





CERN

Eine kurze Einführung

Dr. Sascha Marc Schmeling
CERN Physics Department

CERN – Eine Einführung

- CERN – Organisation, Teilchenphysik, Forschung
- Beschleuniger und Experimente
 - vom Wasserstoff zum schnellen Proton
 - Experimente
- Weitere Aktivitäten

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

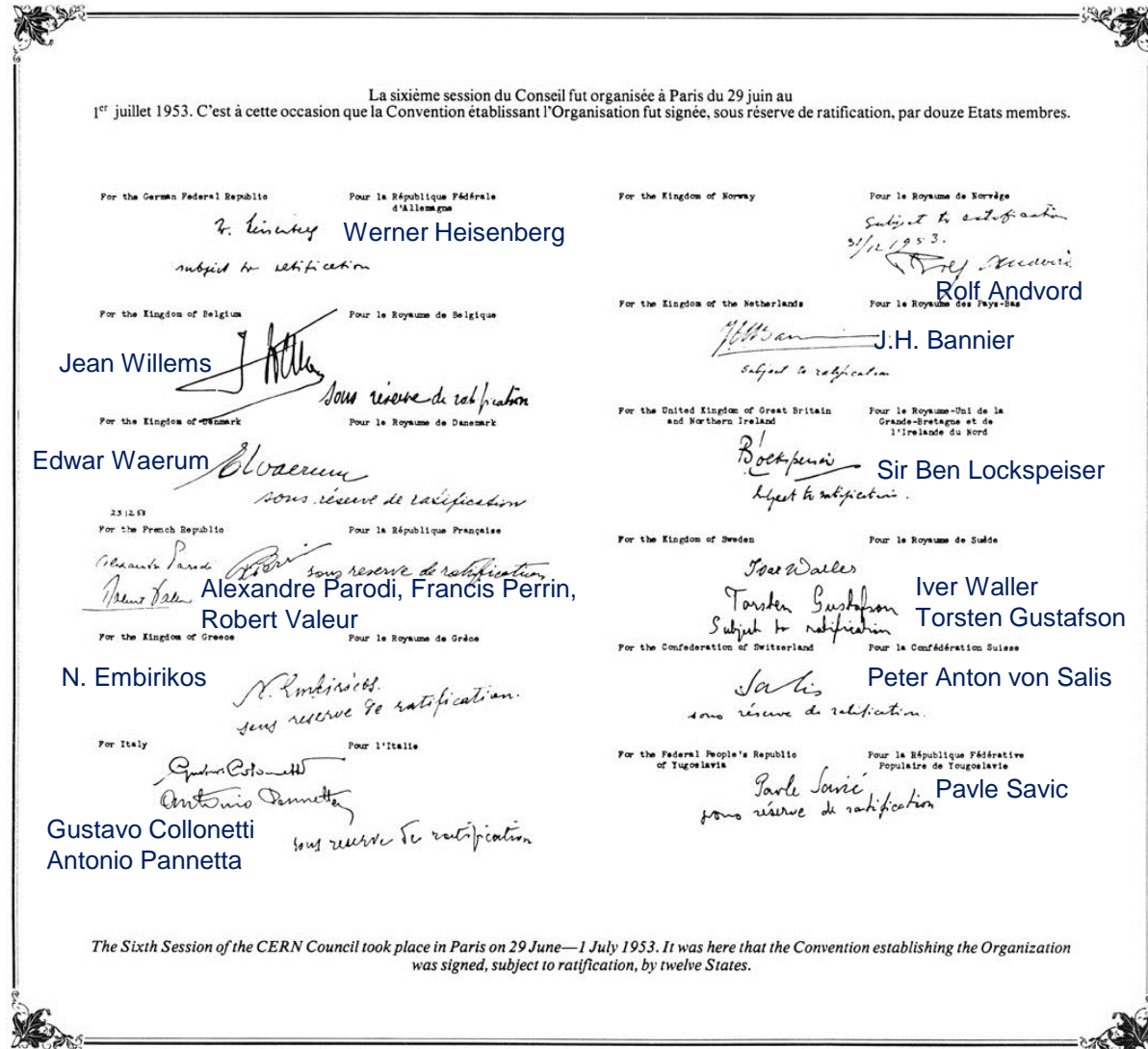
Standortauswahl für Genf

1. Juli 1953

Unterzeichnung der Charta

29. September 1954

Abschluß des
Ratifikationsprozesses in den
ursprünglichen zwölf
Mitgliedsstaaten



CERN was founded 1954: 12 European States

“Science for Peace”

Today: 20 Member States

~ 2300 staff

~ 1050 other paid personnel

> 11000 users

Budget (2012) ~1000 MCHF

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

Candidate for Accession: Romania

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

Applicant States: Cyprus, Slovenia, Turkey

Observers to Council: India, Japan, the Russian Federation, the United States of America, Turkey, the European Commission and UNESCO



CERN – Das Laboratorium



CERN Council

President: M. Spiro

20 Member States

2 members each

1 Candidate for Accession

2 members

2 Associate Member States (pre-membership stage)

2 members each

Several Ex-Officio Members

Several Observers on Invitation

Finance Committee

Chairman: B. Jacobsen

20 Member States

1-3 members each

1 Candidate for Accession

2 members each

2 Associate Member States (pre-membership stage)

1-2 members each

Several Ex-Officio Members

Several Observers on Invitation

Scientific Policy Committee

Chairman: F. Zwirner

16 Individual Members

Several Ex-Officio Members

Chairpersons of Experiment and
Machine Committees

Several Permanent Invitees

e.g. Director General

Tripartite Employment Forum

Chairman: B. Dormy

Pension Fund Governing Board

Chairman: D.-O. Riska



Council Secretariat
EU Projects Office
Legal Service
Translations and Minutes

Directorates' Office

Director General
Rolf Heuer

International Relations
Communication
Host State Relations
Internal Audit
Knowledge and Technology Transfer
Safety Commission

