

DoCoMo's Exhibits for Telecom '99

DoCoMo participated in Telecom '99 held in Geneva (Switzerland) in October 1999, as one of NTT group companies. DoCoMo had demonstrations using radio of W-CDMA Visual Phone, and gave visitors a great impression of DoCoMo brand as well as appealed its high technology development ability.

This exhibition was aimed to seize a chance for future business, featuring the demonstration of the next generation mobile communications system, W-CDMA and introducing i-mode which has been spreading explosively in Japan. It also introduced DoCoMo's open attitude toward international procurement.

This paper describes how our products, forum and publicity activities went in Telecom '99.

Michiko Takano, Masami Kawasaki, Shuji Tachibana, Tomoaki Hirayama, Shogo Ito, Takeshi Yoshimura, Hideki Okimoto, Ryo Yasumura, Kohei Kajimoto and Miki Nakajima

Preface

The Telecom has been sponsored by ITU (International Telecommunication Union) and was first held in 1971. This is 8th time of the event which can be said as "Olympic of Communication Field". It is held every four years likewise the Olympic Games, and is the biggest event in which telecommunication carriers and the manufacturers from all over the world gather.

Having a theme, "Join The World", the world's communication carriers and vendors competed with each other in cutting-edge technologies, and proposed new business models such as solution for management revolution led by information communication technology at each booth. Total number of participating companies were nearly 1,200 and number of visitors were about 180,000, which showed that it attracted a great deal of people of the whole world.

The reason why this exhibition draws world's attention is that the latest technology and solution proposals being introduced here will be practical soon within a few years, thereby it is a significant place for negotiations as well as for grabbing a future business chance for the participating companies. Each company of course lined up the very best of its products and experts to explain, attracting visitors with elaborate presentations. It also involves important decision-making talks since communication Ministry/Agency officials and related corporation executives would gather from all over the world. This event is quite indispensable for communication industry from business strategical point of view.

DoCoMo got this chance as a perfect time for appealing W-CDMA, which was approved as World Standard, and regarded this as the place to show the results of our elaborate study of W-CDMA technology, and strongly demonstrated market potentials of W-CDMA appealing not just its advanced technology. We could make an impression that Mobile Multimedia in IMT-2000 would be promising, by introducing i-mode which has been quite popular in Japan showing a business model for wireless Internet.

Overall Configuration of the Exhibition

DoCoMo displayed products occupying a corner of NTT booth as shown in Picture 1. The display consisted of stage demonstration and system exhibition. Stage demonstration



Picture 1 DoCoMo Stand in Telecom '99

was performed for ten minutes at every hour by a pair of presenters as well as by playing videos inbetween on the stage where large video display was equipped. The live presentation consisted of introductions of the company and its corporate visions, W-CDMA technology, an assuming application, a figure for international roaming and introduction of Visual Phone. Our plan was to gain expectation toward DoCoMo's technology as well as to improve acknowledgment of our brand, and to guide to the exhibited systems. The system being displayed was intended not only to be just a static mock-up but also to let visitors experience W-CDMA by using actual prototype terminal with the latest technology, so that they could feel that the development was about to reach its practical stage.

Demonstration Systems of W-CDMA Mobile Stations

System configuration is shown in Figure 1. This system is structured to fulfill demonstration objectives described below.

- ① To appeal DoCoMo's high level W-CDMA radio technology and downsizing technology of mobile station.
- ② To provide the environment where visitors can experience Video phone, Web access and speech communication by means of W-CDMA.
- ③ To support W-CDMA technical explanation by providing Visual Phone at stage show.

