



EUROPEAN UNION ADVISORY GROUP
TO THE REPUBLIC OF ARMENIA

Scientific and industrial metrology: what other countries do in these fields?

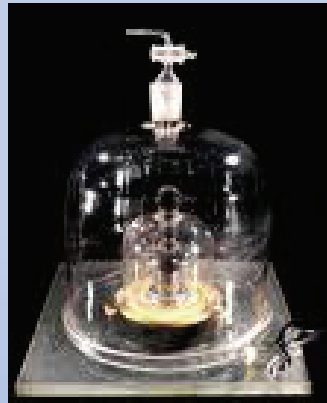
Ani Todorova

Advisor to the Ministry of Economy on Technical Barriers to Trade

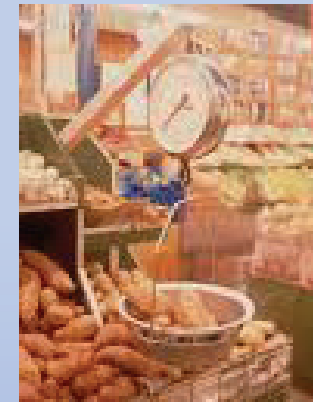
**Metrology - the science of
measurement and its
applications**



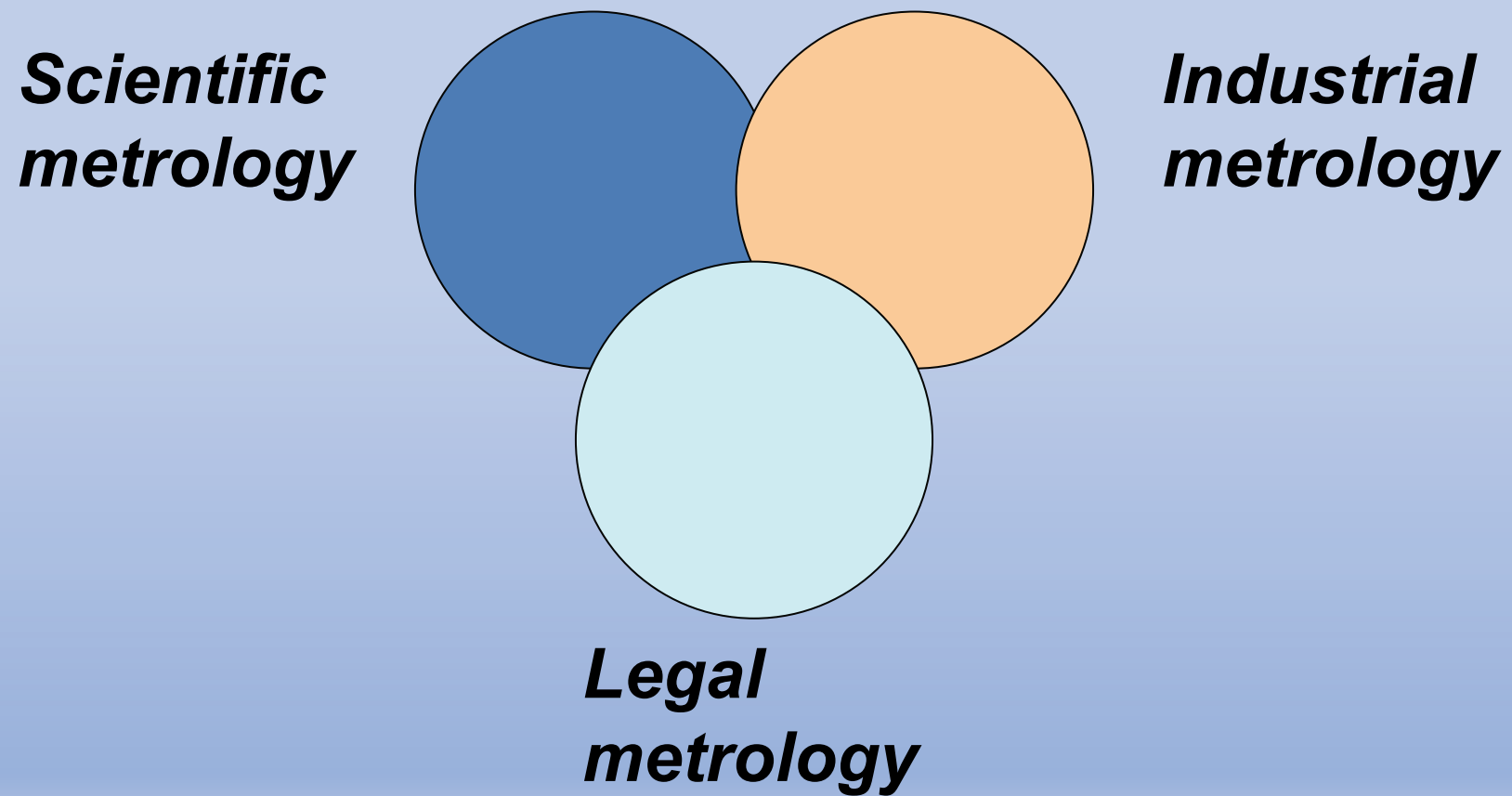
Quantity	Base Unit	Symbol
Length	meter	m
Mass	kilogram	kg
Time	second	s
Electric Current	ampere	A
Temperature	Kelvin	K
Light intensity	candela	cd
Amount of substance	mole	mol