Director for Administration and General Infrastructure
Sigurd Lettow

Director for Research and Scientific Computing
Sergio Bertolucci

Director for Accelerators and Technology
Steve Myers

Sectors

FP
Finance and Procurement
Thierry Lagrange

GS
General Services
Thomas Pettersson

HR
Human Resources
Anne-Sylvie Catherin

IT
Information Technologies
Frederic Hemmer

PH
Physics
Philippe Bloch

BE
Beams
Paul Collier

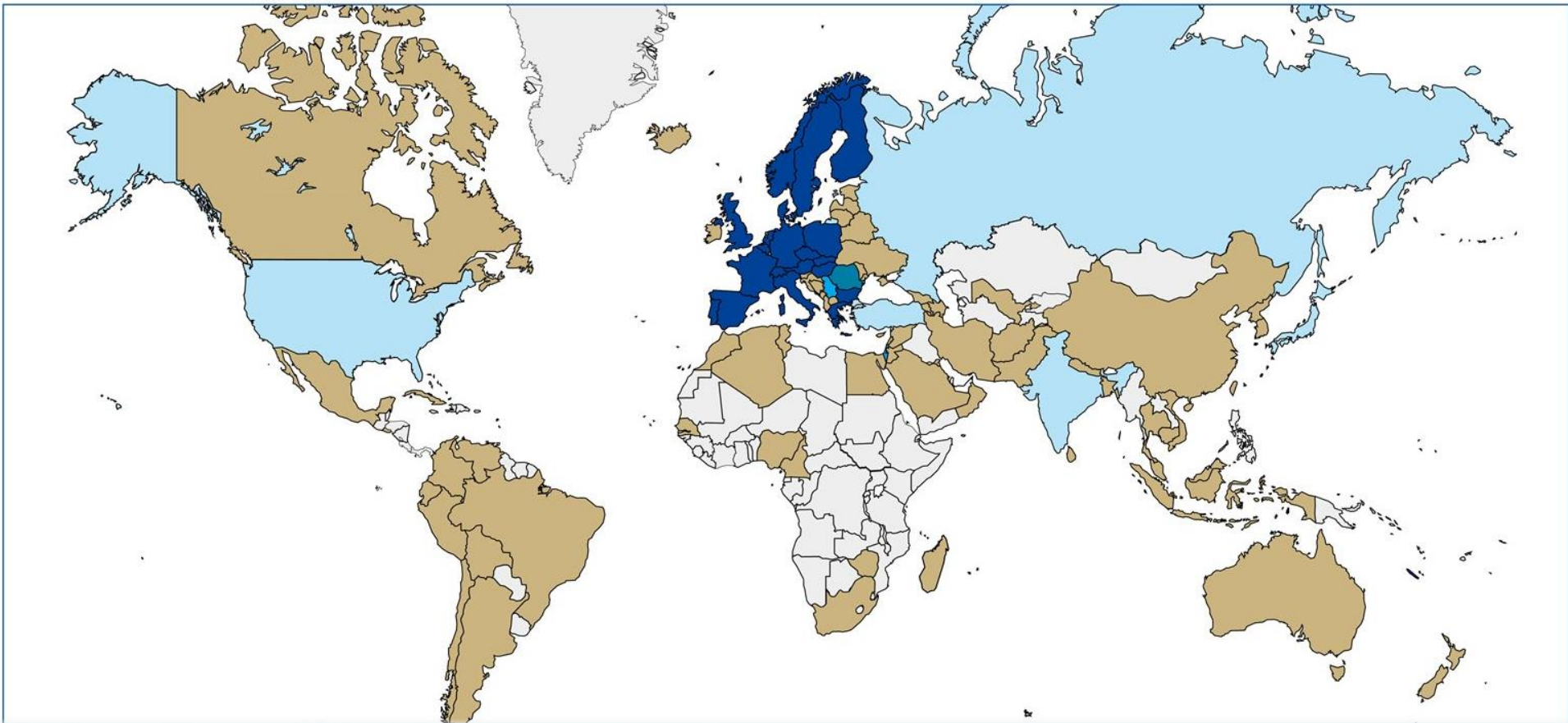
TE
Technology
Frederic Bordry

EN
Engineering
Roberto Saban

Departments



CERN's Organization



Angestellte (Köpfe)

Staff	2501
Fellows	531

Assoziierte (Köpfe)

Wissenschaftler	059
Projektpersonal	170
Studenten	179
Doktoranden	162
Sonstige	1050
User	11011

Firmen (Köpfe)

