

Engineering Note E- 504

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Digital Computer Laboratory  
Massachusetts Institute of Technology  
Cambridge 39, Massachusetts

SUBJECT: FERROELECTRICS FOR DIGITAL INFORMATION STORAGE AND SWITCHING  
(Abstract of Report R-212, A Master's Thesis)

To: 6889 Engineers

From: Dudley A. Buck

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Materials have recently been discovered within which exist domains of permanent electric dipoles. These materials, named ferroelectrics, can be used to advantage in many electronic applications where ferromagnetic materials are currently used, often in circuits which are the duals of those of their ferromagnetic counterparts. Ferroelectrics can be made in the form of single crystals or rugged ceramics.

Digital information can be stored in a matrix of ferroelectric condensers, and an efficient method of storage-element selection is available in the form of a two-coordinate, coincident-voltage scheme. The matrix can be made on a thin ferroelectric sheet by painting the coordinate rows on one side and the coordinate columns on the other. The information can be taken from the matrix via a simple mixing transformer.

Multi-position switching can be accomplished with a group of ferroelectric condensers. The logical circuitry of such a switch, capable of accomplishing many of the switching tasks in a high-speed information-handling system, can be painted directly onto the two sides of a thin ferroelectric ceramic sheet.

Ferroelectrics for pulsed applications are best studied by pulse methods, which allow their properties to be studied without significant heating of the sample, and with rather low-powered test equipment. A barium titanate ceramic, which, when pulsed, switches in about one microsecond, is on the borderline of suitability for the memory application. The pulsed properties of this material are temperature dependent.

Signed... *D.A. Buck* .....  
Dudley A. Buck

Approved... *DRB* .....  
D. R. Brown

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