The European Strategy for Particle Physics

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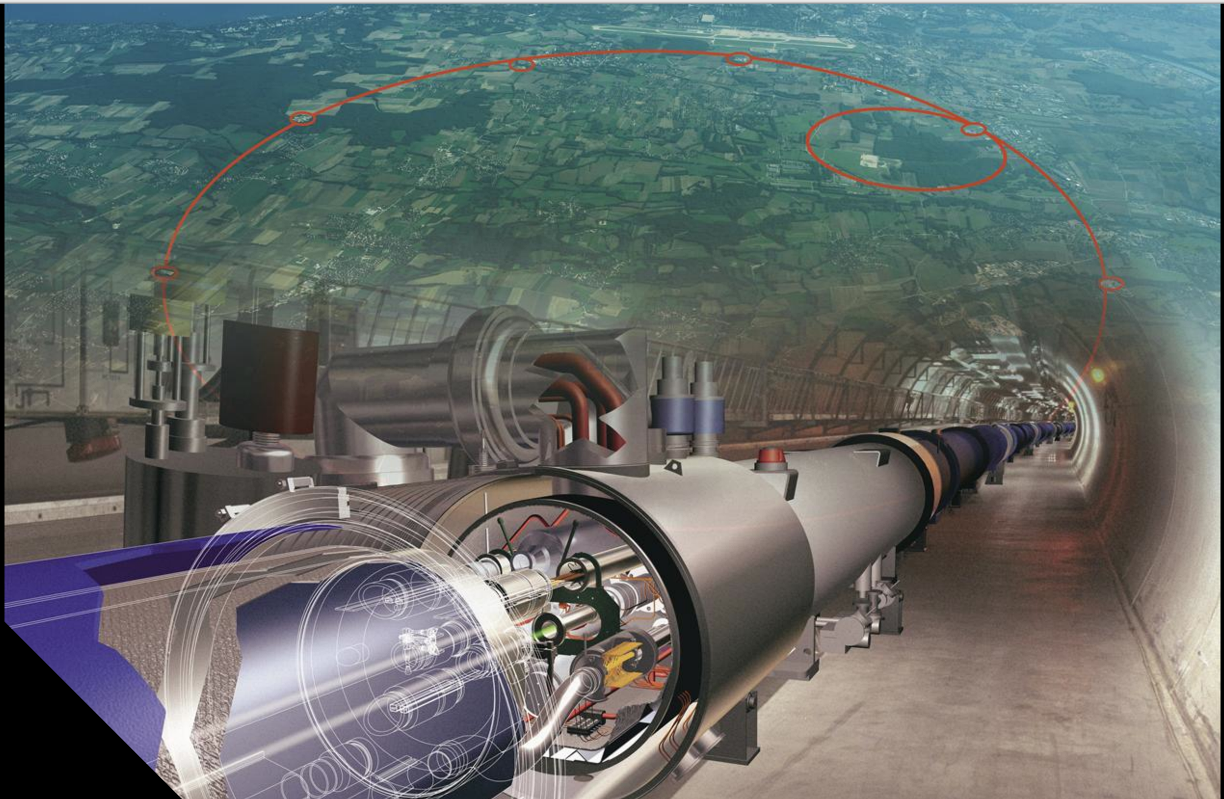
ECFA chairperson
(https://ecfa.web.cern.ch)

CERN-UA, May 2018
Kharkiv, Ukraine



BRUXELLES BRUSSEL

HIGH-ENERGY PHYSICS
RESEARCH CENTRE

My most sincere apologies for my absence today.

The announce delay of my first flight on Monday was a clear prelude of missing my second flight to Kharkiv. And due to a strike of airline pilots in Brussels, there were no options to reach other airports.

I wish you a fruitful meeting.

Jorgen D'Hondt
May 14th, 2018
Brussels

The European Committee for Future Accelerators (ECFA) is a representation of the European Particle Physics community with delegates from typically all major laboratories, research centres and universities.

The main aims of ECFA are to contribute to the long-range planning of European high-energy physics facilities (accelerators, large-scale facilities and equipment), to ensure a good balance between the roles of international and national laboratories and university institutes in research in this field, and to foster close relations between research and education in high-energy physics and other fields. ECFA also monitors the conditions for research and the sharing of facilities between physicists, irrespective of nationality and origin, as conducive to a successful collaborative effort.

The above aims are achieved through regular Plenary ECFA meetings and dedicated country visits of Restricted ECFA.

Traditionally, all CERN Member States, Associate Member States and Observer States are members of ECFA, although this is not mandatory. Membership of ECFA entails the nomination of delegates to PECFA. The number of these delegates is not fixed and depends on the needs and the size of the community.

Also traditionally, all new ECFA member countries are visited by RECFA with the aim of understanding the goals and the needs of their high-energy physics community. The findings are reported to the national funding authorities, and ECFA's experience is that these visits have a very positive impact on the activities of the community concerned. Should Ukraine decide to join ECFA, a visit by RECFA would be on ECFA's list of priorities.

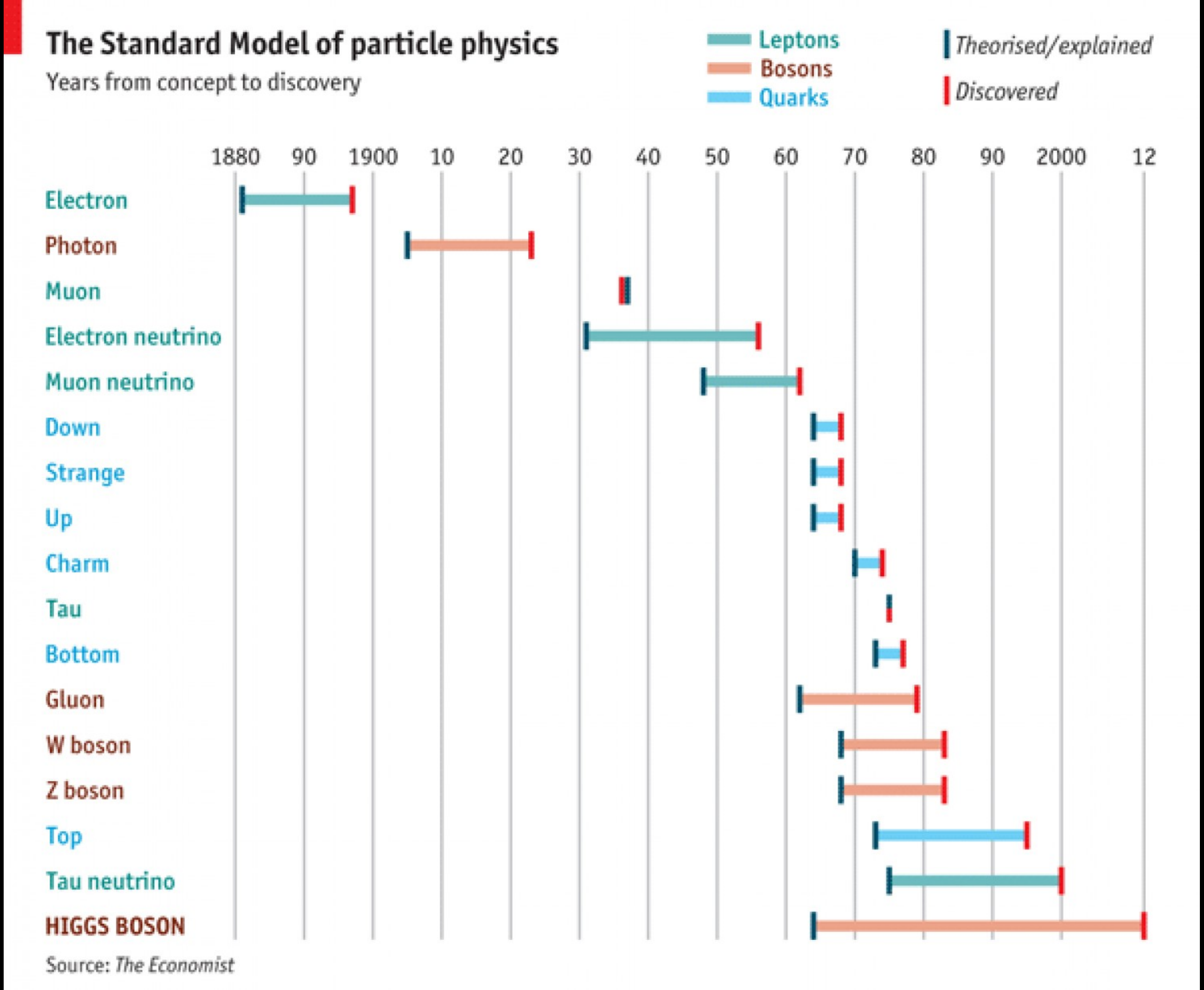
Accordingly a letter of invitation was communicated to Prof. Borys Grinyov and Dr Anatolii Zagorodniy, the Council delegates of Ukraine.

Some historical notes

Slide from L. Evans – 25 years LHC

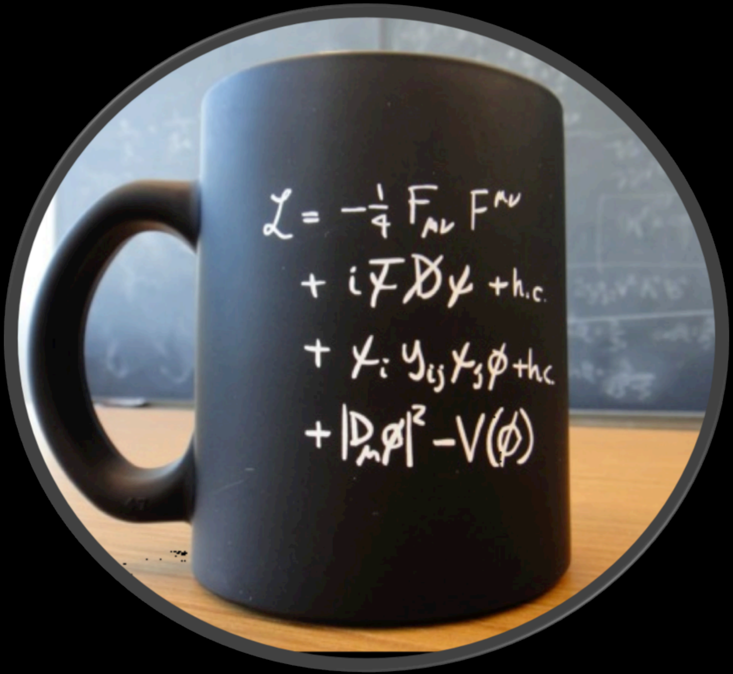
At the beginning of the 1960's a debate was raging about the next step for CERN. Opinions were sharply divided between a "large PS", a proton machine of 300 GeV energy or a much more ambitious colliding beam machine, the Intersecting Storage Rings (ISR). In order to try to guide the discussion, in February 1964, 50 physicists from among Europe's best met at CERN. They decided to transform themselves into a European Committee for Future Accelerators (ECFA) under the chairmanship of Eduardo Amaldi. It took nearly 2 years more before the consensus was formed. On 15th December 1965, with the strong support of Amaldi, the CERN Council approved the construction of the Intersecting Storage Rings

Source:
The Economist
July 4th, 2012

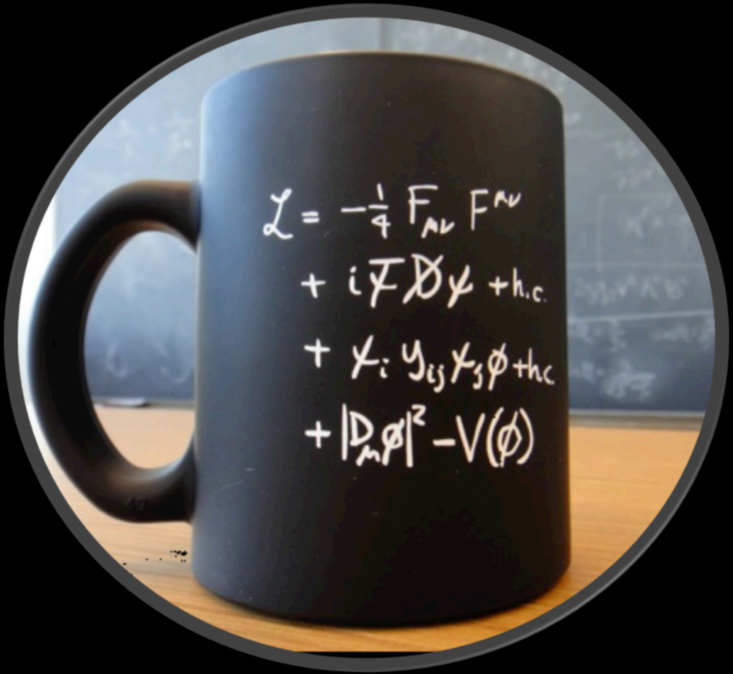


The clear need for long-term planning in our research field.

