

## A. Sait Umar



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### Education

*Ph.D.*: June 1985, Yale University, Physics Department, New Haven, CT  
*M.S.*: June 1981, Yale University, Physics Department, New Haven, CT  
*M.Phil.*: June 1981, Yale University, Physics Department, New Haven, CT  
*B.S.*: June 1979, Bogazici University, Istanbul, Turkey

### Positions

*Professor of Physics* (2000-present)  
Vanderbilt University, Department of Physics and Astronomy, Nashville, TN  
*Associate Professor of Physics* (1993-2000)  
Vanderbilt University, Department of Physics and Astronomy, Nashville, TN  
*Assistant Professor of Physics* (1986-1993)  
Vanderbilt University, Department of Physics and Astronomy, Nashville, TN  
*Research Investigator* (1985-1986)  
University of Pennsylvania, Physics Department, Philadelphia, PA  
*Research Assistant* (1983-1985)  
Oak Ridge National Laboratory, Physics Division, Oak Ridge, TN  
*Research Assistant* (1981-1983)  
Wright Nuclear Structure Laboratory, Yale University, New Haven, CT  
*Teaching Assistant* (1979-1981)  
Physics Department, Yale University, New Haven, CT  
*Research Assistant* (June-September 1978)  
Rutherford Laboratory, Oxford, UK

### Specialization and Memberships

*Main Field*: Theoretical Nuclear Physics  
*Other Fields*: Computational Physics  
*Memberships*: APS-DNP, FRIB Theory Alliance, TALENT

### Recent Conference Scientific Committee/IAC Memberships

1. Co-organizer, session on Fusion/Fission, *Gordon Research Conference (GRC2015)*
2. International Advisory Committee, **ICFN6** (November, 2016)
3. International Advisory Committee, **FUSION17** (February 2017)
4. Scientific Committee, **SHE2017** (September 2017)
5. Scientific Committee, **NNPA2018**, Antalya, Turkey (June 2018)
6. Scientific Committee, **TAN '19**, Wilhelmshaven, Germany (August 2019)
7. International Advisory Committee, **FUSION20** (November 2020)

## Publication Summary

Articles Published in Refereed Journals: 126

Articles Published in Books: 53

Abstracts and Seminars: 76

International Conferences: 79

Editor of Conference Proceedings: 2

## Ph.D. Students

David Dean: 1987-1991, Associate Director, ORNL Physical Sciences

Cem Güçlü: 1989-1995, Professor, ITU, Istanbul, Turkey

Alan Calder: 1992-1997, Associate Professor, Stony Brook

Edgar Teran: 1998-2003, Scientist, PROS Software, Houston, TX

David Pigg: 2007-2012, Assistant Professor, Lee University

Kyle Godbey: 2016-present

Physical Review C	61
Physical Review A	6
Physical Review B	1
Physical Review E	2
Physical Review Letters	5
Physics Letters A,B	11
Nuclear Physics A	4
Prog. Part. Nucl. Phys.	1
Intl. Journal of Mod. Phys.	3
J. of Computational Phys.	2
Comp. Phys. Comm.	5
Astrophysical Journal	2
Eur. Phys. J	14
Physics Reports	1
Annals of Physics	1
Nucl. Inst. Meth. B	1

## Research Funding and Fellowships

DOE-NP

Helmholtz Visiting Fellow

DOE Grand Challenge Award

Consultant:

Graduate Fellowship:

Undergraduate Fellowship:

Funded continuously since 1987

Frankfurt/GSI, January – May, 2010

High Performance Computing and Communications  
The Quantum Structure of Matter (with ORNL, 1992)

