



2009-2016



UNIVERSIDAD TECNICA  
FEDERICO SANTA MARIA



Jan 6th, 2016

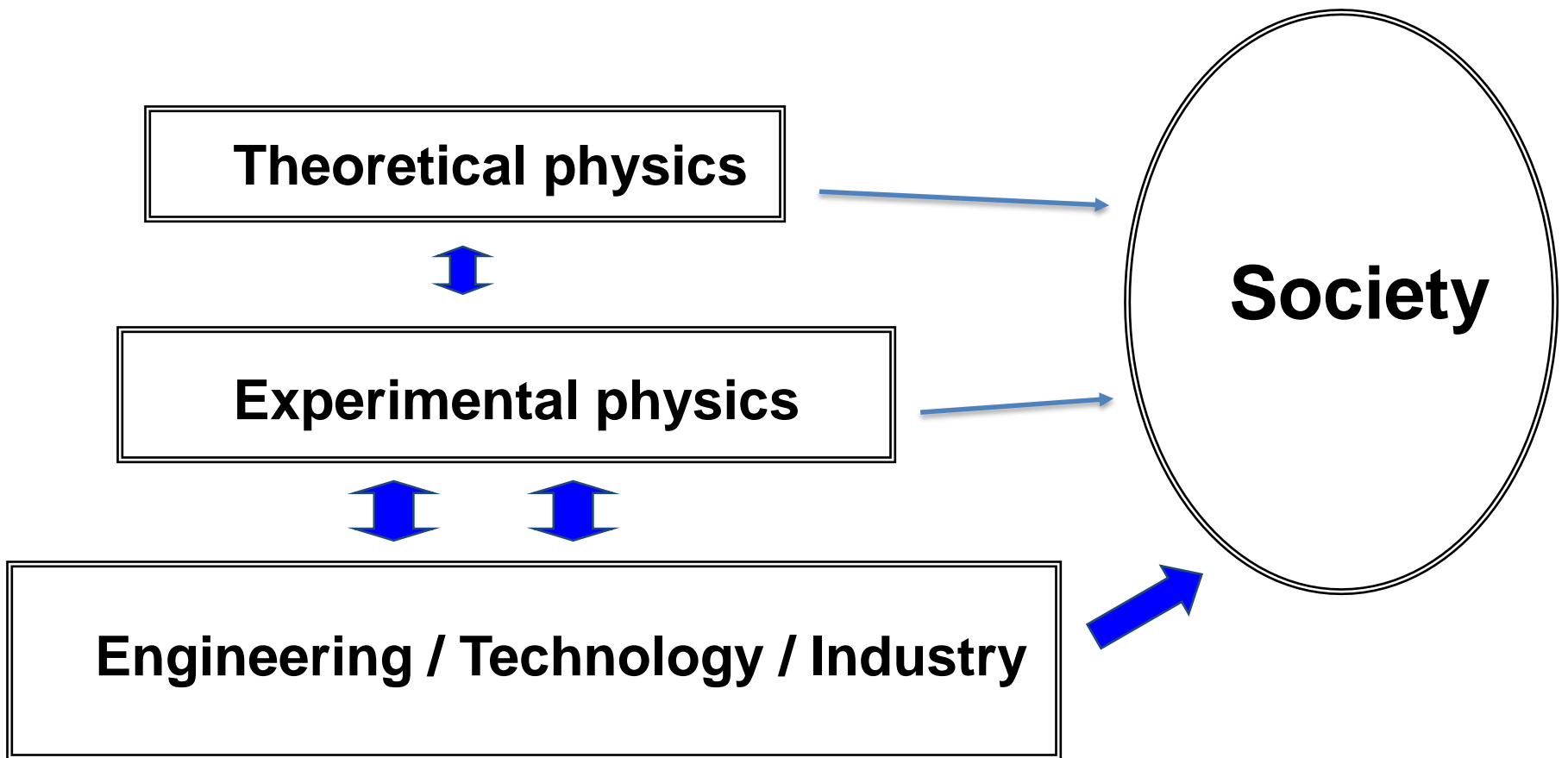
*Ex umbra in solem*

[www.cctval.usm.cl](http://www.cctval.usm.cl)

