IRMM

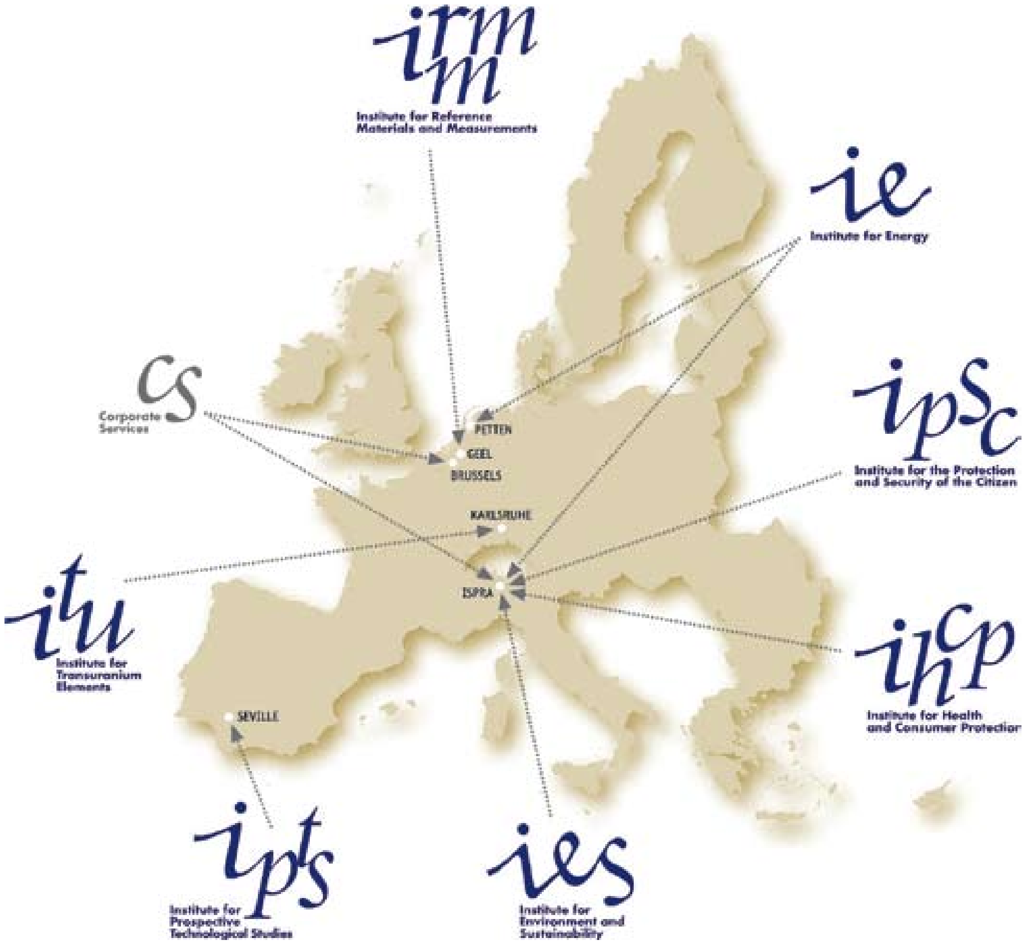
50th Anniversary

1960-2010

Institute
for Reference Materials
and Measurements

Geel, Belgium

JRC
EUROPEAN COMMISSION



The Institute for Reference Materials and Measurements

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IRMM Mission

The vision of the JRC-IRMM is to be the European Commission reference, providing confidence in measurements in support of EU policies.

The mission of the JRC-IRMM is to promote a common reliable European measurement system in support of EU policies.

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European Commission
Joint Research Centre
Institute for Reference Materials and Measurements

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ISBN 978-92-79-13607-8
JRC52033
DOI 10.2787/15609

Luxembourg: Publications Office of the European Union

Printed in Belgium

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Checking the microbalance during evaporation of magnesium-24

Welcome message

The year 2010 marks the 50th anniversary of the establishment of the Joint Research Centre's Institute for Reference Materials and Measurements (IRMM) – formerly known as the Central Bureau for Nuclear Measurements – in Geel, Belgium. The institute's scientific portfolio has evolved over the years to adapt to emerging societal challenges, against a backdrop of unprecedented scientific progress in the second half of the 20th century. At the same time, the institute has remained true to its founding principle of scientific meticulousness in the provision of accurate reference data and measurements.

Krzysztof Maruszewski, Director JRC-IRMM

The 50-year journey of the institute also coincided with a remarkable period in the history of European integration. The vision of Europe's founding fathers of a peaceful, prosperous and free Europe reached fruition; the European Union (EU) has grown from 6 to 27 Members States to become the world's biggest trading block accounting for 20% of global imports and exports. Frontier-free travel and trade, the single European currency, safer food, a greener environment and better living standards in poorer regions are just some of the benefits that the EU's 498 million citizens enjoy thanks to the European project.

Looking to the future, we are confident that measurement science will remain the bedrock for continued prosperity, security and wellbeing. Thanks to its scientific competence and its unique position as an independent reference institute of the European Commission, the IRMM is well-placed to play a leading role in the global endeavour to improve quality of life through a well-functioning measurement infrastructure. The institute will continue to support European policy in key areas such as food safety, environment, bioanalysis and nuclear energy, and will proactively applying its expertise to new measurement challenges.

Krzysztof Maruszewski
Director IRMM
November 2009-present

Alejandro Herrero
Director IRMM
November 2002-October 2009

Manfred Grasserbauer
Director IRMM
February 1997-October 2002

Achiel Deruytter
Director IRMM
(acting)
June 1995-January 1997

Inspection of a vacuum-microbalance under construction in the workshop

History of the European Atomic Energy Community (Euratom)

Rebuilding Europe

In 1945, Europe was in ruins. The Second World War had exacted a heavy toll on both sides, with an estimated 40 million victims in total, more than half of whom were civilians. Following all the deportations and expulsions, there were, in 1945, nearly 20 million displaced persons awaiting repatriation. Factories and transport links were destroyed, traditional trade disrupted, livestock wiped out and raw materials and foodstuffs were in short supply. In the aftermath of the war, Europe's leaders set about the enormous challenge of rebuilding Europe, both economically and politically.

European Coal and Steel Community

On 9 May 1950, the French Foreign Minister, Robert Schuman, made a momentous declaration. Inspired by the European plans of another Frenchman, Jean Monnet, General Commissioner of the National Planning Board, he proposed that the joint output of coal and steel in France and Germany be placed within the framework of a strong, supranational structure, the High Authority.

Robert Schuman, French Minister for Foreign Affairs, proposed on 9 May 1950 to gather coal and steel resources of former enemy nations in order to make war among them impossible. This declaration marks the beginning of European political integration, and 9 May is celebrated as Europe day.

In economic terms, coal and steel were vital raw materials. From the political point of view, the Schuman Plan was based on the assumption that the integration of Germany into a permanent European structure was the best way of guaranteeing peace in Europe.

The Treaty establishing the European Coal and Steel Community (ECSC) was signed in Paris on 18 April 1951 and entered into force on 24 July 1952. It provided for the following institutions: a High Authority (assisted by a Consultative Committee); a Common Assembly; a Special Council of Ministers and a Court of Justice.

Nuclear energy

Encouraged by the success of the coal and steel community, there was ambition to integrate other important sectors, notably the nuclear energy industry. After being considered for a long time as an instrument for achieving military ends, atomic energy was increasingly emerging as an alternative energy source for civilian use in Europe and abroad.

