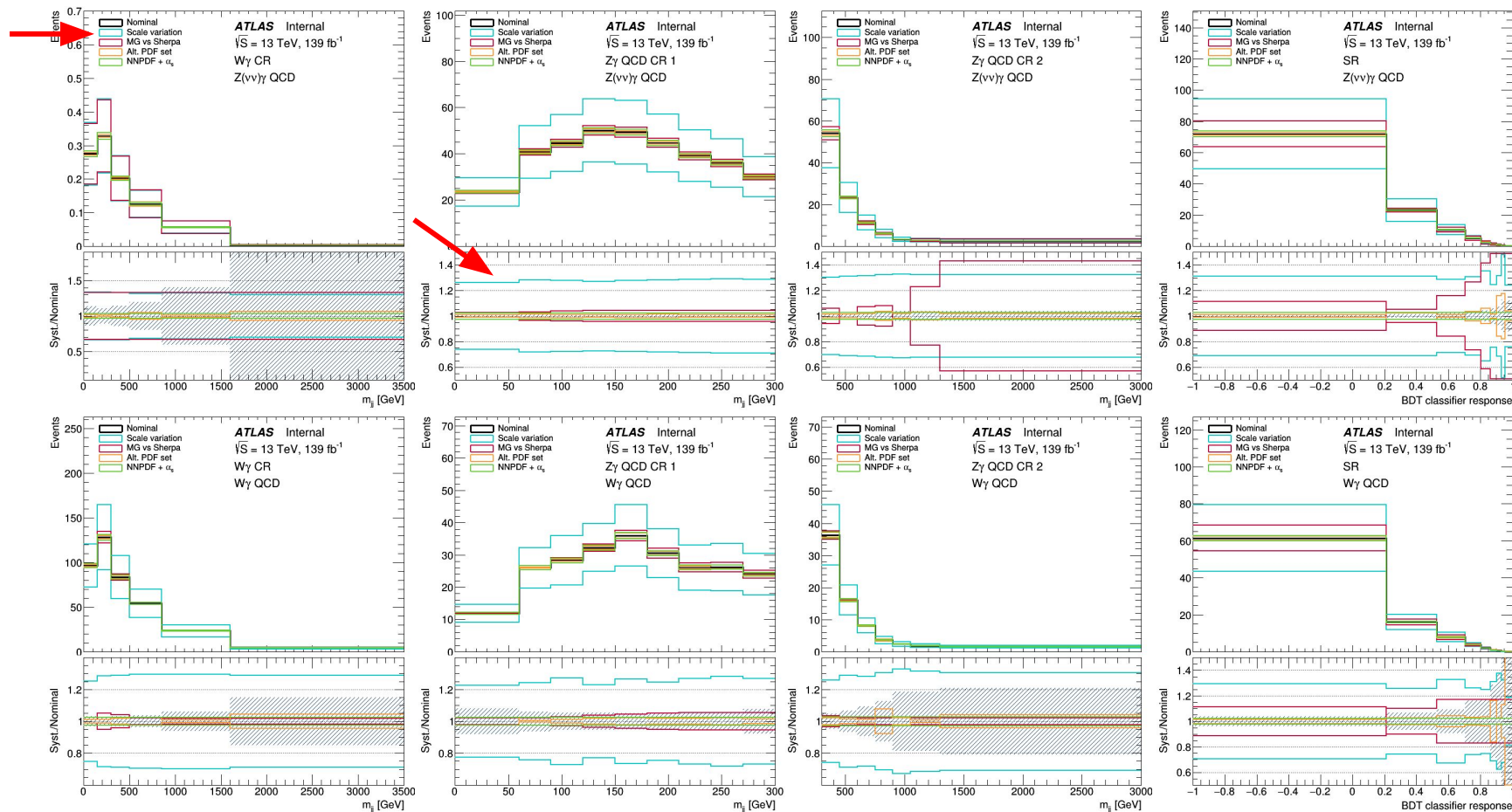
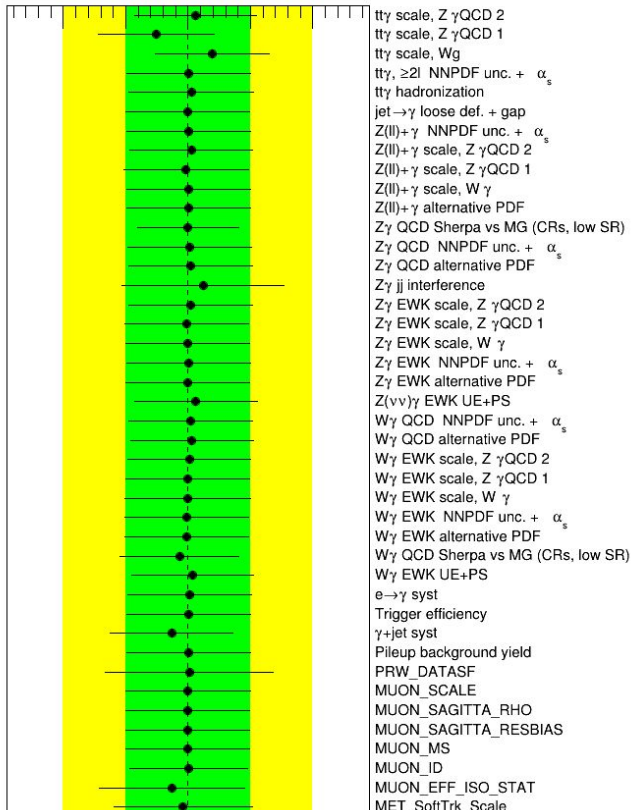


