

# Selected publications of Petros A. Rapidis

## Commentary

I provide some commentary on certain publications of this set that may serve as a guide to my overall scientific career.

**Copies of this subset of my publications can be found in :**

*http://www.inp.demokritos.gr/~rapidis/CVlong/Rapidis\_sel\_pubs*

**A list and copies of all my publications can be found in :**

*http://www.inp.demokritos.gr/~rapidis/CVlong/Rapidis\_all\_pubs*

Item [1] is my first piece of research work with M.L. Perl. It was significant in the sense that it served as a *vade mecum* for the search of the heavy lepton and also that it pointed out the fact that the heavy lepton should have a large hadronic decay width.

Items [2],[5] are the work for my Ph.D., i.e. the study of D meson production in  $e^+e^-$  annihilation and the discovery of the  $\psi''(3772)$ , the first charmonium state above charm threshold.

Item [7] is a nice piece of work, an unexpected finding, which led to an observation and study of Cherenkov light produced below threshold, a phenomenon due to the finite size of the radiating medium and a phenomenon with many interesting connections to other radiation phenomena. I was one of the major investigators of this phenomenon and I really had a lot of fun doing this piece of work.

Items [8],[11],[13] reflect my work with the CCFRR neutrino scattering experiment. They are the measurement of the total cross-section, the technical aspects of the neutrino flux measurement, and the measurement of  $\sin^2\theta_w$ .

Item [17] is cited mostly to illustrate some of the accelerator related work I have done, work that does not easily lead to publication in journals; in this case this article describes the use of the Antiproton Source for lower energy experiments.

Item [27] is a technical paper on the construction of the Lead Glass Central Calorimeter for the E760 experiment, a project that was to very large extent directed by me.

Item [29] is an invited summary/review paper that summarizes the work of E760. I was a prime contributor to many aspects of this work, esp. the precision measurements of the  $J/\psi$  and  $\psi'$ .

Item [30] is pointed out because it is a proposal that only two of us worked on. Even though fundamentally a nice and important experiment, the search for direct CP violation in  $p\bar{p} \rightarrow \bar{\Lambda}\Lambda \rightarrow \bar{p}\pi^+p\pi^-$  would have been an experiment that would have required too many resources, and thus was never carried out.

Items [35],[38],[39] are here to illustrate my work in designing and building the DØ Upgrade, esp. the silicon microvertex tracker (SMT); a task that I devoted quite a few years of my life.

The SMT was used extensively to study b-quark particles. One of the first results was item [37] the measurement of the ratio of  $B^+$  and  $B^0$  meson lifetimes, which confirmed with higher precision the fact that the charged B mesons have a longer lifetime.

Item [36] describes the Run 2b DØ Upgrade that was partially canceled as described in my detailed CV. Nevertheless the SVX4 readout chip (described in some detail in [44]) was built and most of the testing described in this document was work directed by me.

The idea of building large Liquid Argon imaging ionization detectors, which I was promoting, is described in item [41]. This approach has now been adopted by Fermilab as the design choice for the large underground detector for the Long Baseline Neutrino Experiment (LBNE) project!

Items [49],[50],[51] are the conceptual and technical design reports for the KM3NeT project for which I was one of the editors, and a review of the NESTOR project.

Item [53] is a proposal to use an underwater neutrino detector to detect neutrinos from Gamma Ray Bursts, an idea that will be pursued within the recently approved “Thales” grant. The description of the first prototype deployment is in [55], [56].

Finally item [54] is a measurement of the water transparency in the Ionian Sea, a parameter crucial to the design of KM3NeT, a measurement that establishes the superior quality of the Pylos site.

Shown in the last line of each reference and in **typewriter font** are the numerical index of the publication in the complete list of my publications and the file name.

