

GH CV

Gwanghui Ha | Accelerator Physicist



EDUCATION

Ph.D. in Physics,

POSTECH, South KOREA
Mar. 2011 - Feb. 2017

B.S. in Physics

POSTECH, South KOREA
Mar. 2007 - Feb. 2011

CONTACT INFO

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ABOUT ME

- Experimental accelerator physicist with 5+ years of theoretical and experimental experience in beam phase space manipulation and structure wakefield acceleration.
- Proficient in new manipulation methods and diagnostics development, entire experiment process starting from design to analysis.
- Big interests in 6D phase space manipulation methods and their applications.
- A beginner-level teacher; full-time supervisor of 1 PhD candidate, thesis advisor of many PhD candidates.
- Trying to provide students great opportunities and introduce great people as my great teachers did.

WORK EXPERIENCE

Assistant Professor of Physics (Aug. 2023 - Present)

Department of Physics, Northern Illinois University

Leading experiment / Accelerator operator / Laser optics / Vacuum work / Lattice design / Diagnostics design

2-6D correlation control / Emittance repartition / Collective effects / Overall structure/plasma wakefield

High brightness source / Advanced diagnostics

Enrico Fermi Named Fellow (Jul. 2018 - Dec. 2021)

High Energy Physics, Argonne National Laboratory

Leading experiment / Accelerator operator / Laser optics / Vacuum work / Lattice design / Diagnostics design

Injector optimization / Facility maintenance and upgrade

Emittance-exchange / Flat beam transform / Bunch shaping methods / High gradient structure

High transformer ratio / Collective effects / BBU in structure wakefield / High brightness source
Single-shot diagnostics / Photo/field emission cathodes

Post-doctoral appointee (Mar. 2017 - Jun. 2018)

Pohang Accelerator Laboratory

Lattice design / Leading experiment

Emittance-exchange / Structure wakefield (high efficiency) / Medical accelerator

Research Aide Graduate Student (Jun. 2012 - Apr. 2016)

High Energy Physics, Argonne National Laboratory

Leading experiment / Accelerator operator / Laser optics / Vacuum work / Lattice design /
Diagnostics design

Injector optimization

Emittance-exchange / High-gradient structure wakefield / Ultrafast electron microscopy

HONORS AND AWARDS

- Enrico Fermi Named Fellowship 2018 - 2021
- Distinguished performance award,
8th International Accelerator School for Linear Colliders 2013
- Outstanding T. A., Department of Physics, POSTECH 2013
- Outstanding T. A., Department of Physics, POSTECH 2011
- National Scholarship for Science and Engineering 2007 - 2011

RESEARCH VISION AND INTERESTS

"6D phase space by design: designing ideal 6D phase spaces for various accelerator applications and developing manipulation methods to realize designed 6D phase spaces"

- Beam physics with particular focus on phase space manipulation
- Experimental researches of advanced accelerator concepts
- Physics of accelerator-based THz / X-ray radiations
- Medical and industrial applications of compact accelerators

RESEARCH ACTIVITIES

*Items below show highlighted research directions and associated R&D.

Beam Physics

Longitudinal bunch shaping

- Arbitrary profile shaping using
emittance-exchange (EEX)

High brightness source

- Capillary Trojan horse
- High-gradient X-band gun powered by
two-beam acceleration (TBA)

- CSR-free shaping using transverse deflecting cavities
- Lossless arbitrary shaping using transverse wigglers

Electron cooling

- Modulation boosting using a wiggler

Diagnostics

- Single-shot wakefield measurement
- Single-shot transverse phase space measurement
- Ultra-high-resolution longitudinal measurement using EEX

CSR effect mitigation

- CSR shielding effect in EEX

2D correlation control

- Arbitrary correlation generation using transverse wigglers or high-frequency structures

Advanced Accelerator Concepts

High transformer ratio

- Highest transformer ratio in wakefield accelerations (SWFA) ($R \sim 5, 7$)

