Weekly Report

Shuiting Xin

June 29, 2020

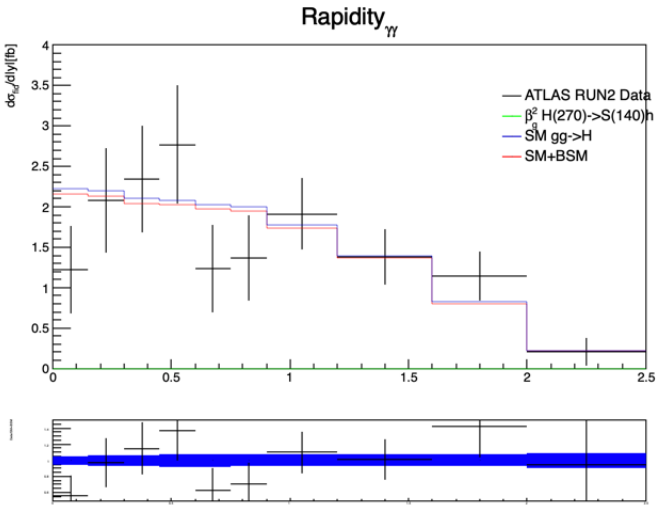
Update on HHML 2LSS

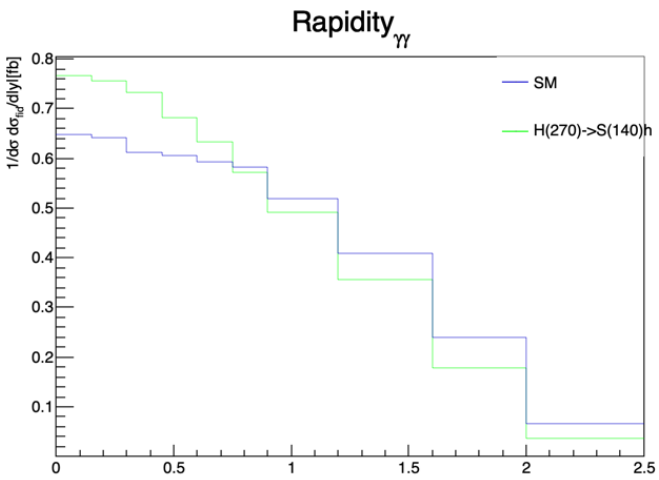
- Validate new version of GFW2
  - Scale_nom issue due to splitting file on grid
  - If j files, the scale_nom would be j times larger
  - $< mean > = \frac{\frac{scale\_nom}{n_1} * n_1 + \frac{scale\_nom}{n_2} * n_2 + \cdots}{n_1 + n_2 + \ldots n_j} = j * scale\_nom$

- The outputs are identical getting from my code

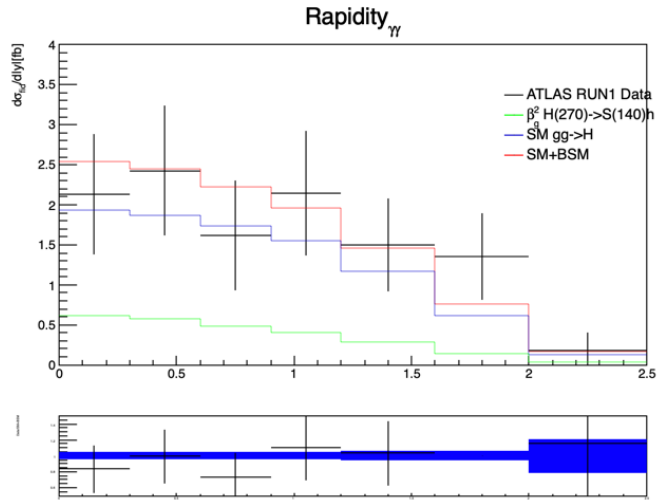
PT Fit to ATLAS H->ZZ

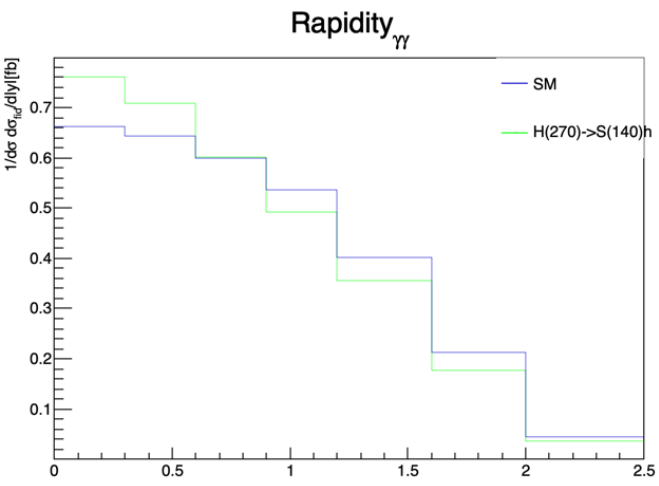
Run2





Run1





Contrary conclusion

PT Fit with 4 datasets

- Delta chi2:
  $\Delta\chi^2 = \Delta^2_{SM} - \Delta^2_{BSM}$
- Significance are derived from $\Delta\chi^2$

