CERN-DORTMUND-HEIDELBERG-WARSAW COLLABORATION.; FISCHER, H.G.; BREAKSTONE, A. - (CERN, Geneva)
- 0226 A search for decays of heavy neutrinos.
 CHARM COLLABORATION.; AMALDI, U.; BERGSMA, F. - (CERN EP 83 063)
- 0227 A search for nu(mu) oscillations at the CERN PS.
 CHARM COLLABORATION.; BERGSMA, F.; DORENBOSCH, J. - (CERN, Geneva)
- 0228 Bounds on supersymmetric particles from a proton beam-dump experiment.
 CHARM COLLABORATION.; AMALDI, U.; BERGSMA, F. - (CERN EP 82 193)
- 0229 Search for coherent muon pair production by neutrinos and antineutrinos.
 CHARM COLLABORATION.; AMALDI, U.; BERGSMA, F. - (CERN EP 82 154)
- 0230 Prompt neutrino production in 400 GeV proton copper interactions.
 (Abstract only)

- CHARM COLLABORATION.; AMALDI, U. - (CERN, Geneva)
- 0231 Experimental study of the nucleon structure functions and of the gluon distribution from charged-current neutrino and antineutrino interactions.
- CHARM COLLABORATION.; AMALDI, U.; BERGSMA, F. - (CERN EP 82 194)
- 0232 Measurement of the polarization of positive muons produced in high-energy antineutrino interactions.
- AMALDI, U.; JONKER, M.; UDO, F. - (CERN EP 82 207)
- 0233 Experimental study of x-distributions in semileptonic neutral-current neutrino reactions.
- CHARM COLLABORATION.; AMALDI, U.; JONKER, M. - (CERN EP 83 049)
- 0234 Ring imaging Cherenkov (RICH) counters in arbitrary geometric configurations.(Abstract only)
- EKELOF, T. - (CERN, Geneva)
- 0235 Future prospects for measuring the mass of galactic neutrinos with coherent detectors.
- SMITH, P.F.; LEWIN, J.D. - (Rutherford Appleton Laboratory, UK)
- 0236 Design study for a high rate high resolution vertex detector using scintillating optical fibres.(Abstract only)
- ATKINSON, M.; CRENNELL, D.; FISHER, C. - (Rutherford Appleton Laboratory, UK)
- 0237 A single-stage photomultiplier and lead glass detector for operation in an intense magnetic field.(Abstract only)
- JEFFREYS, P.W. - (Rutherford Appleton Laboratory, UK)
- 0238 Properties of a fine sampling uranium/copper - scintillator hadron calorimeter.(Abstract only)
- JEFFREYS, P.W. - (Rutherford Appleton Laboratory, UK)
- 0239 A comparison of position measurement by charge division and timing difference along the wire for tubes operating in the limited streamer mode.
- BIAGI, S.F.; BOOTH, P.S.L.; DONALD, R.A. - (University of Liverpool, UK)
- 0240 Experimental search for neutron-antineutron oscillations.
- CERN-ILL-PADOVA-RAL-SUSSEX COLLABORATION.; BALDO-CEOLIN, M.; PUGLIERIN, G. - (National Institute of Nuclear Physics, Padova, Italy)
- 0241 Results from the Mont Blanc nucleon stability experiment.(Abstract only)
- IAROCCHI, E.; BATTISTONI, G.; BELLOTTI, E. - (National Laboratory of Frascati)
- 0242 A search for narrow resonances in the phi phi system.
- CERN-GLASGOW-LIVERPOOL WA67 OMEGA' COLLABORATION.; BOOTH, P.S.L.; FRAME, D. (University of Liverpool, UK)
- 0243 Inclusive phi meson production in pi(-)Be interactions at 85 GeV/c.
- CERN-GLASGOW-LIVERPOOL WA67 OMEGA' COLLABORATION.; BOOTH, P.S.L.; FRAME, D. (NIKHEF H 82 24)
- 0244 Angular correlations in the phi phi system.
- BOOTH, P.S.L.; CARROLL, L.J.; DONALD, R.A. - (University of Liverpool, UK)
- 0245 Recent developments concerning the possible substructure of quarks and leptons.
- LYONS, L. - (University of Oxford, UK)
- 0245 An introduction to the possible substructure of quarks and leptons. A supplement

- LYONS, L. - (OXFORD NUCL PHYS 82 052)
- 0246 Measurement of D production.(Abstract only)
HRS COLLABORATION.; NITZ, D. - (University of Michigan, USA)
- 0247 Super lattices.(Abstract only)
KAKU, M. - (CERN, Geneva)
- 0248 p(bar)p elastic scattering at 30 GeV/c incident momentum.
ANNECY(LAPP) CERN COPENHAGEN(NBI) OSLO GENOVA UNIVERSITY COLLEGE
LONDON COLLABORATION.; FEARNLEY, T. - (CERN, Geneva)
- 0250 Common description of the pp and p(bar)p cross-sections and elastic
scattering.
