



# Role of Designated Institutes in the CIPM MRA

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**B**ureau  
♦ **I**nternational des  
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♦ **M**esures



# Introduction to Designated Institutes (DI's)

## CIPM 2005-07: NMIs AND OTHER DESIGNATED INSTITUTES

... CIPM MRA introduced ... **“Designated Institutes”** as responsible for certain national standards and associated services not covered by the activities of the "traditional" NMI.

- ◆ As of November 1, **156 DIs** among 102 signatories to the CIPM MRA
- ◆ Hold **~15% of the CMCs** worldwide
- ◆ Bring expertise to the metrology community that is not available at NMIs
- ◆ Contribute to an efficient use of national capabilities

# Objectives of this presentation

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- ◆ Present general aspects on the process of being Designated as an Institute to participate in the CIPM MRA
- ◆ Present expectations to DIs within the CIPM MRA (according to CIPM MRA-D-06 (revised March 2017))
- ◆ Provide examples of Designated Institutes within SIM

# Outline

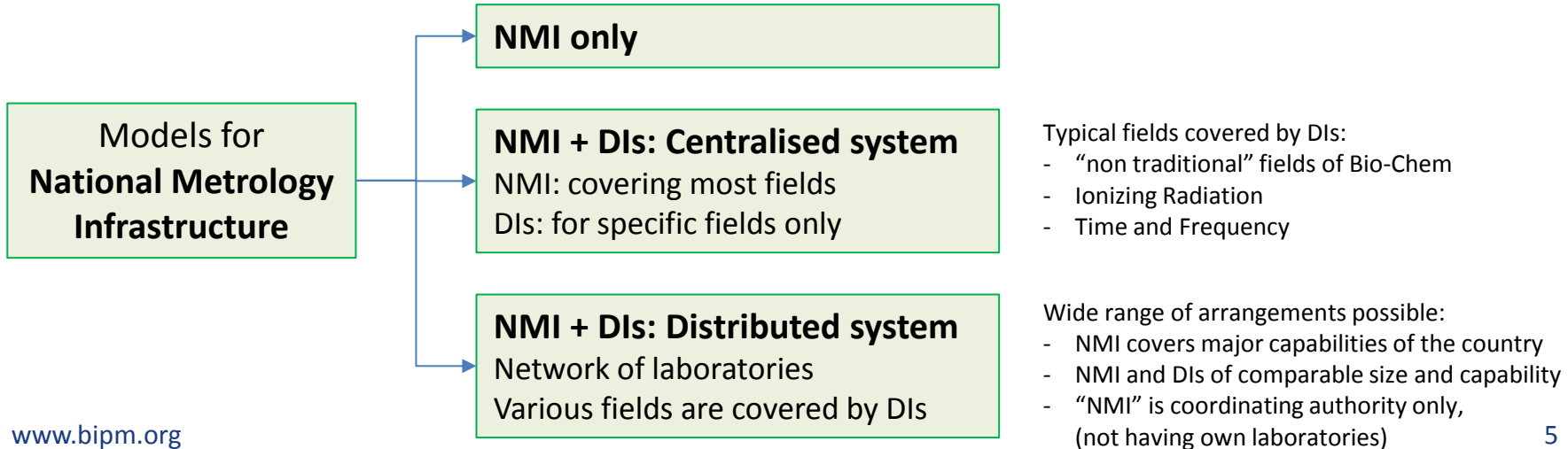
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- Role of DIs in the context of the CIPM MRA
- Designation of an institute: CIPM MRA-D-06
- Consideration of Roles/Relationships: NMI's and DI's
- Examples of DI's within SIM
- Summary

# Designated Institutes in national metrology systems

## CIPM 2005-07: NMIs AND OTHER DESIGNATED INSTITUTES

1.1 Paragraphs 1.4 and 1.5 of the CIPM MRA introduced the concept of "designated institutes" as responsible for certain national standards and associated services that are not covered by the activities of the "traditional" NMI.



# Advantage to integrate DIs into national and international metrology infrastructure

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- ◆ Compliment fields of activities of the NMI ...
- ◆ ... without need of larger investments, efficient use of available national economic resources
- ◆ Bring in expertise not available at the NMI  
*(of particular relevance for new fields like biology, medicine, ... but also for traditional fields like Ionizing Radiation where infrastructure and experience is available in other expert institutes)*
- ◆ More effective dissemination and promotion of metrology & CIPM MRA
  - Providing metrological traceability
  - Making more measurement services available to stakeholders

# Observations:

## What it takes for DI's to succeed in the CIPM MRA

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DIs are frequently small units within larger organizations where metrology is not the key business. In order to be successful participant in the CIPM MRA a DI needs:

- ◆ A steady resource commitment for sustainable maintenance of national standards
  - Support from management for metrology-specific matters
- ◆ Sound understanding of metrology and a culture of measurement excellence
- ◆ To maintain their part in ensuring their role in disseminating the SI units
  - Providing calibration services or certified reference materials
  - Gaining approved CMC's

# Roles of NMI'DIs in the context of the CIPM MRA

- ◆ Participation in key/supplementary comparisons, pilot studies
- ◆ Entry of CMCs to the KCDB
- ◆ Participation in Consultative Committees

Reconnaissance mutuelle  
des étalons nationaux de mesure  
et des certificats d'étalonnage et de mesurage  
émis par les laboratoires nationaux de métrologie  
Paris, le 14 octobre 1999

[Supplément technique révisé en octobre 2003 \(pages 17-20\)](#)



