

YEARS / ANS **CERN**

Willkommen bei CERN

An vorderster Front auf der Suche nach
den kleinsten Teilchen

Dr. Sascha Marc Schmeling
CERN • DG Unit

Geschichte

1949

Erste Ansätze ziviler
Forschung im Bereich der
Nukleartechnik

1952

Gründung des
Conseil Européen pour la
Recherche Nucléaire
unter der Obhut der UNESCO

Oktober 1952

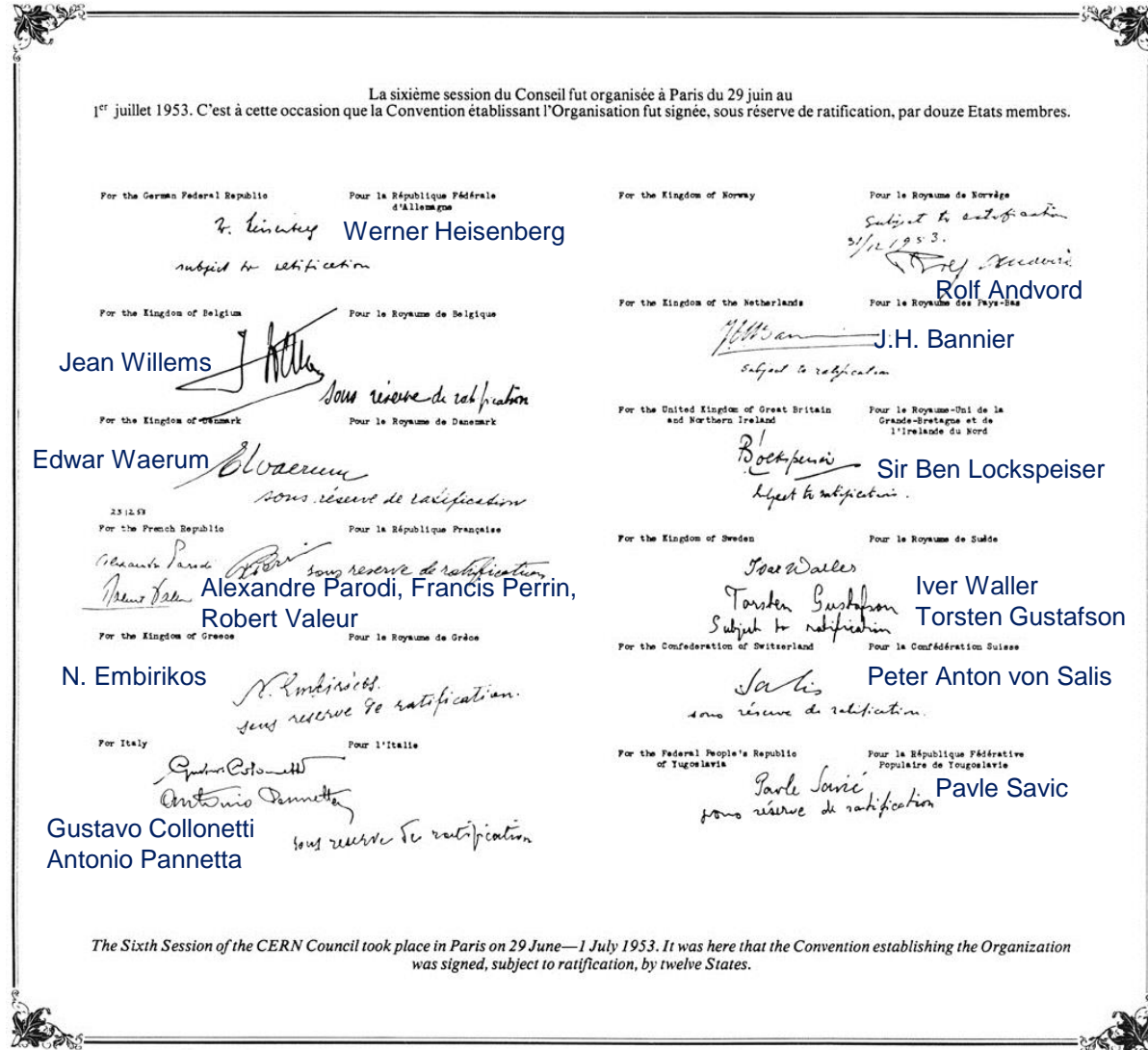
Standortauswahl für Genf

1. Juli 1953

Unterzeichnung der Charta

29. September 1954

Abschluß des
Ratifikationsprozesses in den
ursprünglichen zwölf
Mitgliedsstaaten



CERN wurde 1954 gegründet

12 europäische Staaten

“Science for Peace”

Heute gibt es 21 Mitgliedsstaaten

~ 2300 internationale Beamte

~ 1620 weitere Angestellte

~10500 Nutzer

Budget (2014) ~1000 MCHF

Mitgliedsstaaten: Belgien, Bulgarien, Dänemark, Deutschland, Finnland, Frankreich, Griechenland, Großbritannien, Israel, Italien, Niederlande, Norwegen, Österreich, Polen, Portugal, Schweden, Schweiz, Slowakische Republik, Spanien, Tschechische Republik, Ungarn

Beitrittskandidat: Rumänien

Assoziierte Staaten auf Beitrittskurs: Serbien

Im Antragsverfahren: Brasilien, Pakistan, Rußland, Slowenien, Türkei, Ukraine, Zypern

Beobachter im Rat: Indien, Japan, Russische Föderation, Türkei, USA, EU, UNESCO

CERN – Das Laboratorium



CERN Council

Präsidentin: A. Zalewska

21 Mitgliedsstaaten

2 Delegierte

1 Beitrittskandidat

2 Delegierte

1 Assoziierter Mitgliedsstaat

2 Delegierte

Ex-Officio Mitglieder

Verschiedene Beobachter auf Einladung

Finance Committee

Vorsitzender: C. Jamieson

21 Mitgliedsstaaten

2 Delegierte

1 Beitrittskandidat

2 Delegierte

1 Assoziierter Mitgliedsstaat

2 Delegierte

Ex-Officio Mitglieder

Verschiedene Beobachter auf Einladung

Scientific Policy Committee

Vorsitzender: T. Nakada

16 individuelle Mitglieder

Ex-Officio Mitglieder

Vorsitzenden der Experiment- und Beschleuniger-Komites

mehrere ständig Eingeladene

z.B. Generaldirektor

Tripartite Employment Forum

Vorsitzender: B. Dormy

Pension Fund Governing Board

Vorsitzender: T. Roth



Ratssekretariat
EU Projektbüro
Juristischer Dienst
Sprachendienst

Direktionsassistenten

**Generaldirektor
Rolf Heuer**

Internationale Beziehungen
Bildung & Öffentlichkeitsarbeit
Beziehungen zu den Sitzstaaten
Innenrevision
Technologietransfer
Arbeitssicherheitsinspektion