Two-beam acceleration

- High power generation from 11.7 GHz metallic structure and the first demonstration of TBA-staging in short-pulse regime

Structure R&D support

- Participation of various structures' development and high-power tests

Light Sources

Bunch train generation

- THz-bunch train generation using transverse wiggler and EEX
- Deflecting-cavity-based shaping for high charge bunch train for THz-SWFA
- THz bunch train generation using micro-lens array

Extremely low energy spread

- Bunch compression using double EEX and nonlinear magnet to control time-energy correlation

Multi-color radiation

- Double EEX with wakefield modulator to generate time-controlled spectral bunch train

Medical/Industrial Applications

Klystron development

- High-efficiency S-band klystron

Medical accelerator

- Accelerator-based Boron-Neutron-Capture-Therapy (ABNCT)

TEACHING VISION AND INTERESTS

"Provide environment, knowledge, experience, opportunities, and network to help students' self-motivation and understanding"

- Individual or small group discussion regarding students' goal
- Hands-on experiment classes
- Accelerator physics, classical mechanics, electromagnetism classes

TEACHING ACTIVITIES

MS/PhD Supervision

- **Jimin Seok**, UNIST, PhD program (2017 - 2021)
Thesis topic: Beam manipulation using double emittance-exchange beamline
Currently post-doctoral appointee of Pohang Accelerator Laboratory

Thesis Support

- **Tianzhe Xu**, Northern Illinois University, PhD program (2018-2021)
- **Gongxiaohui Chen**, Illinois Institute of Technology, PhD program (2018-2020)
- **Maomao Peng**, Tsinghua university, PhD program (2018-2019)
- **Nathan Xin Nie**, University of Chicago, MS program (2018)
- **Aliaksei Halavanau**, Northern Illinois University, PhD program (2015-2017)
- **Qiang Gao**, Tsinghua university, PhD program (2015-2017)
- **Nicole Nevau**, Illinois Institute of Technology, PhD program (2014-2018)
- **Jiahang Shao**, Tsinghua university, PhD program (2014-2016)
- **Dan Wang**, Tsinghua university, PhD program (2014-2016)

Teaching/Mentoring

- AWA Intern Advisor

Emmanuel Aneke, 2021

- Summer Internship Program

Tamara Gonzalez Acevedo, University of Puerto Rico, 2019

- Teaching Assistant
Physics Experiment III class, POSTECH, 2012
Physics Experiment I class, POSTECH, 2011
Physics Experiment II class, POSTECH, 2011

PUBLICATIONS

Peer-reviewed publications

1. H. Kong, M. Chung, D. S. Doran, **G. Ha**, S.-H. Kim, J.-J. Kim, W. Liu, X. Lu, J. Power, J.-M. Seok, S. Shin, J. Shao, C. Whiteford, and E. Wisniewski, "Fabrication of THz corrugated wakefield structure and its high power test", **Sci. Rep.** 13, 3207 (2023).

