Ting Xu, Ph. D., PE

CURRICULUM VITAE

Professor
Facility for Rare Isotope Beams
Michigan State University
East Lansing, Michigan 48824-1321, USA
Tel: 1-865-696-2996
Email: xuti@frib.msu.edu

EDUCATION

Ph. D., ME (2007, advisor S. W. Van Sciver), Florida State University, USA
M.S., ME (2001, advisor R. Z. Wang), Shanghai Jiao Tong University, China
B.S., ME (1998), Shanghai Jiao Tong University, China

Employment History

LCLS-II HE STL/FRIB	2022-present
SRF and SC Magnet Department Manager, FRIB/NSCL, MSU, East Lansing, MI	2014- present
Cryogenic Operation Group Leader, FRIB/NSCL, MSU, East Lansing, MI	2012- 2014
Associate SRF Department Manager for ReA3 (M)	2013- 2014
Cryogenics System Engineer, SNS, ORNL, Oak Ridge, TN	2009 –2012
Postdoctoral Associate, NHMFL, FSU, FL	2007- 2009

Research and Engineering Portfolio

Summary

More than 20 years' experience in the fields of superconducting magnets, superconducting RF accelerating modules and cryogenic systems. Board knowledge of EM, FEA, fluid dynamics and thermodynamics and extensive experience of hardware in large accelerator complex. Experience on managing large engineering project from design to install.

License

Licensed professional Engineer (Mechanical Engineer) in TN, US since 2012. License ID 115429

Selected Engineering Projects

Following are the large scale superconducting device and cryogenic system I led the engineering and delivered.

SUPERCONDUCTING RF

ReA3 β=0.085 QWR Cryomodule.

The ReAccelerator ReA3 is a worldwide unique, state-of-the-art reaccelerator for rare isotope beams. Beams of rare isotopes are produced and separated in-flight at the NSCL Coupled Cyclotron Facility and subsequently stopped in a gas cell. The *β=0.085 QWR Cryomodule is the* third cryomodule consists of 8 QWR resonators and 3 9-T solenoids. All technologies used on this module are in-house developed. All 8 QWRs performed beyond design gradient and Q_0 with compact FPC design. Well engineered top down cryomodule design allows cold alignment adjustment and quite operation on top of mezzanine.

FRIB QWR Cryomodules

Novel FRIB bottom-up design. Optimized cavity design and cutting edge processing technique yielded high Q_0 and high gradient performance. Unique two primary cryogenic circuits allow QWRs and focusing solenoids run at different temperature levels and provide flexibility of operation. Innovative strong back at room temperature provide precise alignment of cold cavity string and cut down alignment efforts. Local magnetic shielding with value engineering provides a low cost solution. Excellent manufacture engineering allows efficiency and short assembly time, low overall cost and high quality. FRIB cryomodule presents the state of art design among the SRF society.

FRIB β=0.085 QWR Accelerating Cryomodule

FRIB HWR Cryomodules

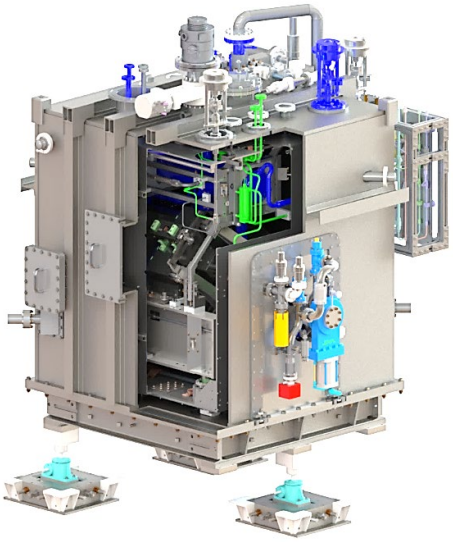
30 HWR cryomodules utilize the same bottom up concept yet with additional engineering challenges: 1) higher Q_0 requirement, 2) high gradient with smaller bandwidth against Lorenz detuning and microphonis, 3) high power FPC and mechanical tuner can provide large tuning range and 4) stringent magnetic shielding. Well balanced design of FRIB HWR cavities minimize Ep

and Bp and multipacting and provide all the provisions to allow thorough surface processing. MP reduced coupler design with innovative solution to apply high voltage bias allows reliable operation at high RF power. Pneumatic tuner without guide bushing provides smooth tuning and maintenance free solution. FRIB HWR cryomodules are the first large scale HWR linac in the world provides the accelerator society important data and engineering proof of concept.

FRIB HWR cryomodules and view of linac (324 resonators in 46 modules all in operation)

SLAC LCLS–II HE SRF Gun

The high-energy upgrade of the Linac Coherent Light Source II (LCLS-II-HE) will extend the X-ray energy range up to 20 keV. The goal is to produce low emittance (0.1 mm·mrad) electron bunches (100 pC/bunch) and accelerate 30 µA beams through the superconducting linac to 8 GeV. A low-frequency superconducting radio-frequency photo-injector (SRF-PI) will be a key aspect of the upgrade. An SRF-PI cryomodule with a 185.7 MHz Quarter-Wave Resonator (QWR) for operation at a cathode field of 30 MV/m and a cathode system compatible with high quantum efficiency photo-cathodes operating at 55-80 K or 300 K are currently being developed.



LCLS-II HE SRF Gun cryoomodule 3D Module

SUPERCONDUCTING MAGNETS

Large Scale Superconducting Dipoles

The 30 degree superconducting dipole is one of the most challenge devices in beam dump vessel of FRIB target hall. This 2T large superconducting sector bending magnet is required to have a high field homogeneity in a large window (0.24m X0.5m), operate in high radiation environment and shielding ~10kW beam heating, have remote handling features and installed in vacuum with 20 Ton crane. This made traditional engineering design no longer applied. A novel supporting structure for cold mass without links made remote handling possible; a set of low profile cooling panels designed to intercept beam heating and made superconducting coils safe in such harsh environment and special design and shaped air filter in pole tip to guarantee field profile.

