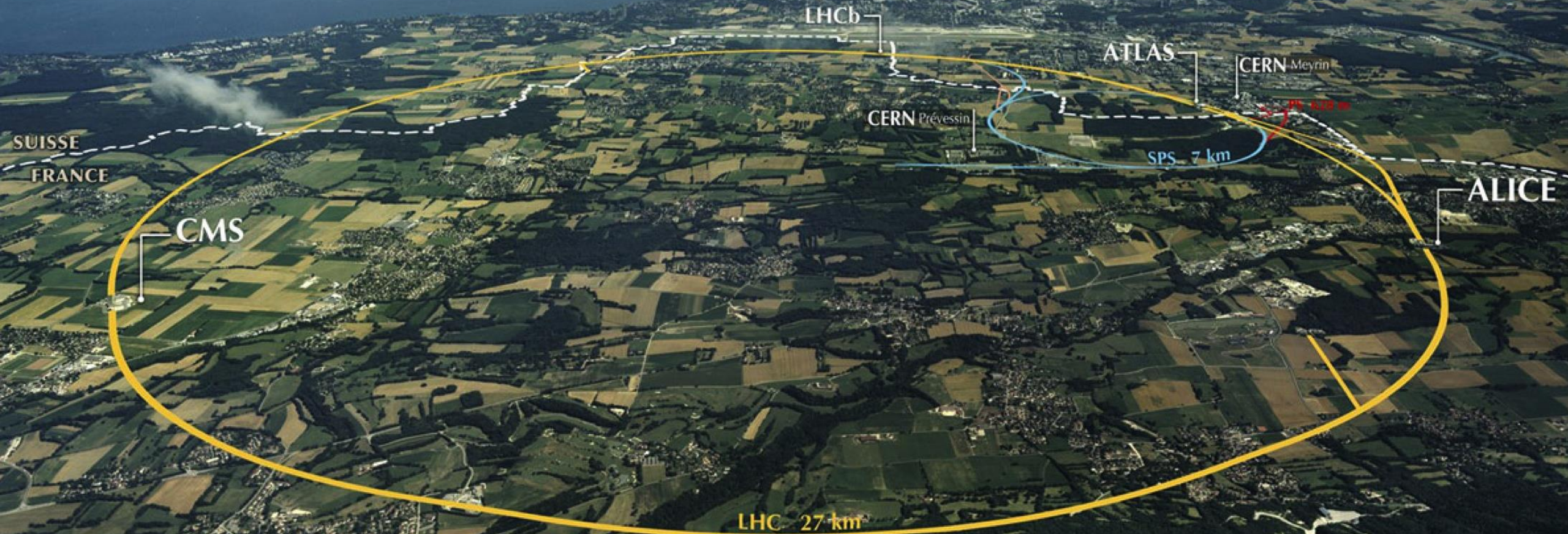


Welcome to the Beams department!

Mike Lamont - DDH



CERN: founded in 1954: 12 European States

“Science for Peace”

Today: 22 Member States

~ 2500 staff

~ 1800 other paid personnel

~ 13000 scientific users

Budget (2018) ~ 1100 MCHF

Member States: Austria, Belgium, Bulgaria, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Israel, Italy, Netherlands, Norway, Poland, Portugal, Romania, Slovak Republic, Spain, Sweden, Switzerland and United Kingdom

Associate Members in the Pre-Stage to Membership: Cyprus, Serbia, Slovenia

Associate Member States: India, Lithuania, Pakistan, Turkey, Ukraine

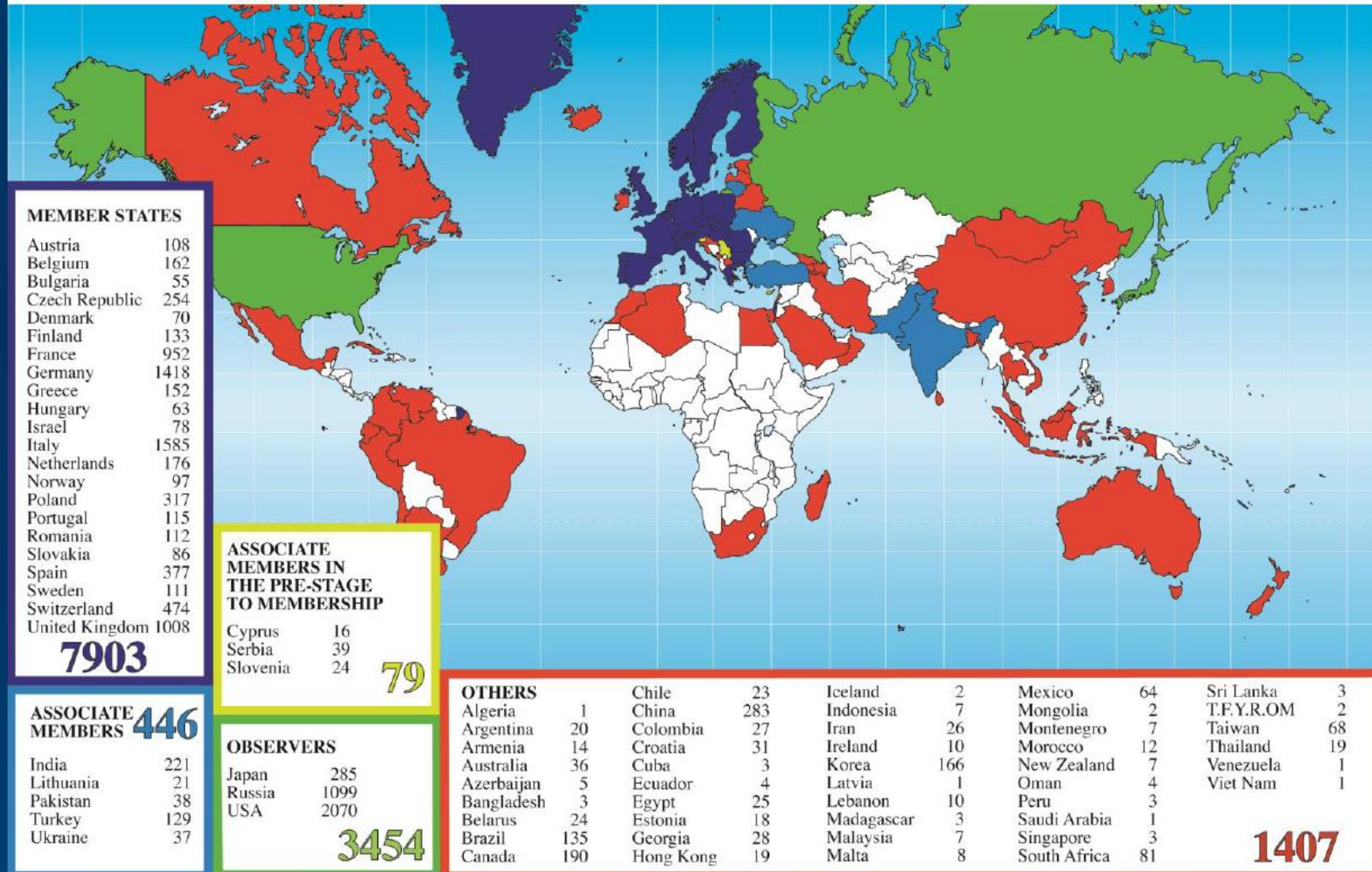
Applications for Membership or Associate Membership:

Brazil, Croatia

Observers to Council: Japan, Russia, United States of America;
European Union, JINR and UNESCO

Science is getting more and more Global

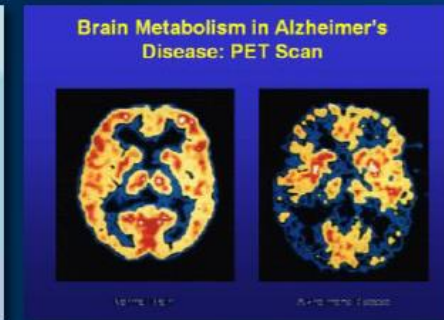
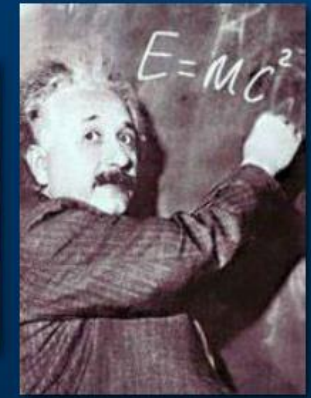
Distribution of All CERN Users by Location of Institute on 24 January 2018



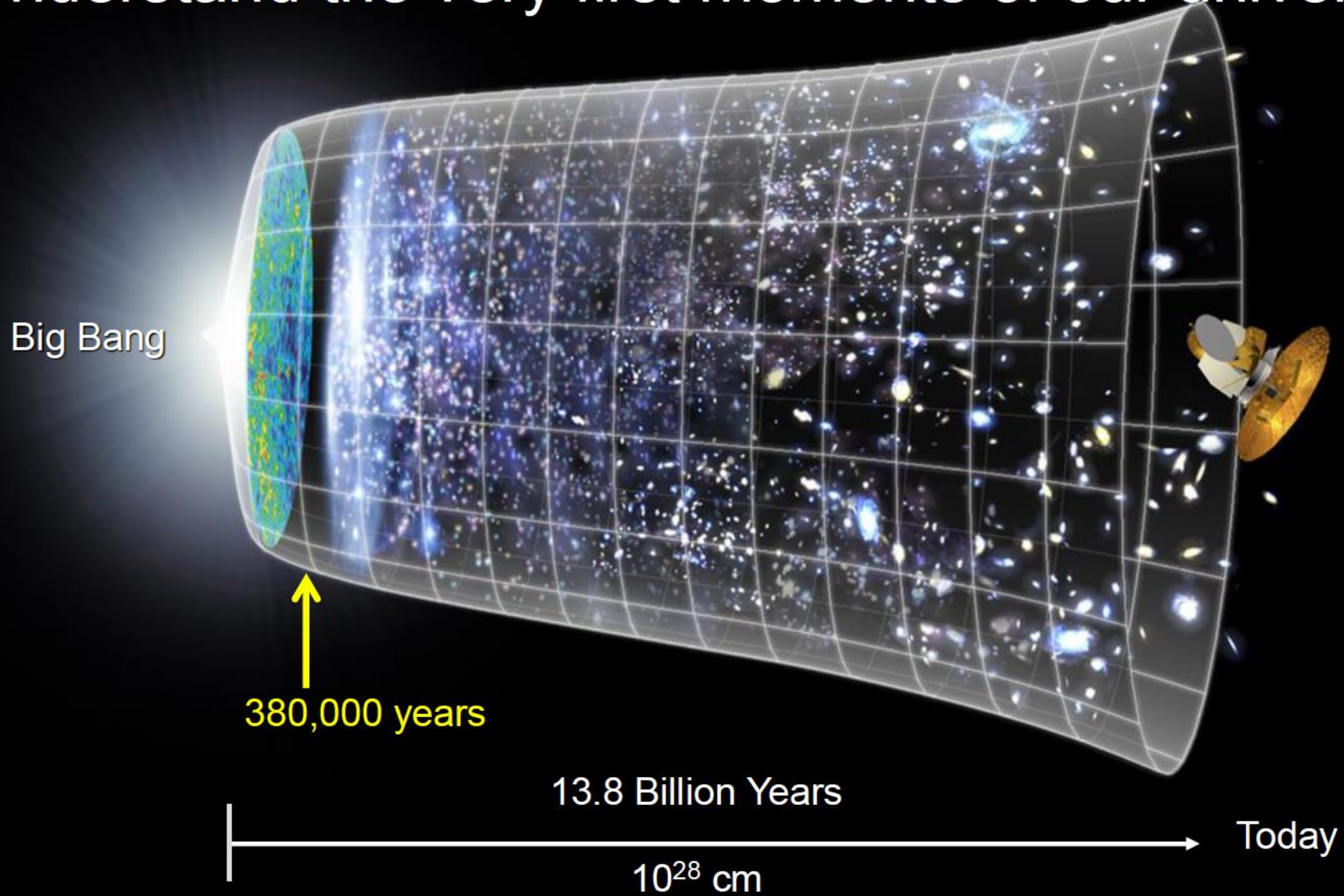
The Mission of CERN

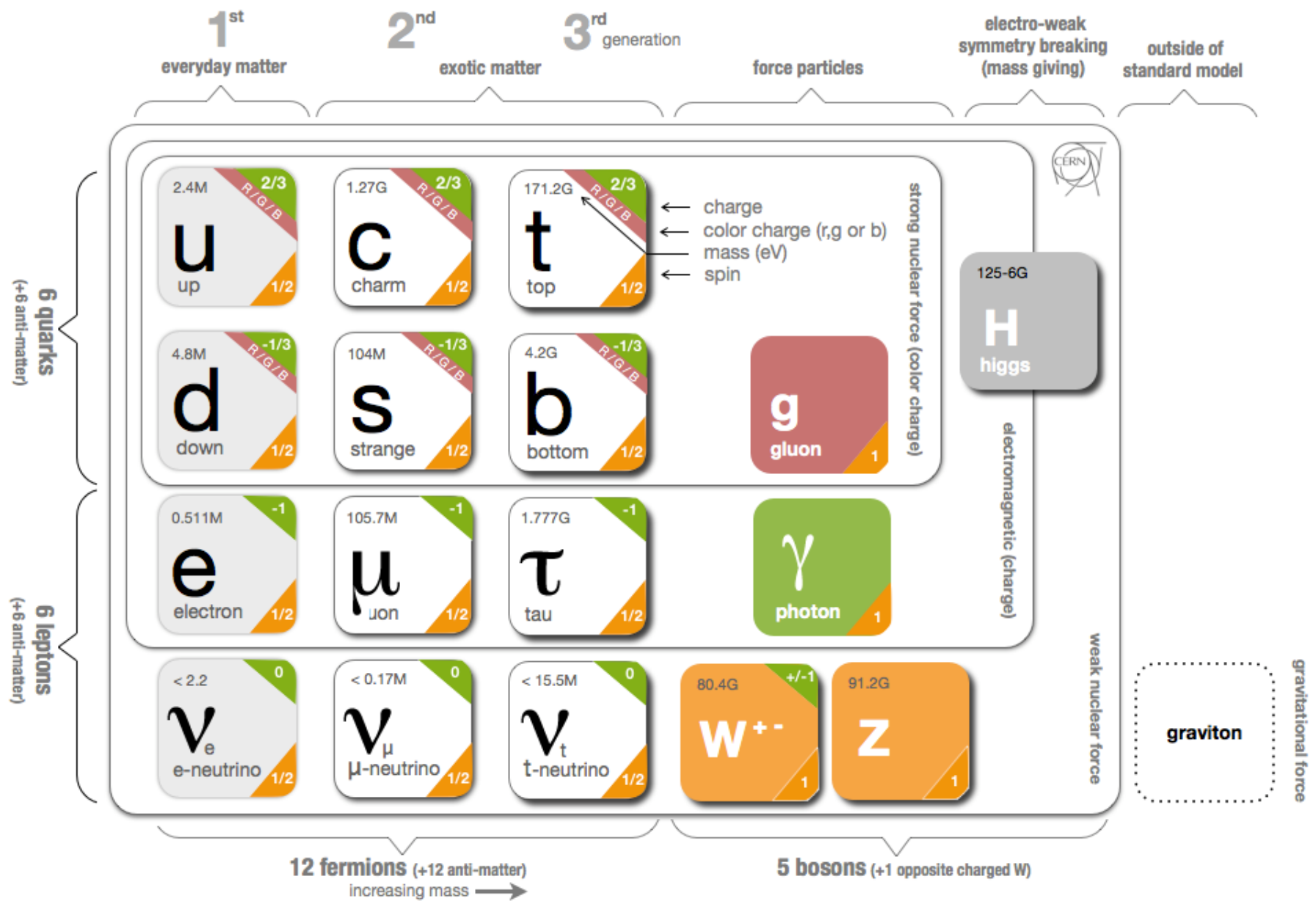


- **Push back** the frontiers of knowledge
- **Develop** new technologies for accelerators and detectors
- **Train** scientists and engineers of tomorrow
- **Unite** people from different countries and cultures

