Laboratoire Leprince-Ringuet

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Element of costing for the Silicon-Tungsten ECAL

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Introduction

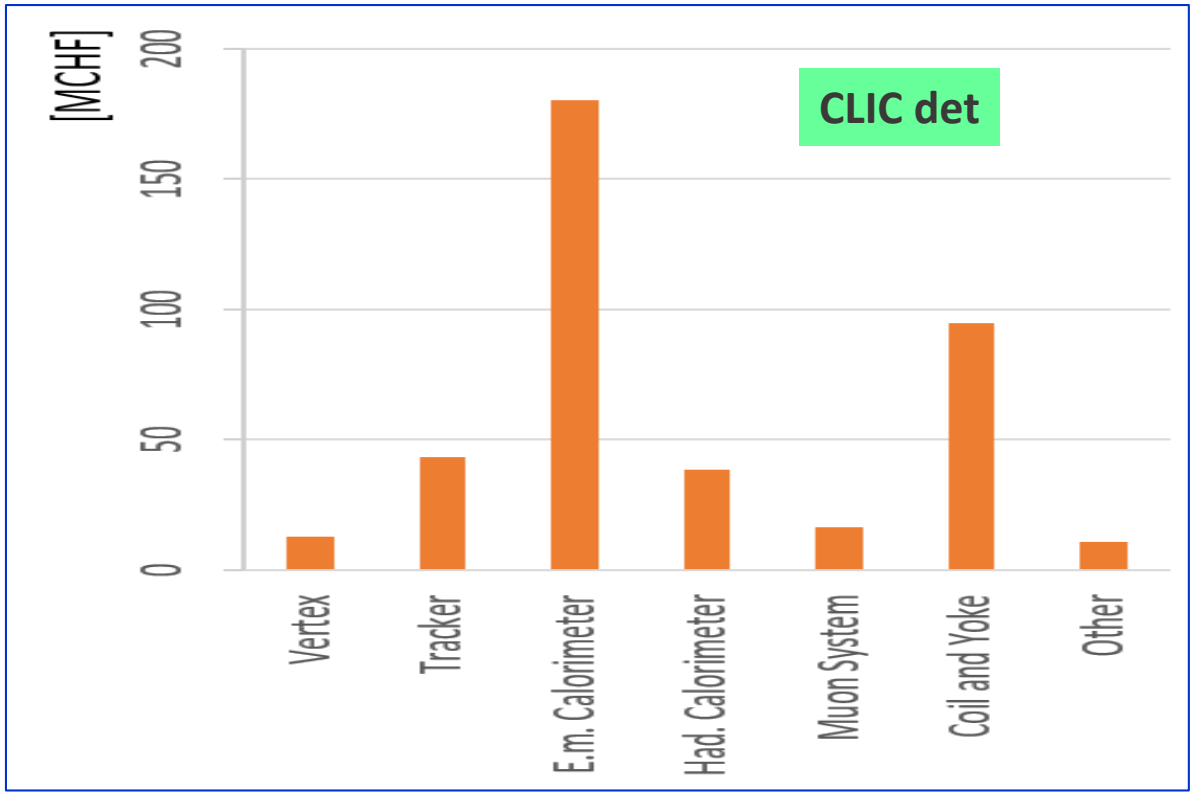
The final estimation is obtained from numbers from