120Ton SCD1 2-T 30-degree Superconducting Dipole at Test stand, FRIB, MSU

Large Scale Superconducting Quad Triplets

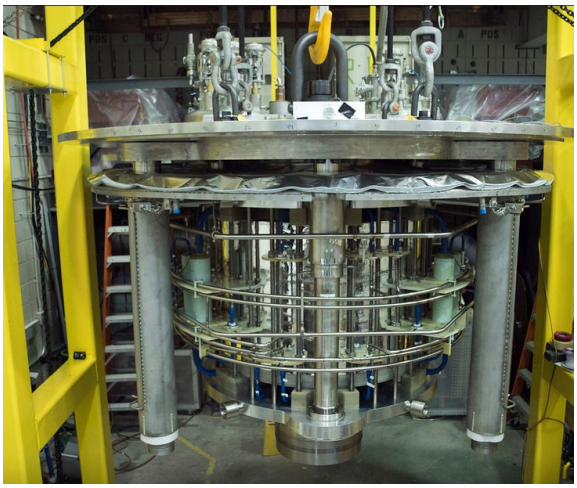
FRIB cold iron quad triplet features with a 600 mm large bore and 3 superconducting quads with a max field gradient at 9 T/m and high field quality. The 26 Ton 4K coldmass, high EM force between quads and multipoles, and thermal mismatch of large steel structure made this magnet a great challenge of engineering and a state of art design.

Cold Iron Quad Triplet for FRIB Fragment Separator, FRIB, MSU

*36T Serial Connected Hybrid Magnet**

The novel hybrid magnet consists of Florida-Bitter resistive coils (insert) and a set of superconducting cable-in-conduit conductor (CICC) coils (outsert). The resistive insert and the superconducting outsert are electrically connected in series and powered by 14 MW power supply. Strongest NRM magnet in the world. High magnetic field and high operation current requested most advanced superconducting material performance.

* Project I didn't led but participated and made important contributions.



36T SCH at National HighMagnet Field Lab funded by NSF

LARGE SCALE CRYOGENIC SYSTEM

FRIB SRF Testing Facility Cryogenic System

A completed cryogenic solution tailored for FRIB cryomodule production needs and MSU R&D program. System featured a 900W helium refrigerator, 3 vertical test apparatus, 1 cryomodule bunker and purifier. The system can support multiple cryogenic tests at 4k and 2K and operated highly efficient and reliable in the last 5 years. Only 4 such scale facilities exist in the nation (Jlab, SNS, Fermi and MSU).

Cryogenic system at SRF high, FRIB, MSU

SNS CTF Cryogenic system, ORNL

A cryogenic system designed to support cryomodule maintenance repair and R&D program at Spallation Neutron Source. The system includes a 640W 4K helium refrigerator and 10 g/s 2K pumping. The customized process design allow testing of vertical dewar, horizontal test apparatus and cryomodule. The system played import role to repair program of SNS cryomodules and R&D program of Proton Upgraded Project at SNS.

Cryogenic testing facility, SNS, Oak Ridge

PATENT

- Method for making a composite high-temperature superconductor Patent number: 8637433
- Solderless cable-in-conduit-conductor (CICC) joint Patent number: 7977573

Review committee

- DOE CD-1 Independent Project Review of Proton Improvement Plan- II Project, Fermi National Lab, Dec 2017
- DOE Independent Project Review of the Proton Improvement Plan- II Project at Fermi National Lab, Dec 2018
- Spallation Neutron Source (SNS) Proton Power Upgrade Project Superconducting Linac Systems Final Design Review, Oak Ridge National Lab, 2019
- Spallation Neutron Source (SNS) Cryogenic Moderator System Review, Oak Ridge National Lab, Jan 2020
- DOE/SC CD-2/3a Review of the Proton Improvement Plan –II (PIP-II) Fermi National lab, Jan 2020
- Director's Review of the Spallation Neutron Source (SNS) Proton Power Upgrade Project, Oak Ridge National Lab, June 2020
- Electron-Ion Collider Conceptual Design Review, Brookheaven National Lab, Nov, 2020
- SNS Accelerator and Target Advisory Committee 2021-Current

CONFERENCE AND WORKSHOP

- Technical Section Chair of Cryogenic Engineering Conference and International Cryogenic Materials Conference 2011, Spokane Washington, USA
- 28th Linear Accelerator Conference local organization committee member, East Lansing, USA
- 2021 International Conference on RF Superconductivity, local organization committee chair
- 2023 International Conference on RF Superconductivity, local organization committee chair

PROFESSIONAL SERVICES

- Referees of journal “cryogenics”, cryogenic engineering conference proceedings, Applied Superconductivity Conference proceedings and International Cryogenic Materials Conference proceedings.
- Reviewer of US Department of Energy Nuclear Physics (NP) SBIR/STTR proposals

INVITED CONFERENCE TALKS

2023 APS April Meeting 2023, Title “The Facility for Rare Isotope Beams: Technologies and Beam development”
2021 2021 International Conference on RF Superconductivity, Virtual Conference, Title “Completion of FRIB Superconducting Linac and Phased Beam Commissioning”
2020 2020 Americas Workshop on Linear Colliders, Title “Potential MSU Contribution to ILC”
2017 2017 International Conference on RF Superconductivity, Lanzhou, China, Title “Progress of FRIB SRF Production”
2016 28th Linear Accelerator Conference, East Lansing, US, Title “FRIB cryomodule design and Production”
2016 2016 North American Particle Accelerator Conference, Chicago, US, Title “SRF Development and Cryomodule Production for the FRIB Linac”

Ph. D. DISSERTATION

“Velocity Field Measurements of He II Forced Flow Using the Particle Image Velocimetry Technique”, Florida State University, US, 2007

