

# Latin American Strategy Forum for Research Infrastructure in High Energy, Cosmology and Astroparticle Physics (LASF4RI-HECAP)

Rogério Rosenfeld  
On behalf of the Preparatory Group



# Timeline

Brainstorming with the HEP community at ICTP-SAIFR 5th ann. and **XI SILAFAE** in Guatemala

## Initial ideas



Iberoamerican Science and Technology Ministerial meeting in Guatemala:  
mandate declaration

## Mandate



National Meetings and formation of the Preparatory Group with delegates from 10 LA countries.

## Preparatory Group



## Initial landscape

Two-page briefs of 18 experiments.  
Gathering support from national communities.

## Town Hall

Town hall meeting at the **XII SILAFAE** in Peru to discuss mandate and next steps



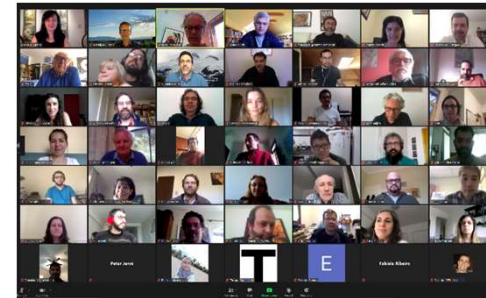
1<sup>st</sup> LASF4RI Workshop and Meeting of the Preparatory Group at ICTP-SAIFR

## LASF4RI Workshop & 1<sup>st</sup> Meeting of Preparatory Group

# Timeline

Deadline for the submission of White Papers to LASF4RI

## White papers



Write-up of the Physics Briefing Book and the Strategy Document.

## Documents write-up



## High-Level Strategy Group

Definition of the composition of the High-Level Strategy Group for HECAP

## HLSG Meeting

Kick-off meeting of the High-Level Strategy Group

## Open Virtual Symposium

Open Virtual Symposium of LASF4RI for HECAP organized by ICTP-SAIFR, delayed from March due to the pandemic

# Timeline



Recognition of advances  
LASF4RI-HECAP  
process



**IB S+T  
Ministerial  
Meeting**



.....

To be continued

**High-Level  
Strategy Group**

Endorsement of Strategy  
Document to the High-  
Level Strategy Group for  
HECAP

**Preparatory  
Group Meeting**

Next steps for the  
Preparatory Group and  
national processes for next  
cycle

SILAF4E 2021



# LASF4RI

[lasf4ri.org](https://lasf4ri.org)



## Latin American Strategy Forum for Research Infrastructure

*Developing a strategy to strengthen Latin American Scientific Collaborations and their impact.*

**First time a strategic planning process in HECAP, with community input, is done in LA.**

# Main Goals of the Process

- To chart the landscape of existing infrastructure and expertise already developed in the region.
- To build consensus and support a strategy-based approach for the participation in, and development of, large-scale research infrastructure projects in Latin America.
- To make a call to Latin American scientific communities to establish a strategic scientific forum in order to coordinate Latin American activities in the area.
- To set-up the LA scientific roadmap based on actual participation in large-scale research infrastructures and the inherent need for long term planning and funding implementing an open call for input from the scientific communities.
- To enable a more effective development of Latin American research groups, facilitating multilateral participation in regional and global research infrastructures, increasing their impact.
- To inform the Ministerial meetings of the development, implementation and impact of the strategy for HECAP.

## 1<sup>st</sup> Preparatory Group Members

**Argentina:** Diana López, Federico Sánchez, Hernán Wahlberg

**Bolivia:** Martin Subieta Vasquez

**Brazil:** Thiago S Goncalves and Rogerio Rosenfeld

**Chile:** Alfonso Zerwekh and Mauro Cambiaso

**Colombia:** **Marta Losada** and Diego Restrepo

**Ecuador:** Edgar Carrera and Harold Yepes Ramírez

**Mexico:** Alfredo Aranda, Juan Carlos D'Olivo, Gerardo Herrera

**Paraguay:** Jorge Molina

**Peru:** Alberto Gago

**Venezuela:** Reina Camacho, Arturo Sánchez

**Europe:** Martijn Mulders

**US:** Marcela Carena and Marcelle Soares

**Asia:** Hiroaki Aihara

### Observers

Leandro de Paula, Brazil

Recently groups from **Guatemala, Honduras**

**Costa Rica** building a CA effort represented today by Ma. Eugenia Cabrera and Melissa Cruz.

# HIGH-LEVEL STRATEGY GROUP MEMBERS

Luciano Maiani – Chair  
Fernando Quevedo - Co-Chair

## Country/Regional Scientific Representatives

**Argentina:** Maria Teresa Dova

**Brazil:** Joao dos Anjos

**Chile:** Claudio Dib

**Ecuador:** Bruce Hoeneisen

**Mexico:** Jacobo Konigsberg

**Venezuela:** Jose Ocariz

**Europe/CERN:** Peter Jenni

**Asia:** Hesheng Chen

**US:** Francis Halzen/Gabriela  
Gonzalez

**ICFA/Fermilab:** Pushpa Bhat

**Asia Pacific:** Geoffrey Taylor

## Institute Directors

Nathan Berkovits, ICTP-SAIFR

Daniel de Florian, ICAS

Alvaro Ferraz, IIP

Jose Roque, LNLS

Ignacio Bediaga, CLAF

Luis Felipe Rodriguez, MAIS

39 white papers submitted.

