

Search for Electro-Weak Top Quark Production at D0 [CMS]

Martin Erdmann, Steffen Kappler,
Matthias Kirsch, Daniel Lenz,
Gero Müller, Jan Steggemann
RWTH-Aachen

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Analysis Steps

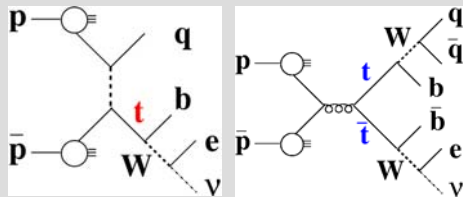
Detector
Recon-
struction

μ
Jet
Jet
 ~~E_T~~

Experim.

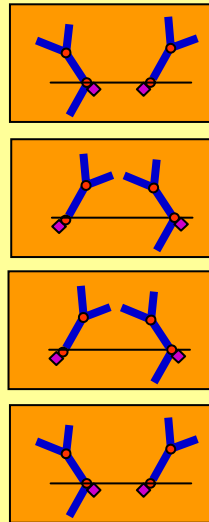
Production
Hypotheses:
eg. MadGraph

μ
 ν
 q
 q



Theory

Parton
Recon-
struction

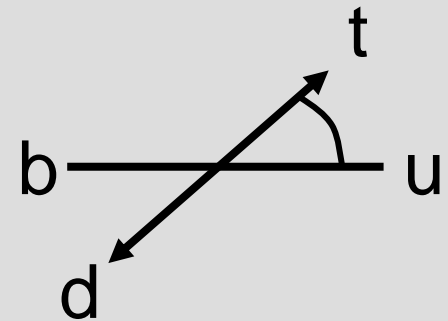


...

Experim.

Judgement:
probability
of process?

*sensitive &
reliable
observables?*



Theory&Exp.

Visual Physics Analysis eXpert

a tool for interactive physics interpretation of HEP events



Factory



Process



Event



Container



Relations



Collision



Vertex

— Particle

The screenshot shows the VisualPax software interface. The main window is titled "VisualPax - File Browser, Event Editor & Process Modelling". The interface is divided into several panels:

- Event:** A list of events from 1 to 22, with event 6 selected.
- Interpret:** A list of objects including "NEW (...)", "Higgs(Z)", "Reconstructed Particles", and "Reconstructed Process".
- Physics-Objects:** A diagram showing a collision vertex (green circle) with incoming particles "Z1" and "Z", and outgoing particles "higgs", "muon", and "jet".
- Properties:** A table of properties for the selected object (Main: FourVector):

Property	Value
Paxid	27
PaxName	Z
Charge	0
Locked	False
ParticleId	0
Simulated	0
Status	0
Workflag	0
Vector	
Mass	77.145572
Energy	98.558538
Pt	56.978705
Px	-7.922004
Py	56.425302
Pz	22.710641
phi	1.710283
theta	1.191514
eta	0.388718
UserRecords	
NEW (...)	
AutoProcess Definitions	
NEW ...	
Visualization	

The status bar at the bottom indicates "Event no. 6".

Editor for process prescription

VisualPax - File Browser, Event Editor & Process Modelling

File

Open File Close File Save Event As Append Event To Clear Event Arrange Interpret Delete Interpret

Event: Interpret: Physics-Objects: Properties:

NEW (...)
feynman diagram single t

Vertex - FourVector Collision - Vertex <>

Add: Vertex

W1 b t b W muon neutrino

Main: Interpret
PaxId 2
PaxName feynman diagram single
Workflag 0

UserRecords
NEW {...}
{event nr} 1

Registered Physics Objects
id_t 8

AutoProcess Definitions
NEW ...