KOPELIOVICH, B.; LAPIDUS, L.; MUKHIN, S. - (JINR, Dubna)
- 0251 Glueballs under harmonic confinement.
CHOUDHURY, S.R.; MITRA, A.N. - (University of Delhi, India)
- 0252 Non-perturbative neutrino masses in left-right symmetric models.
CHAICHIAN, M.; ENQVIST, K. - (CPT 83 P 1489)
- 0253 Differences in leading baryon production from pp(bar) and pp
collisions with square root s=31 GeV at the CERN ISR.
CHAUVAT, P.; BONINO, R.; ALITTI, J. - (CERN EP 83 065)
- 0255 Strong P, CP, T violations in heavy ion collisions.
MORLEY, P.D.; SCHMIDT, I.A. - (University of Valparaiso, Chile)
- 0256 Radiative fermion mass matrix generation in supersymmetric models.
PAPANTONOPOULOS, E.; ZOUPANOS, G. - (CERN TH 3610)
- 0257 A study of high mass e(+)e(-) pairs at the CERN ISR.
CERN-MICHIGAN STATE-OXFORD-ROCKEFELLER (CMOR) COLLABORATION.,
ANGELIS, A.L.S.; BASINI, G.; BESCH, H.-J. - (CERN, Geneva)
- 0258 Measurement of a muon pair asymmetry in e(+)e(-) annihilations at
square root s = 34.7 GeV.
PLUTO COLLABORATION.; BERGER, Ch.; GENZEL, H. - (DESY, Hamburg)
- 0259 Quark theory of charmed D meson two body nonleptonic weak decays.
SCADRON, M.D. - (University of Arizona, Tuscon, USA)
- 0260 What is elastic scattering past the diffraction dip telling us?
HENZI, R.; VALIN, P. - (McGill University, Montreal, Canada)
- 0261 Susskind fermions at strong coupling beyond leading order.
JOLICOEUR, T.; KLUBERG-STERN, H.; MOREL, A. - (CEN, Saclay)
- 0262 J/psi production in 125 GeV/c p(bar)N and pi(-)N interactions.
(Abstract only)
KATSANEVAS, S.; MARKOU, A. - (University of Athens, Greece)
- 0263 Production of high mass dimuons in 125 GeV/c p(bar)N and pi(-)N
interactions.(Abstract only)
BINKLEY, M. - (FNAL, Batavia, USA)
- 0264 Finite temperature Susy GUT phase transition determined by radiative
corrections.
KRIPFGANZ, J.; PERLT, H. - (KMU HEP 83 004)
- 0265 A study of actions with next to next neighbour interactions in
4-dimensional Z(2) gauge theory.(Abstract only)
BHANOT, G.; DROUFFE, J.M.; SCHILLER, A. - (CERN TH 3535)
- 0266 The massive Schwinger model on the lattice studied via a local
Hamiltonian Monte Carlo method.
SCHILLER, A.; RANFT, J. - (KMU HEP 83 005)
- 0267 Local Hamiltonian Monte Carlo study of the massive Schwinger model in
an external background field.
RANFT, J.; SCHILLER, A. - (CERN TH 3469)
- 0268 Particle production in hadron nucleus collisions in a multi-chain
fragmentation model.

- RANFT, J.; RITTER, S. - (CERN, Geneva)
- 0269 Results on charm production.
CERN-DORTMUND-HEIDELBERG-WARSAW COLLABORATION - (CERN, Geneva)
- 0270 Exclusive reactions in gamma gamma collisions.(Abstract only)
LEU, P. - (University of Hamburg, FRG)
- 0271 The p-p(bar) decays of p wave charmonium and the helicity characteristics of massless QCD.
ANDRIKOPOULOU, A. - (ICTP 82 83 16)
- 0272 Electroproduction of isolated protons at high energy as a probe of the proton wave function in QCD.
FONTANNAZ, M.; JONES, H.F. - (ICTP 82 83 019)
- 0273 Comparative study of baryon production in hard and soft processes.
HOFMANN, W.; WEGENER, D. - (University of Dortmund)
- 0274 Is colour broken by a monopole?
RAJASEKARAN, G.; RAMACHANDRAN, R. - (Indian Institute of Technology, Kanpur)
- 0275 Scaling and Y distributions in neutral current muon-neutrino interaction and other topics from a narrow band experiment in the Fermilab 15 foot bubble chamber with a heavy neon fill.(Abstract only)
COLUMBIA-BNL-RUTGERS COLLABORATION - (Columbia University, USA)
- 0276 Lambda(bar)(o) polarization measurements in p(bar)p interactions at square root s=31 GeV
CHAUVAT, P.; EHRAN, S.; HAYES, K. - (CERN, Geneva)
- 0277 Comparison between pp(bar) and pp interactions at the ISR for high p(T) and E(T)o spectra.
CERN-MICHIGAN STATE UNIVERSITY-OXFORD-ROCKEFELLER COLLABORATION.; CMOR COLLABORATION.; CAMILLERI, L.; POPE, B.G. - (CERN, Geneva)
- 0278 A study of two-jet events at square root S=62 GeV using a total neutral energy trigger.