Three main documents produced:

- LA-HECAP Physics Briefing Book
- Strategy Document with recommendations
- Endorsement letter from HLSG

## 8.1 List of White Papers

Table 8.1: Details of the Inputs of White Papers for this Section

Input ID	Title
I-1	Colombian Network on High Energy Physics - Input on Experimental HEP
I-2	Argentina Experimental HEP Input
I-3	Brazilian Participation in the Next-Generation Collider Experiments (Young Scientists)
I-4	White Paper on Nuclear Science in Brazil. Contribution to the Latin American Strategy Forum for Research Infrastructure
I-5	The ASTRI MINI-ARRAY: a Precursor for the Cherenkov Telescope Array (CTA)
I-6	The Cherenkov Telescope Array (CTA)
I-7	DUNE in the context of LASF4RI. The Colombian Case
I-8	LA-CoNGA Physics perspectives for the Latin America Strategy Forum for Research Infrastructure
I-9	Coherent Neutrino-Nucleus Scattering Experiment (CONNIE)
I-10	The Study of the Quark-Gluon Plasma with the ALICE-LHC Experiment
I-11	Letter of Intent of the Paraguayan Group
I-12	Latin American Contribution to JUNO
I-13	Brazilian Community Report on Neutrino Physics
I-14	Brazilian Report on Safeguards Application of Reactor Neutrinos
I-15	Short baseline neutrino experiment in nuclear reactors in Argentina
I-16	The South American Gravitational wave Observatory (SAGO) White Paper
I-17	Unravelling the Mysteries of Ultraenergetic Cosmic Rays with AugerPrime
I-18	Physics exploration with the LHCb experiment. LHCb Group in Brazil
I-19	The ATLAS/Brazil Cluster: Current Status and Perspectives from the ATLAS Upgrade Programme
I-20	CMS Group - Universidade do Estado do Rio de Janeiro (UERJ)– This contribution was retracted.
I-21	A proposal for Transversal Computer-related Strategies and Services for Scientific and Training efforts
I-22	Developing the first astronomical and quantum imaging instrument using the Smart Skipper-CCD technique
I-23	Southern Wide-field-of-view Gamma-ray Observatory (SWG0)
I-24	The Cherenkov Telescopes Array: fundamental physics and instrumentation
I-25	GRAND: Giant Radio Array for Neutrino Detection
I-26	A Venezuelan input to the Latin American Strategy for Research Infrastructures (LASF4RI)
I-27	Colombian Network on High Energy Physics Input on Theoretical HEP
I-28	Hyper-Kamiokande: Possible Contributions from Latin America
I-29	The Latin American Giant Observatory
I-30	Ecuadorian HECAP Groups Input to the Latin American Strategy Forum for Research Infrastructure
I-31	A Latin American graduate school - The PPGCosmo experience
I-32	The ANDES Deep Underground Laboratory
I-33	Macón Ridge Astronomical Site
I-34	Brazilian Community Report on Dark Matter
I-35	Dark Matter and Neutrino Physics - Contribution from Buenos Aires to the LASF4RI
I-36	An Andean Deep-Valley Detector for High-Energy Tau Neutrinos
I-37	QUBIC: Q&U Bolometric Interferometer for Cosmology
I-38	Cosmology with the Large Synoptic Survey Telescope (LSST)
I-39	The BINGO Radio Telescope: an instrument to investigate the Universe through the 21 cm neutral hydrogen line



---

# Latin American Strategy for Research Infrastructures for High Energy, Cosmology, Astroparticle Physics LASF4RI for HECAP

---

## LATIN AMERICAN HECAP PHYSICS BRIEFING BOOK

### Preparatory Group

Hiroaki Aihara - University of Tokyo  
Reina Camacho Toro- LPNHE/CNRS  
Marcela Carena - Fermilab/U. of Chicago  
Juan Carlos D'Olivo - UNAM  
Thiago Goncalves - Valongo Observatory  
Diana López Nacir - DF/IFIBA UBA-CONICET  
Jorge Molina - Universidad Nacional de Asunción  
Diego Restrepo - Universidad de Antioquia,  
Arturo Sánchez- ICTP/INFN/ U. of Udine  
Marcelle Soares-Santos - U. Michigan  
Hernán Wahlberg - U. Nacional de la Plata  
Alfonso Zerwekh - U. Técnica Federico Santa María