## Selected Publications<sup>1</sup>

- [1] **The Search for Heavy Leptons and Muon - Electron Differences.**  
By M.L. Perl, and P.A. Rapidis (SLAC), SLAC-PUB-1496, Sept. 1974.  
Revised version of review paper originally presented at the Muon Physics Conference, Colorado State Univ., Sep 6-10, 1971. Reprinted in '*Reflections on Experimental Science*', *World Scientific Series in 20th Century Physics, Volume 14* by M.L. Perl, World Scientific, Singapore, 1996.  
Cross reference is 1, file name is a001.pdf
  
- [2] **Observation of a Resonance in  $e^+e^-$  Annihilation Just above Charm Threshold.**  
P.A. Rapidis *et al.*, *Phys. Rev. Lett.* **39**,526 (1977), Erratum-*ibid.* **39**,974 (1977).  
Cross reference is 27, file name is a027.pdf
  
- [3] **Inclusive Production of D-Mesons in  $e^+e^-$  Annihilation at 7 GeV.**  
P.A. Rapidis *et al.*, *Phys. Lett.* **84B**,507 (1979).  
Cross reference is 44, file name is a044.pdf
  
- [4] **Inclusive Production of D and K Mesons in  $e^+e^-$  Annihilation.**  
M. Piccolo *et al.*, *Phys. Lett.* **86B**,220 (1979).  
Cross reference is 46, file name is a046.pdf
  
- [5] **D Meson Production in  $e^+e^-$  Annihilation.**  
By P.A. Rapidis (SLAC), SLAC Report No. 0220, June 1979. 103pp.  
Ph.D. Thesis.  
Cross reference is 47, file name is a047.pdf

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<sup>1</sup>Includes mostly publications in refereed journals, but also some presentations and unpublished notes in which I was a major contributor.

- [6] **Recent Results on Total Neutrino and Antineutrino Cross Sections the CFRR Collaboration.**  
 By B.C. Barish *et al.*, Presented by P.A. Rapidis at the 9th SLAC Summer Inst. on Particle Physics, Stanford, Calif., July 27 - August 7, 1981. Published in *Proceedings of Summer Institute on Particle Physics, July 27 - August 7, 1981, The Strong Interactions*, SLAC Report No. 245, Ed. by A. Mosher, (January 1982), p. 641.  
 Cross reference is 54, file name is a054.pdf
- [7] **Observation of Light Below Cherenkov Threshold in a 1.5 Meter Long Integrating Cherenkov Counter.**  
 A. Bodek *et al.*, *Z. Phys. C - Particles and Fields* **18**,289 (1983).  
 Cross reference is 55, file name is a055.pdf
- [8] **Measurement of the Rate of Increase of Neutrino Cross Sections with Energy.**  
 R. Blair *et al.*, *Phys. Rev. Lett.* **51**,343 (1983).  
 Cross reference is 56, file name is a056.pdf
- [9] **Measurement of  $\sin^2\theta_w$  in Semileptonic  $\nu$  Fe and  $\bar{\nu}$  Fe Interactions.**  
 By R.E. Blair *et al.*, Presented by P.A. Rapidis at the Europhysics Study Conference on Electroweak Effects at High Energies, February 1-12, 1983, Erice, Italy. Published in the *Proceedings of the First Europhysics Study Conference on Electroweak Effects at High Energies*, Ed. by H. Newman, Plenum, NY, 1985, p. 87.  
 Cross reference is 57, file name is a057.pdf
- [10] **Limit on Muon-Neutrino Oscillations in the Mass Range  $30 < \Delta m^2 < 1000 eV^2/c^4$ .**  
 By I.E. Stockdale *et al.*, *Phys. Rev. Lett.* **52**,1384 (1984).  
 Cross reference is 58, file name is a058.pdf
- [11] **Monitoring and Calibration System for Neutrino Flux Measurement in a High-Energy Dichromatic Beam.**  
 R. Blair *et al.*, *Nucl. Instrum. Methods.* **226**, 281 (1984).  
 Cross reference is 60, file name is a060.pdf

