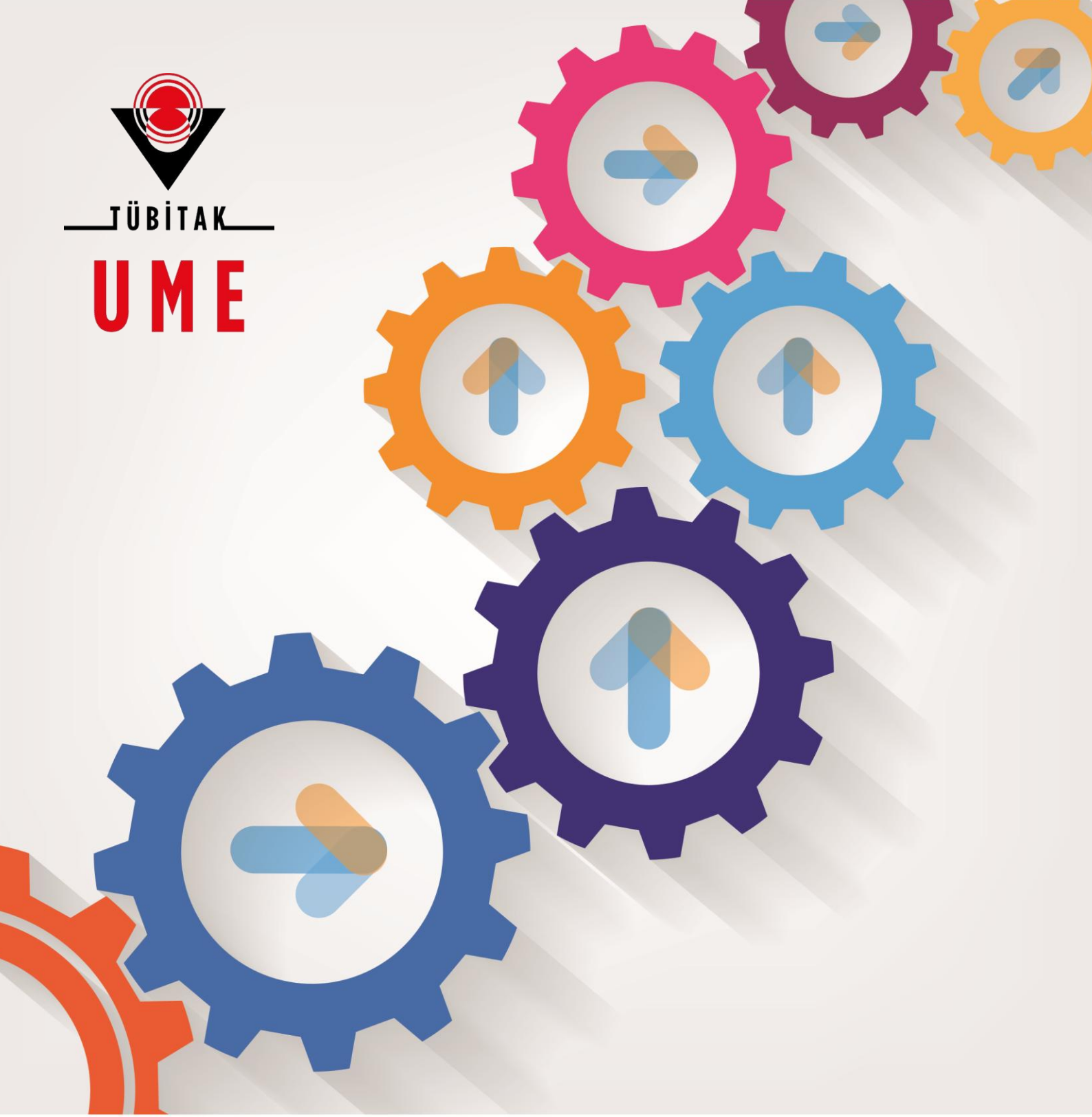




Annual Report 2014

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OUR VISION

To become a worldwide
solution center for
measurement science

INTRODUCTION



Dear Stakeholder,

TÜBİTAK National Metrology Institute is honored to present you its Annual Report which includes detailed information on our performance in the year 2014.

TÜBİTAK UME, as in the previous years, has continued to develop, maintain and ensure traceability for national standards of measurement in 2014. Besides carrying out these core activities, we have increased our participation in international R&D projects and continued our efforts to develop solutions for industrial measurement problems. Work on 68 external projects continued in 2014, of which 35 are supported by the EU, 1 by the Ministry of Development, 9 under various R&D support programmes financed by TUBITAK and the remaining 23 financed by customers (national: 13, international: 10).

In all, 2 new bilateral MoU's have been signed as part of our goal of improving links to NMIs in the Middle East, the Balkans, Central Asia and Africa, for which action plans have been prepared and implemented.

In 2014, 9 joint research projects in which TÜBİTAK UME is a partner and which were accepted in 2013 for funding within the European Metrology Research Programme were initiated while 7 EMRP joint research projects were completed. Furthermore, 13 applications were submitted in response to EMPIR calls in the year of 2015. The SASO D-3, D-4 and J-3 Projects with the Saudi Standards, Metrology and Quality Organization (SASO) were signed regarding the establishment of 26 separate metrology laboratories and 3 separate facilities and the provision of related training and consultancy services.

An application letter and related documents were submitted to BIPM for TÜBİTAK UME to become a full member of the CIPM Consultative Committee for Mass and Related Quantities.

Within the project carried out in partnership with the Energy Markets Regulatory Agency (EPDK) since 2007 180 thousand litres of the national marker used to identify legally marketed fuels has been delivered to licenced establishments. An additional project to produce a marker for ALPET was completed and a new one was begun to produce a different company specific marker for OPET.

Two international patent applications were submitted for TÜBİTAK UME designed measurement systems. These applications are under evaluation.

Our goal is to place TÜBİTAK UME among the top metrology institutes worldwide starting with Europe by the year of 2023 with our innovative scientific and technological performance.

We present you, our valued stakeholders, with a summary of TÜBİTAK UME's performance in 2014 in our annual report. I take this opportunity to offer my sincere gratitude to the staff of TÜBİTAK UME who have contributed to elevating our institute to an internationally competitive position and to our stakeholders who have challenged us to meet our goals while granting us their support.

Dr. Mustafa ÇETİNTAŞ
Acting Director
TÜBİTAK UME

CHRONOLOGY

1875	The Meter Convention was signed on May 20, 1875.
1931	Law No. 1782 on 'Weights and Measures' was signed and usage of the metric system became mandatory on March 26, 1931.
1981	TÜBİTAK was assigned the responsibility of establishing a national metrology center by the Council of Ministers.
1984	The Council of Ministers' decision on the establishment of a primary level "Industrial Metrology and Calibration Laboratory" was published in the Official Gazette.
1986	The 'National Physics and Technical Measurement Standards Center' began operations in 226 m ² of space.
1992	The name of the institution was changed to the "National Metrology Institute" (UME)
1994	TÜBİTAK UME moved its operations to a new building with an indoor area of 7.500 m ² .
1999	TÜBİTAK UME signed the CIPM Mutual Recognition Arrangement (CIPM MRA).



2003

TÜBİTAK UME expanded with the completion of a new complex consisting of 4 blocks with 28.650 m² of space.

2006

TÜBİTAK Science Board designated TÜBİTAK UME as a Research and Development Entity.

2007

TÜBİTAK UME was a founding member for EURAMET.

R&D ACTIVITIES



Activities related to the realization of primary level measurement standards are among the highest priority at TÜBİTAK UME in line with its institutional mission.

There were 13 externally supported projects which were carried out in 2014, of which 8 were completed. There were 4 TÜBİTAK funded projects which were carried out in 2014, of which one was completed. 30 EU and EMRP supported projects were carried out in 2014, and 5 of them were completed during the year 2014.

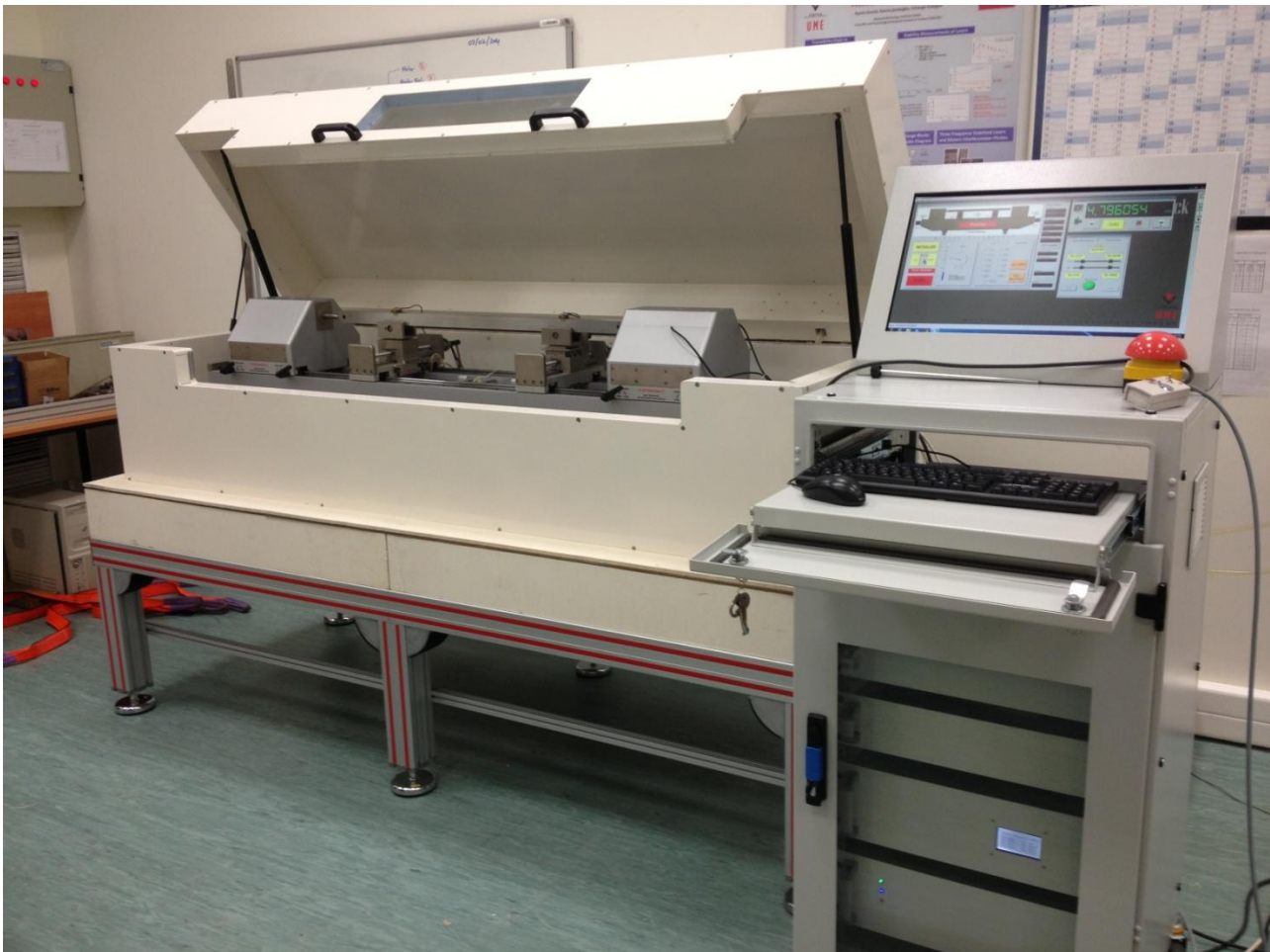
In 2014, work began on 2 EMRP projects in which TÜBİTAK UME is the coordinator.

