

Linear Collider input to the European Strategy

Feed-in and Feed-back are MUCH WELCOME

Francois Le Diberder (CNRS/IN2P3)

KILC 2012, Daegu

Linear Collider input to the **European Strategy**



Update



Linear Collider **input** to the **European Strategy**

One LC input among others: they will be several. This one is meant to **express** the community view.

The European strategy
for particle physics

It should carry a somehow **official** weight

2006

CERN Council

Update

2013

CERN Council

Linear Collider input to the **European Strategy**



Update



<http://council.web.cern.ch/council/en/Welcome.html>

CERN Council

Government representatives of twenty European States meet regularly in the CERN Council to address research in elementary particle physics and related subjects. These meetings are conducted in accordance with an international treaty, the CERN Convention. The Convention bestows upon the Organization **two missions**, namely the operation of laboratories and **the organisation and sponsoring of international co-operation in the field**. The first mission relates to the governance of the CERN Laboratory in Geneva, which is also the seat of the Organization. This is the world's largest elementary particle physics laboratory and provides research infrastructure for around 8,000 scientific users from the Member States and other regions in the world. The CERN Laboratory stands astride the Swiss-French border close to Geneva and is one of the jewel's in Europe's crown, a demonstration of what can be achieved through European collaboration. The Council governs the CERN Geneva Laboratory by defining its strategic programmes, setting and following up its annual goals, approving its budget and appointing its Management; the Laboratory is led by the Director-General who in respect of the Laboratory under his direction is also the formal representative of the Organization. In its role as governing body of CERN, the Council meets four times a year, bringing together around one table delegations from its twenty Member States, under the chairmanship of the President of Council and with the Director-General acting as secretary. The **second of the missions** has been actively addressed since the adoption of the **"European Strategy for Particle Physics"** in July 2006. Dedicated "European Strategy Sessions" are held for this purpose. The main **European Strategy Session takes place in September of each year**, coinciding with the normal CERN Council Session, but shorter European Strategy Sessions can also be held at other times of the year, if so required. The bulk of the organization and preparation for the European Strategy Sessions of Council is undertaken by a Secretariat led by the Scientific secretary who is also the acting secretary at these Council Sessions. As you can see, this web page branches off into two separate pages, reflecting the manner in which the Council addresses the two missions of the Organization. I sincerely hope these pages will help keep you informed about the issues addressed by the CERN Council, the decisions that have been taken, and other news in its various fields of activity.

Michel Spiro
President of the CERN Council

Starts at page 36: brief statements



1) LHC

2) CLIC R&D

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.

3) ILC

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.



And statement 17) is:

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.

Timeline for the European Strategy **Update**

CERN Council - *Strategy finalized*



mid 2013

draft

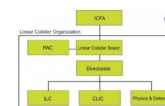
Open Symposium
Sept. 10-12 (Cracow, Poland)

Strategy Group drafting session
January 21-26 (Erice, Italy)



(deadlines->) Open Symposium
July 31

Strategy drafting session
Oct. 15



By accident, at about the time when the new CLICILC world organization takes place.

Linear Collider input to the European Strategy

Mandate

The committee is requested to **review** the **physics case** for a **linear electron-positron** collider in the centre-of-mass energy range from around **250 GeV - 3 TeV** in the light of **LHC results up to mid-2012** and building on previous studies. The committee should consider the case for a linear collider in terms of the **physics reach beyond that of the LHC under the assumptions in the current CERN planning; a) 300 fb⁻¹ and b) 3000 fb⁻¹**. It should assume linear collider performance based on the details contained in current documents from ILC and CLIC but **without a detailed comparison of the relative performance of the machines**. The aim is to make the strongest possible case for a **generic linear collider** for submission to the European Strategy process. The committee is requested to submit its draft report to the GDE European Regional Director, the CERN Linear Collider Studies Leader and the Chair of the ECFA Study for the Linear Collider by **June 18th** 2012. The final version of the report, should be delivered by **end July**.

