U.S. DOE guidelines on Data Management have been issued

- Underscores U.S. commitment to research "transparency"
    - Guidelines in place for other agencies (NSF, NASA, etc.)
    - Promote more efficient and effective use of gov't funding and resources
    - Increase pace of scientific discovery

- Requires U.S. facilities to submit a comprehensive DMP with every proposal
    - Facility-specific plans being developed
    - Should describe how data generated in the course of research be preserved and shared
    - Should describe data management resources at facility
    - Should provide a plan for making research data displayed in publications digitally accessible to public at time of publication

NSTX-U Data Management Plan

1. Data Categories

- Raw: 0 to 3D (including camera images)
- Reduced: Raw converted to reduced through diagnostic-specific analysis software
    - In real physics units
    - Used for input to high-level analysis codes
- Analyzed: Validated reduced data synthesized through direct analysis or higher level analysis codes
    - Forms basis for figures and physics conclusions in presentations and publications

NSTX-U Data Management Plan

2. Data Management Resources, Storage and Archival

- Resources:
  - On-site: real-time, post-expt data reduction, standard data acquisition and storage (MDSplus) with dedicated CPUs, on-call help
  - Maintenance of PPPL and on-site collaborator computers, shared CPU maintenance
  - Web-based visualization and plotting, maintained on PPPL cluster
  - Off-site: Google mail, sites, docs, etc.
- Storage:
  - MDSplus, except for camera videos (own repository)
  - Storage centrally managed in project space
- Archival: Procedure ITD-003 (2010) governs PPPL backup policy
  - Engineering data uses EPICs archiver
  - VERITAS used for data backup for end users
    - Includes both on- and off-site storage

NSTX-U Data Management Plan

3. Data Access and Sharing

- Resources:
  - Web-based visualization tools, common MDSplus architecture/tools
  - Shared analysis codes, NTCC library, FTP services common login cluster
  - Trusted sites (GA, ORNL, NERSC, MIT, ITER)
  - GLOBUS on-line for transferring data over the internet
- Access and Sharing:
  - All research data displayed in publications will be made available at the time of publication (actual implementation mid-2015?) – exp't, thy., eng.
    - Stored in Princeton University data repository – one stop shopping
    - ID'd through Archival Reference Keys (ARKs), which are citable
    - Underlying digital research data will be made available through establishment of collaboration
- Requirements: Collaborations
  - Identify point of contact with NSTX-U researcher
  - Read and sign Data Usage and Publication Form (Theory has code sharing agreement)

- **DMPs similar for other facilities (MIT, GA)**

Example

PHYSICS OF PLASMAS **20**, 055903 (2013)

Characterization and parametric dependencies of low wavenumber pedestal turbulence in the National Spherical Torus Experiment[a)]

D. R. Smith,[1,b)] R. J. Fonck,[1] G. R. McKee,[1] D. S. Thompson,[1] R. E. Bell,[2] A. Diallo,[2]
W. Guttenfelder,[2] S. M. Kaye,[2] B. P. LeBlanc,[2] and M. Podesta[2]
[1]*Department of Engineering Physics, University of Wisconsin-Madison, Madison, Wisconsin 53706, USA*
[2]*Princeton Plasma Physics Laboratory, Princeton, New Jersey 08543, USA*

(Received 29 November 2012; accepted 28 February 2013; published online 7 May 2013)

The spherical torus edge region is among the most challenging regimes for plasma turbulence simulations. Here, we measure the spatial and temporal properties of ion-scale turbulence in the steep gradient region of H-mode pedestals during edge localized mode-free, MHD quiescent periods in the National Spherical Torus Experiment. Poloidal correlation lengths are about 10 ρ_i, and decorrelation times are about $5a/c_s$. Next, we introduce a model aggregation technique to identify parametric dependencies among turbulence quantities and transport-relevant plasma parameters. The parametric dependencies show the most agreement with transport driven by trapped-electron mode, kinetic ballooning mode, and microtearing mode turbulence, and the least agreement with ion temperature gradient turbulence. In addition, the parametric dependencies are consistent with turbulence regulation by flow shear and the empirical relationship between wider pedestals and larger turbulent structures. © *2013 AIP Publishing LLC*. [http://dx.doi.org/10.1063/1.4803913]

