A tasklist for ILD optimization (incl. JSPS discussion)

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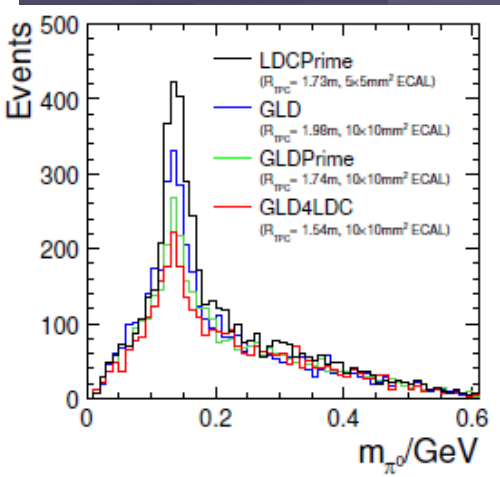
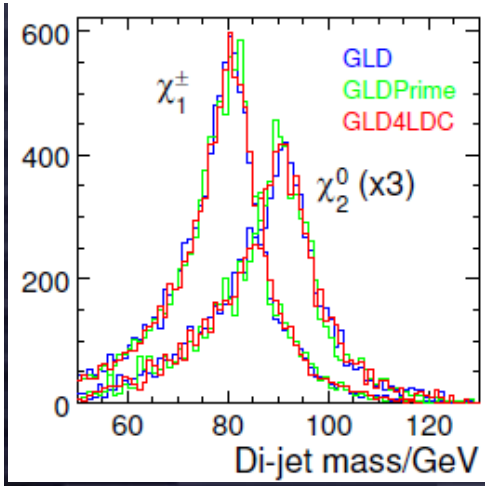
ILD optimization in LoI

Model Name		GLD	GLD′	GLD4LDC	LDC4GLD	LDC′	LDC	ILD
Simulator		Jupiter			Mokka			Mokka
B field (T)		3.0	3.5	4.0	3.0	3.5	4.0	3.5
Beampipe R_{min}		15.0	14.0	13.0	15.5	14.0	13.0	14.5
Vertex Detector	Geometry	cylindrical			ladders			ladders
	Layers	3 doublets			5			3 doublets
	R_{min}	17.5	16.0	15.0	16.5	15.0	14.0	16.0
Barrel SIT	Layers	4 cylinders			2 cylinders			2 cylinders
	Radii	90, 160, 230, 300			161.4, 270.1			165, 309
TPC drift region	R_{min}	437	435	371	371			395
	R_{max}	1978	1740	1520	1931	1733	1511	1739
	z_{max}	2600	2350	2160	2498	2248	2186	2247.5
TPC pad rows		256	217	196	260	227	190	224
ECAL barrel	R_{min}	2100	1850	1600	2020	1825	1610	1847.4
	Layers	33			20(thin)+9(thick)			20+9
	Total X_0	28.4			22.9			23.6
ECAL endcap z_{min}		2800	2250	2100	2700	2300	2550	2450
HCAL barrel	Layers	46	42	37	48			48
	R_{max}	3617	3260	2857	3554	3359	3144	3330
λ_I (ECAL+HCAL)		6.79	6.29	5.67	6.86			6.86





It was rather just a decision than an optimization

What to optimize?

- Size / B
  - r, z and B – 3 parameters
  - affects tracking as well as PFA

- BUT not only size & B!!
  - SiECAL or ScECAL or Hybrid (very important for cost consideration)
  - Pixel size (CAL, VTX), depth
  - TPC or non-TPC (!)
  - Forward

How to optimize

- Should concentrate on critical physics
  - Not as LoI time
- Critical physics
  - 250 GeV: Higgs total cross section
  - 350 GeV: top (seems easy for ILC detectors)
  - 500 GeV: Higgs BR, (ttH) + NP
  - 1000 GeV: Higgs self + NP