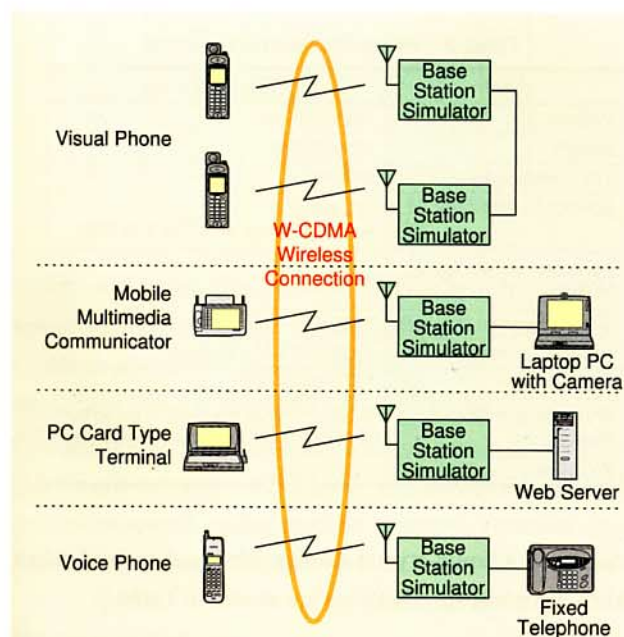


Figure 1 W-CDMA Mobile Station Demonstration System Configuration

We appealed DoCoMo's high technical level of W-CDMA demonstrating Video phone, Web access and speech communication by emitting radio wave into space according to the specifications of W-CDMA air interface [1]. We also presented simulators of Base Station in order to emphasize wireless connection.

■ Visual Phone Demonstration System

Video phone demonstration was put into practice by connecting two Visual Phones via BS simulator. In this case, presenter and visitor, or visitor and visitor connected each other so that visitors themselves could experience the demonstration. Effect of the demonstration enhanced more by using Visual Phone at the stage presentation.

■ Mobile Multimedia Communicator Demonstration System

MMC (Mobile Multimedia Communicator) and BS simulator were connected by wireless in order to demonstrate Video phone communication between MMC and PC that was connected to BS simulator in LAN. In this case, visitors communicated each other so that they could experience the demonstration.

■ PC Card Type Terminal Demonstration System

PC card type terminal and BS simulator were connected by wireless (provided coaxial cable shall be used) in order to access WWW server connected to BS simulator in LAN. English version of DoCoMo Home Page was prepared in the WWW server and the corporate outline and YRP were introduced for promoting demonstration effect.

■ Voice Phone Demonstration System

Voice Phone and BS simulator were connected by wireless (provided coaxial cable shall be used) in order to demonstrate speech communication with a fixed telephone connected to BS simulator. Accordingly, we aimed at having visitors recognize high voice quality as well as compactness of mobile stations.

Exhibitory Equipment of W-CDMA Mobile Station

This exhibition is composed of demonstrations using W-CDMA experimental prototype equipment [2]. Through these demonstrations, we successfully impressed on visitors from all over the world DoCoMo's state-of-the-art W-CDMA radio technology and the ability to realize such compact

Table 1 Characteristics of W-CDMA Exhibitory Equipment and the Demonstration Details

Device	Characteristics, Appeal point	Demonstration detail
Visual Phone	<ul style="list-style-type: none"> Portable moving image transmission terminal Mobile phone with a built-in Video phone function MPEG-4 transmission technology 	<ul style="list-style-type: none"> Video Phone connection between a pair of Visual Phones Demonstration through BS simulator Wireless connection by emitting radio wave into space
Mobile Multimedia Communicator	<ul style="list-style-type: none"> PDA integral terminal Harmonization of PDA and W-CDMA mobile station PDA with a built-in Video phone function 	<ul style="list-style-type: none"> Mobile Multimedia Communicator-Transmit images to PC Demonstration through BS simulator Wireless connection by emitting radio wave into space
PC Card Type Terminal	<ul style="list-style-type: none"> PC card type terminal for data High affinity for PC Built-in PCMCIA interface 	<ul style="list-style-type: none"> Web access from PC card type terminal Demonstration through BS simulator Wireless connection by coaxial cable
Voice Phone	<ul style="list-style-type: none"> Portable terminal for speech Downsize of W-CDMA terminal High quality speech (CS-ASELP) 	<ul style="list-style-type: none"> Connection between terminal and fixed phone for speech Demonstration through BS simulator Wireless connection by coaxial cable
Conceptual Mock	<ul style="list-style-type: none"> Utilization image mock State of future usage State of usage by each purpose 	<ul style="list-style-type: none"> Display mock for operating on the screen (two types) Static display (nine types)

mobile stations, and showed future potentialities of W-CDMA market by demonstrating various application terminals. We also showed future W-CDMA utilization images by displaying conceptual mocks as well.

Table 1 indicates characteristics of W-CDMA exhibitory equipment and the demonstration details.

■ Visual Phone (Picture 2)

It realizes two-way communication of video phone at the bit rate of 64kbit/s, which is based on cellular phones. Communication protocol is H.324, moving image coding method is the latest MPEG-4 and speech coding method is CS-ASELP (in accordance with ITU-T G.729) at the rate of 8kbit/s which is also used for voice phone. Transmission rate for moving image is 48kbit/s, enabling to send ten frames at the maximum (static image) or 7~8 frames at the average (dynamic image) per second in case number of pixels is QCIF (176×144dots). It is about 283g in weight and about 257cc in volume and has a camera and a color liquid-crystal display. Head-set is used when talking. Terminal specifications are given in Table 2.

