

STUDY OF ANOMALOUS QUARTIC GAUGE COUPLING DISCOVERY POTENTIAL FOR THE SAME-SIGN

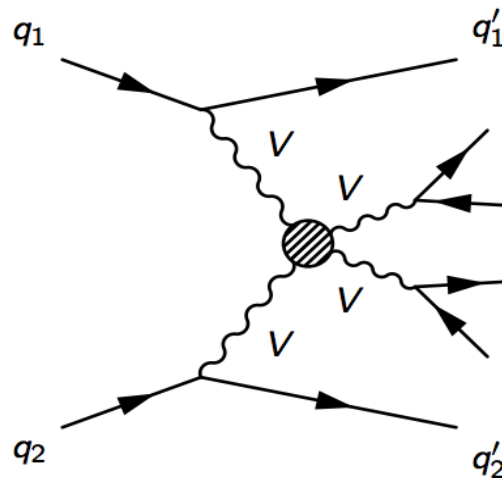
$$W^\pm W^\pm + jj \rightarrow l^\pm \nu l^\pm \nu + jj$$

CHANNEL AT THE LHC

EXPERIMENT

Vector Boson Scattering was recently witnessed for the first time

- $W^\pm W^\pm + j j \rightarrow l^\pm \nu l^\pm \nu + j j$ (best chance at witnessing VBS)
- Current results from two protons colliding at 4 TeV each
- Simulations of future runs will probe at 7 TeV per proton

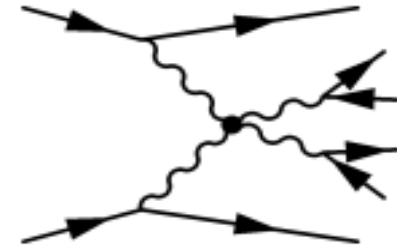


PRIMARY GOALS

SM might be a part of a more complete theory that doesn't break down at high energies.

We want to probe the Lagrangian for new physics terms beyond the SM at High Energies (14 TeV).

$$\mathcal{L} = \mathcal{L}^{SM} + \sum_i \frac{c_i}{\Lambda^2} \mathcal{O}_i + \sum_j \frac{f_j}{\Lambda^4} \mathcal{O}_j$$



I will be covering the FT1 new physics term today.

Anomalous Quartic Gauge Couplings (aQGC)

- Gauge: W bosons
- Quartic: Four vector boson vertex
- Anomalous: may couple to new-physics terms at high energies

