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## ΒΙΟΓΡΑΦΙΚΟ ΣΗΜΕΙΩΜΑ: Ανάλυση Δημοσιεύσεων

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## Εισαγωγή

Η περίληψη (abstract) για κάθε δημοσίευση που συνοψογράφω είναι διαθέσιμη μέσω των ενεργών διαδικτυακών συνδέσμων (doi/arXiv) που έχουν προστεθεί στο συνοδούν αρχείο *publications.pdf* (κατάλογος δημοσιεύσεων).

Ως συμμετέχων σε μεγάλες πειραματικές συνεργασίες, συνοψογράφω όλες αυτές τις δημοσιεύσεις.

Στις περισσότερες από τις δημοσιεύσεις αυτές, η συνεισφορά μου έγκειται απλώς και μόνο στο ότι χρησιμοποιούνται πειραματικά δεδομένα τα οποία ελήφθησαν και χάρη στη δική μου εργασία, όσον αφορά την κατασκευή/συντήρηση/αναβάθμιση επιμέρους ανιχνευτών και των ηλεκτρονικών τους, την ανάπτυξη λογισμικού και firmware για τη λειτουργία τους, την ανάπτυξη software για την online και offline επεξεργασία των δεδομένων, για την παραγωγή προσομοιωμένων και εξομοιωμένων δεδομένων, και φυσικά την εργασία για τη λήψη των δεδομένων (π.χ. shifts) και την επεξεργασία τους (π.χ. computing facilities).

Είναι λοιπόν σκόπιμο να παρουσιαστεί εδώ ένας ξεχωριστός κατάλογος δημοσιεύσεων, στις οποίες η συνεισφορά μου είναι σημαντικότερη σε σχέση με όσα αναφέρθηκαν στην προηγούμενη παράγραφο. Στον κατάλογο αυτό εμφανίζεται εντός <> και ο αντίστοιχος αύξων αριθμός του καταλόγου δημοσιεύσεων.

Θα πρέπει επίσης να τονιστεί πως η συνεισφορά μου είναι σημαντική σε όλες τις παρουσιάσεις σε συνέδρια με πρακτικά που έχω απαριθμήσει στο βιογραφικό μου σημείωμα, τις οποίες και συμπεριλαμβάνω στον κατάλογο αυτό (προσημειώνονται με [CONF]).

## Κατάλογος δημοσιεύσεων με σημαντική προσωπική συνεισφορά

### **πείραμα CMS (CERN)**

1. [CONF] “Development and testing of a Trigger Processor Card based on a Kintex Ultrascale FPGA”, presented at the Topical Workshop on Electronics for Particle Physics (TWEPP) 2018, Antwerpen, Belgium, 17–21 Sep. 2018 <https://indico.cern.ch/event/697988/contributions/3056078>.  
A trigger processor demonstrator card has been designed for the CMS Barrel Muon Trigger (BMT) upgrade at HL-LHC. A two-layer system design is foreseen for BMT. The processor card is a demonstrator for Layer-1 and is instrumented with a Kintex UltraScale FPGA and optical links at 16 Gbps. The Hardware and Firmware design as well as information of the performance is presented.
2. [CONF] “Upgrade of the CMS muon trigger system in the barrel region”, D. Rabady et al., [doi:10.22323/1.282.1080](https://doi.org/10.22323/1.282.1080), PoS ICHEP 2016, 1080 (2017).  
An overview of the new track-finder system for the barrel region, the Barrel Muon Track Finder (BMTF) as well as the cancel-out and sorting layer, the upgraded Global Muon Trigger (μ GMT) is presented together with first results of the muon trigger performance including the barrel region.
3. [CONF] “The CMS Level-1 Trigger Barrel Track Finder”, CMS-CR-2015-304, Topical Workshop on Electronics for Particle Physics, Lisbon, Portugal, 28 Sep – 2 Oct 2015, pp.C03038, [doi:10.1088/1748-0221/11/03/C03038](https://doi.org/10.1088/1748-0221/11/03/C03038).  
The design and performance of the upgraded CMS Level-1 Trigger Barrel Muon Track Finder (BMTF) is presented. Monte Carlo simulation data as well as cosmic ray data from a CMS muon detector slice test have been used to study in detail the performance of the new track finder. Results from detailed studies of comparisons between the BMTF algorithm results and the results of a C++ emulator are also presented.
4. <695> S. Chatrchyan et al. [CMS], “Measurement of the  $\sqrt{s}$  Ratio of the Inclusive 3-Jet Cross Section to the Inclusive 2-Jet Cross Section in pp Collisions at  $\sqrt{s} = 7$  TeV and First Determination of the Strong Coupling Constant in the TeV Range”, Eur. Phys. J. C 73 (2013) no.10, 2604 [doi:10.1140/epjc/s10052-013-2604-6](https://doi.org/10.1140/epjc/s10052-013-2604-6) [arXiv:1304.7498 [hep-ex]]. (118 citations / INSPIRE, 05 Jun 2020)  
A measurement is presented of the ratio of the inclusive 3-jet cross section to the inclusive 2-jet cross section as a function of the average transverse momentum,  $\langle p_{T,2} \rangle$ , of the two leading jets in the event. The data sample was collected during 2011 at a proton–proton centre-of-mass energy of 7 TeV with