Particle Physics today

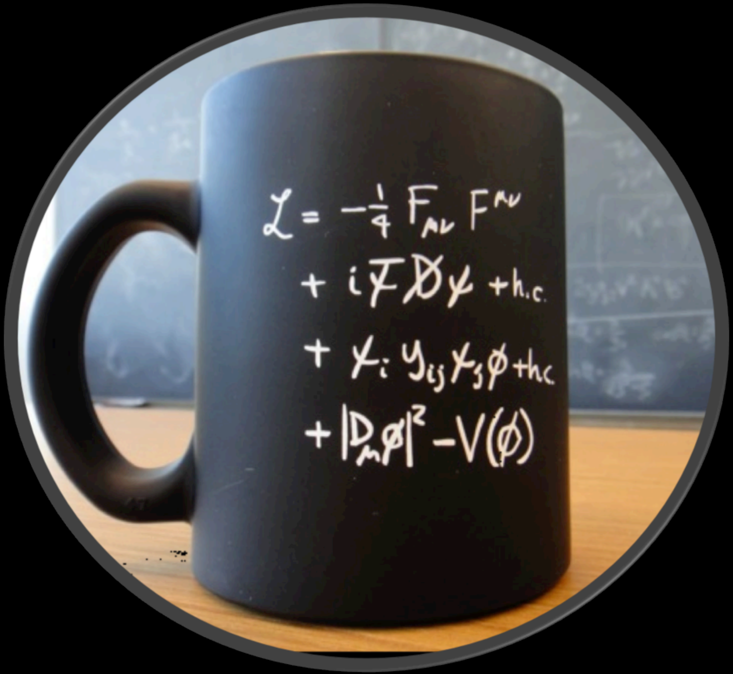


Particle Physics today



description ≠ understanding

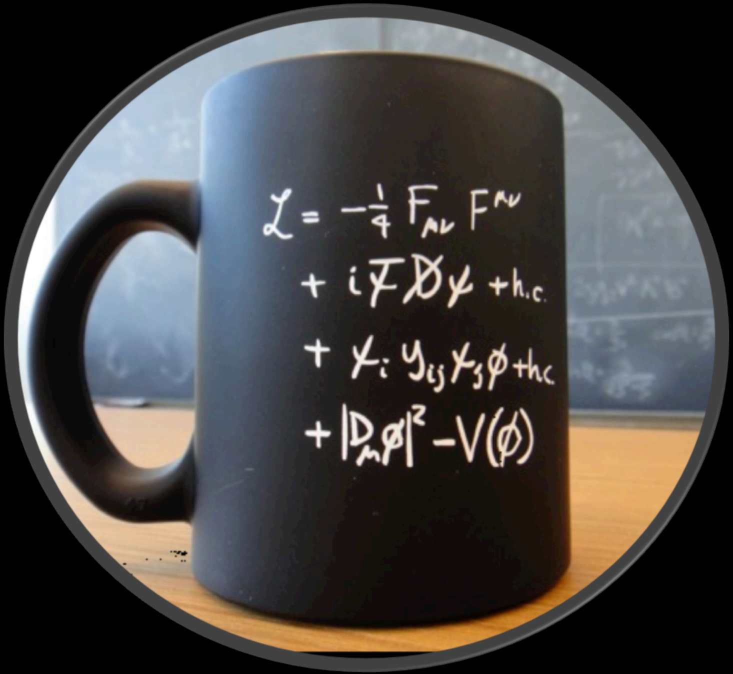
Particle Physics today



description ≠ understanding

new physics

Particle Physics today

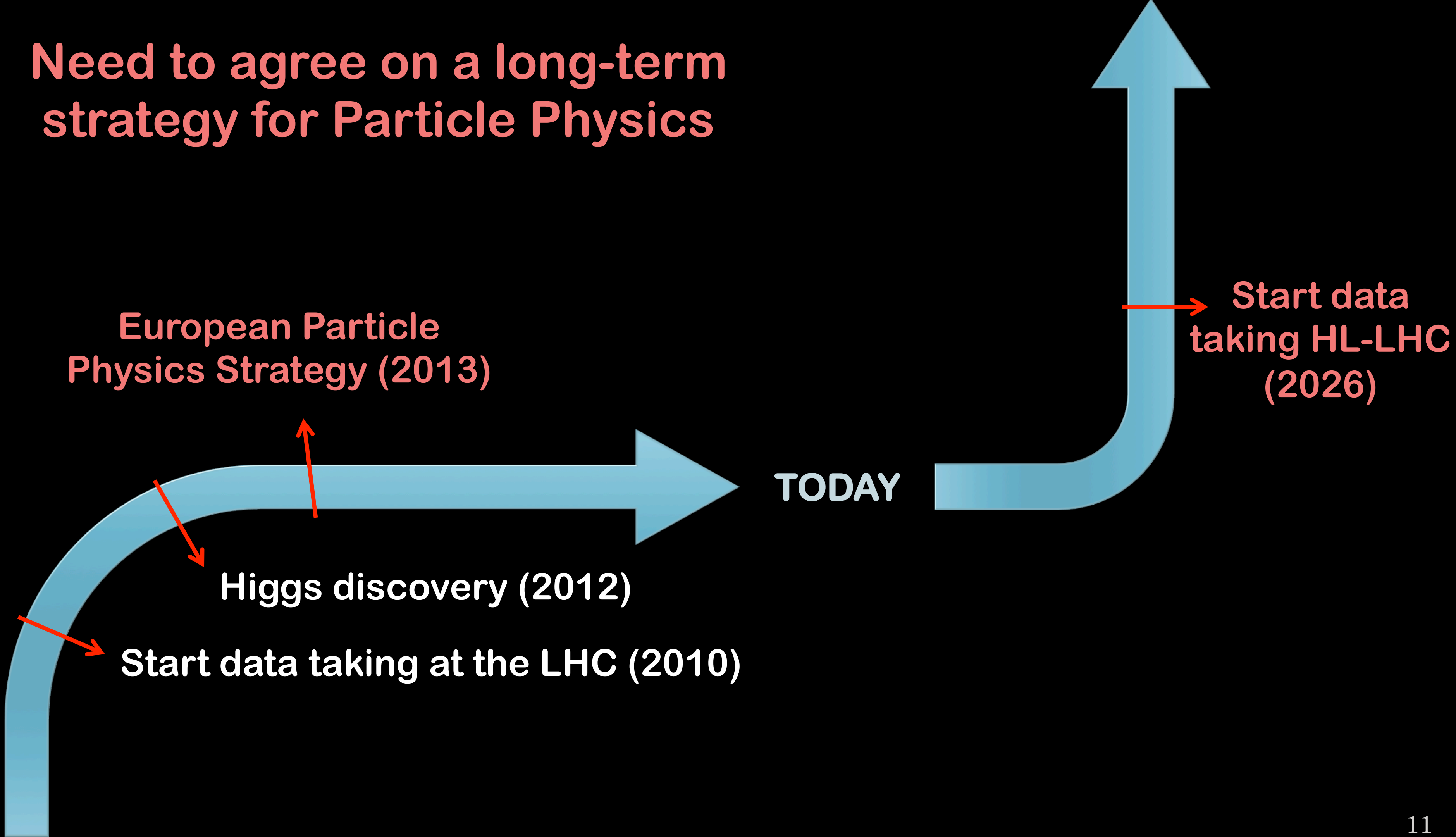


connection

description ≠ understanding

new physics

Need to agree on a long-term strategy for Particle Physics



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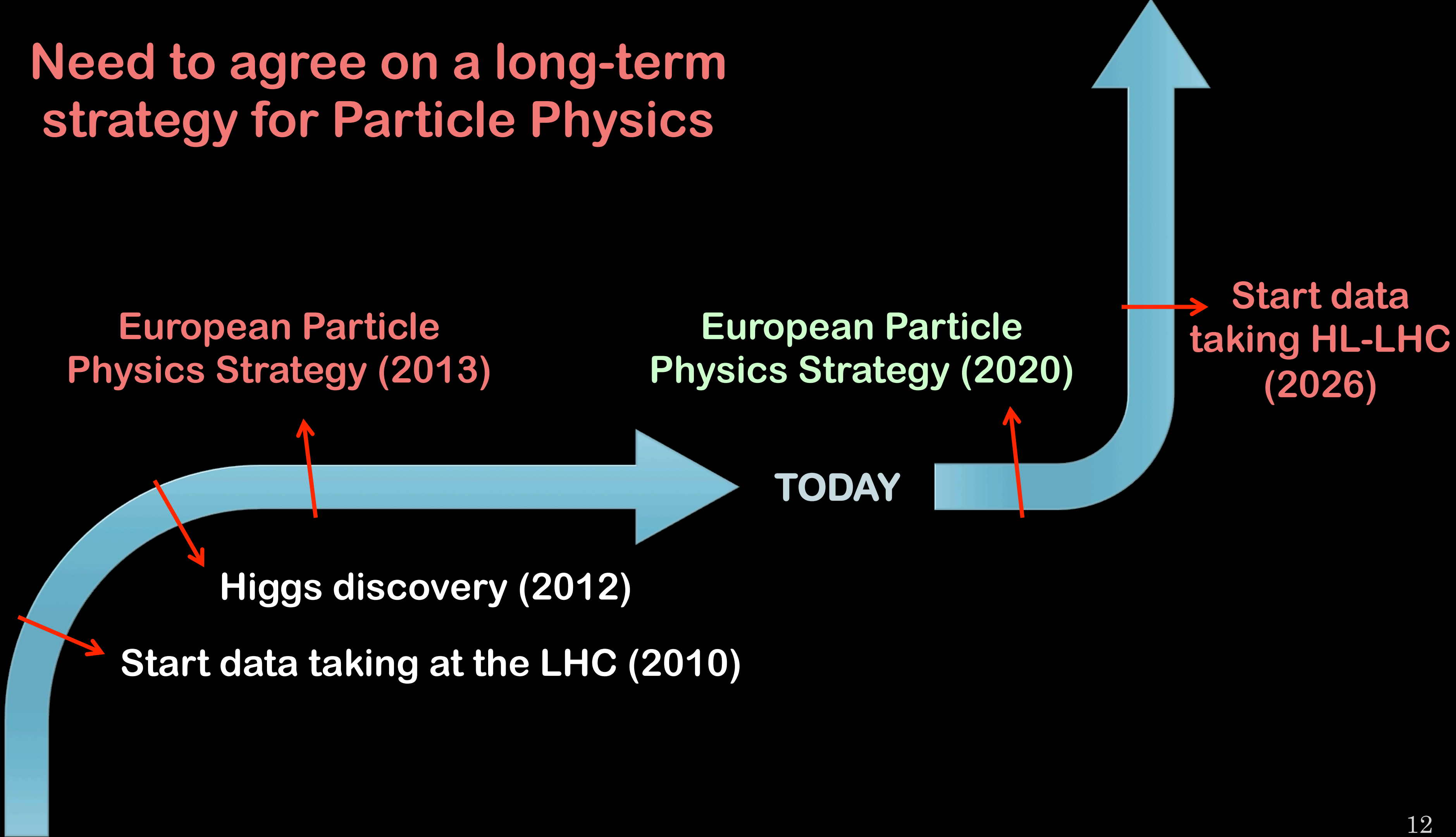

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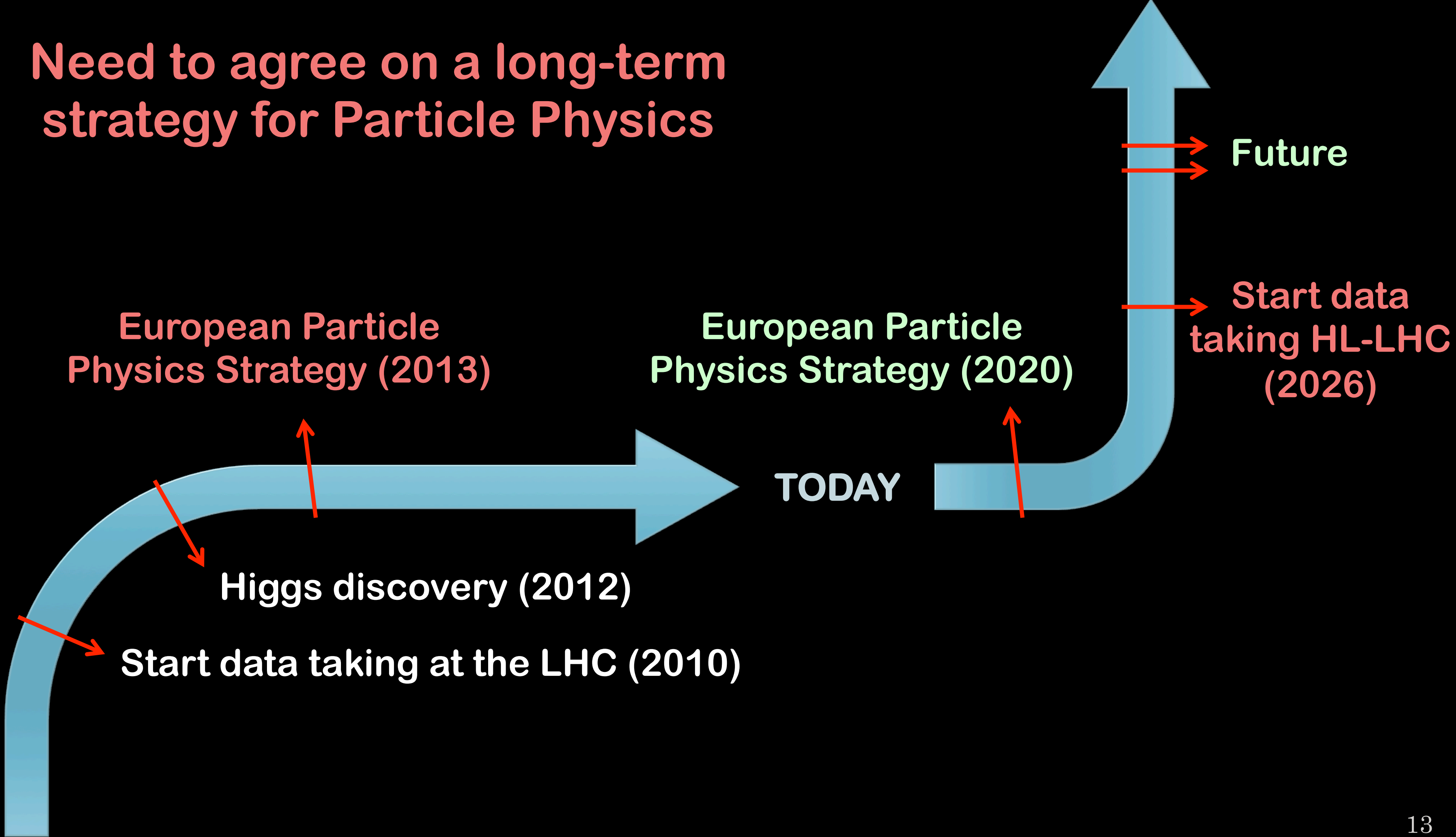
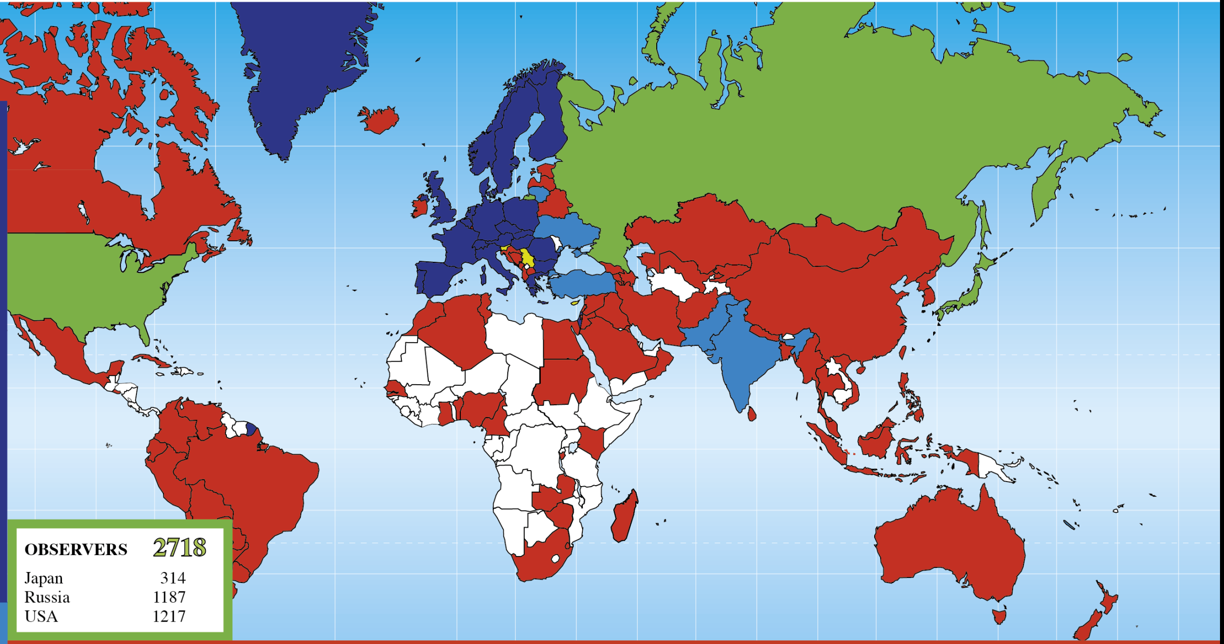


CERN, the European Laboratory for global collaboration

Distribution of All CERN Users by Nationality on 24 January 2018



MEMBER STATES 7889

Austria	117
Belgium	120
Bulgaria	96
Czech Republic	244
Denmark	67
Finland	111
France	868
Germany	1342
Greece	237
Hungary	76
Israel	65
Italy	2045
Netherlands	168
Norway	67
Poland	350
Portugal	127
Romania	134
Slovakia	124
Spain	447
Sweden	85
Switzerland	228
United Kingdom	771

OBSERVERS 2718

Japan	314
Russia	1187
USA	1217

ASSOCIATE MEMBERS 745

India	357
Lithuania	35
Pakistan	65
Turkey	173
Ukraine	115

ASSOCIATE MEMBERS IN THE PRE-STAGE TO MEMBERSHIP 118

Cyprus	26
Serbia	57
Slovenia	35

OTHERS 1872

Afghanistan	1
Albania	3
Algeria	14
Argentina	27
Armenia	19
Australia	31
Azerbaijan	10
Bangladesh	11
Belarus	48
Benin	1
Bolivia	4
Bosnia & Herzegovina	2
Brazil	135
Burundi	1
Cameroon	1
Canada	161
Chile	20
China	510
Colombia	45
Croatia	41
Cuba	12
Ecuador	6
Egypt	31
El Salvador	1
Estonia	15
Georgia	46
Ghana	1
Hong Kong	1
Iceland	3
Indonesia	11
Iran	51
Iraq	1
Ireland	16
Jordan	1
Kazakhstan	5
Kenya	3
Korea Rep.	185
Kyrgyzstan	1
Latvia	2
Lebanon	23
Luxembourg	2
Madagascar	4
Malaysia	15
Malta	9
Mauritius	1
Mexico	82
Mongolia	2
Montenegro	11
Morocco	20
Myanmar	1
Nepal	10
New Zealand	5
Nigeria	3
North Korea	1
Oman	3
Palestine (O.T.).	7
Paraguay	2
Peru	7
Philippines	3
Saint Kitts and Nevis	1
Saudi Arabia	2
Senegal	1
Singapore	4
South Africa	56
Sri Lanka	6
Sudan	1
Swaziland	1
Syria	1
Taiwan	51
Thailand	22
T.F.Y.R.O.M.	2
Tunisia	5
Uruguay	1
Uzbekistan	4
Venezuela	10
Viet Nam	13
Zambia	1
Zimbabwe	2

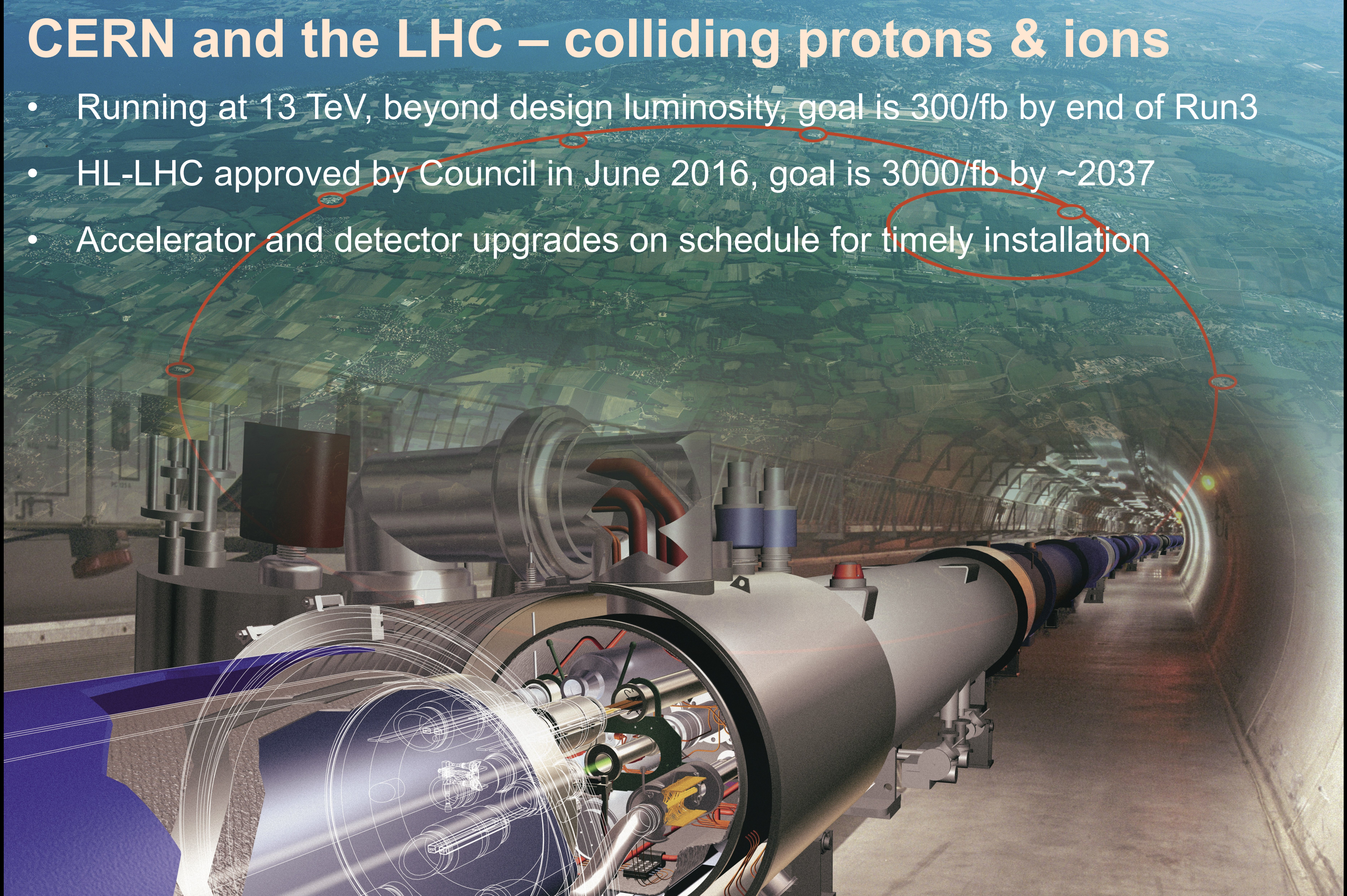
13342 users

60% from member states

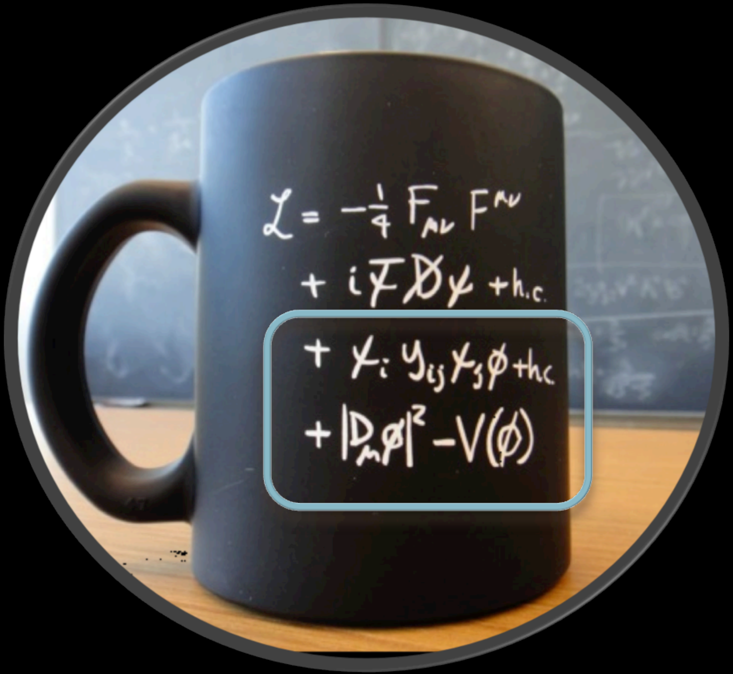
European institutions are involved in Particle Physics experiments worldwide

CERN and the LHC – colliding protons & ions

- Running at 13 TeV, beyond design luminosity, goal is 300/fb by end of Run3
- HL-LHC approved by Council in June 2016, goal is 3000/fb by ~2037
- Accelerator and detector upgrades on schedule for timely installation



