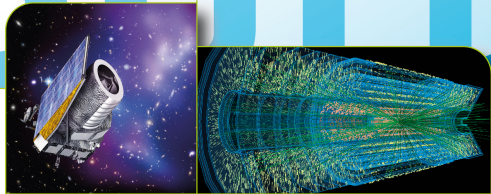


Madrid



**International Summer School on
INtelligent signal processing for
FrontIer Research and Industry**



Introduction to the INFIERI International Summer School series & objectives of the VIth edition at UAM.



**Lectures & Hands-on Labs on Cross-disciplinary
cutting-edge Research fields**

- From Astrophysics (Dark Energy & Dark Matter) and Particle Physics (Higgs & beyond with future accelerators) to Medicine (High technology revolution in Medicine)
- From advanced microelectronics to intelligent devices
- From Artificial Intelligence to Big Data and High Performance Computing in Science and Industry

AUGUST 23rd to SEPTEMBER 4th, 2021
UNIVERSIDAD AUTONOMA MADRID
<http://infiери2020.ft.uam.es/ciaff/>



Aurore Savoy-Navarro
IRFU-CEA, Universite Paris-Saclay
and CNRS/IN2P3

Target audience: M.Sc., Ph.D., postdoc-level physicists and engineers

Support by worldwide Academia, Research Labs & Industry

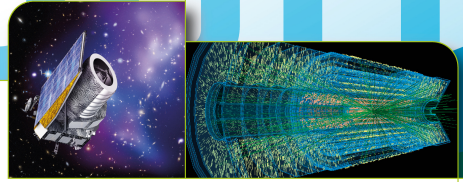




Madrid



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**Lectures & Hands-on Labs on Cross-disciplinary
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- ✓ What “INFIERI” means.
- ✓ Brief historical summary
- ✓ International Ranking
- ✓ Objectives of this global School series
- ✓ Why this school is “special”
- ✓ Objectives of the INFIERI School at the Autonoma in MADRID



INFIERI stands for:
“**IN**telligent signal
processing for
FrontIER **R**esearch and **I**ndustry”

in fieri, en tornar se, deviniendo, in divenire, a (en)
devenir, in becoming (in progress), aan de gang, 进行中



INFIERI SCHOOLS:

The INFIERI Schools create a special framework with lecturers and Labs instructors,

- combining various and worldwide expertise,
- emphasizing **SYNERGY** between different domains, for:

Encouraging & motivating people
to be opened to **NEW IDEAS!**

Young researchers and engineers attending the school will profit from this special environment which aims at developing

CREATIVE MINDS and **BREAKING** the **WALLS!**

in fieri, en tornar-se, deviniendo, in divenire, a devenir, in becoming (in progress), aan de gang, 进行中...



MANY WALLS To BREAK



- The wall we built around ourselves: “egocentric wall”
(*Only focusing on a very restricted domain of research or engineering*)
- Geographical walls (*thinking local / worldwide-opened; MOBILITY: getting introduced to new educational systems, places*)
- Experiment walls (*even between LHC experiments*)
- Disciplinary wall => be really interdisciplinary
(*ex even AstroParticle vs Particle Physics*)
- Inter-sectorial walls: (*ex: industry vs academic worlds*)
- **Conservatism walls** (***think different: look for innovative solutions***)



MANY WALLS to BREAK (cont'd)

*This just starting INFIERI2021 School edition, is breaking a new wall
the VIRTUAL WALL built by the COVID-19 pandemic:
All the events, WG meetings are virtual, teleworking, confined spirits etc...*

*These many virtual walls can be broken thanks to:
Education & Science (e.g. understanding of the pb, vaccine),
Each one sense of responsibility and civic spirit
(my freedom stops where it disturb yours...)*



*Building on these facts, by translating them into the School organization
and logistics, INFIERI 2021 will/must succeed the in-person return...*



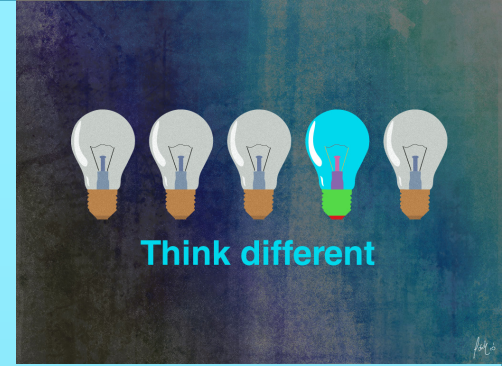
MANY WALLS to **BREAK** (cont'd): **BREAKING COVID19 WALLS**



