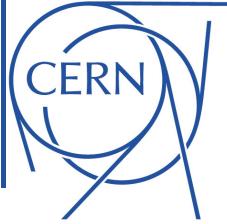




ESPP – Stratégie européenne en physique des particules

<https://europeanstrategyupdate.web.cern.ch/welcome>

Cadre et déroulé



Stratégie européenne en physique des particules

Décision du Conseil en Juin 2005:

« Le Conseil du CERN décide à l'unanimité d'assumer la tâche de définir les orientations stratégiques de la physique des particules européenne. Afin d'atteindre cet objectif, le Conseil décide également à l'unanimité de constituer un groupe consultatif scientifique ad hoc chargé de formuler une proposition qui permettra au Conseil d'élaborer un document d'orientation stratégique approuvé par tous les Etats membres. »

□ Convention du CERN: ARTICLE II : Buts

2. L'Organisation assure la collaboration entre Etats européens pour les recherches nucléaires de caractère purement scientifique et fondamental, ainsi que pour d'autres recherches en rapport essentiel avec celles-ci

...

(b) l'Organisation et l'encouragement de la coopération internationale dans la recherche nucléaire, y compris la collaboration en dehors des laboratoires;

7. Dans le cadre de leurs programmes d'activités, les laboratoires (*du CERN*) collaborent dans toute la mesure du possible avec les laboratoires et institutions situés sur le territoire des Etats Membres. Dans la mesure compatible avec les buts de l'Organisation, les laboratoires doivent s'efforcer d'éviter tout double emploi avec les recherches poursuivies dans lesdits laboratoires ou institutions.

- **Contexte 2005 : rôle du CERN dans la définition de l'espace européen de la Recherche**
- **Enjeu aujourd'hui: rôle du CERN et de l'Europe dans des projets globaux**

Précédentes exercices de stratégie

1^{er} stratégie 2005/2006:

Juin 2005: décision sur la mise en place d'un processus de stratégie européenne au Conseil du CERN

Septembre 2005: approbation sur la composition du groupe de stratégie, son mandat et le planning

30 janvier/1^{er} février 2006: symposium ouvert à Orsay

2-6 mai 2006: « drafting session » à Zeuthen

14/7/2006 : approbation de la stratégie lors d'une session extraordinaire du conseil à Lisbonne



The European strategy for particle physics

Particle physics stands on the threshold of a new and exciting era of discovery. The next generation of experiments will explore new domains and probe the deep structure of space-time. They will measure the properties of the elementary constituents of matter and their interactions with unprecedented accuracy, and they will uncover new phenomena such as the Higgs boson or new forms of matter. Long-standing puzzles such as the origin of mass, the matter-antimatter asymmetry of the Universe and the mysterious dark matter and energy that permeate the cosmos will soon benefit from the insights that new measurements will bring. Together, the results will have a profound impact on the way we see our Universe; *European particle physics should thoroughly exploit its current exciting and diverse research programme. It should position itself to stand ready to address the challenges that will emerge from exploration of the new frontier, and it should participate fully in an increasingly global adventure.*



