

From President of Measurement Business Group



Become a Leading Company Supporting 5G/IoT Society

To play a role as a company
supporting the commercialization
of 5G

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Upon entering the 21st century, the Test and Measurement business was struck by three major recession periods. Following the bursting of the IT bubble and the financial crisis, we are currently entering the transition period from the Long-Term Evolution (LTE) era to the 5G era of high-speed wireless communications, the profit margin is significantly lower than the long-term target, and we are in the middle of an era that is beset with difficulties.

Under the new Mid-term Business Plan GLP2020, we are certain to catch the new 5G wave and place business performance, which has been on a downward trend, back on a growth route. In addition to the communication measurement market, which is susceptible of volatility, under the next mid-term business plan that will follow GLP2020, we will aim to develop new business initiative pillars, for example in fields that utilize 5G or areas that do not rely on the communication measurement market.

Possessing competencies in “Measuring,” Anritsu is one of the few companies that have played a role in supporting a society that is a safe, secure, and prosperous place to live. Taking pride in this role, we will contribute to the development and prosperity of society.

Review of GLP2017


Having adopted “we will acquire global business opportunities with highly value-added solutions and firmly position ourselves as the global market leader” as our vision under the Mid-term Business Plan GLP2017 (fiscal 2015 to fiscal 2017), we established and worked to achieve target fiscal 2017 revenue of ¥90.0 billion and an operating margin of 15%.

From fiscal 2015, the first year of the Plan, however, the dramatic change in the mobile test and measurement market (the shrinking of the mobile manufacturing market and consequent saving of investments by major players) and the sluggish demand for base station construction in the North American market had a major

impact on our business performance. As the downward trend continued even into fiscal 2016, the Test and Measurement business was forced to make a downward revision of its performance and made changes to the GLP2017 plans.

Amid a rapidly shrinking test and measurement market, the Company worked on its managerial restructuring program REBORN-M and thoroughly instilled three main measures: refocusing investment, refocusing capital, and refocusing time. We also worked to secure profits, including the carrying out of measures designed to slim down our organization in North America. In contrast, we did not neglect the investment needed to surely catch the 5G/IoT wave that represents our next growth driver.


A Safe, Secure, and Prosperous Society Realized by 5G/IoT

Ultrahigh speed

Speed **100** times faster


Download a two-hour movie in three seconds



Ultralow latency

Delay time **1** ms

Precision control of a robot in a remote location in real time



Multiple simultaneous connections

Number of simultaneous connections **100** times greater

Nearby devices and sensors connected to the Internet

As a result of these initiatives, in fiscal 2017 our revenue amounted to 54,433 million yen and our operating margin was 3.4%.

A Safe, Secure, and Prosperous Society Realized by 5G/IoT

For services up to and including 4G, the main focus was on advancing the speed of voice and data communications, mainly for smartphones.

In the case of 5G, communications will penetrate new areas, such as IoT, automobiles, industrial areas, and smart homes. For example, autonomous cars are about to revolutionize the automobile industry. Experiments utilizing 5G communications, such as running a convoy of trucks on a highway, have begun. In the construction field, attempts are under way to utilize 5G's real-time properties and large-capacity characteristics to remotely control heavy machinery in real time while watching 4K video.

As communications spread into a wide range of areas in this manner, demands for communication reliability will also increase. For example, there must be no acci-

