



ANNUAL REPORT | 2024

NATIONAL INSTITUTE OF METROLOGY (THAILAND)





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Message from the Chairperson of the National Institute of Metrology



Miss Supamas Isarabhakdi
**Minister of Higher Education,
Science, Research
and Innovation**
**Chair of the National Metrology
Committee**

The year 2024 marks a pivotal moment for the global metrology community, as nations collectively confront multifaceted challenges spanning economic, social, and environmental domains. Notably, advancements in science, technology, and innovation necessitate a robust metrology system to ensure the accuracy of measurements and analyses. Such precision is crucial for research and development efforts aimed at addressing global issues and adapting to dynamic changes across all sectors. In recognition of this, the International Bureau of Weights and Measures (BIPM) and the International Organization of Legal Metrology (OIML) have jointly designated the theme for World Metrology Day 2024 as "We measure today for a sustainable tomorrow." This theme underscores the unified direction for the global metrology community, emphasizing the role of precise measurements in building a sustainable future for our nations and the world at large. Currently, we are amidst global transformations across various sectors. As the Chairperson of the National Metrology Committee, I prioritize accelerating the development and enhancement of the country's metrology infrastructure. This initiative aims to elevate our capabilities in anticipation of transformations in the International System of Units (SI), the progression towards a digital era, climate change challenges, and the advent of the quantum age. Furthermore, I advocate for the active participation of personnel from the National Institute of Metrology (Thailand) (NIMT) on the international stage. Hosting the inaugural International Conference on Measurement Sciences and Applications (IMSA 2024) exemplifies our commitment to fostering regional and global collaborations. Our overarching goal is to establish a modern national metrology system that effectively serves Thailand's current and future interests.

Message from the Director

of the National Institute of Metrology (Thailand)



Pol.Lt.Gen. 
(Pornchai Suteerakune)
Director of the National Institute
of Metrology (Thailand)

Over the past year, the National Institute of Metrology (Thailand) (NIMT) has been steadfast in enhancing and strengthening the country's metrology system to be robust, modern, and highly capable. Our efforts have focused on fostering collaboration with various governmental and private sectors under the National Quality Infrastructure (NQI) framework. Through research and development of new measurement technologies, we aim to significantly boost productivity and reduce costs for entrepreneurs, as well as facilitate tangible commercial applications. In addition, we have prioritized collaboration with international metrology organizations and other national metrology institutes to establish a globally harmonized measurement system. Concurrently, we are committed to building metrological knowledge through various initiatives, including the development of standardized calibration procedures for different types of measuring instruments, the creation of curricula for higher education, and the advancement of metrology professionals. These efforts align with our commitment to sustainable development goals and support agencies and entrepreneurs in leveraging metrology across various measurement fields. Our objective is to ensure that Thailand's metrology system can deliver the necessary measurements both now and in the future, adequately supporting the nation's development in all dimensions and directions.

In 2024, NIMT hosted a significant event for the Thai metrology community the inaugural International Conference on Measurement Sciences and Applications (IMSA 2024). This conference aimed to establish an international academic platform in metrology and to stimulate the development of robust and sustainable research among Thai metrology professionals, under the theme "We measure today for a sustainable tomorrow." Additionally, we organized the "World Metrology Day" event to celebrate the advancements of Thailand's metrology system and to highlight the institute's role in the development of science, technology, innovation, the economy, quality of life, and social equity. The successful implementation of our initiatives has been made possible by the invaluable guidance from the National Metrology Committee, the cooperation from all sectors, and the dedication and commitment of our management and staff. Together, we strive to build a sustainable future for our country and the world.

Road to Metrology



พระราชบัญญัติ
พัฒนาระบบมาตรวิทยาแห่งชาติ
พ.ศ. ๒๕๔๐

June 1, 1998

National Institute of Metrology (Thailand) was established.



July 2003

NIMT CMCs published on BIPM Website (Appendix C).



July 9, 2018

Her Royal Highness Princess Maha Chakri Sirindhorn gave the name "Matra Dumrong" for NIMT laboratory building for the development and production of certified reference materials.



October 14, 1999

Signed in CIPM-MRA at BIPM, France.



August 14, 2006

Her Royal Highness Princess Maha Chakri Sirindhorn gave the name "Pha-dung Matra" for NIMT laboratory building, means "Building for supporting the measurement", and proceeded to open the Pha-dung Matra building.



2021

Opened the NIMT building for standard measurement development to support the rail system.

About NIMT

Vision

A robust metrology system delivers accepted measurements, leading to the enhancement of Thai productivity and national infrastructure for sustainable economic development and quality of life.

Mission

- Establish and maintain national measurement standards, reference materials, and national standards sufficient for domestic demand, ready to cope with the growth of new industries and future technologies, including transferring the accuracy of measurement to domestic users.
- Support and develop the capacity of analytical, testing, and calibration laboratories to achieve reliability, quality, and international recognition.
- Develop metrology services to keep up with changes in technology and innovation, to support new technologies and innovations in the future.
- Systematically integrate the metrology framework with the national quality infrastructure to ensure practical applicability and effectiveness.
- Elevate the quality of life by integrating the national metrology system with the Bio-Circular-Green (BCG) Economy model and aligning with the Sustainable Development Goals (SDGs).
- Promote the practice of metrology professions and develop a sustainable academic atmosphere and knowledge, which will result in increasing the capacity of the metrology system to be on par with international standards.

National Metrology System Development Action Plan No. 4 (2023 - 2027)

Strategy 1 : Enhance measurement capabilities to support the industrial economy, increase competitiveness and sustainable development.

Goal 1 : Metrology systems contribute to enhancing the competitiveness of new industries for both domestic and global markets.

Goal 2 : New measurement innovations that can meet domestic and international usage needs.

Goal 3 : Metrology systems contribute to improving the quality of life and the sustainability of urban infrastructure, society, health and safety.

Strategy 2 : Develop the national metrology system for ready to integration with other elements of the national quality infrastructure.

Goal 1 : The network of analytical, testing and calibration laboratories is of international quality and reliable, and to support domestic needs.

Goal 2 : Systematically integrated with national quality infrastructure can be put into practice.

Strategy 3 : Develop the digital metrology system to support modern industries, future technologies and innovations.

Goal 1 : Metrology systems to support the future technologies and innovations.

Strategy 4 : Develop and promote research work of the National Institute of Metrology and primary level agencies to achieve excellence that is recognized internationally and recognized in its role and importance by Thai society.

Goal 1 : NIMT and primary metrology level agencies have a competence and roles on the national and international stage.

National Metrology Board

Chairman,
Board of the National
Metrology



Ms. Supamas Isarabhakdi
Minister of Higher Education, Science,
Research and Innovation

Vice-Chairman,
Board of the National
Metrology



Mr. Permsuk Sutchaphiwat.
Permanent Secretary for Ministry of
Higher Education, Science, Research and
Innovation

กรรมการโดยตำแหน่ง



Mr. Lavaron Sangsnit
Permanent Secretary of Finance



Mr. Vuttikrai Leewiraphan
Permanent Secretary of Commerce



Mr. Nattapol Rangsitpol
Permanent Secretary of Industry



Mr. Chalermphol Pensoot
Director of Bureau of the Budget



Mr. Danucha Pichayanan
Secretary General of National
Economic and Social Development
Board



Mr. Sanan Angubolkul
President of the Thai Chamber of
Commerce and Board of Trade of
Thailand



Mr. Kriengkrai Thiennukul
Chairman of the Federation of Thai
Industries

กรรมการผู้ทรงคุณวุฒิ



Mr. Veerapong Pairsuwan



Mr. Yuttana Jiamtragan



Mr. Ugrit Asadatorn



Lt.Col. Theppajit Vinagupta

Committee and Secretary



Pol.Lt.Gen. Pornchai Suteerakune
Director of NIMT

Organizational Structure

National Institute of Metrology (Thailand)

