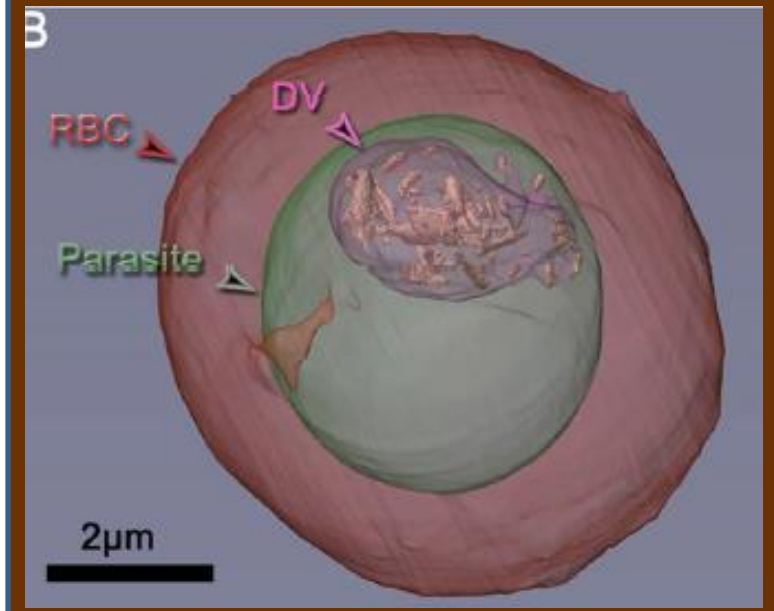
ALBA Synchrotron Light Source

C. Biscari

Understand diseases



How does the malaria parasites infection works?

An international team has unraveled details never described before about how the malaria parasite acts after invading the red blood cells. This discovery has been possible thanks to two advanced microscope techniques combination: X-ray fluorescence microscopy (at ESRF) and soft X-rays tomography, this one conducted at ALBA MISTRAL BL. Infected red blood cells image analysis offer new information that could yield new drugs design against malaria, an illness that claims over 400.000 lives each year.

Nature Scientific Reports (2017) 7, 802.DOI:10.1038/s41598-017-00921-2.
Nature Scientific Reports (2017) 7, 7610.DOI: 10.1038/s41598-017-06650-w

Other examples

- 3D Map of **Hepatitis C**-infected cells ACS Nano (2016) 10 (7). DOI: 10.1021/acsnano.6b01374
- Cholesterol crystals' formation to understand **atherosclerosis** JAmChemSoc (2016) 138 (45). DOI: 10.1021/jacs.6b07584
- **Alzheimer's** mechanisms AnalyticalChemistry (2018) 90 (4). DOI: 10.1021/acs.analchem.7b04818
- Solved a molecular recognition mechanism involved in protein recycling, involved in pathologies like **Alzheimer or Parkinson**. Cell (2016) DOI: 10.1016/j.cell.2016.10.056
- Proving tolcapone as a powerful inhibitor of **familial myloidosis** Nature Communications (2016) 7, 10787.DOI: 10.1038/ncomms10787
- Atomic resolution of enzyme MATα2, related to **colon and liver cancers** PNAS (2016) 8. DOI: 10.1073/pnas.1510959113
- 3D Structure of the fibre head of **turkey adenovirus 3** PLOS One (2015) 29. DOI: 10.1371/journal.pone.0139339

Design drugs

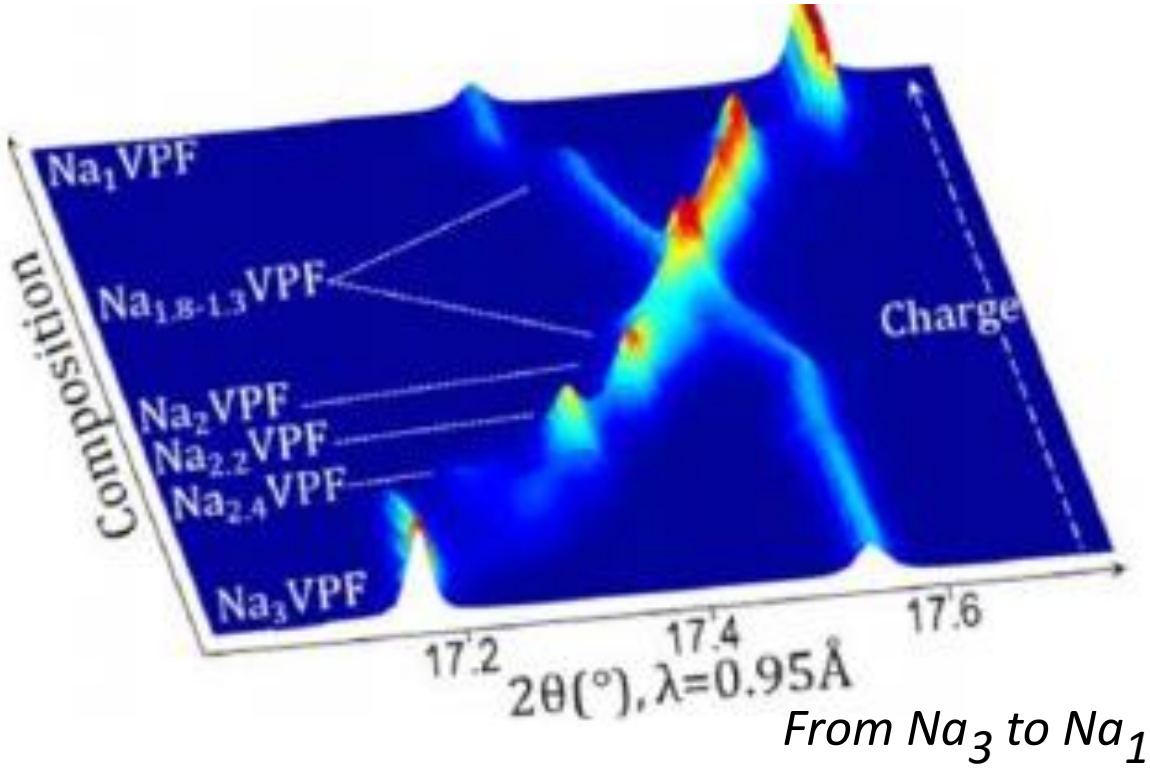
Cancer treatment: understanding the effect of metallic nanocomposites Javier Conesa et al, in preparation

- Organomeallic molecules containing Ir are drugs for cancer treatment. Their localization inside the cancer cells was unknown.
- A combination of X ray tomography (Mistral) and fluorescence imaging (ESRF) has revealed that the metallic Ir is localized at the **mitochondria** which generate ATP (chemical energy source

Other examples

- More stable and less toxic **nanoparticles for medical applications** Chemical Communications (2017) 60. DOI:10.1039/c7cc04945e
- A new key target for **prostate cancer** treatment Nature Communications (2017) 8, 14388. DOI: 10.1038/ncomms14388
- Proven efficacy of a protein with potential to inhibit **HIV-1** PNAS (2014) 111 (51). DOI: 10.1073/pnas.1413592112
- A new drug against **malaria** Acta Crystallographica Section D 70. DOI: 10.1107/S139900471400697X
- **Drugs for sleeping illness** Nucleid Acids Research (2017) 45, 14. DOI: 10.1093/nar/gkx521
- **Iron Oxide Nanoparticles** Stress the Cells *Nanotoxicology*, 1-11

Develop energy materials



From Na_3 to Na_1

Li is expensive and scarce. Research on **batteries** based on alternative electrodes are investigated at MSPD (diffraction) and CLAESS (absorption) beamlines.
Example: **Na based batteries** (Na, V, P, O and F) – Studying the charging capacity by understanding the crystalline structure of the cathode and its changes during charging

CA rechargeable batteries viability demonstrated

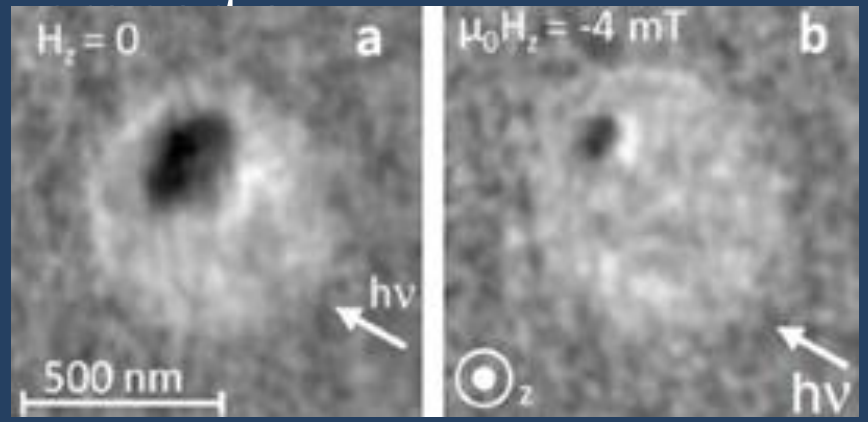
Calcium can be used as electrode in rechargeable batteries according to a study from CSIC in collaboration with Toyota Motor Europe (TME) supported by the measurements performed at ALBA.
This work proves that oxidation-reduction of calcium occurs in a reversible way in electrolytes that can operate at high potential.
Nature Materials (2016) 15. DOI: 10.1038/nmat4462

Other examples:

- **Visualising discharge products in lithium-oxigen batteries**. Nanoletters (2015) 15. DOI: 10.1021/acs.nanolett.5b02862
- **Comparison of Electrospun and Conventional LiFePO4/C composite Cathodes for Li-ion Batteries,** Mater. Sci. Eng. B-Adv. 10.1016/j.mseb.2016.04.006

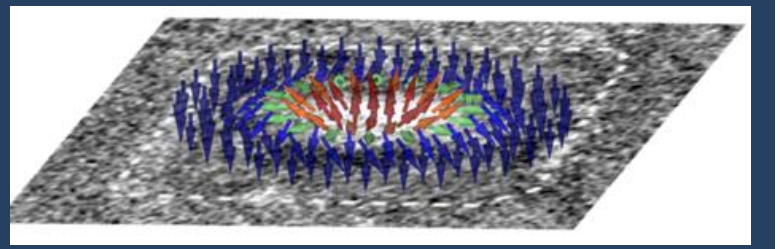
Advance in nanotechnology

- Future **computers** will use the electron charge and magnetic moment for information processing. The science behind is **nanomagnetism** on which Alba performs top level research.
- **Skyrmions** are structures that might be the future carriers of information. CIRCE, BOREAS and MISTRAL BLs are used to study their dynamical and structure



Images from CIRCE showing the contraction of the diameter from 230 to 50 nm under an applied field of 4 mT

Skyrmion schematic

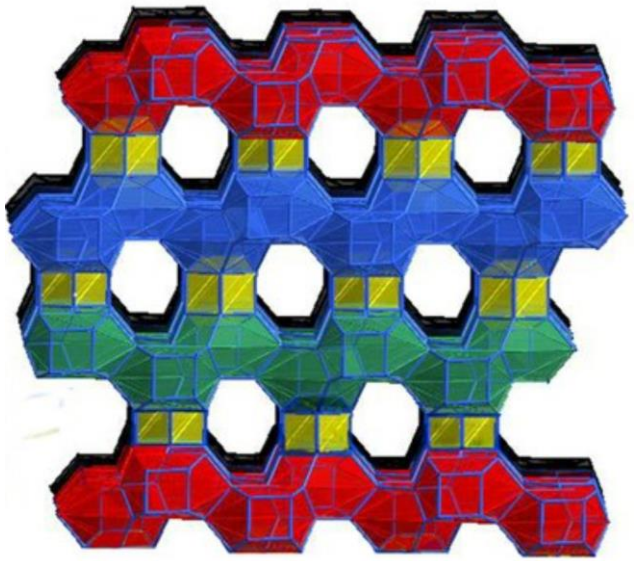


Nature Nanotechnology (2016) O. Bulle ….L. Aballe, M. Foester, …G. Gaudin

Other examples

- Unravelling the water condensation on photoactive nanotubes Langmuir (2017) 33 (26). DOI: 10.1021/acs.langmuir.7b00156
- Nanometric magnetite with full properties Nanoscale (2018) 12. DOI: 10.1039/C7NR07143D
- New method for fabricating high-quality ultrathin cobalt ferrite nanostructures Advanced Materials (2015). DOI: **10.1002/adma.201502799**
- How does cement hydration works? Scientific Reports (2018) 8. DOI: 10.1038/s41598-018-26943-y
- IMAGING HOW MAGNETISM GOES SURFING, M. Foerster et al.Nature Communications 16-28724B
- **New magnetic mechanism in high temperature superconductor cuprates, proving the coexistence of magnetism and superconductivity,** *Advanced Science*. DOI: 10.1002/advs.201500295

Improve catalysis processes

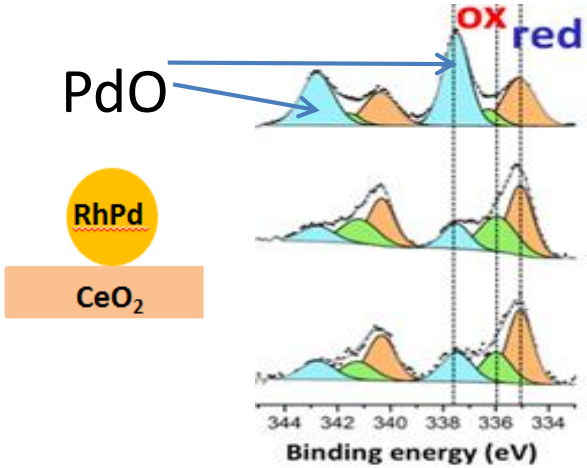


- **Catalysis**: key technology for XXI century. Societal challenges including **fertilizers, fuels from oil, air quality, pharmaceutical, agrochemical**…and more recently photo-catalysis and electro-catalysis for energy research. Improving catalysts requires sophisticated tools to monitor the catalysts in operation.
- Ambient pressure photoemission and absorption spectroscopies at CIRCE and CLAESS are steadily used

Example: Ethanol hydrogenation reaction. Catalyst: PdRh metallic nanoparticles on a CeO2 support

Ambient photoemission reveals that the active catalyst is **oxidized** Pd and **not** metallic Pd

Núria J. Divins *et al.*
Science **346**, 620 (2014);
DOI: 10.1126/science.1258106



Other Examples:

- Metal organic framework-mediated synthesis of highly active and stable Fischer-Tropsch catalysts, Nature Communications 6, 6451 (2015)
- Water affinity and surface charging at the Z-cut and Y-cut LiNbO3 surfaces: An Ambient Pressure XPS Study, The Journal of Physical Chemistry C, 120 (4): 24048-24055 (2016) doi: 10.1021/acs. jpcc.6b05465
- Strong Impact of the Oxygen Content in Na3 V2 (PO4)2 F3-yO y (0 ≤ y ≤ 0.5) on their Structural and Electrochemical Properties, Chemistry of Materials, 28 7683-7692 (2016) doi: 10.1021/acs.chemmater.6b02659
- First direct observation of the development of tailored mesoporosity within zeolites, Chemistry of Materials, 28 (24):8971 – 8979, (2016) doi: 10.1021/acs. chemmater.6b03688

Care for environment and food

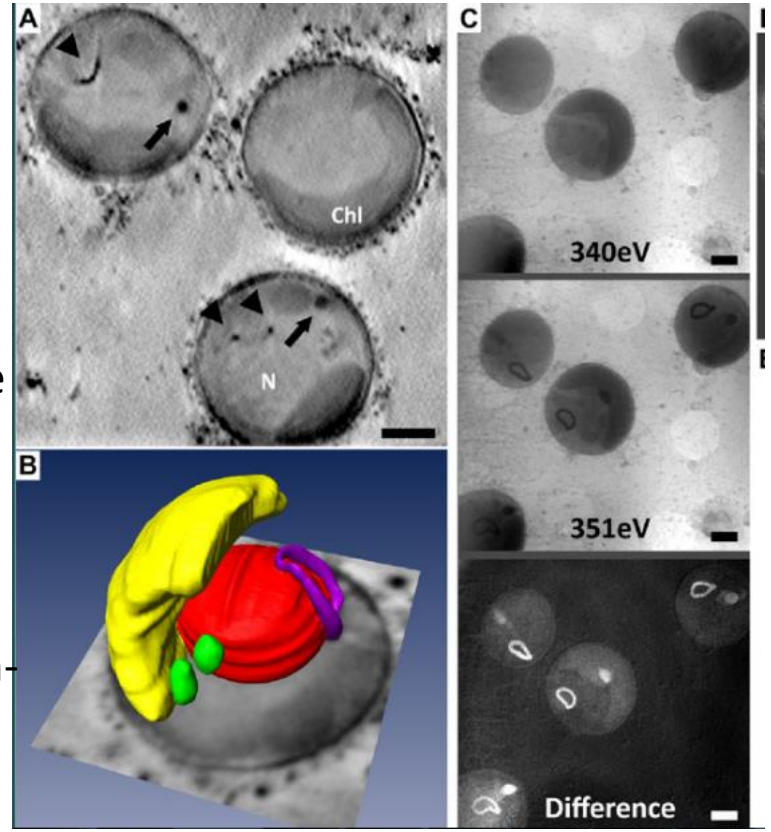
Spatial distribution of calcium in coccolithophores, widespread marine algae that may play an important role in the response of the oceanic ecosystem to predicted global climate change.

