Experimental particle physics

esipap
European School of Instrumentation in Particle & Astroparticle Physics

B1. analysis of classic experiments

Let's read the papers

- Read the paper!

- Discuss the experimental techniques used to achieve the result:
  - ✓ What accelerator, is any? What detector setup?
  - ✓ How was the signal identified?
  - ✓ What were the major experimental challenges? How were they solved?

- Prepare a short presentation (3 slides max!) where the previous points are discussed
  - ✓ It can be a simple cut-and-paste of the most important plots and/or figures from the paper

Muon decay time

1942

Experimental Determination of the Disintegration Curve of Mesotrons

BRUNO ROSSI AND NORRIS NERESON
Cornell University, Ithaca, New York

(Received September 17, 1942)

The disintegration curve of mesotrons has been experimentally determined by investigating the delayed emission of disintegration electrons which takes place after the absorption of mesotrons by matter. Within the experimental errors, the disintegration curve is exponential and corresponds to a mean lifetime of 2.3 ± 0.2 microseconds.

Antiproton discovery

1955

Observation of Antiprotons*

OWEN CHAMBERLAIN, EMILIO SEGRÈ, CLYDE WIEGAND, AND THOMAS YPSILANTIS

Radiation Laboratory, Department of Physics, University of California, Berkeley, California

(Received October 24, 1955)

J/ψ discovery

1974

Experimental Observation of a Heavy Particle J†

J. J. Aubert, U. Becker, P. J. Biggs, J. Burger, M. Chen, G. Everhart, P. Goldhagen, J. Leong, T. McCorriston, T. G. Rhoades, M. Rohde, Samuel C. C. Ting, and Sau Lan Wu
Laboratory for Nuclear Science and Department of Physics, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139

and

Y. Y. Lee
Brookhaven National Laboratory, Upton, New York 11973
(Received 12 November 1974)

J/ψ discovery

1974

Discovery of a Narrow Resonance in e^+e^- Annihilation*

J.-E. Augustin,† A. M. Boyarski, M. Breidenbach, F. Bulos, J. T. Dakin, G. J. Feldman, G. E. Fischer, D. Fryberger, G. Hanson, B. Jean-Marie,† R. R. Larsen, V. Lüth, H. L. Lynch, D. Lyon, C. C. Morehouse, J. M. Paterson, M. L. Perl, B. Richter, P. Rapidis, R. F. Schwitters, W. M. Tanenbaum, and F. Vannucci‡

Stanford Linear Accelerator Center, Stanford University, Stanford, California 94305

and

G. S. Abrams, D. Briggs, W. Chinowsky, C. E. Friedberg, G. Goldhaber, R. J. Hollebeek, J. A. Kadyk, B. Lulu, F. Pierre,§ G. H. Trilling, J. S. Whitaker, J. Wiss, and J. E. Zipse

Lawrence Berkeley Laboratory and Department of Physics, University of California, Berkeley, California 94720

(Received 13 November 1974)

J/ψ discovery

1974

Preliminary Result of Frascati (ADONE) on the Nature of a New 3.1-GeV Particle Produced in e^+e^- Annihilation*

C. Bacci, R. Balbini Celio, M. Berna-Rodini, G. Caton, R. Del Fabbro, M. Grilli, E. Iarocci, M. Locci, C. Mencuccini, G. P. Murtas, G. Penso, G. S. M. Spinetti, M. Spano, B. Stella, and V. Valente

The Gamma-Gamma Group, Laboratori Nazionali di Frascati, Frascati, Italy

and

B. Bartoli, D. Bisello, B. Esposito, F. Felicetti, P. Monacelli, M. Nigro, L. Paolufi, I. Peruzzi, G. Piano Mortemi, M. Piccolo, F. Ronga, F. Sebastiani, L. Trasatti, and F. Vanoli

The Magnet Experimental Group for ADONE, Laboratori Nazionali di Frascati, Frascati, Italy

and

G. Barbarino, G. Barbiellini, C. Bemporad, R. Biancastelli, F. Cevenini, M. Celvetti, F. Costantini, P. Lariccia, P. Parascandalo, E. Sassi, C. Spencer, L. Tortora, U. Troya, and S. Vitale

The Baryon-Antibaryon Group, Laboratori Nazionali di Frascati, Frascati, Italy

(Received 18 November 1974)

