CLICdet cost estimate
(work in progress)

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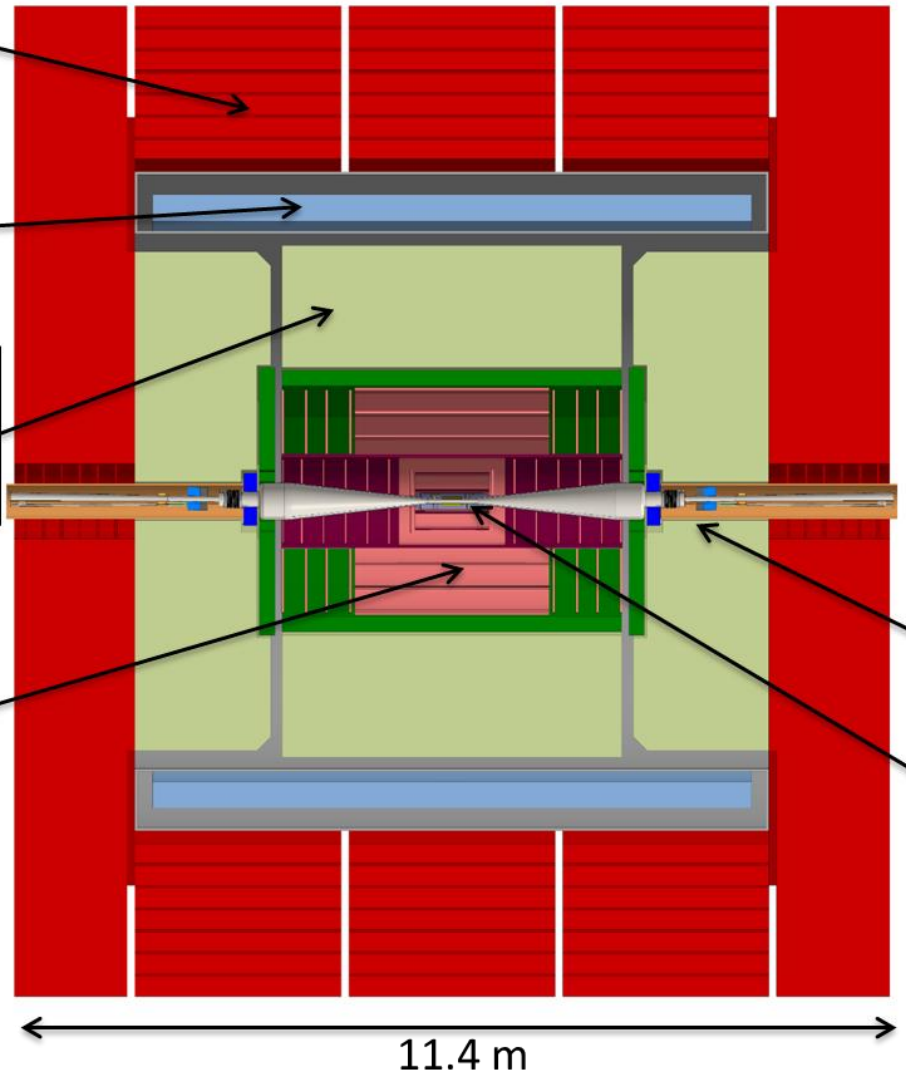
CLICdet


return yoke (Fe) with muon-ID detectors
Superconducting solenoid, 4 Tesla
fine grained (PFA) calorimetry, 1 + 7.5 Λ_i, Si-W ECAL, Sc-FE HCAL
silicon tracker, (large pixels / short strips)
forward region with compact forward calorimeters
ultra low-mass vertex detector, ~25 µm pixels
11.4 m

