Proiecte finalizate
(In calitate de Coordonator sau Partener ISS, 2011-2024)

1. Proiect: Advanced studies of radio signals from ultra high energy cosmic ray induced air showers in the Earth's atmosphere (ROSAS)
Program: PN-II-RU-PD-2011-3-0062
Autoritatea Contractanta: UEFISCDI
Perioada: 2011-2013
Director de proiect: Dr. Paula Gina Isar
Link pagina de proiect ISS: https://www.spacescience.ro/portfolio/rosas

Abstract
Despite a lapse of time of nearly 100 years since discovery of cosmic rays, their origin and accelerator mechanisms are still largely a matter of conjecture, and even more, the flux of the primary cosmic ray falls from 1 particle/cm^2 s to 1 particle/km^2 yr at high energies. However, the particle flux at higher energies is too low for direct measurements by detectors carried by balloon or satellite flights. Thus, Extended Air Showers (EAS) induced by highly energetic particles when penetrating the atmosphere, serve as observables in indirect measurements of primary cosmic rays. Properties of the primaries (arrival direction, energy, mass) have to be reconstructed from measurements of secondary particles, which form the air shower. Through the movement of these secondary particles in the Earth's atmosphere, further detectable effects are been induced, like: Cherenkov radiation, fluorescence in air, and (re-discovered) radio emission.
The first observations of radio emission from EAS goes back to the sixties of the last century, but at that time the effect could not be uniquely established, due to the lack of suitable electronic devices and knowledge in interpreting the measured data. The radio technique aims at achieving a similar quality in the reconstruction of air shower parameters as the established Cherenkov or fluorescence light detection methods, which in contrast to the radio technique are limited to dark, moonless nights. The radio detection technique opens a large window in observing the most energetic particles coming from the Universe, particularly in the transition region between galactic to extragalactic ($10^{19.5}$ eV).
In the recent years, most of the progress in the field of digital radio detection of air showers was either made by CODALEMA (COsmic ray Detection Array with Logarithmic Electro Magnetic Antennas, in France), LOPES (LOFAR PrototypE Station), AERA (Auger Engineering Radio Array) in the frame of the world's largest Pierre Auger cosmic ray Observatory in Argentina, or at LOFAR (LOw Frequency ARray) in the Northern Europe. The project leader is oficial member of both LOPES and Auger collaborations.
The research proposal is associated with the project leader's professional experience gained during PhD studies at KIT (Karlsruhe Institute of Technology) in Germany, in the frame of the LOPES experiment. The proposal is chosen in order to add science to efforts done elsewhere, as well as bring the expertise to Romania, and thus to continue the work started with the PhD thesis. The project aims to improve understandings of both measured and simulated radio signals from EAS, in order to discern the deepest structure of matter in the cosmos.

Echipa proiectului
CSIII Paula Gina ISAR (Director de proiect)
CSI Ion Sorin Zgura (Mentor)

Etapele proiectului
Etapa 1. (Dec. 2011) Software implementation
Etapa 2. (Dec. 2012) Detector sensitivity and simulations
Etapa 3. (Dec. 2013) Comparison of measurements with simulations. Grid applications

Rezultatele proiectului

Dissemination

1. 30th May – 1st of June 2011, FCAL workshop, Predeal, Romania, invited talk
2. 3 – 6th of October 2011, Physikzentrum Bad Honnef, Germany, „490th WE-Heraeus Seminar: Radio Detection in Astroparticle Physics„, discussions and networking
3. 9th of October 2011, Faculty of Physics Bucharest, Romania, World Space Week „Cu mic cu mare…. dincolo de Soare", talk contributions
4. 20th – 26th of May 2012, research stage at Karsruhe Institute of Technology – KIT Campus North, Germany
5. 28th May 2012, in the Final of FameLab Romania (transmitted by TVR), talking science show by British Council Bucharest

6. 24 June – 7 July 2012, CSS12, Sinaia, Romania (participant and co-organizer of the school, Co-editor AIP Conf. Proc., moderator – designated best moderator of the school, hiking guide)
7. 19-22 June, 2012, AERA 2012, Erlangen, Germany (poster contribution)
8. 22 – 24th of October, 2012, KASCADE-Grande and LOPES Collaboration meetings, Freudenstadt, Germany (PGI is responsible person in ISS for KASCADE-Grande and LOPES)
9. 24-03th of November, research stage at KIT Campus North, Germany and poarticipation in the KASCADE-Grande and LOPES Collaboration meetings in Freudenstadt, Germany
10. 11 – 16th November, 2012, Auger Collaboration meeting, Malargue, Argentina, ISS in Auger talk contribution (on Nov. 15th, 2012, the Institute of Space Science, ISS Bucharest, became associate group in Auger. PGI is responsible person in ISS for the Pierre Auger Observatory. See the Acceptance Letter and the Press Release)
11. 21 – 22th January 2013, Auger SDE meeting" (talk contribution on "Contribution from ISS-Romania"), Orsay, France
12. 4 – 7th February, 2013, „Auger AERA meeting" (participation in the Auger Collaboration meeting) in Paris, France
13. 30 – 31th May, 2013, „Auger SDE meeting" (participation in the Auger Collaboration meeting) in Lisbon, Portugal
14. 27th Sept. 2013, Researchers Night – outreach activity, Bucharest
15. 23-26th October, 2013, „Auger SDE meeting" in Orsay, France

Outreach-Education
1. 29th September 2011, Radio Bucuresti fm, „Intalniri capitale cu Andrei Dorobantu", 1h talking science show about physics
2. 20th January 2012, Intact Media Academy & Antena 1 TV, „Cercetatori romani de top", reportage (PGI is certified reporter since 2012, in the frame of a 3 month training at IMA- Intact Media Academy, Bucharest, Romania)
3. 28th of May 2012, FameLab final, Romania, 3min. talking science show, trasnmitted by TVR (PGI was in the final FameLab 2012 talking about „Radiatia cosmica de la Puzzle la Mister". PGI has paticipated at a 2-day Materclass of communicating science organized by BBC expert Malcom Love)
4. 15th February, 2013, „Romanii, intre savantii de elita" (reportaje by Observator – Antena 1 TV, 19:00)
29th March, 2013, organizer in the FameLab Romania 2013, Pre-selction at Magurele – outreach activity – talking science show in partnership with British Council Bucharest, and Faculty of Physics/University of Bucharest.
5. 1st-4th April, 2013, Scoala Altfel „to know more, to be better" – outreach activity – talking science.
16. 20th April, 2013, „Cu mic cu mare … prin Univers" – outreach activity – talking science
6. 12th May, 2013, „Cautand varsta universului" (Reportaje by DIGI 24 – Din interior] (Invitati: Dr. Gina Isar, Dr. Bogdan Popovici, Prof. Vasile Bercu)
7. 4th June, 2013, Radio Romania Cultural, @13:30 interview at „Stiinta in Cuvinte cu Corina Negrea", @17:05, „Stiinta la ea acasa cu Mihaela Ghita", 45 minutes talking science show about „Cosmic Radiation and the Pierre Auger Observatory"
8. Magazine/Revista „Stiinta si Tehnica", nr. 27, July-August, 2013, „Isar-Auger- Publication-S&T-2013„
9. 5th November, 2013, Radio Romania Cultural, 17:00, „Planeta Radio- Univers Stiintific" cu Mihaela Ghita", 45 minute talking science show about „Career in scientific research" (Invitati: Dr. Gina Isar si Dr. Doina Nicolae)