In the middle of the 1950s, atomic energy was seen as a key factor in strategic and economic terms. A wealth of research and a succession of high-profile reports underlined the energy-related challenges facing Europe and the importance of atomic energy. The risk of an energy deficit would leave Europe increasingly dependent on its suppliers, in particular the United States and the Middle East. In turn, this would cause political and monetary difficulties, in view of the balance of payments deficit. The Suez Crisis in 1956 only served to underline the need to secure Western Europe's energy supply. In conclusion, only atomic energy seemed able to meet the growing demand for electricity, which according to the experts, was due to increase threefold between 1955 and 1975. It was imperative that Europe should encourage the production of large amounts of low-cost nuclear-powered electricity.

Signing of the Treaty of Rome on 25 March 1957 by the six founding nations: Belgium, France, the Netherlands, Germany, Luxembourg and Italy.

European Atomic Energy Community

The Treaty establishing Euratom was signed on 25 March 1957 and came into force on 1 January 1958. It contained 225 articles and five annexes, and provided for the same institutional pattern as the other treaties, with an Assembly, a Council, a Commission and a Court of Justice. The Assembly and an Economic and Social Committee (ESC) were to be shared institutions of the EEC and Euratom. Euratom's specific mission, however, dictated that the powers conferred on its institutions should differ in scope from those of the EEC bodies.

Euratom's mission was to contribute to the formation and development of Europe's nuclear industries, to help improve the standard of living in the Member States and to further the development of trade with other countries. Its responsibilities were strictly limited to civil applications of nuclear energy. The idea of the Euratom Treaty — concluded for an unlimited duration, unlike the ECSC Treaty which was valid for 50 years — was to enable the Member States to produce energy of nuclear origin, to control the entire industrial cycle (including research, training and production), to provide for the supply of natural uranium and special fissile materials, and to lay the foundations for the vital task of supervising this particularly sensitive sector. The Euratom Treaty thus created the framework for a nuclear common market.

The Euratom treaty also laid down the initial research and training programme of the Joint Research Centre:

> *"The Joint Centre shall include:*
>
> *(a) general laboratories for chemistry, physics, electronics and metallurgy;*
> *(b) special laboratories for the following subjects:*
> - *nuclear fusion;*
> - *separation of isotopes other than uranium 235 (this laboratory shall be equipped with a high-resolution electromagnetic separator);*
> - *prototypes of prospecting instruments;*
> - *mineralogy;*
> - *radiobiology;*
>
> *(c) a bureau of standards specialising in nuclear measurements for isotope analysis and absolute measurements of radiation and neutron absorption, equipped with its own experimental reactor."*

Euratom Treaty, Annex V, 1957

The bureau of standards referred to Annex V of the Euratom treaty is the legal basis which led to the establishment of the Central Bureau for Nuclear Measurements (CBNM) in Geel, Belgium. It is now known as the Institute for Reference Materials and Measurements (IRMM), one of the seven institutes of the Joint Research Centre[1].

Euratom's mission was to contribute to the formation and development of Europe's nuclear industries, to help improve the standard of living in the Member States and to further the development of trade with other countries.

The Euratom Treaty of 1957 led to the establishment of the Central Bureau for Nuclear Measurements in Geel, Belgium. The photograph shows the construction of the Van de Graaff building.

1. Other institutes of the Joint Research Centre are located in Ispra (Italy), Karlsruhe (Germany), Petten (the Netherlands) and Seville (Spain), with the headquarters in Brussels (Belgium).

The birth of the Central Bureau for Nuclear Measurements (CBNM)

At the end of the 1950s, the nuclear industry was developing at an unprecedented rate and neutron data were urgently needed for reactor design, waste management, reactor safety calculations and dosimetry. The Euratom Treaty explicitly called for a “bureau of standards specialising in nuclear measurements for isotope analysis and absolute measurement of radiation and neutron absorption”, and this led to the establishment of the Central Bureau for Nuclear Measurements (CBNM).

Early shot of the CBNM workshop.

In 1960, the president of the European Commission, Mr. Etienne Hirsch and the Director General of the Belgian Nuclear Research Centre (SCK/CEN), Mr. Louis de Heem, formally agreed to install CBNM on the grounds of the SCK in Geel, Belgium. This contract (EUR/C/464/7/60) was set up for a duration of 99 years and came with a nominal fee of one “European Unit of Account” per year (nowadays one Euro per year):

> Het S.C.K. stelt een terrein van ongeveer 30 ha ter beschikking van de Gemeenschap, in het kader van een erfpachtovereenkomst van 99 jaar, tegen een jaarlijkse symbolische canon van 1 EMO-rekeneenheid Dit terrein wordt afgebakend overeenkomstig de plattegrond in Bijlage I welke onafscheidelijk deel uitmaakt van deze overeenkomst.

Article 2, contract Euratom – SCK/CEN, 1960

Although the first staff members occupied the so-called Biology building of the SCK/CEN at the beginning of 1960, the first official document from CBNM, signed by the Director, J. Spaepen and submitted to the Commission by Mr. Guéron, Director General of the JRC, was dated 16th May, 1960. This document (EUR/C/1497/60) entitled “Programme, Organisation and Equipment of the CBNM”, is considered as the birth certificate of the institute.

It was originally intended to construct a nuclear reactor at CBNM. However this plan was changed in favour of a linear accelerator, a Van De Graaff accelerator and specialised nuclear materials laboratories. All activities were part of a single goal, namely neutron cross-section measurements[2] needed for the development of thermal and fast fission reactors.

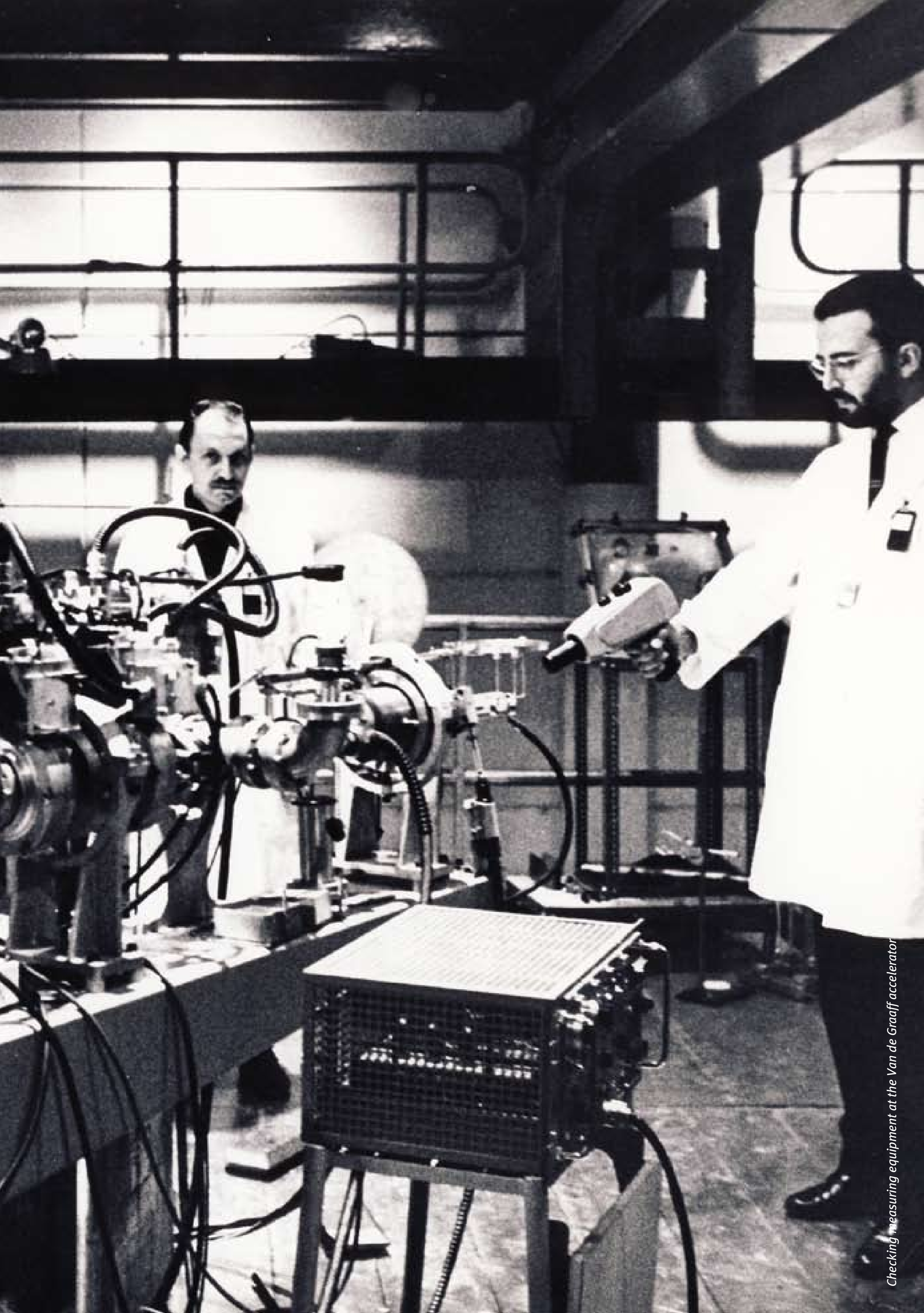
2. Neutron cross-section data are related to the probability that an interaction of a given kind will take place between a nucleus and an incident neutron.

