# CMS Generator Strategy

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(& CMS)

# Legal Disclaimer

- These are my thoughts, opinions, and dreams
- I have contributed mainly to the CMS Physics Generator Group
- I am not currently involved in a specific CMS analysis early or late
- I am involved in Run 2 analyses

# Charge

- Provide several 100M particle-level events for processing downstream
- Guarantee quality of physics input
- Validate generator-level output

- Mix a Standard Model cocktail with sufficient statistics after triggering

# How to accomplish this?

- Multi-purpose event generators are ideal (computationally)
  - Pythia, Herwig
- Request O(100) events
  - Geant-sized bits

# Physics demands

- “Matched” samples are needed in many cases
  - V(=W/Z)+high jet multiplict, Vbb~
- Not well suited to computational model
  - VEGAS (grids with multiple runs)
  - Weighting
  - Veto step after showering

# CMS Generator Software

- Major rewrite in past year
- Constitute events from LHE file (parton level input)
- Special decay packages
  - EvtGen, Tauola, Photos

# MadGraph Production

- Gridpacks
  - “mini-soup” of X + (0-N) partons
  - Preheating of VEGAS grid
- KT-based parton-jet matching (10 GeV)
  - No cuts on Heavy flavor
- mass-ordered Pythia
  - Shower, hadronization, UE model
- CTEQ6L1

# Issues & Future Plans

- Large # of files
  - O(10) / Diagram / SubProcess
- pT shower with UE models
  - Kudos to MCNet for tuning
- CTEQ modified PDFs ~ LO*, LO**

# Other Matching Methods

- Traditional ALPGEN N-parton
  - External VEGAS grid
- Sherpa
  - Deploy pre-compiled binaries for a specific process

# What Do We Need?

- The purpose of WS's like this
- DATA
  - Tools okay for few O(100) pb^-1
  - Coherent strategy for validating SM cocktail and correlations
    - Unitary approach
    - Data-driven methods need to be challenged:  why W+b/W+j ~ k

# W+b Tools

- Heavy Flavor Source Selector
  - “clever” reading of the Pythia event record to classify a b as coming from:
    - ISR
    - FSR
    - Hard ME
- BUT, early “top” measurement will be topological with W+jets background