

FOR IMMEDIATE RELEASE

Development of high speed read technology for next-generation large capacity optical discs used in video and music archives

- Introduction of multi-level optical phase modulation technology used in optical communications -

Tokyo, May 25, 2010 --- Hitachi, Ltd. (NYSE : HIT/TSE : 6501, hereafter Hitachi) today announced a proposal for a 'phase multi-level read/write method' for high-speed read/write in increasingly large capacity of optical discs used to archive video and music, and successful experiments verifying the principle of the data read technology.

The 'phase multi-level read/write method' developed is based on micro-holograms*1 which have a higher compatibility with current optical discs than other next generation large capacity optical discs technologies. It utilizes original homodyne detection*3 technology, developed by Hitachi for optical discs to amplify signal detection using coherency of light*2, to enable multi-level recording*4 and achieve improvements in both storage capacity and data transfer rate simultaneously. In proof-of-principle data-read experiments, it was confirmed that a phase 8-level signal was able to be read. If this technology can be expanded to 32-level recording, it will be possible to achieve an optical disc system with more than ten times the data capacity and ten times faster data transfer rate than current Blu-ray Disc™s.

As the data volume of video and music archives is expected to continue increasing dramatically, further increases in data capacity of optical discs, such a CD, DVD, and BD, suited to long-term data storage, will be required. In order to achieve this, technology innovations in recording method to increase capacity and improvements in data transfer rate to realize shorter reproduction time, are essential. To improve recording methods, research on the multi-layer method which increases the number of recording layers, and the 3-dimensional recording method which records perpendicularly in a single layer, are being pursued. With both these methods, however, as the amount of information recorded in a single layer (areal density) of an optical disc remains unchanged, they do not lead to improvements in data transfer rate, thus raise the issue of increased read/write time due to increased storage volume.

To address this issue, Hitachi has proposed a 'phase multi-level read/write' method based on micro-holograms which can achieve sub-terabyte capacity while maintaining compatibility with current optical discs, and multi-level recording using optical phase information to achieve both increased capacity and improved data transfer rates. Details of the technology developed are as below.

1) Multi-level recording of optical phase information based on micro-hologram method

With the micro-hologram method which records optical interference patterns, it was determined through simulation that it was possible to record the optical phase information at the same time. Further, by modulating the optical phase according to the data to be recorded, that it was possible to perform multi-level recording.

2) Phase multi-level signal read technology using the coherency of light

Interference patterns with phase information are read using a laser beam by issuing two beams from the laser light source: one which is shone on the disc and reflected, and the other, as a reference beam to interfere with the reflected beam to obtain the phase information. This is an application of the original “homodyne detection technology” developed by Hitachi which amplifies detection signals using the coherency of light.

To verify the principle of the read method, an experimental system was prepared to generate pseudo multi-level signals such as that which would be obtained from an optical disc, and used in the multi-signal detection experiments. As a result, a signal with a small phase difference was able to be detected as a phase 8-level signal. These results show the possibilities for multi-level recording which can realize both larger capacity optical discs and higher data transfer rates simultaneously. Further work technological development will be conducted with view to practical application.

These results will be presented at the Optical Data Storage Topical Meeting 2010, being held from 23rd to 26th May 2010 in Boulder, Colorado, U.S.A.

- *1 Micro-hologram method: One technology for larger capacity optical discs using two optical beams to record interference patterns on a disc. It has high compatibility with conventional technology, and thus is able to reduce the cost of the media.
- *2 Coherency of light: Light is a type of electromagnetic wave, and has the properties of a wave. When two waves overlap, if the time delay of the wave (phase) is the same, then the waves strengthen each other's intensity; if the phase is opposite, then the waves diminish each other. This phenomena is known as light interference, and the striped patterns obtained from the interference are referred to as the interference patterns.
- *3 Homodyne detection: A method to amplify and detect light waves by causing interference between a strong reference beam and a signal beam before detection.
- *4 Multi-level recording: To record multi-bit information in a single recording mark.

■ About Hitachi, Ltd.

Hitachi, Ltd., (NYSE:HIT / TSE:6501), headquartered in Tokyo, Japan, is a leading global electronics company with approximately 360,000 employees worldwide. Fiscal 2009 (ended March 31, 2010) consolidated revenues totaled 8,968 billion yen (\$96.4 billion). Hitachi will focus more than ever on the Social Innovation Business, which includes information and telecommunication systems, power systems, environmental, industrial and transportation systems, and social and urban systems, as well as the sophisticated materials and key devices that support them. For more information on Hitachi, please visit the company's website at <http://www.hitachi.com>.

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