



# ILD Optimisation

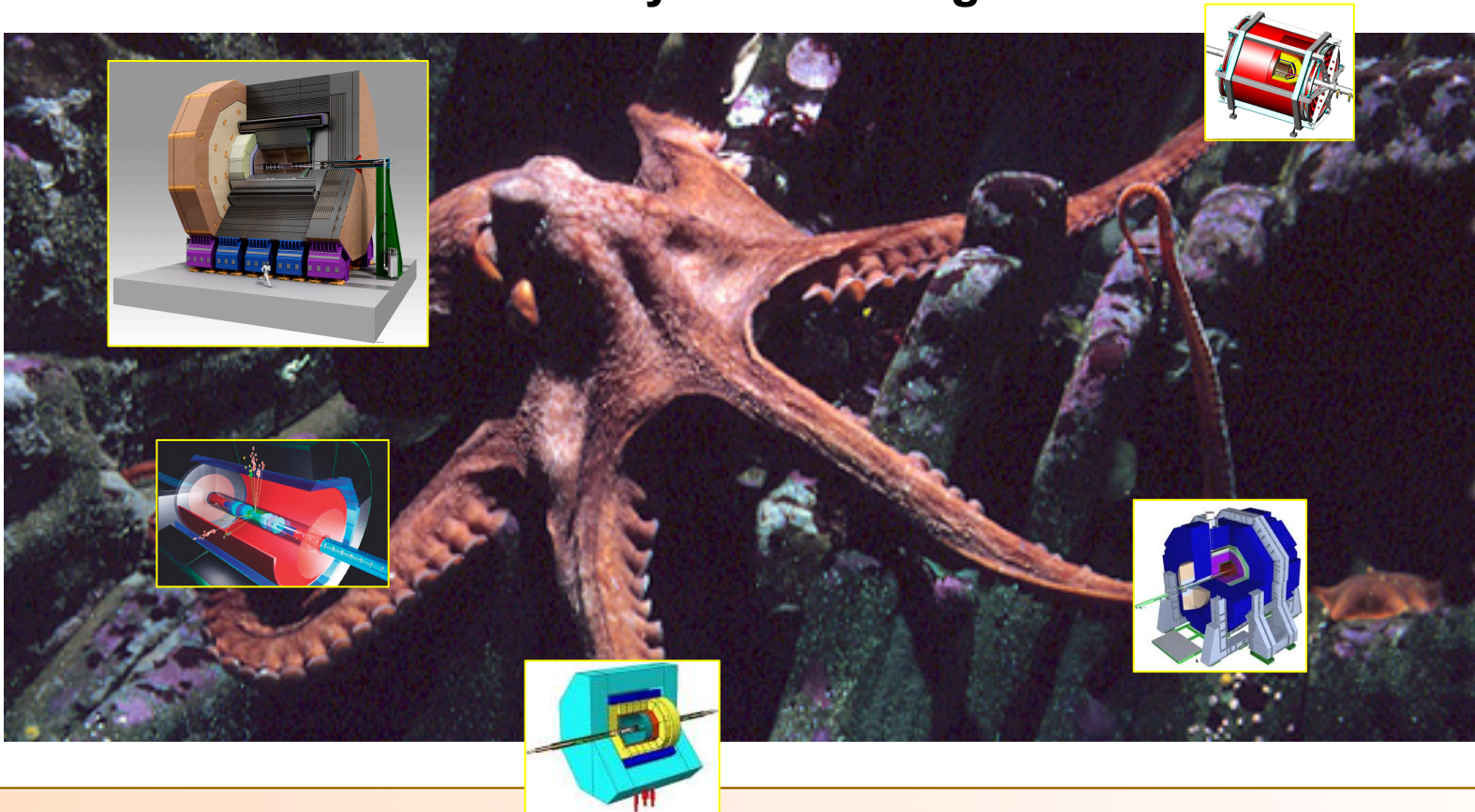
**Mark Thomson,  
University of Cambridge**





# ILD Optimisation

Mark Thomson,  
University of Cambridge





# in 3\* slides



## ★ Optimisation is difficult

- multi-parameter optimisation space (e.g. Keisuke's talk)
  - B, radius, technology, segmentation, layers
- multi-parameter evaluation space
  - single particle, physics performance, cost, ...

## ★ In practice, need to factorise problem:

**Justification**

e.g. why does ILC choose a TPC?

**Sub-system optimisation**

e.g. VTX layout

**Global optimisation**

**cost**

**physics**

\*not including this one



# Justification



## ★ Need to justify our choices for ILD



### ★ Why a TPC and not Si Tracker?

#### ■ Hear many arguments:

- $dE/dx$
- $V^0$  reconstruction
- ...

#### ■ But **must** connect to science reach

- Needs physics studies

### ★ Why Particle Flow ?

- #### ■ Killer argument for 3.5% vs 10% jet energy resolution? for **250 – 500 GeV Physics**



# Justification



## ★ Need to justify our choices for ILD



ETD?

