(Annex 2)

# The Review Team of a New Vision for Utilizing Radio Waves

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## REPORT

**July 2010**

http://www.soumu.go.jp/english/ict

Preface

In Japan various modes of radio wave utilization systems such as wireless LAN and electronic tags, etc., in addition to handheld telephones, are popular/utilized. The expectation is that in the future too, because of progress made in new radio wave utilization systems and services, problems such as area vitalization will need to be solved via use of radio waves as a means of information transmission in local communities, etc. However, radio waves are limited and scarce, thus making it necessary to review from the point of view of how to continue to attempt to effectively utilize radio waves in making people's lives more convenient.

For that purpose a "Review Team of a New Vision for Utilizing Radio Waves" was set up within the Ministry of Internal Affairs and Communications in December last year that has been reviewing effective utilization of radio waves from the users' point of view and with regard to using so-called "white space" a measure of more effectively utilizing radio waves in Japan. Prof. Norihisa Doi of the Research and Development Department of Chuo University was requested to be Chairman, as well as other experts in the information and communication field being requested to participate in the same Review Team from the point of view of technology, economy, etc. and who have dealt with and reviewed various matters, for example inviting propositions, holding public hearings, and implementing a survey on radio waves in ensuring early realization of white space utilization.

We wholeheartedly thank you for that as we were then able to compile "promotion measures for realization of white space utilization" as the result of your kind efforts.

Through implementation of inviting propositions, and holding public hearings, etc. economic and social effects such as area vitalization and the creation of new industries can be widely expected from utilizing white space and thus its early realization is very much needed. Also looking at the situation in foreign countries as to how to continue utilizing this white space, being a new radio wave resource, has been one of the most important tasks and how their governments and private bodies, among others, have been conducting positive activities.

We in the Ministry of Internal Affairs and Communications are determined to continue promoting steadily dealing with the necessary matters in realizing white space utilization in the light of those "promotional measures." Utilization of white space, in particular, in the local communities as a means of information transmission, etc., is expected to regenerate areas and vitalize economic activities as well as alleviate the environmental load, e.g. paperlessness, and we strongly feel the need to make it Japan's motive power. The Ministry of Internal Affairs and Communications therefore wishes to create a "specific white space district" this summer and firmly establish a successful model by conducting verification tests in realizing white space utilization for nationwide deployment.

Let us once again acknowledge Chairman Doi and each one of the team members. We would also like to sincerely ask you to kindly contribute to the promotion of information and communication administration in the present and in the future.

July 30, 2010

Masamitsu Naitou, Vice Minister of Internal Affairs and Communications

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# Chapter 1 Background to Setting Up the Review Team

## 1. Present Status with Utilization of Radio Waves

"Radio waves" are a limited and scarce resource and therefore Article 1 of the Radio Law (1950 Law No. 131; hereinafter referred to as the "Law") prescribes "the purpose of this law is to enhance public welfare by securing fair and efficient utilization of radio waves." Traditionally the nation has been largely responsible for effective utilization of radio waves in improving convenience for its people.
In encouraging effective utilization of radio waves it is first necessary to take into consideration the fact that their properties differ according to the frequency (wavelength) used.

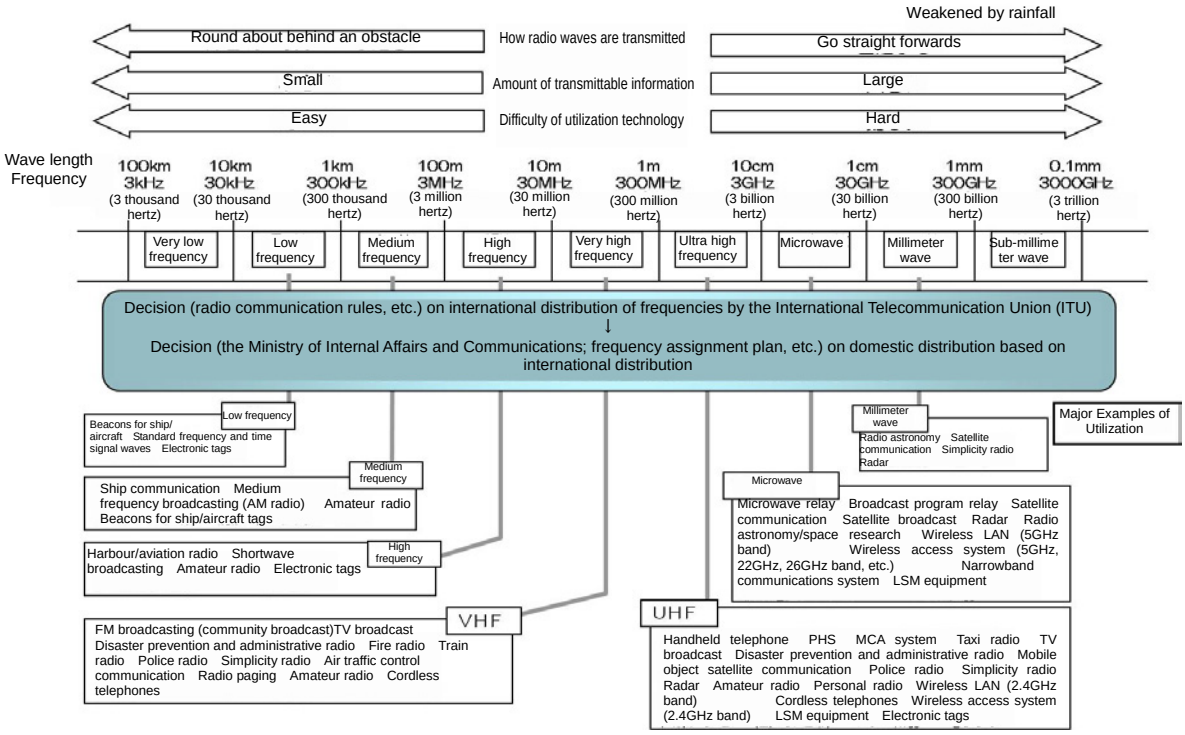



**Figure1-1 Situation with Radio Wave Utilization in Japan**

Figure 1-1 shows examples of how radio waves are transmitted, the amount of transmittable information, and the difficulty of utilization technology differ according to the frequency. In the light of the properties of each frequency band, therefore, satellite communication and radar, etc. are used with radio waves that support large amounts of information being transmitted and of high directivity. Radio and amateur radio, etc. conversely utilize radio waves that do not allow as much information to be transmitted and which can be preferentially broadcast over a wide area.

Furthermore, radio waves can cross national borders and hence the international allocation of frequencies was decided on by the International Telecommunication Union (ITU) in an international framework to prevent any international interference of radio waves. Each country in addition to Japan also sets its own licensing system, technical standards and other various institutions while respecting the ITU's international framework and maintaining international consistency.

At present, however, network connection opportunities and connection modes are drastically increasing due to the development/growth of radio wave utilization. With various new services/businesses that utilize radio waves now becoming popular radio wave utilization is having its importance in our daily lives and social activities increased even more.

Figure 1-2 provides a graph of increases in the number of radio stations.

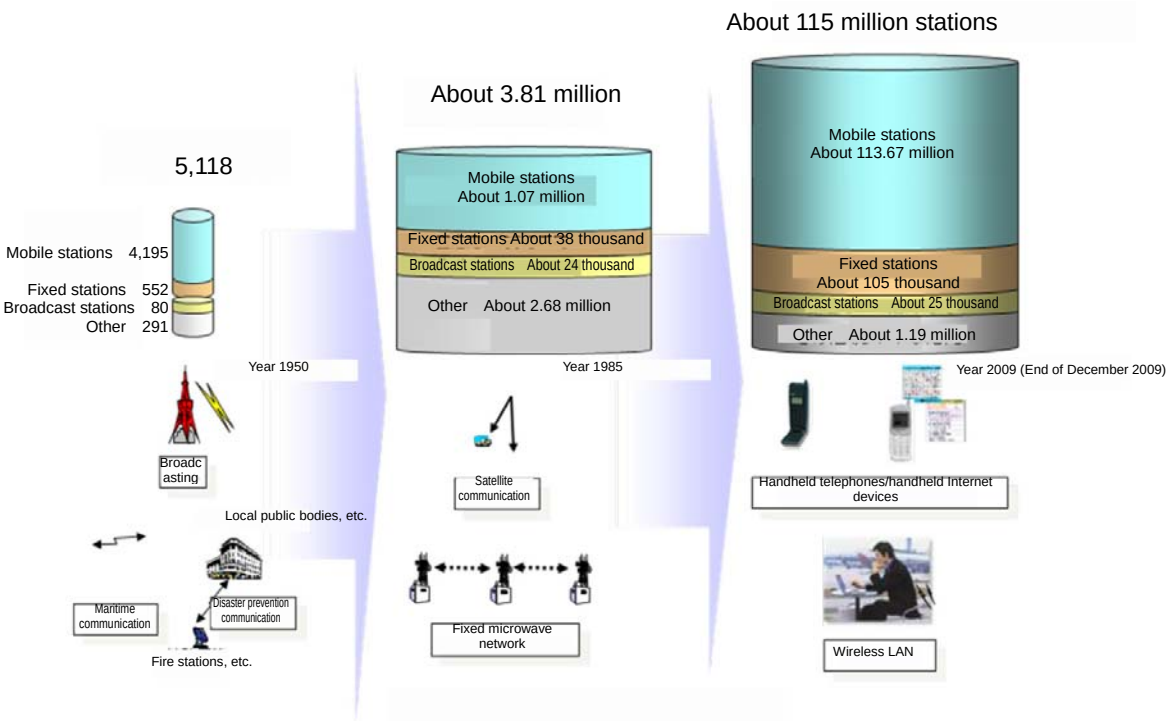



**Figure 1-2 Transition in Number of Radio Stations**

In 1950 the main stream was in public utilization such as broadcasts, security communication for ships/aircraft, disaster prevention communication, etc. Since 1985, however, when it became possible for the private sector to enter the telecommunication business operation, private utilization of radio waves has rapidly expanded. The number of radio stations also explosively increased to more than 700 times the level of 1950. In 2009 the number of radio stations exceeded 100 million because of handheld telephones permeating the public and wireless access systems growing in popularity. It is predictable that it will continue to increase more and more as new ubiquitous utilization of radio waves in ubiquitous society can be expected.

Because of the number of radio stations increasing and new services emerging radio wave utilization systems are also being upgraded in order to enhance efficient utilization of limited radio waves.

Firstly, as shown in Figure 1-3, radio wave utilization systems that can utilize higher frequency bands have been developed/shifted to with both fixed and mobile systems as they have been upgraded. In more concrete terms fixed systems have been shifted to higher frequency bands and mobile systems introduced into the thereby vacant bands, thus encouraging their reallocation.

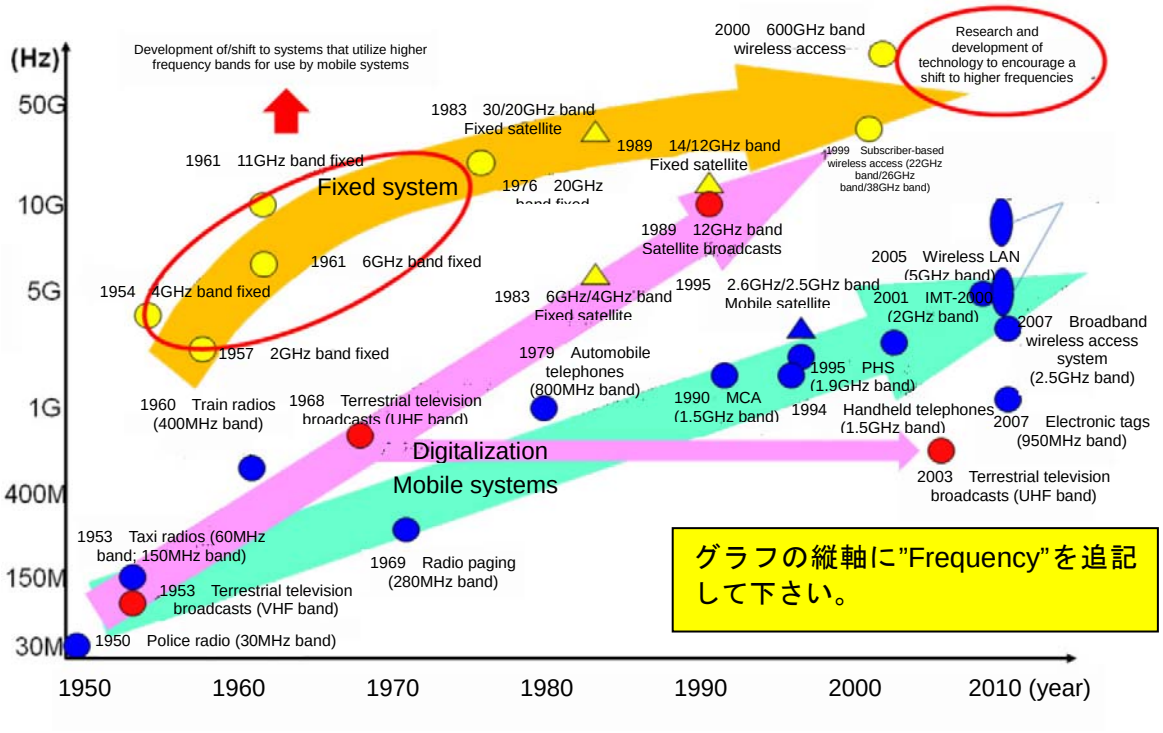



**Figure1-3 Expansion of Frequencies Utilized**

At the same time research and development for practicalization of unused frequencies that are not yet technically utilizable is also being encouraged.

Furthermore, as shown in Figure 1-4, mobile communication system traffic is predicted to increase by 2017 to about 200 times the level of 2007 due to the creation of new services, e.g. uploading Hi-Vision video and linking to home electrical appliances via large-capacity data transmissions, and existing services being upgraded, e.g. video streaming content becoming of larger capacity, and so on. While frequencies of 500MHz width have currently been assigned to mobile communication systems it is considered necessary that frequencies be expanded to about 4 times the current level for a total of about 2GHz width by 2020 in order to meet that increase in the traffic.

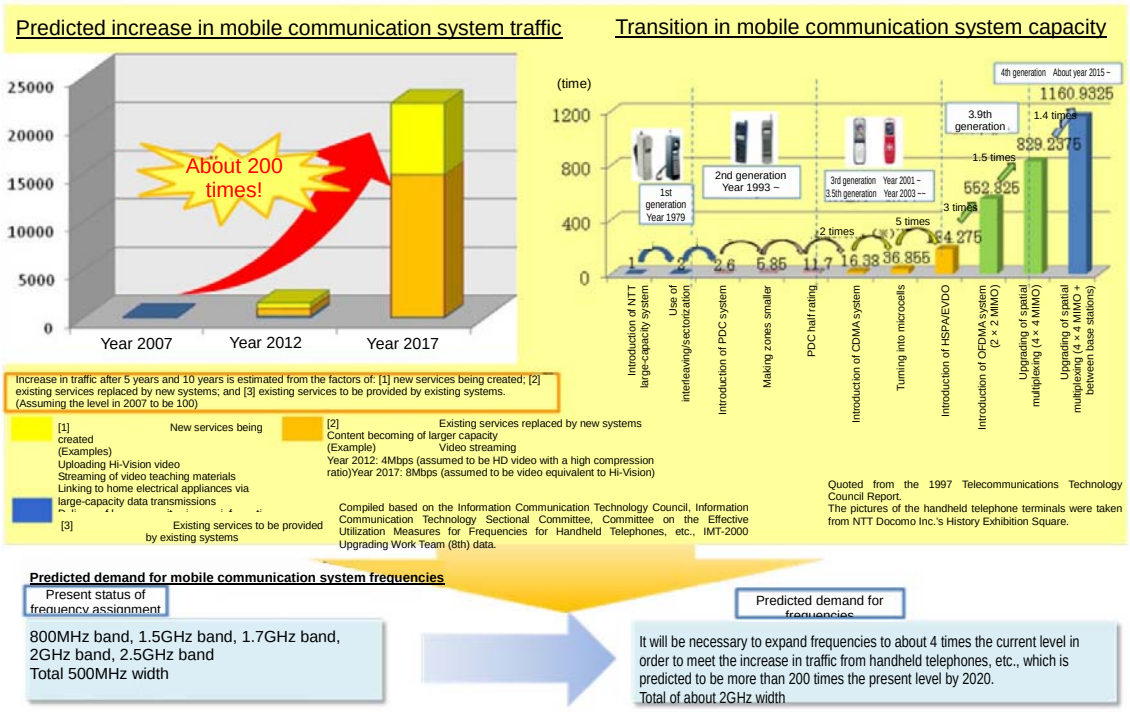



**Figure1-4 Development of Mobile Communication Systems**

**(Examples of development of the radio wave utilization field)**

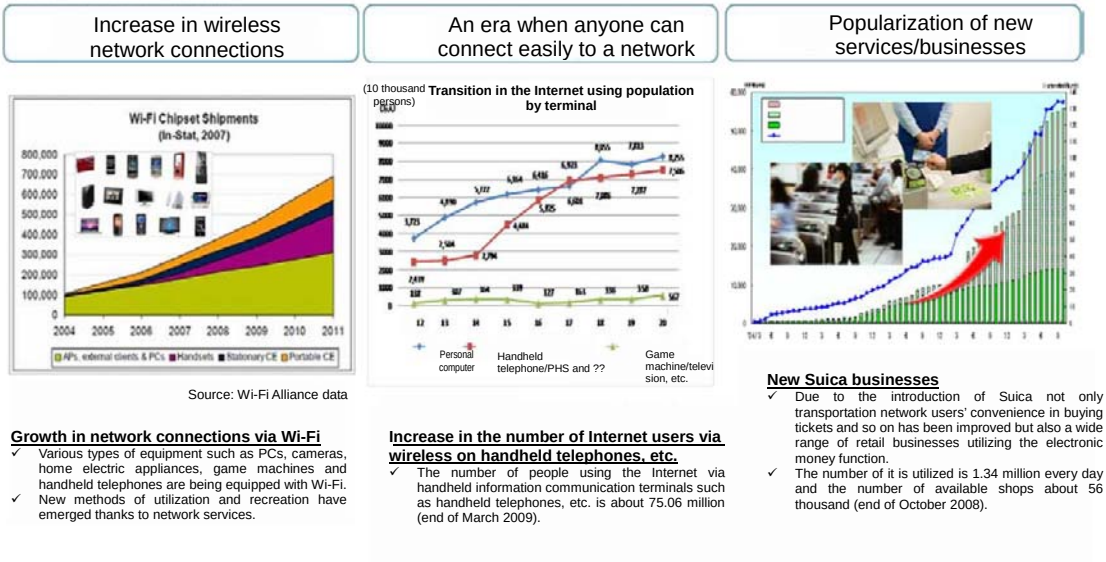



**Figure1-5 Progress in the Radio Wave Utilization Field**

As shown in Figure 1-5, however, progress made in the radio wave utilization field will not necessarily only affect conventional mobile communication systems such as handheld telephones, etc. At present, for example, various types of equipment such as personal computers, home electrical appliances, game machines, and industrial equipment are being equipped with a wireless network connection function. New methods of utilization and recreation have therefore emerged.

Users of mobile Internet devices such as handheld Internet devices and public wireless LAN

connection services are also increasing, and hence wireless Internet connections are starting to be used regardless of where you are or when it is, and have thus deeply permeated our lives and businesses.

In addition, with radio wave utilization technology/semiconductor technology such as electronic tag having been upgraded new services and businesses that utilize radio waves have emerged, e.g. automatic ticketing service at railways and the ETC service on motorways.

New services and businesses that utilize radio waves are therefore emerging and hence upgrading of existing radio wave utilization services and systems is progressing. Because of this the demand for frequencies is increasing even more. Utilization of radio waves in the most effective has become a very serious task.

One measure of dealing with that task is the promotion of the digitalization of terrestrial television broadcasting (Figure 1-6).

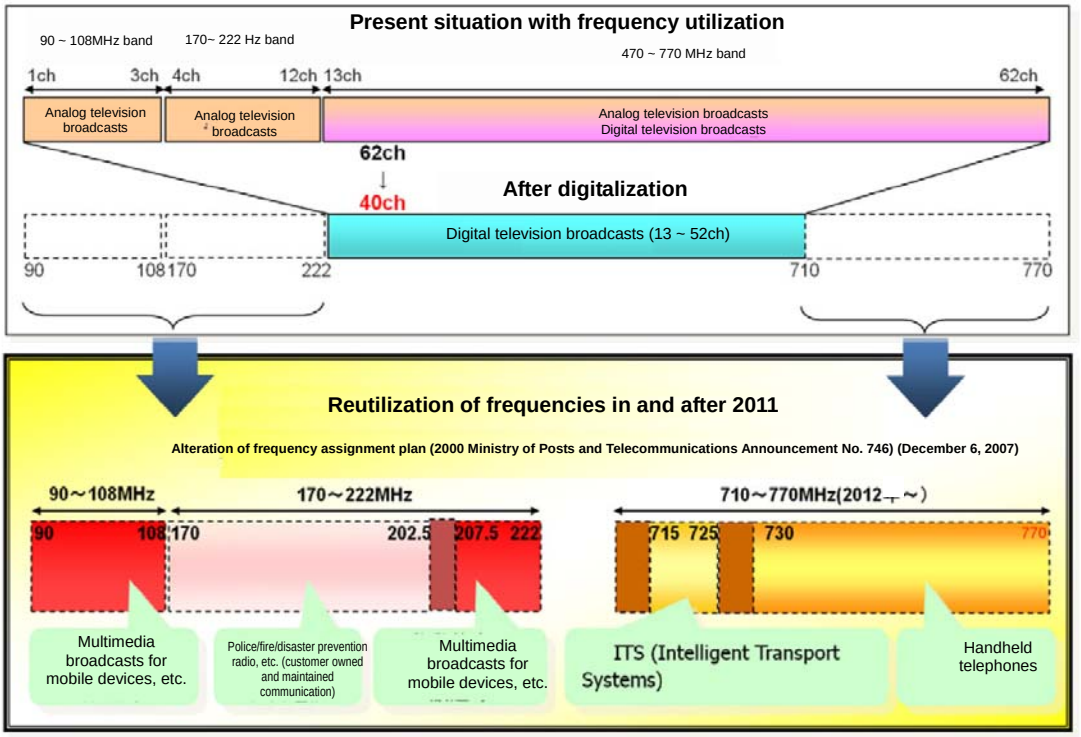



**Figure 1-6 Implementation of Digitalization of Terrestrial Television Broadcasting**

A total shift to digitalization of terrestrial television broadcasts is planned for by July 24, 2011 that will result in broadcasts frequencies, which were using 1ch ~ 62ch, being decreased to 13ch ~ 52ch. The emergence of new services (Figure 1-7) that can then use those vacant frequencies is currently being planned for.

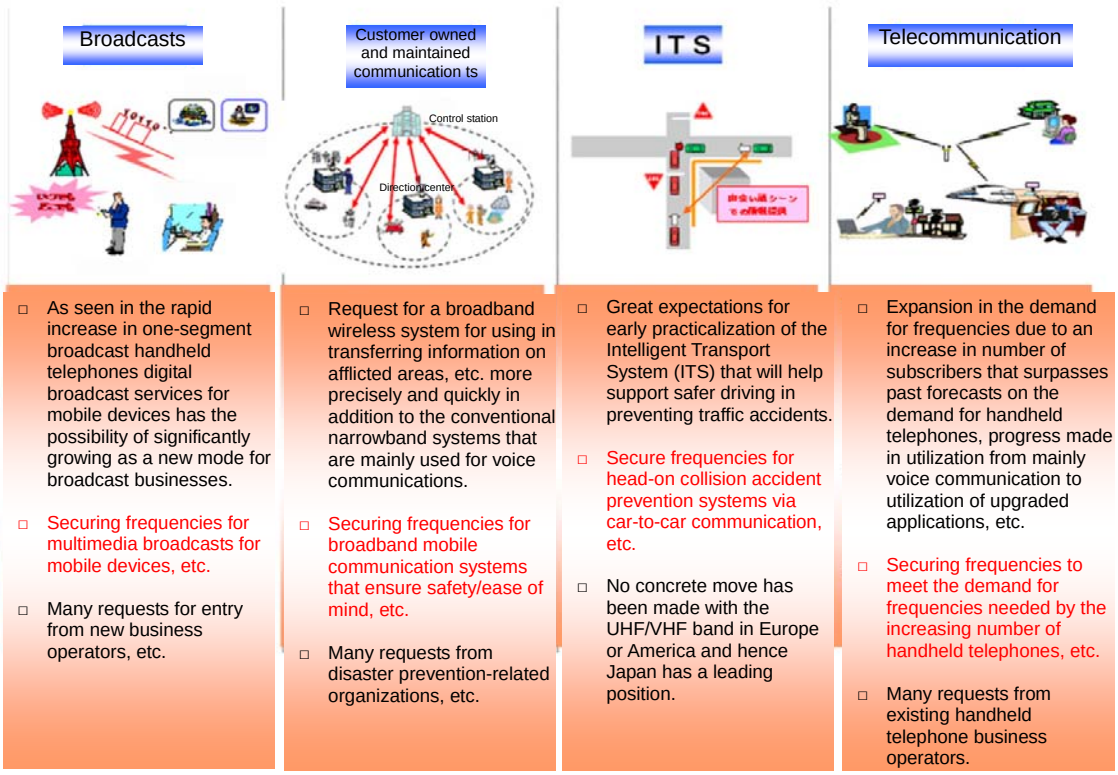



**Figure 1-7 Utilization After Digitalization**

The point of view of whether it will be possible to create newly available frequencies by paying attention to the actual mode of utilization of radio waves is therefore important in encouraging further effective utilization of radio waves and involves discussion of “white space.”

As mentioned earlier domestic allocation of radio waves was conducted while trying to utilize radio waves in the most effective manner and based on the properties of radio waves and international frequency allocation. From the viewpoint of cross talk prevention, etc., it is mainly, so to speak, a nationally uniform allocation.

As shown in Figure 1-8, however, for example the situation with radio stations established in Japan is not necessarily nationally uniform if closely examined as they are concentrated in the Kanto, Tokai and Kinki zones in particular.

Furthermore, examining just the number of broadcast stations from among radio stations, for example, reveals it to be rather small in the Kanto, Tokai and Kinki zones.

The situation with radio stations thus differs according to the area as well as type. This has led to the expectation that it could be possible to utilize radio waves more effectively locally in each area, etc. and the new possibility of even more effective utilization of radio waves, i.e. utilization of white space.

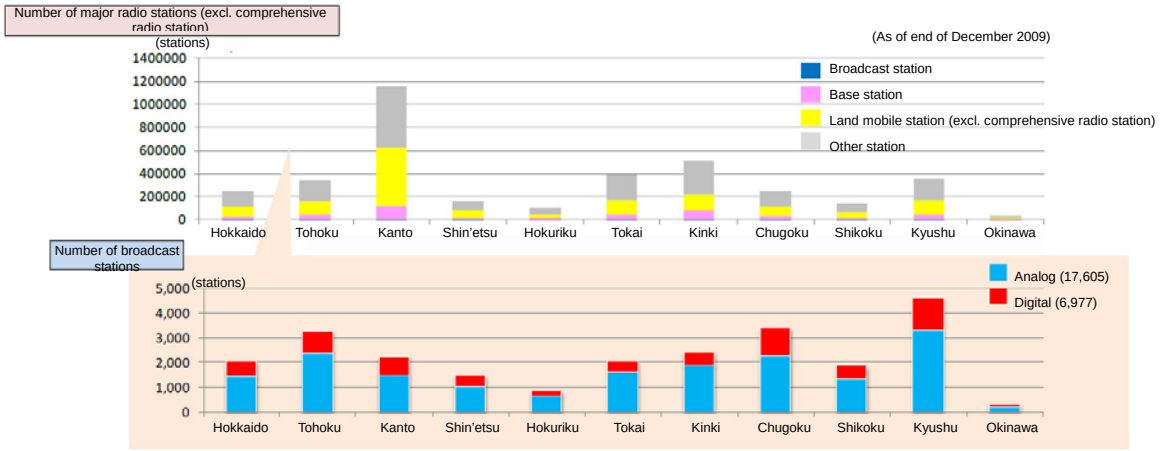



**Figure 1-8　Distribution of Major Radio Stations**

## 2. Expected Utilization of Radio Waves — Possibility of Utilizing "White Space" —

"White space" involves frequencies that have been assigned for a specific purpose, for example broadcasts, but that are available for other purposes depending on the geographical or technical situation.

For example, as shown in Figure 1-9, 13ch ~ 52ch were assigned as for use as digital television broadcast channels for all of Japan. Examining the channel plan (broadcast frequency usage plan (Ministry of Internal Affairs and Communications Announcement)), with "Tokyo" being the origin of the transmissions, however, reveals only 20ch ~ 28ch to have been assigned while the other channels are not actually being used for broadcasts in areas where "Tokyo" is the origin of the transmissions. With channel plans, therefore, it is considered possible that they might be utilized for other purposes than broadcasts.

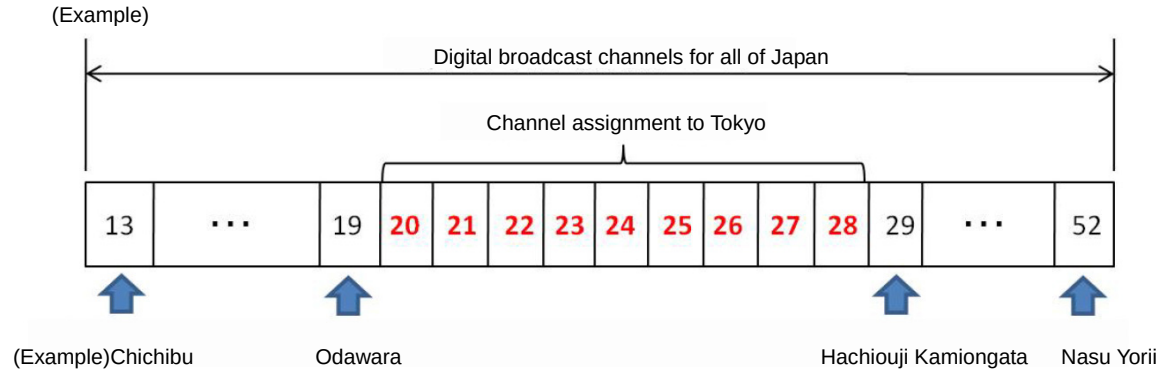



**Figure 1-9 White Space**

Reviewing utilization of white space necessitates taking into consideration the effect on existing business operators that are actually utilizing it. Tokyo's white space, for example, includes channels that are being utilized in its vicinity, e.g. 13ch for Chichibu, 19ch for Odawara and 29ch for Hachiouji Kamiongata. This makes careful review of it necessary in avoiding any negative effects.

Institutional discussions on utilization of white space first began in the U.S. In the U.S., where a mobile/broadband environment is not yet in place on a nationwide basis, the Federal Communications Commission (FCC) began reviewing it in 2002 when major IT-based companies like Microsoft and Intel began requesting that white space in television broadcast frequency bands be freed up for use with to broadband communications.

The FCC, while taking into account existing business operators that opposed utilization of white space by pointing out the possibility of cross talk jamming such as in the television industry and wireless microphone users, etc., made public comments on rules as well as implemented verification tests on the institutionalization of white space utilization. This then resulted in the conclusion that cross talk is completely avoidable by verifying online radio equipment's positional information against a database in addition to a use of a radio wave sensing function for television broadcasts, etc. The FCC just adopted an order to confirm white space utilization in November 2008. Since October 2009 it has been conducting field tests as part of technical verification and the plan is that the FCC will proceed with the relevant work, including the formulation of concrete technical standards and the construction of a database.

Technically, meanwhile, new radio communication technology that enables utilization of white space, for example cognitive wireless technology, has been researched and developed in other countries includingthe U.S. and European countries.

In concrete terms the DARPA XG Project that aims to develop software-defined radio technology for military use is being implemented by the Defense Advanced Research Projects Agency in the U.S. In Europe too a schematic review and research and development on future wireless systems, including cognitive wireless technology and software-defined radio technology, are being implemented as a European Commission's research and development project.

Furthermore, standardization activities concerning the cognitive wireless technology are being implemented by standardization organizations such as the Institute of Electrical and Electronics Engineers (IEEE).

As in the above expectations for white space to be utilized are growing worldwide. Research and development and technical reviews of its institutionalization are also taking place.

## 3. Expected Effects of New Utilization of Radio Waves Such as White Space

Expectations for the use of white space are growing worldwide, but it is not thought to be suitable for deployment in nationwide services in view of its properties that it can only be utilized locally or in a time-limited manner.

However, attention being paid to the property of being utilizable locally leads to the expectation that it could be used to solve social problems such as area regeneration by utilizing radio waves such as white space as a means of transmitting information within limited areas, e.g.local communities, etc. Moreover, it is possible to consider that the emergence of new services and systems in utilizing radio waves would then lead to the creation of new industries and result in more employment, thus contributing to economic growth which would be led by domestic demand.

(1) Expectations with Area Vitalization

In Japan it is an important task in realizing localism that each area autonomously develops by encouraging them to create charming towns. Local communities providing information is essential in encouraging that autonomous development of areas. Utilizing radio waves is considered effective in doing so, especially white space that is geographically available.

Examples exist of areas being revitalized due to encouraging people to make charming towns via information being transmitted from areas that include charming community information or the transmission of “community brands.”

Zushi/Hayama community broadcast station (Shonan Beach FM) is playing a major role in the creation of a charming town by turning the area into a “brand” via information on the area being transmitted such as music characterizing the area, broadcast programs that reflect the Hayama lifestyle such as “wave information” or “wind information,” the issuing of community magazines linked to broadcasts, and holding jazz and classic concerts as “Hayama brand” events. Kamikatsu Town in Tokushima Prefecture, where the population both is aging and declining, meanwhile, utilizes community information transmissions very well, with leaves around every corner having been turned into a “brand.” Currently elderly people in their 70’s and 80’s are supporting a leaf business worth over 200 million yen annually.

In this way the consideration is that revitalization of an area through area regeneration and turning the area into a brand can be expected to result from new community based media which utilizes radio waves such as white space.

(2) Expectations with Creation of New Industries

With the development of radio wave utilization technology various unprecedented services such as the delivery of video/music utilizing radio waves, Internet shopping, electronic money, dynamic-image content, and online games have been deployed. New effective utilization of radio waves such as the utilization of white space lies behind the possibility of new industries being created via the realization of new services and businesses which were yet to be considered.

For example, “digital signage” has been attracting attention as an overall digital delivery system that can be used to display both still and dynamic images via in-shop/out-of-shop liquid crystal displays, multivision, projectors, LEDs, etc. and

thus replacing conventional paper medium based posters, etc. “Digital signage” enables information to be transmitted by time zone or area via utilization of radio waves or guides to shops via campaign information being sent to handheld telephones. This could result in completely new way the advertising industry views itself.

As described above the expectation is that new effective utilization of radio waves such as white space could lead to the creation of new industries via enabling new services/businesses to emerge and renovating the industrial structure.

(3) Expectations with Technical Renovations

The information communication industry has played a major role in leading Japanese economic growth. The radio wave utilization business in particular has upgraded existing services typified by handheld telephones and realized new services such as electronic money in step with radio communication technology having been developed/upgraded. This type of utilization in expanding into other various fields such as homes, traffic and physical distribution, thus making the position of the radio wave utilization business in the Japanese economy more and more important.

