Document 18-4

“Working Group on Discussion of Frequencies Needed to Realize Wireless Broadband Services” Report

- Action Plan for Frequency Reorganization toward Realizing Wireless Broadband -

November 30, 2010

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This working group (WG) was established in April this year under the "Section Meeting Studying Support for Environmental Change in the Telecommunications Market" of ICT Task Force with the aim of discussing measures for securing frequencies for wireless broadband after taking into consideration international trends, including the usage status of mobile phones, etc. and standardization in realizing the most advanced wireless broadband environment in the world.

The WG has to date conducted hearings with the relevant parties at all levels and collected comments twice in [1] surveying the image of the services and systems to be provided by around 2015/2020 and then [2] discussing the issues and methods involved in realizing wireless broadband.

This report was compiled after taking the results of those discussions into consideration.

1. Future Prospects of Radio Use

(1) Changes in the environment surrounding radio waves

[1] Services becoming more diverse and advanced

Progress and growth in various sectors have resulted in opportunities for and types of network connections having increased with various new services that use radio waves now being widely used. The use of radio waves is becoming more and more important in our daily lives and social activities.

Nowadays mobile phones, for which an internet environment is very important, a typical example being smart phones, are becoming very popular. In addition, the dissemination of digital home appliances, including AV and game devices with wireless LANs, etc., which enable anyone to easily connect to a network, has resulted in the use of wireless environments also progressing in homes. Furthermore, in 2010, devices, services, and platforms capable of handling electronic books, etc. have experienced active development in opening a new era of newspapers, magazines, and books, etc. being distributed over networks.

All the above indicate that various services using radio waves to connect to the internet, etc. are becoming more diverse and advanced.

Figure 1 Services using radio waves becoming more diverse

Increase in wireless network connections

Progress in network connections via Wi-Fi

- ✓ Wi-Fi is being made available on a variety of devices that encompass PCs, cameras, home appliances, gaming devices, mobile phones, etc.,
- ✓ New usages and leisure activities have emerged through network services

Source: WiFiAlliance documents

Age of easy network connections for anyone

Changes in user population by device used to connect to the internet

2000

PCs

Mobile phones, PHS, and mobile information and communications devices

Gaming devices, televisions, etc.

(end of year)

(ten thousand persons)
(Source) “Communications Usage Trend Survey” (Households) by the Ministry of Internal Affairs and Communications

Increase in number of internet users via wireless connection, including mobile phones, etc.

- ✓ The number of people using the internet via mobile information and communications devices, including mobile phones, was approximately 75.06 million (as of the end of March, 2009).

Dissemination of new services/businesses

New businesses using Suica

- ✓ The introduction of the Suica system has not only improved convenience when purchasing tickets, etc. for transportation users but has also helped in the development of new businesses in a wide range of the retail trade using its electric money functions.
- ✓ The average number of daily uses is approximately 1.34 million. The number of places where Suica can be used is approximately 56,000 (as of the end of October, 2008).

[2] Increased traffic

Progress/dissemination of broadband availability over wireless networks, including mobile phones, etc. is expected to result in the provision of various services involving large amounts of content and thus increased traffic. According to an estimation made by the Committee on Measures for Effective Frequency Use of Mobile Phones, etc., Information and Communications Technology Sub-Council, Information and Communications Council, the traffic resulting from services made available by mobile communications systems will have increased to be approximately 200 times that in 2007 by 2017.

A further increase in the volume of a variety of content can also be expected with the emergence of new services, including collaborations with home appliances through the uploading of Hi-Vision video pictures, the streaming of educational video picture materials, the transmission of large amounts of data, distribution of large amounts of signage information, and remote medical care via the transmission of medical images, etc.

In identifying the actual situation with the above described increase in traffic the Ministry of Internal Affairs and Communications collected and analyzed mobile communication traffic data (non-voice) in June and September this year in cooperation with five mobile communications carriers. The results are summarized in Figure 3. The total traffic was revealed to have increased by 13.2% over quarter of the year (equivalent to an annual increase of 64%).

Figure 2 Traffic estimate up to 2017 with the introduction of 3.9th generation mobile communications system

- To identify the social/economic impact/effect of the introduction of the 3.9th generation mobile communications system the growth in traffic over the next five and 10 years was estimated using the following factors: [1] newly created services, [2] existing services provided with new systems, [3] existing services provided with existing systems. (Figures in 2007 are assumed to be 100)

Approx. 200 times as much traffic with 3.9th generation mobile communications!

[1] Newly created services

(example)

・ Uploading of Hi-Vision video pictures
・ Streaming of educational video picture materials
・ Collaboration with home appliances via the uploading of Hi-Vision video pictures
・ Distribution of large amounts of signage information
・ Remote medical care through transmission of medical images

[2] Existing services provided with new systems
<Increase in volume of various content>
(example) Streaming video pictures
3.5G: 384Kbps (example of au “LismoVideo”, etc.)
3.9G (2012): 4 Mbps (assumed to be highly compressed HD video pictures)
3.9G (2017): 8 Mbps (assumed to be Hi-Vision equivalent video pictures)

[3] Existing services provided with existing systems

Based on documents from the the (8th Meeting of) IMT-2000/Advanced WG, Committee on Measures for Effective Frequency Use of Mobile Phones, etc., Information and Communications Technology Sub-Council, Information and Communications Council

Figure 3 Current status with mobile communications traffic (comparison between June and September, 2010)

Aggregation method
Internet/other business operator networks, etc.
Content/mail servers, etc.
Relay packet switching nodes (gateways)
Subscriber packet switching nodes
Base stations
Femtocell base stations

Mobile communications traffic (September)
Traffic
Upstream
Downstream
Total upstream and downstream
Total monthly traffic
Average traffic (quarterly increase)
Total monthly traffic
Average traffic per subscriber (total of 113,783,700 subscriptions; published figure by TCA)
Average traffic (quarterly increase)
Total monthly traffic

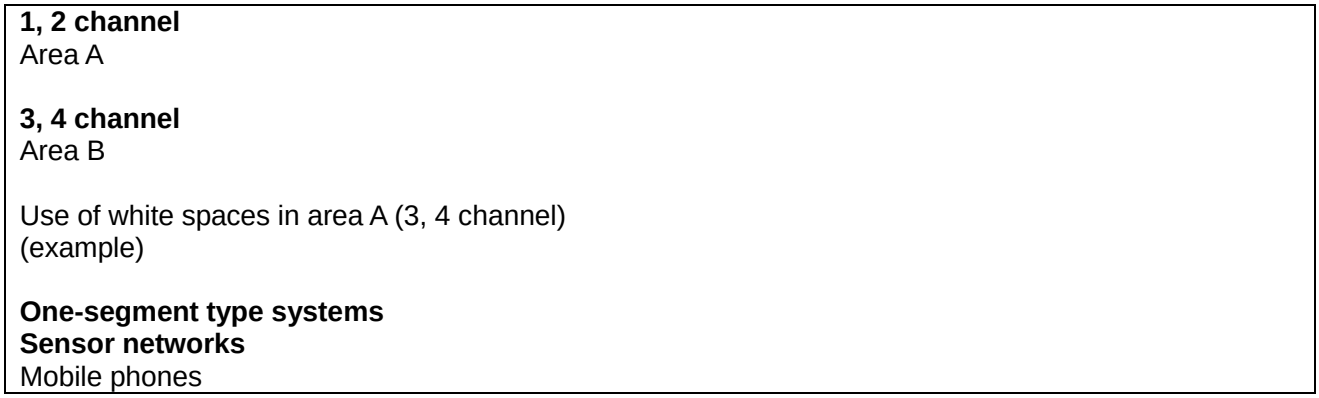
Mobile communications traffic (by day of week and time)
Upstream traffic
Downstream traffic
00:00
04:00
…
Monday
Tuesday
Wednesday
Thursday
Friday
Saturday
Sunday

[3] Use/utilization of white spaces

Expectations involving the use of "white spaces*" have been increasing in view of the creation of new frequencies available for use after focusing on the actual situation with radio use. By taking advantage of its characteristics of local temporary availability white spaces can be expected to facilitate solutions to various social issues, including community revitalization, and the emergence of new services and systems in the creation of new industries through being utilized to provide information within limited areas such as local communities.

