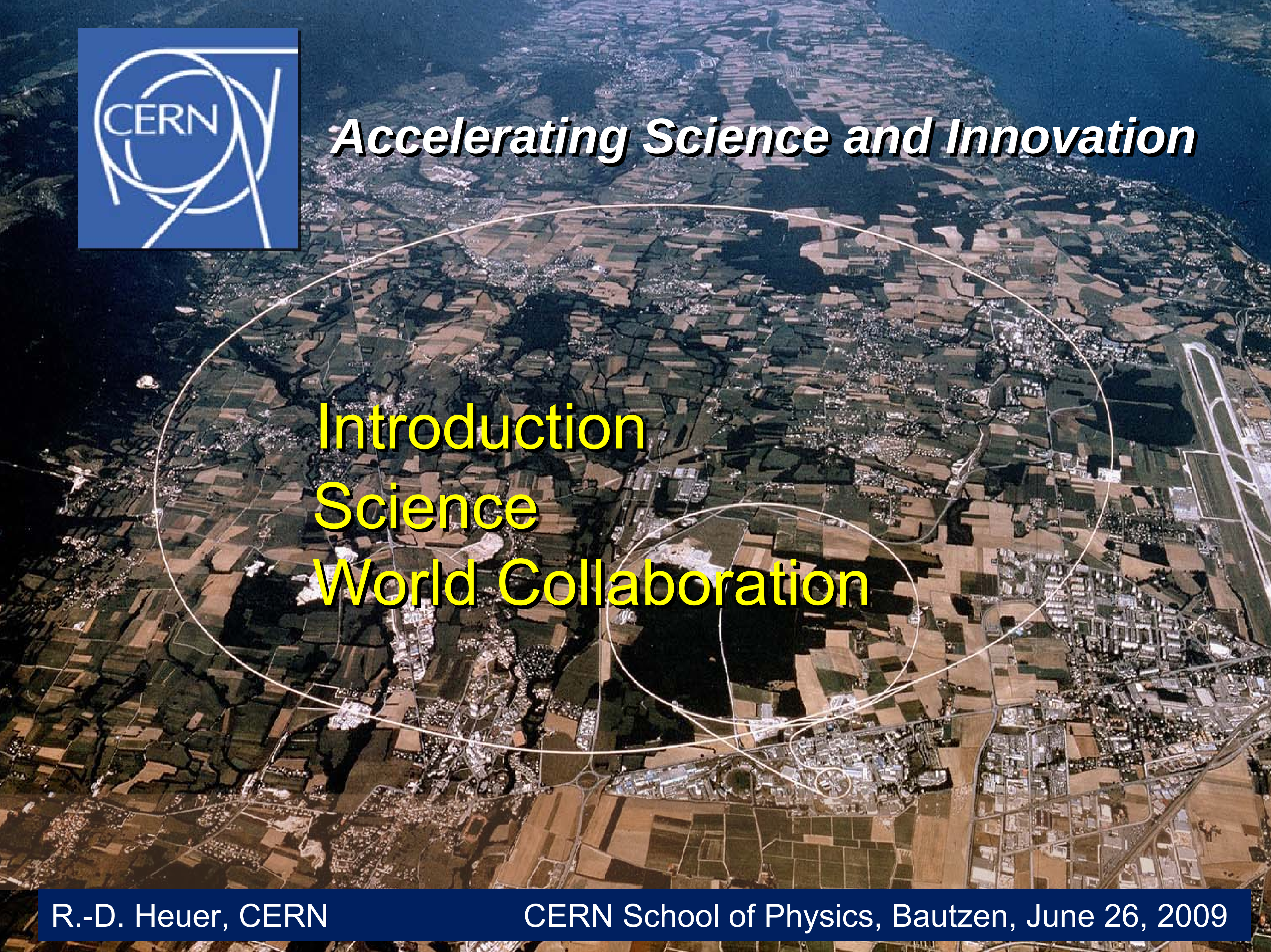
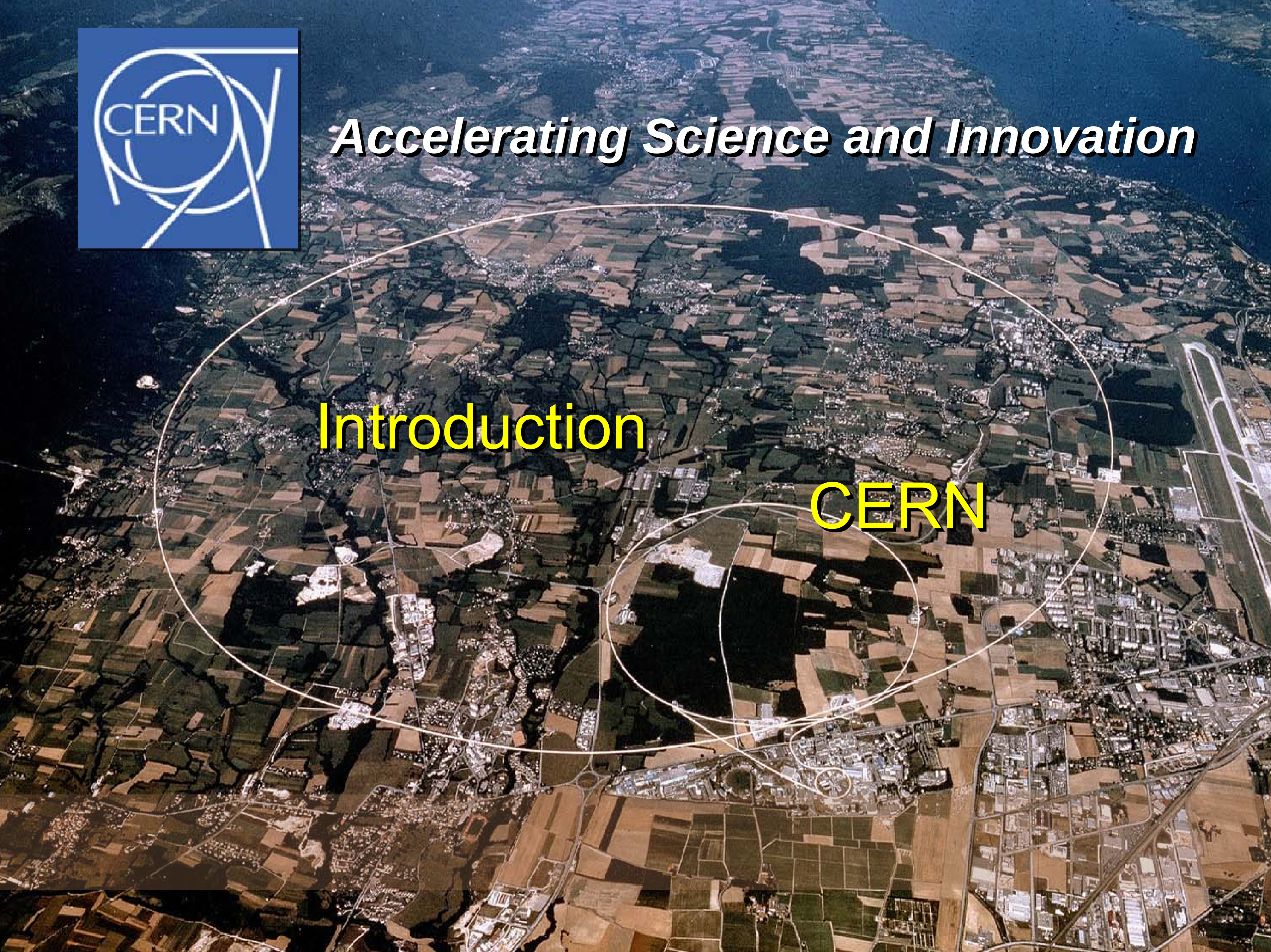


Accelerating Science and Innovation

Introduction
Science
World Collaboration

R.-D. Heuer, CERN

CERN School of Physics, Bautzen, June 26, 2009

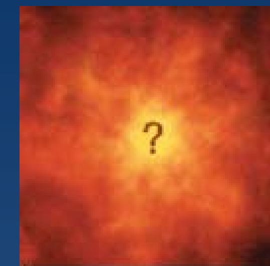

CERN
Accelerating Science and Innovation
Introduction
CERN

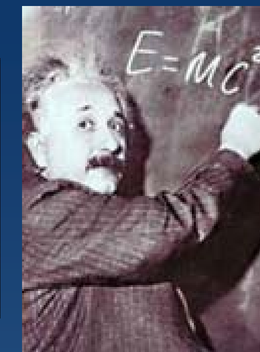
Innovation CERN uniting people Education Research

The Mission of CERN

- Push back the frontiers of knowledge

  E.g. the secrets of the Big Bang …what was the matter like within the first moments of the Universe’s existence?





- Develop new technologies for accelerators and detectors

  Information technology - the Web and the GRID

  Medicine - diagnosis and therapy

- Train scientists and engineers of tomorrow

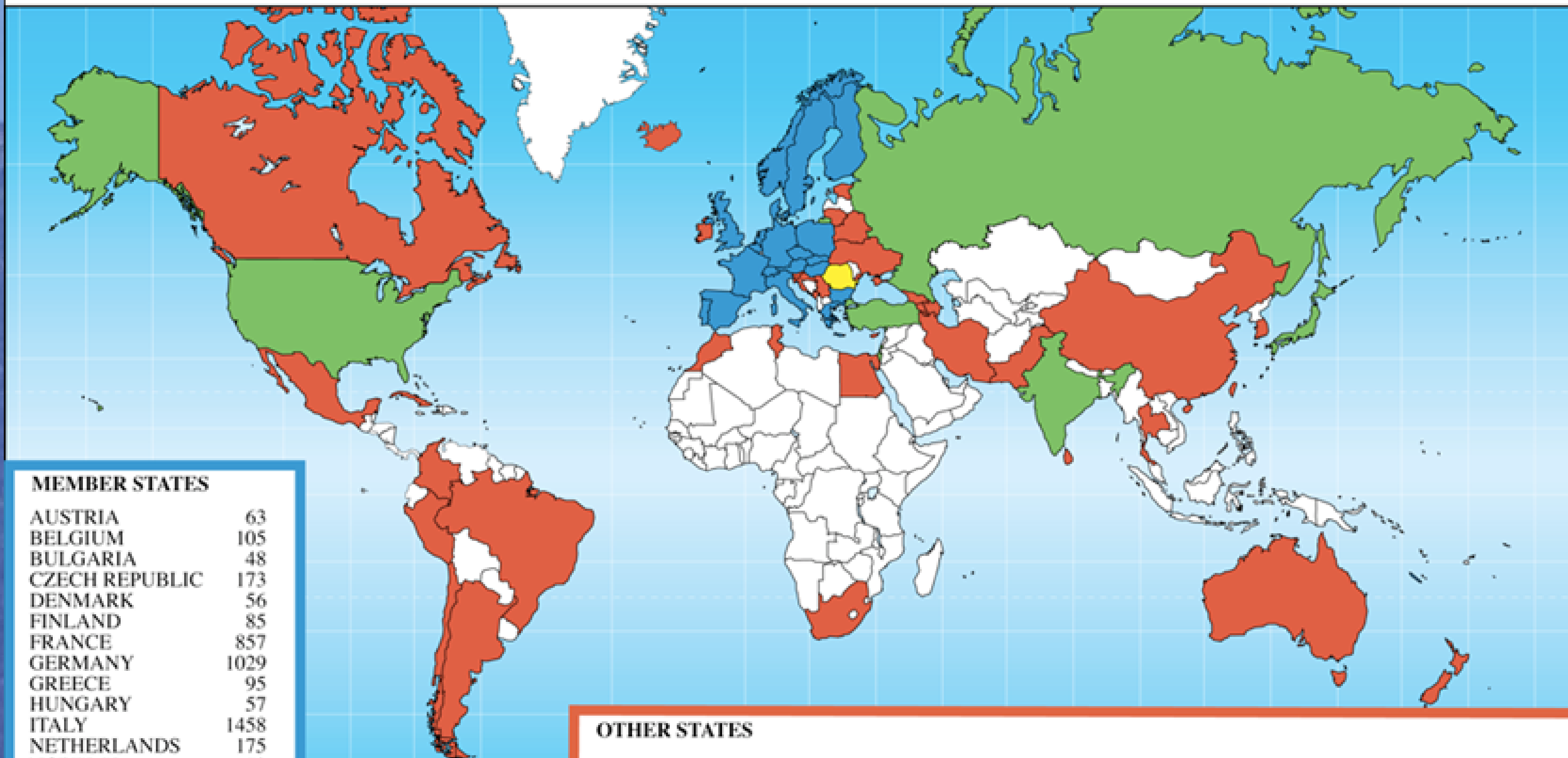
- Unite people from different countries and cultures

CERN in Numbers

- 2256 staff
- ~ 700 other paid personnel
- ~ 9500 users
- Budget (2009) 1100 MCHF

- 20 Member States: Austria, Belgium, Bulgaria, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Italy, Netherlands, Norway, Poland, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.
- 1 Candidate for Accession to Membership of CERN: Romania
- 8 Observers to Council: India, Israel, Japan, the Russian Federation, the United States of America, Turkey, the European Commission and Unesco

CERN in Numbers



Distribution of All CERN Users by Nation of Institute on 17 February 2009

MEMBER STATES

AUSTRIA	63
BELGIUM	105
BULGARIA	48
CZECH REPUBLIC	173
DENMARK	56
FINLAND	85
FRANCE	857
GERMANY	1029
GREECE	95
HUNGARY	57
ITALY	1458
NETHERLANDS	175
NORWAY	72
POLAND	165
PORTUGAL	110
SLOVAKIA	48
SPAIN	291
SWEDEN	73
SWITZERLAND	332
UNITED KINGDOM	697

5989

OBSERVER STATES

INDIA	97
ISRAEL	54
JAPAN	200
RUSSIA	886
TURKEY	51
USA	1499

2787

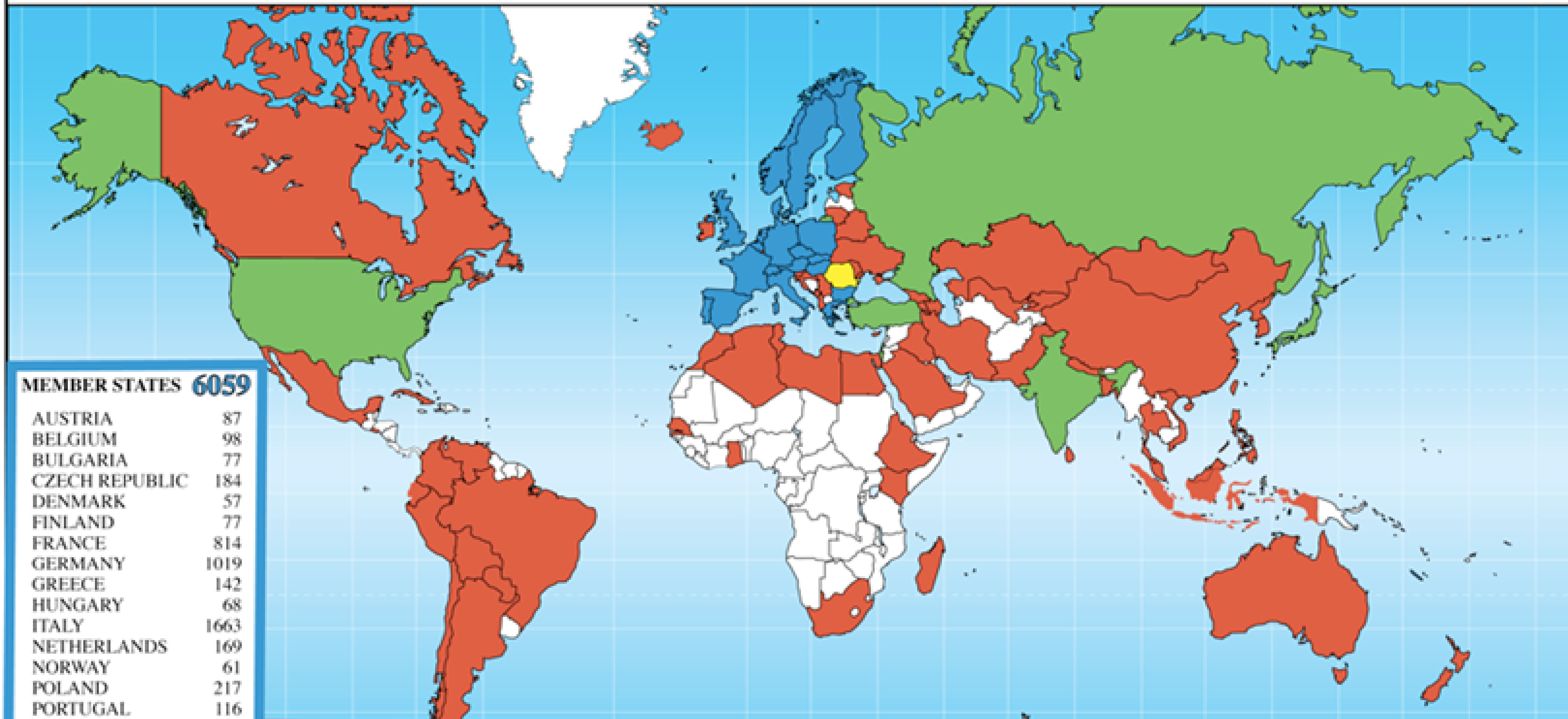
OTHER STATES

ARGENTINA	10
ARMENIA	14
AUSTRALIA	13
AZERBAIJAN	1
BELARUS	19
BRAZIL	70
CANADA	137
CHILE	5
CHINA	69
COLOMBIA	13
CROATIA	20
CUBA	3
CYPRUS	6
EGYPT	1
ESTONIA	11
GEORGIA	10
ICELAND	1
IRAN	12
IRELAND	12
KOREA	52
LITHUANIA	9
MEXICO	29
MONTENEGRO	1
MOROCCO	5
NEW ZEALAND	5
PAKISTAN	22
PERU	1
ROMANIA	50
SERBIA	17
SLOVENIA	16
SOUTH AFRICA	8
SRI LANKA	1
TAIWAN	44
THAILAND	1
TUNISIA	1
UKRAINE	18

