

$HH \rightarrow 4W \ 2LSS$

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IHEP

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- JER/JES problem has been solved;
- New limits w/o syst. uncertainties;
- Importance check, pull check.
- Ongoing.

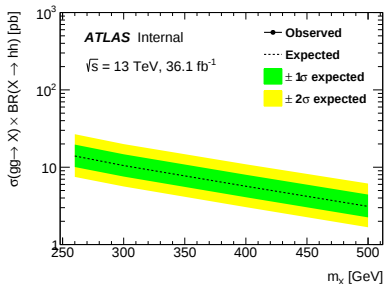
$\epsilon\mu$, Non-resonant-EventWeight(All numbers are in percent)

Uncertainty source	Signal	promptSS	Vgam
pileupEventWeight	-2.12/3.63	-2.24/-0.23	14.83/-20.48
MV2c10_70_EventWeight_B0	0.09/-0.09	2.02/-1.94	0.00/0.00
MV2c10_70_EventWeight_B1	0.01/-0.01	0.98/-0.96	0.00/0.00
MV2c10_70_EventWeight_B2	-0.01/0.01	-0.26/0.26	0.00/0.00
MV2c10_70_EventWeight_B3	0.00/-0.00	-0.04/0.04	0.00/0.00
MV2c10_70_EventWeight_C0	2.63/-2.63	1.71/-1.71	0.00/0.00
MV2c10_70_EventWeight_C1	0.11/-0.10	0.07/-0.07	0.00/0.00
MV2c10_70_EventWeight_Light0	0.44/-0.44	0.50/-0.49	0.47/-0.47
MV2c10_70_EventWeight_Light1	-0.09/0.09	-0.07/0.07	-0.07/0.07
MV2c10_70_EventWeight_Light2	0.04/-0.04	-0.02/0.02	0.13/-0.13
MV2c10_70_EventWeight_Light3	0.00/-0.00	0.01/-0.01	0.15/-0.15
MV2c10_70_EventWeight_Light4	0.11/-0.11	0.11/-0.11	0.03/-0.03
MV2c10_70_EventWeight_Light5	-0.03/0.03	-0.02/0.02	0.02/-0.02
MV2c10_70_EventWeight_Light6	-0.02/0.02	-0.01/0.01	0.02/-0.02
MV2c10_70_EventWeight_Light7	0.01/-0.01	0.00/-0.00	0.01/-0.01
MV2c10_70_EventWeight_extrapolation	-0.03/0.03	-0.11/0.11	0.00/0.00
MV2c10_70_EventWeight_extrapolation_from_charm	-0.03/0.03	-0.10/0.10	0.00/0.00
JVT_EventWeight	0.76/-0.78	0.58/-0.61	0.60/-0.60
lepSFTTrigTight_EL_SF_Trigger	0.00/0.00	0.00/0.00	0.00/0.00
lepSFObjTight_EL_SF_Reco	0.18/-0.18	0.18/-0.18	0.12/-0.12
lepSFObjTight_EL_SF_ID	0.77/-0.77	0.84/-0.84	0.83/-0.83
lepSFObjTight_EL_SF_Isol	0.26/-0.26	0.25/-0.25	0.09/-0.09
lepSFTTrigTight_MU_SF_Trigger_STAT	0.00/0.00	0.00/0.00	0.00/0.00
lepSFTTrigTight_MU_SF_Trigger_SYST	0.00/0.00	0.00/0.00	0.00/0.00
lepSFObjTight_MU_SF_ID_STAT	0.19/-0.19	0.18/-0.18	0.17/-0.17
lepSFObjTight_MU_SF_ID_SYST	0.75/-0.75	0.84/-0.84	0.64/-0.64
lepSFObjTight_MU_SF_ID_STAT_LOWPT	0.00/0.00	0.00/0.00	0.00/0.00
lepSFObjTight_MU_SF_ID_SYST_LOWPT	0.00/0.00	0.00/0.00	0.00/0.00
lepSFObjTight_MU_SF_Isol_STAT	0.04/-0.04	0.03/-0.03	0.02/-0.02
lepSFObjTight_MU_SF_Isol_SYST	0.09/-0.09	0.11/-0.11	0.18/-0.18
lepSFObjTight_MU_SF_TTVA_STAT	0.08/-0.08	0.08/-0.08	0.08/-0.08
lepSFObjTight_MU_SF_TTVA_SYST	0.09/-0.09	0.11/-0.11	0.00/-0.00