3. The LHC will be the energy frontier machine for the foreseeable future, maintaining European leadership in the field; *the highest priority is to fully exploit the physics potential of the LHC, resources for completion of the initial programme have to be secured such that machine and experiments can operate optimally at their design performance. A subsequent major luminosity upgrade (SLHC),* motivated by physics results and operation experience, will be enabled by focussed R&D; to this end, R&D for machine and detectors has to be vigorously pursued now and centrally organized towards a luminosity upgrade by around 2015.
4. In order to be in the position to push the energy and luminosity frontier even further it is vital to strengthen the **advanced accelerator R&D programme;** *a coordinated programme should be intensified, to develop the CLIC technology and high performance magnets for future accelerators, and to play a significant role in the study and development of a high-intensity neutrino facility.*
5. It is fundamental to complement the results of the LHC with measurements at **a linear collider**. In the **energy range of 0.5 to 1 TeV, the ILC**, based on superconducting technology, will provide a unique scientific opportunity at the precision frontier; *there should be a strong well-coordinated European activity, including CERN, through the Global Design Effort, for its design and technical preparation towards the construction decision, to be ready for a new assessment by Council around 2010.*
6. Studies of the scientific case for future **neutrino facilities** and the **R&D into associated technologies** are required to be in a position to define the optimal neutrino programme based on the information available in around 2012; *Council will play an active role in promoting a coordinated European participation in a global neutrino programme.*
7. A range of very important **non-accelerator experiments** take place at the **overlap between particle and astroparticle physics** exploring otherwise inaccessible phenomena; *Council will seek to work with ApPEC to develop a coordinated strategy in these areas of mutual interest.*
8. **Flavour physics and precision measurements** at the high- luminosity frontier at lower energies complement our understanding of particle physics and allow for a more accurate interpretation of the results at the high-energy frontier; *these should be led by national or regional collaborations, and the participation of European laboratories and institutes should be promoted.*
9. A variety of important research lines are at the **interface between particle and nuclear physics** requiring dedicated experiments; *Council will seek to work with NuPECC in areas of mutual interest, and maintain the capability to perform fixed target experiments at CERN.*
10. European theoretical physics has played a crucial role in shaping and consolidating the Standard Model and in formulating possible scenarios for future discoveries. Strong theoretical research and close collaboration with experimentalists are essential to the advancement of particle physics and to take full advantage of experimental progress; *the forthcoming LHC results will open new opportunities for theoretical developments, and create new needs for theoretical calculations, which should be widely supported.*

Précédentes exercices de stratégie

1^{er} stratégie 2005/2006:

Juin 2005: décision sur la mise en place d'un processus de stratégie européenne au Conseil du CERN

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30 janvier/1^{er} février 2006: symposium ouvert à Orsay

2-6 mai 2006: « drafting session » à Zeuthen

14/7/2006 : approbation de la stratégie lors d'une session extraordinaire du conseil à Lisbonne

Mise à jour 2012/2013:

Décembre 2011: lancement du nouveau processus de stratégie pour la physique des particules

10-13 Septembre 2012: symposium ouvert à Carcovie

21-26 Janvier 2013: « drafting session » à Erice

30/5/2013 : approbation de la stratégie lors d'une session extraordinaire du conseil à Bruxelles



The European Strategy for Particle Physics Update 2013

Prepared by the European
Strategy Group for Particle
Physics for the special
European Strategy Session of
Council in Brussels on 30 May
2013

Preamble

Since the adoption of the European Strategy for Particle Physics in 2006, the field has made impressive progress in the pursuit of its core mission, elucidating the laws of nature at the most fundamental level. A giant leap, the discovery of the Higgs boson, has been accompanied by many experimental results confirming the Standard Model beyond the previously explored energy scales.



High-priority large-scale scientific activities

After careful analysis of many possible large-scale scientific activities requiring significant resources, sizeable collaborations and sustained commitment, the following four activities have been identified as carrying the highest priority.

- c) The discovery of the Higgs boson is the start of a major programme of work to measure this particle's properties with the highest possible precision for testing the validity of the Standard Model and to search for further new physics at the energy frontier. The LHC is in a unique position to pursue this programme. *Europe's top priority should be the exploitation of the full potential of the LHC, including the high-luminosity upgrade of the machine and detectors* with a view to collecting ten times more data than in the initial design, by around 2030. This upgrade programme will also provide further exciting opportunities for the *study of flavour physics and the quark-gluon plasma*.
- d) To stay at the forefront of particle physics, Europe needs to be in a position to propose an ambitious post-LHC accelerator project at CERN by the time of the next Strategy update, when physics results from the LHC running at 14 TeV will be available. *CERN should undertake design studies for accelerator projects in a global context, with emphasis on proton-proton and electron- positron high-energy frontier machines*. These design studies should be coupled to a *vigorous accelerator R&D programme*, including *high-field magnets* and *high-gradient accelerating structures*, in collaboration with national institutes, laboratories and universities worldwide.
- e) There is a strong scientific case for an electron-positron collider, complementary to the LHC, that can study the properties of the Higgs boson and other particles with unprecedented precision and whose energy can be upgraded. The Technical Design Report of **the International Linear Collider (ILC)** has been completed, with large European participation. The initiative from the Japanese particle physics community to host the ILC in Japan is most welcome, and European groups are eager to participate. *Europe looks forward to a proposal from Japan to discuss a possible participation*.
- f) Rapid progress in neutrino oscillation physics, with significant European involvement, has established a strong scientific case for a long-baseline neutrino programme exploring CP violation and the mass hierarchy in the neutrino sector. *CERN should develop a neutrino programme to pave the way for a substantial European role in future long-baseline experiments*. Europe should explore the possibility of major participation in *leading long-baseline neutrino projects in the US and Japan*.