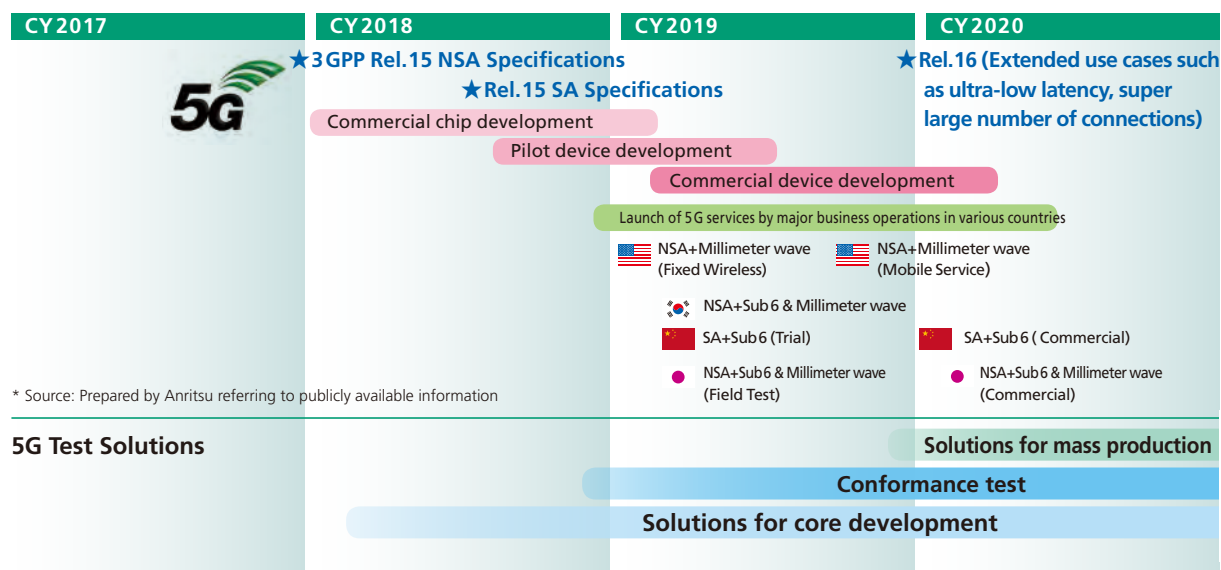
dents caused by communications being interrupted during automated operations. Also, if the quality of communication cannot be guaranteed by remote control, actual operations will be difficult. Anritsu will use its competencies in communication measurement that the Company has cultivated over many years to support 5G's usage in various industrial areas.

To Support 5G Commercialization

■ Mobile Measurement Market Environment

In 2012, the waves of the two demands of instruments for use in LTE development and 3G smartphone manufacturing instruments overlapped, and the scale of the mobile measurement market peaked. Subsequently, due to slowing growth in shipments of smartphones, mergers and acquisitions due to intensified competition among chipset vendors and smartphone vendors, the size of the mobile test and measurement market had shrunk to 40% of its peak at the end of fiscal 2017. Although representing the mobile test and measurement market of the future, the 5G initial development shift is ahead of schedule in the cellular test and measurement market,

5G Service Road Map



and it is expected that they will expand from 2018 onward. We are expecting the market will peak around 2022 to 2023, but we anticipate that it will remain only around 70% compared with 2012.

Meanwhile, together with the expansion of mobile broadband, 5G is expected to expand new demand due to the spread of IoT/automotive and 5G utilization. Factoring in this new demand, we believe that there is a possibility the mobile test and measurement market from 2022 onward may exceed its 2012 peak.

■ Latest Road Map for 5G Service

Under the 3GPP, standardization of 5G NSA-NR was completed in December 2017. Following that, 5G SA-NR standardization was finalized in June 2018, and all specifications for 5G's primary functions have now been established.

Non-Standalone, New Radio (NSA-NR), a format intended to bring about 5G service, is based on the premise that it will be used not solely with 5G, but in tandem with 4G. On the other hand, Standalone, New Radio (SA-NR) is a format where 5G service can be realized independently. Worldwide, NSA-NR is becoming the primary format, although in China, 5G is expected to be rolled out based on SA-NR.

In addition, the two frequency ranges that are under consideration for use in 5G are millimeter waves and 6GHz and under (Sub6GHz). The frequency ranges used by operators around the world vary.

In the United States, service is scheduled to begin from the latter half of 2018. Commercialized services are expected to be available in Korea from 2019, and in China and Japan from 2020.

Leading up to the commercialization of 5G, chipsets for 5G will be available in the first half of 2018, and using those sets, from the latter half of the year, tablets, smartphones, and other pilot devices will be developed.