# CCTVal

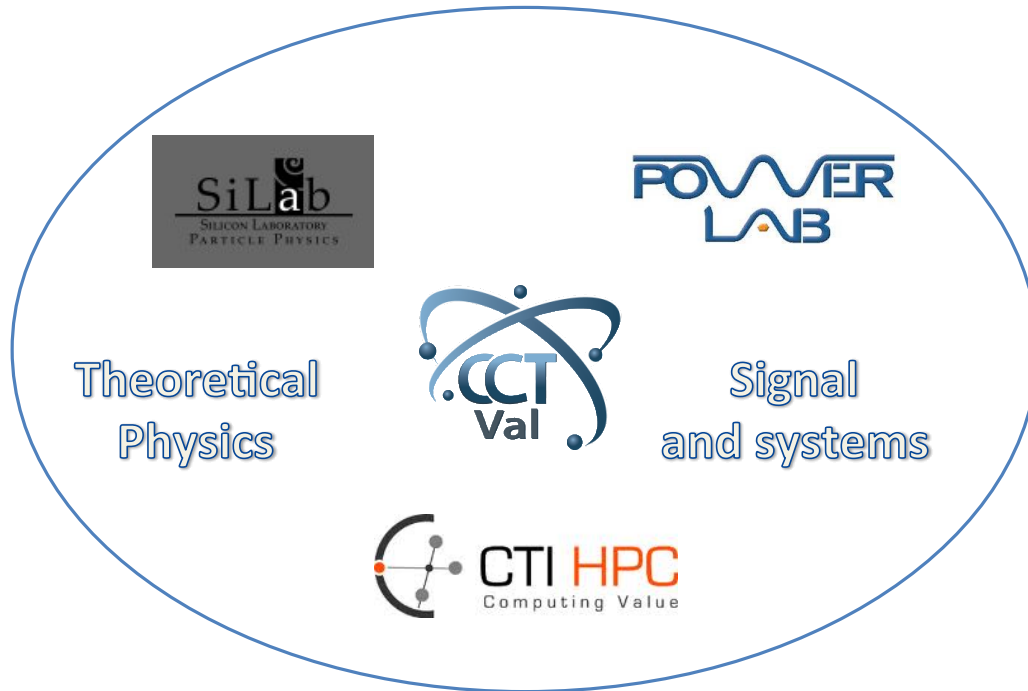
Particle Physics, Computer Science and Electronics.





# Who we are

The Center is composed by 5 main groups



- 12 Senior researchers (7 Chilean, 1 US , 4 Russian)
- 14 Young researchers (10 Chilean, 3 Russian and 1 Armenian)
- 18 Postdocs (11 Chilean, 2 US , 1 Russian, 1 Chinese, 1 Iranian, 1 Venezuelan, 1 Moroccan)
- 3 Project managers (Engineers)
- 2 Technicians + 4 Administration

# Research Activities

- 1 Particle detector technology, advanced sensors**
- 2 Experimental particle physics**
- 3 Particle physics theory and phenomenology**
- 4 Neutrino physics**
- 5 High performance computing**
- 6 Power electronics, modeling, control and signal processing**

# Achievements (2009-2016)

- Researchers 31 ( 35%)
- Postdoctoral Fellows 18 ( 65% non Chilean)
- ISI PUBLICATIONS 541
- Citations 14.701 (Jan 2014)
- Students > 100 (average)
- 
- Theses ( under-post graduated) 185  
*(Physics, Electronics, informatics, Mechanics, Industrial)*
- Participation in SC conferences 302
- Scientific visit ( Labs/ Universities in the world) 122
- Patents ( presented) 5
- Contracts with industry/labs 10
- External funding awarded 10 M USD
- Equipment 1.2 M USD

# International collaborations

ATLAS participation

Higgs physics

Heavy ions (convenor: W. Brooks)



Student training

Ph.D. Electronics Thesis  
Grid computing Thesis

CERN grid connection  
TIER 2 Level

51 % of grid resources in  
LatinAmerica



# ATLAS Muon System Upgrade

## The ATLAS muon system upgrade

The baseline technology, defined in May, is a combination of sTGC (super TGC) and Micromegas



