

Speech in honor of World Metrology Day

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Metrology, a theme of eternal value, while enjoying a long history, continues to grow and shine in this day and age. With the units of measurement being the cornerstone of a measurement system, World Metrology Day has chosen "Constant Evolution of the International System of Units" as the theme of this year, which is a reflection of the changing times and the revolution of metrology. On this very day 143 years ago, that is May 20, 1875, representatives of seventeen nations, including those of France, Russia and Germany, signed the "Metre Convention", which universally acknowledged "the metric system" as the international system of units. The convention also established a basic measurement system which enables the transfer of measurement values among countries based on physical benchmarks. With time, an international system of units of measurement consisting of seven base units was established. The seven units are those of time, length, mass, thermodynamic temperature, electric current, luminous intensity and amount of substance, which, in the following more than 100 years, serve as a metrological foundation to ensure the traceability, accuracy and consistency of the measurement values across the world, facilitate the rapid development of science and contribute to the global economic integration. With the development of quantum theory and technology since the 1960s, the time unit "second" and the length unit "meter" have gradually transitioned from using a physical benchmark to using a quantum benchmark, which in turn led to the quantum transformation of other units of measurement, bringing about vibrant scientific and technological revolutions. At present, significant changes in international metrology will soon be unleashed on a full scale and a new era of fully quantized measurement units will be ushered in.

The quantum evolution of the international system of units represents yet another major reform humanity brought about in utilizing natural laws to create measurement rules and its subsequent impact will be profound and widely-felt. Firstly, it will change the international measurement system and the status quo. The new measurement system will no longer just rely on physical benchmarks to transfer measurement values to countries. The quantization of the international measurement benchmarks and the flattening of the traceability of value transfer will form an advanced multilevel global measurement center or regional measurement centers to carry out the traceability of value transfer. Secondly, it will bolster the new round of industrial revolution. The combination of quantum measurement benchmarks and the information technology will shorten and speed up the value transfer chain with more accurate and reliable measurement results, which highly accords with the new round of industrial revolution based on cyber-physical systems and characterized by intelligent manufacturing. Thirdly, it will trigger disruptive innovation and development in the instrumentation industry. With the high integration of new quantum metrological technologies, sensor technologies and information technology, all units of measurement can be traced to the time unit "second" and comprehensive measurement with multiple parameters and high-precision can be realized, thus giving birth to total innovation in the forms of measurement instrumentation. On a deeper level, the quantization evolution of the international system of units is an all-round revolution which extends from concepts, institutions to various fields.

After years of efforts, China is now ranked no. 4 in the world and no. 1 in Asia in terms of the calibration and measurement capacities that have received international mutual recognition and it has made significant contributions in the redefinition of international units such as those of length, temperature and electricity. At present, the metrological undertakings, just like the quantization evolution of international system of units, are also caught in the new waves of revolution and innovation. The new international system of units enables the reproduction of measurement benchmarks anytime anywhere, making it possible to apply the most accurate "ruler" directly to production and life. This will drive reforms and innovations of metrological management modes centered around physical measurement instruments. Meanwhile, the recent establishment of State Administration for Market Regulation, which are guided by the concepts of Big Market, Big Supervision and Big Quality, has laid a solid foundation for the reform and

innovation of the measurement system, and is conducive to the further development of the fundamental role of measurement, thus making measurement better serve the quality development of the economy and society.

Metrology has been continuously evolving since its inception in ancient times and its influence is still growing and its future bright and promising. At the competent department in charge of metrological work, we are deeply aware that there is no limitation to the development of metrology. In order to do well in the future, we must bring out the potential, release the vitality and foster strong drivers.

First of all, we should further utilize the market mechanism to stimulate the potential in metrology. Metrology is an important basis for ensuring the smooth running of the national economy and fair trade, and it is also an important symbol of national core competitiveness. As one of the products of human civilization, metrology, while ensuring the unification of the international system of units and the accuracy and reliability of values, should also follow the law of and conform to the trend of market development. This firstly requires compliance with the supply and demand mechanism, where the supply of high-quality metrological resources should be continuously increased according to market demand. At present, the key issue is to resolve the contradiction between the ever-growing needs of the people for a better life and the unbalanced and inadequate development of metrology. Solutions precisely targeting those shortcomings and bottlenecks should be put forward and carried out in order to truly solve this issue. Then a competition mechanism should be introduced to stimulate the potential of metrology in various fields. Metrology is a cause that concerns the whole society and needs the involvement of all the relevant departments, local governments, industries, enterprises and all sectors of society. When it comes to metrological development, supervision of metrology and metrological services, a market competition mechanism should be fully utilized so as to unleash the potential of various fields and turn it into a driving force for development, which would contribute to enhancing the people's sense of gain, happiness and security.

Secondly, we should give full play to the market as the main role and release the vitality of metrology. Market dynamism comes from people, especially from entrepreneurs and their entrepreneurship. We should give full play to enterprises as the main role of the market, speed up decentralization and the transformation of functions and attach great importance to

government guidance and policy support. Sound rules should be formulated and put in place and a favorable environment created to make it possible for entrepreneurs to realize their talents while enterprises should be encouraged and guided to become bigger, stronger and better. Metrology is a major battlefield both for decentralization and the provision of technical services. On one hand, the government's role in the supervision of metrology should be duly performed by conducting proper control and relaxation. On the other hand, the technical advantages of measurement should be utilized to guide and serve enterprises and provide quality metrological and testing technical services to help enterprises achieve cost reduction, increased efficiency and quality production.

Thirdly, we should be able to sense and grasp opportunities presented by the metrological revolution and foster new drivers of development. Historically, each evolution of the system of units has directly or indirectly promoted economic and social development. The signing of the "Metre Convention" gave a strong push to the process of industrialization. The quantization of "second" and "meter" gave birth to the laser length measurement technology, shaping a satellite navigation positioning market worth trillions of US dollars and pushing forward major breakthroughs and developments in areas such as information technology, precision technology, nano-materials, equipment manufacturing and space exploration. We must grasp the great opportunities brought by the international metrological reform, strengthen the basic research and frontier research on measurement that meets China's strategic needs, formulate the strategy of China's metrological development in the time of quantization and speed up the construction of a modern and advanced national measurement system, which shall serve to support and secure the development of China into a manufacturing nation of advanced and quality products and better play out the role of measurement in enhancing the national core competitiveness.

With a history spanning from ancient times to now, with an influence affecting the whole world, metrology, which has evolved from physical-based to quantum-based, embodies our millennia-long civilization and carries so much hope of humanity. This is an evolution of the natural laws of the objective world but also an active revolution undertaken by humanity in discovering and complying with the natural laws. For thousands of years, metrology has been developing and changing in a dynamic world but what remains unchanged is its pursuit of

accurate values and measurement. Let us work together, attach more significance to metrology and devote major efforts to its development, which will help constantly improve our ability to understand and change the world and prepare us for an even brighter future!