MISTRAL and **Max-Planck Institute of Molecular Plant Physiology scientists**

have discovered **high amounts of calcium to be concentrated in membrane-bound compartments that are separate from the coccolith producing compartment**

Coccolithophores may play an important role in the response of the oceanic ecosystem to predicted global climate change, and similar changes in the past were recorded in the chemical composition of coccoliths that accumulated in ocean-floor sediments.

Nature Communications (2016) 7, 11228. DOI: 10.1038/ncomms11228

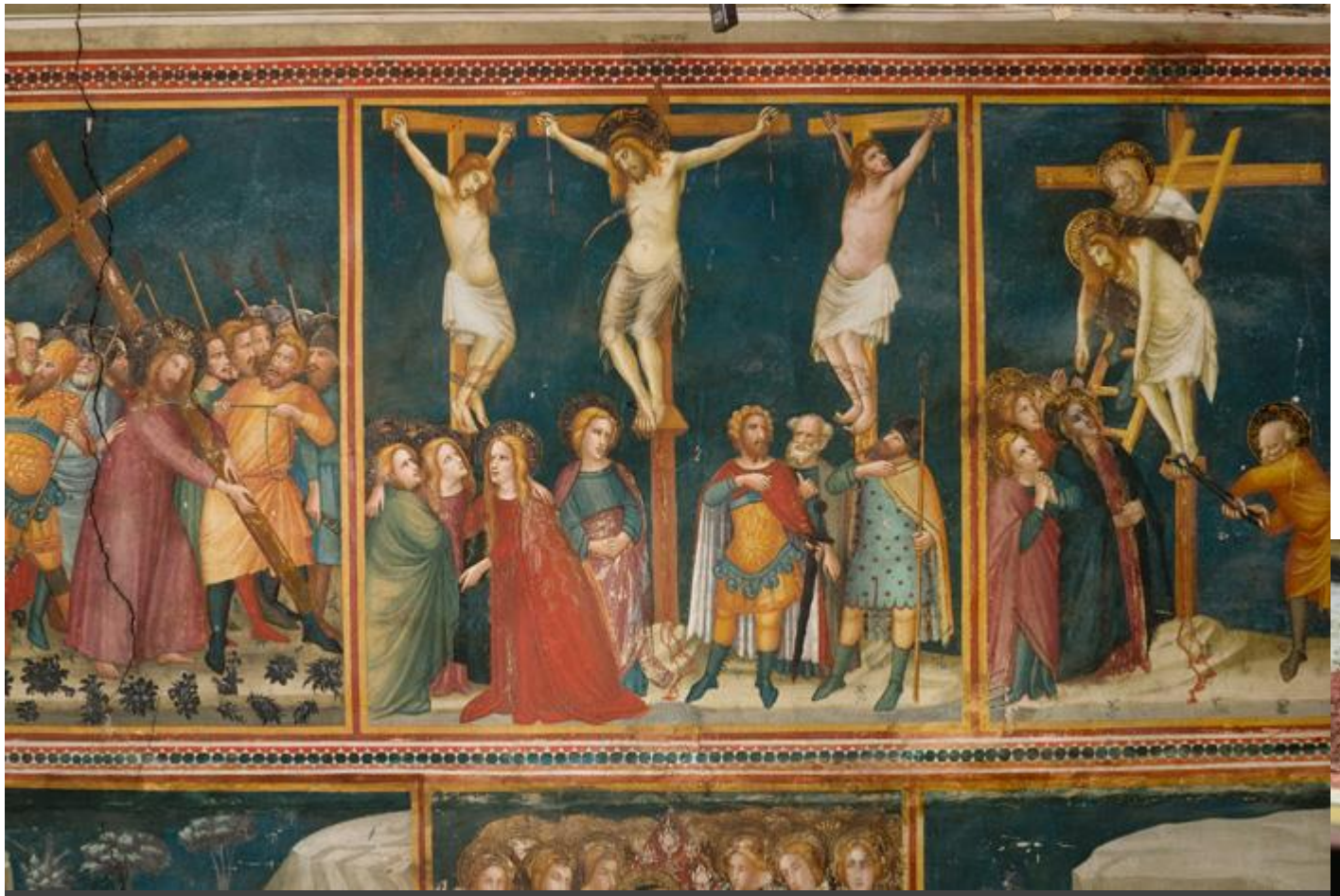


Other examples

- A molecular mechanism that controls plant growth and development. Cell (2014) 156. DOI: 10.1016/j.cell.2013.12.027
- THE INHIBITION OF RAP PHOSPHATASE BY SPECIFIC PHR PEPTIDES, PLoS Biology 2013 11(3):e1001511
- Polymorphic study of alimentary triacyglycerols by SAXS/WAXS simultaneous measurements: from pure components to end food products
- Distribution of Selenium speciation in Se-enriched wheat grain
- HOW DO PLANTS RESIST SOIL MERCURY?

… and others as

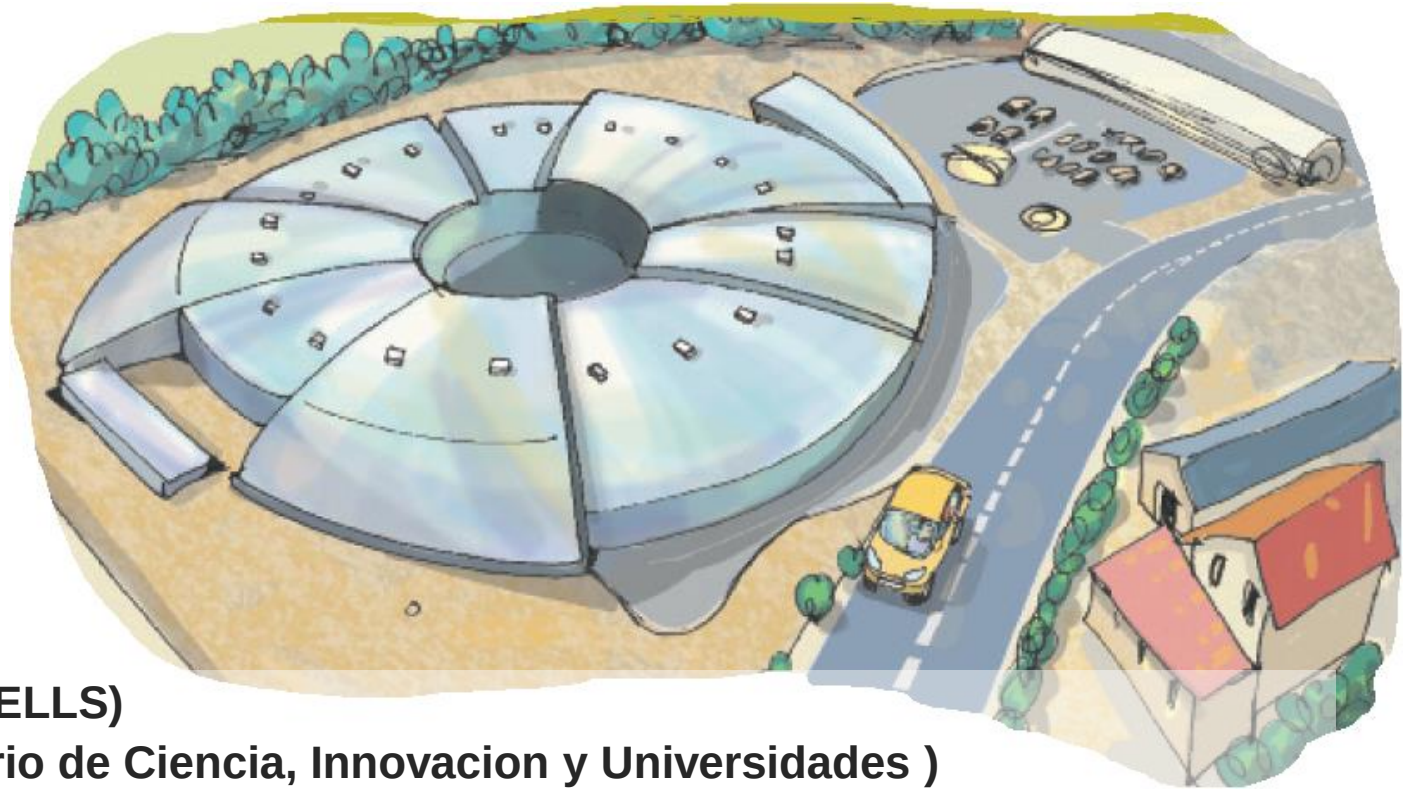
Help cultural heritage conservation and knowledge



Capilla de San Miguel del Monasterio de Pedralbes
Open to public after 10 years of restauration in 2016

Fungi in the paintings detected with Synchrotron Light at ALBA

ALBA is a Research Infrastructure

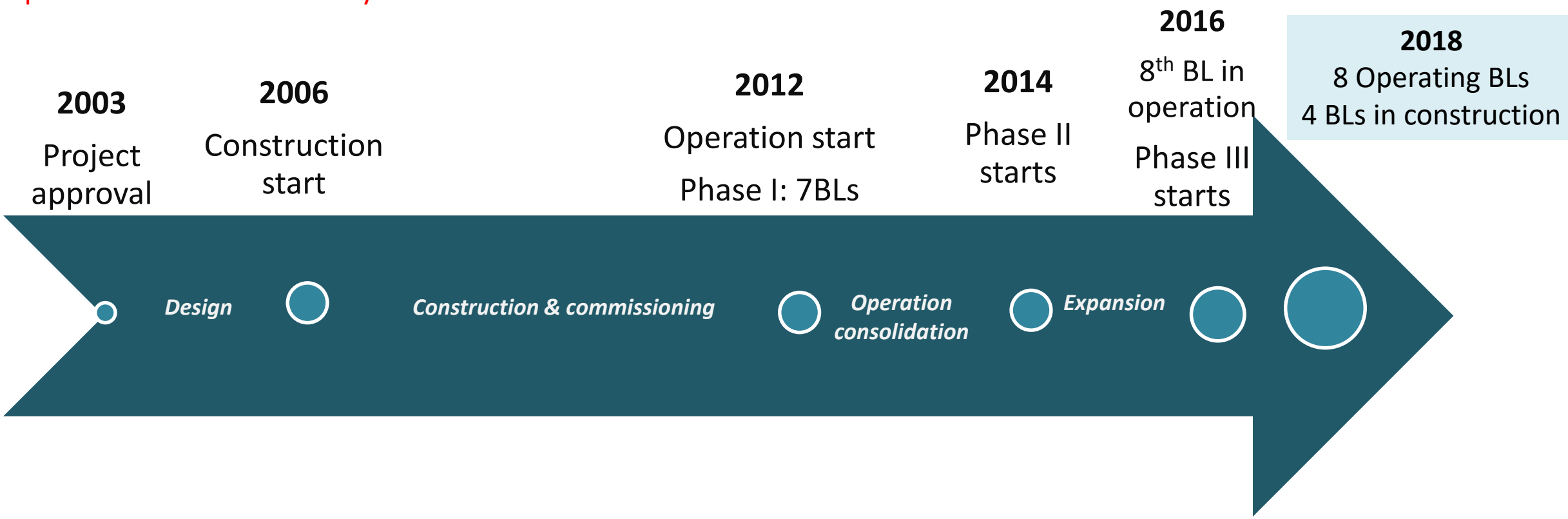


National public consortium (CELLS)
50% national funding (Ministerio de Ciencia, Innovacion y Universidades)
50% regional funding (Departament d'Empresa i Coneixement)

National and international (21%) staff
National and international (35%) users
National and international collaborations
Participation to projects plus services providing extra 7- 8% of income and 10% of staff

ALBA history

Prehistory linked to HEP community: a Tau-charm was the first proposal (‘90s) for building a large research infrastructure in Spain, later on evolved into a synchrotron light source, well suited to Spanish scientific community needs



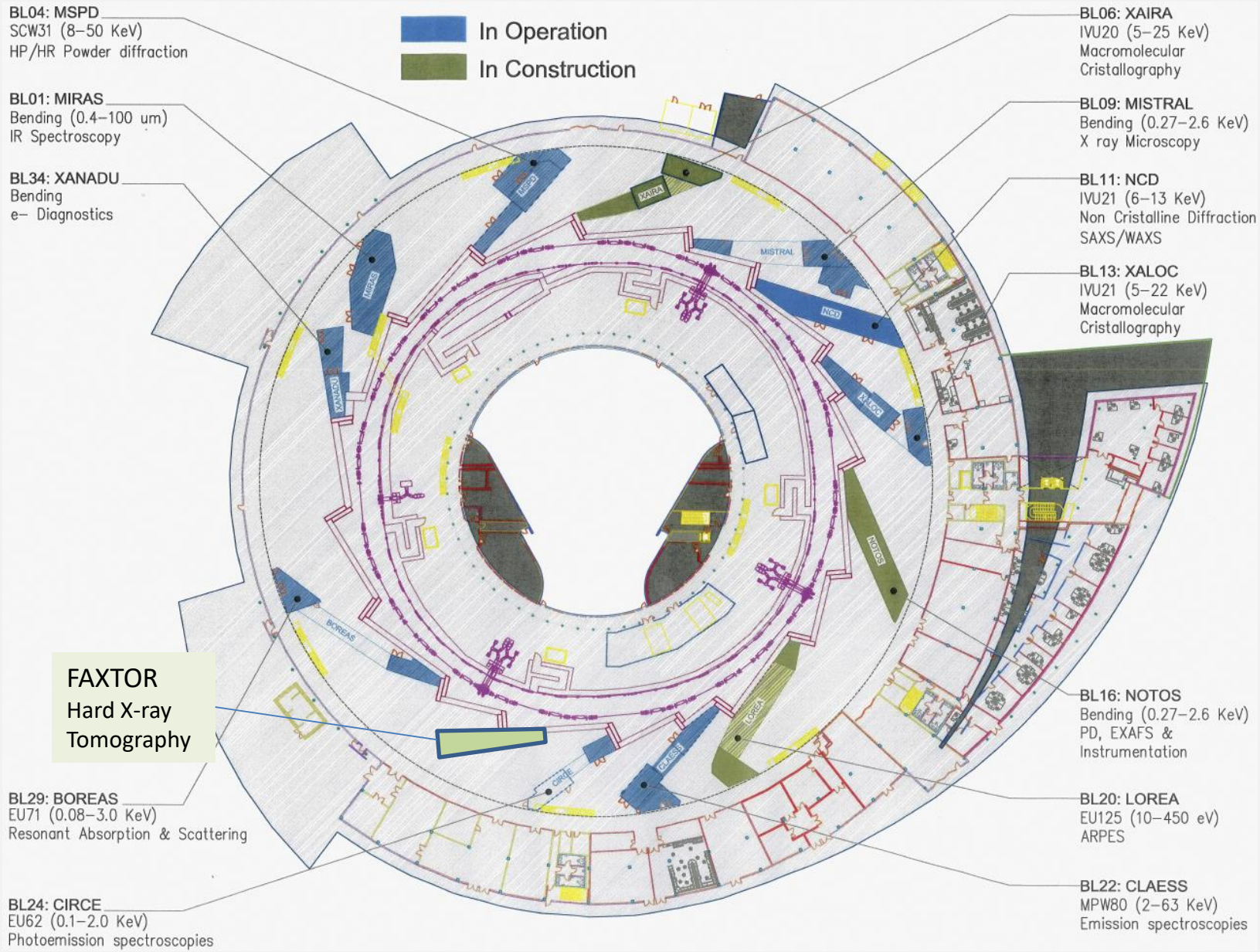
4 Centres of Excellence “Severo Ochoa” and the 2 Units of Excellence “María de Maeztu” are located in the UAB campus

