Follow-up regarding ggF uncertainty recommendations

Recap: “WG1 scheme”

Cross sections and fractional uncertainties

STXS	sig	stat	mu	res	mig01	mig12	pTH	qm_b	qm_top	VBF	Tot
Incl	48.52	+/- 0.00	+4.6%	+2.2%	-0.0%	-0.0%	-0.1%	-0.2%	+0.2%	-0.0%	+5.1%
FWDH	4.29	+/- 0.05	+4.4%	+1.8%	-0.5%	-0.3%	-0.5%	-0.6%	+0.0%	+0.0%	+4.9%
VBF_J3V	0.26	+/- 0.01	+7.9%	+7.9%	+3.9%	+16.1%	-2.6%	-2.4%	+0.1%	-32.0%	+37.9%
VBF_J3	0.35	+/- 0.01	+7.9%	+7.9%	+3.9%	+16.1%	-0.7%	-0.9%	+0.2%	+23.5%	+30.8%
0J	27.21	+/- 0.13	+3.8%	+0.1%	-4.1%	+0.0%	+0.0%	-0.2%	+0.0%	+0.0%	+5.6%
1J_0-60	6.53	+/- 0.06	+5.2%	+4.5%	+7.9%	-6.8%	-4.5%	-3.9%	+0.0%	+0.0%	+13.9%
1J_60	4.51	+/- 0.05	+5.2%	+4.5%	+7.9%	-6.8%	+3.1%	+4.9%	+0.0%	+0.0%	+13.8%
1J_120	0.72	+/- 0.02	+5.2%	+4.5%	+7.9%	-6.8%	+14.0%	+5.0%	+0.5%	+0.0%	+19.5%
1J_200	0.15	+/- 0.01	+5.2%	+4.5%	+7.9%	-6.8%	+16.0%	+5.0%	+10.6%	+0.0%	+23.5%
2J_0-60	1.23	+/- 0.02	+7.9%	+7.9%	+3.9%	+16.1%	-7.4%	-7.2%	+0.0%	+0.0%	+22.4%
2J_60	1.85	+/- 0.03	+7.9%	+7.9%	+3.9%	+16.1%	-1.0%	-0.1%	+0.0%	+0.0%	+20.0%
2J_120	0.98	+/- 0.02	+7.9%	+7.9%	+3.9%	+16.1%	+6.8%	+5.0%	+0.7%	+0.0%	+21.7%
2J_200	0.43	+/- 0.01	+7.9%	+7.9%	+3.9%	+16.1%	+15.5%	+5.0%	+12.0%	+0.0%	+28.4%
=0J	30.09	+/- 0.13	+3.8%	+0.1%	-4.1%	+0.0%	+0.0%	-0.2%	+0.0%	+0.0%	+5.6%
=1J	12.97	+/- 0.08	+5.2%	+4.5%	+7.9%	-6.8%	-0.3%	+0.0%	+0.2%	+0.0%	+12.5%
>=2J	5.47	+/- 0.05	+7.9%	+7.9%	+3.9%	+16.1%	+0.1%	-0.7%	+1.1%	-0.0%	+20.0%
>=1J 60-200	9.07	+/- 0.06	+6.2%	+5.8%	+6.4%	+1.9%	+3.4%	+3.7%	+0.1%	+0.1%	+11.9%
>=1J 120-200	1.93	+/- 0.03	+6.8%	+6.5%	+5.5%	+7.1%	+9.6%	+5.0%	+0.6%	+0.5%	+17.0%
>=1J >200	0.59	+/- 0.01	+7.2%	+7.0%	+5.0%	+10.1%	+15.6%	+5.0%	+11.5%	-0.0%	+25.1%
>=1J >60	9.66	+/- 0.07	+6.3%	+5.8%	+6.3%	+2.4%	+4.2%	+3.8%	+0.8%	+0.1%	+12.3%
>=1J >120	2.52	+/- 0.03	+6.9%	+6.6%	+5.4%	+7.8%	+11.0%	+5.0%	+3.2%	+0.4%	+18.4%
>=1	18.43	+/- 0.09	+6.0%	+5.5%	+6.7%	-0.0%	-0.2%	-0.2%	+0.4%	-0.0%	+10.6%

The “WG1 scheme” is presented in the first contribution on the agenda: indico/event/618048/

Recap: “STXS scheme”

Cross sections and fractional uncertainties

STXS	sig	stat	mu	res	mig01	mig12	D60	D120	D200	VBF	Tot
Incl	48.52	+/- 0.00	+4.6%	+2.2%	-0.0%	-0.0%	-0.0%	-0.0%	+0.2%	-0.0%	+5.1%
FWDH	4.29	+/- 0.05	+4.4%	+1.8%	-0.5%	-0.3%	-0.6%	-0.2%	+0.1%	+0.0%	+4.9%
VBF_J3V	0.26	+/- 0.01	+7.9%	+7.9%	+3.9%	+16.1%	+1.4%	+0.6%	+0.0%	-32.0%	+37.7%
VBF_J3	0.35	+/- 0.01	+7.9%	+7.9%	+3.9%	+16.1%	+4.0%	+2.0%	+0.0%	+23.5%	+31.1%
0J	27.21	+/- 0.13	+3.8%	+0.1%	-4.1%	+0.0%	+0.0%	+0.0%	+0.0%	+0.0%	+5.6%
1J_0-60	6.53	+/- 0.06	+5.2%	+4.5%	+7.9%	-6.8%	-12.1%	-1.3%	+0.0%	+0.0%	+17.5%
1J_60	4.51	+/- 0.05	+5.2%	+4.5%	+7.9%	-6.8%	+11.6%	-1.3%	+0.0%	+0.0%	+17.1%
1J_120	0.72	+/- 0.02	+5.2%	+4.5%	+7.9%	-6.8%	+11.6%	+10.5%	+0.0%	+0.0%	+20.0%
1J_200	0.15	+/- 0.01	+5.2%	+4.5%	+7.9%	-6.8%	+0.1%	+0.0%	+14.2%	+0.0%	+19.0%
2J_0-60	1.23	+/- 0.02	+7.9%	+7.9%	+3.9%	+16.1%	-12.1%	-1.3%	+0.0%	+0.0%	+23.3%
2J_60	1.85	+/- 0.03	+7.9%	+7.9%	+3.9%	+16.1%	+11.6%	-1.3%	+0.0%	+0.0%	+23.1%
2J_120	0.98	+/- 0.02	+7.9%	+7.9%	+3.9%	+16.1%	+11.6%	+10.5%	+0.0%	+0.0%	+25.3%
2J_200	0.43	+/- 0.01	+7.9%	+7.9%	+3.9%	+16.1%	+0.0%	+0.0%	+14.3%	+0.0%	+24.5%
=0J	30.09	+/- 0.13	+3.8%	+0.1%	-4.1%	+0.0%	+0.0%	+0.0%	+0.0%	+0.0%	+5.6%
=1J	12.97	+/- 0.08	+5.2%	+4.5%	+7.9%	-6.8%	-1.7%	-0.6%	+0.2%	+0.0%	+12.6%
>=2J	5.47	+/- 0.05	+7.9%	+7.9%	+3.9%	+16.1%	+3.7%	+1.3%	+1.1%	-0.0%	+20.4%
>=1J 60-200	9.07	+/- 0.06	+6.2%	+5.8%	+6.4%	+1.9%	+11.6%	+1.2%	+0.0%	+0.1%	+15.9%
>=1J 120-200	1.93	+/- 0.03	+6.8%	+6.5%	+5.5%	+7.1%	+11.6%	+10.5%	+0.0%	+0.5%	+20.4%
>=1J >200	0.59	+/- 0.01	+7.2%	+7.0%	+5.0%	+10.1%	+0.0%	+0.0%	+14.3%	-0.0%	+20.8%
>=1J >60	9.66	+/- 0.07	+6.3%	+5.8%	+6.3%	+2.4%	+10.9%	+1.1%	+0.9%	+0.1%	+15.5%
>=1J >120	2.52	+/- 0.03	+6.9%	+6.6%	+5.4%	+7.8%	+8.9%	+8.0%	+3.4%	+0.4%	+18.3%
>=1	18.43	+/- 0.09	+6.0%	+5.5%	+6.7%	-0.0%	-0.1%	-0.0%	+0.5%	-0.0%	+10.6%

The “STXS scheme” is presented in Kerstin’s contribution on the agenda: indico/event/618048/
The evaluation of the uncertainties are in the discussion entry on the agenda.

1. Follow-up on jet bins uncertainties

- **The VBF region**
  - For now, still use uncertainties derived as documented in Section 8.3 of YR3 (1307.1347). The associated ggF uncertainty tool was used using shapes from the MC used for central (Powheg NNLOPS) with the STXS VBF selection. Uncertainties are coming from MCFM (as described in YR3).
  - **New**: The VBF region now has it's 2-jet uncertainty uncorrelated from the other jet bins (following comment by M. Duehrssen and following brief discussion during meeting)
  - **Ongoing**: results are being derived by Gionata: Higgs+3j @NLO. Might replace current VBF uncertainties. Will at least be used for cross checks.
- **New: Uncertainty correlation matrices**
- **New: Cross checks using the jet veto efficiency method (JVE)**
  - Comparing both total uncertainty and uncertainty correlation

Note: both the "WG1" scheme and "STXS" scheme treat the jet bins the same way. Hence no need to compare these when looking at jet bins only.

The VBF region

Table 1.19: Predited cross sections for $gg \to H$ with VBF topology. The QCD uncertainties shown for POWHEG NNLOPS are not valid (the third jet is from the showering). Fixed order NLO predictions with two and three jets are provided by GOSAM+SHERPA. The last two rows show result from normalizing the inclusive cross section to 46.18 pb.

