

Energy Frontier Report preparation (result presentation, e.g. plots, tables etc.)

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Energy Frontier Report

1. Frontier Summary: < ~50 pages (including “Subgroup” summaries)
2. Subgroup Reports
 - Higgs Report
 - Electroweak Report
 - Top Quark Report
 - Strong Interactions Report
 - BSM Report [Three different chapters]
 - Model dependent Searches
 - Generic Searches
 - Dark Matter
 - Combined EFT studies

Snowmass 2021: EF Benchmark Scenarios

Snowmass 2021 Energy Frontier Collider Study Scenarios

Collider	Type	\sqrt{s}	P [%] e^-/e^+	L_{int} ab^{-1}
HL-LHC	pp	14 TeV		6
ILC C ³ : Cool Copper Collider com almost similar	ee	250 GeV	$\pm 80 / \pm 30$	2
		350 GeV	$\pm 80 / \pm 30$	0.2
		500 GeV	$\pm 80 / \pm 30$	4
		1 TeV	$\pm 80 / \pm 20$	8
CLIC	ee	380 GeV	$\pm 80 / 0$	1
		1.5 TeV	$\pm 80 / 0$	2.5
		3.0 TeV	$\pm 80 / 0$	5
CEPC	ee	M_Z		16
		$2M_W$		2.6
		240 GeV		5.6
FCC-ee	ee	M_Z		150
		$2M_W$		10
		240 GeV		5
		$2 M_{top}$		1.5

Snowmass 2021 Energy Frontier Collider Study Scenarios

Collider	Type	\sqrt{s}	P [%] e^-/e^+	L_{int} ab^{-1}
FCC-hh	pp	100 TeV		30
LHeC FCC-eh	ep	1.3 TeV		1
	ep	3.5 TeV		2
muon-collider (higgs)	$\mu\mu$	125 GeV		0.02
High energy muon-collider	$\mu\mu$	3 TeV		1
		10 TeV		10
		14 TeV		20
		30 TeV		90

Note for muon-collider: It is important to note that the plan is not to run subsequently at the various c.o.m etc. These are reference points to explore and assess the physics potential and technology. The luminosity can be varied to determine how best to exploit the physics potential.

Discussion topics

- While all of this work is done in different TGs, and Frontiers, we would like to have some uniform summary plots (if possible) for the overall EF report
 - In some cases coordination needed for the summary plots/tables with XFrontier.
- Format of sensitivity plots specifying reach by collider scenarios
 - Continue with the ESG format ? Or change to 2D ... sensitivity vs c.o.m? vs collider
- How to compare studies with different maturity levels and identify gaps?
 - e.g. compare some advanced studies (e.g. ILC, FCC-ee) with very preliminary results (e.g. muon collider).
 - Study based on full simulation vs fast simulation; Background estimations [full vs ideal]? Differences in treatment of systematic uncertainties ?... etc..
 - a) Color Code OR b) add footnote that clarify the assumptions included in the results ?
- Plots which include maturity of accelerator for the AF-EF combined report?
 - a) Color Code OR b) add footnote that clarify the assumptions included in the results ?

Or are we going too overboard with these plots?

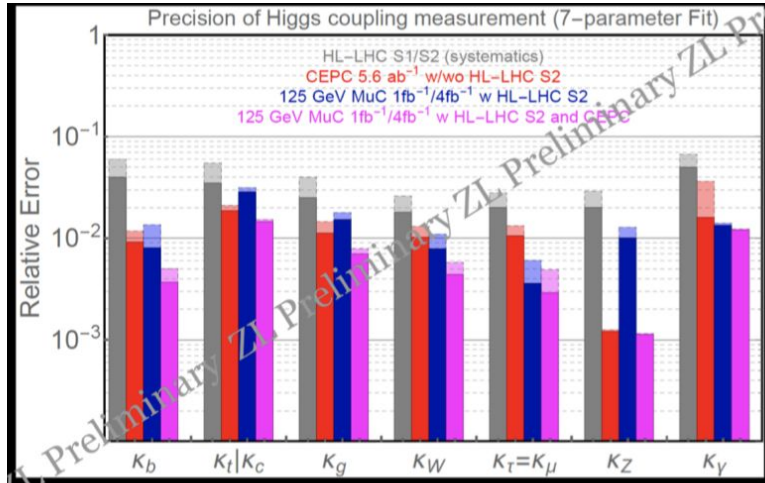
- **Classify the summary plots comparing physics sensitivities in three categories**

1. **HL-LHC** include forward and other experiments - FpF, MATHUSLA, etc.
2. **Higgs Factories** [Energies upto 1TeV - CepC, FCC-ee, ILC, CLIC, C³, muC@125]
[plot relative to HL-LHC]
3. **EF discovery machines** [FCC-hh, SppC, muC, NHE e+e-/gamma-gamma etc]