AND THANKS TO YOU ALL:

*A number of school attendees & lecturers are coming from abroad (even far abroad) or different parts in Spain, **to participate in-person to INFIERI 2021 at UAM.***

***Let's successfully break this wall for this School now!!
It will serve as an example for the events to come***



- **INFIERI SCHOOLS ARE EACH YEAR DIFFERENT**
(No repetition, no copy of the previous schools)
- **NEW TOPICS** are chosen as base for the Lectures & Labs
(Integrating the main specifics and highlights of Research & High Tech fields of interests in the Host Place; combining them with world interests)
- **INFIERI SCHOOLS** apply **MOBILITY** *(each year in a different country; since 2017 in a different continent/world region)*
- **EXCELLENCE** is a key word of the **INFIERI SCHOOLS**:
*Attendance: high level Research or Engineer PhDs, postdocs, few Masters.
Lecturers and Labs organizers are worldwide experts in their field.*



INFIERI SCHOOLS: some basic features

- The school program is built as the “*navigation*” along the full signal & data processing chain of an instrument”.
- **EXAMPLES** in different domains are explained, stressing the **SYNERGY** & differences (lectures completed by Labs)
- **LABS** are an asset of this school series: Hands-on Labs
- **ACADEMICS** and **INDUSTRIALS** collaborate to the Lectures and Labs leading to interesting exchanges
- **TIMETABLE:** All week days, Saturday incl., Sunday Free
 - 9 am-1pm: 2 or 3 Plenary Lectures
 - 1- 2:30 pm: Lunch break
 - 2:30-5:30: Parallel Lab sessions **EACH** afternoon
 - 6 – 8 pm: keynote session

(Addressed to larger scientific/academic audience)



Infieri 2021

23/8 to 4/9, 2021, in Madrid

at the UAM Campus

<http://infieri2020.ft.uam.es/ciaff>



VIth edition of the International Summer School Series on
Intelligent Signal Processing for Frontier Research and Industry

Keywords: *Astrophysics, Medical Physics, Particle Physics, Technological Challenges for confronting Physics Objectives, Exploiting Synergies, Cross Disciplinary*

Cutting edge instrumentation is a driving force for scientific progress, in Physics, Astrophysics as well as in many other scientific disciplines like Medicine. Novel sophisticated signal processing schemes are a key element in building the advanced instruments of the 21st century. It is around all aspects of the signal processing chain that the scientific and technological program of the INFIERI schools is built.

Following successful editions in Oxford, Paris, Hamburg, Sao Paulo and Wuhan the 6th edition will be held from August 23 to September 4, 2021, at the Universidad Autonoma de Madrid (UAM).

The program of the school will cover Advanced Semiconductors, Deep Sub-Micron 3D Technologies, Nanotechnology, Interconnects, Data Transmission, Big Data, High-Performance Computing, Artificial Intelligence, Quantum Technology, as well as their scientific motivations. The latter range from the exploration and understanding of the universe (dark matter/energy and gravity), particle physics and future accelerators, with opening on new energies, to the human-body (Neurology and Nanomedicine).

The three-tier program comprises lectures, keynote talks and hands-on sessions.

The school will only be offering in person attendance as essential to the traditions of the school are the laboratory sessions and the close interactions of students with international experts in fundamental research and instrumentation from Academia and Industry.

The organisers are making every provision to ensure full safety of students and staff through very strict safety rules to be observed by all the participants. The impressive progress in the COVID-19 vaccination, diagnostics and treatment indicate that conditions at the time of the school will allow full safety of all participants to be ensured.

The target audience is M.Sc., Ph.D., postdocs & early-career researchers, mainly physicists and engineers.