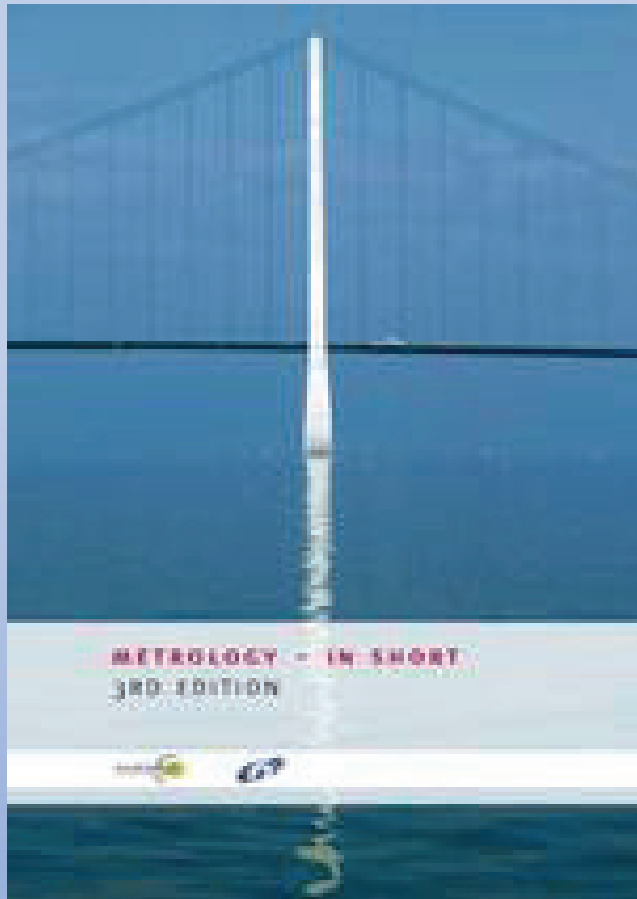
Perceptions of metrology



Modern understanding



European view



Publication of the European
Association of National
Metrology Institute (EURAMET)

“Metrology in short”

