

Effect of 350 C helium bakeout on NSTX performance

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Bakeout System Upgrade:

	Previous bakeout system:	Helium Bakeout system upgrade
Centerstack	Heated ohmically (20kW, 5.8 kA) to 309 °C	350 C ohmic heating
Passive plates, divertor	heated with hot water / steam to 150 C, radiation from CS heats plasma facing surfaces to 220°C.	350 C with He
External vessel wall	≈ 150 C with hot water / steam	150 C (actively cooled to 150 C during bake)
Conditioning:	Bakeout combined with D-GDC, and He-GDC	Bakeout combined with D-GDC, and He-GDC

Motivation:

- NSTX performance may be limited by vessel condition (e.g. H-mode access).
- Performance extension to high auxiliary heating powers and longer pulses will continually increase stress on plasma facing components.
- Heating graphite to 350 C has been shown to accelerate vessel conditioning (big change over even 300 C).

Anticipated benefits:

- Reduce H₂O and volatiles in plasma facing surfaces – lower radiation losses
- Depletion of hydrogenic atoms trapped in graphite – facilitate density control.

Proposal:

- Run series of fiducial discharges after high temp bake to characterize influence on plasma performance. Include both pre- and post boronization conditions.

Discussion points in preparation of XP:

- Penetration depth of plasma ions in wall depends on edge temperature (sheath potential) and Z .
- Flux emitted from wall depends on flux incident on wall.
 - > fiducial discharges should be relevant to high power regime (not only ohmic fiducials).
- Pump duct is not conditioned much and is 13 m^2 cf 41 m^2 for vessel.

Propose Ohmic, NB, RF fiducials

- 1MA, CS ohmic shot -see if we can get more than one in a row (fluorinert should help here).
- 0.8 – 0.9 MA, LSN ohmic shot -see if we can get more current longer flattop. One complication is reduction in PF% lower error field and locked modes.
- NB fiducial 1 source e.g. XMP12 106068 ohmic, 106070 CS, 106071 LSN.
 - 2 source, 4-4.5 kG to avoid beta limit.
- Discuss looking for changes in RF coupling with RF group.
- D edge gas puffs to anticipate increased Ch.Ex. flux & stress on wall
- He, Ne puffs to increase incident ion energy (coordinate with CHI and Dan Stutman).

Diagnostics include: I.R. camera, RGA, VIPS1, VIPS2, SPRED, GRITS, mpts, materials coupon probe.....