# The detector DCR

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Representing the editors TB, Chris Damerell, John Jarros, Akiya Miyamoto

Accompanies the Machine RDR, expected to be released end 2006

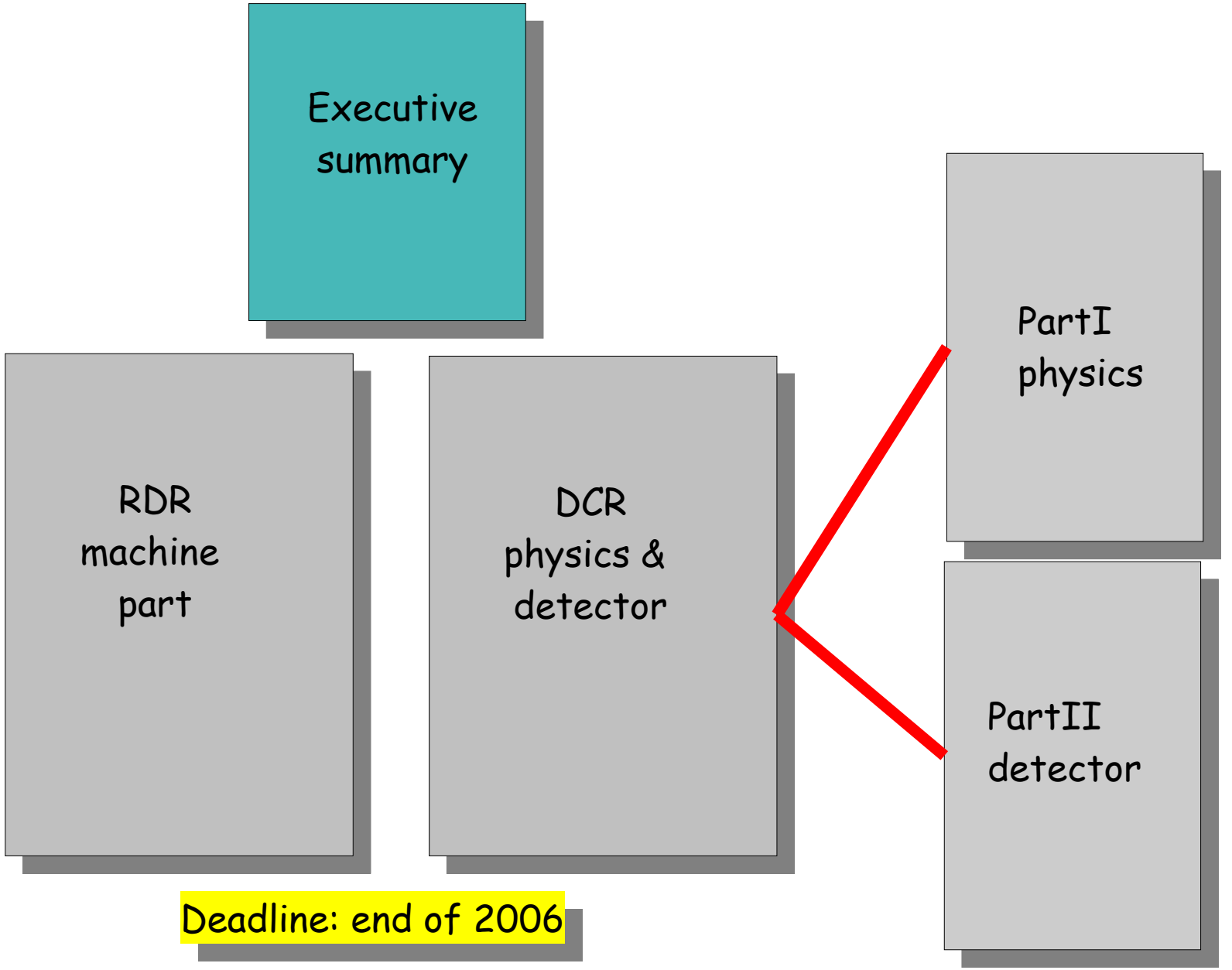
Based on: the four detector concept DOD's

**The goal:**

We want to demonstrate that

- We can do the ILC physics
- We have different and complementary solutions
- We have a clear vision on how to reach the goals (R&D)
- We have some understanding on the cost for these detectors

# The RDR/ DCR complex



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We do not (at this stage) want to enter into a competition between the concepts
Do not play off one concept against the others

# Anticipated Outline

- Physics Motivation and Performance requirements
- General Introduction/ Motivation
- Concepts
- Subsystems
- Backgrounds, MDI discussion
- Luminosity/ Energy/ Polarisation
- Performance studies
- Cost estimate/ discussion

Interaction with physics DCR needs to be clarified

Very first version of an outline, to be iterated!