<http://www.euramet.org/index.php?id=mis>

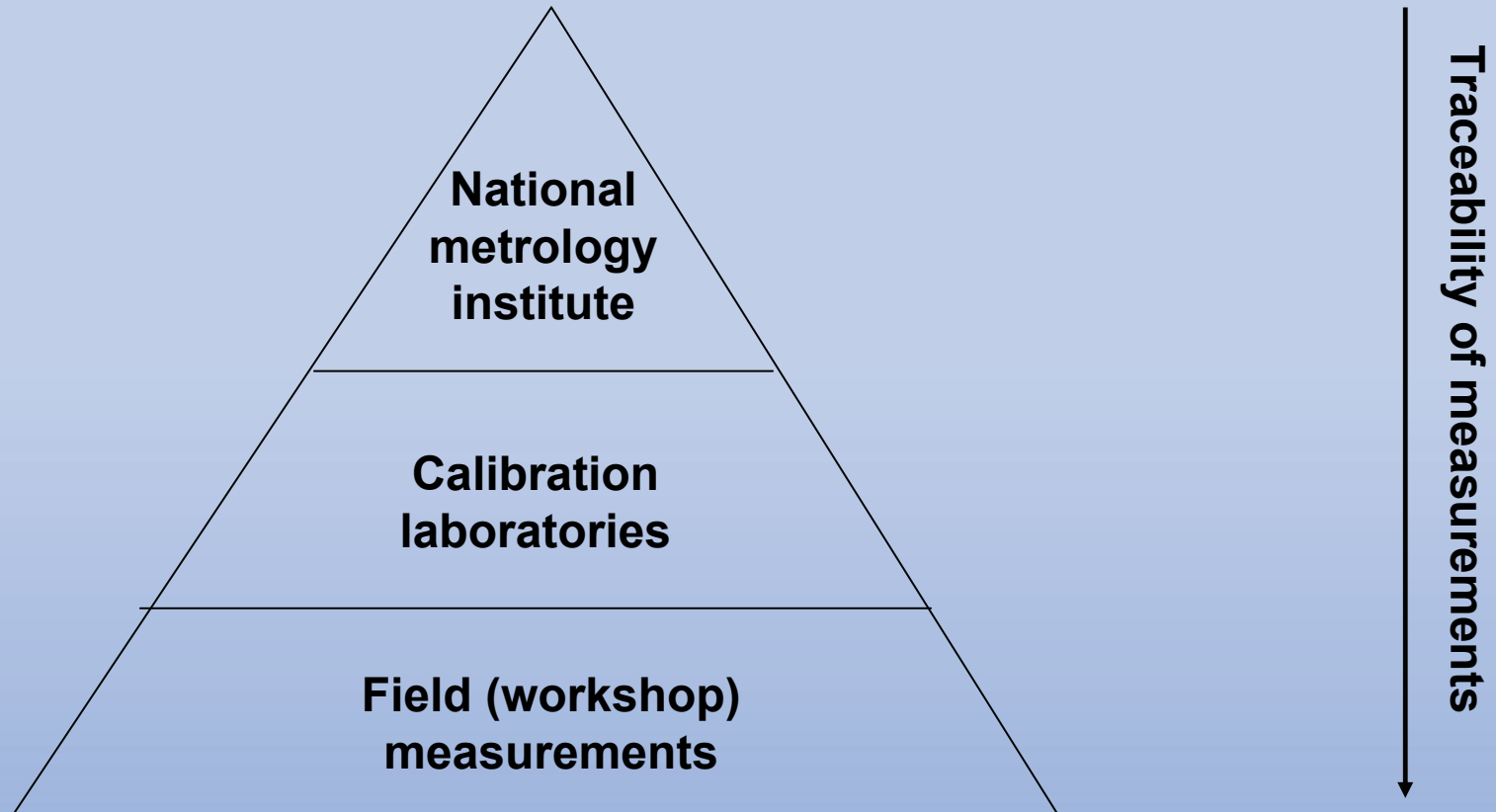
Modern concepts

- Measurement uncertainty
- Traceability of measurement
- Comparability of measurement

**International Vocabulary of Metrology –
Basic and General Concepts and Associated
Terms (VIM)**

<http://www.bipm.org/en/publications/guides/vim.html>

Metrological infrastructure



Much more complex in reality!

National metrology institute

Core functions:

- Maintaining and developing measurement standards
 - Disseminating SI units to laboratories and other users
-
- Participating in international comparisons
 - Ensuring traceability arrangements with other national metrology institutes
 - Maintaining quality management system
 - Participating in the Mutual Recognition Arrangement of the International Committee of Weights and Measures (CIPM MRA)

CIPM MRA



The screenshot shows a web browser window displaying the BIPM website. The browser's address bar shows the URL <http://www.bipm.org/en/cipm-mra/>. The page features the BIPM logo and navigation menu. The main content area is titled "CIPM Mutual Recognition Arrangement" and includes a search facility, a list of links, and a detailed text block about the MRA's history and participants.

BIPM
Bureau International des Poids et Mesures

New search facility:
BIPM metrology portal

Tel : +33 1 45 07 70 70 | Télécopie : +33 1 45 94 20 24
BIPM Home | Site map | Metrologia | KCDB | JCTLM-DB | Contact us

METRE CONVENTION | CIPM MRA | COMMITTEES | BIPM | SCIENTIFIC WORK | SI | PUBLICATIONS | DATABASES

CIPM Mutual Recognition Arrangement

[Version française](#)

[CIPM MRA documents](#) | [KCDB](#) | [Key Comparisons](#) | [Calibration and Measurement Capabilities of NMIs](#) | [Participation in the CIPM MRA](#) | [Use of the CIPM MRA logo](#) | [JCRB](#) | [Symposium to celebrate the ten-year anniversary of the CIPM MRA](#)

→ At a meeting held in Paris on 14 October 1999, the directors of the national metrology institutes (NMIs) of thirty-eight Member States of the BIPM and representatives of two international organizations signed a Mutual Recognition Arrangement (**CIPM MRA**) for national measurement standards and for calibration and measurement certificates issued by NMIs. A number of other institutes have signed since then.