LHCAL?

SET?

### ★ Why a TPC and not Si Tracker?

#### ■ Hear many arguments:

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### ★ Why Particle Flow ?

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# Justification



## ★ Need to justify our choices for ILD



- ★ Why a TPC and not Si
  - Hear many arguments
    - dE/dx
    - ...
  - ... connect to science
  - ...
  - Needs physics studies

- ★ Why Particle Flow ?
  - Killer argument for 3.5% vs 10% jet energy resolution?  
for 250 – 500 GeV Physics

?  
 LHCAL?  
 SET?



# Sub-system optimisation



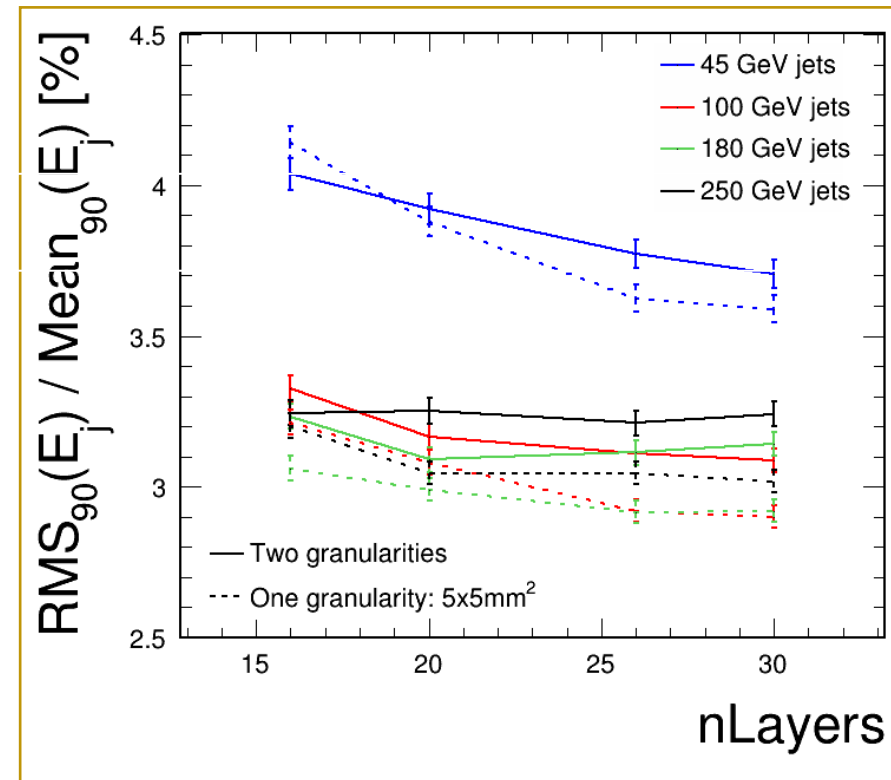
- ★ **Understand** dependence of performance of key sub-systems on main parameters (indep. of technology)
- ★ **Detailed studies** mapping out performance...
  - e.g. ECAL studies from John
    - Understand main issues driving performance
- ★ **Need similar studies for:**

HCAL

VTX  
layout

FTD  
layout

+ ...