	$m_{jj} > 400$ GeV, $\Delta y_{jj} > 2.8$			$m_{jj} > 600$ GeV, $\Delta y_{jj} > 4.0$		
		$p_{T,j3}$ / GeV			$p_{T,j3}$ / GeV	
Prediction	no jet veto	< 30	> 30	no jet veto	< 30	> 30
POWHEG NNLOPS	653^{+86}_{-86} fb	435^{+54}_{-54} fb	218^{+32}_{-32} fb	283^{+36}_{-36} fb	198^{+24}_{-24} fb	85^{+12}_{-12} fb
aMCNLO MG5	512^{+152}_{-133} fb	329^{+92}_{-84} fb	–	214^{+62}_{-57} fb	142^{+39}_{-37} fb	–
HJJ@NLO	610^{+74}_{-120} fb	435^{+0}_{-70} fb	–	268^{+32}_{-55} fb	195^{+0}_{-31} fb	–
HJJJ@NLO	–	–	240^{+17}_{-54} fb	–	–	97^{+5}_{-22} fb
NNLOPS, $k = 1.05$	683^{+90}_{-90} fb	455^{+57}_{-57} fb	228^{+33}_{-33} fb	296^{+38}_{-38} fb	207^{+25}_{-25} fb	89^{+13}_{-13} fb
MG5, $k = 1.41$	721^{+214}_{-188} fb	463^{+129}_{-118} fb	–	302^{+87}_{-80} fb	200^{+55}_{-52} fb	–

- From YR4:
  Powheg NNLOPS about 10% above GoSam+Sherpa in inclusive VBF 2j region
- New GoSam+Sherpa predictions using STXS Stage-1 VBF topology cuts gives
  - Difference to YR4 cuts:
    1. $|y_H| < 2.5$
    2. $p_{TH} < 200$ GeV
    3. $p_T(j3) = 30$ GeV threshold → $p_T(Hjj) = 25$ GeV
- Note: $p_{T,Hjj}$ cut at 25 GeV very challenging theoretically!

HJJ@NLO

$$\sigma_{\geq 2j,\text{VBF cuts}} = 0.56^{+0.08}_{-0.12}$$

$$\sigma_{\geq 2j,\text{VBF 3jv}} = 0.35^{+0.0}_{-0.11}$$

$$\sigma_{\geq 2j,\text{VBF 3j}} = 0.21^{+0.19}_{-0.10}$$

VBF topo region	GoSam+Sherpa	NNLOPS	Rel. diff.
≥2 jets	(0.56 ± 0.12) pb	0.63 pb	+12.5%
$p_T(Hjj) < 25$ GeV	(0.35 ± 0.11) pb	0.27 pb	-23%
$p_T(Hjj) > 25$ GeV	(0.21 ± 0.19) pb	0.36 pb	(+71%)

Similar to YR4 results.

HJJ@NLO w big error. Waiting for HJJJ@NLO

Quark mass effects and EW correction (+5%) accounted for by simply scale factors

The VBF region

Table 1.19: Predited cross sections for $gg \to H$ with VBF topology. The QCD uncertainties shown for POWHEG NNLOPS are not valid (the third jet is from the showering). Fixed order NLO predictions with two and three jets are provided by GOSAM+SHERPA. The last two rows show result from normalizing the inclusive cross section to 46.18 pb.

	$m_{jj} > 400$ GeV, $\Delta y_{jj} > 2.8$			$m_{jj} > 600$ GeV, $\Delta y_{jj} > 4.0$		
		$p_{T,j3}$ / GeV			$p_{T,j3}$ / GeV	
Prediction	no jet veto	< 30	> 30	no jet veto	< 30	> 30
POWHEG NNLOPS	653^{+86}_{-86} fb	435^{+54}_{-54} fb	218^{+32}_{-32} fb	283^{+36}_{-36} fb	198^{+24}_{-24} fb	85^{+12}_{-12} fb
aMCNLO MG5	512^{+152}_{-133} fb	329^{+92}_{-84} fb	–	214^{+62}_{-57} fb	142^{+39}_{-37} fb	–
HJJ@NLO	610^{+74}_{-120} fb	435^{+0}_{-70} fb	–	268^{+32}_{-55} fb	195^{+0}_{-31} fb	–
HJJJ@NLO	–	–	240^{+17}_{-54} fb	–	–	97^{+5}_{-22} fb
NNLOPS, $k = 1.05$	683^{+90}_{-90} fb	455^{+57}_{-57} fb	228^{+33}_{-33} fb	296^{+38}_{-38} fb	207^{+25}_{-25} fb	89^{+13}_{-13} fb
MG5, $k = 1.41$	721^{+214}_{-188} fb	463^{+129}_{-118} fb	–	302^{+87}_{-80} fb	200^{+55}_{-52} fb	–

- From YR4:
  Powheg NNLOPS about 10% above GoSam+Sherpa in inclusive VBF 2j region
- New GoSam+Sherpa predictions using STXS Stage-1 VBF topology cuts gives
  - Difference to YR4 cuts:
    1. $|y_H| < 2.5$
    2. $p_{TH} < 200$ GeV
    3. $p_T(j3) = 30$ GeV threshold → $p_T(Hjj) = 25$ GeV
- Note: $p_{T,Hjj}$ cut at 25 GeV very challenging theoretically!

HJJ@NLO

$$\sigma_{\geq 2j,\text{VBF cuts}} = 0.56^{+0.08}_{-0.12}$$

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$$\sigma_{\geq 2j,\text{VBF 3j}} = 0.21^{+0.19}_{-0.10}$$

VBF topo region	GoSam+Sherpa	NNLOPS	Rel. diff.
≥2 jets	(0.56 ± 0.12) pb	0.63 pb	+12.5%
$p_T(Hjj) < 25$ GeV	(0.35 ± 0.11) pb	0.27 pb	-23%
$p_T(Hjj) > 25$ GeV	(0.21 ± 0.19) pb	0.36 pb	(+71%)
$p_T(Hjj) > 25$ GeV	(0.292 ± 0.069) pb	0.36 pb	+23%

Similar to YR4 results.

HJJ@NLO w big error. Waiting for HJJJ@NLO

HJJJ@NLO very prelim!

Jet bins

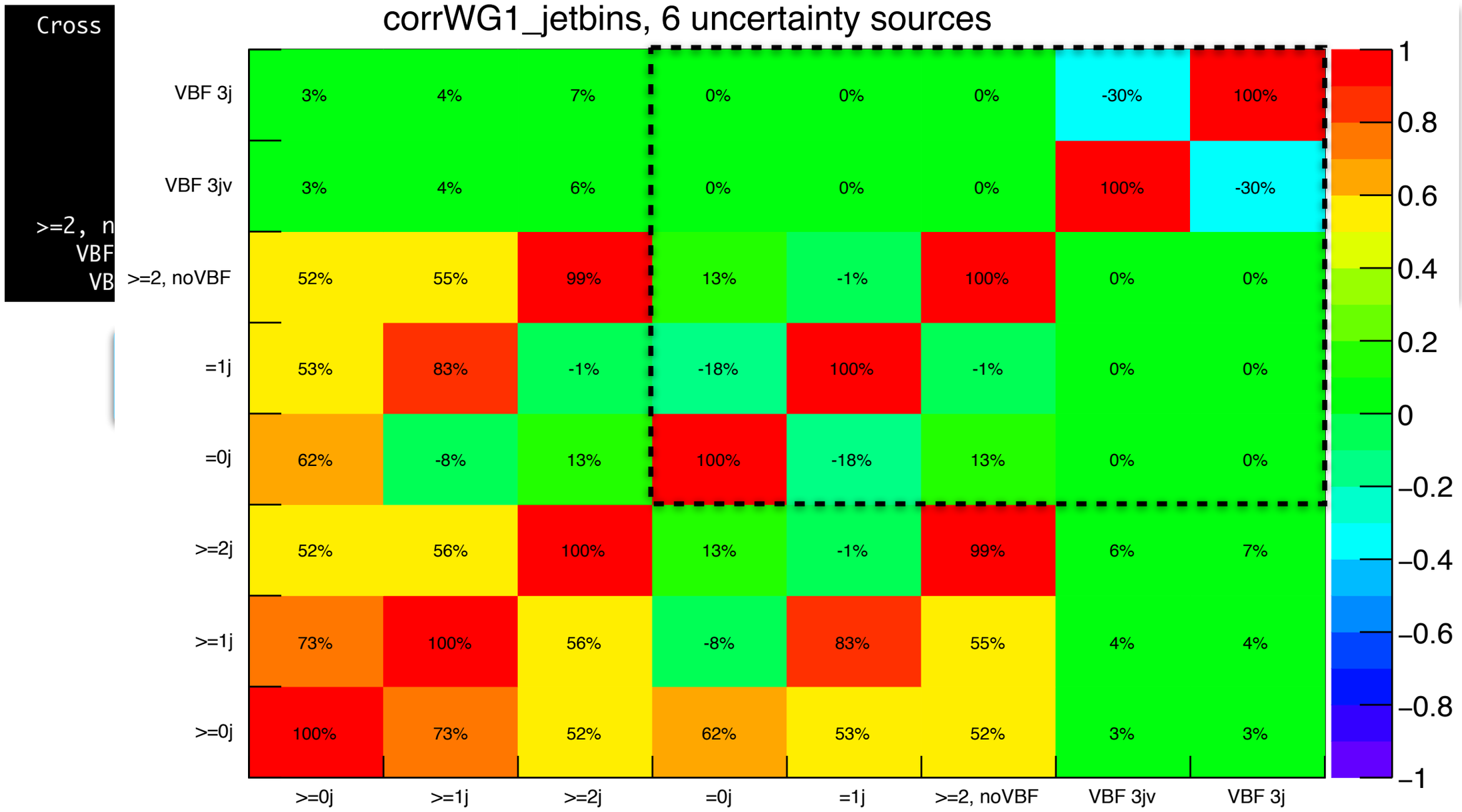
Cross sections and fractional uncertainties

