

Research and Development



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To contribute to realizing safe, secure, and prosperous societies, the Anritsu Group has development centers in Japan, the United States, Europe, and the rest of Asia. These centers conduct R&D for creating “Original and High-Level” products and services.

In the Test and Measurement business, Anritsu, the Anritsu Company (in the United States), Anritsu Ltd. (in the United Kingdom), Anritsu A/S (in Denmark), and other locations work together cooperatively by mutually sharing the technologies they have to realize synergies.

In the PQA business, Anritsu Infivis conducts R&D in Japan and Thailand.

Also, separately from the R&D of the business segments, Anritsu’s Development Center conducts R&D in cutting-edge and core technologies.

Basic Policy

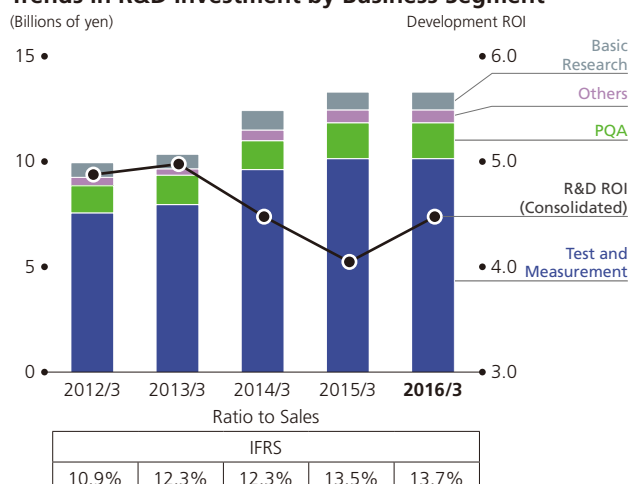
In the communications industry, where the pace of technological progress is high, research themes are growing in number at an accelerating pace, especially in the mobile field Test and Measurement business. Amid this business environment, Anritsu’s business segments manage their investments in R&D with an emphasis on return. Accordingly, they work to increase investment efficiency, and the Development Center aims for the creation of cutting-edge technology.

The key performance indicator (KPI) is Development ROI (gross profit/amount of the development investments) equal to or greater than 4.0.

Principal Research Results

- Measurement equipment for mobile development: New product news releases
(For LTE-Advanced (DL CA 3/4/5CCs and other applications)
- R&D for expansion of wave resources for Japan’s Ministry of Posts and Telecommunications
Measurement technology for broadband/high sensitivity 300GHz band wireless signals (Project commissioned in fiscal 2015, scheduled for completion in fiscal 2018)
- Measurement devices for network infrastructure:
Improvement in Functions
64Gbaud 2-bit D/A converter for use in PAM4 signal generation with 400GbE specifications

Trends in R&D Investment by Business Segment



Global R&D System

To offer products and services in keeping with Anritsu’s corporate philosophy, which is “Original & High Level,” Anritsu has developed a global R&D system. Overseas R&D bases are engaged in research in Anritsu’s two main businesses of Test and Measurement and Products Quality Assurance (PQA). Each of these bases draws on its particular strengths in conducting R&D. In Japan, R&D activities tap Anritsu’s comprehensive strengths to raise the level of sophistication and finish of products and services through combinations of hardware and software. In Europe, there is a trend toward standardization of communications specifications, and R&D bases in this

Global R&D Centers



region focus on taking best advantage of their superior geographical location vis-à-vis specification development, etc. In the United States, R&D activities are located in close proximity to customers to generate best results. On the research side, the units responsible for core technologies are (1) the Advanced Technology Development Center located in the Technical Headquarters, which is carrying on previously ongoing research, and (2) the Device Development Center that supports the semiconductor-related business.

Each of the development centers in the business segments pursue development directly related to their respective businesses, while, on the other hand, the Advanced Technology Development Center, in addition to research and development that looks several years into the future, handles R&D

themes that are shared in common across the Anritsu Group or themes selected from a cross-divisional perspective. These themes include antenna-related OTA* technologies, which are component technologies related to fifth-generation (5G) mobile communications, which will be a future growth driver. Other themes include those related to improving contaminant inspection equipment by incorporating machine-learning technology, which is related to artificial intelligence, into X-ray imaging technology to improve resolution.

Anritsu positions intellectual property, which a source of growth, as an important management resource. In addition to a compensation system for patent applications and patent registrations, Anritsu provides compensation for actual results, and Anritsu's R&D and intellectual property departments work together to support business development. Technical personnel are ranked with the Company along with core managerial personnel under Anritsu's personnel management system. If we can find outstanding technologies, there is a possibility that we will select and promote younger people with excellent qualifications, and they will be highly motivated in their R&D work. Anritsu also works to provide environments where personnel in the R&D workplace can communicate with other researchers, and we believe this contributes to maintaining motivation.



