

This report outlines the research conducted during a one-month visit to UW-Madison supported by the 2023 IPP Early Career Theory fellowship. During the first week, we discussed the usefulness of anomaly mediated SUSY breaking as a tool to explore non-SUSY QCD. This led to a deeper understanding of the topic, which I added to an ongoing project with Daniel Stolarski. The paper from this project will soon be available on Arxiv.

Afterwards, Yang Bai proposed exploring anomaly induced processes with axion-like particles at finite density. We found that axions can be sourced by a finite baryon density and external magnetic field, similar to how it works for the pseudo goldstone bosons of QCD. However, the magnetic field required for significant sourcing is extremely high. The only systems which have significant baryon chemical potential and high enough magnetic field are neutron stars. We explored the implications of this axion hair in the context of neutron stars and found that axions can influence the electric field on the surface of the star. This phenomenon also increases the axion density around the neutron star and as we include the time evolution of the system, can produce additional axion emissions. We developed a detailed analysis of this phenomenon in a paper that will soon be available on Arxiv.