The role of the LHC

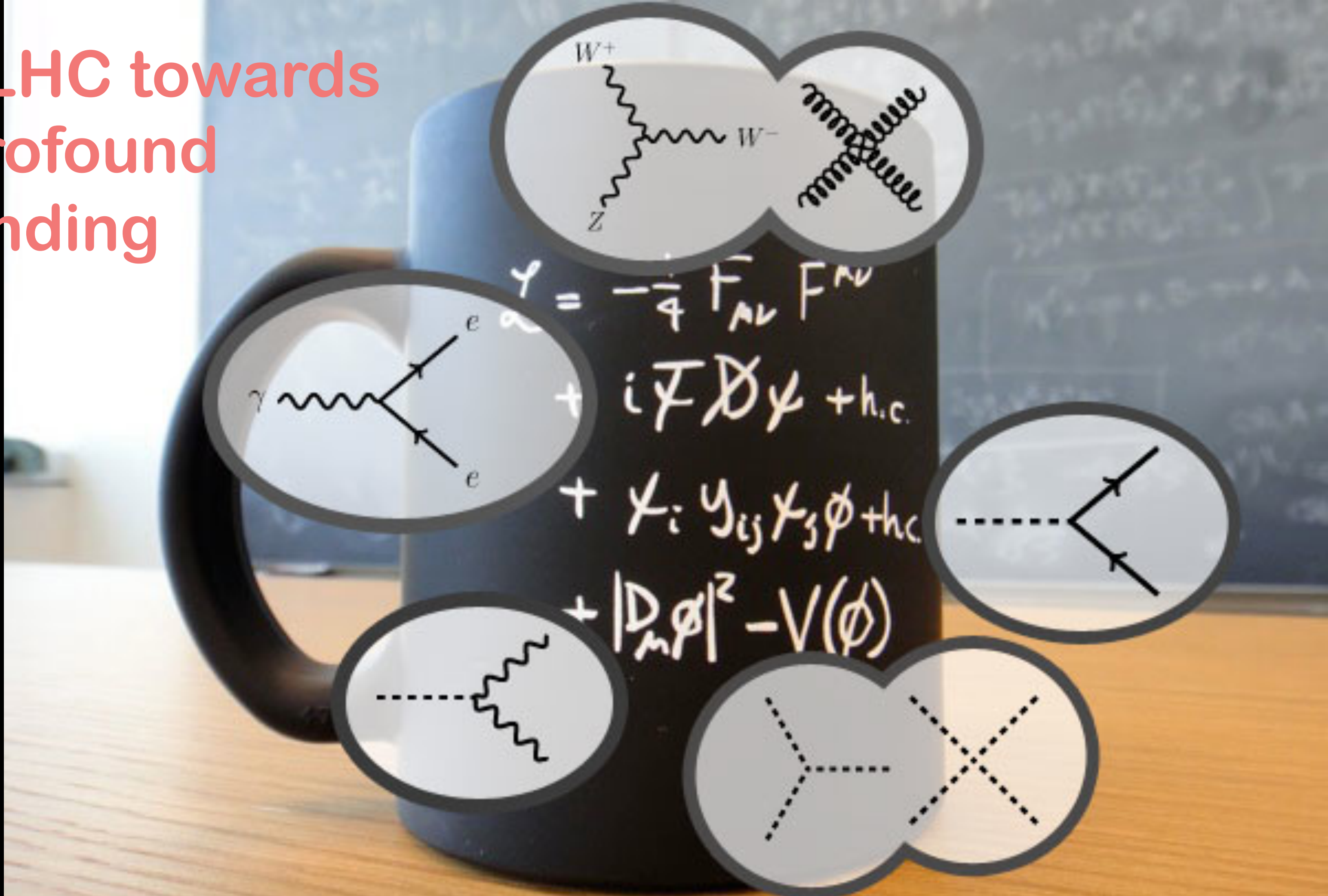


connection

a MORE PRECISE and more COMPLETE description

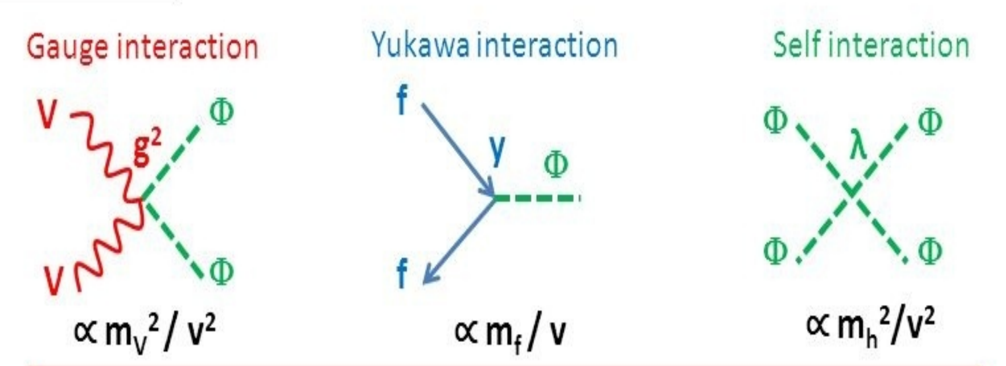
new physics

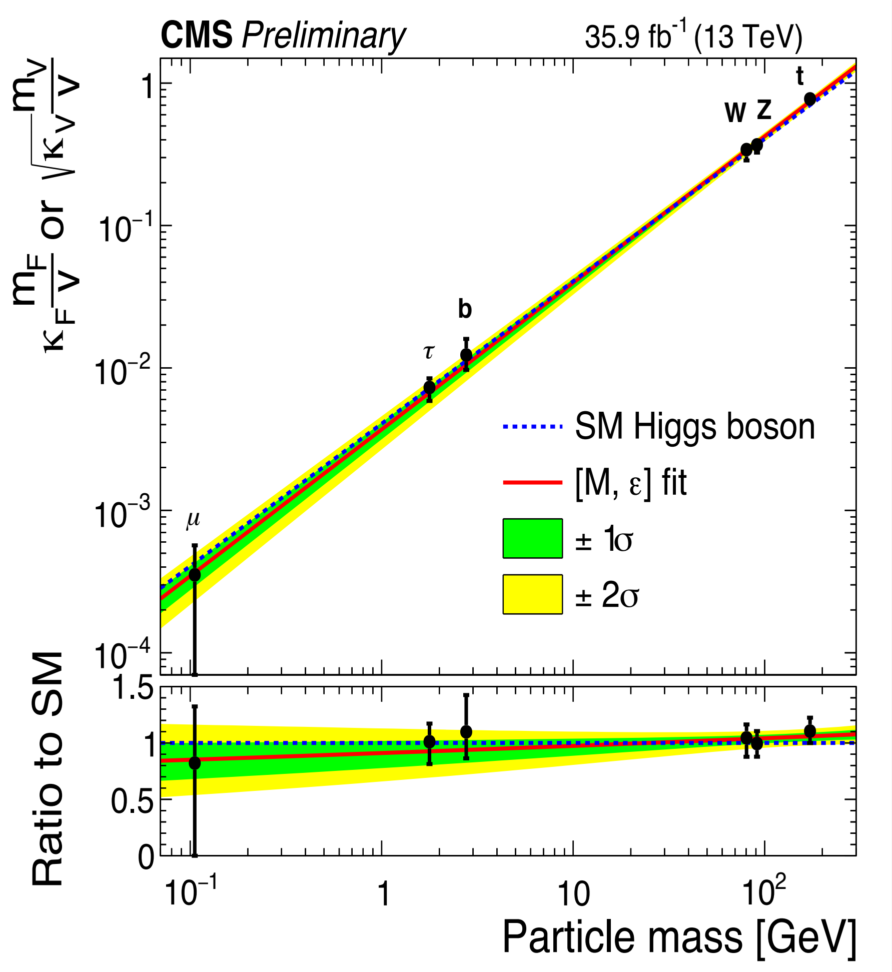
With the LHC towards a more profound understanding



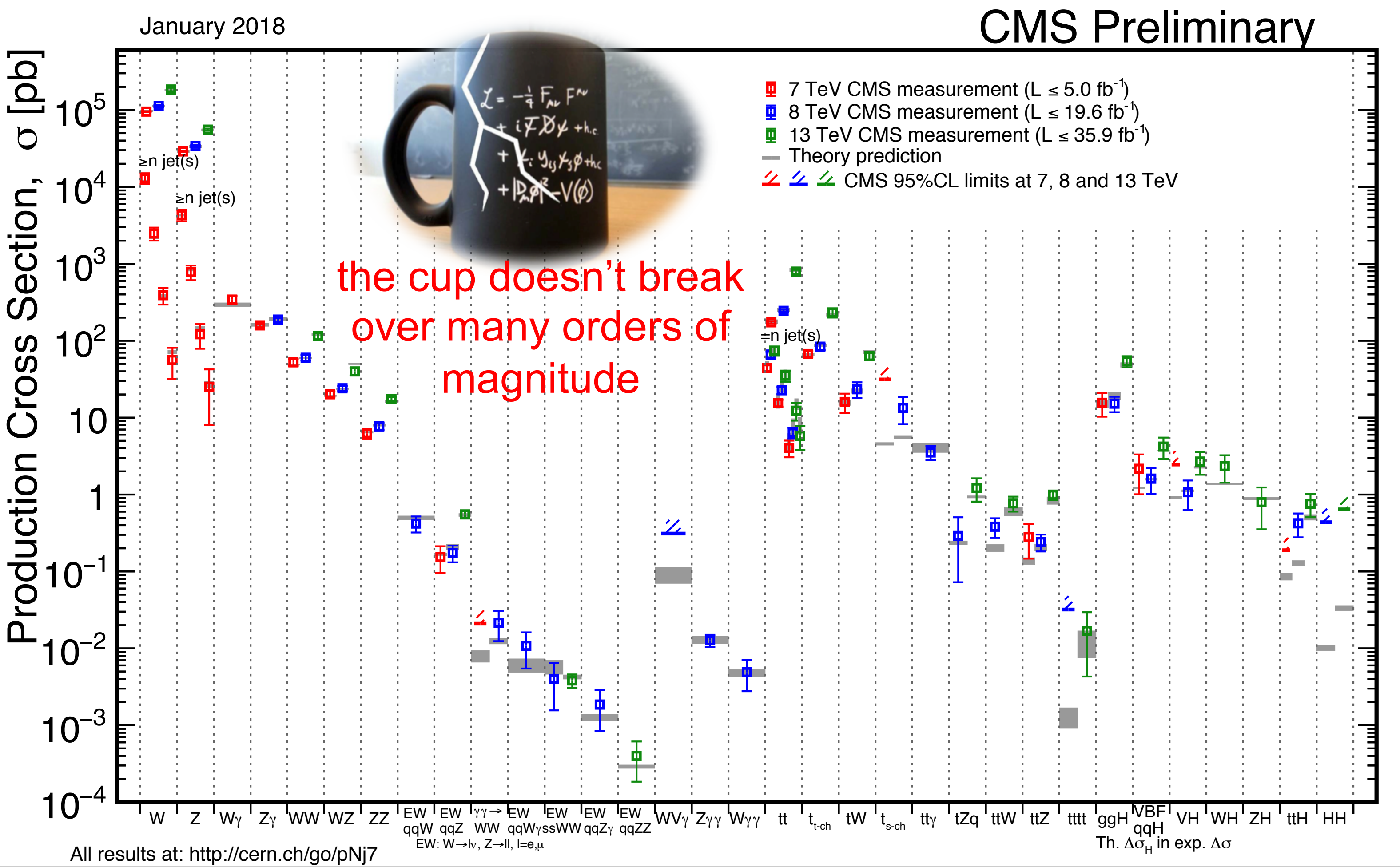
Picture from Flip Tanedo @ Quantum Daires

Some physics results of the LHC – scalar sector





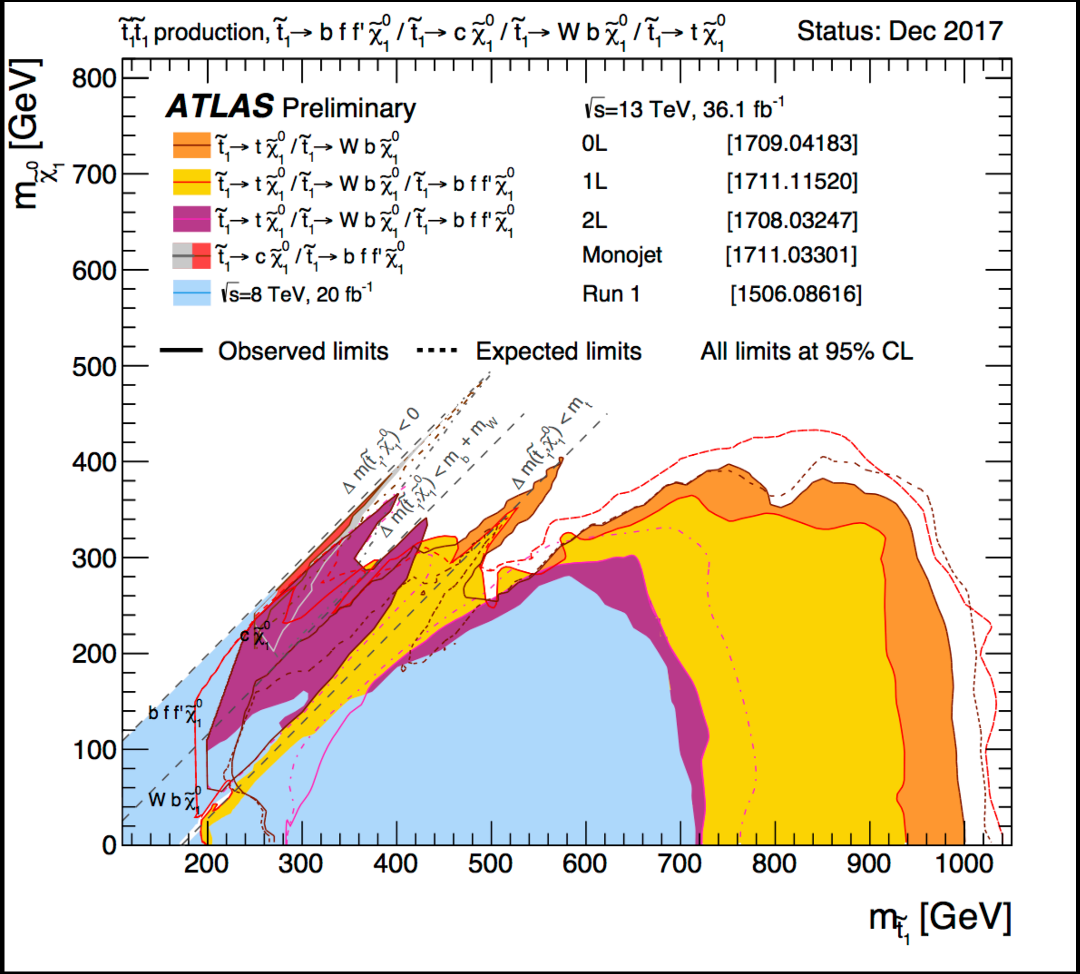
Some physics results of the LHC – Standard Model



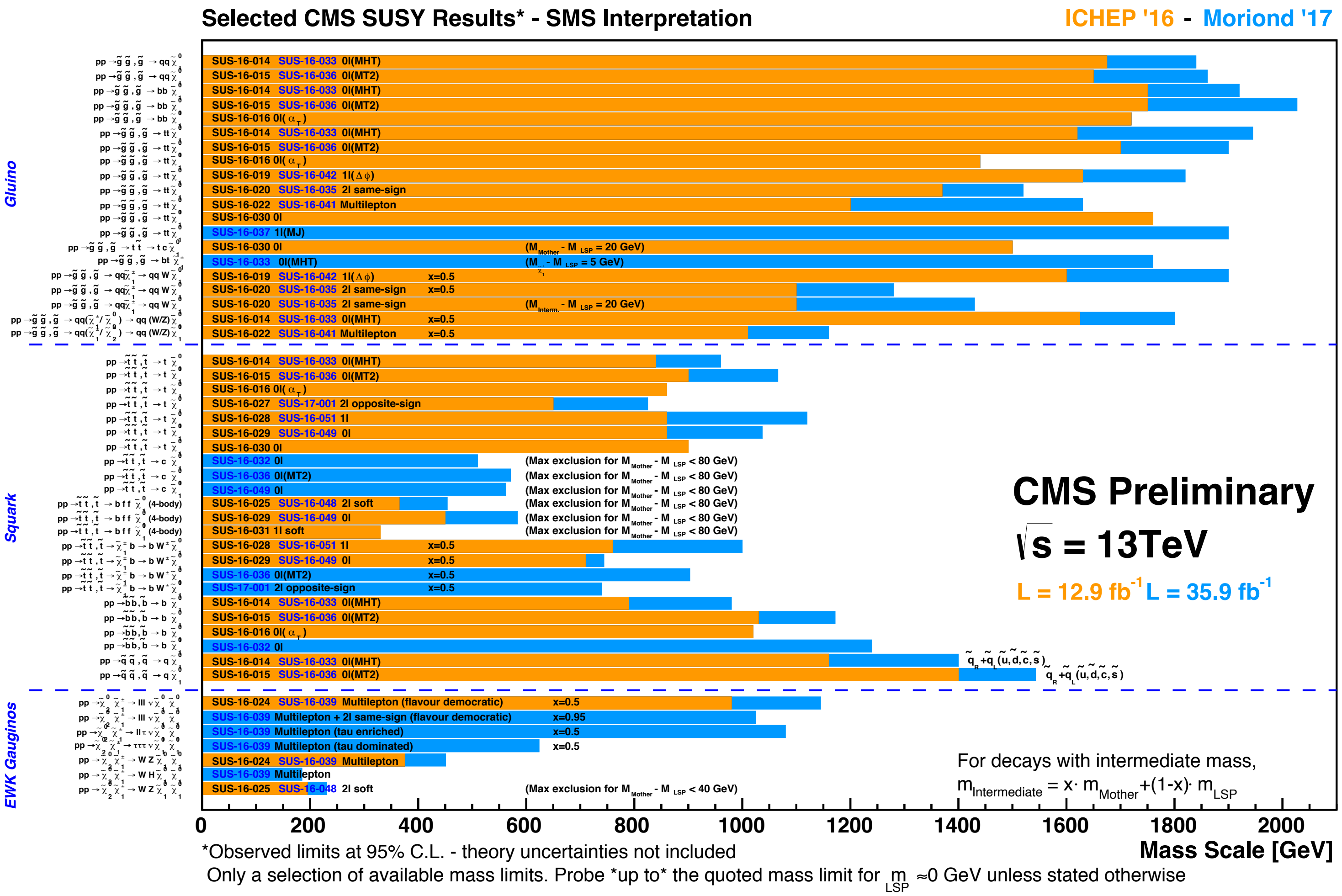
Some physics results of the LHC – SUSY searches

Several strategies to search phenomena of supersymmetry.

The production of a pair of stop quark pairs is searched for in several decay channels.