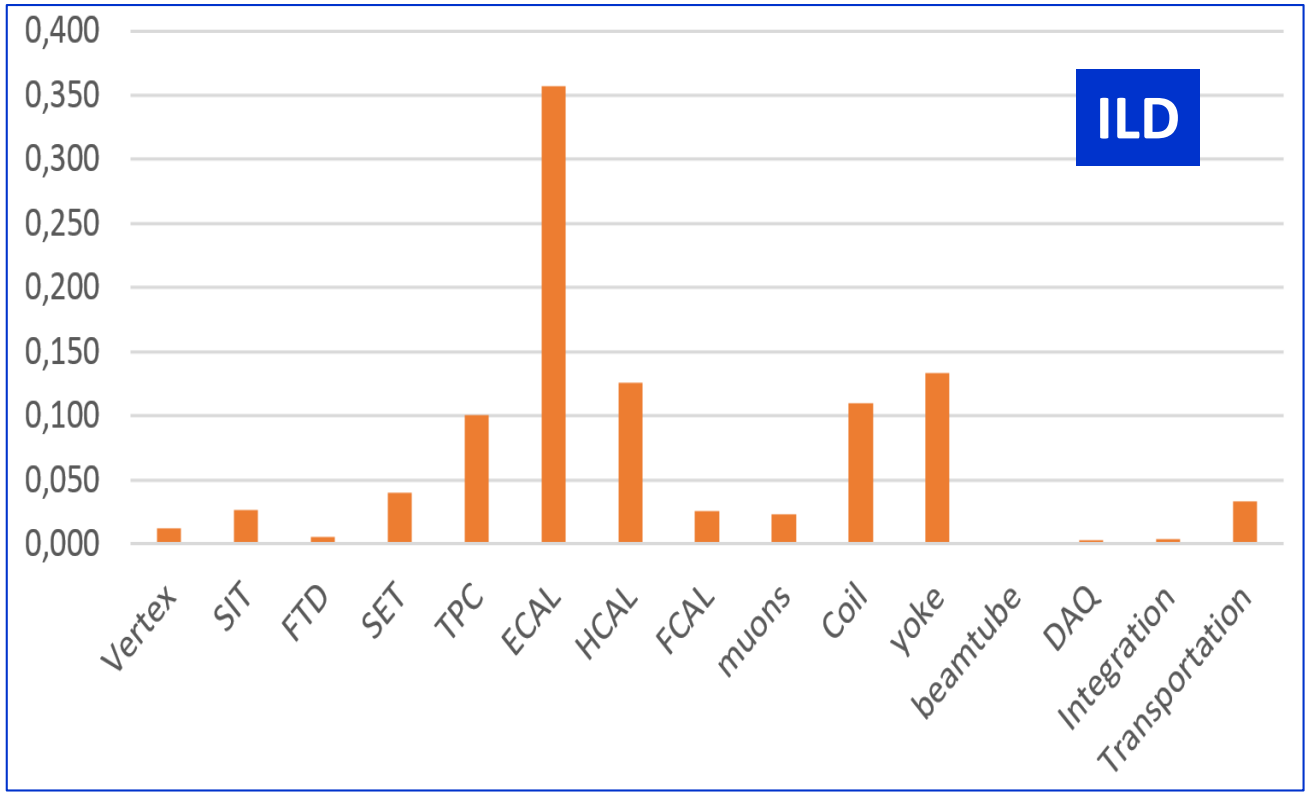
- CERN report, LCD-Note-2018-005 **Cost estimate for CLICdet** , D.Dannheim et al
- INTERNATIONAL LARGE DETECTOR **IDR,** ILD Detector Collaboration , 2019
- CEPC CDR – vol II, IHEP-2018-01, October 2018

Which ECAL are we taking about ?

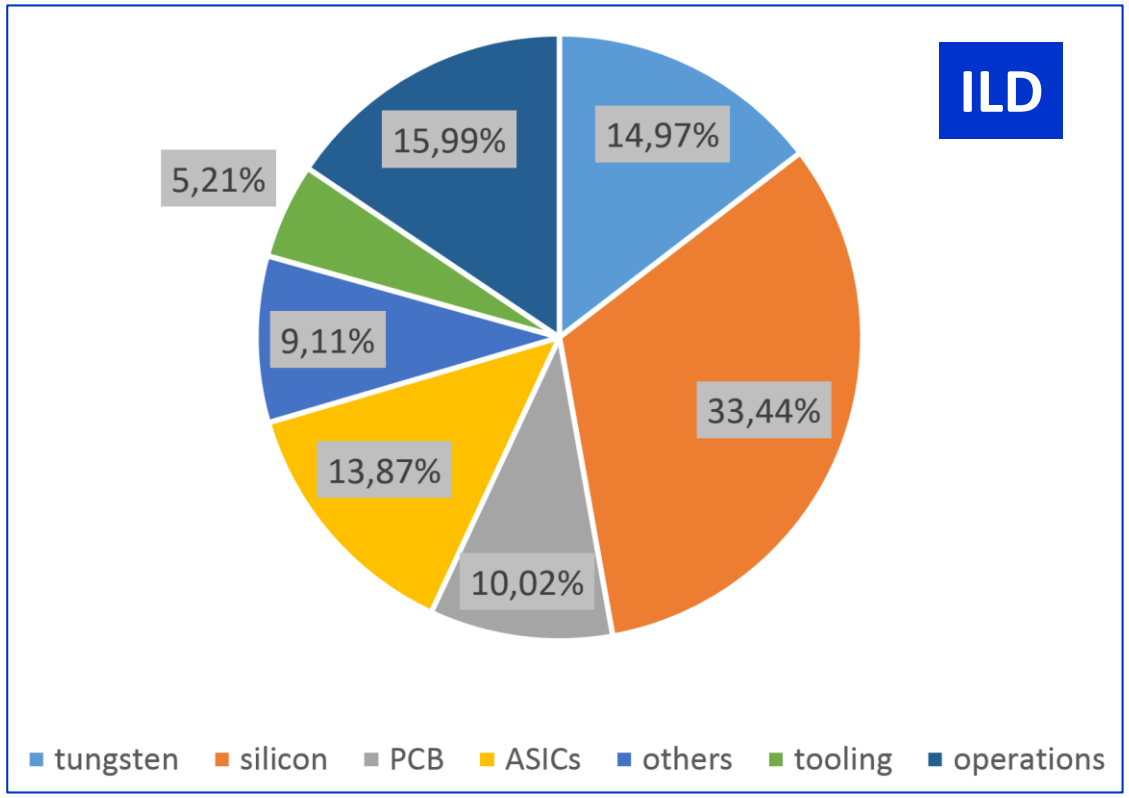
Detector	CLID Det	ILD	CEPC SiW ECAL
Entrance Radius ECAL (m)	1.5	1.8	1.8
Length of barrel (m)	4.42	4.06	4.70
Numbers of layers	40	30	30
Number of rad. length	22	24	24
Pixels size mm^2	5.5 X 5.5	5x5	10x10
Cooling	Passive ??	Passive (Cu plate)	Active “a la CMS”
Tungsten plate (T)	86	120	

