# Searching for Low Mass Exclusive States

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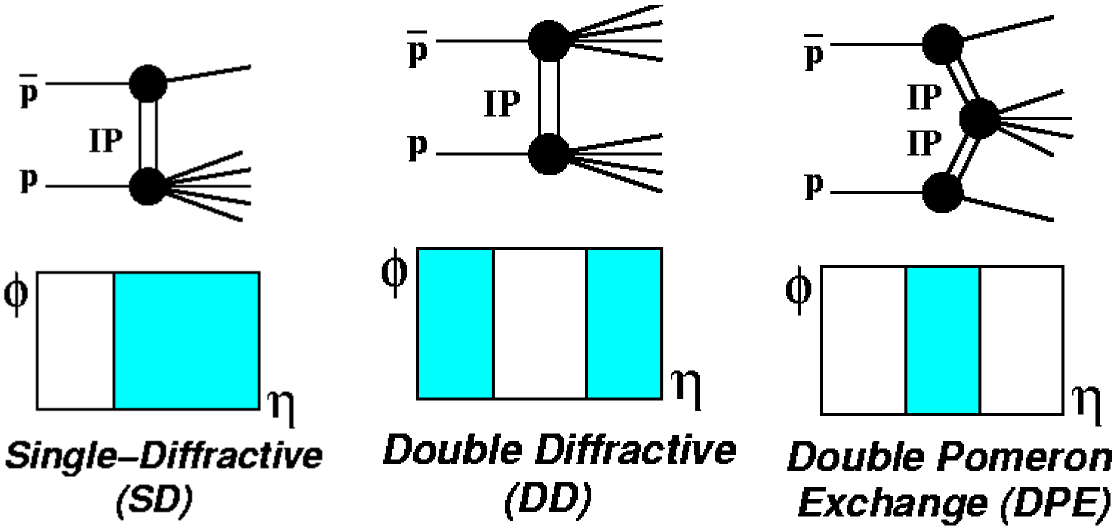
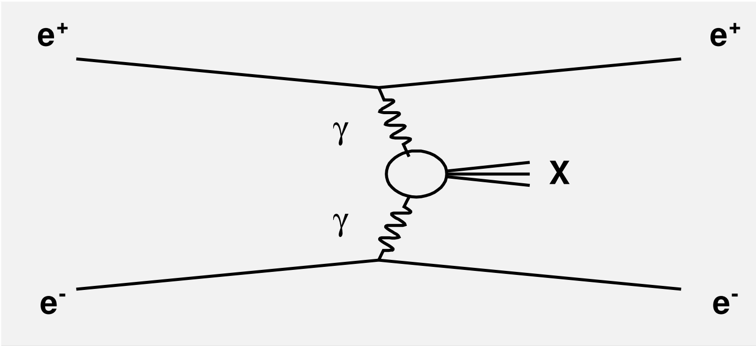
# What is Diffraction?

An interaction with no quantum numbers exchanged, characterized by a large rapidity gap. The exchange "object" is called a Pomeron.

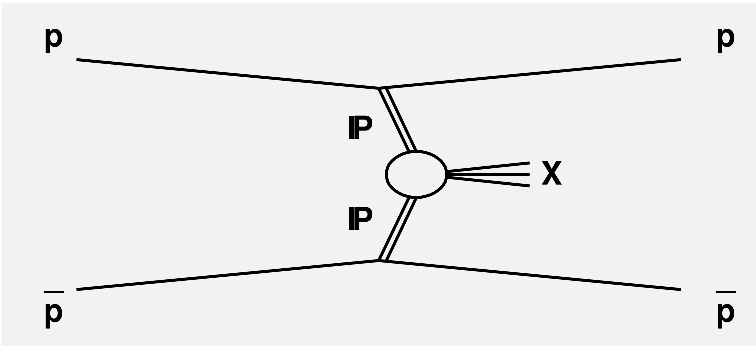


# What is a Pomeron?

The hadronic equivalent of the $\gamma$ in $e^+ + e^- \to e^+ + e^- + X$




Like the photon is chargeless, the pomeron must be colourless, in fact the pomeron must have the quantum numbers of the vacuum.