Methodology

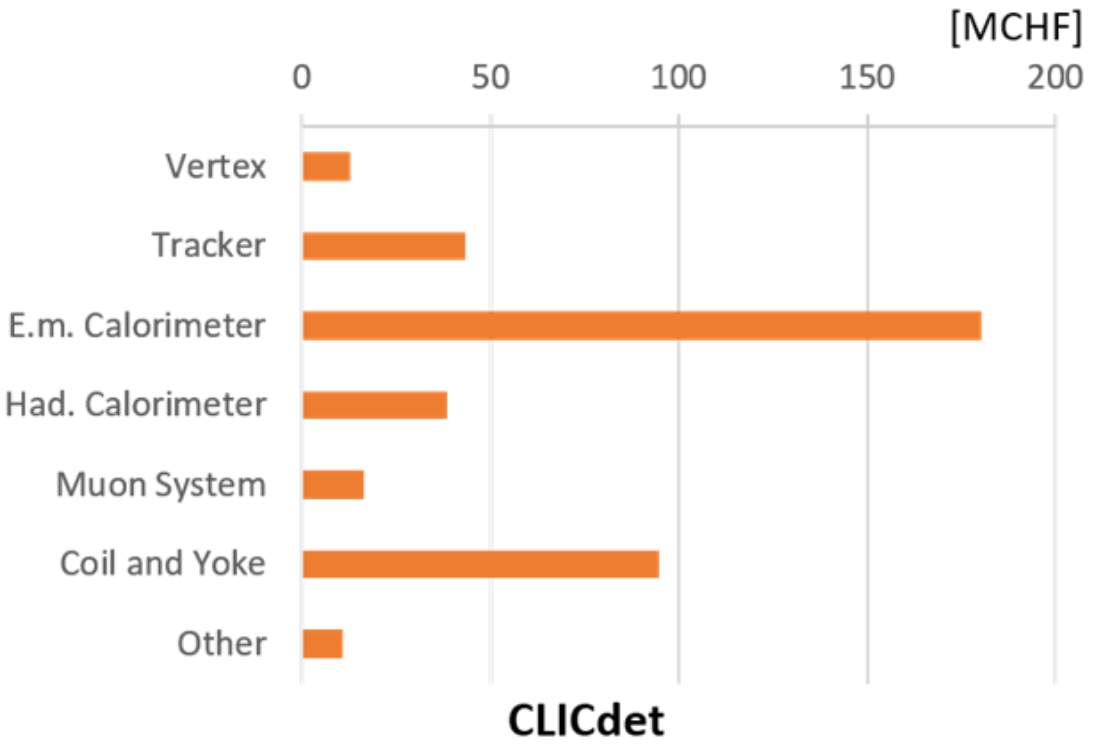
(cf. Appendix C of CDR Vol.2 CERN-2012-003
and LCD-Note-2012-005)

- only direct, production-related personnel and at-factory testing efforts are included in the cost estimate - estimates of personnel efforts in participating institutes – including CERN - are thus excluded;
- contingency and future inflation are not addressed at this stage;
- indirect costs to laboratory infrastructure and operation are not included;
- the civil engineering and general services costs, e.g. for caverns and counting rooms etc., are included in the CLIC accelerator cost;
- aiming at 30% accuracy for total detector cost.

Comments - general

- CLICdet magnet system very similar to CLIC_ILD -> use CDR estimates
- CLICdet very forward calorimeters unchanged -> use CDR estimates
- Vertex cost estimate for CDR obtained from scaling of ATLAS IBL cost
  -> keep CDR estimate (per unit area)
- Calorimetry: much information available from ILD (CALICE);
  AHCAL option, use CDR costs (from scintillator-steel HCAL endcap)
  and scale to CLICdet barrel and endcap dimensions
- Tracker and ECAL: see additional comments below

CLICdet cost - breakdown



	[MCHF]
Vertex	12.76
Tracker	43.23
E.m. Calorimeter	180.34
Had. Calorimeter	38.54
Muon System	16.28
Coil and Yoke	94.86
Other	10.79
Total	**396.8**

Comments – unit costs

Table C.1: Assumed unit cost for some materials

Unit	Agreed Unit Cost
Tungsten for ECAL (tighter mechanical tolerances)	180 CHF / kg
Steel for Yoke (semi-product)	1000 CHF / t
Steel for Yoke (final product, including assembly supervision)	6000 CHF / t
Stainless Steel for HCAL	4500 CHF / t
Silicon Sensor (for tracking detectors and ECAL)	6 CHF / cm^2

(Appendix C of CDR Vol.2 CERN-2012-003)

