

# Workshop on Top Quark Physics at the LC

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On behalf of:

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François Richard, Dirk Zerwas, Wolfgang Hollik,  
Marcel Vos

LC Top Workshop - Paris March 2014

**Thanks for coming**

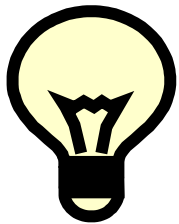
32 registered participants

**Thanks for hosting**

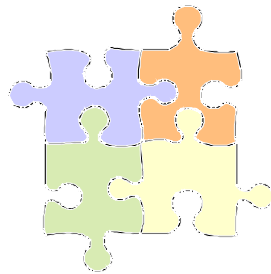
LPNHE was spontaneously ready  
to host the workshop

# Towards New Physics

**Higgs Boson**



Elementary Scalar?



Composite object?

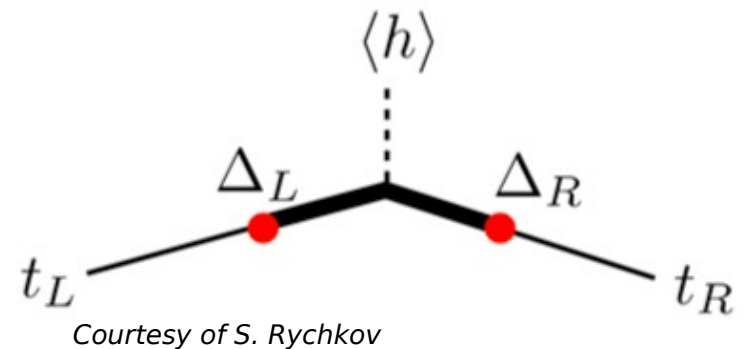
LEPTONS		
Electron Neutrino Mass ~0	Muon Neutrino ~0	Tau Neutrino ~0
Electron .511	Muon 105.7	Tau 1 777
QUARKS		
Up Mass: 5	Charm 1 500	Top ~180 000
Down 8	Strange 160	Bottom 4 250

**Top quark**

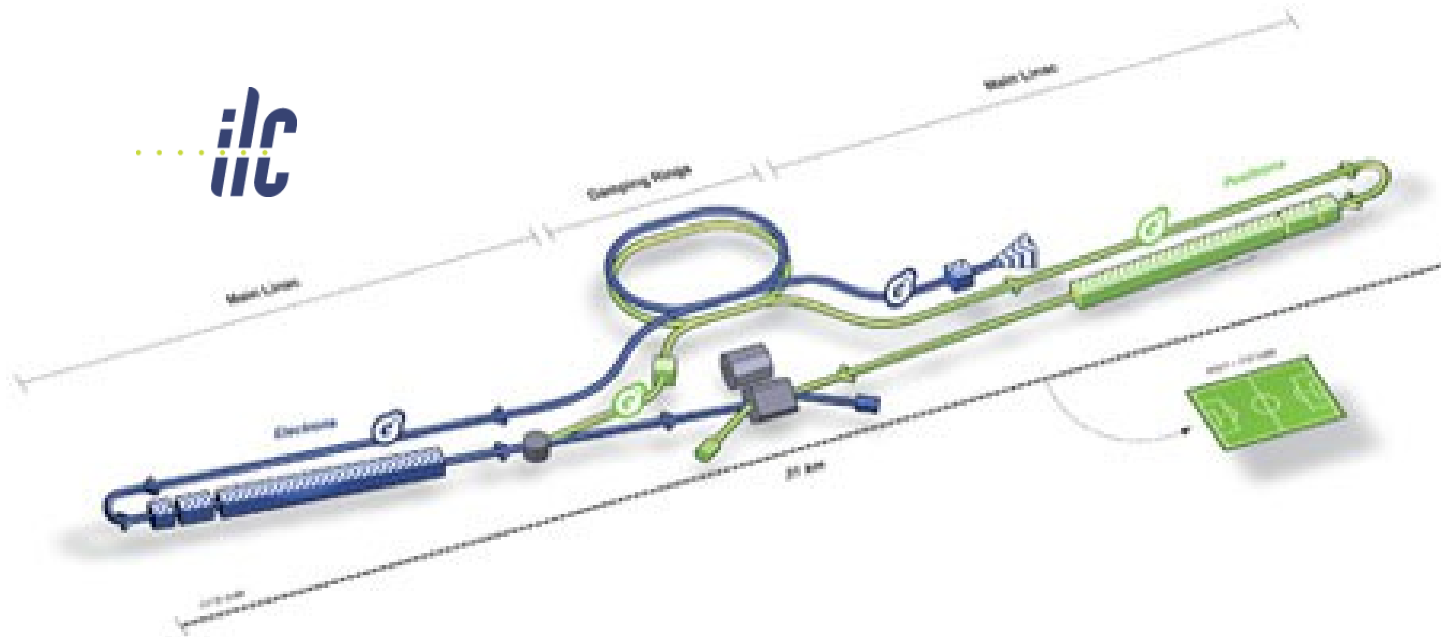
- Higgs and top quark are intimately coupled!  
Top Yukawa coupling  $O(1)$  !  
=> Top mass important SM Parameter

- New physics by compositeness?  
Higgs and top composite objects?