Regge theory describes these diffractive interactions.

# A Brief History

1960's Regge theory developed as a method of predicting angular distribuitions of hadronic interactions. The pomeron is one of the "Regge trajectories".

1970's Birth of QCD put Regge theory on the back burner. Hadronic research focused on *hard* processes, where QCD could be tested.

1980's Some theoretical advances in Regge-based phenomenology, but not much.

1990's Diffraction was observed in DIS at HERA. Also observed at CDF and D0. Somewhat of a resurgence for diffractive research, but it's still considered a fringe topic.

2000's Work continues at FNAL and DESY, many looking to possible production of a diffractive Higgs at LHC.

## What am I doing?

In DPE, $p + \bar{p} \to p + \bar{p} + X$, the $X$ can be any state with quantum numbers

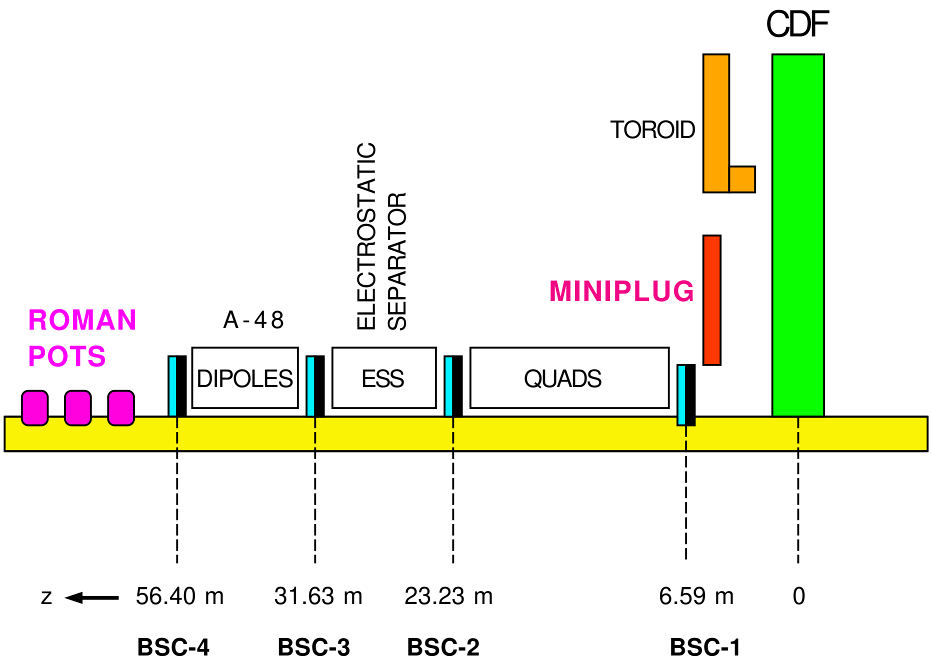
$$I^G J^{PC} = 0^+0^{++}, 0^+2^{++}, ..., 0^+even^{++}$$

including low mass ($<$ 5 GeV) states like $\pi^+\pi^-$, $K^+K^-$, and $p\bar{p}$.

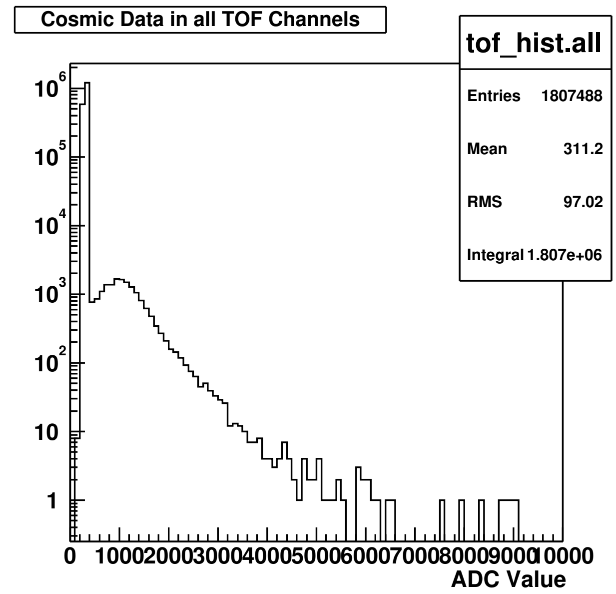
We will be looking for such states with a trigger that requires a large rapidity gap, $\Delta y$, and fewer than 6 tracks in the central region.