Mutual recognition  
of national measurement standards  
and of calibration and measurement certificates  
issued by national metrology institutes

Paris, 14 October 1999

[Technical Supplement revised in October 2003 \(pages 38-41\)](#)

Comité international des poids et mesures

Bureau  
international  
des poids  
et mesures

Organisation  
intergouvernementale  
de la Convention  
du Mètre



# Possible motivation to become a DI

- ◆ Participation in key/supplementary comparisons, pilot studies
- ◆ Entry of CMCs to the KCDB
- ◆ Participation in Consultative Committees
- ◆ Access to top level knowledge in metrology and contact to experts
- ◆ Participation in research programmes of the RMO
- ◆ Access to high level comparisons
- ◆ International recognition
- ◆ Improving the market position (DI in private sector)
- ◆ ... and others

**Expectations of the DI might go beyond the context of the CIPM MRA**

# Expectations to DIs within the CIPM MRA

**CIPM MRA-D-06:**

DIs participating in the CIPM MRA  
Expectations and nomination form

**DIs should act in a similar way as NMIs (within their area of designation)**

- ◆ Hold and maintain national measurement standards
- ◆ Participate in appropriate measurement comparisons
- ◆ Operate a QMS (ISO/IEC 17025, ISO 17034 or currently Guide 34)
- ◆ Publish CMCs
- ◆ Deliver traceability through calibration services and/or CRMs on an equal basis to all customers
- ◆ Participate in activities of the relevant TC of their RMO and CIPM CC
- ◆ Contribute to CIPM MRA processes as an inter-regional reviewer of CMC's  
... and more

# DIs within the national metrology system

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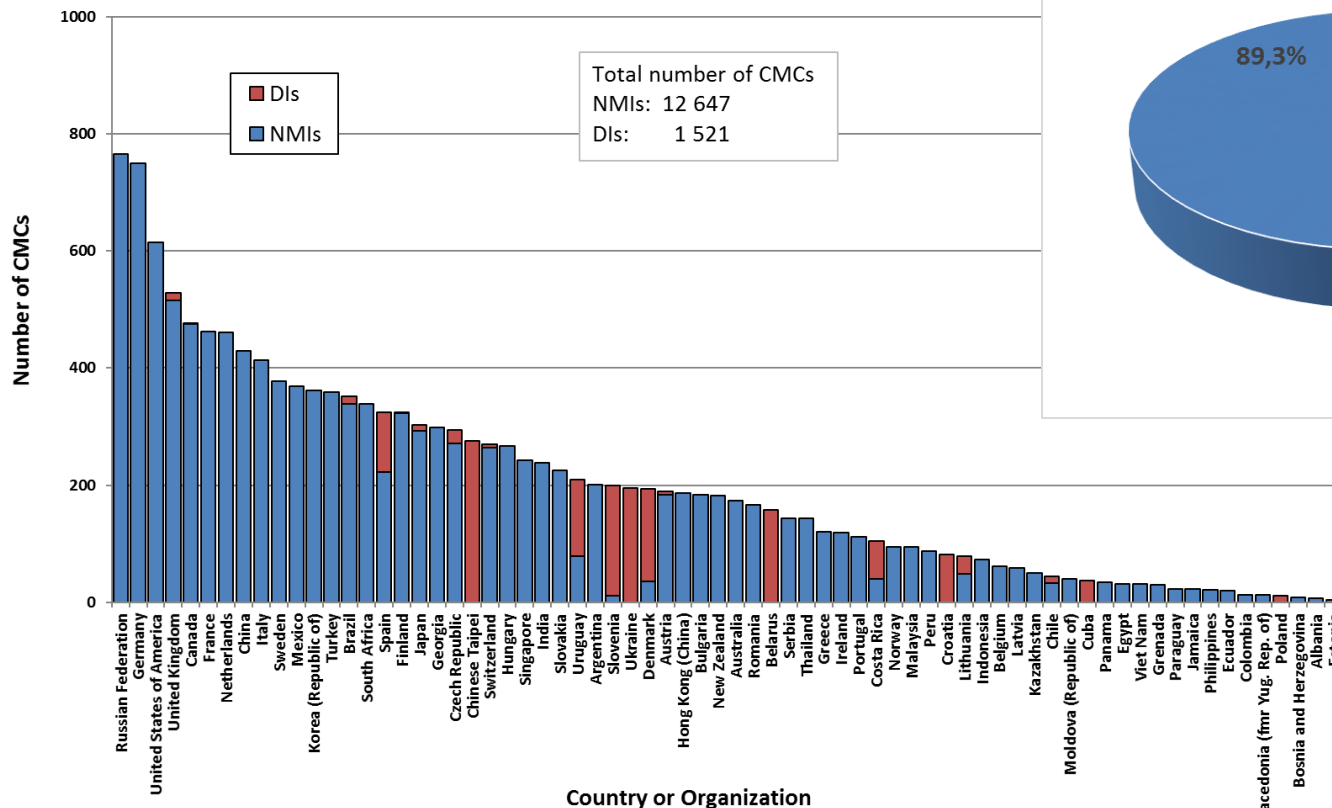
- ◆ In some countries, laboratories are integrated to the national metrology system, for research in metrology and/or for holding national measurement standards and related CMCs, which are not published in the KCDB.
- ◆ Note that these are not “DIs” in the context of the CIPM MRA!

Use of the same term “DI” maybe cause for confusion.

