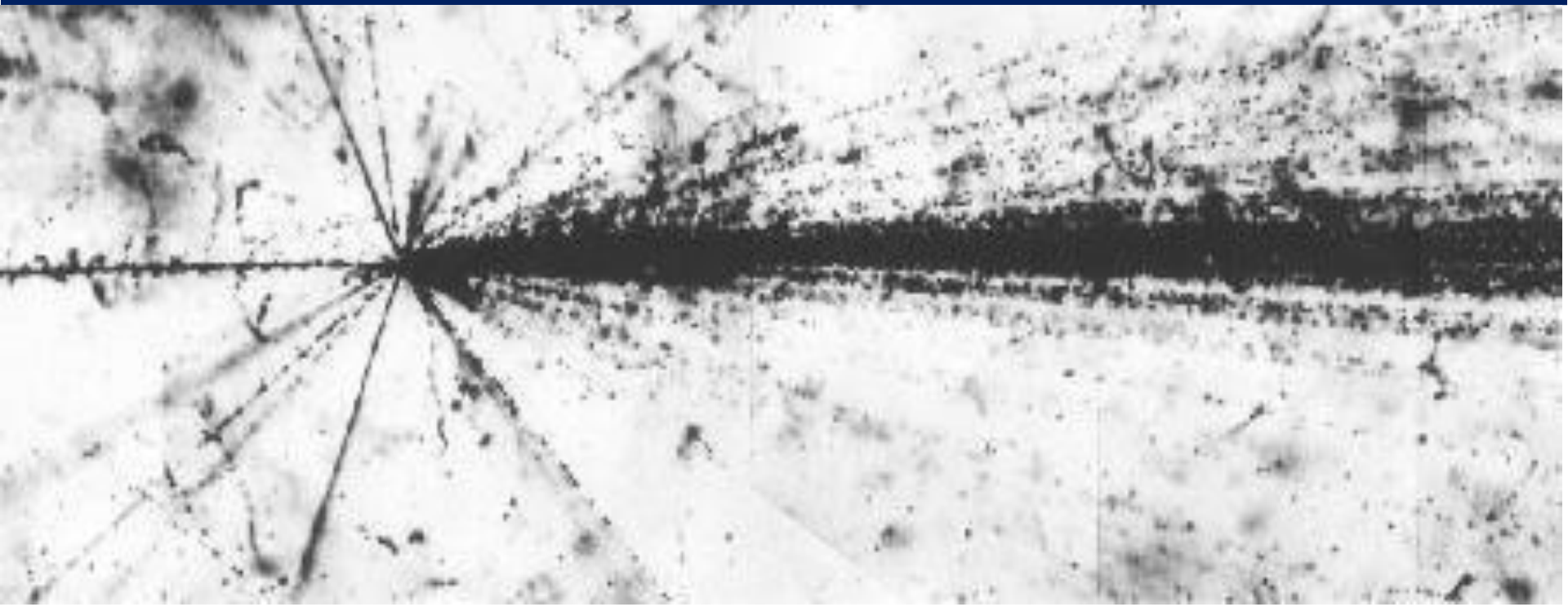
TR-HEP in Non-Collider Experiments

Yesterday, Today,...



TR-HEP History

- Experimental High Energy Physics research work in Turkey started in 1966, when Perihan Tolun who was a member of C. F. Powell's group in Bristol University, came to the physics department of METU and formed there the first experimental High Energy Physics group in Turkey.

- This new group was accepted by CERN on the same level as well-established, experienced groups from CERN members.

1934-2013

The First Experiment Turkish Group Joined

- *Measurement of the magnetic moment of the Δ-hyperon 1966-1970*

Ankara, CERN, Lausanne, Munich, Rome

A New Measurement of the Magnetic Moment of the Λ-Hyperon.

E. Dahl-Jensen (*), N. Doble (**), D. Evans (***), A. J. Herz, U. Liebermeister, Ph. Rosselet (*-*) and C. Busi
CERN - Genève

G. Önengüt and P. Tolun
Middle East Technical University - Ankara

M. Gailloud and R. Weill
Institut de Physique Nucléaire de l'Université - Lausanne (‡)

G. Hansl, A. Manz, W. Püschel and R. Settles
Max-Planck-Institut für Physik - München

G. Baroni, G. Romano and V. Rossi
Istituto Nazionale di Fisica Nucleare - Sezione di Roma
Istituto di Fisica dell'Università - Roma

The Hyperons produced in the $\pi^- + p \rightarrow \Lambda^0 + K^0$ and their decays were detected in nuclear emulsion. The exposure was made at CERN and the emulsion scanning and measurements were done in Ankara, CERN, Lausanne, Munchen and Rome.

- First PhD Thesis (1972): A Measurement of the Magnetic Moment of the Lambda Hyperon by Gülsen Önengut (METU)
- Advisor: Prof. Dr. Perihan Tolun

Charm Production in Neutrino Interactions

Ankara-Brussels-CERN-Dublin-London-Open U.-Pisa-Rome-Turin Collaboration
1978-1980

- The production and decay of a charmed particle has been observed in a ν induced reaction in nuclear emulsion.
- An emulsion stack exposed in front of BEBC to the wide-band neutrino beam at the CERN SPS.

ELSEVIER

Physics Letters B

Volume 87, Issue 3, 5 November 1979, Pages 287-291

First direct observation of the decay of neutral charmed particles produced by neutrinos in emulsion

Ankara-Brussels-CERN-U.C. Dublin-U.C. London-Open University-Pisa-Rome-Turin Collaboration, D
C. Angelini [b, i], P. Bagnaia [c, i], G. Baroni [c, i], J.H. Bartley [d, i], G. Bertrand-Coremans [e, i], V. Bisi [a, i], A
E.H.S. Burhop [d, g, i], F. Carena [g, i], R. Casali [b, i], G. Ciapetti [c, i], M. Conversi [c, g, i], D.H. Davis [d, i], S.
R. Fantechi [b, i], M.L. Ferrer [c, g, i, 1], C. Franzinetti [a, i], D. Gamba [a, i], L. Godfrey [d, i], D. Keane [f, i], E. La
Marzari [a, i], F. Marzano [c, i], A. Montwill [f, i], A. Nappi [b, i], C. Palazzi-Cerrina [c, g, i, 2], R. Pazzi [b, i], S. Petrera
Pierazzini [b, i], G. Romano [c, i], A. Romero [a, i], J. Sacton [e, i], R. Santonico [c, g, i], R. Sever [h, i], F.R. Stannard [i, 1], P.
Tolun [h, i], D.N. Tovee [d, g, i], P. Vilain [e, i, 3], J.H. Wickens [e, i, 4], G. Wilquet [e, i, 3]

[a] Istituto di Fisica dell'Universitá di Torino and INFN, Sezione di Torino, Italy
[b] Istituto di Fisica dell'Università di Pisa and INFN, Sezione di Pisa, Italy
[c] Istituto di Fisica dell'Università di Roma and INFN, Sezione di Roma, Italy
[d] University College, London, England
[e] Inter-University Institute for High Energies, ULB-VUB, Brussels, Belgium
[f] University College, Dublin, Ireland
[g] CERN, Geneva, Switzerland
[h] Middle East Technical University, Ankara, Turkey
[i] Open University, Milton Keynes, England

METU Group
Perihan Tolun
Ramazan Sever (PhD Student)

The CHARM II Experiment

(Brussels IIHE-CERN-Hamburg-Louvain-Moscow-Munich-Naples-Rome,YEFAM)

ELSEVIER

Physics Letters B

Volume 335, Issue 2, 1 September 1994, Pages 246-252

Precision measurement of electroweak parameters from the scattering of muon-neutrinos on electrons