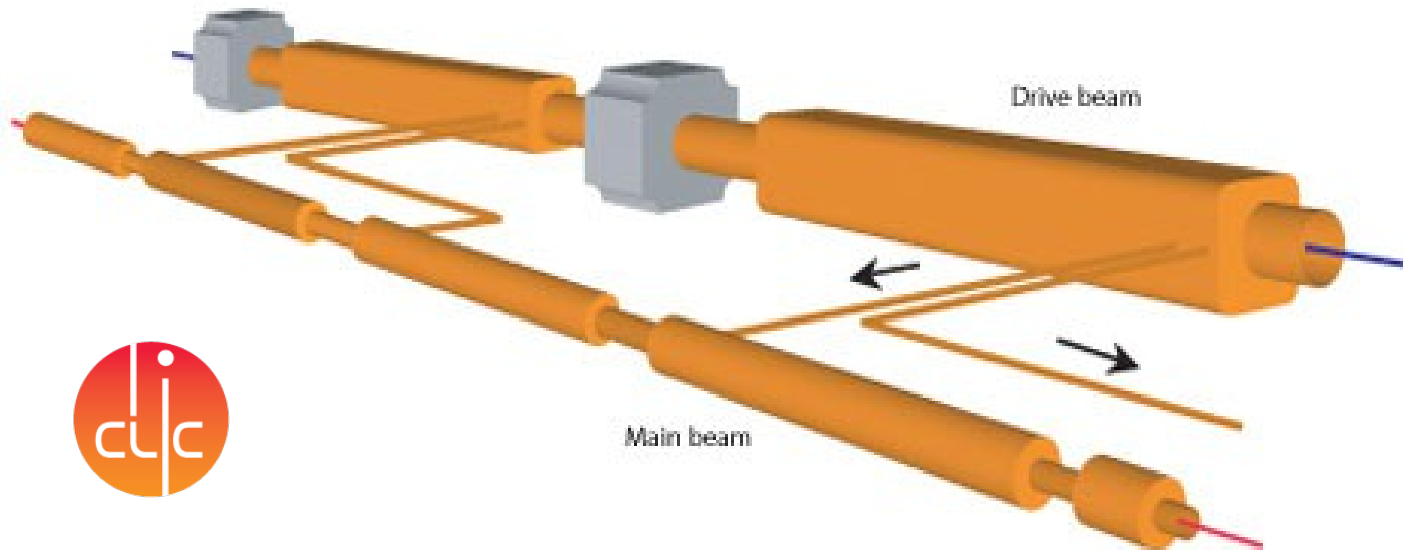
- **LC perfectly suited to decipher both particles**



# (Future) Linear electron-positron colliders



**Energy: 0.1 - 1 TeV**  
**electron (and positron)**  
**polarisation**  
**TDR in 2013**  
**+ DBD for detectors**  
Ready for construction'