ONGOING TÜBİTAK FUNDED PROJECTS

LABORATORY	PROJECT
Reference Materials	Dried Fig Certified Reference Material Production and Certification
Reference Materials	Trace Elements in Nuts Certified Reference Material Production and Certification
Reference Materials	25-OH Vitamin D2/D3 in Lyophilized Sera Certified Reference Material Production and Certification
Reference Materials	Preparation of National Marker Active Ingredients and SRM's of Stock Solution.
Reference Materials	Production of Carbon Isotope Certified Reference Materials and Certification of Delta Values
Reference Materials	Production of Certified Reference Solutions for Measurement and Calibrations
Gas Metrology	Preparation and Certification of Primary Reference Gases for Carbonmonoxide and Carbondioxide.
Gas Metrology	Preparation and Certification of Primary Reference Gases for Natural Gas
Reference Materials	Reference Material Production And Certification for Sulfur in Diesel
Reference Materials	Reference Material Production and Certification for Diesel with Multiple Parameters.
Inorganic Chemistry	Reference Material Production of Certified Effluent Water
Time and Frequency & Wavelength	Utilizing Zeeman Stabilized Laser in Wavelengths
Temperature	Construction of High Temperature Fixed Points for Thermocouple Calibrations
Acoustics	Establishment of Medical Metrology Research Laboratory
Optic	Establishment of the Traceability Chain of Pulsed Laser Radiation Sources Used in the Measurement of Laser Energy Meters
Optic	Investigation of Magneto optic Faraday Effect on the Sensing Coil of Interferometric Fiber Optic Gyroscope
Optic	Reference Calorimeter Device Production for Solid Liquid and Gas
Time and Frequency & Wavelength	First Generation Watt Balance Experiment Installation.
Optic	Spectroradiometer System Installation with High Resolution and Generating Radiation Traceability Chain

COMPLETED TÜBİTAK UME PROJECTS

LABORATORY	PROJECT
Time/Frequency and Wavelength	Long Gauge Block Comparator Design, Manufacture and Production
Time/Frequency and Wavelength	Device Development Project for the Chemistry Group.
Pressure	Manometric Gas Mixture System Installation.
Pressure	Development of a Dynamic Vacuum System
Electromagnetic	Improvement and Development of Electromagnetic Measurements
Acoustics	Installation of a System for Sound Speed Measurements inside Solid Materials
Magnetics	Construction of Single Sheet Tester System to Measure AC Power Loss and Magnetic Properties for Steel-Plates



Long Gauge Block Comparator

ONGOING EXTERNALLY FUNDED PROJECTS

LABORATORY	PROJECT
Organic Chemistry	Company Marker Production for OPET and Supply Of Devices for Field Inspections
Electromagnetic	LST Ship EMI-EMC Tests and Analysis
Electromagnetic	A/OİHSFS EMI-EMC Tests and Analysis
Electromagnetic	MTA SAG EMI-EMC Tests and Analysis
Electromagnetic	ALTAY System EMI-EMC Tests and Consultancy
Electromagnetic	Peace Eagle Ground Support Center EMI/EMC Tests and Analysis
Electromagnetic	MOSHIP KURYED EMI/EMC Tests and Analysis
All Laboratories	SASO National Measurement and Calibration Center Project
Electromagnetic	Joint Work and Consultancy for General Metrology
All Laboratories	SASO / NMCC Program for Development and Consultancy Services
Time/Frequency and Wavelength	SASO / NMCC Time and Frequency Laboratory Improvement Consultancy Services Program
Time/Frequency and Wavelength	King Abdullah Hilal and Astronomy Center (KACCOA) and Mecca Time Center Cooperation and Consultancy
Electromagnetic	N-Type Microcalorimeter Development for an NMI
Power and Energy	Establishment of TEİAŞ Calibration Laboratory

COMPLETED EXTERNALLY FUNDED PROJECTS

LABORATORY	PROJECT
Organic Chemistry	Development and Certification of performance additive for ALPET Company Marker
Organic Chemistry	Development and Application of National Fuel Marker for the Fuels
Electromagnetic	YHT EMI/EMC Activities Project
Power and Energy	ICT design of Electronic Compensation for KOSOVA KEDS
Time/Frequency and Wavelength	SASO Joint Work and Consultancy
Impedance	Development of Inductive Voltage Dividers
Time/Frequency and Wavelength	Temperature and Humidity Sensor Addition to Doppler Radar Calibrator, Software Update and Calibration
Impedance	Development of 1fA – 100 pA DC Low Current Source

ONGOING TÜBİTAK FUNDED PROJECTS

LABORATORY	PROJECT
Power and Energy	Robust Design for High Accuracy Current and Resistance Transducers and Combi Sensors
Magnetic	Usage of Boron to Synthesize and Characterize Radar Absorbant Materials
Acoustics	Improvement of Class Acoustics for Hearing-Impaired Individuals
Reference Materials	UME-Newborn Metabolic Hast-Crm Project

COMPLETED TÜBİTAK PROJECTS

LABORATORY	PROJECT
Bioanalysis	Proteomic Analysis of Kidney and Liver Transplantation Solutions Before Transplant



ONGOING EMRP FUNDED PROJECTS

LABORATORY	PROJECT
Inorganic Chemistry	Metrology for Metalloproteins (Metallomics)
Acoustics	Metrology for a Universal Ear Simulator and the Perception of Non-audible Sound (Ear)
Acoustics	Dosimetry for Ultrasound Therapy (DUTy)
Temperature	Novel Techniques for Traceable Temperature Dissemination (NOTED)
Fluid Mechanics	Metrology for Drug Delivery (MeDD)
Time/Frequency and Wavelength	Traceability of Sub-nm Length Measurements (Subnano)
Bioanalysis	Metrology for Monitoring Infectious Diseases, Antimicrobial Resistance, and Harmful Micro-organisms (INFECT-MET)
Mass	Developing a Practical Means of Disseminating the New Kilogram (NewKILo)
Temperature	Implementing the New Kelvin (InK)
Temperature	Metrology for Moisture in Materials (METefnet)
Voltage	Quantum Standard for Sampled Electrical Measurements (Q-WAVE)
Acoustics	Realisation, Dissemination and Application of the Unit Watt in Airborne Sound (SoundPwr)
Impedance	Automated Impedance Metrology Extending the Quantum Toolbox for Electricity (AIM QuTE)
Electromagnetic	Improved EMC Test Methods in Industrial Environments (EMC Industry)
Bioanalysis	Traceability for Biologically Relevant Molecules and Entities (BioSITrace)
Force	Force Traceability Within the Meganewton Range (Force)
Time/Frequency and Wavelength	Compact and High-Performing Microwave Clocks for Industrial Applications (Mclocks)
Dimensional	Angle Metrology (Angles)
Gas Metrology	Metrology for High-Impact Greenhouse Gases (HIGHGAS)
Gas Metrology	Metrology for Biogas (BIOGAS)
Power and Energy	Sensor Network Metrology for Electrical Grids Characteristics Identification (GridSens)
Power and Energy	Nonconventional Voltage and Flow Sensors for Future Energy Grids (FutureGrids)
Optics	Metrology for Efficient and Safe Innovative Lighting (MESail)
Optics	Metrology for III-V Materials Based High Efficiency Multi-Junctions Solar Cells (SolCell)
Temperature	Metrology for Essential Climate Variables (MeteoMet2)
Organic Chemistry	Metrology in VOC Scaler for Air Pollution and Climate Shift for Metrology (KeyVocs)
Organic Chemistry	Traceability for Mercury Measurements (MeTra)



COMPLETED EMRP PROJECTS

LABORATORY	PROJECT
Magnetics	Metrology for Advanced Industrial Magnetics (MetMags)
Temperature	High Temperature Metrology for Industrial Applications (HITEMS)
Pressure	Vacuum Metrology for Production Environments (Vacuum)
Pressure	Traceable Dynamic Measurement of Mechanical Quantities (Dynamic)
Fluid Mechanics	Metrology for Pressure Temperature, Humidity and Airspeed in the Atmosphere (MeteoMet)
Organic Chemistry	Traceable Measurements for Monitoring Critical Pollutants Under the European Water Framework Directive (WFD)

NATIONAL MEASUREMENT STANDARDS

TÜBİTAK UME continued to fulfill the demands of its local and foreign customers for calibration, training and consultancy services in 2014.

In 2014, TÜBİTAK UME provided 432 types of test and calibration services with its established infrastructure of 116 different primary level standards that cover 99 different measurement quantities.

