June 2016

Curriculum Vitae

Name: Petros Afentoulis **RAPIDIS** (Mr.)
Date of Birth: January 1, 1951
Place of Birth: Heraklion, Crete, Greece
Nationality: Dual, US Citizen (naturalized) and Greek (by birth)

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Education:

Athens College High School, Athens, Greece - Graduated in June 1969
Massachusetts Institute of Technology, Cambridge, Massachusetts
B.Sc., Physics, June 1, 1973
Stanford University, Stanford, California
M.S., Physics, April 3, 1975; Ph.D., Physics, June 17, 1979
Thesis: *D Meson Production in e^+e^- Annihilation;* Advisor: Prof. M. L. Perl

Employment:

October 1974 - May 1979 Stanford Linear Accelerator Center, California

October 1974 - May 1979 Research Assistant

May 1979 - June 2008 Fermi National Accelerator Laboratory, Batavia, Illinois

May 1979 - July 1982	Research Associate
July 1982 - August 1985	R.R. Wilson Fellow
August 1985 - October 1989	Associate Scientist
October 1989 - March 1997	Scientist I
March 1997 - June 2008	Scientist II

(leave of absence from February 2006)

May 1997 - May 1999	Deputy Leader, Silicon Detector Center
June 2000 - June 2002	Co-Leader, DØ Silicon Microvertex Tracker Group
February 2005 - January 2006	Deputy Leader, Liquid Argon TPC Development Group

February 2006 – December 2015 Institute of Nuclear Physics, National Center for Scientific Research 'Demokritos', Athens, Greece

February 2006 - February 2011	Institute Director
February 2006 – December 2015	Director of Research (Researcher A)
May 2011 - February 2013	Member of the CERN Council (Greek Scientific Delegate, CERN Council)

January 2016 – June 2016 Office of High Energy Physics, Office of Science, U.S. Dept. of Energy, Germantown, Maryland
Program Manager, Intensity Frontier

Research Career: 1974-1979: e^+e^- annihilation at SPEAR, Stanford Linear Accelerator Center,
Experiment SP-17 (MARK-I magnetic detector), and
Experiment SP-26 (Lead Glass Wall addition to MARK-I)

1979-1984: Deep inelastic neutrino scattering,
Experiment E616 (CCFRR collaboration),
Experiment E701 (CCFRR neutrino oscillations),
Experiment E744 (Neutrino scattering at the Tevatron), and
Experiment E595 (Prompt muon production and charm production)

1984-1993: Construction of TeV-I (Antiproton Source)
Construct & Commission the Antiproton Source (Ring and beamline diagnostics)
Experiment E760 (Resonant charmonium production in $p\bar{p}$ annihilation)

1993-2004: DØ Experiment (E740/E823) ($p\bar{p}$ collisions at 1.96 TeV),
Design, construction, and operation of the SMT (Silicon Microvertex Tracker)

2004 - 2006: Liquid Argon detector R&D, (Work towards a multi kton Liquid Argon imaging detector for an off-axis location in the Fermilab Neutrino Beam)

2006 - 2015: KM3NeT
Work towards the design of a large volume (a few cubic kilometers) underwater neutrino detector in the Mediterranean Sea

2016 Office of High Energy Physics. U.S. Dept. of Energy
Manager for the Intensity Frontier for High Energy Physics

Professional Societies: American Physical Society, Sigma Xi, European Physical Society, American Association for the Advancement of Science,

Distinctions

For the period of 1982-1985 I was appointed as the third R.R. Wilson Research Fellow at Fermilab. This is the ***highest*** distinction that the Laboratory can bestow to a young scientist.

In May 2011 I was appointed as the scientific Greek Delegate to the CERN Council.

Project/Management Experience

Dr. Rapidis latest position has been that of Program Manager with the Office of High Energy Physics of the US Department of Energy. He has been the manager of the Intensity Frontier experimental program, carried at the National Laboratories and at research universities. This program of approximately 65 M$ is roughly 10% of the overall program for High Energy Physics from DoE. (Other DOE-HEP programs are directed towards the Energy and Cosmic frontier experiments, Accelerator R&D, Detector R&D and Theoretical Research). The Intensity Frontier program encompasses neutrino physics, flavor physics, the measurement of the muon g-2 factor, and the search of the possible conversion of muons to electrons (the last two are probes for new unknown physical processes).