Publications
1. Isar PG, Insides in Astroparticle Physics, http://www.nipne.ro/fcal_2011/docs/ Proceedings_FCAL_RO_2011.pdf
2. Isar PG, Radio detection of cosmic ray air showers with LOPES, Romanian Reports in Physics, Vol. 64, No. 1, P. 308–313, 2012
3. Isar PG, Innovative detection of ultra high energy cosmic ray air showers, Romanian Reports in Physics, Vol. 64, No. 3, P. 825-830, 2012
4. Isar PG, EXOTIC NUCLEI AND NUCLEAR/PARTICLE ASTROPHYSICS (IV). FROM NUCLEI TO STARS: Carpathian Summer School of Physics 2012. AIP Conference Proceedings, Radio emission observations as a new window in observing the Universe, Volume 1498, pp. 344-348, 2012
5. Trache L and Isar PG, EXOTIC NUCLEI AND NUCLEAR/PARTICLE ASTROPHYSICS (IV). FROM NUCLEI TO STARS: Carpathian Summer School of Physics 2012. AIP Conference Proceedings, The outreach session – Round table: Science in times of crisis: Cut or expand?!, Volume 1498, pp. 376-379, 2012
6. Trache L and Isar PG, EXOTIC NUCLEI AND NUCLEAR/PARTICLE ASTROPHYSICS (IV). FROM NUCLEI TO STARS: Carpathian Summer School of Physics 2012. AIP Conference Proceedings, Vol. 1498, pp. 404, 2012
6. P. G. Isar (editor) et al., Scoala Altfel la Institutul de Stiinte Spatiale, http://www2.spacescience.ro/wp-content/uploads/2012/01/PGIsar-SaptamanaScoalaAltfel-ISS1.pdf, April 2013
7. P.G. Isar "Cel mai mare detector de particule cosmice din lume: Pierre Auger Observatory", Revista "Stiinta si Tehnica" nr. 27, pagina 53 – 55, July-August 2013

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2. **Proiect**: Investigation of the cosmic radiation in the Universe using advanced techniques/Studiul radiatiei cosmice in Universe utilizand tehnici avansate (CORONA)
Program: PN-II-ID-PCE-2011-3-0691
Autoritatea Contractanta: UEFISCDI
Perioada: 2012 - 2014
Responsabil de proiect ISS: Dr. Paula Gina Isar
Partneri de proiect: Horia Hulubei National Institute of Physics and Nuclear Engineering (IFIN-HH), University Politechnica of Bucharest (UPB), University of Bucharest (UB), Institute of Space Science (ISS)
Link pagina de proiect IFIN-HH: http://muon1.nipne.ro/~corona/

Echipa proiectului ISS
CSIII Paula Gina Isar (Responsabil ISS)
ACS Gabriel Chiritoi (membru)

Etapele proiectului ISS
Faza 1, (Dec. 2012): Emisia radio a jerbelor atmosferice induse de razele cosmice. Diseminare.
Faza 2, (Dec. 2013): Caracteristici de polarizare ale semnalelor radio de la jerbele de raze cosmice. Diseminare. Partea I.
Faza 3, (Dec. 2014): Caracteristici de polarizare ale semnalelor radio de la jerbele de raze cosmice. Diseminare. Partea II.

Rezultatele proiectului
1. ISS a devenit membru asociat Colaborarii Pierre Auger din 15 Noimenbrie, 2012
2. Romania a devenit tara membra Colaborarii Pierre Auger in 2014, reprezentata institutional de IFIN-HH, ISS, UB, UPB

Diseminare ISS
1. conferinta ARENA, Erlangen, Germania, (Isar, P.G., poster on “On polarization effects of radio emission from extensive air showers”) Junie 19-22, 2012
2. conferinta CSSP12, Sinaia, Romania, (Isar, P.G., talk on "Space Atmospheric interactions of energetic cosmic rays") iunie 24-iulie 7, 2012
3. conferinta colaborarii Auger, Malargue, Argentina, 11-16 noiembrie, 2012
4. conferinta anuala a Facultatii de Fizica (P. G. Isar, talk on "Interdisciplinary physics with energetic cosmic rays induced air showers"), Bucuresti, 20 Iunie 2014

Service ISS
1. Participarea ISS (Isar, P.G) la campania AERA de instalare a 100 de antene radio in Malargue, Argentina, aprilie 22 - mai 11, 2013

Outreach-Education ISS
1. Productie video a campaniei de instalare AERA phase II: http://youtu.be/EJlkDXc1wuw
2. Participare la Radio Romania Cultural,“*Stiinta la ea acasa cu Mihaela Ghita si P. G. Isar”*, Cel mai mare experiment de radiatie cosmica din lume - Observatorul Pierre Auger din Argentina, 4 iunie 2013, 17:05.
3. Participare la Radio Romania Cultural, Emisiunea Platena Radio – Univers Stiintific cu Mihaela Ghita si P. G. Isar, Subiect: Ce ne comunică Universul prin mesagerii cosmici? - Contribuțiile Institutului de Științe Spațiale de la Măgurele, la studiile Observatorului Pierre Auger, 25 Februarie 2014, ora 17:05
4. P. G. Isar, participant/organizator la evenimente de outreach, precum: Scoala Altfel, Noaptea Cercetatorilor, Cu mic cu mare prin Univers, etc.
5. P. G. Isar, Prezentare orala "Află despre razele cosmice măsurate la Observatorul Pierre Auger", Researchers Night, Bucuresti, 26 Septembrie 2014

Publications ISS
1. P. G. Isar, “Pierre Auger Observatory – cel mai mare detector de radiatie cosmica”, revista Stiinta si Tehnica, Nr. 27, Editia Iulie-August, 2013
2. P. G. Isar, Proceedings of Carpathian Summer School of Physics, "Space Atmospheric interactions of energetic cosmic rays", Sinaia, 18-26 Iulie 2014.
3. Publicatie: P. G. Isar, Proceedings of Carpathian Summer School of Physics, "Space Atmospheric interactions
4. of energetic cosmic rays", Sinaia, 18-26 Iulie 2014, (TBP in AIP Conf. Proceedings).

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3. **Proiect**: Pilot study of ultra-high energy COsmic rays through their Space-ATmospheric interactions (COSAT)
Program: C2-CDI-STAR-2013-333
Autoritatea Contractanta: Agentia Spatiala Romana
Perioada: 2013-2015
Director de proiect: Dr. Paula Gina Isar
Partner de proiect : National Institute of Research and Development for Optoelectronics
Link pagina de proiect ISS: https://www.spacescience.ro/portfolio/cosat

Abstract
One hundred years after the discovery of cosmic rays, the study of charged ultra-high energy cosmic rays remains a vital activity in fundamental physics and one of the greatest challenges in Astroparticle Physics, which uses cosmic particles to understand violent phenomena in the Universe. While primary cosmic rays could not be measured directly until it was possible to get the detectors highly in the atmosphere using balloons or spacecraft, nowadays very energetic cosmic rays can be detected indirectly by ground-based experiments measuring their extensive air showers induced Cherenkov light, fluorescence light, or radio waves. All of these measurements rely on an accurate understanding of atmospheric phenomena, therefore, the COSAT project will investigate the energetic cosmic rays physical processes using the atmosphere as a detector. The project is accessing the lowest level of technology readiness and the scientific research begins to be translated into applied R&D. The project results are envisaged to come in support to ESA – EUSO, SSA – space weather and Earth Observation Missions.

