Current Status of Institutionalization and Strategy for Standardization of ITS in Japan

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Assistant Director for ITS, Land Mobile Communications
Radio Department, Telecommunications Bureau
Ministry of Internal Affairs and Communications (MIC), Japan
Intelligent Transport Systems in Japan

Examples of current and future ITS using radio waves in Japan.

Fig 1.
VICS: Vehicle Information and Communication System

Fig 2.
ETC: Electronic Toll Collection

Fig 3.
79GHz High-Resolution Radar

Fig 4.
DSSS: Driving Safety Support Systems

Vehicle approaching, Beware on turning right.

Motorbike close-by, Beware on turning left.
Implementation Structures for ITS in Japan

ICT Strategic Headquarters
(Chief of headquarters: Prime Minister)

Planning Commission
Organized by State Minister for IT policy and related State Secretaries or Vice Ministers.

Board meeting
Organized by State Minister for IT policy, and State Secretaries or Vice Ministers of National Strategy Office, Cabinet Office, MIC and METI.

- CIO Conference
- Expert panel on regulatory and institutional reforms for utilization of ICT
- Task Force for Electronic Government
- Task Force for Medical Care
- Task Force for ITS
New Information Communications Technologies Strategy related to ITS

Road map for greening of the movement of persons and goods

- Wide-ranging vehicle information collection and provision
  - Advancement of traffic control system
- Coordination with highway and traffic policy

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Cooperation with highway and traffic policy

- Verification and technical development of signal control and advanced traffic information for “Probe” information
- Promotion of advanced traffic light control and provision of traffic information, such as traffic light control centralization, multi-step systemized program, and multiple display.
- Mutual use of “Probe” information
- Application of Research and Development
- Optimization of traffic management adapted traffic flow

- Start of operation (included test operation)
- Grand-scale verification of the effects on real-time data provision
- Data verification by real vehicles
- Verification of collection data by simulation
- Selection of data items for simulation
- Verification of the effects on “Probe” information collection and utilization
- Promotion of international standardization activity and overseas operations
- Formulation of road map focused on advanced IT vehicles and overseas operations (by Task Force)
- Consideration of operational model • Shares of cost for information collection and provision • Scope of shared information, etc.
- Wide-ranging vehicle information collection and provision

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- Halve the traffic jams (2010 levels)
- NPA
- MIC
- METI
- MLIT
- CAO

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New Information Communications Technologies Strategy related ITS II

Road map for promotion of automotive safety

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Driving Safety Support Systems

- Formulation of road map (Task Force)

- Formulation of guidelines and technical verification of Vehicle-to-Vehicle communication systems

- Upgrading of cooperation Road-to-Vehicle communication systems on expressway across the country

- Pilot upgrading of cooperation Road-to-Vehicle communication systems on the open road

- Part of UHF band become available to use for ITS

- Inspection of the scene led by the private sector

- ITS World Congress (in Tokyo)

- Under 2,500 traffic fatalities

- Promotion of developing road infrastructure

- Development and expansion of shared onboard units and vehicles

Technical development and institutionalization of the systems for effective and efficient advanced communication systems

Promotion of international standardization activity
Verification of Technical Condition for 79GHz High-Resolution Radar

Characteristics of 79GHz Radar

◆ Long Measurement Distance and High Resolution

79GHz radar can detect/identify multiple obstacles at short and long ranges.

【Reference: Radar Standards in Japan】

<table>
<thead>
<tr>
<th>Type of Radar</th>
<th>Frequency</th>
<th>Bandwidth (Max)</th>
<th>Output Power</th>
<th>Antenna Gain</th>
<th>Resolution</th>
<th>Measurement Distance</th>
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<td>UWB</td>
<td>22～29GHz</td>
<td>4750MHz</td>
<td>-41.3dBm/MHz</td>
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<td>3cm</td>
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<td>60～61GHz</td>
<td>500MHz</td>
<td>10mW</td>
<td>40dBi</td>
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<td>10m 100m</td>
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Institutionalization

• Sharing frequency consideration with AMATEUR.
  → Can be shared.

• Sharing frequency consideration with RADIOASTRONOMY.
  → TBD

Standardization

• Input information document of 79GHz Short-range High-resolution Radar to ITU-R SG5 WP5A.
• Proposed agenda item to APG toward WRC 2012.