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Before that Dr. Rapidis spent almost nine years as senior scientist and director of the Institute of Nuclear Physics of Greece's National Center for Scientific Research 'Demokritos' in Athens, Greece. This is Greece's largest High Energy and Nuclear Physics Laboratory hosting groups working in high energy physics at CERN (CMS and CAST experiments), in nuclear physics and nuclear astrophysics utilizing primarily the in-house 3.5 MeV Tandem Electrostatic Ion Accelerator and also other European facilities. In addition there are groups working on high energy neutrino astronomy using deep sea neutrino telescopes (NESTOR project, and KM3NeT proposed detector) and in the application of nuclear physics techniques to the study of materials and of artifacts of cultural or archeological interest.

In this capacity Dr. Rapidis was a member of the governing board of the Center and participated in the management of the finances of the center as well as of the INPP. He oversaw the activities of 18 scientists, 6 technical support personnel, and 3 administrative aides. Contract employees provided additional engineering and design support as needed. The overall discretionary budget was meager by US standards, of the order of $90 000 per year. Additional funding was sporadic coming from European research grants – notably the theory group was able to get a $500 000 Marie-Curie grant and the KM3NeT effort $1 500 000 from the ESFRI scheme (these grants had 4 and 5 year durations respectively).

During his tenure in the INPP Dr. Rapidis was able to initiate the hiring of three new permanent researchers (two female and one male scientists) even though at the time the Greek public sector started spinning out of control. Since 'Demokritos' is a government laboratory public financial problems have a direct and immediate effect on the Institute's functioning.

As a leading member of Greece's scientific community and of the underwater neutrino effort, Dr. Rapidis was asked to serve in scientific leadership/policy positions. In particular he was a member of the governing and report authoring groups of the KM3NeT effort; he was the spokesperson of the NESTOR effort; he was a member of the Physical and Engineering Subpanels of the ESFRI council; and he was a member of the CERN Council as the Scientific Council Delegate from Greece. He participated in policy discussions, such as the CERN long term planning effort where he argued for the adoption of the Future Circular Collider option by CERN, and in ESFRI where he served in the panel that approved new projects to the ESFRI roadmap. He was also a member of the steering body for Greece's policy panel on Physical Sciences.

All in all Dr. Rapidis fell victim of Greece's financial collapse, and thus instead of leading this country's entry to the mainstream of physics research in Europe, instead he found himself doing 'damage control' trying to prevent the complete destruction of the existing infrastructures.

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Before that Dr. Rapidis spent 29 years as a scientist at the Fermi National Accelerator Laboratory (Fermilab). He joined Fermilab directly after obtaining his Ph.D. from Stanford University. He rose through the ranks as RR Wilson Fellow, Associate Scientist, Scientist I, and Scientist II. The science/research aspect of his work is detailed in the 'Research Experience' section; here the managerial/project aspects of his work are described.

Major projects and responsibilities during his tenure at Fermilab were:

Co-leader of the DØ Silicon Microvertex Tracker Group and Deputy Leader of the Silicon Detector Center the organization charged with bringing together the required resources for the silicon vertex detectors for CDF, DØ, BTev (the B physics experiment at the Tevatron, which was canceled), and the US portion of the CMS silicon tracker. In this capacity he supervised a group of four engineers, six draftsmen, and 36 technicians that built the silicon tracking detectors for DØ and CDF. Had to organize work, lead design efforts, direct engineers, shepherd the procurement of 1000+ silicon sensors from three manufacturers (cost is ~ $1000 per sensor), interact with vendors and offer technical support to them as needed. Travelled numerous times to vendors in the UK and France to iron out various design and production problems. Had to specify and lead the procurement of sophisticated mechanical and electronic equipment used in the construction and testing of the silicon trackers (such as coordinate measuring machines, optical measuring machine, silicon probe test stations, silicon electronic test equipment, etc.). Managed annual budgets of $300 000 (equipment) and $250 000 (operations).

Lead physicist in the construction of the E760 electromagnetic calorimeter. Conceptual and detailed design of a cylindrical EM calorimeter comprising of 1280 pieces of lead glass (approx size each was 40cmx15cmx15cm) of a complicated shape (erect pyramidal frusta with regular trapezoidal base), with a novel mounting mechanism of laser welded stainless steel cellular wedges. Had to guide and direct a small optics manufacturer who proved unable to handle the cutting and polishing of the lead glass by providing design and supervisory support and by sending a team of 6 technicians and machinists from Fermilab to help the manufacturer. This exercise entailed bi-weekly visits to the manufacturer in upstate New York. The cost of the lead glass alone was 1M$ and auxiliary costs for support, photomultipliers, electronics, connectors etc. roughly doubled the cost. At that time Dr. Rapidis was very early in his career!.