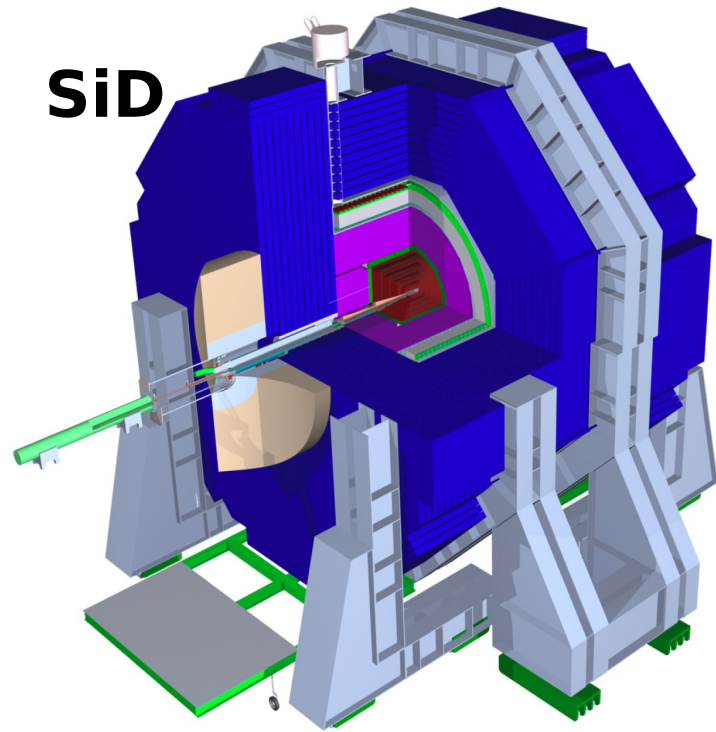


**Energy: 0.5 - 3 TeV**  
**CDR in 2012**



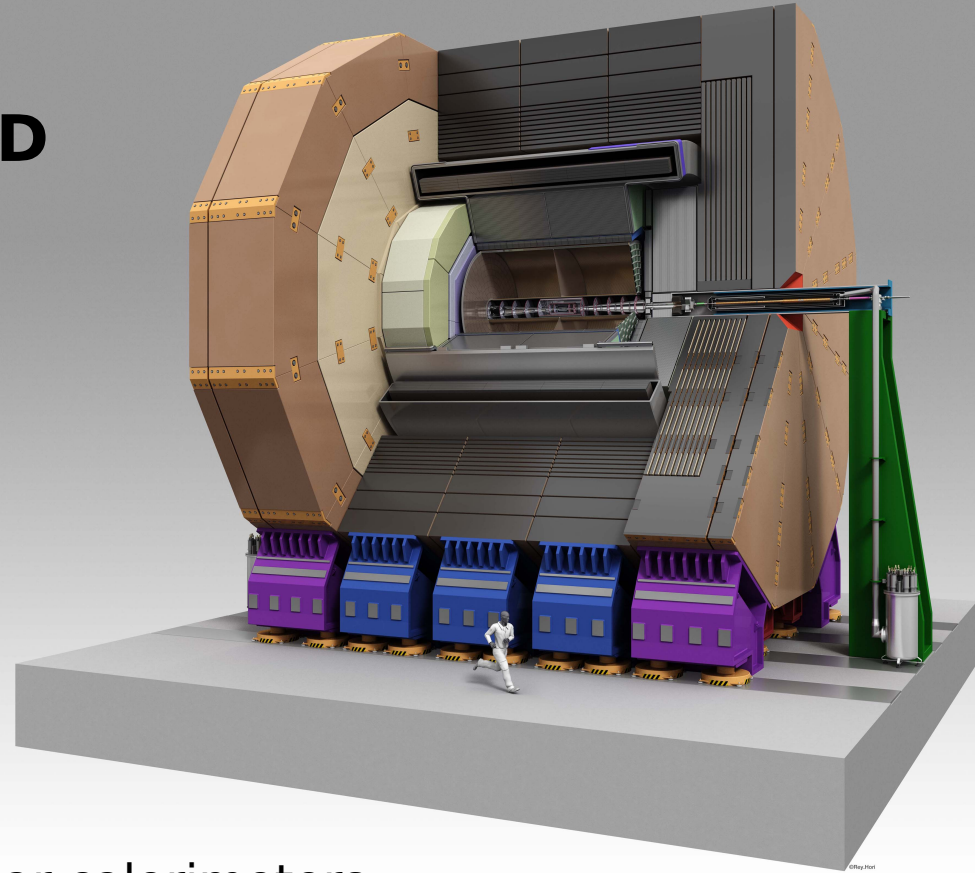
# Detector concepts

**SiD**



Central tracking  
with silicon

**ILD**



Central tracking  
with TPC

Highly granular calorimeters

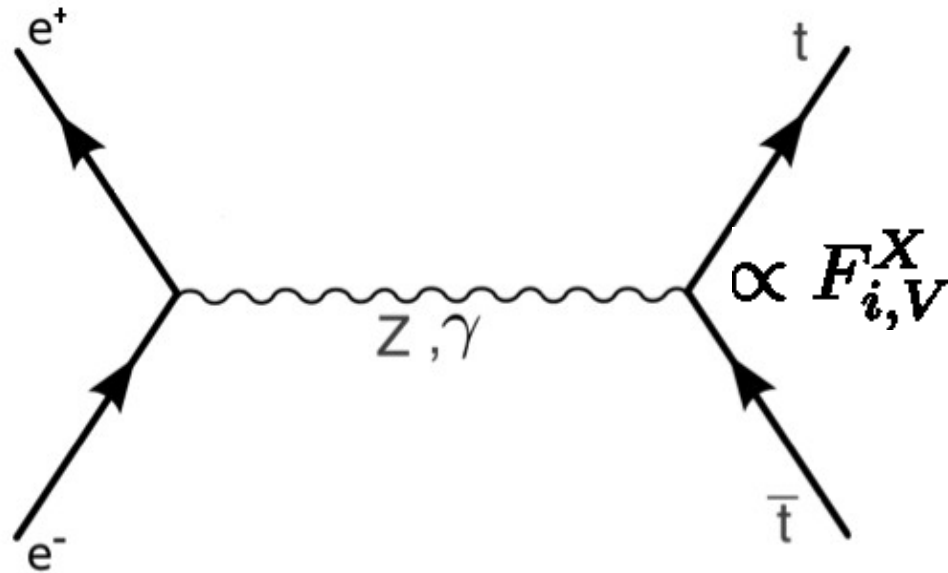
Inner tracking with silicon

- LOI's Validated by IDAG in 2009
- Publication of **D**etector **B**aseline **D**esign in 2013, together with TDR
- Concepts based on input from physics studies and detector R&D organised in R&D collaborations

