Outlook

Enhancing World Collaboration

A look back to the Seventies:

1975 New Orleans:

Topical seminar to discuss facilities which could only be realised on world scale i.e. a world machine

→ International study group set up

but

LEP initiated by CERN before results from the study group available

. . . .

. . . Need was seen but no strategy developed

Facts today

Examples of well established world cooperations/collaborations:

Experiments
WLCG
Communication
Detector R&D
Accelerator R&D
Accelerator construction (or the path to global projects): HERA / LHC
GDE

Questions:

Do we need more?
Do we have the tools?
Is the time ripe? (i.e. different to 1975….)

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Why

How

When

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Past decades until today

“Discovery” of Standard Model

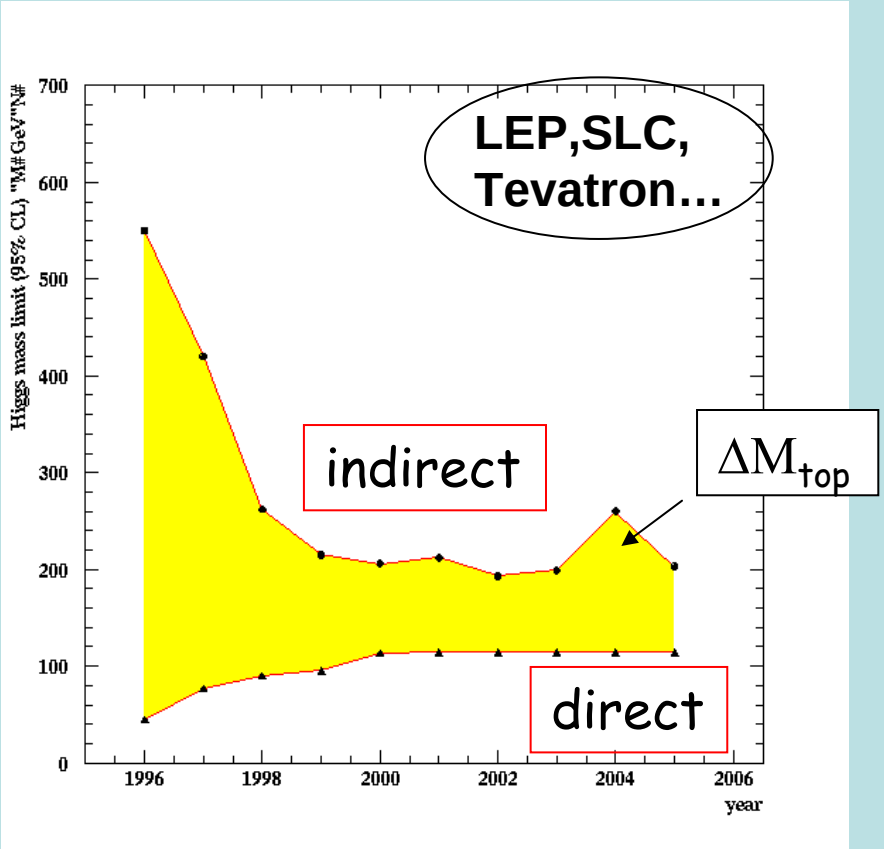
through synergy of

hadron - hadron colliders (e.g. Tevatron)

lepton - hadron colliders (HERA)

electron - positron colliders (e.g. LEP,SLC)

Time evolution of experimental limits on the Higgs boson mass



M_H between 114 and ~200 GeV

Synergy of colliders

knowledge obtained only through combination of results from different accelerator types

