Particle Transport and Density Fluctuations in HSX

1. Interferometer on HSX

- Spatial resolution: 9 chords, 1.5 cm spacing and width.
- Fast time response: analog 120-100 MHz, digital Y 50 MHz
- Low phase noise: 24 dB (100 mHz)
- 0.5% level density fluctuations can be measured.

2. Equilibrium Density Profile

3. Perturbative Particle Transport

4. Density Fluctuations on HSX

5. Summary

Key Points

1. Equilibrium electron density profile is peaked for both the QHS and Mirror Mode configurations (at low density). Mirror Mode plasmas are broader than QHS.
2. Pushing on mid-line allows because the source profile is broad and calculated to be plasma core.
3. Modeled gas puff study indicates constant Dmod ≈ 1 cm²/s, increased with density. No inward pinch required due to broad source profile.
4. Future operation at higher density should move the source to plasma edge allowing particle transport issues to be addressed.
5. High-frequency density fluctuations (10-100 kHz) are observed for QHS plasmas.
6. These fluctuations are closely associated with temperature or pressure gradients (but no resonant surface). TrappedParticle Mode?