Theoretical systematic uncertainties

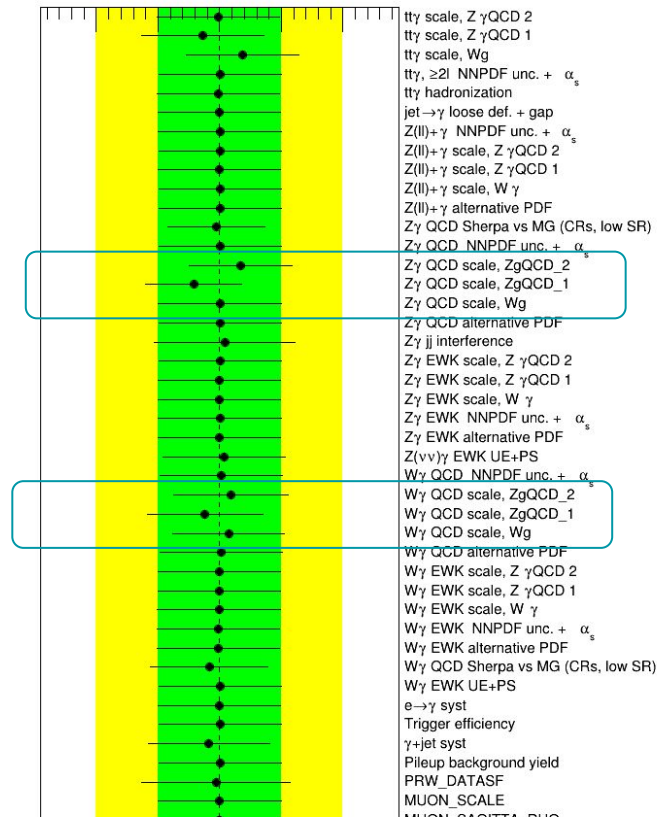


Nuisance parameter pulls

No Z_gQCD/W_gQCD scale uncertainty



With Z_gQCD/W_gQCD scale uncertainty



Correlation matrix

No ZgQCD/WgQCD scale uncertainty

EG_SCALE_ALL	100.0	0.1	0.0	-0.1	0.3	0.5	1.7	-0.2	0.0	0.7	-0.0	0.7	2.7	-4.3	1.2	-16.3	-18.2
JET_Flavor_Composition	0.1	100.0	0.0	-0.4	-0.2	-0.5	-3.4	1.3	0.0	0.6	0.0	1.1	0.0	0.8	-0.3	-14.8	-3.3
Lumi	0.0	0.0	100.0	-0.0	-0.0	-0.0	0.0	-0.0	0.0	0.0	-0.0	0.1	-0.0	-0.0	0.0	-11.1	-10.7
MET_SoftTrk_ResoPara	-0.1	-0.4	-0.0	100.0	-0.9	0.1	2.0	-0.6	-0.0	-0.4	0.0	0.8	-1.5	0.9	-0.3	16.2	11.9
MET_SoftTrk_ResoPerp	0.3	-0.2	-0.0	-0.9	100.0	0.0	-1.0	-0.5	-0.0	-0.3	0.0	1.6	-0.7	0.9	0.6	18.6	17.7
MET_SoftTrk_Scale	0.5	-0.5	-0.0	0.1	0.0	100.0	-1.4	1.0	-0.0	0.1	0.0	0.0	-1.6	1.4	0.2	11.6	12.3
MUON_EFF_ISO_STAT	1.7	-3.4	0.0	2.0	-1.0	-1.4	100.0	1.8	0.0	0.7	0.3	0.5	-9.6	12.6	5.6	53.9	-68.6
PRW_DATASF	-0.2	1.3	-0.0	-0.6	-0.5	1.0	1.8	100.0	-0.0	-1.1	-0.1	-1.1	2.6	-2.2	-0.2	11.8	16.5
Pileup background yield	0.0	0.0	0.0	-0.0	-0.0	-0.0	0.0	-0.0	100.0	0.0	-0.0	0.1	-0.0	-0.0	0.0	-11.1	-10.7