2. J. Seok, **G. Ha**, J. Power, M. Conde, E. Wisniewski, W. Liu, S. Doran, C. Whiteford, and M. Chung, "Experimental demonstration of double emittance exchange toward arbitrary longitudinal beam phase space manipulations", **Phys. Rev. Lett.** 129, 224801 (2022).
3. W. H. Tan, S. Antipov, D. S. Doran, **G. Ha**, C. Jing, E. Knight, S. Kuzikov, W. Liu, X. Lu, P. Piot, J. G. Power, J. Shao, C. Whiteford, and E. E. Wisniewski, "Demonstration of sub-GV/m accelerating field in photoemission electron gun powered by nanosecond X-band radio-frequency pulses", **Phys. Rev. Accel. Beams** 25, 083402 (2022).
4. A. Alba, J. Seok, A. Adelman, S. Doran, **G. Ha**, S. Lee, Y. Piao, J. Power, M. Qian, E. Wisniewski, J. Xu, and A. Zholents, "Benchmarking collective effects of electron interactions in a wiggler with OPAL-FEL", **Comput. Phys. Commun.** 280, 108475 (2022).
5. **G. Ha**, K.-J. Kim, P. Piot, J. G. Power, and Y. Sun, "Bunch shaping in electron linear accelerators", **Rev. Mod. Phys.** 94, 025006 (2022).
6. F. Lemery, G. Andonian, S. Doebert, **G. Ha**, X. Lu, J. Power, and E. Wisniewski, "Drive beam sources and longitudinal shaping techniques for beam driven accelerators", **J. Instrum.** 17, P05036 (2022).
7. J. Picard, I. Mastovsky, M. A. Shapiro, R. J. Temkin, X. Lu, M. Conde, D. S. Doran, **G. Ha**, J. Power, J. Shao, E. E. Wisniewski, and C. Jing, "Generation of 565 MW of X-band power using a metamaterial power extractor for structure-based wakefield acceleration", **Phys. Rev. Accel. Beams** 25, 051301 (2022).
8. C. Jing and **G. Ha**, "Roadmap for structure-based wakefield accelerator (SWFA) R&D and its challenges in beam dynamics", **J. Instrum.** 17, T05007 (2022).
9. **G. Ha**, J. G. Power, E. Wisniewski, W. Liu, and M. Conde, "Single-shot measurement of transverse second moments using projection method", **Phys. Rev. Accel. Beams** 24, 012802 (2021).
10. G. Chen, L. Spentzouris, C. Jing, M. Conde, **G. Ha**, W. Liu, J. Power, E. Wisniewski, A. V. Sumant, S. Antipov, E. Gomez, K. K. Kovi, and J. Shao, "Demonstration of nitrogen-incorporated ultrananocrystalline diamond photocathodes in a RF gun environment", **Appl. Phys. Lett.** 117, 171903 (2020).
11. **G. Ha**, J. G. Power, J. Shao, and C. Jing, "Coherent synchrotron radiation free longitudinal bunch shaping using transverse deflecting cavities", **Phys. Rev. Accel. Beams** 23, 072803 (2020).
12. X. Lu, J. F. Picard, M. A. Shapiro, I. Mastovsky, R. J. Temkin, M. Conde, J. G. Power, J. Shao, E. Wisniewski, M. Peng, **G. Ha**, J. Seok, S. Doran, and C. Jing, "Coherent high-power RF wakefield generation by electron bunch trains in a metamaterial structure", **Appl. Phys. Lett.** 116, 26 (2020).
13. R. Roussel, G. Andonian, W. Lynn, K. Sanwalka, R. Robles, C. Hansel, A. Deng, G. Lawler, J. B. Rosenzweig, **G. Ha**, J. Seok, J. G. Power, M. Conde, E. Wisniewski, D. S. Doran, and C. E. Whiteford, "Single shot characterization of high transformer ratio wakefields in nonlinear plasma acceleration", **Phys. Rev. Lett.** 124, 044802 (2020).
14. J. Shao, C. Jing, E. Wisniewski, **G. Ha**, M. Conde, W. Liu, J. Power, and L. Zheng, "Development and high-power testing of an X-band dielectric-loaded power extractor", **Phys. Rev. Accel. Beams** 23, 011301 (2020).