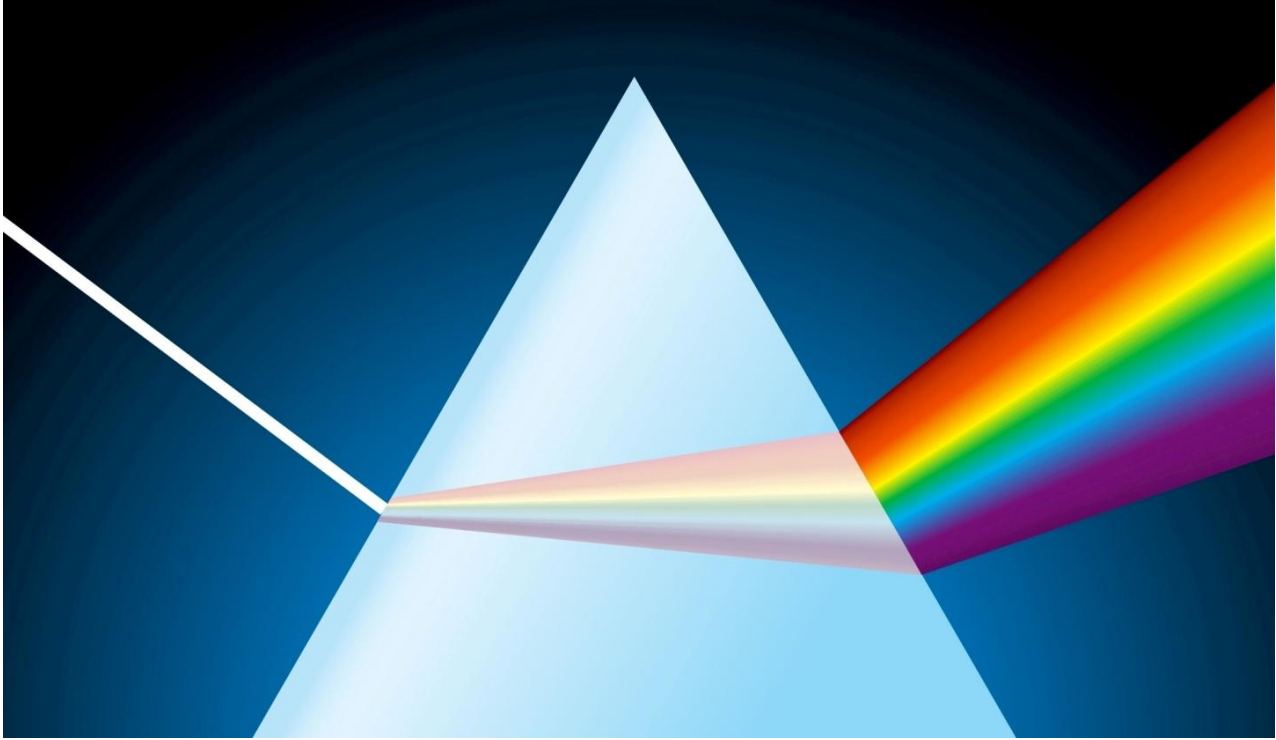
TÜBİTAK UME developed 9 new measurement techniques and added 24 measurement quantities to its range of measurement capabilities.

TÜBİTAK UME produced 125 new references / devices / standards in 2014 for use as national measurement reference standards and/or standard measurement systems.



NEW MEASUREMENT CAPABILITIES

LABORATORY	MEASUREMENT QUANTITY
Bioanalysis	GDO (copy number %)
Bioanalysis	Amount of bacteria (quantity of bacteria/mL)
Bioanalysis	Amount of protein (μ g/L)
Bioanalysis	mRNA (copy number ratio)
Gas Metrology	Gas Mixture ¹
Power and Energy	AC Current Ratio (Imajiner) (rad)
Power and Energy	AC High Voltage Ratio (Reel)
Power and Energy	High Voltage Impedance(Reel)
Power and Energy	High Voltage Impedance (imaginary)
Power and Energy	AC Flow Ratio (Reel) (A/A)
Power and Energy	AC High Voltage Ratio (imaginary) (rad)
Inorganic Chemistry	Elemental Concentration (ng/g)
Organic Chemistry	Tablet Type 2 Collagen
Organic Chemistry	Tablet MSM Quantity Assessment
Organic Chemistry	Acetyl CoA Q10 Quantity Determination in a Primer
Organic Chemistry	Vitamin A,B1,B2,B3,B5,B6,B9,B12,C,D3,E Quantity Determination in a Primer
Organic Chemistry	Glucosamine Quantity Determination for Tablet
Organic Chemistry	Chondroitin Quantity Determination for Tablet
Organic Chemistry	Omega 3 (Codfish oil, EPA, DHA) Quantity Determination in a Primer
Organic Chemistry	Vitamin A,B1,B2,B3,B5,B6,B9,B12,C,D3,E Quantity Determination in a Syrup
High Voltage	PD Weight (pC)
High Voltage	High Voltage Capacitance (pF, μ F) and Tan
High Voltage	Pulse High Voltage Current (kA, μ s)
High Voltage	High Voltage Puncture Resistance (kV/mm)



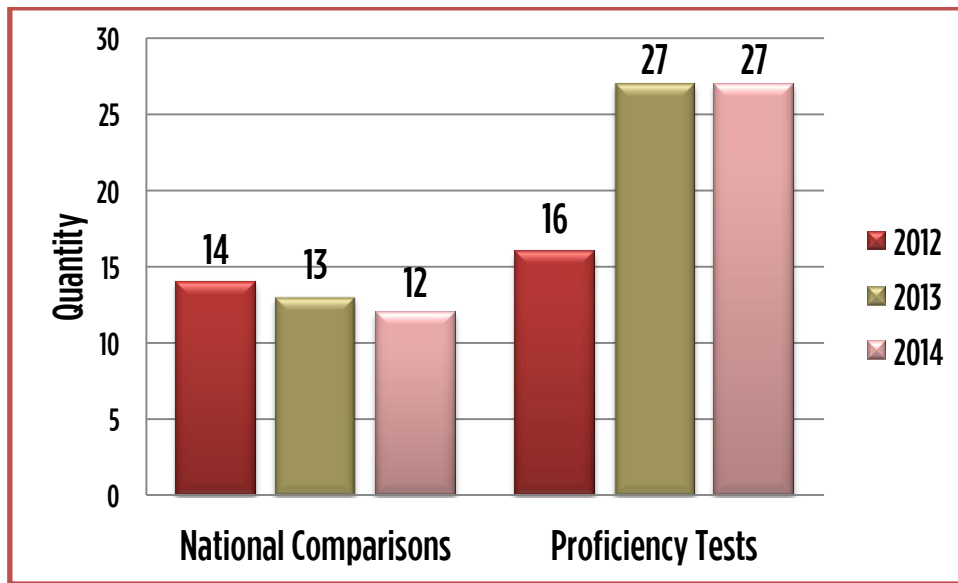
NEW MEASUREMENT TECHNIQUES

LABORATORY	MEASUREMENT TECHNIQUE
Acoustics	Measurement of thermal effect generated by HIFU transducer in tissue by thermal camera
Gas Metrology	Natural gas analyses
Optics	Studies on the detector-based realization of absolute total luminous flux of LEDs
Optics	Measurement of the solar irradiance based on an Absolute Cavity Radiometer system
Optics	Studies on establishment of spectral irradiance scale
Optics	Construction of a measurement system for calibrating Si-structured solar cells
Optics	Construction of a measurement system for calibrating pyranometers according to the ISO 9846 standard
Optics	Construction of a measurement system for calibrating pyrhemometers according to the ISO 9059 standard
Optics	Solar irradiance tracking system

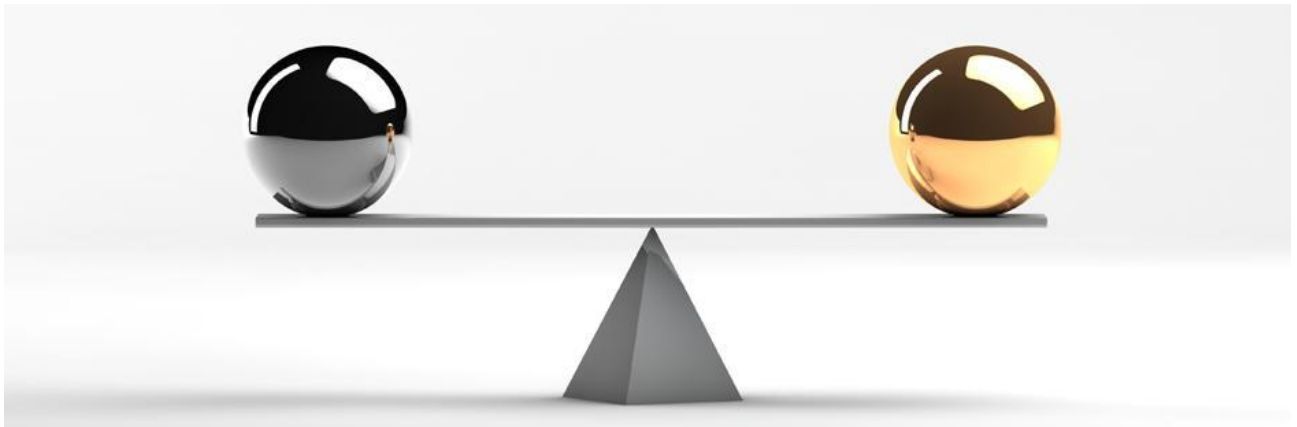
REFERENCE DEVICES / MATERIALS PRODUCED

Laboratory	Reference Device / Material
Acoustics	Primary Reference Sound Power Source (1 adet)
Impedance	1 fA – 100 pA Reference DC Current Source (1 piece)
Impedance	4-decade Inductive Voltage Divider (4 pcs.)
Impedance	7-decade Inductive Voltage Divider (2 pcs.)
Impedance	7-decade Inductive Voltage Divider (2 pcs.)
Impedance	4-decade Inductive Voltage Divider (2 pcs.)
Gas Metrology	UME CRM 1101 / Carbon Dioxide in Nitrogen (7 unit)
Gas Metrology	% 15.0 CO ₂ /N ₂ Primary Reference Gas Mixture (1 unit)
Gas Metrology	% 20.0 CO ₂ /N ₂ Primary Reference Gas Mixture (1 unit)
Gas Metrology	% 17.5 CO ₂ /N ₂ Primary Reference Gas Mixture (2 unit)
Gas Metrology	% 7.5 CO ₂ /N ₂ Primary Reference Gas Mixture (1 unit)
Gas Metrology	% 12.5 CO ₂ /N ₂ Primary Reference Gas Mixture (1 unit)
Gas Metrology	UME CRM 1101 / Carbon Dioxide in Nitrogen (4 unit)
Gas Metrology	Primary Reference Gas Mixture for Carbon Dioxide in Nitrogen (8 unit)
Power and Energy	LPCT Test Set (Quantity: 1)
Power and Energy	Three-Phase Isolation Current Transformer (Quantity: 3)
Power and Energy	Three-Phase Electronically-compensated Isolation Current Transformer (Quantity: 10)
Power and Energy	Three-Phase Calibrator for Three-phase Isolation Current Transformers (Quantity: 1)
Power and Energy	Three-Phase Electronically-compensated Isolation Current Transformer (Quantity: 10)
Power and Energy	DC Power Supply for Three-Phase Isolation Current Transformers (Quantity: 2)
Reference Materials	UME RM 9901 Total Contamination in Diesel (50 adet)
Temperature	Sealed Zinc Fixed Point Cell(Quantity: 1)
Temperature	Type R Thermocouple (Quantity: 1)
Temperature	Triple Point of Water Cell (Quantity: 2)
Temperature	Fabrication of Au/Pt Thermocouple (Quantity: 4)
Temperature	Copper Fixed Point (for thermocouple calibrations) (Quantity: 1)
High Voltage	Reference PD Measurement System (1 piece)

12 national comparisons and 27 proficiency tests were conducted in year 2014. While the national comparisons consisted of the measurements conducted in the areas of Flow, Electromagnetic, Gas, Force, Optics and Temperature, the Proficiency Tests were in the areas of Reference Materials and High Voltage.