Visualization

Browser for reconstructed data

VisualPax - File Browser, Event Editor & Process Modelling

File

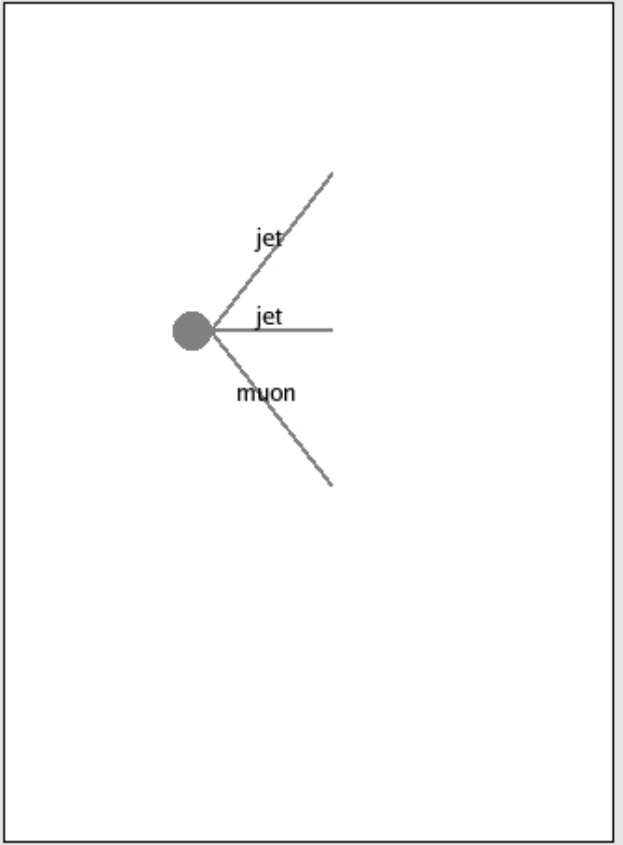
Open File Close File Save Event As Append Event To Clear Event Arrange Interpret Delete Interpret

Event: Interpret: Physics-Objects: Properties:

1 NEW (...)
2 feynman diagram single t
3 Reconstructed Particles
4 Reconstructed Process
5 Reconstructed Process
6 Reconstructed Process
7 Reconstructed Process
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

Vertex - FourVector Collision - Vertex <>

Add: Vertex



Vertex - FourVector Collision - Vertex <>

Properties:

- Main: Interpret
 - PaxId 14
 - PaxName Reconstructed Particles
 - Workflag 0
- UserRecords
 - NEW {...}
 - {run nr} 195657
 - {nr trks} 91
 - {nr muons} 4
 - {nr electrons} 3
 - {nr} 2
 - {event nr} 2990682
 - {SEt} 136.5625
 - {MEz} -0
 - {MEy} 0.413086
 - {MEx} 10.328125
 - {MEt} 10.336383
 - {D0 data} 1
- Registered Physics Objects
- AutoProcess Definitions
 - NEW ...
- Visualization

PAX I/O file: /home/erdmann/VisualPAX/DebugGTK2/reconstructed.paxio Event no. 19

Visual PAX: reconstructed data

Auto Process



VisualPax - File Browser, Event Editor & Process Modelling

File

Open File Close File Save Event As Append Event To Clear Event Arrange Interpret Delete Interpret

Event: Interpret: Physics-Objects: Properties:

1 NEW (...)
2 feynman diagram single t
3 Reconstructed Particles
4 Reconstructed Process
5 Reconstructed Process
6 Reconstructed Process
7 Reconstructed Process
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

Vertex - FourVector Collision - Vertex

Add: Vertex

W1 t jet W jet muon neutrino

Main: FourVector

PaxId	70
PaxName	t
Charge	1
Locked	False
ParticleId	6
Simulated	0
Status	0
Workflag	0

Vector

Mass	222.28291
Energy	260.572623
Pt	27.585923
Px	27.31419
Py	3.862402
Pz	133.144345
phi	0.140475
theta	0.204298
eta	2.277838

UserRecords

NEW {...}	
-----------	--

AutoProcess Definitions

NEW ...	
---------	--

Visualization

[start_position.y]	175
[start_position.x]	185
[end_position.y]	112
[end_position.x]	250

Event no. 19

Visual PAX: reconstructed data

Auto Process



VisualPax - File Browser, Event Editor & Process Modelling

File

Open File Close File Save Event As Append Event To Clear Event Arrange Interpret Delete Interpret

Event: Interpret: Physics-Objects: Properties:

1 NEW (...)
2 feynman diagram single t
3 Reconstructed Particles
4 Reconstructed Process
5 Reconstructed Process
6 Reconstructed Process
7 Reconstructed Process
8 Reconstructed Process
9 Reconstructed Process
10 Reconstructed Process
11 Reconstructed Process
12 Reconstructed Process
13 Reconstructed Process
14 Reconstructed Process
15 Reconstructed Process
16 Reconstructed Process
17
18
19
20
21
22
23
24
25