A broad range of ongoing SUSY searches



ATLAS Exotics Searches* - 95% CL Upper Exclusion Limits

Status: July 2017

ATLAS Preliminary

$\int \mathcal{L}\, dt = (3.2 - 37.0)\ \mathrm{fb}^{-1}$ $\sqrt{s}$ = 8, 13 TeV

	Model	ℓ, γ	Jets†	E_T^{miss}	$\int \mathcal{L}\, dt [\mathrm{fb}^{-1}]$	Limit		Reference
Extra dimensions	ADD $G_{KK} + g/q$	0 e, μ	1 – 4 j	Yes	36.1	M_D 7.75 TeV	$n = 2$	ATLAS-CONF-2017-060
	ADD non-resonant $\gamma\gamma$	2 γ	–	–	36.7	M_S 8.6 TeV	$n = 3$ HLZ NLO	CERN-EP-2017-132
	ADD QBH	–	2 j	–	37.0	M_{th} 8.9 TeV	$n = 6$	1703.09217
	ADD BH high $\sum p_T$	≥ 1 e, μ	≥ 2 j	–	3.2	M_{th} 8.2 TeV	$n = 6$, $M_D = 3$ TeV, rot BH	1606.02265
	ADD BH multijet	–	≥ 3 j	–	3.6	M_{th} 9.55 TeV	$n = 6$, $M_D = 3$ TeV, rot BH	1512.02586
	RS1 $G_{KK} \to \gamma\gamma$	2 γ	–	–	36.7	G_{KK} mass 4.1 TeV	$k/\overline{M}_{Pl} = 0.1$	CERN-EP-2017-132
	Bulk RS $G_{KK} \to WW \to qq\ell\nu$	1 e, μ	1 J	Yes	36.1	G_{KK} mass 1.75 TeV	$k/\overline{M}_{Pl} = 1.0$	ATLAS-CONF-2017-051
	2UED / RPP	1 e, μ	≥ 2 b, ≥ 3 j	Yes	13.2	KK mass 1.6 TeV	Tier (1,1), $\mathcal{B}(A^{(1,1)} \to tt) = 1$	ATLAS-CONF-2016-104
Gauge bosons	SSM $Z' \to \ell\ell$	2 e, μ	–	–	36.1	Z' mass 4.5 TeV		ATLAS-CONF-2017-027
	SSM $Z' \to \tau\tau$	2 τ	–	–	36.1	Z' mass 2.4 TeV		ATLAS-CONF-2017-050
	Leptophobic $Z' \to bb$	–	2 b	–	3.2	Z' mass 1.5 TeV		1603.08791
	Leptophobic $Z' \to tt$	1 e, μ	≥ 1 b, ≥ 1J/2j	Yes	3.2	Z' mass 2.0 TeV	$\Gamma/m = 3\%$	ATLAS-CONF-2016-014
	SSM $W' \to \ell\nu$	1 e, μ	–	Yes	36.1	W' mass 5.1 TeV		1706.04786
	HVT $V' \to WV \to qqqq$ model B	0 e, μ	2 J	–	36.7	V' mass 3.5 TeV	$g_V = 3$	CERN-EP-2017-147
	HVT $V' \to WH/ZH$ model B	multi-channel			36.1	V' mass 2.93 TeV	$g_V = 3$	ATLAS-CONF-2017-055
	LRSM $W'_R \to tb$	1 e, μ	2 b, 0-1 j	Yes	20.3	W' mass 1.92 TeV		1410.4103
	LRSM $W'_R \to tb$	0 e, μ	≥ 1 b, 1 J	–	20.3	W' mass 1.76 TeV		1408.0886
CI	CI $qqqq$	–	2 j	–	37.0	Λ 21.8 TeV η^-_{LL}		1703.09217
	CI $\ell\ell qq$	2 e, μ	–	–	36.1	Λ 40.1 TeV η^-_{LL}		ATLAS-CONF-2017-027
	CI $uutt$	2(SS)/≥3 e,μ	≥1 b, ≥1 j	Yes	20.3	Λ 4.9 TeV	$\lvert C_{RR} \rvert = 1$	1504.04605
DM	Axial-vector mediator (Dirac DM)	0 e, μ	1 – 4 j	Yes	36.1	m_{med} 1.5 TeV	g_q=0.25, g_χ=1.0, $m(\chi) < 400$ GeV	ATLAS-CONF-2017-060
	Vector mediator (Dirac DM)	0 e, μ, 1 γ	≤ 1 j	Yes	36.1	m_{med} 1.2 TeV	g_q=0.25, g_χ=1.0, $m(\chi) < 480$ GeV	1704.03848
	$VV\chi\chi$ EFT (Dirac DM)	0 e, μ	1 J, ≤ 1 j	Yes	3.2	M_* 700 GeV	$m(\chi) < 150$ GeV	1608.02372
LQ	Scalar LQ 1st gen	2 e	≥ 2 j	–	3.2	LQ mass 1.1 TeV	$\beta = 1$	1605.06035
	Scalar LQ 2nd gen	2 μ	≥ 2 j	–	3.2	LQ mass 1.05 TeV	$\beta = 1$	1605.06035
	Scalar LQ 3rd gen	1 e, μ	≥1 b, ≥3 j	Yes	20.3	LQ mass 640 GeV	$\beta = 0$	1508.04735
Heavy quarks	VLQ $TT \to Ht + X$	0 or 1 e, μ	≥ 2 b, ≥ 3 j	Yes	13.2	T mass 1.2 TeV	$\mathcal{B}(T \to Ht) = 1$	ATLAS-CONF-2016-104
	VLQ $TT \to Zt + X$	1 e, μ	≥ 1 b, ≥ 3 j	Yes	36.1	T mass 1.16 TeV	$\mathcal{B}(T \to Zt) = 1$	1705.10751
	VLQ $TT \to Wb + X$	1 e, μ	≥ 1 b, ≥ 1J/2j	Yes	36.1	T mass 1.35 TeV	$\mathcal{B}(T \to Wb) = 1$	CERN-EP-2017-094
	VLQ $BB \to Hb + X$	1 e, μ	≥ 2 b, ≥ 3 j	Yes	20.3	B mass 700 GeV	$\mathcal{B}(B \to Hb) = 1$	1505.04306
	VLQ $BB \to Zb + X$	2/≥3 e, μ	≥2/≥1 b	–	20.3	B mass 790 GeV	$\mathcal{B}(B \to Zb) = 1$	1409.5500
	VLQ $BB \to Wt + X$	1 e, μ	≥ 1 b, ≥ 1J/2j	Yes	36.1	B mass 1.25 TeV	$\mathcal{B}(B \to Wt) = 1$	CERN-EP-2017-094
	VLQ $QQ \to WqWq$	1 e, μ	≥ 4 j	Yes	20.3	Q mass 690 GeV		1509.04261
Excited fermions	Excited quark $q^* \to qg$	–	2 j	–	37.0	q^* mass 6.0 TeV	only u^* and d^*, $\Lambda = m(q^*)$	1703.09127
	Excited quark $q^* \to q\gamma$	1 γ	1 j	–	36.7	q^* mass 5.3 TeV	only u^* and d^*, $\Lambda = m(q^*)$	CERN-EP-2017-148
	Excited quark $b^* \to bg$	–	1 b, 1 j	–	13.3	b^* mass 2.3 TeV		ATLAS-CONF-2016-060
	Excited quark $b^* \to Wt$	1 or 2 e, μ	1 b, 2-0 j	Yes	20.3	b^* mass 1.5 TeV	$f_g = f_L = f_R = 1$	1510.02664
	Excited lepton ℓ^*	3 e, μ	–	–	20.3	ℓ^* mass 3.0 TeV	$\Lambda = 3.0$ TeV	1411.2921
	Excited lepton ν^*	3 e, μ, τ	–	–	20.3	ν^* mass 1.6 TeV	$\Lambda = 1.6$ TeV	1411.2921
Other	LRSM Majorana ν	2 e, μ	2 j	–	20.3	N^0 mass 2.0 TeV	$m(W_R) = 2.4$ TeV, no mixing	1506.06020
	Higgs triplet $H^{\pm\pm} \to \ell\ell$	2,3,4 e, μ (SS)	–	–	36.1	$H^{\pm\pm}$ mass 870 GeV	DY production	ATLAS-CONF-2017-053
	Higgs triplet $H^{\pm\pm} \to \ell\tau$	3 e, μ, τ	–	–	20.3	$H^{\pm\pm}$ mass 400 GeV	DY production, $\mathcal{B}(H^{\pm\pm}_L \to \ell\tau) = 1$	1411.2921
	Monotop (non-res prod)	1 e, μ	1 b	Yes	20.3	spin-1 invisible particle mass 657 GeV	$a_{\text{non-res}} = 0.2$	1410.5404
	Multi-charged particles	–	–	–	20.3	multi-charged particle mass 785 GeV	DY production, $\lvert q \rvert = 5e$	1504.04188
	Magnetic monopoles	–	–	–	7.0	monopole mass 1.34 TeV	DY production, $\lvert g \rvert = 1 g_D$, spin 1/2	1509.08059

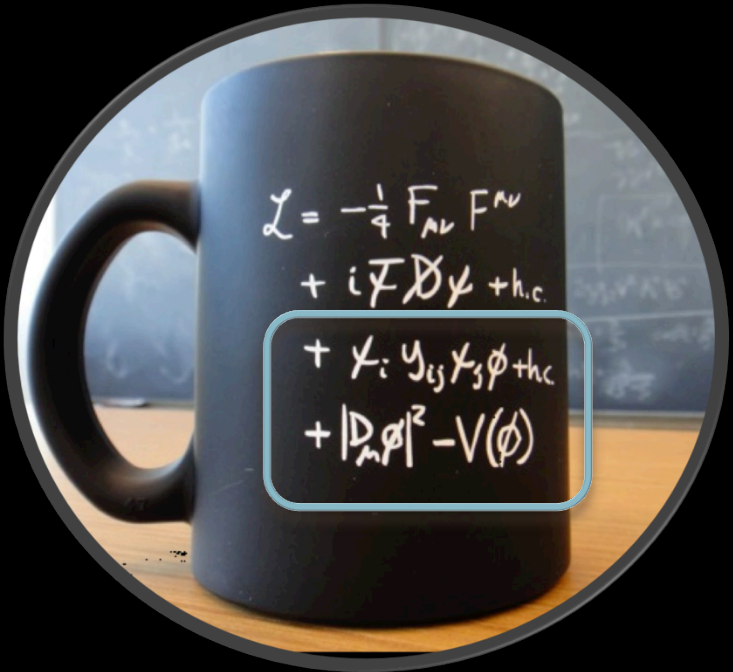
$\sqrt{s}$ = 8 TeV $\sqrt{s}$ = 13 TeV

10^{-1} 1 10 Mass scale [TeV]

*Only a selection of the available mass limits on new states or phenomena is shown.

†Small-radius (large-radius) jets are denoted by the letter j (J).

The role of the LHC

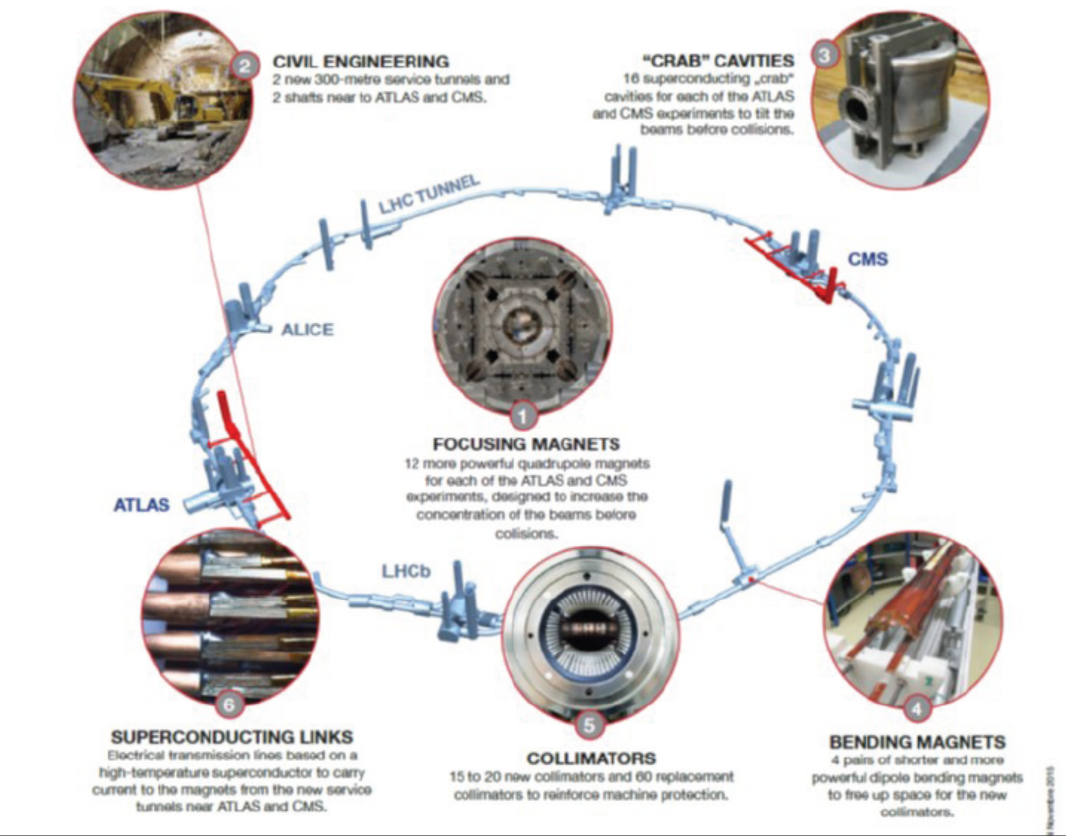


connection

from a BETTER description
towards a more PROFOUND
understanding

new physics

High-Luminosity LHC: 300/fb (by 2023) → 3000/fb (by 2037)



HiLumi HL-LHC PROJECT

New IR-quads Nb_3Sn (inner triplets)

New 11 T Nb_3Sn (short) dipoles

Collimation upgrade

Cryogenics upgrade

Crab Cavities

Cold powering

Machine protection

Civil engineering

Formal approval by CERN Council (June 2016)
Cost to Completion : 950 MCHF (material)

Detector upgrades are well planned as well

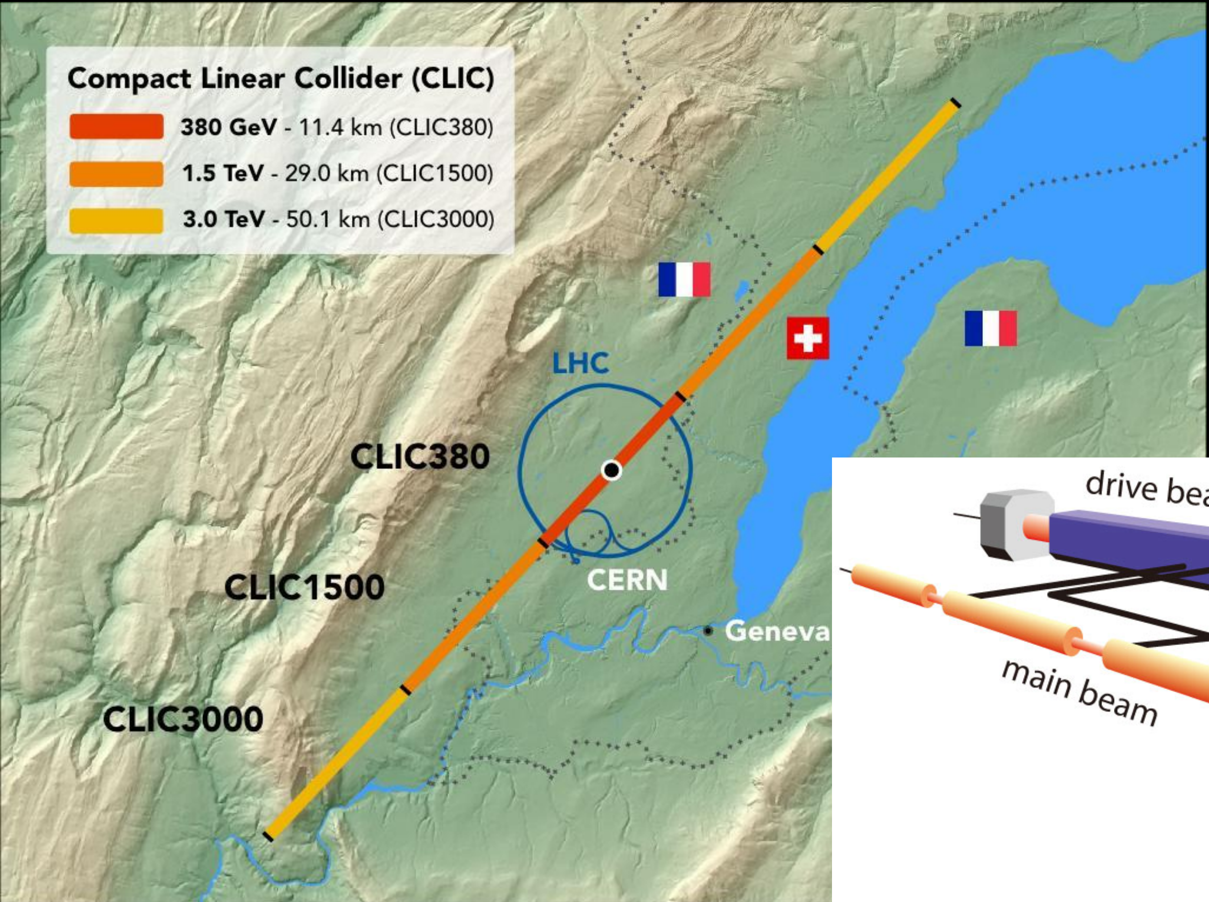
The 2013 European Particle Physics Strategy

"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."

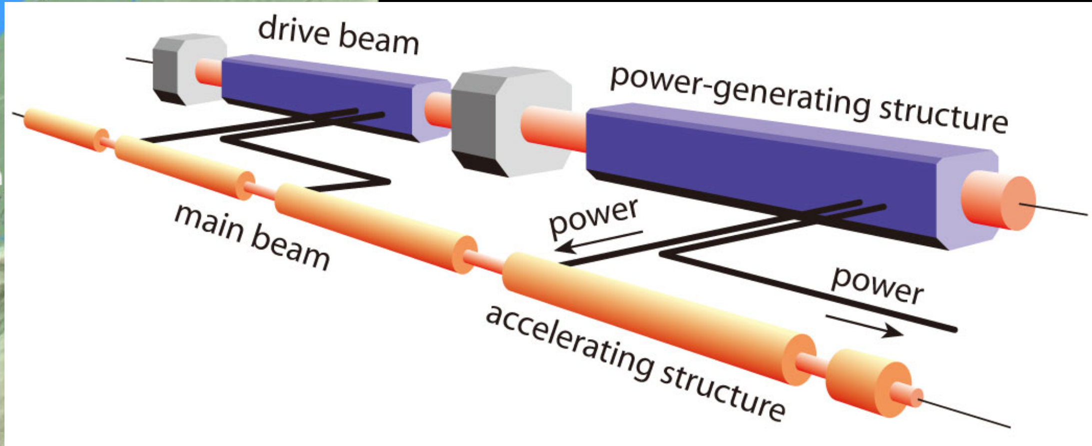
Compact Linear Collider (CLIC)

CERN-2016-004

arXiv:1608.07537



CLIC aims at an acceleration gradient of 100 MV/m. A drive beam is decelerated in dedicated Power Extraction and Transfer Structures (PETS), and the generated RF power is transferred to the main beam.



CLIC – some physics highlights

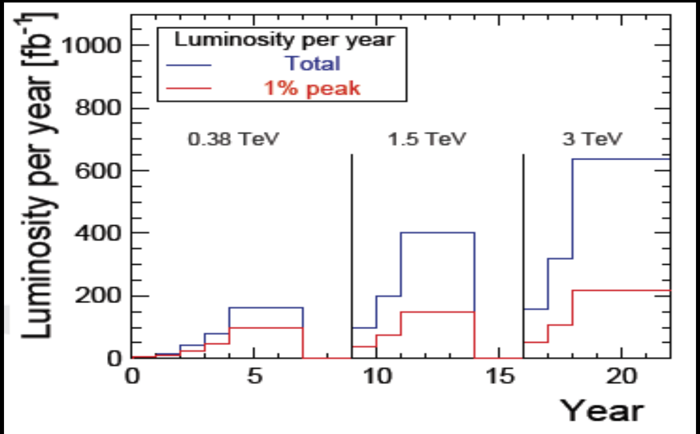
P. Burrows @ ICFA Seminar 2017

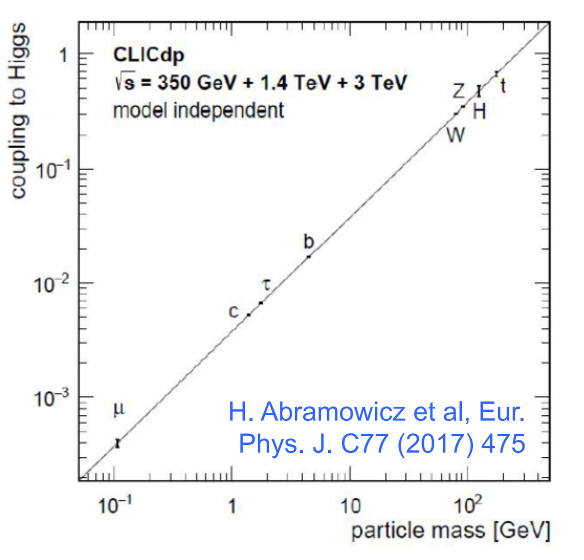
Higgs characterization

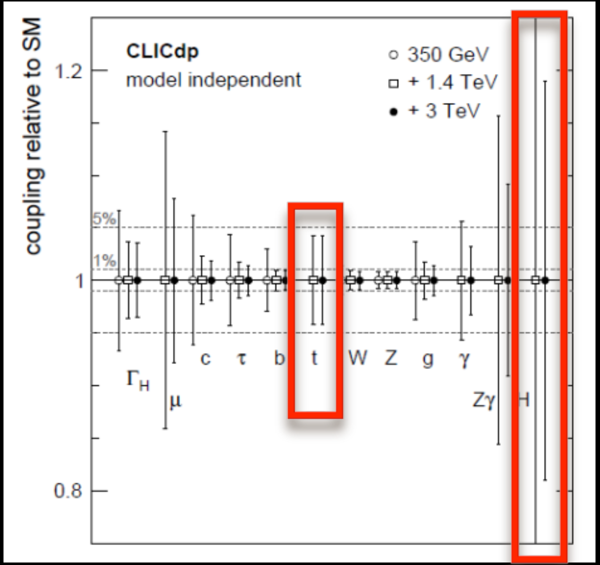
Precision on top quark Yukawa of ~4% and Higgs self-coupling of ~20%.