BARCELONA NANOTECHNOLOGY CLUSTER-BELLATERRA

ICMAB | UAB | ICN2 | ALBA | MATGAS | National Center Microelectronics

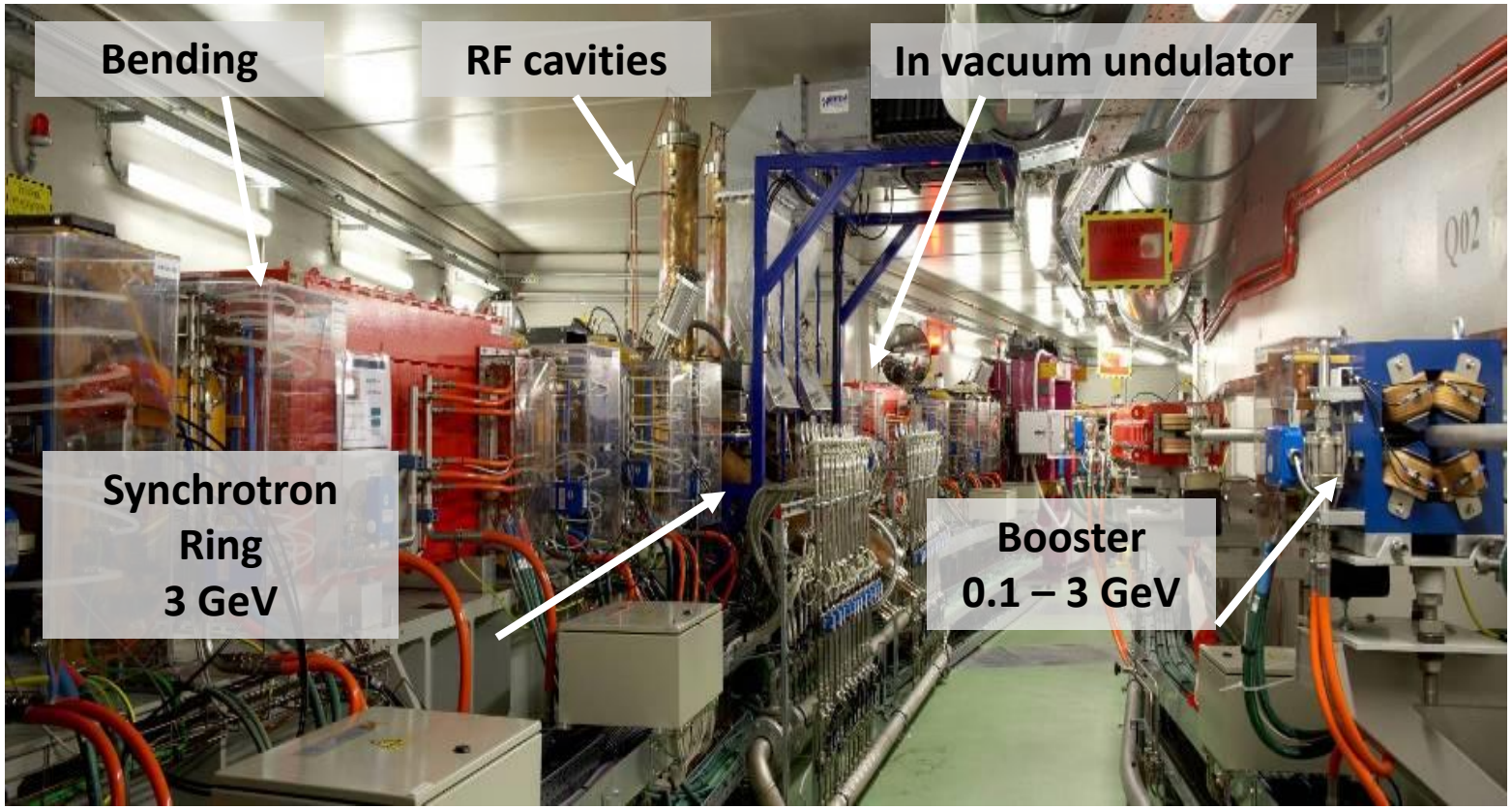
A cluster with nearly 750 scientists and technicians in the areas of Materials, Micro and Nanotechnologies

ALBA layout including accelerators and beamlines



Large infrastructure based on e- accelerator

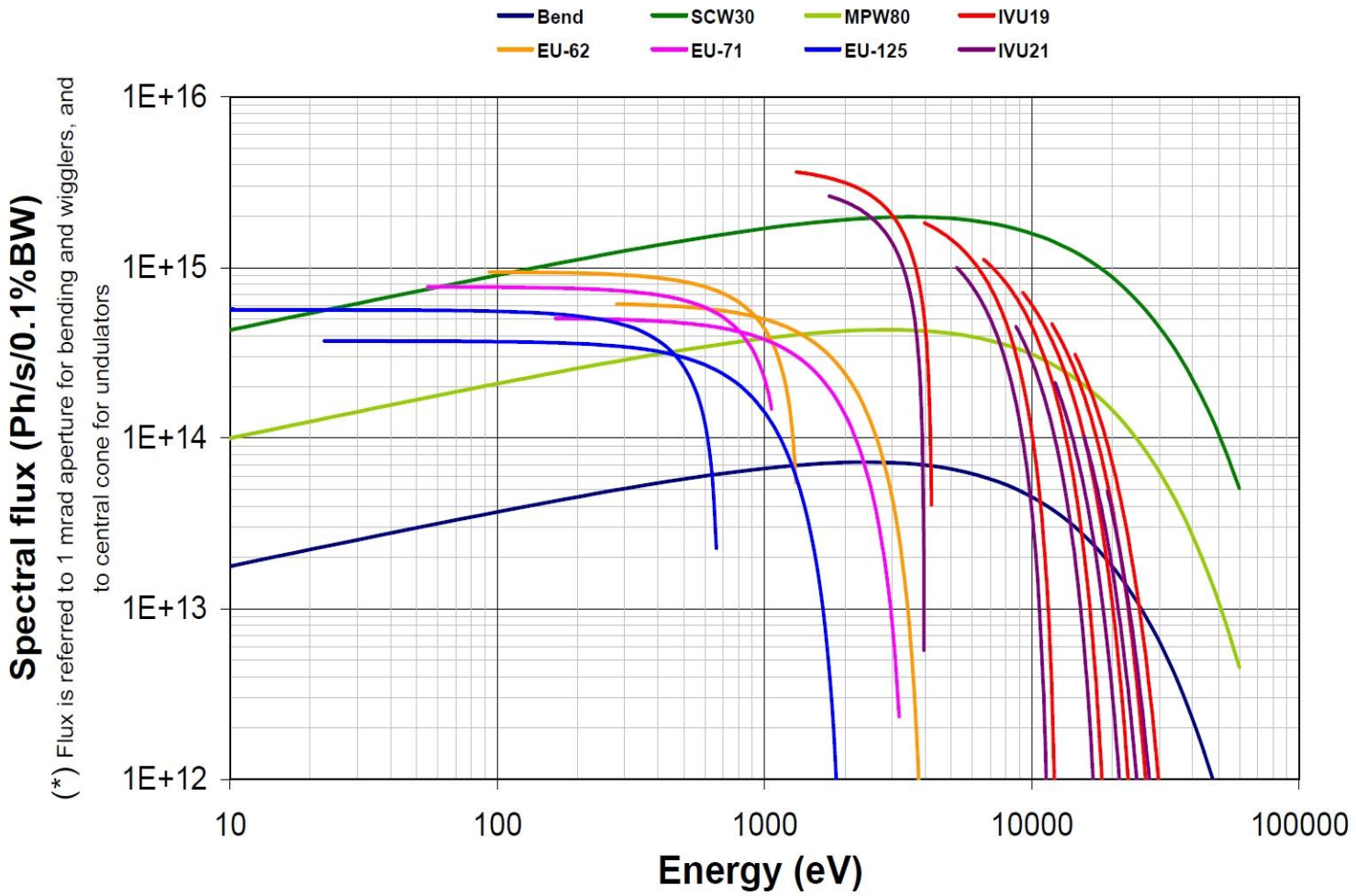
First (and up to now unique) large accelerator infrastructure in Spain



ALBA accelerator expertise in

- Accelerator design / construction / operation at highest international standards
- Magnet design / realization; magnetic measurement lab used also by other institutions and companies
- RF systems – cavities, IOTs, Klystrons, LLRF; RF lab used also by other institutions and companies
- Vacuum systems – vacuum chamber design and optimization; realization; mantainance; vacuum and diagnostic lab used also by other institutions and companies
- e- beam diagnostics and instrumentations systems – BPMs, current monitors, SR monitors, streak cameras
- Conventional infrastructure characteristics for high stability at mechanical and electromagnetic level

Photon sources: Insertion Devices and Bending Magnets



- Bends (critical energy 8.6 keV)
- 1 SCW (2.1 T)
- 1 Multipole wiggler
- Undulators
- 2 IV undulators
- 3 EU undulators

Covering from IR, through soft X-rays up to hard X-rays at 60 keV

Four Beamlines mainly dedicated to Chemistry, Physics - Condensed Matter

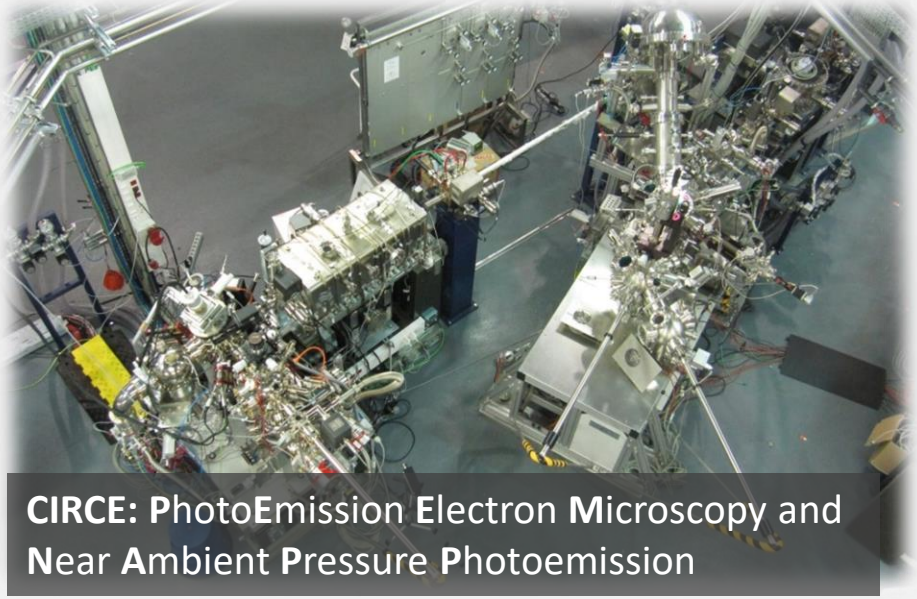
Material science, Cultural heritage, 8 to 50 keV

MSPD: Material **S**cience **P**owder **D**iffraction
HP & HR stations

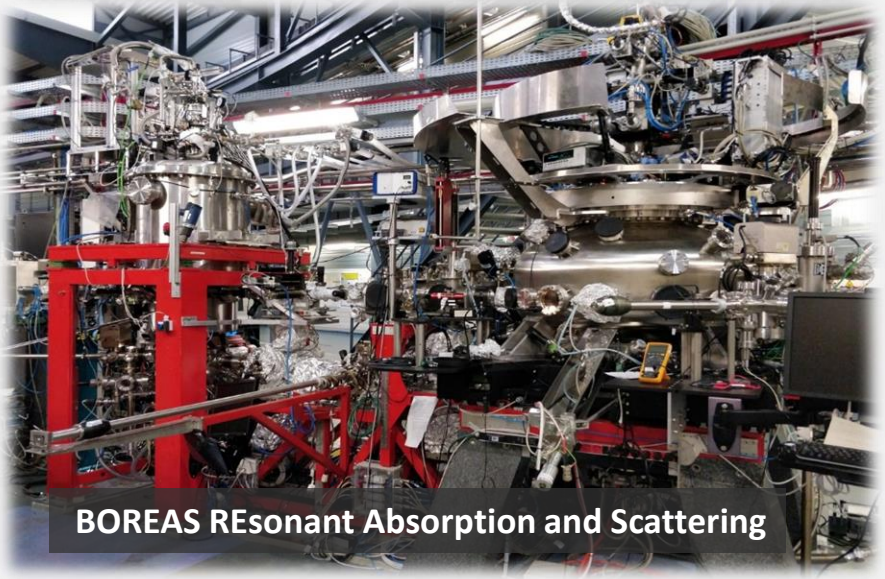
CLAESS:
Absorption & **E**mission **S**pectroscopies

Material science, Catalysis, Cultural heritage, 6 to 64 keV

Nanomagnetism, Surface and materials science, Catalysis, 0.1 to 2 keV



CIRCE: Photo**E**mission **E**lectron **M**icroscopy and **N**ear **A**mbient **P**ressure **P**hotoemission



BOREAS REsonant Absorption and Scattering

Nanomagnetism, Surface science, 0.08 to 4 keV

Four beamlines mainly dedicated to Life Sciences

Biosciences, Polymers, Materials science, 6,5 to 13 keV

NCD – SWEET, Non crystalline diffraction, SAXS, WAXS and GISAXS

XALOC, Macromolecular Crystallography

Biosciences, Proteins, drugs, 5 to 22 keV

Bioscience, Nanomagnetism, 0.27 to 1.2 keV

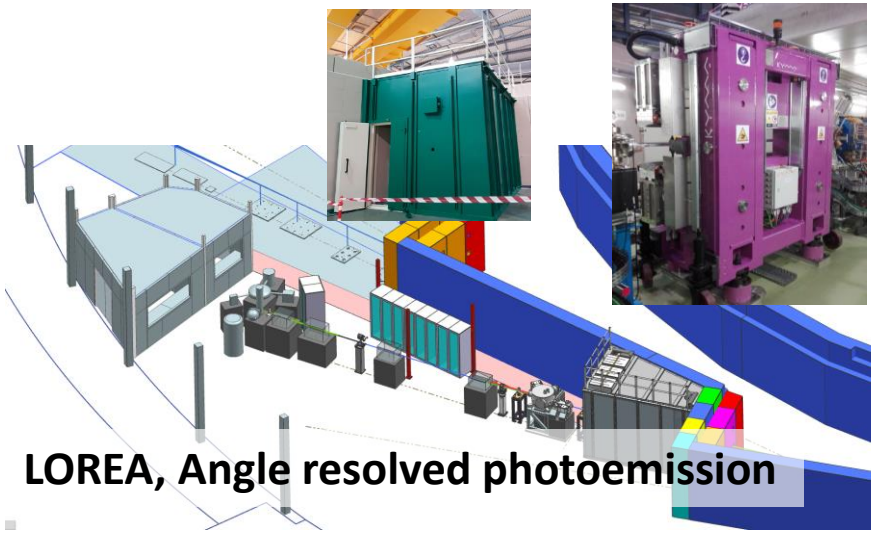
MISTRAL, Cryo nano-tomography

MIRAS, IR spectroscopy

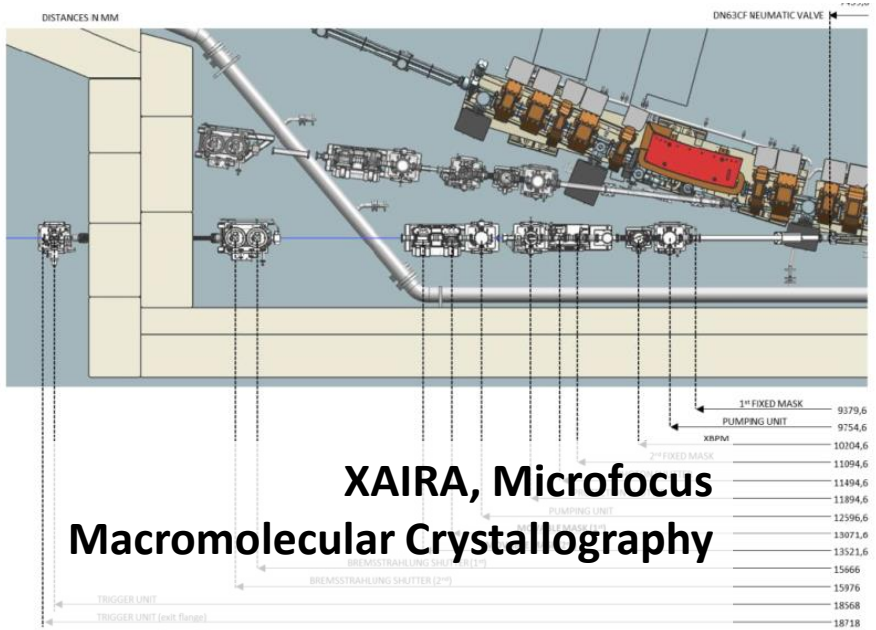
Bioscience, Material Science, Cultural Heritage, IR 10-100 um