■ Mobile Multimedia Communicator (Picture 3)

This terminal is composed of W-CDMA mobile station and PDA (Personal Digital Assistant) realizing two-way communication of video phone at transmission rate of 64kbit/s. H.323 is adopted for communication protocol, H.263 which is the communication protocol for ISDN multimedia currently being used is adopted for moving image coding method and ADPCM (Adaptive Differential Pulse Code Modulation) whose rate is 16kbit/s is used for speech coding method. Transmission rate to be required for sending moving images is 32kbit/s, enabling to send four frames at the average. It is about 800g in weight and about 860cc in volume, and has a



Picture 2 Visual Phone

Table 2 Visual Phone Specifications

Item	Specifications
Volume	About 257cc
Weight	About 283g
Transmission Rate	64kbit/s
Speech Coding Method	CS-ASELP (in accordance with ITU-T G.729)
Dynamic Image Coding Method	MPEG-4
Communication Protocol	H.324
Number of Pixels	QCIF (176 × 144dots)
Camera	CCD camera
Transmission Output Power	0.3W (0.1W at the time of exhibition due to a restriction of radio license)
Frequency Band	2GHz band

camera and a liquid-crystal display. Head-set is used when talking. Terminal specifications are shown in Table 3.

■ PC Card Type Terminal (Picture 4)

This is a terminal only for data communication which was



Picture 3 Mobile Multimedia Communicator

Table 3 Mobile Multimedia Communicator Specifications

Item	Specifications
Volume	About 860cc
Weight	About 800g
Transmission Rate	64kbit/s
Speech Coding Method	ADPCM (16kbit/s)
Dynamic Image Coding Method	H.263
Communication Protocol	H.323
Number of Pixels	SQCIF (128 × 96dots)
Camera	CCD camera
Transmission Output Power	0.3W (0.1W at the time of exhibition due to the restriction of radio license)
Frequency Band	2GHz band

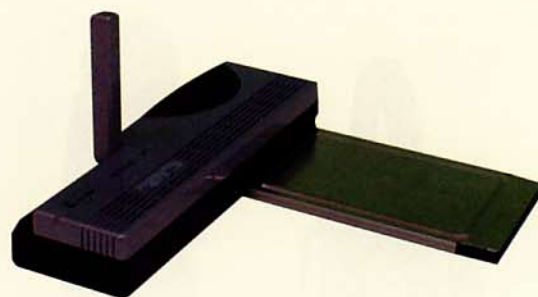
unified with PCMCIA card and W-CDMA radio part, and is aimed at downsizing the terminal. It sends unrestricted data at the rate of 64kbit/s and is used by inserting to PC card slot. Table 4 shows terminal specifications.

■ Voice Phone (Picture 5)

This was specialized only for speech communication function, and was displayed to show feasibility of compact W-CDMA terminals. It is a small-size terminal about 93g in weight and about 93cc in volume, but has a high quality in speech communication. CS-AELP with 8kbit/s (ITU-T G.729) is adopted for speech CODEC as it's an experimental prototype, but GSM-AMR (Global System for Mobile Communications-Adaptive Multi Rate) which is 3GPP standard shall be used at the time of commercialization, so preferable speech quality shall be expected. Terminal specifications are shown in Table 5.

■ Conceptual Mocks

They were prepared on the assumption that they might be used at the time of commercial service, and were displayed



Picture 4 PC Card Type Terminal

Table 4 PC Card Type Terminal Specifications

Item	Specifications
Volume	About 130cc
Weight	About 156g
Transmission Rate	64kbit/s
Transmission Output Power	0.3W (0.1W at the time of exhibition due to the restriction of radio license)
Frequency Band	2GHz band



Picture 5 Voice Phone

Table 5 Voice Phone Specifications

Item	Specifications
Volume	About 93cc
Weight	About 93g
Transmission Rate	8kbit/s
Speech Coding Method	CS-AELP (in accordance with ITU-T G.729)
Transmission Output Power	0.3W (0.1W at the time of exhibition due to the restriction of radio license)
Frequency Band	2GHz band



Picture 6 Conceptual Mock

in order to show potentiality of W-CDMA. We gave visitors an understandable image by providing various conceptual mock-ups. One example was a set of wrist watch-type screen and mobile phone (suppose Bluetooth shall be used between them) which reproduced images on the screen from a DVD player (Picture 6).