Designed and directed the construction of the Liquid Argon Materials Test Facility at the Fermilab Proton Assembly Building. A relatively small scale cryogenic setup to provide proof of principle that a liquid argon drift chamber does not need to be evacuated to obtain large electron drift times. In addition, he created a setup to test materials to find out if they poison the liquid argon. In the process he identified a more efficient oxygen scrubber for liquid argon and proved that a well controlled fill procedure for a liquid argon tank can lead to a high purity state only after four volume changes. In carrying out this work interacted with two cryogenics engineers, a mechanical engineer, two technicians, an electronics engineer and four scientists. The success of this effort was crucial in deciding to use liquid argon as the detector technology for the DUNE, the flagship Deep Underground Neutrino Detector of the US neutrino program.

Other Professional Activities

Scientist in charge of diagnostics in the Antiproton Source rings and beam lines, 1984-1989.

Physicist responsible for the design, construction, and commissioning of the lead-glass cylindrical electromagnetic calorimeter for E760.

Referee to the Fermilab Program Advisory Committee on 'Future Low Energy Antiproton Experiments at the Fermilab Antiproton Source', Summer Meeting of the PAC 1989.

Fermilab representative at the PSSC (Proton Synchrotron Scientific Committee) of CERN at its long range planning meeting of September 12-16, 1990 at Cogne, Italy

One of the leaders in the effort to build the Silicon Trackers for the colliding beam detectors at Fermilab (CDF and DØ), and in particular the co-leader of the DØ Silicon Microvertex Tracker Group (1997-2002).

Fermilab representative to the DØ Experiment's Institutional Board for 2001-2003.

Journal referee for many years for Physical Review D and Physical Review Letters, reviewed numerous submissions (>25) to these journals.

Selected and served as Director of the Institute of Nuclear Physics of the National Center for Scientific Research 'Demokritos' (2006-2011), which is Greece's major group for research in nuclear and particle physics.

Member of the Physical Sciences and Engineering Working Group of the European Strategy Forum for Research Infrastructures (ESFRI) for 2007-2008, served as the Chair of the Astrophysics, Nuclear, and Particle Physics Review Subpanel which reviewed proposals in these fields for inclusion in ESFRI Roadmap.

Member of the KM3NeT Consortium's governing body (Program Coordinating Committee) and of its Conceptual Design Report Editorial Board.

Chief editor of the Proceedings of the 2009 International Workshop on a Very Large Volume Neutrino Telescope for the Mediterranean Sea (VLVnT09), Athens, Oct. 2009, (*Nucl. Instrum. Methods.* **626**–**627** *Supplement*, (2011)

Presented the vision of our group (NESTOR) for the KM3NeT during its review by the Scientific Standing Committee (SSC), an external review panel of leading scientists, in November 2011 at Amsterdam. Our view is explained in the note titled 'An Alternative Strategy for KM3NeT'. The 'Alternative Strategy' note, the report of the SSC, and supporting material can be found on the KM3NeT web pages and have also been placed at the URL http://www.inp.demokritos.gr/~km3net/SSCreport

Selected in May 2011 as the Greek Scientific Delegate to the CERN Council, a position held until February 2013.

Member of European Strategy Group for Particle Physics for the 2013 upgrade of the strategy, participated and contributed significantly during the Strategy Drafting Session held in Erice, Sicily, Italy in January 2013, where he argued towards a Future Circular Collider as the major option for CERN's future.

For January 2012 to December 2015 was spokesperson for the NESTOR project.

For the period of March 2014 to December 2015 was a member of the Physical Sciences Advisory Board of the Greek National Council for Research and Technology.

In January 2016 was competitively selected for the position of Program Manager for the Intensity Frontier in the Office of High Energy Physics of the U.S. Department of Energy.

Research Experience [1]

As an undergraduate at MIT worked at the 600 MeV Bates Electron Linac during its construction and built a plastic scintillator hodoscope to be used as the focal plane detector of its energy loss spectrometer.

At Stanford, as a graduate student, Iworked under Prof. Martin L. Perl on the Mark I magnetic detector at SPEAR (Expt. SP-17) as well as the Lead-Glass Wall addition to it (Expt. SP-26). Besides building hardware [31], working on the DAQ system and supervising the off-line data processing, I first worked [1] on the search for (the then undiscovered) heavy lepton [39]. My thesis was the study of charmed (D) meson production in e^+e^- annihilation [47], and in particular, the inclusive production of D mesons [44] [46]. This included the discovery [27] of the $\psi''(3772)$, the investigation of its properties, the measurement of the cross section for the reaction $e^+e^- \rightarrow D$ + anything, and the measurement of the momentum spectrum of D's produced at the highest energies at SPEAR (Ec.m.= 7 GeV/c^2), which was the first glimpse of the charmed quark fragmentation function.