Observation of QCD jets

1982

OBSERVATION OF VERY LARGE TRANSVERSE MOMENTUM JETS AT THE CERN $\bar{p}p$ COLLIDER

The UA2 Collaboration

M. BANNER [f], Ph. BLOCH [f], F. BONAUDI [b], K. BORER [a], M. BORGHINI [b], J.-C. CHOLLET [d], A.G. CLARK [b], C. CONTA [e], P. DARRIULAT [b], L. Di LELLA [b], J. DINES-HANSEN [c], P.-A. DORSAZ [b], L. FAYARD [d], M. FRATERNALI [e], D. FROIDEVAUX [b,d], J.-M. GAILLARD [d], O. GILDEMEISTER [b], V.G. GOGGI [e,1], H. GROTE [b], B. HAHN [a], H. HÄNNI [a], J.R. HANSEN [b], P. HANSEN [c], T. HIMEL [b], V. HUNGERBÜHLER [b], P. JENNI [b], O. KOFOED-HANSEN [c], M. LIVAN [e], S. LOUCATOS [f], B. MADSEN [c], B. MANSOULIÉ [f], G.C. MANTOVANI [e,2], L. MAPELLI [b], B. MERKEL [d], M. MERMIKIDES [b], R. MØLLERUD [c], B. NILSSON [c], C. ONIONS [b], G. PARROUR [b,d], F. PASTORE [b], H. PLOTHOW-BESCH [d], J.-P. REPELLIN [d], J. RINGEL [b], A. ROTHENBERG [b], A. ROUSSARIE [f], G. SAUVAGE [d], J. SCHACHER [a], J.L. SIEGRIST [b], F. STOCKER [a], J. TEIGER [f], V. VERCESI [e], H.H. WILLIAMS [b], H. ZACCONE [f] and W. ZELLER [a]

[a] *Laboratorium für Hochenergiephysik, Universität Bern, Sidlerstrasse 5, Bern, Switzerland*
[b] *CERN, 1211 Geneva 23, Switzerland*
[c] *Niels Bohr Institute, Blegdamsvej 17, Copenhagen, Denmark*
[d] *Laboratoire de l'Accélérateur Linéaire, Université de Paris-Sud, Orsay, France*
[e] *Istituto di Fisica Nucleare, Università di Pavia and INFN, Sezione di Pavia, Via Bassi 6, Pavia, Italy*
[f] *Centre d'Etudes Nucléaires de Saclay, Gif sur Yvette, France*

Received 25 August 1982

W boson discovery

1983

EXPERIMENTAL OBSERVATION OF ISOLATED LARGE TRANSVERSE ENERGY ELECTRONS WITH ASSOCIATED MISSING ENERGY AT $\sqrt{s}$ = 540 GeV

UA1 Collaboration, CERN, Geneva, Switzerland

G. ARNISON [j], A. ASTBURY [j], B. AUBERT [b], C. BACCI [i], G. BAUER [1], A. BÉZAGUET [d], R. BÖCK [d], T.J.V. BOWCOCK [f], M. CALVETTI [d], T. CARROLL [d], P. CATZ [b], P. CENNINI [d], S. CENTRO [d], F. CERADINI [d], S. CITTOLIN [d], D. CLINE [1], C. COCHET [k], J. COLAS [b], M. CORDEN [c], D. DALLMAN [d], M. DeBEER [k], M. DELLA NEGRA [b], M. DEMOULIN [d], D. DENEGRI [k], A. Di CIACCIO [i], D. DiBITONTO [d], L. DOBRZYNSKI [g], J.D. DOWELL [c], M. EDWARDS [c], K. EGGERT [a], E. EISENHANDLER [f], N. ELLIS [d], P. ERHARD [a], H. FAISSNER [a], G. FONTAINE [g], R. FREY [h], R. FRÜHWIRTH [1], J. GARVEY [c], S. GEER [g], C. GHESQUIÈRE [g], P. GHEZ [b], K.L. GIBONI [a], W.R. GIBSON [f], Y. GIRAUD-HÉRAUD [g], A. GIVERNAUD [k], A. GONIDEC [b], G. GRAYER [j], P. GUTIERREZ [h], T. HANSL-KOZANECKA [a], W.J. HAYNES [j], L.O. HERTZBERGER [2], C. HODGES [h], D. HOFFMANN [a], H. HOFFMANN [d], D.J. HOLTHUIZEN [2], R.J. HOMER [c], A. HONMA [f], W. JANK [d], G. JORAT [d], P.I.P. KALMUS [f], V. KARIMÄKI [e], R. KEELER [f], I. KENYON [c], A. KERNAN [h], R. KINNUNEN [e], H. KOWALSKI [d], W. KOZANECKI [h], D. KRYN [d], F. LACAVA [d], J.-P. LAUGIER [k], J.-P. LEES [b], H. LEHMANN [a], K. LEUCHS [a], A. LÉVÊQUE [k], D. LINGLIN [b], E. LOCCI [k], M. LORET [k], J.-J. MALOSSE [k], T. MARKIEWICZ [d], G. MAURIN [d], T. McMAHON [c], J.-P. MENDIBURU [g], M.-N. MINARD [b], M. MORICCA [i], H. MUIRHEAD [d], F. MULLER [d], A.K. NANDI [j], L. NAUMANN [d], A. NORTON [d], A. ORKIN-LECOURTOIS [g], L. PAOLUZI [i], G. PETRUCCI [d], G. PIANO MORTARI [i], M. PIMIÄ [e], A. PLACCI [d], E. RADERMACHER [a], J. RANSDELL [h], H. REITHLER [a], J.-P. REVOL [d], J. RICH [k], M. RIJSSENBEEK [d], C. ROBERTS [j], J. ROHLF [d], P. ROSSI [d], C. RUBBIA [d], B. SADOULET [d], G. SAJOT [g], G. SALVI [f], G. SALVINI [i], J. SASS [k], J. SAUDRAIX [k], A. SAVOY-NAVARRO [k], D. SCHINZEL [f], W. SCOTT [j], T.P. SHAH [j], M. SPIRO [k], J. STRAUSS [l], K. SUMOROK [c], F. SZONCSO [l], D. SMITH [h], C. TAO [d], G. THOMPSON [f], J. TIMMER [d], E. TSCHESLOG [a], J. TUOMINIEMI [e], S. Van der MEER [d], J.-P. VIALLE [d], J. VRANA [g], V. VUILLEMIN [d], H.D. WAHL [l], P. WATKINS [c], J. WILSON [c], Y.G. XIE [d], M. YVERT [b] and E. ZURFLUH [d]