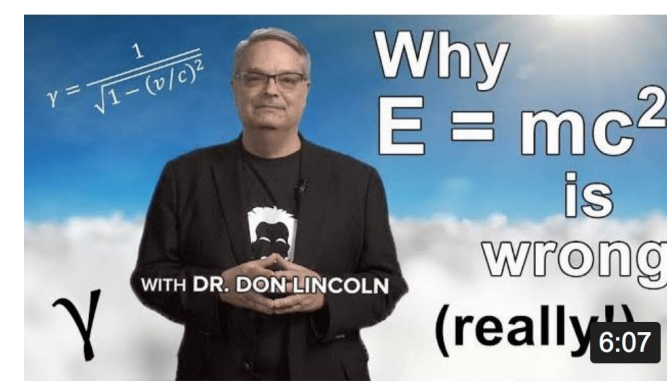


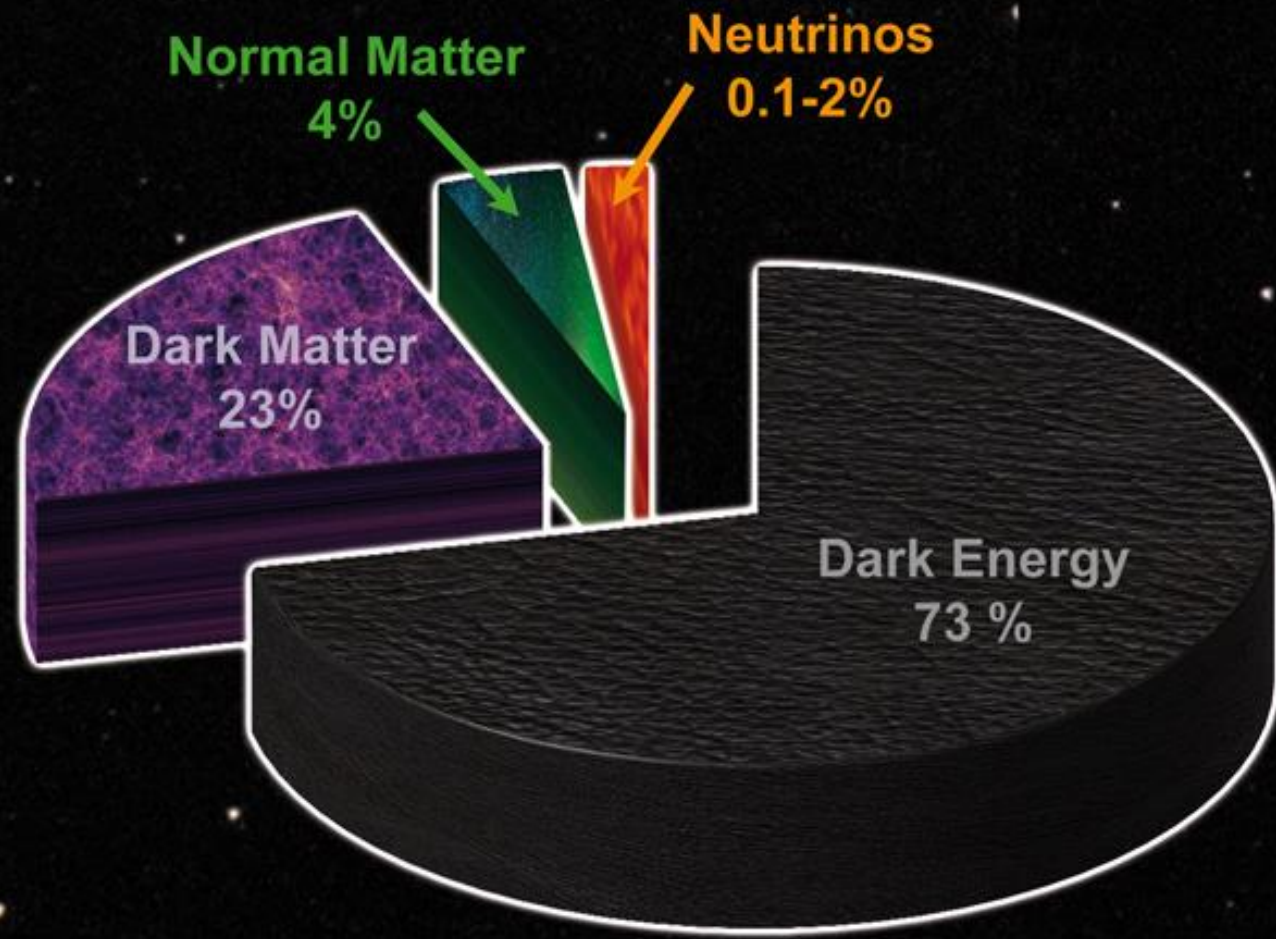
Understand the very first moments of our universe





The Standard Model





Content of the Universe

CERN...

World première research facility for high-energy physics; Supported by its 20 European member states; With 2500 full-time employees CERN hosts about 10,000 visiting scientists from 113 different countries. CERN, among its accomplishments:

- ▶ Found the neutral currents of the electroweak theory,
- ▶ Used neutrinos to confirm the quark hypothesis,
- ▶ Discovered the W and Z bosons.
- ▶ Counted the number of neutrino species,
- ▶ Created the first anti-atoms and
- ▶ Discovered the long sought Higgs Boson

None of these triumphs are likely to contribute anything at all to human health or wealth. Useless Science?

Sheldon Lee Glashow

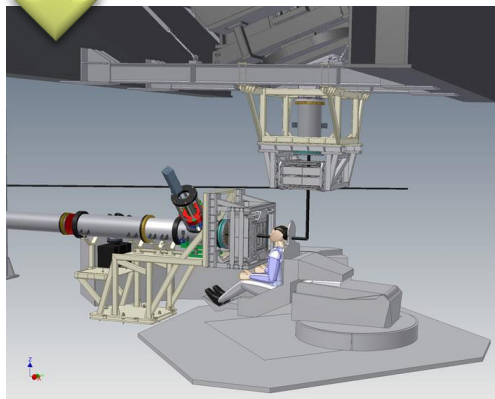
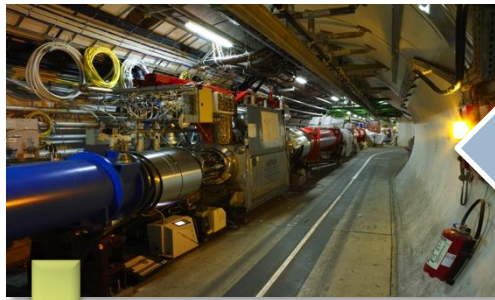
Harvard University, emeritus

Boston University

CERN technologies generate innovation

Medical Applications

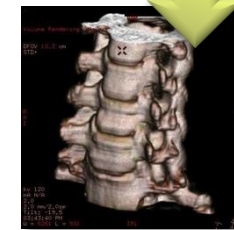
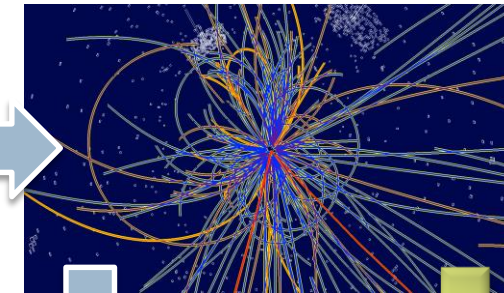
Accelerators



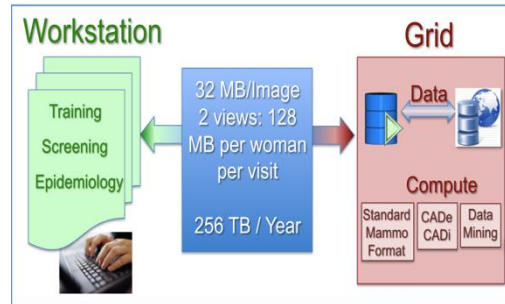
Hadron therapy



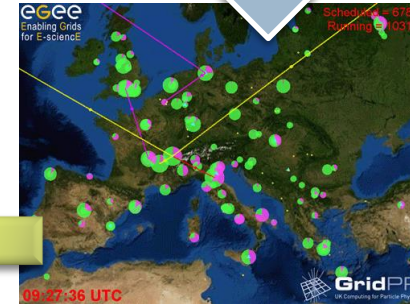
Detectors



CAT
PET



The Computing Grid



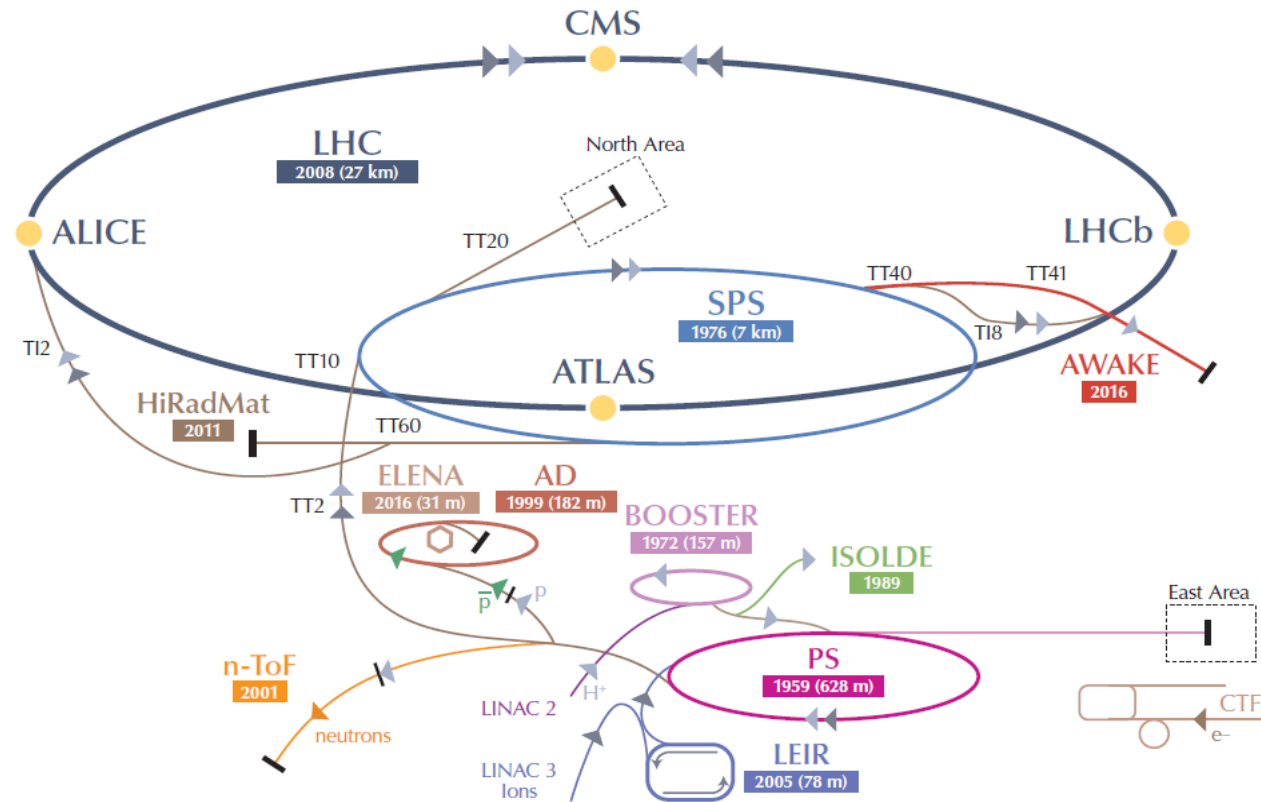
Not quite useless: Think Technology Transfer!

CERN is a hotbed of innovative technologies involving Accelerators, Cryogenics, Detectors, Electronics, Information Technology, Magnets, Material Science, Superconductors &c. Through licencing or joint ventures, CERN makes these resources available for scientific and commercial purposes. Some examples of CERN's Technogical Spinoff:

- ▶ 1990 The World-Wide-Web, by physicists but for the world!
- ▶ 2004 GEANT-4: CERN's simulation software for physics, space science, medicine and radiology.
- ▶ 2003 [DxRay](#), a spinoff company, develops advanced digital X-ray scanners based on CERN technology.
- ▶ 2012 "Thanks to scientists working on particle acceleration at CERN, the Geneva International Airport is the proud owner of the largest solar energy system in Switzerland" (Forbes).

But CERN's primary purposes are to pursue the secrets of Nature and to train the next generation of innovators.