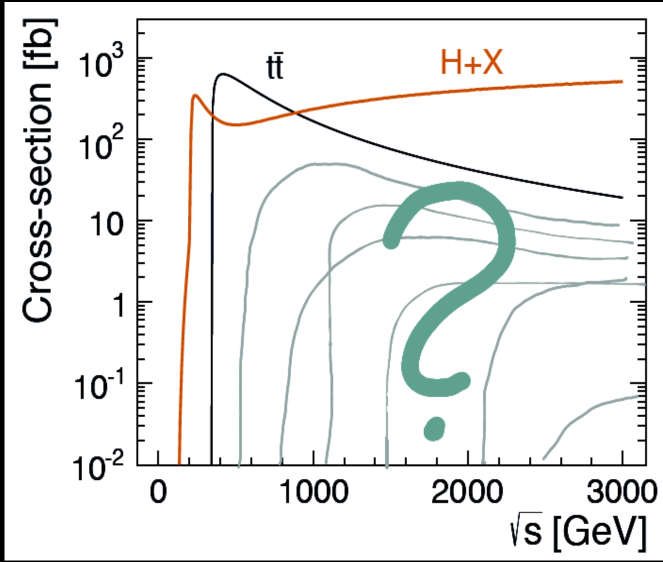
Staged approach

First period around the top quark pair threshold, thereafter increase the energy up to 3 TeV to search for new phenomena.









CLIC roadmap

2013 - 2019 Development Phase

Development of a Project Plan for a staged CLIC implementation in line with LHC results; technical developments with industry, performance studies for accelerator parts and systems, detector technology demonstrators

2020 - 2025 Preparation Phase

Finalisation of implementation parameters, preparation for industrial procurement, Drive Beam Facility and other system verifications, Technical Proposal of the experiment, site authorisation

2026 - 2034 Construction Phase

Construction of the first CLIC accelerator stage compatible with implementation of further stages; construction of the experiment; hardware commissioning

2019 - 2020 Decisions

2025 Construction Start

2035 First Beams

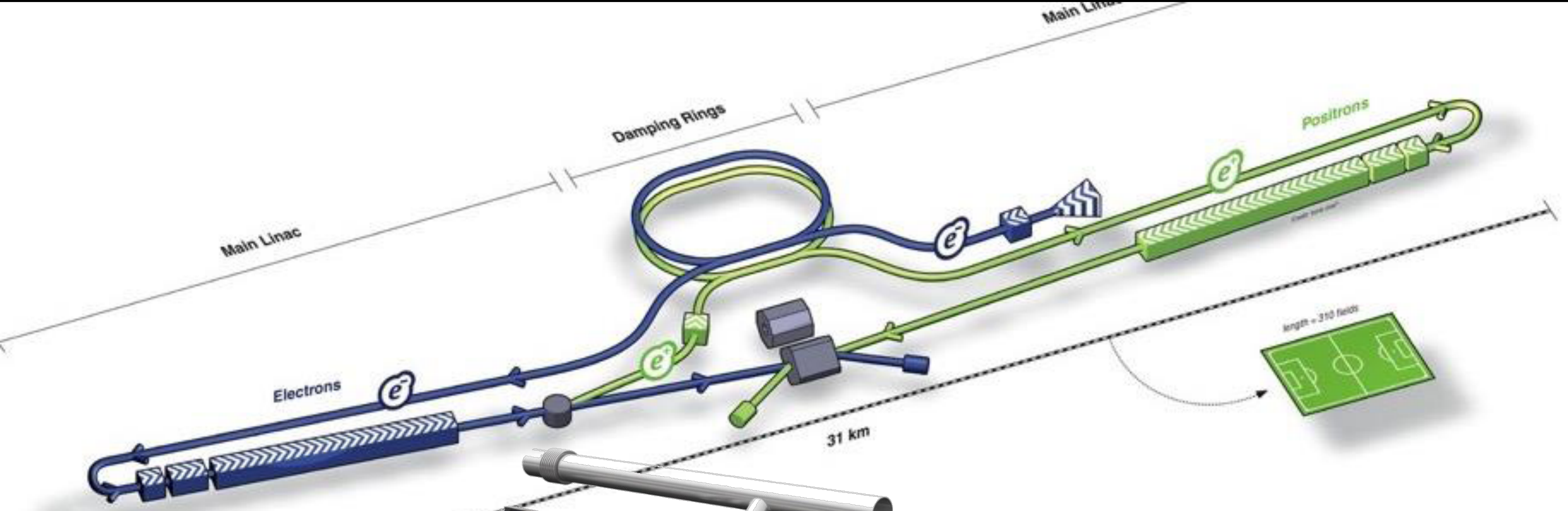
CLIC working on an implementation plan & cost reduction as input to European Particle Physics Strategy

The 2013 European Particle Physics Strategy

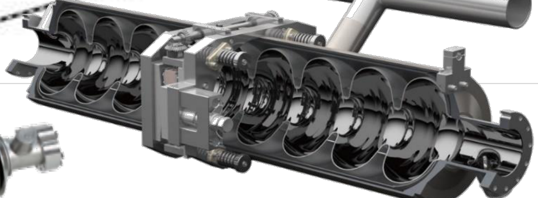
"There is a strong scientific case for an electron-positron collider, … Europe looks forward to a proposal from Japan to discuss a possible participation."

Waiting for a statement from the Japanese Government for their willingness to host ILC before end of 2018

International Linear Collider (ILC)

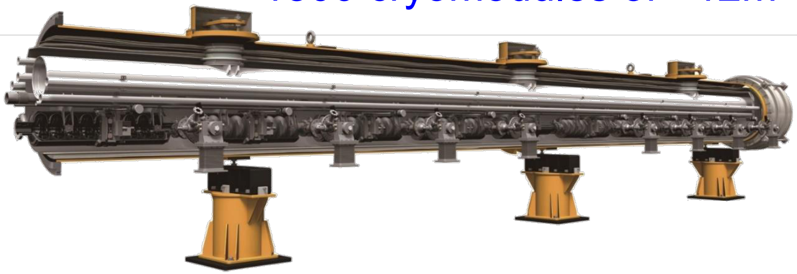


~16000 superconductive cavities of ~1m



in Liquid He vessel

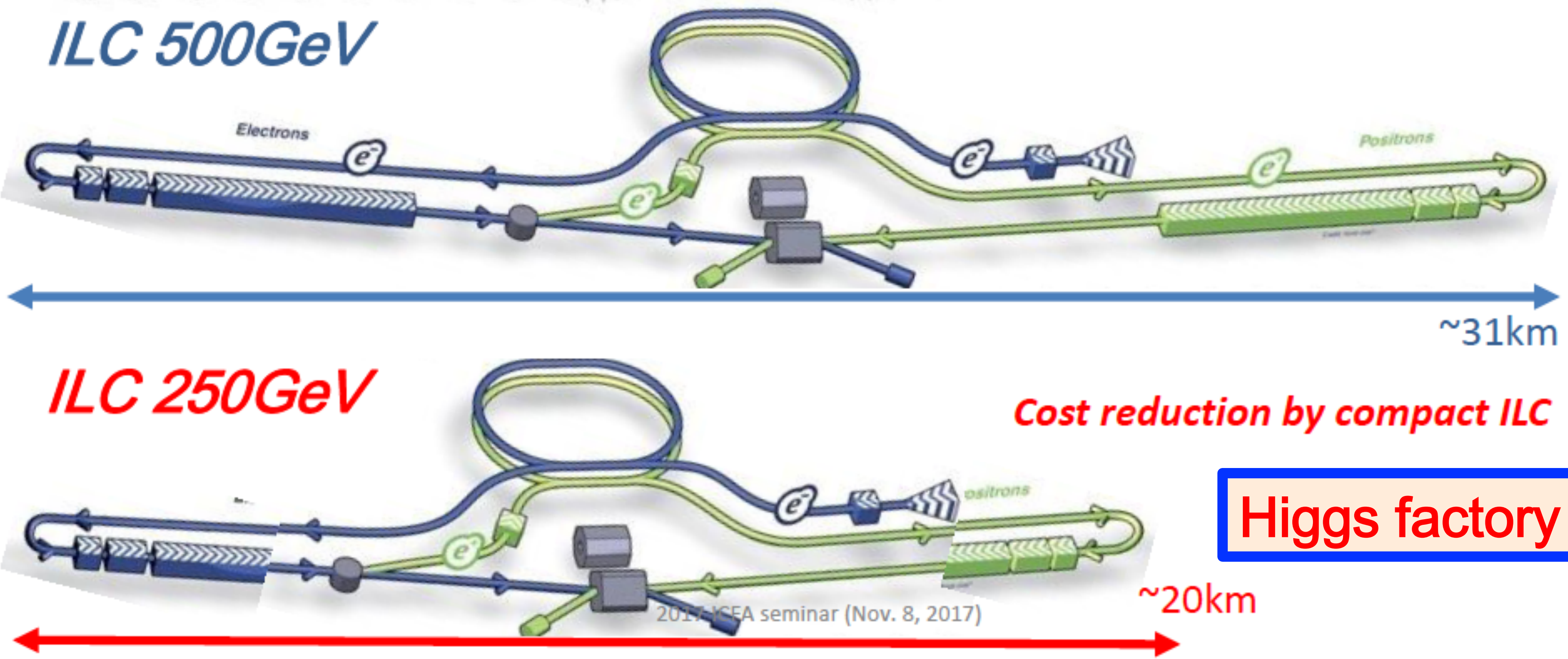
~1800 cryomodules of ~12m



International Linear Collider (ILC) – 500 GeV → 250 GeV

Cost reduction both by scaling from 500 GeV to 250 GeV with a focus on Higgs physics, and by technological innovations on the superconducting materials (Nb) and cavity construction (surface process).

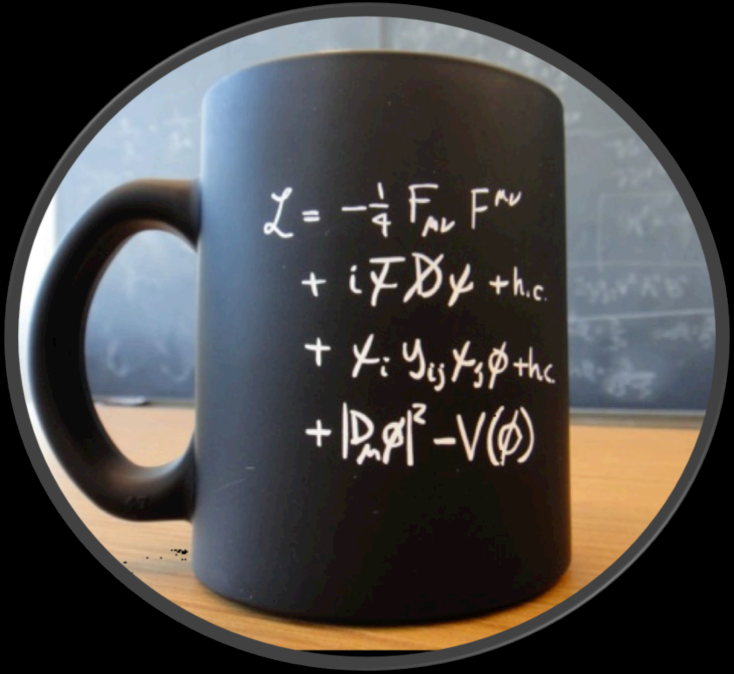
Physics Case for the 250 GeV Stage of the ILC, arXiv:1710.07621



Higgs factory

International Linear Collider (ILC) – physics potential

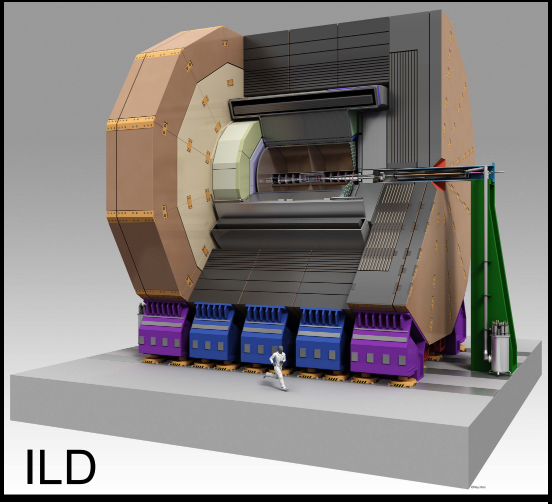
	ILC250 2 ab^{-1} w. pol.	ILC250+500 full ILC 250+500 GeV
$g(hb\bar{b})$	1.1	0.58
$g(hc\bar{c})$	1.9	1.2
$g(hgg)$	1.7	0.95
$g(hWW)$	0.67	0.34
$g(h\tau\tau)$	1.2	0.74
$g(hZZ)$	0.68	0.35
$g(h\gamma\gamma)$	1.2	1.0
$g(h\mu\mu)$	5.6	5.1
$g(hbb)/g(hWW)$	0.88	0.46
$g(hWW)/g(hZZ)$	0.07	0.05
Γ_h	2.5	1.6
$BR(h \to inv)$	0.32	0.29
$BR(h \to other)$	1.6	1.2



With linear colliders one has excellent zoom-in capabilities for many terms

Physics Case for the 250 GeV Stage of the ILC, arXiv:1710.07621

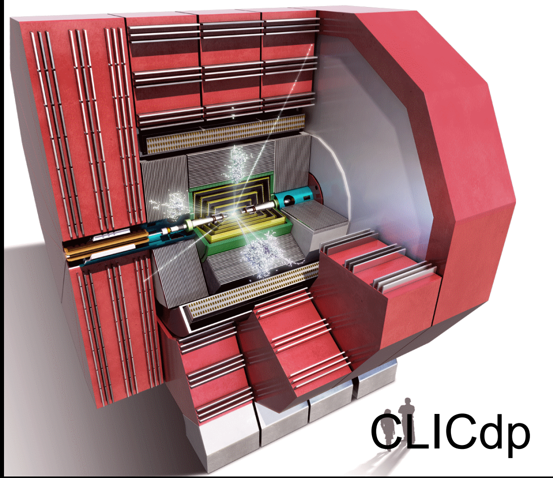
Linear Collider detector & physics studies: Europe engaged

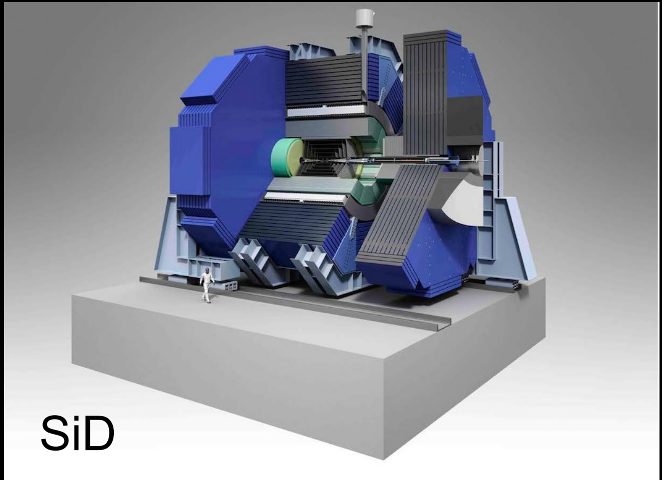


The LCC physics & detector directorate is responsible for activities that advance the physics and detectors of the linear collider.

Three detector concepts:

- ILD: 71 institutions mostly from the European Region
- SiD: 24 institutions many from the European Region
- CLICdp: 29 institutions mostly from the European Region



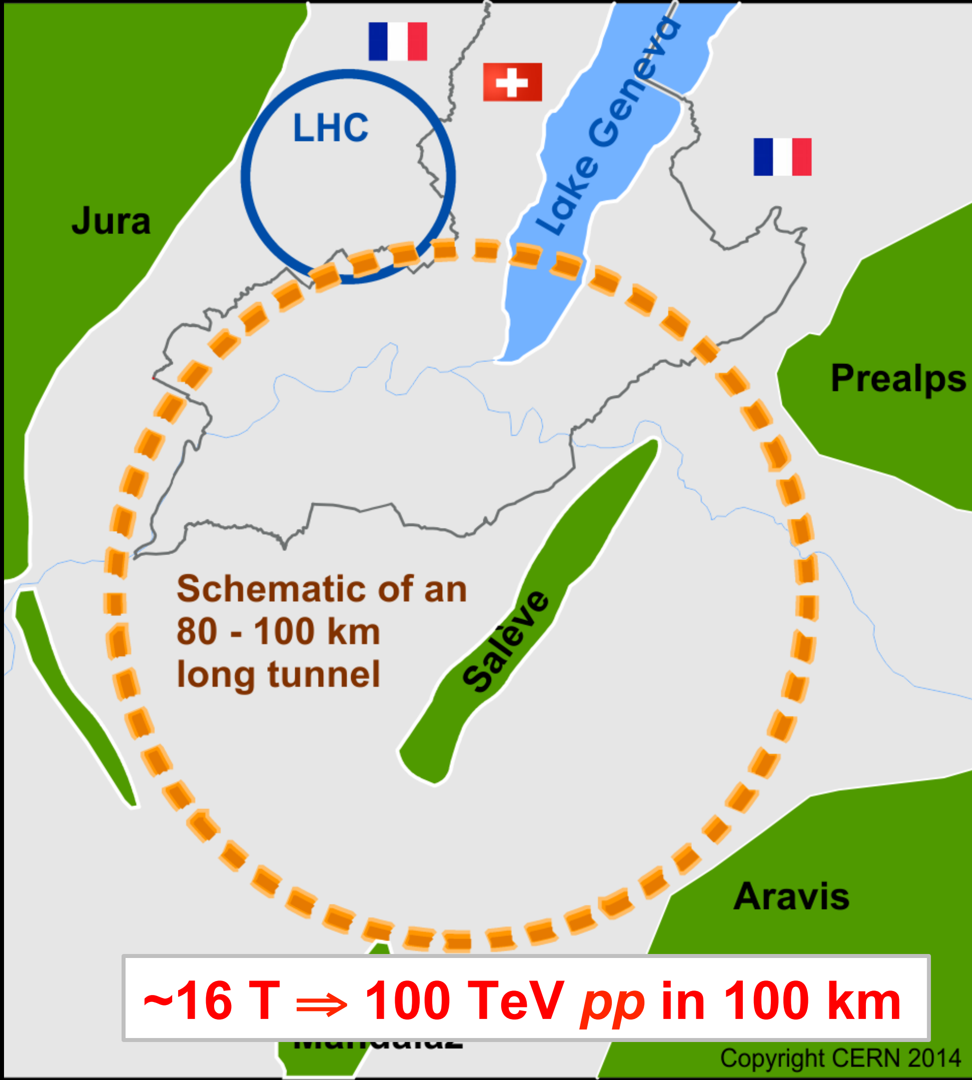


Three detector R&D groups:

- CALICE: 57 institutions mostly from the European Region
- LCTPC: 32 institutions many from the European Region
- FCAL: 14 institutions mostly from the European Region