* Frequencies allocated for specific use, including broadcasting, but which can be made available for other uses depending on the geographical and technical conditions.

Figure 4 Conceptual image of white spaces



After taking into consideration the "Promotion Policies for Realizing White Space Utilization" (Discussion Team on New Radio Utilization Vision) formulated in July 2010 the Ministry of Internal Affairs and Communications now intends to facilitate research and development and proof-of-concept experiments on services and a system that utilize white spaces in "special white space zones", etc. and promote nationwide utilization of white spaces by 2012.

(2) Direction of growth/development of radio use

[1] Further increases in the speed and volume of mobile telecommunications systems

Recent progress made in the advancement of new mobile phones, including smart phones, and digital home appliances has enabled the distribution of rich content over networks and data traffic is increasing at an annual growth rate of approximately 70%. The response to that increase in traffic can be expected to be the introduction of more high-speed, large volume, and convenient mobile communications systems.

Broadband Wireless Access system (BWA) services have already been commenced since February 2009 that provides transmission speeds in the range of several ten Mbps and IEEE 802.16m, which will enable transmission speeds of over 100 Mbps, is expected to be introduced in 2012 or later.

With regard to mobile phone systems the introduction of a 3.9th generation mobile communications system (LTE), which is capable of realizing transmission speed of over 100 Mbps, is planned for December 2010.

In addition, international standardization of a 4th generation mobile communications system (IMT-Advanced: candidate technologies include LTE-Advanced and WirelessMAN-Advanced) that realises a transmission speed equivalent to that of optical fiber is being planned to be completed by around 2012, with its introduction expected to be around 2015 at the earliest.

Figure 5 Changes in mobile phones

Mobile phones
2nd Generation
PDC (Japan)
GSM (EU)
cdmaOne (North America)
3rd Generation
W-CDMA
CDMA2000
(Universal)

3.5th Generation
At present

3.9th Generation
International standardization completed in 2008
Commencement of services planned for December 2010

4th Generation (IMT-Advanced)
During high-speed travel: 100 Mbps
During low-speed travel: 1 Gbps
(Equivalent to optical fiber)
Under discussion by the ITU-R (International Telecommunication Union - Radiocommunication Sector) with the aim of completing international standardization in 2012.

Up to several kbps
Up to 384 kpbs
Up to 22 Mbps
Over 100 Mbps

Voice
Internet connection
(ADSL equivalent) advanced services, including music and games, etc.

2000
2010
2015

[2] Improved wireless broadband environment

Wireless connection of home information appliances, including televisions and digital cameras, etc. is enabled by the utilization of Wi-Fi and Bluetooth, etc.

The increased use of rich content is resulting in the establishment of broadband environments at homes/offices being requested. In addition, with increased demand for network connections “any time” “anywhere” broadband services can be expected to start being provided in mobile environments, including trains, airplanes, and ships, etc.

Electric vehicles have also been rapidly developed over recent years and the expectation for the realization of wireless power-supplies system using electromagnetic waves is increasing.

[3] Realization of sensor networks, etc.

Efforts to utilize sensor networks, where sensors are equipped with communication functions, in various sectors are taking place. In recent years expectations for the realization of smart meters that can automatically collect information from electric power meters and gas meters, etc. installed at people’s homes, etc. which are capable of being remotely controlled in an integrated manner, including opening and closing devices, etc. have grown. Smart meters can be used to optimize resource consumption and improve user convenience, and thus the realization of sensor networks that can be used stably over a wide area is being requested.

Expectations for ITS (Intelligent Transport Systems) to be utilized in reducing traffic accidents are also increasing in the traffic sector. A high percentage of traffic accidents in Japan involve pedestrian accidents and accidents at blind intersections, etc.. Realization of inter-vehicle communication, road-to-vehicle communication, and high resolution radar that will enable beyond-line-of-sight communication is therefore also expected.

In the medical sector, and in order to resolve the issues of a shortage of physicians and disparities in the level of medical care, the realization of remote image diagnoses and body area communication in measuring the health status of patients, etc. is expected. In addition, the realization of capsule endoscopy and capsule robots, etc. that will lead to the burden on patients from their treatment being reduced is also expected.

Figure 6 Expanded use of radio waves for sensor networks

Realization of safety and security through sensor networks

Smart meters
- Wide area sensor networks

Apartment buildings
Base stations

ITS
- inter-vehicle/road-to-vehicle communication
- High resolution radar

Wireless medical care
- Body area communication
- Wireless robotics

[4] Development of digital broadcasts

With terrestrial television broadcasts, digital broadcasting that realizes high-quality and highly functional broadcast at a narrower frequency bandwidth is being promoted. Realization of trial broadcasts of super hi-vision transmissions (super high definition video picture/super high quality sound broadcasts with 16 times as many pixels as Hi-Vision (HDTV)) using terrestrial television frequency band white spaces and trial broadcasts of super high-vision via a 21 GHz band broadcast satellite is being excepted by around 2015 to 2020. In addition, expectations exist that the realization of new services will occur through further advances made with digital broadcasts, including 3D broadcasts and multi-media being broadcast to mobile devices, etc.

Advancement of an 800 MHz band video picture relay system and introduction of large volume/low delay wireless cameras using the millimeter wave band are also expected.

(3) Response to frequency demand

[1] Increased frequency allocation though implementation of frequency reorganization, etc.

Advances made in technologies using radio waves and increased volumes of communications have led to progress in the use of the high frequency band. In response to this and in order to secure frequencies for use in coping with increased traffic over mobile communications systems, including mobile phones and wireless LAN, etc., efforts have been made to secure frequencies according to the new demand through a frequency reorganization in which fixed communications systems are being transferred to higher frequencies and the then available frequencies allocated for use with mobile systems.

Further frequency allocation in appropriately responding to demand will also be needed In order in realizing wireless broadband environments in various sectors in the future too. The need to secure frequencies through rapid and smooth implementation of frequency reorganization can therefore be expected to further increase in the future.

[2] Advances in technologies for more effective frequency use

In addition to increased frequency allocation the promotion of more effective use of radio waves through introducing a variety of technologies that enable more effective frequency use is essential in accommodating the expected increase in traffic. With mobile communications systems that use the same frequency band for communication, for example, the adaptation of more advanced technologies that enable more effective frequency use and the handling of large volumes will then enable increased communication capacity as 3.9th generation mobile phones will be able to provide approximately 550 times as much communication capacity as 1st generation mobile phones were capable of.

The demand will exist for advances to be made in various technologies that enable more effective frequency use in the future, including the possibility of increasing the number of new frequency domains, advanced digital modulation and demodulation techniques, advanced interference reduction technologies, establishment of new frequency sharing technologies, advanced antenna

technologies, and improved communication quality/reliability technologies, and thus the early establishment of these technologies and their introduction is needed.

