

# Introduction to the Greek Participation at CERN

**Costas Foudas – Scientific delegate of Greece at CERN**

# Physics Departments in Greece with HEP Communities

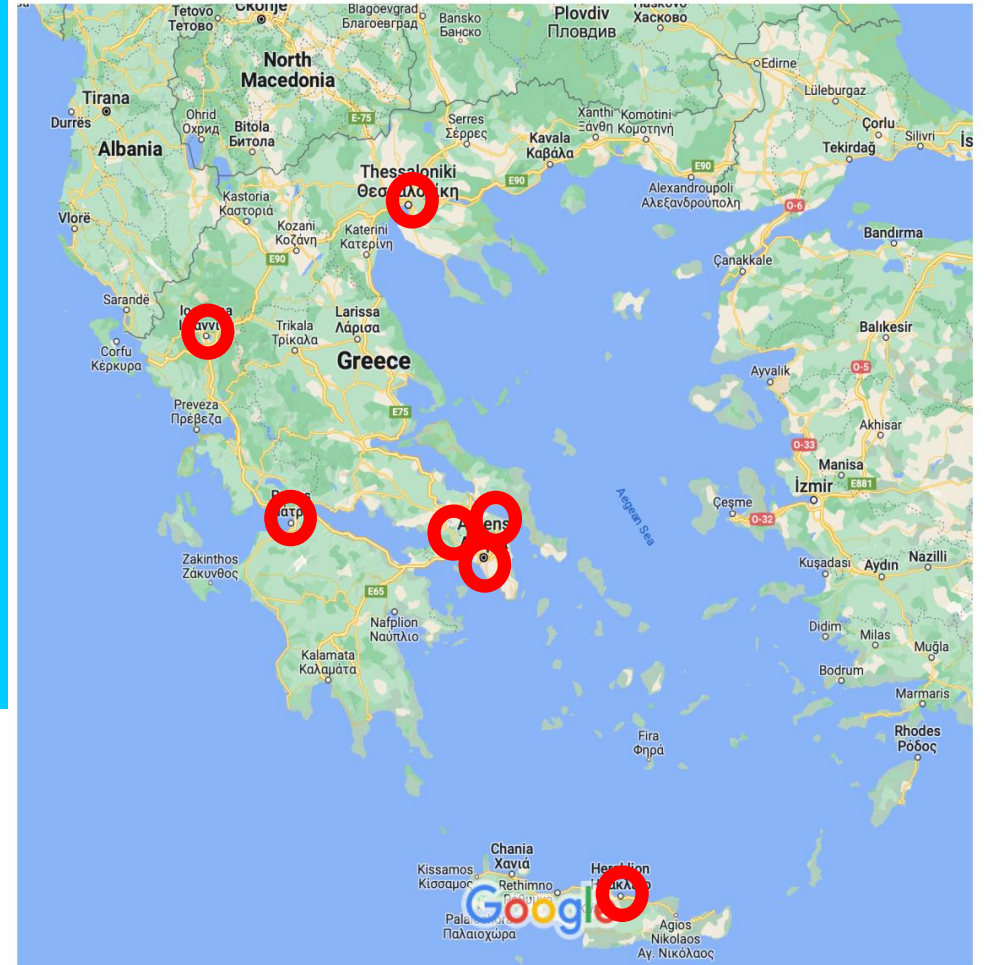
- National Kapodistrian University of Athens - NKUA
- National Technical University of Athens - NTUA
- University of Crete - UoC
- Institute of Nuclear and Particle Physics – Democritos - INPP
- Aristotle University of Thessaloniki - AUTH
- University of Ioannina - Uoi
- University of Patras - UoP
- Faculty from Open University and University of Thessaly are participating via AUTH and faculty from University of Aegean are participating via NKUA

## • 37 hep-ex Faculty in:

- ATLAS: 15
- CMS: 15
- ALICE: 1
- KM3Net: 3
- nTOF: 3

## • 25 hep-th/ph Faculty in:

- AUTH: 2
- NKUA: 6
- NTUA: 5
- Uoi: 5
- UoP : 2
- UoC: 3
- INPP: 2



**The community has been decimated during the financial crisis when there was a hiring freeze and of those retiring were not replaced.**