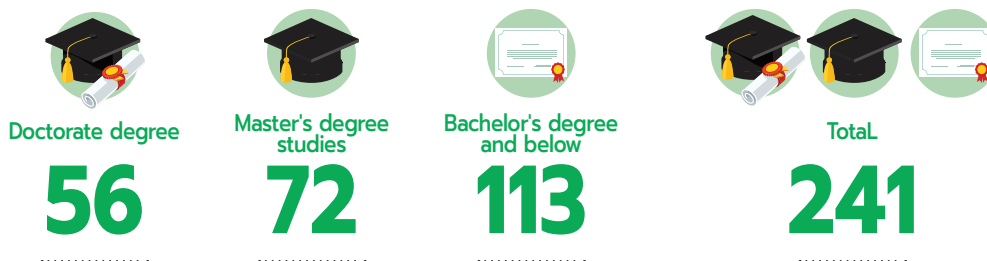


Personnel and Budgeting

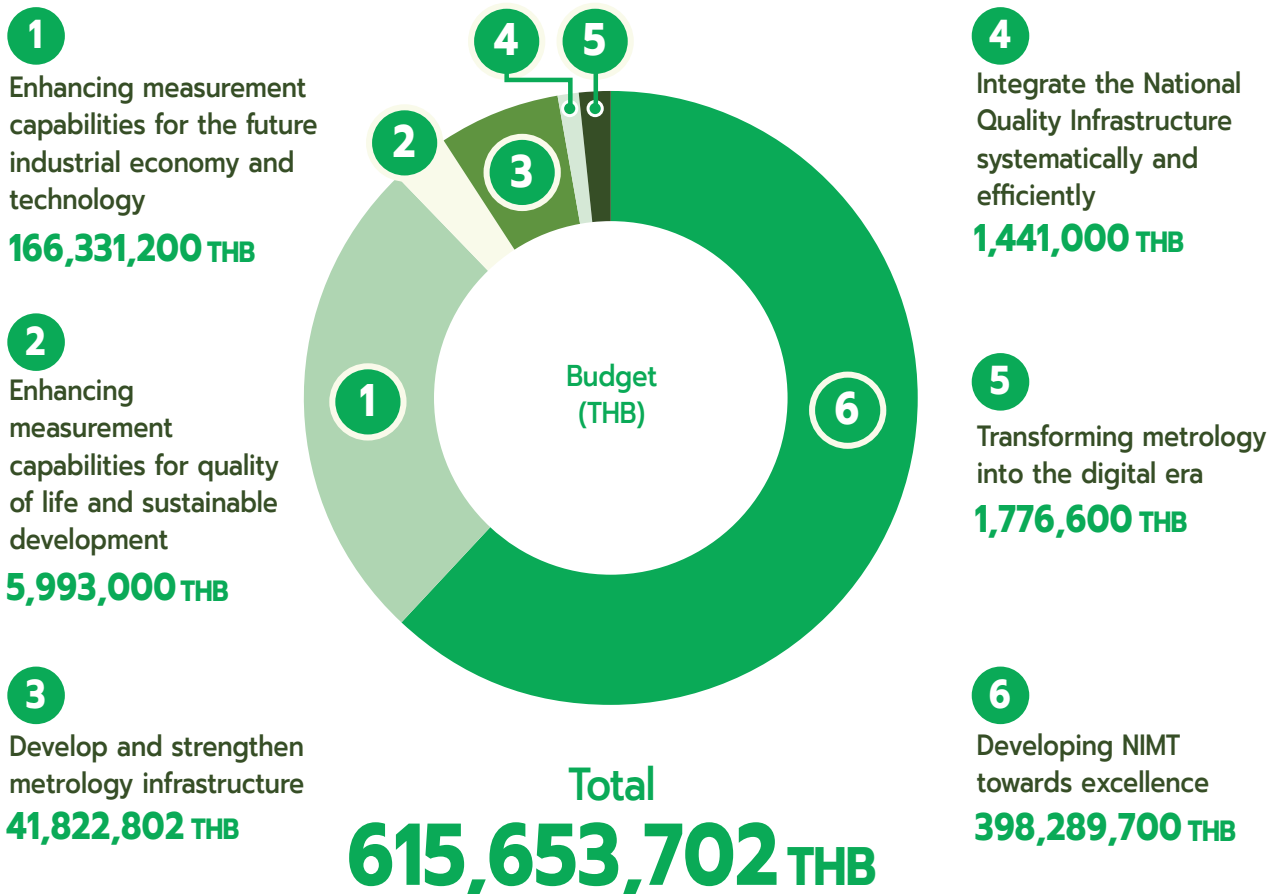
personnel



การศึกษา



Annual budget 2024





Overall Operation/ Overall NIMT

26th Anniversary of NIMT: “We Measure Today for a Sustainable Tomorrow”



May 20 marks the anniversary of the signing of the Metre Convention, first established on May 20, 1875. This treaty laid the foundation for a globally harmonized measurement system crucial for scientific discovery, industrial innovation, international trade, quality of life, and environmental protection. Today, over 80 countries celebrate this date as World Metrology Day, with activities coordinated each year under a theme selected by the International Bureau of Weights and Measures (BIPM) and the International Organization of Legal Metrology (OIML). For 2024, the theme is: **“We Measure Today for a Sustainable Tomorrow”**. The goal is to highlight how measurement underpins the creation of a sustainable global economy and environment. In recognition of this significance, UNESCO has officially designated May 20 as an International Day on its calendar.

The National Institute of Metrology (Thailand) (NIMT), established under the National Metrology Development Act B.E. 2540 (1997), has served as the national body for developing Thailand’s measurement system in alignment with international standards. It officially commenced operations on June 1, 1998. As such, June 1 is celebrated as NIMT’s founding day.

This year, NIMT marks its 26th anniversary by organizing a scientific seminar in conjunction with World Metrology Day. The event aims to raise awareness of metrology’s importance and NIMT’s role as a key pillar in Thailand’s National Quality Infrastructure (NQI), which is essential for sustainable national development. The seminar also promotes integration among various sectors involved in quality infrastructure, including electric vehicles, food and herbal industries, digital technologies, and rail systems.

On this milestone, the event seeks to engage stakeholders and the public by highlighting NIMT’s contributions past, present, and future toward advancing science, technology, innovation, economic development, social equity, and quality of life. The broader goal is to expand awareness of metrology and foster deeper collaboration between NIMT and other sectors in applying metrology to support the nation’s development.



Presiding over the ceremony was Ms. Supamas Isarabhakdi, Minister of Higher Education, Science, Research and Innovation, and Chairman of the National Metrology Committee. Notable attendees included Dr. Hyun-Min Park, Chair of the Asia Pacific Metrology Programme (APMP Chair), and Dr. Hongtao Huang, expert from the National Institute of Metrology, China. Distinguished national experts from various fields also joined the celebration and delivered keynote lectures. The event took place on May 20, 2024, at IMPACT Forum, Muang Thong Thani, Nonthaburi Province.

In her opening remarks, Ms. Supamas emphasized the vital role of the metrology community in shaping a sustainable future, stating: "What we measure today impacts the years to come. Metrology must possess a broad and forward looking vision, strengthening national measurement systems and delivering the capabilities Thailand will need in the future. Metrology must evolve to support every path the country chooses to take and adapt to global transformations in all dimensions. Tomorrow's metrology is a vision of sustainable development."



Pol.Lt.Gen Pornchai Suteerakune, Director of NIMT



A joint address by Mr. Anthony Donnellan, Director of the BILM, in collaboration with the BIPM Director



A congratulatory message from APMP Chair Dr. Hyun-Min Park



Keynote presentation titled "New Energy Vehicles and NIM's Support to Its Development" by Dr. Hongtao Huang, National Institute of Metrology, China

Seminar and Exhibition Highlights



In the afternoon, stakeholders participated in focused breakout sessions to deepen understanding and drive future collaboration across Thailand’s quality infrastructure. The five parallel sessions included:



Development of the National quality infrastructure on Electric Vehicle Charger (EV Charger)



Development of the Digital products towards the digital quality infrastructure



Quality infrastructure to support the development of the railway system of Thailand



Q Cold-Chain and Temperature Metrology in Thailand



Development of the National quality infrastructure for the herbal industry

IMSA 2024

1st IMSA 2024: The First International Conference on Measurement Sciences and Applications in ASEAN



“Measurement for Sustainable Future”

The 1st International Conference on Measurement Sciences and Applications (IMSA 2024) marked the launch of a major international academic platform for metrology in the ASEAN region, under the theme “**Measurement for Sustainable Future.**” Organized by National Institute of Metrology (Thailand) (NIMT) under the Ministry of Higher Education, Science, Research and Innovation, the conference welcomed approximately 200 participants.

The event aimed to provide a regional and international forum for knowledge exchange and presentation of research in measurement science and its multidisciplinary applications. The goal was to drive further research and innovation, build a strong and sustainable scientific foundation, and support national development. Additionally, IMSA 2024 served as a platform to advance academic excellence, develop metrology professionals, and honor individuals or organizations who have significantly contributed to the advancement of national metrology systems.

Conference Highlights

A key highlight was a special keynote session addressing the interconnection between metrology and global challenges, featuring insights from:

- Dr. Victoria Coleman, Member of the International Committee for Weights and Measures (CIPM) and President of the Consultative Committee for Length (CCL)
- Dr. Kieran Stanley, expert from the Atmospheric Chemistry Research Group, University of Bristol, UK
- Dr. Sivinee Sawatdiaree, Head of Electrical Metrology Department of NIMT, Thailand

There were also technical presentations exploring recent advancements in measurement science and its role in driving scientific and technological development, delivered by:

1. Dr. Tetsuya Ido, Director, Space-Time Standards Laboratory, National Institute of Information and Communications Technology (NICT), Japan
2. Ing. Jan Kučera, Ph.D., Deputy Director, Regional Inspectorate Praha 1011 - Department of Primary Metrology of Electrical Impedance and Electrical Quantities, Czech Republic
3. Dr. Wei-En Fu, Center for Measurement Standards, Industrial Technology Research Institute (CMS/ITRI), Taiwan
4. Dr. Visarn Lilavivat, National Energy Technology Center (ENTEC), Thailand

The conference featured both oral and poster presentations, showcasing research and knowledge sharing in 11 key areas: 1) SI and Electrical Measurement 2) Dimensional Measurement 3) Climate - Energy - Pollution 4) Thermometry 5) Materials 6) Future Trends Review 7) SI and Time & Frequency 8) Biotechnology and Food 9) Mechanical Measurement 10) Health and Drugs 11) Digital Transformation.