The CERN Accelerator Complex



▶ p (proton) ▶ ion ▶ neutrons ▶ \bar{p} (antiproton) ▶ electron ▶ \leftrightarrow proton/antiproton conversion

LHC Large Hadron Collider SPS Super Proton Synchrotron PS Proton Synchrotron

AD Antiproton Decelerator CTF3 Clic Test Facility AWAKE Advanced Wakefield Experiment ISOLDE Isotopes Separator Online Device

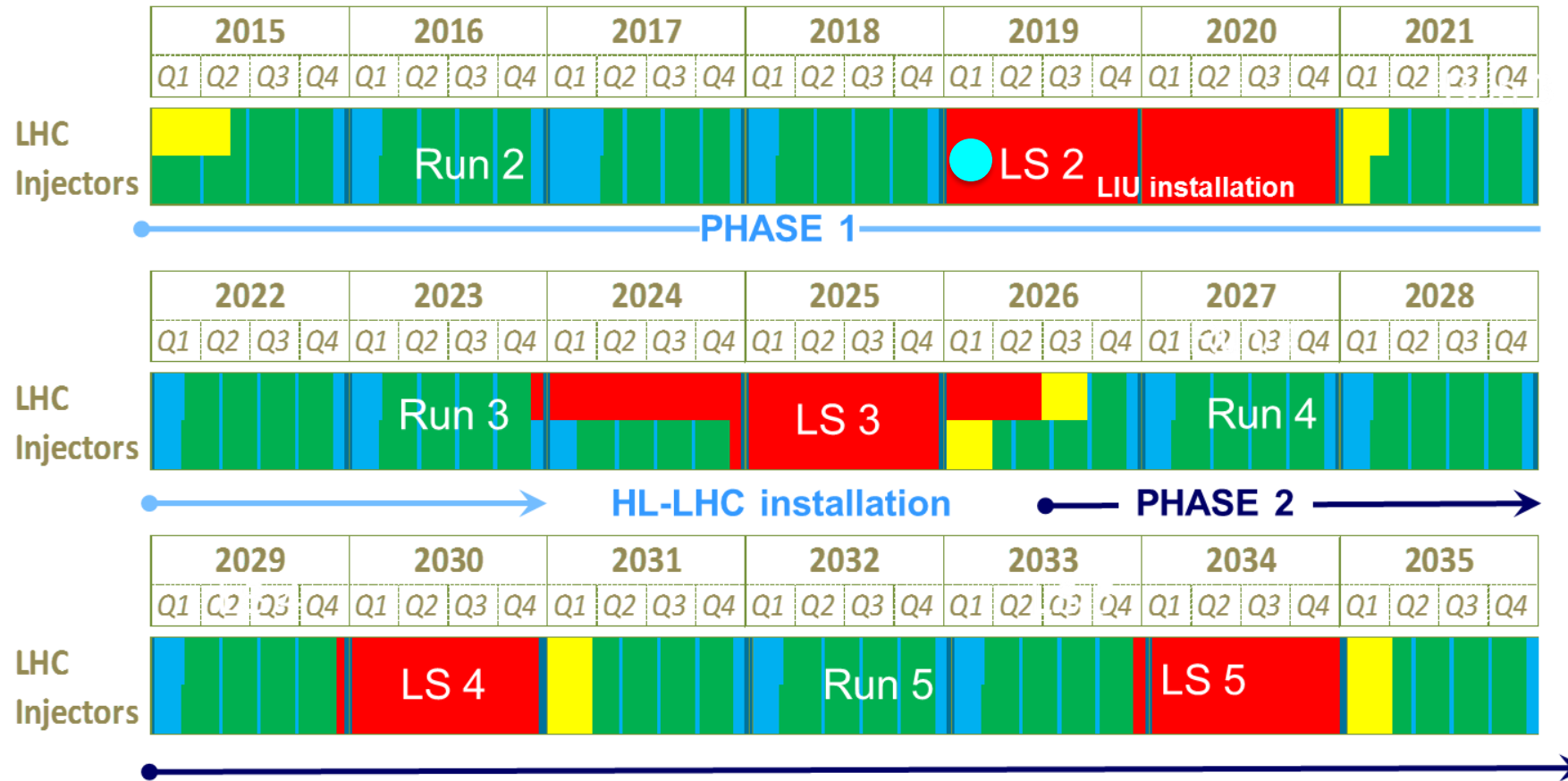
LEIR Low Energy Ion Ring LINAC LINear ACcelerator n-ToF Neutron Time-of-Flight

More about this lot in the talk of Rende ...

Long term perspective

LHC roadmap: according to MTP 2016-2020 V1

LS2 starting in 2019 => 24 months + 3 months BC
 LS3 LHC: starting in 2024 => 30 months + 3 months BC
 Injectors: in 2025 => 13 months + 3 months BC



Accelerator schedules - LHC

	Jan				Feb				Mar		Apr		May				
Wk	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
Mo	1	8	15	22	29	5	12	19	26	↓	5	↓	12	19	26	↓	
Tu		Controls Maintenance															
We						Technical stop (YETS)											
Th																	
Fr																	
Sa																	
Su																	

Start powering tests (Mar 9-10), LHC to OP (Mar 10), LHC, T12, T18 closed (Mar 11-12), Experiments valves open (Mar 13), T12 & T18 Beam tests (Mar 14-15), Start Beam Commissioning (Mar 16)

	Apr		May				June						
Wk	14	15	16	17	18	19	20	21	22	23	24	25	26
Mo	Easter 2	9	16	Scrubbing 23	30	7	14	Whitsun 21	28	4	11	18	25
Tu					1st May								
We													
Th	Recommissioning with beam		Interleaved commissioning & intensity ramp up										
Fr													
Sa													
Su													

First Stable beams (Apr 16), Collisions with 1200 bunches (May 18), Ascension (May 21), MD 1 (Jun 24), VdM program (Jun 25), $\beta^* = 90$ m run (Jun 26)

	July		Aug				Sep						
Wk	27	28	29	30	31	32	33	34	35	36	37	38	39
Mo	$\beta^* = 90$ m 2 run	9	16	23	30	6	13	20	27	3	10	17	24
Tu													
We				MD 2									
Th													
Fr													
Sa													
Su													

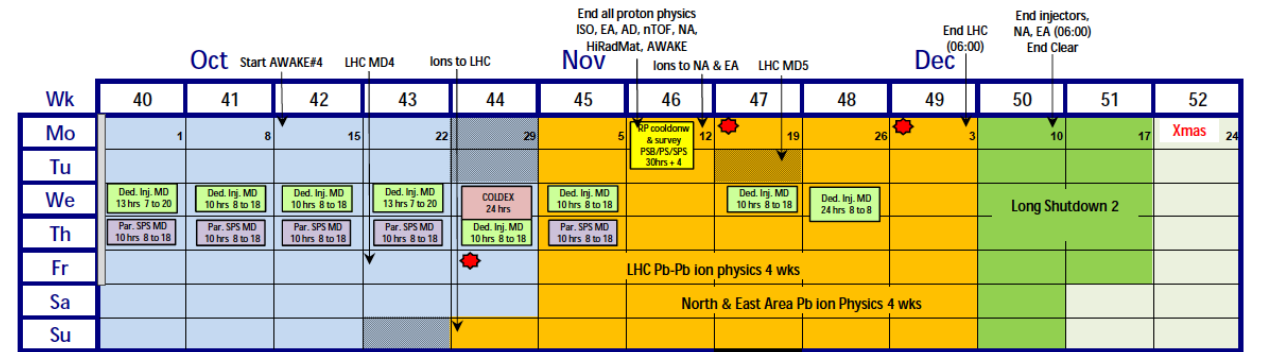
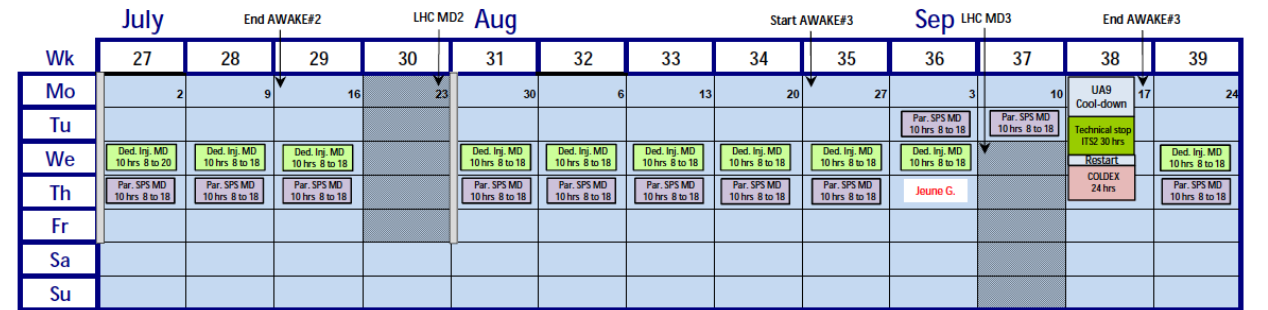
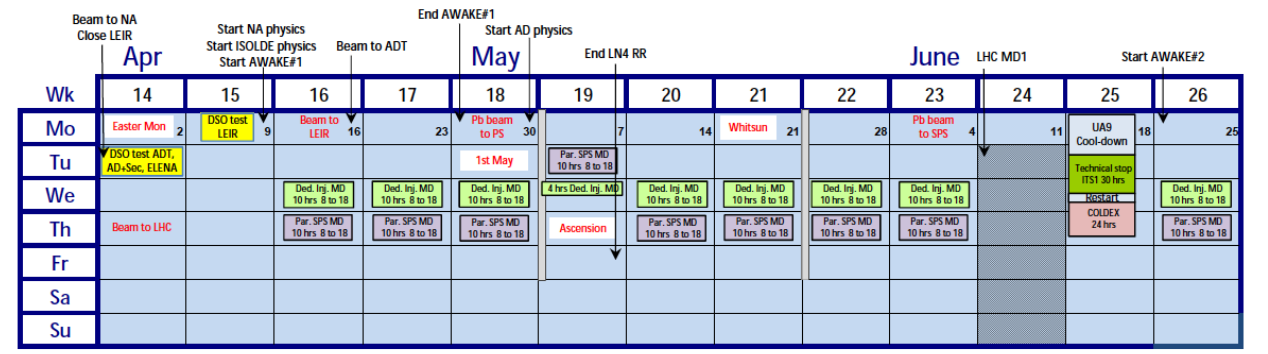
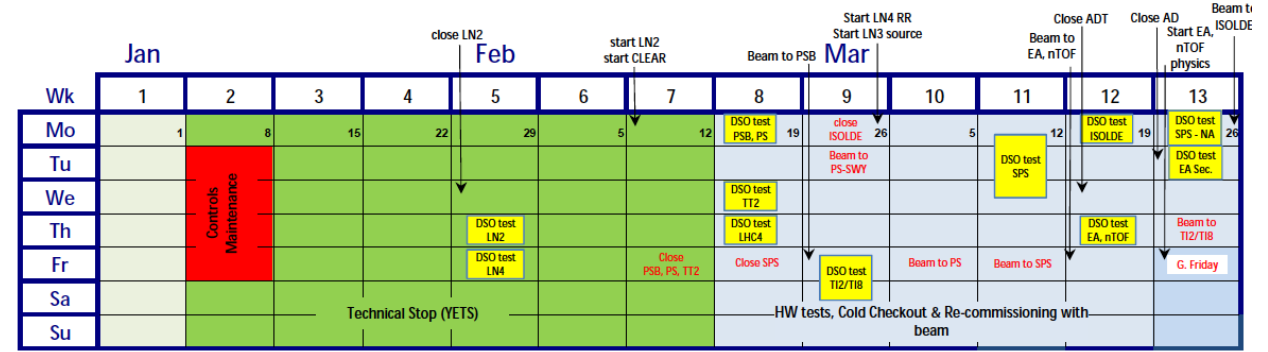
Jeune G. (Sep 3), MD 3 (Sep 24), TS2 (Sep 38)

	Oct		Nov				Dec						
Wk	40	41	42	43	44	45	46	47	48	49	50	51	52
Mo	1	8	15	22	MD 4 29	5	12	19	26	3	10	17	Xmas 24
Tu						ion setting up							
We													
Th													
Fr													
Sa													
Su													

End of run (106:00) (Dec 49), Powering Tests Magnet Training (Dec 49-50), Long Shutdown 2 (Dec 50-51)

- Technical Stop
- Powering tests
- Machine check out
- Recommissioning with beam
- Interleaved commissioning & intensity ramp up
- Proton physics run
- Special physics runs (indicative - schedule to be established)
- Machine development
- Scrubbing (indicative - dates to be established)
- Pb - Pb Ion physics run
- Pb Ion Setting up
- LINAC 3 Pb oven re-fill