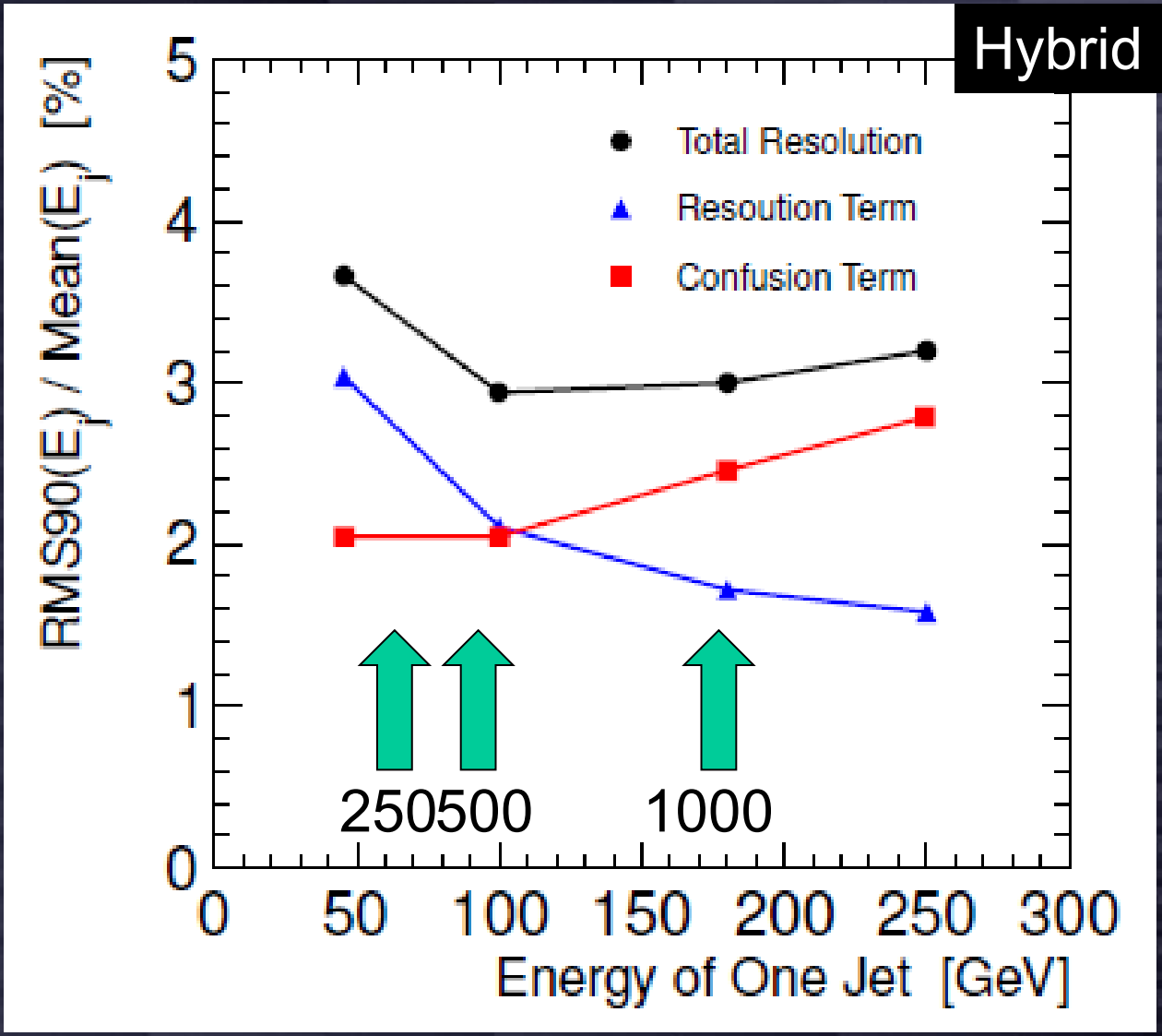
  - New physics: very difficult to identify ‘important’ model/parameter now...

Energy of critical physics

- 250 GeV: mainly 4f
  - 63 GeV / fermion
- 500 GeV: 4f – 8f
  - 63 – 125 GeV / fermion
- 1000 GeV: 4f – 8f
  - 125 – 250 GeV / fermion

- Note: we should not assume calorimeter replacement at 1 TeV run
  - In contrast, vertex will be probably replaced

Confusion and jet energy



Physics: tasklist

- Recoil mass for tracking – Shun
- qqH, invisible – Tatsuhiko & more
- Higgs BR – Hiroaki? (not apparent)
- ZHH / nnHH - many
- ttH – Yuji
- H → tautau – will assign (for CAL study)

- New physics?

