

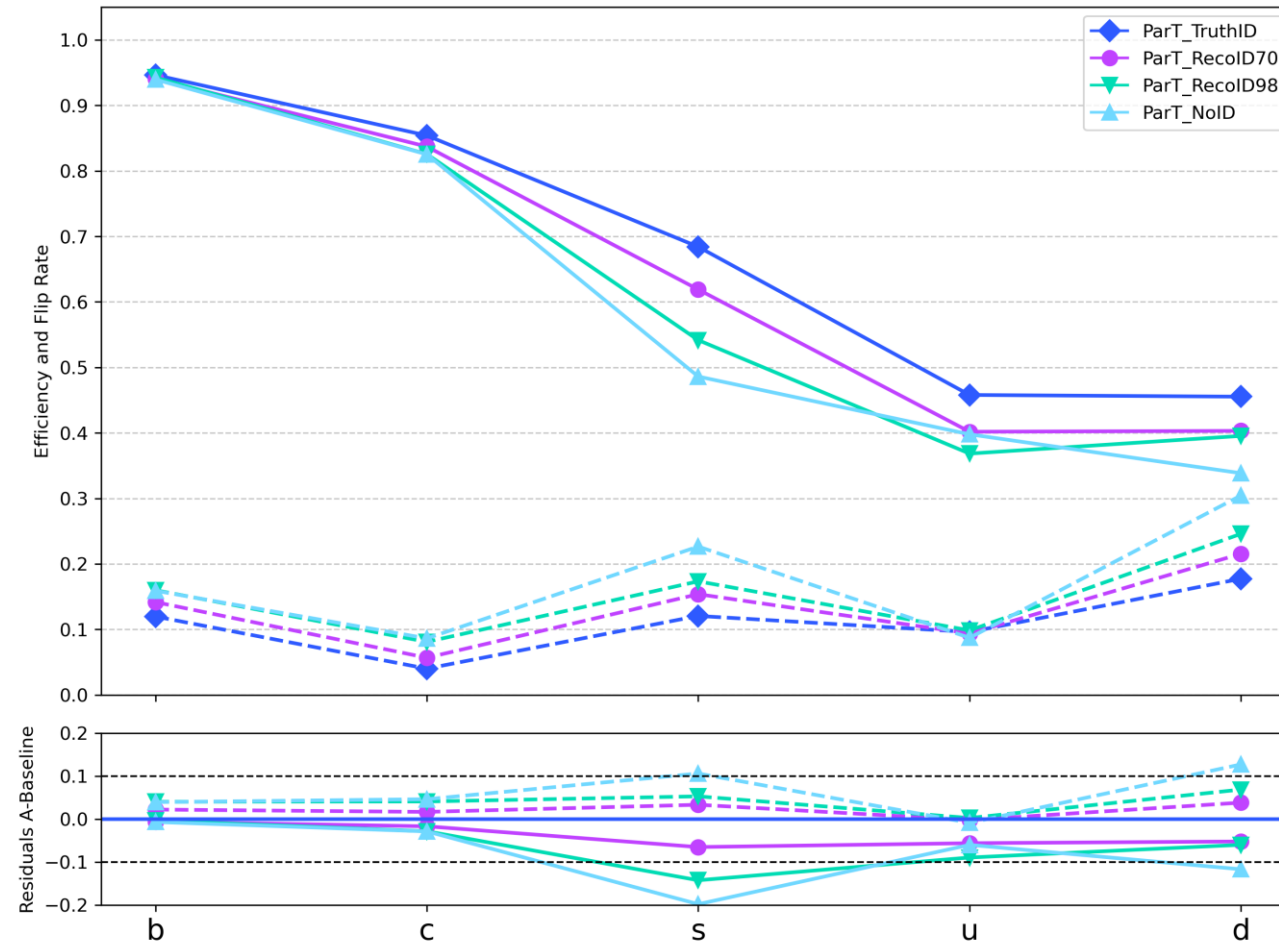
CEPC

Jets, samples and Wednesday working meeting

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CEPC TDR Jet Origin ID



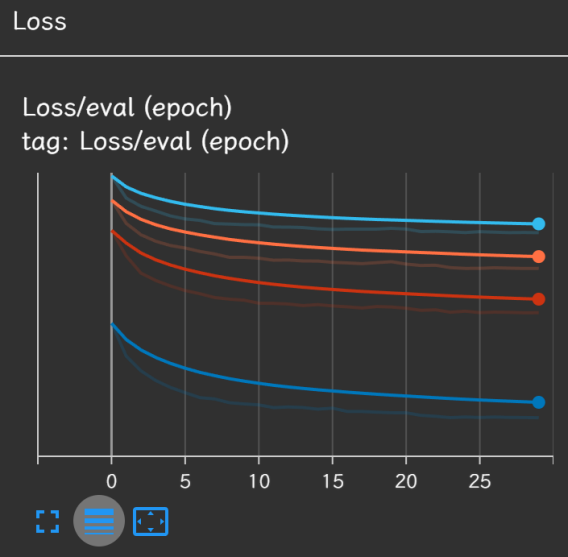
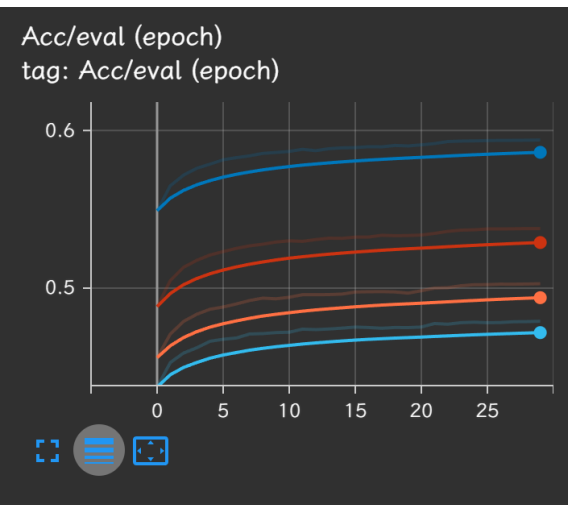
Tagging Eff & Charge Flip rate



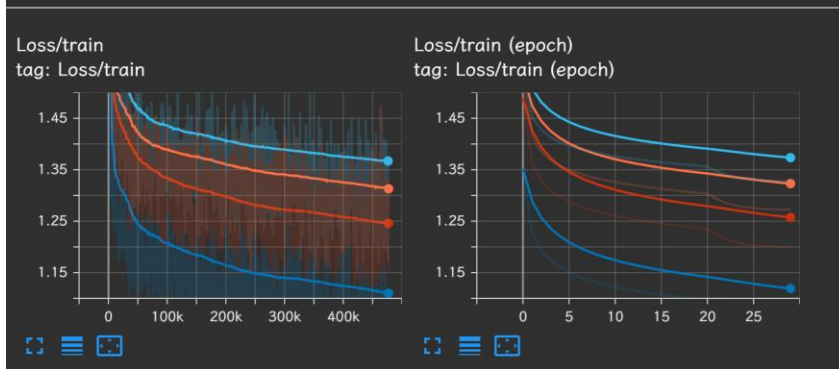
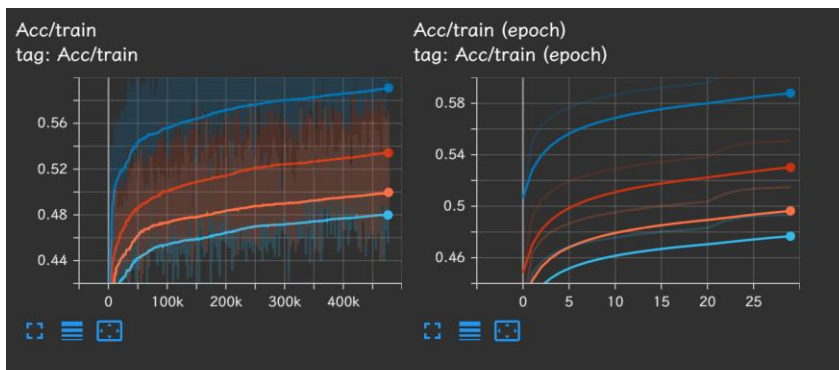
TruthID	Efficiency	Flip Rate	Reco70	Efficiency	Flip Rate	Reco98	Efficiency	Flip Rate	NoID	Efficiency	Flip Rate
b	0.95	0.12	b	0.94	0.14	b	0.94	0.16	b	0.94	0.16
c	0.85	0.04	c	0.84	0.06	c	0.83	0.08	c	0.83	0.09
s	0.68	0.12	s	0.62	0.15	s	0.54	0.17	s	0.49	0.23
u	0.46	0.10	u	0.40	0.09	u	0.37	0.10	u	0.40	0.09
d	0.46	0.18	d	0.40	0.22	d	0.40	0.25	d	0.34	0.30
g	0.44		g	0.46		g	0.41		g	0.47	
Metric	0.5936			0.5510			0.5153			0.5030	