Millimeter Wave Spectrum Allocations

- RADIOASTRONOMY
- RADIOLOCATION
- AMATEUR-SATELLITE
- AMATEUR

Spectrum Allocations for radar system in Europe.
Spectrum Use After “Digital Dividend”

Current Spectrum Allocation

- 90~108 MHz (1~3 ch) for Analog TV
- 170~222 MHz (4~12 ch) for Analog TV
- 470~770 MHz (13~62 ch) for Analog and Digital TV

Future Spectrum Allocation

- After digitization
- 90~108 MHz for Analog TV
- 108~170 MHz for Analog TV
- 170~222 MHz for Analog TV
- 470~770 MHz for Analog and Digital TV

New Spectrum Use

- 90~108 MHz for Self-owned communications (to preserve security and safety)
- 170~222 MHz for Broadcasting (multi-media mobile broadcasting etc.)
- 710~770 MHz for Telecommunications (cellular phones etc.)

Available from July, 2012
Consideration of Technical Requirements for ITS Radio System

MIC consulted the Telecommunications Council on technical requirements of ITS radio system.

Transmission technique enabling V2V and V2I communications

Realize both Vehicle-to-Vehicle (V2V) and Vehicle-to-Infrastructure (V2I) in 700MHz band

Coexistence criteria with adjacent radio systems

Coexistence with mobile communications system (ex. LTE) and digital television system

Interference between mobile communications and ITS

Interference between Digital TV and ITS
Actions for Implementation of a Wireless Broadband Environment

1 Background

- Implementation the world’s most advanced wireless broadband environment
- Discussing how to secure a spectrum for a wireless broadband network
  > “Working Group (WG) to discuss a spectrum for implementation of a wireless broadband environment”.

2 Summary of the report of this WG (related to ITS)

In order to realize a wireless broadband environment, spectrum reallocation is needed to secure new bands. Traffic is expected to grow roughly 200-fold in the next decade. Therefore, it is necessary to secure over 300MHz of spectrum in 2015 and over 1500MHz of spectrum in 2020.

Review and analyze a lot of systems include ITS in the 700MHz.
There are 4 Plans of Spectrum Reallocation.

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<th>Plan 1</th>
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Outline of the Report

1. Future Prospects for Use of Radio

Services becoming more diverse and advanced
- Increased use of smart phones, digital home appliances, and electronic books, etc.
- Expected to have increased 200 fold in 10 years. Increased by 13% or more over the last 3 months.
- Establishment/commencement of proof-of-concept experiment of “special white space zones”, etc.

Direction of growth/development of radio use

- Increased traffic
- Use/utilization of white spaces

Direction of growth/development of radio use

Further increase in speed/capacity
- Introduction of advanced systems, including LTE, IMT-Advanced, and IEEE802.16m, etc.

Improved wireless broadband environment
- Deployment of wireless broadband in homes, and in trains and airplanes, etc.

Realization of sensor networks
- Expanded new use of smart meters, ITS, medical devices, etc.

Development of digital broadcasting
- Advanced ultra-HDTV, regional one-segment, and relay system, etc.

2. Securing Spectrum for Implementation of a Wireless Broadband - Securing Frequencies in a Speedy Manner with Concrete Goals -

Basic concepts

[1] Based on comprehensive decisions with the following three points of view, we will promote measures that enable the most efficient growth/development of radio use:

- Economic growth through creation of new services, etc.
- Improved convenience of users
- Enhanced international competitiveness

[2] Frequencies to be secured in facilitating further effective use of entire frequencies through appropriately responding to technological innovations.

Goals for securing spectrum toward 2015/2020

<Goals by 2015>
- With regard to mobile communication systems and sensor network systems, frequencies of over 300 MHz below 5 GHz will be newly secured, and other frequencies with also be secured to improve the broadband environment, etc.

<Goals by 2020>
- Frequencies of over 1500 MHz will be secured to facilitate introduction of the 4G system and the development of broadband environments in airplanes, ships, and trains, etc.