Example of OTA testing technology: Near-field test with a massive MIMO antenna

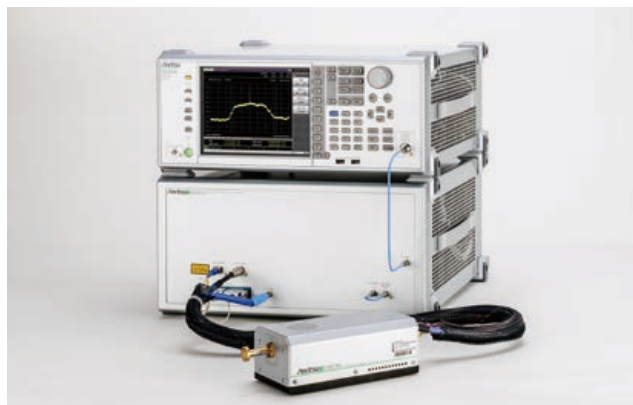
* OTA: Abbreviation for Over The Air and means "via wireless communications." This expression is used when data from an external memory device is transmitted and received via wireless communication.

■ Technological Strengths and Priority Strategic Domains

The milli-wave-related measurement technology development undertaken by Anritsu's Technology Headquarters for

spectrum analysis in ranges over 100GHz can be used with the products of the Anritsu Group. In addition, Anritsu's Device Development Center, which is working on optical and electronic devices for use in semiconductor element development, is also working on the development of semiconductor laser diodes and heterojunction bipolar transistor (HBT) type ICs. The high speed of HBTs is particularly important, because, as communications test equipment, the quality of wave shapes (whether they are clear or not) is an important concern as speeds of transmission increase and high-performance devices are required. This cannot be measured if the device receiving the wave is of lower quality, and, therefore, high-performance key devices are required. Since these devices cannot be sourced externally, Anritsu's capabilities for developing these in-house is an important strength.

For the technologies of its core products, Anritsu insists on in-house production, and we believe that further brushing up is needed. The department responsible for this brushing up of core technologies is the Advanced Technology Development Center of Anritsu's Technology Headquarters and the Device Development Center.



110GHz to 140GHz millimeter-wave spectrum analyzer

■ Intellectual Property and Quality Assurance

Anritsu has positioned 5G and related systems as an important theme. Anritsu's technological personnel and Intellectual Property Department consider whether some elements of the R&D research, etc., can be patented, and patents are applied for wherever possible. Over the past two to three years, the number of patent applications has been on the decline, in part because of closer examination of the content, but, as a result, has been that the number of patents obtained annually has been constant.

Regarding quality, since wireless-related items have become the main source of sales in the Test and Measurement business, although this will be difficult, Anritsu

believes that increasing the quality of software products is an important theme. In other areas, Anritsu is also taking initiatives to increase the quality of product design at the development stage and increasing yields in manufacturing departments. In addition, to prevent defects at the parts level, Anritsu regards acceptance inspections as important.

At Anritsu, personnel in charge of quality control from each division meet periodically to exchange information and engage in the PDCA quality management. While there are not many cases on an annual basis, information on product defects that have occurred is made available on a Company-wide basis, and systems have been put in place to avoid recurrences. Especially as regards devices, systems have been created to garner full information on arrival about the quality of device products manufactured in-house and those of outside suppliers and vendors.

■ Promoting Environmental Management

At Anritsu, we believe that we are working to raise corporate value by responding to the requirements of global society through conducting corporate activities earnestly and sincerely and, thereby, contributing to finding solutions for the issues that society confronts. We are actively promoting environmental management, and, from the development stage to the final commercialization stages and in all our value chains, we are emphasizing environmental issues. From the product level, we are working to manufacture products that are energy-conserving and resource-saving, and can be recycled. In addition, we are also required to comply with laws and regulations. We use parts that meet Restriction of Hazardous Substances (RoHS) and Registration, Evaluation, Authorisation and Restriction of Chemical Substances (REACH) requirements, and, when procuring parts and materials, we are in the process of conducting thorough checks of our suppliers not only in Japan but also in overseas Group companies and/or subsidiaries.

The systems specified under ISO were established about 20 years ago, and all businesses are working steadily on their implementation. In particular, during the current fiscal year, Anritsu will make the transition to the 2015 version of ISO 9001 and ISO 14001. Since there are many overlaps between ISO standards for environmental management and quality, this work is moving forward mainly through the initiatives of the Environment and Quality Promotion Department.

Note: For more information on Anritsu's R&D please refer to the *Anritsu Technical Review* at the following URL
<https://www.anritsu.com/en-US/about-anritsu/r-d/technical-review>