CERN-MICHIGAN STATE-OXFORD-ROCKEFELLER COLLABORATION.; CAMILLERI, L.; POPE, B.G.; CMOR COLLABORATION - (CERN, Geneva).
- 0279 A realistic supersymmetric GUT model coupled to N=1 supergravity.
DONG, F.X.; TU, T.S.; XUE, P.Y. - (BIHEP TH 83 002)
- 0280 Fractional charges, monopoles and peculiar photons in SO(18) GUT models.
DONG, F.X.; TU, T.S.; XUE, P.Y. - (BIHEP TH 83 003)
- 0281 Can we break through supersymmetry spontaneously only through coupling to N=1 supergravity.
DONG, F.X.; TU, T.S.; XUE, P.Y. - (BIHEP TH 82 023)
- 0282 Recent results from the IMB nucleon decay detector.
IRVINE-MICHIGAN-BROOKHAVEN COLLABORATION.; SULAK, L.R.; BIONTA, R.M. (University of Michigan, USA)
- 0283 Scaling violations and weak boson production.(Abstract only)
CHIAPPETTA, P.; PERROTET, M. - (Centre de Physique Theoretique, Marseille)
- 0284 Charged particle multiplicities in 40 GeV/c hadron-nucleus interactions with and without a high P(T) trigger.
RISK COLLABORATION.; BOOS, E.G.; MOSIENKO, A.M.; POKROVSKY, N.A. - (JINR, Dubna, USSR)
- 0285 1/Q expansions of spin and gauge Potts models. Lagrangian formulations.
ANANIYAN, N.S.; IZMAILYAN, N.M. - (IC 83 043)
- 0286 The role helicity asymmetries could play in the search for

- supersymmetric interactions.
 CRAIGIE, N.S.; HIDAKA, K.; RATCLIFFE, P. - (IC 83 043)
- 0287 A semi-empirical model for high energy inclusive reactions.
 WELLS, J. - (OXFORD NUCL PHYS 83 028)
- 0288 A discussion of some nonperturbative effects and their relevance to quark confinement in the quenched Eguchi-Kawai model.
 PARSONS, N.H. - (University of Oxford, UK)
- 0289 Production of $f(0)$ in gamma gamma collisions.
 FIELD, J.H.; KOVACS, F. - (University Pierre and Marie Curie, Paris)
- 0290 Measurement of the neutrino (μ) and antineutrino (μ) nucleon charged current total cross sections and the ratio of neutrino (μ) neutron to neutrino (μ) proton charged current total cross section.
 AMSTERDAM-BERGEN-BOLOGNA-PADOVA-PISA-SACLAY-TORINO COLLABORATION.; WIGMANS, R.; ALLASIA, D. - (NIKHEF H 83 03)
- 0291 A study of exclusive central hadron production at the ISR as a search for gluonium states.
 AXIAL FIELD SPECTROMETER COLLABORATION. - (CERN, Geneva)
- 0292 The pseudo scalar mesons for SU(2) with Susskind fermions.(Abstract only)
 BRILLOIRE, A.; LACAZE, R.; MARINARI, E. - (CEN, Saclay)
- 0293 Cross sections and multiplicity distribution for K+p and pi+p interactions at 250 GeV/c.(Abstract only)
 AACHEN BERLIN BRUSSELS HELSINKI KRAKOW NIJMEGEN RIO DE JANEIRO SERPUKHOV WARSAW-YEREVAN COLLABORATION - (Institute of Physics, Aachen)
- 0294 Multiple collisions inside the nucleus as observed in pi+ and K+ interactions with Al and Au nuclei at 250 GeV/c.
 AACHEN BERLIN BRUSSELS HELSINKI KRAKOW NIJMEGEN RIO DE JANEIRO SERPUKHOV WARSAW-YEREVAN COLLABORATION.; KITTEL, W. - (Institute of Physics, Aachen)
- 0295 Prototype tests of a controlled geometry drift chamber.(Abstract only)
 RUDGE, A.; FABJAN, C.W.; DOLGOSHEIN, B.A. - (CERN, Geneva)
- 0296 Investigation of D(bar)P and D(bar)D interactions at 12 GeV/c.
 (Abstract only)
 DUBNA-BUCHAREST-HELSINKI-KOSICE-MOSCOW-PRAGUE-SOFIA-TBILISI COLLABORATION. (JINR, Dubna)
- 0297 Inclusive Ko(s), Lambda and Lambda (bar) production in p(bar)p
 (Abstract only)
 DUBNA-ALMA ATA-HELSINKI-MOSCOW-PRAGUE-TBILISI COLLABORATION. (JINR, Dubna)
- 0298 A further reason to worry about the meaning of perturbation expansions.
 AUBERSON, G.; MENNESSIER, G. - (USTL, Montpellier, France)
- 0299 Resonant states and nuclear matter.