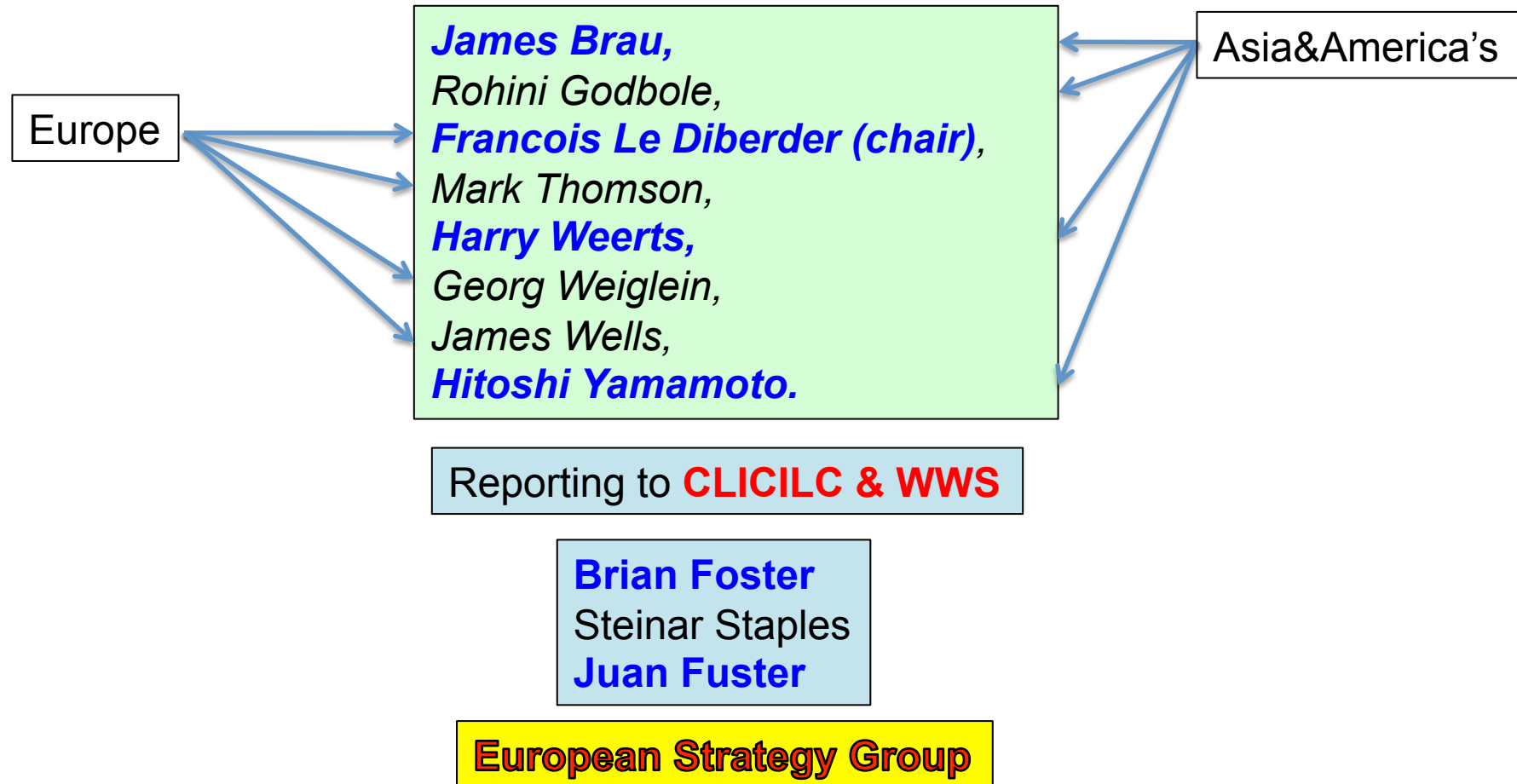
LEP3
SuperTristan



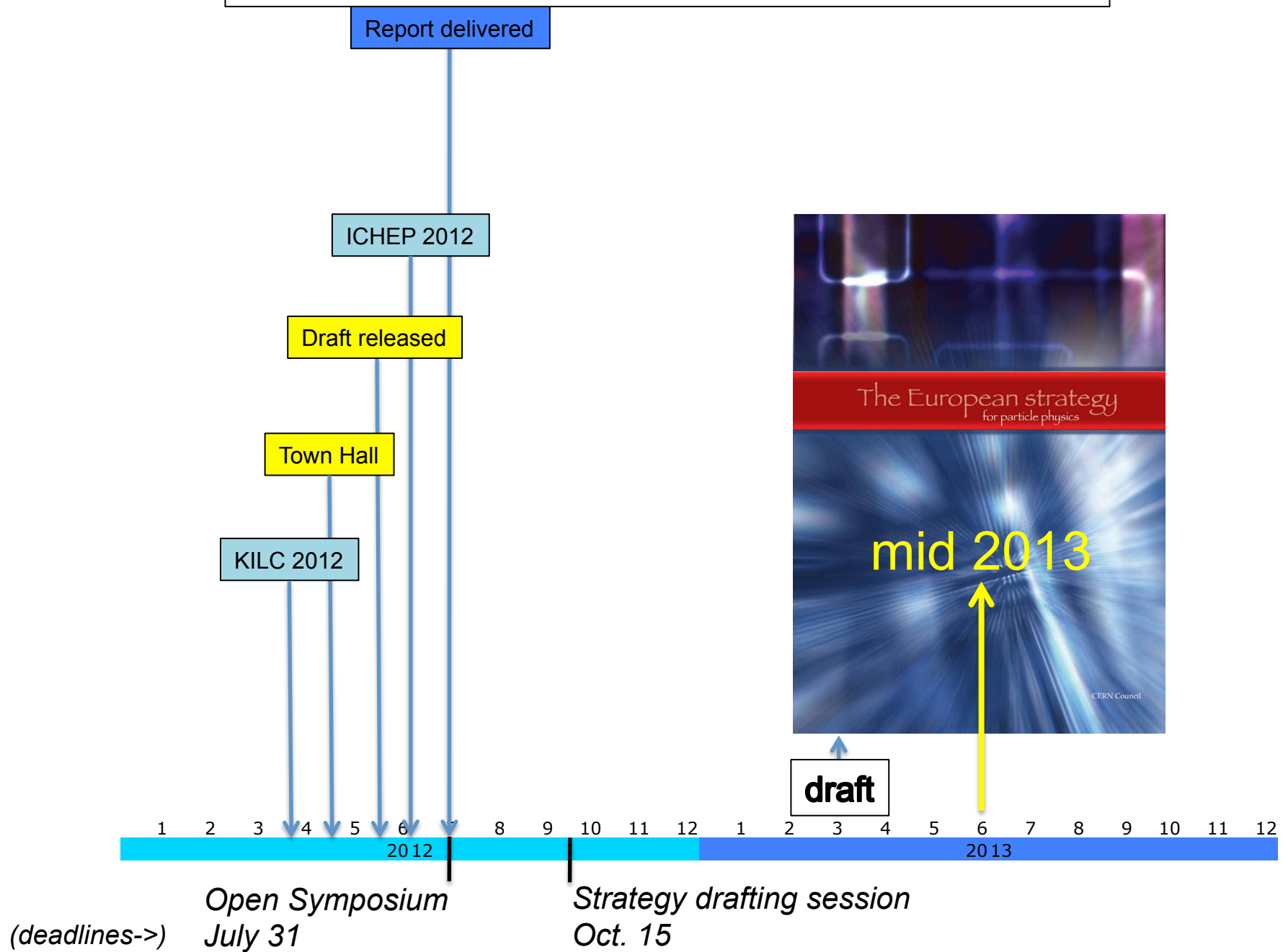
For LHC input to the European Strategy group, will rely on LHC2TSP

Linear Collider input to the European Strategy

The Committee Members



Linear Collider input to the European Strategy

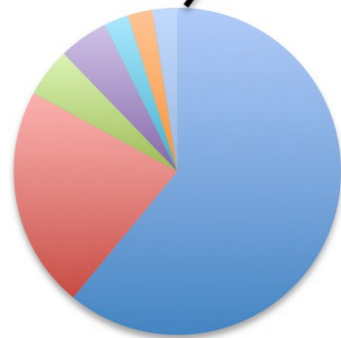


Linear Collider Town Hall Meeting

Paris, May 16, 2012

image: DESY

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- [Program](#)
- [Registration \(free access\)](#)
- [Participants](#)



- France
- Germany
- Spain
- Switzerland
- UK
- Americas
- Asia

At the [EPS-HEP2011](#) conference, the European Committee for Future Accelerators (ECFA) launched the update⁽¹⁾ of the 2006 [European strategy for particle physics](#). The European Strategy covers the European participation in particle physics projects in Europe and beyond Europe. An international committee⁽²⁾ has been established to prepare input from the linear collider community.

On May 16, a Linear Collider Town Hall Meeting will take place in Paris for the whole Particle Physics community to express its view to the committee in charge of drafting the Linear Collider report: the discussions at this meeting, that aims to gather the community at large, will be timely in view of preparations for the European Strategy Update.