Echipa proiectului ISS
CSII Paula Gina Isar (Director proiect)
ACS Claudiu Colesnicescu (membru)
AC Dumitru Bogdan (membru)
CSI Sorin Zgura (membru)
Th. Liviu Irimia (membru)
Th. Ovidiu Banaru (membru)
CSIII Adrian Sevcenco (membru)
CSIII Ionel Stan (membru)
CSIII Ionescu Cristian
Ing. Teodor Julea

Etapele proiectului
Etapa 1. (Dec. 2013): Evidentierea legaturilor interdisciplinare, spatiale si la sol, in fizica astroparticulelor, teledetectie si fizica atmosferica la nivel national si international.
Etapa 2. (Dec. 2014): Masuratori de radiatii cosmice la sol versus masuratori spatiale.
Etapa 3. (Dec. 2015): Folosirea atmosferei ca detector in masurarea jerbelor de raze cosmice de la sol sau din spatiu.

Rezultatele proiectului

Dissemination ISS
1. AERA meeting in Wuppertal (talk presentation), Bergische Universität, Germany, 10-11 Feb 2014
2. (Work) Visit at KIT – Karlsruhe Institute of Technology, Germany, 11-16 Feb 2014
3. ESA-EUSC-JRC 2014, Image Information Mining Conf. University Politehnica Bucharest, 5-7 March 2014
4. EUSO workshop in Bucharest (COSAT – talk presentation), Institute of Space Science, 1-2 April 2014
5. (Work) Visit at KIT, 27 April – 1 May, 2014, Karlsruhe, Germany
6. EGU 2014 (poster), 27April – 2 May, 2014, Viena, Austria
7. „Romanian Space Week" (COSAT – talk presentation), 12-16 May2014, Bucharest, Romania
8. „AtmoHEAD (COSAT – poster presentation; proceedings) 19 – 21 May, 2014, Padova, Italy
9. Annual Scientific Session of the Faculty of Physics, University Bucharest, (talk presentation), 20 June 2014, Bucharest
10. International School on Image Processing (talk presentation), Brasov, 14-18 July, 2014
11. „Carpathian Summer School of Physics" (talk presentation, proceedings), 13-26 July 2014, Sinaia, Romania
12. CORSIKA SCHOOL, 19-23 Oct., 2014, Freudenstadt-Lauterbad, Germany
13. (Work) Visit at the University of Wuppertal, 23-25, Oct. 2014, Wuppertal, Germany
14. Auger Collaboration meeting + shift, 10-24 Nov. 2014, Malargue, Argentina
15. Auger Upgrade Meeting, 3-6 Feb., 2015, Orsay, France
18. Isar, P.G., Nicolae, D., EPJ Web of Conferences, Vol. 89, 04001, 2015

19. 3rd Romanian Space Week (COSAT – talk presentation), 27 – 29 May, 2015, Bucharest
20. Scientific Annual Session/Physics Education (2 talks, Physics Education) at the Faculty of Physics/Uni Bucharest, 19th June, 2015, Magurele
21. Joint Project Workshop on ESA's Earth Observation Programme, Magurele, 3 Nov. 2015
22. Pierre Auger Observatory (talk), Collaboration meeting + shift+Symposion (see press release), Malargue, Argentina, 11-17 Nov, 2015

Outreach-Education ISS
1. Radio Romania Cultural, Emisiunea Planeta Radio – Universul Stiintific cu Mihaela Ghita, (talk show) 17:05, 25 Feb 2014
2. Radio Romania Cultural, „Stiinta in cuvinte potrivite" cu Dan Manolache, Corina Negrea si Mihaela Ghita (interview), 2 April 2014
3. „Scoala Altfel" (Razele cosmice, mesageri ai Universului – education talks), ISS Bucharest, 7-11 April 2014
4. „Space Expo" (GALILEO, COPERNICUS, COSMIC RAYS – public talks), Craiova, Romania, 19-27 April 2014
5. Radio Romania Cultural, Emisiunea Planeta Radio – Universul Stiintific cu Mihaela Ghita, (interdisciplinary talk show, Invitati: Dr. Gina Isar, Dr. Doina Nicolae si Prof. Mihai Dima) 17:05, 3th June 2014, Bucharest
6. Bucharest Science Festival (public talk), 25th Sept. 2014, Bucharest, Romania
7. Researchers Night (public talk), 26th Sept. 2014, Bucharest, Romania
8. Radio Romania Cultural, Emisiunea Planeta Radio – Universul Stiintific cu Mihaela Ghita, (talk show) 17:05, 9 Dec 2014
9. Invited Seminar at the University Polytechnic Bucharest, by Careerteam, 18:00, March 5th, 2015
11. „Scoala Altfel" (Mesageri ai Universului – education talks), ISS Bucharest, 6-9 April 2015
12. Invited Seminar at the University of Bucharest, Faculty of Physics, 30th April, 2015
13. UNESCO-L'OREAL " For Women in Science", in the Final, Romania, 2015 (13th May @ BCU)
14. Radio Romania Cultural, „Stiinta in cuvinte potrivite" cu Dan Manolache, Corina Negrea si Mihaela Ghita (interview, COSAT) , 27th May, 2015
15. Invited speaker by Bucharest British Council & Bucharest Community Foundation at Fondul Stiintescu event, Bucharest, 17th June, 2015
16. Radio Romania Cultural, „Stiinta in cuvinte potrivite" cu Dan Manolache, Corina Negrea si Mihaela Ghita (interview, Invited Siintescu talk – „Calatorie cosmica interactiva: Q&A"), 17th June 2015
17. Bucharest Science Festival 2015 (public talks), 29th Sept., 2 Oct. 2015, Bucharest, Romania
18. TechMentori, Bucharest – ongoing (Tutoring, Dialog)
19. Pierre Auger Observatory (outreach talk), Collaboration meeting + AugerPrime Sympozium (press release), Malargue, Argentina, 11-17 Nov, 2015
20. Practica Masterat 2015 (1 student UPB)
21. Practica Licenta 2015 (1 student UB)
22. Practica de vara 2014 (2 studenti UB, 1 student UPB)
23. Workshop ISS-INOE_INCAS 2015 (organizator)