Four beamlines in construction at different stages

Electronic structures, Materials science, **0.01-1 keV**



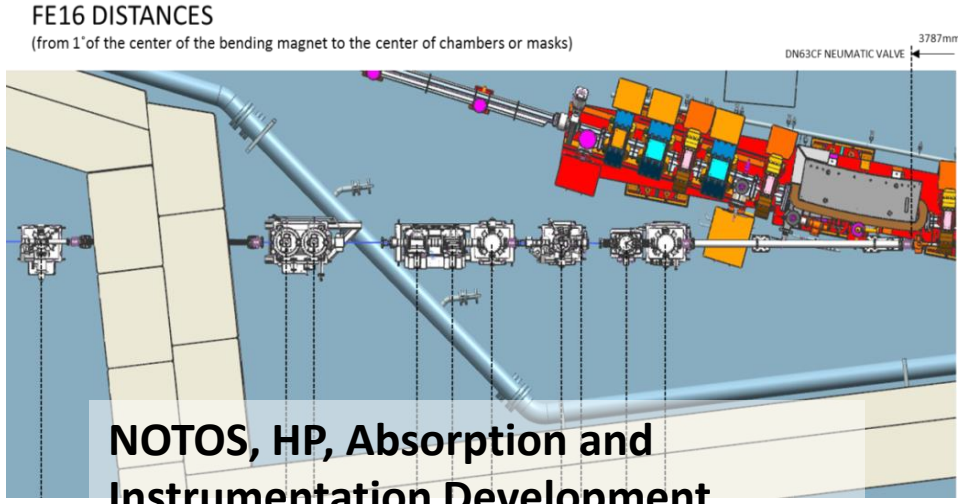
LOREA, Angle resolved photoemission



XAIRA, Microfocus Macromolecular Crystallography

Biosciences, Proteins, drugs, 4 to 22 keV

Material science, catalysis, instrumentation, metrology,, 4.8 to 30 keV



NOTOS, HP, Absorption and Instrumentation Development

Fast X-ray radioscopy, real time tomography hard X-ray range

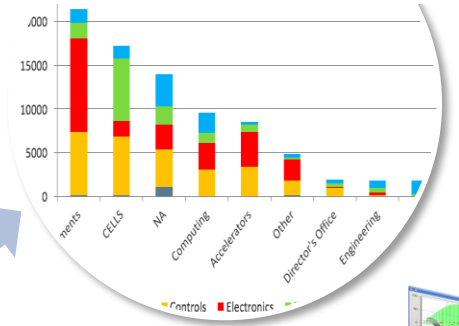
Control & IT Systems

Data Handling

Hardware and Software maintenance and Support to guarantee Availability > 99%

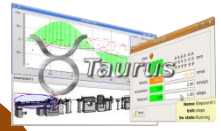
SUPPORT

>66000 h/year devoted to projects and operation



Software development

SARDANA & TAURUS



Instrumentation & Detectors Integration in Beamlines

300 MB/s data rates, Synchronization at nano-seconds and pico-seconds, Custom experimental Setups

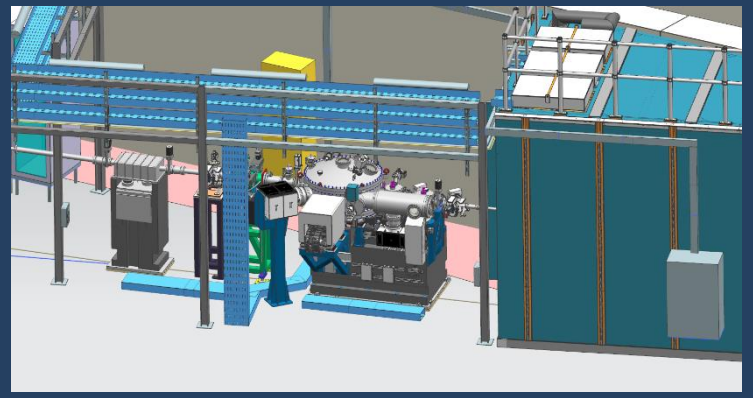
Instrumentation development

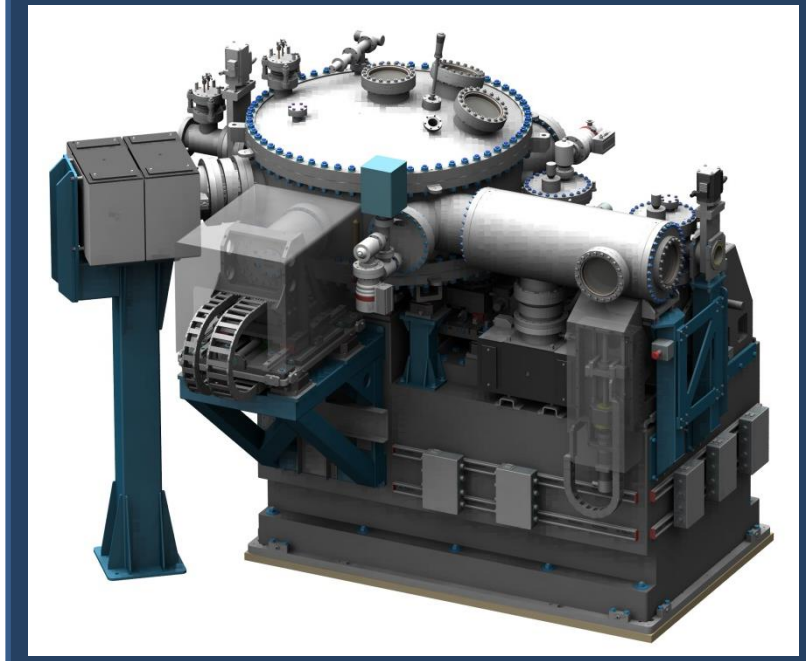
Em# electrometer, High Voltage distribution, RF synchronization…

International collaborations. Reference in the synchrotron community

Cutting edge engineering processes & capabilities

Example: **LOREA Monochromator new design**
Novel grating cooling with thermoelectric modules. avoiding in-vacuum fittings, air guards and air encapsulations
Grating pitch mechanism with with 0.1 µrad resolution





High stability
- First resonance at 65Hz
- The Fine mechanics and services are fully decoupled, structurally and with independent motorization
- Robust grating exchange mechanism
- Mirror movement with compact and rigid goniometers mechanics

ALBA engineering expertise in

- Precision mechanics & mechatronics design of Synchrotron instrumentation.
- Survey & Alignment, and metrology & vibrations test and analysis.
- Vacuum systems design and operation (for third parties also).
- Cryogenics engineering design at system level, and support to operation.
- Workshop operation for high precision mechanical parts manufacturing and assembly.
- Conventional infrastructure design, operation and maintenance (de-ionized water cooling, compressed air, liquid Nitrogen, liquid Helium, electrical systems, HVAC, civil engineering, control of technical installations).
- Radiation protection hutches design following SPR's team specification.

Training Center

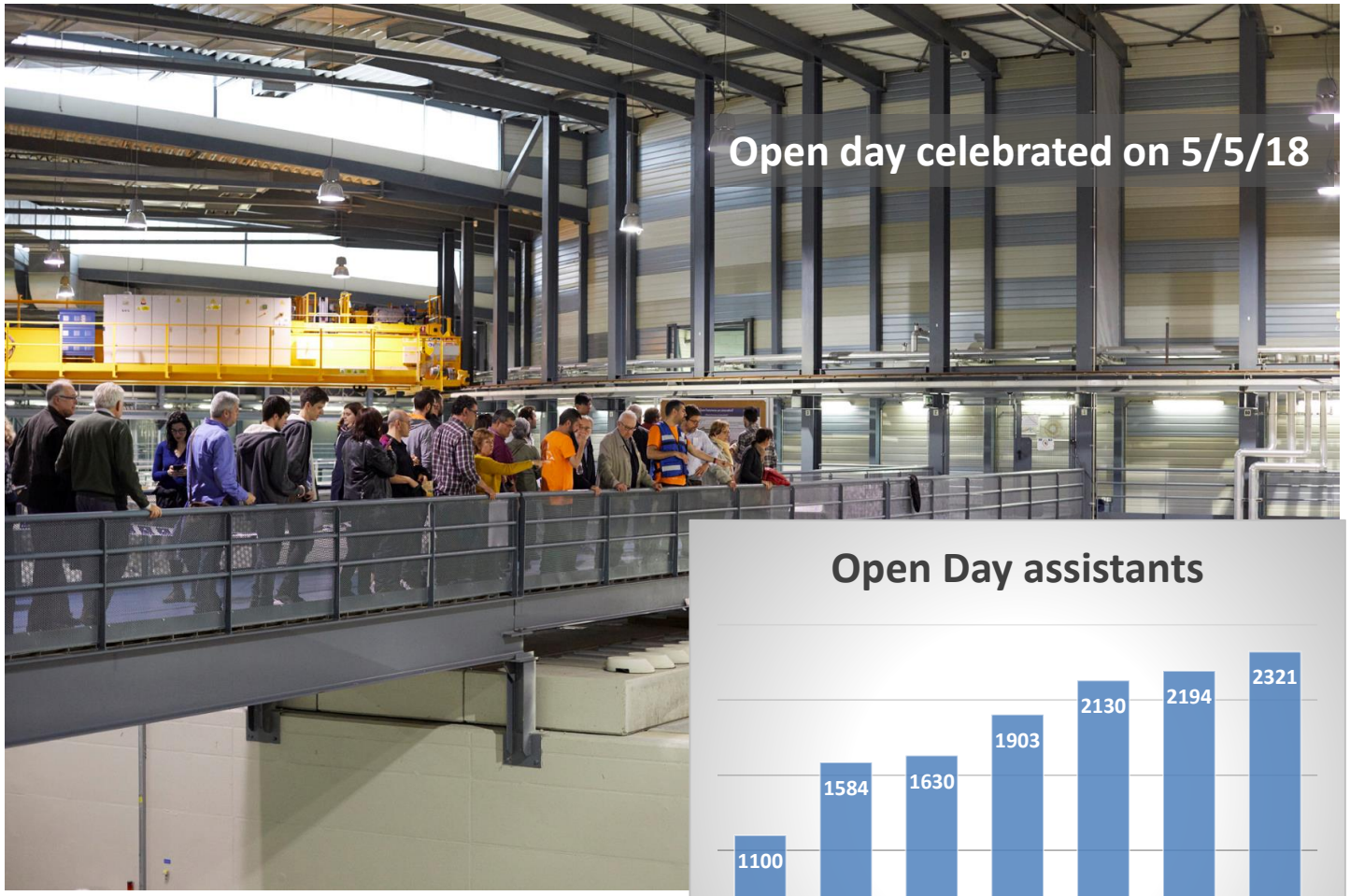
Each year

~ 15-20 PhD students (ER), all with partial or full external funding

~ 20 university students (degrees/master)

10-15 FP (Professional Training) students have joined different areas, from accelerators, engineering, computer & control, beamlines, communication

Outreach towards the society



More than 5000 visits/year

One yearly Open Day with high assistance

Participation of scientist in conferences and debates open to public

Mision ALBA: program to reach all Spanish schools

Experiencia educativa. A través de una web común, los alumnos siguen 4 etapas donde realizan experimentos en clase.

Dirigido a

- **Fomentar vocaciones científicas**
- Proporcionar a los **docentes recursos educativos**
- **Acercar** a la comunidad educativa la labor científica

Assessing socio-economic impact through @RI_Paths

RI PATHS
Research Infrastructure imPact Assessment paTHwayS

+ @RI_PATHS
+ www.ri-paths.eu

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 777563

Mission

Give funders and managers of research infrastructures the tools to assess their impact on the economy and contribution to society.

Objectives

+ Take stock of the existing approaches for impact assessment of research infrastructures and identify future data needs
+ Design a modular impact assessment model that covers all main impact pathways of research infrastructures
+ Define a set of core indicators, provide guidance and pilot the impact assessment model with research infrastructures.

Highlights of the approach:

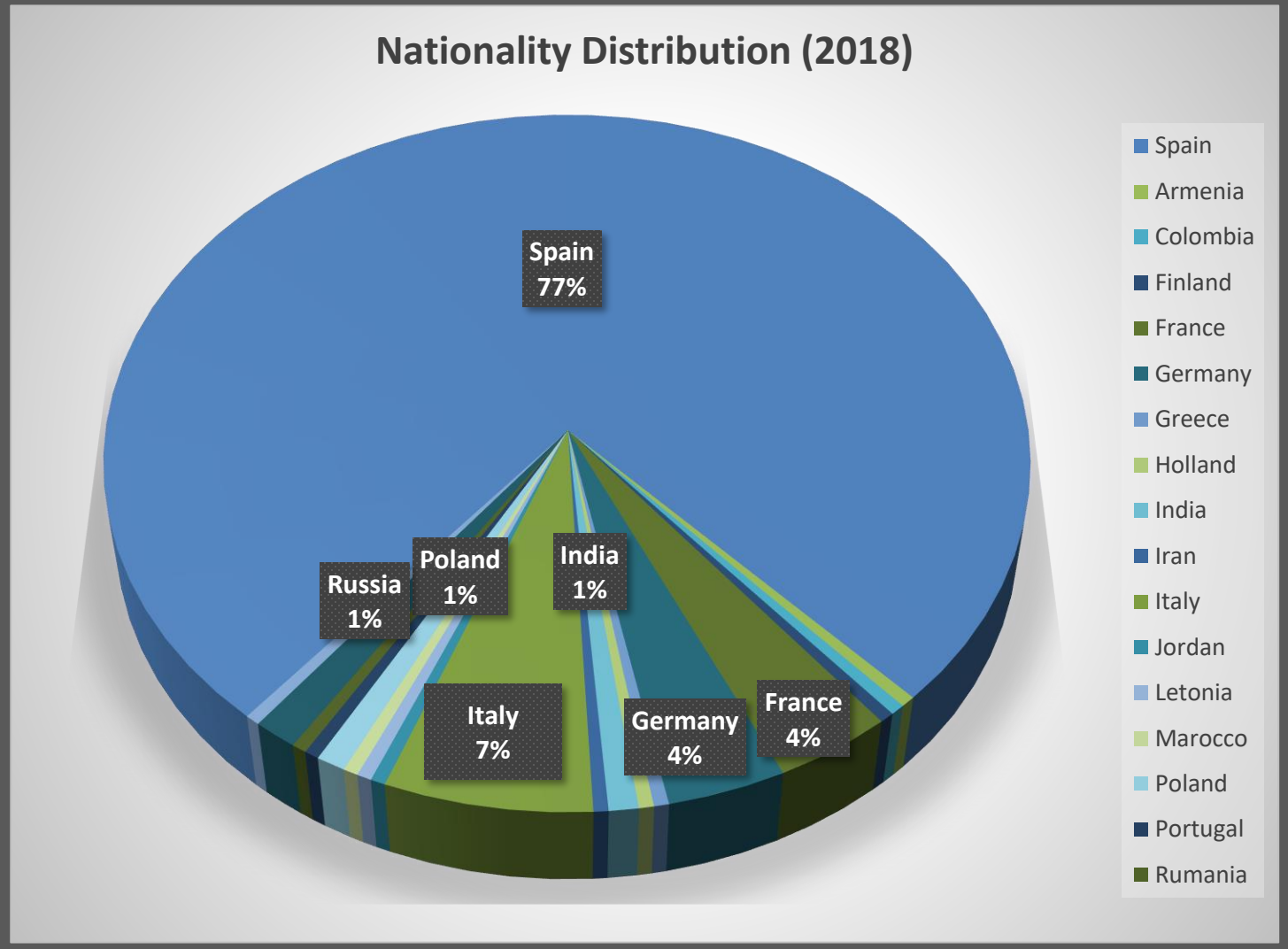
+ A model design reflects the specificities of research infrastructures taking into account their mission, type and phase of development
+ Work is carried out in a participatory manner engaging research infrastructures in a co-design of the impact assessment model
+ Project outcomes provide a practical impact assessment tool-box for policy makers and research infrastructure managers
+ Effort contributes towards a more common approach at international level

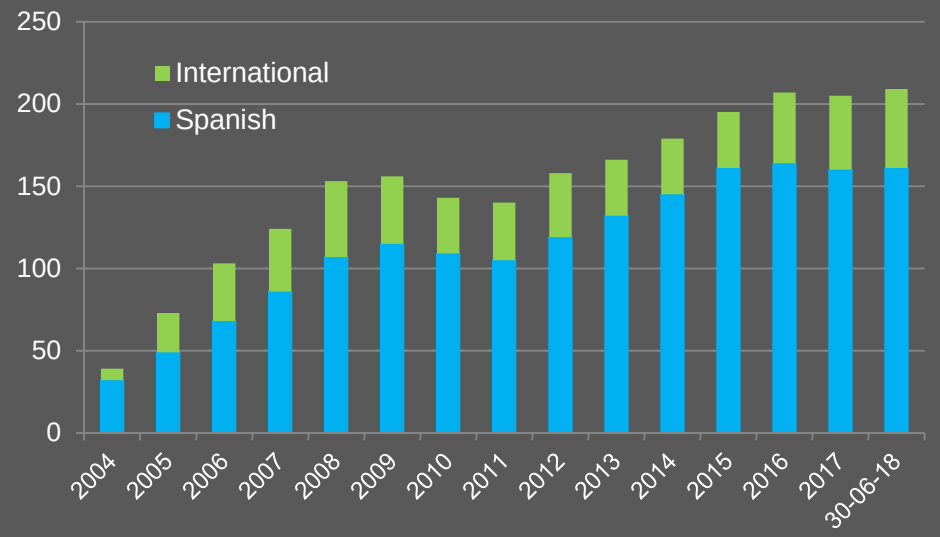
www.ri-paths.eu

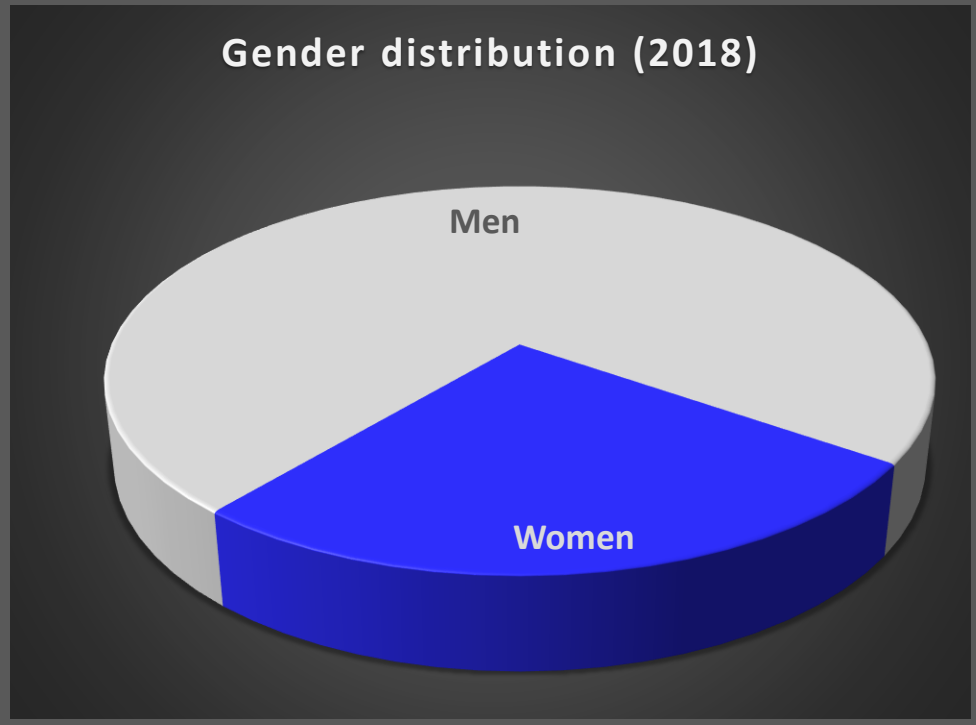
@RI_PATHS
www.linkedin.com/groups/12098402
Sign-up to our newsletter

Get in contact and engage!

