

# CLICdp spokesperson report

## 23 Sept 2014

### Outline

- CLIC Higgs paper
- New CLIC staging baseline
- top physics  $\leftrightarrow$  Higgs physics at lower energy stage
- Detector optimisation working group
- Time for feedback

# CLIC Higgs publication



## “Higgs Physics at the CLIC Electron-Positron Linear Collider”

Editors team: C. Grefe, S. Lukic P. Roloff, F. Simon, M. Thomson

### Current draft:

- Almost fully written draft, 29 pages
- A few analyses still missing from the paper
- Some analyses have initial description only (analysis to be completed)
- Information to be completed in several areas

Progress reports on various analyses were presented today

Encouragement to finish ongoing benchmarks as soon as possible

# CLIC energy staging



The current CLIC staging baseline was introduced in 2012, for CDR volume 3

- It foresees three stages
- The lower and middle stages require only one drive beam complex

“A”

$\nu s$	GeV	500	1400	3000
L	$10^{34} \text{ cm}^{-2}\text{sec}^{-1}$	2.3	3.2	5.9
$L_{0.01}$	$10^{34} \text{ cm}^{-2}\text{sec}^{-1}$	1.4	1.3	2
Gradient	MV/m	80	80/100	100
Site length	km	13.2	27.2	48.3

“B”

$\nu s$	GeV	500	1500	3000
L	$10^{34} \text{ cm}^{-2}\text{sec}^{-1}$	1.3	3.7	5.9
$L_{0.01}$	$10^{34} \text{ cm}^{-2}\text{sec}^{-1}$	0.7	1.4	2
Gradient	MV/m	100	100	100
Site length	km	11.4	27.2	48.3