Figure 7 Technical trends with radio use

New frequency domains
Realization of 0.1 THz wireless system
Realization of 0.5 THz to 3 THz wireless system

Frequency sharing technology
CDMA, OFDMA
New multiple access system

Antenna technology
Tuneable antenna (supporting VHF to 3 GHz)
Tuneable antenna (supporting VHF to 5 GHz)
Multiple band antenna

Analogue/digital 1 chip technology
5 GHz RF
10 GHz RF
20 GHz RF
40 GHz RF

Management technology
Multi-channel analysis, wide-band signal measurement
Measured frequency band switching technology
THz measurement technology

Communication quality/reliability technology
Round trip delay 10 ms
Round trip delay 1 ms or less

Optical communication technology
100 Gbps level
Several Tbps level

Video coding technology
Natural vision motion picture transmission
Natural vision motion picture compression
Realization of 3D video distribution

OS
Multi-core supporting OS
Hardware virtualization OS
Parallel and distributed OS
Distributed hardware virtualization OS

Security authentication technology
Multi-modal biometric authentication
Practical use of DNA authentication

Batteries
Approx. 150 Wh/L
Approx. 300 Wh/L

Approx. 500 Wh/L
Approx. 1000 Wh/L

Memory
FLASH: 16 Gbit
FLASH: 32 Gbit
FLASH: 64 Gbit
FLASH: 128 Gbit

CPUs
3 GHz 8 CPU
3 GHz 16 CPU
4GHz 24 CPU

Displays
High intensity EL material
Ultra low voltage luminescent multi-layered film techniques

Satellite-related technology
120 w/kg Lithium battery
150 w/kg Lithium battery
Regenerative fuel cell for satellite use

[3] Expansion of sectors for radio use

Advances made in technologies for radio use have resulted in various services not previously available having been developed, which include video picture/music distribution, internet shopping, electronic money, one-segment broadcasts, and online games. Radio waves are being used in various sectors, including community revitalization, medical care, and the environment, etc., and thus their importance as part of the social infrastructure is increasing. This increase in the sectors in which radio is being used is resulting in the need for efforts to be made to secure new frequencies.

Figure 8 Emergence of radio use in new sectors

Emergence of radio use in new sectors

Distribution management/food safety
Realization of distribution management via electronic tags, advanced and efficient traceability of food, etc.

Local wireless system
- Bus location information management system
- Tourism information provision system

Next generation information home appliances, home networks
Realization of introduction of wireless home appliance system

Medical care
Realization of efficient health management, new consultation technologies

ITS
Realization of introduction of advanced safe and secure ITS in accident prevention

Car on left
Car on right
Car in front
Up to 100 m

Robot
Realization of object recognition via radio waves, advanced sensor technologies such as attitude control, and remote control technologies

Electronic money/payment collection
Electronic accounting via mobile phones, etc., efficient payment collection, including determining amount of gas remaining/used

Multi-media at sea
Realization of broadband communications in improving safety of maritime navigation

Public sector, safety/security

2. Measures for Securing Frequencies toward Realizing Wireless Broadband

(1) Goals with securing frequencies toward 2015/2020

Expanded/diverse radio use is essential in securing social/economical/cultural development/growth and the safety/security of people's lives in Japan, and can be expected to greatly contribute to broadband environment development in regions where it has yet to have made much progress. Securing frequencies in a speedy manner, therefore, is very important. In order to achieve that a goal for the securement of frequencies should be set and then steady progress made toward that goal.

In addition, the effort involved in realizing wireless broadband environments through setting the abovementioned goal can be expected to contribute to the growth/development of industries that use radio waves, including the creation of new services (according to a report made by the Radio Wave Policy Panel, Ministry of Internal Affairs and Communications in July 2009, with radio wave-related markets worth approximately 50 trillion yen expecting to have been created by 2020).

* In the USA the "development of a global leading wireless broadband environment" was included in the "Connecting America: The National Broadband Plan" that the Federal Communications Commission (FCC) submitted to the federal government in March 2010, and which included the goal of making frequencies of 500 MHz band (300 MHz band by 2015) newly available for use with wireless broadband within 10 years (by 2020).

The "New Broadband Super Highway (*Hikari no Michi*)" Plan targets the date of 2015, thus making it the most appropriate to set the target date for the goal of securing the abovementioned frequencies as 2015 too. In addition, and in consideration of the expected introduction of 4th generation mobile phone systems being in latter half of the 2010s, it would be the most appropriate if the second target date were to be set as 2020.

(2) Basic idea in securing frequencies

Market creation, etc. through utilization of ICT will be a major key in securing greater affluence in the lives of people and facilitating sustainable economic growth in Japan in the future, with expanded use of radio waves being an extremely important contribution to that.

In addition, market creation, etc. through utilization of radio waves should not just be limited to domestic markets but international competitiveness also strengthened through facilitating international standardization pursued.

Securing frequencies should be promoted through comprehensive decisions on three major points, namely "economic growth through creation of new services, etc.", "improved convenience of users", and "enhanced international competitiveness" in enabling the most efficient growth/development of radio use. Frequency allocation should thus be discussed/decided with adequate levels of fairness/transparency taken into account.

In sectors where market globalization can be expected, including mobile communications systems and sensor networks, securing frequencies with consideration given to frequency allocation in foreign countries can be considered to be the basis for strengthening international competitiveness through enabling smooth international developments, etc.

In addition, when frequencies do need to be reorganized they will need to be rapidly secured in thus facilitating further more effective use of them overall through appropriately responding to technological innovations.

[Matters of concern with frequency reorganization]

[1] Any existing systems subject to transfer will necessitate the possibility of improved convenience through advancement, etc. also being discussed in parallel.

[2] Any development and verification being required in making a transfer to another frequency band will necessitate a discussion system involving the relevant partiers for use in making rapid and appropriate decisions among relevant parties being established.

[3] Until the new systems are appropriately operating after the transfer measures that take into consideration the environment being used by existing radio wave users will need to be in place for a specific period, including allowing the use of existing systems at the same time.

Promoting effective radio use with consideration given to future demand for frequencies will necessitate constant review of frequency allocations.

(3) Basic policies for securing frequencies

The points in (1) and (2) above result in frequencies needing to be secured as follows (refer to Attachment-1 for more details).

[1] Mobile communication systems and sensor network systems will require frequencies of over 300 MHz but 5GHz or lower to be newly secured, with other frequencies also needing to be secured in improving the broadband environment, etc. by 2015.

[2] In addition, frequencies of over 1500 MHz should be secured by 2020 to facilitate introduction of the 4th generation mobile communications systems and the development of broadband environments for airplanes, ships, and trains, etc.

With the frequency allocation the status with the progress will need to be managed through annually surveying radio use, etc. and the basic policies reviewed in a timely and appropriate manner.

3. Basic Policies for Allocating 700/900 MHz Band Frequencies

(1) Background of discussion

[1] Opinions on assignment of 700/900 MHz band

The 700/900 MHz band is considered appropriate for mobile communications, including mobile phones, etc., and as its frequency characteristics and specific frequency width is expected to be the one that will be secured its allocation is of great interest of the relevant business operators/vendors.

Part of the bandwidth (730-770 MHz) that will be available for new allocation after completion of transfer to terrestrial digital television broadcasting and that (890−903 MHz, 915-950 MHz) which will be available after the frequency reorganization of 800 MHz band mobile phone system, etc. will then be available for use as mobile phone frequencies after July 25, 2012.

With regard to the allocation of mobile phone frequencies using that band, however, the following opinions were expressed at the initial hearings and in comments received by this WG: [1] frequencies to be available for use by mobile phones in July 2012 should be allocated, and [2] any new allocation should be made through frequency reorganization.

[Summary of opinions received]

i) Opinion proposing joint use of the 700 MHz band and 900 MHz band

An opinion was proposed based on the idea of respecting the initial allocation in enabling more timely allocation for mobile phone systems.

ii) Opinion proposing separate use of the 700 MHz band and 900 MHz band

An opinion was proposed based on the idea of making the allocation with consideration given to the status with allocation in foreign countries. This proposal involves the frequency transfer of other existing systems (FPU, radio microphone, MCA, RFID, etc.).

a. Opinion on 700 MHz band

This opinion takes into consideration allocation in the US and discussion of AWF (APT Wireless Forum) and concerns the creation of both the upstream and downstream bandwidth of mobile phones within the 700 MHz band through reorganizing the 730-770 MHz band along with its adjacent bandwidths. Other opinions include TDD system allocation.

b. Opinion on 900MHz band

This opinion takes into consideration allocation for the 3rd generation mobile phones (UMTS900) in the EU, etc. that uses the 900 MHz band and concerns the creation of both the upstream and downstream bandwidth of mobile phones within the 900 MHz band through reorganizing systems including those using adjacent frequency bands.