**Direktor für Administration
und Infrastruktur
Sigurd Lettow**

**Direktor für Forschung und
wissenschaftliche Informatik
Sergio Bertolucci**

**Direktor für Beschleuniger
und Technologie
Frédéric Bordry**

Sektoren

**FP
Finanzen und Beschaffung**
Thierry Lagrange

**GS
Infrastruktur**
Lluís Miralles Verge

**HR
Personal**
Anne-Sylvie Catherin

**IT
Informatik**
Frédéric Hemmer

**PH
Physik**
Livio Mapelli

**BE
Beschleunigerbetrieb**
Paul Collier

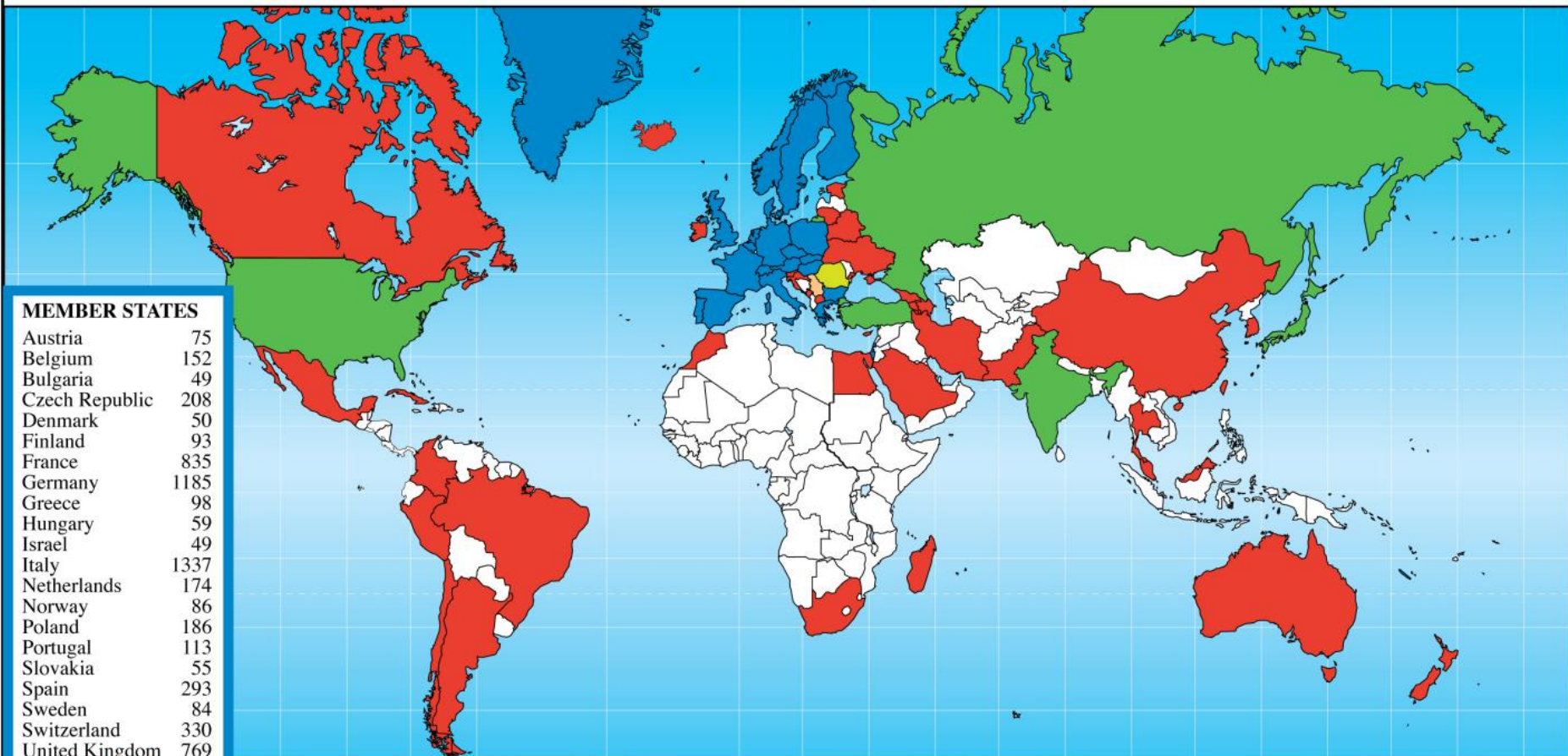
**TE
Technologie**
Jose Miguel Jimenez

**EN
Ingenieurwesen**
Roberto Saban

Departemente



Distribution of All CERN Users by Location of Institute on 14 January 2014



MEMBER STATES

Austria	75
Belgium	152
Bulgaria	49
Czech Republic	208
Denmark	50
Finland	93
France	835
Germany	1185
Greece	98
Hungary	59
Israel	49
Italy	1337
Netherlands	174
Norway	86
Poland	186
Portugal	113
Slovakia	55
Spain	293
Sweden	84
Switzerland	330
United Kingdom	769

6280

OBSERVERS

India	153
Japan	217
Russia	890
Turkey	110
USA	1724

3094

CANDIDATE FOR ACCESSION

Romania	86
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ASSOCIATE MEMBER IN THE PRE-STAGE TO MEMBERSHIP

Serbia	30
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OTHERS

China	122	Iran	20	Pakistan	18
China (Taipei)	71	Ireland	5	Peru	2
Colombia	10	Korea	105	Saudi Arabia	3
Croatia	23	Lithuania	13	Slovenia	25
Australia	39	Madagascar	3	South Africa	32
Azerbaijan	2	Malaysia	8	Thailand	8
Belarus	24	Mexico	46	T.F.Y.R.O.M.	1
Brazil	116	Montenegro	1	Ukraine	24
Canada	147	Morocco	6		
Chile	8	New Zealand	5		

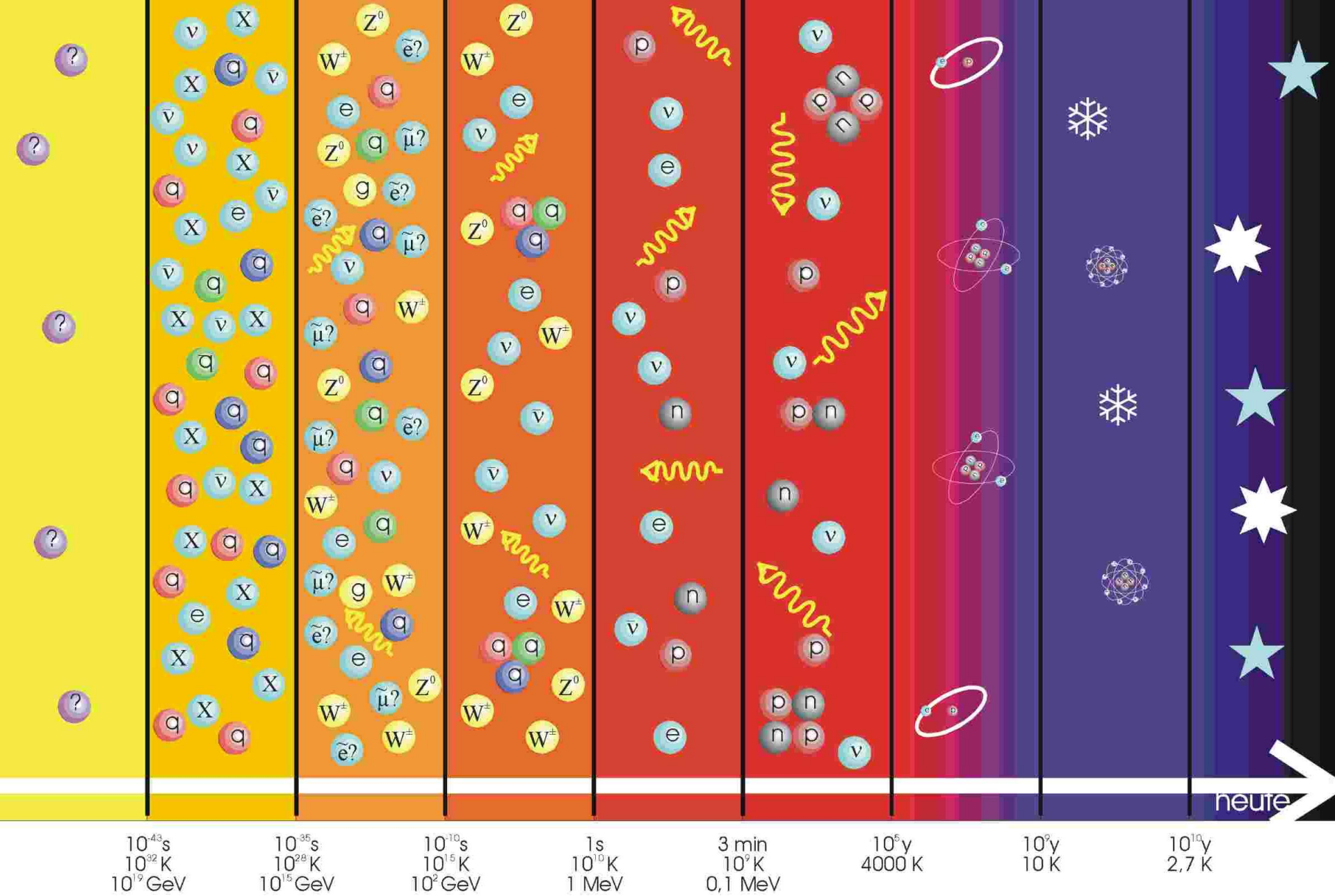
982



Nutzer bei CERN – Januar 2014

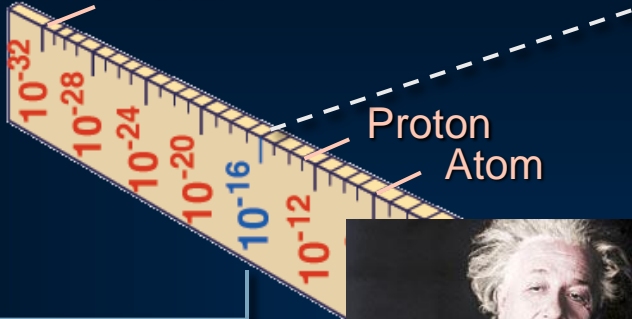
HochEnergiePhysik

- Auf der Suche nach dem,
“Was die Welt im Innersten zusammenhält”
- Suche nach
 - elementaren Teilchen
 - Kräften
 - Symmetrien