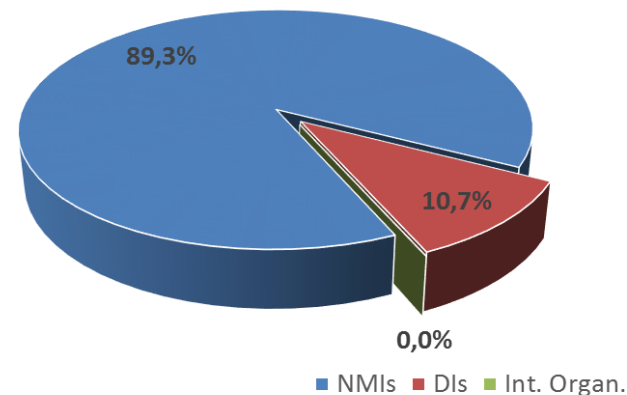
# CMCs of Designated Institutes: Physical Quantities

Status: September 2015

## Physical CMCs



## CMCs in Physical Quantities



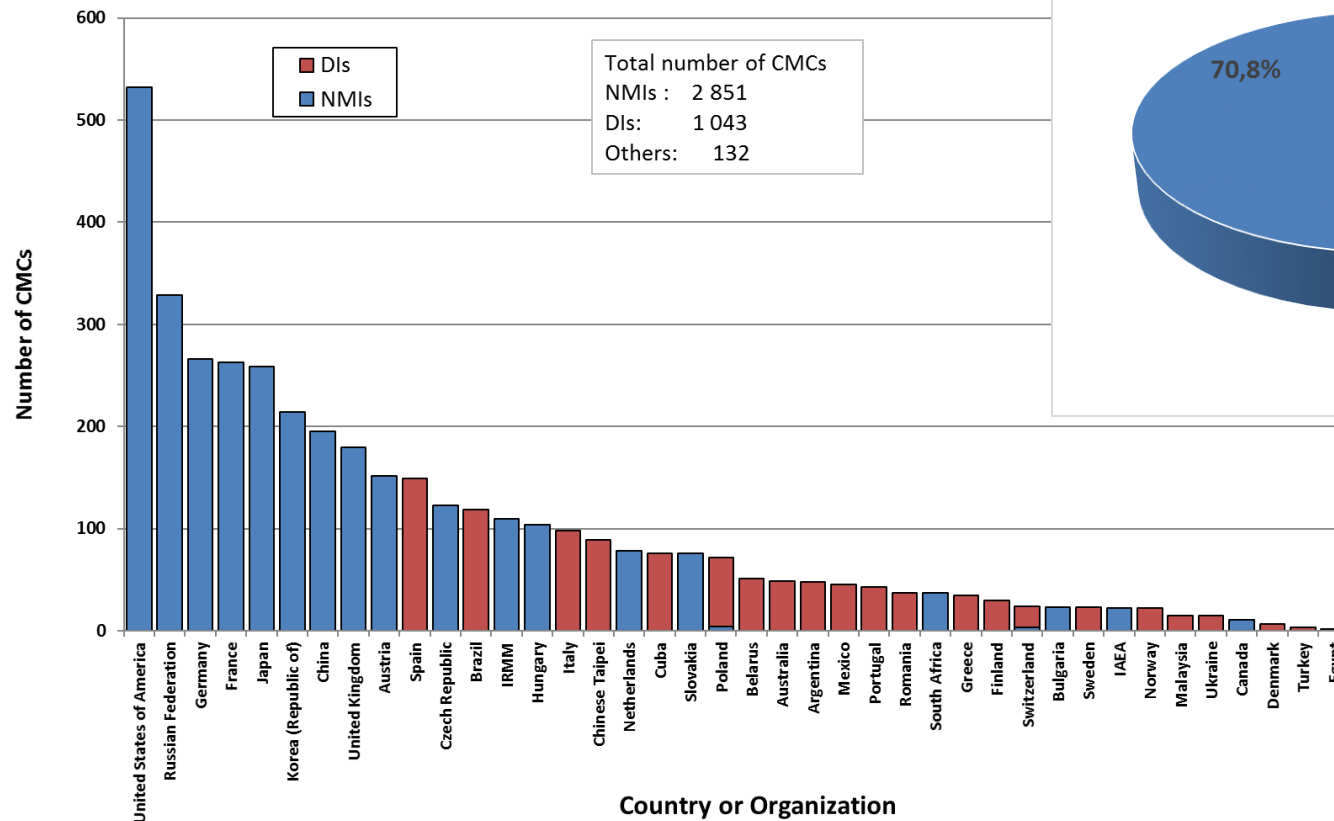
## Countries with CMCs at

NMIs only	48
NMIs & DIs	15
DIs only	7

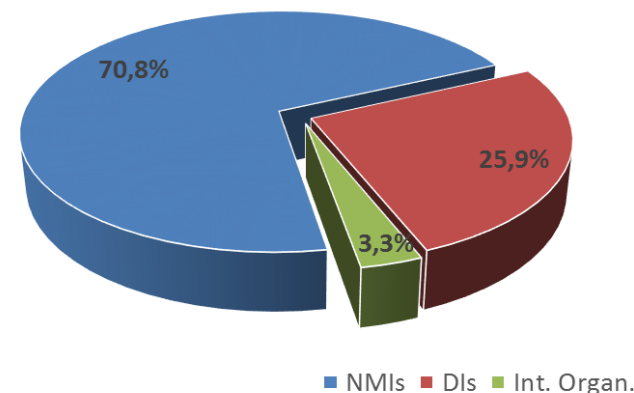
# CMCs of Designated Institutes: Ionizing Radiation