15. H. Andrews, K. Nichols, D. Kim, E. I. Simakov, S. Antipov, G. Chen, M. Conde, D. Doran, **G. Ha**, W. Liu, J. Power, J. Shao, and E. Wisniewski, "Shaped beams from diamond field emitter array cathodes", **IEEE Transactions on Plasma science**, doi: 10.1109/TPS.2020.2984156.
16. K. E. Nichols, H. L. Andrews, D. Kim, E. I. Simakov, M. Conde, D. S. Doran, **G. Ha**, W. Liu, J. G. Power, J. Shao, C. Whiteford, E. E. Wisniewski, S. P. Antipov, and G. Chen, "Demonstration of transport of a patterned electron beam produced by diamond pyramid cathode in an rf gun", **Appl. Phys. Lett.** **116**, 023502 (2020).
17. A. Halavanau, Q. Gao, M. Conde, **G. Ha**, P. Piot, J. G. Power, and E. Wisniewski, "Tailoring of an electron-bunch current distribution via space-to-time mapping of a transversely shaped, photoemission-laser pulse", **Phys. Rev. Accel. Beams** **22**, 114401 (2019).
18. Q. Gao, J. Shi, H. Chen, **G. Ha**, J. G. Power, M. Conde, and W. Gai, "Single-shot wakefield measurement system", **Phys. Rev. Accel. Beams** **21**, 062801 (2018).
19. C. Jing, S. Antipov, M. Conde, W. Gai, **G. Ha**, W. Liu, N. Neveu, J. G. Power, J. Qiu, J. Shi, D. Wang, and E. Wisniewski, "Electron acceleration through two successive electron beam driven wakefield acceleration stages", **Nucl. Instrum. and Methods Phys. Res., Sect. A** **898**, 72 (2018).
20. R. Roussel, G. Andonian, M. Conde, A. Deng, **G. Ha**, J. Hansel, G. Lawler, W. Lynn, J. Power, R. Robles, K. Sanwalka, J. Rosenzweig, "Measurement of transformer ratio from ramped beams in the blowout regime", **Nucl. Instrum. and Methods Phys. Res., Sect. A**, (2018).
21. Q. Gao, **G. Ha**, C. Jing, S. P. Antipov, J. G. Power, M. Conde, W. Gai, H. Chen, J. Shi, E. E. Wisniewski, D. S. Doran, W. Liu, C. E. Whiteford, A. Zholents, P. Piot, and S. S. Baturin, "Observation of high transformer ratio of shaped bunch generated by emittance-exchange beam line", **Phys. Rev. Lett.** **120**, 114801 (2018).
22. A. Halavanau, G. Qiang, **G. Ha**, E. Wisniewski, P. Piot, J. G. Power, and W. Gai, "Spatial control of photoemitted electron beams using a micro-lens-array transverse-shaping technique", **Phys. Rev. Accel. Beams** **20**, 103404 (2017).
23. **G. Ha**, J. G. Power, M. Conde, D. S. Doran, W. Gai, "Limiting effects in double EEX beamline", **Journal of Physics: Conference Series** **874**, 012061 (2017).
24. **G. Ha**, J. G. Power, M. Conde, D. S. Doran, W. Gai, "Simultaneous generation of drive and witness beam for collinear wakefield acceleration", **Journal of Physics: Conference Series** **874**, 012027 (2017).
25. **G. Ha**, M. H. Cho, W. Namkung, J. G. Power, D. S. Doran, E. E. Wisniewski, M. Conde, W. Gai, W. Liu, C. Whiteford, Q. Gao, K. -J. Kim, A. Zholents, Y. -E. Sun, C. Jing, and P. Piot, "Precision control of the longitudinal electron bunch shape using emittance exchange beamline", **Phys. Rev. Lett.** **118**, 104801 (2017).
26. **G. Ha**, M. H. Cho, W. Gai, K. -J. Kim, W. Namkung, and J. G. Power, "Perturbation-minimized triangular bunch for high-transformer ratio using a double dogleg emittance exchange beam line", **Phys. Rev. Accel. Beams** **19**, 121301 (2016).
27. J. Shao, J. Shi, S. Antipov, S. Baryshev, H. Chen, M. Conde, W. Gai, **G. Ha**, C. Jing, F. Wang, E. Wisniewski, "In Situ observation of dark current emission in a high gradient rf photocathode gun", **Phys. Rev. Lett.** **117**, 084801 (2016).
28. D. Wang, S. Antipov, C. Jing, J. G. Power, M. Conde, E. Wisniewski, W. Liu, J. Qiu, **G. Ha**, V. Dolgashev, C. Tang, and W. Gai, "Interaction of an ultrarelativistic electron bunch train with a W-

band accelerating structure: High power and high gradient”, **Phys. Rev. Lett.** **116**, 054801 (2016).