707

CERN in Numbers

Distribution of All CERN Users by Nationality on 17 February 2009



MEMBER STATES	6059
AUSTRIA	87
BELGIUM	98
BULGARIA	77
CZECH REPUBLIC	184
DENMARK	57
FINLAND	77
FRANCE	814
GERMANY	1019
GREECE	142
HUNGARY	68
ITALY	1663
NETHERLANDS	169
NORWAY	61
POLAND	217
PORTUGAL	116
SLOVAKIA	68
SPAIN	300
SWEDEN	72
SWITZERLAND	187
UNITED KINGDOM	583

OBSERVER STATES	2350
INDIA	154
ISRAEL	59
JAPAN	221
RUSSIA	1010
TURKEY	70
USA	836

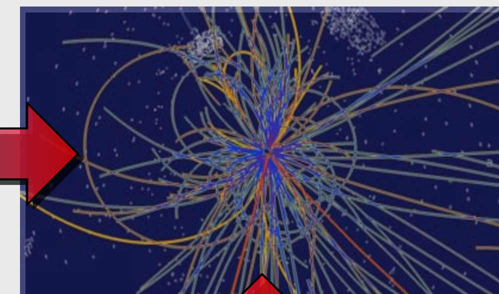
OTHER STATES	1112										
ALBANIA	1	CHINA	170	GIBRALTAR	3	LEBANON	6	NEW ZEALAND	6	SLOVENIA	20
ALGERIA	8	COLOMBIA	21	HONG KONG	1	LITHUANIA	12	PAKISTAN	40	SOUTH AFRICA	9
ARGENTINA	14	CROATIA	26	ICELAND	1	LUXEMBOURG	4	PALESTINIAN TERR., OCC.	1	SRI LANKA	5
ARMENIA	24	CUBA	3	INDONESIA	1	LIBYA	1	PARAGUAY	2	SYRIAN ARAB REP	2
AUSTRALIA	15	CYPRUS	10	IRAN	20	MADAGASCAR	2	PERU	3	TAIWAN PROV. OF CHINA	35
AZERBAIJAN	4	ECUADOR	2	IRAQ	1	MALAYSIA	5	PHILIPPINES	1	THAILAND	2
BANGLADESH	3	EGYPT	3	IRELAND	20	MAURITIUS	1	ROMANIA	95	TUNISIA	3
BELARUS	39	EL SALVADOR	1	KAZAKHSTAN	1	MEXICO	43	SAN MARINO	1	UKRAINE	39
BOLIVIA	2	ESTONIA	11	KENYA	1	MOLDOVA	1	SAUDI ARABIA	2	UZBEKISTAN	1
BRAZIL	69	ETHIOPIA	1	KOREA, D.P.R.	4	MONGOLIA	1	SENEGAL	1	VENEZUELA	3
CANADA	124	GEORGIA	33	KOREA REP.	70	MOROCCO	14	SERBIA	30	VIET NAM	4
CHILE	7	GHANA	1	KYRGYZSTAN	2	NEPAL	1	SINGAPORE	2		

CERN Technologies - Innovation

Three key technology areas at CERN

Accelerating particle beams

Detecting particles



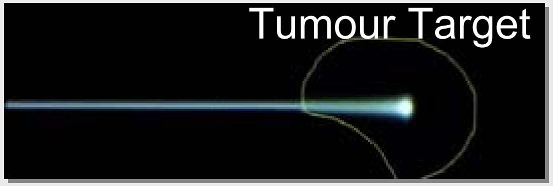
Large-scale **computing** (Grid)

CERN Technologies - Innovation

Medical imaging

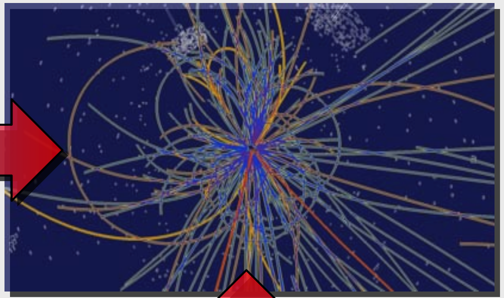
Example: medical application

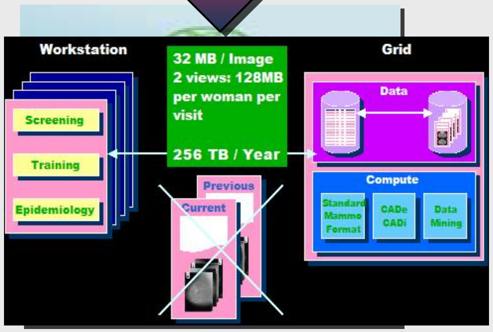
Accelerating particle beams



Charged hadron beam that loses energy in matter

Detecting particles





Large-scale **computing** (Grid)

Grid computing for medical data management and analysis

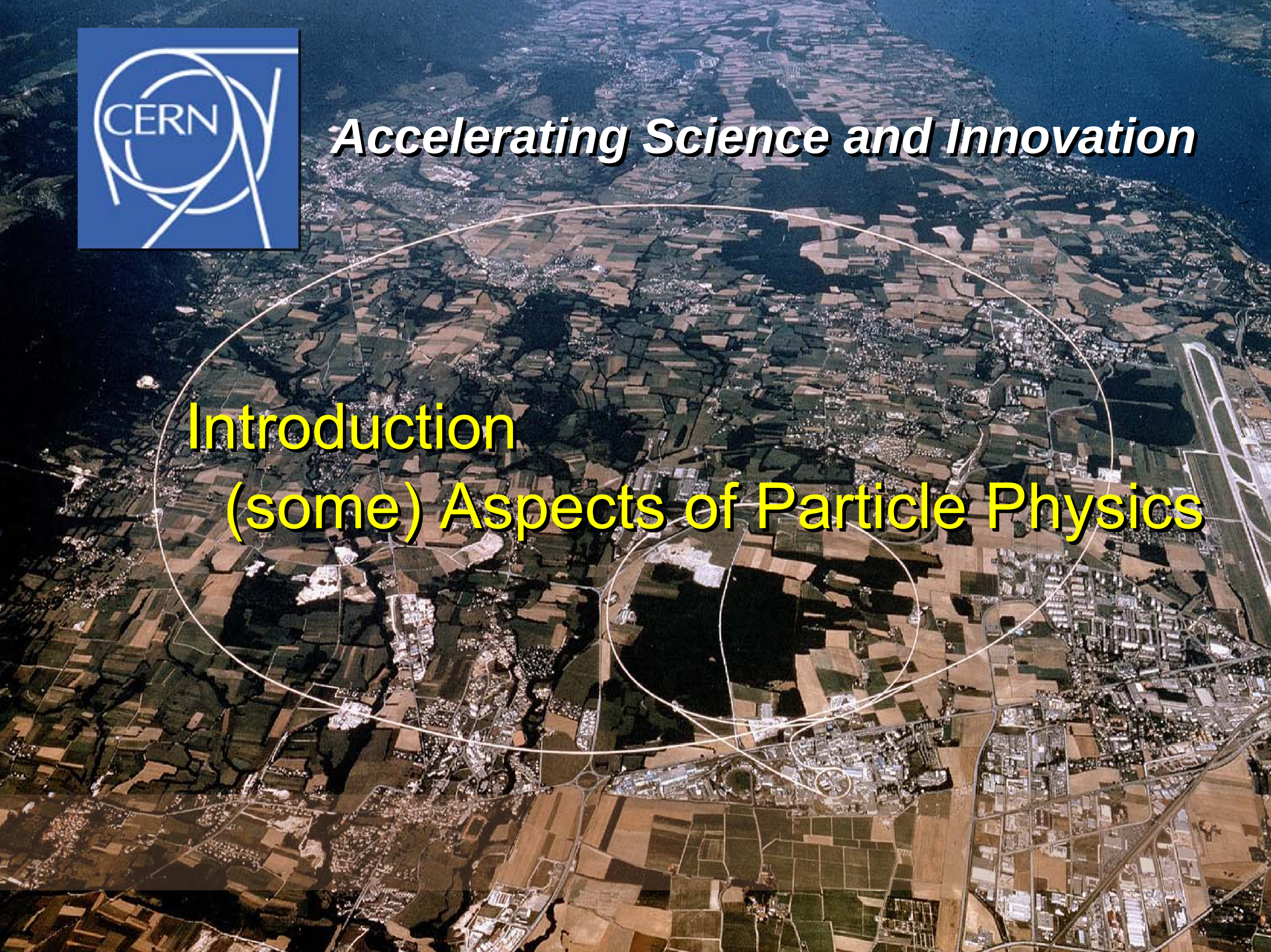
CERN Education Activities

Scientists at CERN
Academic Training Programme

Young Researchers
CERN School of High Energy Physics
CERN School of Computing
CERN Accelerator School

Physics Students
Summer Students
Programme

CERN Teacher Schools
International and National
Programmes


CERN
Accelerating Science and Innovation
Introduction
(some) Aspects of Particle Physics

Features of Particle Physics

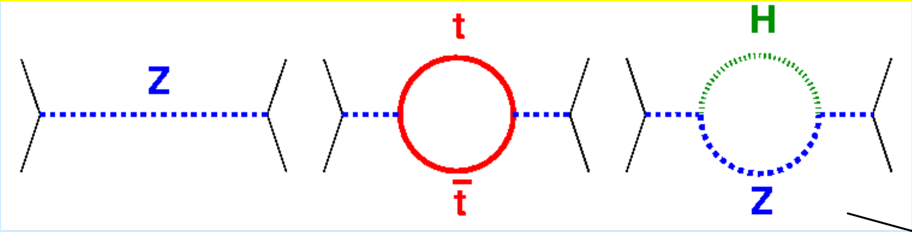
Interplay and Synergy

of different tools
(accelerators – cosmic rays – reactors . . .)

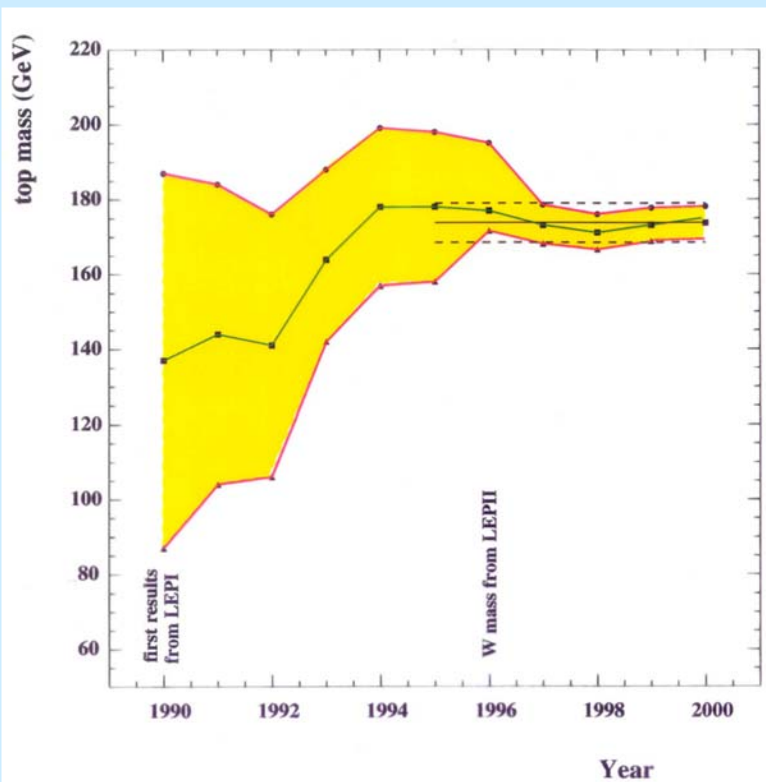
of different facilities
different initial states
lepton collider (electron-positron)
hadron collider (proton-proton)
lepton-hadron collider

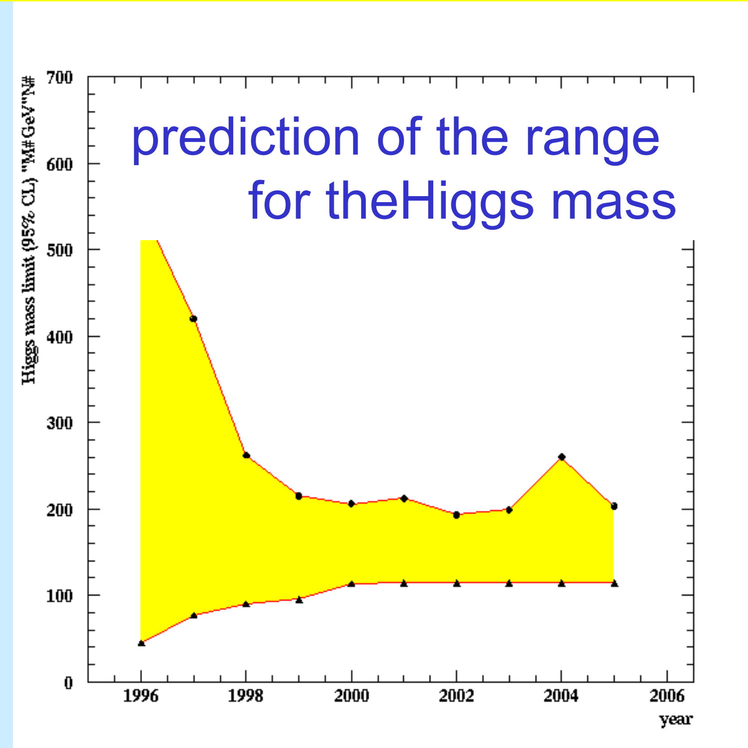
at the energy frontier: high collision energy
and intensity frontier: high reaction rate

Test of the SM at the Level of Quantum Fluctuations



indirect determination of the top mass





possible due to

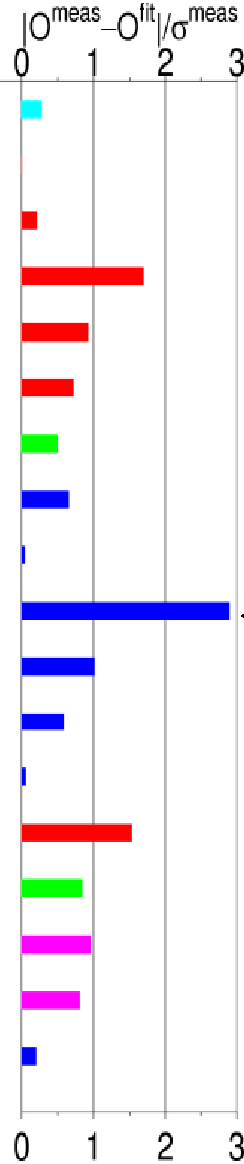
- precision measurements
- known higher order electroweak corrections

$$\propto (\frac{\boxed{M_t}}{M_W})^2, \ln(\frac{\boxed{M_h}}{M_W})$$

Status Summer Conferences 2007

Standard Model Analysis

	Measurement	Fit
$\Delta\alpha_{had}^{(5)}(m_Z)$	0.02758 ± 0.00035	0.02768
m_Z [GeV]	91.1875 ± 0.0021	91.1875
Γ_Z [GeV]	2.4952 ± 0.0023	2.4957
σ_{had}^0 [nb]	41.540 ± 0.037	41.477
R_l	20.767 ± 0.025	20.744
$A_{fb}^{0,l}$	0.01714 ± 0.00095	0.01645
$A_l(P_\tau)$	0.1465 ± 0.0032	0.1481
R_b	0.21629 ± 0.00066	0.21586
R_c	0.1721 ± 0.0030	0.1722
$A_{fb}^{0,b}$	0.0992 ± 0.0016	0.1038
$A_{fb}^{0,c}$	0.0707 ± 0.0035	0.0742
A_b	0.923 ± 0.020	0.935
A_c	0.670 ± 0.027	0.668
A_l(SLD)	0.1513 ± 0.0021	0.1481
$\sin^2\theta_{eff}^{lept}(Q_{fb})$	0.2324 ± 0.0012	0.2314
m_W [GeV]	80.398 ± 0.025	80.374
Γ_W [GeV]	2.140 ± 0.060	2.091
m_t [GeV]	170.9 ± 1.8	171.3



Fit to 17 high-Q^2 observables plus $\Delta\alpha_{had}$:

χ^2/ndof = 18.2/13 (15.1%)

Largest χ^2 contribution:
A_l(SLD) vs. $A_{fb}b$(LEP)

Decided in favour of leptons by M_W

Without this point, the fit is *too* good!