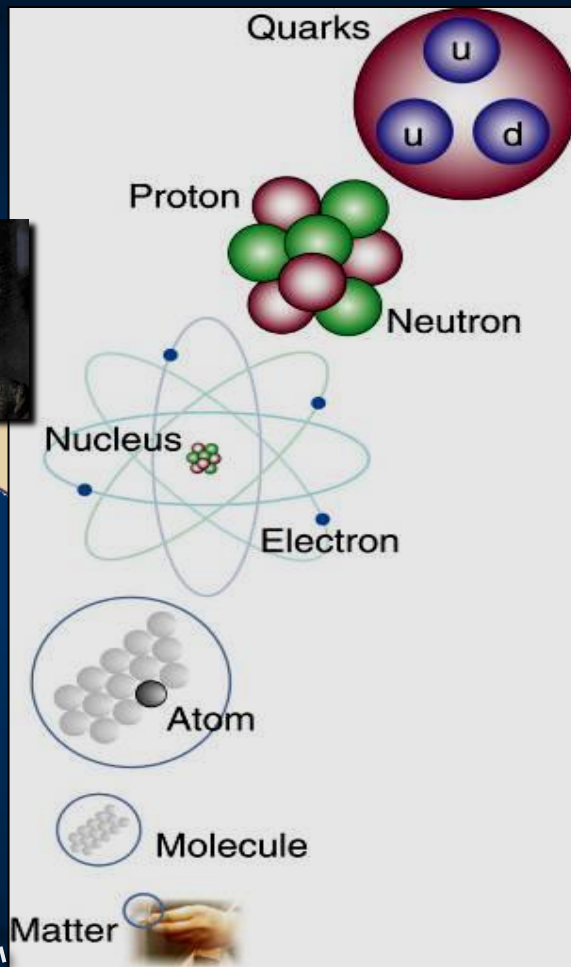


Die Geschichte des Universums

Urknall



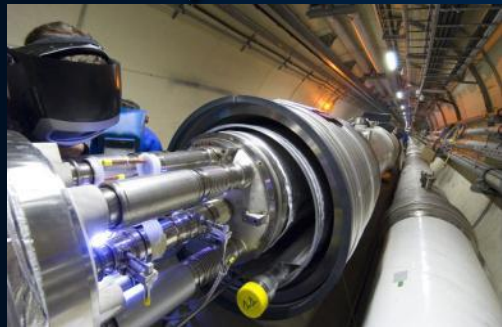
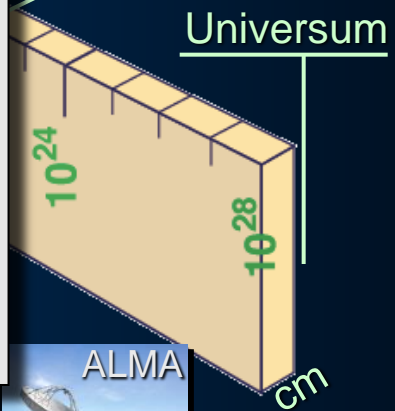
Proton
Atom



Sonne

Galaxien

Universum



LHC

Supermikroskop



AMS



ALMA



VLT





Pressekonferenz 4. Juli 2012

Nobel Prize in Physics 2013



The Nobel Prize in Physics 2013 was awarded jointly to François Englert and Peter W. Higgs "for the theoretical discovery of a mechanism that contributes to our understanding of the origin of mass of subatomic particles, and which recently was confirmed through the discovery of the predicted fundamental particle, by the ATLAS and CMS experiments at CERN's Large Hadron Collider".



2013 Prince of Asturias Award for Technical and Scientific Research



to

F. Englert
P. Higgs
CERN





LHCb

ATLAS

CERN Meyrin

CERN Prévessin

SPS 7 km

RHIC 485 m

SUISSE
FRANCE

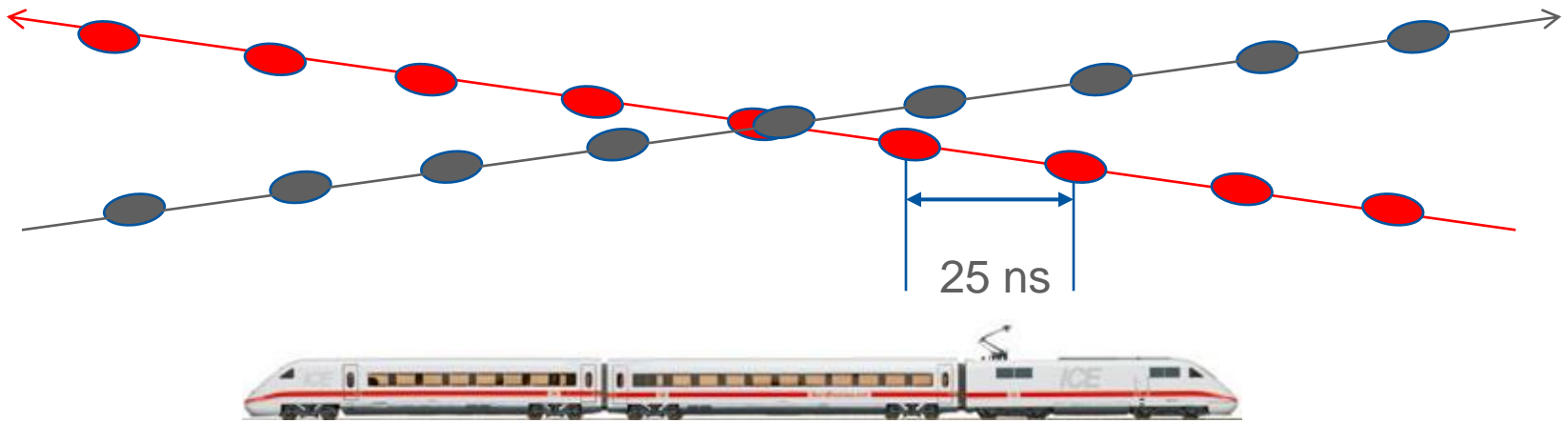
CMS

ALICE

LHC 27 km

- 1982 : Erste Projektstudien
- 1983 : Z^0 -Ereignis am S_pP_S
- 1985 : Nobelpreis für S. van der Meer und C. Rubbia
- 1989 : Beginn des LEP-Betriebs (Z Factory)
- 1994 : Zustimmung zum LHC durch das Council
- 1996 : Endgültige Entscheidung zum Baubeginn
- 1996 : LEP Betrieb bei 100 GeV (W Factory)
- 2000 : Ende des LEP Betriebs
- 2002 : Abschluß des LEP Abbaus
- 2003 : Beginn der LHC Installation
- 2005 : Beginn der LHC Tests
- 2008 : Erste Betriebsaufnahme LHC
- *2009 : Physik!*





Strahlenergie = Protonenenergie • Anzahl der Protonen pro Wolke • Anzahl der Wolken

Protonenenergie: 7 TeV

bei höchster Intensität:

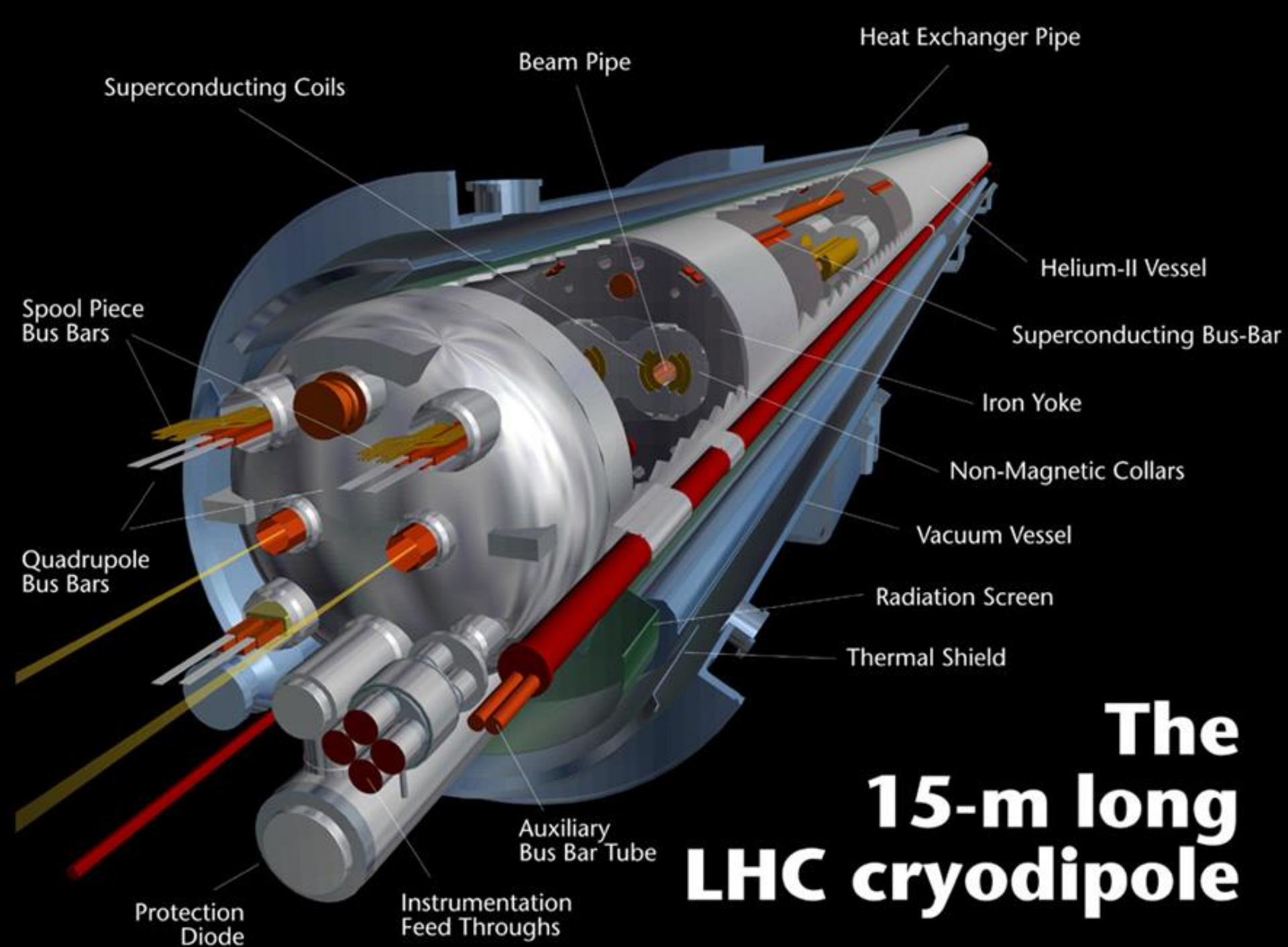
Anzahl der Protonen je Wolke: $1.05 \cdot 10^{11}$