Cognitive wireless technology and software-defined radio technology, etc. are expected to be the core technologies used in developing the radio wave utilization business. Utilization of white space will encourage research and development in the institutionalization of that technology, and lead to the possibility of new technical renovations being expected. A new radio wave utilization market will be formed as new services utilizing such multifarious radio wave utilization technology emerge to meet users’ needs. And it is also thought that such a market will result in the creation of new industries and, as a result employment, thus contributing to economic growth that is led by domestic demand.

(4) Expectations with Solving Social Problems

In recent years radio wave utilization has been applied in area revitalization as well as other various fields such as medical care and the environment. Its importance as part of the social infrastructure is increasing even more. Further expansion in utilization can be expected for the future, e.g. realization of more elaborate and uniform physical distribution via utilization of electronic tags, food information and controlling its quality, etc. via utilization of radio communication technology or making next-generation information home electrical appliances wireless and ensuring safer traffic via an Intelligent Transport System (ITS).

Meanwhile reducing CO2 emission and energy consumption and other environmental problems have become important international issues. The various social problems that Japan faces, e.g. supply of high-level medical care services, coping with an aging society and correcting of local area differences, are also surfacing.

The expectation is that a contribution to solving those social problems will also be made through new effective utilization of radio waves, such as utilization of white space, expand into new radio wave utilization fields and thus realizing new services/businesses.

## 4. Possibilities with Utilizing “White Space”

As described in “1” the actual situation with radio wave utilization reveals the possibility of there being available frequencies depending on the area and of effective utilization of radio waves contributing to the realization of economic growth led by domestic demand via the creation of new industries and employment as the possibility of new effective utilization of radio waves, which is the “utilization of white space,” has begun to be expected worldwide and since, furthermore, as described in “2,” the expectation is an attempt can be made to solve problems such as area regeneration by effectively utilizing radio waves as a means of information transmission in local communities, etc.

The Ministry of Internal Affairs and Communications therefore established a “Review Team on a New Vision for Utilizing Radio Waves” (hereinafter referred to as the ”Review Team”) in December 2009 that has been dealing with reviewing the direction of new effective utilization of radio waves such as white space and formulating concrete propositions for its realization.

(1) About the Viewpoints of Review

The Review Team, recognizing radio waves to be a limited and scarce resource that therefore necessitates new effective utilization of them being encouraged such as the utilization of white space in then connecting them to improving people’s convenience, decided to review the following concrete points of view.

During that review the Review Team also decided to conduct technical verifications and make rules after consulting experts as it is necessary to take into consideration not adversely affecting existing radio wave broadcast, communication, etc. users.

[1] Point of view creating newly available radio waves such as utilization of white space

As mentioned earlier various modes of radio wave utilization systems such as, in addition to handheld telephones, wireless LAN and electronic tags are now popular/utilized in Japan and the expectation is that new radio wave utilization systems and services will progress further in the future. The emergence and upgrading of any such new radio wave utilization systems and services will result in the demand for frequencies presumably increasing, thus making very important that utilization of the white space be realized as early as possible one of the measures used in the creation of newly available radio waves.

Realization of white space utilization will not only meet future demand for frequencies but also open up possibilities of being a means of area revitalization via encouraging the creation of charming towns through improving local community’s information dissemination of their area and tourist information, etc. by utilizing community broadcasts in specific areas and thus becoming an engine for the creation of new industries by renovating the industrial structure such as how advertizing is utilized in digital signage.

Because of this the Review Team decided to create a utilization model and review institutional/technical tasks, etc. with regard to the new effective utilization of radio waves, and among others, the early realization of white space.

While, incidentally, in other countries, including the U.S., reviews are taking place with broadcasting frequency bands in mind when it comes to discussing white

space, the Review Team their review should be in accordance to the assumed mode of utilization rather than just limiting the objective of white space to a specific frequency band for use in broadcasts, etc.

[2] Realization of new utilization of radio waves in contributing to the revitalization of local communities

Radio waves being a limited and scarce resource the Laws of Japan prescribe in Article 1 that “the purpose of this law is to enhance public welfare by securing fair and efficient utilization of radio waves,” and it thus is the nation’s great responsibility to utilize radio waves effectively in improving the convenience of its people. In reviewing how to ensure the most effective utilization of radio waves, therefore, the point of view of realizing new effective utilization of radio waves in such a manner as to contribute to solving the currently social problems faced is essential.

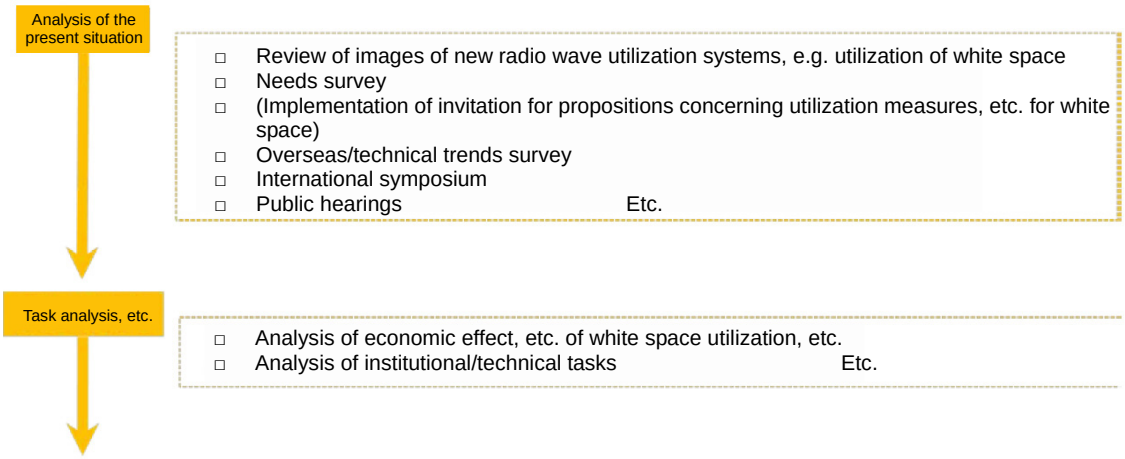
In recent years radio wave utilization has been applied in area revitalization as well as various other fields such as medical care and the environment, with its importance as part of the social infrastructure increasing ever more. Because of this the expectation is that it can be used to solve social problems through new utilization of radio waves, e.g. utilized in solving environmental problems such as supporting towns being more environmentally friendly through use of leading-edge radio communication technology and in solving educational problems such as the creation of an environment in which everyone can receive an education regardless of their physical location.

From this point of view the Review Team is therefore emphasizing discussions being held from the people’s point of view in attempting to ensure that radio waves are used to improve the general public’s convenience rather than just for business operators such as service providers.

(2) Reviewing Schedule

As shown in Figure 1-10 the Review Team has been holding discussions in order to reach a final conclusion by around the summer of 2010 after analyzing the present state, e.g. survey of the actual situation with radio wave utilization and survey of technical trends, during the first half from its commencement (December 2009) to about the spring of 2010, and then analyzing the effect of white space utilization, etc. as well as institutional/technical tasks and so on in the latter half.

**December 2, 2009　Commencement of Review Team**




Around summer of 2010　Final conclusion

**Figure 1-10 Review Schedule**

## Chapter 2 Expectations with the Possibility of Utilizing White Space

### 1. Implementation of Invitation for Propositions Concerning Utilization Measures, Etc. for White Space

The Review Team requested a wide variety of propositions on new utilization measures for radio waves that include utilization measures for white space as part of review of the “image of new radio wave utilization” from Friday, December 11, 2009 through to Tuesday, January 12, 2010.

The content of the invitation for propositions was as follows.

- Image of a new radio wave utilization system such as utilization of white space
  (Concrete examples)
  - Content of the supplied service such as the scenario and objective of utilization
  - Specifications of the radio waves to be used such as the frequency, electricity required by the aerial, etc. Etc.

- Effect of realization of the system
  (Concrete examples)
  - Economic/social effects to be expected through realization of the system such as area revitalization, etc. Etc.

- Tasks to be reviewed in realizing the system and the measures therefor
  (Concrete examples)
  - Implementation of technical development or verification tests for realizing the system, formulation of technical standards
  - Measures against cross talk with existing users, etc.
  - Introduction of the system or making rules with existing users Etc.

- Other
  (Concrete examples)
  - Situation with or technical trends overseas, etc. Etc.

## 2. Results of Invitation for Propositions Concerning Utilization Measures, Etc. for White Space

As a result of the aforementioned proposition request over 100 propositions were received from over 50 parties, thus attesting to the great expectations of white space utilization.

Many of the propositions suggested utilization of area one-segment broadcasts or digital signage. All expected social and economic effects such as the creation of charming towns and employment in local area to result.

(1) Examples of Proposed White Space Utilization Models

The propositions received as white space utilization models were of a wide variety, e.g. events such as festivals, transmission of information from underground malls, shopping centers, etc., information service for local area's residents and disaster/disaster prevention/afflicted area information. They were then classified by place and service, as shown in Table 2-1.

**Table 2-1 Classification of White Space Utilization Models**

| | |
|---|---|
| Classification by place | [1] Events such as festivals, etc.; [2] art museum/museum/movie theater; [3] specific facilities such as sports facilities, amusement parks, etc.; [4] modes of transportation such as buses, etc.; [5] at home/in offices; [6] underground malls; [7] universities; [8] shopping centers Etc. |
| Classification by service | [1] Information service for local communities; [2] disaster/disaster prevention/afflicted area information; [3] tourism; [4] networking in specific areas; [5] area one-segment broadcasts utilizing CATV network; [6] heterogeneous utilization as public use broadband; [7] Super Hi-Vision; [8] town media such as music/fashion/art, etc.; [9] home broadband; [11] FM radio; [11] broadband for communication; [12] advertisement service; [13] FPU for broadcasts, etc.; [14] environmental service; [15] digital delivery of paper media Etc. |

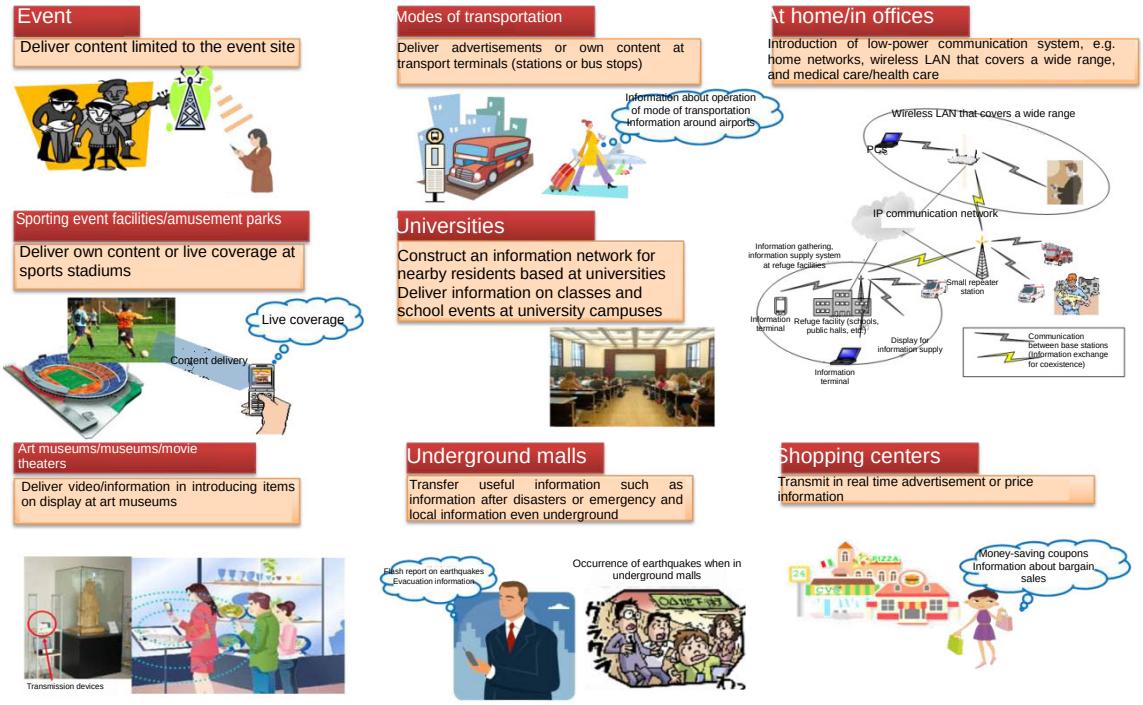



**Figure 2-1 Outline of Proposed White Space Utilization Models (Place)**

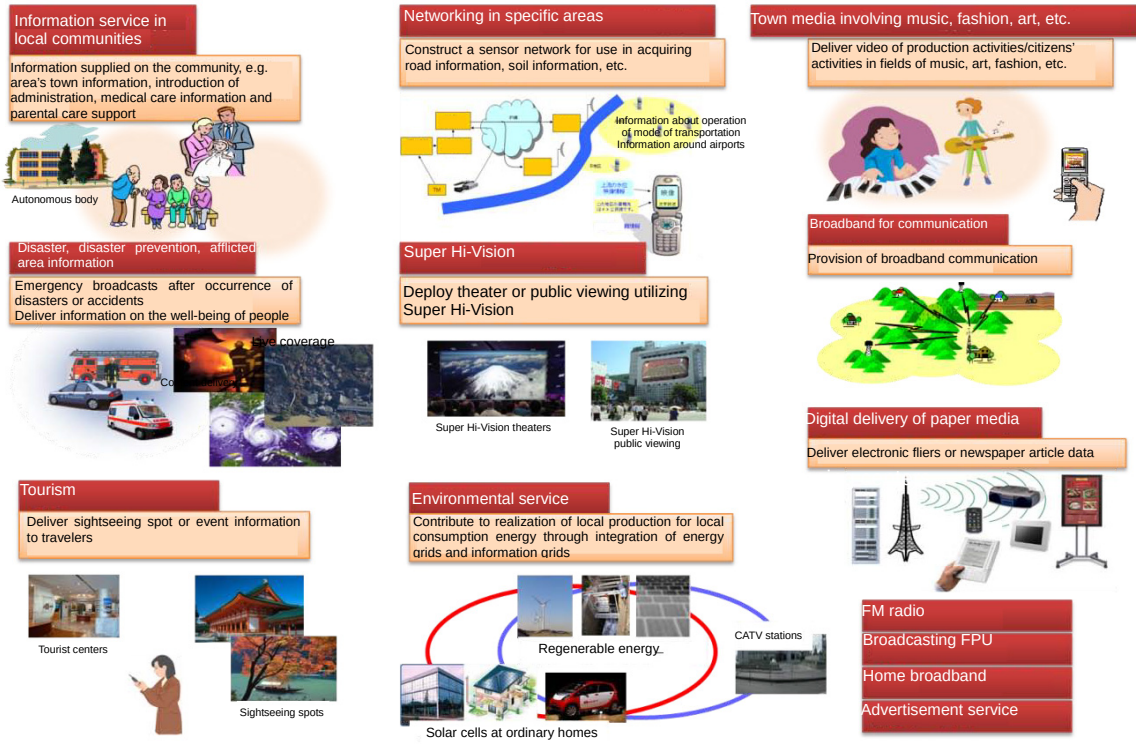



**Figure 2-2 Outline of Proposed White Space Utilization Models (Service)**

(2) Examples of Proposed Radio Wave Utilization Systems

The above models were classified from the point of view of the radio wave utilization system, as shown in Table 2-2.

Many of the propositions suggested, among others, utilization of the area one-segment broadcast-type systems that are available to one-segment broadcast-compatible handheld telephones, now quite widespread, or digital signage-type systems.

**Table 2-2 Examples of Proposed Radio Wave Utilization Systems**

| | |
|---|---|
| Area one-segment broadcast type | The variety of one-segment broadcast services for one-segment broadcast-compatible handheld telephones, which are now quite widespread, etc. |
| Digital signage type | The delivery of video and information in a timely manner to displays installed in shops, etc. |
| Communication network type | • Involves the realization of bidirectional communication via the creation of customer owned and maintained wireless network of sensors<br>• The realization of high-speed wireless broadband or wireless utilization between information equipment |
| Communication and broadcast combination type | A combination of communication-type services (delivery of advertisements or accounting information, etc.) and broadcast-type service (administrative information supply service, etc.) |
| New technology utilization type | An attempt to utilize new radio wave utilization technology, e.g. cognitive wireless technology and Super Hi-Vision |

(3) White Space Utilization Models

In the (1) classification by place and classification by service and (2) classification by radio wave utilization system above some are similar or overlap each other (for example, the shopping center and advertisement services are similar in that they both involve shop advertisement information; with advertisement services too the information supply via area one-segment broadcast and digital signage type overlap in their utilization). White space utilization models being summarized with those similarities or their overlap taken into account results in in the following 23 model summaries.

[Example of proposition 1] Local community information service
[Example of proposition 2] Disaster/disaster prevention/afflicted area information
[Example of proposition 3] Tourism
[Example of proposition 4] Modes of transportation
[Example of proposition 5] Shopping centers (advertisement service)
[Example of proposition 6] Universities
[Example of proposition 7] Events such as festivals, etc.
[Example of proposition 8] Art museums/museums/movie theaters
[Example of proposition 9] Specific facilities such as sporting event facilities, amusement parks, etc.
[Example of proposition 10] At home/in offices (home broadband)
[Example of proposition 11] Underground malls
[Example of proposition 12] Networking in specific areas
[Example of proposition 13] Area one-segment broadcasts utilizing CATV network
[Example of proposition 14] Heterogeneous utilization as public broadband
[Example of proposition 15] Super Hi-Vision

| | |
|---|---|
| [Example of proposition 16] | Town media such as music, fashion, art, etc. |
| [Example of proposition 17] | On-premise FM broadcasts (FM radio) |
| [Example of proposition 18] | Broadband for communication |
| [Example of proposition 19] | Environmental services |
| [Example of proposition 20] | Digital delivery of paper media |
| [Example of proposition 21] | M2M delivery to electronic devices |
| [Example of proposition 22] | Communication network utilizing cognitive wireless technology |
| [Example of proposition 23] | Broadband for customer owned and maintained communication |

**[Example of proposition 1] Local community information service**

(i) Image of the proposed service

Involves a service where community information such as an area's town information and event information is provided utilizing a base in the area or information on events at shopping malls or shopping centers or an area's shop information.

Information services being provided that supports students from overseas or foreigners living in Japan, supply of services in real time according to the present location of the user (geosocial), supply of communication-type delivery service of electronic newspapers or electronic magazines and so on are also conceivable.

(ii) Frequencies used

UHF band

(iii) Effect of realization

If this service were to be realized information on for a community could be supplied to the residents in the area, thus resulting in regeneration of the area's bonds, e.g. an increase in participants in events in the area and enhanced consciousness of belonging to the town. Other results could be an area's bonds deepening, improved ease of mind/safety due to disaster prevention information being provided or an increase in communication between areas, fluidity inside the area or evocation of new consumption behavior due to information being provided, etc.

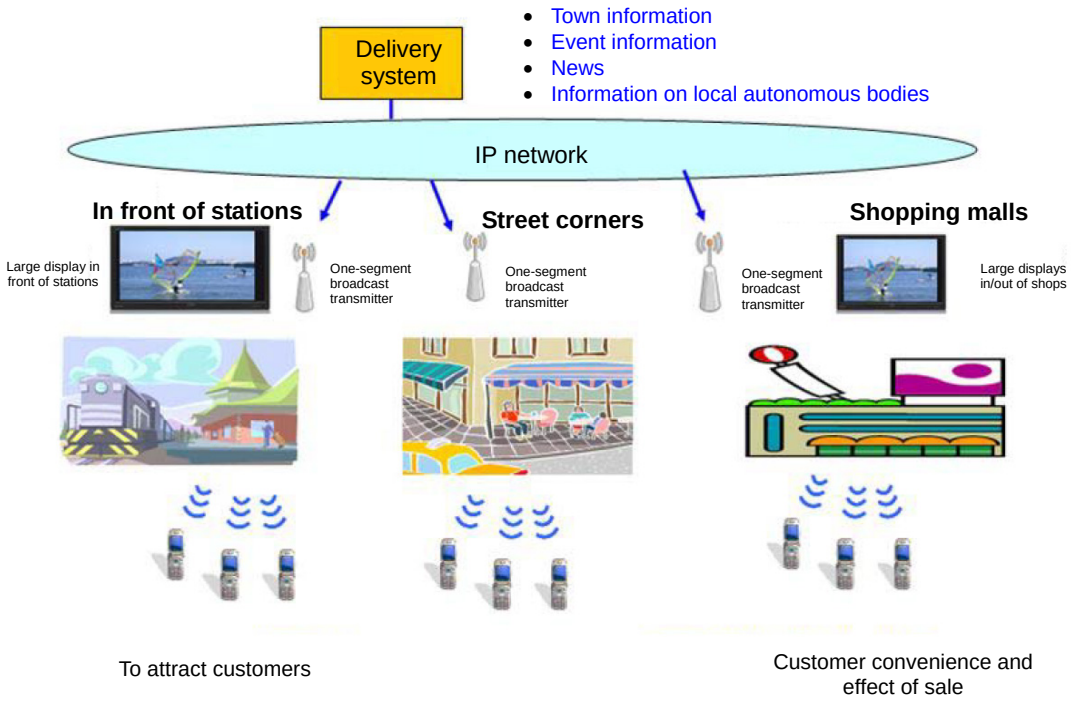



**Figure 2-3 Example of Proposition 1 Local Community Information Service**

**[Example of proposition 2] Disaster/disaster prevention/afflicted area information**

(i) Image of the proposed service

Involves a service used to broadcast urgent relevant information after disasters, accidents, important affairs, etc. or to provide more detailed relevant information to limited areas such as those afflicted. A service that provides the afflicted people with the content of information amassed on well-being, etc. by generating it automatically or emergency medical care information such as the medical institutions which are available, etc. is also conceivable.

(ii) Frequencies used

UHF band

(iii) Effect of realization

This service would enable information to be provided in the form of not only voice by also video and text data, and hence it could be expected to be used in transmitting accurate information on damage from disasters or concerning refuges. It would also enable messages to be sent directly from disaster countermeasure offices to the citizens, and hence could be expected to be of psychological support to citizens at disaster sites.

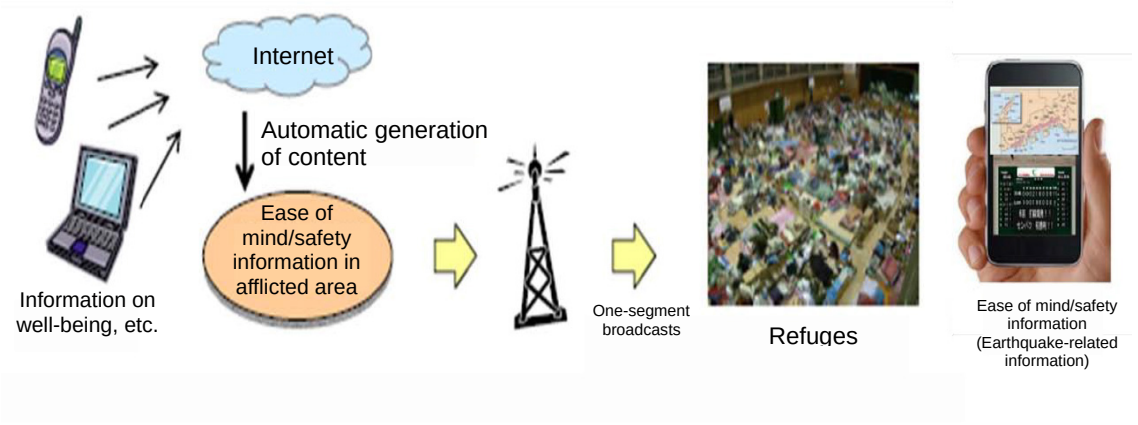



**Figure 2-4 Example of Proposition 2 Disaster/Disaster Prevention/Afflicted Area Information**

**[Example of proposition 3] Tourism**

(i) Image of the proposed service

Involves a service that delivers sightseeing spot or event information to travelers in front of stations, inside cars, sightseeing buses, etc. or tourist information in real time (where to view autumn leaves, vacant parking spaces, etc.) or bargain sale information (time sales at shops, etc.) in limited areas such as sightseeing spots.

(ii) Frequencies used

UHF band

(iii) Effect of realization

If this service were to be realized it would enable meaningful tourist information to be provided to tourists, and hence an increase in the number of customers as well as economic effects at sightseeing spots would be expected.

The information provided by this service could also increase the chances of the area's residents being able to come in contact with local information that they may have found difficult to access, and hence it could be expected that economic activities and information exchanges in local communities would be revitalized.

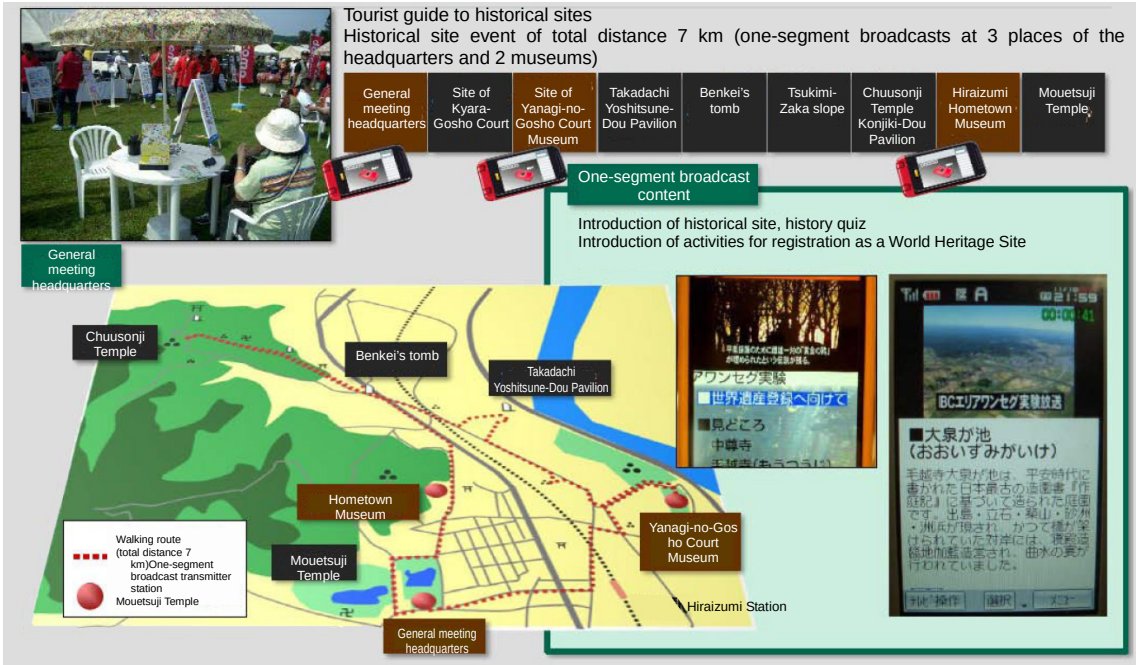



**Figure 2-5 Example of Proposition 3 Tourism**

**[Example of proposition 4] Modes of Transportation**

(i) Image of the proposed service

Involves a service that provides a variety of information for an area such as meteorological or on specialty goods which are limited to the area of a transportation terminal, e.g. stations, bus stops, airports or underground railways, used by a number of commuters every day or at roadside facilities, e.g. intersections, motorway service areas, parking areas or roadside stations, used by automobiles or original content such as advertisements or to retransmit broadcast programs in vehicles such as the buses, etc.

The provision within airports or their vicinity of tourist information or information on specialty goods of the area by constructing a platform linked to major airports, including overseas airports, etc., is also conceivable.

(ii) Frequencies used

UHF band

(iii) Effect of realization

The realization of this service would enable the timely provision of information that changes over time such as that on train delays or accident information, etc., which thus could be expected to improve the convenience of the facility.

It could also be expected to make a contribution to the revitalization of individual areas by accelerating expansion of the interchanging population in the area as the result of a new media business operating model that cover a wide range of the airport and the vicinity of where it is constructed.

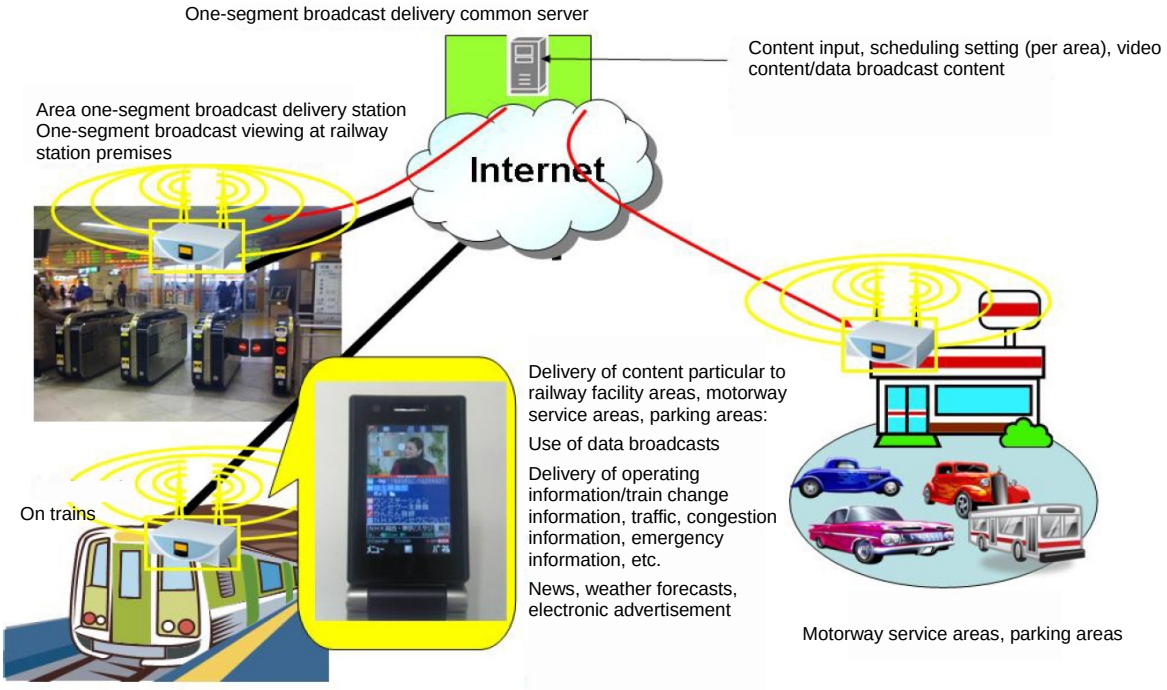



**Figure 2-6 Example of Proposition 4 Modes of Transportation**

**[Example of proposition 5] Shopping centers (advertisement service)**

(i) Image of the proposed service

Involves the provision of realtime information such as on sales or limited coupons, etc. at commercial facilities such as shopping centers and shopping malls.

Sales information from nearby shops and where shops are situated, etc. if a user sends information an article they wish to buy, local information or advertisements using a vacant shop's shutter as the display and then delivering content on shops in the area as a virtual broadcast business operator via broadcast-version MVNO are also conceivable.

(ii) Frequencies used

UHF band

(iii) Effect of realization

The realization of this service would lead to the expectation that shopping centers would be revitalized due to sales there, etc. rising.

Another expectation is that economic activity interchanges or links between areas could be enhanced due to similar services being provided in other neighboring areas as well.


**Figure 2-7 Example of Proposition 5 Shopping Center (Advertisement Service)**

**[Example of proposition 6] University**

(i) Image of the proposed service

Involves a service via the creation of an information network (college one-segment broadcast station) that actively provides information related to the area to the neighboring residents based at a university.

Use of a local autonomous body as the parent managerial organization that links the joint creation of a broadcast station in the area and the university is assumed. One to provide information on school events or classes or congestion in the cafeteria, etc. at the university is also conceivable, as is one used to transmit content on a distant blackboard or projected image to a hand terminal in large classrooms.

(ii) Frequencies used

UHF band

(iii) Effect of realization

The realization of this would lead to the formation of a human network based at a university, thus leading to the expectation that the area being more creative with residents would also be encouraged. Another expectation is that ties between the local area and the university itself would be strengthened as a result of utilizing the content made available by the university's network.

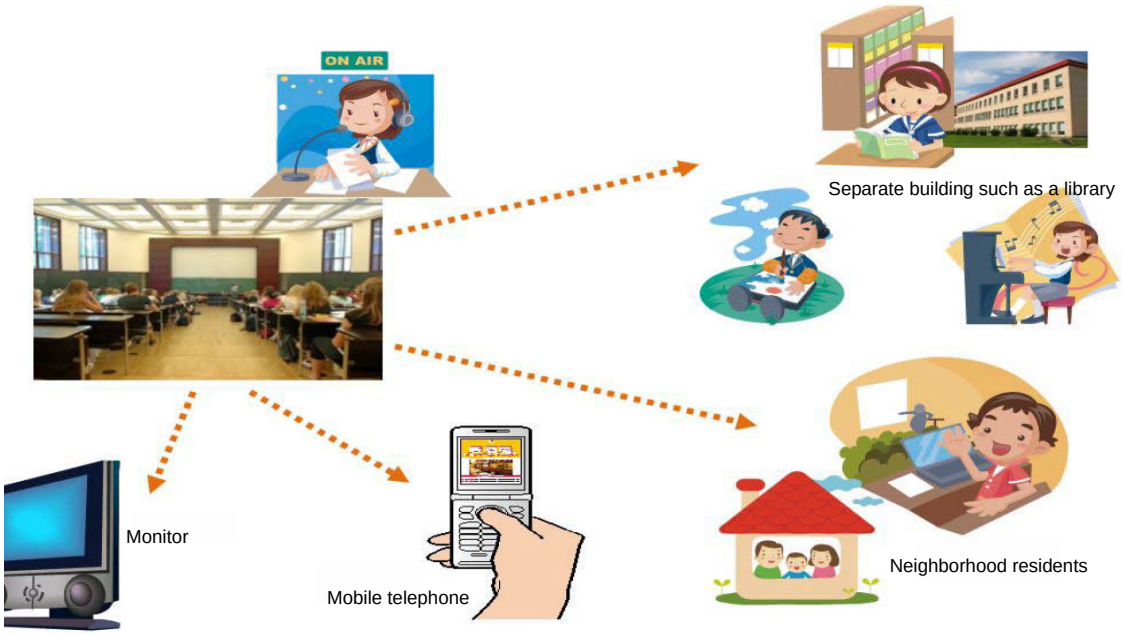



**Figure 2-8 Example of Proposition 6 University**

**[Example of proposition 7] Events such as festivals, etc.**

(i) Image of the proposed service

Involves a service that provides content limited to event sites such as festivals or exhibitions, etc., e.g. a popular musician's unpublicized live video, to participants.

(ii) Frequencies used

UHF band

(iii) Effect of realization

The utilization of this service would enable related information limited to event sites, etc. to be provided which then improves the value of the event. The expected result would be that the event could be enlivened as well as the economic activities in the surrounding area vitalized.

New information could also be added to normal television broadcast information that increases the program producer's intentions, thereby improving the expressive power of the program's production.

Communication could be provided from events to attract people, and furthermore an expected advantage would also be that visitors can smoothly receive information as long as they are in the service area as a simultaneous service provision would be possible, although the possibility exists that congestion, etc. could occur as the communication traffic would be concentrated in a specific area for a specific period of time.

