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Non-zero transverse single spin asymmetry of very forward π^0 in polarized p+p collisions at $\sqrt{s} = 510$ GeV

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Through the 21st and 22nd International Workshop on Deep Inelastic Scattering, a possibility of the non-perturbative contribution for the non-zero transverse single spin asymmetry of forward π^0 ($2 < \eta < 4$) was brought up. Bigger asymmetry was observed with more isolated final state which was connected with the non-perturbative event topology. Since the non-perturbative contribution has been studied by only the forward π^0 production where the perturbative process was expected to be the major interaction rather than non-perturbative one, the RHICf experiment measured the very forward ($\eta > 6$) π^0 to study the non-perturbative contribution in more detail. A new electromagnetic calorimeter was installed for the operation at the zero-degree region of the STAR experiment at RHIC and measured the π^0 over the kinematic range of $x_F > 0.25$ and $0 < p_T < 1$ GeV/c in June, 2017. A clear non-zero asymmetry was observed even in low $p_T < 1$ GeV/c showing a similar x_F dependence with the forward π^0 one as the p_T approached to 1 GeV/c. We present the first measurement of the very forward π^0 asymmetry, its analysis procedure and preliminary result. A future aspect to more precisely study the non-perturbative contribution will be also introduced.

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