*Top@LC - March 2014*

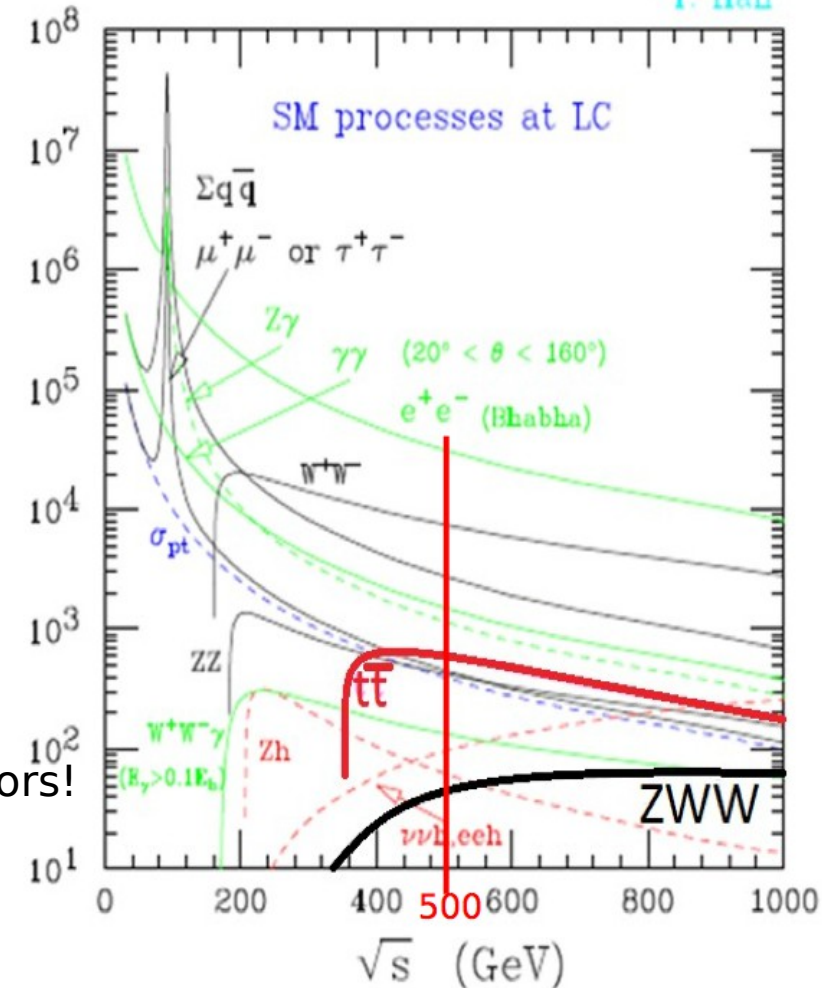
# Top quark physics at electron-positron colliders

T. Han



- Top quark production through **electroweak** processes,  
no competing QCD production  $\Rightarrow$  Small theoretical errors!

- High precision physics



Top quark mass at  $\sim 350$  GeV through **threshold scan** (1<sup>st</sup> session)

**Polarised beams** allow to test chiral structure at  $t\bar{t}X$  vertex (2<sup>nd</sup> session)

Need tools to translate theoretical work into experimental quantities (3<sup>rd</sup> session)

# Objectives of workshop

- Contribute to understanding that top quark physics is mandatory to discover New Physics

Make it a decisive argument for the construction of the (I)LC

Top quark physics starts where circles end

- Identify community interested in the subject and form basis for structured approach (4<sup>th</sup> session)
  - What kind of work is needed on experimental and theoretical side  
What are the timescales?
- Make sure that we understand what both LC and LHC can contribute to the issue
  - Communication is important to avoid “legends”

## **Organisational remarks**

- Coffee breaks on first floor of LPNHE**
- Diner 5/3/14 @ 1900h**

**Terroir Parisien**  
**20 rue Saint Victor**  
**75005 Paris**

**5 - 10 Minutes walk from here**

**Please pay upon leaving from the restaurant**



**Terroir Parisien**

