



Using the BIPM key comparison database

"Sound beginning in the CIPM MRA" Course
BIPM, 14 November 2017

Using the BIPM key comparison database

1 . Main sections of the website

Homepage

Participants in the CIPM MRA

Key and Supplementary Comparisons,

Calibration and Measurement Capabilities (CMCs)

2 . Search engines available

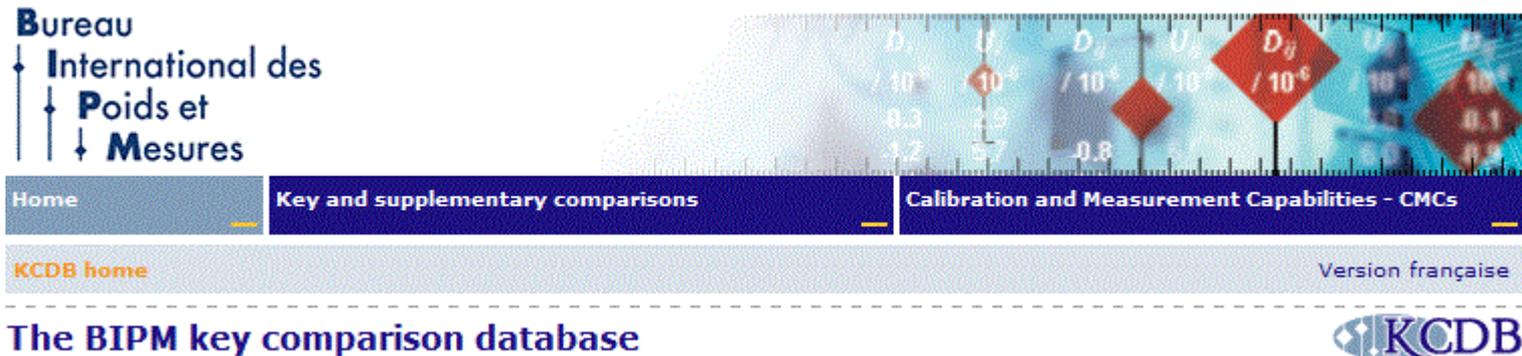
3 . Information available

4 . Search examples

Access the KCDB

<http://kcdb.bipm.org/>

KCDB is an open-access Website available at
<http://kcdb.bipm.org/>



The screenshot shows the top section of the KCDB website. On the left is the logo for the Bureau International des Poids et Mesures (BIPM). To the right is a decorative banner with a ruler and diamond-shaped data points. Below the banner is a navigation menu with three items: 'Home', 'Key and supplementary comparisons', and 'Calibration and Measurement Capabilities - CMCs'. Below the menu is a grey bar with 'KCDB home' on the left and 'Version française' on the right. At the bottom of the screenshot, the text 'The BIPM key comparison database' is on the left and the 'KCDB' logo is on the right.

Bureau International des Poids et Mesures

Home Key and supplementary comparisons Calibration and Measurement Capabilities - CMCs

KCDB home Version française

The BIPM key comparison database KCDB

Access the KCDB

<http://kcdb.bipm.org/>

KCDB maintained at the BIPM and accessible from its main website

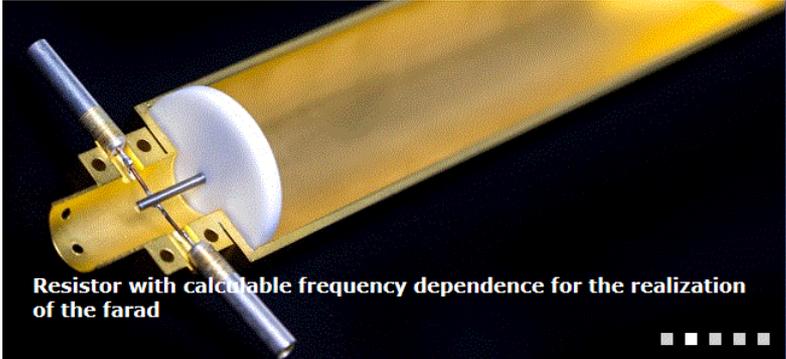
Bureau International des Poids et Mesures
- the intergovernmental organization through which Member States act together on matters related to measurement science and measurement standards.

