

1 Measurement of Λ -hyperon spin correlation in
2 p+p collisions by the STAR experiment

3 Jan Vanek
(for the STAR collaboration)

Brookhaven National Laboratory

4 In the 1970's, Fermilab discovered that Λ hyperons are polarized in colli-
5 sions of unpolarized protons on beryllium. This discovery initiated a 50 year
6 long series of measurements which aimed at solving this Λ hyperon polarization
7 puzzle. Although this puzzle remains to be an open question, the self-polarizing
8 feature of Λ hyperon has been providing an important experimental handle on
9 measuring other polarization phenomena in nonperturbative Quantum Chromo-
10 dynamics, e.g., the global Λ hyperon polarization in heavy-ion collisions, spin
11 transfer in polarized p+p collisions, etc. Hereby we present a status on the
12 first measurement of spin correlation between two Λ hyperons, including $\Lambda\Lambda$,
13 $\bar{\Lambda}\bar{\Lambda}$, and $\Lambda\bar{\Lambda}$, in p+p collisions at $\sqrt{s} = 200$ GeV and $\sqrt{s} = 510$ GeV using
14 the STAR detector. The spin correlation of two Λ hyperons is measured with
15 respect to each other on an event-by-event basis, contrary to other established
16 Λ hyperon polarization measurements. This new observable can provide fur-
17 ther insights to the origin of the Λ hyperon polarization, e.g., the interplay
18 between the initial-state parton spin and the final-state polarising fragmenta-
19 tion. In addition, the spin correlation between a $\Lambda\bar{\Lambda}$ pair can provide a first
20 Clauser-Horne-Shimony-Holt (CHSH) inequality test for spin entanglement in
21 high-energy hadron collider experiment. Implication of the CHSH inequality
22 test in the context of high-energy hadron collisions will be discussed.