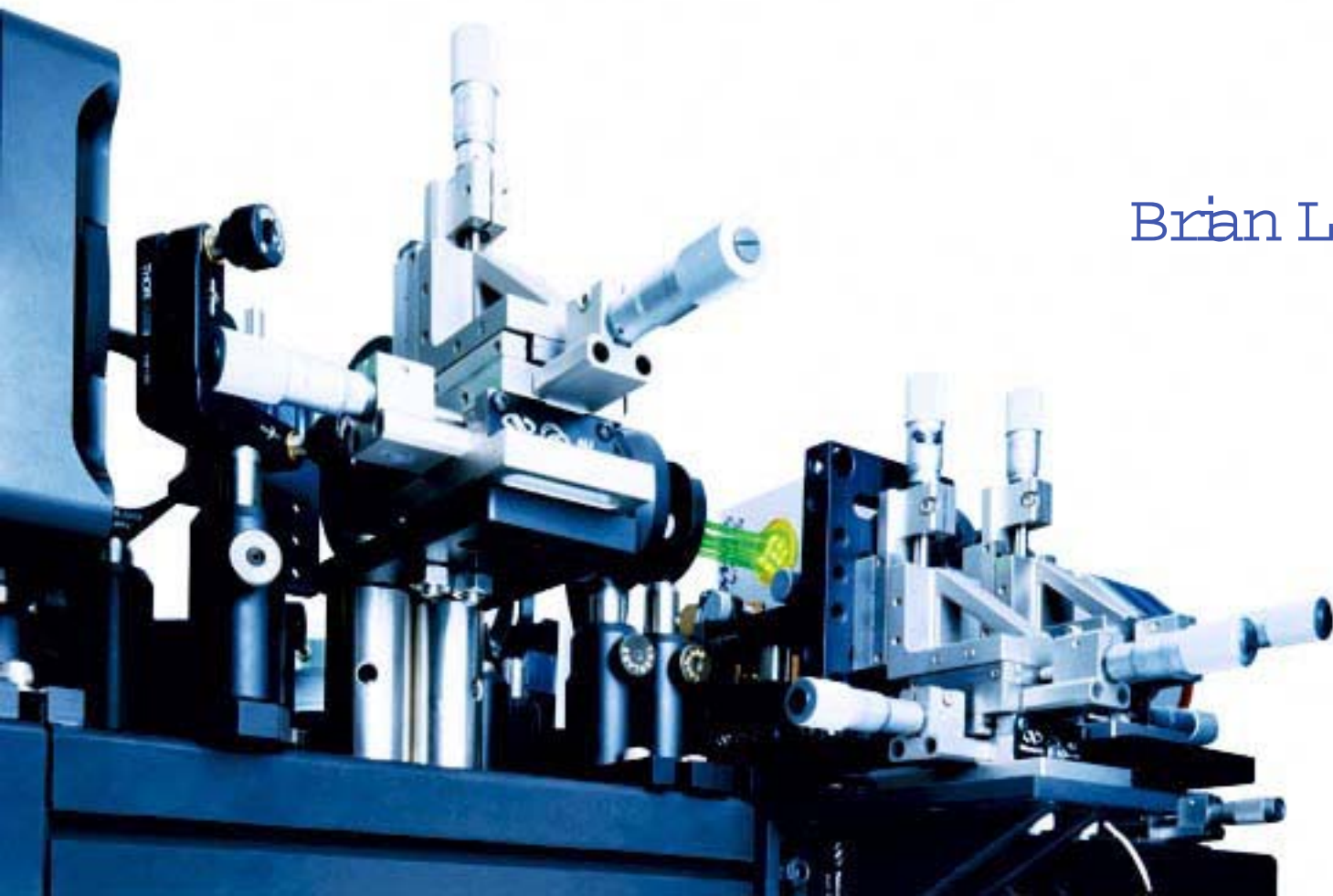


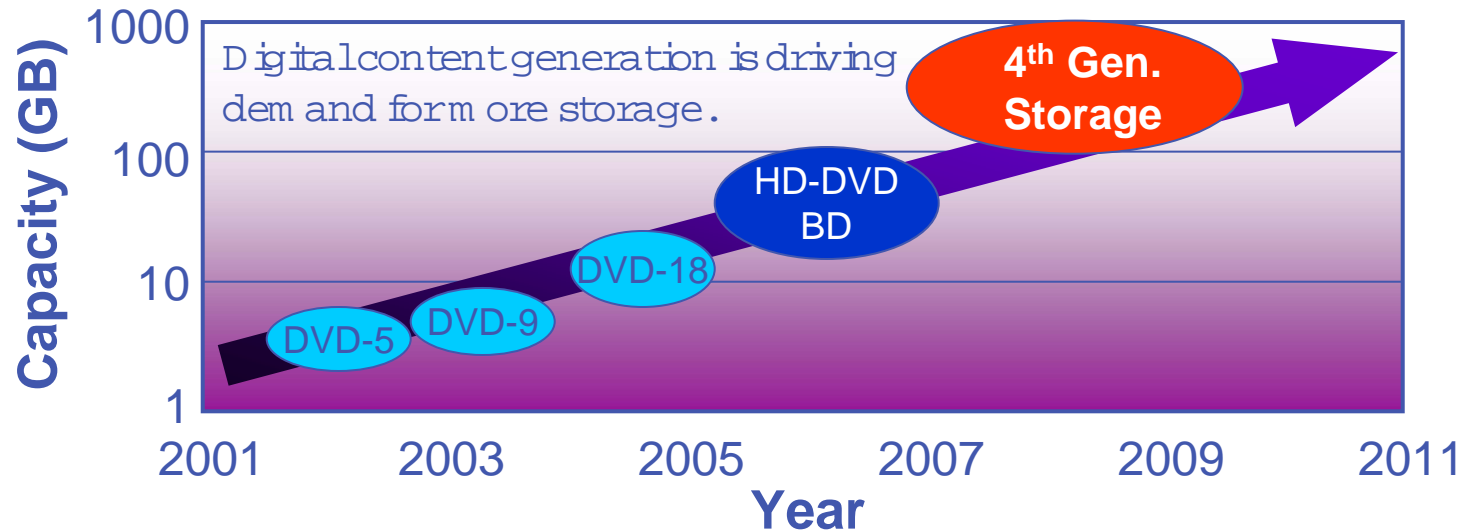
Holographic Storage @ GE

Media-Tech Conference
October 11, 2006

Brian Lawrence



Storage Roadmap



Growing Application Space:

Consumer Electronics



2 hrs video (4K2K) = 100 GB
 2 hrs video (4K4K) = 400 GB

Professional Archival

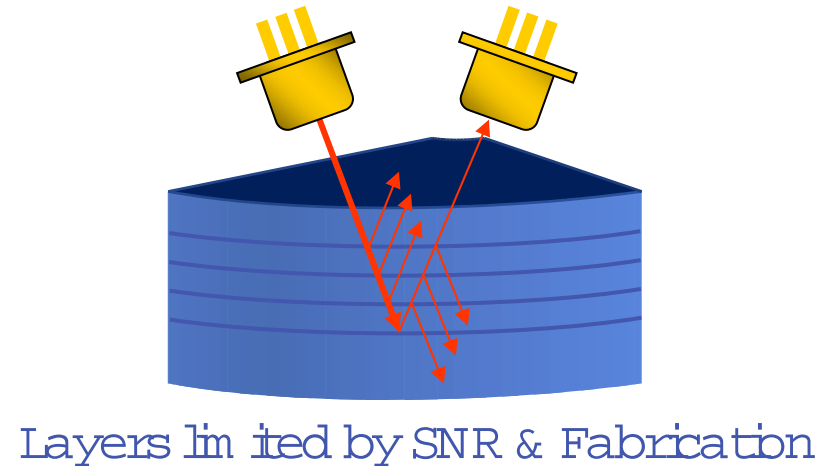
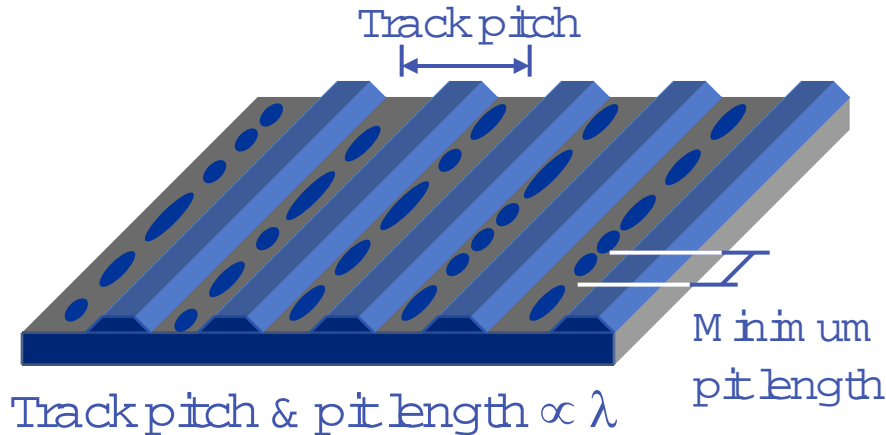


