Stanford

Spencer Gessner

Assistant Professor of Particle Physics and Astrophysics

Bio

BIO

Dr. Spencer Gessner is an Assistant Professor of Particle Physics and Astrophysics at SLAC National Accelerator Laboratory and Stanford University. Dr. Gessner was previously a Staff Scientist at SLAC researching plasma wakefield acceleration at FACET-II, and a Fellow at CERN on the AWAKE proton beam-driven plasma acceleration experiment. Dr. Gessner earned a Ph.D. from Stanford University studying the acceleration of positron beams in plasma. Dr. Gessner is currently coordinating the US 10 TeV Wakefield Collider Design Study and is broadly involved in research on future colliders from Higgs Factories to future Energy Frontier machines.

ACADEMIC APPOINTMENTS

- Assistant Professor, Particle Physics and Astrophysics

HONORS AND AWARDS

- Simon van der Meer Early Career Award in Novel Accelerators, EuroNNAc (2019)
- Outstanding Doctoral Thesis Research in Beam Physics Award, APS DPB (2017)

LINKS

- Google Scholar: https://scholar.google.com/citations?user=ffITc_UAAAAJ&hl=en
- SLAC Profile: https://faculty.slac.stanford.edu/person/spencer-gessner

Teaching

STANFORD ADVISEES

Doctoral Dissertation Advisor (AC)

Yiheng Ye

Publications

PUBLICATIONS

- **Precision alignment and tolerance of a plasma wakefield accelerator in a laser-ionized plasma source** *PHYSICAL REVIEW ACCELERATORS AND BEAMS*
  Lee, V., Ariniello, R., Storey, D., Corde, S., Emma, C., Gessner, S., Hogan, M., Knetsch, A., Majernik, N., O'Shea, B., Rajkovic, I., Litos, M.
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- **Plasma-wakefield accelerator simultaneously boosts electron beam energy and brightness** *NATURE COMMUNICATIONS*

Zhang, C., Storey, D., Knetsch, A., O'shea, B. D., Ariniello, R., Cao, G. J., Corde, S., Dalichaouch, T. N., Emma, C., Finnerud, O. G., Gessner, S., Hansel, C., Hansen, et al
2025; 16 (1): 10719

- **Experimental Generation of Extreme Electron Beams for Advanced Accelerator Applications.** *Physical review letters*
  Emma, C., Majernik, N., Swanson, K. K., Ariniello, R., Gessner, S., Hessami, R., Hogan, M. J., Knetsch, A., Larsen, K. A., Marinelli, A., O'Shea, B., Perez, S., Rajkovic, et al
  2025; 134 (8): 085001

- **Correlations between X-rays, visible light and drive-beam energy loss observed in plasma wakefield acceleration experiments at FACET-II** *JOURNAL OF PLASMA PHYSICS*
  Zhang, C., Storey, D., Claveria, P., Nie, Z., Marsh, K. A., Mori, W. B., Adli, E., An, W., Ariniello, R., Cao, G. J., Clark, C., Corde, S., Dalichaouch, et al
  2024; 90 (4)

- **Wakefield generation in hydrogen and lithium plasmas at FACET-II: Diagnostics and first beam-plasma interaction results** *PHYSICAL REVIEW ACCELERATORS AND BEAMS*
  Storey, D., Zhang, C., Claveria, P., Cao, G. J., Adli, E., Alsberg, L., Ariniello, R., Clarke, C., Corde, S., Dalichaouch, T. N., Doss, C. E., Ekerfelt, H., Emma, et al
  2024; 27 (5)

- **Positron acceleration in plasma wakefields** *PHYSICAL REVIEW ACCELERATORS AND BEAMS*
  Cao, G. J., Lindstrom, C. A., Adli, E., Corde, S., Gessner, S.
  2024; 27 (3)

- **Temporal evolution of the light emitted by a thin, laser-ionized plasma source** *PHYSICS OF PLASMAS*
  Lee, V., Ariniello, R., Doss, C., Wolfinger, K., Stoltz, P., Hansel, C., Gessner, S., Cary, J., Litos, M.
  2024; 31 (1)

