

2024 Summer Kick-Off

Center for Accelerator Physics and Engineering (CAPHÉ)

Moses Chung

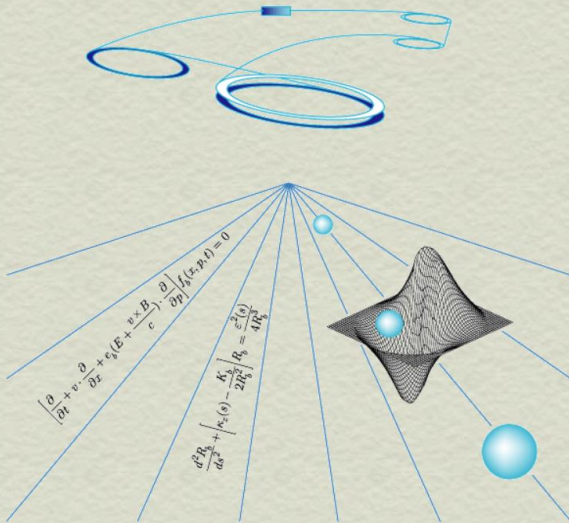
2024. 8. 7.

History of our lab.

2001~2008

Beam Dynamics and Nonneutral Plasma Division
Plasma Physics Laboratory, Princeton University

Objectives Activities Publications Presentations People Home Links



Division Head:

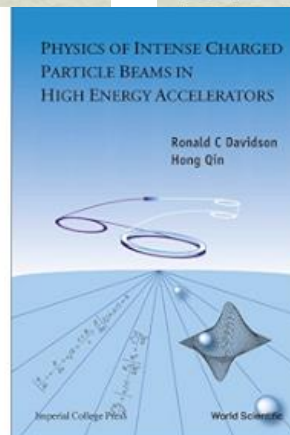


- [Ronald C. Davidson](#)
Professor of Astrophysical Sciences
Editor, Physics of Plasmas
Chair, American Physical Society, Physics of Beams Division (2001)
Deputy Director, Heavy Ion Fusion Virtual National Laboratory (1999-)
Director, Princeton Plasma Physics Laboratory (1991-1996)

Graduate Students:



- [Moses Chung](#)
The Paul Trap Simulator Experiment. Laser-induced fluorescence diagnostic.



History of our lab.

2008~2014

**Accelerator Physics Center at Fermilab :
History and Accomplishments (2007-2018)**

Vladimir Shiltsev

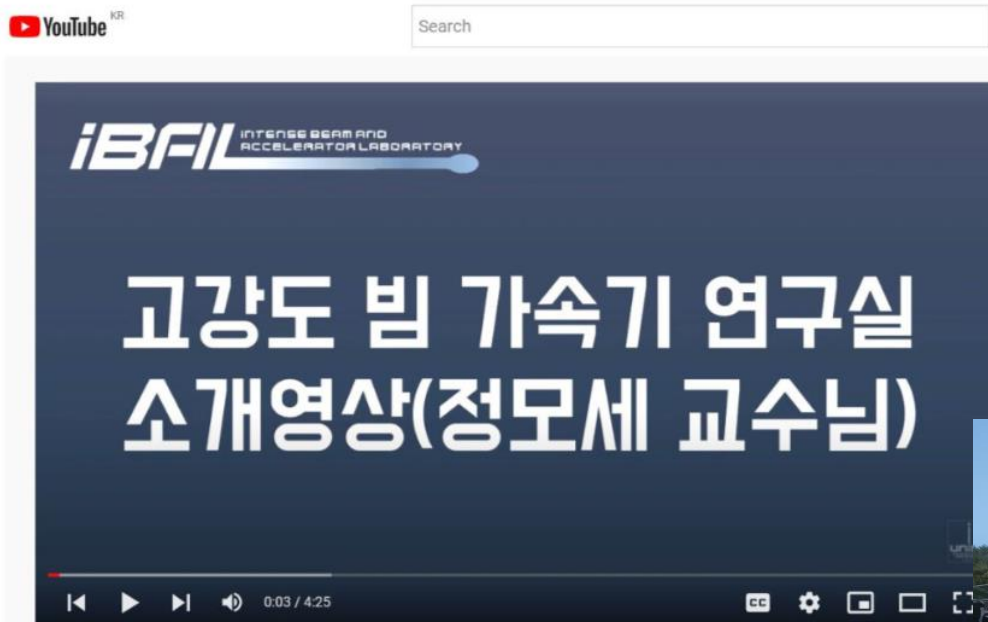
Fermi National Accelerator Laboratory, Batavia, IL, 60510, USA



History of our lab.

