PAUL SCHERRER INSTITUT

ECFA Activities

CHIPP Plenary Meeting 2019

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Schedule of ECFA meetings

- country visits: presentations on particle physics / accelerator developments
- RECFA closed meeting to work out comments, recommendations
- compilation of letter

visits 2019:

- *Spain (Madrid), March 1-2, 2019*
- *Slovenia (Ljubljana), April 5-6, 2019*
- *Poland (Warsaw), May 24-25, 2019*
- Joint ECFA and EPS-HEPP session (Ghent), July 13, 2019 (including RECFA meeting)
- Cyprus, October 25-26, 2019 (confirmed)
- CERN, November 14-15, 2019 (including RECFA on 14 Nov and PECFA on 14-15 Nov)

tentative visits in 2020:

- March: Serbia
- April: Ukraine/France??
- May: France/Ukraine??
- October: Denmark

ECFA Working Groups

Detector R&D Panel: next slides

ApPEC-ECFA-NuPECC Joint Seminar: next slides

ECFA working group on Recognition of Individual Achievements in Large Collaborations: next slides

Working group on Higgs@FutureColliders: next slides

ECFA Working Group on Detector R&D

"A committee to review detector development efforts for future projects"

https://cds.cern.ch/record/2235340/files/Statement%20R&D298.pdf

https://ecfa.web.cern.ch/sites/ecfa.web.cern.ch/files/ECFA_detector_panel_ESPPU_input_Dec2018.pdf

The mandate of the Detector R&D panel (ECFA/16/298, June 2016), some extracts:

- The ECFA Detector Panel is aimed at providing advice on detector development efforts for projects in their preliminary and preparatory phases. It receives R&D proposals on request by research communities, laboratories, institutions, individual authors and bodies such as science funding agencies. It appoints experts charged to evaluate them and make recommendations.
- It helps to create coherence of global detector R&D efforts by encouraging synergies between different activities and advising funding agencies on request.

POLICY

Survey addresses recognition in large collaborations

The European Committee for Future Accelerators (ECFA) has created a working group to examine the recognition of individual achievements in large scientific collaborations. Based on feedback from an initial survey of the leaders of 29 CERN-based or CERN-recognised experiments in particle, nuclear, astroparticle and astrophysics, ECFA found that the community is ready to engage in dialogue on this topic and receptive to potential recommendations.

In response, ECFA has launched a community-wide survey to verify how individual researchers perceive the systems put in place to recognise their achievements. The survey will be distributed widely, and can be found on the ECFA website (https://ecfa.web.cern.ch) with a deadline for responses by 26 October.

The results of the survey will be disseminated and discussed at the upcoming plenary ECFA meeting at CERN on 15–16 November. An open session during the morning of 15 November, also to be webcast, will be devoted to the discussion of the outcomes of the survey, and aims to gather input to be submitted to the update of the European Strategy for Particle Physics (*CERN Courier* April 2018 p7). During the remaining open sessions, comprehensive overviews of all major future collider projects in and beyond Europe, and related accelerator technologies, will be given.

"Visibility and promotion of young scientists is of utmost importance in science and in particular also for the large collaborations in high-energy physics," says ECFA chairperson Jorgen D'Hondt. "On the eve of the update process of the European Strategy update, it is an outstanding opportunity for ECFA to take on its responsibility for informing the community about the opportunities and challenges ahead of us. Everybody is welcome."

CMS-PHO-PUBLIC-2012-014-1

Physicists in CERN's Building 40. The ATLAS and CMS collaborations at the LHC each number more than 3000 members from over 200 institutes.