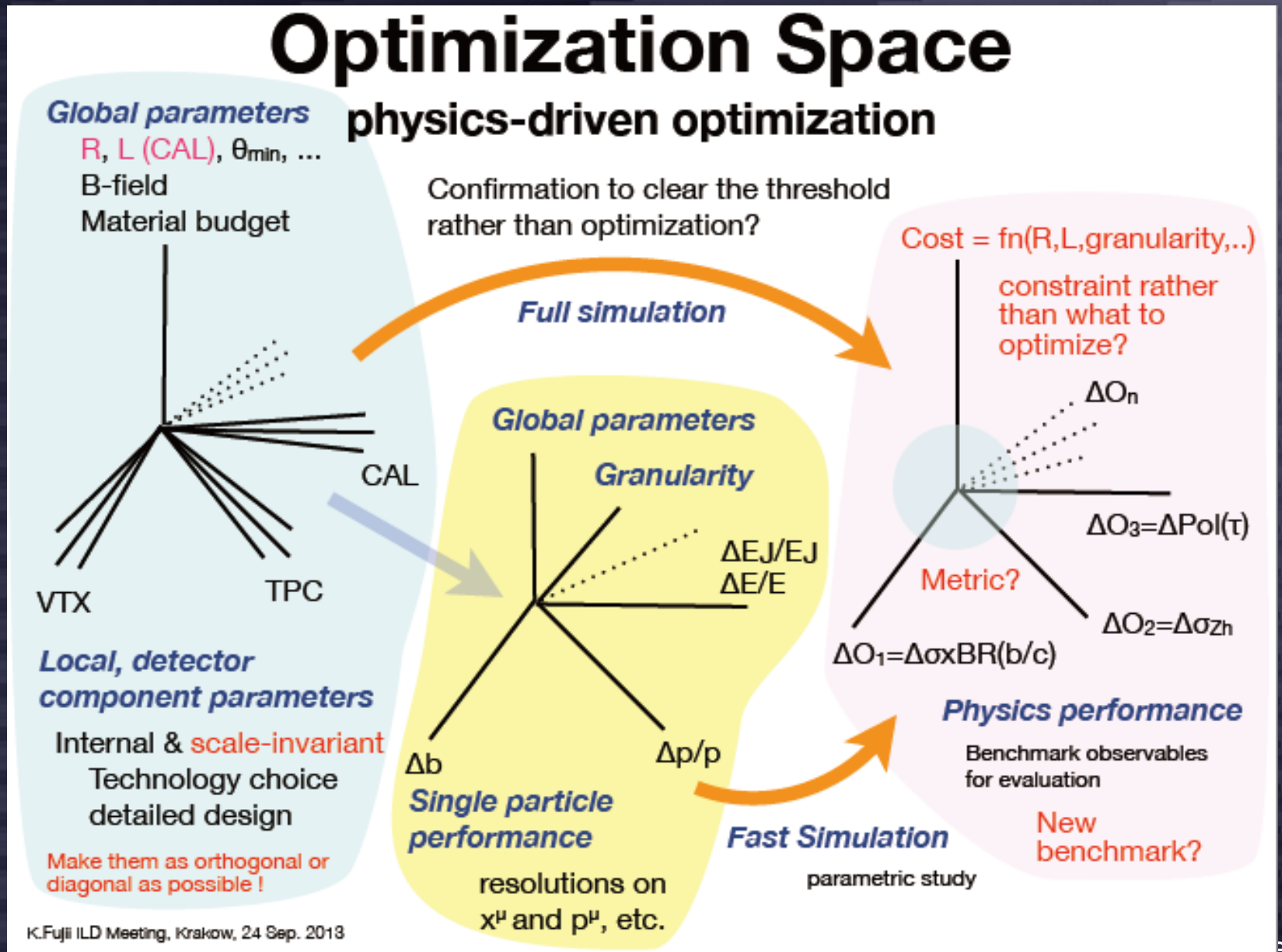
Software

- Actually, software is critical for optimization
- Optimization of software depends on detector configuration – need sophisticated tuning of software on each parameters
- Critical things
  - Tracking?
  - PFA
  - Flavor tagging
  - Jet Clustering?
- Need manpower of ‘experts’