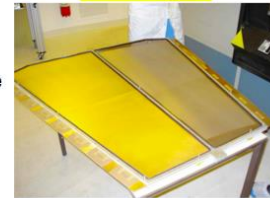
Critical milestones → end 2012

Both sTGC and MM produce L1 signal

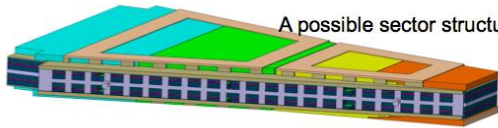
sTGC



Micromegas



A possible sector structure



**Particle  
detector  
technology**

- USM production site (15% of new ATLAS muon spectrometer):
- A clean room with 2 granite tables and a crane
- Graphite spray machines: PRIMA and KUKA robot
- 2 m long winding machine and electrical test set up
- Cosmic ray test facilities in UTFSM and PUC (Santiago)

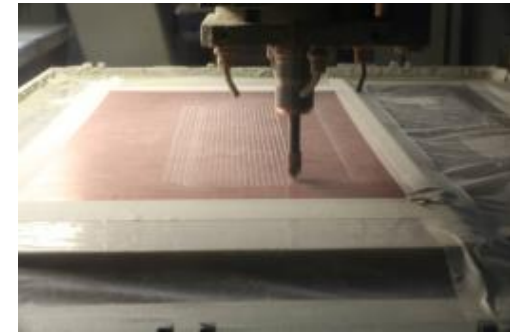
**Group from Electronics Department participates in programming of KUKA robot and PRIMA machine setup**

The screenshot shows the CONICYT website with the following content:

- Header: CONICYT Ministerio de Educación, Gobierno de Chile. Navigation: Ir a CONICYT.cl, Contacto, English, Preguntas Frecuentes, Accesos, Program.
- Section: PCI Programa de Cooperación Internacional. Navigation: Inicio, Sobre PCI, Concursos, Noticias, Estadísticas.
- News Item: **CONICYT Y CERN FIRMAN ACUERDO PARA LA CONSTRUCCIÓN EN CHILE DE PIEZA CLAVE EN LA RENOVACIÓN DEL EXPERIMENTO ATLAS**. Publicado 11-06-2014.
- Text: Con el apoyo de CONICYT además se financiará la incorporación como miembro pleno de la Universidad de Talca al experimento ALICE.
- Image: Small Wheel detector component.
- Text: CONICYT y la Organización Europea de Investigación Nuclear (CERN) firmaron la semana pasada un Memorandum de Entendimiento (MoU) para la construcción de la Pequeña Rueda de Muones (Muon New Small Wheel Project) por parte de científicos de la Pontificia Universidad Católica y del Centro Científico Tecnológico de Valparaíso (CCTVal) de la Universidad Técnica Federico Santa María, como parte del proceso de renovación de ATLAS el detector de partículas más grande del mundo.
- Text: CONICYT financiará con más de 200 millones de pesos el equipamiento necesario para la construcción de parte de la Pequeña Rueda de Muones, proyecto considerado clave en la renovación del experimento ATLAS que busca incrementar la eficiencia en la detección de partículas.



# Atlas Upgrade



# International collaborations



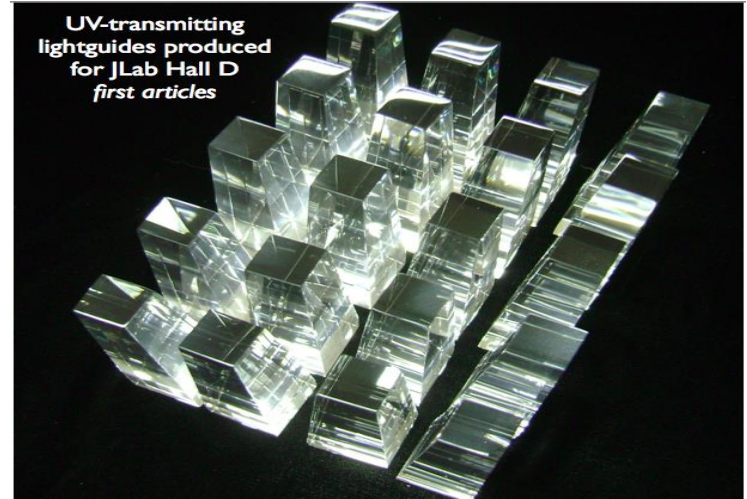
**CLAS:** Strong interactions  
Student visits