the CMS detector at the LHC, corresponding to an integrated luminosity of  $5.0 \text{ fb}^{-1}$ . The strong coupling constant at the scale of the Z boson mass is determined to be  $\alpha_s(M_Z)=0.1148\pm0.0014 \text{ (exp.)} \pm0.0018 \text{ (PDF)}\pm0.0050\text{(theory)}$ , by comparing the ratio in the range  $0.42<\langle p_{T1,2} \rangle<1.39 \text{ TeV}$  to the predictions of perturbative QCD at next-to-leading order. This is the first determination of  $\alpha_s(M_Z)$  from measurements at momentum scales beyond 0.6 TeV. The predicted ratio depends only indirectly on the evolution of the parton distribution functions of the proton such that this measurement also serves as a test of the evolution of the strong coupling constant. No deviation from the expected behaviour is observed.

5. <883> S. Chatrchyan et al. [CMS], “Measurement of the ratio of the 3-jet to 2-jet cross sections in pp collisions at  $\sqrt{s} = 7 \text{ TeV}$ ”, Phys. Lett. B 702 (2011), 336-354  
[doi:10.1016/j.physletb.2011.07.067](https://doi.org/10.1016/j.physletb.2011.07.067) [arXiv:1106.0647 [hep-ex]]. (35 citations / INSPIRE, 31 May 2020)  
 A measurement of the ratio of the inclusive 3-jet to 2-jet cross sections as a function of the total jet transverse momentum,  $H_T$ , in the range  $0.2<H_T<2.5 \text{ TeV}$  is presented. The data have been collected at a proton-proton centre-of-mass energy of 7 TeV with the CMS detector at the LHC, and correspond to an integrated luminosity of  $36 \text{ pb}^{-1}$ . Comparisons are made between the data and the predictions of different QCD-based Monte Carlo models for multijet production. All models considered in this study are consistent with the data for  $H_T>0.5 \text{ TeV}$ . This measurement extends to an  $H_T$  range that has not been explored before.
6. <971> D. Barney, W. Bialas, P. Kokkas, N. Manthos, D. Maletic, I. Papadopoulos, A. Peisert, S. Reynaud and P. Vichoudis, “Detection of muons at 150-GeV/c with a CMS preshower prototype”, Nucl. Instrum. Meth. A 564 (2006), 126-133  
[doi:10.1016/j.nima.2006.03.031](https://doi.org/10.1016/j.nima.2006.03.031) (0 citations / INSPIRE, 25 May 2020)  
 The analysis of 150 GeV/c muon data collected during a test of a CMS Preshower prototype is presented. The test took place in 2004 in the H4 beam at CERN. The results of a Geant-4-based simulation, developed for the Preshower prototype test, are also presented. The results of the simulation are found to be in excellent agreement with the data. It is also demonstrated that by combining the results of the data analysis and simulation an absolute calibration of the CMS Preshower detector system can be performed.
7. <965> S. Chatrchyan et al. [CMS], “The CMS Experiment at the CERN LHC”, JINST 3 (2008), S08004  
[doi:10.1088/1748-0221/3/08/S08004](https://doi.org/10.1088/1748-0221/3/08/S08004) (6941 citations / INSPIRE, 05 Jun 2020)  
 The Compact Muon Solenoid (CMS) detector is described. The detector operates at the Large Hadron Collider (LHC) at CERN. It was conceived to study proton-proton (and lead-lead) collisions at a centre-of-mass energy of 14 TeV (5.5 TeV nucleon-nucleon) and at luminosities up to  $10^{34} \text{ cm}^{-2} \text{ s}^{-1}$  ( $10^{27} \text{ cm}^{-2} \text{ s}^{-1}$ ). At the core of the CMS detector sits a high-magnetic-field and large-bore superconducting solenoid surrounding an all-silicon pixel and strip tracker, a lead-tungstate scintillating-crystals electromagnetic calorimeter, and a brass-scintillator sampling hadron calorimeter. The iron yoke of the flux-return is instrumented with four stations of muon detectors covering most of the  $4\pi$  solid angle. Forward sampling calorimeters extend the pseudorapidity coverage to high values ( $|\eta| \leq 5$ ) assuring very good hermeticity. The overall dimensions of the CMS detector are a length of 21.6 m, a diameter of 14.6 m and a total weight of 12500 t.
8. [CONF] “Production Testing and Quality Assurance of the CMS Preshower Front-end Chips – PACE3”, N. Manthos et al., [doi:10.5170/CERN-2005-011.182](https://doi.org/10.5170/CERN-2005-011.182), LECC 2005, “Heidelberg 2005, Electronics for LHC and future experiments” 32.  
 PACE3 is the 32-channel large dynamic range front-end amplifier, shaper and analogue memory for the CMS Preshower detector. Around 4300 PACE3, designed in  $0.25\mu\text{m}$  CMOS, are required for the detector. Production of the chips has been completed and a number of packaged chips (fpBGA) evaluated using a custom test system equipped with a ZIF socket under LabVIEW control. The tests are described and results presented on overall yield, digital functionality and analogue performance.