National Comparisons and Proficiency Tests Conducted Within the Last 3 Years



NATIONAL COMPARISONS

LABORATORY	COMPARISON NAME
Electromagnetics	Microwave Power Measurements Comparison
Gas Metrology	Comparison of the Volume Vessels Calibration
Optics	Comparison on the Calibration of UV/VIS Spectrophotometers
Flow	Gas Flowmeters Comparison
Electromagnetics	RE102 Bilateral Comparison
Force	Comparison on Force in Material Testing Machines (2 comparisons)
Temperature	SPRT Comparison
Flow	Bilateral Comparison on Gas Flow Measurements
Force	Comparison on Calibration of Material Testing Machine Extensometers (2 comparisons)
Force	National Shoremetre Comparison

PROFICIENCY TESTS

LABORATORY	PROFICIENCY TEST NAME
Reference Materials	Determination of Electrolytic Conductivity in Soil
Reference Materials	Determination of Elements in Soil
Reference Materials	Determination of Refractive Index, Peroxide Value and Iodine Number in Sunflower Oil
Reference Materials	Determination of Refractive Index, Peroxide Value and Iodine Number in Sunflower Oil
Reference Materials	Gasoline Tests
Reference Materials	Diesel Tests
Reference Materials	Determination of Elements in Drinking Water
Reference Materials	Determination of δ ($^{13}\text{C}/^{12}\text{C}$) Isotope Ratio in Honey
Reference Materials	Determination of Sulfur Dioxide (SO ₂) in Dried Apricot
Reference Materials	Fuel Oil Tests
Reference Materials	Determination of Anions (fluoride, phosphate, chloride, nitrate, nitrite and sulfate) in Drinking Water
Reference Materials	Determination of Aflatoxin in Food
Reference Materials	Determination of Elements (Cd, Cu, Fe, Pb, Zn ve Sn) in Tomato Paste
Reference Materials	Determination of Elements in Waste Oil
Reference Materials	Gasoline Jet-A1 Tests
Reference Materials	Determination of pH in Soil
Reference Materials	Determination of Suspended Solids in Water
Reference Materials	Determination of Fatty Acids Composition of Sunflower Oil
Reference Materials	Determination of Cations (calcium, magnesium, sodium, potassium and ammonium) in Drinking Water
Reference Materials	Determination of COD in Waste Water
Reference Materials	Determination of pH in Water
Reference Materials	Determination of Benzoate and Sorbate in Ketchup
Reference Materials	Determination of Elements (As, Cd, Cr, Cu, Fe, Hg, Ni, Pb, ve Zn) in Waste Water
Reference Materials	Determination of Electrolytic Conductivity in Water
Reference Materials	Determination of Moisture, Ash, Fat and Protein in Food
Reference Materials	Total Contamination in Diesel
High Voltage	Determination of Loss in Power Transformers

INTERNATIONAL ACTIVITIES

TÜBİTAK UME raised its profile with new initiatives to increase its engagement with the BIPM and National Metrology Organizations in 2014.

An application and related documents were submitted to the BIPM for membership of the CIPM Consultative Committee for Mass and Related Quantities (CCM).



TÜBİTAK UME became an associate member of COOMET with the Memorandum of Understanding signed at the 24th Meeting of the COOMET Committee in April.

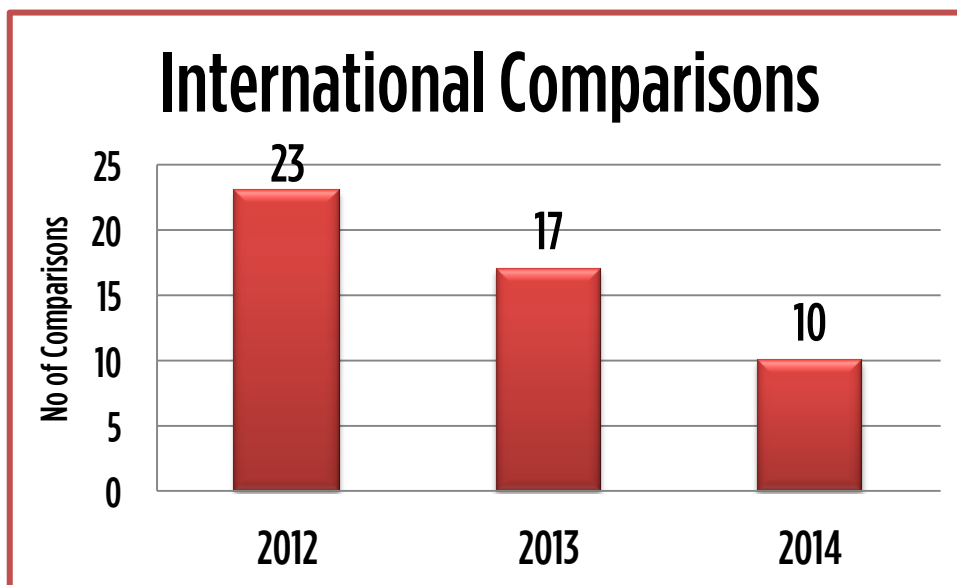
Two international patent applications were submitted for measurement systems designed by TÜBİTAK UME. These applications are in the process of international evaluation.

TÜBİTAK UME is making strides towards achieving the goal of becoming one of the leading metrology institutions in the world by 2023, the centennial of the Turkish Republic.

TÜBİTAK UME participated 10 international comparisons in total with 1 CIPM CCQM Key Comparisons and 1 Pilot Study, 1 CIPM CCQM, 1 CIPM CCEM and 2 EURAMET Key Comparisons, 2 EURAMET and 1 GULFMET Supplemental Comparisons, 2 Bilateral Comparisons.

INTERNATIONAL COMPARISONS

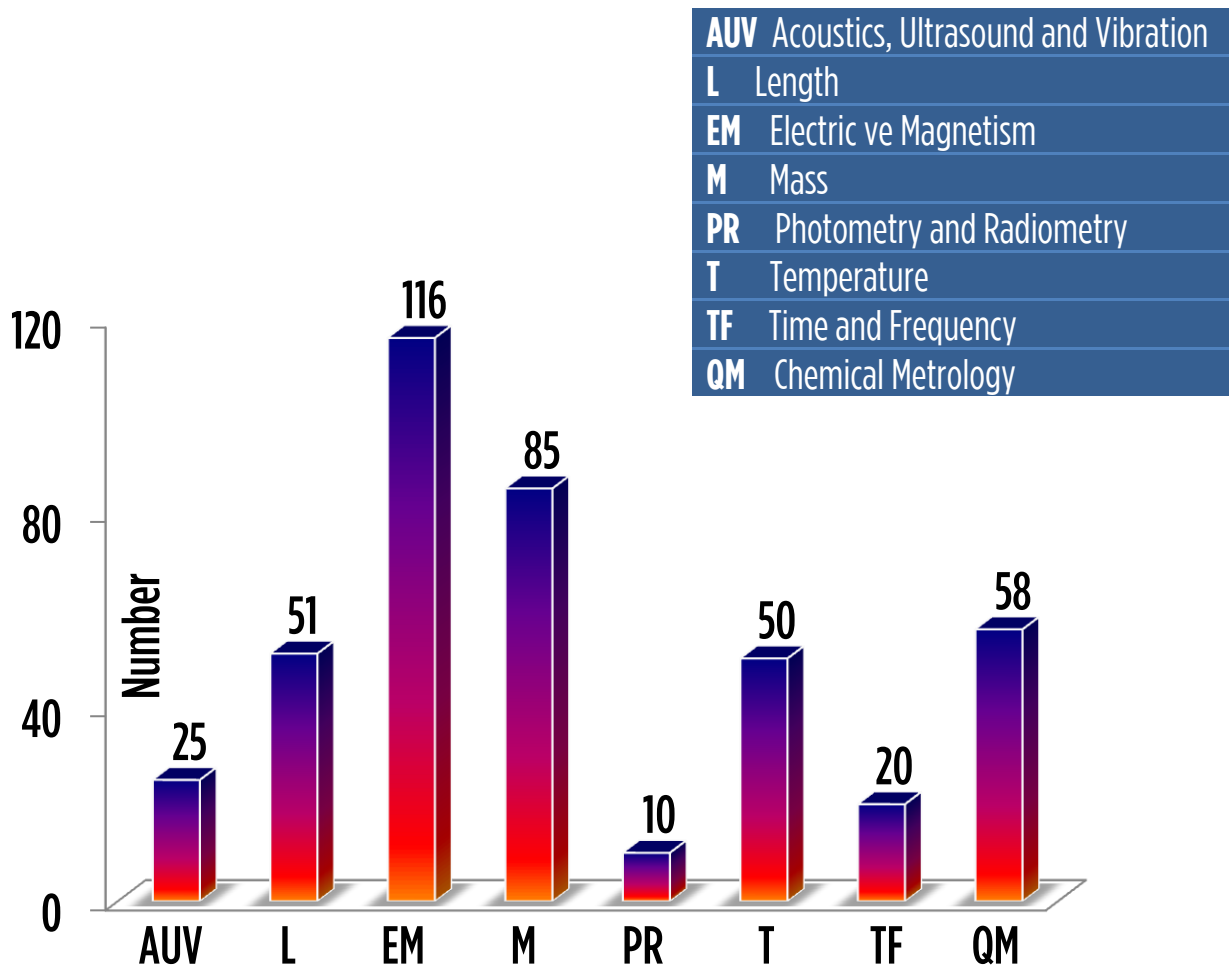
LABORATORY	COMPARISON NAME
Organic Chemistry	CCQM.P150 - Data acquisition and process in qNMR method (TRACK D)
Optics	EURAMET.PR-K4.3 - Bilateral Key Comparison between IO-CSIC (Spain) and UME (Turkey) for Luminous Flux
Temperature	EURAMET P1189 - Comparison of the realisations of the relative humidity in the range from 10% to 95% at temperatures from -10 °C to 70 °C
Dimensional	EURAMET.L-K8 - Comparison of Surface Roughness Standards
Electromagnetic	CCEM.RF-K5c.CL - Scattering Coefficients by Broad-Band Methods 100 MHz – 33 GHz – 3.5 mm Connector
Mass	Multiples and Submultiples of the Kilogram
Flow	EURAMET P1233 - Intercomparison of Water Meter Reference Standards
Optics	EURAMET.PR-K2a - Spectral Responsivity, (A/W), 900 nm to 1600 nm
Inorganic Chemistry	CCQM-K123 - Trace Elements in Biodiesel Fuel
Temperature	EURAMET P1338 - Bilateral International Comparison of the standard platinum resistance thermometer (SPRT) in the temperature range from -40 °C to 230 °C



Number of International Comparisons Joined in the Last 3 Years.