Group photo of on the steps of the LINAC building (late 1960s).

Staff dosimeters (1966).

A Euratom Nuclear Data Committee was set up to screen requests for neutron data and to help coordinate a measurement strategy. Requests for such data were collected on a world-wide basis by the International Atomic Energy Agency (IAEA) in a list called WRENDA (World Request List for Neutron Data Measurements). Neutron data were routinely transmitted to the Centre de Compilation des Données Neutroniques (CCDN) at Paris where data files were kept and continuously updated. Additionally, a close collaboration with the USA was developed through the European-American Nuclear Data Committee (EANDC) and this played an important role in defining CBNM's programme, as did the increasing need for standards and the development of methods for precise neutron flux measurements.

The CBNM grew and expanded in order to meet the changing needs for neutron data. There was also an increased focus on nuclear measurements, the metrology of radionuclide decay and on neutron flux and dose studies as well as on absolute measurements of isotopes.



Checking measuring equipment at the Van de Graaff accelerator

Van de Graaff building with aluminium tower housing the first 3.7 MV accelerator.

Analysing magnet at the Van de Graaff accelerator (2007). The precise energy of the ion beam is defined by the analysing magnet (centre of photo) and a pair of slits, which regulate the accelerator high-voltage terminal to give a beam energy precision of about 0.2%.

The Van de Graaff accelerators

The first accelerator built at CBNM was a 3.5 MV Van de Graaff accelerator fabricated by "High-Voltage Engineering Corporation" in the Netherlands. This positive-ion machine became operational in 1960 and was able to produce continuous or pulsed beams of protons, deuterons or alpha particles. In pulsed mode, particle bunches of 10 ns width could be compressed by a Mobley magnet to bursts of 1ns width. The neutrons were formed by a nuclear reaction in a thin tritium target. The Van de Graaff accelerator was exclusively used in the field of neutron physics. Mainly differential cross-sections for elastic and inelastic scattering of neutrons were measured in the pulsed mode by neutron time-of-flight technique. In the direct current mode, excitation functions were determined by the activation technique. The machine was also used for ion beam analysis (PIXE, microprobe and RBS). This accelerator was dismantled in 2001.

A second Van de Graaff accelerator with a terminal voltage of 7 MV was installed in 1976. This accelerator is operational today, providing beams of protons, deuterons or alpha particles in either continuous or pulsed operation mode. The installation has two pulsing systems: a fast beam pulsing system generating a minimum ion beam pulse width of 2 ns at pulse repetition rates of 2.5, 1.25 or 0.625 MHz, and a slow pulsing system giving a minimum pulse width of 10 µs at an adjustable frequency up to 5 kHz. The accelerator can be operated 24 hours per day and seven days per week.

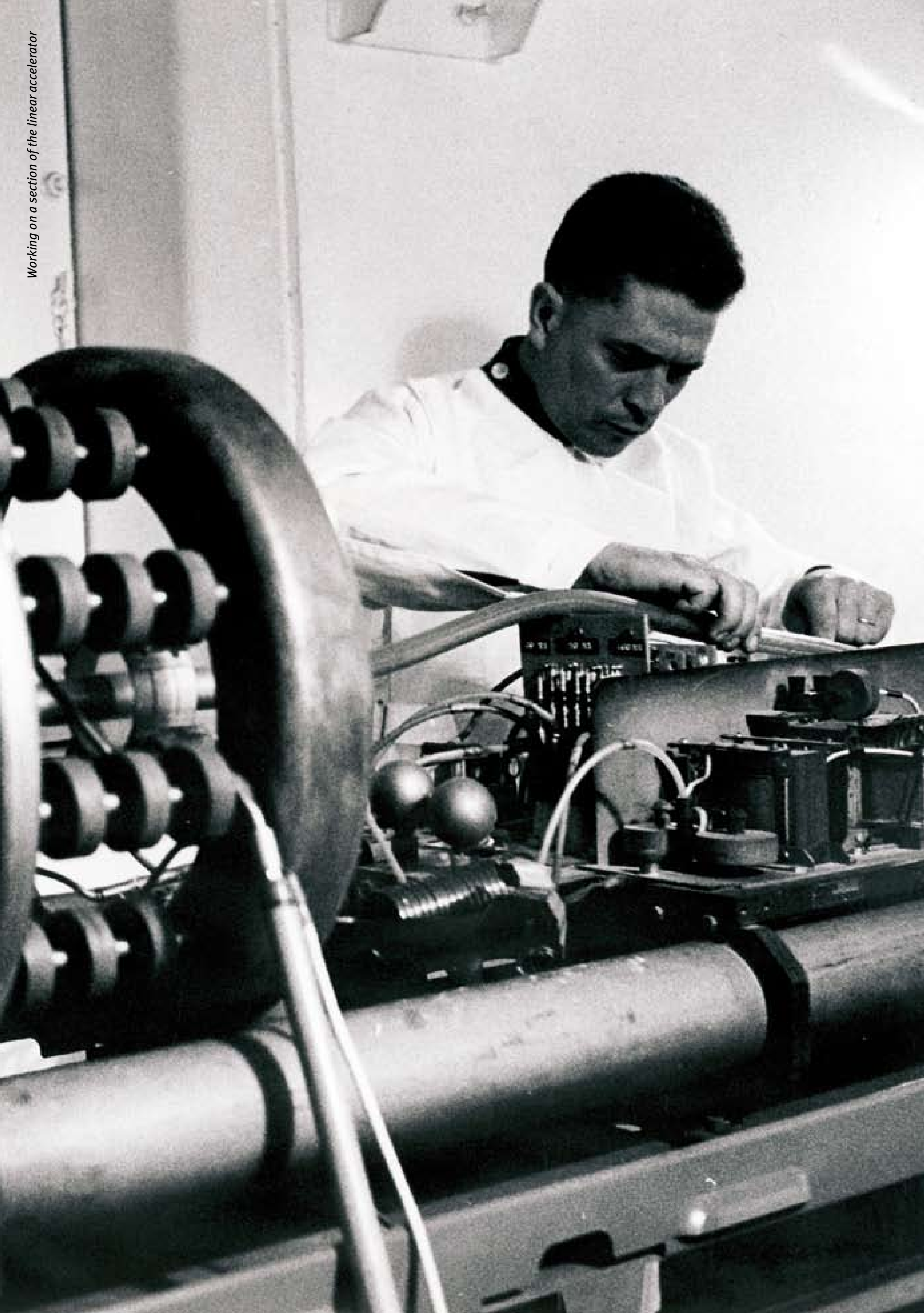
The Van de Graaff facility houses six experimental beam lines in two large laboratory halls. Neutron fields with well defined energies in the ranges 0.3-10.0 MeV and 14.5-24 MeV are produced by the nuclear reactions Li(p,n), T(p,n), D(d,n) or T(d,n). Neutron fluxes and neutron energy spectra are monitored and characterised with high precision by long counters, proportional counters, BF_3 counters, Bonner spheres, time-of-flight systems, fission chambers and activation foils. Absolute neutron fluencies are measured using a calibrated recoil-proton telescope. Several shadow cones are available for measurements of possible neutron scattering. In 2005 a low-frequency beam deflection system was installed for measurements of short-lived reaction products in the µs to ms range.