The committee is requested to review the physics case for a linear electron-positron collider in the centre-of-mass energy range from around 250 GeV - 3 TeV in the light of the Large Hadron Collider results up to mid-2012 and building on previous studies. The committee should consider the case for a linear collider in terms of the physics reach beyond that of the LHC under the assumptions in the current CERN planning; a) 300 fb⁻¹ and b) 3000 fb⁻¹. It should assume linear collider performance based on the details contained in current documents from ILC and CLIC but without a detailed comparison of the relative performance of the machines. The aim is to make the strongest possible case for a generic linear collider for submission to the European Strategy process. The committee is requested to submit its draft report to the ILC Global Design Effort European Regional Director (Brian Foster), the CERN Linear Collider Studies Leader (Steinar Stapnes) and the chair of the ECFA Study for the Linear Collider (Juan Fuster) by June 18, 2012. The final version of the report should be delivered to the European Strategy Group by the end of July 2012, as an input for the [Cracow Open Symposium](#).

(1) The timeline for the update is as follows:

- Submission deadline for inputs to the Open Symposium: July 31, 2012,
- Open Symposium: September 10-12, 2012 (Cracow, Poland),
- Submission deadline for inputs to the Strategy drafting session: October 15, 2012,
- Strategy Group drafting session: January 21-26, 2013 (Erice, Italy),
- Draft Strategy finalised, March 2013 (CERN Council),
- Strategy finalised, May/June 2013 (CERN Council, special meeting).

(2) Committee members are: James Brau, Rohini Godbole, Francois Le Diberder (chair), Mark Thomson, Harry Weerts, Georg Weiglein, James Wells and Hitoshi Yamamoto.

- [Venue](#)
- [Contact](#)
- [Lodging](#)
- [Paris](#)

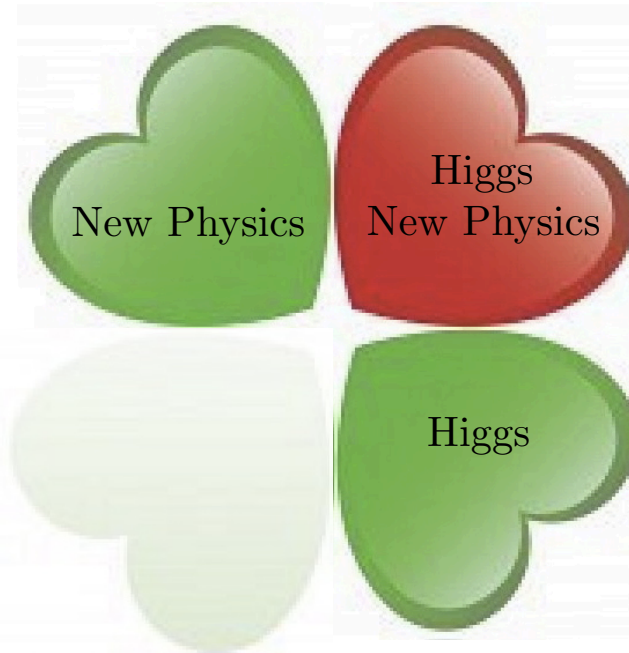


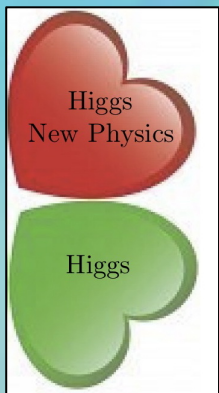
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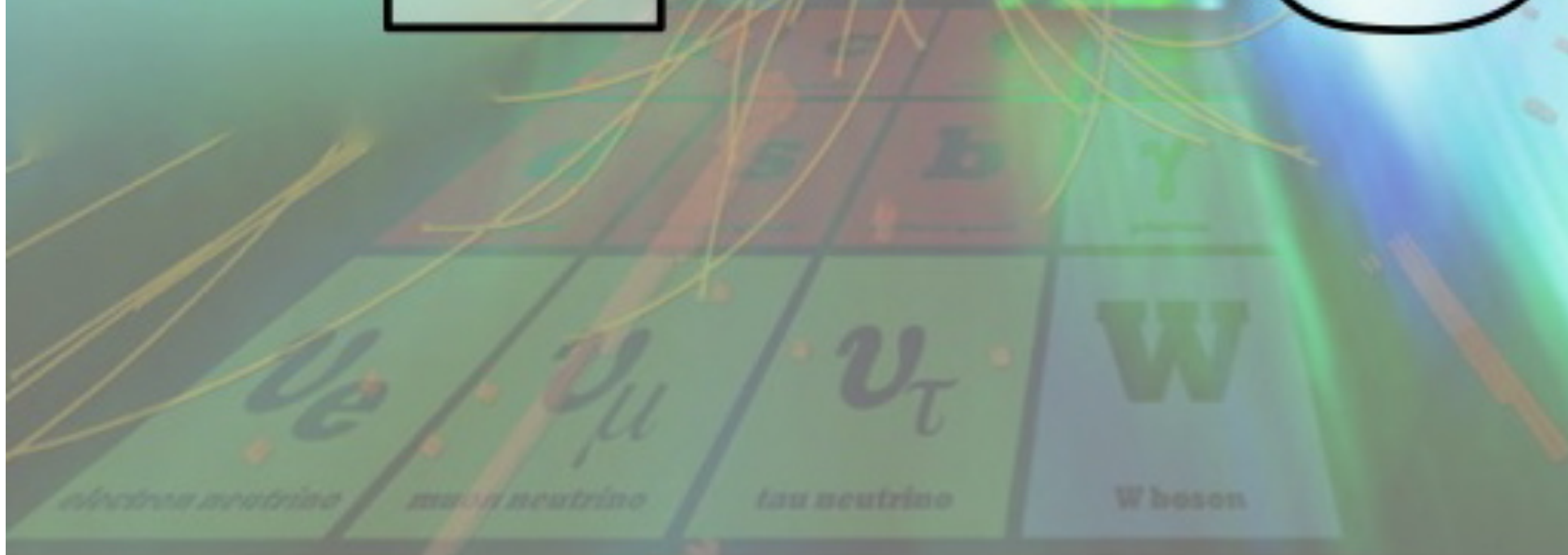
Linear Collider input to the European Strategy