For examples of the previous schools' programs: <https://indico.cern.ch/category/4891/>

Brief Historical Tour:

Initiated from the INFIERI EU-ITN network

INFIERI SCHOOLS:

OXFORD, UK, 07/2013

University of Oxford

PARIS, FR, 07/2014

Université Paris-Diderot

HAMBURG, GE, 09/2015

Universität Hamburg

SAO PAULO, BR, 01/2017

USP, Universidade de São Paulo

WUHAN, CN, 05/2019

Huanzhong U. Science & Tech



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The school will only be offering in person attendance for the first two weeks. The last week will be virtual. The laboratory sessions and the close interaction with the host institutions are fundamental for the success of the school. The organisers are making every effort to ensure the safety of the participants. The safety rules to be observed are the same as in any other event. The school will allow full safety of all participants. The school is open to all career researchers, mainly physicists and engineers.

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fundamental
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For examples of the previous schools' programs: <https://indico.cern.ch/category/4891/>

Brief Historical Tour: Initiated from the INFIERI EU-ITN network

- OXFORD, UK, 07/2013
- PARIS, FR, 07/2014
- Université Paris-Diderot
- HAMBURG, GE, 09/2015
- Universität Hamburg
- SAO PAULO, BR, 01/2017
- USP, Universidade de São Paulo
- WUHAN, CN, 05/2019
- Huanzhong U. Science & Tech

First International Summer School on

cerncourier.com/cws/article/cern/55335/3

Intelligent Front-End Signal Processing for Frontier Exploitation in Research and Industry

University of Oxford, UK, July 10th-16th, 2013

www.physics.ox.ac.uk/INFIERI2013

Astrophysics – Medical Imaging – Particle Physics – Technologies

This is the first of a new global programme of annual summer schools covering the complete signal processing chain for building 21st century instruments. The target audience is Master's & Ph.D. students and early postdocs in physics and engineering from institutes worldwide. The series will focus on the most advanced technologies in the fields of semiconductors, very deep sub-micron and 3D technologies, nanotechnology, advanced packaging & interconnects, telecommunications, real-time signal processing and filtering and massive parallel computing. Each school will provide lectures and laboratory work in a variety of cross-disciplinary example applications drawn from the exploration of the distant universe, through medical imaging of the human body, to exploration of the world of elementary particles. The week-long residential school in Oxford in July 2013 will focus on the challenges and issues of front-end detection and processing. Lectures on technical developments and science overviews will be given by experts from academia and industry, alongside hands-on laboratory sessions with technology demonstrators, and subject-specific masterclasses on science and technology topics.

For registration and detailed programme information visit the website at www.physics.ox.ac.uk/INFIERI2013

Confirmed plenary lecturers:

- | | |
|--|--|
| Philip Allport (Liverpool, GB) | Chris Lintott (Oxford, GB) |
| Robert Patti (Tezzaron Corp., US) | David Townsend (Clinical Imaging Research Center, SG) |
| Véronique Puilli (LAL-Orsay, FR) | Valeri Savelliev (Institute of Applied Mathematics, RUS) |
| York Haemish (Phillips, NL) | Cinzia Da Via (U. Manchester, GB) |
| Richard White (Leicester, GB) | Yoshinobu Unno (High Energy Accelerator Research Organization, JP) |
| Lodovico Ratti (U. Pavia, IT) | Filippo Maria Giorgi (U. Bologna / INFN, IT) |
| Erik Heijne (NIKHEF, NL & CERN) | Ted Liu (FNAL, US) |
| Michael Jones (Oxford, GB) | Nicolas Pinto (MIT, USA) |
| Kris Zarb-Adami (Oxford, GB) | Ingrid Gregor (DESY, D) |
| Stephen Pateras (Mentor Graphics, USA) | Alessandro Marchioro (CERN) |

International Organising Committee:

Ariella Cattai (CERN-CH), Mike Jones (Oxford U., GB), Jacqueline N. Hewitt (MIT-USA), Giancarlo Prati (SSSup-IT), Tony Readhead (Caltech-USA), Aurore Savoy-Navarro (CNRS-FR/INFN-IT), Ian Shipsey (Purdue-USA), David Townsend (CIRC-SG), Sibylle Ziegler (TU-Munich, D)