Overtraining:

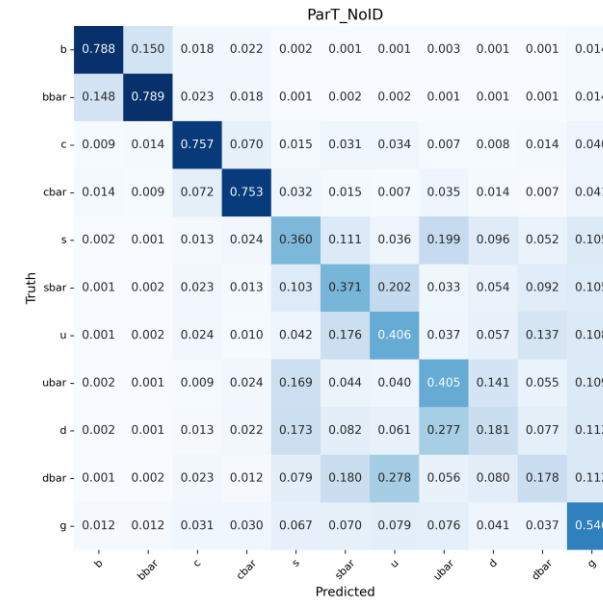
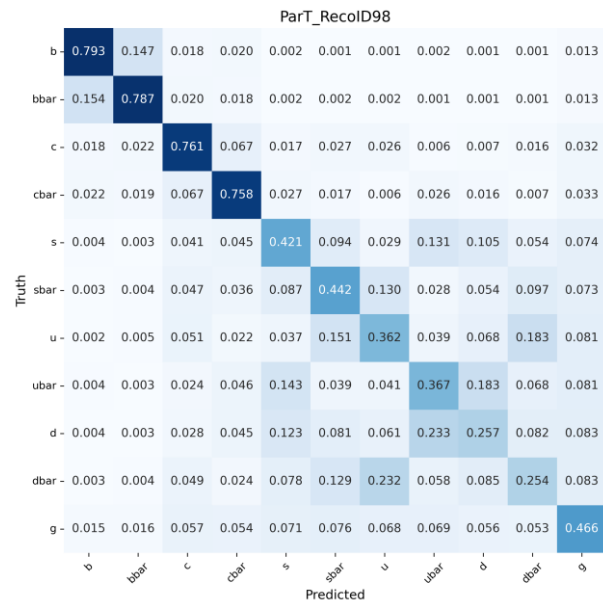
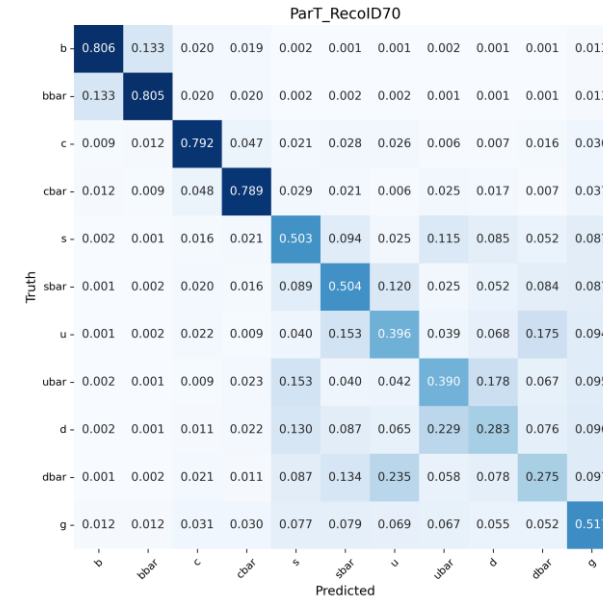
TensorBoard convergence analysis confirms stable training convergence across all models.



Name	Smoothed Value	Value	Step	Time	Relative
Apr15_06-24-56_gpu013.ihep.ac.cnJet_ParT0415NoID_higgs_full_ParT	0.4945	0.5026	29	Tue Apr 15, 23:13:31	16h 14m 52s
Apr15_06-34-40_gpu026.ihep.ac.cnJet_ParT0415TruthID_higgs_full_ParT	0.585	0.5935	29	Tue Apr 15, 20:51:00	13h 47m 43s
Apr15_10-30-36_gpu017.ihep.ac.cnJet_ParT0415CNoID_higgs_full_ParT	0.4749	0.4812	29	Wed Apr 16, 02:47:44	15h 44m 40s
Apr15_10-30-36_gpu019.ihep.ac.cnJet_ParT0415RecoID98_higgs_full_ParT	0.5271	0.5356	29	Wed Apr 16, 05:58:03	18h 49m 5s



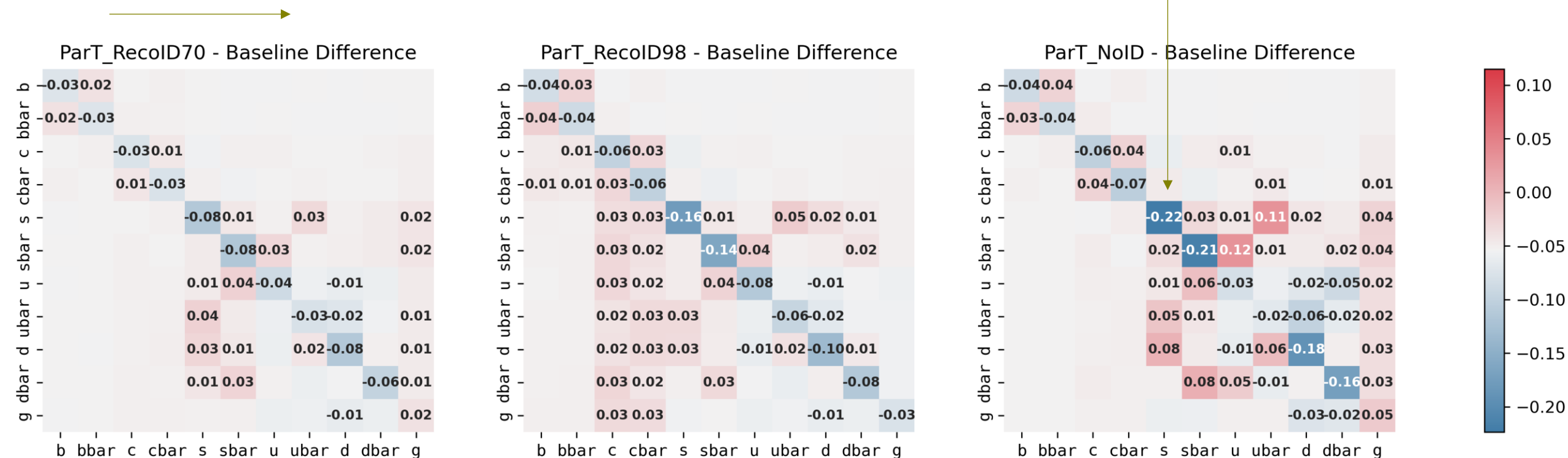
Confusion Matrix



Matrix Difference

- Largest impact in S-Sbar tagging.
- Truth-label-wise normalization ensures row conservation

22% more truth s quarks are not tagged as s quark.
11% more truth s quarks are tagged as ubar quark.