Search facility:

Site map | News | Contact us | [FR]

ABOUT US | WORLDWIDE METROLOGY | INTERNATIONAL EQUIVALENCE | MEASUREMENT UNITS | **SERVICES** | PUBLICATIONS | MEETINGS

About the BIPM



Resistor with calculable frequency dependence for the realization of the farad

- Comparisons piloted by the BIPM
- Calibration and measurement services
- Timescales
 - KCDB**
 - CCFLM
- SI Brochure
- Metrologia
- Meetings
- IERS Conventions Center
- Recommended values of standard frequencies

Homepage

<http://kcdb.bipm.org/>

Bureau International des Poids et Mesures

Home Key and supplementary comparisons Calibration and Measurement Capabilities - CMCs

KCDB home Version française

The BIPM key comparison database

in support to the Mutual Recognition Arrangement of the CIPM (CIPM MRA) of national measurement standards and of calibration and measurement certificates issued by national metrology institutes

What's new ?

- Time and Frequency - APMP 11 October 2016
- Key comparison COOMET-EM-K6.a 10 October 2016
- All news

Related links

- KCDB Statistics
- KCDB FAQs
- KCDB Reports
- CIPM MRA
- JCRB
- Find my NMI
- Metrologia

Contact us

- BIPM.KCDB@bipm.org

Participants in the CIPM MRA (Appendix A)

List of national metrology institutes and designated institutes that are participant in the Arrangement.

[access to the list](#)

Key and supplementary comparisons (Appendix B)

Information on CIPM (Comité International des Poids et Mesures) and RMO (Regional Metrology Organization) key and supplementary comparisons, together with results interpreted in terms of equivalence.

Search comparisons :

[advanced search](#)

Calibration and Measurement Capabilities - CMCs (Appendix C)

Quantities for which calibration and measurements certificates are recognized by institutes participating in the Arrangement.

Search CMCs :

[advanced search](#)

List of key comparisons (Appendix D)

List together with a short description of the key comparisons recorded.

[access to the list](#)

KCDB based on a number of databases, that contain information needed to fulfil the objectives of the CIPM MRA

News on the latest updates

Other useful resources

KCDB Office Contact email

List of participants in the CIPM MRA

<http://www.bipm.org/en/cipm-mra/participation/signatories.html>

As of November 2017, **258 laboratories** (National Metrology Institutes and designated laboratories) from **98 countries** (with **4 international organizations**) that participate in the Arrangement.

- The list is maintained by the BIPM Director's Office and by the BIPM Webmaster.
- KCDB provides a link to the [searchable list](#) available from the main BIPM website

Key and Supplementary Comparisons - Homepage

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

Three search engines available to access information on comparisons

Key and supplementary comparisons



What's new about comparisons ?

- [Key comparison COOMET.EM-K6.a](#)
10 October 2016
- [Key Comparison SIM.EM.RF-K5.b.CL](#)
23 September 2016
- [All news](#)

Related links

- [KCDB Statistics](#)
- [KCDB FAQs](#)
- [KCDB Reports](#)
- [CIPM MRA](#)
- [JCRB](#)
- [Find my NMI](#)
- [Metrologia](#)

Contact us

- BIPM.KCDB@bipm.org

Choose your search engine to access comparisons information

Free search

Type your keywords

[Send us your feedback](#)

Direct search by comparison identifier

Comparison identifier Matches exactly No Yes

Advanced search

Metrology Area	All
Branch	All
Comparison type	All
Organization	All
Validity	All
Country	All

Text-based inquiry

A unique identifier is attributed to each comparison according to the agreed nomenclature (See [section 3.1, CIPM-MRA-D05](#)); e.g. CCEM-K8

Key and Supplementary Comparisons – Advanced search

Users select at least one option below

Field of activity covered by Consultative Committees (CCs)

Acoustics, Ultrasound and Vibration;
Electricity and Magnetism;
Ionizing Radiation;
Length;
Mass and related quantities;
Photometry and Radiometry;
Thermometry;
Time and Frequency;

Amount of Substance (Chemistry
and Biology)

Advanced search

Metrology Area	All
Branch	All
Comparison type	All
Organization	All
Validity	All
Country	All

Reset all Search

Sub-fields of activity of the CCs

Designation of the activity of CC WGs (CCM, CCQM),
sections of CC (CAUV, CCRI), or designation of the
classification of services decided by CCs

