

## **CURRICULUM VITAE**

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## 1. BIOGRAPHICAL NOTE

### PERSONAL DATA

**Name, Surname:** Haralabos, Tsertos

**Date of birth:** January 10, 1953

**Place of birth:** Petalidi – Messinia, Greece

**Nationality:** Greek

**Marital Status:** Married, one Son

### ACADEMIC DEGREES

**1985:** PhD in Physics (“Doktor Rer. Nat.”) at the Physics Department of the Technical University of Munich, Germany. Subject of the thesis : *“Positron production in super heavy collision systems – a sensitive experimental tool for new atomic and nuclear physical phenomena”*

Supervisor: Prof. Paul Kienle.

These pioneering experiments were performed at the Heavy-ion Research Center of GSI Darmstadt by the ORANGE collaboration.

**1980:** M.Sc in Physics at the Physics Department of the Technical University of Munich, Germany. Subject of the thesis : *“Construction and tests of a background-reducing detection system, consisting of a plastic scintillator and a proportional gas counter, for the Orange  $\beta$ -Spectrometer”*.

Supervisor: Prof. Paul Kienle.

**1977:** Bachelor (“ptychion”) in Physics at the Physics Department of the Aristotle University of Thessaloniki, Greece.

**PROFESSIONAL CAREER**

**06/2005 – :** Professor of Physics at the Department of Physics of the University of Cyprus.

**07/1997– 05/2005:** Associate Professor of Physics at the Department of Physics of the University of Cyprus.

**04/1993– 06/1997:** Assistant Professor of Physics at the Department of Natural Sciences<sup>1</sup> of the University of Cyprus

**07/1988 – 03/1993:** Senior Research Associate at the Gesellschaft für Schwerionenforschung (GSI) Darmstadt, Germany.

**06/1986 – 06/1988:** Post Doctoral Fellow at the Gesellschaft für Schwerionenforschung (GSI) Darmstadt, Germany.

**04/1985 – 05/1986:** Active service in the Greek Armed Forces.

**05/1980– 04/1985:** Scientific Associate at the Department of Physics of Technical University of Munich, Germany.

**01/1987 – 03/1990:** Distinguished Visiting Scientist at the Institut Laue–Langevin (ILL) in Grenoble, France.

**OTHER SCIENTIFIC AND PROFESSIONAL ACTIVITIES**

**1993–present:** Principal promoter and coordinator of the scientific collaboration with the Heavy-Ion Research Center of GSI

**1996–present:** Founder and Head of the Nuclear Physics Laboratory of the University of Cyprus

**1991:** Founding member of the International HADES Collaboration at GSI

**1992–present:** Member of the HADES Collaboration Board Committee

**2003–present:** Member of the CBM Collaboration Board Committee

**1987 – 1993:** Founding member and spokesperson of the GSI-ILL collaboration on low-energy Bhabha scattering experiments

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<sup>1</sup> The initial Department of Natural Sciences was split by March 2000 into the physics and chemistry departments

1980–1993: Member of the Orange collaboration at GSI

### MAIN RESEARCH ACHIEVEMENTS IN SHORT (since joining Univ. of CYPRUS)

- **International Collaboration:**

Having put a small department of an unknown and remote University on the international scientific map by joining and actively participating in the international HADES and CBM experiments at the Heavy-ion Research Center of GSI Darmstadt, Germany. Such collaborations contribute considerably into the international scientific recognition of the University and strengthened the research profile and the visibility of our physics department. On the other hand, they offer the opportunity to local scientists and young students to become familiar with modern experimental techniques and new technologies.

- **Nuclear Physics Research Laboratory:**

Having founded and established in our department of a modern nuclear physics research laboratory, with special emphasis on particle detectors, dosimetry, applications to environmental and medical physics as well as to high-performance computing systems. The latter are highly required in order to efficiently carrying out simulations and data analysis of modern high-energy and nuclear physics experiments.

- **High-Performance Computing Laboratory:**

Having founded and established for the nuclear physics laboratory a dedicated high-performance Linux cluster for simulations and data analysis of modern multiparameter experiments. The HADES collaboration, acknowledging the proven high performance computing capability of this laboratory, has addressed to our site the responsibility for all the time-consuming simulations of the HADES experiment.

- **The Project “Radioisotopes” in Cyprus:**

Having carried out, by exploiting the infrastructure and expertise of the nuclear physics laboratory, the project “*Radioisotopes*”, which is of uppermost local importance. In this project, the natural environmental gamma radioactivity and the airborne indoor radon concentration in Cyprus were systematically measured. A

natural  $\gamma$ -radioactivity map and a radon map of Cyprus could become available for the first time. (Normally, this is the job of dedicated and independent radiation and environmental institutes in Europe and USA that continuously and exclusively deal with these sensible issues.)

- **A Research Group:**

Having meanwhile established, in a small department in an environment without previous international scientific tradition, a respective research team that currently consists of an experienced Post-Doctoral research associate, two PhD candidates and two master candidates graduate students. This group is joining the efforts and responsibilities of our laboratory to the HADES experiment and, most noticeably, can interact and compete with the other group members of this international collaboration.

## GENERAL AREAS OF SPECIALIZATION

- **Modern experimental Nuclear Physics with heavy ions at relativistic energies:**
  - *High-resolution dilepton spectroscopy;*
  - *Equation of State (EoS) of hot and dense hadronic matter;*
  - *Collision systems of high particle multiplicities.*
- **Experimental Quantum Electrodynamics (QED) of very strong electromagnetic fields produced in heavy-ion collisions at Coulomb-barrier energies:**
  - *Decay of the neutral vacuum of QED;*
  - *Spontaneous monoenergetic positron creation;*
  - *High-resolution spectroscopy of positrons, electrons and gamma rays.*
- **New particles and exotic phenomena at low energies (MeV range):**
  - *Elastic  $e^+e^-$  (Bhabha) scattering;*
  - *Neutral particle resonances.*
- **Environmental and medical applications of nuclear radiation:**
  - *Natural environmental radioactivity;*
  - *Dosimetry;*
  - *Radiation protection.*

- **Hardware and software expertise:**
  - Particle detectors;
  - Monte Carlo simulation techniques;
  - Main software packages (ROOT, UrQMD, GEANT);
  - Setup and system management of high performance computing systems.

**Languages:** Greek (native), German, English.

## 2. SCIENTIFIC PROJECTS AND RESEARCH ACTIVITIES

### A. INTERNATIONAL RESEARCH COLLABORATIONS

I have initiated and established at the University of Cyprus a cooperation between our Department and the Heavy-Ion Research Center of GSI in Darmstadt (Germany), for scientific collaboration, technical support and funding of traveling and accommodation as well as training of local research associates and graduate students at GSI.

My following scientific projects at GSI have been adopted and officially supported by the University of Cyprus.

- **“Experiments on Electron-Positron Pair Creation in Super-heavy Collision Systems”**

*(ORANGE Collaboration at GSI: 1980–1995)*

The ORANGE Collaboration at the UNILAC Heavy-Ion accelerator of GSI has carried out during the years 1980-1995 the pioneering experiments on electron-positron creation in super-heavy collision systems. The collaboration was headed by Prof. Paul Kienle from the Technical University of Munich. These experiment were devoted to the behavior of QED under the influence of very strong electromagnetic fields, and have attracted much international attention worldwide.

