

# VOLUME HOLOGRAPHIC DATA STORAGE

Special Topics in Physics

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Date: 23/06/2013

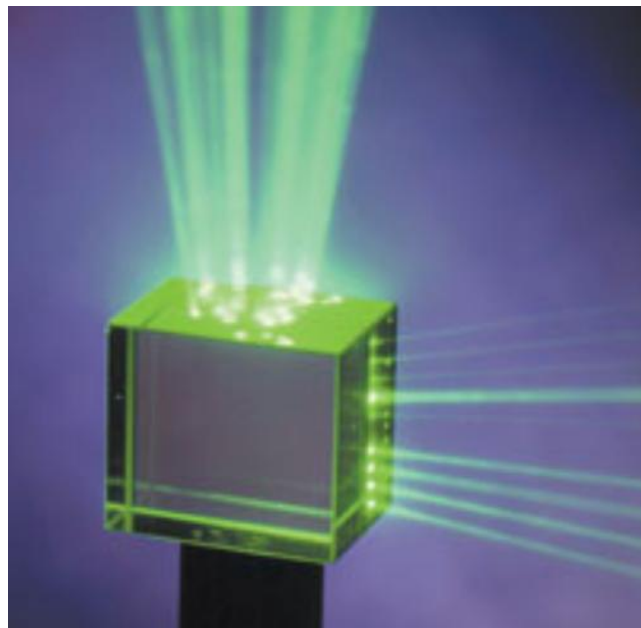
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## ABSTRACT

The size of the digital universe, i. e., the information created world wide, is increasing at an enormous velocity. In 2006, it contained  $1.288 \times 10^{18}$  bits [1], corresponding to 161 Exabytes (= 161 billion GB). In 2007 this number nearly doubled to 281 EB [2], and for the first time in history, more data was created than there was storage capacity available. Since then, the two numbers have been diverging more and more, exceeding 500 EB in 2012 [3]. The conventional storage techniques by means of hard disks, optical disks and magnetic tapes can not provide the steadily growing requirement for new storage capacity.

Holographic data storage with its promising properties such as high data density, short data access time, fast transfer rates and huge search capabilities has proven to outperform the conventional storage technologies such as DVD or Blu-ray disc storage. The approach of utilizing volumetric based storage allows to transfer entire data pages in parallel rather than serially, which does not only lead to very fast transfer rates but also provides new functions such as content related search mechanisms. By means of Bragg selectivity many data pages can be stored within the same medium by varying optical properties, such as the angle or wavelength of the light during recording.

In this talk the basic principles of holography and volume holographic data storage will be discussed and the historical development from the first hologram to the current status of holographic data storage technology will be presented. Finally an outlook will be given, discussing the current problems of this technique and its position on the future market.



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- [1] GANTZ, J. F. *et al.* The expanding digital universe: a forecast of worldwide information growth through 2010. *IDC White Paper* (2007).
- [2] GANTZ, J. F. *et al.* The diverse and exploding digital universe: An updated forecast of worldwide information growth through 2011.

- IDC White Paper* (2008).
- [3] GANTZ, J. F., REINSEL, D. & AREND, C. The digital universe in 2020: big data, bigger shadows and biggest growth in the far east - western europe. *IDC White Paper* (2012).
- [4] Graphic from *Nature*(422) (2013). URL <http://www.nature.com/nature/journal/v422/n6932/images/422556a-i1.0.jpg>.