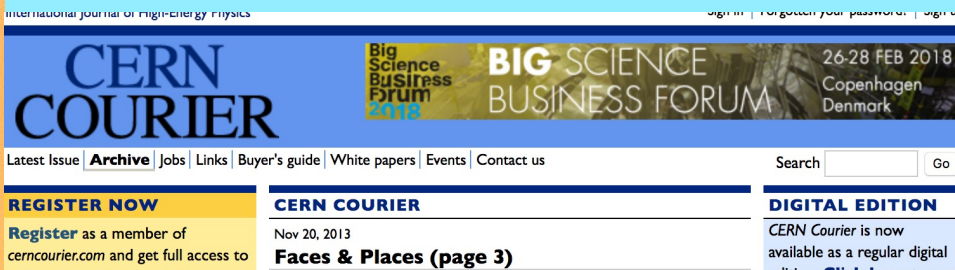
Local Organising Committee:

Garret Cotter, Vanessa Ferraro-Wood, Jamie Leech, Will Potter, Boon-Kok Tan

The 2013 Oxford Summer School is supported by the ICFA Panel on Instrumentation, Innovation and Development, EU FP7 network *INFIERI* and by academic and industrial sponsors worldwide:



Photo: www.josephcaruana.net



New series of summer schools starts in Oxford

The First International Summer School on Intelligent Front-End Signal Processing for Frontier Research and Industry took place in Oxford on 10–16 July – the first of a new series of annual summer schools covering the complete signal-processing chain found in modern instrumentation. The aim is to focus on the most advanced technologies in the



Laboratory session

fields of semiconductors, deep sub-micron and 3D technologies, nanotechnology, advanced packaging and interconnects, telecommunications, real-time signal processing and filtering, and massive parallel computing. The participants studied many of the crucial challenges and issues of front-end detection and processing for building 21st-century frontier instruments.

Participants also took part in social activities in and around the city of Oxford. These included a banquet in the ancient dining hall of Exeter College, evenings in traditional English pubs and an entertaining race around Port Meadow on the River Thames.

Building on the success of this inaugural school, the next will be held in Paris on 14–25 July 2014.

• For more information on the 2013 school, visit

www.physics.ox.ac.uk/INFIERI2013/

First Announcement of the 2nd International Summer School:

On the complete signal processing for 21st Century instruments, for Master's, Ph.D students & Postdocs in Physics and Engineering from institutes worldwide.

Astrophysics - Medical Physics - Particle Physics - Technologies

<http://www.INFIERI2014summerschool.in2p3.fr>

Registration starting on
February 3rd, 2014



INTELLIGENT SIGNAL PROCESSING FOR FRONTIER RESEARCH & INDUSTRY

The focus is on the most advanced technologies in the fields of semiconductors, very deep sub-micron and 3D technologies, nanotechnology, advanced packaging & interconnect, telecommunications, real-time signal processing, filtering and massive parallel computing. The school will provide lectures and Lab work in a variety of cross-disciplinary example applications drawn from the exploration of distant Universe, through Medical imaging of the human body, to exploration of the elementary particle world. Lectures on technical developments and science overviews will be given by experts from Academia and Industry, alongside with hands-on Lab sessions with demonstrators and subject specific master-classes on science & technology.

APC, Paris-Diderot University/CNRS, Paris

July 14-25, 2014

Supported by : ICFA Panel on Instrumentation & Innovation, FP7-INFIERI Network
Academic and Industrial sponsors worldwide

2nd International Summer School on: Intelligent signal processing for Frontier Research and Industry

Astrophysics - Medical Physics - Particle Physics - Technologies

Paris Diderot University, PARIS
July 14th-25th, 2014



**REGISTRATION
DEADLINE**

JUNE 9TH, 2014



Photos by: Alain Monclin (Studio Vidéo Université Paris Diderot), Daniele Vadrucchio (LIP Lisboa), Sarodia Vydellingum (APC Paris)

ALL the informations about the school in:
<http://infieri2014summerschool.in2p3.fr>



OFFICIALLY SUPPORTED by CERN



3rd International Summer School on INtelligent Signal Processing for FrontIER Research and Industry

Astrophysics - Medical Physics - Particle Physics - Technologies

September 14th - 25th, 2015

University of Hamburg - DESY, Germany



EDIT & INFIERI: SUPPORTED by ICFA COMMITTEE AS the 2 IMPORTANT SCHOOLS



REGISTRATION DEADLINE
August 17th, 2015

All information about the school in :
<https://indico.desy.de/event/infieri15>



USF

4th Summer School on INtelligent signal processing for FrontIer Research and Industry

Astrophysics, Medical Physics, Particle Physics, Technological
Challenges for confronting the Physics Challenges,
Exploiting Synergies, Cross Disciplinary