TÜBİTAK UME has 415 Calibration and Measurement Capabilities (CMCs) published in the Key Comparison Database (KCDB) maintained by the BIPM. The certificates issued for calibrations encompassed by these CMCs are accepted by all other institutions that have signed the CIPM Mutual Recognition Agreement (CIPM MRA). In 2014, TÜBİTAK UME's number of CMCs in the Chemistry area reached 58.

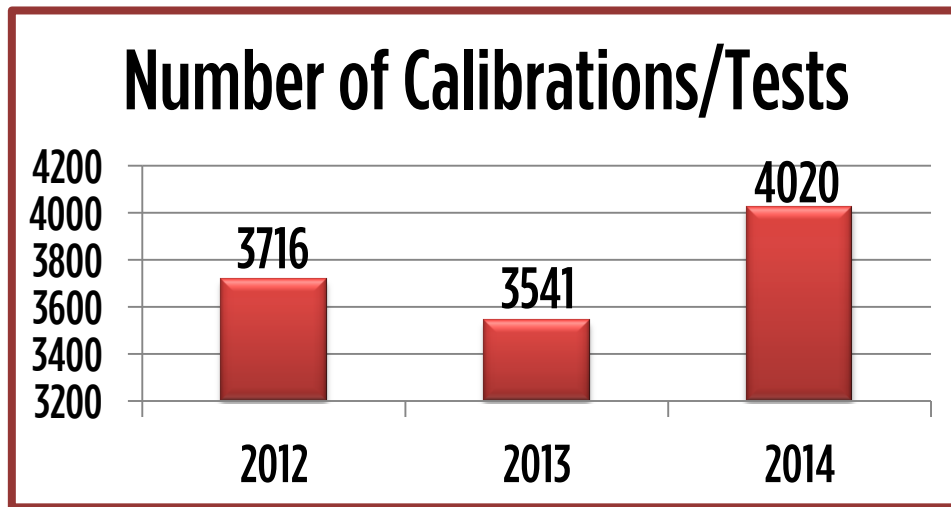
TÜBİTAK UME Calibration and Measurement Capabilities (CMCs) in KCDB



SERVICES

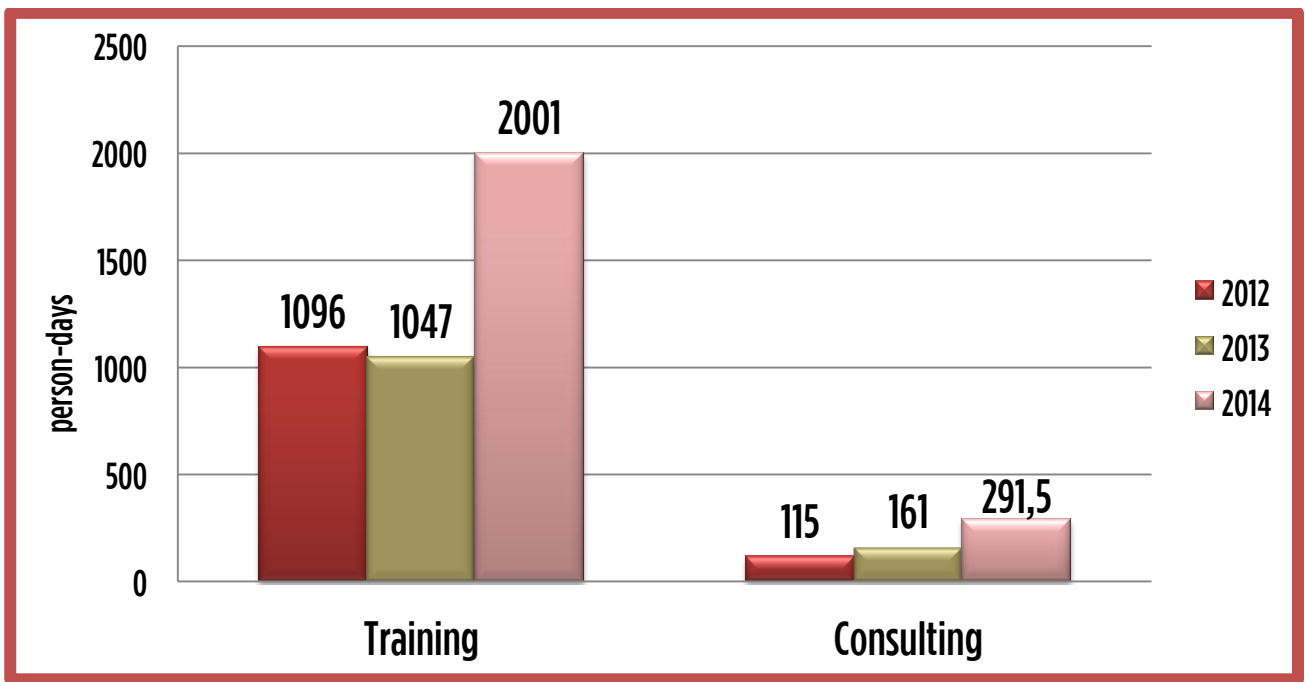
CALIBRATION/TEST SERVICES

TÜBİTAK UME offered 432 types of calibrations/tests to customers in year 2014. 326 out of the 432 services are accredited.



TRAINING AND CONSULTANCY SERVICES

In 2014, 2001 person-days of training services were provided to domestic and international customers. A total of 291,5 person-days of consulting services were provided, of which 210,5 person-days were expended on support for accreditation assessments and 81 person-days on provision of on-site technical support and problem resolution.



HIGHLIGHTS OF 2014

TÜBİTAK UME became an associate member of the Euro-Asian Metrology Cooperation of National Metrology Institutions (COOMET) by signing a Memorandum of Understanding at the 24th COOMET Committee Meeting held on April 16-17, 2014.



An application was submitted to the BIPM in the year 2014 for TÜBİTAK UME to become a member of the CIPM Consultative Committee for Mass and Related Quantities (CCM).

TÜBİTAK UME hosted the 2nd Meeting of the SMIC Metrology Committee in December. With 20 OIC countries represented and a total of 39 participants, matters concerning the development of certified reference materials for halal foods, cooperative activities in training to develop the metrology infrastructures of member countries, financial support mechanisms to be used for the development of those metrology infrastructures, traceability chains to be established among member countries and activities to be performed during 2015 were discussed. Also at the meeting, TÜBİTAK UME Director Dr. Mustafa Çetintaş was voted as the Chairman of the Metrology Committee.



A contract between TÜBİTAK UME and the Saudi Standards, Metrology, and Quality Organisation (SASO) was signed in Riyadh on April 3, 2014 for the establishment of a number of metrology laboratories to operate in the areas of Physics, Electric-Electronics, Mechanics and Chemistry.



In the framework of the contract with SASO, theoretical and applied training in metrology was provided to the staff of the SASO National Measurement and Calibration Center (NMCC). The services provided contributed to TÜBİTAK UME's positive recognition in the Middle East and North Africa.



On September 15-17, 2014 the Emirates Metrology Institute (EMI) was assessed by TÜBİTAK UME experts in administrative and technical areas for the purpose of identification of the institution that will serve as the NMI by the Emirates Authority for Standardization & Metrology (ESMA).

TÜBİTAK UME organized a workshop on metrology at the 'ASIAN-EU Science, Technology and Innovation Days' that was held in Thailand in January 2014 to increase cooperation between South Asian and European Countries.



TÜBİTAK UME participated in the GULFMET Technical Committee meetings which were held in Dubai, U.A.E. on April, 13-18, 2014.



A Memorandum of Understanding between TÜBİTAK UME and the Sudanese Standards and Metrology Organization (SSMO) was signed on January 19-22, 2014.



Various meetings were held regarding cooperative activities with the NMIs of Saudi Arabia, Tunisia, Kosovo, Kazakhstan, Azerbaijan.

Visits to TÜBİTAK UME were received from delegations coming from Libya, Albania, the Gambia and Ivory Coast. Possible cooperation areas were discussed with the delegates.

TÜBİTAK UME provided training to staff of NMIs and other metrology laboratories from Tunisia, Saudi Arabia, Kuwait, Georgia, Azerbaijan, and the United Arab Emirates in 2014.



TÜBİTAK UME Quality Manager Dr. Enver Sadıkoğlu was elected chair of the EURAMET Technical Committee for Quality, while Lead Senior Researcher Dr. Nilgün Tokman was elected to chair the EURAMET-TC-MC Inorganic Subcommittee.





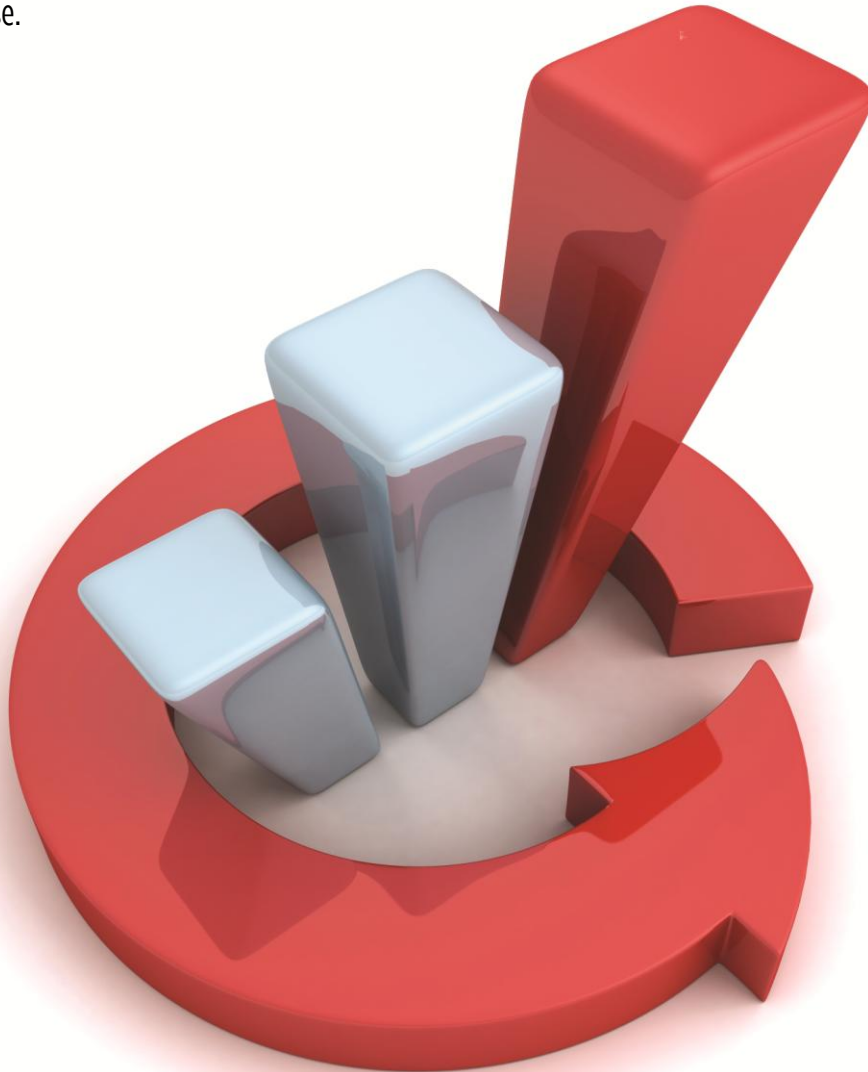
Within the scope of the activities of the EURAMET TC-IM Focus Group on Facilitating National Metrology Infrastructure Development (FG-FNMID), training was held in the area of Mass at TÜBİTAK UME on October 13-17, 2014 and a workshop in preparation for a comparison on calibration of digital multimeters was held at TUBITAK UME on December 8-9, 2014 with participants from the NMI of Albania, Montenegro, Kosovo, Macedonia, Bosnia-Herzegovina and Croatia.



