

Management and Improvement of Network Quality

Policy

KDDI Group

KDDI's Approach (Management and Improvement of Network Quality)

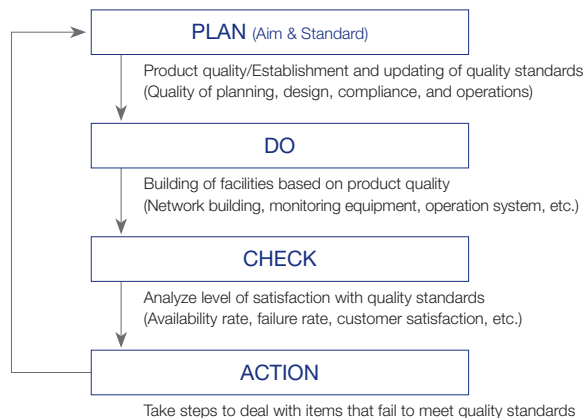
The mission of a telecommunications carrier is to provide a communications environment where customers can use mobile phones and smartphones easily anytime anywhere. KDDI will provide safe and secure communication services by engaging sincerely in every single operation from quality management and improvement of communication infrastructure, such as mobile phone base stations and switching equipment for fixed-line phones, to building next-generation networks.

System

KDDI

Network Service Quality Management System

KDDI owns an array of telecommunications facilities including optical



cables and mobile phone base stations, which it maintains and operates via technical centers situated throughout Japan.

The operations centers conduct centralized monitoring of telecommunications conditions nationwide 24 hours a day, 365 days a year. In the event of an outage, these centers control communications as appropriate, communicating with maintenance departments throughout Japan. With regard to communications service quality, we configure, analyze, and improve our facility operating system in line with the stringent standards that we have set for ourselves. In this manner, we strive to provide reliable communications services of consistently high quality.

Network Service Enhancement Project



KDDI is promoting a "Network Service Enhancement Project" with the aim of identifying and speedily rectifying issues, based on customer feedback. Through this project, we aim to solve problems promptly by using cross-departmental systems including sales, operations, products, technology and equipment.

System

KDDI

Frequency and Duration of Network Interruption

In the event that network failure or maintenance causes problems in communication lines that inconvenience our customers, KDDI will inform customers on the "Failure and maintenance information" page of our website.

-  [Failure and maintenance information \(for personal customers\) \(Japanese\)](#)
-  [Failure and maintenance information \(for corporate customers\) \(Japanese\)](#)

Policy

KDDI

Expansion of Service Areas (Base Station Facilities)

The mission of KDDI is to provide a stable call and data transmission environment 24 hours a day, 365 days a year. The population coverage ratio of au 4G LTE (800MHz platinum band) exceeds 99%. Nevertheless, we continue to upgrade base stations and implement various measures with the aim of improving network connection even in places where radio wave connection is considered to be difficult, such as busy downtown areas, subways and remote underpopulated areas.

System

KDDI

Expansion of 4G LTE Areas

To further improve communication quality, KDDI and Okinawa Cellular Telephone Company adopted 4G LTE. Currently, the population coverage ratio of au 4G LTE (800MHz platinum band) (maximum downlink speed of 75 Mbps) exceeds 99%, and customers can use our services easily even in remote islands and mountainous areas. Furthermore, the number of base stations that support a maximum downlink speed of 150 Mbps currently stands at over 30,000, and the population coverage ratio has reached about 90% as of March 2017.

System

KDDI

Building Mobile Phone Base Stations and Neighborhood Care

With the aim to provide a reliable communications environment to

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For au mobile phone users, KDDI sets up mobile phone base stations in all parts of Japan in order to support new services and improve service area quality. When building a new base station, we abide by the Radio Act, Building Standards Act, and other relevant laws and regulations as well as municipal ordinances and guidelines in order to implement the design and construction.

Furthermore, in cases where the construction is expected to cause a nuisance or inconvenience to the neighborhood (for example, due to the traffic of construction vehicles and noise from construction) or if we received inquiries regarding a mobile phone base station, KDDI provides general information about the base station and explanation of the construction work so that we can earn the understanding and cooperation of the neighborhood.

System

KDDI

Auditing of Base Station Equipment Production Plants

Because failures in base station equipment can lead to communication difficulties over a whole area, we conduct thorough quality management of equipment used in KDDI base stations, and perform audits at plants which produce the equipment.

