

**TITLE:** A Model for Noise Power versus Density in a Perpendicular Digital Magnetic Recording System

**SPEAKER:** H. Neal Bertram  
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**DATE:** Tuesday, September 8, 2009

**TIME:** Reception @ 3:30 PM  
Presentation @ 4:00 PM

**PLACE:** Auditorium - Center for Magnetic Recording Research

**HOST:** Prof. Paul H. Siegel



**Abstract** Noise power versus linear density in a perpendicular recording system exhibits an unusual behavior. At the lowest densities the noise initially increases linearly with density. At a medium density, given by the transition parameter, the curves approximately level until about twice the initial curvature point. Above that secondary point the noise power then increases and eventually levels. In this talk a simple explanation for this behavior is presented. The key phenomenon is the trade off of DC-AC noise versus transition noise levels. At low densities the transition noise dominates and yields the linear increase with density. At the first critical density where the noise flattens the transition noise begins to decrease and the DC noise increases becoming AC erasure noise. The net leveling is the sum of these two effects. At the second critical density the transition noise has vanished and the further increase is dominated by the high density AC erased noise. This theory will be published in: H. N. Bertram and M. E. Schabes, *IEEE Trans Magn.*, Aug 2009.

**Bio:** Dr. Bertram received his B.A. from Reed College in Portland, OR in 1963 and his Ph.D. at Harvard University in Cambridge, MA in 1968. From 1968 to 1985 he was employed by the Ampex Corporation in Redwood City, CA where he worked on fundamental problems in magnetic tape recording. In 1985 he joined the University of California at San Diego as an Endowed Chair Professor in the Electrical Engineering and Computer Sciences Department associated with the (then) newly created Center for Magnetic Recording Research. At UCSD, Dr. Bertram directed a research program in the physics of magnetic recording, including studies of polycrystalline thin film media, magnetoresistive heads, and fine particle tape systems. In addition Dr. Bertram has created graduate courses in magnetic recording theory, analysis of recording materials, and magnetic recording measurements.

In 1986, Dr. Bertram was a IEEE Distinguished Lecturer, and in 1987 he was named an IEEE Fellow. He has published a book entitled "Theory of Magnetic Recording" (Cambridge University Press, March 1994). In 1999 he received the annual technical achievement award from INSIC (International Storage Industry Consortium). In 2003 Dr. Bertram won the IEEE Reynolds B. Johnson Information Storage Award. Dr. Bertram was cited for "fundamental and pioneering contributions to magnetic recording physics research."

In Dec. 2005 he became an emeritus professor and moved to northern California. From 2005-2009 Dr. Bertram worked part time for the Hitachi Corporation and visited CMRR monthly. Currently he is employed by Western Digital part time where he evaluates signal, noise, thermal effects and BER.