The event also included:

- Awards for Best Oral Presentation and Best Poster
- An exhibition featuring metrology laboratories and instrument manufacturers presenting their latest technologies

The conference was held from August 21–23, 2024 at IMPACT Forum, Muang Thong Thani, Nonthaburi Province, Thailand.



Opening Remarks by the Minister

The event was presided over by Ms. Supamas Isarabhakdi, Minister of Higher Education, Science, Research and Innovation, and Chairperson of the National Metrology Board. In her opening speech, she emphasized the long standing history of metrology in Thailand, a country that has long engaged in international trade with diverse cultures and systems of measurement. She underscored the necessity of building a strong national measurement system to protect national interests and the rights of Thai citizens.

As Chairperson of the National Metrology Board, she noted that the world is currently facing multi dimensional challenges scientific, technological, and innovative. These challenges require cross disciplinary, national, and regional cooperation to address effectively. This conference, she stated, was designed to facilitate and encourage such collaboration.

Director of NIMT



Pol. Lt. Gen. Pornchai Sutheerakun,
Director of NIMT



Mr. Anusorn Tonmuanwai,
Deputy Director of NIMT

Keynote Speakers:



Dr. Victoria Coleman



Dr. Kieran Stanley



Dr. Sivinee Sawatdiaree

Plenary Talk:



Dr. Tetsuya Ido



Ing. Jan Kučera, Ph.D.



Dr. Wei-En Fu



Dr. Visarn Lilavivat

Highlight Activities:



R&D Highlights

Automatic Catch Weighing Instrument (ACI)

Automatic Catch Weighing Instrument (ACI) is essential for numerous industries in Thailand, enabling autonomous weighing that significantly boosts efficiency and reduces human error. This technology not only enhances productivity but also leads to substantial cost savings. Despite their widespread application, ACIs are often calibrated according to guidelines meant for non-automatic weighing instruments (NAWIs) operating under static conditions. This approach overlooks dynamic factors that can impact accuracy in real-world scenarios, such as load speed, size, local gravity variations, temperature fluctuations, and air density. As industries increasingly rely on ACIs for precise measurements, there is a pressing need to develop calibration processes specifically tailored for dynamic operational conditions to ensure accurate and reliable performance.

Concept/Working Principles

Dynamic calibration is critical for the accuracy of ACIs while in motion. Following the Euramet Calibration Guideline No. 26 issued in 2023, the calibration procedure includes three key steps: determining errors and repeatability, assessing reproducibility, and evaluating the effects of eccentric loading. The testing process involves passing test loads to the weighing unit located at the center of a conveyor belt, with multiple measurement cycles to ensure consistency. After each cycle, the weighing process is briefly interrupted and restarted to verify that the instrument performs reliably across trials. Additionally, an eccentricity test evaluates how load placement affects measurements by positioning test loads on both sides of the conveyor belt. This comprehensive approach not only improves measurement accuracy but also identifies potential sources of error. By thoroughly assessing the uncertainties associated with dynamic measurements, organizations can ensure that their ACIs meet the stringent quality assurance standards expected by regulators and industry stakeholders, enhancing the credibility of these instruments for critical applications.





Benefits of Establishing Measurement Standards

Implementing dynamic calibration for ACIs provides substantial benefits for Thailand's industries by enhancing competitiveness and operational efficiency. This leads to increased productivity in vital sectors such as food processing and pharmaceuticals, where precise weighing is essential for ensuring safety and compliance. Aligning dynamic calibration with international standards will support growth in automation and precision technologies within Thailand, further improving product quality and safety. By embracing these advancements, Thailand can maintain its competitive edge in the global market. Ultimately, these advancements will drive industrial growth and enhance the nation's economic strength.





NIMT Reference Wall

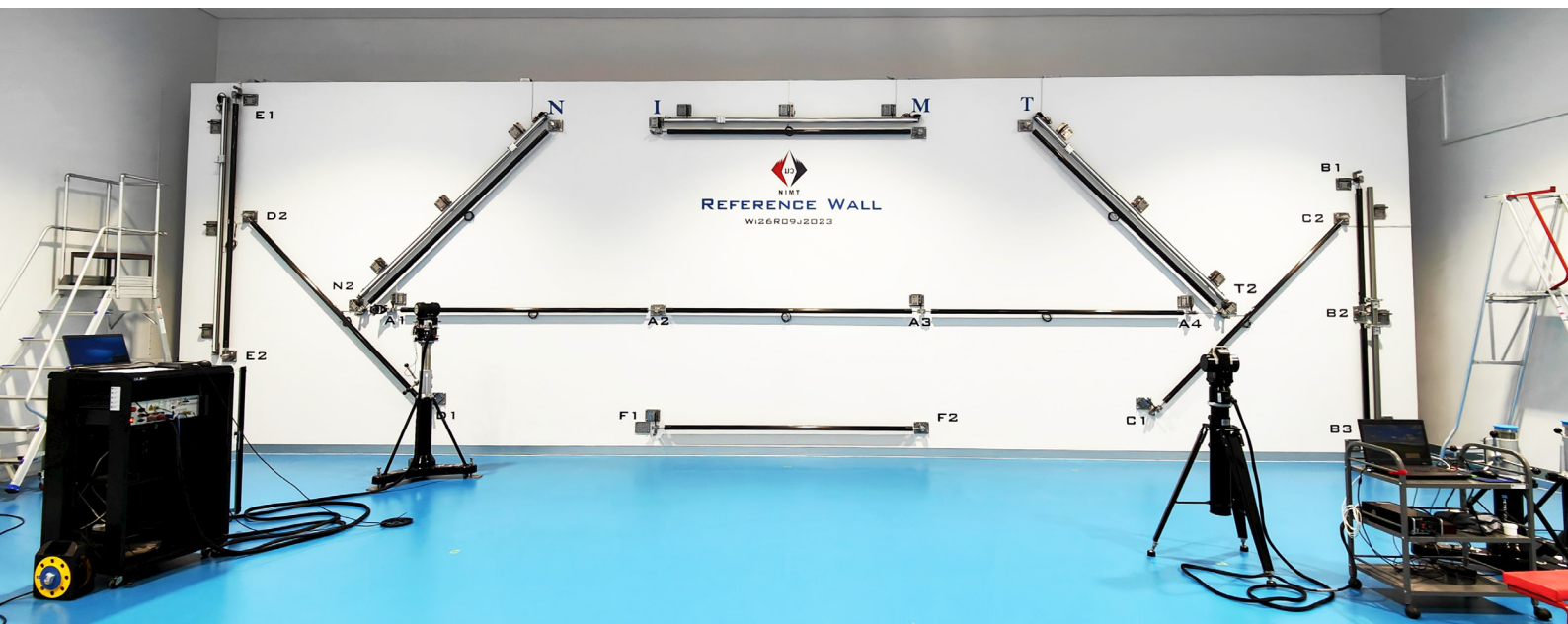
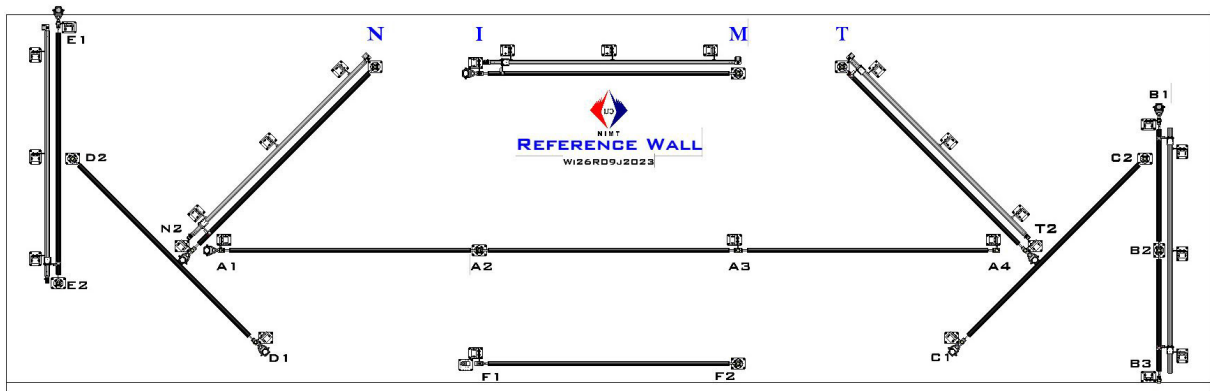
NIMT Reference Wall is the standard lengths which was established to fulfill the mission of the NIMT to procure and maintain national measurement standards sufficient for domestic use, and to be ready for the growth of new industries and future technologies. Before establishing NIMT Reference Wall, laser trackers were not proper verification as the ISO 10360-10 requirements, broken chain of traceability. As a result, products that measured by laser tracker were not internationally accepted, affecting the export of those products. This is one reasons why we established NIMT Reference Wall.