Audits consist of strict checks of production processes and the production environment. If there are problems, we communicate them to the plant and take painstaking preventative action against breakdown of equipment.

<Specific Case Examples of Auditing>

- Ensuring that the 5S measures (Sorting, Setting in Order, Shining, Standardizing, and Sustaining Discipline.) are implemented properly
- Ensuring that the specified values are maintained within electrostatic protection areas

- Ensuring that the appropriate temperature and humidity are maintained within parts storage rooms
- Ensuring that the details of assembly procedures and visual inspections are clear, and that they are performed properly

Policy and System

KDDI

Safety of Electrical Waves

■ KDDI's Approach (policy)

In regard to radio wave safety standards related to KDDI mobile phones and KDDI mobile phone base stations in Japan, KDDI complies with the provisions of laws and regulations regarding radio waves and operates at an electromagnetic wave level below the Radio Radiation Protection Guidelines.

■ System

The Ministry of Internal Affairs and Communications created the "Radio Radiation Protection Guidelines" to enable the safe use of electromagnetic fields, and regulations have been introduced in accordance with these guidelines. The Radio Radiation Protection Guidelines are equivalent to international guidelines advocated by the World Health Organization (WHO) and were created to keep electromagnetic radiation within a range ensuring an adequate safety ratio, in accordance with the results of international research. Experts from WHO and other international institutions are in consensus that safety will be ensured if these guidelines are met.

We take great care to ensure that the electromagnetic radiation from our mobile phone base stations poses no threat to safety. In order to ensure this, we design, build, maintain and periodically inspect our mobile phone base stations in strict compliance with the relevant laws and regulations, including the Radio Radiation

Protection Guidelines stipulated in the Radio Law and the Building Standards Law, as well as local government ordinances. We also explain to residents in local communities that the radio waves transmitted from our mobile phone base stations comply with the standard values of radio radiation protection stipulated in the Radio Radiation Protection Guidelines.

In addition, we provide mobile phone terminals that comply with the permissible values for radio wave strength and radio wave absorption by the human body stipulated in laws and regulations relating to radio waves, and disclose that information on our website.

 [About the absorption rates of au phones \(SAR\) \(Japanese\)](#)

■ About Research to Ensure the Safety of Radio Waves

In November 2002, KDDI began conducting joint experiments with NTT DOCOMO Inc. and SoftBank Corp., using cells of human origin to evaluate the impact of mobile phone radio waves on living organisms. Some results of the experiments were issued in an interim report in 2005, and the final report issued in 2007 concluded that radio waves have no confirmed effect on living organisms at the cellular level or gene level. This research serves as an example of scientific evidence that refutes claims that radio waves have a cancer-causing effect on cell structure and function. It also reaffirms the safety of radio waves emitted from mobile phone base stations.

KDDI is also committed to providing accurate information to all. We will continue to actively collaborate with relevant organizations on research and testing relating to the impact of electromagnetic radiation from mobile phones on the human body and on medical equipment. We also continue striving to stay abreast of trends in research into the safety of electromagnetic waves, both domestic and abroad.

In addition, KDDI will continue providing information regarding

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the safety of radio waves emitted by mobile phone terminals via the website and other sources. When constructing mobile phone base stations, KDDI strives to provide adequate explanations in response to inquiries from local residents regarding the safety of radio waves, in an effort to ensure their full understanding and cooperation.

Organizations to which KDDI Belongs or Is Giving Its Cooperation

| | |
|----------------------|---|
| Affiliation | The Association of Radio Industries and Businesses |
| Affiliation | The National Institute of Information and Communications Technology (NICT) |
| Research cooperation | mobi-kids Japan (study that investigates the effects of mobile phones on health)  mobi-kids |

Activity

KDDI

Providing a Convenient Usage Environment

As part of detailed quality improvement efforts for each of our customers, KDDI offers "Signal Support 24" an after-sales support service concerning radio wave problems, for all customers using au mobile phones. In this service, KDDI staff visit the homes of customers who have inquired about signal quality and examine the reception condition for au mobile phones. KDDI contacts the customer to set up an appointment within 24 hours of their inquiry. KDDI then implements service area improvements using au Femtocells or au repeaters.