Anzahl der Wolken pro Richtung: 2808

Strahlenergie (pro Richtung): 346 MegaJoule



LHC – Strahlenergie



Superconducting Coils

Beam Pipe

Heat Exchanger Pipe

Spool Piece Bus Bars

Helium-II Vessel

Superconducting Bus-Bar

Quadrupole Bus Bars

Iron Yoke

Non-Magnetic Collars

Vacuum Vessel

Radiation Screen

Thermal Shield

Auxiliary Bus Bar Tube

Protection Diode

Instrumentation Feed Throughs

The 15-m long LHC cryodipole

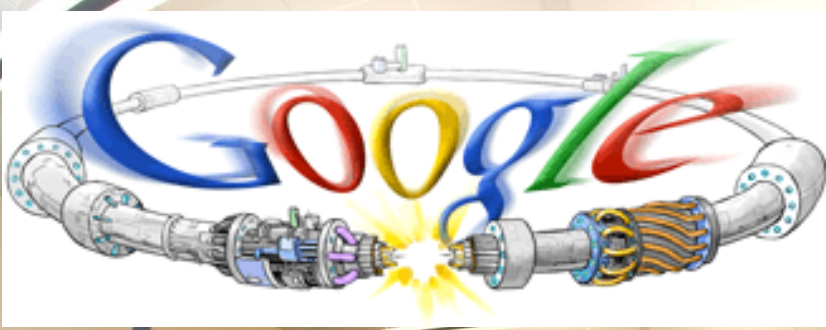
$$E_{\text{Dipol}} = 0.5 \cdot L_{\text{Dipol}} \cdot I_{\text{Dipol}}^2$$

gespeicherte Energie in einem Dipol: 7.6 MJ

Gesamt für alle 1232 Dipole im LHC: 9.4 GJ

Nimitz Klasse Flugzeugträger (90000 t)
bei Reisegeschwindigkeit von 20 kn
Energie = $\frac{1}{2} mv^2 \sim 10\text{GJ}$





