

The Use of MDSplus on NSTX at PPPL

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Abstract # 5

**3rd IAEA Technical Committee Meeting
on Control, Data Acquisition, and
Remote Participation for Fusion Research**

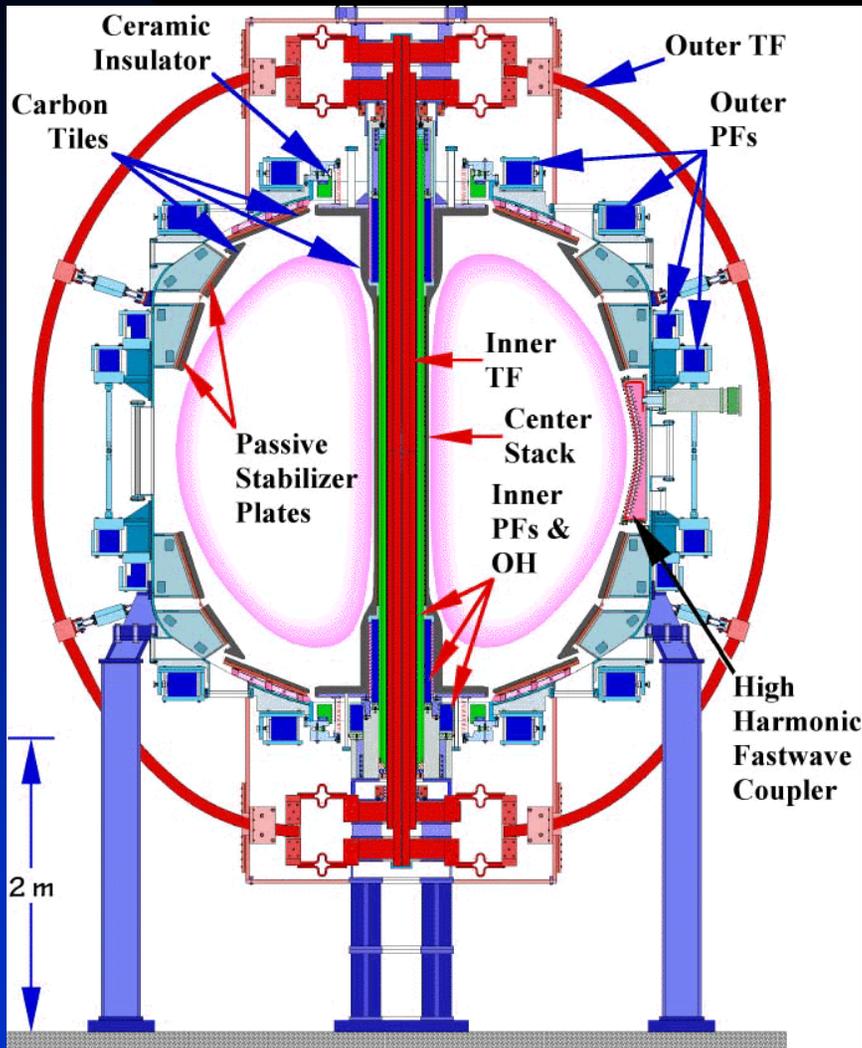
Padova, Italy 16 - 19 July 2001

Overview

- What is NSTX?
- Reasons for choosing MDSplus
- Computer Details
- Integration with other systems
- Locally-developed tools
- Next Steps

What is NSTX?

(National Spherical Torus Experiment)

