

AT&T INNOVATION BRIEFS

Innovation Briefs are summaries of recent discoveries and developments within Bell Labs. AT&T readers who would like to contribute future items are encouraged to contact the Technical Journal editor.

Building Infrastructure for Cellular Digital Packet Data

AT&T recently became the first wireless infrastructure vendor to offer a complete array of Cellular Digital Packet Data (CDPD) products. Although they are designed to complement AT&T's Advanced Mobile Phone Service premiere product line, the Autoplex[®] System 1000, the CDPD products are flexible enough to enable cellular service providers to deploy wireless packet data services over any existing cellular network. A cellular digital technology, CDPD transmits data packets across one or more existing channels in the cellular network in short bursts during idle time. Key to the technology is the use of a packet-switching approach, rather than traditional circuit switching, for data transmission. Packet switching allows network resources to be shared among many users. Portable computers are the fastest growing segment of the computer industry, and cellular is expected to make this segment even more popular. Industry sources expect between four and five million data users in the next few years; at least 25 percent of all cellular traffic is expected to be data by the year 2000.

Hobbit Chip Sets Enhance Personal Communications Capabilities

AT&T Microelectronics recently expanded its 92K Hobbit[®] family of microprocessors and support chips targeted primarily for manufacturers of personal communicators — a new generation of small, mobile devices that integrate voice, data transmission, and reception in a single unit. The new chip sets deliver increased levels of chip integration, higher performance with lower power, and a wider range of price and performance qualities. Based on Bell Labs research begun 12 years ago, the Hobbit development allowed AT&T to become the first manufacturer to address the personal communicator market with a complete silicon solution. Announced in late 1992, this first generation Hobbit family was powered by the ATT92010 microprocessor, a high-performance central processing unit that consumes very little power. The new extension to the Hobbit family, which goes into production early in 1994, is built around the ATT92020S processor, which offers enhanced performance. As a result, the new chip set makes cellular-phone-size personal communicators a reality, and moves the industry a major step closer to creating devices with 24-hour battery life. A key feature of the chip set is a “wait-for-interrupt” instruction. This feature enhances power management by enabling the operating system to put the Hobbit processor “to sleep” when not in use.

Single Molecules Observed by Near-Field Scanning Optical Microscopy

Bell Labs researchers have demonstrated a technique for detecting and identifying single molecules with more than 100 times the sensitivity of any previously known method. Equally important, they've also demonstrated for the first time the ability to display images of the distribution of the molecules on a surface, while simultaneously measuring their orientations. The advances, which may have important applications in molecular engineering, chemistry, cell biology and genetics, were achieved using a novel "near-field" scanning optical microscope. The microscope funnels a light beam, which is used to detect the molecules, through a tapered optical fiber with an opening only 100 billionths of a meter wide — or about 1,000 times smaller than the diameter of a human hair. This technique reduces the measured volume of a sample to the point at which single molecules can be detected repeatedly, and with dramatically improved sensitivity. It also resolves a problem that has long plagued scientists working on single-molecule detection: the masking of the optical signature of a target molecule by the much larger background "haze" from the rest of the measured volume. This background has been minimized by focusing the probe beam to a smaller size. In conventional lenses used for this purpose, the minimum probe volume is limited to dimensions on the order of the wavelength of the probe light, or about a billion times larger than the molecule itself. But the tapered fiber probe, with its smaller beam, is the key element in the near-field scanning optical microscope, which is capable of producing images at a resolution at least 20 times that of the best conventional optical microscopes.

Near-field optical image (left) of single molecules spread on a surface, revealing various patterns depending on the molecular orientation. Such data can be interpreted to result in a molecular dipole map (right).