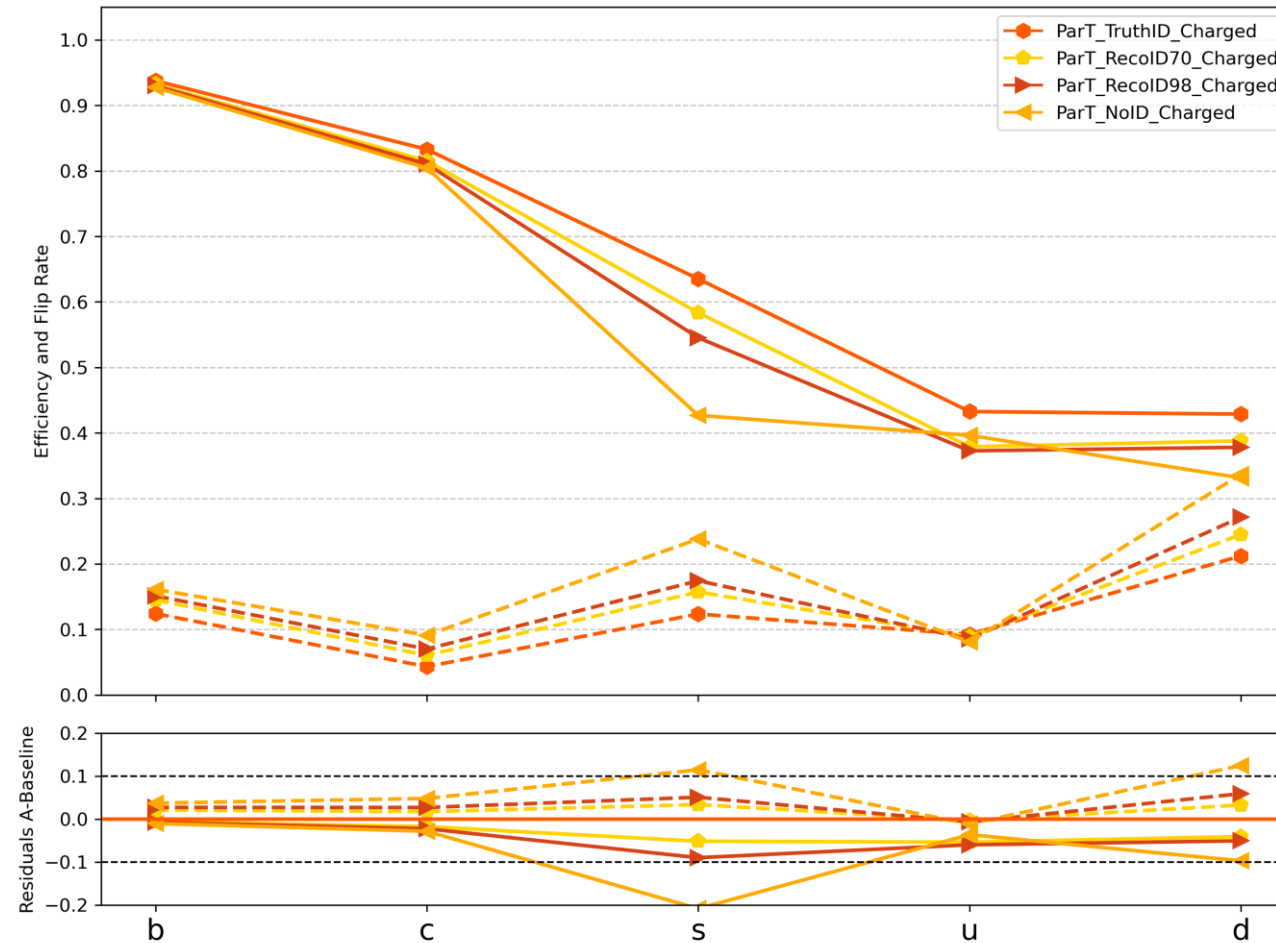
With/wo PID, b/c quark do not mix with udsg.
(but better separation b and bbar).

With RecoID98(higher lepton rate), uds are likely to be tagged as c quark;
While in NoID it disappeared. -> tagged as gluon.

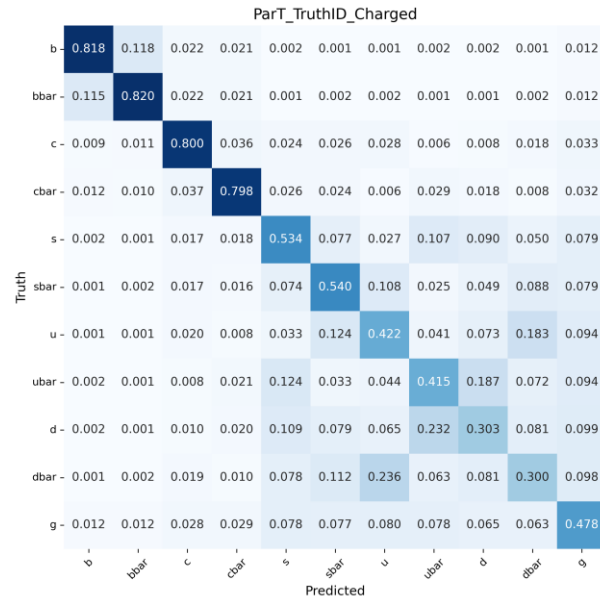
JOI with charged only tracks



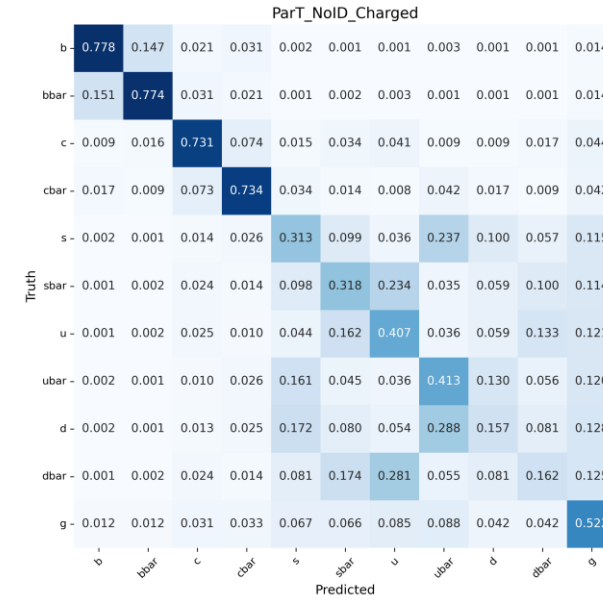
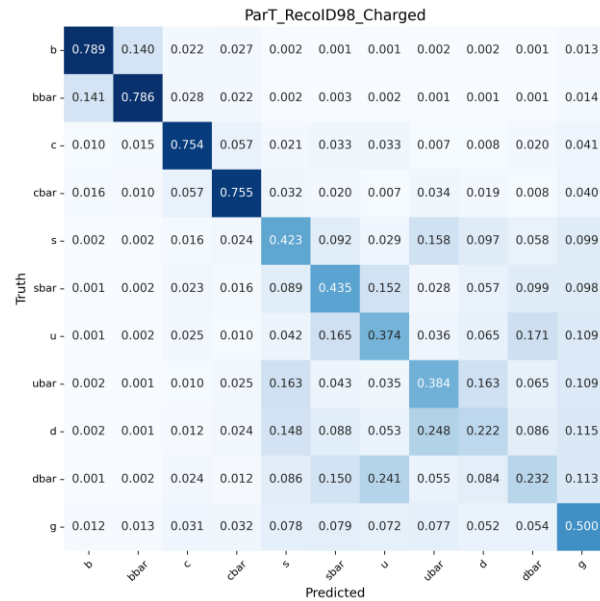
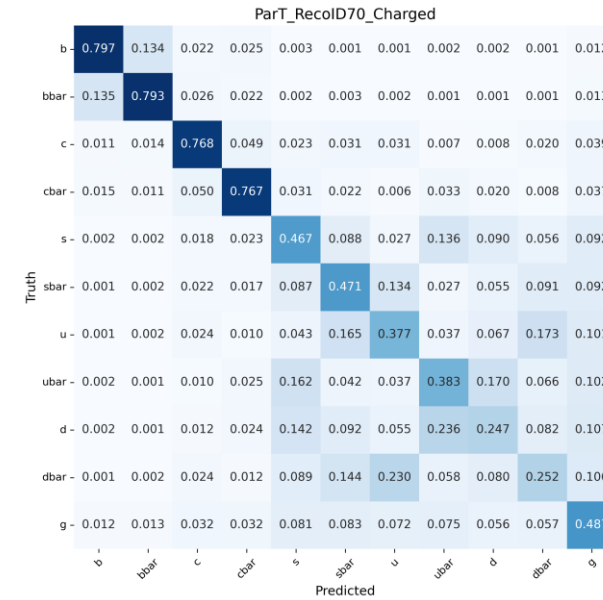
CEPC TDR Jet Origin ID