STXS	sig	stat	mu	res	mig01	mig12	VBF2j	VBF3j	pTH	qm_top	Tot
>=0j	48.52	+/- 0.04	+4.6%	+2.1%	-0.0%	-0.0%	+0.3%	-0.0%	-0.1%	+0.2%	+5.1%
>=1j	18.40	+/- 0.02	+6.0%	+5.5%	+6.7%	-0.0%	+0.7%	-0.0%	-0.2%	+0.4%	+10.6%
>=2j	5.47	+/- 0.01	+7.8%	+7.8%	+3.9%	+16.1%	+2.3%	-0.0%	+0.1%	+1.1%	+20.1%
=0j	30.12	+/- 0.03	+3.8%	+0.1%	-4.1%	+0.0%	+0.0%	+0.0%	+0.0%	+0.0%	+5.6%
=1j	12.92	+/- 0.02	+5.2%	+4.5%	+7.9%	-6.8%	+0.0%	+0.0%	-0.3%	+0.2%	+12.5%
>=2, noVBF	4.84	+/- 0.01	+8.9%	+8.9%	+4.4%	+18.2%	+0.0%	+0.0%	+0.3%	+1.2%	+22.5%
VBF 3jv	0.27	+/- 0.00	+0.0%	+0.0%	+0.0%	+0.0%	+20.0%	-32.0%	-2.5%	+0.1%	+37.8%
VBF 3j	0.36	+/- 0.00	+0.0%	+0.0%	+0.0%	+0.0%	+20.0%	+23.5%	-0.9%	+0.2%	+30.9%

Exclusive bins

New VBF 2j source that makes the VBF bins uncorrelated with other (exclusive) jet bins

Jet bins



Resulting correlation matrix.

Cross check with JVE

- Since Powheg NNLOPS is used for central values, the central values of eps0 and eps1 is taken from there. These are:

$$\varepsilon_0 = \sigma_0/\sigma_{\geq 0} = 0.621$$

$$\varepsilon_1 = \sigma_1/\sigma_{\geq 1} = 0.703$$

- First cross check: choosing JVE uncertainties such that the total uncertainty becomes equal to the BLPTW uncertainties used in the “WG1 scheme”. This yields:

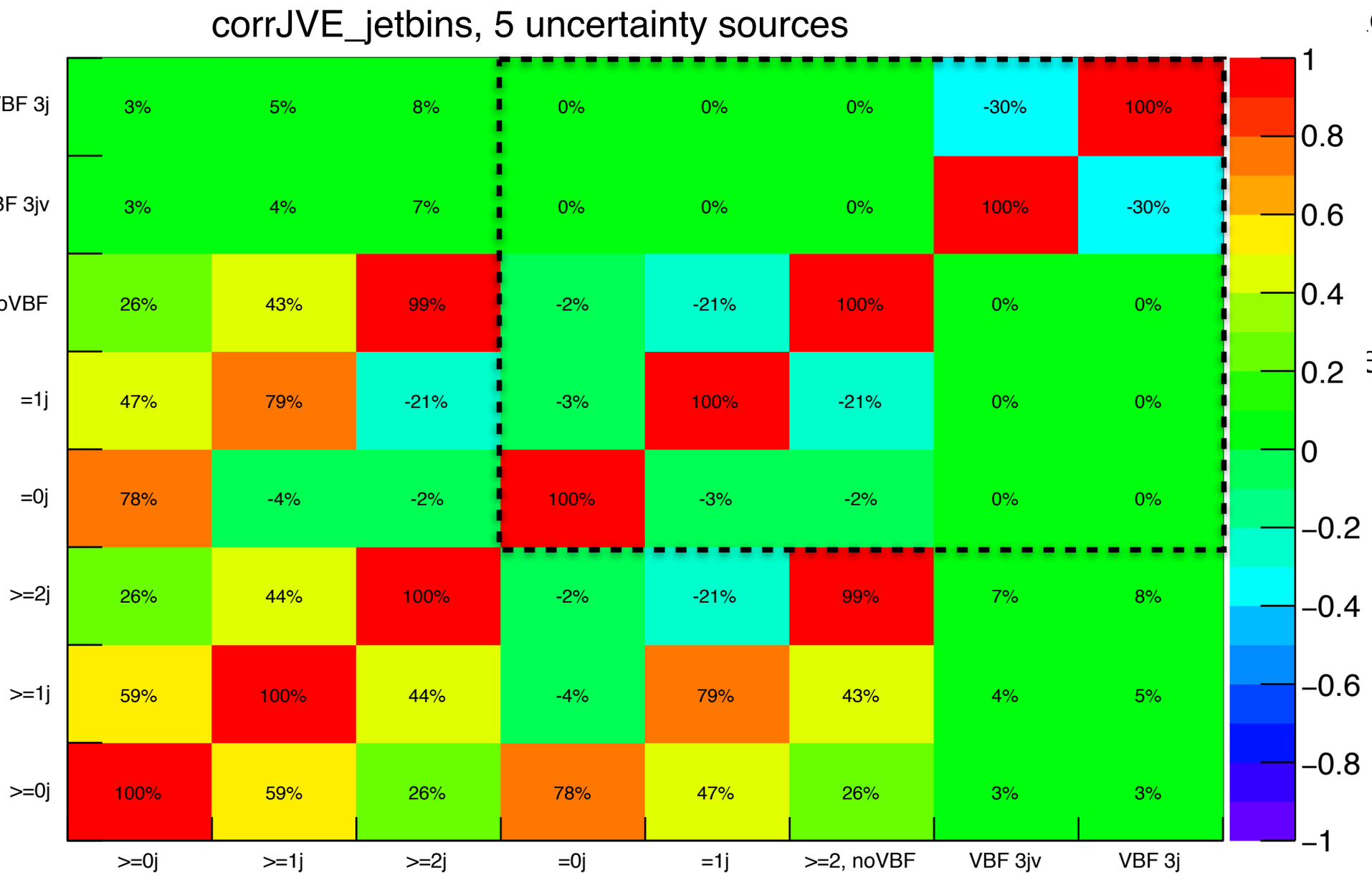
$$\Delta\sigma_{\text{incl}} = 2.48\,\text{pb}\ (5.1\%),\ \Delta\sigma_{0\to\geq 1} = \sigma_{\text{incl}}\Delta\varepsilon_0 = 1.25\ \text{pb},\ \Delta\sigma_{1\to\geq 2} = 0.88\ \text{pb}$$

Cross sections and fractional uncertainties

STXS	sig	stat	incl	mig01	mig12	VBF2j	VBF3j	pTH	qm_top	Tot
>=0j	48.52	+/- 0.04	+5.0%	-0.0%	-0.0%	+0.3%	-0.0%	-0.1%	+0.2%	+5.0%
>=1j	18.40	+/- 0.02	+4.9%	+6.8%	-0.0%	+0.7%	-0.0%	-0.2%	+0.4%	+8.4%
>=2j	5.47	+/- 0.01	+4.5%	+6.2%	+16.1%	+2.3%	-0.0%	+0.1%	+1.1%	+18.0%
=0j	30.12	+/- 0.03	+5.1%	-4.1%	+0.0%	+0.0%	+0.0%	+0.0%	+0.0%	+6.6%
=1j	12.92	+/- 0.02	+5.1%	+7.0%	-6.8%	+0.0%	+0.0%	-0.3%	+0.2%	+11.0%
>=2, noVBF	4.84	+/- 0.01	+5.1%	+7.0%	+18.1%	+0.0%	+0.0%	+0.3%	+1.2%	+20.2%
VBF 3jv	0.27	+/- 0.00	+0.0%	+0.0%	+0.0%	+20.0%	-32.0%	-2.5%	+0.1%	+37.8%
VBF 3j	0.36	+/- 0.00	+0.0%	+0.0%	+0.0%	+20.0%	+23.5%	-0.9%	+0.2%	+30.9%

Cross check with JVE

- Si
  ep
- Fi
  be
  Δ



Resulting correlation matrix.

Comparison using notation presented by Kerstin

"WG1"

BLPTW jet bin uncerts.