I joined Fermilab as a post doc. For four years I worked on Experiments E616, E595, E701, and E744. E616, E701, and E744 were a programmatic series by a Columbia U, U of Chicago, Caltech, Fermilab, U of Rochester, and Rockefeller U collaboration studying neutrino-nucleon scattering. A major result was the accurate measurement of cross sections for charged current neutrino-nucleon interactions [54] [56] [70] that were higher than the ones measured earlier elsewhere.

I contributed to the monitoring of the secondary particle flux [60] [61] in the decay region of Fermilab's dichromatic neutrino beam (which utilized a Cherenkov[2] counter [55], beam current transformers, ionization chambers, a resonant RF cavity, and segmented ion chambers) The calibration of the ion chambers and the RF cavity involved setting up what could be described as three small experiments in a test beam, and in the primary extracted proton beam [54]. This effort, which I orchestrated and to a large extent designed, took more than three months and involved 3-4 physicists and graduate students.

I initiated the study of multimuon production, with the combined E616 and E701 data. Results from this analysis [65] include the determination of the nucleon's strange quark content ($\kappa = 2s/(u + d) = 0.52 \pm 0.17$), and the observation of a signal of same sign dimuons (7 ± 5 events over background), which has not been confirmed. I studied the neutral current interactions with colleagues from the U. of Chicago. This work [57] [63] [69], the thesis topic of P. G. Reutens, lead to the measurement of $\sin^2\theta_w = .242 \pm .015$. Experiment E701 was an early neutrino oscillation experiment with two detectors placed at different locations along the narrow band neutrino beam. The ratio of the neutrino cross sections measured in the two detectors as a function of neutrino energy ($30 < E\nu < 230$ GeV) was used to search for ν oscillations. Since this ratio is largely free of systematic errors, we were sensitive to neutrino oscillations with $30 < \Delta m^2 < 1000$ eV $^2/c^4$ and $\sin^2(2\theta) > 0.02 - 0.40$. No oscillations were observed [58] [62] then. The E701 data were used to perform the same kind of analyses as for E616; this included a new measurement of the neutrino nucleon cross section [70].

Experiment E744 was the first neutrino scattering experiment to take data at the Tevatron. I was a major contributor in the construction, and testing of the drift chambers, but due to other obligations I did not participate in the analysis of E744 data. Experiment E595 was a Caltech, Fermilab, Rochester, and Stanford collaboration. We studied the production of prompt muons from hadrons impinging on a variable density target calorimeter placed in front of the neutrino detector. We measured a prompt muon signal in p Fe interactions by extrapolating the observed muon production off finite density targets to infinite density. The observed signal was at a level expected from the production of charmed particles ($\approx 15\mu b$).

[1] References to specific publications imply that I was a major contributor in the work. The numbers in brackets refer to the numbering of my full publication list. I attach a list of selected publications I refer to - the numbers [NNN] used in this CV appear in the selected publications list as "`Cross reference is NNN`". The list of all publications is:
http://www.inp.demokritos.gr/~rapidis/CVlong/Rapidis_all_pubs/a000_Rapidis_all_pubs.pdf

[2] A very nice quasi-classical result obtained with this device was the observation of Cerenkov light below threshold! - see ref. [55]

In 1985-1990 I was in the Tevatron I Section at Fermilab under Dr. J. Peoples, Jr., the group that designed, built, and commissioned the Fermilab Antiproton Source. My contribution was in the design and construction of diagnostic instrumentation [74]. This included devices for the two storage rings of the Source (e.g. a 'D.C.' current transformer based on a magnetic modulator and a prototype one based on a superconductive coil [98], transverse and longitudinal Schottky pickups,beam loss monitoring system). In the process I learned the intricacies of strong-focusing circular accelerators and of stochastic cooling [76].