This Mutual Recognition Arrangement is a response to a growing need for an open, transparent and comprehensive scheme to give users reliable quantitative information on the comparability of national metrology services and to provide the technical basis for wider agreements negotiated for international trade, commerce and regulatory affairs.

The CIPM MRA has now been signed by the representatives of 78 institutes – from 48 Member States, 27 Associates of the CGPM, and 3 [international organizations](#) – and covers a further 133 institutes designated by the signatory bodies.

[Click here for the full list of participants.](#)

More

- [CIPM MRA documents](#)
- [KCDB](#): The BIPM key comparison database, containing Appendices A, B, C and D of the CIPM MRA
- [Key Comparisons](#): CIPM and RMO key and supplementary comparisons (Appendix B)
- [Calibration and Measurement Capabilities of NMIs](#): CMCs (Appendix C)
- [Participation in the CIPM MRA](#)
- [Use of the CIPM MRA logo](#)
- [JCRB](#): Joint Committee of the Regional Metrology Organizations and the BIPM (role, composition, documents and membership)
- [Symposium to celebrate the ten-year anniversary of the CIPM MRA](#): 8-9 October 2009
- [Signatories of the CIPM MRA \(Appendix A\)](#)

Windows taskbar: BIPM - CIPM MRA - ... | Microsoft PowerPoi... | EN | 04:59

CIPM MRA

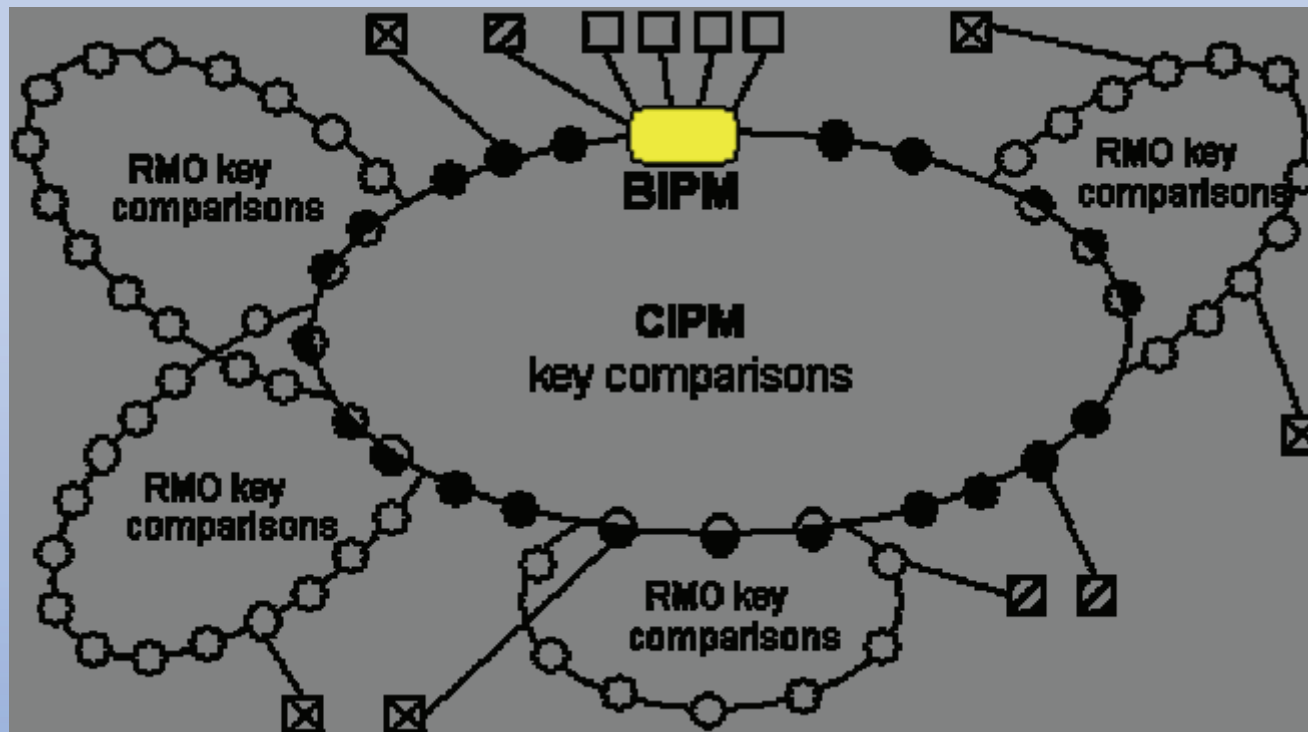
- Key and supplementary comparisons

http://kcdb.bipm.org/appendixB/KCDB_AppB_search.asp

- Calibration and measurement capabilities

<http://kcdb.bipm.org/appendixC/default.asp>
n

Key comparisons



Source: BIPM

Calibration and measurement capabilities

http://kcdb.bipm.org/appendixC/AUV/BR/AUV_BR.pdf - Google Chrome

http://kcdb.bipm.org/appendixC/AUV/BR/AUV_BR.pdf

1 / 4 71.1% Find

Calibration and Measurement Capabilities

Acoustics, Ultrasound and Vibration, Brazil, INMETRO (Instituto Nacional de Metrologia, Normalização e Qualidade Industrial)

Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty					Comments	NMI Internal Service Identifier
Quantity	Instrument or Artifact	Instrument Type or Method	Minimum value	Maximum value	Units	Parameter	Specifications	Value	Units	Coverage factor	Level of Confidence	Is the expanded uncertainty a relative one?		
Charge sensitivity (magnitude)	Accelerometer	ISO 16063-11 (Interferometry)			C/(m/s ²)	Frequency	10 Hz to 50 Hz	1	%	2	95%	Yes	Sinusoidal excitation	8340
Charge sensitivity (magnitude)	Accelerometer	ISO 16063-11 (Interferometry)			C/(m/s ²)	Frequency	50 Hz to 1 kHz	0.5	%	2	95%	Yes	Sinusoidal excitation	8340
Charge sensitivity (magnitude)	Accelerometer	ISO 16063-11 (Interferometry)			C/(m/s ²)	Frequency	1 kHz to 5 kHz	1	%	2	95%	Yes	Sinusoidal excitation	8340