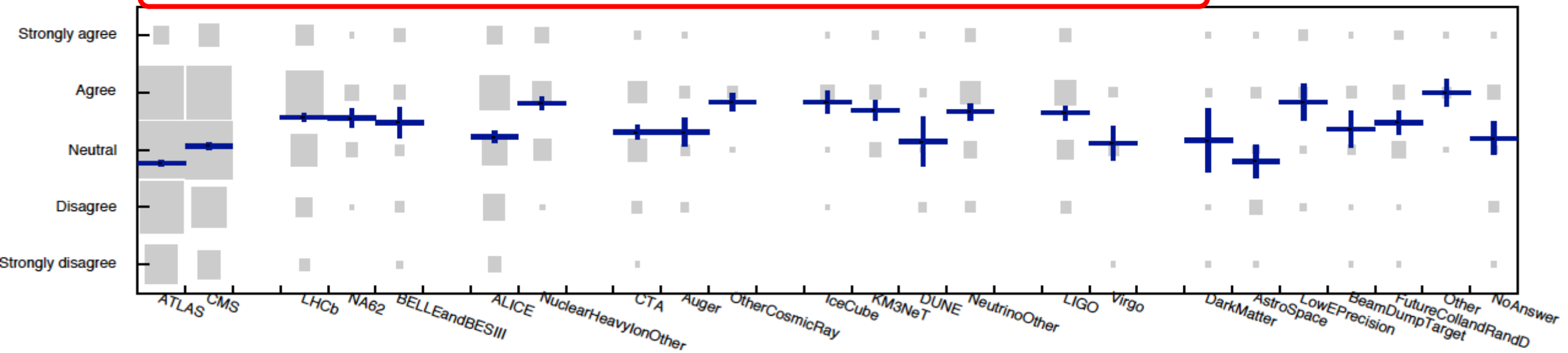
CERN Courier
October 2018
https://cerncourier.com/survey-addresses-recognition-in-large-collaborations/

Also in CERN Bulletin
https://home.cern/cern-people/updates/2018/10/addressing-recognition-large-collaborations?utm_source=Bulletin&utm_medium=Email&utm_content=2018-10-04E&utm_campaign=BulletinEmail

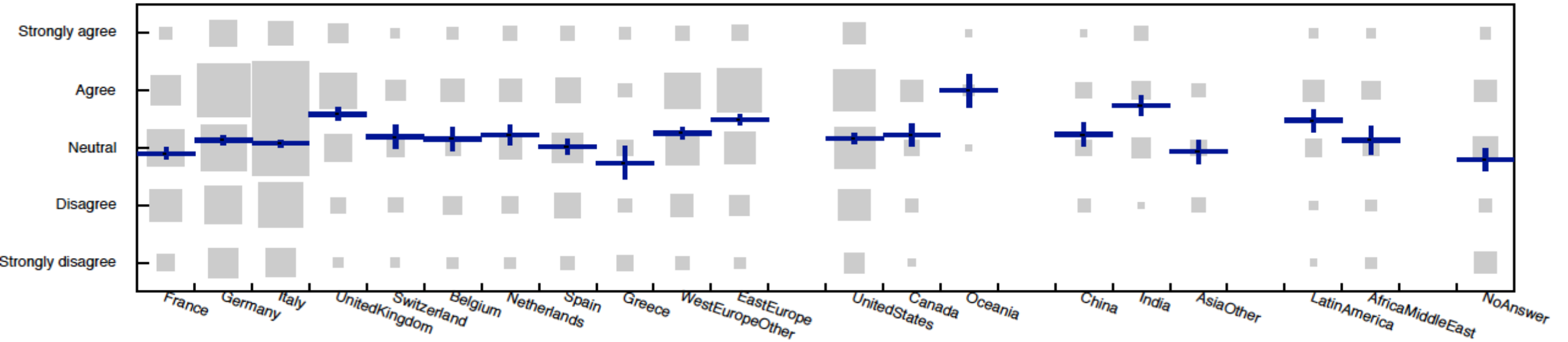
Survey outcome:
https://indico.cern.ch/event/759130/contributions/3148323/attachments/1753311/2874608/ECFA-Survey-Recognition-Results.pdf

illustration

"The collaboration guidelines for speakers at conferences allow me to be creative and demonstrate my talents" - by COLLABORATION



responses split by NATIONALITY



Recognition theme – next steps agreed in ECFA

- In a next step ECFA will create a new working group with representatives from all interested scientific collaborations in particle physics (and to reach out to astroparticle and nuclear physics)