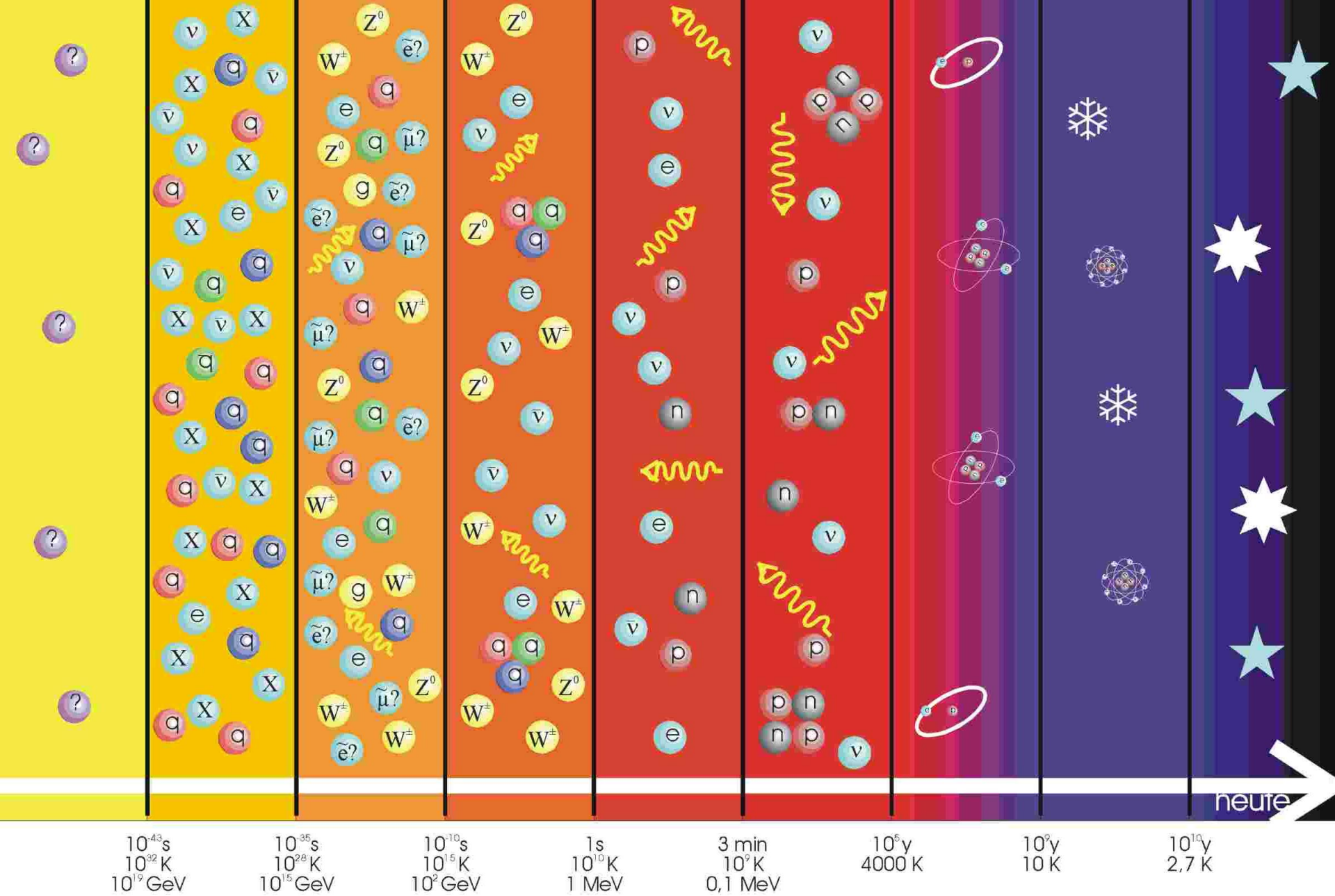
3964



Menschen bei CERN – Herbst 2012

HochEnergiePhysik

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

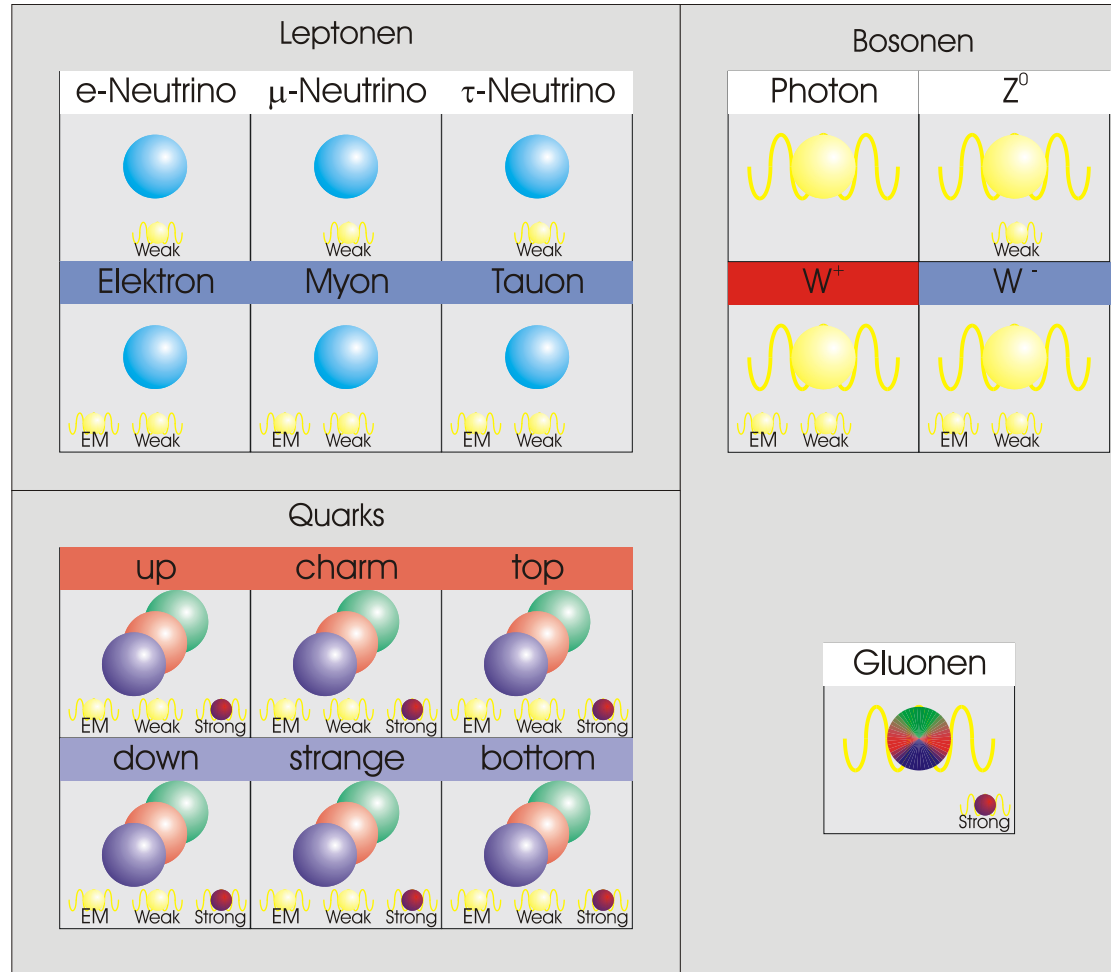


Die Geschichte des Universums

Das Standardmodell

... ist ...

- ... eine experimentell gut bestätigte Beschreibung unserer Welt auf der Ebene der Elementarteilchen
- ... eine Zusammenfassung Alles Wissens um die Natur der kleinsten Teilchen
- ... sehr präzise, sogar so weit, daß zukünftige Entdeckungen recht präzise vorhergesagt werden können



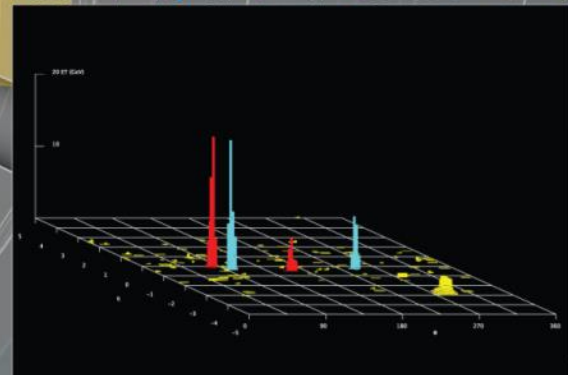
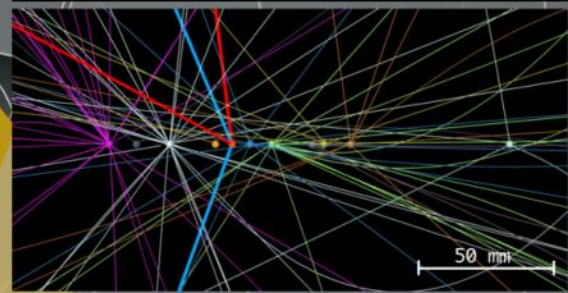
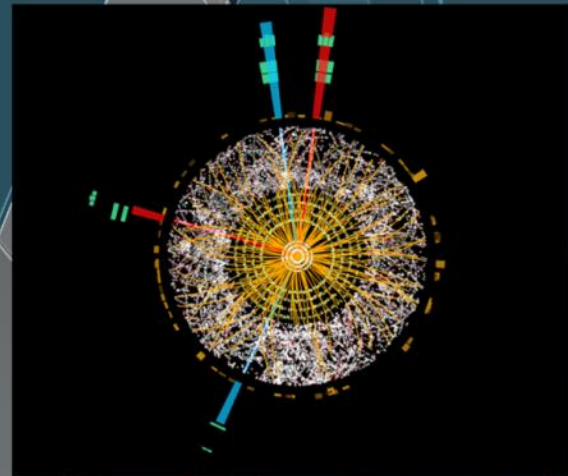
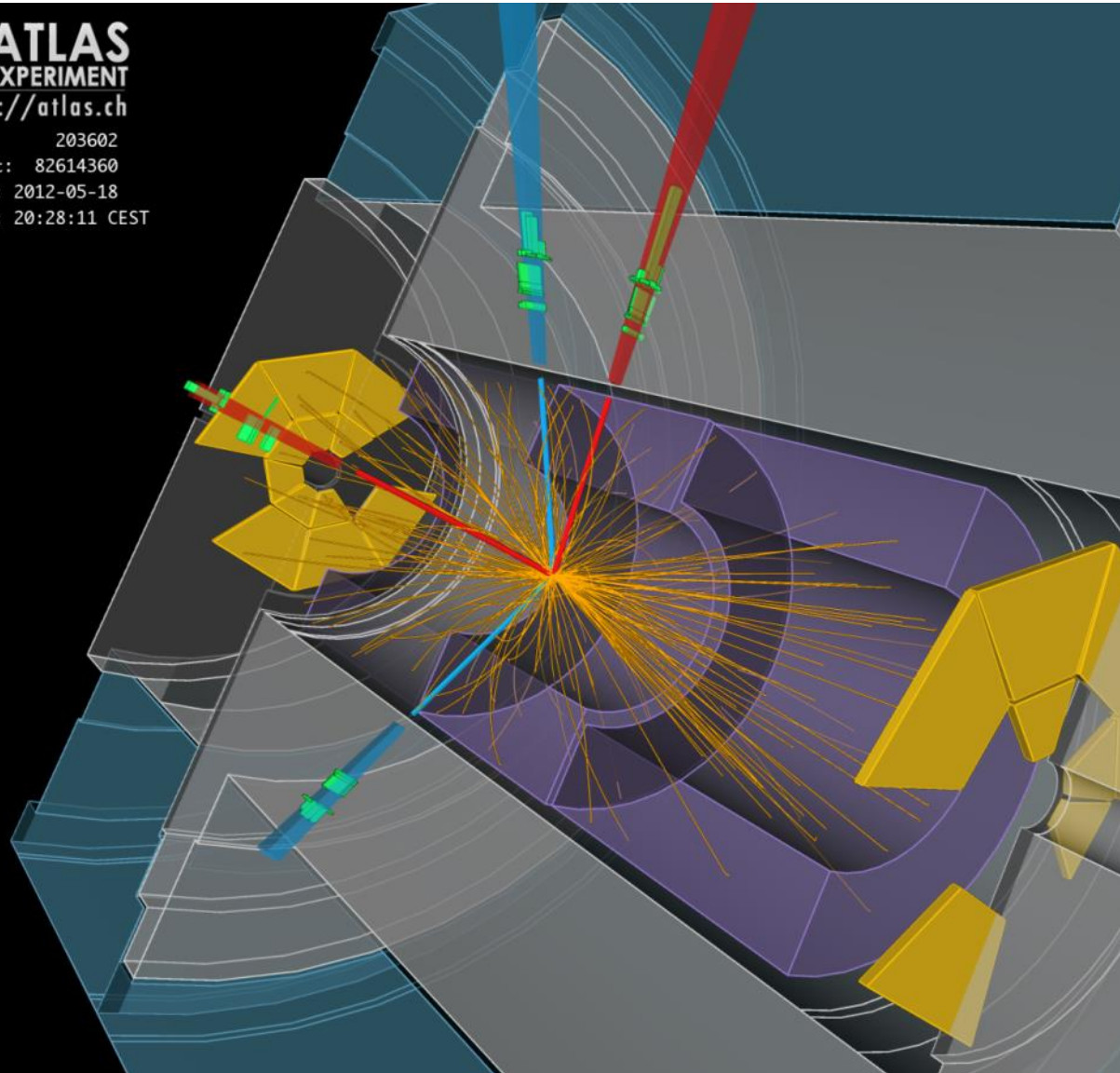
4. Juli 2012: CERN Seminar