Oak Ridge National Laboratory, 1986-1994

Yale University, 1979-1981

Turkish Science Research Council, 1976-1979

## Articles Published in Refereed Journals

1. [Time-Dependent Hartree-Fock Picture of Nuclear Molecular Resonances](#), Phys. Lett. 135B, 261-265 (1984), M.R. Strayer, R.Y. Cusson, A.S. Umar, P.-G. Reinhard, D.A. Bromley, and W. Greiner.
2. [A Time-Dependent External Field Model for Particle Emission in Heavy-Ion Reactions](#), Phys. Lett. 140B, 290-294 (1984), A.S. Umar, M.R. Strayer, and D.J. Ernst.
3. [Mean-Field Theory of Prompt, High-Energy Nucleon Emission](#), Phys. Rev. C30, 1934-1948 (1984), A.S. Umar, M.R. Strayer, D.J. Ernst, and K.R.S. Devi.
4. [Time-Dependent Hartree-Fock Calculations of  \$4\text{He}+^{14}\text{C}\$ ,  \$^{12}\text{C}+^{12}\text{C}\(0^+\)\$ ,  \$4\text{He}+^{20}\text{Ne}\$  Molecular Formations](#), Phys. Rev. C32, 172-183 (1985), A.S. Umar, M.R. Strayer, R.Y. Cusson, P.-G. Reinhard, and D.A. Bromley.
5. [Correlations Between Preequilibrium Nucleons](#), Phys. Rev. Lett. 55, 584-587 (1985), D.J. Ernst, M.R. Strayer, and A.S. Umar.
6. [Nuclear Shape-Isomeric Vibrations](#), Phys. Lett. B171, 353-357 (1986), A.S. Umar and M.R. Strayer.
7. [Application of a Self-Consistent Theory of Large Amplitude Collective Motion to the Generalized Lipkin Model](#), Nucl. Phys. A458, 246-258 (1986), A.S. Umar and Abraham Klein.
8. [Resolution of the Fusion Window Anomaly in Heavy-Ion Reactions](#), Phys. Rev. Lett. 56, 2793-2796 (1986), A.S. Umar, M.R. Strayer, and P.-G. Reinhard.

9. [Relativistic Hartree Calculations for Axially Deformed Nuclei](#), Phys. Rev. Lett. 57, 2916-2919 (1986), S.-J. Lee, J. Fink, A.B. Balantekin, M.R. Strayer, A.S. Umar, P.-G. Reinhard, J.A. Maruhn, and W. Greiner.
10. [Physical Interpretation and Quantization of Periodic TDHF Solutions](#), Phys. Rev. C34, 1965-1968 (1986), Abraham Klein and A.S. Umar.
11. [Physical Interpretation of Time-Dependent Hartree-Fock Density Matrix for Heavy-Ion Scattering](#), Phys. Rev. C35, 1672-1677 (1987), Abraham Klein and A.S. Umar.
12. [Enhanced Dissipation in New Mean Field Studies of Strongly Damped Collisions](#), Phys. Lett. B196, 419-423 (1987), S.-J. Lee, A.S. Umar, K.T.R. Davies, M.R. Strayer, and P.-G. Reinhard.
13. [Relativistic Hartree Calculations for Axially Deformed Nuclei](#), Phys. Rev. Lett. E59, 1171-1172 (1987), S.-J. Lee, J. Fink, A.B. Balantekin, M.R. Strayer, A.S. Umar, P.-G. Reinhard, J.A. Maruhn, and W. Greiner.
14. [Dissipation and Forces in TDHF](#), Phys. Rev. C37, 1026-1035 (1988), P.-G. Reinhard, A.S. Umar, K.T.R. Davies, M.R. Strayer, and S.-J. Lee.