Charged Confusion Matrix



Truth: 0.5661
 Reco70: 0.5281
 Reco98: 0.5142
 NoID: 0.4825

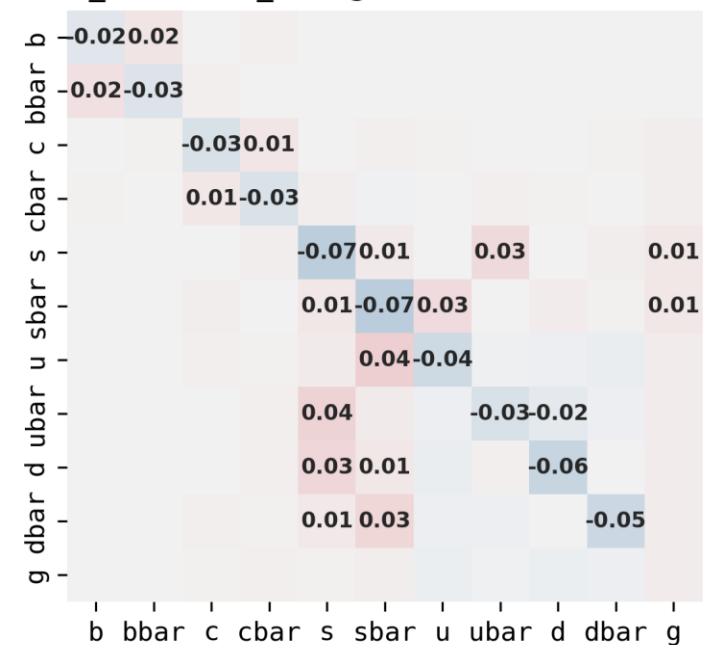


Charged Matrix Difference

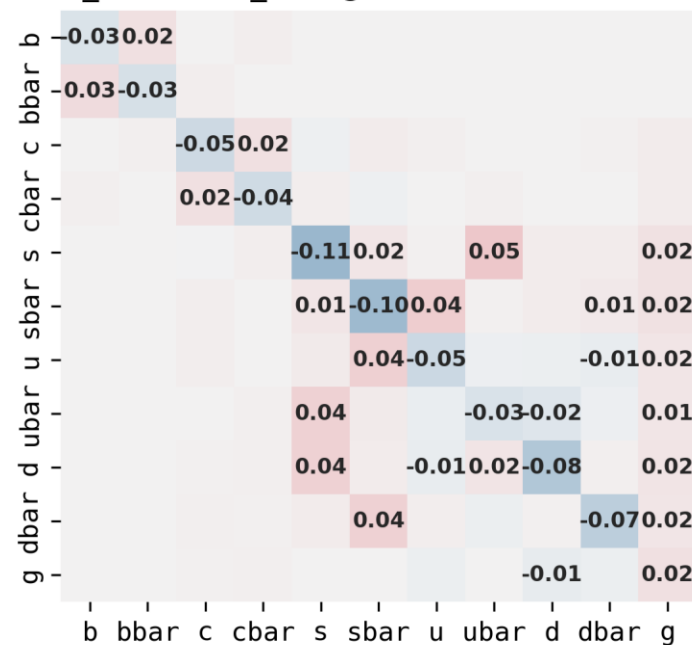
Similar performance corresponds to FullPFOs.

Neutral PFO contributions are global and not for any specified flavor.

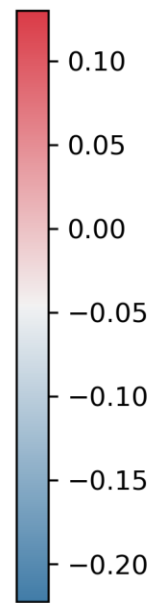
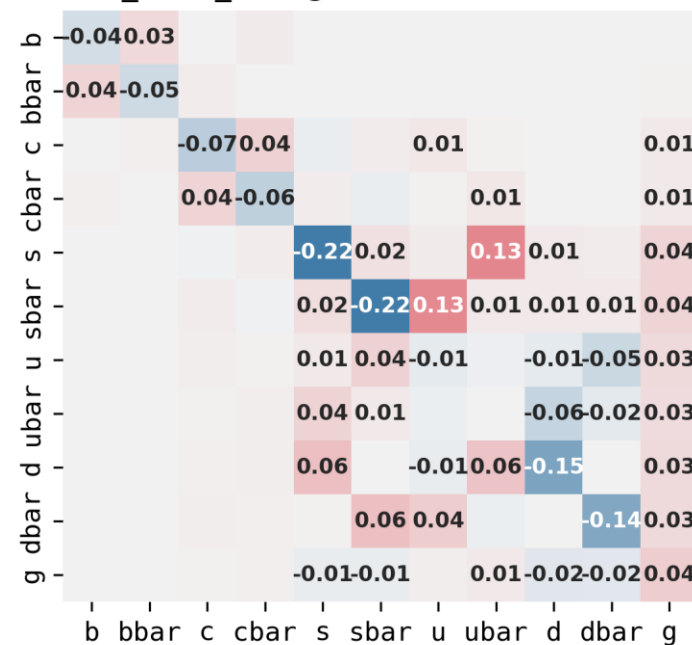
ParT_RecoID70_Charged - Baseline Difference