Mainly activation cross-sections for structural materials were measured as well as neutron induced light charged particle cross sections. The neutron beam is also used to investigate the fission process, measuring fission cross sections, prompt fission neutron spectra and fission fragment distributions for major and minor actinides.

Presently, the facility is used more and more by external users, either in the frame of bilateral collaboration agreements with their institutions or supported by Euratom Transnational Access programmes.

Installation of the 16-ton, 7 MV Van de Graaff accelerator (29 April 1976).

Aerial view of the Van de Graaff building, showing the two towers housing the 3.7 MV and the 7 MV machines.



Working on a section of the linear accelerator

The electron linear accelerator

The original Linear Accelerator chosen for CBNM was a "travelling-wave type" with electron bursts of duration between 10 ns (at 70 MeV and 3.6 A beam current) and 2 µs (at 42 MeV and 0.5 A beam current) that impinged on a mercury cooled uranium target. The resulting "Bremsstrahlung" produced neutrons with a maximum intensity between 1 and 2 MeV neutron energy. First experiments performed after the inauguration in 1965 were transmission measurements on precious ^{240}Pu samples made available from Los Alamos National Laboratory, USA. Measurements of total, scattering, fission and capture cross-sections were carried out with special emphasis given to neutron reference cross-sections and nuclear resonance parameters. An IBM 1800 computer was acquired in 1968 to reduce the raw data while the final evaluation of the results was performed via a tele-processing system at CITES, Euratom's Computer Centre in Ispra, Italy.

In the seventies the accelerator was upgraded to 150 MeV and in 1983 a pulse compression magnet was installed, enabling compression of the beam pulse duration to less than 1 ns and increase correspondingly the peak intensity by a factor of 10. In combination with the long flight path tubes of up to 400 m length this allows to carry out neutron time-of-flight measurements with hitherto unprecedented energy resolution.

The accelerator was modernised continuously over the last 10 years: new types of klystrons where installed and the power modulators and wave guides where renewed. The beam transport system, SF_6 installation, injector pulse modulator and the whole electrical power distribution where replaced by modern equipment. At the end of this modernisation process, the beam handling system was replaced by a computer-controlled new system, designed and implemented entirely in-house, and the new installation was inaugurated in October 2009.

On the GELINA flight-path area the equipment for measurements of neutron induced reactions was upgraded, installing a 12-detector array of HPGe detectors for measurements of neutron inelastic scattering, an 8-detector array

Adjusting the coils at a section of the linear accelerator. On the right-hand side is the connection to the klystrons.

Checking the operation of the linear accelerator at the control panel (late-1960s).

of large C_6D_6 detectors covering nearly a 4π geometry for neutron capture measurements, large neutron detectors for measurements of prompt fission neutron spectra and multiplicities, and improved ionisation chambers for measurements of light charged particles. Simultaneously, the data acquisition systems where gradually upgraded introducing increasingly the use of fast signal digitizers, for which the necessary software was developed in cooperation with the institute's informatics unit.

Presently, the facility is used more and more by external users, either in the frame of bilateral collaboration agreements with their institutions or supported by Euratom Trans-national Access programmes.

Flight paths leaving the target hall of the linear accelerator.

Refurbished linear accelerator is inaugurated by JRC Director-General, Roland Schenkel (12 October 2009).

Construction of a liquid scintillation counter in the workshop

Underground laboratory for the ultra-low-level gamma-ray spectrometry. The back-ground radiation is 10,000 lower than above ground.

Radionuclide metrology

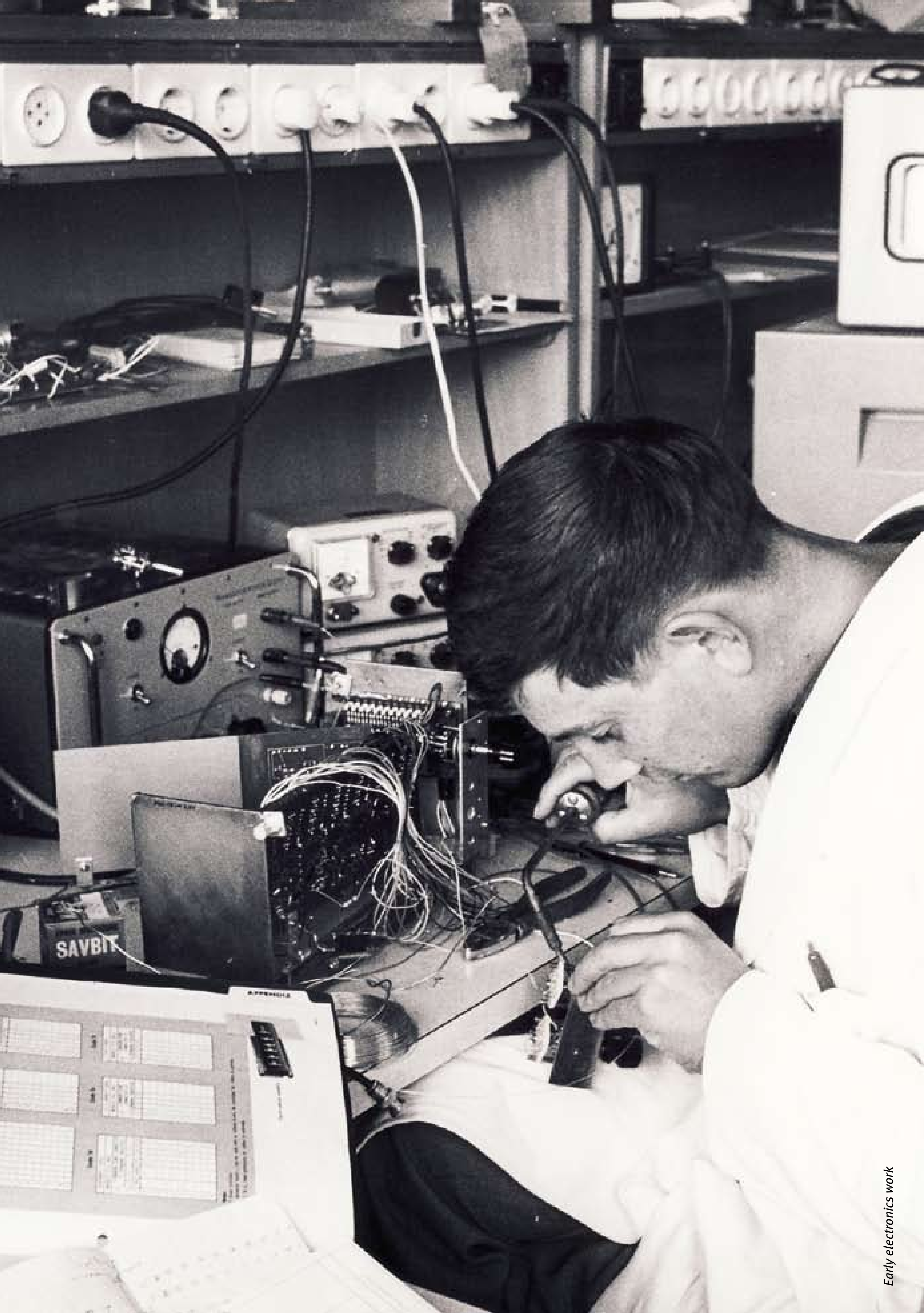
In 1959 the first 15 CBNM staff members were recruited and first experimental work in radionuclide metrology began in the laboratories of the Belgian research centre, Studie Centrum voor Kernenergie / Centre d'Etudes Nucléaires (SCK/CEN). In the same year the first CBNM working groups were formed.