**GlueX:** polarized photons

Fabrication of 4000 UV-transmitting lightguides, 10 different irregular trapezoidal geometries

**\$2 million contract budget**

Complete characterization of 2800 16-cell MPPC/SiPMs for JLab Hall D

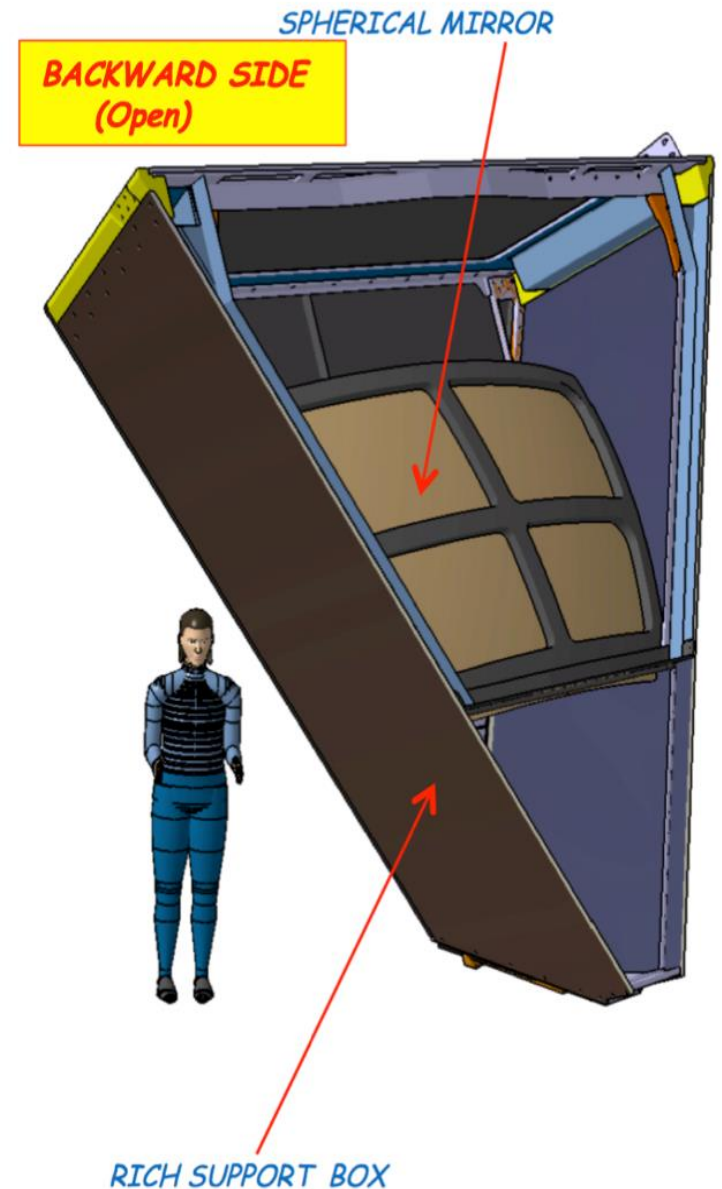


# CLAS12 RICH Mirrors

Crucial detector for CLAS12 particle identification; needed for experiment [E12-06-117](#); three USM spokespersons

USM will make front-surface *ultralight* mirrors using carbon fiber reinforced polymer (CRFP) layup on a polished steel mandrel

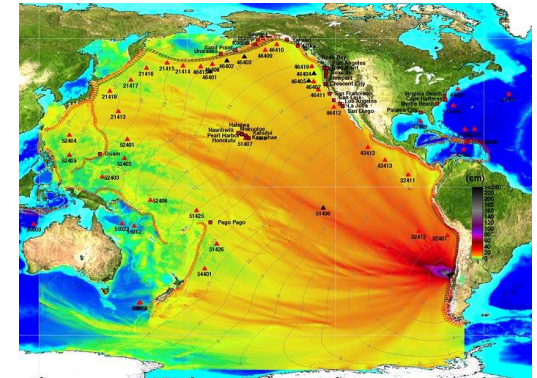
Technology applicable to solar energy, space science, microwave applications





## Advanced tsunami warning

Chilean and US Navy, Boston Univ.  
Computing,  
electronics,....