## πείραμα ATLAS (CERN)

9. <964> G. Aad et al. [ATLAS], “The ATLAS Experiment at the CERN Large Hadron Collider”, JINST 3 (2008), S08003  
[doi:10.1088/1748-0221/3/08/S08003](https://doi.org/10.1088/1748-0221/3/08/S08003) (8385 citations / INSPIRE, 05 Jun 2020)  
The ATLAS detector as installed in its experimental cavern at point 1 at CERN is described in this paper. A brief overview of the expected performance of the detector when the Large Hadron Collider begins operation is also presented.
10. [CONF] “The Second Level Trigger of the ATLAS experiment at CERN's LHC”, A. Dos Anjos et al., [ATL-DAQ-2003-052](#) and IEEE Trans. Nucl. Sci. 51 (2004) 909-914 [doi:10.1109/TNS.2004.829977](https://doi.org/10.1109/TNS.2004.829977).  
The ATLAS trigger reduces the rate of interesting events to be recorded for off-line analysis in three successive levels from 40 MHz to ~100 kHz, ~2 kHz and ~200 Hz. The high level triggers and data acquisition system are designed to profit from commodity computing and networking components to achieve the required performance. In this paper, we discuss data flow aspects of the design of the second level trigger (LVL2) and present results of performance measurements.
11. [CONF] “The base-line DataFlow system of the ATLAS Trigger & DAQ”, H-P Beck et al., [ATL-DAQ-2004-006](#) and IEEE Trans. Nucl. Sci. 51 (2004) 470-475 [doi:10.1109/TNS.2004.828707](https://doi.org/10.1109/TNS.2004.828707).  
The base-line design and implementation of the ATLAS DAQ DataFlow system is described. The main components of the DataFlow system, their interactions, bandwidths, and rates are discussed and performance measurements on a 10% scale prototype for the final ATLAS TDAQ DataFlow system are presented. This prototype is a combination of custom design components and of multithreaded software applications implemented in C++ and running in a Linux environment on commercially available PCs interconnected by a fully switched gigabit Ethernet network.
12. [CONF] “The DataFlow System of the ATLAS Trigger and DAQ”, G. Lehmann et al., [ATL-DAQ-2003-039](#) and CHEP-2003-MOGT009 ([eConf C0303241:MOGT009,2003](#)).  
The baseline design and implementation of the DataFlow system, to be documented in the ATLAS DAQ/HLT Technical Design Report in summer 2003, is presented. Emphasis is placed on the system performance and scalability based on the results from prototyping studies which have maximised the use of commercially available hardware.
13. [NOTE] “The baseline dataflow system of the ATLAS trigger and DAQ”, J. Vermeulen et al., [ATL-DAQ-2003-032](#) and [ATL-COM-DAQ-2003-053](#) [doi:10.5170/CERN-2003-006.147](https://doi.org/10.5170/CERN-2003-006.147).  
In this note the baseline design of the ATLAS High Level Trigger and Data Acquisition system with respect to the DataFlow aspects, as presented in the recently submitted ATLAS Trigger/DAQ/Controls Technical Design Report, is reviewed and recent results of testbed measurements and from modelling are discussed.
14. [CONF] “Experience with multi-threaded C++ applications in the ATLAS DataFlow software”, S. Gadomski et al., [ATL-DAQ-2003-007](#) and [hep-ex/0306113](#).  
The DataFlow is sub-system of the ATLAS data acquisition responsible for the reception, buffering and subsequent movement of partial and full event data to the higher level triggers: Level 2 and Event Filter. The design of the software is based on OO methodology and its implementation relies heavily on the use of posix threads and the Standard Template Library. This article presents our experience with Linux, posix threads and the Standard Template Library in the real time environment of the ATLAS data flow.