17.03.2010 Der LHC Beschleuniger - DPG - Bonn - Jrg Wenniger



Der LHC-Start

The main 2013-14 LHC consolidations

Openings: 100 %

1695 Openings and final reclosures of the interconnections

Complete reconstruction of ~~1000~~ of these splices

3000

66 % done

Consolidation of the 10170 13kA splices, installing 27 000 shunts

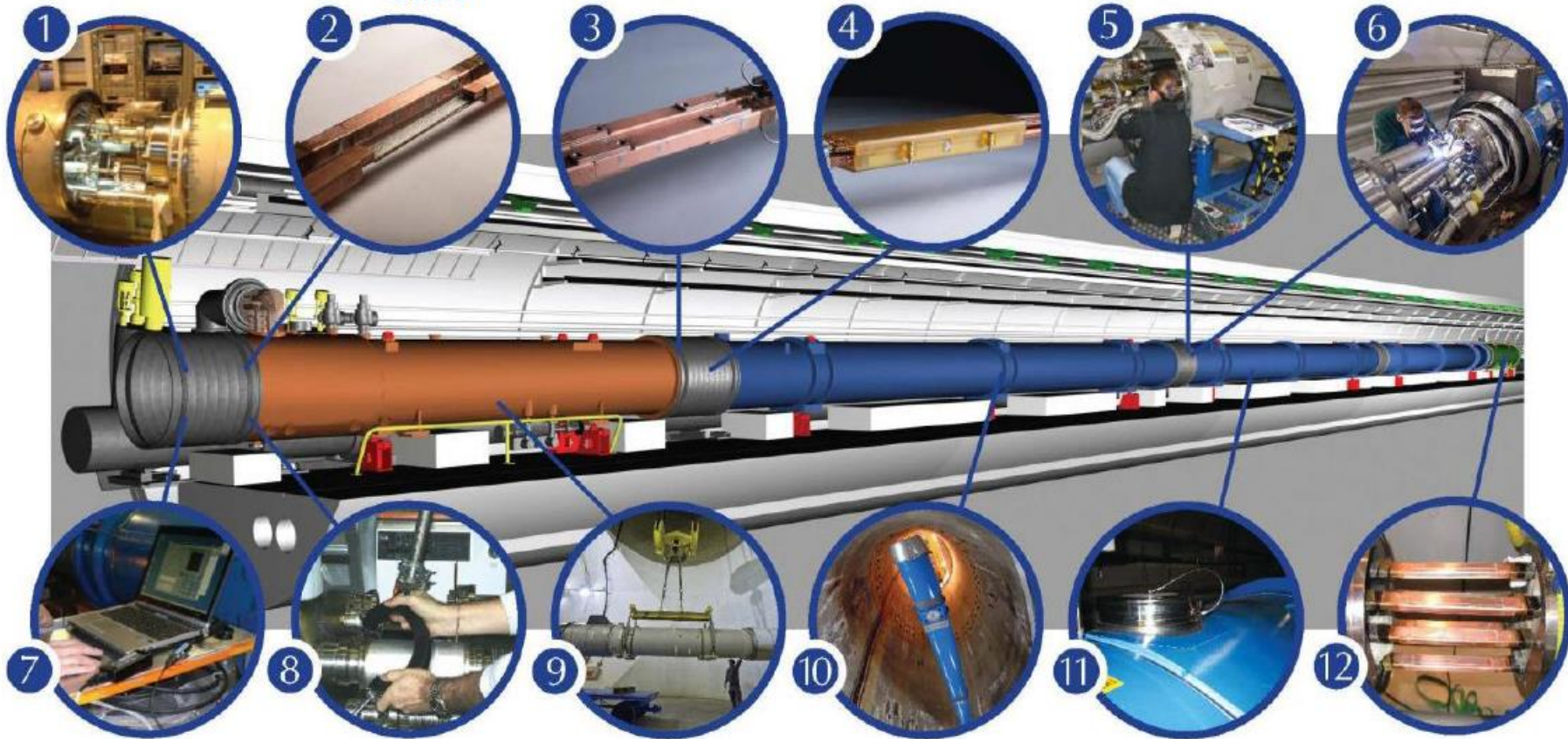
50 % done

Installation of 5000 consolidated electrical insulation systems

300 000 electrical resistance measurements

35 % done

10170 orbital welding of stainless steel lines



18 000 electrical Quality Assurance tests

10170 leak tightness tests

3 quadrupole magnets to be replaced

15 dipole magnets to be replaced

Installation of 612 pressure relief devices to bring the total to 1344

Consolidation of the 13 kA circuits in the 16 main electrical feed-boxes

Done

Done

Done



Plus many activities on accelerators and infrastructure

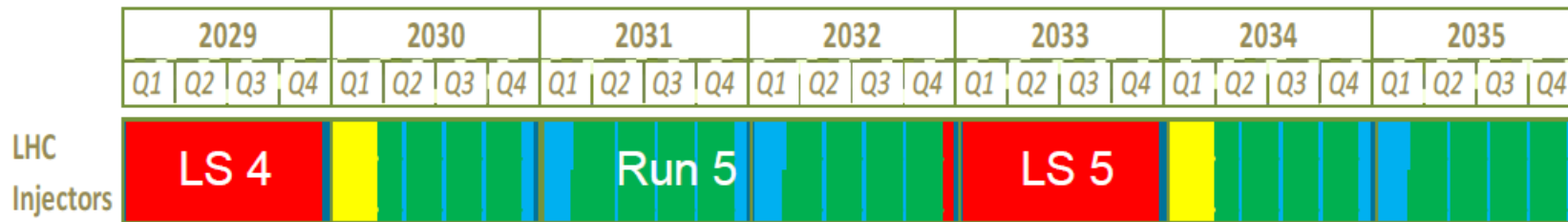
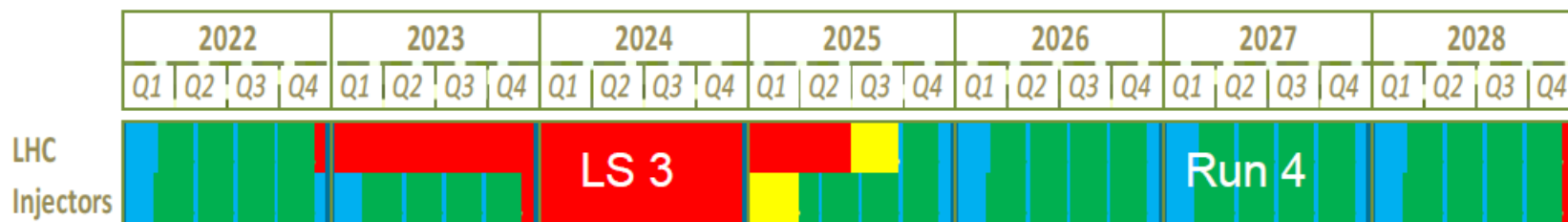
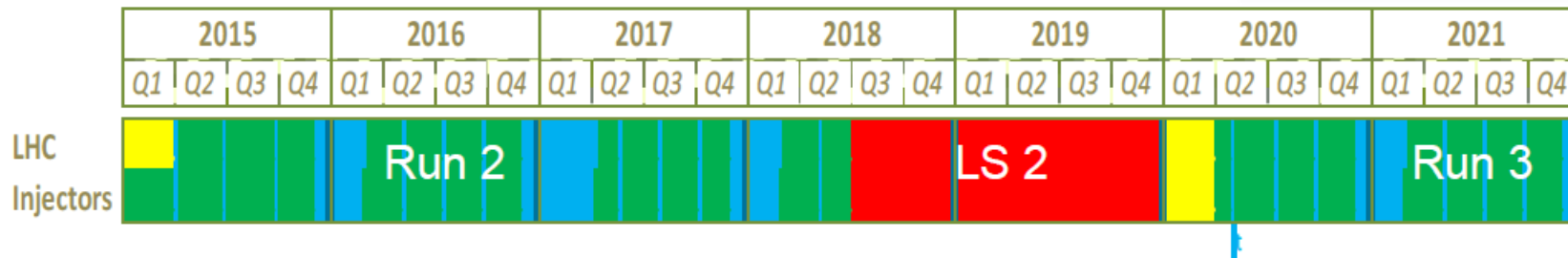
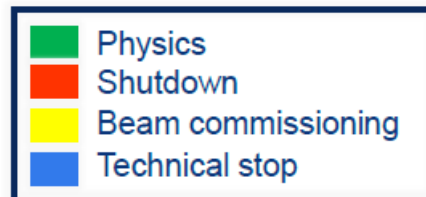
LHC schedule beyond LS1

No Linac4 connection during Run2 - only EYETS* (13+6 weeks)

LS2 starting in 2018 (July) => 18 months + 3 months BC

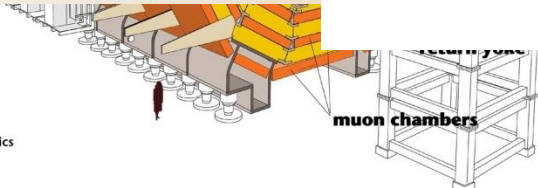
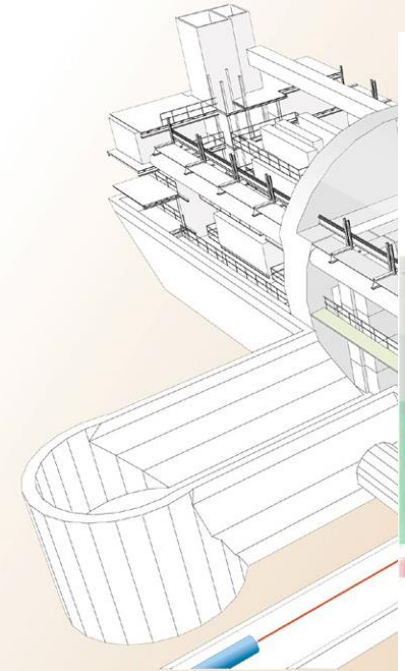
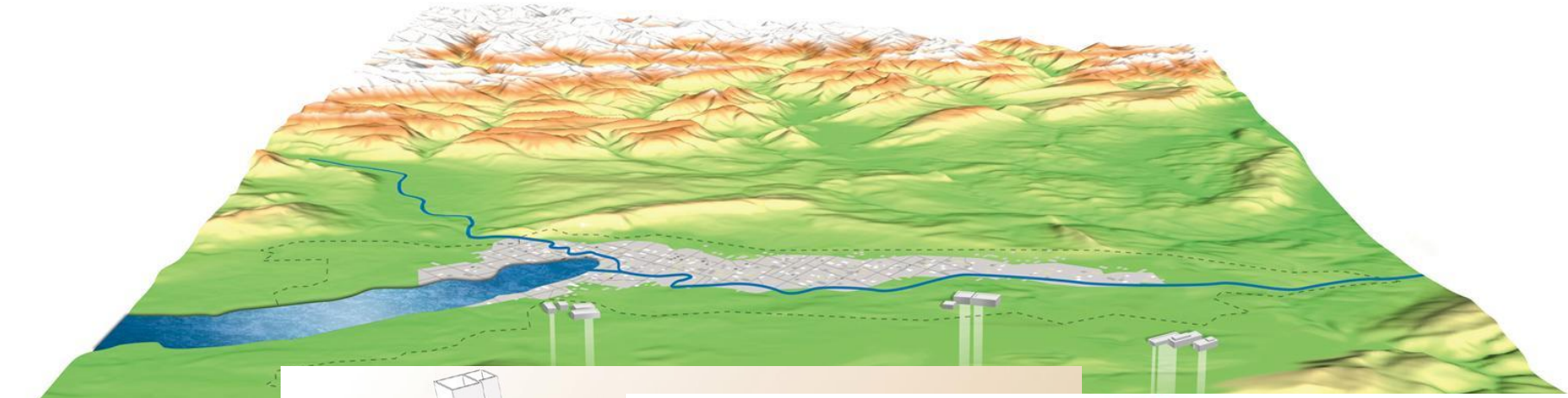
LS3 LHC: starting in 2023 => 30 months + 3 months BC

Injectors: in 2024 => 13 months + 3 months BC



*) Extended Year End Technical Stop



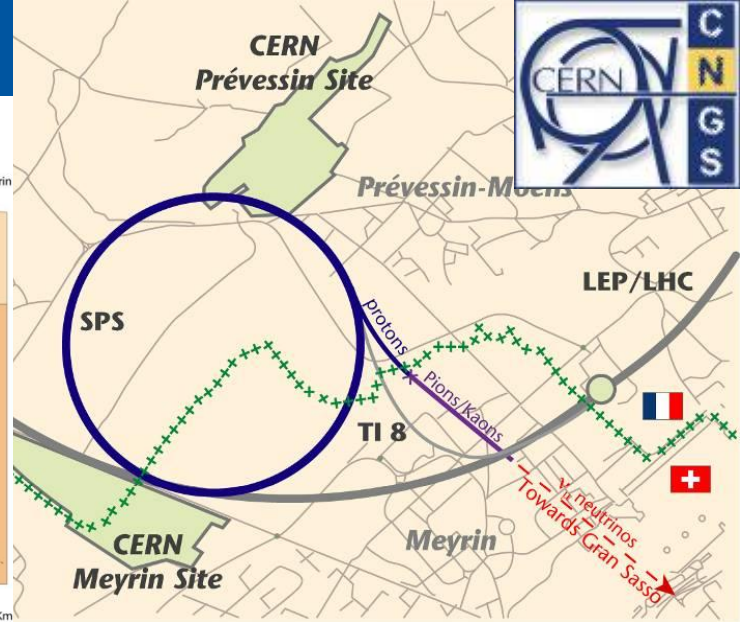
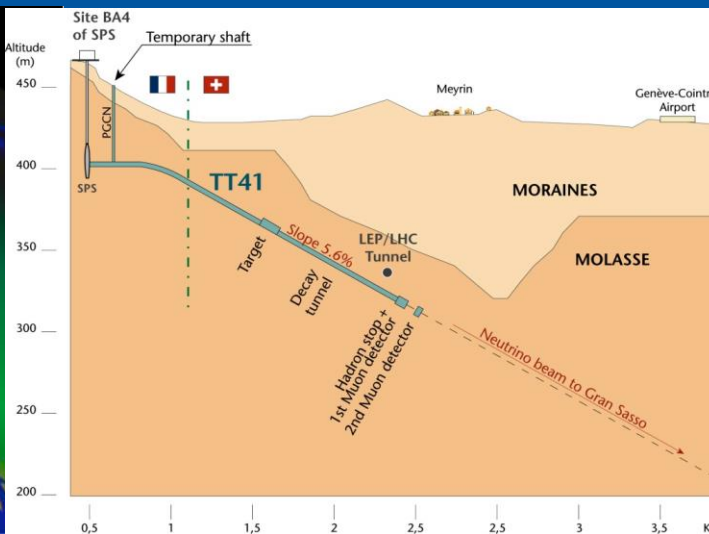
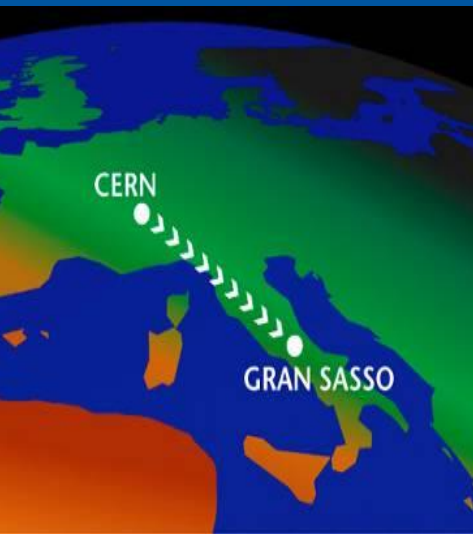