Publications ISS
1. A. Aab, … Isar, P.G. et al., Auger Coll., Searches for Large-scale Anisotropy in the Arrival Directions of Cosmic Rays Detected above Energy of 1019 eV at the Pierre Auger Observatory and the Telescope Array, The Astrophys. J., Vol. 794, Issue 2, article id. 172, 15 pp., 2014
2. A. Aab, … Isar, P.G. et al., Auger Coll., Reconstruction of inclined air showers detected with the Pierre Auger Observatory, Journal of Cosmology and Astroparticle Physics, Issue 08, article id. 019, pp., 2014
3. A. Aab, … Isar, P.G. et al., Auger Coll., Muons in air showers at the Pierre Auger Observatory: Measurement of atmospheric production depth, Phys. Rev. D, Vol. 90, Issue 1, id.012012, 2014
4. A. Aab, … Isar, P.G. et al., Auger Coll., A Targeted Search for Point Sources of EeV Neutrons, The Astrophysical Journal Letters, Volume 789, Issue 2, article id. L34, 7 pp. , 2014
5. A. Aab, … Isar, P.G. et al., Auger Coll., A Search for Point Sources of EeV Photons, The Astrophys. J., Volume 789, Issue 2, article id. 160, 12 pp., 2014
6. Isar, P.G., Space-atmospheric interactions of energetic cosmic rays, AIP Conference Proceedings, Vol. 1645, Issue 1, p.349-352 (2015)
7. Isar, P.G., Nicolae, D., Pilot study of ultra-high energy Cosmic rays through their Space – Atmospheric interactions – COSAT, EPJ Web of Conferences, Vol. 89, 04001 (2015)
8. A. Aab, … Isar, P.G. et al., Auger Coll., Search for patterns by combining cosmic-ray energy and arrival directions at the Pierre Auger Observatory, The European Physical J. C, Vol. 75, article id.269, 15 pp. 2015

9. A. Aab, … Isar, P.G. et al., Auger Coll., Improved limit to the diffuse flux of ultrahigh energy neutrinos from the Pierre Auger Observatory, Physical Review D, Vol. 91, Issue 9, id.092008, 2015
10. A. Aab, … Isar, P.G. et al., Auger Coll., Searches for Anisotropies in the Arrival Directions of the Highest Energy Cosmic Rays Detected by the Pierre Auger Observatory, The Astroph. J., Vol. 804, Issue 1, art. id. 15, 18 pp. (2015)
11. A. Aab, … Isar, P.G. et al., Auger Coll., Large Scale Distribution of Ultra High Energy Cosmic Rays Detected at the Pierre Auger Observatory with Zenith Angles up to 80°, The Astroph. J., Vol. 802, Issue 2, art.id. 111, 11 pp. (2015)
12. A. Aab, … Isar, P.G. et al., Auger Coll., Muons in air showers at the Pierre Auger Observatory: Mean number in highly inclined events, Physical Review D, Volume 91, Issue 3, id.032003 (2015)
13. Timmermans, C. … Isar, P.G. et al. Pierre Auger Coll., (poster, proceedings), 34th ICRC, 2015
14. Isar, P.G., Nicolae, D., ., Pilot study of ultra-high energy Cosmic rays through their Space – Atmospheric interactions – COSAT, p 37, ISBN 978-606-687-219-5, 2015
15. Ionescu, C., Julea, T., Isar, P.G. , Identification of cloud coverage using time series of satellite images, p53, ISBN 978-606-687-219-5, 2015
16. Sevcenco, A., Stan, I., Isar, P.G., Application of GRID high performance computing in COSAT project, p65, ISBN 978-606-687-219-5, 2015
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4. **Proiect**: Innovative Monte Carlo simulations of ultra high energy cosmic rays induced air showers measured at the Pierre Auger Observatory using distributed computing infrastructure (SimDist)
Program: PN-III-P2-2.1-PED-2016-0339
Autoritatea Contractanta: UEFISCDI
Perioada: 2017-2018
Director de Proiect: Dr. Paula Gina Isar
Link pagina de proiect ISS: https://www.spacescience.ro/portfolio/simdist/

Abstract
Ultra high energy cosmic rays remain a mystery after more than a century since their discovery. With increasing the energy the flux of primary particles decreases. Thus, in order to measure cosmic rays indirectly from the Earth through their induced air showers in the Earth's atmosphere, one need a large surface detector array, such as the Pierre Auger Observatory in Argentina. Auger measure such astroparticles with super-hybrid detectors which now are facing the upgrade to continue measurements with improved apparatus until 2025. Through measured cosmic ray induced air showers (secondary particles developed in the air at the interaction of the primary with atmospheric molecules) one can reconstruct the energy of the primary particle, its mass and the incoming direction, in order to be able to point back to the sky and try to locate the source origin. For simulating an event of about 10^{20} eV, one needs much time consuming and plenty of disk space. For this we use distributed computing (GRID) in order to produce bulk simulations and store their large volume of output files. In this project we will contribute to the development of the distributed computing in frame of Auger GRID Virtual Organization in order to increase the efficiency of the Monte Carlo simulations of cosmic ray induced air showers observed at Auger. Moreover, the Auger Upgraded will deliver increased statistics in the ultra high energy range, facilitating thus the unique opportunity to elucidate the origin and properties of the most energetic and rare cosmic rays. In addition, the project will offer a great framework for researchers and students to contribute institutionally and nationally to the international approach of the astroparticle physics studied at the world largest cosmic ray experiment Pierre Auger. Last but not least, the project will increase the awareness of science among a large audience, employing also outreach and education activities for disseminating project results.

Echipa proiectului
CSII Paula Gina Isar (Director proiect)
ACS Cosmin Gabriel Samoila (membru)
CSIII Adrian Sevcenco (membru)
CSIII Ionel Stan (membru)

Etapele Proiectului
Etapa 1. (Dec. 2017): Definirea platformei de lucru pentru simularea jerbelor de raze cosmice utilizand infrastructura distribuita de calcul
Etapa 2. (Dec. 2018): Simularea, monitorizarea, managementul, analiza si interpretarea datelor

Rezultatele proiectului

Dissemination

1. AERA meeting at University Wuppertal (talk contribution) + work visit at Karlsruhe Institute of Tehnology, 27 Sept. – 7 Oct., 2017, Germany
2. Aerospace Europe CEAS Conference (exhibitor in frame of the ISS team), 19-20 October, 2017, Palace of the Parliament, Bucharest, Romania
3. Salonul Cercetarii Romanesti „Conceput in Romania" (exhibitor in frame of the ISS team), 27 October, 2017, Palace of the Parliament, Bucharest, Romania
4. ISAPP 2018 "LHC meets cosmic rays", 20 octombrie - 2 noiembrie 2018, CERN, Geneva, Elvetia (poster contribution on "Simulation of cosmic rays air showers using grid computing" -by G. Isar, A. Sevcenco, I. Stan)
5. Communication Session at the Faculty of Physics, University of Bucharest, (talk contribution and ISI Proceedings Article submitted to RRP: "Closer look on the Cosmic Rays induced Extensive Air Showers using a Graphical User Interface" - by G. Isar, D. Hirnea, A. Jipa), 21-22 June 2018
6. Women Scientists Who Made Nuclear Astrophysics (poster contribution), Proc. of Intl. Conf. „Nuclei in the Cosmos XV", LNGS Assergi, Italy, June 2018
7. Auger Remote Shift at KIT – Karlsruhe Institute of Technology (shift report of taken measurements), Germany, July 4 – 22, 2018
8.. Workshop SimDist, (Scientific session with talks and round table discussions), Institute of Space Science, Bucharest Magurele, 14 Sept. 2018
9. 75 Years of Geomagnetic Measurements of the Romanian Centenary, Geological National Museum and Surlari Observatory (talk contribution on "The geomagnetic signature in the measurement of radio signals from ultra high energy cosmic rays induced air showers- by G. Isar"), 16-17 Oct., 2018