PUBLICATIONS

1. T. Xu et al., “Low-emittance SRF photo-injector prototype cryomodule for the LCLS-II high-energy upgrade: design and fabrication”, presented at the IPAC'23, Venice, Italy, May 2023, paper TUPA028
2. David Greene and Yoonhyuck Choi and Jon DeKamp and Xiaoji Du and Shashikant Manikonda and Peter Ostroumov and Mauricio Portillo and John Wenstrom and Ting Xu "Design of Coil-Dominated Quadrupole Triplet for High Rigidity Isotope Beams," in *IEEE Transactions on Applied Superconductivity*, vol. 33, no. 5, pp. 1-5, Aug. 2023, Art no. 4002405, doi: 10.1109/TASC.2023.3255825.
3. X. Du *et al*., "Design of an Emittance Compensation Superconducting Magnet Package for LCLS-II-HE's SRF Photo-Injector," in *IEEE Transactions on Applied Superconductivity*, vol. 33, no. 5, pp. 1-4, Aug. 2023, Art no. 3500604, doi: 10.1109/TASC.2023.3247699.
4. Y. Choi *et al*., "Overview of Fragment Separator Superconducting Magnets in the Facility for Rare Isotope Beams," in *IEEE Transactions on Applied Superconductivity*, vol. 33, no. 5, pp. 1-5, Aug. 2023, Art no. 4100305, doi: 10.1109/TASC.2023.3244141
5. Sang-Hoon Kim, Chris Adolphsen, Lixin Ge, Walter Hartung, Fuhao Ji, Michael Kelly, Taro Konomi, John Lewellen, Samuel Miller, Mohit Patil, Troy Petersen, Philippe Piot, John Popielarski, Kenji Saito, Liling Xiao, Ting Xu, Tracy Xu. Design of a 185.7 MHz Superconducting RF Photoinjector Quarter-Wave Resonator for the LCLS-II-HE Low Emittance Injector. Proceedings of the 5th North American Particle Accelerator Conference. 2022; NAPAC2022:USA.

Available from: https://jacow.org/napac2022/doi/JACoW-NAPAC2022-MOPA85.html DOI: 10.18429/JACOW-NAPAC2022-MOPA85

6. Taro Konomi, Chris Adolphsen, Stefan Gatzmaga, Walter Hartung, Michael Kelly, Sang-Hoon Kim, John Lewellen, Samuel Miller, Dan Morris, Petr Murcek, Troy Petersen, John Popielarski, Kenji Saito, Alex Taylor, Rong Xiang, Ting Xu. Design of the Cathode Stalk for the LCLS-II-HE Low Emittance Injector. Proceedings of the 5th North American Particle Accelerator Conference. 2022; NAPAC2022:USA. Available from: https://jacow.org/napac2022/doi/JACoW-NAPAC2022-MOPA87.html DOI: 10.18429/JACOW-NAPAC2022-MOPA87
7. John Lewellen, Chris Adolphsen, Andre Arnold, Yoonhyuck Choi, Chris Compton, Robert Coy, Xiaoji Du, Stefan Gatzmaga, Lixin Ge, David Greene, Walter Hartung, Fuhao Ji, Michael Kelly, Sang-Hoon Kim, Taro Konomi, Samuel Miller, Dan Morris, Petr Murcek, Matthew Murphy, Mohit Patil, Troy Petersen, John Popielarski, Laura Popielarski, Kenji Saito, Rong Xiang, Liling Xiao, Ting Xu. Status of the SLAC/MSU SRF Gun Development Project. Proceedings of the 5th North American Particle Accelerator Conference. 2022; NAPAC2022:USA. Available from: https://jacow.org/napac2022/doi/JACoW-NAPAC2022-WEPA03.html DOI: 10.18429/JACOW-NAPAC2022-WEPA03
8. C. Zhang, W. Hartung, J. Popielarski, K. Saito, S. Kim, W. Chang, T. Xu Certification testing of production superconducting quarter-wave and half-wave resonators for FRIB Nuclear Inst. and Methods in Physics Research, A, Volume 1014, 165675 (2021)
9. K. McGee , S. Kim,1 K. Elliott , A. Ganshyn , W. Hartung, E. Metzgar, P. Ostroumov, L. Popielarski, J. Popielarski, A. Taylor, T. Xu, M. P. Kelly, B. Guilfoyle, T. Reid Medium-velocity superconducting cavity for high accelerating gradient continuous-wave hadron linear accelerators. Physical Review Accelerators and Beams 24, 112003 (2021)
10. S. Lidia, H. Ao, B. Barnes, R. Bennett, E. Bernal-Ruiz, G. Bollen, J. Brandon, B. Bull, N. Bultman, F. Casagrande, D. Chabot, S. Cogan, C. Compton, K. Davidson, E. Daykin, D. Georgiobani, P. Gibson, I. Grender, S.-H. Kim, W. Hartung, M. Hausmann, L. Hodges, K. Holland, A. Hussain, M. Ikegami, M. Konrad, G. Kiupel, T. Larter, Z. Li, I. Malloch, G. Machicoane, H. Maniar, P. Manwiller, B. Martins, T. Maruta, D. Morris, P. Morrison, C. Morton, I. Nesterenko, D. Omitto, P. Ostroumov, F. Pellemoine, A. Plastun, J. Popielarski, L. Popielarski, E. Pozdeyev, H. Ren, P. Rodriguez, S. Rodriguez, T. Russo, K. Saito, R. Shane, S. Stanley, A. Stolz, G. Timko, J. Wei, M. Xu, T. Xu, Y. Yamazaki, T. Yashimoto, Q. Zhao & S. Zhao, “Commissioning Status of the Linac for the Facility for Rare Isotope Beams”, J. Korean Phys. Soc. 77 344–50, 2020
11. H. Ao and S. Beher and N.K. Bultman and F. Casagrande and C. Compton and J.C. Curtin and K.D. Davidson and K. Elliott and A. Facco and V. Ganni and A. Ganshyn and P.E. Gibson and I. Grender and W. Hartung and L. Hodges and K. Holland and A. Hussain and M. Ikegami and S. Jones and P. Knudsen and R.E. Laxdal and S.M. Lidia and G. Machicoane and S.J. Miller and D.G. Morris and P.N. Ostroumov and J.T. Popielarski and L. Popielarski and J. Priller and T. Russo and K. Saito and S. Stanley and D.R. Victory and X. Wang and J. Wei and M. Xu and T. Xu and Y. Yamazaki and S. Zhao, “FRIB Driver Linac Integration to be Ready for Phased Beam Commissioning”, Proc. NAPAC'19, 2019
12. J. W ei#, H. Ao, S. Beher, B. Bird, N. Bultman, F. Casagrande, D. Chabot, W . Chang, S. Cogan,C. Compton, J. Curtin, E. Daykin, K. Davidson, K. Elliott, A. Facco1, A. Fila, V. Ganni,A. Ganshyn, P. Gibson, T. Glasmacher, I. Grender, W. Hartung, L. Hodges, K. Holland,H.-C. Hseuh, A. Hussain, M. Ikegami, S. Jones, T. Kanemura, S.-H. Kim, M. Konrad, P. Knudsen, R.E. Laxdal2, J. LeTourneau, Z. Li, S. Lidia, G. Machicoane, P. Manwiller, F. Marti, T. Maruta, E. Metzgar, S. Miller, D. Morris, C. Nguyen, K. Openlander, P. Ostroumov, A. Plastun,J. Popielarski, L. Popielarski, J. Priller, M. Reaume, H. Ren, T. Russo, K. Saito, M. Shuptar,J. Stetson, D. Victory, R. Walker, X. Wang, J. Wenstrom, M. Wright, M. Xu, T. Xu, Y. Yamazaki,Q. Zhao, S. Zhao; “The FRIB SC-Linac-Installation and Phased Commissioning” Proc. 19th International Conference on RF Superconductivity (SRF’19), 2019