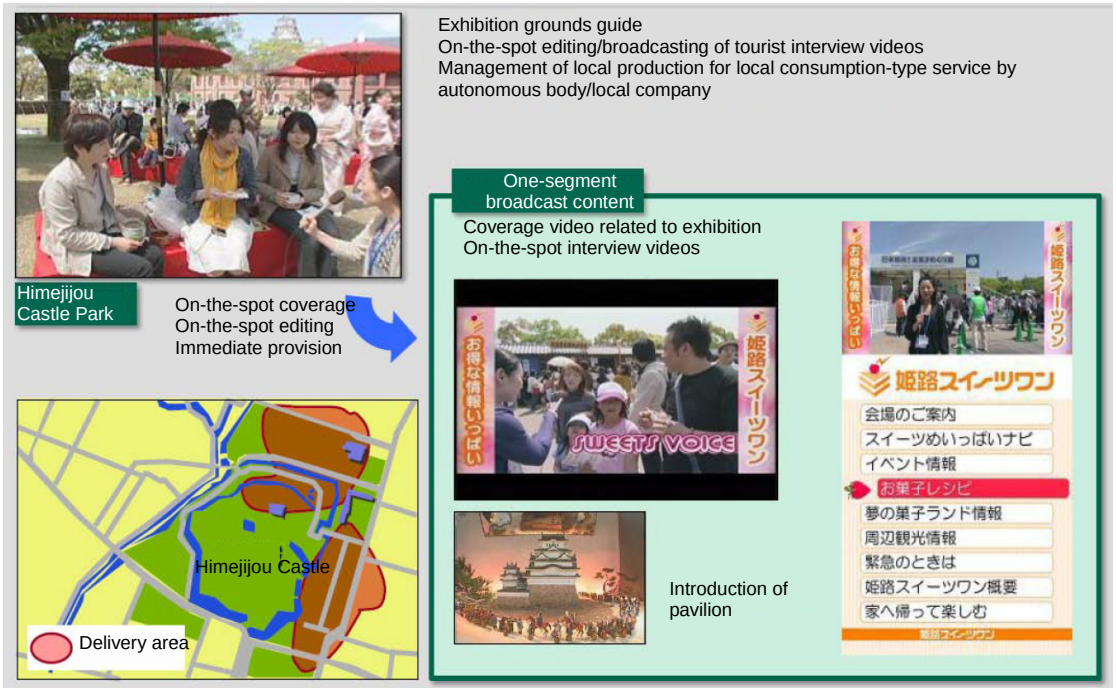



**Figure 2-9 Example of Proposition 7 Events Such as Festivals, Etc.**

**[Example of proposition 8] Art museums/museums/movie theaters**

(i) Image of the proposed service

Involves a service that provides information on galleries or explanations of items on display, etc. at certain facilities such as art museums and museums. Utilization where the content provided could be changed according to the area or booth where the item is on display is also conceivable. At movie theaters, meanwhile, a service that provides videos, continuation of the story, advertisements, etc. with regard to the movie being shown is conceivable.

(ii) Frequencies used

UHF band

(iii) Effect of realization

Information on a limited area being provided at specific facilities such as art museums leads to the expectation that more value would be added to the facility. In addition, more value would be added when viewing movies at movie theaters, thus attracting more customers.


Transmission device
Provision of information on the gallery

[Image of verification test]

**Figure 2-10 Example of Proposition 8 Art Museums/Museums/Movie Theaters**

**[Example of proposition 9] Specific facilities such as sporting event facilities, amusement parks, etc.**

(i) Image of the proposed service

Involves a service that broadcasts content combining video, audio, subtitles and data to visitors at specific facilities such as sports stadiums and amusement parks, etc. linked to the event. Updating the content in a timely manner according to the situation with the event and quickly upon receiving messages, etc. from viewers is also conceivable.

(ii) Frequencies used

UHF band

(iii) Effect of realization

The timely information provided by the service would enable to an increase in the business of related industries such as sports due to interest in sports, etc. being enhanced.

Another expectation is that more lively activities would occur for citizens in the area due to customers being attracted to specific facilities such as sporting event facilities and amusement parks, etc.

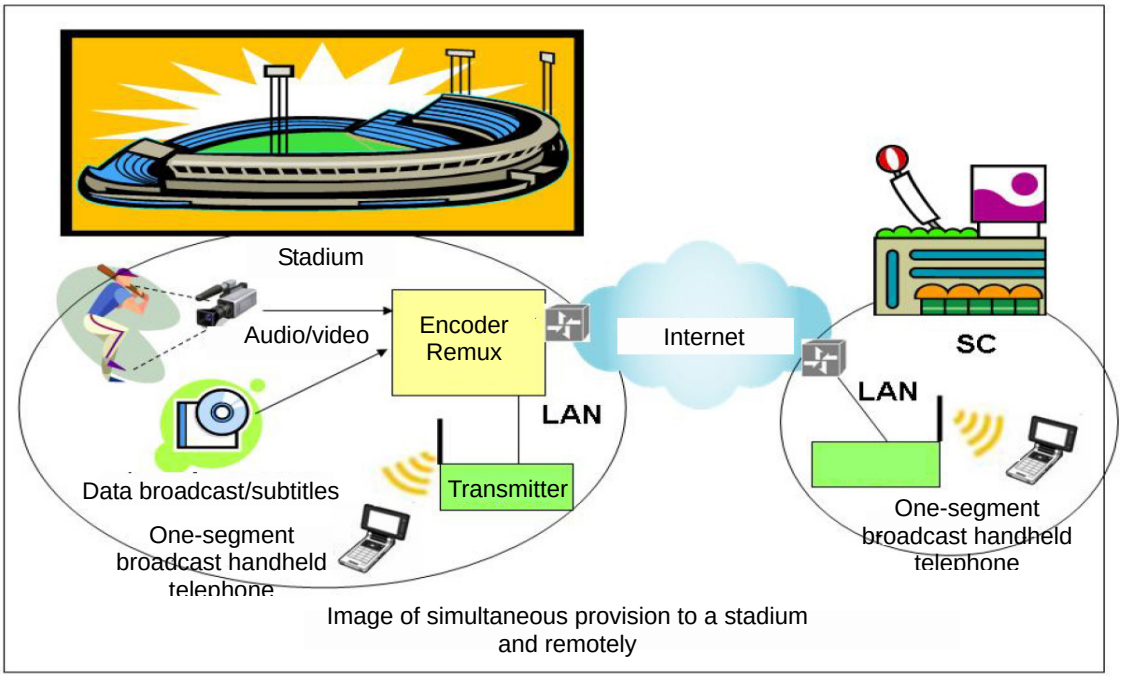



**Figure 2-11 Example of Proposition 9 Specific Facilities Such as Sporting Event Facilities, Amusement Parks, Etc.**

**[Example of proposition 10] At home/in offices (home broadband)**

(i) Image of the proposed service

Involves a service where data is transmitted between equipment or over a home network between different rooms and floors by wirelessly connecting equipment in homes. The service could utilize a lower frequency band than wireless LAN, thus leading to the expectation that wider communication areas would be supported. The practical application of this service involves the assumption that licenses would be unnecessary as being the key to its popularization. It is also conceivable that transmission/reception will take place between femtocell base stations for use with handheld telephones and compatible handheld telephone terminals.

(ii) Frequencies used

UHF band

(iii) Effect of realization

The realization of this service will enable the creation of a low-power radio communication network covering the wide area of about 100 meters (or more) at a transmission rate equivalent to that of currently popular wireless LAN setups, which will then enable connection to other equipment in the next room as well. This will then result in the introduction of services similar to wireless LAN at a low cost in suburbs being possible where the currently popular wireless LAN hotspot service is difficult to introduce.

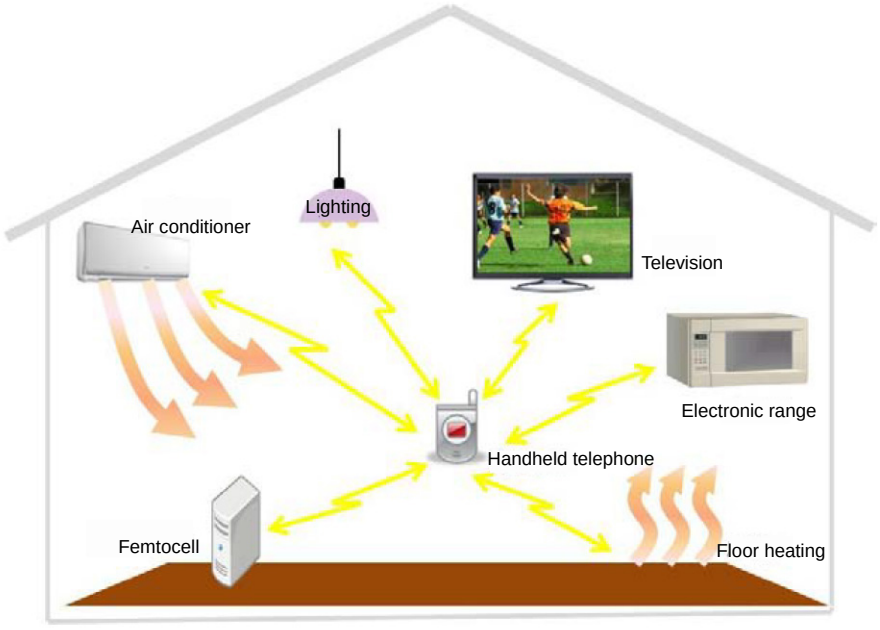



**Figure 2-12 Example of Proposition 10 At Home/In Offices**

**[Example of proposition 11] Underground malls**

(i) Image of the proposed service

Involves a service where various content such as emergency information, operating information of modes of transport, the latest news information, etc. being provided to personal computers, handheld telephones, digital signage, etc. via enabling information to be provided underground such as in underground malls or railways, and in disasters or emergencies in particular.

(ii) Frequencies used

UHF band

(iii) Effect of realization

The realization of this service would enable emergency information or emergency operating information with regard to modes of transportation, etc. after disasters to be provided as well as the delivery of not only a variety of content such as information useful in daily life and advertisements, etc. but also the business operating information of shops, etc. in underground malls, and thus the expectation is that the it would greatly improve safety and comfort in underground spaces.

Another expectation is that it would increase business chances as it would enable multimedia broadcast business operations in underground space.


**Figure 2-13 Example of Proposition 11 Underground Mall**

**[Example of proposition 12] Networking in specific area**

(i) Image of proposed service

Involves a service where a sensor network is created that can be used to acquire, for example, the soil characteristics of farmland or meteorological information, etc. or to monitor rivers or water use facilities such as dams, etc. in a specific area. Other conceivable services include the provision of information on nearby roads, weather information or river information particular to motorway service areas, parking areas, roadside stations, etc.

(ii) Frequencies used

UHF band

(iii) Effect of realization

The realization of this service would enable the provision of information of a specific area, thus leading to the expectation that agriculture, etc. would be more efficient and productivity improved. In the agricultural field, for example, it would be possible to determine the optimal amount of fertilizer to be applied/amount of chemicals to be administered based on a specific area's weather information or soil information, etc. acquired from the sensor network, and hence the expectation that it would improve the efficiency and productivity of farm work.

Another expectation is that the ease of mind/safety of residents living in river basins could be assured because it would enable data from water use facilities such as dams, etc. to be remote monitored and controlled.

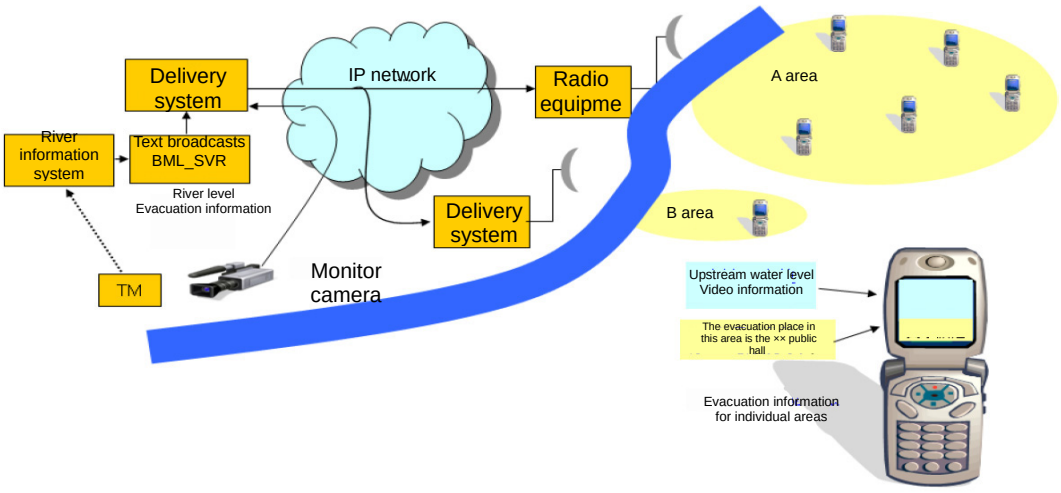



**Figure 2-14 Example of Proposition 12 Networking in Specific Area**

**[Example of proposition 13] Area one-segment broadcasts utilizing CATV network**

(i) Image of proposed service

Involves a service that utilizes the network of a CATV business operating in the area to provide information particular to the area (e.g. life/administrative information, disaster information, event information, tourist information, shopping center information, traffic information) to handheld telephones via one-segment broadcasts and the UHF band. It can be used to provide information suitable to the area's range by classifying the content to be delivered by area into wide areas or spot areas, etc.

(ii) Frequencies used

UHF band

(iii) Effect of realization

The realization of this service would enhance the area's residential ties, this leading to the expectation of revitalization of local economies.

It would also be possible to provide a variety of local information amassed by CATV business operators at a low cost due to CATV networks in the area being utilized.

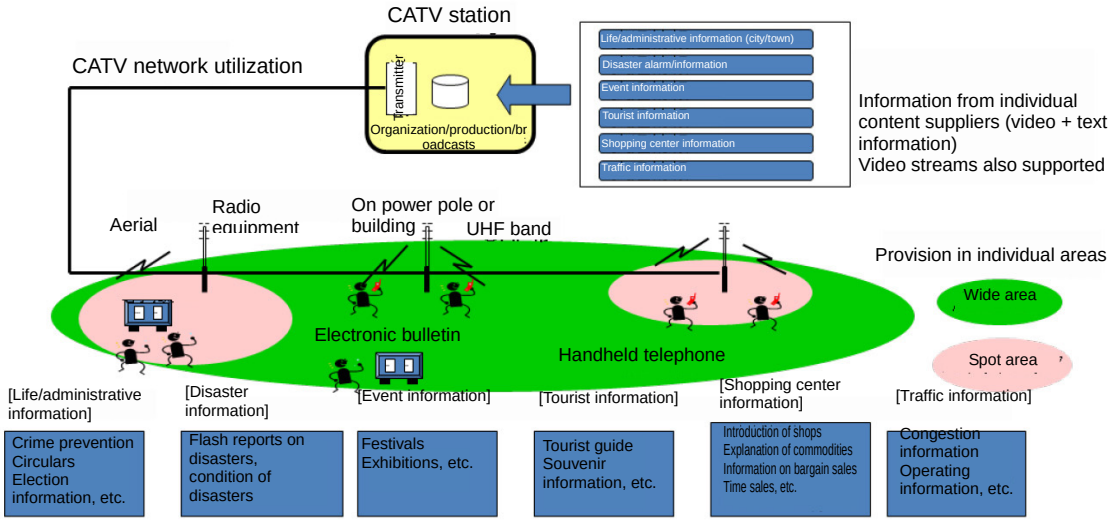



**Figure 2-15 Example of Proposition 13 Area One-Segment Broadcasts Utilizing CATV Network**

**[Example of proposition 14] Heterogeneous utilization of public broadband**

(i) Image of proposed service

Involves a service that will include an attempt to upgrade frequency utilization via use of white space within the public broadband frequency band and the premise that it does not affect existing public systems.

It is conceivable, for example, that white space be utilized as a system in public utilization fields which require a wide range of broadband, e.g. heterogeneous industrial fields such as agriculture, forestry, fisheries, etc. or heterogeneous information fields related to energy supply/demand while still ensuring primary utilization of public communication systems such as police, fire fighting/emergency services, etc. are not obstructed.

(ii) Frequencies used

170MHz ~ 205MHz

(iii) Effect of realization

The realization of this service would enable the introduction of a system within the public utilization field that requires a wide range of broadband, e.g. agriculture, forestry and fisheries or energy supply/demand, thus leading to the expectation of more effective utilization of radio waves.

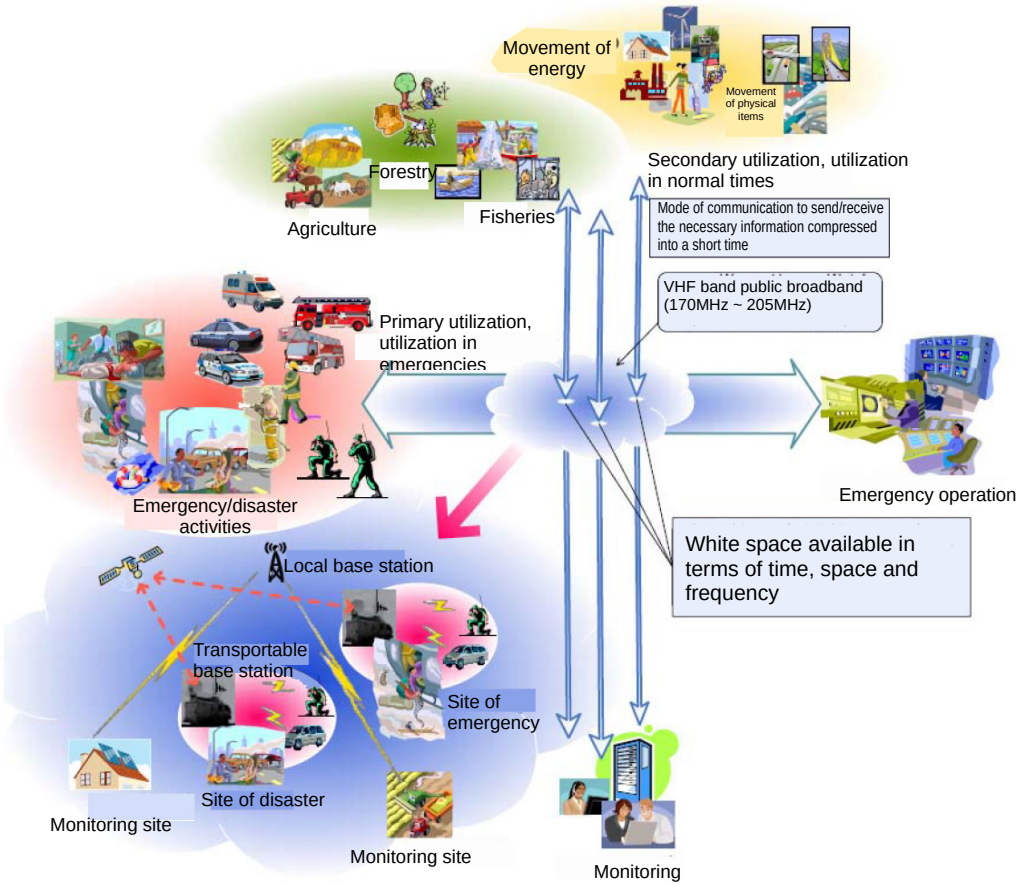



**Figure 2-16 Example of Proposition 14 Heterogeneous Utilization of Public Broadband**

**[Example of proposition 15] Super Hi-Vision**

(i) Image of proposed service

Involves a service that verified Super Hi-Vision tests at theaters, public viewing places, etc. using 2 channels (12MHz) for the purpose of research and development of a next-generation terrestrial broadcast system.

(ii) Frequencies used

UHF band

(iii) Effects of realization

Realization of this service would encourage the development of a next-generation broadcast system, e.g. display technology, source encoding (compression) technology, transmission technology, high-speed download technology and aerial technology. The expectation is that it would thus contribute to innovations being made in broadcasting as well as promote industry.


**Figure 2-17 Example of Proposition 15 Super Hi-Vision**

**[Example of proposition 16] Town media such as music, fashion, art, etc.**

(i) Image of proposed service

Involves a service that provides video of creative/citizens' activities in such fields as music, art, fashion, etc. It would enable invitations to be made with regard to video work that covers amateurs right through to professionals as well as the place of their publication.

(ii) Frequencies used

UHF band

(iii) Effect of realization

Realization of this service would enable interactive local content to be circulated, thus leading to the expectation that it would contribute to commercial activities.

Another expectation is that creative activities or participation in citizens' activities would be stimulated as a result of a variety of forms of publication being made available to amateurs through to professionals.

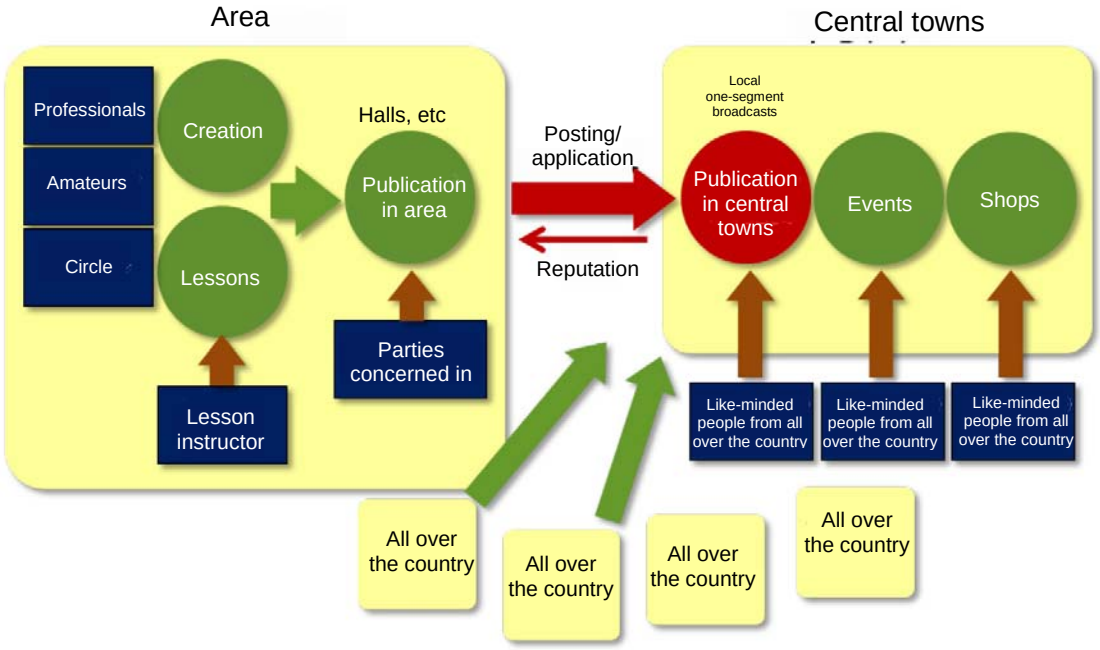



**Figure 2-18 Example of Proposition 16 Town Media Such as Music, Fashion, Art, Etc.**

**[Example of proposition 17] On-premise FM broadcasts (FM radio)**

(i) Image of proposed service

Involves a service of an FM broadcast service within the limited area of event sites as well as the provision of event information, etc. mainly on the content of games/explanations, etc. as a service for spectators. Visitors would be able to utilize the service via commercially available FM radio.

This could also be utilized within the current micro-power radio wave range, but the proposal involves the possibility of easing electrical power demand or operation via utilization of white space.

(ii) Frequencies used

FM channel (76MHz ~ 90MHz band), TV audio 1 ~ 3 channels (90MHz ~ 108MHz band)

(iii) Effect of realization

The expectation is that costs could be lowered as it would be possible for the broadcasts to be made using commercially available FM equipment and white space, even though currently the cost is high due to aerials and aerial cables being needed.

Another expectation is that it would contribute to the revitalization of event holding or sports promotion as visitors would be able to utilize commercially available FM radios as well as wide-area information being provided such as information on traffic in the vicinity or lead to increased sales of FM equipment such as handheld telephones, iPhones, Walkmans, etc.

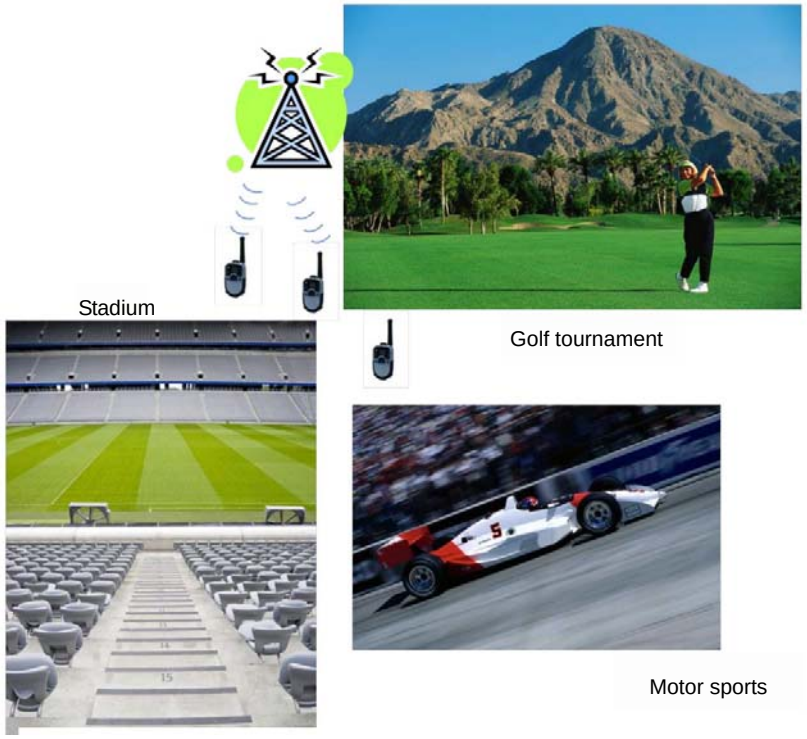



**Figure 2-19 Example of Proposition 17 FM Radio**

**[Example of proposition 18] Broadband for communication**

(i) Image of proposed service

Involves a service of creating community area networks via wide-area wireless LAN. The expectation is that it could also be utilized in the U.S. where the broadband environment is not as advanced as in Japan or in the BOP market where the infrastructure is yet to be created.

* Even in Japan it could be possibly utilized in making broadband available in mountainous/back country areas or on islands, etc. where broadband is not available.

(ii) Frequencies used

UHF band

(iii) Effect of realization

Realization of this service could be expected to lower the cost of making broadcast services available in mountainous/back country areas or on islands. A possibility of new innovations/applications utilizing wide-area wireless data connection is also expectable.

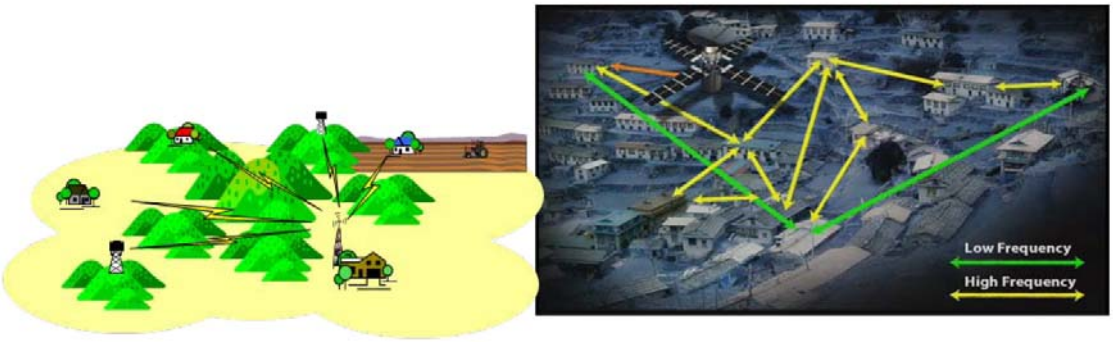



**Figure 2-20 Example of Proposition 18 Broadband for Communication**

**[Example of proposition 19] Environmental service**

(i) Image of proposed service

Involves a service that ensures adequate energy supply/demand control via the construction of a network of integrated energy and information grids utilizing white space in specific areas and for the purpose of local production for local consumption of energy.

(ii) Frequencies used

UHF band

(iii) Effect of realization

The realization of this service would lead to the expectation of a reduction in needed energy because the amount needed could be “visualized”. Adequate energy supply/demand control would also be possible, thereby contributing to solving the problem of global warming or energy problems.

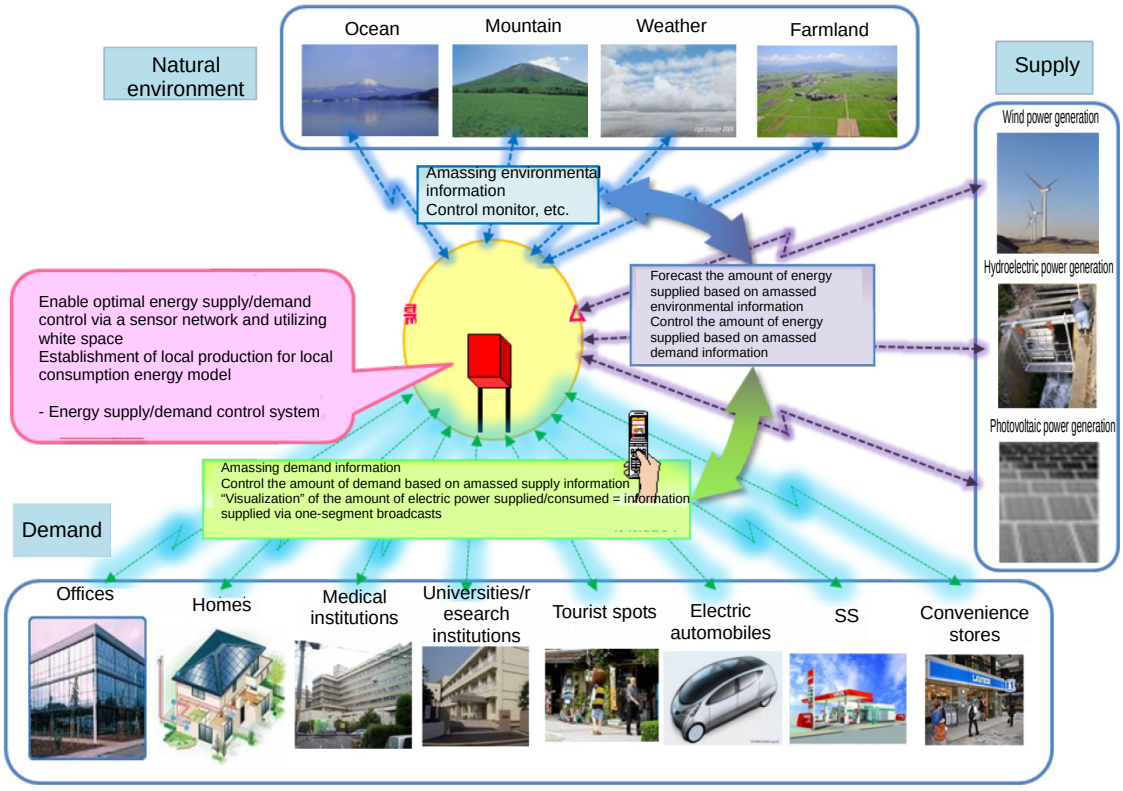



**Figure 2-21 Example of Proposition 19 Environmental Service**

**[Example of proposition 20] Digital delivery of paper media**

(i) Image of proposed service

Involves a service where information from paper media such as fliers, newspaper, etc. is provided to electronic devices via IP-based communication and broadcasts.

(ii) Frequencies used

UHF band

(iii) Effect of realization

Realization of this service would enable a variety of media to be provided to various devices and thus a lot of people, and hence expansion of new broadcast business operators, etc. in the area could be expected.

Changes in content circulation could also be assumed due to local utilization of content being encouraged.

- Simultaneous delivery of newspaper/magazine content, etc. to a number of unspecific devices within a limited period of time.
- Broadcast stations could create a new business model that differs from an advertisement model.
- A new delivery network is also created for the content provider, thus contributing to expansion of the content market.

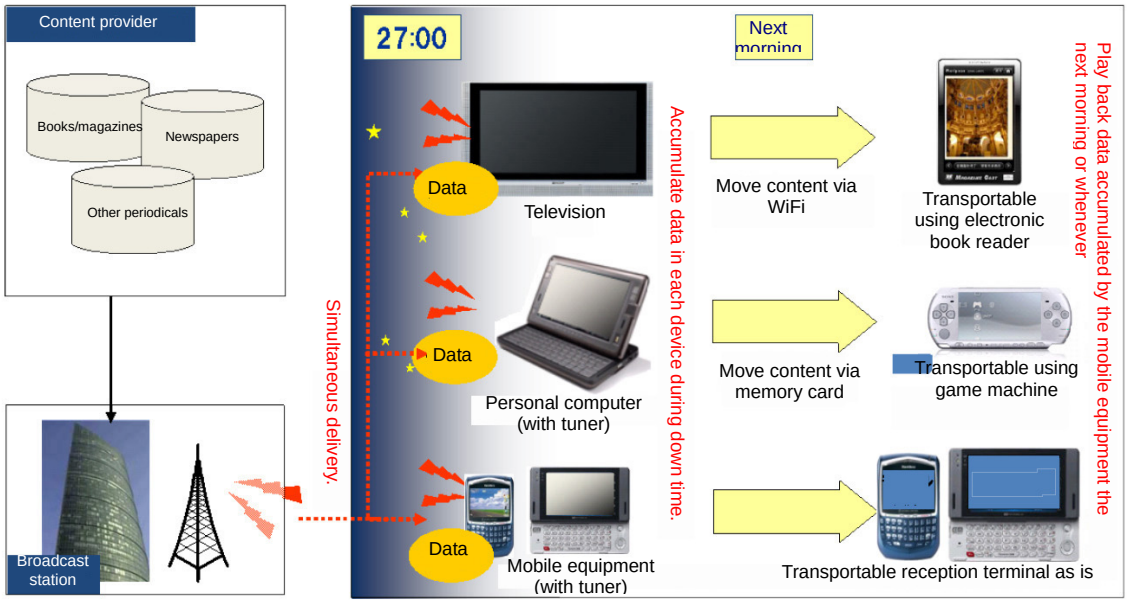



**Figure 2-22 Example of Proposition 20 Digital Delivery of Paper Media**

**[Example of proposition 21] M2M delivery to electronic devices**

(i) Image of proposed service

Involves a service where comparatively small amounts of data such as control data is simultaneously transmitted to a great number of devices, e.g. outdoor vending machines and traffic signs, as well as the simultaneous transmission of control data, e.g. power on as timed to an event, to toys, mobile equipment, home electric appliances, etc.

(ii) Frequencies used

UHF band

(iii) Effect of realization

Generally speaking utilizing communication lines tends to be expensive when there are many recipient devices but only a small amount of data is sent as well as being infrequent. Realization of this service, however, would enable simultaneous delivery of data, and hence the expectation is that would lower the cost of the service and make it more efficient.

