

Current Status of International Mutual Recognition and Future Directions

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Measurement Standards in Everyday Life: Development and Maintenance

As our modern world grows more complex and advanced, the measurement standards on which it depends continue to expand both in the types of standard measures established and the purposes to which they are applied. The requirements upon which various quarters of society insist for these standards are demanding and complex: Technological development depends on uncompromising precision; manufacturers must find the standards easy to use for quality-control purposes; the array of available reference materials must be wide-ranging and comprehensive, to be an effective tool in environmental regulation, and so on.

Moreover, each country must underwrite the reliability of these measurement standards. The role of NMIJ/AIST is to create and support national standards and disseminate the measurement standards introduced. Thereby, it can

provide a guarantee of reliability to people everywhere who use and depend on measurement results. The people who receive these measurement results from NMIJ use them to supply measurement standards at the next level, which in turn informs the next level of standards, until the work of NMIJ pervades every facet of modern Japanese society.

Of course, the chain is no stronger than its weakest link: reliability must be vouchsafed in every part of this process of supplying measurement standards. This is why traceability, the series of links that join these various measurement standards together to ensure their reliability, is extremely important. NMIJ is the organization that creates the framework that guarantees the traceability of measurement standards to Japan's national standards.

The Deployment of International Mutual Recognition and Japan's Response

With the relentless advance of globalization, imported products are bought

and sold and technologies exchanged with ever-increasing frequency. When this happens, if the mutual traceability of the measures — the measurement standards — on which they are based cannot be guaranteed, evaluating the product or technology correctly becomes impossible. Because it is impracticable to verify this traceability every time a product is sold or a technology is transferred, the international community has struck upon the idea of guaranteeing the inter-reliability of each measurement standard in advance, so that mutual traceability can be guaranteed whenever the occasion demands. This system of measurement standards is known as International Mutual Recognition.

In Japan, the institution that is responsible for International Mutual Recognition is NMIJ. To fulfill its responsibilities, NMIJ continuously conducts international comparisons of national measurement standards and peer reviews by measurement standard experts. Under the Meter Convention, for example, in 1999 the national metrology institutes of numerous countries signed a mutual recognition arrangement. Preparations are being made to put this agreement in force from 2004 forward. As an enthusiastic participant in this arrangement, NMIJ has published an impressive body of outstanding results in international comparisons and enjoys a sterling reputation on the international stage.

NMIJ's brief differs from region to region. In the Asia-Pacific region, with whose countries and regions Japan has long enjoyed especially close ties of business and technological development, NMIJ has taken a leadership role in improving the region's measurement standards technologies. In the markets of North America and Europe, assuring quantitative and qualitative accuracy in measurement standards is an important issue in supporting the competitiveness of Japanese products and technologies.

The Next Five Years: Targets and Challenges

NMIJ follows a road map (Figure 1) that calls for the creation and dissemination of some 500 national standards, over the 10-year period from the beginning of its first four-year plan (2001–2004). In scope and ambition, this road map is the equal of that pursued by the United States. The basic component of this road map involves the preparation of some

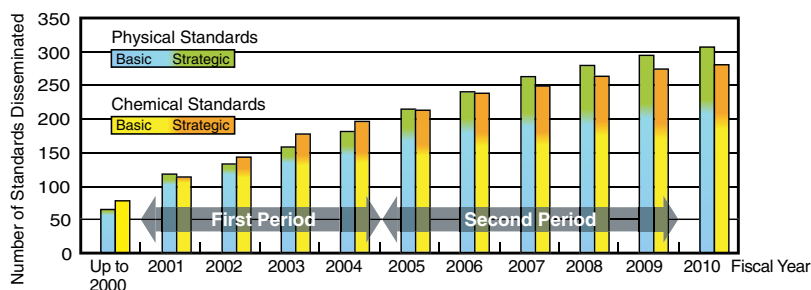


Figure 1: NMIJ's plan of measurement standards

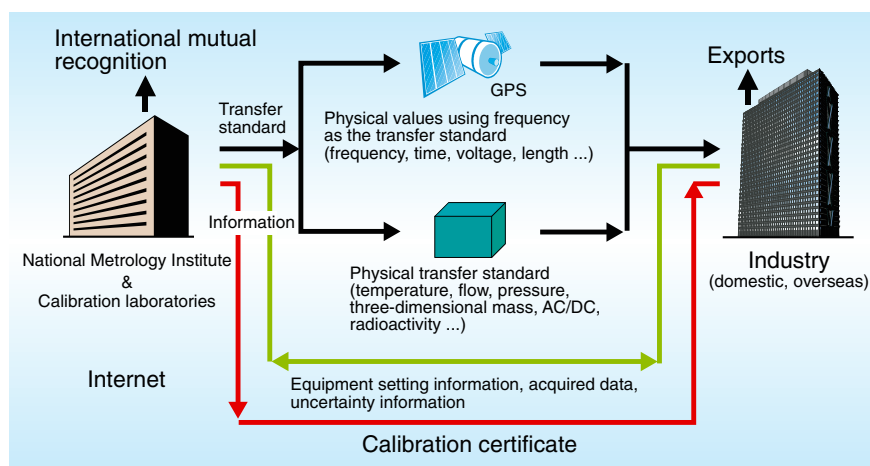


Figure 2: New format for dissemination of standards (remote calibration: e-trace)