in particular:
Elektron-Positron Collider
and
Hadron Collider

together with highly developed theoretical calculations

Facts today

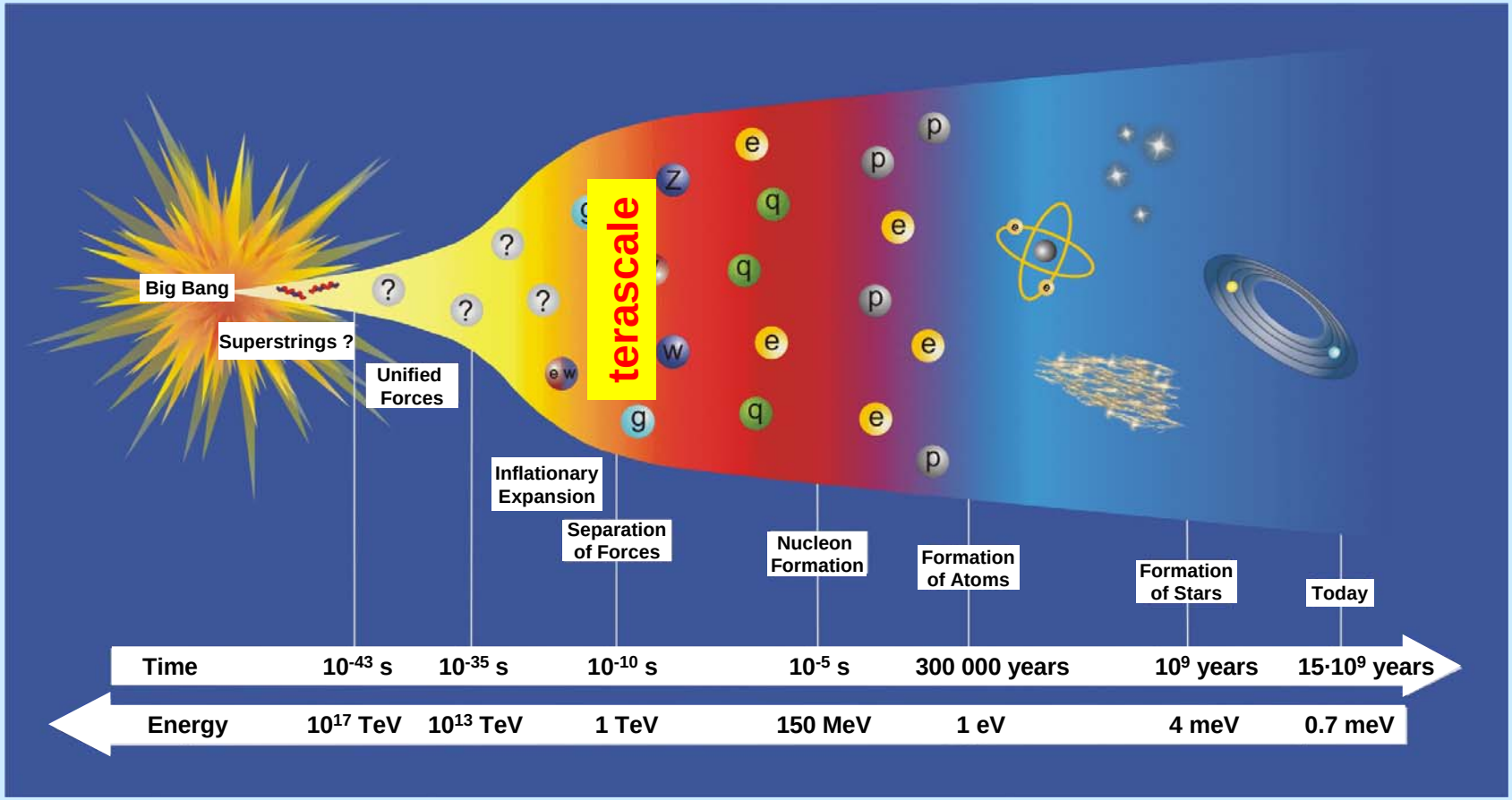
Energy Frontier moving to CERN:

Particle Physics is about to enter the Terascale

LHC will be **the** world machine for many years
→ CERN in a unique position for many years

Vision

- **Revolutionary advances in understanding the microcosm**
- **Connect microcosm with early Universe**



Particle Physics at the Energy Frontier with highest collision energies ever will change our view of the universe

Past decades saw precision studies of 5 % of our Universe → Discovery of the Standard Model

