Measurement of $W^\pm$ single spin asymmetries in polarized $p+p$ collisions at $\sqrt{s} = 510$ GeV at RHIC$^1$ DEVIKA GUNARATHNE, Temple Univ, STAR COLLABORATION — The STAR experiment at RHIC has provided significant contributions to our understanding of the structure of the proton. The STAR experiment is well equipped to measure $W^{\pm\pm} + \nu$ in $\sqrt{s} = 510$ GeV longitudinally polarized $p + p$ collisions. The longitudinal single spin asymmetry in $W$ production, $A_L$, measured as a function of decay positron (electron) pseudo-rapidity $\eta$ for $W^+(W^-)$ is sensitive to the individual helicity polarizations of $u$ and $\bar{d}$ ($d$ and $\bar{u}$) quarks. Due to maximal violation of parity during the production, $W$ bosons couple to left-handed quarks and right-handed anti-quarks and hence offer direct probes of their respective helicity distributions in the nucleon. The published STAR $A_L$ results (2011, 2012 data combined) have been used by several theoretical analyses suggesting a significant impact in constraining the helicity distributions of $\bar{u}$, and $\bar{d}$ quarks. In 2013 STAR collected a dataset at $\sqrt{s} = 510$ GeV with a total integrated luminosity of $\sim 300$ pb$^{-1}$ with an average beam polarization of $\sim 54\%$, a figure of merit three times larger than the dataset used by previous analyses. We will present preliminary results of STAR 2013 $W A_L$ measurement at mid-rapidity ($|\eta| < 1$) region.

$^1$(for the STAR collaboration)