

MadGraph 5

The New MadGraph Generation

FeynRules WorkShop 2010

MADGRAPH 4

MadGraph II

Diagram

- Diagram Generation
- Amplitude (via Helas Routine)
- Link to set of Package (Decay, MadFKS, MadWeight, ...)

MADGRAPH 4

MadGraph II

MadEvent

Diagram

Partonic Events

- Cross section
- distribution
- Events

MADGRAPH 4

MadGraph II

Diagram

MadEvent

Partonic Events

- Cross section
- distribution
- Events
- decay chains
- Matching
- Quarkonium

MADGRAPH 4

MadGraph II

Diagram

MadEvent

Partonic Events

Pythia

Hadronization

PGS/Delphes Detector

MADGRAPH 4

FeynRules

Model

MadGraph II

Diagram

MadEvent

Partonic Events

Pythia

Hadronization

PGS/Delphes Detector

MADGRAPH 4

FeynRules

Model

MadGraph II

Diagram

MadEvent

Partonic Events

FR compatible

Pythia

Hadronization

Stock version

UserMod2

PGS/Delphes Detector

MADGRAPH 4

FeynRules

Model

Theory

MadGraph II

Diagram

MadEvent

Partonic Events

Pythia

Hadronization

Experiment

PGS/Delphes

Detector

MADGRAPH 4

FeynRules

Model

MADGRAPH 5

Diagram

MadEvent

Partonic Events

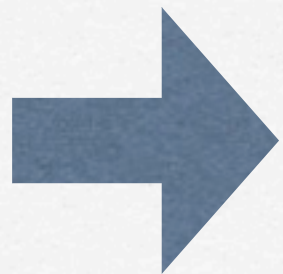
Pythia

Hadronization

PGS/Delphes Detector

WHY CHANGE?

- MQII is in fortran 77
 - Not Object Oriented
 - but not 100% in f77 (scripts..)
- MQII is an old code
 - New implementations are hard

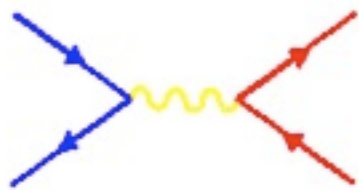


Time For a new Start

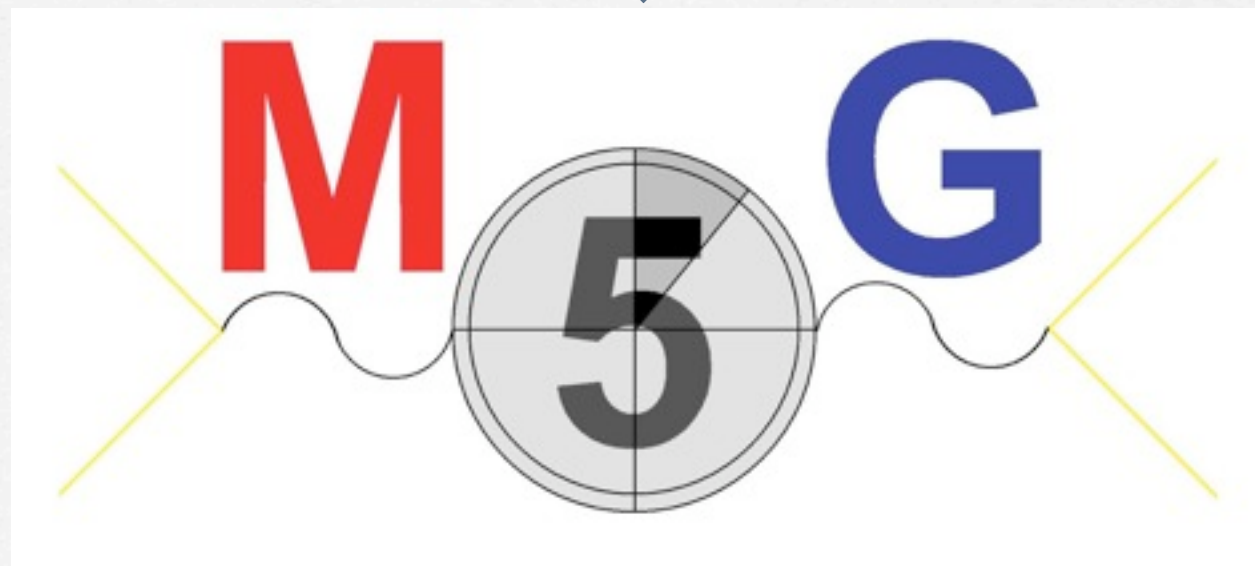
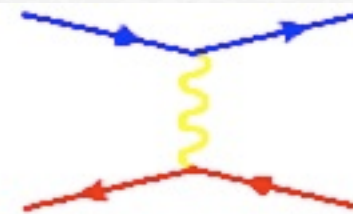
Desired "New" Features