## R&D MICROMEGAS (CEA-Saclay)

15. [CONF] “The Micromegas neutron detector for CERN n\_TOF”, S. Andriamonje et al., Proceedings of the 7th International Conference on Advanced Technology and Particle Physics (ICATPP-7). 15-19 Oct. 2001 Villa Olmo, Como, Italy [doi:10.1142/9789812776464\\_0091](https://doi.org/10.1142/9789812776464_0091).  
A novel neutron detector based on the MICROMEGAS concept is presented. One of the applications of this detector is the determination of the high performance and characteristics (neutron beam profile, flux and energy resolution) of the new high-flux spallation neutron source, the neutron Time-Of-Flight facility (n\_TOF) at CERN.
  
16. <977> A. Bay, J. Perroud, F. Ronga, J. Derre, Y. Giomataris, A. Delbart and Y. Papadopoulos, “Study of sparking in Micromegas chambers”, Nucl. Instrum. Meth. A 488 (2002), 162-174  
[doi:10.1016/S0168-9002\(02\)00510-7](https://doi.org/10.1016/S0168-9002(02)00510-7) (26 citations / INSPIRE, 06 Jun 2020)  
The discharge properties of Micromegas detector are studied in detail. Tests have demonstrated that the origin of discharges in hadron beams is mainly associated with nuclear interactions of the incident particle with the gas of the detector. Use of low average Z gas mixtures diminishes the spark rate. The streamer discharge model of Raether has been proved to be valid for this detector. A detector polarization which minimizes the spark energy is proposed. Gas and geometry factors improving the discharge limit are discussed.
  
17. [CONF] “Electron drift velocity measurements at high electric fields”, P. Colas et al., DAPNIA-01-09 and NIM A 478 (2002) 215-219 [doi:10.1016/S0168-9002\(01\)01760-0](https://doi.org/10.1016/S0168-9002(01)01760-0).  
A method to measure the electron drift velocity is presented. A pulsed UV nitrogen laser is used to excite both the drift and cathode nickel micro-meshes of a Micromegas detector. The signals induced on the anode are then readout by a fast current amplifier. Several results have been obtained for various gas mixtures and electric fields from to . Relevant applications with low (TPCs mode) and high (pre-amplification mode) electric fields is discussed.
  
