Holographic and Fourth generation Optical Data Storage

Definition

The traditional methods of data storage, magnetic and optical, rely on each bit of data being stored as magnetic or optical changes on the surface of the medium. Holographic data storage works by recording data throughout the volume of the medium.

Why Holographic Data Storage?

The large amounts of data that could be stored on a single CD using holographic data storage could forever change how technology operates. A single holographic data storage cube is the size of a grain of sugar, and can hold more than a single terabyte of information. Magnetic and optical storage methods store data in a linear way, each bit is placed side by side. Holographic data storage can store bits in parallel, meaning many bits are stored layer upon layer.

Pros

- Holographic storage technology is based on writing data bits vertically instead of horizontally. The advantage is that, the entire volume of recording media is used for storing information.

- Unlike current storage technologies that record one data bit a time, holography allows more than a million bits of data to be written and read in parallel with a single flash of light.

- High 3D storage densities, fast transfer rates and durable media make holography the most likely choice for next generation data storage and processing needs.

- Long-term media stability and reliability is a compelling advantage for deep archiving purposes

- Holographic technology also provides portability, allowing the distribution of dense data that cannot be sent conveniently over networks, such as broadcast or high-definition video.
In conventional storage, data is recorded and retrieved serially. Holographic storage, on the other hand, uses the information capacity of an optical wave-front so that data can be recorded and retrieved in parallel, one page at a time. Due to the page-oriented nature of holographic storage, the potential exists for extremely high data rates.

Holographic storage also offers greater data transfer rates. Whereas magnetic and optical beam systems read information linearly, one bit at a time, holographic storage can read and write millions of bits of data in parallel. Instead of a relatively slow optical beam moving over bits of information, holographic storage writes data using a flash of light.

Cons

On the downside, early holographic storage drives will run in the £10,000 range, with media costing about £100 per disc. Holographic media capacity is also limited to about 300Gbytes. While this capacity is expected to grow substantially over time, it's hard to make a case for a 300Gbyte optical disc against readily available 1Tbyte hard drives.

Furthermore, the long-term reliability and readability of holographic drives is still unproven.

The technology has so far not been commercialized. Lack of compatibility with existing formats, high costs and other disadvantages have made the technology less attractive than tape and other alternatives.