I became one of the proponents [73] of Experiment E760 (approved 1985). This experiment was a collaboration of Fermilab, Ferrara, Genova, Irvine, Northwestern U, Penn State U and Torino. We used a hydrogen internal gas jet target in the Antiproton Accumulator Ring. We studied $p\bar{p}$ interactions with $E_{c.m.} \approx 2 - 4\,\mathrm{GeV}/c^2$. Our objective was to study the charmonium states produced, identified through their characteristic decays into a high mass e^+e^- or $\gamma\gamma$ pair. This allowed the study of charmonium production in the presence of a hadronic background of $\sim$ 70 mbarn i.e. at least four orders of magnitude larger the signal. The cooled beam of antiprotons had a narrow momentum spread ($dp/p \sim 0.01\%$), thus a center-of-mass energy resolution of 160 keV/c^2 (!) and a precisely controlled energy. We measured with accuracy the widths and masses of the χ_{c1}, χ_{c2} states [80] [81], directly measured (i.e. based on the line shape) the width of the J/ψ and ψ states [85], and the mass of the J/ψ. Branching ratios for these states to decay inclusively into J/ψ, as well as branching ratios to $p\bar{p}$ were obtained. Additionally, we made the first measurement of the proton electromagnetic form factor for large time-like momentum transfers [82].

A notable goal of E760 was the search for the $h_c[1^1P_1]$ state of charmonium [84]. Our observation for that state in the mode $J/\psi\pi^0$ has not been confirmed. Definitive observations of the h_c in other decay modes were seen by E835 (continuation of E760, Andreotti *et al.*, Phys. Rev. **D72**,032001, (2005)), and the CLEO group (Rubin *et al.* Phys. Rev. **D72**, 092004, (2005)). Thus the spectrum of charmonium is better known than for positronium(!), and the fact that the mass of this state lies very close to the center-of-gravity mass for the χ_c states shows that simple single gluon exchange describes charmonium, as expected by QCD. E760 also measured the $\gamma\gamma$ decays of the χ_{c2} and the η_c, and made measurements of light quark resonances produced in $p\bar{p}$ annihilation. These precision results of E760 are a stringent and significant test of QCD. To date one of the best determinations of α_s (strong coupling constant) comes from Lattice QCD calculations using such charmonium masses as input (El-Khadra *et al.*, Phys. Rev. Lett. **69**, 729 (1992)).

I took a leadership role in E760. I was involved in the analysis of the results above, but more importantly I was involved in all aspects of E760. I wrote a good part of the proposal. I was one of the designers and the physicist in charge of building the E760 central electromagnetic calorimeter [90]. This was a large array of lead glass blocks. I was involved in procuring the glass, supervised its machining, its testing, specified the readout electronics, and directed its construction.. Furthermore, I was instrumental in running the Antiproton Source for E760 and devising techniques used in measuring its energy [79].

As a result I was invited to present results at conferences [73] [77] [91], to lead study groups on antiproton physics [75] [78], and be the Fermilab representative to the CERN PSSC (Proton Synchrotron Scientific Committee) at its long range planning meeting of September 12- 16, 1990 at Cogne, Italy. Together with Prof. Cester of the U. of Torino, we wrote the review [93] on Charmonium Formation in $p\bar{p}$ Annihilations for the 1994 volume of the Annual Review of Nuclear and Particle Physics.

In 1991 I proposed, together with Dr. Hsueh, an experiment [97] to search for CP violation in the decays of $\Lambda\bar{\Lambda}$ pairs produced in $p\bar{p}$ annihilations. This very demanding experiment (it needed10^9 hyperon pairs to achieve its sensitivity), needed a small dedicated storage ring, was indefinitely postponed given its cost.

For the period 1993-2004 I was associated with the DØ experiment at Fermilab. This experiment studied high energy $p\bar{p}$ collisions at $E_{CM} \approx 2$ TeV. I joined the Upgrade effort of DØ [118] [209], which involved the addition of a magnetic tracker to the existing calorimetric detector of DØ. The most important part of this new tracker was the Silicon Microvertex Tracker (SMT) [203], which measured tracks with a resolution of $\sim$ 20μm and allowed secondary vertex reconstruction with a similar spatial resolution.

I was involved in the design of the SMT and took on the task of the mechanical integration. This was a formidable task, since alignment requirements for this 1m long device were $\approx 20\mu$m. I became familiar with silicon detector technology, but also with precision machining, temperature compensated materials, precision aligning, manipulating, and measuring equipment (e.g. co-ordinate measuring machines, x-y-z moving tables, microscopes, probing stations). I had to specify and procure such equipment, and to instrument a test station. I designed and implemented a test system for strip detectors using fiber optics and a pulsed infrared laser [99]. I was involved in the detailed design and procurement of the wedge shaped double sided silicon detectors (the so called F-wedges) of the DØ SMT. I also used my accelerator/beam expertise in designing and implementing a radiation damage test station for silicon devices [228].