13. J. Wei, H. Ao, S. Beher, N. Bultman, F. Casagrande, S. Cogan, C. Compton, J. Curtin, L. Dalesio, K. Davidson, K. Dixon, A. Facco, V. Ganni, A. Ganshyn, P. Gibson, T. Glasmacher, Y. Hao, L. Hodges, K. Holland, K. Hosoyama, H.-C. Hseuh, A. Hussain, M. Ikegami, S. Jones, T. Kanemura, M. Kelly, P. Knudsen, R. E. Laxdal, J. LeTourneau, S. Lidia, G. Machicoane, F. Marti, S. Miller, Y. Momozaki, D. Morris, P. Ostroumov, J. Popielarski, L. Popielarski, S. Prestemon, J. Priller, H. Ren, T. Russo, K. Saito, S. Stanley, M. Wiseman, T. Xu and Y. Yamazaki, "Advances of the FRIB project", International Journal of Modern Physics E, 28, No. 03, 1930003, 2019
14. Hartung W, Chang W, Kim S-H, Norton D, Popielarski J, Schwartz J, Saito K, Zhang C and Xu T "Performance of FRIB Production Quarter-Wave and Half-Wave Resonators in Dewar Certification Tests" 19th International Conference on RF Superconductivity (SRF'19), pp 1023–8, 2019
15. Compton C, Ao H, Asciutto J, Craft J, Elliott K, Hartung W, Kim S-H, Metzgar E S, Miller S J, Popielarski J T and Xu T, "The Facility for Rare Isotope Beams superconducting cavity production status and findings concerning surface defects", Proc. Of 19th Int. Conf. on RF Superconductivity, 2019
16. Chang W, Kim S, Hartung W, Popielarski J, Saito K, Xu M, Zhang C, Xu T, Zhao S, Maniar H and others "Progress in FRIB cryomodule bunker tests", 19th Int. Conf. on RF Superconductivity (SRF'19), pp 1029–34, 2019
17. S. Miller, H. Ao, B. Bird, B. Bullock, N. Bultman, F. Casagrande, C. Compton, J. Curtin, K. Elliott, A. Facco1, V. Ganni, I. Grender, W. Hartung, J. Hulbert, S.-H. Kim, P. Manwiller, E. Metzgar, D. Morris, P.N. Ostroumov, J. Popielarski, L. Popielarski, M. Reaume, K. Saito, M. Shuptar, J. Simon,B. Tousignant, D. Victory, J. Wei, J. Wenstrom, K. Witgen, M. Xu, T. Xu, "FRIB cavity and cryomodule performance, comparison with the design and lessons learned" Proc. Of 19th International Conference on RF Superconductivity, 2019
18. M. Xu, H. Ao, B. Bird, R. Bliton, C. Compton, J. Curtin, L. Hodges, K. Holland, S. Miller,K. Saito, T. Xu and C. Zhang, "FRIB LS1 Cryomodule's Solenoid Commissioning" Proc. 19th Int. Conf. on RF Superconductivity, 2019
19. K. Saito, H. Ao, B. Bird, R. Bliton, N. Bultman, F. Casagrande, C. Compton, J. Curtin, K. Elliott,A. Ganshyn, W. Hartung, L. Hodges, K. Holland, S-H Kim, S. Lidia, D. Luo, S. Miller D. Morris,L. Nguyen, D. Norton, J. Popielarski, L. Popielarski, T. Russo, J. Schwartz, S. Shanab, M. Shuptar,D. Victory, C. Wei, J. Wei, M. Xu, T. Xu, Y. Yamazaki, C. Zhang, Q. Zhao and others, "FRIB Solenoid Package in Cryomodule and Local Magnetic Shield", Proc. 19th Int. Conf. on RF Superconductivity, 2019
20. Ikegami, Masanori ; Ao, Hiroyuki ; Bonofiglio, Jon ; Bultman, Nathan ; Casagrande, Fabio ; Cogan, Scott ; Compton, Chris ; Curtin, John ; Davidson, Kelly ; Ganshyn, Andrei ; Gibson, Paul ; Glasmacher, Thomas ; Hodges, Leslie ; Holland, Kent ; Hussain, Aftab ; Jones, Shelly ; Joseph, Nathan ; Kanemura, Takuji ; Letourneau, John ; Lidia, Steven ; Machicoane, Guillaume ; Miller, Samuel ; Morris, Dan ; Ostroumov, Peter ; Popielarski, Laura ; Popielarski, John ; Priller, John ; Ren, Haitao ; Saito, Kenji ; Wei, Jie ; Xu, Ting ; Yamazaki, Yoshishige, "Beam Commissioning Status and Future Plans of FRIB", Proceedings of the 3rd J-PARC Symposium (J-PARC2019) p 11002, 2019
21. Ostroumov P N, Bultman N, Ikegami M, Lidia S, Lund S, Machicoane G, Maruta T, Plastun A S, Pozdeyev E, Rao X, J. Wei, T. Xu, T. Yoshimoto, Q. Zhao, "ACCELERATOR PHYSICS ADVANCES AT FRIB", Proc. 9th International Particle Accelerator Conference, 2018
22. H. Ao, B. Bird, N. Bultman, F. Casagrande, C. Compton, K. Davidson, K. Elliott, V. Ganni, A. Ganshyn, P. Gibson, I. Grender, W. Hartung, L. Hodges, K. Holland, A. Hussain, M. Ikegami, S. Jones, P. Knudsen, S. Lidia, I. Malloch, E. Metzger, S. Miller, D. Morris, P. N. Ostroumov, J. Popielarski, L. Popielarski, M. Reaume, T. Russo, K. Saito, M. Shuptar, S. Stanley, S. Stark, D. Victory, J. Wei, J. Wenstrom, M. Xu, T. Xu, Y. Xu, Y. Yamazaki, Q. Zhao, S. Zhao "Installation Progress on FRIB b= 0.041 Cryomodules Toward Beam Commissioning" 9th International Particle Accelerator Conference, 2018