“CERN experiments observe particle consistent with long-sought Higgs boson”

ATLAS
EXPERIMENT

<http://atlas.ch>

Run: 203602
Event: 82614360
Date: 2012-05-18
Time: 20:28:11 CEST



4. Juli 2012: CERN Seminar

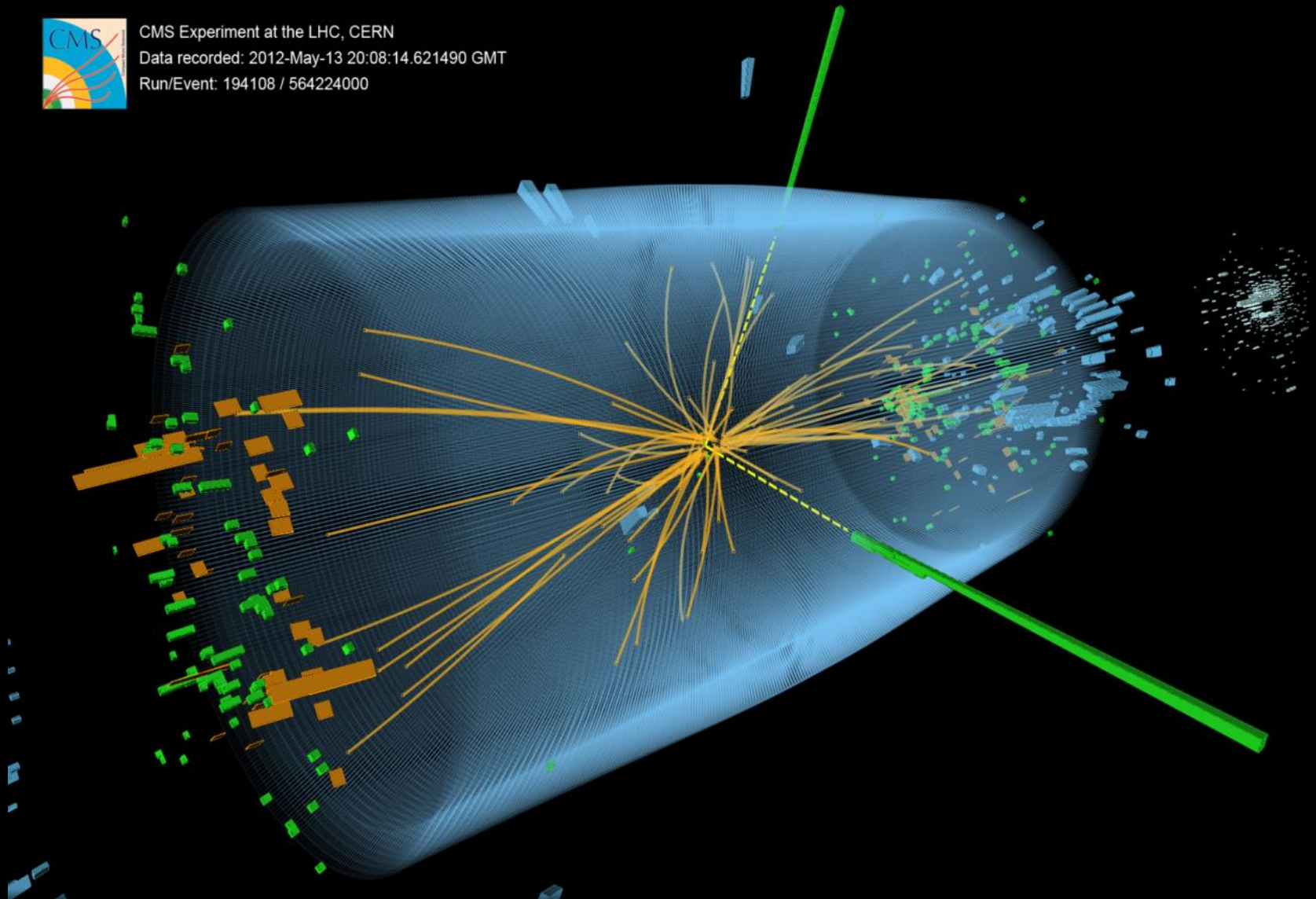
“CERN experiments observe particle consistent with long-sought Higgs boson”



CMS Experiment at the LHC, CERN

Data recorded: 2012-May-13 20:08:14.621490 GMT

Run/Event: 194108 / 564224000





4. Juli 2012: CERN Pressekonferenz



LHCb

ATLAS

CERN Meyrin

CERN Prévessin

SPS 7 km

RHIC 400 m

SUISSE
FRANCE

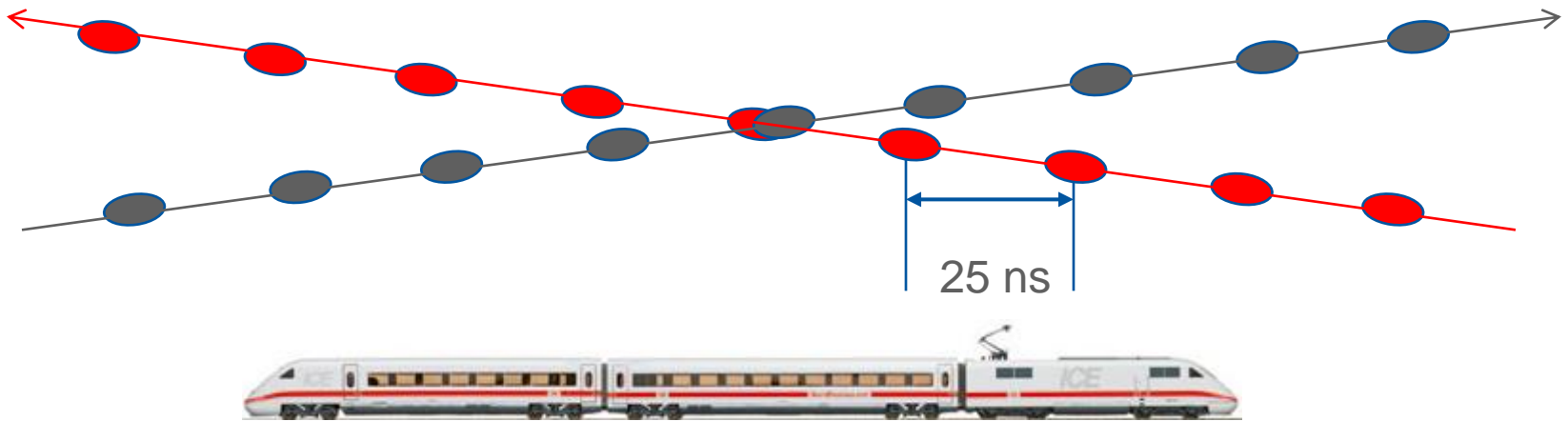
CMS

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 Wolken • Anzahl der Protonen pro Wolke

Protonenenergie: 7 TeV

bei höchster Intensität:

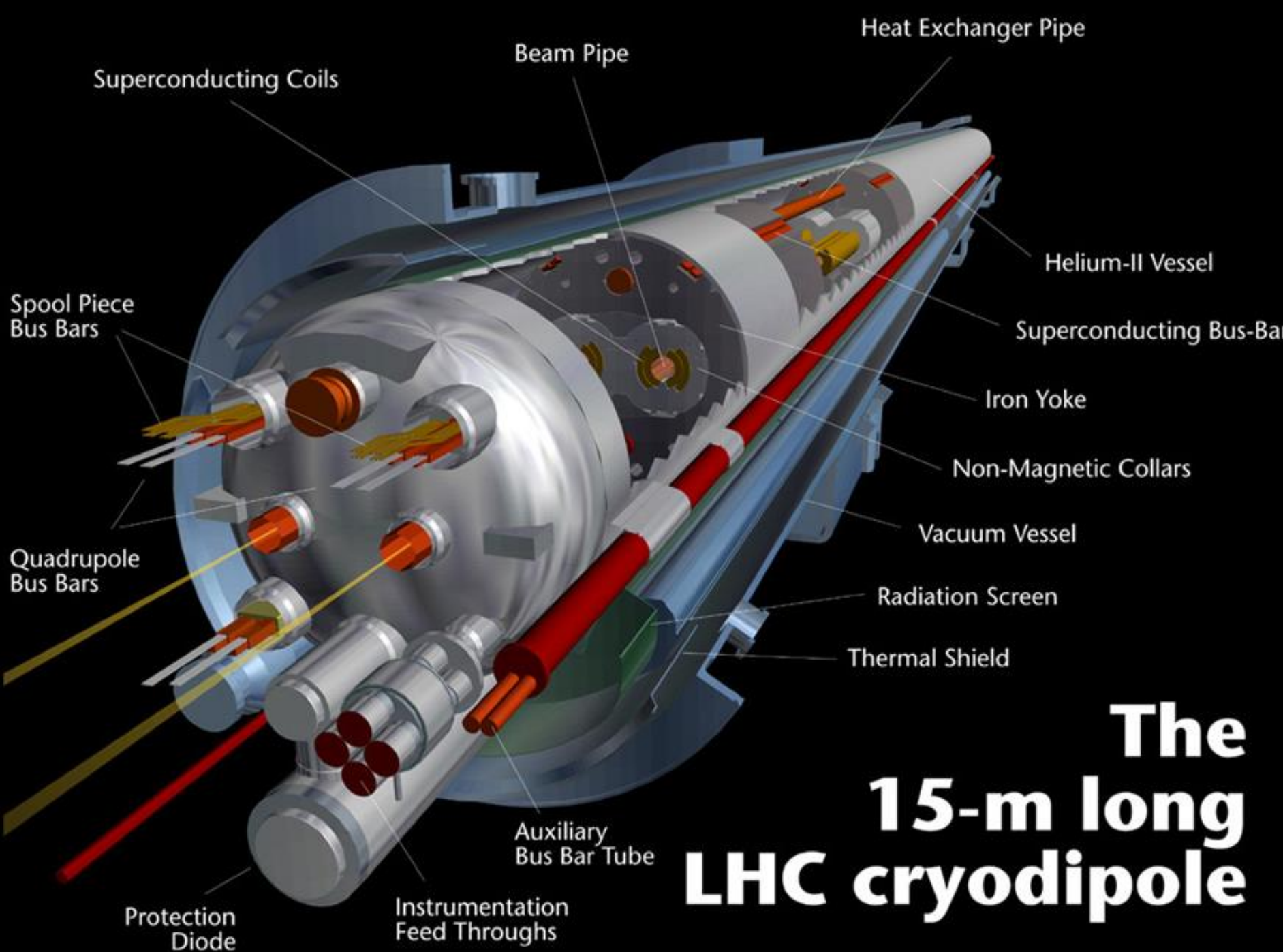
Anzahl der Wolken pro Richtung: 2808

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

Strahlenergie (pro Richtung): 346 MJoule



LHC – Strahlenergie



The 15-m long LHC cryodipole

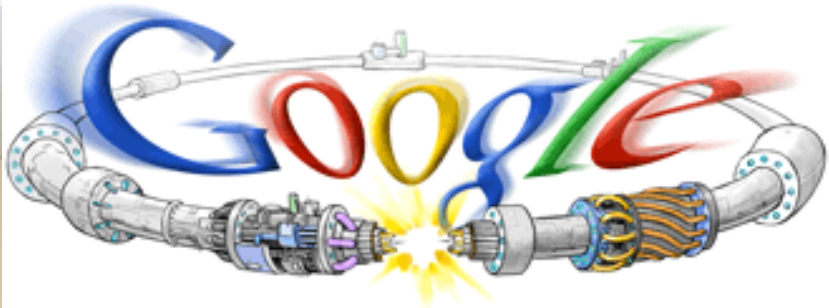
$$E_{\text{Dipol}} = 0.5 \cdot L_{\text{Dipol}} \cdot I_{\text{Dipol}}^2$$

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 = $\frac{1}{2} mv^2 \sim 10\text{GJ}$



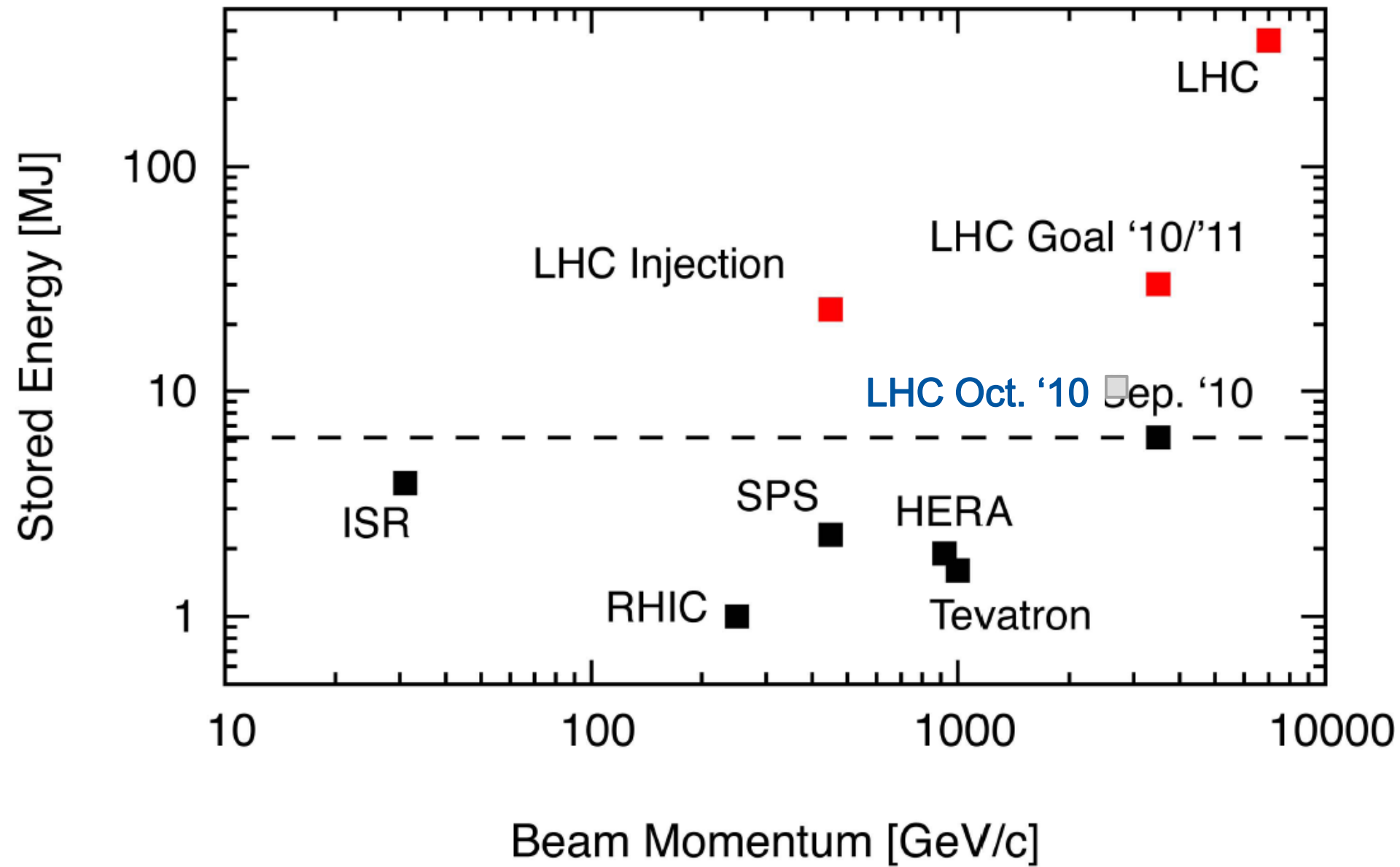


For 3 days all went perfectly well with beam...



