Spectrum Management Policy in Japan

Purpose: Information
Submitted by: Japan
Spectrum Management Policy in Japan
-Strategy for creating of new radio industry-

Outline of Radio Spectrum Management
Japan has undertaken various measures for sophistication of radio spectrum use, corresponding to its growth evolution.

**Reallocation of radio frequencies**
- In order to secure frequencies for new applications, evaluations of actual radio spectrum usage every year. Based on the results, establish “The Action Plan for Spectrum Reallocation” for reallocation the frequency.
- Thereafter, Minister of Internal Affairs and Communications proclaims the frequency assignment plan.

**Environmental improvement**
- Anti-jamming for important radio traffic
  - Strengthening surveillance for safe and secure citizen’s life.
  - 1. Appropriate countermeasures against interference reports
  - 2. Enhancement of surveillance on major events.

**Promotion of R&D and International Standardization**
- R&D (Research and Development) for efficient utilization technologies of frequency
  - Technologies for efficient utilization of frequency by compressing the assigned spectrum.
- R&D for the technologies for shared use of frequency
  - Technologies allowing shared use of frequency in the densely used spectrum without influencing other wireless systems.
- R&D for the change to higher frequency
  - Technologies moving the wireless systems used in the spectrum less than 6 GHz to the higher microwave spectrum or unused spectrum including millimeter wave-band, so that the crunch in less than 6 GHz can be reduced.

**Surveys, Evaluations and Publications of Actual Radio Spectrum Usage**
- All of the radio spectrum is divided into the following three sections.
  - Surveys are conducted every year on one of the sections.
  - 1. Below 770MHz
  - 2. Above 770MHz and below 3.4GHz
  - 3. Above 3.4GHz

**Surveys on Actual Radio Spectrum Usage**

**Evaluation of the extent of efficiency in radio spectrum usage on each frequency band**

**Publications of the survey results**

**Reflection**

**Modification of Frequency Assignment Plan**

**Survey Items**
- Number of radio stations
- Traffic
- Years radio facilities have been in use
- Replaceability with other means of telecommunications such as fiber-optic cables

**Public Comments**
- Need for spectrum refarming to be flexible to meet new demand for radio spectrum
- Need for continuation of existing radio spectrum usage

**Consultation to the Radio Regulatory Council**

**Survey for economical influence to existing licensees**

**Ex. of survey results**
- Spectrum is used effectively now. Spectrum should be compressed.
- Fixed micro wave links should be transferred to optical fiber, etc.

**Views of evaluation for efficient radio spectrum usage**
- 1. Actual distribution of radio stations, etc.
- 2. Actual usage of radio equipment regarding radio stations
- 3. Presence of substitutability
- 4. Others (technology, demand trends etc.)
Digitalization of Analog TV Broadcasting

The Frequency Assignment Plan has been revised on December 2007.

VHF Band [It will be able to use from 25 July 2011]

- Broadcasting
  - Multi-media mobile broadcasting
- Self-owned communications (to preserve security and safety)

UHF Band [It will be able to use from 25 July 2012]

- Broadcasting
  - Multi-media mobile broadcasting
- ITS

Illustrated Radio Frequencies Reallocated after the Digitalization of TV

- **Broadcasting**
  - Realization of new broadcasting service providing various information for wireless mobile
    - An "anytime and wherever" looked/listened television service
    - Secured to receive information on disaster in the time of disaster
    - Possible to provide local minute information

- **Self-owned communications**
  - Broadband mobile communication system for safe and secure society
    - Image/information on disaster site (between disaster site and the countermeasure office)
    - Image/information data on patient (between ambulance/disaster site/hospital/doctor)
    - Information/data necessary for getting instruction (between the countermeasure office and disaster site/vehicle)

- **Telecommunications**
  - To meet the increasing demands on mobile phone
    - By letting more people use mobile phone
    - By realizing advanced functionality such as transferring of large volumes of data, provide more convenient use of mobile phone
  - To avoid collisions by radio spectrum in advance
    - An accident at a blind corner prevented by communications between vehicles
    - A rear-end collision prevented by communications between vehicles and side strip media

- **Warning by a buzzer**
  - Security duties
  - Fire/emergency
  - Disaster measurers
  - Patient (Between ambulance/disaster site and hospital/doctor)
  - Information/data necessary for getting instruction (between the countermeasure office and disaster site/vehicle)
In order to establish the world’s most advanced wireless broadband society, the following items must be implemented in an integrated fashion: (i) Reallocation of frequencies, (ii) Arrangement of use environment, and (iii) Promotion of R&D and International standardization.