[Go to the KCDB Website](#)

Key and Supplementary Comparisons – Advanced search

Users select at least one option below

Key or Supplementary Comparison only
(No pilot study registered in the Database)

Organization conducting the comparison :
CIPM or a RMO (AFRIMETS., APMP,
COOMET., EURAMET., SIM., GULFMET)

Validity of the comparison : Current or Archival

A comparison is “Archived “when superseded
by a new exercise, or abandoned, or has
reached the 10-year limit set by the CCRI

Advanced search

Metrology Area	All
Branch	All
Comparison type	All
Organization	All
Validity	All
Country	All

Reset all Search

Key and Supplementary Comparisons - Search Result

Advanced search

Metrology Area	Acoustics, Ultrasound, and Vibration
Branch	Vibration
Comparison type	Key
Organization	All
Validity	All
Country	All

→ Reset all

→ Search

> List of comparisons corresponding to a selection of search criteria

>> Clicking on the identifier returns the page of information on the comparison.

www.bipm.org

→ **Search criteria** : Acoustics, Ultrasound, and Vibration, Vibration, Key
Your request produced **17** result(s)

List of comparisons

Click on a comparison identifier to view more

Page 1 2 3 4

CCAUV.V- K1	Vibration acceleration 2000 - 2001
Comparison type, Field	Key comparison in Acoustics, Ultrasound, and Vibration, Vibration
Parameter(s)	Frequency: 40 Hz to 5 kHz
Status	Approved for equivalence , Results available
CCAUV.V- K1.1	Vibration acceleration 2006 - 2007
Comparison type, Field	Key comparison in Acoustics, Ultrasound, and Vibration, Vibration
Parameter(s)	Frequency: 40 Hz to 5 kHz
Status	Approved for equivalence , Results available
CCAUV.V- K2	Vibration acceleration 2009 - 2012
Comparison type, Field	Key comparison in Acoustics, Ultrasound, and Vibration, Vibration
Parameter(s)	Frequency: 10 Hz to 10 kHz
Status	Approved for equivalence , Results available
CCAUV.V- K3	Acceleration complex sensitivity 2013 - 2015
Comparison type, Field	Key comparison in Acoustics, Ultrasound, and Vibration, Vibration
Parameter(s)	Different frequencies from 0.1 Hz to 40 Hz with specified acceleration amplitudes
Status	In progress
CCAUV.V- K4	Accelerometer shock calibration 2016 - 2018
Comparison type, Field	Key comparison in Acoustics, Ultrasound, and Vibration, Vibration
Parameter(s)	Acceleration values from 500 m/s ² to 5000 m/s ²
Status	Protocol complete

Key and Supplementary Comparisons - Information

The information displayed here is generally contained in the **Protocol of the comparison**, and **Registration and Progress form** ([template](#) on download from the CIPM MRA document website)

↘ CCAUV.V-K4
• Information
• Pilot / Contact
• Participants
• Results
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↘ Related links
• KCDB Statistics
• KCDB FAQs
• KCDB Reports
• CIPM MRA
• JCRB
• Find my NMI
• Metrologia

Information	
Metrology area, branch	Acoustics, Ultrasound, and Vibration, Vibration
Description	Accelerometer shock calibration
Time of measurement	2016 - 2018
Status	Protocol complete
Reference(s)	CCAUV.V-K4 Registration and progress form CCAUV.V-K4 Technical Protocol
Measurand	Voltage sensitivity at a nominal value of 0.22 mV/(m/s ²) Charge sensitivity at a nominal value of 1.0 pC/(m/s ²)
Parameter(s)	Acceleration values from 500 m/s ² to 5000 m/s ²
Transfer device(s)	Accelerometer chain, back-to-back type Accelerometer, single-ended type
Comparison type	Key comparison
Consultative Committee	CCAUV (Consultative Committee for Acoustics, Ultrasound and Vibration)
Conducted by	CCAUV (Consultative Committee for Acoustics, Ultrasound and Vibration)

Information updated until completion of the comparison

Key and Supplementary Comparisons - Information

Status

Status shows the progress of the work from the **beginning**, status “*Planned*”, to the **end** of the exercise, status “*Approved for equivalence, Results available*” for **key comparisons** or “*Approved and published*” for **supplementary comparisons**.