Aachen [a]–Annecy (LAPP) [b]–Birmingham [c]–CERN [d]–Helsinki [e]–Queen Mary College, London [f]–Paris (Coll. de France) [g] –Riverside [h]–Rome [i]–Rutherford Appleton Lab. [j]–Saclay (CEN) [k]–Vienna [l] Collaboration

Z boson discovery

1983

EVIDENCE FOR $Z^0 \to e^+e^-$ AT THE CERN $\bar{p}p$ COLLIDER

The UA2 Collaboration

P. BAGNAIA [b], M. BANNER [f], R. BATTISTON [1,2], Ph. BLOCH [f], F. BONAUDI [b], K. BORER [a], M. BORGHINI [b], J.-C. CHOLLET [d], A.G. CLARK [b], C. CONTA [e], P. DARRIULAT [b], L. Di LELLA [b], J. DINES-HANSEN [c], P.-A. DORSAZ [b], L. FAYARD [d], M. FRATERNALI [e], D. FROIDEVAUX [b], G. FUMAGALLI [e], J.-M. GAILLARD [d], O. GILDEMEISTER [b], V.G. GOGGI [e], H. GROTE [b], B. HAHN [a], H. HÄNNI [a], J.R. HANSEN [b], P. HANSEN [c], T. HIMEL [b], V. HUNGERBÜHLER [b], P. JENNI [b], O. KOFOED-HANSEN [c], E. LANÇON [f], M. LIVAN [b,e], S. LOUCATOS [f], B. MADSEN [c], P. MANI [a], B. MANSOULIÉ [f], G.C. MANTOVANI [1], L. MAPELLI [b,3], B. MERKEL [d], M. MERMIKIDES [b], R. MØLLERUD [c], B. NILSSON [c], C. ONIONS [b], G. PARROUR [b,d], F. PASTORE [e], H. PLOTHOW-BESCH [b], M. POLVEREL [f], J-P. REPELLIN [d], A. RIMOLDI [e], A. ROTHENBERG [b], A. ROUSSARIE [f], G. SAUVAGE [d], J. SCHACHER [a], J.L. SIEGRIST [b], H.M. STEINER [b,4], G. STIMPFL [b], F. STOCKER [a], J. TEIGER [f], V. VERCESI [e], A.R. WEIDBERG [b], H. ZACCONE [f], J.A. ZAKRZEWSKI [b,5] and W. ZELLER [a]

[a] *Laboratorium für Hochenergiephysik, Universität Bern, Sidlerstrasse 5, Bern, Switzerland*
[b] *CERN, 1211 Geneva 23, Switzerland*
[c] *Niels Bohr Institute, Blegdamsvej 17, Copenhagen, Denmark*
[d] *Laboratoire de l'Accélérateur Linéaire, Université de Paris-Sud, Orsay, France*
[e] *Dipartimento di Fisica Nucleare e Teorica, Università di Pavia and INFN, Sezione di Pavia, Via Bassi 6, Pavia, Italy*
[f] *Centre d'Etudes Nucléaires de Saclay, France*