Future Circular Collider (FCC)

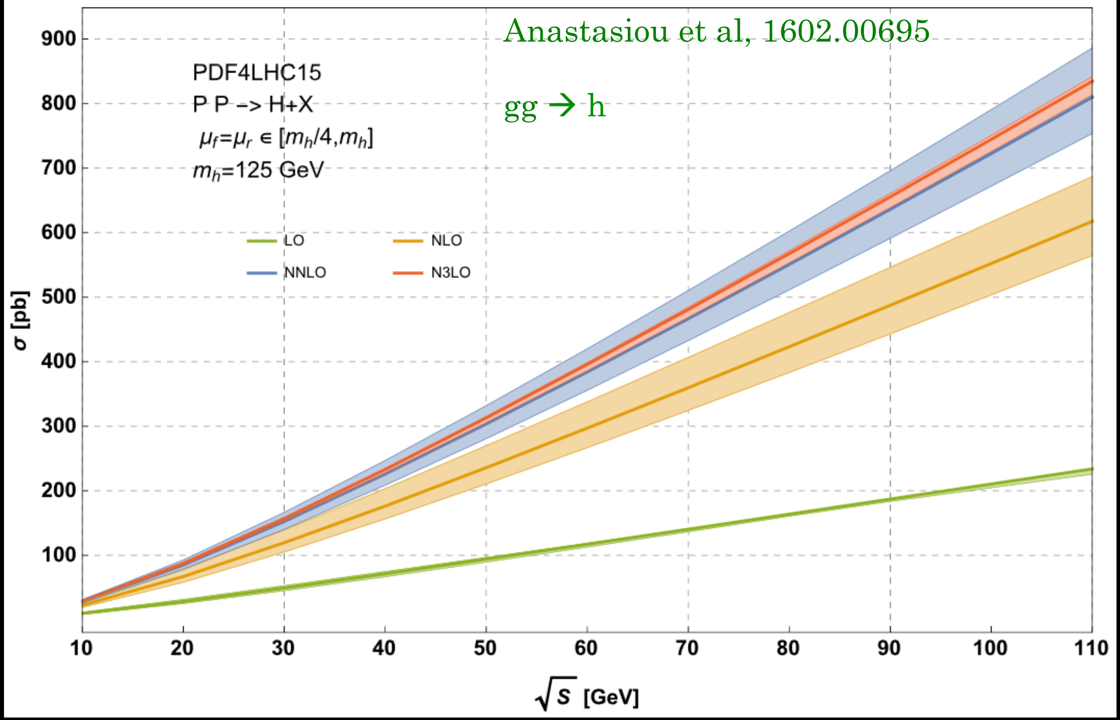
- ***pp*-collider (*FCC-hh*)**
  main emphasis, defining infrastructure requirements
- **e^+e^- collider (*FCC-ee*)**
  as potential first step
- **HE-LHC** with *FCC-hh* technology
- ***p-e* collider (*FCC-he*)** option
- **$\mu\mu$ colider (*FCC-$\mu\mu$*)** option



Future Circular Collider (FCC) – proton collider

Higgs production

Compared to LHC at 14 TeV the cross section increases with a factor of about 16 at NNNLO. Together with a larger luminosity, one can expect 60-400x more events.



Top Yukawa coupling

Measurement to 1% precision

Higgs self-coupling

Measurement to 3-5% precision

Higgs invisible decay Branching Ratio

Sensitivity down to 3-5 x 10^{-4}

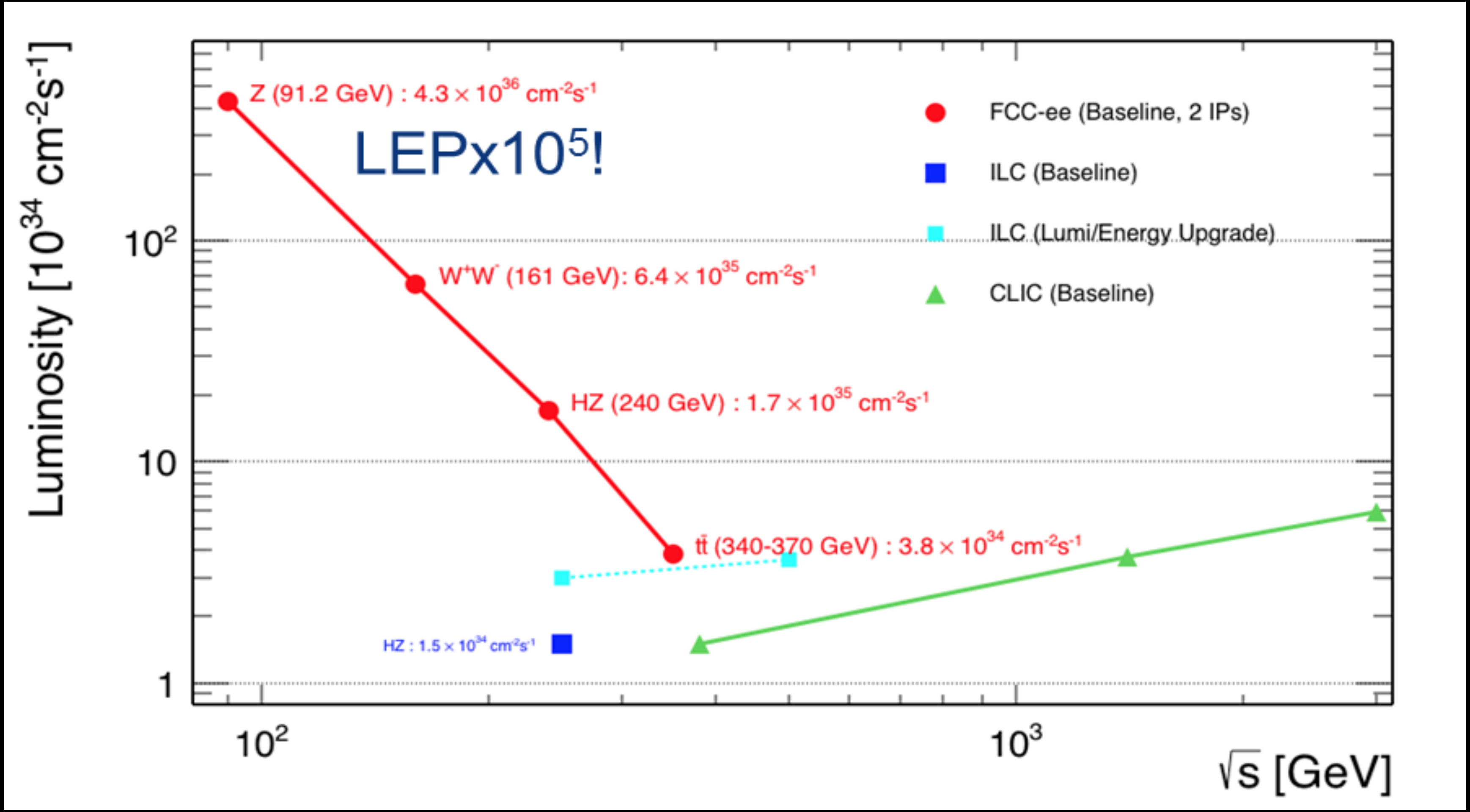
Top quark production

Cross section increases x35 compared to LHC at 14 TeV, and might collect up to 10^{12} top quarks

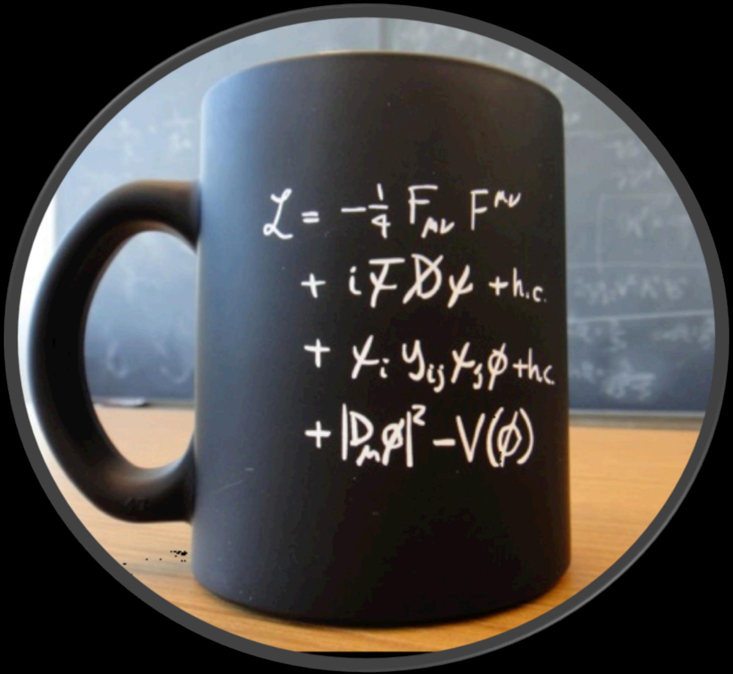
New physics phenomena

In general direct sensitivity to processes with mass scales up to 10-40 TeV.

Future Circular Collider (FCC) – lepton collider luminosities



FCC – some physics objectives

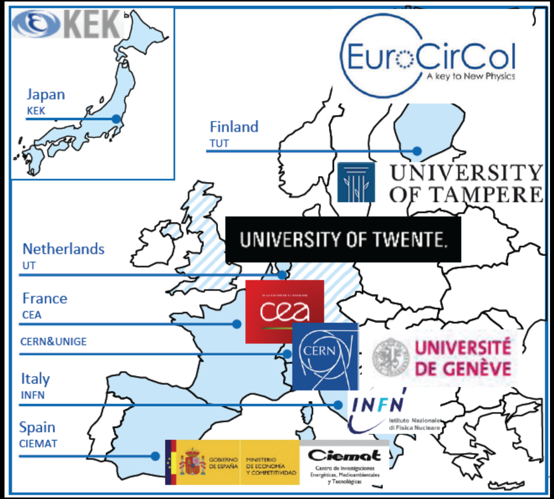


extreme zoom-in capabilities
for about all terms

SC Magnet R&D – *16 T magnets would allow doubling the energy of the LHC machine (HE-LHC)*

EuroCirCol WP5 (until 2019)

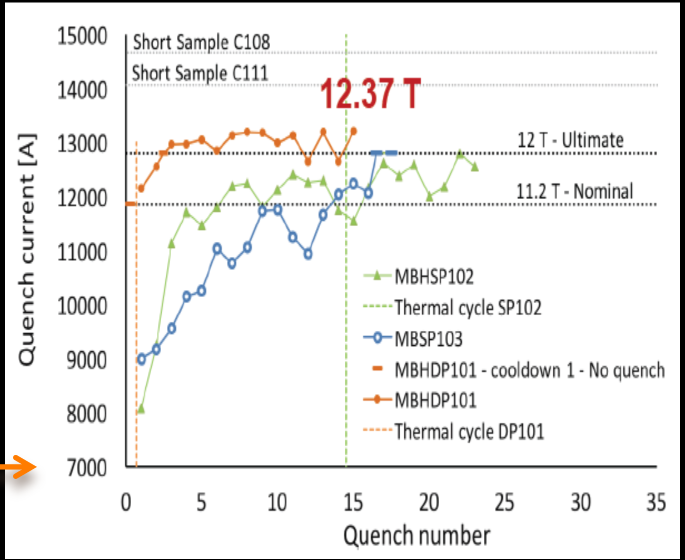
Feed the FCC CDR with a baseline design and a cost model for 16 T magnets

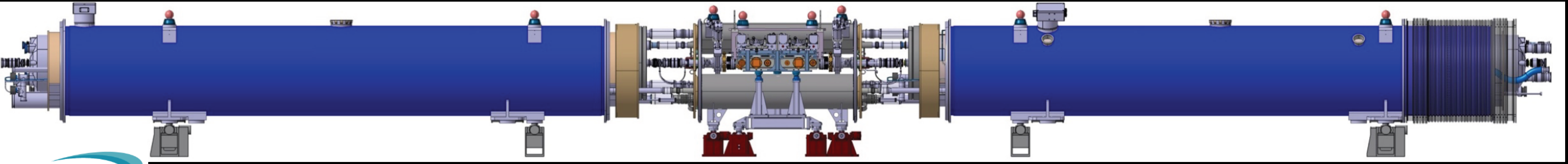


HiLumi LHC

To make space for the new HL-LHC collimators, replace a standard dipole by a pair of shorter 11 T dipoles producing the same integrated field

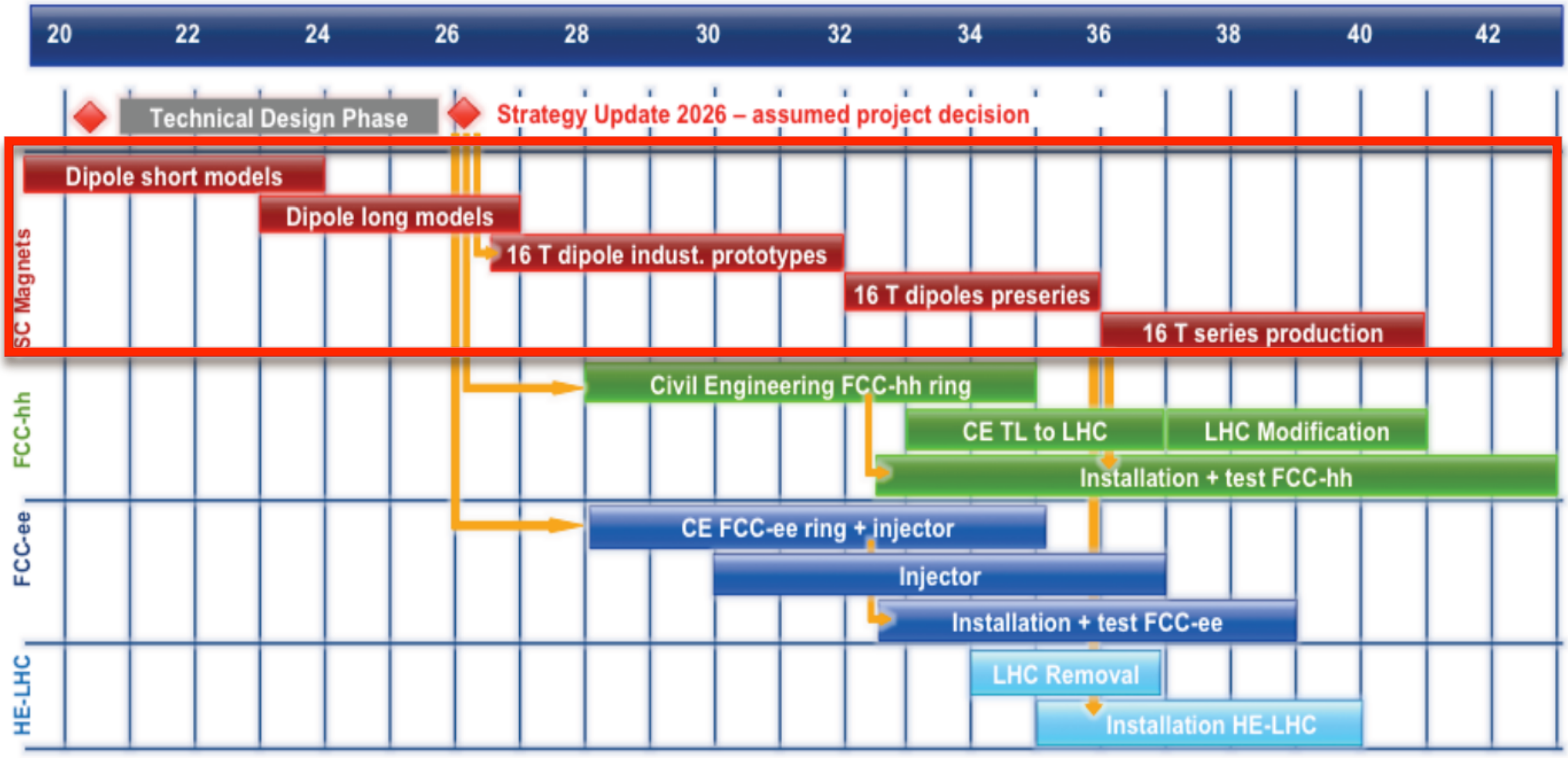
demonstrator short dipoles perform well





HiLumi HL-LHC PROJECT

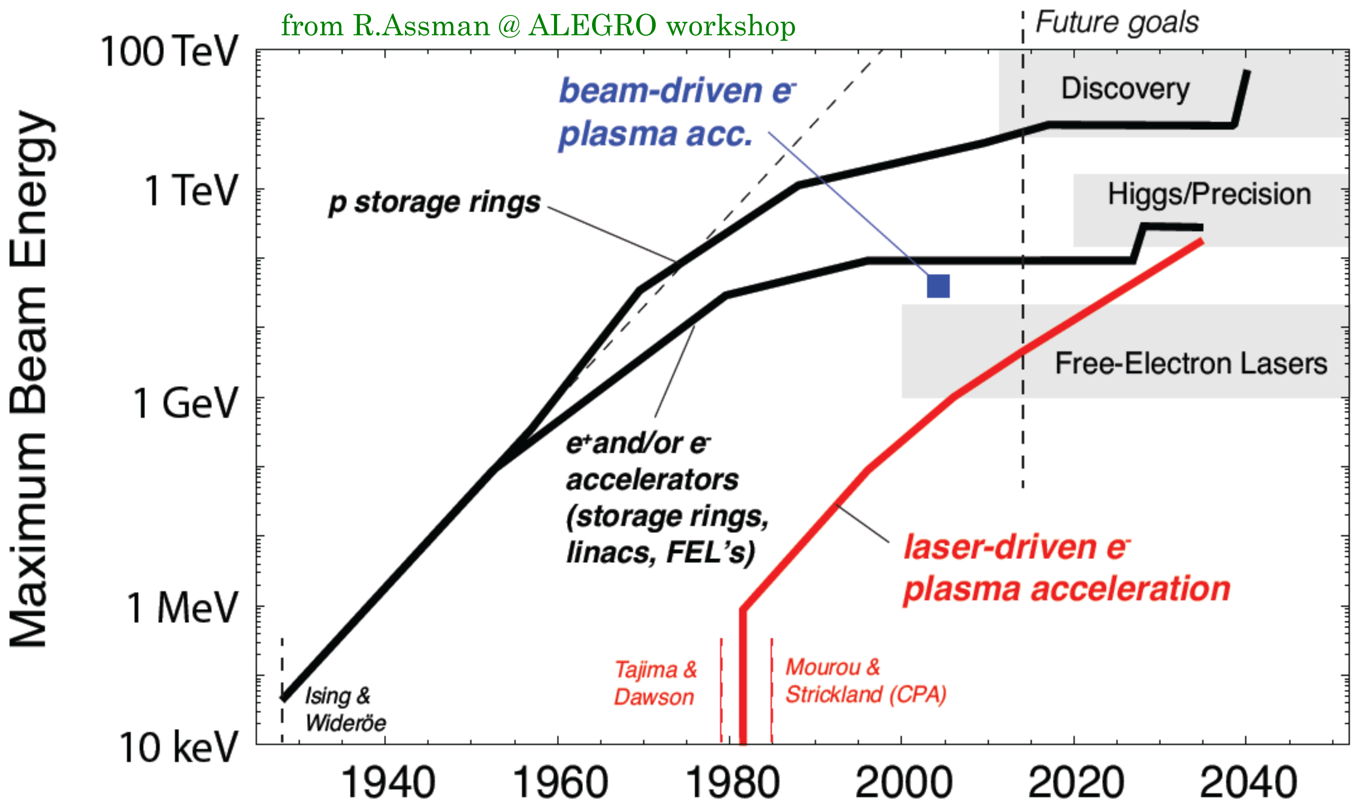
Future Circular Collider (FCC)



Accelerator R&D – Advanced Novel Accelerators (ICFA Panel)

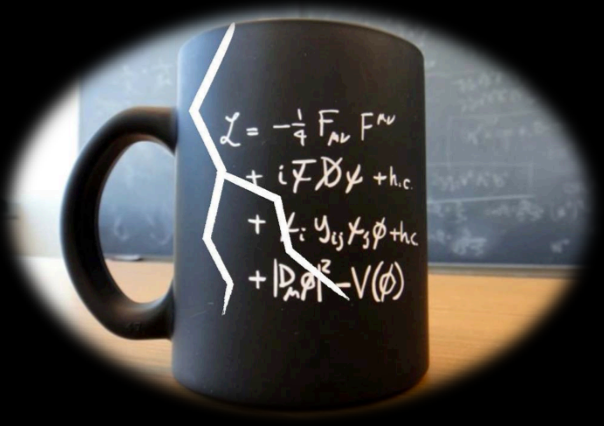
ALEGRO (Advanced LinEar collider study GROup, for a multi-TeV Advanced Linear Collider) Workshop (March 2018 in Oxford): http://www.physics.ox.ac.uk/confs/alegro2018/index.asp

The objective of this first ALEGRO workshop was to prepare and deliver, by the end of 2018, a document detailing the international roadmap and strategy of Advanced Novel Accelerators (ANAs) with clear priorities as input for the European Particle Physics Strategy Update.