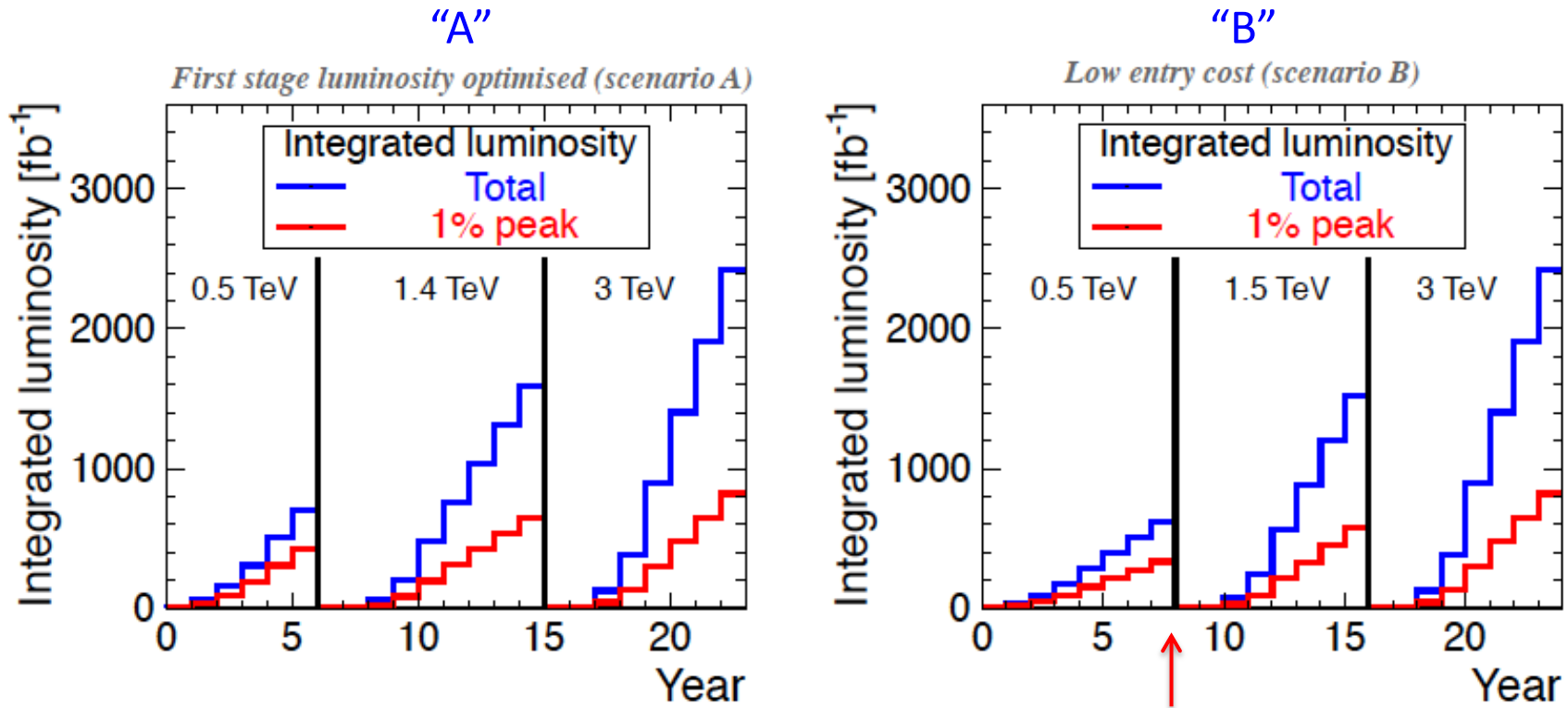


Fig. 5.2: Integrated luminosity in the scenarios optimised for luminosity in the first energy stage (left) and optimised for entry costs (right). Years are counted from the start of beam commissioning. These figures include luminosity ramp-up of four years (5%, 25%, 50%, 75%) in the first stage and two years (25%, 50%) in subsequent stages.

Based on 200 days/year at 50% efficiency (accelerator + data taking combined)  
 Target figures: >600 fb<sup>-1</sup> at first stage, 1.5 ab<sup>-1</sup> at second stage, 2 ab<sup>-1</sup> at third stage

# new CLIC staging baseline (1)



## Further CLIC optimisation promised in the CDR:

- Accelerator optimisation with a staged approach in mind
- Reduce cost, reduce power consumption
- Update on physics input
- Lessons learnt...

## Ongoing re-baselining activity for CLIC accelerator

- Re-visiting many parameters
- Parametrised approach allowing to choose optimal combined solutions

*E.g. see presentation Daniel Schulte at CLICdp 2-day meeting in June*

<http://indico.cern.ch/event/314222/session/0/contribution/9>

## Re-baselining from the physics side

- Fold in lessons learnt from Higgs benchmark analyses
- Any new physics input (e.g. LHC physics, theory, new insights)

# new CLIC staging baseline (2)



## Define a **new CLIC staging baseline**, providing:

- New reference for physics simulation (e.g. luminosity spectrum)
- Consistent set of information for public presentations

## Small **“editing team”**, nominated by Steinar:

Phil Burrows, Philippe Lebrun, Daniel Schulte, Eva Sicking  
Steinar Stapnes, Mark Thomson, LL

## Scope:

- Decision on and description of **one CLIC staging baseline**
- Description in a compact note/publication
- Document will include one chapter on alternative optimised schemes for the lowest energy stage (e.g. a klystron-based option)

## Timeline:

- Possible input for the ICFA seminar, Beijing, end-October (*too optimistic?*)
- CLIC workshop, January 2015

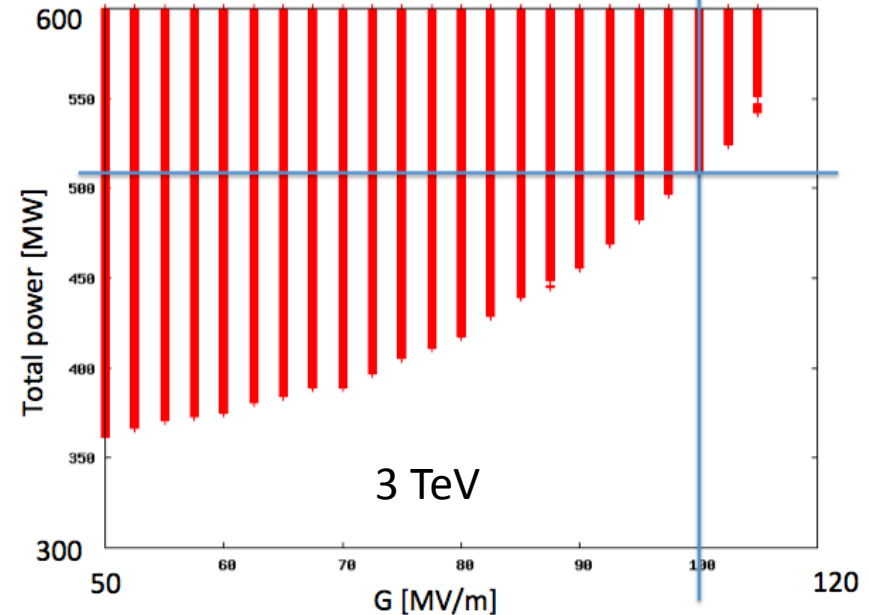
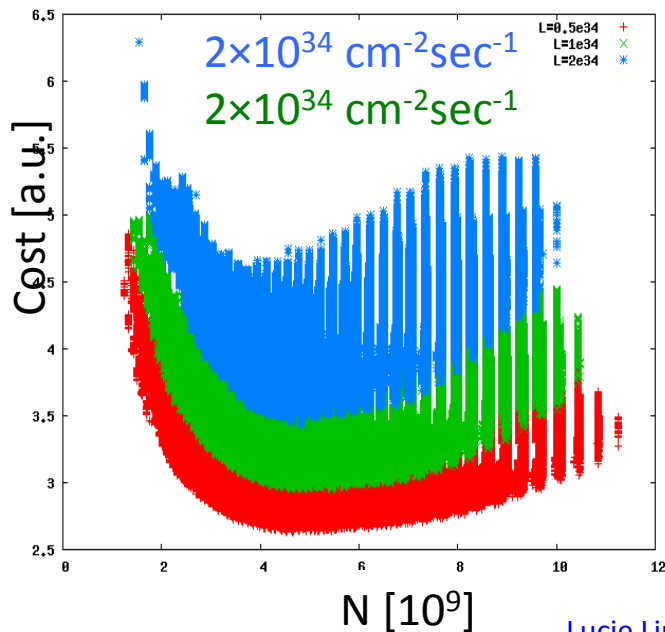
# accelerator optimisation