Status: September 2015

## Ionizing Radiation CMCs



## CMCs in Ionising Radiation



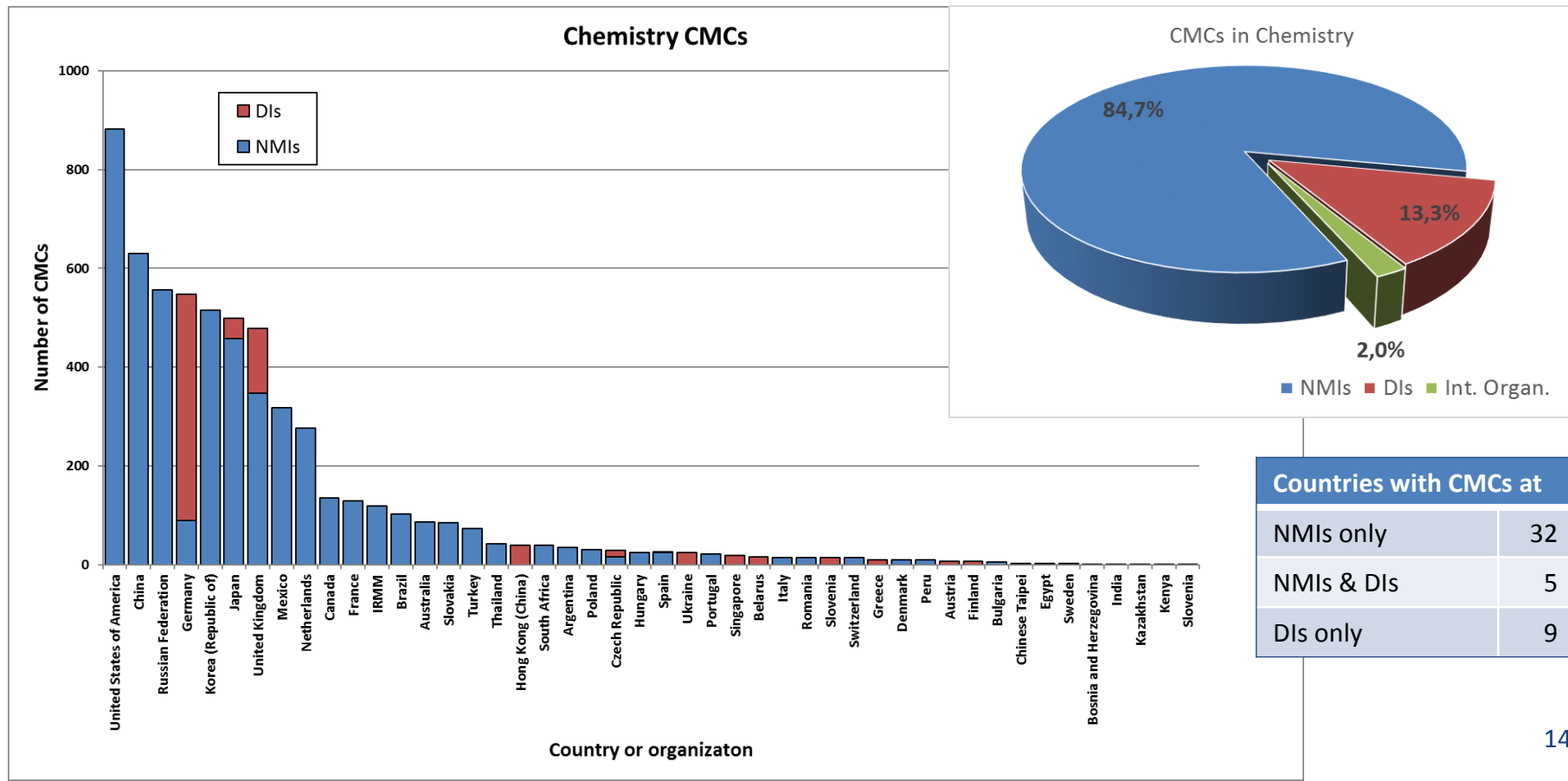
## Countries with CMCs at

NMIs only	17
NMIs & DIs	0
DIs only*	21

\* There are 2 countries with dominated by DIs, with a small number of CMCs at NMIs