**Reallocation of frequencies**
- Securing new frequencies to cope with tight use or upgraded mobile phone
- Implementing reallocation of frequencies to meet demands

**Promotion of R&D and International standardization**
- Development of use techniques for new wireless systems
- Internationalization for strengthening of competitiveness

**Arrangement of use environment**
- Building radio spectrum environment enabling use of mobile phone throughout the nation
- Building environment enabling to monitor radio spectrum without affecting the human body

**Environmental changes around radio spectrum**
- Increasing demands of the radio spectrum use
- Technological innovation

**Establishment of the world’s most advanced wireless broadband society**
Current Radio Spectrum Use Trends in Japan

Growth and Development of the Use of Radio Spectrum

- Radio spectrum use has dramatically expanded according to intended frequencies and purposes.
- Digital home appliances, such as audio-visual equipment and gaming consoles, have been increasingly connected to wireless networks.
- With expanding of mobile phones, anyone can now connect to networks easily.
- As various types of new wireless communication services and businesses have become more popular, convenience for users has increased.

Increase in Traffic

- Distribution and use of rich contents by mobile phones, wireless LANs, etc. have increased.
- Appearance of new wireless systems and expansion of radio spectrum use.
- By 2020, radio spectrum use has dramatically expanded, both in quality and quantity, and the amount of traffic will be 200 times larger.

Advent of New Wireless Communication Technologies

- Systems and services that use new wireless communication technologies, such as cognitive wireless communication technology and software wireless communication technology, have been realized.

Technologies

- New expansion of the usable frequency domain
- Development of a technology for sharing frequencies
- Development of broadband antennas
- Development of analog and digital one-chip-forming technologies
- Upgrading of the communication quality and reliability technology
- Upgrading of the optical communication technology
- Upgrading of the video encoding technology
- Virtualization and decentralization of OSs
- Upgrading of the security authentication technology
- Improvement of battery performance
- Realization of large-size memories
- Improvement of the processing capability of CPUs
- Development of new materials and new methods for displays
- Upgrading of satellite-related technologies
- Upgrading of the EMC-directive compliant technology
- Upgrading of the measurement technology

New Field of Radio Spectrum Use

- Radio spectrum have been used in various ways in new fields, such as combination of wireless communication and home appliances, local revitalization, application to the medical sector, and countermeasures against environmental problems.

Increase in Data Traffic Due to Development of Radio Spectrum Use

- Distribution and use of rich contents by mobile phones, wireless LANs, etc. have increased.
- Appearance of new wireless systems and expansion of radio spectrum use.
- By 2020, radio spectrum use will have dramatically expanded, both in quality and quantity, and the amount of traffic will be 200 times larger.

Example of Traffic Provisional Calculation: Result of the Estimation of 3.9G Mobile Communication System Traffic

Increase in traffic in five and ten years was provisionally calculated concerning (1) newly created services, (2) existing services provided under a new system, and (3) existing services provided under the existing system from the viewpoint of the impact and effect on the society and economy exerted by the introduction of the 3.9G mobile communication system (when the traffic in 2007 was regarded as 100).

1. Emerging services
   - Uploading of high-definition video
   - Streaming of video teaching materials
   - Cooperation with home appliances through high-capacity data transmission
   - Distribution of large-amount signage information
   - Telemedicine supported by medical image transmission

2. Existing services provided under a new system
   - Realization of large-size content
   - Example: Video streaming
   - 3.5 G (2007): 384 Kbps (Example of au “LISMO”, etc.)
   - 3.8 G (2010): 2 Mbps (high-definition video)
   - 3.9 G (2012): 5 Mbps (Video with definition similar to high-definition is assured)

3. Existing services provided under the existing system

Example:
- Video streaming
- Uploading of high-definition video
- Distribution of large-amount signage information

Source: 5th meeting Working Party of Upgrading IMT, 2007 Committee on Measures for Efficient Use of Frequencies for Mobile Phones, Telecommunication Technology Subcommittee, Telecommunication Council
Future Image of Wireless Systems in the 2010s

Direction of the Development of the Wireless Broadband Field

- Wireless systems and services have been upgraded and developed so far, based on the main wireless media represented by “broadband mobile system” “digital broadcasting system” and “satellite system.”
- The “Wireless Broadband Field” composed of these main wireless media is expected to grow and be developed further also in the 2010s due to the technologies, etc. that realize ultra high-speed and higher-capacity wireless transmission.

- Broadband Mobile System
  - The transmission speed of mobile phones and wireless LANs will be increased up to about tens of Gbps in order to deal with richer contents, such as video distribution and 3D information, and traffic that will be more than 200 times larger by 2020.
  - Terminals combined with various products, such as high-definition display, electronic tag, GPS, and digital terrestrial TV, will appear.
  - Personalization seen in the provision of agent services for each individual, gateway function that combines devices around a person, etc. will be developed. Multiple types of networks, such as mobile phones, BWA, and wireless LANs, will be available.
  - High-quality video broadcasting that gives you never-experienced realistic sensation and exceeds HDTV will be provided.
  - Broadcasting services in any place, such as mobile HDTV and uninterrupted broadcasting, will be developed.
  - Downloading services under the cooperation between communication and broadcasting that allows users to watch and listen to both contents distributed simultaneously from a broadcasting transmission line and ones distributed individually from a communication transmission line will be provided.