 BELLINI, G.; FRABETTI, P.L.; DI CORATO, M. - (CERN, Geneva)
- 0300 First results from the Crystal Ball at DORIS II.(Abstract only)
 SCHWARZ, A. - (University of Hamburg)

- 0301 Resonance formation in $\gamma\gamma$ * collision with one virtual photon. (Abstract only)
PLUTO COLLABORATION - (DESY, Hamburg)
- 0302 Two γ exclusive production of muon and hadron pairs. (Abstract only)
PLUTO COLLABORATION - (DESY, Hamburg)
- 0303 High p_T jets in two photon interactions. (Abstract only)
PLUTO COLLABORATION - (DESY, Hamburg)
- 0304 Measurement of photon structure functions in a large range of Q^2 . (Abstract only)
PLUTO COLLABORATION - (DESY, Hamburg)
- 0305 Experimental study of the hadronic photon structure function.
CELLO COLLABORATION. - (LAL 83 03; DESY 83 018)
- 0306 Lepton pair production in deep inelastic $e - \gamma$ scattering.
CELLO COLLABORATION. - (LAL 83 02; DESY 83 017)
- 0307 Four fermion condensates and the Higgs phenomenon.
LACAZE, R.; NAPOLY, O. - (CEN, Saclay)
- 0308 Strong radiative corrections to strangeness changing processes in the presence of right handed currents.
BIGI, I.I.; FRERE, J.M. - (Institute of Physics, RWTH, Aachen)
- 0309 Heavy quark spectroscopy from CLEO at CESR.
GALIK, R.S.; CLEO COLLABORATION. - (Cornell University, USA)
- 0310 Geometry from a pregeometric quantum lattice.
LEHTO, M.; NIELSEN, H.B.; NINOMIYA, M. - (NORDITA, Copenhagen)
- 0311 Operation of the Brookhaven MPS II facility.
ETKIN, A.; FOLEY, K.J.; LONGACRE, R.S. - (BNL, New York, USA)
- 0313 Adler-Bell-Jackiw anomaly and Weyl fermions in crystal.
NIELSEN, H.B.; NINOMIYA, M. - (BROWN HET 501)
- 0314 Possible heavy lepton signals at $p(\bar{p})p$ colliders.
BARGER, V.; BAER, H.; MARTIN, A.D. - (University of Durham, UK)
- 0315 A correlation decay theorem at high temperature.
LEHTO, M.; NIELSEN, H.B.; NINOMIYA, M. - (NORDITA 83 022)
- 0316 Electrostatic avalanche energy and streamer chamber resolution.
GLAGOLEVA, N.S.; MATYUSHIN, A.T.; MATYUSHIN, V.T. - (JINR, Dubna)
- 0317 The analysis of events with particle production in a lifetime interval of 10^{-13} s for interactions of negative pions with nuclei at (50-60) GeV/c.
BUCHAREST-DUBNA-DYUSHAMBE COLLABORATION.; ALI-MUSSA, N.; SHABRATOVA, G.S.; TOLSTOV, K.D. - (JINR, Dubna)
- 0318 Light cone expansion and scaling laws for radiative orthoquarkonium decays.
KUHN, J.H. - (Institute for Theoretical Physics, RWTH, Aachen)
- 0319 The anomalous behaviour of nuclear structure functions revisited.
FURMANSKI, W.; KRZYWICKI, A. - (LP THE 83 011)
- 0320 Production and decay of toponium P-states.
KUHN, J.H.; ONO, S. - (PITHA 83 005)
- 0321 On the correlation between transverse momentum and multiplicity of secondaries at the collider energy.
CAPELLA, A.; KRZYWICKI, A. - (LP THE 83 012)
- 0322 Dispersive contribution to $K(0) - K(-0)$ transition and Higgs-boson exchange model of CP violation.
DUPONT, Y.; PHAM, T.N. (A498 0482)

- 0323 Nonleptonic $K \rightarrow 2\pi$ decay and $K\pi$ matrix element of effective 4-quark operator.
DUPONT, Y.; PHAM, T.N. - (A533 1282)
- 0324 The screening of colour charge in numerical hopping parameter expansion.
JOOS, H.; MONTVAY, I. - (DESY 83 046)
- 0325 Neutral strange particle production in $K(+)p$ interactions at 32 GeV/c.
CERN-USSR COLLABORATION.; AJINENKO, I.V.; DE WOLF, E.A. - (IIHE 83 006)
- 0326 Fragmentation model predictions for the reaction $pp \rightarrow p h(+-)X$.
DE WOLF, E.A. - (IIHE 83 001)
- 0327 Charge distributions and correlations in fragmentation models for soft hadron collisions.
DE WOLF, E.A. - (IIHE 83 004)
- 0328 The fate of $K(+)p$ valence quarks in low- $p(T)$ $K(+)p$ interactions at 32 GeV/c.
DE WOLF, E.A.; CHLIAPNIKOV, P.V.; TOMARADSE, A.G. - (IIHE 83 005)
- 0329 Inclusive photon and $\pi(0)$ production in $K(+)p$ interactions at 70 GeV/c.