2014~2024

Link to a short video clip: 연구실 소개 동영상 (곽동현 제작)



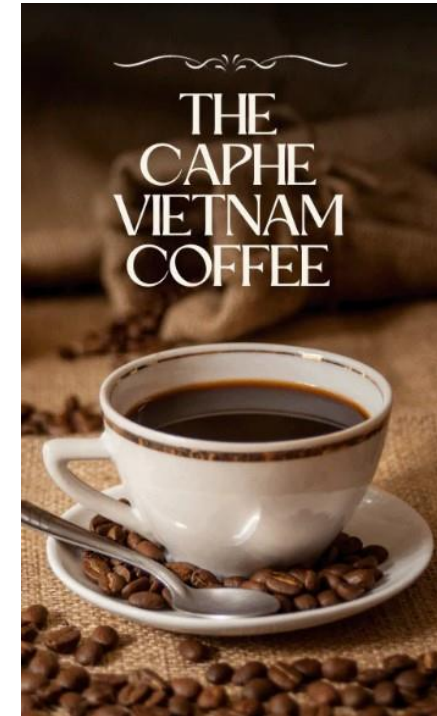
<https://www.youtube.com/watch?v=9RxYB4yXQ3I>



History of our lab.

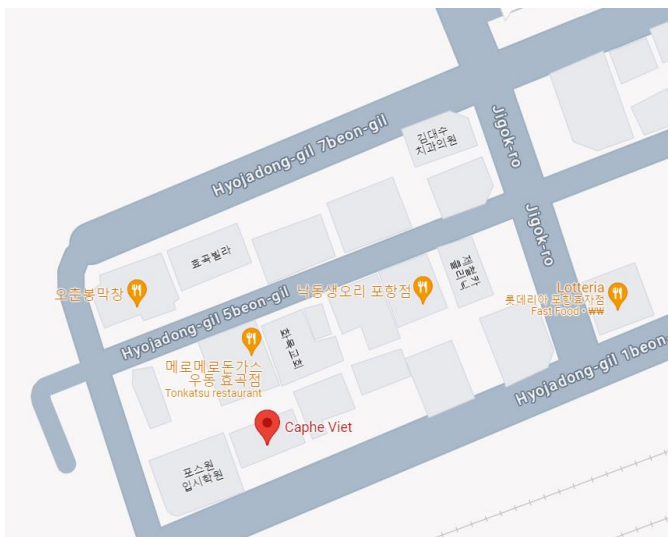


본 연구그룹은 고도화된 빔 물리 이론 및 수치해석 코드 (ML/AI 포함), 첨단 빔 진단 및 제어 장치를 활용하여, 국내외에 건설 또는 운영 중인 대형 가속기의 설계 및 구축, 최적화 및 성능향상에 기여하고, 나아가 지금보다 효율(Brightness, Intensity, Accelerating Gradient 등)이 10~100 배 높은 첨단 가속기 개발에 필요한 물리적-공학적인 난제에 도전한다. 이러한 첨단 가속기는 핵융합 재료 연구, 원자력 폐기물 처리, 암 치료, 신소재/신약 개발, 우주의 신비 탐구 등 인류가 당면한 여러 문제를 해결하는 데 필수적인 첨단기술이다.

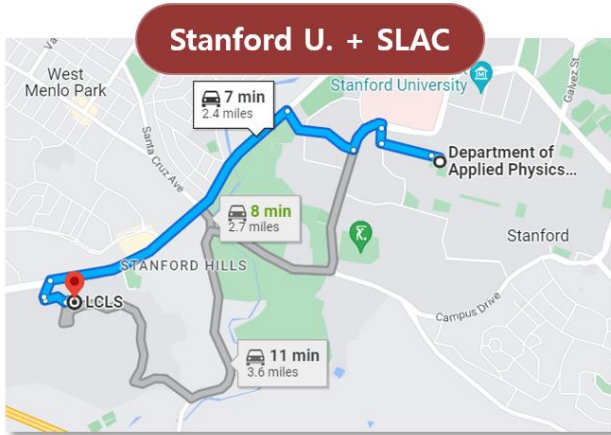


Coffee, Cafe, Caphe 단어의 뜻과 차이는 다음과 같습니다.