Vertex - FourVector Collision - Vertex <>

Add: Vertex

jet W1 t jet W muon neutrino

Main: FourVector

PaxId	187
PaxName	t
Charge	1
Locked	False
ParticleId	6
Simulated	0
Status	0
Workflag	0

Vector

Mass	198.256942
Energy	317.625533
Pt	31.078173
Px	31.076496
Py	-0.32281
Pz	246.199738
phi	-0.010387
theta	0.125567
eta	2.766745

UserRecords

NEW {...}	
-----------	--

AutoProcess Definitions

NEW ...	
---------	--

Visualization

[start_position.y]	237
[start_position.x]	185
[end_position.y]	206
[end_position.x]	250

Event no. 24

Visual PAX: Root Tree

VisualPax - File Browser, Event Editor & Process Modelling

File: Open File, Close File, Save Event As, Append Event To, Clear Event, Arrange Interpret, Delete Interpret

Event: 1-25

Interpret: NEW (...)

Physics-Objects: Vertex - FourVector, Collision - Vertex

Properties: Main: FourVector

- PaxId: 187
- PaxName: t
- Charge: 1
- Locked: False
- ParticleId: 6
- Simulated: 0
- Status: 0
- Worktag: 0

Vector

- Mass: 198.256942
- Energy: 317.625533
- Pt: 31.078173
- Px: 31.076496
- Py: -0.32281
- Pz: 246.199738
- phi: -0.010387
- theta: 0.125567
- eta: 2.766745

UserRecords: NEW (...)

AutoProcess Definitions: NEW ...

Visualization

- [start_position.y]: 237
- [start_position.x]: 185
- [end_position.y]: 206
- [end_position.x]: 250

Event no. 24

ROOT Object Browser

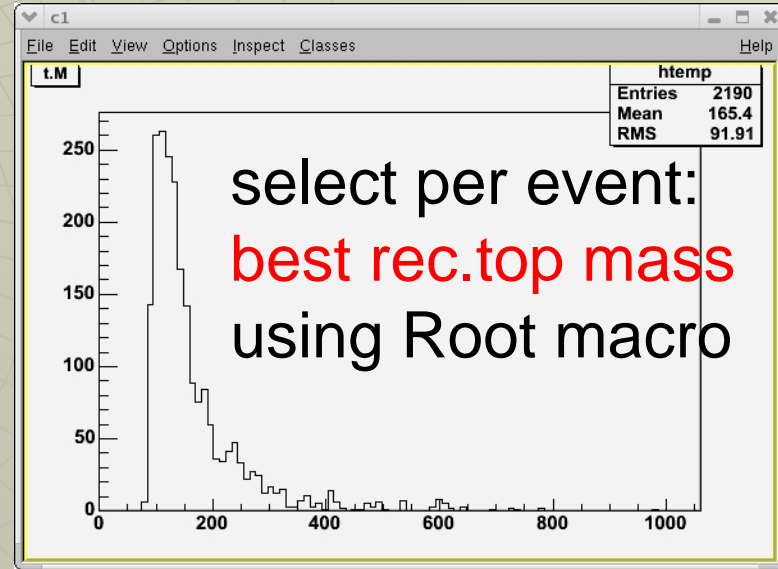
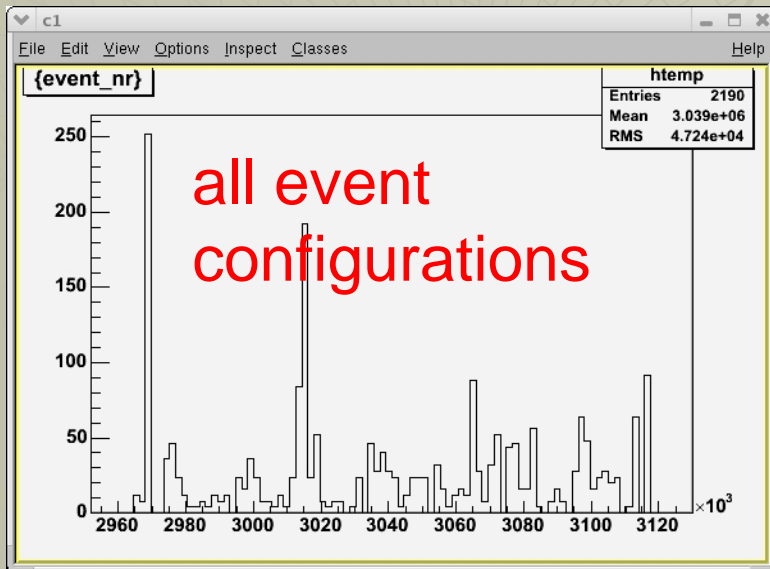
File View Options

reconstructed proc

All Folders: root, /home/erdmann/VisualPAX, ROOT Files, reconstruction.root, reconstructed process