15. [Numerical Method for the Calculation of Continuum Excitation Amplitudes for Time-Dependent External Field Problems](#), Phys. Rev. C37, 2487-2494 (1988), C. Bottcher, M.R. Strayer, A.S. Umar, V.E. Oberacker.
16. [Spin-Orbit Force in TDHF Calculations of Heavy-Ion Collisions](#), Phys. Rev. C40, 706-714 (1989), A.S. Umar, P.-G. Reinhard, M.R. Strayer, K.T.R. Davies, and S.-J. Lee.
17. [Velocity Dependence of Prompt, High-Energy Nucleon Emission](#), Phys. Rev. C40, 1213-1218 (1989), D.J. Dean, A.S. Umar, and M.R. Strayer.
18. [Damped Relaxation Method to Calculate Relativistic Bound States](#), Phys. Rev. A40, 4182-4189 (1989), C. Bottcher, M.R. Strayer, A.S. Umar, and P.-G. Reinhard.
19. [Lattice Calculation of Muon-Pair Production with Capture In Relativistic Heavy-Ion Collisions](#), Phys. Rev. A41, 1399-1407 (1990), M.R. Strayer, C. Bottcher, V.E. Oberacker, and A.S. Umar.
20. [Basis-Spline Collocation Method for the Lattice Solution of Boundary Value Problems, J. Comp. Phys.](#) 93, 426-448 (1991), A.S. Umar, J. Wu, M.R. Strayer, and C. Bottcher.
21. [Numerical Methods for Nuclear Mean Field Dynamics, A thematic issue on Time Dependent Methods for Quantum Dynamics](#), Comp. Phys. Comm. 63, 179-188 (1991), A.S. Umar and M.R. Strayer.
22. [Nuclear Hartree-Fock Calculations with Splines](#), Phys. Rev. C44, 2512-2521 (1991), A.S. Umar, M.R. Strayer, J.-S. Wu, D.J. Dean, and C. Güçlü.
23. [A Dynamical String-Parton Model for Relativistic Heavy-Ion Collisions](#), Phys. Rev. C45, 400-414 (1992), D.J. Dean, A.S. Umar, J.-S. Wu, and M.R. Strayer.
24. [Nonperturbative Electromagnetic Lepton-Pair Production in Peripheral Relativistic Heavy-Ion Collisions](#), Phys. Rev. A45, 6296-6312 (1992), J.C. Wells, V.E. Oberacker, A.S. Umar, C. Bottcher, M.R. Strayer, J.-S. Wu, and G. Plunien.
25. [A Dynamical String-Parton Model for Relativistic Heavy-Ion Collisions](#), Nucl. Phys. A544, 475-478 (1992), A.S. Umar, D.J. Dean, J.-S. Wu, and M.R. Strayer.
26. [Multiparticle Production in Lepton-Nucleus Collisions and Relativistic String Models](#), Phys. Rev. C46, 2066-2076 (1992), D.J. Dean, M. Gyulassy, B. Müller, E.A. Remler, M.R. Strayer, A.S. Umar, and J.-S. Wu.
27. [Study of Nuclear Dissipation via Muon-Induced Fission: a Relativistic Lattice Calculation](#), Phys. Lett. B293, 270-274 (1992), V.E. Oberacker, A.S. Umar, J.C. Wells, M.R. Strayer, C. Bottcher.
28. [A Numerical Implementation of the Dirac Equation on a Hypercube Multicomputer](#), Int. J. Mod. Phys. C4, 459-492 (1993), J.C. Wells, A.S. Umar, V.E. Oberacker, C. Bottcher, M.R. Strayer, J.-S. Wu, J. Drake, and R. Flanery.
29. [Dynamical Calculation of Central Energy Density in Relativistic Heavy-Ion Collisions](#), Int. J. Mod. Phys. E2, 565-573 (1993), D.J. Dean, A.S. Umar, and M.R. Strayer.