23. Ostroumov P N, Contreras C, Plastun A S, Rathke J, Schultheiss T, Taylor A, Wei J, Xu M, Xu T and Zhao Q, "Elliptical superconducting RF cavities for FRIB energy upgrade", Nucl. Instruments Methods Phys. Res. Sect. A Accel. Spectrometers, Detect. Assoc. Equip. 888 53–63, 2018
24. D. Morris, J. Brandon, M. Konrad, T. Larter, H. Maniar, E. Pozdeyev, H. Ren, S. Zhao,Facility for Rare Isotope Beams, Michigan State University, East Lansing 48824, USAN. Bultman, K. Davidson, P. Gibson, L. Hodges, P. Morrison, P. Ostroumov, J. Popielarski, T.Russo, K. Schrock, R. Walker, J. Wei, T. Xu, Y. Xu, "RF System for FRIB Accelerator", Proc. IPAC2018, 2018
25. Xu, Mengxin and Compton, Chris and Contreras-Martinez, Crispin and Gonin, Ivan and Hartung, Walter and Khabiboulline, Timergali and Kim, Sang-Hoon and Miller, Samuel and Ostroumov, Peter and Plastun, Alexander and Popielarski, John and Popielarski, Laura and Reaume, Marc and Saito, Kenji and Taylor, Alex and Wei, Jie and Xu, Ting and Yakovlev, Vyacheslav and Zhao, Qiang, "Design of β= 0.65, 5 Cells, 644 MHz Elliptical Cavity for FRIB Upgrade" Proc. Of 9th International Particle Accelerator Conference, 2018
26. E. Pozdeyev, H. Ao, J. Brandon, N. Bultman, F. Casagrande, S. Cogan, K. Davidson, E. Daykin, P. Gibson, W. Hartung, L. Hodges, K. Holland, M. Ikegami, D. Jager, S. Kim, M. Konrad, B. Kortum, T. Larter, Z. Li, S. Lidia, S. Lund, G. Machicoane, I. Malloch, H. Maniar, F. Marti, T. Maruta, C. Morton, D. Morris, D. Omitto, P. Ostroumov, A. Plastun, J. Popielarski, H. Ren, K. Saito, J. Stetson, D. Victory, Y. Yamazaki, T. Yoshimoto, J. Wei, J. Wong, M. Xu, T. Xu, S. Zhao, Q. Zhao, "First acceleration at FRIB", Proc. 29th Linear Accelerator Conf p 615, 2018
27. Xu T, Saito K, Ao H, Bird B, Bultman N K, Casagrande F, Compton C, Davidson K D, Elliott K and Ganni V "Progress of FRIB SRF production", Proc. 18th Int. Conf. RF Superconductivity (Joint Accelerator Conferences Lanzhou) p 345, 2017
28. Ostroumov P N, Kazakov S, Morris D, Larter T, Plastun A S, Popielarski J, Wei J and Xu T, " Suppression of multipacting in high power RF couplers operating with superconducting cavities", Nucl. Instruments Methods Phys. Res. Sect. A Accel. Spectrometers, Detect. Assoc. Equip. 856 77–80, 2017
29. C. Compton, H. Ao, J. Asciutto, B. Bird, S. Drake, S. Enness, K. Curtain, W. Hartung, J. Holbert, S. Miller, J. Popielarski, L. Popielarski, M. Reaume, K. Saito, M. Shuptar, S. Stark, T. Stine, B. Tousignant, J. VanAken, E. Wellman, K. Witgen, T. Xu, W. Zheng, "PRODUCTION STATUS OF SUPERCONDUCTING CRYOMODULES FOR THE FACILITY FOR RARE ISOTOPE BEAMS (FRIB) PROJECT", Proc. Of 18th International Conference on RF Superconductivity pp 928–34, 2017
30. Popielarski J T, Compton C, Ganshyn A, Hartung W, Luo D, Miller S J, Morris D G, Ostroumov P N, Popielarski L, Saito K and T. Xu 2018 "Performance testing of FRIB early series cryomodules" Proc. Of 18th International Conference on RF Superconductivity pp 715–21, 2017
31. Ao H, Asciutto J, Bird B, Bultman N, Burkhardt E, Casagrande F, Compton C, Davidson K, Elliott K, Ganshyn A and Xu T.; "FABRICATION AND COLD TEST RESULT OF FRIB BETA= 0.53 PRE-PRODUCTION CRYOMODULE", Proc. Of 18th Int. Conf. on RF Superconductivity (SRF'17), pp 120–4, 2017
32. J. Wei, H. Ao, S. Beher, N. Bultman, F. Casagrande, J. Chen, S. Cogan, C. Compton, L. Dalesio, K. Davidson, A. Facco, F. Feyzi, V. Ganni, A. Ganshyn, P. Gibson, T. Glasmacher, L. Hodges, K. Holland, H.-C. Hseuh, A. Hussain, M. Ikegami, S. Jones, R.E. Laxdal, S. Lidia, G. Machicoane, I. Malloch, F. Marti, S. Miller, D. Morris, J. Nolen, P. Ostroumov, J. Popielarski, L. Popielarski, E. Pozdeyev, T. Russo, K. Saito, S. Stanley, H. Tatsumoto, R. Webber, T. Xu, Y. Yamazaki, K. Dixon, M. Wiseman, M. Kelly, K. Hosoyama, S. Prestemon, A. Aleksandrov, N. Eddy, "FRIB Project Status and Beam Instrumentation Challenges", Proceedings of International Beam Instrumentation Conference, 2017