Staff


Nationality Distribution (2018)
Spain 77%
Russia 1%
Poland 1%
India 1%
Italy 7%
Germany 4%
France 4%
Spain
Armenia
Colombia
Finland
France
Germany
Greece
Holland
India
Iran
Italy
Jordan
Letonia
Marocco
Poland
Portugal
Rumania


250
200
150
100
50
0
International
Spanish
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
30-06-18


Gender distribution (2018)
Men
Women

Operation

ALBA Operations Calendar, January 2018-December 2018

BL operation	BL	BL users (external, friendly, in-house & commissioning)
bl operation	bl	BL/FE/ID Commissioning & Accelerator Optimization for BLs
Start-up	M	Start up of accelerators with beam & Accelerator's Studies
Warm-up	W	Warm: Linac & RF & magnets & sub-systems maintenace and optimisation
Shutdown	Off	Civil Engineering, Accelerators and BL maintenance with no beam, installations and upgrades
Public & CELLS holiday		

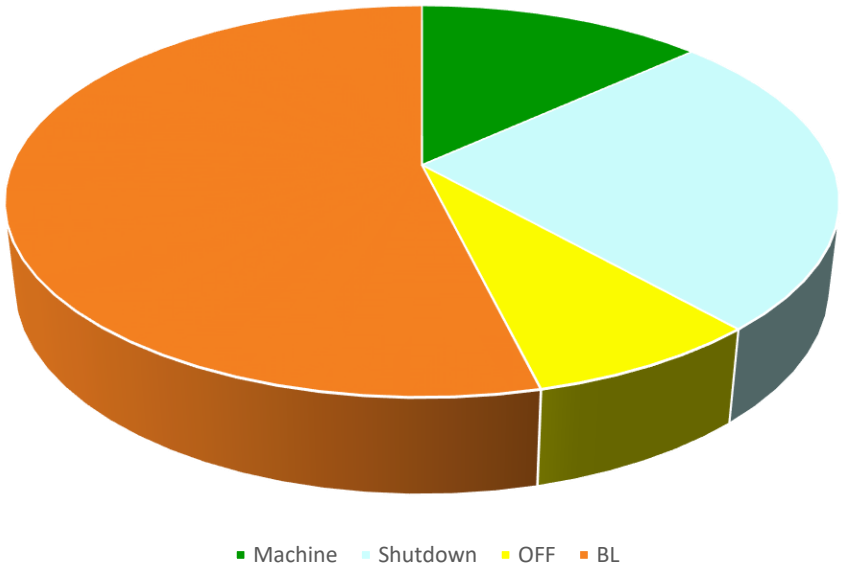
2018_calendari_v8_20180111.xlsx

Weekday	JANUARY Week Day	Shift M	A	N	FEBRUARY Week Day	Shift M	A	N	MARCH Week	Shift M	A	N	APRIL Week Day	Shift M	A	N	MAY Week	Shift M	A	N	JUNE Week Day	Shift M	A	N	JULY Week Day	Shift M	A	N	AUGUST Week Day	Shift M	A	N	SETEMBER Week Day	Shift M	A	N	OCTOBER Week Day	Shift M	A	N	NOVEMBER Week Day	Shift M	A	N	DECEMBER Week Day	Shift M	A	N
Mo	1	1 W	W	W														1 W	W	W															40 1 PSS	W	W									
Tu		2 W	W	W														2 PSS	W	W						2 PSS	W	W																			
We		3 W	W	W														3 PSS	W	W									1 Off	Off	Off							3 W	W	W							
Th		4 W	W	W	1	BL	BL	BL	1	BL	BL	BL						4 W	W	W		1 BL	BL	BL					2 Off	Off	Off							4 W	W	W	1 W	W	W				
Fr		5 W	W	W	2	BL	BL	BL	2	BL	BL	BL						5 W	W	W									3 Off	Off	Off							5 W	W	W	2 W	W	W				
Sa		6 W	W	W	3	BL	BL	BL	3	BL	BL	BL						6 W	W	W		2 BL	BL	BL					4 Off	Off	Off		1 M	M	M			6 W	W	W	3 W	W	W		1 W	W	W
Su		7 W	W	W	4	BL	BL	BL	4	BL	BL	BL	1	W	W	W		6 W	W	W		3 BL	BL	BL		1 BL	BL	BL	5 Off	Off	Off		2 M	M	M		7 W	W	W	4 W	W	W		2 W	W	W
Mo	2	8 W	W	W	6	5 M	M	M	10	5 M	M	M	14	2 W	W	W	19	7 M	M	M	23	4 SPR	W	W	27	2 W	W	W	32	6 Off	Off	Off	36	3 M	M	M	41	8 M	M	M	45	5 M	M	M	49	3 M	M	M
Tu		9 W	W	W		6 BL	BL	BL		6 BL	BL	BL		3 W	W	W		8 BL	BL	BL		5 SPR	W	W		3 W	W	W		7 Off	Off	Off		4 M	M	M		9 BL	BL	BL		6 BL	BL	BL		4 BL	BL	BL
We		10 W	W	W		7 BL	BL	BL		7 BL	BL	BL		4 M	M	M		9 BL	BL	BL		6 W	W	W		4 W	W	W		8 Off	Off	Off		5 BL	BL	BL		10 BL	BL	BL		7 BL	BL	BL		5 BL	BL	BL
Th		11 W	W	W		8 BL	BL	BL		8 BL	BL	BL		5 M	M	M		10 BL	BL	BL		7 W	W	W		5 W	W	W		9 Off	Off	Off		6 BL	BL	BL		11 BL	BL	BL		8 BL	BL	BL		6 BL	BL	BL
Fr		12 W	W	W		9 BL	BL	BL		9 BL	BL	BL		6 BL	BL	BL		11 BL	BL	BL		8 W	W	W		6 W	W	W		10 Off	Off	Off		7 BL	BL	BL		12 BL	BL	BL		9 BL	BL	BL		7 BL	BL	BL
Sa		13 W	W	W		10 BL	BL	BL		10 BL	BL	BL		7 BL	BL	BL		12 BL	BL	BL		9 W	W	W		7 W	W	W		11 Off	Off	Off		8 BL	BL	BL		13 BL	BL	BL		10 BL	BL	BL		8 BL	BL	BL
Su		14 W	W	W		11 BL	BL	BL		11 BL	BL	BL		8 BL	BL	BL		13 BL	BL	BL		10 W	W	W		8 W	W	W		12 Off	Off	Off		9 BL	BL	BL		14 BL	BL	BL		11 BL	BL	BL		9 BL	BL	BL
Mo	3	15 W	W	W	7	12 M	M	M	11	12 M	M	M	15	9 M	M	M	20	14 M	M	M	24	11 M	M	M	28	9 M	M	M	33	13 Off	Off	Off	37	10 M	M	M	42	15 M	M	M	46	12 M	M	M	50	10 M	M	M
Tu		16 W	W	W		13 BL	BL	BL		13 BL	BL	BL		10 BL	BL	BL		15 BL	BL	BL		12 BL	BL	BL		10 BL	BL	BL		14 Off	Off	Off		11 BL	BL	BL		16 BL	BL	BL		13 BL	BL	BL		11 BL	BL	BL
We		17 M	M	W		14 BL	BL	BL		14 BL	BL	BL		11 BL	BL	BL		16 BL	BL	BL		13 BL	BL	BL		11 BL	BL	BL		15 Off	Off	Off		12 BL	BL	BL		17 BL	BL	BL		14 BL	BL	BL		12 BL	BL	BL
Th		18 M	M	W		15 BL	BL	BL		15 BL	BL	BL		12 BL	BL	BL		17 BL	BL	BL		14 BL	BL	BL		12 BL	BL	BL		16 Off	Off	Off		13 BL	BL	BL		18 BL	BL	BL		15 BL	BL	BL		13 BL	BL	BL
Fr		19 M	M	M		16 BL	BL	BL		16 BL	BL	BL		13 BL	BL	BL		18 BL	BL	BL		15 BL	BL	BL		13 BL	BL	BL		17 Off	Off	Off		14 BL	BL	BL		19 BL	BL	BL		16 BL	BL	BL		14 BL	BL	BL
Sa		20 M	M	M		17 BL	BL	BL		17 BL	BL	BL		14 BL	BL	BL		19 BL	BL	BL		16 BL	BL	BL		14 BL	BL	BL		18 Off	Off	Off		15 BL	BL	BL		20 BL	BL	BL		17 BL	BL	BL		15 BL	BL	BL
Su		21 M	M	M		18 M	M	M		18 M	M	M		15 M	M	M		20 M	M	M		17 BL	BL	BL		15 BL	BL	BL		19 Off	Off	Off		16 BL	BL	BL		21 BL	BL	BL		18 BL	BL	BL		16 M	M	M
Mo	4	22 M	M	M	8	19 W	W	W	12	19 BL	BL	BL	16	16 M	M	M	21	21 M	M	M	25	18 M	M	M	29	16 M	M	M	34	20 PSS	W	W	38	17 M	M	M	43	22 M	M	M	47	19 M	M	M	51	17 BL	BL	BL
Tu		23 BL	BL	BL		20 W	W	W		20 BL	BL	BL		17 BL	BL	BL		22 BL	BL	BL		19 BL	BL	BL		17 BL	BL	BL		21 PSS	W	W		18 BL	BL	BL		23 BL	BL	BL		20 BL	BL	BL		18 BL	BL	BL
We		24 BL	BL	BL		21 W	W	W		21 BL	BL	BL		18 BL	BL	BL		23 BL	BL	BL		20 BL	BL	BL		18 BL	BL	BL		22 PSS	W	W		19 BL	BL	BL		24 BL	BL	BL		21 BL	BL	BL		19 BL	BL	BL
Th		25 BL	BL	BL		22 W	W	W		22 BL	BL	BL		19 BL	BL	BL		24 BL	BL	BL		21 BL	BL	BL		19 BL	BL	BL		23 PSS	W	W		20 BL	BL	BL		25 BL	BL	BL		22 BL	BL	BL		20 BL	BL	BL
Fr		26 BL	BL	BL		23 W	W	W		23 BL	BL	BL		20 BL	BL	BL		25 BL	BL	BL		22 BL	BL	BL		20 BL	BL	BL		24 PSS	W	W		21 bl	bl	bl		26 bl	bl	bl		23 BL	BL	BL		21 W	W	W
Sa		27 BL	BL	BL		24 W	W	W		24 W	W	W		21 BL	BL	BL		26 BL	BL	BL		23 BL	BL	BL		21 BL	BL	BL		25 PSS	W	W		22 bl	bl	bl		27 bl	bl	bl		24 BL	BL	BL		22 W	W	W
Su		28 BL	BL	BL		25 W	W	W		25 W	W	W		22 BL	BL	BL		27 BL	BL	BL		24 BL	BL	BL		22 BL	BL	BL		26 PSS	W	W		23 M	M	M		28 M	M	M		25 M	M	M		23 W	W	W
Mo	5	29 M	M	M	9	26 M	M	M	13	26 W	W	W	17	23 M	M	M	22	28 M	M	M	26	25 M	M	M	30	23 Off	Off	Off	35	27 PSS	W	W	39	24 M	M	M	44	29 BL	BL	BL	48	26 BL	BL	BL	52	24 W	W	W
Tu		30 BL	BL	BL		27 BL	BL	BL		27 W	W	W		24 BL	BL	BL		29 BL	BL	BL		26 BL	BL	BL		24 Off	Off	Off		28 PSS	W	W		25 BL	BL	BL		30 BL	BL	BL		27 BL	BL	BL		25 W	W	W
We		31 BL	BL	BL		28 BL	BL	BL		28 W	W	W		25 BL	BL	BL		30 BL	BL	BL		27 BL	BL	BL		25 Off	Off	Off		29 PSS	W	W		26 BL	BL	BL		31 BL	BL	BL		28 BL	BL	BL		26 W	W	W
Th										29 W	W	W		26 BL	BL	BL		31 BL	BL	BL		28 BL	BL	BL		26 Off	Off	Off		30 M	M	W		27 BL	BL	BL						29 M	M	M		27 W	W	W
Fr										30 W	W	W		27 BL	BL	BL						29 BL	BL	BL		27 Off	Off	Off		31 M	M	W		28 BL	BL	BL						30 W	W	W		28 W	W	W
Sa										31 W	W	W		28 BL	BL	BL						30 BL	BL	BL		28 Off	Off	Off						29 BL	BL	BL										29 W	W	W
Su														29 BL	BL	BL										29 Off	Off	Off						30 BL	BL	BL										30 W	W	W
Mo													18	30 W	W	W									31	30 Off	Off	Off																	31 W	W	W
Tu																										31 Off	Off	Off																			

2018 versio 8.0
11/01/2018
MBM approved
10 shut downs
28 days off in August
PSS days: From 20 to 23.5 PSS and BO_RF work together
PSS days: From 23.5 to 29 SPR exclusively PSS verification

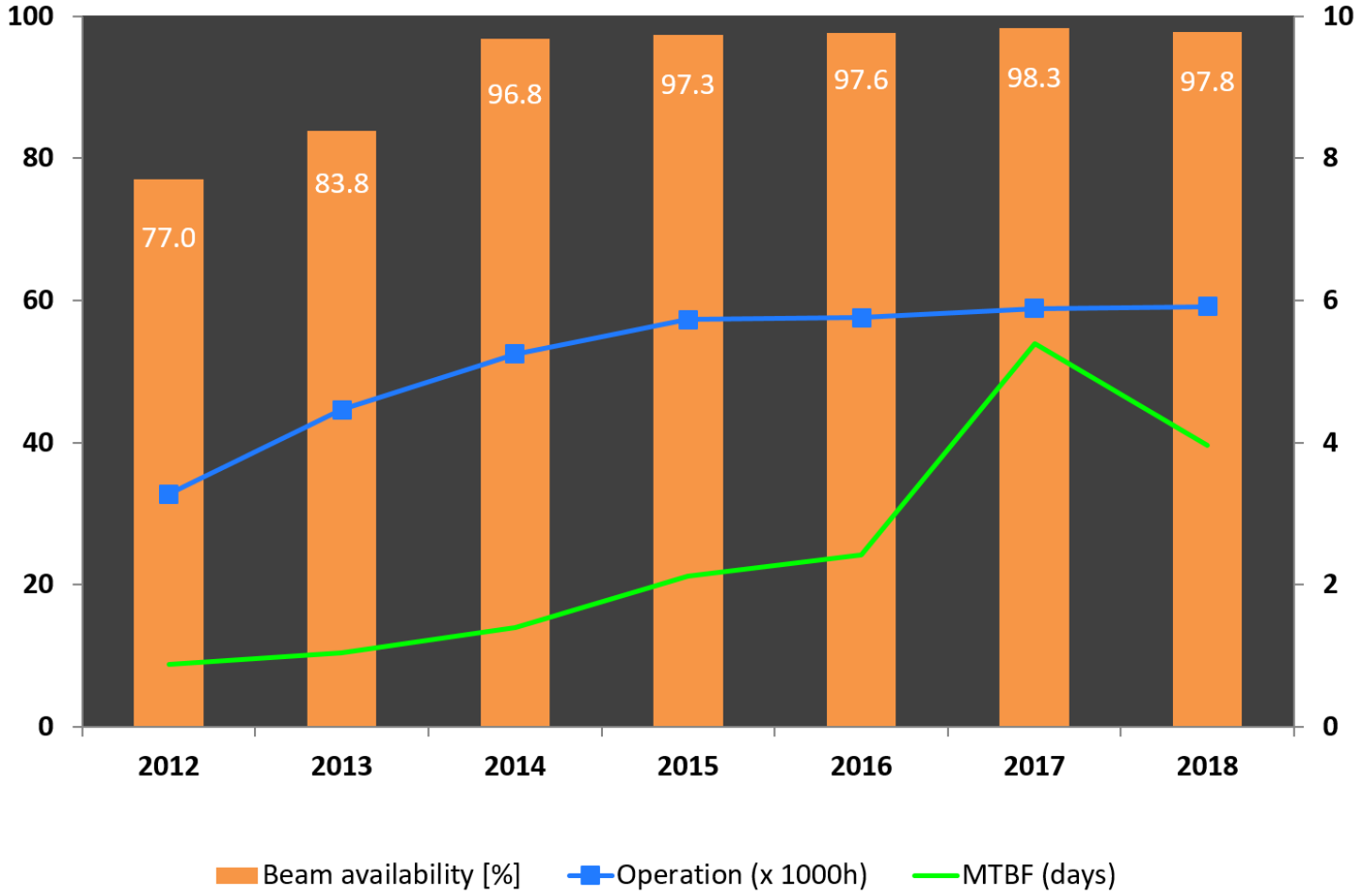
Status	Days
Shutdown (basic systems on)	91
Shutdown (all systems off)	64
Machine days	51
BEAMLINES operation	195