29. Evgenya I. Simakov, Sergey A. Arsenyev, Cynthia E. Buechler, Randall L. Edwards, William P. Romero, Manoel Conde, **Gwanghui Ha**, John G. Power, Eric E. Wisniewski, and Chunguang Jing, “Observation of wakefield suppression in a photonic-band-gap accelerator structure”, **Phys. Rev. Lett.** **116**, 064801 (2016).
30. Jiaqi Qiu, **Gwanghui Ha**, Chunguang Jing, Sergey V. Baryshev, Bryan W. Reed, June W. Lau, and Yimei Zhu, “GHz laser-free time-resolved transmission electron microscopy: A stroboscopic high-duty-cycle method”, **Ultramicroscopy**, **161**, 130 (2016).
31. Sang-hoon Kim, Hae-Ryong Yang, Jong-Seok Oh, **Gwanghui Ha**, Sung-Duck Jang, Yoon-Gyu Son, Sung-Ju Park, Kangok Lee, Kie-Hyung Chung, Moo-Hyun Cho, and Won Namkung, “Suppression of Initial Energy Spreads in Electron Radio Frequency Linacs for Intense Irradiation Applications”, **JJAP**, **50**, 116001 (2011).

Non-peer-reviewed publications

1. **G. Ha**, “Arbitrary transverse and longitudinal correlation generation using transverse wiggler and wakefield structures”, in Proc. of IPAC23 (Venice, Italy, May 7-12, 2023), WEPA045 (2023).
2. **G. Ha**, “Emittance exchange with periphery cut for high-brightness beam”, in Proc. of IPAC23 (Venice, Italy, May 7-12, 2023), WEPA046 (2023).
3. **G. Ha**, “Feasibility study on multi-channel power extraction tube”, in Proc. of IPAC23 (Venice, Italy, May 7-12, 2023), TUPLO058 (2023).
4. **G. Ha**, “Preliminary study on THz-TBA based X-ray source”, in Proc. of IPAC23 (Venice, Italy, May 7-12, 2023), TUPLO057 (2023).
5. W. Lynn, T. Xu, G. Andonian, S. Doran, **G. Ha**, N. Majernik, P. Piot, J. Power, J. Rosenzweig, C. Whiteford, and E. Wisniewski, “Observation of skewed electromagnetic wakefields in an asymmetric structure driven by flat electron bunches”, arXiv: 2308.09137 (2023).
6. A. A. Al Marzouk, P. Piot, T. Xu, S. V. Benson, K. E. Deitrick, J. Guo, A. Hutton, G.-T. Park, S. Wang, D. S. Doran, **G. Ha**, P. Piot, J. G. Power, C. Whiteford, E. E. Wisniewski, C. E. Mitchell, J. Qiang, and R. D. Ryne, “Preliminary tests and beam dynamics simulations of a straight-merger beamline”, in Proc. of NAPAC22 (Albuquerque, NM, USA, Aug 7-12, 2022), MOPA72 (2022).
7. S. Y. Kim, G. Chen, D. S. Doran, **G. Ha**, W. Liu, J. G. Power, E. E. Wisniewski, E. Frame, and P. Piot, “Benchmarking simulation for AWA drive linac and emittance exchange using OPAL, GPT, and impact-T”, in Proc. of NAPAC22 (Albuquerque, NM, USA, Aug 7-12, 2022), WEXD5 (2022).
8. W. H. Tan, X. Lu, P. Piot, S. P. Antipov, C. Jing, E. Knight, S. Kuzikov, D. S. Doarn, **G. Ha**, W. Liu, J. G. Power, J. Shao, C. Whiteford, and E. E. Wisniewski, “Commissioning of a high-gradient X-band RF gun powered by short RF pulses from a wakefield accelerator”, in Proc. of IPAC22 (Bangkok, Thailand, June 12-17, 2022). MOPOMS014 (2022).
9. J. H. Shao, D. S. Doran, **G. Ha**, W. Liu, J. G. Power, C. Whiteford, E. E. Wisniewski, H. B. Chen, X. Lin, M. M. Peng, J. Shi, H. Zha, and C. Jing, “Demonstration of gradient above 300 MV/m in short pulse regime using an X-band single-cell structure”, in Proc. of IPAC22 (Bangkok, Thailand, June 12-17, 2022), FROXSP2 (2022).
10. P. Manwani, H. Ancelin, N. Majernik, M. Yadav, G. Andonian, J. Rosenzweig, **G. Ha**, and J. Power, “Beam matching in an elliptical plasma blowout driven by highly asymmetric flat beams”,

