

Update on b/c AFB prospects

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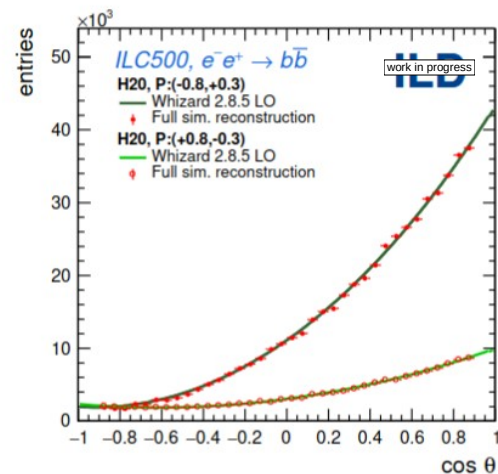
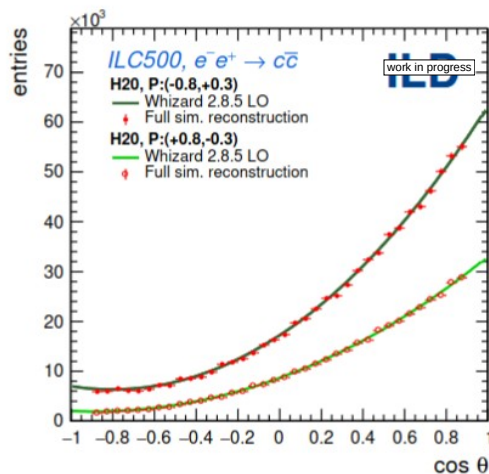
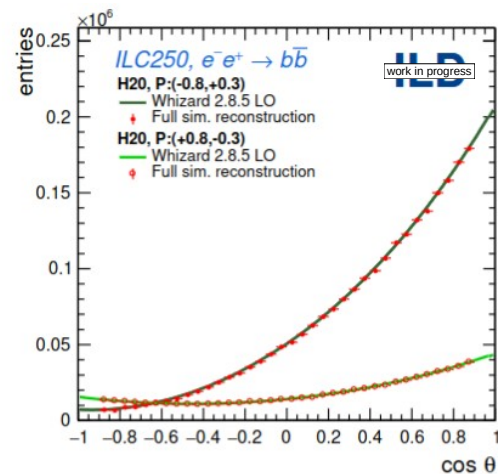
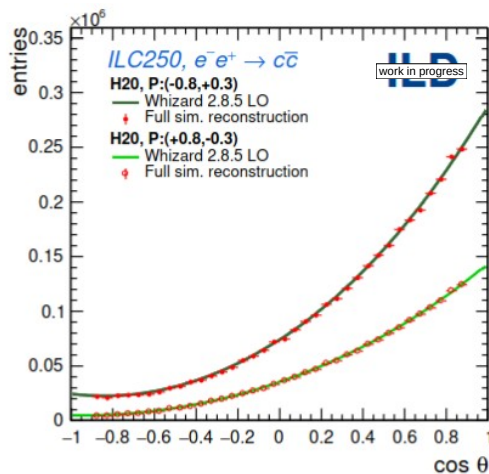
Based in

- ▶ ILD note and previous works <https://inspirehep.net/literature/2669897>
 - ILC50, b and c studies
- ▶ Work presented in LCWS (J.P. Márquez)
 - Proceeding <https://inspirehep.net/literature/2682331>
 - Talk https://indico.slac.stanford.edu/event/7467/contributions/5977/attachments/2862/8042/LCWS2023_JPMH.pdf
 - ILC250+ILC500 comparing scenarios with different PID (no PID, dEdx, dNdx)
- ▶ Work presented in EPS-HEP (J.P. Márquez)
 - First theory prospects
 - <https://indico.desy.de/event/34916/contributions/147224/>
- ▶ Theory from
 - Models A <https://arxiv.org/abs/1705.05282> (2017, Funatsu, Hatanaka, Hosotani, Oriksa)
 - Models B <https://arxiv.org/abs/2006.02157> (2020, Funatsu, Hatanaka, Hosotani, Oriksa, Namatsu)
 - Models X^\pm <https://arxiv.org/abs/2301.07833> (2023 Funatsu, Hatanaka, Oriksa, Namatsu)