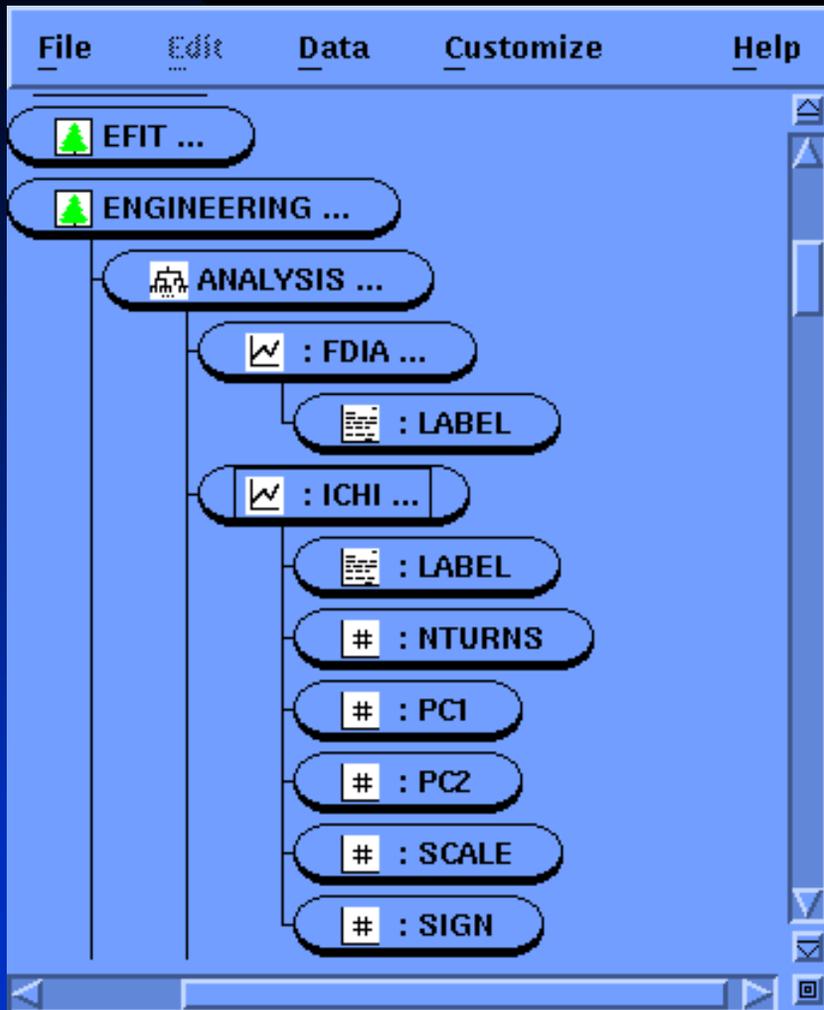


- A low-aspect ratio (spherical) tokamak
- Predicted to have less MHD and micro-instabilities, and less energy loss
- Mission is to explore low-aspect ratio physics at high β (= Plasma Pressure / Magnetic field pressure)
 - ◆ $\beta_t \leq 40\%$, a fourfold increase over conventional aspect-ratio tokamaks



Operations Began February, 1999

What is MDSplus?