mH	mS	sm_factor	beta_g	Chi2	Chi2/ndof	Delta chi2	significance
262	136	0.963	0.250	39.843	1.022	0.180	0.424
262	138	1.000	0.016	40.020	1.026	0.003	0.055
262	140	1.000	0.000	40.023	1.026	0.000	0.000
262	142	1.000	0.000	40.023	1.026	0.000	0.000
262	144	1.000	0.000	40.023	1.026	0.000	0.000
264	136	0.944	0.343	39.703	1.018	0.320	0.566
264	138	0.958	0.298	39.794	1.020	0.229	0.479
264	140	1.000	0.022	40.016	1.026	0.007	0.084
264	142	1.000	0.000	40.023	1.026	0.000	0.000
264	144	1.000	0.000	40.023	1.026	0.000	0.000
266	136	0.985	0.130	39.936	1.024	0.087	0.295
266	138	0.942	0.358	39.681	1.017	0.342	0.585
266	140	0.960	0.270	39.822	1.021	0.201	0.448
266	142	1.000	0.021	40.018	1.026	0.005	0.071
266	144	1.000	0.000	40.023	1.026	0.000	0.000
268	136	1.000	0.041	39.994	1.025	0.029	0.170
268	138	0.982	0.148	39.922	1.024	0.101	0.318
268	140	0.939	0.381	39.643	1.016	0.380	0.616
268	142	0.962	0.261	39.835	1.021	0.188	0.434
268	144	1.000	0.021	40.018	1.026	0.005	0.071
270	136	1.000	0.011	40.021	1.026	0.002	0.045
270	138	1.000	0.041	39.993	1.025	0.030	0.173
270	140	0.981	0.154	39.918	1.024	0.105	0.324
270	142	0.941	0.373	39.650	1.017	0.373	0.611
270	144	0.961	0.272	39.820	1.021	0.203	0.451
272	136	1.000	0.000	40.023	1.026	0.000	0.000
272	138	1.000	0.006	40.022	1.026	0.001	0.032
272	140	1.000	0.041	39.995	1.026	0.028	0.167
272	142	0.981	0.156	39.916	1.023	0.107	0.327
272	144	0.945	0.354	39.686	1.018	0.337	0.581
274	136	1.000	0.000	40.023	1.026	0.000	0.000
274	138	1.000	0.000	40.023	1.026	0.000	0.000
274	140	1.000	0.009	40.022	1.026	0.001	0.032
274	142	1.000	0.041	39.994	1.025	0.029	0.170
274	144	0.981	0.157	39.917	1.024	0.106	0.326

Rapidity Fit with 4 datasets

- Delta chi2:
  $\Delta\chi^2 = \Delta^2_{SM} - \Delta^2_{BSM}$
- Significance are derived from $\Delta\chi^2$