2020 mise à jour de la stratégie européenne

Décembre 2016: établissement du calendrier pour la stratégie européenne par le Conseil du CERN

Septembre 2017: mise en place du secrétariat pour la stratégie européenne

Chair: Halina Abramowicz, SPC chair, ECFA chair, Lab-Dir chair

④ organisation de l'exercice de stratégie

Septembre 2018: lancement de la stratégie européenne

Décembre 2018: date limite pour la soumission de contributions

④ 160 contributions reçues <https://indico.cern.ch/event/765096/contributions/>

13-16 Mai 2019 : symposium ouvert à Grenade

- 13/7/2019 EPS-conférence Gand : session commune EPS/ECFA sur la stratégie européenne

Septembre 2019 : publication du « Briefing Book »

- 14-16/10/2019: JENAS conférence (ECFA, APPEC, NUPPEC) à Orsay

- 14-15/11/2019: plenary ECFA meeting CERN: nouvelles technologies pour des accélérateurs

- 14/11/2019: Symposium des jeunes physiciens organisés par l'ECFA

20-25 Janvier 2020 : « Drafting Session » à Bad Honnef

19-20 Mars 2020 : session du Conseil pour la discussion du document pour la stratégie

25 Mai 2020 : session extraordinaire du Conseil à Budapest en vue d'approuver la stratégie



Open symposium Grenade

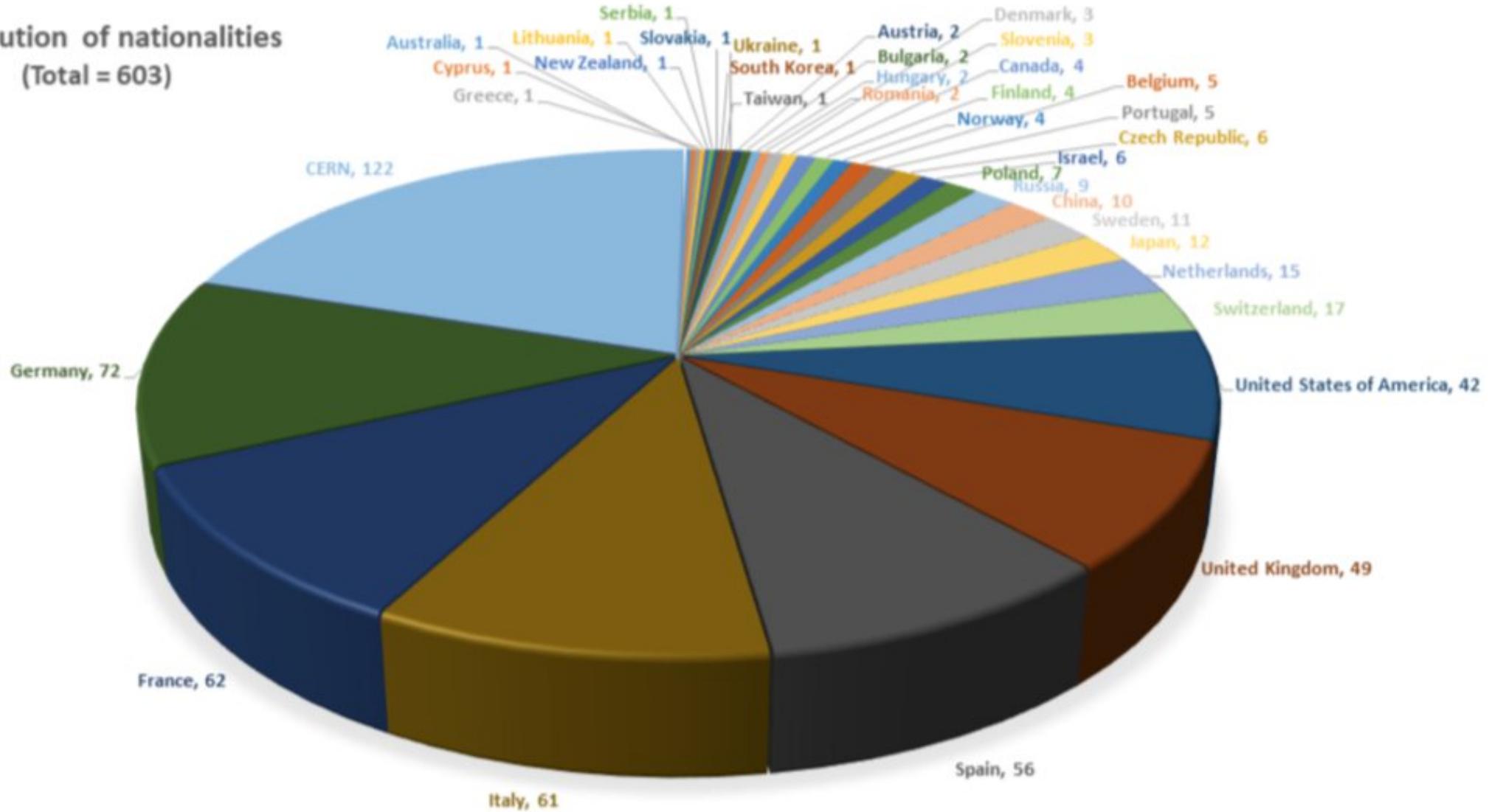
④ Discussions thématiques encadrées par le Physics Preparatory Group (PPG):