Backup

Some EXAMPLES

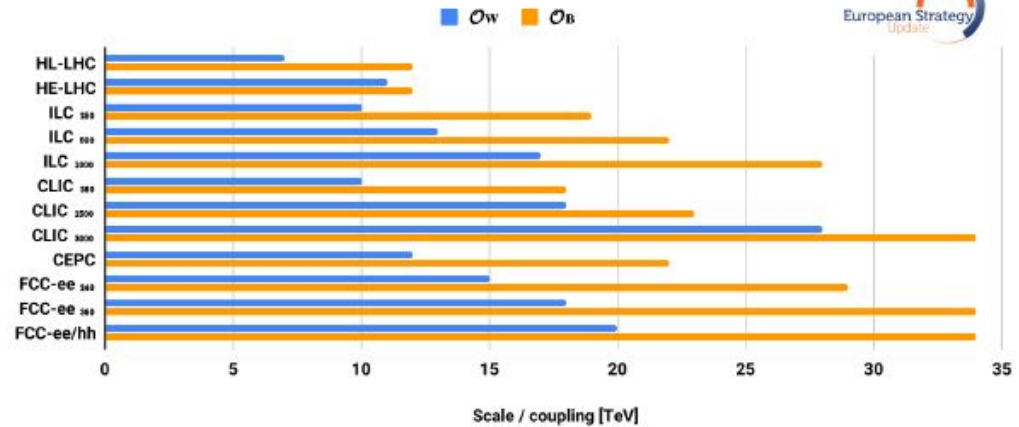
Higgs Couplings



Adding sensitivity studies from Muon Colliders

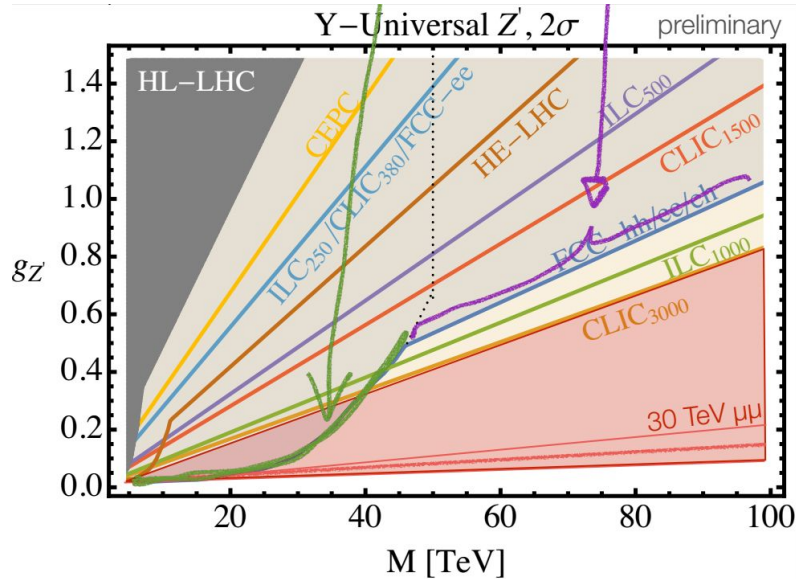
C.I. scale

95% CL scale limits on 2-fermion 2-boson contact interactions



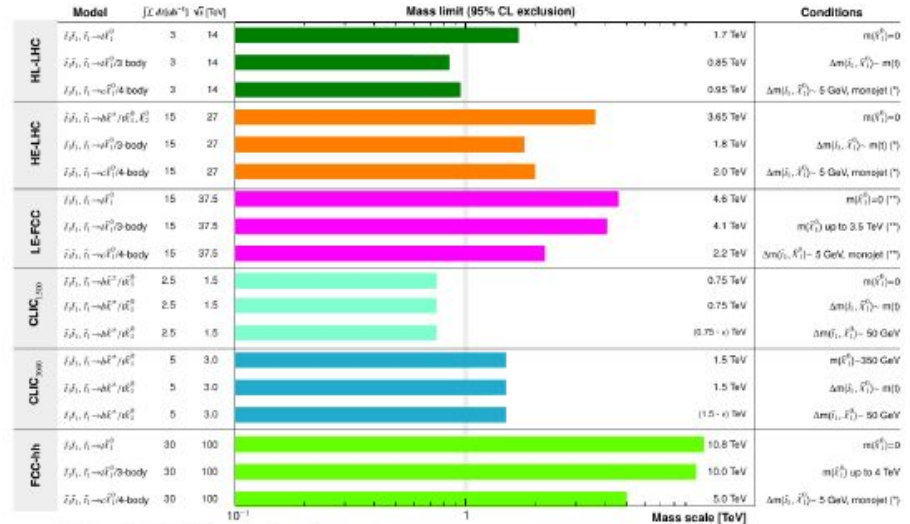
Add other colliders,
but would it be better in 2D?

Some EXAMPLES: New Particle Searches



- Added muon collider
- Focus on 5 sigma discovery reach scenarios
- 95% CL constraints are welcome too.

All Colliders: Top squark projections
(R-parity conserving SUSY, prompt searches)



(*) indicates projection of existing experimental searches

(**) extrapolated from FCC-hh prospects

ILC 500: discovery in all scenarios up to Kinematic limit $\sqrt{s}/2$

Additional Modes?
Additional colliders?
Model independence