# CMCs of Designated Institutes: Chemistry

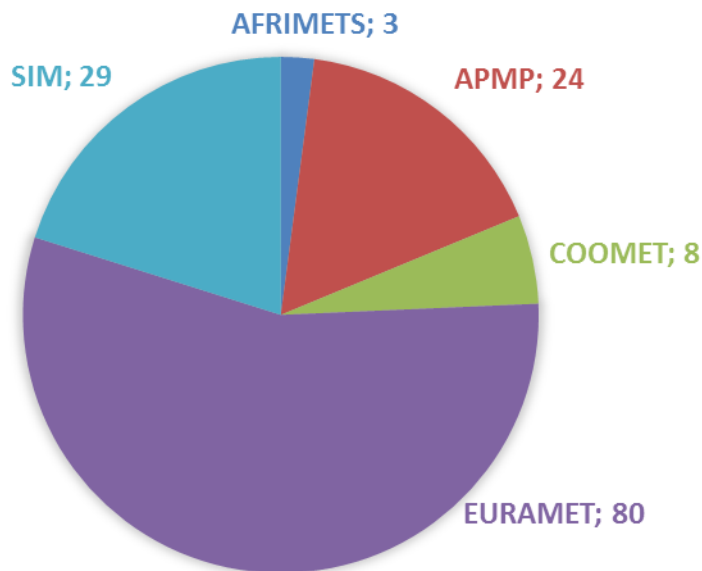
Status: September 2015



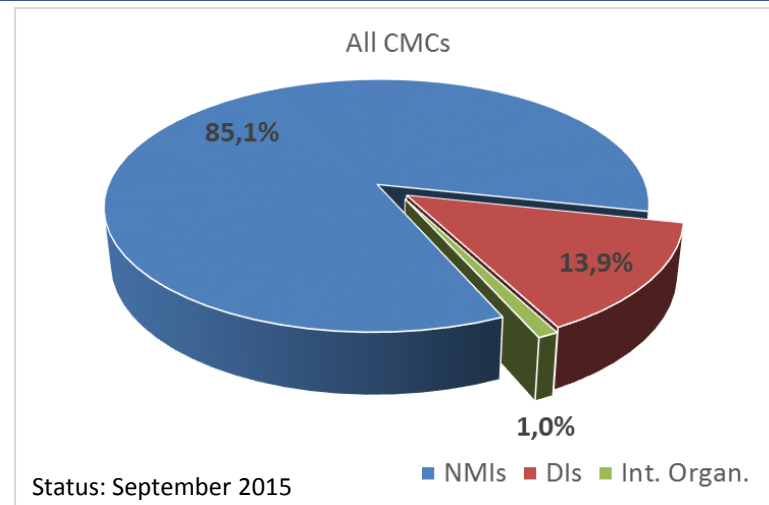
# DIs & CMCs worldwide: Some statistics

Status: October 2016

## Number of DIs in the RMOs



*In the presented statistics, the 7 DIs of the Russian Federation are considered as NMIs*



### Economies with DIs

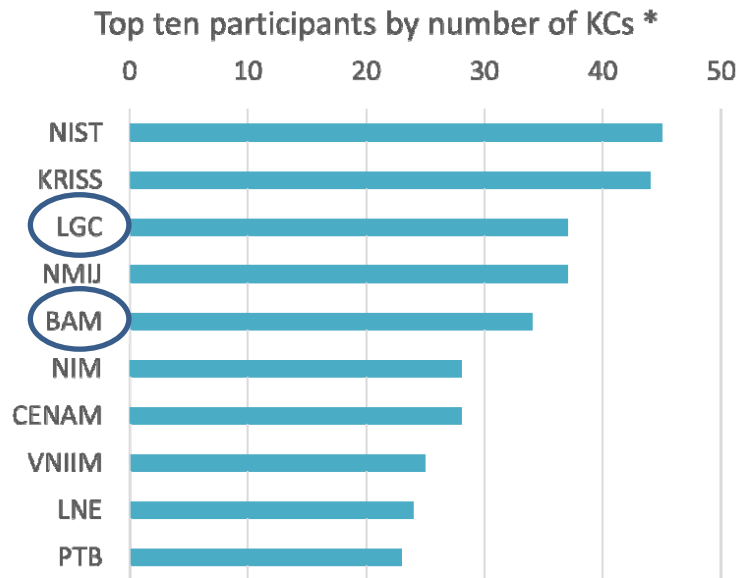
AFRIMETS	15 %
APMP	68 %
COOMET	38 %
EURAMET	68 %
SIM	50 %

### Highest number of DIs

CARICOM	11
France	9
Slovenia	9
Chile	8
Thailand	7

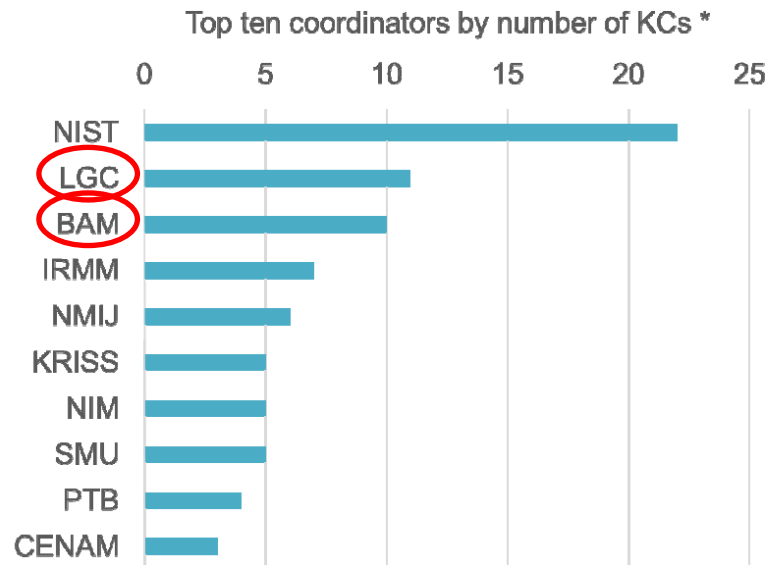
# Coordination of comparisons by DIs (example)

## Participation in CCQM key comparisons



11

## Coordination of CCQM key comparisons



12

\* KCs which have been reported or approved for DoE in the BAWG, IAWG and OAWG

### Source:

Mike Sargent, LGC Limited, UK  
LGC's experience as a Designated Institute,  
EURAMET DI Workshop, 18-19 February 2016, Copenhagen



# Outline

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- Designation of an institute: CIPM MRA-D-06

# Process of designation: CIPM-MRA-D-06



Designated Institutes participating in  
the CIPM MRA

Expectations and nomination form

CIPM MRA-D-06  
Version 1.1

## 2.1. Designation of a Institute

Institutes should only be designated if they have appropriate metrological expertise ... and ...