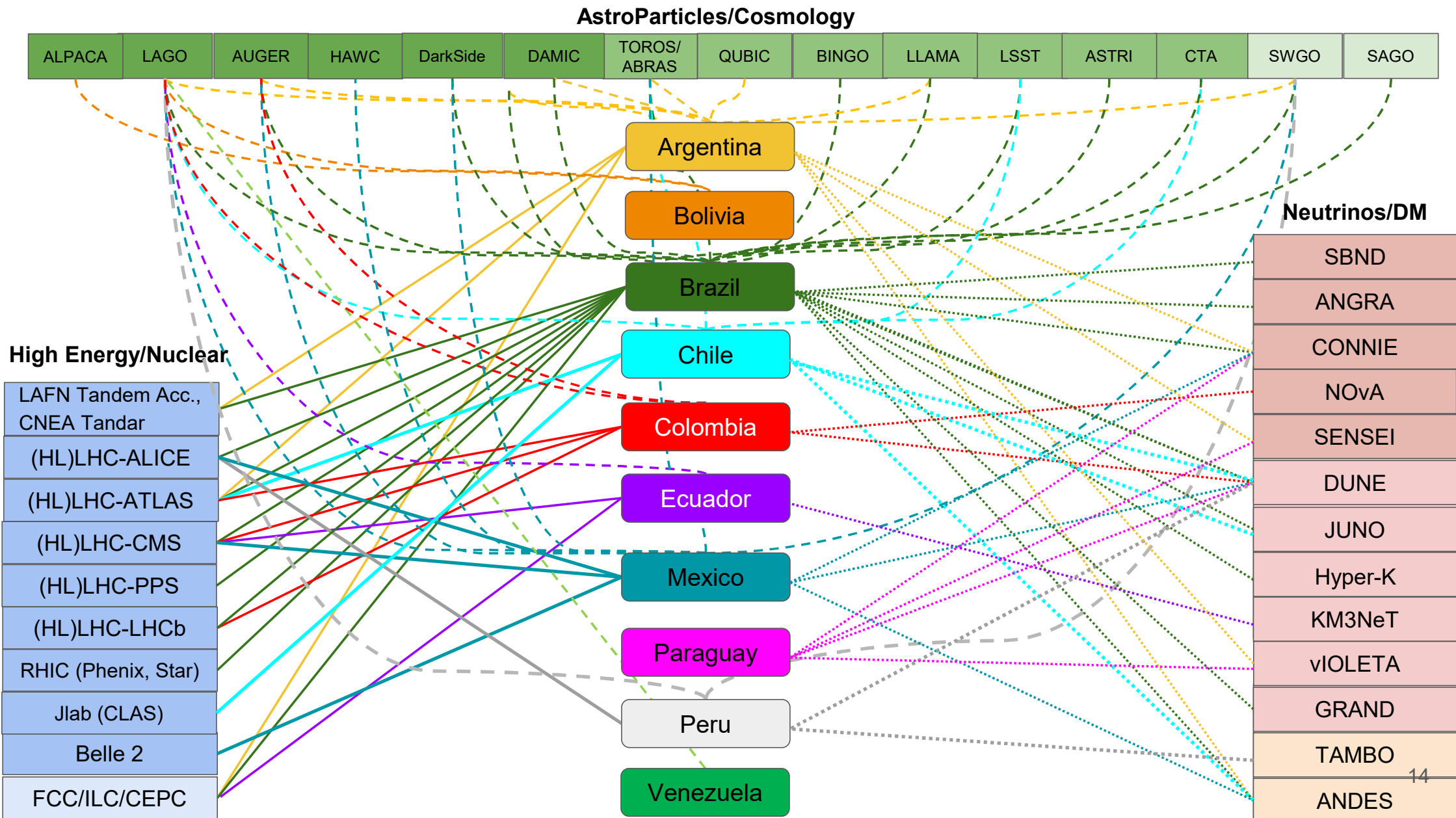
Alfredo Aranda - University of Colima  
Mauro Cambiaso - Universidad Andrés Bello  
Edgar Carrera - Universidad San Francisco de Quito  
Alberto Gago - Pontifica Universidad Católica del Perú  
Gerardo Herrera - CINVESTAV  
Marta Losada - NYUAD  
Martijn Mulders - CERN  
Rogerio Rosenfeld - IFT-UNESP & ICTP-SAIFR  
Federico Sánchez - U. Nacional de San Martín  
Martin Subieta - U. Mayor de San Andrés  
Harold Yepes Ramirez - YTU