Received 11 August 1983

Z boson discovery

1983

EXPERIMENTAL OBSERVATION OF LEPTON PAIRS OF INVARIANT MASS AROUND 95 GeV/c^2 AT THE CERN SPS COLLIDER

UA1 Collaboration, CERN, Geneva, Switzerland

G. ARNISON [j], A. ASTBURY [j], B. AUBERT [b], C. BACCI [i], G. BAUER [1], A. BÉZAGUET [d], R. BÖCK [d], T.J.V. BOWCOCK [f], M. CALVETTI [d], P. CATZ [b], P. CENNINI [d], S. CENTRO [d], F. CERADINI [d,i], S. CITTOLIN [d], D. CLINE [1], C. COCHET [k], J. COLAS [b], M. CORDEN [c], D. DALLMAN [d,l], D. DAU [2], M. DeBEER [k], M. DELLA NEGRA [b,d], M. DEMOULIN [d], D. DENEGRI [k], A. Di CIACCIO [i], D. DiBITONTO [d], L. DOBRZYNSKI [g], J.D. DOWELL [c], K. EGGERT [a], E. EISENHANDLER [f], N. ELLIS [d], P. ERHARD [a], H. FAISSNER [a], M. FINCKE [2], G. FONTAINE [g], R. FREY [h], R. FRÜHWIRTH [l], J. GARVEY [c], S. GEER [g], C. GHESQUIÈRE [g], P. GHEZ [b], K. GIBONI [a], W.R. GIBSON [f], Y. GIRAUD-HÉRAUD [g], A. GIVERNAUD [k], A. GONIDEC [b], G. GRAYER [j], T. HANSL-KOZANECKA [a], W.J. HAYNES [j], L.O. HERTZBERGER [3], C. HODGES [h], D. HOFFMANN [a], H. HOFFMANN [d], D.J. HOLTHUIZEN [3], R.J. HOMER [c], A. HONMA [f], W. JANK [d], G. JORAT [d], P.I.P. KALMUS [f], V. KARIMÄKI [e], R. KEELER [f], I. KENYON [c], A. KERNAN [h], R. KINNUNEN [e], W. KOZANECKI [h], D. KRYN [d,g], F. LACAVA [i], J.-P. LAUGIER [k], J.-P. LEES [b], H. LEHMANN [a], R. LEUCHS [a], A. LÉVÊQUE [k,d], D. LINGLIN [b], E. LOCCI [k], J.-J. MALOSSE [k], T. MARKIEWICZ [d], G. MAURIN [d], T. McMAHON [c], J.-P. MENDIBURU [g], M.-N. MINARD [b], M. MOHAMMADI [1], M. MORICCA [i], K. MORGAN [h], H. MUIRHEAD [4], F. MULLER [d], A.K. NANDI [j], L. NAUMANN [d], A. NORTON [d], A. ORKIN-LECOURTOIS [g], L. PAOLUZI [i], F. PAUSS [d], G. PIANO MORTARI [i], E. PIETARINEN [e], M. PIMIÄ [e], A. PLACCI [d], J.P. PORTE [d], E. RADERMACHER [a], J. RANSDELL [h], H. REITHLER [a], J.-P. REVOL [d], J. RICH [k], M. RIJSSENBEEK [d], C. ROBERTS [j], J. ROHLF [d], P. ROSSI [d], C. RUBBIA [d], B. SADOULET [d], G. SAJOT [g], G. SALVI [f], G. SALVINI [i], J. SASS [k], J. SAUDRAIX [k], A. SAVOY-NAVARRO [k], D. SCHINZEL [d], W. SCOTT [j], T.P. SHAH [j], M. SPIRO [k], J. STRAUSS [l], J. STREETS [c], K. SUMOROK [d], F. SZONCSO [l], D. SMITH [h], C. TAO [3], G. THOMPSON [f], J. TIMMER [d], E. TSCHESLOG [a], J. TUOMINIEMI [e], B. Van EIJK [3], J.-P. VIALLE [d], J. VRANA [g], V. VUILLEMIN [d], H.D. WAHL [l], P. WATKINS [c], J. WILSON [c], C. WULZ [l], G.Y. XIE [d], M. YVERT [b] and E. ZURFLUH [d]

Aachen [a] – Annecy (LAPP) [b] – Birmingham [c] – CERN [d] – Helsinki [e] – Queen Mary College, London [f] – Paris (Coll. de France) [g] – Riverside [h] – Rome [i] – Rutherford Appleton Lab. [j] – Saclay (CEN) [k] – Vienna [h] Collaboration

Received 6 June 1983