NSTX-U

Supported by

U.S. DEPARTMENT OF ENERGY | Office of Science

NSTX-U Collaboration Status and Plans for: Charged Fusion Product Diagnostic FIU

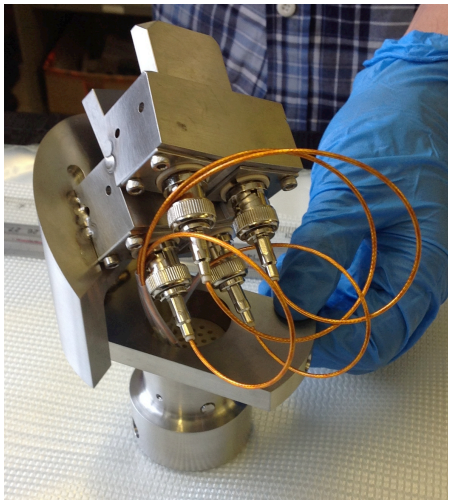
Werner U. Boeglin

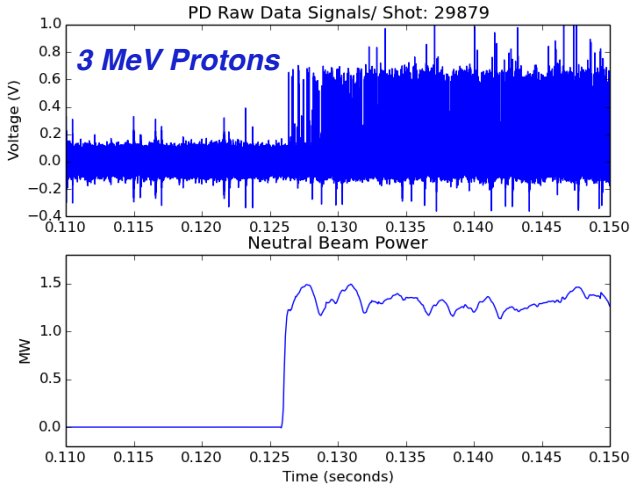
Ramona Perez, Alexander Netepenko, FIU

D.S. Darrow PPPL

NSTX-U Collaborator Research Plan Meetings
PPPL – LSB B318
April / May 2014

Coll of Wm & Mary
Columbia U
CompX
General Atomics
FIU
INL
Johns Hopkins U
LANL
LLNL
Lodestar
MIT
Lehigh U
Nova Photonics
ORNL
PPPL
Princeton U
Purdue U
SNL
Think Tank, Inc.
UC Davis
UC Irvine
UCLA
UCSD
U Colorado
U Illinois
U Maryland
U Rochester
U Tennessee
U Tulsa
U Washington
U Wisconsin
X Science LLC





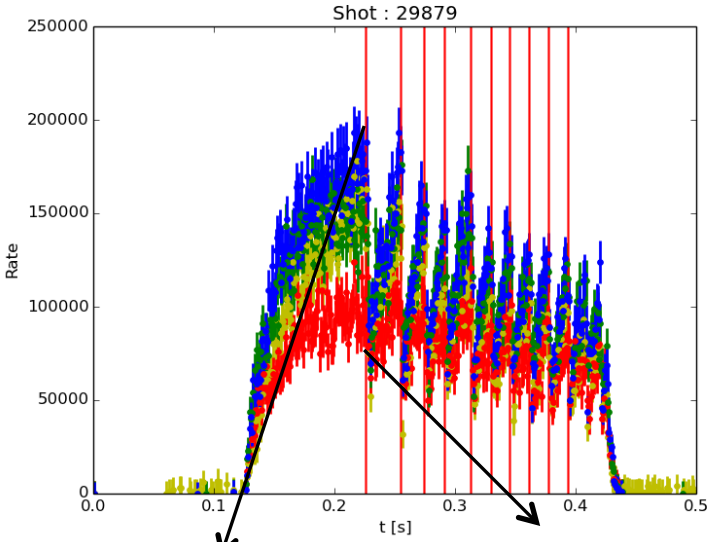
Culham Sci Ctr
York U
Chubu U
Fukui U
Hiroshima U
Hyogo U
Kyoto U
Kyushu U
Kyushu Tokai U
NIFS
Niigata U
U Tokyo
JAEA
Inst for Nucl Res, Kiev
Ioffe Inst
TRINITI
Chonbuk Natl U
NFRI
KAIST
POSTECH
Seoul Natl U
ASIPP
CIEMAT
FOM Inst DIFFER
ENEA, Frascati
CEA, Cadarache
IPP, Jülich
IPP, Garching
ASCR, Czech Rep

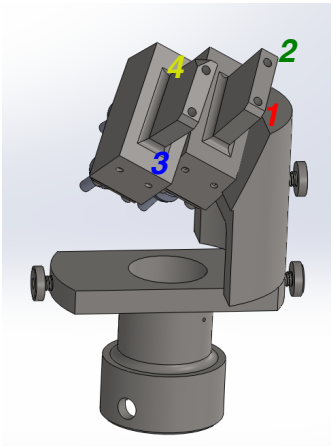
Research plans and needs for this year (FY2014) in preparation for NSTX-U operations in FY2015

