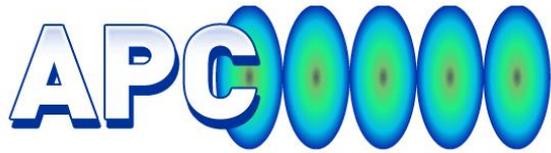


Advanced Accelerator R&D

P. Piot (FNAL/NIU)

(L. Bellantoni), (H. Edwards), (S.
Nagaitsev), Y.-E Sun, (C. Y. Tan), (M.
Wendt)



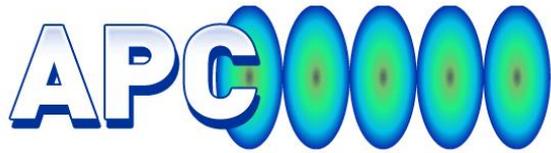
AARD: introduction

- *Mission:*

- Identity new enabling-technology R&D topics to accelerate, manipulate and/or diagnose beams,
- Work on these topics with the ultimate goal of performing proof-of-principle experiments if possible using Fermilab's accelerator facilities.

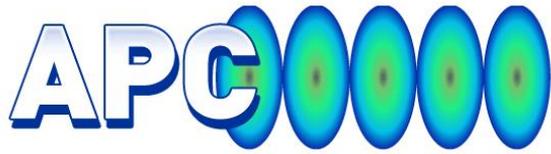
- *R&D topic covered:*

- Generation, manipulation and diagnostics of high brightness electron beams,
- Plasma-wakefield based acceleration technique,
- Electromagnetic structure and laser-based acceleration methods,
- Radiation sources.



AARD: accomplishments

- Design of the high-brightness photoinjector for the NML facility (FNAL/NIU)
- Longitudinal-to-transverse emittance exchange between two degree of freedoms (ANL/FNAL/NIU)
 - Did beam dynamics design for the AWA proof-of-principle experiment [Piot, Power (ANL), Sun (ANL/FNAL)],
 - Supports A0 experiment (beam dynamics and diagnostics simulations) [Fliller, Sun (FNAL) et al.].
- Measurement of short e- bunches via electro-optical imaging (ANL/FNAL/NIU)
 - Generation and analysis of THz radiation produced via optical rectifications at AWA [Ruan, Tan, et al.],
- Multi-beamlets transverse space charge experiment at AWA [Piot, Rihaoui (NIU)]



AARD: anticipated accomplishments for FY'08

- Support of A0 AARD [Sun]
 - Support of A0 emittance exchange experiment, data analysis and modeling [Fliller, Sun et al.]
 - Image charge undulator [with JLab: Boyce, Derbenev, and Zhang]
 - TM_{010}^* laser-based “in vacuum” acceleration,
- Extramural collaborations:
 - ANL/NIU: Commissioning of emittance exchange experiment at AWA: generation of low longitudinal emittance + diagnostics tests [Piot]
 - ANL/NIU: EO-imaging (experiment at AWA?) [Ruan, Tan et al.]
 - NIU: Optical Beam Position Monitor [Piot, Maxwell (NIU)]
 - U. of Tokyo/NIU: measurement of fs bunches from a LPFA [Maxwell (NIU), Piot]
- Theory/Modeling of AARD activities to be tested at NML [Piot]
 - Dielectric wakefield accelerator in the quasi-optical (THz) regime: [Piot, proposal pending]
 - Variable R_{56} , low energy, magnetic bunch compressor [SBIR w. RadiaBeam, pending]