- **“The International Experiment HADES at the Heavy-Ion Research Center of GSI”**

*(HADES Collaboration at GSI: 1992–today)*

I have been one of the founding members of this big project at the Heavy-Ion Research Center of GSI. A technical proposal has been put forward for the study of dilepton production in relativistic heavy-ion collisions at the SIS accelerator facility of GSI.

The proposal was presented by a new, international collaboration (HADES Collaboration) consisting meanwhile of 120 scientists from 22 European Universities and Institutes, among them the Department of Physics of the University of Cyprus.

The collaboration has proposed to build a second-generation dilepton spectrometer of high acceptance and high momentum resolution, called **HADES**<sup>2</sup>. The main components of the HADES setup include a Ring-Imaging Cherenkov detector (RICH) for electron identification, a superconducting magnet with toroidal geometry, Multiwire Drift Chambers (MDC's) for tracking, and a Multiplicity/Electron Trigger Array (META) with Time-of-Flight (ToF) measurement and shower detection.

The final technical proposal was approved in July 1994.

After a construction phase of six to seven years, the commissioning could start by begin of the year 2001, and first real experiments could be performed in the following years. This project represents a major scientific program of GSI, and is unique worldwide with respect to both its innovative technical design and physics questions addressed.

The HADES experiment is now fully operational and has entered into the phase of mass production of data taking, which will be continued at high priority for the next years. Local group members, and particularly students and young scientists from our remote University, will have then the opportunity to participate in a modern field of nuclear physics for a period of more than 5 years. This is absolutely essential to make them familiar with modern experimental techniques and new technologies.

- **“The International CBM Experiment at the Heavy-Ion Research Center of GSI”**  
*(CBM Collaboration at GSI: 2004–)*

Recently, a new collaboration has been formed at GSI to design and build the Compressed Baryonic Matter (CBM) Experiment at the future accelerator facility of GSI. The Department of Physics of the University of Cyprus is a founding member of this collaboration. The main task of the CBM experiment is to identify both leptons

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<sup>2</sup> More details can be obtained from the official HADES web page: <http://www-hades.gsi.de/>



and hadrons and to detect rare probes in a heavy-ion environment. The apparatus should be able to investigate the heaviest collision systems available at a broad range of incident beam energies. The CBM experiment is expected to be fully installed and commissioning around 2010 to 2012.

## **B. LOCAL RESEARCH ACTIVITIES**

### **Nuclear physics laboratory**

Initiator for the development in our department of a nuclear physics research laboratory, with special emphasis on particle detectors, dosimetry, applications to environmental and medical physics as well as to high-performance computing systems.

The basic infrastructure of the laboratory includes various NIM and CAMAC electronic modules, a complete detection system for  $\gamma$ -radiation (equipped with Ge(i) and Na(Tl)I detectors), a complete detection system for high-resolution X-Ray Fluorescence measurements (equipped with a Si(Li) detector), a high-resolution detector system for  $\alpha$ -spectroscopy, a portable Ge(i) detector system for in-situ  $\gamma$ -activity measurements as well as high-sensitivity portable radon monitors.

Exploiting the infrastructure of the nuclear physics laboratory, we have carried out the project “*Radioisotopes*”, which aimed at systematically measuring for the first time the natural environmental  $\gamma$ -radioactivity and the airborne indoor radon concentration in Cyprus. A first natural  $\gamma$ -radioactivity map and a radon map of Cyprus have become available (*see for details in the laboratory web page:*

[http://www-np.ucy.ac.cy/radio\\_isotopes/wwwen/radio\\_start.html](http://www-np.ucy.ac.cy/radio_isotopes/wwwen/radio_start.html)).

This project represents therefore a major contribution to the local society and enabled the harmonization of Cyprus to European Union common recommendations and rules concerning this sensible issue.

### **High-performance computing laboratory**

Modern high-energy and heavy-ion experiments produce incredible amounts of data (several terabytes per week). In order to be able to process and analyze such large amounts of data, high performance computing systems are needed. This is also true for the simulations and the analysis of the experimental data produced by the HADES experiment at GSI.

Recently, our laboratory has made a significant step towards high-performance computing by building a new, modular Linux cluster for simulations and analysis of multiparameter experimental data. The cluster comprises currently of 1 master node and 20 computing (slave) nodes each consisting of two 2.4 GHz Intel Xeon processors, 4 Gb of RAM of the master and 1 Gb of each node. Four easy RAID disk array systems are also attached to the master node (see Figure 1 in Appendix D).

The current configuration of the system provides a peak performance of ~100 Gflops and a total disk capacity of ~9 Tbyte. This high-performance computing environment is heavily exploited to carry out in our site the extremely time-consuming simulations and analysis of experimental data obtained from the HADES collaboration (*see for details in the laboratory web page: [http://www-np.ucy.ac.cy/hpc/high\\_performance\\_linux\\_custer.htm](http://www-np.ucy.ac.cy/hpc/high_performance_linux_custer.htm)*)

Including the computer facilities, a total amount of about \$ 600,000 has been invested up to now to the nuclear physics research laboratory.

I have also initiated a cooperation agreement with the Oncology Center of the Bank of Cyprus at Nicosia and with the Medical Physics Department of the General Hospital of Nicosia.

#### **FUNDING OF RESEARCH GRANTS (since joining Univ. of CYPRUS)**

- **“Experiments at the Heavy-Ion Research Center of GSI”**

A research proposal funded by the University of Cyprus (1995-1998).

About \$ 100,000 were approved for a Post-Doctoral position, computer equipment and traveling costs.

- **“Member of an European TMR Network”**

(Program contracts *ERBCHRX--CT94--0634 and ERBCIPD--CT94—0091*), located at GSI. About 350,000 Euros have been approved from which I got (as a subcontractor) about 20.000 Euros, mainly for traveling costs. In addition, within the HADES collaboration, we got about 20,000 Euros, for electronic and detector devices as well as of traveling costs.

- **“The International Experiment HADES at the Heavy-Ion Research Center of GSI ”**

A research program funded by the University of Cyprus (2000-2005).

From this program, which has been evaluated by two independent external reviewers, a total of about \$200,000 were approved for our participation in the HADES experiment, for a Post-Doctoral position, computer equipment and traveling costs.

- **“HADES and secondary beams”** EU-Funding program of guest researchers of GSI. A total of 20 person-days per year and additional travel and accommodation expenses have been granted (2000 - 2003).
- **“Detection and determination of the activity of environmental radioisotopes in various areas of Cyprus” - The project “Radioisotopes”**. A total amount of about \$90,000 was granted jointly by the Cyprus Research Promotion Foundation (80%) and the University of Cyprus (20%) (2001-2004). As mentioned before, this project represents a major local activity of my laboratory with the objective to systematically measure for the first time the terrestrial gamma radiation in the island, and determine its contribution to the annual effective dose equivalent to the population.
- **“Installation of a High-Performance Linux Cluster for analysis and simulations of complex data in physics experiments ”** A total amount of about 150,000 Euros was granted by the University of Cyprus (2002- 2004), in order to install a modular high-performance computing environment in our laboratory for simulations and data analysis of multiparameter experimental data.
- **“HADES and secondary beams”** EU-Funding program of guest researchers of GSI. A total of 30 person-days per year and additional travel and accommodation expenses have been granted (2004 - 2006).
- **“I3HP FP6 Program”** Transnational Access to Research Infrastructures (TARI) (*Contract N. RII3-CT-2004-506078*). EU-Funding program of guest researchers of GSI. A total of 30 person-days and additional travel and accommodation expenses have been granted for this year.
- **“Studying nuclear matter under extreme conditions of high baryonic density and high temperature - The HADES and the CBM experiments at GSI Darmstadt, Germany”** A new follow-up research proposal has been recently put forward into the Research Committee of the University of Cyprus. The program has been sent to external

reviewers for evaluation and foresees an annual budget of about \$50,000 for the next five years.