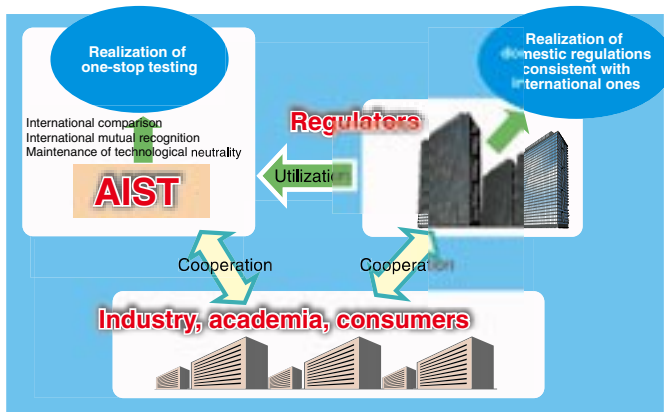


Figure 3: System for reliability and international consistency in measurement



Figure 4: Japan's response to the emerging tri-polar leadership structure in the world

300 standards. NMIJ is steadily pressing forward in the execution of this plan. In the second four-year plan, beginning fiscal 2005, NMIJ will augment this basic corpus of standards, aiming to establish and extend measurement standards in certain strategic fields, in view of Japan's global position in the world of industrial technology.

Unlike the national metrology institutes of other advanced countries, AIST incorporates not only National Metrology Institute of Japan (NMIJ), but a host of other agencies as well, devoted to the fields of biotechnology, the environment, energy and IT. It also conducts vigorous programs of exchange in each category. As such, NMIJ can be expected to create national standards that will lead the world in reference materials for biotechnology, clinical pathology, medicine, the environment and nanotechnology, and in technologies for evaluating the reliability of instrumentation software.

Today's industries require flexibility in the dissemination of measurement standards. Users must be able to choose the level of reliability that is appropriate for them, according to the time and cost required to obtain the standards. Accordingly, NMIJ will be hard at work technically optimizing the formats by which measurement standards are delivered. We are developing remote calibration technologies, using electronic communications and IT to deliver highly reliable

measurement standards to users in remote locations (Figure 2). These efforts include ongoing research to speed up the supply of time and voltage standards and to develop new formats for the supply of radioactivity and temperature standards.

Another issue of vital importance at NMIJ is the development of greater reliability in national and international standards. As described above, NMIJ is participating in joint international research on the Avogadro constant to develop a new generation of highly accurate standards for mass that do not depend on artificial physical models for the kilogram. It is using alloys to establish standards for high temperatures. In all of these critically important efforts, NMIJ plays a world-leading role.

Emerging Needs in Measurement Standards

As those fields in which measurement standards are used continue to expand, it is of paramount importance to ensure that measurements conducted in Japan can be reliably traced to international measurement standards. This process of traceability forms part of the technological bedrock underpinning the sustainability of economic activity and R&D in Japan. To execute this process smoothly, a nationwide system must be designed for the creation and dissemination of national standards, to ensure traceability in the standards used

to materials and technologies and in the regulations that govern society. Industry, government and academia must work closely to introduce a level of sophistication beyond that of conventional physical and chemical standards (Figure 3).

The call to action is no less urgent on the international front, where the contours of the process are often shaped by conflicting national agendas. The United States continues to insist strongly on its own national measurement standards, while the European Union is busily unifying measurement standards as it knits itself into a cohesive economic bloc. Moreover, the Asian-Pacific region is emerging as factory to the world and an immense market in its own right. Consequently, these three different powers form a tri-polar configuration strengthening internal ties within themselves (Figure 4). Under these circumstances, expectations are high both at home and abroad for Japan to continue to play a leadership role in the Asian-Pacific region. To serve such expectations, surrounded by a unique jumble of advanced industrial powerhouses and developing nations, Japan should keep making suggestions as to what direction the region should take with regard to measurement standards. At the same time, Japan should show her presence on the world stage by maintaining a high global profile for Japan's measurement standards.