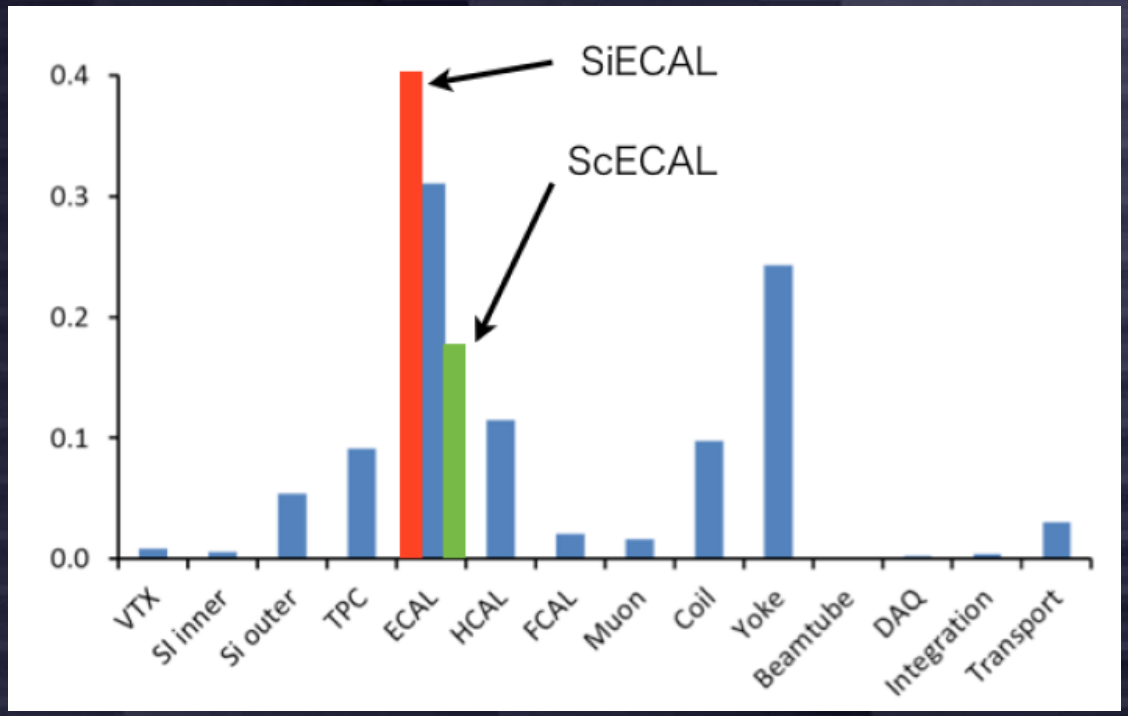
General comments

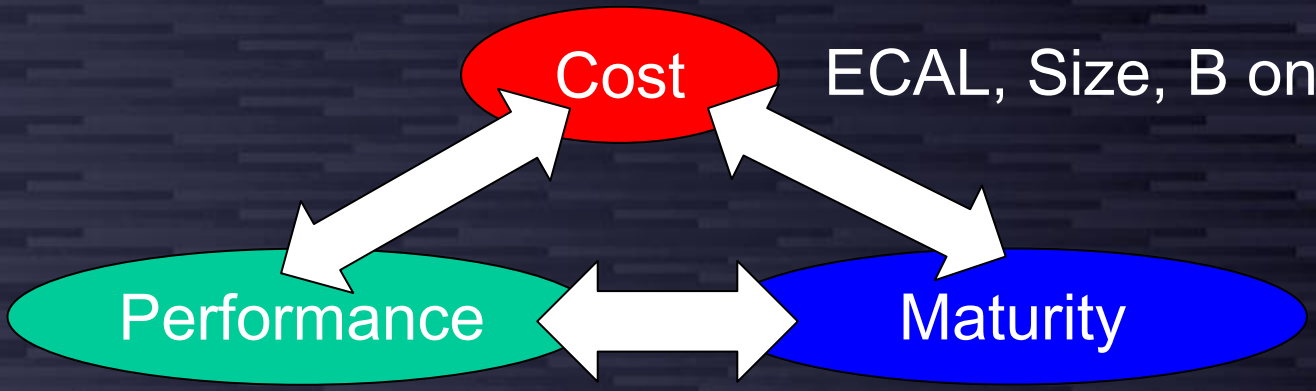
- Mature analysis for critical channels are essential
- Performance will be checked at several parameters – not only size but many others
  - We are generally not so positive to go smaller
- We should collect manpower – we are discussing assignments
- Software is critical – we should keep improvements of our core software

ILD optimization in TDR



Cost: ECAL and size/B are concern





ECAL, Size, B only

Cost

- Smaller is cheaper, for sure.
  Smaller B is also cheaper.
  - Smaller is better – apparently not!
  - Expects significant degradation of PFA
    - Have to address in critical physics analyses
  - Expects degradation also in tracking
- ScECAL is cheaper, for sure.
  - ScECAL is better – maybe??
  - Currently no significant degradation seen
    - Have to address also
  - Large ScECAL → coil&yoke cost
  - Small ScECAL also possible (of course)