Time distribution during the year



In a user facility, whose users have few days at their disposal (in average 3), it is essential to assure the maximum reliability

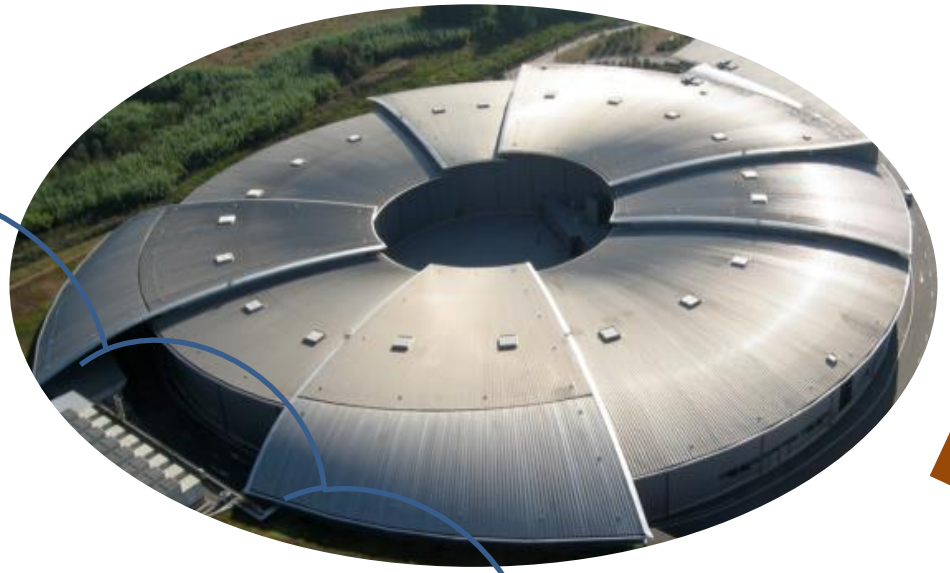
Availability since the start of the operation



Mean Time Between Failures above 4 days since 2017. Thanks to

- Sound design and realization of the whole infrastructure and its systems, from the low-tech ones to the most advanced
- Usage of preventive maintenance
- Spare system availability optimized within budget constraints
- Availability of maintenance teams 24/24 for all technical systems with quick reaction capacity based also on on-call organization

USERS



Academic

Free access based on competitive process Open science

Joint academic and industrial

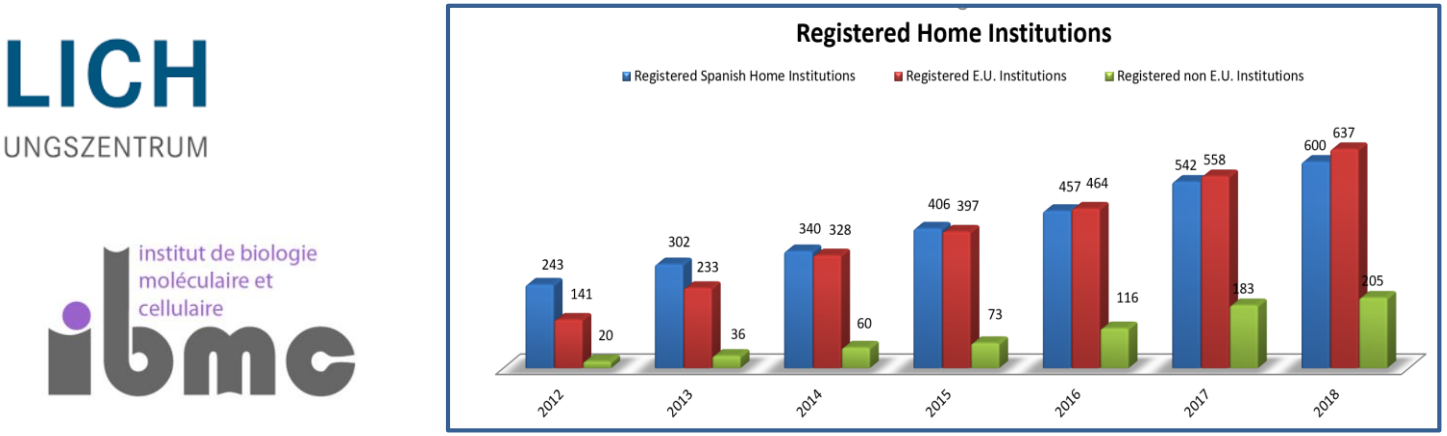
Industrial

Direct access covering operational costs Private results

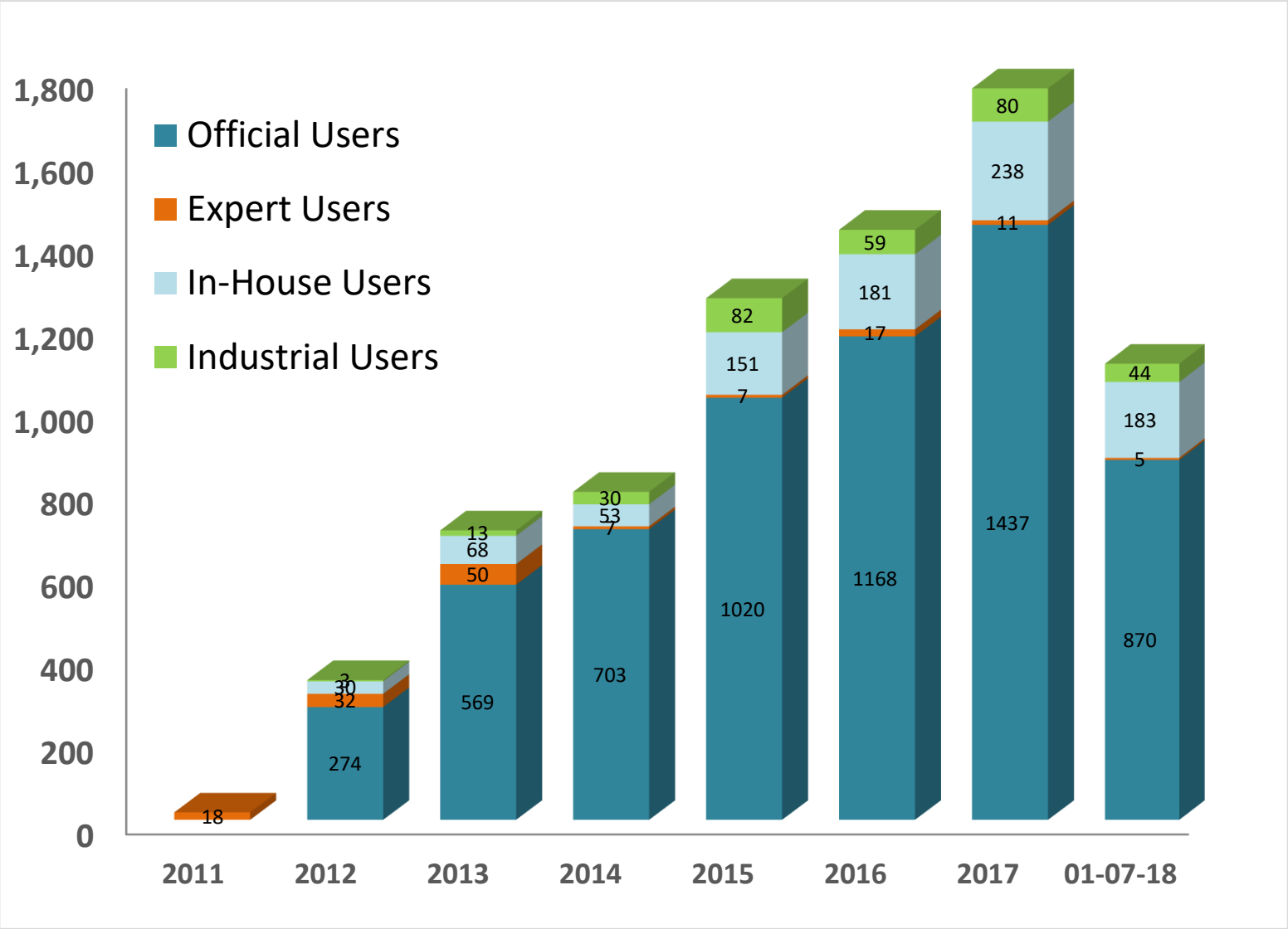
Life and Material Science
few examples of users from all Spain
(600 registered institutions in our user database)

+ Universities

Few examples of users from the rest of the world
(842 registered institutions in our user database)

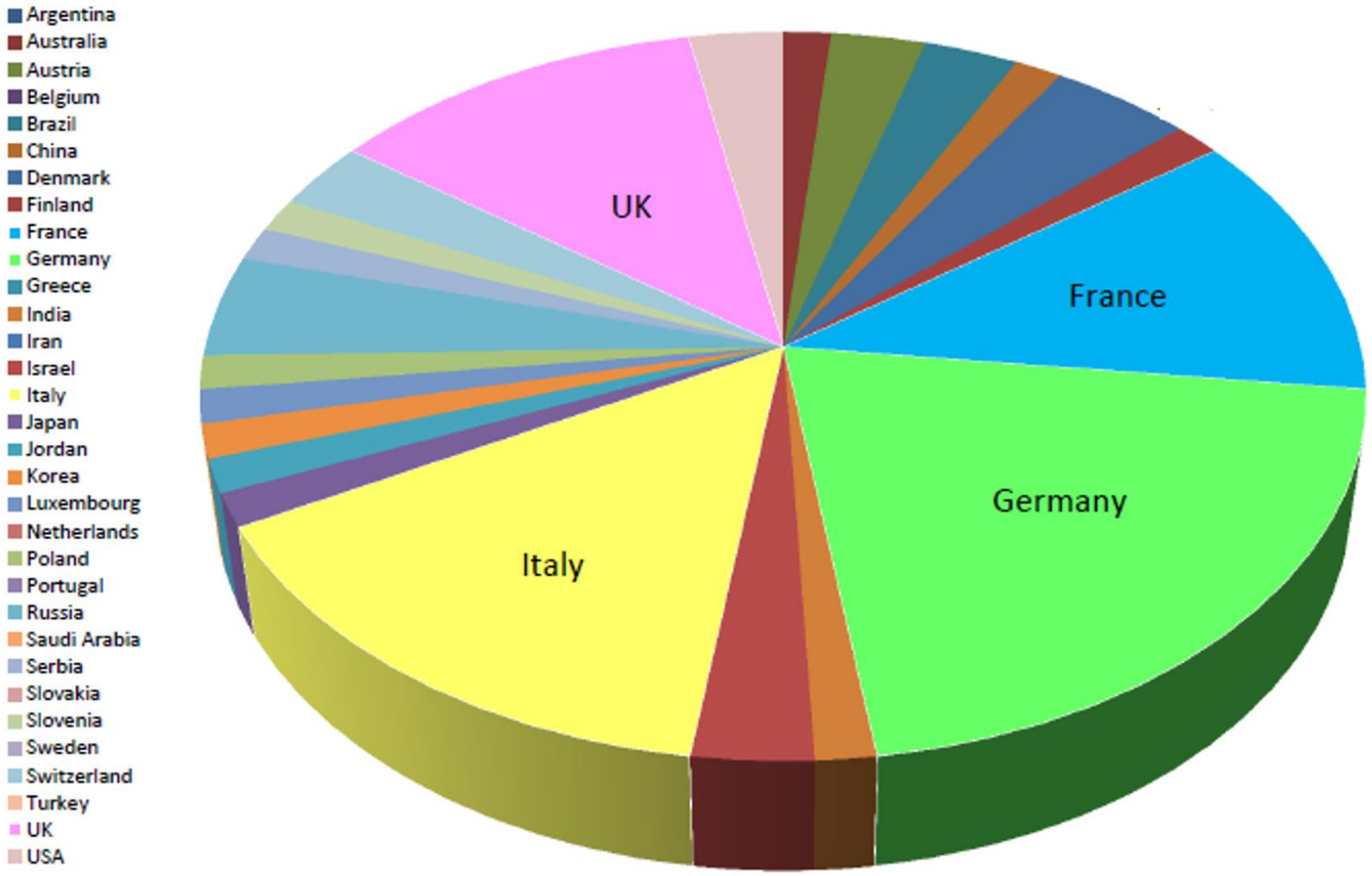


Users evolution



- 2012-2016: Seven Operating Beamlines and progressive increase of beamtime hours per BL
- 2016 fall-today: Eight Operating BLs – beamtime hours/BL at maximum; beamline optimization and evolution allow to carry on experiments using shorter times, and hosting more users

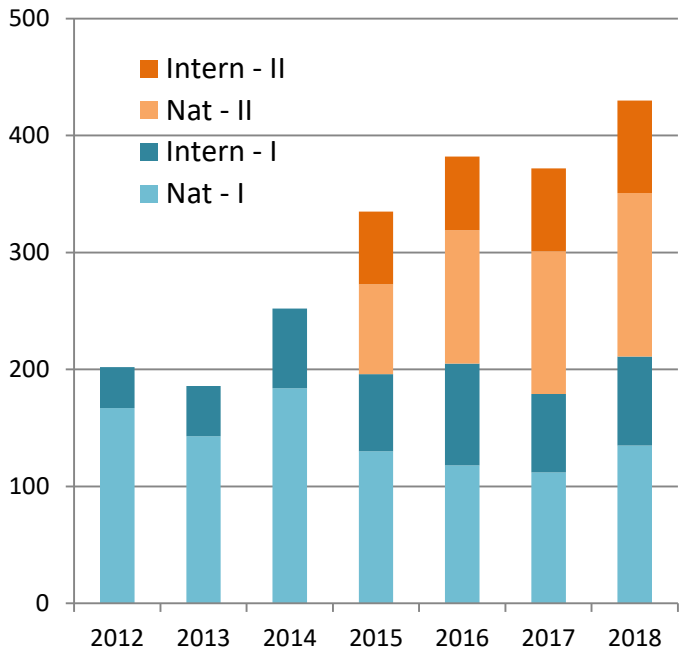
International User Distribution – example of latest call



Summing up all calls, about 40 different countries have participated to ALBA calls, about 30 countries have been granted beamtime

