LAWRENCE R. SULAK

SELECTED PUBLICATIONS AND WORKS

from 150 refereed papers cited over 11,000 times

Neutrino Oscillations

1. First proposal for a massive underground ring-imaging water Cherenkov detector. These papersr focus on both the detection of proton decay, the critical signals for muon- and electron-neutrino induced events, and the up/down asymmetry measurement which led to the discovery of neutrino mass and oscillations.

"Studies of a Detector to Test for Baryon Stability to a Lifetime of 10^{33} Years", L.R. Sulak, Proceedings of the Seminar on Proton Stability, Madison (D. Cline, ed.) 8 December 1978, p. A1; also appeared as Harvard University Particle Physics Preprint HUPP 252.

"A Nucleon Decay Search: Design of a New Experiment Sensitive to a Lifetime of 10^{33} Years", B. Cortez et al., Int'l Conf. on Neutrino Physics 1979 (A. Haadtuft and C. Jarlskog, ed.), Trykk: Astvedt Industrier A/S, Vol. 3 (1979), p. 121.

"A Long Baseline Neutrino Oscillation Experiment Sensitive to Mass Differences of Hundredths of an Electron Volt", B. Cortez and L.R. Sulak, Unification of the Fundamental Particle Interactions (S. Ferrara, J. Ellis, and P. Van Nieuwenhuizen, eds.) Erice, March 17-24, 1980, Plenum Press, (1980), pp. 661-671

"The Irvine-Michigan-Brookhaven Nucleon Decay Facility: Status Report on a Proton Decay Experiment Sensitive to a Lifetime of 10^{33} Years", and a Long Baseline Neutrino Oscillation Experiment Sensitive to Mass Differences of Hundredths of an Electron Volt, L. Sulak, First Workshop on Grand Unification (Paul H. Frampton, Sheldon L. Glashow, Asim Yildez, eds.), April 10-12, Math Sci. Press, University of New Hampshire, (1980), p. 163

2. IMB:The first suggestion of a muon deficit in the cosmic ray atmospheric neutrino appears after one live year of data taking. First refereed publication of a deficit of atmospheric muon neutrinos (relative to the number of electron neutrinos), precursor to the discovery of neutrino oscillations.

"A Search for Nucleon Decay Into Lepton and K^0", B. Cortez, Harvard University Ph.D. Thesis, September 1983 (advisor: LRS)

"Calculation of Atmospheric Neutrino Induced Backgrounds in a Nucleon Decay Search", T.J. Haines et al., Phys. Rev. Lett. 57, (1986).

3. Super-K high statistics proof of the oscillation of muon neutrinos, a manifestation of an unexpected non-zero mass of the Neutrino, the first observation of physics beyond the standard model:

"Evidence for Oscillation of Atmospheric Neutrinos", Y. Fukuda et al., Phys. Rev. Lett. 81 (1998) p. 1562-1567. (1085 entries in Citation Index)

4. Super-K demonstration that oscillations of muon neutrinos are most likely into tau neutrinos:

"Tau Neutrinos Favored Over Sterile Neutrinos in Atmospheric Muon Neutrino Oscillation", S. Fukuda et al., Super-Kamiokande Collaboration, Phys. Rev. Lett. (2000).

Neutrino and Supernova Astrophysics

5. First observation of extra-galactic neutrinos from the gravitational collapse of a supernova, simultaneously observed by the Kamiokande detector:

"Observation of a Neutrino Burst in Coincidence with Supernova 1987A in the Large Magellanic Cloud", R.M. Bionta, G. Blewitt, C.B. Bratton, D. Casper, A. Ciocio, R. Claus, B. Cortez, M. Crouch, S.T. Dye, S. Errede, G. W. Foster, W. Gajewskik, K.S. Ganezer, M. Goldhaber, T. J. Haines, T.W. Jones, D. Kielczewska, W.R. Kropp, J. G. Learned, J.M. LoSecco, J. Matthews, R. Miller, M.S. Mudan, H.S. Park, L.R. Price, F. Reines, J. Schultz, S. Seidel, E. Shumard, D. Sinclair, H.W. Sobel, J.L. Stone, L.R. Sulak, R. Svoboda, G. Thornton, J.C. van der Velde, and C. Wuest, Phys. Rev. Lett., Vol. 58, No. 14,(6 April 1987), p. 1494. (418 entries in Citation Index)

Nucleon Decay Searches

6. Establishment of a limit on the proton lifetime at the Grand Unification Scale, 5 orders of magnitude better than previous measurements. The death of the simplest and most elegant theory, SU5. LRS was a Principal Investigator: and a vocal advocate of the building of IMB:

"A Search for Proton Decay into *e*+ π^o", R.M. Bionta, G. Blewitt, C. B. Bratton, B.G. Cortez, S. Errede, G.W. Foster, W. Gajewski, M. Goldhaber, J. Greenberg, T. J. Haines, T.W. Jones, D. Kielczewska, W.R. Kropp, J. G. Learned, E. Lemann, J.M. LoSecco, P.V.R. Murthy, H.S. Park, F. Reines, J. Schultz, E. Shumard, D. Sinclair, D.W. Smith, H.W. Sobel, J.L. Stone, L.R. Sulak, R. Svoboda, J. C. van der Velde, and C. Wuest, Phys. Rev. Lett., Vol. 51, No. 1, 27 (4 July 1983) (130 entries in Citation Index)

"Search for Nucleon Decay into μ^+ K° and νK°" , B.G. Cortez et al., Phys. Rev. Lett. Vol., 52 (26 March 1984).

"A Search for Proton Decay into e^+ π^o", R.M. Bionta et al., Phys. Rev. Lett., Vol. 51 (4 July 1983), p. 27 (125 citations).

7. Limits on 44 decay modes of the nucleon, most remain world records to date.

"A Search for Nucleon Decay Using the IMB-3 Detector", C. McGrew et al., Phys. Rev. D59 (1999) p. 5204.

Observations of Neutral Currents

8. The first observation of both elastic neutrino- and antineutrino-proton elastic scattering, the weak analog of beta decay. LRS was Spokesman, and in charge of the pms, electronics, world's largest drift chambers (4x4 m), 60 T liquid segmented scintillator detector and data acquisition:

"Observation of Elastic Neutrino-Proton Scattering", D. Cline, A. Entenberg, W. Kozanecki, A. K. Mann, D.D. Reeder, C. Rubbia, J. Strait, L. R. Sulak and H.H. Williams, Phys. Rev. Lett. Vol. 37, No. 5, p. 252 (2 August 1976). (110 entries in Citation Index)

"Observation of Elastic Antineutrino-Proton Scattering", D. Cline, A. Entenberg, W. Kozanecki, A.K. Mann, D.D. Reeder, C. Rubbia, J. Strait, L.R. Sulak and H.H. Williams, Phys. Rev. Lett., Vol. 37, no. 11, p. 648 (13 September 1976). (95 entries in Citation Index)

9. The first observation of neutral-current neutrino events (contemporaneously with a similar measurement at Gargamelle, CERN), proof of the unification of electromagnetism and weak radioactive decay. LRS was responsible for the 100 T totally absorptive liquid scintillator detector and the trigger counters, as well as designing the electronics :

"Observation of Muonless Neutrino-Induced Inelastic Interactions", A. Benvenuti, D.C. Cheng, D. Cline, W.T. Ford, R. Imlay, T. Y. Ling, A. K. Mann, F. Messing, R. L. Piccioni, J. Pilcher, D. D. Reeder, C. Rubbia, R.

Stefanski and L.R. Sulak, Phys. Rev. Lett., Vol. 32, No. 14, p. 800 (8 April 1974, received 3 August 1973). (224 entries in Citation Index)

10. The first determination of the spacetime structure of the neutral current, showing that it fits the electroweak theory:

"Model Independent Determination of Hadronic Neutral Current Couplings", M. Claudson, E. A. Paschos, J. Strait, and L.R. Sulak, Phys. Rev. D, Vol. 19, No. 5, p. 1973, (1 March 1979).

g-2 Experiment at Brookhaven

11. Invention of high-rate detectors segmented in time and in position for a new generation of experiment. LRS led the effort, did much of the original prototyping and test beam work, and drafted the first proposal:

"Precise Measurement of the Positive Muon Anomalous Magnetic Moment", H. N. Brown et al., Muon g-2 Collaboration, Phys. Rev. Lett. 86, (2001) (360 entries in Citation Index)

"Improved Measurement of the Positive Muon Anomalous Magnetic Moment", R. Carey et al., g-2 Collaboration, Phys. Rev. D. (2000)

"Scintillating Fiber Calorimeters with Cast Absorbers", D. Brown et al., IEEE Trans. Nucl. Sci. (1991).

"Cast Lead Eutectic Solid and Liquid Scintillating Fiber Shower Calorimeters", T. Coan, W. Worstell, J. Miller, B. L. Roberts, L. R. Sulak, D. R. Winn, P. Cushman, S. Dhawan, and V. W. Hughes, Nucl. Instr. Meth. (1991).

"Design and Performance of a New Electron Calorimeter for the Muon g-2 Experiment", C. W. Heisey et al., Nucl. Instr. and Meth. (1988).

Kaon Physics

12. First measurement of the neutral kaon mass difference at the 1% level:

"$K_1^o - K_2^o$ Mass Difference," R. K. Carnegie et al., Phys. Rev. D. Vol. 4 (1 July 1971), p.1