$e\mu$, Non-resonant-JER/JES(All numbers are in percent)

EG_RESOLUTION_ALL	0.05/-0.03	0.22/-0.14	0.00/0.00
EG_SCALE_ALL	0.05/-0.05	0.14/-0.05	0.00/0.00
JET_21NP_JET_BJES_Response	0.03/0.00	-0.13/0.06	0.00/0.00
JET_21NP_JET_EffectiveNP_1	1.83/-1.28	0.43/-4.68	0.00/-0.00
JET_21NP_JET_EffectiveNP_2	-0.42/0.53	-0.07/0.22	-0.00/0.00
JET_21NP_JET_EffectiveNP_3	0.11/-0.09	-0.08/-0.02	-0.00/0.00
JET_21NP_JET_EffectiveNP_4	-0.08/0.01	0.02/-0.08	-0.00/-0.00
JET_21NP_JET_EffectiveNP_5	-0.00/0.01	0.02/-0.04	0.00/0.00
JET_21NP_JET_EffectiveNP_6	0.10/-0.12	-0.06/0.01	0.00/-0.00
JET_21NP_JET_EffectiveNP_7	-0.05/0.07	0.04/-0.09	-0.00/0.00
JET_21NP_JET_EffectiveNP_8restTerm	0.03/-0.07	-0.07/0.07	0.00/-0.00
JET_21NP_JET_EtaIntercalibration_Modelling	0.38/-0.54	-0.18/-1.56	0.00/-0.00
JET_21NP_JET_EtaIntercalibration_NonClosure	-0.21/-0.08	-0.32/-0.05	-0.00/0.00
JET_21NP_JET_EtaIntercalibration_TotalStat	0.46/-0.33	0.05/-0.17	0.00/-0.00
JET_21NP_JET_Flavor_Composition	3.36/-3.20	13.69/-9.15	98.34/-0.01
JET_21NP_JET_Flavor_Response	-1.19/1.04	-0.58/0.05	-0.00/0.01
JET_21NP_JET_Pileup_OffsetMu	-0.08/0.16	-0.01/0.11	-0.00/0.00
JET_21NP_JET_Pileup_OffsetNPV	0.75/-0.29	-0.22/-0.19	0.00/-0.00
JET_21NP_JET_Pileup_PtTerm	0.03/0.03	-0.05/-0.06	0.00/-0.00
JET_21NP_JET_Pileup_RhoTopology	2.63/-1.92	4.75/-7.73	98.38/-0.00
JET_21NP_JET_PunchThrough_AFII	0.00/0.00	0.58/0.58	0.00/0.00
JET_21NP_JET_PunchThrough_MC15	0.00/0.00	0.58/0.58	0.00/0.00
JET_21NP_JET_RelativeNonClosure_AFII	-0.60/0.56	0.58/0.58	0.00/0.00
JET_21NP_JET_SingleParticle_HighPt	0.00/0.00	0.00/0.00	0.00/0.00
MUON_ID	-0.30/-0.02	0.15/0.02	0.00/0.00
MUON_MS	-0.17/0.75	-0.04/0.21	0.00/0.00
MUON_SAGITTA_RESBIAS	0.00/0.00	0.00/0.00	0.00/0.00
MUON_SAGITTA_RHO	0.00/0.00	0.00/0.00	0.00/0.00
MUON_SCALE	0.01/0.10	-0.04/0.19	0.00/0.00
JET_JER_SINGLE_NP	0.10/-0.10	-2.10/2.10	95.94/-95.94
MET_SoftTrk_ResoPara	-0.53/0.53	-0.02/0.02	0.00/0.00
MET_SoftTrk_ResoPerp	-0.59/0.59	0.03/-0.03	0.00/0.00
MET_SoftTrk_Scale	-0.45/-0.26	0.06/-1.24	0.00/0.00