mH	mS	sm_factor	Beta_g	chi2	Chi2/ndof	Delta chi2	significance
262	136	1	0.208	20.001	0.71432	0.817	0.904
262	138	1	0.245	19.975	0.71339	0.843	0.918
262	140	1	0.274	19.986	0.71379	0.832	0.912
262	142	1	0.287	19.988	0.71386	0.83	0.911
262	144	1	0.286	19.983	0.71368	0.835	0.914
264	136	1	0.212	19.994	0.71407	0.824	0.908
264	138	1	0.211	19.996	0.71414	0.822	0.907
264	140	1	0.24	19.919	0.71139	0.899	0.948
264	142	1	0.281	19.958	0.71279	0.86	0.927
264	144	1	0.279	20.004	0.71443	0.814	0.902
266	136	1	0.216	19.98	0.71357	0.838	0.915
266	138	1	0.215	19.989	0.71389	0.829	0.910
266	140	1	0.214	19.985	0.71375	0.833	0.913
266	142	1	0.249	19.983	0.71368	0.835	0.914
266	144	1	0.279	19.989	0.71389	0.829	0.910
268	136	1	0.219	19.975	0.71339	0.843	0.918
268	138	1	0.218	19.984	0.71371	0.834	0.913
268	140	1	0.22	19.971	0.71325	0.847	0.920
268	142	1	0.216	19.996	0.71414	0.822	0.907
268	144	1	0.254	19.972	0.71329	0.846	0.920
270	136	1	0.22	19.987	0.71382	0.831	0.912
270	138	1	0.221	19.98	0.71357	0.838	0.915
270	140	1	0.22	19.985	0.71375	0.833	0.913
270	142	1	0.222	19.962	0.71293	0.856	0.925
270	144	1	0.221	19.972	0.71329	0.846	0.920
272	136	1	0.224	19.968	0.71314	0.85	0.922
272	138	1	0.222	19.991	0.71396	0.827	0.909
272	140	1	0.224	19.973	0.71332	0.845	0.919
272	142	1	0.223	19.979	0.71354	0.839	0.916
272	144	1	0.223	19.977	0.71346	0.841	0.917
274	136	1	0.229	19.966	0.71307	0.852	0.923
274	138	1	0.228	19.968	0.71314	0.85	0.922
274	140	1	0.23	19.944	0.71229	0.874	0.935
274	142	1	0.226	19.971	0.71325	0.847	0.920
274	144	1	0.225	19.982	0.71364	0.836	0.914

Combined Fit with 4 datasets

- Within 1 sigma significance is observed from combined fit
- Most sensitive masses at (268,140),(270,242)

mH	mS	sm_factor	Beta_g	chi2	Chi2/ndof	Delta chi2	significance
262	136	0.998	0.16	60.054	0.87035	0.787	0.887
262	138	1	0.136	60.345	0.87457	0.496	0.704
262	140	1	0.112	60.558	0.87765	0.283	0.532
262	142	1	0.093	60.655	0.87906	0.186	0.431
262	144	1	0.079	60.699	0.8797	0.142	0.377
264	136	0.981	0.24	59.962	0.86901	0.879	0.938
264	138	0.987	0.224	59.98	0.86928	0.861	0.928
264	140	1	0.135	60.291	0.87378	0.55	0.742
264	142	1	0.116	60.542	0.87742	0.299	0.547
264	144	1	0.094	60.648	0.87896	0.193	0.439
266	136	1	0.143	60.127	0.87141	0.714	0.845
266	138	0.978	0.257	59.939	0.86868	0.902	0.950
266	140	0.992	0.192	60.024	0.86991	0.817	0.904
266	142	1	0.14	60.336	0.87443	0.505	0.711
266	144	1	0.113	60.563	0.87772	0.278	0.527
268	136	1	0.129	60.252	0.87322	0.589	0.767
268	138	1	0.146	60.116	0.87125	0.725	0.851
268	140	0.972	0.293	59.885	0.8679	0.956	0.978
268	142	0.996	0.176	60.042	0.87017	0.799	0.894
268	144	1	0.143	60.329	0.87433	0.512	0.716
270	136	1	0.11	60.404	0.87542	0.437	0.661
270	138	1	0.13	60.253	0.87323	0.588	0.767
270	140	1	0.147	60.112	0.87119	0.729	0.854
270	142	0.972	0.296	59.874	0.86774	0.967	0.983
270	144	0.99	0.208	60.006	0.86965	0.835	0.914
272	136	1	0.09	60.542	0.87742	0.299	0.547
272	138	1	0.108	60.425	0.87572	0.416	0.645
272	140	1	0.131	60.255	0.87326	0.586	0.766
272	142	1	0.149	60.105	0.87109	0.736	0.858
272	144	0.978	0.27	59.92	0.86841	0.921	0.960
274	136	1	0.067	60.674	0.87933	0.167	0.409
274	138	1	0.09	60.551	0.87755	0.29	0.539
274	140	1	0.113	60.391	0.87523	0.45	0.671
274	142	1	0.132	60.251	0.8732	0.59	0.768
274	144	1	0.151	60.108	0.87113	0.733	0.856

Impact from ATLAS H->ZZ RUN2

- Include run2 data

mH	mS	sm_factor	Beta_g	Chi2/ndof	Delta chi2	z_0
268	140	0.972	0.293	59.885/69	0.956	0.978

- Include run1 data

mH	mS	sm_factor	Beta_g	Chi2/ndof	Delta chi2	z_0
268	140	0.843	1.068	48.296/66	5.207	2.281

- Don’t include

mH	mS	sm_factor	Beta_g	Chi2/ndof	Delta chi2	z_0
268	140	0.799	1.228	37.164/50	4.526	2.127