Outreach-Education
1. Bucharest Science Festival, Museum of Geology, (exhibitor in frame of the ISS team) Bucharest, 29 Sept., 2017
2. Sci+Fi Fest, National Library, (exhibitor in frame of the ISS team) Bucharest, 30 Sept.– 1 Oct., 2017
3. Scoala Altfel, 26 October 2017, visit of about 50 gymnasium pupils together with teachers and parents from Constanta at the ISS;
4. „Researcher Day" at Physics Faculty, University of Bucharest (talk contribution), 16 November, 2017, Magurele, Romania
5. Participare la Scoala Altfel la ISS, 26-30 martie 2018
5. AstroFest, Biblioteca Nationala a Romaniei, 19 May 2018
6. Master Thesis: COSMOS: Framework for combining simulation and optimization software, University Politehnica Bucharest/Computer Science Faculty, June 2018. (work continued with PhD Thesis, start of Oct. 2018)
7. Diploma Thesis: Introduction to cosmic ray air showers physics, University Bucharest/Physics Faculty, June 2018. (work continued with Master Thesis, start of Oct. 2018)
8. An EAS browser display, an academic practical work release, June 2018
9. Conferinta Fusion, Rezidenta Scena 9, Bucharest, (talk contribution) 10 September 2018
10. Sci+Fi fest, Biblioteca Nationala a Romaniei, (organiser and exhibitor in frame of the ISS team) 15-16 Septembrie, 2018; https://stiintasitehnica.com/scififest-2018/
11. European Researcher Night -ERN, Promenada Mall, (organiser and exhibitor in frame of the ISS team) 28 September 2018 (public talk by G. Isar, hands-on by I. Stan); http://noapteacercetatorilor.ro/bucuresti/
12. Participare la Famelab Hall of Science, in cadrul evenimentului Noaptea Cercetatorilor Europeni, de la Promenada Mall din 28 octombrie, 2018
13. Particpare la workshopul "Comunicarea stiintei pe intelesul altora", 6 sept. 2018, ISS-Magurele, 16 Noiembrie 2018, UAIC-Iasi (talk by G. Isar)
14. Interviuri acordate la Radio Romania Cultural, prelegere invitata la Space Talks "Odiseea Spatiala in Romania" (https://spacetalks.net/event/odiseea-spatiala-in-romania/), 28 noiembrie 2018, la Libraria Carturesti Verona, Bucuresti.

Service
1. In cadrul proiectului a fost realizata "o camera de control remote la ISS-Magurele pentru monitorizarea si operarea detectorilor de la Observatorul Pierre Auger" din Malargue, Argentina, conform strandardelor Auger.

Publications
1. Isar, P.G.; Sevcenco, A.; Stan, I., Remote control and operation of the Pierre Auger Observatory in Malargue from Magurele, Nota Interna Auger 2018 (GAP2018_044)
2. Cretu, C.; Isar, P.G.; Zamfirescu, M., PERSPECTRUM - an audio-visual installation, INFORMATION AND COMMUNICATION TECHNOLOGY IN MUSICAL FIELD 10 (2) , pp.65-71, 2019

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5. PROIECT: Development of security applications based on the complex experimental technologies utilized in the study of cosmic radiation (DEXTER)
Program: PN-III-P1-1.2-PCCDI-2017-0839
Autoritatea Contractanta: UEFISCDI
Perioada: 2018-2021
Responsabil de proiect ISS: Dr. Paula Gina Isar
Partneri: Universitatea din Petrosani, Institutul de Stiinte Spatiale, INCD Constanta, Universitatea Politehnica Bucuresti, Institutul de Geodinamica
Link pagina de proiect IFIN-HH: https://www.nipne.ro/proiecte/pn3/12-proiecte.html

Abstract
The main goal of this complex project is to develop applications, prototypes and services based on new technologies with applicability in the economic environment and which have demonstrated their reliability and efficiency in large experiments in the cosmic radiation physics and beyond.
Adapting the technologies used in nuclear physics and cosmic radiation (especially at the Pierre Auger International Observatory) to the needs of the industrial environment and small consumers will mainly be done by reducing the cost of equipment and services. This is possible due to the accelerated evolution in the information and telecommunications technology sector.
Moreover, the methods of radioactivity detection of cosmic particles are very similar to classical telecommunication systems (front end), so that progress in one direction or another can directly and immediately influence the evolution in the other field. Many electronic solutions that until now have been specifically built for each experiment can now be found at much lower and at least equivalent prices.

Etapele Proiectului
Etapa 1. (Dec. 2018) Scientific and technical documentation necessary for the implementation of the project 2.
Etapa 2. (Dec. 2019) Starting of the cosmic muons measurements and development of the radiation monitoring
Etapa 3. (Dec. 2020) Final assembly of prototypes
Etapa 4. (Apr. 2021) Final prototype testing in laboratory conditions and in real operating conditions

Echipa proiectului ISS
CSII Paula Gina Isar (Responsabil ISS)
ACS Dragos Hirnea (membru)
Th Ovidiu Banaru (membru)
CSIII Adrian Sevcenco (membru)
CSIII Ionel Stan (membru)

Rezultatele proiectului

Dissemination ISS
1. NIC 2018 conference, L'Aquila, Italia, 24-29 Iunie, 2018 (poster contribution "Women Scientists who made nuclear astrophysics" - by Hampton, C.V. .. Isar, P.G. et al., to appear in Springer Proceedings in Physics - Proc. of Intl. Conf. "Nuclei in the Cosmos XV", LNGS Assergi, Italy, June 2018), eprint arXiv:1809.01045
2. ISAPP School 2018, „LHC meets cosmic rays" (poster contribution on "An EAS Browser Display" - by D. Hirnea, G. Isar), CERN, 28 Oct. –2 Nov., 2018
3. Sesiunea Stiintifica Anuala a Facultatii de Fizica, Universitatea Bucuresti, 21 iunie 2019 (talk contribution "Cosmic rays air showers properties and characteristics of the emitted radio signals using analytical approaches and full Monte Carlo simulations" – by P. G. Isar, D. Hirnea, A. Jipa; articol in Press, Rom. Rep. in Phys.)
4. Project meeting, 24 Iulie 2019, Universitatea Politehnica Bucurest (talk contribution on "Contributii ISS", G. Isar)
5. AERA meeting, KIT, Germany, 30 Sept. – 3 Oct., 2019 (talk contribution on "A potential contribution to RD", P. G. Isar)
6. JENAS seminar, 13-16 Octombrie 2019, Orsay (poster contribution on "Education and Outreach activities on Astroparticle Physics in Romania", P. G. Isar)
7. Auger Collaboration meeting online, 10/11/2020, talk by G. Isar, D. Hirnea on "Puzzle game and cosmic rain
8. AERA workshop online, 6/10/ 2020 (talk contribution on "Highlighted elementary features for a sample of simulated radio signals by using a hexagonal detection area chosen inside AERA-153" – by G. Isar, D. Hirnea)
9. Auger Collaboration meeting, 2 Martie 2021 (talk online "Monte Carlo Simulations – Staus of the task" – by R. Colallilo, E. Sants, G. Isar, A. Yushkov)

10. Sesiunea Stiintifica Anuala a Facultatii de Fizica/Universitatea Bucuresti, 18 iunie 2021 (talk contribution “The response of a model hexagonal detectors area to radio signals from ultra high energy cosmic rays air showers” - by G. Isar, D. Hirnea, with publication in Rom. Rep. in Phys.)