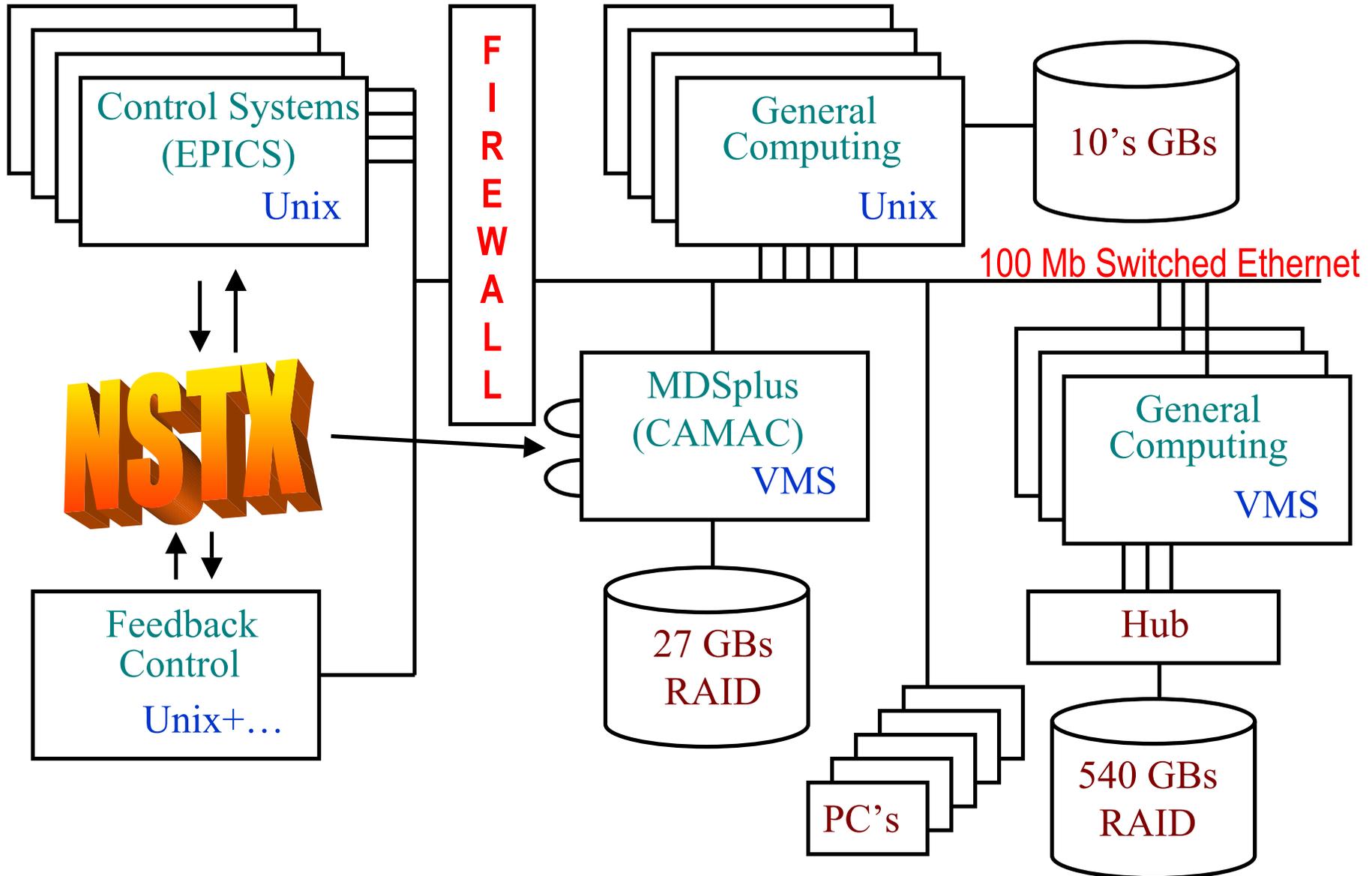
A System for:

- Data Acquisition
- Hierarchical Data Storage
- Data Display tools
- Cross-platform networking
- Expression Evaluation

Reasons for Choosing MDSplus

- Designed for shot-cycle based experiments
- Used at other Fusion Facilities
- We had good experience with MDS
- Turn-key support for most of our Legacy CAMAC modules
- Works on VMS, Unix, Linux, Windows,...

NSTX Computer Schematic



Major NSTX Computers

OS	Model	# CPUs	MHz	Memory (MB)
VMS	DS20E	2	667	3500
“	AlphaServer 800	1	500	1000
“	Alpha 2100A 4/275	3	275	768
“	Alpha 2100 4/275	3	275	500
Solaris	UltraSPARC-II	4	400	2000
“	UltraSPARC-II	2	400	1500
“	(2) Sparc Ultra 30	1	300	768