Contents of "/ROOT Files/reconstruction.root/reconstructed process": t.E, t.Eta, t.M, t.Phi, t.Pt, t.Px, t.Py, t.Pz, t.Theta, {event_nr}

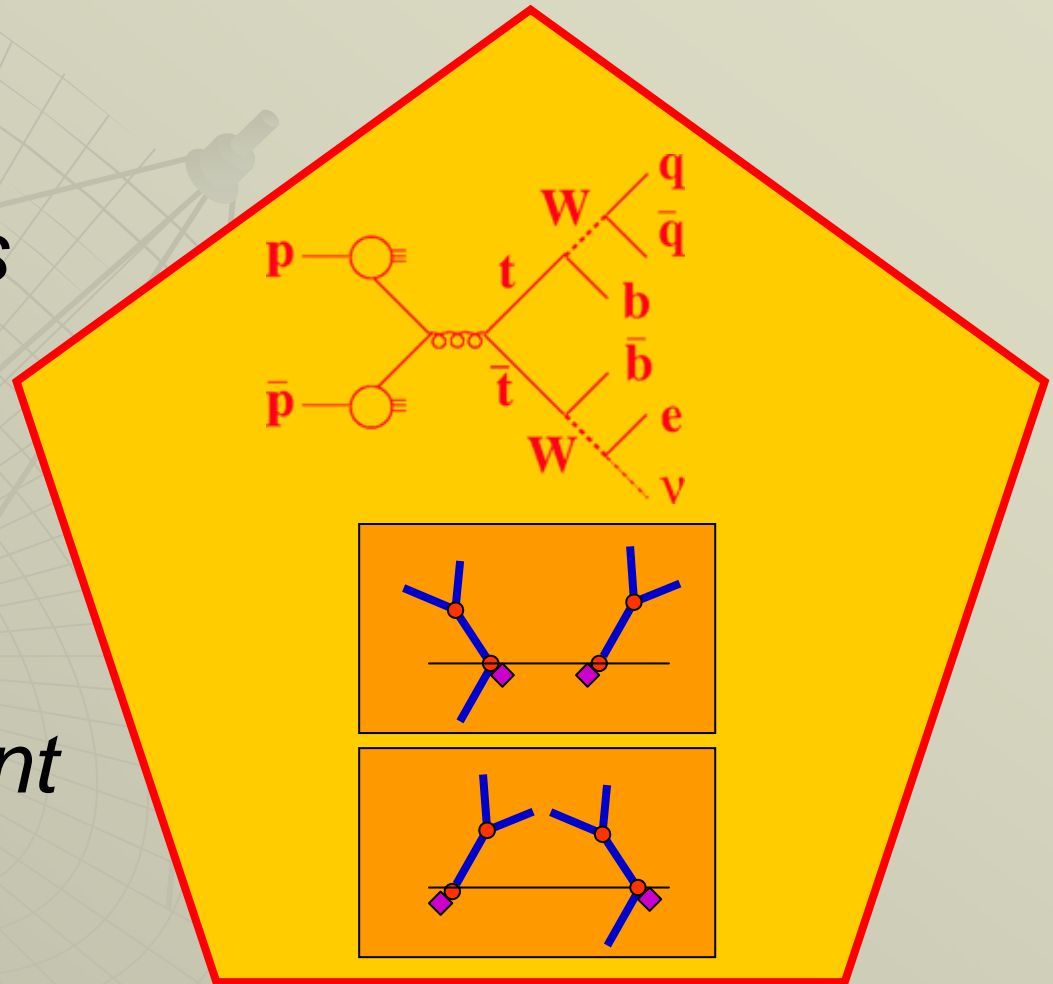
20 Objects. reconstructed process



PAX: Auto Process

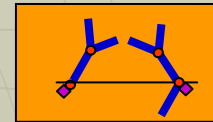