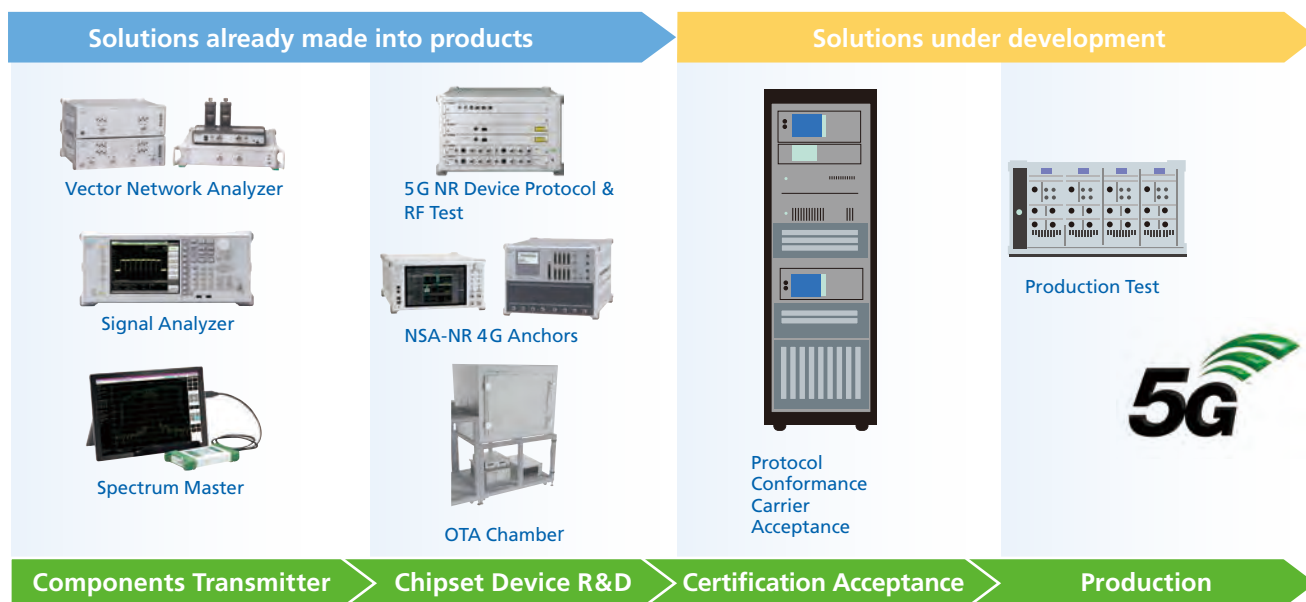
■ 5G Chipset, the Communications Device Development Tester MT8000A

In April 2018, Anritsu introduced to the market its MT8000A radio communication test station, a tester used for the development of 5G chipsets, terminals, and other devices. The MT8000A functions as a pseudo base station, and, by wirelessly connecting it to a chipset or a smartphone or other communications device equipped with such a chipset, it can be used to evaluate functionality and performance. It possesses the flexible scalability to match the evolution of specifications, making it possible



MT8000A radio communication test station

5G Solutions Road Map



to use with 3GPP's latest 5G NR specifications, and it can handle a variety of testing conditions. It can also be used with Sub6GHz and millimeter wave frequencies necessary for 5G NR.

While 5G terminals use the millimeter wave range, frequency bandwidth is broad, and, because there are many antenna elements, there is no conventional external RF connector for measurements. Moreover, the use of beamforming requires an assessment of directivity. As such, new OTA (Over The Air) and broad bandwidth compatibility is required in 5G measuring equipment. Combining the MT8000A with the OTA chamber (anechoic box) enables both millimeter wave band RF measurements and beamforming tests using call connections specified by 3GPP.

High-frequency (millimeter wave) measurement technology

For low-frequency



Accurate measurements are possible with a cable connection.

For high-frequency (millimeter wave)



Accurate measurements are possible with Over The Air (OTA) using chamber.

Anritsu-Provided 5G Solutions, from Development to Manufacture

Anritsu is planning to deploy test solutions that will support customers at every 5G business phase, from development to manufacture. In May 2017, we launched onto the market the MS2850A signal analyzer equipped with the 5G NR dedicated analysis function necessary for the development and manufacture of 5G base stations and terminals. The MT8000A introduced above is a tester and measuring instrument used at the development stage of, for example, chipsets and communications terminals.