January 23rd -February 3rd 2017, University of São Paulo, Brazil



More information about the school:
<http://www.usp.br/ime/inferi2016/>



5th Summer School on Intelligent signal processing for FrontIer Research and Industry

Lectures And Hand-on Labs On Cross-disciplinary Applications

- From astrophysics and particle physics to brain science
- From advanced microelectronics to intelligent devices
- From A.I. to big data and HPC in science and industry

From ASTROPHYSICS

to PARTICLE PHYSICS

to MEDICINE

TO BRAIN

May 12th-26th 2019
Huazhong University of Science and Technology, Wuhan, China

<http://petlab.hust.edu.cn/inferi2019.htm>
(general enquiries: inferi2019@hust.edu.cn)

For Information Contact:
Prof. Qingguo, Xie (qgxie@hust.edu.cn)
Prof. Nicola D'Asenzo (ndasenc@hust.edu.cn)
Prof. Antine Savoy-Navarro (aurore.savoy.navarro@cern.ch)

A HIGH RANKED INTERNATIONAL SCHOOL



Quoted by CERN, ICFA, JINST Proceedings etc..

Many High skilled/renown lecturers and Lab organizers contributors

Worldwide Top Universities hosting & supporting the school as well as important research Labs and Institutions

A HIGH RANKED INTERNATIONAL SCHOOL



The International Advisory Committee (IAC)

Phil ALLPORT University of Birmingham, UNITED KINGDOM

David BARNEY, European Organization for Nuclear Research, SWITZERLAND

Sergio BERTOLUCCI University of Bologna, ITALY

Mar Capeans GARRIDO European Organization for Nuclear Research, SWITZERLAND

Sonia CONTERA, University of Oxford, UNITED KINGDOM

Brajesh Chandra CHOUDHARY, University of DEHLI, INDIA

Maxwell CHERTOK, University of California, Davis, USA

Jean Gabriel CUBY Laboratoire d'Astrophysique de Marseille, Centre National de la Recherche Scientifique/INSU, FRANCE

Cinzia DA VIA, Manchester University, UNITED KINGDOM

Nicola D'ASCENZO, Huanzhong University, CHINA, and NEUROMED, ITALY

Elisabetta GALLO-VOSS University of Hamburg/DESY, GERMANY

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Jesus MARCO de LUCAS Consejo Superior de Investigaciones Científicas, SPAIN

Nadia PASTRONE, INFN Sezione di Torino, ITALY

Ramon MIQUEL, Institute for High Energy Physics, IFAE, SPAIN

Robert PATTI NHANCED Semiconductors Inc, UNITED STATES

Jose Antonio ROQUE de SILVA, CNPEM and University of Sao Paulo, USP, BRAZIL

Aurore Savoy-NAVARRO (Chair) Institute of Research into Fundamental laws of the Universe, IRFU-CEA & CNRS/IN2P3, FR

Ian SHIPSEY University of OXFORD, UNITED KINGDOM

Yoshinobu UNNO High Energy Accelerator Research Organization, JAPAN

Juan Jose VAQUERO University Carlos III de Madrid, SPAIN

Pierre VEDRINE, IRFU-CEA, FRANCE

CHOICE OF HOT WORLDWIDE PROJECTS & TOPICS => THIS YEAR:

- ⇒ **Astrophysics/Cosmology** from underground to Space experiments: i) *GW 2nd generation* (Quantum sensing) ii) *Dark energy & Dark Matter exploration inSpace EUCLID (ESA)* iii) *VLT to ELT (ESO)* iv) *Astro Space projects in China & USA.*
- ⇒ **Particle Physics***: the **Future machines**: the new ROAD(s) for higher and higher energies, worldwide (EU, CN, JP, USA):HL-LHC, FCC-ee, CepC, ILC, CLIC, SppC, FCC-hh , HE- Muon collider: Physics motivations and Technological challenges
- ⇒ **Applied fields, opening this year a new field besides Medecine.**
 - **Medical Field:** Neurology, High Technologies Revolution in Medecine (nanotechnologies including mARN applied to vaccine & medication)
 - **New Energies: New solar cells, Nuclear Fusion, Wave energy conversion**
- ⇒ **Related High Tech**, advances/prospects in Semiconductor technologies, Sub micron/nano electronics, Si Photonics, Data transmission, Big Data, MPC & HPC, AI from the ASIC to real time applications Quantum Computing from Theory to applications (Q. Communication and Building Q. Computers)