# Experiments and R&D

- **ATLAS:** Data Analysis, Muon Detector, New Small Wheel, L1 Trigger/DAQ – NKUA, NTUA, AUTH, INPP
  - **CMS:** Data Analysis, Preshower, Silicon Tracker, L1 Muon Trigger – NKUA, NTUA, INPP, UoI
  - **ALICE:** Data analysis – NKUA
  - **CAST:** Completed in 2022, significant contributions to Axion physics – Up, INPP
  - **nTOF:** Neutron cross section measurements for nuclear astrophysics, energy and medical applications: UoI, NTUA
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- **RD-51:** R&D in Gaseous detectors: NTUA, INPP, AUTH, NKUA
  - **RD-50:** R&D in Silicon detectors: INPP
  - **L1 Trigger** R&D: UoI, NKUA
  - **Accelerator:** AUTH
  - **DRD3** Silicon detectors: NTUA, INPP, UoI, NKUA
  - **DRD1** Gaseous detectors: NTUA, INPP, AUTH

# Physics Education in Greece: Statistical data

# Undergraduates admitted in Physics Departments

HEI/Year	2017	2018	2019	2020	2021	2022
NKUA	267	290	318	282	241	230
NTUA	46	63	78	50	68	58
UoI	160	160	160	160	160	52
AUTH	253	245	284	260	213	161
UoC	167	181	173	56	63	57
UoP	200	200	200	200	200	156
TOTAL	1093	1139	1213	1008	901	714

- The decrease observed in 2022 has two reasons
  - The departments were allowed to set admission thresholds themselves and they are still optimizing their criteria
  - There may be other reasons such as competition with other disciplines which may offer better job opportunities but this is under investigation

# Undergraduates Selecting HEP/Nuclear Physics

HEI/Year	2017	2018	2019	2020	2021	2022	FIELD
NKUA	36	57	52	55	52	N/A	HEP/NUC
NTUA	31	25	26	35	20	N/A	HEP/NUC
UoI	50	82	75	83	70	63	HEP/NUC
AUTH	35	36	46	55	35	38	HEP/NUC
UoC	26	24	26	37	38	27	HEP-TH
UoP	10	10	10	10	10	10	HEP-TH
TOTAL	188	234	235	275	225	N/A	

- The number of students selecting HEP or Nuclear appears to be stable integrating over all departments.
- Given that these course are at later years, the effect of the decrease of the number of students entering is not yet seen here.

# Students entering MSc in HEP/Nuclear Physics

	2017	2018	2019	2020	2021	2022
NKUA	10	9	15	8	9	15
NTUA	21	9	18	11	11	11
UoI	6	9	2	3	3	3
AUTH	3	2	3	9	10	9
UoC	3	1	3	0	1	0
UoP	3	3	3	3	3	3
TOTAL	46	33	44	34	37	38

- MSc is a 1.5 years program which practically means 2.0 years
- A large fraction continues for a PhD afterwards.....

# Msc Students Entering a PhD in HEP/Nuclear

	2017	2018	2019	2020	2021	2022
NKUA	10	2	6	8	4	3
NTUA	2	13	9	11	4	4
UoI	7	4	4	3	2	2
AUTH	6	7	2	2	4	5
UoC	0	0	1	2	1	0
UoP	0	1	0	1	0	1
TOTAL	25	27	22	27	15	15

- Number of entering PhD candidates is lower for the years 2021 and 2022



# Current PhD and Master Students in HEP Nuclear Physics

Institution	PhD Candidates	Master Candidates
AUTH (Thessaloniki) - EXP	9	5
AUTH (Thessaloniki) - TH	6	6
NKUA (Univ. of Athens) - EXP	7	11
NKUA (Univ. of Athens) - TH	30	15
NTUA (Nat. Tech. Univ. of Athens) - EXP	16	8
NTUA (Nat. Tech. Univ. of Athens) - TH	19	0
INPP Democritos - EXP	4	2
INPP Democritos - TH	4	0
Univ. of Ioannina - EXP	10	7
Univ. of Ioannina - TH	6	6
Univ. of Patras - TH	3	6
Km3Net	3	0
<b>Total</b>	<b>117</b>	<b>66</b>

- The vast majority of these candidates work from Greece and are mostly underfunded or not funded at all.

# Female Students in Physics for BSc, MSc, PhD

	2017	2018	2019	2020	2021	2022
%BSc	35%	41%	41%	44%	42%	40%
%MSc	35%	35%	46%	43%	37%	37%
%PhD	25%	29%	12%	20%	20%	36%

- The ratio is essentially the same for the BSc and MSc levels, ranging between 35% and 44%
- It drops to ~25% for PhDs