The status for **BIPM key comparisons** is “*Ongoing*” or “*Ongoing, Results available*” since the exercise lasts as long as the need exists.

At the beginning of the implementation of the CIPM MRA, CCs were requested to choose a number of comparisons already completed in order to set up a basis for the first sets of CMCs. It results that :

- 88 key and supplementary comparisons received the status “*Approved for provisional equivalence*” and “*Published*”, respectively.
- KCDB displays a publication reference but no values or graphs.
- The KCDB turns these key comparisons to archives, as soon as new results become available.

In November 2017, 53 comparisons are set « Archived ».

Other information and comments

- Some RMOs also use an internal identifier before the comparison is registered.
This identifier may be kept in the KCDB and can be found using the website free form search engine

Pilot and Contact

↘ CCAUV.V-K4

- [Information](#)
- [Pilot / Contact](#)
- [Participants](#)
- [Results](#)
- [Print out](#)

↘ Related links

- [KCDB Statistics](#)
- [KCDB FAQs](#)
- [KCDB Reports](#)
- [CIPM MRA](#)
- [JCRB](#)
- [Find my NMI](#)
- [Metrologia](#)

↘ Contact us

- BIPM.KCDB@bipm.org

CCAUV.V-K4

↘ Pilot laboratory(ies)

NIM National Institute of Metrology
China
[Pilot-Web](#)

NMIJ AIST National Metrology Institute of Japan
Japan
[Pilot-Web](#)

↘ Contact person(s)

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[Contact-WEB](#)

Key and Supplementary Comparisons - Information

Participants

↘ CCAUV.V-K4
<ul style="list-style-type: none">• Information• Pilot / Contact• Participants• Results• Print out
↘ Related links
<ul style="list-style-type: none">• KCDB Statistics• KCDB FAQs• KCDB Reports• CIPM MRA• JCRB• Find my NMI• Metrologia
↘ Contact us
<ul style="list-style-type: none">• BIPM.KCDB@bipm.org

CCAUV.V-K4

↘ Participants

CENAM	Centro Nacional de Metrologia <i>Mexico, SIM</i>
INMETRO	Instituto Nacional de Metrologia, Qualidade e Tecnologia <i>Brazil, SIM</i>
KRISS	Korea Research Institute of Standards and Science <i>Korea, Republic of, APMP</i>
NIM	National Institute of Metrology <i>China, APMP</i>
NMIA	National Measurement Institute, Australia <i>Australia, APMP</i>
NMIJ AIST	National Metrology Institute of Japan <i>Japan, APMP</i>
NMISA	National Metrology Institute of South Africa <i>South Africa, AFRIMETS</i>
PTB	Physikalisch-Technische Bundesanstalt <i>Germany, EURAMET</i>
VNIM	D.I. Mendeleev Institute for Metrology, Rosstandart <i>Russian Federation, COOMET</i>

Supplementary Comparison - Results

- ◆ “Supplementary Comparisons (SCs)” are conducted by the RMOs to meet specific needs not covered by key comparisons, including comparisons to support confidence in calibration and measurement certificates.

EURAMET.EM-S32

Information	
Metrology area, branch	Electricity and Magnetism, Resistance
Description	DC resistance
Time of measurement	2009 - 2010
Status	Approved and published
Reference(s)	Metrologia, 2013, 50, Tech. Suppl., 01008 EURAMET.EM-S32 Final Report, 2013, 136 pages
Measurand	DC resistance: 1 teraohm and 100 teraohms
Transfer device(s)	Well-characterized travelling standards
Comparison type	Supplementary comparison
Consultative Committee	CCEM (Consultative Committee for Electricity and Magnetism)
Conducted by	EURAMET (formerly EUROMET) (European Association of National Metrology Institutes)

Publication of results in the KCDB:

- Update of the Status
- Issue the Final Report as a *Metrologia Technical Supplement*

Supplementary Comparison - Results

EURAMET.EM-S32

Information

Metrology area, branch	Electricity and Magnetism, Resistance
Description	DC resistance
Time of measurement	2009 - 2010
Status	Approved and published
Reference(s)	Metrologia, 2013, 50, Tech. Suppl., 01008 EURAMET.EM-S32 Final Report, 2013, 136 pages
Measurand	DC resistance: 1 teraohm and 100 teraohms
Transfer device(s)	Well-characterized travelling standards
Comparison type	Supplementary comparison
Consultative Committee	CCEM (Consultative Committee for Electricity and Magnetism)
Conducted by	EURAMET (formerly EUROMET) (European Association of National Metrology Institutes)