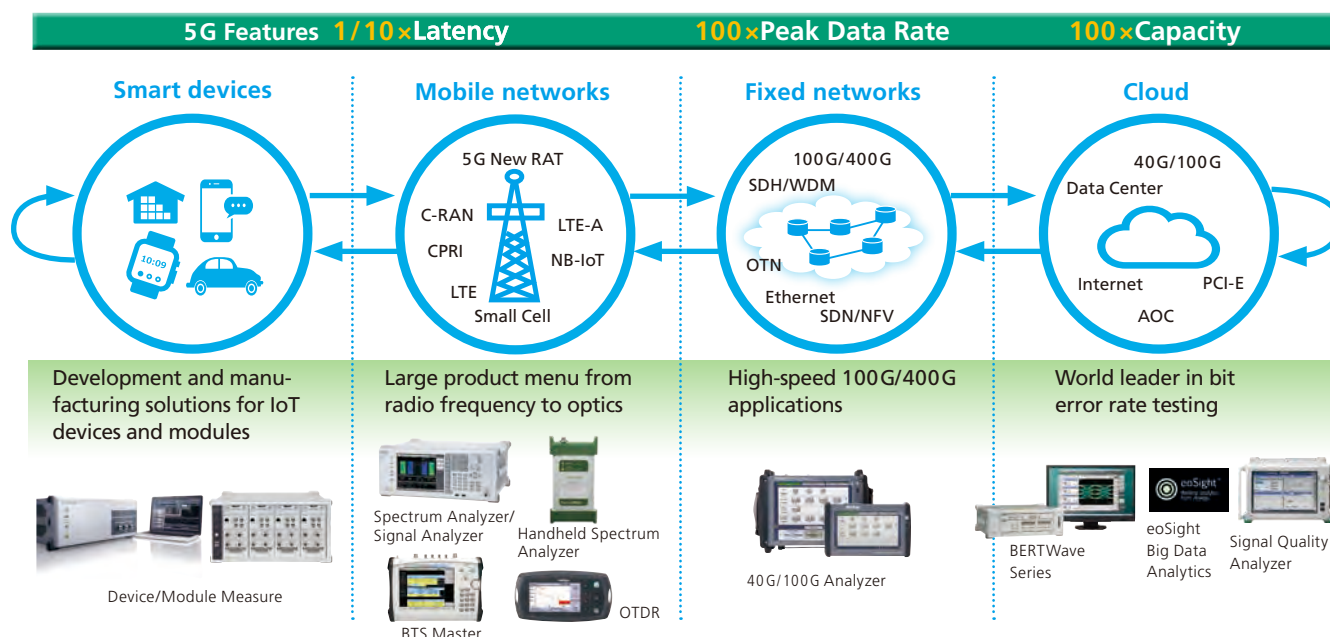
Subsequently, as terminal development for 5G services progresses, demand for conformance test systems will emerge. As 5G services become full-scale, demand for mass-production solutions for 5G terminals will also emerge. Assessment by OTA is required even in the mass production inspection process of 5G millimeter wave communications terminals.

Compared with conventional LTE terminals, which can be measured by cable connection, it is a time- and labor-consuming inspection process, and thus the provision of solutions to efficiently perform OTA testing is being demanded.

We are planning to sequentially launch onto the market measurement solutions that will be indispensable for making these 5G services more widespread.

From President of Measurement Business Group

Anritsu solutions for supporting 5G network



■ Service Infrastructure Solutions for Supporting 5G/IoT

More than just the evolution of wireless networks is needed to realize 5G. In association with the evolution of 5G, the loads placed on wired networks, cloud services, and data centers will also increase.

While we will also introduce new technologies for wired networks, the expansion of network capability is advancing at a rapid pace. To respond to the use of AI and increase of Big Data, there are demands for data centers to be scaled up, further speed up, and have improved reliability.

With regard to the infrastructure supporting these 5G developments, we also provide Original, High-Level technologies and a wide range of product lineups to customers.

GLP2020

Become a leading company, supporting 5G/IoT

■ GLP2020

Under GLP2020, three growth drivers were decided: (1) 5G, LTE-Advanced; (2) IoT/automotive, connectivity, and (3) IP data traffic/cloud services.

The standardization of all 5G major functions specifications has been completed with 3GPP Release 15, and up to 2020 services centered on “high speed and large capacity” are being deployed, and we believe that popu-

larization utilizing the mission-critical features of 5G will be from 2021 onward. Accordingly, we consider three years of GLP2020 as the initial stage of 5G development and are looking ahead to the period after 2021, when full-scale operations of 5G will be underway, to increase the profits of the existing LTE business and which we are positioning as the phase for investment in 5G. LTE, however, is on a downward trend, and there remains the risk that the LTE market will shrink more than expected. Therefore, we have to watch the trend in the LTE market carefully, and to control 5G development investment properly.

In fiscal 2018, the first year, we are certain to capture initial 5G demand and aim to achieve revenue of 60 billion yen and an operating margin of 6%.