- **“Study of hot and dense nuclear matter via high-resolution dilepton spectroscopy”**

A new research proposal submitted to the Cyprus Research Promotion Foundation to mainly cover a full PhD fellowship (M. Aspromalli) and traveling costs. The total budget of this project amounts to about \$100,000 for the time period (2005-207).

- **“Simulations and data analysis of the HADES experiment by using a high performance Linux cluster”**

A new research proposal submitted to the Cyprus Research Promotion Foundation to mainly cover a full PhD fellowship (Z. Zenonos) and traveling costs. The total budget of this project amounts to about \$100,000 for the time period (2005-207).

### 3. TEACHING AND SUPERVISION EXPERIENCE

#### SEMESTER COURSES AT THE UNIVERSITY OF CYPRUS

I have prepared and held the following lectures:

1. PHY511 - University Physics Experiments I (mechanics)  
(students of physics/chemistry of first year, 1993 – 1997, 2003).
2. PHY231-Electromagnetism I  
(students of physics of second year, 1994 - ).
3. PHY321-Nuclear Physics  
(students of physics of third/fourth year, 1996 - ).
4. PHY522-Advanced Experiments II, (fundamental atomic and nuclear physics experiments) (students of physics of third/fourth year, 1996 - ).
5. PHY811-Graduate Experimental Physics (part I, Techniques and Experiments in Nuclear Physics) (Graduate students, 1999 - ).
6. PHY658–Physics of hot and dense nuclear matter (special graduate course)
7. PHY659– Advanced Subjects in Nuclear Physics (special graduate course)
8. PHY659 - Measurement and detection techniques of nuclear radiation (special graduate course)

**LECTURE NOTES FOR STUDENTS AT THE UNIVERSITY OF CYPRUS**

1. H. Tsertos, *"Introduction into the Experimental Measurements and Error Analysis"* (University of Cyprus, 1993, in Greek).
2. P. Razis and H. Tsertos, *"Laboratory Physics, part I and part II (mechanics and electromagnetism)"* (University of Cyprus, 1993, in Greek).
3. H. Tsertos, *"Advanced Experiments in Atomic and Nuclear Physics"* (University of Cyprus, 1997, in Greek).
4. H. Tsertos, *"Introductory Nuclear Physics"* (in Greek). All the one-semester course matter is provided in pdf format, including figures, tables, and an English/Greek terminology glossary (University of Cyprus, 2002, in Greek).
5. H. Tsertos, *"Guidelines for writing and presenting Diploma, Master and PhD theses"* (University of Cyprus, 1997, in Greek).

**SUPERVISION OF DIPLOMA THESES (FINAL YEAR PROJECTS) AT THE UNIVERSITY OF CYPRUS**

1. *"Simulation studies for the HADES first-level trigger"*  
Michalis Axiotis  
Diploma Thesis, University of Cyprus, June 1997.
2. *"Calibration and test of a portable intrinsic Ge detector for high-resolution  $\gamma$ -ray spectroscopy"*  
Eleni Charalambous  
Diploma Thesis, University of Cyprus, June 1998.
3. *"Methods and devices used in nuclear medicine"*  
Panagiota Pilina  
Diploma Thesis, University of Cyprus, June 1998.
4. *"Calibration measurements with a high-resolution  $\alpha$ -detection system"*  
Cleopatra Neokleous  
Diploma Thesis, University of Cyprus, June 2000.
5. *"The present status of experimental dilepton spectroscopy"*  
Despo Floridou  
Diploma Thesis, University of Cyprus, June 2000.
6. *"Study of hot and dense nuclear matter via high-resolution dilepton spectroscopy with the HADES spectrometer at GSI"*  
Demetra Tsiakouri  
Diploma Thesis, University of Cyprus, June 2001.

7. *“Determination of low-activity  $\alpha$ -emitting uranium radioisotopes in natural water samples by means of high- resolution  $\alpha$ -spectrometry ”*  
Katerina Adamou  
Diploma Thesis, University of Cyprus, June 2002.
8. *“Indoor radon ( $^{222}\text{Rn}$ ) concentration measurements in Cyprus using high-sensitivity portable detectors”*  
Tasos Anastasiou  
Diploma Thesis, University of Cyprus, June 2002.
9. *“Activity concentration measurements of naturally occurring radioactive samples by means of high- resolution  $\gamma$ -ray spectrometry”*  
Michalis Tzortzis  
Diploma Thesis, University of Cyprus, June 2002.
10. *“Radiometric determination of uranium in natural sea and ground water samples by means of high- resolution  $\alpha$ -spectrometry ”*  
Chrystalla Poullika  
Diploma Thesis, University of Cyprus, expected June 2005.
11. *“In-situ  $\gamma$ -ray spectrometry using a high-resolution portable detection system”*  
Stefania Stefanou  
Diploma Thesis, University of Cyprus, expected June 2005.

### **SUPERVISION OF MASTER THESES<sup>3</sup> (TWO YEAR PROJECTS) AT THE UNIVERSITY OF CYPRUS**

1. *“Particle identification with the HADES spectrometer”*  
Despo Floridou  
Master Thesis, University of Cyprus, June 2004.
2. *“UrQMD and Geant simulations in the collision systems C+C, Si+Si, and Ca+Ca at beam energies of 1-2xA GeV ”*  
Christos Hadjivasiliou  
Master Thesis, University of Cyprus, expected June 2006.
3. *“Experimental results on dilepton production in C+C collisions at beam energies of 1-2xA GeV with the HADES spectrometer ”*  
Marina Leondiadou  
Master Thesis, University of Cyprus, expected June 2006.

### **ONGOING PhD THESES (FOUR-FIVE YEAR PROJECTS) AT THE**

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<sup>3</sup> Please note that the graduate programme of our department has officially started only a few years ago. In fact, only a small number of students have received graduate (master) degrees so far.

**UNIVERSITY OF CYPRUS**

1. *“Experimental study on dilepton production in heavy-ion collisions at beam energies of 1-2×A GeV with the HADES spectrometer”*  
Myrianthi Aspromalli  
PhD Thesis, University of Cyprus, started by July 2004.
2. *“High-resolution dilepton spectroscopy with the HADES spectrometer at GSI”*  
Zenon Zenonos  
PhD Thesis, University of Cyprus, started by June 2004.

**SUPERVISION OF POSTDOCTORAL RESEARCH ASSOCIATES AT THE UNIVERSITY OF CYPRUS**

1. 1996-1998: Dr. Reiner Schicker (now a senior scientist at the University of Heidelberg, Germany).
2. 2001-2002: Dr. Ruben Ispiryan (now works in a computer company in Germany)
3. 2002-present: Dr. J. Mousa. He joins the efforts of my laboratory to the HADES project at GSI.