We accept inquiries about signal quality not only in homes, but also outdoors and in offices and restaurants. The number of proposals KDDI made for measures to improve signal quality in 2016 was about 40,000 cases. We will continue to strive to improve service

area quality as well as deliver a reliable communication environment.

 [Signal Support 24 \(Japanese\)](#)

Policy

KDDI Group

Approach to Next-Generation High-Speed Communication

The mobile network that supports communication on smartphones and mobile phones has evolved from the first generation (1G) to the fourth generation (4G) together with changes in the times and lifestyle. KDDI is engaged in research and development of next-generation mobile communication systems in order to provide communication services with greater stability and higher speed than currently to customers, and to promote dramatic change in ICT network infrastructure.

Activity and Results

KDDI Group

Advancing Research on 5G

With the evolution of devices and the proliferation of IoT, mobile networks are required to perform at much higher levels than expected so far. KDDI is conducting tests on the 5G next-generation mobile communication system (5G) that allows a massive number of high speed and high capacity connections to be made at low latency with the goal of launching 5G services around 2020. Research is being conducted throughout the world to study the potential for utilization of high frequency bands including 28GHz to achieve high speed and high capacity communication under 5G.

In May 2017, for the first time in Japan, KDDI and Japan


Broadcasting Corporation conducted tests on real time transmission of 8K video from moving vehicles using 5G technology.

Furthermore, in the same month, KDDI and Secom Co., Ltd. conducted tests of an advanced security system using 5G in the age of IoT, and we were the first in Japan to succeed in transmitting videos from multiple 5G devices using multi-user MIMO*.

* This is a technology that allows multiple users to transmit and receive large amounts of high-speed data simultaneously by using several antennas from base stations.

Other Initiatives Related to Advancing Research on 5G

 [About promotion of the 5G testing project in the Technology Testing Office of the Ministry of Internal Affairs and Communications \(Japanese\)](#)

 [KDDI, OBAYASHI Corporation and NEC conducting tests on remote operation of construction machines using 5G \(Japanese\)](#)

Activity and Results

KDDI

Initiatives in Remote and Underpopulated Areas

KDDI is engaged in initiatives that aim to provide a constantly available smartphone and mobile phone connection in remote and underpopulated areas as well. The population coverage of KDDI's 4G LTE 800MHz platinum band has reached 99%. In 2017, we are working on not only population coverage, but also further expansion by implementing measures in tourist areas that see an increase in customers according to the season. As an example of our initiatives in remote areas, one of KDDI's efforts to support a safe and comfortable mountain climbing experience on Mt. Fuji is to provide coverage at the peak of Mt. Fuji during the climbing season, which KDDI has been

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doing every year since 2009. In addition, 4G LTE communication can be used at the starting point of the mountain trails and along the trails throughout the year.

Activity and Results

KDDI

Overseas Initiatives

KDDI is striving to provide high quality and highly reliable services in various countries based on a global network linking all parts of the world and a data center "TELEHOUSE" among other things. In addition, to allow smartphone and mobile phone subscribers in Japan to use KDDI services safely and comfortably even when they are overseas, we expanded coverage of the "au World Service" which lets customers use their au mobile phones overseas by making use of partnerships with overseas telecommunications carriers that we have cultivated in the course of providing international telephone services for more than 60 years. In July 2016, we started the "World Data Flat" service which allows customers to use data communication overseas in the same way as when they are in Japan at a flat rate for 24 hours.


Maintenance and Operation of Global Network

KDDI connects communications providers around the world to their networks. In cooperation with these companies, we maintain and operate a global network linking all parts of the world. As well as offering high quality international communication services using highly reliable optical fiber submarine cables, KDDI aims to offer services using new technologies centered on its IP services.

Submarine cables provide 99% of Japan's international traffic*, making them an important component of the social infrastructure. Moving forward, KDDI aims to provide an unprecedented level of reliability in communication services for the Asia-Pacific region,

where demand is expected to continue growing. In addition, through partnerships with companies such as INMARSAT and Intelsat, KDDI offers services using satellite communications, enabling call and data transmissions to anywhere in the world, including ships at sea, airplanes, the South Pole, other remote areas and islands where cables do not reach.

* According to research by KDDI.

-  Complete opening of "TELEHOUSE LONDON Docklands North Two" (Japanese)
-  Starting of "World Data Flat" service which can be used in the same way as in Japan at 980 yen a day (Japanese)
-  INMARSAT service