Many theories devised to explain these
We are at the edge of an energy scale
Standard Model is successful yet incomplete
the data
the Standard Model backgrounds to
In each subset, we perform a fit of the Standard Model backgrounds to the data.

Step 1. Inclusive Comparison and Fits
We divide our dataset into 7 inclusive subsets
1. e + jets + MET
2. µ + jets + MET
3. ee + X, X = any additional jets, electrons, or MET
4. µµ + X, X = any additional jets, muons, or MET
5. µe + X, X = any additional jets, electrons, muons, or MET
6. jet + X, X = any additional jets, muons, taus, or MET
7. τ + X, X = any additional jets, electrons, muons, taus, or MET

In each subset, we perform a fit of the Standard Model backgrounds to the data.
The fit accounts for the effects of systematic uncertainties, normalizes data-driven multijet background
Events with high \( p_T \) objects excluded from the fits, to avoid bias in SLEUTH
We fit to shapes of some kinematic distributions, e.g., lepton and jet \( p_T \), MET, and \( \Delta \Phi \).

The fit accounts for the effects of systematic uncertainties, normalizes data-driven multijet background
Events with high \( p_T \) objects excluded from the fits, to avoid bias in SLEUTH
We fit to shapes of some kinematic distributions, e.g., lepton and jet \( p_T \), MET, and \( \Delta \Phi \).

More complex variables, such as di-lepton invariant mass, the transverse mass of the lepton + MET, and dilepton \( p_T \) are excluded from these fits
The effect of the fits on the excluded distributions are used to assess the quality of the fits

Step 2. Exclusive Comparison Using VISTA
We divide the inclusive final states into exclusive final states
For example, \( e + X \rightarrow e^{-} e^{+} + 1jet, e^{-} e^{+} \), \( e^{-} + MET + 2j, etc \)
7 inclusive final states \( \rightarrow \) 117 exclusive final states, 5543 kinematic distributions

First check for discrepancies in total
number of events per final state
Find 2 final states with discrepancies exceeding \( 3 \sigma \) \( \rightarrow \) \( \mu + MET + MET \) & \( \mu + 2jets + MET \)

The \( \mu + MET \) discrepancy is associated with difficulties modeling the momentum distributions of high \( p_T \)
The \( \mu + 2jets + MET \) discrepancy is associated with known issues modeling ISR/FSR jets in forward \( \eta \) region, can be resolved with SHERPA MC

Next check shape distributions with K-S test
All \( \geq 3 \sigma \) discrepancies related to ISR/FSR modeling

Step 3. SLEUTH
SLEUTH algorithm assumes new physics more likely to be found in
high \( p_T \) events
We also assume light lepton universality and rebin in the number of jets – reduces number of final states from 117\( \rightarrow \) 31

Consider the \( \Sigma p_T \) of all objects in the event, including MET
We look for an excess in the tail of the \( \Sigma p_T \) distribution
We find an excess in the 2 final states with number discrepancies in VISTA
No additional discrepancies in excess of \( 3 \sigma \) found
Most discrepant final state in SLEUTH not found in VISTA is \( e^{-} e^{+} + MET \)

Results and Conclusions
We have done a global study of DØ high \( p_T \) data corresponding to
1.1 fb\(^{-1}\) of integrated luminosity to search for significant deviations from Standard Model expectations.
Discrepancies seen in VISTA consistent with known modeling issues
No additional significant discrepancies seen in SLEUTH
We do not claim evidence of any significant deviation from the Standard Model