**TEACHING ASSISTANT AT THE TECHNICAL UNIVERSITY OF MUNICH (TUM)**

**1980/81:** Praktikum in general physics.

**1981/82:** General physics.

**1982/83:** Praktikum in general physics.

**1983/84:** Praktikum in general physics.

**CO-SUPERVISION OF GRADUATE STUDENTS AT TUM/GSI, GERMANY**

1. *“Untersuchungen zur Bestimmung des Emissionssystems einer monoenergetischen Positronenquelle bei Stößen sehr schwerer Ionen”*  
Martin Franosch  
Master Thesis, Technical University of Munich, January 1985.
2. *“Positronenspektroskopie an unterkritischen Stosssystemen”*  
Stefan Huchler  
PhD Thesis, Technical University of Munich, May 1988.
3. *“Optimierung und Ausbau der GSI-Doppel-Orangen-Apparatur zur Untersuchung von*

*in Schwerionenstößen emittierten  $e^+e^-$  Paaren"*

Arnold Schrötter

Master Thesis, Technical University of Munich, April 1989.

4. *"Konzeptionelle Untersuchungen eines Dielektronenspektrometers für Schwerionenstöße im GeV/u-Bereich"*

Walter Karig

Master Thesis, University of Frankfurt/Main, 1993.

5. *"Untersuchung der  $e^+e^-$  -Paaremission aus schweren Systemen mit der Doppel-ORANGE-Apparatur"*

Uwe Leinberger

PhD Thesis, Technical University of Munich, March 1996.

## LABORATORIES ORGANIZATION

I have been deeply involved in the organization and development of the department infrastructure. More specifically, I worked in collaboration with the initial two other experimental colleagues (C. Christofides and P. Razis) on the specifications, tendering and evaluation of instruments of general nature for building the research and teaching infrastructure of the Physics Laboratories:

1. Laboratory of General Physics I (Mechanics)
2. Laboratory of General Physics II (Electromagnetism and Thermodynamics)
3. Laboratory of General Physics III (Waves and Optics)
4. Advanced Physics Laboratory I (Applied and Solid state Physics)
5. Advanced Physics Laboratory II (Atomic and Nuclear Physics)
6. Graduate Physics Laboratory (Applied, Solid State, Atomic, Nuclear, and Particle Physics)
7. Founder of the Nuclear Physics Research Laboratory of the Department of Physics
8. Founder of the High Performance Computing Laboratory for Data Analysis of Physics Experiments (a joint project of the Laboratories of Nuclear and High Energy Physics)



## 4. ADMINISTRATIVE WORK

### AT THE UNIVERSITY OF CYPRUS

#### Departmental Level

- 03/2002 –10/2002: Chairman of the Department of Physics
- 02/2000 – present: Member of the Board of the Department of Physics
- 1995-01/2000: Member of the Board of the Dept. of Natural Sciences (Physics-Chemistry)
- 1993-present: Initiator and representative for the scientific collaboration with the Heavy-Ion Research Center of GSI Darmstadt, Germany.
- 01/1996-present: Founder and Director of the Nuclear Physics Research Laboratory.
- 2002-present: Founder and Director of the High Performance Computing Laboratory for Data Analysis in Physics Experiments.
- 09/1993-1997: Responsible for the Physics Laboratory I (mechanics).
- 03/1996-present: Responsible for the Advanced Physics Laboratory II (atomic and nuclear physics experiments).
- 1993-present: Member of many Tender Evaluation Committees for computer and other experimental equipments.
- 09/1993-06/1994: Organizing coordinator of the Seminars and Colloquia of the Dept. of Natural Sciences.
- 1993-1999: System administrator of the departmental computer server and initiator/administrator of the first WWW server of the department.
- 1997-2000: Initial coordinator of the committee on Final Year Projects.
- 1993-present: Repeatedly participating in various *ad hoc* committees to:
  - Faculty appointments in Physics and Chemistry
  - Contract renewals for nonpermanent staff members
  - Recruitment and appointment of Research Associates
  - Graduate admissions
  - Evaluation of undergraduate theses and graduate master theses

**Faculty Level**

- 1996-1998: Member of the Board of the Faculty of Pure and Applied Sciences
- 02/2001-present: Ex Officio member of the Board of the Faculty of Pure and Applied Sciences
- 02/2001-05/2002: Elected Vice Dean of the Faculty of Pure and Applied Sciences
- 05/2002-05/2005: Elected Vice Dean of the Faculty of Pure and Applied Sciences
- 03/2001-12/2003: Chairman of the *ad hoc* committee for the building's organization and planning for the movement of the faculty to the new University Main Campus.

**University Level**

- 01/2001-12/2002: Elected member of the Senate of the University of Cyprus
- 01/2003-12/2004: Elected member of the Senate of the University of Cyprus
- 1999-2001: Member of the University security committee
- 2002-present: Member of the Senate *ad hoc* committee for the revision of the Governmental law of the University of Cyprus

**AT INTERNATIONAL COLLABORATIONS**

- 1991: Founding member of the HADES Collaboration at GSI
- 1992-present: Member of the HADES Collaboration Board Committee
- 1992-2002: Coordinator of the HADES *Publication & Documentation* Board Committee
- 2003- present: Coordinator of the UrQMD + GEANT simulations of the HADES Experiment.
- 2003- present: Member of the CBM Collaboration Board Committee

## **5. SUMMARY OF CURRENT RESEARCH ACTIVITIES**

### **A. HADES COLLABORATION:**

#### **Responsibilities within the HADES Collaboration**

- Coordinator of the HADES Research Program at the University of Cyprus.
- Member in the HADES Collaboration Board Committee.
- Coordinator of the time-consuming UrQMD/GEANT simulations.

In the past years the group has contributed to the HADES experiment by the project coordinator, an experienced senior research scientist (Dr. Rainer Schicker, 1995-1998, Dr. Ruben Ispiryan 2001-2002, Dr. J. Mousa, 2002-present) and a few diploma and master students. The group has mainly carried out the following tasks:

- Contribution to the development and preparation of the final HADES proposal.
- Detailed Monte-Carlo simulations of the whole HADES setup. From these results we prepared in our department a comprehensive publication (see Ref.18 in publication list), which is the first technical official HADES publication at all.
- Detailed simulations on the HADES first level trigger, which should start the procedure of accepting or rejecting an event. A comprehensive publication is obtained (see Ref.14 in publication list). The HADES first level trigger is built based on this concept.
- Contribution to various HADES collaboration board meetings and related dilepton work shops
- Installation of a high performance Linux cluster in our Nuclear Physics Laboratory, and implementation of all the HADES related simulation and analysis software packages (see below).
- Significant contribution to the development of the HADES Particle Identification (PID) analysis algorithm (see Refs 6 and 8 in publication list, and Ref. 51 in the list of conference proceedings)
- Preparation of three Diploma theses and one Master thesis on the HADES first level trigger, PID analysis and other issues related to the HADES project.