I. INTRODUCTION

Global confinement and first-wall heat load predictions in ITER and next-step devices depend on accurate models of the steep pedestal region. The spherical torus (ST)[1] edge region is among the most challenging regimes for plasma turbulence simulations due to the inherent challenges of edge simulations and the distinct ST parameter regime with high β $(2\mu_0 p/B^2)$, large $\rho*$ (ρ_s/a), strong beam-driven flow, and strong shaping. Past results from the National Spherical Torus Experiment (NSTX)[2] highlight novel turbulence and transport properties in ST plasmas. For instance, power balance analysis indicates electron thermal transport is the dominant loss mechanism, and ion thermal transport is at or near neoclassical values in NSTX beam-heated H-mode discharges.[3,4] Stabilization or suppression of low-wavenumber (low-k) turbulence by strong equilibrium $E \times B$ flow shear[5] and field line curvature[6] are leading explanations for near neoclassical ion thermal transport in NSTX beam-heated plasmas. Particle, momentum, and electron thermal transport remain anomalous and point to a turbulent transport mechanism. Also, power balance analysis indicates ion thermal transport decreases at higher plasma current, but the confinement time increase with plasma current in non-lithiated plasmas is weaker than that observed in conventional tokamaks.[3,4,7] The high β regime makes ST plasmas more susceptible to low-k microtearing modes,[8–10] and the scaling of NSTX confinement time with collisionality is consistent with collisional microtearing modes.[11] Finally, recent turbulence measurements at the top of the H-mode pedestal during the ELM (edge localized mode) cycle were found to be consistent with ion-scale turbulence, such as ion temperature gradient (ITG), trapped electron mode (TEM), or kinetic ballooning mode (KBM) turbulence.[12]

Edge and pedestal model validation motivates efforts to characterize low-k pedestal turbulence in the challenging ST parameter regime. Here, we characterize low-k pedestal turbulence quantities $(k_\theta\rho_i \lesssim 1.5,\ 0.8 < r/a < 0.95)$ from beam emission spectroscopy (BES) measurements during ELM-free, MHD quiescent periods in NSTX H-mode discharges. In addition, we identify parametric dependencies among turbulence quantities and transport-relevant plasma parameters using a new model aggregation technique. Coherence spectra for poloidally adjacent channels exhibit broadband turbulence up to about 50 kHz. The turbulence parameters under investigation include poloidal correlation length, decorrelation time, and poloidal wavenumber. Poloidal correlation lengths in the pedestal are typically $L_p \approx 15$ cm and $L_p/\rho_i \approx 10$, and poloidal wavenumbers are typically $k_\theta\rho_i \approx 0.2$. Also, decorrelation times are $\tau_d/(a/c_s) \sim 5$. The dimensionless quantities are similar to those observed in the core regions of L-mode tokamak discharges[13] and consistent with drift-wave turbulence parameters. Next, a model aggregation algorithm identifies parametric dependencies among turbulence quantities and transport-relevant plasma parameters. Model aggregation is an analysis technique that identifies patterns in multi-dimensional datasets with complex interdependencies. Model aggregation can (1) identify more scalings than a single regression model and (2) produce a distribution of scaling coefficients covering a variety of model constraints. Observed scalings from model aggregation indicate L_p increases at higher ∇n_e, higher collisionality, and lower ∇T_i. Using heuristic transport models and turbulence theory, the observed scalings show the most agreement with transport driven by trapped-electron mode, kinetic ballooning mode, and microtearing mode turbulence, and the least agreement

---

[a)] Paper YI3 4, Bull. Am. Phys. Soc. **57**, 371 (2012).
[b)] Invited speaker. Electronic address: drsmith@engr.wisc.edu