Information to be provided to the KCDB Office for publication of SC results

- Email confirming the formal approval of the Final Report from the appropriate body, CC, and/or RMO, or WG
- PDF File (non-protected file) of the Final Report
- Completed [form](#) to Issue the Final Report as a *Metrologia Technical Supplement*

Key Comparison - Results

- ◆ Key Comparisons (KCs) selected by a Consultative Committee (CC) to test the principal techniques and methods in the field, and conducted by CCs, BIPM, and RMOs.

CCRI(III)-K11

Information

Metrology area, branch	Ionizing Radiation, Section III (Neutron Measurements)
Description	Comparison of neutron fluence
Time of measurement	2011 - 2012
Status	Approved for equivalence, Results available
Reference(s)	Metrologia, 2014, 51, Tech. Suppl., 06009 CCRI(III)-K11 Final Report, 2014, 33 pages CCRI(III)-K11 Technical Protocol
Measurand	Neutron fluence
Parameter(s)	Neutron energy: 27.4 keV, 565 keV, 2.5 MeV and 17 MeV
Transfer device(s)	All measurements are performed with the participants' instruments in the same neutron fields at the AMANDE accelerator facility
Comparison type	Key comparison
Consultative Committee	CCRI (Consultative Committee for Ionizing Radiation)
Conducted by	CCRI (Consultative Committee for Ionizing Radiation)

Publication of KC results in the KCDB :

- Update of the Status
- Publication of the results interpreted in terms of equivalence as inserted in the Final Report
- Issue a *Metrologia Technical Supplement* for the Final Report

Key Comparison - Results

CCRI(III)-K11

Information

Metrology area, branch	Ionizing Radiation, Section III (Neutron Measurements)
Description	Comparison of neutron fluence
Time of measurement	2011 - 2012
Status	Approved for equivalence, Results available
Reference(s)	Metrologia, 2014, 51, Tech. Suppl., 06009 CCRI(III)-K11 Final Report, 2014, 33 pages CCRI(III)-K11 Technical Protocol
Measurand	Neutron fluence
Parameter(s)	Neutron energy: 27.4 keV, 565 keV, 2.5 MeV and 17 MeV
Transfer device(s)	All measurements are performed with the participants' instruments in the same neutron fields at the AMANDE accelerator facility
Comparison type	Key comparison
Consultative Committee	CCRI (Consultative Committee for Ionizing Radiation)
Conducted by	CCRI (Consultative Committee for Ionizing Radiation)

Information to be provided to the KCDB Office for publication of KC results

- Email confirming the formal approval of the Final Report from the appropriate body, CC, and/or RMO, or WG
- PDF File (non-protected file) of the Final Report including results interpreted in terms of equivalence as foreseen in the [Technical Supplement of the CIPM MRA](#) (T1 and T2)
- File with numbers & graphs of the Degrees of equivalence
- Completed [form](#) to Issue the Final Report as a *Metrologia Technical Supplement*

Key Comparisons - Results



Key and supplementary comparisons - Results

CCRI(III)-K11

- [Information](#)
- [Pilot / Contact](#)
- [Participants](#)
- **[Results](#)**
 - [27.4 keV](#)
 - [565 keV](#)
 - [2.5 MeV](#)
 - [17 MeV](#)
- [Print out](#)

Related links

- [KCDB Statistics](#)
- [KCDB FAQs](#)
- [KCDB Reports](#)

CCRI(III)-K11

Results

Results published on 21 May 2014

Neutron fluence

Click on one of the following links to access results:

[27.4 keV](#)
[565 keV](#)
[2.5 MeV](#)
[17 MeV](#)

Access is given to the following PDF files:

- [Summary Results](#),
- [Final Report](#).