Detector characteristics

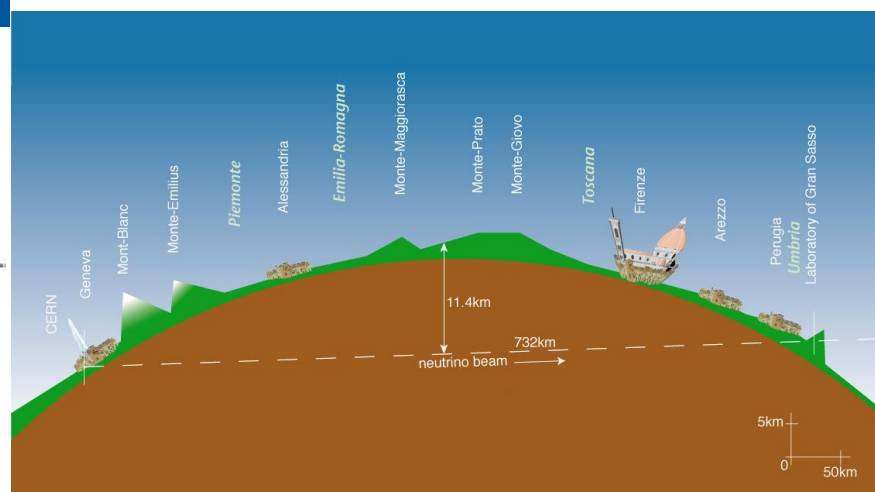
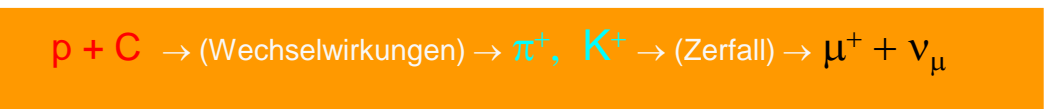
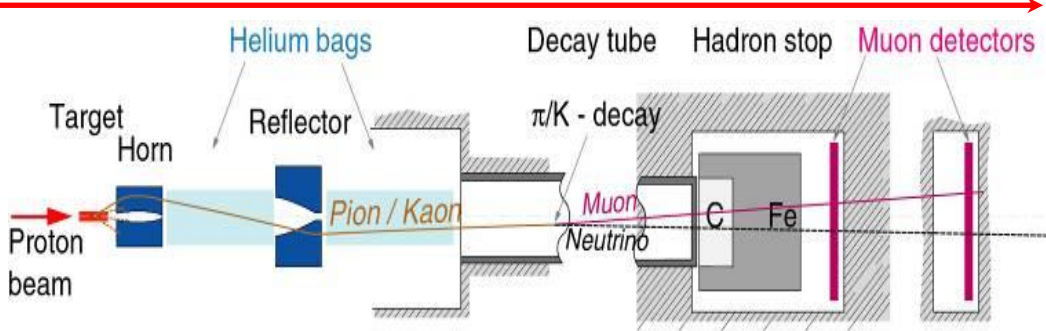
Width: 22m
Diameter: 15m
Weight: 14500t

Weitere Aktivitäten

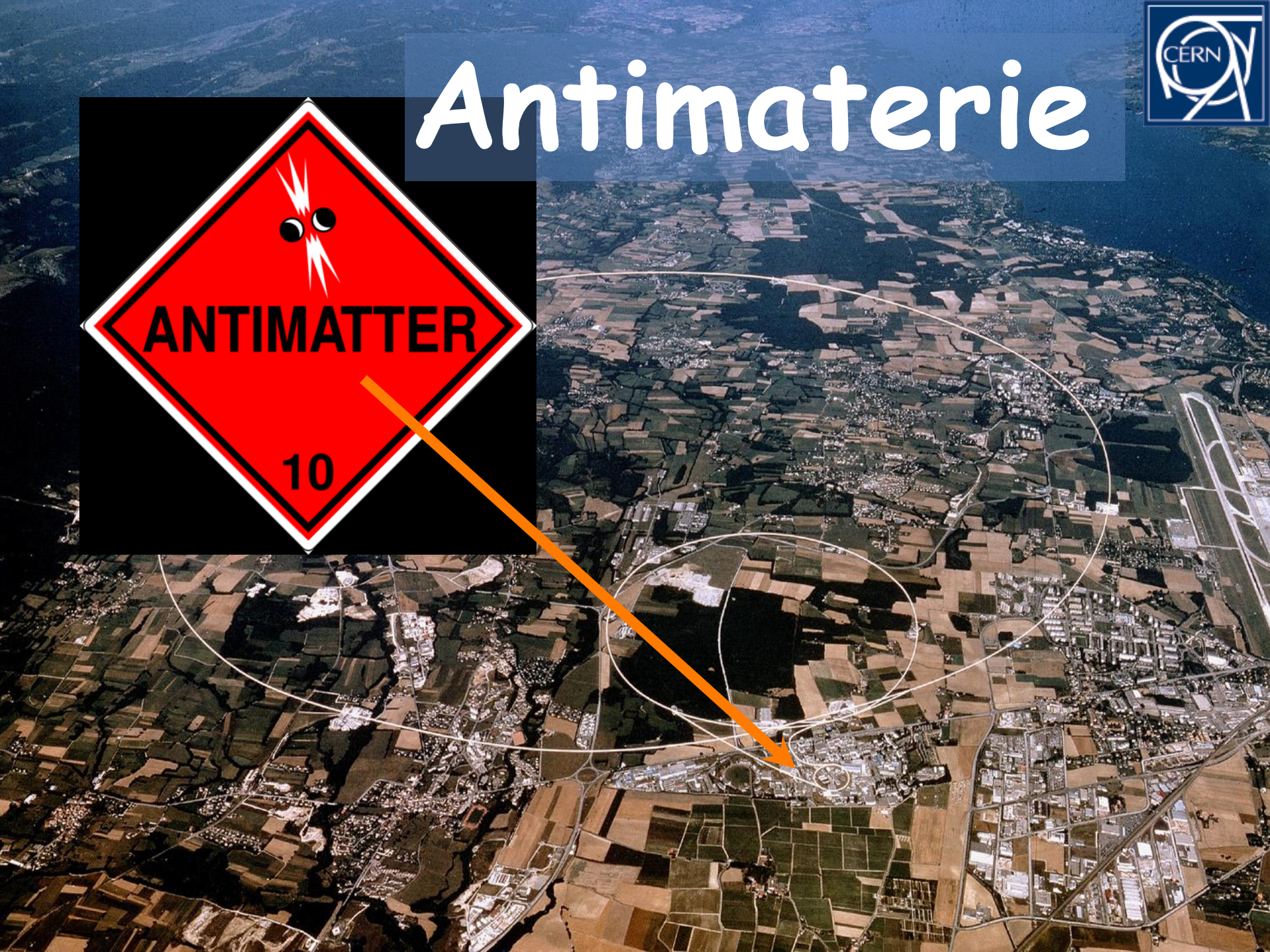
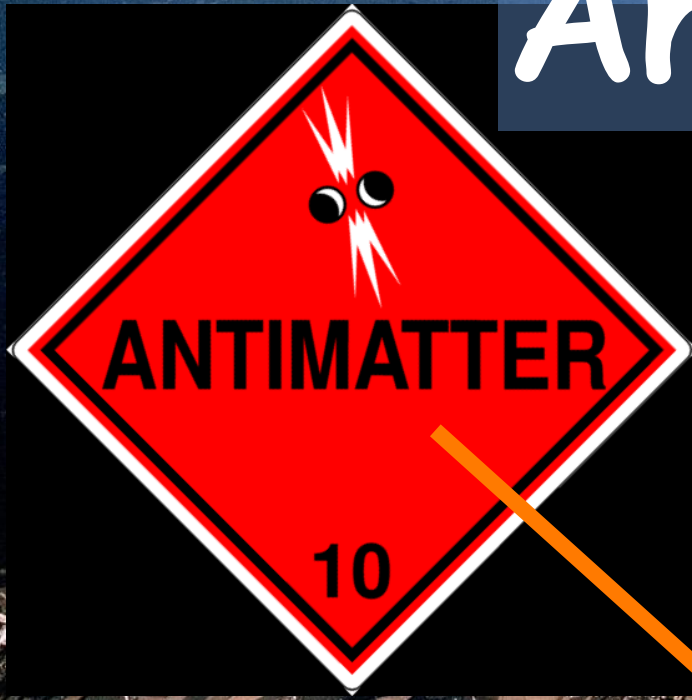
CERN Neutrinos zum Gran Sasso