1070-664X/2013/20(5)/055903/9/$30.00

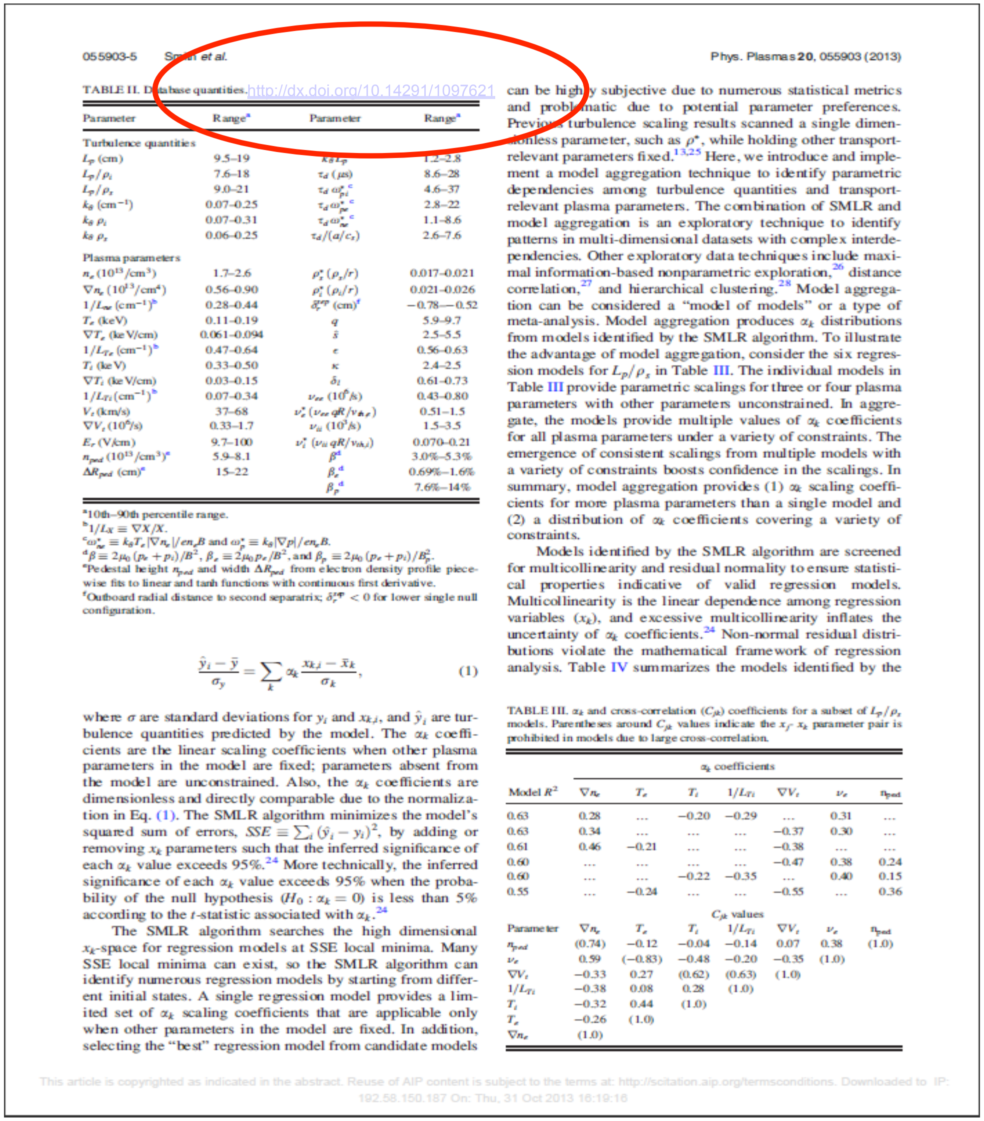


TABLE II. Database quantities. http://dx.doi.org/10.14291/1097621

Parameter	Range[a]	Parameter	Range[a]
Turbulence quantities			
L_p (cm)	9.5–19	$k_\theta L_p$	1.2–2.8
L_p/ρ_i	7.6–18	τ_d (μs)	8.6–28
L_p/ρ_s	9.0–21	$\tau_d\,\omega^*_{pi}$[c]	4.6–37
k_θ (cm^{-1})	0.07–0.25	$\tau_d\,\omega^*_{pe}$[c]	2.8–22
$k_\theta\,\rho_i$	0.07–0.31	$\tau_d\,\omega^*_{ne}$[c]	1.1–8.6
$k_\theta\,\rho_s$	0.06–0.25	$\tau_d/(a/c_s)$	2.6–7.6
Plasma parameters			
n_e (10^{13}/cm^3)	1.7–2.6	ρ^*_s (ρ_s/r)	0.017–0.021
∇n_e (10^{13}/cm^4)	0.56–0.90	ρ^*_i (ρ_i/r)	0.021–0.026
$1/L_{ne}$ (cm^{-1})[b]	0.28–0.44	δ_r^{sep} (cm)[f]	−0.78—0.52
T_e (keV)	0.11–0.19	q	5.9–9.7
∇T_e (keV/cm)	0.061–0.094	$\hat{s}$	2.5–5.5
$1/L_{Te}$ (cm^{-1})[b]	0.47–0.64	ϵ	0.56–0.63
T_i (keV)	0.33–0.50	κ	2.4–2.5
∇T_i (keV/cm)	0.03–0.15	δ_l	0.61–0.73
$1/L_{Ti}$ (cm^{-1})[b]	0.07–0.34	ν_{ee} (10^6/s)	0.43–0.80
V_t (km/s)	37–68	ν^*_e $(\nu_{ee}\,qR/v_{th,e})$	0.51–1.5
∇V_t (10^6/s)	0.33–1.7	ν_{ii} (10^3/s)	1.5–3.5
E_r (V/cm)	9.7–100	ν^*_i $(\nu_{ii}\,qR/v_{th,i})$	0.070–0.21
n_{ped} (10^{13}/cm^3)[e]	5.9–8.1	β[d]	3.0%–5.3%
ΔR_{ped} (cm)[e]	15–22	β_e[d]	0.69%–1.6%
		β_p[d]	7.6%–14%

