SHIMURA LAB.

[Holographic data storage and opto-magnonics]

Center for Photonics Electronics Convergence

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Applied Nonlinear Optics

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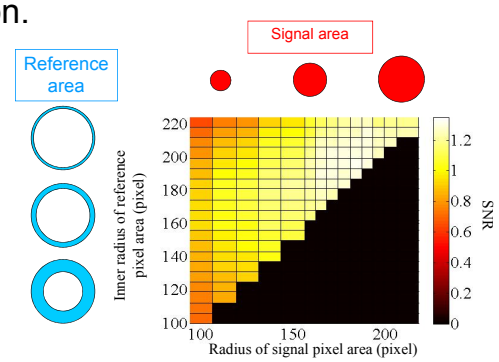
Holographic Data Storage

Volume holographic memory (VHM) is a high-density optical data storage system utilizing the principles of holography. The information is stored as a volume hologram and retrieved through the holographic reconstruction process. The VHM has a completely different recording system compared with the other conventional optical recording systems, like a DVD or Blu-ray. For example, thousands of holograms can be multiplexed in the same 1-cm^3 volume, and lots of data bits are simultaneously retrieved through the two-dimensional image reconstruction.

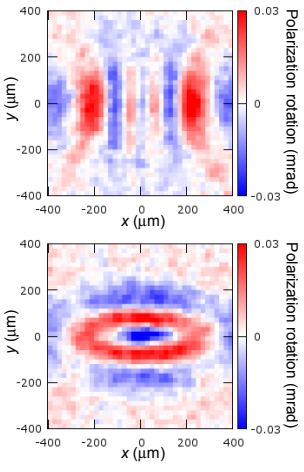
Especially, collinear holographic storage systems have significant advantages, such as a uniform shift selectivity and fairly large tolerances. However, no detailed theoretical analysis of such systems has been reported so far. We propose a fast calculation method of SNR considering a statistical property of the noise diffraction. Using this method, we optimize the signal and the reference patterns, and estimate the system limit of the storage density in collinear holography.



Dependence of the SNR on the reference and signal area. The total raw data capacity was set to be 10 TB/disk.

Opto-Magnonics: Ultrafast Spin Manipulation by Light Pulses

We investigate ultrafast coherent spin manipulation of magnetic materials by using femtosecond laser pulses and terahertz pulses. (Sub)terahertz spin precessions have been nonthermally induced by circularly polarized pulses. We also study imaging of spin wave propagation in ferrimagnets excited by light pulses. We propose a principle to synthesize spin wave by using a spatially shaped light pulse with circular polarization. We controlled the direction of the energy flow by shaping the light spot into an ellipse with its major axis parallel or perpendicular to the magnetic field.



Two-dimensional maps of spin wave emission. Longer side of the aperture was parallel and perpendicular to the magnetic field, respectively.