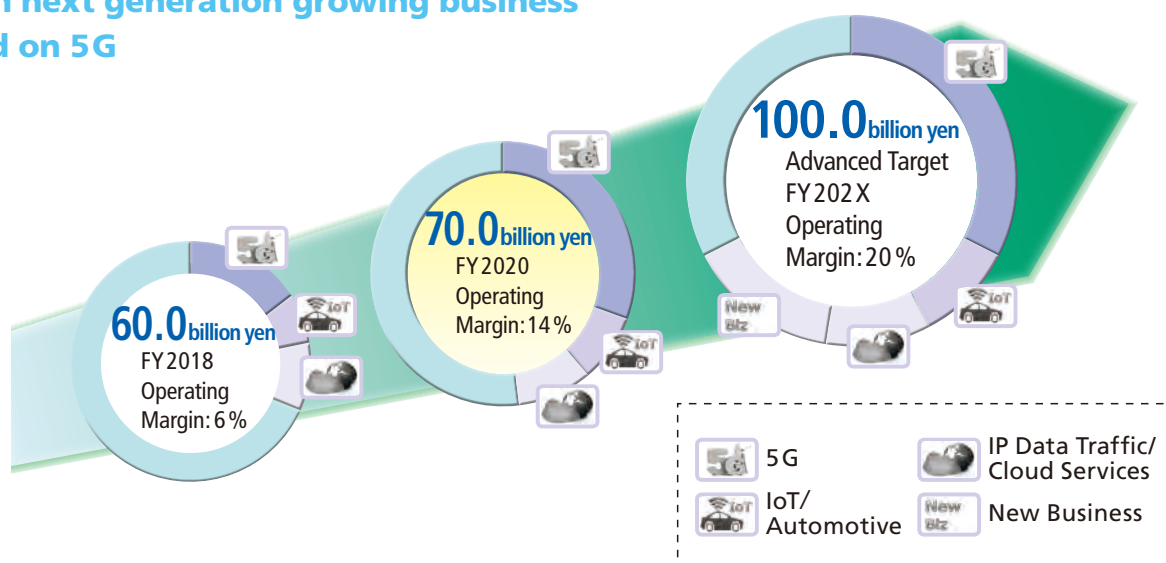
Responding to the evolution of standards such as 3GPP even after hardware delivery, our mobile business is a stock-type business that earns by providing software recurrently. From 2018 to 2019, we will steadily acquire market share by customers purchasing 5G measuring instrument hardware at the initial demand stage of 5G. After that, we will surely earn revenue in the software business and aim for revenue of 70 billion yen and an operating margin of 14% in fiscal 2020.

■ Toward Next Period GLP2023

Under GLP2020, we were unable to formulate a plan aiming for an operating margin $\geq 20\%$, which is a guide-

GLP2020 Revenue and Operating Profit Plan

Establish next generation growing business centered on 5G



line for medium- to long-term business goals. That will provide a challenge for the next period, GLP2023. Beginning in 2021, in addition to the 5G cellular test market, new needs are expected in industrial fields that utilize 5G, such as IoT/automotive. Under GLP2023, the plan will be to further accelerate the three growth drivers focused on under GLP2020, to launch new businesses and to bring about sales growth. For that reason, we will work intensively on the emergence of business activities, including M&A measures, during the GLP2020 time-frame.

The peak of the 5G cellular test market is predicted to be around 2022 to 2023. Therefore, the urgent business is to set up in advance a growth driver that does not depend on the cellular measurement market. Regarding our strengths in measurement technologies as the core, the markets and business areas regarded as targets are the areas and peripheral fields, including the automotive market where dramatic social change is anticipated, where applications that exploit the features such as 5G's high reliability and low latency will become widespread. We aim to realize the above growth scenario, with net sales of 100 billion yen and an operating margin of 20%. We do not expect to be able to launch a new business easily, but will lay the foundations for the next development and work towards stable corporate management by taking resolute decisions.

Social Value Provided by Test and Management Business

To build a strong communications networks with no digital divides and to realize a safe, secure, and comfortable 5G/IoT society have become major social issues.

By means of its measurement technologies, our Test and Measurement business will contribute to the development of strong network infrastructure that safely and securely connect everything by providing solutions that assist in the development and manufacture of 5G/IoT systems, the construction of communication networks as well as the development and manufacture of mobile devices and electronic devices. For example, although IoT communications technology is applied to intelligent transport systems (ITS), it also leads to a reduction in congestion and traffic accidents, thereby contributing to a comfortable city life and the provision of a means of transportation.

In this way, the Test and Measurement business possesses the potential to provide a lot of social value. Developing safe and secure infrastructure, in the years to come, we will contribute to the creation of industries and the promotion of innovation that will lead to the construction of a sustainable society.