Afb(b) has largest pull: 2.9σ!

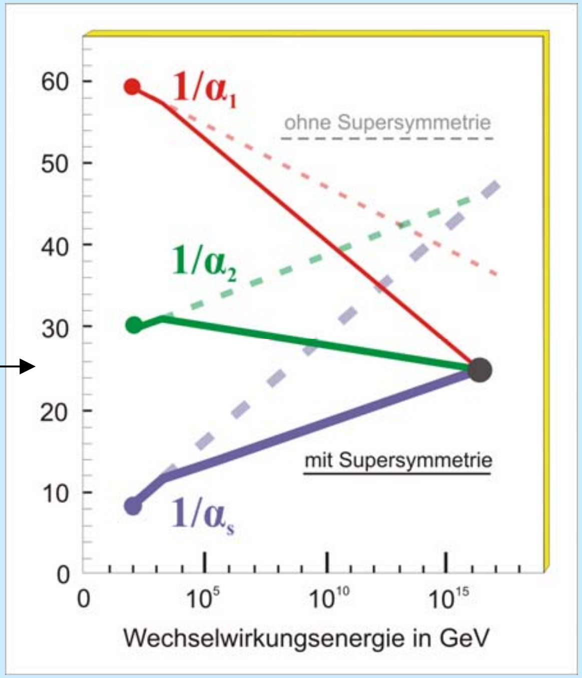
however . . .
. . . one piece missing
within Standard Model

plus many open questions

Key Questions of Particle Physics

origin of mass/matter or
origin of electroweak symmetry breaking

unification of forces



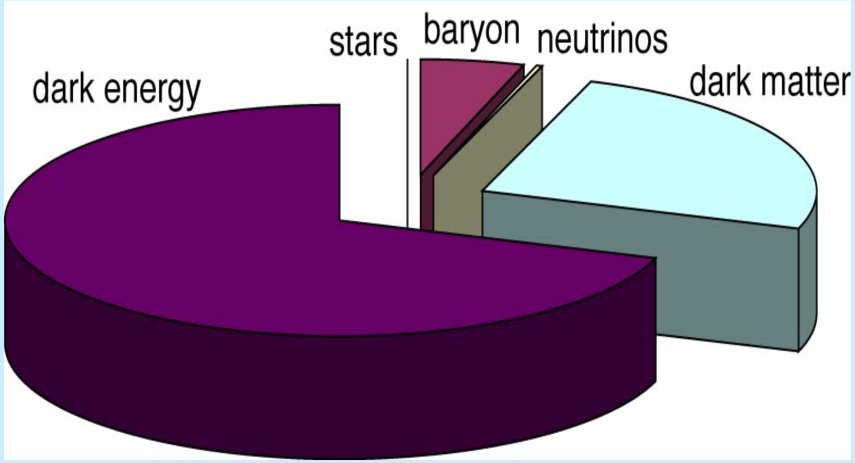
fundamental symmetry of forces and matter

unification of quantum physics and general relativity

number of space/time dimensions

what is dark matter

what is dark energy



Features of Particle Physics

Duration of large particle physics projects:

decade(s)
from science case
via concept, R&D, and design
to realisation and exploitation

Excellent training grounds
in particle physics,
accelerator and detector technologies,
computing

Duration of Projects

LEP Note 440

11.4.1983

1983

PRELIMINARY PERFORMANCE ESTIMATES FOR A LEP PROTON COLLIDER

S. Myers and W. Schnell

First LHC physics workshop 1984

LEP experiments: LoI 1982

1. Introduction

This analysis ... the United States where very large $p\bar{p}$ ... ively being studied at the moment. Inde... ic performance limitations of possible $p\bar{p}$ or ... nel seems overdue, however far off in the future a ... such a p-LEP project may yet be in time. What we shall ..., in fact, rather obvious, but such a discussion has, to the best ... our knowledge, not been presented so far.

We shall not address any detailed design questions but shall give basic equations and make a few plausible assumptions for the purpose of illustration. Thus, we shall assume throughout that the maximum energy per beam is 8 TeV (corresponding to a little over 9 T bending field in very advanced superconducting magnets) and that injection is at 0.4 TeV. The ring circumference is, of course that of LEP, namely 26,659 m. It should be clear from this requirement of "Ten Tesla Magnets" alone that such a project is not for the near future and that it should not be attempted before the technology is ready.

driving technology

long term stability and strategy

Accelerating Science and Innovation

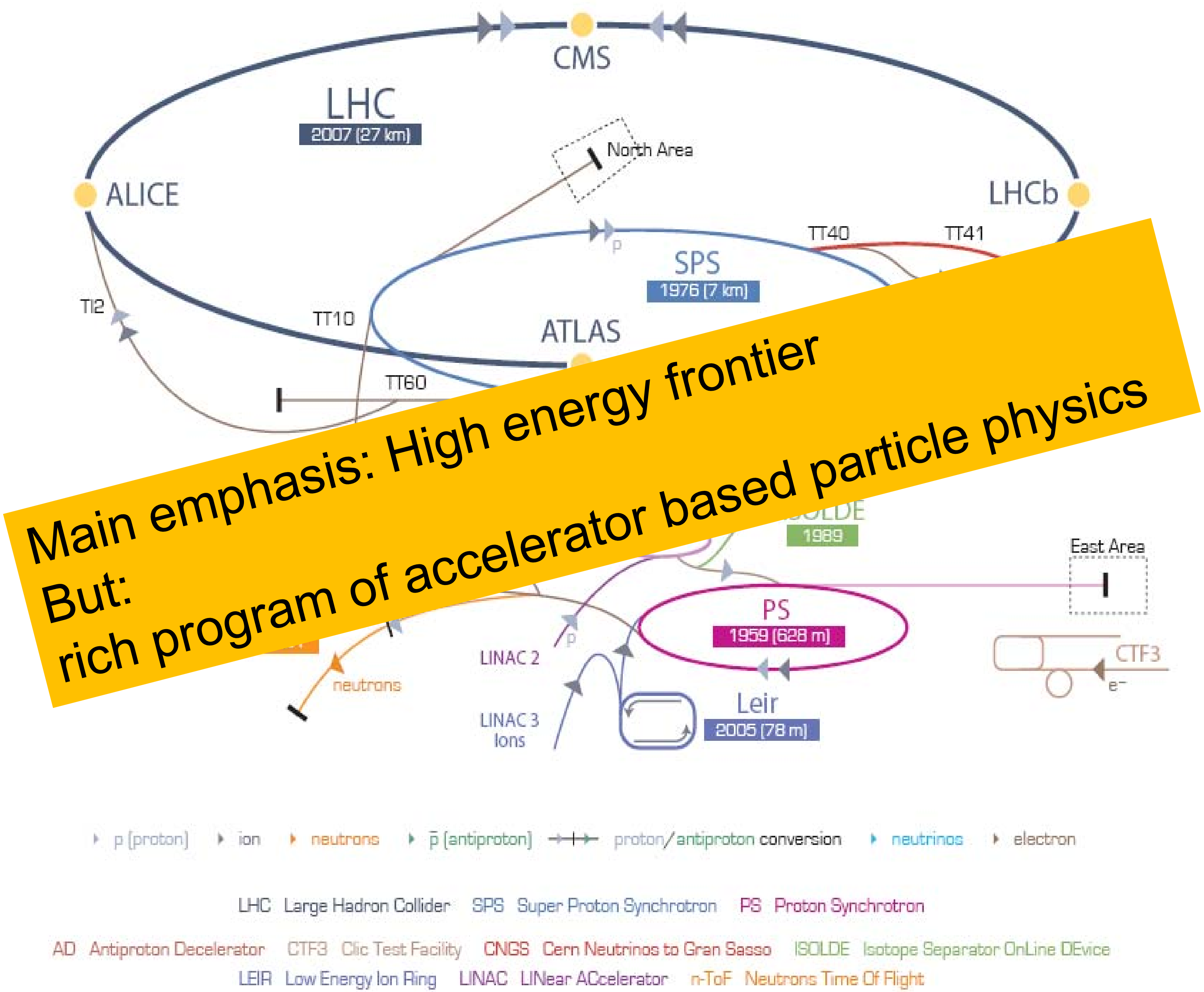
Science

Particle Physics at CERN
and
CERN and the European Strategy for Particle Physics

Main emphasis: High energy frontier

But:

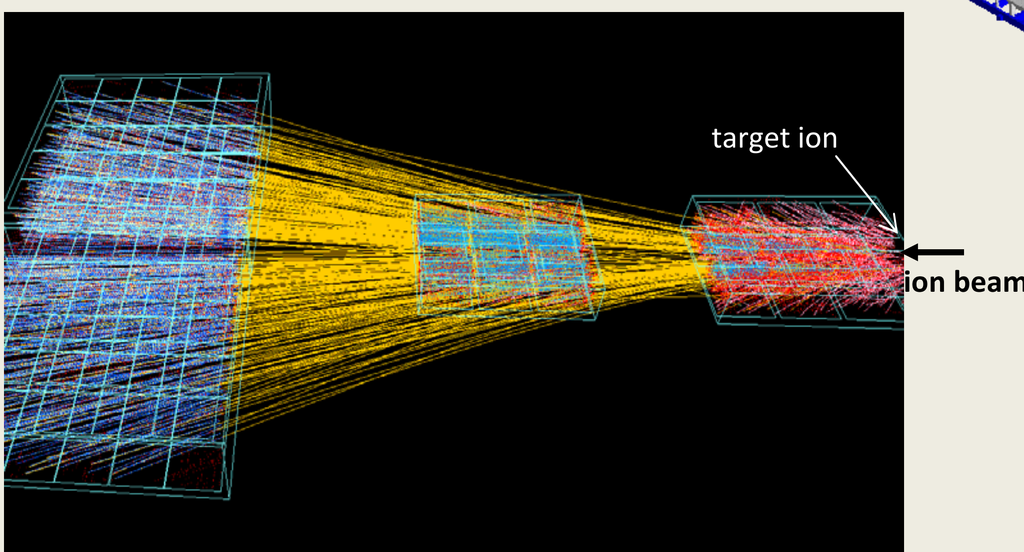
rich program of accelerator based particle physics



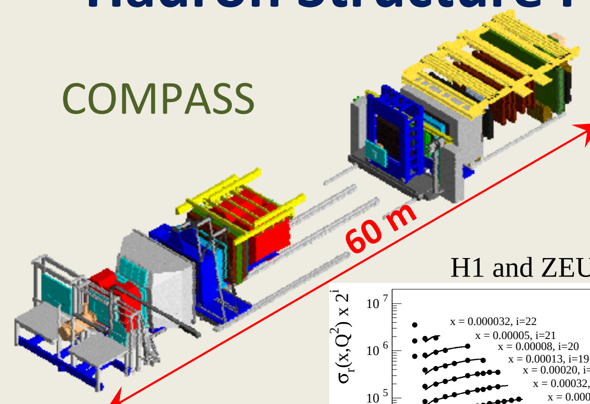
Fixed Target Physics

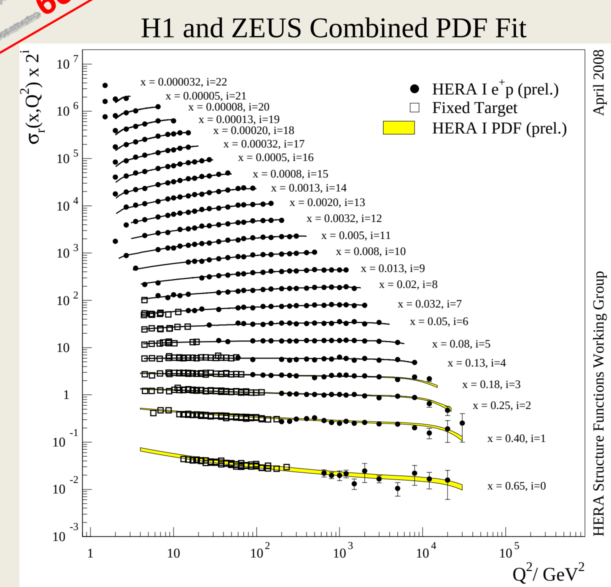
Heavy-ion Physics

- Heavy ion fixed-target physics
  - study of matter at extreme energy density
  - search for state of quasi-free partons
    quarks and gluons ⟶ quark-gluon plasma (QGP) ?