- Fusion reaction profile determination
  - MAST results: new, for plasma physics interesting data
- Funding status:
  - Current grant ends August 14
  - New application pending
- Diagnostic work planned by August 14:
  - Analysis of MAST proton/triton/neutron data
  - TRANSP comparison
  - Enhance proton detection system
    - FIU has currently 4 detectors fully instrumented
    - Procure amplifiers for up to 8 detectors
  - Preparation for installation in NSTX-U
    - Conceptual design of new detector mount for NSTX-U
    - 4 and 6 – 8 detector array

First 3 MeV Proton Results from MAST

SAW TOOTH





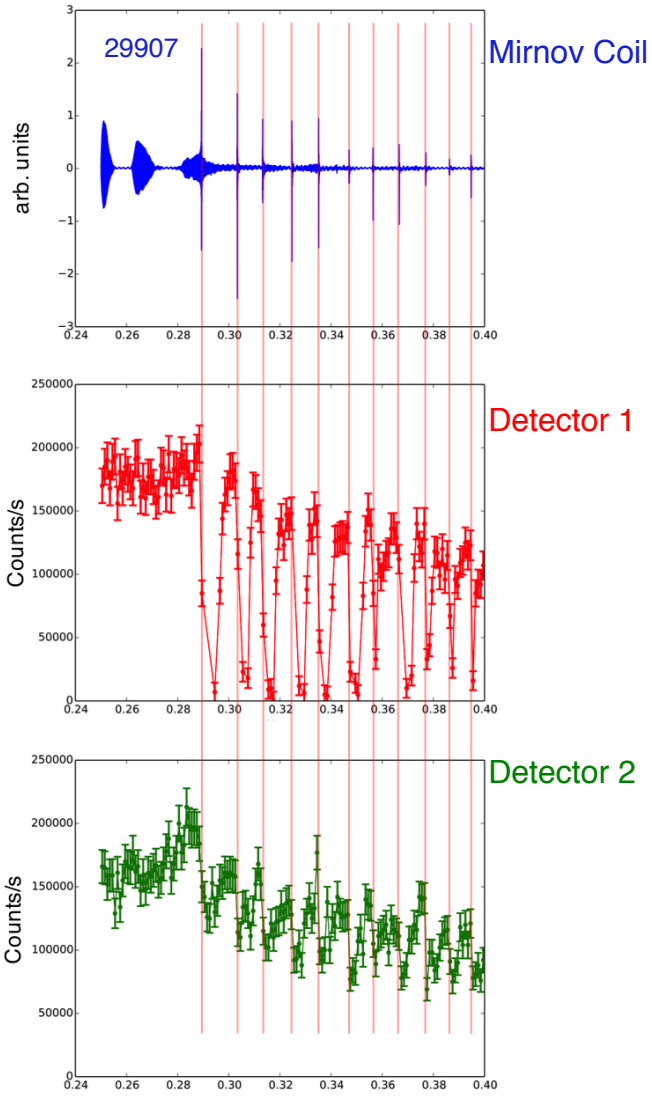
Detector 1

Detector 2

Detector 3

Detector 4

SAW TOOTH (?)



Research Plans for FY2015 beyond
(The years covered will depend on the duration of your present grant)

- Installation of charged fusion product diagnostic
  - Construction and installation of new array
  - Use simple version possibly with 4 – 6 detectors
- Optimize energy resolution
  - Perform signal noise studies
  - Perform rate studies
  - Optimize electrical shielding
- Increase the number of channels (sight lines) to 8
  - Explore other detector systems (e.g. pad detectors)
- Data taking with maximal number of channels
- Increase to full 16-channel system

Ideas to enhance participation in NSTX-U research/program by U.S. Universities, early-career researchers, and students

- Projects feasible for smaller university groups:
  - Participate actively in diagnostic development (funding needed)
  - Data taking (remotely if possible)
  - Data analysis
  - Travel support
- Example: FIU group
  - 1 faculty member, 1 Ph.D. Student (Ph.D. in 2015), 1 new Ph.D. student
  - Undergraduate Student Involvement: Students are very interested in this research area
    - At FIU we currently we have six undergraduate students involved
    - Experiment preparations with individual responsibilities
    - Participation in experimental campaigns (e.g. MAST, NSTX-U), 4 students
    - Participation in various undergraduate programs e.g McNair, REU, SULI

Highest-priority incremental measurement capability
(For diagnostic solicitation grantees funded for 2012-2015)

- First proton diagnostic for NSTX-U construction
  - Mechanical
    - Detector mount for NSTX-U
    - Mount design adapted to NSTX-U
    - Thermal shielding design
    - Construction
  - Electrical
    - Cabling and feed through systems
    - Electrical shielding optimization
    - 2-4 More standard SSB detectors
  - Travel