- secrétariat de la stratégie , 4 représentants SPC, 4 représentants ECFA
- 2 participants Amériques (Canada, US) et Asie (Chine, Japon)

- Accelerator Science and Technology
 - [Caterina Biscari](#) and [Lenny Rivkin](#)
- Beyond the Standard Model at colliders (present and future)
 - [Gian Giudice \(th\)](#) and [Paris Sphicas \(exp\)](#)
- Dark matter and dark sector (accelerator and non-accelerator dark matter, dark photons, hidden sector, axions)
 - [Marcela Carena \(th\)](#) and [Shoji Asai \(exp\)](#)
- Instrumentation and computing
 - [Xinchou Lou \(exp\)](#) and [Brigitte Vachon \(exp\)](#)
- Electroweak physics (physics of the W, Z, H bosons, of the top quark, and QED)
 - [Keith Ellis \(th\)](#) and [Beate Heinemann \(exp\)](#)
- Flavour Physics and CP violation (quarks, charged leptons and rare processes)
 - [Belen Gavela \(th\)](#) and [Antonio Zoccoli \(exp\)](#)
- Neutrino physics (accelerator and non-accelerator)
 - [Stan Bentvelsen \(astro-exp\)](#) and [Marco Zito \(exp\)](#)
- Strong interactions (perturbative and non-perturbative QCD, DIS, heavy ions)
 - [Krzysztof Redlich \(th\)](#) and [Jorgen D'Hondt \(exp\)](#)

Participation à Grenade

Distribution of nationalities
(Total = 603)



Physics Briefing Book

Input for the European Strategy for Particle Physics Update 2020

Electroweak Physics: Richard Keith Ellis¹, Beate Heinemann^{2,3} (*Conveners*)
Jorge de Blas^{4,5}, Maria Cepeda⁶, Christophe Grojean^{2,7}, Fabio Maltoni^{8,9}, Aleandro Nisati¹⁰,
Elisabeth Petit¹¹, Riccardo Rattazzi¹², Wouter Verkerke¹³ (*Contributors*)

Strong Interactions: Jorgen D'Hondt¹⁴, Krzysztof Redlich¹⁵ (*Conveners*)
Anton Andronic¹⁶, Ferenc Siklér¹⁷ (*Scientific Secretaries*)
Nestor Armesto¹⁸, Daniël Boer¹⁹, David d'Enterria²⁰, Tetyana Galatyuk²¹, Thomas Gehrmann²²,
Klaus Kirch²³, Uta Klein²⁴, Jean-Philippe Lansberg²⁵, Gavin P. Salam²⁶, Gunnar Schnell²⁷,
Johanna Stachel²⁸, Tanguy Pierog²⁹, Hartmut Wittig³⁰, Urs Wiedemann²⁰ (*Contributors*)