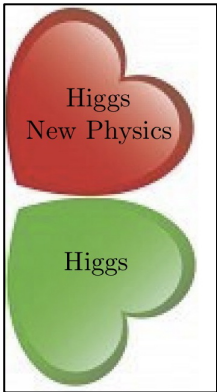
What follows mostly represents my personal views



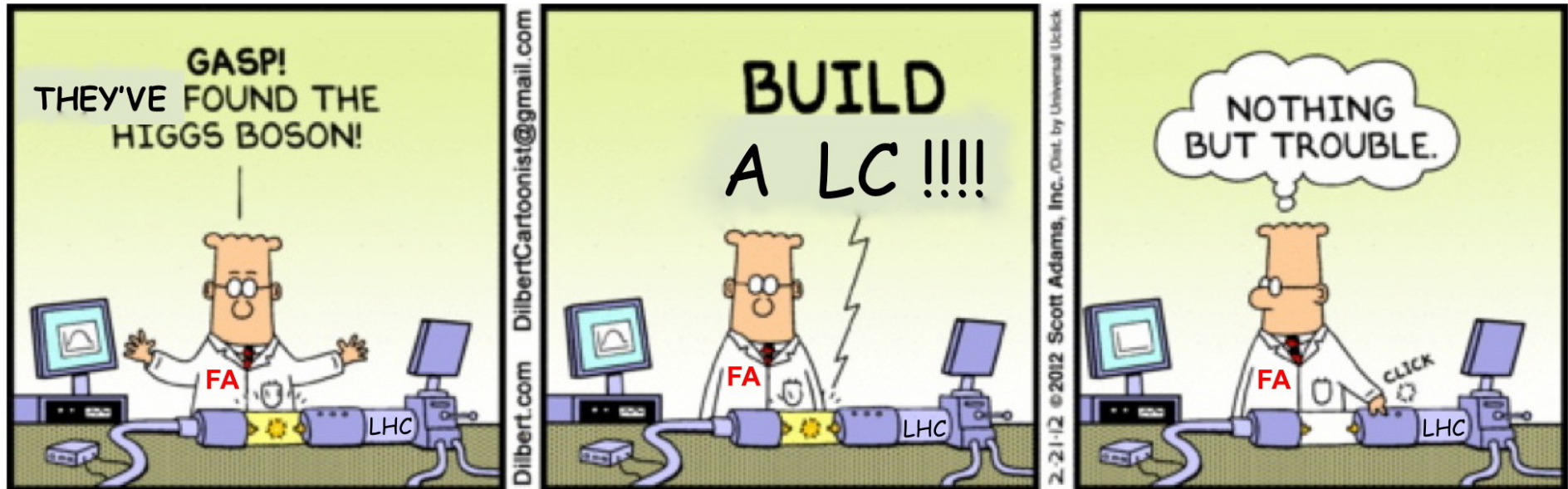


LEG



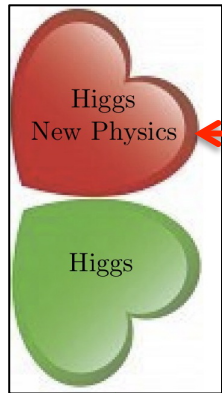


Linear Collider input to the **F**unding **A**gencies

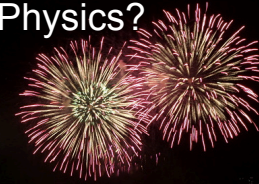


Act quickly & unanimously to expose a compelling scientific case.

Linear Collider input to the European Strategy



New Physics?



Huge Fireworks
over Geneva lake

May have to await first year
of 13 TeV data taking

Executive Summary

Introduction

Discoveries beyond SM

Precision measurements beyond SM

Higgs and SM particles

Higgs?



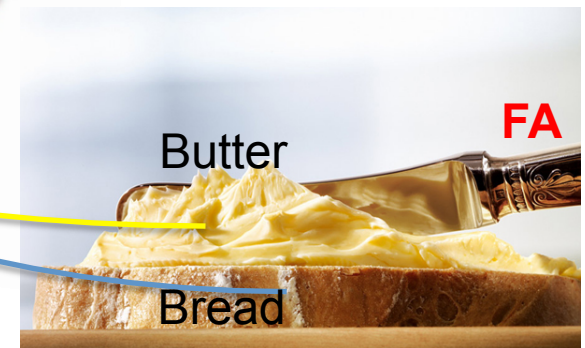
Great Fireworks
over Geneva lake

Meaning, at least no looming exclusion by
mid 2012, emphasis will obviously depend
on the status of the Higgs searches.

Butter

FA

Bread





Linear Collider input to the European Strategy

**Need for a
Higgs Factory
to study the
New Beast**

- a) Mass(es)
- b) J^{PC}
- c) Couplings
- i) Fermions
- ii) Gauge bosons
- iii) **Itself**
- d) Loop decays

u	c	t	γ
d	s	b	Z^0
ν_e	ν_μ	ν_τ	W^\pm
e	μ	τ	g

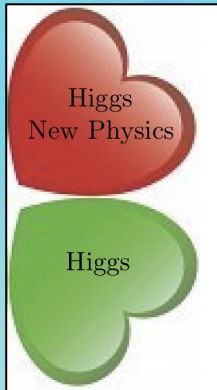
electron neutrino

muon neutrino

tau neutrino

W boson

Linear Collider input to the European Strategy



Rare decays,
upper limits only

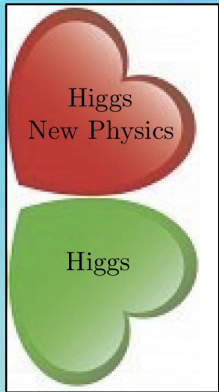
u	c	t	γ
d	s	b	Z^0
ν_e	ν_μ	ν_τ	W^\pm
e	μ	τ	g