- 영어권 - Coffee / 커피 / 음료
- 영어권 - Cafe / 카페 / 매장
- 프랑스 - Café / 카페 / 음료, 매장
- 베트남 - Càphê / 카페 / 음료, 매장



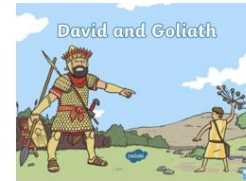
Benchmark



"Stanford University operates SLAC for the DOE Office of Science."



"POSTECH operates PAL for the Government of South Korea."



FACET-II vs eLABs:
→ Advanced Accelerator R&D

SPEAR3 vs PLS-II:
→ Synchrotron Light Source

LCLS-II vs PAL-XFEL:
→ Hard X-ray Free Electron Laser



Budget: \$383 million (2017)
Staff: 1684



Budget: 580억원 (2021)
Staff: 259명 (2022년 3월 현재)

How to get a Ph.D?

1. At least 1~2 SCI papers as a first author.

and

2.

- You know your topic better than your advisor.

or

- You can find your job by yourself.

[To do that, you need **skill set** for the job: Beam physics (various beam dynamics codes) / RF(CST) / Control(EPICS) / Design (CAD) / Diagnostics / Magnet / Vacuum / Computation (Python, Matlab, AL/ML) etc.]

Preferred Qualifications:

- Experience with modern programming languages, particularly Python
- Demonstrated ability to communicate research results through reports, publications and presentations.
- Experience in accelerator physics, which may include working in a control room, conducting accelerator-based experiments, and computational modeling

Desired Qualifications

- 2+ years experience with software and hardware for instrument design and calibration
- 2+ years experience with software and hardware methodologies for instrument control and data acquisition.
- 2+ years experience with large-scale scientific or industrial control systems.
- 2+ years experience with programming and scripting languages.
- An understanding of advanced mathematical and scientific software applications as evidenced through educational preparation or professional use.

연구 방향

- 실험실 차원의 독자적인 가속기 시설 구축은 연구비/인력/공간 등의 제한으로 현실적으로 어려우므로, "빔 물리 및 빔 진단/제어 (small footprint), 시뮬레이션, 포항가속기연구소 시설 적극 활용, 국내외 가속기 시설 이용/파견"에 초점을 맞출 예정.
- 1)대형 가속기 개발/구축을 주로 하는 연구소 및 2)잘 알려진 이론과 기술로 상용 가속기를 만드는 회사와는 차별화된 3)"new 빔 물리현상의 발견/이해/구현, novel 빔 진단 및 제어 장치 개발"에 강조점을 둘 예정.
- 이론/시뮬레이션, 장치설계/제작(주로 업체)/설치, 측정실험, 결과해석을 모두 할 수 있는 멀티플레이어 및 문제해결 능력을 갖춘 물리학자/공학자 양성.

Target Journals

- Nature/Nature Photonics, Nature Physics, Nature Communications: Nearly lottery. Need to join big collaboration
- Physical Review Letters: Practically the best in our field
- Physical Review - Accelerators and Beams
- Physics of Plasmas
- Nuclear Instruments and Methods in Physics Research A/B
- Journal of Instrumentation
- Review of Scientific Instruments (RSI)
- Korean journals in case of emergency: JKPS(KPS), NET(KNS)

} Need physics results

} Related with experimental system

Duties

- Lab. Leader: 송우진 (P) / 정준영 (U)
- IT manager: 미정 (P) / Emre Cosgun (U)
 - PC purchase/maintenance
 - Server maintenance
 - CST/TraceWin/HFSS/COMSOL/SIMION/Mathematica etc.
- Equipment manger: 미정 (P) / 정준영(U)
- Project manager and accounting:
 - 조한나 선생님(P): 제2실험동 3층
 - 진주아 선생님(U): 108동 5층

