

Holographic Data Storage Systems

LAMBERTUS HESSELINK, SERGEI S. ORLOV, AND MATTHEW C. BASHAW

Invited Paper

In this paper, we discuss fundamental issues underlying holographic data storage: grating formation, recording and readout of thick and thin holograms, multiplexing techniques, signal-to-noise ratio considerations, and readout techniques suitable for conventional, phase conjugate, and associative search data retrieval. Next, we consider holographic materials characteristics for digital data storage, followed by a discussion on photorefractive media, fixing techniques, and noise in photovoltaic and other media with a local response. Subsequently, we discuss photopolymer materials, followed by a discussion on system tradeoffs and a section on signal processing and en/decoding techniques, succeeded by a discussion on electronic implementations for control, signal encoding, and recovery. We proceed further by presenting significant demonstrations of digital holographic systems. We close by discussing the outlook for future holographic data storage systems and potential applications for which holographic data storage systems would be particularly suited.

Keywords—*Diffraction gratings, gratings, high density data storage, holographic data storage, holographic recording materials, holography, optical data storage, optical storage materials, photopolymer media, photorefractive media, volumetric data storage.*

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