CHARM II Collaboration, P. Vilain [a, 1], G. Wilquet [a, 1], R. Beyer [b], W. Flegel [b], H. Grote [b], T. Mouthuy [b, 2], H. Øveras [b], J. Panman [b], A. Rozanov [b, 3], K. Winter [b], G. Zacek [b], V. Zacek [b], F.W. Büsser [c], C. Foos [c], L. Gerland [c], T. Layda [c, 4], F. Niebergall [c], G. Rädel [c, 5], P. Stähelin [c], T. Voss [c], D. Favart [d], G. Grégoire [d], E. Knoops [d, 7], V. Lemaître [d], P. Gorbunov [e], E. Grigoriev [e], V. Khovansky [e], A. Maslennikov [e], W. Lippich [f], A. Nathaniel [f], A. Staude [f], J. Vogt [f], A.G. Cocco [g], A. Ereditato [g], G. Fiorillo [g], F. Marchetti-Stasi [g], V. Palladino [g], P. Strolin [g], A. Capone [h], D. De Pedis [h], U. Dore [h], A. Frenkel-Rambaldi [h], P.F. Loverre [h], D. Macina [h], G. Piredda [h], R. Santacesaria [h], E. Di Capua [i], S. Ricciardi [i], B. Saitta [i], B. Akkus [j, 8], E. Arik [j, 8], M. Serin-Zeyrek [j], R. Sever [j], P. Tolun [j], K. Hiller [k], R. Nahnhauer [k], H.E. Roloff [k]

[a] Inter-University Institute for High Energies (ULB-VUB), Brussels, Belgium
[b] CERN, Geneva, Switzerland
[c] Institut für Experimentalphysik, Universität, Hamburg, Germany[6]
[d] Université Catholique de Louvain, Louvain-la-Neuve, Belgium
[e] Institute for Theoretical and Experimental Physics, Moscow, Russian Federation
[f] Sektion Physik der Universität München, München, Germany[6]
[g] Dipartimento and Istituto Nazionale di Fisica Nucleare (INFN), Naples, Italy
[h] Università 'La Sapienza' and Istituto Nazionale di Fisica Nucleare (INFN), Rome, Italy
[i] Università di Ferrara and Istituto Nationale di Fisica Nucleare (INFN), Ferrara, Italy
[j] High Energy Physics Research Centre, YEFAM, Ankara, Turkey
[k] DESY - Institut für Hochenergiephysik, Zeuthen, Germany

YEFAM: Boğaziçi and METU
Perihan Tolun (Team Leader)
Engin Arık
Baki Akkuş
Meltem Serin-Zeyrek (PhD Student)

The study of muon-neutrino and muon-antineutrino scattering on electrons.

Spin Muon Collaboration (SMC)

SMC studied deep inelastic events of polarized muons on polarized deuterons and on polarized proton.

Data Taking: 1992-1993

ELSEVIER

Physics Letters B

Volume 336, Issue 1, 15 September 1994, Pages 125-130

Spin asymmetry in muon-proton deep inelastic scattering on a transversely-polarized target

Spin Muon Collaboration (SMC), D. Adams [s], B. Adeva [u], E. Arik [b], A. Arvidson [x], B. Badelek [x, z], M.K. Ballintijn [p], G. Bardin [t], G. Baum [a], P. Berglund [i], L. Betev [n], I.G. Bird [t, 1], R. Birsa [w], P. Björkholm [x], B.E. Bonner [s], N. de Botton [t], F. Bradamante [w], A. Bressan [w], A. Brüll [g, 3], S. Bültmann [a], E. Burtin [t], C. Cavata [t], M. Clocchiatti [w], M.D. Corcoran [s], D. Crabb [y], J. Cranshaw [s], M. Crawford [d], T. Çuhadar [b], S. Dalla Torre [w], R. van Dantzig [p], S. Dhawan [aa, aa], C. Dulya [c], A. Dyring [x], S. Eichblatt [s], J.C. Faivre [t], D. Fasching [r], F. Feinstein [t], C. Fernandez [u, j, ja], B. Frois [e, t], J.A. Garzon [u, j, ja], T. Gaussiran [s], M. Giorgi [w], E. von Goeler [q], G. Gracia [u], N. de Groot [p], M. Grosse Perdekamp [c], E. Gülmez [b], D. von Harrach [l], T. Hasegawa [o, 5], P. Hautle [f, 4], N. Hayashi [o, 11], C.A. Heusch [d], N. Horikawa [o], V.W. Hughes [aa], G. Igo [c], S. Ishimoto [o, 6], T. Iwata [o], E.M. Kabuß [l], R. Kaiser [g], A. Karev [k], H.J. Kessler [g], T.J. Ketel [p], A. Kishi [o], Yu. Kisselev [k], L. Klostermann [p], D. Krämer [a], V. Krivokhijine [k], V. Kukhtin [k], J. Kyynäräinen [e, i], M. Lamanna [w], U. Landgraf [g], K. Lau [j, ja], T. Layda [d], J.M. Le Goff [t], F. Lehar [t], A. de Lesquen [t], J. Lichtenstadt [v], T. Lindqvist [x], M. Litmaath [p], S. Lopez-Ponte [u, j, ja], M. Lowe [s], A. Magnon [e, t], G.K. Mallot [l, e], F. Marie [t], A. Martin [w], J. Martino [t], T. Matsuda [o, 5], B. Mayes [j, ja], J.S. McCarthy [y], K. Medved [ja], G. van Middelkoop

Miller [r], K. Mori [o], J. Moromisato [q], A. Nagaitsev [ja], J. Nassalski [z], L. Naumann [e], T.O. Niinikoski [e], J.E.J.

D.P. Parks [j, ja], A. Penzo [w], C. Perez [u], F. Perrot-Kunne [t], D. Peshekhonov [ja], R. Piegaia [e, aa, 7], L.

Platchkov [t], M. Plo [u], D. Pose [ja], H. Postma [p], J. Pretz [ℓ], T. Pussieux [t], J. Pyrlik [j, ja], I. Reyhancan [b],

A. Rijllart [e], J.B. Roberts [s], S. Rock [e, 9], M. Rodriguez [u], E. Rondio [z], A. Rosado [n], I. Sabo [v], J.

ert [n],

olders [m], R

[a] University

[b] Bog˘azi[12]

Boğaziçi University

Engin Arık (Team Leader)

