

## **Joint Development of an Optical Head for the Next-Generation Double-Sided 100-Gigabyte Memory DVD**

- Increased reliability with a single-objective lens and aberration compensation technology -

**Tokyo, Japan, October 11, 2001**-- Hitachi, Ltd. (NYSE: HIT / TSE: 6501) and Asahi Optical Co., Ltd. (TSE: 7750) today announced that they have jointly developed fundamental technology to achieve a high reliability high resolution optical head for the next-generation high density DVD (Digital Versatile Disk) using a single objective lens.

This technology significantly improves the reliability of the optical head, as well as making it possible to lower the cost of its production. It is expected to become basic technology in achieving the 12-cm (same size as current DVDs) double-sided 100-Gigabyte memory DVD.

The current DVD used in personal computers and information appliances has a diameter of 12cm, and a single-sided recording capability of 4.7 Gigabytes. To achieve increased capacity and density,

- 1) the use of a shorter wavelength light source in the optical head,<sup>(1)</sup>
- 2) higher resolution objective lens in the optical head,<sup>(2)</sup>
- 3) multi-layering of the disk recording film,<sup>(3)</sup>

are 3 key technologies which are being investigated in R&D. By applying such technology such as a shorter wavelength light source and higher resolution to next-generation high density DVD, a single-sided 12cm diameter disk with 25 Gigabyte capacity,<sup>(4)</sup> or by, using a double recording layer and a double-sided disk, that a 100 Gigabyte capacity disk can be achieved.

The current optical head for DVDs use a single objective lens, however as it was considered difficult to process a single-objective lens of high enough resolution for the next-generation DVD, the use of an upper and lower two lens combination was proposed. This method, however, requires the precise adjustment of a few microns between the lens as well as maintaining a gap of 0.15 mm between the optical head and the disk, leading to concerns about contact between the head and disk, and the difficulty in achieving high reliability.

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The technology developed is a convergence of Asahi Optical's glass-molding technology to produce a high-resolution objective lens, and Hitachi's aberration compensation system that automatically detects and corrects distortions in the light spot, and provides basic technology for a high resolution high reliability single objective lens for the optical head.

The objective lens developed by Asahi Optical, provides the same performance as a 2 lens set-up, however as there is only 1 lens, the adjustment process between the lenses becomes unnecessary. Further, the distance between the lens and the disk can be widened to 0.7mm, thereby reducing possible contact and thus increases reliability.

The aberration compensation method for the optical head, developed by Hitachi, allows distortions in the light spot, caused by irregular thickness in the high density DVD, inclination, slight distortion in adjustment of optical components, or other distortions caused over time by changes in temperature and humidity, to be corrected.

The above technology is scheduled to be presented at the International Symposium on Optical Memory (*ISOM*) to be held in Taipei, Taiwan from 16<sup>th</sup>-19<sup>th</sup> October 2001.

### **【Explanation of Terms】**

- Note 1: Shortening the laser light source wavelength: Currently in DVD drives, red laser-diodes (wavelength: 650 nanometers) are used as the light source in optical heads. Violet laser-diodes (wavelength: 400 nanometers), however, are expected to replace red laser-diodes as the read-write light source to achieve higher density in the next generation.
- Note 2: Higher resolution objective lens: As in microscopes, the numerical aperture (NA), which is sine value of the maximum incident angle of the focusing rays, indicates the resolution of the objective lens. The larger the NA value, the higher the resolution. The recording density of an optical disk is proportional to NA squared.
- Note 3: Multi-layering of the recording film: Multiple recording layers are used to increase the recording capacity of optical disks. Each layer is able to record and reproduce information independently. A double-layer DVD-ROM is already available on the market.
- Note 4: The recording density of a layer is increased approx. 2.6 times by shortening the wavelength of the light source from red (650 nanometers) to violet (400 nanometers), laser diode, and about twice by heightening the NA of the objective lens from 0.6 to 0.85. As an overall result, the recording density is increased by 5.3 times, compared to conventional DVDs.

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**About Hitachi, Ltd.**

Hitachi, Ltd., headquartered in Tokyo, Japan, is one of the world's leading global electronics companies, with fiscal 2000 (ended March 31, 2001) consolidated sales of 8,417 billion yen (\$67.9 billion\*) The company manufactures and markets a wide range of products, including computers, semiconductors, consumer products and power and industrial equipment. For more information on Hitachi, Ltd., please visit Hitachi's Web site at <http://global.hitachi.com>

\* At an exchange rate of 124 yen to the dollar.

**About Asahi Optical Co., Ltd.**

For the more than 80 years, Asahi Optical Co. Ltd. has always pursued new technologies which provide "greater satisfaction to customers," under the corporate slogan of "Light and Image."

Over the years, the company has diversified technologies, products and services into the optical, medical, ophthalmic, and information and communications fields. Thanks to originality and innovation, Asahi Optical was able to introduce numerous world-and industry-first technologies and products, which have made Pentax one of the most prominent brands of the globe.

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