Base Transceiver Station

In this Telecom, we presented lots of demos of W-CDMA terminals and service applications as well as BTS (Base Transceiver Station) (Picture 7) in static status, in order to give visitors more precise image of W-CDMA. The BTS however, is an equipment for system experiment. Table 6 shows parameter for the BTS for W-CDMA system experiment.

■ BTS (for System Experiment)

BTS for system experiment being displayed is 1800mm in height, 800mm in width and 600mm in depth, and accommodates five functionality — CONT part, HW-IF part, BB part, TRX part and AMP part — which the downsizing has already been underway.

We have completed various function tests so far in the equipment for system experiment such as service application demonstration tests of 8kbit/s speech communication, of 64kbit/s, 128kbit/s and 384kbit/s unrestricted digital and packet communications, transmission output power control and handover, etc. We could therefore, appeal the world the development ability of DoCoMo, tremendous capability and reality of W-CDMA, by showing the system experimental equipment which has the same size with a commercial equip-



Picture 7 BTS for System Experiment

Table 6 BTS Specifications

Item	Specifications
Size	Height : 1,800mm, Width : 800mm, Depth : 600mm
Weight	460kg
Frequency	2GHz band
Bandwidth	5MHz
Sector	6 sectors
Modulation Method	Data : QPSK Spreading : QPSK
Chip Rate	4.096Mcps
Speech CODEC	ITU-T G.729 (CS-ACELP)
Inter-BS Sync.	Asynchronous
Channel Volume	Max. 300chs (8kbit/s speech conversion)
Transmission Rate	8kbit/s (speech) 64kbit/s, 128kbit/s, 384kbit/s (unrestricted digital) ※ 384kbit/s is multi-code transmission Max. 157.6kbit/s × 3 (packet)

ment.

DoCoMo also conducts asymmetrical transmission and dynamic image transfer test using MPEG4 in the system experimental equipment, so the connection between W-CDMA mobile station and application, and BTS could be imaged more concretely for Visual Phone demo.

MPEG-4 Related Items

As one of the key applications in W-CDMA, MPEG-4 experimental systems were displayed (Picture 8). MPEG-4 is an audio/visual coding standard with high compression rate and advanced functions. Since MPEG-4 enables low-bit rate transmission under 100kbit/s, and has strong error resilience, it was determined to be Multimedia coding method in W-CDMA. We showed abilities of W-CDMA and MPEG-4 in the Telecom '99 through MPEG-4 experimental



Picture 8 Outlook of MPEG-4 Experimental System Display

systems described below.

■ Two-Way Real-Time Demo

We demonstrated two-way and real-time MPEG-4 transmission. Input signals from video cameras and microphones are coded to MPEG-4 bit streams and then transmitted via W-CDMA channel simulator. The system configuration is shown in Figure 2. It was emphasized that visual communications such as video conference and remote monitoring, as well as existing voice or text communications, are feasible in W-CDMA. This demonstration also showed that high quality video transmission could be achieved by MPEG-4 error resilient technology even in error-prone environments.

■ Client-Server Demo

MPEG-4 Client-Server demonstration was performed, supposing Video On Demand service or Multimedia On Demand service shall be used. Figure 3 shows the system configuration. We showed several scenes of "DoCoMo concert" in order to assure feasibility of distribution services of high quality video and music.

■ MPEG-4 Video Phone

Laptop PCs equipped with MPEG-4 video phone system were displayed (Picture 9). They represent that MPEG-4 chips have already been implemented into such small equipment, and that the video telephony is possible in outdoors with these small PCs through W-CDMA.

Pursuit of i-mode

This was the third time that "i-mode" was displayed in overseas exhibition after the CeBIT '99 (Germany) and Communic Asia '99 (Singapore).