Uncompressed HD video archiving

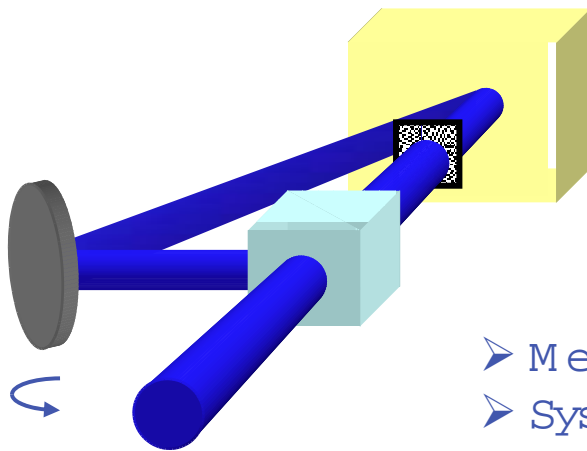
Enables storage of digitized film
 2 hrs HDTV video = 2 TB

Storage Technology

Physical Layer Storage:



Holographic Storage:

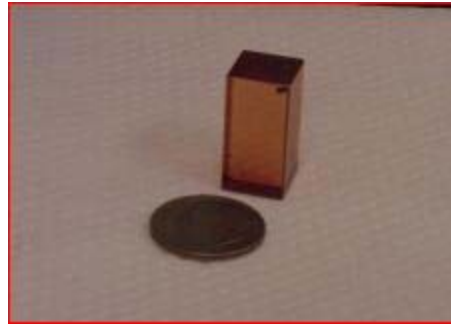


- Data imparted to signal beam via SLM
- Signal beam interfered with reference beam
- Interference pattern stores data in volume of media
- Capacity increased by storing data at multiple θ 's



- Media: functional materials (Δn and sensitivity)
- Systems: optical drives capable of reading stored patterns