electron neutrino

muon neutrino

tau neutrino

W boson



Linear Collider input to the European Strategy

u	c	t	γ
d	s	b	Z^0
ν_e	ν_μ	ν_τ	W^\pm
e	μ	τ	g

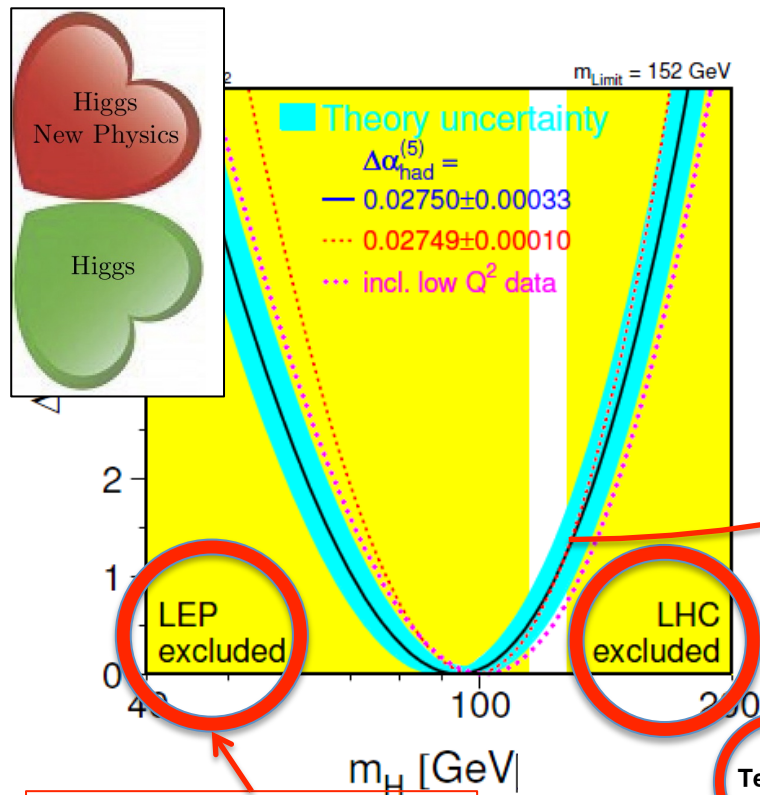
Very well known
Arguments in favor
of a LC, but keeping
in mind that the SM
backgrounds can be
very large, and that
Tevatron&LHC are
Great machines...

electron neutrino

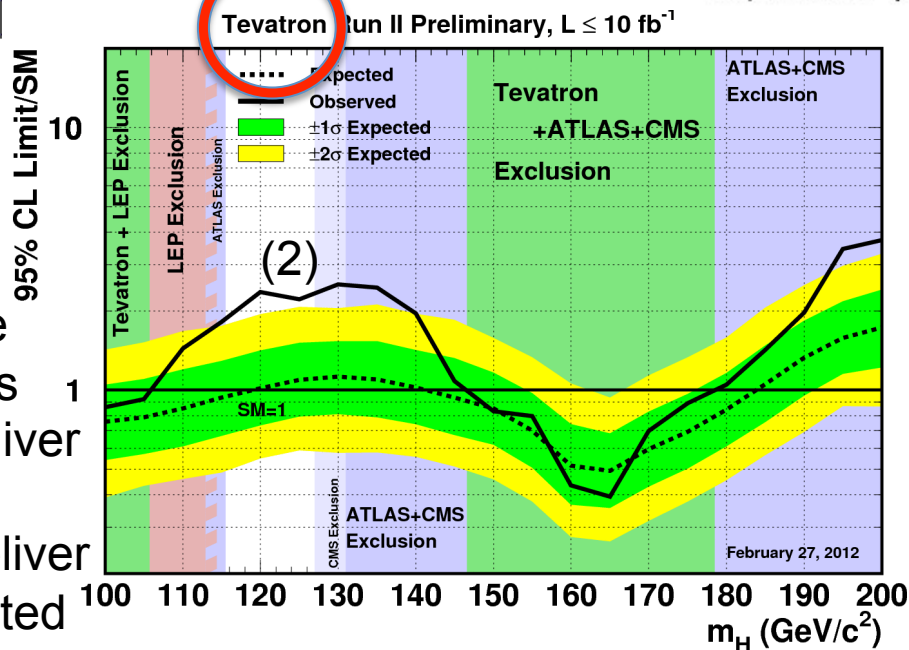
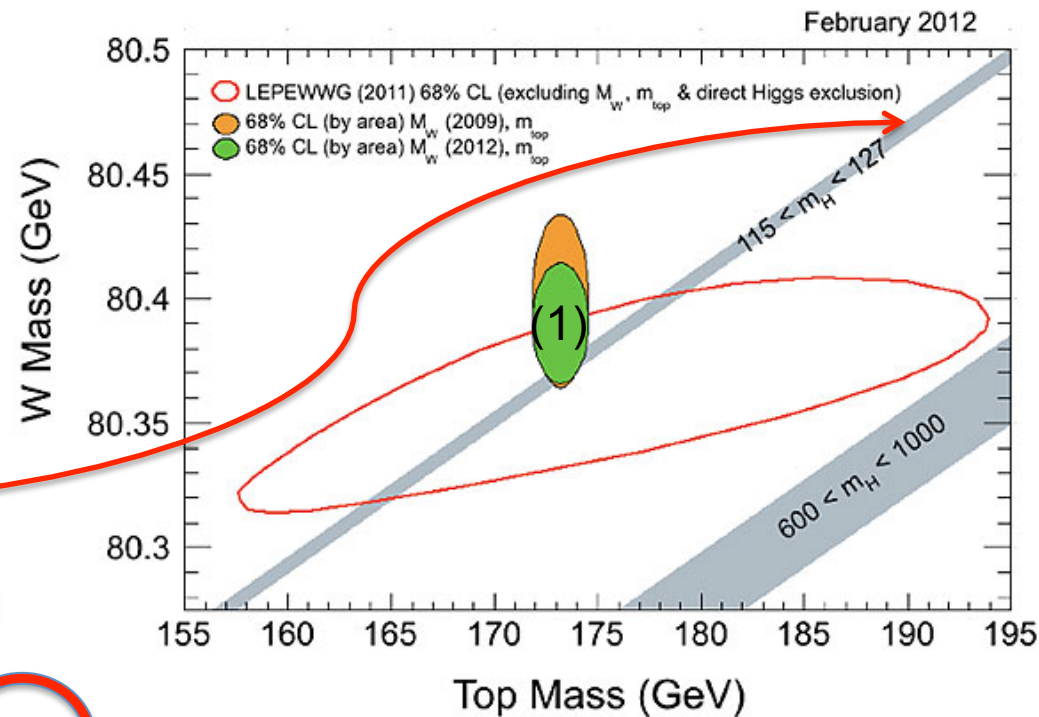
muon neutrino