18. <981> A. Delbart et al., “Performance of MICROMEGAS with preamplification at high intensity hadron beams”, DAPNIA-01-04 and NIM A 478 (2002) 205-209,  
[doi:10.1016/S0168-9002\(01\)01758-2](https://doi.org/10.1016/S0168-9002(01)01758-2) (8 citations / INSPIRE, 25 May 2020).  
Systematic studies of efficiency-rate characteristics of the MICROMEGAS detector in high-intensity hadron beams are presented. The discharge probability has been studied as a function of the gain for several gas mixtures. Using a full tracking system of several MICROMEGAS chambers we measured simultaneously the gain, the efficiency, the spatial resolution and the sparking probability. We are discussing the various issues, with single and double amplification, for the use of this detector in future high-rate hadron accelerators.
  
19. [CONF] “MICROMEGAS as a neutron beam profiler”, [DAPNIA-SED-2000-02](#) and IEEE 2000 Nuclear Science Symposium / Medical Imaging Conference, Lyon, France, 15-20 october 2000, Conference Record vol.1, p.5/60-5/62.  
Two MICROMEGAS detectors, equipped with solid neutron converters, were tested on a neutron beam. The detectors have a 3 mm drift gap, a 100  $\mu\text{m}$  amplification gap and a strip pitch of 317.5  $\mu\text{m}$ . The filling gas mixtures used for this test were argon/isobutane (90:10 and 98:2) and pure  $\text{CF}_4$ . Preliminary results of the operation of the detectors are presented.
  
20. [CONF] “New developments of Micromegas detector”, 8th Pisa Meeting on Advanced Detectors (PISA2000), 21-27 May 2000, La Biodata Isola d'Elba, Italy, Nucl. Instrum. Meth. A 461 (2001), 84-87  
[doi:10.1016/S0168-9002\(00\)01175-X](https://doi.org/10.1016/S0168-9002(00)01175-X) (38 citations counted in INSPIRE as of 06 Jun 2020)  
A new type of micro-mesh, based on etching techniques, has been developed for the Micromegas detector. In this paper, we will briefly describe this new design and give some results about the performances obtained in different gas mixtures. The geometry of the mesh allows good uniformity of the electrostatic field. An energy resolution of 11.7 % full-width at half-maximum is obtained with X-rays at 5.9 keV and 5.4 % at 22 keV in an argon/isobutane (90%/10%) gas mixture. This is a significant improvement for a gaseous detector operating at high gain (about 5000).

## πείραμα CPLEAR (CERN PS 195)

21. <983> A. Apostolakis et al. [CPLEAR], “A detailed description of the analysis of the decay of neutral kaons to  $\pi^+\pi^-$  in the CPLEAR experiment”, Eur. Phys. J. C 18 (2000), 41-55  
[doi:10.1007/s100520000504](https://doi.org/10.1007/s100520000504) (14 citations / INSPIRE, 25 May 2020)  
 A detailed description is given of the analysis of neutral kaons decaying to  $\pi^+\pi^-$ , based on the complete set of data collected with the CPLEAR experiment. Using a novel approach involving initially strangeness-tagged  $K^0$  and  $K^0$ -bar, the time-dependent decay-rate asymmetry has been measured. This asymmetry, resulting from the interference between the  $K_S$  and  $K_L$  decay amplitudes, has enabled both the magnitude and phase of the CP-violation parameter,  $\eta_{+-}$ , to be measured, with a precision comparable to that of the current world-average values.
  
22. <987> A. Apostolakis et al. [CPLEAR], “Determination of the T and CPT violation parameters in the neutral kaon system using the Bell-Steinberger relation and data from CPLEAR”, Phys. Lett. B 456 (1999), 297-303  
[doi:10.1016/S0370-2693\(99\)00483-9](https://doi.org/10.1016/S0370-2693(99)00483-9) (79 citations / INSPIRE, 25 May 2020)  
 Data from the CPLEAR experiment, together with the most recent world averages for some of the neutral-kaon parameters, were constrained with the Bell-Steinberger (or unitarity) relation, allowing the T-violation parameter  $\text{Re}(\epsilon)$  and the CPT-violation parameter  $\text{Im}(\delta)$  of the neutral-kaon mixing matrix to be determined with an increased accuracy:  $\text{Re}(\epsilon)=(164.9\pm 2.5)\times 10^{-5}$ ,  $\text{Im}(\delta)=(2.4\pm 5.0)\times 10^{-5}$ . Moreover, the constraint allows the CPT-violation parameter for the neutral-kaon semileptonic decays,  $\text{Re}(y)$ , to be determined for the first time. The  $\Delta S\neq\Delta Q$  parameters  $\text{Re}(x_-)$  and  $\text{Im}(x_+)$  are given with an increased accuracy. The quantity  $\text{Re}(y+x_-)$ , which enters the T-violation CPLEAR asymmetry previously published, is determined to be  $(-0.2\pm 0.3)\times 10^{-3}$ . The value obtained for  $\text{Re}(\delta)$  is in agreement with the one resulting from a previous unconstrained fit and has a slightly smaller error.
  