30. [\*Dynamical Evolution of Hadronic Matter in Relativistic Collisions\*](#), Phys. Rev. C48, 2433-2442 (1993), D.J. Dean, A.S. Umar, and M.R. Strayer.
31. [\*Muon-Induced Fission: A Probe for Nuclear Dissipation and Fission Dynamics\*](#), Phys. Rev. C48, 1297-1306 (1993), V.E. Oberacker, A.S. Umar, J.C. Wells, C. Bottcher, M.R. Strayer, and J.A. Maruhn.
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33. [\*Parallel Implementation of Many-Body Mean-Field Equations\*](#), Phys. Rev. E50, 5096-5106 (1994), C.R. Chinn, A.S. Umar, M. Vallieres, and M.R. Strayer.
34. [\*Shape Coexistence Around 44S; The Deformed N=28 Region\*](#), Phys. Lett. B335, 259-264 (1994), T.R. Werner, J.A. Sheikh, W. Nazarewicz, M.R. Strayer, A.S. Umar, and M. Misu.
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36. [\*Impact Parameter Dependence of Multiple Lepton-Pair Production from Electromagnetic Fields\*](#), Phys. Rev. A51, 1836-1844 (1995), C. Guclu, J.C. Wells, A.S. Umar, M.R. Strayer, D.J. Ernst.
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38. [\*Lattice Calculation for Lepton Capture from Vacuum-Pair Production in Relativistic Heavy Ion Collisions\*](#), Nucl. Inst. Meth. B99, 293-296 (1995), J.C. Wells, V.E. Oberacker, M.R. Strayer, and A.S. Umar.
39. [\*Convergence of a Lattice Calculation for Bound-Free Muon-Pair Production in Peripheral Relativistic Heavy-Ion Collisions\*](#), Phys. Rev. A 53, 1498-1504 (1996), J.C. Wells, V.E. Oberacker, M.R. Strayer, and A.S. Umar.
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42. [\*Ground State Properties of Exotic Si, S, Ar, and Ca Isotopes\*](#), Nucl. Phys. A597, 327-340 (1996), T.R. Werner, J.A. Sheikh, M. Misu, W. Nazarewicz, J. Rikowska, K. Heeger, A.S. Umar, and M.R. Strayer.
43. [\*Basis Spline Collocation Method for Solving the Schroedinger Equation in Axially Symmetric Systems\*](#), J. Comp. Phys. 128, 197-208 (1996), D.R. Kegley, V.E. Oberacker, M.R. Strayer, A.S. Umar, and J.C. Wells.
44. [\*The Interplay Between Protoneutron Star Convection and Neutrino Transport in Core Collapse Supernovae\*](#), A. Mezzacappa, A.C. Calder, S.W. Bruenn, J.M. Blondin, M.W. Guidry, M.R. Strayer, and A.S. Umar, ApJ 493, 848-862 (1998).
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47. [\*Particle Identification in the Dynamical String-Parton Model of Relativistic Heavy-Ion Collisions\*](#), D.E. Malov, A.S. Umar, D.J. Ernst, and D.J. Dean, Intl. J. Mod. Phys. E8, 299-306 (1999).
48. [\*Hadronic Structure Functions as Distributions of Classical Strings\*](#), D.E. Malov, A.S. Umar, D.J. Ernst, and D.J. Dean, Phys. Rev. C 59, 2289-2292 (1999).
49. [\*Classical Strings and the Collisions of heavy-ions\*](#), D.J. Ernst, D.E. Malov, and A.S. Umar, Acta Phys. Hungarica: Heavy-Ion Physics 11, 239-246 (2000).
50. [\*Relativistic Heavy-Ion Collisions in the Dynamical String-Parton Model\*](#), D.E. Malov, A.S. Umar, D.J. Ernst, and D.J. Dean, Phys. Rev. C 63, 024902-1-18 (2001).