- Key objectives within an advisory and exploratory mandate of the working group:
  - exchange and discuss **best practices**, and reflect on alternative or additional procedures
  - potentially perform a **second survey** in 2020-2021 to monitor the progress on the topic
  - however, the group **will not be an ombudscommittee** for individual problems

- The working group should openly communicate about its activities to the community at large

- The collaborations remain themselves responsible for the actions of the working group and to implement (or not) recommendations; ApPEC-ECFA-NuPECC will be there for example to facilitate, to invite the collaborations, to draft the initial mandate and potentially to assign (co-)chair(s)

Working group on Higgs@FutureColliders

- In the context of exploring the Higgs sector, provide a coherent comparison of the reach with all future collider programmes proposed for the European Strategy, and to project the information on a timeline.
- For the benefit of the comparison, motivate the choice for an adequate interpretation framework (e.g. EFT, κ, …) and apply it, and map the potential prerequisites related to the validity and use of such framework(s).

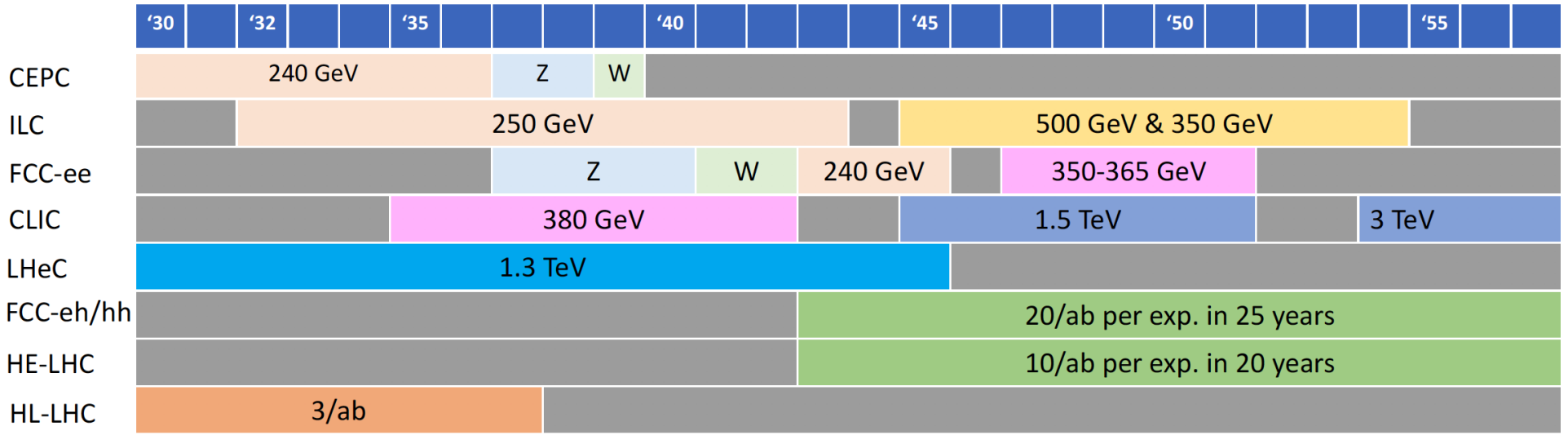
- Members: **Aleandro Nisati** (Rome, *chair*), **Christoph Grojean** (DESY), **Fabio Maltoni** (Louvain/Bologna), **Jorge de Blas** (University of Padova), **Maria Cepeda** (CIEMAT), **Riccardo Rattazzi** (EPFL), **Wouter Verkerke** (NIKHEF), and ex-officio Keith Ellis and Beate Heinemann (PPG conveners for the EW sector), and ex-officio the ECFA Chair; Elisabeth Petit (CPPM) joined in March as speaker of the H^3 talk in Granada.