The main objective of the radionuclide metrology group was the accurate measurement of radioactivity and decay properties of radionuclides. This research is needed for many branches of nuclear energy and for applications of isotopes and radiation in the industrial, environmental and medical fields. The group developed and applied accurate primary standardisation techniques for radioactivity and measured and evaluated nuclear decay schemes and atomic data. With time, the work was extended to characterisation of reference materials and the organisation of intercomparisons among European monitoring laboratories.

The radionuclide metrology group also developed a laboratory 255 m underground for ultra-low gamma-ray spectrometry, located in the HADES underground facility of SCK/CEN. The multitude of applications includes environmental radioactivity, retrospective calculation of dosimetry of Hiroshima victims, new methods for neutron cross section and fluence measurements and the measurement of decay data of very long-lived radionuclides (10^{10} to 10^{20} years).

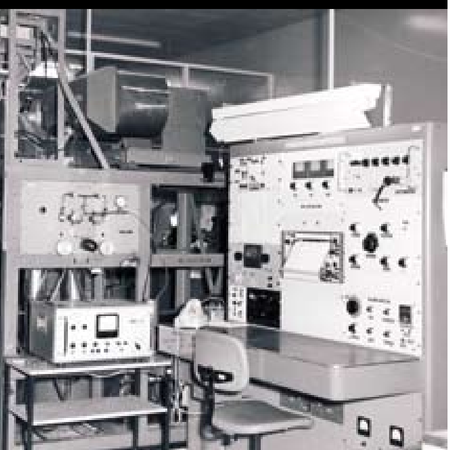
The group contributes to the harmonisation of radioactivity measurements worldwide by its collaborations with National Metrology Institutes and international organisations, such as Bureau International des Poids et Mesures (BIPM) and International Atomic Energy Agency (IAEA). That activity supports the Mutual Recognition Arrangement for national measurement standards and for calibration and measurement capabilities signed under the auspices of the Comité International des Poids et Mesures (CIPM) of the Metre Convention.

Over the last 50 years, this group has – through continuous research and development – built up a reputation as one of the world's leading laboratories in primary standardisation of



Early electronics work

A Nuclide Tandem isotope mass spectrometer (Nuclide Corporation, State College, PA, USA).



A CEC 21-702B isotope mass spectrometer (CEC = Consolidated Engineering Corporation, USA).

From mass spectrometry to isotopic measurements

Starting off with four mass spectrometers purchased from the Belgian Nuclear Centre in 1960, this number soon grew to seven forming the backbone of this unit. Upon request, the unit provided other institutes with analyses of nuclear fuel, burn-up determinations, isotopic assaying of reference samples, quantitative analyses of gases, including fission gases and high precision isotope-ratio determinations. The unit also began to specialise in instrumental development, atomic weights and isotopic compositions of all elements interacting with the world-famous International Commission on Atomic Weights and Isotope Abundances of IUPAC. The group started to organise interlaboratory comparisons whereby CBNM would provide certified isotopic reference materials to laboratories in Europe and the United States.

By 1969, CBNM had become actively involved in providing scientific and technical support to the Safeguards Directorate of the Commission whose task was, and still is today, to safeguard fissile material in the countries of the Community by virtue of the Euratom Treaty. CBNM provided control measurements and launched quality-assurance programmes (REIMEP) within ESARDA (European Safeguards Research and Development Association, founded in 1969) and the European Commission's Safeguards Analytical Measurement (ECSAM) system. To handle the growth of this unit the mass spectrometry building was extended and modernised several times, housing an Ultra Clean Chemical Laboratory and a nuclear controlled area. Nuclear isotopic work on particles became an important research area and Nuclear Signatures Interlaboratory Measurement Evaluation Programme (NUSIMEP) activity started in 2002. The laboratory became the largest provider in the world for reference materials for nuclear safeguards applications. State-of-the-art spectrometers were purchased and a robotised sample preparation system was commissioned.

Involvement in research on the Avogadro constant in 1981 provided the stepping stone towards membership in EUROMET, EURACHEM, CITAC, CCQM at BIPM and in playing a key role in Metrology in Chemistry in the 1990s.

Since 2000, stable isotope work further developed in the environmental and food area using differential isotope ratio mass spectrometry, and an ICP-MS laboratory was constructed which provides reference values for the Community reference laboratory for heavy metals in food and feed.

Over the years, the importance of knowledge transfer came to the fore, and at the start of 2000 – triggered by EU enlargement – IRMM launched a life-long learning programme for training in metrology in chemistry (TrainMiC®). The role of TrainMiC® is to improve the quality of analytical results by promoting and providing a European-wide harmonised training in metrology in chemistry via a network of national providers sharing resources. Similarly, the institute began providing technical assistance in metrology through projects in Albania, Croatia and Turkey.

A set of uranium isotopic reference materials.

TrainMiC
Training in Metrology in Chemistry

Liquid nitrogen is poured into a state-of-the-art mass spectrometer used to measure plutonium isotope ratios (2008).

Inspecting dried carbon foils (thickness 0.15 to several microns)

Reference materials

From its first days, the Central Bureau for Nuclear Measurements carried out the preparation and characterisation of sophisticated materials, needed for the accurate determination of parameters relevant for the nuclear industry. These materials were prepared for national nuclear research laboratories, universities, and other research laboratories both inside and outside of the European Community. In 1969, the institute started to support the EURISOTOP programme on gases in non-ferrous metals — the first step in the CBNM involvement in non-nuclear reference materials.

A thin carbon foil is carefully removed from the surface of the water.