Holographic Media



Decades of holographic storage work done in inorganic crystals

But crystals are expensive and impractical

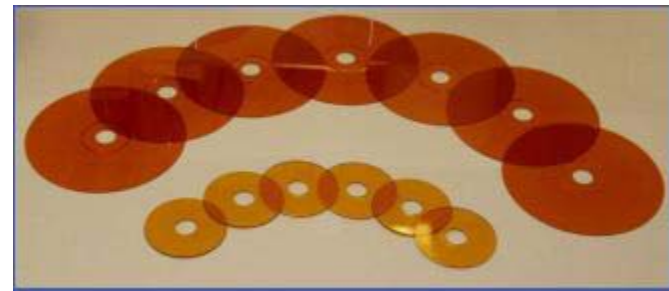


Photopolymers



Monomer/binder mixtures that polymerize when exposed to light

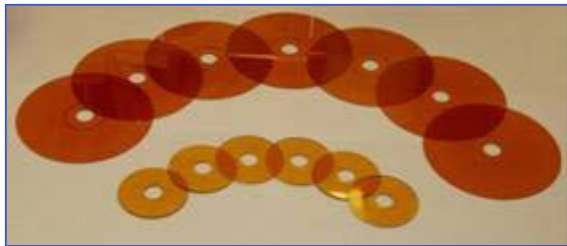
GE Thermoplastics



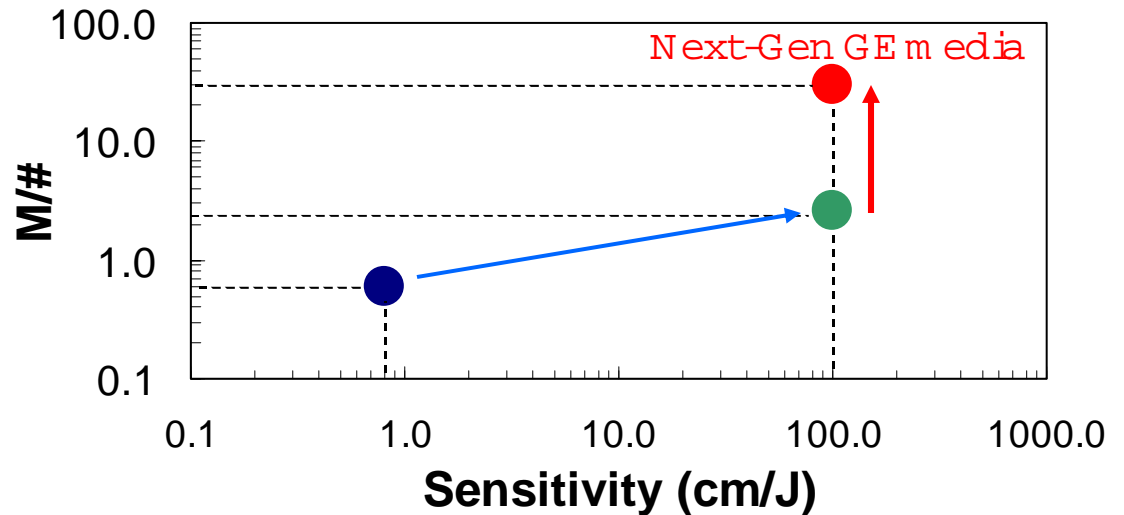
Injection-molded plastic discs that undergo molecular changes when exposed to light

GE Hobographic Thermoplastic

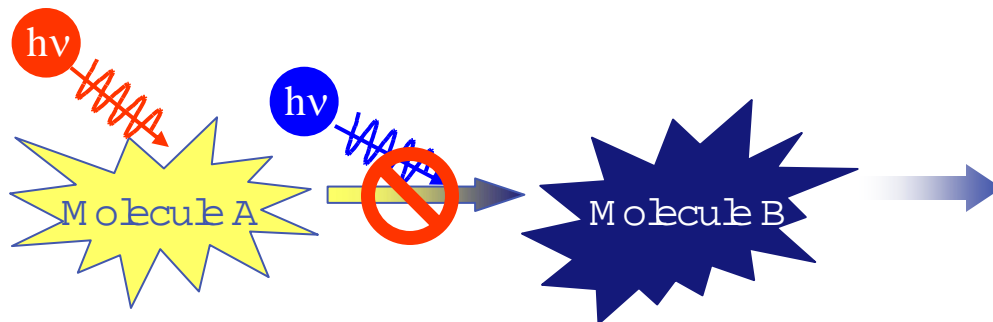
Hobographic Performance



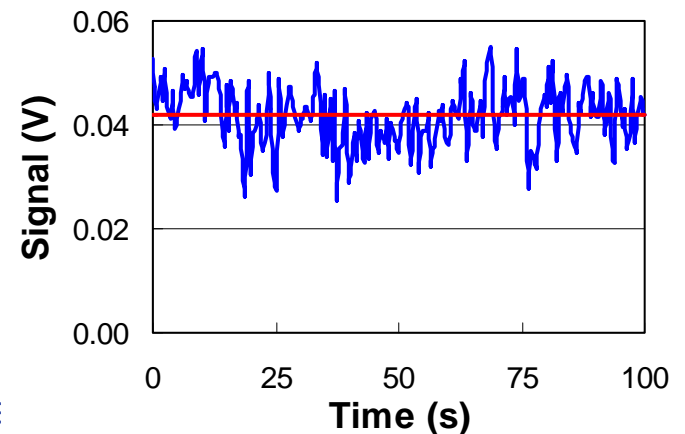
Injection-molded Discs
($> 300^{\circ}\text{C}$, 8 sec/disc)



