


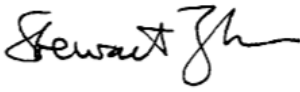
[Record of Discussion for FY2012 NSTX Research Collaboration Proposals](#)

Key results of discussions between prospective NSTX collaborators and an NSTX Research Contact in support of **University and Industry Diagnostic Collaboration** proposals submitted to DOE.

A completed and signed record of discussion must be included with collaboration proposals to DOE which are due **Tuesday, October 18, 2011, 11:59 PM Eastern Time.**

Please send completed and signed forms (preferably with scanned or digital signature included in this MS Word document) to Jon Menard (jmenard@pppl.gov) and Masa Ono (mono@pppl.gov) **no later than Tuesday, October 11, 2011, 5PM EST for final review and comment.**

Questions or comments regarding processing of this form should be forwarded to Thomas Egebo (tegebo@pppl.gov). The NSTX Project Fax Number is (609) 243-2222.

<u>Title of Research Activities:</u> Enhanced Gas Puff Imaging Diagnostic for 3-D Edge Turbulence Studies		<u>Collaboration began (mm/yy) or New:</u> New
<u>Off-Site Institution:</u> University of Colorado		<u>Discussion Dates</u> <u>Initiated on:</u> July 1, 2011 <u>Completed on:</u> October 10, 2011
<u>Collaboration Principal Researcher:</u> <u>Name:</u> Tobin Munsat <u>Email:</u> tobin.munsat@colorado.edu <u>Tel:</u> (303) 735-5596 <div style="text-align: center;">  </div> <u>Signature:</u> <u>Date:</u> 10/10/11	<u>On-Site Research Contact:</u> <u>Name:</u> Stewart Zweben <u>Email:</u> szweben@pppl.gov <u>Tel:</u> (609) 243-3243 <div style="text-align: center;">  </div> <u>Signature:</u> <u>Date:</u> 10/11/11	

Research Goals:

This project is to upgrade the measurement and analysis capability of the Gas Puff Imaging (GPI) diagnostic to include assessment of extended structures and 3-D effects. This will impact broad research goals relating to turbulence and transport in the NSTX edge and scrape-off layer, including blob birth and transport, zonal flows, L-H transition physics, RMP effects on ELMs and other edge phenomena, Lithium effects, fluctuation behavior in the divertor, etc.

The hardware portion of the project involves the addition of several camera views and gas injection manifolds, as described below. This Record of Discussion follows an ongoing conversation between T. Munsat and S. Zweben, and a meeting on 10/4/2011 at PPPL attended by T. Munsat, B. Stratton, R. Kaita, L. Roquemore, and S. Zweben to discuss NSTX hardware/program issues.

Following this meeting, it was determined that the following views were considered to be achievable with only minor in-vessel and external modifications. Specifically, the following views were discussed, providing maximum diagnostic versatility with minimal hardware modification (also summarized in a table following this list):

1. Bay B, approx. 20 deg. above outer midplane (i.e. existing GPI view). Gas manifold, re-entrant viewport and shutter exist; no change needed.
2. Bay B, symmetrically 20 deg. below outer midplane. This view will use a modified re-entrant window on the existing port cover, which will open a second view in the opposite direction as view #1. Only a single hole (~0.75") will need to be added to the port cover, to accommodate a second shutter. A gas manifold exists at this location (i.e. adjacent to the RF antenna), but will need to be moved downward by several inches.
3. Duplicate of the view 1&2 combination, located at the existing port between Bay I and Bay J. The re-entrant window would be identical to the Bay B window. Three new gas injection manifolds are required: One at 20 deg. above midplane, one at 20 deg. below midplane, and one at ~40 deg below midplane. (In a given experiment, only one or the other below-midplane manifolds would be used at a time).
4. Inner wall view. Bay B viewport already exists for this view. Inner-wall gas injection manifold already exists (with old center-stack) across from Bay E. R. Kaita is assessing locations for NSTX-U inner-wall puffer, which may end up in the same place as now.
5. Divertor X-point view. Viewport exists at Bay F, as does divertor gas puffer. The optical assembly at this view may be useful for other measurements besides GPI as well (i.e. switching camera settings and perhaps bayonet-mount lenses, depending on the experiment).
6. Lower divertor view from top of vessel. This viewport exists (at Bay E), already viewing the lower-divertor gas puff. The optical assembly at this view may be useful for other measurements besides GPI as well (i.e. switching camera settings and perhaps bayonet-mount lenses, depending on the experiment).