Accelerator schedules - Injectors



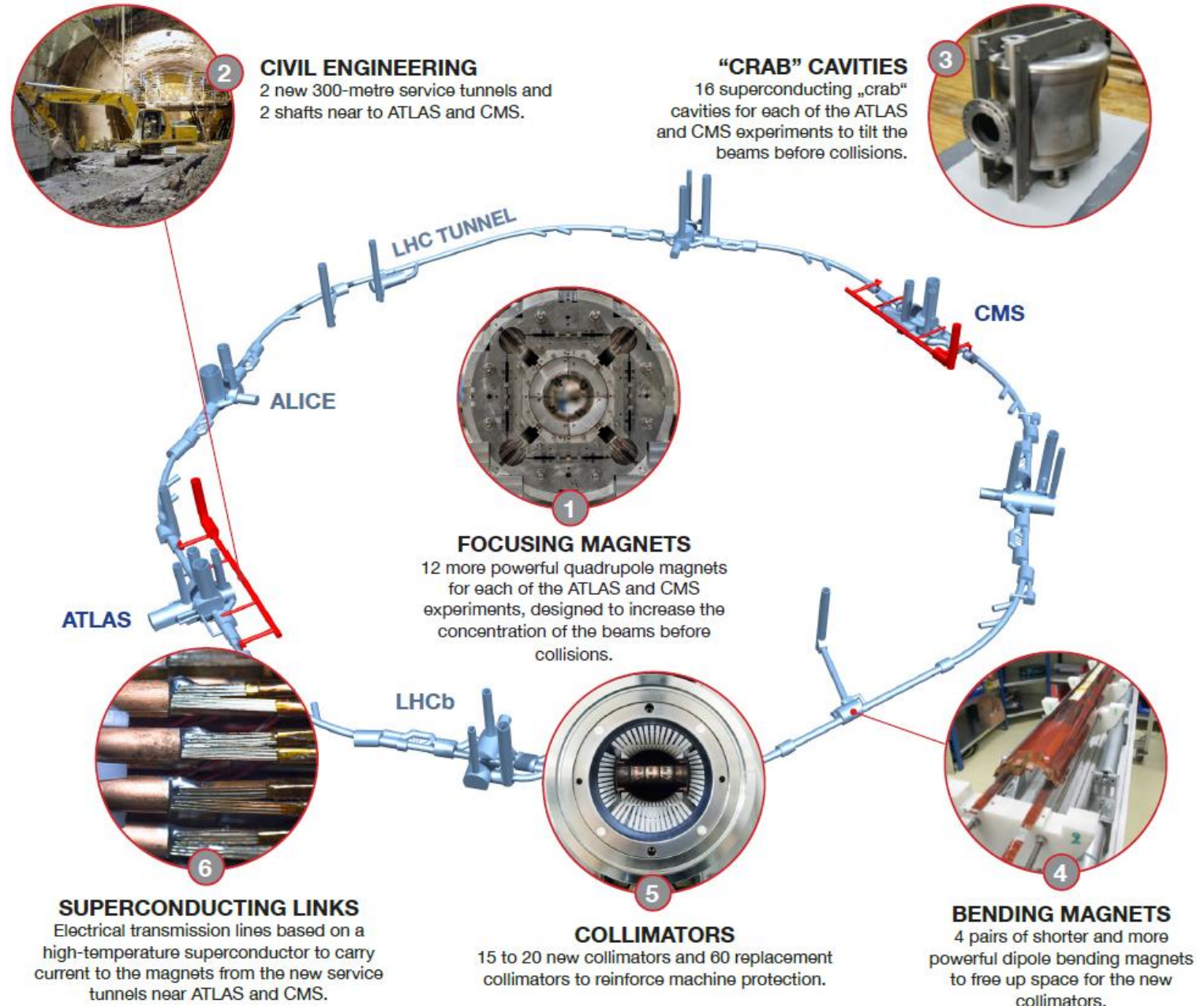
- Injector Complex MD Block
- Technical stop for the Injector Chain
- Indication of LHC MD blocks proton period
- Special (physics) runs
- LINAC 3 Pb oven re-fill
- HiRadMat: possible beam request
- Ions to NA and/or LHC
- Indication of LHC MD blocks ion period
- Parallel SPS MD, reduced duty cycle for NA

INCOMING

HL-LHC

$5 \times 10^{34} \text{ cm}^{-2}\text{s}^{-1}$
and 250 fb^{-1} per year

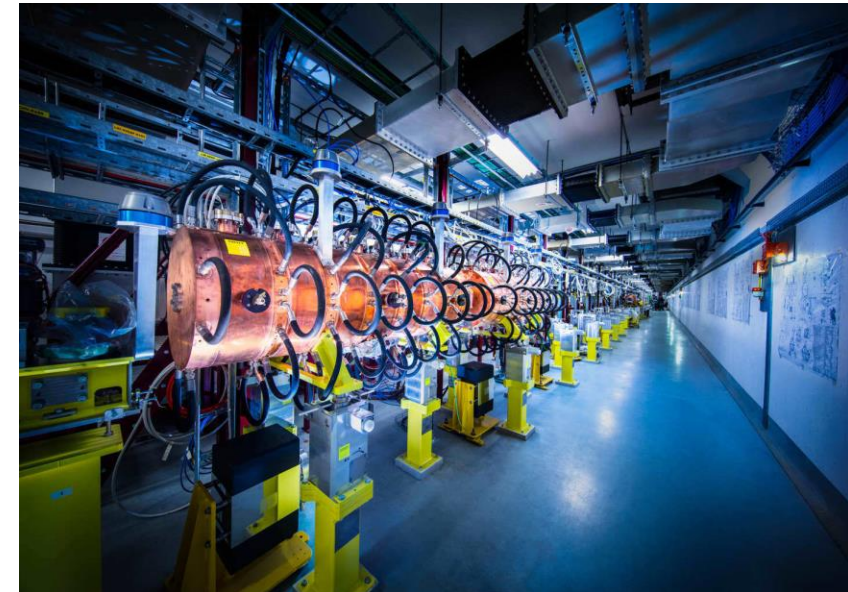
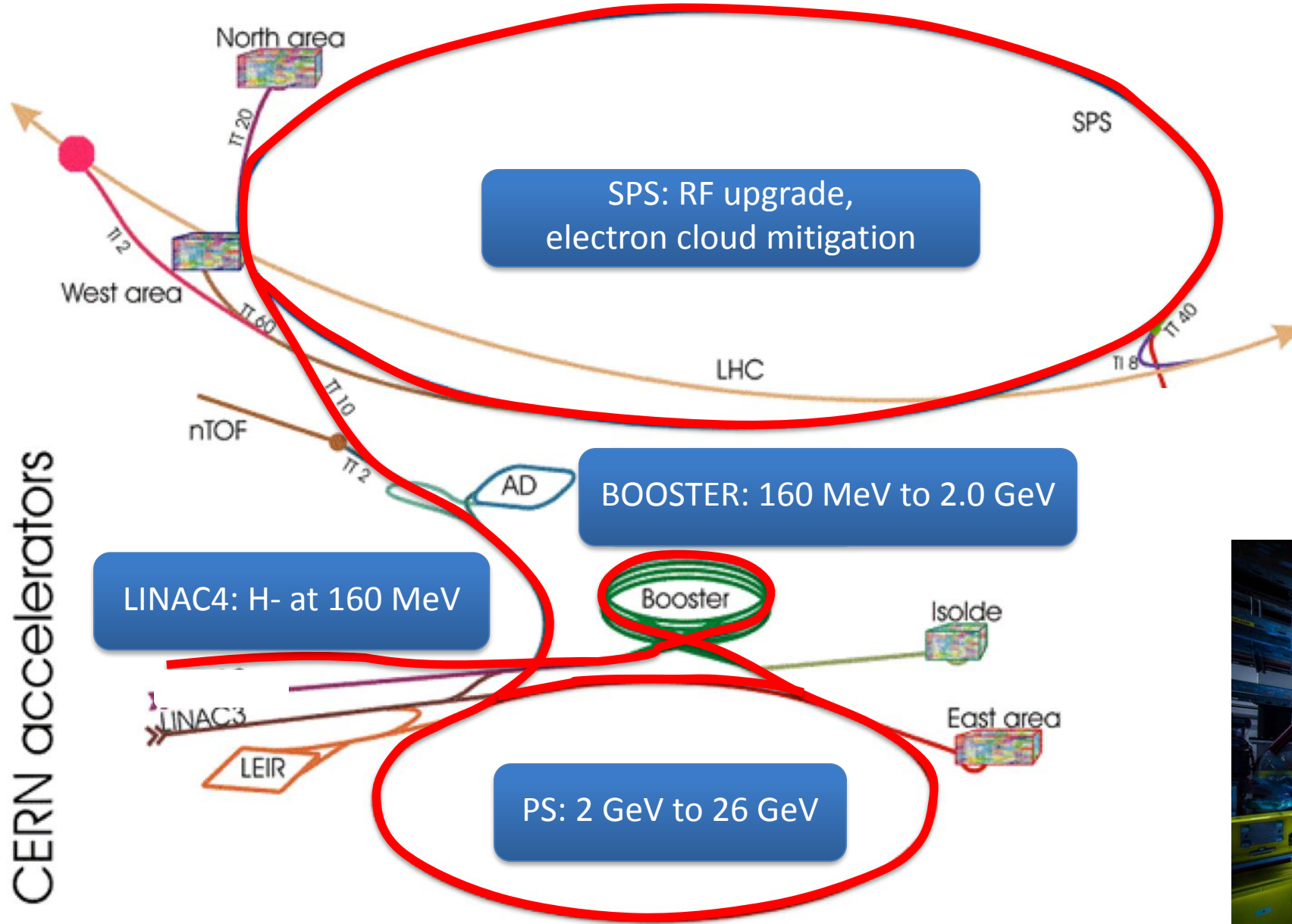
- Lower beta*
- Crossing angle compensation
- Beam from injectors
- Dealing with the regime





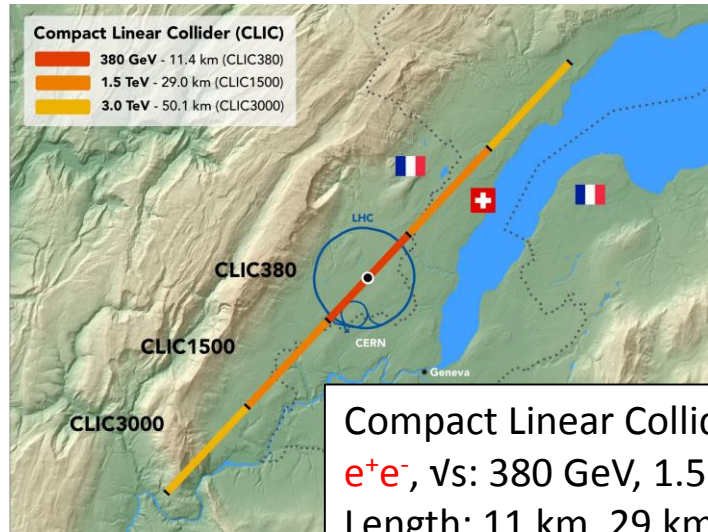
Civil Engineering Pt1 and Pt5 has started

LHC Injector Upgrade (LIU)

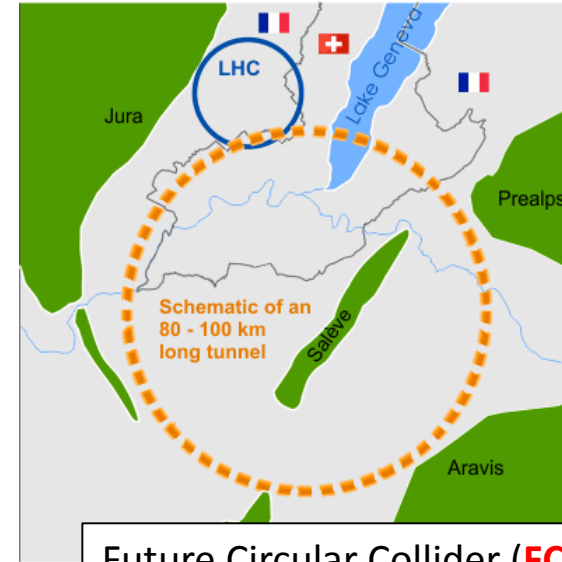


Targeting $\sim 2.3 \times 10^{11}$ protons per bunch

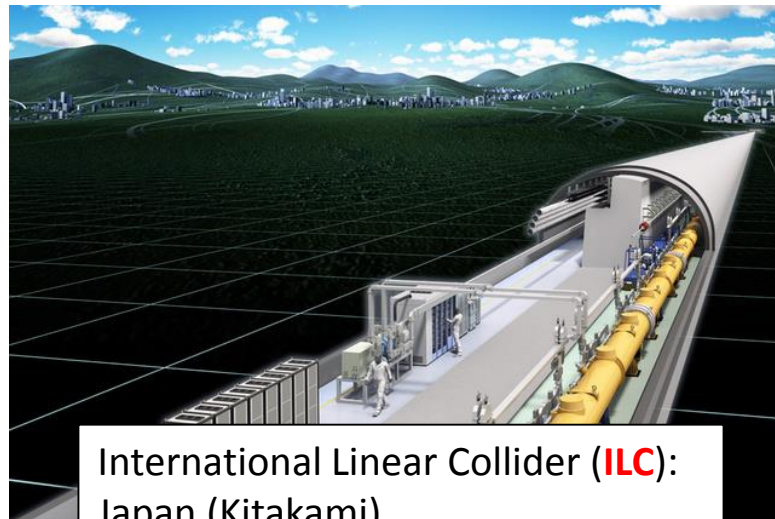
High-energy e^+e^- collider studies



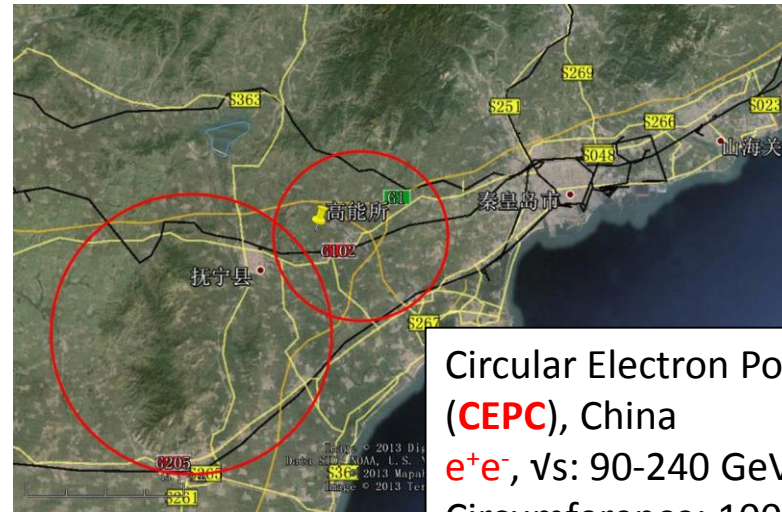
Compact Linear Collider (**CLIC**): CERN
 e^+e^- , ν s: 380 GeV, 1.5 TeV, 3 TeV
 Length: 11 km, 29 km, 50 km



Future Circular Collider (**FCC-ee**): CERN
 e^+e^- , ν s: 90 - 350 (365) GeV; FCC-hh pp
 Circumference: 97.75 km