- Digital Broadcasting System
  - Distribution of rich contents, such as music, video, and games.
  - Data traffic about 74 times larger than that of four years ago.
  - With upgraded multiple functions added.
  - Spread of wireless LANs and introduction of BWA.
  - High-quality video broadcasting that gives you never-experienced realistic sensation and exceeds HDTV will be provided.
  - Broadcasting services in any place, such as mobile HDTV and uninterrupted broadcasting, will be developed.
  - Downloading services under the cooperation between communication and broadcasting that allows users to watch and listen to both contents distributed simultaneously from a broadcasting transmission line and ones distributed individually from a communication transmission line will be provided.

- Satellite System
  - Speedy and inexpensive broadband services of up to about 10 Mbps will be provided in all places in Japan including mountain areas and isolated islands. The services include dual-mode (satellite/terrestrial) mobile phones that can be used even at the time of disaster or in mountain areas and isolated islands.
  - Mobile satellite communication services that provide broadcast services for airplanes, ships, vehicles traveling at a high speed, etc. will be available as well as satellite-based communication and broadcasting services that handle large-volume contents, such as ultra high-definition and 3D images.
  - Diversified and highly accurate environmental information observation with satellites all over the world.
  - Speedy and inexpensive broadband services of up to about 10 Mbps will be provided in all places in Japan including mountain areas and isolated islands. The services include dual-mode (satellite/terrestrial) mobile phones that can be used even at the time of disaster or in mountain areas and isolated islands.
  - Mobile satellite communication services that provide broadcast services for airplanes, ships, vehicles traveling at a high speed, etc. will be available as well as satellite-based communication and broadcasting services that handle large-volume contents, such as ultra high-definition and 3D images.
  - Diversified and highly accurate environmental information observation with satellites all over the world.
Future Image of the Wireless Systems in the 2010s

- As radio utilization in the wireless broadband field and core technologies that support the field are developed, the following systems will be created in the 2010s.

1. **Intelligent terminal systems**
   - Thin client terminal
   - Wireless communication with realistic sensation

2. **Medical and Population Problem Wireless systems**
   - Body area communication
   - Wireless robotics

3. **Application services**
   - Medical examinations using capsule endoscopes
   - Realization of an elderly people-assisting service in the areas of agriculture, nursing care, etc.

4. **Future Image of the Wireless Systems in the 2010s**
   - Creation of ripple effects of 70 trillion yen, in addition to these direct effects
     - 2015: 37.6 trillion yen, 2020: 88.9 trillion yen

5. **In-Home wireless systems**
   - Wireless installation in home appliances easily and as desired
   - No cable needed between a TV set and a recorder in houses
   - A wireless function installed in home appliances can be used around the world

6. **In-Home wireless systems**
   - Wall outlet-free houses with wireless power supply to home appliances
   - No cable needed between a TV set and a recorder in houses
   - A wireless function installed in home appliances easily and as desired

7. **Future Image of the Wireless Systems in the 2010s**
   - Creation of a New Radio-Related Market by the Wireless Systems to be Realized in the 2010s
   - Creation of an export market worth 8 trillion yen, through the realization of new wireless systems

8. **Future Image of the Wireless Systems in the 2010s**
   - Creation of an export market worth 8 trillion yen, through aggressive international development policies
     - 2015: 6 trillion yen, 2020: 7 trillion yen

9. **Future Image of the Wireless Systems in the 2010s**
   - Creation of an export market worth 8 trillion yen, through aggressive international development policies
     - 2015: 6 trillion yen, 2020: 7 trillion yen

10. **Future Image of the Wireless Systems in the 2010s**
    - Creation of an export market worth 8 trillion yen, through aggressive international development policies
     - 2015: 6 trillion yen, 2020: 7 trillion yen
Strategies for Creating New Radio Industries
Establishment of Five Projects to Generate Wireless Industries

- It is indispensable to realize five wireless systems by 2015 and advance/develop them by 2020 in order to generate new wireless industries, resolve various social problems faced by Japan, and improve quality of life.
- The following five comprehensive projects will be established as engines to realize these new wireless systems and coordinate new spectrum allocation and R&D.