in Proc. of IPAC22 (Bangkok, Thailand, June 12-17, 2022), WEPOST046 (2022).

11. X. Lu, J. Shao, J. Power, C. Jing, **G. Ha**, P. Piot, M. Shapiro, E. Nanni, J. Rosenzweig, G. Andonian, A. Murokh, S. Kutsaev, A. Smirnov, and R. Agustsson, "Advanced RF structures for wakefield acceleration and high-gradient research", arXiv: 2203. 08374 (2022).
12. C. Jing, J. Power, J. Shao, **G. Ha**, P. Piot, X. Lu, A. Zholents, A. Kanareykin, S. Kuzikov, J. B. Rosenzweig, G. Andonian, E. Simakov, J. Upadhyay, C. Tang, R. J. Temkin, E. Nanni, and J. Lewellen, "Continuous and coordinated efforts of structure wakefield acceleration (SWFA) development for an energy frontier machine", arXiv: 2203. 08275 (2022).
13. W. H. Tan, P. Piot, C. Jing, S. Kuzikov, G. Chen, and **G. Ha**, "Beam dynamics simulations in a high-gradient X-band photoinjector", in Proc. of IPAC21 (Campinas, Brazil, May 24-28, 2021), THPAB129 (2021).
14. S. Kuzikov, S. Antipov, P. Avrakhov, E. Dosov, C. Jing, E. Knight, **G. Ha**, W. Liu, P. Piot, J. G. Power, D. Scott, J. Shao, E. Wisniewski, W. H. Tan, and X. Lu, "An X-band ultra-high gradient photoinjector", in Proc. of IPAC21 (Campinas, Brazil, May 24-28, 2021), WEPAB163 (2021).
15. W. Liu, C. Whiteford, E. E. Wisniewski, **G. Ha**, J. H. Shao, J. G. Power, P. Piot, D. S. Doran, C. Serrano, D. Filippetto, D. Li, L. Doolittle, S. Paagua, and V. K. Vytla, "LLRF upgrade at the Argonne wakefield accelerator test facility", in Proc. of IPAC21 (Campinas, Brazil, May 24-28, 2021), TUPAB296 (2021).
16. W. Liu, C. Whiteford, E. E. Wisniewski, **G. Ha**, J. H. Shao, J. G. Power, P. Piot, D. S. Doran, G. Shen, A. Johnson, and J. Byrd, "Upgrade to the EPICS control system at the Argonne wakefield accelerator test facility", in Proc. of IPAC21 (Campinas, Brazil, May 24-28, 2021), TUPAB295 (2021).
17. P. Manwani, H. Ancelin, M. Yadav, G. Andonian, J. Rosenzweig, **G. Ha**, and J. Power, "Asymmetric beam driven plasma wakefields at the AWA", in Proc. of IPAC21 (Campinas, Brazil, May 24-28, 2021), TUPAB147 (2021).
18. N. Majernik, G. Andonian, J. B. Rosenzweig, R. Roussel, S. Doran, **G. Ha**, J. Power, and E. Wisniewski, "Arbitrary longitudinal pulse shaping with a multi-leaf collimator and emittance exchange", in Proc. of IPAC21 (Campinas, Brazil, May 24-28, 2021), TUPAB095 (2021).
19. B. Freemire, C. Jing, Y. Zhao, M. Conde, D. S. Doran, **G. Ha**, W. Liu, M. Peng, J. G. Power, J. Shao, C. Whiteford, and E. E. Wisniewski, "High power test of a dielectric disk loaded accelerator for a two beam wakefield accelerator", in Proc. of IPAC21 (Campinas, Brazil, May 24-28, 2021), MOPAB352 (2021).
20. E. Siebert, S. Baturin, W. Liu, C. Whiteford, E. E. Wisniewski, **G. Ha**, J. H. Shao, J. G. Power, P. Piot, and D. S. Doran, "The development of single pulse high dynamic range BPM signal detector design at AWA", in Proc. of IPAC21 (Campinas, Brazil, May 24-28, 2021), MOPAB287 (2021).
21. G. Andonian, T. Campese, N. Cook, W. Lynn, N. Majernik, J. Rosenzweig, V. Yu, S. Doran, **G. Ha**, J. Power, J. Shao, and E. Wisniewski, "Dielectric wakefield acceleration with laser injected witness beam", in Proc. of IPAC21 (Campinas, Brazil, May 24-28, 2021), MOPAB138 (2021).
22. N. Majernik, G. Andonian, R. Roussel, S. Doran, **G. Ha**, J. Power, E. Wisniewski and J. Rosenzweig, "Multileaf collimator for real-time beam shaping using emittance exchange", arXiv: 2107.00125 (2021).