(Reference) The U.S. Federal Communications Commission (FCC) published a recommendation in the “National Broadband Plan” submitted to Congress in March of 2010 involving a request that 500 MHz spectrum for use with mobile broadband be secured within the next 10 years.
Outline of the Report

(1) Further increase speed/capacity of mobile communication systems

- 700/900 MHz band: Immediately formulate frequency allocation policies <100 MHz bandwidth at maximum>
- 1.7 GHz band: Additional allocation of frequencies for mobile phones <10 MHz bandwidth
- 2.5 GHz band: Advanced BWA (Broadband Wireless Access system) <30 MHz bandwidth at maximum>
- 3 - 4 GHz band: Frequencies for 4G systems (IMT-Advanced) <200 MHz bandwidth>

(2) Improved wireless broadband environment

- 60 GHz band: Development of broadband environment at homes and offices <2 GHz bandwidth>
- 400 MHz band: Deployment of broadband in train radio wave systems, etc. <expand to approx. 3 MHz bandwidth>

(3) Introduction of sensor systems

- 900 MHz band: Immediately determine reallocation schedule of 900 MHz bandwidth and implement <5 MHz bandwidth>
- 280 MHz band: For covering wide areas <5 MHz bandwidth>

- [1] Introduction of smart meters, etc.
- [2] Improved safety of automobile transportation
- [3] Use in medical/healthcare fields

(4) Development of new services, etc. through utilization of white spaces

(5) Response to advanced broadcasting systems

Frequency band to be secured by 2015

(1) Further increase speed/capacity of mobile communication systems

- 3 - 4 GHz band: Frequencies for 4G systems (IMT-Advanced) <approx. 1.1 GHz bandwidth>

(2) Improved wireless broadband environment

- 40 GHz band: Development of environment for the use of broadband in airplanes, ships, and trains <approx. 1.2 GHz bandwidth>

* In addition, frequencies will also be allocated in response to increased use of smart meters, etc. and implementation of experimental broadcasting of super-hi-vision satellite broadcasting

Frequency band to be secured by 2010
3. Basic Policies for Allocating 700/900 MHz Band Spectrum - Realizing Bandwidth Allocation through Spectrum Reallocation with Consideration Given to International Point of View -

**Outline of the Report**

### Background for discussion (Initially received opinions on allocation of 700/900 MHz band spectrum)

[1] Frequencies to be available for use with mobile phones in July 2012 should be allocated

[2] New allocation should be made through spectrum reallocation (transferring the spectrum of other radio systems)

Hearings from relevant parties and technical verification, etc. was conducted in cooperation with the Information and Communications Technology Sub-Council, Information and Communications Council, on the following points of view.

#### (1) Hearings with relevant parties of systems subject to transfer

(Although not necessarily in favor of the transfer but) if the transfer takes place, the expenses for transfer must be borne by mobile communications carriers, etc. and other certain conditions will need to be secured.

#### (2) Hearings with mobile communications carriers

[1] In favor of respectively allocating 700 MHz band and 900 MHz band frequencies.

[2] In order to promote rapid frequency reorganization the need to bear the transfer expenses is understandable (However, details of expenses need to be examined.).

(Reference) Requests from carriers

<table>
<thead>
<tr>
<th>Requested frequency band</th>
<th>Requested allocation date</th>
<th>System for using frequencies</th>
<th>Purpose of using frequencies</th>
<th>Requested frequency band per business operator</th>
</tr>
</thead>
<tbody>
<tr>
<td>700 MHz band</td>
<td>In or after 2012 but no later than 2015</td>
<td>LTE</td>
<td>Traffic measures</td>
<td>15MHz × 2</td>
</tr>
<tr>
<td>900 MHz band</td>
<td>2012</td>
<td>W-CDMA (LTE)</td>
<td>Traffic measures/area expansion</td>
<td>5MHz × 2 ～ 15MHz × 2</td>
</tr>
</tbody>
</table>

#### (3) Conducted technical verification

<700 MHz band> More detailed interference analysis/evaluation between television broadcasting and mobile phones, etc. needed using data, etc. on actual devices.

<900 MHz band> Frequency reorganization is possible through implementing interference measures.

### Basic policies for frequency allocation

1. In view of ensuring consistency with the frequency allocation status of other countries, an “allocation method that makes respective use of the 700 MHz band and 900 MHz band” would be considered appropriate.

2. Frequency reorganization to be implemented rapidly in enabling the entry of mobile phone businesses of 700 MHz in 2015 and 900 MHz in 2012.