Comments – tracker (total: 43 MCHF)

→ VERY PRELIMINARY ESTIMATE ←

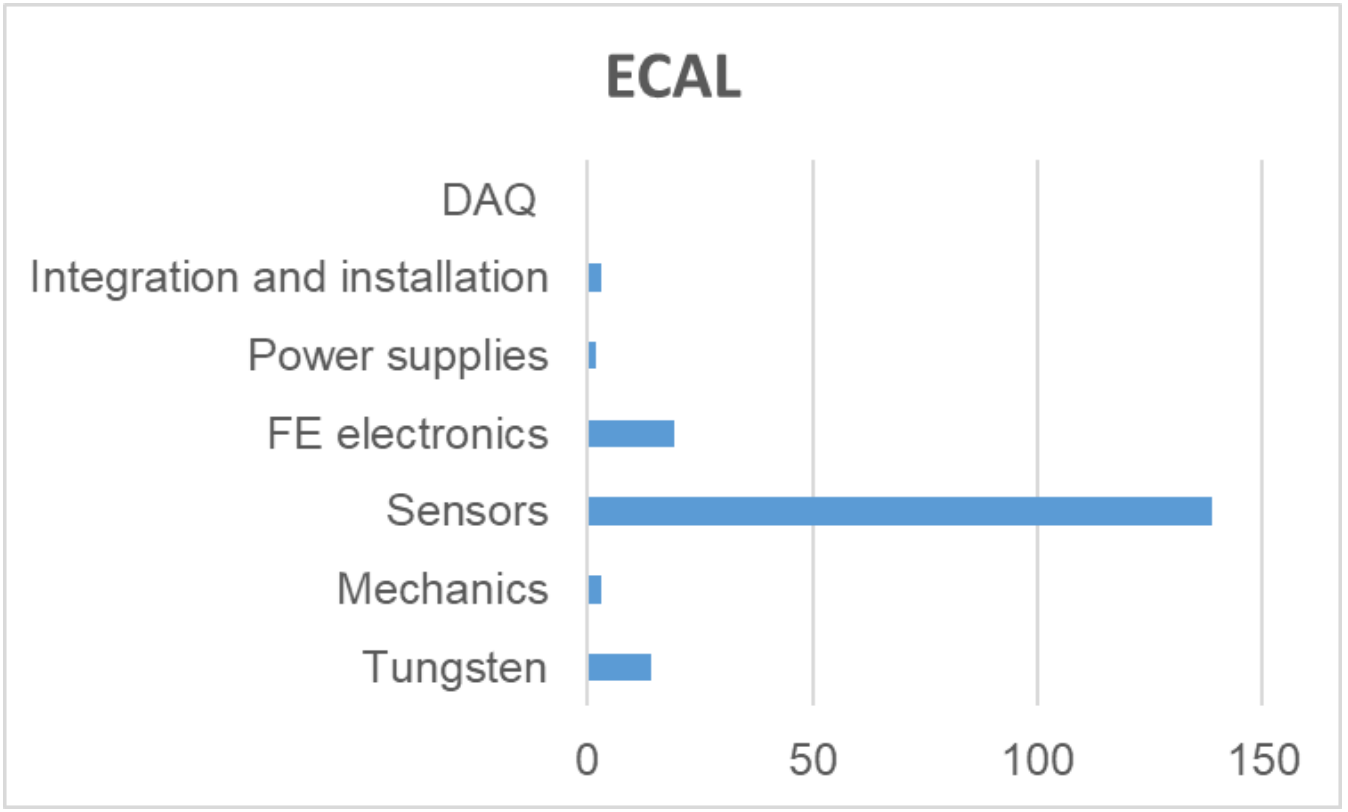
- ITD1 (pixelated disks): 16.7 MCHF (scaled from VTX cost)
  (VTX area: **0.84 m²** ITD1 area: **1.25 m²**)
- Sensor for inner and outer tracker: 7.7 MCHF (use unit cost)
  (Tracker area (without ITD1): **137 m²**)
- Electronics for “strips”: 14.1 MCHF
  (scaled from CLIC_SiD, 110 kCHF/ m^2)
- Mechanics/Integration: 4.5 MCHF (scaled from CLIC_ILD)