Figure 9 Outline of Opinions on Assignment of 9,700/900 MHz Band

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

Personal radio
Digital terrestrial broadcasts
ITS
FPU/radio microphones

KDDI (au) (3rd Generation)
NTT docomo (3rd Generation)

[2] Assignment should be made with harmonization with Asia and North America taken into account

[3] Assignment should be made with harmonization with the EU taken into account

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

* FPU (Field Pickup Unit): A transportable system used in the broadcasting business, including news and sports broadcasting
* MCA (Multi Channel Access radio system): A mobile telecommunication system for independent use with broadcasts (simultaneous instructions) and group communication functions, etc. Mainly used in areas involving surface transportation, disaster management, taxis, etc.

[2] Direction of discussion

Each opinion received has both advantages and disadvantages, and hence discussions took place on the following points based on the opinions received. Discussions were based on the assumption that the basic framework concerning the completion of transfer to terrestrial digital television broadcasts (frequencies for terrestrial digital broadcasts and the content of systems to be introduced after completion of the transfer to terrestrial digital broadcasts) would be maintained and the that the transfer to the terrestrial digital broadcasting system is scheduled to be completed next year taken into consideration. (However, frequencies for ITS, for example, will not be fixed within the specific frequency band of 715-725 MHz that is currently scheduled to be allocated to ITS and allocation of bandwidth that will be available after the completion of transfer to terrestrial digital broadcasting will also be discussed.

a. Clarification of time schedule

Clarification of the date within which assignment for use by mobile phone systems will be made with consideration given to the expected growth in traffic, etc.

b. Clarification of methods for transferring frequencies

Clarification of the methods used to select frequencies to transfer to, the cost and terms required for technological development, and costs and terms required for the transfer, etc.

c. Verification of technical issues

Verification of other systems and the possibility of avoiding any interference with neighbouring countries, etc. (establishment of guard bands and filters, etc.)

More concretely, in addition to the status with allocation (refer to Annex-1) of frequencies for mobile phone in foreign countries (refer to Annex-2) discussions took place with consideration given to the following:

a. Results of hearings with relevant parties of systems subject to transfer
b. Results of hearings with mobile communications carriers
c. Results of discussion on interference by the Information and Communications Technology Sub-Council, Information and Communications Council (Committee on Measures for Effective Frequency Use of Mobile Phones, etc.), etc.

Policies for allocating 700/900 MHz band frequencies will be described with these results, etc.

Figure 10 Discussion model proposals for 700/900 MHz band allocation

1. Proposal for jointly reorganizing 700 MHz band and 900 MHz band

Proposal 700/900: Plan for jointly reorganizing 700 MHz band and 900 MHz band (40 MHz x 2)
Personal radio
Television broadcasts
ITS
FPU/radio microphones
Mobile phones (upstream)
MCA
Mobile phones (downstream)
RFID
STL

2. Reorganization of 700/900 MHz band
(1) 700 MHz band

Proposal 700-1: Allocation plan based on current frequency allocation (15 MHz x 2)
(Merits)
Transfer of other systems is not necessary and thus will be available for use by July 2012
(Major issues)
[1] Relationship with allocation in foreign countries
[2] Prevention of interference with Korea
[3] Verification of guard bands with FPU/radio microphones

Proposal 700-2: Allocation plan with consideration given to allocation in USA (20 MHz x 2)
(Merits)
Able to realize harmonization with frequencies allocated in USA
(Major issues)
[1] Securing frequencies for FPU/radio microphones to transfer to and possibilities of their transfer
[2] Prevention of interference with Korea
[3] Verification of guard bands with FPU/radio microphones

Proposal 700-3: Allocation plan with consideration given to discussion of AWF (35 MHz x 2)
(Merits)
Able to realize harmonization with frequencies discussed by AWF (*)
* Placement of UL/DL has not been decided upon
(Major issues)
[1] Securing frequencies for FPU/radio microphones to transfer to and possibilities of their transfer
[2] Prevention of interference with Korea
[3] Status of countries with prospects of making allocation based on the AWF plan

Proposal 700-4: Allocation plan based on TDD method
(Merits)
Able to realize harmonization with WiMAX Forum Class7
(Major issues)
[1] Securing frequencies for FPU/radio microphones to transfer to and possibilities of their transfer
[2] Prevention of interference with Korea
[3] Verification of guard bands with FPU/radio microphones
(2) 900MHz band

Proposal 900-1: Allocation plan with consideration given to allocation of 3GPP BAND8 (EU) (plan based on the current frequency allocation) (5 MHz x 2)
(Merits)
Transfer of other systems is not necessary and thus will be available for use by July 2012
(Major issues)
[1] Effective use of guard bands
[2] Limited use of personal radio, possibilities of shared use with mobile phones
[3] Guard bandwidth between 900 MHz band and 800 MHz band (clarification of characteristics of additional filters)

Proposal 900-2: Allocation plan with consideration given to allocation of 3GPP BAND8 (EU) (plan for transferring RFID/MCA to guard bands) (15 MHz x 2)
(Merits)
Able to realize harmonization with EU for mobile phones and with USA for RFID
(Major issues)
[1] Possibilities of transferring RFID/MCA (schedule, support measures, etc.)
[2] Limited use of personal radio and STL, possibilities of shared use with mobile phones
[3] Guard bandwidth between 900 MHz band and 800 MHz band (clarification of characteristics of additional filters)

* Transfer from the model proposal 900-1 to the model proposal 900-2 will also be considered in the future discussion.

(2) Results of hearings with relevant parties (refer to Annex-3 for details)

Hearings with the relevant parties of systems subject to transfer and mobile communications carriers (5 carriers) have been conducted in clarifying the status with the usage and future prospects of systems subject to transfer (FPU, radio microphones, MCA, RFID), transfer expenses and methods, outline of systems requesting new entry and preferred time of introduction, etc.

[1] Summary of opinions of relevant parties of systems subject to transfer

The opinions of the relevant parties of the systems subject to transfer may be summarized as being not necessarily in favour of the transfer, although if the transfer takes place the expenses for transfer must be borne by mobile communications carriers, etc., with other certain conditions also needing to be secured.

The amount of transfer expenses will depend on the method of transfer and frequencies to which the transfers are made, etc., but the total expenses required for transferring the 700 MHz band and 900 MHz band systems that are subject to transfer have been calculated to be around 100 billion yen.

[2] Summary of opinions of mobile communications carriers (5 carriers)

Hearings with mobile communications carriers, etc. were initially conducted at the beginning of this WG. Hearings were conducted again on their preferred entry, etc., with the results being summarized as follows.

a. They are in favour of respective allocation of the 700 MHz band and 900 MHz band frequencies.
b. Agreement needs to be reached between the relevant parties with regard to the transfer schedule, cost bearing methods, and procedures of transfer, etc.
c. In order to promote rapid frequency reorganization the need to bear the transfer expenses is understandable (however, more details of the transfer expenses need to be examined).

(3) Status with technical verification (refer to Annex-4 for details)

The decision was made to discuss the feasibility of model proposals with the Information and Communications Technology Sub-Council, Information and Communications Council from the technical point of view, with intensive discussions on interference between wireless systems then having taken place by the Committee on Measures for Effective Frequency Use of Mobile Phones, etc. of the said Sub-Council since September this year.

More concretely, discussions were made on the minimum required guard bandwidth and its technical requirements as conditions for the coexistence of possible adjacent wireless systems, although depending on the frequency allocation. Discussions also took place on the possibility of frequencies being shared between the new and old systems during the transfer period.

Discussions on interference were made on the following combinations.