Concept/Working Principles

The concept idea of establishing NIMT Reference Wall must support the test of laser tackers reverification according to the current international standard (ISO 10360-10). These standard lengths installed on the standard wall must be stable, with very little change in length over time or less changes in environment. To ensure that the standard lengths on the reference wall is stable, the selection of materials for the reference lengths and the fastening fixtures must be appropriately selected and carefully engineered. Carbon rods (Carbon Fiber-Reinforced Plastic, CFRP) with low coefficient of thermal expansion are used as standard lengths. The fixtures used to clamp CFRP rods on the wall are free tension designed to prevent thermal stress, and prevent changes in standard length when the concrete wall undergoes thermal expansion. The standard lengths on the reference wall are measured by a high-precision Laser Tracer. The length has an uncertainty of 0.00528 mm for a standard length of 8 m, or 0.00066 mm per 1 m of length.

Benefits of Establishing Measurement Standards

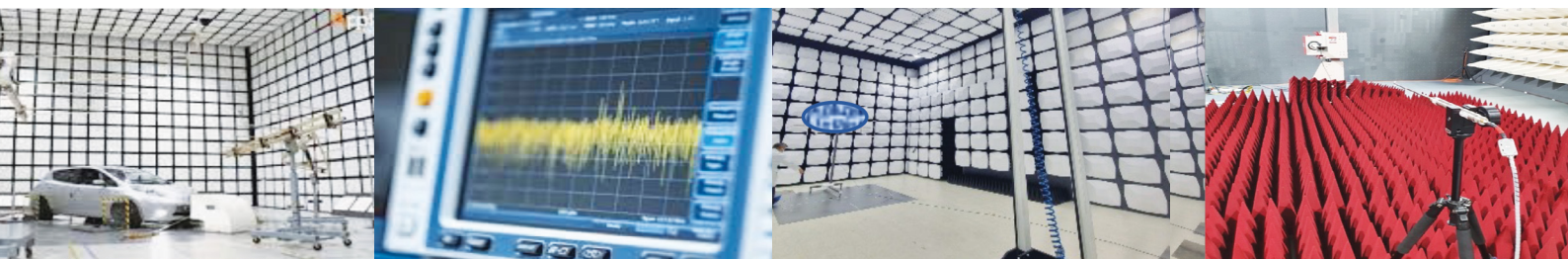
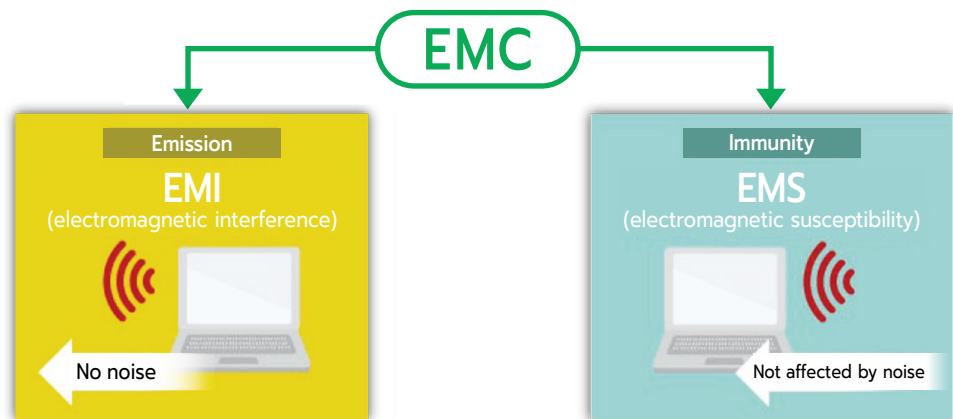
This reference wall enables the traceability of measurements of the laser trackers to be completed along the traceability chain to SI units at NIMT. As a result, industries such as automation, ship-building, rail-transportation, and aerospace that use laser trackers, can verify laser tracker in domestic, reducing the time it takes to transport tools overseas for verification, and their products more reliable and internationally accepted.



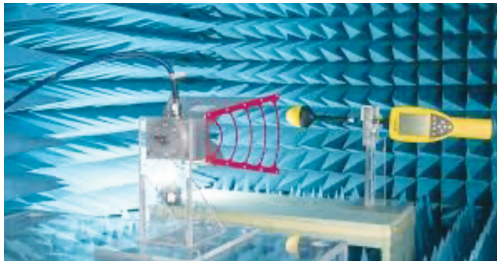
NIMT Reference Wall

NIMT Wireless Signal Measurement to enhance the capabilities of the electronic component industry for electrical appliances and electric vehicles

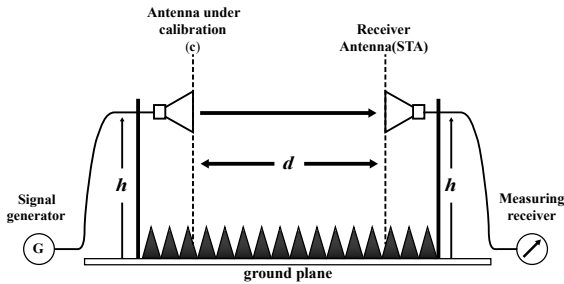
The evaluation of Electromagnetic Compatibility (EMC) is an essential procedure designed to guarantee the efficient functioning of electronic devices in environments with electromagnetic interference, while minimizing the risk of excessive disturbances. EMC testing is a compulsory regulatory obligation across major global markets, including the European Union, the United States, China, South Korea, Australia, and New Zealand. Adherence to these standards is critical for maintaining compliance with legal requirements, optimizing product performance, and safeguarding the integrity of electrical and electronic circuits in consumer appliances and electric vehicles. This process aligns with internationally established standards such as CISPR 12 and CISPR 25.



Nationwide, standard EMC testing laboratories have been established to offer testing services for electrical appliances and electric vehicles in relation to EMC. However, a complete traceability system has not yet to be fully developed. Addressing this gap requires metrological efforts to establish a comprehensive traceability chain. This process begins with the validation of EMC testing laboratories at operational sites (covering field uniformity, sVSWR, and NSA) and the calibration of standard equipment used in EMC testing systems. Examples of such calibrations include assessing antenna performance (Antenna Factor and SWR) and calibrating pulse generators. These initiatives are currently undergoing accreditation certification by the Thai Industrial Standards Institute (TISI), with technical assessments conducted by metrology experts from Japan's National Metrology Institute in late 2024.



Calibration Referred Standard: IEEE 1309



Calibration Referred Standard: ANSI C63.5



Calibration Referred Standard: CISPR 16-1-1

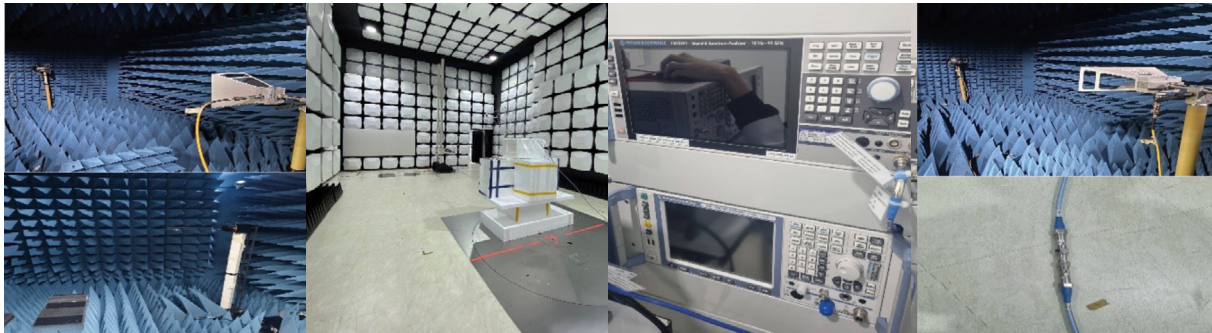
Working Principle

1. Providing calibration services for RF-electric field probes, which serve as reference tools for evaluating uniformity in anechoic chambers, conducted in compliance with IEC 61000-6-4 standards through the standard probe method.

2. Performing antenna calibration, beginning with horn antennas operating at frequencies up to 18 GHz, utilizing national reference standards to transfer measurement values to customer equipment in accordance with the standard antenna method.

3. Calibration of pulse generators accordance to CISPR 16-1-1 / EN 55016-1-1 standards.

Furthermore, a new service, onsite calibration, has been introduced to certify the capabilities of laboratories specifically designed to accommodate environments for testing electromagnetic fields through the air or radiation, as well as assessing electromagnetic immunity.