33. H. Ao, B. Bird, G. Bryant, B. Bullock, N. Bultman, C. Compton, J. Hulbert, S. Miller,J. Popielarski, L. Popielarski, M. Reaume, K. Saito, M. Shuptar, J. Simon, S. Stark, B. Tousignant, J. Wenstrom, K. Witgen, T. Xu, Z. Zheng , "STATUS OF BETA= 0.53 PRE-PRODUCTION", Proceedings of LINAC2016, 2016
34. J. Wei, H. Ao, S. Beher, N. Bultman, F. Casagrande, C. Compton, L. Dalesio, K. Davidson, A. Facco1, F. Feyzi, V. Ganni, A. Ganshyn, P. Gibson, T. Glasmacher, W. Hartung, L. Hodges, L. Hoff, K. Holland, H.-C. Hseuh2, A. Hussain, M. Ikegami, S. Jones, K. Kranz, R.E. Laxdal3, S. Lidia, G. Machicoane, F. Marti, S. Miller, D. Morris, A.C. Morton, J. Nolen4, P. Ostroumov, J. Popielarski, L. Popielarski, E. Pozdeyev, T. Russo, K. Saito, G. Shen, S. Stanley, H. Tatsumoto, T. Xu, Y. Yamazaki Facco A, "The FRIB Superconducting Linac-Status and Plans", Proc. 28th Linear Accelerator Conf.(LINAC'16), 2016
35. Xu T, Ao H, Bird B, Bultman N, Burkhardt E, Casagrande F, Compton C, Crisp J, Davidson K and Elliott K, and others, "FRIB cryomodule design and production", Proc. LINAC'16 673–8, 2016
36. Zheng Z, Popielarski J, Saito K, Xu T and others, "Cost Reduction for FRIB Magnetic Shielding" Proc. Of 28th Linear Accelerator Conference, 2016
37. Y. Yamazaki#, H. Ao, N. Bultman, F. Casagrande, C. Compton, K. Davidson, A. Facco1, F. Feyzi, P. Gibson, T. Glasmacher, Z. He, L. Hoff, K. Holland, M. Ikegami, S. Jones, S. Lidia, Z. Liu, G. Machicoane, F. Marti, S. Miller, D. Morris, J. Popielarski, L. Popielarski, E. Pozdeyev, T. Russo, K. Saito, S. Shanab, G. Shen, H. Tatsumoto, R. Webber, J. Wei, T. Xu, Y. Zhang, Q. Zhao, Z. Zheng, "Beam Physics and Technical Challenges of the FRIB Driver Linac", 7th Int. Particle Accelerator Conf.(IPAC'16), pp 2039–44, 2016
38. Elliott K, Miller S, Oja B, Popielarski J, Popielarski L, Victory D, Wilbur M, Xu T and Wiseman M, "First FRIB β= 0.041 Production Coldmass Build", Proc. Of 28th Linear Accelerator Conference, 2016
39. Xu T, Ao H, Bird B, Bultman N, Burkhardt E, Casagrande F, Compton C, Crisp J, Davidson K, Elliott K and others "SRF development and cryomodule production for the FRIB Linac", Proceedings, 2nd North American Particle Accelerator Conference (NAPAC2016), 2016
40. Zheng Z, Stark S, Saito K, Popielarski J, Xu T and Yamazaki Y, "Design and Commissioning of FRIB Multipacting Free Fundamental Power Coupler", Proc. Of 28th Linear Accelerator Conference, 2016
41. H. Ao, B. Bird, G. Bryant, B. Bullock, N. Bultman, C. Compton, J. Hulbert, S. Miller,J. Popielarski, L. Popielarski, M. Reaume, K. Saito, M. Shuptar, J. Simon, S. Stark, B. Tousignant, J. Wenstrom, K. Witgen, T. Xu, Z. Zheng "Status of β= 0.53 Pre-Production Cryomodule", Proc. of 28th Linear Accelerator Conf.(LINAC'16) pp 811–4, 2016
42. S. Miller, H. Ao, B. Bird, G. Bryant, B. Bullock,N. Bultman, F. Casagrande, C. Compton, A. Facco1, W. Hartung, J. Hulbert, D. Morris, P. Ostroumov, J. Popielarski, L. Popielarski, M. Reaume, K. Saito, M. Shuptar, J. Simon, S. Stark, B. Tousignant, J. Wei, J. Wenstrom, K. Witgen, T. Xu, Z. Zheng, "Design of a FRIB Half-Wave Pre-Production Cryomodule" Proc. of 28th Linear Accelerator Conf.(LINAC'16), pp 795–7, 2016
43. Stark S, Facco A, Miller S, Ostroumov P, Popielarski J, Saito K, Tousignant B, Xu T, Gerbick S and Kelly M, "FRIB HWR TUNER DEVELOPMENT" Proc. of 28th Linear Accelerator Conf.(LINAC'16), pp 535–7, 2016
44. Popielarski L, Barker B, Compton C, Elliott K, Malloch I, Metzgar E, Popielarski J, Saito K, Velianoff G, Victory D, and Xu T; "Low-beta SRF cavity processing and testing facility for the Facility for Rare Isotope Beams at Michigan State University" Proc. 17th International Conference on RF Superconductivity pp 597–601, 2015
45. K. Saito#, H. Ao, B. Barker, B. Bird, N. Bultman, E. Burkhardt, F. Casagrande, S. Chandrasekaran, S. Chouhan, C. Compton, J. Crisp, K. Davidson, K. Elliott, A. Feyzi, A. Fox, P. Gibson, K. Holland, L. Hodges, G. Kiupel, S. Lidia, D. Morris, I. Malloch, E. Metzgar, D. Miller, S. Miller, D. Norton, J. Popielarski, L. Popielarski, A. Rauch, R. Rose, T. Russo, S. Shanab, M. Shuptar, S. Stark, M. Thrush, N. Usher, G. Velianoff, D. Victory, J. Wei, T. Xu, Y. Xu, M. Xu, Y. Yamazaki, Q. Zhao, W. Zheng; "FRIB project: moving to production phase", Proc. 17th International Conference on RF Superconductivity pp 1–5, 2015