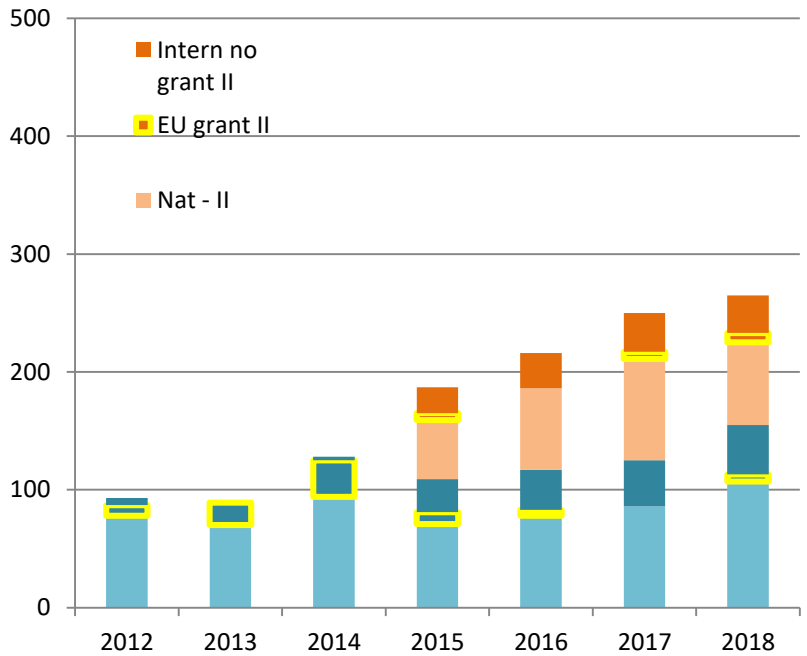
Academic proposals

Submitted



7 BLs | 8 BLs

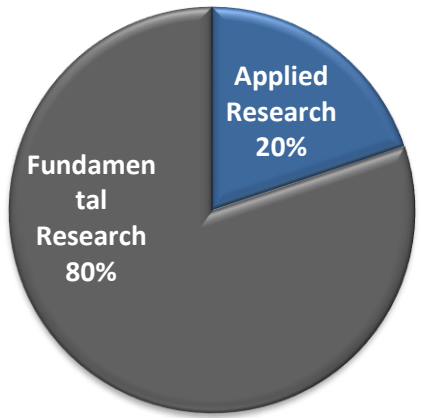
Granted



7 BLs | 8 BLs

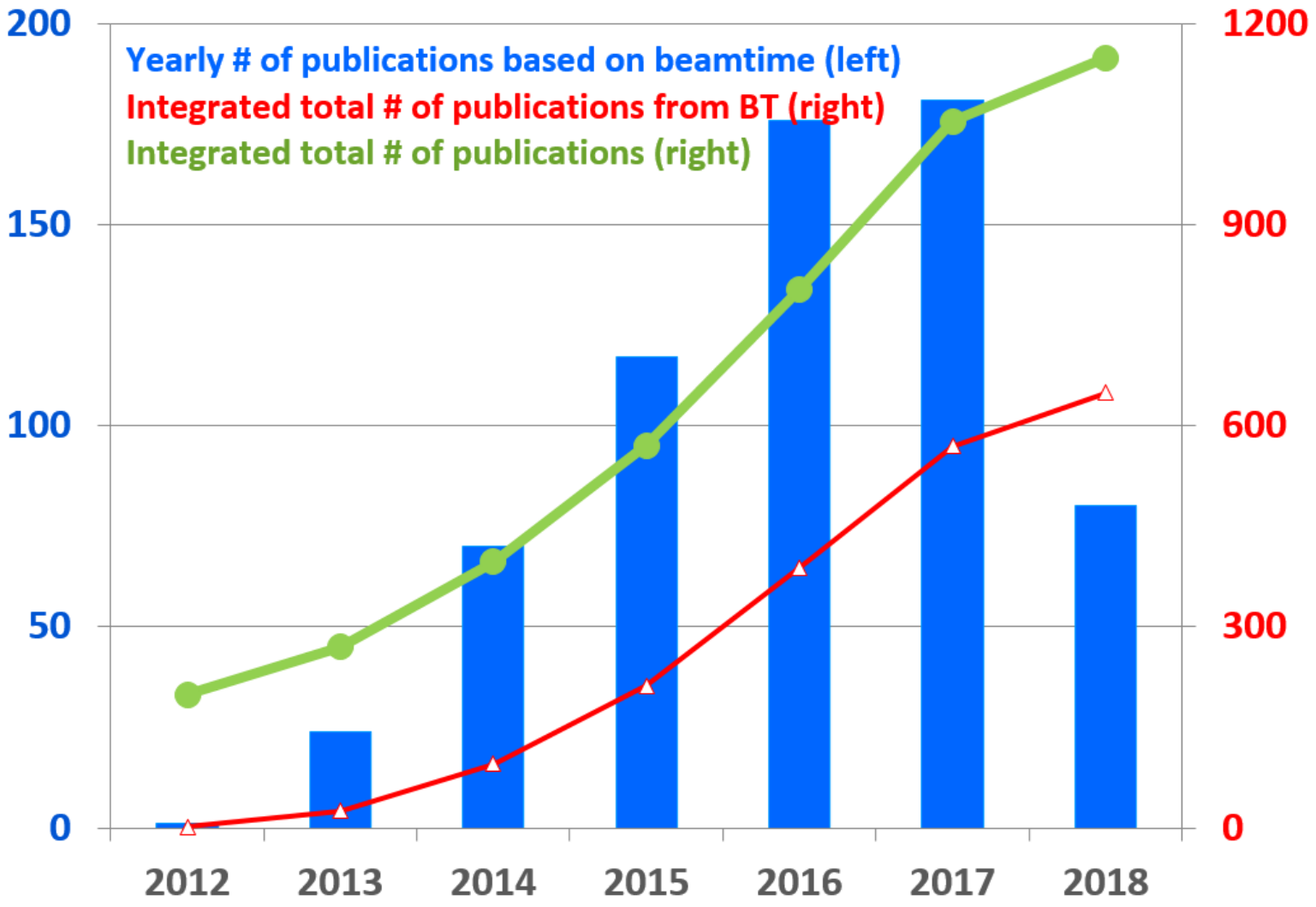
- One single user call in the first three years
- Two user calls since 2015
- In average the overbooking factor is a factor of 2.
- Number of proposal increase is kept on with more effective beamtime distribution and lower commissioning periods.

2018-I Granted proposals by Type of Science

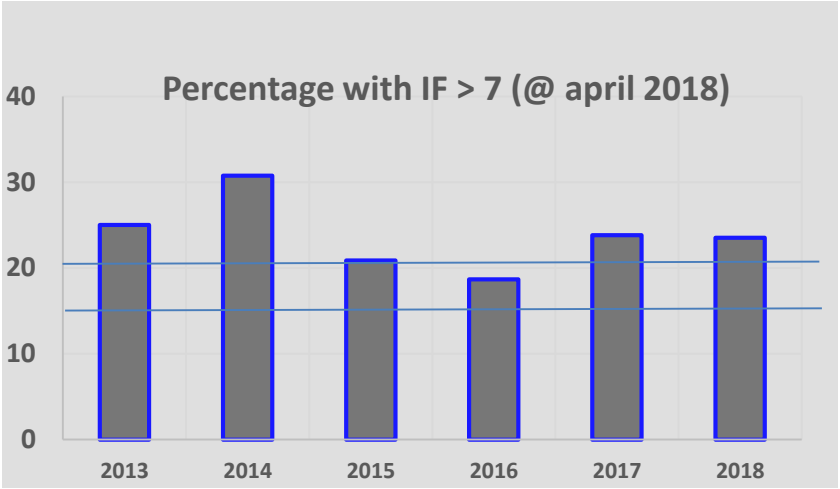


2159 submitted proposals, 1118 granted (859 national, 369 international of which 94 granted through EU programs)

Scientific productivity



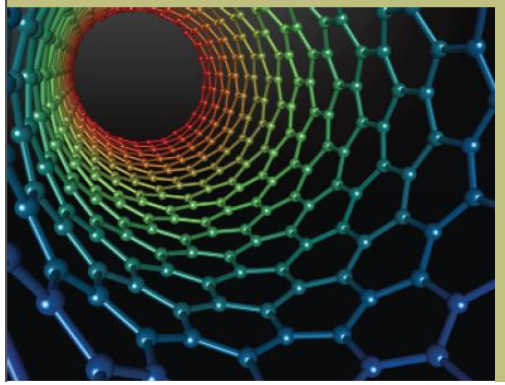
In synchrotron radiation community: a percentage of 15% publications based on beamtime usage with Impact Factor > 7 is considered good, over 20% is excellent



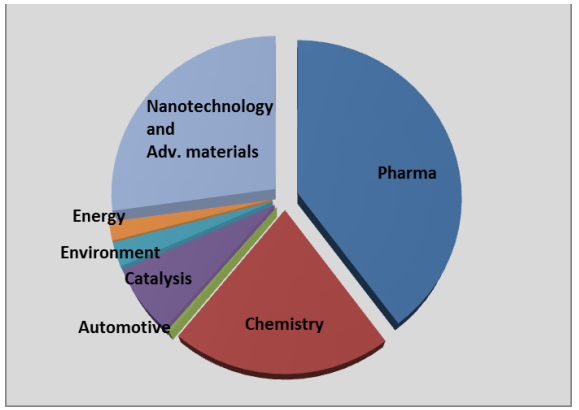
Innovation Hub: Industrial users

The services include mail-in, pre and post experiment support, data treatment, experimental reports, advice on synchrotron techniques, etc

ELECTRONIC AND MAGNETIC STRUCTURE OF MATTER



- **Magnetic (nano)materials**
  Data storage
- **Energy**
  Batteries, solar cells, combustion, fuel cells, oil and gas
- **Nanotechnology**
  Nanoparticles, Nanoelectronics, Semiconductors
- **Advanced materials**
  Magnetic, Superconductors, Multilayers

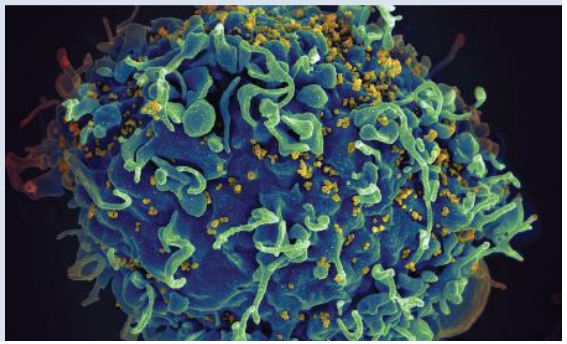


CHEMISTRY AND MATERIAL SCIENCE

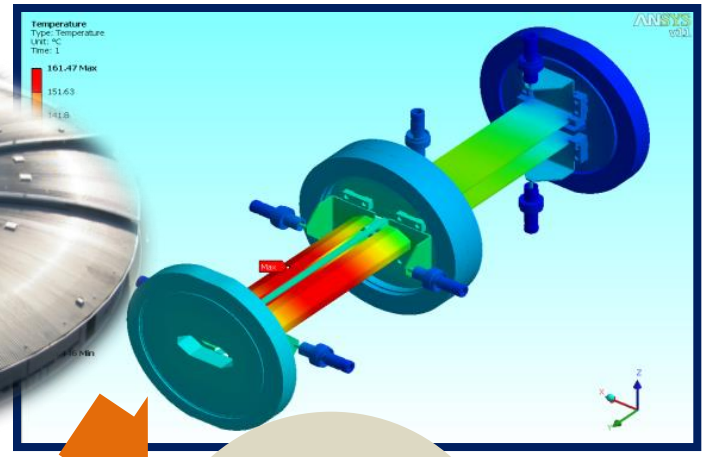
- **Chemistry**
  Catalysis, Plastics, Polymers, Pigments, Adhesives, Textiles, Cements, Ceramics, Glasses
- **Environmental science**
  Soils, Pollutants
- **Cultural heritage, Paleontology, Archeology**
  Ancient materials, Painting, Pottery
- **Automotive and aerospace**
  Coating, Motor oil, Corrosion, Plastics

- **Health and Healthcare**
  Cosmetics, Biotomography, Emulsions and Gels
- **Food and agriculture**
  Food ingredients, Toxins, Plants
- **Pharmaceutical**
  Structural Biology, Drug discovery, Excipient phase, Polymorphs, Drug characterization

LIFE SCIENCE AND SOFT CONDENSED MATTER



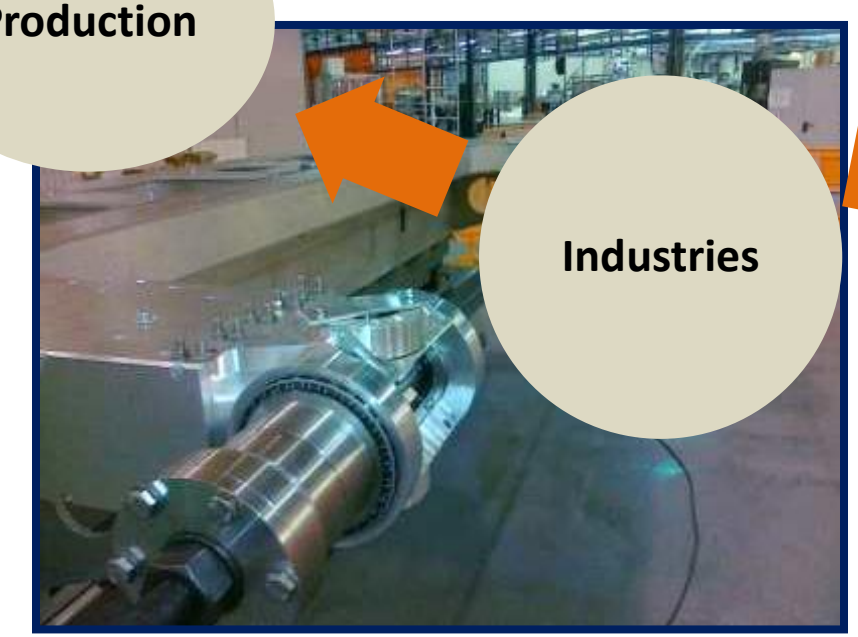
Technology Transfer

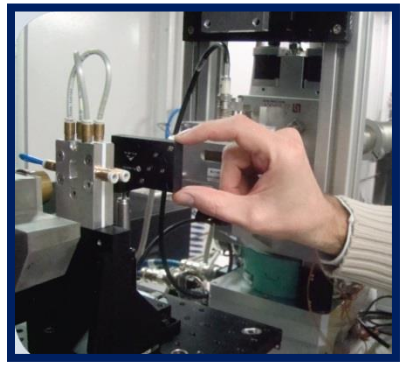


Production

Innovative Designs

Industries





Other scientific infrastructures, national and international

Examples of other activities

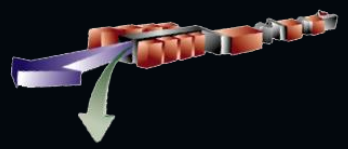
Collaboration with HEP community mainly on accelerator physics and technologies (see F. Perez talk on participation to FCC and CLIC studies)

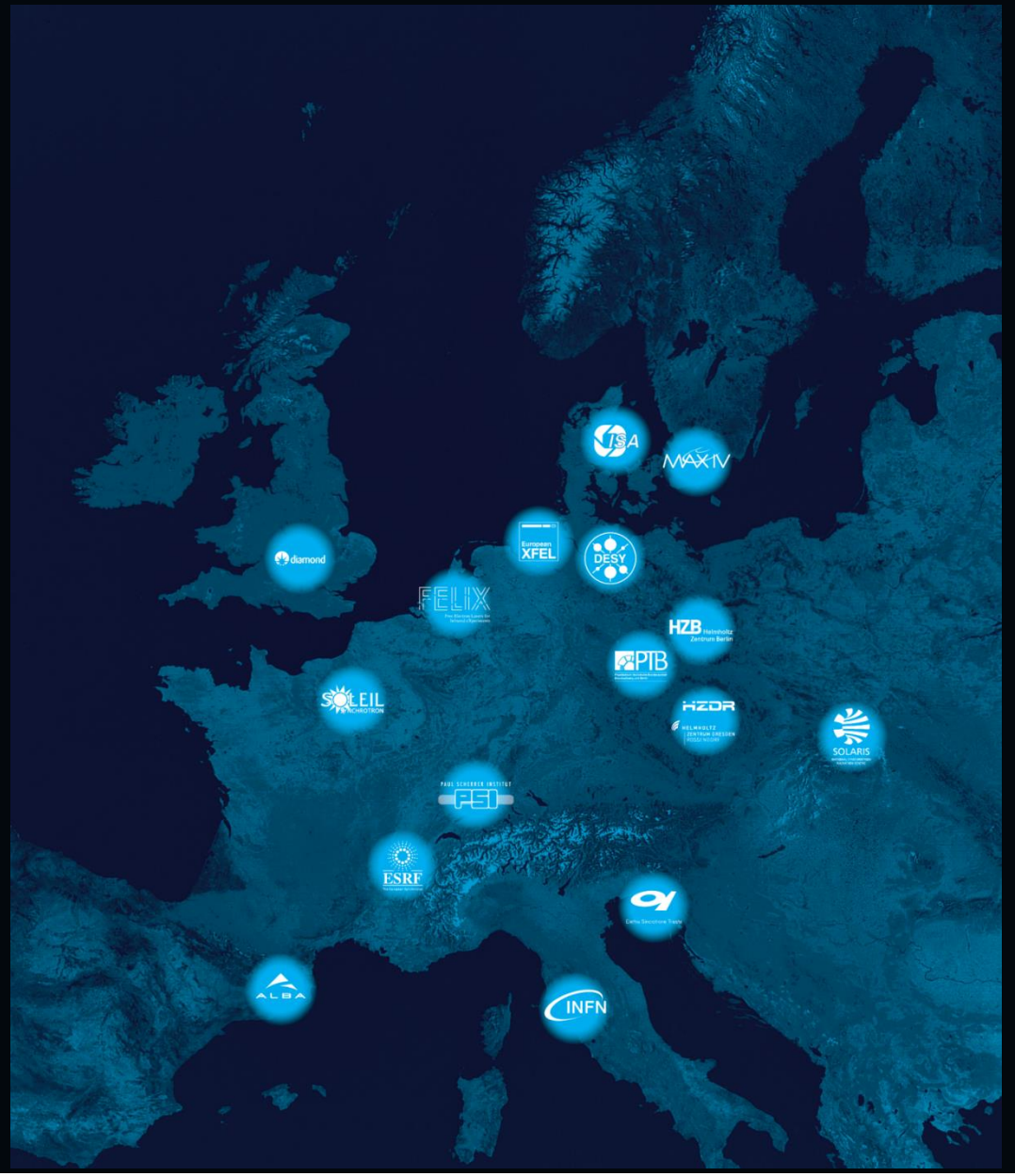
Collaboration with **SESAME**

- CESSAMAG program, directly working with CERN for synchrotron ring dipole measurements
- OPEN SESAME program, ALBA work package leader for training