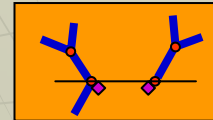
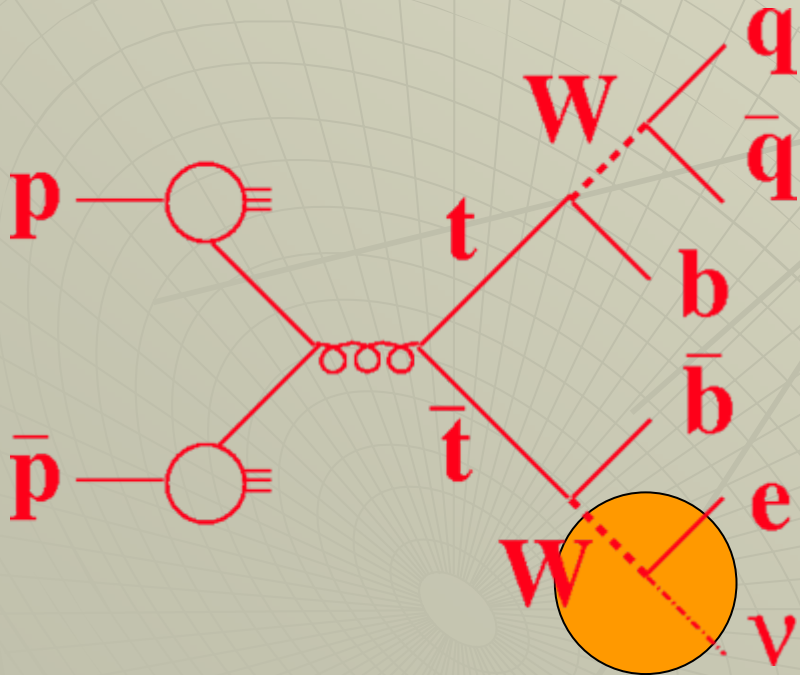
*for a given
physics process*

*automatically
reconstruct
all possible event
configurations*



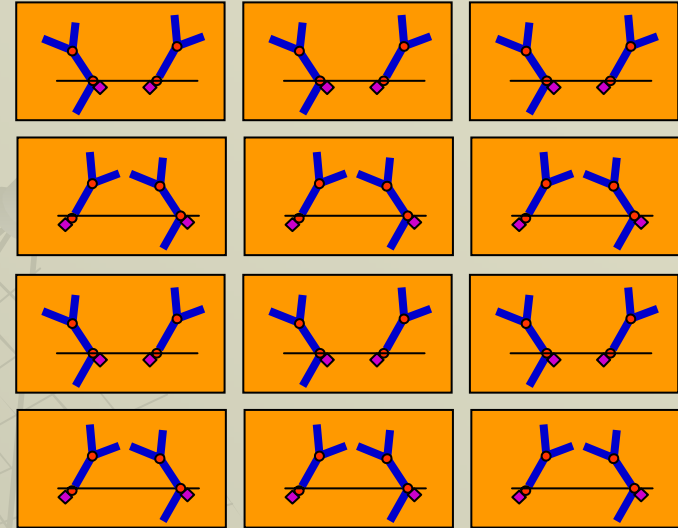
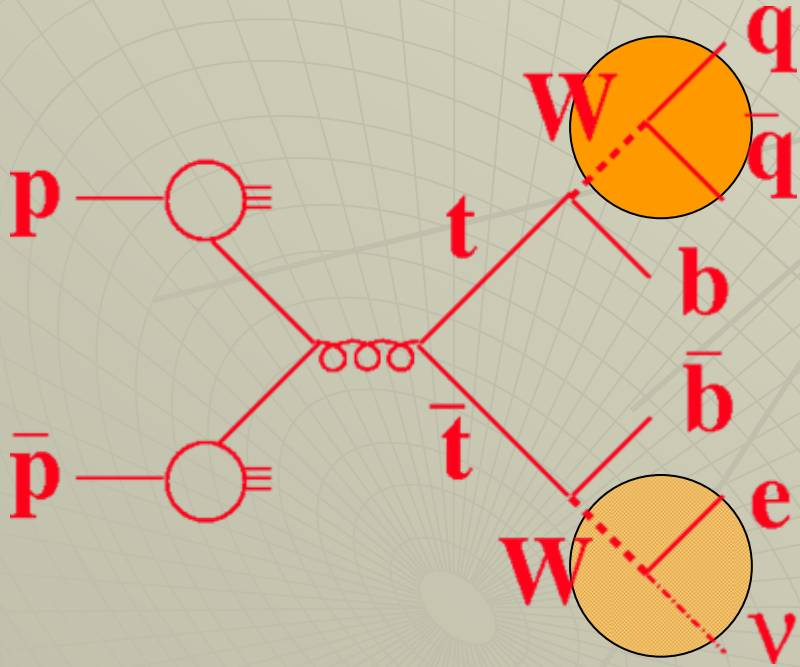