- Preliminary report available at: http://inspirehep.net/record/1733996 (arXiv:1905.03764)
- The working group will now take into account comments received during he Open Symposium, and work towards a final report with an opportunity to present the final report during the ECFA-EPS sessions (July 13, 2019).

next: selected accelerator aspects of HEP strategy discussion

- Higgs factories & timelines
- magnet low field option
- energy efficiency

Proposed Schedules



Project	Start construction	Start Physics (higgs)
CEPC	2022	2030
ILC	2024	2033
CLIC	2026	2035
FCC-ee	2029	2039 (2044)
LHeC		

Proposed dates from projects

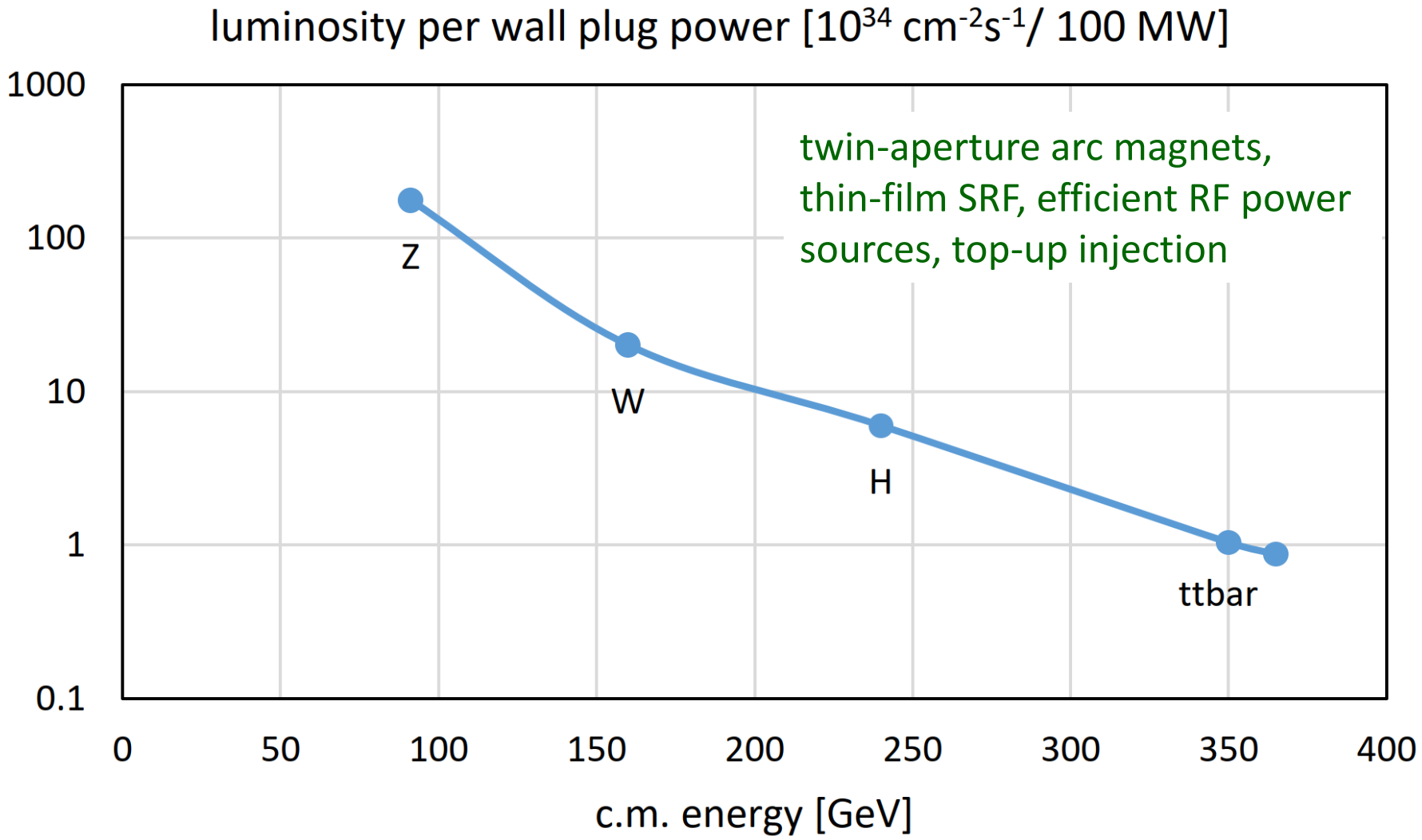
Would expect that technically required time to start construction is O(5-10 years) for prototyping etc.