tau neutrino

W boson



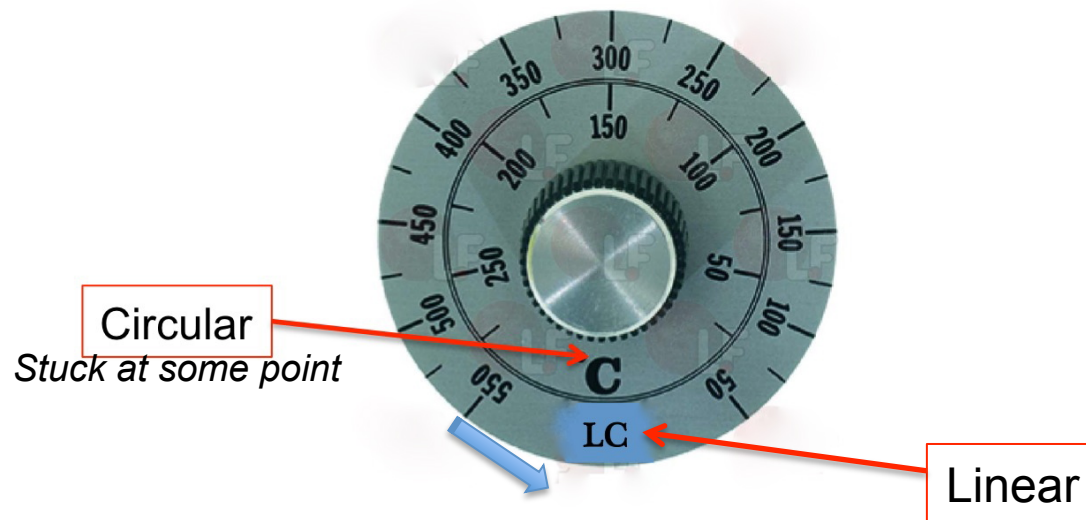
... and SLC, and numerous other experiments (BaBar, Belle ...)



- (1) Hadron colliders are also precision machines
- (2) Colliders tend to deliver more than expected
- (3) Theorists tend to deliver more than (they) expected

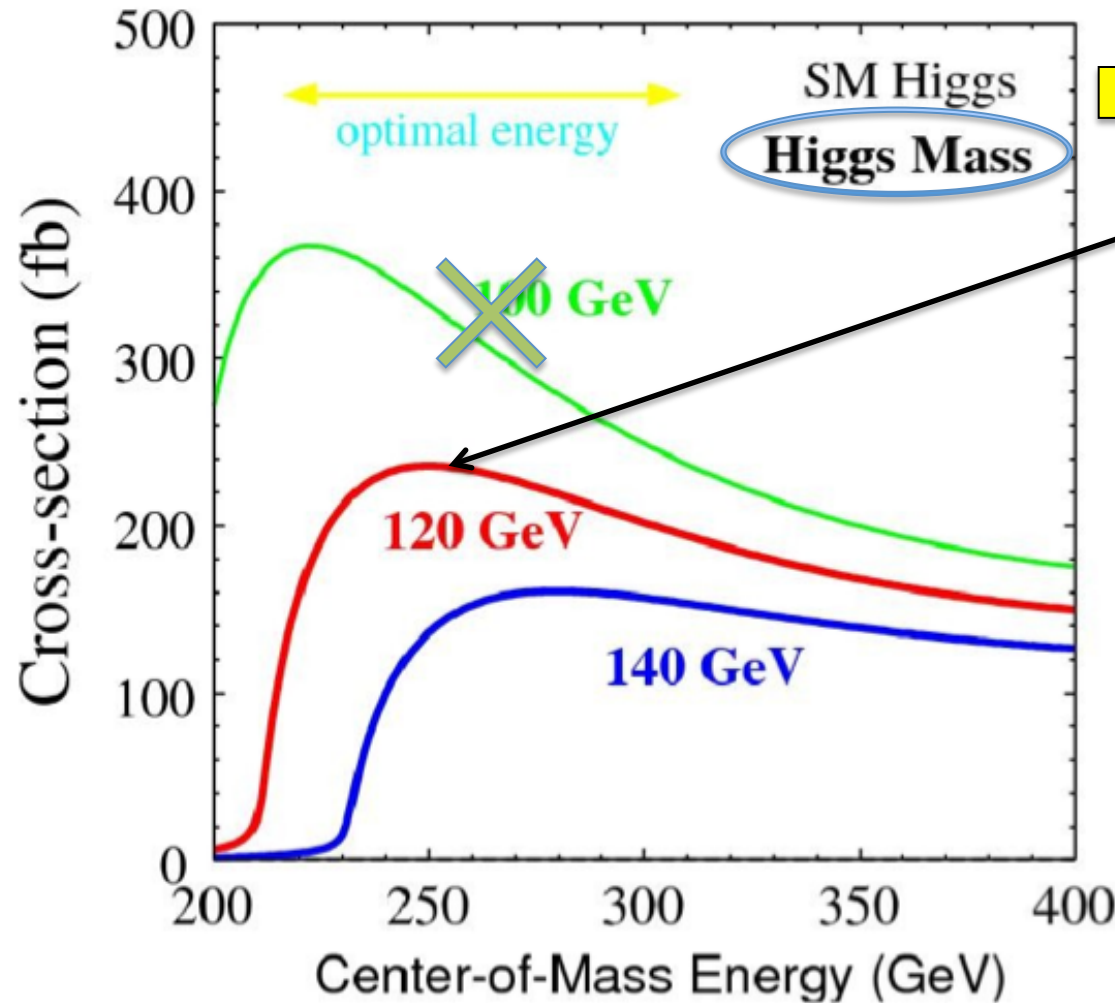
Linear Collider input to the European Strategy

- 1) Energy [**incremental Physics case** from 250 to 3000 GeV]
- 2) Luminosity [assume ILC & CLIC numbers]
- 3) Polarization(s) [assume ILC & CLICL numbers]



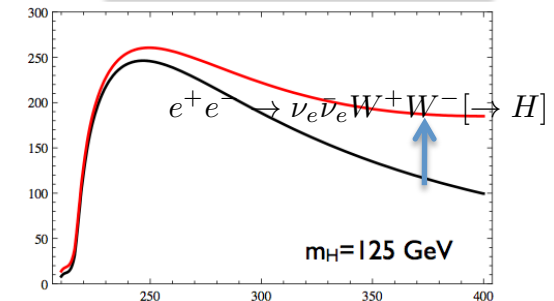
NB: Giga Z and $\gamma\gamma$ & $e\gamma$ & e^-e^- colliders are out of the scope, but they should be mentioned

Linear Collider input to the European Strategy

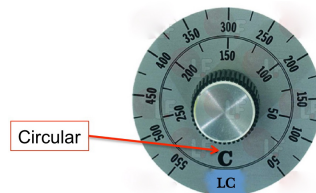


e.g. ILD (250 fb^{-1})
a) m_H at 0.03 GeV
b) $\sigma[ee \rightarrow ZH]$ at 2.5%

Why do we care?