- [12] **Search for Muon Neutrino and Antineutrino Oscillations in the Mass Range  $15 < \Delta m^2 < 1,000 eV^2/c^4$ .**  
 By I.E. Stockdale *et al.*, *Z. Phys. C - Particles and Fields* **27**,53 (1985).  
 Cross reference is 62, file name is a062.pdf
- [13] **Measurement of  $\sin^2\theta_w$  and  $\rho$  in Deep Inelastic Neutrino-Nucleon Scattering.**  
 P.G. Reutens *et al.*, *Phys. Lett.* **152B**, 404 (1985).  
 Cross reference is 63, file name is a063.pdf
- [14] **Neutrino Production of Dimuons.**  
 K. Lang *et al.*, *Z. Phys. C - Particles and Fields* **33**,483 (1987).  
 Cross reference is 65, file name is a065.pdf
- [15] **A Measurement of the Neutral Current Electroweak Parameters using the Fermilab Narrow Band Neutrino Beam.**  
 P.G. Reutens *et al.*, *Z. Phys. C - Particles and Fields* **45**,539 (1990).  
 Cross reference is 69, file name is a069.pdf
- [16] **Measurement of the Inclusive Charged Current Cross-Section for Neutrino and Anti-Neutrino Scattering on Isoscalar Nucleons.**  
 P.S. Auchincloss *et al.*, *Z. Phys. C - Particles and Fields* **48**,411 (1990).  
 Cross reference is 70, file name is a070.pdf
- [17] **The Fermilab Antiproton Source : Prospects for  $p\bar{p}$  Experiments.**  
 By P.A. Rapidis (Fermilab), Presented at the First Workshop on Antimatter Physics at Low Energy, Batavia, Illinois, April 10-12, 1986. Published in *Proceedings of the First Workshop on Antimatter Physics at Low Energy*, Fermilab Publication, Ed. by B. E. Bonner and L. S. Pinsky , (1986), p. 83.  
 Cross reference is 73, file name is a073.pdf

- [18] **The Fermilab Antiproton Source : Recent Performance and Improvements.**  
 By P.A. Rapidis *et al.*, Presented at the 1st European Particle Accelerator Conference, Rome, Italy, June 7-11, 1988. Published in *EPAC, European Particle Accelerator Conference*, Ed. by S. Tazzari, World Scientific, Singapore, 1989, p. 404.  
 Cross reference is 74, file name is a074.pdf
- [19] **Experiments with Anti-Protons: Summary of the Working Group's Activities.**  
 By P.A. Rapidis (Fermilab), in *Proceedings of the Workshop on Physics at the Main Injector, May 16-18, 1989, Batavia, Illinois*, Ed. by S.D. Holmes and B.D. Winstein, Fermilab, 1989 p. 165.  
 Cross reference is 75, file name is a075.pdf
- [20]  **$p\bar{p}$  Accumulator Physics.**  
 By P.A. Rapidis (Fermilab), and G.A. Smith (Penn State U.), editors for the  $\bar{p}$  Accumulator Physics Group, in *Proceedings of Physics at Fermilab in the 1990's, August 15-24, 1989, Breckenridge, Colorado*, Ed. by D. Green and H. Lubatti, World Scientific Publishers, Singapore, 1990, p. 474.  
 Cross reference is 78, file name is a078.pdf
- [21] **Energy and Energy Width Measurement in the FNAL Antiproton Accumulator.**  
 By M. Church, S. Hsueh, P. Rapidis, and S. Werkema. Published in *Conference Record of the 1991 IEEE Particle Accelerator Conference, May 6-9, 1991, San Francisco, California*, p. 108.  
 Cross reference is 79, file name is a079.pdf
- [22] **Precision Measurements of Charmonium States Formed in  $\bar{p}p$  Annihilation.**  
 T.A. Armstrong *et al.*, *Phys. Rev. Lett.* **68**, 1468 (1992).  
 Cross reference is 80, file name is a080.pdf
- [23] **Study of the  $\chi_{c1}$  and  $\chi_{c2}$  Charmonium States Formed in  $\bar{p}p$  Annihilations.**  
 T.A. Armstrong *et al.*, *Nucl. Phys.* **B373**, 35 (1992).  
 Cross reference is 81, file name is a081.pdf