Shot Cycle Timing

Time

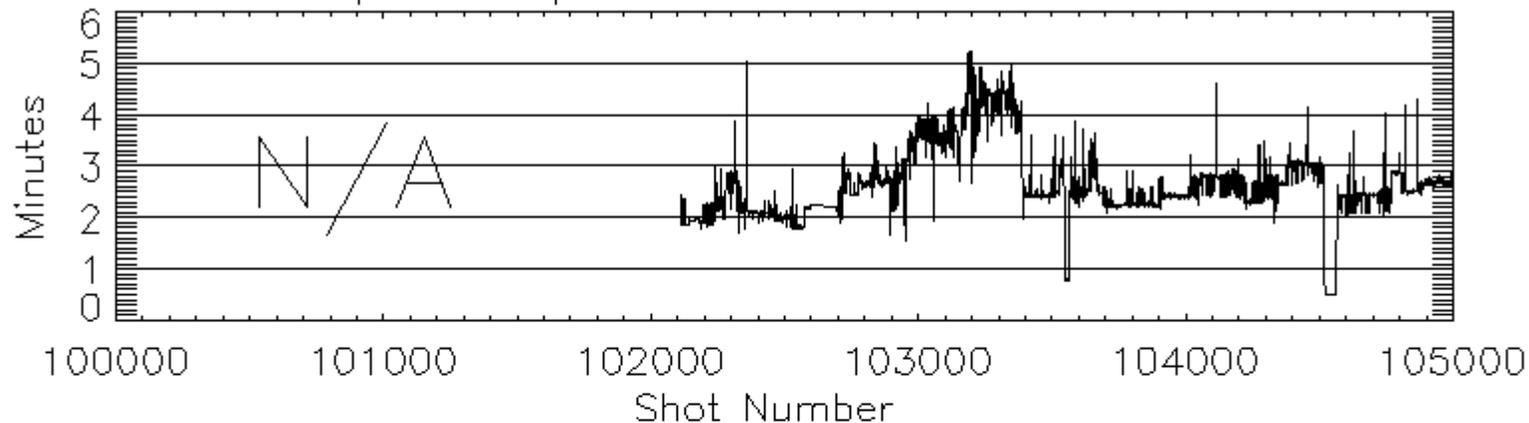


Before	Users Adjust Settings
-2:20	Checks and Ramp-ups
-1:00	Files are Created
0:00	Plasma Shot Begins
0:01	Shot Finishes
0:09	Data Acquisition Begins
2:30	Data Acquisition Finishes
After	Users Analyze Data