23. <988> A. Apostolakis et al. [CPLEAR], “A Determination of the CP violation parameter  $\eta_{+-}$  from the decay of strangeness tagged neutral kaons”, Phys. Lett. B 458 (1999), 545-552  
[doi:10.1016/S0370-2693\(99\)00596-1](https://doi.org/10.1016/S0370-2693(99)00596-1) (46 citations / INSPIRE, 25 May 2020)  
 We report a measurement of the CP violation parameter  $\eta_{+-}$  from the time-dependent asymmetry between the decay rates of initially tagged  $K^0$  and  $K^0$ -bar. The results are based on the complete data sample collected by the CPLEAR collaboration. With  $\Delta m=(530.1\pm 1.4)\times 10^7\hbar s^{-1}$  and  $\tau_S=(89.34\pm 0.08)$  ps, the values obtained are  

$$|\eta_{+-}|=(2.264\pm 0.023_{\text{stat}}\pm 0.026_{\text{syst}}\pm 0.007_{\tau_S})\times 10^{-3} \text{ and } \varphi_{+-}=43.19^\circ\pm 0.53^\circ_{\text{stat}}\pm 0.28^\circ_{\text{syst}}\pm 0.42^\circ_{\Delta m}.$$
  
24. <990> A. al. et al. [CPLEAR], “Dispersion relation analysis of the neutral kaon regeneration amplitude in carbon”, Eur. Phys. J. C 10 (1999), 19-25  
[doi:10.1007/s100529900140](https://doi.org/10.1007/s100529900140) [arXiv:hep-ex/9905007 [hep-ex]]. (6 citations / INSPIRE, 06 Jun 2020)  
 We apply a forward dispersion relation to the regeneration amplitude for kaon scattering on  $^{12}\text{C}$  using all available data. The CPLEAR data at low energies allow the determination of the net contribution from the subthreshold region which turns out to be much smaller than earlier evaluations, solving a long standing puzzle.
  
25. <997> A. Angelopoulos et al. [CPLEAR], “Measurement of the neutral kaon regeneration amplitude in carbon at momenta below 1-GeV/c”, Phys. Lett. B 413 (1997), 422-430  
[doi:10.1016/S0370-2693\(97\)01193-3](https://doi.org/10.1016/S0370-2693(97)01193-3) (25 citations / INSPIRE, 25 May 2020)  
 The neutral kaon regeneration amplitude in carbon at momenta between 250 and 750 MeV/c was determined by measuring the interference of inherent and coherently regenerated  $K_S$  amplitudes. This interference appears in the rates of initially pure (tagged)  $K^0$  and  $K^0$ -bar decaying to  $\pi^+\pi^-$  after crossing a carbon absorber.