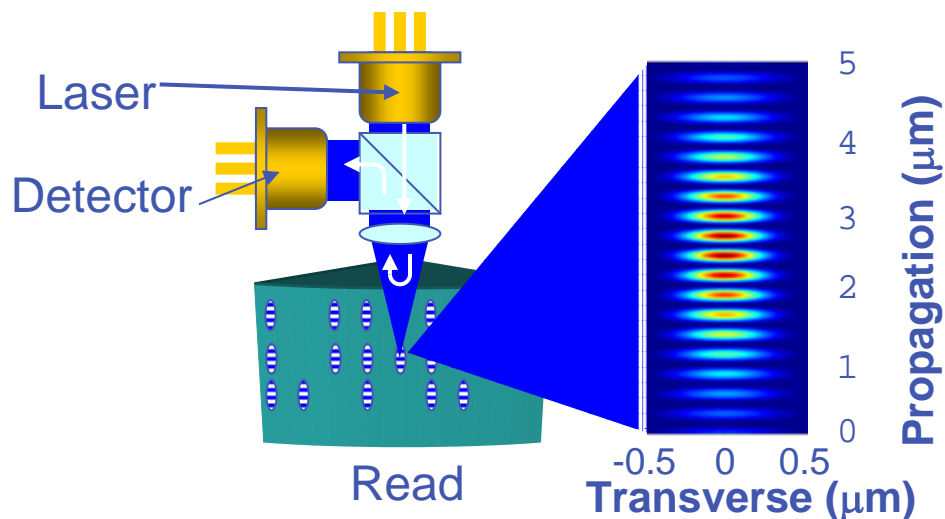
Fixing:



Feasibility demonstrated - implementation in process

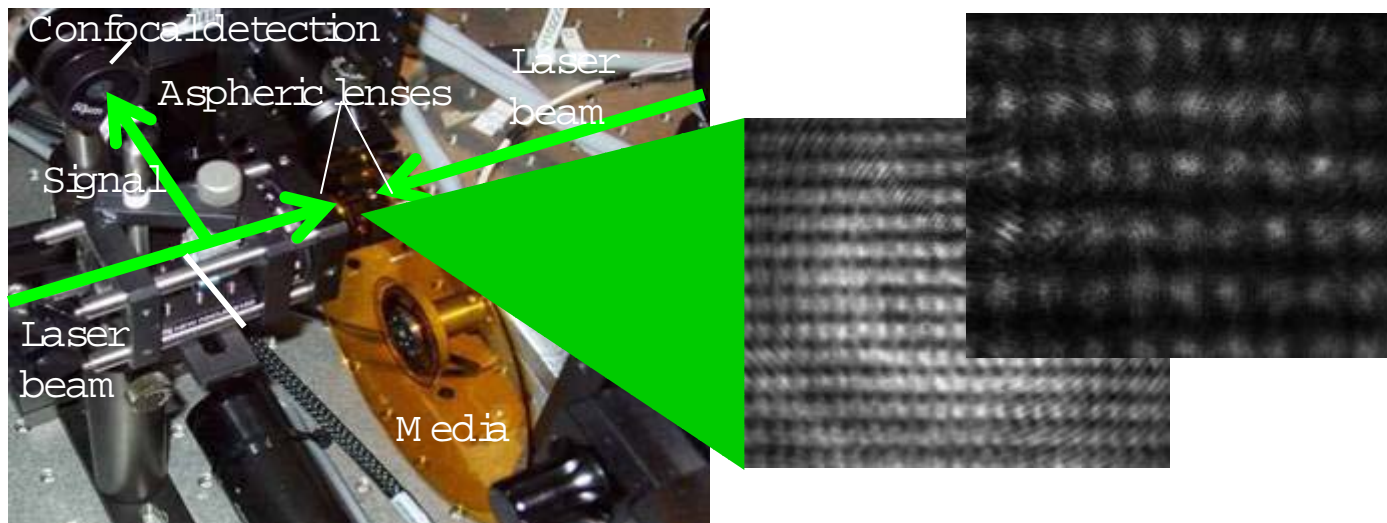


μ HDS: The Single Bit Approach



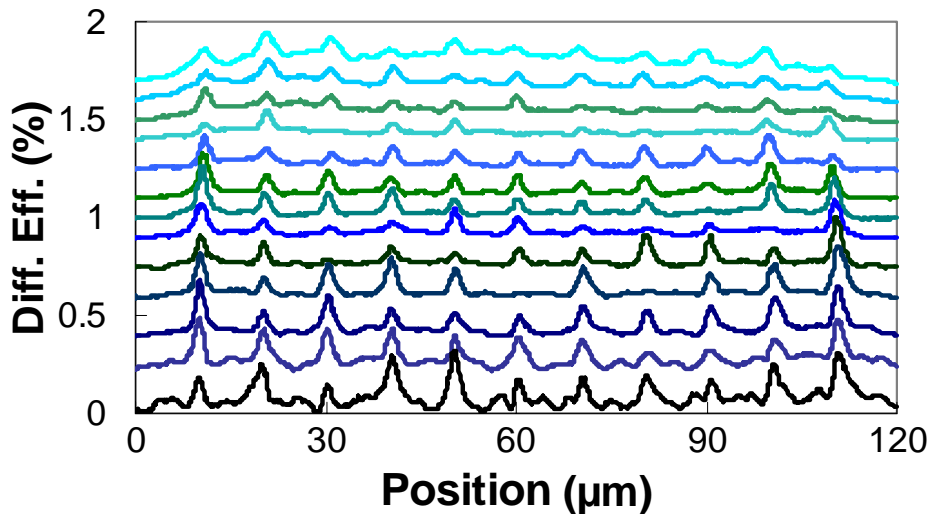
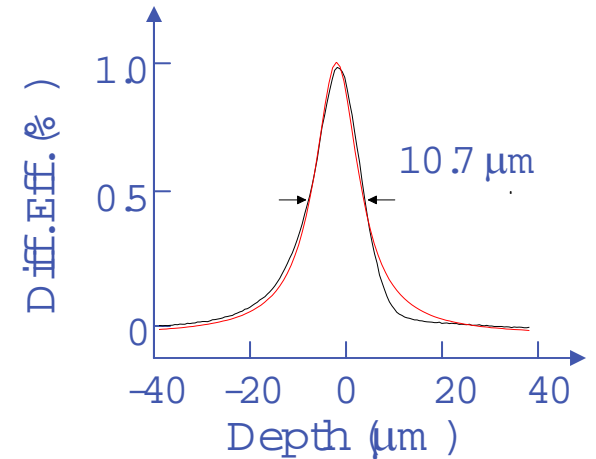
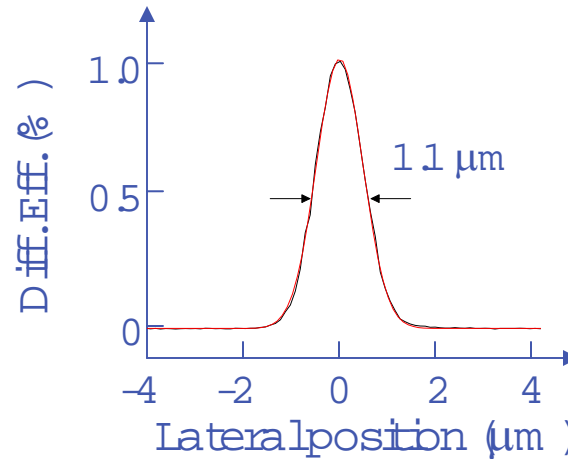
Utilize entire disc volume in layers:

- TB capacities
- More tolerant than conventional HDS
- Enables backward compatibility



Single-bit System Performance

- NA = 0.4 (DVD = 0.6)
- No aberration correction
- 532 nm
- Confocal detection: 30 μm aperture



- 3 μm bit spacing
- 13 layers @ 50 μm /layer
- $R_{\text{AVG}} = 0.1\%$

Density: > 1 Gbit/in²



@ 15 μm bit spacing
Density: > 4 Gbit/in²

Summary

- Novel GE thermoplastic holographic media
 - Injection-molded substrates
 - Current $M/\# \sim 3, M/\# > 20$ under evaluation
 - Sensitivity $> 100 \text{ cm}^2/\text{J}$
 - Demonstrated feasibility of fixing
- Developed single-bit robust storage systems
 - Capable of TB+ capacities
 - Manageable tolerances
 - Leverages/compatible with existing technology
 - Demonstrated $> 4 \text{ Gbit}/\text{in}^2$ ($\sim 5 \text{ GB}/\text{disc}$ user capacity)
- Developing customer/industry partnerships