TOSHIBA REVIEW

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Special Reports

Toward Third-Generation Mobile Communications for Mobile Phones

Realizing the Ubiquitous Society with Third-Generation Mobile Phones
OKAMOTO Kosei

Approach to Evolving 3G Mobile Phones
NANNICHI Toshihiko
Third-generation (3G) mobile phones have shown rapid growth as personal terminals for the ubiquitous network era with the realization of high-speed data communications, global roaming, and high-quality voice communications. Various applicable services have appeared, such as a payment system using contactless IC technology. In addition, the latest technologies including compatibility with other wireless methods such as Bluetooth™ and wireless LAN (W-LAN) are also required.

Toshiba is actively working on the development of 3G mobile phones and has been launching wideband code division multiple access (W-CDMA) and CDMA2000 handsets. We will continue to supply ever-evolving mobile phones to the market by developing and implementing the latest core technologies for advanced services.

Vodafone 902T W-CDMA Phone
GOTO Hiroyuki / GOTO Takashi / HIRAI Masato
Higher functionality for cellular phones requires third-generation (3G) technology. The Vodafone Group encourages the development of 3G convergence models that can be used in more than 100 countries. The Vodafone 902T wideband code division multiple access (W-CDMA) phone is the most advanced model that Toshiba has developed. It features dual-mode technology, which improves radio frequency coverage; video telephony technology, which requires simultaneous data and voice communication; and multimedia messaging services (MMS) functionality, which enables users to send and receive slide-format mail with pictures, video images, or music attached. The "Active Turn Style" dual-hinge mechanical structure of the phone also improves camera usability.

W31T CDMA2000 1xEV-DO Cellular Phone for Japanese Market
KATAYANAGI Masanori / DAI Hiroyuki / MAKINO Hiroshi
The CDMA2000 1xEV-DO (code division multiple access 2000 1x evolution data only) service was launched by the Japanese service provider au in November 2003. In response to this service, Toshiba commercialized the W21T cellular phone for the Japanese market in November 2004, which received favorable evaluations. Large-volume contents can be downloaded with a maximum forward link communication speed of 2.4 Mbps, which is the main feature of this service, enabling users to enjoy 3D games, high-quality music, and so on. On the other hand, the size of this model is comparatively large due to the installation of various features.

We have now developed the W31T model, which is the latest CDMA2000 1xEV-DO cellular phone for the Japanese market. Despite having even more features than the preceding W21T model, the W31T is only 20 mm thick, making it the thinnest model of this baseband series in the Japanese market (as of May 2005).

Platform Software for Mobile Phones
INOUE Sakae
The volume of software for mobile phones continues to increase with the expansion and evolution of both carrier-specific services and device vendor-specific services. As a result, it is necessary to develop software more efficiently while maintaining software quality.

To meet these requirements, Toshiba has constructed the "Toshiba Framework Plan" composed of the following three elements: improvement of porting, improvement of maintenance, and improvement of openness. The Toshiba Framework is evolving together with not only Toshiba applications but also other software platforms provided by software vendors. It is important to design software mechanisms that control both the Toshiba Framework and the software platforms of software vendors in a coordinated manner.

Multimedia Technologies for Convergence of Telecommunications and Broadcasting
AKIMOTO Satoshi / MASUDA Isao / UNOKI Yasushi
As third-generation (3G) cellular phones become increasingly widespread, remarkable progress is being made in broadband media services such as video telephony, movie downloading, and streaming.

Toshiba has developed a new "Mobile Turbo" series of multimedia LSIs that make it possible to upgrade various products for multimedia services. In addition, we consider our synchronous control and error handling technologies to be key elements of such multimedia services. We are providing multimedia services that offer greater satisfaction to users by implementing these technologies for cellular phones.

Multiband Internal Antenna Technology
AMANO Takashi / SATO Koichi / MIZOGUCHI Satoshi
The evolution of mobile phones has also led to a remarkable evolution in antenna technologies. Antennas for mobile communications must respond much more closely to the effects of the surrounding environment than antennas for fixed communications. Moreover, the recent demand for internal antennas has resulted in even further advancements in the design technology.

Toshiba has developed a multiband internal antenna aimed at third-generation mobile phones. The newly developed antenna realizes half the mounted volume as well as a 2 dB improvement in antenna efficiency.

Key Technologies for Mobile Terminals in Future Wireless Communication Systems
DEGUCHI Noritaka / SATO Kazumi / KOBAYASHI Takahiro
Higher data rates and higher capacity are expected features of the coming next-generation wireless systems. Another expected feature is seamless access to plural systems. On the other hand, mobile terminals for such enhanced systems tend to be complicated.

Toshiba has therefore developed a multiple input multiple output (MIMO) receiver with group detection and layered architecture for a software-defined radio modem that respectively reduce the amounts of digital signal processing and software processing. These technologies achieve reductions in both the complexity and the power consumption of the mobile terminal.

Feature Articles

Liquid Light-Emitting Display
MIZUNO Yukitami / SAITO Nobuyoshi / ENOMOTO Shintaro
Electrogenerated chemiluminescence (ECL) is created by applying alternating current (AC) to an emitting solution. This luminescence phenomenon should avoid the short-life problem caused by the accumulation of ionic impurities on electrodes in organic electroluminescence (EL), which is created by applying not AC but direct current (DC). Toshiba has found that the response time for luminescence of the polyfluorene compound poly[9,9?-bis(3,6-dioxaheptyl)fluorene-2,7-diyl] (PBDOHF) is faster than that for rubrene by considering the mechanism of ECL and the results of a comparison experiment. Based on the results of spectrum measurements of ECL material (polyfluorene compound), the luminescent color can be expected to be controlled by changing the conjugation length in the molecular structure for full-color display applications.

Universal Simulator for Railway Systems with New Energy Supply System
MIYOSHI Miyako / TAIRA Masato / HASEBE Toshio
Although railways are generally considered to be an energy-saving form of transportation, various efforts have still been made to reduce their power consumption. One such example is the application of energy storage devices to the train system or substations. Regenerative braking, which recycles electric power through the overhead wires, is in practical use in railway systems, particularly when many trains are in operation. However, the recycling of electric power is not fully effective when fewer trains are running, and in such cases the installation of energy storage devices on the train cars is a highly promising means of energy saving. It is assumed that differences in energy requirements in railway systems depend greatly on the transportation conditions. Therefore, when considering the architecture of a power supply system, it is necessary to calculate the power requirements based on these differences in transportation conditions.

Toshiba is developing and utilizing computer simulation technologies and software systems for this purpose.

Frontiers of Research & Development

Lifetime Projection of HfSiON as Alternative High-Permittivity Gate Dielectric
Flatbed Autostereoscopic Media Creating New Visual Expression
Improving Descriptions of Medical Reports Using Text Mining