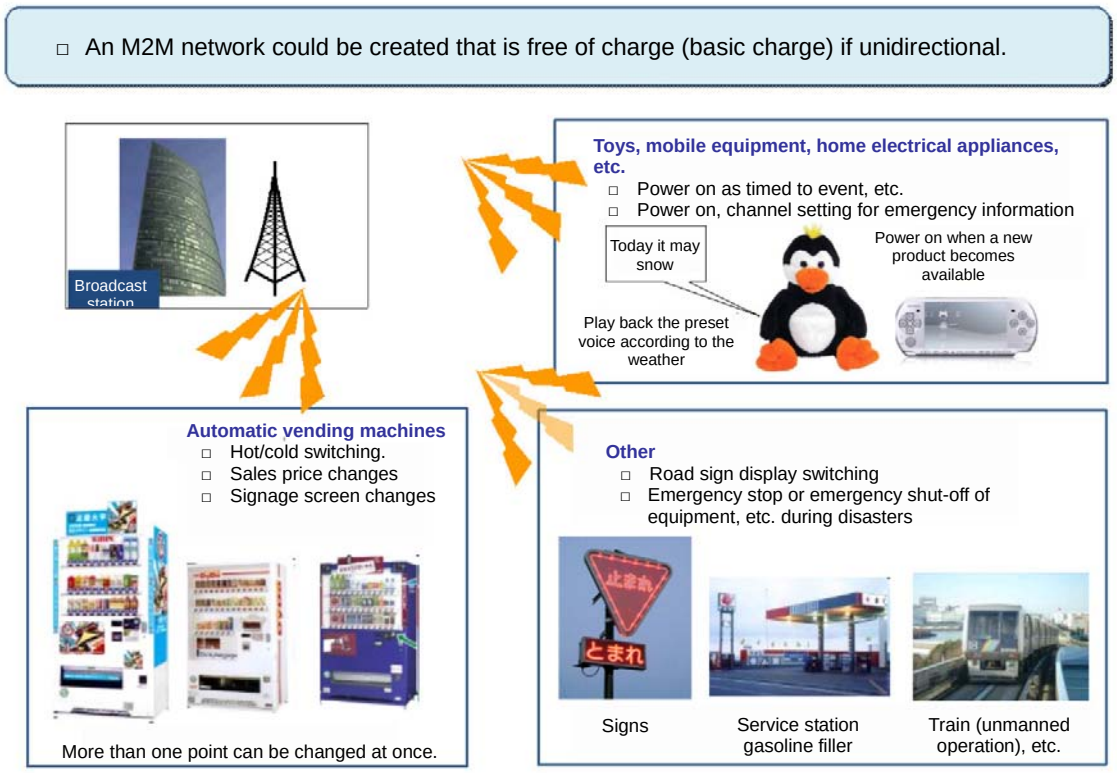



**Figure 2-23 Example of Proposition 21 M2M Delivery to Electronic Device**

**[Example of proposition 22] Communication network utilizing cognitive wireless technology**

(i) Image of proposed service

Involves a service that realizes an IP-based low-power data communication system in which a cognitive wireless function is introduced into fields such as medical care, emergency communication, etc. or data communication via the introduction of cognitive wireless technology between comparatively close points such as inside houses or between neighboring houses.
The realization of a car-to-car/road-to-car communication network of a next-generation ITS via utilization of cognitive wireless technology is also conceivable.

(ii) Frequencies used

UHF band, ISM band (2.4GHz band), etc.

(iii) Effect of realization

Realization of this service would enable the construction of a low-power radio communication network that covers the wide area of about 100 meters (or more) at a transmission rate equivalent to that of the currently popular wireless LAN systems. It would also enable the construction of an emergency communication system for use in disasters, etc. at a comparatively low cost.
Furthermore, the construction of a next-generation ITS would lead to the expectation of greater ease of mind/safety and less electric power consumption and thus be low-carbon producing.

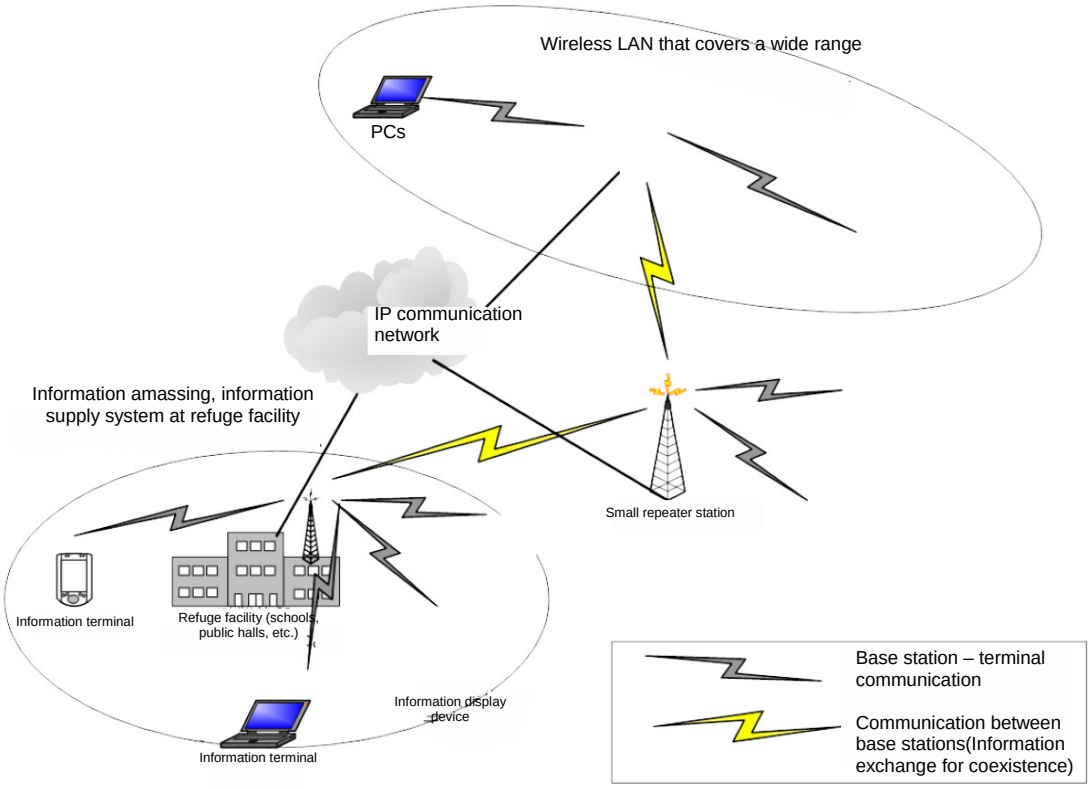



**Figure 2-24 Example of Proposition 22 Communication Network Utilizing Cognitive Wireless Technology**

**[Example of proposition 23] Broadband for customer owned and maintained communication**

(i) Image of proposed service

Involves a service that utilizes customer owned and maintained systems, e.g. systems for broadcast programs such as FPU broadcasts, radio microphones, etc. and MCA and white space that is available in terms of area/time.

(ii) Frequencies used

UHF band

(iii) Effect of realization

Realization of this service would enable the exploitation of as many new frequencies as possible for use with mobile communication systems of the 3.9th generation, etc. in meeting traffic demand, which is predicted to increase.

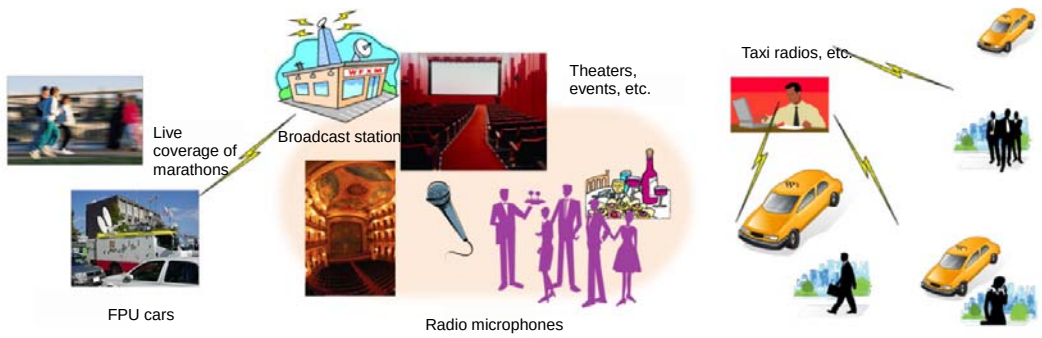



**Figure 2-25 Example of Proposition 23 Broadband for Customer Owned and Maintained Communication**

(4) Tasks to Be Reviewed in Realizing the Content of the Propositions, Etc.

As a result of inviting propositions to be made an opinion concerning the necessity of utilizing white space instead of the existing radio communication network, an opinion from the point of view of cross talk protection with regard to existing systems, etc., an opinion concerning institutional tasks, and an opinion concerning technical tasks, etc. were received as tasks that would need to be reviewed.

[1] Necessity for providing broadcast-type services that use white space instead of the existing radio communication network

The following opinions were on the necessity of utilizing white space, in the broadcast frequency band in particular, instead of the existing radio communication network.

(i) Merits of the “broadcast type”

- It would be necessary to reinforce the delivery facility as viewers increase in delivery with the “communication type” but the services could be made available using cheap small-scale facilities for delivery with the “broadcast type.” This would then contribute to making the business operation model’s infrastructure solid in terms of the cost.
- Creation of businesses with information vitalization can be expected to result from viewers’ time axes being shared.
- Viewing content would be free, thus attracting many viewers.

(ii) Merits of “area one-segment broadcasts”

If the currently already popular “area one-segment broadcasts” (the number of one-segment broadcast-compatible handheld terminals sold was over 80 million as of May 2010[1]) were to be utilized the merits of above (i) could be taken advantage of as well enabling services to be commenced upon at a small investment and in a short period of time.

(iii) Merits of utilizing “white space”

- Specialized information in meeting demand in limited areas in terms of area and time could be provided.

- Services being provided by individual area information agents would unite their local industries and information media. This would then lead to the expectation that the areas could generate nationwide vitality as they link up and compete with each other.

[2] Cross talk protection with regard to existing systems, etc.
The following opinions were aired from the point of view of cross talk prevention with existing systems, etc. when utilizing white space.

(i) Securing cross talk prevention measures

[1] Statistical data from the Japan Electronics and Information Technology Industries Association; domestic shipment results for mobile telephones in May 2010

- The first principle should be not to incur any cross talk jamming of existing business operations.

- A white space utilization system generating cross talk jamming would make a system that enables measures to prevent any such cross talk necessary. In more concrete terms a licensing system would be desirable.

- When reviewing white space utilization system channels a system of making it obligatory to contact existing business operators and so on would be necessary. Consideration should also be given to not confusing users of the existing systems.

- It would be necessary to make rules together with existing business operators if any cross talk or interference did occur.

- It would also be necessary to put contact/adjustment rules in order with regard to avoiding any cross talk between white space utilization systems.

- A problem solving council, etc. to realize local one-segment broadcasts should be set up.

- Measures for cross talk that differ according to the area, etc. utilized in should be reviewed. (For example, large stadiums and plazas have different radio wave shielding.)

- Cross talk where retransmission business operations are to be conducted, e.g. CATV business operators, should also be reviewed. (Contacting the CATV business operator in the relevant area would be desirable.)

(ii) Implementation of verification tests and formulation of technical standards, etc.

- It would be necessary to check that no interference occurs with existing systems via verification tests and then formulating technical and operation standards according to the results thereof. A “specific white space district” could be created for the verification tests.

- With the verification tests it would be necessary to continue sampling with regard to actual utilization, e.g. the possibility of cross talk and, for example, the delay until being able to provide the information to viewers.

- The necessity for technical standards to be equipped with the following functions in avoiding any cross talk with existing systems.
  - A spectral sensory function to detect the existence of an existing system
  - A function to obtain radio equipment’s positional information
  - A function to access a database related to the situation with utilization of existing base stations in the relevant area

- With some of white space utilization systems, meanwhile, fundamental technical reviews have already been implemented. With them, therefore, reviewing the minimal technical standards, e.g. frequency and the electricity required by the aerial, is adequate.

- When formulating technical standards it should be noted that full area one-segment broadcasts require a wider spectrum width, using the band width of 6MHz, than area one-segment broadcasts.

[3] Institutional tasks

The following opinions were aired on tasks such as making flexible rules in the light of an area's needs, business operability, etc., the need for rules in the case of multiple utilization of white space, review of publication of information concerning white space frequencies, etc. in institutionalizing white space utilization.

(i) Flexible rules in the light of the area's needs, business operability, etc.

- The introduction of flexible operating conditions is necessary in meeting an area's needs with the administrative authorities that have jurisdiction over the frequencies in the area, such as the general communication station in each area, etc., being the agent with regard to licensing, frequency assignment and service operating conditions.

- The creation of flexible rules will be necessary with commercial licensing rather than the current test licensing. It would be desirable, for example, that the acquisition procedure be simplified at the test bureau, etc. as well as opportunities created to utilize the same frequency channel continually at the test bureau, etc. when shifting to practicalization of services provided in the light of the test results.

- It would be desirable that the application procedure be simplified, e.g. alleviation of the license acquisition requirements, institutionalization of equipment conforming to the technical standards, and simplification of the registration procedure.

- A frequency band common throughout the country should be granted when services will be provided in various places throughout the country. If that is difficult to achieve it would be desirable that the institution would be able to set a granted frequency band according to the area from among more than one specific frequency band.

- With regard to the frequency band width a flexible institution that enables utilization of only the central 1 segment (about 430kHz width) as well during limited periods until the business operation infrastructure has been established with 6MHz width being the premise would be desirable.

- An institution is necessary that would enable management which can take advantage of the area's originality and ingenuity while, with regard to utilization of white space, being able to keep the burden light in terms of micro power emissions.

- An institution that enables links to multimedia broadcasts would enable links between services or upgrading of services.

- The attempt should be made to realize a more elaborate service by linking V-low digital radio, which prefectural area broadcasts are expected to use,

and a white space utilization service mainly of an information supply within limited areas. In achieving that institutional adjustments, including handling the principle of ruling out concentrations of mass media, would be necessary.

- Formulation of white space licensing standards should be reviewed and clarified.

(ii) Organizing communication and broadcast fusion-type frequency licenses

An institution will need to be organized that enables utilization of a single infrastructure for both communication and broadcasts.

(iii) Rules for the case of multiple utilization of white space

- Services in limited areas where it is made available by one specific business operator (airports, stations, etc.) would make desirable the introduction of multi-segment service technology which enables utilization of the entire 6MHz band in making multiple services possible.

- Fair selection standards would need to be made for granting licenses in areas where service suppliers are limited (e.g. airports) to such a business operator and to allow, when more than one business operator does exist, such business operators to also participate.

- Multiple services being available from more than one business operator in limited areas should only be made possible after an agreement has been reached between more than one service supplier based on the technical standards and operating guidelines.

(iv) Organizing copyright processing rules

Copyright rules, etc. for multiple use of content will need to be reviewed.

(v) Organizing rules for paid delivery of content

The processing system/operating method for the authentication/charge system (limited to paid content) will need to be reviewed.

(vi) Review of publication of information concerning white space frequencies

Encouraging making frequency information concerning white space as a database and how it should be published will need to be reviewed.

[4] Technical tasks

The realization of white space utilization includes opinions on technical tasks, e.g. necessity of implementing research and development and verification tests and dealing with standardization.

(i) Dealing with research and development of frequency sharing technology

- Developing cognitive wireless technology (a concrete frequency band is yet to be specified) for utilizing frequencies not in use in terms of time and

space will be necessary.

- Developing technology that enables use of more than one base station area dynamically overlapping at the same frequency in the same area and in the same time zone will be necessary.

- Developing multi-segment technology such as bundled-segment broadcasts, separate-segment broadcasts, etc. will be necessary in effective utilization of radio waves.

(ii) Implementation of verification tests

- Verifying cross talk protection standards for multi-segment technology will be necessary as it has yet to have been systematically verified.

- Introducing cognitive wireless technology into a frequency band such as white space will necessitate an attempt to clarify the technical conditions necessary in preventing any unwanted cross talk and interference via the following verification tests.

  - Verification tests of technology that senses in real time the situation with frequencies in a specific area.
  - The creation of a database that defines protection conditions for existing systems.
  - Application of cognitive wireless technology in data communication between points that have been fixed at a comparatively short distance (intelligent homes).
  - Application of cognitive wireless technology in data communication with mobile devices at a short distance away (car-to-car/road-to-car communication network for next-generation ITS).

(iii) Dealing with standardization

Discussing standardization of technical standards at IEEE should be positively dealt with.

[5] Other

(i) Development of handheld terminals that suit utilization of area one-segment broadcasts

- With area one-segment broadcasts handheld terminals have no preset functionality when tuning into a channel other than existing broadcast stations. This then makes it necessary that terminals be developed which enable anyone to easily tune into the channel. The terminal's specifications will also need to be standardized.

- Where there are limited vacant channels it is conceivable that "bundled-segment broadcasts" be utilized. Present handheld telephones have no such function, however, thus making it necessary that handheld terminals equipped with a bundled-segment broadcast reception function be developed.

- Regarding other services, e.g. automatic detection function of more than

one white space channel and multimedia broadcasts, as well, it will be possible to realize a variety of services as a result of expanding and upgrading terminal functions, e.g. the function of enabling seamless viewing.

- Terminal specifications to meet existing one-segment broadcasting becoming IP based will need to be reviewed.

(ii) Development of reception/transmission systems

- Review of the introduction/deployment of reception devices that can be realized at low cost by consulting electric appliance manufacturers and so on will need to take place.

- Cheap transmission systems, e.g. utilization of gap fillers, will need to be developed.

(iii) Establishment of an information delivery scheme for local areas

Review of an information delivery scheme for areas on the premise of commercial services and establishment of operating methods will need to be reviewed.

(iv) Establishment of a stable content supply institution

Review of an institution that can produce content in a stable manner will need to take place. The assumption is that the participation of local content suppliers, etc. will be requested with a local autonomous body at the center.

(v) Participation in international discussions

In reviewing the formulation of domestic regulations discussions at ITU-R should be participated in.

(vi) Regarding utilization of broadcasting in the future, etc.

- White space utilization systems must not adversely affect present and future broadcast business operations.

- Measures for utilizing white space should be limited to being provisional in ensuring that future broadcast innovations are not obstructed.

- Utilization of white space should be commenced upon after reviewing the reduction in the present terrestrial television broadcast band and futuristic methods of utilizing frequencies.

- Utilizing white space in the terrestrial broadcast frequency band will necessitate frequencies also being secured for the changeover (elimination of barely listened to/viewed areas, etc.) to terrestrial digital television broadcasting to be implemented from 2011 on.

## Chapter 3 Dealing with White Space Utilization Overseas

Expectation of white space being utilized is growing worldwide. Research and development of the new radio communication technology concerned and standardization activities are taking place in other countries.

In this chapter trends in new radio communication technologies and dealing with white space utilization overseas are analyzed.

### 1. New Trends in Radio Communication Technology

(1) Present State of Effective Utilization Technology for Frequencies

Generally speaking effective utilization technology for frequencies can be classified into the following three.

- Technology that enables improved transmission efficiency and containment efficiency
  Technology that enables effective utilization of frequency bands by attempting to improve transmission efficiency or creating a narrowband within an existing frequency band

- Effective utilization technology for high frequency bands
  Technology for effectively utilizing high frequency bands of 3GHz or more for which utilization technology is yet to be established

- Technology to alleviate or eliminate any cross talk/jamming

Technology for utilizing frequencies more effectively by sharing them via alleviating or eliminating any cross talk/jamming

The “technology to alleviate or eliminate any cross talk/jamming” mentioned above is so-called frequency sharing technology. It includes a method of sharing the same frequency by time, space, code (Time Division Multiple Access; TDMA), Multiple Input Multiple Output (MIMO), Code Division Multiple Access (CDMA), etc. or a method of sharing an ultrawideband frequency at low electrical power (Ultra Wide Band; UWB), etc. and also cognitive wireless/software-defined radio.

TDMA, MIMO, CDMA and UWB have already been practicalized. Future research and development of cognitive wireless and software-defined radio can be expected. A new concept of sharing utilization of them is currently attracting international attention.

“Cognitive wireless technology” enables the radio wave utilization environment to be adapted by first identifying and then flexibly selecting the optimal frequency band, radio channel band, modulation system, access system, etc. More than one frequency or network can be effectively utilized within one system and hence that system can share the same frequency while still avoiding any interference.

“Software-defined radio technology,” meanwhile, is radio communication technology that will be the core to realizing cognitive wireless technology. It enables the creation of a radio communication system that meets the needs of various communication systems and frequencies via digitalization and then being rewritten using software. Examples of practicalization include U.S. radio defense equipment, handheld telephone base stations, terminal facilities, etc.

(2) Trends with Research and Development in Japan

Trends with research and development in Japan concerning cognitive wireless technology and software-defined radio technology are as follows.

[Cognitive wireless technology]

Research and development of cognitive wireless technology in Japan has been conducted by the National Institute of Information and Communications Technology (NICT), an independent administrative institution, as well as private business operators such as NTT Docomo, KDDI, SoftBank, etc.

Cognitive wireless technology includes heterogeneous cognitive wireless technology and carrier sensing cognitive wireless technology.
With heterogeneous cognitive wireless technology communication is performed by a radio communication system that acknowledges an existing radio communication system and secures the frequency band width that the user requires according to the results thereof. With carrier sensing cognitive wireless technology, meanwhile, communication is performed by a radio communication system that acknowledges a vacant frequency and time zone and secures the frequency band required using that vacant frequency and time zone. It is a method that is called the white space approach.

The results of that research and development get reflected in the standardization activities of IEEE, etc. In more concrete terms they were reflected in the IEEE 1900.4's standards. General propositions are also being made with regard to standards currently created in IEEE 802.19. It is safe to say that they will very much contribute to standardization activities.

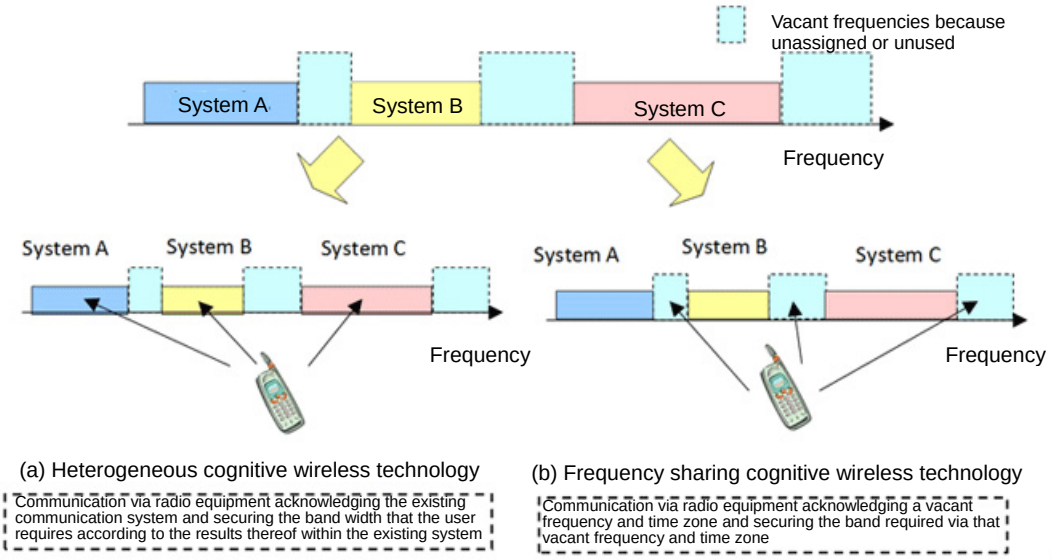



**Figure 3-1 Outline of Cognitive Wireless Technology**

[Software-defined radio technology]

Research and development of software-defined radio technology in Japan has been conducted mainly at the NICT. Examples of application include development of a software radio for advanced road traffic communication in enabling the operation of more than one mode, e.g. a radio that integrates PHS, ETC and GPS, the development of a software radio for mounting on satellites in enabling the construction of satellites, the service life of which is 10 ~ 15 years, to meet advances made in communication technology via software, etc.

In the future research and development of new radio communication technology in realizing the upgrading of utilization of white space is deemed necessary. Research and development of radio communication technology that realizes further upgraded utilization of frequencies in terms of area, time and space within tight frequency bands in particular is considered necessary.

The results of any such research and development will still need to be reflected in the standardization formulation of IEEE, etc.

(3) Trends with Research and Development Overseas

Overseas research and development has mainly taken place in the U.S. by the Software Defined Radio (SDR) Forum and the Cognitive Networking Alliance (COGNEA), while in Europe it has been dealt with as part of the E3 project.

[1] Software Defined Radio (SDR) Forum

The SDR Forum is a nonprofit mutual benefit corporation set up in 1996 as the Modular Multifunction Information Transfer System (MMTS) Forum which later had its name changed to the SDRForum. It is an organization that promotes next-generation radio communication technology such as Software Defined Radio (SDR), Cognitive Radio (CR), Dynamic Spectrum Access (DSA), etc.

Its members cover a variety of European and American as well as Asian hardware and software manufacturers, autonomous bodies, wireless service providers, network operators, etc. As of the end of 2007 there were 102 participating parties. From Japan Hitachi, Hitachi Kokusai Electric, NEC, Yokohama National University and NICT are all members. From the Republic of Korea the Electronics and Telecommunications Research Institute (ETRI) and Hanyang University are members and from China Huawei is a member.

So far it has publicized 5 instances of standard specifications for software-defined radio technology (High-Level SDR Security Requirements; Software Defined Radio Commercial Handset Guidelines; etc.), 16 instances of survey reports on the software-defined radio technology market and regulations (Public Safety Radio System Cost Model; Cognitive Radio Definitions and Nomenclature; Base Station System Structure; etc.) and 22 instances of opinion/recommendation documents to the FCC and other standardization bodies, etc. (Comments of the SDR Forum on the FCC's Innovation Notice of Inquiry; Comments of the SDR Forum on the 2nd Notice of Proposed Rulemaking in the Matter of Implementing a Nationwide, Broadband, Interoperable Public Safety Network in the 700MHz Band; etc.).

In December 2009 this forum, judging that software-defined radio technology had now entered a market expansion period from its initial market entry period, changed its name to the Wireless Innovation Forum and its objective of activity from mainly technology to mainly market expansion. In concrete terms it assumes responsibility for the 4 pillars of: [1] popularization supportive movement; [2] market opportunity expansion; [3] commercialization and; [4] education as its new objectives.

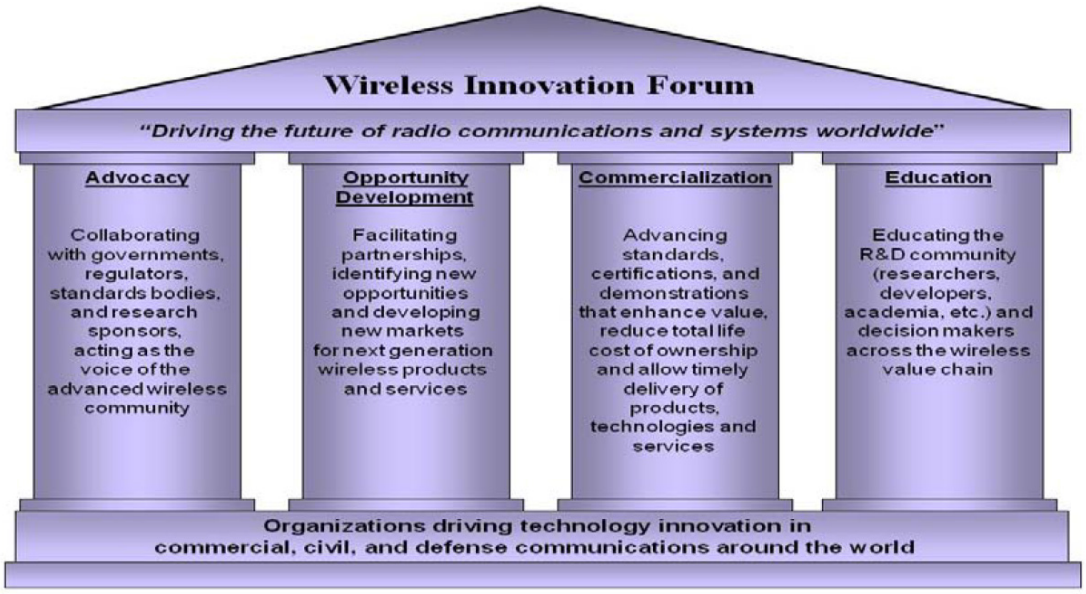



**Figure 3-2 SDR Forum's Objectives During 2010 ~ 2014**

[2] Cognitive Networking Alliance (COGNEA)

COGNEA is an organization that promotes low-power personal/portable TV band devices available for use with TV white spaces. It was set up on December 16, 2008.

Its board members include ETRI, Samsung Electronics, Hewlett Packard (HP), Philips, etc. Cooperative members include the Georgia Electronic Design Center (Georgia Institute of Technology) and Motorola.

In 2009 it created the standard for TV white space equipment of "MAC and PHY for Operation in TV White Space" in cooperation with the European Computer Manufacturer Association International (ECMA International), which is a standardization organization related to ICT. It aims at stable connectivity and economy both indoors and outdoors via the realization of a high-speed wireless network available with wide coverage that takes advantage of the characteristics of the UHF band of TV white spaces as well as, and furthermore, making propositions on utilizing cognitive wireless technology to ensure it does not interfere with personal/portable devices in satisfying the FCC's rules and existing systems.

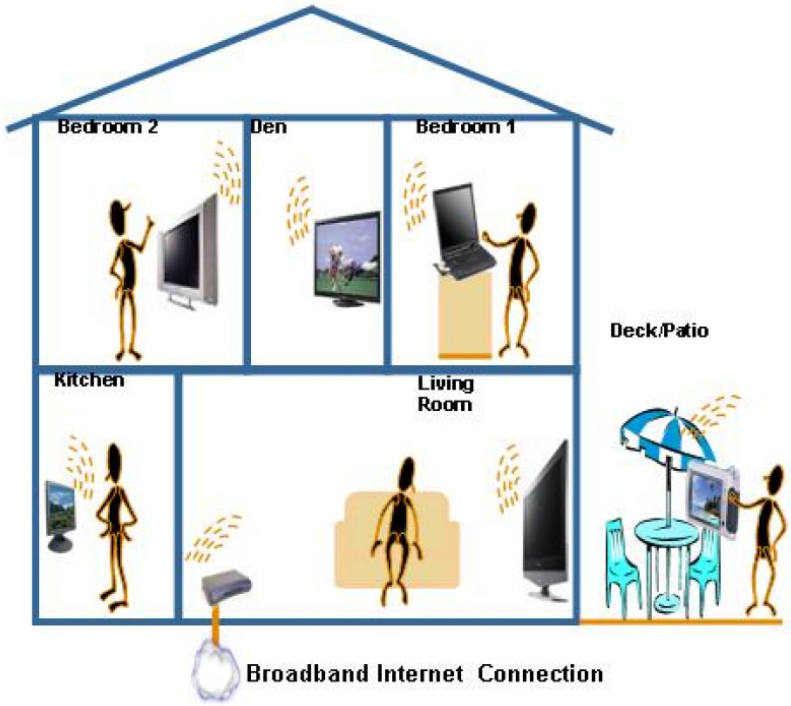



**Figure 3-3 Example of System Proposed by ECMA**

[3] E3 Project

The E3 Project is one (2007 ~ 2013) research and development support institution (FP7) in increasing employment and reinforcing the competitiveness of the EU area. The European Commission aids in in up to 50% of its research capital.

E3 aims at enabling, via next-generation wireless systems, efficient and high-expandability integration of a cognitive wireless system into the conventional wireless system. In more concrete terms, it is involved in the development of a cognitive wireless system that can automatically meet changes in the wireless environment in a dynamic manner and research and development on improving network operations via a cognitive wireless system and operation of efficient recomposition. Its objective is optimal utilization of more than one wireless system.

(4) Trends in Standardization of Cognitive Wireless Technology/Software-Defined Radio Technology

Regarding the standardization of cognitive wireless technology and software-defined radio technology individual standardization bodies such as the IEEE or the European Telecommunications Standards Institute (ETSI), etc. proceeds with a review for a decision to be made by the ITU.

[1] ITU

At the World Radiocommunication Conference 2007 (WRC-07) ITU decided to review the regulatory items that will accompany the introduction of software-defined radio systems and cognitive wireless systems and with the items concerned therewith being

the subject of discussion at the WRC-11 planned to be held in 2012.

Upon this decision having been made the ITU's international telecommunication sector ITU-R began reviewing definitions of software-defined radio system and cognitive wireless system and their position within Radiocommunication Rules (RR), etc.

The present situation with that review, first regarding the position of software-defined radio and cognitive wireless systems, is that an opinion has been disclosed that although they are technology for use in realizing effective utilization of frequencies in all radio communication service operations they are not actually radio communication service operations, and hence it is not necessary to distribute frequencies to them.

The review of introducing cognitive wireless systems in the future also includes reviewing several methods of reflecting in the Radiocommunication Rules (RR) utilization of a cognitive wireless system.

Via such reviews by the ITU-R each individual standardization body, such as IEEE, ETSI, etc., proposes standard specifications.

[2] ETSI

The ETSI is a standardization body set up in 1988 to formulate standard specifications for telecommunications in Europe. It consists of public offices, telecommunication business operators, manufacturers, research institutions, etc. in European countries.

In 2008 it set up a committee concerning the cognitive wireless system TC RRS (Reconfigurable Radio Systems) and over the first 2 years was involved in basic reviews such as what and how long standards should last as a preliminary survey. The committee's activities have been supported by FP7, being part of the EC's research framework.

[3] IEEE

The IEEE is a nonprofit specialist institution that came together through the American Institute of Electrical Engineers and the Institute of Radio Engineers merging in 1963. Its main office is based in the U.S. it has members from all over the world. It is the world's largest institution of the kind. It is mainly involved in standardization activities in addition to issuing periodic academic papers.

At present standard specifications for common elemental technology that will be necessary in realizing a communication system that uses cognitive wireless technology are being reviewed by the IEEE SCC41. A decision being made to free TV broadcast wave white spaces having been made by the FCC, meanwhile, has resulted in a review of standard specifications concerning communication systems and TV white spaces in the light of the FCC standards taking place at IEEE802 meetings. Incidentally, the reason why the IEEE802 discussions are being made in the light of the FCC standards is because the IEEE has the principle of conducting discussions in line with existing standards. If a standard concerning white space should be formulated in another country in the future a discussion in light of that too will presumably take place.

(i) IEEE SCC41

IEEE SCC41 was set up in 2005 for formulating standard specifications of common elementary technology that will be necessary for the realization of a cognitive wireless system. At present it is mainly involved in reviewing standardization of communication systems for use between pieces of equipment directly connected in an architecture or network. NICT acts as chairman, and there are also many participant manufacturers, etc. from Japan, who are also involved in the discussions.

- IEEE1900.1

  IEEE1900.1 finished standardization work concerning definition of terms in 2008.

- IEEE1900.2

  IEEE1900.2 finished standardization work concerning the method of analyzing the allowable amount of interference in 2008.

- IEEE1900.3

  IEEE1900.3 was dissolved without reaching standardization (at first it aimed at standardization concerning a method of approving radio equipment to be assigned dynamic frequencies).

- IEEE1900.4

  IEEE1900.4 finished standardization work concerning the fundamental architecture of a cognitive wireless network in February 2009. 1900.4a was set up to revise this standard in March 2009, while review also started of a cognitive wireless network in white space. Standardization in about 2011 is being aimed at.

- IEEE1900.5

  IEEE1900.5 is proceeding with reviewing standardization concerning the information to be exchanged between networks and terminals. Standardization in about 2010 is being aimed at.

- IEEE1900.6

  IEEE1900.6 is proceeding with reviewing standardization concerning specifications for spectrum sensing.