QUALITY MANAGEMENT SYSTEM AND ACCREDITATION

A software developed by TUBITAK UME for the electronic authentication of the Calibration Certificates and Test Reports was brought online in 2014. Furthermore, the formats for Calibration Certificates and the Test Reports were revised, adding the logo of the CIPM MRA for services within the scope of Calibration and Measurement Capabilities (CMCs) published in the Key Comparison Database, and put to use on February 17, 2014.

An initiative to publish information in the International Database for Certified Reference Materials (COMAR) for Certified Reference Materials produced by TUBITAK UME was made and approved by the database managers. Starting in 2014, data on gas mixtures and fresh water reference materials produced by TUBITAK UME have been published in the COMAR database.



On June 10-11, June 16-18 and July 21-22, 2014 TÜBİTAK UME underwent assessment by TÜRKAK for renewal of accreditation. Within this scope, assessments of the following laboratories were completed:

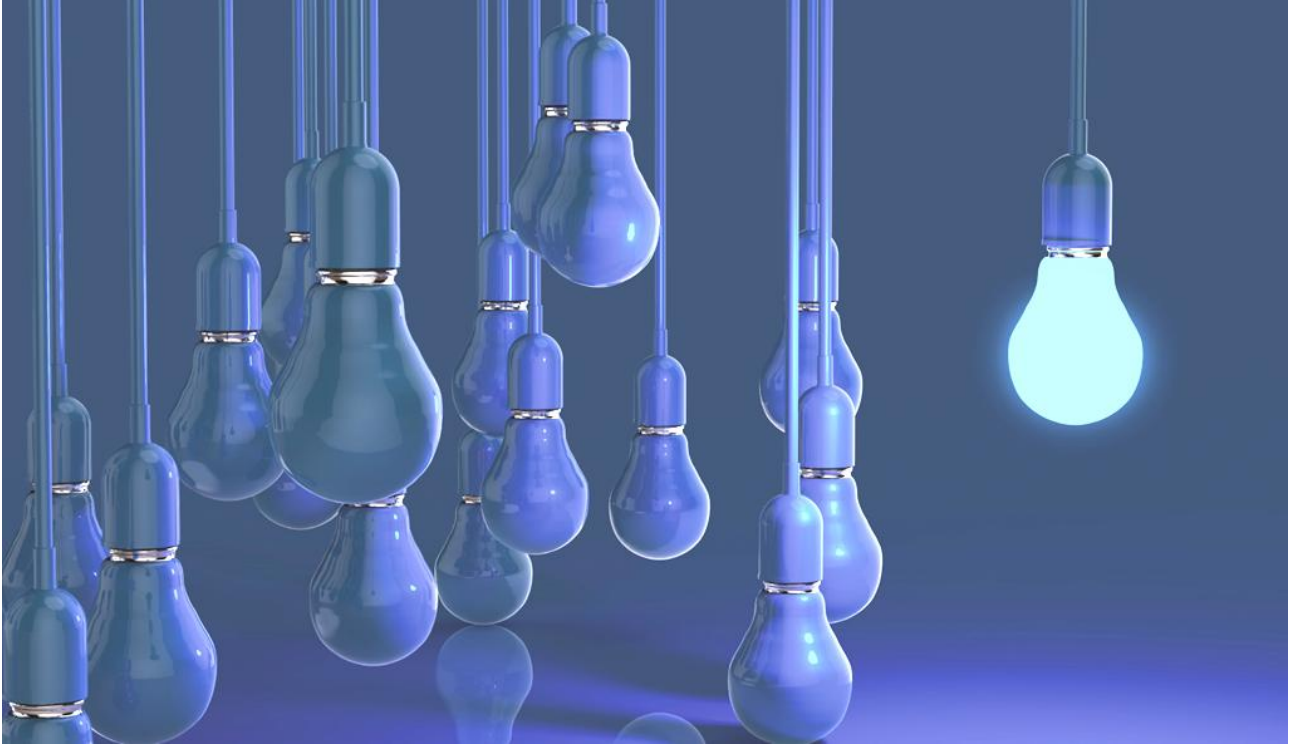
- Voltage Laboratory
- Impedance Laboratory
- High Voltage Laboratory (Calibration and Testing)
- Electromagnetic Laboratory (EMC Tests)
- Flow Laboratory (Gas and Liquid Flow)
- Pressure Laboratory
- Dimensional Laboratory
- Vacuum Laboratory
- Acoustics Laboratory (Testing)
- Mass Laboratory
- Force Laboratory
- Temperature Laboratory
- Quality Management System

EURAMET's official authorization to translate the following EURAMET Calibration Guides to Turkish was obtained:

- Calibration of Pressure Balances (EURAMET cg-3)
- Extent of Calibration for Cylindrical Diameter Standards (EURAMET cg-6)
- Determination of Pitch Diameter of Parallel Thread Gauges by Mechanical Probing (EURAMET cg-10)
- Guidelines on the Calibration of Digital Multimeters (EURAMET cg-15)
- Guidelines on the Calibration of Electromechanical Manometers (EURAMET cg-17)
- Calibration of Climatic Chambers, Guidance for Calibration Laboratories (EURAMET cg-20)

Of these guides, translations of EURAMET cg-15 ve EURAMET cg-20 were completed and published on TÜBİTAK UME's website.

A workshop on “Establishment of Quality Management Systems in National Metrology Institutes” held on April 14-15, 2014, in Dubai was organized by TÜBİTAK UME within the framework of cooperation with GULFMET.



On 3-7 February 2014, training on the establishment and implementation of a quality management system was provided to the Quality Manager of the Saudi Standards, Metrology and Quality Organization (SASO). Under the “SASO Consultancy and Cooperation” project, SASO National Measurement and Calibration Center (NMCC) was visited on the dates of April 19 - May 1, 2014. During this visit, the existing quality management system at SASO NMCC was evaluated on site. Also, 27 staff members were trained on the establishment of a quality management system in line with the ISO/IEC 17025 standard at National Metrology Institutes and on the CIPM Mutual Recognition Arrangement and its requirements. Between June 2-6, two SASO staff members were trained on producing quality management system documentation in line with the ISO/IEC 17025 standard.

An expert from Kosova Metrology Agency was trained between October 15-17, 2014 on the international metrology system and quality management issues.

On 3-5 February 2014, under the TÜRKAK-TÜBİTAK cooperation arrangement, a training given by TÜRKAK on assessment practices for the ISO/IEC 17025 standard was arranged for 22 UME staff members. Additionally, training was provided to 23 TÜRKAK personnel on “Certified Reference Materials and Metrology”.

INFORMATION AND TECHNOLOGY TRANSFERS

TÜBİTAK ÜME organized 29 business development meetings with leading industrial and public institutions in order to develop and implement novel project ideas. Within this period, one national and three international symposiums, workshops or conferences were organized, and a various conferences and fairs were attended for the purpose of promoting TÜBİTAK ÜME's services and capabilities.

In order to increase cooperation with academic institutions, protocols were signed with the Anadolu University, Gaziantep University and Kocaeli University on February 18, February 20 and April 7, respectively.



In order to enhance its profile, TÜBİTAK UME attended the WIN'2014 Fair on March 19-22, Expomed Fair on April 3-6, the 2nd International Istanbul Smart Networks Congress and Fair (ICSG) on May 8-9, WIN 2014 Metal Working Fair on June 5-8, the 2nd National Laboratory Accreditation and Security Symposium and Exposition on October 30-31, and the High Tech Port at the 15. MÜSIAD International Fair on November 26-30.



The Executive and General Committee meetings for the Istanbul International Smart Networks Congress and Fair (ICSG) were held at TUBITAK UME on September 26 and committee members were given a tour of the laboratories.

10 scientific seminars given by TÜBİTAK UME personnel were organized.

Visits to TÜBİTAK UME were organized for 18 different student groups from secondary schools and universities.

2014

ANNUAL REPORT



MOVE FORWARD
WITH **ACCURATE** MEASUREMENTS!

TRUE
MEASUREMENT
EXCELLENCE



2014 IN NUMBERS

R&D Projects **83**

National & International Comparisons **22**

Reference Materials & Standards Produced **125**

Quantities Measured **99**

Primary Level Standards **116**

Types of Calibration/Test Services **432**

Calibration/Test Services Performed **4020**

International/National Scientific Publications **68**

National & International Technical Committee Memberships **112**

Employees **252**

STEPS TO SUCCESS

TÜBİTAK UME Establishing Institute in Saudi Arabia



Projects worth a total of 29 M\$ were signed for turn-key establishment of 26 metrology laboratories and 3 infrastructural facilities for the the National Measurement and Calibration Center (NMCC) of the Saudi Standards, Metrology and Quality Organization (SASO). The agreement also involves provision of related consultancy services and training for NMMC staff.

The staff of the National Measurement and Calibration Center (NMCC) continue to be trained in theoretical and practical applications of metrology at TÜBİTAK UME Laboratories under the consultancy and cooperation components of the projects. These activities also serve to enhance the knowledge, experience and skills of TÜBİTAK UME's researchers and contribute to the recognition of TÜBİTAK UME within the Middle Eastern and North African regions.

Makkah Time Center Project



The recently established Makkah Time Center (MTC) obtained membership in the BIPM TAI club, however, the uncertainties of its monthly published values in the Circular T were high. An agreement with the Makkah Time Center was signed to enhance its current capabilities by providing necessary training and consultancy to MTC personel. In 2014, equipment was purchased and new software was developed in order to improve the technical infrastructure and related training and consultancy were provided. MTC's accuracy has improved significantly as a result of the work performed.

A Microcalorimeter for the National Institute of Standards of Egypt

Under an agreement with the National Institute of Standards (NIS) of Egypt, an N-type Microcalorimeter was designed and produced by the TUBITAK UME RF and Microwave Laboratory for the first time. Within 2014, the system was completed and performance tests were conducted.