KCDB publishes the results of key comparison obtained for one value of the measurand or one value of an influence parameter

Key Comparisons - Results

- ◆ Results of key comparison obtained for one value of the measurand or one value of an influence parameter generally take the form of a foursheet folder displayed in Appendix B

CCRI(III)-K11

↘ Results	Equivalence statements	Degrees of equivalence	Graph(s) of equivalence
MEASURAND : Fluence per monitor M1-count at 1 m distance from the target in vacuum in cm⁻² NEUTRON ENERGY : 27.4 keV			

[CCRI\(III\)-K11 Results](#)

Key Comparisons - Results

CCRI(III)-K11

Results

Laboratory individual measurements	Equivalence statements	Degrees of equivalence	Graph(s) of equivalence
------------------------------------	------------------------	------------------------	-------------------------

MEASURAND : Fluence per monitor M1-count at 1 m distance from the target in vacuum in cm^{-2}

NEUTRON ENERGY : 27.4 keV

x_i : result of measurement carried out by laboratory i

u_i : combined standard uncertainty of x_i

All measurements were performed from September 2011 to October 2012.

Lab i	x_i / (cm^{-2})	u_i / (cm^{-2})	u_i / x_i / %
NPL	1.770	0.059	3.33
VNIIM	1.700	0.054	3.18
IRMM	-	-	-
PTB	1.795	0.043	2.40
NIST	1.656	0.093	5.62
NMIJ	1.821	0.078	4.28
LNE-IRSN	1.716	0.060	3.50

Unless otherwise stated, in the final numbers presented here, rounding has been applied according to ISO 80000-1:2009 Annex B Rule B.

KCDB publishes :

- The value of the result of measurement and associated combined standard uncertainties obtained by the participants
- Date of measurement
- Other information of interest : method, transfer standard,...

Key Comparisons - Results

CCRI(III)-K11

Results

Laboratory individual measurements	Equivalence statements	Degrees of equivalence	Graph(s) of equivalence
MEASURAND : Fluence per monitor M1-count at 1 m distance from the target in vacuum in cm^{-2}			
NEUTRON ENERGY : 27.4 keV			
The key comparison reference value, x_R , and its standard uncertainty, u_R , are obtained from the weighted mean of the participants' results.			
$x_R = 1.752 \text{ cm}^{-2} \text{ and } u_R = 0.022 \text{ cm}^{-2}$			
The degree of equivalence of each laboratory i with respect to the key comparison reference value is given by a pair of terms: $D_i = (x_i - x_R)$ and U_i , its expanded uncertainty ($k = 2$), $U_i = 2(u_i^2 - u_R^2)^{1/2}$.			
The degree of equivalence between two laboratories i and j is given by a pair of terms: $D_{ij} = D_i - D_j = x_i - x_j$ and U_{ij} , its expanded uncertainty ($k = 2$), $U_{ij} = 2(u_i^2 + u_j^2)^{1/2}$.			
The pair-wise degrees of equivalence are not explicitly given here, but can be found in Table A.3.1 to A.3.4 on page 26 and 27 of the Final Report .			

KCDB publishes few sentences on the process used for computing :

- the key comparison reference value and its combined standard uncertainty (obtained from statistical analysis of the participants' results)
- The degree of equivalence of each participant relative to the key comparison reference value (offset + uncertainty)
- (if available) The pair-wise degrees of equivalence with a reference to these values in the Final report.

Key Comparisons - Results

CCRI(III)-K11

Results

Laboratory individual measurements	Equivalence statements	Degrees of equivalence	Graph(s) of equivalence
------------------------------------	------------------------	------------------------	-------------------------

MEASURAND : Fluence per monitor M1-count at 1 m distance from the target in vacuum in cm^{-2}

NEUTRON ENERGY : 27.4 keV

Degrees of equivalence: D_i and U_i ($k = 2$) expressed in cm^{-2}

Lab i ↓	D_i	U_i
	/ (cm^{-2})	
NPL	0.018	0.109
VNIIM	-0.052	0.099
PTB	0.043	0.074
NIST	-0.096	0.181
NMIJ	0.069	0.150
LNE-IRSN	-0.036	0.112

Results are presented under A4 printable format in [Summary Results](#) (PDF file).

Unless otherwise stated, in the final numbers presented here, rounding has been applied according to ISO 80000-1:2009 Annex B Rule B.