Fractional impact of each uncertainty source								
STXS	sig	stat	mu	res	mig01	mig12	VBF2j	VBF3j
Total abs uncertainty			2.25	1.04	1.25	0.88	0.13	0.08
>=0j	48.52 +/- 0.04		1.00	1.00	-0.01	-0.00	1.00	-0.02
>=1j	18.40 +/- 0.02		0.49	0.97	0.99	-0.00	1.00	-0.02
>=2j	5.47 +/- 0.01		0.19	0.41	0.17	1.00	1.00	-0.02
=0j	30.12 +/- 0.03		0.51	0.03	-1.00	0.00	0.00	0.00
=1j	12.92 +/- 0.02		0.30	0.56	0.82	-1.00	0.00	0.00
>=2, noVBF	4.84 +/- 0.01		0.19	0.41	0.17	1.00	0.00	0.00
VBF 3jv	0.27 +/- 0.00		0.00	0.00	0.00	0.00	0.43	-1.00
VBF 3j	0.36 +/- 0.00		0.00	0.00	0.00	0.00	0.57	1.00

Total uncertainty in pb

$(2.25 \oplus 1.04)$ pb = 2.48 pb

JVE

Fractional impact of each uncertainty source							
STXS	sig	stat	incl	mig01	mig12	VBF2j	VBF3j
Total abs uncertainty			2.48	1.25	0.88	0.13	0.08
>=0j	48.52 +/- 0.04		1.00	-0.00	-0.00	1.00	-0.02
>=1j	18.40 +/- 0.02		0.37	1.00	-0.00	1.00	-0.02
>=2j	5.47 +/- 0.01		0.10	0.27	1.00	1.00	-0.02
=0j	30.12 +/- 0.03		0.63	-1.00	0.00	0.00	0.00
=1j	12.92 +/- 0.02		0.27	0.73	-1.00	0.00	0.00
>=2, noVBF	4.84 +/- 0.01		0.10	0.27	1.00	0.00	0.00
VBF 3jv	0.27 +/- 0.00		0.00	0.00	0.00	0.43	-1.00
VBF 3j	0.36 +/- 0.00		0.00	0.00	0.00	0.57	1.00

Fractional impact of total uncertainty in each bin.
x and *z* etc in Kerstin's tables.
Extracted from MC.

Sign convention used: positive uncertainty (pull) means jettier/harder topology.

Second JVE comparison

- Uncertainty correlations fairly similar between JVE and BLPTW when using the same (absolute) migration uncertainties
  - JVE has stronger anti-correlation between =1 and >=2 jets (-21% vs -1% for BLTPW). BLTWP has more anti-corrlation between =0 and =1 jets (-18% vs -3%)
- Next comparing JVE with **N3LO** uncertainties: 3.9% for inclusive, and precise jet veto numbers derived by Pier+Fabrizio:

eps0 = 0.617 +- 0.012
eps1 = 0.681 +- 0.057

Cross sections and fractional uncertainties

STXS	sig	stat	mu	res	mig01	mig12	VBF2j	VBF3j	pTH	qm_top	Tot
>=0j	48.52	+/- 0.04	+4.6%	+2.1%	-0.0%	-0.0%	+0.3%	-0.0%	-0.1%	+0.2%	+5.1%
>=1j	18.40	+/- 0.02	+6.0%	+5.5%	+6.7%	-0.0%	+0.7%	-0.0%	-0.2%	+0.4%	+10.6%
>=2j	5.47	+/- 0.01	+7.8%	+7.8%	+3.9%	+16.1%	+2.3%	-0.0%	+0.1%	+1.1%	+20.1%
=0j	30.12	+/- 0.03	+3.8%	+0.1%	-4.1%	+0.0%	+0.0%	+0.0%	+0.0%	+0.0%	+5.6%
=1j	12.92	+/- 0.02	+5.2%	+4.5%	+7.9%	-6.8%	+0.0%	+0.0%	-0.3%	+0.2%	+12.5%
>=2, noVBF	4.84	+/- 0.01	+8.9%	+8.9%	+4.4%	+18.2%	+0.0%	+0.0%	+0.3%	+1.2%	+22.5%
VBF 3jv	0.27	+/- 0.00	+0.0%	+0.0%	+0.0%	+0.0%	+20.0%	-32.0%	-2.5%	+0.1%	+37.8%
VBF 3j	0.36	+/- 0.00	+0.0%	+0.0%	+0.0%	+0.0%	+20.0%	+23.5%	-0.9%	+0.2%	+30.9%

"WG1"

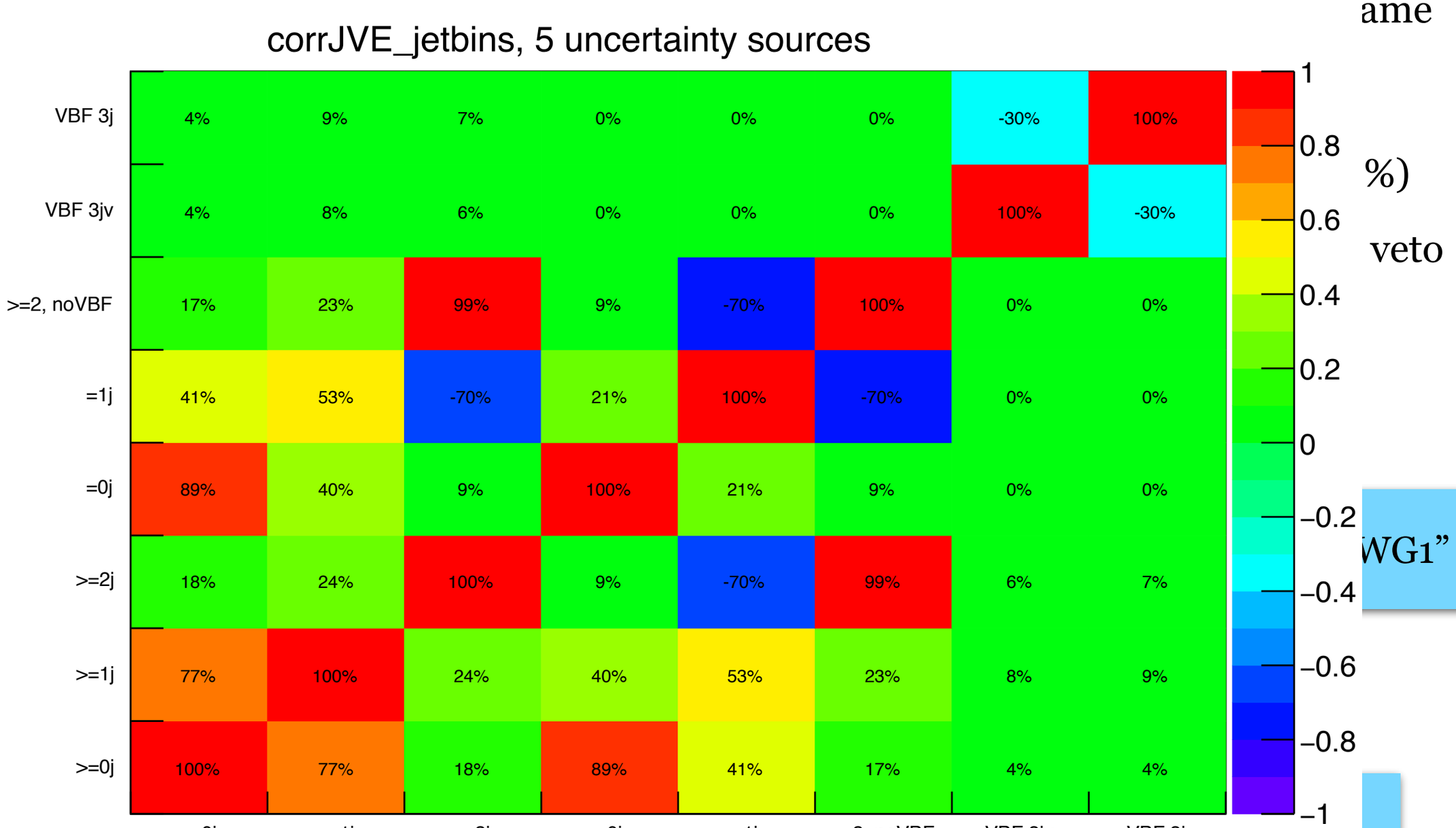
Cross sections and fractional uncertainties

STXS	sig	stat	incl	eps0	eps1	VBF2j	VBF3j	pTH	qm_top	Tot
>=0j	48.52	+/- 0.04	+3.8%	-0.0%	-0.0%	+0.3%	-0.0%	-0.1%	+0.2%	+3.9%
>=1j	18.40	+/- 0.02	+3.8%	+3.2%	-0.0%	+0.7%	-0.0%	-0.2%	+0.4%	+5.0%
>=2j	5.47	+/- 0.01	+3.4%	+2.9%	+19.1%	+2.3%	-0.0%	+0.1%	+1.1%	+19.8%
=0j	30.12	+/- 0.03	+3.9%	-1.9%	+0.0%	+0.0%	+0.0%	+0.0%	+0.0%	+4.3%
=1j	12.92	+/- 0.02	+3.9%	+3.3%	-8.1%	+0.0%	+0.0%	-0.3%	+0.2%	+9.6%
>=2, noVBF	4.84	+/- 0.01	+3.9%	+3.3%	+21.6%	+0.0%	+0.0%	+0.3%	+1.2%	+22.3%
VBF 3jv	0.27	+/- 0.00	+0.0%	+0.0%	+0.0%	+20.0%	-32.0%	-2.5%	+0.1%	+37.8%
VBF 3j	0.36	+/- 0.00	+0.0%	+0.0%	+0.0%	+20.0%	+23.5%	-0.9%	+0.2%	+30.9%

JVE

Second JVE comparison

- Ur … ame
  (al … %)
  - …
- Ne … veto
  nu …



Cross … WG1”