■ = reached

■ = goals



Energien in Beschleunigern



For 3 days all went perfectly well with beam...

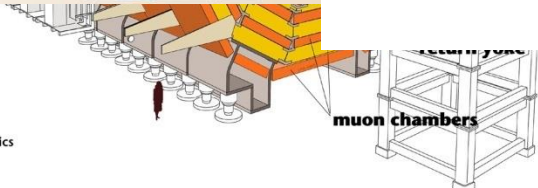
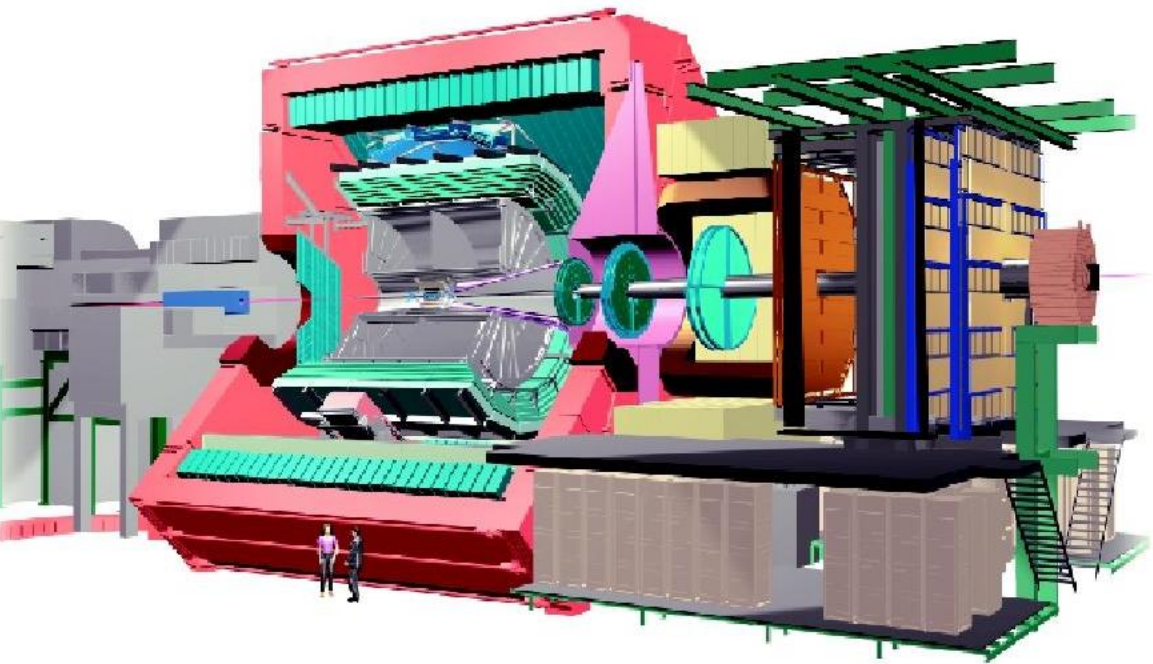
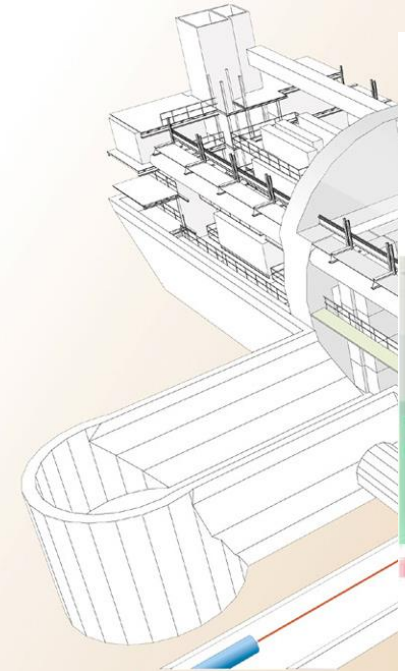
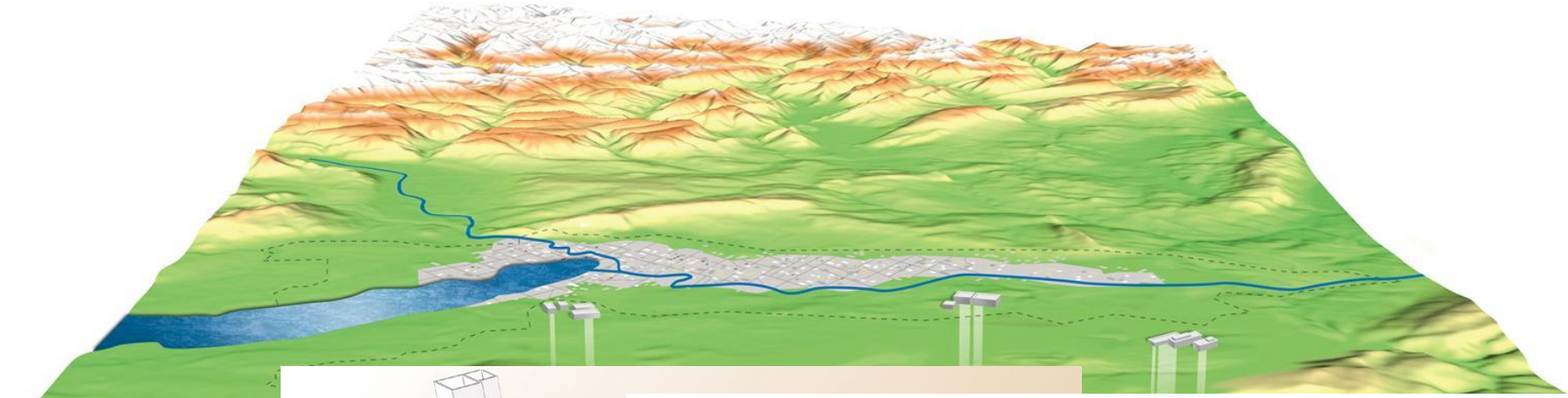


