SEKAZI KAUZE MTINGWA

Sekazi K. Mtingwa graduated Phi Beta Kappa with B.S. degrees in physics and pure mathematics from MIT in 1971 and Master's and Ph.D. degrees in theoretical high energy physics from Princeton University in 1976. He held postdoctoral positions at the University of Rochester (1976-1978), the University of Maryland - College Park (1978-1980), and Fermi National Accelerator Laboratory, where he served a one-year tenure (1980-1981) as a Ford Foundation Postdoctoral Fellow. Subsequently, he served in staff physicist positions at both Fermilab (1981-1988) and Argonne National Laboratory (1988-1991). At Fermilab, Mtingwa and James Bjorken developed a theory of particle beam dynamics called intrabeam scattering, which sets the performance limitations on a wide class of modern accelerators, including hadron-hadron and electron-positron colliders, as well as high brightness synchrotron light sources. In recent times, the work by Mtingwa and collaborators on intrabeam scattering played a crucial role in improving the rate of proton-antiproton collisions in the Tevatron. Also, more work on intrabeam scattering in 2005 by Mtingwa, Kiyoshi Kubo, and Andy Wolski provided one of the justifications for increasing the beam energies of the electron and positron damping rings to 5 GeV for the International Linear Collider (ILC).

Mtingwa played an important role in the design and construction of two of the Antiproton Source accelerator systems at Fermilab that were used in the discovery of the top quark and other exotic particles. Nowadays, those systems are performing well and yielding exciting physics, perhaps even discovering the Higgs particle in the near future. Mtingwa designed the end-fields of the Antiproton Source dipole and quadrupole magnets. Those end-field corrections are necessary for the magnets to bend and focus the antiproton beams to high precision. He made important contributions to the design and construction of the pickup and kicker devices of the stochastic cooling systems. He contributed to their vacuum system design, and with John Marriner optimized their sensitivities to the antiproton beam. Mtingwa was the scientific liaison to the technical staff that assembled the pickups and kickers, was responsible for their quality assurance and the beam testing

of prototypes in Argonne's electron accelerator, and he supervised the installation of the pickups and kickers in the Antiproton Source tunnels. He also conducted one of the earliest studies of increasing the bandwidth of the stochastic cooling systems to 4-8 GHz to increase the cooling rate. This was eventually implemented.

In 1988, Mtingwa provided an important mathematical proof that transient effects would not spoil the effectiveness of the plasma wakefield acceleration scheme. Before his work, for simplicity theorists only considered infinitely long plasmas and did not consider the effect of the finite length of the plasma chamber used in the acceleration. Nobel Laureate Simon van der Meer emphasized the need to study this question and Mtingwa provided the solution. In 1989, while on a six-month visit to various research institutes in the Soviet Union, Mtingwa, Leonid Gorbunov and collaborators at Moscow's Lebedev Institute were the first to suggest varying the plasma density to fix the accelerated electron bunch on the crest of the plasma wakefield wave to optimize the acceleration.

In 1989 during a visit to the Leningrad Nuclear Physics Institute, Mtingwa and Mark Strikman were the first to elucidate the high precision fixed target physics that could be performed at a next generation electron-positron collider, such as the ILC. More recently, Mtingwa and Yury Kolomensky led the fixed target physics initiative for the ILC.

During 1991-2004, Mtingwa was Professor of Physics at North Carolina A&T State University, where he served as Department Chair during 1991-1994 and laid the foundation for the current graduate program in physics. One of the research groups that he established has participated in many important nuclear physics experiments at Jefferson Lab starting from the lab's first commissioning. During the early to mid 1990s, Mtingwa was the lead faculty person for raising funding for and designing the Interdisciplinary Research Center (IRC) at North Carolina A&T. The IRC played an important role in establishing the university's first Ph.D. programs, which were in electrical and mechanical engineering. Mtingwa continues his association today with the university as Affiliate Professor of Physics, whereby he collaborates with the faculty on research projects, teaches from time to time during summer sessions, and works on various projects.

During 2001-2005, Mtingwa served two years as Martin Luther King, Jr. Visiting Professor of Physics at MIT and two years as Visiting Professor of Physics at Harvard University. Currently, at MIT he is Senior Lecturer in the Concourse Program and Faculty Director of Academic Programs in the Office of Minority Education. As lead physics lecturer in MIT's Concourse Program, he is experimenting with better ways of teaching introductory college physics. At MIT, he continues his research on beam dynamics and fixed target possibilities for the ILC. For his research accomplishments, Mtingwa was elected a Fellow of the American Physical Society in 2008.

Mtingwa is involved in a number of national and international initiatives. He is a former Board Member and one of the founders of the African Laser Centre (ALC), which is a

nonprofit organization based in Pretoria, South Africa and is a network of approximately thirty laboratories throughout Africa that are engaged in laser-related research and training. He is the principal author of the *Strategy and Business Plan* upon which the ALC is based and currently serves as the organization's Representative to the Americas. In that capacity, Mtingwa was Co-Director of the US-Africa Advanced Studies Institute on Environmental and Biological Applications of Lasers (EBAL) held during January 2008 in Cairo, Egypt. Currently, Mtingwa is involved in initiatives to establish the new Julius K. Nyerere University of Science, Technology and Innovation in the Mara Region of Tanzania and a new science research and training institute in Saltpond, Ghana. In 2007, Mtingwa received the Science Education Award and was the keynote speaker at the National Council of Ghanaian Associations' March 10 Benefit Gala in New York City that celebrated the 50^{th} Anniversary of Ghana's Independence, having been the first African country south of the Sahara to gain independence from colonialism. The award was for outstanding contributions to science education among African peoples.

Mtingwa served from its inception in 1998 until 2008 on the U.S. Department of Energy's Nuclear Energy Research Advisory Committee (NERAC), now called the Nuclear Energy Advisory Committee (NEAC). He continues to serve on NEAC's Subcommittee on Advanced Nuclear Transformation Technology, which is chaired by Nobel Laureate Burton Richter and advises DOE on its nuclear reactor spent fuel partitioning and transmutation R&D program. During 2005-2008, Mtingwa served on the American Physical Society's Panel on Public Affairs, for which he co-chaired with Ruth Howes of Marquette University a 2007 study on electricity storage technologies and chaired a 2008 study on U.S. workforce and educational facilities' readiness to meet the future challenges of nuclear energy. This latter report has been circulated widely in the news media.

Mtingwa holds a black belt in Tae Kwon Do and speaks Russian, French, Spanish, and Italian.