BRUSSELS-CERN-GENOVA-MONS-NIJMEGEN-SERPUKHOV COLLABORTION.; BARTH, M.; DE WOLF, E.A. - (IIHE 83 007)
- 0330 Testing the held-back effect in soft hadron collisions.
DE WOLF, E.A. - (IIHE 83 002)
- 0331 On the topological structure of the vacuum in $SU(2)$ and $SU(3)$ lattice gauge theories.
ISHIKAWA, K.; SCHIERHOLZ, G.; SCHNEIDER, H.; TEPER, M. - (LAPP TH 071; DESY 83 071)
- 0332 On investigating the structure of hadrons: Lattice Monte Carlo measurements of colour magnetic and electric fields and the topological charge density inside glueballs.
ISHIKAWA, K.; SCHIERHOLZ, G.; SCHNEIDER, H.; TEPER, M. - (DESY 82 087; LAPP TH 070)
- 0333 Calculation of the glueball mass spectrum of $SU(2)$ and $SU(3)$ non-abelian lattice gauge theories I: Introduction and $SU(2)$.
ISHIKAWA, K.; SCHIERHOLZ, G.; TEPER, M. - (DESY 83 004; LAPP TH 072)
- 0334 Charm photoproduction at 20 GeV.
SLAC HYBRID FACILITY PHOTON COLLABORATION.; ABE, K.; BACON, T.C.; FRANEK, B. - (Rutherford Appleton Laboratory, UK)
- 0335 Lattice QCD with light quark masses: Does chiral symmetry get broken spontaneously?
BARBOUR, I.M.; GILCHRIST, J.P.; SCHNEIDER, H. - (DESY 83 012; LAPP TH 074)
- 0336 Recent developments in bubble chamber technology. (Abstract only)
HARIGEL, G. - (CERN, Geneva)
- 0337 A prototype high density projection chamber. (Abstract only)
ELY.; PAXTON.; TYNDEL.; WALLIS.
- 0338 Extraction of electromagnetic photon structure functions in the reaction $ee \rightarrow ee\mu\mu$ at 29 GeV in the center of mass
PELLETT, D.E.; ARMITAGE, J.C.; BUIJS, A. (National Institute for High Energy Physics, Amsterdam)
- 0339 First results from a search for fractional charges produced in heavy ion collisions.
BLAND, R.; LINDGREN, M.A.; JOYCE, D.C. (San Francisco State

- University, USA)
- 0340 On the hadronic production of lepton pairs from heavy flavour decay.
FISCHER, H.G.; GEIST, W.M. - (CERN EP 83 030)
- 0341 Associated production of prompt leptons and jets in proton-antiproton collisions.
SEHGAL, L.M.; ZERWAS, P.M. - (PITHA 83 010)
- 0342 Proton decay catalyzed by a monopole: The ratio of $e(+)$ to $e(+)\pi(0)$ final states.
SCHMID, C. - (Institute for Theoretical Physics, Zurich)
- 0343 Measurement of the neutral current coupling constants in neutrino and antineutrino interactions with deuterium.
AMSTERDAM-BERGEN-BOLOGNA-PADOVA-PISA-SACLAY-TORINO COLLABORATION.; ALLASIA, D.; ANGELINI, C.; VAN DAM, P.H.A. (National Institute for High Energy Physics, Amsterdam)
- 0344 KNO scaling at collider energies. (Abstract only)
HAYOT, F. - (SPHT 83 51)
- 0345 Horizontal interactions as the source of family mixing.
ZOU PANOS, G. - (National Technical University, Athens)
- 0346 Electron scattering from nuclear targets and quark distributions in nuclei.
BODEK, A.; GIOKARIS, N.; ATWOOD, W.B. - (SLAC PUB 3041; COO 3065 348; UR 841)
- 0347 Method for W - boson mass determination in $e(+)\bar{e}(-)$ - collisions.
KOVAL'CHUK, V.A.; REKALO, M.P.; STOLETNI1, I.V. (Institute of Physics and Technology, Kharkov, USSR)
- 0348 Spontaneous compactification of $N=2$, $d=10$ supergravity.
VOLKOV, D.V.; SOROKIN, D.P.; TKACH, V.I. (Institute of Physics and Technology, Kharkov, USSR)
- 0349 On some representations of $SU(2)$ -extended supersymmetry group with central charges.
SOROKA, V.A. - (Institute of Physics and Technology, Kharkov, USSR)
- 0350 Energy-loss and energy-straggling of protons and pions in the momentum range 0.7 to 115 GeV/c.
HANCOCK, S.; JAMES, F.; MOVCHET, J. - (CERN, Geneva)
- 0351 Bethe-Salpeter few-quark dynamics and the pion dimension.
MITTAL, A.; MITRA, A.N. - (University of Delhi, India)
- 0352 Measurement of the neutron and proton structure functions from neutrino and antineutrino scattering in deuterium.
AMSTERDAM-BERGEN-BOLOGNA-PADOVA-PISA-SACLAY-TORINO COLLABORATION.; WA25 COLLABORATION.; ALLASIA, D.; ANGELINI, C.; WIGMANS, R. (National Institute for High Energy Physics, Amsterdam)
- 0353 Absence of Goldstone boson for a $U(N)$ gauge theory with Dirac-Kahler fermions on the lattice.