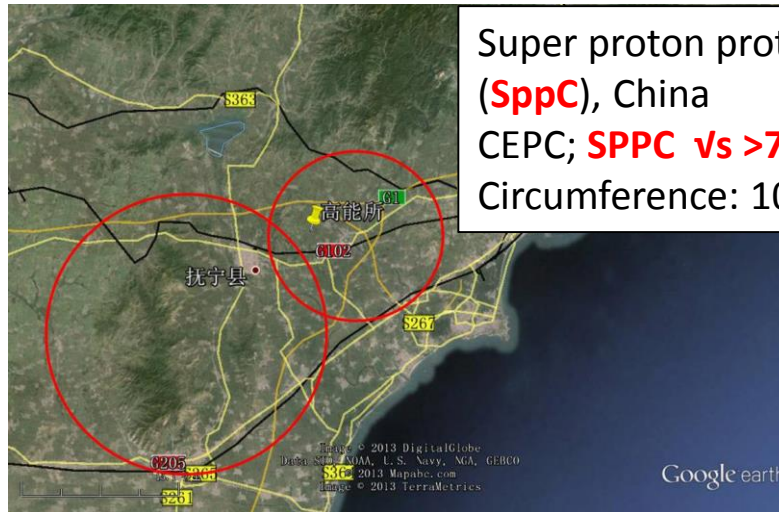


International Linear Collider (**ILC**):
 Japan (Kitakami)
 e^+e^- , ν s: 250 – 500 GeV (1 TeV)
 Length: 17 km, 31 km (50 km)

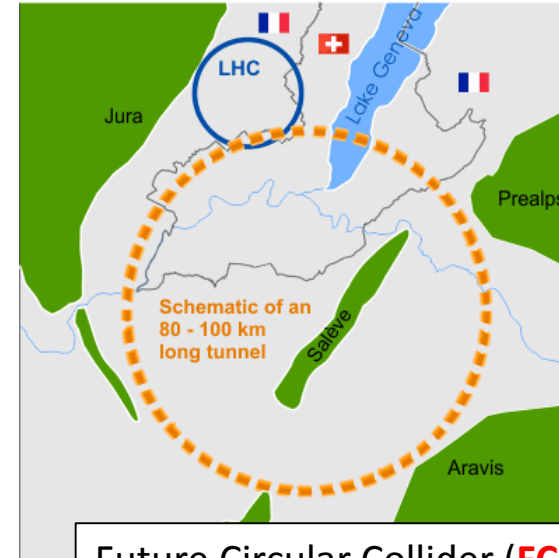


Circular Electron Positron Collider (**CEPC**), China
 e^+e^- , ν s: 90-240 GeV; SPPC pp,
 Circumference: 100 km

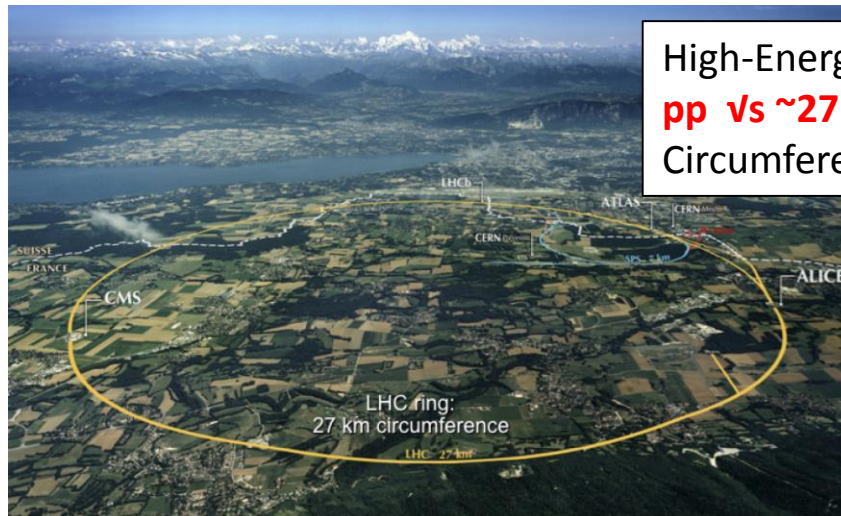
High-energy **pp** collider studies



Super proton proton Collider (**SppC**), China
CEPC; **SPPC vs >70 TeV**
Circumference: 100 km



Future Circular Collider (**FCC-hh**): CERN
FCC-ee; **FCC-hh vs ~100 TeV**
Circumference: 97.75 km



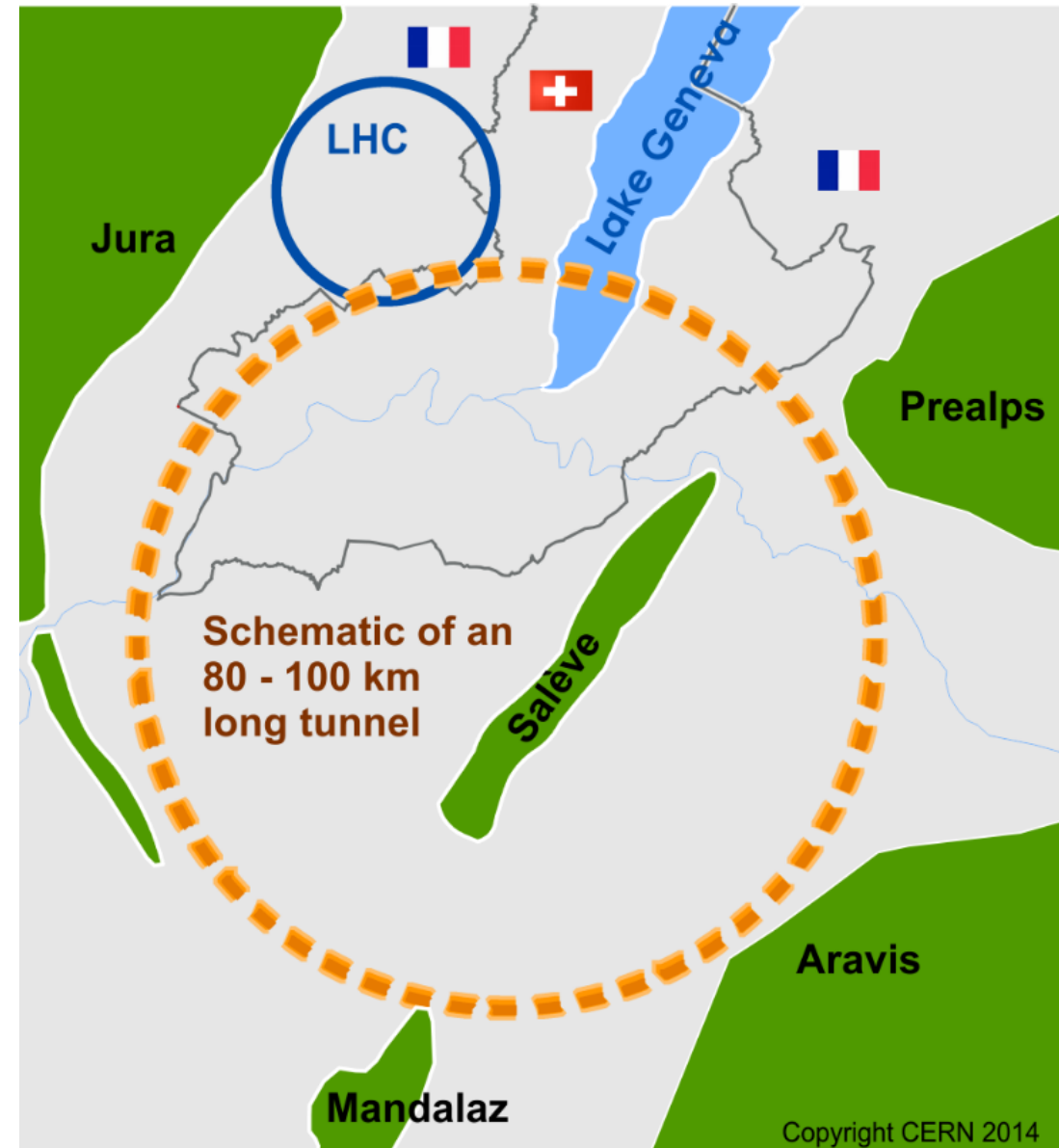
High-Energy LHC (**HE-LHC**): CERN
pp vs ~27 TeV
Circumference: 27 km

Future Circular Collider Study

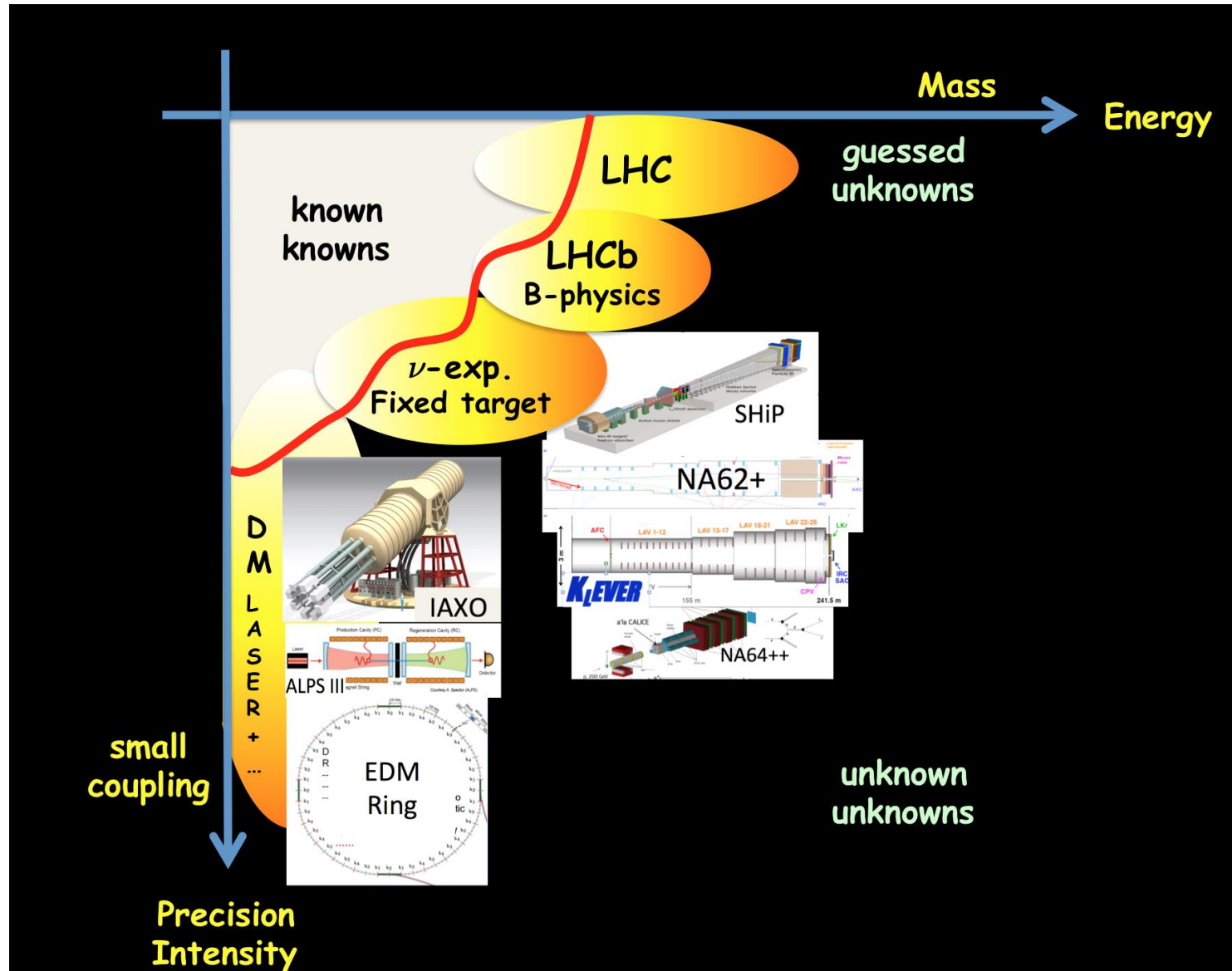
International FCC collaboration
(CERN as host lab) to study:

- **pp -collider (*FCC-hh*)** →
main emphasis, defining infrastructure requirements

~16 T \Rightarrow 100 TeV pp in 100 km
- **80-100 km tunnel infrastructure** in Geneva area, site specific
- **e^+e^- collider (*FCC-ee*)**, as potential first step
- **$p-e$ (*FCC-he*) option**, integration one IP, FCC-hh & ERL
- **HE-LHC** with *FCC-hh* technology