The microcalorimeter is a primary level system for RF power measurements and is used by national metrology institutes for the calibration of power sensors. These systems are not commercially available and are instead custom produced by leading metrology institutes such as NPL, PTB, LCIE, INRIM and NIST. Microcalorimeters with different builds suitable for various types of connectors and power sensors are designed to meet the specific needs of each institute.



ICT Design for Kosovo Electricity Distribution and Supply

TÜBİTAK UME supplied the Kosovo Electricity Distribution and Supply Company (KEDS) with 20 three-phase electronically compensated isolation current transformers and two DC power sources, and 60 secondary and three primary connectors designed and produced by the TÜBİTAK UME Power and Energy Laboratory. TÜBİTAK UME also made necessary modifications to the customer's systems for adaption of the equipment and supplied related training to its staff.



Inductive Voltage Dividers Produced for Laboratoire National de Métrologie et d'essais (LNE) of France

TÜBİTAK UME Impedance Laboratory custom designed and produced inductive voltage dividers for use in impedance comparator bridges that are under development by Laboratoire national de métrologie et d'essais (LNE) of France.

A total of 10 inductive voltage dividers were built according to LNE's specifications. Similar inductive voltage dividers have also been produced for the Federal Institute of Metrology (METAS) of Switzerland.



A Company Fuel Marker for OPET

A five year contract was signed with OPET, a fuel distribution company, for the production of a unique chemical marker to be injected into fuel distributed by the company and for the supply of the detection devices to be used in field inspections.

Components of the agreement include development of the unique chemical marker, its production and delivery to OPET once every 2 months, supply of devices to be used in field inspections, the provision of training to OPET personnel for the duration of the contract and the establishment of an online database system that is remotely accessible by OPET personnel for purposes of monitoring inspection results.



Medical Metrology Laboratory Established at TÜBİTAK UME



TÜBİTAK UME established a Medical Metrology Laboratory equipped with systems for the calibration of medical devices. Additionally, projects were initiated to produce an ultrasonic wattmeter and conduct research on imaging technologies.

Upon the request of the Agency for Pharmaceuticals and Medical Devices of Turkey, it was decided that TÜBİTAK UME would provide training on the subjects of metrology, measurement uncertainty, accreditation and medical device calibration to accredited laboratories.

In the field of clinical metrology, investments were made in equipment, production of reference materials was started and proficiency tests were organized.

PUBLICATIONS

SCI Articles

In 2014, TÜBİTAK UME staff published 47 articles in SCI journals.

1. T. Yandayan, S. A. Akgöz, M. Aşar, “Calibration of high-resolution electronic autocollimators with demanded low uncertainties using single reading head angle encoders”, Measurement Science and Technology, Iss. 25, Vol. 015010, P. 1-16
2. A. Demir, A. Baykal, H. Sözeri, R. Topkaya, “Low temperature magnetic investigation of Fe₃O₄ nanoparticles filled into multiwalled carbon nanotubes”, Synthetic Metals, Iss. 187, Vol. 1, P. 75-80
3. S. Kervan, N. Kervan, H. Sözeri, “Magnetic properties of Pr_{3-x}Gd_xCo₁₁B₄ borides”, Journal of Magnetism and Magnetic Materials, Vol. 354, P. 17-20
4. H. Sözeri, E. Uysal, A. Baykal, M. Demirelli, E. Karaoğlu, “Synthesis, characterization and catalytic activity of CoFe₂O₄-APTES-Pd magnetic recyclable catalyst”, Journal of Alloys and Compounds, Vol. 582, P. 201-207
5. E. Mozioglu, M. Akgöz, C. Tamerler, T. Kocagöz, “A simple guanidinium isothiocyanate method for bacterial genomic DNA isolation”, Turkish Journal of Biology, Iss. 38, P. 125-129
6. T. Yandayan, B. Özgür, “A motorised 5 m tape comparator for traceable measurements of tapes and rules”, Measurement, Vol. 49, P. 113-125
7. E. Demirel, F. Dinçer, M. Karaaslan, E. Unal, O. Akgol, C. Sabah, “Polarization and angle independent perfect metamaterial absorber based on discontinuous cross-wire-strips”, Journal of Electromagnetic Waves and Applications, Iss. 6, Vol. 28, P. 741-751
8. S. Gündüz, H. Yılmaz, A. C. Gören, “Halal Food and Metrology: Ethyl Alcohol Contents of Beverages”, Journal of Chemical Metrology, Iss. 1, Vol. 7, P. 7-9
9. S. Dedeoğlu, S. Yılmaz, “Design and implementation of a programmable high-voltage impulse measurement system”, Turkish Journal of Electrical Engineering & Computer Sciences, Iss. 2, Vol. 22, P. 262-275
10. Ö. Pehlivan, D. Menda, O. Yılmaz, A. O. Kodolbaş, O. Özdemir, Ö. Duygulu, K. Kutlu, M. Tomak, “Structural and interfacial properties of large area n-a-Si:H/i-a-Si:H/p-c-Si heterojunction solar cells”, Materials Science in Semiconductor Processing, Iss. 22, P. 69-75

11. A. C. Gören, "Use of Stachys Species (Mountain Tea) as Herbal Tea and Food", Records of Natural Products, Iss. 8, Vol. 2, P. 71-82
12. H. Sözeri, H. Deligöz, H. Kavas, A. Baykal, "Magnetic, dielectric and microwave properties of M-Ti substituted barium hexaferrites ($M=Mn^{2+}$, Co^{2+} , Cu^{2+} , Ni^{2+} , Zn^{2+})", Ceramics International, Iss. , Vol. 40, P. 8645-8657
13. A.C. Gören, A. Ertaş, M. Boğa, G. Topçu, U. Kolak, "Antioxidant, anticholinesterase, and antimicrobial activities and fatty acid constituents of *Achillea cappadocica* Hausskn. et Bornm.", Turkish Journal of Chemistry, Iss. 4 , Vol. 38, P. 592-599
14. A. Ertaş, A. C. Gören, M. Boğa, Y. Yeşil, U. Kolak, "Essential oil compositions and anticholinesterase activities of two edible plants *Tragopogon latifolius* var. *angustifolius* and *Lycopsis orientalis*", Natural Product Research, Iss. 17, Vol. 28, P. 1045-1408
15. M. Tunç, Q. Christophe, "International System of Units Traceable Results of Hg Mass Concentration at Saturation in Air from a Newly Developed Measurement Procedure", Analytical Chemistry, Iss. 86, P. 7819-7827
16. J. Hallström, A. Bergman, A. Merev, S. Dedeoğlu, A.P. Elg, "Performance of a Wideband 200-kV HVDC Reference Divider Module", IEEE Transactions on Instrumentation and Measurement, Iss. 9, Vol. 63, P. 2264-2270
17. A. Merev, J. Hallström, "A Reference System for Measuring High-DC Voltage Based on Voltage References", IEEE Transactions on Instrumentation and Measurement, Iss. 9, Vol. 63, P. 1-6
18. A. Merev, S. Dedeoğlu, K. Gülnihar, "Erratum to: Evaluation of The Performance of Portable New Design High DC Voltage Measuring System up to 40 kV", MAPAN - Journal of Metrology Society of India, Iss. 3, Vol. 29, P. 163
19. A. Merev, "Evaluation of The Performance of Portable New Design High DC Voltage Measuring System up 40 kV", MAPAN - Journal of Metrology Society of India, Iss. 3, Vol. 29, P. 157-161
20. O. Kurnaz, S. Helhel, "Near ground propagation model for pine tree forest environment", International Journal of Electronics and Communications (AEÜ), Iss. 10, Vol. 68, P. 944-950
21. C. Sabah, F. Dinçer, M. Karaaslan, E. Ünal, O. Akgöl, E. Demirel, "Perfect metamaterial absorber with polarization and incident angle independencies based on ring and cross-wire resonators for shielding and a sensor application", Optics Communications, Vol. 322, P. 137-142

22. M. Sadli, A. Diril, F. Bourson, C. Journeau, D. Lowe, C. Parga, "Construction and in-situ characterisation of high-temperature fixed point cells devoted to industrial applications", The European Physical Journal Conferences, Iss. 77, Vol. 18, P. 1-7
23. C. Sabah, F. Dinçer, M. Karaaslan, O. Akgöl, E. Demirel, E. Ünal, "New-Generation Chiral Metamaterials Based on Rectangular Split Ring Resonators With Small and Constant Chirality Over a Certain Frequency Band", IEEE Transactions on Antennas and Propagation, Iss. 11, Vol. 62, P. 5745-5751
24. M. Demirelli, E. Karaoğlu, A. Baykal, H. Sözeri, E. Uysal, "Synthesis, characterization and catalytic activity of CoFe_2O_4 -APTES-Pd magnetic recyclable catalyst ", Journal of Alloys and Compounds, Iss. 582, P. 201-207
25. S. Esir, A. Baykal, H. Sözeri, "Size controlled synthesis of CoFe_2O_4 nanoparticles with polyethylene glycol", Journal of Superconductivity and Novel Magnetism, Iss. 5, Vol. 27, P.1309-1313
26. J. Vogl, Y.-H. Yim, K-S. Lee, H. Goenaga-Infante, D. Malinowskiy, T. Ren, J. Wang, R. D. Vocke Jr, K. Murphy, N. Nonose, O. Rienitz, J. Noordmann, T. Näykki, T. Sara-Aho, B. Ari, O. Cankur, "Final report of the key comparison CCQM-K98: Pb isotope amount ratios in bronze", Metrologia, Vol. 51
27. J. Vogl, H. Kipphardt, M. R. A. Torres, J. V. L. Manzano, J. M. Rodrigues, R. C. Sena, Y.-H. Yim, S. W. Heo, T. Zhou, G. C. Turk, M. Winchester, L. L Yu, T. Miura, B. Methven, R. Sturgeon, R. Jährling, O. Rienitz, M. Tunç, S. Z. Can, "Final report of the key comparison CCQM-K72: Purity of zinc with respect to six defined metallic analytes", Metrologia, Vol. 51
28. G. Machin, J. Bojkovski, D.del Campo, A. Kartal Doğan, J. Fischer, Y. Hermier, A. Merlone, J. Nielsen, A. Peruzzi, J. Ranostaj, R. Strnad, "A European Roadmap for Thermometry", International Journal of Thermophysics, Iss. 3, Vol. 35, P. 385-394
29. F. Bahadori, G. Topçu, M. S. Eroglu, H. Önyüksel, "A new lipid-based nano formulation of Vinorelbine", AAPS PharmSciTech , Iss. , Vol.
30. U. Topal, H. Sözeri, "A Novel Design of Fluxgate Magnetometer: An Insect like Configuration", Journal Of Superconductivity And Novel Magnetism , Iss. , Vol. , P.
31. A. Ertaş, A.C. Gören, M. Boğa, S. Demirci, U. Kolak, "Chemical Composition of The Essential Oils of Three Centaurea Species Growing Wild in Anatolia and Their Anticholinesterase Activities", Journal of Essential Oil Bearing Plants, Iss. 5, Vol.17, P. 926