MY PROJECT

MadGraph:
Simulate Signal with
its new Physics
Parameters and
Backgrounds

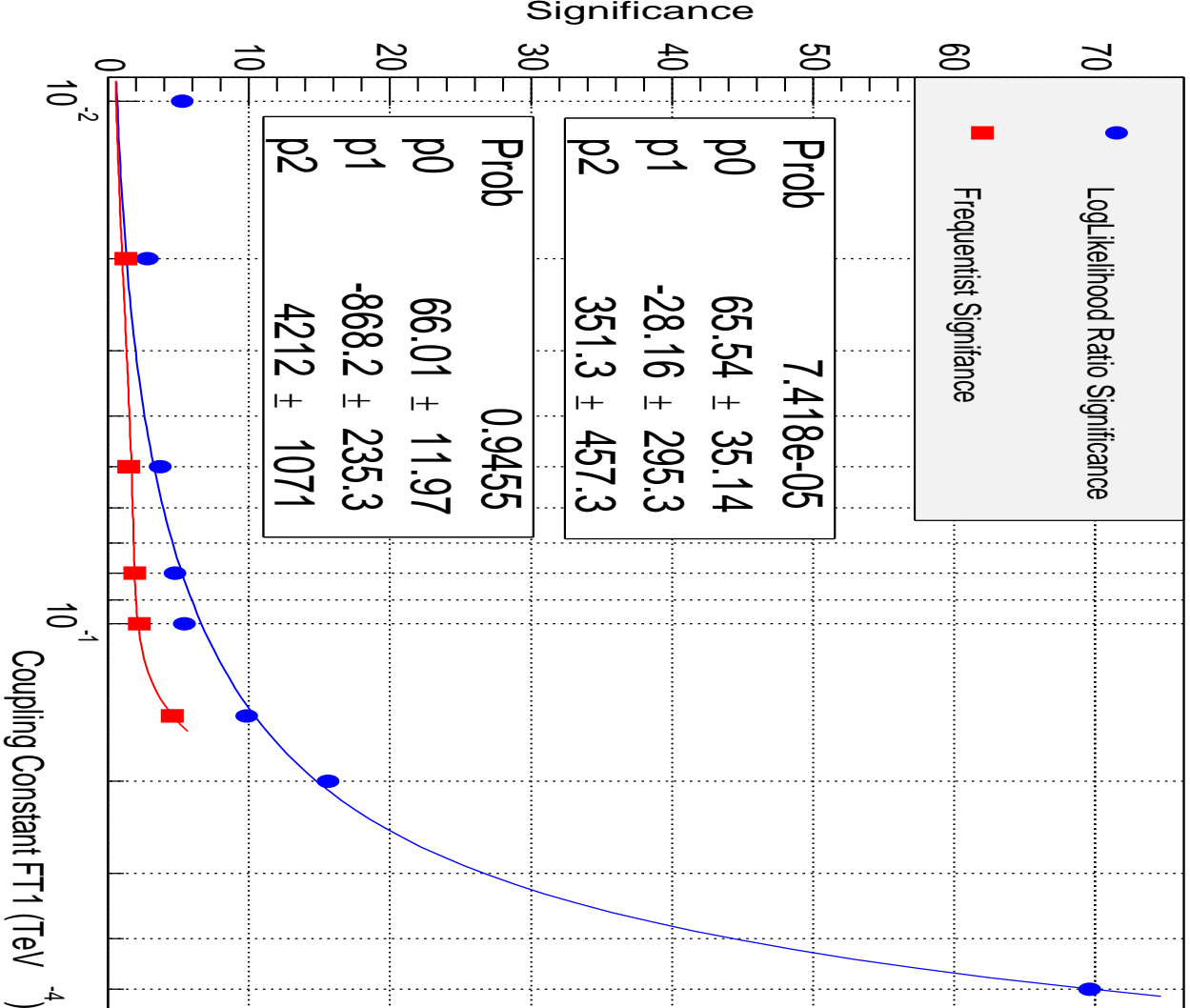
Detector:
Simulate the Signal
Showering and
mixing with
Background

Root:
Analyze data and
look for a 5σ
significance

FT1 NEW PHYSICS

Coupling Constant (TeV ⁴)	Cross Section (fb)	Event Yield (0 Pileup)
0.005	14.49	3080
0.01	14.52	2979
0.02	14.54	3123
0.05	14.52	3131
0.08	14.6	3164
0.1	14.61	3170
0.15	14.78	3256
0.2	15.1	3359
0.5	18.53	4808
SM	14.48	3076

Significance Studies for New Physics (FT1) in the sswEW channel



$\sigma = 0.0764$
 $\sigma = 0.1544$

CONCERNS?

The gears are running smoothly now, but there may not be enough time to compute all 8 new physics variables.

Sources:

C. Gumpert. 2014. "Measurement of the Electroweak $W_{\pm}W_{\pm}jj$ Production Cross Section with ATLAS." *ICHEP*.

<http://arxiv.org/pdf/1309.7452v1.pdf>

P. Angeret al. 2014. "Same Sign $W_{\pm}W_{\pm}$ Production and Limits on Anomalous Quartic Gauge Couplings." *ATLAS Note*.

http://en.wikipedia.org/wiki/ATLAS_experiment

http://www.atlas.ch/photos/atlas_photos/selected-photos/events/VP1-W-munu-2.png

WORK HARD, PLAY HARD



7/17/14

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