[a] 10th–90th percentile range.
[b] $1/L_X \equiv \nabla X/X$.
[c] $\omega^*_{ne} \equiv k_\theta T_e|\nabla n_e|/en_eB$ and $\omega^*_p \equiv k_\theta|\nabla p|/en_eB$.
[d] $\beta \equiv 2\mu_0(p_e+p_i)/B^2$, $\beta_e \equiv 2\mu_0 p_e/B^2$, and $\beta_p \equiv 2\mu_0(p_e+p_i)/B_p^2$.
[e] Pedestal height n_{ped} and width ΔR_{ped} from electron density profile piecewise fits to linear and tanh functions with continuous first derivative.
[f] Outboard radial distance to second separatrix; $\delta_r^{sep} < 0$ for lower single null configuration.

$$\frac{\hat{y}_i - \bar{y}}{\sigma_y} = \sum_k \alpha_k \frac{x_{k,i} - \bar{x}_k}{\sigma_k}, \tag{1}$$

where σ are standard deviations for y_i and $x_{k,i}$, and $\hat{y}_i$ are turbulence quantities predicted by the model. The α_k coefficients are the linear scaling coefficients when other plasma parameters in the model are fixed; parameters absent from the model are unconstrained. Also, the α_k coefficients are dimensionless and directly comparable due to the normalization in Eq. (1). The SMLR algorithm minimizes the model's squared sum of errors, $SSE \equiv \sum_i(\hat{y}_i - y_i)^2$, by adding or removing x_k parameters such that the inferred significance of each α_k value exceeds 95%.[24] More technically, the inferred significance of each α_k value exceeds 95% when the probability of the null hypothesis $(H_0 : \alpha_k = 0)$ is less than 5% according to the t-statistic associated with α_k.[24]