Hadron Structure Physics





- spin structure of nucleon (w/ μ beam)
- uds + g QCD spectroscopy (w/ hadron beam)

Fixed Target Physics

Antiproton Physics

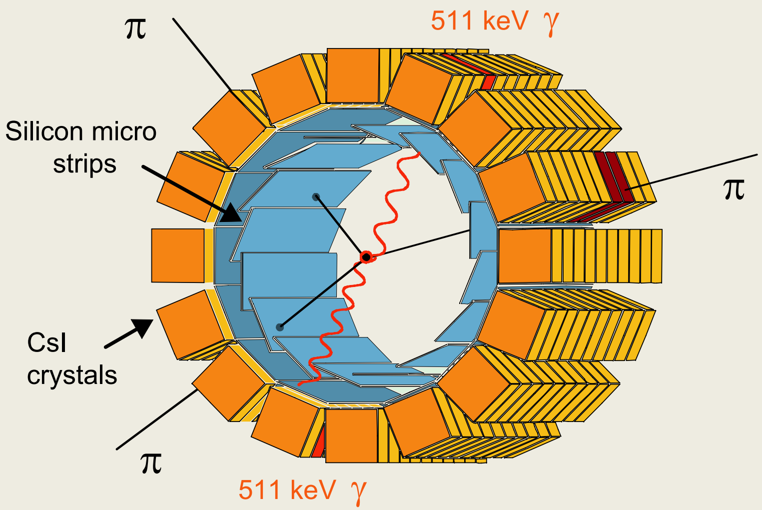
Cold antiprotons
("manufacturing anti-matter")

1. PS $p \longrightarrow \bar{p}p$ 10^{-6}/collision
2. AD deceleration + cooling
   stochastic + electron
3. Extraction @ ~ 0.1*c*
4. Produce thousands of *anti-H*

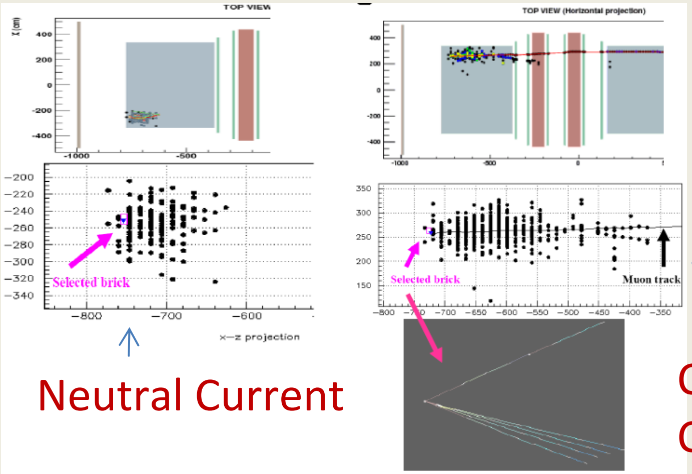
Anti-H annihilations detected

ATHENA (→ ALPHA)

anti-H ($\bar{p}e^{+}$) + matter $\longrightarrow \pi^{+}\pi^{-} + \gamma\gamma$



Neutrino Physics



OPERA

The European Strategy for particle physics

General issues

1. European particle physics is founded on strong national institutes, universities and laboratories and the CERN Organization; *Europe should maintain and strengthen its central position in particle physics.*

2. Increased globalization, concentration and scale of particle physics make a well coordinated strategy in Europe paramount; *this strategy will be defined and updated by CERN Council as outlined below.*

The European Strategy for particle physics

The process:

CERN Council Strategy Group established

Open Symposium (Orsay, Jan 31/Feb 1, 2006)

Final Workshop (Zeuthen, May 2006)

Strategy Document approved unanimously
by Council July 14, 2006

The European Strategy for particle physics

Unanimously approved by CERN Council July 14, 2006

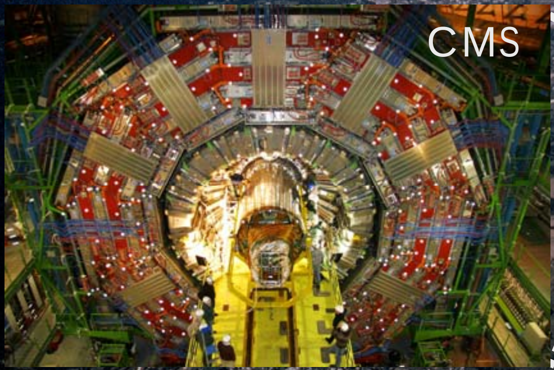
LHC

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.*

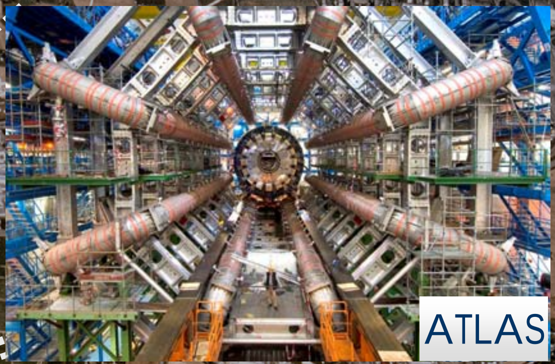
$L \sim 10^{34}$

Enter a New Era in Fundamental Science

Start-up of the Large Hadron Collider (LHC), one of the largest and truly global scientific projects ever, is the most exciting turning point in particle physics.



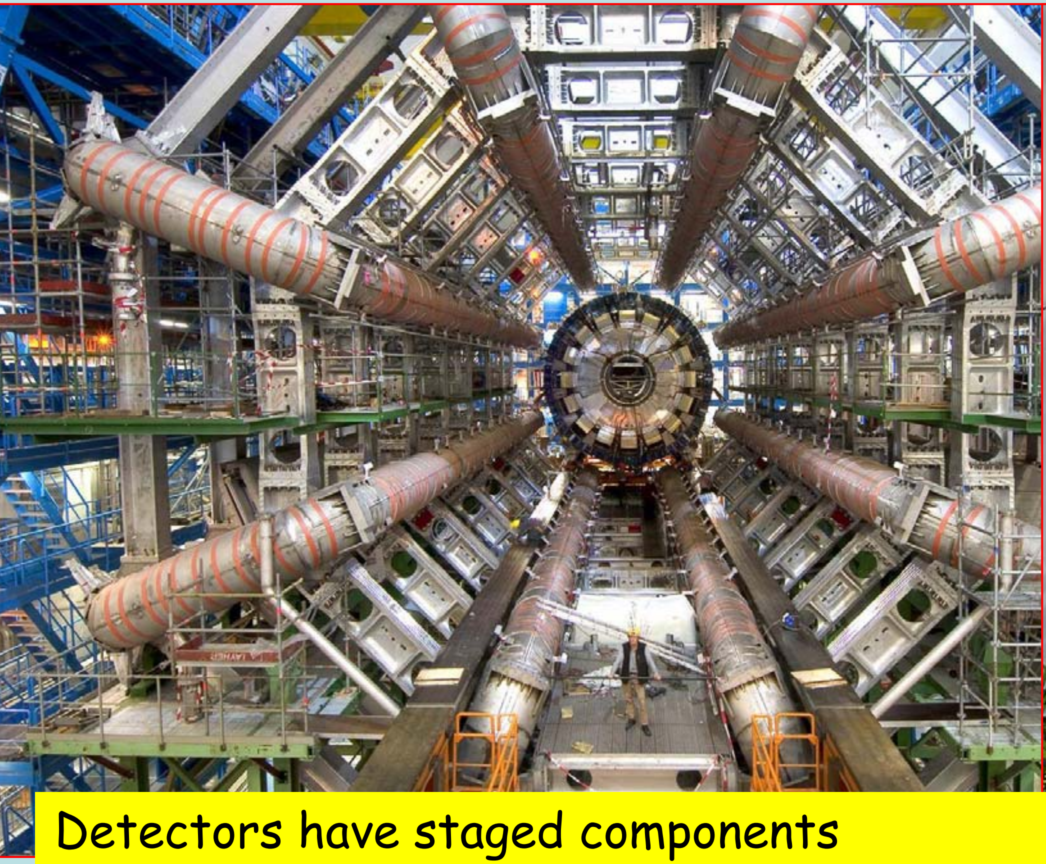
Exploration of a new energy frontier
Proton-proton collisions at E_{CM} = 14 TeV

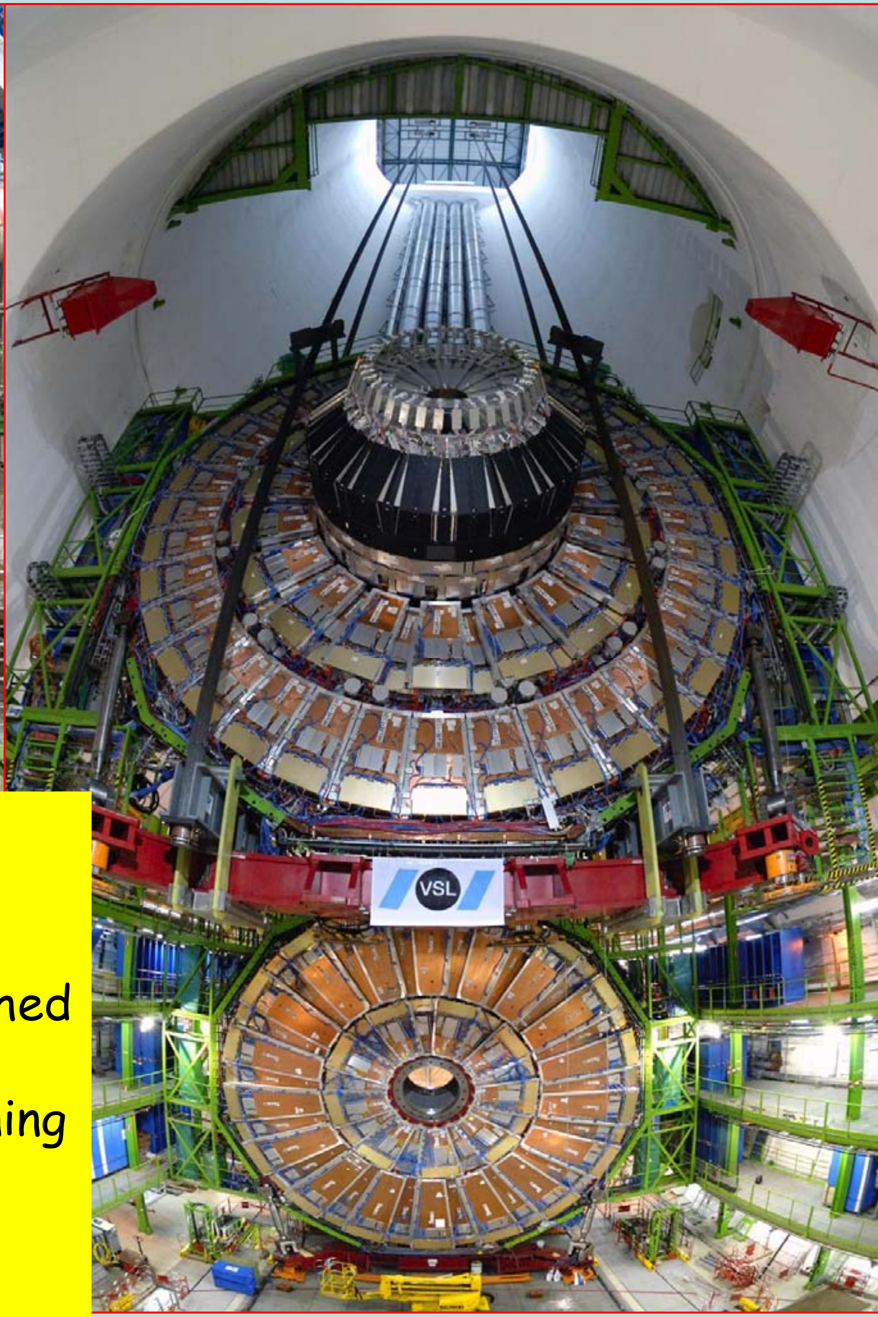


First beam around the ring Sept. 10, 2008

Incident Sept. 19, 2008

Inauguration October 21, 2008





Detectors have staged components

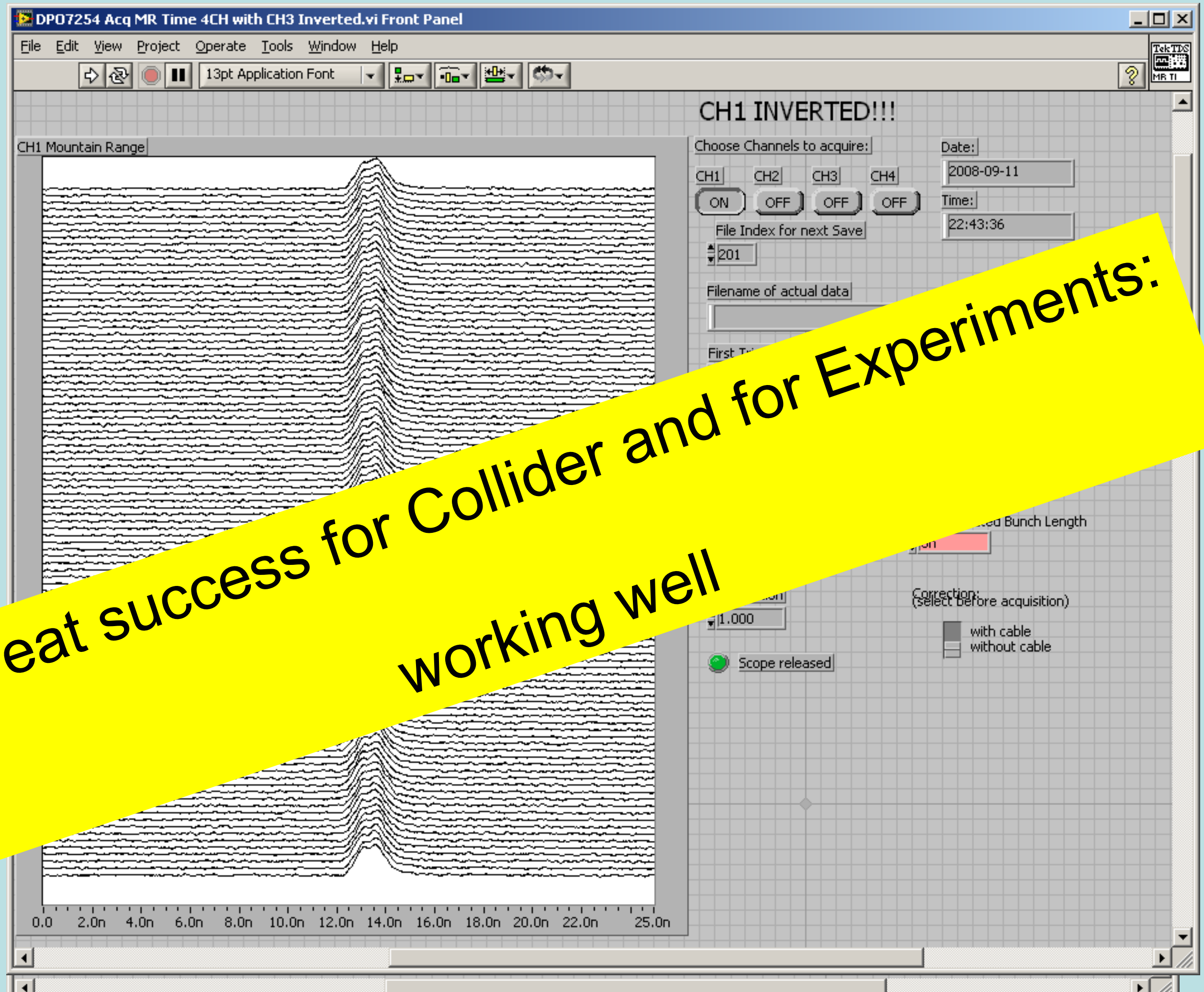
→ The initial phase (approved program) of LHC experiments is not yet fully established