- ▶ Gauge-Higgs Unification model. One parameter, θ_H , determines the projection of the 5D fields, fixing most of the physical effects
- ▶ A models
 - quark-lepton multiplets, are introduced in the vector representation of $SO(5)$
 - with m_{kk} from 7-11 TeV
- ▶ B models
 - Inspired by grand unification. It is constructed as a low-energy effective description of the $SO(11)$ gauge-Higgs grand unification model
 - Systematic variations of θ_H and/or m_{kk} from 11-15 TeV
- ▶ X^\pm models
 - Extension of B-models, including variations of the sign of the bulk fermion masses
 - with m_{kk} from 13-25 TeV

Update of few plots (exp. distribution)

- ▶ Only cosmetic update,
 - Show the different beam polarization scenarios in only one plot



New results, wrt EPS-HEP

- ▶ Comparison of the new (2023) models
- ▶ Inclusion of ILC1000 results (extrapolated from ILC500)
- ▶ Propagation of the uncertainties of the Z-couplings to the separation power calculation
 - Current uncertainties
 - Assumptions with ILCGigaZ run
 - Assumptions with ILC250-radiative return studies
 - <https://arxiv.org/abs/2203.07622>

New results - 1

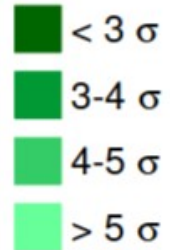
GHU vs SM discrimination power (σ -level)

work in progress

C ⁺	0.1	0.4	0.5	0.1	0.7	0.8	0.5	1.3	1.3	1.7	2.5	2.6
C ⁻	0.1	0.4	0.5	0.3	0.9	0.9	0.9	2.7	2.7	3.3	6.7	6.8
B ⁺	0.2	0.7	0.8	0.3	1.5	1.6	0.9	2.2	2.3	3.1	4.6	4.7
B ⁻	0.2	0.7	0.7	0.5	1.4	1.5	1.7	4.6	4.8	6.4	>10	>10
A ⁺	0.3	1.6	1.7	0.7	3.2	3.5	1.5	4.4	4.7	4.4	6.9	7.1
A ⁻	0.5	1.4	1.4	0.9	2.7	2.8	3.3	9.6	9.9	>10	>10	>10
B ₊	0.4	1.3	1.3	0.8	2.5	2.6	3.0	8.6	8.9	>10	>10	>10
B ₋	0.5	1.5	1.6	0.9	2.9	3.1	3.7	>10	>10	>10	>10	>10
B _H	0.5	1.3	1.4	0.8	2.5	2.6	2.9	8.1	8.4	>10	>10	>10
B _L	0.6	1.7	1.8	1.0	3.1	3.2	3.9	>10	>10	>10	>10	>10
A ₃	0.6	3.3	3.6	0.9	4.8	5.3	4.3	>10	>10	>10	>10	>10
A ₂	0.8	3.9	4.2	1.0	5.0	5.5	5.3	>10	>10	>10	>10	>10
A ₁	1.1	5.1	5.6	1.4	6.0	6.6	7.5	>10	>10	>10	>10	>10
	C	R	Z	C	R	Z	C	R	Z	C	R	Z
	ILC250* (no pol.)			ILC250			ILC250 +500			ILC250 +500 +1000*		