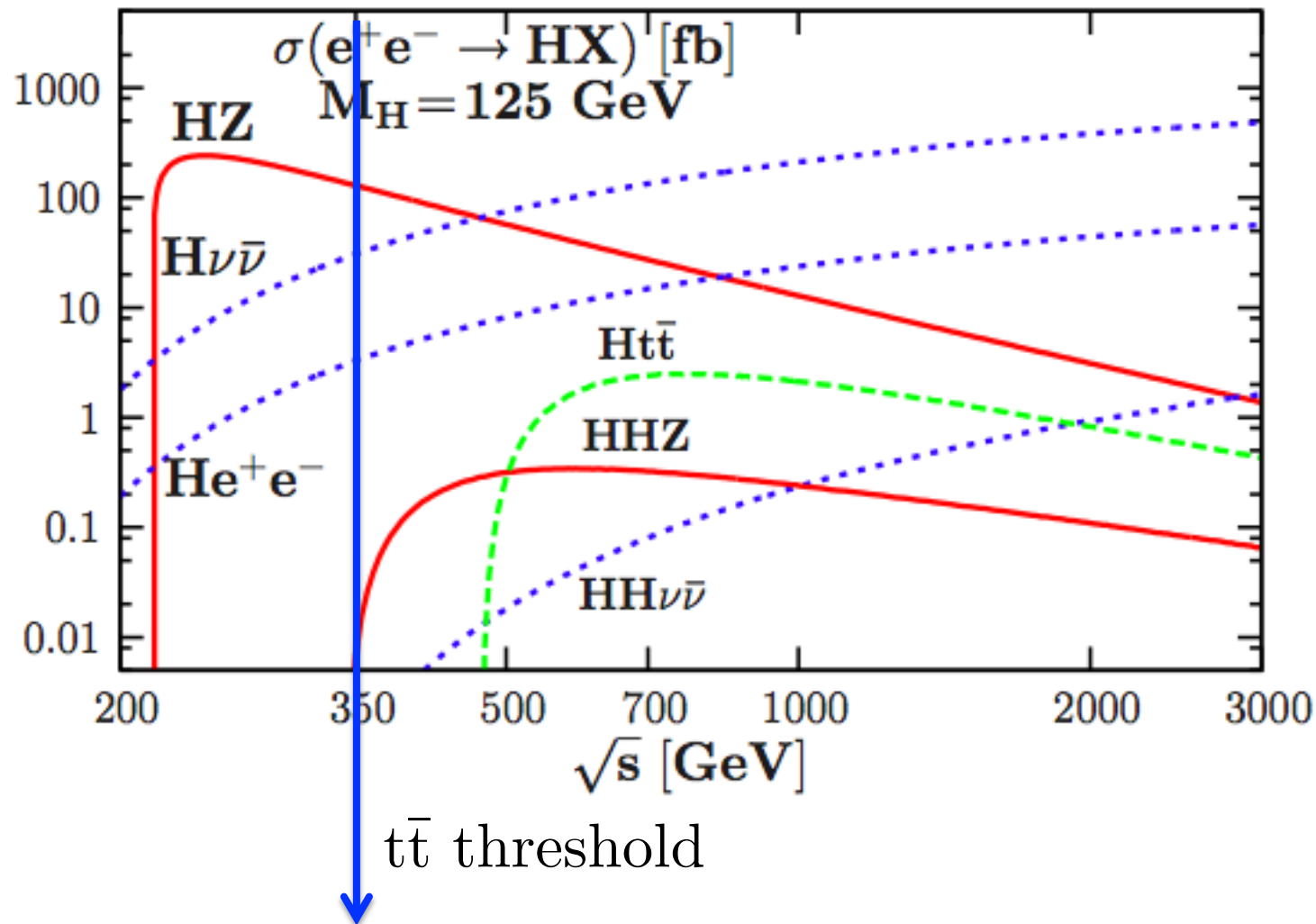


A **smooth** decrease
+ Luminosity increase
+ Opening of :
a) top (&H) Physics
b) VV Physics
c) HHH couplings