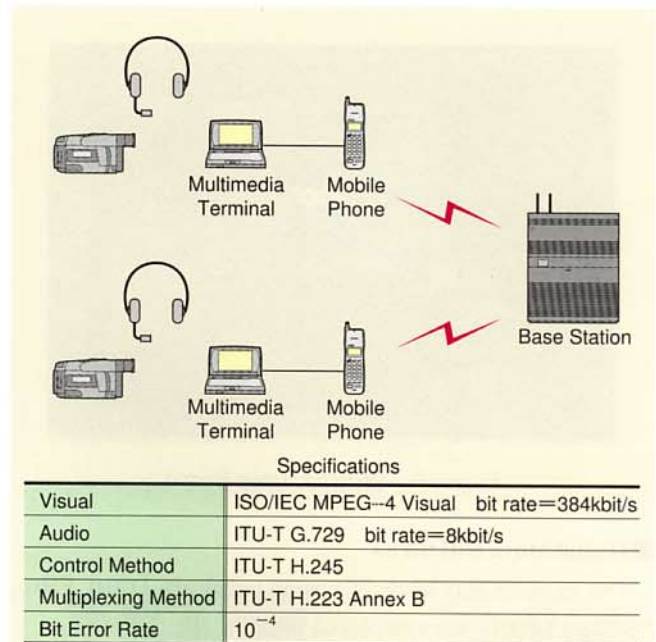


Figure 2 Configuration of Two-Way Real-Time Transmission Demo System

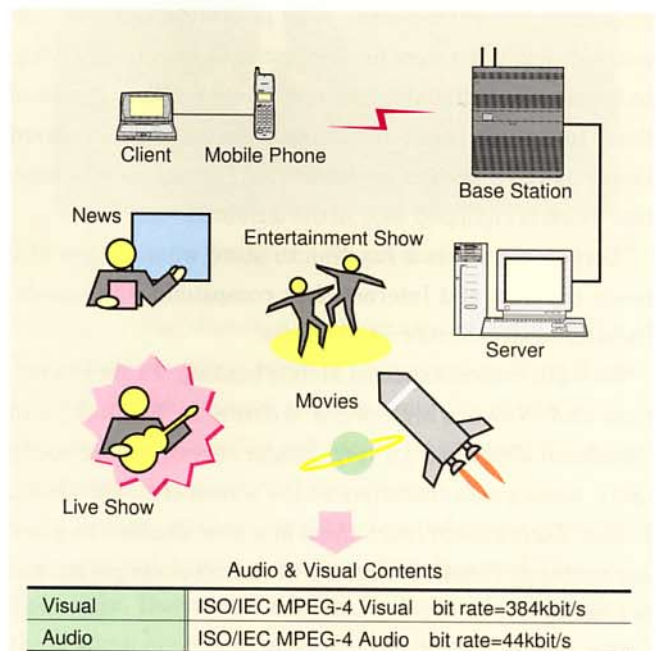


Figure 3 Configuration of Client-Server Type Transmission Demo System

"i-mode" has been gaining public favor in Japan since its service was started on February 22, 1999, and the total number of subscribers exceeded two million on October 18. We can say that it is well-known more than enough in Japan, but still not enough in overseas. We therefore participated this time in Telecom '99 to make "i-mode" known to many more people.



Picture 9 MPEG-4 Video Phone

■ Digital Mova 501i Series

The existing four kinds of i-mode terminals- D501i, F501i, N501i and P501i, were displayed (Picture 10).

Visitors were not able to use or experience each content of the terminals since GSM (Global System for Mobile Communications) is adopted in Switzerland. Primarily i-mode is "a product to touch", that is, you can grasp its convenience and enjoyment for the first time by actually trying, so it was very regrettable that they could not have a taste of them. In order to promote understanding and interest toward i-mode in the Telecom, we introduced "screen memo" function which is equipped with all the terminals.

"Screen memo" is a function to store whole pages of i-mode contents and Internet sites compatible with i-mode. Each terminal can store 5 to 20 items.

We input contents such as Mobile banking, Ticket reservation and News which were written in English, and "Itsudemo Charappa", a very popular service among young users, putting cute characters on the screen of mobile phone, so that visitors could touch them in a near situation to a real environment. Thanks to this, lots of visitors could get the feel of i-mode.

■ Next i-mode Terminals with Color Liquid-Crystal Screen

As monochrome screens of laptop PC and PDA were replaced by color screen, the same wave surged in terms of liquid-crystal screen of mobile phone. Terminals with color liquid-crystal screen about to be introduced in Japan were presented for the first time in the world in this exhibition. These terminals were produced by Mitsubishi and Fujitsu, and is the first mobile phone with color liquid-crystal. It was expected to go on the market around end of 1999. We can expect that the contents will be diversified because of the arrival of the color liquid-crystal screen.



