

# Edge Turbulence Physics with Enhanced GPI

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## Physics Issues & Questions:

### *Identification of edge zonal flows*

- Edge poloidal flow relationship with turbulence
- Identification of GAMs in NSTX

### *L-H transition physics*

- Limit-cycle behavior predicted/observed

### *ELM physics/transport*

- Impact of turbulence and 3-D fields on ELMs

### *Effect of 3-D fields (RMP) on edge turbulence and flow*

- Mapping of turbulent structures as flux tubes deform

### *Lithium effects on edge behavior*

### *RF Coupling*

# Needs Addressed with Upgraded GPI

- Expand views from 1 to 5 (or 6)
- At least 2 toroidally-separated views (alternate phasing of RMP)
  - Above/below midplane (along common B-field line)
  - Toroidally-separate midplane
  - Tangential X-point view
  - Top-down divertor view
  - Inboard limiter view
- Re-entrant ports/windows and additional fast cameras/fibers (possibly faster than current gen)
- Increase poloidal view from 25 cm to 40 cm
- Develop/test narrower sheet of neutral gas (sharpen images)
- Combine measurements with:
  - edge-rotation diagnostic
  - edge/divertor probe arrays [map along common B-field]

**Flux tube map in 3-D:**  
Is this the 3-D structure of edge turbulence ?



*Farina, Pozzoli, Ryutov  
NF 1993*

GPI views to follow  
3-D structure of B

