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TRT Aging

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Introduction

The ATLAS TRT is a straw detector. It is dependent on particles moving through the staws and ionizing electrons through the gas. These electrons are then accelerated, due to a central potential, towards a central wire. The modules are fed active gas from either Input A (+720 mm) or Input C (-720 mm). One issue for this type of detector is gas contamination, this issue can increase with time and luminosity. It is our believe that this effect is dependent on the gas flow direction, so we will take this into account.

Monitoring

The effects of aging will be most prevalently seen in High Threshold (HT) hits. We will make an efficiency plot by taking the histogram of HT hits and dividing it by the histogram of the total hits as a function of track z position for the two inputs (A and C). Then we subtract the efficiency plots for the two inputs (Input A efficiency - Input C efficiency). If aging is not a factor, the result should be flat and centered around zero. If aging or any other gas contamination is present, there should be a slope due to the opposite direction of gas flow in input A and input C. Next we will divide the difference plot by twice the average efficiency (HT/All) which gives the percent change in efficiency in each module. Finally we fit the slope for different data periods as a method of measuring and comparing the effect of aging in the detector.

Ozone

Another issue with the this type of detector is ozone production. Ozone is produced near the input and is feed through the straw creating an avalanche effect. This can lead to a decrease in efficiency along the gas flow direction of the straw. This effect could be confused with aging. Unlike aging, the rate of ozone production is proportional to the instantaneous luminosity. If ozone is a factor there should be a larger effect for high instantaneous luminosity than for low instantaneous luminosity. At first we used the number of reconstructed vertices as a method approximating the instantaneous luminosity. It was then decided that this method represented to the ability to reconstruct the data more than the instantaneous luminosity. It was then decided to us the average number of interactions per crossing, <mu>, as the method of apporximating the instantaneous luminosity.

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