arXiv:2104.06852v1 [hep-ex] 14 Apr 2021

# Contents

<b>1 Introduction</b>	<b>1</b>		
<b>2 Astronomy, Astrophysics and Astroparticle Physics</b>	<b>4</b>		
2.1 Introduction	4		
2.2 Involvement of Latin American Countries	6		
2.2.1 Pierre Auger Observatory	6		
2.2.2 Latin American Giant Observatory	7		
2.2.3 Cherenkov Telescope Array	7		
2.2.4 Southern Wide-field-of-view Gamma-Ray Observatory	7		
2.2.5 Large Latin American Millimeter Array	8		
2.2.6 Giant Radio Array for Neutrino Detection	8		
2.3 Leadership Areas	8		
2.4 Drivers for Multiple Approaches	10		
2.5 Synergies	10		
2.6 Conclusions	11		
<b>3 Cosmology</b>	<b>14</b>		
3.1 Introduction	14		
3.2 Experiments and infrastructure with cosmological impact with LA participation	16		
3.2.1 BAO from Integrated Neutral Gas Observations (BINGO)	17		
3.2.2 Macon Ridge Astronomical Site: The ABRAS and TOROS projects	17		
3.2.3 Q&U Bolometric Interferometer for Cosmology (QUBIC)	19		
3.2.4 South American Gravitational-Wave Observatory (SAGO)	20		
3.2.5 Vera Rubin Observatory's Legacy Survey of Space and Time (LSST)	21		
3.2.6 Latin American PhD program	22		
3.3 Areas of Excellence	23		
3.4 Synergies	23		
3.5 Conclusions	24		
<b>4 Dark Matter</b>	<b>27</b>		
4.1 Introduction	27		
4.2 Astrophysical and cosmological probes of DM	28		
4.2.1 Direct detection	28		
4.2.2 Indirect detection	30		
4.3 DM production at colliders	31		
4.4 DM portals	31		
4.5 DM Phenomenology community in LA	33		
4.6 Synergies	34		
4.7 Conclusions	34		
<b>5 Neutrinos</b>	<b>42</b>		
5.1 Introduction	42		
5.1.1 Neutrino oscillations, mass hierarchy and leptonic phase	42		
5.1.2 Neutrino masses and nature	44		
5.1.3 Astrophysical probes	45		
5.1.4 Search for new neutrinos states: light sterile neutrinos and heavy neutral leptons	46		
5.2 Research infrastructures	47		
		5.2.1 Latin America-based large-scale infrastructures	48
		5.2.2 Latin America-based small-scale - high impact- infrastructures	48
		5.2.3 International large-scale infrastructures	50
		5.3 Areas of excellence in Latin America	52
		5.4 Synergies	52
		5.4.1 Local large-scale infrastructures	52
		5.4.2 Local small-scale infrastructures	53
		5.4.3 International large-scale infrastructures	53
		5.5 Conclusions	53
		<b>6 Electroweak &amp; Strong Interactions, Higgs Physics, CP &amp; Flavour Physics and BSM</b>	<b>57</b>
		6.1 Introduction	57
		6.2 Participation of LA groups in HEP Activities	60
		6.2.1 Nuclear Physics	60
		6.2.2 Jefferson Laboratory	63
		6.2.3 LHC-ATLAS	63
		6.2.4 LHC-CMS	65
		6.2.5 LHC-LHCb	66
		6.2.6 LHC-ALICE	67
		6.2.7 SuperKEKB	68
		6.2.8 Future Colliders	68
		6.2.9 Theory	69
		6.3 Training, outreach, exchange programmes	70
		6.4 Areas of excellence and leadership	70
		6.5 Synergies	70
		6.6 Conclusions	71
		<b>7 Instrumentation and Computing</b>	<b>73</b>
		7.1 Introduction	73
		7.1.1 Main key scientific questions and highlights	73
		7.1.2 Non-scientific drivers	75
		7.2 Topics within similar instrumentation drivers	75
		7.2.1 FPGA Boards	75
		7.2.2 Read Out systems	76
		7.2.3 Small-area Photomultipliers (sPMTs)	76
		7.2.4 Silicon Photomultipliers (SiPMs)	76
		7.2.5 Charge-Coupled Devices (CCDs and Skipper CCDs)	77
		7.2.6 Resistive Plate Chambers (RPC)	77
		7.2.7 ARAPUCA Light Trap (Argon R&D Advanced Program at UNICAMP)	78
		7.2.8 Water Cherenkov Detectors	78
		7.2.9 Laser Interferometer	78
		7.3 Computing and software	79
		7.3.1 General remarks	79
		7.3.2 Large collaboration examples in the region	79
		7.3.3 Training and knowledge transfer efforts	80
		7.4 Synergies with other chapters/scientific topics	80
		7.5 Developing and preserving knowledge and expertise	81
		7.6 Conclusions	81
		<b>8 Appendix</b>	<b>84</b>
		8.1 List of White Papers	84
		8.2 Glossary of Experiments	85