We identified the SVX2 readout chip as a capricious piece of electronics - prone to failure, with tight operating margins, and with occasional pathological behavior. Given the complexity of the readout system I argued for and carried out an extensive test involving 20% of the final system. We exercised the electronics, but also the mechanical and thermal components and significant aspects of the DØ data acquisition system. It was acknowledged that this test, which occupied besides myself a post-doc and a graduate student for a full year, was crucial for the successful operation[3] of the completed device [144].

I led the effort of commissioning and operating the SMT for two years and I was involved with it ever since it was installed (in 1999), to the detriment of any major physics analysis work. We discovered that a significant portion ($\approx$ 15%) of the SVX2 chips failed for reasons hard to identify. This and the need for better efficiency for b-tagging, and larger data acquisition bandwidth led us to propose an upgraded SMT [161] for the next run of the Tevatron (RunIIb). The new SMT would have been read out by a new generation chip, the SVX4, much more robust than the SVX2. I was involved in the specification, design, and testing of this chip [229] [230] [231], [232]. Its operation proved flawless and the upgraded SMT was moving well, when unexpectedly this part of the upgrade was cancelled, in my opinion for no good reason.

The SMT was successfully used to tag B particles and obtain results on B-production and lifetimes, which allowed for another way to probe CP violation. I was involved with this phase of the DØ work [190] and I was invited to give a summary talk on b-physics at the Tevatron at WIN'03

In the wake of the cancelation of the DØ Run IIb silicon upgrade I opted for a new direction. In early 2005 I switched to the study of neutrino oscillations. I had worked in a neutrino oscillation experiment, but at that time I did not believe in massive neutrinos. It was that belief, my disillusionment with the engineering style of neutrino physics of the intervening years, and my involvement with the Fermilab Antiproton Source that drove me at that time away from the study of these very light fermions.

The renaissance of neutrino physics - heralded by the Kamiokande discoveries - reignited my interest. So I became one of the group that proposed a massive detector for Fermilab's off-axis neutrino beam [226], a Liquid Argon Time Projection Chamber with a mass of 15 to 50 ktons. This proposal was met with encouragement from Fermilab. For a year and a half (2004-2006) I was a leading member of a small group from the Laboratory and universities that designed such a detector and charted out a plan for R&D [233] [234]. We requested R&D funds of 5M$ over four years to be followed by 100M$+ construction program for the large detector, and got 0.5M$ for R&D. We argued [227] for such a program to the U.S. NuSAG panel (Neutrino Science Assessment Group). I am glad to see that this line of approach is now the chosen technology for a large underground detector for DUNE (Deep Underground Neutrino Experiment).

In early 2006 I left Fermilab and went to Greece to assume the Directorship of the Institute of Nuclear Physics of the NCSR" Demokritos". I led the efforts of the Institute with continuing the support of the CMS effort at CERN, and the locally based program in Experimental Nuclear Physics (mostly Nuclear Astrophysics utilizing the Institute's 3.5 MeV Electrostatic Tandem Ion Accelerator).

[3]The usefulness of this exercise led the CMS silicon tracker effort to carry out a similar a major (10% - like) test

My own interests were in Neutrino Astronomy. It is remarkable that most of the recent important observations about Nature came from observing the Heavens. Neutrino oscillations and masses, the accelerating universe, dark matter and dark energy, the verification of the inflationary scenario of cosmology, the observation of gravitational waves come (almost exclusively) from Astrophysical/Astroparticle [sic] observations. It is therefore important to look at the sky using all possible modalities. Every time a new modality has become available, new surprises were found. A modality not yet been fully exploited is viewing the sky utilizing neutrinos. The field of observing high energy cosmic origin neutrinos is currently being pursued by experiments in the deep ice (IceCube, South Pole), the deep sea (ANTARES, French Mediterranean). The deep sea efforts, which for the Mediterranean originated with the NESTOR project [237], are the ones most easily expandable to truly large detectors with sensitivity to the expected flux of high energy neutrinos. A proposal for a detector of at a least one cubic kilometer of sea water, the KM3NeT [235], is being pursued by a Greek-French-Italian-German-Dutch-English consortium. This effort is one of the large Research Infrastructure projects that the ESFRI process is promoting for implementation within a European research framework. A Conceptual Design Report (CDR) [236] and a Technical Design Report (TDR) [243] have been completed and I was a member of the editorial/writing group for both reports.