Hope to get better estimates from ALICE-ITS upgrade

Comments – ECAL (total: 180 MCHF)

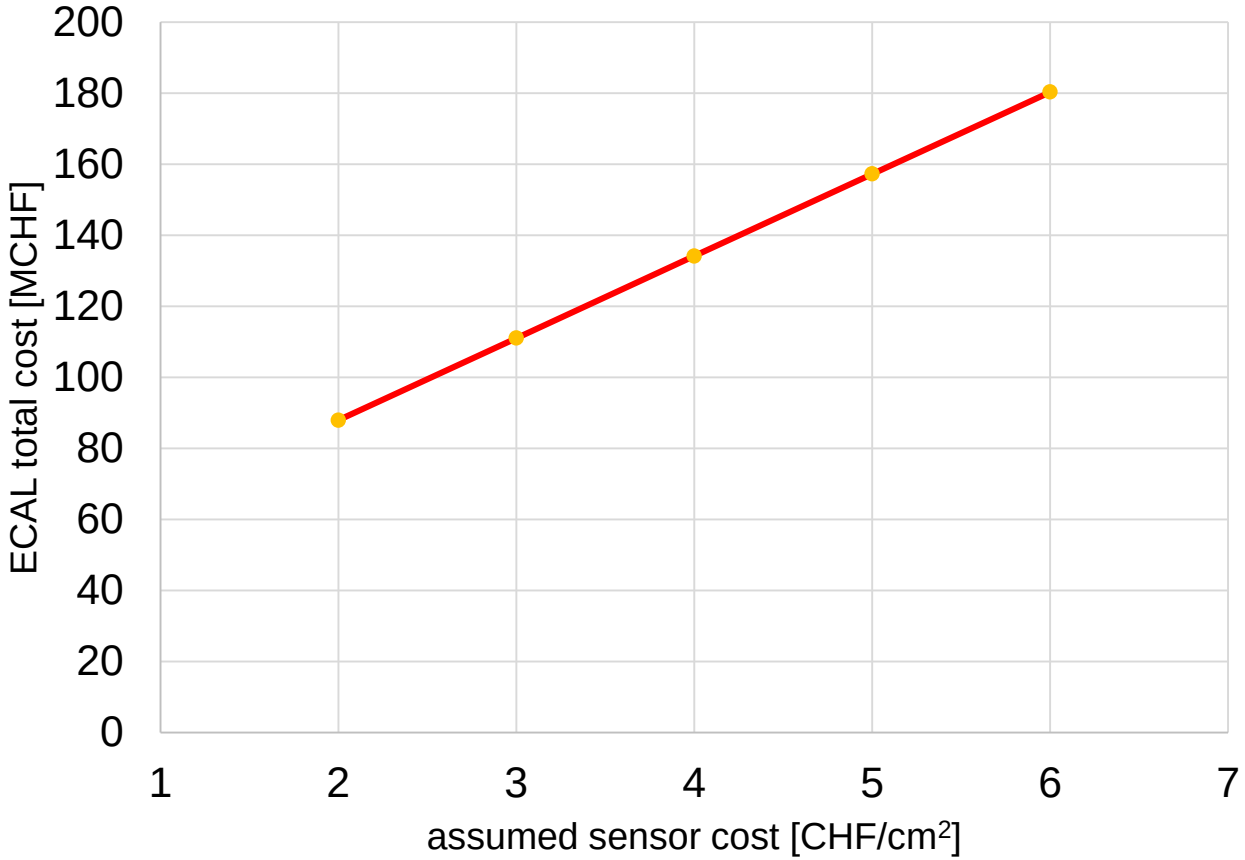
ECAL cost breakdown in some detail

(ECAL sensor area: **2500 m^2**)



Comments – ECAL cost vs. sensor cost

(Must keep observing the CMS HGAL silicon sensor procurement !)