(ii) IEEE802

IEEE802 set up working committees according to the range of a wireless network's communication area. Review has taken place of the standard specifications of communication technology of each network.

- 802.11

  Review of the standard specifications of LAN communication technology (radius about 100m) has taken place. 802.11.af was set up in January 2010, and reviews commenced upon in the light of FCC standards. Standardization in about 2011 is being aimed at. NICT acts as the secretary.

- 802.22

  Review of standard specifications of a fixed communication system utilizing RAN white space (radius about 10 km) has taken place. Review in the light of the FCC standards commenced earlier than any other 802 working committee but standardization is yet to be achieved. The timing of the standardization is yet to be set.

- 802.19

  802.19 involves a place to discuss the common items of 802 working committees. 802.19.1 was set up in January 2010, and review of common specifications of a coexistence system for between systems commenced upon in the light of FCC standards, etc. Standardization in about 2013 is being aimed at. NICT acts as the chairman.

## 2. Situation with Dealing with White Space Utilization in Foreign Countries

(1) Situation in the U.S.

In the U.S. major IT-based companies such as Google, Microsoft, Motorola, Dell, etc. have requested that frequency bands (white space) not being utilized, depending on place, of 2 ~ 51ch (digitalization complete in 2009) of terrestrial television broadcast frequencies be freed up for use with broadband communication. The FCC then commenced reviewing the possibility of utilizing white space in 2012.

Upon this the television industry and wireless microphone users, etc. expressed their opposition to white space utilization because of the possibility of cross talk jamming. Nevertheless, the FCC concluded that cross talk could be fully avoided by online checking radio equipment positional information using a database in addition to a radio wave sensory function for television broadcasts, etc. around after implementing public comments on rules and verification tests of the effectiveness of cross talk jamming avoidance technology, and then in November 2008 issued an order approving utilization of radio equipment for broadband communication utilizing white space.

The order is outlined below.

- Utilization of radio equipment for broadband communication for personal/commercial use has been approved with no license needed on the condition of it being secondary utilization (television broadcasts have priority) of white space.

- The radio equipment must be equipped with: [1] a position identification function; [2] a database access function via the Internet; and [3] a carrier sensing function. In addition, while radio equipment equipped only with a carrier sensing function is allowable it will be judged more strictly.

- The radio equipment must be certified by the FCC to have the above functions. The certification shall involve both public room and field tests and the test results shall then be made available to the public.

- The FCC shall conduct strict market supervision of any radio equipment that utilizes white space. Any equipment not in compliance shall be subjected to recovery orders, etc.

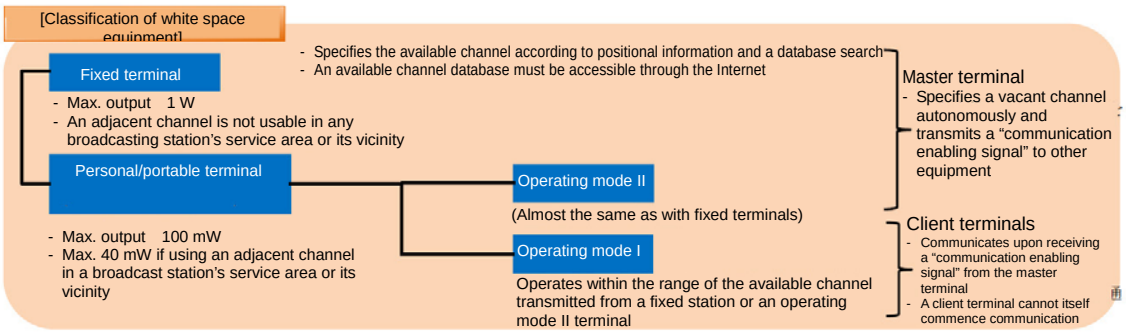



**Figure 3-4 Classification of White Space Equipment**

To free up white space the FCC officially invited administrators to manage a database in November 2009.

The conditions for being a database administrator are that they acquire/accumulate data from the FCC database and also verify it against the FCC database at least once a week, that they have registered existing radio stations that need to be protected from cross talk such as fixed broadcast stations, that they shall provide a service for at least 5 years and if there is any hint of an error in the database take appropriate measures, and so on. As the content presented by a database management applicant the FCC indicates the need for a business plan for operating the database for 5 years, the charge collection process, and database functions such as the method of storage and method of determining available channels, the database management institution, etc.

Any organization that wishes be involved in that management must apply to the FCC by January 4, 2010, with to date 9 companies, including Google, having applied. Google set up in February 2009 an organization called the "White Space Database Group," the purpose of which is to construct a database for white space utilization, together with Comsearch, Dell, Hewlett-Packard, Microsoft, Motorola and NeuStar.

The FCC also announced in February 2009 the commencement of an initiative called the "International TV White Space Fellowship and Training Initiative" to promote utilization of white space at an international level. It states that in concrete terms it will provide online training to governments and specialists of foreign countries interested in white space utilization as well as hold explanatory meetings on site.

Meanwhile the FCC has just commenced upon field tests by granting test licenses from October 2009 on as part of technical verification of white space utilization. The tests are taking place in the States of Virginia and North Carolina.

[Test in Claudville, Virginia State]

In Claudville, Virginia State, (population about 900; a village in a forest zone in the mountains; high-speed Internet service opened for the first time in July 2009) a venture company called Spectrum Bridge and the financial group of the Telecommunications Development Fund (TDF) implemented a test service. A computer laboratory installed by the TDF connects to WiFi, etc. installed at a school or café via broadband communication utilizing white space. The band width is 2MHz, the transmission rate a maximum of 2Mbps, and the average rate 700kbps ~ 1Mbps. The plan is to provide the service for 18 months from October 2009 on.

[Test in Wilmington City, New Hanover County, North Carolina State]

In Wilmington City, New Hanover County, North Carolina State (population about 100 thousand; a major urban area), a venture company called Spectrum Bridge has implemented a test service in cooperation with TV Band Service LLC, a radio communication system company located in Wilmington City. After installing white space base stations in 3 places in the city Spectrum Bridge connected them to optical fiber for utilization as a public WiFi access network in a park, a network of traffic supervisory video monitors on an avenue, a network of environmental supervisory monitors for water quality, etc.

The plan is to provide the service for 18 months from February 2010 on as the service will

be utilized in the future for public school WiFi access and in telemedical care for monitoring patients recuperating at home.

Hereafter the FCC intends to work on formulating concrete technical standards and constructing a database. The "National Broadband Plan," which the FCC submitted to congress in March 2010 too, states that a conclusion should be obtained as early possible on the procedure concerning TV white spaces.

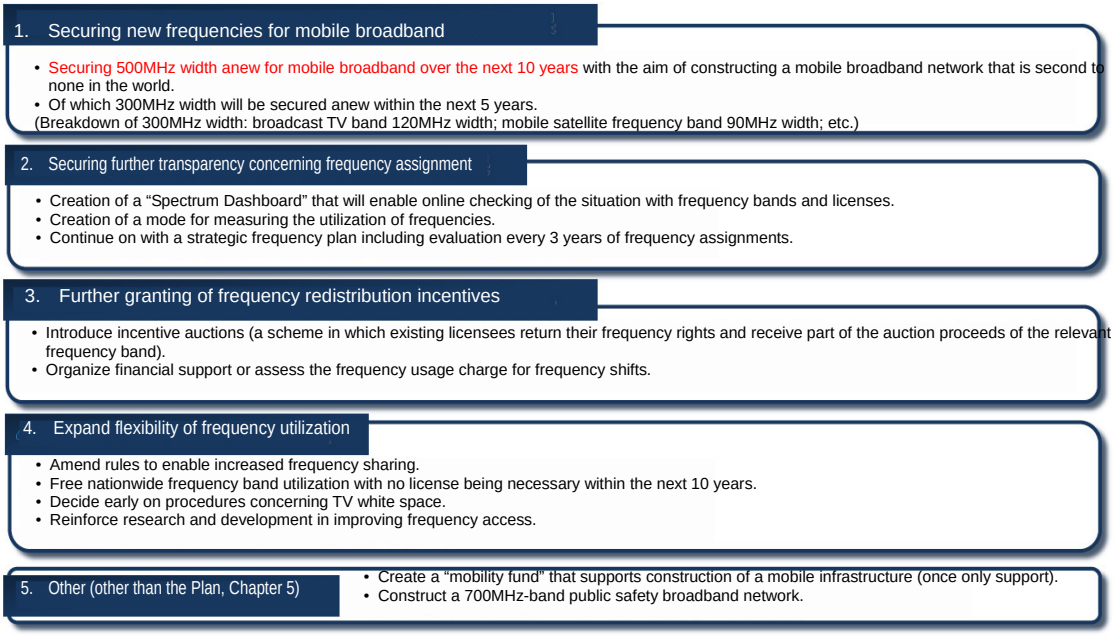


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**Figure 3-5 National Broadband Plan (Excerpt from Chapter 5 "Spectrum")**

(2) Situation in Europe

In Europe the European Conference of Postal and Telecommunications Administrations (CEPT) publicized a technical report on utilization of TV white space of "Report 24: A preliminary assessment of the feasibility of fitting new/future applications/services into non-harmonized spectrum of the digital dividend (namely so-called "white space" between allotments)" in June 2008 after being requested to do so by the European Commission (EC).

Report 24 is outlined below.

- Utilization of applications and services in the white space will only be possible under the principle of non-interference/non-protection (no interference with other radio stations and not protected by other radio stations) for primary utilization services in limited areas/times.

- Frequency sharing by cognitive wireless is yet to have been fully verified and not at the stage of judging its effectiveness. Sharing of frequencies, sharing with broadcasts, PMSE (Program Making and Special Events), etc. in particular must be carefully reviewed.

- It is still too early to make any decisions on the use of cognitive radio equipment in the European environment.

- CEPT's idea at the present time is that any white space applications whatsoever should be used under the principle of non-interference/non-protection.

- Further review within this framework will be necessary to enable utilization of cognitive radio equipment in white space.

In Britain, meanwhile, the Office of Communications (Ofcom) publicized a "Digital Dividend Review" in December 2007 and revealed the idea to use in approving utilization of TV white space (interleaved spectrum). An auction was then held under a licensing system but an existing business operator, etc. won the bid, and hence the entry of a new service did not take place.

Subsequently in July 2009 Ofcom publicized "Digital Dividend: Cognitive Access" and revealed an idea for approving utilization of cognitive radio equipment that does not require a license for TV white space.

The decision was made to coordinate with other European countries in that part of TV broadcast frequencies would be assigned for communication broadband, however, the frequencies and areas that become available as TV white space then changed. Review is therefore taking place again.

(3) Situation in Canada

In Canada Industry Canada announced in June 2006 that it would approve Remote Rural Broadband Service (RRBS) using TV white space under a licensing system, which is outlined below.

- Under a licensing system priority would be given to use for broadcasts and RRBS would be secondary.

- Introduction only in remote rural areas (area with a population density of less than 100,000 people/radius 50 km) where no existing broadband infrastructure (DSL, cable, etc.) is available.

- Limited to PtoMP fixed service.

- With multi-access an area radius of about 30 km with a high-output system (500W EIRP) via FDD or TDD.

- Ensure no constraints upon existing or future broadcast services using a sufficient distance from population concentrations.

- A licensed period of 1 year (renewable).

(4) Situation in Singapore

In Singapore the Info-communication Development Authority (IDA), a public organization that promotes ICT research and development in Singapore, announced in April 2010 a trial of a service using TV white space. It will be inviting implementation agents until July. The trial is outlined below.

- The trial is for implementing verification of whether TV white spaces can be made available without interfering with existing services or not.

- Test period of 6 months.  (Planned to be formally publicized on July 30, 2010)

- Output 100mW max. (note: 2.5 mW max. for adjacent channel; 50 mW max. for adjacent channel)

- Band width  In units of 8MHz

- Implemented in the following5 places.
  Kranji Carpark (Singapore/Malaysian Coast)
  Marina South Pier (Singapore/Indonesia Coast)
  Opposite Beauty World (Mitigation near broadcast tower)Cairnhill Carpark (Dense urban environment)
  Science Park II (In-building environment)

**[Reference]The Holding of International Symposiums**

The Review Team held an “International Symposium Concerning Effective Utilization of Radio Waves” in March 2010 to which government organizations and business operators were invited from overseas to exchange opinions with the members of the Review Team in order to contribute to reviewing white space utilization models.

Table of Overseas Lecturers at the International Symposium

| | |
|---|---|
| Microsoft | Mr. Paul W. Garnett<br>(Director, Policy and Regulatory Affairs in Entertainment and Devices Division) |
| Intel | Mr. Kazumasa Yoshida<br>(Vice President of Sales and Marketing Group) |
| European Commission | Mr. Ruprecht Niepold<br>(Adviser Radio Spectrum Policy, Directorate Generalfor Information Society and Media) |
| FCC | Mr. Paul W. Garnett<br>(Former Legal and Regulatory Advisor of the FederalCommunications Commission) |

* Mr. Paul W. Garnett of Microsoft also participated as a former member of the FCC since he was once legal advisor to it.

(1) Stances of the parties concerned overseas towards white space utilization

[1] Microsoft

Microsoft as well as other major IT companies request that the FCC free up TV white space for use with broadband communication and are reviewing its utilization. It positions TV white space as important technology in realizing ubiquitous networks as they have a great need to utilize the UHF band and because many band widths can be utilized.

In concrete terms their expectation is, as the image of utilization of white space, construction of home broadband, organization of a broadband environment in underpopulated areas, utilization in security/medical care, etc. In the U.S. it is also conducting verification tests on the provision of information on hurricane damage in North Carolina State. It says that the expectation is that utilization of white space will lead to the creation of new businesses and improve people’s convenience.

[2] Intel

Intel too, in addition to such major IT companies as Microsoft, is requesting the FCC to free up TV white space for use with broadband communication and reviewing its utilization. Their expectation is that utilization of white space will contribute to the realization of a wireless broadband environment. It revealed its expectation that just as the emergence of new technology that realized utilization of white space prompted wireless LAN (2.4GHz band) and thus created a large market more white space utilization could also contribute to economic growth, area vitalization, fostering of industries, etc.

[3] European Commission

The European Commission makes decisions on the regulatory framework of frequency policies, e.g. frequency control and frequency trade, within Europe. It proceeds with reviews; for instance, it requested the European Conference of Postal and Telecommunications Administrations (CEPT) to create a technical report concerning utilization of TV white space.

It assumes that it is still too early to judge on the use of cognitive radio equipment but that any such equipment whatsoever should be used under the principle of non-interference/non-protection. However, it does position research and development of technology concerning the sharing of frequencies that include utilization of white space as an important European project and assumes that utilization of white space will be reviewed in the light of technical trends.

[4] FCC

The FCC handles frequency control (excluding federal government frequencies) as well as the licensing of radio stations and regulations, etc. in the U.S. After receiving requests from major IT companies to free up white space as a measure of organizing a mobile broadband environment it started reviewing white space utilization in 2002.

In November 2008 it issued an order approving white space utilization. At present it is dealing with organizing the environment, e.g. verification tests, while also overseeing coordination with existing business operators in its institutionalization.

(2) Exchange of opinions

Opinions were exchanged between parties concerned overseas and members of the Review Team and it was recognized that Japan, Europe and the U.S. have a global commonality that white space should be connected to people's convenience, e.g. area vitalization and creation of new businesses. It was also recognized that the international deployment of white space utilization would necessitate global exchanges of opinions, etc.

| | Japan | U.S. | Europe |
|---|---|---|---|
| Background to review | - A review team was set up in December 2009 because of the characteristic of white space of being utilizable in local areas leads to the expectation of it being utilized as a means of information transmission, etc. in local communities and thus is connected to area revitalization.<br>- The review team review white space utilization models, tasks for their realization, etc. | - In the present situation where a mobile broadband environment is yet to have been organized nationwide major IT-based companies such as Microsoft and Intel are requesting the FCC to free up TV white space for use with broadband communication.<br>- The FCC commenced a review in 2002 and after inviting opinions and implementing verification tests issued an order approving utilization of white space in November 2008.<br>- Field tests commenced in October 2009.<br>- A public announcement was made in November 2009 requesting database managers. | - In June 2008 CEPT publicized a report on TV white space utilization.<br>-> It assumed that it is still too early to judge on the use of cognitive radio equipment but that any equipment whatsoever should be used under the principle of non-interference/non-protection<br>- However, it does position research and development of technology for use in sharing frequencies, including utilization of white space, as an important European project.<br>- Britain is positive about utilizing TV white space. (At present it is reviewing it anew because of a frequency reorganization.) |
| Expected deployment of utilization | The stance of continuing to connect white space to improving people's convenience, e.g. area vitalization and creation of new businesses, is common.<br>**Unidirectional services such as the broadcast type as the mainstream.**<br>- Unidirectional services via area one-segment broadcasts or digital signage are very much being expected.<br>- There are also propositions involving bidirectional services such as home or office broadband, etc., but they are expected as futuristic services that will emerge through research and development, etc. | **Bidirectional services as the mainstream**<br>- Unidirectional services via area one-segment broadcasts or digital signage are very much being expected.<br>- There are also propositions involving bidirectional services such as home or office broadband, etc., but they are expected as futuristic services that will emerge through research and development, etc. | **Unidirectional services such as the broadcast type as the mainstream.**<br>- Conceptual review and research and development of future wireless systems including cognitive wireless technology and software-defined radio technology are taking place within the European Commission's research and development project. |
| Direction of reviews | **Classifying white space utilization models into:**<br>- Those considered introducible over the short term<br>- Those requiring mid- to long-term review | - Hereinafter the FCC will need to formulate concrete technical standards and construct a database.<br>- The "National Broadband Plan" (submitted to congress in March 2010) too states that a conclusion should be obtained as early as possible with regard to the procedure concerning TV white space utilization. | - The sharing of frequencies is recognized as requiring the organization of an institutional framework.<br>- First a technical review is necessary and then it will be important to continue contributing to international standardization activities, etc.<br>- Review of utilization of TV white space in the light of technical trends, etc. |

内 容 が 異なる。

**Figure of Situation with Utilization of White Space in Japan, the U.S. and Europe**

## Chapter 4 Possibility of Utilizing White Space in Japan

To aid in identifying the possibility of utilizing white space in Japan the Review Team conducted field surveys (measurements) of an actual mode of utilization of radio waves in several cities/areas in Japan in cooperation with the Ministry of Internal Affairs and Communications and the organizations concerned and then analyzed the measured results.

(1) Method of Measurement

As well as implementing measurements utilizing the Ministry of Internal Affairs and Communications' Bureau of Telecommunications' radio wave supervisory system the electrical field intensity was measured with a spectrum analyzer under the following conditions.

- Frequency
  Measurements took place in the same place all day per constant frequency band over 90MHz ~ 3000MHz.

- Measurement sites
  In consideration of the effect of the geographical location on the radio wave propagation characteristics and the geographical balance across Japan 6 locations, including an urban area, a mountainous area, a seaside area, the Setouchi area, an area affected by neighboring countries, etc. were selected.

**Table 4-1 Survey Locations Utilized in Measuring of Radio Waves**

| Measurement Area | Latitude and Longitude | Measurement Site | Geographical Condition |
|---|---|---|---|
| Kanto and its vicinity (23 wards) | North latitude 35.37.28<br>East longitude 139.39.43 | Metropolitan Komazawa Olympic Park | Urban area |
| Kanto and its vicinity (Tama area) | North latitude 35.42.53<br>East longitude 139.31.02 | Koganei Park | Urban area |
| Nagano Prefecture (Matsumoto City and its vicinity) | North latitude 36.15.20<br>East longitude 137.55.44 | Azusa Athletic Park | Mountainous area |
| Chuukyou and its vicinity (Nagoya City and its vicinity) | North latitude 35.03.27<br>East longitude 136.44.22 | Kisomisaki Town, Mie Prefecture | Urban area<br>Seaside area |
| Chugoku/Shikoku and its vicinity (Hiroshima Cityand its vicinity) | North latitude 34.21.11<br>East longitude 132.27.11 | Hiroshima Port | Setouchi area<br>Seaside area |
| Kyushu (Fukuoka City and its vicinity) | North latitude 33.38.21<br>East longitude 130.11.56 | Futamigaura, ShimaTown, Fukuoka Prefecture | Neighboring countries<br>Seaside area |

- Method of measurement
  - With the plane of polarization both horizontally polarized and vertically polarized waves were measured.
  - Log periodic aerials were used in the measurements set at a height of 4 m above ground that were rotated in measuring the radio waves from all directions.

- Cautionary measures taken
  A 20dB preamplifier was inserted during the measurement of 1 ~ 3GHz. The measured results were calibrated values. During the measurement of horizontally polarized waves in Hiroshima the received power became excessively high and hence the preamplifier was not used; 10dB attenuation was carried out with all bands and the measured results were calibrated values.

- Measurement system
  Figure 4-1 outlines the measurement system. Using directional aerials the measurements simultaneously took place for both horizontally polarized and vertically polarized waves.

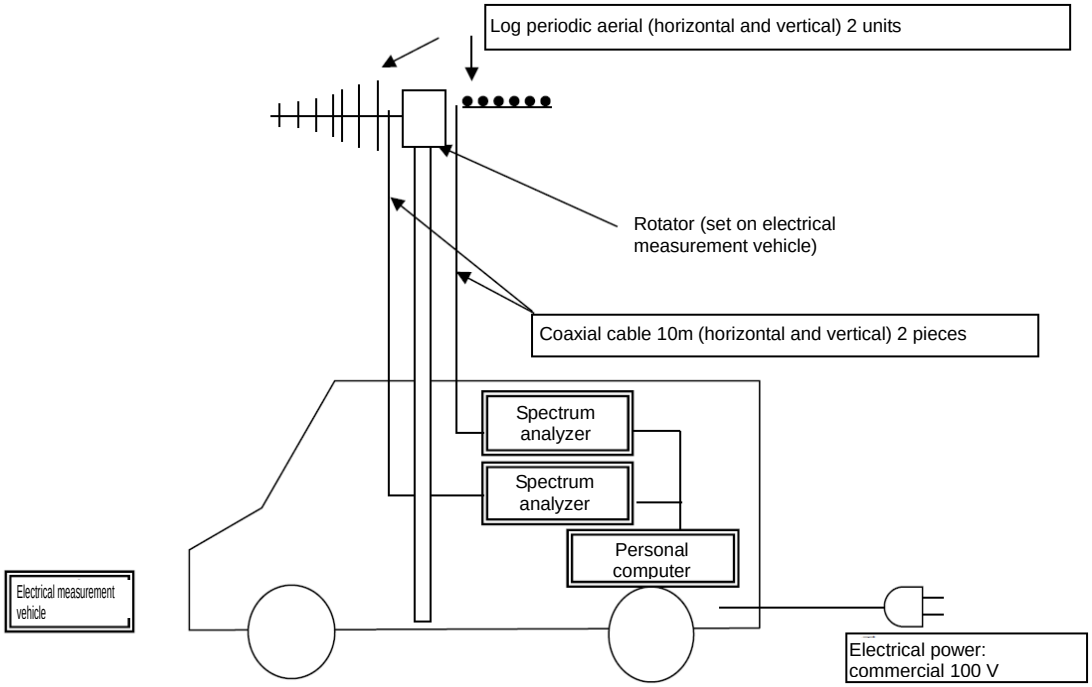


**Figure 4-1 Measurement System**

(2) Outline of Measurement Sites

- Kanto and its vicinity (23 wards)

  Being located in the middle of 23 wards it was an area with an intense electrical field of radio waves from Tokyo Tower which is equipped with various kinds of high density radio equipment. There are also many high-rise apartments and buildings in the neighborhood.

- Kanto and its vicinity (Tama area)

  Though an urban area it is quite far from the metropolitan center, and hence the intensity of radio waves from Tokyo Tower is lower than in Kanto and its vicinity (23 wards), but there are also quite a few high-rise apartments and buildings.

- Nagano Prefecture (Matsumoto City)

  A local city in a mountainous area with quite a few terrestrial television broadcast repeater stations in the vicinity because of topographical reasons.

- Chuukyou and its vicinity (Nagoya City and its vicinity)

  A major urban area and its vicinity that is slightly removed from the city center.

- Chugoku/Shikoku and its vicinity (Hiroshima City and its vicinity)

  A city center in a major urban area facing the Seto Inland Sea. An area with an intense electrical field from a terrestrial television broadcast transmitter and repeater stations being located in Hiroshima City as well as radio waves from the opposite shore, i.e. Shikoku. It is also affected by radio waves from nearby airfields and ports.

- Kyushu (Fukuoka City and its vicinity)

  In measuring the effect of radio waves from the Republic of Korea an area in which the effect of terrestrial television broadcast transmitter stations in Fukuoka City was as small as possible was selected.

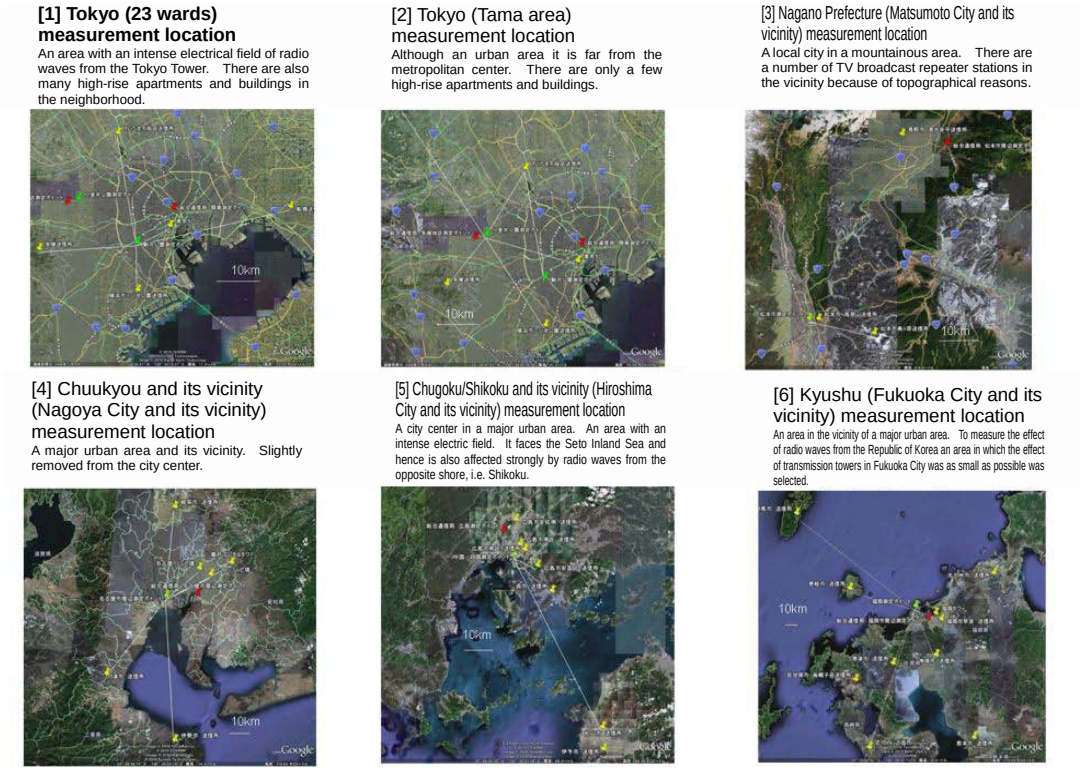


**Figure 4-2 Locations of Measurement**

(3) Survey Results

The survey results for the utilized conditions of radio waves are shown below.

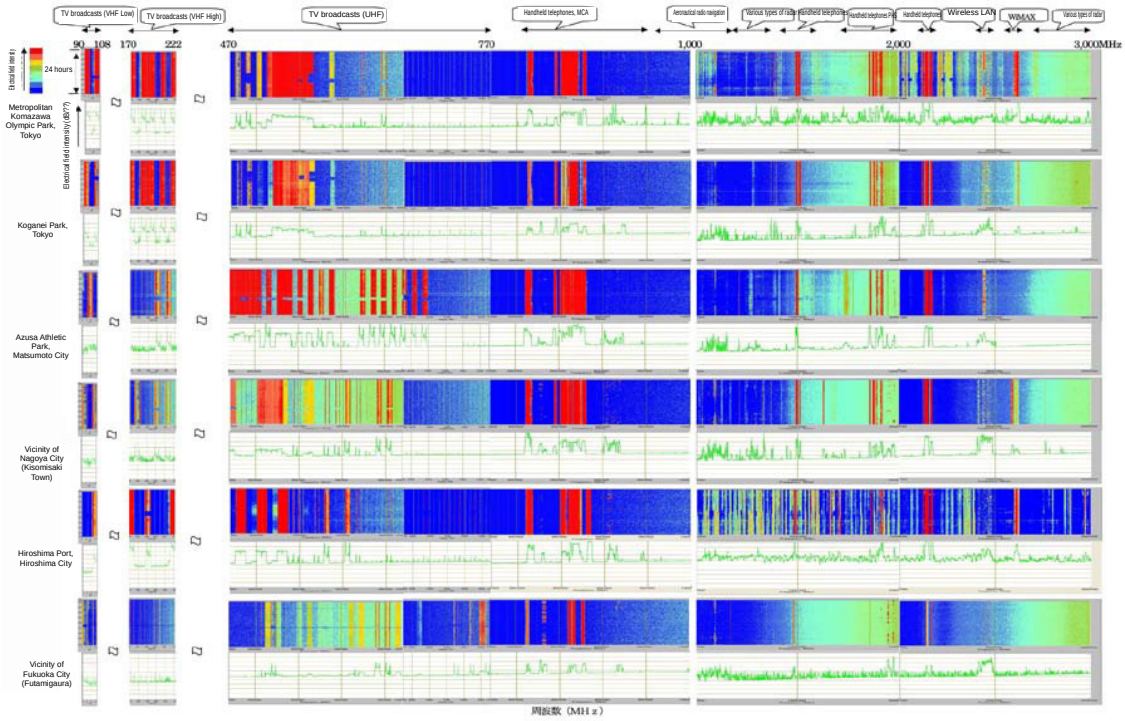


**Figure 4-3 List of Survey Results**

(4) Analysis of Survey Results

[1] Features of radio wave utilization in light of the frequency

(i) VHF band

This frequency band is presently being exclusively used for terrestrial analog television broadcasts. In the metropolitan area (the Tokyo Tower area) almost all channels are utilized for terrestrial analog television broadcasts except for Tokyo Metropolitan Television Broadcasts and the Open University of Japan. In local cities too 3 to 5 channels are utilized for terrestrial analog television broadcasts.

In both cases 24-hour utilization was recognized except for a broadcast pause time zone.

(ii) UHF band

This frequency band is presently being exclusively used for both terrestrial analog television broadcasts and terrestrial digital television broadcasts at present.

In the metropolitan area (the Tokyo Tower area) radio waves from Saitama and Kanagawa were recognized in addition to those from Tokyo Tower. 24-hour utilization was also recognized except for a broadcast pause time zone, as with the VHF band. Broadcasting station radio waves in the surrounding area were also weakly observed.

In the metropolitan area terrestrial analog television broadcasts and terrestrial digital

television broadcasts from Tokyo Tower and terrestrial analog television broadcasts and terrestrial digital television broadcasts from both Saitama and Kanagawa were recognized. Radio waves from Yokohama Minato and Tama repeater stations were also recognized.

In Matsumoto radio waves of terrestrial analog television broadcasts and terrestrial digital television broadcasts from Matsumoto, terrestrial analog television broadcasts and terrestrial digital television broadcasts from Nagano, and terrestrial analog television broadcasts from Shiojiri-Higashi were all recognized.

In Nagoya radio waves of terrestrial analog television broadcasts and terrestrial digital television broadcasts from Nagoya, terrestrial analog television broadcasts and terrestrial digital television broadcasts from Tsu, terrestrial analog television broadcasts from Gifu, and terrestrial analog television broadcasts from Chuunou were all recognized. Incidentally in Nagoya City it was impossible to conduct measurements and hence they were conducted in Mie Prefecture, which is near Nagoya. As a result radio waves from transmitter stations in Nagoya were only weakly observed.

In Hiroshima radio waves of terrestrial analog television broadcasts and terrestrial digital television broadcasts from Hiroshima, terrestrial analog television broadcasts from Kure, and terrestrial analog television broadcasts and terrestrial digital television broadcasts from Matsuyama were all observed.

In Fukuoka radio waves of terrestrial analog television broadcasts and terrestrial digital television broadcasts from Fukuoka, terrestrial analog television broadcasts from Kita-Kyushu, and terrestrial analog television broadcasts from Gounoura were all observed. Measurements were conducted where Fukuoka's radio waves are weak in order to measure the radio waves from the Republic of Korea, but all the values were low.

(iii) 770 ~ 1000MHz

This frequency band is mainly utilized for wireless microphones, FPUs, handheld telephones, MCA (800MHz band), area disaster prevention mobile radio systems, etc.

At all the measurement locations radio wave utilization was basically normally observed regarding handheld telephone base stations. Radio waves from terminals were sporadically observed (in the color mapping diagram the sporadic red spots).

Radio waves of communication systems of wireless microphones, FPUs, etc., the service area of which did not cover the measurement location, were not recognized.

(iv) 1000 ~ 2000MHz

This frequency band is mainly utilized for handheld telephones, PHS, MCA (1.5GHz band), Inmarsat, Iridium, aeronautical radio navigation, GPS, etc.

At all measurement locations the radio wave utilization was basically normally observed regarding handheld telephone base stations. Radio waves from terminals were sporadically observed (in the color mapping diagram the sporadic red spots).

Radio wave utilization of aeronautical radio navigation and various types of radar was observed approximately 24 hours a day, although there were localized differences.

Radio wave utilization from satellites such as GPS, Inmarsat, Iridium, etc. was not recognized. (It is presumed that sufficient sensitivity could not be obtained during the

measurements.)

(v) 2000 ~ 3000MHz

This frequency band is utilized mainly for handheld telephones, wireless LAN, WiMAX, various types of radar, etc.

At all measurement locations radio wave utilization was basically normally observed regarding handheld telephone base stations. Radio waves from terminals were sporadically observed (in the color mapping diagram the sporadic red spots).

Radio waves of base stations of business operators whose service areas do not cover the measurement location were not recognized.

Radio wave utilization of various types of radar was observed approximately 24 hours a day, although there were localized differences.

Radio wave utilization of WiMAX was observed in some places such as the metropolitan area, Hiroshima, etc. where the service is currently available.

Radio wave utilization of wireless LAN was basically normally observed.

[2] Features of radio wave utilization in light of the geography

(i) Television broadcast frequency bands

- Urban area
  In Kanto and its vicinity (Metropolitan Komazawa Olympic Park and Koganei Park) radio waves from nearby transmitter stations (including analog) such as from Kanagawa, Yokohama, Chiba, Tama, etc. were observed.

- Mountainous area
  Matsumoto City has a number of repeater stations for securing television viewing in the mountains dotted around. Radio waves from these repeater stations were observed. Terrestrial analog television broadcast radio waves were particularly observed in the higher frequency bands.

- Seaside area
  In the vicinity of Nagoya City measurements were conducted in Kisomisaki Town, Mie Prefecture. Radio waves from nearby transmitter stations in Nagoya, Gifu, etc. were observed. Terrestrial analog television broadcast radio waves were also observed in the high frequency band, although their transmitter stations could not be identified.

- Setouchi area
  Radio waves of broadcast stations in both the Chugoku and Shikoku areas arrive in the Setouchi area. Radio waves not only from transmitter stations in Hiroshima and Kure near the measurement location (Hiroshima Port) but also from those (including analog too) in Matsuyama in Shikoku were observed.

