Review of “Optimization and Active Stabilization of a Far-Infrared Laser for NSTX-U High Poloidal Wavenumber Scattering Diagnostics”:

The paper by Xu et al. presents a detailed study on the optimization and active stabilization of a far-infrared (FIR) laser system designed for high poloidal wavenumber scattering diagnostics on the National Spherical Torus Experiment Upgrade (NSTX-U). The work focuses on improving the FIR laser’s beam quality and output power stability through precise mirror alignment and real-time feedback control of the cavity length. The system is critical for investigating electron-scale turbulence in tokamak plasmas, a key factor in understanding electron thermal transport and improving energy confinement in fusion devices.

There are several issues that need to be clarified to improve the paper:

1. The manuscript is mostly clear, but a few grammatical errors and awkward phrases could benefit from proofreading. Examples: “Mythology” should be corrected to “Methodology” in the author contributions.
2. The power stability improvement after feedback activation is shown qualitatively, adding RMS fluctuation or standard deviation values would strengthen the claim.
3. The paper could be strengthened by comparing the proposed FIR laser system to other diagnostic approaches (e.g., microwave or other laser-based systems) in terms of performance, cost, or complexity. This would better highlight the system’s unique advantages.

Recommendation:

Accept with Minor Revisions

The manuscript presents a well-justified and well-executed engineering solution to a practical and important problem in fusion diagnostics. The experimental methodology is sound, and the results support the conclusions. Minor language polishing and the addition of a few more quantitative metrics would further strengthen the manuscript.