W2Pho v0.1

Introduction

This is a leading order Monte Carlo generator for $pp \rightarrow \mathrm{l}\nu\gamma\gamma$ ($\mathrm{l} = \mathrm{e}\nu$ events with an anomalous $\mathrm{WW}\gamma\gamma$ coupling. The original version was supplied by O. J. P. Éboli and S. M. Lietti of the Instituto de Física Teórica and was used in the study described in [1]. This extension by Dušan Reljić of The Institute of Physics, Belgrade and Paul Bell of The University of Manchester includes the previously missing valence-sea quark contributions to the total cross-section, an unweighting algorithm and corrected charged lepton masses. It has been used in the study described here [2]

Organization of the program

The W2Pho generator is organized in directories and files as follows:

```
W2Pho.f
cards.dat
initialize.f
Makefile
subroutines_DHelas
subroutines_DHelas_ANO
subroutines_MadGraph
subroutines_MadGraph_ANO
subroutines_PhaseSpace
subroutines_Vegas
```

- **W2Pho.f**

  The main fortran programme for the process $qq \rightarrow \mathrm{l}\nu\gamma\gamma$ ($\mathrm{l} = \mathrm{e}\nu$) including the Standard Model contribution plus the anomalous WWaa vertex. The input parameters (cuts) are defined in the **cards.dat** file

- **subroutines_DHelas**

  The subdirectory with the HELAS subroutines.

- **subroutines_DHelas_ANO**

  The subdirectory with the HELAS subroutines for the anomalous WWaa vertex.

- **subroutines_MadGraph**

  The subdirectory with the subroutines generated by "madgraph" that return the SM amplitude squared summed/averaged over colors and helicities for the processes $\mathrm{u}\bar{\mathrm{d}} \rightarrow \mathrm{l}\nu\gamma\gamma$ and $\mathrm{d}\bar{\mathrm{u}} \rightarrow \mathrm{l}\nu\gamma\gamma$

- **subroutines_MadGraph_ANO**

  The subdirectory with the subroutines generated by "madgraph" that return the SM plus anomalous WWAA vertex amplitude squared summed/averaged over colors and helicities for the processes $\mathrm{u}\bar{\mathrm{d}} \rightarrow \mathrm{l}\nu\gamma\gamma$ and $\mathrm{d}\bar{\mathrm{u}} \rightarrow \mathrm{l}\nu\gamma\gamma$

- **subroutines_PhaseSpace**

  The subroutines to evaluates the momentum of the final particles.

- **subroutines_Vegas**

  The Monte Carlo integrator.

Running the program

The executable is built using the make file. The file **cards.dat** is the input file for the generator parameters and cuts. The structure of the file is self explanatory. The output files are:

```
Cevki_atlas_sm
cs_atlas_sm.dat
LHout.txt
LHout2.txt
wmass.txt
pp_atlas_sm.hbook
```

where

- **LHout.txt**

  is the file where all unweighted events from generator are written in Les Houches format. Events are written using Les Houches HEPEUP common block.

- **LHout2.txt**

  is the second Les Houches files with Les Houches HEPRUP common block.

- **cs_atlas_sm.dat**

  is the file that contains calculated cross section (in fb), and error (in pb).

References

[1] O. J. P. Eboli, M. C. Gonzalez-Garcia, S. M. Lietti, S. F. Novaes, *Phys. Rev.* **D 63** (2001) 075008.

[2] Coming soon...