- [24] **Proton Electromagnetic Form Factor in the Timelike Region from 8.9 to 13.0 GeV<sup>2</sup>.**  
T.A. Armstrong *et al.*, *Phys. Rev. Lett.* **70**, 1212 (1993).  
Cross reference is 82, file name is a082.pdf
- [25] **Observation of the <sup>1</sup>P<sub>1</sub> State of Charmonium.**  
T.A. Armstrong *et al.*, *Phys. Rev. Lett.* **69**, 2337 (1992).  
Cross reference is 84, file name is a084.pdf
- [26] **Measurement of the *J/ψ* and *ψ'* resonance parameters in  $\bar{p}p$  annihilation.**  
T.A. Armstrong *et al.*, *Phys. Rev.* **D47**, 772 (1993).  
Cross reference is 85, file name is a085.pdf
- [27] **The E760 Lead Glass Central Calorimeter: Design and Initial Test Results.**  
L. Bartoszek *et al.*, *Nucl. Instrum. Meth.* **A301**, 47 (1991).  
Cross reference is 90, file name is a090.pdf
- [28] **Precision Charmonium Spectroscopy at the Fermilab Antiproton Accumulator.**  
By P.A. Rapidis (Fermilab), Presented at the 1992 Summer Institute on Particle Physics, Stanford, California, July 13-24, 1992. Published in *Proceedings of the Summer Institute on Particle Physics, July 13-24, 1992, The Third Family and the Physics of Flavor*, edited by L. Vassilian, SLAC, 1993, p. 469.  
Cross reference is 91, file name is a091.pdf
- [29] **Charmonium Formation in  $p\bar{p}$  Annihilations.**  
R. Cester (U. of Turin), and P.A. Rapidis (Fermilab), *Ann. Rev. Nucl. Part. Sci.*, **44**, 329 (1994).  
Cross reference is 93, file name is a093.pdf
- [30] **Search for Direct CP Violation in  $p\bar{p} \rightarrow \bar{\Lambda}\Lambda \rightarrow \bar{p}\pi^+p\pi^-$**   
S. Y. Hsueh, and P.A. Rapidis (Fermilab), *Fermilab Proposal P-859*, January 1992, unpublished.  
Cross reference is 97, file name is a097.pdf

- [31] **SQUID Based Beam Current Meter.**  
M. Kuchnir, J.D. McCarthy, and P.A. Rapidis (Fermilab). *et al.*, *IEEE Transactions on Magnetics* **MAG-21**,997 (1985).  
Cross reference is 98, file name is a098.pdf
- [32] **Pulsed Laser for Testing Silicon Strip Detectors.**  
M. Vaz (Rio de Janeiro, CBPF & Rio de Janeiro U.), S. Cihangir, and P.A. Rapidis (Fermilab), FERMILAB-TM-1849, Jul 1993. 16pp.  
Cross reference is 99, file name is a099.pdf
- [33] **Jet Production via Strongly-Interacting Color-Singlet Exchange in  $p\bar{p}$  Collisions.**  
S. Abachi *et al.* (DØ Collaboration), *Phys. Rev. Lett.* **76**, 734 (1996).  
Cross reference is 101, file name is a101.pdf
- [34] **The DØ Upgrade.**  
S. Abachi *et al.* (DØ Collaboration), Submitted to International Europhysics Conference on High Energy Physics (HEP 95), Brussels, Belgium, 27 Jul - 2 Aug 1995, in *International Europhysics Conference on High Energy Physics (HEP 95): Proceedings*, edited by J. Lemonne, C. Vander Velde, and F. Verbeure, World Scientific, Singapore, 1996.  
Cross reference is 118, file name is a118.pdf
- [35] **The DØ Silicon Microstrip Tracker: Construction and Testing.**  
P. A. Rapidis , in *High Energy Physics, ICHEP 2000, Proceedings of the 30th International Conference on High-Energy Physics , Osaka, Japan, 27 Jul - 2 Aug 2000* , Edited by C. .S. Lim and T. Yamanaka, World Scientific, Singapore, 2001, p. 1238-1239.  
Cross reference is 144, file name is a144.pdf
- [36] **Run IIb Upgrade - Technical Design Report - DØ Collaboration.**  
V. M. Abazov *et al.*(DØ Collaboration), *Unpublished*, FERMILAB-PUB-02-327-E, (2002)  
Cross reference is 161, file name is a161.pdf