The LHC will soon deliver data
first discoveries to be expected in a few years

We are just at the beginning of exploring
95 % of the Universe

Phantastic opportunity for Particle Physics

Facts today

Energy Frontier moving to CERN:

Particle Physics is about to enter the Terascale

LHC will be **the** world machine for many years
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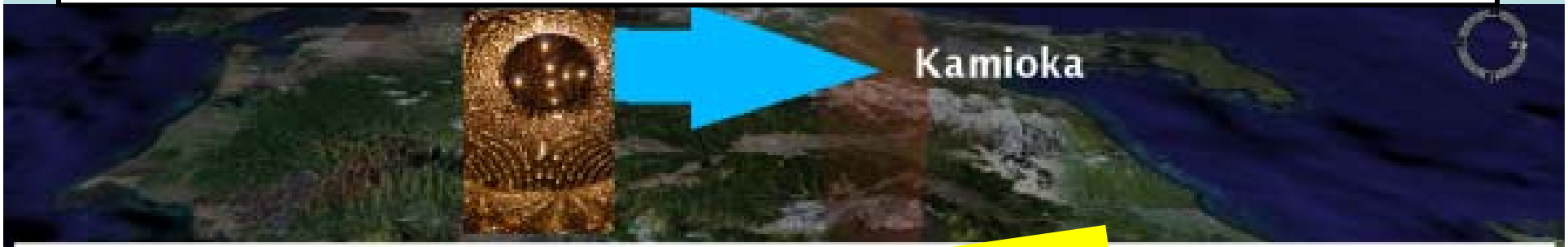
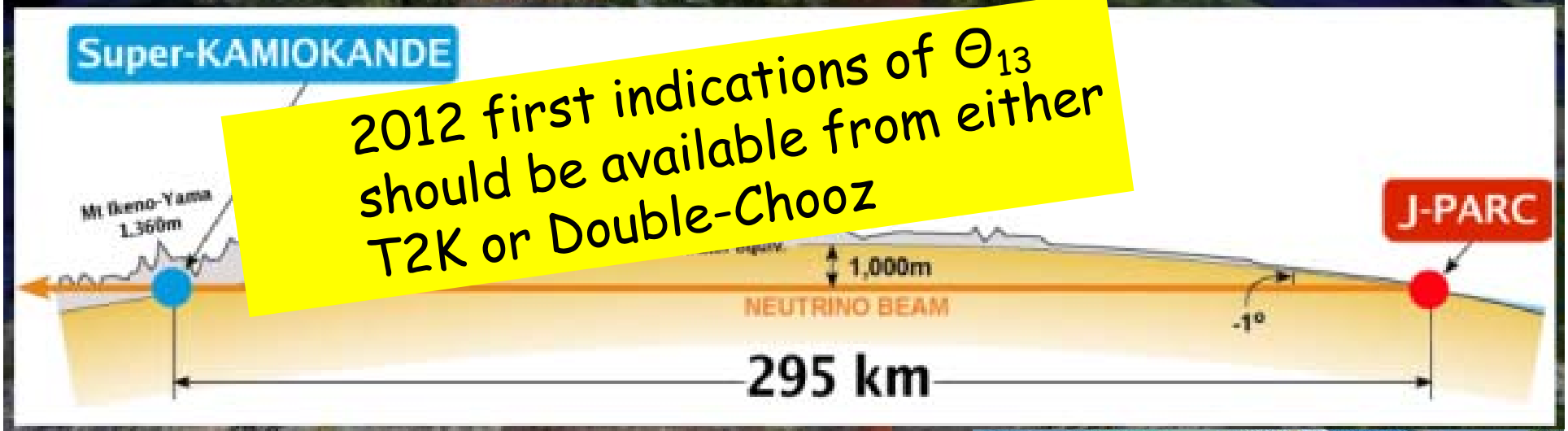
But: many other projects ongoing in the three regions
→ rich program