# Greece at CERN

# Greek Funding for CERN and CERN Experiments

- The funding comes from the **General Secretariat for Research and Innovation (GSRI)**
- GSRI belonged to the Education Ministry until 2019 and after that it belongs to the Development Ministry
- The Greek contribution to CERN is ~ 1% of the CERN yearly budget as computed using the GDP of Greece in the 3 years prior to the year of payment. Over the past 6 years it has been in the range between **10.6 – 12.2 MCHF** (see table below)
- The contributions of GSRI to the CERN experiments with Greek participation (M&O-A/B) is ~ **600 KCHF** a year.
- In addition GSRI is paying yearly old arrears coming from unpaid CERN contributions prior to 2016.
  - In 2016 Greece owed to CERN 33.9 MCHF. CERN council allowed Greece to pay them back in 15 yearly payments
  - In 2016 the Council reduced the Greek contribution by 15% for the years 2017, 2018, 2019 but did not wave it. Instead it will be paid back in 3 yearly payments after the end of the previous payments and are indexed.
  - These yearly payments due every 1<sup>st</sup> of December amount to **2.2 – 2.4 MCHF**
  - After the Dec 2023 payment Greece will still owe to CERN 19.3 MCHF to CERN (last payment on 1.12.2034)

- Funding for CERN and the CERN Experiments (M&O-A/B) has been paid every year punctually since 2016
- A lot of credit here goes to the GSRI personnel who get things moving every year and make sure that Greece does not fall behind in payments

Year	Greek Contribution (MCHF)	Greek Arrears (MCHF)
2017	11.4 *	2.3
2018	10.7 *	2.3
2019	10.6 *	2.3
2020	12.3	2.4
2021	12.2	2.4
2022	11.9	2.4
2023	11.9	2.4 (due on 1.12.23)

\* Reduced by 15% per CERN Council decision, difference to be paid together with arrears

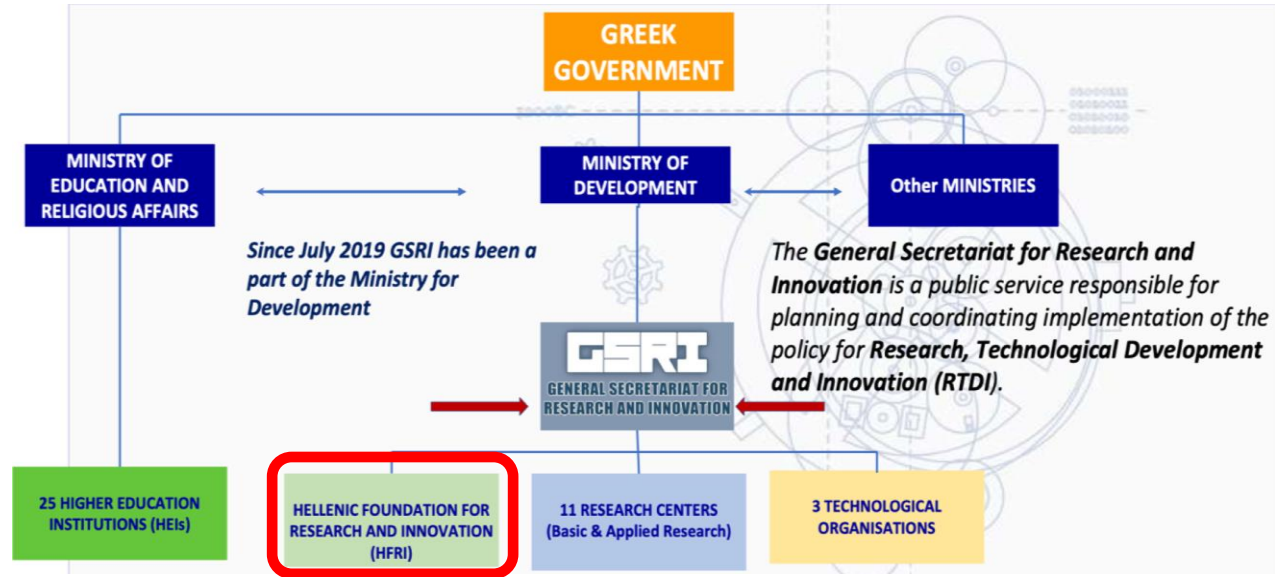
# Greeks @ CERN

- There is a large Greek community at CERN
  - **225 Greek citizens are at CERN**
  - **115 Greeks are at CERN with affiliation to Greek institutions**
- CERN is supporting the research and education of a rather significant number of young and senior Greek scientists, engineers, etc

Year	Fellows		Doctoral Students		Technical Students		Administr. Students		Staff	
2016	36	5.55%	13	6.50%	36	19.78%			30	1.22%
2017	51	6.46%	14	7.04%	27	13.71%			33	1.27%
2018	54	6.47%	13	5.75%	34	18.18%	5	20.00%	43	1.62%
2019	54	6.83%	12	5.43%	19	11.73%	12	27.00%	48	1.81%
2020	56	7.76%	13	6.19%	17	11.64%	4	16.67%	51	1.94%
2021	51	6.59%	15	6.28%	31	15.50%	3	9.38%	56	2.10%
2023	48	7.62%	11	3.96%	12	8.00%	2	6.23%	66	2.48%