## ONGOING ACTIVITIES

### Computing Power

As mentioend before, the Nuclear Physics Laboratory of the University of Cyprus has recently made a significant step towards high-performance computing by building a new modular Linux cluster that is based on the new generation Intel Xeon dual processors (see Appendix D). The current configuration of the system provides a peak performance of 100 Gflops and a total disk capacity of 9 Tbyte. This dedicated high-performance Linux cluster enables the analysis and simulations of complex experimental data obtained by HADES and other experiments very efficiently. It provides also the possibility to compile and run jobs that are based on parallel algorithms. A fast Internet connection is available, which allows data transfer from and to the Nuclear Physics Laboratory of the University of Cyprus for local analysis and storage. The operating system running is Linux (Red Hat Linux 8.0). The Red Hat Linux 8.0 operating system provides two versions of the GNU C/C++ compilers (gcc 3.2 and gcc 2.96) to pre-process, assemble, and link C/C++ language source files. The complete HADES analysis and simulation software packages have been installed and tested on this cluster. Most of them run under the compiler gcc 2.96, and part under the compiler gcc 3.2. More specifically the following packages have been installed under the compiler gcc 2.96:

1. *Root versions: 302-07, 303-09, **403** (in bold is the currently working version)*
2. *CERN library versions: 2000, **2002***
3. *Pluto versions: v3.58, v3.60, **v405***
4. *Hydra versions: v6\_06, v6\_08, nov02, nov02-lvl3, v6\_13, v6\_14, **v7\_02c***
5. *UrQMD versions: v1.2, v1.3, **v1.3p1***
6. *HGeant versions: v3\_13, v3\_14, **v7\_01***
7. *Oracle interface, version 8.1.7, **9.0.1***

For the future CBM experiment, GEANT4-based detector simulation package will be used and, for this reason, we are planing to install this package in our Linux Cluster.

### Root

Root is an object oriented framework based software with main emphasis on physics data analysis. Root written in C++, contains an efficient hierarchical OO database, advanced statistical analysis (multi dimensional histogramming, fitting, minimization, cluster finding algorithms) and visualization tools. The user interacts with ROOT via a graphical user interface, the command line or batch scripts. The command and scripting language is C++ and

large scripts can be compiled and dynamically linked in. ROOT provides a basic framework that offers a common set of features and tools for the domains of data analysis, data acquisition, event reconstruction and generation, detector simulation and related fields.

### **Pluto**

The Pluto program is frequently used for event generation in Heavy-ion Physics, which was developed at GSI for the simulation of the HADES experiments. It has been designed within the ROOT environment, and makes use of ROOT and CLHEP-library resources. The building functionality of ROOT as an analysis environment, including tree structure, provides powerful tools that are fully exploited, enabling complex operations such as the calculation of spectral functions from first principles for hadronic resonances with multiple decay modes. Thermal distributions are implemented, enabling multi-hadron decays of hot fireballs. An important effect that must be taken into account for realistic simulations is the deviation of resonance shapes from fixed-width Breit-Wigner distributions, which is typically modeled as a mass-dependence in the resonance width. This is particularly important for resonances with large widths, such as the  $\rho$ ,  $\Delta$ ,  $N^*$ , and  $\Delta^*$  resonance excitations for which the effect is largest.

### **Hydra**

For the HADES analysis the Hydra package has been developed. It is a C++ analysis package in the ROOT environment. Hydra contains classes for the full event reconstruction and analysis. The reconstruction is divided into several steps:

1. Reading event information from database.
2. Retrieve all the parameters from a database describing the detector setup (geometry parameters, calibration parameters).
3. Detecting particles hits in the sub-detectors using pattern recognition techniques.
4. Identify particles.
5. Fitting reconstructed tracks to obtain the particles' momenta.

### **HGeant**

HGeant describes the HADES simulation package. The simulation is based on the CERN software GEANT 3.2, which is used

1. To define and represent the detector geometry, i.e. volumes and media
2. To track particles through an experimental setup for the simulation of detector response

3. To generate hit ROOT based on a realistic modeling of the physical processes occurring along the tracks. Following this, the hit ROOT are digitized and analyzed in the framework of the HADES ROOT environment.

The HGeant system allows the user to:

1. Describe an experimental setup by a structure of geometrical volumes.
2. Accept events simulated by UrQMD or Pluto;
3. Transport particles through the various regions of the setup, taking into account geometrical volume boundaries and physical effects according to the nature of the particles themselves, their interactions with matter and the magnetic field
4. Record particle trajectories and the response of the sensitive detectors
5. Visualise the detectors and the particle trajectories

### **Oracle interface**

Oracle is a commercial, very powerful relational database using SQL as query language. It is accessible from all Unix and Windows platforms at GSI. The access to the data stored in the Oracle database for HADES at GSI is available via WWW worldwide. It is possible to access the actual data online, with no need of making temporary copies or export files. The data is accessed directly from the Oracle database. All the parameters (geometry parameters, calibration parameters) of the HADES experiment are stored in the HADES Oracle database.

### **The UrQMD Model**

The Ultra-Relativistic Quantum Molecular Dynamics (UrQMD) model is microscopic model developed in the University of Frankfurt/Germany for simulating heavy ion collisions in the energy range from SIS to RHIC. It represents a Monte Carlo solution of a large set of coupled equations for the time evolution of the various phase space densities of particle species. Main goals are to gain understanding about the following physical phenomena within a single transport model:

- Creation of dense hadronic matter at high temperatures
- Properties of nuclear matter, Delta & Resonance matter
- Creation of mesonic matter and of anti-matter
- Creation and transport of rare particles in hadronic matter.
- Creation, modification and destruction of strangeness in matter
- Emission of electromagnetic probes

### **Full simulations of $2 \times A$ GeV $^{12}\text{C} + ^{12}\text{C}$ collisions**

The goal of this task is to produce 200 million simulation events of the  $2 \times A$  GeV  $^{12}\text{C}+^{12}\text{C}$  in order to compare the real data which were taken in 2002 with the HADES spectrometer.

In order to analyze the data, we have performed simulations using the GEANT 3.21 code . As event generators we have used the UrQMD transport code of the Frankfurt group. The UrQMD code has been installed in our cluster machines, as mentioned before. Two hundred million UrQMD events have been produced in our computer farm for  $^{12}\text{C}+^{12}\text{C}$  collisions at a beam energy of  $2 \times A$  GeV, which can be use as an input for HGEANT simulation. These event files have been stored on Easy Raid disks. These event numbers will be then processed through HGeant and Hydra. Finally, the simulation events will be reconstructed in several steps:

1. Read event information from some database with different reconstruction levels,
2. Make pattern recognition in some or all of the HADES detectors and subdetectors;
3. Identify particles,
4. Fitting reconstructed tracks to obtained the particles momenta and provide information about reconstructed events.

Such calculations are extremely time-consuming and would require about 645 CPU days on a single Pentium 4 processor (see Table 1). In our efficient cluster farm, this time is significantly reduced to about 16 CPU days.

**Table1:** *The computing time (CPU) that is needed to generate 200 million simulation events of the  $2 \times A$  GeV  $^{12}\text{C}+^{12}\text{C}$  collision system by using our cluster farm as compared to one single Pentium 4 processor.*

<b>Program</b>	<b>One Single Processor Pentium 4 (CPU days)</b>	<b>Our Cluster farm (CPU days)</b>
<b>UrQMD</b>	187.5	4.7
<b>Geant</b>	354	8.9
<b>Hydra Analysis</b>	104	2.6
<b>Total</b>	645.5	16.2

We have just completed this task and are on the way to produce another 200 million fully simulated events, in order to improve the statistic by the comparison with the real experiment.

**B. THE LOCAL “RADIOISOTOPES“ PROJECT:**

We have just finished and submitted to the Cyprus Research Promotion Foundation the final report of the local research program “Radioisotopes”. All the results obtained have meanwhile been published in scientific journals (see publication list). Three Diploma theses were completed on this subject.