Taylan Akdoğan

Erhan Gülmez

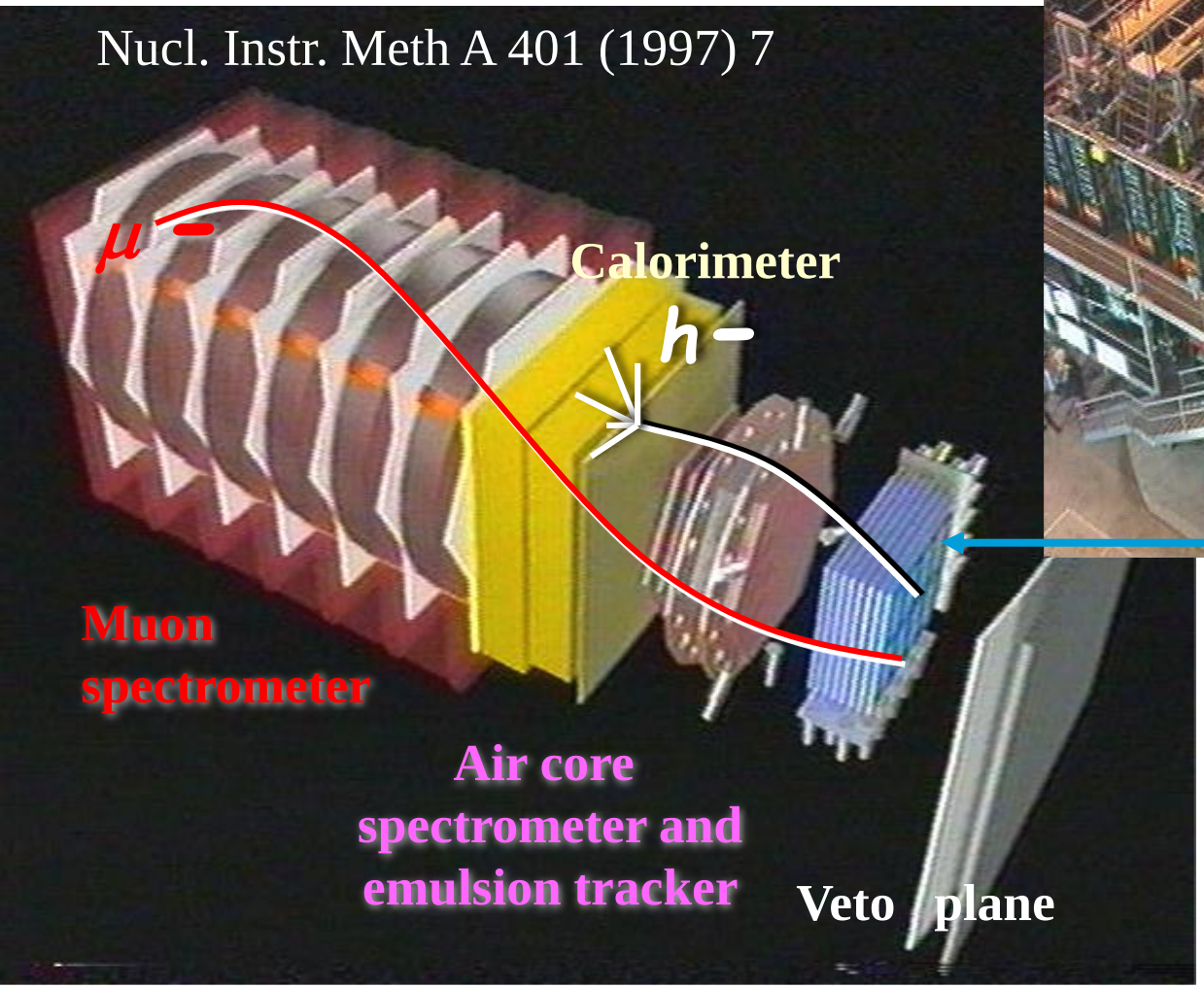
Cenap Özben

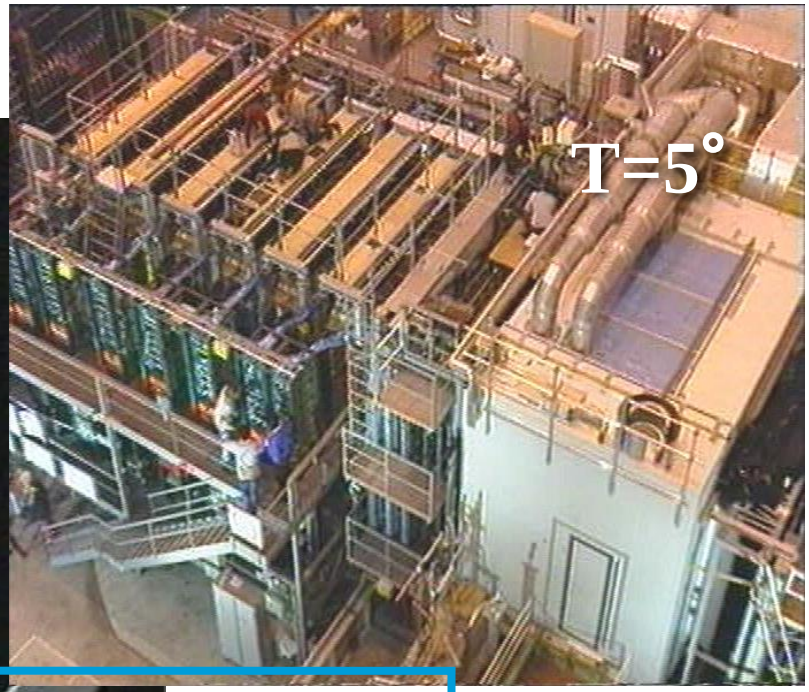
Tülay Çuhadar (Ms Student)

Partially supported by TUBITAK and the Centre for Turkish-Balkan Physics Research and Application (Bogaziçi University).

The CHORUS Experiment

Data Taking: 1994-1998





770 kg emulsion target and scintillating fibre tracker

The CHORUS Experiment

- **Funded by TUBITAK 1992-1996**

Boğaziçi University
- Engin Arık (Team Leader)
- Inanc Birol
- A.A. Mailov

METU Group
- Perihan Tolun (Team Leader)
- Ramazan Sever
- Meltem Serin-Zeyrek
- Mehmet Zeyrek
- A. Murat Güler (PhD Student)
- Erhan Pesen (PhD Student)
- Umut Köse (PhD Student)
- Ahmet Sedat Ayan (Ms Student)
- Sami Kama (Ms Student)
- Volkan Cuha (Ms Student)

Çukurova University
- Gülsen Önengüt (Team Leader)
- Eda Eşkut
- Ayse Kayış-Topaksu (PhD Student)

The CHORUS Experiment: Contributions

- Phase-I : $\nu_\mu \rightarrow \nu_\tau$ Oscillations
  - Design and production of ligth guides (METU)
  - Data taking and Analysis (BU,CU and METU)

- Phase-II : Neutrino Charm Production
  - First study in Phase II PhD Thesis: Neutral D-meson production (A. Murat Güler)
  - *CHORUS event selection contact* (Ali Murat Güler, METU)
  - Data Analysis and MC Simulation (CU, METU)

The last paper published in 2011

Measurement of charm production in neutrino charged-current interactions by CHORUS collaboration, New J. Phys.13:093002 (2011) .

The CHORUS Experiment: Contributions

2nd National Particle Accelerators and Applications Congress, 7-9 June 2004, Ankara

Talk given by Dr. J. ELLIS, "Contribution of Turkish Scientists to Experiments at CERN"

Turkish high-energy physicsts have been active in many experiments at CERN. A notable example has been CHORUS for which Turkish high-energy physicsts made several important contributions to the analysis.

COLLABORATION

High-energy physics gets accelerated in Turkey

Participants at the UPHUK-2 conference.

Turkey has been a CERN Observer State since 1986, and Turkish high-energy physicists have been active in many experiments at CERN. A notable example has been CHORUS, for which Turkish high-energy physicists made several important contributions to the analysis. Now they are involved in preparing the CMS and ATLAS experiments for the Large Hadron Collider, and in parallel a group of nuclear physicists plans to participate in the ALICE experiment.

These were among the topics discussed at the second Turkish National Accelerators and Applications Conference (UPHUK-2), organized in Ankara this year by the Chamber of Commerce of Ankara and the Turkish Atomic Energy Authority. The meeting also discussed the prospects for a Turkish Accelerator Complex (TAC), as well as medical and industrial applications of accelerators. Subsequently a TAC group from Ankara visited CERN with a view to participating in R&D on the Compact Linear Collider project, CLIC.

The Turkish high-energy physics community is now formulating proposals for developing the relationship between Turkey and CERN. This was discussed during a visit to CERN by the acting president of the Scientific and Technical Res (TUBITAK), N Omer Cebeci