Experiments need manpower for commissioning

→ The initial phase of LHC still needs sustained international collaboration

Capture with optimum injection phasing, correct reference

September 10, 2008

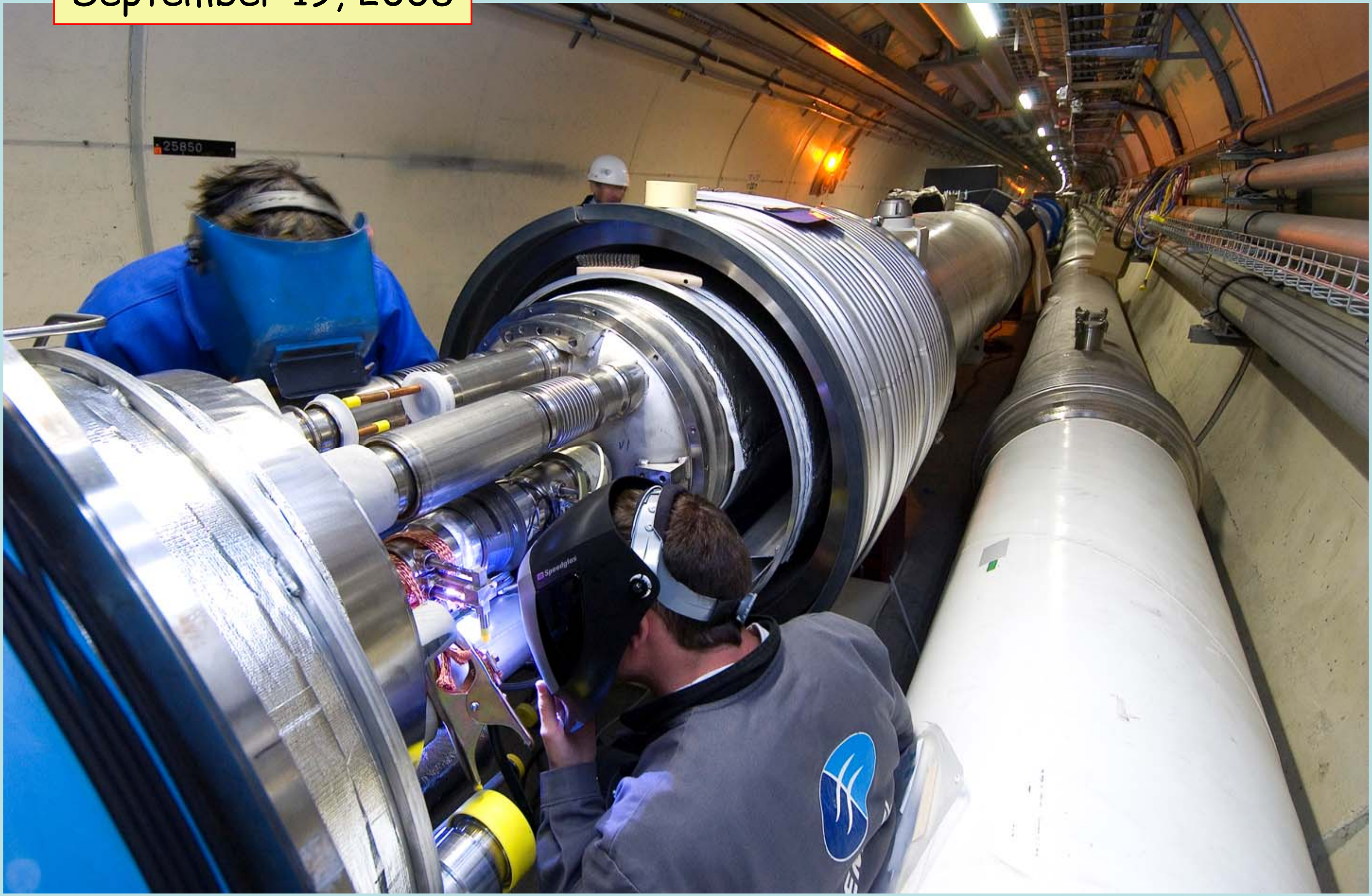


Great success for Collider and for Experiments: working well

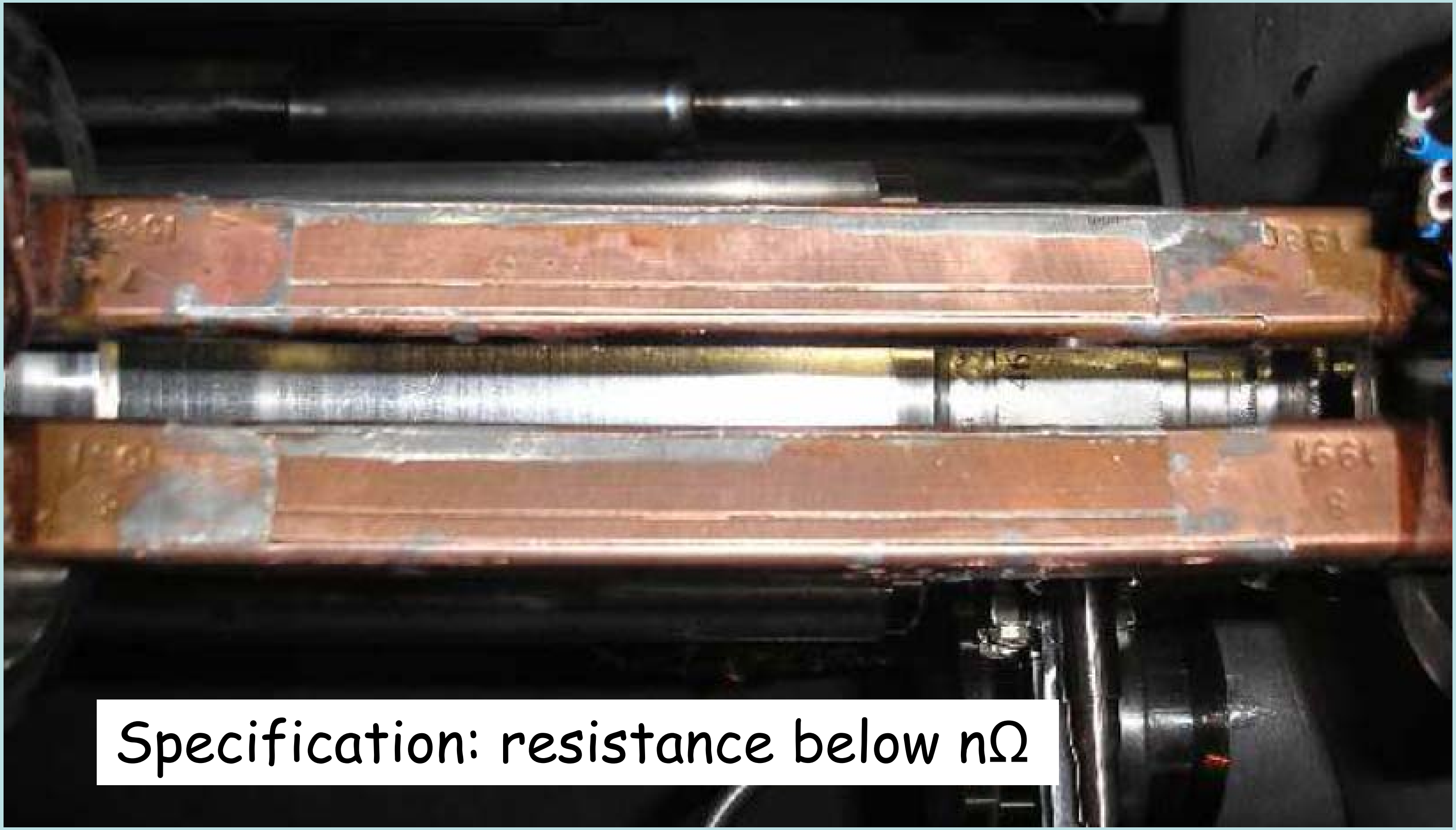
Courtesy E. Ciapala

Interconnects

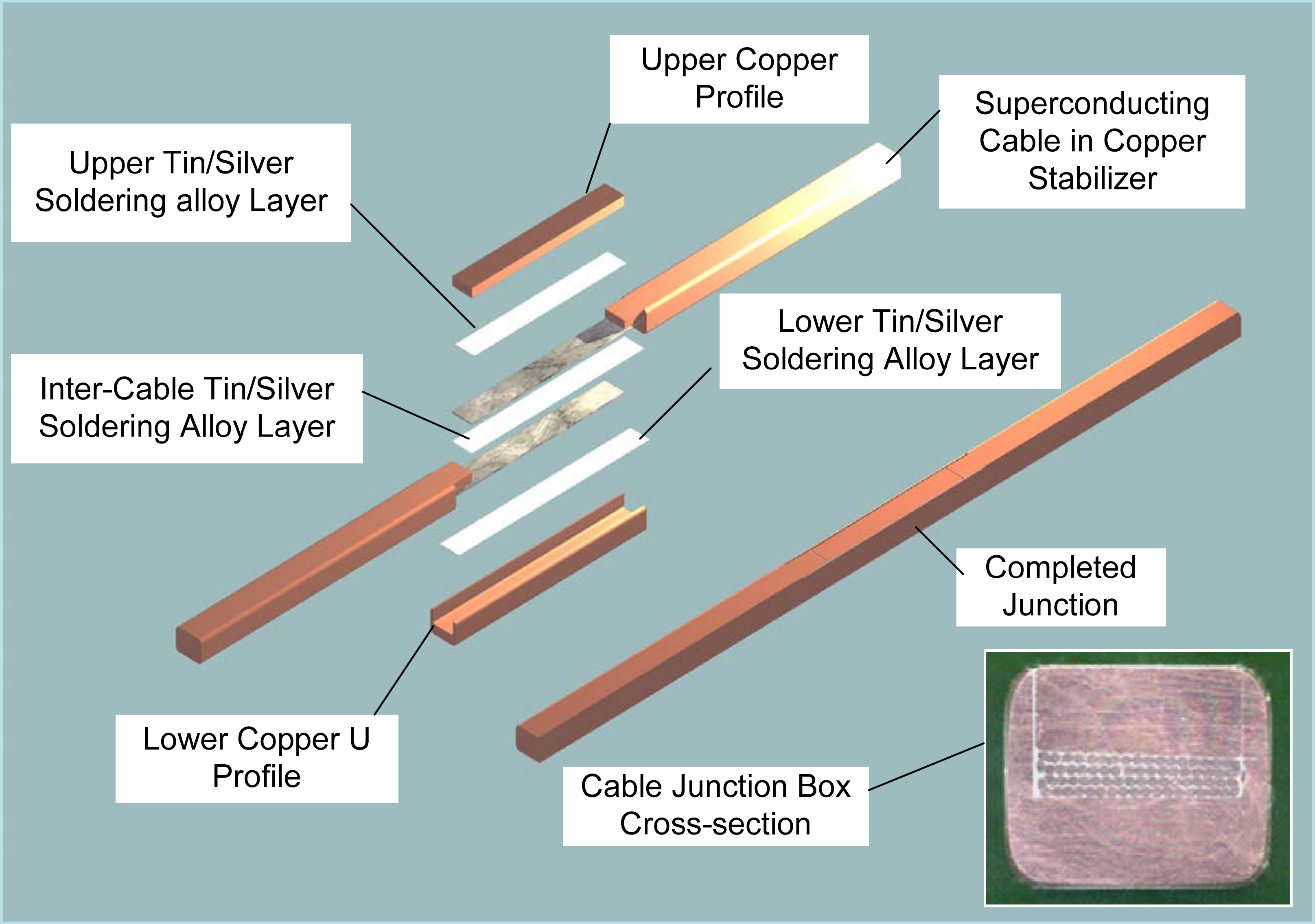
September 19, 2008



Busbar splice



Busbar splice



Only with fully commissioned experiments we will be able to open the door to the new physics world!

1. Is there a Higgs?
2. What is the Higgs mass?
3. Is the Higgs a SM-like we
4. Is the Higgs elem
5. Is the stab ned by a symmetry or dyn
6. Is su effective at the weak scale?
7. Will w cover DM at the LHC?
8. Are there extra dimensions? Are there new strong forces?
9. Are there totally unexpected phenomena?
10. What is the mechanism of EW breaking?

Initial phase of LHC will tell which way nature wants us to go

Standard

Nearly Standard

Not at all Standard

Initial phase of LHC will tell which way nature wants us to go

Possible ways beyond initial LHC:

Luminosity upgrade (sLHC)

Doubling the energy (DLHC)
    new machine, R&D on high field magnets ongoing

Electron-Positron Collider
    ILC
    CLIC

Electron-Proton Collider
    LHeC

The European Strategy for particle physics

one possible way : luminosity upgrade

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.*

sLHC

$L \sim 10^{35}$

CERN 2008 – 2011: 240 MSFr additional funding

will partly be used to gradually increase performance of LHC, i.e. towards luminosity upgrade ($L \sim 10^{35}$) sLHC :

- New inner triplet -> towards $L \sim 2*10^{34}$
- New Linac (Linac4) -> towards $L \sim 5*10^{34}$

  construction can/will start now → ~ 2012/13

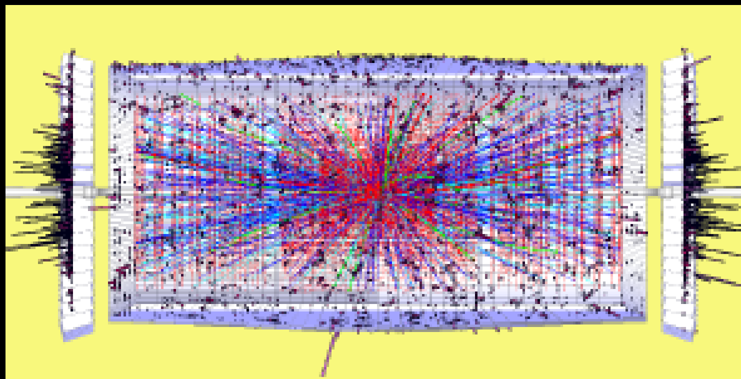
- New PS (PS2 with double circumference)
- Superconducting Proton Linac (SPL)

  start ***design*** now, ready for decision ~ 2011/12
  aimed for $L \sim 10^{35}$ around 2016/17 if physics requires

- Detector R&D (seed money)

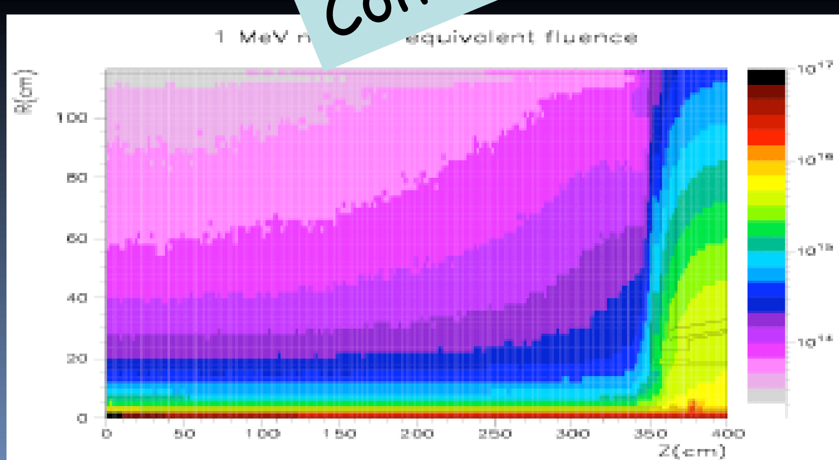
Important: international collaboration

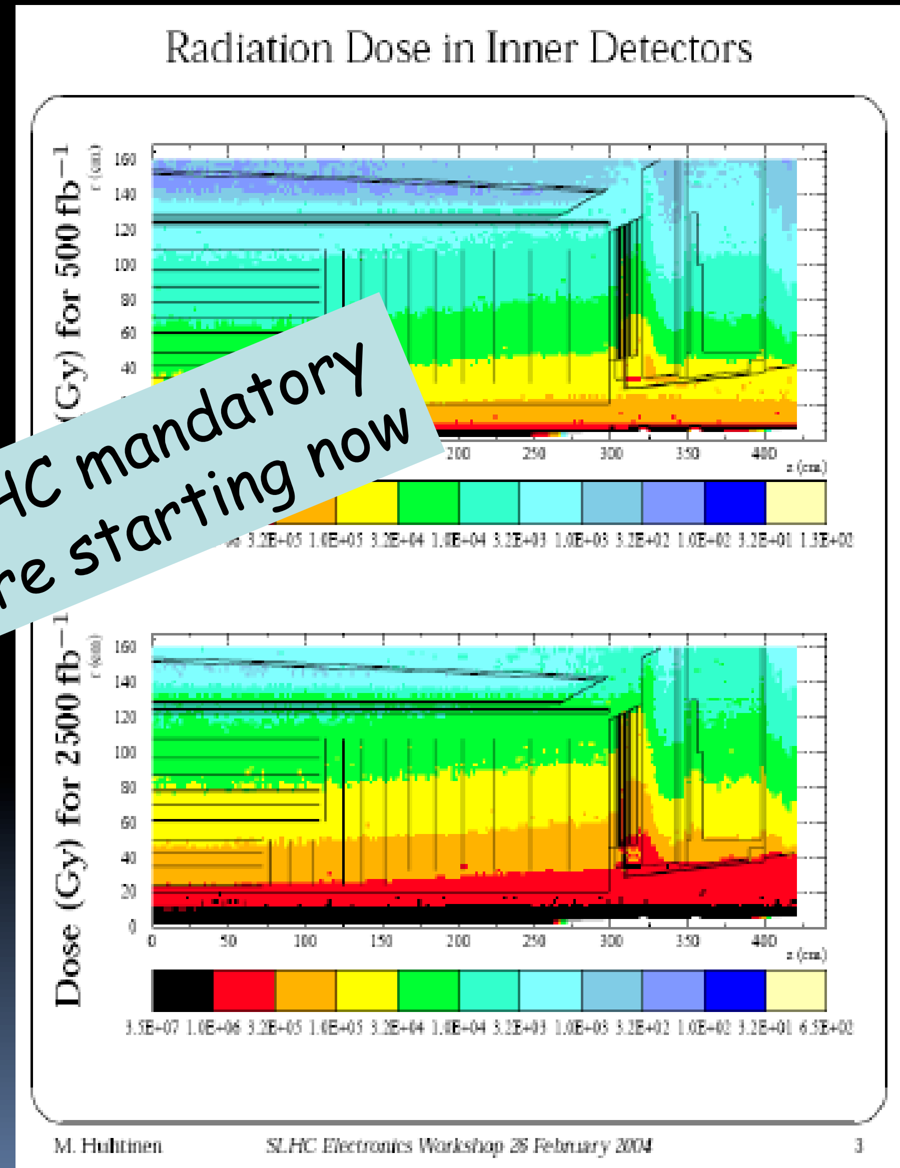
What are the conditions at SLHC?