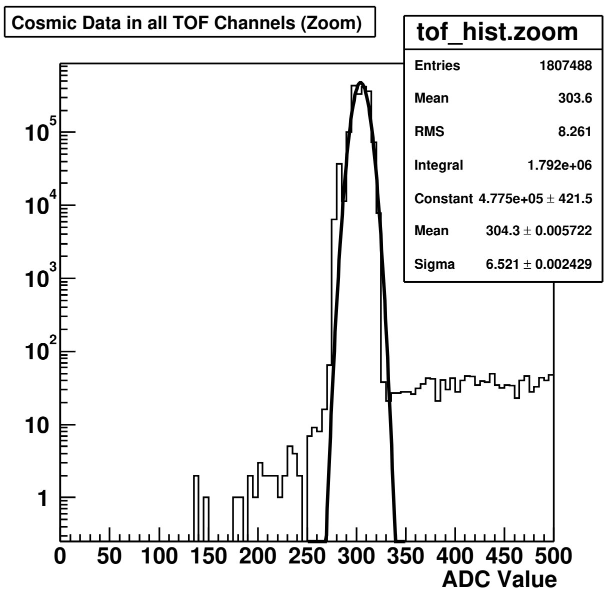
Using the Beam Shower Counters, MiniPlug, and Plug we can ensure there are no particles from $y \simeq 7.5$ (the BSC) to $y \simeq 1.5$ (the edge of the plug). Using the TOF we can quickly look for the number of particles in the central region.