γ +jet syst	0.7	0.6	0.0	-0.4	-0.3	0.1	0.7	-1.1	0.0	100.0	0.0	1.9	0.1	1.2	-1.8	-16.2	-2.4
Z γ QCD NNPDF unc. + α_s	-0.0	0.0	-0.0	0.0	0.0	0.0	0.3	-0.1	-0.0	0.0	100.0	-0.1	-0.2	0.1	0.2	-14.0	-0.4
Z γ QCD Sherpa vs MG (CRs, low SR)	0.7	1.1	0.1	0.8	1.6	0.0	0.5	-1.1	0.1	1.9	-0.1	100.0	0.7	0.5	0.9	15.3	-0.4
tt γ hadronization	2.7	0.0	-0.0	-1.5	-0.7	-1.6	-9.6	2.6	-0.0	0.1	-0.2	0.7	100.0	5.2	7.7	-26.6	49.5
tt γ scale, Wg	-4.3	0.8	-0.0	0.9	0.9	1.4	12.6	-2.2	-0.0	1.2	0.1	0.5	5.2	100.0	4.5	31.5	-35.7
tt γ scale, Z γ QCD 1	1.2	-0.3	0.0	-0.3	0.6	0.2	5.6	-0.2	0.0	-1.8	0.2	0.9	7.7	4.5	100.0	-10.2	-2.0
μ (Z γ QCD)	-16.3	-14.8	-11.1	16.2	18.6	11.6	53.9	11.8	-11.1	-16.2	-14.0	15.3	-26.6	31.5	-10.2	100.0	-40.6
μ (W γ)	-18.2	-3.3	-10.7	11.9	17.7	12.3	-68.6	16.5	-10.7	-2.4	-0.4	-0.4	49.5	-35.7	-2.0	-40.6	100.0
EG_SCALE_ALL	EG_SCALE_ALL	JET_Flavor_Composition	Lumi	MET_SoftTrk_ResoPara	MET_SoftTrk_ResoPerp	MET_SoftTrk_Scale	MUON_EFF_ISO_STAT	PRW_DATASF	Pileup background yield	γ +jet syst	Z γ QCD NNPDF unc. + α_s	Z γ QCD Sherpa vs MG (CRs, low SR)	tt γ hadronization	tt γ scale, Wg	tt γ scale, Z γ QCD 1	μ (Z γ QCD)	μ (W γ)