## 6. LIST OF PUBLICATIONS

### A. PUBLICATIONS IN SCIENTIFIC JOURNALS

**1. Dilepton analysis in the HADES spectrometer for C+C at 2 A GeV**

J. Bielcik *et al.*, (The HADES Collaboration)

*Published in J. Phys. G: Nucl. Part. Phys.* 31 (2005) S231–S237

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**2. Probing of in-medium hadron structure with HADES**

P. Salabura *et al.*, (The HADES Collaboration)

*Published in Nuclear Physics A* 749, 150c–159c (2005)

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**3. Natural radioelement concentration in the Troodos Ophiolite Complex of Cyprus**

M. Tzortzis and H. Tsertos★

**e-print archive:** physics/0409079

*Published in Journal of Geochemical Exploration* 85, 47-54 (2005)

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**4. Dilepton analysis in the Hades spectrometer for  $^{12}\text{C} + ^{12}\text{C}$  at 2A GeV**

J. Otwinowski *et al.* (The HADES Collaboration)

*Published in International Journal of Modern Physics A*, 2004 (in press)

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**5. Determination of thorium, uranium, and potassium elemental concentrations in surface soils in Cyprus**

M. Tzortzis and H. Tsertos★

**e-print archive:** physics/0309008

*Published in Journal of Environmental Radioactivity* 77, 325-338 (2004)

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**6. A comprehensive study of natural gamma radioactivity levels and associated dose rates from surface soils in Cyprus**

M. Tzortzis, E. Svoukis and H. Tsertos★

**e-print archive:** physics/0309009

*Published in Radiation Protection Dosimetry, Vol. 109, No. 3, 217-224 (2004)*

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**7. Radiometric determination of uranium in natural waters after enrichment and separation by cation-exchange and liquid-liquid extraction**

I. Pashalidis and H. Tsertos<sup>★</sup>

**e-print archive:** physics/0304103

*Published in Journal of Radioanalytical and Nuclear Chemistry, Vol. 260, No. 3, 439-442 (2004)*

**8. Charged hadrons and leptons identification at HADES**

A. Kugler *et al.* (The HADES Collaboration)

*Published in Acta Physica Slovaca 54 (4), 375-384 (2004)*

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**9. Study of  $e^+$ ,  $e^-$  production in elementary and nuclear collisions near production threshold with HADES**

P. Salabura *et al.* (The HADES Collaboration)

*Published in Prog. in Part. and Nucl. Phys., Vol53, Issue 1, 49-58 (2004)*

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**10. Particle identification at HADES**

A. Kugler *et al.* (The HADES Collaboration)

*Published in Nuclear Physics A734, 78-81 (2004)*

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**11. Studying in-medium hadron properties with HADES**

P. Salabura *et al.* (The HADES Collaboration)

*Published in Acta Physica Polonica B35, 1119-1129 (2004)*

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**12. Gamma radiation measurements and dose rates in commercially-used natural tiling rocks (granites)**

M. Tzortzis and H. Tsertos<sup>★</sup>, S. Christofides and G. Christodoulides

**e-print archive:** physics/ 0212104.

*Published in Journal of Environmental Radioactivity 70, 223-235 (2003)*

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<sup>★</sup> An asterisk by my name would indicate that I have had a major and leading contribution to that work and that I have been the author of correspondence for this publication.

**13. Gamma-ray measurements of naturally occurring radioactive samples from Cyprus characteristic geological rocks**

M. Tzortzis and H. Tsertos<sup>★</sup>, S. Christofides and G. Christodoulides

**e-print archive:** physics/ 0212099.

*Published in Radiation Measurements 37, 221-229 (2003)*

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**14. Indoor radon (<sup>222</sup>Rn) concentration measurements in Cyprus using high-sensitivity portable detectors**

T. Anastasiou and H. Tsertos<sup>★</sup>, S. Christofides and G. Christodoulides

**e-print archive:** physics/ 0212105.

*Published in Journal of Environmental Radioactivity 68, 159-169 (2003)*

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**15. Positron spectra from internal pair conversion observed in collisions of <sup>238</sup>U with heavy nuclei**

S. Heinz, E. Berdermann, F. Heine, O. Joeres, P. Kienle, I. Koenig, W. Koenig, C. Kozhuharov, U. Leinberger, M. Rhein, A. Schröter, and H. Tsertos<sup>★</sup>

**e-print archive:** nucl-ex/0004009

*Published in European Physical Journal A9, 55-61 (2000)*

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**16. A versatile dielectron trigger for nucleon-nucleon and nucleus-nucleus collisions**

R. Schicker, M. Axiotis and H. Tsertos<sup>★</sup>

**e-print archive:** nucl-ex/9802003

*Published in Nuclear Instruments and Methods A413, 213–227 (1998)*

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**17. First energy and angle resolved measurements of e<sup>+</sup>e<sup>-</sup> pairs emitted by internal pair conversion of excited heavy nuclei**

U. Leinberger E. Berdermann, F. Heine, S. Heinz, O. Joeres, P. Kienle, I. Koenig, W. Koenig, C. Kozhuharov, A. Schröter, H. Tsertos<sup>★</sup>, Ch. Hofmann, G. Soff

**e-print archive:** nucl-ex/9704007

*Published in European Physical Journal A1, 249-256 (1998)*

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**18. Weak e<sup>+</sup>e<sup>-</sup> lines from internal pair conversion observed in collisions of <sup>238</sup>U with heavy nuclei**

S. Heinz, E. Berdermann, F. Heine, O. Joeres, P. Kienle, I. Koenig, W. Koenig,

C. Kozhuharov, U. Leinberger, M. Rhein, A. Schröter, and H. Tsertos<sup>★</sup>

**e-print archive:** nucl-ex/9706009

*Published in European Physical Journal A1, 27-37 (1998)*

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**19. New results on  $e^+e^-$  line emission in U+Ta collisions**

U. Leinberger, E. Berdermann, F. Heine, S. Heinz, O. Joeres, P. Kienle, I. Koenig, W. Koenig, C. Kozhuharov, M. Rhein, A. Schröter, and H. Tsertos<sup>★</sup>

**e-print archive:** nucl-ex/9610001

*Published in Physics Letters B394, 16-22 (1997)*

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**20. Resolution and acceptance simulation studies for the dielectron spectrometer**

**Hades at GSI**

R. Schicker, A. Brenschede, K. Garrow, H. Schoen, A. Balanda, H. Bokemeyer, J. Friese, W. Karig, P. Kienle, W. Koenig, W. Kuehn, F. Lefevre, V. Metag, G. Roche, P. Salabura, A. Schröter, J. Stroth, H. Tsertos<sup>★</sup>

**e-print archive:** nucl-ex/9605004

*Published in Nuclear Instruments and Methods A380, 586-596 (1996)*

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**21. Experiments on  $e^+e^-$  line emission in HI collisions**

R. Baer *et al.* (EPOS + ORANGE Collaborations)

*Published in Nuclear Physics A583, 237-246 (1995)*

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**22. Investigations of correlated  $e^+e^-$  emission in heavy-ion collisions near the Coulomb barrier**