Flavour Physics: Belen Gavela³¹, Antonio Zoccoli³² (*Conveners*)
Sandra Malvezzi³³, Ana M. Teixeira³⁴, Jure Zupan³⁵ (*Scientific Secretaries*)
Daniel Aloni³⁶, Augusto Ceccucci²⁰, Avital Dery³⁶, Michael Dine³⁷, Svetlana Fajfer³⁸, Stefania Gori³⁷,
Gudrun Hiller³⁹, Gino Isidori²², Yoshikata Kuno⁴⁰, Alberto Lusiani⁴¹, Yosef Nir³⁶,
Marie-Helene Schune⁴², Marco Sozzi⁴³, Stephan Paul⁴⁴, Carlos Pena³¹ (*Contributors*)

Neutrino Physics & Cosmic Messengers: Stan Bentvelsen⁴⁵, Marco Zito^{46,47} (*Conveners*)
Albert De Roeck²⁰, Thomas Schwetz²⁹ (*Scientific Secretaries*)
Bonnie Fleming⁴⁸, Francis Halzen⁴⁹, Andreas Haungs²⁹, Marek Kowalski², Susanne Mertens⁴⁴,
Mauro Mezzetto⁵, Silvia Pascoli⁵⁰, Bangalore Sathyaprakash⁵¹, Nicola Serra²² (*Contributors*)

Beyond the Standard Model: Gian F. Giudice²⁰, Paris Sphicas^{20,52} (*Conveners*)
Juan Alcaraz Maestre⁶, Caterina Doglioni⁵³, Gaia Lanfranchi^{20,54}, Monica D'Onofrio²⁴,
Matthew McCullough²⁰, Gilad Perez³⁶, Philipp Roloff²⁰, Veronica Sanz⁵⁵, Andreas Weiler⁴⁴,
Andrea Wulzer^{4,12,20} (*Contributors*)

Dark Matter and Dark Sector: Shoji Asai⁵⁶, Marcela Carena⁵⁷ (*Conveners*)
Babette Döbrich²⁰, Caterina Doglioni⁵³, Joerg Jaeckel¹, Gordan Krnjaic⁵⁷, Jocelyn Monroe⁵⁸,
Konstantinos Petridis⁵⁹, Christoph Weniger⁶⁰ (*Scientific Secretaries/Contributors*)

Accelerator Science and Technology: Caterina Biscari⁶¹, Leonid Rivkin⁶² (*Conveners*)
Philip Burrows²⁶, Frank Zimmermann²⁰ (*Scientific Secretaries*)
Michael Benedikt²⁰, Pierluigi Campana⁵⁴, Edda Gschwendtner²⁰, Erk Jensen²⁰, Mike Lamont²⁰,
Wim Leemans², Lucio Rossi²⁰, Daniel Schulte²⁰, Mike Seidel⁶², Vladimir Shiltsev⁶³,
Steinar Stapnes²⁰, Akira Yamamoto^{20,64} (*Contributors*)

Instrumentation and Computing: Xinchou Lou⁶⁵, Brigitte Vachon⁶⁶ (*Conveners*)
Roger Jones⁶⁷, Emilia Leogrande²⁰ (*Scientific Secretaries*)
Ian Bird²⁰, Simone Campana²⁰, Ariella Cattal²⁰, Didier Contardo⁶⁸, Cinzia Da Via⁶⁹, Francesco Forti⁷⁰,
Maria Girone²⁰, Matthias Kasemann², Lucie Linssen²⁰, Felix Sefkow², Graeme Stewart²⁰ (*Contributors*)

- Compilation des contributions reçus et des discussions à Grenade sur 250 pages
- Excellent résumée des questions et défis en physique des particules aujourd'hui !