51. [Dipole Resonances in Time-Dependent Density Matrix Theory](#), M. Tohyama and A.S. Umar, Phys. Lett. B 516, 415-420 (2001).
52. [Fusion Window Problem in TDHF Theory Revisited](#), M. Tohyama and A.S. Umar, Phys. Rev. C65, 037601- 1-3 (2002).
53. [Quadrupole Resonances in Unstable Oxygen Isotopes in Time-Dependent Density Matrix Formalism](#), M. Tohyama and A.S. Umar, Phys. Lett. B549, 72-78 (2002).
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56. [Hartree-Fock-Bogoliubov Calculations in Coordinate Space: Neutron-Rich Sulfur, Zirconium, Cerium, and Samarium Isotopes](#), V.E. Oberacker, A.S. Umar, E. Teran, and A. Blazkiewicz, Phys. Rev. C 68, 064302 (2003).
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60. [Time-Dependent Response Calculations of Nuclear Resonances](#), A.S. Umar and V.E. Oberacker, Phys. Rev. C 71, 034314 (2005).
61. [Prompt Muon-Induced Fission: A Sensitive Probe for Nuclear Energy Dissipation and Fission Dynamics](#), V.E. Oberacker and A.S. Umar, **Muons: New Research**, (Nova Science Publishers, New York, 2005) pp. 179-208.
62. [Three-Dimensional Unrestricted Time-Dependent Hartree-Fock Fusion Calculations Using the Full Skyrme Interaction](#), A.S. Umar and V.E. Oberacker, Phys. Rev. C 73, 054607 (2006).
63. [Time-Dependent Hartree-Fock Fusion Calculations for Spherical, Deformed Systems](#), A.S. Umar and V.E. Oberacker, Phys. Rev. C74, 024606 (2006).
64. [Heavy-Ion Interaction Potential Deduced From Density-Constrained Time-Dependent Hartree-Fock Calculation](#), A.S. Umar and V.E. Oberacker, Phys. Rev. C74, 021601(R) (2006).
65. [Dynamic Deformation Effects in Subbarrier Fusion of  \$^{64}\text{Ni}+^{132}\text{Sn}\$](#) , A.S. Umar and V.E. Oberacker, Phys. Rev. C74, 061601 (Rapid Communication) (2006).
66.  [\$^{64}\text{Ni}+^{132}\text{Sn}\$  Fusion with Density Constrained TDHF Formalism](#), A.S. Umar and V.E. Oberacker, Phys. Rev. C76, 014614 (2007).
67. [Compressibility and Equation of State of Finite Nuclei](#), A.S. Umar and V.E. Oberacker, Phys. Rev. C76, 024316 (2007).
68. [Skyrme-HFB Calculations in Coordinate Space for the Krypton Isotopes up to the Two-Neutron Dripline](#), V.E. Oberacker, A. Blazkiewicz, and A.S. Umar, Rom. Rep. Phys. Vol. 59, No. 2, 559-568, (2007).
69.  [\$^{64}\text{Ni}+^{64}\text{Ni}\$  Fusion Reaction Calculated with the Density-Constrained Time-Dependent Hartree-Fock Formalism](#), A.S. Umar and V.E. Oberacker, Phys. Rev. C 77, 064605 (2008).
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71. [Density-Constrained Time-Dependent Hartree-Fock Calculation of  \$^{16}\text{O}+^{208}\text{Pb}\$  Fusion Cross Sections](#), A.S. Umar and V.E. Oberacker, Eur. Phys. J. A 39, 243-247 (2009).
72. [Center-of-Mass Motion and Cross-Channel Coupling in TDHF](#), A.S. Umar and V.E. Oberacker, J. Phys. G: Nucl. Part. Phys. 36 (2009) 025101.
73. [Microscopic Calculation of Pre-Compound Excitation Energies for Heavy-Ion Collisions](#), A.S. Umar, V.E. Oberacker, J.A. Maruhn, and P.-G. Reinhard, Phys. Rev. C 80, 041601(R) (2009).