Outreach Education ISS

1. Sci+Fi Fest “100 de Ani de Cercetare Romaneasca”, Biblioteca Nationala a Romaniei, Bucuresti, 15-16 septembrie 2018 (public talk Isar, P.G); https://stiintasitehnica.com/scififest-2018/
2. FameLab hall of Science, in cadrul evenimentului Noaptea Cercetatorilor Europeni, Promenada Mall, 28 sept, 2018 (public talk Isar, P.G); http://noapteacercetatorilor.ro/bucuresti/
3. Space Talks “Odiseea Spatiala in Romania” (https://spacetalks.net/event/odiseea-spatiala-in-romania/), invitat G. Isar, 28 noiembrie 2018 la Libraria Carturesti Verona, Bucuresti.
4. Workshop cu profesori din Jud. Neamt la ISS – 28 martie 2019 (RRC, Interviu cu Gina Isar, Realizator Mihaela Ghita, https://radioromaniacultural.ro/profesorii-de-fizica-din-judetul-neamt-in-vizita-pe-platforma-magurele)
5. Scoala Altfel la ISS – 14-19 Aprilie 2019
6. AstroFest la Parke Lake Mall Bucuresti – 25 Mai 2019
7. Sci+Fi Fest la Parke Lake Mall Bucuresti – 14 Sept 2019
8. Noaptea Cercetatorilor Europeni in Parcul Lumea Copiilor – 27 sept, 2019
10. Workshop cu elevi/profesori ERASMUS la ISS – 24 Oct. 2019
11. Radio Romania Cultural, Stiinta in cuvinte potrivite, Interviu cu Gina Isar (despre” Observatorul Pierre Auger sărbătorește anul acesta 20 de ani de la înființare!), realizator Corina Negrea, https://radioromaniacultural.ro/observatorul-pierre-auger-sarbatoreste-anul-acesta-20-de-ani-de-la-infiintare/
12. Scoala Altfel la ISS - 25/2/2020;
13. Noaptea Cercetatorilor - 27/11/2020
14. Interviuri acordate la Radio Guerrilla si Radio Romania Cultural, 2020
15. Interviu acordat de G. Isar Institutului Francez: 4 Februarie 2021
16. Interviu acordat de G. Isar Colaborarii Auger, 11 Februarie 2021, #WomenInScience, https://www.auger.org/index.php/edu-outreach/women-in-science
17. Interviu acordat de G. Isar la Radio Romania Cultural: 1 Martie 2021
18. FUZION AIR: artist -scientist talk online, 16 Martie 2021 (G. Isar - ISS, C. Ciuclea - artist)

Services ISS

1. Auger Remote shift FD si LIDAR la ISS-Magurele, 22 Iulie - 9 August, 2019 (ISS shifters: P. G. Isar, D. Hirnea)
2. Auger Remote shift AERA, 18-25 Nov, 2019 (ISS: P. G. Isar, IFIN-HH: A. Saftoiu)

Publications ISS

1. Hirnea, D., Isar, P.G., Jipa, A., Cosmic rays air showers properties and characteristics of the emitted radio signals using analytical approaches and full Monte Carlo simulations”, Rom. Rep. Phys. 72, 301 (2020)
2. Isar, G.; Hirnea, D., The Cosmic Particle Rain - User's Manual, Nota Interna Auger 2021 (GAP2021_016)
3. Isar, G.; Hirnea, D., The response of a model hexagonal detector area to radio signals from ultra-high energy cosmic rays air showers, Nota Interna Auger 2021 (GAP2021_017)
4. Hirnea, D., Isar, P.G., The response of a model hexagonal detector area to radio signals from ultra-high energy cosmic rays air showers, Rom. Rep. Phys. 74 (2), 2022
5. Isar, P.G., Radio signals from highly energetic extensive air showers: status and new perspective, Rom. Rep. Phys. 75 (2), 2023
6. Aab, A. … Isar, P.G. et al., The Pierre Auger Collaboration, Observation of inclined EeV air showers with the radio detector of the Pierre Auger Observatory, JCAP 10 (2018) 026
7. Aab, A. … Isar, P.G. et al., The Pierre Auger Collaboration, Limits on point-like sources of ultra-high-energy neutrinos with the Pierre Auger Observatory, JCAP11 (2019) 004
8. Aab, A. … Isar, P.G. et al., The Pierre Auger Collaboration, Data-driven estimation of the invisible energy of cosmic ray showers with the Pierre Auger Observatory, Phys. Rev. D 100, 082003
9. Aab, A. … Isar, P.G. et al., The Pierre Auger Collaboration, Probing the origin of ultra-high-energy cosmic rays with neutrinos in the EeV energy range using the Pierre Auger Observatory, JCAP 10 (2019) 22
10. Aab, A. … Isar, P.G. et al., The Pierre Auger Collaboration, Measurement of the average shape of longitudinal profiles of cosmic-ray air showers at the Pierre Auger Observatory, JCAP 3 (2019) 18
11. Aab, A. … Isar, P.G. et al., The Pierre Auger Collaboration, Data-driven estimation of the invisible energy of cosmic ray showers with the Pierre Auger Observatory, Physical Review D 100 (2019) 082003
12. Aab, A. … Isar, P.G. et al., The Pierre Auger Collaboration, Search for magnetically-induced signatures in the arrival directions of ultra-high-energy cosmic rays measured at the Pierre Auger Observatory, JCAP 06 (2020) 017

13. Aab, A. … Isar, P.G. et al., The Pierre Auger Collaboration, Direct measurement of the muonic content of extensive air showers between 2x10^17 and 2x10^18 eV at the Pierre Auger Observatory, Eur. Phys. J. C (2020) 80:751
14. Aab, A. … Isar, P.G. et al., The Pierre Auger Collaboration, Cosmic ray anisotropies in right ascension measured by the Pierre Auger Observatory, The Astrophysical Journal, Volume 891, 142 (2020)
15. Aab, A. … Isar, P.G. et al., The Pierre Auger Collaboration, Features of the energy spectrum of cosmic rays above 2.5 x 10^18 eV using the Pierre Auger Observatory, Phys. Rev. Lett. 125, 121106 (2020)
16. Aab, A. … Isar, P.G. et al., The Pierre Auger Collaboration, Measurement of the cosmic ray energy spectrum above 2.5 x 10^18 eV using the Pierre Auger Observatory, Phys. Rev. D 102, 062005 (2020)
17. Aab, A. … Isar, P.G. et al., The Pierre Auger Collaboration, Studies on the response of a water-Cherenkov detector of the Pierre Auger Observatory to atmospheric muons using an RPC hodoscope, (2020) JINST 15 P09002
18. Aab, A. … Isar, P.G. et al., The Pierre Auger Collaboration, Reconstruction of events recorded with the surface detector of the Pierre Auger Observatory, (2020) JINST 15 P10021
19. Aab, A. … Isar, P.G. et al., The Pierre Auger Collaboration, A Search for Ultra-high-energy Neutrinos from TXS 0506+056 Using the Pierre Auger Observatory, (2020) ApJ 902 105
20. Aab, A. … Isar, P.G. et al., The Pierre Auger Collaboration, The energy spectrum of cosmic rays beyond the turn-down around 10^17 eV as measured with the surface detector of the Pierre Auger Observatory, Eur. Phys. J. C (2021) 81:966
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6. Proiect: Large-scale DEtector response to radio signals from ultra-high energy COsmic Rays induced air Showers (DECORS)
Program: PNIII-P1-1_1-TE-2021-0924
Autoritatea Contractanta: UEFISCDI
Perioada: 2022 – 2024
Director de proiect: Dr. Paula Gina ISAR
Pagina de proiect ISS: https://www.spacescience.ro/portfolio/decors/