High  
performance  
computing

## Biomedical image processing

Hyperspectral imaging  
PET

## Computational astrophysics

Redshift determination  
Molecular astrophysics

## Big data and machine learning

## Scientific computing

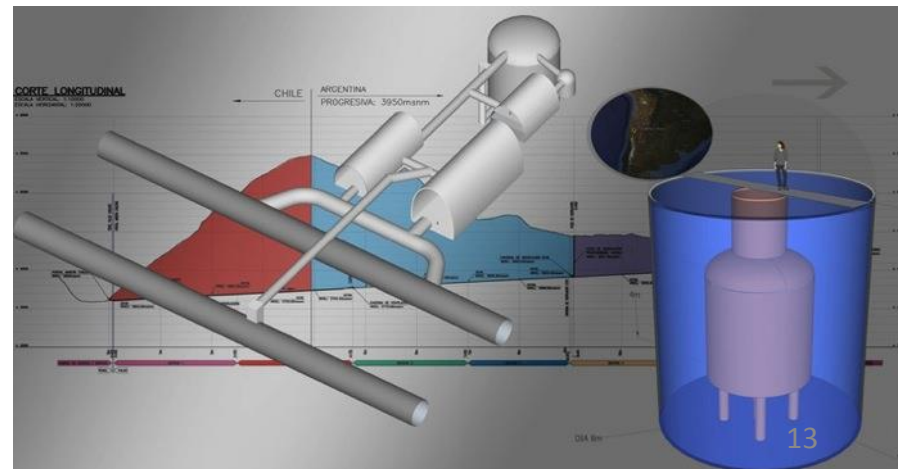
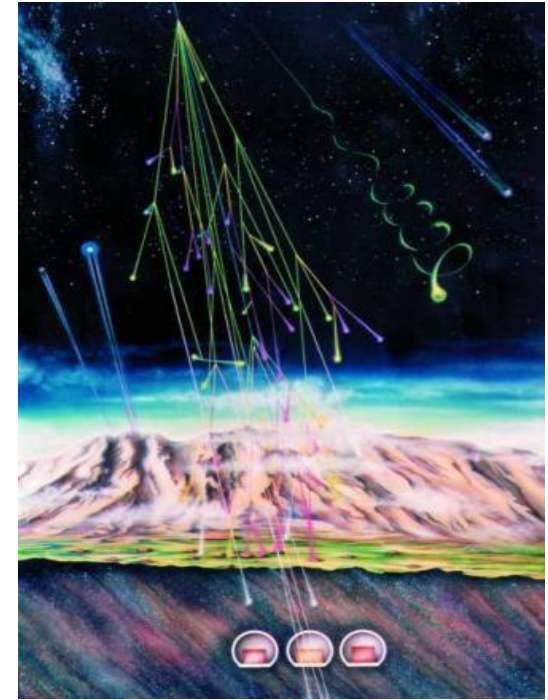
## Databasing (CERN-ATLAS)

GRID  
Event-Index

# ANDES deep underground Lab

## Neutrino physics

- Projected deep underground Laboratory: ANDES
- Inside road tunnel under the Andes Mountains
- First U-Lab on the Southern Hemisphere
- World's 3rd deepest (1750 m under rock)
- International Latin American laboratory
- Our group has the coordination in Chile