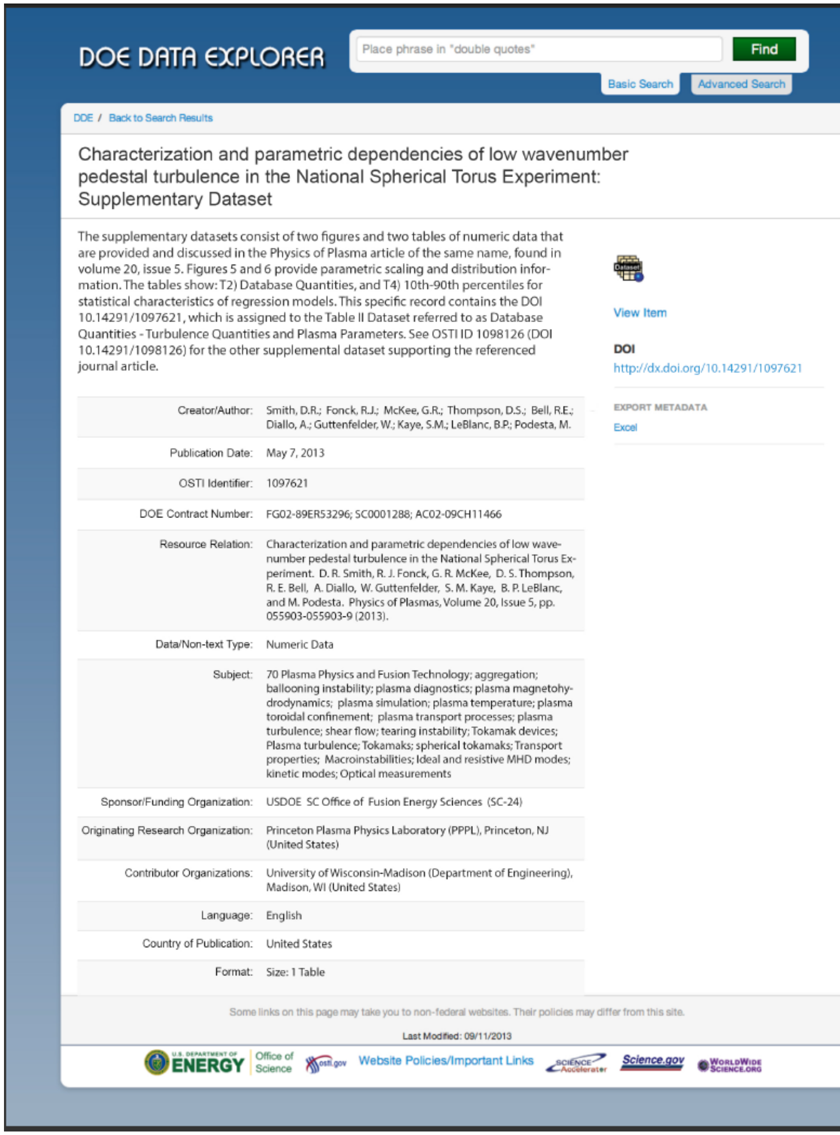
The SMLR algorithm searches the high dimensional x_k-space for regression models at SSE local minima. Many SSE local minima can exist, so the SMLR algorithm can identify numerous regression models by starting from different initial states. A single regression model provides a limited set of α_k scaling coefficients that are applicable only when other parameters in the model are fixed. In addition, selecting the "best" regression model from candidate models can be highly subjective due to numerous statistical metrics and problematic due to potential parameter preferences. Previous turbulence scaling results scanned a single dimensionless parameter, such as ρ^*, while holding other transport-relevant parameters fixed.[13,25] Here, we introduce and implement a model aggregation technique to identify parametric dependencies among turbulence quantities and transport-relevant plasma parameters. The combination of SMLR and model aggregation is an exploratory technique to identify patterns in multi-dimensional datasets with complex interdependencies. Other exploratory data techniques include maximal information-based nonparametric exploration,[26] distance correlation,[27] and hierarchical clustering.[28] Model aggregation can be considered a "model of models" or a type of meta-analysis. Model aggregation produces α_k distributions from models identified by the SMLR algorithm. To illustrate the advantage of model aggregation, consider the six regression models for L_p/ρ_s in Table III. The individual models in Table III provide parametric scalings for three or four plasma parameters with other parameters unconstrained. In aggregate, the models provide multiple values of α_k coefficients for all plasma parameters under a variety of constraints. The emergence of consistent scalings from multiple models with a variety of constraints boosts confidence in the scalings. In summary, model aggregation provides (1) α_k scaling coefficients for more plasma parameters than a single model and (2) a distribution of α_k coefficients covering a variety of constraints.

Models identified by the SMLR algorithm are screened for multicollinearity and residual normality to ensure statistical properties indicative of valid regression models. Multicollinearity is the linear dependence among regression variables (x_k), and excessive multicollinearity inflates the uncertainty of α_k coefficients.[24] Non-normal residual distributions violate the mathematical framework of regression analysis. Table IV summarizes the models identified by the

TABLE III. α_k and cross-correlation (C_{jk}) coefficients for a subset of L_p/ρ_s models. Parentheses around C_{jk} values indicate the x_j- x_k parameter pair is prohibited in models due to large cross-correlation.

	α_k coefficients						
Model R^2	∇n_e	T_e	T_i	$1/L_{Ti}$	∇V_t	ν_e	n_{ped}
0.63	0.28	…	−0.20	−0.29	…	0.31	…
0.63	0.34	…	…	…	−0.37	0.30	…
0.61	0.46	−0.21	…	…	−0.38	…	…
0.60	…	…	…	…	−0.47	0.38	0.24
0.60	…	…	−0.22	−0.35	…	0.40	0.15
0.55	…	−0.24	…	…	−0.55	…	0.36
	C_{jk} values						
Parameter	∇n_e	T_e	T_i	$1/L_{Ti}$	∇V_t	ν_e	n_{ped}
n_{ped}	(0.74)	−0.12	−0.04	−0.14	0.07	0.38	(1.0)
ν_e	0.59	(−0.83)	−0.48	−0.20	−0.35	(1.0)	
∇V_t	−0.33	0.27	(0.62)	(0.63)	(1.0)		
$1/L_{Ti}$	−0.38	0.08	0.28	(1.0)			
T_i	−0.32	0.44	(1.0)				
T_e	−0.26	(1.0)					
∇n_e	(1.0)						

Example



Characterization and parametric dependencies of low wavenumber pedestal turbulence in the National Spherical Torus Experiment: Supplementary Dataset

The supplementary datasets consist of two figures and two tables of numeric data that are provided and discussed in the Physics of Plasma article of the same name, found in volume 20, issue 5. Figures 5 and 6 provide parametric scaling and distribution information. The tables show: T2) Database Quantities, and T4) 10th-90th percentiles for statistical characteristics of regression models. This specific record contains the DOI 10.14291/1097621, which is assigned to the Table II Dataset referred to as Database Quantities - Turbulence Quantities and Plasma Parameters. See OSTI ID 1098126 (DOI 10.14291/1098126) for the other supplemental dataset supporting the referenced journal article.