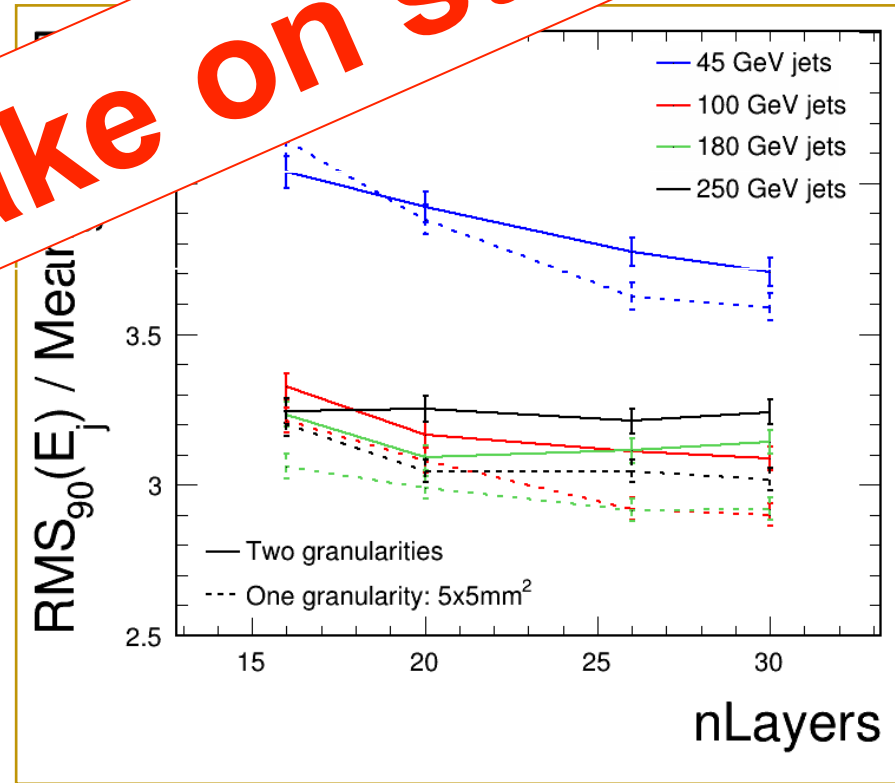


# Sub-system optimisation



- ★ **Understand** dependence of performance of key sub-systems on main parameters (indep. of technology)
- ★ **Detailed studies** mapping out performance
  - e.g. ECAL studies from John
    - Understand main issues driving performance
- ★ **Need similar studies**

Need people to take on studies







# Towards ILD MkII



- ★ **Ultimate aim – come up with new optimised ILD model**
  - **cost-aware design optimised for physics performance**
    - **Focus on ILC as planned, e.g. 250 GeV – 500 GeV**
- ★ **Big question: how does global detector design impact performance?**
- ★ **Possible approach:**
  - **come up with several new detector models spanning:**
    - **The good, the bad and the ugly...**



# Towards ILD MkII



**The best we could  
contemplate**



**n intermediate  
models**



**The worst we could  
contemplate**



# Towards ILD MkII



**The best we could contemplate**



**n intermediate models**



**The worst we could contemplate**

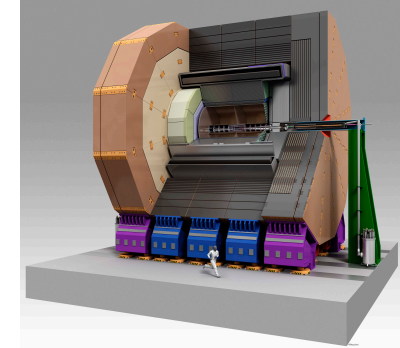




# Towards ILD MkII



**The best we could contemplate**



**ILD00**

**n intermediate models**

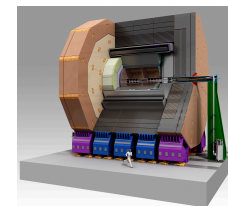


**Smaller**

**Less segmented**

**+...**

**The worst we could contemplate**



**smaller  
less segmented  
...**



# Compare physics



**STUDY HIGGS PHYSICS POTENTIAL**  
e.g. **Full set** of BR measurements  
+ ...

This is doable with a **limited** number of Mokka models  
+ full reconstructed DSTs for main processes



**Defensible scientific motivation for  
choice of parameters for ILD++**

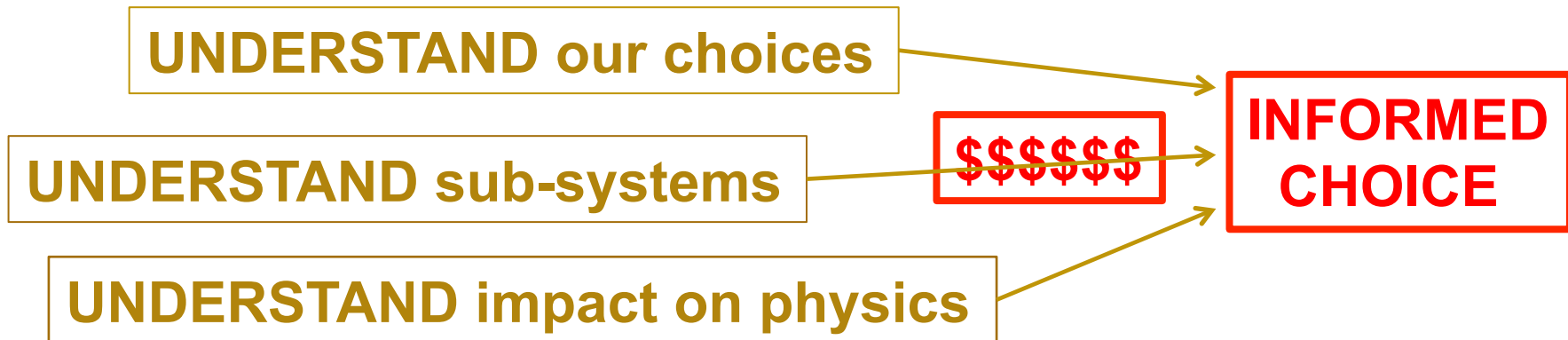


# Organisation



## Not a trivial task:

- ★ Needs organisation
  - Identify list of factorised tasks + **NAMES**
  - Define **potential “models”** and then organise:
    - G4 simulation
    - Event reconstruction
    - Production





# No conclusions



# Time to plan the next steps