46. J. Wei, H. Ao, N. Bultman, F. Casagrande, C. Compton, L. Dalesio, K. Davidson, K. Dixon, B. Durickovic, A. Facco, F. Feyzi, V. Ganni, A. Ganshyn, P. Gibson, T. Glasmacher, W. Hartung, L. Hodges, L. Hoff, K. Holland, H.-C. Hseuh, A. Hussain, M. Ikegami, S. Jones, M. Kelly, K. Kranz, R.E. Laxdal, S. Lidia, S. Lund, G. Machicoane, F. Marti, S. Miller, D. Morris, J. Nolen, P. Ostroumov, S. Peng, J. Popielarski, L. Popielarski, E. Pozdeyev, T. Russo, K. Saito, G. Shen, S. Stanley, M. Wiseman, T. Xu, Y. Yamazaki, "FRIB Accelerator: Design and Construction Status". Proc. 13th Int. Conf. on Heavy Ion Accelerator Technology" .(HIAT'15) pp 6–10, 2015
47. Miller S, Bird B, Bryant G, Bullock B, Bultman N, Casagrande F, Compton C, Facco A, Gibson P, Hulbert J and Xu T. "Construction and performance of FRIB quarter wave prototype cryomodule", Proc. 17th Int. Conf. RF Supercondictivity p 1446, 2015
48. Compton C, Facco A, Miller S, Popielarski J, Popielarski L, Rauch A, Saito K, Velianoff G, Wellman E, Witgen K and Xu T, "Production status of SRF cavities for the facility for rare isotope beams (FRIB) project", Proc. 17th Int. Conf. RF Supercondictivity, 2015
49. He Z, Zhang Y, Xu T, Zhao Q, Ikegami M and Marti F, "BEAM DYNAMICS OPTIMIZATION OF FRIB FOLDING SEGMENT 1 WITH A SINGLE TYPE OF REBUNCHER CRYOMODULE", Proc. 6th International Particle Accelerator Conference pp 4042–4, 2015
50. Morris D, Nolen J, Peng S, Popielarski J, Popielarski L, Pozdeyev E, Russo T, Saito K, Xu T and Yamazaki Y, "ACCELERATOR CHALLENGES OF HIGH INTENSITY LINACS AND THE FACILITY FOR RARE ISOTOPE BEAMS", Proceedings of HB2014, 2014
51. Popielarski L, Casagrande F, Compton C, Elkin T, Fila A, Gibson P, Hodek M, Hodges L, Leitner M and Malloch I, C. Nguyen, R. Oweiss, J. Ozelis, J. Popielarski, C. Thronson, D. Victory, T. Xu; "SRF Highbay technical infrastructure for FRIB production at Michigan State University", Proc. 27th Linear Accelerator Conference pp 954–6, 2014
52. J. Wei, N. Bultman, F. Casagrande, C. Compton, K. Davidson, B. Drewyor, K. Dixon, A. Facco, F. Feyzi, V. Ganni, P. Gibson, T. Glasmacher, L. Hoff, K. Holland, M. Ikegami, M. Johnson, S. Jones, M. Kelly, R.E. Laxdal, S. Lidia, G. Machicoane, F. Marti, S. Miller, D. Morris, P. Ostroumov, J. Nolen, S. Peng, J. Popielarski, L. Popielarski, E. Pozdeyev, T. Russo, K. Saito, T. Xu, and Y. Yamazaki, "Accelerator challenges of high intensity linacs and the facility for rare isotope beams", HB2014, East Lansing 2014
53. Xu T, Arend B, Bird B, Casagrande F, Crisp J, Davidson K, Dudley C, Facco A, Grender I, Gibson P and others , "MSU re-accelerator ReA3 0.085 QWR cryomodule status", Proc. LINAC2014, Geneva 155–7, 2014
54. M. Leitner, B. Bird, F. Casagrande, S. Chouhan, C. Compton, J. Crisp, K. Elliot, A. Facco, A. Fox, M. Hodek, M. Johnson, G. Kiupel, I. Malloch, D. Miller, S. Miller, D. Morris, D. Norton, R. Oweiss, J. Ozelis, J. Popielarski, L. Popielarski, A. Rauch, R. Rose, K. Saito, M. Shuptar, N. Usher, G. Velianoff, D. Victory, J. Wei, J. Whitaker, K. Witgen, T. Xu, Y. Xu, O. Yair, and S. Zhao "The FRIB project at MSU", Proc. SRF13, 2013
55. J. Wei, D. Arenius, N. Bultman, F. Casagrande, C. Compton, K. Davidson, J. DeKamp, B. Drewyor, K. Elliott, A. Facco, V. Ganni, P. Gibson, T. Glasmacher, K. Holland, M. Johnson, S. Jones, R.E. Laxdal, D. Leitner, M. Leitner, G. Machicoane, F. Marti, D. Morris, J. Nolen, J. Ozelis, S. Peng, J. Popielarski, L. Popielarski, E. Pozdeyev, T. Russo, K. Saito, J. Savino, R. Webber, M. Williams, T. Xu, Y. Yamazaki, A. Zeller, Y. Zhang, Q. Zhao, "Progress towards the facility for rare isotope beams", Proc. of NA-PAC 1453–7, 2013
56. Howell M, Coleman A, DeGraff B, Kim S H, Neustadt T, Proulx J, Saunders J, Strong W and Xu T, "Status of Spallation Neutron Source Cryogenic Test Facility (CTF) ", Proceedings of PAC2013, 2013
57. K. Saito, N. Bultman, F. Casagrande, S. Chandrasekaran, S. Chouhan, C. Compton, K. Elliot, A. Facco, M. Johnson, S. Jones, M. Leitner, S. Miller, R. Oweiss, J. Ozelis, J. Popielarski, L. Popielarski, S. Shanab, J. Wei, T. Xu, Y. Yamazaki, Y. Zhang, Z. Zheng, "SRF developments at MSU for FRIB", Proceedings of the 16th International Conference on RF Superconductivity, September pp 23–37, 2013