KCDB publishes

- The table of the degree of equivalence of each participant relative to the key comparison reference value (offset + uncertainty)

Key Comparisons - Results

CCRI(III)-K11

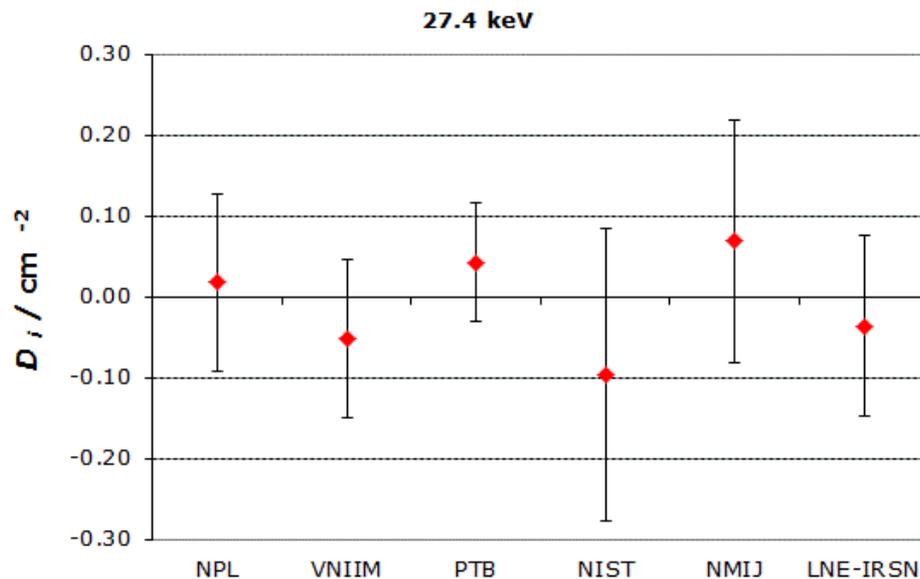
Results

Laboratory individual measurements	Equivalence statements	Degrees of equivalence	Graph(s) of equivalence
------------------------------------	------------------------	------------------------	-------------------------

MEASURAND : Fluence per monitor M1-count at 1 m distance from the target in vacuum in cm^{-2}

NEUTRON ENERGY : 27.4 keV

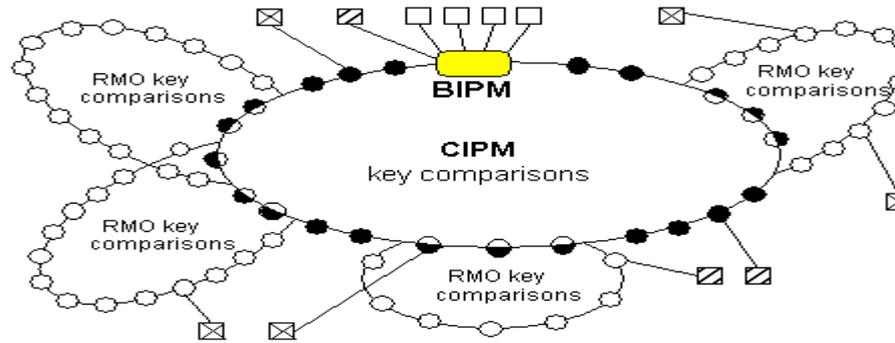
Degrees of equivalence: D_i and U_i ($k = 2$) expressed in cm^{-2}



KCDB publishes

- The graph of the degree of equivalence of each participant relative to the key comparison reference value (zero horizontal axis)

Linkage of Key comparisons of the same family



- Results of key comparisons are interpreted to show equivalence between any one of the participants in any comparison of the family.
- A family can be identified in the KCDB through the common part in the comparison identifier, for example of [M.P-K13](#) family

- ◆ Using free search engine on comparison data:
 - Direct access to specific instrument: e.g. Zener diode
 - Direct access to quantity : e.g. distribution of KC in Electrolytic Conductivity
 - Statistics on participation of France in EURAMET Key Comparison



Thank you

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International des
Poids et
Mesures

Key Comparisons – Results

Linkage of Key comparisons of the same family

- Common participant(s) in the CIPM key comparison and the equivalent RMO key comparison.
- Linkage does not modify CIPM key comparison reference value which remains unique and unaltered for the whole family
- Linkage allows to extend the set of degrees of equivalence and the graph of equivalence in order to give evidence of the comparability between institutes that have only participated in one of the exercises. The expanded uncertainty included in their degrees of equivalence is, however, generally higher than if they had been compared directly.

Example of [M.P-K13](#) family