- 300 – 400 pile-up events at start of spill (unless luminosity leveling)
- Want to survive at least 3000 fb^{-1} dat
- B-layer at 37 mm:
  - ~30 tracks per
  - >10^{16} 1
  - Few 10

Detector R&D for sLHC mandatory
Concerted efforts are starting now





The European Strategy for particle physics

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.*

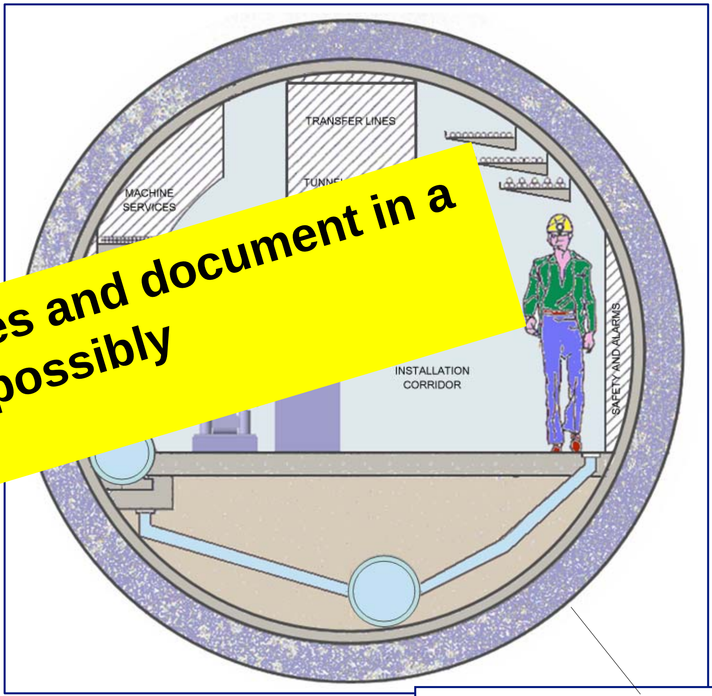
High Energy Colliders: CLIC (E$_{cm}$ up to ~ 3TeV)

- **High acceleration gradient: ~ 100 MV/m**
  - **"Compact" collider – total length < 50 km at 3 TeV**
  - **Normal conducting acceleration structures at high frequency**

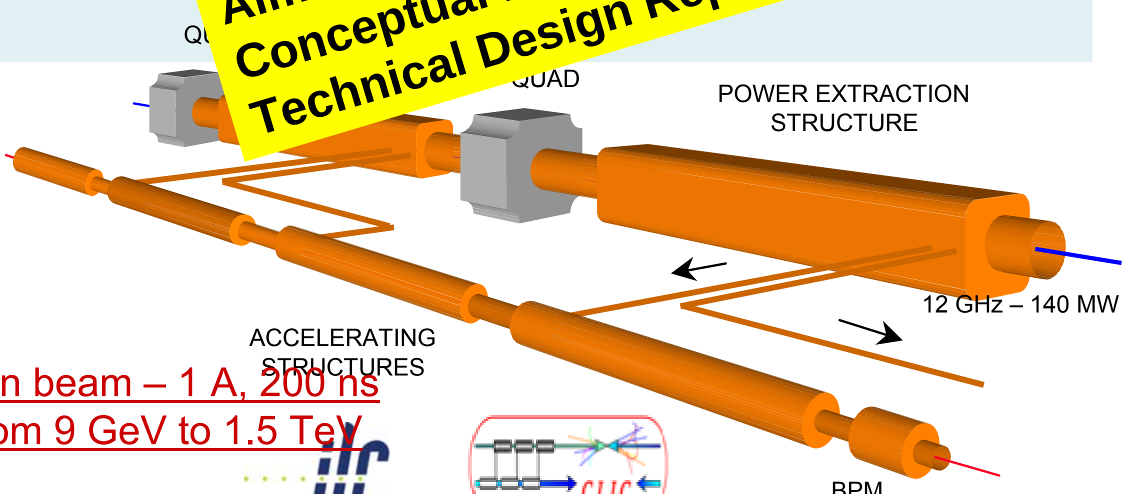
- **Novel Two-Beam Acceleration Scheme**
  - **Cost effective, reliable, efficient**
  - **Simple tunnel, no active**
  - **Modular, easy e... stages**

Aim: Demonstrate all key feasibility issues and document in a Conceptual Design Report by 2010 and possibly Technical Design Report by 2015 + ?

CLIC TUNNEL CROSS-SECTION



4.5 m diameter



Drive beam - 95 A, 300 ns from 2.4 GeV to 240 MeV

Main beam – 1 A, 200 ns from 9 GeV to 1.5 TeV

New CLIC main parameters

Center-of-mass energy	3 TeV
Peak Luminosity	$7{\cdot}10^{34}$ cm^{-2} s^{-1}
Peak luminosity (in 1% of energy)	$2{\cdot}10^{34}$ cm^{-2} s^{-1}
Repetition rate	50 Hz
Loaded accelerating gradient	100 MV/m
Main linac RF frequency	12 GHz
Overall two-linac length	41.7 km
Bunch charge	$4{\cdot}10^{9}$
Beam pulse length	200 ns
Average current in pulse	1 A
Hor./vert. normalized emittance	660 / 20 nm rad
Hor./vert. IP beam size bef. pinch	53 / ~1 nm
Total site length	48.25 km
Total power consumption	390 MW

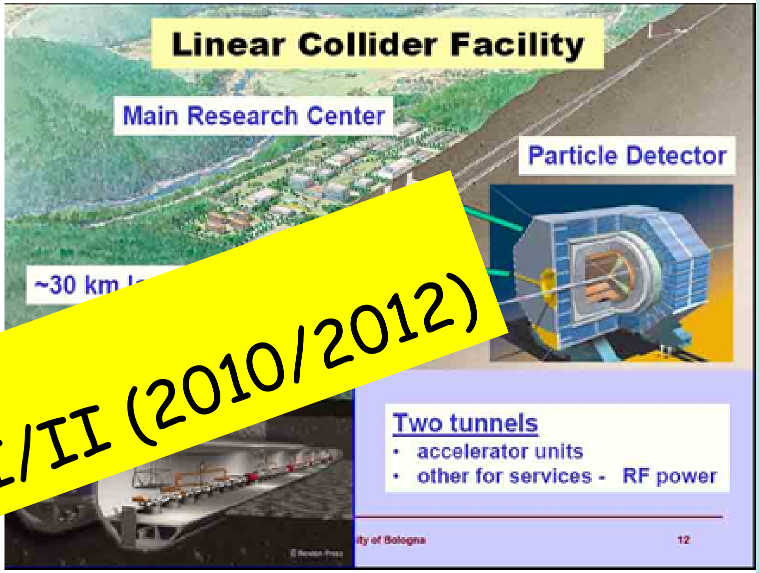
~~Provisional values~~

High Energy Colliders: ILC (E_{cm} up to ~ 1TeV)

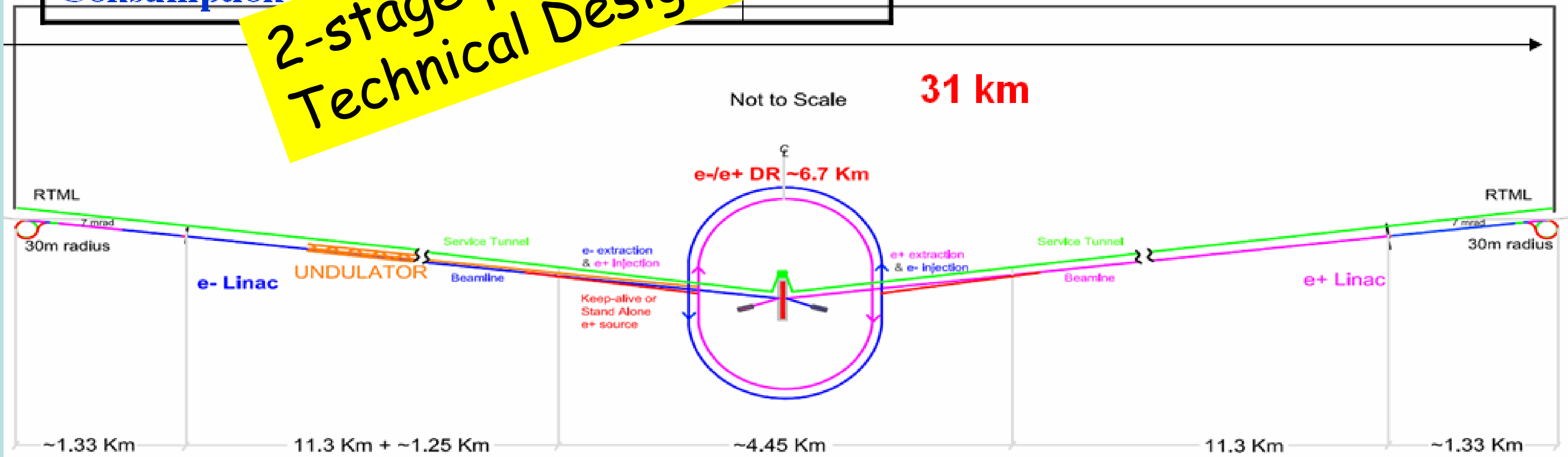
ILC @ 500 GeV

ILC web site: http://www.linearcollider.org/cms/

Max. Center-of-mass energy	500	GeV
Peak Luminosity	$\sim 2\times10^{34}$	$cm^{-2}s^{-1}$
Beam Current	9.0	mA
Repetition rate	5	Hz
Average accelerating gradient	31.5	MV/m
Beam pulse length	0.95	ms
Total Site Length	[illegible]	[illegible]
Total AC Power Consumption	[illegible]	[illegible]

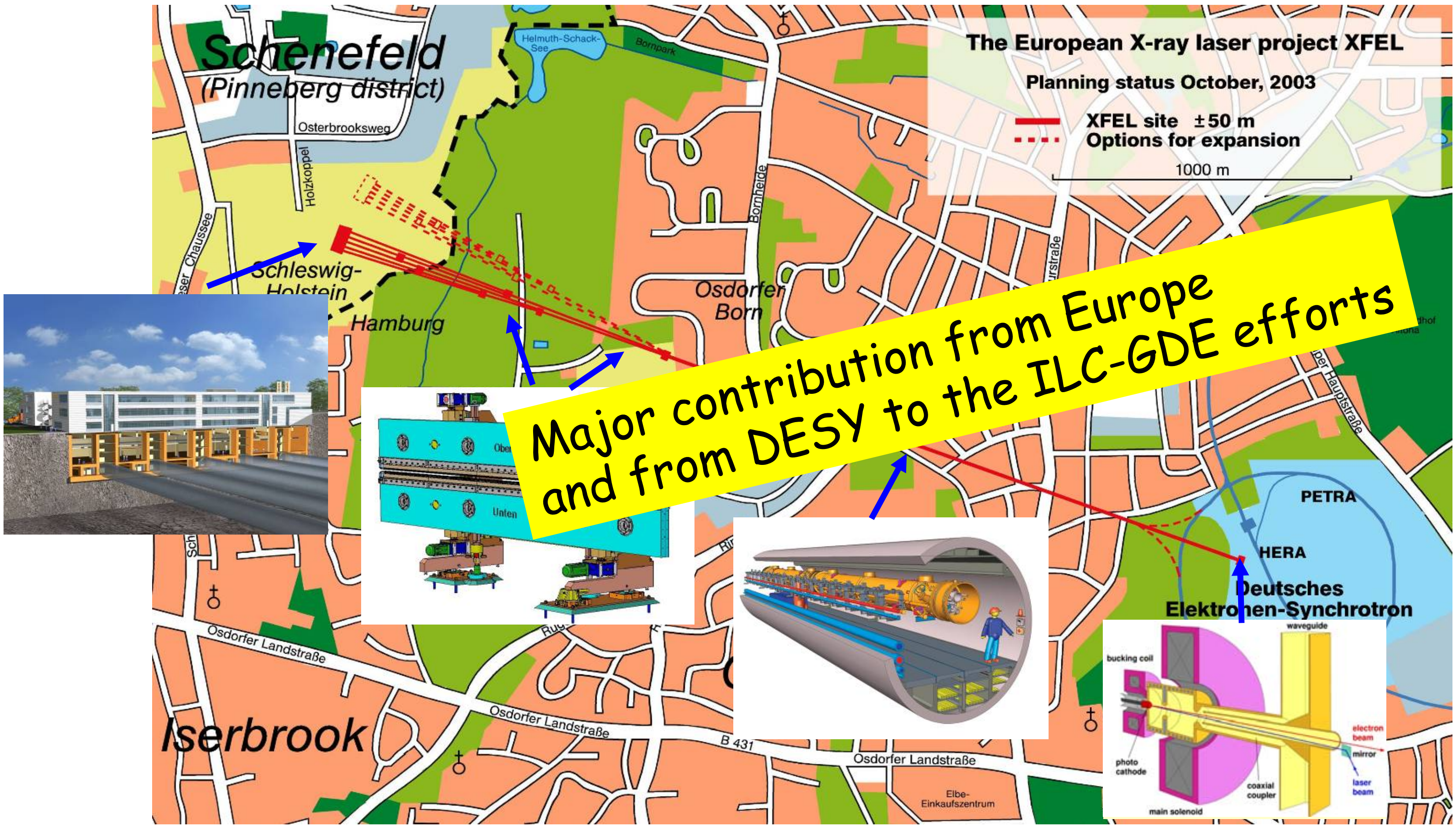


2-stage process
Technical Design Phase I/II (2010/2012)



X-FEL at DESY
a 10% ILC and 800 MEuros Test Facility!

3.4km



Technically ready, start construction soon for operation from 2013

Strategy to address LC key issues

Recent progress: much closer collaboration

first meeting: February 08

GDE

ation

Two weeks ago:

Meeting of ILC and CLIC Steering Committees

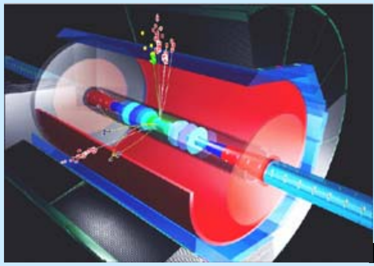
Result:

even closer collaboration towards one project

LC detector R&D project established at CERN

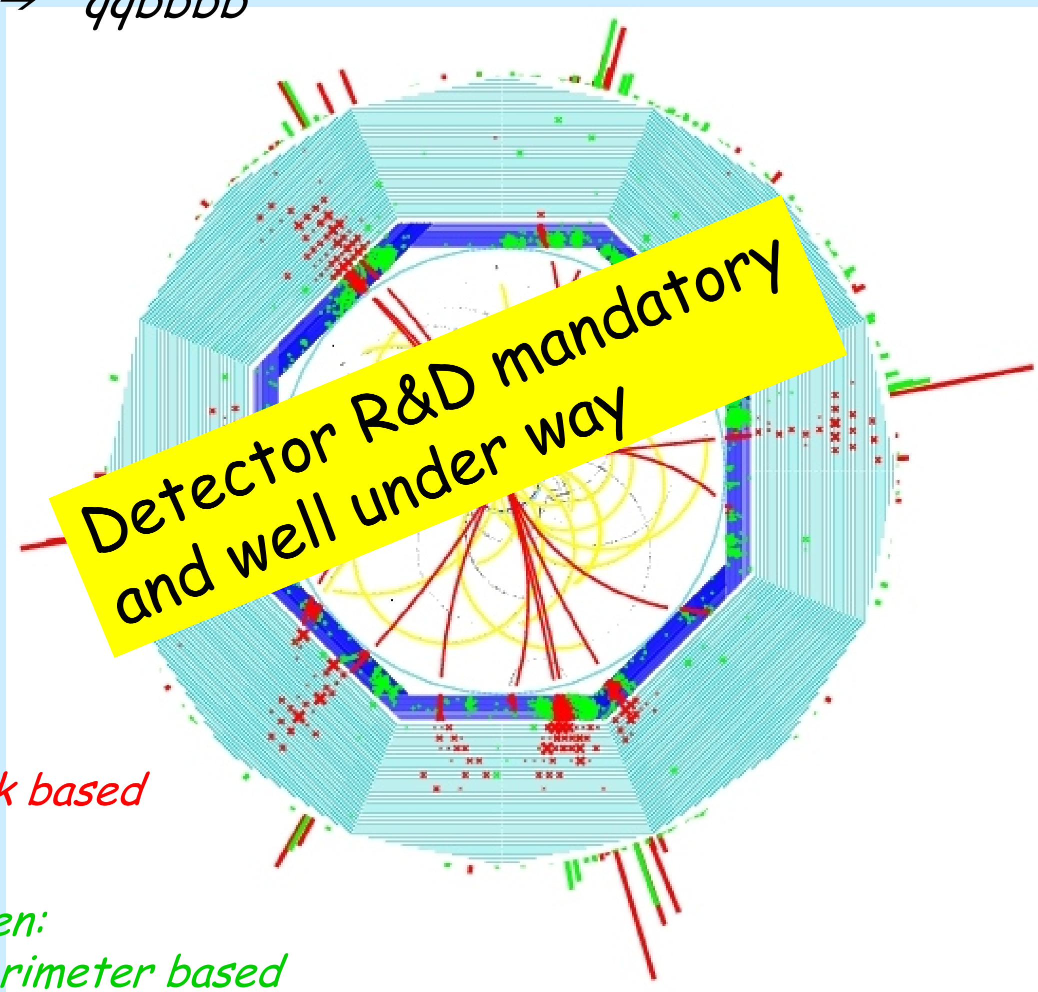
R

detector/physics issues



LC Detector challenges: calorimeter

ZHH → qqbbbb



red: track based

green: calorimeter based

High precision measurements demand new approach to the reconstruction:

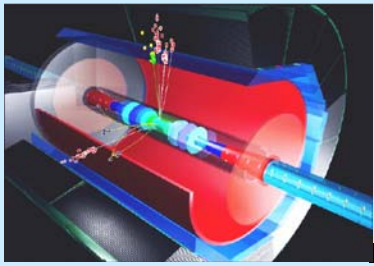
particle flow (i.e. reconstruction of ALL individual particles)

this requires

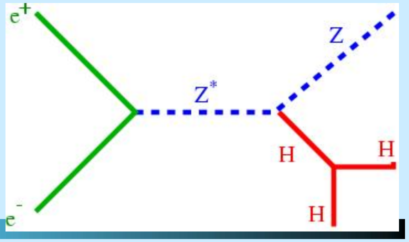
unprecedented granularity

in three dimensions

R&D needed now for key components

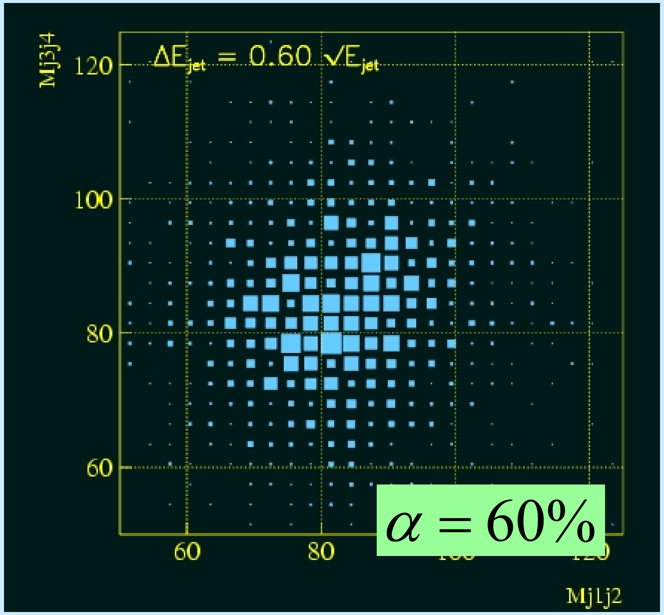


Jet energy resolution

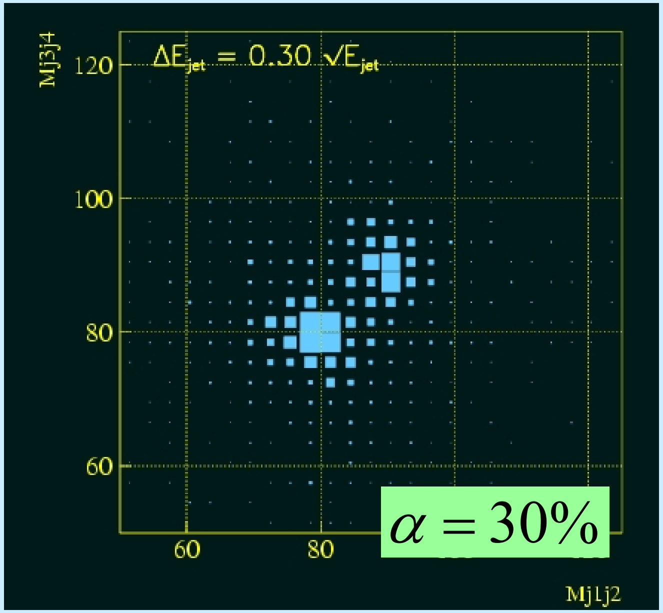


- Dijet masses in WWνν, ZZνν events (no kinematic fit possible):
- Challenge: separate W and Z in their hadronic decay mode

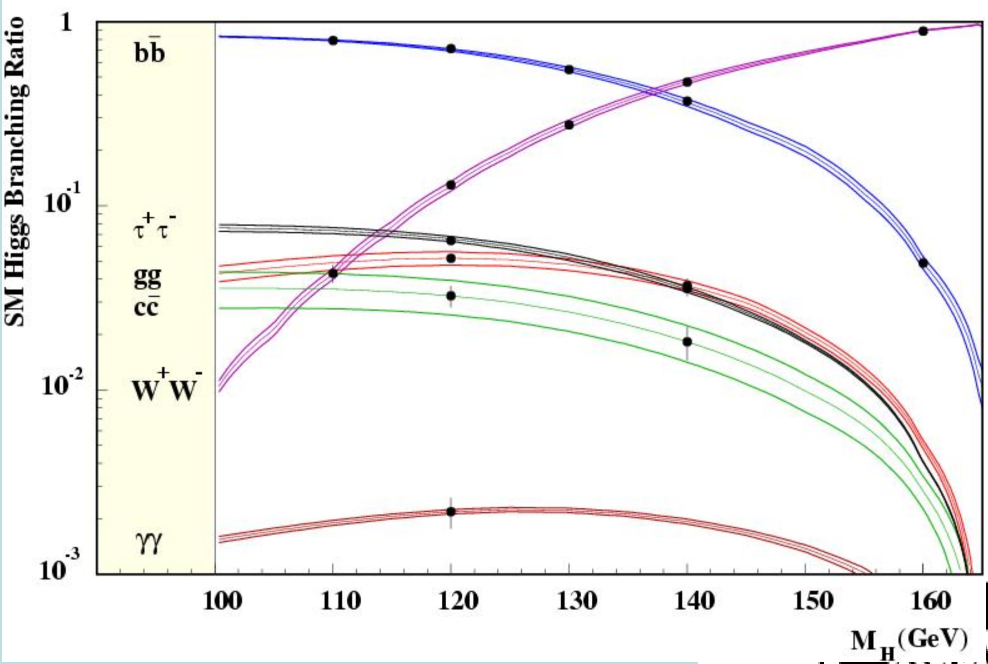
LEP-like detector

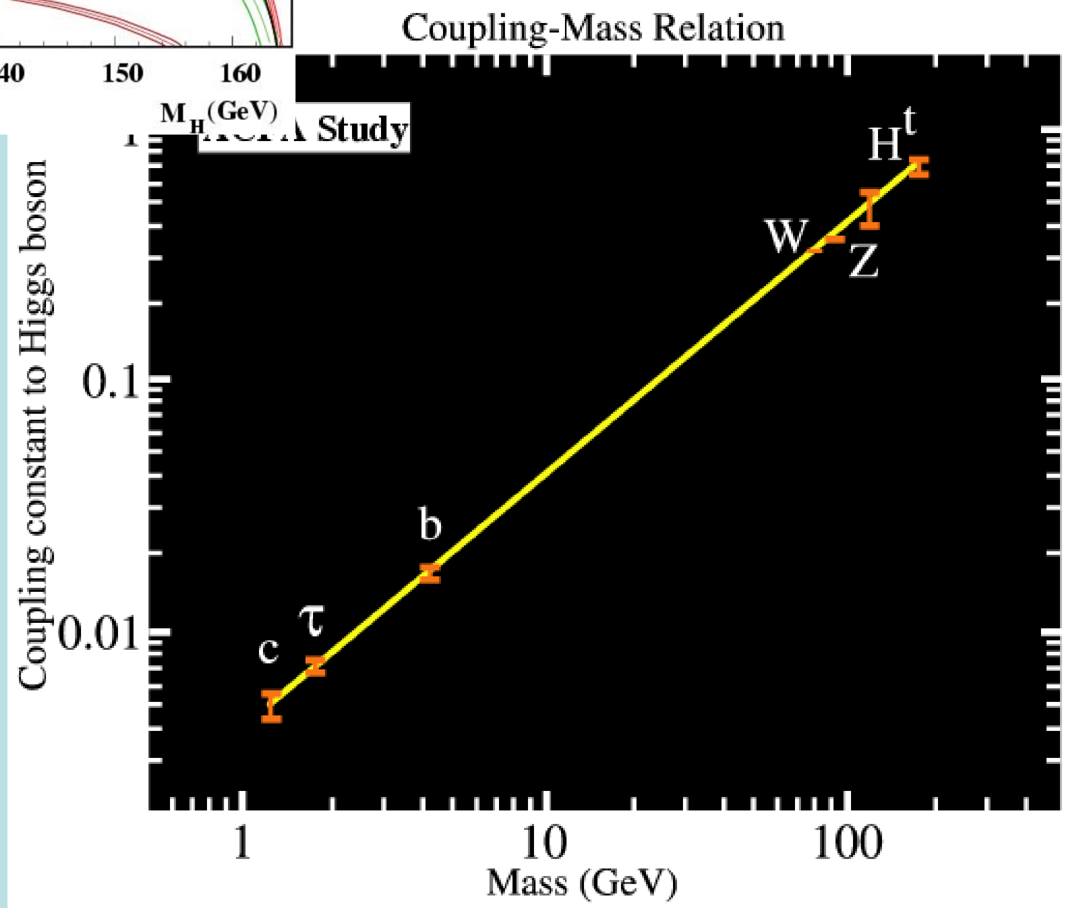


LC design goal



Precision Higgs physics

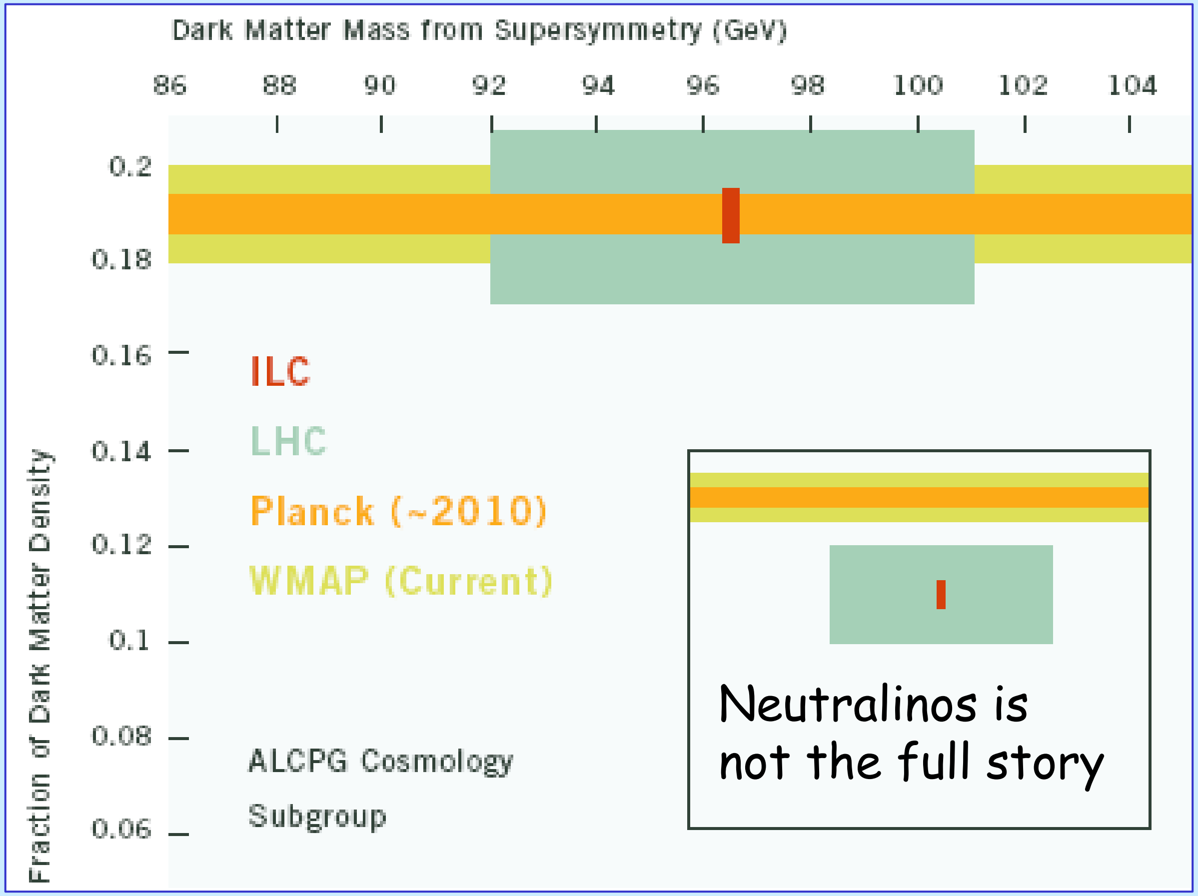




Determination of absolute coupling values with high precision

Dark Matter and SUSY

- Is dark matter linked to the Lightest Supersymmetric Particle?



LC and satellite data (WMAP and Planck):

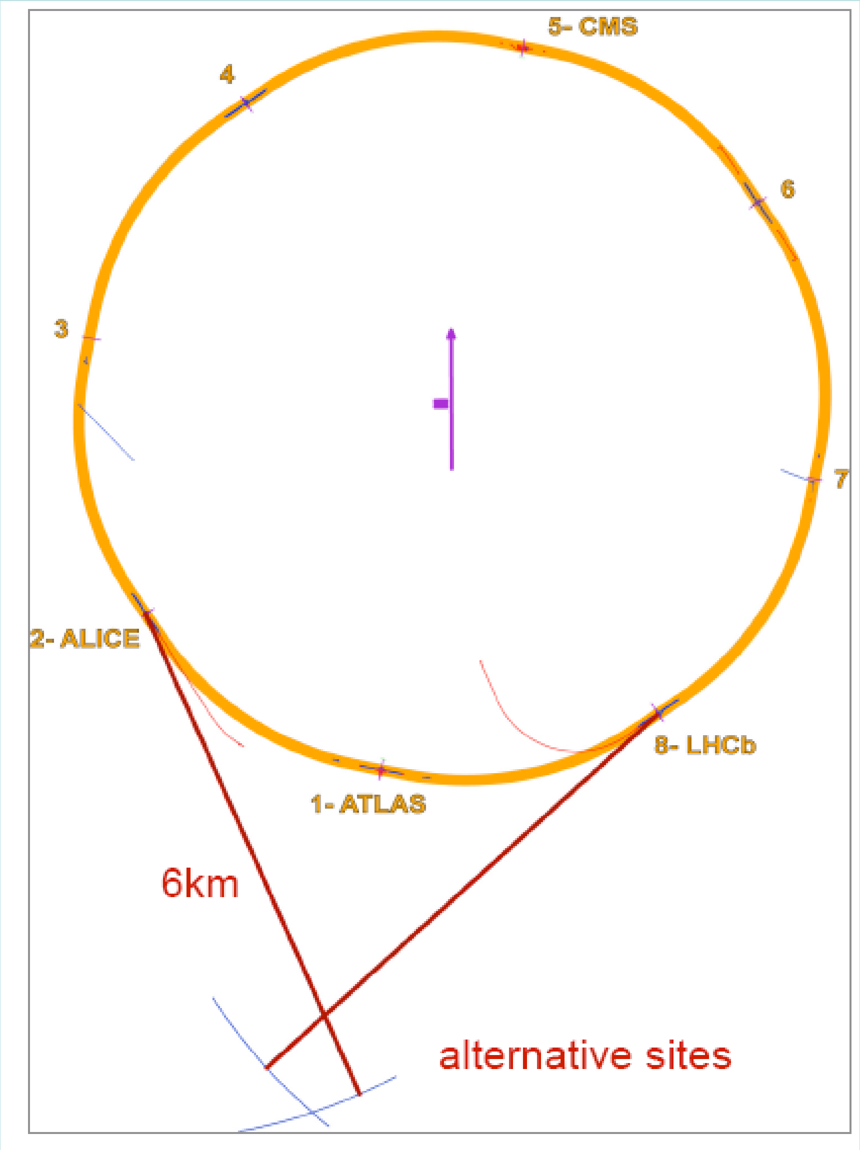
complementary views of dark matter.