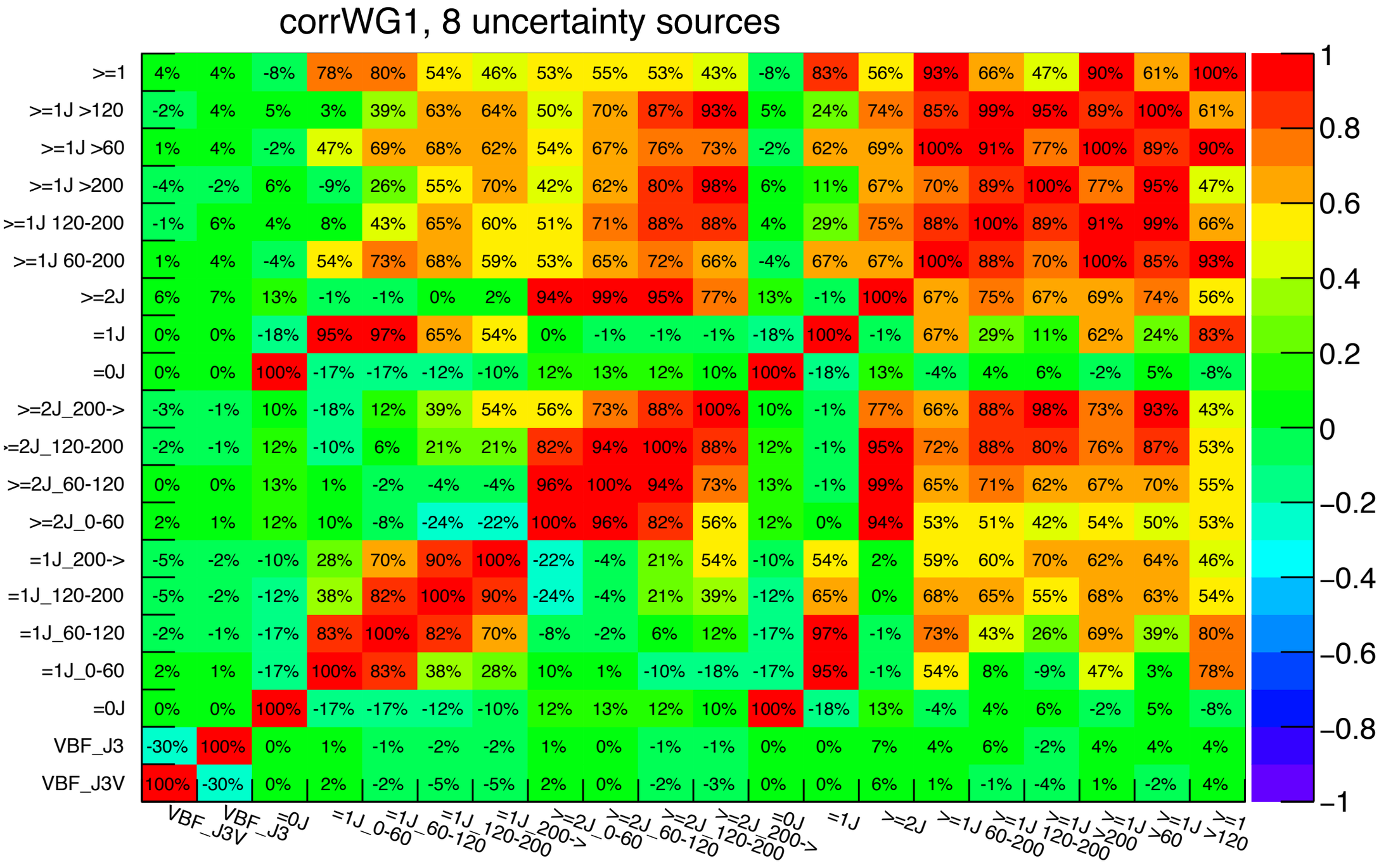
Cross …

Resulting correlation matrix.

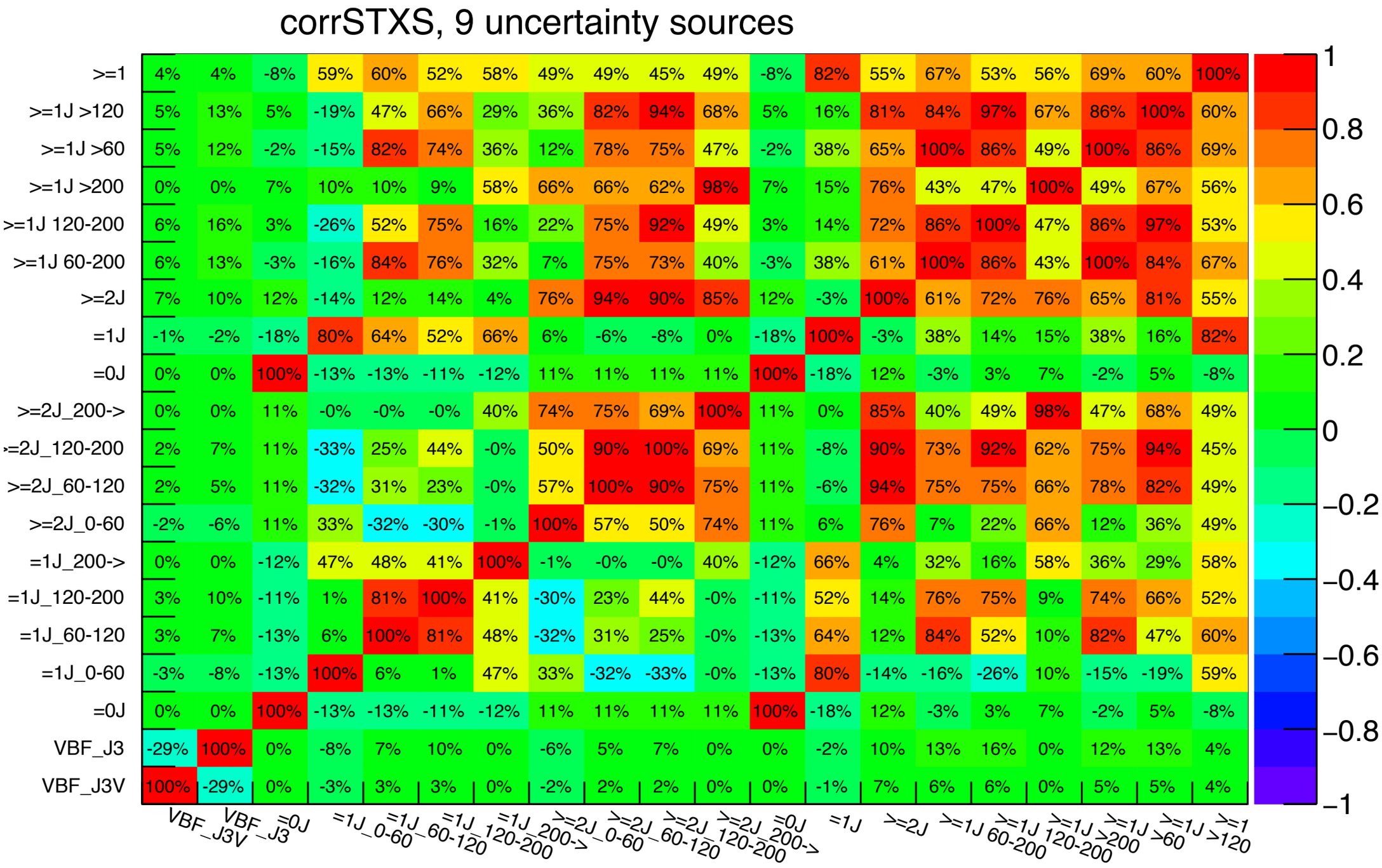
VBF 3jv	0.27 +/- 0.00	+0.0%	+0.0%	+0.0%	+20.0%	-32.0%	-2.5%	+0.1%	+37.8%
VBF 3j	0.36 +/- 0.00	+0.0%	+0.0%	+0.0%	+20.0%	+23.5%	-0.9%	+0.2%	+30.9%