# Very complex landscape revealed:



---

## **Latin American Strategy Forum for Research Infrastructures for High Energy, Cosmology, Astroparticle Physics LASF4RI for HECAP**

---

### **Latin American Strategy for HECAP**

Proposal submitted to the High Level Strategy Group

#### **Strategy Document Committee**

Alfredo Aranda, Diana López Nacir, Marta Losada, Rogerio Rosenfeld,  
Arturo Sánchez, Federico Sánchez, Harold Yepes Ramirez

#### **Preparatory Group**

ARGENTINA: Diana López Nacir, Hernán Wahlberg, Federico Sánchez  
ASIA-JAPAN: Hiroaki Aihara  
BOLIVIA: Martin Subieta  
BRAZIL: Thiago Goncalves, Rogerio Rosenfeld  
CHILE: Mauro Cambiaso, Alfonso Zerwekh  
COLOMBIA: Marta Losada, Diego Restrepo  
ECUADOR: Edgar Carrera, Harold Yepes Ramirez  
EUROPE-CERN: Martijn Mulders  
MEXICO: Alfredo Aranda, Juan Carlos D'Olivio, Gerardo Herrera  
PERU: Alberto Gago  
PARAGUAY: Jorge Molina  
USA: Marcela Carena, Marcelle Soares-Santos  
VENEZUELA: Reina Camacho Toro, Arturo Sánchez

Date: October 1, 2020

# Recommendations for HECAP Research Infrastructures



## Recommendation 1

*Support the development and operation of current- and next-generation projects in astronomy, cosmology and astroparticle physics located in Latin America, enhancing leadership roles in these strategic regional projects that drive capacity building and technological development.*

- ✓ Successful design, deployment and operation of astro/astroparticle/cosmo physics infrastructures in the region.
- ✓ Strong science drivers to further understand the Universe.
- ✓ Clear comparative geographic and atmospheric advantages in the region.
- ✓ Sustained annual increase of scientists participating in these experiments.
- ✓ Desirable to enhance participation of LA groups.
- ✓ Ensure continuity of human resources and funding.

- Ongoing experiments: AUGER, LAGO, TOROS
- Short term (< 3 years): ABRAS, AUGERPrime, BINGO, QUBIC, LLAMA, LSST
- Mid term ( 3-10 years): CTA/Astri, SWGO
- Long term (> 10 years): GRAND200K, SAGO

## Recommendation 2

*Pursue the establishment of the flagship international laboratory, ANDES, that will enable the region as a global center for underground physics and other sciences.*

- ✓ Multi-purpose flagship international underground laboratory located in Latin America.
- ✓ Unique opportunity for frontier underground physics experiments and related sciences.
- ✓ Ideal for competitive neutrino and dark matter experiments for which there is tech expertise.
- ✓ Also relevant for geological and biological sciences.
- ✓ Requires a coordinated and strategic commitment from LA countries.

### Recommendation 3

*Support the existing efforts in international projects in which Latin American groups are actively participating, and in some cases leading initiatives, as a strategy to position Latin America to key leadership roles in future international flagship projects in collider and neutrino physics.*

#### Colliders

- ✓ Strong involvement in all LHC experiments.
- ✓ Major scientific drivers in EW/QCD/Flavour/CP/BSM.
- ✓ Significant contributions made and capacity building over the past 15 years.
- ✓ Highest priority in electron-positron collider.
- ✓ Focus LA contribution to a unique effort in a future collider to enhance impact and relevance of LA groups.

- Ongoing experiments: LHC
- Mid term ( 3-10 years): HL-LHC
- Long term (> 10 years): FCC/ILC/CEPC

#### Neutrinos

- ✓ Seven countries active in neutrino experiments.
- ✓ Focused contribution to DUNE-PDS from LA groups is a top priority.
- ✓ Significant technological expertise given the broad neutrino physics program.
- ✓ Opportunities to develop novel neutrino experiments in the region.

- Ongoing experiments: vANGRA, CONNIE, NOvA, SBND, KM3NeT (Phase-I).
- Short term (< 3 years): vIOLETA, JUNO.
- Mid term (3-10 years): DUNE, Hyper-K, KM3NeT (Phase-II).
- Long term (> 10 years): TAMBO, GRAND200K

## Recommendation 4

*Support small scale, high impact dedicated experiments across HECAP.*

- ✓ Striking a balance that gives room to the development of new ideas.
- ✓ Existing and future small and mid- scale experiments targeting specific scientific objectives and measurements across all HECAP.
- ✓ Direct contributions to advanced training (R6) and R&D (R7).
- ✓ Performance studies for (sub)detector components and prototypes.
- ✓ Development of Skipper CCD-based proposals.

