

Madgraph5: Tutorial

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Install MG/ ME5

- You will need MG_ME 4.4.38
[http://madgraph.hep.uiuc.edu/](http://madgraph.hep.uiuc.edu/Downloads/MG_ME_v4.4.38.tar.gz)
[Downloads/MG_ME_v4.4.38.tar.gz](http://madgraph.hep.uiuc.edu/Downloads/MG_ME_v4.4.38.tar.gz)
- MG5: [https://code.launchpad.net/](https://code.launchpad.net/madgraph5/+download)
[madgraph5/+download](https://code.launchpad.net/madgraph5/+download)
takes beta version 0.4.1
install as madgraph5 in MG_ME

2) Install Python

- <http://www.python.org/download/>
- For Windows/MAC: follow instructions
- For Linux (from source)
 - ./setup.py
 - make install
 - make

Your first command line

- `$> ./madgraph5/bin/mg5`
- `mg5> help`
- `mg5> help import`
- `mg5> import model_v4 sm`
- `mg5> generate e+ e- > e+ e-`
- `mg5> draw .`
- `! gv ./diagrams_0_e+e-_e+e-.eps`

result:

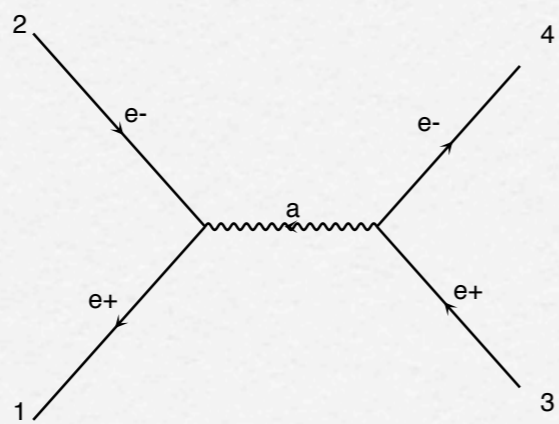


diagram 1

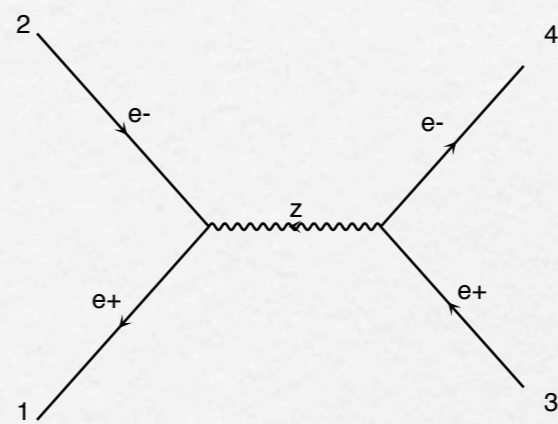


diagram 2

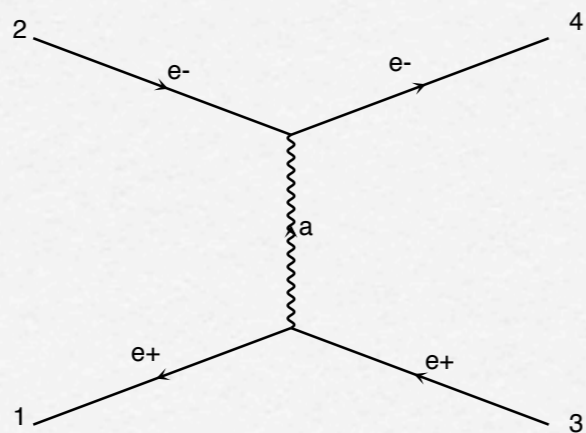


diagram 3

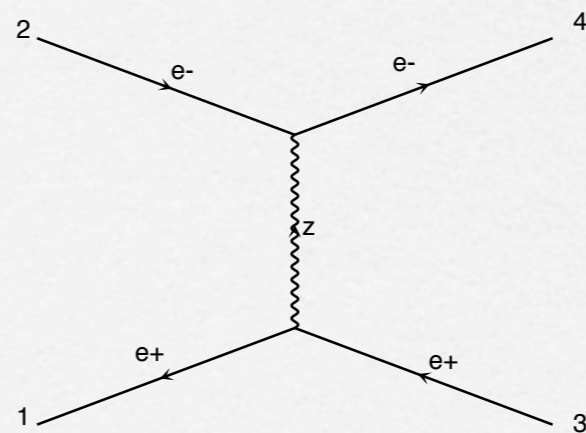


diagram 4

First Trial

Make

□ $mg5 >$ define $P u u \sim d d \sim g$

and then compare

□ $mg5 >$ generate $P P > u u \sim$

□ $mg5 >$ generate $P P > u u \sim /g$

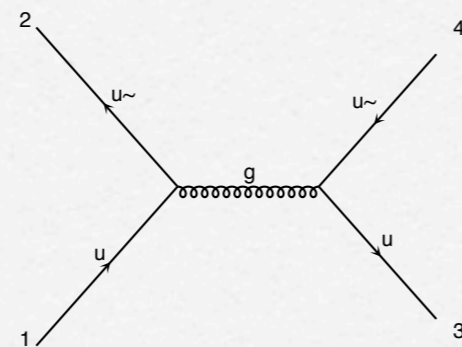
□ $mg5 >$ generate $P P > u u \sim \$ g$

□ $mg5 >$ generate $P P > u u \sim QED=0$

Solutions:

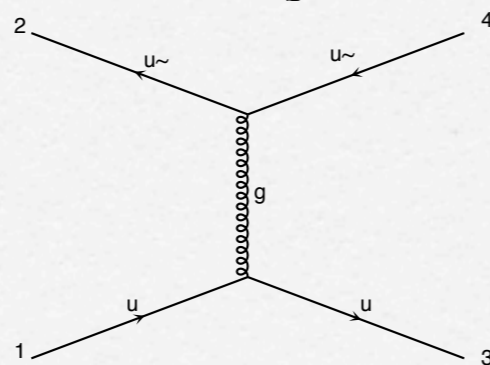
□ $u u \sim \rightarrow u u \sim$: 6 diagrams

□ $u u \sim \rightarrow u u \sim \# g$: 5 diagrams