The Physics case has
to be very strongly made

Linear Collider input to the European Strategy

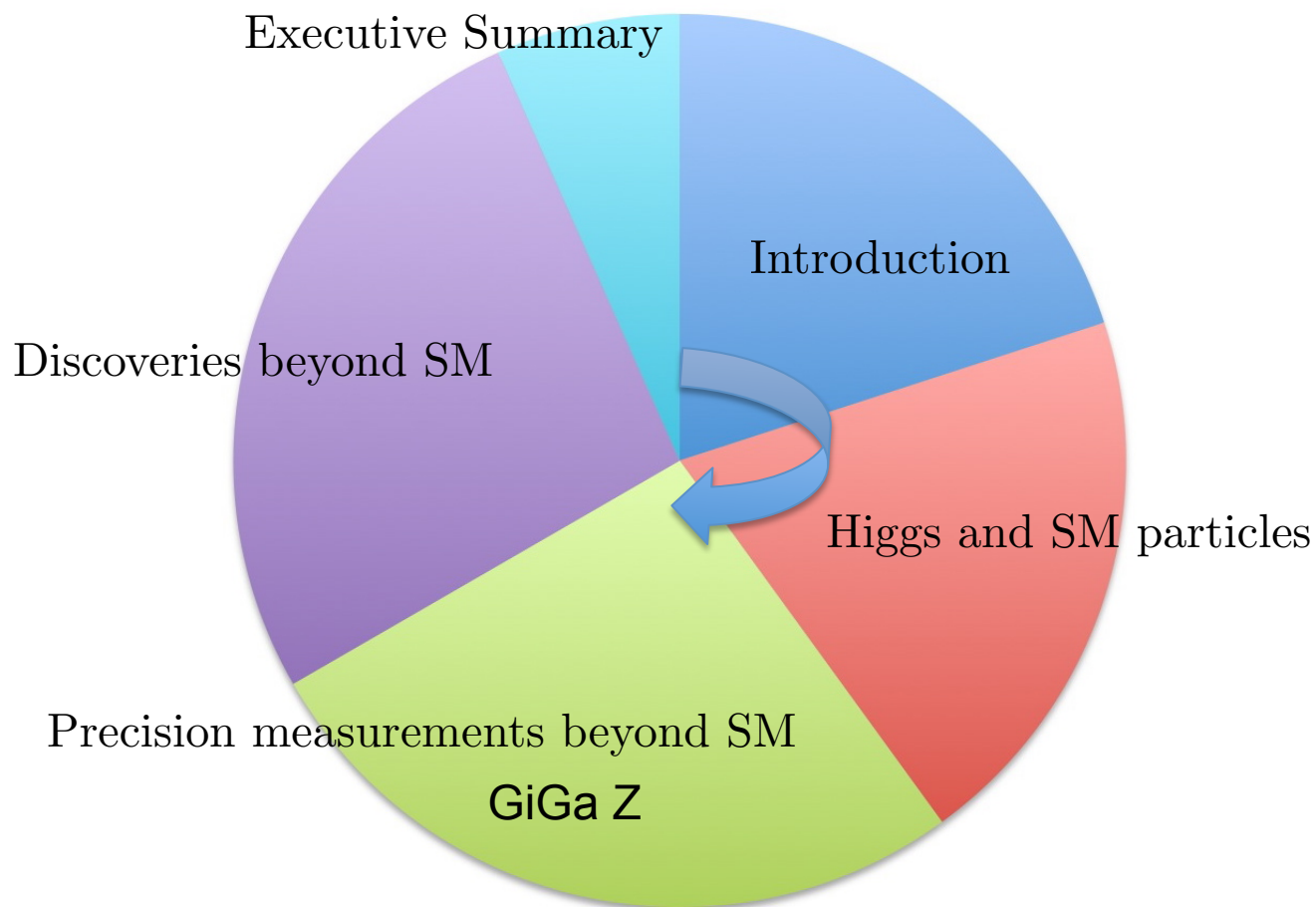


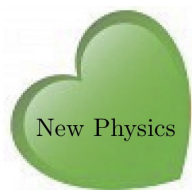
350 GeV is the portal to the whole SM



Linear Collider input to the European Strategy

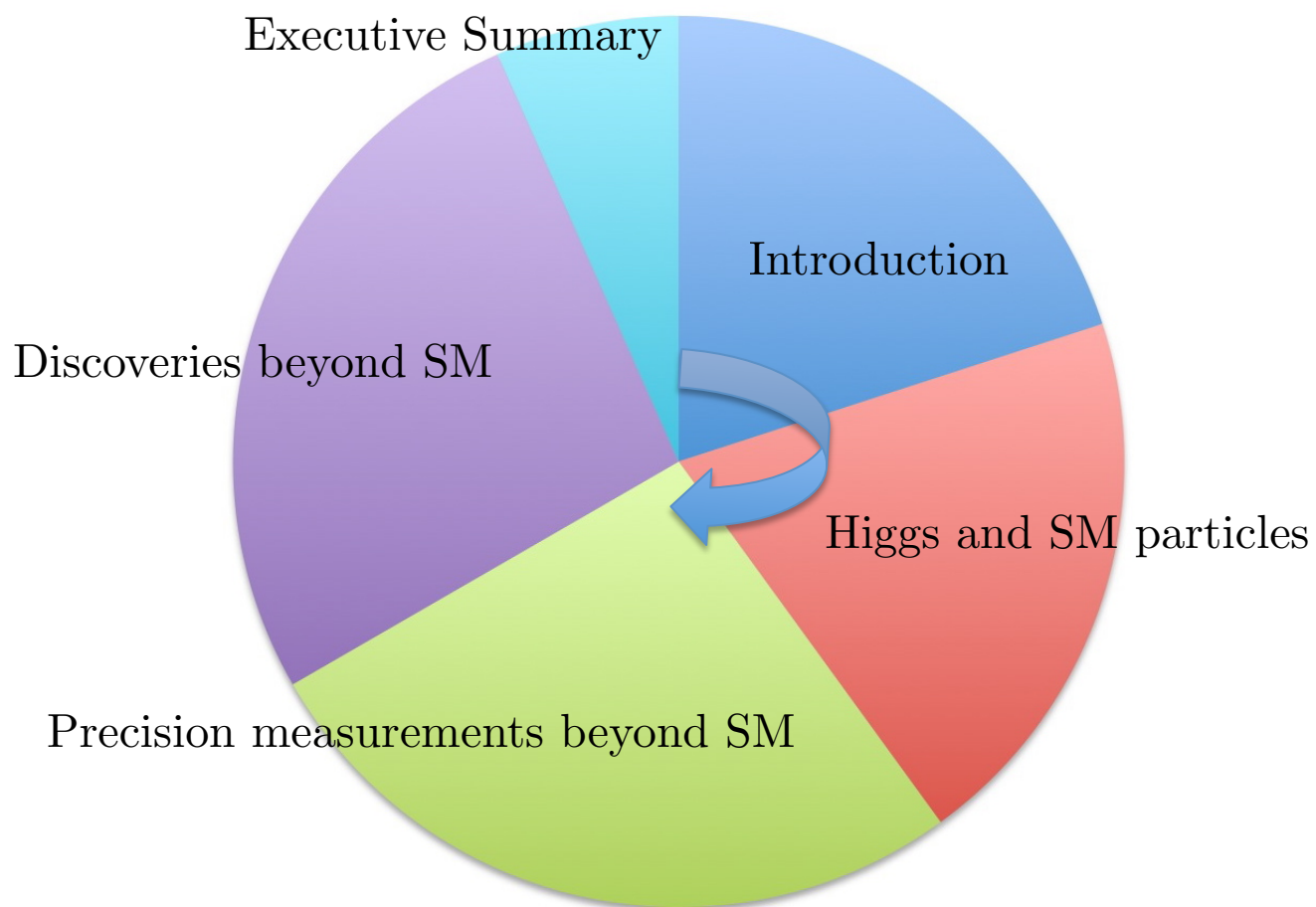
SM Higgs excluded, and no New Physics:
not unlikely, but not much thoughts, yet.





Linear Collider input to the European Strategy

New Physics unraveled by mid-2012: not much thoughts, yet.



Linear Collider input to the European Strategy

Goal is to deliver a (Global) Community Input

James Brau,
Rohini Godbole,
Francois Le Diberder (chair),
Mark Thomson,
Harry Weerts,
Georg Weiglein,
James Wells,
Hitoshi Yamamoto.

Brian Foster
Steinar Staples
Juan Fuster

Feed-in and Feed-back are MUCH WELCOME

Francois Le Diberder (CNRS/IN2P3)



Linear Collider Town Hall Meeting
Paris, May 16, 2012

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Switzerland
UK
Americas
Asia

Logo: CERN, INFN, Irfu, ilc, CLIC, Webmaster: C. Bourde

KILC 2012, Daegu