With ZgQCD/WgQCD scale uncertainty

EG_SCALE_ALL	100.0	-0.1	0.2	2.0	-0.4	0.7	-1.0	1.5	0.3	-0.5	0.3	0.8	2.7	-4.1	-10.0	-14.6
MET_SoftTrk_ResoPara	-0.1	100.0	-0.7	2.3	-0.6	-0.3	1.9	0.3	-3.8	-1.9	0.9	0.7	-1.9	1.0	11.5	8.4
MET_SoftTrk_ResoPerp	0.2	-0.7	100.0	-0.3	-0.4	-0.3	1.4	1.1	-2.4	-1.3	0.7	1.7	-1.3	1.2	12.2	13.1
MUON_EFF_ISO_STAT	2.0	2.3	-0.3	100.0	2.4	0.8	-8.2	5.7	-3.0	-1.8	0.4	0.2	-9.5	12.7	24.7	-50.0
PRW_DATASF	-0.4	-0.6	-0.4	2.4	100.0	-0.9	0.8	-0.0	-1.7	0.8	-0.3	-1.5	1.9	-1.4	5.4	11.1
γ +jet syst	0.7	-0.3	-0.3	0.8	-0.9	100.0	1.0	-3.3	0.9	-1.9	1.6	1.6	0.2	1.2	-6.9	-2.6
W γ QCD scale, Wg	-1.0	1.9	1.4	-8.2	0.8	1.0	100.0	7.3	-3.8	-1.8	0.2	0.5	3.0	-5.2	31.7	-59.8
W γ QCD scale, ZgQCD_1	1.5	0.3	1.1	5.7	-0.0	-3.3	7.3	100.0	8.8	-31.2	18.4	1.0	-2.0	3.4	-17.8	-9.7
W γ QCD scale, ZgQCD_2	0.3	-3.8	-2.4	-3.0	-1.7	0.9	-3.8	8.8	100.0	25.7	-14.1	-0.9	1.3	-1.7	-32.7	3.9
Z γ QCD scale, ZgQCD_1	-0.5	-1.9	-1.3	-1.8	0.8	-1.9	-1.8	-31.2	25.7	100.0	49.5	1.4	3.5	-0.8	-62.9	3.5
Z γ QCD scale, ZgQCD_2	0.3	0.9	0.7	0.4	-0.3	1.6	0.2	18.4	-14.1	49.5	100.0	-1.0	-1.8	0.0	-56.7	-1.0
Z γ QCD Sherpa vs MG (CRs, low SR)	0.8	0.7	1.7	0.2	-1.5	1.6	0.5	1.0	-0.9	1.4	-1.0	100.0	0.7	0.3	7.7	-0.4
tt γ hadronization	2.7	-1.9	-1.3	-9.5	1.9	0.2	3.0	-2.0	1.3	3.5	-1.8	0.7	100.0	4.7	-12.5	36.5
tt γ scale, Wg	-4.1	1.0	1.2	12.7	-1.4	1.2	-5.2	3.4	-1.7	-0.8	0.0	0.3	4.7	100.0	14.5	-25.8
μ (Z γ QCD)	-10.0	11.5	12.2	24.7	5.4	-6.9	31.7	-17.8	-32.7	-62.9	-56.7	7.7	-12.5	14.5	100.0	-34.5
μ (W γ)	-14.6	8.4	13.1	-50.0	11.1	-2.6	-59.8	-9.7	3.9	3.5	-1.0	-0.4	36.5	-25.8	-34.5	100.0
EG_SCALE_ALL	EG_SCALE_ALL	MET_SoftTrk_ResoPara	MET_SoftTrk_ResoPerp	MUON_EFF_ISO_STAT	PRW_DATASF	γ +jet syst	W γ QCD scale, Wg	W γ QCD scale, ZgQCD_1	W γ QCD scale, ZgQCD_2	Z γ QCD scale, ZgQCD_1	Z γ QCD scale, ZgQCD_2	Z γ QCD Sherpa vs MG (CRs, low SR)	tt γ hadronization	tt γ scale, Wg	μ (Z γ QCD)	μ (W γ)