- Near neighboring countries
  Fukuoka City and its vicinity, a location near the sea coast of Shima Town, Fukuoka Prefecture, which is far from the transmitter stations in Fukuoka, was selected in order to measure the effect of radio waves from neighboring countries such as the Republic of Korea. As a result radio waves from transmitter stations in Fukuoka were blocked

by mountains and only low-level radio waves were observed.

While radio waves from neighboring countries were not observed those from transmitter stations (including analog too) on offshore islands were.

(ii) Other than television broadcast frequency bands

- At frequencies higher than 770MHz basically the same tendencies were seen in the 6 cities.

- Radio waves of handheld telephones and MCA base stations were observed almost 24 hours a day at every location, although there were differences in the radio wave intensity level from one measurement location to another.

- Radio waves of communication systems in a service area that the measurement location did not cover were not recognized. Radio waves of handheld terminals, etc. that are thought to have been used near the measurement location during the measurements were also sporadically observed.

- Radio waves of wireless LAN were also observed at every location.

- Radio waves at frequencies for WiMAX, now being deployed nationwide, were observed in the urban areas of Kanto, Tokai and Hiroshima.

- Radio waves of various types of radar were observed in Kanto and its vicinity (Metropolitan Komazawa Olympic Park) and Hiroshima City as they have air fields nearby.

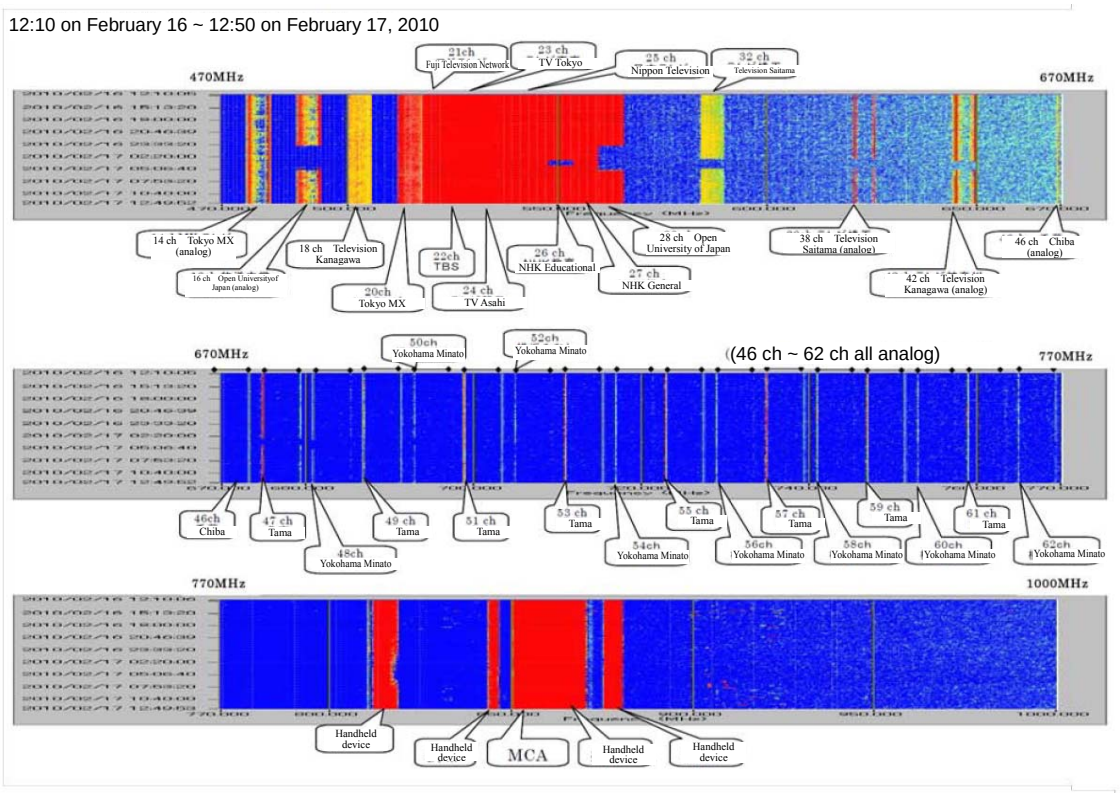


**Figure 4-4 Measurement Results (Metropolitan Komazawa Olympic Park)**

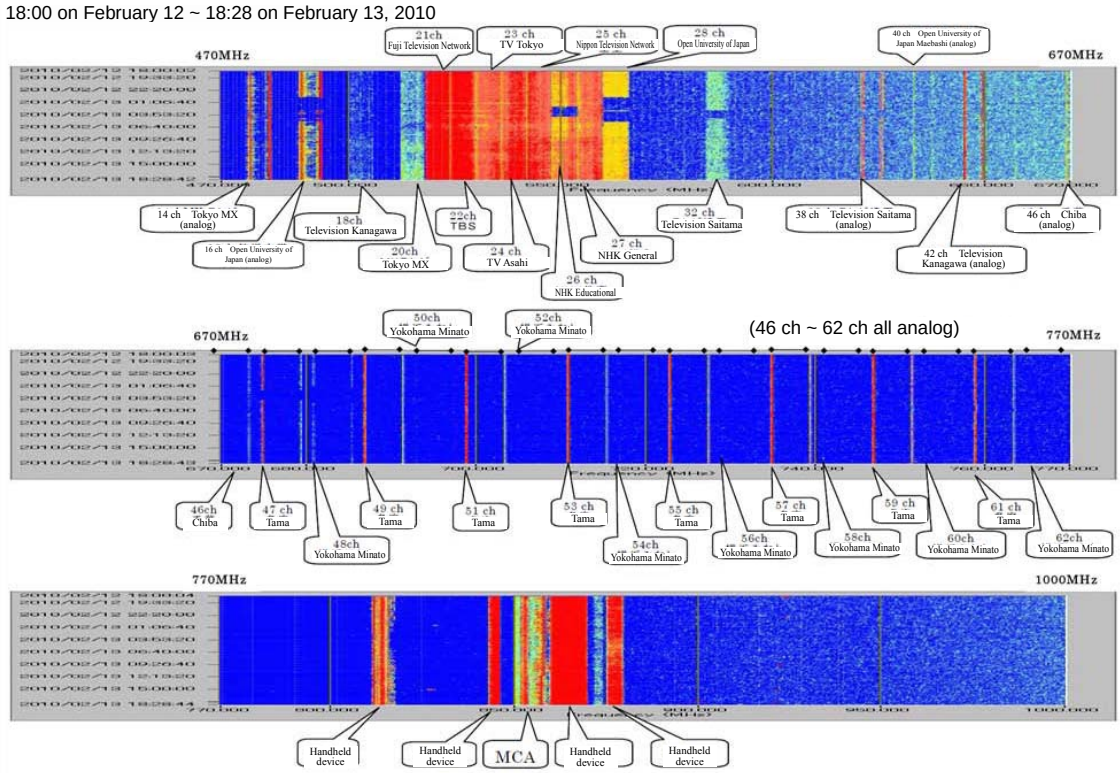


**Figure 4-5 Measurement Results (Koganei Park)**

12:00 on February 19 ~ 12:28 on February 20, 2010

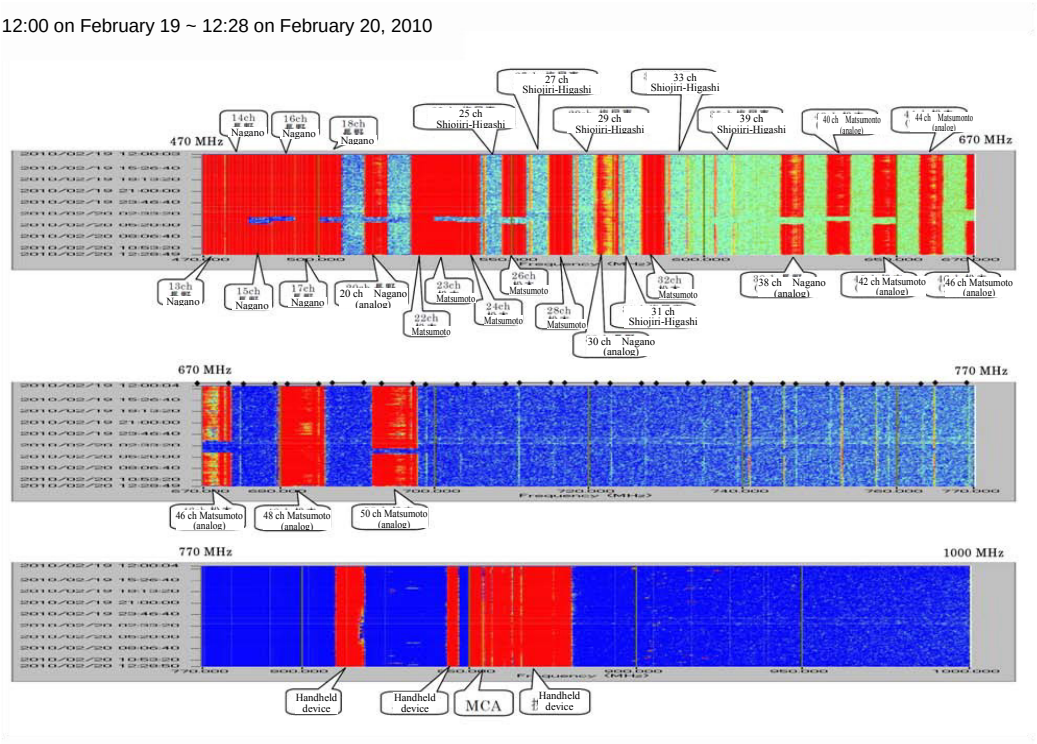


**Figure 4-6 Measurement Results (Azusa Athletic Park)**

12:00 on February 22 ~ 12:14 on February 23, 2010

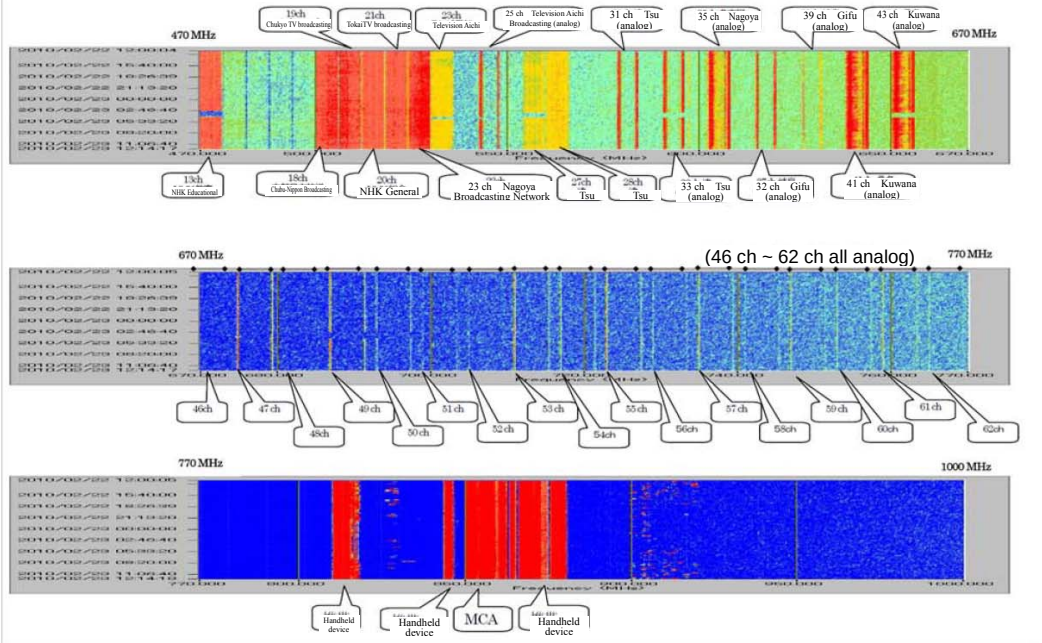


**Figure 4-7 Measurement Results (Kisomisaki Town, Mie Prefecture)**

14:00 on February 26 ~ 14:17 on February 27, 2010

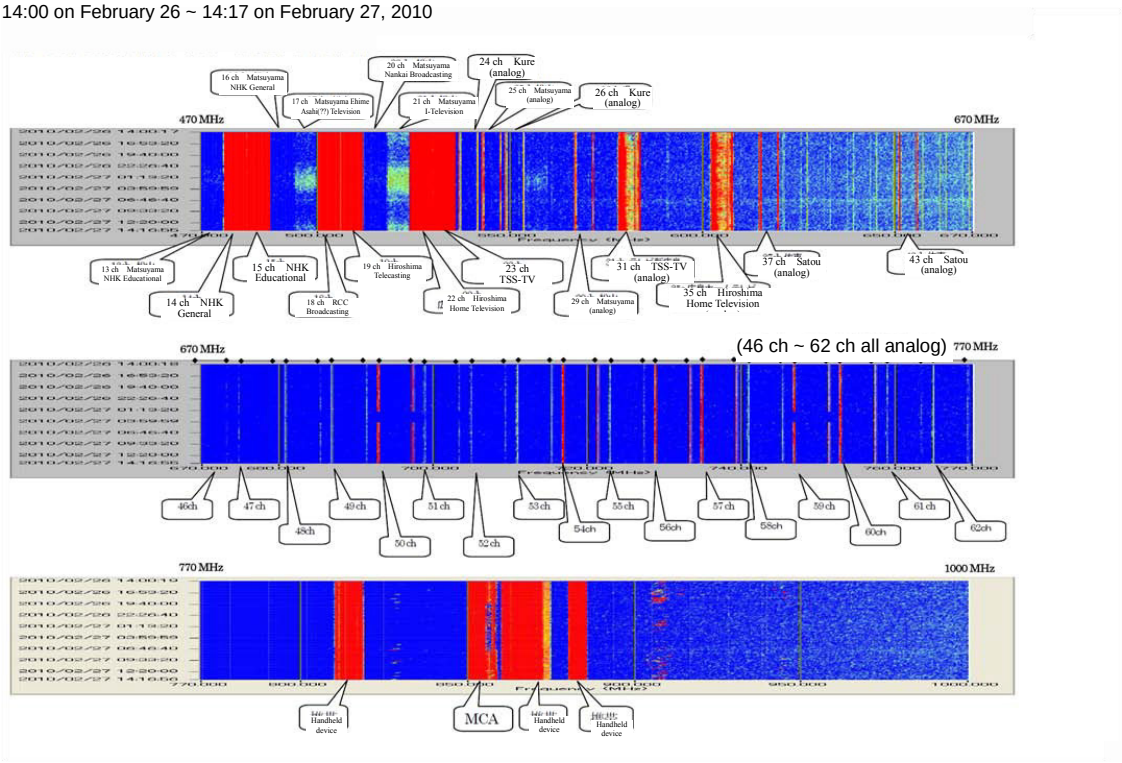


**Figure 4-8 Measurement Results (HiroshimaPort)**

14:00 on March 2 ~ 14:15 on March 3, 2010

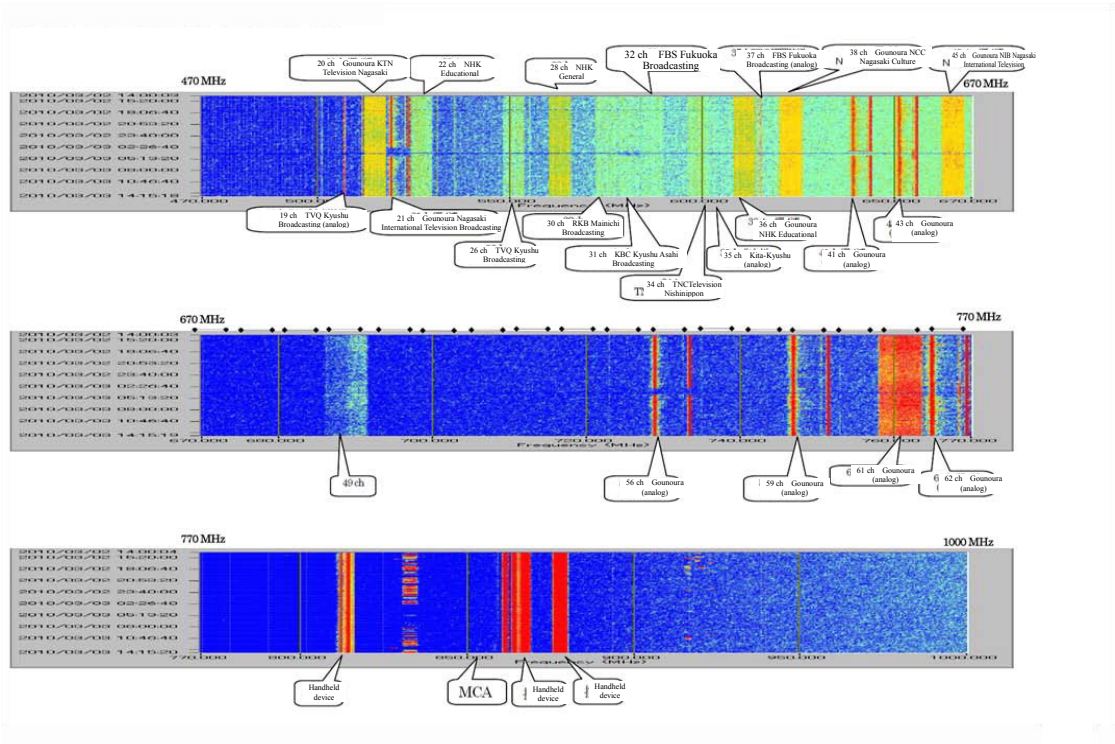


**Figure 4-9 Measurement Results (Futamigaura, Shima Town, Fukuoka Prefecture)**

[3] Conclusion

Electrical field intensity over 24 hours was measured at 6 locations throughout Japan. The measured results clarified that the utilization of radio waves is affected by temporal and geographical conditions.

With communication-based systems utilization differs according to the place, time, etc. The survey was conducted over a limited period of time (one day) and in limited places (6 locations all over Japan) only and hence utilization of the frequency band white space for communication-based systems will therefore require more detailed surveys. Even during the survey, however, the places and time of radio wave utilization regarding the frequency bands for communication-based systems not recognized were observable. It is therefore thought that the possibility of utilizing white space does exist and that it would be possible to conduct verification tests, etc. on utilizing white space by taking utilization conditions such as the frequency band, output, etc. into account.

However, and regarding television broadcast frequency bands, the utilized condition in accordance with the channel plan (channels thought to be utilized in the relevant area could be observed at all the measurement locations in that they were being utilized 24 hours a day except for the broadcast pause time zone; with channels thought to be not utilized in the relevant area the electrical field intensity was observed to be low) could be observed at all the measurement locations and were very clearly observable when compared to the other frequency bands.

Regarding the frequencies at which the electric field intensity was observed to be low with television broadcast frequency bands it is necessary to take into consideration the possibility of poor reception due to cross talk with viewers of terrestrial digital television broadcasts in other than the relevant area and the actual mode of reception being that out-of-bounds reception of broadcast was occurring in remote places because of geographical/historical circumstances. Nevertheless, the possibility of utilization in the relevant area of so-called white space is considered to be high. Further detailed surveys are deemed necessary as the situation will change according to the utilization for new systems, e.g. frequency bands, communication system, output and utilization area, but this survey leads to the consideration that several channels could be made available for use in the Metropolitan Komazawa Olympic Park and about 1 ~ 2 channels in Matsumoto City and its vicinity as white space if, for example, low-output area one-segment broadcasts were to be used.

Incidentally, and for example in the Metropolitan Komazawa Olympic Park, terrestrial analog television broadcasts waves of about 10 channels can be seen. The consideration therefore is that after terrestrial analog television broadcasts have finished channels available as white space could appear from among those channels and then be added to those several channels.

As seen above the consideration is that available white space of about 1 ~ 2 channels exist in quite a few areas throughout Japan at present. The consideration is therefore that it would be possible to conduct verification tests, etc. on utilizing white space in relevant areas.

In any case this survey was conducted under limited conditions. In realizing white space utilization, therefore, it would be necessary to conduct more detailed surveys on interference/non-interference with existing users, etc. via specifying the target frequencies. It is also necessary to take into consideration the fact that there will be changes in the frequency bands due to repacking of the television broadcast frequency bands when terrestrial analog television broadcasts end.

## Chapter 5 Towards Realization of White Space Utilization

### - Formulation of Promotion Measures -

In researching the possibility of white space utilization the Review Team has to date requested propositions and held public hearings and implemented and dealt with surveys on trends in wireless technology and a field survey of the utilization of radio waves.

The results of all the above revealed that in foreign countries too review towards practicalization of white space utilization has taken place while research and development and standardization of new wireless technology dealt with because of the aim of upgrading utilization of white space, e.g. cognitive wireless technology, and also that in Japan too great social expectations exist for white space to be utilized, e.g. mainly area one-segment broadcasts and digital signage, and that, furthermore any such systems and services utilizing white space are expected to have the social as well as economic effects of leading to the creation of charming towns and local employment.

An overview of the market related to systems and services utilizing white space, for example, could be presented as covering the currently popular one-segment broadcast-compatible handheld terminals, etc., mobile advertisements, mobile content, and mobile commerce through to electronic devices and large displays.

With that type of inter-related market as the core white space therefore gives rise to the expectation of multifarious services being made available from content delivery of news, weather forecasts, etc. through to local town information and administrative information being provided at, for example, 98 airports throughout Japan, about 10 thousand stations or about 240 thousand sports facilities, about 17 thousand public halls, etc. and, through being utilized by 63 million railway passengers a day and about 300 million tourists a year, etc. the expectation is therefore that it will result in various economic and social effects such as emergence of new services, promotion of the tourist industry, increase in retail/service sales through to ensuring ease of mind/safety, turning area into brands, ensuring fairness in educational opportunities, etc.[2]

[2] Ministry of Internal Affairs and Communications “Survey Results on the Actual Situation with the Mobile Content Industrial Structure” (2008); Dentsu “Advertisement Costs in Japan in 2008”; Ministry of Economy, Trade and Industry (2008) “Machinery Statistics (??) Year Total”; Ministry of Land, Infrastructure, Transport and Tourism’s Japan Tourism Agency (2009) “Statistics on Lodging Travels”; Ministry of Economy, Trade and Industry (2004) “Statistics on the Actual Situation with Specific Service Industries”; Japanese statistics; NEXCO East Japan’s home page http://www.driveplaza.com/dp/SapaTop; Japan Federation of Shopping Center Promotion Associations’ home page “Outline/History of JFSCPA” http://www.syoutengai.or.jp/zenshinren/index.html

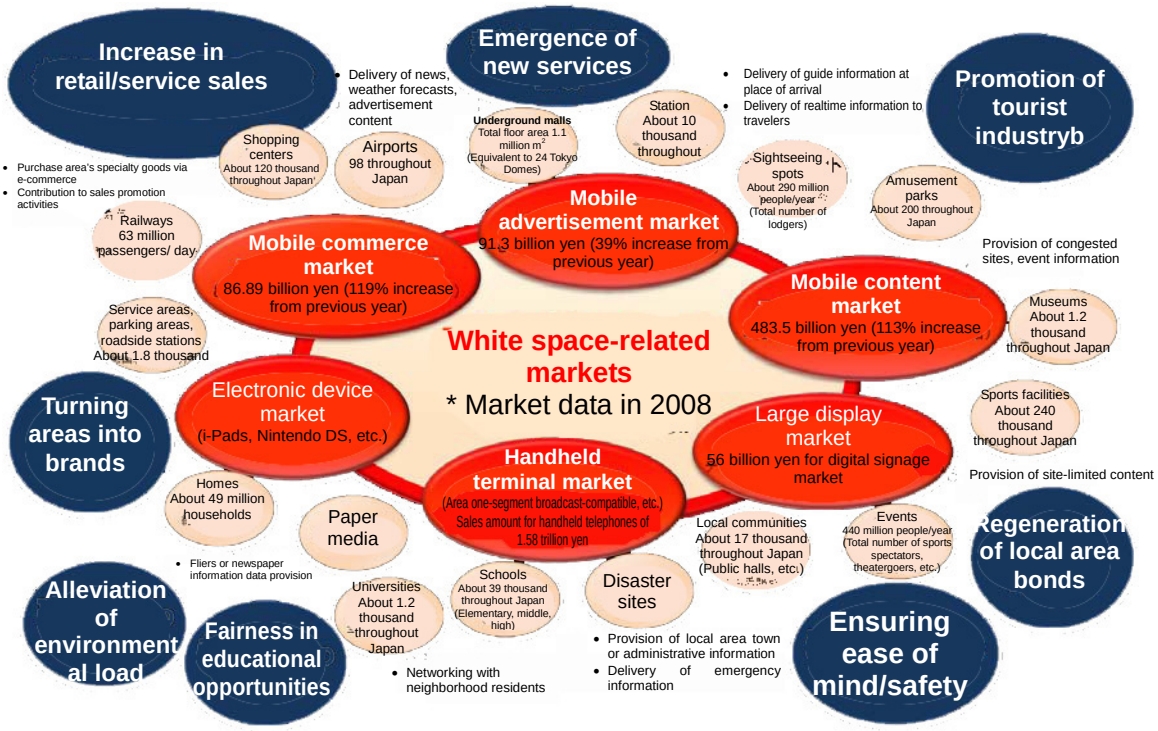


**Figure 5-1 White Space-Related Markets**

The economic and social effects can as well be considered as classified into the 3 pillars of: [1] regeneration of local area bonds; [2] creation of employment in protecting livelihoods; and [3] alleviation of environmental load.

[1] Regeneration of local area bonds

Local area bonds can be regenerated as the residents' consciousness of belonging to their community is enhanced by information being provided or emergency broadcasts after disasters or accidents have occurred in the community based on city halls, etc. as well as the construction of networks between neighboring area residents based on universities, etc. This is then connected to the enlivenment of local events and improvement of ease of mind/safety in encouraging the creation of charming towns.

[2] Creation of employment in protecting livelihoods

The timely provision of tourist information to tourists, advertisements on modes of transportation such as underground railways and bus stops, etc. is connected to attracting customers at sightseeing spots and promoting shop sales, and hence promotion of the tourist industry and revitalization of economic activities in the area concerned can be expected.

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Seed Planning, Inc.'s home page "Summary of Survey Results on the Present Situation and Future of the Digital Signage Market" http://www.seedplanning.co.jp/press/2009/0106.html; Ministry of Land, Infrastructure, Transport and Tourism's Civil Aviation Bureau's home page "Statistics/Data, etc." http://www.mlit.go.jp/koku/04_outline/01_kuko/01_haichi/index.html

Utilization of white space also gives rise to the expectations of new services being created, e.g. realization of data transmissions between equipment at homes and the deployment of public views utilizing realistic Super Hi-Vision, which will then contribute to Japan's economic growth.

That type of industrial development will promote reinforcement of our international competitiveness as well as the creation of new employment.

[3] Alleviation of environmental load

Establishment of local production for local consumption of energy via sensor networks, digital provision of paper media, etc. will realize better energy supply/demand control and paperlessness. This is then connected to solving energy problems and the creation of a low-carbon society in contributing to alleviating environmental load.


**Figure 5-2 New Effective Utilization of Radio Waves Such as White Space**

A field survey on the utilization of radio waves was conducted in order to identify whether frequencies available as white space actually exist in Japan or not. The resulting conclusion was that although more detailed surveys would be necessary the consideration is that even at present available white spaces of about 1 ~ 2 channels exist in quite a few areas throughout Japan and that it would be possible to conduct verification tests on utilizing white space in the relevant areas.

Furthermore, while there were some that had a high possibility of being used in business deployments among the proposed utilization measures with white space, adjustment in utilizing white space would take some time as the radio waves available as white space differ from area to area. In the smooth introduction of white space utilization, therefore, it will be desirable to that precedent models be implemented before actual institutionalization.

It is also considered, moreover, that the implementation of any such precedent models will have the significance of being useable as a reflection in the institutionalization of white space utilization.

As described above it is necessary for Japan too to commence reviewing practicalization of white space utilization as early as possible and realize area revitalization or the creation of new industries via utilizing white space as a means of providing information in local communities, etc., thus promoting dealing with our country's economic growth.

We have therefore formulated the following promotion measures for use in realizing white space utilization.

## 1. Formulation of Promotion Measures for Use in Realizing White Space Utilization

The realization of utilization of white space makes the following important: [1] clearly identifying the timing of practicalization and the formulation of a process chart that concretizes how to deal with it and then the promotion of review of institutionalization; [2]the results of many verification tests being necessary also in institutionalizing the utilization of white space as the frequencies available as white space differ from area to area; and that it is desirable to implement a precedent model before institutionalization from the point of view of encouraging business deployments since some time will be needed until services come available due to adjustments between the parties concerned in each area being necessary; and, furthermore, [3] steadily dealing with solving institutional and technical tasks, e.g. securing preventive measures against any cross talk with existing business operators, etc.

We therefore propose the following as “promotion measures for use in realizing white space utilization.”

- Formulation of promotion scenarios for white space utilization models for nationwide deployment by the year 2012.

- Creation of “specific white space districts” and encouragement of reflection in the institutionalization of white space utilization as well as business deployments.

- Solutions to institutional and technical tasks in realizing white space utilization, encouragement of rules being made in consideration of prevention of cross talk with existing systems, etc. and businesslike utilization of white space as well as research and development on new radio communication technology with the aim of upgrading utilization of white space.

## 2. Formulation of Promotion Scenarios for White Space Utilization Models

Radio wave utilization models utilizing white space can be divided into the following two: [1] those that are considered to be introducible over the short term; and [2] those that require mid- to long-term review, with promotion scenarios being formulated in the light of the tasks to be assumed for their respective realization.

As a result of requesting propositions on utilization measures, etc. for use with white space the 5 radio wave utilization systems of the area one-segment broadcast type, the digital signage type, the communication network type, the communication and broadcast combination type, and the new technology utilization type were received.

With the area one-segment broadcast and digital signage types verification tests have already been conducted in many areas and certain verification results obtained. With the communication network and new technology utilization types future research and development of cognitive wireless technology, etc. can be considered to be the precondition.

With [1] those that are considered to be introducible over the short term, therefore, the area one-segment broadcast and digital signage types can be collectively classified as the "one-segment broadcast utilization type" and nationwide deployment aimed at by the year 2012. With [2] those that require mid- to long-term review, meanwhile, can be classified into a "communication network type" and a "new technology utilization type" and their respective promotion scenarios then formulated.

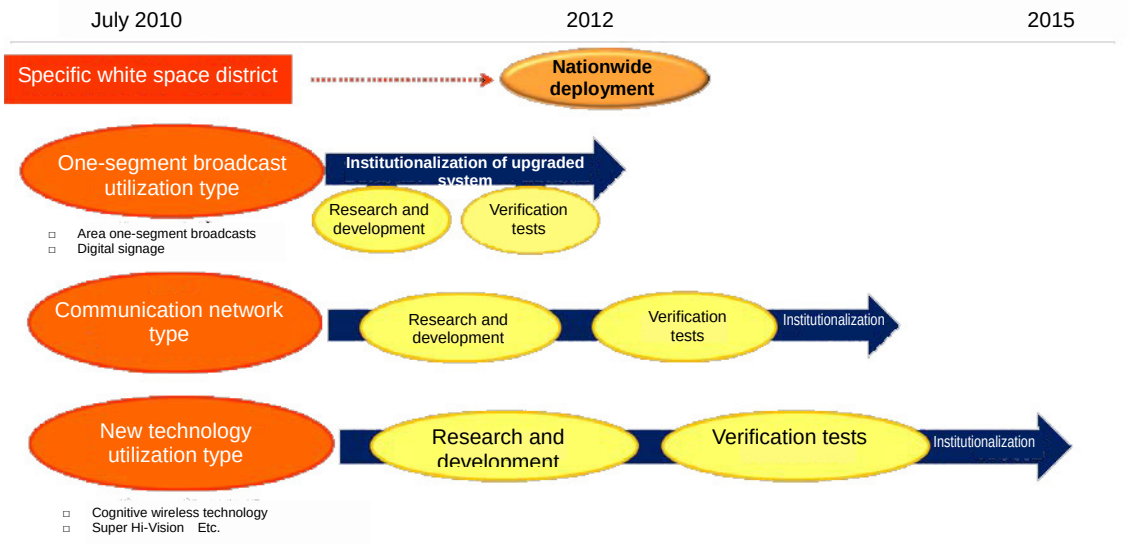



**Figure 5-3 White Space Utilization Scenarios**

### (1) One-Segment Broadcast Utilization Type

The one-segment broadcast utilization type is a unidirectional service performed by dividing terrestrial digital television broadcasting's one channel of 6MHz band width into 13 "segments" and then utilizing one of them. It is utilizable with the currently widely popular one-segment broadcast-compatible handheld telephones, etc. Digital signage that provides timely videos or information via displays installed at shops, etc. is technically also the same as the one-segment broadcast utilization type.

[1] Future deployment

(i) Technical upgrading

The present one-segment broadcast service will only utilize one of the 13 segments, and its image quality is lower than of home electrical appliances such as the televisions, etc. It is important, therefore, to continue promoting research and development and system verification with the aim of realizing a full-segment broadcast type service that uses one-segment broadcasts plus the 12 other segments in enabling a more high-quality video service.

The frequencies available as white space also differ according to each area's utilization of frequencies, geographical conditions, etc. Areas where frequencies available as white space are limited give rise to worry that the entry of new services could be obstructed. It will be necessary, therefore, to promote research and development and system verification that aims at realizing services of the bundled-segment broadcast type or the separate-segment broadcast type in enabling not only one segment but also the remaining 12 segments to provide 12 independent kinds of services of the one-segment broadcast utilization type and, furthermore to organize an appropriate environment, e.g. formulation of technical standards and operating standards, in order to introduce that type of multiple utilization of white space.

(ii) International deployment

The one-segment broadcasting utilization type utilizes the ISDB-T system, which is the Japanese terrestrial digital television broadcast system. Its international deployment in other countries that have adopted the same ISDB-T system can be expected, however. In countries that adopt a different system as well, meanwhile, it can be expected that the Japanese one-segment broadcast utilization type will be deployed by taking advantage of the service's feature that the area is limited, deploying transmitters and receivers as a set and, for example, by introducing utilization of the Japanese one-segment broadcast utilization type at certain spots such as art museums or museums. The expectation is therefore that the Japanese one-segment broadcast utilization type will also be deployed overseas and thus eventually increase Japan's international competitiveness.

It is also important from the point of view of realizing Japan as a tourism-oriented country to review if it might be possible to provide a service utilizing broadcasting systems adopted by other countries in limited areas even in Japan in ensuring the provision of information to terminals owned by visitors to Japan.