https://indico.cern.ch/event/808335/contributions/3365144/

Comparisons [Daniel Schulte]

Project	Type	Energy [TeV]	Int. Lumi. [a^{-1}]	Oper. Time [y]	Power [MW]	Cost
ILC	ee	0.25	2	11	129 (upgr. 150-200)	4.8-5.3 GILCU + upgrade
		0.5	4	10	163 (204)	7.8 GILCU
		1.0			300	?
CLIC	ee	0.38	1	8	168	5.9 GCHF
		1.5	2.5	7	(370)	+5.1 GCHF
		3	5	8	(590)	+7.3 GCHF
CEPC	ee	0.091+0.16	16+2.6		149	5 G$
		0.24	5.6	7	266	
FCC-ee	ee	0.091+0.16	150+10	4+1	259	10.5 GCHF
		0.24	5	3	282	
		0.365 (+0.35)	1.5 (+0.2)	4 (+1)	340	+1.1 GCHF
LHeC	ep	60 / 7000	1	12	(+100)	1.75 GCHF
FCC-hh	pp	100	30	25	580 (550)	17 GCHF (+7 GCHF)
HE-LHC	pp	27	20	20		7.2 GCHF

FCC-ee: a sustainable accelerator



Frank Zimmermann FCC-week

electricity cost ~200 euro per Higgs boson

The 25 y LHC construction time line
possible only because SSC developed the superconductor…

9 T - 1 m single bore

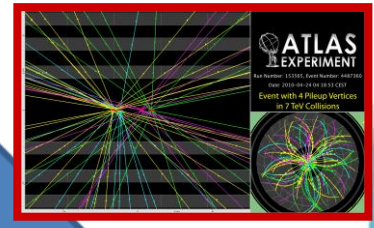
10 T-1m Nb3Sn dipole

9 T -10 m long protoype

9 T-15 m final protoype

Last LHC dipole

1985 1987 1990 1994 2000 2006 2010



Only 2 y to make a short magnet «near to final». Conductor available(SSC)

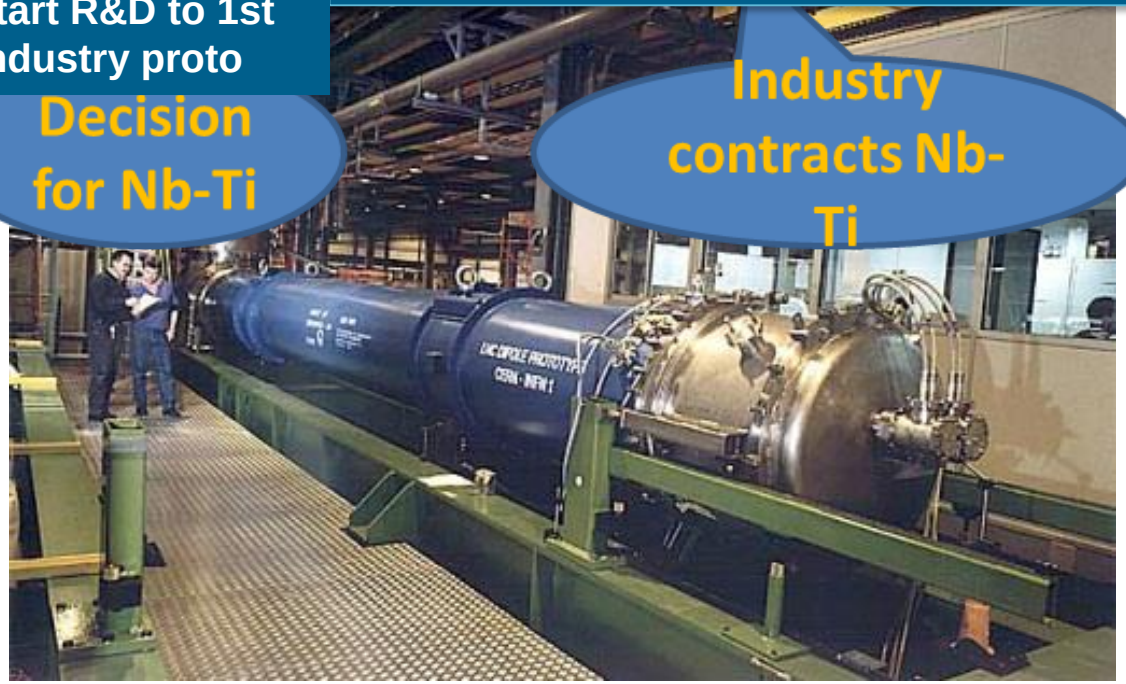
7 years from start R&D to 1st Industry proto