Neutrinos

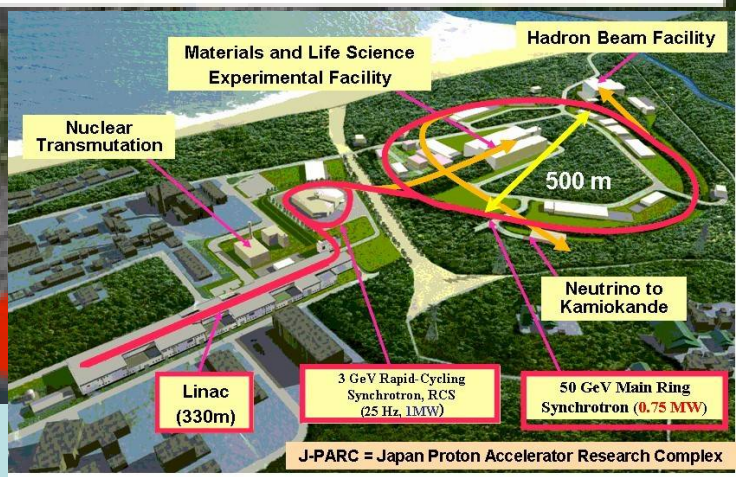
J-PARC and T2K

ex: Θ_{13}



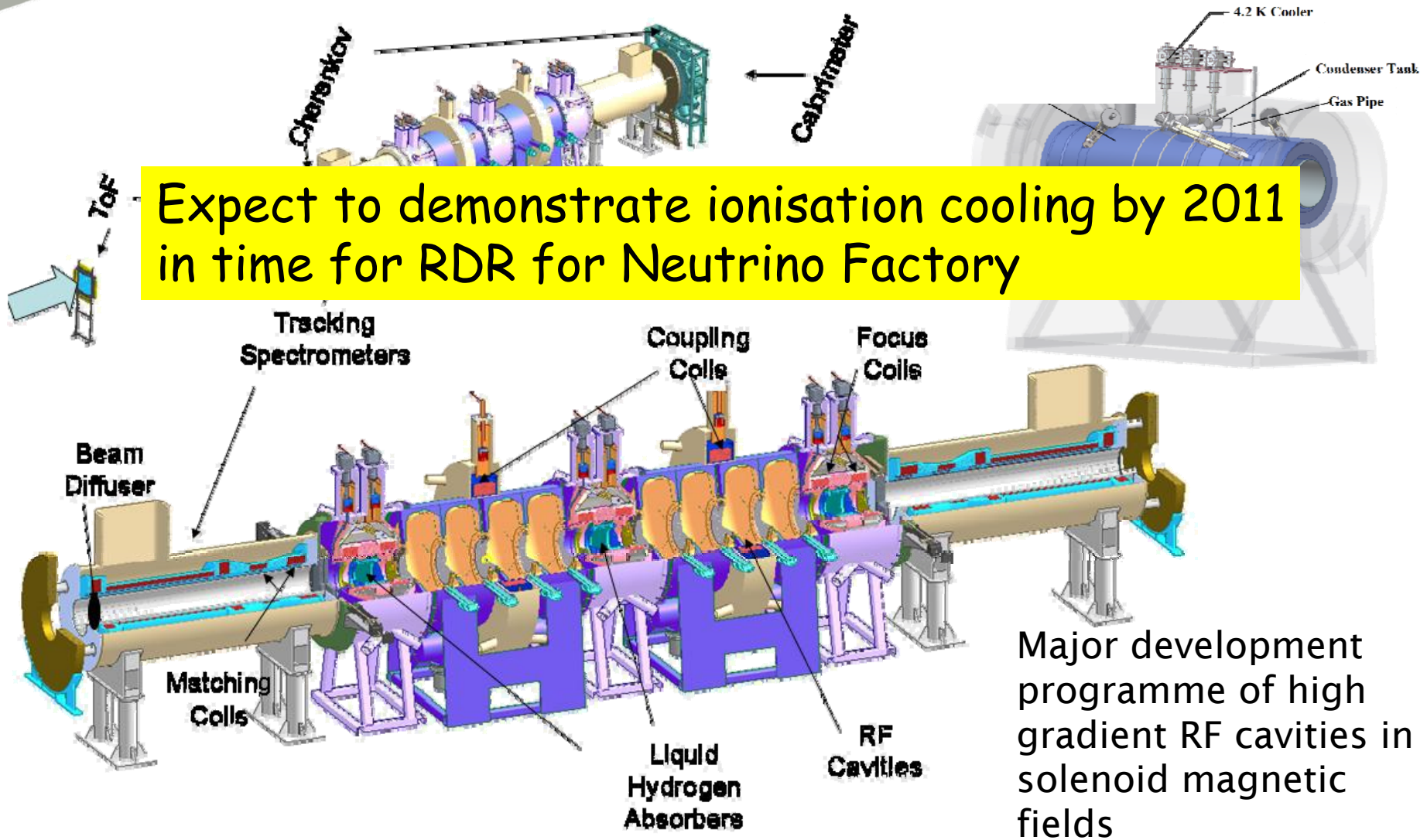


2012 first indications of Θ_{13} should be available from either T2K or Double-Chooz



Science & Technology Facilities Council
ASTeC

Muon Ionisation Cooling Experiment (MICE at RAL)



Expect to demonstrate ionisation cooling by 2011 in time for RDR for Neutrino Factory

Major development programme of high gradient RF cavities in solenoid magnetic fields

Bottom line: Synergy

- *Big questions = ambitious questions*
- *Need to clear the cloud of*
  physics to obtai
- *Ma* *e*
  to
- *Har* *conceivable*
- *No single experiment would achieve it, need a broad program*

Great opportunities ahead

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

So….why to change?

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

ex: ICFA Statement on Future Neutrino Facilities

15 August 2007

ICFA Statement on Future Neutrino Facilities

ICFA recognizes the recent advances in neutrino physics and the scientific interest in pursuing next generation accelerator facilities to produce more intense neutrino beams for precision experiments. The neutrino community is already very active in organizing workshops and schools to plan the future program in this area.

However, the neutrino community has not itself come to a consensus to which sort of facility - superbeams, muon storage rings or beta beams - should be pursued.

Given the present situation, it is too early for ICFA to take action along the lines it has devoted to the ILC planning.

The International scoping study proposes that an International Design Study begin, which would consider all three types of proposed facilities. ICFA is encouraged by these activities, but at this stage in planning it does not see a need to become involved in the process.

Should the effort coalesce around a facility proposal to take forward as a global project, it would then be appropriate for ICFA to assist in advancing this.

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

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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

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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.*

from CERN Council Strategy Document

