Abstract Submitted
for the DPP16 Meeting of
The American Physical Society

Density Fluctuation measurement with Upgraded FIR System on the HSX Stellarator[1] C.B. DENG, D.L. BROWER, University of California, Los Angeles, D.T. ANDERSON, F.S.B. ANDERSON, K.M. LIKIN, J.N. TALMADGE, University of Wisconsin-Madison — Going forward, a primary physics goal for HSX is to study configuration optimization for reducing turbulence which requires measurement of turbulence with $k_y\rho_s$up to 1. For characteristic HSX parameters (Te ˜200 eV at r/a ˜0.5 where the density gradient peaks), this condition corresponds to $k_y$up to 7 cm^{-1}. To accommodate this goal, the 9-chord HSX interferometer/far-forward scattering system (k<2 cm^{-1}) will be upgraded to measure density turbulence at higher k. The existing source (4 mW, 288 GHz) employing frequency modulation will be replaced with two high power (30 mW each, 320 GHz), solid-state sources with fixed frequency offset ˜4 MHz. This will permit true heterodyne detection, thereby realizing faster measurement time response, increased bandwidth and reduced noise. High power sources and high sensitivity planar-diode mixers will allow us to reduce the aperture of the receiver optics to a few mm thereby increasing the maximum wavenumber to k˜15 cm^{-1}. Reconfiguring the interferometer system into a finite-angle collective scattering arrangement is also planned as it will increase the measured k-spectrum up to 18 cm^{-1} with some spatial resolution (core or edge).

[1]Supported by USDOE grants DE-FG03-01ER54615 and DE-FG02-93ER54222.

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Date submitted: 15 Jul 2016 Electronic form version 1.4