New: Uncertainty correlation WG1 scheme

http://dgillber.web.cern.ch/dgillber/ggF_uncertainty_2017/

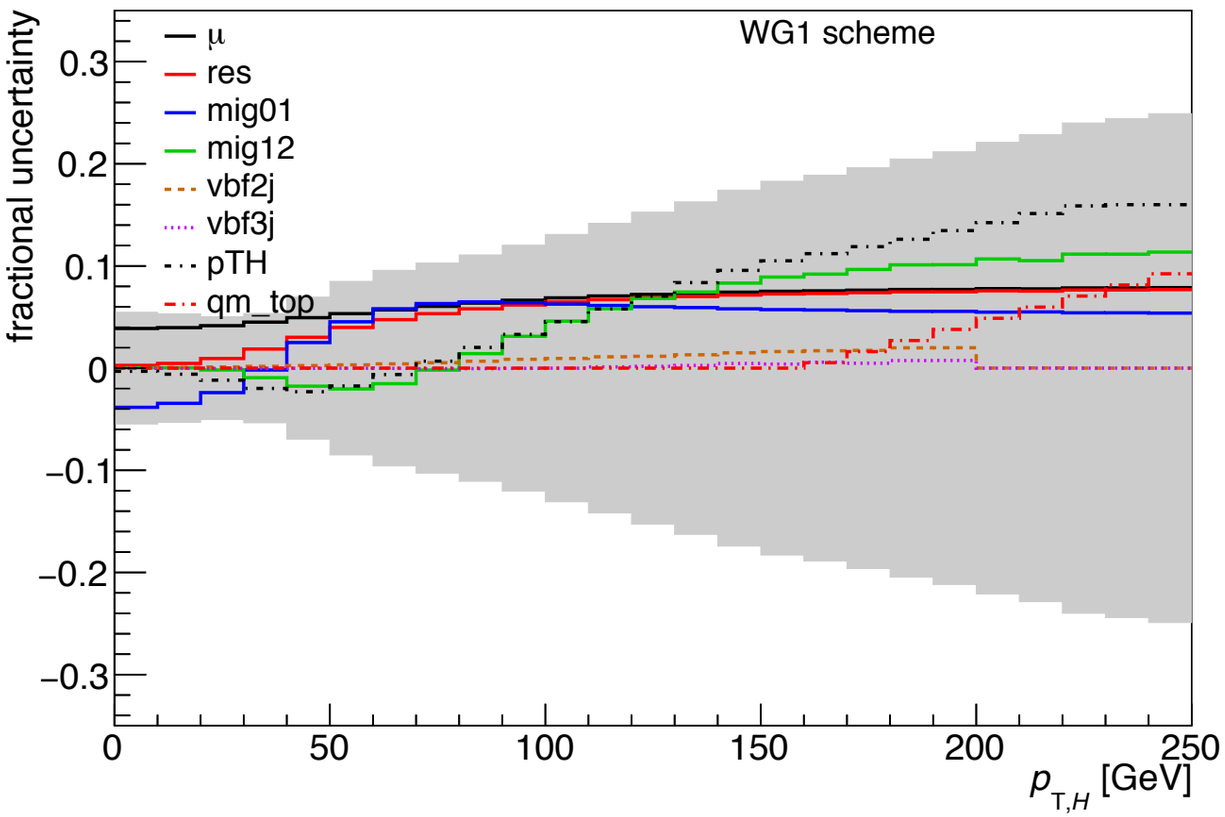


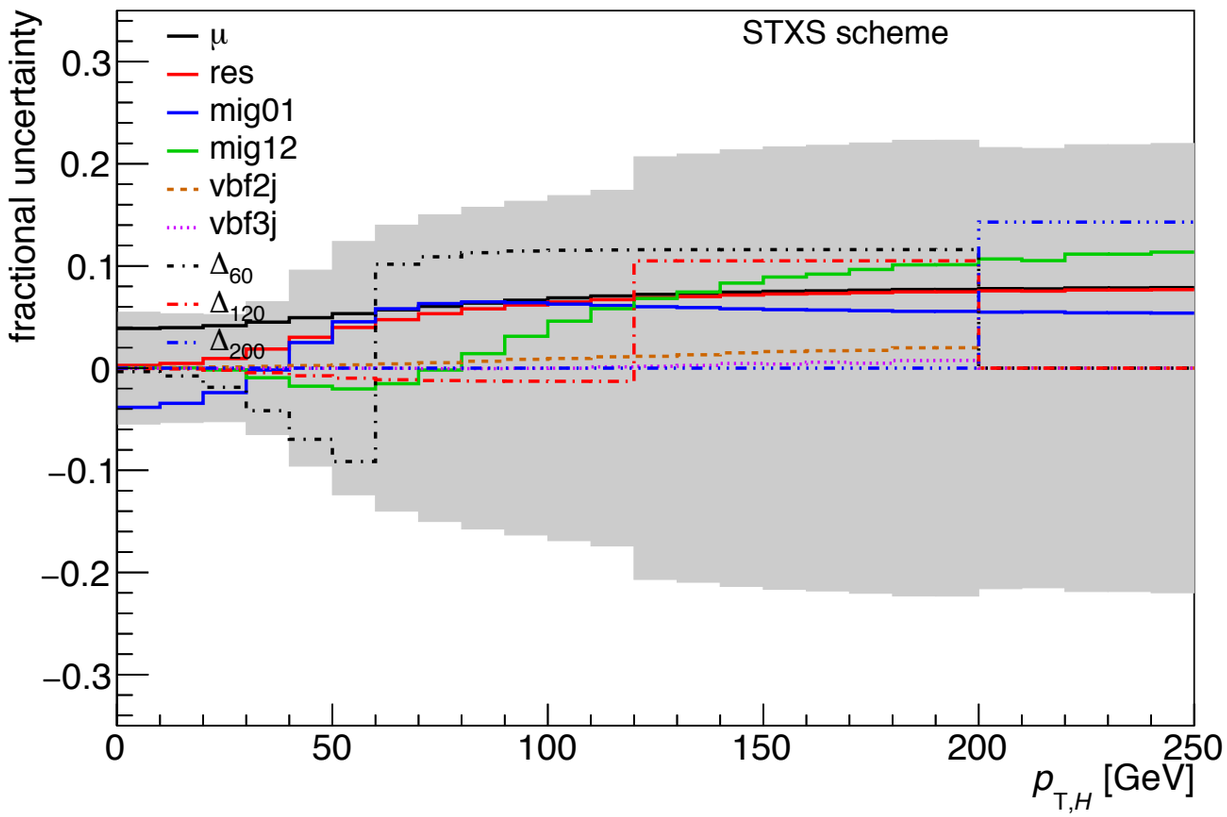
New: Uncertainty correlation STXS scheme



Merging of the two schemes

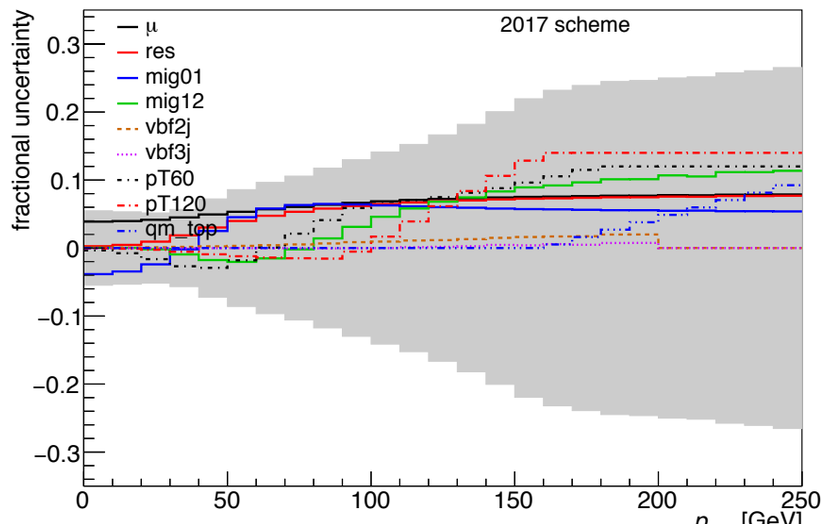
- The perturbative uncertainty on the pT spectrum are obtained in different ways between the two schemes
  - In the “WG1” scheme, this uncertainty is taken as a shape uncertainty from Powheg’s scale variations (integral poorly defined)
  - The procedure in Kerstin’s talk defines the integral, but not the shape
    results in theta function behaviour when plotting uncertainty vs pT (see below)
- Point raised during meeting to attempt to merge the schemes
  - Attempt to keep the integral while assigning smooth shape