Charge sensitivity (magnitude)	Accelerometer	ISO 16063-11 (Interferometry)			C/(m/s ²)	Frequency	5 kHz to 10 kHz	1.5	%	2	95%	Yes	Sinusoidal excitation	8340
Voltage sensitivity (magnitude)	Acceleration measuring chain	ISO 16063-11 (Interferometry)			V/(m/s ²)	Frequency	10 Hz to 50 Hz	1	%	2	95%	Yes	Sinusoidal excitation	8340
Voltage sensitivity (magnitude)	Acceleration measuring chain	ISO 16063-11 (Interferometry)			V/(m/s ²)	Frequency	50 Hz to 1 kHz	0.5	%	2	95%	Yes	Sinusoidal excitation	8340
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Charge sensitivity (magnitude)	Accelerometer	ISO 5347-3 (comparison)			C/(m/s ²)	Frequency	10 Hz to 50 Hz	1.5	%	2	95%	Yes	Sinusoidal excitation	8342
Charge sensitivity (magnitude)	Accelerometer	ISO 5347-3 (comparison)			C/(m/s ²)	Frequency	50 Hz to 1 kHz	1	%	2	95%	Yes	Sinusoidal excitation	8342
Charge sensitivity (magnitude)	Accelerometer	ISO 5347-3 (comparison)			C/(m/s ²)	Frequency	1 kHz to 5 kHz	1.5	%	2	95%	Yes	Sinusoidal excitation	8342
Charge sensitivity (magnitude)	Accelerometer	ISO 5347-3 (comparison)			C/(m/s ²)	Frequency	5 kHz to 10 kHz	2	%	2	95%	Yes	Sinusoidal excitation	8342

Metrological research

EU example: <http://www.euramet.org/index.php?id=993>



- Grand challenges for multi-discipline metrology (health, energy, environment, new technologies)
- Grand challenges on fundamental metrology
- Focused single-discipline and applied metrology

Services to the industry

The example of German metrology institute PTB



The screenshot shows a web browser window displaying the PTB website. The address bar shows the URL http://www.ptb.de/en/wegweiser/industriekunden/_index.html. The page content includes a navigation menu on the left, a breadcrumb trail 'PTB > Thematic tours > Partner of industry', and a main heading 'PTB as the partner of industry'. Below the heading, there is a paragraph asking if the user is coming from industry and pointing to large Internet chapters. A list of links follows, including 'Services', 'PTB – Partner of medium-sized businesses', and 'Technology transfer'. To the right of this list is a graphic of a signpost with four directional signs. Below the signpost, there is another paragraph about general information and a list of links for a personal tour, including 'Calibration, Standards, Traceability, Accreditation', 'Approvals', 'Joint projects with industry', 'Technology transfer', and 'Cooperation in standardization'. At the bottom, there is an 'Additional information' section with links to 'Chapter "Services"' and 'Contact persons in the field "Metrology for economy"'. The browser's taskbar at the bottom shows several open applications, including 'Physikalisch-Techni...' and 'Microsoft PowerPoi...', and the system clock shows 05:31.