I took a leadership role in this exercise, serving both in the governing body of this consortium and also as one of the editors for the CDR. I certainly looked forward to the building of such a neutrino telescope in deepest part of the Mediterranean (≈ 5000m deep) in the sea near southwestern Peloponnese, comprising of a lattice of roughly 10 000 photodetecting modules instrumenting a volume of approximately six cubic kilometers. The Cherenkov light produced by the fast moving secondaries (muons, electrons, or hadrons) produced by neutrinos interacting with the nucleons of the detector's volume and of nearby matter provides the means for observing these cosmic messengers. The likelihood of the Greek site being chosen seemed very high, given its superior features (depth, water clarity, lack of bioluminescence, proximity to land) and the fact that the Greek State had embraced it by 'committing' 50 million euros over the next seven years for this. (<u>But for the real situation please see the 'Epilogue' two paragraphs below</u>.)

For the more immediate future the NESTOR team is following the ideas in the proposed Neutrino Burst Experiment (NuBE [238]) which will use the existing infrastructure for a 'quick and dirty' search for high energy neutrino events in coincidence with gamma ray bursts, presumably originating in Active Galactic Nuclei. Under somewhat favorable circumstances some 50 such coincidences may be detected each year. R&D for this program is being supported by a recent Greek grant and is our short range objective.

<u>Epilogue (summer 2015)</u>

In mid-2014 the Greek Secretariat for Research and Development decided that neutrino astronomy will not be part of the Greek research roadmap. This was precipitated by the recent financial crisis in Greece and the drastic reduction in public expenditures. The future for this promising program looks truly bleak. The crisis has also led to a steep reduction in resources in the last two years, to the point that my function has been to carry out 'damage control', i.e. just to try to preserve the existing infrastructure!

I stuck out the last couple of years due to stubbornness and the hope for a better turn of events. I also felt an obligation to the scientists and technicians of the group. Seeing no improvements, and having helped towards arranging for a better future for the group members I think it is time to move forward... return to accelerator based physics, I guess ... or do something different!

(<u>Epilogue – Continued</u>)

In late 2015 I applied for and was selected for the position of Program Manager for the Intensity Frontier Programs with the Office of High Energy Physics, Office of Science, U.S. Department of Energy, which I assumed in late January 2016. The duties of this position involve the management of the US program in neutrino physics, flavor physics, and the measurements of the muon g-2 factor, and the search of the possible muon to electron conversion (these last two are probes for new unknown physical processes). Overseeing the research budget of some 60 M$/year, allocating to various research thrusts, arranging for reviews and evaluations are also duties of the program manager.

Note:

I attach only a list of selected publications, a copy of these selected publications is in:

http://www.inp.demokritos.gr/~rapidis/CVlong/Rapidis_sel_pubs/

Furthermore, a list of all my publications is at:

http://www.inp.demokritos.gr/~rapidis/CVlong/Rapidis_all_pubs/a000_Rapidis_all_pubs.pdf

and that copies of all my publications can be found in:

http://www.inp.demokritos.gr/~rapidis/CVlong/Rapidis_all_pubs/

In addition, this document itself is found at:

http://www.inp.demokritos.gr/~rapidis/CVlong/CVf.pdf

Selected Talks

April 24, 1978 at the 1978 Spring Meeting of the APS in Washington, D.C. Contributed paper on *Characteristics of D Meson Production in e^+e^- Annihilation.*

August 7, 1981 at the Stanford Linear Accelerator Center, Stanford, California. Invited talk at the 1981 Summer Institute on Particle Physics on *Recent Results on Total Neutrino and Antineutrino Cross Sections by the CFRR Collaboration*.

November 10, 1982 at the University of Chicago, Chicago, Illinois. Invited High Energy Physics Seminar on *Nucleon Structure Function Measurements from the CFRR Neutrino Experiment*.

November 12, 1982 at the Fermi National Accelerator Laboratory, Batavia, Illinois. Joint Experimental-Theoretical Physics Seminar ('Wine and Cheese') on *Results from E616: Neutrino Cross Sections and Nucleon Structure Functions*.

February 2, 1983 at the *Ettore Majorana* Centre for Scientific Culture, Erice, Italy. Invited talk at the Euro-physics Study Conference on Electroweak Effects at High Energies on *Measurement of $sin^2\theta_w$ in Semileptonic νFe and $\bar{\nu}$Fe Interactions*.

April 10, 1986 at the Fermi National Accelerator Laboratory, Batavia, Illinois. Invited talk at the First Workshop on Antimatter Physics at Low Energy on *The Fermilab Antiproton Source: Prospects for $p\bar{p}$ Experiments*.