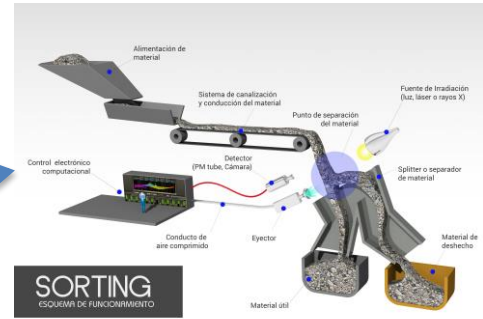
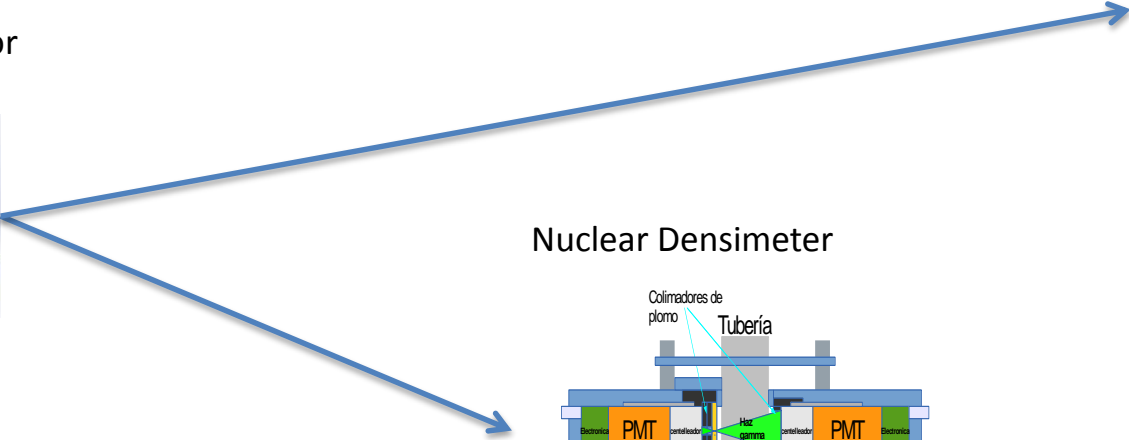
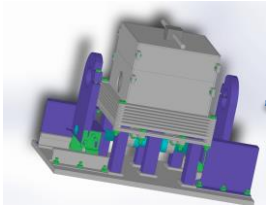




# Applied Research

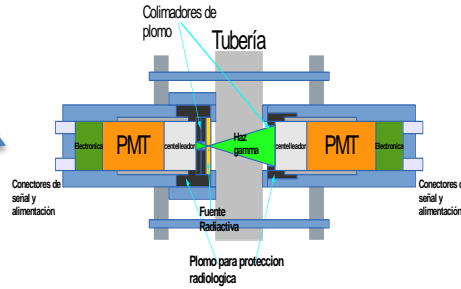
# Applied Research Projects

Copper Detector



Mining copper Sorting Equipment

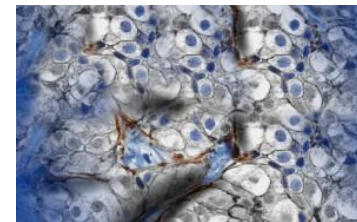
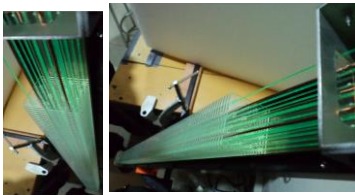
Nuclear Densimeter



wireless probe for use in radio guided surgery



Radon Detector



Medical Image solution

2012

2013

2014



# Applied Research Projects



Low cost Pc-board ,



internet Cloud Platform for Industrial Equipment's ( case for Mining – Energy)



*quitz*

Mobile payment Latam platform



Automation solutions for Mining and Agriculture



micro sleep and a high level of fatigue ( mining truck workers)



# Physics

Experiment

Will Brooks  
Sergey Kuleshov  
Hayk Hakobyan  
Jonathan Miller  
Ryan White  
Ahmed El Alaoui  
Fedor Prokoshin  
Edson Carquin

Theory

Claudio Dib  
Boris Kopeliovic  
Sergey Kovalenko  
Eugeny Levin  
Antonio Carcamo  
Amir Rezaeian  
Juan Carlos Helo  
Irina Potashnikova  
Alfonso Zerwekh  
Maximiliano Rivera  
Marat Siddikov  
Sebastian Mendizabal  
Oscar Castillo-Felisola  
Ivan Schmidt

Thank you for coming