[1] 700 MHz band

- Mobile phones (upstream and downstream of 700 MHz band mobile phones)
- Between mobile phones and other wireless systems (between mobile phones and television broadcasts, ITS, FPU, and radio microphones)
- Between other wireless systems (between ITS and FPU and radio microphones)

[2] 900 MHz band

- Between mobile phone systems (between 800 MHz band mobile phones and 900 MHz mobile phones)
- Between mobile phones and other wireless systems (between mobile phones and personal radio, MCA, RFID, STL, and airplane radio navigation systems)
- Between other wireless systems (between MCA and RFID)

The feasibility of model proposals with consideration given to the results of discussions on interference is as follows.

[1] 700 MHz band

More detailed discussion on interference will be needed in establishing guard bands between a

number of systems, including between mobile phones and television broadcasts, etc. Detailed analysis/evaluation using performance values (data obtained from the actual system and actual operational configuration, etc.) will need to be conducted in the future.

[2] 900 MHz band

Discussions on interference have almost been completed for all combinations. After taking into general consideration the individual conditions for coexistence early implementation of model proposal 900-1 (5 MHz x 2) is considered possible because it does not require any transfer of other wireless systems. Model proposal 900-2 (15 MHz x 2) is also considered possible, although it may take some time to implement because it assumes a RFID and MCA transfer. Discussions also took place on the possibility of the new and old systems sharing the same frequency band during the transfer period, and agreement reached that that sharing would be considered possible under certain conditions.

Based on the above, reorganization in a stepwise transfer from the model proposal 900-1 to the model proposal 900-2 is considered generally possible.

(4) Basic Policies for allocating 700/900 MHz band frequencies (refer to Annex-2 for the frequency reorganization policies of individual bandwidths)

In view of ensuring consistency with the frequency allocation status of foreign countries and in consideration of the above (1) through (3) an “allocation method that makes respective use of the 700 MHz band and 900 MHz band” is considered the most appropriate.

In order to appropriately respond to future frequency demand in mobile communications, however, the necessary measures with bearing the expense of transferring the frequencies of existing systems will need to be taken (refer to (1) of 4).

4. Measures for Realizing Wireless Broadband

(1) Introduction of new measures for rapid and smooth frequency reorganization

[1] Introduction of new methods

Frequency reorganization methods mainly taken at present include:

a. Transfer frequencies of existing systems in approximately 5 to 10 years with consideration given to the facility renewal period (expenses required for the transfer will be self-borne).

b. Introduce new systems when transfer complete.

Introduction of new systems may actually take 10 or more years after commencement of discussion due to the adjustment period needed to implement the transfer.

However, as with the 700/900 MHz band allocation, rapid frequency reorganization will be required in establishing wireless broadband environments in the future.

In fulfilling that necessity the frequency reorganization can be accelerated through the following methods.

a. Not introducing new systems after the completion of the frequency reorganization and instead facilitating rapid reorganization according to the development of new systems in broad areas while sharing existing system frequencies in a geographical/time-based manner.

b. Users of transferred frequencies bearing the expense of transferring the frequencies of existing systems

Implementation of these methods will require consideration of the following matters.

a. The amount of expenses required for rapid frequency reorganization is expected to be quite large, as indicated by the estimated amount of transfer expenses for the 700/900 MHz band frequencies.

b. Incentives for bearing expenses need to be provided to the users of the transferred frequencies.

c. Methods for sharing and transferring the existing systems may differ and thus the amount of transfer expenses change depending on the planned commencement date of services and area developments.

This then makes the introduction of methods that utilize market principles in having those that wish to use the transferred frequencies indicate their ability to bear the expenses required for the transfer appropriate.

More concretely, the government when selecting users of the transferred frequencies may introduce a method of determining the business operators that takes into consideration their ability to bear the expenses required for the transfer and planned commencement date of services, etc.

As indicated the introduction of a method that incorporates the idea of auctions can be used to induce rapid commencement of services and area developments with mobile communications carriers, etc. then bearing the expenses required for the frequency transfer, and thus can be expected to contribute to the early realization of a wireless broadband environment and lead to the creation of new services and strengthened international competitiveness, etc.

Efforts will therefore need to be made through a more detailed system design in achieving that.

[2] Matters to be considered when introducing new methods

The following opinions were received from mobile communications carriers on the introduction of the new methods.

- A negotiation system between the relevant parties needs to be established. Certain rules as preconditions also need to be established.
- The scope of expenses to be borne should be determined in advance in order in ensuring that the amount of transfer expenses is appropriate.
- The maximum amount of the expenses borne should be established based on reasonable grounds.
- Measures to ensure completion of the transfer need to be taken.
- A negotiation system for use by current users, newly entering business operators, and third parties (Ministry of Internal Affairs and Communications, etc.) ensuring an appropriate transfer takes place needs to be established.
- A system that is based on a comparison examination and requiring an indication of an ability to bear the transfer expenses with financial evidence.

As a result of discussions that took these opinions into consideration the design of a concrete system with consideration given to the following points would be considered appropriate when introducing new measures.

- The government making a decision on the implementation framework and providing the necessary supervision to enable a smooth frequency transfer would be the most appropriate, and therefore the government implementing the following, for example, should be discussed.
  - Measures to ensure a smooth transfer need to be taken, including determining the scope of expenses to be borne and transfer deadlines, etc. 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 the systems subject to transfer and periodic confirmation of transfer status, etc.
- In view of facilitating rapid frequency reorganization the relevant parties will need to act independently under the above framework. For instance, in view of promoting a smooth transfer after selecting the appropriate business operators the schedule and method of transfer to the respective radio stations, etc. should be determined through negotiation between the relevant parties.

  Expanding the scope of negotiation between relevant parties should also be discussed, including enabling the provision of facilities required for the transfer as a method of bearing expenses in addition to the payment of money.

[3] Matters to be considered when taking measures

In case any development/verification is needed in the frequency transfer actions such as conducting negotiations between the relevant parties in enabling smooth development/development with common understanding between the relevant parties through clarifying the content of the requirements will need to be taken.

In addition, the Ministry of Internal Affairs and Communications, in cooperation with the relevant parties, will need to further verify the transfer expenses and methods, etc. toward the frequency reorganization of the 700/900 MHz band.

(2) Other measures to be promoted

[1] Promotion of research and development, etc.

Responding to the bandwidth needed to realize wireless broadband will necessitate continuing to research and develop technologies that enable more effective use of radio waves and proof of concept experiments, etc. toward the early introduction of those technologies.

Research and development should be promoted within the following focused areas.

a. Technologies for effective frequency use toward realization of the next generation mobile communications systems, including 4th generation mobile phones, etc.
b. Frequency sharing technologies toward realization of new wireless broadband access with advanced use of white spaces, etc.
c. Home wireless technologies
d. Technology for facilitating the use of unused frequency bands
e. Technologies for enabling frequency changes to be made via software

If the development of a system is required in transferring existing systems to new frequency bands, etc. it will need to be facilitated, including through utilization of radio usage fees.

[2] Promotion of development of environment for the use of radio waves

Formulation of business plans and strategies for developing new services using radio waves will be easier if the status of radio use can be checked/analyzed.

More concretely, the provision of information that gives a “rough idea” whether intended frequencies are available for use in some specific regions in an understandable manner can be expected to contribute to the smooth expansion of radio wave related markets, including various wireless systems, that is expected to take place in the future.

The Ministry of Internal Affairs and Communications to date has enabled users to check the status of radio use through radio station information retrieval, etc. from the “Radio Use Web Site”, which is used as a method of publishing information on ratio stations, etc. (concerning paragraph 1, Article 25 of the Radio Act). In order to further facilitate the rapid and smooth securing of frequencies measures such as “Making Radio Waves Identifiable”, etc. will need to be discussed through developing an environment for the use of radio waves, including identifying the situation with radio

wave use and discussing methods of dissemination, etc.