26. <998> A. Angelopoulos et al. [CPLEAR], “Direct determination of two pion correlations for anti-p p  $\rightarrow$  2  $\pi^+$  2  $\pi^-$  annihilation at rest”, Eur. Phys. J. C 1 (1998), 139-148  
[doi:10.1007/s100520050068](https://doi.org/10.1007/s100520050068) (12 citations / INSPIRE, 25 May 2020)  
 We study  $\pi\pi$  correlations in the exclusive reaction  $pp \rightarrow 2\pi^+2\pi^-$  at rest measured by the CPLEAR experiment. Avoiding the introduction of an arbitrary reference sample, we analyse differential distributions for equal charge pion pairs removing the phase-space factor event by event. A peak at small relative momenta is most pronounced for large total momentum of the pair. The physical implications of bosonic symmetrization for the properties of the pion source, in particular its radius, are briefly discussed. The two extremes considered are the chaotic Hanbury-Brown-Twiss mechanism and the coherent Skyrmion model.
27. <1011> R. Adler et al. [CPLEAR], “Measurement of the CP violation parameter  $\eta_{+-}$  using tagged  $K^0$  and anti- $K^0$ ”, Phys. Lett. B 363 (1995), 243-248  
[doi:10.1016/0370-2693\(95\)01295-0](https://doi.org/10.1016/0370-2693(95)01295-0) (56 citations / INSPIRE, 25 May 2020)  
 The CP violation parameter  $\eta_{+-}$  is determined through the eigentime-dependent asymmetry in the rates of initially tagged  $K^0$  and  $K^0$ -bar decaying to  $\pi^+\pi^-$ . The obtained values are  $|\eta_{+-}| = (2.312 \pm 0.043_{\text{stat.}} \pm 0.030_{\text{syst.}} \pm 0.011_{\text{cs}}) \times 10^{-3}$  and  $\Phi_{+-} = 42.7^\circ \pm 0.9^\circ_{\text{stat.}} \pm 0.6^\circ_{\text{syst.}} \pm 0.9^\circ_{\Delta m}$  with  $\Delta = (527.4 \pm 2.9) \times 10^7 \text{hs}^{-1}$  measured in the same experiment using the semileptonic decay channel.

## **πείραμα TARC (CERN PS 211)**

28. <978> A. Abanades et al., “Experimental verification of neutron phenomenology in lead and of transmutation by adiabatic resonance crossing in accelerator driven systems: A summary of the TARCProject at CERN”, Nucl. Instrum. Meth. A 463 (2001), 586-592  
[doi:10.1016/S0168-9002\(01\)00173-5](https://doi.org/10.1016/S0168-9002(01)00173-5) (6 citations / INSPIRE, 25 May 2020)  
 The Transmutation by Adiabatic Resonance Crossing (TARC) experiment was carried out as PS211 at the CERN PS from 1996 to 1999. Energy and space distributions of spallation neutrons (produced by 2.5 and 3.57 GeV/c CERN proton beams) slowing down in a  $3.3 \times 3.3 \times 3 \text{ m}^3$  lead volume and neutron capture rates on long-lived fission fragments  $^{99}\text{Tc}$  and  $^{129}\text{I}$  demonstrate that Adiabatic Resonance Crossing (ARC) can be used to eliminate efficiently such nuclear waste and validate innovative simulation.
29. <979> A. Abanades et al. [TARC], “Results from the TARC experiment: Spallation neutron phenomenology in lead and neutron-driven nuclear transmutation by adiabatic resonance crossing”, Nucl. Instrum. Meth. A 478 (2002), 577-730  
[doi:10.1016/S0168-9002\(01\)00789-6](https://doi.org/10.1016/S0168-9002(01)00789-6) (12 citations / INSPIRE, 25 May 2020)  
 We summarize here the results of the TARC experiment whose main purpose is to demonstrate the possibility of using Adiabatic Resonance Crossing (ARC) to destroy efficiently Long-Lived Fission Fragments (LLFFs) in accelerator-driven systems and to validate a new simulation developed in the framework of the Energy Amplifier programme. An experimental set-up was installed in a CERN PS proton beam line to study how neutrons produced by spallation at relatively high energy ( $E_n \geq 1 \text{ MeV}$ ) slow down quasi-adiabatically with almost flat isoenergic energy distribution and reach the capture resonance energy of an element to be transmuted where they will have a high probability of being captured. Precision measurements of energy and space distributions of spallation neutrons (using 2.5 and 3.5 GeV/c protons) slowing down in a  $3.3 \text{ m} \times 3.3 \text{ m} \times 3 \text{ m}$  lead volume and of neutron capture rates on LLFFs  $^{99}\text{Tc}$ ,  $^{129}\text{I}$ , and several other elements were performed. An appropriate formalism and appropriate computational tools necessary for the analysis and understanding of the data were developed and validated in detail. Our direct experimental observation of ARC demonstrates the possibility to destroy, in a parasitic mode, outside the Energy Amplifier core, large amounts of  $^{99}\text{Tc}$  or  $^{129}\text{I}$  at a rate exceeding the production rate, thereby making it practical to reduce correspondingly the existing stockpile of LLFFs. In addition, TARC opens up new possibilities for radioactive isotope production as an alternative to nuclear reactors, in particular for medical applications, as well as new possibilities for neutron research and industrial applications.