Table 4.1: Roadmap of current and future experiment across HECAP with LA participation. Options of future colliders are included but the recommendation is to focus efforts on only one initiative.

Field	Project	Scientific Driver	Status	Start of Operations
Astro	Auger	UHECR	Ongoing	NA
Astro	AugerPrime	UHECR	Upgrade	2022
Astro	LAGO	$\gamma$ rays	Ongoing	NA
Astro	LLAMA	CMB+Radio	Under construction	2020
Astro	CTA	$\gamma$ rays	Under construction	2025
Astro	SWGO	$\gamma$ rays	Collaboration Agreement	2026
Astro/Neutrinos	GRAND 200K-LA sub-array	Neutrino astronomy/UHECR	Future experiment	> 2030
Cosmo	TOROS	EM follow up GW	Under construction	2020
Cosmo	ABRAS	EM follow up GW	Under construction	2021
Cosmo	BINGO	BAO in radio	Under construction	2022
Cosmo	QUBIC	CMB polarization	Under construction	2021
Cosmo	LSST	Dark Matter/Dark Energy	Under construction	2022
Cosmo	SAGO	Next generation GW	Future experiment	2040
Colliders	LHC (all experiments)	EW/Higgs/BSM/Flavour/CP/QCD	Upgrade for Run 3	NA
Colliders	HL-LHC (all experiments)	EW/Higgs/BSM/Flavour/CP/QCD	Approved	2027
Colliders	FCC/ILC/CEPC	Higgs/BSM	Future collider	> 2035
Neutrinos	NovA	$\nu$ oscillation prop.	Ongoing	NA
Neutrinos	SBND	Precision $\nu$ -Ar interactions	Ongoing	NA
Neutrinos	$\nu$ ANGRA	Nuclear safeguards	Ongoing	NA
Neutrinos	CONNIE	CEvNS	Ongoing	NA
Neutrinos	KM3NET (Phase-I)	neutrino astronomy	Ongoing	NA
Neutrinos	$\nu$ IOLETA	CEvNS, NMM, Light Vector Mediators	Under construction	2021
Neutrinos	JUNO	Precision oscillation, mass hierarchy, BSM	Under construction	2022
Neutrinos	Hyper-K	CP violation, solar neutrinos, mass hierarchy, BSM	Under construction	2025
Neutrinos	DUNE	$\nu$ properties, Leptonic CP, BSM	Under construction	2026
Neutrinos	TAMBO	$\nu_\tau$ astronomy	Future experiment	> 2030
Neutrinos/DM	ANDES	Low mass DM/ $\nu 0\beta\beta$	Future facility	> 2030

## Recommendations for a healthy and integral HECAP Science Program in LA



## Recommendation 5

*Strengthen the collaboration among different theoretical groups in the region working in HECAP and their interactions with the experimental efforts.*

- ✓ Contributes to building a stronger science program.
- ✓ Strong theoretical and phenomenology groups in LA.
- ✓ Relevance of SILAFAE, continued support for this event.
- ✓ Significant benefits of interactions between theorists and experimentalists.

## Recommendation 6

*Support and develop advanced training programs that harness regional capacities and expertise across all Latin American countries active in HECAP.*

- ✓ Contribute to highly qualified human talent training.
- ✓ Advanced training programs are critical to support planned activities.
- ✓ Intra-regional training networks enhanced by links to hubs of knowledge.
- ✓ Opportunities to be trained at the same level as global peers while enhancing retention for the benefit of the region.
- ✓ Highly qualified human resources that can enrich other domains of society with their knowledge and skills.
- ✓ Role of regional institutes to continue to support these initiatives.

## Recommendation 7

*Foster R&D capabilities in key technologies across HECAP, enabling connections with industry, and with possible broader societal impact.*

- ✓ R&D crucial to provide successful participation and contributions to major experimental endeavors.
- ✓ Important regional advances in harnessing expertise in some technologies that are now bearing fruit but clear gaps that still need to be addressed.
- ✓ Innovative technology developments allow for novel design of experiments to pursue the outstanding scientific drivers.
- ✓ Particular relevance of R&D in areas that are common to several types experiments.
- ✓ Relevance of maintaining a dynamic R&D activity in parallel and in latency periods of the operation of major experiments.
- ✓ Some successful regional examples of industrial connections that can only increase with a thriving HECAP science program.
- ✓ Identification of applications for broader societal impact.