- **Status and future plans for C³ R&D** *JOURNAL OF INSTRUMENTATION*
  Nanni, E. A., Breidenbach, M., Li, Z., Vernieri, C., Wang, F., White, G., Bai, M., Belomestnykh, S., Bhat, P., Barklow, T., Berg, W. J., Borzenets, V., Byrd, et al
  2023; 18 (9)

- **Beam delivery and beamstrahlung considerations for ultra-high energy linear colliders** *JOURNAL OF INSTRUMENTATION*
  Barklow, T., Gessner, S., Hogan, M., Ng, C., Peskin, M., Raubenheimer, T., White, G., Adli, E., Cao, G., Lindstrom, C. A., Sjobak, K., Barber, S., Geddes, et al
  2023; 18 (9)

- **A liquid xenon positron target concept** *NUCLEAR INSTRUMENTS & METHODS IN PHYSICS RESEARCH SECTION A-ACCELERATORS SPECTROMETERS DETECTORS AND ASSOCIATED EQUIPMENT*
  Varverakis, M., Holtzapple, R., Fujii, H., Gessner, S.
  2023; 1053

- **Probing strong-field QED in beam-plasma collisions (vol 6, 141, 2023)** *COMMUNICATIONS PHYSICS*
  Matheron, A., Claveria, P., Ariniello, R., Ekerfelt, H., Fiuza, F., Gessner, S., Gilljohann, M. F. F., Hogan, M. J. J., Keitel, C. H., Knetsch, A., Litos, M., Mankovska, Y., Montefiori, et al
  2023; 6 (1)

- **Probing strong-field QED in beam-plasma collisions** *COMMUNICATIONS PHYSICS*
  Matheron, A., Claveria, P., Ariniello, R., Ekerfelt, H., Fiuza, F., Gessner, S., Gilljohann, M. F., Hogan, M., Keitel, C., Knetsch, A., Litos, M., Mankovska, Y., Montefiori, et al
  2023; 6 (1)

- **9 GeV energy gain in a beam-driven plasma wakefield accelerator** *PLASMA PHYSICS AND CONTROLLED FUSION*
  Litos, M., Adli, E., Allen, J. M., An, W., Clarke, C. I., Corde, S., Clayton, C. E., FREDERICO, J., Gessner, S. J., Green, S. Z., Hogan, M. J., Joshi, C., Lu, et al
  2016; 58 (3)

- **Adaptive method for electron bunch profile prediction** *PHYSICAL REVIEW SPECIAL TOPICS-ACCELERATORS AND BEAMS*
  Scheinker, A., Gessner, S.
  2015; 18 (10)

- **Multi-gigaelectronvolt acceleration of positrons in a self-loaded plasma wakefield** *NATURE*
  Corde, S., Adli, E., Allen, J. M., An, W., Clarke, C. I., Clayton, C. E., Delahaye, J. P., FREDERICO, J., Gessner, S., Green, S. Z., Hogan, M. J., Joshi, C., Lipkowitz, et al
  2015; 524 (7566): 442-?

- **High-efficiency acceleration of an electron beam in a plasma wakefield accelerator** *NATURE*
  Litos, M., Adli, E., An, W., Clarke, C. I., Clayton, C. E., Corde, S., Delahaye, J. P., England, R. J., Fisher, A. S., FREDERICO, J., Gessner, S., Green, S. Z., Hogan, et al
  2014; 515 (7525): 92-?

- **Laser ionized preformed plasma at FACET** *PLASMA PHYSICS AND CONTROLLED FUSION*
  Green, S. Z., Adli, E., Clarke, C. I., Corde, S., Edstrom, S. A., Fisher, A. S., FREDERICO, J., Frisch, J. C., Gessner, S., Gilevich, S., Hering, P., Hogan, M. J., Jobe, et al
  2014; 56 (8)

- **Extremum Seeking for Parameter Identification, Implementation for Electron Beam Property Prediction**
  Scheinker, A., Gessner, S., IEEE
  IEEE.2014: 2673–78