**N.B. HL-LHC upgrades presented in view of their potential for addressing the experimental challenges of the new machines to be built/running in XXI*

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=> **Astrophysics/Cosmology** from underground to Space experiments: GW *2nd generation* (Quantum sensing) ii) *Dark energy & Dark Matter exploration in Space EUCLID (ESA)* iii) *VLT to ELT (ESO)* in *projects in China & USA.*

=> **Particle Physics***: the **Future machines**: the higher energies, worldwide (EU, CN, JP) CLIC, SppC, FCC-hh , HE- Muon colliders Technological challenges

=> **Applied fields, opening**

- **Medical Field:** Nanotechnology in Medicine (nanotechnology in medicine & medication)

- **Nanotechnology** in **Medicine** (nanotechnology in medicine & medication)

Quantum Computing in Semiconductor technologies, Submicron, Wave energy conversion
Quantum Computing from time applications Quantum Computing from Q. Communication and Building Q. Computers)

**N.B. These topics are presented in view of their potential for addressing the experimental challenges of the new machines to be built/running in XXI*



6TH EDITION OF THE INFIERI SCHOOL AT UAM, MADRID:

THE LAB SESSIONS

***A BOOKLET was produced by the
Lab organizers.***

***It includes the title, co-authors and
abstract/brief description of each
proposed Lab.***

***It was issued on July 14 and posted
Since then on the School website.***

HANDS-ON LABS

They are an essential part of the training in this School series.
They are obligatory (10/students)
Will provide "credits"

There is an Hands-on Lab related to
~ each lecture and keynote topic.
It provides a complementary and
allows a deeper understanding of
the topic.

The Program of Labs will be presented
by the Lab organizers this afternoon.

This school has a record number of
Labs with a remarkable quality wrt
Items and high skilled training staff,
from many places in the world, in
Spain, in Madrid, and UAM.



6TH EDITION OF THE
INFIERI SCHOOL
AT UAM, MADRID:

IMPRESSIVE PROGRAMME OF HANDS ON LABS

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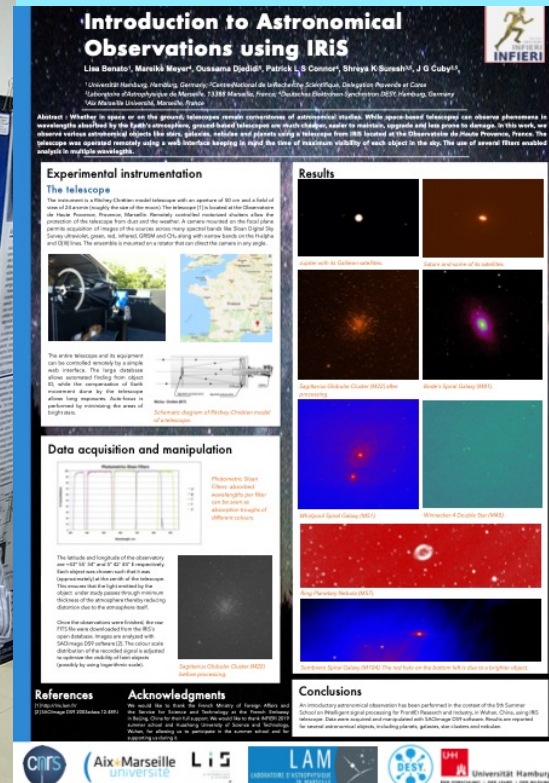
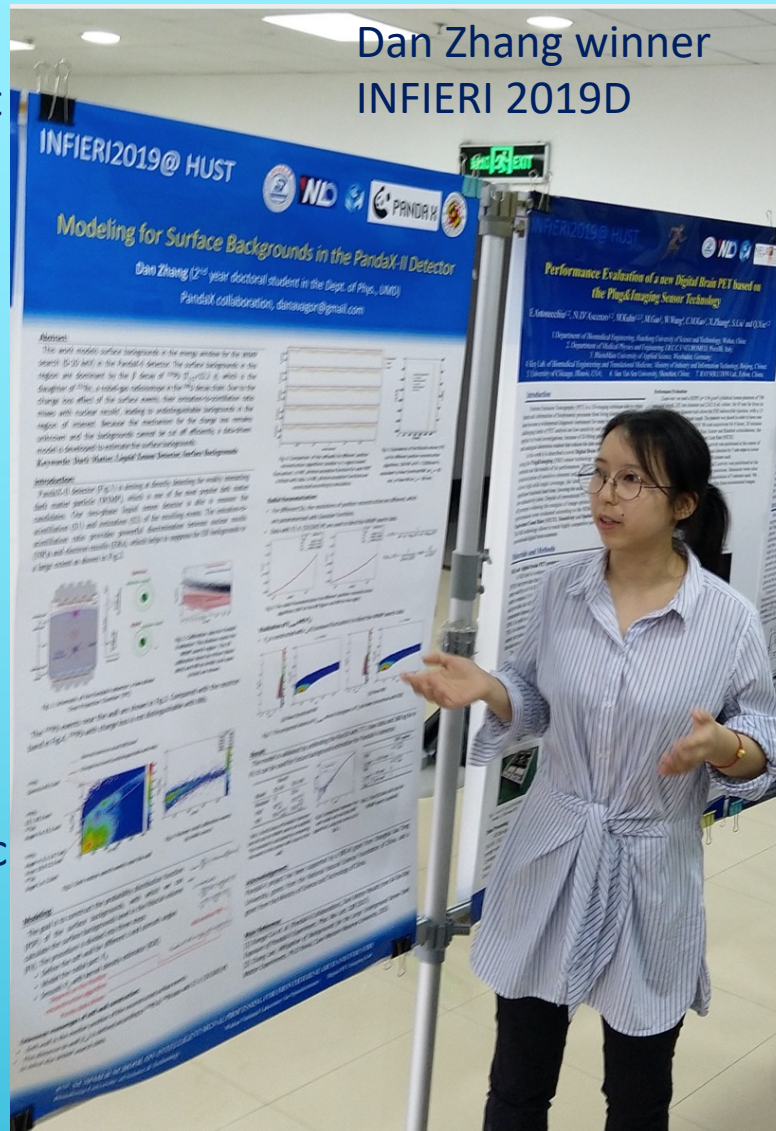
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POSTERS: EACH ATTENDEE
Has to prepare a poster about
Her/his current work or study

POSTERS EXHIBITION:
Over the all school duration,
The posters are exhibited
=> FORUM of discussions and
Exchanges between school
Attendees and with training
Staff

POSTERS PRESENTATION (4/9)
Excellent (difficult) exercise:
Explaining in ~10min the topic
To other students and all the
Training staff present that day
=> PRIZE to the 2 or 3 best
posters

Dan Zhang winner
INIFIERI 2019D



Poster on Teamwork at
INIFIERI 2019
(observational Lab)

SPECIAL ORGANIZATION IN THOSE COVID-19 TIMES



UAM AUDITORIUM & LABS: organized to follow all the safety rules (social distancing, air renewal, washing hands)

CODE OF GOOD CONDUCT: to be strictly observed **BY ALL the school participants at the SCHOOL **and everywhere else!!! (each one responsibility!!)****

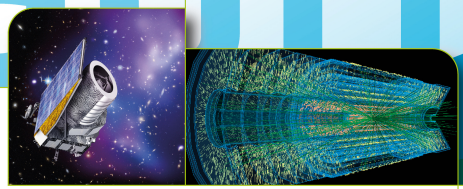
ALL LECTURERS AND LAB ORGANIZERS VACCINATED

A VERY LARGE FRACTION OF THE SCHOOL ATTENDEES AS WELL (cf their registration) or if not PCR<48h.

[VACCINATION **AND FOLLOW STRICTLY SAFETY RULES] = our WEAPONS against COVID & the KEY and sine qua non condition for the SUCCESS of THE SCHOOL**



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Target audience: M.Sc., Ph.D., postdoc-level physicists and engineers

Support by worldwide Academia, Research Labs & Industry



***IT's the 1st
INTERNATIONAL
EVENT back in-person***

***MADRID, UAM, SPAIN
is where it HAPPENS***

***INFIERI SCHOOL in
MADRID MUST SERVE
AS an EXAMPLE!!***



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***MANY THANKS to the
UAM University for its
remarkable support.***