CERN Courier Nov 24, 2004

The CHORUS Experiment: Thesis

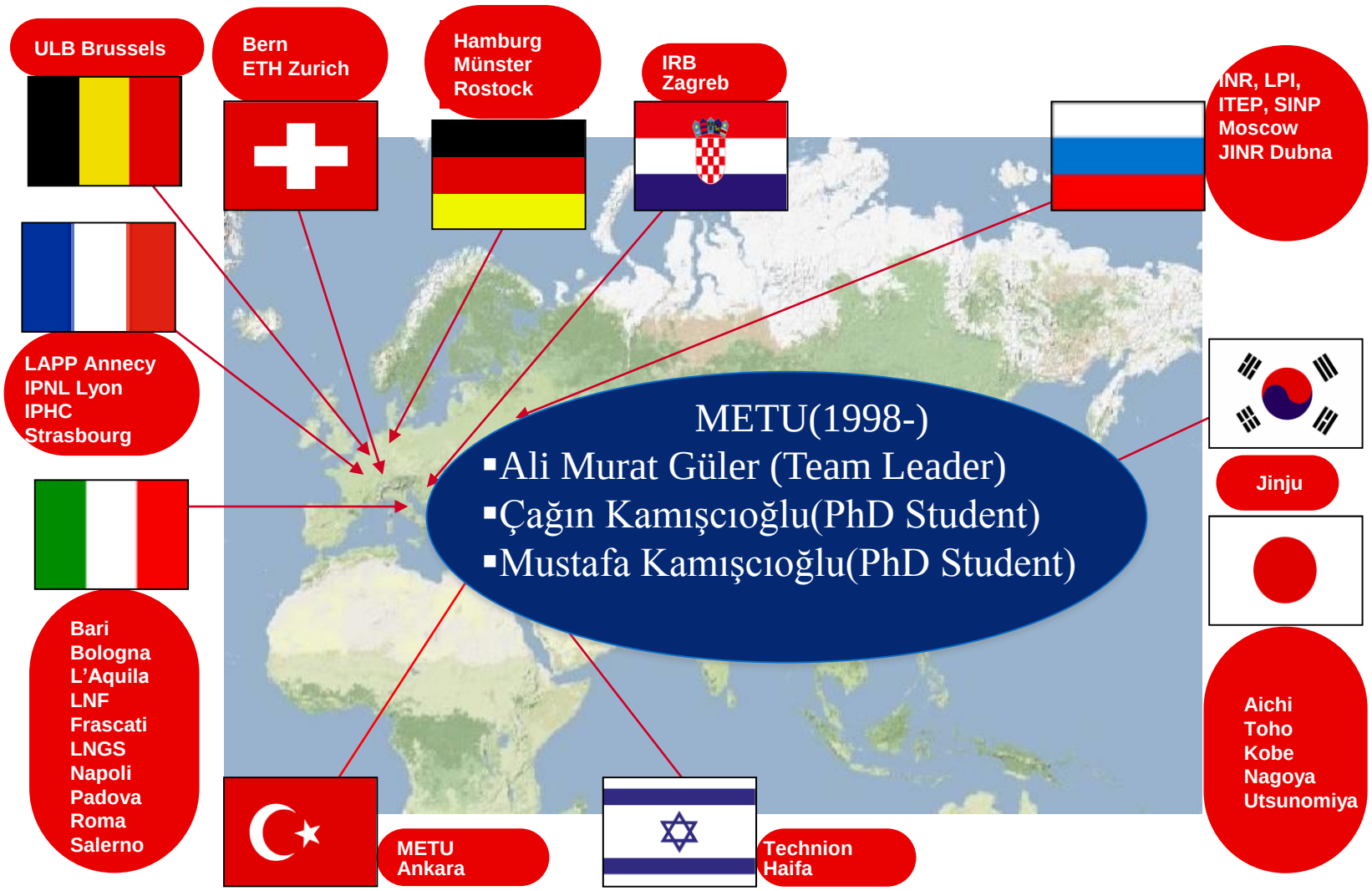
1996-2006
4 PhD + 4 Ms Thesis

- Erhan Pesen **PhD Thesis** (Advisor: Prof. Dr. Perihan Tolun) *Oscillation search study using tau-to-electron decay channel in the chorus experiment* (1997) METU
- Aysel Kayış-Topaksu **PhD Thesis** (Advisor: Prof. Dr. Gülsen Önengut) A Study On Increasing the Sensitivity of the CHORUS Neutrino Detector(1999) Cukurova University.
- A. Murat Güler **PhD Thesis** (Advisor: Prof.Dr. Perihan Tolun) *D^0 production rate measurement in neutrino interaction and a limit on muon neutrino to tau neutrino oscillation by M. Güler* **PhD Thesis** CERN-THESIS- 2002-027 (2000) METU.
- Umut Köse, **PhD Thesis** (Advisor: Prof. A. Murat Güler), *Antineutrino Charm Production and Pentaquark Search in the CHORUS Experiment* (2006) METU.
- Aysel Kayış-Topaksu Ms Thesis (Advisor: Prof. Dr. Gülsen Önengut) CHORUS Nötrino Osilasyon Deneyinde Kullanılan Muon Spektrometresinin Simülasyonu(*1995)* Cukurova University
- Ahmet Sedat Ayan Ms Thesis (Advisor: Prof. Perihan Tolun) . *A technique for observation of neutrino oscillations (1996)* METU.
- Sami Kama Ms Thesis (Advisor: Prof.Dr. Meltem Serin) . Measurement of (anti-) neutrino-nucleon structure functions in chorus experiment (2005) METU.
- Volkan Çuha Ms Thesis (Advisor: Prof. A. Murat Güler), *Study of Neutrino Interactions in the CHORUS Experiment* (2006) METU.

Present...

- The OPERA Experiment (1998-)
- The CAST Experiment (2000-)
- The TEXONO Experiment (2005-)
- AMS-02 (2011-)
- The CDEX Experiment (2017-)

The OPERA Experiment

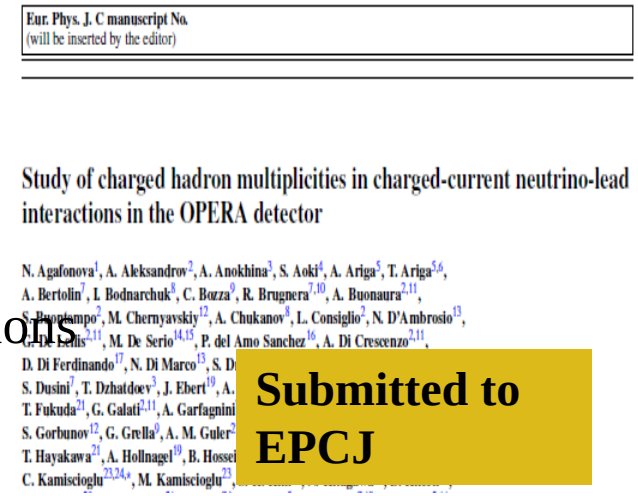


METU joined to the collaboration from the beginnig (1998-)

METU group was partially supported by TUBITAK (Project No:**108T324**)

The OPERA Experiment: Contributions

- Detector Construction
  - Construction of Emulsion Refreshing facility in Gran Sasso
- Data Taking
  - CS film Scanning and Analysis(Gran Sasso), 2008-2013.
  - Emulsion Film Scanning and Analysis(METU) 2012-2016
- MC Simulation
  - D^0 background to neutrino oscillations
  - Study vertexing efficiency and purity
  - Responsible from reconstruction algorithms
- Data Analysis
  - Charm production and decay in neutrino interactions
  - Multiplicity distributions in neutrino interactions

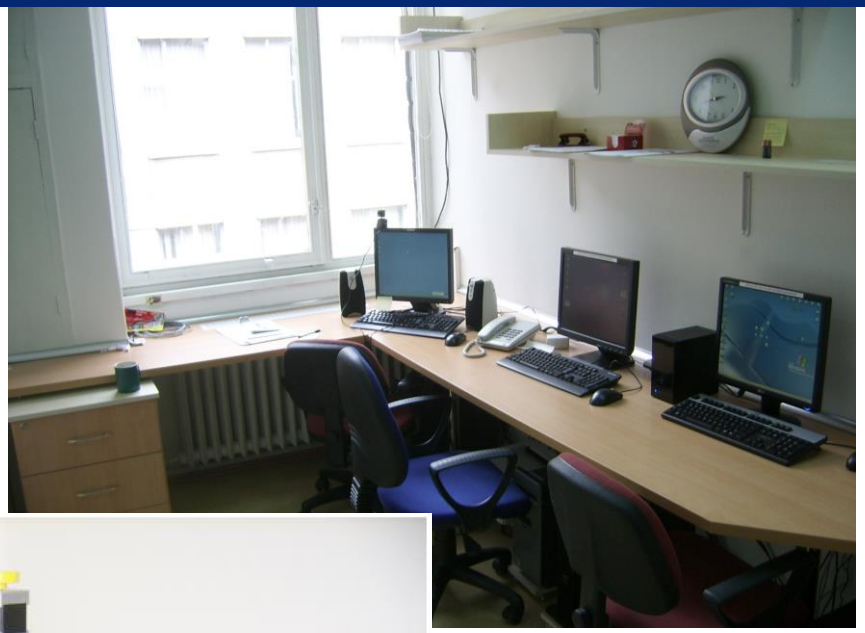

Eur. Phys. J. C manuscript No.
(will be inserted by the editor)