I. Koenig, E. Berdermann, F. Bosch, P. Kienle, W. Koenig, C. Kozhuharov, A. Schröter, H. Tsertos<sup>★</sup>

*Published in Z. Physik A346, 153-168 (1993)*

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**23. Systematic studies of positron production in heavy-ion collisions near the Coulomb barrier**

H. Tsertos<sup>★</sup>, E. Berdermann, F. Bosch, M. Clemente, S. Huchler, P. Kienle, W. Koenig, C. Kozhuharov

*Published in Z. Physik A342, 79-94 (1992)*

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**24. Comment on "composite –particle decay and the  $e^+e^-$  puzzle"**

W. Koenig and H. Tsertos★

*Published in Physical Review Letters 68, 1959 (1992)*

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**25. Conventional physics eliminated in positron puzzle**

H. Tsertos★

*Published in Physics World, V.4, No 12, December 1991 p.21*

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**26. Experimental exclusion of neutral resonances in Bhabha scattering at MeV energies**

H. Tsertos★, P. Kienle, S.M. Judge, K.Schreckenbach

*Published in Physics Letters B266, 259-263 (1991)*

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**27. Search for long-lived neutral resonances in Bhabha scattering around  $1.8 \text{ MeV}/c^2$** 

S.M. Judge, B. Krusche, K. Schreckenbach, H. Tsertos★, and P. Kienle

*Published in Physical Review Letters 65, 972-975 (1990)*

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**28. Search for resonant Bhabha scattering at MeV energies**

H. Tsertos★

*Published in Nuclear Instruments and Methods in Physics Research A284, 54-58 (1989)*

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**29. High-sensitivity measurements of the excitation function for Bhabha scattering at MeV energies**

H. Tsertos★, C. Kozhuharov, P. Armbruster, P. Kienle, B. Krusche, and K. Schreckenbach

*Published in Physical Review D40, 1397-1410 (1989)*

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**30. Comment on "electron peaks in  $e^+ + \text{Th}$ ,  $\text{U}$ , and  $\text{Ta}$  interactions"**

H. Tsertos★

*Published in Physical Review C40, 1839-1840 (1989)*

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**31. On the momentum correlation of  $e^+e^-$  pairs observed in  $\text{U}+\text{U}$  and  $\text{U}+\text{Pb}$  collisions**

W. Koenig, E. Berdermann, F. Bosch, S. Hucler, P. Kienle, C. Kozhuharov, A. Schröter, S. Schubeck, H. Tsertos★  
*Published in Physics Letters B218, 12-16 (1989)*

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**32. New limits for resonant Bhabha scattering around the invariant mass of 1.8 MeV/c<sup>2</sup>**

H. Tsertos★, C. Kozhuharov, P. Armbruster, P. Kienle, B. Krusche, and K. Schreckenbach  
*Published in Z. Physik A331, 103-104 (1988)*

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**33. Sensitive search for neutral resonances in Bhabha scattering around 1.8 MeV/c<sup>2</sup>**

H. Tsertos★, C. Kozhuharov, P. Armbruster, P. Kienle, B. Krusche, and K. Schreckenbach  
*Published in Physics Letters B207, 273-277 (1988)*

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**34. Monoenergetic e<sup>+</sup>e<sup>-</sup> pairs from heavy-ion collisions**

E. Berdermann, F. Bosch, P. Kienle, W. Koenig, C. Kozhuharov, H. Tsertos★, S. Schubeck, S. Huchler, J. Kemmer, A. Schröter  
*Published in Nuclear Physics A488, 683-688 (1988)*

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**35. On the production mechanism of the narrow positron lines observed in heavy-ion collisions**

H. Tsertos★, F. Bosch, W. Koenig, P. Kienle, C. Kozhuharov, E. Berdermann, M. Clemente, and W. Wagner  
*Published in Z. Physik A328, 499-500 (1987)*

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**36. Positron lines from subcritical heavy ion-atom collisions**

W. Koenig, F. Bosch, P. Kienle, C. Kozhuharov, H. Tsertos★, E. Berdermann, S. Huchler, and W. Wagner  
*Published in Z. Physik A328, 129-145 (1987)*

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**37. Positron lines from subcritical systems**

E. Berdermann, F. Bosch, M. Franosch, S. Huchler, J. Kemmer, P. Kienle, W. Koenig, C. Kozhuharov, H. Tsertos, and W. Wagner

*Published in: Physics of Strong Fields, W. Greiner (ed.), NASI Series  
B153 pp. 281-304, Plenum New York, 1987*

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**38. Multiple positron structures observed from U - U collisions at 5.6 MeV/u and 5.9 MeV/u**

H. Tsertos<sup>★</sup>, F. Bosch, P. Kienle, C. Kozhuharov, W. Koenig, E. Berdermann, S. Huchler, and W. Wagner

*Published in Z. Physik A326, 235-236 (1987)*

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**39. On the scattering-angle dependence of the monochromatic positron emission from U + U and U + Th collisions**

H. Tsertos<sup>★</sup>, M. Clemente, E. Berdermann, P. Kienle, W. Wagner, F. Bosch, C. Kozhuharov, W. Koenig

*Published in Physics Letters B162, 273–276 (1985)*

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**40. Narrow positron lines from U + U and U +Th collisions**

M. Clemente, E. Berdermann, P. Kienle, H. Tsertos<sup>★</sup>, W. Wagner, F. Bosch, C. Kozhuharov, W. Koenig

*Published in Physics Letters B137, 41-46 (1984)*

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**Other publications within the HADES collaboration**

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**41. Photon detection efficiency in the CsI based HADES RICH**

L. Fabbietti *et al.* (for the HADES collaboration)

*Published in Nuclear Instruments and Methods A502, 256-260 (2003)*

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**42. Performance of the HADES ring recognition hardware**

J. Lehnert *et al.* (for the HADES collaboration)

*Published in Nuclear Instruments and Methods A502, 261-265 (2003)*

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**43. A highly selective dilepton-trigger system based on ring recognition**

A. Toia *et al.* (for the HADES collaboration)

*Published in Nuclear Instruments and Methods A502, 270-274 (2003)*

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**44. Measurement of  $\pi^0$ - induced leptons with the HADES RICH detector**

T. Eberl *et al.* (for the HADES collaboration)

*Published in Nuclear Instruments and Methods A502, 305-309 (2003)*

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**45. Lepton pair spectroscopy with HADES at GSI**

J. Friese (for the HADES collaboration)

Hadron and Nuclear Physics with Electromagnetic Probes

*Published in Elsevier Science BV, p.4 (2000)*

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**46. Ring recognition in the HADES second-level trigger**

J. Lehnert *et al.* (for the HADES collaboration)

*Published in Nuclear Instruments and Methods A433, 268 (1999)*

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**47. Studying in-medium hadron properties with HADES**

J. Friese (for the HADES collaboration)

*Published in Progr. in Part. and Nucl. Physics 42, 235 (1999)*

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**48. Status and physics perspectives of the new di-electron spectrometer HADES**

J. Stroth (for the HADES collaboration)

*Published in Advances in Nuclear Dynamics 5, 311 (1999)*

---

**49. The di-electron spectrometer HADES at GSI: a status report**

C. Müntz (for the HADES collaboration)

*Published in Nuclear Physics B78, 139 (1999)*

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**50. HADES, the new electron-pair spectrometer at GSI**

J. Friese (for the HADES collaboration)

*Published in Nuclear Physics A654, 1017 (1999)*

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**51. A low-mass drift chamber system for the HADES spectrometer**