Picture 10 Outlook of i-mode Display

■ i-mode Terminal with Java *

Heading for commercialization by spring 2001, we exhibited a reference terminal, "i-mode compatible with Java", that we are currently working on. We also introduced a demo unit mounting "KVM", an execute environment of new Java that Sun Microsystems developed to solve restrictions on mobile phone's resources. As some of the executable examples of the "KVM", we demonstrated various application cases, e.g. forecasts of weather, temperature and humidity that are drew on the national map by graphics, stock prices expressed by graphics and games that can be downloaded, etc.

■ Joint Symposium with Sun Microsystems

We announced a tie-up with Sun Microsystems in March 1999, and are running for the commercialization of i-mode terminals compatible with Java.

This time, a joint symposium with Sun Microsystems was held at the Hotel Holiday Inn, near from the exhibition hall. Having nearly seventy participants, mainly press people, the gathering was a success with almost full of people. At the joint symposium which had a favorable reception, a lecture "Java Goes Mobile" was given by Mr. Samir Mitra of Sun Microsystems and a presentation of "i-mode's strategy for 3G" was given by Mr. Enoki, Executive Manager of Gateway Business Department, followed by a lively Q & A session.

Activities for International Procurement

DoCoMo has been seeking to promote understanding of our procurement policy at the overseas exhibitions. On August 1 1999, the former procurement procedures based on

* : Java : Registered trademarks of Sun Microsystems.

Track I, II and III was repealed and new one has started. The Telecom this time therefore, was the first opportunity to appeal for the new procedures in overseas exhibitions.

In the new procurement procedures, a new principle of "Speedy", "Flexible" and "Efficient" are settled in addition to the former basics, "Openness", "Fairness" and "Non-discriminatory". That brings both domestic and foreign suppliers to make product proposals toward DoCoMo easier and wider.

For the launching of the W-CDMA service in spring 2001, DoCoMo chose suppliers for the equipment such as mobile station, base station and radio network control system, etc, and is proceeding the developments. It is expected that more product proposals relating to W-CDMA will be made not only from domestic but also foreign suppliers. DoCoMo has therefore, explained to overseas suppliers more than ever, the means to access information on DoCoMo's procurement, to join for the procurement and flow of the procedures, etc, so that they would be able to apply new procedures effectively and to supply competitive products to meet the business needs.

Participation in Forum

Besides the exhibition, forum was also held in Telecom '99 (Picture 11). The forum consisted of four sections; ① Policy/Regulation summit, ② Infrastructure summit (Network and system), ③ Interactive summit (Service and application) and ④ Telecom development symposium. DoCoMo participated in Session 4 of the Interactive summit (Theme : Access & Distribution to Multimedia Application), and DoCoMo Chairman Oboshi joined as one of the panelists. A chairman of the session was Mr. Probst of Swisscom, and it was proceeded with a keynote speech first given by Mr. McNealy, CEO of Sun Microsystems followed by panel discussion by four panelists. A lively Q & A was exchanged between not only session members but also the audience.

PR Activities

DoCoMo had aggressive PR activities in the Telecom '99.

Before the exhibition, we distributed press release among the domestic and foreign presses as NTT group, and announced DoCoMo's activity toward the exhibition to join as the group. As an individual activity, DoCoMo prepared precise materials on the exhibition in English and French for



Picture 11 Outlook of Forum



Picture 12 Report Scene

foreign media, distributed them among main media in European countries in advance and encourage them to gather data. This was aimed at getting into the special issue of the telecommunication industries magazines, to be published in the same time with the Telecom.

As a result, articles relating to DoCoMo were reported in European and American media such as Financial Times, The Economist, Business Week and Le Temps, l'agei, which is the leading economic paper in Switzerland. It was a very effective PR for us and lots of visitors and media staff who have read these articles stopped by our booth (Picture 12).

There was a great response again during the session on DoCoMo's high technical level, symbolized by W-CDMA and i-mode, e.g. having interviews of president Tachikawa with Financial Times and Nippon Keizai Shimbun, being mentioned in CNN and the local newspapers. Plenty of people visited DoCoMo booth such as Secretary-General of the ITU Utsumi, a former Minister of Posts and Telecommunications Ms. Noda and Chinese Ministry of Information Industry Deputy Manager, Mr. Lou and many more.

It was extremely effective PR activities, for a lot of media of nearly 160 companies from 20 countries came to see us.

Closing

This paper described exhibits in Telecom '99 in Switzerland such as W-CDMA demo systems, i-mode terminals, as well as the international procurement and PR activities. Through these activities, we were able to proclaim DoCoMo's standpoint toward mobile communication business, going further than just showing DoCoMo's technology.

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