NAPOLY, O. - (SPHT 83 077)
- 0354 Parity violation in atomic cesium and alternatives to the standard model of electroweak interactions.
BOUCHIAT, C.; PIKETTY, C.A. - (LPTENS 83 018)
- 0355 A non-perturbative treatment of spin-dependent interactions of heavy quarkonia.
FALKENSTEINER, P.; FLAMM, D.; SCHOBERL, F. - (UWTHPH 83 012)
- 0356 A comparison of the deep inelastic structure functions of deuterium and aluminum nuclei.
BODEK, A.; GIOKARIS, N.; ATWOOD, W.B. - (SLAC PUB 3089; UR 846; COO 3065 353)

- 0357 Cosmology from higher-dimensional gravity.
SHAFI, Q.; WETTERICH, C. - (CERN TH 3613)
- 0358 Local compactification and black holes in $d = 11$ supergravity.
VAN BAAL, P.; BAIS, F.A.; VAN NIEUWENHUIZEN, P. (Institute for Theoretical Physics, Utrecht)
- 0359 Measurement of the average transverse momentum and of the interaction volume in the reactions proton nuclei and antiproton nuclei at 200 GeV.
DE MARZO, C.; DE PALMA, M.; DISTANTE, A.; DERADO, I. (National Institute for Nuclear Physics, Italy)
- 0360 A QCD appreciation of calorimetric physics.
NICOLAIDIS, A. - (Laboratoire de Physique Corpusculaire, Paris)
- 0361 Transverse momentum distributions for weak bosons at the $pp(\bar{p})$ collider.
CHIAPPETTA, P.; GRECO, M. - (CNRS, Marseille)
- 0362 Gluonic radiation and calorimeter physics.
NICOLAIDIS, A. - (Laboratoire de Physique Corpusculaire, Paris)
- 0363 Phase transitions at finite chemical potential in grand unified theories.
BAILIN, D.; LOVE, A. - (University of Sussex, UK)
- 0364 A comparison of charged current cross-sections and structure functions for neutrino and antineutrino beams on hydrogen and neon.
BEBE TST NEUTRINO COLLABORATION.; PARKER, M.A.; FRANCOIS, T.; GUY, J.G. (Rutherford Appleton Laboratory, UK)
- 0365 Towards a blacker, edgier and larger proton.
HENZI, R.; VALIN, P. - (McGill University, Montreal, Canada)
- 0366 On the handling of fermion integrations in lattice gauge theory.
KERLER, W. - (University of Marburg, FRG)
- 0367 Standard model group survival of the fittest.
NIELSEN, H.B.; BRENE, N. - (NBI HE 83 04)
- 0368 Electroweak effects in $N-N$ and $N(\bar{N})-N$ scattering.
BUTTIMORE, N.H.; CHIAPPETTA, P.; SOFFER, J. - (MARSEILLE 83 PE 1477)
- 0369 Glueballs in the reaction $\pi(-)p \rightarrow \phi \phi n$.
ETKIN, A.; FOLEY, K.J.; LONGACRE, R.S.; LINDENBAUM, S.J. (Brookhaven National Laboratory, New York, USA)
- 0370 On scalar resonances in $\pi \pi \rightarrow \pi \pi, KK(\bar{K}), \eta \eta$ reactions.
ACHASOV, N.N.; DEVYANIN, S.A.; SHESTAKOV, G.N. - (NOVOSIBIRSK TP 029 133)
- 0371 The effect of confinement size on nuclear structure functions.
CLOSE, F.E.; ROBERTS, R.G.; ROSS, G.G. - (RL 83 051)
- 0372 Cabibbo mixings and radiative corrections.
ACHIMAN, Y. - (WU B 83 012)
- 0373 A new determination of alphas from ψ and Υ , Υ' , Υ'' gluonic and leptonic decay widths.
DURAND, B.; KNUTESON, R.O. - (University of Wisconsin, Madison, USA)
- 0374 Particle ratios at high transverse momentum in pp collisions at square root $s = 63$ GeV and correlations between high $p(T)$ identified charged particles and associated identified charged particles.
AXIAL FIELD SPECTROMETER COLLABORATION.; AKESSON, T.; ALBROW, M.G.; ALMEHED, S. - (Niels Bohr Institute, Copenhagen)
- 0375 Microcircuits for HEP. (Abstract only)
O'CONNELL, B. - (LeCroy Research Systems, Oxford, UK)
- 0376 Hadron production by the longitudinal photon ($|q^2| \ll 1$ (GeV/c) 2).
ACHASOV, N.N.; KARNAKOV, V.A. - (NOVOSIBIRSK TP 22 131)

- 0376 Hadron production by the longitudinal photon (small q^2).
ACHASOV, N.N.; KARNAKOV, V.A. - (NOVOSIBIRSK TP 33 132)
- 0377 Measurement of the reactions $\gamma\gamma \rightarrow \pi^+\pi^+\pi^-\pi^-$ at PETRA.