- ◆ hold and maintain national measurement standards
- ◆ will deliver metrological traceability ...  
in a well defined area, and on equal basis to all customers
- ◆ will act similar as the NMI ... and accept the obligations of participation in the CIPM MRA
- ◆ are appropriately resourced and sufficiently stable ...

The designation must be done by the authorized body of the state or economy

- a) responsible ministry or authority within the government, or
- b) the NMI, if authorized to do so by its government

# Process of designation: CIPM-MRA-D-06



Designated Institutes participating in  
the CIPM MRA

Expectations and nomination form

CIPM MRA-D-06  
Version 1.1

## 3. General Guidelines

Section provides better understanding of expectations when designating an institute

- ◆ NMI should be involved in process
- ◆ Scopes of NMI and DI(s) must be complementary (to be confirmed by the JCRB Executive Secretary)
- ◆ CIPM MRA is about dissemination of the unit it is not intended to cover testing services
- ◆ Explanation what “dissemination of the unit” means and how it is typically done
- ◆ Designation in the private sector needs special attention, to avoid unfair market advantage

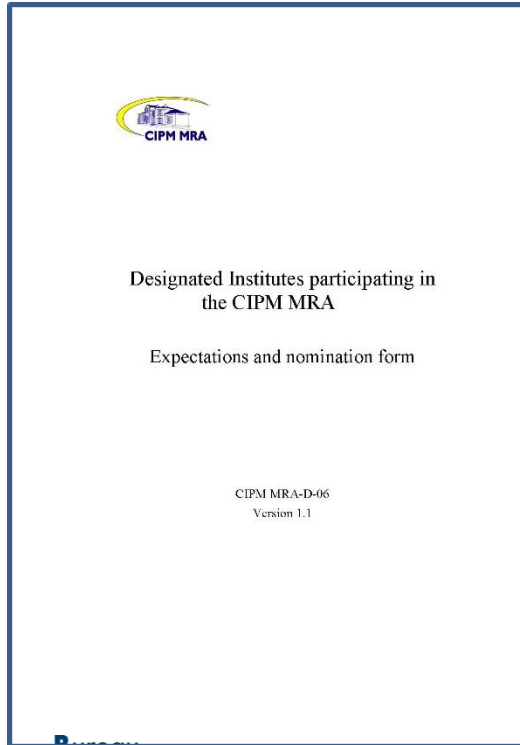
# Process of designation: CIPM-MRA-D-06

## 3. General Guidelines

- ❖ CIPM MRA assigns responsibilities to the RMOs.
  - ❖ RMOs play an important role in establishing that DIs are, in practice, able to satisfy the CIPM MRA criteria.

### DI is expected to

- ◆ Meet specific requirements of RMO
- ◆ Participate in comparisons
- ◆ Operate a QMS complying with ISO 17025 and/or ISO 17034 (or currently ISO guide 34)
- ◆ Declare CMCs and subject them to review process
- ◆ Participate in TC activities and, if relevant, in CIPM CCs
- ◆ Contribute to CIPM MRA review process (inter-regional review of CMC's from other NMI's/DI/s)



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Mesures

# Process of designation: CIPM-MRA-D-06



Designated Institutes participating in  
the CIPM MRA

Expectations and nomination form

CIPM MRA-D-06  
Version 1.1

## 3. General Guidelines

Drawing up CMCs, submission and review shall follow the standard practice as described in CIPM MRA-D-04

Description of traceability rules within the CIPM MRA are briefly described in D-06

# Process of designation

## Nomination form

### Nomination of a Designated Institute

Name of State/Economy: \_\_\_\_\_

Name of body that has the authority to designate: \_\_\_\_\_

Name of the institute to be designated (DI): \_\_\_\_\_

DI legal entity: \_\_\_\_\_  
(if different from above)

DI Acronym: \_\_\_\_\_ DI website: \_\_\_\_\_

DI mailing address: \_\_\_\_\_

Post code: \_\_\_\_\_ City: \_\_\_\_\_ Tel/Fax: \_\_\_\_\_

Contact Person at DI: \_\_\_\_\_

Contact Person's e-mail: \_\_\_\_\_

Metrology area of designation\*: \_\_\_\_\_

Note that within the meaning of the CIPM MRA only one institute per State or Economy can be designated for any given metrology area\*\*

*We confirm that we have the authority to designate within the meaning of the CIPM MRA and this designation is compatible with the spirit, rights and obligations of the CIPM MRA and with document CIPM MRA-D-06. Furthermore we confirm that the organization being designated understands and accepts the rights and obligations of designation.*

Your name and position within the designating body: \_\_\_\_\_

\_\_\_\_\_

Date: \_\_\_\_\_ Signature: \_\_\_\_\_

Please return to:  
BIPM Pavillon de Breteuil  
F-92312 Sèvres Cedex, France  
e-mail: [cfellag@bipm.org](mailto:cfellag@bipm.org); [jcrb\\_es@bipm.org](mailto:jcrb_es@bipm.org)

# Outline

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- Role of DIs in the context of the CIPM MRA
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# Recommendations to designating authorities

- ♦ Carefully analyze the needs for national standards in the country:
  - Demand in the country? Strategic technology area?
- ♦ Avoid fragmentation of metrology landscape due to narrow scopes
- ♦ Consider alternatives to designation: accreditation/sub-contracting
- ♦ Avoid conferring unfair market advantage
  - Designation in the private sector needs special attention
- ♦ Engage in a Contractual arrangement with DI
  - include the requirements of CIPM MRA D06 in the contract