\Rightarrow No S-propagator

□ $u u \sim \rightarrow u u \sim / g$: 4 diagrams



\Rightarrow No propagator

Solutions

- $u u \sim \rightarrow u u \sim \text{QED} = 0$: 2 diagrams
- Note that QCD is not specify
- default couplings restriction to infinity
- MG4 default was zero!!!

Trial 2:

- save your previous command in a file
- execute this files
- Then add a second process
($e^+ e^- \rightarrow e^+ e^-$ a for example)
- draw both processes in one command

Don't forget the help command ;-)

Solution

- `mg5> history my_file`
- `mg5> import command my_file`
- `mg5> add process e+ e- > e+ e- a`
- draw.

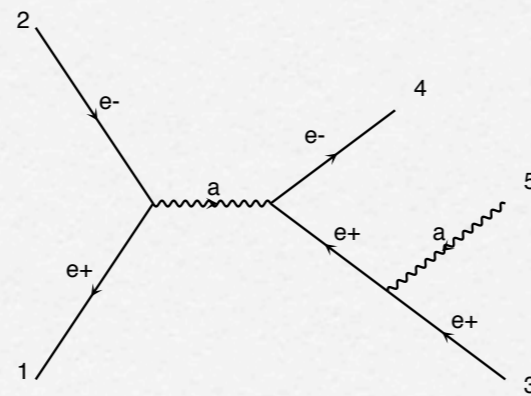


diagram 1

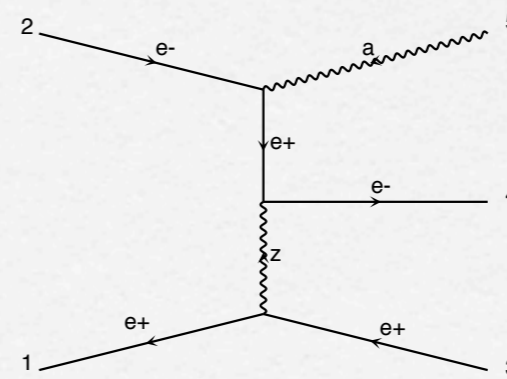


diagram 6

trial 3

- create a full Madevent output for $pp > e+e-$ including
 - creating a directory
 - creates the output
 - creates the web pages

Solution

- `mg5> import model_v4 sm`
- `mg5> define P u u~ d~ g`
- `mg5> generate P P> e+ e-`
- `mg5> setup madevent_v4 auto/My_dir`
- `mg5> export madevent_v4`
- `mg5> makehtml`

second solution

- `$> cp Template my_dir`
- `edit proc_card.dat`
 - `edit proc_card_mg5.dat`
- `./madgraph5/bin/mg5`
- `import proc_v4 my_dir`
 - `import command proc_card_mg5.dat`

Third solution

- `$> cp Template my_dir`
- `edit proc_card.dat/ proc_card_mg5.dat`
- `cd my_dir`
- `./bin/newprocess_mg5`

trial 4: decay chains

- generate $t t^{\sim} + 1\text{jet}$ (with fully leptonic decay)
- syntax: core, (decay, subdecay), (decay2, subdecay2), ...
- make the html output for madevent,
- run madevent