Abstract
Ultra High Energy Cosmic Rays are the most rare and energetic particles in the Universe, of which source origin, production mechanisms and type of primary particle we still don't know yet. Because of this, the Pierre Auger Observatory became the world's largest cosmic rays experiment on ground, where hundreds of researchers contribute worldwide to the physics studies of the most mysterious particles in the Universe, employing thus complementary innovative detectors on a large-scale in Argentina. Romania became full Auger member in 2014, being represented by 3 institutes presently, among which the host Institute of Space Science is represented by the project leader. The project comes in support of the local Auger group in order to contribute to the current upgrade of Auger detectors, where some are improved and some are extended, as the radio detector will cover the entire array of 3000 km2. The outcome of the project will be towards understanding of the radio detector response at large scale, for inclined events at very high energies, contribution to official simulation production in Auger GRID VO, and optimized simulations with a reduced list of candidate observers in order to accelerate time computing. The project will employ students from a complementary field, and will disseminate results accordingly, to increase the group visibility and science awareness, and support the continuity of research activity of the local group in Auger.

Echipa proiectului
Dr. Paula Gina Isar (Director de proiect:)
Dr. Adrian Servcenco (Membru)
Dr. Ionel Stan (Membru)
Tudor Alexandru Calafeteanu (Membru)

Etapele proiectului
Etapa 1. (Dec. 2022) Simulare a emisiei radio de la jerbele de raze cosmice pentru optimizarea raspunsului detectorului la scala larga la semnalele radio de la jerbele de raze cosmice; asigurare service operational anual la experimentul super-hibrid Auger prin efectuarea de ture operationale la distanta de la ISS-Magurele (partial – continuare in Etapa II); corelare a muncii in cadrul Auger si diseminare rezultate (partial – continuare in Etapa II); implicare studenti in calcul modern si stiinta interdisciplinara (partial – continuare in Etapa II)

Etapa 2. (Dec. 2023) Utilizare metode computationale moderne de calcul si analiza de date cu aplicare la fizica jerbelor de raze cosmice si semnalele radio inregistrate – I (partial – continuare in Etapa III); asigurare service operational anual la experimentul super-hibrid Auger prin efectuarea de ture operationale la distanta de la ISS-Magurele (partial – continuare in Etapa III); corelare a muncii in cadrul Auger si diseminare rezultate (partial – continuare in Etapa III); implicare studenti in calcul modern si stiinta interdisciplinara (partial – continuare in Etapa III)

Etapa 3. (Mai 2024) Utilizare metode computationale moderne de calcul si analiza de date cu aplicare la fizica jerbelor de raze cosmice si semnalele radio inregistrate – II; asigurare service operational anual la experimentul super-hibrid Auger prin efectuarea de ture operationale la distanta de la ISS-Magurele; corelare a muncii in cadrul Auger si diseminare rezultate; implicare studenti in calcul modern si stiinta interdisciplinara.

Rezultatele proiectului

Dissemination

1. Annual Scientific Session of Faculty of Physics, University of Bucharest, June 24, 2022 (talk, article)
2. Auger Analysis meeting, Wuppertal, Germany, July 18-22, 2022
3. XI International Conference on New Frontiers in Physics (online), August 30 – September 11, 2022, Crete, Greece (invited talk on AugerPrime, proceedings submitted in 2023)
4. Auger Radio workshop (online), October 21-25, 2022
5. Seminar (online) at University Politehnica Bucharest (UPB), October 18, 2022 (Talk on "Towards Phase II of the Pierre Auger Observatory – AugerPrime" by Isar, P.G.)
6. Auger Collaboraton Meetng in Malargue, Argentina (online talk), November 13-18, 20227. Auger Radio workshop AERA (online), February 28th- March 1st, 2023,
7. Auger Radio workshop AERA (online), February 28th- March 1st, 2023,
8. Auger Collaboration meeting (online), March 12-17, 2023, Malargue, Argentina (talk)
9. Annual Scientific Session of Faculty of Physics, University of Bucharest, May 26th, 2023 (talk)
10. Auger Analysis meeting, Bruxelles, Belgium, June 4-9, 2023 (talk)
11. GCOS meeting (online), Bruxelles, Belgium, June 10-11, 2023
12. CORSIKA8 workshop (online), June 12-14, 2023
13. Carpathian Summer School of Physics – CSSP23, 2-9 July, 2023, Sinaia, Romania (invited talk)
14. Second edition of the ATCx event in Romania (Altair Technology Conference) organized by SiMART 3D company, 28 Septembe,r 2023, Bucharest (networking)
15. Earth Explorer 11 User Consultation Meeting, ESA event in Bucharest, October 10-11, 2023
16. Auger Radio workshop AERA (online), October 18-20, 2023, Karlsruhe, Germany (talk)
17. Invited work-visit at Hamburg University, November 1-4, 2023 (invited seminar)
18. Auger Collaboration meeting (online), November 12-17, 2023, Malargue, Argentina (talk)
19. Auger Radio workshop AERA (online), March 20-22, 2024, Wuppteral, Germany (talk)
20. Auger Collaboration meeting (online), April 14-19, 2024, Malargue, Argentina (talk)
21. Annual Scientific Session of Faculty of Physics, University of Bucharest, May 24th, 2024 (talk/manuscript proposal by July 11th, 2024)
22. Special issue „Advanced Studies in Ultra-High Energy Cosmic Rays" of open access journal Universe (manuscript proposal by end June 2024)
23. Auger GAP-Note (manuscript submitted on June 28, 2024)

Outreach-Education

1. Seminar on „Physics studied at the Pierre Auger Observatory" at the Polytechnic University of Bucharest, October 18, 2022
2. Astronomy School – ASTRO ALL STARS by Expertise Factory (online), November 24, 2022, „Mysteries of cosmic cosmic rays, the messengers of the Universe" by P.G. Isar (invited lecture)
3. (IMC2023) International MasterClass 2023 – with the Pierre Auger Observatory, March 18, 2023, ISS-Bucharest, in frame of IPPOG – International Particle Physics Outreach Group (organizer, talks, hands-on) AugerMasterClass, Follow-up
4. Article in MarketWatch, April 12, 2023, „Aportul cercetarii romanesti la cel mai mare experiment international de studiere a radiatiei cosmice" (interview)
5. Teachers visit at the ISS-Magurele (organized interdisciplinary workshop, talk), May 16th, 2023
6. Astrofest, Crangasi Park, Bucharest, 20 May 2023, "Particule mesagere ale spațiului cosmic" (public talk),
7. CSSP2023, 2-9 Iuly 2023, Sinaia, Romania, "Science Education in Astropartcle Physics with the Pierre Auger Observatory" (invited talk)
8. Auger Early career MasterClass (online), 10 November 2023 (talk)
9. A special issue „Advanced Studies in Ultra-High Energy Cosmic Rays" of open access journal Universe (ISSN 2218-1997) was launched in August 2023, with deadline for manuscript submissions by end of July 2024.
10. (IMC2024) International MasterClass 2024 – with the Pierre Auger Observatory, March 16, 2024, ISS-Bucharest, in frame of IPPOG – International Particle Physics Outreach Group (organizer, mentor, talks, hands-on) AugerMasterClass, Follow-up