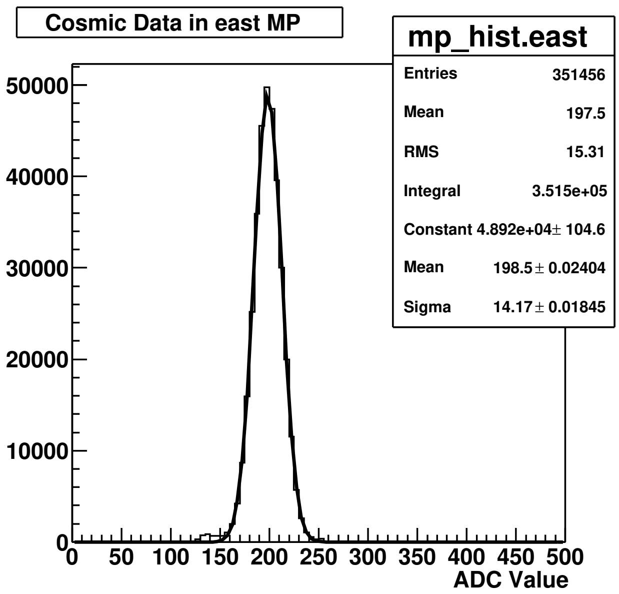
# The Forward Detectors

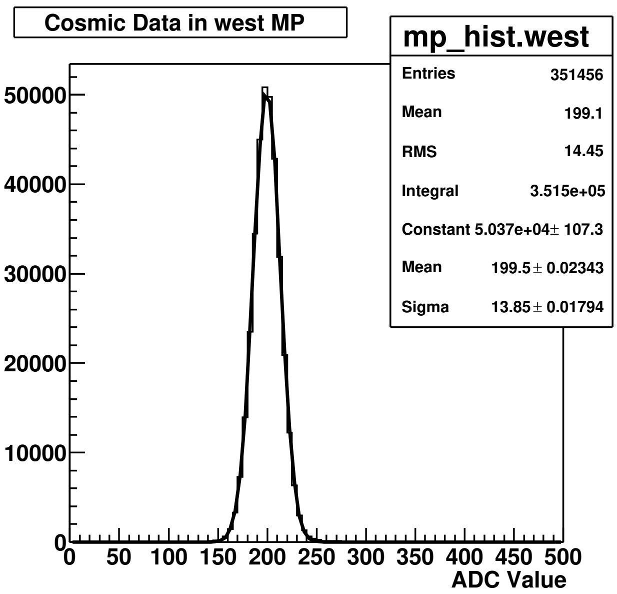


# What's been done so far?

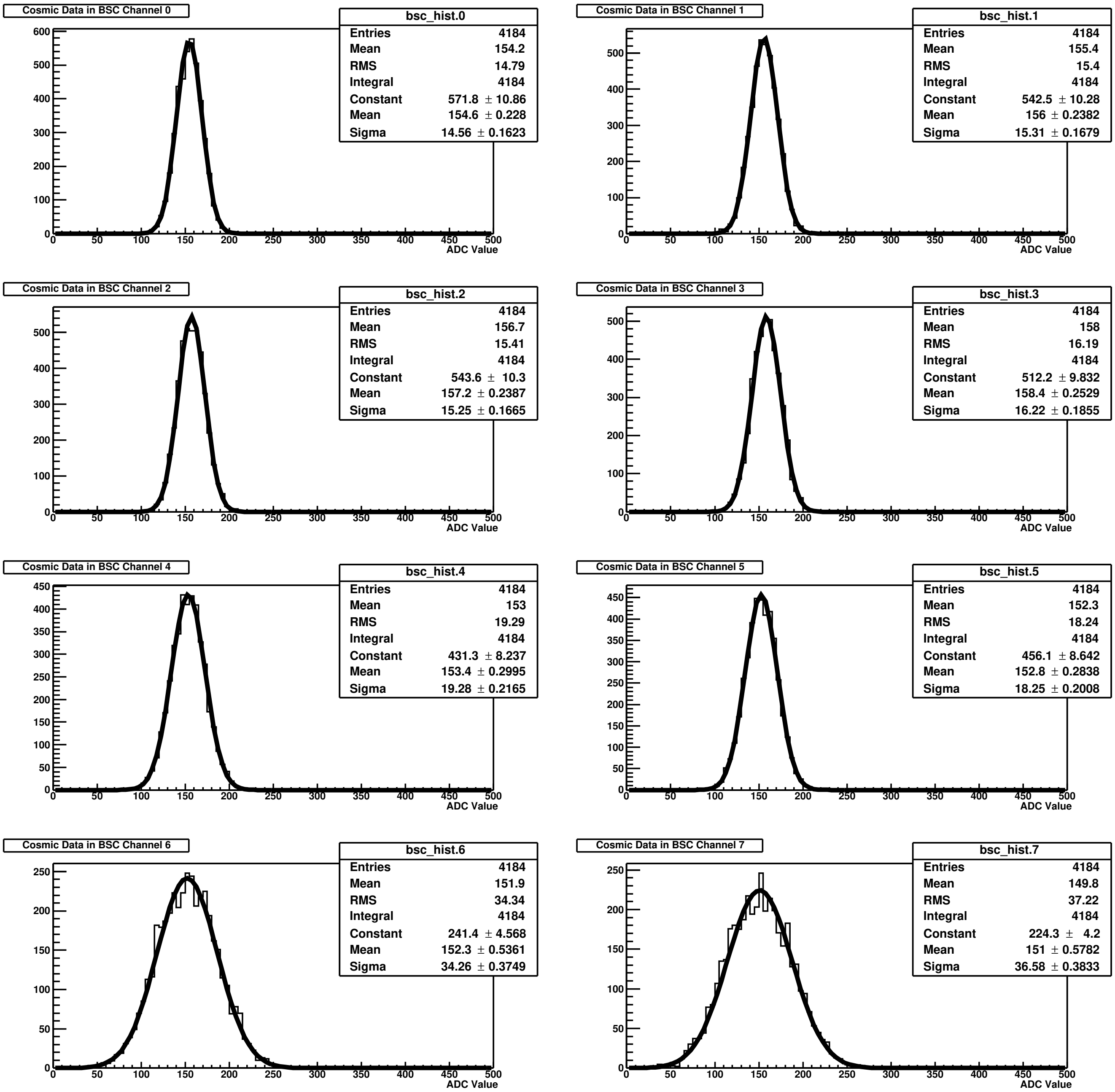