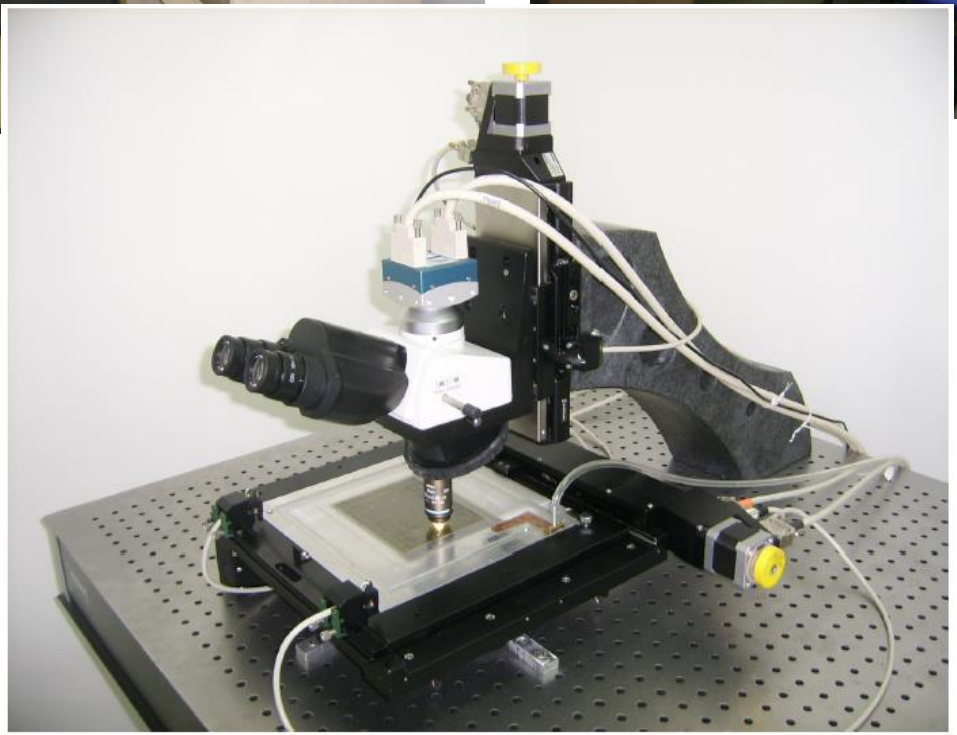
Study of charged hadron multiplicities in charged-current neutrino-lead interactions in the OPERA detector

N. Agafonova[1], A. Aleksandrov[2], A. Anokhina[3], S. Aoki[4], A. Ariga[5], T. Ariga[5,6], A. Bertolin[7], L. Bodnarchuk[8], C. Bozza[9], R. Brugnera[7,10], A. Buonaura[2,11], S. Buontempo[2], M. Chernyavskiy[12], A. Chukanov[8], L. Consiglio[2], N. D'Ambrosio[13], G. De Lellis[2,11], M. De Serio[14,15], P. del Amo Sanchez[16], A. Di Crescenzo[2,11], D. Di Ferdinando[17], N. Di Marco[13], S. D[illegible], S. Dusini[7], T. Dzhatdoev[3], J. Ebert[19], A. [illegible], T. Fukuda[21], G. Galati[2,11], A. Garfagnini[illegible], S. Gorbunov[12], G. Grella[9], A. M. Guler[illegible], T. Hayakawa[21], A. Hollnagel[19], B. Hosse[illegible], C. Kamiscioglu[23,24,*], M. Kamiscioglu[23], [illegible]

Submitted to EPCJ

Emulsion Scanning Lab. @METU





The OPERA Experiment: Thesis

2 PhD + 5 Ms Thesis

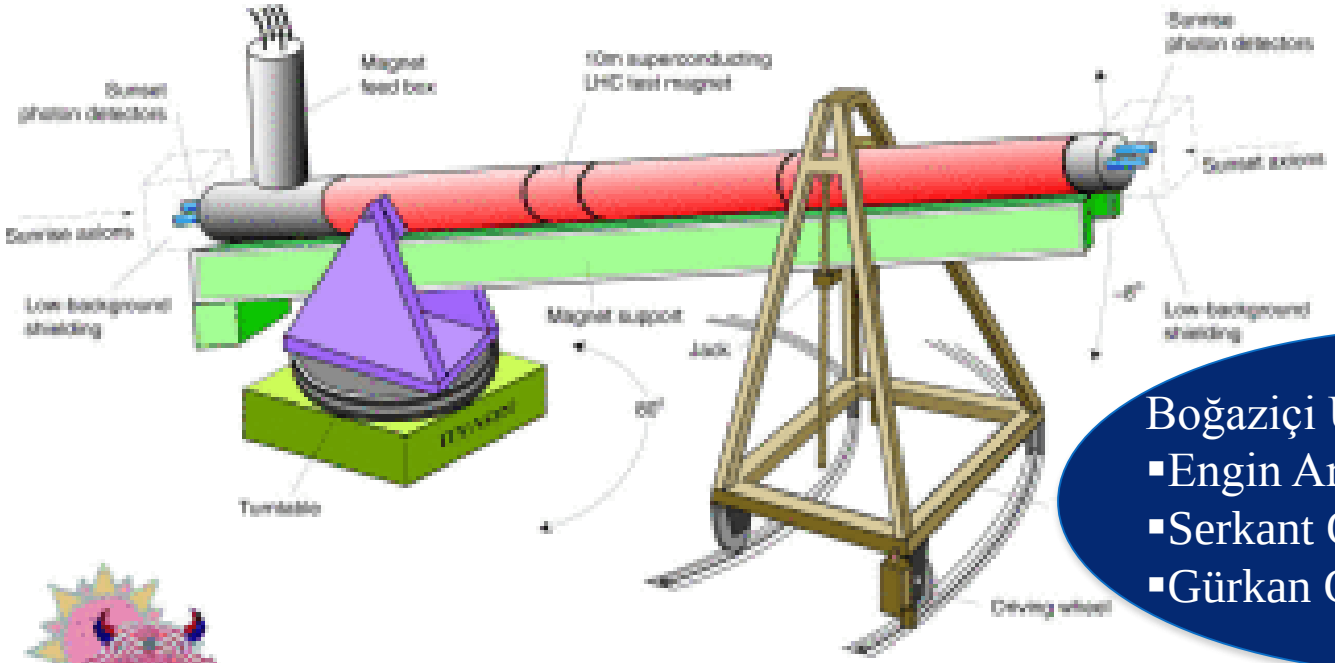
- **Çağın Kamışcıoğlu (PhD Thesis) Charged particle Multiplicities in neutrino interactions (2017).**
- **Mustafa Kamışcıoğlu (PhD ongoing) Search for short-lived particles in the OPERA experiment (2018).**
- Fatih Bay (Ms Thesis) Study of Electron Identification in the OPERA Detector(2008).
- Serhan Tufanlı (Ms Thesis) D^0 Background to Neutrino Oscillations in the OPERA Experiment (2009).
- Özgür Altınok (Ms Thesis) High-Speed Automatic Scanning System For Emulsion Analysis in the OPERA Experiment (2011).
- Behzad Hosseini (Ms Thesis) Neutrino Interaction Analysis with an Automatic Scanning System in the OPERA Experiment (2012).
- Mustafa Kamışcıoğlu Ms Thesis "Analysis of Neutrino Interactions in the OPERA Experiment" (2012).

The OPERA Collaboration Meeting

- **The OPERA Collaboration Meeting**
  April 1- 4, 2009 @ METU, Ankara

The CAST Experiment

- The CERN Axion Solar Telescope (CAST) aims to search for axions originating from the Sun's core, or relic axions /axion-like particles, transforming CAST to an antenna for relics.