4. On-site validation services for anechoic chambers, conducted in accordance with CISPR 16-1-4 and IEEE 299 standards.

Benefits of our new establishing measurement standards

The formalization of EMC measurement standards facilitates complete traceability to SI units, thereby ensuring an internationally recognized measurement framework. This initiative significantly contributes to the enhancement of the electronic component industry, particularly in relation to household appliances and electric vehicles. The primary beneficiaries of these services include secondary calibration laboratories (PTEC, EEI) and industrial laboratories within the automotive and electrical appliance sectors.

Realization of spectral responsivity scale based on quantum efficiency modelling

At NIMT, the primary realization of radiometry units is realized by using three trap detectors based on the detector-based method. The cryogenic radiometer is used to calibrate the spectral responsivity of the trap detectors, which established the traceability of the photometric and radiometric quantities to the SI units. During calibration, an Ar+Kr laser is employed to provide 8 lines in the visible region (400-799 nm).

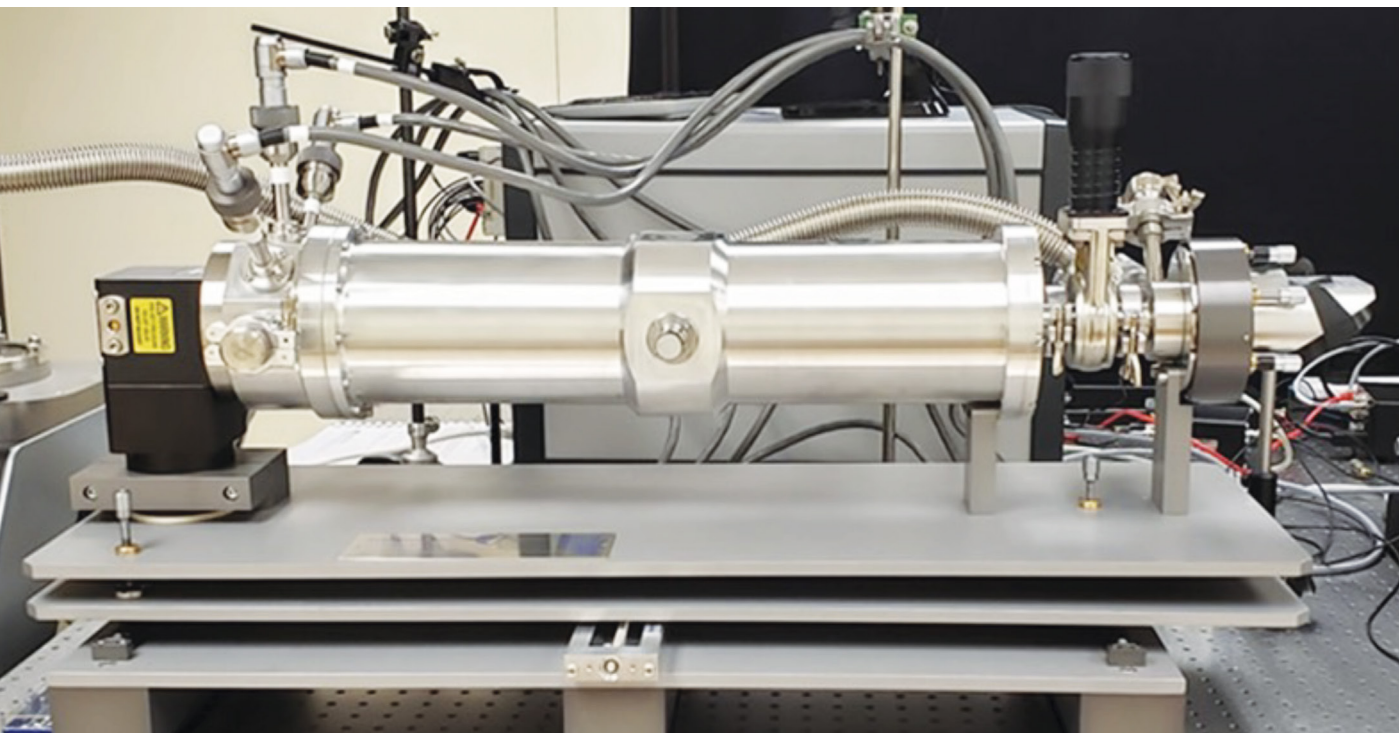
However, to get the spectral responsivity of the trap detectors for a whole wavelength from 400 nm to 800 nm, their quantum efficiency modelling is needed.

Concept/Working Principles

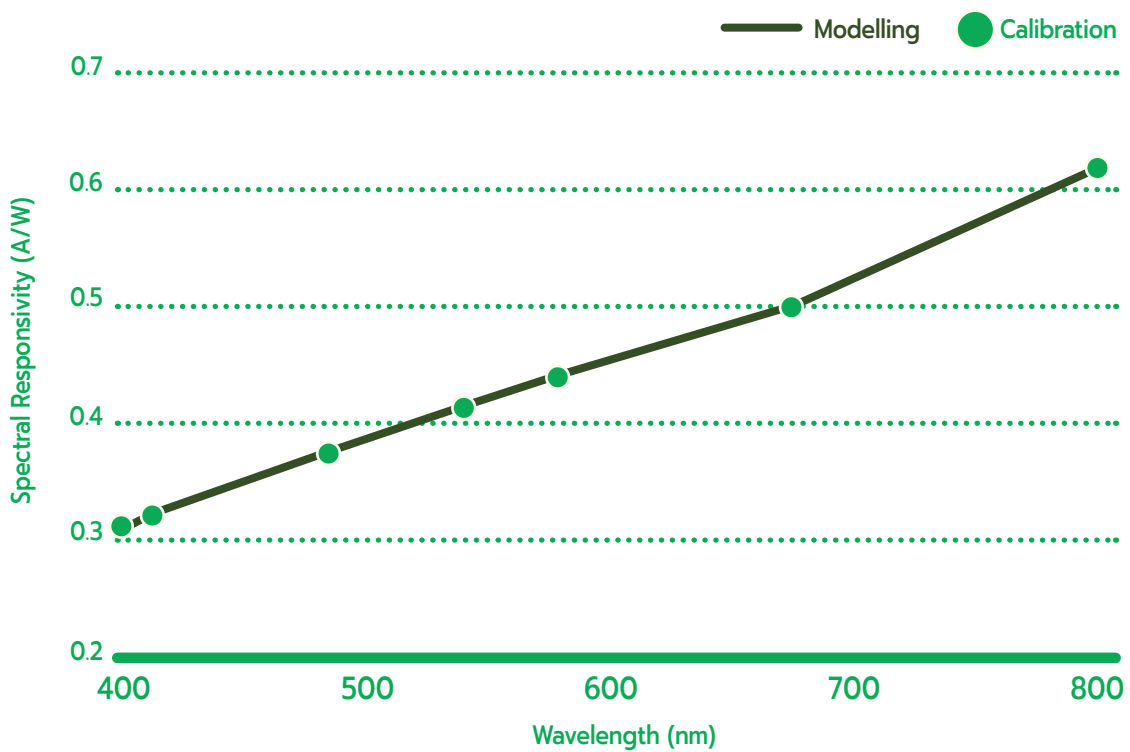
A researcher of Light and Colour Group, Thermometry and Optical metrology department succeeds with the modelling of quantum efficiency from both of physical models and empirical model. That means the spectral responsivity of the NIMT's trap detectors from 400 nm to 800 nm can be determined.

Benefits of Establishing Measurement Standards

Based on the developed modelling, the trap detector can be used to calibrate working standards for further use. These will be utilized to calibrate the spectral response of other Si detectors.



Cryogenic radiometer of NIMT used as primary standard in radiometry



Measured spectral responsivity of a trap detector at laser wavelengths and from the modelling.

Measurement of nanoparticle number concentration in liquid suspension

Background of the establishment of new measurement standards

Nanotechnology measurement is a rapidly growing. Nanoparticles are used in a variety of materials and products, including coatings (on plastics, glass, and clothing), sun protection products, antimicrobial bandages, and fuel additives. Nanotechnology products play a role in the food industry and commercial markets, directly or indirectly affecting consumers. For example, the measurement of nanoparticles in food and toxicological samples is crucial for understanding the potential benefits and risks of nanoparticle applications. Developing methods to measure nanoparticle number concentration addresses the need for appropriate measurement techniques for the detection and characterization of nanoparticles. The development of internationally recognized analytical methods for nanoparticle number concentration in liquid suspension is important for consumer safety. Therefore, the National Institute of Metrology (Thailand) should establish a national nanotechnology metrology system to promote and support measurement activities related to nanotechnology, ensuring consumer safety and enhancing the value of nanotechnology products through measurement results traceable to the measurement standards developed by the National Institute of Metrology (Thailand).

Concept/ Principle

The establishment of nanoparticle number concentration measurement is an integrated activity between Chemical Metrology and Biometry department and the Dimensional Metrology Division. In the field of chemistry, the development of nanoparticle number concentration measurement is a new measurement technology. The Inorganic Chemistry Analysis Group, Chemical Metrology and Biometry department, must accelerate the development of measurement methods to establish measurement standards. In particular, the simultaneous characterization of elemental composition, particle number, size, and size distribution are a challenging task for inorganic chemical nanoparticle measurement. One of the most suitable techniques for this characterization is Inductively Coupled Plasma Mass Spectrometry (ICP-MS), which can be operated in single particle mode. This technique and Transmission Electron Microscopy (TEM) technique, are used for participation in CCQM-K166/P210 interlaboratory comparisons: Measurement of nanoparticle number concentration in liquid suspension, at the CCQM-IAWG level. Thailand's nanoparticle number concentration measurement results have been highly successful and are globally recognized.