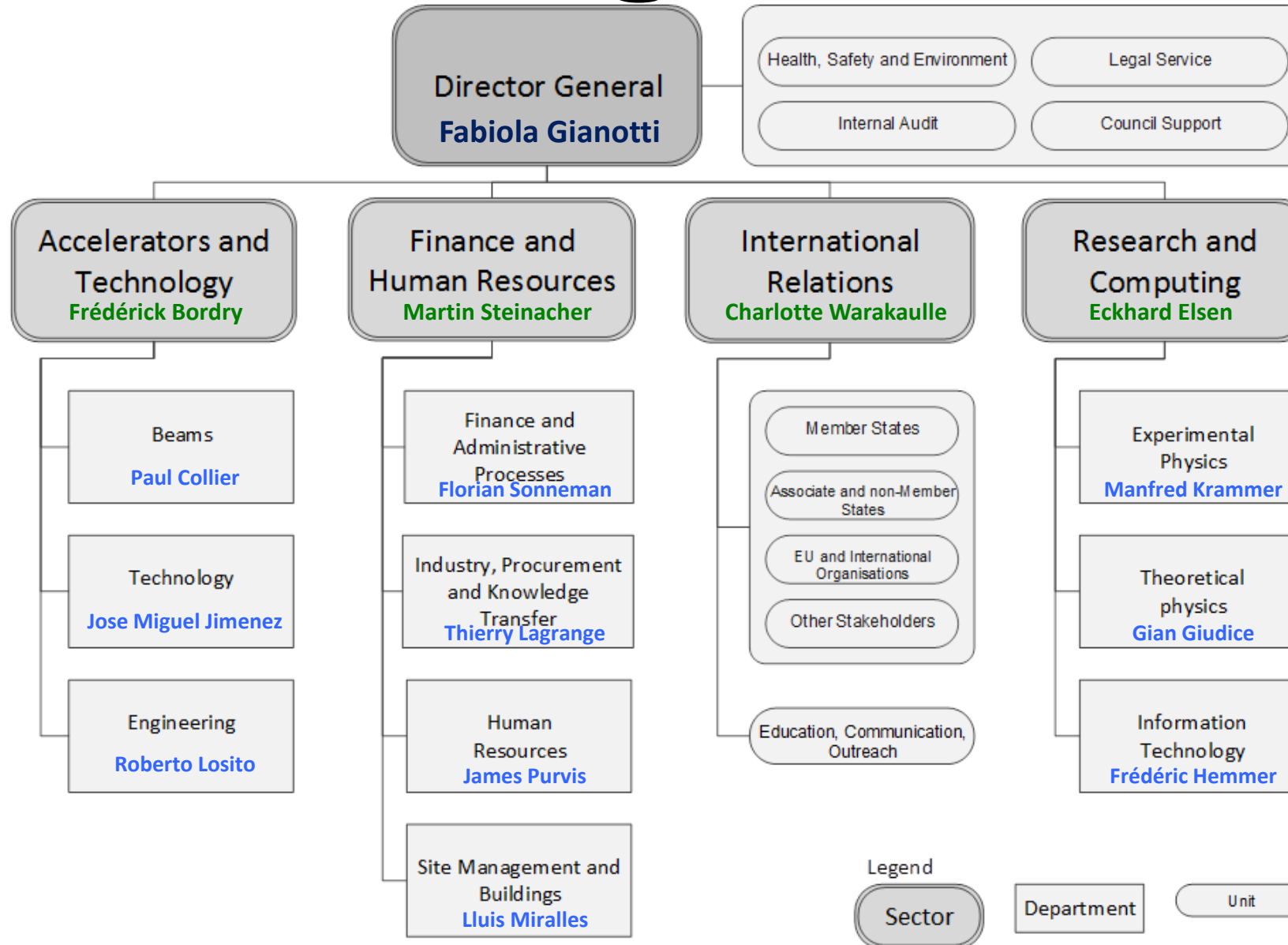


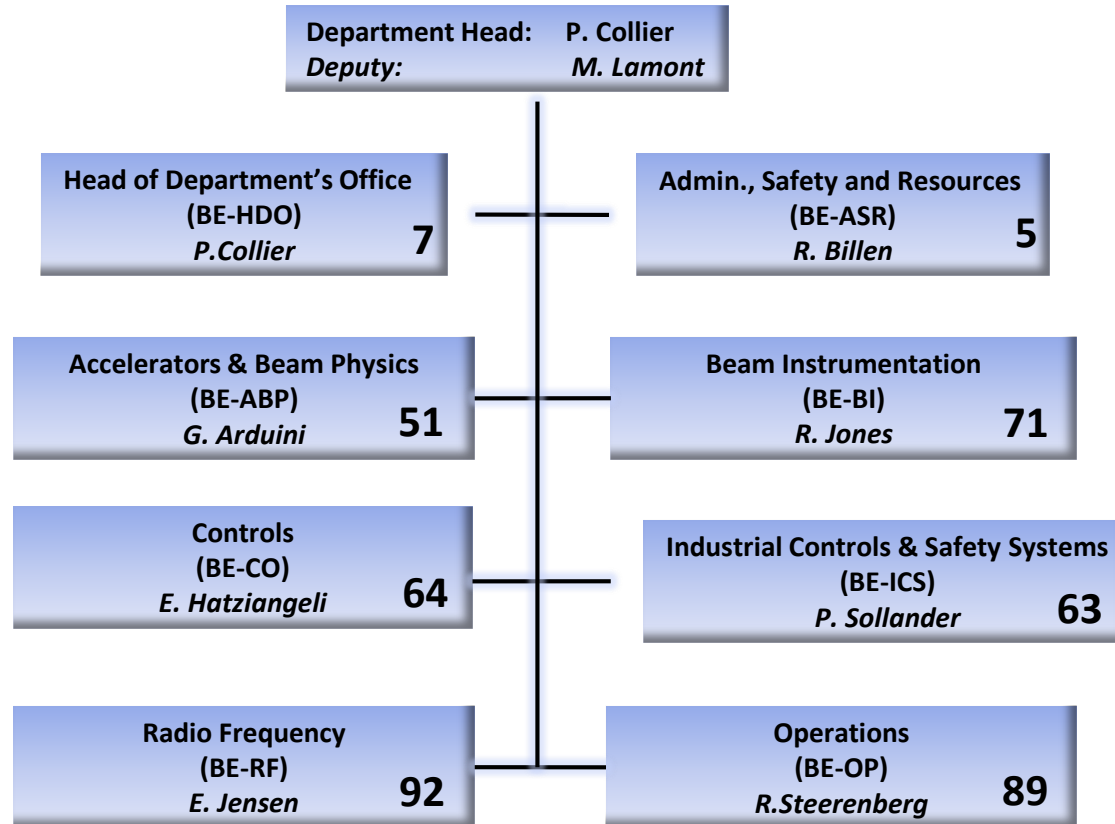
Physics Beyond Colliders!



ORGANIZATION

The CERN Management Structure





DAO : J. Kotzian
 DPO : R. Billen
 DSO : M. Tavlet
 DTO : E. Montesinos
 RSO : F. Pirotte
 HRA : S. Bott (HR)

443 Staff
 (31st December 2018)



Activities

Operation/Exploitation:

- Machines,
- Technical Infrastructure
- Experimental Areas
- Site Access & Safety Systems

Projects:

- Consolidation
- Upgrades
- Approved Projects

Studies:

- New Facilities and machines

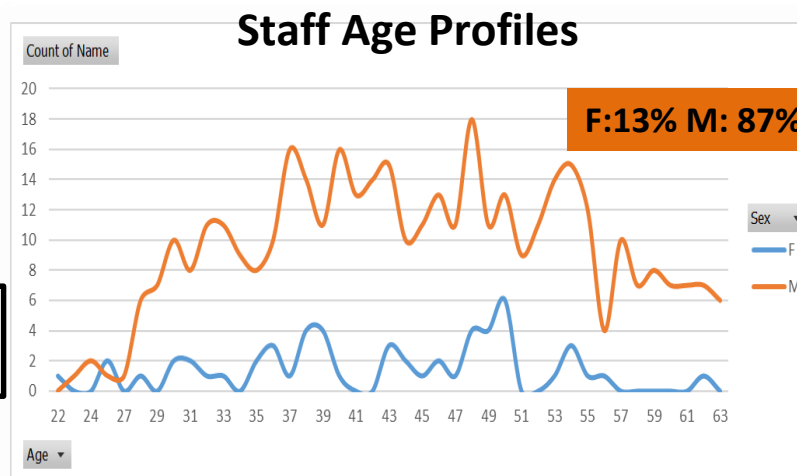
	Staff	%
Scientific and Engineering	250	56
Technical and Technical Engineering	181	41
Office and Admin	12	3
Total	443	100

Staff :
 301 on IC contracts, 68 %
 142 on LD contracts, 32 %

Nationality	Number
FR	151
IT	110
GB	78
DE	75
ES	63
CH	50
PL	49
GR	46
RU	38
BE	19
AT	18
SE	17
NL	12
PT	12
US	11
HU	10
FI	9
NO	9
DK	8
JP	8
CN	7
TR	7
UA	6
BG	4
CZ	4
MX	4
AU	3
CY	3
IN	3
IR	3
MT	3
SK	3
PK	2
AL	1
AM	1
BY	1
CA	1
IL	1
LT	1
MG	1
KR	1
RO	1
RS	1
LK	1
TN	1

45 Nationalities

		%
Staff	443	50
Fellows & Trainees	116	13
Doctoral Students	58	7
Technical Students	40	5
Project Associates	41	5
Other Associates	174	20
Total	872	100

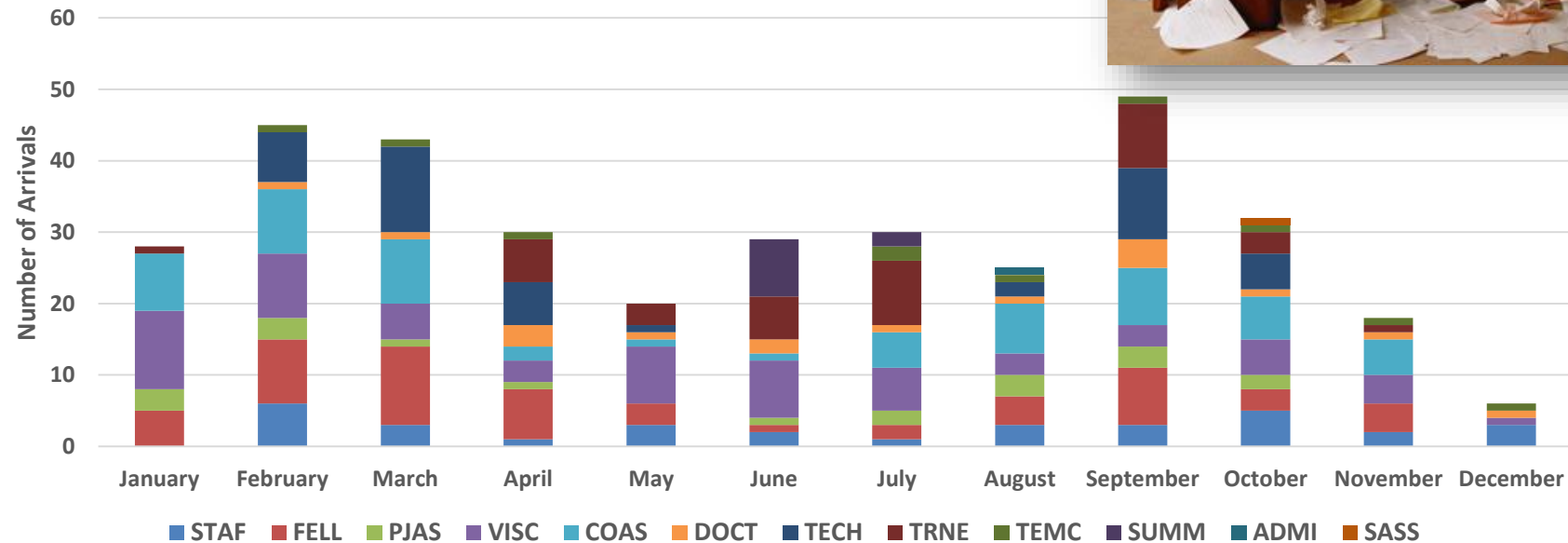


+ 246 colleagues in Industrial support contracts
 + 90 colleagues in a partnership contract (ADAM)

Only *half* of all people working in BE are *staff members* – the other types of personnel are a vital resource to allow the department to fulfil its mandate

HDO: Head of Department Office

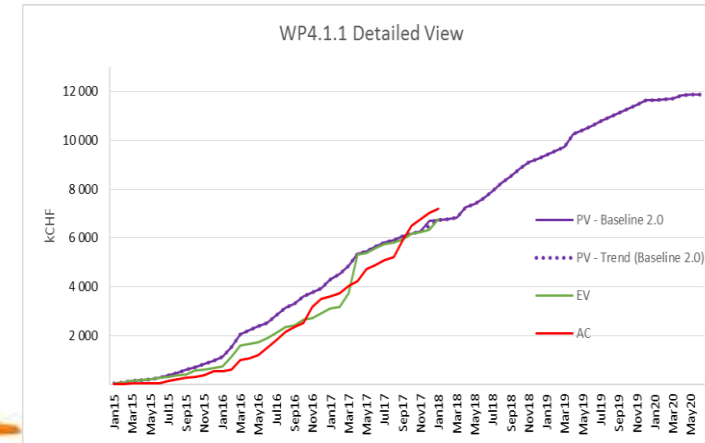
HDO Looks after the general administration of the department



ASR: Administration, Resources & Safety Group

The ASR group is responsible for:

- The overall management and planning of departmental resources
- Safety in the beams Department and safety during operation of all beam facilities at CERN

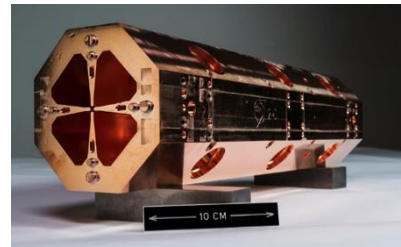


Group Leader
Ronny Billen



ABP: Accelerators and Beam Physics Group

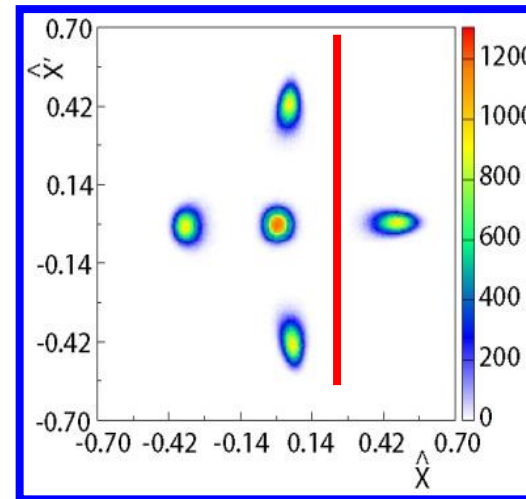
- Accelerator Physics & beam dynamics studies over the complete CERN accelerator complex with the aim of improving accelerator performance.
- Providing operational support for the exploitation of the complex.
- Operation, maintenance and development of hadron sources and Linacs,
- Development and maintenance of accelerator physics computer codes
- Beam and machine parameters and beam dynamics studies for the LHC and Injector Upgrades
- Studies for future accelerators, New Acceleration Techniques and Medical Accelerators.
- Teaching accelerator physics in international schools