30. <986> H. Arnould et al., , “Experimental Verification of Neutron Phenomenology in Lead and Transmutation by Adiabatic Resonance Crossing in Accelerator Driven Systems”, Phys. Lett. B 458 (1999), 167-180  
[doi:10.1016/S0370-2693\(99\)00584-5](https://doi.org/10.1016/S0370-2693(99)00584-5) (14 citations / INSPIRE, 25 May 2020)  
Energy and space distributions of spallation neutrons (from 2.5 and 3.57 GeV/c CERN proton beams) slowing down in a  $3.3 \times 3.3 \times 3 \text{ m}^3$  lead volume and neutron capture rates on long-lived fission fragments  $^{99}\text{Tc}$  and  $^{129}\text{I}$  demonstrate that Adiabatic Resonance Crossing (ARC) can be used to eliminate efficiently such nuclear waste and validate innovative simulation.

### 1993-1994, Θερμοφωταύγεια<sup>1</sup> (ΑΠΘ)

31. <1012> G. Kitis, J.G. Papadopoulos, S. Charalambous and J.W.N. Tuyn, “The influence of heating rate on the response and trapping parameters of  $\alpha\text{-Al}_2\text{O}_3\text{:C}$ ”, Radiat. Prot. Dosim. 55 (1994), 183-190  
[doi:10.1093/oxfordjournals.rpd.a082391](https://doi.org/10.1093/oxfordjournals.rpd.a082391) (54 citations / SCOPUS, 6 Jun 2020)  
The effects of the heating rate from 0.6 up to  $50 \text{ }^\circ\text{C.s}^{-1}$  on the thermoluminescence of  $\alpha\text{-Al}_2\text{O}_3\text{:C}$  are very intensive. The material rapidly loses its high sensitivity as the heating rate increases. The peak shape characteristics, peak maximum and full width at half maximum agree only qualitatively with those theoretically predicted. The trapping parameters calculated by the curve fitting method, the peak shape method, the variable heating rate method and the initial rise method, were found to decrease as the heating rate increases. The validity of the results are discussed in the framework of the kinetic models.
32. <1013> G. Kitis, M. Spiropulu, J. Papadopoulos, Stef. Charalambous, “Heating rate effects on the TL glow- peaks of three thermoluminescence phosphors”, NIM B 73 (1993), 367-372  
[doi:10.1016/0168-583X\(93\)95753-R](https://doi.org/10.1016/0168-583X(93)95753-R) (56 citations / SCOPUS, 6 Jun 2020)  
The maximum temperature, the integral and the full width at half maximum of the thermoluminescence glow-peak as a function of the heating rate were studied. The glow-peaks studied are the  $110^\circ\text{C}$  glow-peak of Norwegian quartz, the  $210^\circ\text{C}$  glow-peak of  $\text{LiF:Mg,Ti}$  (TLD-700) and the  $250^\circ\text{C}$  glow-peak of natural  $\text{CaF}_2\text{:MBLE}$ . The heating rate ranges from 2 up to  $50 \text{ }^\circ\text{C/s}$ . The experimental results are compared with theoretical calculations in order to test the theory.

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<sup>1</sup> Οι δύο αυτές δημοσιεύσεις δεν σχετίζονται με τη Φυσική Υψηλών Ενεργειών, και είναι αποτελέσματα της διπλωματικής μου εργασίας ως προπτυχιακού φοιτητή του Τμ. Φυσικής του ΑΠΘ στο πεδίο της Θερμοφωταύγειας (επιβλέπων: καθ. Γ. Κίτης).