Der LHC Beschleuniger - DPG - Bonn - Jrg Wenniger

17.03.2010



Der LHC-Start

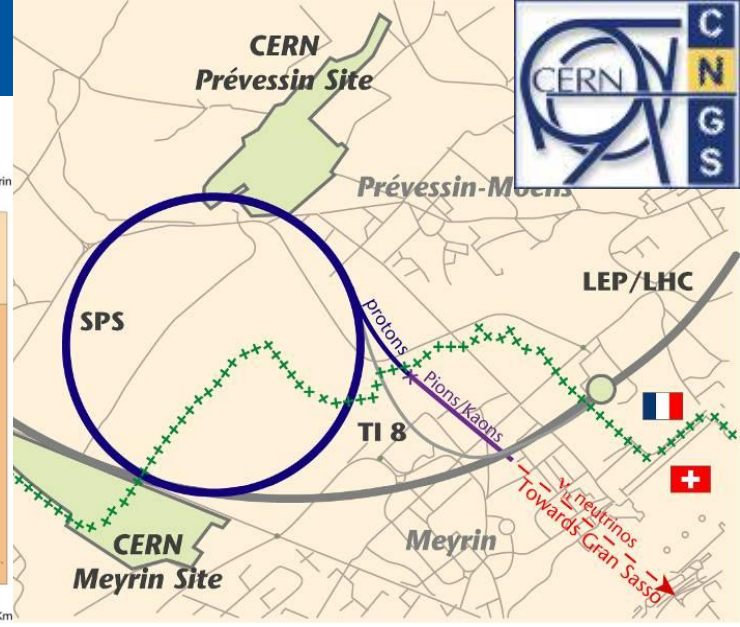
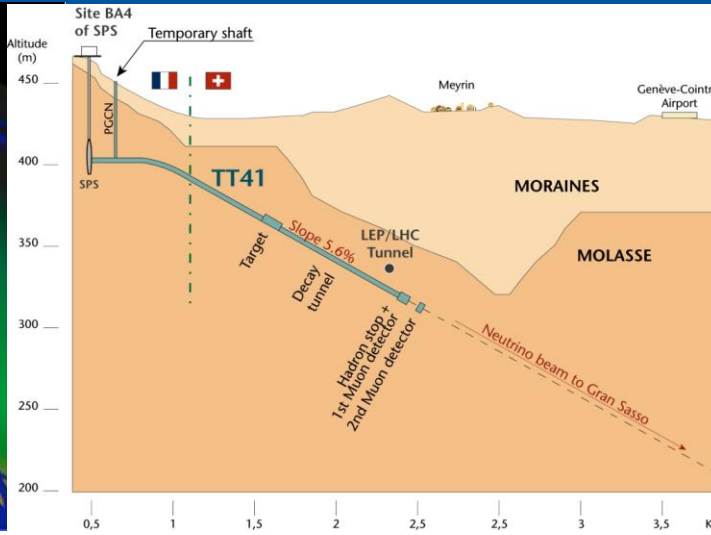


Detector characteristics

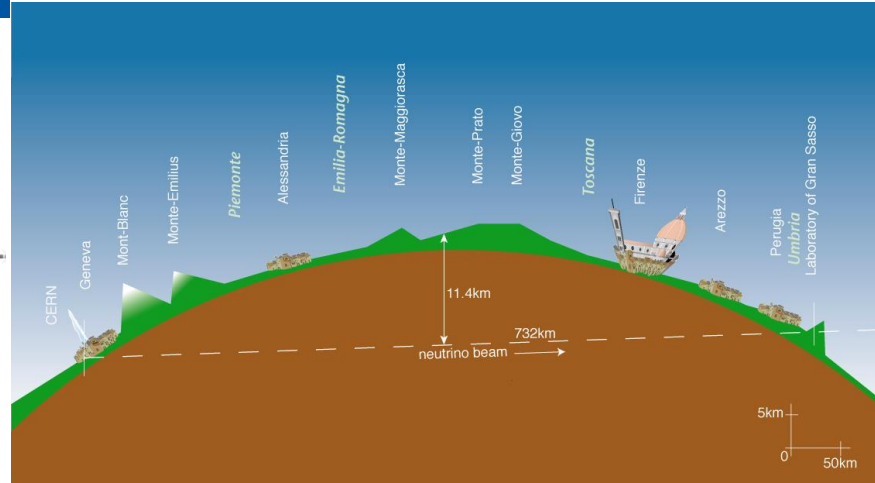
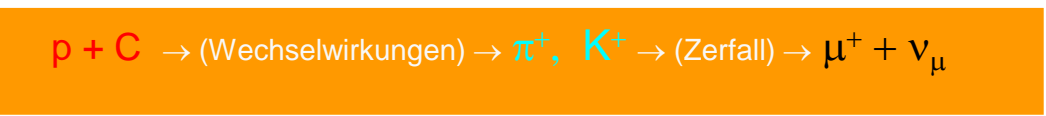
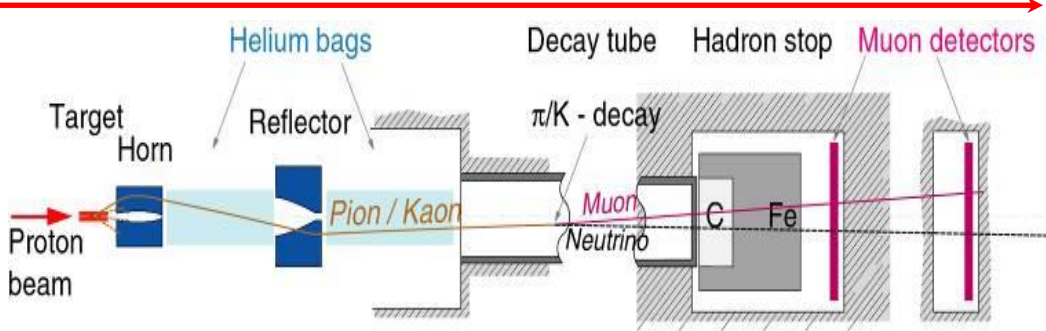
Width: 22m
Diameter: 15m
Weight: 14500t