Z-fermion couplings

- C: Current precision
- R: ILC250 (Rad. Ret.)
- Z: Giga-Z



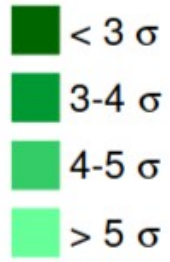
New results - 2



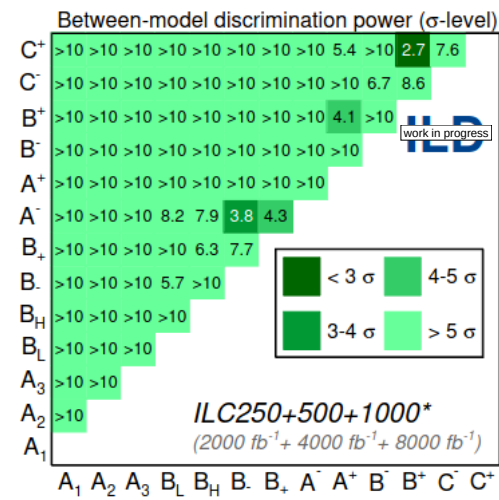
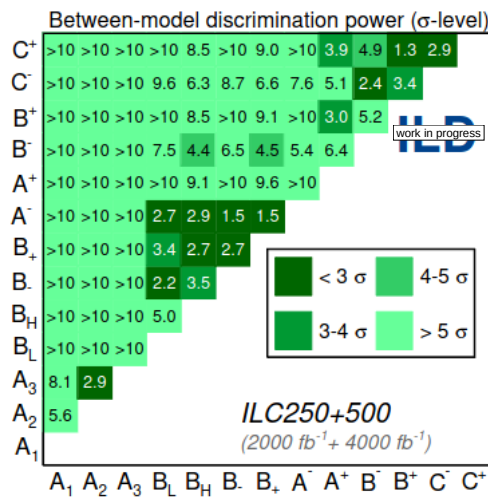
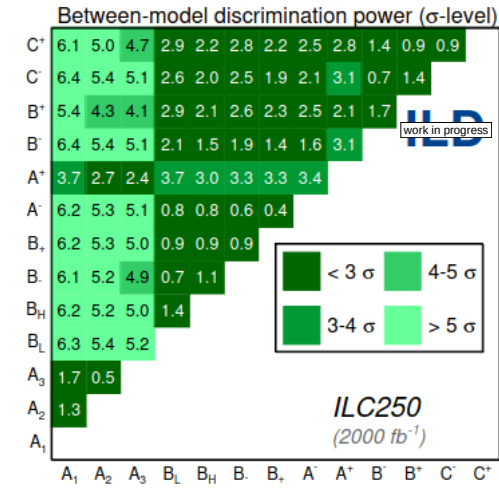
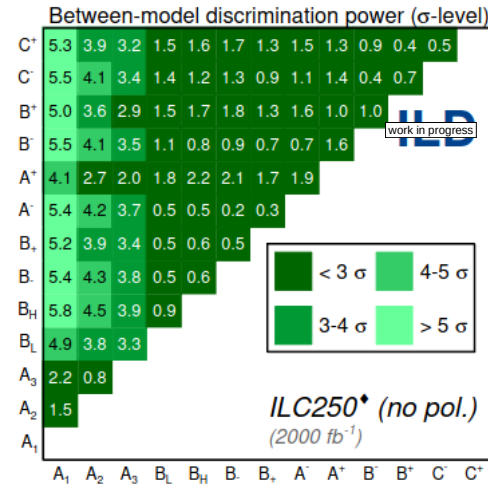
GHU vs SM discrimination power (σ -level)

C ⁺	0.3	0.4	0.4	0.5	0.7	0.7	0.9	1.2	1.3	2.2	2.5	2.5
C ⁻	0.2	0.4	0.4	0.5	0.8	0.9	1.7	2.6	2.7	4.2	6.5	6.7
B ⁺	0.5	0.7	0.7	0.9	1.4	1.5	1.7	2.1	2.2	3.9	4.5	4.6
B ⁻	0.3	0.6	0.7	0.8	1.3	1.4	2.9	4.5	4.6	8.0	>10	>10
A ⁺	1.1	1.5	1.6	2.2	3.1	3.2	3.4	4.3	4.4	5.7	6.8	6.9
A ⁻	0.6	1.2	1.4	1.4	2.4	2.7	5.9	9.3	9.6	>10	>10	>10
B ₊	0.6	1.2	1.3	1.3	2.3	2.5	5.3	8.4	8.6	>10	>10	>10
B ₋	0.7	1.4	1.5	1.6	2.8	2.9	6.5	>10	>10	>10	>10	>10
B _H	0.7	1.2	1.3	1.3	2.3	2.5	4.9	7.9	8.1	>10	>10	>10
B _L	0.9	1.5	1.7	1.7	2.9	3.1	7.1	>10	>10	>10	>10	>10
A ₃	2.2	3.2	3.3	3.3	4.7	4.8	>10	>10	>10	>10	>10	>10
A ₂	2.7	3.8	3.9	3.5	4.9	5.0	>10	>10	>10	>10	>10	>10
A ₁	3.5	4.9	5.1	4.1	5.8	6.0	>10	>10	>10	>10	>10	>10
	O	E	N	O	E	N	O	E	N	O	E	N
	ILC250 [♦] (no pol.)			ILC250			ILC250 +500			ILC250 +500 +1000*		

- Ch. had. PID
- O: No PID
 - E: $\frac{dE}{dx}$
 - N: $\frac{dN}{dx}$



New results - 3



- ▶ For Paestum: reduce the number of models under test
 - Some are disfavored by LHC observations, some are very similar between them
 - Go from 13 models to 8.
- ▶ Plan to publish these results.
 - Ask for ILD editorial board in the coming N days.
 - (N>4)