More appropriate identification of trends with frequency demand is needed in enabling frequencies to be secured in a timely and appropriate manner. Increased traffic, caused mainly by data communication over mobile communications systems, has especially been a significant factor in frequency shortages in recent years. Appropriate identification of trends with frequency demand, therefore, is also necessary in the development of a radio use environment in the future.

Figure 11 Image of "Making Radio Waves Identifiable"

Information on individual systems
Licensing information
Application information
General information
Radio wave monitoring
Status of use

Cooperation
Analysis

"Making Radio Waves Identifiable" web site
Geographic Information on radio stations
Retrieval of white space information
Status with radio use
Frequency distribution
Improved more efficient radio use

Information provision
Inquiries
Response

Improved government services
Analysis
Business plan formulation
Enterprises (business operators)
Licensees
Promotion of radio wave market creation

5. Future Directions, etc.

(1) Early realization of concrete measures, including frequency reorganization, etc.

In consideration of the content of this report the Ministry of Internal Affairs and Communications will need to discuss concrete measures toward early realization of wireless broadband environments before then taking the necessary actions.

Frequency reorganization, in particular, is a very necessary step in realizing a wireless broadband environment as well as economic growth in Japan, improved convenience of users, and enhanced international competitiveness, thus making its early implementation necessary.

(2) Full-scale discussion of auctions

In addition to the recommendation that a method incorporating the idea of auctions be introduced for users of transferred frequencies in them bearing the expenses required in the frequency transfers and as a measure of ensuring a rapid frequency reorganization takes place, the promotion of discussion on auctions implemented in foreign countries will also be necessary.

Because of this point the following ideas were expressed in the "Basic Policies for Review of Radio Usage Fees in the Next Term" published by the Ministry of Internal Affairs and Communications on August 30 of this year, and thus promotion of discussions with consideration given to them would be the most appropriate.

[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 appropriate explanations to be made. In addition, the 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 will therefore need to be made in verifying their need/rationality in light of the purpose/effectiveness of introducing them and the results then disclosed to the public.

Incorporating the idea of auctions has been discussed with attention paid to methods of bearing the expenses required for the frequency transfer. In discussing the introduction of auctions implemented in foreign countries, however, broad discussions that include methods of handling part of the auction revenues not allotted for bearing the transfer expenses, etc. will be necessary.

The following opinions were expressed in hearings with mobile communications carriers on the introduction of auctions.

[1] Careful discussions will be required or they may induce high bidding prices and cause a delay in provision of advanced services and increase the user burden.

[2] Business operators with abundant funds will be more likely to make a successful bid, which could come in conflict with the promotion of competition through new entries.

[3] The bidding price of the auctions will eventually be reflected in service provision fees, thus necessitating that sufficient understanding of the public be obtained.

In addition, opinions from various sectors will need to be broadly collected in promoting discussions taking place.

In any case, the measures described here will need to be taken in realizing early frequency reorganization while discussions on auctions also need to be promoted with consideration given to the status of the frequency reorganization.

Attachment-1

Basic Policies with Securing Frequencies toward 2015/2020

The realization of wireless broadband will require frequencies of at least 300 MHz bandwidth being secured by 2015 and at least 1,500 MHz bandwidth by 2020, as described below.

The status with the progress of the frequency allocation will need to be managed through annually surveying radio use, etc.

1. Frequency band to be secured by the goal of 2015

Frequencies of over 300 MHz but 5GHz or lower will be newly secured for mobile communication system and sensor network system use, and other frequencies also secured in improving the broadband environment, etc.

(1) Response to increased speed/volume of mobile communication systems

- **700/900 MHz band <100 MHz bandwidth at maximum>**

  Frequency allocation policies should be immediately formulated with the goal of securing an approximate maximum of 100 MHz bandwidth.

- **1.7 GHz band <10 MHz bandwidth>**

  In addition to the 10 MHz bandwidth (5 MHz x 2) that is not currently allocated adjustment should be promoted in newly securing 10 MHz bandwidth in 2012. With regard to the frequency band use that is currently limited to the area of from Tokyo to Osaka, discussion should also take place on expanding the area of its usage.

- **2.5 GHz band <30 MHz bandwidth at maximum>**

  The provision of high-speed BWA (Broadband Wireless Access system) services of approximately 100 Mbps will require technical standards for further advancement of the system and additional frequency allocations (2,625-2,660 MHz) to be immediately formulated and implemented toward practical use in 2012. In addition to this, utilization of the 2 GHz band TDD method (2,010-2,025 MHz) will also need to be discussed.

- **3-4 GHz band <200 MHz bandwidth>**

  Technical standards, etc. should be formulated that enable practical use of 3.4−3.6 GHz as the frequencies for the 4th generation mobile communications systems (IMT-Advanced) by 2015.

(2) Improved broadband environment

- **60 GHz band <2 GHz bandwidth>**

  In developing broadband environments at homes and offices discussion will need to take place on expanding the available bandwidth of 60 GHz band by 2 GHz in making 57-66GHz available for use by the goal of 2012.

- **400 MHz band <expand to approx. 3 MHz band>**

  Facilitating the development of broadband train radio wave systems, etc. will require discussions to take place on expanding the allocation of 400 MHz to approximately 3 MHz band by the goal of 2015.

(3) Introduction of sensor systems

[1] Introduction of smart meters, etc.

- **900 MHz band <5MHz bandwidth>**

  With RFID, and in order to avoid any obstruction to the introduction of smart meters in the areas of electricity and gas, etc., the reallocation schedule with the 900 MHz band will need to be immediately determined. This will also necessitate the 5 MHz bandwidth being allocated by the goal of 2012.

- **280 MHz band <5 MHz bandwidth>**

  System development should be promoted in securing approximately 5 MHz bandwidth in making the VHF band (280 MHz band) available for use for sensor networks that cover a wide range of areas by 2012.

[2] Improved safety of automobile transportation

- **700 MHz band <10 MHz bandwidth>**

  In order to prevent accidents involving beyond-line-of-sight vehicles the frequency allocation for ITS will need to take place as early as possible with consideration also given to the status of the discussion on the scheduled allocation of the 700 MHz band frequencies.

- **79 GHz band <4 GHz bandwidth>**

  Practical use of high resolution radar should be promoted by the goal of 2015 after having formulated the technical standards, etc.

[4] Use in medical/healthcare fields

- **400 MHz band <approx. 10 MHz bandwidth>**

  Discussions will need to take place in facilitating the introduction of new systems in the medical sector with consideration given to trends in international standardization, including a patient vital data collection system, while also being shared with the existing system by the goal of 2015.

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

In consideration of demonstrating use of “special white space zones” discussion on developing the appropriate environment should be commenced upon in 2010 with the aim of nationwide development by 2012.

(5) Response to advanced broadcast systems

Securing the required frequency for the video image relay system should be facilitated while also facilitating its advancement, including Hi-Vision support, etc.

2. Frequency band to be secured by the goal of 2020

Frequencies of over 1500 MHz but 5 GHz or lower will need to be secured in facilitating the introduction of 4th generation mobile communications systems and the development of broadband environments for airplanes, ships, and trains, etc., with the frequencies for improving broadband environments, etc. needing to be secured by 2020.

(1) Response to advancement/increased volume of mobile communication systems

- **3-4 GHz band <approx. 1.1 GHz bandwidth>**

  Allocation of frequencies of 3.6-4.2 GHz and 4.4−4.9 GHz for the 4th generation mobile communications system (IMT-Advanced) should be discussed while also facilitating international collaborations.

(2) Improved broadband environment

- **400 MHz band**

  Discussions on securing frequencies in responding to increased use of smart meters, etc. should be promoted.

- **21 GHz band**

  Discussions on securing frequencies toward realization of satellite super high-vision trial broadcasts should be promoted.

- **40 GHz band <approx. 1.2 GHz bandwidth>**

  Discussions on frequency allocation for developing environments for the use of broadband on airplanes, ships, and trains should be promoted.