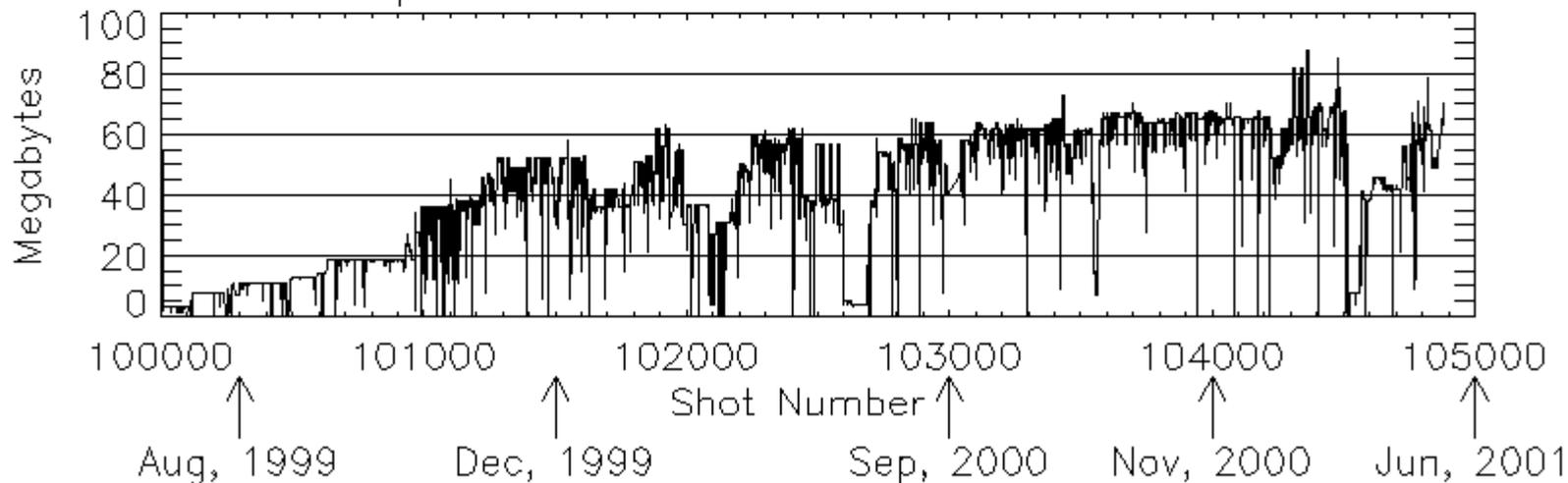
Data Acquisition Statistics



MDSplus Acquisition Time vs. Shot Number



Uncompressed Data Amounts vs. Shot Number



MDSplus Integration with Other Systems

- Files received from the Experimental Physics and Industrial Control System - EPICS (a Distributed Control System)
- 5 (and counting) PC-based systems write to trees directly
- MS-SQL hooks in use
- Callable from IDL and FORTRAN

Locally Developed Tools

- Two General Plotting Programs
- Web Tools that users don't need help with
- CAMAC Control Widgets
- Database Plotting Tool
- Web Documentation getting better

Web Tools Page

File Edit View Go Communicator Help

Bookmarks Location: <http://nstx.pppl.gov/nstx/Software/WebTools> What's Related

NSTX Overview Programming Diagnostics Details
FAQ Web Tools UNIX & VMS
software

Web-based tools for NSTX

PLOTTING NSTX DATA	mdsplots , plot NSTX signals (with overlays)
FINDING SIGNALS IN TREE	treesearch , search for text, node or TDI
FINDING SIGNALS IN LABEL LIST	List of NSTX MDSplus signals and their labels , for searching with Browser 'Find'
LOGBOOK READ ACCESS	Logbook standard and custom queries, autoupdates
CHECKING DATA LIMITS	mdsShotSearch searches a range of shot numbers for signal data within user-specified limits

XP/XMP SHOT INDEX

CY2000 Physics XPs

CY2001 Physics XPs

Web Shot Search Tool

File Edit View Go Communicator Help

Bookmarks Location: <http://nstx.pppl.gov/nstx/Software/WebTools/mds/> What's Related

 **NSTX**

Overview Programming Diagnostics Details

FAQ Web Tools UNIX & VMS

software

Search for Shots in the NSTX MDSplus trees

(To use this page from outside the pppl.gov domain, you must be [authenticated at the firewall](#))

Find **Shots** between and

To find the shots for a certain date, [Query the NSTX Logbook](#)

Where the **Maximum value** for Signal:

(select from this list, **OR** type a signal name below)

(The signal name must include the tree, e.g., wf:ip
-- See the [NSTX Signals and Labels page](#) or the [MDSplus Tree Search Tool](#)).

is (Defaults to all shots)

When the **Median-Smoothing** Neighborhood is

[Return to the NSTX MDSplus Plotting Tool](#)

100%

Animating Profiles with other Data

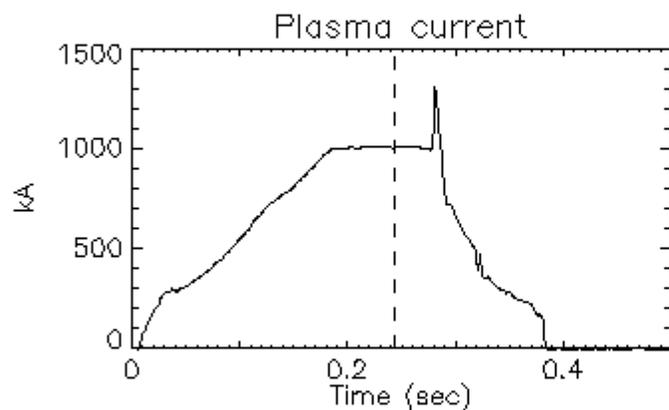
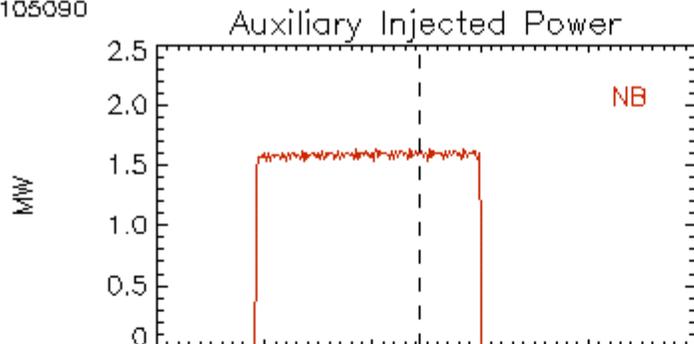
Animation Speed:
Frames/Sec: 0.0