CLICdet cost - Summary

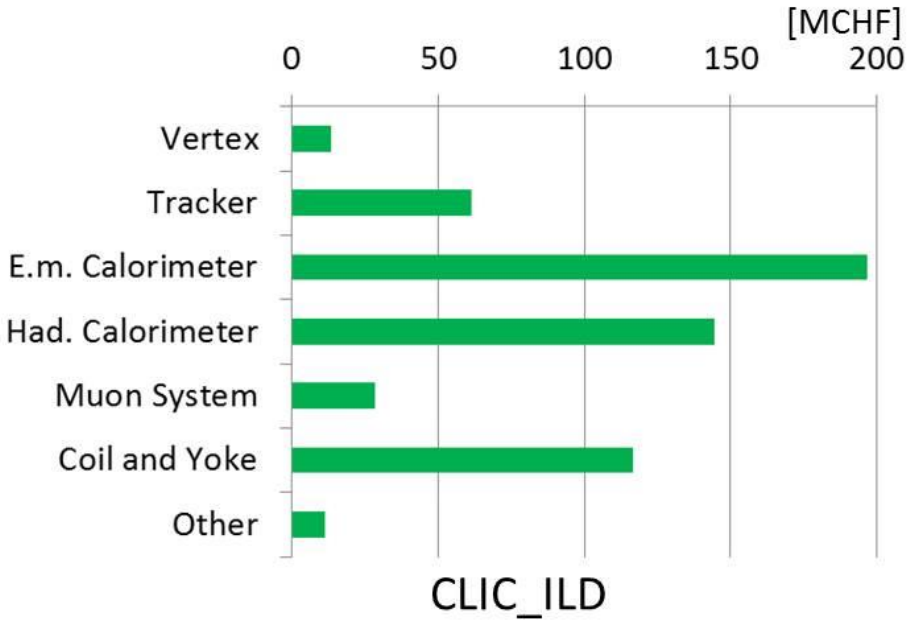
Along lines of work done for CLIC_ILD and CLIC_SiD,
-> very preliminary cost estimate for CLICdet

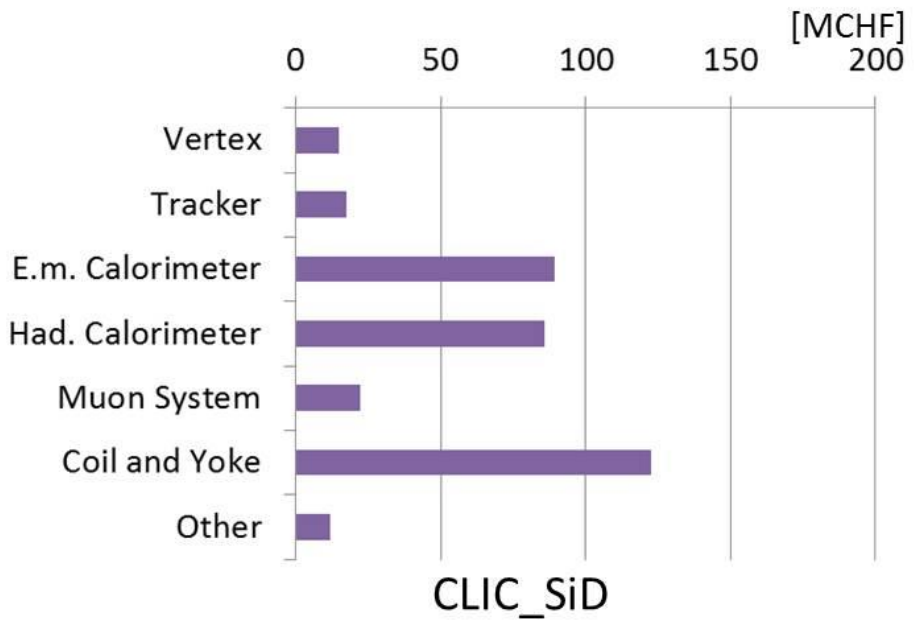
CLICdet cost around 400 MCHF (30% uncertainty)

Major changes to this estimate could come from:

- information on effective silicon cost for a large area
  (CMS-HGCAL -> impact on the ECAL cost)
- information on the cost for the ALICE ITS upgrade
  (impact on the tracker cost)
- other errors found…

backup





For comparison, the different main contributions to the estimated total cost for CLIC_ILD (left) and CLIC_SiD (right) (taken from CDR Vol. 3).