Spin Studies Update

J. Pela

Imperial College London

2012-11-30

Since Last Presentations

On the Spin Analysis

- Moved to HCP dataset
  - More Data...
  - Same graviton sample...
- Looking into variables to explain difference on Yield total/relative between different signals.
- Create a CVS area for current code (now shared between me and Matt).
- Implemented several fixes and improvements to analysis code.

Other activities

- Finished my central shifts for 2012
- Created/Tested/Deployed new CMSSW package tag for L1 DQM Offline.

Looking into relevant variables

Why?

- In the current analysis we start from the assumption the SM Higgs and Graviton cross section is the same.
- After minimal diphoton BDT cuts ($score > -0.05$) the Graviton yield is approximately half the SM Higgs.
- It would be important to determine which are the variables that make more graviton events get rejected or moved to lower BDT categories.

What?

Looked at:

- Contribution to mass peak of events between barrel and endcap
- p_T and η of lead/sublead photon
- p_T and η diphoton
- Minimum and Maximum photon η

Changes ICHEP to HCP analysis

Differences Main Analysis

- All the changes/new features of the main HCP analysis.
- Including the new calibration and VBF MVA.
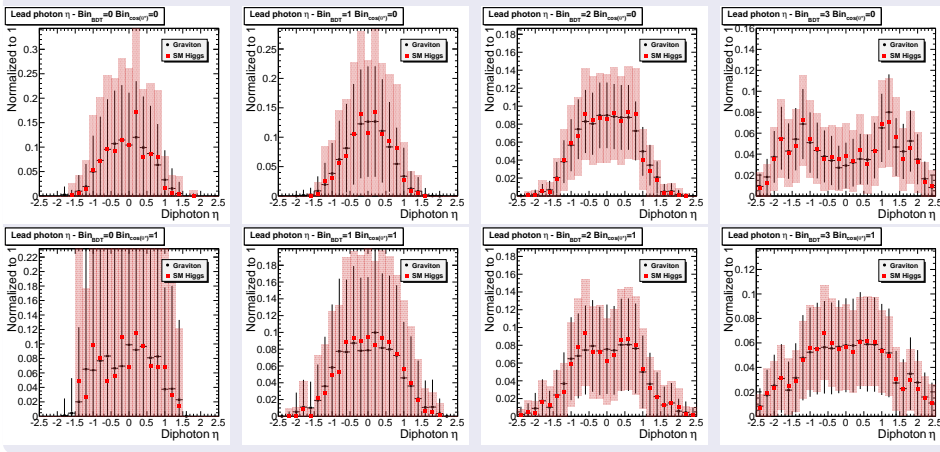
Differences Spin Analysis

- New optimized $cos(\theta*)$ bins. Ordered by BDT category:
  - ICHEP: 0.7, 0.3, 0.4, 0.5
  - HCP: 0.5, 0.4, 0.4, 0.5

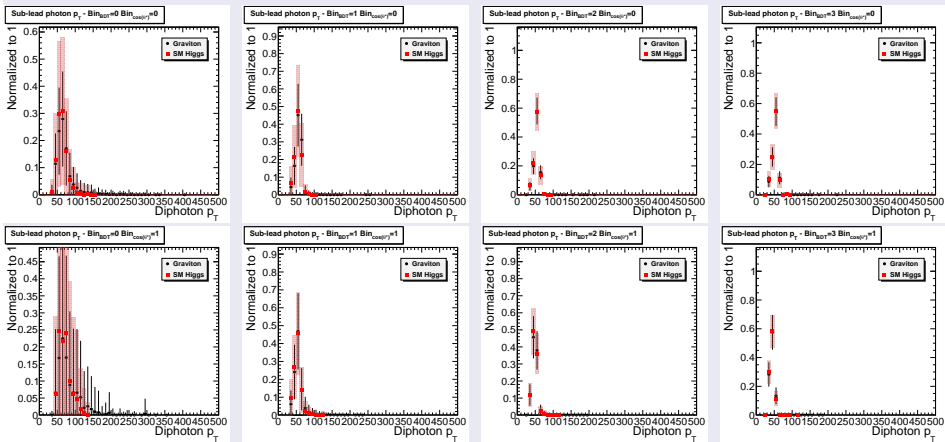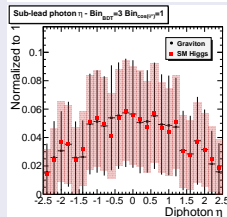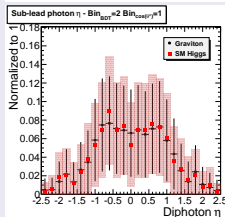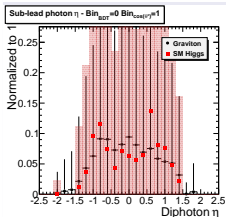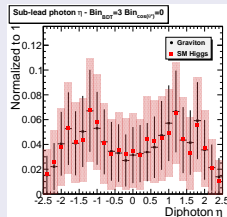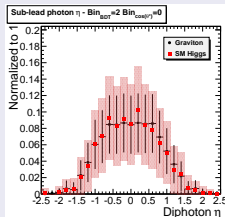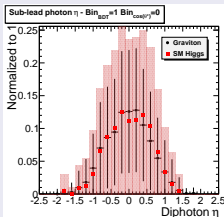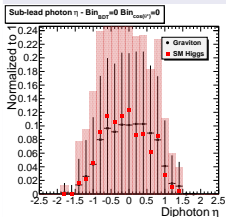- In all categories SM Higgs and graviton are compatible within statistical errors

