

Abstract Submitted
for the DNP20 Meeting of
The American Physical Society

Real-time chiral dynamics from a digital quantum simulation¹

YUTA KIKUCHI, DMITRI KHARZEEV, Brookhaven National Laboratory — The chiral magnetic effect in a strong magnetic field can be described using the chiral anomaly in the $(1+1)$ -dimensional massive Schwinger model with a time-dependent θ -term. We perform a digital quantum simulation of the model at finite θ -angle and vanishing gauge coupling using an IBM-Q digital quantum simulator, and observe the corresponding vector current induced in a system of relativistic fermions by a global *chiral quench* – a sudden change in the chiral chemical potential or θ -angle. At finite fermion mass, there appears an additional contribution to this current that stems from the non-anomalous relaxation of chirality. Our results are relevant for the real-time dynamics of chiral magnetic effect in heavy ion collisions and in chiral materials, as well as for modeling high-energy processes at hadron colliders.

¹U.S. Department of Energy, Office of Nuclear Physics under contracts DE-FG-88ER40388 and DE-AC02-98CH10886, and the Office of Basic Energy Science under contract DE-SC-0017662

Yuta Kikuchi
Brookhaven National Laboratory

Date submitted: 29 Jun 2020

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