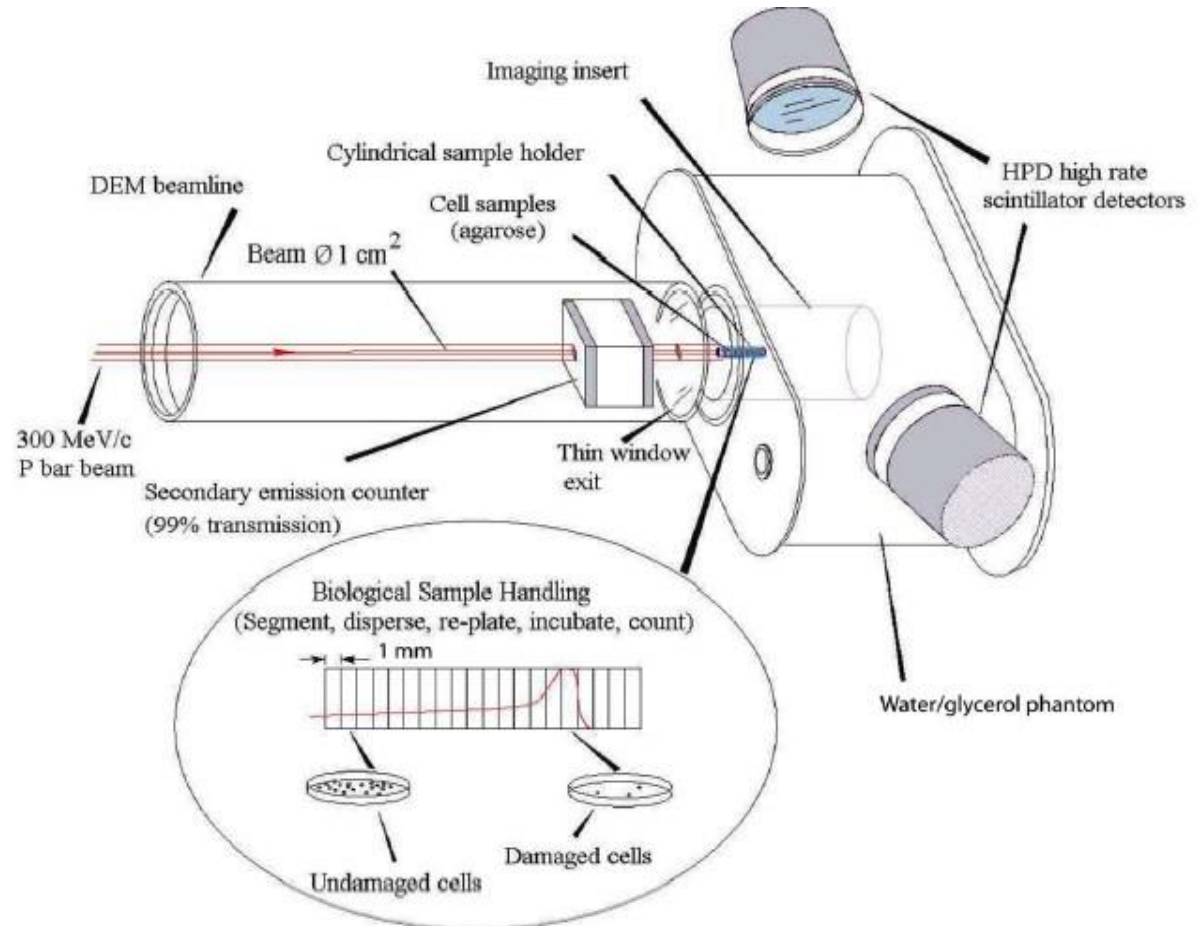
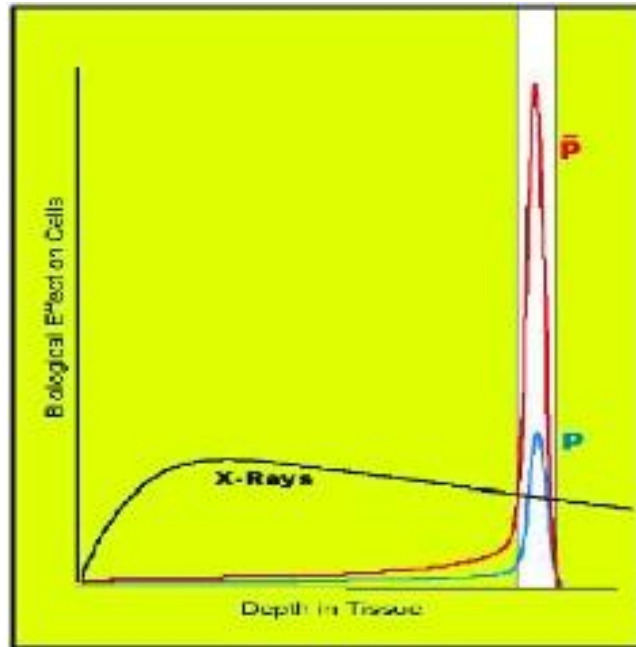
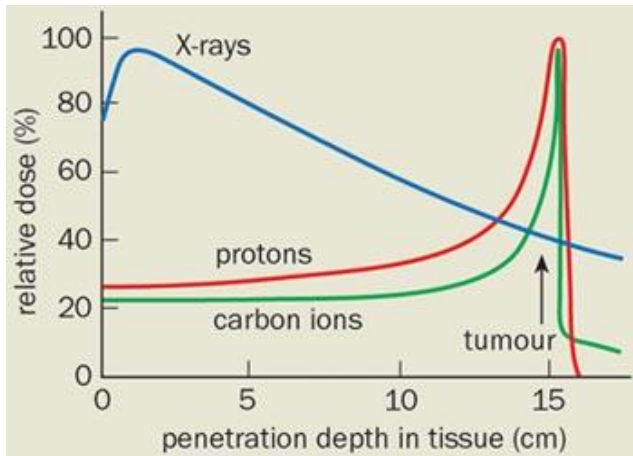
700 m 100 m 1000m 67 m



Antimaterie



ACE Experiment bei CERN



181 Protocol and National visits in 2013

Member States: 87

Austria 3
Belgium 5
Bulgaria 1
Czech Republic 3
Finland 1
France 9
Germany 8
Greece 4
Hungary 3
Italy 7
Netherlands 5
Norway 3
Poland 7
Portugal 1
Slovak Republic 2
Spain 3
Sweden 1
Switzerland 7
United Kingdom 14

Associate Member and Observers: 38

European Commission 3
India 4
Israel 7
Japan 6
Russian Federation 5
Turkey 6
UNESCO 1
United States of America 6



EU High Representative
Lady Ashton

International Organisations Special events: 19

- International Organisations 12
- DG's New Year Reception
- Inaugural Fundamental Physics Prize Ceremony
- Passeport Big-Bang
- ILC Handover event
- Visits for CERN Delegates 3

US Former Vice President Gore



PL Deputy Minister Styczen, CZ Deputy Minister Braun and SK State Secretary Palko



UA Vice Prime Minister Gryshchenko



NMS: 37

Australia 1
Bangladesh 1
Brazil 2
Burkina Faso 1
Canada 1
Chile 1
China 1
Chinese Taipei 2
Colombia 1
Cuba 1
Cyprus 1
Dominican Republic 1
Estonia 1
Georgia 1
Ireland 1
Jamaica 1
Korea 3
Lesotho 1
Lithuania 1
Mexico 2
Mongolia 2
Nigeria 1
New Zealand 2
Pakistan 2
Panama 1
Sri Lanka 1
Thailand 1
Ukraine 2



