Abstract Submitted
for the DPP12 Meeting of
The American Physical Society

**Multiple harmonic oscillations and magnetic islands in NSTX**[1]
KING-LAP WONG, RONALD E. BELL, BENOIT P. LEBLANC, JOEL P. HOSEA, Princeton Plasma Physics Laboratory — Multiple harmonic oscillations (MHOs) appear in the 10 - 100 kHz range in NSTX plasmas. They are observed by Mirnov coils located near the plasma edge. Their frequency spectrum has a distinct feature of multiple peaks with equal spacing $\Delta$f between neighboring peaks, i.e., the n-th peak has frequency fn = n$\Delta$f = nf1. They may last from a few to tens of milliseconds in NSTX. Since Mirnov coils have no spatial resolution, these frequently observed oscillations remain unexplained for many years. In this paper, we report the first successful explanation based on the good correlation between the measured magnetic island rotation frequency and the MHO frequencies. The island location can vary from the plasma core to the plasma edge. Enhanced electron transport appears in the vicinity of the island causing redistribution of electron thermal energy. Deterioration of global plasma confinement happens when multiple islands overlap. When the island appears at the edge of a H-mode plasma, it can suppress the edge-localized modes (ELMs) while the global energy confinement continues to improve. This is the first observation of such quiescent (no ELMs) H-mode plasma in spherical tokamaks. The unambiguous presence of magnetic islands at the plasma edge clearly reveals the trigger process for the first time. It provides a natural explanation for ELM suppression based on the known mechanism of stochastic magnetic fields.

[1]This work is supported by USDoE under contract No. DE-AC02-09CH11466.

King-Lap Wong
Princeton Plasma Physics Laboratory

Date submitted: 13 Jul 2012 Electronic form version 1.4