

The list of all systematic uncertainties for the semi-leptonic channels as output by the ROOT file.
The alias “shift” can stand for “up” or “down”, respectively.

All systematics marked in red are outdated and **should not be used anymore**.

All systematics highlighted in orange **should also not be used** since the 3 njets categories from the SM HTT analysis are merged into just 2 njets categories in case of the LQ analysis, i.e. it is an artefact.

nSysts = 105

These 6 uncertainties refer to the 6 nuisance parameters referred to as “FF correction (syst.)” in the table below. They stem from the closure and bias correction of the individual FF components (W+jets, ttbar, QCD). Down shifts are calculated by not applying the respective correction and up shifts are calculated by applying the correction twice. Plots of the corrections can be found in Figs. A6/7 A14/15 A22/23 of my thesis.

| | |
|-----------------------------|--------------------------------------|
| ff_corr_qcd_muiso_shift | -> no normalisation to nominal yield |
| ff_corr_qcd_mvis_shift | -> no normalisation to nominal yield |
| ff_corr_qcd_mvis_osss_shift | -> no normalisation to nominal yield |
| ff_corr_tt_syst_shift | -> no normalisation to nominal yield |
| ff_corr_w_lepPt_shift | -> no normalisation to nominal yield |
| ff_corr_w_mt_shift | -> no normalisation to nominal yield |

This uncertainty is referred to as “fractions” in the table below

ff_frac_w_shift -> no normalisation to nominal yield

ff_fracqcd
ff_fractt
ff_fracw
ff_onlyqcd
ff_onlytt
ff_onlyw

The 2 uncertainties in use refer to the 2 nuisance parameters referred to as “raw FF measurement (stat.)” under QCD multijet in the table below. They stem from the stat. uncertainties in the raw FF measurement. The up/down variations are morphed as explained in Section 8.2.4. of my thesis (see also Fig. 8.32). There are two of them corresponding to the two njets categories. Corresponding plots are shown in Figs. A3/11/19 of my thesis.

ff_qcd_dr0_njet0_morphed_stat_shift
ff_qcd_dr0_njet0_stat_shift
ff_qcd_dr0_njet1_morphed_stat_shift
ff_qcd_dr0_njet1_stat_shift
ff_qcd_dr0_njet2_morphed_stat_shift
ff_qcd_dr0_njet2_stat_shift
ff_qcd_dr1_njet0_stat_shift
ff_qcd_dr1_njet1_stat_shift

This uncertainty comes from varying the MC contributions subtracted in the determination of the raw QCD FF. It appears in “MC subtraction” under QCD multijet in the table below.

ff_qcd_mc_shift -> no normalisation to nominal yield

The 3 uncertainties in use refer to the 3 nuisance parameters referred to as “Ff correction (stat.)” under QCD multijet in the table below. They stem from the stat. uncertainties in the 3 corrections applied to the raw QCD FF (one closure and two bias corrections). The up/down variations are morphed as explained in Section 8.2.4. of my thesis (see also Fig. 8.32) - even though `_morphed_` is not part of the naming.

Corresponding plots are shown in Figs. A6/7 A14/15 A22/23 (middle row) of my thesis

`ff_qcd_muiso_shift`
`ff_qcd_mvis_shift`
`ff_qcd_mvis_osss_shift`
`ff_qcd_stat_shift`
`ff_qcd_syst_shift`

The uncertainty in use refers to the one nuisance parameter referred to as “raw Ff measurement (stat.)” under `ttbar` in the table below. It stems from the stat. uncertainties in the raw FF measurement. The up/down variations are morphed as explained in Section 8.2.4. of my thesis (see also Fig. 8.32).

There is only one because only a single `njets` category is used for `ttbar`.

Corresponding plots are shown in Figs. A4/12/20 of my thesis.

`ff_tt_dr0_njet0_morphed_stat_shift`
`ff_tt_dr0_njet0_stat_shift`
`ff_tt_dr0_njet1_morphed_stat_shift`
`ff_tt_dr0_njet1_stat_shift`
`ff_tt_dr1_njet0_stat_shift`
`ff_tt_dr1_njet1_stat_shift`

The uncertainty in use refers to the one nuisance parameter referred to as “Ff correction (stat.)” under `ttbar` in the table below. It stems from the stat. uncertainties in the closure correction applied to the raw `ttbar` FF. The up/down variations are morphed as explained in Section 8.2.4. of my thesis (see also Fig. 8.32).

Corresponding plots are shown in Figs. A6/7 A14/15 A22/23 (bottom row) of my thesis

`ff_tt_morphed_shift`
`ff_tt_sf_shift`
`ff_tt_stat_shift`
`ff_tt_syst_shift`

The 4 uncertainties in use refer to the 4 nuisance parameters referred to as “raw Ff measurement (stat.)” under `W+jets` in the table below. They stem from the stat. uncertainties in the raw FF measurement. The up/down variations are morphed as explained in Section 8.2.4. of my thesis (see also Fig. 8.32).

There are four of them corresponding to the two `njets` categories times two `dR` categories. Corresponding plots are shown in Figs. A1/2 A9/10 A17/18 of my thesis.

`ff_w_dr0_njet0_morphed_stat_shift`
`ff_w_dr0_njet0_stat_shift`
`ff_w_dr0_njet1_morphed_stat_shift`
`ff_w_dr0_njet1_stat_shift`
`ff_w_dr0_njet2_morphed_stat_shift`
`ff_w_dr0_njet2_stat_shift`

ff_w_dr1_njet0_morphed_stat_shift
ff_w_dr1_njet0_stat_shift
ff_w_dr1_njet1_morphed_stat_shift
ff_w_dr1_njet1_stat_shift
ff_w_dr1_njet2_morphed_stat_shift
ff_w_dr1_njet2_stat_shift

This uncertainty refers to one of the nuisance parameter referred to as “F_F correction (stat.)” under W+jets in the table below. It stems from the stat. uncertainties in the closure correction applied to the raw W+jets FF. The up/down variations are morphed as explained in Section 8.2.4. of my thesis (see also Fig. 8.32) - even though _morphed_ is not part of the naming. Corresponding plots are shown in Figs. A6/7 A14/15 A22/23 (top left) of my thesis

ff_w_lepPt_shift

This uncertainty comes from varying the MC contributions subtracted in the determination of the raw W+jets FF. It appears in “MC subtraction” under W+jets in the table below.

ff_w_mc_shift -> no normalisation to nominal yield

ff_w_mc_lepPt_shift

This uncertainty refers to one of the nuisance parameter referred to as “F_F correction (stat.)” under W+jets in the table below. It stems from the stat. uncertainties in the bias correction applied to the raw W+jets FF. The up/down variations are morphed as explained in Section 8.2.4. of my thesis (see also Fig. 8.32) - even though _morphed_ is not part of the naming. Corresponding plots are shown in Figs. A6/7 A14/15 A22/23 (top right) of my thesis

ff_w_mt_shift

ff_w_stat_shift
ff_w_syst_shift

| source | W+jets | tt | QCD multijet | Total | Yield normalization |
|--|--------|----|--------------|-------|---------------------|
| raw F _F measurement (stat.) | 4 | 1 | 2 | 7 | yes |
| F _F correction (stat.) | 2 | 1 | 3 | 6 | yes |
| F _F correction (syst.) | 2 | 1 | 3 | 6 | no |
| MC subtraction | 1 | 0 | 1 | 2 | no |
| fractions | 1 | 0 | 0 | 1 | no |