European Strategy Group (ESG)

Groupe en charge de préparer le draft du document de stratégie à Bad Honnef:

- 1 représentant de chacun des 23 pays membre du CERN:
 - France: Reynald Pain
- CERN-DG
- Représentant des laboratoires nationaux européens:
 - Irfu: Anne-Isabelle Etienne
 - IJC: Achille Stocchi
- Secrétariat de la stratégie

Invités:

- Président du Conseil
- Membres associés: Chypre, Slovénie, Lituanie, Turquie, Ukraine
- Etats observatoires : Japon, Russie, Etats-Unis
- Organisations observatoires: Commission européenne, JINR
- Présidents APPEC, ESFRI, FALC, NUPECC
- Physics Preparatory Group

Groupes de travail transversales de l'ESG

WG1 - Social and career aspects for the next generation (Eric Laenen)

WG2 - Organizational structure for European participation in global projects (Mark Thomson)

WG3 - Relations with external bodies and fields of physics (Tatsuya Nakada)

WG4 - Knowledge and technology transfer (Leander Litov)

WG5 - Outreach, education and communication (Sijbrand De Jong)

WG6 - Sustainability and environmental impact (Dirk Ryckebosch)

- ⌚ réflexions intéressantes et utiles sur les aspects subjacentes à notre disciplines
- ⌚ rapport de chaque groupe de travail pour la drafting session à Bad Honnef :
cristallisation des discussions sur une phrase pour point
- ⌚ nouveau: impact environnemental

Compilation :

- des positions nationales
- des projets soumis
- discussion des scénarios

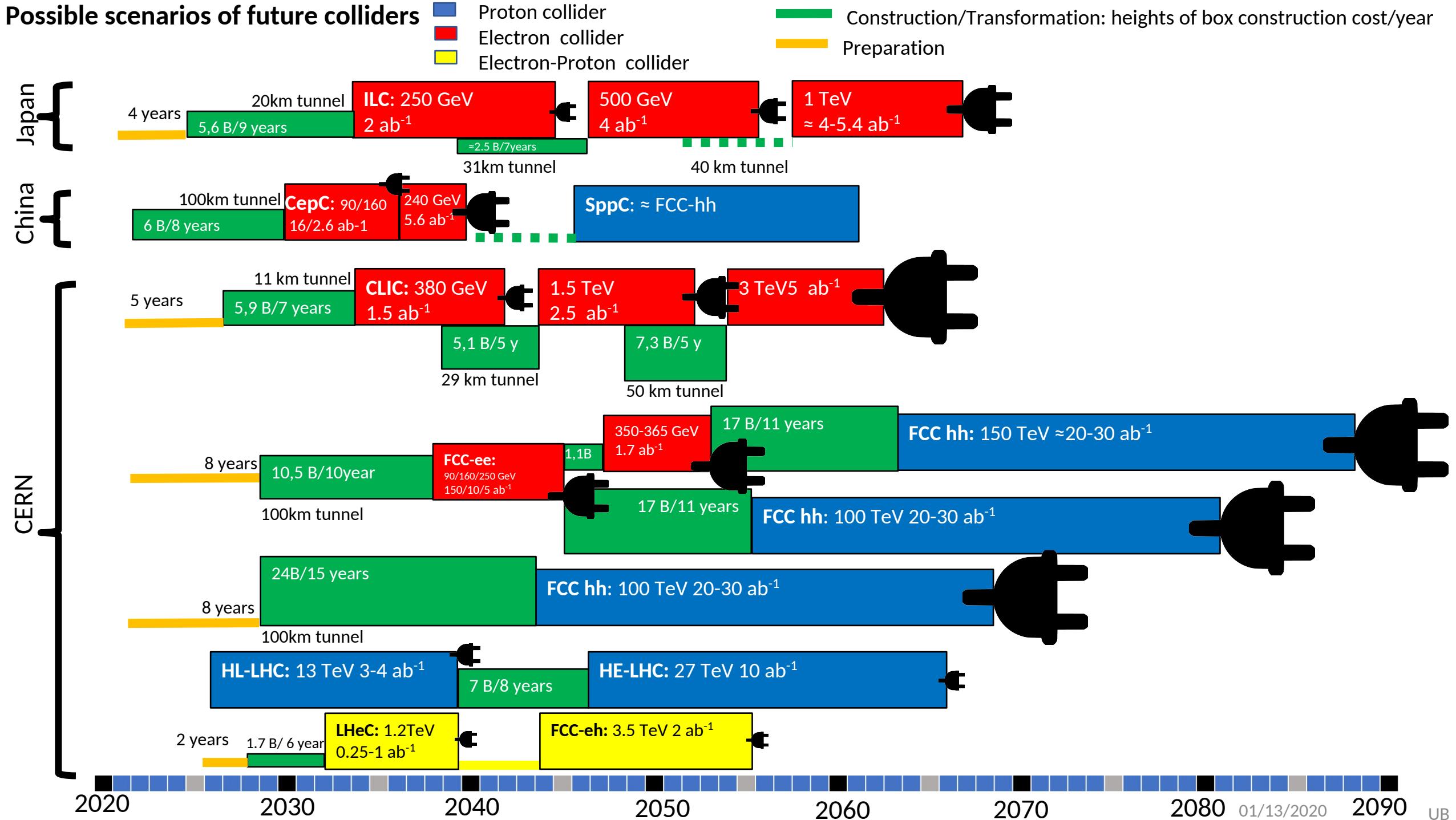
Stratégie européenne physique des particules