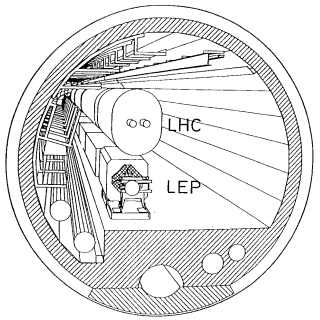
12 y from first working prototype to last magnet

Decision for Nb-Ti

Industry contracts Nb-Ti

LHC start-up





LARGE HADRON COLLIDER
IN THE LEP TUNNEL

HiLumi HL-LHC PROJECT

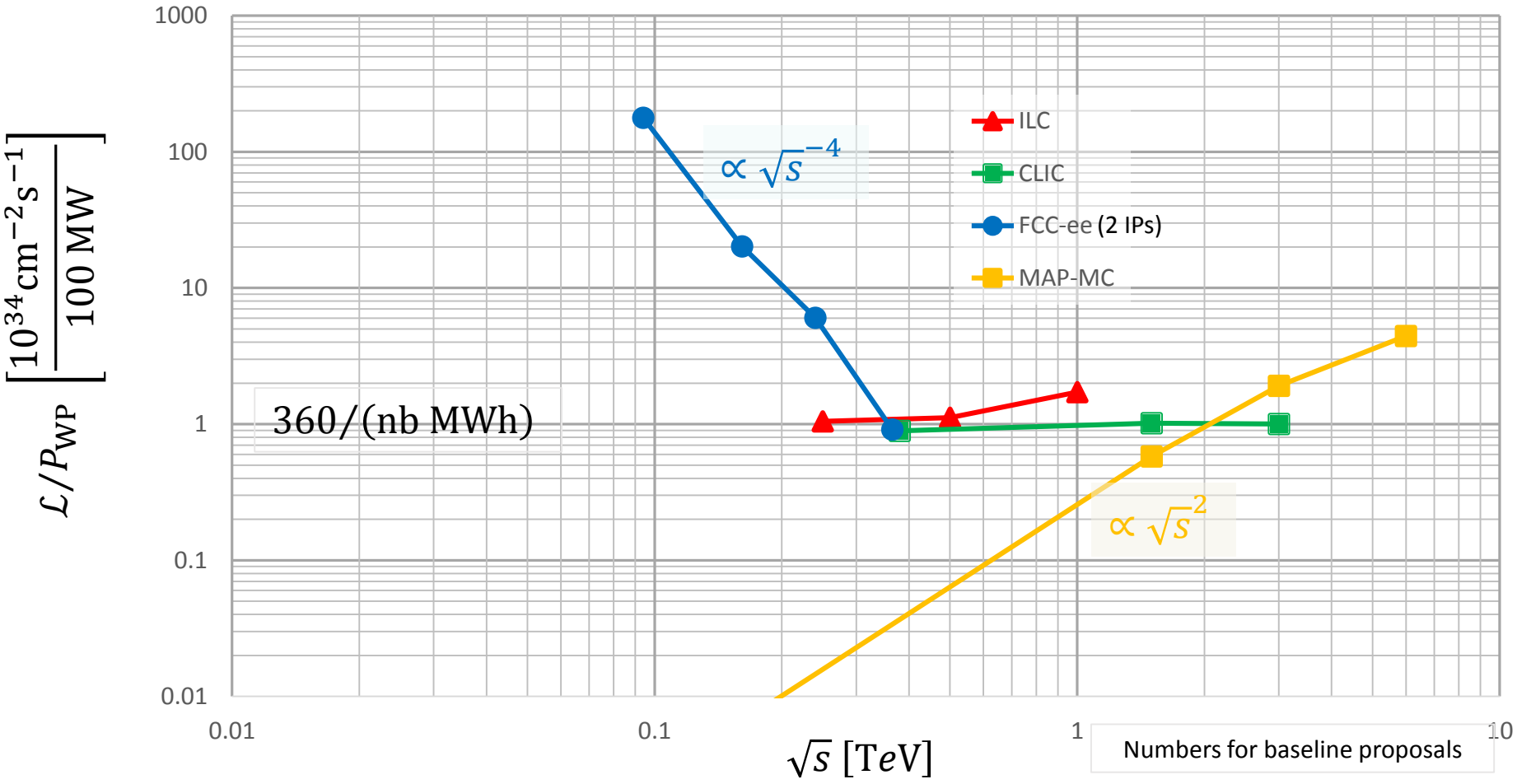
https://indico.cern.ch/event/727555/contributions/3447469/attachments/1867359/3071163/190624_Overview_of_the_FCC_Study_ap.pdf

