Veto Note 2
Nontriggerable Firing of Channels (Percentages)

1. Motivation

The motivation for this study came about from my previous study of the different types of events within the veto shield. The three types of events are as follows: Triggerable events, Nontriggerable events, and Single Trigger events. Single Trigger events are considered Nontriggerable events, but as the percentage of Nontriggerable events are predominantly Single Trigger events, the Single Trigger events are considered important enough to warrant it's own class and possible future study in relation to muon trigger efficiencies. The previous study yielded that of the total percentage of triggers, the Nontriggerable events constituted $\sim (25 \pm 10)\%$. As these percentages of events are abnormally high compared to initial expected results, a closer look into these Nontriggerable events was warranted.

2. Possible Explanations

The exact cause of this high percentage of events is unknown at the current time, but possible explanations offer promising insight into the data given below in figures 2 through 5. Before these possible explanations can be laid out in full, a basic discussion of how the data is read from the varying tubes must be had.

As discussed in the previous note, the architecture of the veto shield and the electronics that interpret the signals from the veto shield are as follows in figure 1.

~~~~~~figure that gives a flow diagram from some tubes to the stretchers to a given mux on a given station. Will make before Tuesday meeting.

As can be seen in the above figure the basic flow of the data starts when a particle interacts with the proportional tubes that constitute a given tube. On each tube there are two channels. 16 of these tubes are connected to a stretcher (32 bits), where 8 of these stretchers are connected to a mux, where 2 to 3 of these muxes make a station. These 8 stretchers constitute 256 bits of binary where a one represents a channel firing (particle passing through that half of the corresponding tube) and a 0 represents no interaction with any particle. The mux reads and