Digital Sandwich: Tasty Terabytes

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The problem of storing large amounts of data is becoming more actual with the development of digital archiving technologies. Existing optical data storages almost reached the limit of the recording density. Our idea is to use self-focusing in a nonlinear media for creating opaque cone-like structures with size much smaller than the diffraction limit. The focus area can be located at different depths so that the presence of overlying cones does not interfere with access to underlying layers. Thus, the recording of information becomes multilayer looking like a sandwich full of digits. Reading of recorded information is performed by focusing a low-power laser diode radiation to a depth of the chosen layer, and the reception of the diffraction pattern onto a set of photocells. The records of cone-like structures were made on the samples of consumer organic glass with the use of short-pulse laser module. We obtained cones of various lengths that indicated the possibility of further increasing the capacity of the storage, recording more than two bits per every point. According to estimates of theoretically reachable density based on the possibility of using the near UV femtosecond laser for recording, we can write up to 46 GB/cm2. Thus, storage of CD size can hold 4.6 terabytes of information. The theoretical limit of record density noted above can be overcome in future, increasing the number of information layers, the number of bits per cone and using types of media with higher nonlinearity. Developed technology allows multiplying the density of data on digital storages, which can be used in long-term storing of huge volumes of information for example in libraries, banking archiving, digital modeling etc.

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