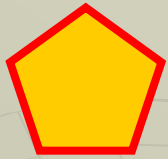
PAX: Auto Process



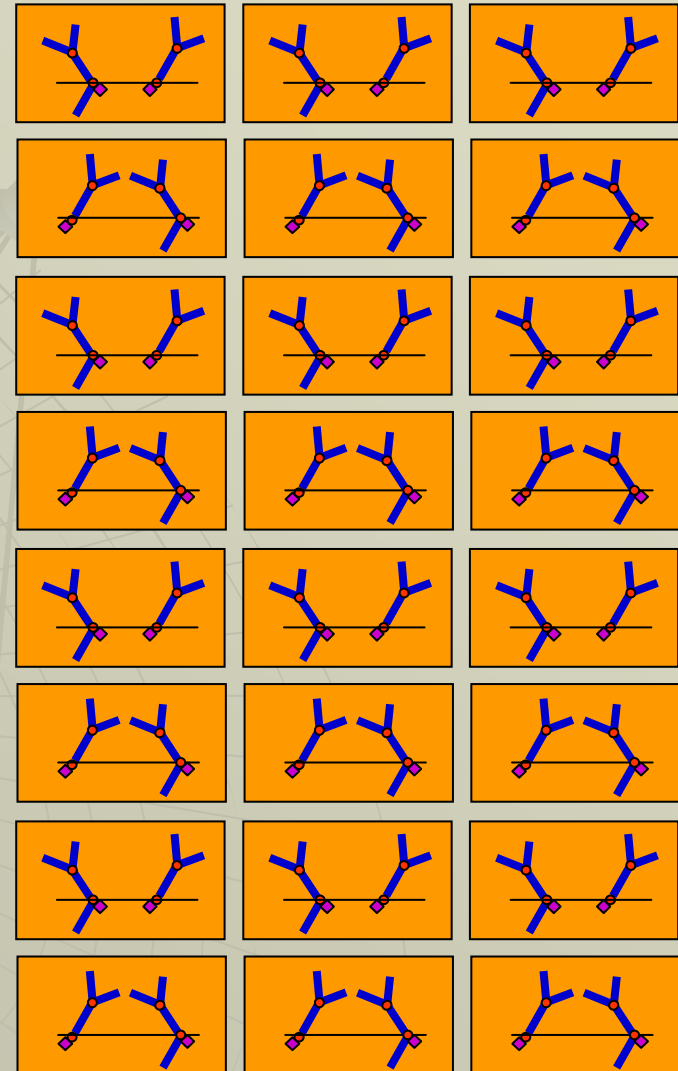
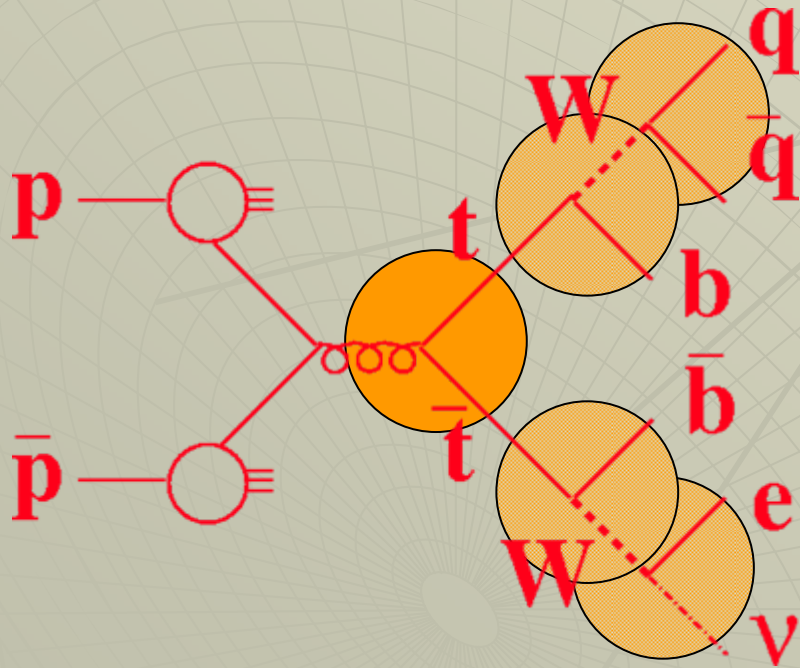