ESG request for parameters of a lower-energy hadron collider

parameter	FCC-hh		FCC-hh-6T	HE-LHC	HL-LHC	LHC
collision energy cms [TeV]	100		37.5	27	14	14
dipole field [T]	16		6	16	8.33	8.33
beam current [A]	0.5		0.6	1.1	1.1	0.58
synchr. rad. power/ring [kW]	2400		57	101	7.3	3.6
peak luminosity [10^{34} $cm^{-2}s^{-1}$]	5	30	10 (lev.)	16	5 (lev.)	1
events/bunch crossing	170	1000	~300	460	132	27
stored energy/beam [GJ]	8.4		3.75	1.4	0.7	0.36

- **NbTi technology from LHC, magnet with single-layer coil providing 6 T at 1.9 K:**
  - → Corresponding beam energy 18.75 TeV or 37.5 TeV c.m.
  - → Significant reduction of synchrotron radiation wrt FCC-hh (factor 50) and corresponding cryogenic system requirements.
- **Luminosity goal 10 ab^{-1} over 20 years or 0.5 ab^{-1} annual luminosity:**
  - → Beam current 0.6 A or 20% higher than for FCC-hh, 1.2E11 ppb (FCC-hh: 1.0 ppb).
  - → Stored beam energy 3.75 GJ vs 8.4 GJ for FCC-hh.
- **Analysis of physics potential, technology requirements and cost ongoing.**

Luminosity per Grid Power



[E.Jensen, Granada]

Proposed HEP Projects and Grid Power Consumption

	ECM [TeV]	L / IP [10^{34}cm^{-2}s^{-1}]	P_{Grid} [MW]	power driving effects
FCC-ee (Z)	0.091	230	**259**	SR Power: 50MW/beam
FCC-ee (t)	0.365	1.5	**359**	SR power: 50MW/beam
FCC-hh	100	30	**580**	SR power: 2.4MW/beam @ 50K, cryogenics
ILC	1	4.9	**300**	beam power: 13.6 MW/beam, cryogenics
CLIC	3	5.9	**582**	beam power: 14 MW/beam
muon coll.	6	12	**270**	mu decay, 1.6MW/drive beam, cycling magnets, but scaling advantages, least developed