F. Dohrmann *et al.* (for the HADES collaboration)

*Published in Acta Physica Polonica B29, 3189 (1998)*

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**52. The time of flight wall for the HADES spectrometer**

C. Agodi *et al.* (for the HADES collaboration)

*Published in IEEE Transactions on Nuclear Science 45, Nr. 3, 665 (1998)*

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**53. The HADES dilepton spectrometer**

C. Garabatos (for the HADES collaboration)

*Published in Nuclear Physics B61, 607 (1998)*

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**54. Dilepton spectroscopy with HADES at SIS**

P. Salabura (for the HADES collaboration)

*Published in Acta Physica Polonica B27, No 11, 3095 (1996)*

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**55. Simulation of recoilless production of mesons**

W. Schön *et al.* (for the HADES collaboration)

*Published in Acta Physica Polonica B27, No 11, 2959 (1996)*

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**56. HADES-A high acceptance dielectron spectrometer**

P. Salabura *et al.* (for the HADES collaboration)

*Published in Nuclear Physics B44, 701 (1995)*

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**57. Proposal for a high acceptance di-electron spectrometer**

Hades Collaboration (final, approved technical proposal, GSI, 1994)

*Partially published in: Nucl. Instr. and Meth. A380, 586-596(1996);*

*and in Nucl. Instr. and Meth. A371, 300 (1996)*

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**58. Hades – a high acceptance di-electron spectrometer proposed for relativistic heavy-ion collisions**

H. Neumann *et al.* (HADES Collaboration)

*Published in Acta Physica Slovaca Vol. 44, No. 3, 195-205 (1994)*

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**B. CONTRIBUTIONS TO SCIENTIFIC CONFERENCES AND WORKSHOPS**

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**1. Detektoranordnung für ein Orangen- $\beta$ -Spektrometer mit Untergrunds-Unterdrückung, hoher Transmission und breitem relativen Impulsband**

M. Clemente, H. Tsertos, P. Kienle, C. Kozhuharov

*In Proceedings of the Spring Meeting of the German Physical Society,*

*Nuclear Physics Section, (München, Fed. Rep. of Germany, 1980) p. 1137*

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**2. Spektroskopie hochenergetischer  $\delta$ -Elektronen aus schweren Ion-Atom-Stößen**

E. Berdermann, H. Bokemeyer, F. Bosch, M. Clemente, F. Güttner, P. Kienle, W.

Koenig,

C. Kozhuharov, B. Martin, B. Povh, H. Tsertos, Th. Walcher

*In Proceedings of the Spring Meeting of the German Physical Society,*

*Nuclear Physics Section, (München, Fed. Rep. of Germany, 1980) p. 1168*

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**3. Positronenerzeugung nach 1.4 GeV Uran-Atom-Stößen**

E. Berdermann, F. Bosch, M. Clemente, F. Güttner, P. Kienle, W. Koenig, C.

Kozhuharov, B. Martin, B. Povh, H. Tsertos, Th. Walcher

*In Proceedings of the Spring Meeting of the German Physical Society,*

*Nuclear Physics Section, (München, Fed. Rep. of Germany, 1980) p. 1204*

---

**4. Study of inner shell atomic states at  $Z\alpha \approx 1$  by  $\delta$ -ray spectroscopy**

F. Güttner, W. Koenig, B. Martin, B. Povh, H. Skapa, J. Soltani, Th. Walcher,

F. Bosch, C. Kozhuharov, E. Berdermann, M. Clemente, P. Kienle, H. Tsertos,

L. Meyer- Schützmeister

*In Proceedings of the Spring Meeting of the German Physical Society,*

*Nuclear Physics Section, (Hamburg, Fed. Rep. of Germany, 1981) p. 793*

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**5. Energy distribution of positrons from 1.4 GeV uranium-atom collisions**

E. Berdermann, F. Bosch, M. Clemente, F. Güttner, P. Kienle, W. Koenig,

C. Kozhuharov, B. Martin, B. Povh, H. Tsertos, Th. Walcher

*In Proceedings of the Spring Meeting of the German Physical Society,*

*Nuclear Physics Section*, (Hamburg, Fed. Rep. of Germany, 1981) p. 806

**6. Strukturen im Positronenspektrum im Schwerionen–Atom–Stoss**

E. Berdermann, M. Clemente, P. Kienle, H. Tsertos, W. Wagner, F. Bosch,  
C. Kozhuharov, W. Koenig

*In Proceedings of the Spring Meeting of the German Physical Society,*  
*Nuclear Physics Section*, (Karlsruhe, Fed. Rep. of Germany, 1982) p. 1112

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**7. Investigation of positrons emitted in heavy ion–atom collisions from the systems  
U + U and U + Th**

E. Berdermann, M. Clemente, P. Kienle, H. Tsertos, W. Wagner, F. Bosch,  
C. Kozhuharov, W. Koenig

*In Proceedings of the Spring Meeting of the German Physical Society,*  
*Nuclear Physics Section*, (Münster, Fed. Rep. of Germany, 1983) p. 1048

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**8.  $\delta$ –rays emitted in heavy–ion collisions**

P. Armbruster, E. Berdermann, F. Bosch, M. Clemente, P. Kienle, W. Koenig,  
C. Kozhuharov, H. Tsertos, W. Wagner,

*In Proceedings of the Spring Meeting of the German Physical Society,*  
*Nuclear Physics Section*, (Münster, Fed. Rep. of Germany, 1983) p. 1066

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**9. Observation of positron lines from heavy–ion collisions**

M. Clemente, E. Berdermann, F. Bosch, P. Kienle, W. Koenig, C. Kozhuharov,  
H. Tsertos, and W. Wagner

*In Proceedings of the International Conference on Nuclear Physics,*  
(Florence, Italy, 1983) p. 693

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**10. Untersuchung der Positronenlinie in (U + U) –Stößen an der Coulombbarriere**

E. Berdermann, M. Clemente, J. Kemmer, P. Kienle, H. Tsertos, W. Wagner,  
F. Bosch, C. Kozhuharov, W. Koenig

*In Proceedings of the Spring Meeting of the German Physical Society,*  
*Nuclear Physics Section*, (Innsbruck, Austria, 1984) p. 903

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**11. Hochenergetische  $\delta$ –Elektronen von Pb–Cm–Atomen**

P. Armbruster, E. Berdermann, F. Bosch, P. Kienle, W. Koenig, C. Kozhuharov,

H. Tsertos, W. Wagner, J.B. Wilhelmy

*In Proceedings of the Spring Meeting of the German Physical Society,  
Nuclear Physics Section, (Innsbruck, Austria, 1984) p. 904*

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**12. Winkelabhängigkeit des Wirkungsquerschnittes der Positronenlinien in (U+Th)–  
und (U+U) –Stößen**

H. Tsertos, E. Berdermann, F. Bosch, M. Clemente, P. Kienle, W. Koenig,  
C. Kozhuharov, W. Wagner

*In Proceedings of the Spring Meeting of the German Physical Society,  
Nuclear Physics Section, (München, Fed. Rep. of Germany, 1985) p. 391*

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**13. Eine Messanordnung zur Bestimmung der Geschwindigkeit der Emissions-Quelle  
monoenergetischer Positronen aus Schwerionenstößen**

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H. Tsertos

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