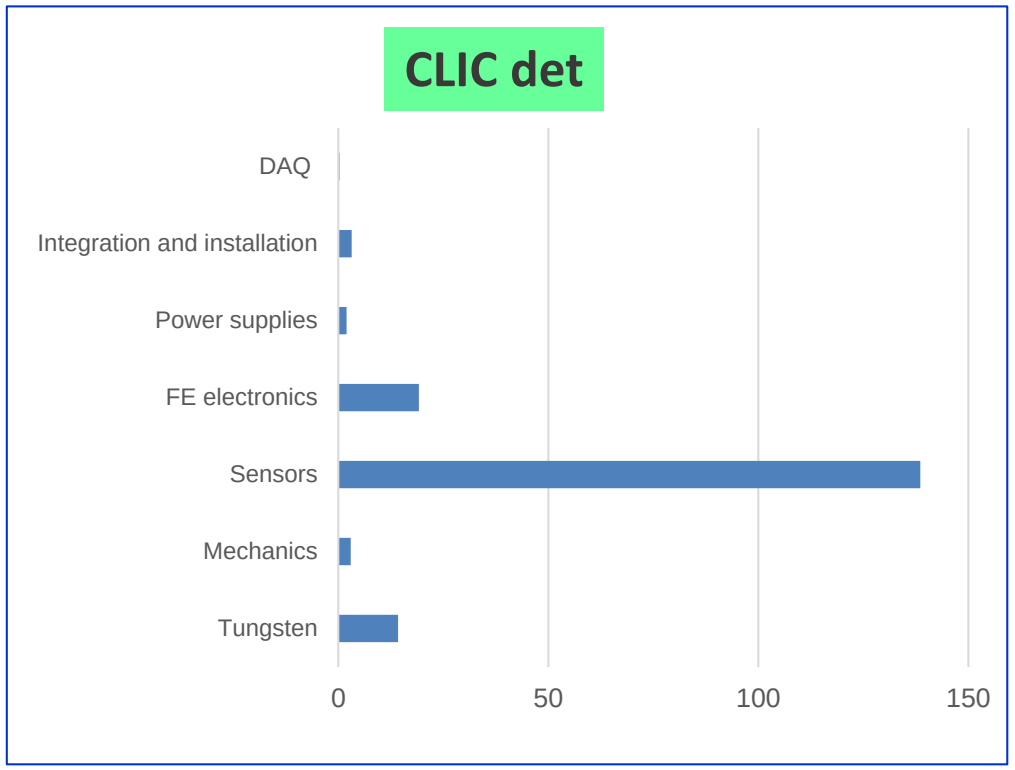
Cost per device





Fractions of the ECAL cost





ILD

	Material	Manpower	TOTAL
ILD model baseline	119	11	130
ILD-Small 26 layers	81	8	89

Sensors : 2€/cm²

Cost proposed to HGCAL-CMS
by a producer in Japan ….. 2€/cm²

CLIC det

ITEMs	Cost (MCHF)
Mechanics	17.17
Detectors and sensors	157.76
Power supplies	1.96
Integration and installation	3.16
Barrel & end caps	180.06
DAQ	0.29
ECAL Total	180.34

Sensors : 6 CHF/cm² → 5.4 €/cm²

Generic price for Silicon tracker and ECAL !!

CONCLUSION

To have a first and rough estimation, we

Use ILD cost	130 M€
Reduce the electronics (ASICS) by ¾	115 M€
Add the cost of cooling system *	**129 M€**

As it is used for simulation today in CEPC groups,

To be compare to **110 M€ (2005)** CMS- PbWO4 ECAL
(with inflation it is closer to 140 M€ 2019 cost)

Remember :

- Layers can go down to 24 layers (-20%)
- Readout can be rearranged (-50% on electronics)
- Reduce the internal radius 1.8 → 1.5m (-23%)

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Cost estimate calculated from CMS active cooling	
Cooper	3 M€
Copper processing	3 M€
CO2 cooling central	8 M€

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BUT

The gain in thickness for silicon ECAL means that the cost has to be given for the overall detector !! Not by single device

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My opinion

- 20X0
- 22 layers

90 M€

*

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