The Value of Establishing Measurement Standards

Nanoparticle number concentration measurement demonstrates calibration measurement capability (CMC) for a new measurement scope and establishes traceability for nanomaterial measurement results within the country. This capability can be further developed to support the establishment of future nanotechnology standards, including serving as a reference standard for air quality/pollution/dust measurement and nanoplastic studies, providing reference values for optical-based particle measurement instruments, supporting automotive standards like Euro 6, where nanoparticle number is specified. Additionally, it can provide reference values to manufacturers of nanomaterial reference materials and nanotechnology product quality testing laboratories for nanomaterial calibration.



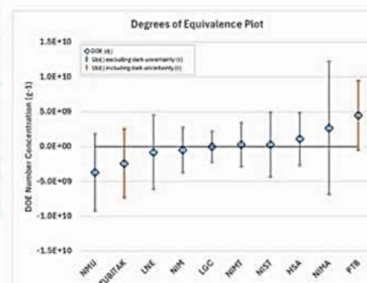
NIMT nanoparticle number concentration result

CCM-K166: Degrees of Equivalence

NIST DT: Laplace hierarchical model



Lab	x_j	u_j	D_j	d_j (%)	$U(d_j)$	$d_j/U(d_j)$
NMIJ	1.79E+10	2.70E+09	-3.72E+09	-20.8%	5.54E+09	-0.67
TUBITAK	1.92E+10	9.00E+08*	-2.42E+09	-12.6%	4.95E+09	-0.49
LNE	2.08E+10	2.62E+09	-8.16E+08	-3.9%	5.35E+09	-0.15
NIM	2.11E+10	1.5E+09	-5.16E+08	-2.4%	3.27E+09	-0.16
LGC	2.16E+10	9.00E+08	-1.60E+07	-0.1%	2.25E+09	-0.01
NIMT	2.19E+10	1.44E+09	2.84E+08	1.3%	3.14E+09	0.09
NIST	2.19E+10	2.26E+09	2.84E+08	1.3%	4.67E+09	0.06
HSA	2.27E+10	1.78E+09	1.08E+09	4.8%	3.81E+09	0.28
NIMA	2.43E+10	4.7E+09	2.68E+09	11.0%	9.56E+09	0.28
PTB	2.61E+10	1.0E+09*	4.48E+09	17.2%	5.00E+09	0.90



Angular vibration sensor calibration by comparison method



The Angular vibration Sensor Calibration System

The Angular vibration Sensor Calibration System

The angular vibration sensor calibration system was developed to meet the need for precise measurement and control of angular vibration in industries that demand high accuracy, such as aerospace, automotive, and machinery manufacturing. Accurate, standards-compliant measurements are essential to monitor the operation of equipment involving complex angular motion. Reliable measurement data also reduces the risk of poor decision-making that could lead to equipment damage or compromise user safety.

Concept/Working Principles

The establishment of this calibration system originated from the recognition by metrological and industrial organizations of the need for a global standard in calibrating angular vibration sensors. This ensures consistent usage worldwide and supports efficient and sustainable development in the measurement and testing industry.

Benefits of Establishing Measurement Standards

Angular vibration measurement benefits various sectors and related fields. For example, automotive and aerospace manufacturers use this measurement in performance testing of equipment to enhance efficiency and safety. Similarly, industries use it to reduce wear and improve preventive maintenance, which reduces repair costs and extends equipment lifespan. As a result, angular vibration data has become a crucial resource for adding value and mitigating risks across different processes.

Principle of Angular Vibration Measurement

The principle behind angular vibration measurement relies on sensors capable of detecting changes in angular motion. These sensors are attached to an angular calibrator, which generates angular movement signals to measure the rate of speed and angular acceleration changes. The output from the calibration system is expressed in terms of sensitivity, with units of $mV/^\circ/s$ and degrees ($^\circ$). Laboratory capabilities can calibrate at frequencies from 1 Hz to 200 Hz, with an uncertainty level of 1% for modulus and 1.5° for phase testing.

Importance of Angular Vibration Sensor Calibration

1. Enhanced Measurement Accuracy

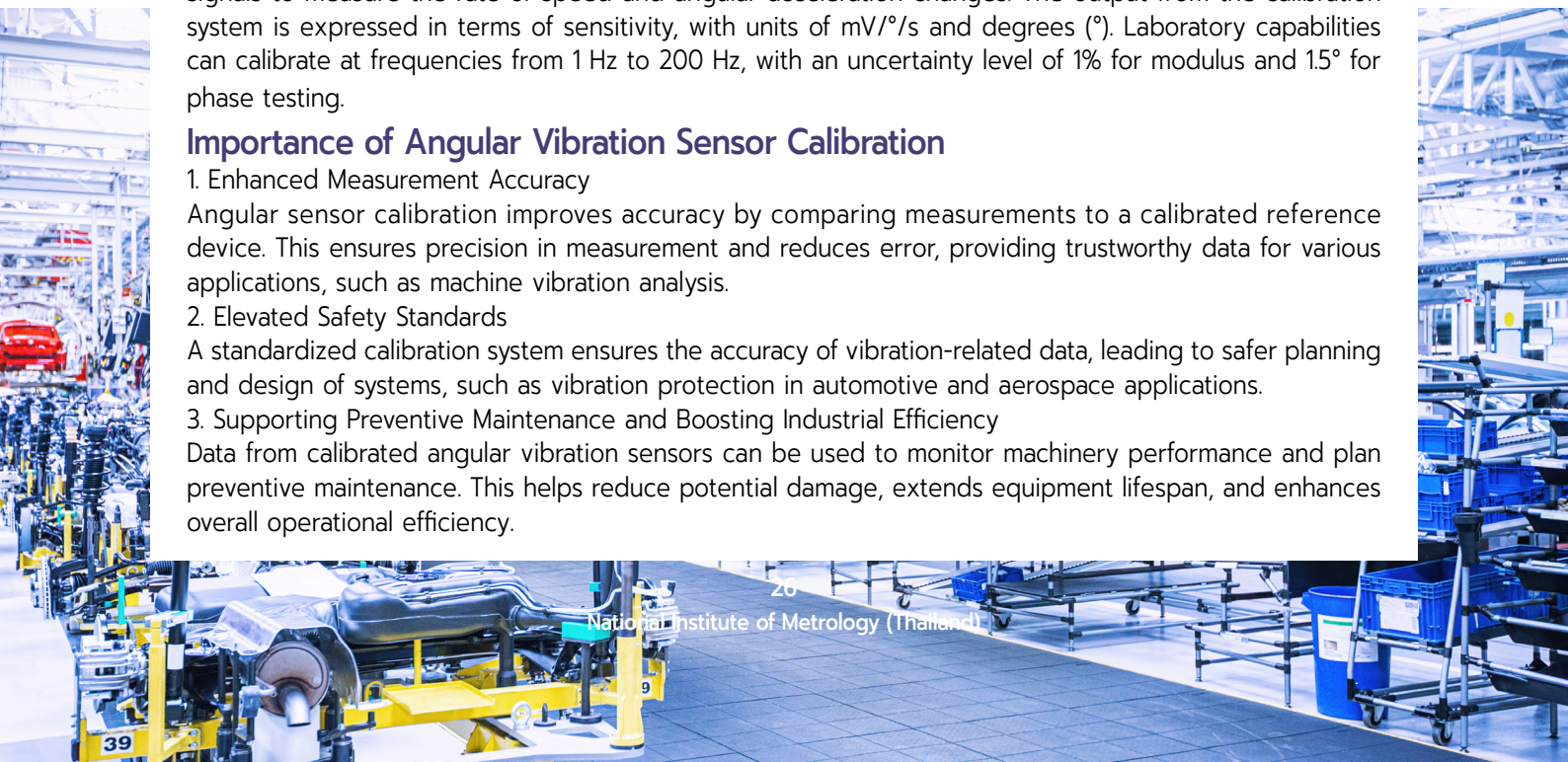
Angular sensor calibration improves accuracy by comparing measurements to a calibrated reference device. This ensures precision in measurement and reduces error, providing trustworthy data for various applications, such as machine vibration analysis.

2. Elevated Safety Standards

A standardized calibration system ensures the accuracy of vibration-related data, leading to safer planning and design of systems, such as vibration protection in automotive and aerospace applications.

3. Supporting Preventive Maintenance and Boosting Industrial Efficiency

Data from calibrated angular vibration sensors can be used to monitor machinery performance and plan preventive maintenance. This helps reduce potential damage, extends equipment lifespan, and enhances overall operational efficiency.