LC: identify DM particle, measures its mass;

WMAP/Planck: sensitive to total density of dark matter.

Together with LHC they establish the nature of dark matter.

Large Hadron electron Collider: possible layouts



40 - 140 GeV
on
1 - 7 TeV

ring-ring solution:
$L \leq 10^{33}$

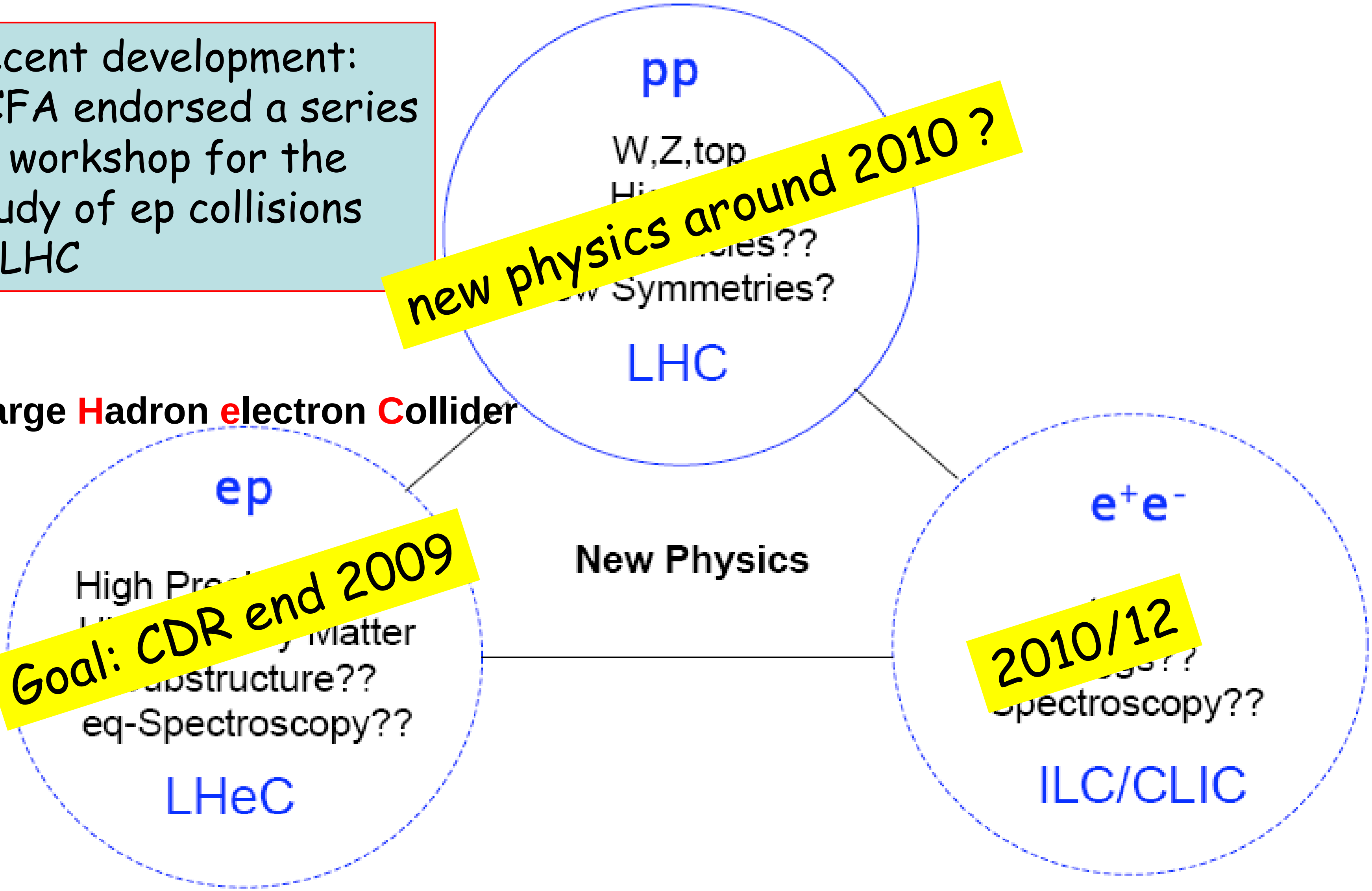
linac-ring solution:
L few 10^{31}

Would be the successor of HERA at higher cms

The TeV Scale [2008-2033..]

Recent development:
ECFA endorsed a series of workshop for the study of ep collisions in LHC

Large Hadron electron Collider



neutrino sector

The European Strategy for particle physics

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.*

Neutrino beam CERN -> Gran Sasso

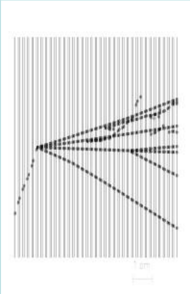
tau-neutrino appearance

OPERA

A hybrid emulsion
and tracking detector

Goal: Verify that the ν_μ
are oscillating into ν_τ

5 yrs
data taking



Pb target 1.8 kton

CNGS:
Beam $<E_\nu> \approx$ 17 GeV
Baseline 732 km

Expected event rate:
~3600 ν NC+CC /kton/year
~16 ν_τ CC /kton/year

(for $\sin^2 2\theta_{23}=1$, $\Delta m_{32}^2=2.5\times10^{-3}$ eV^2)

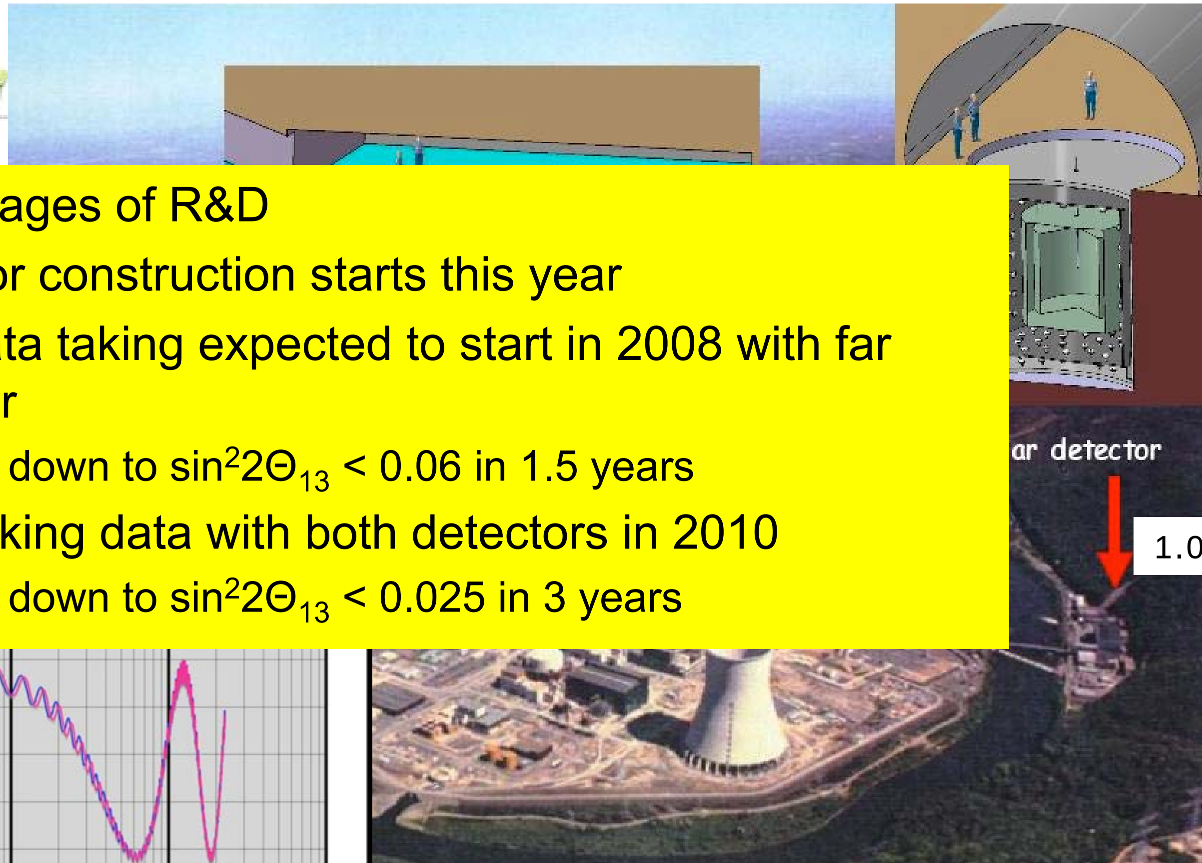
LAr detector

ICARUS

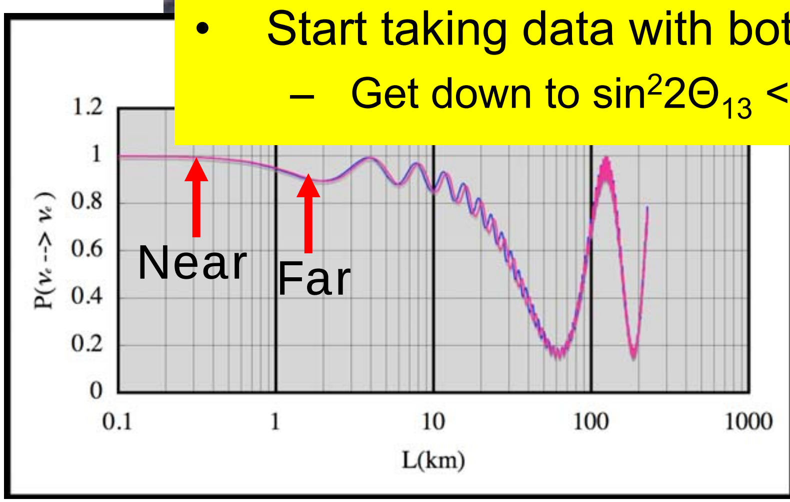
will demonstrate feasibility for future
neutrino projects

Double Chooz

Θ_{13}



- Final stages of R&D
- Detector construction starts this year
- First data taking expected to start in 2008 with far detector
  - Get down to $\sin^2 2\Theta_{13} < 0.06$ in 1.5 years
- Start taking data with both detectors in 2010
  - Get down to $\sin^2 2\Theta_{13} < 0.025$ in 3 years



Suekane DBD07

Neutrino Factory

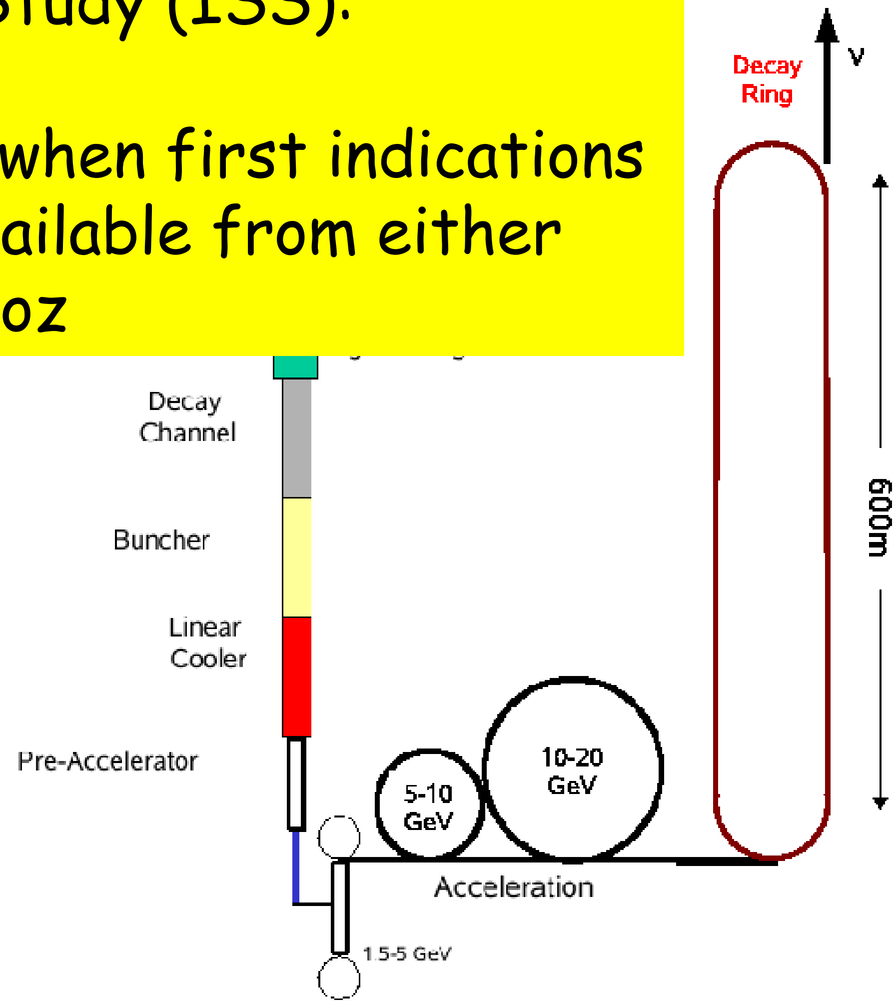
International Scoping Study (ISS):

aim: have RDR by 2012 when first indications of Θ_{13} should be available from either T2K or Double-Chooz

- Pro
- Tar
- Cooling
  - Reduce transverse emittance
- Muon acceleration
  - ~130 MeV to 20-50 GeV
- Decay ring(s)

  Store for ~500 turns

  Long production straights



Bottom line: Synergy

- *Big questions = ambitious questions*
- *Need to clear the cloud of T...*
  physics to obta...
- *M... ...e*
  to ...
- *Har... ...ut conceivable*
- *No s... ...gle experiment would achieve it,*
  need a broad program

Great opportunities ahead

Window of opportunity for decision on the way forward 2010-2012 (?)


CERN
Accelerating Science and Innovation
World Collaboration

Cooperation works rather well world wide, so…any changes needed for the future?

facilities for HEP (and other sciences) becoming larger and expensive

funding not increasing

fewer facilities realisable

time scales becoming longer

laboratories are changing missions

→ more coordination and more collaboration required

Outlook: Enhancing World Collaboration

Key message

Future major facilities in Europe and elsewhere require collaborations on a global scale; *Council, drawing on the European experience in the successful construction and operation of large-scale facilities, will prepare a framework for Europe to engage with the other regions of the world with the goal of optimizing the particle physics output through the best shared use of resources while maintaining European capabilities.*

from CERN Council Strategy Document

We need

- to maintain expertise in all regions

- long term stability and support in all three regions

- to engage all countries with particle physics communities

- to integrate particle physics developing countries (regions)

- global view from funding agencies

- a closer linkage of (at least) particle physics and astroparticle physics

We need

- to maintain expertise in all regions

national – regional – global projects

- long term stability and support in all three regions

→ example: CERN Council

- to engage all countries with particle physics communities

→ CERN Council Working Group set up

and CERN Coordinator for External Relations established

- to integrate particle physics developing countries (regions)

CERN Council Working Group / ICFA

CERN Coordinator for External Relations

- global view from funding agencies

FALC (modified) as a first step ?

- a closer linkage of (at least) particle physics and astroparticle physics

Europe: CERN, CERN Council, ASPERA

ICFA ? . . . .

We are NOW entering a new exciting era of particle physics

Turn on of LHC
allows particle physics experiments
at the highest collision energies ever

Expect
- revolutionary advances in understanding the microcosm
- changes to our view of the early Universe

CERN
unique position as host for the LHC

Results from LHC will guide the way

Expect
- period for decision taking on next steps in 2010 to 2012
(at least) concerning energy frontier
-(similar situation concerning neutrino sector Θ_{13})

We are NOW in a new exciting era of accelerator planning-design-construction-running
and need
- intensified efforts on R&D and technical design work
to enable these decisions
- global collaboration and stability on long time scales
(reminder: first workshop on LHC was 1984)

We need to define the most appropriate organisational form
NOW and need to be open and inventive
(scientists, funding agencies, politicians. . .)

Mandatory to have accelerator laboratories in all regions
as partners in accelerator development / construction /
commissiong / exploitation

Planning and execution of HEP projects today need
global partnership for *global, regional and national* projects
in other words: for the whole program

Use the exciting times ahead to establish such a partnership

Particle Physics can and should play its role as

spearhead in innovations as in the past

now and in future