Cern Axion Solar Telescope

Boğaziçi University(2000-2002)
- Engin Arık
- Serkant Çetin
- Gürkan Çelebi

No funding was found.
Had to leave collaboration because of lacking financial resources

The CAST Experiment: Status

- 2005-2015, Doğuş University, TL: Serkant Çetin
  - 2005-2007: University signed and paid for MoU (This is the first time a Turkish university signs an MoU with CERN)
  - 2008-2010: TAEK signed and paid for MoU
  - 2007-2010: TAEK funding project for travel
  - 2011-2014: TAEK did **NOT** sign MoU & no university resources
  - 2011-2013: TAEK funding project for travel
- 2015-now, Bilgi University, TL: Serkant Çetin
  - 2016-2018: University signed and pays for MoU

Current team:

1 senior, 1 engineer, 1 grad. student

The CAST Experiment: Activities

- Micromegas detectors maintanence and operation
- Data analysis of micromegas detectors
- Setting up daily fast analysis results of micromegas detectors
- Simulation of detection power of paraphotons
- Grid measurements for allignment of the magnet
- CFD* simulations of the gas in the cold bore
- KWISP** setup and operation
- KWISP data analysis

- Shifts during data taking shifts
- Run coordination
- Slow control
- Experiment contact person
- CAST web pages
- CAST e-groups
- Several conference talks

*** CFD: Computational Fluid Dynamics**

**** KWISP: Kinetic Weakly Interacting Sub-eV Particle Detection)**

The CAST Experiment: Thesis

✓ PhD

- Unfinished: Özgen Berkol Doğan (deceased end of 2007)
- 2013: Cenk Yıldız

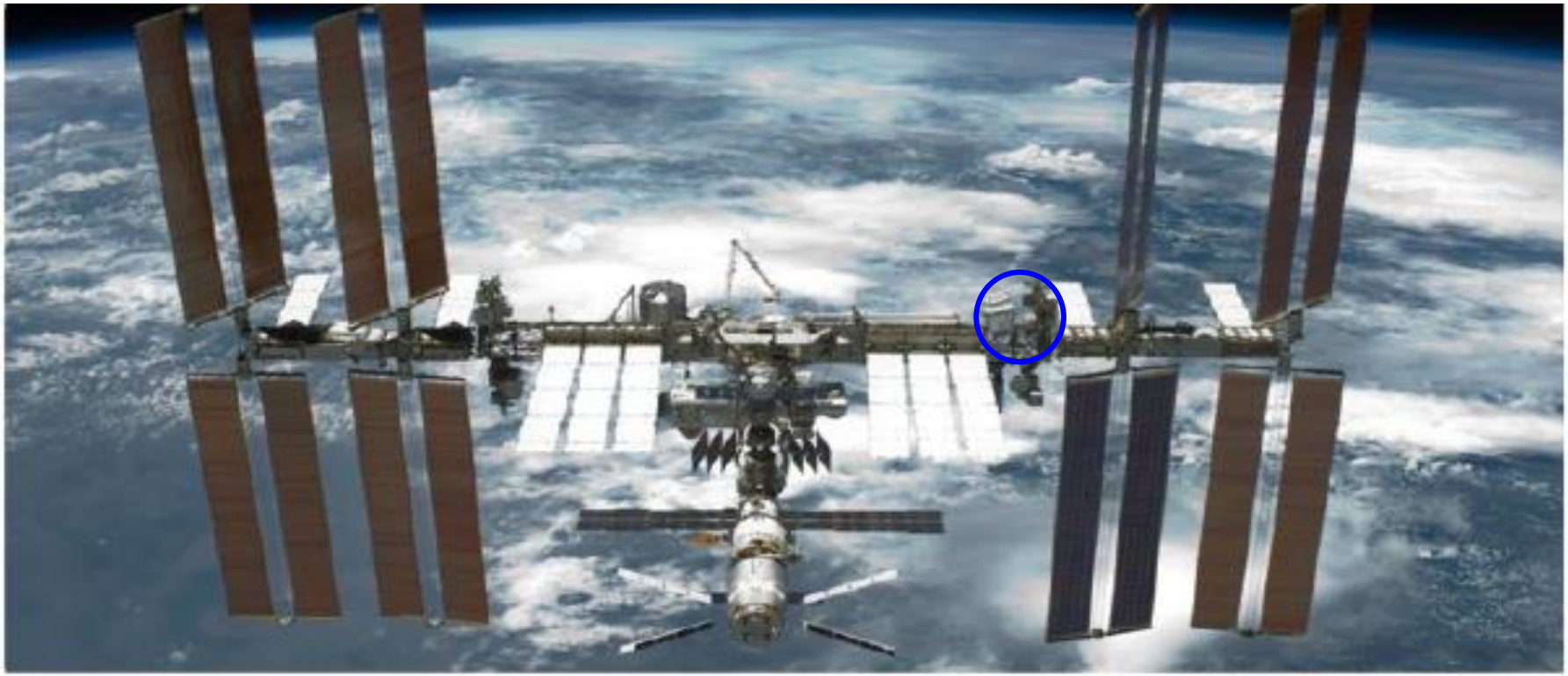
✓ MSc

- 2006: Özgen Berkol Doğan
- 2008: Cemile Ezer*
- 2008: Fulya Çifter*
- 2010: Umut Deniz Özuğurel
- 2017: Arif Bayır

* *Thesis on the theory of axions but the students were actively involved in operations.*

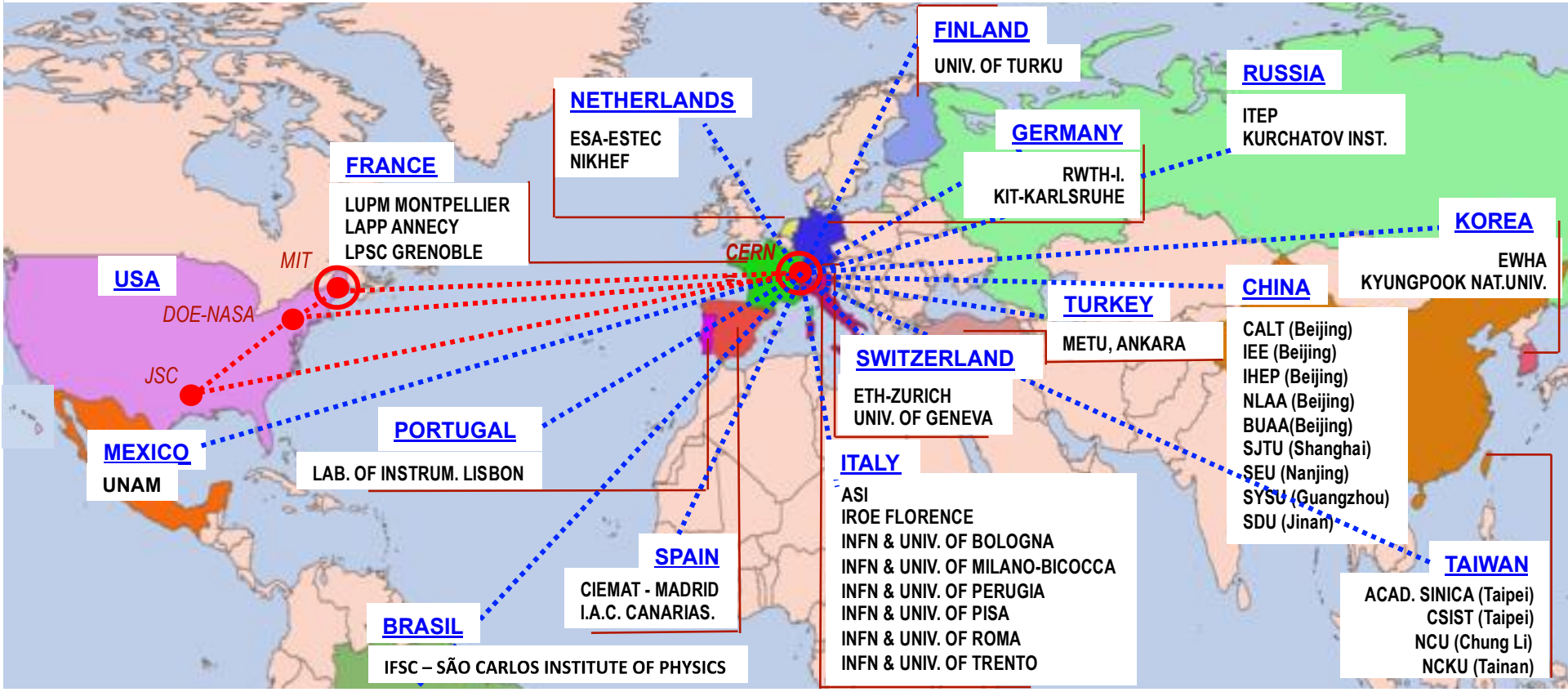
AMS-02

- The Alpha Magnetic Spectrometer (AMS-02). Main motivation is to study the universe and its origin by searching for antimatter, dark matter while performing precision measurements of cosmic rays composition and flux.