Apprentices

Accelerator School

Doctoral Students

Academic Training

Fellows

Physics School

Exhibitions

CERN-Latin America School

Computing School

Visits

Technical Students

Summer Students

Microcosm

Outreach

Science on Stage

Language Training

Technical Training

Communications Training

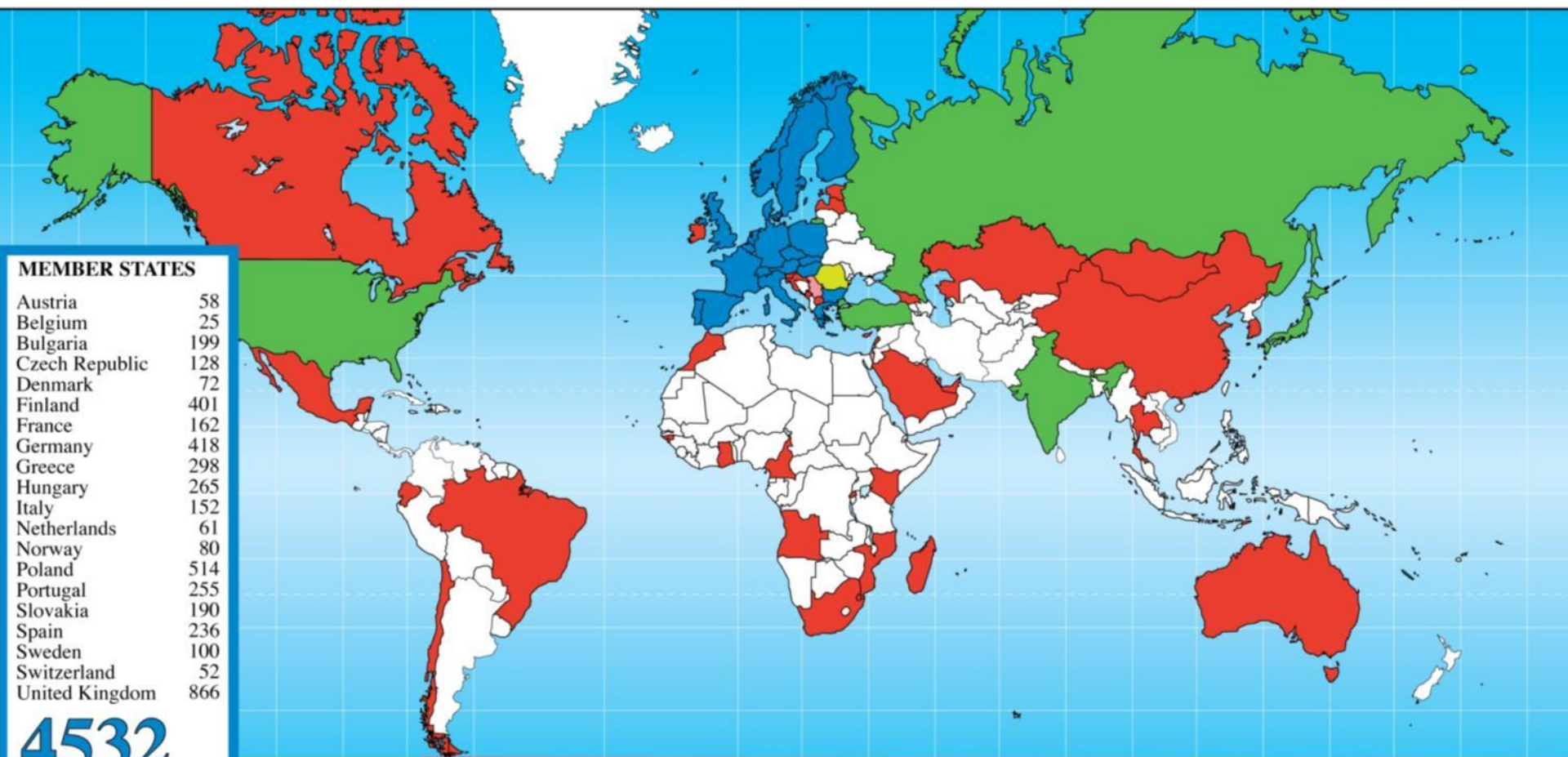
Teachers programmes

Conferences

Management Training



Eine Vielzahl anderer Aktivitäten ...



MEMBER STATES

Austria	58
Belgium	25
Bulgaria	199
Czech Republic	128
Denmark	72
Finland	401
France	162
Germany	418
Greece	298
Hungary	265
Italy	152
Netherlands	61
Norway	80
Poland	514
Portugal	255
Slovakia	190
Spain	236
Sweden	100
Switzerland	52
United Kingdom	866

4532

CANDIDATE FOR ACCESSION

Romania	10
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ASSOCIATE MEMBER IN THE PRE-STAGE TO MEMBERSHIP

Israel	2
Serbia	10

OBSERVER STATES

India	2
Japan	3
Russia	132
Turkey	3
USA	56

196

OTHERS

China	1	Kenya	2	Qatar	1	Thailand	4
Croatia	1	Latvia	1	Rwanda	15	T.F.Y.R.O.M.	11
Cyprus	4	Lebanon	1	Sao Tome	2	Timor-Leste	1
Australia	3	Madagascar	1	Saudi Arabia	1	Ukraine	30
Azerbaijan	1	Malta	36	Singapore	2	U.A.E.	1
Brazil	53	Mexico	5	Slovenia	21		
Cameroon	1	Ghana	4	South Africa	6		
Canada	1	Guinea Bissau	1	South Korea	22		
Cape Verde	2	Ireland	3	Swaziland	1		
Chile	3	Kazakhstan	3				
		Mozambique	13				

343



CERN Lehrerprogramme



Sommerstudenten

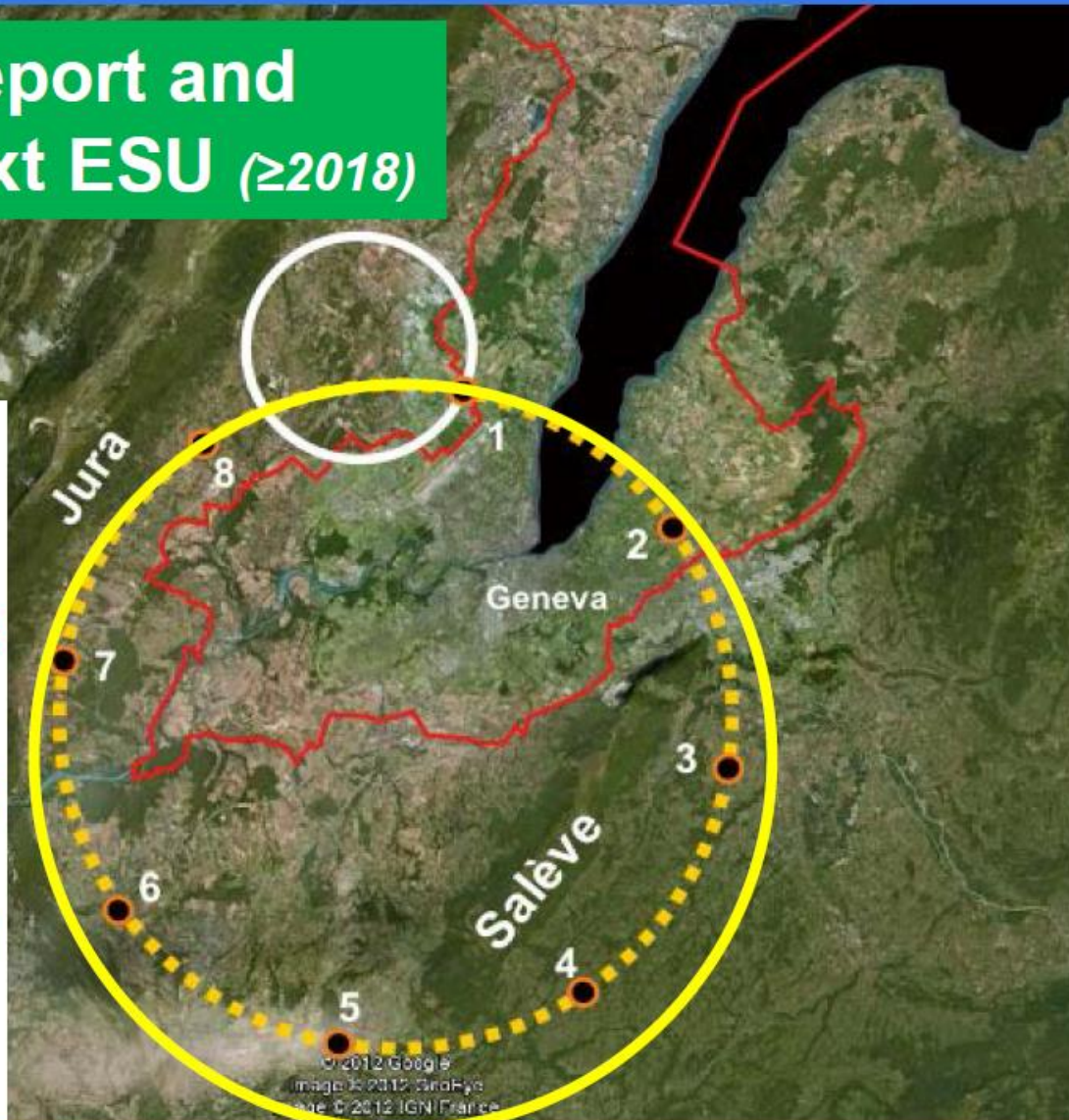
80-100 km tunnel infrastructure in Geneva area – design driven by pp-collider requirements with possibility of e⁺-e⁻ (TLEP) and p-e (VLHeC)

Conceptual Design Report and cost review for the next ESU (≥ 2018)

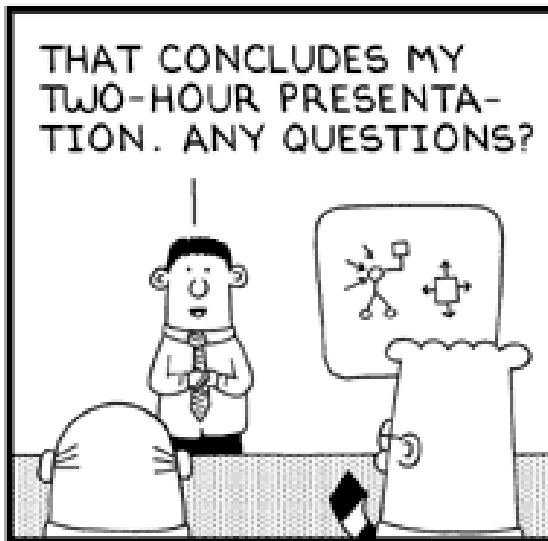
15 T \Rightarrow 100 TeV in 100 km
20 T \Rightarrow 100 TeV in 80 km

FCC Design Study Kick-off Meeting: 12-14. February 2014 at Geneva University

- *Establishing international collaborations*
- *Set-up study groups and committees*



Ihre Fragen ?



www.dilbert.com scottadams@aol.com



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