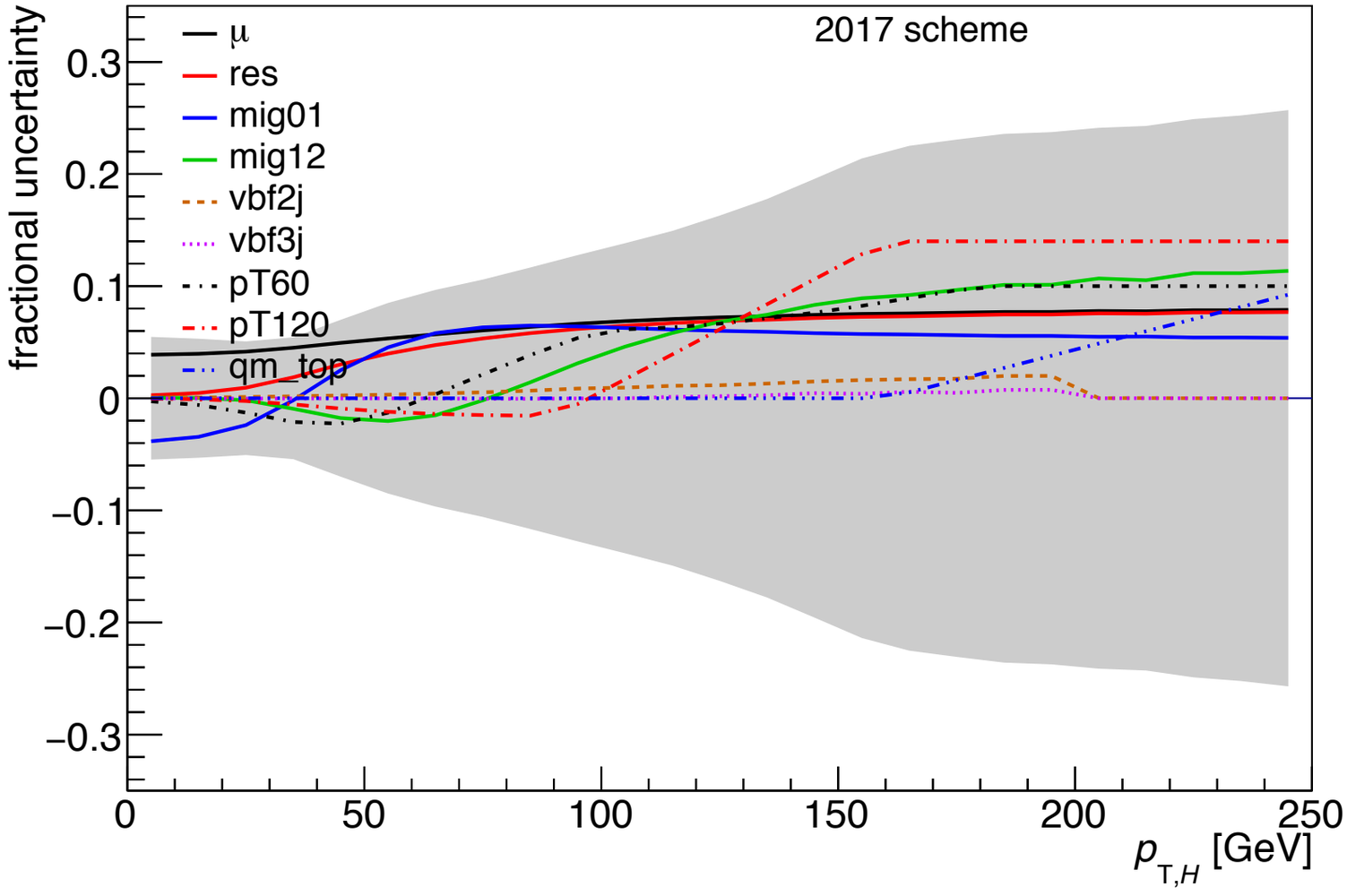




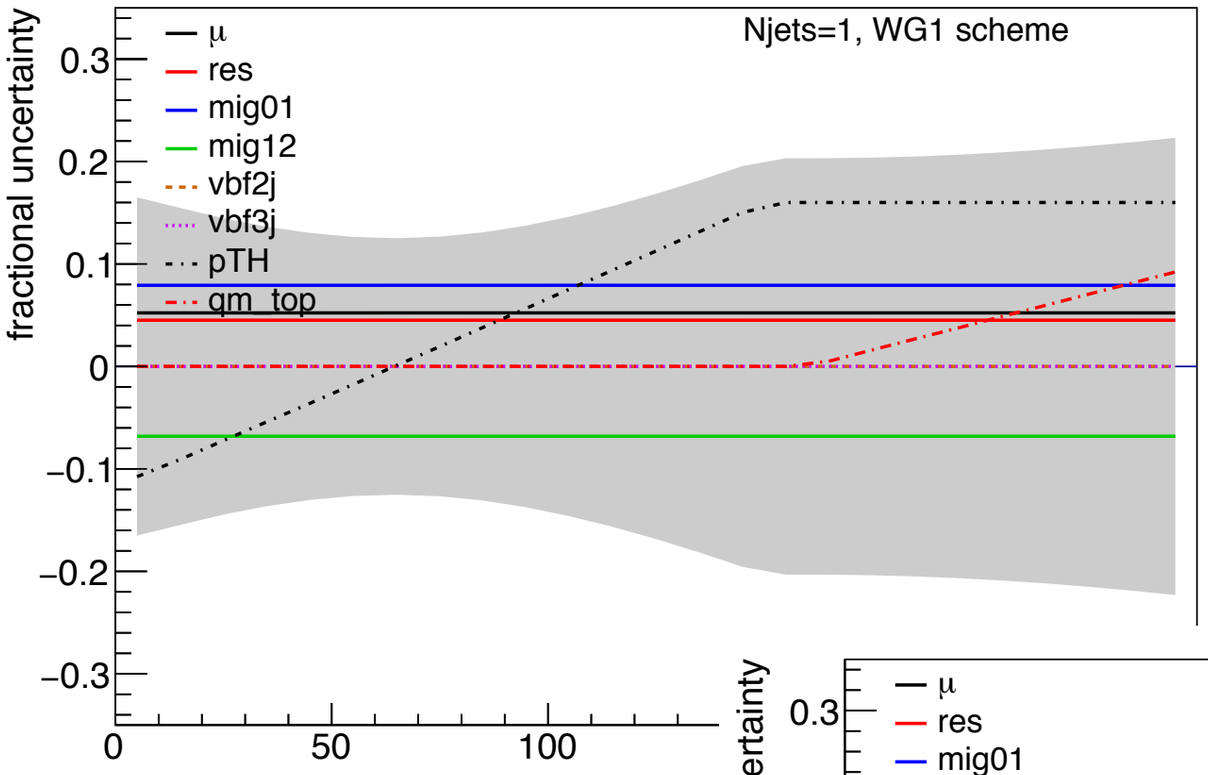
Merging of the two schemes

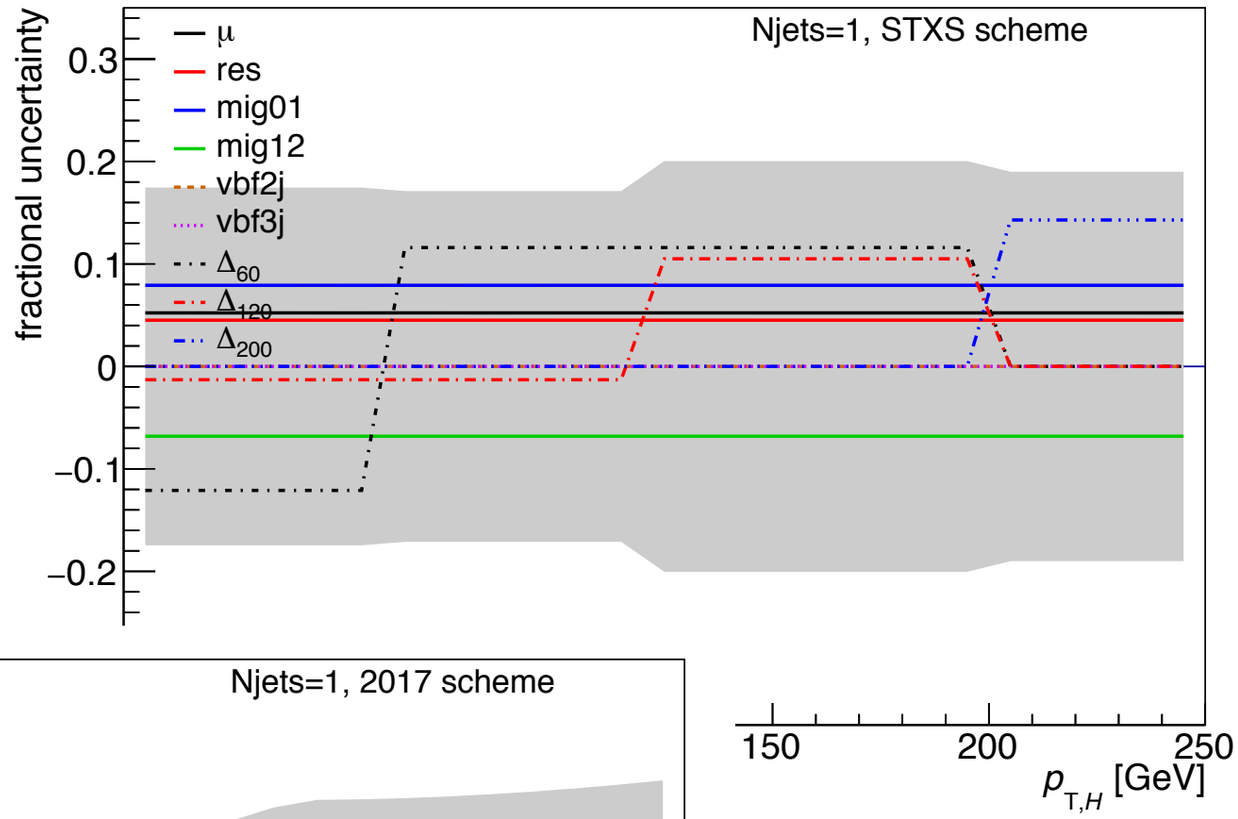
- Point raised during meeting to attempt to merge the schemes
  - Result “2017 scheme”
- Three pT dependent components:
  - pT60 & pT120 for migrations across these boundaries
  - Keeping the finite top mass uncertainty that becomes large at high pT (in place of D200 in STXS scheme)