- In all categories SM Higgs and graviton are compatible within statistical errors
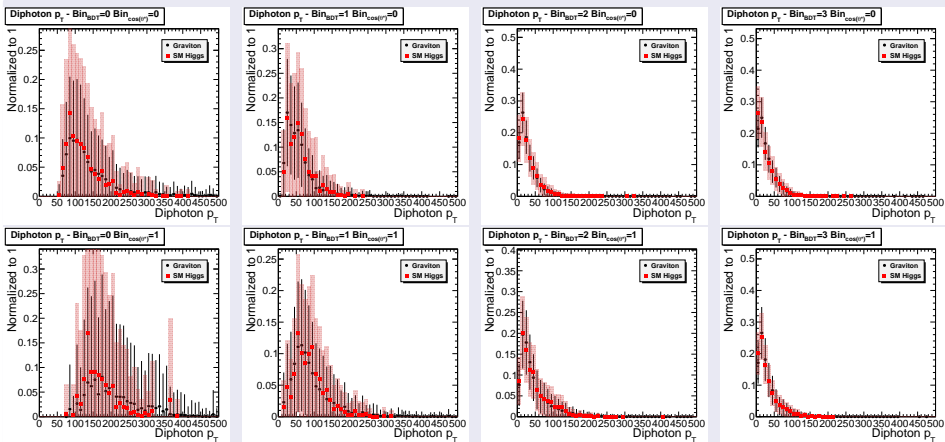- But High $cos(\theta*)$ plots show a different shape, peaking at $|eta| \sim 1$

- In all categories SM Higgs and graviton are compatible within statistical errors
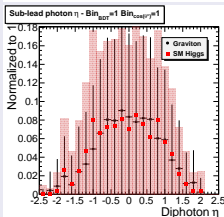
- In all categories SM Higgs and graviton are compatible within statistical errors
- But High $cos(\theta*)$ plots show a different shape, peaking at $|eta| \sim 1$