Solution

- generate pp $> t \sim j$, ($t > b w+$, $w+ > l +vl$), ($t \sim > b \sim w-$, $w- > l -vl \sim$)
- (generation in 1.7 sec)
- setup madevent_v4 auto
- export madevent_v4 (5 sec)
- makehtml

Solution

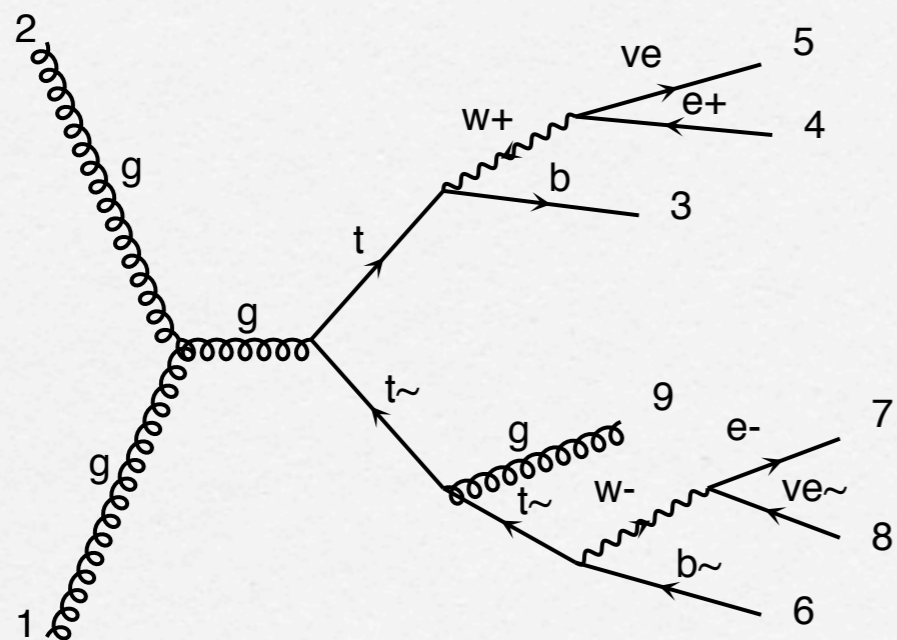


diagram 3

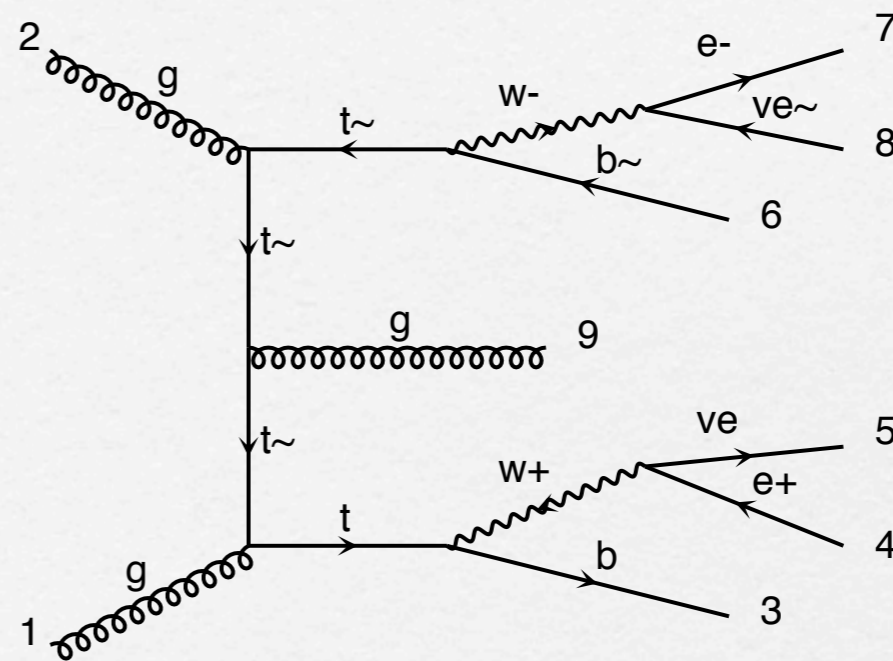


diagram 4

USE The Web

- http://madgraph.phys.ucl.ac.be/new_gen_proc_card_mg5.html
- select MG5 (beta)
- generate your favorite process
 - Note differences for space/ couplings

Bug/request/...

- Bug/feature/code status/download:
 - <https://launchpad.net/madgraph5>
- Wiki:
 - <https://server06.fynu.ucl.ac.be/projects/madgraph/wiki/>
- Thanks To you!!!