# Motivation - Introduction

General: Introduction into detectors at the ILC
(physics requirements,
resolution requirements,
discuss relative importance of performance numbers)

Benchmarks (physics) used for detector optimization

Event reconstruction at the ILC: basic thoughts and concepts

The role of tracking
The role of vertexing
The role of calorimetry (PFA and pfa
to compensate or not to compensate
etc)

Motivate the need for specific detector performance

# Concept Specifics

A brief outline for each concept

No to very little technical details

- conceptual ideas and directions
- one layout picture for each concept

SiD – LDC – GLD - 4th

Which concepts are going to be explicitly included
will be decided by the WW study OC

Show the breath of available concepts,
illustrate the interest of the community,
without going into technical details
at this stage

# Subsystems

Introduce the main sub-systems

vertexing
Forward Tracking
central tracking
calorimetry (ECAL and HCAL)
forward calorimetry
muon system
magnet
DAQ, electronics, detector integration

This is a very first version of the list, and will need to be updated over the next weeks/ months

Try to present the possible solutions (if applicable, more than one) briefly
to illustrate the technological challenges,
the developments needed.
Heavy use of existing material (refer to DOD more detail)

# Performance

Look at a (small) number of selected benchmarks,
and demonstrate that we can reach the desired performance:

Z-mass reconstruction

ZH reconstruction (model independent) at 500 GeV

ZH reconstruction, Z->νν, H->bb at 350 GeV

top mass reconstruction at 500 GeV

WZ separation at 500 GeV

ZHH reconstruction at 800 GeV

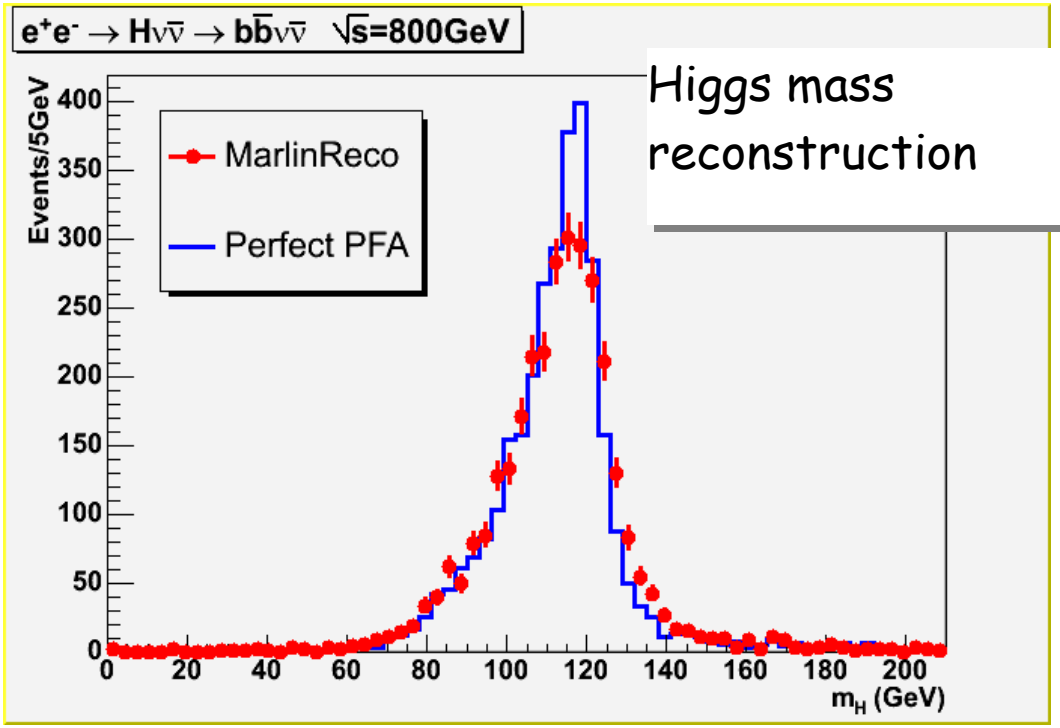
Show performance plots
and discuss them,
but distribute the reactions
among the concepts