ParT_RecoID98_Charged - Baseline Difference

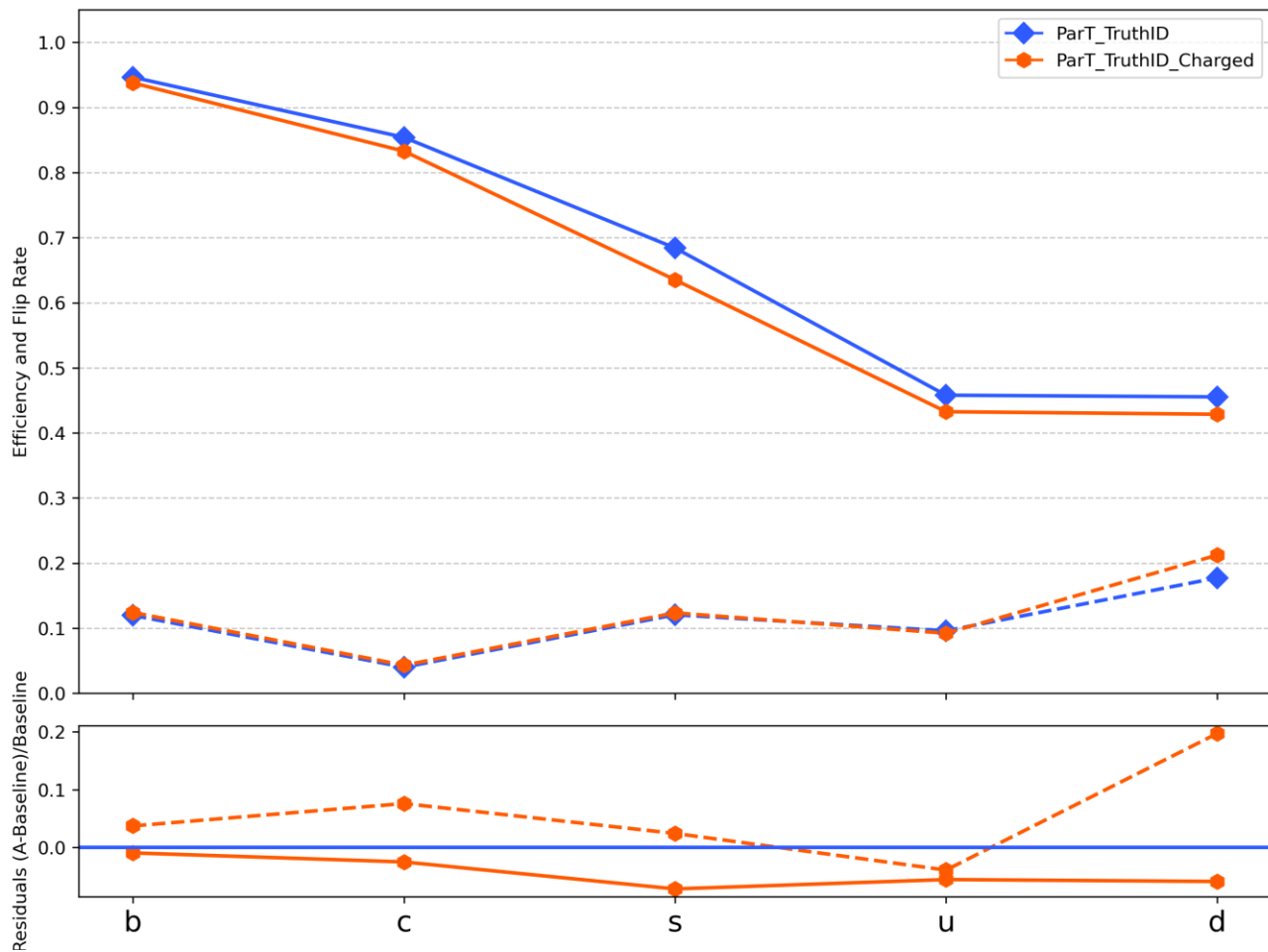


ParT_NoID_Charged - Baseline Difference



Residual: only charged tracks

CEPC TDR Jet Origin ID



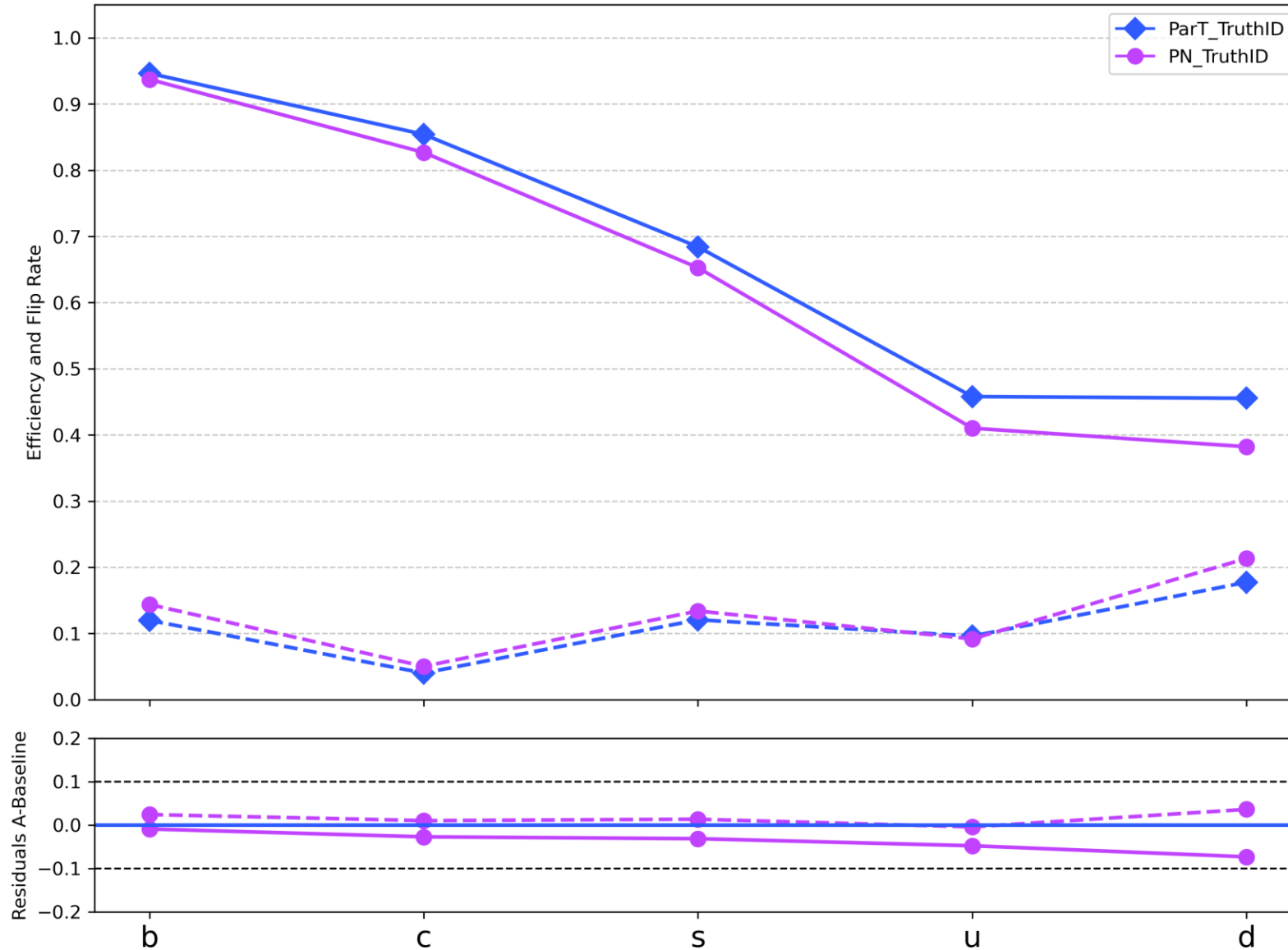
Baseline	Efficiency	Flip Rate	Charged	Efficiency	Flip Rate
b	0.95	0.12	b	0.94	0.12
c	0.85	0.04	c	0.83	0.04
s	0.68	0.12	s	0.64	0.12
u	0.46	0.10	u	0.43	0.09
d	0.46	0.18	d	0.43	0.21
g	0.44		g	0.42	
Metric	0.5936			0.5661	

Consistent Analysis: TDR ParT vs PN Truth ID



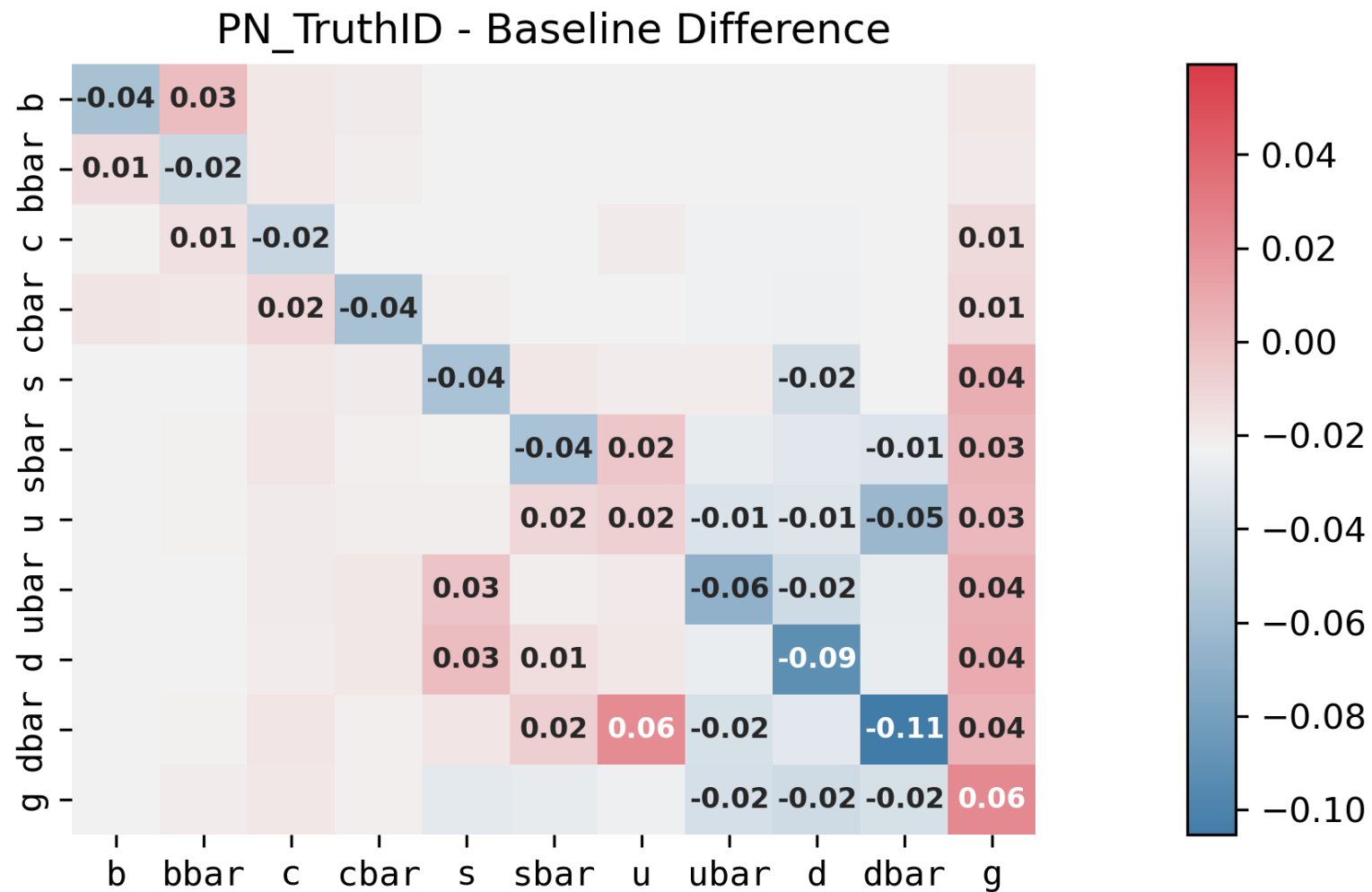
CEPC TDR Jet Origin ID

0.5936: 0.5579



Matrix Difference

ParT with better metric, while PN has better gluon separation.
 The improvement is believed from TLorentz vector information.

