TS1.2
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This tutorial will introduce a variety of topics related to the Front End of the Line (FEOL) reliability. The entire landscape of FEOL reliability will be covered including the origins of Bias Temperature Instability (xBTI), Time Dependent Dielectric Breakdown (TDDB), and Hot Carrier Instability (HCI). The tutorial will also touch on testing approaches for reliability qualification, process solutions to FEOL reliability, and the effect of future scaling on FEOL reliability.

Barry P. Linder received his B.S. from Pennsylvania State University in 1993, and an M.S and Ph.D. in Electrical Engineering from the University of California at Berkeley in 1999. His doctoral thesis dealt with plasma processing, plasma implantation, and plasma charging damage. From 1999-2016, Dr. Linder was employed as a Research Staff Member at the IBM T. J. Watson Research Center, Yorktown Heights, NY. Initially his work centered on the breakdown of ultra-thin gate oxides, including the statistics of breakdown phenomenon, post-breakdown conduction mechanisms, and the interaction between oxide breakdown and circuit operation. This work formed the basis for the paper that received an "Outstanding Paper Award" at the 2003 International Reliability Physics Symposium.

After 2003, his focus switched to electrical characterization and integration of metal gates and high-k materials. He has studied the full array of advanced gate stack materials including their integration and their effect on effective work function, channel mobility, gate leakage, and inversion layer thickness scaling. He specialized on the interaction between cap layers, interface layers, and metal gate composition on the final electrical properties of the gate stack. As manufacturing of high-k/metal gate stacks approached, he concentrated on all reliability aspects with emphasis on dielectric breakdown and bias temperature instability. More recently, he focused on the effect of transistor degradation on circuit functionality and performance, optimizing the trade-off of system performance with system reliability.

Since 2016, Barry has managed the Technology Reliability and Quality group for the IBM Systems Group. In this role he is responsible for the end to end technology qualification for from technology specification definitions to accelerated life testing.