International Cooperation

NIMT's International Collaborative Activities in the Year 2024



MRA Activities

BIPM

- 1) Director and Deputy Director of NIMT attended the 22nd Meeting of NMI Directors and Member States Representatives on 19 - 20 October 2023 at BIPM, France.
- 2) Dr. Kittiya Shearman and Dr. Sutthinun Taebunpakul attended the 29th Meeting of CCQM on 21 - 28 April 2024 at BIPM, France.
- 3) Dr. Oijai Ongrai attended the "Young metrologists' 2050+vision", as the RMO Coordinator, on 30 June - 5 July 2024 at BIPM, France.

IMEKO

- 1) Dr. Jariya Buajarern attended the IMEKO 68th General Council and Technical Board Sessions on 23 August - 6 September 2024 in Germany.
- 2) NIMT Metrologists attended the IMEKO 2024 XXIV World Congress on 24 August - 1 September 2024 in Germany.

APMP

- 1) NIMT executive and staff attended the 39th APMP General Assembly and Related Activities 2023 on 27 November - 3 December 2023 at NIM, China.
- 2) NIMT executive and staff attended the 2024 APMP Mid-Year Meetings on 24 - 28 June 2024 in the Philippines.
- 3) Miss Rugkanawan Wongpithayadisai attended the 48th JCRB, as APMP TCQS Chair, on 23 - 27 September 2024 held at BIPM, France.

การลงนาม MOU

- 1) NIMT and Vietnam Metrology Institute (VMI) signed MOU on 1 December 2023, during the 39th APMP General Assembly and Related Activities 2023 at NIM, China.
- 2) NIMT signed MOU with the Department Standardization and Metrology (DosM), the National Institute of Metrology, Myanmar (NIMM) and the National Metrology Center of Cambodia (NMC) on 7 August 2024, during the 11th Meeting of the ASEAN Experts Group on Metrology (EGM-11) at NIMT.



Training/Joint research/Technical collaboration

(Germany/Japan/South Korea/China)

- 1) NIMT Metrologists conducted joint research on the topic "Timescale using and Optical Clock" and "Multi-ion clock and Scalable traps" on 2 October 2023 – 31 March 2024 at PTB, Germany.
- 2) Miss Praiya Thongluang conducted joint research in the field of Digital Transformation on 4 May - 1 August 2024 at PTB, Germany.
- 3) Miss Pariyakorn Petkaew conducted joint research and training for the project "Guest scientist programme" on 21 September - 19 December 2024 at PTB, Germany.
- 4) NIMT Metrologists discussed the technical cooperation with NMIJ researchers on 3 - 6 July 2024 at NMIJ, Japan.
- 5) Mrs. Parinda Tarusa attended the workshop on Metrology in Analytical Chemistry on 21 September - 3 October 2024 at KRISS, the Republic of Korea.
- 6) NIMT Metrologists attended the training under the Lancang-Mekong Cooperation (LMC) Framework on 1 - 28 September 2024 at NIM, China.

Hospitality and Visiting

- 1) NIMT welcomed the delegates of the Japan Measuring Instruments Federation (JMIF) on 21 November 2023.
- 2) NIMT welcomed the professors of the University of Electro-Communications, Japan (UEC) on 7 December 2023.
- 3) NIMT welcomed the delegates of the Mongolian Agency for Standardization and Metrology (MASM) on 27 February 2024.
- 4) NIMT welcomed lecturers and students of the Kyushu Institute of Technology (Kyutech) on 18 March 2024.
- 5) NIMT welcomed the delegates of the National Institute of Metrology of China (NMI) on 20 - 21 May 2024.
- 6) NIMT welcomed the delegates of the Uzbek National Institute of Metrology (UzNIM) on 11 - 14 June 2024.

In addition, in 2024, NIMT hosted the important international conferences as follows:

APLMF/APMP Training Course on Sphygmomanometers

This training was held on 9 - 11 July 2024 at Centara Grand at Central Plaza Ladprao Bangkok and NIMT, Klong 5, Pathumthani. The main objective was to transfer knowledge on international standards and requirements of the sphygmomanometers for the member countries of APLMF and APMP to implement as a guideline for type approval, verification/testing in their countries. There were more than 40 participants from several countries: Bangladesh, Cambodia, China, India, Indonesia, Japan, Kiribati, the Republic of Korea, Laos, Malaysia, Mongolia, Nepal, Peru, the Philippines, Sri Lanka, Thailand, and Vietnam.



The 11th Meeting of the ASEAN Experts Group on Metrology (EGM-11)

This meeting was organized on 6 - 7 August 2024 at Mandarin Hotel, Bangkok and NIMT, Klong 5, Pathumthani. It aimed to promote international cooperation on metrology and serve as a forum for discussion and determination on the development of the metrology systems of member countries. There were over 30 attendees from 9 member countries: Cambodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Vietnam. The meeting resolved the topics of collaboration in 2025 – 2027 as follows: 1) Traceability and calibration of EV charging stations 2) Digital Transformation 3) Quality Infrastructure 4) Basic Metrology Training and 5) Comparison / Proficiency Testing.



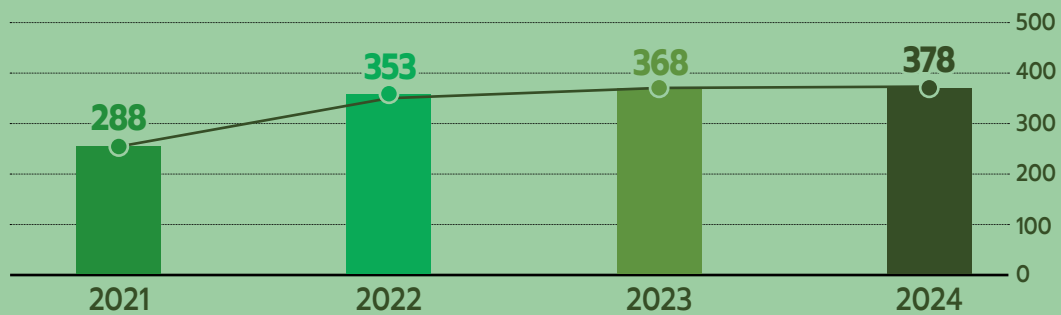
The 1st International Conference on Measurement Sciences and Applications (IMSA 2024)

The conference was organized on 21 - 23 August 2024 at Impact Forum, Muang Thong Thani, Nonthaburi, Thailand, under the theme "Measurement for Sustainable Future". The objective was to serve as an international platform for knowledge exchange and research presentation on measurement science and applications to create sustainable research development that benefited to the country development. This was the first year conference and the main topics related to SI challenges, Climate crises, Technology challenges, and Quality infrastructure.

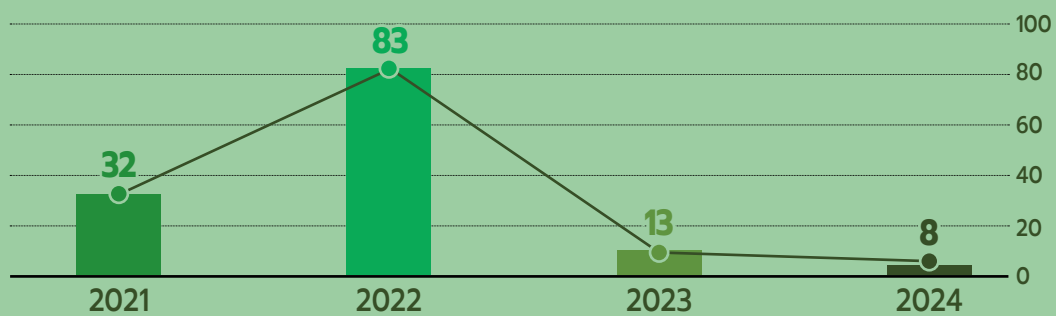


NIMT's quality system (2021-2024)

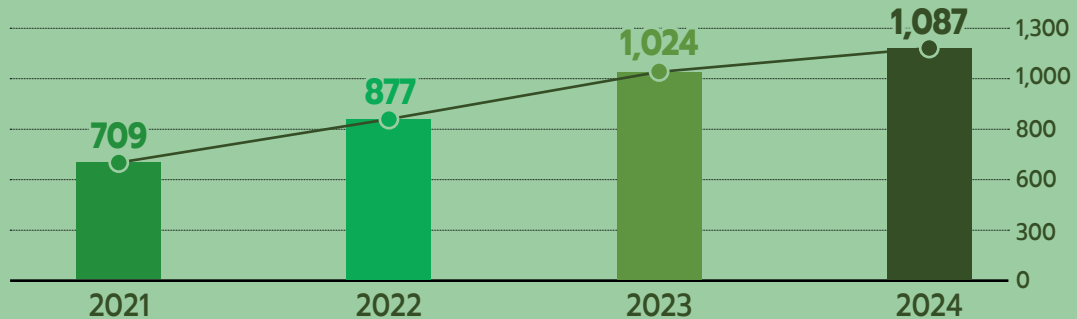
- Number of CMC published in KCDB database on BIPM website (items)