Camera View(s)	Gas Manifold(s)	Modifications Required
<i>Bay B</i> (2 views along common field line)	<ul style="list-style-type: none"> • 20° above midplane • 20° below midplane 	Modify re-entrant viewport (i.e. change “elbow” to “tee”). Move existing lower manifold several inches downward. Add 3/4” penetration into port cover and install shutter on second window.
<i>Between Bay I and Bay J</i> (2 views along common field line + 1 view further down along field line)	<ul style="list-style-type: none"> • 20° above midplane • 20° above midplane • ~40° below midplane 	Fabricate “tee” re-entrant viewport, (probably identical to Bay B version) with shutters. Add three GPI gas manifolds.
<i>Inner wall</i>	<ul style="list-style-type: none"> • Center-stack puffer 	None.
<i>Divertor (X-point)</i>	<ul style="list-style-type: none"> • Divertor puffer 	None.
<i>Divertor (from above)</i>	<ul style="list-style-type: none"> • Divertor puffer 	None.

In addition to the viewports and gas manifolds described above, the gas handling systems (Piezo valves, plumbing, etc.) will need to be provided for the Bay I/J view. This is similar to what exists now for the current GPI system.

Normal diagnostic data handling and storage will be required, including 2-3 fast ethernet connections from the test-cell for transferring camera data.

Off-Site Research Tasks:

Design of complete system, project management and coordination. Design of experiments and analysis of data.

On-Site Research Support Tasks:

The proposal includes a postdoc to be located at PPPL for this project. The postdoc would handle most of the hands-on construction and installation where possible, working with the NSTX team (including technicians, engineers, S. Zweben, B. Stratton, R. Kaita, L. Roquemore, etc.).

Estimated Researcher Effort Required (Man-Months):

The primary collaborator for this project is S. Zweben, who would like to spend ~50% of his effort on the GPI project.

On-Site Engineering Support Tasks:

- Design, fabrication, and installation of the modified re-entrant viewport for the Bay B views. This includes shutter assemblies for both windows.
- Design, fabrication, and installation of Bay I/J viewport. This will either be identical or nearly identical to the Bay B window set.
- Repositioning of lower gas manifold at Bay B next to RF antenna.
- Installation of new gas manifolds (3x) around Bays I/J.
- Design and fabrication of gas handling system for new gas manifolds. This is similar or identical to existing GPI gas manifolds.

Engineering Effort Required (Man-Months): 0.75 man-months engineering
1.5 man-months tech shop
Estimated Hardware Cost Required (\$k): \$19k materials & supplies
(estimates provided by L. Roquemore)

Collaboration Researcher Questions and Issues:
1) None. (All questions were addressed at in-person meeting and described above).

Responses by On-Site Research Contact and Task Manager:
1) None (see above)

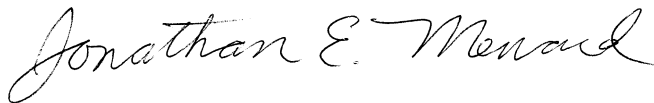
Additional Collaboration Researcher's Comments (if any):
1) None.

Additional On-Site Research Contact and Task Manager Comments (if any):
1)
2)
etc.

Review and Comment:

The proposed GPI diagnostic enhancements are strongly supportive of the edge transport and turbulence goals of the NSTX Upgrade research program.

NSTX Program Director



Signature

October 12, 2011

Date

Review and Comment:

NSTX Project Director, Concurrence



Signature

October 12, 2011

Date