- [37] **Measurement of the ratio of  $B^+$  and  $B^0$  meson lifetimes.**  
V. M. Abazov *et al.* (DØ Collaboration), *Phys. Rev. Lett.* **94**, 182001 (2005).  
Cross reference is 190, file name is a190.pdf
- [38] **The DØ Silicon Microstrip Tracker .**  
S.N. Ahmed, *et al.* (DØ Collaboration), *Nucl. Instrum. Meth.* **A634**, 8 (2011)  
Cross reference is 203, file name is a203.pdf
- [39] **The Upgraded DØ Detector.**  
V. M. Abazov *et al.*(DØ Collaboration), *Nucl. Instrum. Meth.* **A565**, 463 (2006)  
Cross reference is 209, file name is a209.pdf
- [40] **FLARE: Fermilab liquid argon experiments.**  
L. Bartoszek *et al.*, Unpublished FERMILAB-PROPOSAL-0942, Aug 2004; arXiv:hep-ex/0408121.  
Cross reference is 226, file name is a226.pdf
- [41] **A Large Liquid Argon Time Projection Chamber for Long-baseline Off-axis Neutrino Oscillation Physics.**  
D. Finley *et al.*, submission to NuSAG, Aug 2005 ; Available as FERMILAB-FN-0776-E, Sep 2005. 63pp.  
Cross reference is 227, file name is a227.pdf
- [42] **Results from irradiation tests on DØRun 2a silicon detectors at the radiation damage facility at Fermilab.**  
J. Gardner *et al.* (DØ Collaboration), Unpublished note, available as FERMILAB-TM-2345-E, Mar 2006. 17pp.  
Cross reference is 228, file name is a228.pdf
- [43] **The Stimulus Test Stand.**  
L. Christofek, P. Rapidis, and A. Reinhard, Unpublished note, available as FERMILAB-TM-2315-E, Jun 2005. 13pp.  
Cross reference is 229, file name is a229.pdf
- [44] **Preliminary Test Results For The SVX4.**  
L. Christofek, K. Hanagaki, P. Rapidis and M. Utes, Unpublished note,

available as FERMILAB-TM-2316-E, Jun 2005. 49pp.  
Cross reference is 230, file name is a230.pdf

- [45] **Test results for the SVX4 version of A/B chip.**  
L. Christofek, K. Hanagaki, M. Jun, D. Kau, P. Rapidis and M. Utes,  
Unpublished note, available as FERMILAB-TM-2317-E, Jun 2005.  
31pp  
Cross reference is 231, file name is a231.pdf
- [46] **SVX4 user's manual.**  
L. Christofek *et al.*, Unpublished note, available as FERMILAB-TM-  
2318-E, Jun 2005, 59pp.  
Cross reference is 232, file name is a232.pdf
- [47] **Work at FNAL to achieve long electron drift lifetime in liquid argon.**  
D. Finley, W. Jaskierny, C. Kendziora, J. Krider, S. Pordes, P. A. Rapidis and T. Tope, Unpublished note, available as FERMILAB-TM-2385-E, Oct 2006.  
Cross reference is 233, file name is a233.pdf
- [48] **Test of purging a small tank with argon.**  
W. Jaskierny, H. Jostlein, S. Pordes, P. A. Rapidis and T. Tope, Unpublished note, available as FERMILAB-TM-2384-E, Oct 2006.  
Cross reference is 234, file name is a234.pdf
- [49] **KM3NeT: A large underwater neutrino telescope in the Mediterranean Sea.**  
P. A. Rapidis (for the KM3NeT consortium), Talk at the *10th International Conference On Topics In Astroparticle And Underground Physics (TAUP 2007)* , 11-15 Sep 2007, Sendai, Japan; to appear in the proceedings; available as arXiv:0803.2478.  
Cross reference is 235, file name is a235.pdf