74. [Microscopic Description of Nuclear Fission Dynamics](#), A.S. Umar, V.E. Oberacker, J.A. Maruhn, and P.-G. Reinhard, J. Phys. G: Nucl. Part. Phys. 37 064037 (2010).
75. [Microscopic Study of the Triple-Alpha Reaction](#), A. S. Umar, J. A. Maruhn, N. Itagaki, and V. E. Oberacker, Physical Review Letters 104, 212503 (2010).
76. [Entrance Channel Dynamics of Hot and Cold Fusion Reactions Leading to Superheavy Elements](#), A. S. Umar, V. E. Oberacker, J. A. Maruhn, and P.-G. Reinhard, Phys. Rev. C 81, 064607 (2010).
77. [Linear-Chain Structure of Three-Alpha Clusters in  \$^{12}\text{C}\$ ,  \$^{16}\text{C}\$ , and  \$^{20}\text{C}\$](#) , J.A. Maruhn, N. Loebl, A.S. Umar, N. Itagaki, M. Kimura, H. Horiuchi, and A. Tohsaki, Mod. Phys. Lett. A, 25, 1866 (2010).
78. [Microscopic study of the  \$^{132,124}\text{Sn}+^{96}\text{Zr}\$  reactions: Dynamic excitation energy, energy-dependent heavy-ion potential, and capture cross section](#), V.E. Oberacker, A.S. Umar, J. A. Maruhn, and P.-G. Reinhard, Phys. Rev. C 82. 034603 (2010).
79. [Localization in light nuclei](#), P.-G. Reinhard, J. A. Maruhn, A. S. Umar, and V. E. Oberacker, Phys. Rev. C 83, 034312 (2011).
80. [Microscopic Calculation of Heavy-Ion Potentials Based on TDHF](#), A.S. Umar, V.E. Oberacker, J.A. Maruhn, and P.-G. Reinhard, Eur. Phys. J. 17, 09001 (2011).
81. [Static and Dynamic Chain Structures in Mean-Field Theory](#), T. Ichikawa, N. Itagaki, N. Loeffl, J.A. Maruhn, V.E. Oberacker, S. Ohkubo, B. Schuetrumpf, and A.S. Umar, Eur. Phys. J. 17, 07002 (2011).
82. [Microscopic Composition of Ion-Ion Interaction Potentials](#), A. S. Umar, V. E. Oberacker, J. A. Maruhn, and P.-G. Reinhard, Phys. Rev. C 85, 017602 (2012).
83. [Dynamic Microscopic Study of Pre-equilibrium Giant Resonance Excitation and Fusion in the Reactions  \$^{132}\text{Sn} + ^{48}\text{Ca}\$  and  \$^{124}\text{Sn} + ^{40}\text{Ca}\$](#) , V. E. Oberacker, A. S. Umar, J. A. Maruhn, and P.-G. Reinhard, Phys. Rev. C 85, 034609 (2012).
84. [Microscopic Study of Ca + Ca Fusion](#), R. Keser, A. S. Umar, and V. E. Oberacker, Phys. Rev. C 85, 044606 (2012).
85. [Microscopic sub-barrier fusion calculations for the neutron star crust](#), A. S. Umar, V. E. Oberacker, and C. J. Horowitz, Phys. Rev. C 85, 055801 (2012).
86. [Single-particle dissipation in a time-dependent Hartree-Fock approach studied from a phase-space perspective](#), N. Loebl, A. S. Umar, J. A. Maruhn, P.-G. Reinhard, P. D. Stevenson, and V. E. Oberacker, Phys. Rev. C 86, 024608 (2012).
87. [Microscopic analysis of sub-barrier fusion in  \$^{132}\text{Sn}+^{40}\text{Ca}\$  versus  \$^{132}\text{Sn}+^{48}\text{Ca}\$](#) , V. E. Oberacker, and A. S. Umar, Phys. Rev. C 87, 034611 (2013).
88. [Confronting measured near and sub-barrier fusion cross-sections for  \$^{200}+^{12}\text{C}\$  with a microscopic method](#), R.T. deSouza, S. Hudan, V.E. Oberacker, A.S. Umar, Phys. Rev. C 88, 014602 (2013).
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90. [The TDHF Code Sky3D](#), J. A. Maruhn, P.-G. Reinhard, P. D. Stevenson, and A.S. Umar, Comp. Phys. Comm. 185, 2195-2216 (2014).
91. [Energy dependence of potential barriers and its effect on fusion cross-sections](#), A.S. Umar, C.Simenel, V.E. Oberacker, Phys. Rev. C 89, 034611 (2014).
92. [Formation and Dynamics of Fission Fragments](#), C. Simenel and A.S. Umar, Phys. Rev. C 89, 031601(R) (2014).
93. [Eulerian Rotations of Deformed Nuclei for TDDFT Calculations](#), D.A. Pigg, A.S. Umar, and V.E. Oberacker, Comp. Phys. Comm. 185, 1410-1414 (2014).
94. [Fusion using time-dependent density-constrained DFT](#), R. Keser, A.S. Umar, V.E. Oberacker, J.A. Maruhn, and P.-G. Reinhard, Eur. Phys. J. 66, 03042 (2014).
95. [Sub-barrier enhancement of fusion as compared to a microscopic method in  \$^{18}\text{O}+^{12}\text{C}\$](#) , T. K. Steinbach, J. Vadas, J. Schmidt, C. Haycraft, S. Hudan, and R. T. deSouza, L. T. Baby, S. A. Kuvin, and I. Wiedenhover, A. S. Umar, and V. E. Oberacker, Phys. Rev. C 90, 041603(R) (2014).

96. [Dissipative dynamics in quasifission](#), V.E. Oberacker, A.S. Umar, and C. Simenel, Phys. Rev. C 90, 054605 (2014).
97. [Microscopic study of the effect of intrinsic degrees of freedom on fusion](#), C. Simenel, M. Dasgupta, D. J. Hinde, V. E. Oberacker, A. S. Umar, and E. Williams, Eur. Phys. J. 86, 00047 (2015).
98. [Role of the Skyrme tensor force in heavy-ion fusion](#), P. D. Stevenson, E. B. Suckling, S. Fracasso, E. D. Simmons, and A. S. Umar, Eur. Phys. J. 86, 00058 (2015).
99. [Reduced quasifission competition in fusion reactions forming neutron-rich heavy elements](#), K. Hammerton, Z. Kohley, D. J. Hinde, M. Dasgupta, A. Wakhle, E. Williams, V. E. Oberacker, A. S. Umar, et al. Phys. Rev. C 91, 041602(R) (2015).
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