April 14, 1986 at Northwestern University, Evanston, Illinois. Physics Department Colloquium on *The Fermilab Antiproton Source and its use in the Study of Charmonium.*

July 5, 1990 at the First Biennial Conference on Low Energy Antiproton Physics (LEAP 90), in Stockholm, Sweden. Invited Talk on *Low and Medium Energy Antiproton Facilities in the USA.*

April 21, 1992 at the 1992 Joint Meeting of the American Physical Society and the American Association of Physics Teachers in Washington, D.C. Invited talk on *Formation of Charmonium states in $p\bar{p}$ Annihilation*

May 9, 1992 at the 1992 Spring Meeting of the Ohio Section of the American Physical Society in Cincinnati, Ohio. Invited talk on *New Results in Charmonium Physics*.

July 18, 1992 at the Stanford Linear Accelerator Center, Stanford, California. Invited talk at the 1992 Summer Institute on Particle Physics on *Precision Charmonium Spectroscopy at Fermilab Antiproton Accumulator*.

October 20, 1993 at Pylos, Greece. Invited talk at the 3rd NESTOR Workshop on *Overview of the Fermilab Long Baseline Neutrino Experimental Program*.

June 12, 1995 at the 4th International Workshop on Vertex Detectors *Vertex 95*, En Gedi, Israel, June 11- 16, 1995, on *The Silicon Vertex Detector for the DØ Upgrade*.

April 13, 1996 presentation as referee to the Fermilab Program Advisory Committee on *Possibilities for Low Energy $p\bar{p}$ Physics at Fermilab*.

August 27, 2000 at the International Conference on High Energy Physics, Osaka, Japan, on *The Silicon Vertex Detector for the DØ Upgrade*.

August 25 to September 7, 2002. Discussion leader at 2002 European School of High-Energy Physics (formerly the CERN-JINR School of Physics), Pylos, Greece.

8 October 2003. Invited talk at the 19th International Workshop on Weak Interactions and Neutrinos, WIN'03, Lake Geneva, Wisconsin, on *B-physics results from the CDF and DØ Collaborations (excluding lifetime measurements).*

1 April 2004. Invited talk at the Conference on Recent Advances in Particle and Astroparticle Physics, Chios, Greece, on *Tevatron Run II, Status and Recent Results*.

10 September 2004. Invited talk at the XIII International Symposium on Very High Energy Cosmic Ray Interactions, (XIII ISVHECR), Pylos, Greece, on *Tevatron Results*.

12 September 2007, Invited talk at the 10th International Conference On Topics In Astroparticle And Underground Physics (TAUP 2007), Sendai, Japan on *KM3NeT: A large underwater neutrino telescope in the Mediterranean Sea*.

22 April 2008, Invited talk at the International Workshop on a Very Large Volume Neutrino Telescope for the Mediterranean Sea (VLVnT08), Toulon, France, *The NESTOR neutrino telescope - Present status and plans*

16 June 2010, Invited talk at the XXIV International Conference on Neutrino Physics and Astrophysics (Neutrino 2010), Athens, Greece, *The KM3NeT neutrino telescope project*

2 August 2014, Invited talk at the 3rd International Conference on New Frontiers in Physics (ICNFP 2014), Kolymbari, Greece *Neutrino Astronomy in the Deep Mediterranean Sea*

Participation in Policy Conferences

CERN Council Open Symposium on European Strategy for Particle Physics, Kraków, Poland, 10-12 September 2012

European Strategy Group for Particle Physics, Strategy Drafting Session in Erice, Italy, 21-25 January 2015

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 <u>all</u> 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 $\sin^2\theta_{\rm w}$.

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/ψ and ψ'.

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 $p\overline{p} \to \overline{\Lambda}\Lambda \to \overline{p}\pi^+ p\pi^-$ 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[1]

[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`

[1] 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 $\sin^2\theta_{\rm w}$ in Semileptonic ν Fe and $\overline{\nu}$ 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** $\sin^2\theta_{\rm w}$ **and** ρ **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** $p\overline{p}$ **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] $p\overline{p}$ **Accumulator Physics.**
By P.A. Rapidis (Fermilab), and G.A. Smith (Penn State U.), editors for the $\overline{p}$ 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 $\overline{p}p$ 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 χ_{c1} and χ_{c2} Charmonium States Formed in $\overline{p}p$ 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^2.**
T.A. Armstrong *et al., Phys. Rev. Lett.* **70**, 1212 (1993).
`Cross reference is 82, file name is a082.pdf`

[25] **Observation of the $^1P_1$ 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 $\overline{p}p$ 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 $p\overline{p}$ 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 $p\overline{p} \to \overline{\Lambda}\Lambda \to \overline{p}\pi^+ p\pi^-$**
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 $p\overline{p}$ 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 ,
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`