

# Introduction to Statistical Issues in Upper Limit Setting

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Session on Statistical Issues on Upper Limit Setting

# Detection “vs” Upper Limits

## Detection:

- ❖ False alarm prob is paramount
  - » Aggressive vetoing
- ❖ Can be done in parallel with upper limit
  - » no reason why you can't set an upper limit and then follow up candidates

## Upper Limits:

- ❖ Statistical in nature
- ❖ False dismissal prob is paramount
  - » Pipeline design based on “playground” data
- ❖ Limit on a population
  - » Efficiency computed on fixed pipeline
  - » Ensure real signals are not excluded

An upper limit analysis does not preclude detection!

# Upper Limits

- ❖ Choose a population & a parameter to limit (e.g., event rate, strain, ...)
- ❖ Construct a detection pipeline
- ❖ Construct an upper limit statistic
- ❖ Evaluate efficiency of detection using Monte Carlo: this *requires* a fixed pipeline
  - » In order to develop a pipeline, may need to reserve “playground” data used to set choose thresholds, etc., without biasing the data
- ❖ Upper limit only as useful as population model and efficiency estimate!