## Just a few observations:

- Several cost-savings identified (e.g. no pre-damping ring needed)
- Power saving can be significant (>100 MW) for some options
- Luminosity at 360 GeV has its price:  $1 \times 10^{34} \Rightarrow 2 \times 10^{34} \text{ cm}^{-2}\text{sec}^{-1}$  at significant cost increase
- Optimised design at 360 GeV with gradients around 70-90 MV/m
- Lower cost options at 3 TeV have higher gradients
- High power options may be overall cost-effective, but not easily seen as acceptable
- 3 TeV machine options with low power have lower gradients => exceed 50 km length
- Matching of 360 GeV and 3 TeV designs put constraints (e.g. pulse length, DB current)

**Several effective solutions have been identified => choices to be made**



# trade-off top physics ↔ Higgs physics



## Top physics:

- Mass measurement, threshold scan at  $\approx 360 \text{ GeV}$
- Coupling of the top to Z, gamma, W
  - making use of forward-backward asymmetry, top production, top decay
  - Kinematic properties => will probably require  $\sim 420 \text{ GeV or more}$

## Higgs couplings:

- Requires access to **Higgsstrahlung and WW-fusion** (initially to determine  $g_{HZZ}$ ,  $g_{HWW}$ ,  $\Gamma_H$ , followed by all other couplings)
- Precision of  $g_{HZZ}$  dominated by looking at recoil in Higgsstrahlung with  $Z \Rightarrow qq$
- $\sim 350 \text{ GeV}$  seems a good choice for Higgs physics at the first CLIC energy stage.  
*Would we profit from a somewhat higher energy? Up to where?*

## Higgs mass:

- Accurate mass peak in Higgsstrahlung with  $Z \Rightarrow \mu\mu$ . Best at  $\sim 250 \text{ GeV}$
- Higgs mass reconstruction from  $H \Rightarrow bb$ : *best at higher energies* with better jet resolution and more statistics.
- Need to assess calibration issue

**How to choose optimal energy stage in the 360-500 GeV range ?**

**See also presentation at today's analysis meeting**



**CLIC workshop 2015,  
Monday January 26- Friday January 30**  
<http://indico.cern.ch/event/336335/>

In 2014 => CLICdp sessions were limited to 2.5 days:

- Monday afternoon: plenaries (incl. talks on other energy frontier projects)
- Tuesday + Wednesday: parallel CLICdp sessions

**Our wishes for 2015 CLIC workshop?**  
**How many days?**

CLIC accelerator proposes the following common sessions:

- Wednesday afternoon => plenary (incl. talks on other energy frontier projects)
- Wednesday evening => dinner
- Friday morning => common CLIC-related plenaries (not necessarily summary talks)

# Detector optimisation WG



**Lucie Linssen**

To: clicdp-ib@cern.ch

18 Sep 2014 20:00

[Hide Details](#)

Advance notice, in preparation of the CLICdp institute board meeting

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Dear Institute Board members,

In preparation of the CLICdp Institute Board meeting of this coming Tuesday 23/9, I would like to give you advance notification that I plan to seek approval from the IB for the replacement of one for the co-conveners of the CLICdp Detector Optimisation Working Group.

At present, the co-conveners are Frank Simon (MPI Munich) and Christian Grefe (CERN).

Christian Grefe has just moved to a new job on ATLAS with Bonn University. As a result, he will not be able to continue the follow-up of the detector optimisation activities for CLICdp. We therefore agreed with Christian that he would be replaced in his role as co-convener of the CLICdp detector optimisation WG.

I would like to propose Konrad Elsener to become co-convener of the Detector Optimisation Working Group together with Frank Simon.

This email gives you some time to think about it in advance of the meeting. In case you have comments or hesitations, you can express them at the meeting or, alternatively, send them to myself or Frank Simon prior the meeting.

With my best regards,

Lucie

thank you

please give your feedback