CELLO COLLABORATION.; BEHREND, H.-J.; FENNER, H. - (DESY, Hamburg)
- 0378 tau branching ratios and polarization limits in e^+e^- interactions at square root $s = 34$ GeV.
CELLO COLLABORATION.; BEHREND, H.-J.; CHEN, Ch. - (DESY 83 019)
- 0379 Inclusive production of electrons and muons in multihadronic events at PETRA.
CELLO COLLABORATION.; BEHREND, H.-J.; FENNER, H. - (DESY 83 034)
- 0380 Measurement of cross sections for neutral strange particle production in $p(\bar{p})p$ -interactions at 32 GeV/c and comparison with the pp -interaction data.
ERMOLOV, P.F.; KRUGLOV, N.A.; PROSKURYAKOV, A.S. (Institute of Nuclear Physics, Moscow State University)
- 0381 Determination of the $p(\bar{p})p$ cross sections of different channels of strange particle production at 32 GeV/c.
ERMOLOV, P.F.; KRUGLOV, N.A.; PROSKURYAKOV, A.S. (Institute of Nuclear Physics, Moscow State University)
- 0383 Inclusive gamma and π^0 production in e^+e^- annihilation at 14, 22 and 34 GeV c.m. energy.
CELLO COLLABORATION.; BEHREND, H.-J.; FENNER, H.; SCHACHTER, M.-J. (DESY, Hamburg)
- 0384 Confinement in the presence of matter fields.
SZLACHANYI, K. - (Central Research Institute for Physics, Budapest, Hungary)
- 0385 A lifetime measurement of hadronically produced D mesons.
ACCMOR COLLABORATION.; BAILEY, R.; BELAU, E.; BOEHRINGER, T. - (CERN, Geneva)
- 0386 Evidence for coherent interactions of antineutrinos on neon nuclei.
MARAGE, P. - (WA59 Collaboration)
- 0387 Proton fragmentation into pions and pion systems in K-p interactions at 110 GeV/c and comparison to model predictions.
AACHEN BERLIN CERN CRACOW INNSBRUCK LONDON IC VIENNA WARSAW COLLABORATION.; KUHN, D. - (Innsbruck University, Austria)
- 0388 Observation of two photon production of eta mesons by the Crystal Ball Collaboration at SPEAR.
WEINSTEIN, A.J.; ANTREASYAN, D.; GU, Y.F. - (SLAC, Stanford, USA)
- 0389 The hypothesis of statistical jet evolution confronted with e^+e^- annihilation data.
OCHS, W. - (Max Planck Institute, Munich)
- 0390 Search for exotic decays of orthopositronium.
AMALDI, U.; CARBONI, G.; LLOYD OWEN, D. - (CERN, Geneva)
- 0391 Fast neutrino decay in horizontal Majoron models.
VALLE, J.W.F. - (RL 83 050)
- 0392 Lepton number violation with the quasi-Dirac neutrinos.
VALLE, J.W.F.; SINGER, M. - (RL 83 018)
- 0393 J/ψ and ψ' photoproduction at a mean photon energy of 90 GeV.
NA 14 COLLABORATION. - (CERN, Geneva)
- 0394 Photoproduction of direct photons at high transverse momentum.
NA 14 COLLABORATION. - (CERN, Geneva)
- 0395 Photoproduction of π^0 's at high transverse momenta.
NA 14 COLLABORATION. (CERN, Geneva)

- 0396 On the model dependence of the determination of the strong coupling constant in second order from e^+e^- annihilation into hadrons.
CELLO COLLABORATION; BEHREND, H.-J.; FENNER, H.; SCHACTER, M.-J. (DESY, Hamburg)
- 0397 Properties of jets in high- $E(t)$ events produced in pp collisions at $\sqrt{s}=63$ GeV.
AXIAL FIELD SPECTROMETER COLLABORATION; AKESSON, T.; ALBROW, M.G.; ALMEHED, S. - (CERN, Geneva)
- 0398 Observation of baryons in B meson decay.
CLEO COLLABORATION.; ALAM, M.S.; CSORNA, S.E.; GARREN, L. - (CLNS 83 570; CLEO 83 06)
- 0399 Evidence of F meson at 1970 MeV.
CLEO COLLABORATION.; CHEN, A.; GOLDBERG, M.; HORWITZ, N. (CLNS 83 569; CLEO 83 005)
- 0400 The D (o) spectrum from B meson decay.
CLEO COLLABORATION.; GREEN, J.; HICKS, R.G.; SANNES, F. (CLNS 83 566; CLEO 83 004)
- 0401 Production of charmed mesons in e^+e^- annihilation at 10.5 GeV.
AVERY, P.; BEBEK, C.; BERKELMAN, K. - (Cornell University, USA)
- 0402 The status of superstrings.
GREEN, M.B. - (Queen Mary College, London)
- 0403 New results from the Fermilab prompt neutrino experiment.
BALL, C.; COFFIN, C.T.; GUSTAFSON, L.W. - (University of Michigan, USA)
- 0405 Inclusive D and D* production in e^+e^- annihilation at 29 GeV.
