

Abstract Submitted  
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**Implementation of millimeter-wave polarimetry on NSTX<sup>1</sup>**  
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PLASMA DIAGNOSTIC GROUP TEAM, NSTX RESEARCH TEAM — Measure-  
ments of internal magnetic fluctuations on NSTX, a high- $\beta$  machine, are important  
to understand stability, fast-ion and thermal transport. A 288 GHz polarimeter op-  
erating along a major radial chord in a retroreflection geometry has been developed  
and installed on NSTX. This will provide the first direct measurement of internal  
magnetic fluctuations (1–100 kHz) in a high-performance spherical tokamak. Labo-  
ratory tests indicate  $\leq 1^\circ$  phase resolution. Calculations using a simplified tearing  
mode model indicate the feasibility of measurement of magnetic fluctuation levels  
 $\geq 0.2\%$ . The sensitivity of polarimetry to microtearing modes is assessed using gy-  
rokinetic simulations. The polarimetry phase fluctuations are calculated using the  
predicted magnetic ( $\leq 1\%$ ) and density ( $\sim 1\%$ ) fluctuations in addition to the input  
equilibrium profiles. It is shown that the system is primarily sensitive to magnetic  
fluctuations, as long as the propagation chord lies within  $\pm 10$  cm of the plasma  
midplane. Initial measurement results from NSTX will be presented.

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