Attachment-2

Basic Policies for Reorganizing 700MHz Band Frequencies

1. Basic idea

- Frequency transfer/reorganization will commence from 2015 on with the aim of realizing the use of mobile phone systems.
- Research and development, proof-of-concept experiments, and system verification, etc. of the systems that existing systems will be transferred to will therefore need to be conducted and a frequency transfer plan formulated with the results taken into account by around FY 2012.
- In formulating the above plan discussions will need to take place on the conditions for geographical/time-based sharing of frequencies with existing systems and early implementation of mobile phone system then promoted if such sharing is possible.
- In conducting research and development, etc. the relevant parties will need to cooperate in making efforts with consideration paid to requests concerning the frequencies to which existing users will be transferred, etc.
- In consideration of the effect on boosters used to receive television broadcasts, etc. the frequencies the base stations use will need to be 770 MHz or higher. In addition, detailed technical verification of the establishment of guard bands, including for use between television broadcasts and mobile phones, etc., will need to be conducted and the results then reflected in the formulation of frequency transfer plans. Efforts will also need to be made to rapidly determining frequencies for ITS use.

2. Transfer of FPU frequencies

- Efforts will need to be made to realize the transfer using the 1.2 GHz or 2.3 GHz band. Efforts will also need to be made in research and development, etc. with the aim of introducing effective radio use technologies, including advanced HDTV transmission of broadcast programs, etc.
- Transfer of existing FPU will be promoted with the above results taken into account. Any cases where the period and area of use can be determined in advance, for example those used for marathon broadcasts, will require use of the transferred frequencies to be determined through adjustment between licensees for a certain period after 2015.

3. Transfer of radio microphone frequencies

- Efforts will be made to realize the transfer through use of white spaces or the 1.2 GHz band. Efforts will also be made through research and development, etc. with the aim of introducing effective radio use technologies, including low delay digital systems, etc.
- Use of white spaces will require the frequencies for use being discussed, including securing shared frequencies, with consideration given to not impairing the convenience of users.

- The transfer of existing radio microphones will need to be promoted with the above results taken into account. The frequency transfer will need to be implemented with the area development made by mobile communications carriers taken into account and with the use of existing radio microphones needing to be continued to be allowed through adjustment between licensees for a certain period after 2015.
- Any shielding effect being expected to occur at theatres and broadcast station studios, in particular, will result in effective use of frequencies needing to be facilitated through adjustment between licensees and systems developed that allow shared frequency use as required.

Basic Policies for Reorganizing 900 MHz Band Frequencies

1. Basic idea

- Frequency reorganization will be implemented with the aim of commencing use of 5 MHz x 2 to be commenced in 2012 and the use of 10 MHz x 2 by 2015.
- The allocation status in the EU (or 3GPP band plan) and the allocation status of the 800 MHz band results in the 45 MHz interval for upstream and downstream being considered appropriate

2. Transfer of frequencies for existing systems, etc.

- In consideration of the allocation status in the EU and the USA and in view of strengthening international competition the RFID frequencies will need to be transferred to 915-928 MHz.
- Frequencies for MCA (terminals) will be transferred to 930−940 MHz.
- Personal radio will be abolished around FY 2015. Mobile phone services will be provided under the conditions the frequencies are shared for the period of 2012 to 2015.

3. Transfer schedule

- The transfer of RFID and MCA will take place within the same frequency band, and hence the technical standards, etc. will need to be developed for device development, etc. by summer 2011 and the frequency transfer then commenced upon in 2012.
- Efforts will be made to enable mobile phones using the said frequency band by around 2015 with consideration given to the status of frequency transfer, and in regions where the transfer will not complete by then, etc. the transfer will be promoted with the aim of completing it by around the end of FY 2017 while also making adjustments for use with existing licensees.

4. Matters to be considered in implementing transfer

- A concrete transfer plan will need to be formulated by the relevant parties in enabling a smooth frequency transfer with the following points taken into account.

[MCA]

At present the frequency transfer of the 1.5 GHz band and digital use of the 800 MHz band is being promoted, with the number of users and terminal devices using the systems being relatively large.

[RFID]

If RF tags need to be changed the frequency transfer procedures may become rather complex.

Annex-1

Summary of Usage Status of 700/900 MHz Band

1. 700 MHz band

- 710-770 MHz will be available for new allocation after July 25, 2012.
- Allocating the said frequency band to ITS and mobile phones was decided upon in 2009 (Information and Communications Council report)
- 770-806 MHz band is in use by FTP and radio microphones (shared use)
- FPU utilizes the 9 MHz band as one block and also 4 channels for SD transmissions. Technologies that allow 2 channels to be used together for HD transmissions have already been established.
- As with FPU radio microphones also utilize the 2 MHz band as one block but also 2 blocks (779-788, 797-806 MHz) for mainly analogue systems. 142 channels have already been allocated, but only about 20 channels can be used at any one time due to the effect of mutual modulation, etc. Technical standards for digital methods that expand the frequencies to 4 blocks (770-806 MHz) and allot 285 channels were therefore formulated in 2009. However, products have not been commercially available until this year and the number introductions still relatively small. In addition, some issues remain to be resolved, including delays in voice transmissions, etc.

2. 900 MHz band

- 890-903 and 915-950 MHz will be available for new allocation after July 25, 2012.
- 903-905 MHz will be used for personal radio, 905-915 MHz for MCA (terminal side), 950-958 MHz for RFID, 958-960 MHz for STL, and 960-1,215 MHz for airplane radio navigation systems. STL will be transferred, however, to another frequency band by 2015
- The number of personal radio stations is rapidly decreasing with the devices no longer being manufactured.
- At present 800 MHz band and 1.5GHz band are being used for MCA but the use of 1.5 GHz band will be terminated at the end of FY 2014. And although the number of stations has been on a decreasing trend its use in disaster prevention areas, etc. is increasing.
- RFID was systematized in 2005 and its use is expected to increase in the future with smart meters, etc.

Annex-2

Allocation Status of Frequencies for Mobile Phone in Foreign Countries

1. Allocation status in Japan, the EU, and the USA

Figure 1 Current status with frequencies for mobile phones in Japan, EU, and the USA

- There is no international standard frequency/communication method.
- For example, frequencies allocated for mobile phones in the USA and the EU differ.
- Communications device vendors offer mobile phones use frequencies/communication methods that are in accordance with the regions in which they are sold.

[Communication method]
Japan
USA
EU
Under discussion
[Frequency]
700 MHz band
850 MHz band
900 MHz band
1.7 GHz band
2 GHz band

2. Status of 700MHz band allocation in Asian region, etc.

At the most recent meeting of the AWF (APT Wireless Forum) this September an APT report was compiled on the use of 698-806 MHz band frequencies in realizing greater harmonization of the frequencies. The report provided the following 698-806 MHz band plan. With any concrete frequency allocations made in the future attention will need to be paid not only to trends in the EU and the USA but also to the status with discussions held by the AWF and the trends in frequency allocation in Asian countries, etc.

<FDD method>
UL: 703-748 MHz
DL: 758-803 MHz (center gap: 10 MHz, high/low-frequency gap: 55 MHz)

<TDD method>
UL/DL: 698-806 MHz

Annex-3

Summary of Opinions of Relevant Parties on 700/900 MHz Band

1. Summary of opinions of relevant parties of systems subject to transfer

(1) The opinions of the relevant parties of systems subject to transfer can be summarized as in the following table. Not all relevant parties are necessarily in favour of the transfer but if the transfer does take place the expenses for that transfer will need to be borne by the mobile communications carriers, etc. and other specific conditions also secured.

The amount of transfer expenses will depend on the transfer method used and frequencies to which the transfer is made, etc., but has been estimated to be around 100 billion yen for 700 MHz band and 900 MHz band.

(2) Major opinions are as in the following table.