Creator/Author:	Smith, D.R.; Fonck, R.J.; McKee, G.R.; Thompson, D.S.; Bell, R.E.; Diallo, A.; Guttenfelder, W.; Kaye, S.M.; LeBlanc, B.P.; Podesta, M.
Publication Date:	May 7, 2013
OSTI Identifier:	1097621
DOE Contract Number:	FG02-89ER53296; SC0001288; AC02-09CH11466
Resource Relation:	Characterization and parametric dependencies of low wavenumber pedestal turbulence in the National Spherical Torus Experiment. D. R. Smith, R. J. Fonck, G. R. McKee, D. S. Thompson, R. E. Bell, A. Diallo, W. Guttenfelder, S. M. Kaye, B. P. LeBlanc, and M. Podesta. Physics of Plasmas, Volume 20, Issue 5, pp. 055903-055903-9 (2013).
Data/Non-text Type:	Numeric Data
Subject:	70 Plasma Physics and Fusion Technology; aggregation; ballooning instability; plasma diagnostics; plasma magnetohydrodynamics; plasma simulation; plasma temperature; plasma toroidal confinement; plasma transport processes; plasma turbulence; shear flow; tearing instability; Tokamak devices; Plasma turbulence; Tokamaks; spherical tokamaks; Transport properties; Macroinstabilities; Ideal and resistive MHD modes; kinetic modes; Optical measurements
Sponsor/Funding Organization:	USDOE SC Office of Fusion Energy Sciences (SC-24)
Originating Research Organization:	Princeton Plasma Physics Laboratory (PPPL), Princeton, NJ (United States)
Contributor Organizations:	University of Wisconsin-Madison (Department of Engineering), Madison, WI (United States)
Language:	English
Country of Publication:	United States
Format:	Size: 1 Table