multiplexes these 256 bit binary values in a specific way that could result in a higher percentage of nontriggerable events. ~~~~ Anthony, we'll talk about the timing and the way the bits are read in tomorrow and the possible implications that these features of the electronics have on effecting the nontriggerable percentages. And after we discuss this I'll complete the possible explanations for the high nontriggerable event percentages.

3. Data ~~~~~ Still have to get the plots for SW station mux1 and mux2, will do tomorrow.

*Note-data points that are zero percent are channels that have low/high rates of firing that were taken out by setting low and high bounds on the rate of firing.
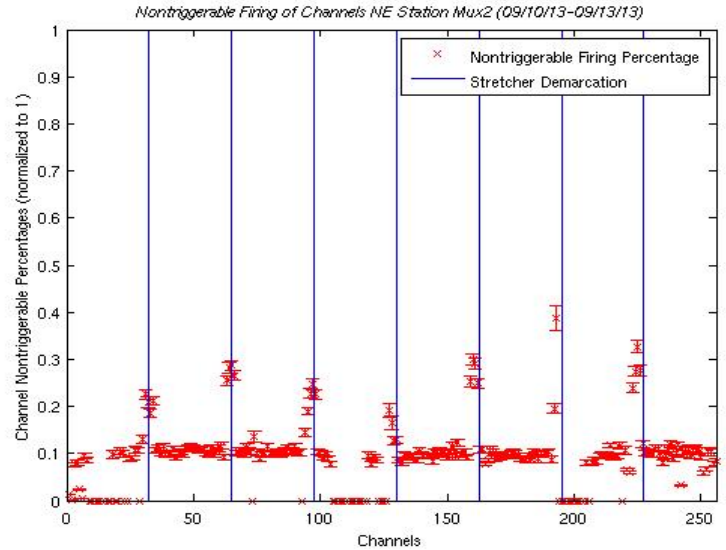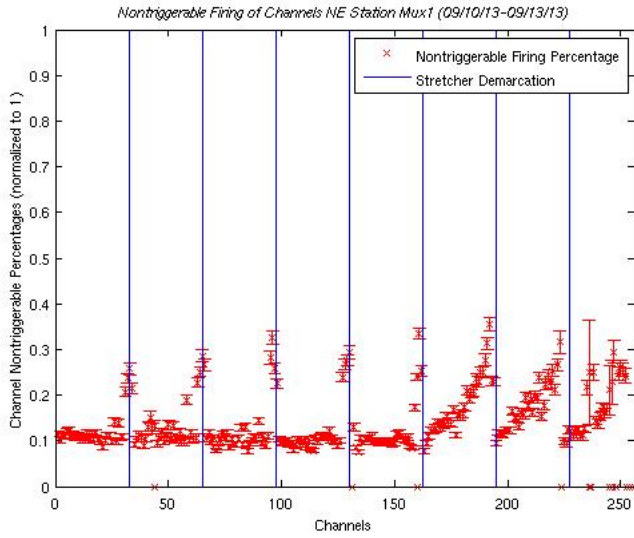

Figure 2: In this figure we have nontriggerable firing percentages for each channel on mux 1 (left) and mux 2 (right) for the northeast station of the veto shield.
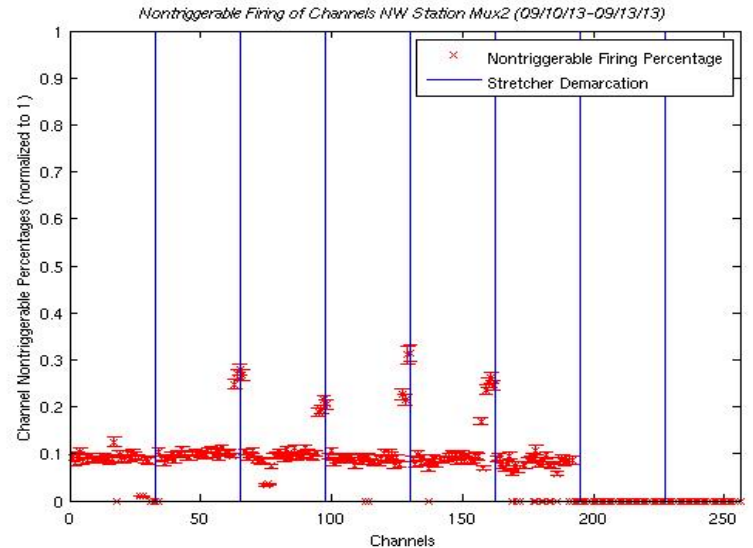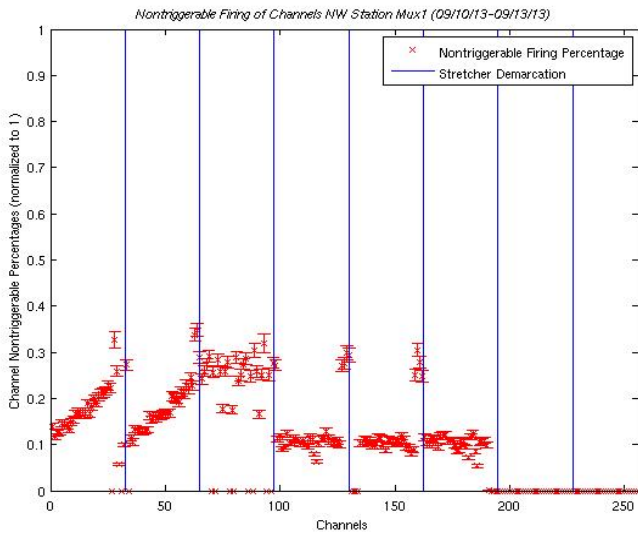

Figure 3: In this figure we have nontriggerable firing percentages for each channel for mux 1 (left) and mux 2 (right) for the northwest station of the veto shield. Stretchers 6 and 7 (from stretcher 0 to 7) have fire rates that are below the given bounds, and therefore these stretchers will yield negligible effect on the total percentage of nontriggerable events.
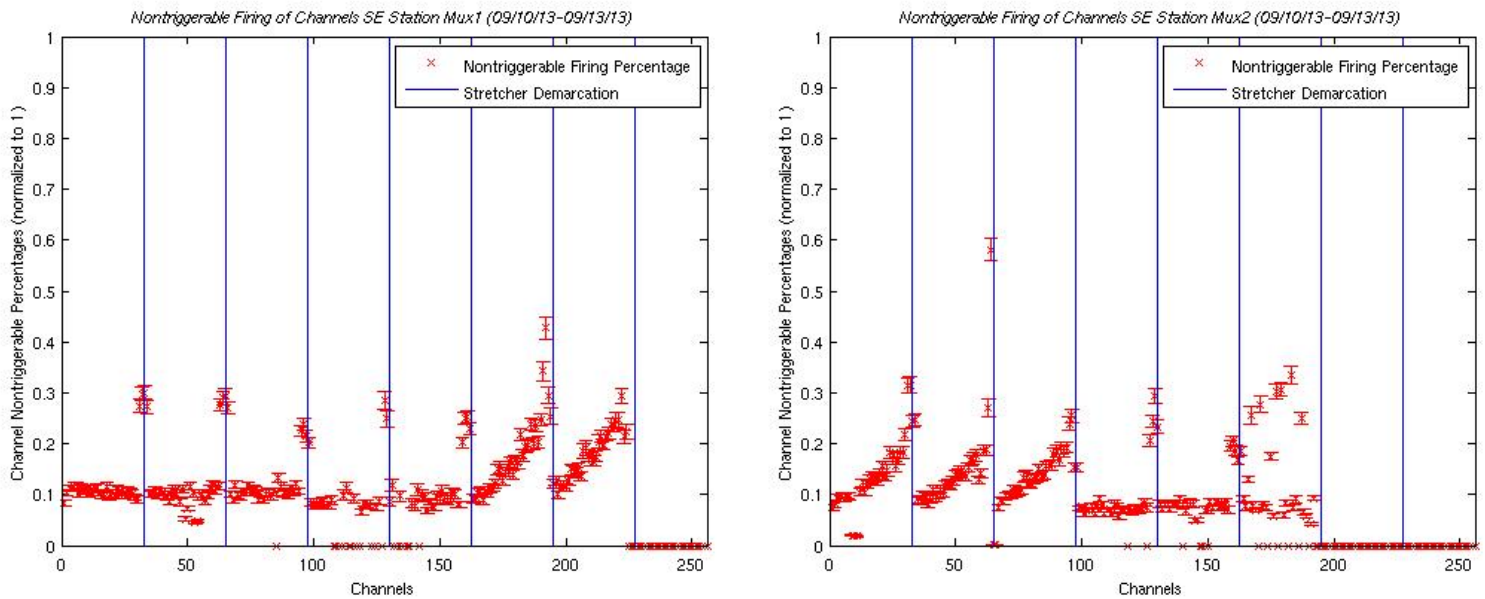
Figure 4: In this figure we have nontriggerable firing percentages for each channel for mux 1 (left) and mux 2(right) for the southeast station of the veto shield. Similarly to northwest station, this portion of the veto shield gives negligible fire rates for higher valued stretchers (stretcher 6-7).

Figure 5:~~~~~ will complete tomorrow

Quick Note: the bounds on the fire rate were stated very loosely. Many of the channels had nontriggerable firing counts of 250-750 over the course of 3 days. The lower bounds stated that any channel <75 counts were omitted, and any channel <1100 counts were omitted. If this is an issue we can talk about this tomorrow and the plots can be redone.