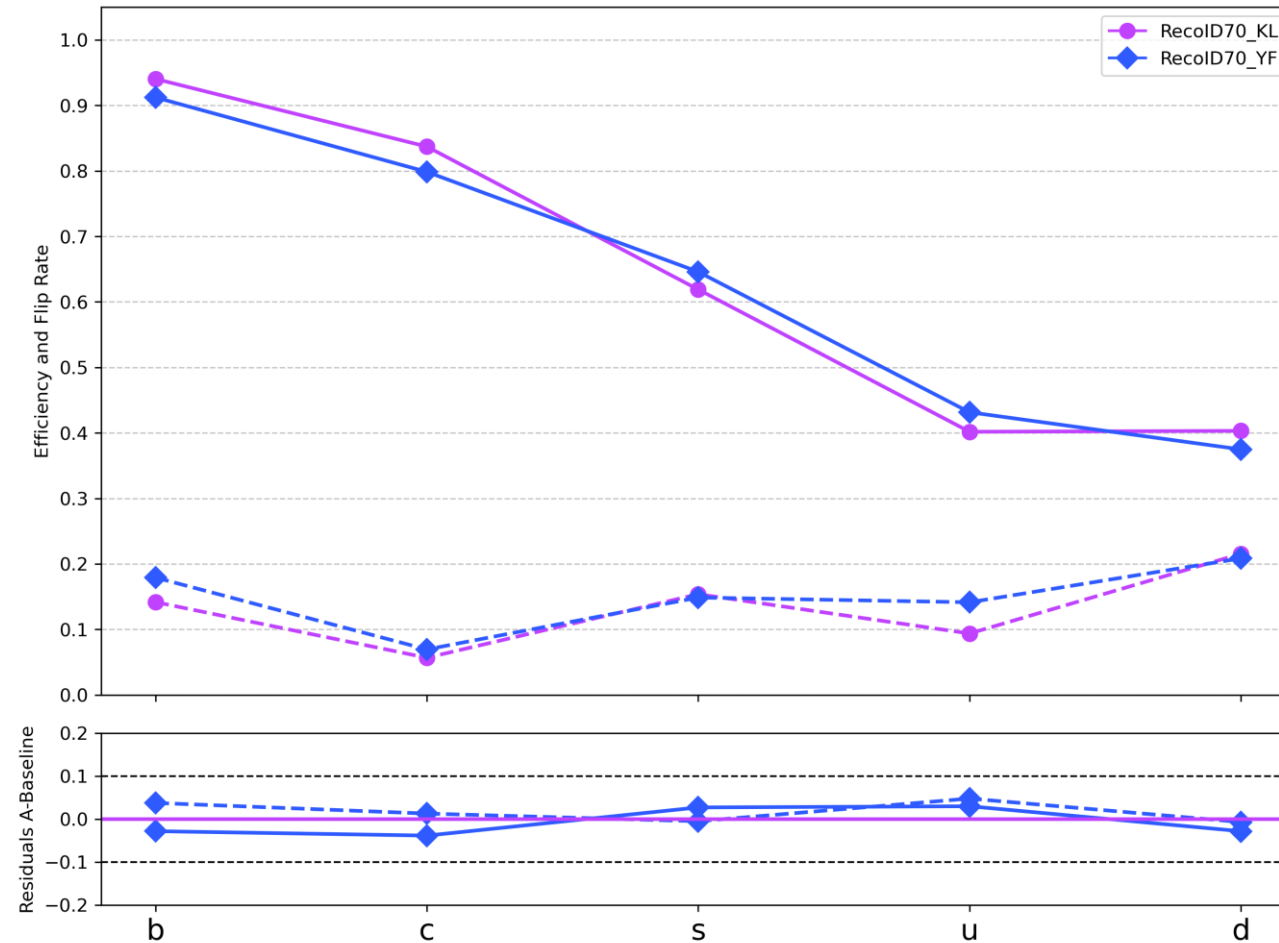


Consistent Analysis: ParT_Reco70



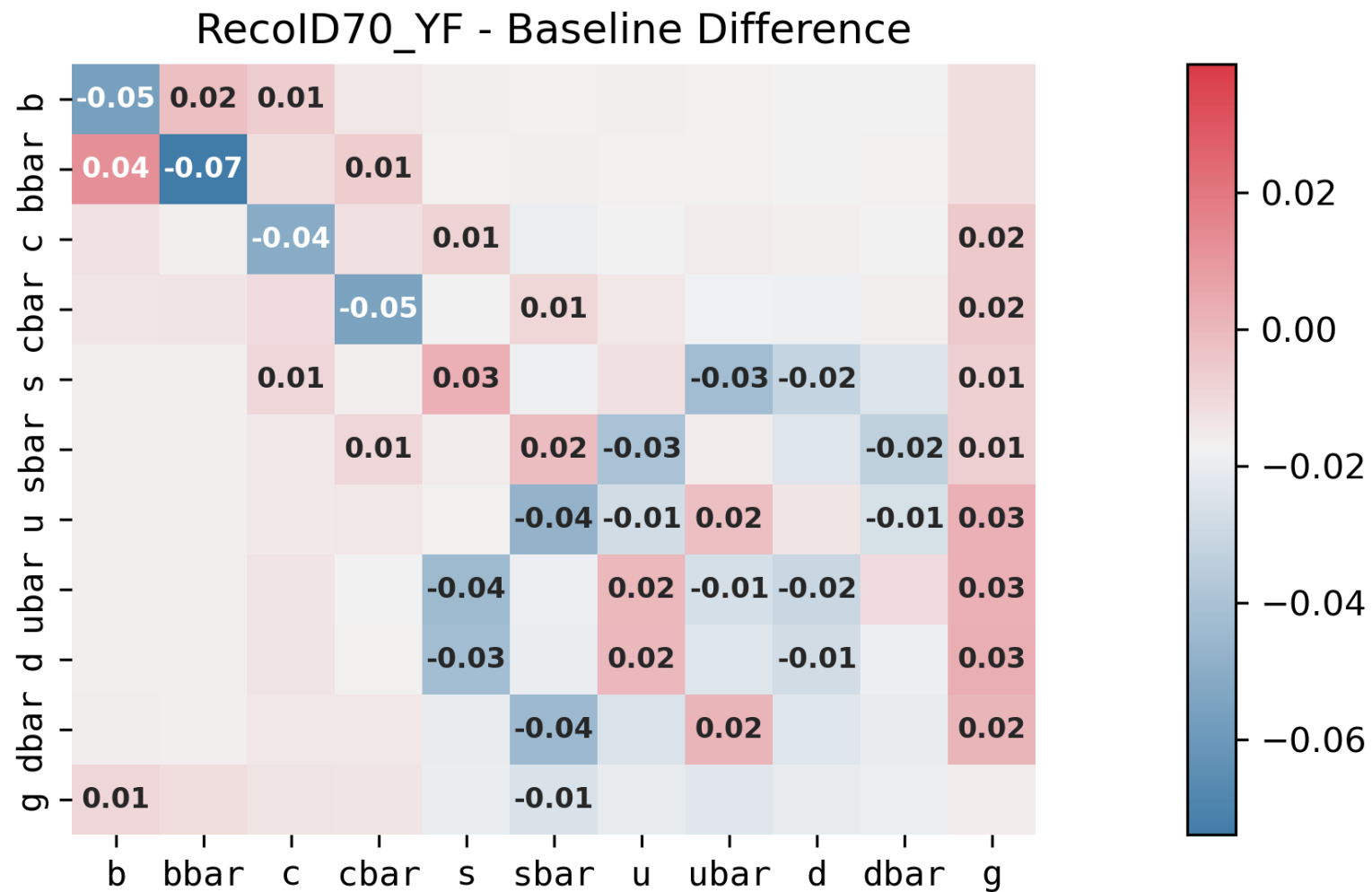
0.5510: 0.5319

CEPC TDR Jet Origin ID



Matrix Difference

Under check for input variables and traing hyper parameter.