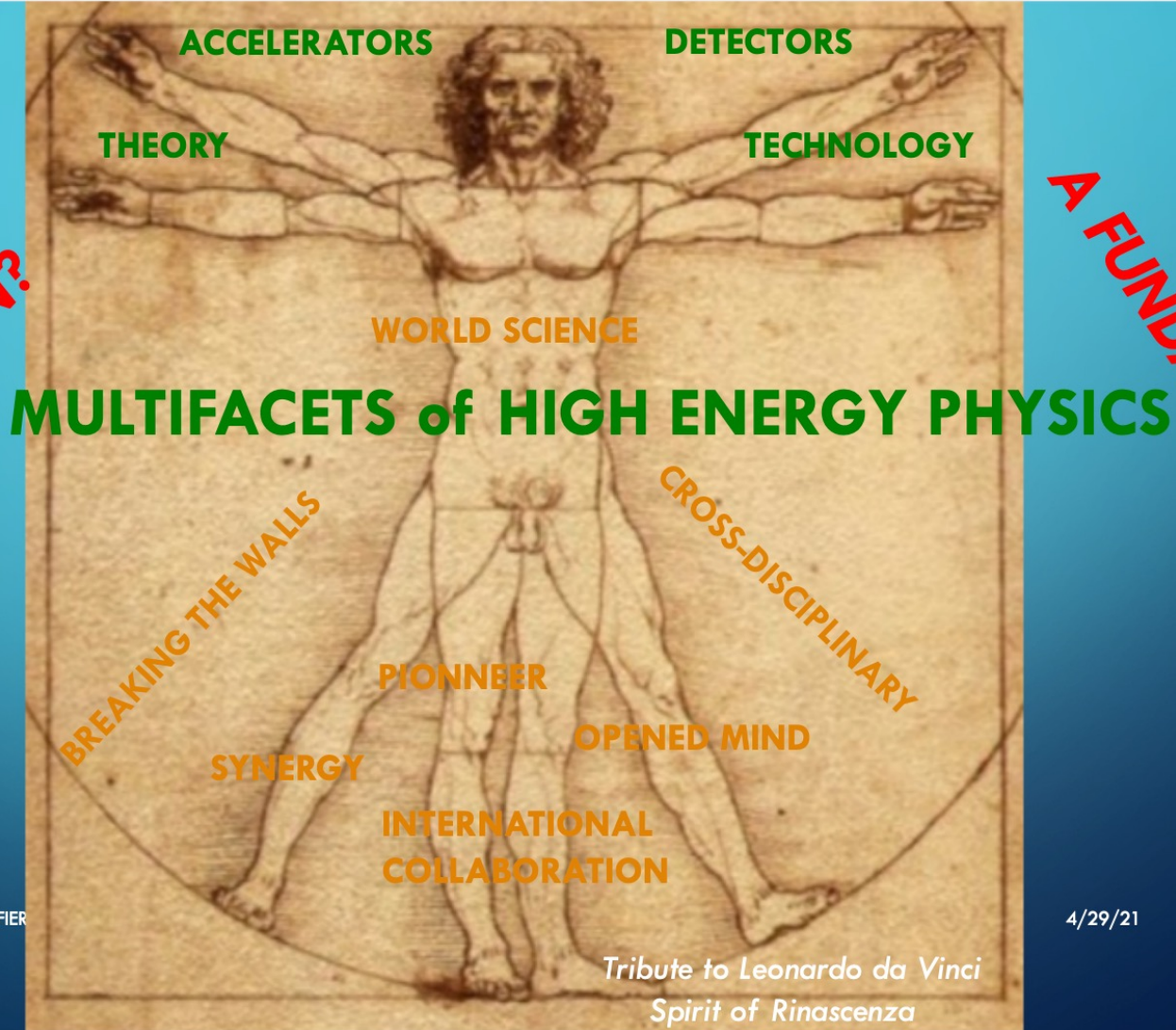
***Welcome to school
attendees who were
able to come here.***

***Let's them profit of all
the efforts put by so
many people to make
this School happening.***

WHAT IS TRUE FOR HEP IS TRUE AS WELL FOR MANY OTHER FIELDS ...

INSTRUMENTATION?

A FUNDAMENTAL NEED



HEP-INTRODUCTION-INFIER

4/29/21

4

ASN's presentation at ECFA Detector R&D Roadmap, workshop on Training