# What's been done so far? (con't)



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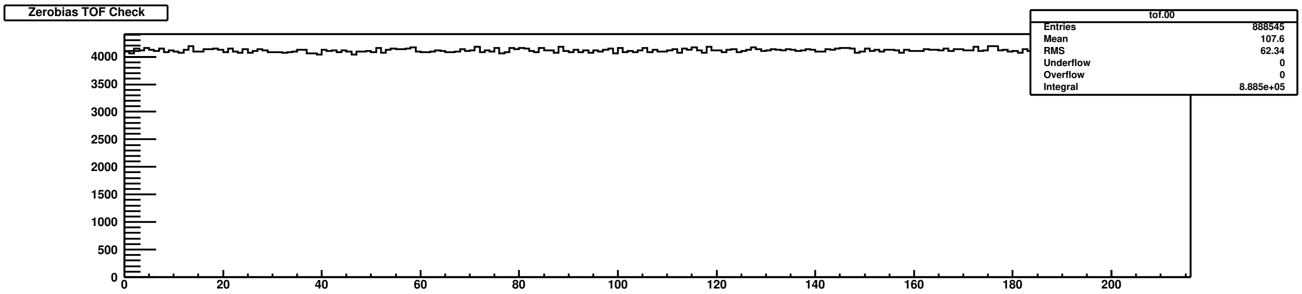