## Recommendation 8

*Enhance the high performance computing infrastructure and internet connectivity in the region.*

- ✓ HECAP experiments are among the largest producers of big data that drives valuable expertise among its users.
- ✓ Integration of existing infrastructures to develop and consolidate linked macro-structures that perform as a single entity.
- ✓ Development of a robust, high-performance scientific computing (HPSC) infrastructure, as well as the improvement of internet connectivity in the region, is fundamental to all experimental efforts.
- ✓ A Latin American Science Cluster, similar to the European ESCAPE project, that includes HECAP should be a priority.
- ✓ A strong computing infrastructure also allows for the training and capacity building in the area of software development, computer-integration and data analysis that feeds into ever increasing needs for data scientists in the region.

## Recommendation 9

*Develop formal and stable mechanisms for coordination and funding among research councils and funding agencies at the regional level to support HECAP initiatives.*

- ✓ Coordinating support at the funding agency level for Latin American groups in HECAP research allows for synergies to increase both scientific impact and local benefits.
- ✓ Continuity in funding mechanisms is required to develop the HECAP strategy.
- ✓ Resources to contribute to detector development, software and computing requirements for the various experiments and the successful completion of these projects.
- ✓ Fulfillment of commitments to international collaborations ensuring outcomes and science goals.

## Recommendation 10

*Encourage the dissemination of knowledge, outreach and the active involvement of the general population in scientific research, boosting Societal Engagement.*

- ✓ Recognize the importance of looking beyond responding open scientific questions and advances in technological development to consider how to benefit society more broadly.
- ✓ Need to continue to make the case for science and its importance in our societies.
- ✓ Increase the pipeline of younger generations motivated by science.
- ✓ Wider implementation of citizen science initiatives.
- ✓ Create a positive culture around the facilities and experiments, crucial for their long-term survival.



# Endorsement by the High-Level Strategy Group

- HLSG Meeting of Oct 20 2020

After reviewing and discussing this document the HLSG wishes to express that it applauds the process that has been undertaken in Latin America for the *first time* to develop with broad participation of the HECAP scientific community a strategy for research infrastructures. The research topics combine an exciting contribution to understand the deepest structures and fundamental interactions of our Universe with the latest technological developments and with concrete applications to society. The resulting documents reflect an in-depth and systemic exercise to understand the current landscape, identify the regional strengths and weaknesses, and propose concrete projects to focus on while maintaining a balanced perspective that includes crucial capacity building initiatives.

The **LASF4RI-HECAP Strategy Document** presented to the HLSG shows an impressive degree of maturity of the Latin American region in moving forward with participation and leadership roles in state of the art large research infrastructures and related experimental facilities in HECAP areas. Its pillars are *ten* overarching recommendations whose successful implementation could lead to significant improvement of the impact of, and benefit for, the Latin American region in technological and scientific development in the near and medium term future. The findings and recommendations define the priorities for Latin American scientists in the coming decade and beyond.

# Endorsement by the High-Level Strategy Group

The **LASF4RI-HECAP Strategy Document** addresses several aspects that need to be simultaneously developed to sustain a thriving research environment which includes fostering R&D for key technologies, enhancing the computing and network infrastructures, advanced training of the younger generations, and broad dissemination of knowledge with increased initiatives for citizen science. The importance of reinforcing connections between theorists and experimentalists to advance the research questions posed and the exploration of answers through experimentation is clearly stated and is considered of great value by the HLSG.

The recommendation for stable and continuous mechanisms for funding and coordination at the level of funding agencies and research councils for HECAP is of paramount importance and this HLSG endorses it enthusiastically.

Finally, the HLSG strongly recommends that the HECAP community put in place a robust structure and mechanisms that would allow the community to come together, on a periodic basis, ideally about every five years, to examine progress and consolidate community input to develop and/or update the strategic plan for the region. The European Particle Physics Strategy Update and the United States “Snowmass” processes are examples of successful national/regional models. Such sustained and recurring community engagement in the strategy development process will ensure regional coordination in the participation, as well as in developing leading roles, in regional and global scientific research infrastructures. This would also facilitate funding agencies in their decision-making process to adequately support the HECAP efforts in Latin America.

**Given the above considerations the High Level Strategy Group expresses its endorsement of the 2020 LASF4RI-HECAP Strategy Document.**

# 2020 Iberoamerican S+T Ministerial Meeting

## October 27 2020

- [https://www.segib.org/wp-content/uploads/Declaracion-IV-RMCTI\\_ES.pdf](https://www.segib.org/wp-content/uploads/Declaracion-IV-RMCTI_ES.pdf)

Recognition of LASF4RI-HECAP process:

Los avances en el establecimiento del Foro Estratégico Iberoamericano para las Grandes Infraestructuras, a partir del desarrollo de un programa piloto en el área de física de altas energías, astropartículas y cosmología, cuyos resultados se han plasmado en el documento estratégico para el desarrollo de estas disciplinas, que incluye la definición de recomendaciones y el establecimiento de una hoja de ruta.

Main goals of the process have been accomplished

Huge thanks to Marta Losada!