Laboratory rules

- Workhour: Mon ~ Fri., 10 AM ~ 6 PM → But will be flexible → For example, if you are late by 1 hour, then you would stay by 7 PM etc. 다만, 병역특례중인 학생들은 출퇴근 확실하게....
- Meeting: Just call/email/text me before you come to my office to make sure I'm available.
 - Regular group meeting on every Friday 2 PM (발표는 2~3 주에 한번씩 돌아가도록 지정할 예정)
- Vacation: Usually, 5 days in summer and 5 days in winter. In case you need to take days off in addition to the regular vacations, just let me know. Things are very flexible.

주요 연구 과제 현황 (책임)

- 과제(책임):
 - Beam-driven Wakefield 과제 → 2020.03.01~2025.02.28
 - 가속기 인력 양성 과제 → 2022.05.01~2027.12.31
 - 포항공대 정착 과제 → 2024.03.01~2027.2.28

2024 여름/가을 주요 행사

- EBIS/T 2024@폴란드: 한제환 (8월 27~30일)
- LINAC 2024@시카고: Emre Cosgun (8월 26~30일)
- IBIC 2024@북경: 송우진 (9월 9 ~ 13일)
- ICABU 초록 마감: 8월 25일 (아마도 연장 될 듯)
- 한국물리학회(여수), 한국원자력학회(창원): 10월 23~25일

PAL POHANG ACCELERATOR LABORATORY **KOMAC** Korea Multi-purpose Accelerator Complex **IRIS** Institute for Rare Isotope Science **KAFAT** Korea Association for Fusion Energy and Accelerator Technology

ICABU 2024

26th International Conference on Accelerators and Beam Utilizations

Nov 13 – 15, 2024
Hotel Lahan, Pohang, Korea
Asia/Seoul timezone

Some Tips

1. If you feel you're in slump and need some breakthrough in your research, please take a practical action (for example, **getting to the office an hour earlier and staying an hour longer, or avoiding useless web-surfing/game/chat during work hours, etc.**)
2. We are not genius. So, please **take a detailed note, document your daily work, and collect all the information before you forget**, in terms of logbook, e-log, files, or whatever method you would prefer.
3. **Please read recent papers (e.g., PRL, PRAB, Nature etc.) and books as much as you can**, not only to gather up-to-date research trends, but also to improve your English writing skill.
4. **Please use Google, YouTube, and NAVER etc. actively to search useful information.** There are tons of valuable information in the internet within a few clicks away.
5. **Don't be afraid of having a meeting with your advisor (i.e, me).** I may give harsh comments, negative feedbacks, and criticisms, but you have to face them and overcome. No pain, no gain.

Additional tips

- You need to have **good relationship/teamwork** with researchers in national laboratories to make the most of facilities or to get a job there.
- **English** is essential to collaborate with experts worldwide and to write a nice paper. You can make the most of AI tools to improve your English.
- **Driver's license**
- Insurance/Radiation safety: once per year
- **CST/COMSOL/Mathematica** etc.: Take education program (mostly on-line these days) when available

Subtle Items

- 인건비: 과제 상황에 따라 유동성이 있는데, 총액이 ~200만원/월 전후가 되도록 할 예정. 연차/수업여부 및 타 교수님/박사님 과제 참여 여부에 따라 다소 달라질 수 있음.
- 해외학회/School/파견: 공평하게 기회가 가도록 순차적으로 보낼 예정. 단, 몇 년에 한번 돌아오는 학회/과목/실험이 있을 경우, 순서를 탄력적으로 운영할 생각임.

보낸 사람: USPAS <uspas@fnal.gov>
보낸 날짜: 2024년 8월 3일 토요일 오전 4:01:33
받는 사람: Moses Chung (POSTECH)
제목: RE: Information on Korean students

Hello Moses! I hope you are doing well and that life is good in your corner of the world. I just want to send you a short note to thank you for sending Youngmin to our school. I had the pleasure of meeting him late one evening after he and his group finished their homework, we all sat and chatted for quite a while - what a friendly and pleasant guy! I see a lot of promise in him and this is exactly the type of student we love to have at our school. Keep sending your students, they've all been just great!

Warm regards,
Susan