23. J. Picard, M. Shapiro, I. Mastovsky, R. Temkin, X. Lu, J. Shao, M. Conde, J. Power, E. Wisniewski, M. Peng, **G. Ha**, S. Doran and C. Jing, "Generation of 1 GW of 11.7 GHz power using a metamaterial-based power extractor for structure-based wakefield acceleration", Bulletin of the American Physical Society (2021).
24. J. Seok, **G. Ha**, J. Power and M. Chung, "Longitudinal phase space manipulation using double emittance exchange to generate multi-color X-ray", arXiv: 2104.07296 (2021).
25. **G. Ha**, C. Jing, J. Power, P. Piot and J. Shao, "Advanced beam diagnostics R&D", SNOWMASS LOI (2020).
26. **G. Ha**, C. Jing, J. Power, P. Piot, and J. Shao, "Designing phase space with 6D manipulation", SNOWMASS LOI (2020).
27. J. Shao, J. Power, C. Jing, **G. Ha**, P. Piot, A. Zholents, X. Lu, R. J. Temkin, J. F. Picard, V. M. Tsakanov, C. Tang, Y. Du, J. Shi, E. A. Nanni, B. O'Shea, Y. Saveliev, T. Pacey, J. Rosenzweig, G. Andonian, E. I. Simakov, and F. Lemery, "Short-pulse wakefield structure R&D for high gradient and high efficiency acceleration in future large-scale machines", SNOWMASS LOI (2020).
28. C. Jing, J. Power, J. Shao, **G. Ha**, P. Piot, S. S. Baturin, A. Kanareykin, S. Kuzikov, E. I. Simakov, J. Upadhyay, K. Nichols, J. Lewellen, V. M. Tsakanov, C. Tang, R. J. Temkin, E. A. Nanni, S. Gessner, and C. B. Schroeder, "Structure wakefield acceleration (SWFA) development for an energy frontier machine", SNOWMASS LOI (2020).
29. J. Shao, J. Power, C. Jing, **G. Ha**, P. Piot, A. Zholents, X. Lu, R. J. Temkin, J. F. Picard, and V. M. Tsakanov, "SWFA demonstrators with integrated technologies for future large scale machines", SNOWMASS LOI (2020).
30. C. Jing, J. Power, J. Shao, **G. Ha**, P. Piot, R. J. Temkin, S. Gessner, and C. B. Schroeder, "Argonne Flexible Linear Collider (AFLC) – beyond concept: A 3-TeV linear collider using short rf pulse (~20 ns) two-beam accelerator", SNOWMASS LOI (2020).
31. J. Power, J. Shao, **G. Ha**, A. Zholents, C. Jing, P. Piot, X. Lu, S. S. Baturin, A. Kanareykin, J. Rosenzweig, G. Andonian, E. I. Simakov, N. Moody, J. Lewellen, C. Tang, J. Shi, Y. Du, R. J. Temkin, J. Picard, E. Nanni, B. O' Shea, Y. Saveliev, V. M. Tsakanov, F. Lemery, L. Spentzouris, S. Baryshev, Y.-K. Kim, and A. Schroeder, "Research educational opportunities at the Argonne Wakefield Accelerator (AWA) facility", SNOWMASS LOI (2020).
32. P. Piot, M. Conde, **G. Ha**, C. Jing, W. Liu, J. Power, J. Shao, E. Wisniewski, A. Zholents, Y. Saveliev, V. Tsakanov, R. Abmann, R. Brinkmann, Klaus Flottmann, F. Lemery, S. Antipov, A. Kanareykin, M. Ferrario, H. Andrews, D. Kim, K. Nichols, E. I. Simakov, R. Tempkins, S. Baturin, B. O' Shea, G. Andonian, and J. Rosenzweig, "Beam physics challenges & research opportunities for structure-based wakefield accelerators", SNOWMASS LOI (2020).
33. **G. Ha**, M. E. Conde, J. G. Power, M. Chung, and J. Seok, "Applications and opportunities for the emittance exchange beamline", in Proc. of NAPAC19 (Lansing, MI, USA, 2019), FRXBA3 (2019).
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PRESENTATIONS