[2] Road map

- Institutionalization of the one-segment broadcast type/full-segment broadcast type by the year 2011
- Formulation of a channel space map and institutionalization of an upgraded system such as the bundled-segment broadcast type or separate-segment broadcast type by the year 2012
- Surveying of the available frequencies in each area as the occasion arises and reflecting them in the channel space map
- Promotion of international deployment

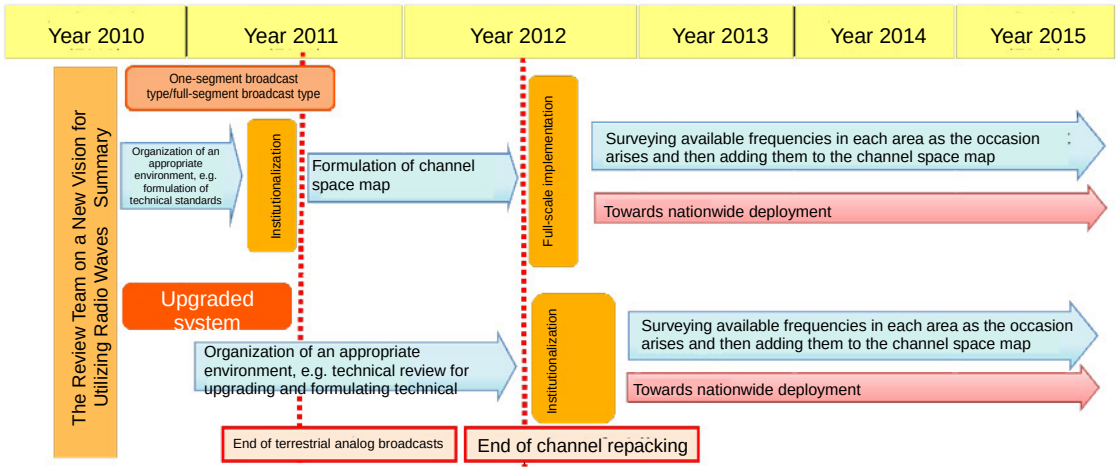



**Figure 5-4 One-Segment Broadcast Utilization Type Road Map**

(2) Communication Network Type

The communication network type is a bidirectional service that realizes a customer owned and maintained communication network via a sensor network and wireless broadband or wireless utilization between information equipment.

Rather than a unidirectional service it is bidirectional and hence realization of the service will necessitate technical reviews because of the special consideration of the possibility of cross talk with existing systems, etc. And while it is also assumed that frequency bands which suit each of the services to be introduced will be encountered, unlike with the one-segment broadcast utilization type, the objective white space frequencies are not limited to the UHF band. This therefore makes review of realization in the full light of future research and development and system verification necessary. In practicalization thereafter it will be necessary to organize an appropriate environment, e.g. formulation of technical standards and operating standards in the light of the results of research and development and verification tests.

[1] Future deployment

(i) Technical upgrading

Any service utilizing the communication network type has more tasks to be technically solved than that utilizing the one-segment broadcast utilization type. Its realization will therefore require mid- to long-term reviews.

However, the difficulty and tasks to be reviewed differ according to, among others, whether the system to be introduced into the white space is of the fixed type or mobile type, whether the white space to be utilized is of a specific frequency band or unspecific frequency band, and so on.

If, for example, the frequency band of the white space to be utilized has been specified and a fixed type system then introduced it is thought that technical reviews that take the possibility of cross talk into consideration would be comparatively easy as the system's image of utilization and existing systems in the relevant frequency band, etc. would have

already been specified and thus the technical elements to be developed anew comparatively few. If the white space to be utilized had not been specified and in addition a mobile type system was to be introduced it would be essential to establish new radio communication technology such as cognitive wireless technology, e.g. spectrum sensing technology and dynamic spectrum access technology, as the possibility of cross talk with existing systems would have to be reviewed, etc. because they had not been specified and therefore it is thought that long-term reviews would be required in practicalization.

Practicalizing the communication network type, therefore, would require that reviews to take place one by one from early practicalization of those expected in the light of trends with research and development of wireless technology to be realizable.

Any service utilizing the communication network type would require mid- to long-term review for its practicalization, and furthermore it is predictable that at the stage by it could finally be practicalized services utilizing other white spaces might have already been institutionalized. The possibility does therefore exist that it would be necessary to review sharing of them.

(ii) International deployment

Discussions on freeing up white space in the U.S. first commenced because of an insufficient wireless broadband environment in its rural areas. The consideration is therefore that the need exists in foreign countries as well for communication services which utilize white space for services in making a broadband environment available in mountainous/back country where it is yet to be available. After practicalizing a communication network type system through research and development and verification tests, therefore, it will also be important to investigate the possibility of deploying the Japanese communication network type system in the light of such needs overseas.

The research and development and verification tests conducted in Japan will also need to have their results reflected in the international standardization activities of the IEEE, etc. as the occasion arises in continuing to reinforce our international competitiveness in radio communication technology.

[2] Road map

- Implementation of research and development and verification tests in realizing communication broadband or sensor networks, etc. via use of white space
- Review of practicalization in the light of the results of research and development, etc.
- Positive participation in standardization activities in coordination with standardization organizations (IEEE, etc.), etc. both in Japan and overseas

(3) New Technology Utilization Type

Services utilizing the new technology utilization type include those in verification tests of new wireless technology such as Super Hi-Vision, etc. and those in utilizing new radio communication technology such as cognitive wireless technology, etc. They are all modes which will necessitate dealing with future research and development.

[1] Future deployment

The realization of services utilizing new radio communication technology such as Super Hi-Vision and cognitive wireless technology will necessitate research and development on establishing such new technology and system verifications being based on the results of that research and development and so on.

The point of view of improving our international competitiveness, meanwhile, makes the stance of continuous positive participation in standardization activities in coordination with standardization organizations (IEEE, etc.), etc. both in Japan and overseas important as well as making the results of research and development and verification tests conducted in Japan in any such international standardization activities as the occasion arises. It is important as well to investigate the possibility of overseas deployments.

[2] Road map

- Implementation of research and development and verification tests for practicalizing new technology such as Super Hi-Vision and cognitive wireless technology
- Review of practicalization in the light of the results of research and development, etc.
- Positive participation in standardization activities in coordination with standardization organizations (IEEE, etc.), etc. both in Japan and overseas

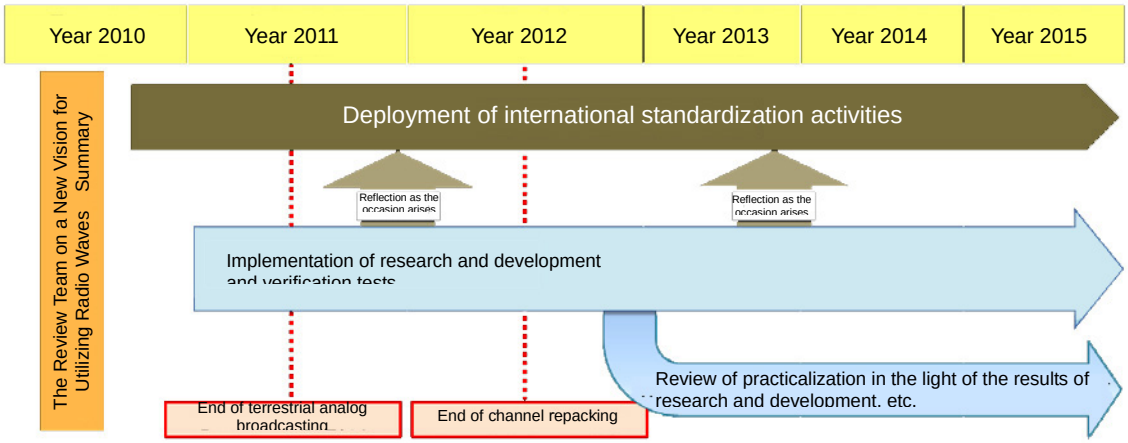



**Figure 5-5 Communication Network Type and New Technology Utilization Type Road Map**

## 3. Creation of “Specific White Space Districts”

The conditions with radio waves as frequencies available as white space and the possibility of cross talk with existing business operators, etc. differ from area to area, thus making it necessary that verifications take place in the light of adjustments with the parties concerned, etc. per area. Services that utilize white space can also be expected to utilize the area’s characteristics, e.g. nature and industry, thus it necessary for deployments to take place that meet the area’s needs.

“Specific white space districts” will therefore be created in order to implement research and development and verification tests early on regarding the system that utilizes white space and to encourage reflection in institutionalization and business deployments in realization of the system. The aim is, furthermore, to deploy examples of successful cases nationwide, e.g. create new industries and vitalize areas through utilization of white space, by creating “specific white space districts” and connect them to our country’s economic growth.

It is important for the nation, meanwhile, that rules for deploying white space utilization be reviewed as well as flexible operation ensured in meeting each area’s radio wave conditions and needs in the light of the results of research and development and verification tests in “specific white space districts,” thus then allowing the results from “specific white space districts” to be adequately reflected in eventual institutionalization.

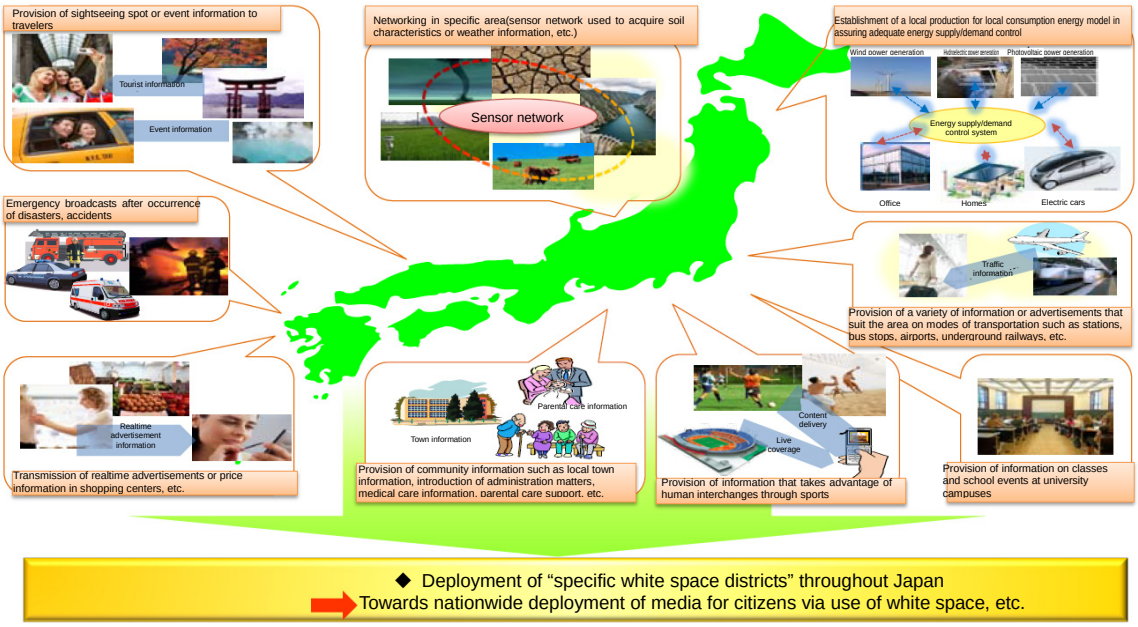



**Figure 5-6 Creation of the “Specific White Space Districts”**

### (1) Basic Idea of “Specific White Space Districts”

The following will be the basic principles used with “specific white space districts” and for the above purpose.

- Respect the self-motivation, originality, and ingenuity of proposals made by private business operators and local public bodies, etc. to the fullest extent.

- Aim at white space utilization connected to people's convenience, e.g. area revitalization and the creation of new industries.

- Aim at institutionalization in principle by the year 2012. (Excluding research and development, etc., however.)

- Regularly evaluate the results.

- In implementing research and development financial support by the nation will also be reviewed. From the point of view of encouraging autonomous management, however, the necessary expenses should in principle be met by the proposer.

- In view of realizing various services and systems and in consideration of existing business operators certain standards will be set for the areas, etc. and as far as possible wide selections then made according thereto.

- With the aim of wide installation throughout the country the target will be at least one place in each prefecture.

(2) Selection and Evaluation of "Specific White Space Districts"

Selection of "specific white space districts" will necessitate as many as possible private business operator and local public body, etc. proposals being secured who can then equally propose services and systems that utilize white space. Selection must then be made using a fair and transparent procedure.

Selecting "specific white space districts" by publicly inviting propositions and based on certain selection standards at "evaluation meetings" (provisional name) composed of knowledgeable experts, e.g. academic experts would therefore be considered suitable. From the point of view of respecting the self-motivation, originality, and ingenuity of proposals to the fullest extent possible, however, will make encouraging business deployments utilizing white space in which the selection process involves the stance of approving them as far as possible, although based on certain selection standards, important. From the point of view of encouraging autonomous management by the proposers, however, the necessary procedures when conducting research and development and verification tests in "specific white space districts" will be carried out as the proposer's responsibility.

In addition, after making a selection an "evaluation meeting" will be used to evaluate the results thereof regularly upon receiving report from the proposers after a certain period and, if as a result of the evaluation any particular matters are thought to be appropriate for reflection in institutionalization or if is necessary to stop the verification for a serious problem, etc. and so on it will then be reported to the nation. If there are any additional matters, etc. pertinent when selecting "specific white space districts" they can then be appropriately reflected in the selection procedure by, for example, changing the selection standards. This is considered necessary from the point of view of encouraging the deployment of white space utilization.

It is timely and desirable to hold the first public invitation on "specific white space districts" with the establishment of the "White Space Promotion Conference" (described later). For the purpose of enhancing expectations of and interest in white space utilization nationwide, however, one, from among the propositions concerning utilization of white space received, that was recognized early on as meeting the above standards after going through a public hearing, will be positioned as a precedent model for use as a "specific white space district" and research and development and verification tests then conducted on it.

If financial support was provided by the nation as one in which to conduct research and development with the aim of realizing white space utilization or its upgrading, it will incidentally be appropriately handled as a “specific white space district” as its original purpose will be reflection in institutionalization of white space utilization.

[1] Selection standards for “specific white space districts”

For the purpose of creating “specific white space districts” and regarding a system to utilize white space, research and development and verification tests early on and to encourage reflection in institutionalization and business deployment in realizing the system the selections will be made according to the of 3 pillars of: (i) whether the proposed model could possibly be established or not and whether it would be sustainable as a business or not; (ii) whether economic and social effects, e.g. area revitalization and creation of new industries, can be expected or not as a result of the proposed model being established; and, furthermore, (iii) whether the tasks to be reviewed in realizing the proposed model will contribute in being reflected in institutionalization in the future or not. As concrete examples of each pillar the following are conceivable. Incidentally, any ones in which research and development, etc. will take place will require mid- to long-term review before practicalization, and hence they should be subjected to selection standards in consideration thereof.

(i) Possibility of establishment of proposed model (business sustainability)

- Does a need exist for it?
- Does the proposed model have a service supply system that is sustainable as a business? (Networking, production/supply of content, balance of payments structure, etc.)
- Does the proposed model have a concrete or realizable plan (for about 2 years on for the time being) for realizing the service?
- Are the locations of the service supply and the setting of the covered area adjustable? Adjustment could be necessary if the radio wave conditions are not in accordance with the proposed content, e.g. the available white space does not exist.
- With any involving research and development, etc. can practicalization, reflection in technical standards, and a contribution to international standardization be expected as a result and so on?

(ii) Effects of the proposed model (economic and social effects, e.g. area revitalization and creation of new industries)

- What economic and social effects can be expected and are they realizable?
- Is there any novelty value instead of just simply verifying a service or system? (The verification of a service linked to digital signage or upgrading of a service rather than just verification of area one-segment broadcasts only, etc.)
- With those involving research and development, etc. can any economic and social effects be expected to result from them being utilized and so on?

(iii) Tasks to be reviewed for realization (technical and institutional tasks)

- Will the proposed tasks make a contribution through being reflected in institutionalization in the future? Can their solution be expected to contribute to the overall economic revitalization in the nation, etc.?

- Has an institution to prevent any cross talk with existing systems, etc. been considered?

The content of activities expected in concrete terms with“specific white space districts” are conceived to be the development of applications and system verifications necessary in establishing the service, review of formulation of operating guidelines setting forth a preliminary communication system for use between the parties concerned from the point of view of preventing any cross talk, review of an information delivery scheme in the area, review of an institution for use in ensuring stable content, etc.

[2] Implementation of precedent “specific white space district” models

The proposers shown in Table 5-1 , who participated in a public hearing held prior to public invitations on “specific white space districts” are positioned to be precedent “specific white space district” models as they have satisfied the above standards and that could encourage being reflected in institutionalization and business deployment of a system for use in utilizing white space and research and development and verification tests to be conducted for white space utilization.

**Table 5-1 Precedent "Specific White Space District" Models**

| Objective Precedent Model | Content of Implementation | Location |
|---|---|---|
| Shonan Bellmare Co., Ltd. | Delivery of sports videos, etc. via one-segment broadcasts | Hiratsuka City, Kanagawa Prefecture (Hiratsuka Stadium, shopping center, etc.) |
| Tokyo Broadcast System Television, Inc. | Akasaka Sacas Broadcast Project | Akasaka Sacas (Minato Ward, Tokyo) |
| Tomo-Degi Corporation | ICT-Transport linkage service | Kagoshima Central Station and surrounding sightseeing spots |
| Japan Airport Terminal Co., Ltd. | Airport linkage one-segment broadcast service | Haneda Airport |
| Digital Media Professionals Inc. | Multimedia broadcast station in underground area | Tokyo Metro/Tokyu Omotesando ~ Futako-Tamagawa, etc. |
| Hyogo Prefecture Area Media Test Convention | Limited-area broadcast station utilizing area one-segment broadcasts | Nagata Ward, Kobe City |
| Kurihara City, Miyagi Prefecture | Provision of disaster information, etc. via area one-segment broadcasts | Kurihara City (city hall, public hall, etc.) |
| YRP R&D Promotion Committee | Provision of local information, etc. via area one-segment broadcasts | Yokosuka City, Kanagawa Prefecture (YRP area) |
| Japan Cable and Telecommunications Association | Area one-segment broadcasts utilizing CATV network | Niihama City, Ehime Prefecture (Heart Network Co., Ltd.) |
| Japan Broadcast Corporation | Super Hi-Vision tests | Kinuta, Setagaya Ward (NHK Science & Technical Research Laboratories) |
| | Provision of afflicted area information via area one-segment broadcasts | Nagoya City and its vicinity |

**[Reference]About the Public Hearings**

1) Implementation of the public hearings

The Review Team selected the following proposers from those that applied to the invitation for propositions and then held 3 public hearings to provide a place to hear the content of each proposition directly from the proposer.

During the public hearings opinions were exchanged from the point of view of, and in addition to the sustainability of the content of the proposition in being established as a business or not, whether such social and economic effects as area revitalization, etc. could be expectable or not due to the content of the proposition being realized.

| First public hearing (April 9) |
|---|
| • Shonan Bellmare Co., Ltd.<br>• Tokyo Broadcast System Television, Inc.<br>• Television Kanagawa<br>• Tomo-Degi Corporation<br>• Japan Airport Terminal Co., Ltd. |
| Second public hearing (April 15) |
| • Fujisawa City, Kanagawa Prefecture<br>• Digital Media Professionals Inc.<br>• Hyogo Area Media Test Convention (Hyogo Prefecture)<br>• Kurihara City, Miyagi Prefecture<br>• YRP R&D Promotion Committee |
| Third public hearing (April 16) |
| • NTT Docomo Inc.<br>• Yuuji Oie, Dean of the Faculty of Computer Science and Systems Engineering, and others, Kyushu Institute of Technology<br>• Shigenobu Sasaki, Professor, Niigata University<br>• Japan Cable and Telecommunications Association<br>• National Association of Commercial Broadcasters in Japan<br>• Japan Broadcast Corporation<br>• White Space Review Committee (Head Office, NEXT WAVE Co., Ltd.) |

2) About the results of the public hearings (concrete service content, etc.)

In light of the concrete service content, profit structure, deployment scenario, etc. the propositions can be classified into the following 6.

[1] Propositions taking local characteristics into account (Shonan Bellmare Co. Ltd.; Tokyo Broadcast System Television, Inc.; Hyogo Prefecture)

Propositions that take local characteristics into account involve the provision of event and administrative information, etc. for users or visitors in front of stations or at shopping centers, facilities, etc. As the media to be utilized, one-segment broadcasting handheld, signage, etc. are assumed.

The assumption with the profit structure, meanwhile, is that it will cover costs such as for the management, content production, etc. via utilization of advertizing income, and use of volunteers and NPOs, etc. Creation of employment, regeneration of local area bonds, etc. are also expected to result from practicalization.

Future deployment scenarios and early practicalization, e.g. in about 2011, are being kept in mind.

[2] Propositions on service involving modes of transportation (Tomo-Degi Corporation; Japan Airport Terminal Co. Ltd.; Digital Media Professionals Inc.)

Propositions on services involving modes of transportation encompass the provision of operating information, emergency information, business or tourist information, etc. to users of station yards, airports, underground malls, etc. The assumed media to be utilized includes one-segment broadcasts for handheld devices, signage, etc.

The profit structure, meanwhile, is assumed to include e-commerce income, advertisement income, etc. The creation of employment, etc. is expected to result from practicalization.

Future deployment scenarios and early practicalization, e.g. verification tests from 2010 and being operated as a business operation in about 2012, are being kept in mind.

[3] Propositions on services at universities, etc. (Television Kanagawa; White Space Review Committee)

Propositions on services at universities, etc. involve the provision of content on classes, digital textbooks, local area content, etc. to citizens and students around universities, etc. This also involves opportunities to provide content production and transmissions to citizens and students. The assumed media to be utilized involves one-segment broadcasts for handheld devices, signage, etc.

The profit structure, meanwhile, is assumed to include usage fees for content downloads, advertisement income, etc. Social effects such as human resource developments, alleviation of environmental load, etc. can be expected to result from practicalization.

As a future deployment scenario practicalization is being planned for after the business operating system and business models have been reviewed. Being turned into a business will necessitate the handling of the copyright of textbooks, etc. to be organized.

[4] Propositions on service that promote the availability of public information (Kurihara City, Miyagi Prefecture; NHK (utilization test for area one-segment broadcasts in afflicted areas))

Propositions that promote the availability of public information involve the provision of afflicted area information, etc. to refugees at refuges, etc. The assumed media to be utilized involves one-segment broadcasts to handheld devices, signage, etc.

The profit structure, meanwhile, is assumed to include autonomous body budgeting, the participation of NPOs, etc. The realization of greater ease of mind/safety for society, industrial promotion, etc. can be expected from practicalization.

The future deployment scenario involves the plan of implementing verification tests, etc. from 2010 on.

[5] Propositions that utilizing new technology (NTT Docomo Inc.; Prof. Oie and others, Kyushu Institute of Technology; Prof. Sasaki, Niigata University; NHK (Super Hi-Vision))

Propositions that utilize new technology involve propositions which encourage research and development and hence nothing concrete is assumed with regard to the location of the service, objective customers, content to be supplied, media to be utilized, or profit structure.

The expected effect of practicalization of the new technology would be more effective utilization of frequencies, etc. The deployment scenario involves the assumption of research and development being necessary over the mid- to long-term of 5 to 10 years.

[6] Other (Japan Cable and Telecommunications Association; National Association of Commercial Broadcasters in Japan; Fujisawa City,KanagawaPrefecture; YRP R&D Promotion Committee)

These propositions involve the provision of tourist information, etc. to tourists, etc. at sightseeing spots, etc. The assumed media to be utilized involves one-segment broadcasts to handheld devices, digital signage, etc.

The assumed profit structure, meanwhile, involves advertisement income, etc. The realization of greater ease of mind/safety for society, area revitalization, etc. can be expected to result from practicalization.

The figure below summarizes the above.

| | Place Provided | Objective Customers | Content of Service | Media | Profit Structure | Effects | Deployment Scenario |
|---|---|---|---|---|---|---|---|
| Propositions on services that take local characteristics into account<br>• Shonan Bellmare Co., Ltd.<br>• Tokyo Broadcast System Television, Inc.<br>• Hyogo Area Media Test Convention (Hyogo Prefecture) | In front of stations<br>Shopping centers<br>Facilities, etc. | Users<br>Visitors<br>Etc. | Event information<br>Administrative information<br>Etc. | One-segment broadcasts to handheld devices<br>Signage<br>Etc. | Advertisement income<br>Volunteers or NPOs<br>Etc. | Creation of employment<br>Local area bonds<br>Etc. | Year ○○<br>Practicalization<br>Etc. |
| Propositions on services involving modes of transportation<br>• Tomo-Degi Corporation<br>• Japan Airport Terminal Co., Ltd.<br>• Digital Media Professionals Inc. | Station yards<br>Airports<br>Underground malls<br>Etc. | Passengers | Operating information<br>Emergency information<br>Business<br>Tourist information<br>Etc. | One-segment broadcasts to handheld devices<br>Signage<br>Etc. | E-commerce income<br>Advertisement income<br>Etc. | Creation of employment<br>Etc. | Year ○○<br>Verification tests<br>Turning into a business<br>Etc. |
| Propositions on services at universities, etc.<br>• Television Kanagawa<br>• White Space Review Committee | Universities<br>Etc. | Citizens<br>Students<br>Etc. | Class<br>Digital textbooks<br>Etc. | One-segment broadcasts to handheld devices<br>Signage<br>Etc. | Advertisement income<br>Etc. | Provision of classwork<br>Alleviation of environmental load<br>Etc. | Expansion of market scale<br>Etc. |
| Propositions on services that promote the availability of public information<br>• Kurihara City, Miyagi Prefecture<br>• NHK (utilization test for area one-segment broadcasts in afflicted areas) | Refuge<br>Etc. | Refugees<br>Etc. | Afflicted area information<br>Etc. | One-segment broadcasts to handheld devices<br>Signage | NPOs<br>Etc. | Ease of mind/safety<br>Industrial promotion<br>Etc. | Year ○○<br>Verification test<br>Etc. |
| Propositions on services that utilize new technology<br>• NTT Docomo Inc.<br>• Prof. Oie and others, Kyushu Institute of Technology<br>• Prof. Sasaki, Niigata University<br>• NHK (Super Hi-Vision) | Encouragement of research and development is being proposed with no specific concrete services<br>Etc. | | | | | Effective utilization of frequencies<br>Etc. | Practicalization in the 2010's |
| Other<br>• Japan Cable and Telecommunications Association<br>• National Association of Commercial Broadcasters in Japan<br>• Fujisawa City, Kanagawa Prefecture<br>• YRP R&D Promotion Committee | Sightseeing spots<br>Etc. | Tourists<br>Etc. | Tourist information<br>Etc. | One-segment broadcasts to handheld devices<br>Signage | Advertisement income<br>Etc. | Area revitalization<br>Etc. | Year ○○<br>Utilization start<br>Etc. |

**Figure of Summary of Propositions Heard at Public Hearings**

## 4. Dealing with Solving Institutional and Technical Tasks

With the realization of white space utilization it became apparent from the results of the invitation for propositions and the public hearings that it mainly encompasses the following problems and so on.

- The effect on existing business operators, e.g. interference, will need to be taken into consideration.
- Verification tests will need to take place in verifying that no interference occurs with existing systems and an institution then created in the light of the results thereof.
- Upgrading white space utilization will necessitate research and development/verification tests of frequency sharing technology, e.g. cognitive wireless technology.
- Research and development will need to take place on utilizing white space in the practicalization of new wireless systems, e.g. Super Hi-Vision.
- The provision of services will necessitate flexible operations being enabled in meeting an area's needs by making adjustments/verifications with the parties concerned per area.
- An environment will need to be organized that enables the realization of multifarious services which utilize the area's characteristics of its nature, industry, etc.
- Adjustments/trials will need to take place between the parties concerned, e.g. the form of the information provision scheme.

Solving the above problems and so on will necessitate first dealing with the following 4 goals.

- Securing preventive measures against any cross talk with existing systems, etc.
- Encouraging research and development
- Creating rules towards deployment of white space utilization
- Acceleration of business deployment

(1) Securing Preventive Measures Against Any Cross Talk with Existing Systems, Etc.

[1] Institutional framework for securing cross talk prevention measures

A "white space" involves frequencies that have been assigned for a certain purpose, for example broadcasts, but that are also available for other purposes depending on the geographical or temporal situation. Frequencies that are therefore available as white space differ according to an area's frequency utilization and topographical situation, etc. White space involves frequencies that have already been primarily assigned, however, and thus its utilization necessitates taking any side effects into consideration, e.g. interference, with regard to existing business operators utilizing, in particular, the same frequency band or an adjacent frequency band, as well securing cross talk prevention measures for existing systems, etc. too in smoothly introducing services utilizing white space.

If we therefore look at trends in institutionalization in foreign countries, for example Canada, which implemented institutionalization in March 2010, places priority on use by existing business operators under a licensing system because of the point of view of cross talk protection for them, and limits utilization of white space for secondary operations (and therefore the stance that any cross talk which could be harmful to existing business operators must not be incurred and that a request must not be made for protection from harmful cross talk from any existing business operators). Europe too considers that, regarding utilization of white space, all applications should be used under the principle of non-interference/non-protection and is currently reviewing practicalization using that framework.

Meanwhile, the U.S., which approved utilization of white space with no license being required in November 2008, places priority on white space being utilized by existing business operators and, based on the situation with secondary utilization, makes it obligatory for all applications to be able to identify positional information and be equipped with a data access function and a carrier sensing function via the Internet, while also making equipment certification by the FCC necessary. To prevent any cross talk within a framework where a license is not required the U.S. therefore preliminarily decided to oblige radio stations to upgrade their functions. It is currently at the stage of conducting verifications while also implementing field trials, etc. for use in the formulation of concrete technical standards and the creation of a database. They are currently in the situation where a certain period will be required for practicalization.

In Japan, meanwhile, multifarious services utilizing area one-segment broadcasts or digital signage, etc. are being expected to be used as white space utilization models. The expectation is that the utilization of the white space as a means of providing information, etc. in local communities will lead to the area revitalization and the creation of new industries, both of which are connected economic growth. White space needs to be quickly institutionalized for that purpose too.

Because of this the early institutionalization of white space utilization in Japan will require use of it to be approved using a specific licensing system for the time being in the light of trends with research and development of radio communication technology, etc.

[2] Deployment via secondary utilization

Wireless service operations to which frequencies are distributed internationally include “primary service operations” and “secondary service operations.” The frequency assignment plan according to Article 26 of the relevant Law prescribes that a secondary service radio station can be assigned with frequencies on the condition that it will follow the following conditions.

- A secondary service radio station must not be responsible for any cross talk that is harmful to a primary service radio station which has already been assigned with frequencies or which will be assigned with frequencies at a later date.

- A secondary service radio station must not request protection from harmful cross talk from a primary service radio station which has already been assigned with frequencies or which will be assigned with frequencies at a later date.

Whether the frequency assignment plan assumes the wireless service operations to which the frequencies are distributed to be asecondary service operation or not is decided in consideration of the international allocation of frequencies set by the ITU, securement of fair and efficient utilization of radio waves, etc.

In this respect, and as the utilization of white space means utilizing primarily already assigned frequencies, consideration for existing business operators is indispensable in its smooth introduction. Examining trends with institutionalization in foreign countries reveals that all of them have approved utilization of white space in secondary utilization or under the principle of non-interference/non-protection.

In the light of the above, and with institutionalizing utilization of white space in Japan too, the thought is that it will be necessary to deploy secondary utilization from the point of view of attempting to smoothly introduce white space utilization.

[3] Formulation of technical standards, etc.

To secure cross talk prevention for existing systems, etc., it will be necessary to conduct verification tests as needed in avoiding any incurrence of cross talk with existing systems, etc. and formulate technical standards and operating standards using the results thereof.

Utilization of white space in particular depends on radio waves that can differ from area to area. In formulating technical standards, etc., therefore, it is necessary to make reviews in the light of a number of verifications such as the results of “specific white space districts,” etc.

(2) Encouraging Research and Development

Upgrading white space utilization will necessitate research and development and verification tests on cognitive wireless technology or multi-segment technology, etc. and the continued reflection of the results thereof in institutionalization. It will also be necessary to conduct research and development utilizing white space in practicalizing new wireless systems, e.g. Super Hi-Vision.

It will therefore also be important to take the stance of continuously contributing to international standardization activities of the IEEE, etc. by positively participating in them from the point of view of reinforcing our international competitiveness in radio communication technology, etc.

[1] Encouraging research and development on upgrading white space utilization

Upgrading the utilization of white space will necessitate research and development of wireless technology in realizing further upgraded utilization of frequencies in terms of the area, time and space and the tight frequency situation. Establishment of that technology has been positively dealt with internationally.

In Japan too it will be necessary to attempt to further effectively utilize radio waves by encouraging research and development on developing cognitive wireless technology such as spectrum sensing technology, dynamic spectrum access technology, etc., as well as technology that enables more than one frequency band to be used dynamically and cross talk prevention established for existing systems, etc.

Upgrading white space utilization, with the one-segment broadcast utilization type in particular, will also necessitate the development of multi-segment technology. This then makes continuous promotion of research and development and system verification necessary with the aim of establishing technology of, in concrete terms, a full-segment broadcast type that enables a high-quality video service and bundled-segment broadcast and separate-segment broadcast types in then enabling independent services to be provided using the currently not utilized 12 segments as well.

[2] White space utilization in research and development for practicalizing new wireless systems

Encouraging research and development concerning white space makes, from the viewpoint of upgrading radio wave utilization, not only upgrading white space utilization but also research and development important that utilizes white space in practicalizing new wireless systems such as Super Hi-Vision. Super Hi-Vision, for example, is a next-generation broadcast system with a resolution 16 times that of existing Hi-Vision. It will provide viewers with the possibility of a service that incorporates a high feeling of presence and the expectation of being a new type of broadcast service. System development of display technology, transmission technology, etc. concerning Super Hi-Vision is also expected to contribute to industrial promotion in Japan. Furthermore, testing that new wireless system can be connected to creating appeal for it internationally, thus leading to reinforcing Japan's international competitiveness.

With research and development concerning white space, therefore, it will be important to take the stance of continuously encouraging research and development that aims at practicalizing new wireless systems via utilization of white space.

[3] Reflection of research and development, etc. in institutionalization

The realization of an upgrading of white space utilization and practicalization of new wireless systems will necessitate that the results of the research and development and verification tests above be verified and then reflected in in institutionalization, e.g. formulation of technical standards.

The introduction of cognitive wireless technology using white space, for example, will necessitate an attempt being made to clarify the technical conditions necessary in preventing any unwanted cross talk or interference with existing systems, etc. It will necessitate, therefore, research and development of technology for use in sensing the frequency utilization in specifics area in real time, etc. and the creation of a database that defines the needed protection for existing systems and, after verifying them, to proceed with social verification for practicalization, e.g. application of cognitive wireless technology in data communication between fixed points or data communication with mobile devices, etc.

Regarding multi-segment technology of the bundled-segment broadcast type or separate-segment broadcasting type too, meanwhile, systematic verification has yet to have been conducted from the point of view of preventing cross talk. Its practicalization will therefore require verification and reflection of the results in the institutionalization of upgrading white space utilization with the one-segment broadcast utilization type, which is also the same as with the practicalization of new wireless systems.

With the results of research and development and verification tests, etc. conducted via "specific white space districts" in particular it will be important to create an evaluation system to ensure the results are reflected adequately in institutionalization.

[4] Contribution to international standardization activities

As mentioned above as trends in research and development concerning the utilization of the white space the establishment of new radio communication technology such as cognitive wireless technology has been positively dealt with internationally. This is also the same with trends in standardization as well as research and development. The decision was therefore made that at the WRC-12 to be held in 2012 by the ITU a review concerning the regulatory items which will accompany the introduction of a software-defined radio system

and cognitive wireless system would be subjected to discussion. As part of that standardization bodies such as IEEE, ETSI, etc. have put together at least one review committee and are proceeding with the reviews.

Because of this, and if any standardization that deviates from utilization of white space in Japan takes place, positive international deployment will then be difficult for Japan, and hence the opportunity of reinforcing its international competitiveness lost.