3. In implementing the frequency reorganization, the necessary measures along with bearing the expense of transferring the frequencies of existing systems need to be taken.
3rd TC ITS Workshop February 11 2011 /Venice, Italy

Outline of the Report

* FPU (Field Pickup Unit): A transportable system used in the broadcasting services, including news and sports broadcasting
* MCA (Multi-Channel Access radio system): A mobile communications system for independent use with broadcast (simultaneous instruction) and group communication functions, etc. Mainly used in sectors involving surface transportation, disaster management, taxis, etc.

1. **Allocation should be made with consideration given to harmonization with Asia and North America**

2. **Allocation should be made with consideration given to harmonization with Europe**

3. Spectrum transfer is required for FPU, radio microphones, MCA, RFID (Radio Frequency Identification), etc

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(Reference) Discussion on Allocation of 700/900 MHz spectrum

[1] 700 MHz spectrum and 900 MHz spectrum should be jointly used in enabling more timely use

[2] Allocation should be made with consideration given to harmonization with Asia and North America

[3] Allocation should be made with consideration given to harmonization with Europe

(Reference) Current situation with frequencies for mobile phone use in Japan, USA and Europe

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* Situation with 700 MHz band allocation in Asian region

At the most recent meeting of AWF (APT Wireless Forum) this September, a report on the spectrum use of 698-806 MHz in Asia/Pacific region was completed.

* Band plan*

- **FDD system UL:** 703-748 MHz
- **DL:** 758-803 MHz (center gap: 10 MHz, high/low-frequency gap: 55 MHz)
- **TDD system UL/DL:** 698-806 MHz

When discussing allocation of spectrum, the status of discussions at AWF and trends with allocation in Asian countries need to be closely observed.
(1) Reorganization needs to be rapidly facilitated according to the development of areas while sharing existing system frequencies in a geographical/time-based manner.

(2) Accelerate spectrum reallocation through users of transferred spectrum bearing the expense of transferring the spectrum of existing systems.

**[Current Methods of reallocation existing frequencies]**

- Implement reorganization in approximately 5 to 10 years with consideration given to the facility renewal period of existing systems (expenses required for transfer will be self-borne).
- Introduce new systems when transfer complete.

The government making a decision on the implementation framework and providing the necessary supervision to enable the smooth transferring of spectrum would be the most appropriate, and therefore the government implementing the following, for example, should be discussed:

- Scope of expenses to be borne and transfer deadline, etc. need to be determined in advance.
- Conditions for geographical/time-based sharing of frequencies between existing systems and new systems need to be established in advance.
- Provision of information on systems subject to transfer and periodic confirmation of transfer status, etc.

In view of facilitating rapid spectrum reallocation, the relevant parties should act independently under the above framework.
5. Future Directions

(1) Early realization of concrete measures, including radio reallocation, etc.

Concrete measures should be discussed and necessary steps taken with consideration given the content of this report.

Frequency reorganization, in particular, is a necessary step in realizing a wireless broadband environment as well as “economic growth in Japan”, “improved convenience of users”, and “enhanced international competitiveness”, and thus its early implementation needs to be facilitated.

(2) Full-scale discussion on auctions

In consideration of the content on auctions in the “Basic Policies for Review of Radio Wave Usage Fees in the Next Term”, a full-scale discussion on the introduction of auctions implemented in other countries with (1) above will need to be promoted with consideration also given to the situation with the radio reallocation.

[Reference] Basic Policies for Review of Radio Usage Fees over the Next Term (published on August 30, 2010 by the Ministry of Internal Affairs and Communications) (excerpt)

[1] In view of securing fair and efficient use of radio waves and transparency in licensing procedures, the introduction of auctions that utilize market principles is worth discussing.

[2] Introduction of auctions, however, imposes an additional burden on licensees, thus requiring the appropriate explanation to be made. In addition, subjects for auction should be selected carefully so as not to cause any competition policy problems with preceding business operators.

[3] Full-scale discussions on the introduction of auctions should therefore be made to verify their need/rationality in light of the purpose/effectiveness of introducing them and the results disclosed to the public.
Summary

1. New ITS policy and road maps were drawn up by IT Strategic Headquarters. “Promotion of automotive safety” is focused on ITS strategy in Japan.

2. Technical condition and sharing frequency for 79GHz (77-81GHz band) High-Resolution Radar is considered in Japan.

3. 700MHz band is going to be used for advanced Driving Safety Support Systems in Japan.
Thank you for your attention!