Animation Frame:
6

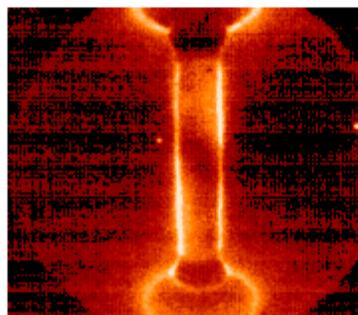
Active Slider

End Animation
Colors...
Write MPEG
Help

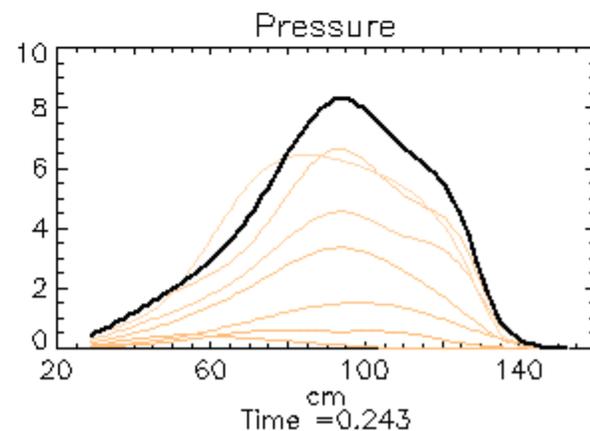
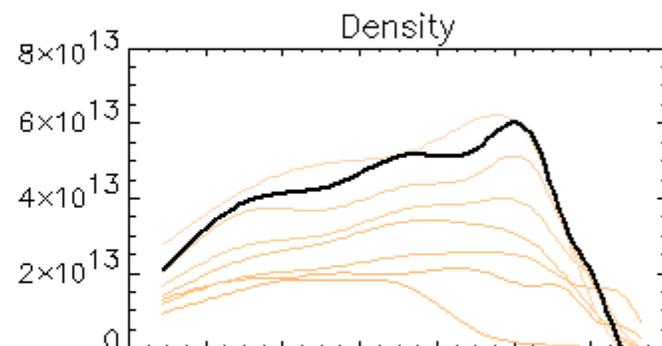
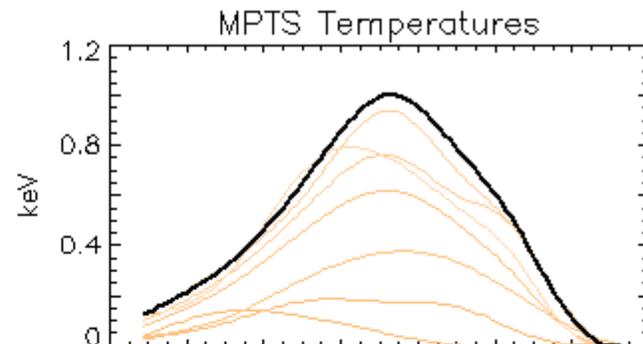
=NSTX=
105090



LANL
Fast
Camera



6-JUN-2001



Next Steps

- Extend Web documentation
- Better system diagnostics (CAMAC errors, sorting MDSplus diagnostics, event logging)
- Non-CAMAC data acquisition
- Spectral analysis tools

Summary

- ~ 1 man-year to bring up our system
- The use of MDSplus has saved years of development time.
- 4 programmers continue to support NSTX

For more information, come to the
**19th IEEE/NPSS Symposium on
Fusion Engineering (SOFE)
October 2-5, 2001 in Atlantic City, NJ USA**

Questions?

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Thanks to co-authors:

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Dana Mastorvito

Supported by