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34. B. Karaböce, Y. Gülmez, E. Bilgiç, E. Sadıkoğlu, A. T. İnce, Y. Skarlatos, “Comparison of the Input Electrical Power Measurement Methods for HIFU Transducers”, IEEE Xplore, Iss. 978, Vol.1,
35. S. Bostan, E. Mutlu, H. Kazak, S.S. Keskin, E. T. Oner, M. Eroğlu, “Comprehensive characterization of chitosan/PEO/levan ternary blend films.”, Polymers,
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38. İ. Osken, E. Sezer, E. Ertaş, T. Öztürk, “Electrochemical impedance spectroscopy study of poly [3,5-dithiophene-2-ylidithieno[3,2-b;2',3'-d]thiophene] P(Th2DTT)”, Journal of Electroanalytical Chemistry, Vol. 726,
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42. H. Sözeri, U. Topal, F. Genç, E. Turhan, “Magnetic and Microwave Absorption Properties of $\text{Ni}_x\text{Zn}_{0.9-x}\text{Mn}_{0.1}\text{Fe}_2\text{O}_4$ prepared by boron addition”, Journal Of Superconductivity And Novel Magnetism

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44. U. Topal, E.G. Çoker, U. Kolemen, “Physical and Mechanical Properties of B₂O₃ doped YBCO Superconductors: Applicability as a Low DC Magnetometer”, Journal Of Superconductivity And Novel Magnetism
45. A.C. Gören, G. Bilsel, H. Yılmaz, M. Bilsel, M. Çergel, F.G. Çoşkun, E. Uysal, S. Gündüz, İ. Ün, J. Warren, “Final report on key comparison CCQM-K55.c (L-(+)-Valine): Characterization of organic substances for chemical purity”, Metrologia, Iss. 51,
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47. E. Uysal, F. Akçadağ, N. Tokman, “Proficiency testing for determination of metals in tomato paste”, Journal of Chemical Metrology, Iss. 1, Vol. 8, P. 13-26

International Conference Papers and Presentations

In 2014, 23 papers were submitted at international conferences

1. S. D. Hatipoğlu, N. Zorlu, E. Mozioğlu, H. Yılmaz, A.C. Gören, “Construction of a 200 kV HVDC Reference Divider Module”, International Istanbul Smart Grid Congress and Fair, 08 – 09 Mayıs 2014, Istanbul
2. Ö. Yılmaz, H. Çaycı, G. Hasancebi, “State Estimation in Smart Grids”, International Istanbul Smart Grid Congress and Fair, 08 – 09 Mayıs 2014, Istanbul
3. H. Çaycı, “Reliability of Electricity Meters and Traceability in Measurements”, International Istanbul Smart Grid Congress and Fair, 08 – 09 Mayıs 2014, Istanbul
4. B. Karaböce, Y. Gülmez, E. Bilgiç, E. Sadıkoğlu, A. T. İnce, Y. Skarlatos, “Comparison of the Input Electrical Power Measurement Methods for HIFU Transducers”, IEEE International Symposium on Medical Measurement and Applications, 11 – 12 Haziran 2014
5. B. Vatansever, A. İşleyen, G. Bilsel, S. D. Hatipoğlu, K. Topal, A. C. Gören, M. Çelik, “A New Certified Reference Material Of 25-(OH)-D2 and 25-(OH)-D3”, IFCC WorldLab Istanbul 2014, 22 - 26 Temmuz 2014, Istanbul
6. F. Üstüner, E. Aydemir, E. Güleç, M. İlarıslan, M. Çelebi, E. Demirel, “Antenna Radiation Pattern Measurement Using an Unmanned Aerial Vehicle (UAV)”, Proceedings of the XXXIst URSI General Assembly and Scientific Symposium, 17 - 23 Ağustos 2014, Pekin
7. M. Çetintaş, S. Çakır, O. Şen, M. Çınar, F. Üstüner, “Loop Antenna Pattern Measurements”, CPEM 2014, Conference on Precision Electromagnetic Measurements, 24 - 29 Ağustos 2014, Rio De Jenairo
8. M. Celep, H. Sakarya, “Design and test of gas tight microwave transmission lines for resonance frequency measurements with cavity resonators up to 830 K”, CPEM 2014, Conference on Precision Electromagnetic Measurements, 24 - 29 Ağustos 2014, Rio De Jenairo
9. M. Celep, C. Hayırlı, Ş. Yaran, H. Sakarya, A. Dolma, “Realization of Low Power Measurement System in the Range of -60 dBm - -120 dBm up to 26.5 GHz”, CPEM 2014, Conference on Precision Electromagnetic Measurements, 24 - 29 Ağustos 2014, Rio De Jenairo
10. S. Çakır, O. Şen, M. Çınar, A. Ayaydın, M. Çetintaş, F. Üstüner, “Effects of Sensor Positions on Military Radiated Susceptibility Tests”, CPEM 2014, Conference on Precision Electromagnetic Measurements, 24 - 29 Ağustos 2014, Rio De Jenairo

11. H. Çaycı, “A Simple Method for the Measurement of Instrument Current Transformer Burdens”, CPEM 2014, Conference on Precision Electromagnetic Measurements, 24 - 29 Ağustos 2014, Rio De Janeiro
12. B. Binici, M. Bilsel, A.C. Gören, C. Swart, R. Philipp, “Determination of PBDEs by Validated GC-IDMS Method in Water with Low Detection Limit”, 5th EuCheMS Chemistry Congress, 31 Ağustos – 04 Eylül 2014, İstanbul
13. S. Çakır, O. Şen, M. Çınar, M. Çetintaş, “Alternative Conducted Emission Measurements for Industry, EMC Europe 2014, 01 Eylül 2014, Gothenburg
14. H. Kaykısızlı, B. Akselli, S. Cevahir Şenlikçi, “Investigating Environmental Effects On Ultrasonic Anemometer Calibrations In The Wind Tunnel”, MMC 2014 (Metrology for Meteorology and Climate), 15 Eylül 2014, Brdo
15. E. Bilgiç, Y. Durgut, “Effects of Waveform Model on Sensitivity Values of Transducers Used in Mechanical Dynamic Measurements”, International Conference on Computational and Experimental Science and Engineering, 25 – 29 Ekim 2014, Antalya
16. B. Aydemir, H. Kazdal Zeytin, G. Güven, A. Güngör, “Deformation behaviour of cold-formed 32Mn2.3Si3Al TWIP steel in tension at different temperatures”, ISITES 2014
17. B. Aydemir, H. Kazdal Zeytin, G. Güven, A. Güngör, “Investigation of mechanical properties of DP 600 steels at elevated temperatures”, ISITES 2014
18. J. Hallström, A. Bergman, A.P Elg, A. Merev, S. Dedeoğlu, “New references for HVDC metering”, CIGRE 2014
19. T. Yandayan, R. D. Geckeler, F. Siewerth, “Pushing the limits: latest developments in angle metrology for the inspection of ultra-precise synchrotron optics”, Proc. SPIE 9206, Advances in Metrology for X-Ray and EUV Optics V
20. J. Setina, R. Kangi, A. Elkatmis, K. Jousten, M. Bergoglio, F. Boineau, M. Vicar, S. Ruiz, “Study of long-term stability and reproducibility of quadrupole mass spectrometers”,
21. J. Setina, A. Elkatmış, F. Boineau, M. Vicar, S. Ruiz, “Investigation of influence of operational parameters on metrological performance of quadrupole mass spectrometers”

In 2014, 2 presentations were made at international conferences.

1. R. Kangi, B. Ongun, “Environmental influences on leak elements”, Workshop on Vacuum Metrology for Industry
2. J. Setina, A. Elkatmış, R. Kangi, K. Jousten, M. Bergoglio, F. Boineau, S. Ruiz, M. Vicar, Study of Long Term Stability of Quadrupole Mass Spectrometers

National Conference Papers and Presentations

In 2014, 21 papers were submitted at national conferences.

1. S. D. Hatipoğlu, N. Zorlu, E. Mozioğlu, H. Yılmaz, A.C. Gören, “Kırk Sekiz Farklı Salvia Türünün Antioksidan, Antikolinesteraz, Antimikrobiyal Aktiviteleri ve Uçucu organik Bileşiklerinin İncelenmesi”, 2. İlaç Kimyası, Üretimi, Teknolojisi, Standardizasyonu Kongresi, 21 – 23 Mart 2014, Antalya
2. S. D. Hatipoğlu, M. Akgöz, B. Yalçınkaya, A.C. Gören, “Bitkilerin Gösterdiği Halusinatif Etkiler ve Bunların Adli Olaylardaki Analizi”, 2. İlaç Kimyası, Üretimi, Teknolojisi, Standardizasyonu Kongresi, 21 – 23 Mart 2014, Antalya
3. T. Gökçen, G. Bilsel, A. C. Gören, M. Al, T. Öztürk, “Karbonik Anhidraz İnhibitörü Olarak Bazı Sülfonamid Türevleri”, 2. İlaç Kimyası, Üretimi, Teknolojisi, Standardizasyonu Kongresi, 21 – 23 Mart 2014, Antalya
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GLOSSARY OF METROLOGY

Metrology^(*)

science of measurement and its application

Measurement^(*)

process of experimentally obtaining one or more quantity values that can reasonably be attributed to a quantity

Measurement Accuracy^(*)

closeness of agreement between a measured quantity value and a true quantity value of a measurand

Calibration^(*)

operation that, under specified conditions, in a first step, establishes a relation between the quantity values with measurement uncertainties provided by measurement standards and corresponding indications with associated measurement uncertainties and, in a second step, uses this information to establish a relation for obtaining a measurement result from an indication

Measurement Uncertainty^(*)

non-negative parameter characterizing the dispersion of the quantity values being attributed to a measurand, based on the information used

Primary Measurement Standard^(*)

measurement standard established using a primary reference measurement procedure, or created as an artifact, chosen by convention

Metrological Traceability^(*)

property of a measurement result whereby the result can be related to a reference through a documented unbroken chain of calibrations, each contributing to the measurement uncertainty

Calibration Certificate

A document produced at the end of a calibration, containing information on the measurement standards and reference instruments used, the calibration method and procedure, environmental conditions, measurement results and uncertainties and which establishes traceability to the national measurement standards that realize SI units.

(*) International vocabulary of metrology - Basic and general concepts and associated terms (VIM) (JCGM 200:2012, 3rd edition)

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