HRS COLLABORATION. - (Argonne National Laboratory, Illinois, USA)
- 0406 A study of e^+e^- annihilation in the 1400-2250 MeV energy range with the magnetic detector DM2 at DCI.
AUGUSTIN, J.E.; AYACH, L.; CALCATERRA, S. (Laboratoire de l'Accelérateur Lineaire, Orsay, France)
- 0407 Branching ratio and mass spectrum of the decay $T' \rightarrow \pi^+\pi^-$.
ALBRECHT, H.; SCHULZ, H.D.; DREWS, G. - (DESY, Hamburg)
- 0408 MonteCarlo study of SU(3) gauge theory.
BARKAI, D.; CREUTZ, M.; MORIARTY, K.J.M. - (Colorado State University, USA)
- 0409 A study of possible new heavy-flavour production at the CERN pp(\bar{p}) collider.
BASILE, M.; BERBIERS, J.; BONVICINI, G. - (CERN EP 83 052)
- 0410 Scale breaking effects in (pp) interactions and comparison with e^+e^- annihilation.
BASILE, M.; BONVICINI, G.; CARA ROMA, G. - (CERN, Geneva)
- 0411 Universality features in (pp), e^+e^- and DIS processes.
BASILE, M.; BONVICINI, G.; CARA ROMA, G. - (CERN, Geneva)
- 0412 An estimate for the formation length of hadrons produced in neutrino-nucleus interactions.
BARANOV, D.S.; IVANILOV, A.A.; IVANOV, P.V. - (IHEP, Serpukhov, USSR)
- 0413 TASSO high precision vertex detector.
TASSO COLLABORATION.; FOSTER, B. - (Imperial College, London)
- 0414 On the correlations between slow and fast protons in hadron-nucleus interactions.
BOHM, G.; GENSCHE, U.; NAUMANN, T. - (Institute for High Energy Physics, Berlin)
- 0415 Transverse momentum of charged hadrons in neutrino and anti-neutrino charged current interactions on a deuterium target.

- AMSTERDAM-BERGEN-BOLOGNA-PADOVA-PISA-SACLAY-TORINO COLLABORATION
- 0416 On approximate KNO scaling at $p(\bar{p})p$ collider.
KAM, C.H.; LIM, Y.K.; PHUA, K.K. - (NUS HEP 83005)
- 0417 Forward-backward multiplicity correlations and the mixed two-component model.
KAM, C.H.; LIM, Y.K.; PHUA, K.K. - (NUS HEP 83002)
- 0418 Multiplicity measurement of events produced in emulsion and analyzed by silicon detector telescopes and the omega prime spectrometer.
CERN-GENOA-MILAN-MOSCOW-PARIS(LPNHE)-ROME-SANTANDER-VALENCIA. (CERN, Geneva)
- 0419 Scaling violations and weak boson production.
CHIAPPETTA, P.; PERROTTETT, M. - (CNRS, Marseille)
- 0420 Description of multihadron production at superhigh energies in the multicomponent approach.
MAVRODIEV, S.Ch.; SISSAKIAN, A.N.; TOROSIAN, H.T. - (JINR, Dubna)
- 0421 Proton fragmentation into pions and pion systems in K-P interactions at 110 GeV/c and comparison to model predictions.
AACHEN BERLIN CERN CRACOW INNSBRUCK LONDON IC VIENNA WARSAW COLLABORATION KUHN, D. - (Innsbruck University, Austria)
- 0422 The quark-parton structure functions of nuclei.
BALDIN, A.M. - (JINR 83 415)
- 0423 A study of the Lambda (c)(+) produced in (n)C interactions at about 58 GeV.
BIS-2 COLLABORATION. - (JINR 83 417)
- 0424 Observation of a structure of phi pi(0) mass spectrum.
BITYUKOV, S.I.; DOROFEEV, V.A.; DZHELYADIN, R.I. - (IHEP 83 109)
- 0425 Gluon jets.
ORAVA, R.; SAIRENEN, K. - (University of Helsinki, Finland)
- 0426 The model of high energy hadron elastic scattering and diffraction dissociation processes.
TROSHIN, S.M.; TYURIN, N.E. - (IHEP 83 62)
- 0427 Volume reduction of lattice gauge systems at finite n.
ORLAND, P. - (Imperial College, London)
- 0428 Composite vector bosons and the weak mixing angles.
GOUNARIS, G.; KOEGERLER, R.; SCHILDKNECHT, D. - (BI TP 83 011)
- 0429 Chiral symmetry breaking and topology.
MCDUGALL, N.A. - (OXFORD THEOR PHYS 83 034)
- 0430 The estimation of neutrino mass from tritium beta spectrum in valine.
LUBIMOV, V.; BORIS, S.; GOLUTVIN, A. - (ITEP, Moscow, USSR)
- 0431 Fast simulation of lattice systems.
BOHR, H.; KATZNELSON, E. (International Centre for Theoretical Physics, Trieste, Italy)