With the establishment of the Bureau Communautaire de Référence (BCR) by the European Commission in Brussels in 1974 the CBNM got involved in these activities from the beginning. The BCR programme aimed to bring together laboratories from the different Member States to prepare CRMs and to compare their results for physical measurements and chemical analyses in interlaboratory studies. It was initially focused on industrial certified reference materials (CRMs), whereas the production of environmental reference materials was especially promoted since the 1980s. In 1984, CBNM started building dedicated facilities for the efficient preparation of highest-quality biological and environmental CRMs and the centralised storage of BCR CRMs. In 1995, under the new name of the Institute for Reference Materials and Measurements (IRMM), the institute took over the full responsibility for the storage and distribution of all BCR CRMs, together with the renewal of exhausted reference materials. IRMM's own CRM programme was significantly expanded to clinical and food CRMs and the development of CRMs for genetically modified seeds in the 1990s. In 2003, IRMM became solely responsible for the management of all BCR materials and the development, production and certification of new reference materials in the Commission.

Certified reference materials to better detect two classes of flame retardants banned under European legislation.

In parallel to the systematic increase of the development, production and distribution of reference materials, the institute strengthened its networking within the international metrology and standardisation communities. Strategic partnerships such as the ERM® (European Reference Materials) cooperation, founded between IRMM, the German Federal Institute for Materials Research and Testing (BAM) and LGC

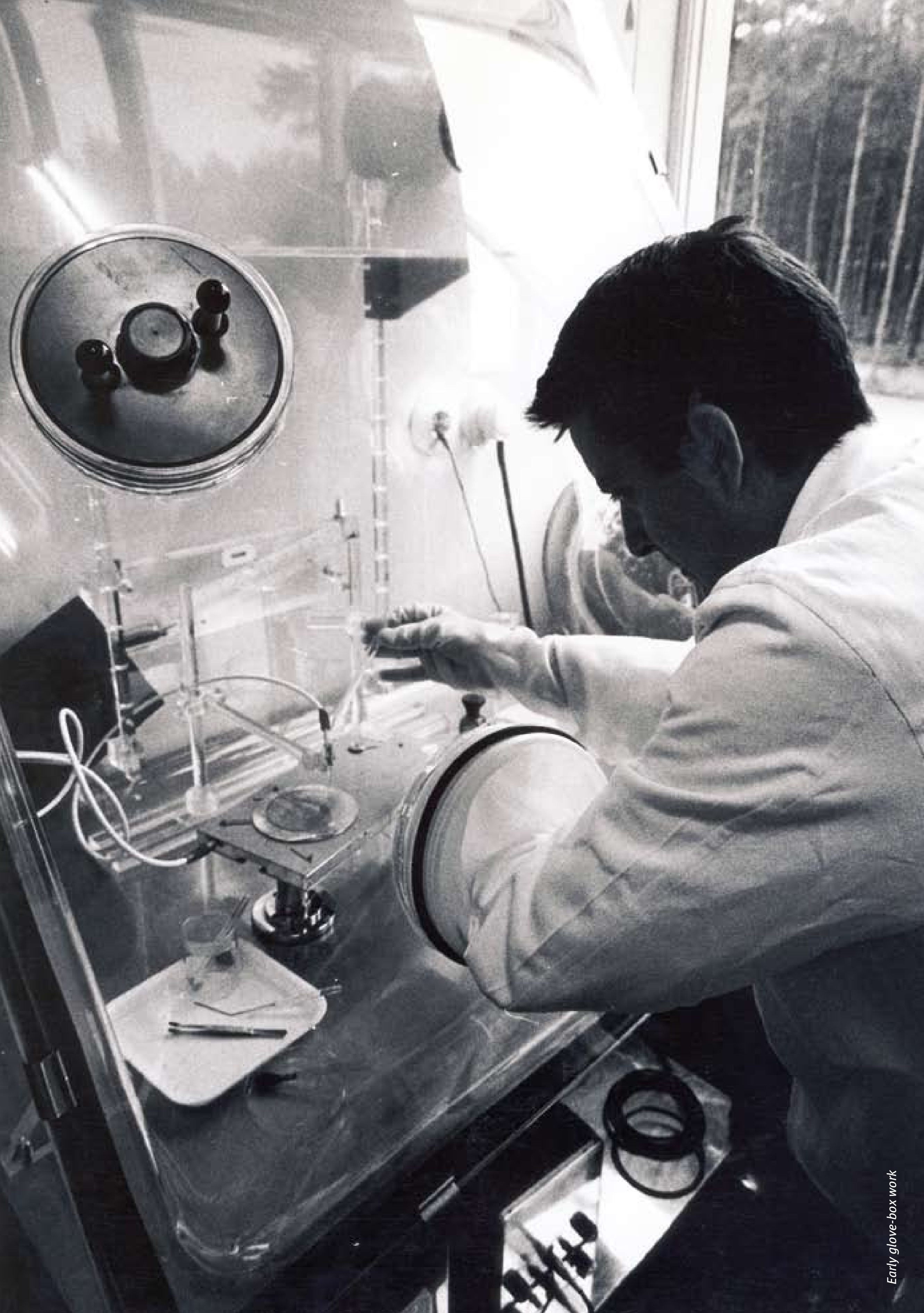
Reference materials for genetically modified organisms. IRMM was the first European reference material producer to obtain accreditation according to ISO Guide 34.

Facility for large-scale mixing of powders (up to 550 litres or 400 kg) during reference material production (2008).

from the UK in 2003, collaboration agreements with the US National Institute of Standards and Technology (NIST) and the Korean Research Institute of Standards and Science (KRISS) and others enabled early cooperation in CRM activities. Moreover, IRMM's Reference Materials Unit has pioneered in Europe the accreditation of reference material producers and has obtained its accreditation certificate according to ISO Guide 34 and ISO/IEC 17025 for its laboratories in 2004.

Today IRMM is a most innovative reference material producer with world-wide recognition. It offers high-quality CRMs for calibration, method validation and quality control in areas such as food and feed analysis, clinical chemistry and laboratory medicine, microbiology, environmental analysis, nuclear security and safeguards, engineered materials, bio- and nanotechnologies. IRMM's research on new reference materials ranges from the basic conceptual level in metrology to the technical realisation of stabilised and sufficiently characterised measurement standards which are mimicking complex real-world materials. Developments are focused on crucial new reference materials to serve EU policy needs and to advance measurement sciences.

This is supported by the establishment of new facilities at IRMM, such as specialised laboratories for the preparation of biological materials and their analysis as well as new buildings for controlled reference materials storage and advanced reference materials processing. Moreover, IRMM contributes to international committees and organisations in metrology (e.g. Comité international des poids et mesures (CIPM), European Association of National Metrology Institutes (EURAMET)), standardisation (e.g. ISO, CEN) and pre-normative research (e.g. Versailles Project on Advanced Materials and Standards (VAMAS), International Federation of Clinical Chemistry and Laboratory Medicine (IFCC), AOAC) at European and global level, for instance by chairing the ISO Committee on Reference Materials (ISO/REMCO).



Early glove-box work

JRC-IRMM operates four Community reference laboratories: feed additives, heavy metals in food and feed, polycyclic aromatic hydrocarbons and mycotoxins.