Asimov data fit results

No ZgQCD/WgQCD scale uncertainty

$\mu(\text{Z}\gamma\text{EWK})$	$1.00^{+0.27}_{-0.25} (\text{stat})^{+0.25}_{-0.18} (\text{syst})$
$\mu(\text{Z}\gamma\text{QCD})$	$1.11 \pm 0.08 (\text{stat}) \pm 0.17 (\text{syst})$
$\mu(\text{W}\gamma)$	$1.09 \pm 0.04 (\text{stat})^{+0.20}_{-0.14} (\text{syst})$

Expected median significance: **3.7 σ**

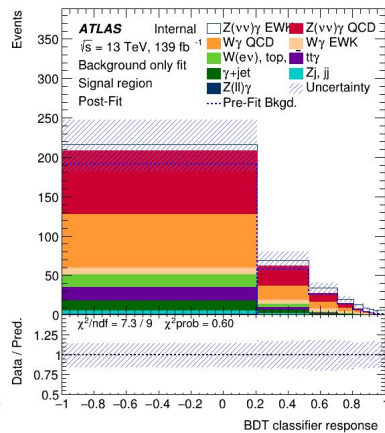
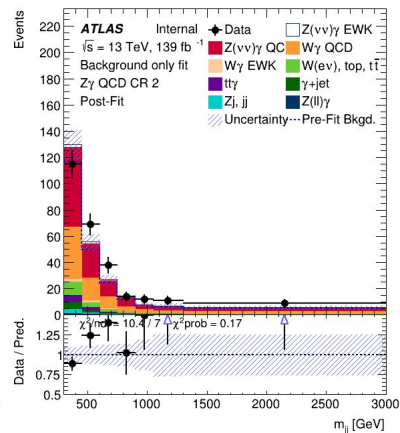
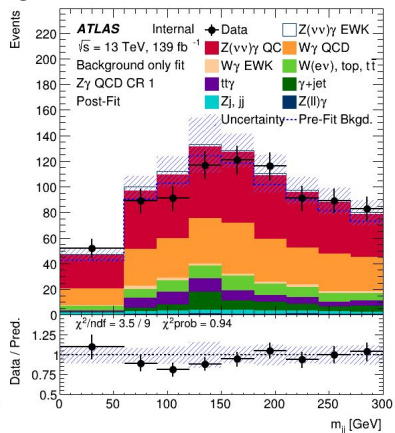
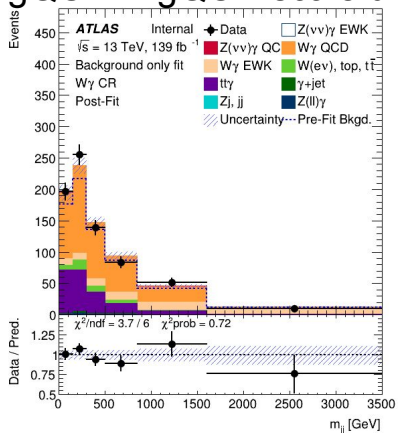
With ZgQCD/WgQCD scale uncertainty

$\mu(\text{Z}\gamma\text{EWK})$	$1.00^{+0.27}_{-0.25} (\text{stat})^{+0.27}_{-0.20} (\text{syst})$
$\mu(\text{Z}\gamma\text{QCD})$	$1.22 \pm 0.08 (\text{stat})^{+0.39}_{-0.32} (\text{syst})$
$\mu(\text{W}\gamma)$	$1.05 \pm 0.04 (\text{stat})^{+0.27}_{-0.19} (\text{syst})$

Expected median significance: **3.6 σ**

Background only fit results

No ZgQCD/WgQCD scale unc.



With ZgQCD/WgQCD scale unc.