# Recommendations to designating authorities

- ◆ Involve the NMI in the finding and selection process of new DIs
- ◆ DI should have already experience in metrology and precise measurements
- ◆ Validate technical competence of the institute before designation with support of NMI, e.g. via pilot study
- ◆ Take care of availability of resources and financial stability of the DI
- ◆ Follow-up the performance of the DI
- ◆ Inform BIPM and RMO on relevant changes of the DI



# Subcontracting as alternative to designation

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**Avoid designation of DIs with a very limited scope, e.g. only one CMC**

- inefficient for institute and RMO
- risk of fragmentation

Alternative ([CIPM 2005-09](#)): **NMI or DI subcontracts the service to the expert lab**  
e.g. for making use of a very expensive or unique facility not available at the NMI/DI

- ◆ NMI/DI assures capability and competence of the lab, including QMS
- ◆ NMI/DI takes full responsibility for calibrations carried out
- ◆ NMI/DI keeps the subcontracted process in its own QMS
- ◆ Name of the subcontracted lab is not published in the KCDB

# Recommendations to DIs



- ◆ Strategy of the organization to include “maintenance of national standards” (in particular if DI is part of a larger organization)
- ◆ Establish the technical requirements for maintaining national standards
- ◆ Train the staff, in particular for metrology specific aspects
- ◆ Maintain regular interactions with NMI
  - on metrology aspects
  - on QMS matters
- ◆ Participate in TC meetings and activities of the RMO (and in CC WGs)
- ◆ Participate in key and supplementary comparisons
- ◆ **Start working immediately after the designation “towards CMCs”**

# Governance of national metrology system

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- ◆ Each country should find the most appropriate model, fitting best to the specific situation in the country
- ◆ Typical forms of coordination:
  - a) by the NMI
  - b) by a ministry or other national authority
  - c) Metrology Council, representing NMI, DIs & ministry
- ◆ In any case, it is recommended that NMI should have a central role
- ◆ Contractual arrangements are recommended

# Outline

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- Examples of DI's within the SIM region

## What are the Measurement Capabilities in the 20 DIs in SIM?

Ionizing Radiation	4
Electricity & Magnetism	3
Chemistry (amount of substance)	3
Time & Frequency	2
Flow	2
Force	2
Mass	2
Temperature	1
Dimensional	1
Pressure	1

Country	NMI	DI	Quantity	CMCs?
Argentina	INTI	CNEA	Ionizing Radiation	YES
Brazil	INMETRO	LNMRI/IRD	Ionizing Radiation	YES
Brazil	INMETRO	ON/DSHO	Time & Frequency	YES
Canada	NRC	TCC	Gas Flow	YES
Chile	INN / RNM	CESMEC	Mass	YES
Chile	INN / RNM	CESMEC	Temperature	YES
Chile	INN / RNM	CISA	Flow	NO
Chile	INN / RNM	CODELCO	Amount of Substance	NO
Chile	INN / RNM	DICTUC	Dimensional	YES
Chile	INN / RNM	ENAER	Pressure	NO
Chile	INN / RNM	IDIC	Force	YES
Chile	INN / RNM	ISP	Amount of Substance	NO
Chile	INN / RNM	UDEC	Electricity & Magnetism	YES
Costa Rica	LACOMET	ICE	Electricity & Magnetism Time & Frequency	YES
Costa Rica	LACOMET	LanammeUCR	Force	NO
Costa Rica	LACOMET	RECOPE	Mass	NO
Mexico	CENAM	CENICA	Ozone in air	NO
Mexico	CENAM	ININ	Ionizing Radiation	YES
Uruguay	LATU	MIEM-LSMRI	Ionizing Radiation	NO
Uruguay	LATU	UTE	Electricity & Magnetism	YES

Q: How Many  
of the 20 SIM DIs  
have CMCs?

**A: 60%**  
**(12 of 20)**

# Tales from Designation

Planeta Saturno e alguns de seus satélites



- ◆ Founded in 1827
- ◆ Part of the Brazilian Ministry of Science and Technology
- ◆ Designated for Time and Frequency by INMETRO since 1983
- ◆ Derives traceability from BIPM
- ◆ Provides traceability to all Brazilian laboratories



# Tales from Designation: Brazil

Planeta Saturno e alguns de seus satélites



- ◆ ON considers designation essential
  - Needed for traceable measurements
  - Provides confidence
- ◆ Designated because:
  - First institute of Brazil to work in Time and Frequency
  - Had the equipment, personnel, expertise
- ◆ Designation requires:
  - Engagement with INMETRO
  - Large investment in facilities, equipment, staff



## Tales from Designation: Canada

- ◆ TCC: doing gas flow measurements since 2001
- ◆ Designated by NRC since 2006
  - Designated because:
  - TCC is one of only 3 institutes in the world that can perform these calibrations

TransCanada Pipeline runs through their facility





## Tales from Designation: Canada



- ◆ Accredited by CLAS Measurement Canada for Flow
- ◆ Verifications and Inspections to perform Legal Metrology for Meters provided by Measurement Canada
  - Ultrasonic, Turbine, and Rotary meters
- ◆ Benefits of Designation:
  - International trade

## Tales from Designation: Argentina



- ◆ The National Commission for Atomic Energy (CNEA) is INTI's only DI
  - INTI has refused requests from other interested institutes
- ◆ Designated because:
  - Only institute in the country that has the resources
  - INTI does not have the resources to provide these capabilities



# Tales from Designation: Argentina

CNEA has 2 laboratories:

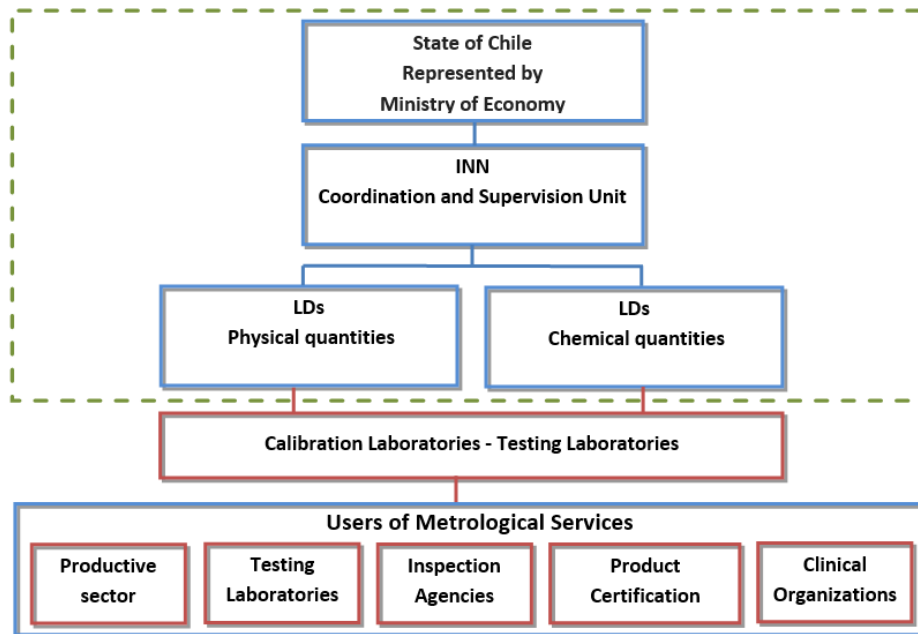
- **Radioisotopes (primary)**
  - ♦ **CMC's are published in the KCDB**
- **Dosimetry (secondary)**
  - ♦ No current CMCs
  - ♦ Quality system was presented to / approved by QSTF in 2006 but it expired in 2011
  - ♦ Accredited, so maintaining capabilities
  - ♦ INTI wants them to have formal CMCs, but for them accreditation is sufficient



- ◆ All DIs are coordinated by the National Institute of Standardization (INN)
  - Not a traditional NMI
  - INN has no laboratories, only DIs
- ◆ DIs + INN forms the National Network of Metrology (Red Nacional de Metrología (RNM))

# Tales from Designation: Chile

## Metrological structure in Chile



## Tales from Designation: Chile

Designated Institutes are chosen by:

- Public announcement
- Direct invitation
- Request from institutes that wish to invest in a specific area

Designated Institutes are a mix of public, private and academic institutes



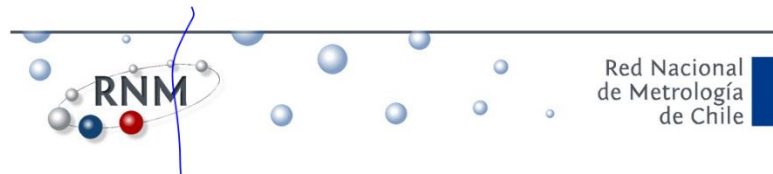


## Metrology in Chile is a public-private-university partnership of ONLY Designated Institutes

Name	Organization	Designated Institute for
DICTUC S.A.	Catholic University of Chile	Length
CESMEC Ltda	Center for Studies, Measurement and Quality Certification	Mass Temperature
IDIC	Research and control institute of the Army	Force
ENAER	National Aeronautics Company	Pressure Humidity
CISA S.A.	Industrial calibrations	Liquid flow
UDEC	Concepción University	Electricity
ISP	Public Health Institute	Water and food analysis
CODELCO	Chilean Copper Company	Metals and alloys analysis
CCHEN	Chilean Nuclear Energy Commission	Ionizing radiation



## Tales from Designation: Chile



### National Metrology Network

The RNM is a public-private partnership created by the Chile to coordinate and manage the metrological system and dissemination of quantities, in accordance with its status as signatory of Metre Convention and signatory of CIPM - MRA; ensuring that measurements made in Chile are comparable and traceable to SI and accepted in other countries.

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# In Summary, Designated Institutes...

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- ◆ Participate in the MRA within their limited area of activity, equally with NMIs
- ◆ Undergo the same review process for CMCs as NMIs
- ◆ Have the same obligations to have an approved Quality Management System as NMIs
- ◆ Publish in the Key Comparison Database
- ◆ Receive the same recognition under the MRA

# Summary

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- ◆ DIs play an essential role within the CIPM MRA:
  - 156 DIs worldwide hold ~15% of CMCs
  - half of signatories of CIPM MRA have DIs
- ◆ DIs bring in additional expertise, in particular in non-traditional fields  
Areas with highest relevance of DIs are RI and QM
- ◆ DIs may be the choice to for an efficient use of available national capabilities (in particular for emerging economies)

# Summary – Additional Information in Guides

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## ◆ Guides:

- CIPM MRA-D-06 is a clear guideline for the designation process and expectations of the DI's
  - ◆ <https://www.bipm.org/utils/common/documents/CIPM-MRA/CIPM-MRA-D-06.pdf>
- EURAMET Guide 2 gives recommendations to:  
Designating authority / DIs / NMI / RMO
  - ◆ Downloadable from the Euramet media center  
<https://www.euramet.org/publications-media-centre/documents/>



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