58. Shuptar M, Casagrande F, Fox A, Johnson M, Leitner M, Miller S, Nellis T, Patil M, Xu T, Xu Y and others 2013 “Mechanical Design of the Cryogenic Sub-Systems for ReA6 Quarter Wave Resonator Cryomodule” Proc. of PAC2013 pp 1256–8, 2013
59. J. Saunders, R. Afanador, M. Crofford, M. Howell, S-H. Kim, S. Stewart, T. Xu “STATUS OF SRF FACILITIES AT SNS”, Proc. IPAC 2012, 2012
60. Xu T, Casagrande F, Ganni V, Knudsen P and Strong W H; “Status of cryogenic system for spallation neutron source’s superconducting radiofrequency test facility at Oak Ridge National Lab”, AIP Conference Proceedings vol 1434 pp 1085–91, 2012
61. Painter, Thomas A. and Adkins, Todd and Bai, Hongyu and Bird, Mark D. and Bole, Scott and Cantrell, Kurt and Chen, Jingping and Dixon, Iain R. and Ehmler, Hartmut and Gavrilin, Andy and Han, Ke and Lu, Jun and Smeibidl, Peter and Walsh, Robert and Weijers, Huub W. and Xu, Ting and Zhai, Yuhu “Recent progress of the series-connected hybrid magnet projects” IEEE Trans. Appl. Supercond. 20 692–5, 2010
62. Bai, Hongyu and Adkins, Todd and Bole, Scott T. and Dixon, Iain R. and Marks, Emsley L. and Miller, George E. and Noyes, Patrick D. and Painter, Thomas A. and Stanton, Robert F. and Weijers, Hubertus W. and Xu, Ting ; “Joint design and test for the SCH”, IEEE Trans. Appl. Supercond. 21 2122–5, 2010
63. Bai H, Bird M D, Bole S T, Cantrell K R, Dixon I R, Gavrilin A V, Painter T A and Xu T, “Safety Protection of Series Connected Hybrid Cryogenic System”, AIP Conference Proceedings vol 1218 pp 1231–8, 2010
64. Xu T and Van Sciver S W; “PIV application in He 2 forced flow research”, J. Cryog. Soc. Japan 43 100–8, 2009
65. Bird, Mark D. and Bai, Hongyu and Bole, Scott and Chen, Jingping and Dixon, Iain R. and Ehmler, Hartmut and Gavrilin, Andrew Vladimir and Painter, Thomas A. and Smeibidl, Peter and Toth, Jack and Weijers, Hubertus and Xu, Ting and Zhai, Yuhu; “The NHMFL hybrid magnet projects”, IEEE Trans. Appl. Supercond. 19 1612–6, 2009
66. Xu T, Painter T A, Weijers H W, Adkins T, Bole S, Eyssa Y M, Lu J, Miller J R, Miller G E and Noyes P D “Development and testing of electrical joints for the 36-T series-connected hybrid magnet”, IEEE Trans. Appl. Supercond. 19 1604–7, 2009
67. Painter T A, Bird M D, Dixon I R, Ehmler H, Heinrich J, Smeibidl P, Xu T and Zhai Y “Series-Connected Hybrid Magnetic Shielding Conceptual Design for the Helmholtz Centre Berlin for Materials and Energy”, IEEE Trans. Appl. Supercond. 19 1600–3, 2009
68. Van Sciver S W, Fuzier S and Xu T; ‘Particle image velocimetry studies of counterflow heat transport in superfluid helium II “, J. Low Temp. Phys. 148 225–33 , 2007
69. Xu, T. and S.W. Van Sciver, Solid H_2/D_2 Particle Seeding and Injection System for Particle Image Velocimetry (PIV) Measurement of He II, AIP Conference Proceedings, Vol. 823, pp. 1685-1691 (2006)
70. Wang, R. Z. and T. Xu, Liquid Nitrogen Heat Transfer in Narrow Channels, Low temperature and specialty gases, Vol. 20 No. 2 pp 7-11(2002)
71. Xu, T. and R. Z. Wang, Investigation of heat transfer of HeIIp in the narrow channel, Chinese journal of low temperature physics, Vol.22 No.2 pp.124-129 (2000)