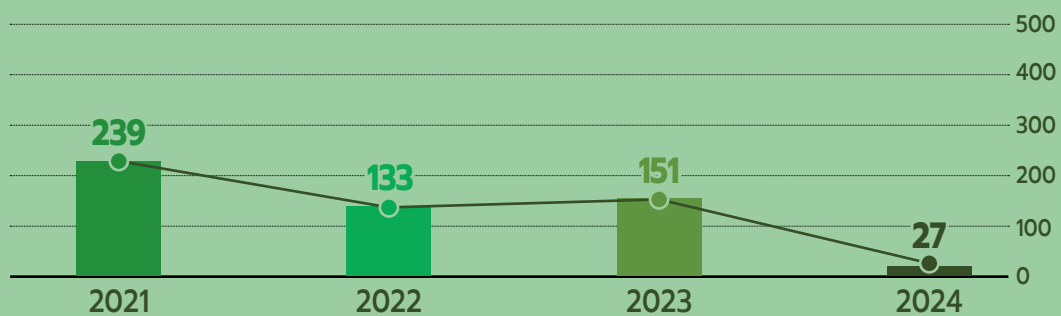
- Number of CMC submission in KCDB database on BIPM website (items)



- Number of measurement items continuously maintained under ISO/IEC 17025 and ISO 17034 quality management system (items)



- Number of measurement items certified under ISO/IEC 17025 and ISO 17034 quality management system (increasing items)



Appendix



Number of Calibration and Measurement Competencies (CMC) certified to ISO/IEC 17025 and ISO 17034 (increased)



7,109
items

Calibration services and consulting services

97.62%



Percentage of calibration services satisfaction

97 courses



Courses for developing skills and developing labor skills

1,045
man

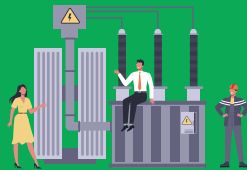


Developing SME personnel skills for entering Digital Transformation



18
items

Inter-laboratory comparison program



245
items

On-site calibration services

2,989
Man-day



Number of participants in knowledge dissemination training activities

97.21%



Percentage of Training services satisfaction

301
man



Development of personnel skills in the medical equipment sector



101
items

In-Country laboratory comparison program



321
entrepreneurs

Number of TRMs that can be sold



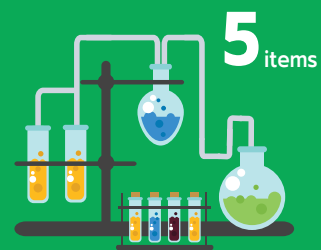
469
entrepreneurs

Number of entrepreneurs who using metrology services

3,384 man



Number of SME personnel who have completed skills development



5 items

Establish standards and methods for calibrating medical devices

National Institute of Metrology (Thailand)

Statement of Financial Position

As of 30 September 2024


(Unit: Baht)

	Note	2024	2023
Asset			
Current assets			
Cash and cash equivalents	4	618,469,893.52	568,120,329.60
Trade receivables	5	4,125,832.84	3,634,650.80
Other short-term receivables	6	16,877,287.38	16,423,187.86
Inventories		4,817,552.04	7,252,226.17
Other current assets	7	2,708,448.84	1,907,211.44
Total current assets		646,999,014.62	597,337,605.87
Non-current assets			
Buildings and Equipment	8	1,609,671,783.48	1,756,831,987.05
Intangible assets-net	9	7,634,045.61	9,631,806.92
Total non-current assets		1,617,305,829.09	1,766,463,793.97
Total assets		2,264,304,843.71	2,363,801,399.84
Liabilities and Net Assets/Equity			
Liabilities			
Current liabilities			
Trade payables	10	13,455,397.68	30,076,188.49
Short-term payables	11	11,233,311.10	7,762,363.07
Other current liabilities	12	2,291,023.41	1,965,672.30
Total current liabilities		26,979,732.19	39,804,223.86
Non-current liabilities			
Deferred revenue		126,441,146.18	77,427,642.16
Employee benefit obligation	13	81,727,854.84	68,128,248.25
Other non-current liabilities	14	6,718,903.00	9,652,310.79
Total non-current liabilities		214,887,904.02	155,208,201.20
Total liabilities		241,867,636.21	195,012,425.06
Net assets/equity			
Capital		972,956,158.35	972,956,158.35
Accumulated income over expenses		1,049,481,049.15	1,195,832,816.43
Total net assets/equity		2,022,437,207.50	2,168,788,974.78
Total liabilities and net assets/equity		2,264,304,843.71	2,363,801,399.84

Note: The accompanying notes are an integral part of these financial statements.



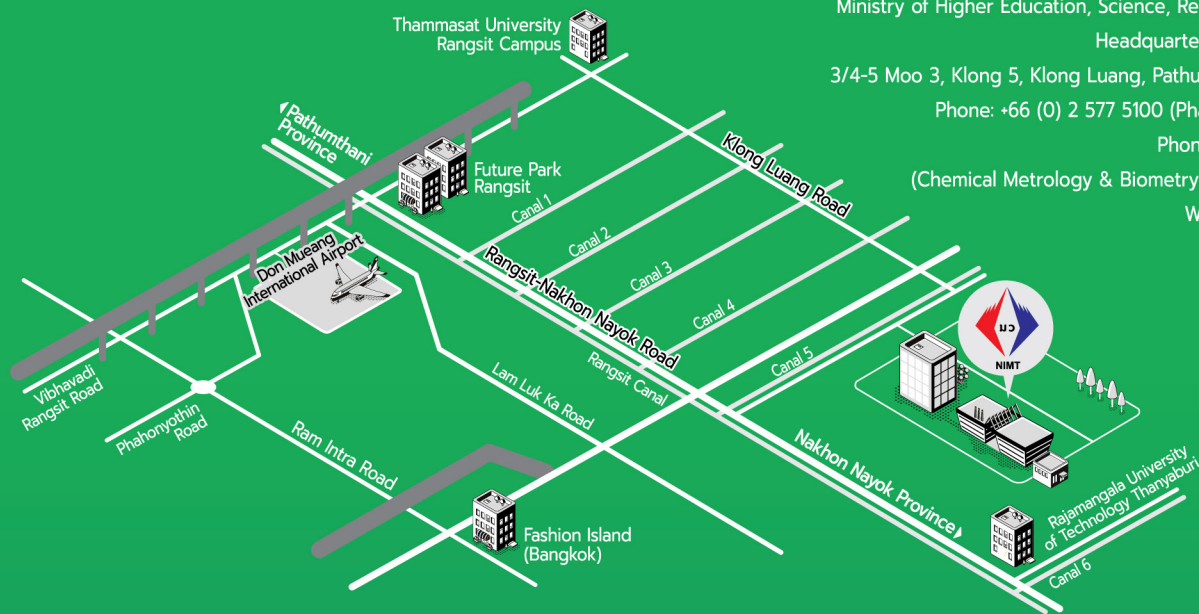
Financial
Report for
Fiscal Year 2024


(Mr. Jeniphathny Ya-anan)
Manager of Administration
Department


Pol.Lt.Gen
(Pornchai Suteerakune)
Director, National Institute
of Metrology (Thailand)

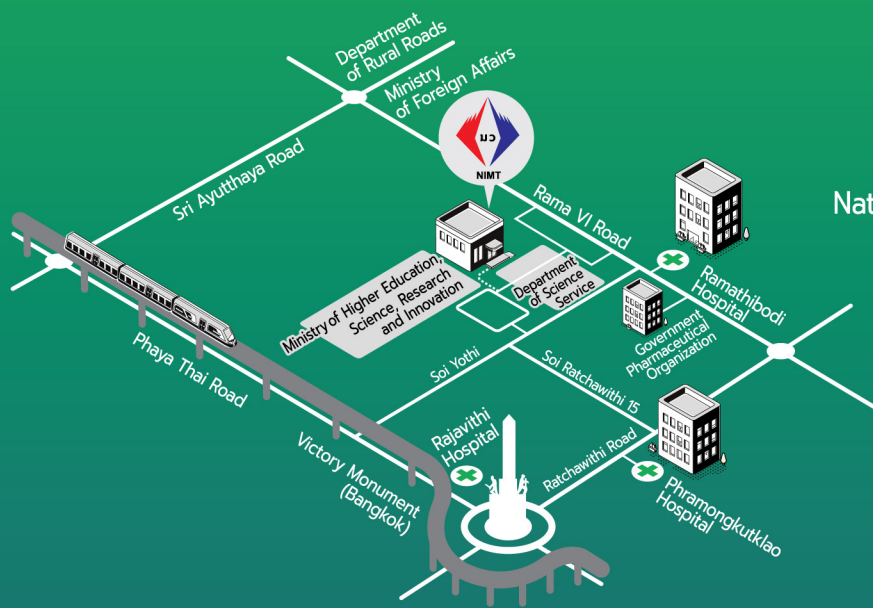
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Annual Report 2024
 National Institute
 of Metrology (Thailand)
 Produced and published by:
 Organisational
 Communication Group,
 NIMT



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