- Runs for ALL BSM Model coming from FR (w/ Automatic Helas generation)
- Events Generator at NLO
 - Not only Squared Amplitudes
- Improved multi parton amplitudes
- Export ME's w/ spin info (ex: Pythia)

MG5 and Python



MadGraph Version 4
UCL UIUC Fermi
by the MG/ME Development team



FeynRules Workshop 2010

MG5 First Objectives

- Diagram Generation (tree level)
- Diagram Drawing
- Color handling
- Amplitude generation
- Helas Generation

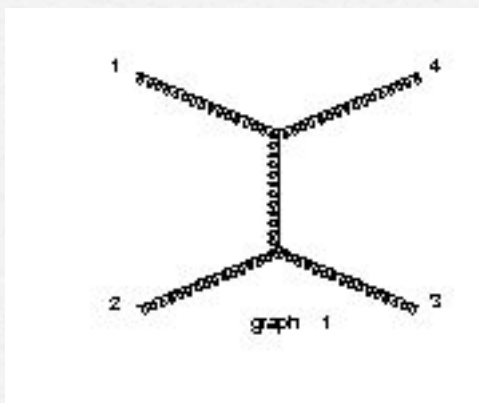
MG5 First Objectives

- Diagram Generation (tree level) ✓
- Diagram Drawing ✓
- Color Factor 95%
- Amplitude Computation ✓
- Helas Automatic Generation 75%

MG4 vs MG5

□ MG4 in SM

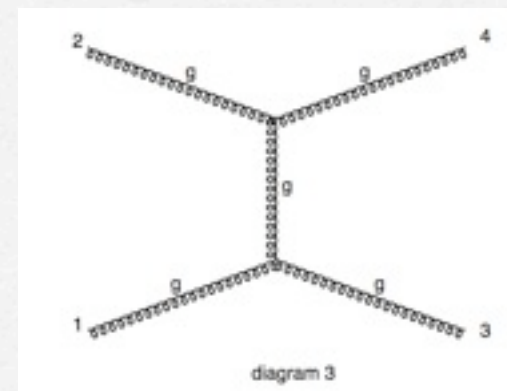
□ XX > XX



□ 4 minutes

□ MG5 in SM

□ XX > XX



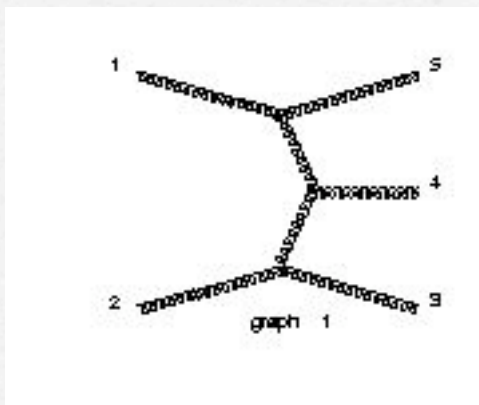
□ 1 minutes

100% Agreement

MG4 vs MG5

□ MG4 in SM

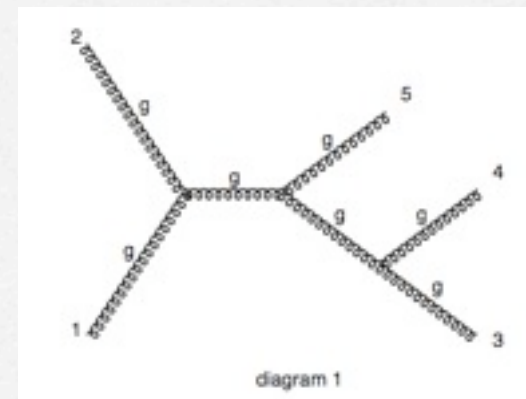
□ XX > XXX



□ 70 minutes

□ MG5 in SM

□ XX > XXX



□ 26 minutes

100% Agreement

What's Needed from FR

- Need A Python Module for the Model
- Discussion on this Workshop
- particles/vertices/parameters/
couplings
- Lorentz information for creating Helas
- (see working group)

Conclusion

- Two Directions for MadGraph5
 - NLO
(MadDipole/MadFKS/...)
 - BSM
(via FeynRules)
- madgraph.phys.ucl.ac.be