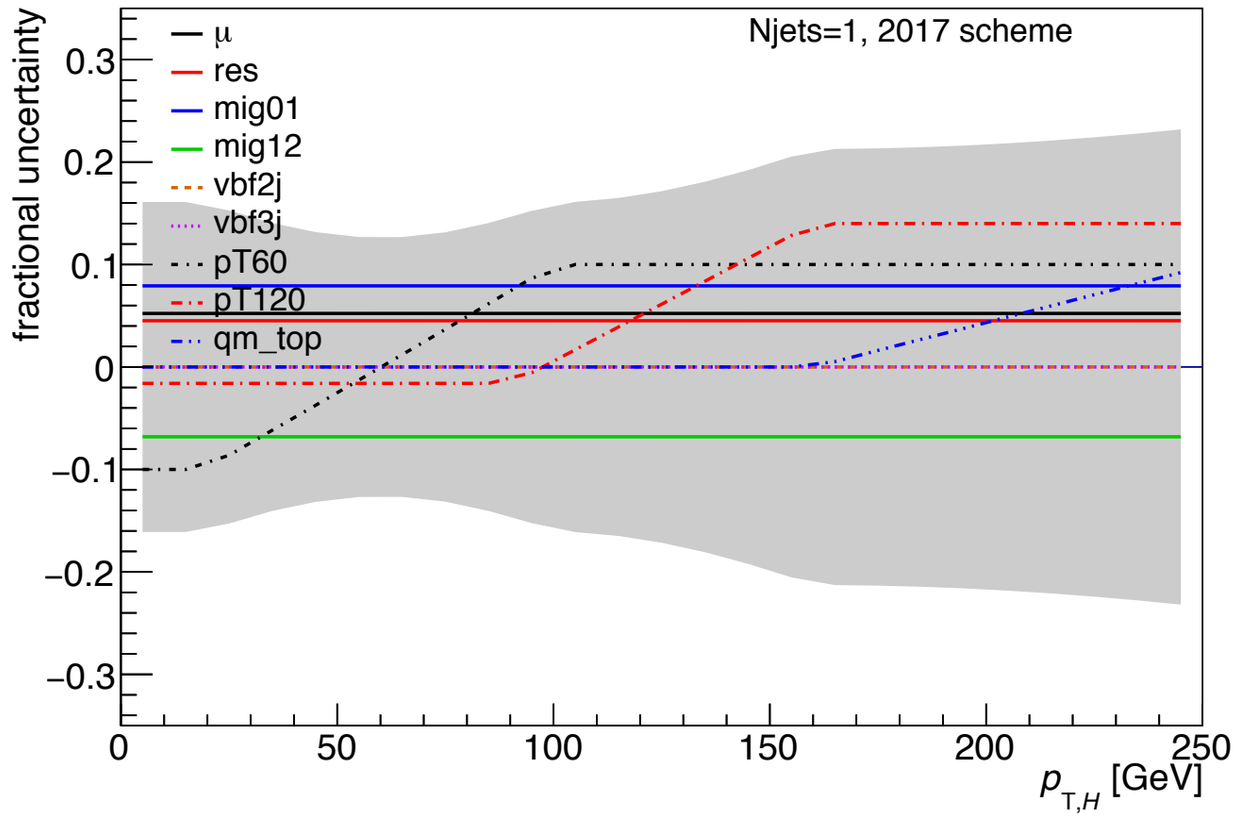




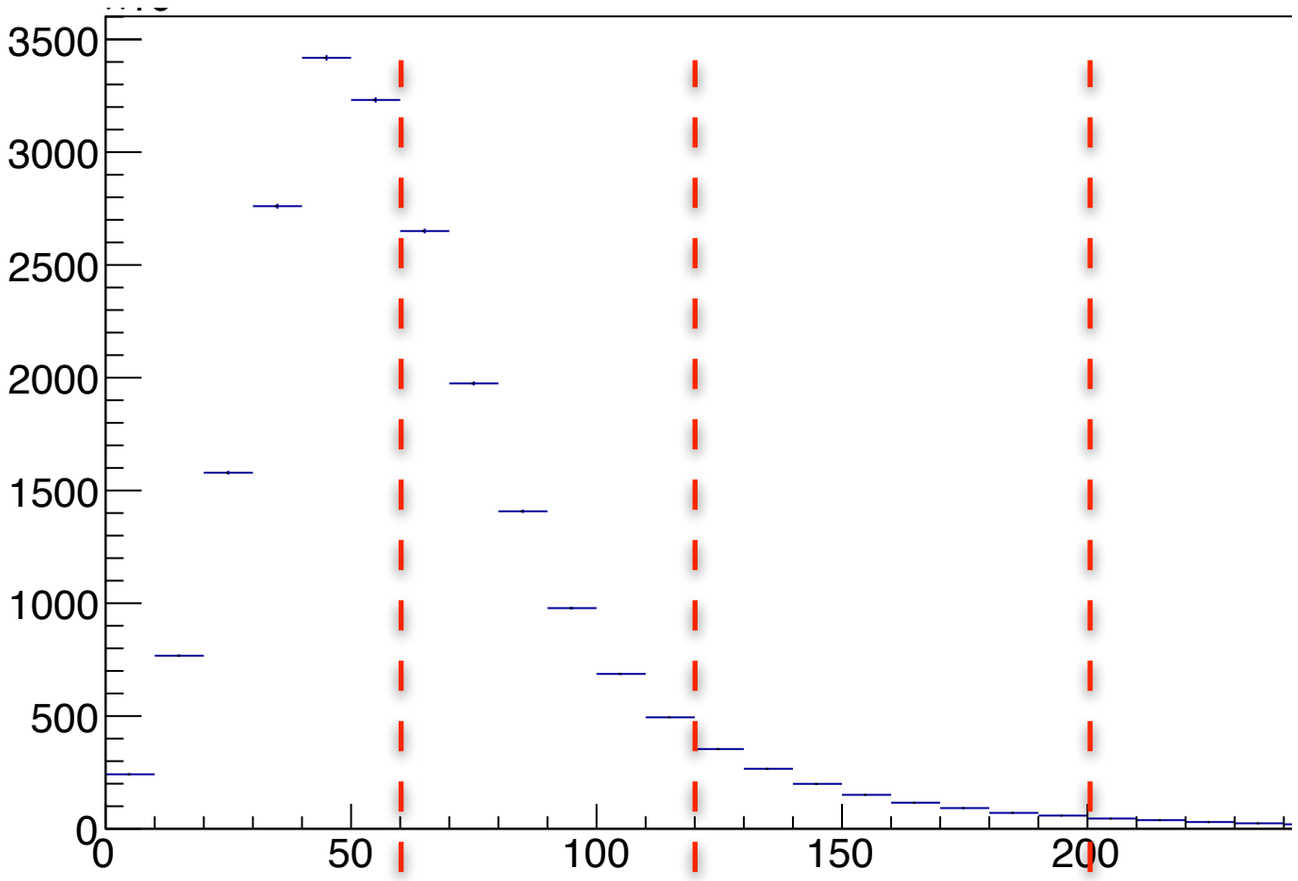
Higgs p_T uncertainties, Njets=1







$p_{T,H}$ uncertainty for $N_{jets} = 1$, with cut at 60 GeV



Cut at 60 GeV cuts spectrum in half
Uncertainty on integral provided by jet bin uncertainty: 12.5%.

Uncertainty from 60 GeV and up from NNLOPS. Difficult to find a smooth shape that yield the desired uncertainty from 60 GeV and up.

Uncertainties, “2017 scheme”

Cross sections and fractional uncertainties

STXS	sig	stat	mu	res	mig01	mig12	VBF2j	VBF3j	pT60	pT120	qm_top	Tot
Incl	48.52	+/- 0.00	+4.6%	+2.1%	-0.0%	-0.0%	+0.3%	-0.0%	+0.0%	+0.2%	+0.2%	+5.1%
FWDH	4.27	+/- 0.01	+4.5%	+1.9%	-0.5%	-0.2%	+0.0%	+0.0%	-0.3%	-0.1%	+0.0%	+4.9%
VBF_J3V	0.27	+/- 0.00	+0.0%	+0.0%	+0.0%	+0.0%	+20.0%	-32.0%	-1.6%	+1.1%	+0.1%	+37.8%
VBF_J3	0.36	+/- 0.00	+0.0%	+0.0%	+0.0%	+0.0%	+20.0%	+23.5%	-0.2%	+2.5%	+0.2%	+31.0%
=0J	27.25	+/- 0.03	+3.8%	+0.1%	-4.1%	+0.0%	+0.0%	+0.0%	+0.0%	+0.0%	+0.0%	+5.6%
=1J_0-60	6.49	+/- 0.01	+5.2%	+4.5%	+7.9%	-6.8%	+0.0%	+0.0%	-4.8%	-1.6%	+0.0%	+13.5%
=1J_60-120	4.50	+/- 0.01	+5.2%	+4.5%	+7.9%	-6.8%	+0.0%	+0.0%	+4.8%	-0.9%	+0.0%	+13.4%
=1J_120-200	0.74	+/- 0.00	+5.2%	+4.5%	+7.9%	-6.8%	+0.0%	+0.0%	+10.0%	+10.1%	+0.5%	+18.9%
=1J_200->	0.15	+/- 0.00	+5.2%	+4.5%	+7.9%	-6.8%	+0.0%	+0.0%	+10.0%	+14.0%	+10.5%	+23.7%
>=2J_0-60	1.22	+/- 0.01	+8.9%	+8.9%	+4.4%	+18.2%	+0.0%	+0.0%	-5.9%	-1.6%	+0.0%	+23.3%
>=2J_60-120	1.86	+/- 0.01	+8.9%	+8.9%	+4.4%	+18.2%	+0.0%	+0.0%	-0.2%	-0.2%	+0.0%	+22.5%
>=2J_120-200	0.99	+/- 0.00	+8.9%	+8.9%	+4.4%	+18.2%	+0.0%	+0.0%	+6.6%	+10.6%	+0.6%	+25.8%
>=2J_200->	0.42	+/- 0.00	+8.9%	+8.9%	+4.4%	+18.2%	+0.0%	+0.0%	+10.0%	+14.0%	+11.8%	+30.7%
=0J	30.12	+/- 0.03	+3.8%	+0.1%	-4.1%	+0.0%	+0.0%	+0.0%	+0.0%	+0.0%	+0.0%	+5.6%
=1J	12.92	+/- 0.02	+5.2%	+4.5%	+7.9%	-6.8%	+0.0%	+0.0%	-0.1%	-0.4%	+0.2%	+12.5%
>=2J	5.47	+/- 0.01	+7.8%	+7.8%	+3.9%	+16.1%	+2.3%	-0.0%	+0.4%	+2.9%	+1.1%	+20.3%
>=1J 60-200	9.09	+/- 0.01	+6.2%	+5.8%	+6.4%	+1.9%	+0.9%	+0.1%	+4.2%	+1.7%	+0.1%	+11.8%
>=1J 120-200	1.96	+/- 0.01	+6.8%	+6.5%	+5.5%	+6.9%	+1.5%	+0.4%	+8.0%	+10.4%	+0.6%	+18.5%
>=1J >200	0.58	+/- 0.00	+7.9%	+7.7%	+5.4%	+11.6%	+0.0%	+0.0%	+10.0%	+14.0%	+11.4%	+26.7%
>=1J >60	9.68	+/- 0.01	+6.3%	+5.9%	+6.3%	+2.5%	+0.8%	+0.1%	+4.6%	+2.5%	+0.8%	+12.2%
>=1J >120	2.54	+/- 0.01	+7.0%	+6.8%	+5.5%	+8.0%	+1.2%	+0.3%	+8.4%	+11.2%	+3.0%	+19.9%
>=1	18.40	+/- 0.02	+6.0%	+5.5%	+6.7%	-0.0%	+0.7%	-0.0%	+0.0%	+0.5%	+0.4%	+10.6%

Correlation matrix “2017 scheme”