**Broadband Wireless Project**
- Mobile broadband
- Satellite systems
- Digital broadcasting

**In-Home wireless Project**
- Wireless chip
- Non-contact broadband
- Wireless power supply

**Intelligent Terminal Project**
- Thin-client terminals
- Wireless virtual reality communications

**Medical and Population Problem Wireless Project**
- Wireless body area networks
- Wireless robotics

**Keeping Security and Safety Wireless Project**
- Sensor networks
- Safe & secure/private wireless system
- Wireless space/time infrastructure

New Radio Industry Development Strategy

**Five Promotion Programs**

- **"Creating the Action Plan for Spectrum Reallocation"** Coordinated with Research and Development
- **"Development of Applications and Conducting Field Tests"** that Utilizes User Participation Open Test Platform
- **Establishment of Broadband Wireless Forum"** through Collaboration of Industry, Academia, and Government Aiming at International Expansion
- **"Fundamental Revision of Radio Usage System"** to Propel the Development of Radio Industries
- **"Preparation of Radio Usage Environment"** that Can Cope with Diversifying RF Environment

**Implement cross boundary environment preparations**
- Clarify Gvt.-led R&D for efficient spectrum usage, and the direction of band reallocation to extend the mobile phone band four times. Create the best action plan coordinating the two issues.
- Support the development of spectrum usage technology through application development and field verification utilizing a test platform whereby comprehensive wireless R&D can be conducted.
- Establish an industry, academia, & government forum to create an internationally expandable R&D and standardization strategy, growing out from the domestic-oriented wireless business model.
- Review the range of stations that do not require a license, and introduction of a proposal system for standard criteria creation. Preparation of a system to certify compliance with technological standards and verification for effective white space usage.
- Research to ensure the safety of radio for human beings; establishment & improvement of radio monitoring system; countermeasures against technologically-incompliant devices.
Strategies for Creating New Radio Industries

Along with creating a new radio-related market, it is necessary to realize five systems for creating new radio industries by 2015, and for further developing them by 2020, in order to solve the various social issues of Japan and to further improve lives of the users.

6 Projects for Creating New Radio Industries

- Further allocate bandwidth of 1.4 GHz in total for mobile phone use, in order to allocate 2 GHz in all, which is the quadruple of the current bandwidth.
- Allocate 2 GHz in 22 GHz frequency band for 5GHz satellite broadcasting.
- Allocate 3 GHz frequency band for satellite broadband internet service.
- Allocate millimeter-wave bands (60 GHz, 70 GHz and 130 GHz) for indoor wireless super broadband.
- Allocate VHF band and microwave ISM band for wireless power supply.

Wireless Broadband Project
- Broadband mobile systems
- Digital broadcasting
- Satellite systems
- Flexible radio technologies
- Worldwide standardization

In-Home Wireless Project
- Wireless phone
- Contacts broadband
- Wireless power supply.

Intelligent Terminal Project
- Instant terminals
- Wireless communication with auto-dial indication
- Medical and Population Problem Wireless Project
- Medical and population
- Keeping Security and Safety Wireless Project
- Social demonstration
- Wireless network for medical emergency

5 Promotion Programs

- Promotion of a new action plan for radio spectrum realization, related to research developments
- Establishment of the Broadband Wireless Forum under the collaboration of industry, academia and government, with international development in mind
- Fundamental review of the utilization system, for promoting the creation of radio industries
- Improvement of the radio utilization environment, in response to the diversifying radio environment

Organize

General meeting of Broadband Wireless Forum
Members (109 members from telecommunications carriers, manufacturers, research laboratories, academics)

Steering committee
Chairman: Shiro OKINO (CTIF Japan)

Sectional meeting on Project and Strategy
Chairman: Hiroyuki MORIYAMA (Tokyo University)

By using the test bed, a new radio wave use system and service can be realized.

Test bed usage working party
- Broadband Wireless project Ad-hoc
- In-Home Wireless Project Ad-hoc
- Keeping Security and Safety Wireless Project Ad-hoc
- Medical and Population Problem Wireless Project Ad-hoc
- Intelligent Terminal Project Ad-hoc

Promote five projects on new wireless technologies

Social demonstration working party
- Test bed demonstration

Test bed demonstration
- Demonstration of a new action plan for radio spectrum realization related to research developments
- Establishment of the Broadband Wireless Forum under the collaboration of industry, academia and government, with international development in mind
- Fundamental review of the utilization system, for promoting the creation of radio industries
- Improvement of the radio utilization environment, in response to the diversifying radio environment

Background - Summary

- It is anticipated that a new radio industry exceeding 50 trillion yen will be created in 2020 with the emergence of new radio use systems such as “the car that will not crash” and “the cordless household appliance”.
- “Wireless test bed” is planned to be set up at YRP. (YRP: Yokosuka Research Park)
- Based on this, the Broadband Wireless Forum is to be established for practical use, testing, and international progressing concerning a new radio use system and service acceleration.

R&D
Telecommunications carriers
Universities
Standardization
Manufacturers
Research laboratories
International development
Commercialization
Market cultivation
Test bed

2010/6/17