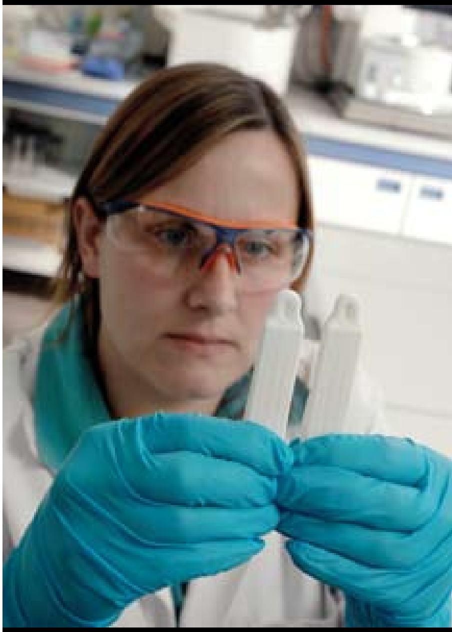
Food safety and quality

The Food Safety and Quality Unit is the youngest among the scientific units of the IRMM. It was created in 2002 by transferring part of the Food Products Unit, originally located at the Institute for Health and Consumer Protection in Ispra, Italy, and merging it with the Analytical Chemistry Unit in Geel. Provision of fit-for-purpose validated testing methods to food and feed safety testing laboratories is the main objective of the Unit. Next to that interlaboratory comparisons are organised to benchmark the capabilities of official and private food control laboratories across the EU. Taken all together, the activities aim at ensuring the comparability of testing results to provide the basis for the harmonised implementation of EU food and feed safety regulations. Measurement related expert advice given to other Commission services dealing with food and feed safety and quality complements the laboratory based activities.

The last decade of the 20th century has seen a number of food scandals, which triggered an overhaul of food and feed safety regulations in the EU. At the turn of the millennium the concept of an integrated feed - food chain (farm-to-table approach), with appropriate controls along the chain, proper risk assessment through evaluation of the scientific evidence, and rigorous product traceability was introduced. To ensure that food entering the market is safe Member States are obliged to set up appropriate inspection and control systems. European Commission services were tasked to make certain that legislation is properly implemented across EU countries. One of the measures taken was the setting up of a number of Community reference laboratories (CRLs), who together with a network of national reference laboratories, contribute to the organisation of an effective measurement infrastructure in the Member States.

Four CRLs are now operated by IRMM. The CRL for feed additives was the first one which was put in operation in November 2004, followed by the CRLs for mycotoxins, polycyclic aromatic hydrocarbons, and heavy metals, which were inaugurated in 2006. The CRL for feed additives has a dual role: in the frame of the authorisation procedure of a new feed additive it evaluates the method of analysis proposed by the applicant, and it has also been nominated as CRL for control of feed additives. The other three CRLs are responsible for setting EU-wide standards and practices for the control of food and feed within their field of expertise.

Since its creation, the Food Safety and Quality Unit has built up facilities and expertise to engage in the rapidly developing area of the "omics" sciences. Genomics, proteomics, metabolomics and metabonomics are used as a basis for the development of methods for the detection of allergens in food and the authentication of foodstuffs to protect the well-being of consumers and give them the opportunity of an informed choice when purchasing foodstuffs.



JRC-IRMM deploys its measurement expertise in food and feed to protect the well-being of consumers and give them the opportunity of an informed choice when purchasing foodstuffs.

Extracts for mycotoxin analysis.

Ultra performance liquid chromatography: loading the autosampler tray

A changing research profile

In 1960 the first Director of the Central Bureau for Nuclear Measurements, Jozef Spaepen, defined the inaugural mission of CBNM:

As a bureau of standards, this laboratory will be in the nuclear field and in charge of:

- *the conservation of primary standards and the intercomparison of these standards with those of similar laboratories in the world;*
- *the distribution and the periodic verification of secondary standards and standard samples for science, industry, commerce and medicine in the Euratom countries;*
- *improvement of standards and methods of measurement;*
- *precision measurements of nuclear constants;*
- *fundamental research, related to precision measurements;*
- *calibration and physical analysis;*
- *connection with standardisation organisations for the establishment of specifications in the nuclear field.*

Today in 2010, the mission of the JRC's Institute for Reference Materials and Measurements is defined as follows:

The mission of the IRMM is to promote a common and reliable European measurement system in support of EU policies.

The prime objective of the IRMM is to build confidence in the comparability of measurements by the production and dissemination of internationally accepted quality assurance tools, including validated methods, reference materials, reference measurements, interlaboratory comparisons and training.

Glove box for vacuum deposition of ^{235}U

Timeline: 1950-2010

1950s

European integration

1950
The French Foreign Minister Robert Schuman presented a plan for deeper cooperation. Later, every 9 May is celebrated as 'Europe Day'.

1951
Six countries sign a treaty to run their heavy industries – coal and steel – under a common management. In this way, none can on its own make the weapons of war to turn against the other, as in the past. The six are Germany, France, Italy, the Netherlands, Belgium and Luxembourg.

1957
Building on the success of the Coal and Steel Treaty, the six countries expand co-operation to other economic sectors. They sign the Treaty of Rome, creating the European Economic Community (EEC), or 'common market', and establish the European Atomic Energy Community (EAEC), generally referred to as Euratom.

1958
The Euratom Treaty entered into force and Louis Armand was elected president of the European Communities.

CBNM-IRMM

1958
On 1 November, Jozef Spaepen was appointed Director of CBNM.

1959
The first fifteen CBNM staff members were recruited and, in collaboration with the Belgian Studie Centrum voor Kernenergie (SCK) / Centre d'Etudes Nucléaires (CEN), first experimental work began in SCK/CEN laboratories. In the same year the first CBNM working groups were formed.

1960s

1962
The EU starts its 'common agricultural policy' giving the countries joint control over food production. Farmers are paid the same price for their produce. The EU grows enough food for its needs and farmers earn well. The unwanted side-effect is overproduction with mountains of surplus produce. Since the 1990s, priorities have been to cut surpluses and raise food quality.

1963
The EU signs its first big international agreement on 20 July – a deal to help 18 former colonies in Africa. Today, the EU is the world's biggest provider of development assistance to poorer countries.

1968
The six Member States remove customs duties on goods imported from each other in July, allowing free cross-border trade for the first time. They also apply the same duties on their imports from outside countries. The world's biggest trading group is born.

1960
On the 16 May, Jozef Spaepen, signed the first official document marking the birth of the institute. The Belgian Government offered the Euratom Commission a 99 year loan for the CBNM site. Construction of laboratories commenced, four mass-spectrometers were purchased and the 3.0 MV Van de Graaff (VDG) accelerator was ordered.

1961
An order was placed for the Electron Linear Accelerator (Linac) to be constructed by the French firm "Compagnie Général de Télegraphie sans Fil".

1962
The Van de Graaff accelerator was installed and construction of the Mass Spectrometry and the Linear Accelerator buildings commenced.

1963
The four mass-spectrometers were moved from SCK/CEN to CBNM and the first 'on-site' measurements began. Additionally, the voltage of the Van de Graaff accelerator was upgraded to 3.7 MV.

1964
The Electron Linear Accelerator arrived and the process of mounting, installing and testing commenced.

1965
Inauguration of the Linear Accelerator.

1966
The central workshop, the drawing office, the glass-blowing room and the central stores were all constructed within one new building.

1967
On 11 March, Jozef Spaepen was seriously injured in a car accident and Alfred Spernol and Hendrik Moret shared the role of Acting Director.

1968
The first IBM 1800 computing system was installed for the processing of neutron data.

1969
Jozef Spaepen signed an agreement to support the EURISOTOP programme.

1970s

1972
To maintain monetary stability, Member States decided to allow their currencies to fluctuate against each other only within narrow limits, and created the exchange rate mechanism (ERM). It was a first step towards the introduction of the euro, 30 years later.

1973
On 1 March, Denmark, Ireland and the United Kingdom joined the European Communities.

1979
EU citizens directly elected the members of the European Parliament for the first time. Previously they were delegated by national parliaments.

1970
On 1 July, Adriaan Aten was appointed Director of CBNM.

1973
On 1 December, Adriaan Aten retired and was replaced by Jozef De Meulder.

1974
The Bureau Communautaire de Référence (BCR) was created and an order was placed for the 7.0 MV Van de Graaff accelerator.