Frequency band	Major opinions of relevant parties
700 MHz band	○ If other bandwidths need to be transferred to their frequencies to transfer should only be decided after taking the results of development, proof-of-concept experiments, and system verification (requires approximately 2 to 3 years) into account. ○ After taking into consideration the results of the above the development of the new FPU systems can only be completed in approximately 3 years at earliest and 5 years with radio microphones with the transfer expenses taken care of. ○ The transfer needs to be implemented in such a way that it results in improved convenience. **[FPU]** Securement of frequencies in wider bandwidths that suit mobile relay broadcasts and support Hi-Vision **[Radio microphone]** Increased number of available channels, introduction of digital methods with less transmission delay ○ The current FPU bandwidth should continue to be made available (through time-based sharing with mobile phones) for a specific period after the development of new systems, although provided that the period and area of use can be determined in advance, including for road race broadcasts. ○ A number of radio stations are being used in various ways with regard to radio microphones, including broadcasts, concerts, and theatres, and hence the transfer should be limited to the minimum necessary level.
900 MHz band	○ Transfer of MCA will be possible in approximately 5 years at earliest and RFID in 5 years with the transfer expenses taken care of. ○ The number of MCA radio stations is very large, and hence cooperation between business operators, vendors, and sales dealers, etc. will be necessary in ensuring rapid completion of the transfer. (At present approximately 260,000 stations) ○ Consideration should be given to the fact that the transfer expenses for RFID will not only include reader/writer replacement fees but also RF tag replacement fees. (Cumulative total of RF tag shipments approximately 41.2 million) ○ In light of the status with allocation in foreign countries RFID should be transferred to frequencies of 915-925 MHz.

2. Summary of opinions of mobile communications carriers

(1) Hearings with mobile communications carriers, etc. were initially conducted at the beginning of this WG. Hearings were conducted again on their preferred entry, etc., with the results being summarized as follows.

a. They are in favour of respective allocation of the 700 MHz band and 900 MHz band frequencies.

b. Agreement needs to be reached between the relevant parties with regard to the transfer schedule, cost bearing methods, and transfer procedure, etc.

c. In order to promote rapid frequency reorganization the need for the transfer expenses to be borne is understandable (however, more details of the transfer expenses need to be examined).

(2) Opinions for their preferences with entering the 700/900 MHz band can be summarized as follows.

Requested frequency band	Requested allocation date	Frequency use system	Purpose of using frequencies	Requested frequency band per business operator
700 MHz band	In or after 2012 but no later than 2015	LTE	Traffic measures	15 MHz x 2
900 MHz band	2012	W-CDMA (others, LTE)	Traffic measures, area expansion	5 MHz x 2 to 15 MHz x 2

In addition to the 700/900 MHz band requests for additional allocations were also submitted for the 1.7 GHz band, 2.5 GHz band, and 3-4 GHz band (4th generation mobile communications). Opinions requesting that reorganization policies for the 700 MHz band and 900 MHz band be formulated at the same time were also received.

(3) Opinions on auctions implemented in foreign countries collected at hearings include the following.

- Careful discussion is necessary because they could induce higher bid prices and thus cause a delay in the provision of advanced services and increased user burden, similar to the case of the EU.
- With simple auction systems business operators with abundant funds are more likely to make successful bids, which could thus come in conflict with the promotion of competition through new entries.
- The bidding price of auctions will eventually be reflected in service provision fees, and hence the understanding of the public will need to be obtained.
- Consistency with the current radio system/radio usage fee system should be maintained after clarifying the purpose and characteristics of radio usage fees.

Annex-4

Results of Discussion on Technical Feasibility of Discussion Model Proposals for 700/900 MHz Band Allocation

1. Discussion at the Committee on Measures for Effective Frequency Use of Mobile Phones, etc., Information and Communications Technology Sub-Council, Information and Communications Council

○ Following an interim report made by the Working Group on Discussion of Frequencies the said committee has met a total of 10 times. A number of relevant parties participated in the discussions.

○ The respective model proposals were used to list the combinations of wireless systems that would require discussion on interference and the minimum guard bandwidth (GB) and conditions required for coexistence of systems then identified for each individual combination.

2. Status of discussion on interference of 700/900 MHz band

○ With regard to the reorganization of the 900 MHz band a reorganization involving a transfer from proposal 900-1 to 900-2 is considered basically feasible (Note).

(Note) Many of the combinations discussed were determined to be capable of coexistence provided that filters are used at base stations, adjustment of their placement will take place, and terminal operations partially limited.

○ More detailed discussion on interference with the many systems will be needed for the 700 MHz band. Detailed analysis/evaluation using performance values (data obtained from the actual system and actual operational configuration, etc.) will need to be continued to be made toward minimizing GB.

(1) Proposals for reorganizing 700 MHz band

(Note) Red arrows: primary discussion completed, blue arrows: detailed discussion required

Proposal 700-1: Allocation plan based on current frequency allocation (10-15 MHz x 2)
Proposal 700-2: Allocation plan with consideration given to allocation in USA (15-20 MHz x 2)
Proposal 700-3: Allocation plan with consideration given to AWF discussions (25-35 MHz x 2)
Proposal 700-4: Allocation plan based on TDD method (15-20 MHz x 2)

Television broadcasts
ITS
FPU/radio microphones
Mobile phones (upstream)
TDD (Proposal based on current allocation)
TDD (Proposal involving transfer)

■ Several combinations remain requiring more detailed discussion on interference.
■ Status of discussion at present is as follows.

■ Verifications are continued to be required toward minimizing GB.
[2] <Against television broadcasts>
Base stations are of GB 30 MHz or higher and require specific elongation
Land mobile stations are of GB 15 MHz and require specific elongation
No discussion took place on land mobile relay stations and low power repeaters
[3] <Against ITS>
Base stations are of GB 5 MHz
Land mobile stations are of GB 5 MHz (GB 5-10 MHz with transmissions from land mobile stations to ITS vehicle equipped devices (in-vehicle model))
[4] <Against FPU>
Base stations and land mobile relay stations are of GB 5 MHz (can be lower than 5 MHz)
Land mobile stations and low power repeaters are of GB 10 MHz (can be lower than 10 MHz)
[5] <Against radio microphones>
Base stations are of GB 5 MHz
Land mobile stations and low power repeaters are of GB 10 MHz or higher (can be lower than 10 MHz)
Land mobile relay stations are of GB 5-10 MHz

(2) Proposals for reorganizing 900 MHz band
(Note) Red arrows: primary discussion completed, blue arrows: detailed discussion required

Proposal 900-1: Allocation plan with consideration given to allocation of 3GPP BAND8 (EU) (plan based on current frequency allocation) (5 MHz x 2)
Proposal 900-2: Allocation plan with consideration given to allocation of 3GPP BAND8 (EU) (plan involving transfer of RFID/MCA) (up to15 MHz x 2)

Mobile phones (upstream)
MCA (downstream)
Mobile phones (downstream)
MCA (upstream)
RFID
MCAT
GB
Airplane radio navigation system

■ Expected to be feasible as long as consideration is given to the following
* Locations for establishing base stations, etc. and individual adjustments, including use of filters, etc.
* Introduction in regions where the percentage of personal radio use is low, etc.
■ Some detailed discussion on interference with airplane radio navigation systems still remains (similar allocation has been made in foreign countries)
■ Expected to be feasible as long as consideration is given to the following
* Locations for establishing base stations, etc. and individual adjustments, including use of filters, etc.
* Introduction in regions where the percentage of personal radio use is low
* Partially limits operation of mobile phones, etc.
■ If frequencies are shared with MCA or RFID, etc. during the course of the transfer sufficient elongation from existing systems will need to be secured.
■ Some detailed discussion on interference with airplane radio navigation system still remains (similar allocation has been made in foreign countries)
■ GB bandwidth between MCA upstream and RFID of 2 MHz is sufficient for coexistence