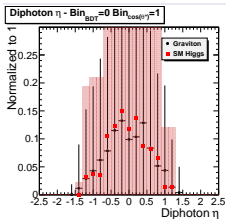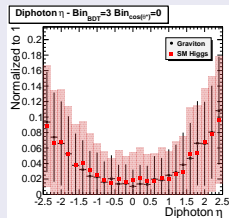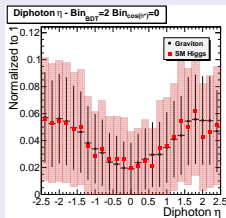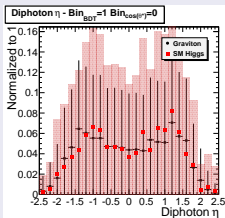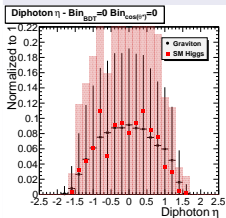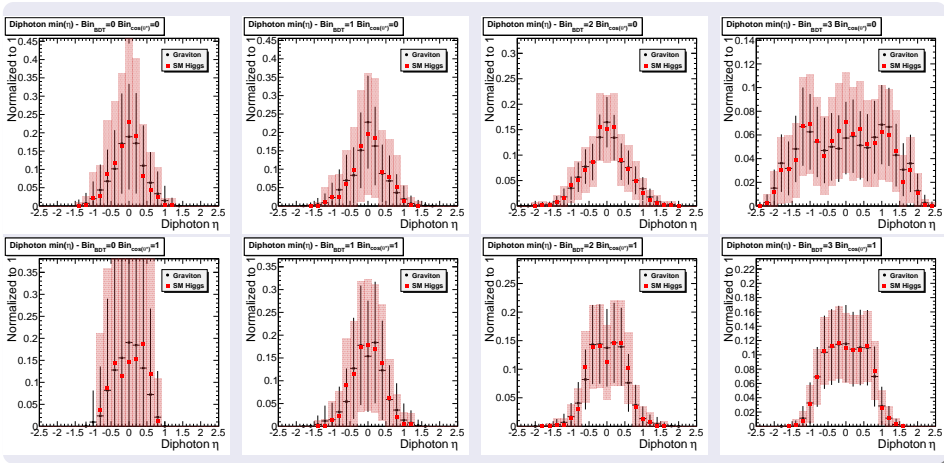- In all categories SM Higgs and graviton are compatible within statistical errors
- But High $cos(\theta*)$ (bdt=1,2) plots show a different shape, peaking at more sharply and decaying faster for Graviton
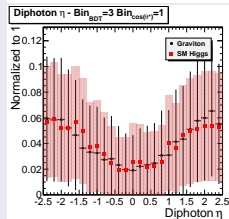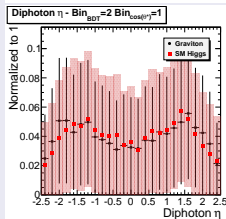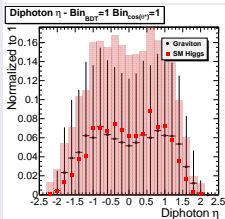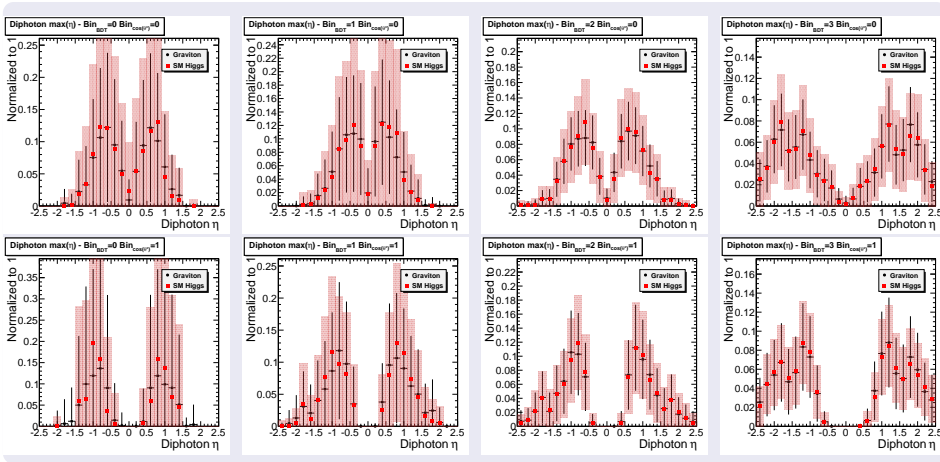
- In all categories SM Higgs and graviton are compatible within statistical errors
- Several categories show significant shape differences

Minimum photon η

- In all categories SM Higgs and graviton are compatible within statistical errors
- High $cos(\theta*)$ seem bins to show that on the photons is always more central

- In all categories SM Higgs and graviton are compatible within statistical errors
- High $cos(\theta*)$ bins as expected have higher values

Conclusions

Conclusions

- Significant shape differences where found in p_T and η distributions but suffering from low sample statistics.

Next

- Redo all plots with HCP dataset
- Investigate more variables
- Look into other possible event selection methodologies (example: cut based)