At present the National Institute of Information and Communications Technology (NICT) holds the position of chairman of IEEE SCC41. There are also many participant manufacturers, etc. from Japan leading the discussions. It will be necessary in the future too to promote positive participation in international standardization activities by the government, private sector and academia in coordinating and institutionalizing early on white space utilization in Japan in then ensuring that the results of research and development and verification tests conducted in Japan can be reflected adequately in standardization.

(3) Rules for the Deployment of White Space Utilization

The attempt to create new industries and deploy multifarious services by encouraging white space utilization under a licensing system will necessitate flexible operations that enable needs to be met by simplifying the procedure.

Solving that will involve: [1] simplification of the procedure; [2] formulation of a channel space map; and, furthermore, [3] flexible operation to meet each area's needs.

[1] Simplification of the procedure

The current institution prescribes that the acquisition of a radio station license involves requirements on the location of the radio operator (Law, Article 39, Item 1) in addition to such technical standards as radio equipment rules, radio station operating rules, etc. all being in accordance to the law.

While it is necessary to formulate technical standards based on sufficient verification from the point of view of preventing any cross talk with existing systems, etc., and as the services are expected to be utilized as white space utilization models, ones that do not require any expert knowledge of radio equipment can also be assumed to be used, e.g. a mode for use by local public bodies, shopping centers in local areas, NPOs, etc. to transmit information via utilization of area one-segment broadcasts, digital signage, etc. It will therefore be necessary to review simplifying the procedure by, for example, loosening up the other requirements, e.g. location of the radio operator according to the content of the service to be supplied or the radio equipment itself.

According to the prescriptions of the Law, Article 38, 7, Item 1, etc. preferential measures are applicable to the procedure for opening a radio station such as omission of the licensing procedure, etc. by law if radio equipment is used which has previously undergone standard certification according to the law and which is therefore compliant (compliant radio equipment). Reviewing the formulation of technical standards for white space utilization, etc., therefore, will necessitate reviewing simplification of the procedure and in consideration of utilizing a technical standards compatibility certification system too.

[2] Formulation of a channel space map

The frequencies available as white space differ according to the area's frequency utilization

and topographical situation, etc. Encouraging business deployments utilizing white space will, therefore, make preliminarily publicizing the frequencies available as white space in each area important.

It will therefore be necessary for the nation to systematically identify the frequencies that are available as white space in areas with great needs, formulate them as a channel space map, and then publicize then. In more concrete terms it will be necessary to formulate a channel map of white space related to the digital television broadcast frequency bands, which have a great need for white space, by the year 2011, and for the other frequency bands as well to continue publicizing the information as soon as the possibility of utilizing white space in each area is identified.

In that case it will be appropriate to continue utilizing the same channel repeatedly on a plane with white space utilization from the point of view of encouraging effective utilization of radio waves while also enabling the entry of many new services.

[3] Flexible operation in meeting each area's needs

The frequencies available as white space differ according to the area's frequency utilization and topographical situation, etc. The needs for the content of a service utilizing white space are also considered to be multifarious and dependent on the area. With white space utilization, therefore, it will be appropriate to conduct flexible operations in meeting each area's needs and organize a system therefor.

In more concrete terms, it will be appropriate frequencies available as white space in each area to be exploited in the light of an area's needs and to continue reflecting them in the channel space map under elaborate coordination.

(4) Acceleration of Business Deployments

Establishing services utilizing white space as businesses involves a number of tasks to be solved such as development of a reception/transmission system and an information delivery scheme, etc. in addition to securing cross talk prevention measures for existing systems, etc.

A "White Space Promotion Conference" therefore needed to be set up that consists of concerned parties such as manufacturers, broadcast business operators, and telecommunication business operators, etc. in continuing to aim at nationwide deployment of white space utilization.

In more concrete terms the "White Space Promotion Conference" will consist of the parties concerned of service business operators, telecommunication business operators, manufacturers, government ministries and agencies, people with specialist knowledge, etc. who are deploying activities on a nationwide scale and the expectation is that it will encourage review of white space utilization which takes advantage of each area's characteristics by persons in charge of autonomous bodies or business operators concerned in the area and review of how adjustments concerning cross talk prevention for existing systems, etc. should be or standardization of reception/transmission systems. Furthermore, it will also be involved in analyzing the situation with deployment of white space utilization, tasks and needs with continuing utilization of white space, etc. and the attempt to maintain coordination with the Ministry of Internal Affairs and Communications by exchanging opinions and so on.

Acceleration of the business deployment of services utilizing white space will necessitate the constant aim of nationwide deployment of white space utilization by constructing a promotional system within that mutual coordination/cooperation.

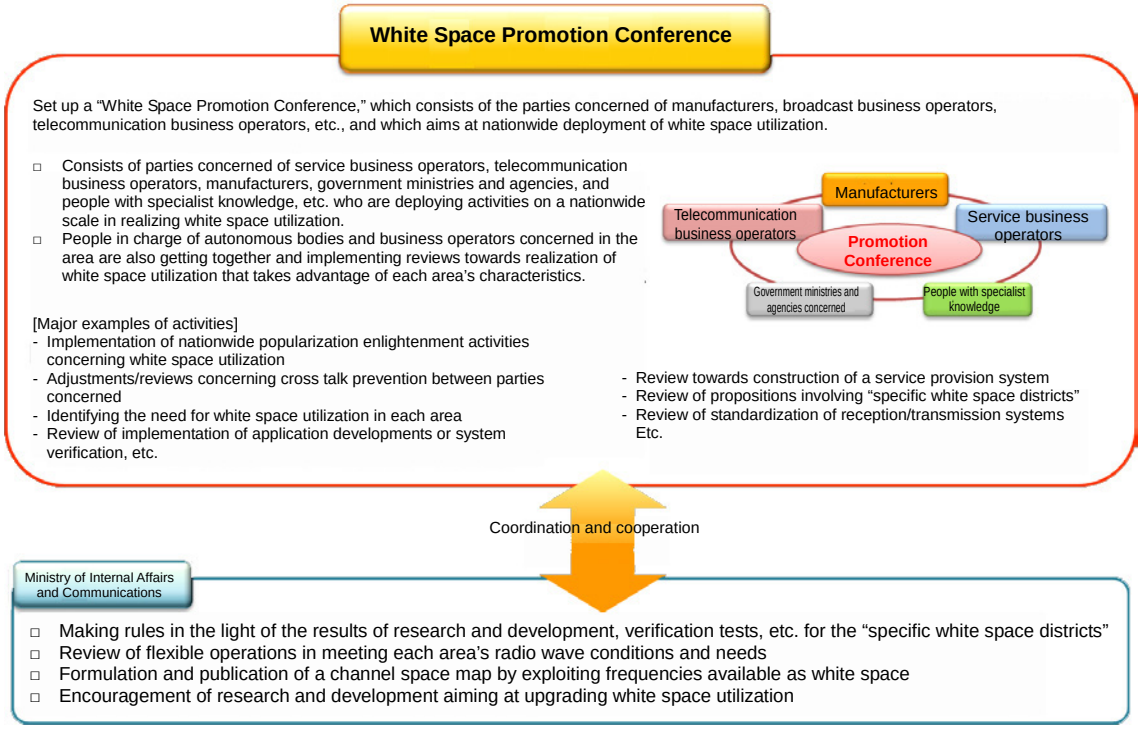



**Figure 5-7 White Space Promotion Conference**

As we have seen white space utilization must be realized as early as possible from the point of view of continuing to connect radio waves, a limited and scarce resource, to improving people's convenience. After institutionalization as well it will be necessary to continue dealing with research and development and verification tests in upgrading the systems involved along with constant efforts to continue encouraging further effective utilization of radio waves.

We are therefore promoting the "promotional measures for realizing white space utilization" described in this chapter and steadily dealing with nationwide deployment of white space utilization through industry, government and academia coordinating with each other around the "White Space Promotion Conference."

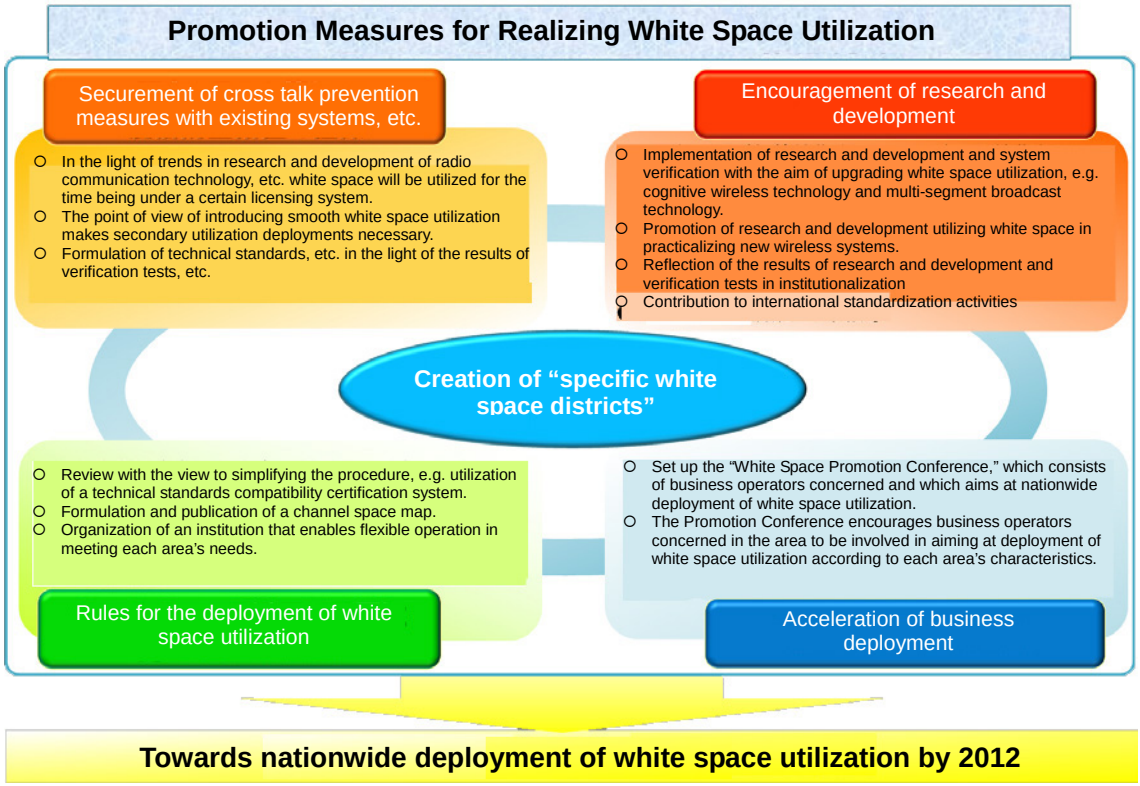
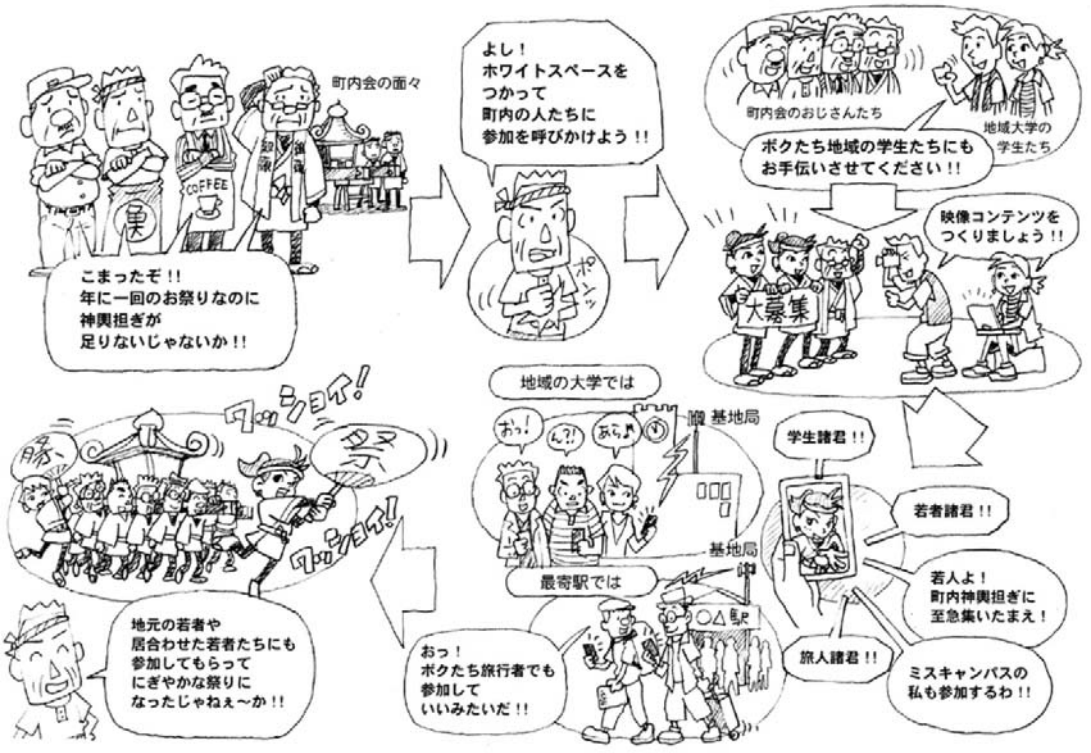



**Figure 5-8 Promotional Measures for Realizing White Space Utilization**

# Scenarios of Utilization Systems and White Space

Scenario of Utilization of a System and White Space [1]

1. Neighborhood association volunteers




<Utilization scene>

There are not enough miniature shrine carriers when the once-a-year festival draws near in a town. The people in the neighborhood association are therefore troubled and consider requesting more participants through local media via white space. In cooperation with students of a university located in the area they set about producing a video content to be provided via white space. A message requesting miniature shrine carriers during the festival is delivered to the people in the area from a white space base station installed on a university campus or at a nearby station, etc. Youths who viewed it then gather together at the festival. There are enough miniature shrine carriers, thus realizing a lively festival.

<Explanation>

White space can be utilized to make small amounts of local media that a community such as a neighborhood association, etc. can then utilize as its own initiative. The utilization scene illustrates how an area's bonds can be strengthened by calling in real time for the participation of volunteers through use of a small amount of local media.

By taking advantage of the characteristic of white space that allows information to be supplied via a push without requiring any user registration, etc. the area's residents themselves could call upon the people present in the objective area. The effect of lowering any blocks to human interchanges can thus be expected as information can be provided not only to other residents but also to people who happen to be in the area.

Scenario of Utilization of a System and White Space [2]

2. A sightseeing spot without signboards


<Utilization scenario>

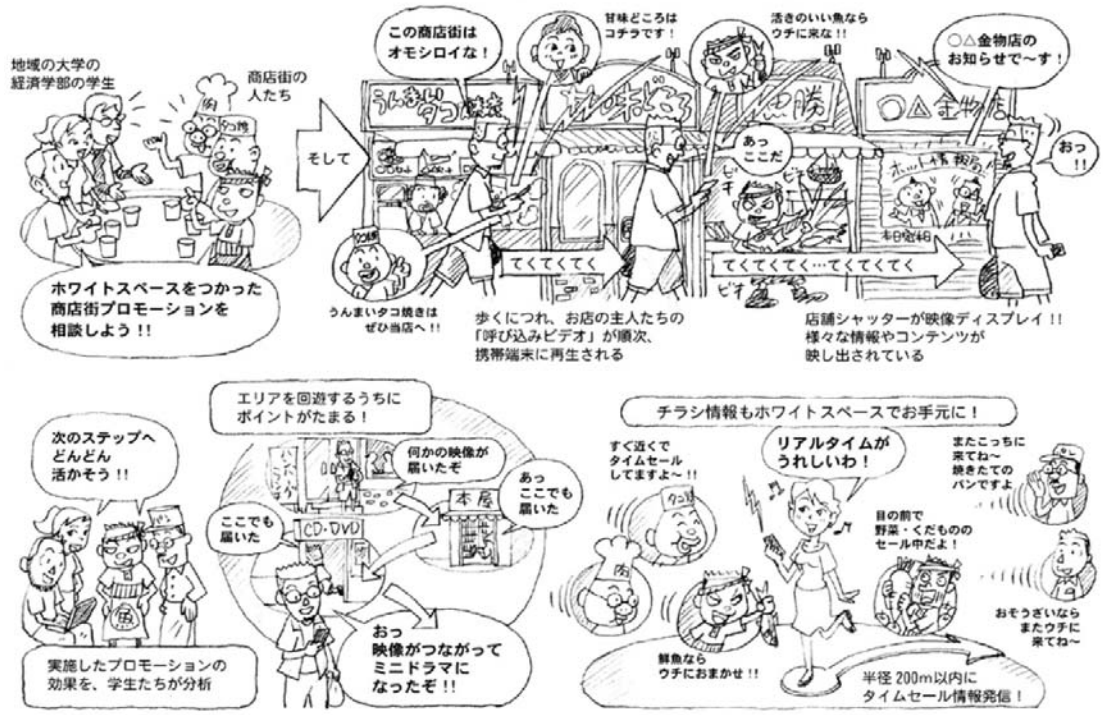
A group of foreign tourists visit Aso as part of green tourism. They are impressed not only by the majestic landscape but also by the fact that there are no signboards obstructing it. People from various countries participate in the tour but they do not need a tour guide and instead have their own handheld terminals so they can enjoy freely walking around. Video/audio guidance on the route or of explanations of the sightseeing spots, etc. is automatically delivered to their handheld terminals while they move around. They are all very impressed as the guidance is available in more than one language. Information on souvenir shops, restaurants, etc. is also provided as needed. The tourists can also request information as necessary if, for example, they suddenly need to use a toilet and so on.

<Explanation>

An image of utilization in the tourism field. Each white space base station is of low-power so the range of the radio waves is limited. Taking advantage of this characteristic enables information to be provided according to a tourist's present position by locating base stations at pivotal points at a sightseeing spot. Information can be provided by the push type to each tourist's terminal. The information can also be utilized as a means of replacing or eliminating signboards, etc. that mar the landscape in scenic areas, etc. If the content is prepared in multiple languages tourists not from English-speaking countries can also utilize tourist guidance material in their own language. In addition, and thanks to information being deliverer according to their present position, tourists will able to utilize information necessary "here now" on demand. A supply of information that is more convenient than signboards will therefore have been realized.

Scenario of Utilization of a System and White Space [3]

## 3. An attractive shopping center



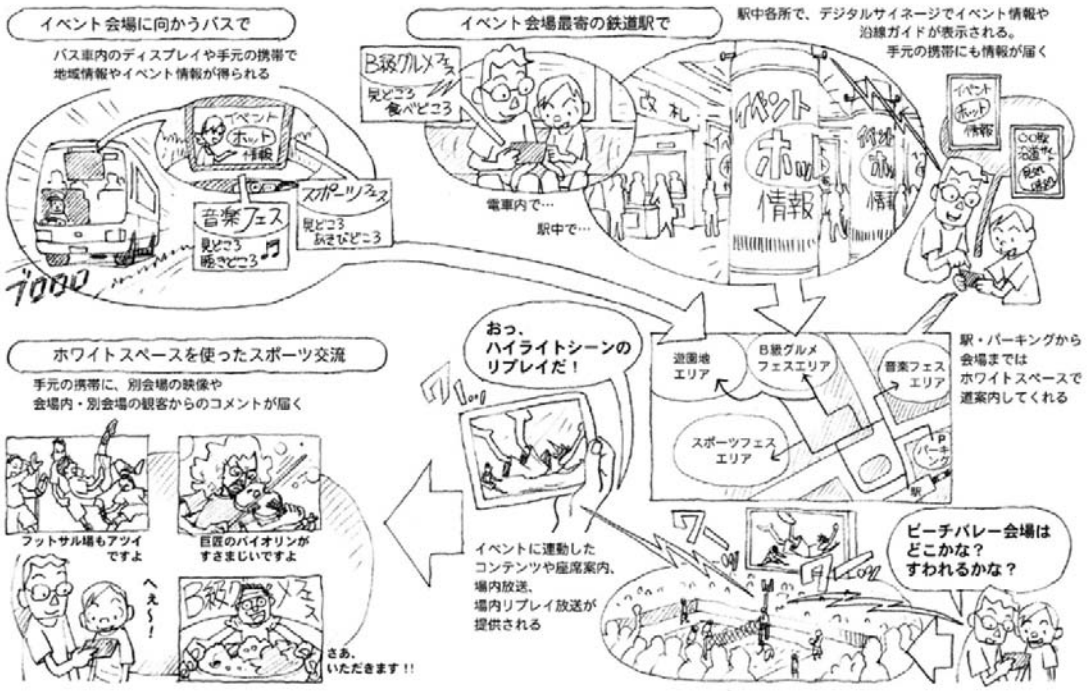

<Utilization scene>
Shop owners who are having a hard time vitalizing their shopping center introduce some original media using white space into their shopping center. They decided to conduct promotion activities for the shopping center in cooperation with local students.

The shop owners produce their own shop advertisement video. Within the shopping center “catch videos” or real time sales information, coupons, etc. are delivered to handheld terminals when people are near each shop. When shops are closed their shutters are used to display a variety of content such as on future bargain sales and event information, etc. Upon entering a shop its attraction points or video content is delivered to your handheld terminal. Customers are thus lured to browse through the shopping center as the different points and content gets skillfully used, for example by delivering part of a mini-drama per shop. The shopping center is vitalized through the effect of the promotion activities then being analyzed by the students who cooperated in the project and the results thereof fed back.

<Explanation>
An image of utilizing white space in a shopping center. Low-power base stations installed at each shop operate uniformly throughout the entire shopping center in promote both the individual shop and the actual shopping center itself. Information delivery to digital signage (electronic signboards) via white space and a community-based original promotional media that provides limited-area real time sales information or content service, etc. of limited coupons or a stamp rally, etc. to visitor’s handheld terminal is thus realized. The shopping center has its own original media that it can operate itself, and thus shopping center vitalization taking advantage of the area’s resources, for example cooperating with students interested in media or the economy, is therefore realized.

Scenario of Utilization of a System and White Space [4]

4. An event where you don't get lost or bored




<Utilization scenario>

The day of a large-scale outdoor event. Participants heading for the site by rail can check on a display inside the train or their own handheld terminal the event's timetable or points to see, gourmet information in the surrounding area, etc. At a nearby station event information, etc. is displayed via digital signage and related information also delivered to handheld telephones. The route to each event site is also delivered in real time, thus ensuring that you can arrive at the objective site without getting lost, even if you haven't been there before.

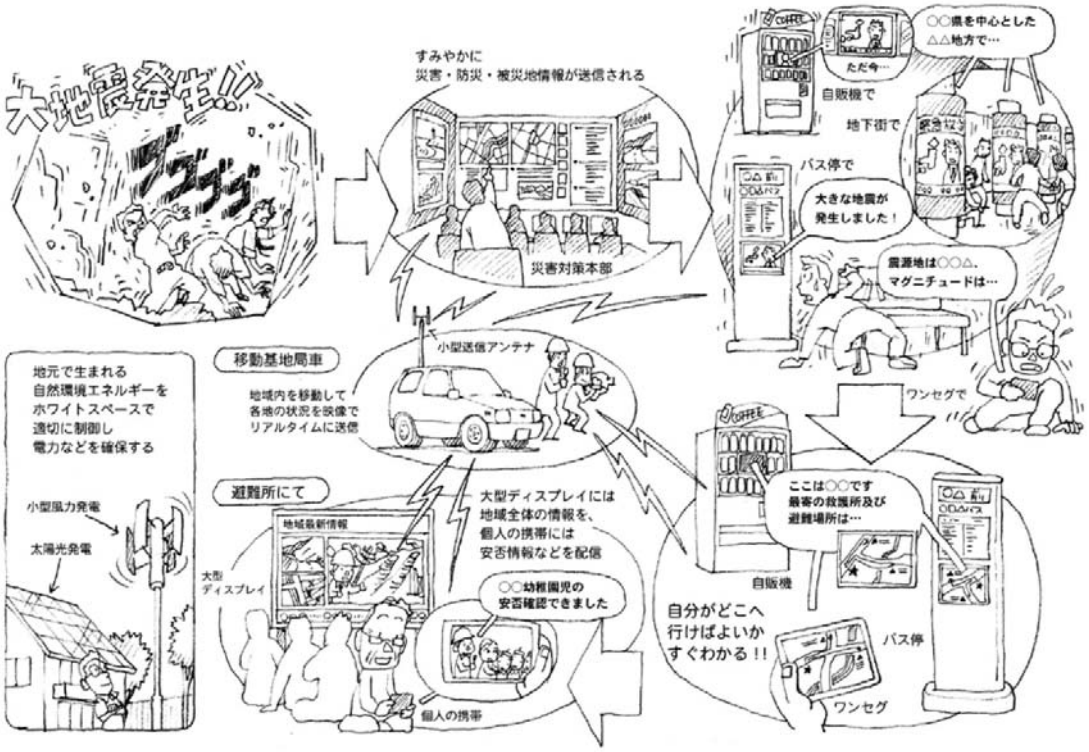
Upon entering the event site an onsite seat guide or on-premise broadcast is delivered to a handheld terminal, and hence you always know what to do next. A super large onsite display enables Super Hi-Vision video to be enjoyed and highlight videos are also delivered as needed to handheld terminals. In addition, information on events being held at other sites in the area or the comments of spectators, etc. can be viewed. The event can thus be enjoyed in a number of ways via the utilization video and information content at the same time.

<Explanation>

An image of utilization where many people gather such as a sports stadium or amusement park, etc. At large-scale events where many people gather it will be possible for information to be effectively provided to visitors via white space base stations installed at the event site or in surrounding areas. In such a case the information being supplied via mobile communication could be subject to congestion or delays due to the concentrated volume of communication. There is no such worry with information broadcast via white space, however. All visitors in the area would always be able to smoothly receive the necessary content and utilize it.

Scenario of Utilization of a System and White Space [5]

5. A town with ease of mind




<Utilization scene>

A big earthquake occurs in a certain city. Information on the nearest refuge is immediately broadcast via white space from the disaster countermeasure office to the people in the various places in the area. Vending machines and digital signage at bus stops and street corners, etc. also all display disaster information on refuge information, etc., and hence anyone that doesn't have a handheld terminal can also check where to take cover.

Mobile cars equipped with a small base station each are dispatched to transmit in real time the situation in each place to the disaster countermeasure office, refuges, etc. The refugees can also check information on the well-being of their families, acquaintances, etc. through handheld terminals. Electricity power is necessary for that operation but natural environmental energy generated in the locality can be utilized.

<Explanation>

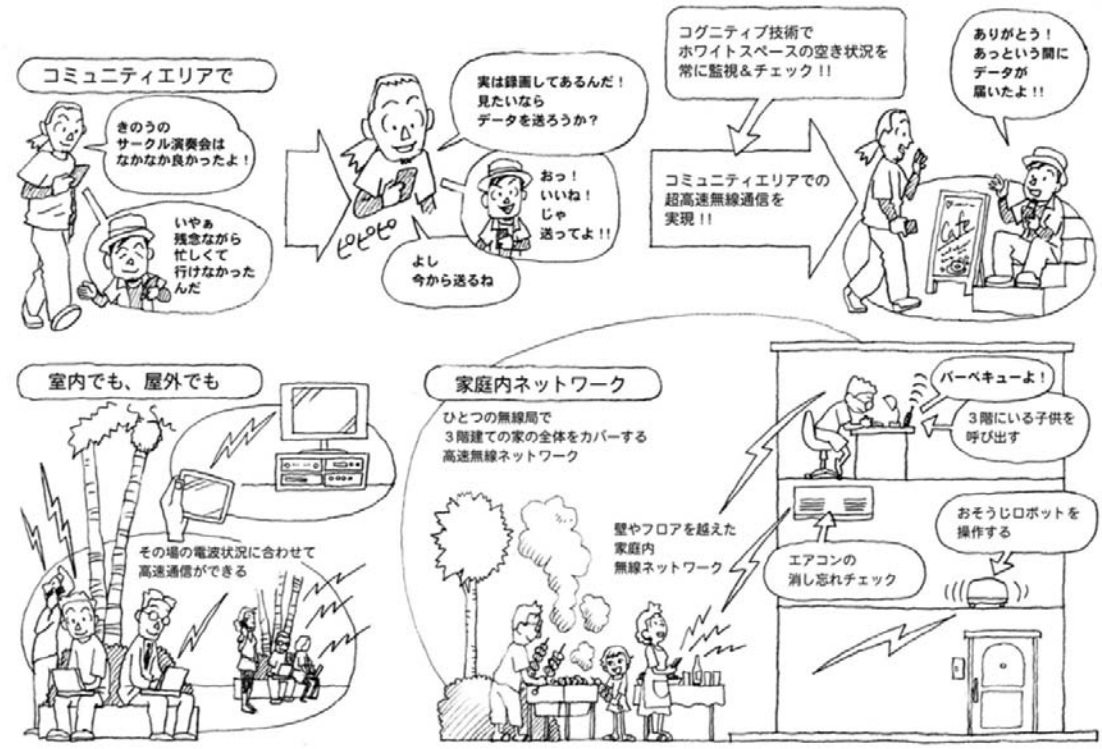
An image of utilization as part an infrastructure that enables ease of mind/safety after the occurrence of a major disaster. In the afflicted area elaborate necessary information per area can be transmitted via white space directly from the disaster countermeasure office to everybody. The necessary information is of the push type not only to the area's residents but also to anyone who happens to be in the afflicted area.

If the base station is not available because of the disaster emergency vehicles equipped with a base station function can be dispatched in then creating a temporary network system. A means of identifying the situation in the area and of providing information to the refugees would thus be enabled, and hence secondary damage could be kept to a minimum.

Electricity would be necessary in realizing the above and for the refuges, etc. but it could be secured utilizing a system that enables control, via white space, of natural environmental energy, e.g. photovoltaic power generation and wind power generation, in the area.

Scenario of Utilization of a System and White Space [6]

## 6. Broadband cognitive communication




<Utilization scenario>

A scene in an area where very high-speed area radio communication utilizing white space has been organized. A man is television phoning while going to a café in the neighborhood where he is to meet a friend. He transfers data that he has recorded on his handheld terminal to a friend upon hearing that the friend could not come to a concert. When he arrives at the meeting place he is told how happy his friend was that the data arrived so quickly.

In the area anyone can utilize very high-speed radio communication as necessary even if they are in a park or a house. A certain household is having a more convenient life via utilization of a home wireless network, for example by operating home electrical appliances in their house using a handheld terminal while barbecuing in the garden or calling their child on the 3rd floor by television telephone.

<Explanation>

An image of utilization of a high-speed radio communication network and white space. High-speed radio communication could be utilized according to the radio wave situation in the area regardless of whether indoors or outdoors via cognitive wireless technology being used to perform the communication by changing the frequency or system according to the situation with terminals, base stations, etc. and typically checking for vacancies in the white space around. Each home installing a small dedicated base station would allow a high-speed wireless network to cover their whole house as well as the garden, free of charge. All home electrical appliances equipped with a communication function could be part of the network and controllable at any time from the handheld terminals of each member of the family.

## Coda

The “Review Team on a New Vision for Utilizing Radio Waves” commenced in December 2009 under the initiative of Mr. Natiou, the Vice-Minister of Internal Affairs and Communications. I as the chairman have done my best in proceeding with reviewing the situation in encouraging effective utilization of radio waves in the future, such as in the utilization of white space.

At present our country’s radio wave environment is being significantly developed through the popularization of transmission of high-precision dynamic images or variation in terminals, such as the smart phone, in addition to upgrading of handheld telephones. The demand for radio waves is predicted to increase even more and thus how to continue to effectively utilize radio waves has become an urgent task.

Because of those types of circumstances the possibility of utilizing white space in creating newly available radio waves is attracting attention worldwide. It has been energetically dealt with by the FCC in the U.S. and IEEE, etc.

Our country has been striving via research and development in attempting to reorganize/shift frequencies or making frequencies narrowband, e.g. digitalization of terrestrial television broadcasting, etc., but utilization of white space is an epoch-making approach within measures to more effectively utilize radio waves in that it makes frequencies that have been assigned for certain purposes available for another purpose.

Our Review Team’s discussions also involved the stance of being on radio wave utilization from the user side rather than on the supply side, and reviews have taken place from the point of view of, instead of simply whether technically possible or not or institutionally possible or not, whether people would have a need or not, whether useful to them or not and, if yes, then whether technically possible or not.

This report summarizes the “promotion measures for realizing white space utilization,” that are the results of discussions held by in the Review Team.

We hope that in the light of this report Japan will become the global forerunner in realizing utilization of white space as a result of new technical innovations, with new businesses and services then being created, as well as verification tests and research and development for institutionalizing white space utilization or encouraging business deployment being positively encouraged, which will all be a source of Japan being more competitive.

Finally we wholeheartedly thank the many people who kindly helped us in creating this report.

July 30, 2010

Norihisa Doi

Chairman, Review Team on a New Vision for Utilizing Radio Waves

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| Hiroyuki Morikawa | Professor, Research Center for Advanced Science and Technology, University of Tokyo |

# History of the Holdings of the Review Team Concerning A New Vision of Utilizing Radio Waves

| Meeting | Date Held | Major Subjects |
|---|---|---|
| 1st | December 2, 2009 | • Greetings by Vice-Minister of Internal Affairs and Communications<br>• Greetings by Chairman<br>• Exchange of opinions |
| 2nd | December 25, 2009 | • Presentation by member<br>• Exchange of opinions |
| 3rd | January 22, 2010 | • Presentation by member<br>• Field survey on radio wave utilization<br>• Flash report on results of proposition invitations |
| 4th | February 15, 2010 | • About the situation with radio wave utilization<br>• Presentation by member<br>• About the results of the proposition invitations |
| International symposium on effective utilization of radio waves | March 1, 2010 | • Opening greetings<br>• Keynote lecture<br>• Session 1<br>(About the possibility of new effective utilization of radio waves such as white space from a business point of view)<br>• Session 2<br>(About trends in policies concerning new effective utilization of radio waves such as white space) |
| 5th | April 9, 2010 | • 1st public hearing<br>(Shonan Bellmare Co., Ltd.; Tokyo Broadcast System Television, Inc.; Television Kanagawa; Tomo-Degi Corporation; Japan Airport Terminal Co., Ltd.) |
| 6th | April 15, 2010 | • 2nd public hearing<br>(Fujisawa City, Kanagawa Prefecture; Digital Media Professionals Inc.; Hyogo Area Media Test Convention (Hyogo Prefecture); Kurihara City, Miyagi Prefecture; YRP R&D Promotion Committee) |
| 7th | April 16, 2010 | • 3rd public hearing<br>(NTT Docomo Inc.; Prof. Yuuji Oie, Dean of the Faculty of Computer Science and Systems Engineering, and others, Kyushu Institute of Technology; Prof. Shigenobu Sasaki, Professor, Niigata University; Japan Cable and Telecommunications Association; National Association of Commercial Broadcasters in Japan; Japan Broadcast Corporation; White Space Review Committee (Head Office, NEXT WAVE Co., Ltd.)) |

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| 8th | May 28, 2010 | • About the results of field surveys on utilization of radio waves<br>• About the results of the public hearings |
| 9th | June 18, 2010 | • About the results of the survey on trends in new wireless technology<br>• About “specific white space districts”<br>• About the results of the public hearings |
| 10th | | Not publicized |
| 11th | July 30, 2010 | • About decision on precedent “specific white space district” models<br>• About the report (draft) of the Review Team on a New Vision for Utilizing Radio Waves |