

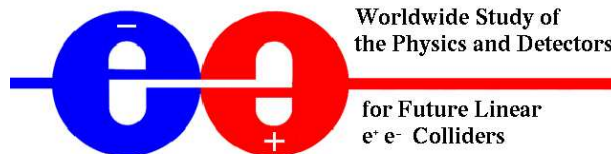
---

# *LHC / ILC Study Group report*

Georg Weiglein

IPPP Durham

Durham 09/2006



[www.ippp.dur.ac.uk/~georg/lhcilc](http://www.ippp.dur.ac.uk/~georg/lhcilc)

# ***LHC / ILC Study Group***

---

What is the physics gain of LHC / ILC interplay?

⇒ **LHC / ILC Study Group** [www.ippp.dur.ac.uk/~georg/lhcilc](http://www.ippp.dur.ac.uk/~georg/lhcilc)

World-wide working group of Hadron Collider and Linear Collider experimental communities and theorists

# ***LHC / ILC Study Group***

---

What is the physics gain of LHC / ILC interplay?

⇒ **LHC / ILC Study Group** [www.ippp.dur.ac.uk/~georg/lhcilc](http://www.ippp.dur.ac.uk/~georg/lhcilc)

World-wide working group of Hadron Collider and Linear Collider experimental communities and theorists

## **Recent news:**

- First report has meanwhile appeared:

[*G. W. et al., hep-ph/0410364, Phys. Rept. 426 (2006) 47*]

122 authors from 75 institutions

# **LHC / ILC Study Group**

---

What is the physics gain of LHC / ILC interplay?

⇒ **LHC / ILC Study Group** [www.ippp.dur.ac.uk/~georg/lhcilc](http://www.ippp.dur.ac.uk/~georg/lhcilc)

World-wide working group of Hadron Collider and Linear Collider experimental communities and theorists

## **Recent news:**

- First report has meanwhile appeared:  
[*G. W. et al., hep-ph/0410364, Phys. Rept. 426 (2006) 47*]  
122 authors from 75 institutions
- American Linear Collider Physics Group (ALCPG) has introduced a dedicated LHC / ILC working group,  
convenors: J. Alexander, D. Rainwater, T. Tait, W. Trischuk  
first session: Vancouver, 07/2006

## *How should we proceed?*

---

The LHC / ILC Report provides a comprehensive picture of possible scenarios of physics at the TeV scale

Many examples of LHC / ILC synergy have been discussed qualitatively

Detailed quantitative studies have been performed for cases where results on the prospective capabilities of LHC and ILC for measuring various observables have been available

**Example:** reconstruction of the SUSY mass spectrum with input from LHC and ILC

# *How should we proceed?*

---

ATLAS and CMS are actively preparing for the start of data taking: CMS has just issued their physics TDR, many new studies in ATLAS (full simulations, new scenarios)

+ ongoing ILC studies

⇒ Many new results, ideal input for studying LHC / ILC interplay

## *How should we proceed?*

---

ATLAS and CMS are actively preparing for the start of data taking: CMS has just issued their physics TDR, many new studies in ATLAS (full simulations, new scenarios)

+ ongoing ILC studies

⇒ Many new results, ideal input for studying LHC / ILC interplay

A different question arises in the same context:

How do we draw ILC-related conclusions from the arriving LHC data?

# ***What will be the impact of the early LHC data on the ILC?***

---



# *What will be the impact of the early LHC data on the ILC?*

---

- The start of data taking at the LHC will be a phase transition in the LHC–ILC connection

# *What will be the impact of the early LHC data on the ILC?*

---

- The start of data taking at the LHC will be a phase transition in the LHC–ILC connection
- The question will then be what the real data tell us about physics at the TeV scale

# *What will be the impact of the early LHC data on the ILC?*

---

- The start of data taking at the LHC will be a phase transition in the LHC–ILC connection
- The question will then be what the real data tell us about physics at the TeV scale
- The answer to this question will influence the decision about the start of construction of the ILC and design considerations for possible LHC and ILC upgrades

# *What will be the impact of the early LHC data on the ILC?*

---

- The start of data taking at the LHC will be a phase transition in the LHC–ILC connection
- The question will then be what the real data tell us about physics at the TeV scale
- The answer to this question will influence the decision about the start of construction of the ILC and design considerations for possible LHC and ILC upgrades
- The particle physics community will have to come up with a convincing and scientifically solid conclusion on how to proceed

# *What will be the impact of the early LHC data on the ILC?*

---

- The start of data taking at the LHC will be a phase transition in the LHC–ILC connection
- The question will then be what the real data tell us about physics at the TeV scale
- The answer to this question will influence the decision about the start of construction of the ILC and design considerations for possible LHC and ILC upgrades
- The particle physics community will have to come up with a convincing and scientifically solid conclusion on how to proceed

**Now is the time to start thinking about how this could be achieved!**

# *Planned Workshop: “The LHC early phase for the ILC”, April 12–14, 2007, Fermilab*

---

Organisers: M. Carena, M. Demarteau, H. Weerts, G. W., ...

## *Draft version of the charge:*

- What could be the impact of early LHC results on the choice of the ultimate ILC energy range and the ILC upgrade path?  
Could there be issues that would need to be implemented into the ILC machine and detectors design from the start?
- Could there be cases that would change the consensus about the physics case for an ILC with an energy of about 500 GeV?
- What are the prospects for LHC / ILC interplay based on early LHC data? (“early LHC data”  $\approx 10 \text{ fb}^{-1}$ )

# ***Workshop: proposed scenarios of results observed in the initial LHC runs***

---

- the detection of only one new state with properties that are compatible with those of a Higgs boson
  - no experimental evidence for a Higgs boson at the early stage of the LHC
  - the detection of new states of physics beyond the Standard Model
- ⇒ Working groups; further subdivision of third scenario:
- (a) missing energy (+nothing, leptons, jets) signals,
  - (b) leptonic resonances
  - (c) multi-gauge-boson signals
  - (d) everything else

# *Long-term strategy*

---



# *Long-term strategy*

---

Decisions on the impact of early LHC data on the ILC can be made neither by the LHC community nor the ILC community alone

# *Long-term strategy*

---

Decisions on the impact of early LHC data on the ILC can be made neither by the LHC community nor the ILC community alone

We should start to think about a global process (→ ICFA?)