FOR IMMEDIATE RELEASE

Succeeded in record-breaking 16-level per symbol 40 Gbit/s optical transmission
-- Enabling a four-fold increase of information transmitted across one optical fiber --

Tokyo, October 8, 2004 ---Hitachi, Ltd. (NYSE:HIT / TSE:6501), has succeeded in 40 Gbit/s optical transmission using 16-level per symbol multi-level modulation, the highest number of signal levels per symbol in high speed optical transmission to be reported to date, for application in next generation trunk line (inter-city) and metropolitan (intra-city) optical fiber networks. This was achieved by a Hitachi's unique amplitude and phase modulation method, enabling a four-fold increase in the amount of information which can be transmitted through one optical fiber. This will become basic technology for achieving large capacity optical networks in the future.

With the rapid development of the Internet, and proliferation of ADSL,[*1)] FTTH[*2)] and other broadband technologies, the amount of information traffic within and between cities can be expected to continue to increase. Even with optical fiber networks, increasing capacity is being required, and technology such as WDM[*3)] and increasing the speed of optical modulation have been considered. However, as these methods are approaching a limit,[*4)] increasing attention is being directed to the application of multi-level signal modulation technology, used in radio communication, where combinations of different signal amplitudes and phases, are used to transfer information. By using multi-level modulation, it is possible to double transmission capacity for four signal levels, triple capacity for 8 levels,[*5)] and quadruple capacity for 16 levels. In ultra high-speed optical transmission beyond 10 Gbit/s, however, as it was difficult to modulate and demodulate optical multi-level signals, more than 8 levels of optical multi-level modulation had not been achieved.

Given this challenge, Hitachi successfully developed a 16-level per symbol optical modulation/demodulation scheme, the highest number of levels to be reported yet. Details of the technology developed are as below:

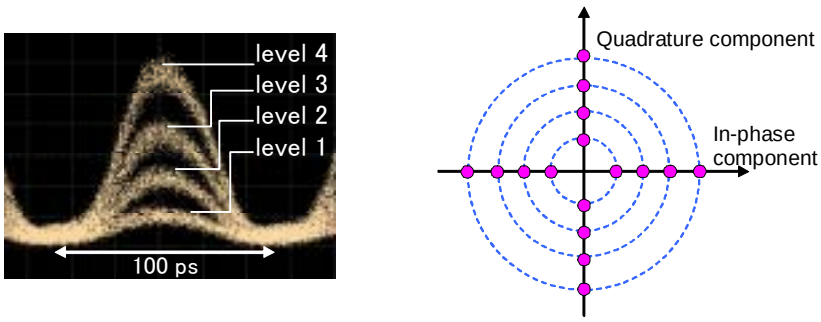
(1) Optical 16-level modulation technology

Until now, the highest number of signal levels in optical multi-level modulation was eight, achieved by Hitachi, by the combination of the four level phase modulation and the two level amplitude modulation. With this development, Hitachi proposed and succeeded in optical 16-level modulation for the first time in the world, by increasing the number of amplitude levels to four. It demonstrated the achievement of a highly effective multi-level optical modulation, which is an important milestone in approaching an efficiency level similar to sophisticated radio communication.

(2) Amplitude and phase co-modulation technology

One problem which needed to be overcome was that phase information of an optical signal, when the amplitude and phase were modulated by multi-level signals at the same time, could not be demodulated by strong signal interference. Hitachi developed a method of interference reduction by arranging the phase point of the signal on the concentric circles and making the amplitude and phase modulation components orthogonal to each other. This was the key to enabling practical demodulation of an optical 16-level signal.

Hitachi applied these technologies to 10 Gbit/s optical transmission, and demonstrated for the first time in the world, 40 Gbit/s optical transmission with 16-level multi-level optical modulation. The next step will be to demonstrate large capacity optical fiber communication using this technology, and the development of high efficiency multilevel modulation method, and low cost, compact optical multi-level transceiver modules. These results were presented at the 30th European Conference on Optical Communication (*ECOC 2004*), to be held from 6th - 9th September, in Stockholm, Sweden.



Optical waveform

Phase point arrangement / Signal constellation map

(4 amplitude and 4 phase levels)

Fig.1 Waveform of 40 Gbit/s 16-level per symbol optical signal and phase point arrangement

■ Notes

*1) ADSL (Asymmetric Digital Subscriber Line): A representative example of a broadband communication method for subscribers using ordinary/existing telephone lines. The technology enables high speed data transmission of several Mbit/s to several tens of Mbit/s, and is used, for example, for Internet access and IP telephones. Subscription is widespread with Japanese domestic users exceeding 10 million.

*2) FTTH (Fiber-to-the-home): A broadband communication method where optical fibers are installed directly into the home. The technology enables an extremely high speed data transmission achieving 100 Mbit/s, and is used for Internet access and video distribution. Subscription is rising with Japanese domestic users exceeding 1 million.

*3) WDM (Wavelength Division Multiplexing): Technology to transmit a large amount of data by sending optical signals of different wavelengths along one optical fiber at the same time. At the wavelength used in optical transmission (1.5 microns), it is possible to transmit a maximum of more than 100 different wavelengths.

*4) Issues in increasing capacity in optical fiber transmission:

In the past, higher capacity transmission was achieved mainly by increasing the number of signal wavelengths or increasing the modulation speed of optical signals. The number of signal wavelengths, however, has reached a limit as bandwidth is restricted by the gain-bandwidth of optical fiber amplifiers installed along the optical fiber transmission line. On the other hand, while a high-speed practical modulation speed of 40 Gbit/s has already been achieved for optical signals, modulation speed also cannot be increased as the frequency bandwidth of optical signals would also increase and interfere with optical signals at adjacent wavelengths. Thus, it was thought that the limit had been reached the data transmission capacity of one optical fiber.

*5) Technical Paper

Shigenori Hayase, Nobuhiko Kikuchi, Kenro Sekine, and Shinya Sasaki, “Proposal of 8-state per symbol (binary ASK and QPSK) 30-Gbit/s optical modulation / demodulation scheme,” ECOC 2003, Th2.6.4 (presented September 2003).

About Hitachi, Ltd.

Hitachi, Ltd., (NYSE:HIT/TSE:6501) headquartered in Tokyo, Japan, is a leading global electronics company, with approximately 326,000 employees worldwide. Fiscal 2003 (ended March 31, 2004) consolidated sales totaled 8,632.4 billion yen ($81.4 billion). The company offers a wide range of systems, products and services in market sectors, including information systems, electronic devices, power and industrial systems, consumer products, materials and financial services. For more information on Hitachi, please visit the company's Web site at http://www.hitachi.com.

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