- **AMS-02 is taking data on the International Space Station since May 2012**

AMS-02



METU(2011-)

- Bilge Demirköz (Team Leader)
- 4 physicists, 5 engineers, 2 technicians
- 2 PhD + 2 Ms students.

Group activities:

- Both Calorimetric and conversion-mode photon flux measurement.
- Positron/electron ratio.
- Proton flux and its variability.
- Shadow of the moon in cosmic rays

The TEXONO Collaboration

Taiwan EXperiment On NeutrinO

Program: Low Energy Neutrino & Astroparticle Physics

Collaboration : Taiwan (AS, INER, KSNPS, NTU) ; China (IHEP, CIAE, THU, NJU) ; Turkey (DEU, METU) ; USA (UMD)

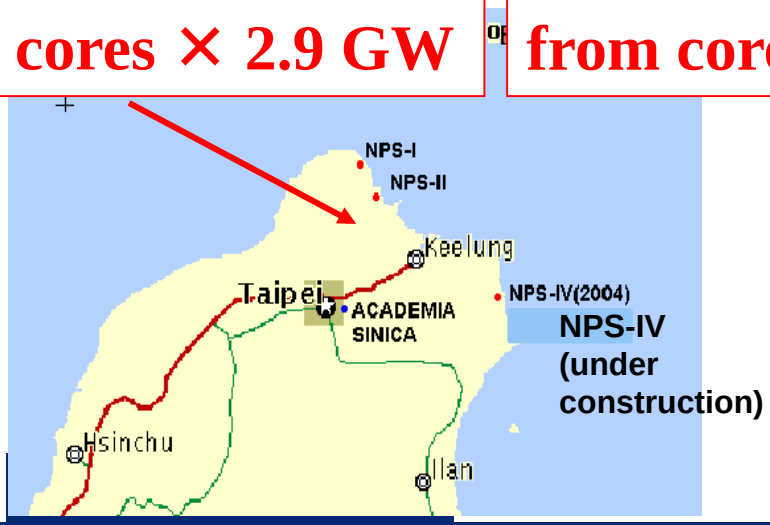
M. Deniz , M. Ağartıoğlu, A. Ajjaq, S. Kerman, B. Sevda , A. Sonay,

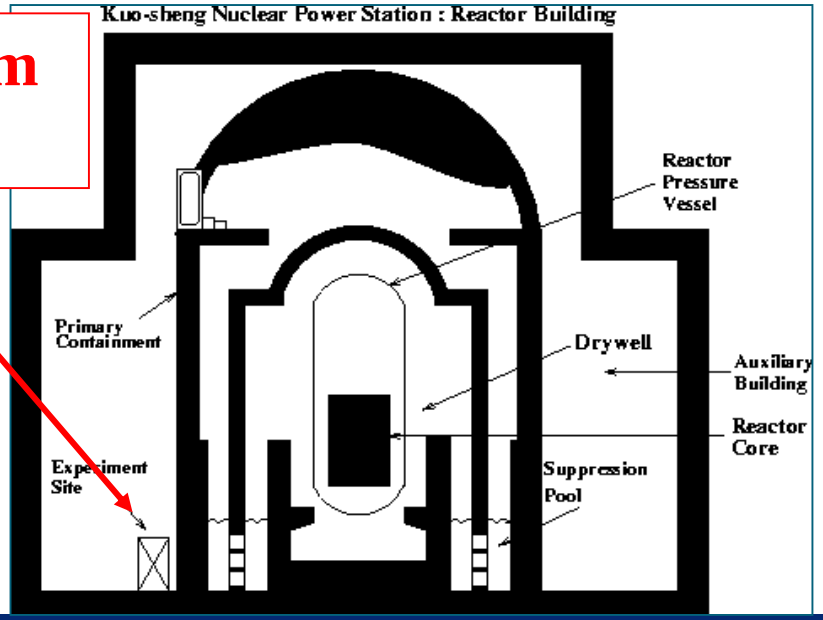
M. Serin, M. Zeyrek

➢ **Kuo-Sheng (KS) Reactor Neutrino Laboratory**

KS NPS-II :
2 cores × 2.9 GW

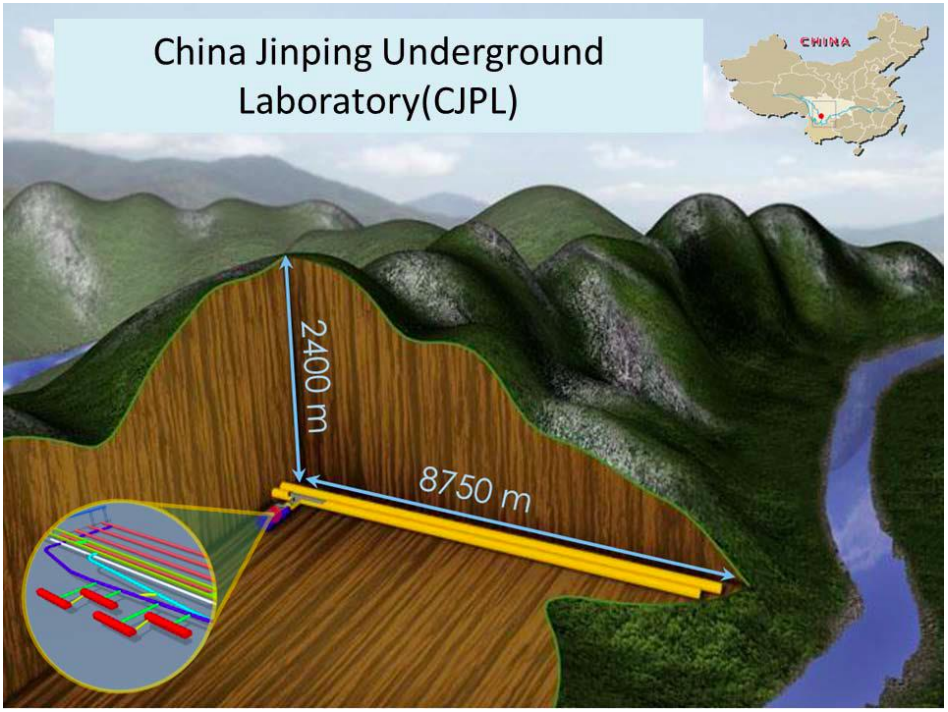
KS ν Lab: 28 m from core#1

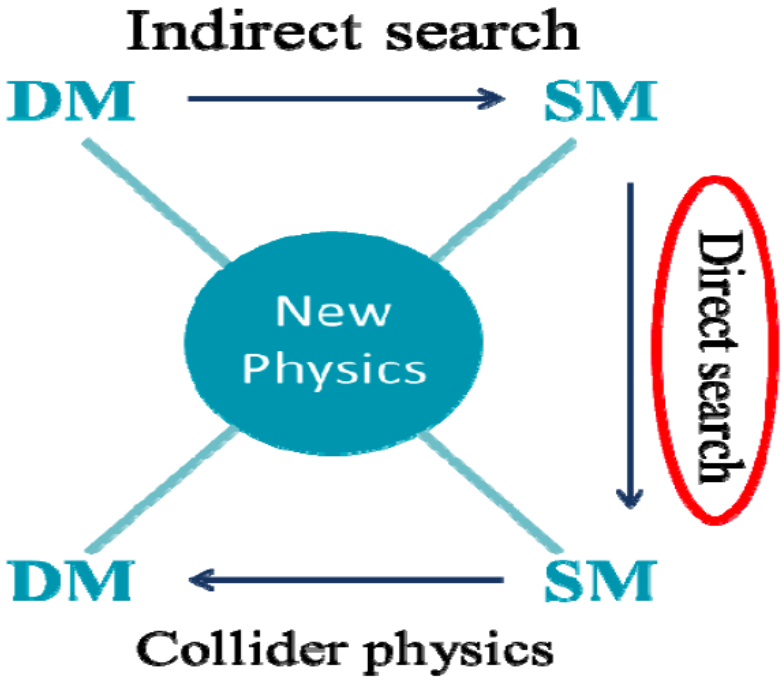




The CDEX Experiment

- China Dark matter EXperiment





DEU (2017-)
- M. Deniz

CDEX: direct detection of low mass dark matter with PCGe at China JinPing underground Laboratory(CJPL).