The 2013 European Particle Physics Strategy

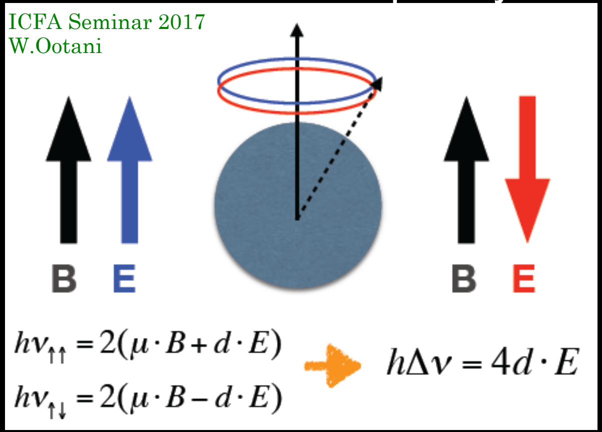
"Experiments studying quark flavour physics, dipole moments, charged-lepton violation and performing other precision measurements ... with neutrons, muons and antiprotons may give access to higher energy scales than direct particle production ... They can be based in national laboratories, with a moderate cost … Experiments in Europe with unique reach should be supported, as well as participation in experiments in other regions of the world."



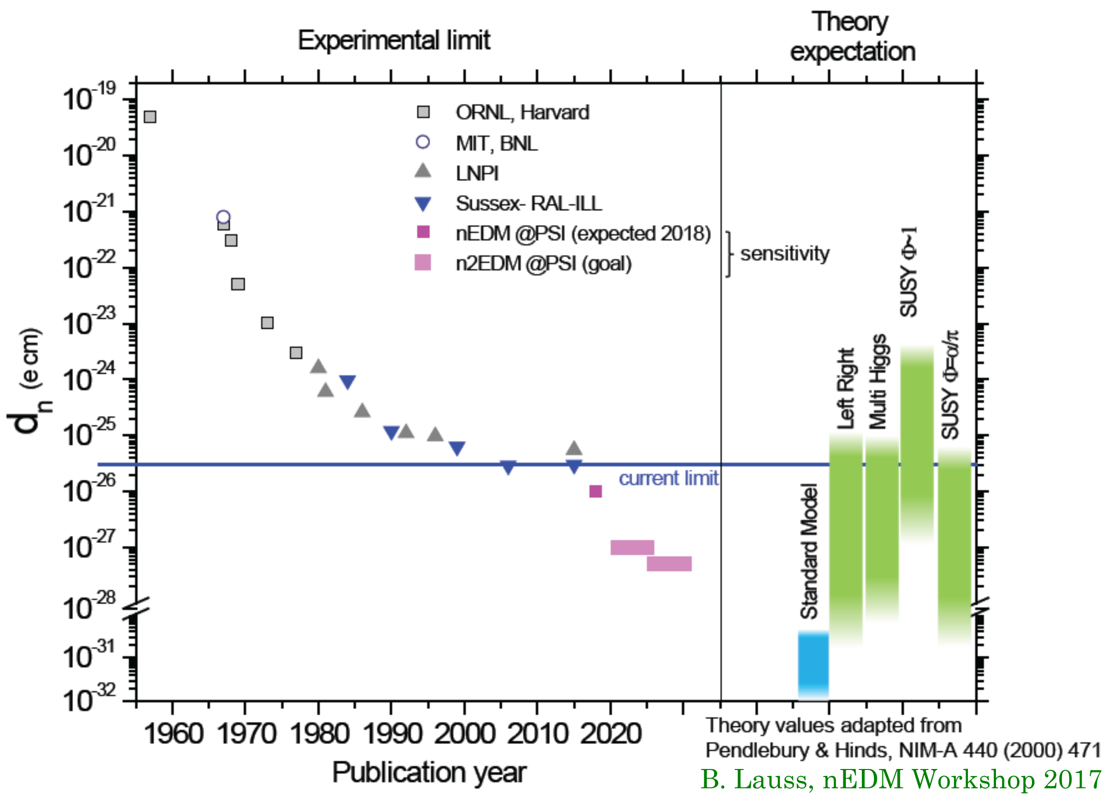
Electric Dipole Moment (EDM)

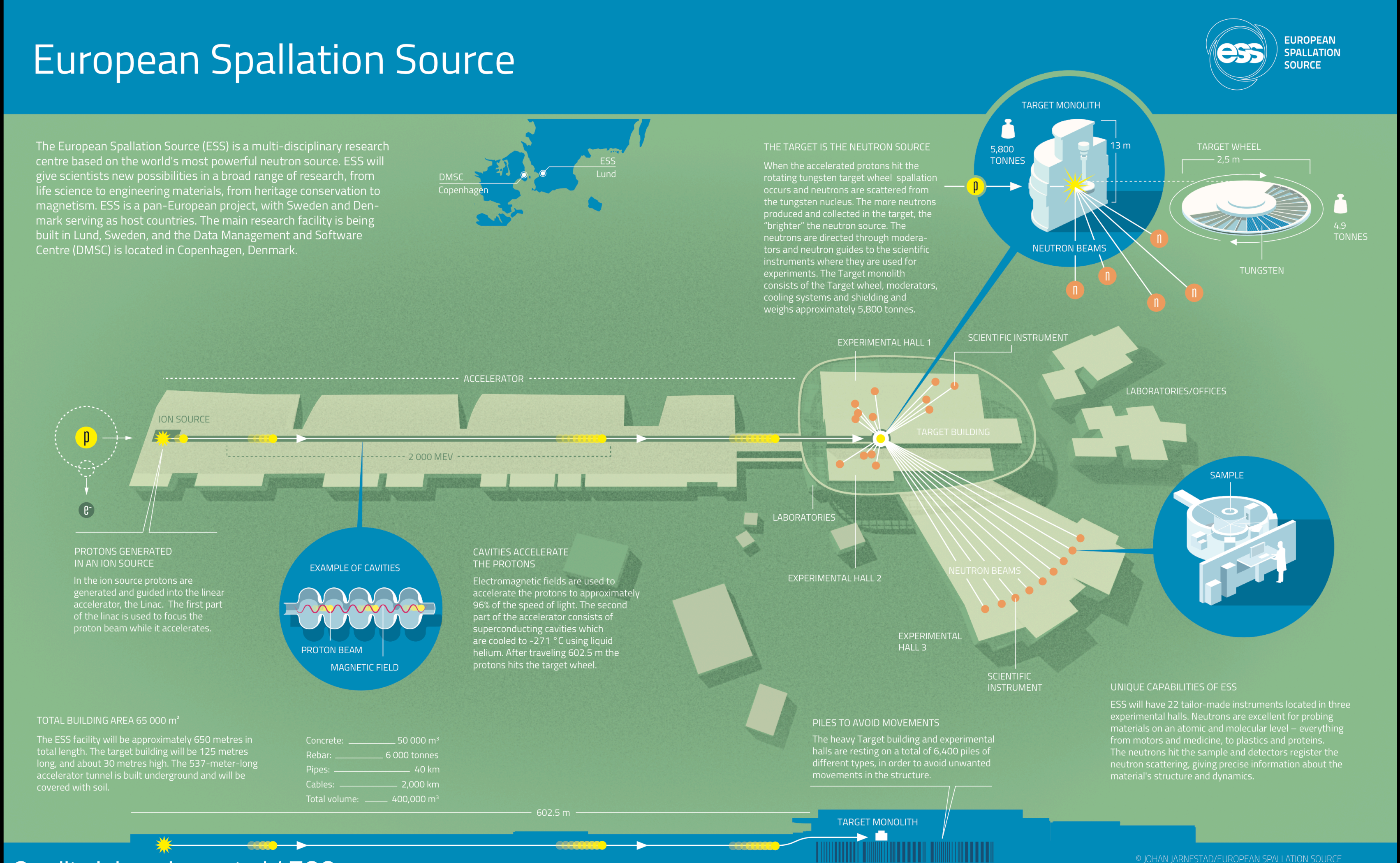
Separation of particle charge along angular momentum axis.
The EDM in the Standard Model is negligible (SM EDM electron 10^{-38} e-cm, best limit is 8.7 x 10^{-29} e-cm at 90% CL), if non-zero it violates symmetries like P, T, CP.

Measure Larmor frequency shift



Variety of systems used from neutrons and electrons to atoms and molecules.





Credit: Johan Jarnestad / ESS

Aerial view October 2017

Construction Financing

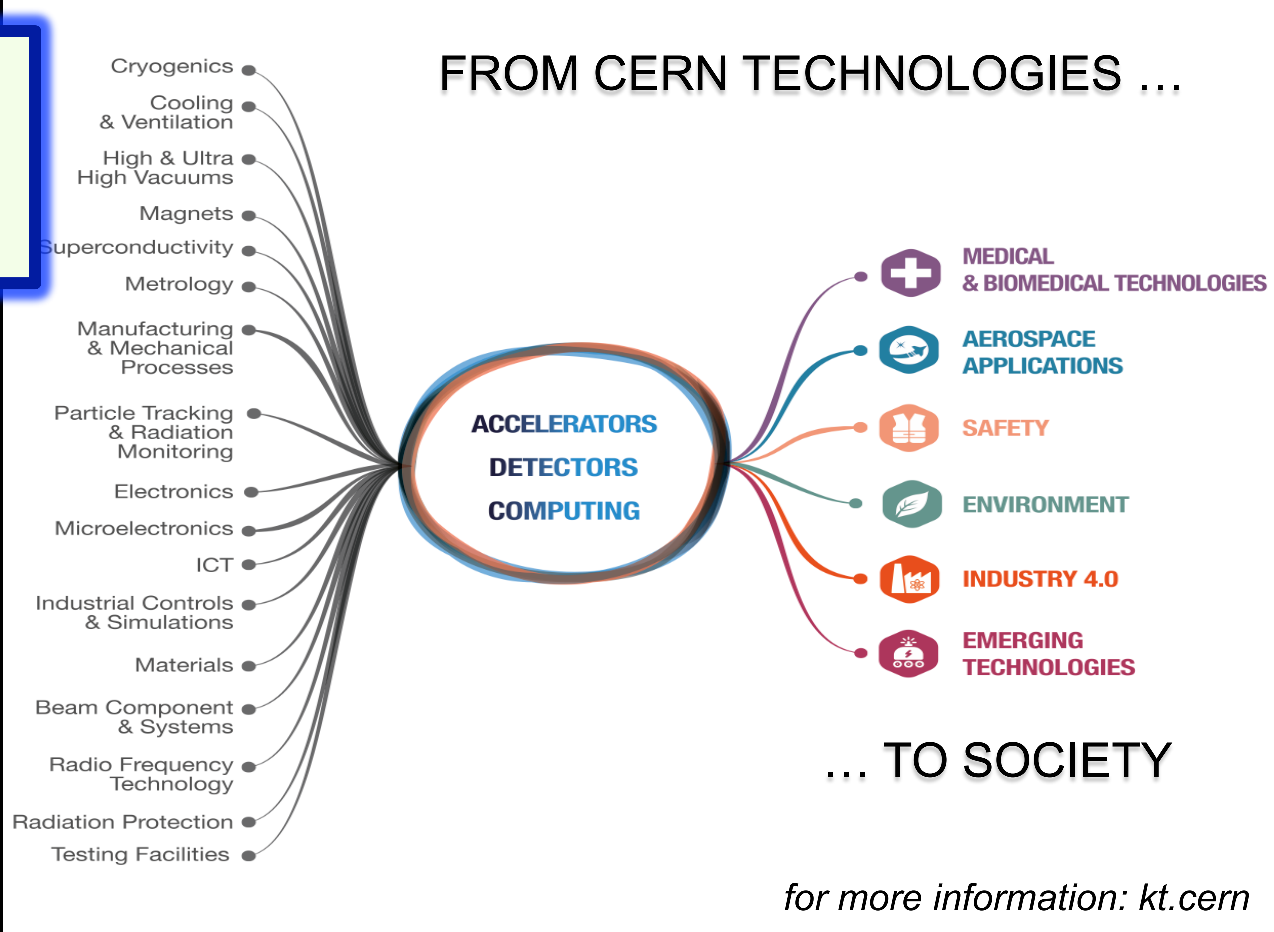
BUDGET	HOST COUNTRIES SWEDEN & DENMARK	NON-HOST MEMBERS	IN-KIND CONTRIBUTIONS
€1.843 Billion	47.5%	52.5%	€747.5 Million

ESS is working with 15 nations, nearly 40 European in-kind partner institutions, and more than 130 collaborating institutions worldwide.

Important as well for the European Part. Phys. Strategy

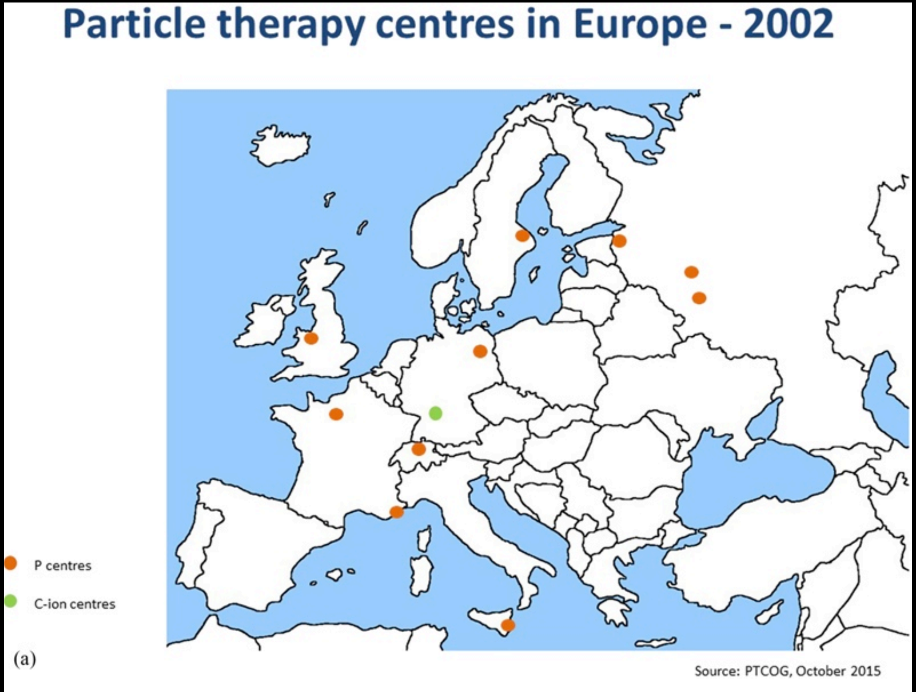
Applications in society are as well important to motivate large scale experiments.

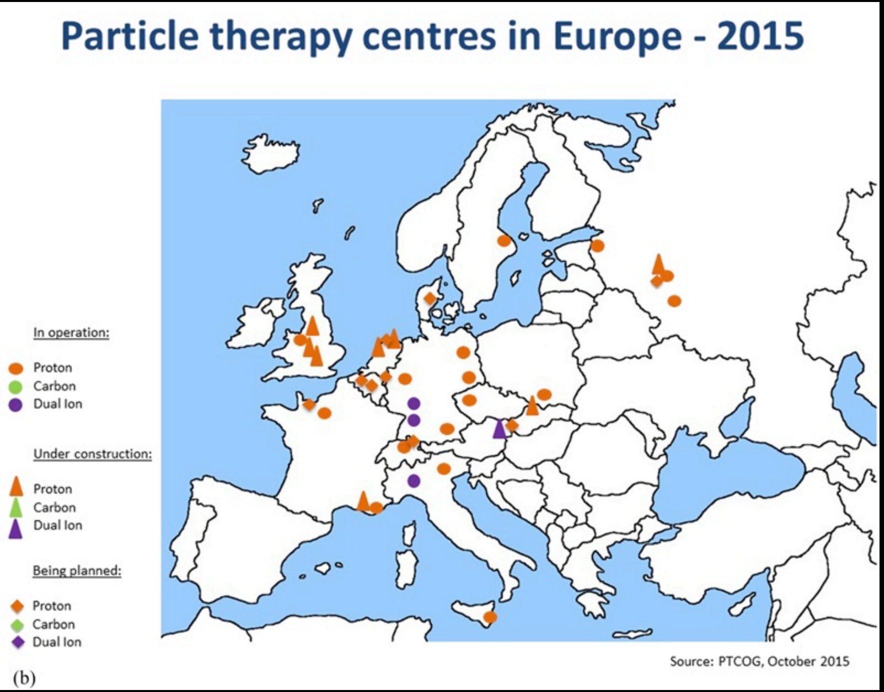
- Since 2011 CERN signed more than 250 licenses and other kind of agreements with industry and other partners
- Ever year several tens of new technology disclosures (91 in 2016)
- 18 new start-ups are using CERN technologies since 2012



European Particle Physics and Particle Therapy

European Network for Light Ion Therapy (ENLIGHT) since 2002





information from Manjit Dosanjh, "From Particle Physics to Medical Applications", IOP Publishing 2017, Bristol, UK