# Performance

Set off the performance

against the

"ideal" performance we can expect
(true particle flow)




Express (wherever possible) the performance in terms of
"luminosity factors" (a factor 2 loss in performance means a factor N more Lumi)

Need to coordinate this with the physics editors / groups of the DCR

# Background

Backgrounds play an important role in the detector design
and thus the experimental program

- Summarise the relevant background sources
- Put together a table with typical background numbers in different detector subsystems.
- Discuss anticipated "survival rates": how bad can the backgrounds be without compromising the physics program?

Have to understand how to handle different concepts

(but my personal impression is that they are fairly similar in the number of background hits accepted)

# Luminosity/ Energy/ Polarisation

Discuss the importance of each of these issues

Discuss the needed precision

Discuss the possible experimental precision which can be reached

This topic is closely related to pre- and post IP diagnostics, and to the question of crossing angle.

# Infrastructure

Make the point for 2 Interaction Regions

from a viewpoint of the detector community

Try to discuss the cons (and pros? Are there any apart from cost?) of a single IR or push-pull option

The DCR might be an excellent place to voice clearly the needs of the detector community

We need a real discussion in the community here to improve making the point. Listening to our collegues from the machine, we did not yet really convince them that we REALLY need two IP's

# Detector R&D

Take the basic conclusions from the detector R&D report

(the detector R&D report was "researcher driven")

Fold this with the needs of the concepts and where they perceive their greatest needs

Describe the main areas of detector R&D over the next years

Chris Damerell (chair of Detector R&D panel) will lead this part.

# Performance studies

Some preliminary remarks:

We do not – at this moment – have a solid and understood full reconstruction (although a lot of progress has been made recently!)

I do not think that we will get there on the time scale of this document

We will need a lot of discussion and feedback to make sure that the correct things are included, and that the correct conclusions are drawn.

We will need to work closely with the concepts / the studies to encourage more studies, and to try to bring to fruition at least some selected reactions.

Lets see where we are after this meeting!

# Performance Studies

We see a lot of dublication of effort, and (maybe?) too little common effort.

We could use this occasion of the DCR to make an effort to rectify this situation together, for the DCR

(this might be our last chance to work together so closely, before we get into the busiiess of LOI's and competition for Interaction Regions)

Following the Cambridge Software and Analysis meeting, we will **try** to start a series of international analysis phone/ video meetings (was already discussed at snowmass, but did not yet happen)

# Cost

We will not detail the cost of the different concepts

Based on the information from the concepts,
we will work out together with the costing people in the concepts,
an "average" for "a typical detector program"
details need to be worked out
(see e.g. The 23 costing rules of the GDE)

To be done:

fix the costing methodolgy

understand the costs, normalise them to the same starting points
(e.g. Cost of raw material)

come up with a sensible way to calculate an "average cost"

# Conclusion

Editorial Team:

| | |
|---|---|
| John Jarros | Americas |
| Akiya Miyamoto | Asia |
| Ties Behnke | Europe |
| Chris Damerell | R&D Panel |

We need your help in gathering the material

The most critical item are solid performance studies
(performance, not necessarily optimisation)

In the end the whole community should unite behind this document!

# How to proceed

Hardware aspects: generally reasonably well under control,
stringent and varied R&D programs do exist
it should be possible to extract from the DOD's the relevant
information and present a fairly global and complete picture

The big problem:

reliable and good performance studies.

Once the DODs are publicly released,
will start to sort and accumulate the material and flesh out the details.

Timeline?

# Conclusion

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A word of caution:
All this is the result of a few short discussion between JJ, AM, TB
Chris has not yet been involved
YOU should give feedback

We need your help to gather the material

The most critical item are solid performance studies
(performance, not necessarily optimisation)

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A personal remark: I vote to do the DCR in latex
(but this is not yet decided...)!