Thematic tours [Homepage](#) | [Deutsche Version](#)

PTB > Thematic tours > Partner of industry

PTB

[Calibration](#) | [Standards](#) | [Traceability](#) | [Accreditation](#) | [Joint projects](#) | [Technology transfer](#) | [Standardization](#)

PTB as the partner of industry

Are you coming from industry? Then have a look at our large Internet chapters for industrial customers:

- [Services](#)
- [PTB – Partner of medium-sized businesses](#)
- [Technology transfer](#)

If you want to start with some general information about what PTB is doing for industry, you can compose your personal tour from the following links:

- [Calibration, Standards, Traceability, Accreditation](#)
- [Approvals](#)
- [Joint projects with industry](#)
- [Technology transfer](#)
- [Cooperation in standardization](#)

Additional information:

[Chapter "Services"](#)
[Contact persons in the field "Metrology for economy"](#)

Training and knowledge transfer

The example of National Physical Laboratory UK

The screenshot displays the National Physical Laboratory (NPL) website, specifically the 'Educate + Explore' page. The browser window shows the URL <http://www.npl.co.uk/educate-explore/>. The website features a navigation menu with links for 'About NPL', 'Products + Services', 'News + Events', 'Reference', 'Publications', 'Measurement Network', 'Careers', and 'Contact'. The main header includes the NPL logo and the tagline 'The UK's National Measurement Institute'. A search bar is located on the left side, and a sidebar lists various categories such as 'Science + Technology', 'Commercial Services', and 'Educate + Explore'. The 'Educate + Explore' section is highlighted, providing information about educational resources, contact details for Andrew Hanson, and links to various educational materials like 'History of NPL', 'Online Barograph', 'NPL interactive and new media', 'Protons for Breakfast', 'Virtual Physical Laboratory (VPLab)', 'Measurement Units', and 'The NPL Academy'. The Windows taskbar at the bottom shows the system tray with the time 05:36 and the language set to EN.

EURAMET: European Ass... Educate + Explore: Natio... Physikalisch-Technische ...

http://www.npl.co.uk/educate-explore/

About NPL Products + Services News + Events Reference Publications Measurement Network Careers Contact

NPL
National Physical Laboratory

The UK's National Measurement Institute

Search for site
Enter search term here
GO

Science + Technology
Commercial Services
Educate + Explore

- Be Amazed
- Posters
- New Media
- History of NPL
- Online Barograph
- Protons for Breakfast
- Units of Measurements
- What is the Time?
- Water Rocket Challenge
- Physics Handbook
- Science: [So what? So everything!]

Home > Educate + Explore

Educate + Explore

Find out more about the interesting things we do; from measuring time to building water rockets - including information on our educational resources.

For more information, please contact [Andrew Hanson](#)

History of NPL
The National Physical Laboratory was founded in 1900 to promote links between science and commerce.
[More](#)

Online Barograph
The NPL online barograph has been recording the pressure in Teddington, UK, since 1st January 1998.
[More](#)

NPL interactive and new media
See NPL's interactive media assets from our YouTube, iTunes and Flickr presences.
[More](#)

Protons for Breakfast
A 6-week course for people interested in science and its impact on our lives.
[More](#)

Virtual Physical Laboratory (VPLab)
The Virtual Physical Laboratory (VPLab) software contains over 180 interactive experiments for use by teachers and by pupils individually.
[More](#)

Measurement Units
Outline of Measurement Units information including SI units.
[More](#)

The NPL Academy
The NPL Academy gives GCSE students a real taster for work at the UK's leading measurement research laboratory.
[More](#)

EMRP-HQ.wmv

Show all downloads...

EN 05:36

National metrology institutes

- The backbone of the national metrology infrastructure
- Differ in size and functions
- Differ in measurement capabilities
- In some countries – a complex structure (distributed or decentralised systems)
- In some countries – autonomous institutes, in others – integrated within research organisations