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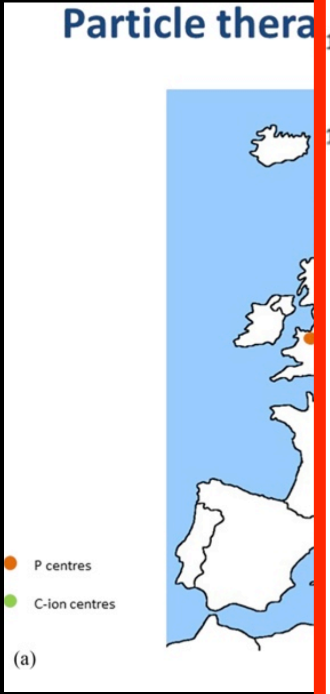
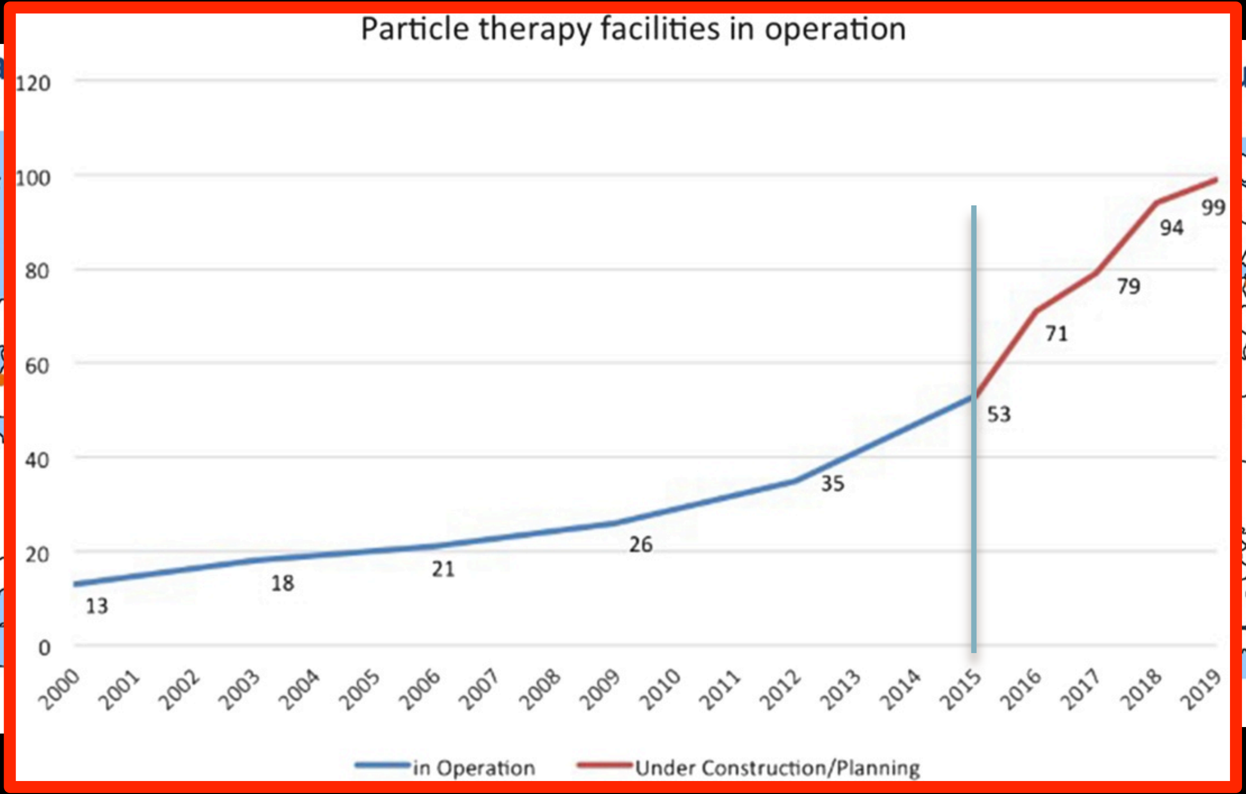
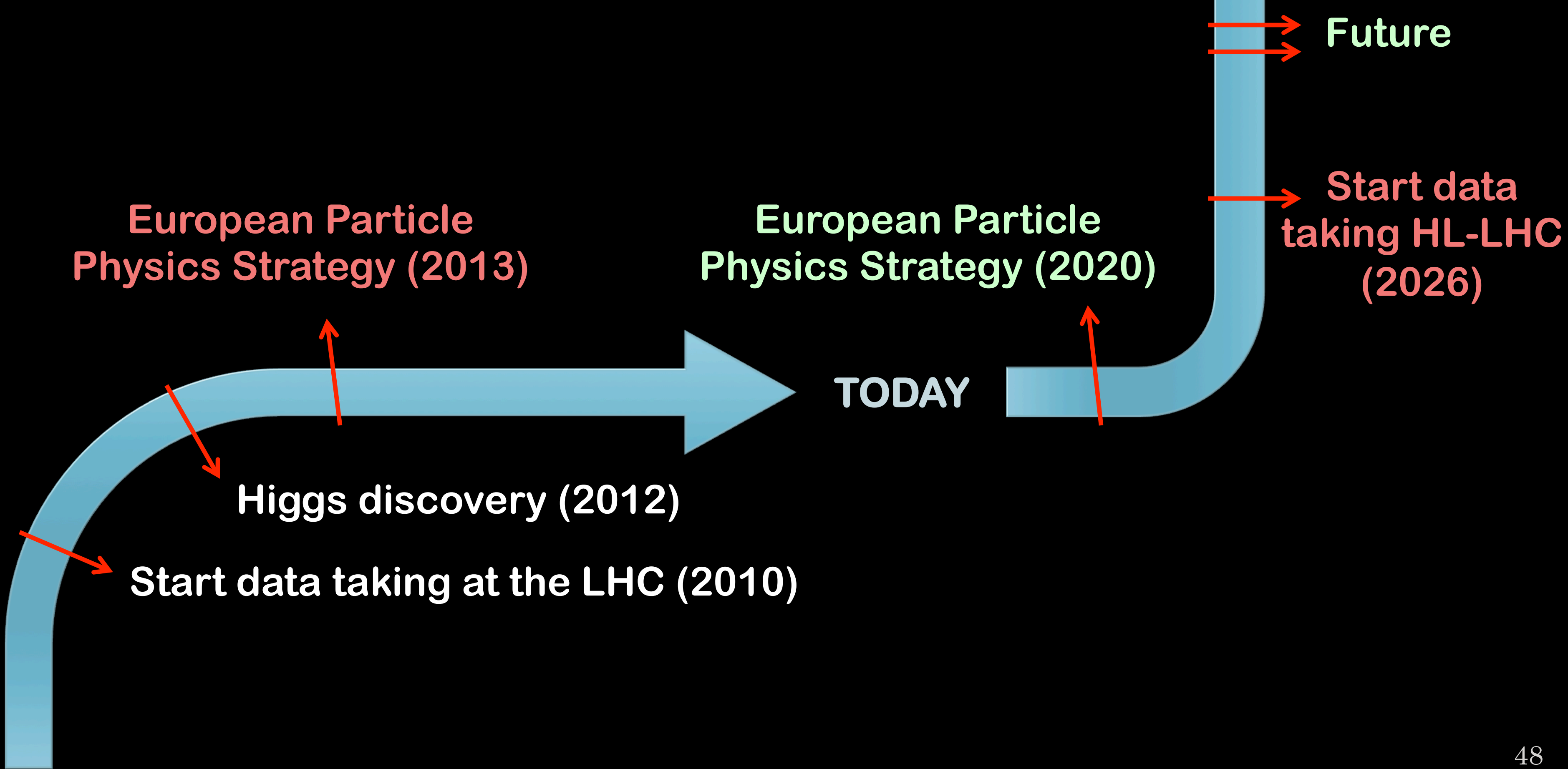




information from Manjit Dosanjh, "From Particle Physics to Medical Applications", IOP Publishing 2017, Bristol, UK

The European Particle Physics community is ready to initiate its Strategy Update



Key objectives set by CERN Council

- Deliver by May 2020 an update of the European Particle Physics Strategy in a global context
- This strategy or vision will thereafter be a roadmap for funding agencies and laboratories to define concrete research programmes

CERN Council approved the Strategy Secretariat

Council appointment, September 2017:

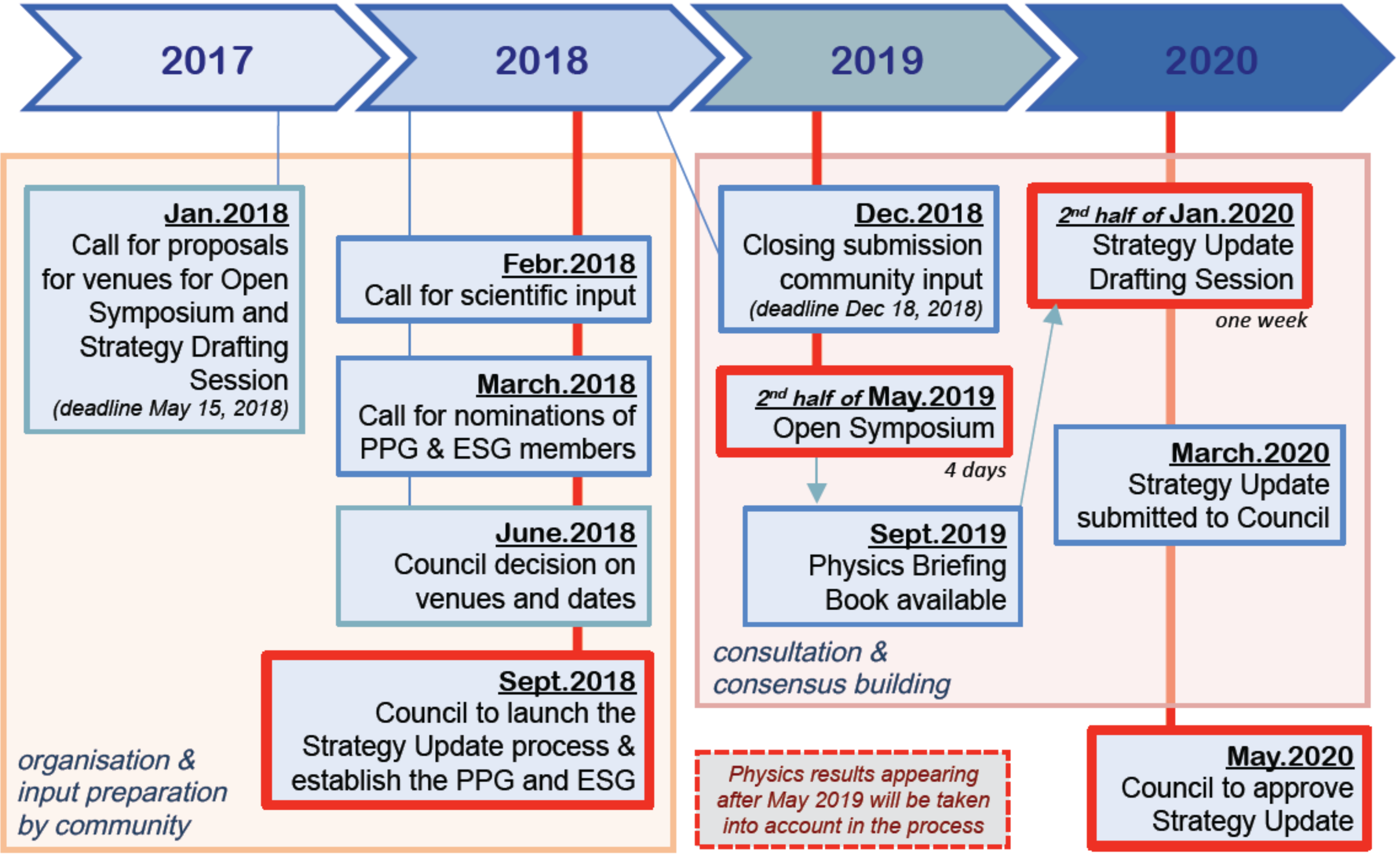
- H. Abramowicz (Chairperson)
- J. D'Hondt (ECFA Chairperson, *ECFA: European Committee for Future Accelerators*)
- K. Ellis (SPC Chairperson, *SPC: Science Policy Committee @ CERN*)
- L. Rivkin (European LDG Chairperson, *LDG: Lab Directors Group*)

- Contact: EPPSU-Strategy-Secretariat@cern.ch

Responsible for the organisation of the process.

European Strategy Update

European Particle Physics Strategy *Update*



Call for input

General considerations by the Strategy Secretariat:

- The Strategy Update process follows a bottom-up approach
- To facilitate the bottom-up approach an Open Call for input reaching out to all members of the particle physics community is issued; including research groups, research networks or collaborations, laboratories, universities, (inter)national institutions and/or organisations.
- The aim is to gather all relevant input, e.g. on scientific projects, position papers, national roadmaps, etc.
- The concrete scientific input will be considered by the Physics Preparatory Group (PPG) towards the organisation of the Open Symposium and to deliver the Physics Briefing Book.
- Other inputs will be consider by the European Strategy Group (ESG) to draft the Strategy Update.

European Strategy Update

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- Other inputs will be consider by the European Strategy Group (ESG) to draft the Strategy Update.

Pragmatically, general guidelines are provided to facilitate both the collection of the input and its use by the PPG and the ESG; i.e. be brief, comprehensive and self-contained.

Open call to all members of the particle physics community

Extract from the Open call circulated within the community

The CERN Council has set itself the objective of updating the European Strategy for Particle Physics by May 2020. To achieve this, it has established a Strategy Secretariat to which it has assigned the task of organising the update process.

The Strategy update process will include two major events: an "Open Symposium" and a "Strategy Drafting Session".

At the Open Symposium, to be held in the second half of May 2019, the community will be invited to debate the scientific input into the Strategy update, which will take the form of a "Briefing Book". This will be prepared over the summer of 2019 by a Physics Preparatory Group (PPG) and submitted to the European Strategy Group (ESG) for consideration before and during its Strategy Drafting Session to be held in the second half of January 2020.

To prepare the Open Symposium, the Strategy Secretariat hereby calls upon the particle physics community in universities, laboratories, national institutes and institutions to submit written input following the enclosed guidelines.

The deadline for input is **18 December 2018**.

Input should be submitted via a portal that will be created on the Strategy update website, which will be available from the beginning of October 2018, once the Strategy update has been formally launched by the CERN Council. The link to this website will appear on the CERN Council's web pages - https://council.web.cern.ch/en - and be widely communicated through the appropriate channels.

The Strategy Secretariat
Update of the European Strategy for Particle Physics
EPPSU-Strategy-Secretariat@cern.ch

Guidelines for submitting input

Cover page (1 page)
Each document submitted should carry a single cover page containing no more than the title, the contact person(s) and an abstract.

Comprehensive overview (maximum 10 pages)
This core part of the document must be no more than 10 pages long (excluding the cover page) and must provide a comprehensive and self-contained overview of the proposed input.

Addendum
A separate addendum is to be provided addressing the following topics (where relevant):

- interested community,
- timeline,
- construction and operational costs (if applicable),
- computing requirements.

The mandatory addendum has no strict page limit, but should be comprehensive and self-contained.

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Comprehensive overview (maximum 10 pages)
This core part of the document must be no more than 10 pages long (excluding the cover page) and must provide a comprehensive and self-contained overview of the proposed input. It should address:

- scientific context,
- objectives,
- methodology,
- readiness and expected challenges.

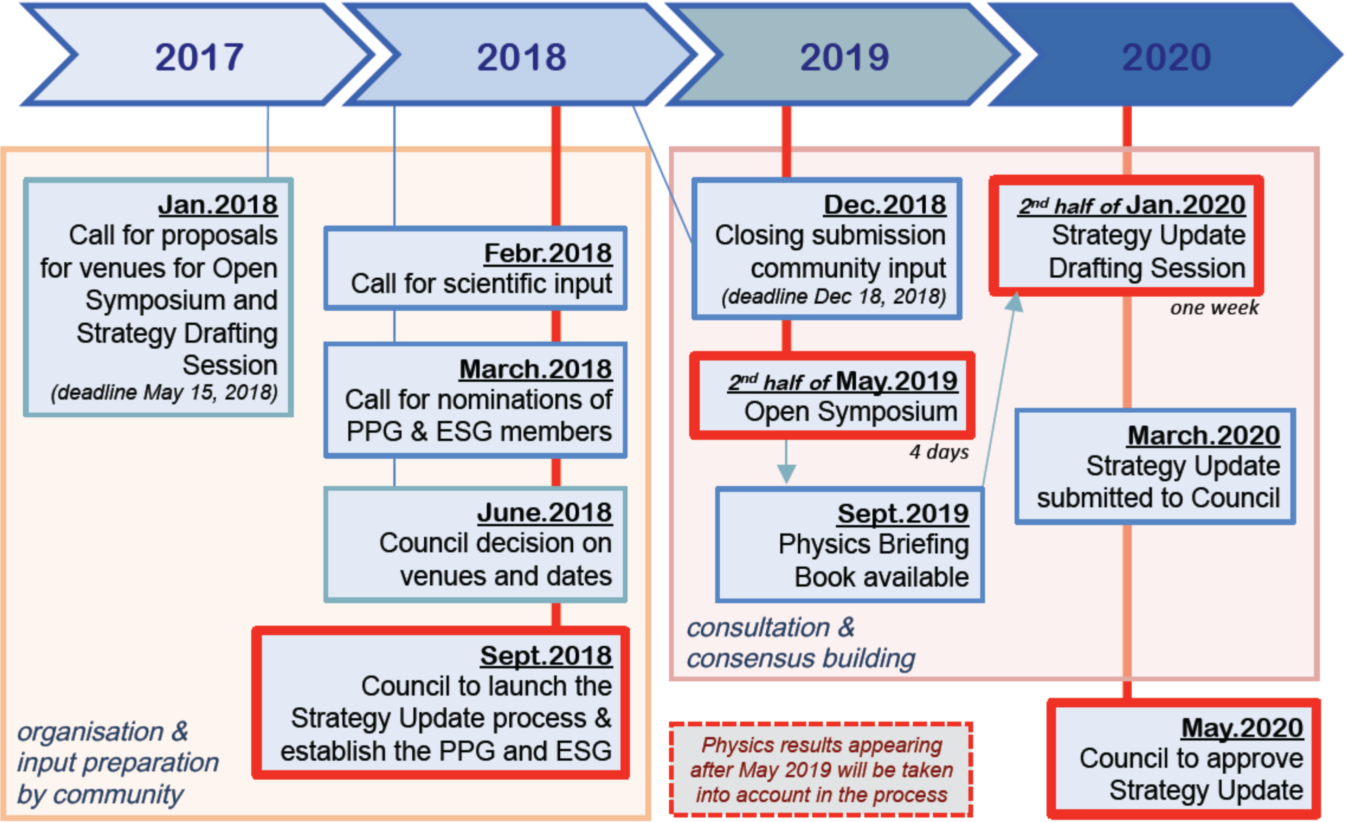
For the sub-structure of the 10-pages "comprehensive overview" we provide additional guidance that might be useful especially for scientific projects.

Addendum
A separate addendum is to be provided addressing the following topics (where relevant):

- interested community,
- timeline,
- construction and operational costs (if applicable),
- computing requirements.

The mandatory addendum has no strict page limit, but should be comprehensive and self-contained.

Thank you for your attention



Additional slides

European Strategy Update

Practical instructions for submitting input

Format and deadline for submission

The cover page and the comprehensive overview are to be submitted as a single file, the "main document", in portable document format (pdf) by 18 December 2018. The addendum is to be submitted as a separate file by the same deadline. A dedicated submission portal will be available on the EPPSU website as of October 2018, once the Strategy update has been formally launched by the Council at its September 2018 Session. The link to the EPPSU website will appear on the CERN Council's web pages - https://council.web.cern.ch/en - and be widely communicated through the appropriate channels.

Distribution

Both documents submitted (main and addendum) will be passed on to the Physics Preparatory Group (PPG) and the European Strategy Group (ESG). Unless explicitly requested otherwise, they will also be made public. The option not to make either document public will be available upon submission via the dedicated portal.

Composition of the PPG

Physics Preparatory Group (PPG) composition, adopted by Council, December 2013:

- The Strategy Secretary (acting as Chairperson),
- four members appointed by the Council on the recommendation of the SPC,
- four members appointed by the Council on the recommendation of ECFA,
- the SPC Chairperson,
- the ECFA Chairperson,
- the Chairperson of the European Laboratory Directors' meeting,
- one representative appointed by CERN,
- two representatives from Asia appointed by the respective regional representatives in ICFA,
- two representatives from the Americas appointed by the respective regional representatives in ICFA.

Responsible to organise the Open Symposium and to deliver to the European Strategy Group (ESG) a Physics Briefing book.

Composition of the ESG

European Strategy Group (ESG) composition, adopted by Council, December 2013:

- the Strategy Secretary (acting as Chairperson),
- one representative appointed by each CERN Member State,
- one representative for each of the Laboratories participating in the major European Laboratory Directors' meeting, including its Chairperson,
- the CERN Director-General,
- the SPC Chairperson,
- the ECFA Chairperson.

Responsible to deliver a draft Strategy Update to Council.

Invited:

- the President of the CERN Council,
- one representative from each of the Associate Member States,
- one representative from each Observer State,
- one representative from the European Commission,
- the Chairpersons of ApPEC, FALC, ESFRI and NuPECC,
- the members of the Physics Preparatory Group.