Spin Studies Update

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Work being developed

Since Last Presentations

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Analysis definition: Mass Factorized Based

Analysis Flow

- Start from the categorization of the *Mass Factorized* Analysis taking categories 0 to 3
- Split events on those categories into $cos(\theta^*)$ bins.
- Produce dataset over new categories (4×2) from data and MC signal samples
- Create and fit Signal Model ($3\times$ Gaussian) to MC signal SM
- Fit same model to Alternative Model (Spin 2)
- Fit background Model to data sideband and extrapolate yield at signal region
- Compute separation from previous values (to be done)
- Fix all parameters on all the categories of Signal Model
- Fit Signal Model (floating signal strength μ) + Background Model to data.

Details

- Signal area 2% around 125 GeV.

To be done:

- Normalization of Alternative Model (Spin 2) to SM Model total number of events.
- Pass event Yields to separation code

Analysis definition: Cut based

Analysis Flow

- Start from the categorization of the *Cut Based* Analysis taking categories 0 to 3
- Split events on those categories into 5 $cos(\theta^*)$ bins (0.2 spacing).
- Produce dataset over new categories (4×5) from data and MC signal samples
- Create and fit Signal Model ($3\times$ Gaussian) to MC signal SM
- Create efficiency function to flat out $cos(\theta^*)$ for SM
- Fit Signal Model to Alternative Sample (Spin 2) and apply efficiency correction (to be done)
- Fit background Model to data sideband and extrapolate yield at signal region
- Compute separation from previous values (to be done)
- Fix all parameters on all the categories of Signal Model (to be done)
- Fit Signal Model (floating signal strength μ) + Background Model to data. (to be done)

Details

- Signal area 2% around 125 GeV.

To be done:

- Normalization of Alternative Model (Spin 2) to SM Model total number of events.
- Pass event Yields to separation code

Normalization of MC Models

For consistency the Model B (Spin 2 Model) is normalized to the total number of events over all categories after diphoton BDT cut.

Absolute Values

Model Normalization									
	bin_{CTh0}^{BDT0}	bin_{CTh1}^{BDT0}	bin_{CTh0}^{BDT1}	bin_{CTh1}^{BDT1}	bin_{CTh0}^{BDT2}	bin_{CTh1}^{BDT2}	bin_{CTh0}^{BDT3}	bin_{CTh1}^{BDT3}	Total
Model A	8.924	3.199	25.869	9.856	103.603	43.781	95.076	60.979	351.288
Model B (before)	4.802	3.003	12.602	8.761	50.401	39.061	52.351	67.679	238.660
Model B (after)	7.068	4.420	18.549	12.896	74.186	57.494	77.056	99.618	351.288

Relative

Model Normalization (relative)									
	bin_{CTh0}^{BDT0}	bin_{CTh1}^{BDT0}	bin_{CTh0}^{BDT1}	bin_{CTh1}^{BDT1}	bin_{CTh0}^{BDT2}	bin_{CTh1}^{BDT2}	bin_{CTh0}^{BDT3}	bin_{CTh1}^{BDT3}	Total
Model A	0.025	0.009	0.074	0.028	0.295	0.125	0.271	0.174	1.000
Model B (before)	0.020	0.013	0.053	0.037	0.211	0.164	0.219	0.284	1.000
Model B (after)	0.020	0.013	0.053	0.037	0.211	0.164	0.219	0.284	1.000

Conclusions

[noframenumbering]
Backup Slides