# Funding for research in Greece

# Greek funding for Research in Sciences



- HFRI was funded in 2016 and has been the main source of research funds in Greece it is supervised by GSRI
- Started with 350 MEuro. 220 MEuro came from a loan (European Bank for Investment - 1% interest) and 130 MEuro were from Greek state funds. This is the first time in history that Greece had a foundation to support research.
- It has provided scholarships for PhD students and Postdocs, supported young researchers to return to Greece and Faculty research projects (250 KEuro/project) as well as provided funds to researchers to procure lab infrastructure.
- Given the years of underinvestment in research the HFRI funds could hardly cover the needs of sciences but nevertheless it provided some breath to our research groups.
- Unfortunately, since 2016 no new money has been invested on HFRI and every year it provides less and less. It is expected that its funds will run out very soon.

# Organization of the High Energy and Nuclear Physics Community in Greece

- **Greek Delegation at CERN:** I. Ghikas (Ambassador-GVA Permanent Mission), C. Foudas (Scientific delegate), A. Christodoulea (GVA Permanent Mission)
- **Greek Delegation to the CERN Finance Committee:** N. Manthos, C. Foudas
- **Greek Industrial Liaison Officer (ILO):** N. Manthos
- **Greek delegation to Resource Review Board:** C. Foudas, G. Tsipolitis
- **CERN Committee of GSRI:** Monitors the CERN program and makes recommendations to the General Secretary. Chaired by the General Secretary Prof. A. Kyriazis
- **CERN Greece Liaison Committee (- 2021):** Monitored progress in Greek personnel at CERN as well as Industrial return.
- **Greek Society for High Energy Physics:** K. Zachariadou (Chair). It represents the Greek High Energy Physics Community. It organizes yearly scientific conference and the Greek Scientific delegate as well as the ILO report there. Most community discussions take place in meetings of this society.
- **Greek Society for Nuclear Physics and Applications:** C. Chabaris (Chair). Similar functions as above.



# Requested budget for CMS Upgrades for HL-LHC

## CMS-GR Budget for HL-LHC Upgrades

Contribution	Amount
Percent of Greece in CMS	1.3% (3.457 MCHF)
Si-Tracker	1.4 MCHF
L1-Trigger	1.0 MCHF
EndCap Calorimeter HGCal	0.35 MCHF
Common Fund	0.326
<b>TOTAL</b>	<b><u>3.076 MCHF</u></b>

## ATLAS-GR Budget for HL-LHC Upgrades

Contribution	System	Amount
Event Filter-Pattern Recognition Mezzanine (PRM)	TDAQ	0.80 MCHF
RPC - DCT boards	MUONS	0.85 MCHF
Power Systems	MUONS	0.65 MCHF
MDTS Mezzanine boards	MUONS	0.50 MCHF
L1DDC, Electronics	MUONS	0.49 MCHF
Muon CF	MUONS	0.21 MCHF
<b>TOTAL</b>		<b><u>3.50 MCHF</u></b>

# ATLAS AND CMD REVIEW PANEL

## Review Committee for ATLAS and CMS HL-LHC Upgrades

J. Karyotakis (Indep. Member)

K. Jakobs (ATLAS)

T. Camporesi (CMS)

Y. Semertzidis (Indep. Member)

P. Jenni (ATLAS)

J. Virdee (CMS)

- ATLAS and CMS have submitted their plans for HL-LHC according to the money matrices of the two experiments
- These will be submitted to this panel which should make the final recommendation to the General Secretary of GSRI

# Industrial Return

# Inflow of Contracts from CERN to Greek Companies

## CERN Budget and Greek Contribution

2023 (NOV) : 1 230 381 850, 11 887 650 (0.99%)  
 2022 : 1 206 283 950, 11 894 950 (1.01%)  
 2021 : 1 168 922 250, 12 232 750 (1.05%)  
 2020 : 1 168 922 250, 12 308 750 (1.05%)  
 2019 : 1 171 420 100, 12 453 650 (1.06%)  
 2018 : 1 148 237 250, 12 567 300 (1.09%)

