PPPL Off-site University Research Support

FY ’03 Summary

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Accomplishments:

PPPL provided scientific and technical support to over 25 University research groups in FY ’03 through the "Off-Site University Research Support" program. A list of the Universities supported in FY ’03 is shown in Table 1. This support was provided by over 20 PPPL staff typically at the level of 1-2 man-months per University group. The topics of this support included diagnostic development, engineering analysis, and theoretical and computational physics, and safety analysis.

A continuing accomplishment of this program is to provide scientific “outreach” to Universities with small plasma groups, which can most benefit from the resources of PPPL. To this end, significant support was provided to Prairie View A&M, New Jersey Institute of Technology, Augsburg College, Illinois Institute of Technology, and other small Universities as listed in Table 1.

Highlights:

• Several PPPL personnel visited Prairie View A&M in Texas this past year to help improve the operation and diagnostics of their Rotamak FRC experiment. Their RF power systems were improved and a design for higher frequency operation was made. A data acquisition system was assembled for them based on the CAMAC hardware previously used on TFTR. Improvements to their probe and spectroscopic diagnostics are also under development.

• A team of four engineers from PPPL, including the Head of PPPL’s ES&H division, visited the UCLA Electric Tokamak (ET) facility to perform a brief review of ET safety practices and to provide advice regarding possible safety improvements. Discussions were held with members of the ET staff and with UCLA safety professionals, and results of the PPPL review were communicated to Bob Taylor (ET Principal Investigator).

* PPPL engineers helped design and analyze the vacuum vessel and magnetic field coil configuration for the new Non-neutral Torus experiment at Columbia University. The copper cross section, insulation requirements, and winding scheme for the poloidal field and interlocking coils has been defined and a draft of the final procurement package for the PF and IL coils is currently underway.

The vacuum vessel is nearly complete and PPPL will participate in the final design review of the coils.

• PPPL scientists have helped Prof Earl Scime (West Virginia University) on the development of a portable laser-induced-fluorescence (LIF) system for plasma diagnosis. A 3rd-year WVU grad student came to PPPL during the summer to develop and test a the WVU LIF system on the Magnetic Nozzle Experiment (MNX), a helicon heated plasma device. At the end of the summer, two PPPL people went to WVU to assist in setting up the LIF system and to aid in data analysis.

• Three PPPL researchers have provided theoretical support for University experiments, observations and simulations of space physics phenomena. We have helped the solar physics group at the New Jersey Institute of Technology on theoretical understanding of the relation between coronal mass ejections and solar flare emission based on magnetic reconnection. We have also helped Prof. Engebretson's group at Ausburg College to understand magnetic fluctuations observed by satellites and ground-based magnetometers, and Prof. Otto of University of Alaska to develop a new model for including kinetic physics in his MHD simulation codes.

• PPPL has supported research at the University of Toledo and the University of Houston on low-pressure plasma discharges. A PPPL theorist has developed a self-consistent system of equations for the kinetic description of nonlocal, nonuniform, nearly collisionless plasmas of low-pressure discharges. This model was used to improve numerical code calculations for low pressure plasmas done at these Univerisites.

Milestones for FY '03:

	Scheduled	Done
1) Define list of Universities to be supported in FY '03	12/02	12/02
2) Add additional University programs or increase support for some programs if budget is available	5/03	5/03
3) Write short reports for each of these University support programs on work done in FY'02	11/03	soon

Table 1: PPPL University support projects in FY '03 (red = new forFY '03)

University	Contact	PPPL Contact(s)	Topic
Alaska	Otto	Cheng,Johnson	Plasma transport at Magnetopause
Augsburg	Engebretson	Cheng,Johnson	MHD waves in magnetosphere
Auburn	Knowlton	Majeski	RF heating for stellarator
Chicago	Rosner	Yamada,Ji	Resistive MHD physics
Columbia	Pedersen	Dahlgren	Non-neutral stellarator design
Columbia	Mauel	Paul, Budny	Rotation diagnostic / RF modeling
Houston	Economou	Kaganovich	Low pressure discharge
Illinois IT	Shvets	Kaganovich,Pletzer	IFE physics, code development
Irvine	Lin	Wang	GTC code development
Lehigh	Kritz	Budny	Modeling comparisons
Maryland	Drake	Yamada,Ji	Non-local MHD physics
Michigan	Keidar	Raitses	Anode sheath in Hall thrusters
MIT	Kesner	Zweben	Diagnostics for LDX
MIT	Egedal	Ji	Magnetic reconnection in VTF
NJIT	Wang/Gary	Choe/Cheng	Solar magnetism and plasmas
Rochester	Blackman	Ji	Laboratory astrophysics
Prairie View	Huang	Roquemore	Rotamak experiment
Swarthmore	Brown	Yamada,Terry	Global reconnection in SSX
Toledo	Polomarov	Kaganovich	Low pressure discharges
UCLA	Stenzel	Yamada,Ji,Terry	Whistler and lower hybrid waves
UC Davis	Luhmann	Park	Fluctuation diagnostics
UCLA	Abdou	Majeski, Ji	Liquid metal physics in MTOR
UCLA	Taylor	Zweben, Budny	Experiments and modeling in ET
UCLA	Gekelman	Zweben, Ji	Fluctuations in LAPD
West Virginia	Scime	Cohen	LIF plasma diagnositc
Wisconsin	Forest	Ji	Liquid metal experiments
Wisconsin	Hegna	Hudson	3-D MHD stability calculations
Wisconsin	Fonck	Efthimion, Taylor	EBW heating and current drive