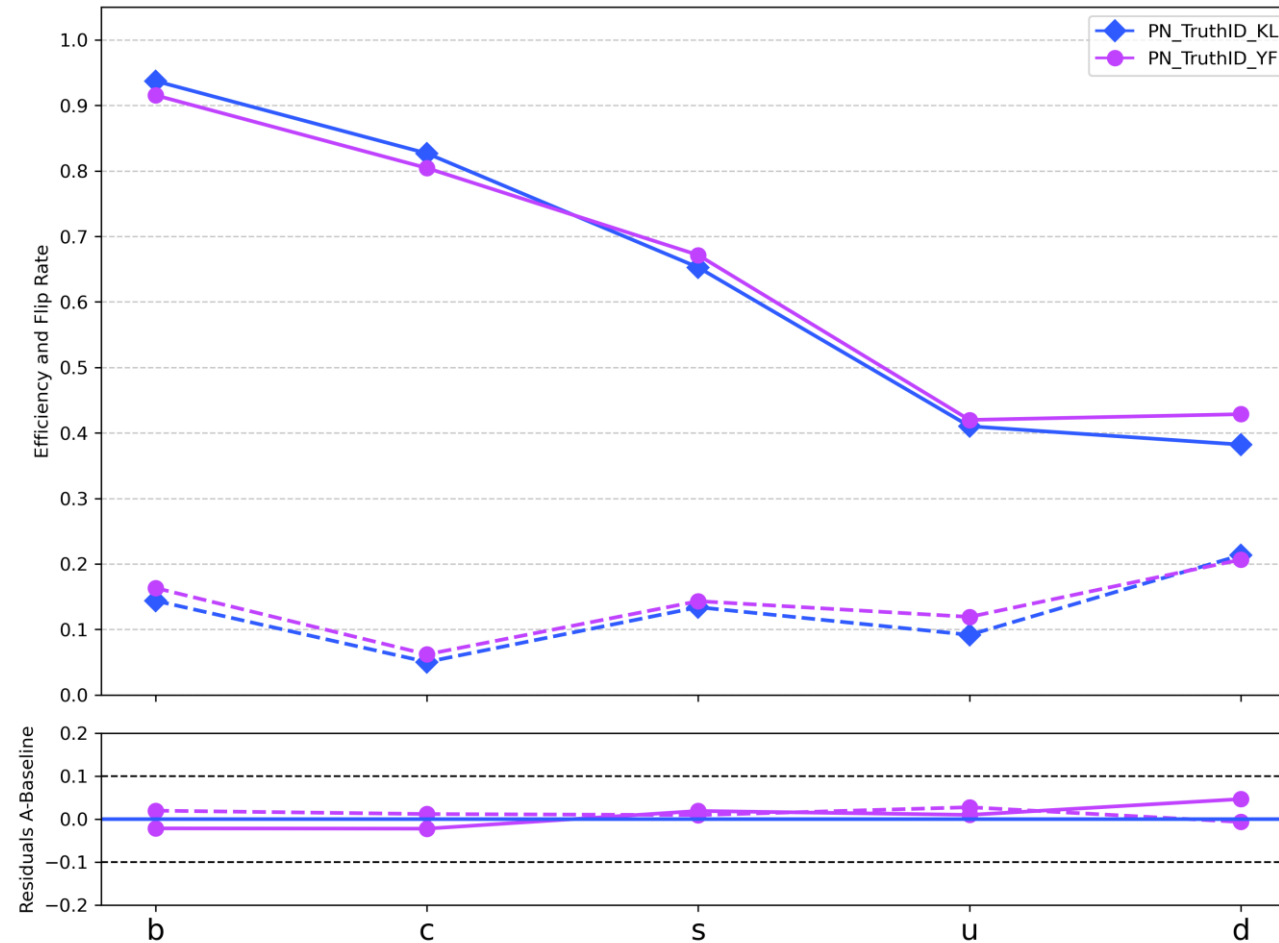


Consistent Analysis: PN_TruthID



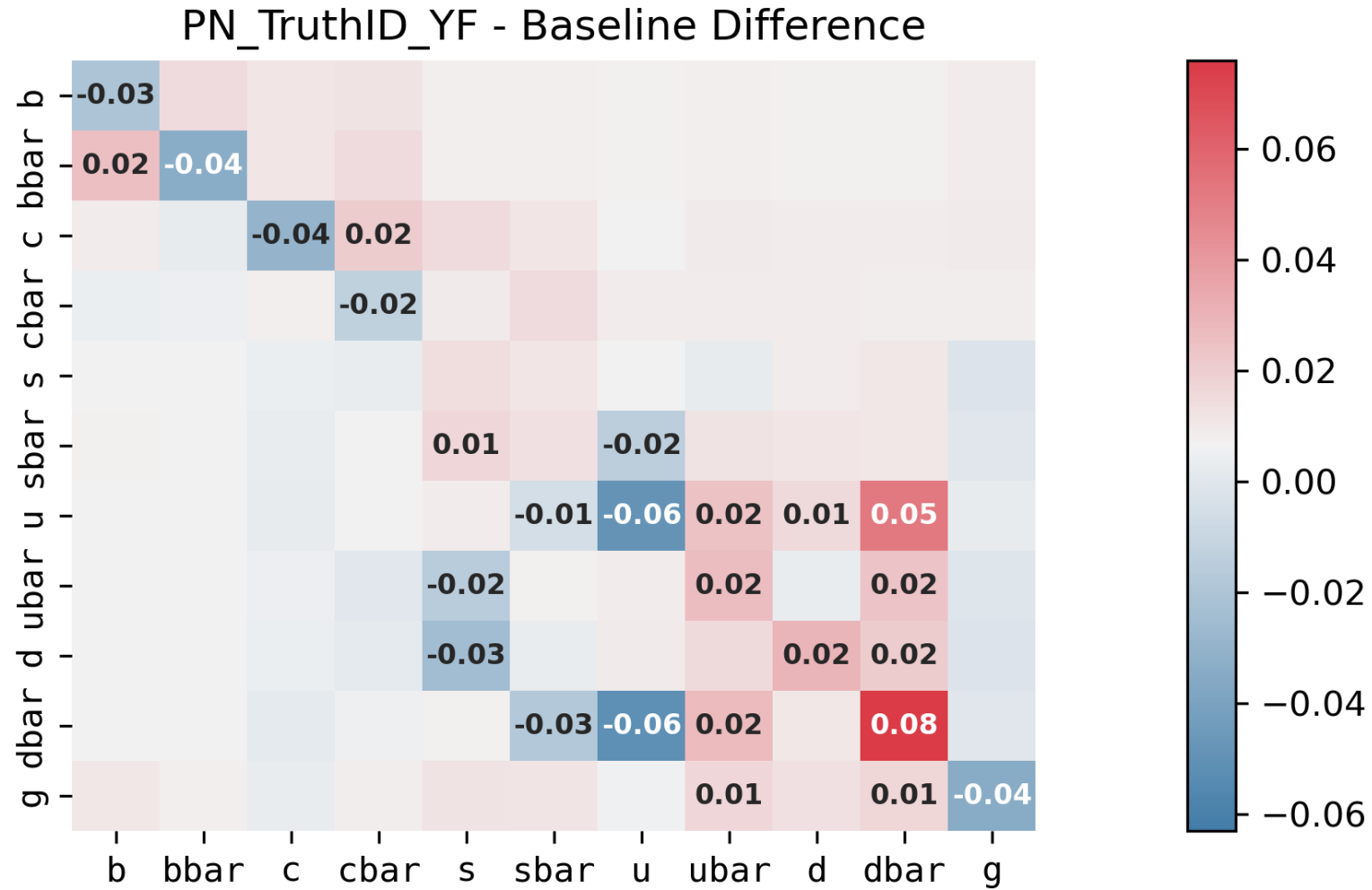
0.5579: 0.5486

CEPC TDR Jet Origin ID



Matrix Difference

Similar performance while migration from u/dbar.



TDR/CDR, PN, truth ID:



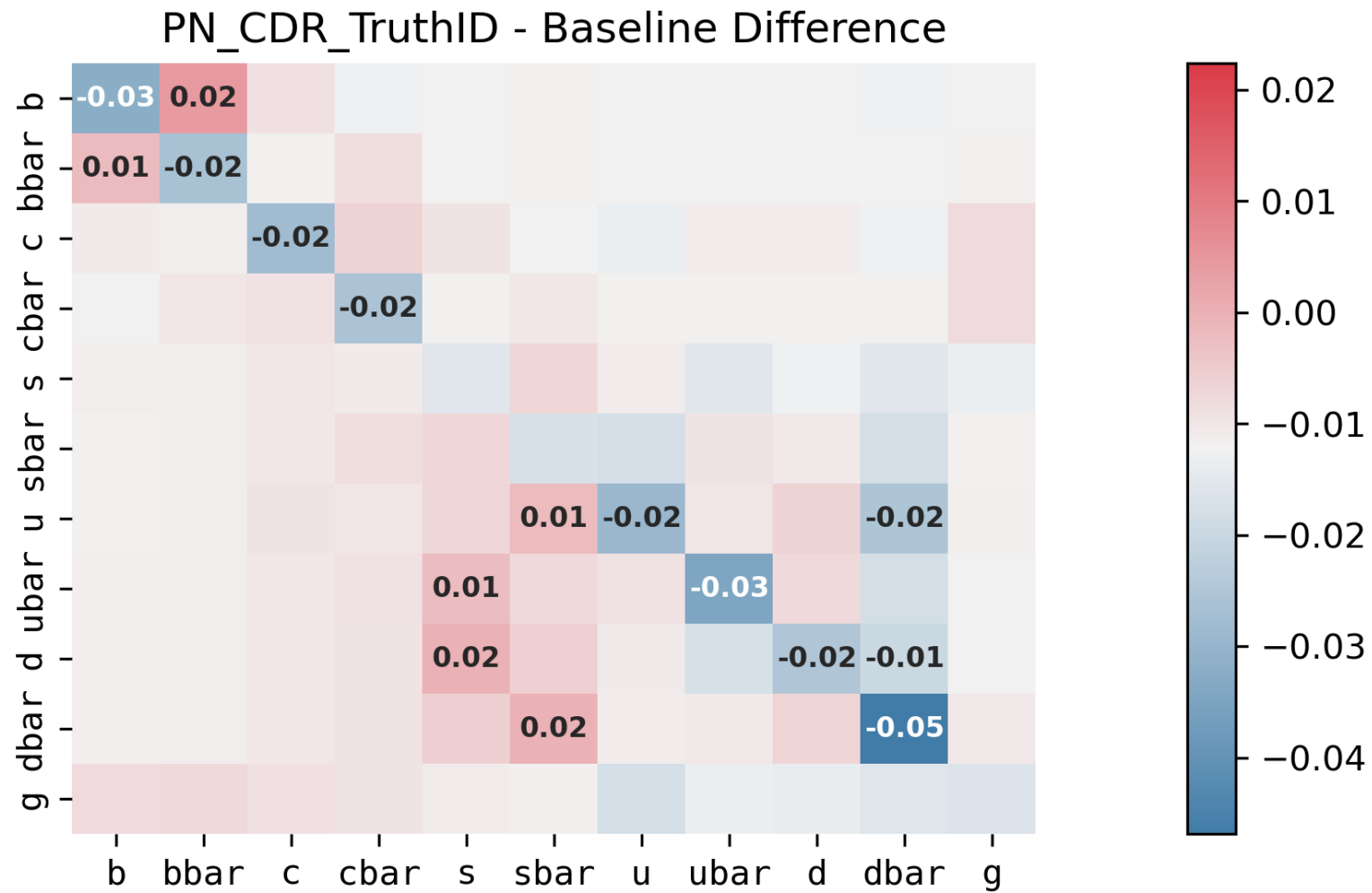
0.5486: 0.5285

CEPC TDR Jet Origin ID



Matrix Difference

TDR improved from CDR in 2%.