1977
Installation of the 7.0 MV Van de Graaff was completed.

1978
The Regular Interlaboratory Measurement Evaluation Programme (REIMEP) for the evaluation of safeguards measurements was launched.

1979
On 30 June, Jozef De Meulder resigned as Director of CBNM and Werner Müller acted temporarily as Director until 1 September when Robert Batchelor was appointed as the new CBNM Director.

1980s

1981
On 1 October Greece joined the European Communities bringing the tally of Member States to ten.

1986
On 1 January expansion of the European Communities continued through the addition of Portugal and Spain. In the same year the Single European Act was passed in the European Parliament, aiming at reducing trade barriers and strengthening environmental protection.

1980
A procedure was agreed for the EC certification of nuclear reference materials.

1981
The Nuclear Certification group was established and the first EC certificate for nuclear reference materials was issued.

1984
Robert Batchelor retired on 31 December and Werner Müller was appointed new Director of CBNM. A decision was taken to construct a building for the Bureau Communautaire de Références (BCR) work.

1985
The International Measurement Evaluation Programme (IMEP) was founded by the mass spectrometry unit of CBNM.

1990s

1990
Germany was united after more than 40 years, and its eastern part joined the EU in October 1990.

1992
The Treaty on European Union was signed in Maastricht. It was a major EU milestone, setting clear rules for the future single currency as well as for foreign and security policy and closer cooperation in justice and home affairs. Under the treaty, the name 'European Union' officially replaced 'European Community'.

1995
Austria, Finland and Sweden joined the EU bringing the total number of Member States to 15.

The Schengen Agreement took effect in seven countries — Belgium, Germany, Spain, France, Luxembourg, the Netherlands and Portugal. Travellers of any nationality could travel between all these countries without any passport control at the frontiers. Other countries have since joined the passport-free Schengen area.

1997
The Amsterdam Treaty was signed by the Member States. It built on the achievements of the treaty from Maastricht, laying down plans to reform EU institutions, to give Europe a stronger voice in the world, and to concentrate more resources on employment and the rights of citizens.

1999
On the 1 May, the implementation of the Treaty of Amsterdam commenced laying down the work plan for the accession of 11 new member states.

The euro was introduced in 11 countries (joined by Greece in 2001) for commercial and financial transactions only. Notes and coins came later (2002).

1993
In reflection of a changing mission, on 1 January the name of the institute was changed to the Institute for Reference Materials and Measurements (IRMM).

1995
Werner Müller retired and from 1 June Achiel Deruytter took over as Acting Director.

1997
On 1 February, Manfred Grasserbauer was appointed as Director of IRMM.

2002
Euro notes and coins arrived.

2004
Eight countries of central and eastern Europe — the Czech Republic, Estonia, Latvia, Lithuania, Hungary, Poland, Slovenia and Slovakia — joined the EU. Cyprus and Malta also became members, bringing the total to 25 countries.

2007
Two more countries from eastern Europe, Bulgaria and Romania, joined the EU, bringing the number of Member States to 27.

[1]

[2]

[3]

2001
IRMM launched the TrainMiC® network for life-long learning in metrology in chemistry in Europe.

2002
Alejandro Herrero was appointed Director of IRMM in November. The Food Safety and Quality Unit was incorporated into IRMM. The decommissioning of the radiochemistry building was completed (Commissioner Philippe Busquin inaugurates the renovated building). [1]

2003
IRMM assumed full responsibility for the certification of certified reference materials under the Bureau Communautaire de Références (BCR) programme.

The ERM® cooperation (European Reference Materials) began, founded by IRMM, the German Federal Institute for Materials Research and Testing (BAM) and LGC (UK).

2005
IRMM celebrated its 45th anniversary and the opening of the new building for reference materials storage, inaugurated by Commissioner Janez Potočnik in the company of Nobel Laureate Stanley Prusiner. [2]

2006
IRMM entrusted with 3 more Community reference laboratories (CRLs): heavy metals in feed and food, mycotoxins, and polycyclic aromatic hydrocarbons.

2007
Commissioner Markos Kyprianou officially inaugurated the new Community reference laboratories (CRLs) in March. [3]

JRC-IRMM became the first EC Directorate to achieve a triple-integrated certification for quality management: ISO 9001, ISO 14001 and OHSAS 18001.

2009
Krzysztof Maruszewski was appointed Director of IRMM in November.

2010
JRC's Institute for Reference Materials and Measurements, formerly Central Bureau for Nuclear Measurements, celebrates its 50th anniversary, 1960-2010.

Enlargement of the European Union 1957-2007

Member states of the European Union (2008)

Candidate countries

1957 Germany, France, Italy, the Netherlands, Belgium, Luxembourg.

1973 Denmark, Ireland, United Kingdom.

1981 Greece.

1986 Portugal, Spain.

1995 Austria, Sweden, Finland.

2004 Czech Republic, Estonia, Latvia, Lithuania, Hungary, Poland, Slovenia, Slovakia, Cyprus , Malta.

2007 Romania, Bulgaria.

Presidents of EURATOM and the European Commission

Louis Armand*	10.01.1958	-	14.01.1959
Étienne Hirsch*	02.02.1959	-	09.01.1962
Pierre Chatenet*	10.01.1962	-	30.06.1967
Jean Rey	01.07.1967	-	30.06.1970
Franco Maria Malfatti	01.07.1970	-	21.03.1972
Sicco Mansholt	21.03.1972	-	05.01.1973
François Xavier Ortoli	06.01.1973	-	05.01.1977
Roy Jenkins	06.01.1977	-	05.01.1981
Gaston E. Thorn	06.01.1981	-	05.01.1985
Jacques Delors	06.01.1985	-	05.01.1995
Jacques Santer	06.01.1995	-	15.09.1999
Romano Prodi	15.09.1999	-	30.10.2004
José-Manuel Barroso	23.11.2004	-	present

CBNM / IRMM Directors

J. Spaepen	01.11.1958 *(until 11.03.1967)*	-	31.12.1970
H. Moret and A. Spernol	12.03.1967 *(acting)*	-	31.04.1970
A. H. Aten	01.05.1970	-	01.02.1973
S. Spernol	01.02.1973 *(acting)*	-	31.05.1973
J. De Meulder	01.06.1973	-	31.06.1979
W. Müller	01.07.1979 *(acting)*	-	31.08.1979
R. Batchelor	01.09.1979	-	31.12.1984
W. Müller	01.01.1985	-	31.05.1995
A. Deruytter	01.06.1995 *(acting)*	-	30.01.1997
M. Grasserbauer	01.02.1997	-	31.10.2002
A. Herrero	01.11.2002	-	31.10.2009
K. Maruszewski	01.11.2009	-	present

IRMM

Confidence in measurements®

European Commission

EUR 23826 EN – Joint Research Centre,
Institute for Reference Materials and Measurements

50th Anniversary Brochure, 2010

Editor: D. Anderson
Graphic design: J.J. Blasco
2010 - 40 p. - 17,6 x 25 cm
Luxembourg: Publications Office of the European Union

ISBN 978 92-79-13607-8
LA-32-09-138-EN-C
DOI 10.2787/15609

Abstract

This brochure describes the history and evolution of the JRC's Institute for Reference Materials and Measurements —formerly known as the Central Bureau for Nuclear Measurements— over the last 50 years.

LA-32-09-138-EN-C

1960-2010
IRMM
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ISBN 978-92-79-13607-8

Publications Office