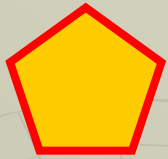
PAX: Auto Process



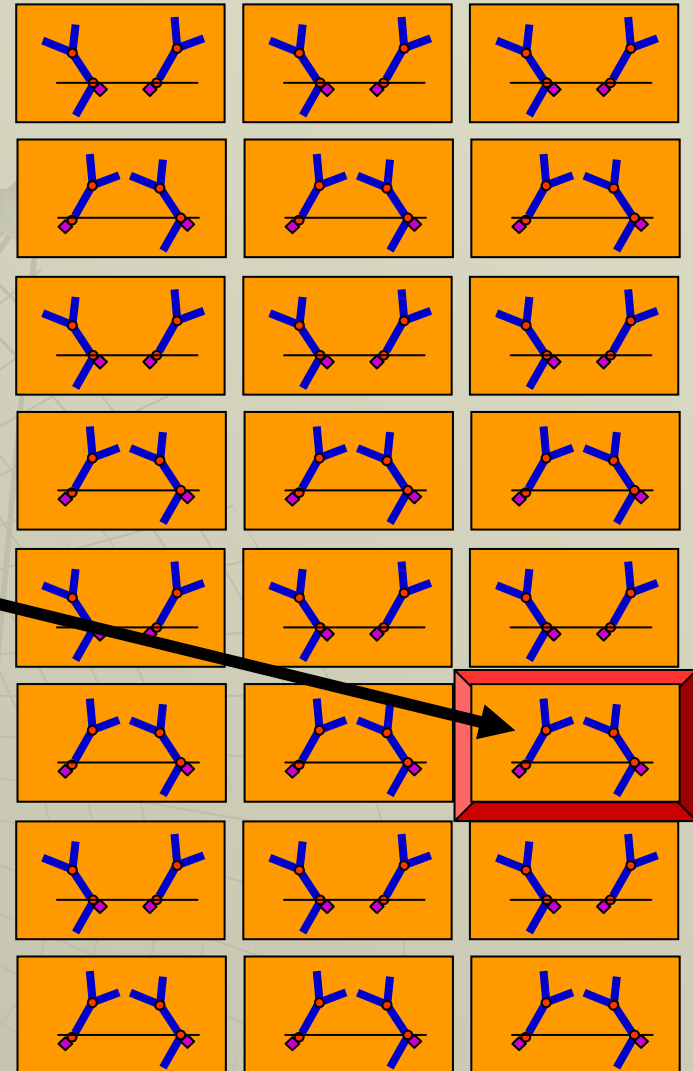
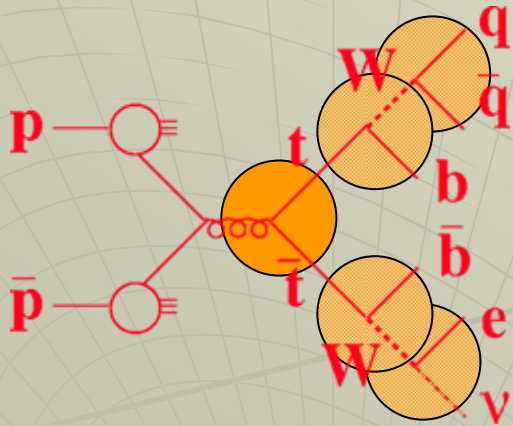


PAX: Auto Process





PAX: Auto Process



Judgement: probability of resulting from a $t\bar{t}$ event? We need reliable, sensitive observables w.r.t. H_0 corrections, Parton distributions, ...

My primary question to workshop

- Judgement, i.e., event probability of*
- *resulting from a top physics process*
 - *configuration correctly reconstructed*

*What are sensitive, reliable observables
w.r.t.*

- *HO corrections*
- *Parton distributions*
- *... ???*