Weitere Aktivitäten

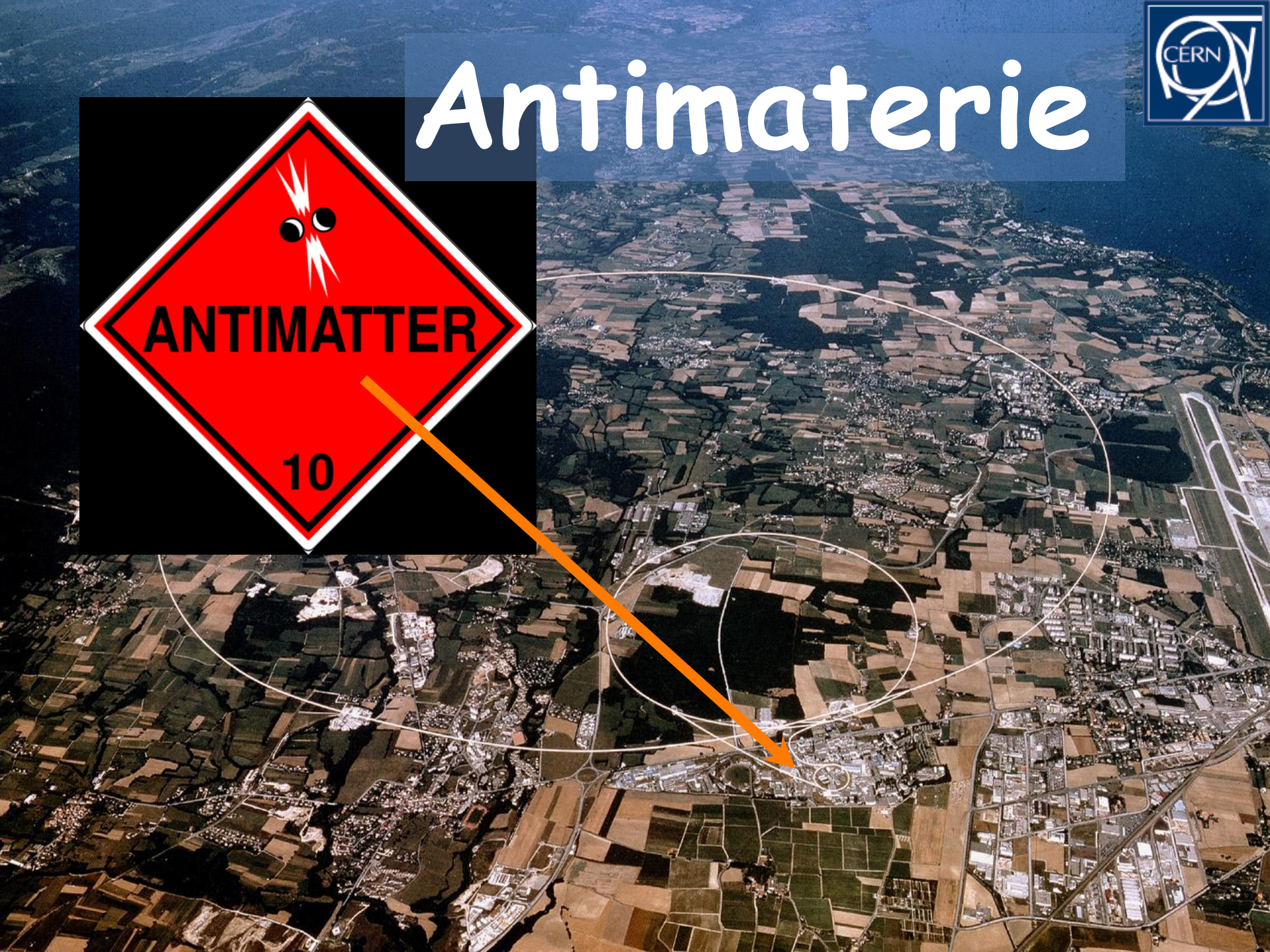
CERN Neutrinos zum Gran Sasso



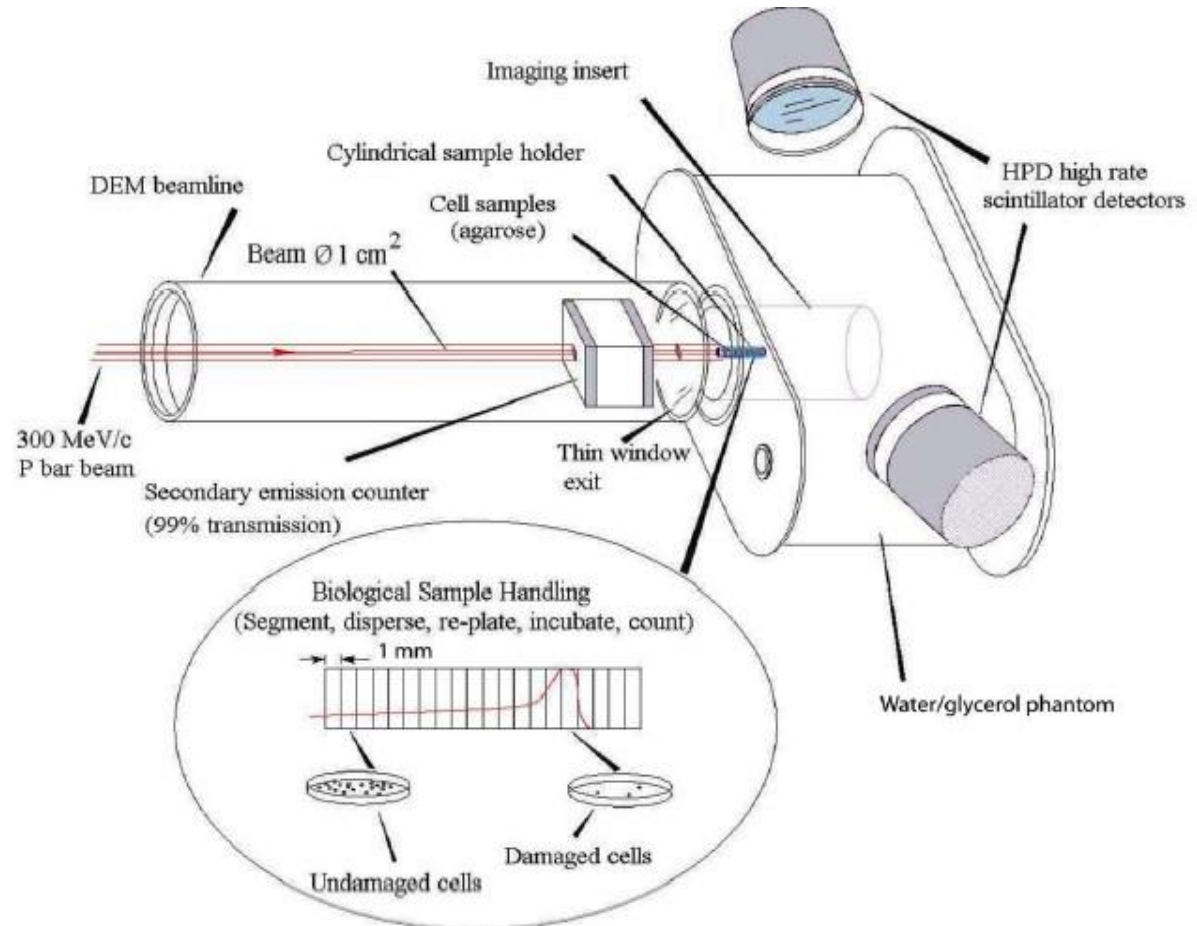
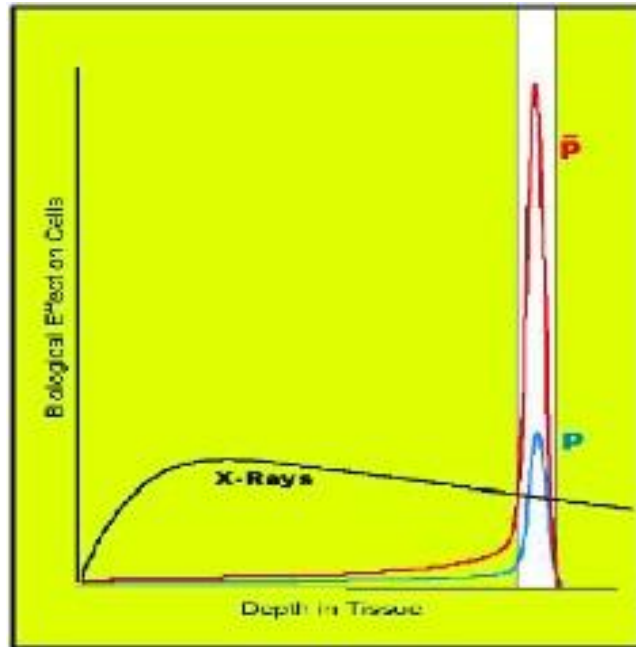
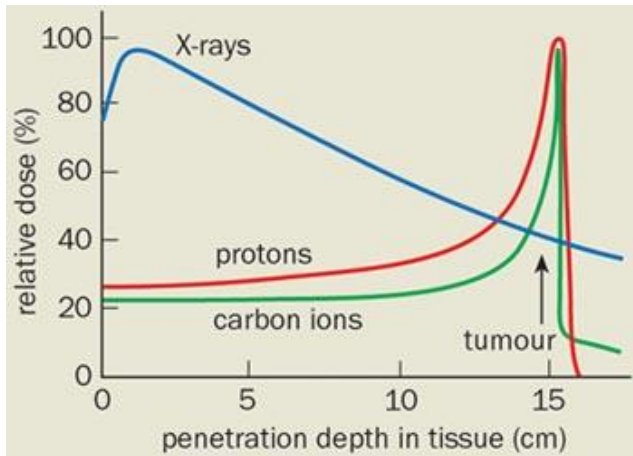
700 m 100 m 1000m 67 m



Antimaterie



ACE Experiment bei CERN





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

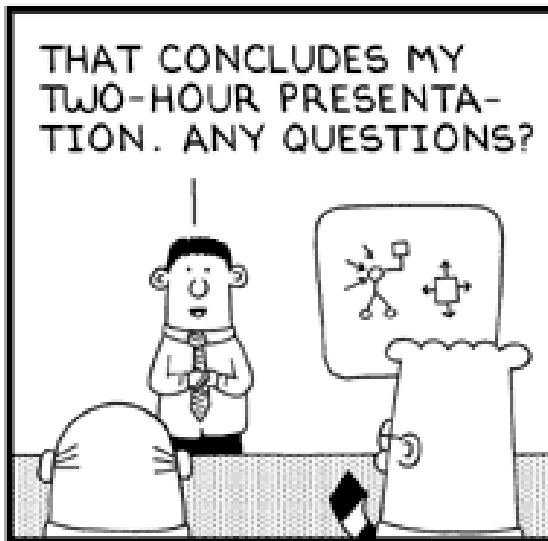
Conferences

Management Training



Eine Vielzahl anderer Aktivitäten ...

Ihre Fragen ?



www.dilbert.com scottadams@aol.com



8/1/03 © 2003 United Feature Syndicate, Inc.