Invited talks

1. "High brightness electron beam generation: Experience from Argonne Wakefield Accelerator Facility", FRIB Seminar (East Lansing, MI, USA, Oct 13, 2023).
2. "AWA and opportunities for EIC", EIC Accelerator Collaboration Meeting (Chicago, IL, USA, Oct 9-11, 2019).
3. "Longitudinal bunch shaping methods for beam driven wakefield accelerators", Physics and Applications of High Brightness Beams (Crete, Greece, Apr 8-12, 2019).
4. "Observation of high transformer ratio of shaped bunch generated by emittance exchange beamline", Advanced Accelerator Concepts Workshop (Breckenridge, Colorado, USA, Aug 12-17, 2018).

5. "Proof of principle experiment for single shot transverse phase space measurement", International Particle Accelerator Conference (Vancouver, Canada, Apr 20-May 4, 2018).
6. "Saw-tooth beam generation at AWA", International ICFA mini-workshop on Nonlinear Dynamics and Collective Effects in Particle Beam Physics (Arcidosso, Italy, Sep 19-22, 2017).
7. "Demonstration of longitudinal bunch shaping with double dog-leg emittance exchange beamline", Physics and Application of High Brightness Beams (Havana, Cuba, Mar 28-Apr 1, 2016).

Contributed talks

1. "Overview on longitudinal bunch shaping methods", HEP GARD Roadmap workshop (San Francisco, CA, USA, Dec 9-10, 2019).
2. "Applications and opportunities of the emittance exchange beamline", North America Particle Accelerator Conference (Lansing, MI, USA, Sep 1-6, 2019).
3. "Demonstration of current profile shaping using double dog-leg emittance exchange beamline at Argonne Wakefield Accelerator", International Particle Accelerator Conference (Busan, KOREA, May 9-13, 2016).

PATENT

- "Compact-tridactyl-high-energy beam transport lines with minimal quadrupole magnets for accelerator Boron Neutron Capture Therapy", Application number: 10-2016-0159516 (KOREA)
- "A transverse beam expander using electromagnets to minimize the size of the inner beam", Application number: 10-2017-0107149 (KOREA)
- "Apparatus for GHz rate high duty cycle pulsing and manipulation of low and medium energy DC electron beams", Publication number: US20160293377 A1 (United States)