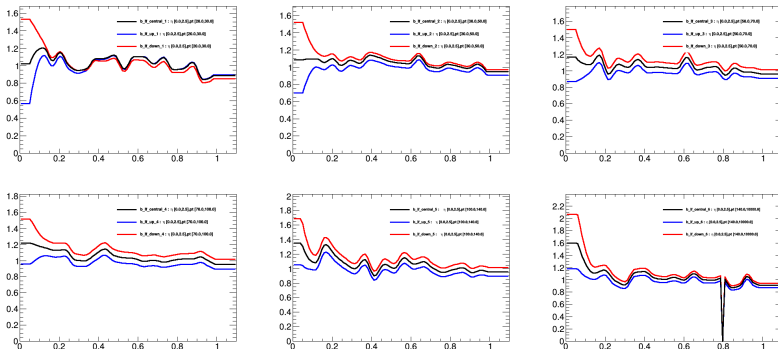


BShape calibration

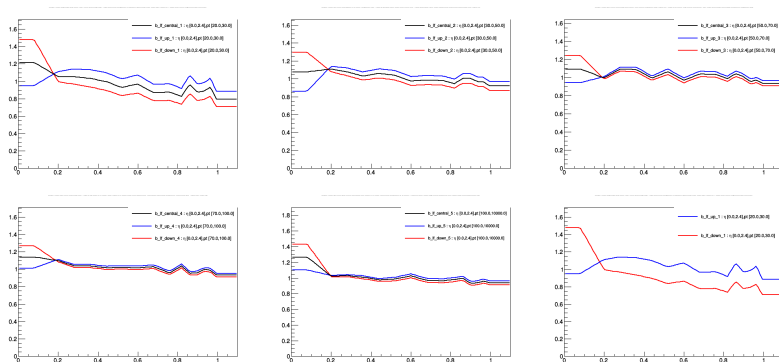
- The SF depends on Jet pt, eta, bscore and hadronFlavour.
- 9 variations
 - jes
 - hf, lf
 - hf/lf stats1/2
 - cferr1/2
- phase space extrapolation factor(PSEF) : this is to make sure the shape scale factor will not change the expected yield. It is derived by $\sum_i w_{gen} / \sum_i (w_{gen} * w_{btag})$ after a preselection.
- Normalization : for a event i ,
$$w_i = lumi * CrossSection * \frac{w_{gen} * SF}{\sum w_{gen}} * PSEF$$
- We need to understand whether we need $\sum_i w_{gen} / \sum_i (w_{gen} * w_{btag \text{ up/down}})$ to make the normalization unchange when do up/down variation.
- Let's take a two-event example in tttt sample.

SF and If variation on truth b-jet



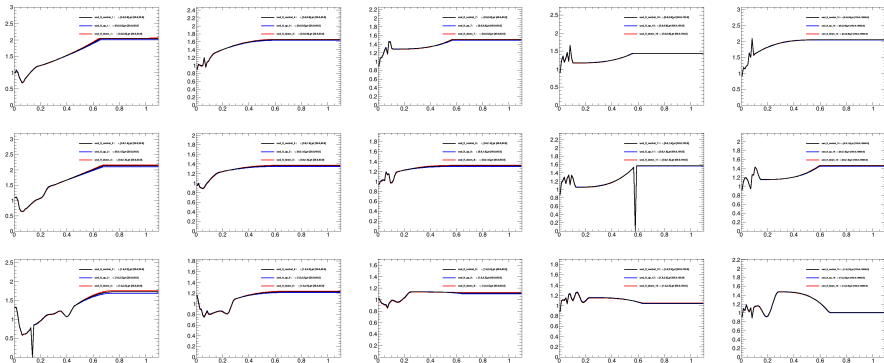
- The uncertainty band looks like a flat scale up and down and will change the normalization.
- It is not exact what we expect for shape calibration.

SF and uncertainty in preUL csv file



- These curves make more sense to me. e.g. the up curve scales the high bscore region up and scales low bscore region down.

SF and If variation on truth light jet



Two example event in 1Tau1L category

jet index	pt	eta	bscore	hadronFlavour	central	up_lf	down_hf
0	500.400	-0.648	0.056	0	1.433	1.435	1.429
1	233.196	0.624	0.062	0	0.943	0.945	0.939
2	120.172	-2.303	0.031	0	1.039	1.043	1.034
3	97.118	1.388	0.947	5	0.966	0.906	1.026
4	68.109	-1.218	0.009	5	1.063	0.785	1.380
5	52.427	0.244	0.726	5	0.997	0.937	1.053
6	50.547	-0.121	0.087	4	1.000	1.000	1.000
summary	-	-	-	-	1.436	0.943	2.069
divided by central SF	-	-	-	-	1.000	0.657	1.441

jet index	pt	eta	bscore	hadronFlavour	central	up_lf	down_hf
0	146.199	0.800	0.025	0	1.102	1.104	1.099
1	134.139	-2.109	0.995	5	0.957	0.899	1.015
2	128.707	-1.369	0.007	0	0.965	0.967	0.963
3	103.150	1.258	0.999	5	0.957	0.899	1.015
4	61.591	-0.944	0.006	0	0.973	0.975	0.969
5	61.012	-0.366	0.044	5	1.063	0.785	1.380
6	29.044	-1.686	0.037	0	1.052	1.056	1.044
7	26.158	-0.820	0.479	5	0.987	0.972	0.973
summary	-	-	-	-	1.501	0.639	3.071
divided by central SF	-	-	-	-	1.000	0.426	2.046

- The error band is mainly from the truth b-jet at low bscore region.
- Currently we apply same phase space extrapolation factor for central, up and down SF. As a result, the normalization changes a lot.

If I use the preUL csv file

jet index	pt	eta	bscore	hadronFlavour	central	up_lf	down_hf
0	500.400	-0.648	0.056	0	1.101	1.104	1.098
1	233.196	0.624	0.062	0	1.087	1.091	1.084
2	120.172	-2.303	0.031	0	1.039	1.040	1.038
3	97.118	1.388	0.947	5	0.993	1.014	0.971
4	68.109	-1.218	0.009	5	1.095	0.944	1.247
5	52.427	0.244	0.726	5	1.037	1.067	1.007
6	50.547	-0.121	0.087	4	1.000	1.000	1.000
summary	-	-	-	-	1.402	1.279	1.506
divided by central SF	-	-	-	-	1.000	0.912	1.074

jet index	pt	eta	bscore	hadronFlavour	central	up_lf	down_hf
0	146.199	0.800	0.025	0	1.049	1.050	1.048
1	134.139	-2.109	0.995	5	0.938	0.963	0.912
2	128.707	-1.369	0.007	0	0.977	0.977	0.977
3	103.150	1.258	0.999	5	0.937	0.963	0.912
4	61.591	-0.944	0.006	0	0.977	0.977	0.977
5	61.012	-0.366	0.044	5	1.095	0.944	1.247
6	29.044	-1.686	0.037	0	1.061	1.062	1.060
7	26.158	-0.820	0.479	5	0.964	1.064	0.865
summary	-	-	-	-	1.381	1.266	1.434
divided by central SF	-	-	-	-	1.000	0.917	1.038