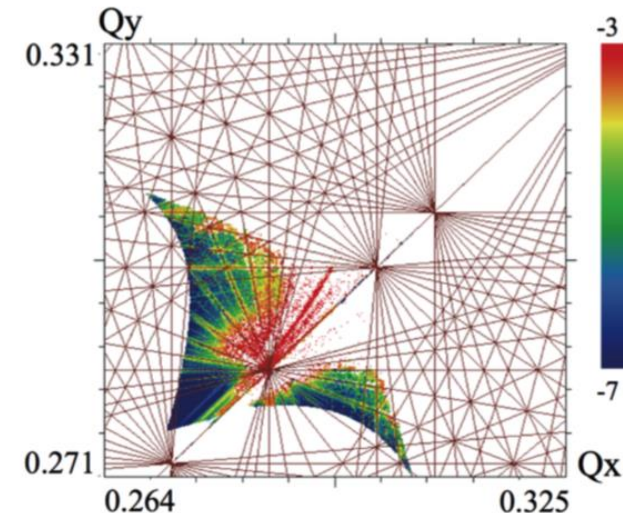
750 MHz RFQ



Group Leader
Gianluigi Arduini



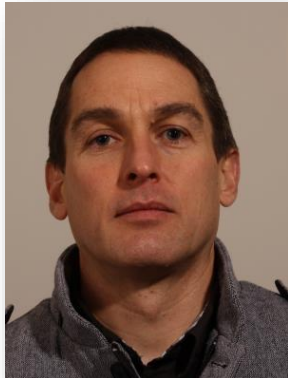
PS Multi-turn Extraction
Scheme



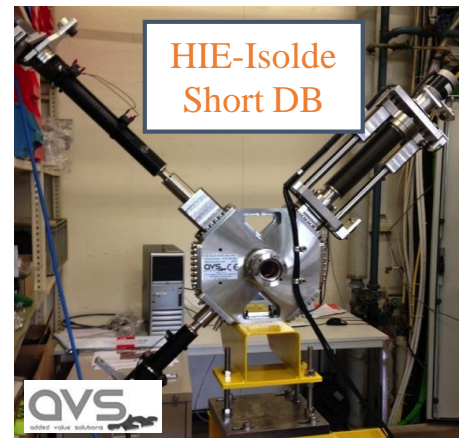
Uncompensated Beam-Beam
Footprint in HL-LHC

BI: Beam Instrumentation Group

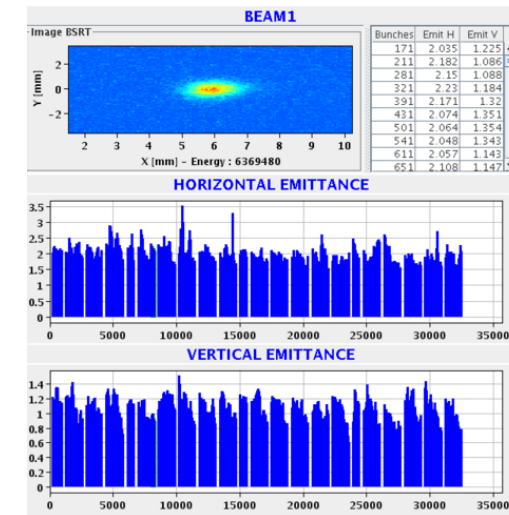
- Responsible for designing, building and maintaining the instruments that allow observation of the particle beams and the measurement of related parameters for all CERN accelerators and transfer lines.
- It is also engaged in research and development to improve existing detection techniques and explore new avenues to allow further optimization of the current machines and to meet the challenges associated with future accelerators.
- Activities include: accelerator physics, detector technology, custom built electronics, mechanical and vacuum engineering for detector housings and software engineering.



Group Leader
Rhodri Jones

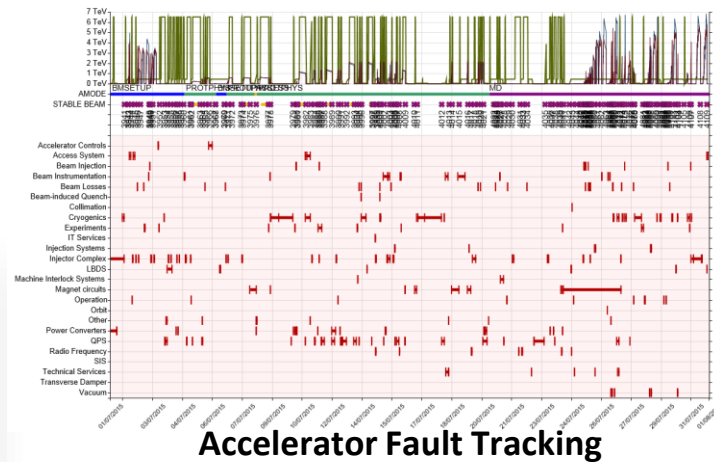


AD Cryogenic Current Comparator

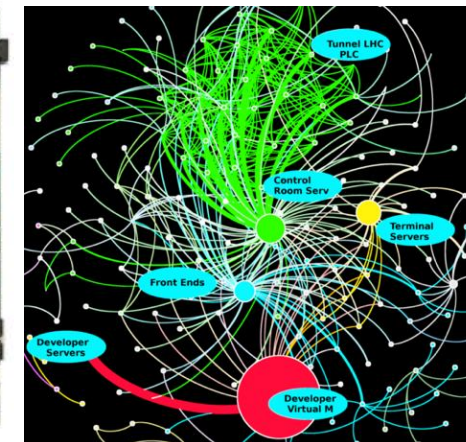


CO : Controls Group

- Responsible for the controls infrastructure for all CERN accelerators, transfer lines and experimental areas
- Covers from embedded front end controllers up to the applications software
- Provides standardised hardware and software services and frameworks as well as timing distribution, signal observation, alarms, surveillance, logging and data management
- Also provides desktop support to the department as well as security policy and electronic instrument repair and calibration



Group Leader
Eugenia Hatziangeli

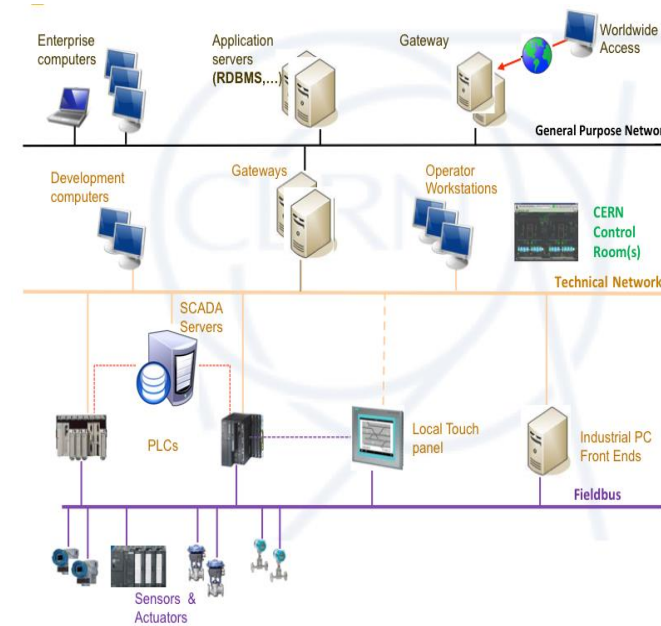
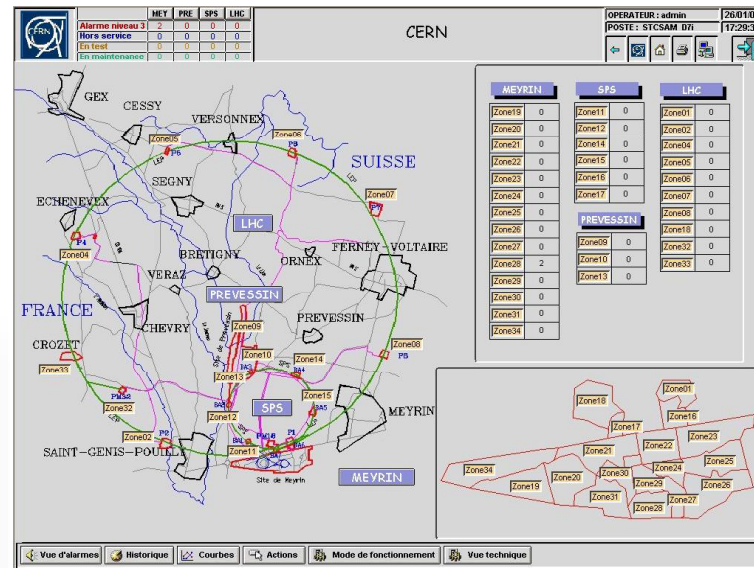


ICS: Industrial Controls and Safety Systems Group

- Design, implement, install, maintain and support
 - ✓ CERN's safety and access control systems (site and machines)
 - ✓ Industrial control systems for experiments, technical infrastructure, accelerator interlocks and other equipment
- Evaluate, select and support related tools and technologies
- Provide the necessary tools, frameworks and interfaces to integrate these systems in the CERN environment

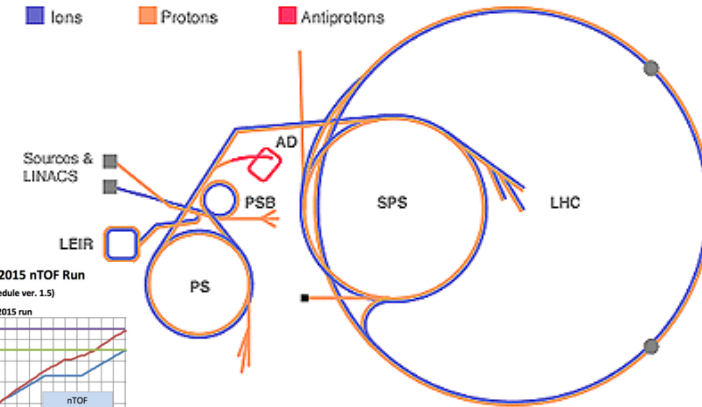
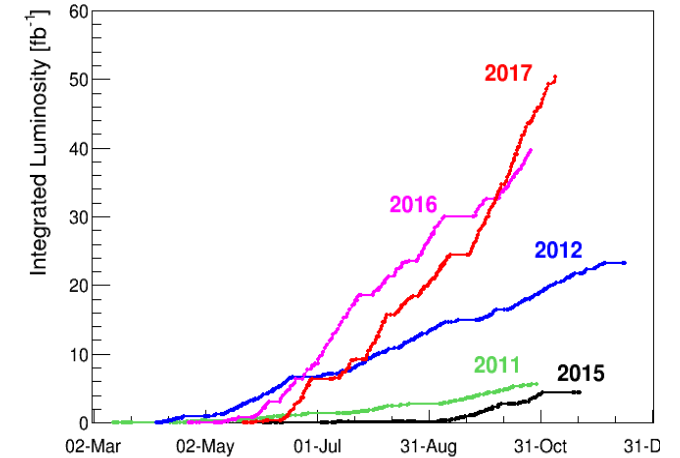
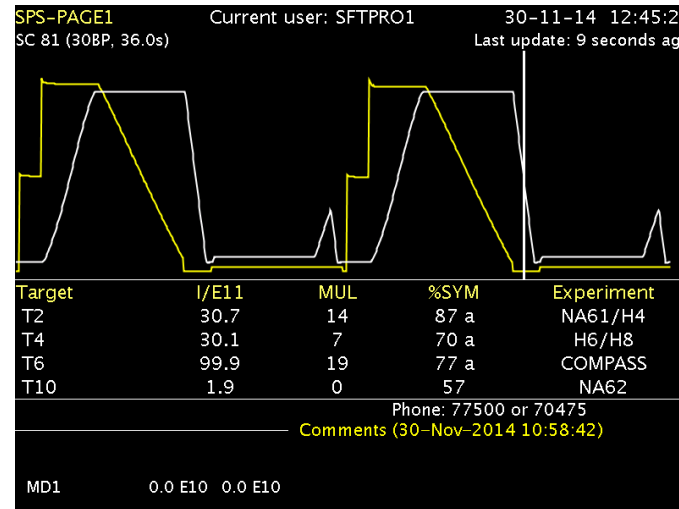


Group Leader
Peter Sollander

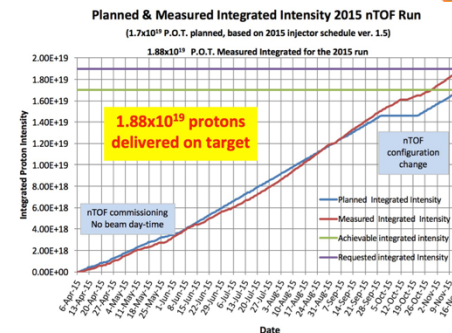


OP: Operations Group

- Responsible for the co-ordination & operation of all CERN accelerators and experimental areas including safety and access in the installations
- Monitoring of the technical infrastructure for the whole CERN site
- Wide range of additional activities including machine studies, application software, operational procedures & statistics