Future ...

- The NEWSdm Experiment (2018-)
- ESSνSB (2018-2021)
- The SHiP Experiment (2021-)
- The LEGEND Experiment (2021-)

The NEWSdm Experiment

LNGS-LOI 48/15

NEWS: Nuclear Emulsions for WIMP Search
Letter of Intent
(NEWS Collaboration)

A. Aleksandrov[b], A. Anokhina[n], T. Asada[k], D. Bender[p], I. Bodnarchuk[m], A. Buonaura[b,h], S. Buontempo[b], M. Chernyavskii[o], A. Chukanov[m], L. Consiglio[b,h], N. D'Ambrosio[e], G. De Lellis[b,h], M. De Serio[a,g], A. Di Crescenzo[b,h], N. Di Marco[e], S. Dmitrievski[m], T. Dzhatdoev[s], R. A. Fini[a], S. Furuya[k], G. Galati[b,h], V. Gentile[b,h], S. Gorbunov[o], Y. Gornushkin[m], A. M. Guler[p], H. Ichiki[k], C. Kamiscioglu[p], M. Kamiscioglu[p], T. Katsuragawa[k], M. Kimura[k], N. Konovalova[o], K. Kuge[j], A. Lauria[b,h], P. Loverre[d,j], S. Machii[k], A. Managadze[n], P. Monacelli[d,j], M. C. Montesi[b,h], T. Naka[k], M. Nakamura[k], T. Nakano[k], A. Pastore[a,g], D. Podgrudkov[n], N. Polukhina[o], F. Pupilli[f], T. Roganova[n], G. Rosa[d,j], O. Sato[k], T. Shchedrina[o], S. Simone[a,g], C. Sirignano[c,i], A. Sotnikov[m], N. Starkov[o], P. Strolin[b,h], Y. Tawara[k], V. Tioukov[b], A. Umemoto[k], M. Vladymyrov[o], M. Yoshimoto[k], S. Zemskova[m]

[a]*INFN Sezione di Bari, Bari, Italy*
[b]*INFN Sezione di Napoli, Napoli, Italy*

- Directional dark matter search with solid tracking detector (3∼4 g/cm^3), spin independent search.

~60 physicists

https://arxiv.org/abs/1604.04199

Italy
- Napoli University "Federico II"
- LNGS – INFN
- Bari University
- Roma University "La Sapienza"

Japan
- Nagoya University
- Chiba University

Russia
- JINR Dubna
- Moscow State University
- Lebedev Physical Institute

Turkey
- METU

Design Study of ESSvSB

European Spallation Source Neutrino Super-Beam

- Discovery and measurement of leptonic CP violation using an intensive neutrino Super Beam generated with the exceptionally powerful ESS linear accelerator.

Approved (2018-2021)

N.	Proposer name	Country
1	CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE CNRS	FR
2	UPPSALA UNIVERSITET	SE
3	KUNGLIGA TEKNISKA HOEGSKOLAN	SE
4	EUROPEAN SPALLATION SOURCE ERIC	SE
5	UNIVERSITY OF CUKUROVA	TR
6	UNIVERSIDAD AUTONOMA DE MADRID	ES
7	NATIONAL CENTER FOR SCIENTIFIC RESEARCH "DEMOKRITOS"	EL
8	ISTITUTO NAZIONALE DI FISICA NUCLEARE	IT
9	RUDER BOSKOVIC INSTITUTE	
10	SOFIISKI UNIVERSITET SVETI KLIM	
11	LUNDS UNIVERSITET	
12	AKADEMIA GORNICZO-HU STASZICA W KRAKOWIE	
13	EUROPEAN ORGANIZAT	
14	UNIVERSITE DE GENEVE	
15	UNIVERSITY OF DURHAM	
	Total:	

Çukurova University

- Aysel Kayış-Topaksu(Team Leader)
- Gül Gokbulut

Modification of the ESS linac to produce neutrinos

The SHiP Experiment

➢SHiP (Search for Hidden Particles) is a new proposed fixed-target experiment at the CERN SPS accelerator to search for hidden, very weakly interacting new particles.

➢At the same time, also ideal for ν_τ physics.

EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH (CERN)

SHiP

CERN-SPSC-2015-016
SPSC-P-350
8 April 2015

Technical Proposal

A Facility to Search for Hidden Particles (SHiP) at the CERN SPS

The SHiP Collaboration[1]

arXiv:1504.04956v1 [physics.ins-det] 20 Apr 2015

Abstract

A new general purpose fixed target facility is proposed at the CERN SPS accelerator which is aimed at exploring the domain of hidden particles and make measurements with tau neutrinos. Hidden particles are predicted by a large number of models beyond the Standard Model. The high intensity of the SPS 400 GeV beam allows probing a wide variety of models containing light long-lived exotic particles with masses below $\mathcal{O}(10)$ GeV/c^2, including very weakly interacting low-energy SUSY states. The experimental programme of the proposed facility is capable of being extended in the future, e.g. to include direct searches for Dark Matter and Lepton Flavour Violation.

METU

- Ali Murat Güler(Team Leader)
- Akif Korkmaz (PhD Student)
- Atakan Akmete (Ms Student)
- Onur Durhan (Ms Student)

- The group has not funding commitments yet.
- Group activities:
  - Test Beam Studies
  - MC Simulation

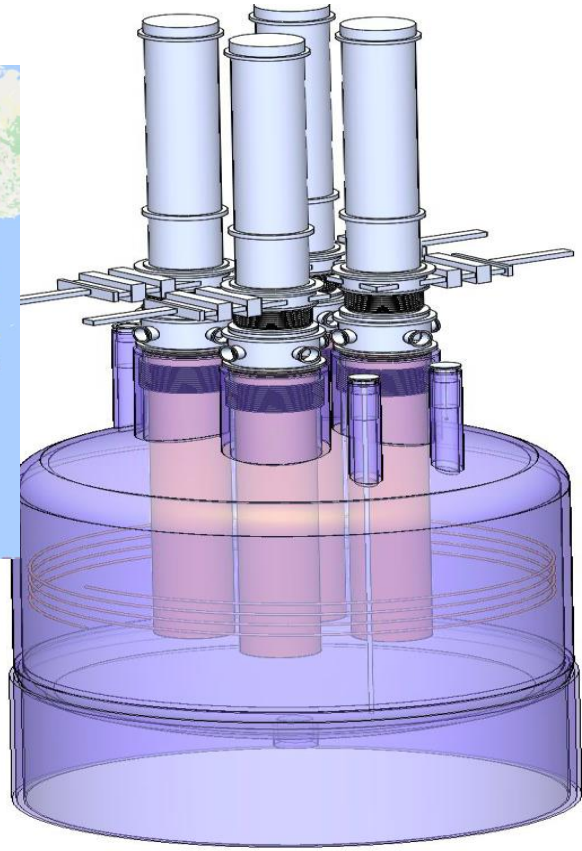
Ankara University

- Ali Ulvi Yılmazer(Team Leader)
- Deniz Yılmaz
- Çağın Kamışcıoğlu

The LEGEND Experiment

Large Enriched Germanium Experiment for Neutrinoless ββ Decay (2021-)

"The collaboration aims to develop a phased, Ge-76 based double-beta decay experimental program with discovery potential at a half-life significantly longer than 10^{27} years."



DEU (2017-)

- M. Deniz(Team Leader)
- M. Agartioglu
- A. Ajjaq
- A. Sonay

Summary

- Turkish high-energy physicsts have been active in many experiments in past and present.
- Turkish groups have made important contributions to the experiments.
- Turkish groups plan to participate in future experiments.
- Mechanism and funding are critical issues.