- basée sur les contributions et les discussions de toute la communauté de physique des particules en Europe
- élaborée par des déléguées, souvent leaders institutionnels dans les pays membres (en lien avec les ministères nationaux)
- approuvée par les délégués du conseil du CERN (scientifiques et politiques)
 - ne constitue pas une approbation des projets mentionnés, ni au CERN, ni dans les états membres
 - Contribution importante pour les discussions stratégiques dans d'autres pays/régions en particulier en vue de projets globaux





Backup





LHC Schedule & Injectors (from the LHC WWW page)		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
6 NA64	M2: mu H4: pi, K-	0.67 MCHF 1.16 MCHF	LS2 Proposal Detector upgrade	LS2 Proposal, Preparation	8Be, Dark Sector g-2, Dark Sector	Data Taking	LS3 Data Taking	Dark Sector	Dark Sector											
13 NA61/SHINE		1.5 MCHF	Detector upgrade		Data Taking															
94 Faser		0.8 MCHF	Construction Phase I		Data Taking															
35 Awake					Run 2															
118 MuonE		<10 MCHF	Preparation	Test of Modul		Running														
111 LHC Spin		4.2 MCHF	Design	Construction & Testing			LS3 Running													
36 LDMX		<10 MCHF		Construction																
153 KLEVER		38.95 MCHF	Proposal to SI		R&D		Installation		Running							Possible Extension				
47 Alice Fix Traget		?					Preparation / Construction									Data Taking				
75 MATHUSLA		<100 MCHF	Design for De	Funding to test design		Construction										Data Taking				
12 SHiP		70 MCHF	Comprehensive	Design and Prototyping		Production & Construction		Installation								Data Taking				
102 TauFV		?		Preparation				Installation of Experiment in B		Data Taking						Data Taking				
110 Next Generation Heavy Ion		150 MCHF		R&D				Construction								Installation			Data Talking	
36 eSPS		79.5 MCHF		Construction																
129 Beam Dump Facility		156.3 MCHF		Construction																
6 Gamma Factory at CERN		1.44 MCHF	Preparation	Installation & Tests and TDI	TDR submitte	Demo Design Eqipment rea	LHC demo beam test													
154 nuSTORM		160 MCHF	CDR		Prototyping		TDR		Approval											
120 Muon Collider				Baseline Design				Design Optimisation								Project Preparation		Approve		
7 ANA Scientific Roadmap			r, Accelerator stages with controlled para	x10 improved beam quality at higher energies				reliable stages acceleration 10 GeV module								advanced Linear Colliders CDR and TDR				
SE	98 ESSvSB		ESSvSB Design	CDR	Preparatory Phase and TDR		Preconstruction									Construction			Data Taking	
FR	147 PERLE	18 MCHF	TDR	1% cryo assembly & Installati	Phase 1 Oper	2nd cryo impl	Phase 2 Operation													
DE/COSY	18 CPEDIM	16.9 MCHF	CDR and TDR		Construction			Physics												

Smaller scale projects (J. Schieck/H. Abramowicz)