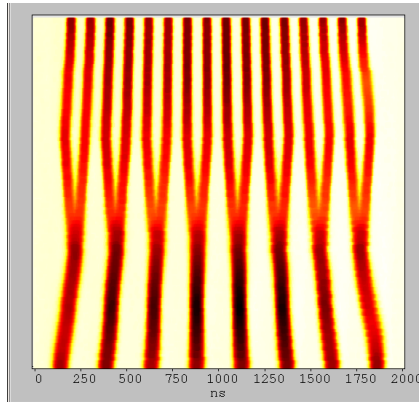


Group Leader
Rende Steerenberg

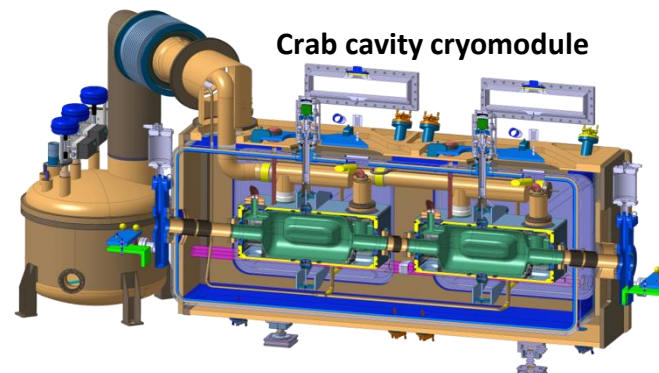


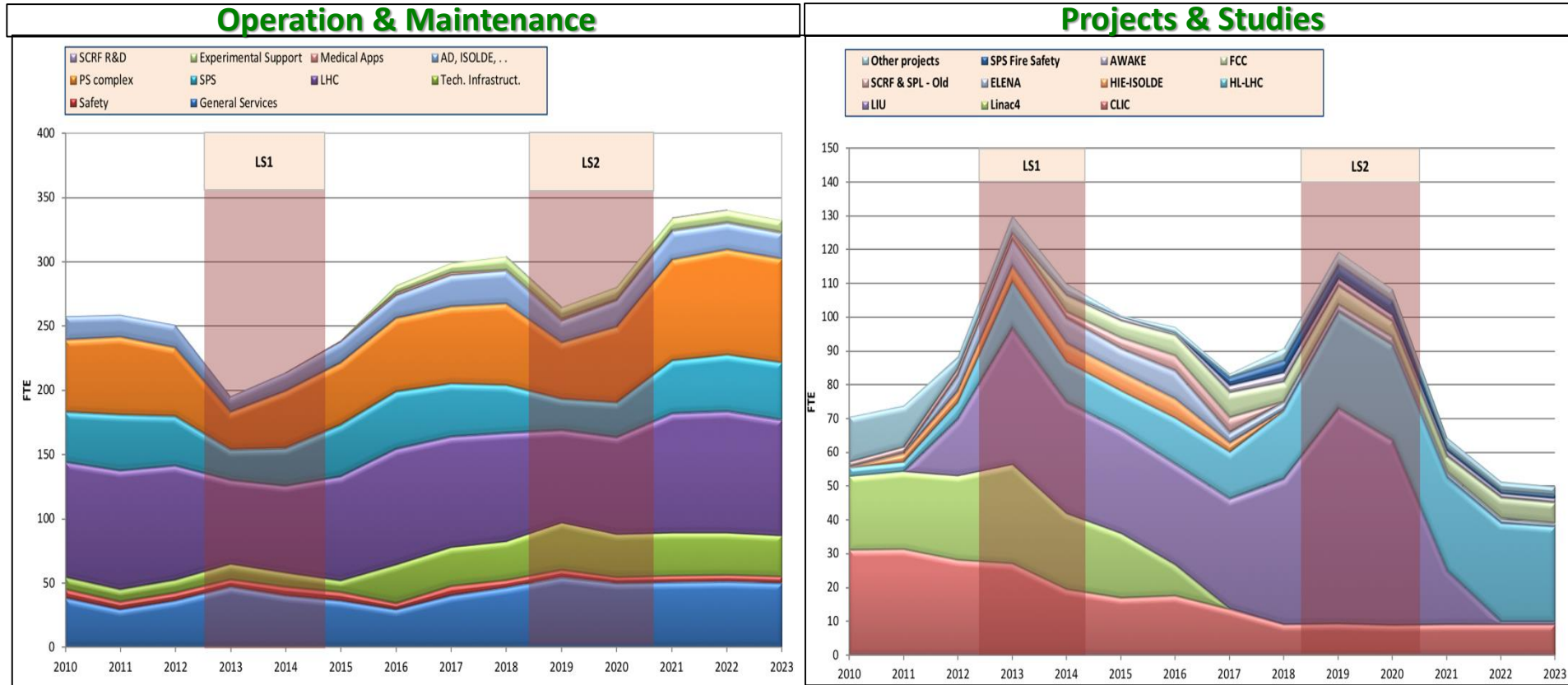
RF: Radio Frequency Group

- Responsible for the accelerating and damping systems for all accelerators at CERN, including:
 - Operation, maintenance and upgrades of these systems in all existing machines
 - Design and construction for new approved machines ;
 - Research & development and design studies for future machines
- RF parameters and longitudinal dynamics in present and future accelerators



Group Leader
Erk Jensen





The manpower of the department changes activities to match the rhythm of our machines!

This flexibility is vital to meeting our (& CERN's) overall goals

It also, I hope, makes life even more interesting and stimulating for all of us!

Safety at CERN and in BE

Safety =

- ✓ Health and safety of all persons possibly impacted by CERN activities
- ✓ Operational safety
- ✓ Impact on the environment

The responsibilities in matters of safety follow the hierarchical line.

→ YOU are responsible for all safety aspects related to your activities!

→ Your supervisor is the first person to consult in case of doubt.

Please be aware of the safety rules and apply them.

Hazards and Risks in BE

The main hazard you are probably thinking of when you come to CERN is **radiation**.

Indeed, the operation of particle accelerators produce radiation.

Operation of accelerators also requires **electricity, produces RF waves, magnetic fields, may include operation of powerful lasers...**

The equipment groups, with the help of the BE Safety Unit manage these risks.

Be aware of the risks you are exposed to when doing your job.

→ Fill-in carefully your OHS-0-0-3 form with your supervisor.

+ Follow the appropriate safety training.

Hazards and Risks at CERN and in BE

Accident statistics show that the main hazard you are exposed to when coming to CERN and working on the sites is...

Road traffic !

Especially (but not only) if you are a cyclist.

- Be aware of the traffic rules (same as in cities in France or Switzerland)
- Respect the traffic rules
- Respect other road users
- If you are a cyclist, wear appropriate protections and high-visibility clothing ...
(that you can get from the CERN stores with your Group budget)



Who can help you?

Marc Tavlet
Chef section
DSO



Christelle
Gaignant
DDSO



Florence
Pirotte
RSO

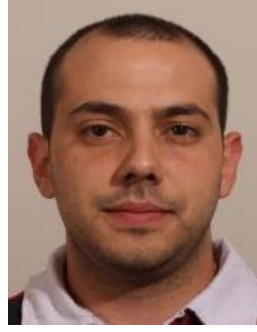


+ Safety Officers for the A&T Sector
CSO LSO FGSO

Olivier Pirotte Bruce Marsh



David Jaillet



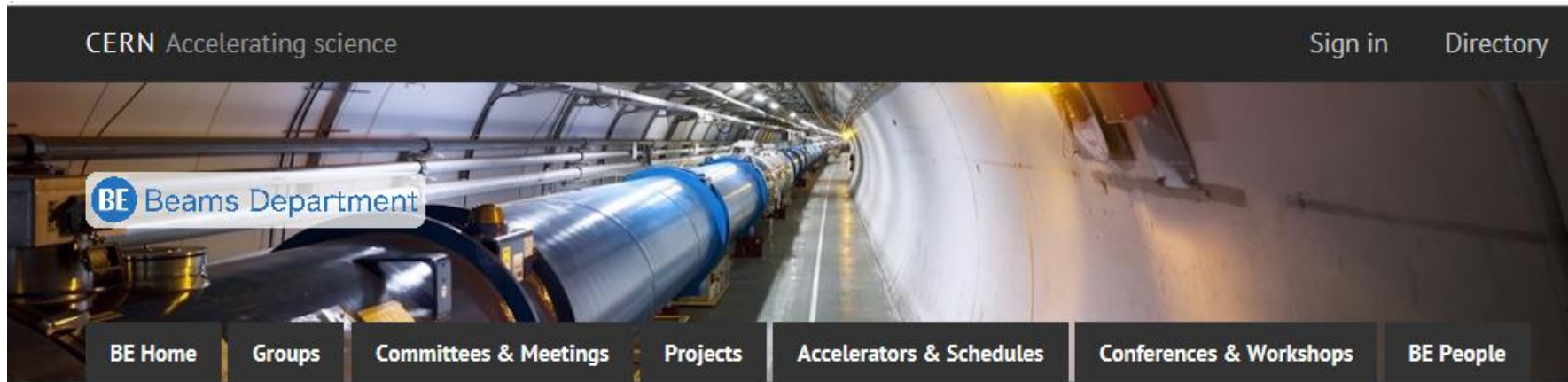
You are not left on your own; look for help in case of doubt:

- Your supervisor ; he/she is responsible
- Your colleagues ; they may have the knowledge
- **The Safety Officers in the BE Safety Unit**
- The Safety Link Persons and Radiation Support Officers in your Group
- **The Territorial Safety Officer (TSO) of your building**
- The HSE Unit

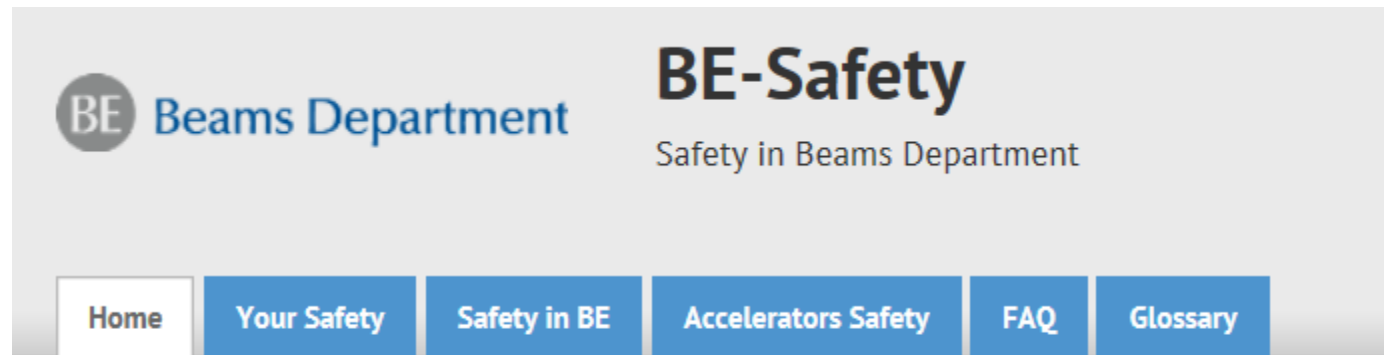
For your building TSO
See the BE Safety
Web Pages

Safety in BE: More Information?

Consult the BE Safety website



[Mandate](#) [Organigram](#) [Roles & Representatives](#) [Administration](#) [Safety](#) [Services](#) [Training](#) [BE Annual Reports](#)



[Safety Unit](#) [Safety Officers in BE](#)

SECURITY is not complete without U

CERN is targeted. YOU are a target!

From: Evelyn [mailto:evelyn@cern.com]
Sent: 11 January 2016 15:29
To: [REDACTED]
Subject: Congratulations David

Dear colleagues,

Some of you might know David as the kind man he is. It has been 20 years ago since he first joined the financial department. To celebrate his anniversary, we have prepared a video for David. Click here<<http://support.x10.bz/?c=8gf3&u=01f4e8c8>> to view this video.

With kind regards,
Head administration
Evelyn



Don't let them in:

- **Stop --- Think --- Don't open dubious links & attachment!**
- **Don't share your password!**

Let us help you: Computer.Security@cern.ch

SECURITY is not complete without U

It is the responsibility of all of us to improve CERN's computer security!

**Do not use pirated software/licenses.
Respect copyright of music, videos, ...
Violating copyrights is **against the law**
in many countries (incl. CH, F).**

Protect the Organization.

**Software piracy and copyright violation
will **reflect negatively on CERN** and could
harm its reputation.**

Let us help you.

**Do not answer to infringement letters.
Contact Computer.Security@cern.ch**

**Your password is valuable!
Protect it well! Make it
complex & never share.**

Contact us and let us help you: Computer.Security@cern.ch

Help!

HR FRONTLINE, provides services in the following areas:

- o Day-to-day work and career concerns of CERN contributors
- o Support to supervisors in their HR and people activities
- o Putting into operation the HR Strategy
- o Support to change management activities

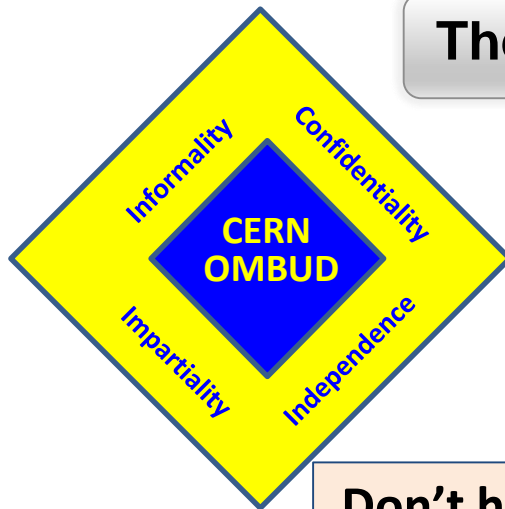


Sebastian Bott

Human Resources Advisor for **BE**
Member of the HR **Frontline** team

Permanance 865/1-012 Monday & Friday mornings

The CERN Ombuds – There to help!



Pierre Gildermyn

Office: Bldg 500-1-004
eMail: Ombuds@cern.ch



Don't hesitate to contact them for help, or advice!

Training

CERN's centrally defined trainings and BE policy

If you do not speak French at all

Mandatory for ALL newcomers

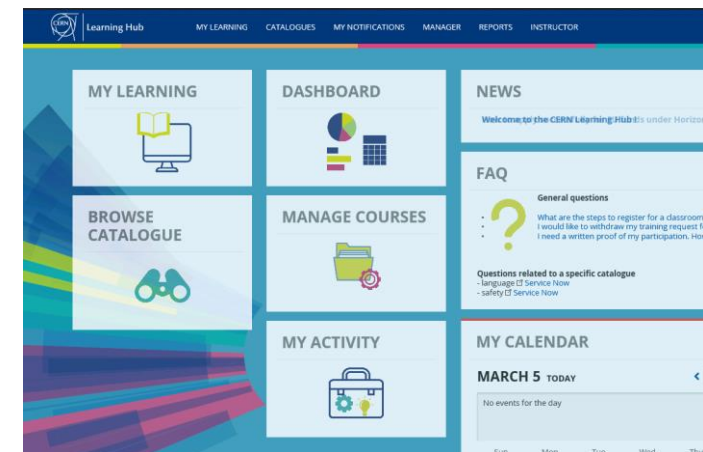
Training	Duration	Who	Before
Language Integration	60 hours 10 weeks	MPE MPA contract > 6 months	Month 3
Communication 1+2 (Newcomers)	2 x one day	Once per career Staff (Fellows + MPA) on request	Month 2 Month 6

For **you** and **your supervisor** to define your training needs, regarding your function and your role



DTO:
Eric Montesinos

In BE, any training request shall be linked to functions and roles



The CERN Alumni Network is for YOU!

Alumni & Members of Personnel



Alumni Events

ASI From academia to Data Science -
ASI Fellowship
ASI Data Science | Short term project offer

Location	London, United Kingdom
Type of contract	Fixed term
Salary	—
Experience	3-5 years
Start date	September 10, 2018

a day ago **CERN Alumni – The High-Energy**

Access to an Exclusive



Alumni Interviews

Stay Connected!

<https://alumni.cern>

alumni.relations@cern.ch

Job

Op



Alumni Groups

BE Seminars:

- Friday Afternoon, every ~4 weeks,
- Alternate between Meyrin (6) and Preveessin (774) Auditorium
- Organized by Efthymia Laderi

ATS Seminars:

- Thursday Afternoons, Similar frequency
- Jointly organized by the departments. For BE its Helmut Burkhardt

BE Newsletter:

- Published every ~3 months
- Editor-in Chief: Lars Jensen

Your input and contributions are very welcome

...and, of course, lots of stuff to look at on the BE website ...

Have fun out there!