## **LASF4RI-HECAP Preparatory Group 2021-2023**

**Chair: Rogerio Rosenfeld; Co-chair: Diana López Nacir**

### **Argentina**

Diana López Nacir

Federico Sánchez

Hernán Wahlberg

### **Bolivia**

Martín Subieta

### **Brazil**

Jailson Alcaniz

Ignácio Bediaga

Rogerio Rosenfeld

### **Chile**

Alfonso Zerwekh

Mauro Cambiaso

### **Colombia**

Nicolás Bernal

José David Ruiz Álvarez

### **Ecuador**

Francisco Yumiceva

Dennis Cazar Ramírez,

Harold Yepes

### **Central America**

Maria Eugenia Cabrera - Guatemala

Melissa Cruz Torres - Honduras

Federico Muñoz - Costa Rica

### **Mexico**

Alfredo Aranda

Juan Carlos D'Olivo

Gerardo Herrera

### **Paraguay**

Jorge Molina

### **Peru**

Alberto Gago

### **Venezuela**

Reina Camacho Toro

Arturo Sánchez Pineda

José Antonio López

### **International**

Marcela Carena

Martijn Mulders

**Marta Losada (ex-officio)**

# New Timeline (continued)

## 1<sup>st</sup> Meeting of the new Preparatory Group

Mandate 2021-2023



### SILAF AE EXPRESS

Creation of the Latin American  
Association for HECAP

# Activities of the Preparatory Group since June 2021

## (~monthly meetings)

- Proposal for a timeline for new process
  - July 2022 - Call for Letter of Intent to write White Papers
  - July 2023 – Deadline for Letters of Intent
  - July 2024 - Deadline for White Papers
  - December 2024 - Workshop about white papers
  - 2025 - writing the Strategy
- Letters to Ministries & Funding agencies sent
- Talks to EURAXESS about MSCA-Staff Exchange application
- Talks to BID, LA-ConGA and RedCLARA about possible joint project(s)
- Development of a Logo (huge thanks to Arturo Sánchez!)
- Development of the bylaws for the Latin American Association for HECAP – huge thanks to Salvatore Mele!

# Latin American Association for HECAP

## Objectives

- 1.Strengthen existing ties within the Latin American HECAP community and foster new and existing collaborations.
- 2.Engage the wider scientific community and the general public through the promotion of HECAP.
- 3.Represent the Latin American HECAP communities in other scientific international bodies.
- 4.Announce activities in HECAP in the region through means such periodic newsletters and a website.
- 5.Promote other activities such as the organization of symposia, workshops, schools, university-institution cooperation and exchange programs for students, and the production of educational and outreach material.
- 6.Engage with Ministries, funding agencies and other national authorities related to Science and Technology to promote the rollout and development of the current LASF4RI-HECAP process.
- 7.Organize SILAFAE every two years.
8. Coordinate periodic assessment and strategic planning within the LASF4RI-HECAP process.



# Latin American Association for HECAP

Should be as inclusive as possible:

Anyone interested in HECAP can in principle be a member

There are no fees

You can join the Association by just filling a simple form at

<https://forms.gle/SrWWcjrMWEPFHa7t7>

We will send the link by email to the registered participants. **Please help to spread in your local community!!**

We can use all the help  
you can give! Thank you!

## New in 2021

- Final version of LASF4RI-HECAP Physics Briefing Book, [arXiv:2104.06852](https://arxiv.org/abs/2104.06852)
- Presentation by F. Quevedo at CILAC 2021: Latin American Open Science Forum
- LA Representatives for ALCC, I. Bediaga (Brasil) and M.A. Diaz (Chile)
- New members of the Preparatory Group including now members from Costa Rica, Honduras and Guatemala
- New Chair and Co-chair of the Preparatory Group: Rogerio Rosenfeld (Brasil) and Diana López Nacir (Argentina)
- Current work focused on:
  - Preparation of Implementation Project to present to Rafael Anta from IDB.
  - Constitution of LA-HECAP Association, for approval at next SILAF AE.

# Summary of Recommendations

Four major recommendations with regard to HECAP research infrastructures:

- Ensure a rich program of astro/astroparticle/cosmo experiments in the region *with enhanced participation of LA*.
- Develop on >10 year scale new facilities and areas of expertise in the region (underground physics, gravity, neutrino astronomy).
- Continue strong links and participation in major international projects in collider and neutrino physics *via a more focused, coordinated and impactful approach*.
- Maintain a balanced approach including smaller scale regional projects to drive new ideas and technological developments.

Five recommendations to strengthen the HECAP science program as a whole:

- R&D technologies
- Advanced training program
- Connections between theorists and experimentalists
- Computing and network infrastructures
- Societal engagement

**One major recommendation** for stability and continuity mechanisms in funding and cooperation across funding agencies in LA.