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 being 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 ? …….

How to engage the world in a
commonly coordinated and supported particle physics program

Important aspect:
participation in the program in general
not only in specific projects

Nonetheless as a first approach:
Global Accelerator Network
Introduced for specific projects but could be modified

→

Ultimate step:
World laboratory or sustained partnership

Global Accelerator Network

- make best use of world-wide competence, ideas, resources

- make projects part of the national programs of the participating countries

- create a visible presence of activities in all participating countries

- keep culture of accelerator development (scientific and technical) alive in laboratories and universities and be attractive for young scientists

Global Accelerator Network

- project should have a minimal administrative structure, with mainly management oversight functions

- well defined roles and obligations of all partners

- coherent and transparent process for reaching decisions (consensus) inside collaboration

- financial stability combined with necessary flexibility

- not an international permanent institution but an international project of limited duration

Global Accelerator Network

- Follows major detector collaboration in particle physics

- Partners contribute in full responsibility through components or subsystems

- Facility is common property

- Responsibility, cost are shared

- Remote operation

2002

goes far beyond particle physics

GAN

Remote operation will very likely be of key importance for the future operation of large facilities.

Key issues:

- social aspects
- technical aspects

Tests in these areas are ongoing or planned

ICFA will sponsor future GAN workshops and has set up a group to deal with this matter

How to engage the world in a
commonly coordinated and supported particle physics program

Important aspect:
participation in the program in general not only in specific projects

First step (idea) : Global Accelerator Network for a specific project

→

Ultimate step:
World laboratory or sustained partnership

World Laboratory == ‘International’ CERN ?
Global Laboratory == Long -Term Partnership ?

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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