View Item

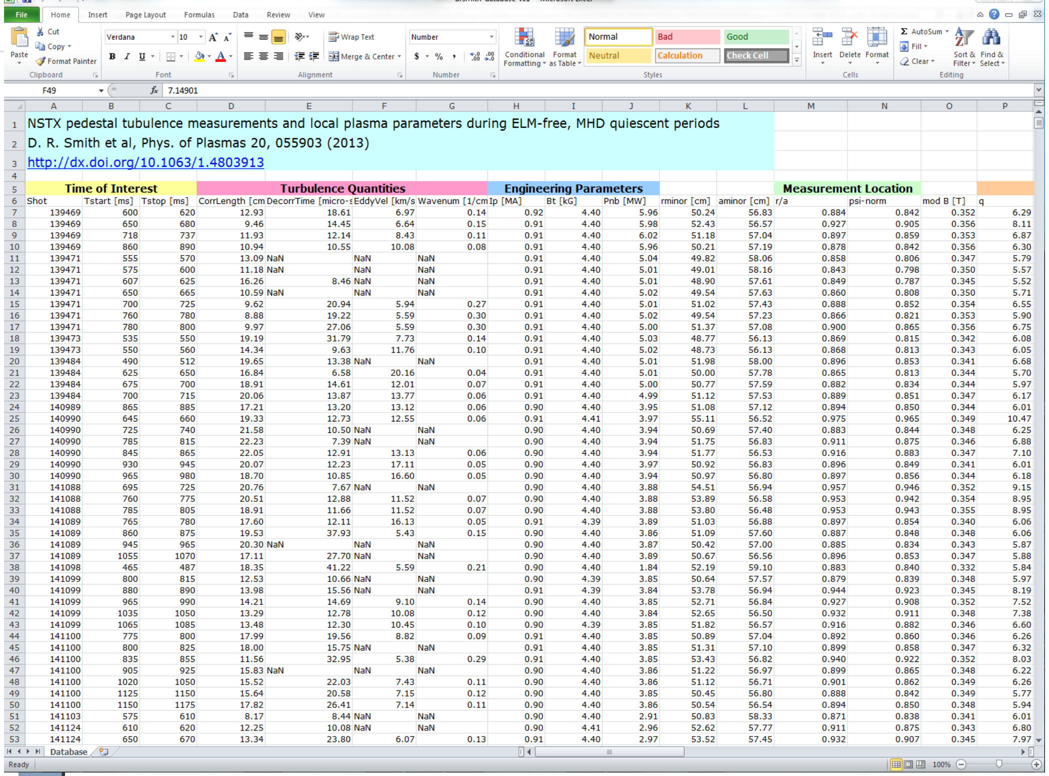
DOI

http://dx.doi.org/10.14291/1097621

EXPORT METADATA

Excel

Last Modified: 09/11/2013



F49 7.14901

NSTX pedestal tubulence measurements and local plasma parameters during ELM-free, MHD quiescent periods