To dos



- Further check inputs/outputs for consistence, like costheta
- After sanity check, applications:
 - b/c/g/s tagging, H->bb/cc/gg/ss analysis
 - Ability for genializing: JOI to Zpole, to E240 ZZ/WW/qq
 - Package for users
 - ...

Results from YF

ParT TDR RecoID70

Truth	b	bbar	c	cbar	s	sbar	u	ubar	d	dbar	g
b	0.755	0.152	0.035	0.023	0.004	0.002	0.002	0.003	0.002	0.001	0.021
bbar	0.172	0.731	0.027	0.034	0.003	0.003	0.003	0.002	0.001	0.002	0.021
c	0.016	0.014	0.749	0.053	0.034	0.025	0.026	0.008	0.008	0.015	0.052
cbar	0.017	0.015	0.058	0.740	0.028	0.032	0.010	0.024	0.015	0.008	0.053
s	0.003	0.003	0.027	0.022	0.529	0.092	0.032	0.082	0.067	0.043	0.100
sbar	0.003	0.003	0.024	0.027	0.092	0.525	0.090	0.028	0.045	0.063	0.101
u	0.003	0.003	0.026	0.013	0.041	0.115	0.383	0.060	0.073	0.164	0.120
ubar	0.003	0.003	0.014	0.023	0.118	0.038	0.066	0.378	0.161	0.076	0.121
d	0.003	0.003	0.016	0.023	0.098	0.084	0.087	0.221	0.269	0.073	0.123
dbar	0.003	0.003	0.026	0.015	0.084	0.098	0.225	0.082	0.069	0.272	0.122
g	0.022	0.020	0.037	0.035	0.074	0.068	0.064	0.059	0.050	0.049	0.520

- ParT TDR RecoID70: 0.5319
- PN TDR TruthID: 0.5486
- PN TDR RecoID70: 0.5075
- PN TDR RecoID70Charged: 0.4952
- PN CDR TruthID: 0.5285

Results from YF



PN TDR TruthID

Truth	b	bbar	c	cbar	s	sbar	u	ubar	d	dbar	g
b	0.732	0.173	0.034	0.026	0.004	0.003	0.002	0.003	0.002	0.001	0.021
bbar	0.160	0.744	0.026	0.034	0.003	0.004	0.003	0.002	0.001	0.002	0.020
c	0.015	0.015	0.736	0.057	0.036	0.030	0.025	0.008	0.009	0.016	0.052
cbar	0.014	0.016	0.055	0.737	0.030	0.036	0.009	0.025	0.016	0.009	0.052
s	0.003	0.003	0.022	0.019	0.544	0.099	0.029	0.079	0.063	0.042	0.097
sbar	0.002	0.004	0.020	0.022	0.099	0.544	0.082	0.027	0.044	0.059	0.098
u	0.002	0.003	0.021	0.012	0.042	0.130	0.375	0.053	0.085	0.163	0.114
ubar	0.003	0.003	0.011	0.021	0.130	0.041	0.060	0.356	0.184	0.075	0.115
d	0.003	0.003	0.013	0.021	0.109	0.090	0.083	0.210	0.281	0.072	0.117
dbar	0.002	0.003	0.020	0.013	0.090	0.109	0.229	0.076	0.082	0.258	0.117
g	0.021	0.023	0.034	0.034	0.075	0.075	0.065	0.064	0.052	0.050	0.507

PN CDR TruthID

Truth	b	bbar	c	cbar	s	sbar	u	ubar	d	dbar	g
b	0.732	0.173	0.034	0.026	0.004	0.003	0.002	0.003	0.002	0.001	0.021
bbar	0.160	0.744	0.026	0.034	0.003	0.004	0.003	0.002	0.001	0.002	0.020
c	0.015	0.015	0.736	0.057	0.036	0.030	0.025	0.008	0.009	0.016	0.052
cbar	0.014	0.016	0.055	0.737	0.030	0.036	0.009	0.025	0.016	0.009	0.052
s	0.003	0.003	0.022	0.019	0.544	0.099	0.029	0.079	0.063	0.042	0.097
sbar	0.002	0.004	0.020	0.022	0.099	0.544	0.082	0.027	0.044	0.059	0.098
u	0.002	0.003	0.021	0.012	0.042	0.130	0.375	0.053	0.085	0.163	0.114
ubar	0.003	0.003	0.011	0.021	0.130	0.041	0.060	0.356	0.184	0.075	0.115
d	0.003	0.003	0.013	0.021	0.109	0.090	0.083	0.210	0.281	0.072	0.117
dbar	0.002	0.003	0.020	0.013	0.090	0.109	0.229	0.076	0.082	0.258	0.117
g	0.021	0.023	0.034	0.034	0.075	0.075	0.065	0.064	0.052	0.050	0.507

ParT TDR RecoID70

Truth	b	bbar	c	cbar	s	sbar	u	ubar	d	dbar	g
b	0.755	0.152	0.035	0.023	0.004	0.002	0.002	0.003	0.002	0.001	0.021
bbar	0.172	0.731	0.027	0.034	0.003	0.003	0.003	0.002	0.001	0.002	0.021
c	0.016	0.014	0.749	0.053	0.034	0.025	0.026	0.008	0.008	0.015	0.052
cbar	0.017	0.015	0.058	0.740	0.028	0.032	0.010	0.024	0.015	0.008	0.053
s	0.003	0.003	0.027	0.022	0.529	0.092	0.032	0.082	0.067	0.043	0.100
sbar	0.003	0.003	0.024	0.027	0.092	0.525	0.090	0.028	0.045	0.063	0.101
u	0.003	0.003	0.026	0.013	0.041	0.115	0.383	0.060	0.073	0.164	0.120
ubar	0.003	0.003	0.014	0.023	0.118	0.038	0.066	0.378	0.161	0.076	0.121
d	0.003	0.003	0.016	0.023	0.098	0.084	0.087	0.221	0.269	0.073	0.123
dbar	0.003	0.003	0.026	0.015	0.084	0.098	0.225	0.082	0.069	0.272	0.122
g	0.022	0.020	0.037	0.035	0.074	0.068	0.064	0.059	0.050	0.049	0.520

PN TDR RecoID70Charged

Truth	b	bbar	c	cbar	s	sbar	u	ubar	d	dbar	g
b	0.750	0.153	0.027	0.033	0.004	0.003	0.002	0.004	0.002	0.002	0.021
bbar	0.149	0.754	0.032	0.027	0.003	0.004	0.003	0.002	0.002	0.002	0.022
c	0.013	0.016	0.712	0.058	0.028	0.033	0.038	0.008	0.010	0.026	0.058
cbar	0.017	0.012	0.056	0.714	0.035	0.028	0.008	0.038	0.024	0.010	0.057
s	0.002	0.002	0.020	0.026	0.422	0.083	0.027	0.146	0.095	0.062	0.116
sbar	0.002	0.002	0.026	0.020	0.085	0.422	0.143	0.027	0.058	0.100	0.114
u	0.001	0.002	0.030	0.012	0.045	0.158	0.363	0.036	0.065	0.163	0.125
ubar	0.002	0.002	0.012	0.029	0.158	0.044	0.037	0.363	0.163	0.065	0.127
d	0.002	0.002	0.014	0.029	0.130	0.087	0.053	0.243	0.224	0.084	0.132
dbar	0.002	0.002	0.029	0.015	0.090	0.127	0.242	0.053	0.085	0.225	0.130
g	0.015	0.015	0.035	0.036	0.076	0.076	0.072	0.071	0.052	0.053	0.499