11. (Seminar ISS) Ultra-High Energy Cosmic Rays: Some phenomenological and theoretical perspectives, March 27, 2024, Invited speaker: Prof. Dr. Günter Sigl, Universität Hamburg, II. Institut für Theoretische Physik, Hamburg, Germany
12. (Seminar ISS) Remnants from the past, building blocks for the future: the near-Earth asteroids, April 11, 2024, Invited speaker: Dr. Marcel Popescu, Astronomical Institute of the Romanian Academy, Bucharest, Romania
13. Master Thesis (in Scientific Computing with application in Astroparticle Physics, defended on June 25, 2024, at University Politechnica Bucharest)

Services
1. Remote operation and monitoring of the Fluorescence and Lidar detectors at the Pierre Auger Observatory, September 15 – October 2, 2022 (team from Romania-ISS, France-IN2P3, Australia-U.Adelaide and Argentina-PAO)
2. Remote operation and monitoring of the Radio detectors at the Pierre Auger Observatory, October 10-17, 2022 (team from Romania – ISS, IFIN-HH)
3. Remote operation and monitoring of the Radio detectors at the Pierre Auger Observatory, January 16-23, 2023 (team from Romania – ISS, IFIN-HH)
4. Remote operation and monitoring of the Surface Water-Cherenkov Particle Detectors at the Pierre Auger Observatory, May 1-15, 2023 (team from Romania – ISS)
5. Remote operation and monitoring of the Fluorescence and Lidar detectors, August 6-25, 2023 (team from Romania-ISS and Argentina-PAO)
6. Remote opperation and moniring of the Radio Detectors, May 22-29, Iuly 24-31, 2023 (team from Romania-ISS and IFIN-HH)
7. Remote operation and monitoring of the Fluorescence and Lidar detectors at the Pierre Auger Observatory, August 6 – 25, 2023 (teams from Romania-ISS & IFIN-HH and Argentina-PAO)
8. Remote operation and monitoring of the Radio detectors at the Pierre Auger Observatory, January 15-22, 2024 (team from Romania – ISS, IFIN-HH)
9. Remote operation and monitoring of the Radio detectors at the Pierre Auger Observatory, March 25-April 1st, 2024 (team from Romania – ISS, IFIN-HH)
10. Remote operation and monitoring of the Surface Water-Cherenkov Particle Detectors at the Pierre Auger Observatory, April 16-30, 2024 (team from Romania – ISS)
11. Remote operation and monitoring of the Radio detectors at the Pierre Auger Observatory, June 3-10, 2024 (team from Romania – ISS, IFIN-HH)
12. Remote operation and monitoring of the Fluorescence and Lidar detectors at the Pierre Auger Observatory, July 26 – August 13, 2024 (remote operation from Romania-ISS, with teams from Romania-ISS and Germany-DESY)

Publications
1. Abreu, P., … Isar, P.G. et al., The Pierre Auger Collaboration, „Searches for Ultra-High- Energy Photons at the Pierre Auger Observatory", Universe 8 (2022) 579
2. Isar P.G., RADIO SIGNALS FROM HIGHLY ENERGETIC EXTENSIVE AIR SHOWERS: STATUS AND NEW PROSPECTIVE, Romanian Reports in Physics 75 (2023) 2
3. Halim, AA, Abreu, P., … Isar, P.G. et al., The Pierre Auger Collaboration, "Constraining the sources of ultra-high-energy cosmic rays across and above the ankle with the spectrum and composition data measured at the Pierre Auger Observatory", Journal of Cosmology and Astroparticle Physics 05 (2023) 024
4. Abreu, P. ,… Isar, P.G. et al., The Pierre Auger Collaboration, "Search for photons above 1019 eV with the surface detector of the Pierre Auger Observatory", Journal of Cosmology and Astroparticle Physics 05 (2023) 021
5. Halim, AA; Abreu, P; …. Isar P.G. et al., The Pierre Auger Collaboration, Search for Ultra-highenergy Photons from Gravitational Wave Sources with the Pierre Auger Observatory, ASTROPHYSICAL JOURNAL, 952 (2023) 1
6. Halim, AA; Abreu, P; …… Isar P.G. et al., The Pierre Auger Collaboration, A Catalog of the Highest-energy Cosmic Rays Recorded during Phase I of Operation of the Pierre Auger Observatory, Astrophysical Journal Supplement Series 264 (2023) 2
7. A. Abdul Halim ,…. Isar P.G. et al., the Pierre Auger Collaboration, Demonstrating Agreement between Radio and Fluorescence Measurements of the Depth of Maximum of Extensive Air Showers at the Pierre Auger Observatory, PHYSICAL REVIEW LETTERS 132 (2024) 021001
8. Abdul Halim ,…. Isar P.G. et al., the Pierre Auger Collaboration, Constraining models for the origin of ultra-high-energy cosmic rays with a novel combined analysis of arrival directions, spectrum, and composition data measured at the Pierre Auger Observatory, Journal of
Cosmology and Astroparticle Physics 01 (2024) 022
9. Abdul Halim ,…. Isar P.G. et al., the Pierre Auger Collaboration, Radio measurements of the depth of air-shower maximum at the Pierre Auger Observatory, PHYSICAL REVIEW D 109 (2024) 022002

10. Calafeteanu, T.A.; Isar, P.G.;Slusanschi, E.I. Convolutional Neural Network Processing of Radio Emission for Nuclear Composition Classification of Ultra-High-Energy Cosmic Rays. Universe 10 (2024) 10, 327
11. Tudor Calafeteanu, Gina Isar, Data science in air showers research: machine learning processing and optimal radio detector selection, Internal GAP Note Auger (GAP2024_035)
12. Calafeteanu, T.A.; Isar, P.G.;Slusanschi, E.I. Calafeteanu, T.A.; Isar, P.G.;Slusanschi, E.I. Convolutional Neural Network Processing of Radio Emission for Nuclear Composition Classification of Ultra-High-Energy Cosmic Rays. Universe 11 (2025) 192

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7. Proiect: “Noaptea Europeană a Cercetătorilor, Handle with Science” (HSciRo)
Program: H2020 (Noaptea Cercetatorilor Europeni 2018-2019)
Perioada: 2018-2019
Responsabil de proiect ISS: Dr. Paula Gina Isar
Link pagina de proiect: https://noapteacercetatorilor.ro/nc/evenimente-anterioare/nc20182019/

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8. Proiect: “Noaptea Europeană a Cercetătorilor, Doing Research at Midnight in Romania” (DoReMi-RO)
Program: H2020 (Noaptea Cercetatorilor Europeni 2020)
Perioada: 2020
Responsabil de proiect ISS: Dr. Paula Gina Isar
Link pagina de proiect: https://noapteacercetatorilor.ro/nc/evenimente-anterioare/nc2020/
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