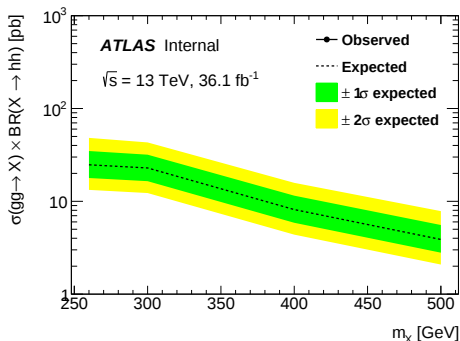
	Higgs pair	260 GeV	300 GeV	400 GeV	500 GeV
Median	4.62	13.97	10.51	5.68	3.12
Observed	blinded	blinded	blinded	blinded	blinded
$+2\sigma$	9.10	26.74	19.91	10.91	6.15
$+1\sigma$	6.56	19.62	14.70	7.99	4.43
-1σ	3.33	10.06	7.57	4.09	2.25
-2σ	2.48	7.50	5.64	3.05	1.67



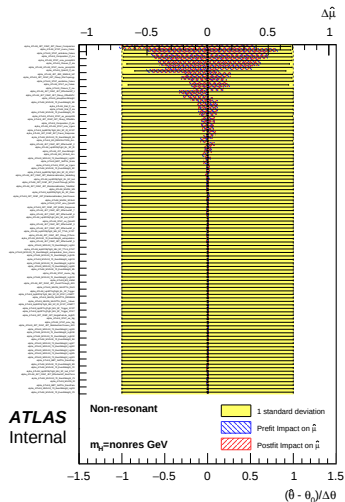
Limits-EventWeightTypeOnly

	Higgs pair	260 GeV	300 GeV	400 GeV	500 GeV
Median	4.84505	20.215	18.642	6.62669	3.21922
Observed	blinded	blinded	blinded	blinded	blinded
$+2\sigma$	9.53173	36.0074	32.7483	12.4395	6.40123
$+1\sigma$	6.86972	27.3056	25.1491	9.21284	4.58262
-1σ	3.49113	14.566	13.4326	4.7749	2.31962
-2σ	2.60047	10.8499	10.0057	3.55671	1.72784

	Higgs pair	260 GeV	300 GeV	400 GeV	500 GeV
Median	5.06	24.74	22.88	8.15	3.88
Observed	blinded	blinded	blinded	blinded	blinded
$+2\sigma$	10.08	48.26	43.10	15.82	7.84
$+1\sigma$	7.20	34.83	31.80	11.51	5.55
-1σ	3.64	17.83	16.48	5.87	2.80
-2σ	2.72	13.28	12.28	4.37	2.08

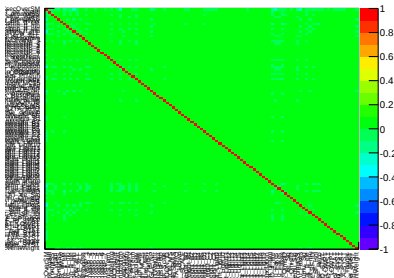


NP ranking

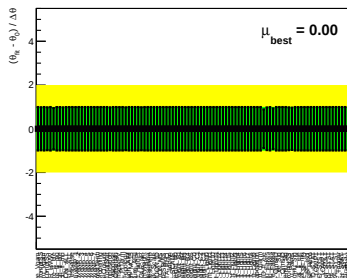


Correlations, pull check - $\mu=0$

correlation_matrix

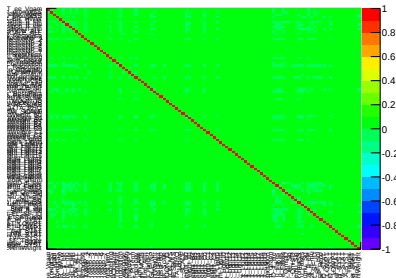


h_NuisParaPull_GlobalFit_unconditionnal_mu0

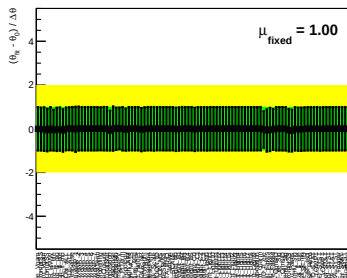


Correlations, pull check - $\mu=1$

correlation_matrix



h_NuisParaPull_GlobalFit_conditional_mu1



To do:

- Theoretical uncertainty;
- Trigger SF uncertainty(available in v28);
- Update supporting note.

Back up