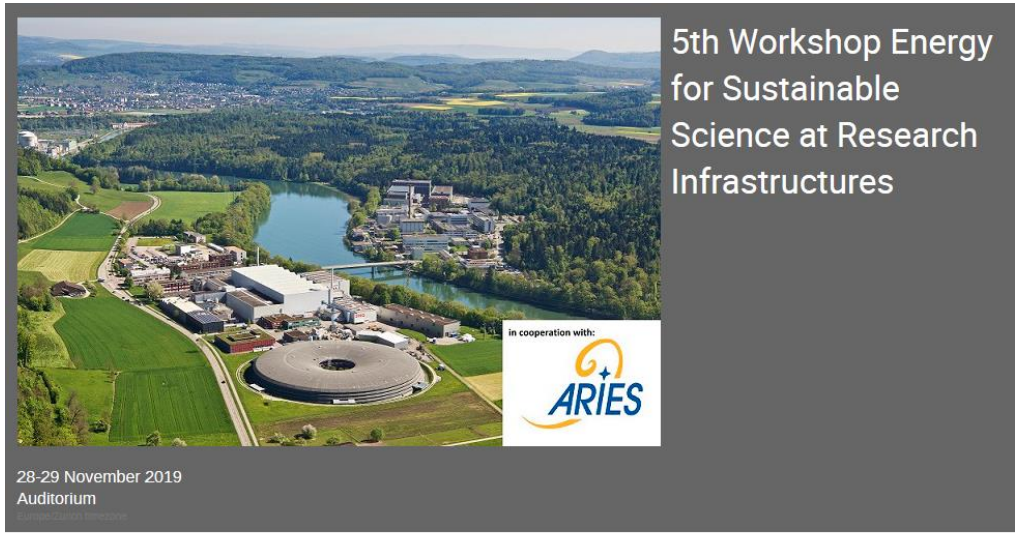
$$P_{\mathrm{SR}} \propto \left(\frac{E}{E_0}\right)^4 \frac{1}{R}$$

$$L_{\mathrm{lin.col.}} \propto H_D \sqrt{\frac{\delta_E}{\varepsilon_{y,n}}} P_{\mathrm{beam}}$$

$$L_{\mathrm{mu.col.}} \propto B \frac{N_0}{\varepsilon_n} \gamma P_{\mathrm{beam}}$$

→ **need more R&D towards efficient concepts & technology, and energy management**

Upcoming Workshop on sustainable RIs



Overview CERN/ERF/ESS Workshop
Timetable
Registration
Participant List
Committees
Contact
Support
EWorkshop2019@psi.ch

Scarcity of resources, along with rising energy costs and climate change are ever growing concerns that need to be considered for the next generation of large-scale research infrastructures. Indeed, the much increased performance of proposed new facilities often comes together with anticipated increased power consumption. Mid- and long-term strategies have to be devised for sustainable developments at research infrastructures, including the aim for reliable, affordable and carbon-neutral energy supplies.

This workshop will bring together international sustainability experts, stakeholders and representatives from research facilities and future research infrastructure projects all over the world in order to identify the challenges, best practices and policies to develop and implement sustainable solutions at research infrastructures. This includes the increase of energy efficiencies, energy system optimizations, storage and savings, implementation and management issues as well as the review of challenges represented by potential future technological solutions and the tools for effective collaboration.

The Paul Scherrer Institut, in collaboration with CERN (The European Organization for Nuclear Research), ERF (The European Association of National Research Facilities), ESS (The European Spallation Source), and ARIES (The Accelerator Research and Innovation for European Science and Society), will host on 28-29 November 2019, the fifth Workshop on Energy for Sustainable Science at Research Infrastructures Facilities.

Program

1. General sustainability aspects (6)
2. Energy management at Research Infrastructures (8)
3. Energy efficient technologies (8)
4. Research on Sustainable Technologies using RI's (4)
5. Cryogenic Systems and Conventional Cooling (4)

Organizing Committee

Carlo Bocchetta, ESS
Frederick Bordry, CERN
Florian Gliksohn, ERF
Joachim Grillenberger, PSI
Frank Lehner, DESY
Thomas Schmidt, PSI
Carlo Rizzuto, ELI
Mike Seidel, PSI

reserve the date: Paul Scherrer Institut, CH, **November 28-29, 2019**
https://indico.psi.ch/event/6754/