A new consortium of excellence in Europe devising a transformative level of coordination and integration

13 European Synchrotron Radiation and **6** FEL Facilities are joining forces to master the challenges of the next decades





Strategy recently published

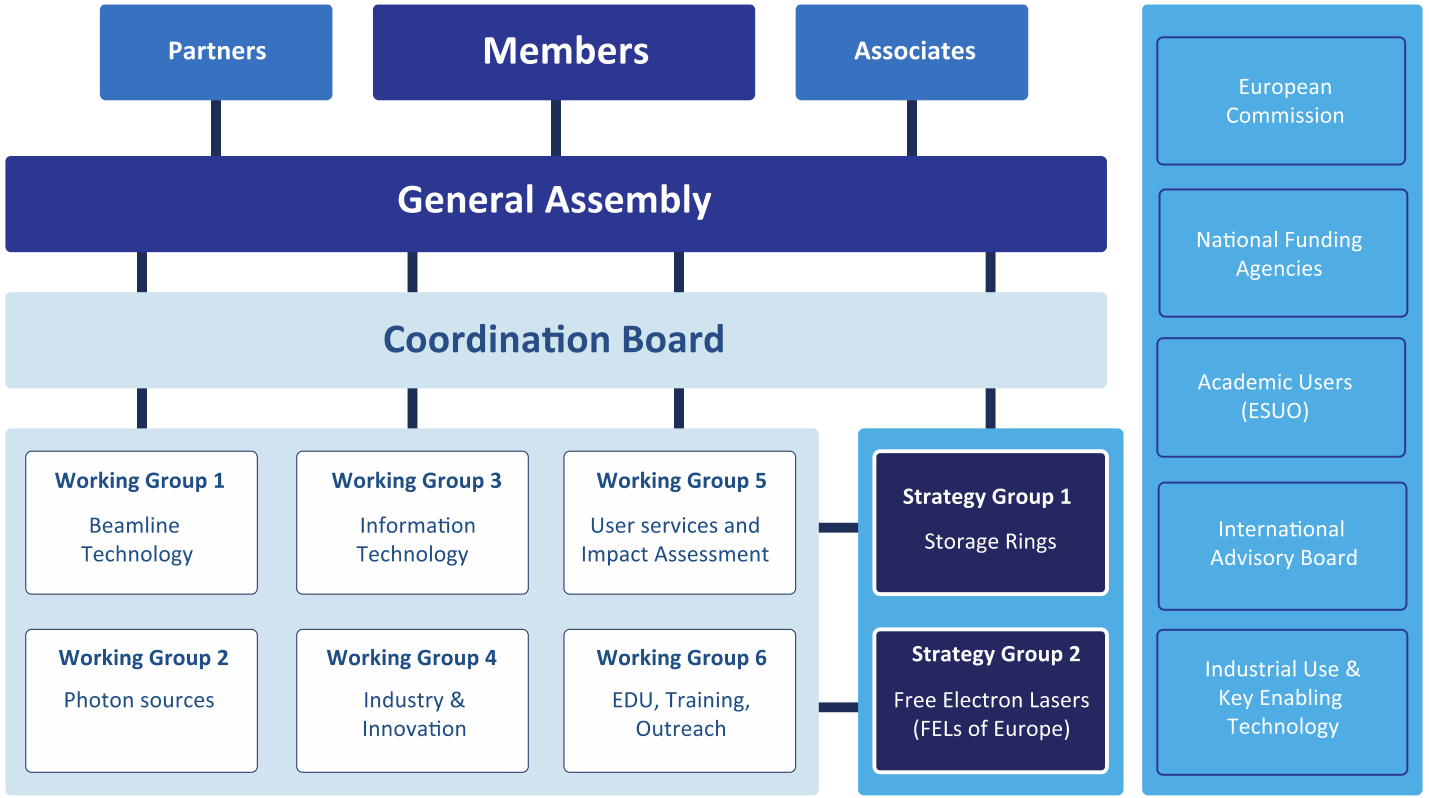
Available at https://www.leaps-initiative.eu/news/presentation_of_leaps_strategy_2030/

What LEAPS aims at:

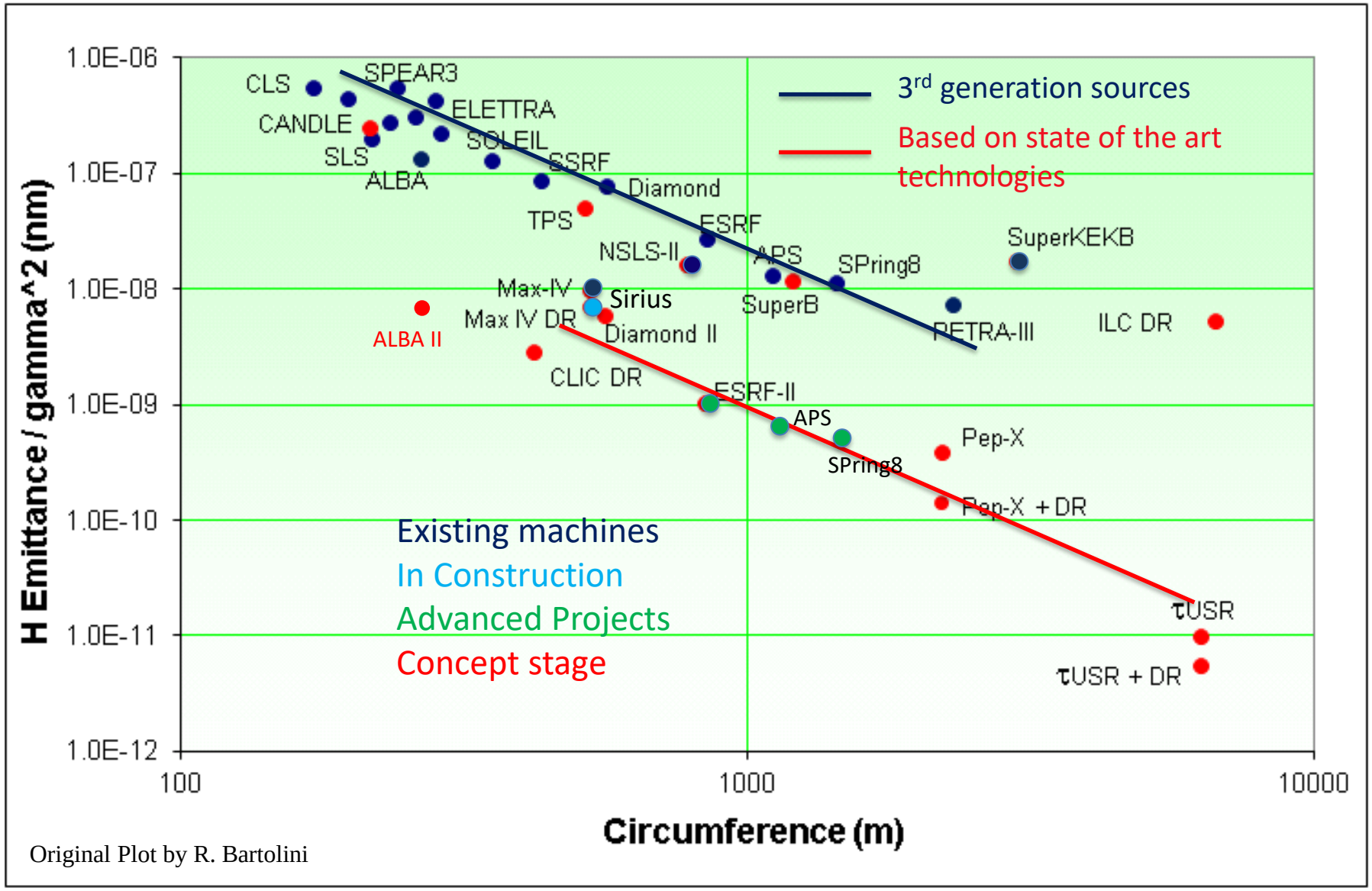
Pushing X-Ray Science in Europe to the next level optimizing RI resources from now towards Horizon Europe and beyond

New Cooperation between European Facilities in close interaction with national authorities and the European Commission

- **Coordinated transformation** of Europe´s facilities towards the next Gen facilities
- **Smart specialisation** strategy among LEAPS facilities
- **LEAPS roadmaps** for facility developments and new technologies
- Most **advanced technologies** to academia and industry
- New European **training platform** for nextGen scientists, industry and future managers
- Development of LEAPS as a contact point of the future **EOSC**
- **Integration** of emerging communities and strategic partners of Europe



Low Emittance Rings Trend



Original Plot by R. Bartolini

Increase brightness and coherence of photon beam by decreasing e- emittances - Most SR planning for upgrades

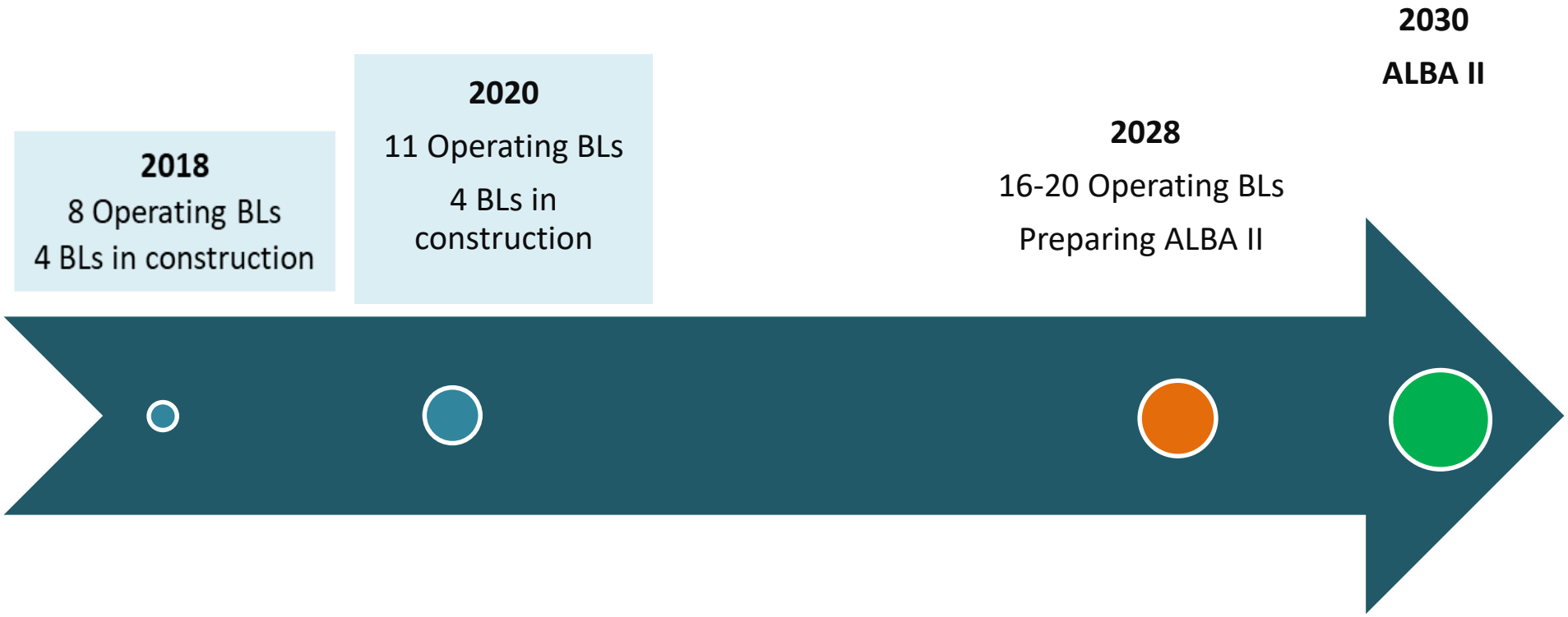
Low emittance e- rings in HEP and LEAPS community

- Damping rings for LC
- Ultimate Storage Rings

Multibend achromats:

- MAX IV (starting operation)
- ESRF-EBS upgrade (in construction)

ALBA future



2017-2020 Strategy Plan
In progress

Next decade fully exploiting the initial infrastructure by increasing number of BLs and add addional platforms (as Advanced Microscope Center)

Upgrade to more brilliant source

Thanks to colleagues from

ALBA

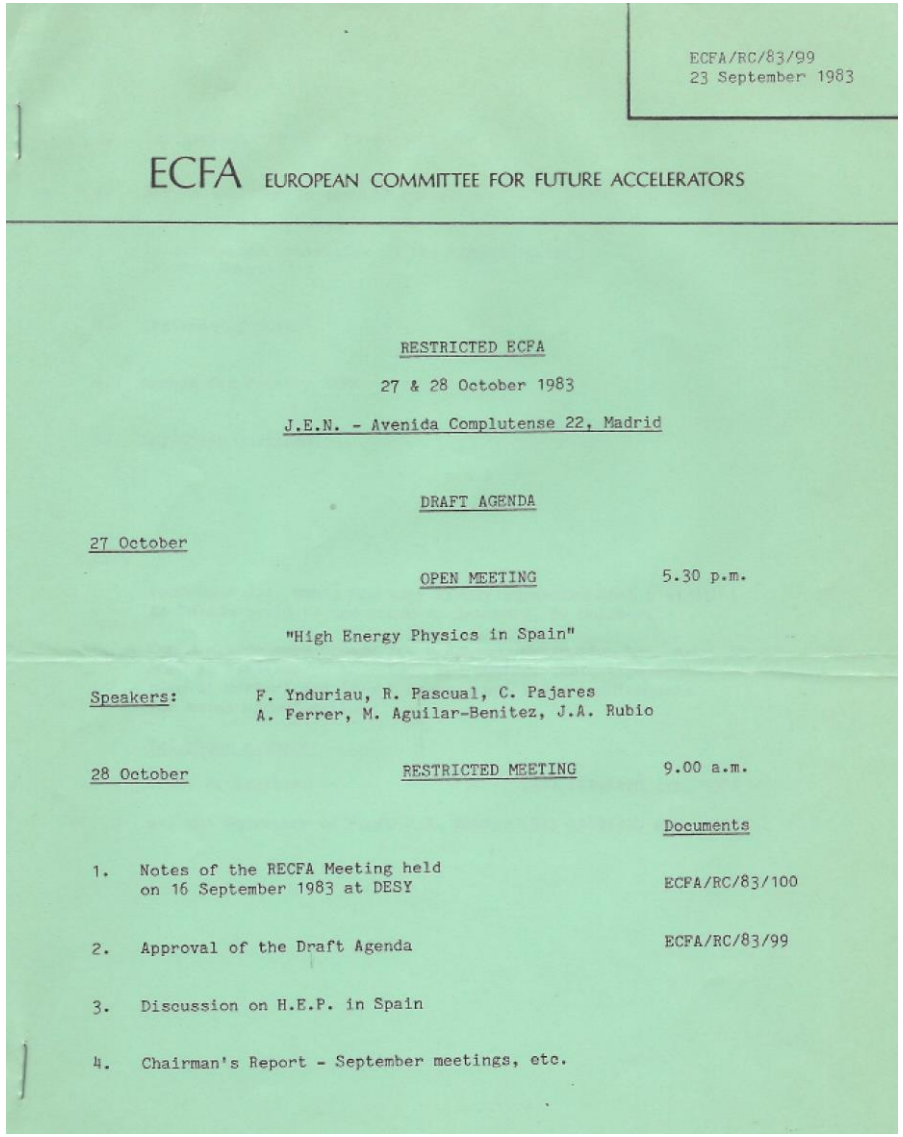
IFAE Institut de Física d'Altes Energies — Excelencia Severo Ochoa — BIST Barcelona Institute of Science and Technology

IFIC Institut de Física Corpuscular — Excelencia Severo Ochoa — CSIC — Universitat de València

ifl Instituto de Física Teórica UAM-CSIC

for the organization of this meeting (special thanks to Enric Vinyals and Yolanda Ruiz for their precious help)

ECFA meeting in Madrid, 1983



ECFA/RC/83/99
23 September 1983

ECFA EUROPEAN COMMITTEE FOR FUTURE ACCELERATORS

RESTRICTED ECFA

27 & 28 October 1983

J.E.N. - Avenida Complutense 22, Madrid

DRAFT AGENDA

27 October

OPEN MEETING 5.30 p.m.

"High Energy Physics in Spain"

Speakers: F. Ynduriau, R. Pascual, C. Pajares
A. Ferrer, M. Aguilar-Benitez, J.A. Rubio

28 October RESTRICTED MEETING 9.00 a.m.

Documents

1. Notes of the RECFA Meeting held on 16 September 1983 at DESY — ECFA/RC/83/100
2. Approval of the Draft Agenda — ECFA/RC/83/99
3. Discussion on H.E.P. in Spain
4. Chairman's Report - September meetings, etc.

Thank you for the attention

Glasses of a Romanic chapel studied at ALBA