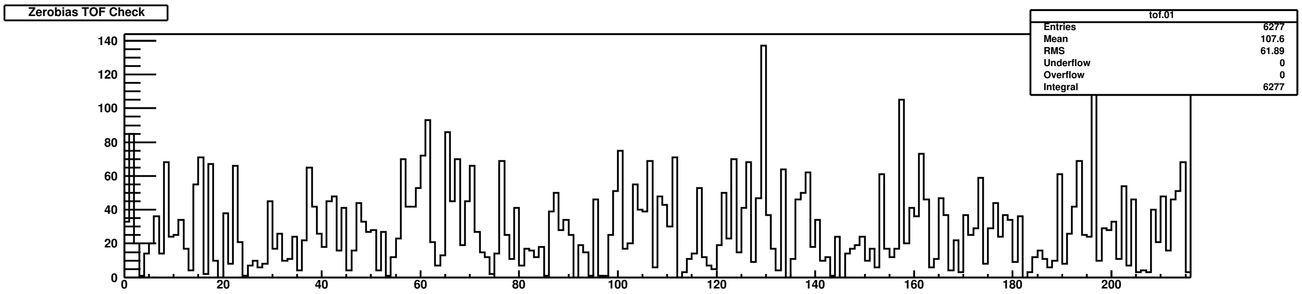


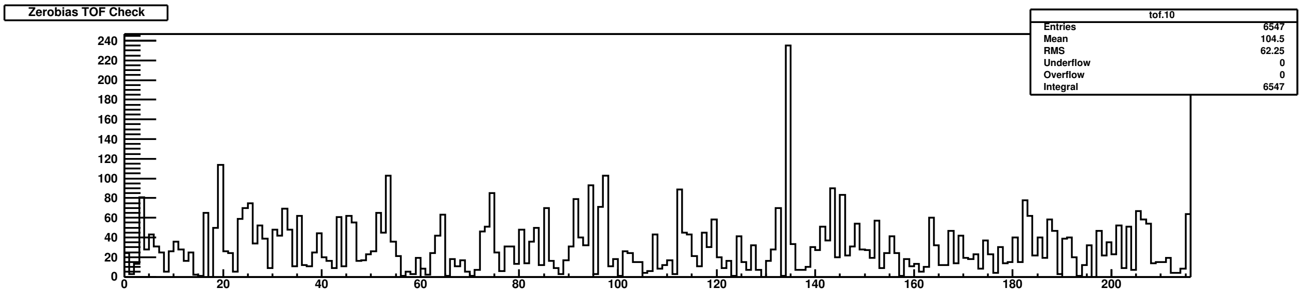


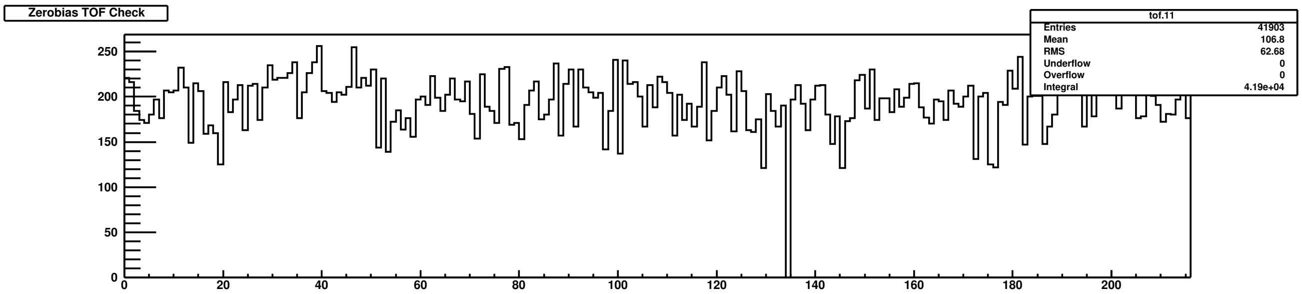

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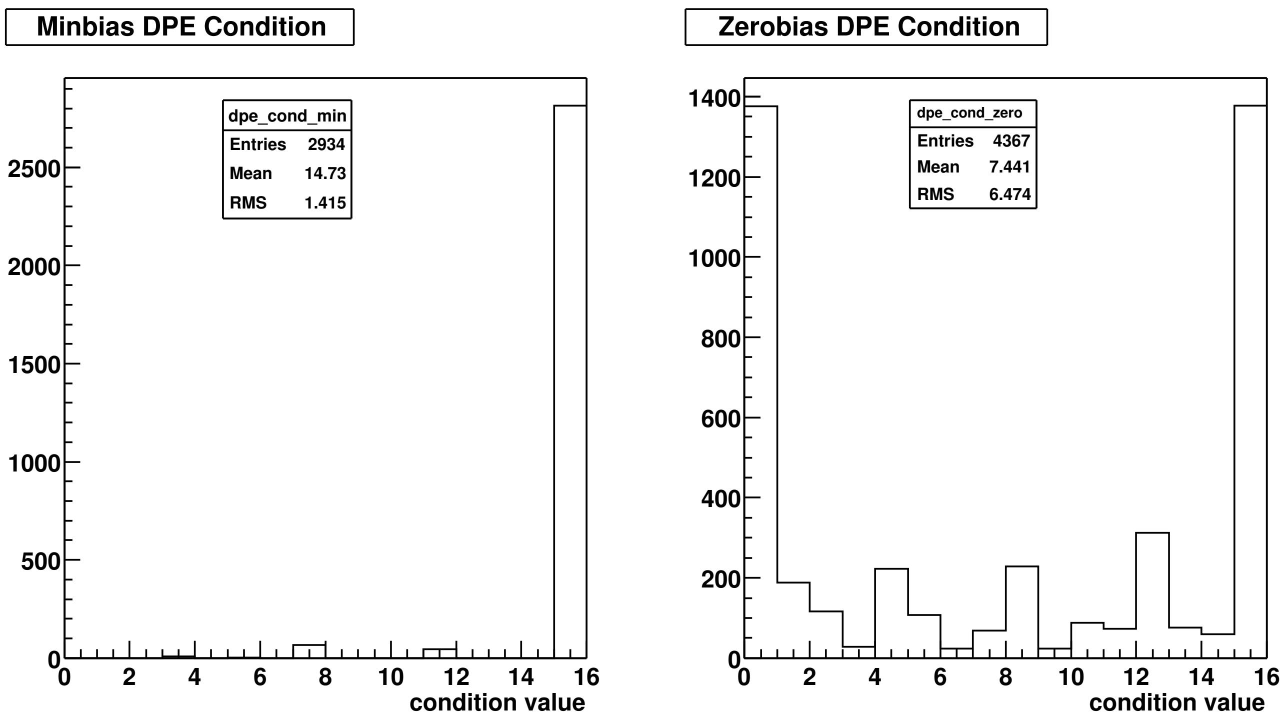


Waiting for a test of our L1 trigger.