D. R. Smith et al, Phys. of Plasmas 20, 055903 (2013)

http://dx.doi.org/10.1063/1.4803913

Time of Interest			Turbulence Quantities				Engineering Parameters					Measurement Location			
Shot	Tstart [ms]	Tstop [ms]	CorrLength [cm	DecorrTime [micro-s	EddyVel [km/s	Wavenum [1/cm	Ip [MA]	Bt [kG]	Pnb [MW]	rminor [cm]	aminor [cm]	r/a	psi-norm	mod B [T]	q
139469	600	620	12.93	18.61	6.97	0.14	0.92	4.40	5.96	50.24	56.83	0.884	0.842	0.352	6.29
139469	650	680	9.46	14.45	6.64	0.15	0.91	4.40	5.98	52.43	56.57	0.927	0.905	0.356	8.11
139469	718	737	11.93	12.14	8.43	0.11	0.91	4.40	6.02	51.18	57.04	0.897	0.859	0.353	6.87
139469	860	890	10.94	10.55	10.08	0.08	0.91	4.40	5.96	50.21	57.19	0.878	0.842	0.356	6.30
139471	555	570	13.09	NaN	NaN	NaN	0.91	4.40	5.04	49.82	58.06	0.858	0.806	0.347	5.79
139471	575	600	11.18	NaN	NaN	NaN	0.91	4.40	5.01	49.01	58.16	0.843	0.798	0.350	5.57
139471	607	625	16.26	8.46	NaN	NaN	0.91	4.40	5.01	48.90	57.61	0.849	0.787	0.345	5.52
139471	650	665	10.59	NaN	NaN	NaN	0.91	4.40	5.02	49.54	57.63	0.860	0.808	0.350	5.71
139471	700	725	9.62	20.94	5.94	0.27	0.91	4.40	5.01	51.02	57.43	0.888	0.852	0.354	6.55
139471	760	780	8.88	19.22	5.59	0.30	0.91	4.40	5.02	49.54	57.23	0.866	0.821	0.353	5.90
139471	780	800	9.97	27.06	5.59	0.30	0.91	4.40	5.00	51.37	57.08	0.900	0.865	0.356	6.75
139473	535	550	19.19	31.79	7.73	0.14	0.91	4.40	5.03	48.77	56.13	0.869	0.815	0.342	6.08
139473	550	560	14.34	9.63	11.76	0.10	0.91	4.40	5.02	48.73	56.13	0.868	0.813	0.343	6.05
139484	490	512	19.65	13.38	NaN	NaN	0.91	4.40	5.01	51.98	58.00	0.896	0.853	0.341	6.68
139484	625	650	16.84	6.58	20.16	0.04	0.91	4.40	5.01	50.00	57.78	0.865	0.813	0.344	5.70
139484	675	700	18.91	14.61	12.01	0.07	0.91	4.40	5.00	50.77	57.59	0.882	0.834	0.344	5.97
139484	700	715	20.06	13.87	13.77	0.06	0.91	4.40	4.99	51.12	57.53	0.889	0.851	0.347	6.17
140989	865	885	17.21	13.20	13.12	0.06	0.90	4.40	3.95	51.08	57.12	0.894	0.850	0.344	6.01
140990	645	660	19.33	12.73	12.55	0.06	0.91	4.41	3.97	55.11	56.52	0.975	0.965	0.349	10.47
140990	725	740	21.58	10.50	NaN	NaN	0.90	4.40	3.94	50.69	57.40	0.883	0.844	0.348	6.25
140990	785	815	22.23	7.39	NaN	NaN	0.90	4.40	3.94	51.75	56.83	0.911	0.875	0.346	6.88
140990	845	865	22.05	12.91	13.13	0.06	0.90	4.40	3.94	51.77	56.53	0.916	0.883	0.347	7.10
140990	930	945	20.07	12.23	17.11	0.05	0.90	4.40	3.97	50.92	56.83	0.896	0.849	0.341	6.01
140990	965	980	18.70	10.85	16.60	0.05	0.90	4.40	3.94	50.97	56.80	0.897	0.856	0.344	6.18
141088	695	725	20.76	7.67	NaN	NaN	0.90	4.40	3.88	54.51	56.94	0.957	0.946	0.352	9.15
141088	760	775	20.51	12.88	11.52	0.07	0.90	4.40	3.88	53.89	56.58	0.953	0.942	0.354	8.95
141088	785	805	18.91	11.66	11.52	0.07	0.90	4.40	3.88	53.80	56.48	0.953	0.943	0.355	8.95
141089	765	780	17.60	12.11	16.13	0.05	0.91	4.39	3.89	51.03	56.88	0.897	0.854	0.340	6.06
141089	860	875	19.53	37.93	5.43	0.15	0.90	4.40	3.86	51.09	57.60	0.887	0.848	0.348	6.06
141089	945	965	20.30	NaN	NaN	NaN	0.90	4.40	3.87	50.42	57.00	0.885	0.834	0.343	5.87
141089	1055	1070	17.11	27.70	NaN	NaN	0.90	4.40	3.89	50.67	56.56	0.896	0.853	0.347	5.88
141098	465	487	18.35	41.22	5.59	0.21	0.90	4.40	1.84	52.19	59.10	0.883	0.840	0.332	5.84
141099	800	815	12.53	10.66	NaN	NaN	0.90	4.39	3.85	50.64	57.57	0.879	0.839	0.348	5.97
141099	880	890	13.98	15.56	NaN	NaN	0.91	4.39	3.84	53.78	56.94	0.944	0.923	0.345	8.19
141099	965	990	14.21	14.69	9.10	0.14	0.90	4.40	3.85	52.71	56.84	0.927	0.908	0.352	7.52
141099	1035	1050	13.29	12.78	10.08	0.12	0.90	4.40	3.84	52.65	56.50	0.932	0.911	0.348	7.38
141099	1065	1085	13.48	12.30	10.45	0.10	0.90	4.39	3.85	51.82	56.57	0.916	0.882	0.346	6.60
141100	775	800	17.99	19.56	8.82	0.09	0.91	4.40	3.85	50.89	57.04	0.892	0.860	0.346	6.26
141100	800	825	18.00	15.75	NaN	NaN	0.91	4.40	3.85	51.31	57.10	0.899	0.858	0.347	6.32
141100	835	855	11.56	32.95	5.38	0.29	0.91	4.40	3.85	53.43	56.82	0.940	0.922	0.352	8.03
141100	905	925	15.83	NaN	NaN	NaN	0.90	4.40	3.86	51.22	56.97	0.899	0.865	0.348	6.22
141100	1020	1050	15.52	22.03	7.43	0.11	0.90	4.40	3.86	51.12	56.71	0.901	0.862	0.349	6.26
141100	1125	1150	15.64	20.58	7.15	0.12	0.90	4.40	3.85	50.45	56.80	0.888	0.842	0.349	5.77
141100	1150	1175	17.82	26.41	7.14	0.11	0.90	4.40	3.86	50.54	56.54	0.894	0.850	0.348	5.94
141103	575	610	8.17	8.44	NaN	NaN	0.90	4.40	2.91	50.83	58.33	0.871	0.838	0.341	6.01
141124	610	620	12.25	10.08	NaN	NaN	0.90	4.41	2.96	52.62	57.77	0.911	0.875	0.343	6.80
141124	650	670	13.34	23.80	6.07	0.13	0.91	4.40	2.97	53.52	57.45	0.932	0.907	0.345	7.97

Making data public – some points

- Plan on providing data from figures, tables, etc. for research papers submitted in 2015 (DMP has to get DOE approval)
- Will be more relaxed for Review papers – many figures already published; will not need to provide files
- Use standard file formats: text (tab or space delimited), CSV, Excel files, self-describing NETCDF or HDF5 (others?)
- Image files (e.g., from GPI) can be accessed through NSTX-U web site (files can be made publicly accessble & URL will be provided in article – ARK can also be obtained)
- For publications from collaborations: host institutions rules rule
    - This may also include data from a collection of facilities
    - Will be leading a discussion of U.S. policy and implications with international community at next week's ITPA CC mtg.