## Supplies Services CERN

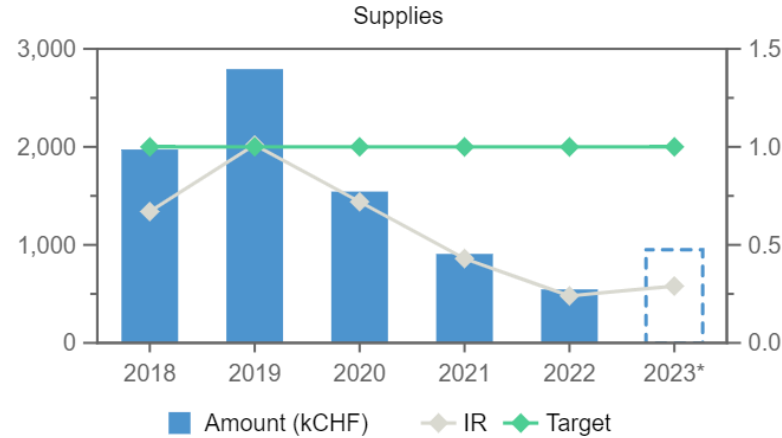
267 860 000, 143 306 000  
 226 311 000, 127 469 000  
 206 717 000, 133 358 000  
 207 407 000, 131 216 000  
 261 375 000, 167 528 000  
 267 860 000, 146 760 000

## Supplies Services Greece

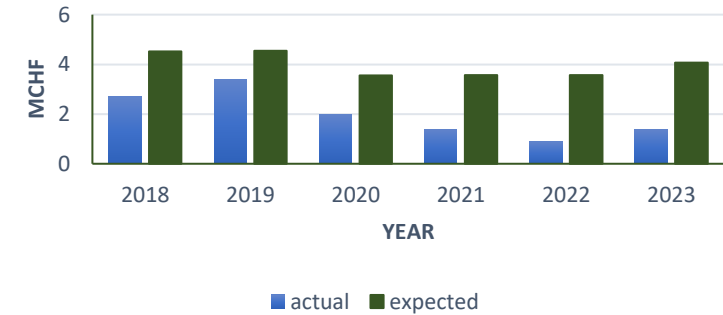
950 000, 416 000  
 546 000, 376 000  
 908 000, 430 000  
 1 544 000, 446 000  
 2 793 000, 449 000  
 1 973 013, 487 000

## GR-Industrial return/Cern Contribution in %

2023 (Nov) 1 366 000/ 11 887 650 = ~ 11.5%  
 2022: 926 000/ 11 894 950 = ~ 8%  
 2021: 1 416 000/ 12 232 750 = ~ 12%  
 2020: 2 046 000/ 12 308 750 = ~ 17%  
 2019: 3 403 000/ 12 453 650 = ~ 27%  
 2018: 2 665 832/ 12 567 300 = ~ 21%



## CERN GR anual return



- The Greek industrial return kept increasing up to and including 2019.
- The 2019 industrial return was satisfactory for first time in history.
- However, after 2019 the industrial return is declining mainly in supplies but also in total.
- We are investigating to find the possible caused for this.

# ILO Activities aiming to increase the industrial return

- Invitation of potential Greek firms to enrich the firm database (increase by ~15%).
- Workshop “Doing business with CERN”, **Doing business with CERN**, 18 Nov 2021 , with potential Greek firms organized by GSRT in Greece to advertise the CERN “market” including talks by CERN procurement service experts). ~100 participants (~50 firms). B2B meetings with CERN procurement group: ~20 firms.
- Exhibition at CERN (**Greece@CERN**), 14-15.11.2022. 10 Greek firms. Participation of the Greek Delegate at UN, GSRI officers and the following firms: NAX GP, TEMMA SA, INN NCSR, PYLON SA, ISD SA, ADM SA, ELFON LDT, FEAC engineering, ALEXMOLDS SA, PRISMA SA. 27 official + #>20 unofficial B2B meetings with CERN personnel



# Summary:

- Greek researchers are making key contributions to the CERN experiments and due to this have raised further the profile of the country at CERN despite all difficulties.
- The support to CERN via the Greek yearly contribution and to the experiments via the yearly payment of the M&O contributions has been stable over the past 7 years (thanks to GSRI and hard work of the personnel there).
- Support is desperately needed in Greece for physics exploitation of the experiments that we support as well as for instrumentation R&D. It is encouraging that groups have been formed to participate in DRD1 and DRD3.
- New positions need to be opened which combined with adequate financial support can reverse the brain drain and create the new generation of HEP researchers.
- HFRI has making marked contributions to research in Greece and it would a major loss not to fund it further.
- The young generation working on LHC must start contributing to the future of our field by participating in R&D for Fcc.
- The news on industrial return are not good and this despite of the intense effort of our ILO to register companies to CERN and encourage them to participate in tenders. We hope to find the reasons for this soon and take the corresponding actions.