- [50] **KM3NeT, Conceptual Design Report for a Deep-Sea Research Infrastructure Incorporating a Very Large Volume Neutrino Telescope in the Mediterranean Sea.**  
 The KM3NeT consortium, ISBN 978-90-6488-031-5, April 2008, 120pp.  
 Can be found online at :  
<http://www.km3net.org/CDR/CDR-KM3NeT.pdf> also at  
<http://www.inp.demokritos.gr/~rapidis/CDR-KM3NeT.pdf>  
 Cross reference is 236, file name is a236.pdf
- [51] **KM3NeT, Technical Design Report for a Deep-Sea Research Infrastructure in the Mediterranean Sea Incorporating a Very Large Volume Neutrino Telescope.**  
 The KM3NeT consortium, ISBN 978-90-6488-033-9, March 2011, 193pp.  
 Can be found online at :  
<http://www.km3net.org/TDR/TDRKM3NeT.pdf> also at  
<http://www.inp.demokritos.gr/~rapidis/TDR-KM3NeT.pdf>  
 Cross reference is 243, file name is a243.pdf
- [52] **The NESTOR neutrino telescope project.**  
 P. A. Rapidis (for the NESTOR collaboration), Invited talk at the *International Workshop on a Very Large Volume Neutrino Telescope for the Mediterranean Sea VLVnT08*, Toulon, France, 22-24 April 2008; *Nucl. Instrum. Methods. A* **602**, 54 (2009).  
 Cross reference is 237, file name is a237.pdf
- [53] **Proposal to Measure High Energy Neutrinos in Coincidence with Gamma Ray Bursts.**  
 H.J.Crawford *et al.* (NuBE collaboration), unpublished proposal, June 2006.  
 Available from:  
[http://www.inp.demokritos.gr/~rapidis/km3net\\_talks/NUBEPRO-060620\\_last.pdf](http://www.inp.demokritos.gr/~rapidis/km3net_talks/NUBEPRO-060620_last.pdf) ,  
 see also: <http://hena.lbl.gov/NuBE/index.html> .  
 Cross reference is 238, file name is a238.pdf

- [54] **Water transparency measurements in the deep Ionian Sea.**  
E.G. Anassontzis *et al.*. *Astropart.Phys.* **34**, 187, (2010).  
Cross reference is 242, file name is a242.pdf  
*I have included this in my publications since I directed and carried out most of the analysis and the writing of it. I withdrew my name from the author list in protest over the capricious behavior of Prof. Leo Resvanis who insistend on excluding from the author list persons that signiificantly contributed to this work while including others that were hardly involved.*
- [55] **GRBNeT A prototype for an autonomous underwater neutrino detector**  
K. Pikounis *et al.*. *EPJ Web Conf.***116** (2016) 09004.  
Cross reference is 250, file name is a250.pdf
- [56] **Digital and Analog Electronics for an autonomous, deep-sea, Gamma Ray Burst Neutrino prototype detector.**  
K. Manolopoulos, A. Belias, C. Markou, P. Rapidis, and E. Kappos  
*EPJ Web Conf.***116** (2016) 05010.  
Cross reference is 251, file name is a251.pdf